



**EAST  
ZONE**

## **TRAI AUDIT BROADBAND REPORT – KOLKATA - AUDIT OF OND QUARTER, 2015**

**Prepared By -**



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## 1. INTRODUCTION

### 1.1 About TRAI

TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace that will enable India to play a leading role in the emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

In pursuance of above objective, TRAI has been issuing regulations, order and directives to deal with the issues or complaints raised by the operators as well as the consumers. These regulations, order and directives have helped to nurture the growth of multi operator multi service - an open competitive market from a government owned monopoly. Also, the directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

TRAI initiated a regulation - The Standards of Quality of Service of Basic Telephone Service (Wire line) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated 20th March, 2009, the "Standards of Quality of Service for Wireless Data Services Regulations, 2012 dated 4th December 2012, and the "Quality of Service of Broadband Service Regulations", 2006 (11 of 2006) dated 6th October, 2006 that provide the benchmarks for the parameters on customer perception of service to be achieved by service provider.

In order to assess the above regulations, TRAI has commissioned a third party agency to conduct the audit of the service providers and check the performance of the operators on the various benchmarks set by Telecom Regulatory Authority of India (TRAI).

### 1.2 OBJECTIVES

The primary objective of the Audit module is to:

- ✎ Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).

### 1.3 COVERAGE

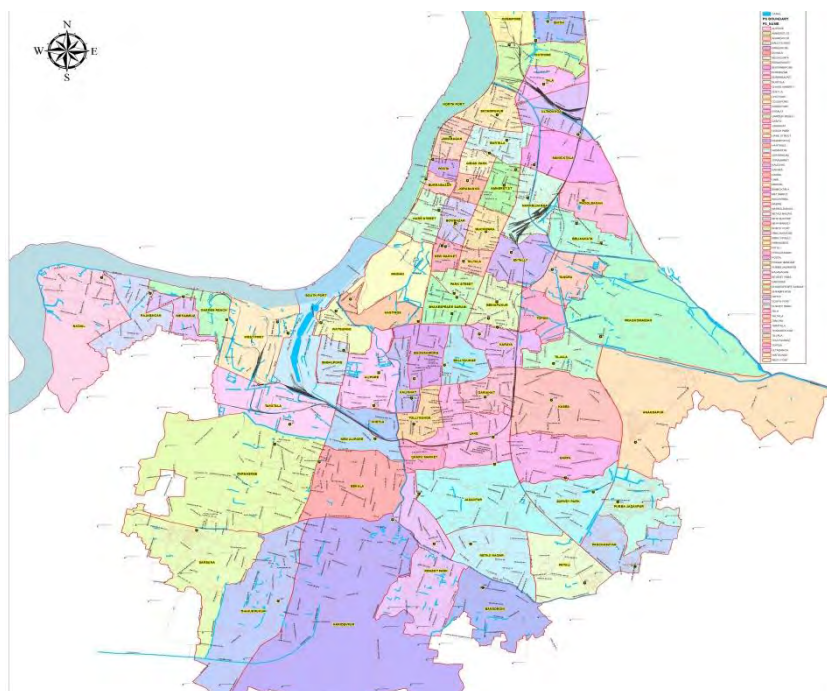


Image Source: Internet

The broadband audit was conducted in Kolkata circle. For BSNL, a geographical spread among the SDCAs and POPs was maintained. For other operators, the audit was conducted for all SDCAs at overall level.

### 1.4 AUDIT PROCESS AND OPERATOR SELECTION

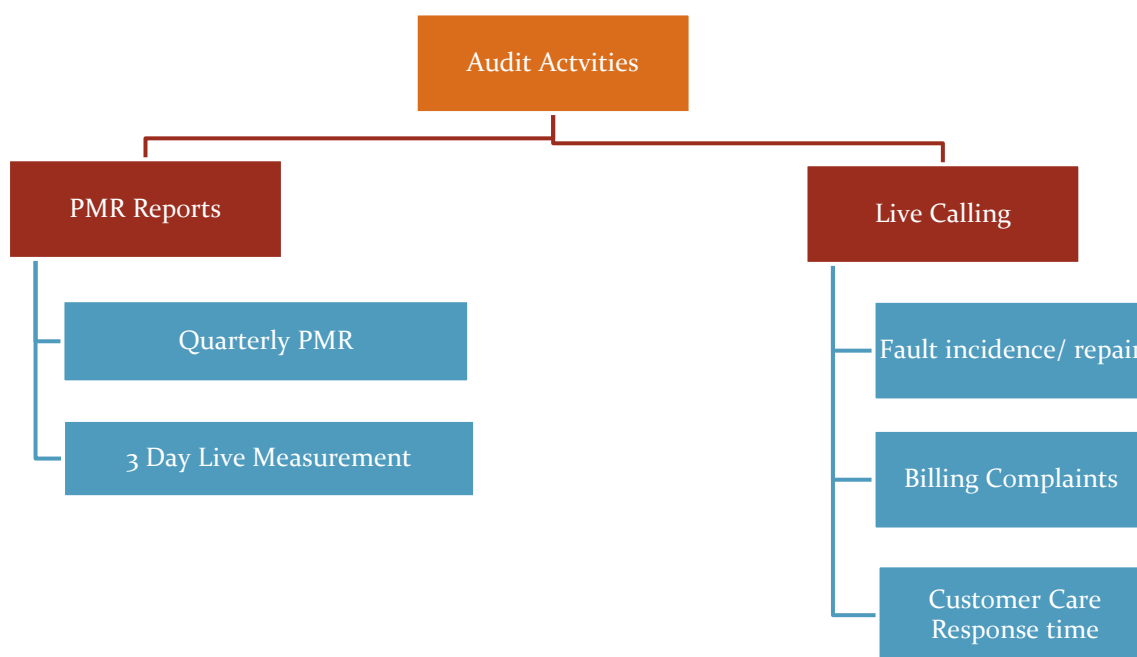
As per TRAI guidelines, the Broadband Audit for a circle is conducted once every year.

- The operators have been assimilated as per TRAI guidelines given in QoS tender document 2015 and latest list of licensees (with more than 10,000 subscriber in their LSAs) provided by TRAI.
- To conduct the audit, IMRB auditors contacted the broadband operators given in the list below to conduct the audit in Kolkata circle for the OND 2015 quarter.

Airtel
BSNL
Alliance
TATA
Siti
Wish Net
Meghbela Cable
Ortel
Reliance

- The PMR was generated from the raw data pertaining to Oct, Nov and Dec 2015 (OND'15), which was extracted by auditor from the operator's systems during the audit conducted in the month of Jan 2016.
- Live calling activity was carried out during the period of Dec 2015. The data considered for live calling was for the month prior to the live calling month. In this round of audit, Nov 2015 data was considered for live calling for all operators whereas live measurement was carried out at the centralised operation centres of the operators, as per tender document.
- 3 day live measurement activity was carried out on working days during the month of Dec 2015. The data for the last three working days from the date of live measurement was extracted from operator's systems and audited by the auditors.

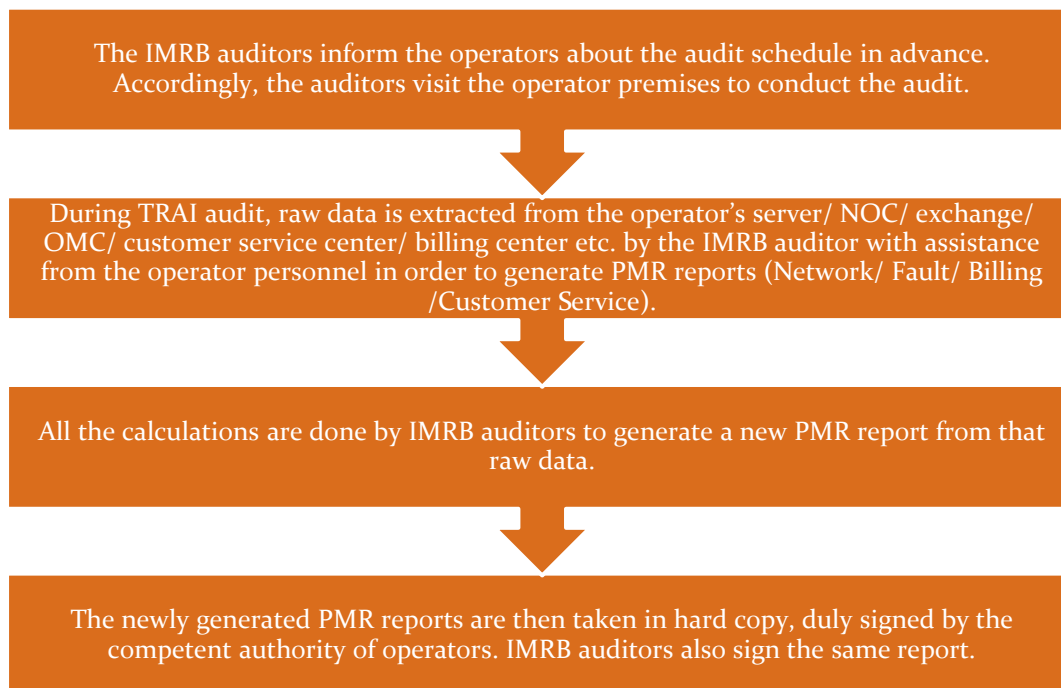
## 1.5 FRAMEWORK USED



### 1.5.1 PMR REPORTS - SIGNIFICANCE AND METHODOLOGY

The significance of PMR or Performance Monitoring Reports is to assess the various Quality of Service (QoS) parameters involved in the Broadband services, which indicate the overall health of service for an operator.

To verify the QoS performance of the operators, TRAI has appointed IMRB as their auditor in East Zone to conduct QoS audit of operators. The steps involved in the audit have been given below.



The raw data extracted is then used to generate PMR reports in the following formats.

- ↳ Quarterly PMR
- ↳ 3 Day Live Measurement Data

Let us understand these formats in detail.

This report has been prepared from the raw data extracted for the period of OND'15 during Jan 2016.

#### 1.5.1.1 QUARTERLY PMR REPORT – PARAMETERS REVIEWED

The main purpose of quarterly PMR report is to verify the following key QoS parameters on quarterly basis as per the methodology stated above in section 1.4.

- Service Provisioning
- Fault incidence/clearance related statistic
- Billing Performance (Metering and billing credibility)
- Resolution of billing complaints
- Response time to customer for assistance
- Bandwidth Utilization
- Broadband download speed
- Service Availability/ Uptime
- Network Latency/ Packet Loss

### 1.5.1.2 3 DAY LIVE MEASUREMENT - SIGNIFICANCE AND METHODOLOGY

The main purpose of 3 day live measurement is to evaluate the following parameters on intraday basis. The auditors visit the sample exchanges (in case of BSNL) and main exchanges (in case of other operators) to collect the 3 day live data for the following parameters.

- Bandwidth Utilization
- Broadband download speed
- Service Availability/ Uptime
- Network Latency/ Packet Loss

While the quarterly PMR report provides an overall view of the performance of QoS parameters, the 3 day live data helps looking at intraday performance on the above given parameters. All the calculations are then done on the basis of that raw data of 3 days.

### 1.5.1.3 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per QoS regulations 2006 (11 of 2006), Time Consistent Busy Hour” or “TCBH” means the one hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration and such Time Consistent Busy Hour shall be established on the basis of analysis of traffic data for a period of ninety days.

Step by step procedure to identify TCBH for an operator:

Day wise raw data is fetched from the operator's OMCR and kept in a readable format (preferably MS-Excel). Data for a period of 90 days is used to identify TCBH.

The 90 day period is decided upon the basis of month of audit. For example, for audit of Dec 2015, the 90 day period data used to identify TCBH would be the data of, Oct, Nov & Dec 2015

For each day, the hour in which average traffic of the resource group concerned is greatest for the day will be the 'Busy Hour' for the operator.

The modal frequency of the busy hour is calculated for 90 days period and the hour with highest modal frequency will be considered as TCBH for the operator

During audit, the auditors identified following TCBHs from the raw data collected from the operators for the quarter of OND'15.

Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
11:00 - 12:00	19:00 - 20:00	18:00 - 01:00	17:00- 18:00	20:00 - 21:00	1:00- 2:00	20:00 - 21:00	20:00-00:00	08:00-20:00

The data for network parameters has been taken as per the TCBH identified by the auditor for the operators.

## 1.5.2 LIVE CALLING - SIGNIFICANCE AND METHODOLOGY

The main purpose of live calling is to verify the performance of following parameters by doing test calls to the subscribers/ specific numbers.

- Service Provisioning
- Fault incidence/clearance related statistic
- Resolution of billing complaints
- Response time to customer for assistance

The process of conducting live calling has been stated below.

The IMRB auditor visits the operator premises such as main exchanges/ OMC/ customer service center etc. to do live calling. The auditors take the raw data of service provisioning, fault repair, customer complaints (billing) from the operator's system for the preceding month and also the list of customer service numbers to be verified through live calling

IMRB auditors then make live calls to a random sample of subscribers from the raw data provided to verify the resolution of complaints

The auditors also verify the performance of call center by calling the numbers using operator's wireline network

Let us now discuss the methodology of live calling for each parameter in detail.

### 1.5.2.1 SERVICE PROVISIONING

Live calling for service provisioning is done to verify the following.

- ✎ Number of connections provided in 15 days from customer request

#### Live Calling Process:

- ✎ Auditors request the operator to provide the database of all the subscribers who requested for a new connection in one month prior to IMRB auditor visit
- ✎ 100 Calls per service provider are made to customers or in case of BSNL, 10% or 30 per SDCA by randomly selecting from the database provided by operator
- ✎ Auditors check and record whether the connection was provided to customers within the timeframes as mentioned in the benchmark

#### Benchmark:

- ✎ New connections provided within 15 days: 100%

### 1.5.2.2 FAULT CLEARANCE

Live calling for fault clearance is done to verify the following.

- ✦ Fault repair by next working day
- ✦ Fault repair within 3 working days

#### Live Calling Process:

- ✦ Auditors request the operator to provide the database of all the subscribers who reported Faults in one month prior to IMRB auditor visit
- ✦ Calls are made to up to 10% or 100 complainants, whichever is less, per service provider or in case of BSNL, if there are more than 1 SDCA's selected for the sample, 10% or 30 complainants per sample SDCA by randomly selecting from the list provided by operator.
- ✦ Auditors check and record whether the fault was corrected within the timeframes as mentioned in the benchmark

#### Benchmarks:

- ✦ Fault repair by next working day: =>90%
- ✦ Fault repair within 3 working days: =>99%

### 1.5.2.3 RESOLUTION OF BILLING COMPLAINTS

Live calling is done to verify Resolution of billing complaints within stipulated time. The process for this parameter is stated below.

- ✦ Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically
- ✦ A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator
- ✦ Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

#### Benchmarks:

100% complaints resolved within 4 weeks.

### 1.5.2.4 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

Live calling is done to verify response time for customer assistance is done to verify the performance of call center in terms of

- ✦ % age of calls answered by operator ( voice to voice) within 60 seconds: In 60% of the cases or more
- ✦ % age of calls answered by operator (voice to voice) within 90 seconds: In 80% of the cases or more

The process for this parameter is stated below.

- ⇒ Overall sample size was 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS.
- ⇒ Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.
- ⇒ All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

## 1.6 SAMPLING METHODOLOGY

- As per audit tender regulations, to conduct the Broadband audit for BSNL, auditors need to devise a sampling plan as given below
  - A minimum sample of 5% Point of Presence (POP) of ISP should be spread across at least 10% of SDCA's in the telecom circle
  - As per TRAI instructions, a DSLAM site was considered as a point of presence for the operator.
- The sampling plan was finalized as per TRAI guidelines. The POP details have been provided below in section 5.10 of the report, Whereas for Reliance, Ortel and TATA has only 1 POP.
- As per tender guidelines, no sampling activity was required in case of operators other than BSNL. Hence, the audit for operators other than BSNL has been conducted by taking the data for entire circle (all exchanges/ POPs combined).

Audit for BSNL has been conducted for the data pertaining to selected POPs in the sampling plan.

Name of Operator	Customers
Airtel	44528
BSNL	127296
Alliance	88738
TATA	1872
Siti	86088
Wish Net	19702
Meghbela Cable	43473
Ortel	1820
Reliance	6000

## 1.7 COLOUR CODE TO READ THE REPORT



**Not Meeting the benchmark**

## 1.8 AUDIT METHODOLOGY

As per audit tender, following table explains the audit methodology for Broadband services. Here, a YES signifies that the mentioned parameter gets audited by the given audit method (PMR/ Live Measurement/ Live Calling).

	Parameters	Quarterly PMR Data	3 day live measurement	Live calling
1	<b>Service Provisioning/ Activation time</b>	YES		YES
2	<b>Fault Repair/ Restoration Time</b>	YES		YES
3	<b>Billing Performance</b>			
(i)	Billing Complaints per 100 Bills issued	YES		
(ii)	%age of billing complaints resolved in four weeks	YES		Yes
(iii)	Refund of deposits after closure within 60 days	YES		
4	<b>Response time to the customer for assistance(Voice to Voice)</b>			
(i)	<i>Within 60 seconds &gt; 60%</i>	YES		YES
(ii)	<i>Within 90 seconds &gt; 80%</i>	YES		YES
5	<b>Bandwidth Utilization/ Throughput:</b>			
	<i>A) Bandwidth Utilization</i>			
-	POP to ISP gateway Node [Intra – network] Links	YES	YES	
-	ISP Gateway Node to IGSP / NIXI Node upstream Link(s) for international connectivity	YES	YES	
	<i>B) Broadband Connection Speed (Download)</i>	YES	YES	
6	<b>Service Availability/Uptime</b>	YES	YES	
7	<b>Packet Loss</b>	YES	YES	
8	<b>Network Latency for wired broadband access)</b>			
(i)	<i>User reference point at POP / ISP Gateway Node to International Gateway (IGSP/NIXI)</i>	YES	YES	
(ii)	<i>User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)</i>	YES	YES	
(iii)	<i>User reference point at ISP Gateway Node to International nearest NAP port abroad ( Satellite)</i>	YES	YES	

## 2. EXECUTIVE SUMMARY

### 2.1 PMR QUARTERLY DATA – OND'15

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall broadband performance of various operators with a parameter wise performance evaluation as compared to TRAI benchmark.

Parameters	Benchmarks	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Service provisioning uptime										
Percentage connections provided within 15 days	100%	100.00%	100.00%	100.00%	99.79%	100.00%	100.00%	100.00%	100.00%	NA
Fault repair restoration time										
Percentage faults repaired by next working days	≥ 90%	92.72%	91.32%	92.53%	94.74%	94.00%	98.90%	100.00%	92.36%	100.00%
Percentage faults repaired within three working days	≥ 99%	99.72%	99.31%	99.97%	98.43%	99.37%	100.00%	100.00%	99.62%	100.00%
Billing performance										
Billing complaints per 100 bills issued	< 2%	0.07%	0.06%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.07%
%age of billing complaints resolved in 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	NA	NA	NA	NA	NA
%age cases in which refund of deposits after closure was made in 60 days	100%	100.00%	NA	NA	NA	NA	NA	NA	NA	NA
Customer care/helpline assessment (Voice to Voice)										
Percentage calls answered within 60 seconds	≥ 60%	69.00%	NDR	78.02%	85.50%	74.67%	100.00%	93.00%	100.00%	97.14%
Percentage calls answered within 90 seconds	≥ 80%	95.00%	NDR	95.00%	89.00%	86.00%	100.00%	100.00%	100.00%	97.47%
Bandwidth utilisation/Throughput										
Intra network links (POP to ISP Node)		259	NDR	5	2	102	9	2	1	2
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		10365	NDR	15635	19490	6513	16221	4491	335	104000
Percentage bandwidth utilised on upstream links	<80% link(s)/route bandwidth utilization	79.20%	NDR	76.47%	71.09%	83.28%	73.79%	74.99%	59.70%	50.41%
Broadband download speed	≥ 80%	100.00%	89.00%	97.00%	99.88%	95.00%	100.00%	100.00%	87.33%	86.25%
Service availability/uptime	≥ 98%	99.58%	99.69%	33.70%	99.72%	99.37%	99.86%	99.86%	99.95%	99.86%
Packet loss	< 1%	0.20%	0.64%	0.68%	0.00%	0.04%	0.00%	0.00%	0.00%	0.49%
Network Latency										
POP/ISP Node to NIXI	< 120 msec	45	NDR	112	44.46	67	44	9	0.035	6
ISP node to NAP port (Terrestrial)	< 350 msec	76.33	NDR	315	44.46	125	NA	290	0.064	7

NA: Parameters not applicable for the operators.

NDR: No data received. Audit of BSNL at its NOC for Bandwidth Utilization and Network Latency is yet to be conducted. Auditors have contacted the NOC of BSNL well in advance, however, the operator is yet to provide an appointment to IMRB auditors to conduct audit at BSNL NOC.

Following are the parameter wise observations for the operators in Kolkata circle.

### 2.1.1 SERVICE PROVISIONING/ ACTIVATION TIME

As per audit, all operators met the benchmark for providing new connections within 15 days.

NA: In the audit period, no new connection was registered with Reliance.

### 2.1.2 FAULT REPAIR/ RESTORATION

The benchmark of repairing 90% faults within the next day and 99% faults within next three days of receiving complaints was not met by TATA.

### 2.1.3 BILLING PERFORMANCE

As per audit, all operators met the benchmark for metering and billing credibility.

All the operators met the benchmark for resolution of billing complaints within 4 weeks.

NA: Subscribers did not log any billing complaints. Hence, resolution of billing complaints is not applicable for the operators.

### 2.1.4 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

All operators met the benchmark for answering 60% calls within 60 seconds and 80% calls within 90 seconds as per audit.

### 2.1.5 BANDWIDTH UTILIZATION AND THROUGHPUT

Siti failed meet the benchmark for bandwidth utilized on upstream links during audit.

Alliance failed to meet the benchmark for service availability time as per audit.

NDR: No data has been received from BSNL related to bandwidth utilization as stated above.

### 2.1.6 NETWORK LATENCY

All operators met the benchmark for Network Latency parameters.

NDR: No data has been received for these parameters from BSNL.

## 2.2 LIVE MEASUREMENT

Parameters	Benchmarks	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Bandwidth utilisation/Throughput										
Intra network links (POP to ISP Node)		2	NDR	5	2	102	30	2	1	2
Upstream Bandwidth (ISP Node to NIXI/NAP/IGSP)		10365	NDR	15635	19490	6513	5411	4491	335	106000
Percentage bandwidth utilised on upstream links	<80% link(s)/route bandwidth utilization	73.83%	NDR	76.47%	58.49%	83.28%	73.96%	74.99%	67.46%	69.60%
Broadband download speed	≥ 80%	100.00%	90.00%	97.00%	99.88%	96.00%	100.00%	NA	92.31%	95.00%
Service availability/uptime	≥ 98%	99.89%	99.31%	0.00%	99.84%	100.00%	100.00%	99.86%	100.00%	100.00%
Packet loss	< 1%	0.00%	0.00%	0.33%	2.00%	0.04%	0.00%	0.00%	0.00%	0.00%
Network Latency										
POP/ISP Node to NIXI	< 120 msec	45	NDR	110	44.46	71	64	9	0.035	1.51
ISP node to NAP port (Terrestrial)	< 350 msec	77	NDR	320	44.46	126	NA	290	0.064	2.1

For, Wish Net network latency <350 msec is not applicable because they don't have any satellite connection customers (DSL Customers).

NDR: No data received. Audit of BSNL at its NOC for Bandwidth Utilization and Network Latency is yet to be conducted. Auditors have contacted the NOC of BSNL well in advance, however, the operator is yet to provide an appointment to IMRB auditors to conduct audit at BSNL NOC.

### 2.2.1 BANDWIDTH UTILIZATION AND THROUGHPUT

Siti failed to meet the benchmark for bandwidth utilized on upstream links during live measurement.

All operators met the benchmark of providing committed broadband download speed as per live measurement.

Alliance failed to meet the benchmark for service availability time as per live measurement.

TATA failed to meet the benchmark for packet loss during live measurement.

### 2.2.2 NETWORK LATENCY

During live measurement, all operators met the benchmark for network latency parameters.

## 2.3 LIVE CALLING

Parameters	Benchmarks	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Service provisioning uptime										
Percentage connections provided within 15 days	100%	100.00%	95.00%	100.00%	98.00%	96.00%	89.00%	81.00%	92.00%	NA
Fault repair restoration time										
Percentage faults repaired by next working days	≥ 90%	80.00%	86.67%	73.33%	56.67%	83.33%	80.00%	93.33%	45.00%	68.00%
Percentage faults repaired within three working days	≥ 99%	100.00%	100.00%	96.67%	43.33%	86.67%	93.33%	96.67%	76.00%	84.00%
Billing performance										
%age of billing complaints resolved in 4 weeks	100%	100.00%	97.00%	99.00%	NA	NA	100.00%	NA	NA	75.00%
Customer care/helpline assessment (Voice to Voice)										
Percentage calls answered within 60 seconds	≥ 60%	90.00%	100.00%	100.00%	100.00%	100.00%	100.00%	90.00%	86.00%	98.00%
Percentage calls answered within 90 seconds	≥ 80%	100.00%	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%	100.00%	100.00%

NA: Parameters not applicable for the operators.

### 2.3.1 SERVICE PROVISIONING/ ACTIVATION TIMES

As per live calling, BSNL, TATA, Siti, Wish Net, Meghbela and Ortel failed to meet the benchmark of providing 100% new connections within the TRAI stipulated timeline of 15 days.

### 2.3.2 FAULT REPAIR/ RESTORATION

All operators failed to meet the benchmark of repairing 90% faults within next working day except Meghbela, however Alliance, TATA, Siti, Wish Net, Meghbela, Ortel and Reliance failed to meet the benchmark of repairing 99% faults within 3 days

### 2.3.3 BILLING PERFORMANCE

BSNL, Alliance and reliance failed to meet the benchmark for resolution of billing complaints within 4 weeks and BSNL & Alliance failed to meet the benchmark within 6 weeks.

NA: Live calling for Ortel, TATA, Siti and Meghbela for 'resolution of billing complaints' has not been conducted due to very low/ zero base of billing complaints for the operators.

### 2.3.4 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

As per live calling, all operators met both the benchmarks for customer care promptness parameters.

### 3. CRITICAL FINDINGS

#### Service Provisioning

- As per audit, all operators met the benchmark for providing new connections within 15 days. However, during live calling it was observed that BSNL, TATA, Siti, Wish Net, Meghbela and Ortel failed to meet the benchmark of providing 100% new connections within the TRAI stipulated timeline of 15 days.

#### Fault Repair

- All operators met the benchmark for the parameter Fault Repair within next working day as per audit; however all operators failed to meet the benchmark during live calling except Meghbela.
- All operators met the benchmark for the parameter Fault Repair within 3 working days as per audit; however Alliance, TATA, Siti, Wish Net, Meghbela, Ortel and Reliance failed to meet the benchmark during live calling.

#### Resolution of billing complaints

- As per audit, BSNL and Reliance failed to meet the benchmark for resolution of billing complaints within 4 weeks during live calling.

#### Refund of deposits after closure

- All operators met the benchmark for the parameter.

#### Bandwidth Utilization

- All operators met the benchmark for bandwidth utilization during audit except Siti.

#### Service Availability

- All operators met the benchmark for service availability time as per audit except Alliance.

## 4. DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA AND LIVE MEASUREMENT/ CALLING DATA

### 4.1 SERVICE PROVISIONING/ ACTIVATION TIME

#### 4.1.1 PARAMETER EXPLANATION

##### 4.1.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to number of applications received at the service provider's level in the following time frames:-

- ✎ Number of applications received at the service provider's level
- ✎ Number of connections provided within 15 days
- ✎ Number of connections provided after 15 days

#### Live Calling: -

- ✎ At least 10% of the subscribers who had requested for new connections in month prior to Audit were called to check whether connection was provided in 15 days

Data for the parameter was extracted from OMC (Operations and Maintenance Center) of the operators.

##### 4.1.1.2 COMPUTATIONAL METHODOLOGY

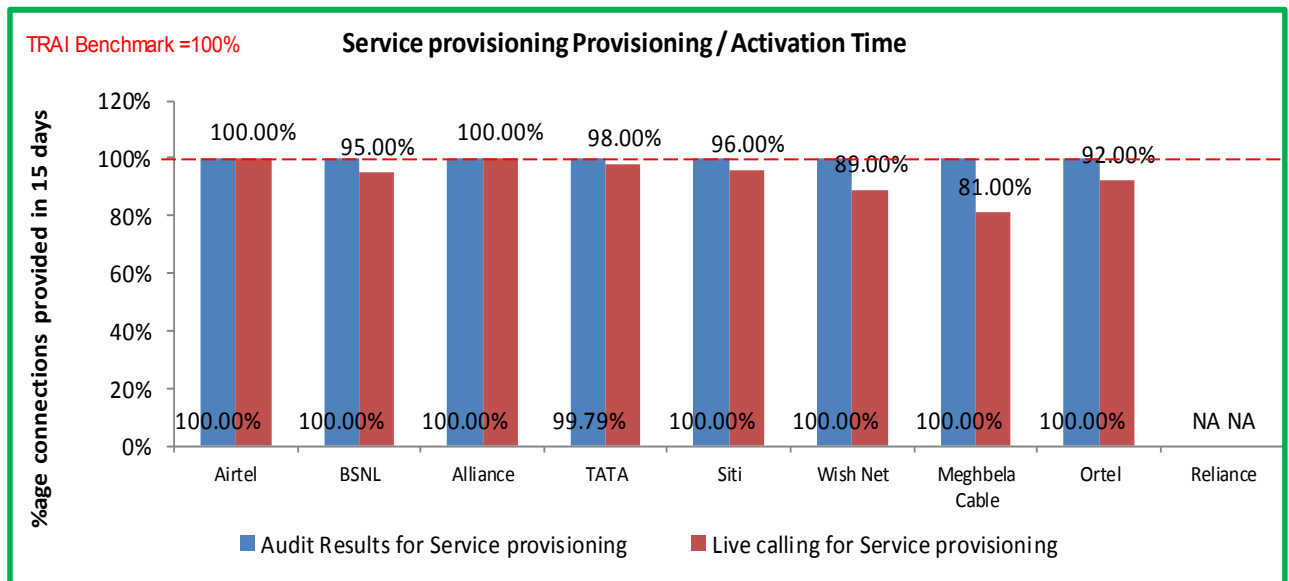
- ✎ Technically Non Feasible (TNF) cases such as unavailability of Broadband infrastructure/ equipment in the Area or Spare Capacity i.e. Broadband Ports including equipment to be installed at the customer premises for activating Broadband connection were excluded from the calculation of this parameter.
- ✎ Also, problems relating to customer owned equipment such as PC, LAN Card/ USB Port and internal wiring or non-availability of such equipment were excluded from the calculation of this parameter.

**Percentage connections provided within X working days =  $\frac{\text{No of connections provided within X working days}}{\text{Total number of connections registered during the period}} * 100$**

##### 4.1.1.3 BENCHMARK

100 % cases in =<15 working days.

#### 4.1.2 DETAILED FINDINGS - SERVICE PROVISIONING



Data Source: OMC (Operations and Maintenance Center) of the operators

As per audit, all operators met the benchmark for providing new connections within 15 days. However, during live calling it was observed that BSNL, TATA, Siti, Wish Net, Meghbela and Ortel failed to meet the benchmark of providing 100% new connections within the TRAI stipulated timeline of 15 days.

NA: In the audit period, no new connection was registered with Reliance.

### 4.2 FAULT REPAIR/ RESTORATION TIME

#### 4.2.1 PARAMETER EXPLANATION

##### 4.2.1.1 AUDIT PROCEDURE

IMRB Auditors to verify and collect data pertaining to number of fault received and also number of faults cleared at the service provider's level in the following time frames:-

- ✎ Number of faults cleared within 24 hours
- ✎ Number of cleared in more than 1 day but less than 3 days
- ✎ Number of cleared in more than 3 days

##### Live calling: -

- ✎ Live calling is done to verify 'Fault repair by next working day', 'Fault repair within 3 working days' and 'Fault repair in more than 3 working days'
- ✎ Interviewers ensure that operator provided a list of all the subscribers who reported Faults in one month prior to IMRB staff visit
- ✎ Calls are made to up to 10% or 100 complainants, whichever is less, per service provider or in case of BSNL, if there are more than 1 SDCAs selected for the sample, 10% or 30 complainants per sample SDCA by randomly selecting from the list provided by operator.
- ✎ Auditors check and record whether the fault was corrected within the timeframes as mentioned in the benchmark

Data for the parameter was extracted from OMC (Operations and Maintenance Center) of the operators.

#### 4.2.1.2 COMPUTATIONAL METHODOLOGY

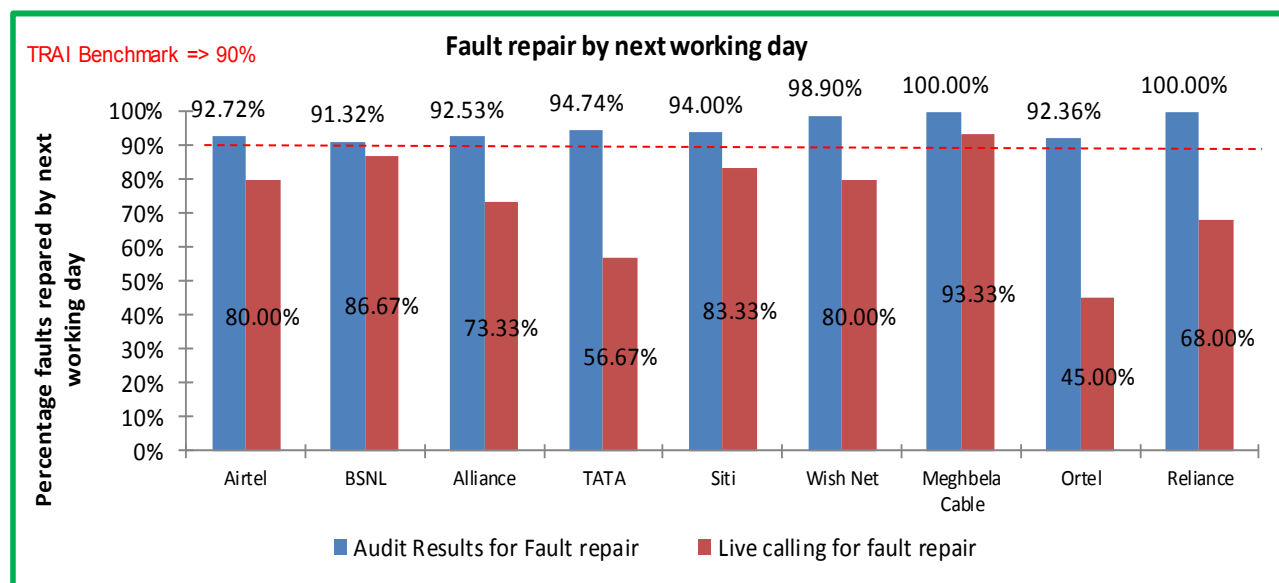
- ✎ The time period for fault repair starts from the time when the fault is reported to the service provider either through customer care help line or in person by the subscriber
- ✎ Only the complaints registered till the close of the business hours of the day are to be taken into account. All the complaints registered after the business hours are to be considered as being registered in the next day business hours

**Fault incidence = (Total no of faults repaired in X working days /Total number of faults reported during the period)\*100**

#### 4.2.1.3 BENCHMARK

- ✎ By next working day: => 90% and within 3 working days: => 99%.

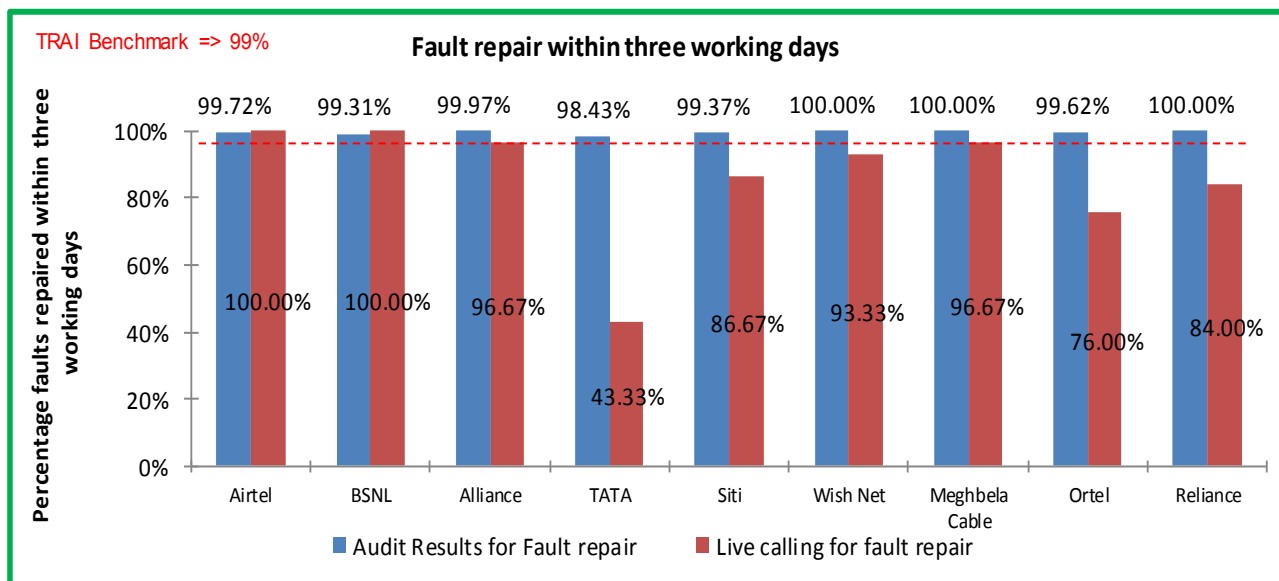
#### 4.2.2 DETAILED FINDINGS - FAULT REPAIR WITHIN NEXT WORKING DAY



Data Source: OMC (Operations and Maintenance Center) of the operators

All operators met the benchmark for the parameter as per audit; however all operators failed to meet the benchmark during live calling except Meghbela.

### 4.2.3 DETAILED FINDINGS - FAULT REPAIR WITHIN 3 WORKING DAYS



Data Source: OMC (Operations and Maintenance Center) of the operators

All operators met the benchmark for the parameter as per audit, however TATA, Siti, Wish Net, Meghbela, Ortel and Reliance failed to meet the benchmark during live calling.

## 4.3 METERING AND BILLING CREDIBILITY

### 4.3.1 PARAMETER EXPLANATION – BILLING COMPLAINTS

All the complaints related to billing as per clause 3.7.2 of QoS regulation of 2006 (11 of 2006) dated 6th October, 2006 were covered. The types of billing complaints covered are listed below.

- ✎ Payments made and not credited to the subscriber account
- ✎ Payment made on time but late payment charge levied wrongly
- ✎ Double charges
- ✎ Credit agreed to be given in resolution of complaint, but not accounted in the bill
- ✎ Charging for services provided without consent
- ✎ Charging not as per tariff plans
- ✎ Overcharging or undercharging

In addition to the above, any billing complaint which leads to billing error, waiver, refund, credit, or any adjustment is also considered as a billing complaint for calculating the number of disputed bills.

#### 4.3.1.1 AUDIT PROCEDURE

IMRB Auditors to verify and collect data pertaining to –

- ⇒ Number of Billing complaints received at the service provider's level
- ⇒ Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled.
- ⇒ Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills
- ⇒ Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc.
- ⇒ Billing complaints resolution database, with opening and closing date of complaint to identify the time taken to resolve a complaint

##### **Live calling:**

- ⇒ Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically. In case the sample data is too low to fulfill the target calls, auditors may call subscribers whose complaints got resolved in other months of the same audit period.
- ⇒ A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator
- ⇒ Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

Raw data for the parameter was extracted from central billing center of the operators.

#### 4.3.1.2 COMPUTATIONAL METHODOLOGY – METERING AND BILLING CREDIBILITY

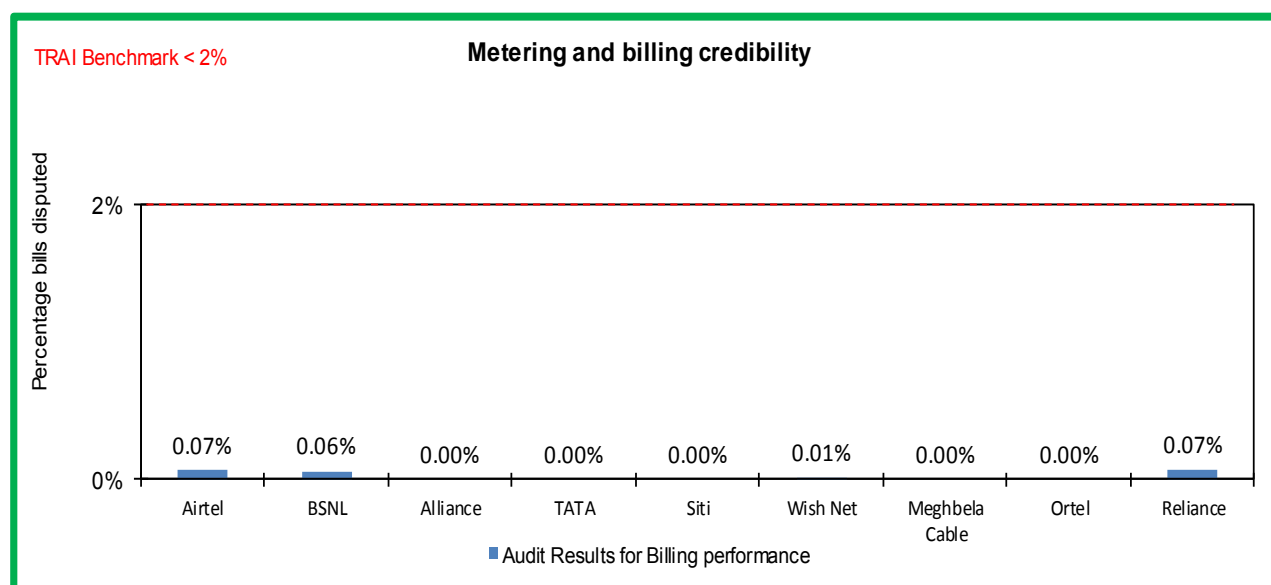
The calculation methodology (given below) as per QoS regulations 2006 (11 of 2006) dated 6th October, 2006 was followed to calculate incidence of billing complaints.

$$\text{Billing complaints (\%)} = \frac{\text{total number of disputed bills} \times 100}{\text{total number of bills issued during one billing cycle.}}$$

- ✎ \*Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated
- ✎ \*\*Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.

**TRAI Benchmark:** < 2%

#### 4.3.1.3 METERING AND BILLING CREDIBILITY – AUDIT FINDINGS



Data Source: Billing Center of the operators

All operators met the benchmark for the parameter.

#### 4.3.1.4 COMPUTATIONAL METHODOLOGY – RESOLUTION OF BILLING COMPLAINTS

##### ✍ **Calculation of Percentage resolution of billing complaints**

The calculation methodology (given below) as per QoS regulations 2006 (11 of 2006) dated 6th October, 2006 and TRAI guidelines (Received on Sep 08, 2014) was followed to calculate resolution of billing complaints.

##### **Resolution of billing complaints within 4 weeks:**

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

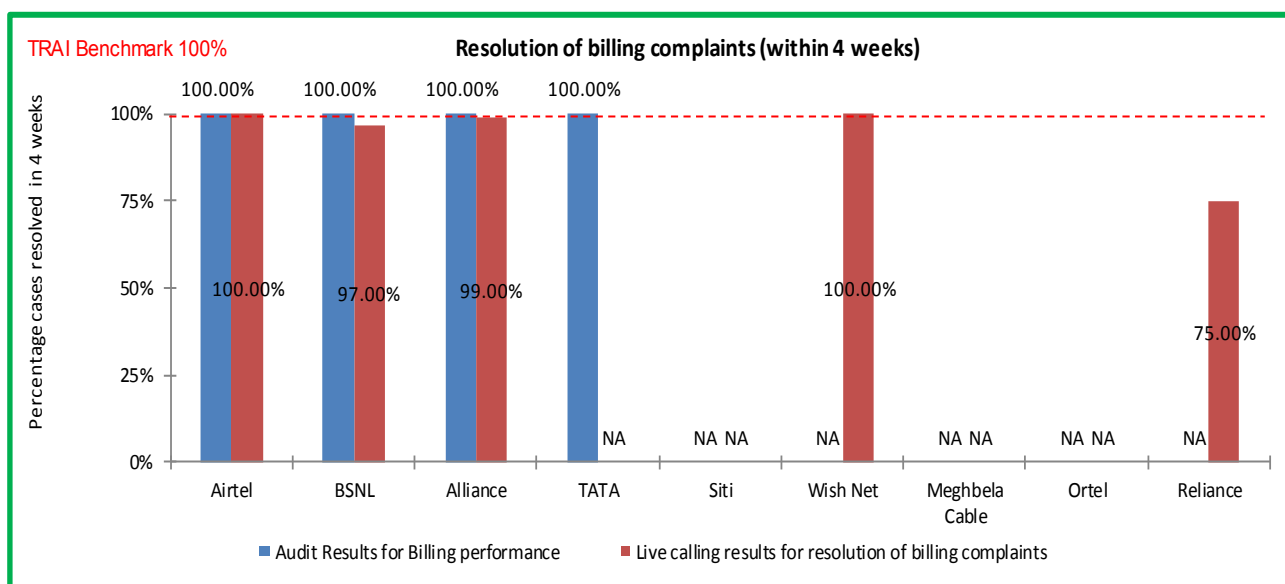
$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 4 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

- \*\*Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally. Complaints raised by the consumers to operator are only considered as part of the calculation.
- The complaints that get marked as invalid by the operator are not considered for calculation as those complaints cannot be considered as resolved by the operator.

✍ \*\*\* Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.

Benchmark: 100% complaints resolved within 4 weeks.

#### 4.3.1.5 RESOLUTION OF BILLING COMPLAINTS – AUDIT FINDINGS



As per audit, BSNL and Reliance failed to meet the benchmark for resolution of billing complaints within 4 weeks during live calling. However, it was observed during live calling that the performance of BSNL and Alliance failed meet the benchmark within 6 weeks.

NA: Subscribers of Siti, Meghbela, Wishnet, Reliance and Ortel did not log any billing complaints. Hence, resolution of billing complaints is not applicable for these operators. Also, live calling for resolution of billing complaints for Siti, Meghbela and Ortel has not been conducted due to low/ zero base billing complaints for the operators.

## 4.4 TIME TAKEN TO REFUND AFTER CLOSURE

### 4.4.1 PARAMETER EXPLANATION

#### 4.4.1.1 AUDIT PROCEDURE

IMRB Auditors collected and verified data pertaining to -

- ↗ Number of cases requiring refund of deposits
- ↗ Number of cases where refund was made within 60 days
- ↗ %age cases where refund was made within 60 days.

Data for the parameter was extracted from central billing center of the operators.

#### 4.4.1.2 COMPUTATIONAL METHODOLOGY

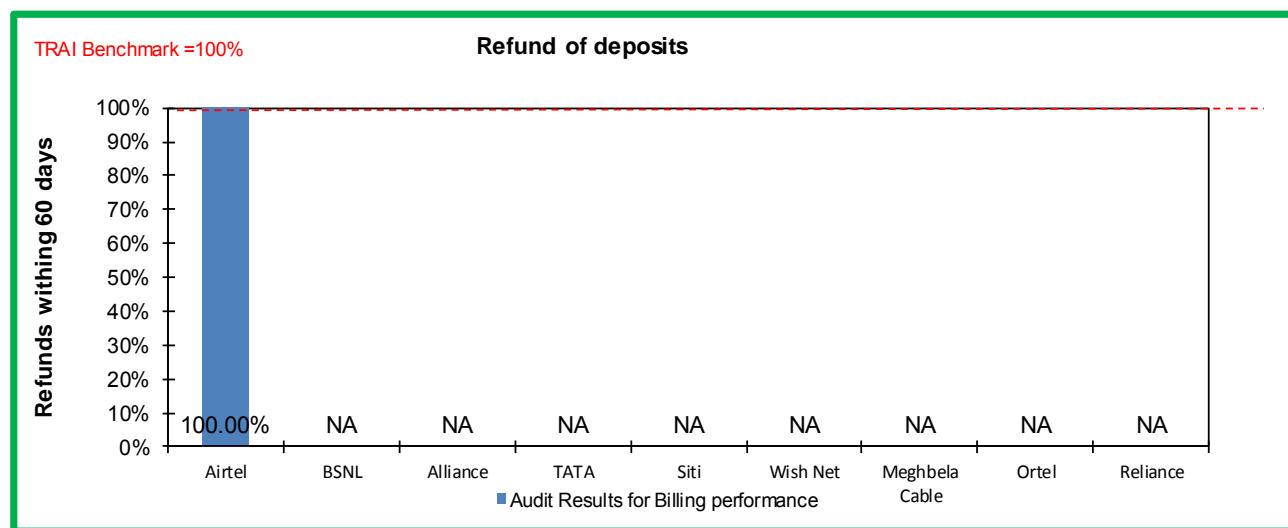
- ↗ Date of closure is considered to be the date on which the connection is discontinued in the service provider database of active customers

**Time taken to refund = Date of refund – Date of closure**

#### 4.4.1.3 BENCHMARK

- ↗ 100% cases in less than 60 days

### 4.4.2 DETAILED FINDINGS - REFUND OF DEPOSITS



Airtel met the benchmark for the parameter.

NA: Ortel, BSNL, Alliance, TATA, Siti, Wish Net, Meghbela and Reliance had no cases where a refund was applicable.

## 4.5 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

### 4.5.1 PARAMETER EXPLANATION

#### 4.5.1.1 AUDIT PROCEDURE

IMRB Auditors collected and verified data pertaining to

- ↗ Number of calls received by the operator
- ↗ Number and percentage calls answered within 60 seconds
- ↗ Number and percentage calls answered within 80 seconds

#### Live calling:

- ↗ Overall 100 number of live calls at different points of time were made in a licensed service area/circle for each service provider to assess the efficiency of the call center

Data for the parameter was extracted from central customer service center of the operators.

#### 4.5.1.2 COMPUTATIONAL METHODOLOGY

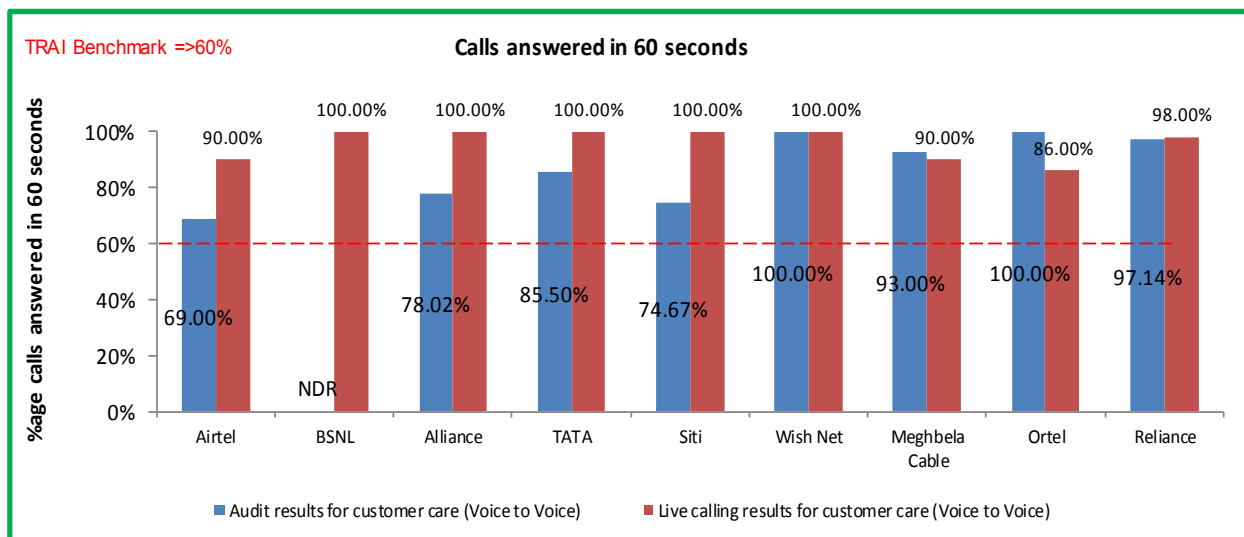
**%age of calls answered by operator (voice to voice) within n seconds = (Number of calls where time taken for operator to respond\* >= n sec / Total number of calls where an attempt to route to the operator was made) x 100)\*.**

**Time taken for operator to respond = Time when an operator responds to a call – Time when the relevant code to reach the operator is dialled**

#### 4.5.1.3 BENCHMARK

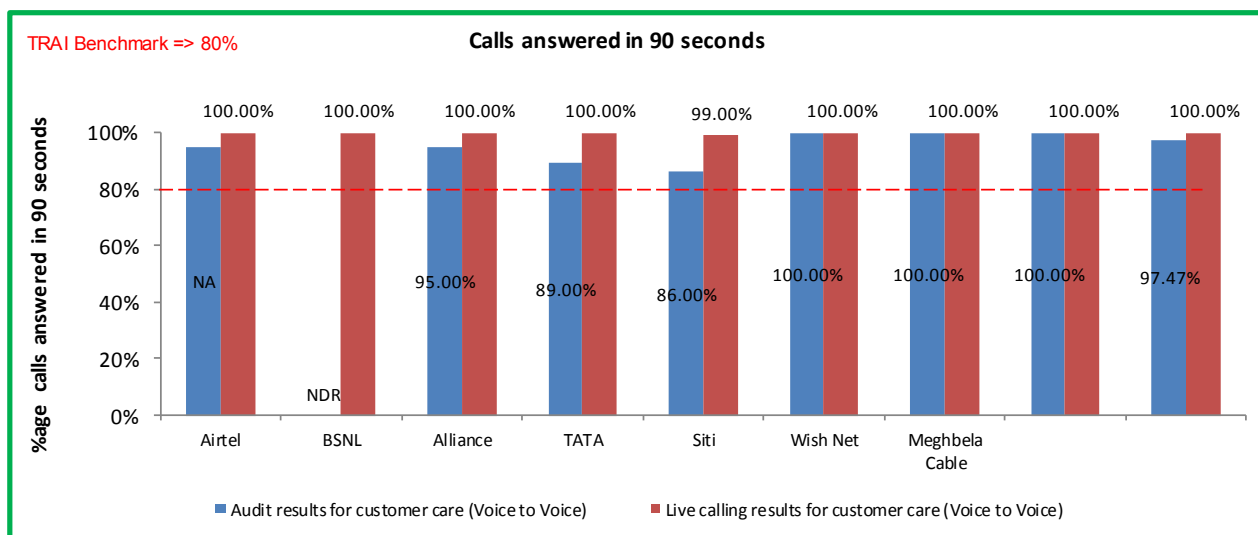
- ↗ Calls answered within 60 seconds => 60 %
- ↗ Calls answered within 90 seconds => 80%

#### 4.5.2 DETAILED FINDINGS - CALL ANSWERED WITHIN 60 SECONDS



Data Source: Customer Service Center of the operators

#### 4.5.3 DETAILED FINDINGS - CALL ANSWERED WITHIN 90 SECONDS



Data Source: Customer Service Center of the operators

**Aircel has centralized call center so they were not able to provide the data.**

All operators met the benchmark for answering 60% calls within 60 seconds and 80% calls within 90 seconds as per audit.

## 4.6 BANDWIDTH UTILIZATION & DOWNLOAD SPEED

### 4.6.1 PARAMETER EXPLANATION – BANDWIDTH UTILIZATION

#### 4.6.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to –

#### POP to ISP gateway Node [Intra – network] Links

- ✎ Auditors to verify and collect data pertaining to Total Bandwidth available and Total Bandwidth utilized during TCBH at some of the sample intra network links (POP to ISP Node) on each of the three days of live measurement separately
- ✎ Total Bandwidth available and Total bandwidth utilized during at the sample links TCBH for the complete month of audit
- ✎ Total number of intra network links having >90% bandwidth utilization during the month of Audit

#### ISP Gateway Node to IGSP / NIXI Node upstream Link's) for international connectivity

- ✎ Total number of upstream links for International connectivity
- ✎ Total number of links having Bandwidth > 90% Total Bandwidth available and Total Bandwidth utilized on all the upstream links during TCBH (POP to ISP Node) on each of the three days of live measurement separately
- ✎ Total Bandwidth available and Total bandwidth utilized at all the international links during TCBH for the complete month of audit (Also obtain details separately for the days)

Data for the parameter was extracted from NOC (Network Operations Center) of the operators.

#### 4.6.1.2 COMPUTATIONAL METHODOLOGY

**Percentage Bandwidth available on the link =  $\frac{\text{Total Bandwidth} * \text{utilised in TCBH for the period}}{\text{Total Bandwidth Available during the period}} * 100$**

#### 4.6.1.3 BENCHMARK

- ✎ < 80% link(s)/route bandwidth utilization during peak hours (TCBH).
- ✎ If on any link(s)/route bandwidth utilization exceeds 90%, then network is considered to have congestion. For this additional provisioning of bandwidth on immediate basis, but not later than one month is mandated.

## 4.6.2 DETAILED FINDINGS – BANDWIDTH UTILIZATION

Audit results for Bandwidth Utilization										
Bandwidth utilization	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Intra-network links (POP to ISP Node)										
Total number of intra network links		259	NDR	5	2	102	9	2	1	2
No of Intra network found to be above 90%										
Total number of upstream links		259	NDR	5	1	12	18	4	1	2
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In Mbps)		10365	NDR	15635	19490	6513	16221	4491	335	104000
Total International Bandwidth utilised during peak hours		8209.48	NDR	11956	13855	5424	11969	3368	200	52423
Percentage Bandwidth utilisation during peak hours (In Mbps)	<80% link(s)/route bandwidth utilization	79.20%	NDR	76.47%	71.09%	83.28%	73.79%	74.99%	59.70%	50.41%
If on any link(s)/route/ bandwidth utilization exceeds 90%		0	NDR	0	0	0	0	0	0	0

&gt;&gt;

Live measurement results for Bandwidth Utilization										
Bandwidth utilization	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Intra-network links (POP to ISP Node)										
Total number of intra network links		2	NDR	5	2	102	30	2	1	2
International Bandwidth										
Total number of upstream links		2	NDR	5	0	12	6	4	1	2
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In Mbps)		10365	NDR	15635	19490	6513	5411	4491	335	106000
Total International Bandwidth utilised during peak hours		7652.56	NDR	11956	11400	5424	4002	3368	226	73777
Percentage Bandwidth utilisation during peak hours (In Mbps)	<80%	73.83%	NDR	76.47%	58.49%	83.28%	73.96%	74.99%	67.46%	69.60%
No of Intra network found to be above 90%		0	NDR	0	0	0	0	0	0	0

Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for bandwidth utilization during audit except Siti.

NDR: No data received. Audit of BSNL at its NOC for Bandwidth Utilization is yet to be conducted.

Auditors have contacted the NOC of BSNL, however, the operator is yet to provide an appointment to IMRB auditors to conduct audit at BSNL NOC.

## 4.6.3 PARAMETER EXPLANATION - BROADBAND DOWNLOAD SPEED

### 4.6.3.1 AUDIT PROCEDURE

Auditors collected and verified the following information from the operator's system.

- ✎ Total committed download speed to the all subscribers (In Mbps) (A)
- ✎ Total average download speed observed during TCBH (In Mbps)

#### Live Calling/ Measurement:

- ✎ Details of live customers were obtained from the service providers
- ✎ Overall 50 numbers of live calls at were made during peak hours (TCBH) in a licensed service area/circle for each service provider to assess the download speed available to subscribers. A download measurement software tool provided by the service providers was used for the same

- Details of total committed download speed and speed available to the users were recorded for each of the subscriber

#### 4.6.3.2 COMPUTATIONAL METHODOLOGY

- The download speed for one customer is calculated by the download speed measurement software using the formula provided below:

**Data Download Speed = Size of test file (data) in ISP server/ Transmission time required for error free transfer of the entire data**

Percentage download speed available was calculated as = Sum of total speed available for 50 customers/Total committed download speed for 50 customers\*100

#### 4.6.3.3 BENCHMARK

Subscribed broadband connection speed to be met  $\geq 80\%$  from ISP Node to user

Data for the parameter was taken from "Download measurement software" installed in the server at ISP Node of the operators.

#### 4.6.4 DETAILED FINDINGS – BROADBAND DOWNLOAD SPEED

Audit results for broadband download speed										
Broadband download speed	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total average committed download speed (In Mbps) (A)		16.0	2	60	8	20	512	512	1.5	4
Total average download speed observed during TCBH (In Mbps) (B)		16.0	1.78	58.2	7.99	19	512	512	1.31	3.45
%age subscribed speed available to the subscriber during TCBH (B/A)*100	$\geq 80\%$	100.00%	89.00%	97.00%	99.88%	95.00%	100.00%	100.00%	87.33%	86.25%
>>										
Live measurement results for broadband download speed										
Broadband download speed	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total committed download speed to the sample subscribers (In Mbps) (A)		16.0	2	60	8	50	512	NA	39	1
Total average download speed observed during TCBH (In Mbps) (B)		16.0	1.8	58.2	7.99	48	512	NA	36	0.95
%age subscribed speed available to the subscriber during TCBH (B/A)*100	$\geq 80\%$	100.00%	90.00%	97.00%	99.88%	96.00%	100.00%	NA	92.31%	95.00%
>>										
Service availability/uptime										
>>										
Audit results for service availability										
Service Availability	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Operational Hours		720	2208	2208	68208	2208	2160	2208	2208	2208
Total Downtime		2	7	0	191	14	3	3	0	3
Total time when the service was available		717	2201	744	68017	2194	2157	2205	2207	2205
Service Availability Uptime in Percentage	$\geq 98\%$	99.58%	99.69%	33.70%	99.72%	99.37%	99.86%	99.86%	99.95%	99.86%
>>										
Live measurement results for service availability										
Service Availability	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Operational Hours		72	36	72	70680	72	72	2208	72	24
Total Downtime		0.08	0.25	0	111	0	0	3	0	0
Total time when the service was available		71.9	35.8	0.0	70569.0	72.0	72.0	2205.0	72.0	24.0
Service Availability Uptime in Percentage	$\geq 98\%$	99.89%	99.31%	0.00%	99.84%	100.00%	100.00%	99.86%	100.00%	100.00%

Data Source: Download measurement software installed in the server at ISP Node of the operators

All operators met the benchmark of providing committed broadband download speed as per audit.

## 4.7 SERVICE AVAILABILITY/UPTIME

### 4.7.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to –

- ✎ Total operational hrs.
- ✎ Total downtime hrs.
- ✎ The above mentioned data was obtained and verified separately for three days in which the live measurement was carried out, Month in which audit was carried out/

Data for the parameter was extracted from OMC (Operations and Maintenance Center) of the operators.

### 4.7.1.2 COMPUTATIONAL METHODOLOGY

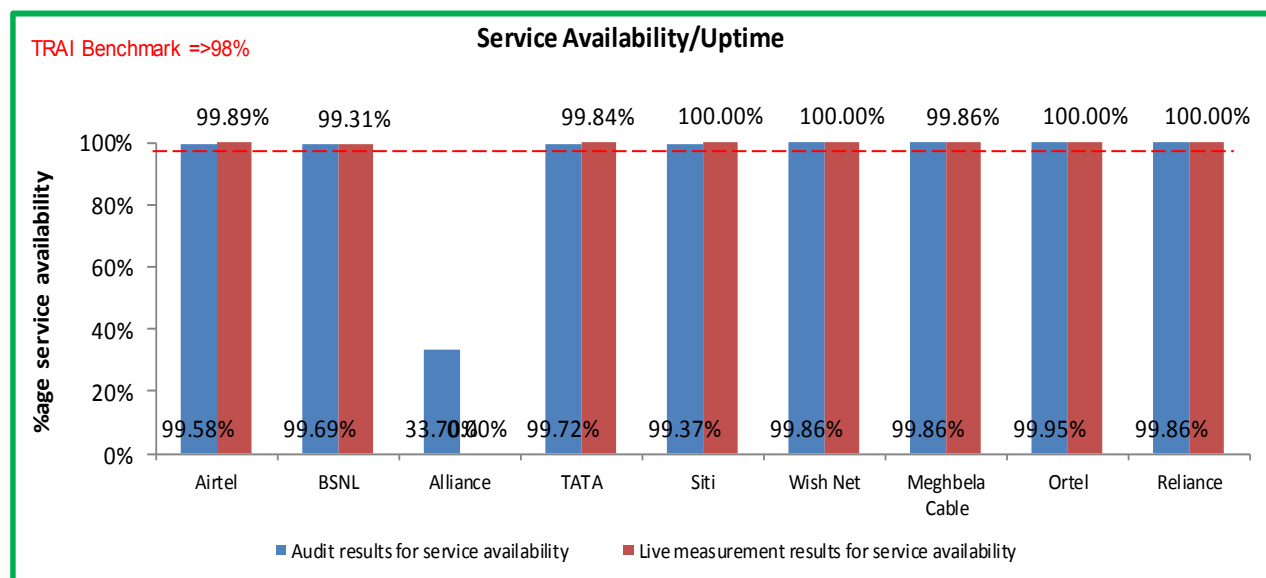
- ✎ Total downtime for all users, including the LAN switches, Routers, Servers, etc. at ISP Node and connectivity to upstream service provider are to be included
- ✎ Planned outages for routine maintenance of the system are excluded from the calculation of service availability/uptime

**Service availability/Uptime =  $(\text{Total operational hours} - \text{Total Downtime hrs}) * 100 / \text{Total operational hours}$**

### 4.7.1.3 BENCHMARK

- ✎ =>98% with effect from quarter ending September 2007 and onwards

## 4.7.2 DETAILED FINDINGS - SERVICE AVAILABILITY



Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark for service availability time as per audit except Alliance.

## 4.8 NETWORK LATENCY & PACKET LOSS

### 4.8.1 PARAMETER EXPLANATION - NETWORK LATENCY

Network Latency: Network Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/ Customer Premises Equipment (CPE).

#### 4.8.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to:

- ↗ Records maintained for ping tests conducted during the period
- ↗ Smoked ping test (wherever available) results for the period
- ↗ Results of live ping tests conducted during three day live measurement and month of Audit (During peak hours)
- ↗ Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

Data for the parameter was extracted from NOC (Network Operations Center) of the operators.

#### 4.8.1.2 COMPUTATIONAL METHODOLOGY

- ↗ Latency is the measure of duration of a round trip for a data packet between specific source and destination Router Port/Customer Premises Equipment (CPE). The round trip delay for the ping packets from ISP premises to the IGSP premises to the IGSP/NIXI gateway and to the nearest NAP port abroad are measured by computing delay for 1000 pings of 64 bytes each (Pings are to be sent subsequent to acknowledgement received for the same for previous ping)
- ↗ Service provider needs to carry out such tests daily during Time Consistent Busy Hour (TCBH) and report the average results for the month in the performance monitoring report to TRAI
- ↗ Minimum sample reference points for each service area shall be three in number or multiple reference points if required

**Hence the formula for network latency would be Network latency for X days= Total round trip time for all the ping packets transmitted in X days /No of days during the period**

#### 4.8.1.3 BENCHMARK

- ↗ < 120 msec from user reference point at POP/ISP Node to International Gateway
- ↗ < 350 msec from User reference point at ISP Gateway Node to International nearest NAP port (Terrestrial)
- ↗ < 800 msec from User reference point at ISP Gateway Node to International nearest Nap port (Satellite)

#### 4.8.2 PARAMETER EXPLANATION – PACKET LOSS

Packet Loss: Packet loss is the percentage of packets lost to the total packets transmitted between two designated CPE/ Router Ports.

##### 4.8.2.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to –

- ✧ Records maintained for ping tests conducted during the period
- ✧ Smoked ping test (wherever available) results for the period
- ✧ Results of live ping tests conducted during three day live measurement and month of Audit (During TCBH)
- ✧ Live ping tests were conducting by selecting a minimum of three user reference test points at POP/ISP Node in each circle

Data for the parameter was extracted from NOC (Network Operations Center) of the operators.

##### 4.8.2.2 COMPUTATIONAL METHODOLOGY

- ✧ Packet loss is the percentage of packets lost to total packets transmitted between two designated Customer Premises Equipment's/Router ports. It is the measurement of packet lost from the broadband customer (User) configuration/User reference point at POP/ISP Node to IGSP/NIXI Gateway and to the nearest NAP port abroad
- ✧ The packet loss is measured by computing the percent packet loss of 1000 pings of 64 byte packet each.
- ✧ Service provider needs to carry out such tests daily during Time Consistent Busy Hour(TCBH) and report the average results for the month in the performance monitoring report to TRAI
- ✧ Minimum sample reference points for each service area were three in number or multiple reference points if required

**Hence Packet loss is computed by the formula:  $(\text{Total number of ping packets lost during the period} / \text{Total number of ping packets transmitted}) * 100$**

##### 4.8.2.3 BENCHMARK

- ✧ Packets Loss <1 %

### 4.8.3 DETAILED FINDINGS - NETWORK LATENCY / PACKET LOSS

Audit results for Latency and packet loss										
Network Latency and Packet Loss	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Packet Loss (Percentage)	< 1%	0.20%	0.64%	0.68%	0.00%	0.04%	0.00%	0.00%	0.00%	0.49%
Network Latency										
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	45	NDR	112	44.46	67	44	9	0.035	6
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	76.33	NDR	315	44.46	125	NA	290	0.064	7
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<800msec	NA	NDR	757	NA	NA	NA	NA	NA	NA
>>										
Live measurement results for Latency and packet loss										
Network Latency and Packet Loss	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Packet Loss (Percentage)	< 1%	0.00%	0.00%	0.33%	2.00%	0.04%	0.00%	0.00%	0.00%	0.00%
Network Latency										
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	45	NDR	110	44.46	71	64	9	0.035	1.51
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	77	NDR	320	44.46	126	NA	290	0.064	2.1
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<800msec	NA	NDR	750	NA	NA	NA	NA	NA	NA

Data Source: Network Operations Center (NOC) of the operators

**Airtel, BSNL, TATA, SITI, Wish Net, Meghbela, Ortel and Reliance for this operator's network latency <800 msec is not applicable because they don't have any satellite connection customers (DSL Customers).**

All met the benchmark for network latency related parameters.

NDR: No data received. Audit of BSNL at its NOC for Network Latency is yet to be conducted. Auditors have contacted the NOC of BSNL, however, the operator is yet to provide an appointment to IMRB auditors to conduct audit at BSNL NOC.

## 5. ANNEXURE – OND’15

### 5.1 SERVICE PROVISIONING

Audit Results for Service provisioning										
	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total connections registered during the period		4821	2714	9066	471	19242	624	132326	263	NA
Number of connections provided within 15 days		4821	2714	9066	470	19242	624	132326	263	NA
Percentage of connections provided within 15 days	100%	100.00%	100.00%	100.00%	99.79%	100.00%	100.00%	100.00%	100.00%	NA
Number of connections provided after 15 days of registration of demand		4821	2714	9066	471	19242	624	132326	263	NA
percentage of connections provided after 15 days of registration of demand	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA
Number of customers to whom credit is given for delayed connections		0	0	0	0	0	0	0	0	NA
Percentage of customers to whom credit is given for delayed connections	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA

>>

Live calling for Service provisioning										
	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total connections registered during the period		100	100	100	100	100	100	100	100	NA
Number of connections provided within 15 days		100	95	100	98	96	89	81	92	NA
Percentage of connections provided within 15 days	100%	100.00%	95.00%	100.00%	98.00%	96.00%	89.00%	81.00%	92.00%	NA

Data Source: Operations and Maintenance Center (OMC) of the operators

TATA failed to meet the benchmark, however for live calling all operators failed to meet the benchmark except Airtel and Alliance.

NA: In the audit period, no new connection was registered with Reliance.

## 5.2 FAULT REPAIR/ RESTORATION

Audit Results for Fault repair										
Fault repair	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total No. of faults registered during the period		7115	59139	14767	2223	59624	12332	8309	2631	154
No. of faults repaired by next working day during the period		6597	54003	13664	2106	56046	12196	8309	2430	154
Percentage of faults repaired by next working day during the period	≥ 90%	92.72%	91.32%	92.53%	94.74%	94.00%	98.90%	100.00%	92.36%	100.00%
No. of faults repaired within 3 days during the period		7095	58732	14762	2188	59246	12332	8309	2621	154
Percentage of faults repaired within 3 days during the period	≥ 99%	99.72%	99.31%	99.97%	98.43%	99.37%	100.00%	100.00%	99.62%	100.00%
No. of cases with faults pending for >3 days		20	407	5	35	378	0	0	10	0
>>										
Rent rebate	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Percentage of cases where rent rebate for >3 days was given	100%	NA	NA	NA	NA	NA	NA	NA	NA	NA
>>										
Live calling for fault repair										
Fault repair	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Number of calls made to subscribers		30	30	30	30	30	30	30	100	50
Number of cases where faults were repaired by next working day		24	26	22	17	25	24	28	45	34
Percentage cases where faults were repaired by next working day	≥ 90%	80.00%	86.67%	73.33%	56.67%	83.33%	80.00%	93.33%	45.00%	68.00%
Number of cases where faults were repaired within 3 days		30	30	29	13	26	28	29	76	42
Percentage cases where faults were repaired within 3 days	≥ 99%	100.00%	100.00%	96.67%	43.33%	86.67%	93.33%	96.67%	76.00%	84.00%

Data Source: Operations and Maintenance Center (OMC) of the operators and live calls conducted by the auditors from operator's network

### 5.3 BILLING PERFORMANCE – METERING AND BILLING CREDIBILITY

Audit Results for Billing performance										
Billing Performance	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Billing disputes										
Total bills generated during the period		156503	252799	88738	3	236013	58334	98582	5414	5429
Total number of bills disputed		104	159	924	0	0	5	0	0	4
Percentage bills disputed (Avg of 3 billing cycles)	≤ 2%	0.07%	0.06%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.07%
Resolution of billing complaints										
Total number of complaints		14	0	924	3	NA	NA	NA	NA	NA
Total complaints resolved in 4 weeks from date of receipt		14	0	924	3	NA	NA	NA	NA	NA
Percentage complaints resolved within 4 weeks of date of receipt	100%	100.00%	100.00%	100.00%	100.00%	NA	NA	NA	NA	NA
Refund of deposits										
Total number of cases requiring refund		2	NA	NA	NA	NA	NA	NA	NA	NA
Total number of cases where refund was made within 60 days		2	NA	NA	NA	NA	NA	NA	NA	NA
Percentage cases in which refund was received within 60 days	100%	100.00%	NA	NA	NA	NA	NA	NA	NA	NA

Data Source: Billing Center of the operators

NA: Subscribers of Ortel, Siti, Wish Net, Meghbela and Reliance did not log any billing complaints. Hence, resolution of billing complaints is not applicable for the operators.

Live calling results for resolution of billing complaints										
Resolution of billing complaints	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Number of calls made		50	100	100	NA	NA	5	NA	NA	4
Number of cases resolved in 4 weeks		50	97	99	NA	NA	5	NA	NA	3
Percentage cases resolved in 4 weeks	100%	100.00%	97.00%	99.00%	NA	NA	100.00%	NA	NA	75.00%

Data Source: Live calls conducted by the auditors from operator's network

NA: Live calling for Ortel and Reliance for 'resolution of billing complaints' has not been conducted due to low/ zero base of billing complaints for the operators.

## 5.4 RESPONSE TIME TO THE CUSTOMER FOR ASSISTANCE

Audit results for customer care (Voice to Voice)										
Calls Answered within 60 seconds										
Customer Care Assessment	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Number of calls received		21249	NDR	13129	6947	40086	4436	30555	396605	80381
Total Number of calls answered within 60 seconds		14662	NDR	10243	5940	29931	4436	28416	396605	78079
Percentage calls answered within 60 seconds	≥ 60%	69.00%	NDR	78.02%	85.50%	74.67%	100.00%	93.00%	100.00%	97.14%
Calls Answered within 90 seconds										
Total Number of calls received		21249	NDR	12473	6195	34474	4436	2139	396605	80381
Total Number of calls answered within 90 seconds		5335	NDR	11849	5514	29648	4436	2139	396605	78344
Percentage calls answered within 90 seconds	≥ 80%	95.00%	NDR	95.00%	89.00%	86.00%	100.00%	100.00%	100.00%	97.47%

Data Source: Customer Service Center of the operators

Live calling results for customer care (Voice to Voice)										
Customer Care Assessment	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Number of calls received		100	100	100	100	100	100	100	100	100
Total Number of calls answered within 60 seconds		90	100	100	100	100	100	90	86	98
Percentage calls answered within 60 seconds	≥ 60%	90.00%	100.00%	100.00%	100.00%	100.00%	100.00%	90.00%	86.00%	98.00%
Total Number of calls answered within 90 seconds		100	100	100	100	99	100	100	100	100
Percentage calls answered within 90 seconds	≥ 80%	100.00%	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Live calls conducted by the auditors from operator's network

## 5.5 BANDWIDTH UTILIZATION

Audit results for Bandwidth Utilization										
Bandwidth utilization	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Intra-network links (POP to ISP Node)										
Total number of intra network links		259	NDR	5	2	102	9	2	1	2
No of Intra network found to be above 90%										
Total number of upstream links		259	NDR	5	1	12	18	4	1	2
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In Mbps)		10365	NDR	15635	19490	6513	16221	4491	335	104000
Total International Bandwidth utilised during peak hours		8209.48	NDR	11956	13855	5424	11969	3368	200	52423
Percentage Bandwidth utilisation during peak hours (In Mbps)	<80% link(s)/route bandwidth utilization	79.20%	NDR	76.47%	71.09%	83.28%	73.79%	74.99%	59.70%	50.41%
If on any link(s)/route/ bandwidth utilization exceeds 90%		0	NDR	0	0	0	0	0	0	0

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Live measurment results for Bandwidth Utilization										
Bandwidth utilization	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Intra-network links (POP to ISP Node)										
Total number of intra network links		2	NDR	5	2	102	30	2	1	2
International Bandwidth										
Total number of upstream links		2	NDR	5	0	12	6	4	1	2
Total International Bandwidth available from ISP Node to IGSP/NIXI/NAP (In Mbps)		10365	NDR	15635	19490	6513	5411	4491	335	106000
Total International Bandwidth utilised during peak hours		7652.56	NDR	11956	11400	5424	4002	3368	226	73777
Percentage Bandwidth utilisation during peak hours (In Mbps)	<80%	73.83%	NDR	76.47%	58.49%	83.28%	73.96%	74.99%	67.46%	69.60%
No of Intra network found to be above 90%		0	NDR	0	0	0	0	0	0	0

Data Source: Network Operations Center (NOC) of the operators

NDR: No data received. Audit of BSNL at its NOC for Bandwidth Utilization is yet to be conducted. Auditors have contacted the NOC of BSNL, however, the operator is yet to provide an appointment to IMRB auditors to conduct audit at BSNL NOC.

## 5.6 BROADBAND DOWNLOAD SPEED

Audit results for broadband download speed										
Broadband download speed	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total average committed download speed (In Mbps) (A)		16.0	2	60	8	20	512	512	1.5	4
Total average download speed observed during TCBH (In Mbps) (B)		16.0	1.78	58.2	7.99	19	512	512	1.31	3.45
%age subscribed speed available to the subscriber during TCBH (B/A)*100	≥ 80%	100.00%	89.00%	97.00%	99.88%	95.00%	100.00%	100.00%	87.33%	86.25%

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Live measurement results for broadband download speed										
Broadband download speed	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total committed download speed to the sample subscribers (In Mbps) (A)		16.0	2	60	8	50	512	NA	39	1
Total average download speed observed during TCBH (In Mbps) (B)		16.0	1.8	58.2	7.99	48	512	NA	36	0.95
%age subscribed speed available to the subscriber during TCBH (B/A)*100	≥ 80%	100.00%	90.00%	97.00%	99.88%	96.00%	100.00%	NA	92.31%	95.00%

Data Source: Download measurement software installed in the server at ISP Node of the operators

## 5.7 SERVICE AVAILABILITY/ UPTIME

Audit results for service availability										
Service Availability	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Operational Hours		720	2208	2208	68208	2208	2160	2208	2208	2208
Total Downtime		2	7	0	191	14	3	3	0	3
Total time when the service was available		717	2201	744	68017	2194	2157	2205	2207	2205
Service Availability Uptime in Percentage	≥ 98%	99.58%	99.69%	33.70%	99.72%	99.37%	99.86%	99.86%	99.95%	99.86%

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Live measurement results for service availability										
Service Availability	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Total Operational Hours		72	36	72	70680	72	72	2208	72	24
Total Downtime		0.08	0.25	0	111	0	0	3	0	0
Total time when the service was available		71.9	35.8	0.0	70569.0	72.0	72.0	2205.0	72.0	24.0
Service Availability Uptime in Percentage	≥ 98%	99.89%	99.31%	0.00%	99.84%	100.00%	100.00%	99.86%	100.00%	100.00%

Data Source: Operations and Maintenance Center (OMC) of the operators

## 5.8 NETWORK LATENCY / PACKET LOSS

Audit results for Latency and packet loss										
Network Latency and Packet Loss	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Packet Loss (Percentage)	< 1%	0.20%	0.64%	0.68%	0.00%	0.04%	0.00%	0.00%	0.00%	0.49%
Network Latency										
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	45	NDR	112	44.46	67	44	9	0.035	6
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	76.33	NDR	315	44.46	125	NA	290	0.064	7
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<800msec	NA	NDR	757	NA	NA	NA	NA	NA	NA

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Live measurement results for Latency and packet loss										
Network Latency and Packet Loss	Benchmark	Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Packet Loss (Percentage)	< 1%	0.00%	0.00%	0.33%	2.00%	0.04%	0.00%	0.00%	0.00%	0.00%
Network Latency										
From user reference point at POP/ISP Node to IGSP/ NIXI (msec)	<120msec	45	NDR	110	44.46	71	64	9	0.035	1.51
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<350msec	77	NDR	320	44.46	126	NA	290	0.064	2.1
From user reference point at ISP Gateway Node to nearest NAP Port (Terrestrial) (In msec)	<800msec	NA	NDR	750	NA	NA	NA	NA	NA	NA

Data Source: Network Operations Center (NOC) of the operators

Airtel, BSNL, TATA, SITI, Wish Net, Meghbela, Ortel and Reliance for this operator's network latency <800 msec is not applicable because they don't have any satellite connection customers (DSL Customers).

NDR: No data received. Audit of BSNL at its NOC for Network Latency is yet to be conducted. Auditors have contacted the NOC of BSNL, however, the operator is yet to provide an appointment to IMRB auditors to conduct audit at BSNL NOC.

## 5.9 TOTAL CAPACITY AND SUBSCRIBERS

Capacity and Subscribers										
		Airtel	BSNL	Alliance	TATA	Siti	Wish Net	Meghbela Cable	Ortel	Reliance
Capacity		52480	443810	120000	5518	156000	50000	55000	8000	2522
Total No of customers served (Jun 2015)		44528	127296	88738	1872	86088	19702	43473	1820	6000

Data Source: Operations and Maintenance Center (OMC) of the operators

## 5.10 POP DETAILS

Airtel	
Name	Address
BZR	9, Elgin Rd, Kolkata 700020
KST	121 Santoshpur Avenue, Kol-25
GHM	11, Moni Mukherjee Road, P.S. Gariahut, P.O. Ballygunge, Kolkata - 700 019
KES	Eden Shop. Green wood park. FLT Owned NO IC-1, New Town , Rajarhat, Kol-156
CCS	1/1 Biplabi Anukul Chandra Street, Kolkata : 700072
EIH	20B Abdul Hameed Street, Kolkata : 700001
KGH	Greenfield Housing, hi tech chambers 7th floor 84/1 B Topsia Road, kolkata-46
CMC	213A, B.B. Ganguly St, Kolkata : 700012
KGV	Joka, Diamond Harbour Road, kolkata-104
MFA	T9, Palm Avenue, Kolkata 700019
ENB	Holy Trust School, EN Block-55, Sector V, Salt Lake, Kolkata : 700091
RYL	5/1, Russel street, kolkata -700071

IEP	P 38,INDIA EXCHANGE PLACE, Kolkata : 700001
KLM	21 Sardar Sankar Road, Kol-29
KSH	Aster Green, Aathghara, Phultala, Rajarhat, Kol-136
WST	27, Weston Street, 5th. Floor, Owned No. 517, Bowbazar Kolkata - 700012
IRS	UTTARA 13, BROAD STREET, P.S.- BALLYGUNGE, KOLKATA - 700019
KUT	Uttara Housing Complex, Rajarhat, Kol-156
SAV	Anand Appt, #116 Southern Avenue Road, Kolkata : 700029
PRK	99A, Park street kolkata - 700016
IBM	PLOT NO. 62 DC-1, BLOCK-DN, SECTOR-V, SALT LAKE CITY, KOLKATA-700097
KTP	57 Jatin Das Road, Kol-29
KVG	NBCC, Vibgyor, Action Area, Rajarhat, New Town
CLB	CL-25 Salt Lake, Kolkata : 700091
KVE	VIP ENCLAVE,SHOP NO 28B,VIP RD,RAGHUNATHPUR,KOL-59
MJH	109F Block G, NEW ALIPUR, Kolkata : 700027
DBB	Block DB, Sector -I, Salt Lake, Kolkata -64
KGC	P-132, A, C.I.T. Road, Scheme-VI, Phul Bagan, Kolkata : 700054
KML	24/2 SARIF Lane, kol-16
TNT	TRINITY TOWER, 83, Topsia Road (South), Kolkata - 700 046
KHW	Action area-II c New Town, kolkata
KPT	J-221, Baisnabghata, Patuli Town ship, Kolkata-94
HNS	6, Hastings Park Road,Kolkata - 700 027
KWT	BE-4, Sector 1 Salt Lake, Kolkata : 700091
MMB	115 MG Road, Kol : 7
KLK	327, LAKE GARDENS, KOL-45
CGS	213A,B.B.Ganguly St, Kolkata : 700012
KSB	2/1A Ghore Bibi Lane, Kolkata : 700054
BAC	18/7 Dover Lane, Kolkata : 700029
TPR	42C TARAK PRAMANICK ROAD, KOL-700006
ETR	ETERNITY, PLOT NO-1, BLOCK- DN, SECTOR-V, SALT LAKE ELECTRONICS COMPLEX,SALT LAKE CITY, KOLKATA-700091
KGP	252D CR Avenue, Kolkata : 700006
MDV	Gautam Appt, Ekdalia Road, Kolkata : 700019
JSR	P-270, BANGUR AVENUE, PO-BANGUR AVENUE, PS- LATE TOWN, KOLKATA-700055, 24PGS(N)
KVP	49 V.I.P. PARK ROAD, KOL-101
KJD	1/260 Garihat rd south,Kol_ 700068
MDT	6, Little Russel Street, Kolkata -700071
WDH	10K Manohar Pukur Road, Kolkata : 700029
KSR	5, KIRAN SHANKAR ROY ROAD, P.S.- HARE STREET, KOLKATA-700001
BFB	BF - BLOCK - SALT LAKE, Kolkata : 700011
GGC	74/8/117, Jadavpur Central Road, kolkata - 700032
CSM	165 Muktarlam Babu Street, Kolkata : 700007
MSH	Owned No- 945, 33/1 N.S. Road, P.S.- Hare Street Kolkata-700001
KFH	Panchavati Apartments vip road
BCR	10C Ballygunj Circular Road, Kolkata : 700019
KJB	150 Lenin Sarani, Kolkata-13
KPN	1/10 PODDER NAGAR COLONY No-1, KOL-700068
BGP	44/1 Ballygunj Place, Kolkata : 700019
RKM	5B, Ballygaunge Terrace, P.O. Sarar Bose Road, Kolkata - 700 029
KSS	5, JBS Halden Avenue, KOL-105
KBB	52B Shakespeare Sarani, Kolkata : 700017
KUN	Kolkata Unnayan Commercial Complex
DCL	13A Dacers Lane, Kolkata : 700069

EEB	EE-199 SALT LAKE CITY SECTOR-II, SALT LAKE, BIDHAN NAGAR, kolkata-700091
MLN	235/2A, A.J.C Bose Road. Kolkata-700020
MLK	28 Armenian Street, Kolkata : 700007
KEC	ECOSPACE Block-A Phase 1 New Town Rajarhat Kolkata-700156
TDC	2, Lal Bazar Street kolkata-700001
TDS	119B CR Avenue, Kolkata : 700073
TPO	Technopolis, BP-4, Sector V, Salt Lake, Kolkata : 700091
KCI	22, Ashutosh Chowdhary Avenue, Ballygunge, kolkata - 700019
NLK	26/B, Camac Street, Kolkata 700016
KRB	152 Shyama Prasad Mukherjee Road, Kol : 700026
RBA	200, Rash behari Avenue, Kolkata 700019
BGR	P-58, BLOCK-C, BANGUR AVENUE, PO- BANGUR AVENUE, PS- LAKE TOWN, KOLKATA-700055, 24PGS(N)
KCT	P-29 CIT Road, Kolkata : 700014
KDB	40C Jessore Road (South), Dakbanglow more Kol -127
HLP	HIGHLAND PARK, 25, CHAK GARIA, P.O. CHAK GARIA, P.S. PURBA JADAVPUR, KOLKATA - 94
LDT	Lansdown Tower, Sarat Bose Road, Near Minto Park, Kolkata : 700020
CEB	CE-107, Salt Lake, Kolkata : 700091
CLR	10 Clive Row, Kolkata : 700007
UDG	P164, VIP Rd, Ultadunga, Kolkata 700097
KMS	164/1 Maniktala Main Road, Kolkata : 700054
FDB	FD- 307, Bidhan Nagar, Sector - III, P.O. IB Market, Kol - 106, Dist - 24 Pgs(N)
KIA	INDIAN COUNCIL OF REHABILITATION & SPORTS FOR THE DISABLED, KASBA INDUSTRIAL ESTATE, PHASE - I, Plot No. 36, P.O. ANANDAPUR, KOLKATA - 700 107
SBW	55B, Mirza gaalib street, Kolkata 700016
LKT	P -703/(A), BLOCK - A, PO & PS - LAKE TOWN, KOLKATA - 700089, 24PGS(N)
PCC	170 Bipin Bihari Ganguly Street, Kolkata : 700012
REG	Regency, 6 Hungerford Street, Kolkata : 700017
KRJ	770 RAJDANGA MAIN ROAD, KOL-700107
WLS	8 Waterloo Street, Kolkata : 700069
KDR	25/2/1D Darga Road, Kolkata : 700017
BBD	4/1 Red cross Place, Kolkata : 700001
PNB	AA-35, Sector 1 Salt Lake, Kolkata : 700064
GCA	4, GANESH CHANDRA AVENUE, KOLKATA-700013
KDH	1/427 Gariahat Road(south), Kol-68
PRB	Purbachal Housing Complex, Cluster XIII, Salt Lake, Kolkata : 700064
PGM	5/30/A, RAJENDRA PRASAD COLONY, P.S.- JADAVPUR, KOLKATA-700033
KRC	70 KALITALA ROAD, KOL-700078
KCA	86B Nasiruddin Road, Kolkata : 700017
CTC	PLOT NO. DC-1, BLOCK-DC, SECTOR-I, SALT LAKE CITY, KOLKATA-700091
SNG	4 - Synagouge St, Kolkata : 700001
JCH	137, Block- A, Lake Town, Kolkata - 700089
NSB	23A N S Road, kol-01
LSH	5A/1A, Lord Sinha Road. P.O.- Middleton Street, Kolkata-700071
NLB	28/B, Shakesphere sarani, Kolkata 700017
DVR	Dover Court 22, Dover Road, kolkata -700019
KLD	P-108/A C.I.T Road, Kol -14
KIB	Infinity Benchmark. Sector V, Saltlake. Kol-91
MRS	34/1 Haripada Dutta Lane, Kolkata : 700033
AGJ	Ajimganj House 7, Camac street. Kolkata-700017
KCH	IA - 271, Sector III, Salt Lake Kolkata - 97
SDF	SDF Building, Sector V, Salt Lake City, Kolkata : 700091

KSC	SOUTH CITY PROJECTS LTD, PRINCE ANWAR SHAH ROAD, KOL-68
BDB	Plot No. 10, BLOCK BD, SECTOR - 1, SALT LAKE, P.O. CC BLOCK, KOLKATA - 64
RWD	36B, shakespeare sarani, P.O.- Shakespeare Sarani, P.S.- Shakespeare sarani, kolkata-700017
STC	3, Sir William Jones Sarani, Kolkata 700071
KHP	180b Harish Mukherjee Road
KBP	16 GOLD PARK, RAJDANGA, KOL-700078
LRS	Shristi Appt, Little Russel Street, Kolkata : 700071
KHZ	10A NAFAR KUNDU ROAD, Kol-26
BKC	Bikhamchand Market, 14/2 Old China Bazaar Street, Kolkata : 700001
PGL	5B Pratap Ghosh Lane, Kolkata : 700007
KPA	BLOCK-O, PLOT-2, PATULI, BAISNABGHATA, KOLKATA-700094
ALP	22/1, Alipore Rd, Kolkata 700027
BBG	285 A,B,C Bipin Bihari Ganguly Street, Kolkata : 700012
CRS	229, A.J.C Bose Road , Kolkata -700020
KRW	J1/5 Block EP, Sector V, Saltlake city, Kolkata 700091
GDB	Plot No. 300, Block - GD, Sector - III, SALT LAKE CITY, P.O. Bidhan Nagar IB Block, Kolkata - 700 106 Dist. 24 Pgs.(North)
KMP	134 Metropolitan Co-operative Housing society Ltd, Canal south road(sec-B) Kol-39
LGH	20A, Lindsay Street, Kolkata -87
SLD	27 Baitakkhana Road, Kolkata : 700009
KCG	Globsyn Building, Crystal - 1, 2nd Floor, Premises No: XI - 11 & 12, Block EP, Salt Lake Sector V, Kol : 91
SRB	A-102, Southern Avenue, Kolkata : 700029
KUW	Uniworld City, New Town, Kolkata-700156
KDG	The Galleria, DLF, Action Area-1, New Town, Kolkata-700156
KEG	Elita Garden Vistan Rajarhat, New Town
KQM	Quest Mall, 33, Asutosh Choudhury Road, Beckbagan, Kolkata-700017.
KNH	DLF New Town Heights, Action Area-III, New Town, Kolkata, West Bengal-700135
KRD	Rosedale, AA-III, BLK-3, Action Area-III, Rajarhat, Kolkata, West Bengal-700156
KAP	Acropolis Mall Basement 1858/1 Rajdanga Main Road

### BSNL

MSU	EXCH NAME	AREA
CTDALPO01	ALIPUR	ALP
CTDBAGE01	BAGBAZAR	NORTH
CTDBBZE01	BURRA BAZAR	CEN
CTDBBZH01	BURRA BAZAR NGN	CEN
CTDBEHE01	BEHALA EWSD	ALP
CTDBHLO01	BEHALA OCB	ALP
CTDBHTO01	BHATPARA	BKP
CTDBKPE01	BARRACKPORE	BKP
CTDBRSO01	BARASAT	BKP
CTDCENH01	CENTRAL NGN	CEN
CTDCENO01	CENTRAL OCB	CEN
CTDCIRE01	CIRCUS	CEN
CTDCNSO01	CHINSURA	SMP
CTDCRNE01	CITTARANJAN	CEN
CTDCSPO01	COSSIPORE	NORTH
CTDCTMO01	COT	CITY
CTDDDMH01	DUMDUM NGN	BDN
CTDDDMO01	DUMDUM OCB	BDN
CTDDUMS01	DUMDUM 5ESS	BDN

CTDJDPO01	JADAVPUR OCB	JDV
CTDJDVE01	JADAVPUR EWSD	JDV
CTDKALO01	KALIGHAT OCB	SOUTH
CTDMKTE01	MANIKTALA	NORTH
CTDNDPO01	NARENDRAPUR	JDV
CTDPHTO01	PANIHATI	BKP
CTDRSME01	RUSSA	SOUTH
CTDSATH01	SATYABALA NGN	HWH
CTDSATO01	SATYABALA	HWH
CTDSBPH01	SIBPUR NGN	HWH
CTDSBPO01	SIBPUR OCB	HWH
CTDSIBE01	SIBPUR EWSD	HWH
CTDSLME01	SALTLAKE MAIN	BDN
CTDSLME01	SALTLAKE NGN	BDN
CTDTBHE01	TELEPHONE BHAVAN	CITY
CTDTBZO01	TERITTA BAZAR	CITY
CTDUTPO01	UTTARPARA	SMP

### Meghbela Cable

191A, Jodhpur Garden, Kolkata-700 045.
Saktigarh Math,Jadavpur, Kolkata- 700 032.
BD -173, Saltlake City, Kolkata- 700 064.
35B/1B, Raja Naba Krishna Street, Kolkata- 700 005.
29/2C, Chandranath Chatterjee, Bhawanipur, Kolkata- 700 025.
12A, S N Roy Road, Kolkata - 700 038.
52, Sarat Bose Colony, Khardah, Kolkata- 700 118.
49A S N Banerjee Road, Barrackpur, Kolkata- 700 120.
Makardaha Road,Laxmi Tyre Complex,Shanpur, Howrah- 711 105.

### Wishnet

Saltlake, Plot Y-9, College More, Kolkata
430/1, VIP Nagar,Coloney, (Tiljala), LP- 15/15,Kolkata - 100
EC-21, Baguiati
4B, Raja Basanta Roy Road, Kolkata - 29
183B, Ananda Pally, Kolkata-32
52 D/1, Babu Bagan Lane, Kolkata - 31
P121 Jodu Colony Behala, Kolkata-34
267/C, B. B. Chatterjee Road, Kasba, Kolkata - 42
Anurag Appartment,41/B,Narandranagar,Belgharia,Kolkata-56
396B, N.S.C. Bose Road, Dibakar Apartment.
110 Cannel Street, Shebhum, Kolkata-48
140/42, NSC Bose Road, Kolkata - 40
140/42, Southern Avenue, Kolkata - 29
139/C, Ananda Palit Road, Kolkata - 14
13, Royd Street, Kolkata - 16
8C/21, old CIT Building, Belegghata
58/84, Prince Anwar Shah Road, Kolkata

28, Old Ballygunge 1st Lane, Kolkata - 19
EN-27, Advantage Tower, Sector V
9/1, R. N. Mukherjee Road, Birla Building, Kolkata - 1
51B, Justice Chandra Madhab Road, Kolkata - 20
Anuradha Apartment, Sodepur Road (East), Holding No. -52, Kolkata - 129
B - 366, Lake Gardens, Kolkata - 45
2nd Floor, 8/1, Middleton Row, Kolkata - 71
Synthesis Business Park, , 2nd Floor, New Town, 24 PGS (N), Kolkata - 157
Vasundra Apartment, Floor - 8, 2/7, Sarat Bose Road, Kolkata - 21
Vasundra Apartment, Floor - 8, 2/7, Sarat Bose Road, Kolkata - 21
13, Royd Street, Kolkata - 16
DN-24, 8th & 9th Floor, Sector - V, Kolkata - 91
EN-27, Advantage Tower, Sector V

### Siti

J -1/12 , 3rd Floor. BI - EP, Sev - V, Kolkata - 91
2/1D Bidhan Sarani, Kolkata - 6
201 New Park St, 4th Floor, Kol - 14
8 Arindam Chowdhury Lane, Vivek Vihar, Phase - 3, Howrah - 711101
55/3 Desurana Rd, Bally
29/F BT Rd, Peearless Nagar Complex, Kol-110
31 Panchanantala Lane, Behala Thana, Kol- 34
Malancha, Tallygunj, Kol-40
Gita Apt, Kestopur, Kol - 59

### Alliance

Location	Address
BALLYGUNG	1 / 2, Banam Para Lane, Kolkata - 700019
SULEKHA	18 A, Naba Nagar, Kolkata - 700032
BEHALA	57/1 Nabalia Para Road, Kolkata - 700008
HEDUA	1, Shibu Biswas Lane, Kolkata - 700006
BAGUIATI	H/H 18, Bagui Para, Kolkata - 700159
MALL ROAD	27/1, K. B. Sarani, Kolkata - 700080
SODHPUR	6/1, Jiban Krishna Chatterjee Road, Kolkata - 700110
KANKURGACHI	100/A, Maniktata Main Road, Kolkata - 700054
SALT LAKE SECOTR - V	DN-30, Salt Lake, Sector – V, Kolkata 700091
SHYAMNAGAR	5, Tagore Temple Road, 24 Pgs (N), Shyamnagar, 743127
Howrah	24/1/1 Sarat Chatterjee Road, Howrah - 711104



SCO 47, 5<sup>th</sup> Floor, Old Judicial Complex, Sector 15  
Part 1, Gurgaon, Haryana – 122001

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**EAST  
ZONE**

## **TRAI AUDIT WIRELINE REPORT – KOLKATA CIRCLE - AUDIT OF OND QUARTER, 2015**

**Prepared By -**



**Prepared For-**



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The following terms/abbreviations have been commonly used in this report. This section provides meaning of the abbreviations used in the report. .... 50

## 1 INTRODUCTION

### 1.1 About TRAI

TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace that will enable India to play a leading role in the emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

In pursuance of above objective, TRAI has been issuing regulations, order and directives to deal with the issues or complaints raised by the operators as well as the consumers. These regulations, order and directives have helped to nurture the growth of multi operator multi service - an open competitive market from a government owned monopoly. Also, the directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

TRAI initiated a regulation - The Standards of Quality of Service of Basic Telephone Service (Wire line) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated 20th March, 2009, the "Standards of Quality of Service for Wireless Data Services Regulations, 2012 dated 4<sup>th</sup> December 2012, and the "Quality of Service of Broadband Service Regulations", 2006 (11 of 2006) dated 6th October, 2006 that provide the benchmarks for the parameters on customer perception of service to be achieved by service provider.

In order to assess the above regulations, TRAI has commissioned a third party agency to conduct the audit of the service providers and check the performance of the operators on the various benchmarks set by Telecom Regulatory Authority of India (TRAI).

### 1.2 OBJECTIVES

The primary objective of the Audit module is to -

- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).

### 1.3 COVERAGE

The wireline audit was conducted in Kolkata circle. For BSNL, geographical spread among SDCAs and exchanges was maintained. For other operators, the audit was conducted for all exchanges at overall level.

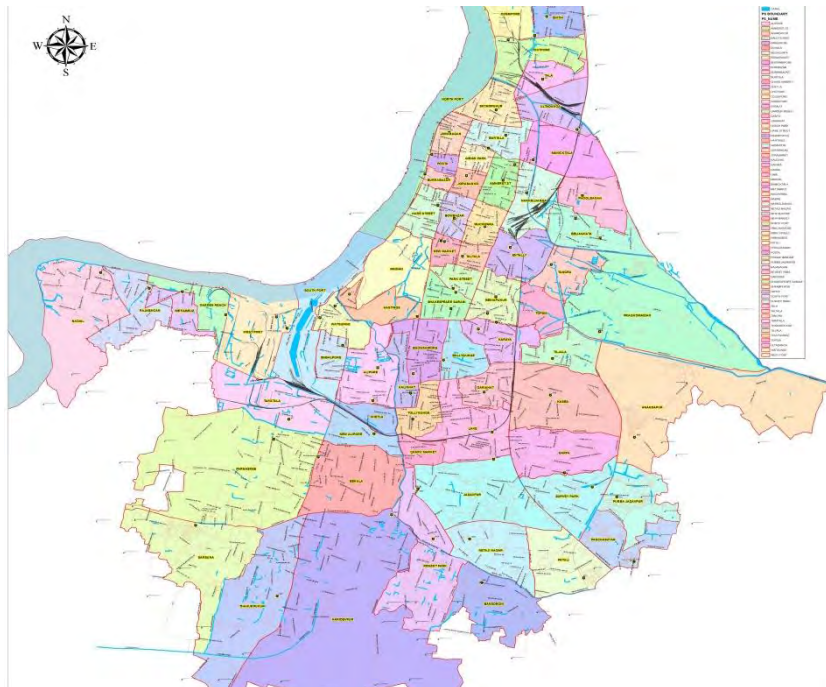


Image Source: BSNL Website

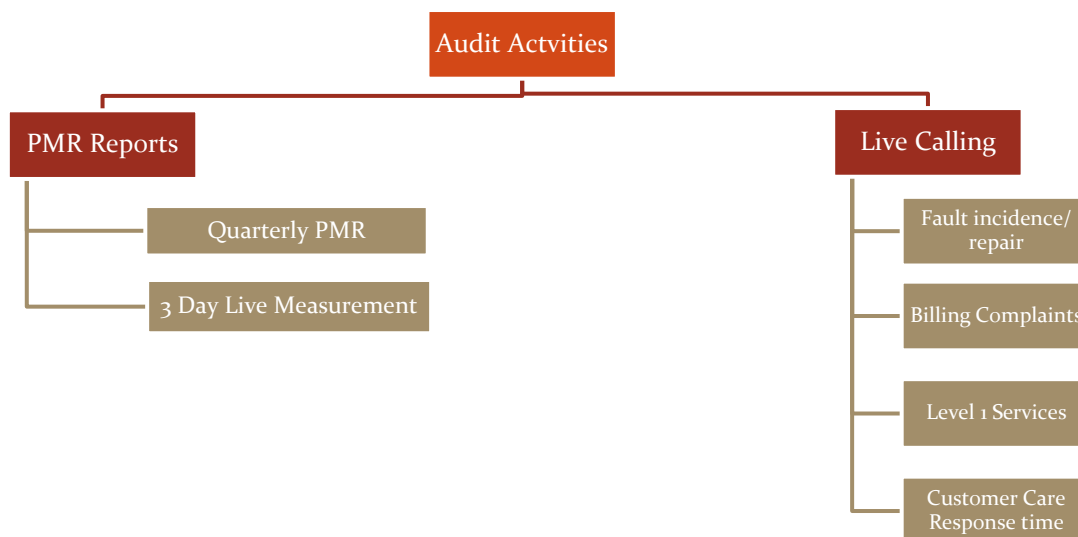
### 1.4 AUDIT PROCESS

As per TRAI guidelines, the Wireline Audit for a circle is conducted for one quarter once every year.

- The operators have been assimilated as per TRAI guidelines given in QoS tender document 2015 and latest list of licensees provided by TRAI.
- IMRB auditors contacted the following wireline operators to conduct the audit in Kolkata for the OND 2015 quarter.
  - BSNL
  - Bharti Airtel
  - Reliance
  - Tata Teleservices
  - Vodafone
- The PMR was generated from the raw data pertaining to Oct, Nov and Dec 2015 (OND'15), which was collected from the operator during the audit conducted in the month of Jan 2015.

- Live calling and 3 day live measurement activity was carried out during the month of Dec 2015. The data considered for live calling was for the month prior to the month in which the live calling activity was being conducted. For example, data of Nov 2015 was considered for live calling activity conducted in Dec 2015.

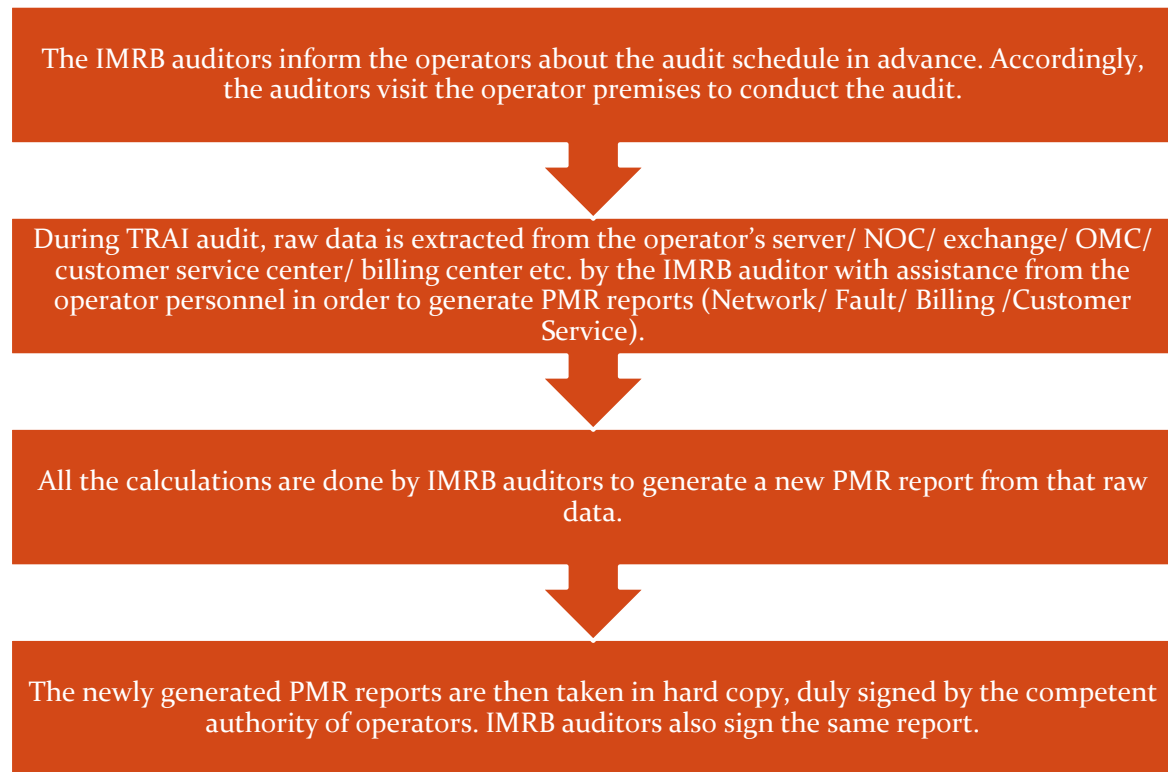
## 1.5 FRAMEWORK USED



### 1.5.1 PMR REPORTS - SIGNIFICANCE AND METHODOLOGY

The significance of PMR or Performance Monitoring Reports is to assess the various Quality of Service (QoS) parameters involved in the Basic (Wireline) telephone services, which indicate the overall health of service for an operator. The operators submit these PMR reports to TRAI time on time as per instructions from TRAI.

To verify the QoS performance of the operators, TRAI has appointed IMRB as their auditor in East Zone to conduct QoS audit of operators. The steps involved in the audit have been given below.



The raw data extracted is then used to generate PMR reports in the following formats.

- ↳ Quarterly PMR
- ↳ 3 Day Live Measurement Data

Let us understand these formats in detail.

#### 1.5.1.1 QUARTERLY PMR REPORT – PARAMETERS REVIEWED

The main purpose of quarterly PMR report is to verify the following key QoS parameters on quarterly basis as per the methodology stated above in section 1.4

- Fault incidence/clearance related statistic
- Mean Time to Repair (MTTR)
- POI (Point of Interconnection) Congestion
- Metering and billing credibility
- Resolution of billing complaints

- Customer care promptness
- Time taken to refund of deposits after closure

### 1.5.1.2 3 DAY LIVE MEASUREMENT – METHODOLOGY AND PARAMETERS REVIEWED

The main purpose of 3 day live measurement is to evaluate the following parameters on intraday basis. The auditors visit the sample exchanges (in case of BSNL) and main exchanges (in case of other operators) to collect the 3 day live data for the following parameters

- POI (Point of Interconnection) Congestion

While the quarterly PMR report provides an overall view of the performance of QoS parameters, the 3 day live data helps looking at intraday performance on the above given parameters. All the calculations are then done on the basis of that raw data of 3 days.

### 1.5.1.3 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per QoS regulations 2009 (7 of 2009), Time Consistent Busy Hour” or “TCBH” means the one hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration and such Time Consistent Busy Hour shall be established on the basis of analysis of traffic data for a period of ninety days.

Step by step procedure to identify TCBH for an operator:

Day wise raw data is fetched from the operator's OMCR and kept in a readable format (preferably MS-Excel). Data for a period of 90 days is used to identify TCBH.

The 90 day period is decided upon the basis of month of audit. For example, for audit of OND 2015, the 90 day period data used to identify TCBH would be the data of October, November & December 2015.

For each day, the hour in which average traffic of the resource group concerned is greatest for the day will be the 'Busy Hour' for the operator.

The modal frequency of the busy hour is calculated for 90 days period and the hour with highest modal frequency will be considered as TCBH for the operator.

During audit, the auditors identified from the raw data that the TCBH for the operators in OND'15 was the time period as given below.

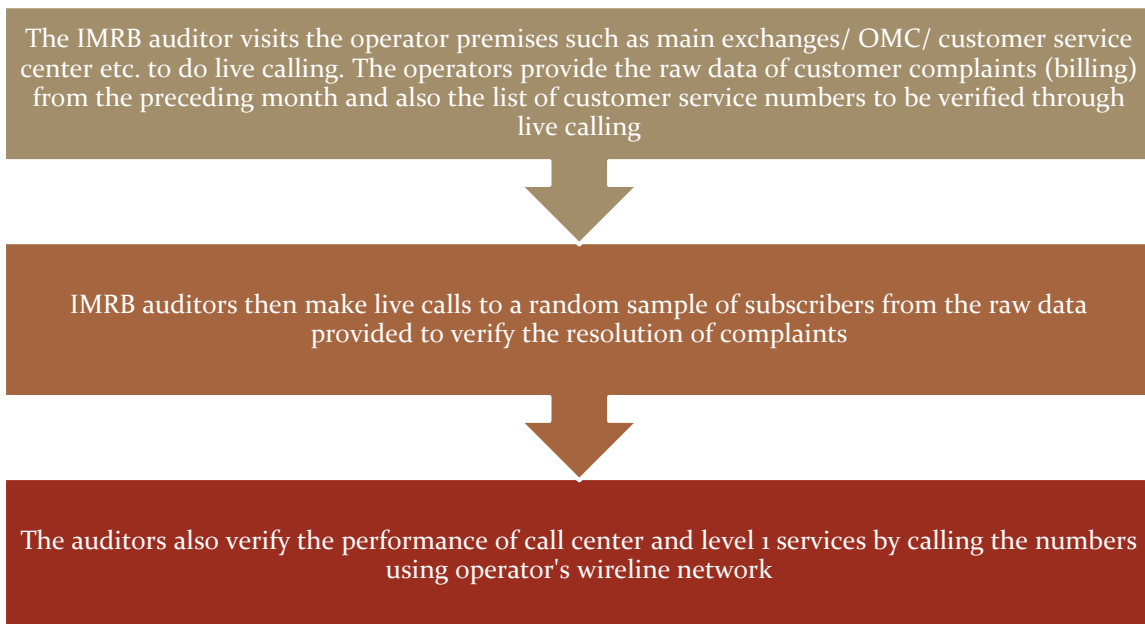
BSNL	Airtel	Tata	Vodafone	Reliance
16:00 - 17:00	18:00 - 19:00	17:00 - 18:00	18:00 - 19:00	20:00 - 21:00

### 1.5.2 LIVE CALLING - SIGNIFICANCE AND METHODOLOGY

The main purpose of live calling is to verify the performance of following parameters by doing test calls to the subscribers/ specific numbers.

- Fault clearance
- Resolution of billing complaints
- Response time to the customer for assistance
- Level 1 services

The process of conducting live calling has been stated below.



Let us now discuss the methodology of live calling for each parameter in detail.

#### 1.5.2.1 FAULT CLEARANCE

Live calling for fault clearance is done to verify the following.

- Fault repair by next working day - for both Urban and Rural Exchanges
- Fault repair within 5 working days – Urban Exchanges
- Fault repair within 7 working days – Rural Exchanges

⇒ Auditors request the operator to provide the database of all the subscribers who reported Faults in one month prior to IMRB auditor visit

- ✧ Calls are made to up to 10% or 100 complainants, whichever is less, per service provider or in case of BSNL, if there are more than 1 SDCAs selected for the sample, 10% or 30 complainants per sample SDCA by randomly selecting from the list provided by operator.
- ✧ Auditors check and record whether the fault was corrected within the timeframes as mentioned in the benchmark

**Benchmark:**

- Fault repair by next working day (Urban Exchanges): =>85%
- Fault repair by next working day (Rural Exchanges): =>75%
- Fault repair within 5 working days (Urban Exchanges): =100%
- Fault repair within 7 working days (Rural Exchanges): =100%

### 1.5.2.2 RESOLUTION OF BILLING COMPLAINTS

Live calling is done to verify Resolution of billing complaints within stipulated time. The process for this parameter is stated below.

- ✧ Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically
- ✧ A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator
- ✧ Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

**Benchmark:**

98% complaints resolved within 4 weeks, 100% complaints resolved within 6 weeks

### 1.5.2.3 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

Live calling is done to verify response time for customer assistance is done to verify the performance of call center in terms of

- ✧ Calls getting connected and answered:
- ✧ % age of calls answered by operator / voice to voice) within 90 seconds: In 95% of the cases or more

The process for this parameter is stated below.

- Overall sample size is 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS.
- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.
- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

#### 1.5.2.4 LEVEL 1 SERVICE

Level 1 is used for accessing special services like emergency services, supplementary services, inquiry and operator-assisted services. Level 1 Services include services such as police, fire, ambulance (Emergency services). Test calls were made from operator network to test the accessibility and efficiency of Level 1 services on an operator's network.

A minimum of 300 test calls were made per service provider in the quarter. In case of BSNL, calls were equally distributed among SDCAs (Short Distance Charging Area) visited for the purpose of live calling.

In OND'15, IMRB has conducted the live calling to the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

##### 1.5.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

- On visiting the operator's premises (Exchange/Central Server etc.), auditors ask the operator authorized personnel to provide a list of Level 1 services being active in their service. The list should contain a description of the numbers along with dialing code.
- Operators might provide a long list of L1 services. To identify emergency L1 service numbers, auditors check if there is any number that starts with code '10' in that list. If auditors find any emergency number in addition to the below list, that number is also tested during live calling.
- On receiving the list, auditors verify it if the below given list of numbers are active in the service provider's network.
- If there are any other additional numbers provided by the operator, auditors also do live calling on those numbers along with below list.
- If any of these numbers is not active, then we would write the same in our report, auditors write in the report.
- Post verifying the list, auditors do live calling by equally distributing the calls among the various numbers and update the results in the live calling sheet.

L1 Code	Description	L1 Code	Description
100	Police	1090	Call Alart ( Crime Branch)
101	Fire	1091	Women Helpline
102	Ambulance	1097	National AIDS Helpline to NACO
104	Health Information Helpline	1099	Central Accident and Trauma Services (CATS)
108	Emergency and Disaster Management Helpline	10580	Educational & Vocational Guidance and Counselling
138	All India Helpline for Passengers	10589	Mother and Child Tracking ( MCTH)
149	Public Road Transport Utility Service	10740	Central Pollution Control Board
181	Chief Minister Helpline	10741	Pollution Control Board
182	Indian Railway Security Helpline	1511	Police Related Service for all Metro Railway Project
1033	Road Accident Management Service	1512	Prevention of Crime in Railway
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'	1514	National Career Service(NCS)
1056	Emergency Medical Services	15100	Free Legal Service Helpline
106X	State of the Art Hospitals	155304	Municipal Corporations
1063	Public Grievance Cell DoT Hq	155214	Labour Helpline
1064	Anti Corruption Helpline	1903	Sashastra Seema Bal (SSB)
1070	Relief Commission for Natural Calamities	1909	National Do Not Call Registry
1071	Air Accident Helpline	1912	Complaint of Electricity
1072	Rail Accident Helpline	1916	Drinking Water Supply
1073	Road Accident Helpline	1950	Election Commission of India
1077	Control Room for District Collector		

### 1.5.3 AUDIT METHODOLOGY

As per audit tender, following table explains the audit methodology for Basic (Wireline) services. Here, a YES signifies that the mentioned parameter gets audited by the given audit method (PMR/ Live Measurement/ Live Calling).

Sl. No.	Parameters	PMR	Live measurement	Live calling
1	Fault incidence/clearance related statistic	YES		
1.1	- Total number of faults registered per month	YES		
1.2	- Fault repair by next working day (Urban and Rural)	YES		YES
1.3.1	- Fault repair within 5 working days (Urban)	YES		YES
1.3.2	- Fault repair within 7 working days (Rural)	YES		YES
1.4	Mean Time to Repair (MTTR)	YES		
4	POI Congestion	YES	YES	
5	Metering and billing credibility – postpaid	YES		YES
5.1	Metering and billing credibility – prepaid	YES		YES
6	Customer service promptness	YES		
6.1	Processing closure request	YES		
7	Response time to customer	YES		
7.1	While call is getting connected and answered	YES		YES
7.2	While call is answered by operator	YES		YES

	(voice to voice)			
8	Level 1 Services			YES
9	Time taken to refund of deposits after closure	YES		

The audit methodology for each parameter has been explained along with the findings of same.

#### 1.5.4 MEASUREMENT METHODOLOGY

As per audit tender, following table explains the measurement methodology in terms of time period consideration for various parameters involved in audit of Basic (Wireline) services.

Sl. No.	Parameters	Averaged over a period
1	Fault incidence	One Quarter
1.1	Total number of faults registered per month	One Quarter
1.2	Fault repair by next working day (Urban and Rural)	One Quarter
1.3.1	Fault repair within 5 working days (Urban)	One Quarter
1.3.2	Fault repair within 7 working days (Rural)	One Quarter
1.4	Mean Time to Repair (MTTR)	One Quarter
4	POI Congestion	One Month
5	Metering and billing credibility – postpaid	One Billing Cycle
5.1	Metering and billing credibility – prepaid	One Quarter
6	Customer care promptness	One Quarter
6.1	Processing closure request	One Quarter
7	Response time to customer	One Quarter
7.1	While call is getting connected and answered	One Quarter
7.2	While call is answered by operator (voice to voice) within 90 seconds	One Quarter
8	Time taken to refund of deposits after closure	One Quarter

## 1.6 SAMPLING METHODOLOGY

- For BSNL, a minimum sample of 5% of the total exchanges was spread across 10% of SDCA's in the entire service area for the purpose of audit, live calling and live measurement.
- The sampling plan for BSNL was finalized as per TRAI guidelines. The details of exchange list are given in section 5.8
- As per tender guidelines, there was no sampling activity involved in case of other operators.

**Airtel, BSNL, Reliance, TATA and Vodafone were audited in centralized exchange and same was carried out for live calling.**

Audit for BSNL has been conducted on the basis of data pertaining to sample SDCA's and exchanges.

Name of Operator
Airtel
BSNL
Tata
Vodafone
Reliance

## 1.7 COLOUR CODE TO READ THE REPORT



**Not Meeting the benchmark**

## 2 EXECUTIVE SUMMARY

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall performance of various operators in the Kolkata circle, with a parameter wise performance evaluation as compared to TRAI benchmark.

### 2.1 PMR (PERFORMANCE MONITORING REPORT) DATA – OND'15

Parameters	Benchmarks	Airtel	BSNL	Tata	Vodafone	Reliance
Faults incidences ( No. of faults/100 Subs./month) - averaged for the quarter	≤7	3.66	10.83	1.00	12.00	0.07
% of faults repaired by next working day	≥ 85% (Urban)	87.20%	19.45%	99.03%	100.00%	100.00%
% of faults repaired within 5 days	100% (Urban)	100.00%	82.37%	100.00%	100.00%	100.00%
Percentage of faults repaired by next working day during the quarter	≥ 75% (Rural)	NA	NA	NA	NA	NA
Percentage of faults repaired within 7 days during the quarter	100% (Rural)	NA	NA	NA	NA	NA
Faults pending for > 3days and ≤7 days	Rent rebate of 7 days	NA	NA	NA	NA	NA
Faults pending for > 7 days and ≤15 days	Rent rebate of 15 days	NA	NA	NA	NA	NA
Faults pending for > 15 days	Rent rebate of 1 month	NA	NA	NA	NA	NA
Mean Time to Repair (MTTR)	≤ 10 Hrs	6.45	8.12	2.92	1.43	4.08
No. of POIs with congestion > 0.5%	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
Metering and billing credibility - Number of bills disputed during the quarter	≤ 0.1%	0.10%	0.00%	0.04%	0.00%	0.02%
Resolution of billing complaints within 4 weeks	≥ 98%	100.00%	NA	100.00%	NA	100.00%
Percentage complaints resolved within 6 weeks of date of receipt	100%	100.00%	NA	100.00%	NA	100.00%
Period of applying credit / waiver within 1 week	100%	100.00%	NA	100.00%	NA	100.00%
Closure within 7 days	100%	100.00%	49.72%	100.00%	NA	100.00%
Refund of deposits within 60 days of closure of service	100%	100.00%	100.00%	100.00%	100.00%	100.00%
Response time to customer for assistance	Benchmarks	Airtel	BSNL	Tata	Vodafone	Reliance
% age calls getting connected and answered	≥ 95%	99.60%	99.61%	99.29%	100.00%	98.36%
Percentage of calls answered by the operators (voice to voice) within 90 seconds	≥ 95%	99.60%	95.17%	96.07%	100.00%	97.47%

NA: Parameters not applicable for the operators.

In case of POI for Tata, there is no direct POI from Wireline MSC. All Calls are getting routed via Inter MSC TGs with GSM/ CDMA MSCs. So, Total number of working POI is not present in the wireline system of Tata. The operator system is not equipped to provide the POI data separately for wireline.

Following are the parameter wise observations for the operators in Kolkata circle:

### 2.1.1 FAULT INCIDENCE / CLEARANCE STATISTICS

BSNL and Vodafone failed to meet the benchmark for fault incidence.

In urban areas, BSNL failed to meet the benchmark of fault repair within next day and for fault repair within 5 days in urban areas. Reliance and Tata met the benchmark of fault repair parameters in urban areas.

### 2.1.2 MEAN TIME TO REPAIR (MTTR)

All the operators met the benchmark for the Mean time to repair (MTTR).

### 2.1.3 POI (POINT OF INTERCONNECTION) CONGESTION

All operators met the benchmark with 0% POIs with congestion.

### 2.1.4 METERING AND BILLING CREDIBILITY

Airtel failed to meet the benchmark for metering and billing credibility.

### 2.1.5 RESOLUTION OF BILLING COMPLAINTS

All operators met the benchmark for resolution of billing complaints within 4 weeks and within 6 weeks. Tata met the benchmark for the parameter during the audit period.

NA: Not available, BSNL has no billing complaints were logged in the audit period.

### 2.1.6 PERIOD OF APPLYING CREDIT/ WAIVER

All operators met the benchmark for the parameter.

NA: BSNL had no cases where credit/ waiver were required during the audit period.

### 2.1.7 CLOSURE WITHIN 7 DAYS

BSNL failed to meet the benchmark for the parameter.

### 2.1.8 REFUND OF DEPOSIT WITHIN 60 DAYS FROM CLOSURE

All the operators met the benchmark for the parameter.

### 2.1.9 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

All operators met the TRAI benchmark in terms of number of IVR calls being connected and answered.

The benchmark of 95% of voice to voice calls answered within stipulated time of 90 seconds was also met by all operators.

## 2.2 3 DAY LIVE MEASUREMENT

Parameters	Benchmarks	Airtel	BSNL	Tata	Vodafone	Reliance
POI Congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%

Let us now review the various parameters involved during live measurement.

### 2.2.1 POI (POINT OF INTERCONNECTION) CONGESTION

All operators met the benchmark with 0% POIs with congestion.

## 2.3 LIVE CALLING

Parameters	Benchmarks	Airtel	BSNL	Tata	Vodafone	Reliance
Fault Repair/ Clearance						
% of faults repaired by next working day	≥ 85% (Urban)	37.00%	21.00%	86.00%	90.91%	46.00%
Percentage cases where faults were repaired by next working day	≥ 75% (Rural)	NA	NA	NA	NA	NA
% of faults repaired within 5 days	100% (Urban)	93.00%	75.00%	10.00%	9.09%	72.00%
Percentage cases where faults were repaired within 7 days	100% (Rural)	NA	NA	NA	NA	NA
Resolution of billing complaints						
Resolution of billing complaints within 4 weeks	≥ 98%	94.59%	96.00%	100.00%	NA	100.00%
Percentage complaints resolved within 6 weeks of date of receipt	100%	100.00%	100.00%	100.00%	NA	100.00%
Response time to customer for assistance						
% age calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%
% age call answered by operator in 90 seconds	≥ 95%	100.00%	100.00%	96.00%	100.00%	100.00%
Level 1 Services						
% age calls made to Level 1 services getting answered	≥ 90%	88.33%	86.67%	87.67%	100.00%	95.67%

### 2.3.1 FAULTS REPAIR/ CLEARANCE

BSNL, Airtel and Reliance failed to meet the benchmark of fault repair within next day in urban areas.

BSNL, Airtel, Vodafone, Reliance and TATA failed to meet the benchmark of fault repair within 5 days in urban areas.

### 2.3.2 RESOLUTION OF BILLING COMPLAINTS

During live calling, it was observed that Airtel failed to meet the benchmark of resolving complaints within 4 weeks and BSNL failed to meet the benchmark within 4 weeks.

### 2.3.3 RESPONSE TIME TO CUSTOMER FOR ASSISTANCE

During live calling, it was observed that all operators met the benchmark of 95% IVR calls getting connected and answered.

All operators met the benchmark of 95% calls getting answered (voice to voice) within 90 seconds.

### 2.3.4 LEVEL 1 SERVICES

All operators failed to meet the benchmark for Level 1 services. The category 1 (restricted) services were tested from different SDCAs. The details of live calling can be found in the annexure (Section 5.8).

It has been observed that a number of Category-I (i.e. mandatory) services were not being operated by the operators.

### 3 CRITICAL FINDINGS - OND'15

#### Fault Incidence/ Clearance Statistic

- BSNL and Vodafone failed to meet the benchmark for fault incidence.
- In urban areas, BSNL failed to meet the benchmark of fault repair within next day and fault repair within 5 days in urban areas.

#### Metering and Billing Credibility

- Airtel failed to meet the benchmark for metering and billing credibility.

#### Closure within 7 days

- The benchmark of completing 100% closure requests within 7 days was not met by BSNL.

#### Refund of deposit after closure

- The benchmark of refunding 100% deposits within 60 days was not met by BSNL.

#### Closure within 7 days

- BSNL failed to meet the benchmark for the parameter.

#### 3day live measurement

- BSNL failed to meet the benchmark of 75% for Answer to Seizure Ratio (ASR).

#### Live Calling

- BSNL & Airtel failed to meet the benchmark of fault repair within next day in urban areas.
- BSNL, Airtel, Vodafone, Reliance and TATA failed to meet the benchmark of fault repair within 5 days in urban areas.
- During live calling, it was observed that Airtel failed to meet the benchmark of resolving complaints within 4 weeks and BSNL failed to meet the benchmark within 6 weeks.
- During live calling, it was observed that all operators met the benchmark of 95% IVR calls getting connected and answered and 95% calls getting answered (voice to voice) within 90 seconds.
- All operators failed to meet the benchmark for Level 1 services. The category 1 (restricted) services were tested from different SDCAs. The details of live calling can be found in the annexure (Section 5.9).

It has been observed that a number of Category-I (i.e. mandatory) services were not being operated by the operators. As per live calling conducted for 'level 1' services, a number of Category-I (i.e. mandatory) services were not being operated by the operators.

## 4 PARAMETER EXPLANATION AND DETAILED FINDINGS - COMPARISON BETWEEN PMR AND LIVE CALLING/ MEASUREMENT DATA

### 4.1 FAULT INCIDENCE/ CLEARANCE RELATED SERVICES

#### 4.1.1 PARAMETER EXPLANATION

##### 4.1.1.1 DEFINITION

**Fault Incidence:** This parameter quantifies the number of faults registered per 100 subscribers/ per month for a wireline service provider in a quarter.

**Fault Clearance/Repair:** This parameter quantifies the number of faults repaired within a stipulated period of time (within a day, within 5 days – urban, within 7 days – rural) in the quarter

**Mean Time to Repair (MTTR):** It is the average of total time taken to repair for all faults reported in a quarter

##### 4.1.1.2 AUDIT PROCEDURE

IMRB Auditors to verify and collect data pertaining to number of fault received and also number of faults cleared at the service provider's level in the following time frames:-

- ✍ Number of faults cleared within 24 hours (Urban & Rural)
- ✍ Number of cleared in more than 1 day but less than 5 days (Urban)
- ✍ Number of cleared in more than 5 days but less than 7 days (Urban)
- ✍ Number of cleared in more than 1 day but less than 7 days (Rural)
- ✍ Number of cleared in more than 7 days but less than 15 days (Urban & Rural)
- ✍ Number of cleared in more than 15 days (Urban & Rural)

The mean time to repair (in hours) is also calculated by averaging the total time of repair for each customer.

#### Live calling: -

- ✍ Live calling was done to verify the following
  - Fault repair by next working day - for both Urban and Rural Exchanges
  - Fault repair within 5 working days – Urban Exchanges
  - Fault repair within 7 working days – Rural Exchanges
- ✍ Auditors ensured that the operator provided a list of all the subscribers who reported Faults in one month prior to IMRB auditor visit

- ↳ Calls are made to up to 10% or 100 complainants, whichever is less, per service provider or in case of BSNL, if there are more than 1 SDCAs selected for the sample, 10% or 30 complainants per sample SDCA by randomly selecting from the list provided by operator.
- ↳ Auditors checked and recorded whether the fault was corrected within the timeframes as mentioned in the benchmark

#### 4.1.1.3 COMPUTATIONAL METHODOLOGY

The calculation methodology (given below) as per QoS regulations 2009 (7 of 2009) was followed for calculating fault related parameters.

##### Fault Incidence:

Fault incidences – No. of faults/100 subscriber/month =

$$\frac{\text{Total number of faults in the Quarter (3 months)}}{\text{Total No. of DELs at the end of the Quarter}} \times \frac{100}{3}$$

Here, DEL or Direct Exchange Line would be the subscribers of wireline services.

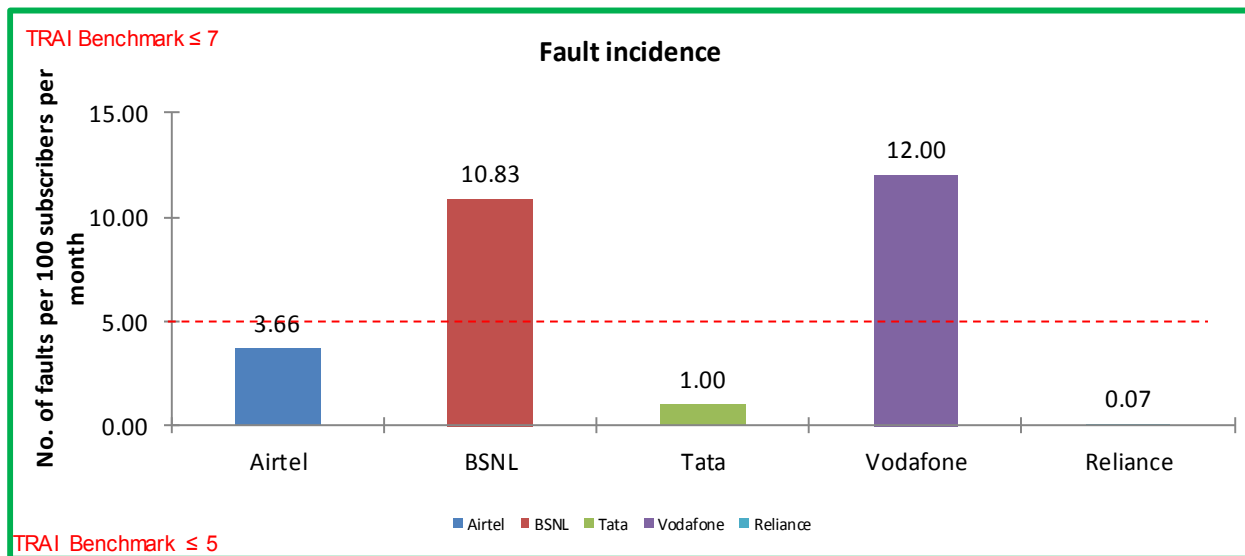
##### MTTR (Mean Time to Repair):

$$\text{Mean Time to Repair} = \frac{\text{sum of duration of each repair time in hours for all the fault incidences in a Quarter (3 months)}}{\text{Total number of fault incidences in a Quarter (3 months)}}$$

#### 4.1.1.4 BENCHMARK

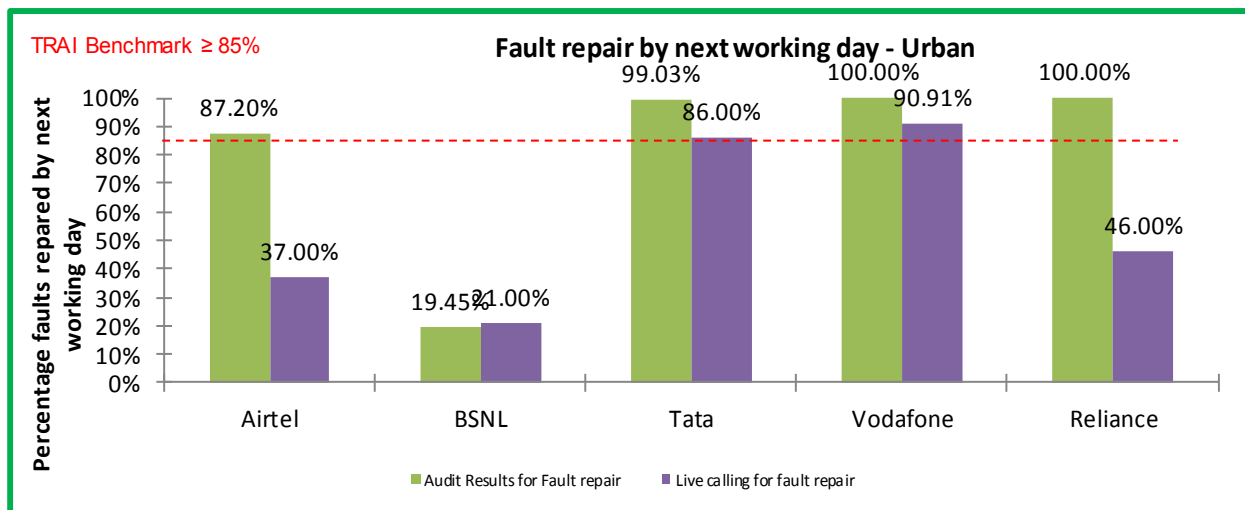
- ↳ Total number of faults registered per month: ≤5 complaints per 100 subscribers
- ↳ Fault repair:
  - Fault repair by next working day (Urban Exchanges): ≥85%
  - Fault repair by next working day (Rural Exchanges): ≥75%
  - Fault repair within 5 working days (Urban Exchanges): =100%
  - Number of cleared in within 7 days (Rural Exchanges): =100%
- ↳ Mean Time to Repair: 10 hours

### 4.1.2 DETAILED FINDINGS - FAULT INCIDENCE



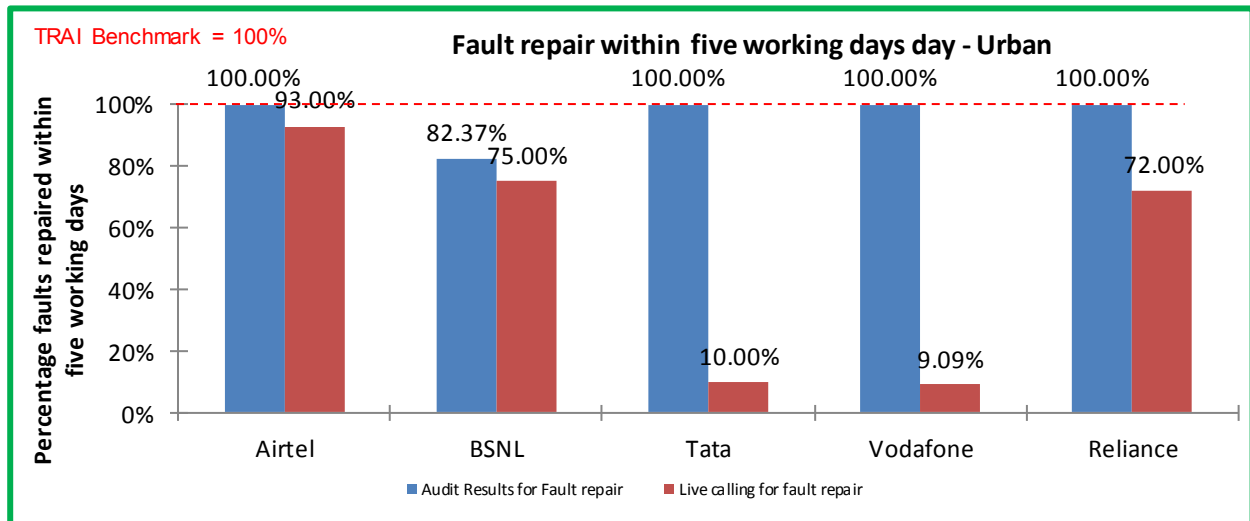
BSNL and Vodafone failed to meet the benchmark for fault incidence.

### 4.1.3 DETAILED FINDINGS - FAULT REPAIR BY NEXT DAY (URBAN)



In urban areas, BSNL failed to meet the benchmark in PMR audit and Airtel, BSNL and Reliance failed for live calling of fault repair within next day.

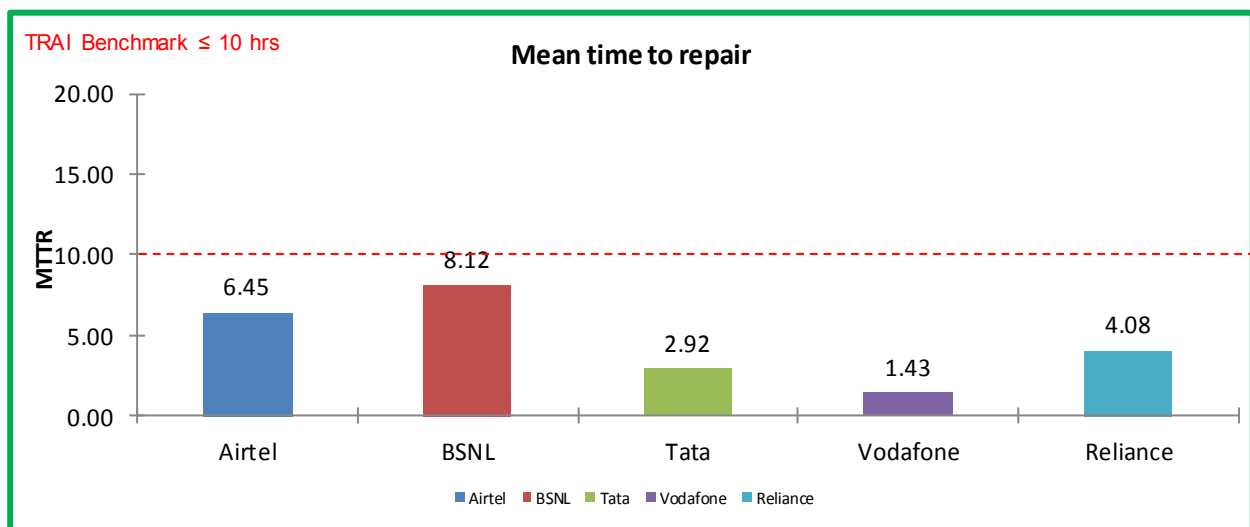
#### 4.1.4 FINDINGS - FAULT REPAIR WITHIN FIVE WORKING DAYS (URBAN)



Data Source: Operations and Maintenance Center (OMC) of the operators

BSNL failed to meet the benchmark of fault repair within five working days in urban areas. Also, during live calling the performance of all operator was slightly below the audit results.

#### 4.1.5 DETAILED FINDINGS - MEAN TIME TO REPAIR



Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark for MTTR.

## 4.2 METERING AND BILLING CREDIBILITY

### 4.2.1 PARAMETER EXPLANATION

All the complaints related to billing as per clause 3.7.2 of QoS regulation of 20<sup>th</sup> March, 2009 were covered. The types of billing complaints covered are listed below.

- ↗ Payments made and not credited to the subscriber account
- ↗ Payment made on time but late payment charge levied wrongly
- ↗ Double charges
- ↗ Charging for toll free services
- ↗ Local calls charged/billed as STD/ISD or vice versa
- ↗ Calls made disputed
- ↗ Credit agreed to be given in resolution of complaint, but not accounted in the bill
- ↗ Charging for services provided without consent
- ↗ Charging not as per tariff plans
- ↗ Overcharging or undercharging

In addition to the above, any billing complaint which leads to billing error, waiver, refund, credit, or any adjustment is also considered as a valid billing complaint for calculating the number of disputed bills.

#### 4.2.1.1 AUDIT PROCEDURE

IMRB Auditors to verify and collect data pertaining to –

- ↗ Number of Billing complaints received at the service provider's level
- ↗ Last billing cycle stated should be such that due date for payment of bills must be beyond the date when this form is filled.
- ↗ Include all types of bills generated for customers. This could include online as well as other forms of bills presentation including printed bills
- ↗ Billing complaint is any of written complaint/ personal visit/ telephonic complaint related to: Excess metering/ wrong tariff scheme charged, Payment made in time but charged penalty/ not reflected in next bill, Last payment not reflected in bill, Adjustment/ waiver not done, Anything else related to bills, Toll free numbers charged etc.
- ↗ Billing complaints resolution database, with opening and closing date of complaint to identify the time taken to resolve a complaint

### Live calling:

- ↳ Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically
- ↳ A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator
- ↳ Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

### Benchmarks:

- ↳ 98% complaints resolved within 4 weeks, 100% complaints resolved within 6 weeks

#### 4.2.1.2 COMPUTATIONAL METHODOLOGY – METERING AND BILLING CREDIBILITY

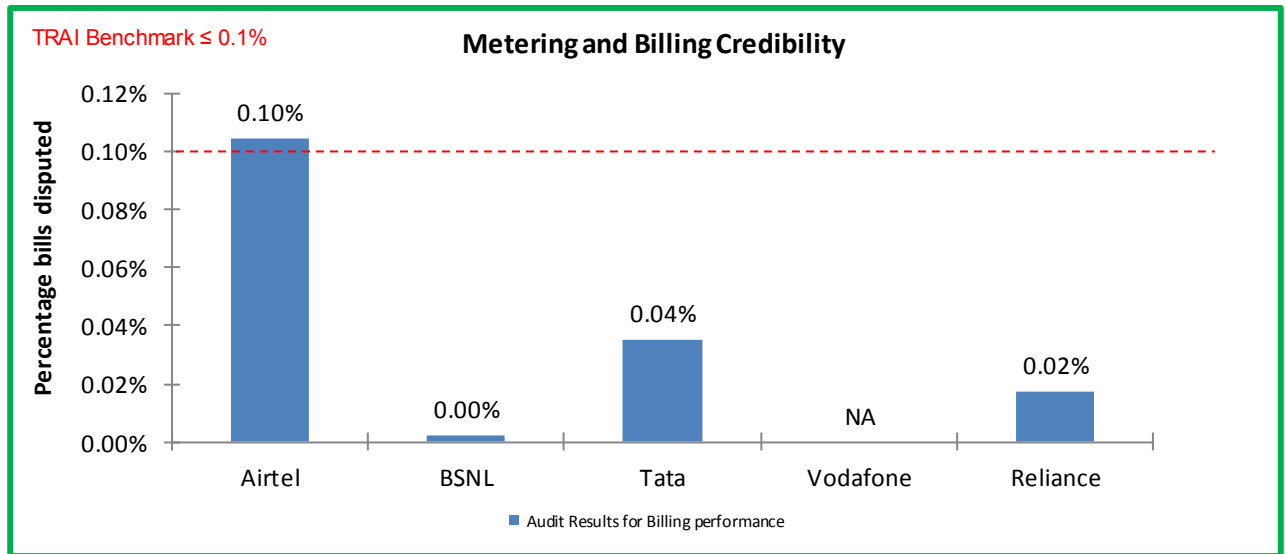
The calculation methodology (given below) as per QoS regulations 2009 (7 of 2009) was followed to calculate incidence of billing complaints.

$$\text{Billing complaints (\%)} = \frac{\text{total number of disputed bills} \times 100}{\text{total number of bills issued during one billing cycle.}}$$

- ↳ \*Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated
- ↳ \*\*Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.

**TRAI Benchmark:** < 0.1%

#### 4.2.1.1 METERING AND BILLING CREDIBILITY – AUDIT FINDINGS



Data Source: Billing Center of the operators

All operators met the benchmark for the parameter.

#### 4.2.1.2 COMPUTATIONAL METHODOLOGY – RESOLUTION OF BILLING COMPLAINTS

##### ↪ Calculation of Percentage resolution of billing complaints

The calculation methodology (given below) as per QoS regulations 2009 (7 of 2009) and TRAI guidelines (Received on Sep 08, 2015) was followed to calculate resolution of billing complaints.

##### Resolution of billing complaints within 4 weeks:

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 4 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

##### Resolution of billing complaints within 6 weeks:

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

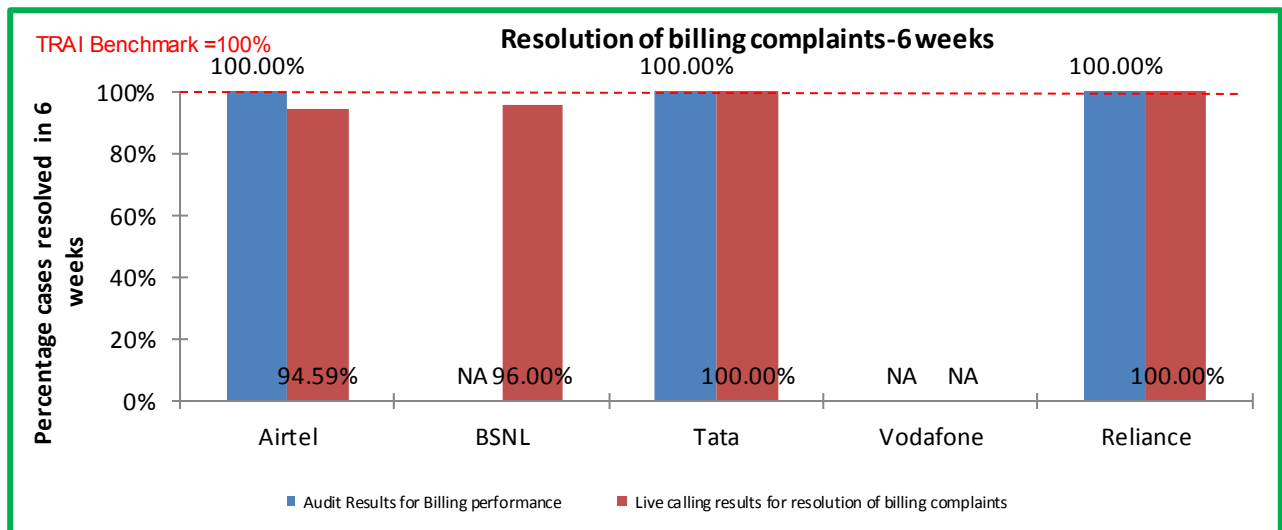
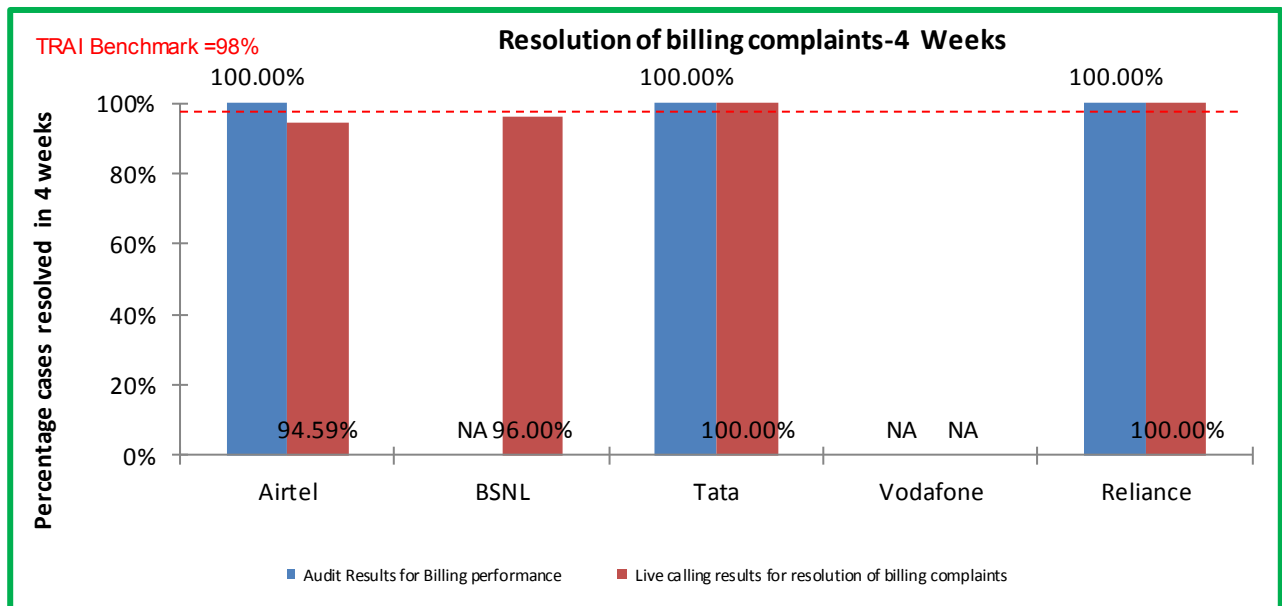
$$\frac{\text{number of billing complaints for post-paid customers/charging, credit/ validity complaints for pre-paid customers resolved within 6 weeks during the quarter}}{\text{number of billing/charging, credit / validity complaints received during the quarter}} \times 100$$

- \*\*Billing complaints here shall include only dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally. Complaints raised by the consumers to operator are only considered as part of the calculation.
- The complaints that get marked as invalid by the operator are not considered for calculation as those complaints cannot be considered as resolved by the operator.

↪ \*\*\* Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.

Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

### 4.2.1.3 RESOLUTION OF BILLING COMPLAINTS – AUDIT FINDINGS



As per audit conducted, all operators met the benchmark for resolution of billing complaints within 4 weeks and within 6 weeks. Airtel failed to meet the benchmark during live calling.

NA: Parameter not applicable for Vodafone as no billing complaints were logged in the audit period.

#### 4.2.1.4 COMPUTATION METHODOLOGY - PERIOD OF APPLYING CREDIT WAIVER

This parameter measures whether all refunds in the form of credit/ waiver/ adjustment are made within 7 days from the date of resolution of complaint.

##### ➤ Computational Methodology:

➤ Period of applying credit waiver = (number of cases where credit waiver is applied within 7 days/ total number of cases eligible for credit waiver) \* 100

##### ➤ TRAI Benchmark:

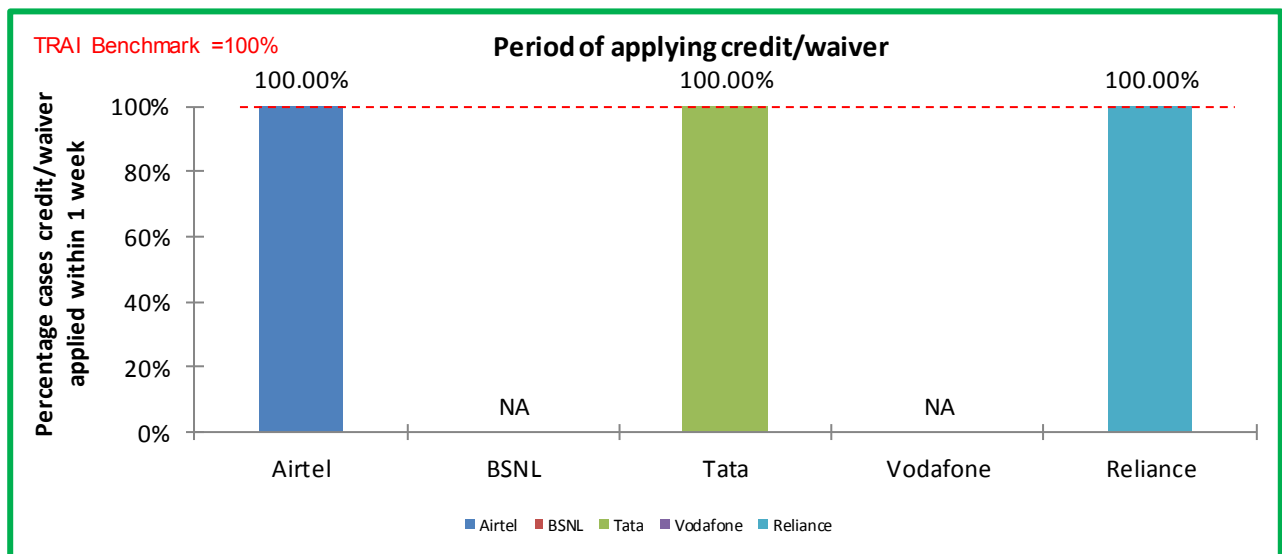
➤ Period of applying credit waiver within 7 days: 100%

##### ➤ Audit Procedure:

➤ Operator to provide details of:-

- Dates of applying credit waiver to all the eligible cases.
- Dates of lodging the request for applying credit waiver for all eligible cases

#### 4.2.1.5 PERIOD OF APPLYING CREDIT WAIVER – AUDIT FINDINGS



All operators met the benchmark for the parameter.

NA: Vodafone and BSNL had no cases where credit/ waiver were required during the audit period.

## 4.3 RESPONSE TIME TO CUSTOMER

### 4.3.1 PARAMETER EXPLANATION

Following two sub-parameters are covered for this parameter:

- ✦ Accessibility of Call Centre: The percentage of calls getting connected and answered by the call center. Not more than 5% calls shall encounter busy signal, no reply or any other failure in getting connected to the IVR.
- ✦ % age of calls answered by operators (voice to voice) within stipulated time: Not more than 5% calls shall encounter busy signal, no reply or any other failure in getting connected to the call center executive.

#### 4.3.1.1 AUDIT PROCEDURE

- ✦ IMRB auditors collect the data for time taken to connect a customer's call both to the IVR as well as to a customer care executive.
- ✦ All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

#### Live calling:

- ✦ Overall sample size was 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS.
- ✦ Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.
- ✦ All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

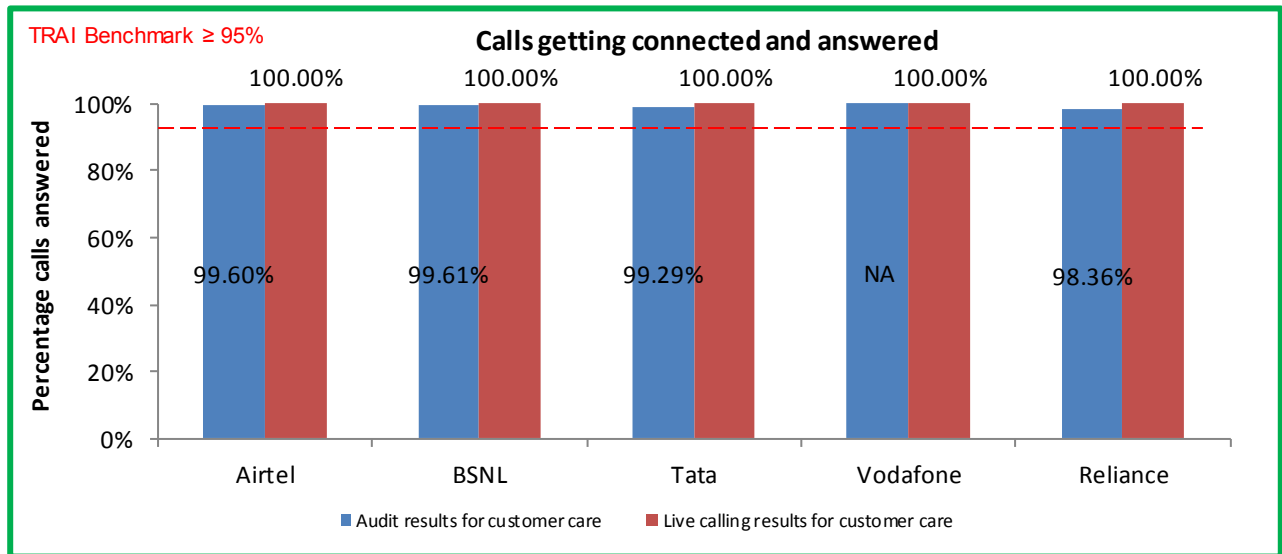
#### 4.3.1.2 COMPUTATIONAL METHODOLOGY

- ✦ **Percentage of calls answered in a specified time = (Total no. of calls answered within that specified time / Total no. of calls dialed for a particular service)\*100**

#### 4.3.1.3 BENCHMARK

- ✦ % age of calls getting connected and answered: In 95% of the cases or more.
- ✦ % age of calls answered by operator / voice to voice) within 90 seconds: In 95% of the cases or more

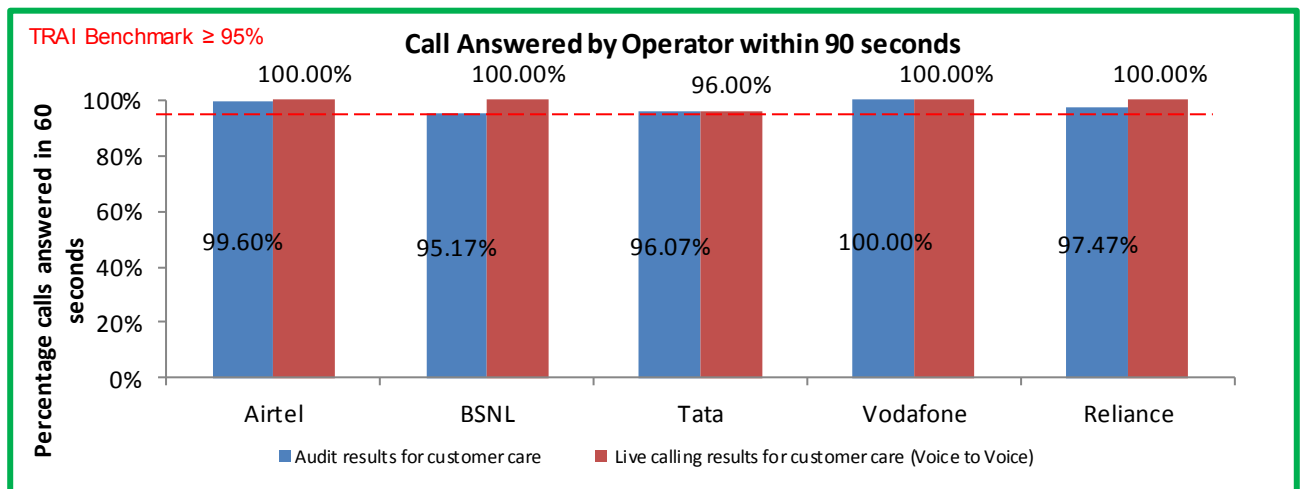
### 4.3.2 CALLS GETTING CONNECTED AND ANSWERED



Data Source: Customer Service Center of the operators

All operators failed to meet the TRAI benchmark in terms of number of IVR calls being connected and answered. However, during live calling, all operators met the benchmark.

### 4.3.3 CALL ANSWERED BY OPERATOR WITHIN 90 SECONDS



Data Source: Customer Service Center of the operators

The benchmark of 95% of voice to voice calls answered within stipulated time of 90 seconds as well as during live calling was met by all operators.

## 4.4 CUSTOMER CARE PROMPTNESS

### 4.4.1 PARAMETER EXPLANATION

#### 4.4.1.1 AUDIT PROCEDURE

IMRB Auditors collected and verified data pertaining to -

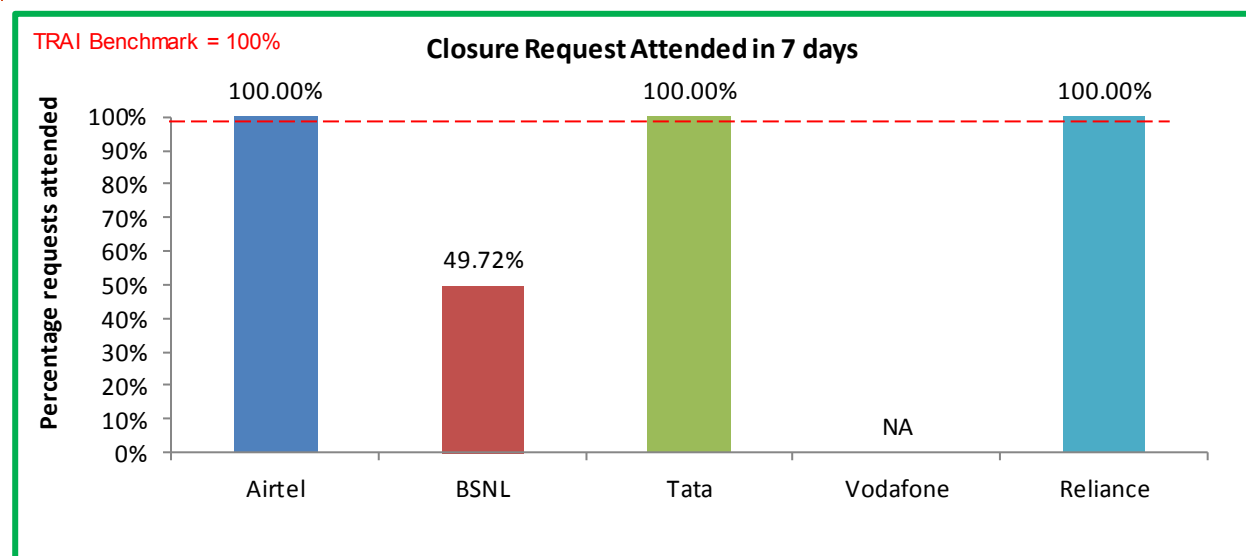
**Processing of closure request** (Following key points were taken care of while verifying the data)

- ✦ The operator includes all Requests for volunteer Permanent Closure and External (shifts to other exchanges) Shift requests received at their exchange.
- ✦ DNP (due to Non – payment) cases are excluded.
- ✦ All holidays are excluded for calculating 7 days.
- ✦ Closure requests attended in the previous months are excluded
- ✦ The period for closure starts from the time of submission of application by the subscriber.

#### 4.4.1.2 BENCHMARK

- ✦ Processing of closure requests within 7 days = 100%

### 4.4.2 FINDINGS - CLOSURE REQUEST ATTENDED IN 7 DAYS



Data Source: Customer Service Center of the operators

BSNL failed to meet the benchmark for the parameter.

NA: Vodafone did not have any closure request during the audit period.

## 4.5 TIME TAKEN TO REFUND DEPOSIT AFTER CLOSURE

### 4.5.1 PARAMETER EXPLANATION

#### 4.5.1.1 AUDIT PROCEDURE

IMRB Auditors verified and collected data pertaining to -

- Cases requiring refund of deposits after closure are to be included.
- Time taken starts from the date on which the closure is made by the service provider and ends at the date on which refund is received by the customer

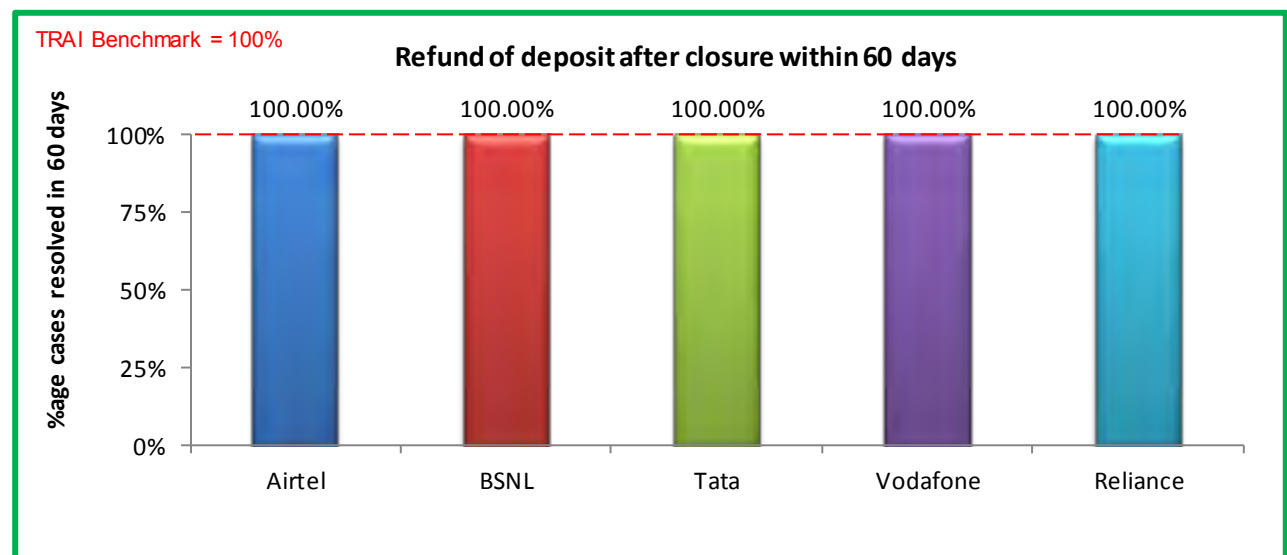
#### 4.5.1.2 COMPUTATIONAL METHODOLOGY

- **Percentage of cases where refund has been made within stipulated time = (Total no. of cases where refund was made within stipulated time/ Total no. of cases requiring refunds)\*100**

#### 4.5.1.3 BENCHMARK

- Time taken to refund = 100% within 60 days

### 4.5.2 FINDINGS - REFUND OF DEPOSIT AFTER CLOSURE WITHIN 60 DAYS



Data Source: Customer Service Center of the operators

Airtel met the benchmark for the parameter.

NA: Reliance, BSNL, Vodafone and Tata did not have any closure request during the audit period.

## 4.6 CRITICAL FINDINGS - OND'15

### Fault repair by next working day

- Airtel, BSNL and Reliance had a huge difference between PMR and live calling, whereas live calling values were below 50%.

### Fault repair within five working days day – Urban

- TATA and Vodafone had a huge difference between PMR and live calling, whereas live calling values for TATA 10% and Vodafone 9.09%.

## 5 ANNEXURE – OND'15

### 5.1 FAULT INCIDENCE / CLEARANCE STATISTIC

Audit Results for Fault repair						
Fault incidences	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Faults incidences (Urban)	≤ 7	3.66	10.83	1.00	12.00	0.07
Fault repair (Urban areas)	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total No. of faults registered during the quarter		12626	223430	308	14	149.00
No. of faults repaired by next working day during the quarter		11010	43446	305	14	149.00
Percentage of faults repaired by next working day during the quarter	≥ 85%	87.20%	19.45%	99.03%	100.00%	100.00%
No. of faults repaired within 5 days during the quarter		12626	184034	308	14	149
Percentage of faults repaired within 5 days during the quarter	100%	100.00%	82.37%	100.00%	100.00%	100.00%
Fault repair (Rural & Hilly areas)	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total No. of faults registered during the quarter		NA	223430	NA	NA	NA
No. of faults repaired by next working day during the quarter		NA	52041	NA	NA	NA
Percentage of faults repaired by next working day during the quarter	≥ 75%	NA	NA	NA	NA	NA
No. of faults repaired within 7 days during the quarter		NA	19259	NA	NA	NA
Percentage of faults repaired within 7 days during the quarter	100%	NA	NA	NA	NA	NA

Data Source: Operations and Maintenance Center (OMC) of the operators

Rent rebate	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
No. of cases with faults pending for >5 days and ≤7 days		NA	NA	NA	NA	NA
Out of these number of cases where rent rebate for 7 days was given		NA	NA	NA	NA	NA
Percentage of cases where rent rebate for 7 days was given	100%	NA	NA	NA	NA	NA
No. of cases with faults pending for >7 days and ≤15 days		NA	NA	NA	NA	NA
Out of these number of cases where rent rebate for 15 days was given		NA	NA	NA	NA	NA
Percentage of cases where rent rebate for 15 days was given	100%	NA	NA	NA	NA	NA
No. of cases with faults pending for ≥15 days		NA	NA	NA	NA	NA
Out of these number of cases where rent rebate for 30 days was given		NA	NA	NA	NA	NA
Percentage of cases where rent rebate for 30 days was given	100%	NA	NA	NA	NA	NA
MTTR (Urban + Rural)	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Mean time taken to repair the fault in hours	≤ 10 Hrs	6.45	8.12	2.92	1.43	4.08

Data Source: Operations and Maintenance Center (OMC) of the operators

NA: Rent rebate not applicable for any operators as all faults were repaired within stipulated time.

Live calling for fault repair						
Urban area	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total Number of calls made		100	100	100	22	50
Number of cases where faults were repaired by next working day		37	21	86	20	23
Percentage cases where faults were repaired by next working day	≥ 85%	37.00%	21.00%	86.00%	90.91%	46.00%
Number of cases where faults were repaired within 5 days		93	75	10	2	36
Percentage cases where faults were repaired within 5 days	100%	93.00%	75.00%	10.00%	9.09%	72.00%
Fault Repair (Rural & Hilly areas)	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total Number of calls made		NA	NA	NA	NA	NA
Number of cases where faults were repaired by next working day		NA	NA	NA	NA	NA
Percentage cases where faults were repaired by next working day	≥ 75%	NA	NA	NA	NA	NA
Number of cases where faults were repaired within 7 days		NA	NA	NA	NA	NA
Percentage cases where faults were repaired within 7 days	100%	NA	NA	NA	NA	NA

Data Source: Live calls made by auditors from operator's network

NA: Reliance, BSNL, Airtel, Vodafone and Tata do not have network presence in rural and hilly areas.

Number of calls made for fault repair lower than target due to low base of fault repair incidences.

## 5.2 POI CONGESTION

Audit Results for POI Congestion - Consolidated						
POI congestion	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total capacity of all POIs (Average of 3 months)		7026	38580	NA	333	1848
Served traffic for all POI's (Average of 3 months)		4819	8351	NA	32	417
Traffic failed on all POI's (Average of 3 months)	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
POI congestion	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
No. of POIs not meeting benchmark (Avg. of 3 months)		26	104	NA	10	12.00
Total number of working POIs (Avg. of 3 months)		0	0	NA	0	0.00

Data Source: Network Operations Center (NOC) of the operators

Live measurement results for POI congestion						
POI congestion	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total capacity of all POIs		7026	38580	NA	335	1848
Served traffic for all POI's		1919	8351	NA	41	417
Traffic failed on all POI's	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%
POI congestion	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
No. of POIs not meeting benchmark		26	104	NA	10	12.00
Total number of working POIs		0	0	NA	0	0.00

Data Source: Network Operations Center (NOC) of the operators

NA: In case of POI for Tata, there is no direct POI from Wireline MSC. All Calls are getting routed via InterMSC TGs with GSM/ CDMA MSCs. So, Total number of working POI is not present in the wireline system of Tata. The operator system is not equipped to provide the POI data separately for wireline.

### 5.3 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance						
Billing Performance	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Billing disputes						
Total bills generated during the quarter		156503	1617646	11317	40	11470.00
Total number of bills disputed		163	40	4	0	2.00
Percentage bills disputed (Average of 3 billing cycles)	≤ 0.1%	0.10%	0.00%	0.04%	0.00%	0.02%
Resolution of billing complaints						
Total number of billing/charging complaints		51	NA	1	NA	2.00
Total complaints resolved in 4 weeks from date of receipt		51	NA	1	NA	2.00
Percentage complaints resolved within 4 weeks of date of receipt	≥ 98%	100.00%	NA	100.00%	NA	100.00%
Total complaints resolved in 6 weeks from date of receipt		51	NA	1	NA	2
Percentage complaints resolved within 6 weeks of date of receipt	100%	100.00%	NA	100.00%	NA	100.00%

Data Source: Billing Center of the operators

NA: Resolution of complaints parameter not applicable for BSNL & Vodafone as no billing complaints were logged in the audit period for the operator.

Period of applying credit / waiver						
No. of complaints resolved in favour of the customer during the quarter		51	NA	1	NA	2.00
No. of complaints disposed on account of not considered as valid complaints		51	NA	1	NA	2.00
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	NA	100.00%	NA	100.00%

Data Source: Billing Center of the operators

NA: Reliance & Tata had no cases where credit/ waiver were required during the audit period.

Audit Results for Closure Requests						
Closure Requests	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total no. of requests received for Closures		1669	9453	133	NA	3125.00
Total no. of requests for closures attended within 7 days		1669	4700	133	NA	3125.00
Percentage of requests for closures attended within 7 days	100%	100.00%	49.72%	100.00%	NA	100.00%
Total no. of requests for closures not attended or attended beyond 7 days		0	4753.00	0.00	NA	0.00

NA: Live calling for Vodafone was not conducted as there were no complaints reported for the operator in the audit period.

## 5.4 RESPONSE TIME TO THE CUSTOMER FOR ASSISTANCE

Audit results for customer care						
Customer Care Assessment	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total no. of call attempts to call centre / customer care nos.		202545	3320	840	29387	34449.00
No. of calls connected and answered successfully to call centre / customer care nos.		201736	3307	834	29387	33884.00
Percentage of calls getting connected and answered electronically	≥ 95%	99.60%	99.61%	99.29%	100.00%	98.36%
Audit results for customer care (voice to voice)						
Total no. of call attempts to call centre / customer care (voice to voice)		202545	107478	840	29387	34449.00
No. of calls connected and answered successfully to call centre / customer care nos.		201736	102289	807	29387	33576.00
Percentage of calls answered by the operators (voice to voice) within 90 seconds (Avg of 3 months)	≥ 95%	99.60%	95.17%	96.07%	100.00%	97.47%
Live calling results for customer care						
Customer Care Assessment	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total Number of calls made		100.00	100.00	100.00	50.00	50.00
Total Number of calls getting connected and answered		100.00	100.00	100.00	50.00	50.00
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for customer care (Voice to Voice)						
Customer Care Assessment	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total Number of calls received		100	100	100	50	50.00
Total Number of calls answered within 90 seconds		100	100	96	50	50.00
Percentage calls answered within 90 seconds	≥ 95%	100.00%	100.00%	96.00%	100.00%	100.00%

Data Source: Live calls made by auditors from operator's network

## 5.5 CUSTOMER CARE - PROMPTNESS IN ATTENDING CUSTOMER REQUEST

Audit Results for Closure Requests						
Closure Requests	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total no. of requests received for Closures		1669	9453	133	NA	3125.00
Total no. of requests for closures attended within 7 days		1669	4700	133	NA	3125.00
Percentage of requests for closures attended within 7 days	100%	100.00%	49.72%	100.00%	NA	100.00%
Total no. of requests for closures not attended or attended beyond 7 days		0	4753.00	0.00	NA	0.00

Data Source: Customer Service Center of the operators

NA: Vodafone did not have any closure request during the audit period.

## 5.6 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits						
Refund	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total number of cases requiring refund of deposits		23.00	0.00	0.00	0.00	0.00
Total number of cases where refund was made within 60 days		23.00	0.00	0.00	0.00	0.00
Percentage cases in which refund was received within 60 days	100%	100.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

NA: Reliance, BSNL, Vodafone and Tata did not have any closure request during the audit period.

#### Live Calling for Level 1 Services

Live calling for level 1 services						
Level 1 services	Benchmark	Airtel	BSNL	Tata	Vodafone	Reliance
Total no. of calls made		300.00	300.00	300.00	300.00	300.00
Calls answered		265.00	260.00	263.00	300.00	287.00
Percentage of Calls answered	≥ 90%	88.33%	86.67%	87.67%	100.00%	95.67%

Data Source: Live calling conducted by auditors from operator's network

## 5.7 EXCHANGE CAPACITY AND SUBSCRIBERS – SAMPLE EXCHANGES

Exchange capacity and Subscribers						
Exchange Capacity & Subscribers		Airtel	BSNL	Tata	Vodafone	Reliance
Equipped Capacity of the exchange (in erlangs)		250000	1475249	180300	5000	128000
Total number of customers served		115848	676911	41414	3390	70121

Data Source: Operations and Maintenance Center (OMC) of the operators

## 5.8 EXCHANGE DETAILS

BSNL		
MSU	EXCH NAME	AREA
CTDALPO01	ALIPUR	ALP
CTDBAGE01	BAGBAZAR	NORTH
CTDBBZE01	BURRA BAZAR	CEN
CTDBBZH01	BURRA BAZAR NGN	CEN
CTDBEHE01	BEHALA EWSD	ALP
CTDBHLO01	BEHALA OCB	ALP
CTDBHTO01	BHATPARA	BKP
CTDBKPE01	BARRACKPORE	BKP
CTDBRSO01	BARASAT	BKP
CTDCENH01	CENTRAL NGN	CEN
CTDCENO01	CENTRAL OCB	CEN
CTDCIRE01	CIRCUS	CEN
CTDCNSO01	CHINSURA	SMP

CTDCRNE01	CITTARANJAN	CEN
CTDCSPO01	COSSIPORE	NORTH
CTDCTMO01	COT	CITY
CTDDDMH01	DUMDUM NGN	BDN
CTDDDMO01	DUMDUM OCB	BDN
CTDDUMS01	DUMDUM 5ESS	BDN
CTDJDP001	JADAVPUR OCB	JDV
CTDJDVE01	JADAVPUR EWSD	JDV
CTDKALO01	KALIGHAT OCB	SOUTH
CTDMKTE01	MANIKTALA	NORTH
CTDNDRPO01	NARENDRAPUR	JDV
CTDPHTO01	PANIHATI	BKP
CTDRSME01	RUSSA	SOUTH
CTDSATH01	SATYABALA NGN	HWH
CTDSATO01	SATYABALA	HWH
CTDSBPH01	SIBPUR NGN	HWH
CTDSBPO01	SIBPUR OCB	HWH
CTDSIBE01	SIBPUR EWSD	HWH
CTDSLME01	SALTLAKE MAIN	BDN
CTDSLME01	SALTLAKE NGN	BDN
CTDTBHE01	TELEPHONE BHAVAN	CITY
CTDTBZO01	TERITTA BAZAR	CITY
CTDUTPO01	UTTARPARA	SMP

### Airtel

Name	Address
BZR	9, Elgin Rd, Kolkata 700020
KST	121 Santoshpur Avenue, Kol-25
GHM	11, Moni Mukherjee Road, P.S. Gariahut, P.O. Ballygunge, Kolkata - 700 019
KES	Eden Shop. Green wood park. FLT Owned NO IC-1, New Town , Rajarhat, Kol-156
CCS	1/1 Biplabi Anukul Chandra Street, Kolkata : 700072
EIH	20B Abdul Hameed Street, Kolkata : 700001
KGH	Greenfield Housing, hi tech chambers 7th floor 84/1 B Topsia Road, kolkata-46
CMC	213A, B.B. Ganguly St, Kolkata : 700012
KGV	Joka, Diamond Harbour Road, kolkata-104
MFA	T9, Palm Avenue, Kolkata 700019
ENB	Holy Trust School, EN Block-55, Sector V, Salt Lake, Kolkata : 700091
RYL	5/1, Russel street, kolkata -700071
IEP	P 38, INDIA EXCHANGE PLACE, Kolkata : 700001
KLM	21 Sardar Sankar Road, Kol-29
KSH	Aster Green, Aathghara, Phultala, Rajarhat, Kol-136
WST	27, Weston Street, 5th. Floor, Owned No. 517, Bowbazar Kolkata - 700012
IRS	UTTARA 13, BROAD STREET, P.S.- BALLYGUNGE, KOLKATA - 700019
KUT	Uttara Housing Complex, Rajarhat, Kol-156
SAV	Anand Appt, #116 Southern Avenue Road, Kolkata : 700029
PRK	99A, Park street kolkata - 700016
IBM	PLOT NO. 62 DC-1, BLOCK-DN, SECTOR-V, SALT LAKE CITY, KOLKATA-700097
KTP	57 Jatin Das Road, Kol-29
KVG	NBCC, Vibgyor, Action Area, Rajarhat, New Town
CLB	CL-25 Salt Lake, Kolkata : 700091

KVE	VIP ENCLAVE,SHOP NO 28B,VIP RD,RAGHUNATHPUR,KOL-59
MJH	109F Block G, NEW ALIPUR, Kolkata : 700027
DBB	Block DB, Sector -I, Salt Lake, Kolkata -64
KGC	P-132, A, C.I.T. Road, Scheme-VI, Phul Bagan, Kolkata : 700054
KML	24/2 SARIF Lane, kol-16
TNT	TRINITY TOWER, 83, Topsia Road (South), Kolkata - 700 046
KHW	Action area-II c New Town, kolkata
KPT	J-221, Baisnabghata, Patuli Town ship, Kolkata-94
HNS	6, Hastings Park Road,Kolkata - 700 027
KWT	BE-4, Sector 1 Salt Lake, Kolkata : 700091
MMB	115 MG Road, Kol : 7
KLK	327, LAKE GARDENS, KOL-45
CGS	213A,B.B.Ganguly St, Kolkata : 700012
KSB	2/1A Ghore Bibi Lane, Kolkata : 700054
BAC	18/7 Dover Lane, Kolkata : 700029
TPR	42C TARAK PRAMANICK ROAD, KOL-700006
ETR	ETERNITY, PLOT NO-1, BLOCK- DN, SECTOR-V, SALT LAKE ELECTRONICS COMPLEX,SALT LAKE CITY, KOLKATA-700091
KGP	252D CR Avenue, Kolkata : 700006
MDV	Gautam Appt, Ekdalia Road, Kolkata : 700019
JSR	P-270, BANGUR AVENUE, PO-BANGUR AVENUE, PS- LATE TOWN, KOLKATA-700055, 24PGS(N)
KVP	49 V.I.P. PARK ROAD, KOL-101
KJD	1/260 Garihat rd south,Kol_ 700068
MDT	6, Little Russel Street, Kolkata -700071
WDH	10K Manohar Pukur Road, Kolkata : 700029
KSR	5, KIRAN SHANKAR ROY ROAD, P.S.- HARE STREET, KOLKATA-700001
BFB	BF - BLOCK - SALT LAKE, Kolkata : 700011
GGC	74/8/117, Jadavpur Central Road, kolkata - 700032
CSM	165 Muktaram Babu Street, Kolkata : 700007
MSH	Owned No- 945, 33/1 N.S. Road, P.S.- Hare Street Kolkata-700001
KFH	Panchavati Apartments vip road
BCR	10C Ballygunj Circular Road, Kolkata : 700019
KJB	150 Lenin Sarani, Kolkata-13
KPN	1/10 PODDER NAGAR COLONY No-1, KOL-700068
BGP	44/1 Ballygunj Place, Kolkata : 700019
RKM	5B, Ballygaunge Terrace, P.O. Sarar Bose Road, Kolkata - 700 029
KSS	5, JBS Halden Avenue, KOL-105
KBB	52B Shakespeare Sarani, Kolkata : 700017
KUN	Kolkata Unnayan Commercial Complex
DCL	13A Dacers Lane, Kolkata : 700069
EEB	EE-199 SALT LAKE CITY SECTOR-II, SALT LAKE, BIDHAN NAGAR, kolkata-700091
MLN	235/2A, A.J.C Bose Road. Kolkata-700020
MLK	28 Armenian Street, Kolkata : 700007
KEC	ECOSPACE Block-A Phase 1 New Town Rajarhat Kolkata-700156
TDC	2, Lal Bazar Street kolkata-700001
TDS	119B CR Avenue, Kolkata : 700073
TPO	Technopolis, BP-4, Sector V, Salt Lake, Kolkata : 700091
KCI	22, Ashutosh Chowdhary Avenue, Ballygunge, kolkata - 700019
NLK	26/B, Camac Street, Kolkata 700016
KRB	152 Shyama Prasad Mukherjee Road, Kol : 700026
RBA	200, Rash behari Avenue, Kolkata 700019

BGR	P-58, BLOCK-C, BANGUR AVENUE, PO- BANGUR AVENUE, PS- LAKE TOWN, KOLKATA-700055, 24PGS(N)
KCT	P-29 CIT Road, Kolkata : 700014
KDB	40C Jessore Road (South), Dakbanglow more Kol -127
HLP	HIGHLAND PARK, 25, CHAK GARIA, P.O. CHAK GARIA, P.S. PURBA JADAVPUR, KOLKATA - 94
LDT	Lansdown Tower, Sarat Bose Road, Near Minto Park, Kolkata : 700020
CEB	CE-107, Salt Lake, Kolkata : 700091
CLR	10 Clive Row, Kolkata : 700007
UDG	P164, VIP Rd, Ultadunga, Kolkata 700097
KMS	164/1 Maniktala Main Road, Kolkata : 700054
FDB	FD- 307, Bidhan Nagar, Sector - III, P.O. IB Market, Kol - 106, Dist - 24 Pgs(N)
KIA	INDIAN COUNCIL OF REHABILITATION & SPORTS FOR THE DISABLED, KASBA INDUSTRIAL ESTATE, PHASE - I, Plot No. 36, P.O. ANANDAPUR, KOLKATA - 700 107
SBW	55B, Mirza gaalib street, Kolkata 700016
LKT	P -703/(A), BLOCK - A, PO & PS - LAKE TOWN, KOLKATA - 700089, 24PGS(N)
PCC	170 Bipin Bihari Ganguly Street, Kolkata : 700012
REG	Regency, 6 Hungerford Street, Kolkata : 700017
KRJ	770 RAJDANGA MAIN ROAD, KOL-700107
WLS	8 Waterloo Street, Kolkata : 700069
KDR	25/2/1D Darga Road, Kolkata : 700017
BBD	4/1 Red cross Place, Kolkata : 700001
PNB	AA-35, Sector 1 Salt Lake, Kolkata : 700064
GCA	4, GANESH CHANDRA AVENUE, KOLKATA-700013
KDH	1/427 Gariahat Road(south), Kol-68
PRB	Purbachal Housing Complex, Cluster XIII, Salt Lake, Kolkata : 700064
PGM	5/30/A, RAJENDRA PRASAD COLONY, P.S.- JADAVPUR, KOLKATA-700033
KRC	70 KALITALA ROAD, KOL-700078
KCA	86B Nasiruddin Road, Kolkata : 700017
CTC	PLOT NO. DC-1, BLOCK-DC, SECTOR-I, SALT LAKE CITY, KOLKATA-700091
SNG	4 - Synagouge St, Kolkata : 700001
JCH	137, Block- A, Lake Town, Kolkata - 700089
NSB	23A N S Road, kol-01
LSH	5A/1A, Lord Sinha Road. P.O.- Middleton Street, Kolkata-700071
NLB	28/B, Shakesphere sarani, Kolkata 700017
DVR	Dover Court 22, Dover Road, kolkata -700019
KLD	P-108/A C.I.T Road, Kol -14
KIB	Infinity Benchmark. Sector V, Saltlake. Kol-91
MRS	34/1 Haripada Dutta Lane, Kolkata : 700033
AGJ	Ajimganj House 7, Camac street. Kolkata-700017
KCH	IA - 271, Sector III, Salt Lake Kolkata - 97
SDF	SDF Building, Sector V, Salt Lake City, Kolkata : 700091
KSC	SOUTH CITY PROJECTS LTD, PRINCE ANWAR SHAH ROAD, KOL-68
BDB	Plot No. 10, BLOCK BD, SECTOR - 1,SALT LAKE, P.O. CC BLOCK, KOLKATA - 64
RWD	36B, shakespeare sarani, P.O.- Shakespeare Sarani, P.S.- Shakespeare sarani, kolkata-700017
STC	3, Sir William Jones Sarani, Kolkata 700071
KHP	180b Harish Mukherjee Road
KBP	16 GOLD PARK, RAJDANGA, KOL-700078
LRS	Shristi Appt, Little Russel Street, Kolkata : 700071
KHZ	10A NAFAR KUNDU ROAD,Kol-26
BKC	Bikhamchand Market, 14/2 Old China Bazaar Street, Kolkata : 700001
PGL	5B Pratap Ghosh Lane, Kolkata : 700007
KPA	BLOCK-O, PLOT-2, PATULI, BAISNABGHATA, KOLKATA-700094
ALP	22/1, Alipore Rd, Kolkata 700027

BBG	285 A,B,C Bipin Bihari Ganguly Street, Kolkata : 700012
CRS	229, A.J.C Bose Road , Kolkata -700020
KRW	J1/5 Block EP, Sector V, Saltlake city, Kolkata 700091
GDB	Plot No. 300, Block - GD, Sector - III, SALT LAKE CITY, P.O. Bidhan Nagar IB Block, Kolkata - 700 106 Dist. 24 Pgs.(North)
KMP	134 Metropolitan Co-operative Housing society Ltd, Canal south road(sec-B) Kol-39
LGH	20A, Lindsay Street, Kolkata -87
SLD	27 Baitakkhana Road, Kolkata : 700009
KCG	Globsyn Building, Crystal - 1, 2nd Floor, Premises No: XI - 11 & 12, Block EP, Salt Lake Sector V, Kol : 91
SRB	A-102, Southern Avenue, Kolkata : 700029
KUW	Uniworld City, New Town, Kolkata-700156
KDG	The Galleria, DLF, Action Area-1, New Town, Kolkata-700156
KEG	Elita GardenVistan Rajarhat, New Town
KQM	Quest Mall,33 , Asutosh Choudhury Road , Beckbagan ,Kolkata-700017.
KNH	DLF New Town Heights, Action Area-III, New Town, Kolkata, West Bengal-700135
KRD	Rosedale, AA-III, BLK-3, Action Area-III, Rajarhat, Kolkata, West Bengal-700156
KAP	Acropolis Mall Basment 1858/1 Rajdanga Main Road

## 5.9 LEVEL 1 DETAILS

Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		38	33
101	Fire	Y		37	34
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		38	33
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline	Y		38	33
1072	Rail Accident Helpline	Y		37	33

1073	Road Accident Helpline	Y		38	33
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)		N		
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		37	33
11212	Complaint of Electricity	Y		37	33
11216	Drinking Water Supply		N		
11250	Election Commission of India		N		
BSNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	17
101	Fire	Y		20	17
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		20	17
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	18
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		

1070	Relief Commission for Natural Calamities	Y		20	17
1071	Air Accident Helpline	Y		20	18
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	17
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		20	18
10121	Women Helpline	Y		20	17
10127	National AIDS Helpline to NACO	Y		20	18
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		20	17
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		20	17
112012	National Do Not Call Registry	Y		20	17
11212	Complaint of Electricity	Y		20	18
11216	Drinking Water Supply	Y		20	17
11250	Election Commission of India		N		
<b>TATA</b>					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		23	20
101	Fire	Y		24	20
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		23	20
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		

1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		23	21
1071	Air Accident Helpline	Y		23	20
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		23	21
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		23	20
10121	Women Helpline	Y		23	21
10127	National AIDS Helpline to NACO	Y		23	20
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		23	20
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		23	20
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		23	20
11212	Complaint of Electricity	Y		23	20
11216	Drinking Water Supply		N		
11250	Election Commission of India		N		
Reliance					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		25	24
101	Fire	Y		25	24
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		25	24
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		25	24

1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		25	24
1071	Air Accident Helpline	Y		25	23
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		25	24
10121	Women Helpline	Y		25	24
10127	National AIDS Helpline to NACO	Y		25	24
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		25	24
11212	Complaint of Electricity	Y		25	24
11216	Drinking Water Supply	Y		25	24
11250	Election Commission of India		N		
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	20
101	Fire	Y		20	20
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		

138	All India Helpline for Passangers	Y		20	20
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals	Y		20	20
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		20	20
1071	Air Accident Helpline	Y		20	20
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	20
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		20	20
10121	Women Helpline	Y		20	20
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		20	20
1514	National Career Service(NCS)	Y		20	20
15100	Free Legal Service Helpline	Y		20	20
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		20	20
11212	Complaint of Electricity	Y		20	20
11216	Drinking Water Supply	Y		20	20
11250	Election Commission of India		N		

**THE FOLLOWING TERMS/ABBREVIATIONS HAVE BEEN COMMONLY USED IN THIS REPORT. THIS SECTION PROVIDES MEANING OF THE ABBREVIATIONS USED IN THE REPORT.**

1. TRAI – Telecom Regulatory Authority of India
2. QoS – Quality of Service
3. OND'15 – Refers to the quarter of Oct, Nov and Dec 2015
4. IMRB – Refers to IMRB International, the audit agency for this report
5. NOC – Network Operation Center
6. OMC – Operations and Maintenance Center
7. SDCA – Short Distance Charging Area
8. PMR – Performance Monitoring Reports
9. MTTR - Mean Time to Repair faults
10. TCBH – Time Consistent Busy Hour
11. NA – Not Applicable
12. NC – Non Compliance
13. POI – Point of Interconnection
14. IVR – Interactive Voice Response
15. DEL – Direct Exchange Line
16. STD – Standard Trunk Dialing
17. ISD – International Subscriber Dialing



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# TRAI Audit Wireless Report for Kolkata Circle

QE December 2015

EAST  
ZONE

Prepared by:



Submitted to:



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## 2 INTRODUCTION

### 2.1 ABOUT TRAI

TRAI's mission is to create and nurture conditions for growth of telecommunications in the country in a manner and at a pace that will enable India to play a leading role in the emerging global information society. One of the main objectives of TRAI is to provide a fair and transparent policy environment which promotes a level playing field and facilitates fair competition.

In pursuance of above objective, TRAI has been issuing regulations, order and directives to deal with the issues or complaints raised by the operators as well as the consumers. These regulations, order and directives have helped to nurture the growth of multi operator multi service - an open competitive market from a government owned monopoly. Also, the directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

TRAI initiated a regulation - The Standard of Quality of Service of Basic Telephone Service (Wireline) and Cellular Mobile Telephone Service regulations, 2009 (7 of 2009) dated December 20, 2009 and Quality of Service of Broadband Service Regulations, 2006 (11 of 2006) dated October 6, 2006 that provide the benchmarks for the parameters on customer perception of service to be achieved by service provider.

In order to assess the above regulations, TRAI has commissioned a third party agency to conduct the audit of the service providers and check the performance of the operators on the various benchmarks set by Telecom Regulatory Authority of India (TRAI).

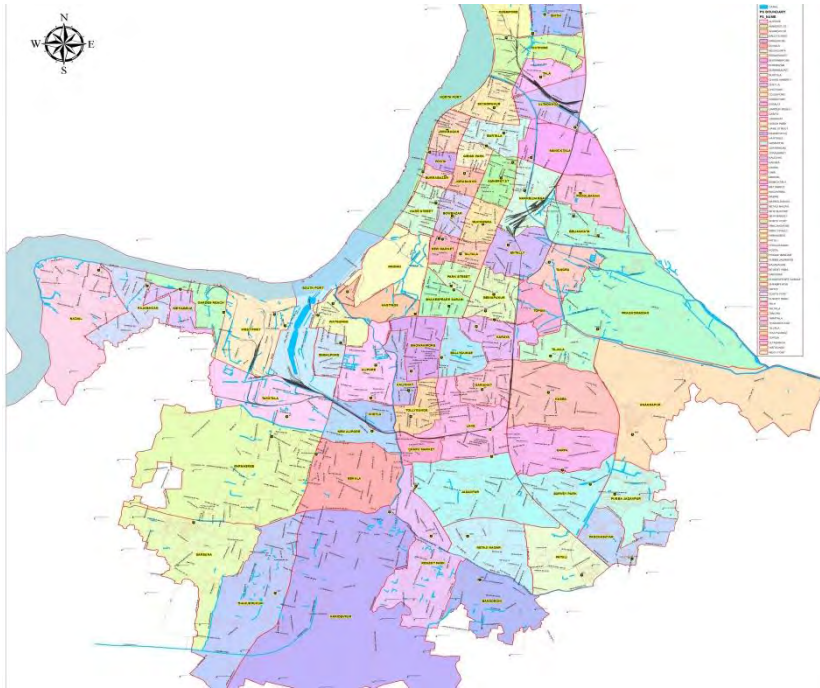
### 2.2 OBJECTIVES

The primary objective of the Audit module is to-

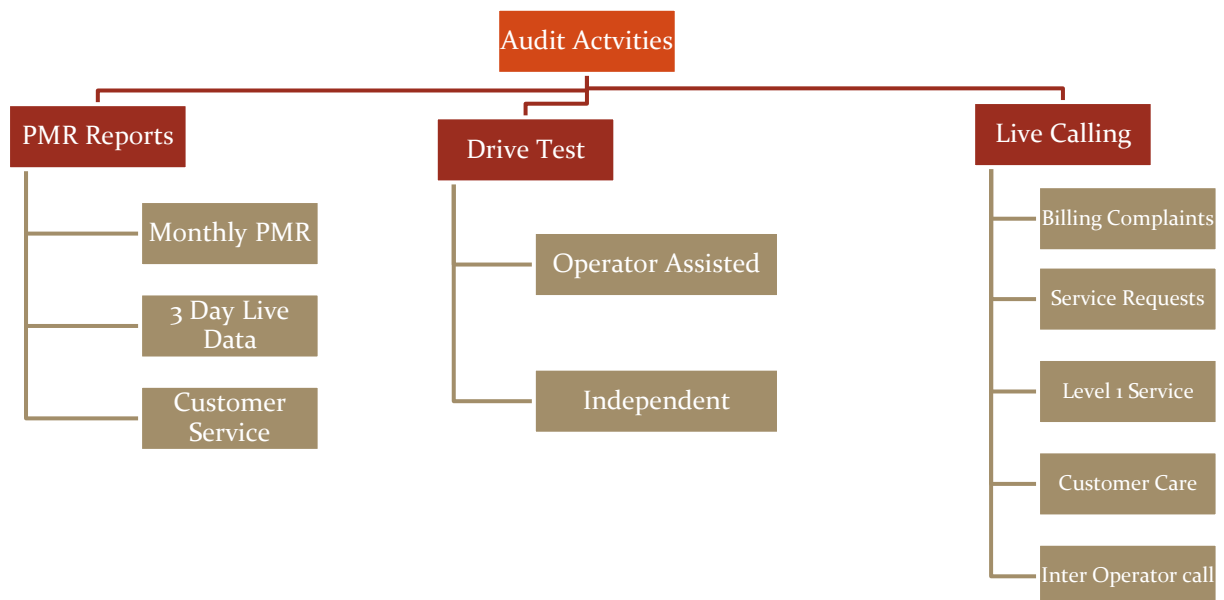
- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).
- This report covers the audit results of the audit conducted for Cellular Mobile (Wireless) services in Kolkata circle.

## 2.3 COVERAGE

The audit was conducted in Kolkata circle covering all the SSAs (Secondary Switching Areas).



## 2.4 FRAMEWORK USED

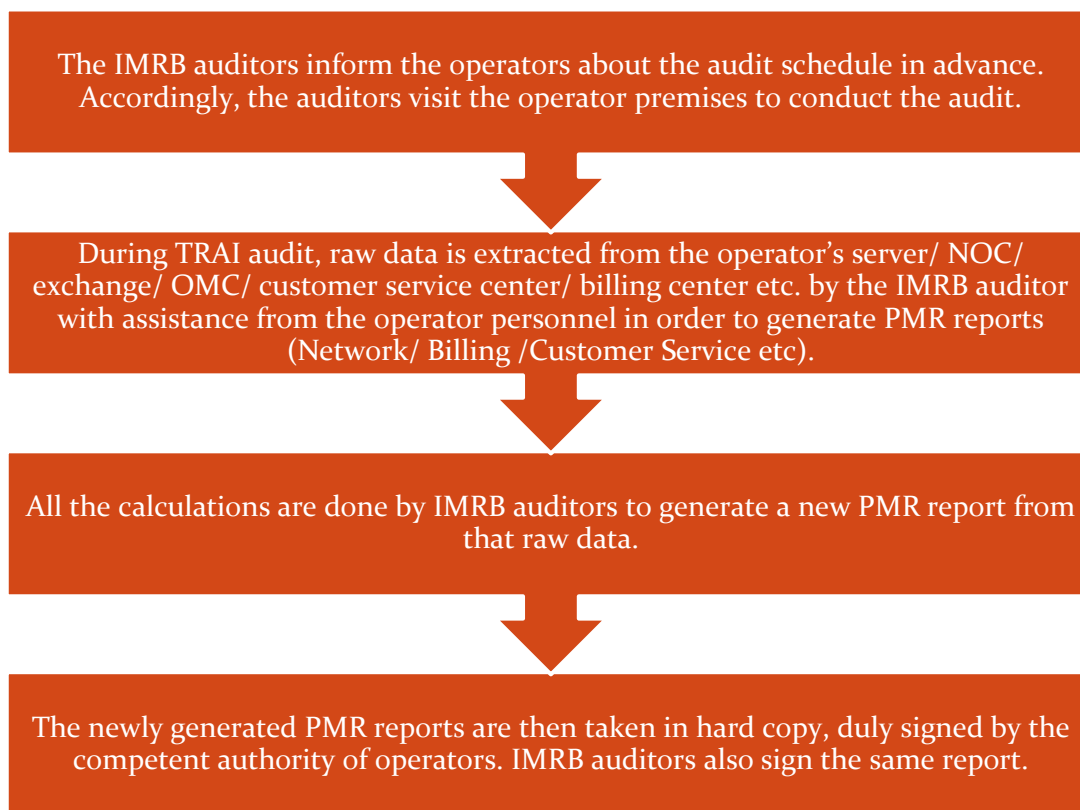


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

## 2.4.1 PMR REPORTS

### 2.4.1.1 SIGNIFICANCE AND METHODOLOGY

PMR or Performance Monitoring Reports are generated to assess the various Quality of Service parameters involved in the mobile telephony service, which indicate the overall health of service for an operator.



The PMR report for network parameters is taken for each month of the audit quarter and is extracted and verified in the first week of the subsequent month of the audit month. For example, October 2015 audit data was collected in the month of November 2015.

The PMR report for customer service parameters is extracted from Customer Service Center and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending December 2015 (OND'15) was collected in the month of January 2016.

The raw data extracted from operator's systems is used to create PMR in the following three formats.

- ↳ Monthly PMR (Network Parameters & Wireless Data Services) – 2G & 3G
- ↳ 3 Day Live Measurement Data (Network Parameters & Wireless Data Services) – 2G & 3G
- ↳ Customer Service Data

Let us understand these formats in detail.

### 2.4.1.2 MONTHLY PMR 2G

This involved calculation of the various 2G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of October, November and December 2015. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

#### Network Availability

- BTS accumulated downtime
- Worst affected BTS due to downtime

#### Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

#### Network Congestion Parameters

- SDCCH/Paging Channel Congestion
- TCH Congestion
- Point of Interconnection

#### Connection Maintenance

- Call Drop rate
- Worst affected cells having more than 3% TCH drop

#### Voice Quality

- % Connections with good voice quality

All the parameters have been described in detail along with key findings of the parameters in section 5 of the report. The benchmark values for each parameter have been given in the table below.

### 2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

Let us now look at the various parameters involved in the audit reports.

#### Network Related

Network Parameters - 2G		
Parameter Category	Parameter	Benchmark
Network Availability	BTSs Accumulated downtime (not available for service)	$\leq 2\%$
	Worst affected BTSs due to downtime	$\leq 2\%$
Connection Establishment (Accessibility)	Call Set-up Success Rate (within licensee's own network)	$\geq 95\%$
	SDCCH/ Paging Chl. Congestion (%age)	$\leq 1\%$
	TCH Congestion (%age)	$\leq 2\%$
Connection Maintenance (Retainability)	Call Drop Rate (%age)	$\leq 2\%$
	Worst affected cells having more than 3% TCH drop	$\leq 3\%$
	%age of connection with good voice quality	$\geq 95\%$
	Point of Interconnection (POI)	$\leq 0.5\%$

#### 2.4.1.4 MONTHLY PMR 3G

This involved calculation of the various 3G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of October, November and December 2015. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

##### Network Availability

- Node Bs accumulated downtime
- Worst affected Node Bs due to downtime

##### Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

##### Network Congestion Parameters

- RRC Congestion
- Circuit Switched RAB Congestion
- Point of Interconnection

##### Connection Maintenance

- Circuit Switched Voice Drop rate
- Worst affected cells having more than 3% Circuit switched Voice drop rate

##### Voice Quality

- % Connections with good Circuit Switched Voice Quality

All the parameters have been described in detail along with key findings of the parameters in section 5 of the report. The benchmark values for each parameter have been given in the table below.

#### 2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

Let us now look at the various parameters involved in the audit reports.

##### Network Related

Network Parameters - 3G		
Network Availability	Node Bs downtime (not available for service)	≤ 2%
	Worst affected Node Bs due to downtime	≤ 2%
Connection Establishment (Accessibility)	Call Set-up Success Rate (within licensee's own network)	≥ 95%
	RRC Congestion	≤ 1%
	Circuit Switched RAB Congestion	≤ 2%
Connection Maintenance (Retainability)	Circuit Switched voice drop rate	≤ 2%
	Worst affected cells having more than 3% Circuit switched voice drop rate	≤ 3%
	%age of connection with good circuit switched voice quality	≥ 95%
	Point of Interconnection (POI)	0.5%

#### 2.4.1.6 MONTHLY PMR – WIRELESS DATA SERVICES (2G & 3G)

The PMR report for wireless data service (2G and 3G) is extracted at the operator premises and verified every month of the quarter. This includes three parameters-

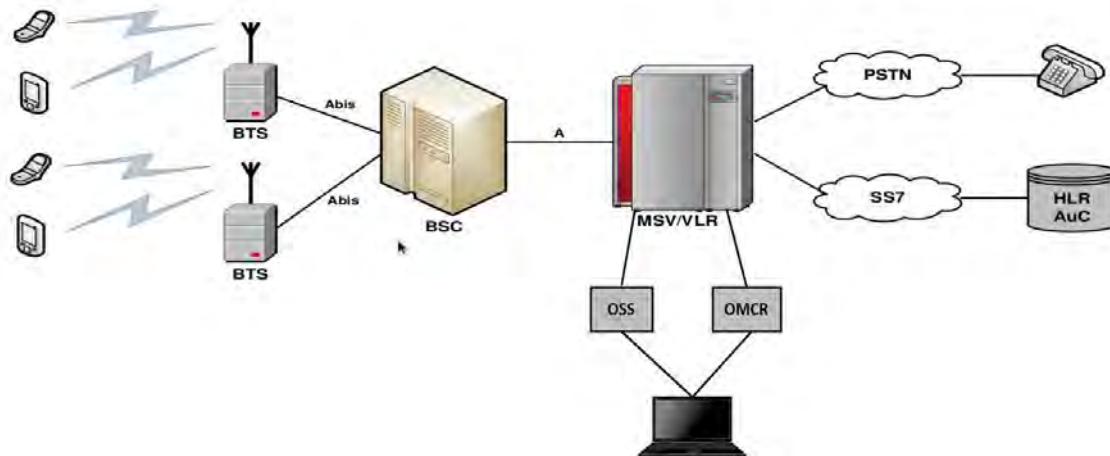
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

#### 2.4.1.7 AUDIT PARAMETERS – WIRELESS DATA SERVICES (2G & 3G)

Wireless Data Service		
Service Activation	Activation done within 4 hours	≥ 95%
PDP Context activation success rate	PDP Context activation success rate	≥ 95%
Drop Rate	Drop Rate	≤ 5%

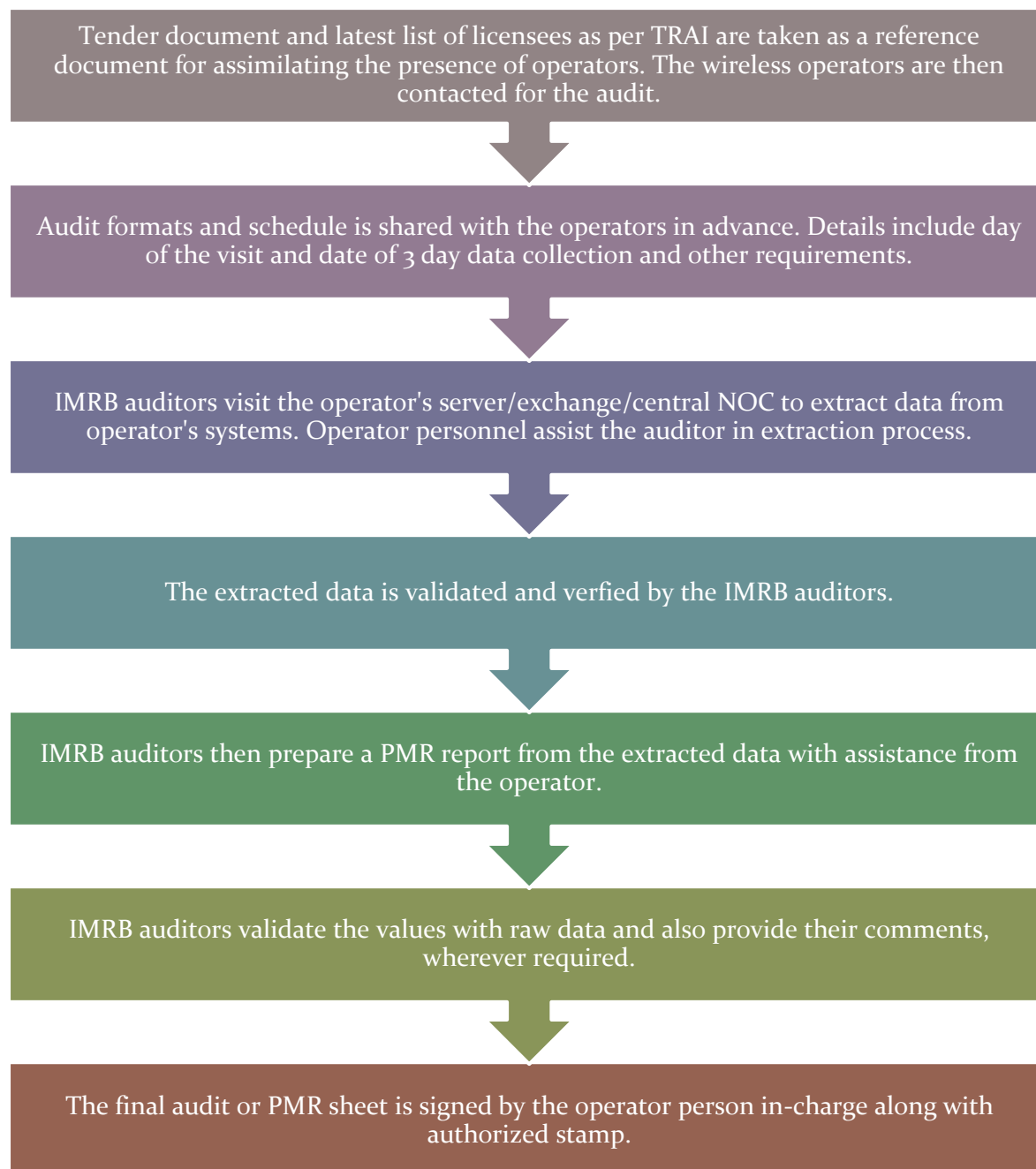
#### 2.4.1.8 POINT OF DATA EXTRACTION

The data is extracted from a terminal/computer connected to OMCR & OSS on the operator network.



#### 2.4.1.9 STEP BY STEP AUDIT PROCEDURE

The key steps followed for extraction of reports at the operator premises are given below.



Data has been extracted and calculated as per the counter details provided by the operators. The details of counters have been provided in section 8.15 of the report. The calculation methodology for each parameter has been stated in the table given below.

### 2.4.1.10 GENERIC CALCULATION METHODOLOGY– NETWORK PARAMETERS 2G

Parameter	Calculation Methodology
<b>BTS Accumulated Downtime</b>	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month / (24 x Number of days in a month x Number of BTSs in the network in licensed service area) x 100
<b>Worst Affected BTS Due to Downtime</b>	(Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) * 100
<b>Call Setup Success Rate</b>	(Calls Established / Total Call Attempts) * 100
<b>SDCCH/ Paging Channel Congestion</b>	$\text{SDCCH / TCH Congestion\%} = [(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$ <p>Where:  <math>A_1</math> = Number of attempts to establish SDCCH / TCH made on day 1  <math>C_1</math> = Average SDCCH / TCH Congestion % on day 1  <math>A_2</math> = Number of attempts to establish SDCCH / TCH made on day 2  <math>C_2</math> = Average SDCCH / TCH Congestion % on day 2  <math>A_n</math> = Number of attempts to establish SDCCH / TCH made on day n  <math>C_n</math> = Average SDCCH / TCH Congestion % on day n</p>
<b>TCH Congestion</b>	$\text{POI Congestion\%} = [(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$ <p>Where:  <math>A_1</math> = POI traffic offered on all POIs (no. of calls) on day 1  <math>C_1</math> = Average POI Congestion % on day 1  <math>A_2</math> = POI traffic offered on all POIs (no. of calls) on day 2  <math>C_2</math> = Average POI Congestion % on day 2  <math>A_n</math> = POI traffic offered on all POIs (no. of calls) on day n  <math>C_n</math> = Average POI Congestion % on day n</p>
<b>POI Congestion</b>	
<b>Call Drop Rate</b>	Total Calls Dropped / Total Calls Established x 100
<b>Worst Affected Cells having more than 3% TCH drop</b>	Total number of cells having more than 3% TCH drop during CBBH/ Total number of cells in the LSA x 100
<b>Connections with good voice quality</b>	No. of voice samples with good voice quality / Total number of samples x 100

## 2.4.1.11 CALCULATION METHODOLOGY – NETWORK PARAMETERS 3G

Parameter	Calculation Methodology
<b>Node Bs Accumulated Downtime</b>	Sum of downtime of Node Bs in a month in hours i.e. total outage time of all Node Bs in hours during a month / (24 x Number of days in a month x Number of Node Bs in the network in licensed service area) x 100
<b>Worst Affected Node Bs Due to Downtime</b>	(Number of Node Bs having accumulated downtime greater than 24 hours in a month / Number of Node B in Licensed Service Area) * 100
<b>Call Setup Success Rate</b>	(RRC Established / Total RRC Attempts) * 100
<b>RRC Congestion</b>	$\text{RRC / RAB Congestion\%} = [(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$ <p>Where:  <math>A_1</math> = Number of attempts to establish RRC/ RAB made on day 1  <math>C_1</math> = Average RRC/ RAB Congestion % on day 1  <math>A_2</math> = Number of attempts to establish RRC/ RAB made on day 2  <math>C_2</math> = Average RRC/ RAB Congestion % on day 2  <math>A_n</math> = Number of attempts to establish RRC/ RAB made on day n  <math>C_n</math> = Average RRC/ RAB Congestion % on day n</p>
<b>Circuit Switched RAB Congestion</b>	$\text{POI Congestion\%} = [(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$ <p>Where:  <math>A_1</math> = POI traffic offered on all POIs (no. of calls) on day 1  <math>C_1</math> = Average POI Congestion % on day 1  <math>A_2</math> = POI traffic offered on all POIs (no. of calls) on day 2  <math>C_2</math> = Average POI Congestion % on day 2  <math>A_n</math> = POI traffic offered on all POIs (no. of calls) on day n  <math>C_n</math> = Average POI Congestion % on day n</p>
<b>POI Congestion</b>	
<b>Circuit Switched Voice Drop Rate</b>	No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released) x 100
<b>Worst Affected Cells having more than 3% Circuit Switched Voice Drop Rate</b>	Number of cells having CSV drop rate > 3% during CBBH in a month / Total number of cells in the licensed area) x 100
<b>Connections with good Circuit switched voice quality</b>	1- ( Number of Faulty Transport Blocks In Uplink downlink After Selection Combining Speech / Total number of Transport Blocks In Uplink downlink After Selection Combining Speech)) x 100

#### 2.4.1.12 3 DAY LIVE DATA

The main purpose of 3 day live measurement is to evaluate the network parameters on intraday basis. While the monthly PMR report provides an overall view of the performance of QoS parameters, the 3 day live data helps looking at intraday performance on the network parameters discussed earlier. All the calculations are done on the basis of that raw data of 3 days.

The 3 day live data provides a sample of 9 days in a quarter (3 days each month of a quarter) with hourly performance, which enables the auditor to identify and validate intraday issues for an operator on the QoS network parameters. For example, network congestion being faced by an operator during busy/peak hours.

Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3<sup>rd</sup> day. The extracted data is then used to create a report (similar to PMR report) to assess the various QoS parameters.

The 3 day live measurement was conducted for network parameters (2G & 3G) and wireless data services (2G & 3G).

#### 2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per QoS regulations 2009 (7 of 2009), Time Consistent Busy Hour" or "TCBH" means the one hour period starting at the same time each day for which the average traffic of the resource group concerned is greatest over the days under consideration and such Time Consistent Busy Hour shall be established on the basis of analysis of traffic data for a period of ninety days.

Step by step procedure to identify TCBH for an operator:

Day wise raw data is fetched from the operator's OMCR and kept in a readable format (preferably MS-Excel). Data for a period of 90 days is used to identify TCBH.

The 90 day period is decided upon the basis of month of audit. For example, for audit of Aug 2015, the 90 day period data used to identify TCBH would be the data of Jun, Jul and Aug 2015

For each day, the hour in which average traffic of the resource group concerned is greatest for the day will be the 'Busy Hour' for the operator.

The modal frequency of the busy hour is calculated for 90 days period and the hour with highest modal frequency will be considered as TCBH for the operator

#### 2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

As per QoS regulations 2009 (7 of 2009), Cell Bouncing Busy Hour (CBBH) means the one hour period in a day during which a cell in cellular mobile telephone network experiences the maximum traffic.

Step by step procedure to identify CBBH for an operator:

Day wise raw data is fetched from the operator's OMCR and kept in a readable format (preferably MS-Excel). Data for a period of 90 days is used to identify CBBH.

For each day, the hour in which a cell in cellular mobile telephone network experiences maximum traffic for the day will be the 'Busy Hour' for the operator.

The 90 day period is decided upon the basis of month of audit. For example, for audit of Aug 2015, the 90 day period data used to identify CBBH would be the data of Jun, Jul and Aug 2015

The modal frequency of the busy hour is calculated for 90 days period and the hour with highest modal frequency will be considered as CBBH for the operator

#### 2.4.1.15 CUSTOMER SERVICE PARAMETERS

The data to generate PMR report for customer service parameters is extracted at the operator premises and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending December 2015 (OND'15) was collected in the month of January 2016. To extract the data for customer service parameters for the purpose of audit, IMRB auditors primarily visit the following locations/ departments/ offices at the operator's end.

- Central Billing Center
- Central Customer Service Center

The operators are duly informed in advance about the audit schedule.

The Customer Service Quality Parameters include the following:

- Metering and billing credibility (postpaid and prepaid)
- Resolution of billing/charging complaints
- Period of applying credit/waiver/adjustment to customer's account
- Response time to the customer for assistance
- Termination/closure of service
- Time taken for refund of security deposit after closures.

Most of the customer service parameters were calculated by averaging over the quarter; however billing parameters were calculated by averaging over one billing cycle for a quarter.

All the parameters have been described in detail along with key findings of the parameter in section 6 of the report. The benchmark values for each parameter have been given in the table below.

#### 2.4.1.16 AUDIT PARAMETERS – CUSTOMER SERVICE

Metering and Billing Credibility	Benchmark
No of billing complaints received - Post paid	$\leq 0.1\%$
No. of billing complaints received- Prepaid	$\leq 0.1\%$
Resolution of billing/ charging complaints within 4 weeks	98%
Resolution of billing/ charging complaints within 6 weeks	100%
Period of applying credit/ waiver within 1 week of resolution of complaint	100%
Response Time to the Customer form Assistance	
Accessibility of call centre/customer care	$\geq 95\%$
Percentage of calls answered by the operators (voice to voice) within 90 seconds	$\geq 95\%$
Termination/ closure of service	$\leq 7$ days
Time taken for refund of deposits after closures within 60 days	100%

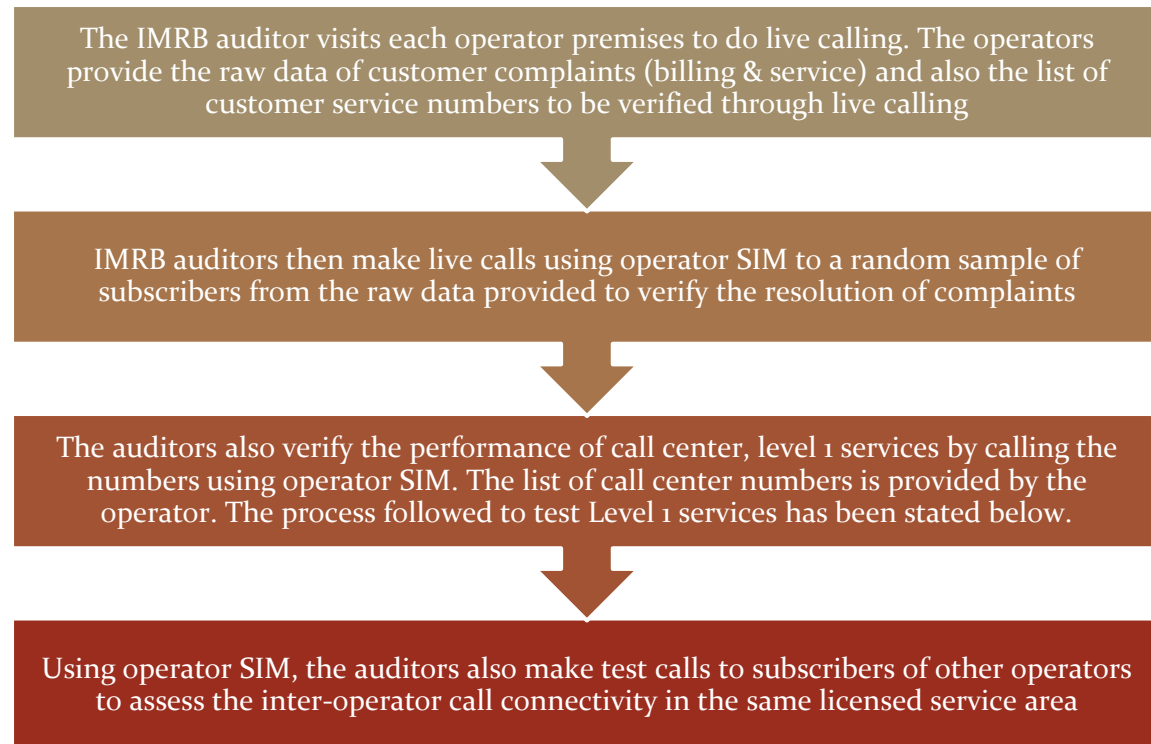
### 2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

Parameter	Calculation Methodology
<b>Metering and billing credibility - Postpaid</b>	Total billing complaints received during the relevant billing cycle / Total bills generated during the relevant billing cycle * 100
<b>Metering and billing credibility – Prepaid</b>	Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter * 100
<b>Resolution of billing/ charging complaints (Postpaid + Prepaid)</b>	There are two benchmarks involved here:  Billing or Charging Complaints resolved in 4 weeks from date of receipt / Total billing or charging complaints received during the quarter) x 100  Billing or Charging Complaints resolved in 6 weeks from date of receipt / Total billing or charging complaints received during the quarter) x 100
<b>Period of applying credit waiver</b>	Number of cases where credit waiver is applied within 7 days/ total number of cases eligible for credit waiver * 100
<b>Call centre performance IVR (Calling getting connected and answered by IVR)</b>	Number of calls connected and answered by IVR/ All calls attempted to IVR * 100
<b>Call centre performance (Voice to Voice)</b>	Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 100  The calculation excludes the calls dropped before 90 seconds
<b>Time taken for termination/ closure of service</b>	Number of closures done within 7 days/ total number of closure requests * 100
<b>Time taken for refund for deposit after closures</b>	Number of cases of refund after closure done within 60 days/ total number of cases of refund after closure * 100

## 2.4.2 LIVE CALLING

### 2.4.2.1 SIGNIFICANCE AND METHODOLOGY

The main purpose of live calling is to verify the performance of various customer service parameters by doing test calls to the subscribers/ specific numbers. Below is a step wise procedure of live calling.



Live calling activity was carried out during the period of December 2015. The data considered for live calling was for the month prior to the month in which the live calling activity was being conducted. In this case, data of November 2015 was considered for live calling activity conducted in December 2015.

A detailed explanation of each parameter is explained below.

### 2.4.2.2 BILLING COMPLAINTS

Live calling is done to verify Resolution of billing complaints within stipulated time. The process for this parameter is stated below.

- ⇒ Auditors request the operator provided the database of all the subscribers who reported billing complaints in one month prior to IMRB auditor visit. In case of BSNL, data for the complaints from the subscribers belonging to the sample exchanges is requested specifically
- ⇒ A sample of 10% or 100 complainants, whichever is less, is selected randomly from the list provided by operator

Calls are made by auditors to the sample of subscribers to check and record whether the complaint was resolved within the timeframes as mentioned in the benchmark.

All the complaints related to billing as per clause 3.7.2 of QoS regulation of 20<sup>th</sup> December, 2009 were considered as population for selection of samples. A complete list of the same has been provided in Section 6.1.1.

#### TRAI benchmark-

**Resolution of billing/ charging complaints** - 98% within 4 weeks, 100% within 6 weeks

#### 2.4.2.3 SERVICE COMPLAINTS REQUESTS

“Service request” means a request made to a service provider by its consumer pertaining to his account, and includes.

- ⇒ A request for change of tariff plan
- ⇒ A request for activation or deactivation of a value added service or a supplementary service or a special pack
- ⇒ A request for activation of any service available on the service provider's network
- ⇒ A request for shift or closure or termination of service or for billing details

All the complaints other than billing were covered. A total of 100 calls per service provider for each service in licensed service area were done by the IMRB auditors.

#### 2.4.2.4 LEVEL 1 SERVICE

Level 1 is used for accessing special services like emergency services, supplementary services, inquiry and operator-assisted services.

Level 1 Services include services such as police, fire, ambulance (Emergency services). Test calls were made from operator SIMs. A total of 300 test calls were made per service provider in the quarter.

In OND'15, IMRB has tried contacting the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

#### 2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

- On visiting the operator's premises (Exchange/Central Server etc.), auditors ask the operator authorized personnel to provide a list of Level 1 services being active in their service. The list should contain a description of the numbers along with dialing code.
- Operators might provide a long list of L1 services. To identify emergency L1 service numbers, auditors check if there is any number that starts with code '10' in that list. If auditors find any emergency number in addition to the below list, that number is also tested during live calling.
- On receiving the list, auditors verify it if the below given list of numbers are active in the service provider's network.
- If there are any other additional numbers provided by the operator, auditors also do live calling on those numbers along with below list.
- If any of these numbers is not active, then we would write the same in our report, auditors write in the report.
- Post verifying the list, auditors do live calling by equally distributing the calls among the various numbers and update the results in the live calling sheet.

L1 Code	Description
100	Police
101	Fire
102	Ambulance
104	Health Information Helpline
108	Emergency and Disaster Management Helpline
138	All India Helpline for Passangers
149	Public Road Transport Utility Service
181	Chief Minister Helpline
182	Indian Railway Security Helpline
1033	Road Accident Management Service
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'
1056	Emergency Medical Services
106X	State of the Art Hospitals
1063	Public Grievance Cell DoT Hq
1064	Anti Corruption Helpline
1070	Relief Commission for Natural Calamities
1071	Air Accident Helpline
1072	Rail Accident Helpline
1073	Road Accident Helpline
1077	Control Room for District Collector
1090	Call Alart ( Crime Branch)
1091	Women Helpline
1097	National AIDS Helpline to NACO
1099	Central Accident and Trauma Services (CATS)
10580	Educational & Vocational Guidance and Counselling
10589	Mother and Child Tracking ( MCTH)
10740	Central Pollution Control Board
10741	Pollution Control Board
1511	Police Related Service for all Metro Railway Project
1512	Prevention of Crime in Railway
1514	National Career Service(NCS)
15100	Free Legal Service Helpline
155304	Municipal Corporations
155214	Labour Helpline
1903	Sashastra Seema Bal (SSB)
1909	National Do Not Call Registry
1912	Complaint of Electricity
1916	Drinking Water Supply
1950	Election Commission of India

#### 2.4.2.5 CUSTOMER CARE

Live calling is done to verify response time for customer assistance is done to verify the performance of call center in terms of

- ⇒ Calls getting connected and answered by operator's IVR.
- ⇒ % age of calls answered by operator / voice to voice) within 90 seconds: In 95% of the cases or more

The process for this parameter is stated below.

- Overall sample size is 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1100 HRS to 1400 HRS and 50 calls between 1600 HRS to 1900 HRS.
- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.
- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.

#### 2.4.2.6 INTER OPERATOR CALL ASSESEMENT

A total of 100 calls per service provider to all the other service providers in a licensed service area were done for the purpose of audit.

### 2.4.3 VOICE DRIVE TEST – 2G & 3G

#### 2.4.3.1 SIGNIFICANCE AND METHODOLOGY

Drive test, as the name suggests, is conducted to measure the performance of an operator in a moving vehicle in a specified network coverage area.

The main purpose of the drive test is to check the health of the mobile network of various operators in the area in terms of coverage (signal strength), voice quality, call drop rate, call set up success rate etc.

To assess the indoor coverage, the test is also conducted at two static indoor locations in each SSA, such as Malls, office buildings, shopping complexes, government buildings etc.

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test

The main difference between the two is that in the operator assisted, operators participate in the drive test along with their hardware, software, phones etc. while in the independent drive test IMRB conducts the drive test on solitary basis and uses its own hardware. Operators generally do not have any knowledge of the drive test being conducted.

A detailed explanation of the two methodologies has been provided below.

#### 2.4.3.2 OPERATOR ASSISTED DRIVE TEST – VOICE 2G & 3G

SSAs are selected according to the total no. of SSAs on that region and audited in each quarter, at least 1 SSA in each month it may be more depends on the total no. of drive on that circle. The drive tests were conducted for all operators in the circle, for both 2G and 3G voice services. As per TRAI instructions, the 2G drive was done in 2G only mode, while 3G drive test was conducted in dual mode (3G on priority).

As per the new directive given by TRAI headquarters, drive test in the quarter were conducted at a SSA level. SSAs have been defined in two categories by TRAI as per the criticality of the SSA.

1. Normal SSA
2. Difficult SSA

**During the drive test in normal SSA, the methodology adopted for the drive test is:**

- ✍ 3 consecutive days were selected for drive test in selected SSA. SSAs were defined as per BSNL and SSA list was finalized by regional TRAI office.
- ✍ On an average, a minimum of 80 kilometers was covered each day, covering a minimum distance of 250kms in 3 days.
- ✍ Route map was designed in such a way that all the major roads, highways and all the important towns and villages were covered as part of audit.
- ✍ Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI.
- ✍ The route is defined in a way that we cover maximum area in the SSA and try to cover maximum villages and cities within the SSA. The route is designed such that there is no overlap of roads (if possible).
- ✍ The route was classified as-
  - With In city
  - Major Roads
  - Highways
  - Shopping complex/ Mall
  - Office Complex/ Government Building
- ✍ There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- ✍ The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- ✍ The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- ✍ The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- ✍ The speed of the vehicle was kept at around 30-50 km/hr.
- ✍ The holding period of each test call was 120 seconds.
- ✍ A test call was generated 10 seconds after the previous test call is completed. For 3G, the gap between two calls was 30 seconds.
- ✍ Height of the antenna was kept uniform in case of all service providers.

**In drive test for difficult SSAs, the methodology adopted for the drive test is:-**

- ✍ Drive test was conducted for 6 consecutive days in selected SSAs; SSAs are defined as per BSNL and SSA list was finalized by regional TRAI office.
- ✍ On an average, a minimum of 80 kilometers was covered each day, covering a minimum distance of 500kms in 6 days.

Rest of the activities for drive test in difficult SSAs are same as drive test for normal SSAs.

### 2.4.3.3 INDEPENDENT DRIVE TEST – 2G & 3G

The number of independent drive tests to be conducted and their locations are decided basis TRAI recommendation.

- ✎ A minimum of 80 kilometers was traversed during the independent drive test in a SSA on each day. The SSAs were defined as per BSNL and SSA list was finalized by regional TRAI office.
- ✎ Route map was designed in such a way that all the major roads, highways and all the important towns and villages were covered as part of audit.
- ✎ Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI.
- ✎ The route is defined in a way that we cover maximum area in the SSA and try to cover maximum villages and cities within the SSA. The route is designed such that there is no overlap of roads (if possible).
- ✎ The route was classified as-
  - With In city
  - Major Roads
  - Highways
  - Shopping complex/ Mall
  - Office Complex/ Government Building
- ✎ There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- ✎ The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- ✎ The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- ✎ The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- ✎ The speed of the vehicle was kept at around 30-50 km/hr.
- ✎ The holding period of each test call was 120 seconds.
- ✎ A test call was generated 10 seconds after the previous test call is completed. For 3G, the gap between two calls was 30 seconds.
- ✎ Height of the antenna was kept uniform in case of all service providers.

### 2.4.3.4 PARAMETERS EVALUATED DURING VOICE DRIVE TEST – 2G & 3G

The parameters which were captured during the drive test include. Below are the parameters which are captured for the GSM and CDMA operators.

- ✎ Coverage-Signal strength (GSM)
  - ✓ Total calls made (A)
  - ✓ Number of calls with signal strength between 0 to -75 dBm
  - ✓ Number of calls with signal strength between 0 to -85 dBm
  - ✓ Number of calls with signal strength between 0 to -95 dBm
- ✎ Coverage-Signal strength (CDMA)
  - ✓ Total Ec/Io BINS (A)
  - ✓ Total Ec/Io BINS with less than -15 (B)
  - ✓ Low Interference =  $[1 - (B/A)] \times 100$
- ✎ Voice quality (GSM)

- ✓ Total RxQual Samples – A
- ✓ RxQual samples with 0-5 value – B
- ✓ %age samples with good voice quality =  $B/A \times 100$
- ✎ Voice quality (CDMA)
  - ✓ Total FER BINs (forward FER) – A
  - ✓ FER BINs with 0-2 value (forward FER) – B
  - ✓ FER BINs with 0-4 value (forward FER) – C
  - ✓ %age samples with FER bins having 0-2 value (forward FER) =  $B/A \times 100$
  - ✓ %age samples with FER bins having 0-4 value (forward FER) =  $C/A \times 100$
  - ✓ No. of FER samples with value  $> 4 = [A-C]$
- ✎ Call setup success rate
  - ✓ Total number of call attempts – A
  - ✓ Total Calls successfully established – B
  - ✓ Call success rate (%age) =  $(B/A) \times 100$
- ✎ Blocked calls
  - ✓ 100% - Call Set up Rate
- ✎ Call drop rate
  - ✓ Total Calls successfully established – A
  - ✓ Total calls dropped after being established – B
  - ✓ Call Drop Rate (%age) =  $(B/A) \times 100$

#### 2.4.4 WIRELESS DATA DRIVE TEST – 2G & 3G

The data drive test is conducted at stationary places called hotspots in a SSA for all the days the voice drive test is conducted in the same SSA.

##### 2.4.4.1 METHODOLOGY

The measurement setup is used to conduct test calls for measuring successful data transmission download and upload attempts, minimum download speed, average throughput and latency is given in figure given below.

The basic measurement set-up consists of a Test-Device and a Test-Server with specified software and hardware. Test calls are established between the Test-Device and Test-Server and measurements are made for the respective QoS parameters. These parameters are measured in a stationary mode. Service Activation/Provisioning, PDP Context Activation Success Rate and Drop rate are reported from the actual network counters/database.

- ✎ To assess the quality of the connection between an end user and an Internet Service Provider (ISP), ideally the Test-Server is placed as near as possible to the gateway providing the interconnection between access network and ISP network. The location of the test-server is as near as possible to the gateway providing the interconnection between access network and ISP network implies that the measurements will not reflect the influence in the QoS of the ISP network, between that gateway and the gateway interconnecting with the Internet.

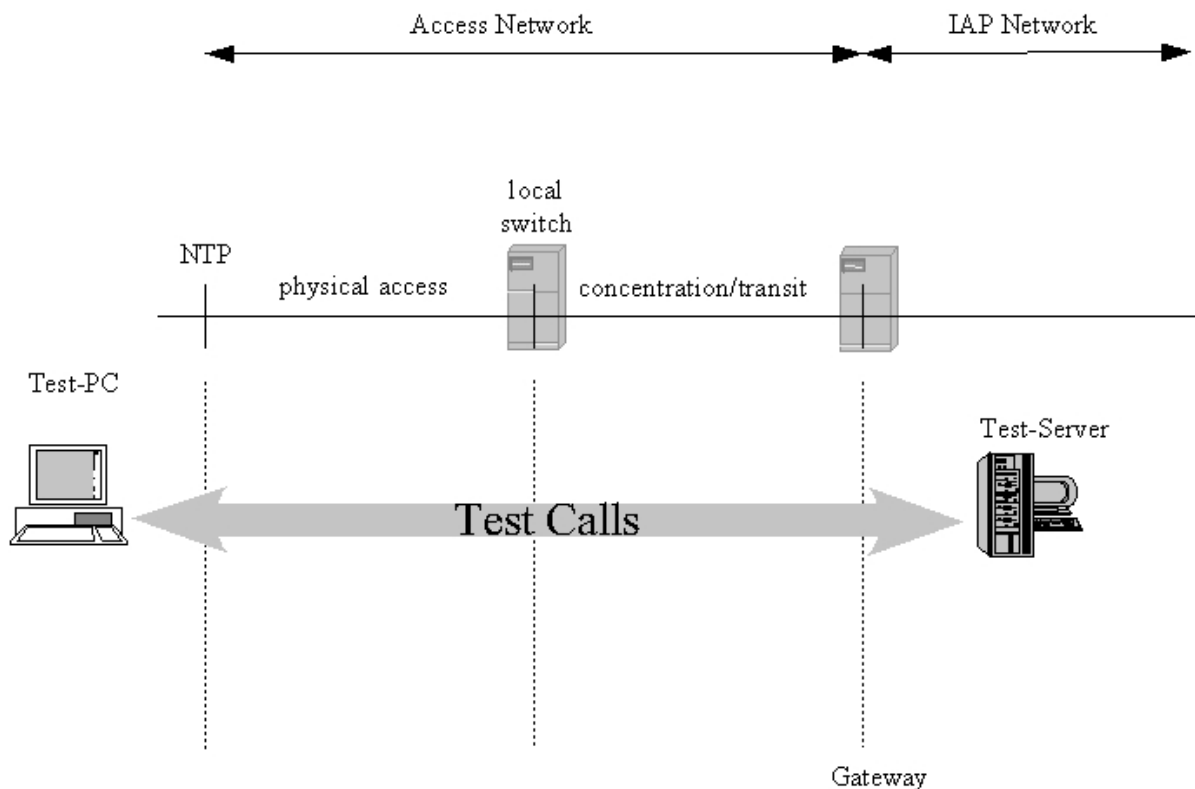


Figure for Measurement set-up

#### 2.4.4.2 REQUIREMENTS FOR THE TEST-SERVER

For all tests, a dedicated test server is used as a well-defined reference. The test server may be located centrally for all the licensed service areas (LSA) or for a number of LSAs or in each LSA (not more than one in each LSA). Under no circumstances a commercial server (e.g. www.yahoo.com) is used, since the test conditions for such a server may change over time making later reproduction of the results impossible. The test server is identified by an IP address and not by its fully qualified Domain Name (FQDN) in order to avoid issues with Domain Name Server (DNS) lookup and including the DNS caching strategies of the used operating system into the measurement.

- ↳ The Transmission Control Protocol (TCP) settings of the server tested against, is also recorded. Since the number of host operating systems for internet servers is larger than on the client side, no detailed recommendation concerning the TCP settings of the server is given.

However, the TCP stack of the reference server should at least be capable of the following:

- Maximum Segment Size between 1380 Bytes and 1460 Bytes.
- TCP RX Window Size > 4096 Bytes
- SACK (Selective Acknowledgement) enabled.
- TCP Fast Retransmit.
- TCP Fast Recovery enabled.
- Delayed ACK enabled (zooms).

### 2.4.4.3 TEST FILES

The test file consist of incompressible data i.e. a data file that is already compressed, e.g. like a zip or jpg file. The test file has at least twice the size (in Kbit) of the theoretically maximum data transmission rate per second (in Kbit/s) of the Internet access under consideration.

### 2.4.4.4 REPRESENTATIVENESS OR NUMBER OF TEST CALLS

- ✍ The choice of adequate test calls, i.e. geographical locations of origin and destination of calls as well as traffic variations, is a crucial point with respect to the comparability and validation of the statistics are calculated for the measured parameters. For each parameter, it is ensured that the samples are aggregated over all classes of customers for fairness in reflecting the QoS actually perceived by the user and the statistics are preserved to substantiate the same.
- ✍ The necessary number of samples (test calls) are 1067 for each of the category “A” and “Metro” licensed service area (LSA), 600 for each of the category “B” LSA and 384 for each of the category “C” LSA for all the parameters.

### 2.4.4.5 PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

#### 2.4.4.5.1 SUCCESSFUL DATA TRANSMISSIONS DOWNLOAD ATTEMPTS

The successful data download attempts is defined as the ratio of successful data downloads to the total number of data download attempts in a specified time period. A data transmission is successful if a test file is downloaded completely and with no errors.

#### Measurement:

The percentage that is the sum total of successful data downloads, divided by the sum total of all attempts to download a test file is provided. The statistics are calculated from test calls made according to the measurement set-up and taking into account the representativeness requirements. The successful data download is measured by downloading a test file. An attempt to transmit the test file is considered unsuccessful if it takes longer than 60 seconds.

**Successful data transmission download attempts =**

$$\frac{\text{Total Successful download attempts}}{\text{Total download attempts}} \times 100$$

#### 2.4.4.5.2 SUCCESSFUL DATA TRANSMISSION UPLOAD ATTEMPTS

The successful data upload attempts is defined as the ratio of successful data uploads to the total number of data upload attempts in a specified time period. A data upload is successful if a test file is uploaded completely and with no errors.

##### Measurement:

The percentage that is the sum total of successful data uploads, divided by the sum total of all attempts to upload a test file should be provided. The statistics are calculated from test calls made according to the measurement set-up and taking into account the representativeness requirements. The successful data upload is measured by uploading a test file. An attempt to transmit the test file is considered unsuccessful if it takes longer than 60 seconds.

$$\text{Successful data transmission upload attempts} = \frac{\text{Total Successful upload attempts}}{\text{Total upload attempts}} \times 100$$

#### 2.4.4.5.3 MINIMUM DOWNLOAD SPEED

The download speed is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device.

##### Measurement:

The minimum download speed is calculated from test calls made according to the measurement set-up. Test calls are to be made to weigh the results according to the patterns of real traffic. Minimum download speed is the average of the lower 10% of all such test calls.

$$\text{Minimum download speed (average of lower 10\% of all test calls)} = \frac{\text{Download speed (A}_1\text{+A}_2\text{+A}_3\text{+A}_4\text{+A}_5\text{+A}_6\text{)}}{6} \times 100$$

**Note-** A<sub>1</sub>, A<sub>2</sub>, A<sub>3</sub>, A<sub>4</sub>, A<sub>5</sub> & A<sub>6</sub> are download speeds at 6 hotspots

#### 2.4.4.5.4 AVERAGE THROUGHPUT FOR PACKET DATA

It is defined as the rate at which packets are transmitted in a network. In a mobile network the download speed varies depending on the number of users in a particular location. Even though a service provider may be advertising certain speed, the actual speed may vary as per the number of users in the network and there could be customer dissatisfaction on account of relatively slow speed. Hence, there is a need to prescribe an average throughput to protect the interest of consumers. The service providers need to constantly upgrade their network to meet average throughput benchmark.

- ↳ The throughput is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device.
- ↳ The service provider will advertise the throughput being offered to its customers as per their category or plan and it should be meted out as per their commitment.

##### Measurement:

The average throughput for packet data should be calculated from all the test calls made according to the measurement setup.

Test calls are made to weigh the results according to the patterns of real traffic. Average throughput is calculated as the average of all such test calls.

**Average Throughput for Packet data** = Average of download attempts in Kbit/ average download time in secs

#### 2.4.4.5.5 LATENCY

Latency is the amount of time taken by a packet to reach the receiving endpoint after being transmitted from the sending point. This time period is termed the "end-to-end delay" occurring along the transmission path. Latency generally refers to network conditions, such as congestion, that may affect the overall time required for transit.

#### Measurement:

Latency is measured with the test server for ping connected directly to the server on the same Intranet domain.

**Latency (Percentage of successful pinged)** = 
$$\frac{\text{Total number of successful ping} \times 100}{\text{Total number of ping sent to the Test Server}}$$

## 2.5 OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G	Name of Operator	Number of Subscriber as per VLR-3G
Aircel	2256752	Aircel	514421
Airtel	3787031	Airtel	NDR
BSNL	48303	BSNL	42568
Idea	1842343	Vodafone	910560
MTS	482484		
Reliance CDMA	NDR		
Reliance GSM	NDR		
TATA CDMA	91198		
TATA GSM	2093494		
Vodafone	4121737		

Dec'15 VLR data was considered for the number of subscribers.

## 2.6 COLOUR CODES TO READ THE REPORT



Not Meeting the benchmark



Best Performing Operator

### 3 EXECUTIVE SUMMARY-2G

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall performance of various operators in the Kolkata circle, with a parameter wise performance evaluation as compared to TRAI benchmark.

#### 3.1 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 2G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
<b>Benchmark</b>	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.19%	0.73%	97.89%	0.40%	0.43%	0.65%	2.25%	97.37%
Airtel	0.02%	0.00%	99.35%	0.02%	0.02%	0.69%	2.67%	97.48%
BSNL	2.67%	6.51%	98.96%	0.62%	0.80%	1.19%	2.41%	99.77%
Idea	0.13%	0.36%	99.48%	0.09%	0.21%	0.32%	0.45%	97.20%
MTS	0.05%	0.00%	99.87%	NA	0.00%	0.53%	1.96%	99.98%
Reliance CDMA	6.19%	1.29%	97.29%	NA	1.19%	0.26%	1.10%	99.03%
Reliance GSM	15.59%	0.22%	98.90%	0.39%	0.40%	0.00%	0.52%	99.11%
TATA CDMA	0.07%	0.72%	98.87%	NA	0.20%	0.54%	2.77%	99.26%
TATA GSM	0.13%	0.64%	98.39%	0.09%	0.05%	0.61%	2.32%	98.30%
Vodafone	0.05%	0.18%	99.54%	0.19%	0.46%	0.84%	2.83%	96.31%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

Following are the parameter wise observations for wireless operators for Kolkata circle:

#### BTSS Accumulated Downtime:

Reliance (GSM & CDMA) and BSNL did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.02%.

#### Worst Affected BTSS Due to Downtime:

BSNL failed to meet the benchmark. Minimum worst affected BTSS due to downtime was recorded for Airtel & MTS at 0.00%.

#### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.87%.

**SDCCH/ Paging Chl. Congestion:**

All operators met the benchmark on SDCCH / Paging Channel Congestion.

Airtel recorded the best SDCCH / Paging Channel Congestion.

**TCH Congestion:**

All operators met the benchmark on TCH congestion, while MTS performed the best on TCH congestion.

**Call Drop Rate:**

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance GSM at 0.00%.

**Worst Affected Cells Having More than 3% TCH Drop:**

All operators met the benchmark for the parameter. Best performance was recorded for Idea at 0.45%.

**Voice Quality**

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 99.98%.

All the service providers were measuring this parameter as per the TRAI guidelines that have been stated in parameter description section.

Below are the month wise summary tables for each network parameter basis PMR data.

### 3.1.1 PMR DATA - OCTOBER FOR 2G

Name of Service Provider Month October	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSS Accumulated downtime (not available for service)	Worst affected BTSS due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.23%	0.82%	97.89%	0.43%	0.42%	0.68%	2.39%	97.40%
Airtel	0.01%	0.00%	99.34%	0.03%	0.02%	0.70%	2.53%	97.47%
BSNL	2.92%	6.59%	98.46%	0.51%	0.52%	1.54%	2.63%	99.77%
Idea	0.14%	0.37%	99.39%	0.07%	0.21%	0.31%	0.47%	97.13%
MTS	0.07%	0.00%	99.87%	NA	0.00%	0.54%	1.87%	100.00%
Reliance CDMA	13.35%	1.91%	97.51%	NA	1.19%	0.25%	1.91%	99.23%
Reliance GSM	0.16%	0.61%	98.77%	0.09%	0.13%	0.12%	0.51%	99.09%
TATA CDMA	0.09%	1.45%	98.81%	NA	0.18%	0.57%	2.85%	99.23%
TATA GSM	0.22%	0.83%	97.97%	0.14%	0.08%	0.61%	2.39%	98.15%
Vodafone	0.05%	0.15%	99.35%	0.47%	0.65%	0.84%	2.85%	95.03%

### 3.1.2 PMR DATA – NOVEMBER FOR 2G

Name of Service Provider Month November	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSS Accumulated downtime (not available for service)	Worst affected BTSS due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.16%	0.59%	97.96%	0.31%	0.33%	0.62%	2.16%	97.45%
Airtel	0.02%	0.00%	99.35%	0.02%	0.02%	0.67%	2.54%	97.54%
BSNL	2.71%	6.72%	99.33%	0.84%	0.45%	0.68%	2.34%	99.77%
Idea	0.14%	0.42%	99.47%	0.09%	0.26%	0.31%	0.41%	97.16%
MTS	0.04%	0.00%	99.86%	NA	0.00%	0.55%	2.05%	100.00%
Reliance CDMA	5.05%	1.91%	97.42%	NA	1.19%	0.25%	1.69%	99.29%
Reliance GSM	5.68%	0.06%	99.00%	0.99%	1.00%	0.00%	0.71%	99.09%
TATA CDMA	0.10%	0.72%	98.83%	NA	0.23%	0.53%	2.85%	99.26%
TATA GSM	0.00%	0.44%	98.61%	0.06%	0.03%	0.58%	2.16%	98.36%
Vodafone	0.08%	0.30%	99.65%	0.03%	0.35%	0.80%	2.59%	96.91%

## 3.1.3 PMR DATA - DECEMBER FOR 2G

Name of Service Provider Month December	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSS Accumulated downtime (not available for service)	Worst affected BTSS due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.19%	0.77%	97.82%	0.47%	0.54%	0.66%	2.20%	97.25%
Airtel	0.01%	0.00%	99.36%	0.02%	0.03%	0.69%	2.94%	97.43%
BSNL	2.47%	6.23%	99.09%	0.52%	1.44%	1.03%	2.28%	99.77%
Idea	0.10%	0.28%	99.57%	0.10%	0.17%	0.34%	0.48%	97.31%
MTS	0.06%	0.00%	99.87%	NA	0.00%	0.51%	1.94%	99.95%
Reliance CDMA	0.12%	0.00%	96.93%	NA	1.18%	0.27%	0.61%	98.56%
Reliance GSM	0.69%	0.00%	98.92%	0.10%	0.07%	0.10%	0.32%	99.14%
TATA CDMA	0.02%	0.00%	98.97%	NA	0.20%	0.52%	2.60%	99.28%
TATA GSM	0.18%	0.66%	98.59%	0.06%	0.05%	0.62%	2.43%	98.39%
Vodafone	0.04%	0.15%	99.62%	0.06%	0.38%	0.87%	2.97%	96.98%

### 3.2 3 DAYS LIVE DATA – CONSOLIDATED FOR 2G

A three day live measurement was conducted to measure the QoS provided by the operators. The table provided below gives a snapshot of the performance of all operators during live measurement.

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSS Accumulated downtime (not available for service)	Worst affected BTSS due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
<b>Benchmark</b>	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.15%	0.00%	98.27%	0.44%	0.24%	0.55%	2.22%	97.80%
Airtel	0.02%	0.00%	99.34%	0.05%	0.03%	0.72%	2.52%	97.52%
BSNL	1.21%	0.81%	99.23%	1.20%	0.80%	0.79%	2.26%	99.06%
Idea	0.13%	0.16%	99.68%	0.05%	0.10%	0.27%	0.03%	97.36%
MTS	0.07%	0.00%	99.89%	NA	0.00%	0.40%	0.74%	99.89%
Reliance CDMA	0.07%	0.00%	97.03%	NA	1.16%	0.24%	0.53%	99.21%
Reliance GSM	0.12%	0.00%	99.46%	0.08%	0.01%	0.08%	0.05%	99.25%
TATA CDMA	0.09%	0.00%	99.01%	NA	0.26%	0.48%	4.59%	99.30%
TATA GSM	0.13%	0.15%	98.60%	0.06%	0.03%	0.56%	2.72%	98.91%
Vodafone	0.03%	0.00%	99.75%	0.16%	0.25%	0.66%	2.63%	97.04%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. .

**Note: - Data representing for Reliance CDMA and Reliance GSM is December 2015, since they had server issue in the month of October 2015 and November 2015 we could not able to conduct the audit same has been intimated to TRAI by the operator.**

#### BTSS Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.02%.

#### Worst Affected BTSS Due to Downtime:

All operators met the benchmark. Minimum worst affected BTSS due to downtime was recorded for Aircel, Airtel, MTS, Reliance CDMA & GSM, TATA CDMA and Vodafone at 0.00%.

#### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for MTS with 99.89%.

#### SDCCH/ Paging Chl. Congestion:

BSNL did not meet the benchmark on SDCCH / Paging Channel Congestion. Idea recorded the best SDCCH / Paging Channel Congestion.

### **TCH Congestion:**

All operators met the benchmark, while MTS performed the best on TCH congestion.

### **Call Drop Rate:**

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance GSM at 0.08%.

### **Worst Affected Cells Having More than 3% TCH Drop:**

TATA CDMA failed to meet the benchmark. Best performance was recorded for Idea at 0.03%.

### **Voice Quality**

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 99.89%.

Below are the month wise summary tables for each network parameter basis 3 day live data.

### 3.2.1 3 DAY DATA - OCTOBER FOR 2G

Name of Service Provider 3 Day October	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.15%	0.00%	98.30%	0.41%	0.15%	0.66%	2.19%	97.85%
Airtel	0.00%	0.00%	99.33%	0.04%	0.02%	0.73%	2.57%	97.57%
BSNL	1.42%	0.00%	99.01%	1.37%	0.51%	0.99%	2.19%	99.17%
Idea	0.13%	0.19%	99.68%	0.05%	0.11%	0.27%	0.03%	97.24%
MTS	0.04%	0.00%	99.88%	NA	0.00%	0.41%	0.09%	99.91%
Reliance CDMA	NDR	NDR	NDR	NA	NDR	NDR	NDR	NDR
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
TATA CDMA	0.10%	0.00%	99.10%	NA	0.13%	0.51%	4.61%	99.28%
TATA GSM	0.08%	0.33%	98.61%	0.07%	0.02%	0.55%	3.37%	98.57%
Vodafone	0.03%	0.00%	99.79%	0.39%	0.21%	0.62%	2.55%	96.32%

**Note:** - For Reliance GSM & CDMA, data for October'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

### 3.2.2 3 DAY DATA – NOVEMBER FOR 2G

Name of Service Provider 3 Day November	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.18%	0.00%	98.29%	0.39%	0.17%	0.52%	2.22%	97.93%
Airtel	0.05%	0.00%	99.34%	0.08%	0.04%	0.73%	2.51%	97.57%
BSNL	0.66%	0.49%	99.47%	1.43%	0.20%	0.53%	2.34%	99.00%
Idea	0.12%	0.14%	99.68%	0.05%	0.09%	0.27%	0.03%	97.28%
MTS	0.05%	0.00%	99.88%	NA	0.00%	0.41%	2.05%	99.89%
Reliance CDMA	NDR	NDR	NDR	NA	NDR	NDR	NDR	NDR
Reliance GSM	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
TATA CDMA	0.12%	0.00%	98.65%	NA	0.65%	0.49%	4.17%	99.28%
TATA GSM	0.21%	0.11%	98.65%	0.06%	0.02%	0.54%	2.35%	98.61%
Vodafone	0.04%	0.00%	99.75%	0.04%	0.25%	0.70%	2.57%	97.41%

**Note:** - **Note:** - For Reliance GSM & CDMA, data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 3.2.3 3 DAY DATA - DECEMBER FOR 2G

Name of Service Provider 3 Day December	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSS Accumulated downtime (not available for service)	Worst affected BTSS due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.14%	0.00%	98.21%	0.51%	0.41%	0.57%	2.26%	97.61%
Airtel	0.02%	0.00%	99.36%	0.02%	0.03%	0.71%	2.48%	97.42%
BSNL	1.54%	1.94%	99.20%	0.81%	1.69%	0.83%	2.26%	99.00%
Idea	0.13%	0.14%	99.68%	0.05%	0.10%	0.28%	0.04%	97.56%
MTS	0.11%	0.00%	99.90%	NA	0.00%	0.38%	0.08%	99.88%
Reliance CDMA	0.07%	0.00%	97.03%	NA	1.16%	0.24%	0.53%	99.21%
Reliance GSM	0.12%	0.00%	99.46%	0.08%	0.01%	0.08%	0.05%	99.25%
TATA CDMA	0.05%	0.00%	99.28%	NA	0.01%	0.44%	5.00%	99.33%
TATA GSM	0.10%	0.00%	98.55%	0.05%	0.04%	0.58%	2.46%	99.55%
Vodafone	0.04%	0.00%	99.70%	0.06%	0.30%	0.75%	2.94%	97.40%

### 3.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.17%	0.67%	98.75%	0.70%	0.18%	0.33%	2.72%	99.25%
BSNL	2.85%	0.00%	98.09%	0.86%	2.53%	1.19%	3.16%	99.77%
Vodafone	0.05%	1.65%	99.99%	0.01%	0.06%	0.33%	2.13%	99.00%

Following are the parameter wise observations for wireless operators for Kolkata circle:

#### Node Bs downtime:

BSNL did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for Vodafone at 0.05%.

#### Worst affected Node Bs due to downtime:

All operators met the benchmark. Minimum worst affected BTSs due to downtime was recorded for BSNL at 0.00%.

#### Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.99%.

#### RRC Congestion:

All operators met the benchmark. Minimum RRC congestion was recorded for Vodafone at 0.01%.

#### Circuit Switched RAB Congestion:

BSNL did not meet the benchmark. Minimum Circuit Switched RAB congestion was recorded for Vodafone at 0.06%.

#### Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Aircel & Vodafone at 0.33%.

#### Worst affected cells having more than 3% Circuit switched voice drop rate:

BSNL failed to meet the benchmark for the parameter. Best performance was recorded for Vodafone at 2.13%.

#### Circuit Switch Voice Quality:

All operators met the benchmark for the parameter. Best performance was recorded for BSNL at 99.77%.

Below are the month wise summary tables for each network parameter basis PMR data.

### 3.3.1 PMR DATA - OCTOBER FOR 3G

Month								
Name of Service Provider Month October	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.22%	0.70%	99.03%	0.58%	0.16%	0.32%	2.65%	98.88%
BSNL	3.01%	7.24%	98.76%	1.24%	0.83%	NA	0.31%	NDR
Vodafone	0.04%	0.15%	99.99%	0.01%	0.15%	0.32%	2.13%	99.30%

### 3.3.2 PMR DATA – NOVEMBER FOR 3G

Month								
Name of Service Provider Month November	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.10%	0.38%	98.98%	0.54%	0.12%	0.31%	2.54%	98.89%
BSNL	2.83%	6.29%	99.81%	0.19%	1.26%	0.71%	7.94%	99.77%
Vodafone	0.05%	0.23%	99.99%	0.01%	0.01%	0.33%	2.12%	98.85%

### 3.3.3 PMR DATA - DECEMBER FOR 3G

Month								
Name of Service Provider Month December	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.18%	0.92%	98.25%	0.98%	0.25%	0.35%	2.95%	99.98%
BSNL	2.70%	5.60%	95.70%	1.14%	5.50%	1.21%	2.17%	99.77%
Vodafone	0.05%	0.08%	99.98%	0.02%	0.01%	0.34%	2.12%	98.85%

### 3.4 3 DAY LIVE DATA – CONSOLIDATED FOR 3G

A three day live measurement was conducted to measure the QoS provided by the operators. The table provided below gives a snapshot of the performance of all operators during live measurement.

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.16%	0.07%	97.96%	0.80%	0.13%	0.34%	2.47%	96.80%
BSNL	1.45%	1.65%	95.14%	0.52%	2.23%	0.44%	2.02%	99.39%
Vodafone	0.06%	0.03%	99.99%	0.01%	0.06%	0.11%	0.82%	98.85%

#### Node Bs downtime:

All operators met the benchmark for the parameter. Minimum Node Bs Accumulated downtime was recorded for Vodafone at 0.06%.

#### Worst affected Node Bs due to downtime:

All operators met the benchmark for the parameter. Minimum worst affected Node Bs due to downtime was recorded for Vodafone at .03%.

#### Call Set-up Success Rate (CSSR):

All operators met the benchmark for the parameter. The maximum CSSR was observed for Vodafone with 99.99%.

#### RRC Congestion:

All operators met the benchmark for the parameter. Minimum RRC congestion was for Vodafone with 0.01%.

#### Circuit Switched RAB Congestion:

BSNL failed to meet the benchmark for the parameter. Minimum Circuit Switched RAB congestion was for Vodafone with 0.06%

#### Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Vodafone at 0.11%.

#### Worst affected cells having more than 3% Circuit switched voice drop rate:

All operators met the benchmark for the parameter. Minimum Worst affected cells having more than 3% Circuit switched voice drop rate was recorded for Vodafone at 0.82%.

#### Circuit Switch Voice Quality:

Vodafone failed to meet the benchmark. Best performance was recorded for BSNL at 99.70%.

Below are the month wise summary tables for each network parameter basis 3 day live data.

### 3.4.1 3 DAY DATA - OCTOBER FOR 3G

3 Day								
Name of Service Provider 3 Day October	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.11%	0.00%	97.98%	2.09%	0.09%	0.35%	2.00%	98.84%
BSNL	NDR	NDR	NDR	NDR	NDR	NDR	NDR	NDR
Vodafone	0.08%	0.08%	100.00%	0.00%	0.00%	0.04%	0.09%	98.84%

### 3.4.2 3 DAY DATA – NOVEMBER FOR 3G

3 Day								
Name of Service Provider 3 Day November	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.21%	0.21%	98.19%	98.13%	0.08%	0.31%	2.57%	98.86%
BSNL	1.02%	1.50%	94.06%	0.34%	1.69%	0.79%	4.13%	99.77%
Vodafone	0.03%	0.00%	99.99%	0.01%	0.15%	0.34%	0.09%	98.87%

### 3.4.3 3 DAY DATA - DECEMBER FOR 3G

3 Day								
Name of Service Provider 3 Day December	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.15%	0.00%	97.70%	2.23%	0.21%	0.35%	2.77%	98.44%
BSNL	1.89%	1.80%	96.23%	0.70%	2.76%	0.36%	0.48%	99.00%
Vodafone	0.06%	0.00%	99.97%	0.03%	0.02%	0.37%	2.28%	98.85%

### 3.5 WIRELESS DATA PMR & 3 DAY LIVE – CONSOLIDATED FOR 2G

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
<b>Benchmark</b>	<b>≥ 95%</b>	<b>≥ 95%</b>	<b>≤ 5%</b>	<b>≥ 95%</b>	<b>≥ 95%</b>	<b>≤ 5%</b>
Aircel	99.90%	99.09%	1.27%	85.39%	99.92%	1.22%
BSNL	NDR	58.86%	NDR	NDR	41.67%	NDR
Idea	100.00%	98.95%	1.14%	99.92%	98.97%	1.27%
MTS	97.60%	99.77%	1.44%	96.05%	99.81%	1.37%
Reliance CDMA	99.93%	NDR	NDR	99.93%	NDR	NDR
Reliance GSM	99.61%	100.00%	0.00%	99.61%	NDR	NDR
TATA CDMA	100.00%	NDR	1.47%	100.00%	NDR	1.45%
TATA GSM	100.00%	99.98%	1.61%	100.00%	99.86%	1.61%
Vodafone	99.30%	99.82%	1.87%	99.56%	99.69%	1.85%

Following are the parameter wise observations for wireless operators for Kolkata circle:

#### Activation done within 4 hours:

In PMR all operators met the benchmark. Maximum Activation done within 4 hours was recorded for TATA GSM & CDMA at 100.00%. However in 3day live Aircel failed to meet the benchmark and maximum Activation done within 4 hours was recorded for TATA GSM & CDMA at 100.00%.

#### PDP Context activation success rate:

In PMR BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Reliance GSM at 100.00%. However in 3day live BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Aircel at 99.92%.

#### Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed for in PMR Reliance GSM with 0.00% and in 3day live with Aircel 1.22%.

### 3.6 WIRELESS DATA PMR & 3 DAY LIVE – CONSOLIDATED FOR 3G

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
<b>Benchmark</b>	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
<b>Aircel</b>	99.90%	99.09%	1.15%	85.39%	99.92%	1.27%
<b>BSNL</b>	NDR	54.13%	3.65%	NDR	39.43%	4.52%
<b>Vodafone</b>	98.30%	96.47%	0.40%	96.93%	96.62%	0.40%

Following are the parameter wise observations for wireless operators for Kolkata circle:

#### Activation done within 4 hours:

In PMR all operators met the benchmark. Maximum Activation done within 4 hours was recorded for Aircel at 99.90%. However in 3day live Aircel failed to meet the benchmark and maximum Activation done within 4 hours was recorded for Vodafone at 96.63%.

#### PDP Context activation success rate:

In PMR as well as 3day live BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Aircel at 99.09%. However in 3day live maximum PDP Context activation success rate was recorded for Aircel at 99.92%.

#### Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed for PMR as well 3days live Vodafone with 0.40%.

Below are the month wise summary tables for each network parameter basis PMR and Live data.

### 3.7 LIVE CALLING DATA - CONSOLIDATED

Name of Service Provider	Metering and Billing		Response time to customer for assistance		Level 1 Service	Service Requests
	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to	Call answered	Complaint /Request attended to Satisfaction
<b>Benchmark</b>	<b>98%</b>	<b>100%</b>	<b>≥ 95%</b>	<b>≥ 95%</b>	<b>≥ 95%</b>	
Aircel	98.00%	100.00%	100.00%	100.00%	43.67%	100.00%
Airtel	98.00%	100.00%	100.00%	100.00%	63.00%	96.00%
BSNL	99.00%	100.00%	95.00%	100.00%	70.33%	94.00%
Idea	96.00%	100.00%	100.00%	100.00%	81.67%	95.00%
MTS	97.00%	100.00%	100.00%	100.00%	100.00%	98.00%
Reliance CDMA	97.00%	100.00%	100.00%	100.00%	91.67%	96.00%
Reliance GSM	96.00%	100.00%	100.00%	100.00%	80.00%	99.00%
TATA CDMA	100.00%	100.00%	100.00%	98.00%	72.33%	95.00%
TATA GSM	98.00%	100.00%	100.00%	100.00%	84.33%	98.00%
Vodafone	100.00%	100.00%	100.00%	95.00%	83.67%	100.00%

#### Resolution of billing complaints

As per the consumers (live calling exercise) Idea, MTS and Reliance GSM & CDMA failed to meet the benchmark of resolving 98% complaints within 4 weeks, however all operators met the benchmark of 100% complaints within 6 weeks.

#### Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests. Aircel and Vodafone recorded the best performance at 100.00%.

#### Level 1 Service

As per the live calling results, none of the operators met the TRAI benchmark for level 1 service with calls being answered except MTS. The details of live calling done for the level 1 service have been provided in the annexure for each operator.

It was also observed that a number of Category-I (i.e. mandatory) services were not being operated by most of the operators.

### **Accessibility of Call Centre/Customer Care-IVR**

For the IVR aspect, all operators met the TRAI benchmark of 95% with most of the operators recording 100% for the parameter except BSNL.

### **Customer Care / Helpline Assessment (voice to voice)**

All the operators met the TRAI benchmark of 95% with most of the operators recording 100% for the parameter.

### 3.8 BILLING AND CUSTOMER CARE - CONSOLIDATED

Name of Service Provider	Metering and billing credibility		Billing Complaints		Response time to customer for assistance	Customer care	
	Postpaid Subscribers	Prepaid Subscribers	% of complaints resolved in 4 weeks	% of complaints resolved in 6 weeks	% of cases where credit/wavier is received within one week	Percentage of calls answered by the IVR	Percentage of calls answered by the operators (voice to)
<b>Benchmark</b>	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel	0.06%	0.03%	100.00%	100.00%	100.00%	98.11%	96.80%
Airtel	0.09%	0.03%	100.00%	100.00%	100.00%	100.00%	87.54%
BSNL	0.07%	0.08%	100.00%	100.00%	100.00%	96.84%	96.44%
Idea	0.77%	0.06%	100.00%	100.00%	100.00%	99.26%	97.95%
MTS	0.08%	0.03%	100.00%	100.00%	100.00%	99.06%	97.75%
Reliance CDMA	0.09%	0.01%	100.00%	100.00%	100.00%	97.51%	75.01%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	97.45%	74.22%
TATA CDMA	0.00%	0.00%	100.00%	100.00%	100.00%	99.35%	98.57%
TATA GSM	0.00%	0.00%	100.00%	100.00%	100.00%	99.15%	93.68%
Vodafone	0.11%	0.09%	100.00%	100.00%	100.00%	100.00%	96.54%

#### Metering and Billing Credibility – Post-paid Subscribers

For the billing disputes of postpaid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter. TATA GSM & CDMA had the best performance with 0.00% billing disputes.

#### Metering and Billing Credibility – Prepaid Subscribers

For the prepaid customers, all operators met the benchmark of charging disputes. TATA GSM & CDMA performed the best with 0.00% disputes.

#### Resolution of billing complaints

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and 6 weeks with 100.00%.

#### Response Time to customer for assistance - % of cases in which advance waiver is received within one week

All the operators met the TRAI benchmark of providing credit or waiver within one week in case of complaints received.

### Customer Care Percentage of calls answered by the IVR

All operators met the benchmark of 95% IVR call being attended. Airtel and Vodafone recorded the best performance for the parameter.

### Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds

TATA GSM, Airtel and Reliance (GSM & CDMA) failed to meet the TRAI specified benchmark of 95%. TATA CDMA recorded the best performance for the parameter with 98.57%.

### 3.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment										
Inter operator call Assessment To↓ From→	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Aircel	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Airtel	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%
BSNL	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	96.00%	100.00%	100.00%
Idea	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%
MTS	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	99.00%	100.00%	100.00%
Reliance CDMA	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%
Reliance GSM	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%
TATA CDMA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%
TATA GSM	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%
Vodafone	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA



Maximum Problem faced by the calling operator to other operator. The orange colour denotes performance below circle average.

In the inter-operator call assessment, most of the operators connected well to other operators, however Airtel, BSNL, Idea and MTS were facing problem with TATA CDMA

### PMR Consolidated (Network Parameters) for 2G

- Reliance (GSM & CDMA) and BSNL did not meet the benchmark BTS Accumulated downtime.
- BSNL failed to meet the benchmark worst affected BTSs due to downtime

### 3 Day Live Measurement (Network Parameters) for 2G

- BSNL did not meet the benchmark on SDCCCH / Paging Channel Congestion.
- TATA CDMA failed to meet the benchmark Worst Affected Cells Having More than 3% TCH Drop.

### PMR Consolidated (Network Parameters) for 3G

- BSNL did not meet the benchmark BTS Accumulated downtime was recorded for Vodafone at 0.05%.
- BSNL did not meet the benchmark Circuit Switched RAB congestion.
- BSNL failed to meet the benchmark for the parameter Worst affected cells having more than 3% Circuit switched voice drop rate.

### 3 Day Live Measurement (Network Parameters) for 3G

- BSNL failed to meet the benchmark for the parameter Circuit Switched RAB congestion was for Vodafone with 0.06%
- Vodafone failed to meet the benchmark Circuit Switch Voice Quality.

### Wireless data services for 3G

- In PMR all operators met the benchmark. Maximum Activation done within 4 hours was recorded for TATA GSM & CDMA at 100.00%. However in 3day live Aircel failed to meet the benchmark and maximum Activation done within 4 hours was recorded for TATA GSM & CDMA at 100.00%.
- In PMR BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Reliance GSM at 100.00%. However in 3day live BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Aircel at 99.92%.

### Wireless data services for 3G

- In PMR all operators met the benchmark. Maximum Activation done within 4 hours was recorded for Aircel at 99.90%. However in 3day live Aircel failed to meet the benchmark and maximum Activation done within 4 hours was recorded for Vodafone at 96.63%.
- In PMR as well as 3day live BSNL failed to meet the benchmark. Maximum PDP Context activation success rate was recorded for Aircel at 99.09%. However in 3day live maximum PDP Context activation success rate was recorded for Aircel at 99.92%.

### Live Calling

- As per the consumers (live calling exercise) Idea, MTS and Reliance GSM & CDMA failed to meet the benchmark of resolving 98% complaints within 4 weeks, however all operators met the benchmark of 100% complaints within 6 weeks.
- As per the live calling results, none of the operators met the TRAI benchmark for level 1 service with calls being answered except MTS. The details of live calling done for the level 1 service have been provided in the annexure for each operator.
- For the IVR aspect, all operators met the TRAI benchmark of 95% with most of the operators recording 100% for the parameter except BSNL.

### Metering and billing credibility

- For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter. TATA GSM & CDMA had the best performance with 0.00% billing disputes.
- TATA GSM, Airtel and Reliance (GSM & CDMA) failed to meet the TRAI specified benchmark Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds

### Drive Test (Operator Assisted)

- BSNL GSM failed to meet the benchmark in outdoor as well as indoor locations for Voice quality. Airtel and BSNL CDMA did not meet the benchmark in outdoor locations.
- BSNL GSM failed to meet the benchmark for CSSR in outdoor locations.
- BSNL GSM failed to meet the benchmark for call drop rate in outdoor locations.

## 5 PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 2G

**3 Day Live Data:** - Data representing for Reliance CDMA and Reliance GSM is for December 2015, since they had server issue in the month of October 2015 and November 2015 we could not able to conduct the audit same has been intimated to TRAI by the operator.

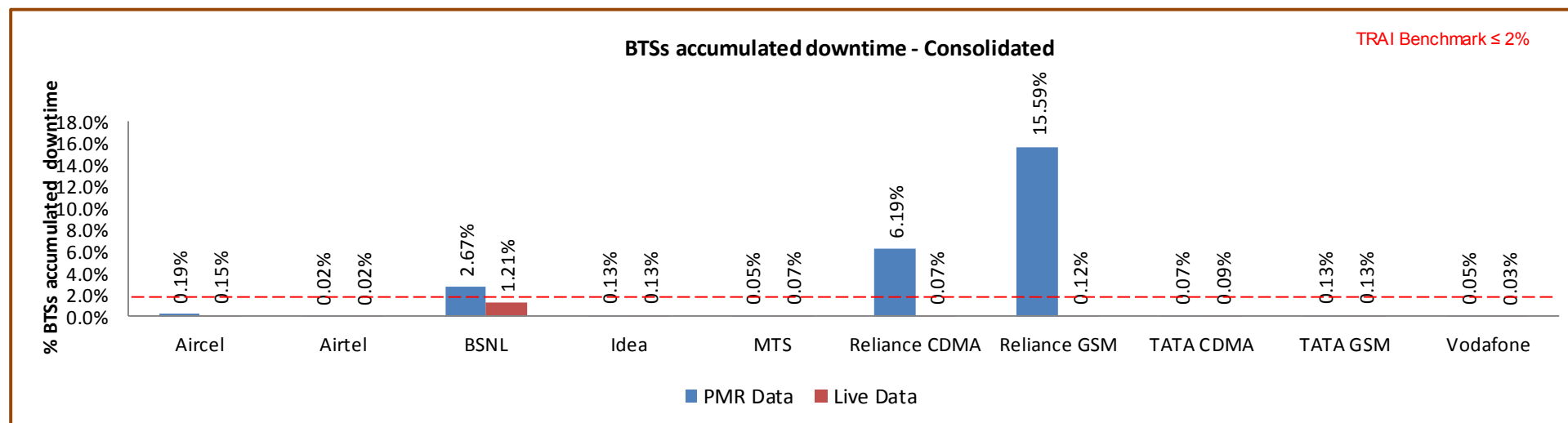
### 5.1 BTS ACCUMULATED DOWNTIME

#### 5.1.1 PARAMETER DESCRIPTION

- The parameter of network availability would be measured from following sub-parameters
  1. BTSs Accumulated downtime (not available for service)
  2. Worst affected BTSs due to downtime
- 1. **Definition - BTSs (Base Transceiver Station) accumulated downtime** (not available for service) shall basically measure the downtime of the BTSs, including its transmission links/circuits during the period of a month, but excludes all planned service downtime for any maintenance or software up gradation. For measuring the performance against the benchmark for this parameter the downtime of each BTS lasting more than 1 hour at a time in a day during the period of a month were considered.
- 2. **Computation Methodology –**  
**BTS accumulated downtime (not available for service) =  $\frac{\text{Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month}}{(24 \times \text{Number of days in a month} \times \text{Number of BTSs in the network in licensed service area})} \times 100$**
- 3. **TRAI Benchmark –**
  - a. BTSs Accumulated downtime (not available for service)  $\leq 2\%$
- 4. **Audit Procedure –**

- The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited
- All the BTS in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.
- Any outage as a result of force majeure were not considered at the time of calculation
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- List of operating sites with cell details and ids are taken from the operator.
- When there is any outage a performance report gets generated in line with that cell resulting and master base of the Accumulated downtime and worst affected BTS due to downtime.

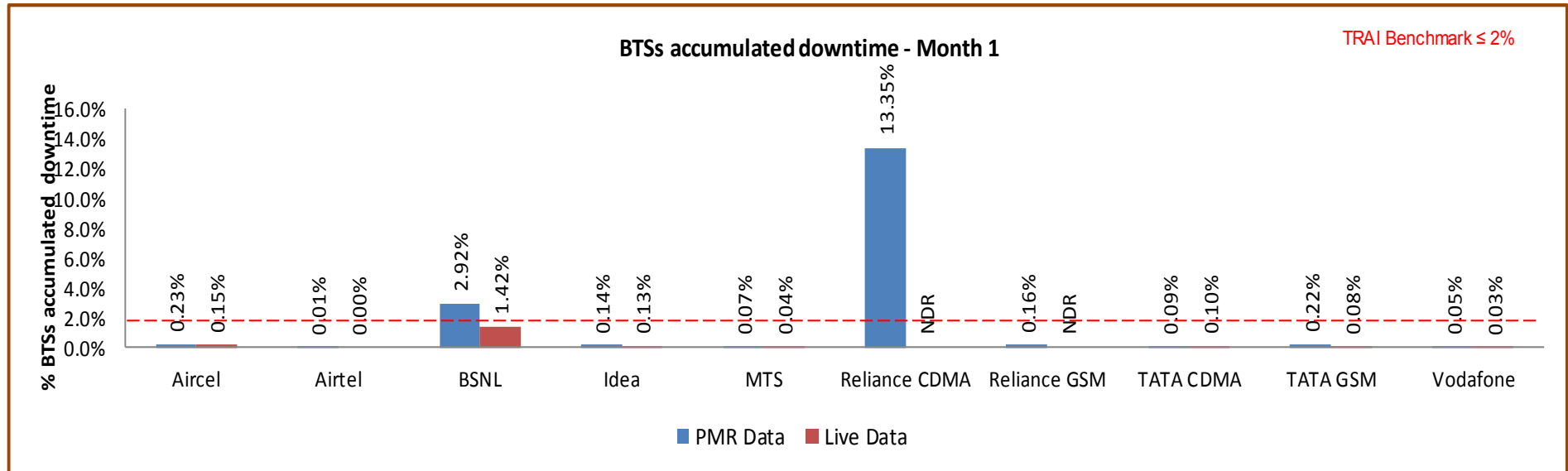
### 5.1.2 KEY FINDINGS - CONSOLIDATED



Data Source: Operations and Maintenance Center (OMC) of the operators

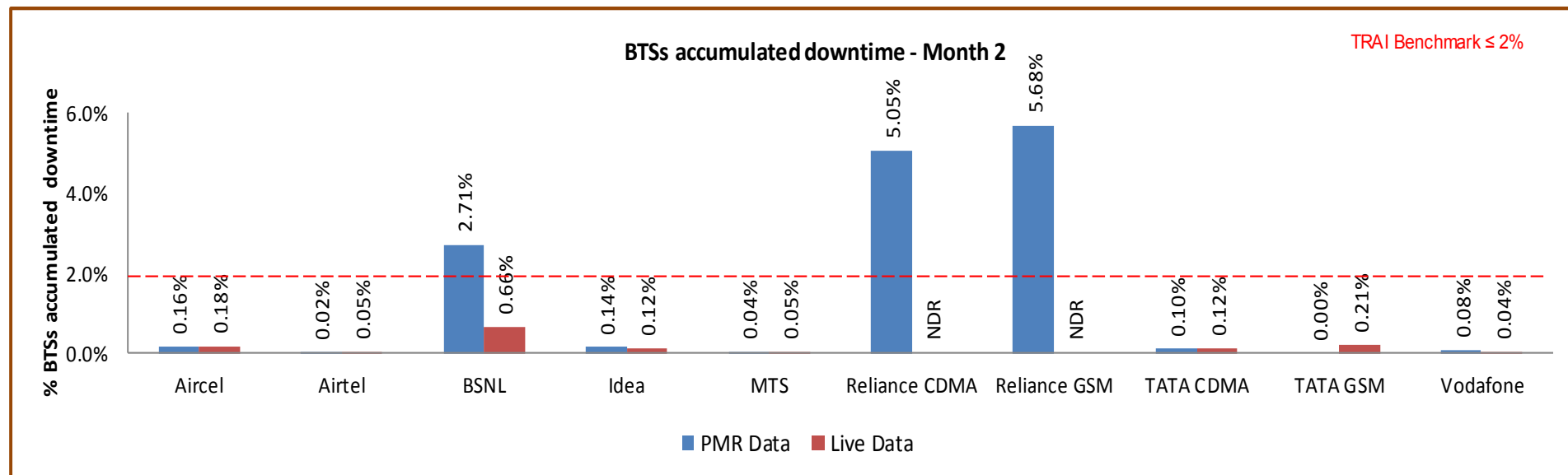
Reliance GSM & CDMA and BSNL did not meet the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

## 5.1.2.1 KEY FINDINGS – MONTH 1



Data Source: Operations and Maintenance Center (OMC) of the operators

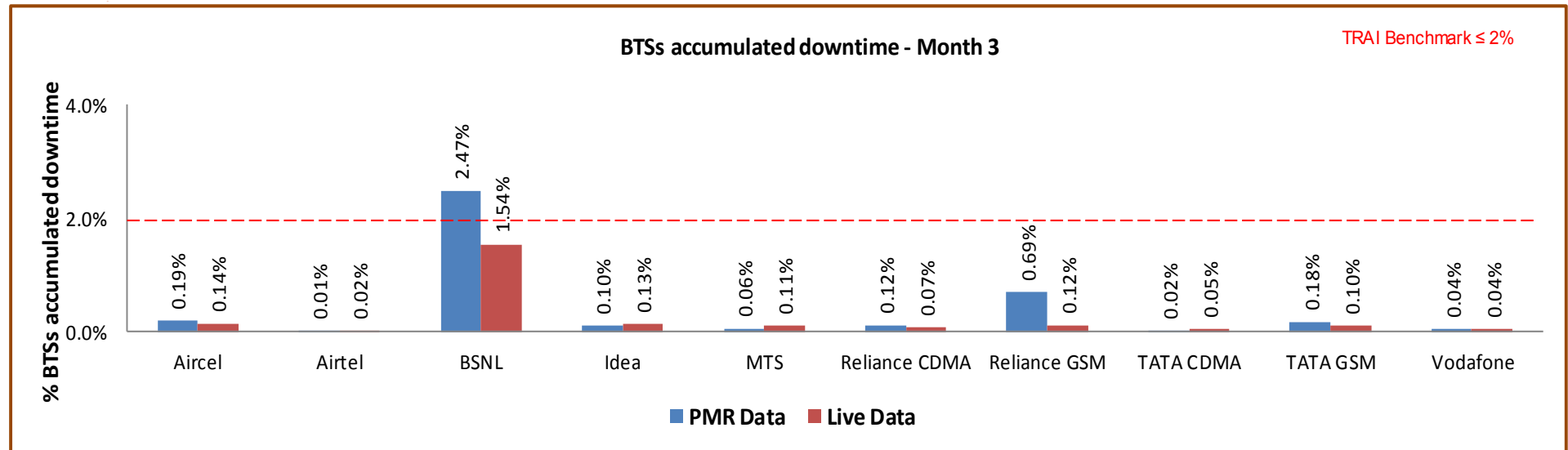
## 5.1.2.2 KEY FINDINGS – MONTH 2



Data Source: Operations and Maintenance Center (OMC) of the operators

3 days live for Reliance GSM & CDMA; data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 5.1.2.3 KEY FINDINGS – MONTH 3



Data Source: Operations and Maintenance Center (OMC) of the operators

## 5.2 WORST AFFECTED BTS DUE TO DOWNTIME

### 5.2.1 PARAMETER DESCRIPTION

- **Definition – Worst Affected BTS due to downtime** shall basically measure percentage of BTS having downtime greater than 24 hours in a month. Planned outages were not considered as part while computing.

For measuring the parameter “Percentage of worst affected BTSs due to downtime” the downtime of each BTS lasting for more than 1 hour at a time in a day during the period of a month was considered.

- **Computation Methodology –**

**Worst affected BTSs due to downtime** = (Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) \* 100

- **TRAI Benchmark –**

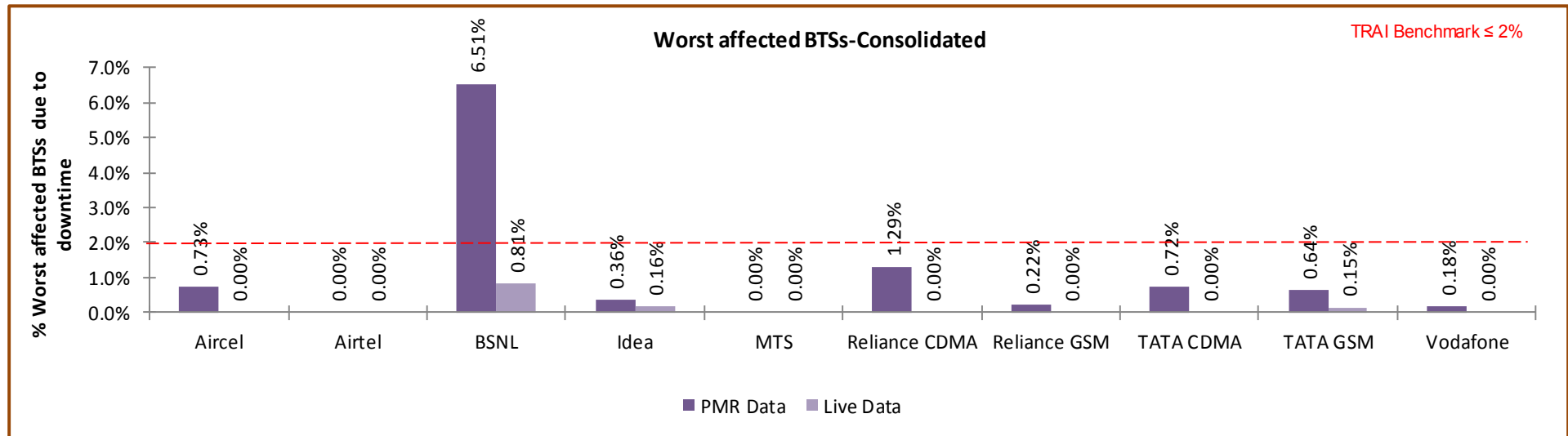
- Worst affected BTSs due to downtime  $\leq 2\%$

- **Audit Procedure –**

- The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited
- All the BTS in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- Any outage as a result of force majeure was not considered at the time of calculation.

- v. List of operating sites with cell details and ids are taken from the operator.
- vi. All the BTS having down time greater than 24 hours is assessed and values of BTS accumulated downtime is computed in accordance.

### 5.2.2 KEY FINDINGS – CONSOLIDATED

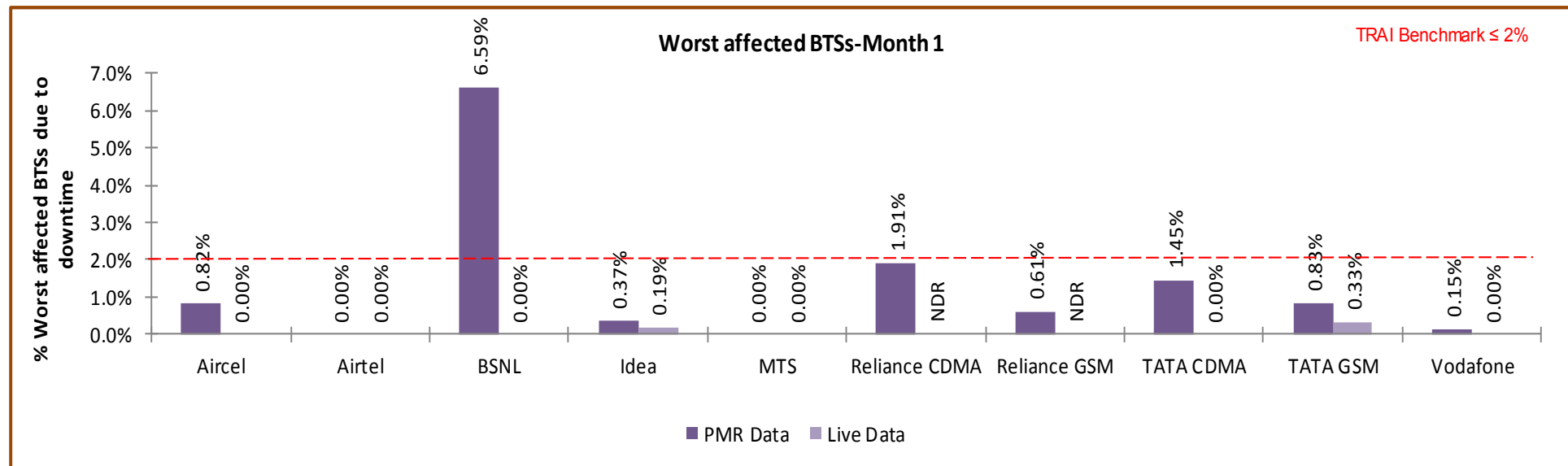


Data Source: Operations and Maintenance Center (OMC) of the operators

BSNL did not meet the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

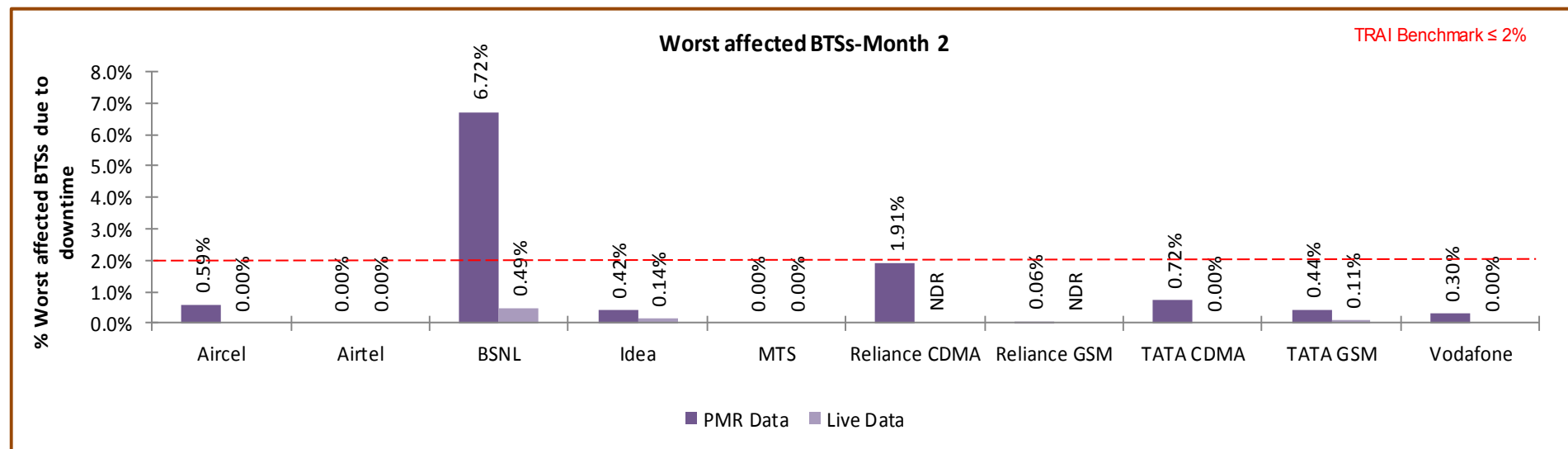
Significant difference was observed between PMR & live measurement data for Aircel, Reliance CDMA, TATA (CDMA & GSM) and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

## 5.2.2.1 KEY FINDINGS – MONTH 1



Data Source: Operations and Maintenance Center (OMC) of the operators

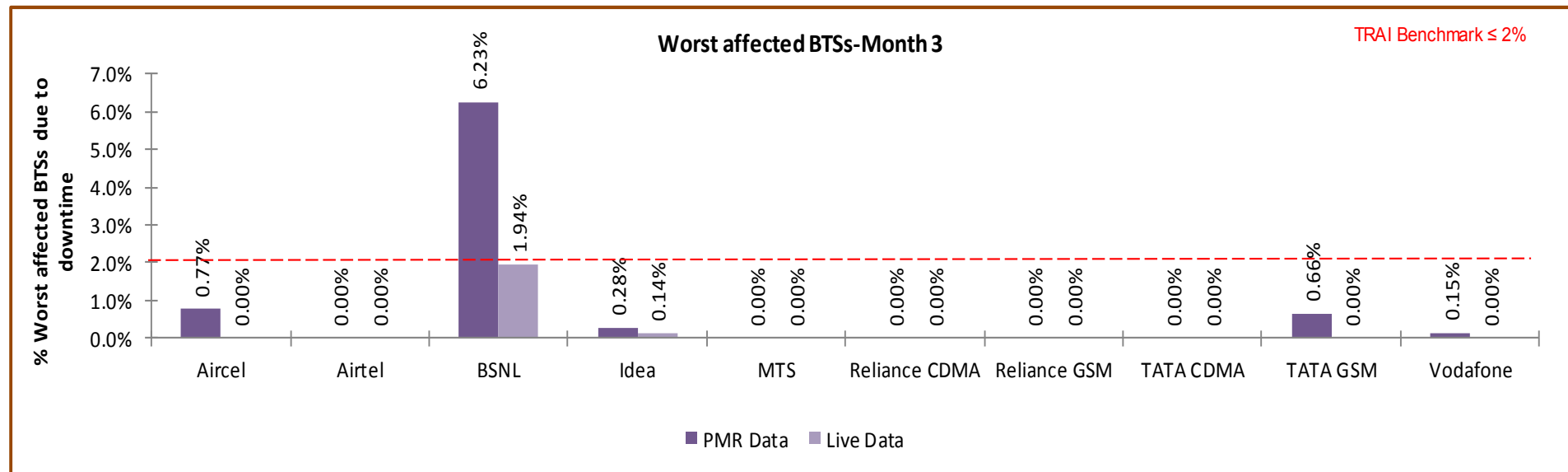
## 5.2.2.2 KEY FINDINGS – MONTH 2



3 days live for Reliance GSM & CDMA; data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

Data Source: Operations and Maintenance Center (OMC) of the operators

## 5.2.2.3 KEY FINDINGS – MONTH 3



Data Source: Operations and Maintenance Center (OMC) of the operators

## 5.3 CALL SET UP SUCCESS RATE

### 5.3.1 PARAMETER DESCRIPTION

1. **Definition:** The ratio of successful calls established to total calls is known as Call Set-Up Success Rate (CSSR).
2. **Computation Methodology-**

$$(\text{Calls Established} / \text{Total Call Attempts}) * 100$$

Call Established means the following events have happened in call setup:-

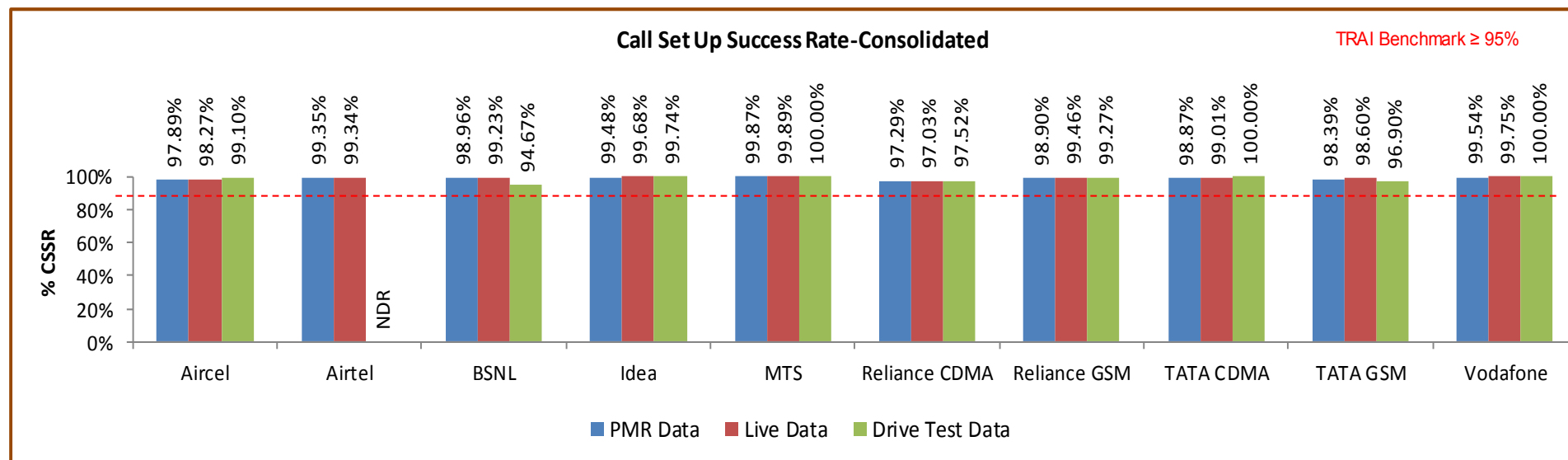
- ✎ call attempt is made
- ✎ the TCH is allocated
- ✎ the call is routed to the outward path of the concerned MSC

3. **TRAI Benchmark**  $\geq 95\%$

4. **Audit Procedure –**

- ✎ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements
- ✎ CSSR calculation should be measured using OMC generated data only
- ✎ Measurement should be only in Time Consistent Busy Hour (CBBH) period for all days of the week
- ✎ Counter data is extracted from the NOC of the operators.
- ✎ Total calls established include all calls established excluding Signaling blocking, TCH Drop and TCH blocking.
- ✎ The numerator and denominator values are derived from adding the counter values from the MSC.

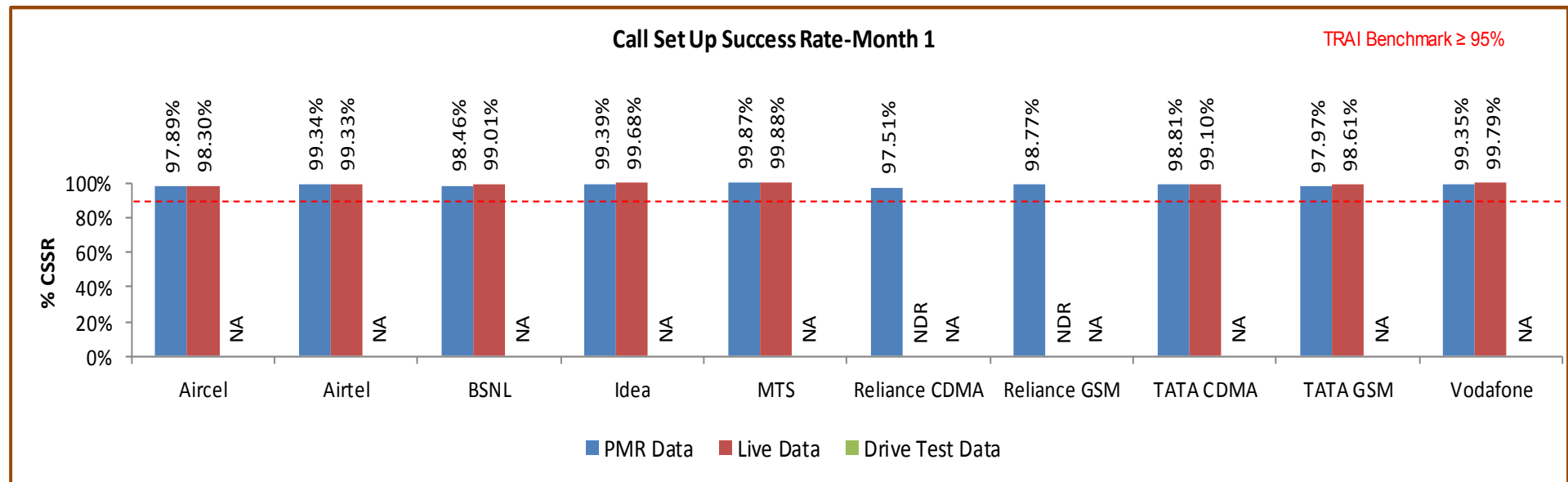
## 5.3.2 KEY FINDINGS - CONSOLIDATED



Data Source: Network Operations Center (NOC) of the operators

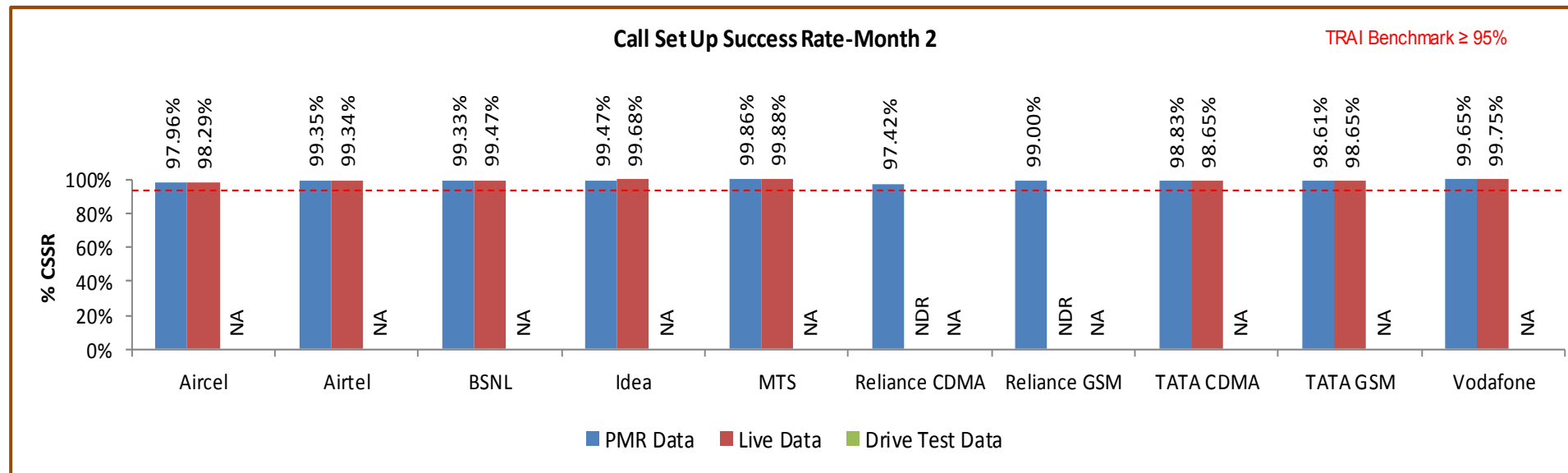
All operators met the TRAI benchmark as per audit/PMR data.

## 5.3.2.1 KEY FINDINGS – MONTH 1



Data Source: Network Operations Center (NOC) of the operators

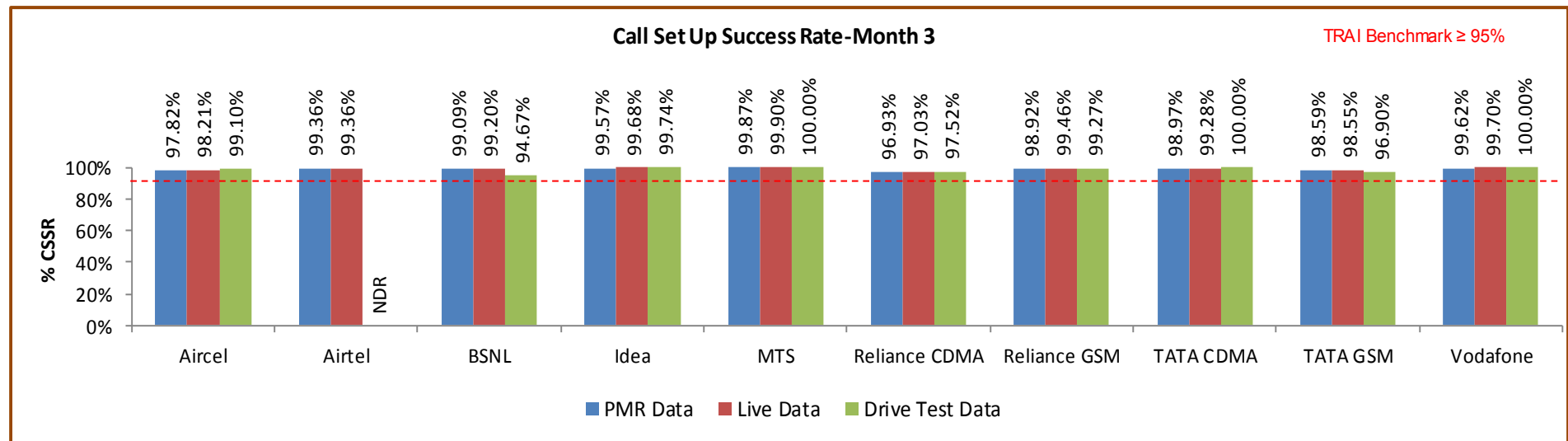
## 5.3.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

3 day live for Reliance GSM & CDMA, data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

### 5.3.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 5.4 NETWORK CHANNEL CONGESTION- PAGING CHANNEL /TCH CONGESTION/POI

### 5.4.1 PARAMETER DESCRIPTION

- Definition:** It means a call is not connected because there is no free channel to serve the call attempt. This parameter represents congestion in the network. It happens at three levels:

↗ SDCCH Level: Stand-alone dedicated control channel

↗ TCH Level: Traffic Channel

↗ POI Level: Point of Interconnect

- Computational Methodology:**

↗ **SDCCH / TCH Congestion%** =  $[(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$

- Where:- $A_1$  = Number of attempts to establish SDCCH / TCH made on day 1
- $C_1$  = Average SDCCH / TCH Congestion % on day 1
- $A_2$  = Number of attempts to establish SDCCH / TCH made on day 2
- $C_2$  = Average SDCCH / TCH Congestion % on day 2
- $A_n$  = Number of attempts to establish SDCCH / TCH made on day n
- $C_n$  = Average SDCCH / TCH Congestion % on day n

↗ **POI Congestion%** =  $[(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$

- Where:- $A_1$  = POI traffic offered on all POIs (no. of calls) on day 1
- $C_1$  = Average POI Congestion % on day 1
- $A_2$  = POI traffic offered on all POIs (no. of calls) on day 2
- $C_2$  = Average POI Congestion % on day 2

- $A_n$  = POI traffic offered on all POIs (no. of calls) on day n
- $C_n$  = Average POI Congestion % on day n

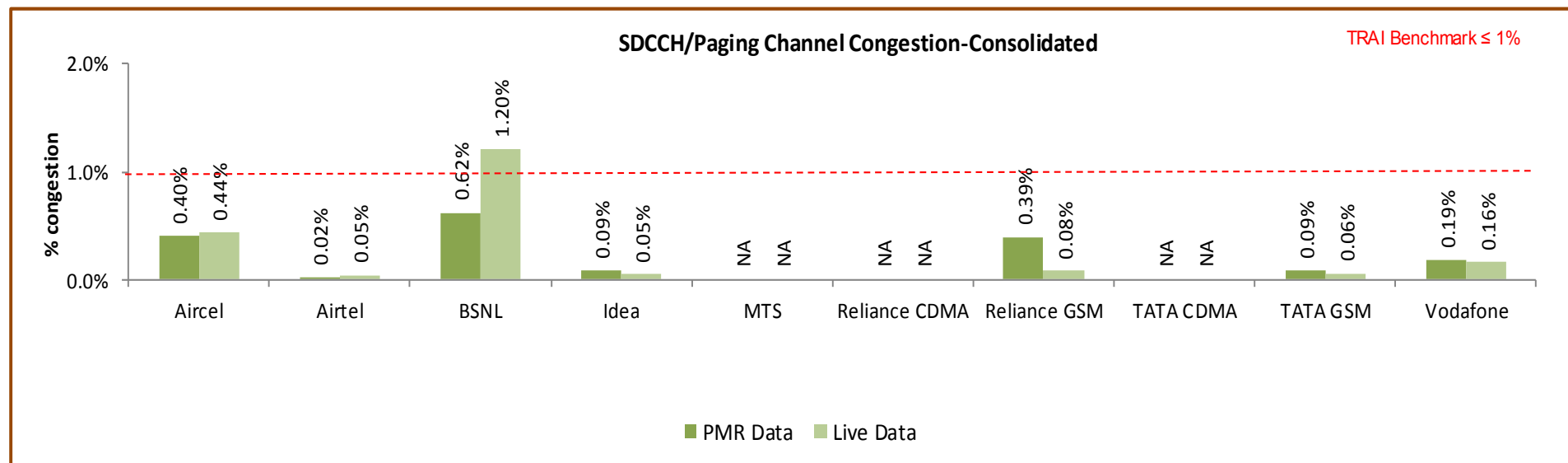
### 3. Benchmark:

⇒ SDCCH Congestion:  $\leq 1\%$ , TCH Congestion:  $\leq 2\%$ , POI Congestion:  $\leq 0.5\%$

### 4. Audit Procedure –

- ⇒ Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC-Switch data only) would be conducted
- ⇒ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH

### 5.4.2 KEY FINDINGS - SDCCH/PAGING CHANNEL CONGESTION (CONSOLIDATED)



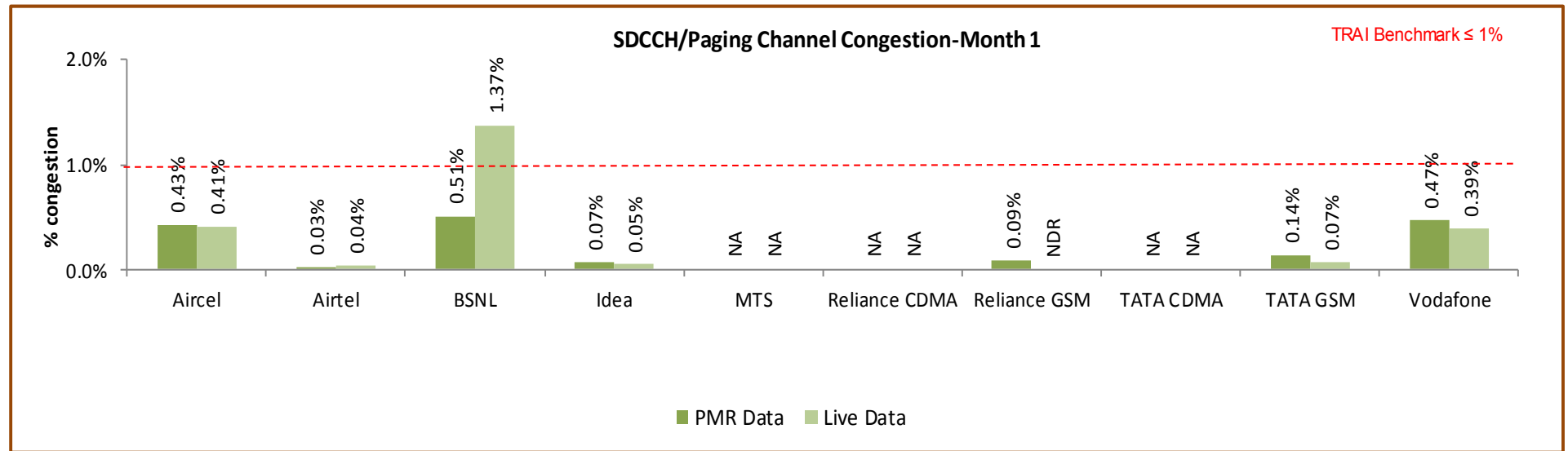
Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark as per PMR/audit Data except BSNL for 3days live.

Significant difference was observed between PMR & live measurement data for BSNL and Reliance GSM. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for 3 days.

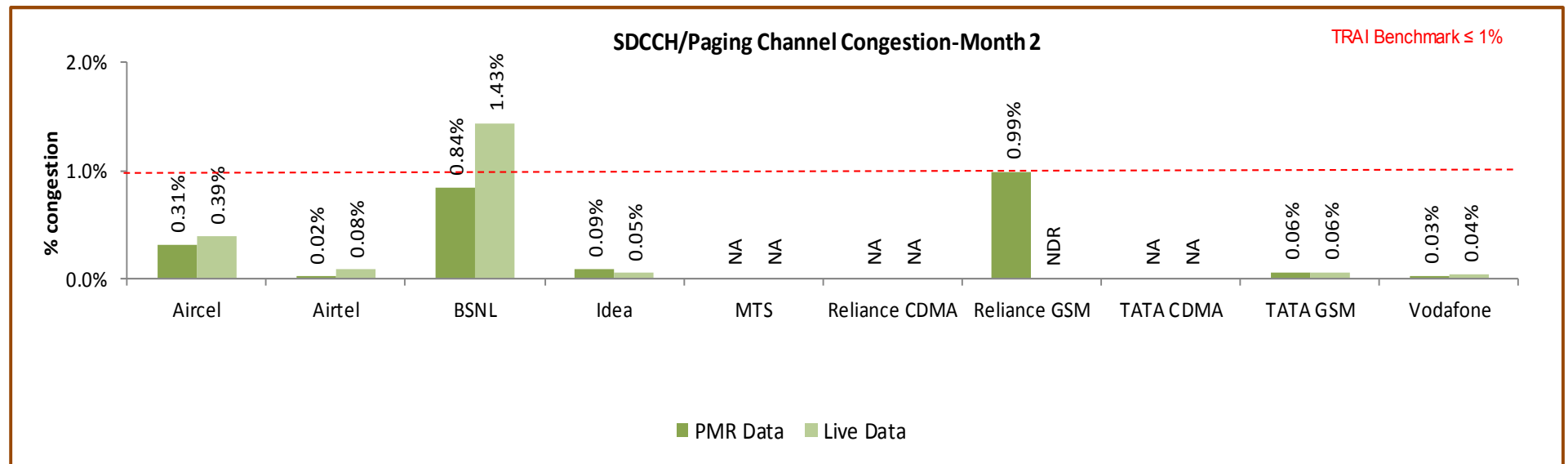
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. .

## 5.4.2.1 KEY FINDINGS – MONTH 1



Data Source: Network Operations Center (NOC) of the operators

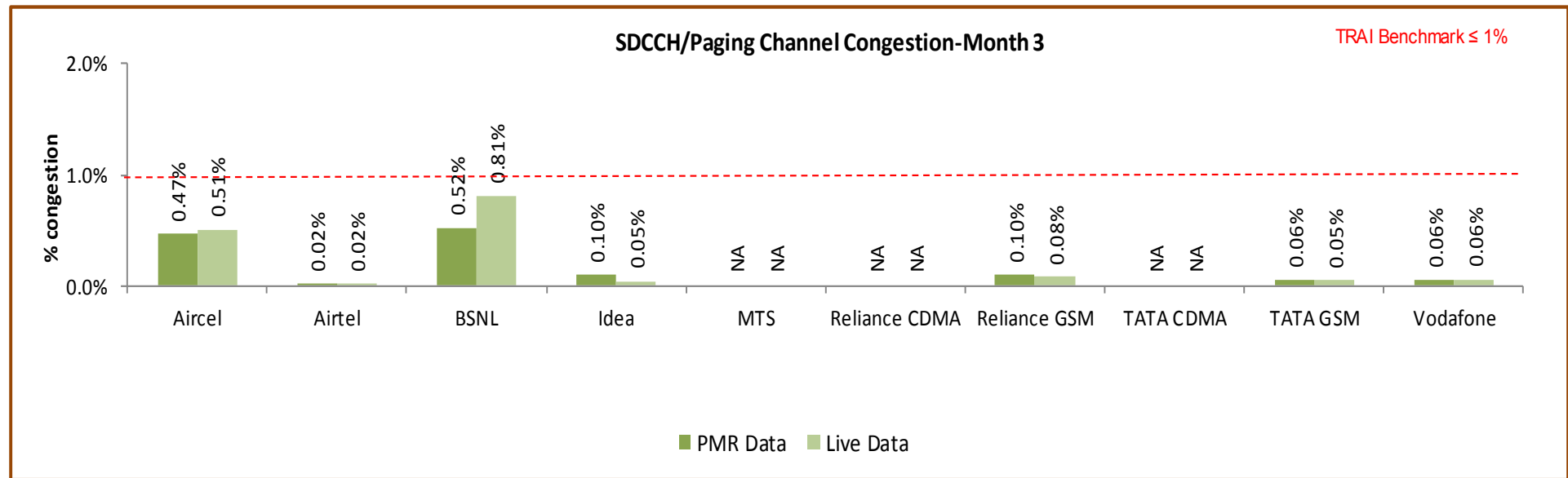
## 5.4.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

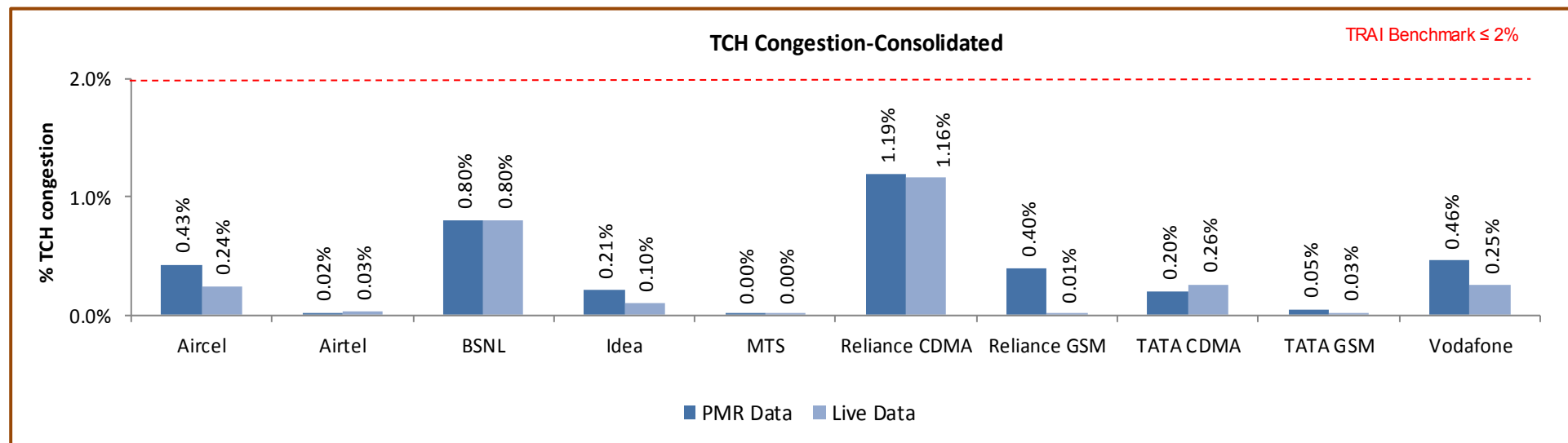
3 days live for Reliance GSM; data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 5.4.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

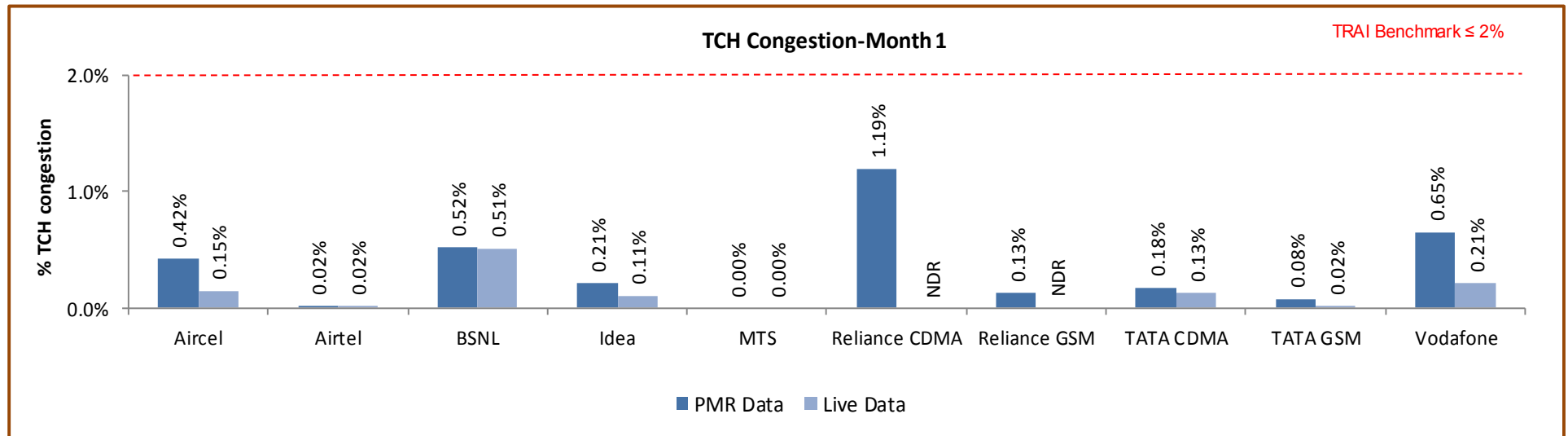
## 5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)



Data Source: Network Operations Center (NOC) of the operators

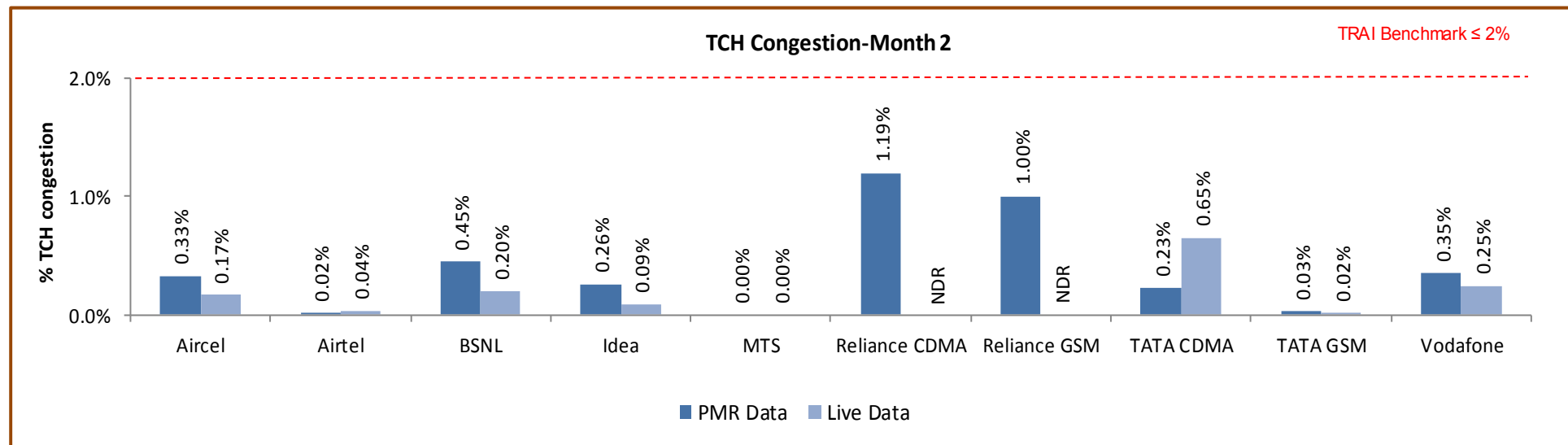
All operators met the benchmark as per audit/PMR report.

## 5.4.3.1 KEY FINDINGS – MONTH 1



Data Source: Network Operations Center (NOC) of the operators

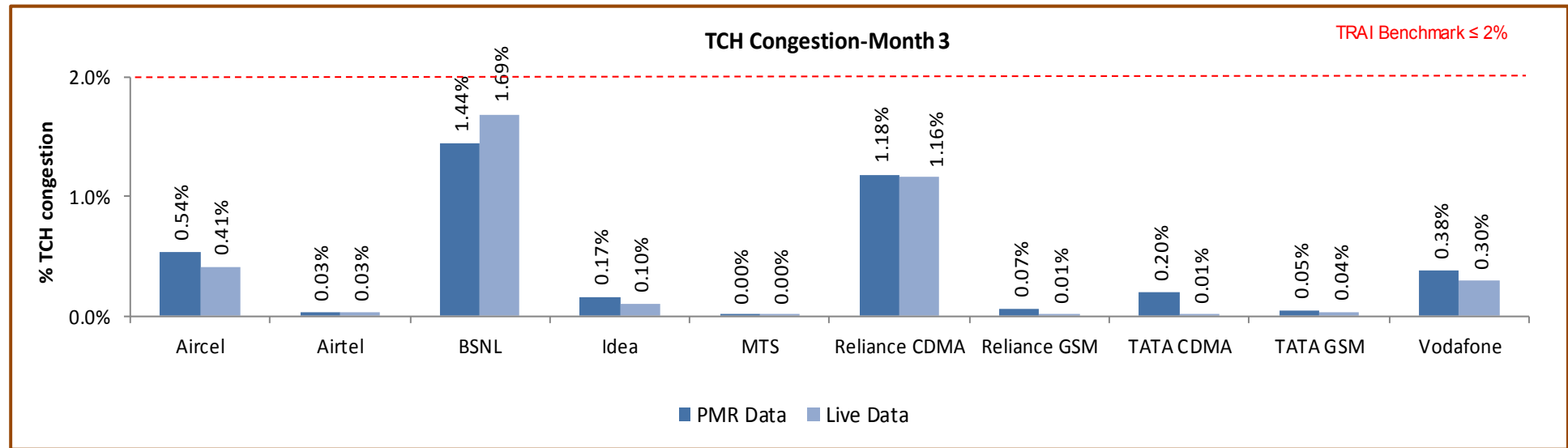
### 5.4.3.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

3day live for Reliance GSM, data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 5.4.3.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

#### 5.4.4 KEY FINDINGS – POI CONGESTION (CONSOLIDATED) – AVERAGE OF 3 MONTHS

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		47	32	78	91	40	12	29	43	30	46
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68694	243380	966564	172540	112006	24459	35631	73449	32020	735121
Traffic served for all POIs (B)- in erlangs		26536	113427	33830	86378	32337	8475	18252	30872	17176	364835
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		132	94	233	274	120	12	29	129	89	139
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		204027	699076	1407575	178669	111770	8153	250096	73649	32477	735579
Traffic served for all POIs (B)- in erlangs		43328	351602	35966	89445	33028	1502	85900	22819	9062	181420
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark of POI Congestion as per PMR/audit Data.

## 5.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-October											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		42	31	77	90	40	12	29	44	29	49
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68444	80971	56220	61204	37488	8153	11877	25770	9851	358965
Traffic served for all POIs (B)- in erlangs		26260	36620	11364	29165	10679	2804	6750	10707	5138	179811
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-October											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		41	31	77	90	40	NDR	NDR	44	29	49
No. of POIs not meeting benchmark		0	0	0	0	0	NDR	NDR	0	0	0
Total Capacity of all POIs (A) - in erlangs		67492	242913	471903	61372	37481	NDR	NDR	25770	9851	359411
Traffic served for all POIs (B)- in erlangs		14175	114070	11940	28793	10958	NDR	NDR	10707	2641	79671
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NDR	NDR	0.00%	0.00%	0.00%

Data Source: Network Operations Center (NOC) of the operators

3day live for Reliance GSM & CDMA, November15 data is not available due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-November											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	77	90	40	12	29	44	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		69375	81079	465723	55568	37345	8153	11877	25409	9851	186378
Traffic served for all POIs (B)- in erlangs		26476	37470	11288	25695	10717	2798	6616	10933	5128	90044
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		42	31	77	90	40	NDR	NDR	44	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	NDR	NDR	0	0	0
Total Capacity of all POIs (A) - in erlangs		68471	212913	485641	61372	37481	NDR	NDR	25616	9731	186518
Traffic served for all POIs (B)- in erlangs		14944	120282	12411	29853	11411	NDR	NDR	6719	2722	51779
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NDR	NDR	0.00%	0.00%	0.00%

Data Source: Network Operations Center (NOC) of the operators

3day live for Reliance GSM & CDMA, November15 data is not available due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 5.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-December											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	31	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68263	81330	444621	55768	37172	8153	11877	22270	12319	189777
Traffic served for all POIs (B) - in erlangs		26873	39338	11178	31518	10941	2873	4887	9232	6910	94981
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-December											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	31	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68064	243250	450031	55925	36807	8153	250096	22263	12895	189650
Traffic served for all POIs (B) - in erlangs		14209	117250	11615	30799	10660	1502	85900	5393	3699	49970
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

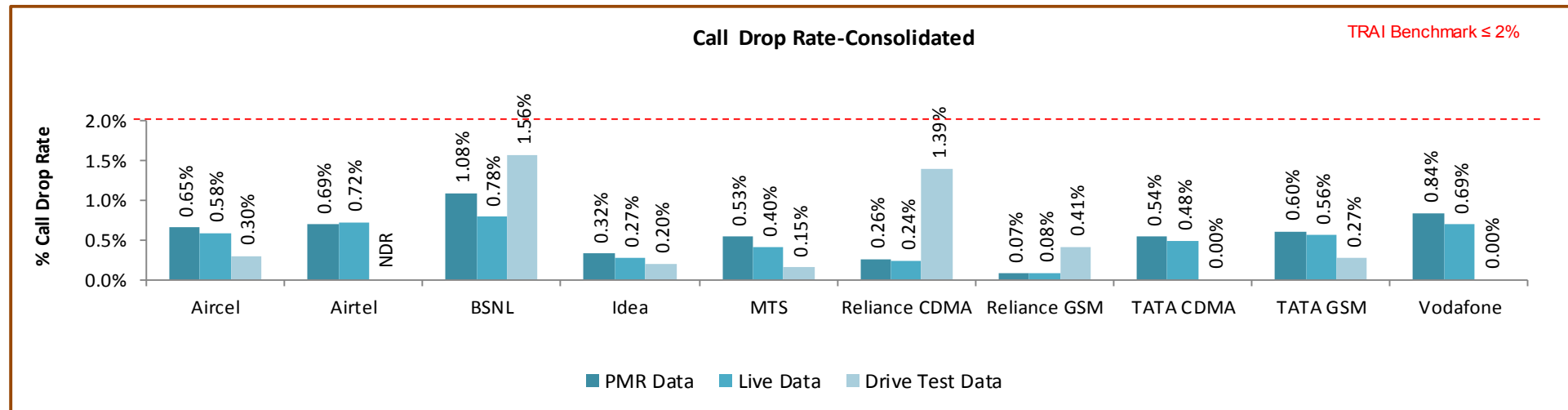
Data Source: Network Operations Center (NOC) of the operators

## 5.5 CALL DROP RATE

### 5.5.1 PARAMETER DESCRIPTION

1. **Definition** - The dropped call rate is the ratio of successfully originated calls that were found to drop to the total number of successfully originated calls that were correctly released.
  - ↗ **Total calls dropped** = All calls ceasing unnaturally i.e. due to handover or due to radio loss
  - ↗ **Total calls established** = All calls that have TCH allocation during busy hour
2. **Computational Methodology:**  $(\text{Total Calls Dropped} / \text{Total Calls Established}) \times 100$
3. **TRAI Benchmark** –
  - ↗ Call drop rate  $\leq 2\%$
4. **Audit Procedure** –
  - ↗ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was used
  - ↗ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter.

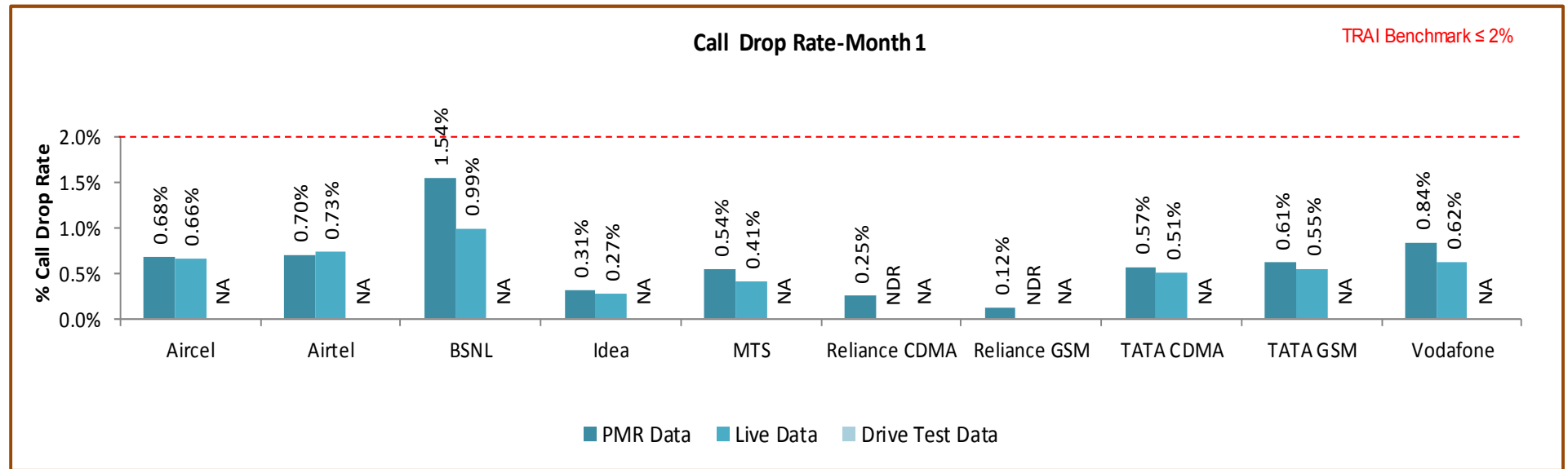
## 5.5.2 KEY FINDINGS - CONSOLIDATED



Data Source: Network Operations Center (NOC) of the operators

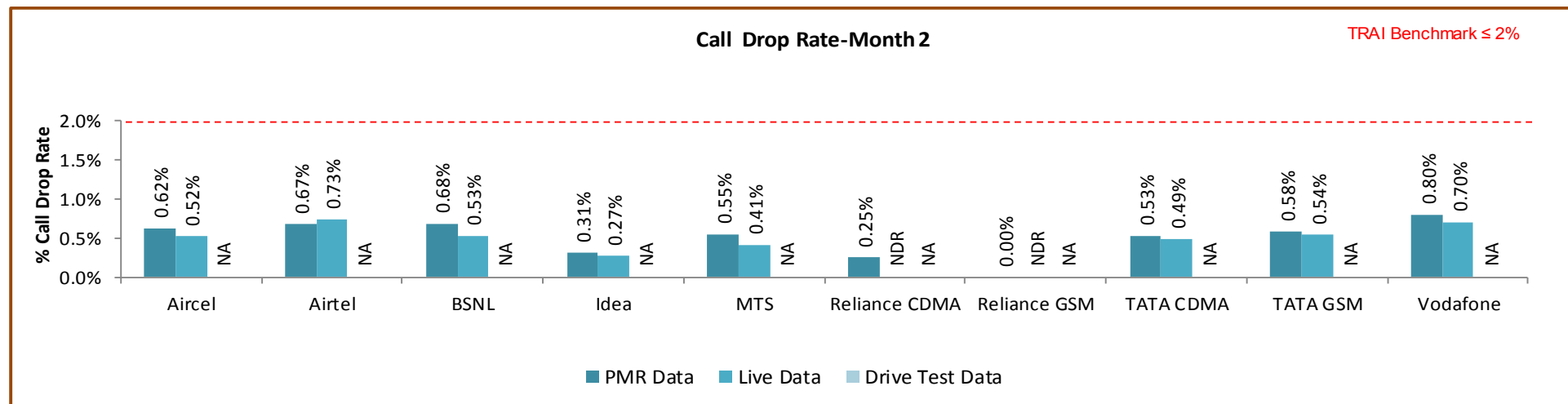
All operators met the benchmark for call drop rate during audit. The call drop rate during drive test was observed to be higher than audit for BSNL.

## 5.5.2.1 KEY FINDINGS – MONTH 1



Data Source: Network Operations Center (NOC) of the operators

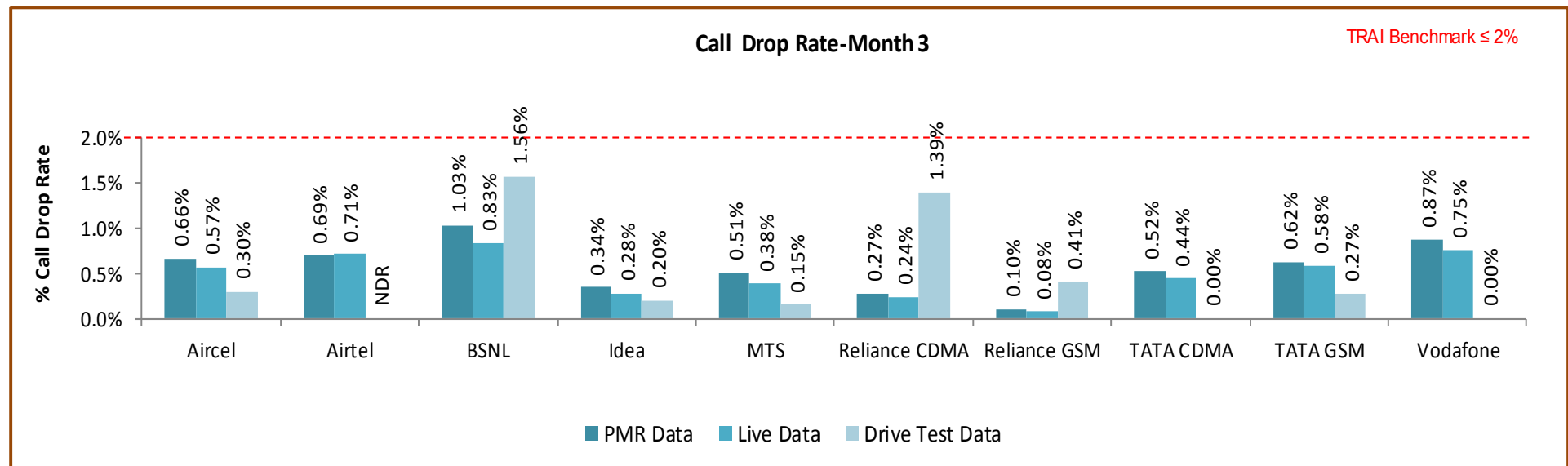
## 5.5.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

3day live for Reliance GSM & CDMA, data for November'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

## 5.5.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

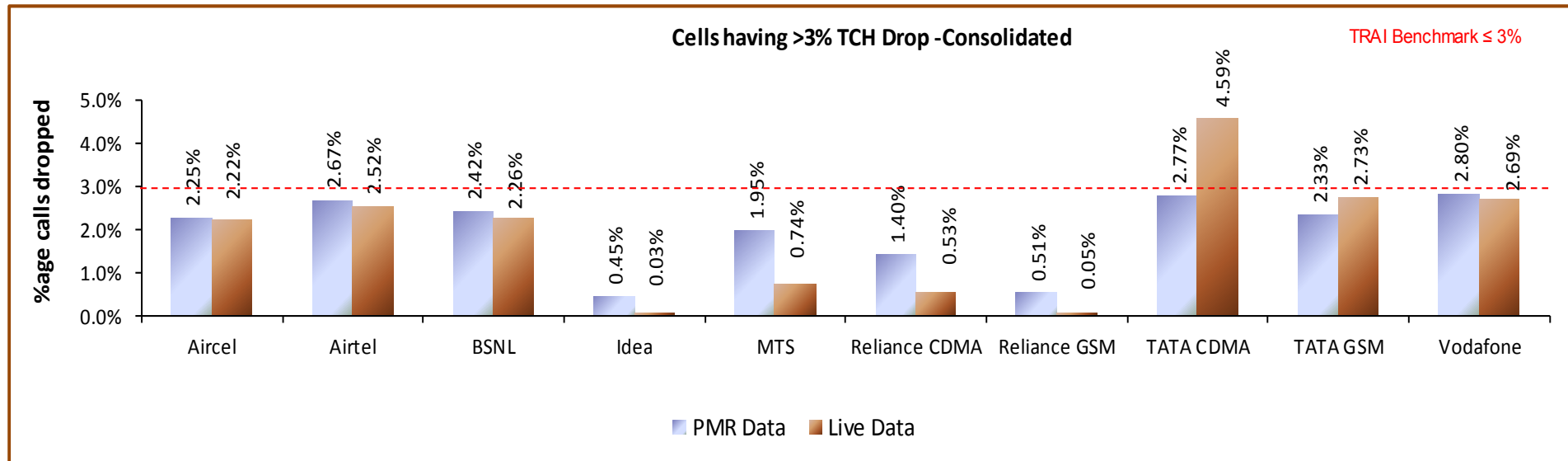
## 5.6 CELLS HAVING GREATER THAN 3% TCH DROP

### 5.6.1 PARAMETER DESCRIPTION

1. **Definition- Worst Affected Cells having more than 3% TCH drop** shall measure the ratio of total number of cells in the network to the ratio of cells having more than 3% TCH drop.
2. **Computational Methodology:**  $(\text{Total number of cells having more than 3\% TCH drop during CBBH} / \text{Total number of cells in the network}) \times 100$
3. **TRAI Benchmark –**
  - ↪ Worst affected cells having more than 3% TCH drop rate  $\leq 3\%$
4. **Audit Procedure –**
  - ↪ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR would be conducted.

The operator should only be considering those calls which are dropped during Cell Bouncing Busy hour (CBBH) for all days of the relevant quarter.

## 5.6.2 KEY FINDINGS - CONSOLIDATED

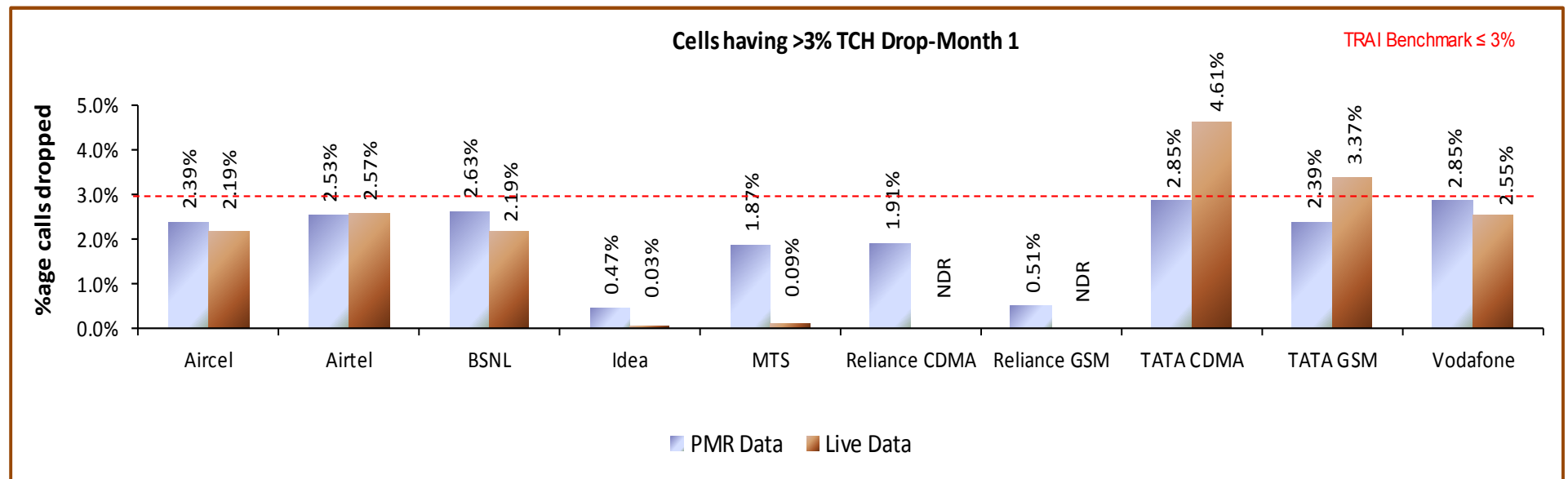


Data Source: Network Operations Center (NOC) of the operators

TATA CDMA failed to meet the benchmark for cell having >3% TCH Drop rate in 3day live.

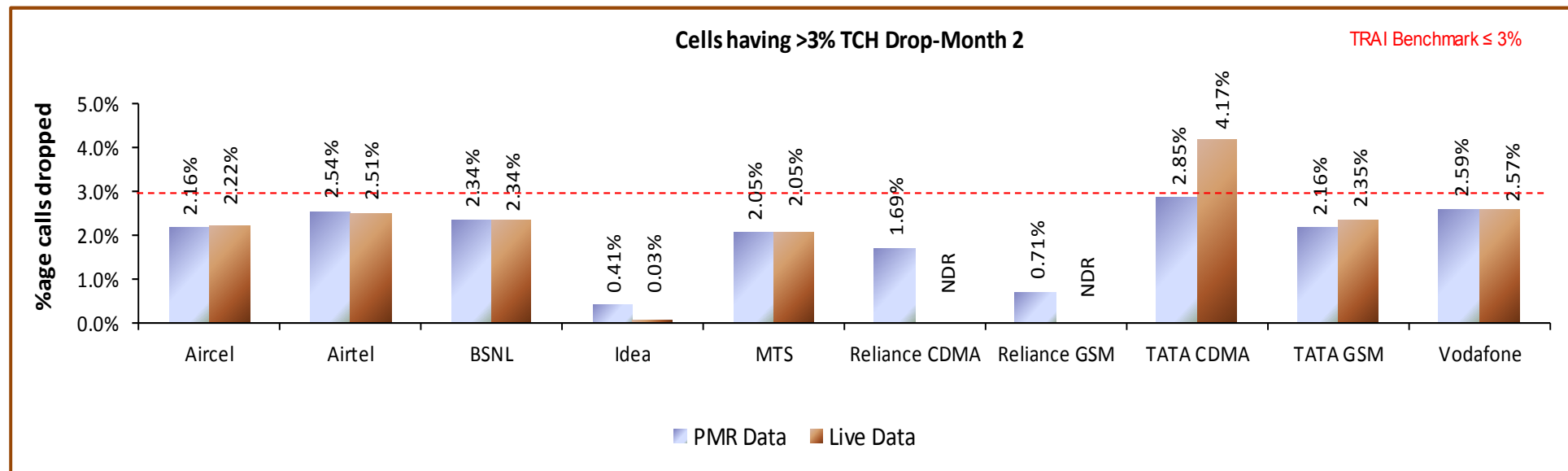
May Significant difference was observed between PMR & live measurement data for MTS, Reliance GSM & CDMA, TATA CDMA and Vodafone. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for 3 days

## 5.6.2.1 KEY FINDINGS – MONTH 1



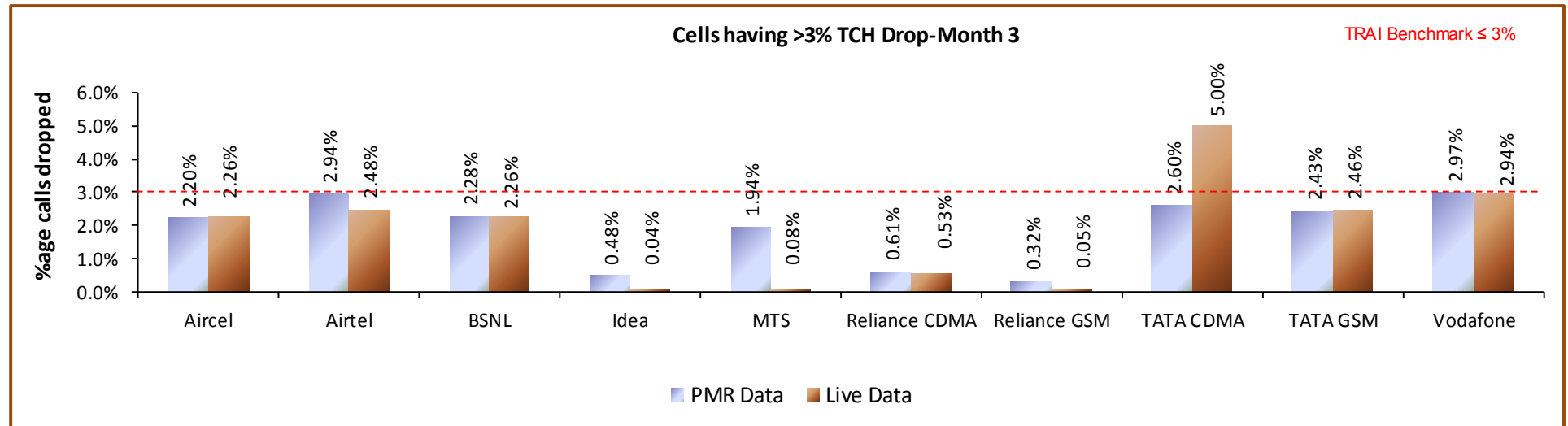
Data Source: Network Operations Center (NOC) of the operators

## 5.6.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 5.6.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 5.7 VOICE QUALITY

### 5.7.1 PARAMETER DESCRIPTION

#### 1. Definition:

- ↳ for GSM service providers the calls having a value of 0 – 5 are considered to be of good quality (on a seven point scale)
- ↳ For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when its FER value lies between 0 – 4 %

#### 2. Computational Methodology:

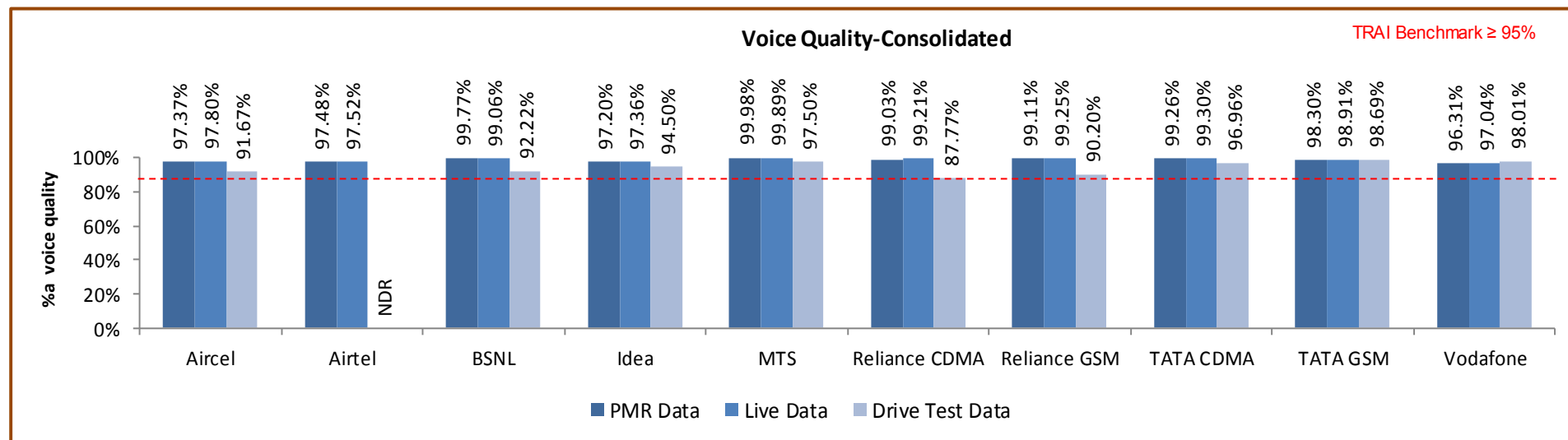
$$\text{\% Connections with good voice quality} = (\text{No. of voice samples with good voice quality} / \text{Total number of samples}) \times 100$$

#### 3. TRAI Benchmark: $\geq 95\%$

#### 4. Audit Procedure –

- a. A sample of calls would be taken randomly from the total calls established.
- b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

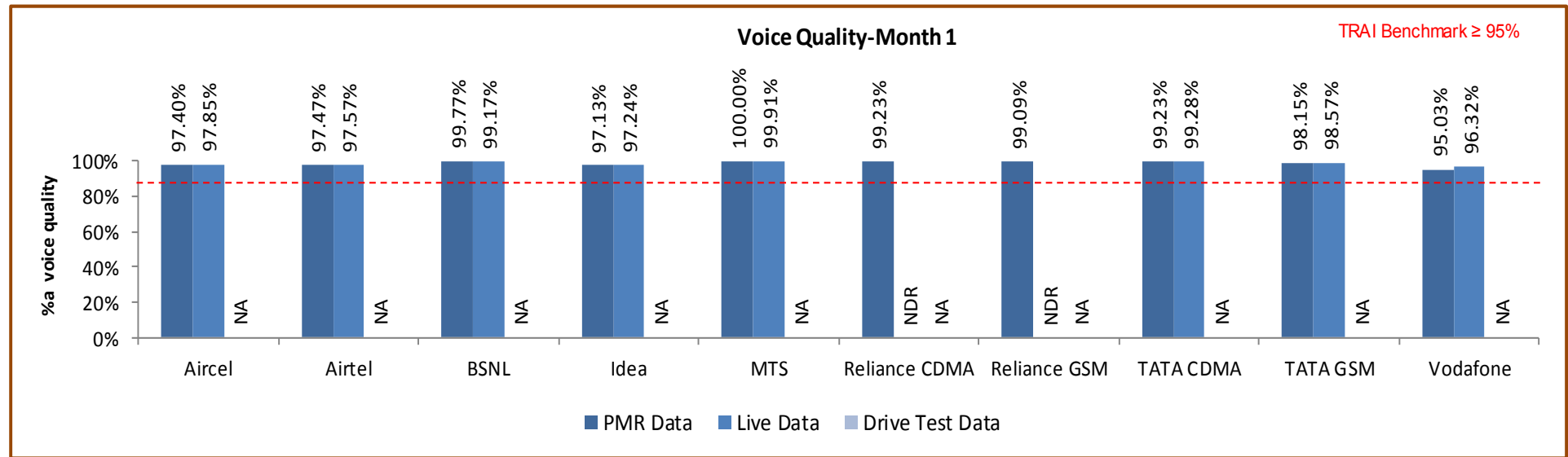
## 5.7.2 KEY FINDINGS



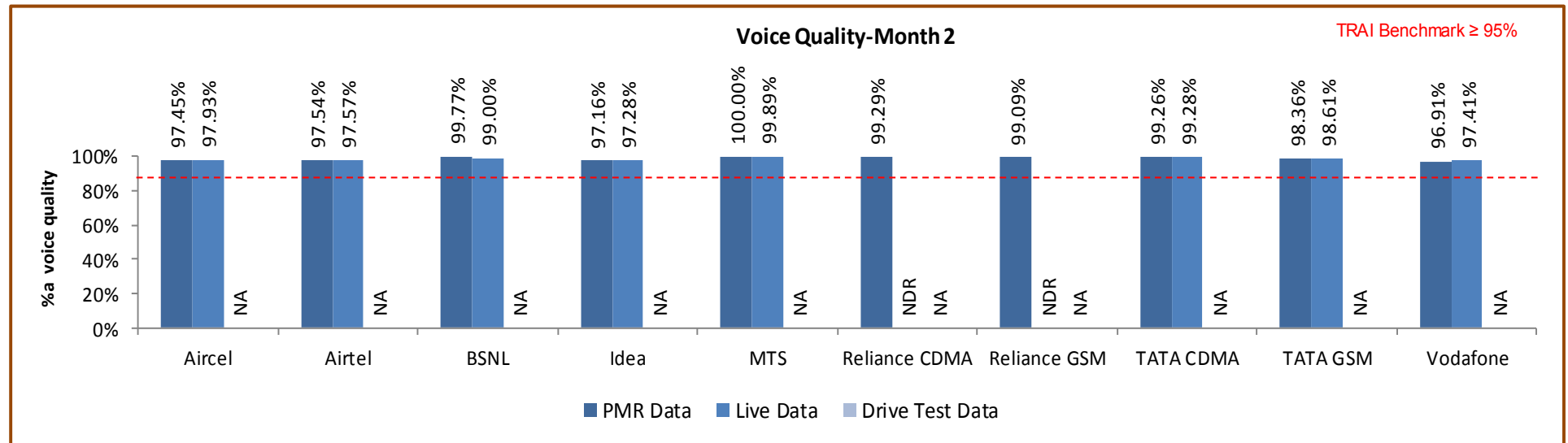
Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for Voice quality as per PMR data except Reliance GSM for drive test.

### 5.7.2.1 KEY FINDINGS – MONTH 1

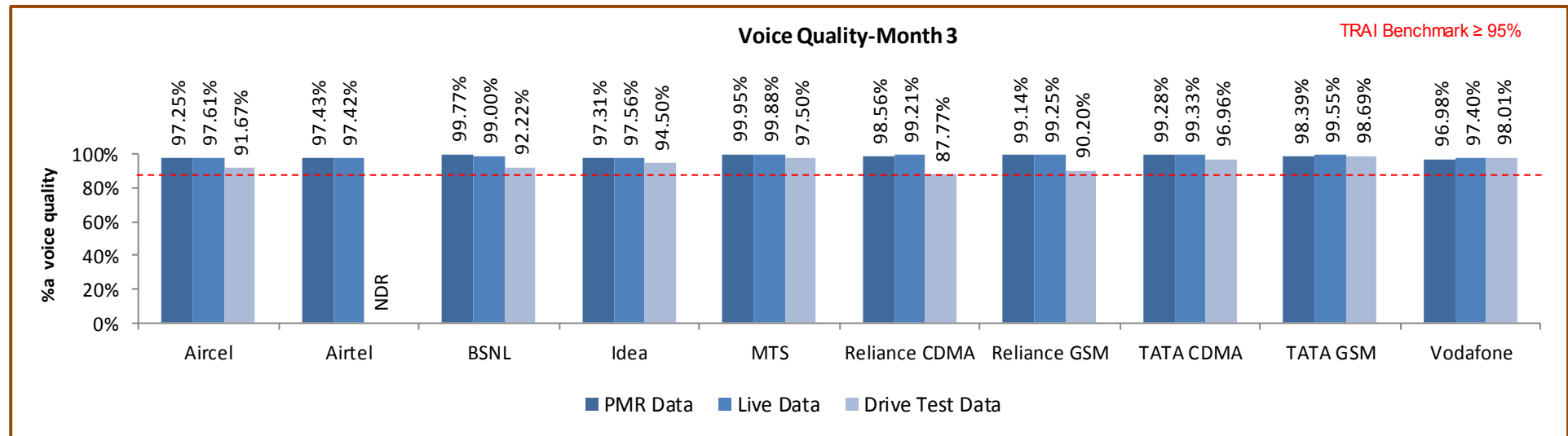


## 5.7.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 5.7.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 6 PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 3G

### 6.1 NODE BS DOWNTIME

#### 6.1.1 PARAMETER DESCRIPTION

- The parameter of network availability would be measured from following sub-parameters

1. Node Bs downtime (not available for service)

2. Worst affected Node Bs due to downtime

- **Definition - Node Bs downtime (not available for service):** In the case of 3G networks, instead of BTS the nomenclature is Node B. The measurement methodology for the parameter Node B Accumulated downtime (not available for service) will be similar to the existing parameter for BTSs Accumulated downtime (not available for service).

- **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

- **Source of Data:** Network Operation Center (NOC) or a Central Server

- **Computation Methodology** –

**Node Bs downtime (not available for service) = Sum of downtime of Node Bs in a month in hours i.e. total outage time of all Node Bs in hours during a month / (24 x Number of days in a month x Number of Node Bs in the network in licensed service area) x 100**

3. TRAI Benchmark –

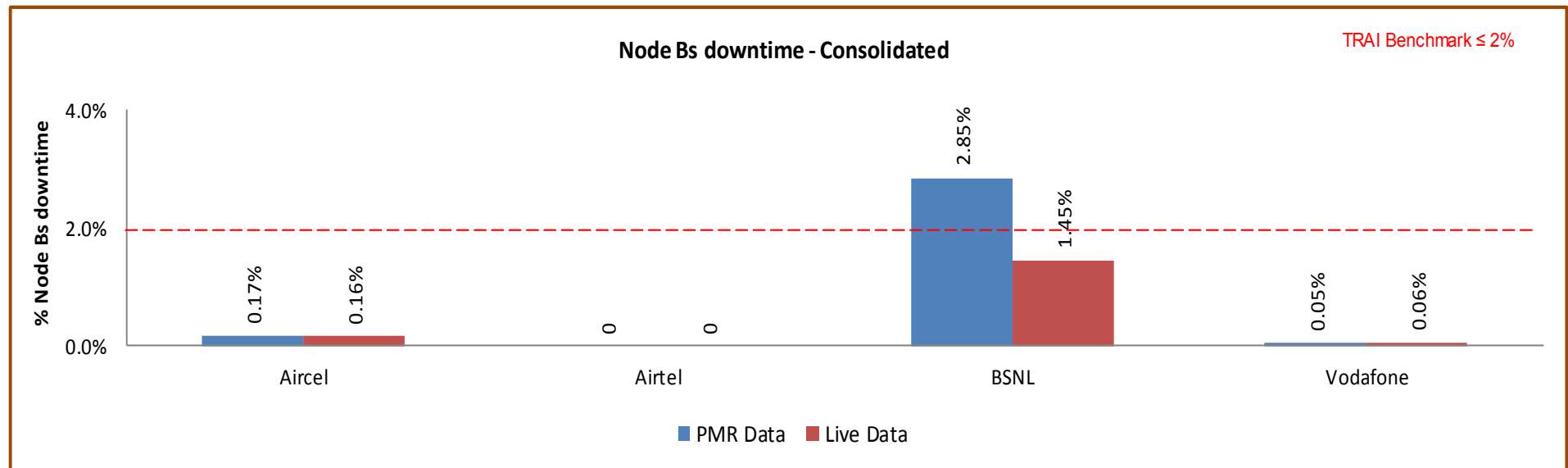
- a. Node Bs downtime (not available for service)  $\leq 2\%$

4. Audit Procedure –

- The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

- All the Node Bs in service area was considered. Planned outages due to network up gradation, routine maintenance were not considered.
- Any outage as a result of force majeure were not considered at the time of calculation
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- List of operating sites with cell details and ids are taken from the operator.
  - When there is any outage a performance report gets generated in line with that cell resulting and master base of the Node Bs downtime and worst affected Node Bs due to downtime.

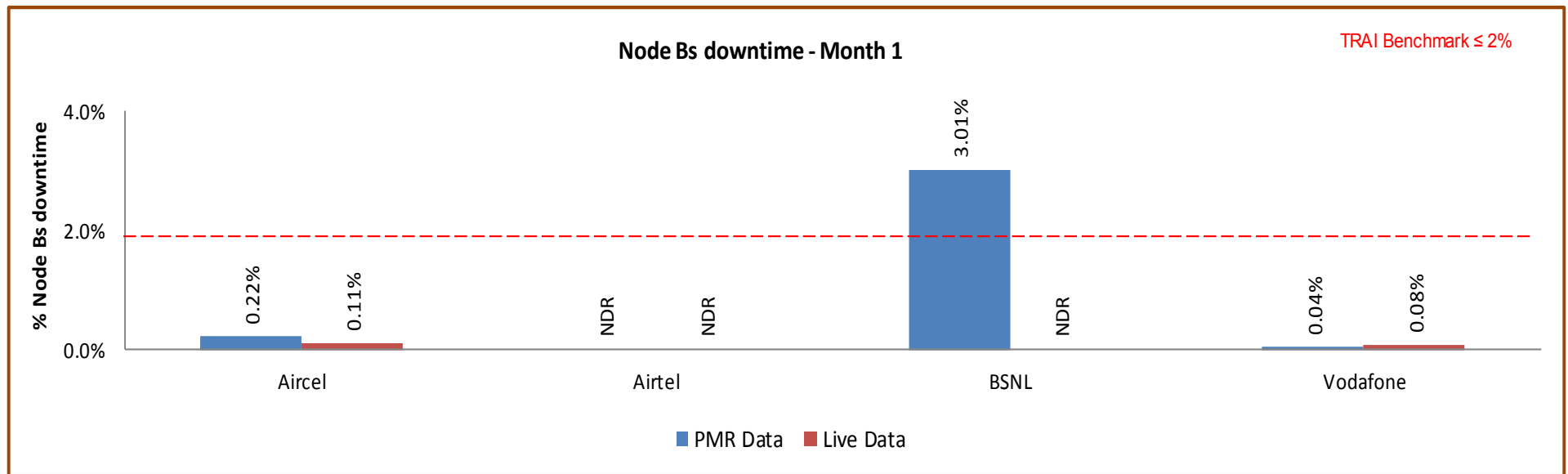
## 6.1.2 KEY FINDINGS - CONSOLIDATED



Data Source: Operations and Maintenance Center (OMC) of the operators

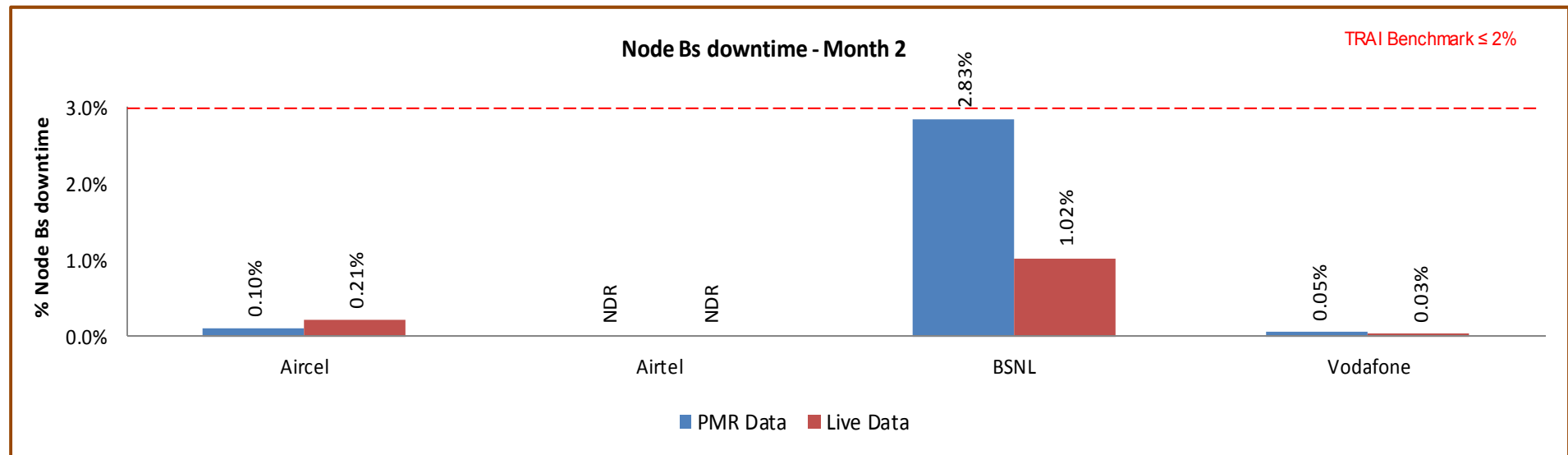
BSNL failed to meet the benchmark for Node Bs down time in PMR audit data, rest of the operators are meeting the benchmark.

## 6.1.2.1 KEY FINDINGS – MONTH 1



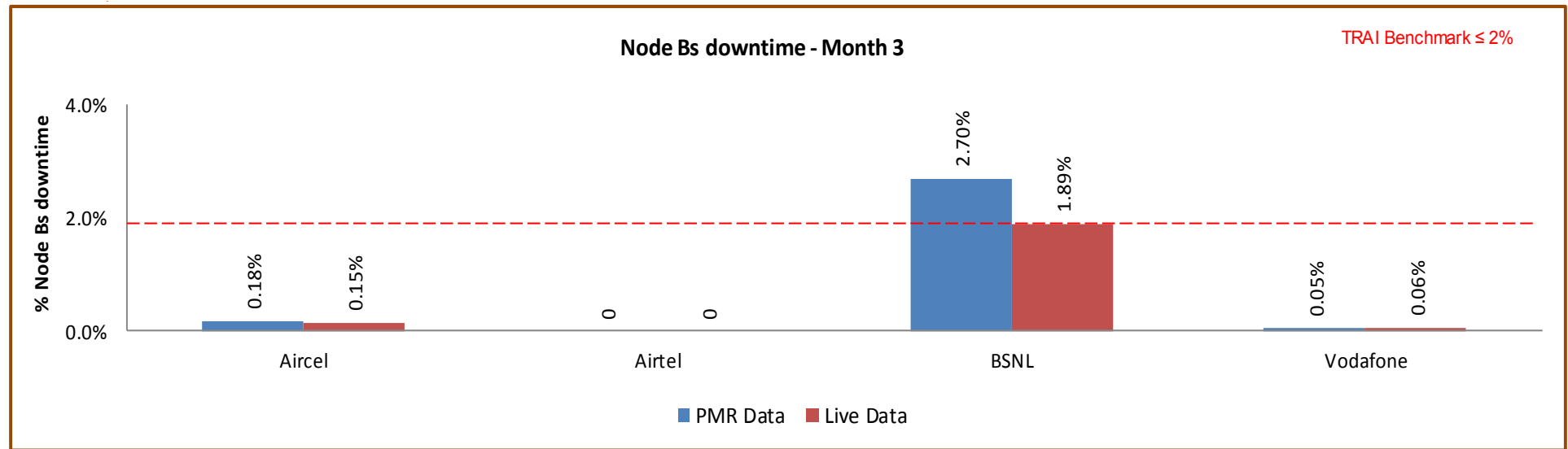
Data Source: Operations and Maintenance Center (OMC) of the operators

## 6.1.2.2 KEY FINDINGS – MONTH 2



Data Source: Operations and Maintenance Center (OMC) of the operators

## 6.1.2.3 KEY FINDINGS – MONTH 3



Data Source: Operations and Maintenance Center (OMC) of the operators

## 6.2 WORST AFFECTED NODE BS DUE TO DOWNTIME

### 6.2.1 PARAMETER DESCRIPTION

- **Definition – Worst Affected Node Bs due to downtime** shall basically measure percentage of Node Bs having downtime greater than 24 hours in a month. Planned outages were not considered as part while computing.

For measuring the parameter “Percentage of worst affected Node Bs due to downtime” the downtime of each Node B lasting for more than 1 hour at a time in a day during the period of a month was considered.

- **Computation Methodology –**

**Worst affected Node Bs due to downtime = (Number of Node Bs having accumulated downtime greater than 24 hours in a month / Number of Node Bs in Licensed Service Area) \* 100**

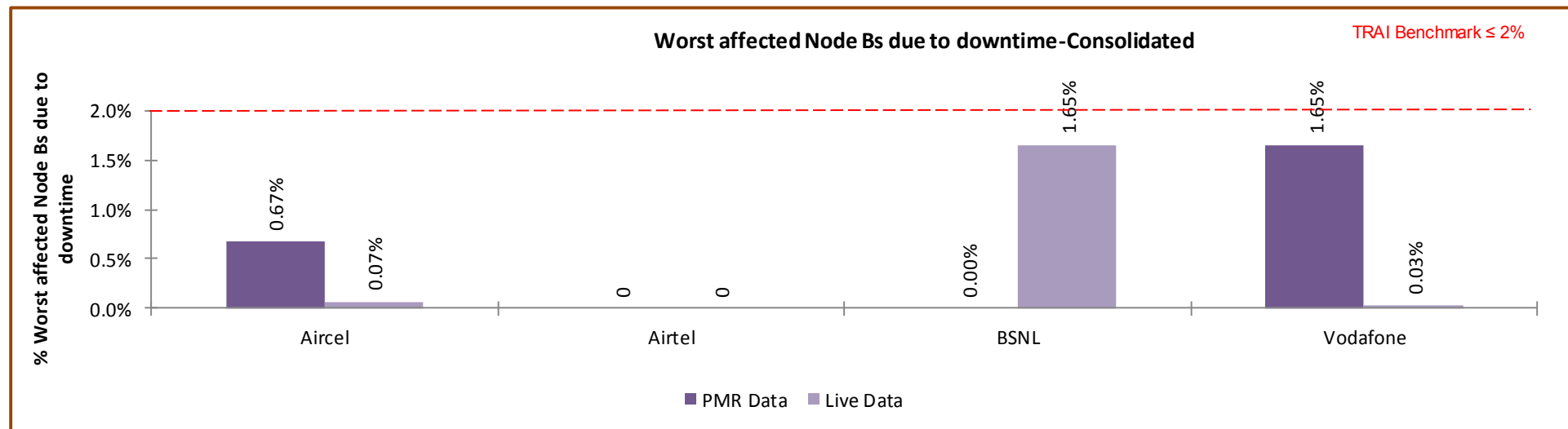
- **TRAI Benchmark –**

b. Worst affected Node Bss due to downtime  $\leq 2\%$

- **Audit Procedure –**

- The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited
- All the Node Bs in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- Any outage as a result of force majeure was not considered at the time of calculation.
- List of operating sites with cell details and ids are taken from the operator.
- All the Node Bs having down time greater than 24 hours is assessed and values of Node Bs accumulated downtime is computed in accordance.

## 6.2.2 KEY FINDINGS – CONSOLIDATED

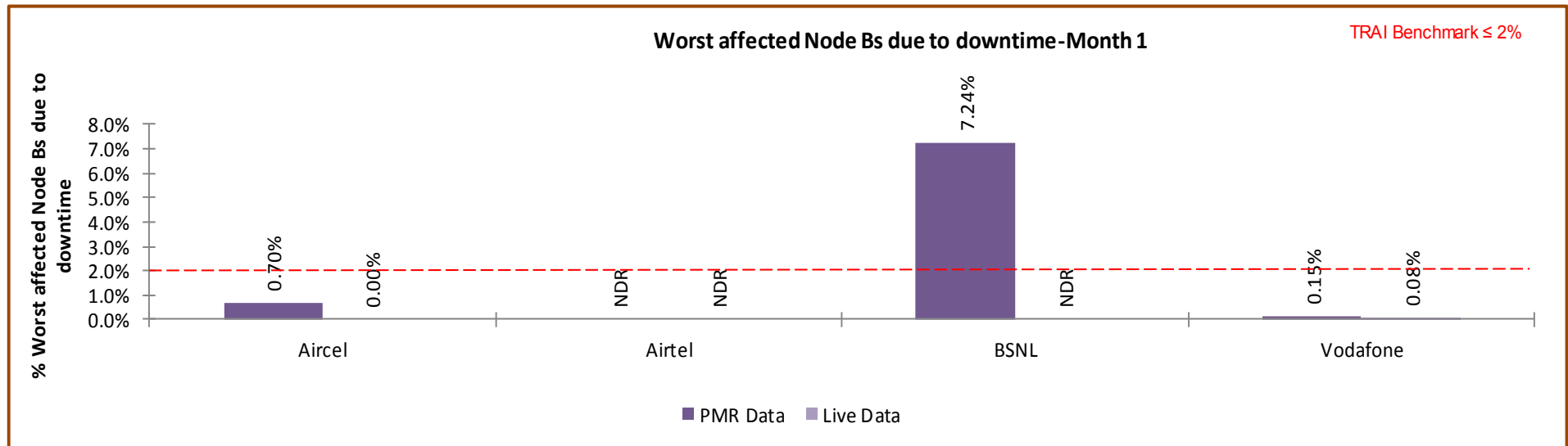


Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

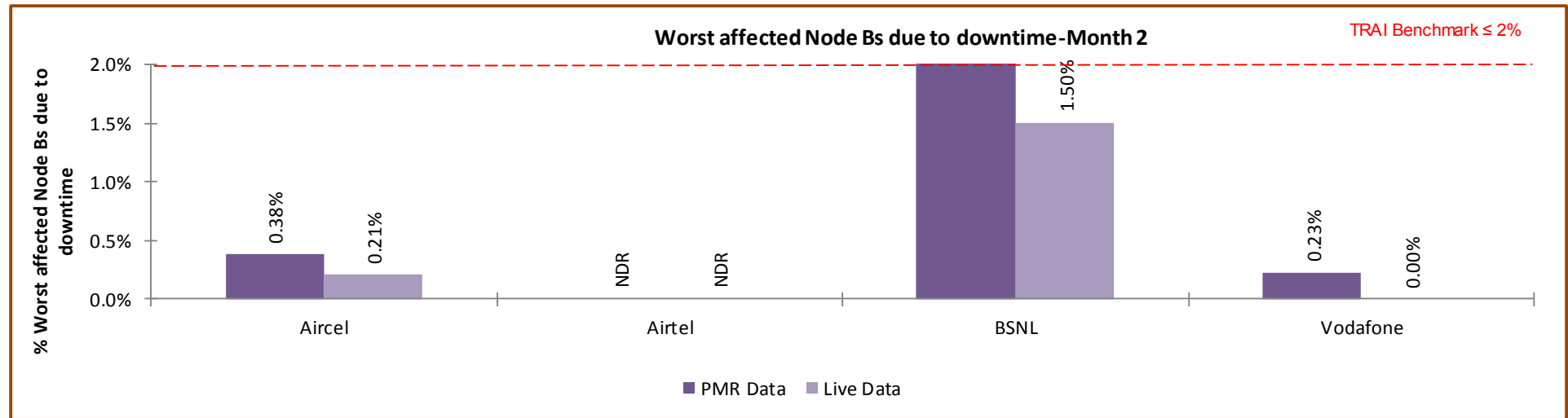
Significant difference was observed between PMR & live measurement data for Aircel, Vodafone and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

## 6.2.2.1 KEY FINDINGS – MONTH 1



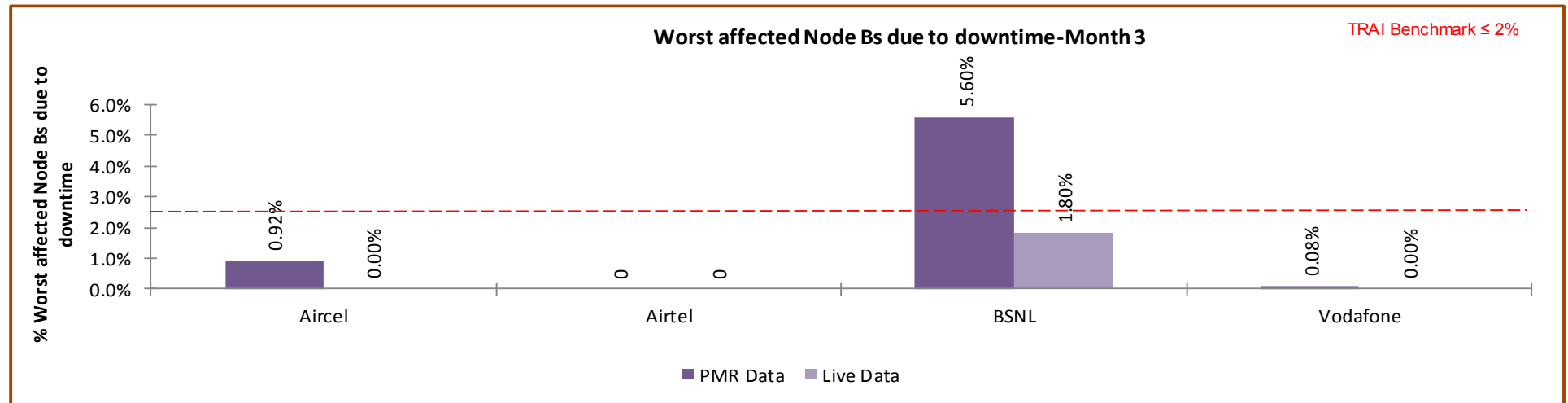
Data Source: Operations and Maintenance Center (OMC) of the operators

## 6.2.2.2 KEY FINDINGS – MONTH 2



Data Source: Operations and Maintenance Center (OMC) of the operators

## 6.2.2.3 KEY FINDINGS – MONTH 3



Data Source: Operations and Maintenance Center (OMC) of the operators

## 6.3 CALL SET UP SUCCESS RATE

### 6.3.1 PARAMETER DESCRIPTION

1. **Definition:** This parameter is same for 2G Networks as well as 3G Networks. However, the network elements involved in both the networks are different. Call Set-up Success Rate is defined as the ratio of Established Calls to Call Attempts. For establishing a call in 3G Networks, User Equipment (UE) accesses the Universal Terrestrial Radio Access Network (UTRAN) and establishes an RRC connection. Once RRC connection is established the Non Access Stratum (NAS) messages are exchanged between the UE and the Core Network (CN). The last step of the call setup is the establishment of a Radio Access Bearer (RAB) between the CN and the UE. However, any RAB abnormal release after RAB Assignment Response or Alerting/Connect message is to be considered as a dropped call.
2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

4. **Computation Methodology-**  

$$\text{(RRC Established / Total RRC Attempts)} * 100$$

RRC Established means the following events have happened in RRC setup:-

- ↳ RRC attempt is made
- ↳ The RRC established
- ↳ The RRC is routed to the outward path of the concerned MSC

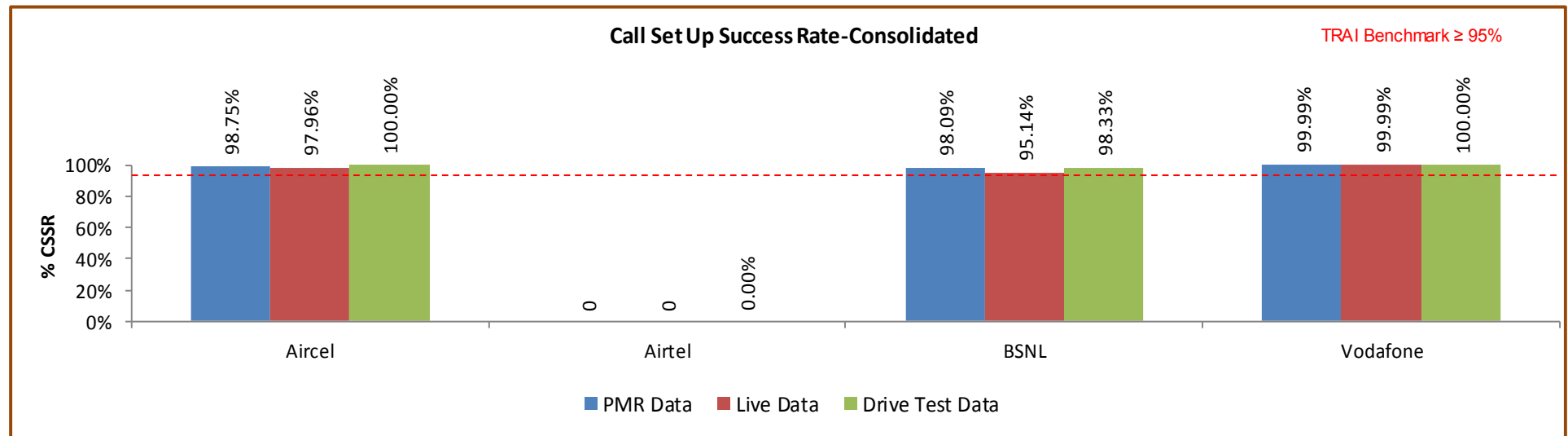
5. **TRAI Benchmark**  $\geq 95\%$

6. **Audit Procedure –**

- ➡ The cell-wise data generated through counters/ MMC available in the switch for traffic measurements

- CSSR calculation should be measured using OMC generated data only
- Measurement should be only in Time Consistent Busy Hour (CBBH) period for all days of the week
- Counter data is extracted from the NOC of the operators.
- Total calls established include all calls established excluding RAB congestion.
  - ↳ The numerator and denominator values are derived from adding the counter values from the MSC.

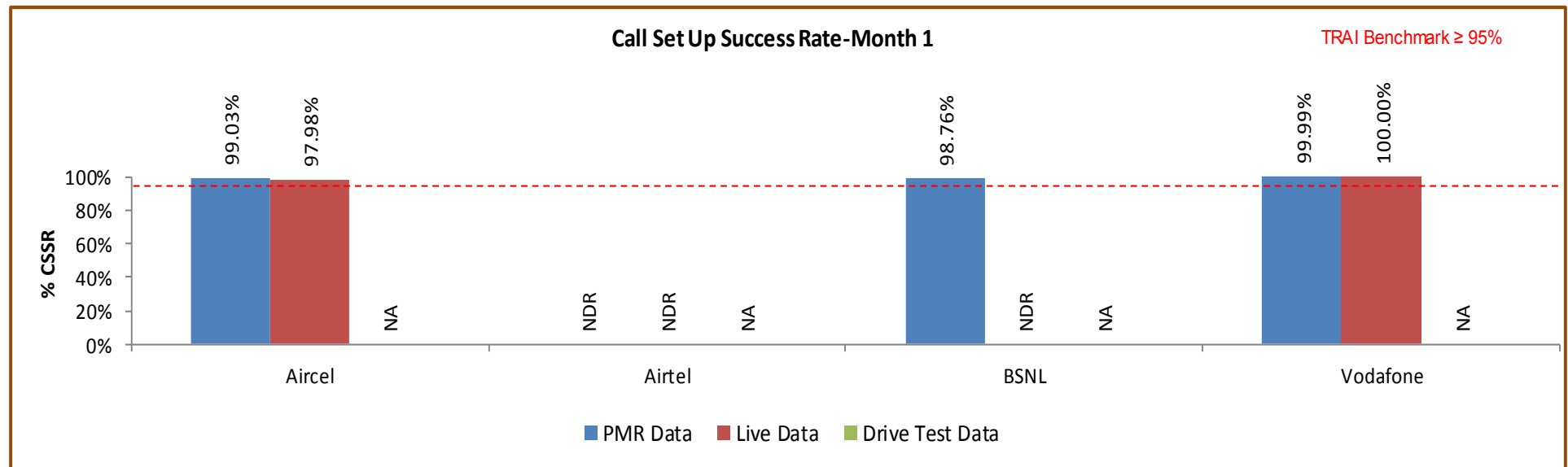
## 6.3.2 KEY FINDINGS - CONSOLIDATED



Data Source: Network Operations Center (NOC) of the operators

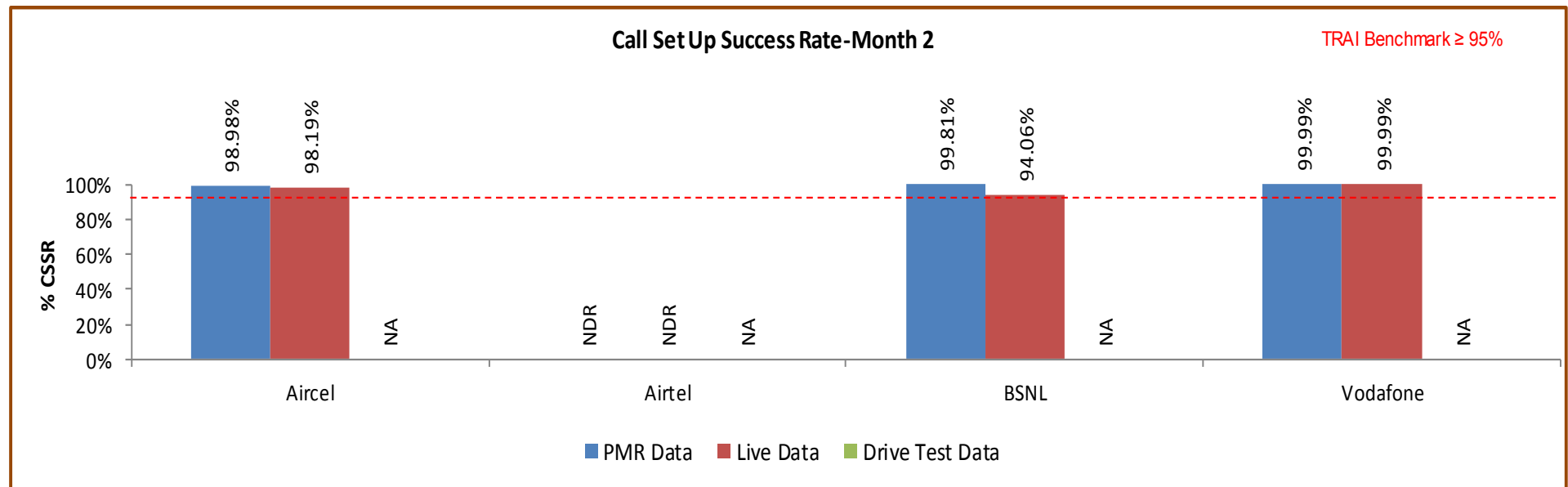
All operators met the TRAI benchmark as per audit/PMR data.

## 6.3.2.1 KEY FINDINGS – MONTH 1



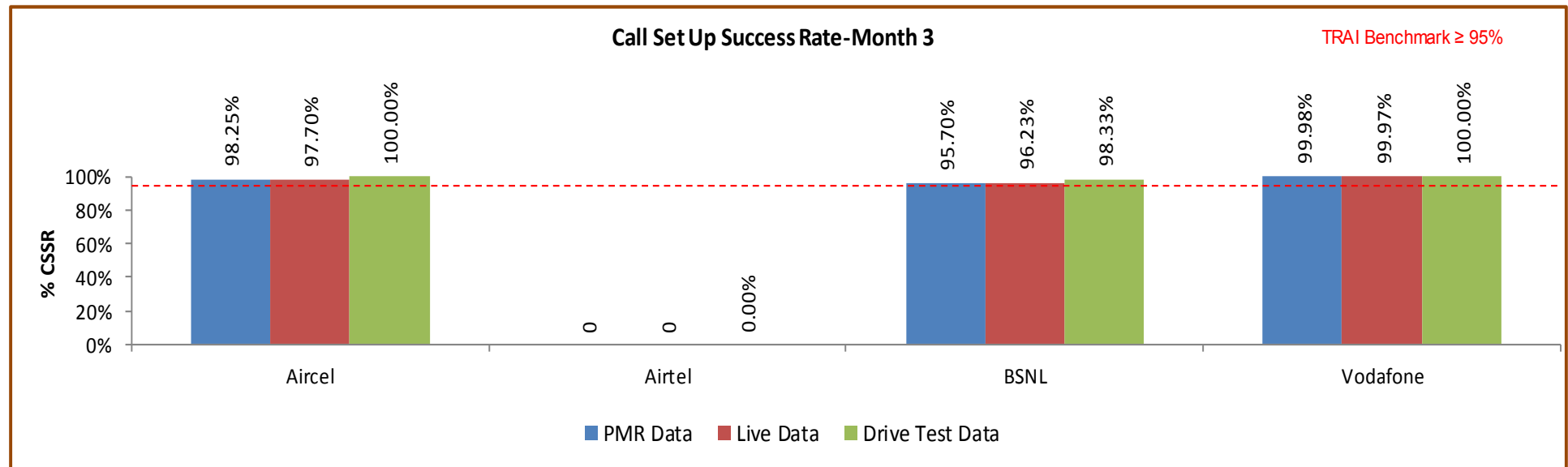
Data Source: Network Operations Center (NOC) of the operators

## 6.3.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 6.3.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 6.4 NETWORK CHANNEL CONGESTION- RRC CONGESTION/ CIRCUIT SWITCHED RAB CONGESTION

### 6.4.1 PARAMETER DESCRIPTION

1. **Definition (RRC Congestion):** This parameter has been amended to include RRC Congestion in 3G Networks.
2. **Definition (Circuit Switched RAB congestion):** Circuit Switched RAB congestion is similar to Traffic Channel Congestion. Therefore, the existing parameter has been amended to include RAB congestion in 3G Networks.
3. **Point of Interconnection (POI) Congestion:** This parameter denotes congestion at the outgoing traffic between two networks and is equally applicable for 2G networks and 3G networks.

↗ RRC Level: Stand-alone dedicated control channel

↗ RAB Level: Traffic Channel

↗ POI Level: Point of Interconnect

4. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
5. **Source of Data:** Network Operation Center (NOC) or a Central Server
6. **Computational Methodology:**

$$\text{RRC / RAB Congestion\%} = [(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$$

- Where:- $A_1$  = Number of attempts to establish RRC / RAB made on day 1
- $C_1$  = Average RRC / RAB Congestion % on day 1
- $A_2$  = Number of attempts to establish RRC / RAB made on day 2
- $C_2$  = Average RRC / RAB Congestion % on day 2
- $A_n$  = Number of attempts to establish RRC / RAB made on day n
- $C_n$  = Average RRC / RAB Congestion % on day n

$$\Rightarrow \text{POI Congestion\%} = [(A_1 \times C_1) + (A_2 \times C_2) + \dots + (A_n \times C_n)] / (A_1 + A_2 + \dots + A_n)$$

- Where:-A<sub>1</sub> = POI traffic offered on all POIs (no. of calls) on day 1
- C<sub>1</sub> = Average POI Congestion % on day 1
- A<sub>2</sub> = POI traffic offered on all POIs (no. of calls) on day 2
- C<sub>2</sub> = Average POI Congestion % on day 2
- A<sub>n</sub> = POI traffic offered on all POIs (no. of calls) on day n
- C<sub>n</sub> = Average POI Congestion % on day n

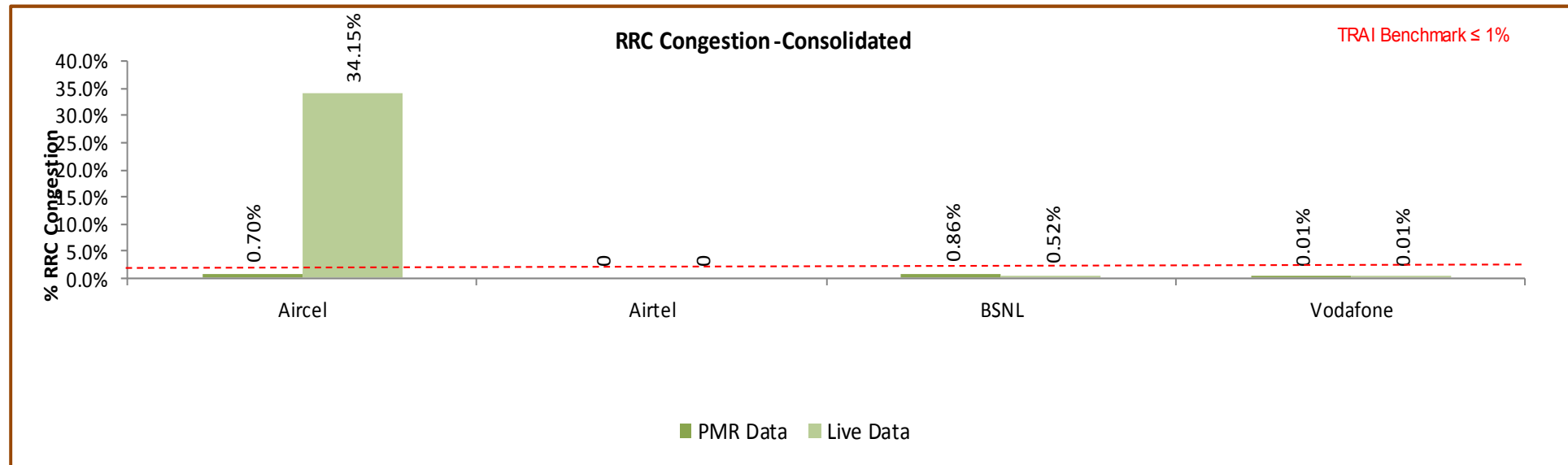
## 7. Benchmark:

$$\Rightarrow \text{RRC Congestion: } \leq 1\%, \text{ RAB Congestion: } \leq 2\%, \text{ POI Congestion: } \leq 0.5\%$$

## 8. Audit Procedure –

- ➔ Audit of the details of RRC and RAB congestion percentages computed by the operator (using OMC-Switch data only) would be conducted
- ➔ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only RRC

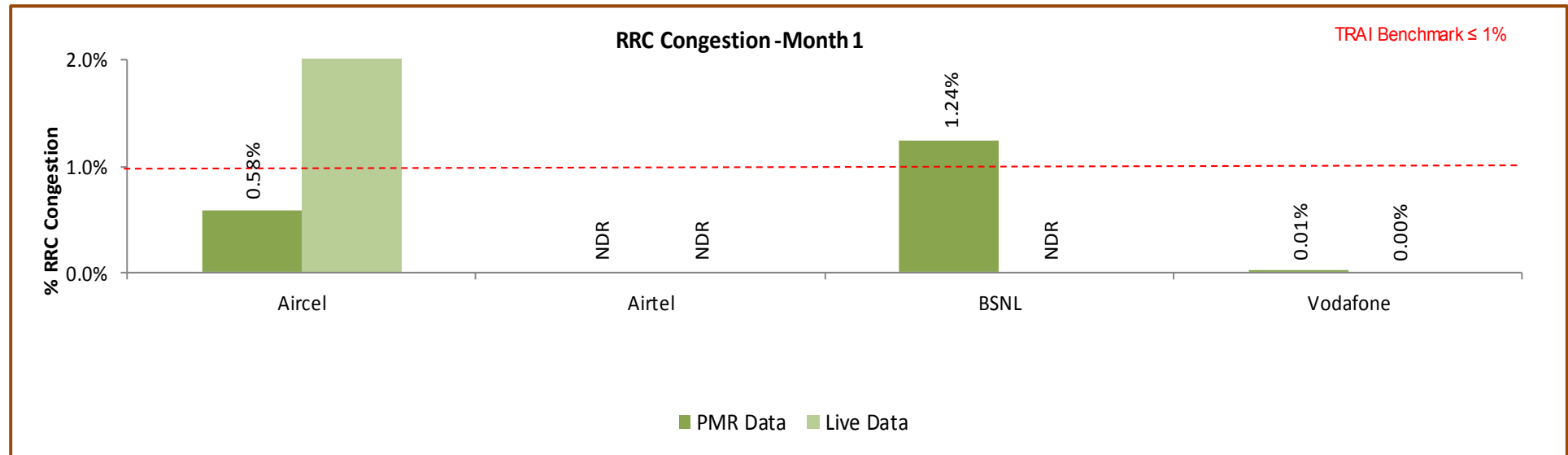
## 6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



Data Source: Network Operations Center (NOC) of the operators

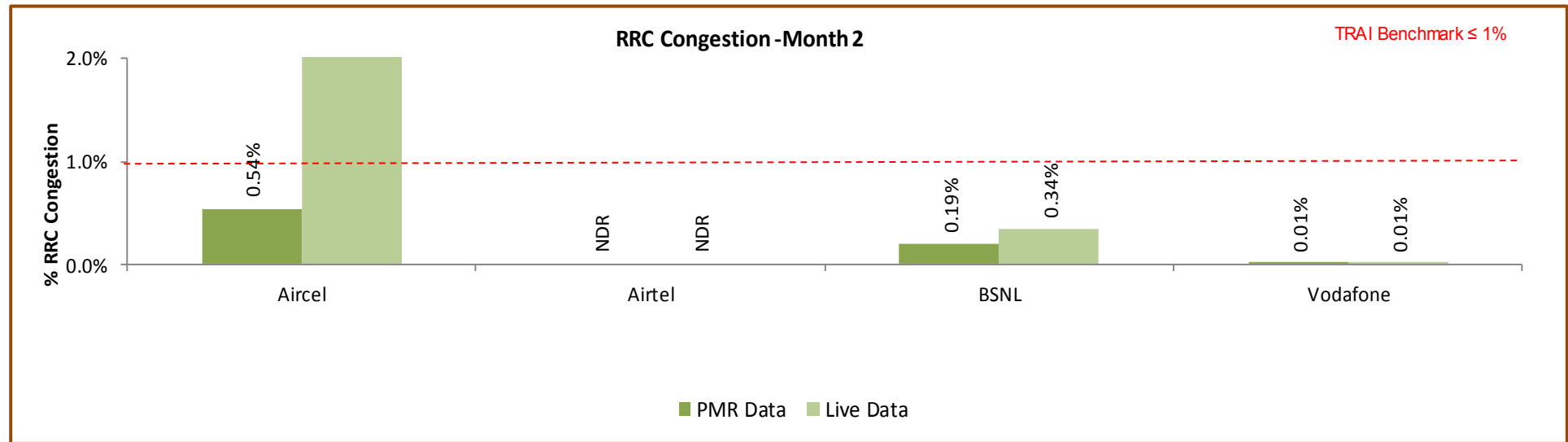
Airtel for 3days live and BSNL for PMR failed to meet the benchmark for RRC Congestion.

## 6.4.2.1 KEY FINDINGS – MONTH 1



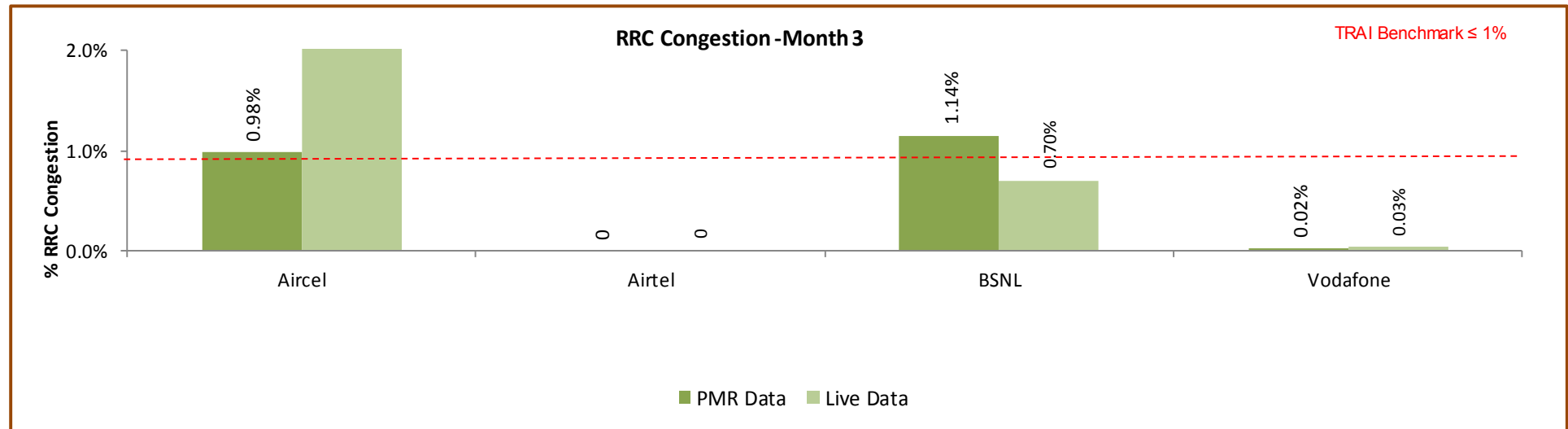
Data Source: Network Operations Center (NOC) of the operators

## 6.4.2.2 KEY FINDINGS – MONTH 2



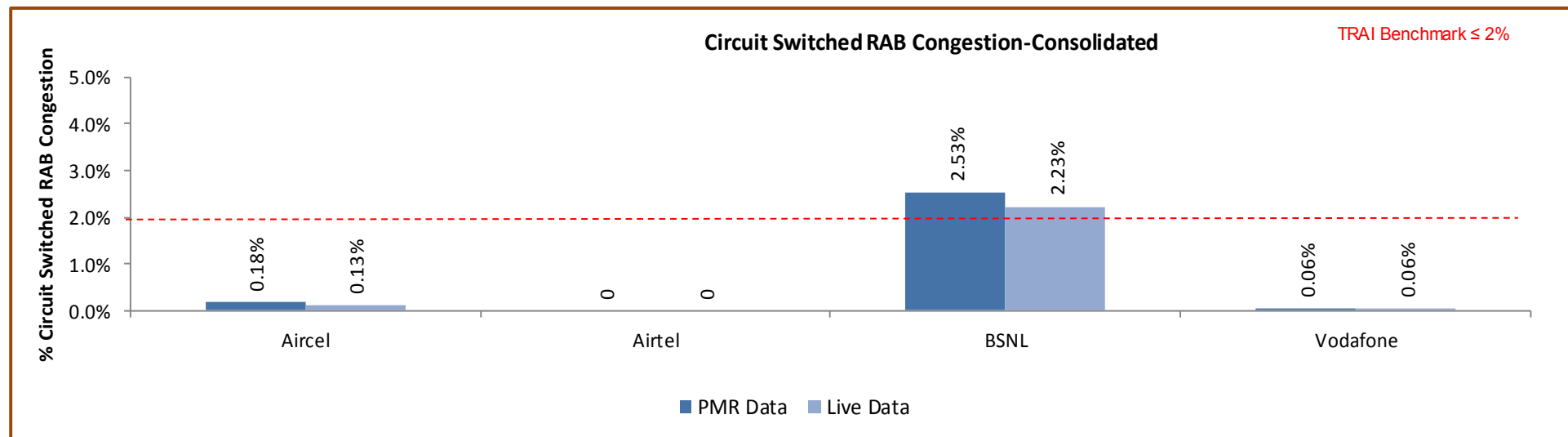
Data Source: Network Operations Center (NOC) of the operators

## 6.4.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

### 6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)

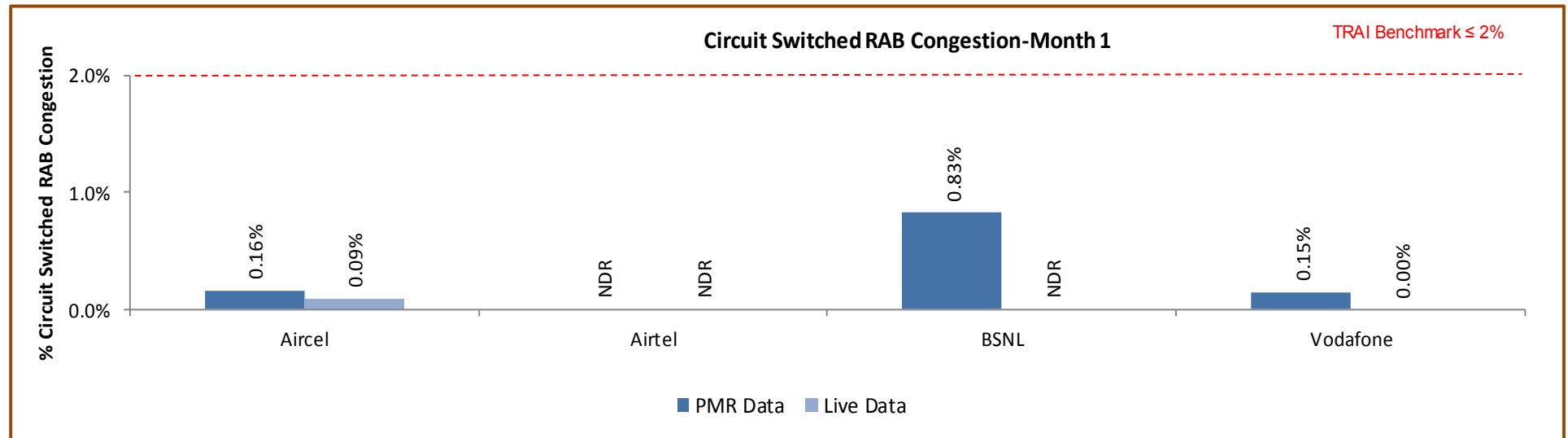


Data Source: Network Operations Center (NOC) of the operators

BSNL failed to meet the benchmark as per audit/PMR & 3days live report.

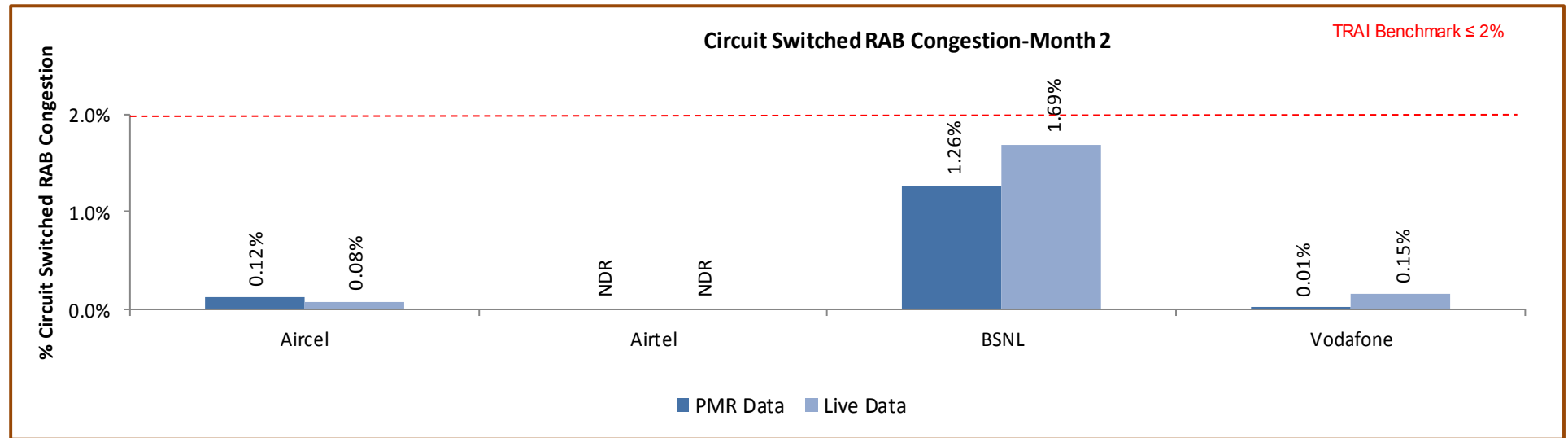
Significant difference was observed between PMR & live measurement data for BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

## 6.4.3.1 KEY FINDINGS – MONTH 1



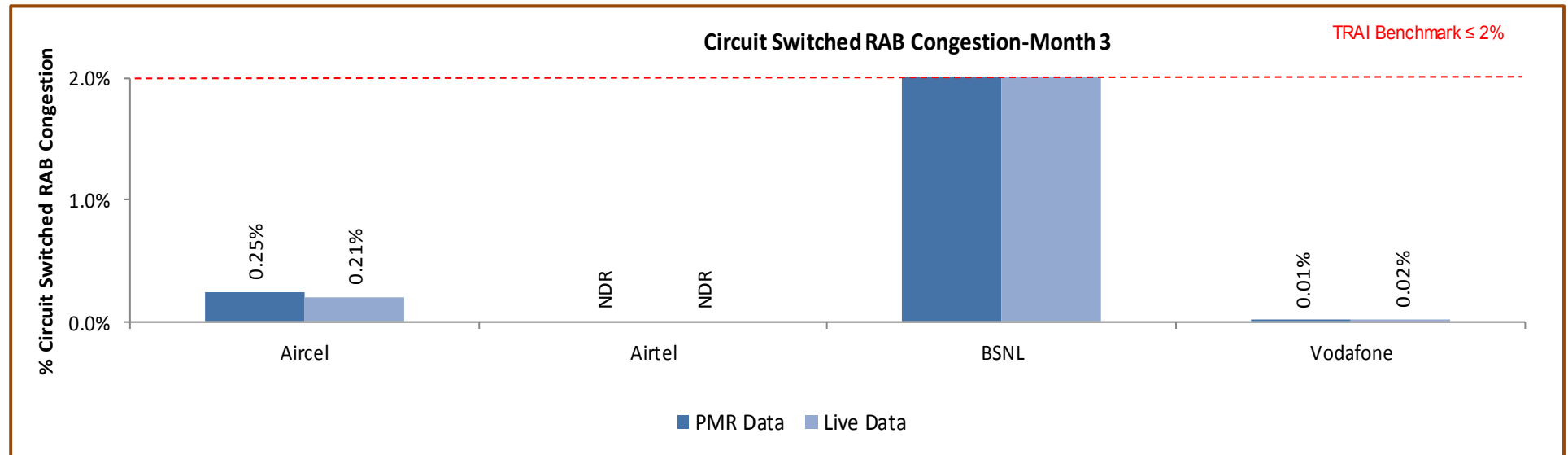
Data Source: Network Operations Center (NOC) of the operators

## 6.4.3.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 6.4.3.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 6.5 CIRCUIT SWITCHED VOICE DROP RATE

### 6.5.1 PARAMETER DESCRIPTION

1. **Definition** - The Call Drop Rate measures the inability of Network to maintain a call and is defined as the ratio of abnormal speech disconnects with respect to all speech disconnects (both normal and abnormal). In 3G Networks, a normal disconnect is initiated from the Mobile Switching Centre (MSC) at completion of the call by a RAB Disconnect message. An abnormal RAB disconnect can be initiated by either UTRAN or CN and includes Radio Link Failures, Uplink (UL) or Downlink (DL) interference or any other reason.

✎ **Total No. of voice RAB abnormally released** = All calls ceasing unnaturally i.e. due to handover or due to radio loss

✎ **No. of voice RAB normally released** = All calls that have RAB allocation during busy hour

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
3. **Source of Data:** Network Operation Center (NOC) or a Central Server
4. **Computational Methodology:**  $(\text{No. of voice RAB normally released} / (\text{No. of voice RAB normally released} + \text{RAB abnormally released}) \times 100$

Key Performance Indicator Term	Definition
#RAB Normal Release(CSV)	Number of voice RAB normally Released
#RAB Abnormal Release(CSV)	Number of voice RAB abnormally Released

5. **TRAI Benchmark** –

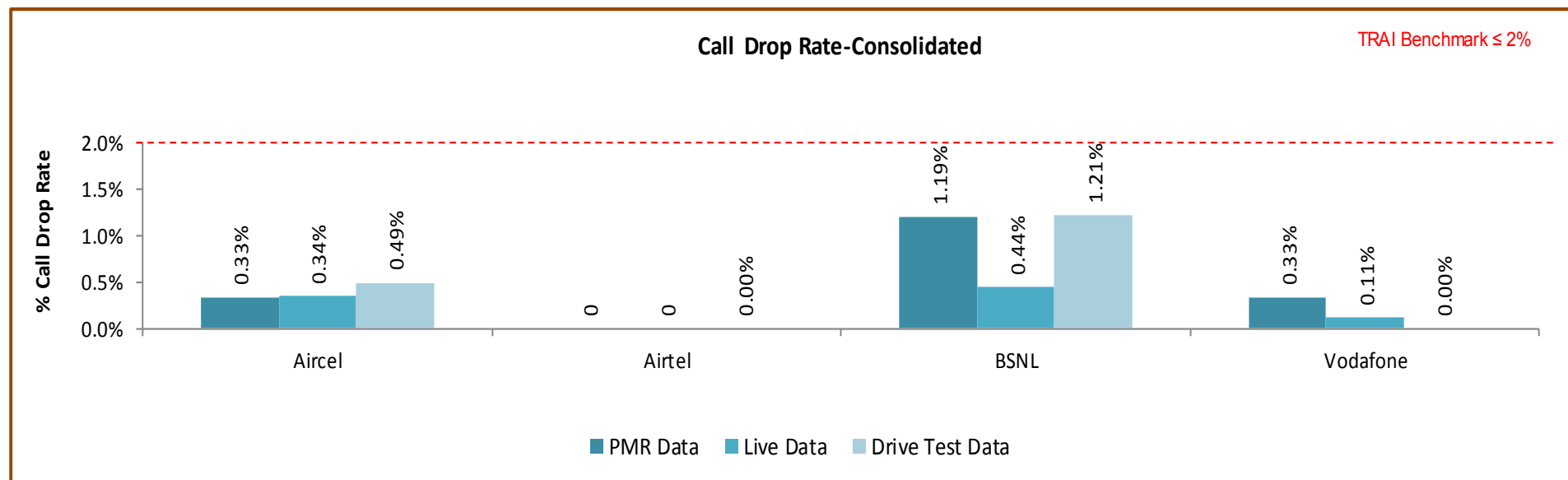
✎ Circuit switched voice drop rate  $\leq 2\%$

6. **Audit Procedure** –

➡ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was used

✎ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter.

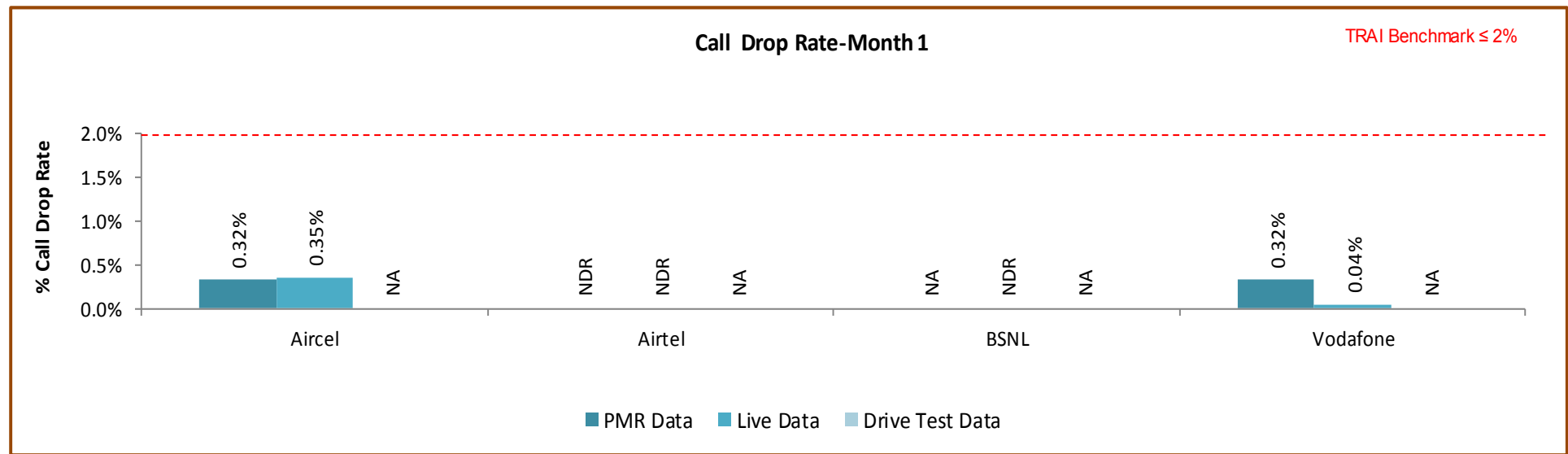
## 6.5.2 KEY FINDINGS - CONSOLIDATED



Data Source: Network Operations Center (NOC) of the operators

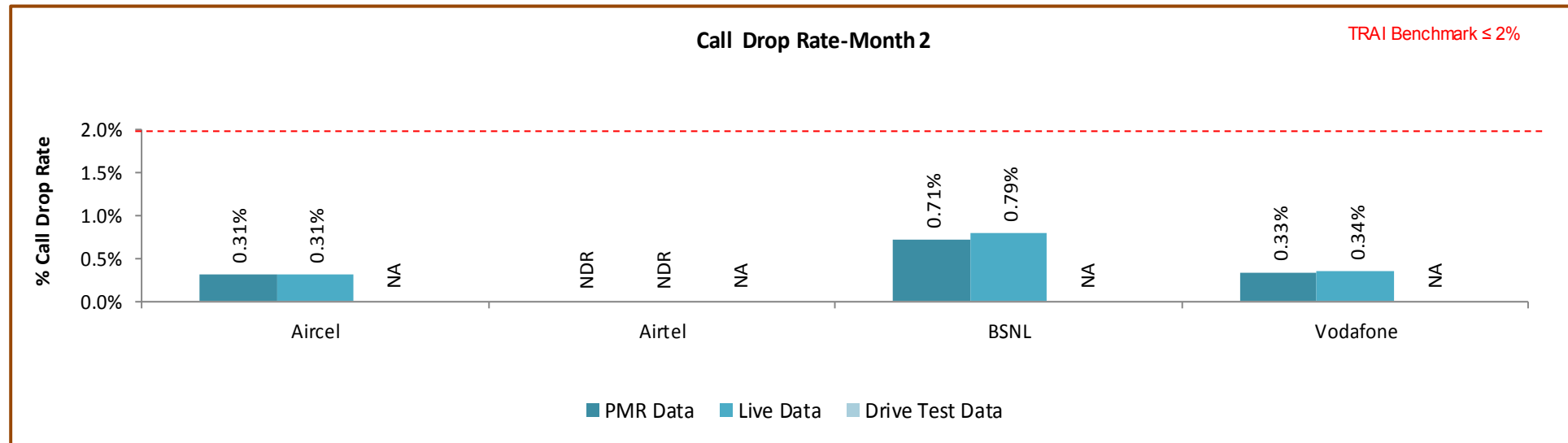
All operators met the benchmark for call drop rate during audit. The call drop rate during drive test was observed to be higher than audit for BSNL.

## 6.5.2.1 KEY FINDINGS – MONTH 1



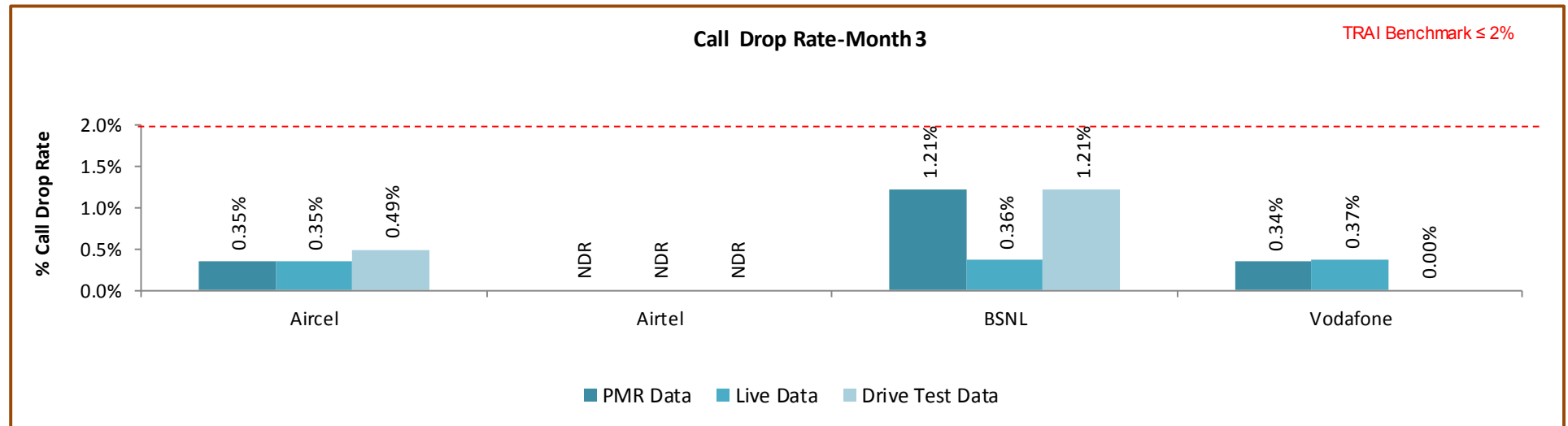
Data Source: Network Operations Center (NOC) of the operators

## 6.5.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 6.5.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

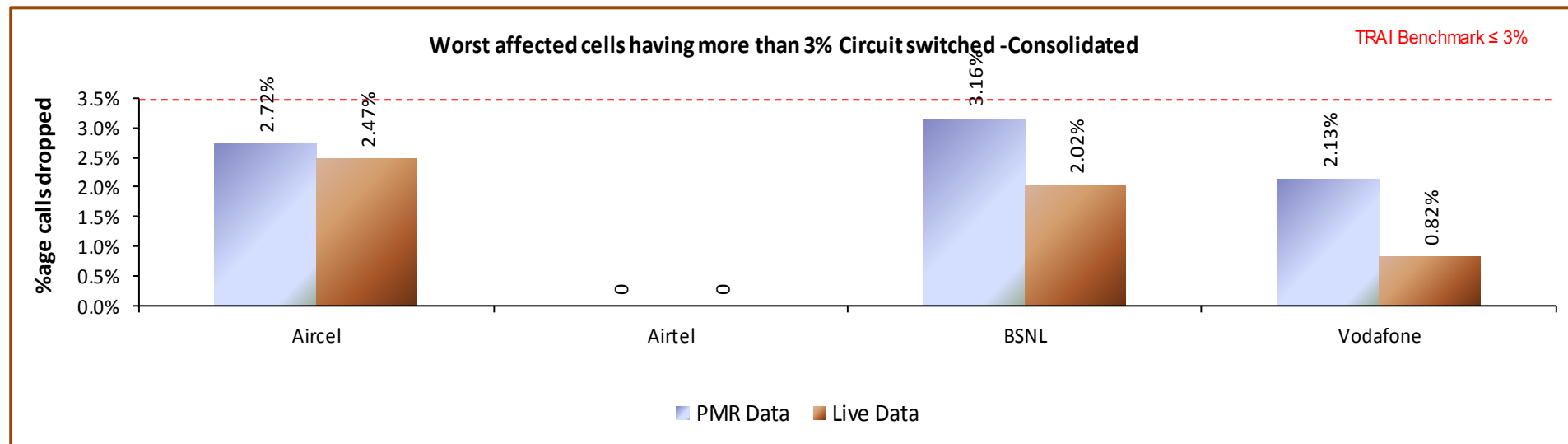
## 6.6 WORST AFFECTED CELLS HAVING MORE THAN 3% CIRCUIT SWITCHED VOICE DROP RATE

### 6.6.1 PARAMETER DESCRIPTION

1. **Definition- Cells having more than 3% circuit switch voice quality:** The existing parameter has been amended to cover 3G Networks to assess worst affected cells having more than 3% CSV Drop Rate.
2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
3. **Source of Data:** Network Operation Center (NOC) or a Central Server
4. **Computational Methodology:** 
$$\frac{\text{Number of cells having CSV drop rate} > 3\% \text{ during CBBH in a month}}{\text{Total number of cells in the licensed area}} \times 100$$
5. **TRAI Benchmark** –
  - ↳ Worst affected cells having CSV drop rate  $> 3\%$  during CBBH in a month  $\leq 3\%$
6. **Audit Procedure** –
  - ➡ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR would be conducted.

The operator should only be considering those calls which are dropped during Cell Bouncing Busy hour (CBBH) for all days of the relevant quarter.

## 6.6.2 KEY FINDINGS - CONSOLIDATED

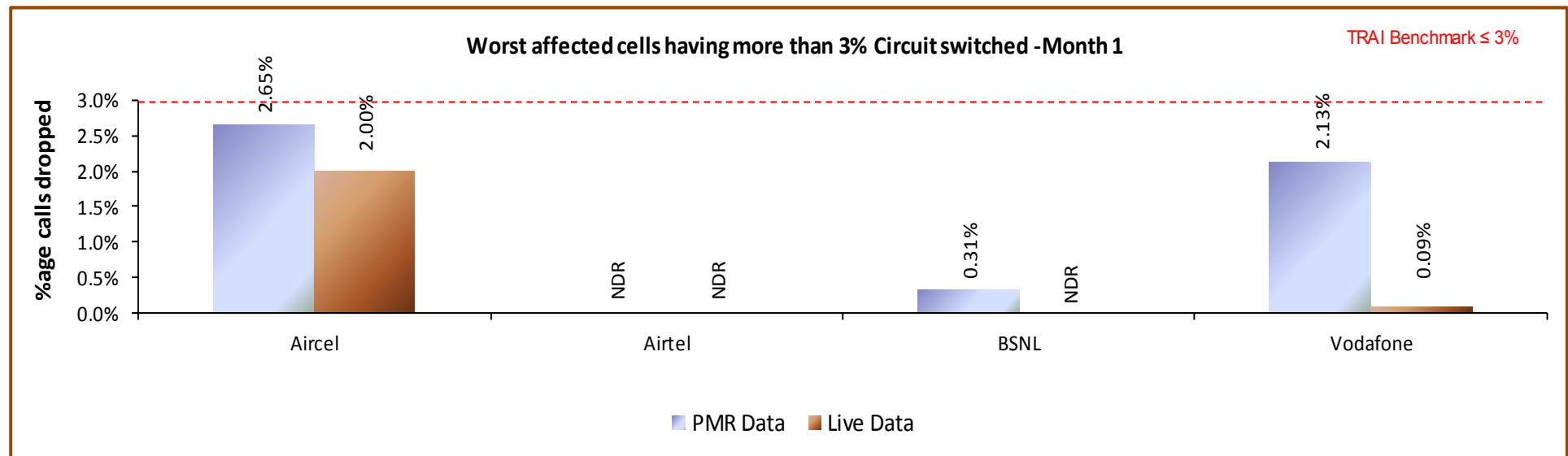


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark during audit.

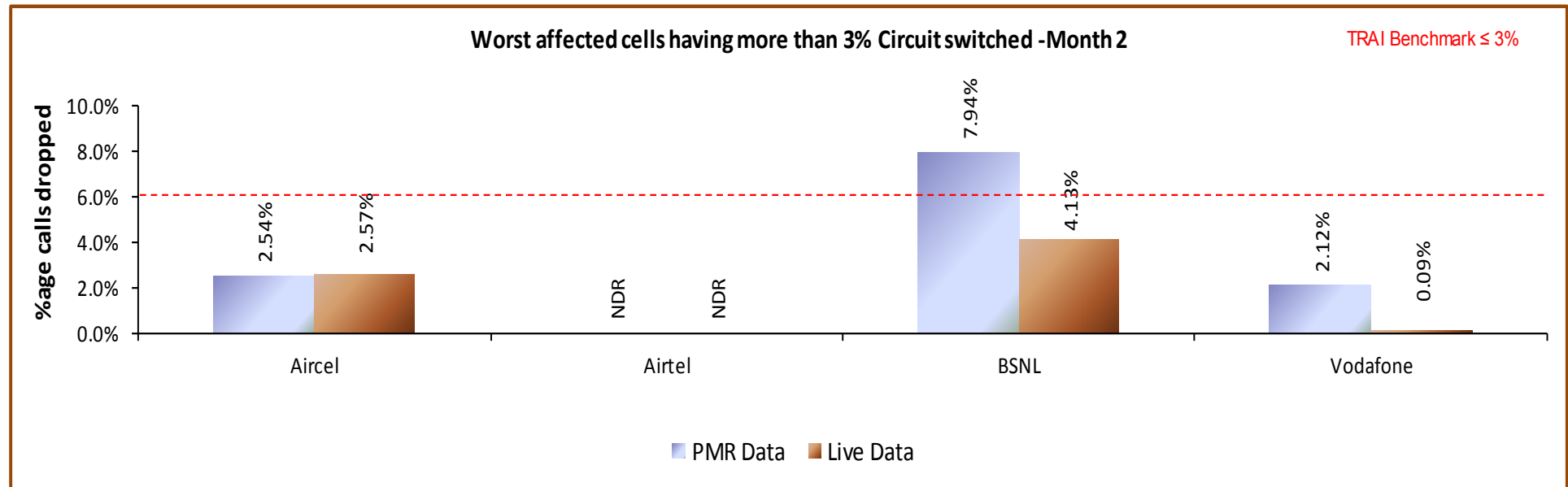
Significant difference was observed between PMR & live measurement data for Aircel, Vodafone and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

## 6.6.2.1 KEY FINDINGS – MONTH 1



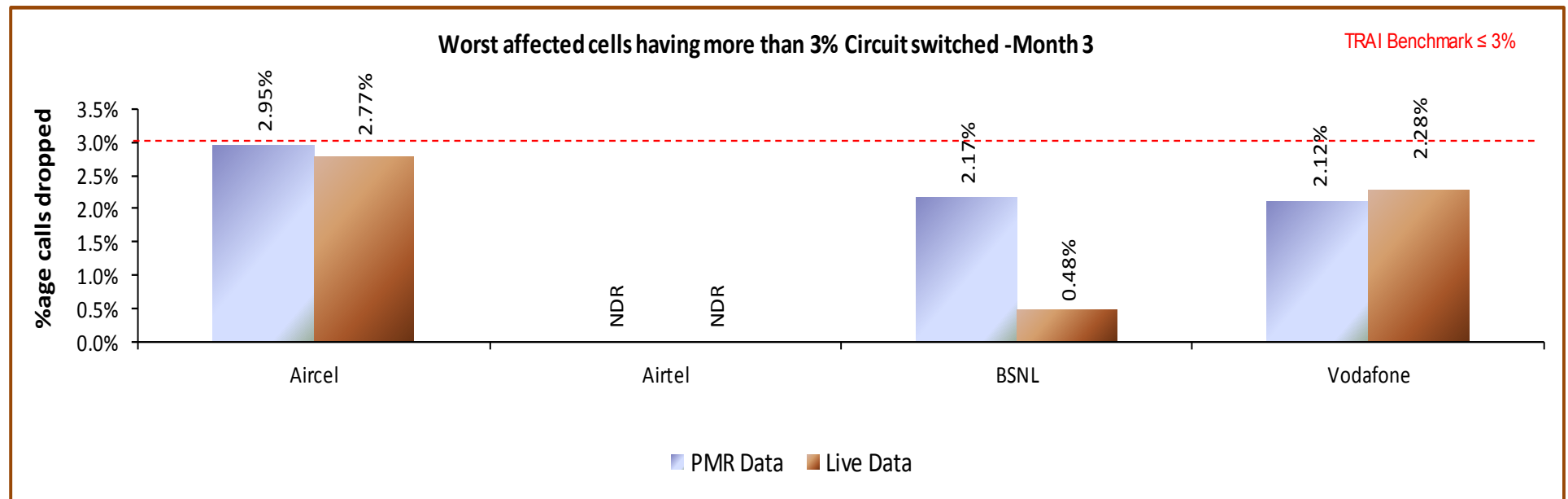
Data Source: Network Operations Center (NOC) of the operators

## 6.6.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 6.6.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 6.7 CIRCUIT SWITCH VOICE QUALITY

### 6.7.1 PARAMETER DESCRIPTION

#### 5. Definition:

- ↳ for GSM service providers the calls having a value of 0 – 5 are considered to be of good quality (on a seven point scale)
- ↳ For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when its FER value lies between 0 – 4 %

#### 6. Computational Methodology:

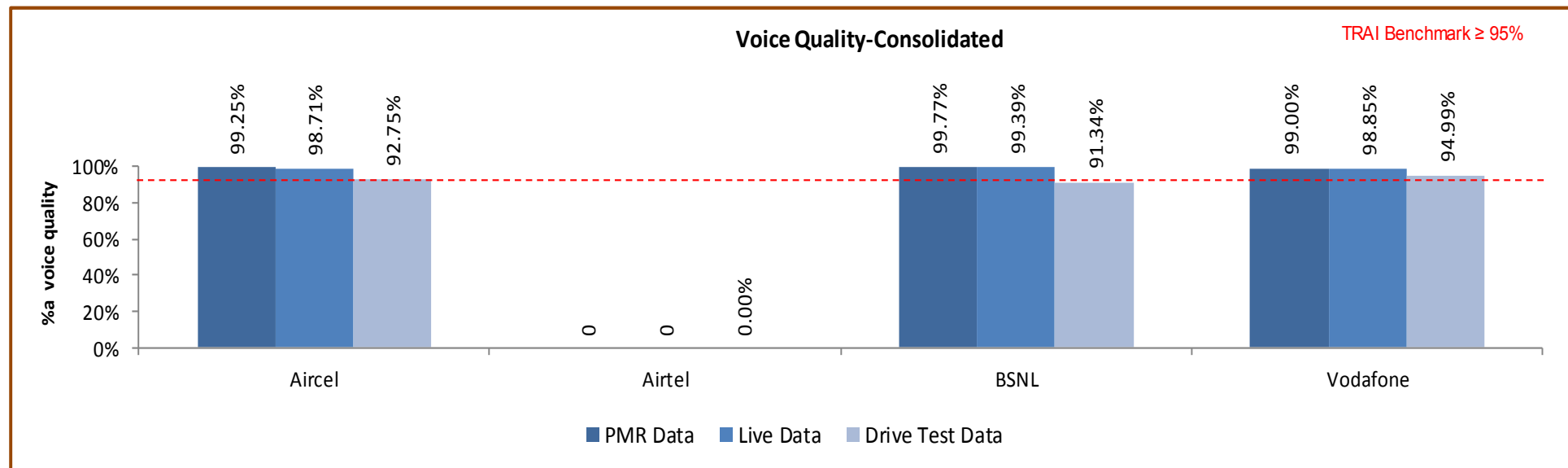
$$\text{\% Connections with good voice quality} = (\text{No. of voice samples with good voice quality} / \text{Total number of samples}) \times 100$$

#### 7. TRAI Benchmark: $\geq 95\%$

#### 8. Audit Procedure –

- a. A sample of calls would be taken randomly from the total calls established.
- b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

## 6.7.2 KEY FINDINGS

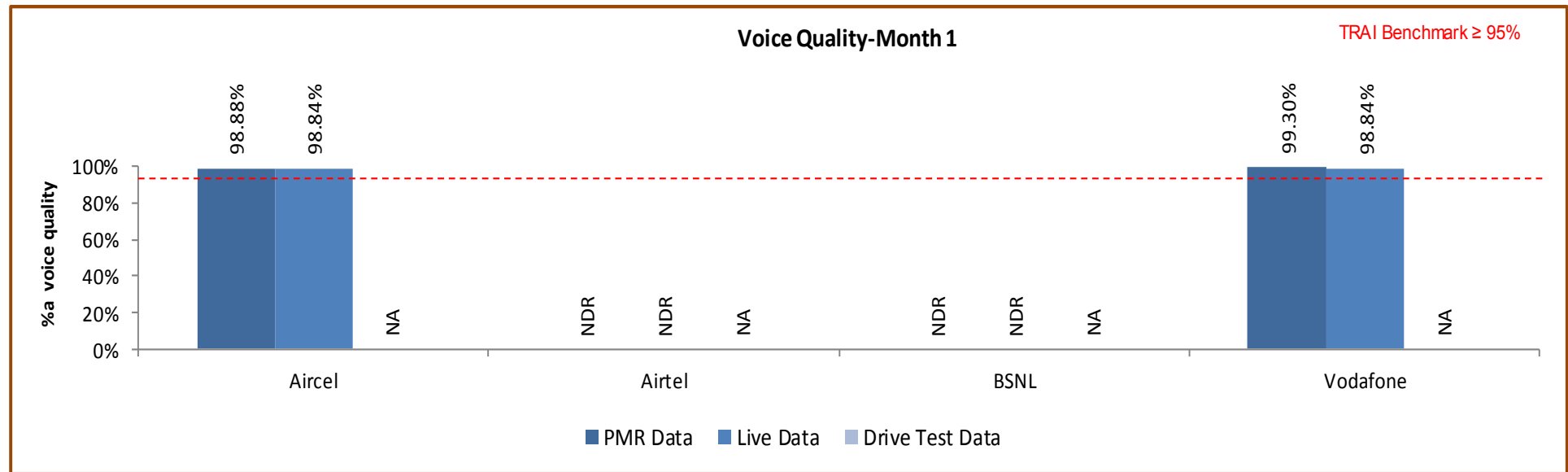


Data Source: Network Operations Center (NOC) of the operators

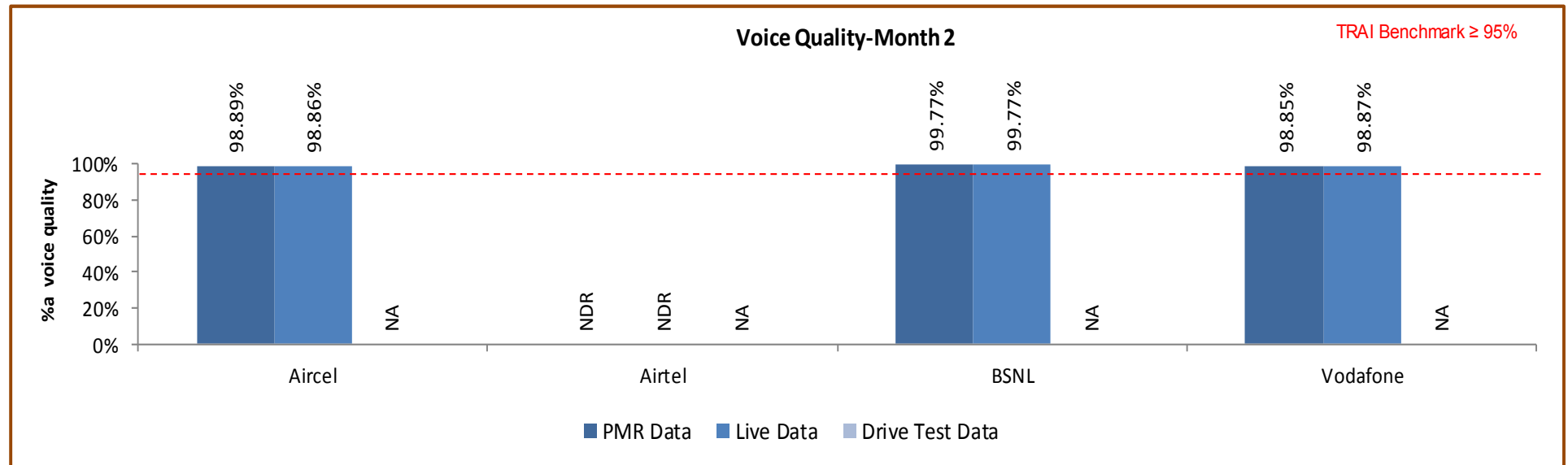
Aircel and Vodafone failed to meet the benchmark in 3day live Audit and drive test.

Significant difference was observed between PMR & live measurement data for Aircel and Vodafone. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

## 6.7.2.1 KEY FINDINGS – MONTH 1

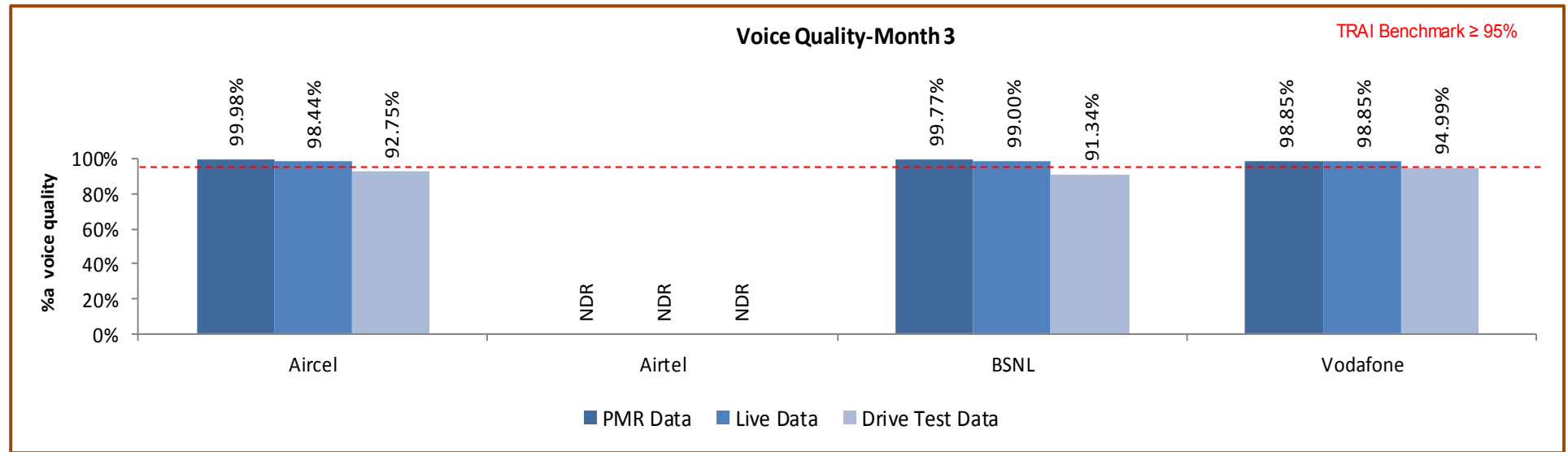


## 6.7.2.2 KEY FINDINGS – MONTH 2



Data Source: Network Operations Center (NOC) of the operators

## 6.7.2.3 KEY FINDINGS – MONTH 3



Data Source: Network Operations Center (NOC) of the operators

## 7 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

### 7.1 METERING AND BILLING CREDIBILITY

The billing complaints for postpaid are calculated by averaging over one billing cycle in a quarter. For example, there are three billing cycles in a quarter, the data for each billing cycle is calculated separately and then averaged over.

The charging complaints for prepaid are calculated by taking all complaints in a quarter.

#### 7.1.1 PARAMETER DESCRIPTION

All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20<sup>th</sup> December, 2009 were covered. The types of billing complaints covered are listed below.

- ↗ Payments made and not credited to the subscriber account
- ↗ Payment made on time but late payment charge levied wrongly
- ↗ Wrong roaming charges
- ↗ Double charges
- ↗ Charging for toll free services
- ↗ Local calls charged/billed as STD/ISD or vice versa
- ↗ Calls or messages made disputed
- ↗ Validity related complaints
- ↗ Credit agreed to be given in resolution of complaint, but not accounted in the bill
- ↗ Charging for services provided without consent
- ↗ Charging not as per tariff plans or top up vouchers/ special packs etc.
- ↗ Overcharging or undercharging

In addition to the above, any billing complaint which leads to billing error, waiver, refund, credit, or any adjustment is also considered as valid billing complaint for calculating the number of disputed bills.

➤ Computational Methodology:

✍ **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints\*\* received during the relevant billing cycle / Total bills generated\* during the relevant billing cycle)\*100

✍ \*Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated

✍ \*\*Billing complaints here shall include only dispute related issues (including those that November arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.

✍ **Charging complaints per 100 subscribers (Prepaid)** = (Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter) \* 100

➤ TRAI Benchmark: <= 0.1%

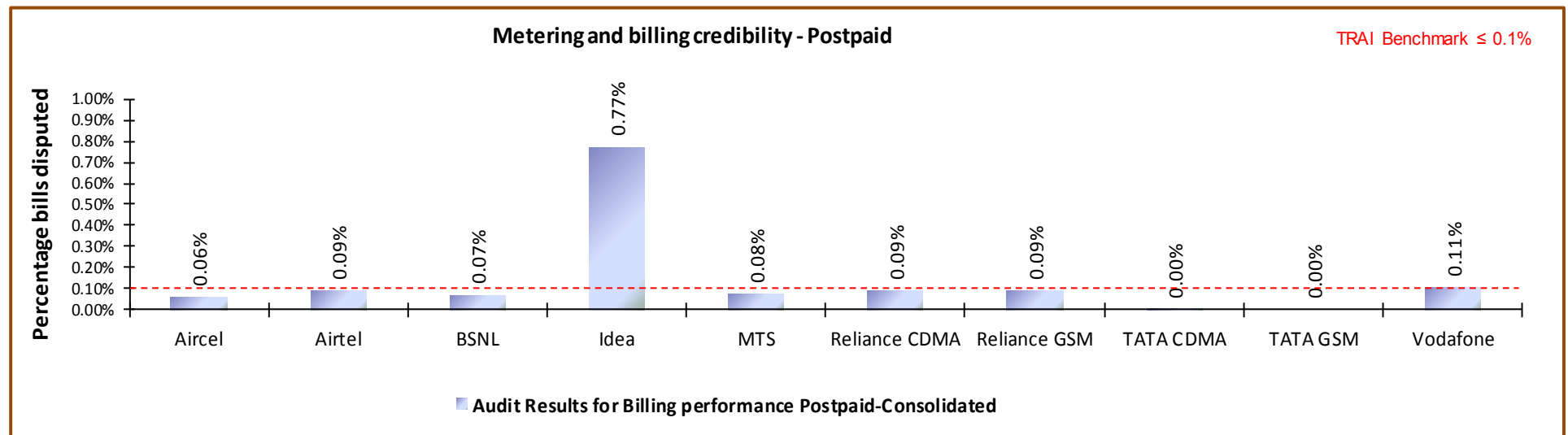
➤ Audit Procedure:

✍ Audit of billing complaint details for the complaints received during the quarter and used for arriving at the benchmark reported to TRAI would be conducted

➤ For Postpaid, the total billing complaints would be audited by averaging over billing cycles in a quarter

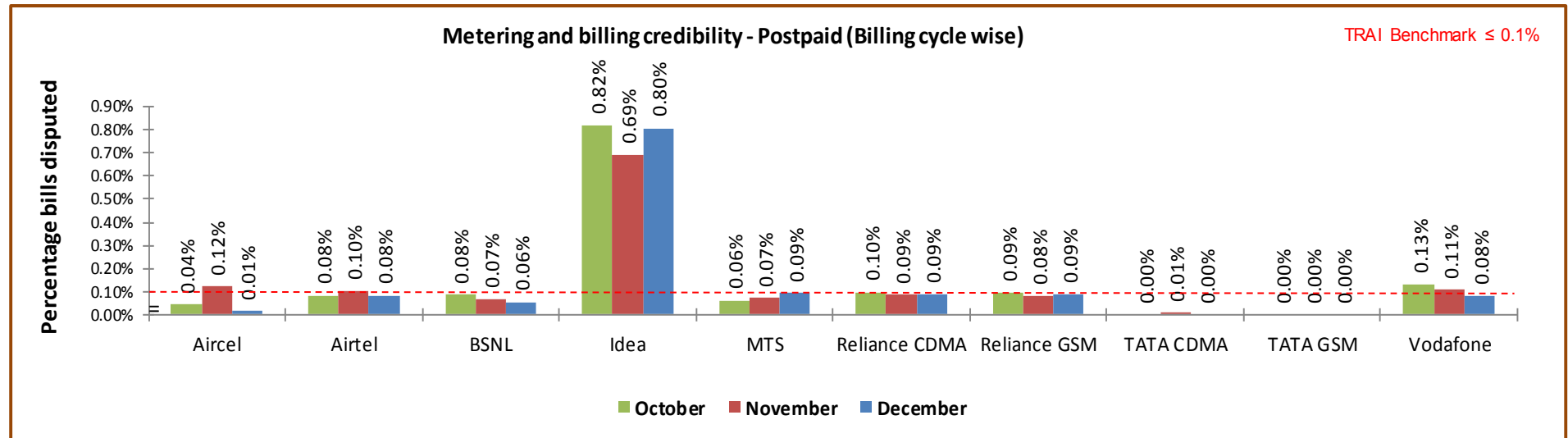
➤ For Prepaid, the data of total charging complaints in a quarter would be taken for the purpose of audit

## 7.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



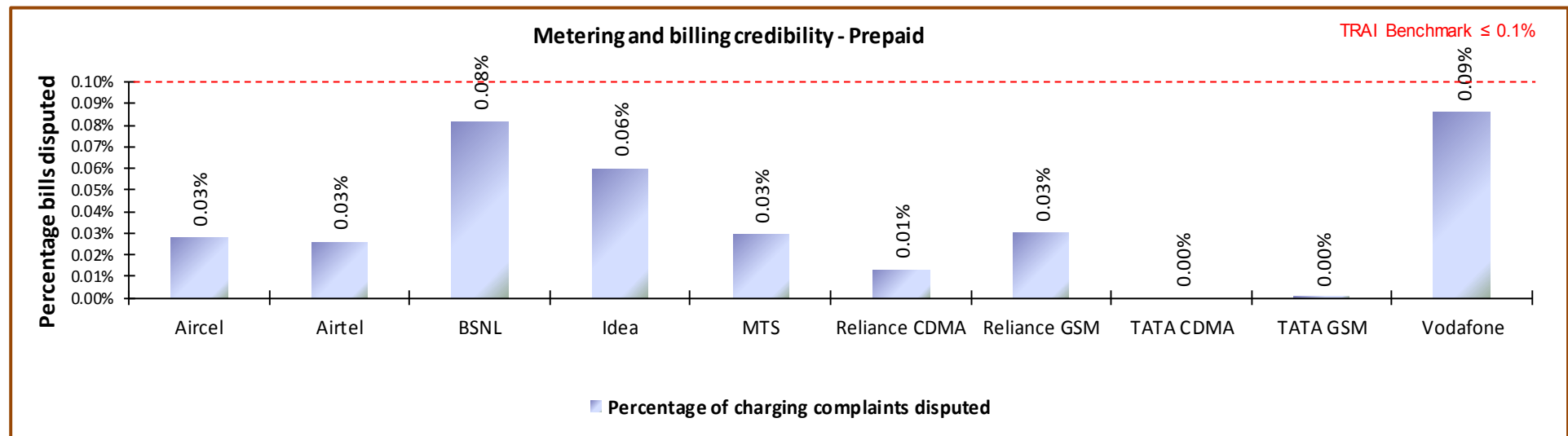
Data Source: Billing Center of the operators

Idea and Vodafone failed to meet the benchmark of 0.1% postpaid metering and billing credibility.



Data Source: Billing Center of the operators

## 7.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)



Data Source: Billing Center of the operators

All operators met the benchmark for metering and billing credibility of prepaid subscribers.

## 7.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

### 7.2.1 PARAMETER DESCRIPTION

#### Calculation of Percentage resolution of billing complaints

The calculation methodology (given below) as per QoS regulations 2009 (7 of 2009) was followed to -calculate resolution of billing complaints.

#### Resolution of billing complaints within 4 weeks:

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 4 weeks =

number of billing complaints for post-paid  
customers/charging, credit/ validity complaints for  
pre-paid customers resolved within 4 weeks  
during the quarter X 100

-----  
number of billing/charging, credit / validity complaints received  
during the quarter

#### Resolution of billing complaints within 6 weeks:

%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

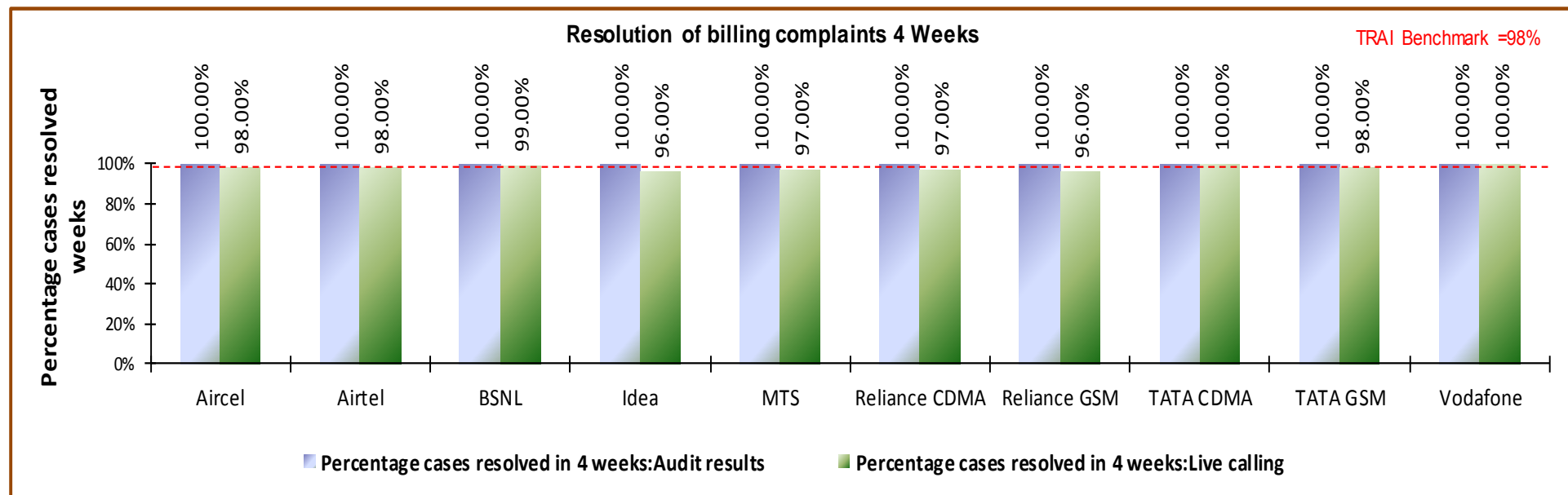
number of billing complaints for post-paid  
customers/charging, credit/ validity complaints for  
pre-paid customers resolved within 6 weeks  
during the quarter X 100

-----  
number of billing/charging, credit / validity complaints received  
during the quarter

- ✍ \*\*Billing complaints here shall include only dispute related issues (including those that November arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally. Complaints raised by the consumers to operator are only considered as part of the calculation.
- ✍ The complaints that get marked as invalid by the operator are not considered for calculation as those complaints cannot be considered as resolved by the operator.
- ➡ \*\*\* Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.

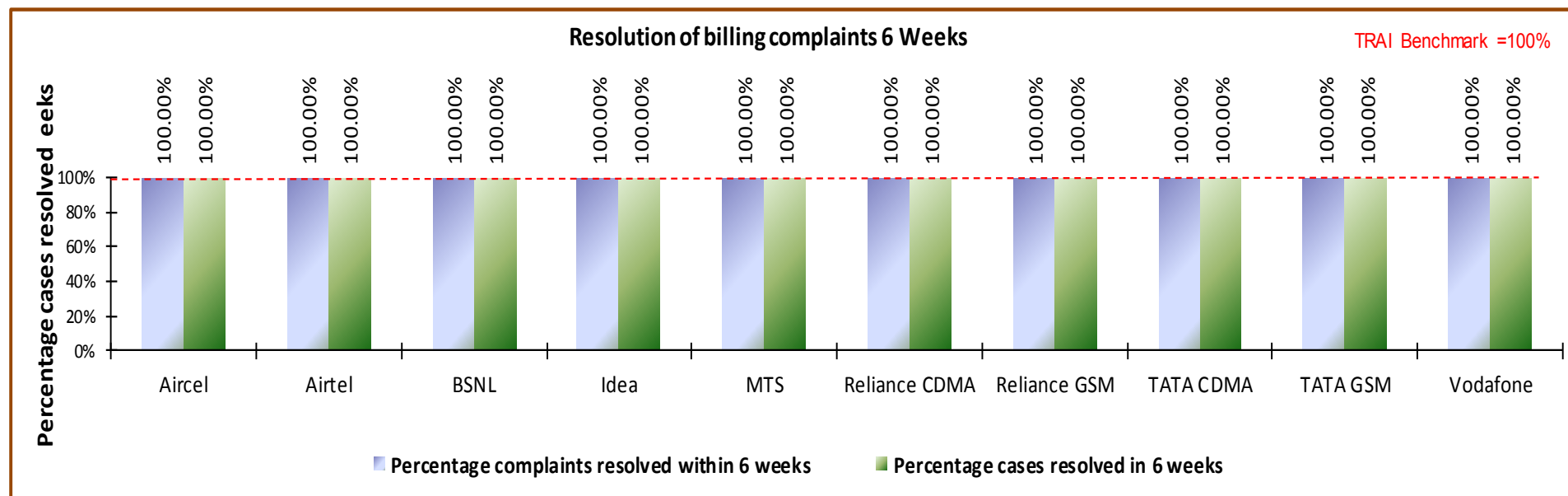
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

## 7.2.2 KEY FINDINGS - WITHIN 4 WEEKS



Data Source: Billing Center of the operators

## 7.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks, however in 3days live Idea, MTS, Reliance GSM & CDMA fell slightly short of the benchmark of resolution of billing complaints within 4 weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the PMR data.

## 7.3 PERIOD OF APPLYING CREDIT/WAVIER

### 7.3.1 PARAMETER DESCRIPTION

#### ➤ Computational Methodology:

↳ **Period of applying credit waiver = (number of cases where credit waiver is applied within 7 days/ total number of cases eligible for credit waiver) \* 100**

#### ➤ TRAI Benchmark:

↳ Period of applying credit waiver within 7 days: 100%

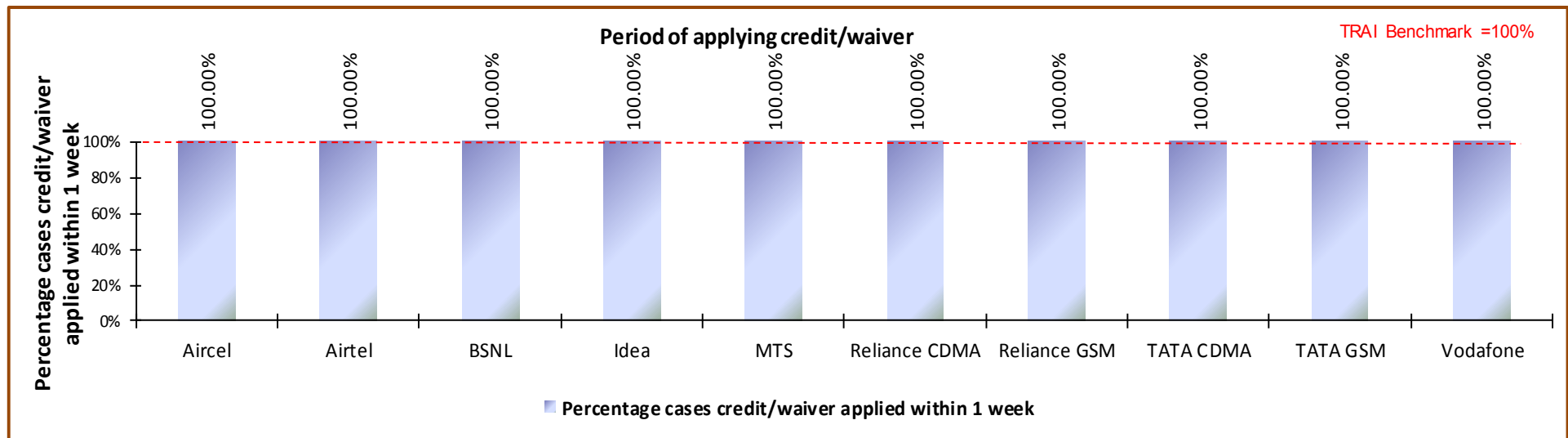
#### ➤ Audit Procedure:

↳ Operator to provide details of:-

▸ List of all eligible cases along with

- Date of applying credit waiver to all the eligible cases.
- Date of resolution of complaint for all eligible cases

## 7.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

All operators met the benchmark for this parameter.

## 7.4 CALL CENTRE PERFORMANCE-IVR

### 7.4.1 PARAMETER DESCRIPTION

➤ Computational Methodology:

✍ **Call centre performance IVR = (Number of calls connected and answered by IVR/ All calls attempted to IVR) \* 100**

➤ TRAI Benchmark:  $\geq 95\%$

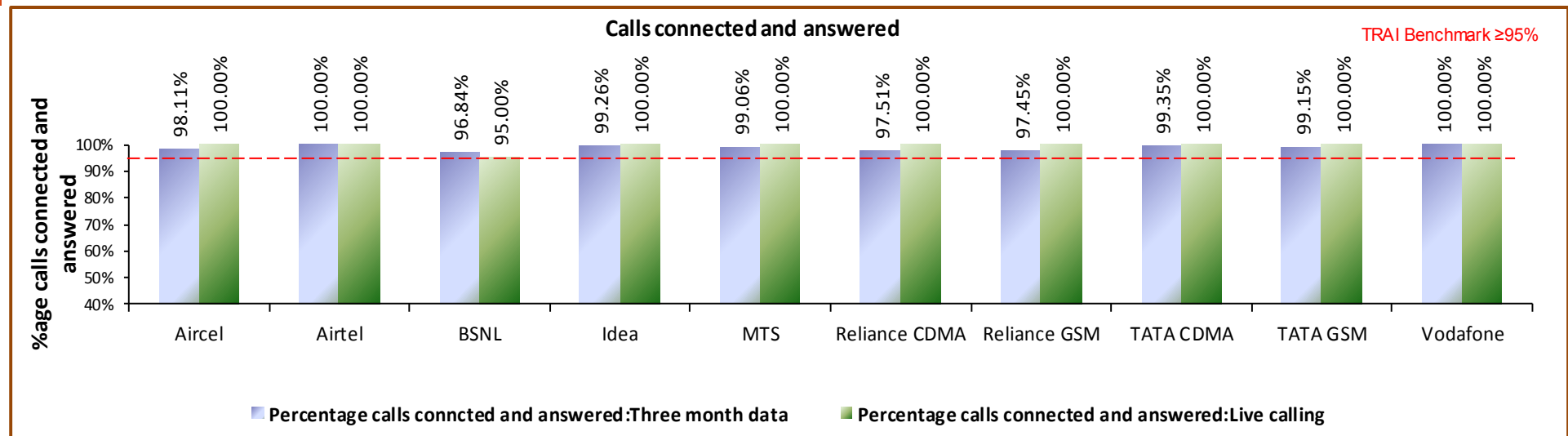
➤ Audit Procedure:

✍ Operators provide details of the following from their central call centre/ customer service database:

- Total calls connected and answered by IVR
- Total calls attempted to IVR

✍ Also live calling is done to test the calls connected and answered by IVR

## 7.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

As per PMR data, all operators met the benchmark.

## 7.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

### 7.5.1 PARAMETER DESCRIPTION

#### ➤ Computational Methodology:

➤ Call centre performance Voice to Voice =  $\frac{\text{Number of calls answered by operator within 90 seconds}}{\text{All calls attempted to connect to the operator}} \times 100$

#### ➤ Audit Procedure:

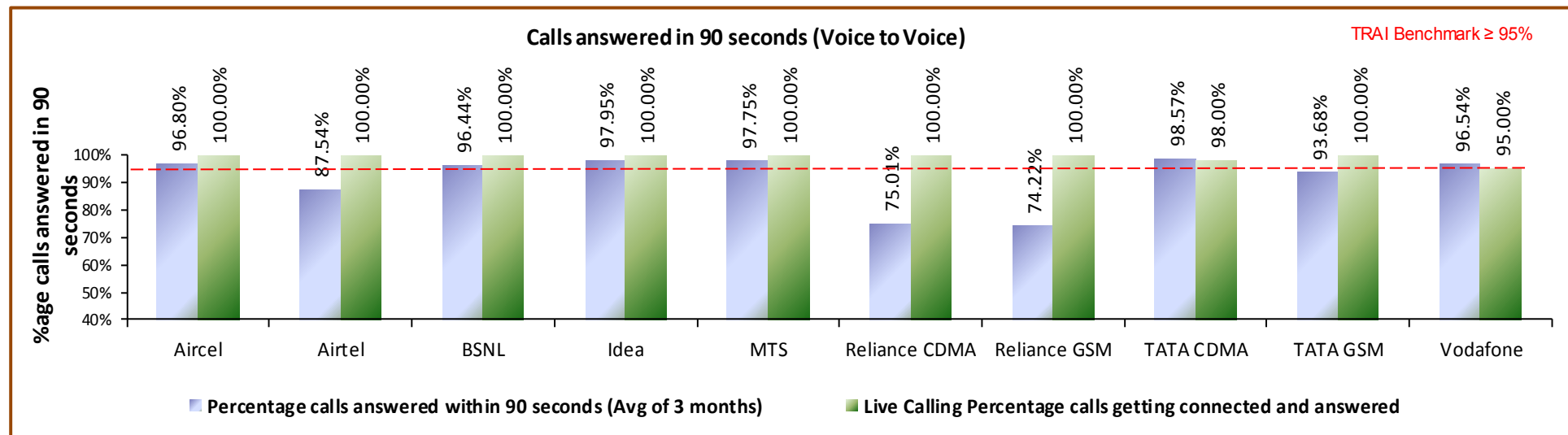
➤ Operators provide details of the following from their central call centre/ customer service database:

- Total calls connected and answered by operator within 90 seconds
- Total calls attempted to connect to the operator

➤ Also live calling was done to test the calls answered within 90 seconds by the operator

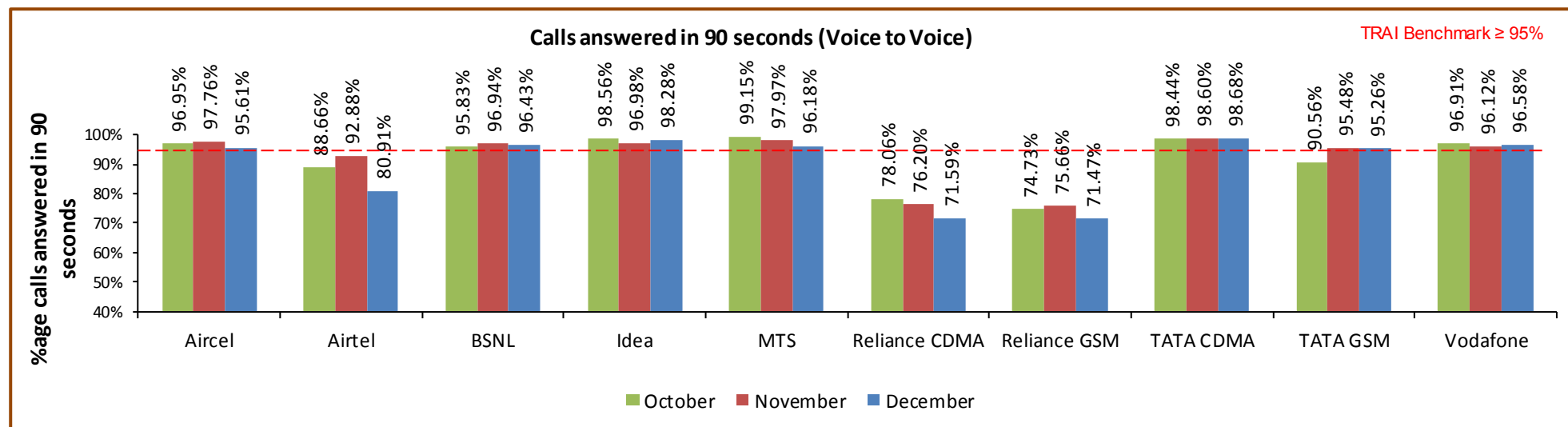
**Benchmark:** 95% calls to be answered within 90 seconds

## 7.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Airtel, TATA GSM and Reliance GSM & CDMA were not able to meet the benchmark as per audit PMR data. However, as per live calling done to customers, the performance of all operators met the benchmark.



Data Source: Customer Service Center of the operators

## 7.6 TERMINATION/CLOSURE OF SERVICE

### 7.6.1 PARAMETER DESCRIPTION

➤ Computational Methodology:

↳ **Time taken for closure of service = (number of closures done within 7 days/ total number of closure requests) \* 100**

➤ TRAI Benchmark:

↳ Termination/Closure of Service: <=7 days

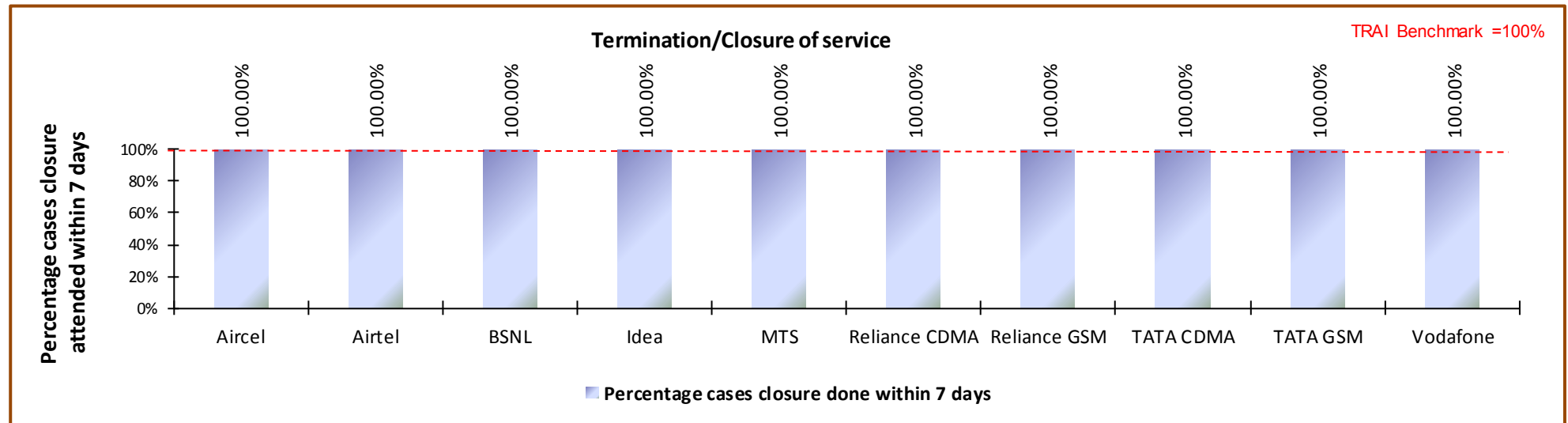
➤ Audit Procedure:

↳ Operator provide details of the following from their central billing/CS database:

➤ Date of lodging the closure request (all requests in given period)

➤ Date of closure of service

## 7.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter.

## 7.7 REFUND OF DEPOSITS AFTER CLOSURE

### 7.7.1 PARAMETER DESCRIPTION

#### ➤ Computational Methodology:

✎ **Time taken for refund for deposit after closures = (number of cases of refund after closure done within 60 days/ total number of cases of refund after closure) \* 100**

✎ Any case where the operators need to return the amount back to consumers post closure of service in form of cheque/cash is considered to be refund.

#### ➤ TRAI Benchmark:

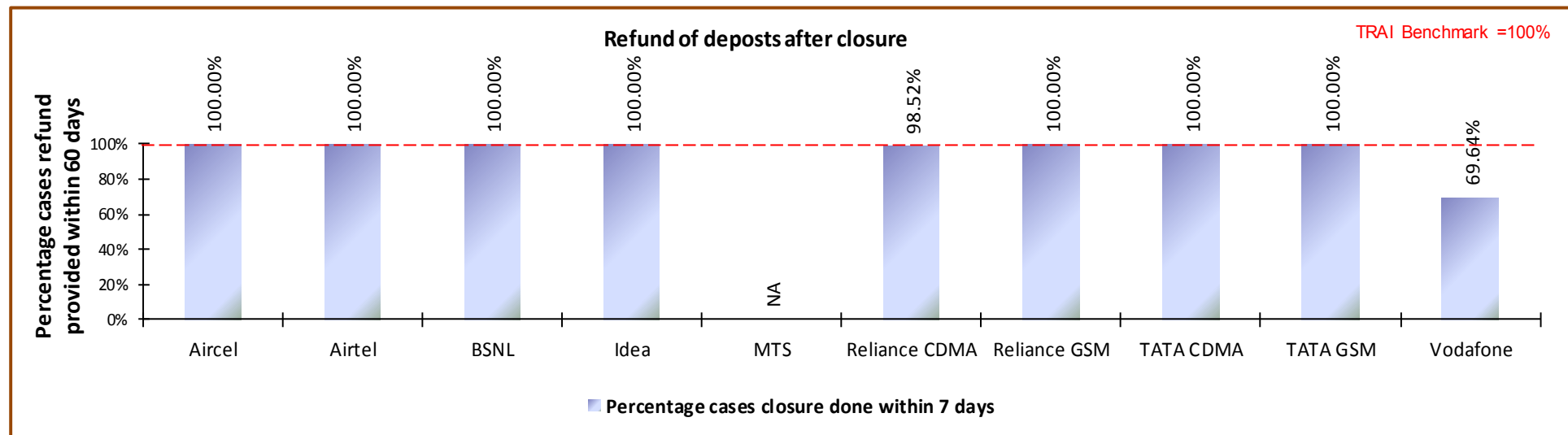
✎ Time taken for refund for deposit after closures: 100% within 60 days

#### ➤ Audit Procedure:

✎ Operator provide details of the following from their central billing/refund database:

- Dates of completion of all 'closure requests' resulting in requirement of a refund by the operator.
- Dates of refund pertaining to all closure request received during the relevant quarter

## 7.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

All operators met the TRAI benchmark for the parameter except Vodafone & Reliance CDMA.

## 8 DETAILED FINDINGS - DRIVE TEST DATA

### 8.1 OPERATOR ASSISTED DRIVE TEST - VOICE

The drive test was conducted simultaneously for all the operators present in the Kolkata circle. As per the new directive given by TRAI headquarters, drive test in the quarter were conducted at a SSA level. SSAs have been defined in two categories by TRAI as per the criticality of the SSA.

3. Normal SSA
4. Difficult SSA

The drive test in Normal SSA was conducted for three days with minimum distance of 250 kilometers over three days. The drive test in difficult SSAs was conducted for six days with minimum distance of 500 kilometers over six days. The selection of routes ensured that the maximum towns, villages, highways are covered as part of drive test. The routes were selected post discussion with TRAI regional teams. The holding period for all test calls was 120 seconds and gap between calls was 10 seconds.

For measuring voice quality RxQual samples for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. RxQual greater than 5 meant that the sample was not of appropriate voice quality and for CDMA operators FERs of more than 4 were considered bad. Call drops were measured by the number of calls that were dropped to the total number of calls established during the drive test. Similarly CSSR was measured as the ratio of total calls established to the total call attempts made. Signal strength was measured in Dbm with strength > -75 dbm for indoor, -85 dbm for in-vehicle and > -95 dbm outdoor routes.

The schedule and operators involved in the operator assisted drive test for Kolkata circle are given below.

2G	3G
Aircel	Aircel
Airtel	Airtel
BSNL	BSNL
Idea	Vodafone
MTS	
Reliance CDMA	
Reliance GSM	
TATA CDMA	
TATA GSM	
Vodafone	

## 8.1.1 Kolkata SSA

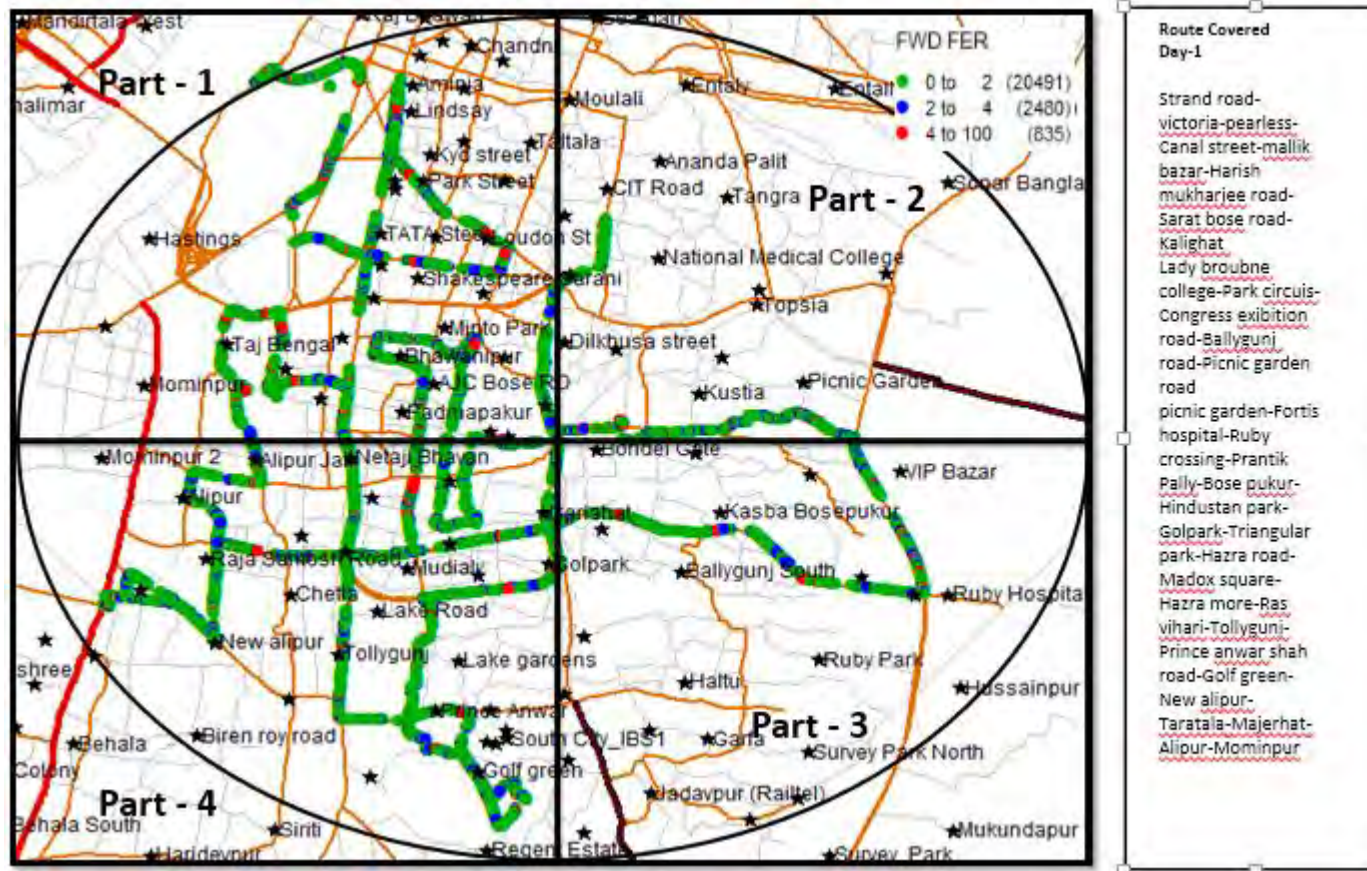
Month	Name of SSA	Start date	End Date	Kilometer Travelled
December	Kolkata	14/12/15	19/12/15	637

## 8.1.1.1 Route Details - Kolkata SSA

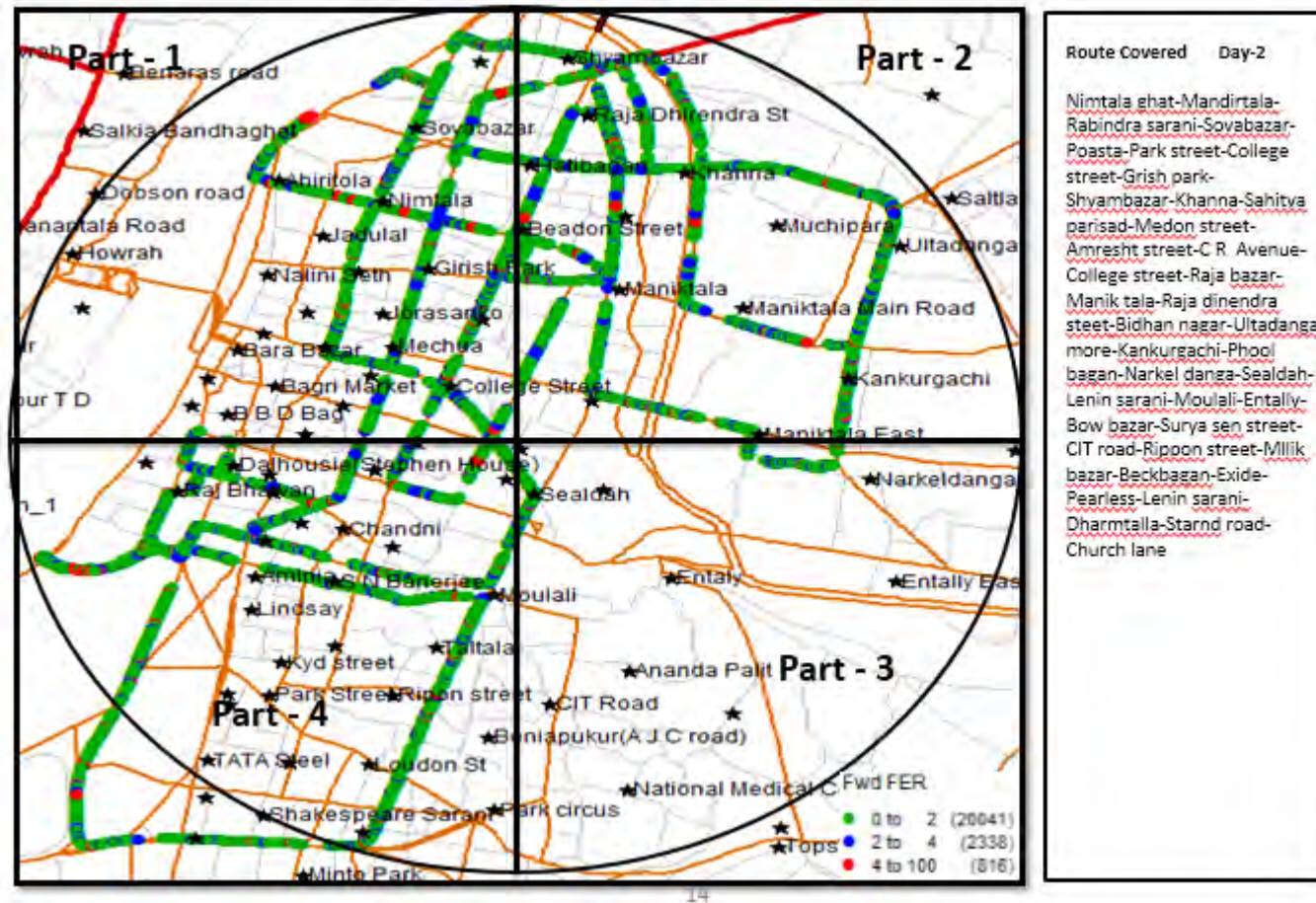
Category	Type of location	December Kolkata					
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Outdoor	Major Roads	Strand road-victoria-pearless-Canal street-mallik bazar-Harish mukharjee road-Sarat bose road-Kalighat	Nimtala ghat-Mandirtala-Rabindra sarani-Sovabazar-Poasta-Park street-College street-Grish park-Shyambazar-Khanna-Sahitya parisad-Medon street-Amresht street-C R Avenue-College street-Raja bazar-Manik tala-Raja dinendra steet-Bidhan nagar-Ultadanga more-Kankurgachi-Phool bagan-Narkel danga-Sealdah-Lenin sarani-Moulali-Entally-Bow bazar-Surya sen street-CIT road-Rippon street-Milik bazar	Moulali-Tangra-Topsia road-Beliaghata road-Phoolbagan-Kankurgachi-Bengal chemical-Saltlake sec-5-Punjab bank more-Ultadanga more-Canel steet-Lake town-Prafulla kanan-Bgauhati-Taghoria-City centre-New town-ECO park-HIDCO more-Technopolis-Godrej water side-Benfish-Slatlake sec5-Park circuis-Congress exhibition road-Hazra road-Griahat-Hindustan park-Golpark-South city-Prince anwar shah road-Golf green-Bijoygarh-Baghajatin-Patuli-Baishnab ghata-Garia station-Highland park-Mukundpur-AMRI hospital-Jora bridge -Kalikapur road-Shrachi-Narkelbagan-Ruby-Fortis-Panchano gram hospital	Swami vivekanad road-Budge budge-Batanagar eden city-Btanagar-Mahestala-Mollar gate-Benipukur-Brace bridge Jinjra bazar-Khidirpur-Garden Reach-Race course-Watgunj-Hasting-Telecom factory-Mominpur-Alipur-Majerhat-Taratata road-Pranashree-Behala-Behala tramdeput-James long sarani-Biren roy road-Sarsuna-Diamond harbour road-Tollkygunj metro-Panchan tala-Haridevpur-Bansdrone-Moore avenue-NSC bose road crossing-Haridevpur-M.G Road-Kabardanga-Thakurpukur badamtala-Bankrahat-Rasakunj-Gria-Subodh park-Bankra hat road-	kharda-TitagarhTaki road-Talpukur-Barackpore RLY station-Palta-Ichapur-Garulia-ShyaMNAGAR-Moomenpara-Naihati-Naihati saheb colony-Dogachia-Klyani highway-Selvi telni para-Nilgunj-Akrampur Barasat nabapally-Barasat Dakbanglow more-Khardah-Sodepur B.T road-Panihati-Agarpara-kamarhati-Feeder road-Dunlop-Pramanik ghat-Cossipur road-Shyambazar-Ultadanga-Shyambazar crossing-Northern avenue-Tala park-Belgachia-Lake town-Jessore road-Dum dum station road-Nagarbazar-Chattakol	Makarda-Domjur-Jhapardah-Bhaspur-Dafapur-Bolohati-Jagadishpur-Ramkrishna bati-Garalgacha-Dankuni-Dankuni-Maitiapa-Joypurbill-Chamrail-Khalia paschim para-Bally station-Bally khal-Dewangachi road-Belur math-Liluah-Ghusri-Salkia-G.T road crossing-Howrah a.c market-Dobson road-Howrah-Shibtala-Cowles ghat-Mandir tala-Shibpur-Carry ghat-Kadamtala-Baltikuri-Bankra-Bagpara-Belgachia-Tikiapara-Domjur-Salap more-Munsi danga-Buxara-Santragachi-Makarda-
	Highways	Lady broubne college-Park circuis-Congress exhibition road-Ballygunj road-Picnic garden road	picnic garden-Fortis hospital-Ruby crossing-Prantik Pally-Bose pukur-Hindustan park-Golpark-Triangular park-Hazra road-Madox square-Hazra more-Ras vihari-Tollygunj-Prince anwar shah road-Golf green-New alipur-Taratata-Majerhat-Alipur-Mominpur				
	With in the City						
Indoor	Shopping complex						
	Office complex						

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We November observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

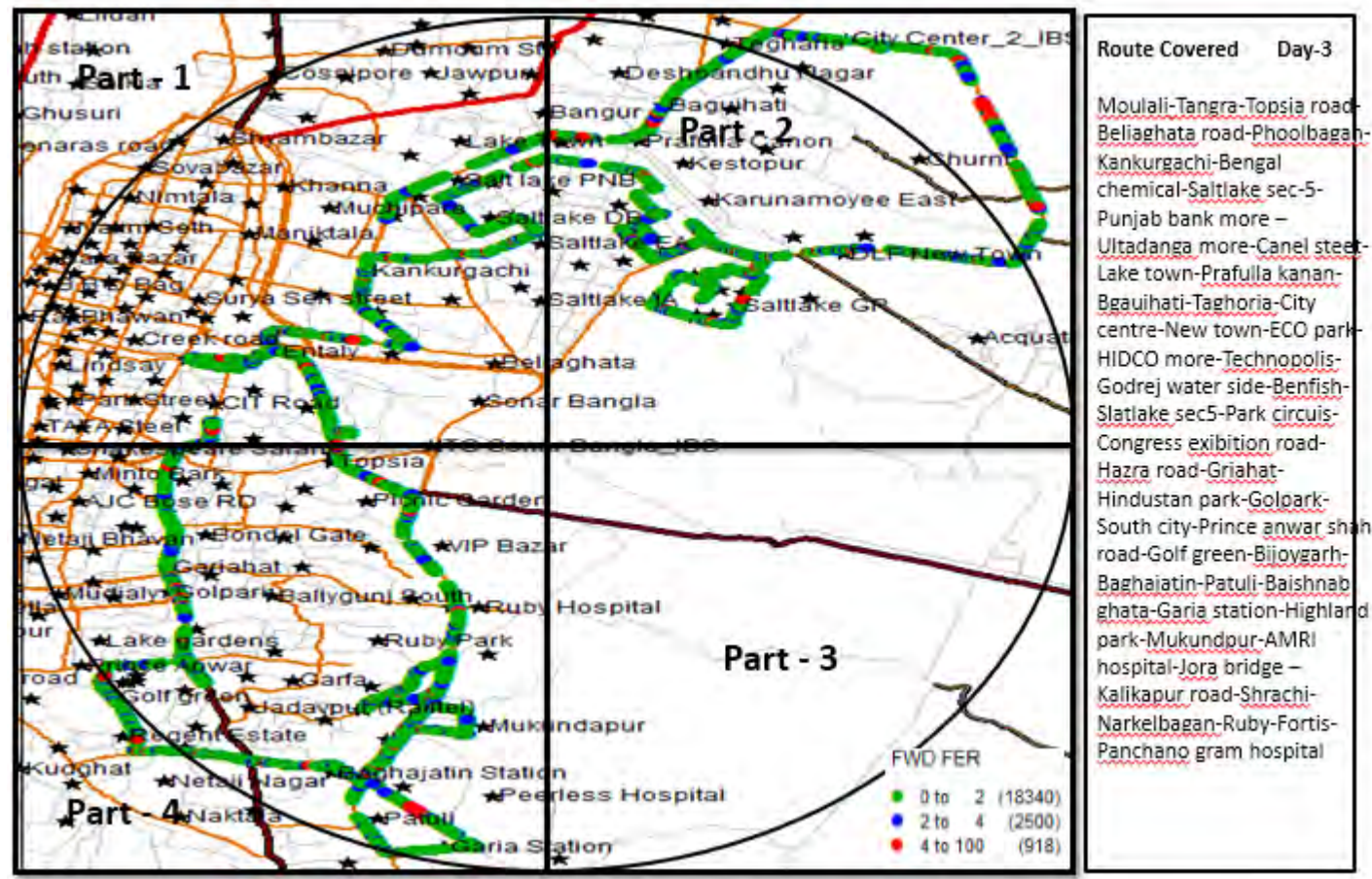
## 8.1.1.2 Route Map - Kolkata DAY 1



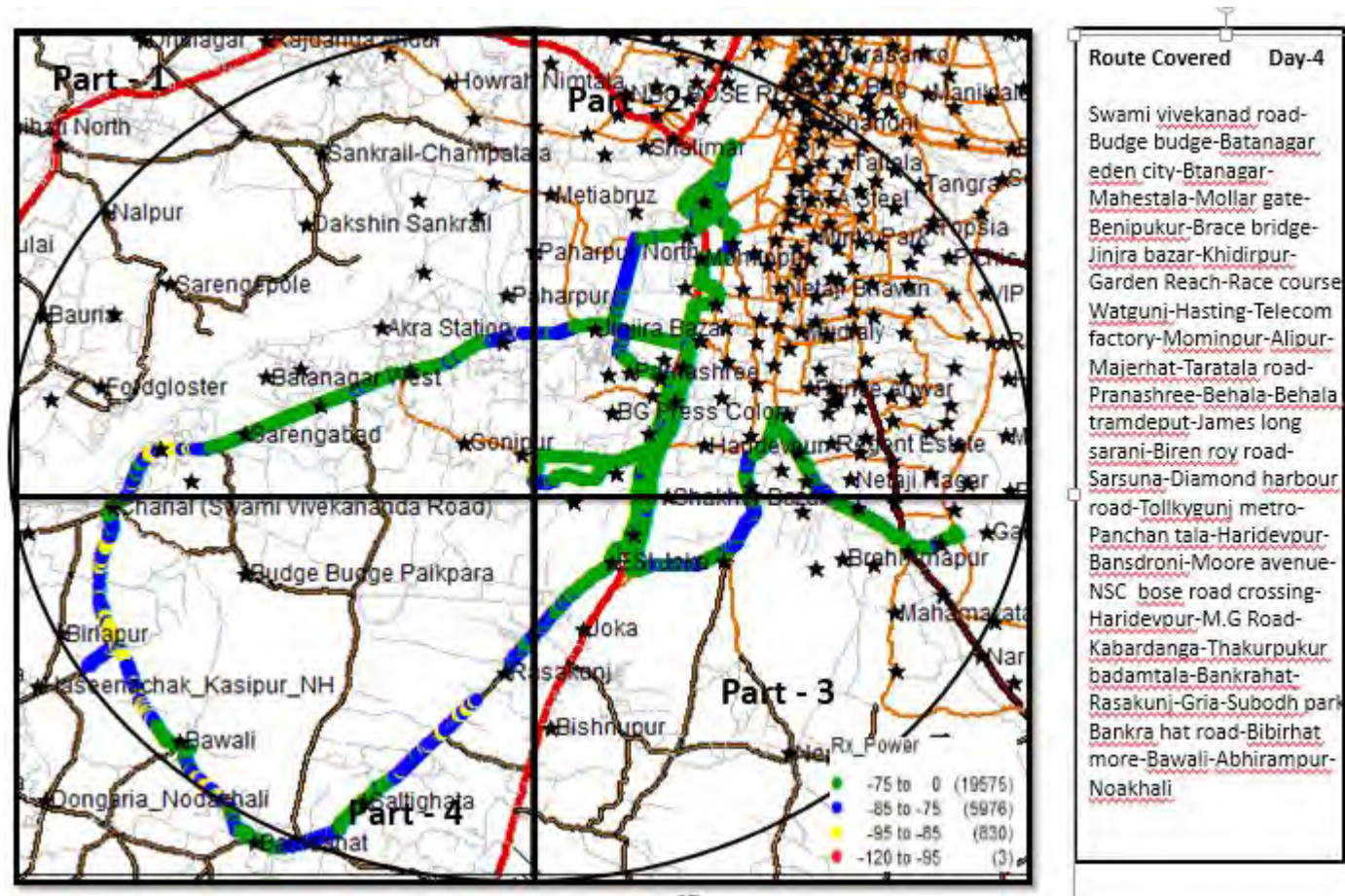
## 8.1.1.3 Route Map - Kolkata DAY 2



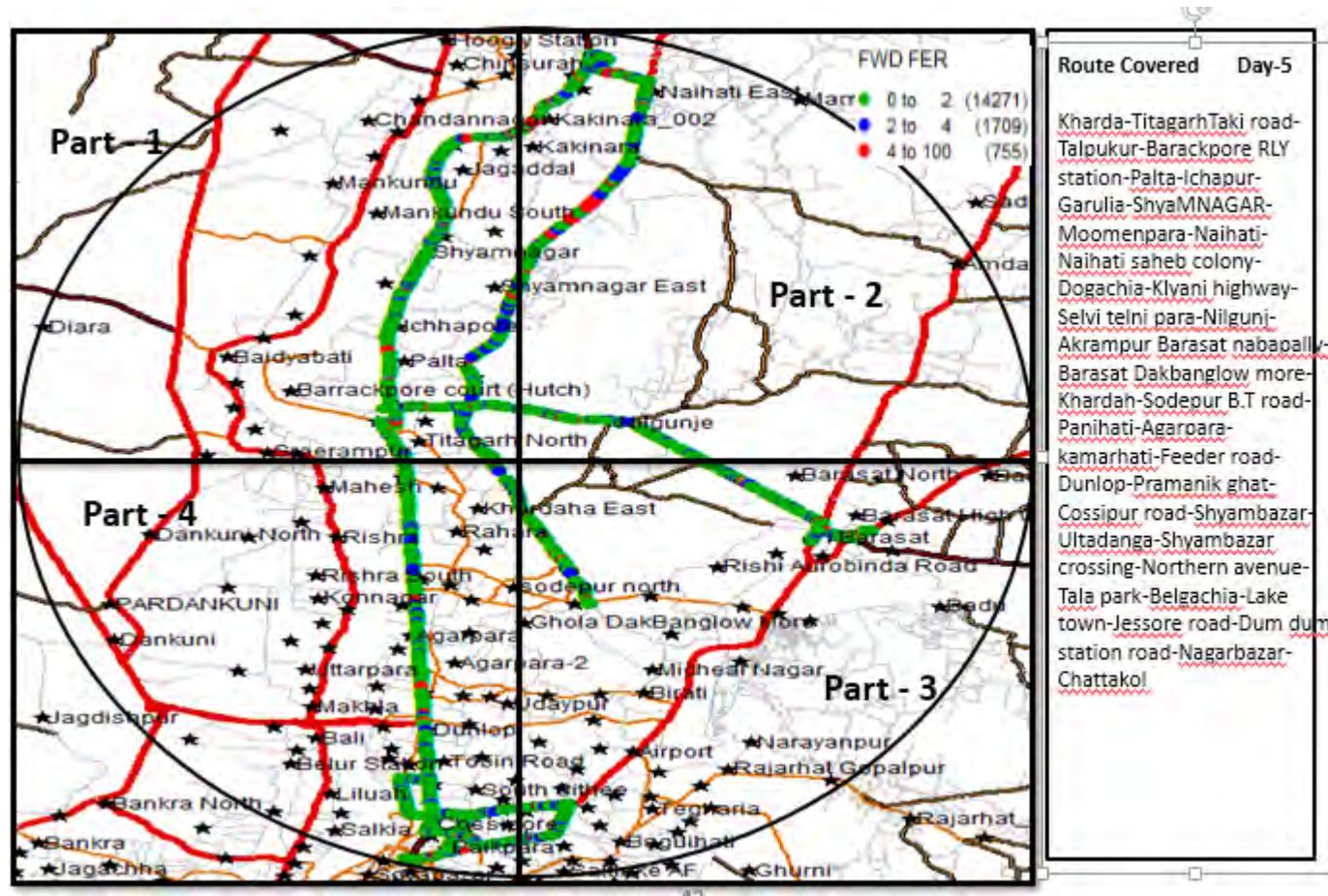
## 8.1.1.4 Route Map - Kolkata DAY 3



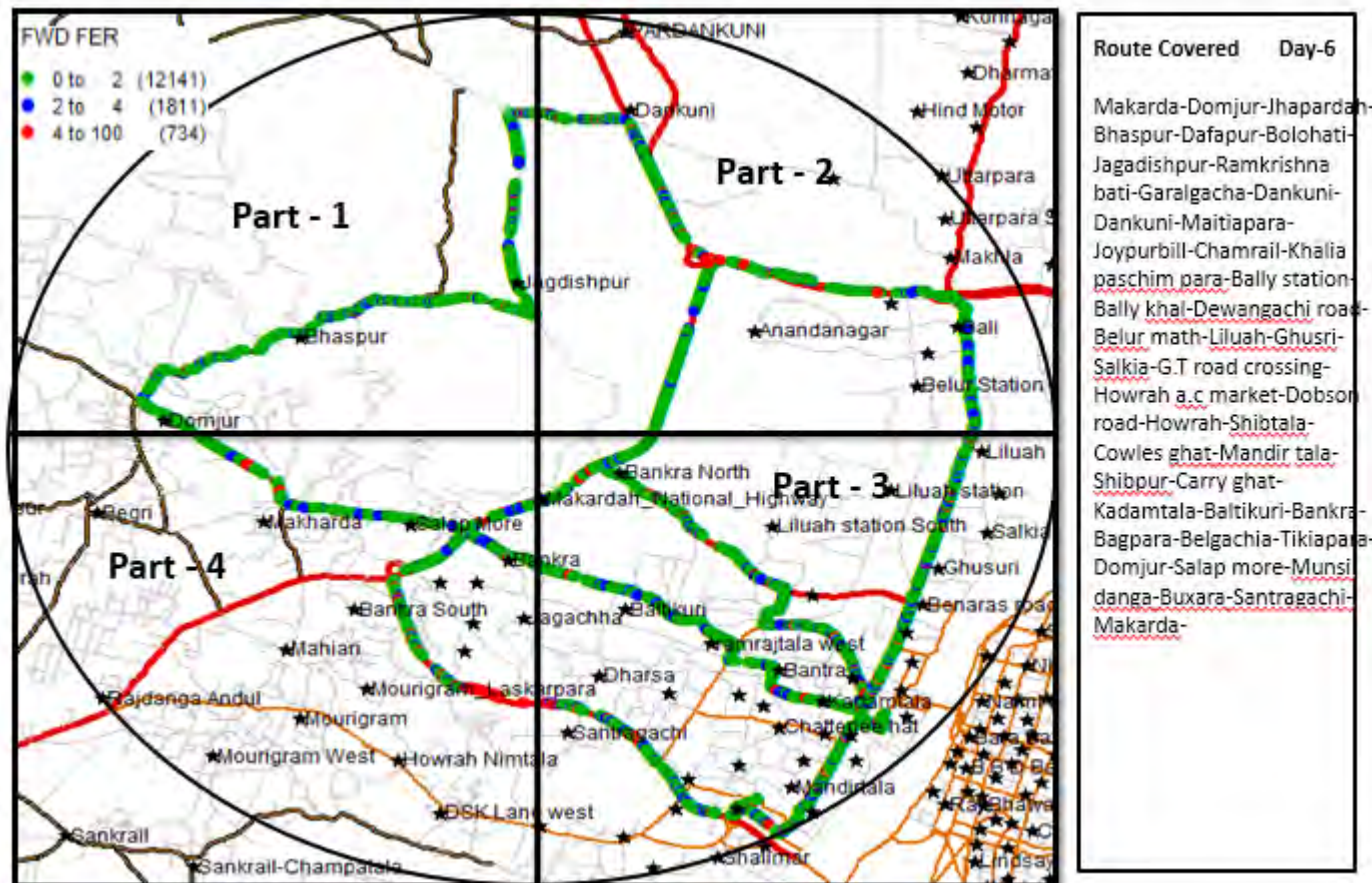
### 8.1.1.1 Route Map - Kolkata DAY 4



### 8.1.1.2 Route Map - Kolkata DAY 5



### 8.1.1.3 Route Map - Kolkata DAY 6



## 8.1.1.4 Drive Test Results - Kolkata SSA-2G

December																					
	B'mark	Aircel		Airtel		BSNL		Idea		MTS		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		77.59%	93.14%	NDR		88.57%	82.38%	48.93%	84.34%	71.91%	96.02%	25.98%	56.73%	27.31%	52.00%	67.92%	90.57%	55.56%	84.92%	94.15%	97.06%
0 to -85 dBm		99.02%	99.11%			96.59%	97.68%	85.74%	98.84%	98.37%	99.79%	56.39%	86.00%	87.63%	89.42%	99.49%	98.97%	96.74%	97.53%	97.66%	99.85%
0 to -95 dBm		99.81%	99.87%			100.00%	99.92%	99.90%	99.92%	99.90%	99.91%	99.92%	99.75%	99.59%	99.44%	100.00%	99.99%	99.72%	99.59%	100.00%	100.00%
Voice quality	≥ 95%	96.92%	90.47%			92.54%	92.15%	99.17%	94.36%	98.67%	96.30%	87.22%	88.32%	92.92%	93.56%	98.15%	95.77%	99.40%	98.56%	98.84%	97.76%
CSSR	≥ 95%	100.00%	98.89%			97.20%	94.10%	100.00%	99.69%	100.00%	100.00%	97.51%	98.60%	99.27%	98.30%	100.00%	100.00%	99.20%	96.37%	100.00%	100.00%
%age Blocked calls		0.00%	1.11%			1.20%	1.63%	0.00%	0.31%	0.00%	0.00%	7.00%	6.55%	0.00%	9.00%	0.00%	0.00%	0.00%	1.94%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.37%			0.00%	1.93%	0.00%	0.23%	0.00%	0.16%	1.42%	1.30%	0.41%	0.52%	0.00%	0.00%	0.00%	0.33%	0.00%	0.00%
Hands off success rate		100.00%	98.45%			97.92%	96.70%	100.00%	98.88%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	0.00%	0.00%	95.15%	97.29%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

### Voice Quality

BSNL GSM failed to meet the benchmark in outdoor as well as indoor locations. Aircel and BSNL CDMA did not meet the benchmark in outdoor locations.

### Call Set Success Rate (CSSR)

BSNL GSM failed to meet the benchmark for CSSR in outdoor locations.

### Call Drop Rate

BSNL GSM failed to meet the benchmark for call drop rate in outdoor locations.

## 8.1.1.1 Drive Test Results - Kolkata SSA-3G

December									
	B'mark	Aircel		Airtel		BSNL		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		52.92%	62.71%	NDR		58.61%	64.36%	90.76%	87.16%
0 to -85 dBm		73.96%	89.08%			81.01%	84.39%	99.83%	98.31%
0 to -95 dBm		95.17%	98.52%			100.00%	100.00%	100.00%	100.00%
Voice quality	≥ 95%	99.00%	90.90%			91.50%	91.31%	96.29%	94.72%
CSSR	≥ 95%	100.00%	100.00%			101.71%	101.69%	100.00%	100.00%
%age Blocked calls		0.39%	2.01%			2.10%	1.67%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.62%			0.43%	1.39%	0.00%	0.00%
Hands off success rate		98.46%	98.56%			95.18%	96.94%	100.00%	100.00%

## Voice Quality

BSNL failed to meet the benchmark in outdoor as well as indoor locations. Aircel and Vodafone did not meet the benchmark in outdoor locations.

## Call Set Success Rate (CSSR)

All the operators met the TRAI benchmark.

## Call Drop Rate

All the operators met the TRAI benchmark.

## 8.1.1.1 Drive Test Results - Kolkata SSA-DATA- 2G

December	Kolkata										
Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	MTS	RCOM CDMA	RCOM GSM	TATA CDMA	TATA GSM	Vodafone
Successful Data Transmission download speed attempts	>80%	100%	Not Received	93	100%	100%	Not Participated		100%	100%	100%
Successful Data Transmission upload speed attempts	>75%	100%		92	100%	100%			100%	100%	100%
Minimum download speed		91		49	111	170			1119	72	88
Average throughput for Packet Data		151		70	109	868			1393	114	135
Latency	<250ms	NDR		NDR	100	100			100	NDR	NDR

All the parameters met the TRAI benchmark.

## 8.1.1.1 Drive Test Results - Kolkata SSA-DATA- 3G

December	Kolkata				
Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Vodafone
Successful Data Transmission download speed attempts	>80%	100%	Not Received	93	100%
Successful Data Transmission upload speed attempts	>75%	100%		92	100%
Minimum download speed		1512		253	2497
Average throughput for Packet Data		3141		767	5054
Latency	<250ms	NDR		100	NDR

All the parameters met the TRAI benchmark.

## 9 ANNEXURE – CONSOLIDATED-2G

3 Day Live Data: - Data representing for Reliance CDMA and Reliance GSM is for December 2015, since they had server issue in the month of October 2015 and November 2015 we could not able to conduct the audit same has been intimated to TRAI by the operator.

### 9.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		6614	8202	3702	6435	1713	1400	4902	416	5427	12680
Sum of downtime of BTSs in a month (in hours)		9301	920	73560	6095	689	64483	568607	217	5299	5015
BTSs accumulated downtime (not available for service)	≤ 2%	0.19%	0.02%	2.67%	0.13%	0.05%	6.19%	15.59%	0.07%	0.13%	0.05%
Number of BTSs having accumulated downtime >24 hours		48	0	241	23	0	18	11	3	35	23
Worst affected BTSs due to downtime	≤ 2%	0.73%	0.00%	6.51%	0.36%	0.00%	1.29%	0.22%	0.72%	0.64%	0.18%
Live Measurement Results for Network Availability- 3 Day live data											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		6611	8190	3684	6436	1712	456	1634	414	5425	12635
Sum of downtime of BTSs in a month (in hours)		736	136	3199	592	84	24	147	27	511	308
BTSs accumulated downtime (not available for service)	≤ 2%	0.15%	0.02%	1.21%	0.13%	0.07%	0.07%	0.12%	0.09%	0.13%	0.03%
Number of BTSs having accumulated downtime >24 hours		0	0	30	10	0	0	0	0	8	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.81%	0.16%	0.00%	0.00%	0.00%	0.00%	0.15%	0.00%

Data Source: Operations and Maintenance Center (OMC) of the operators

## 9.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.89%	99.35%	98.96%	99.48%	99.87%	97.29%	98.90%	98.87%	98.39%	99.54%
SDCCH/Paging channel congestion	≤ 1%	0.40%	0.02%	0.62%	0.09%	NA	NA	0.39%	NA	0.09%	0.19%
TCH congestion	≤ 2%	0.43%	0.02%	0.80%	0.21%	0.00%	1.19%	0.40%	0.20%	0.05%	0.46%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.27%	99.34%	99.23%	99.68%	99.89%	97.03%	99.46%	99.01%	98.60%	99.75%
SDCCH/Paging channel congestion	≤ 1%	0.44%	0.05%	1.20%	0.05%	NA	NA	0.08%	NA	0.06%	0.16%
TCH congestion	≤ 2%	0.24%	0.03%	0.80%	0.10%	0.00%	1.16%	0.01%	0.26%	0.03%	0.25%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		1327	NDR	1351	1537	1345	1008	1235	1277	1514	1290
Total number of successful calls established		1315	NDR	1279	1533	1345	983	1226	1277	1467	1290
CSSR	≥ 95%	99.10%	NDR	94.67%	99.74%	100.00%	97.52%	99.27%	100.00%	96.90%	100.00%
%age blocked calls		0.90%	NDR	5.33%	0.26%	0.00%	2.48%	0.73%	0.00%	3.10%	0.00%

Data Source: Network Operations Center (NOC) of the operators and Data Source: Drive test reports submitted by operators to auditors

### 9.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		213551512	266582859	360804766	156839716	38186382	53235853	154055926990897	4129717	165410769	667560204
Total number of calls dropped		1397246	1830651	4307823	508726	203572	136288	110397	22375	1003246	5581996
Call drop rate	≤ 2%	0.65%	0.69%	1.08%	0.32%	0.53%	0.26%	0.07%	0.54%	0.60%	0.84%
Total number of cells in the network		19818	24096	10528	19225	6578	2312	14742	1369	15854	35747
Total number of cells having more than 3% TCH		446	643	254	87	129	25	76	38	369	1010
Worst affected cells having more than 3% TCH	≤ 3%	2.25%	2.67%	2.42%	0.45%	1.95%	1.40%	0.51%	2.77%	2.33%	2.80%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		117100880	26091210	54359576	16283526	3760937	1984304	3297928	395535	16065708	31579594
Total number of calls dropped		630576	188475	428325	44780	1262141	5571	3029	2160	99301	267809
Call drop rate	≤ 2%	0.58%	0.72%	0.78%	0.27%	0.40%	0.24%	0.08%	0.48%	0.56%	0.69%
Total number of cells in the network		19795	72087	10391	19226	6573	1368	4914	1368	15856	35636
Total number of cells having more than 3% TCH		440	1815	235	6	49	7	2	63	432	936
Worst affected cells having more than 3% TCH	≤ 3%	2.22%	2.52%	2.26%	0.03%	0.74%	0.53%	0.05%	4.59%	2.73%	2.69%

Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		1315	NDR	1279	1533	1344	1008	1235	1277	1467	1290
Total number of calls dropped		4	NDR	20	3	2	14	5	0	4	0
Call drop rate	≤ 2%	0.30%	NDR	1.56%	0.20%	0.15%	1.39%	0.41%	0.00%	0.27%	0.00%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

## 9.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		42835722520	46172077860	18000	22417369551	201562	NA	18176124317	282376637	23906040035	112225458449
Total number of calls with good voice quality		41706679142	45016056075	17958	21789782737	201529	NA	18014159291	280277932	23499970867	107279796845
%age calls with good voice quality	≥ 95%	97.37%	97.48%	99.77%	97.20%	99.98%	99.03%	99.11%	99.26%	98.30%	96.31%
Live measurement results for Voice quality-3 Day data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		4307036513	3149020267	1800	2234055427	19717	NA	643333420	28420378	2431250691	5033150662
Total number of calls with good voice quality		4195200006	3069990131	1783	2171943229	19701	NA	638063566	28213016	2390056925	4882961745
%age calls with good voice quality	≥ 95%	97.80%	97.52%	99.06%	97.36%	99.89%	99.21%	99.25%	99.30%	98.91%	97.04%
Drive test results for Voice quality (Average of three drive tests) - DT data											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		336624	NDR	1997060	2205819	NA	NA	14489	NA	2846295	338683
Total number of calls with good voice quality		308589	NDR	1841767	2084544	NA	NA	13069	NA	2808970	331941
%age calls with good voice quality	≥ 95%	91.67%	NDR	92.22%	94.50%	97.50%	87.77%	90.20%	96.96%	98.69%	98.01%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

## 9.5 POI CONGESTION

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		47	32	78	91	40	12	29	43	30	46
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68694	243380	966564	172540	112006	24459	35631	73449	32020	735121
Traffic served for all POIs (B)- in erlangs		26536	113427	33830	86378	32337	8475	18252	30872	17176	364835
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		132	94	233	274	120	12	29	129	89	139
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		204027	699076	1407575	178669	111770	8153	250096	73649	32477	735579
Traffic served for all POIs (B)- in erlangs		43328	351602	35966	89445	33028	1502	85900	22819	9062	181420
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Data Source: Network Operations Center (NOC) of the operators

## 9.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang										
Traffic in Erlang	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Equipped capacity of the network	83223.14022	109271	10455	64277.06195	50400	NDR	NDR	18737	97953	146443.65
Total traffic handled in erlang during TCBH	66955.16168	76753.17	8240	46224.88	11111.57	NDR	NDR	2265	49130.975	98766.63355
Total no. of customers served (as per VLR)	2256752	3787031	48303	1842343	482484	NDR	NDR	91198	2093494	4121737

Data Source: Network Operations Center (NOC) of the operators

## 10 ANNEXURE – CONSOLIDATED-3G

For Reliance GSM, data is pertaining to Apr'15. Data for November'15 and Jun'15 could not be audited due to a server issue at operator's end. The same was pre-informed to TRAI by the operator.

### 10.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		4632	NDR	2028	7829
Sum of downtime (i.e. total outage time) of Node Bs		5716	NDR	42929	2762
Node Bs downtime (not available for service)	≤ 2%	0.17%	NDR	2.85%	0.05%
Number of Node Bs having accumulated downtime of >24 hours in a month		31	NDR	0	129
Worst affected Node Bs due to downtime	≤ 2%	0.67%	NDR	0.00%	1.65%
Live Measurement Results for Network Availability- 3 Day live data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		4467	NDR	1336	7804
Sum of downtime (i.e. total outage time) of Node Bs		502	NDR	1396	323
Node Bs downtime (not available for service)	≤ 2%	0.16%	NDR	1.45%	0.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		3	NDR	22	2
Worst affected Node Bs due to downtime	≤ 2%	0.07%	NDR	1.65%	0.03%

Data Source: Operations and Maintenance Center (OMC) of the operators

## 10.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	98.75%	NDR	98.09%	99.99%
RRC Congestion	≤ 1%	0.70%	NDR	0.86%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.18%	NDR	2.53%	0.06%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	97.96%	NDR	95.14%	99.99%
RRC Congestion	≤ 1%	34.15%	NDR	0.52%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.13%	NDR	2.23%	0.06%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of RRC attempts (A)		838	NDR	1259	1359
Total number of RRC established (B)		838	NDR	1238	1359
Call setup success rate (B/A*100)	≥ 95%	100.00%	NDR	98.33%	100.00%
%age blocked calls		0.00%	NDR	1.67%	0.00%

Data Source: Network Operations Center (NOC) of the operators and Data Source: Drive test reports submitted by operators to auditors

### 10.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		38586641	NDR	121257990	111163420
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		126075	NDR	1440041	367974
Call drop rate (B/A*100)	≤ 2%	0.33%	NDR	1.19%	0.33%
Total no. of cells in the licensed service area (B)		13832	NDR	5771	22887
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		376	NDR	182	487
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.72%	NDR	3.16%	2.13%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		19480886	NDR	2663520	3729422
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		68161	NDR	11646	11274
Call drop rate (B/A*100)	≤ 2%	0.34%	NDR	0.44%	0.11%
Total no. of cells in the licensed service area (B)		13814	NDR	3819	22807
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		341	NDR	77	188
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.47%	NDR	2.02%	0.82%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		1228	NDR	1237	1359
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		6	NDR	15	0
Call drop rate (B/A*100)	≤ 2%	0.49%	NDR	1.21%	0.00%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

## 10.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		176288107228	NDR	12000	215064070488
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		175107579516	NDR	11972	212796711763
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.25%	NDR	99.77%	99.00%
Live measurement results for Voice quality-3 Day data					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		17894352350	NDR	6600	21842153354
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		17661640782	NDR	6580	21601246317
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.71%	NDR	99.39%	98.85%
Drive test results for Voice quality (Average of three drive tests) - DT data					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		601533	NDR	1923043	116580
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		557944	NDR	1756572	110736
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	92.75%	NDR	91.34%	94.99%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

## 10.5 POI CONGESTION

Audit Results for POI Congestion- PMR data					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		140	NDR	233	139
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		206081	NDR	966564	735121
Traffic served for all POIs (B)- in erlangs		79608	NDR	33830	364835
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		133	NDR	233	139
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		1815816	NDR	991892	735109
Traffic served for all POIs (B)- in erlangs		379868	NDR	35390	181679
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%

Data Source: Network Operations Center (NOC) of the operators

## 10.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang				
Traffic in Erlang	Aircel	Airtel	BSNL	Vodafone
Equipped capacity of the network	0	NDR	10020	NA
Total taffic handled in erlang during TCBH	4985.32	NDR	1325	36880
Total no. of customers served (as per VLR)	514421	NDR	42568	910560

## 11 ANNEXURE – CUSTOMER SERVICES

### 11.1 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated											
Billing Performance	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Metering and billing credibility - Postpaid (Avg of 3 billing cycles)											
Metering and billing credibility - Postpaid											
Total bills generated during the period		20184	1362126	263602	167801	149656	187637	216803	31794	150082	2627899
Total number of bills disputed		12	1233	183	1294	114	171	193	1	0	2792
Total number of valid billing complaints		1	375	182	157	50	171	193	1	0	1820
Total complaints considered invalid		11	858	1	1137	64	0	0	0	0	972
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.06%	0.09%	0.07%	0.77%	0.08%	0.09%	0.09%	0.00%	0.00%	0.11%
October											
Total bills generated during the first billing cycle		6833	453039	88425	54524	49088	63923	72901	10790	51507	852523
Total number of bills disputed in first billing cycle		3	383	75	446	31	63	69	0	0	1123
Total number of valid billing complaints (billing cycle 1)		0	90	74	52	13	63	69	0	0	714
Total complaints considered invalid (billing cycle 1)		3	293	1	394	18	0	0	0	0	409
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.04%	0.08%	0.08%	0.82%	0.06%	0.10%	0.09%	0.00%	0.00%	0.13%
November											
Total bills generated during the second billing cycle		6589	459640	87752	55387	46666	63200	71813	10565	49936	874936
Total number of bills disputed in second billing cycle		8	472	59	382	33	54	60	1	0	929
Total number of valid billing complaints (billing cycle 2)		1	190	59	52	18	54	60	1	0	585
Total complaints considered invalid (billing cycle 2)		7	282	0	330	15	0	0	0	0	344
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.12%	0.10%	0.07%	0.69%	0.07%	0.09%	0.08%	0.01%	0.00%	0.11%

December											
Total bills generated during the third billing cycle		6762	449447	87425	57890	53902	60514	72089	10439	48639	900440
Total number of bills disputed in third billing cycle		1	378	49	466	50	54	64	0	0	740
Total number of valid billing complaints (billing cycle 3)		0	95	49	53	19	54	64	0	0	521
Total complaints considered invalid (billing cycle 3)		1	283	0	413	31	0	0	0	0	219
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.01%	0.08%	0.06%	0.80%	0.09%	0.09%	0.09%	0.00%	0.00%	0.08%

Data Source: Billing Center of the operators

Metering and billing credibility - Prepaid											
Performance prepaid	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of charging complaints (valid) - sum of 3 months		3366	243	1613	584	81	206	2919	0	1	1335
Total complaints considered invalid (sum of 3 months)		0	2769	14	3007	73	165	0	0	0	2493
Total number of charging complaints (sum of 3 months)		3366	3012	1627	3591	154	371	2919	0	1	3828
Total no of customers served (Sum of 3 months)		12052021	11523460	1991179	5984520	526395	2817156	9719642	634518	8692865	4463358
Percentage of charging complaints disputed	≤ 0.1%	0.03%	0.03%	0.08%	0.06%	0.03%	0.01%	0.03%	0.00%	0.00%	0.09%

Data Source: Billing Center of the operators

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of billing/charging complaints		3378	4245	1810	9029	399	707	3112	1	1	6620
Total number of complaints resolved in favour of customer		1	618	1795	4885	268	542	3112	1	1	3155
Total complaints considered invalid		3377	3627	15	4144	131	165	0	0	0	3465
Number of complaints resolved in 4 weeks		1	618	1795	4885	268	542	3112	1	1	3155
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Number of complaints resolved in 6 weeks		1	618	1795	4885	268	542	3112	1	1	3155
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		1	618	486	741	131	556	3112	1	1	335
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for resolution of billing complaints											
Resolution of billing complaints	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made		100	100	100	100	100	100	100	21	100	100
Number of cases resolved in 4 weeks		98	98	99	96	97	97	96	21	98	100
Percentage cases resolved in 4 weeks	≥ 98%	98.00%	98.00%	99.00%	96.00%	97.00%	97.00%	96.00%	100.00%	98.00%	100.00%
Number of cases resolved in 6 weeks		100	100	100	100	100	100	100	21	100	100
Percentage cases resolved in 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

## 11.2 CUSTOMER CARE

Audit results for customer care (IVR and voice-to-Voice) -Consolidated											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts to customer care for assistance		10354993	766697	1243871	4533454	956210	453111	3313555	34562	508512	7272276
Number of calls getting connected and answered (electronically)		10159453	766697	1204603	4500014	947174	441815	3229077	34336	504196	7272276
Percentage calls getting connected and answered	≥ 95%	98.11%	100.00%	96.84%	99.26%	99.06%	97.51%	97.45%	99.35%	99.15%	100.00%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls received (3 months)		2652885	1766124	163027	1575731	315955	352988	1046156	36495	759903	2504480
Total Number of calls answered within 90 seconds (3 months)		2567895	1546128	157219	1543371	308845	264783	776489	35974	711856	2417886
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	96.80%	87.54%	96.44%	97.95%	97.75%	75.01%	74.22%	98.57%	93.68%	96.54%
October											
Total calls received (Month 1)		972321	595805	44377	502754	105448	97056	395800	12140	267229	840974
Total calls answered within 90 seconds (Month 1)		942649	528217	42526	495536	104551	75760	295777	11951	242002	815012
% calls answered within 90 seconds (Month 1)	≥ 95%	96.95%	88.66%	95.83%	98.56%	99.15%	78.06%	74.73%	98.44%	90.56%	96.91%
November											
Total calls received (Month 2)		859946	593228	53941	512430	102318	125793	379750	12744	242510	825662
Total calls answered within 90 seconds (Month 2)		840657	550985	52291	496934	100240	95857	287306	12565	231541	793649
% calls answered within 90 seconds (Month 2)	≥ 95%	97.76%	92.88%	96.94%	96.98%	97.97%	76.20%	75.66%	98.60%	95.48%	96.12%
December											
Total calls received (Month 3)		820618	577091	64709	560547	108189	130139	270606	11611	250164	837844
Total calls answered within 90 seconds (Month 3)		784589	466926	62402	550901	104054	93166	193406	11458	238313	809225
% calls answered within 90 seconds (Month 3)	≥ 95%	95.61%	80.91%	96.43%	98.28%	96.18%	71.59%	71.47%	98.68%	95.26%	96.58%

Live calling results for customer care (IVR)											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts to customer care for assistance		100	100	100	100	100	100	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	95	100	100	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	95.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for customer care (Voice to Voice)											
Customer Care Assessment	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls received		100	100	95	100	100	100	100	100	100	100
Total Number of calls getting connected and answered		100	100	95	100	100	100	100	98	100	95
Live Calling Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.00%	100.00%	95.00%

### 11.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated											
Termination	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of closure request		167	6412	9291	4805	2413	1282	1687	883	3967	16754
Number of requests attended within 7 days		167	6412	9291	4805	2413	1282	1687	883	3967	16754
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Customer Service Center of the operators

### 11.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated											
Refund	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of cases requiring refund of deposits		165	770	91	1021	NA	1079	1476	139	393	20476
Total number of cases where refund was made within 60 days		165	770	91	1021	NA	1063	1476	139	393	14260
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	100.00%	100.00%	NA	98.52%	100.00%	100.00%	100.00%	69.64%

Data Source: Billing Center of the operators

## 11.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests										
Resolution of service requests	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made	100	100	100	100	100	100	100	100	100	100
Number of cases resolved to satisfaction	100	96	94	95	98	96	99	95	98	100
Percentage cases resolved in four weeks	100.00%	96.00%	94.00%	95.00%	98.00%	96.00%	99.00%	95.00%	98.00%	100.00%

Data Source: Live calls made by auditors from operator's network

## 11.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services											
Level 1 services		Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total no. of calls made		300	300	300	300	300	300	300	300	300	300
Calls answered		131	189	211	245	300	275	240	217	253	251
% of calls connected	≥ 95%	43.67%	63.00%	70.33%	81.67%	100.00%	91.67%	80.00%	72.33%	84.33%	83.67%

## 11.7 LEVEL 1 SERVICE CALLS MADE

All the numbers given in mandatory list in Section 2.4.2.4.1 were tested. The following table provides the numbers that are activated for each operator. A tick (✓) for an operator signifies that the number was active for the operator.

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		18	8
101	Fire	Y		18	7
102	Ambulance	Y		18	8
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		17	7
138	All India Helpline for Passangers	Y		18	7
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service	Y		17	8
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		18	7

1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		17	8
1073	Road Accident Helpline	Y		18	7
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		17	8
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		18	8
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board	Y		18	8
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway	Y		17	8
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	8
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		18	8
112012	National Do Not Call Registry	Y		17	8
11212	Complaint of Electricity		N		
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		18	8
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected

100	Police	Y		18	12
101	Fire	Y		18	11
102	Ambulance	Y		17	11
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline				
138	All India Helpline for Passangers	Y		18	11
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		17	11
1033	Road Accident Management Service	Y		17	12
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		17	11
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		18	11
1073	Road Accident Helpline	Y		17	11
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)		N		
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		18	11
101212	Central Accident and Trauma Services (CATS)		N		

10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board	Y		18	11
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		18	11
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	11
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		18	11
11212	Complaint of Electricity	Y		17	11
11216	Drinking Water Supply	Y		18	11
11250	Election Commission of India	Y		18	11
BSNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		30	21
101	Fire	Y		30	21
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		30	21
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		

182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		30	21
1071	Air Accident Helpline	Y		30	21
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		30	21
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		30	21
10121	Women Helpline	Y		30	22
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		

15100	Free Legal Service Helpline	Y		30	21
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		30	21
11216	Drinking Water Supply		N		
11250	Election Commission of India		N		
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		28	22
101	Fire	Y		27	23
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		28	23
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		

1070	Relief Commission for Natural Calamities	Y		27	23
1071	Air Accident Helpline	Y		27	23
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		27	22
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		28	23
10121	Women Helpline	Y		27	23
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		27	21
11212	Complaint of Electricity	Y		27	21
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		27	21
MTS					

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	16
101	Fire	Y		16	16
102	Ambulance	Y		15	15
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		16	16
138	All India Helpline for Passangers	Y		16	16
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		16	16
182	Indian Railway Security Helpline	Y		16	16
1033	Road Accident Management Service	Y		16	16
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		16	16
1073	Road Accident Helpline	Y		16	16
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		16	16
10121	Women Helpline		N		
10127	National AIDS Helpline to NACO	Y		16	16

101212	Central Accident and Trauma Services (CATS)	Y		16	16
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		16	16
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		16	16
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)	Y		15	15
112012	National Do Not Call Registry	Y		15	15
11212	Complaint of Electricity	Y		15	15
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		16	16
Reliance CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	10
101	Fire	Y		20	11
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		20	10
138	All India Helpline for Passangers	Y		20	10

1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		20	11
182	Indian Railway Security Helpline	Y		20	11
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		20	11
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		20	10
1073	Road Accident Helpline	Y		20	11
1077	Control Room for District Collector	Y		20	11
10120	Call Alart ( Crime Branch)	Y		20	10
10121	Women Helpline	Y		20	11
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)	Y		20	10
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		

1512	Prevention of Crime in Railway	Y		20	10
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		20	10
11216	Drinking Water Supply		N		
11250	Election Commission of India		N		
Reliance GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	16
101	Fire	Y		20	16
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		20	16
138	All India Helpline for Passangers	Y		20	16
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		20	16
182	Indian Railway Security Helpline	Y		20	16
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		

1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		20	16
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		20	16
1073	Road Accident Helpline	Y		20	16
1077	Control Room for District Collector	Y		20	16
10120	Call Alart ( Crime Branch)	Y		20	16
10121	Women Helpline	Y		20	16
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)	Y		20	16
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		20	16
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry		N		
11212	Complaint of Electricity	Y		20	16
11216	Drinking Water Supply		N		

11250	Election Commission of India		N		
TATA CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	15
101	Fire	Y		20	14
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		20	14
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	14
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		20	15
1071	Air Accident Helpline	Y		20	14
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	14
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		20	14

10121	Women Helpline	Y		20	15
10127	National AIDS Helpline to NACO	Y		20	14
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		20	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		20	15
11212	Complaint of Electricity	Y		20	14
11216	Drinking Water Supply	Y		20	15
11250	Election Commission of India	Y		20	15
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		25	22
101	Fire	Y		25	21
102	Ambulance		N		
104	Health Information Helpline		N		

108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		25	21
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		25	20
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		25	21
1071	Air Accident Helpline	Y		25	21
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		25	22
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		25	21
10121	Women Helpline	Y		25	21
10127	National AIDS Helpline to NACO		N		
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board		N		

10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		25	21
11212	Complaint of Electricity	Y		25	21
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		25	21
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	16
101	Fire	Y		18	16
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passangers	Y		18	16
1412	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		19	15
1033	Road Accident Management Service		N		

1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		18	16
1071	Air Accident Helpline	Y		19	16
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		19	16
1077	Control Room for District Collector		N		
10120	Call Alart ( Crime Branch)	Y		19	16
10121	Women Helpline	Y		19	16
10127	National AIDS Helpline to NACO	Y		19	15
101212	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
105812	Mother and Child Tracking ( MCTH)		N		
10740	Central Pollution Control Board	Y		19	16
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		19	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	16
155304	Municipal Corporations		N		

155214	Labour Helpline		N		
11203	Sashastra Seema Bal (SSB)		N		
112012	National Do Not Call Registry	Y		19	16
11212	Complaint of Electricity	Y		19	15
11216	Drinking Water Supply		N		
11250	Election Commission of India	Y		19	15

Live calls were made to the active numbers to test the calls answered. The details of the same have been given below for each operator.

*Data Source: Live calls made by auditors from operator's network*

## 11.8 COUNTER DETAILS

SI No.	KPI	Formula with Counter Description
1	CSSR= (No of established Calls / No of Attempted Calls)%	<p><b>No of established Calls</b> = ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)]+[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)])/<b>No of Attempted Calls</b> = ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Changeable)])</p>
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	<p><b>SDCCH Failure</b>= ([Channel Assignment Failures (All Channels Busy or Channels Unconfigured) in Immediate Assignment Procedure (SDCCH)] + [Failed Internal Intra-Cell Handovers (No Channel Available) (SDCCH)] + [Number of Unsuccessful Incoming Internal Inter-Cell Handovers (No Channel Available) (SDCCH)] + [Failed Incoming External Inter-Cell Handovers (No Channel Available) (SDCCH)])/<b>SDCCH attempts</b> = ([Channel Assignment Requests in Immediate Assignment Procedure (SDCCH)] + [Internal Intra-Cell Handover Requests (SDCCH)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)])</p>
3	TCH congestion= (TCH Failures /TCH Attempts)%	<p><b>TCH Failures</b>= ((Failed TCH Seizures due to Busy TCH (Signaling Channel))+([Failed Assignments (First Assignment, No Channel Available in Assignment Procedure)]+[Failed Assignments (First Assignment, No Channel Available in Directed Retry Procedure)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Assignment)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Directed Retry)])/<b>TCH Attempts</b> = ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Changeable)])</p>

4	Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)	<p><b><u>The total no of dropped calls=</u></b> ([Call Drops on Radio Interface in Stable State (Traffic Channel)] + [Call Drops on Radio Interface in Handover State (Traffic Channel)] + [Call Drops Due to No MR from MS for a Long Time (Traffic Channel)] + [Call Drops due to Abis Terrestrial Link Failure (Traffic Channel)] + [Call Drops due to Equipment Failure (Traffic Channel)] + [Call Drops due to Forced Handover (Traffic Channel)] + [Call Drops due to local switching Start Failure] + [Call Drops due to Failures to Return to Normal Call from local switching])/<b><u>Total no of calls successfully established (where traffic channel is allotted)=</u></b> ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)]+[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)])</p>
5	Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area	Above formula with counters being used in CBBH.
6	Connection with good quality voice= (Connection with good quality voice/Total voice samples)%	<p><b><u>Connection with good quality voice =</u></b> ((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)) /<b><u>Total voice samples=</u></b> ((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHF (Receive Quality Rank 6)+Number of MRs on Downlink TCHF (Receive Quality Rank 7)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 6)+Number of MRs on Downlink TCHH (Receive Quality Rank 7)))</p>

### 11.8.1 ERICSSON

Ericsson provides network support to Vodafone, Aircel, BSNL, Reliance CDMA and Reliance GSM in the circle.

SI No.	KPI	Ericsson
1	<b>CSSR= (No of established Calls / No of Attempted Calls)%</b>	CSSR (No of established Calls / No of Attempted Calls)=(TCASSALL/TASSALL)*100
2	<b>SDCCH congestion= (SDCCH Failure/SDCCH attempts)%</b>	SDCCH congestion (SDCCH Failure/SDCCH attempts)% = (CCONGS/CCALLS)*100
3	<b>TCH congestion= (TCH Failures /TCH Attempts)%</b>	TCH congestion (TCH Failures /TCH Attempts)%= (CNRELCONG+TNRELCONG)/TASSALL)*100
4	<b>Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)</b>	Call Drop Rate (Total no dropped calls/No of established calls)%= (TNDROP)/TCASSALL *100
5	<b>Call Drop Rate= (No of cells having call drop rate &gt;3% during CBBH in a month*100)/Total no of cells in the licensed service area</b>	Above formula with counters being used in CBBH.
6	<b>Connection with good quality voice= (Connection with good quality voice/Total voice samples)%</b>	Connection with good quality voice (Connection with good quality voice samples 0-5 /Total voice samples)= 100 * (QUAL50DL + QUAL40DL + QUAL30DL + QUAL20DL + QUAL10DL + QUAL00DL) / (QUAL70DL + QUAL60DL + QUAL50DL + QUAL40DL + QUAL30DL + QUAL20DL + QUAL10DL + QUAL00DL)

#### Ericsson Counters

Counter	Counter Description
TCASSALL	Number of assignment complete messages on TCH for all MS classes
TASSALL	Number of first assignment attempts on TCH for all MS classes.
CNRELCONG	Number of released connections on SDCCH due to TCH or Transcoder (TRA) congestion.
TNRELCONG	Number of released TCH signalling connections due to transcoder resource congestion during immediate assignment on TCH
CCONGS	Congestion counter for SDCCH. Stepped per congested allocation attempt.

CCALLS	Channel allocation attempt counter on SDCCH.
TNDROP	The total number of dropped TCH Connections.
QUAL00DL	Number of quality 0 reported on downlink.
QUAL10DL	Number of quality 1 reported on downlink.
QUAL20DL	Number of quality 2 reported on downlink.
QUAL30DL	Number of quality 3 reported on downlink.
QUAL40DL	Number of quality 4 reported on downlink.
QUAL50DL	Number of quality 5 reported on downlink.
QUAL60DL	Number of quality 6 reported on downlink.
QUAL70DL	Number of quality 7 reported on downlink.

### 11.8.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel in the circle.

Sl No.	KPI	NSN
1	CSSR= (No of established Calls / No of Attempted Calls)%	$\text{CSSR} = 100 - 100 * \frac{(\text{SDCCH\_BUSY\_ATT}) - (\text{TCH\_SEIZ\_DUE\_SDCCH\_CON}) + (\text{SDCCH\_RADIO\_FAIL}) + (\text{SDCCH\_RF\_OLD\_HO}) + (\text{SDCCH\_USER\_ACT}) + (\text{SDCCH\_BCSU\_RESET}) + (\text{SDCCH\_NETW\_ACT}) + (\text{SDCCH\_BTS\_FAIL}) + (\text{SDCCH\_LAPD\_FAIL}) + (\text{BLCK\_8I\_NOM})}{\{(\text{CH\_REQ\_MSG\_REC}) + (\text{PACKET\_CH\_REQ})\} - \{(\text{GHOST\_CCCH\_RES}) - (\text{REJ\_SEIZ\_ATT\_DUE\_DIST})\}}$
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	$\text{SDCCH congestion} = \frac{(\text{sdccch\_busy\_att} - \text{.tch\_seiz\_due\_sdccch\_con})}{\{(\text{CH\_REQ\_MSG\_REC}) + (\text{PACKET\_CH\_REQ})\} - \{(\text{GHOST\_CCCH\_RES}) - (\text{REJ\_SEIZ\_ATT\_DUE\_DIST})\}}$
3	TCH congestion= (TCH Failures /TCH Attempts)%	$\text{TCH congestion} = \frac{\text{BLCK\_8I\_NOM}}{\{(\text{TCH\_NORM\_SEIZ}) + (\text{MSC\_I\_SDCCH\_TCH\_AT}) + (\text{BSC\_I\_SDCCH\_TCH\_AT})\}}$

4	Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)	$\text{TCH Drop} = (\text{drop\_after\_tch\_assign}) - (\text{tch\_re\_est\_release}) / \{(\text{TCH\_NORM\_SEIZ}) + (\text{MSC\_I\_SDCCH\_TCH\_AT}) + (\text{BSC\_I\_SDCCH\_TCH\_AT})\}$
5	Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area	Above formula with counters being used in CBBH.
6	Connection with good quality voice= (Connection with good quality voice/Total voice samples)%	$\text{Connection with good quality voice} = \frac{(\text{FREQ\_DL\_QUAL0} + \text{FREQ\_DL\_QUAL1} + \text{FREQ\_DL\_QUAL2} + \text{FREQ\_DL\_QUAL3} + \text{FREQ\_DL\_QUAL4} + \text{FREQ\_DL\_QUAL5})}{(\text{FREQ\_DL\_QUAL0} + \text{FREQ\_DL\_QUAL1} + \text{FREQ\_DL\_QUAL2} + \text{FREQ\_DL\_QUAL3} + \text{FREQ\_DL\_QUAL4} + \text{FREQ\_DL\_QUAL5} + \text{FREQ\_DL\_QUAL6} + \text{FREQ\_DL\_QUAL7})}$

### 11.8.3 HUAWEI

Huawei provides network support to Idea, Tata GSM, Tata CDMA and MTS in the circle.

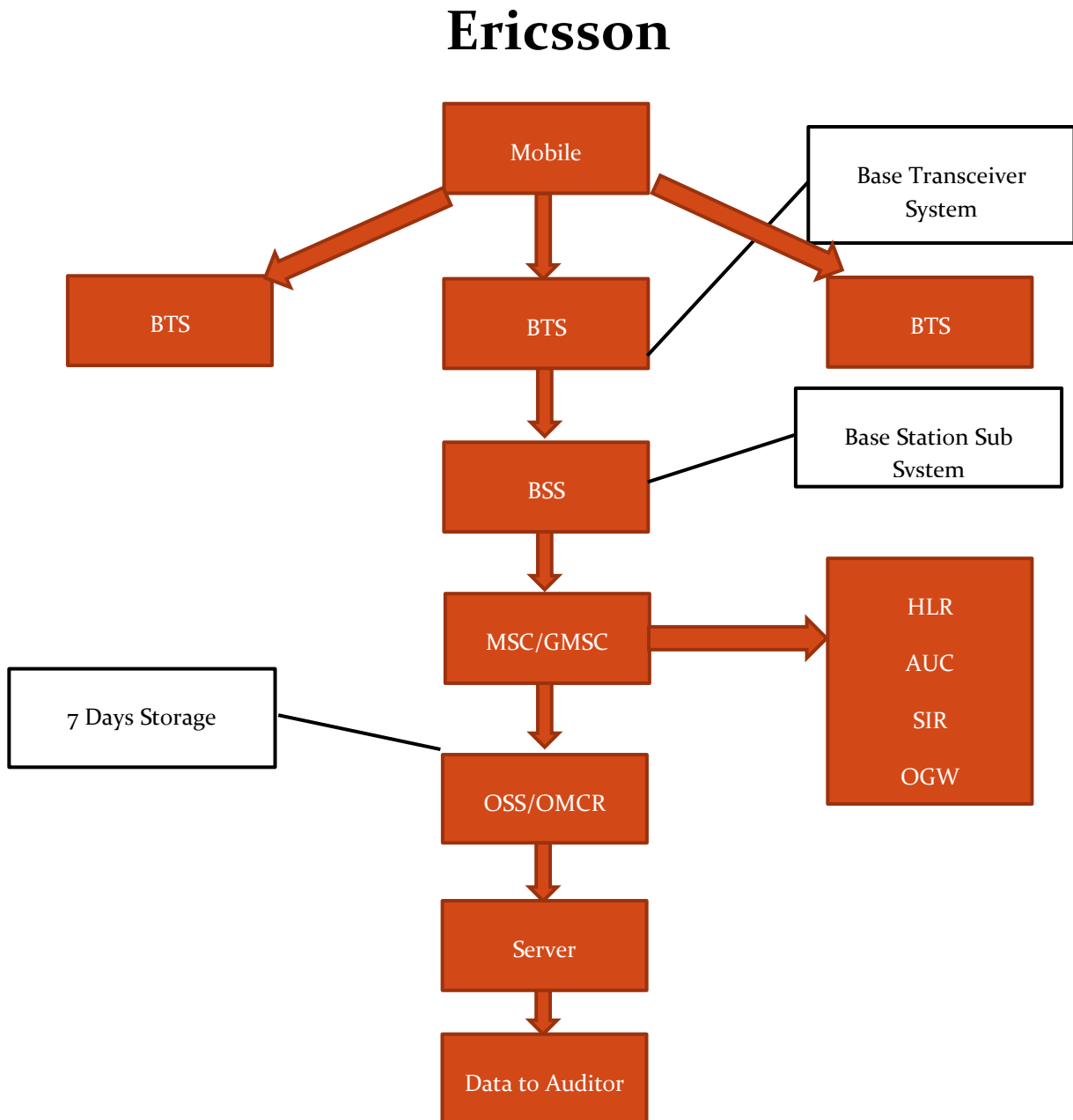
HUAWEI		
SR.NO	KPI	HUAWEI FORMULA
1	CALL SETUP SUCCES (NUM)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups] ([1157628567] + [1157628587] + [1157628568] + [1157628588] )
2	CALL SETUP SUCCES (DEN)	[CS IS-95 Orig Attempts + CS IS-2000 Orig Attempts + CS IS-95 Term Attempts + CS IS-2000 Term Attempts] ([1157628553] + [1157628573] + [1157628554] + [1157628574] )
3	CALL SETUP SUCCESS RATE (%)	CALL SETUP SUCCES (NUM) / CALL SETUP SUCCES (DEN) * 100\

4	CALL DROP RATE (NUM)	[CS IS-95 Call Drops (Too many Erasure frames) + CS IS-2000 Call Drops (Too many Erasure frames) + CS IS-95 Call Drops (No reverse frame received) + CS IS-2000 Call Drops (No reverse frame received) + CS IS-95 Call Drops (Abis interface abnormal) + CS IS-2000 Call Drops (Abis interface abnormal) + CS IS-95 Call Drops (A2 interface abnormal) + CS IS-2000 Call Drops (A2 interface abnormal) + CS IS-95 Call Drops (HHO fail) + CS IS-2000 Call Drops (HHO fail) + CS IS-95 Call Drops (Other causes) + CS IS-2000 Call Drops (Other causes)] $([1157628608] + [1157628614] + [1157628609] + [1157628615] + [1157628610] + [1157628616] + [1157628611] + [1157628617] + [1157628612] + [1157628618] + [1157628613] + [1157628619])$
5	CALL DROP RATE(DEN)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups + CS IS-95 Successful Incoming Hard HOs + CS IS-2000 Successful Incoming Hard HOs] $[1157628619] \times 100 / ([1157628567] + [1157628587] + [1157628568] + [1157628588] + [1157628569] + [1157628589])$
6	Call DROP Rate	CALL DROP RATE (NUM) / CALL DROP RATE(DEN) * 100\
7	RF BLOCK RATE (NUM)	{[(TCH Assignment Requests-CS Orig-IS95[Times] + TCH Assignment Requests-CS Orig-IS2000[Times] + TCH Assignment Requests-CS Term-IS95[Times] + TCH Assignment Requests-CS Term-IS2000[Times]) - (Successful TCH Assignments-CS Orig-IS95[Times] + Successful TCH Assignments-CS Orig-IS2000[Times] + Successful TCH Assignments-CS Term-IS95[Times] + Successful TCH Assignments-CS Term-IS2000[Times]) ]} $\{([1157628621 + 1157628628 + 1157628635 + 1157628642])\}$
8	RF BLOCK RATE (DEN)	{[(TCH Assignment Requests-CS Orig-IS95[Times] + TCH Assignment Requests-CS Orig-IS2000[Times] + TCH Assignment Requests-CS Term-IS95[Times] + TCH Assignment Requests-CS Term-IS2000[Times])]} $[([1157628621 + 1157628628 + 1157628635 + 1157628642])]$
9	RF BLOCK RATE	RF BLOCK RATE (NUM) / RF BLOCK RATE (DEN) *100
10	Call Quality (RFER)	CS Reverse Link Average FER of Carrier[%]

## 11.9 BLOCK SCHEMATIC DIAGRAMS

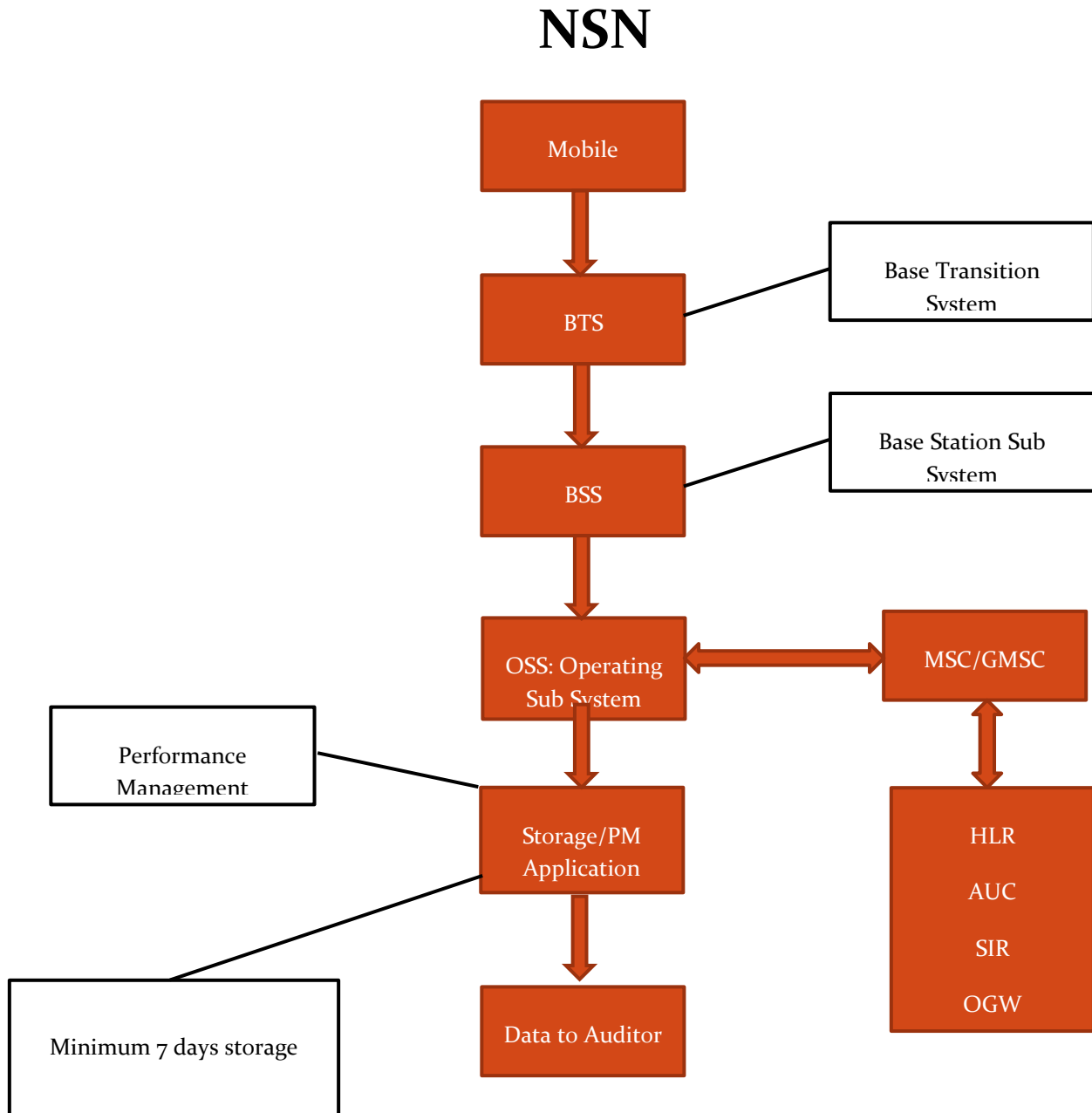
### 11.9.1 ERICSSON

Ericsson provides network support to Vodafone, Aircel, BSNL, Reliance CDMA and Reliance GSM in the circle.



### 11.9.2 NSN (NOKIA SIEMENS NETWORKS)

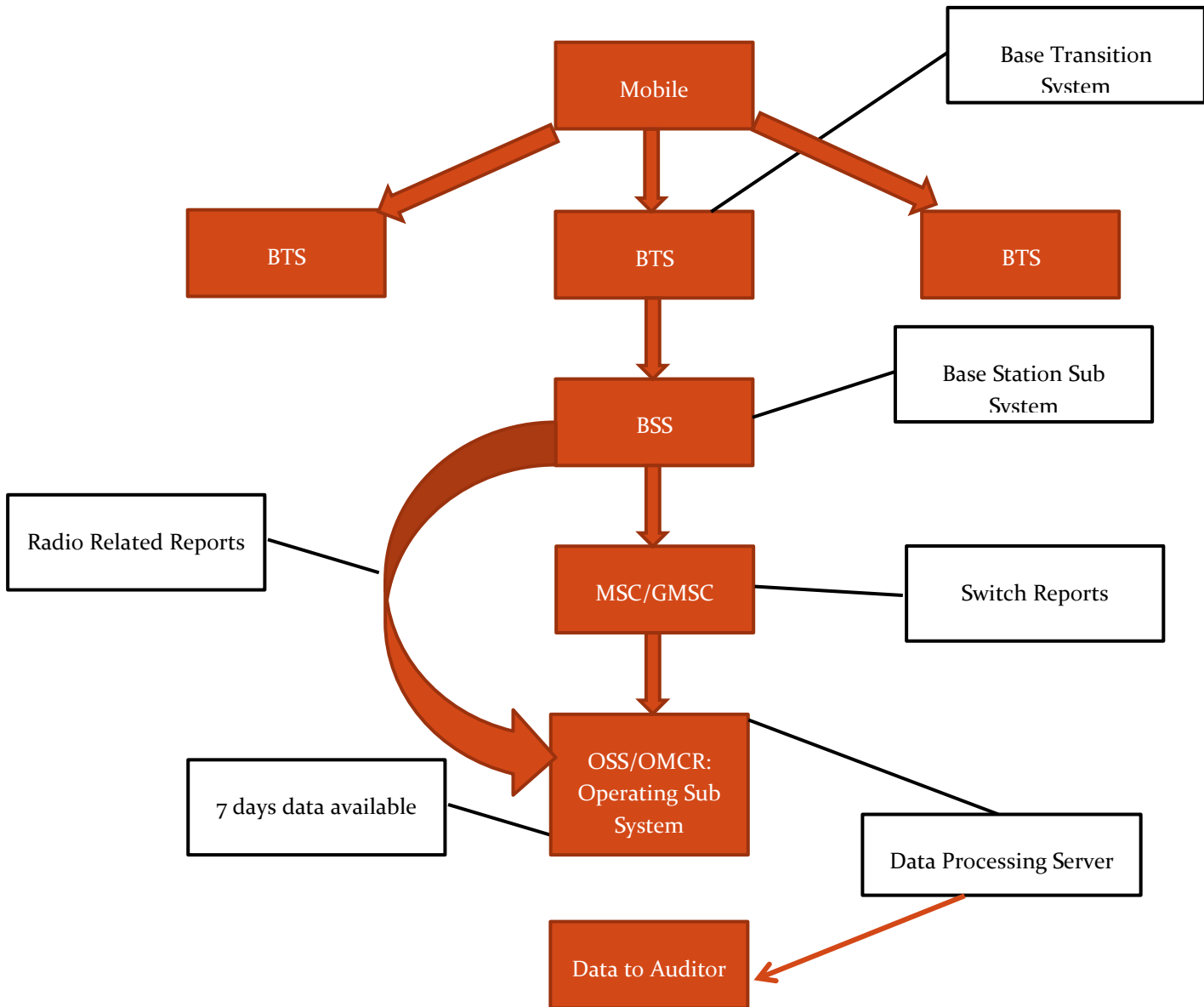
NSN provides network support to Airtel in the circle.



### 11.9.3 HUAWEI

Huawei provides network support to Idea, Tata GSM, Tata CDMA and MTS in the circle.

## Huawei



## 12 ANNEXURE – OCTOBER -2G

3 Day Live: -Reliance CDMA and Reliance GSM had a server issue in the month of October 2015 and November 2015 we could not able to conduct the audit, same has been intimated to TRAI by the operator.

Audit Results for Network Availability- PMR data-October											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2199	2729	1214	2146	571	472	1634	138	1811	7379
Sum of downtime of BTSs in a month (in hours)		3706	256	26351	2226	280	46897	1945	93	2938	2660
BTSs accumulated downtime (not available for service)	≤ 2%	0.23%	0.01%	2.92%	0.14%	0.07%	13.35%	0.16%	0.09%	0.22%	0.05%
Number of BTSs having accumulated downtime >24 hours		18	0	80	8	0	9	10	2	15	11
Worst affected BTSs due to downtime	≤ 2%	0.82%	0.00%	6.59%	0.37%	0.00%	1.91%	0.61%	1.45%	0.83%	0.15%
Live Measurement Results for Network Availability- 3 Day live data-October											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2199	2729	1214	2146	571	NDR	NDR	138	1811	7379
Sum of downtime of BTSs in a month (in hours)		233	9	1238	203	18	NDR	NDR	10	103	167
BTSs accumulated downtime (not available for service)	≤ 2%	0.15%	0.00%	1.42%	0.13%	0.04%	NDR	NDR	0.10%	0.08%	0.03%
Number of BTSs having accumulated downtime >24 hours		0	0	0	4	0	NDR	NDR	0	6	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.19%	0.00%	NDR	NDR	0.00%	0.33%	0.00%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-October											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.89%	99.34%	98.46%	99.39%	99.87%	97.51%	98.77%	98.81%	97.97%	99.35%
SDCCH/Paging channel congestion	≤ 1%	0.43%	0.03%	0.51%	0.07%	NA	NA	0.09%	NA	0.14%	0.47%
TCH congestion	≤ 2%	0.42%	0.02%	0.52%	0.21%	0.00%	1.19%	0.13%	0.18%	0.08%	0.65%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-October											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.30%	99.33%	99.01%	99.68%	99.88%	NDR	NDR	99.10%	98.61%	99.79%
SDCCH/Paging channel congestion	≤ 1%	0.41%	0.04%	1.37%	0.05%	NA	NA	NDR	NA	0.07%	0.39%
TCH congestion	≤ 2%	0.15%	0.02%	0.51%	0.11%	0.00%	NDR	NDR	0.13%	0.02%	0.21%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-October											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-October											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		72233404	89323466	201657754	49485767	13215569	17161988	33069452	1466831	56364682	456632417
Total number of calls dropped		491544	624710	3099797	153528	70889	42158	39963	8386	343933	3818492
Call drop rate	≤ 2%	0.68%	0.70%	1.54%	0.31%	0.54%	0.25%	0.12%	0.57%	0.61%	0.84%
Total number of cells in the network		6580	7996	3421	6411	2192	472	4914	456	5282	22106
Total number of cells having more than 3% TCH		157	202	90	30	41	9	25	13	126	631
Worst affected cells having more than 3% TCH	≤ 3%	2.39%	2.53%	2.63%	0.47%	1.87%	1.91%	0.51%	2.85%	2.39%	2.85%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-October											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		7087112	8330991	19144610	4702572	1250905	NDR	NDR	133372	5249304	10311734
Total number of calls dropped		46436	60823	190020	14167	1249321	NDR	NDR	800	32348	86609
Call drop rate	≤ 2%	0.66%	0.73%	0.99%	0.27%	0.41%	NDR	NDR	0.51%	0.55%	0.62%
Total number of cells in the network		6580	23967	3421	6410	2192	NDR	NDR	456	5282	22106
Total number of cells having more than 3% TCH		144	616	75	2	2	NDR	NDR	21	178	563
Worst affected cells having more than 3% TCH	≤ 3%	2.19%	2.57%	2.19%	0.03%	0.09%	NDR	NDR	4.61%	3.37%	2.55%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-October											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-October											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		14479059524	16708664	6000	7148267752	67923	NA	5878652808	92446754	7817491697	79091720060
Total number of calls with good voice quality		14102850002	15812290	5986	6942890356	67923	NA	5825065229	91732089	7672540624	75157641002
%age calls with good voice quality	≥ 95%	97.40%	97.47%	99.77%	97.13%	100.00%	99.23%	99.09%	99.23%	98.15%	95.03%
Live measurement results for Voice quality-3 Day data-October											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1431255379	1812420	600	730923268	6574	NDR	NDR	9562459	801961829	1648013331
Total number of calls with good voice quality		1395831315	1687211	595	709825516	6568	NDR	NDR	9491001	787926627	1598502007
%age calls with good voice quality	≥ 95%	97.85%	97.57%	99.17%	97.24%	99.91%	NDR	NDR	99.28%	98.57%	96.32%
Drive test results for Voice quality (Average of three drive tests) - DT data-October											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-October											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		42	31	77	90	40	12	29	44	29	49
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68444	80971	56220	61204	37488	8153	11877	25770	9851	358965
Traffic served for all POIs (B)- in erlangs		26260	36620	11364	29165	10679	2804	6750	10707	5138	179811
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-October											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		41	31	77	90	40	NDR	NDR	44	29	49
No. of POIs not meeting benchmark		0	0	0	0	0	NDR	NDR	0	0	0
Total Capacity of all POIs (A) - in erlangs		67492	242913	471903	61372	37481	NDR	NDR	25770	9851	359411
Traffic served for all POIs (B)- in erlangs		14175	114070	11940	28793	10958	NDR	NDR	10707	2641	79671
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NDR	NDR	0.00%	0.00%	0.00%

### 13 ANNEXURE – NOVEMBER-2G

3 Day Live: -Reliance CDMA and Reliance GSM had a server issue in the month of October 2015 and November 2015 we could not able to conduct the audit, same has been intimated to TRAI by the operator.

Audit Results for Network Availability- PMR data-November											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2201	2736	1235	2144	571	472	1634	138	1807	2638
Sum of downtime of BTSs in a month (in hours)		2501	426	24141	2236	157	17168	66787	104	0	1516
BTSs accumulated downtime (not available for service)	≤ 2%	0.16%	0.02%	2.71%	0.14%	0.04%	5.05%	5.68%	0.10%	0.00%	0.08%
Number of BTSs having accumulated downtime >24 hours		13	0	83	9	0	9	1	1	8	8
Worst affected BTSs due to downtime	≤ 2%	0.59%	0.00%	6.72%	0.42%	0.00%	1.91%	0.06%	0.72%	0.44%	0.30%
Live Measurement Results for Network Availability- 3 Day live data-November											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2199	2728	1235	2146	571	NDR	NDR	138	1807	2618
Sum of downtime of BTSs in a month (in hours)		282	95	590	181	22	NDR	NDR	12	272	67
BTSs accumulated downtime (not available for service)	≤ 2%	0.18%	0.05%	0.66%	0.12%	0.05%	NDR	NDR	0.12%	0.21%	0.04%
Number of BTSs having accumulated downtime >24 hours		0	0	6	3	0	NDR	NDR	0	2	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.49%	0.14%	0.00%	NDR	NDR	0.00%	0.11%	0.00%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-November											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.96%	99.35%	99.33%	99.47%	99.86%	97.42%	99.00%	98.83%	98.61%	99.65%
SDCCH/Paging channel congestion	≤ 1%	0.31%	0.02%	0.84%	0.09%	NA	NA	0.99%	NA	0.06%	0.03%
TCH congestion	≤ 2%	0.33%	0.02%	0.45%	0.26%	0.00%	1.19%	1.00%	0.23%	0.03%	0.35%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-November											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.29%	99.34%	99.47%	99.68%	99.88%	NDR	NDR	98.65%	98.65%	99.75%
SDCCH/Paging channel congestion	≤ 1%	0.39%	0.08%	1.43%	0.05%	NA	NA	NDR	NA	0.06%	0.04%
TCH congestion	≤ 2%	0.17%	0.04%	0.20%	0.09%	0.00%	NDR	NDR	0.65%	0.02%	0.25%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-November											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-November											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		68979191	86754473	122777900	49873898	12417778	16479155	154055860748516	1345905	53514749	102530933
Total number of calls dropped		427707	582822	833900	157065	68126	40586	37047	7134	312630	824654
Call drop rate	≤ 2%	0.62%	0.67%	0.68%	0.31%	0.55%	0.25%	0.00%	0.53%	0.58%	0.80%
Total number of cells in the network		6610	8036	3554	6405	2192	472	4914	456	5272	6796
Total number of cells having more than 3% TCH		143	204	83	26	45	8	35	13	114	176
Worst affected cells having more than 3% TCH	≤ 3%	2.16%	2.54%	2.34%	0.41%	2.05%	1.69%	0.71%	2.85%	2.16%	2.59%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-November											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		103294728	9047705	18184486	6115802	1320676	NDR	NDR	140384	5505290	10855101
Total number of calls dropped		539258	66192	96766	13019	6855	NDR	NDR	706	32616	88287
Call drop rate	≤ 2%	0.52%	0.73%	0.53%	0.27%	0.41%	NDR	NDR	0.49%	0.54%	0.70%
Total number of cells in the network		6586	23979	3421	6411	2192	NDR	NDR	456	5282	6721
Total number of cells having more than 3% TCH		146	601	80	2	45	NDR	NDR	19	124	173
Worst affected cells having more than 3% TCH	≤ 3%	2.22%	2.51%	2.34%	0.03%	2.05%	NDR	NDR	4.17%	2.35%	2.57%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-November											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-November											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		13688391380	29834460235	6000	7314160069	65760	NA	5788817560	93681159	7781080008	15843556519
Total number of calls with good voice quality		13339181284	29099177522	5986	7106252291	65760	NA	5736095774	92991530	7653834434	15354458420
%age calls with good voice quality	≥ 95%	97.45%	97.54%	99.77%	97.16%	100.00%	99.29%	99.09%	99.26%	98.36%	96.91%
Live measurement results for Voice quality-3 Day data-November											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1481152358	1574910378	600	742520240	6576	NDR	NDR	9898729	826999429	1712646524
Total number of calls with good voice quality		1444440015	1536613110	594	721515211	6569	NDR	NDR	9826189	813076845	1662428726
%age calls with good voice quality	≥ 95%	97.93%	97.57%	99.00%	97.28%	99.89%	NDR	NDR	99.28%	98.61%	97.41%
Drive test results for Voice quality (Average of three drive tests) - DT data-November											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-November											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	77	90	40	12	29	44	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		69375	81079	465723	55568	37345	8153	11877	25409	9851	186378
Traffic served for all POIs (B)- in erlangs		26476	37470	11288	25695	10717	2798	6616	10933	5128	90044
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		42	31	77	90	40	NDR	NDR	44	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	NDR	NDR	0	0	0
Total Capacity of all POIs (A) - in erlangs		68471	212913	485641	61372	37481	NDR	NDR	25616	9731	186518
Traffic served for all POIs (B)- in erlangs		14944	120282	12411	29853	11411	NDR	NDR	6719	2722	51779
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NDR	NDR	0.00%	0.00%	0.00%

## 14 ANNEXURE – DECEMBER-2G

Audit Results for Network Availability- PMR data-December											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2214	2737	1253	2145	571	456	1634	140	1809	2663
Sum of downtime of BTSs in a month (in hours)		3094	238	23068	1633	252	418	499875	20	2361	838
BTSs accumulated downtime (not available for service)	≤ 2%	0.19%	0.01%	2.47%	0.10%	0.06%	0.12%	0.69%	0.02%	0.18%	0.04%
Number of BTSs having accumulated downtime >24 hours		17	0	78	6	0	0	0	0	12	4
Worst affected BTSs due to downtime	≤ 2%	0.77%	0.00%	6.23%	0.28%	0.00%	0.00%	0.00%	0.00%	0.66%	0.15%
Live Measurement Results for Network Availability- 3 Day live data-December											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2213	2733	1235	2144	570	456	1634	138	1807	2638
Sum of downtime of BTSs in a month (in hours)		221	32	1371	208	44	24	147	5	136	74
BTSs accumulated downtime (not available for service)	≤ 2%	0.14%	0.02%	1.54%	0.13%	0.11%	0.07%	0.12%	0.05%	0.10%	0.04%
Number of BTSs having accumulated downtime >24 hours		0	0	24	3	0	0	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	1.94%	0.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-December											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	97.82%	99.36%	99.09%	99.57%	99.87%	96.93%	98.92%	98.97%	98.59%	99.62%
SDCCH/Paging channel congestion	≤ 1%	0.47%	0.02%	0.52%	0.10%	NA	NA	0.10%	NA	0.06%	0.06%
TCH congestion	≤ 2%	0.54%	0.03%	1.44%	0.17%	0.00%	1.18%	0.07%	0.20%	0.05%	0.38%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-December											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
CSSR	≥ 95%	98.21%	99.36%	99.20%	99.68%	99.90%	97.03%	99.46%	99.28%	98.55%	99.70%
SDCCH/Paging channel congestion	≤ 1%	0.51%	0.02%	0.81%	0.05%	NA	NA	0.08%	NA	0.05%	0.06%
TCH congestion	≤ 2%	0.41%	0.03%	1.69%	0.10%	0.00%	1.16%	0.01%	0.01%	0.04%	0.30%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-December											
CSSR	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of call attempts		1327	NDR	1351	1537	1345	1008	1235	1277	1514	1290
Total number of successful calls established		1315	NDR	1279	1533	1345	983	1226	1277	1467	1290
CSSR	≥ 95%	99.10%	NDR	94.67%	99.74%	100.00%	97.52%	99.27%	100.00%	96.90%	100.00%
%age blocked calls		0.90%	NDR	5.33%	0.26%	0.00%	2.48%	0.73%	0.00%	3.10%	0.00%

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-December											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		72338917	90504920	36369112	57480051	12553035	19594710	33172929	1316981	55531338	108396854
Total number of calls dropped		477995	623119	374126	198133	64557	53544	33387	6855	346683	938850
Call drop rate	≤ 2%	0.66%	0.69%	1.03%	0.34%	0.51%	0.27%	0.10%	0.52%	0.62%	0.87%
Total number of cells in the network		6628	8064	3553	6409	2194	1368	4914	457	5300	6845
Total number of cells having more than 3% TCH		146	237	81	31	43	8	16	12	129	203
Worst affected cells having more than 3% TCH	≤ 3%	2.20%	2.94%	2.28%	0.48%	1.94%	0.61%	0.32%	2.60%	2.43%	2.97%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-December											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		6719040	8712514	17030480	5465152	1189356	1984304	3297928	121779	5311114	10412759
Total number of calls dropped		44882	61460	141539	17594	5965	5571	3029	654	34337	92913
Call drop rate	≤ 2%	0.57%	0.71%	0.83%	0.28%	0.38%	0.24%	0.08%	0.44%	0.58%	0.75%
Total number of cells in the network		6629	24141	3549	6405	2189	1368	4914	456	5292	6809
Total number of cells having more than 3% TCH		150	598	80	2	2	7	2	23	130	200
Worst affected cells having more than 3% TCH	≤ 3%	2.26%	2.48%	2.26%	0.04%	0.08%	0.53%	0.05%	5.00%	2.46%	2.94%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-December											
Call drop rate	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of calls established		1315	NDR	1279	1533	1344	1008	1235	1277	1467	1290
Total number of calls dropped		4	NDR	20	3	2	14	5	0	4	0
Call drop rate	≤ 2%	0.30%	NDR	1.56%	0.20%	0.15%	1.39%	0.41%	0.00%	0.27%	0.00%

Audit Results for Voice quality -PMR Data-December											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		14668271616	16320908961	6000	7954941730	67879	NA	6508653949	96248724	8307468330	17290181870
Total number of calls with good voice quality		14264647856	15901066263	5986	7740640090	67846	NA	6452998288	95554313	8173595809	16767697423
%age calls with good voice quality	≥ 95%	97.25%	97.43%	99.77%	97.31%	99.95%	98.56%	99.14%	99.28%	98.39%	96.98%
Live measurement results for Voice quality-3 Day data-December											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1394628776	1572297469	600	760611919	6567	NA	643333420	8959190	802289433	1672490807
Total number of calls with good voice quality		1354928676	1531689810	594	740602502	6564	NA	638063566	8895827	789053453	1622031012
%age calls with good voice quality	≥ 95%	97.61%	97.42%	99.00%	97.56%	99.88%	99.21%	99.25%	99.33%	99.55%	97.40%
Drive test results for Voice quality (Average of three drive tests) - DT data-December											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		336624	NDR	1997060	2205819	NA	NA	14489	NA	2846295	338683
Total number of calls with good voice quality		308589	NDR	1841767	2084544	NA	NA	13069	NA	2808970	331941
%age calls with good voice quality	≥ 95%	91.67%	NDR	92.22%	94.50%	97.50%	87.77%	90.20%	96.96%	98.69%	98.01%

Audit Results for POI Congestion- PMR data-December											
POI congestion	Benchmark	AirceI	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	31	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68263	81330	444621	55768	37172	8153	11877	22270	12319	189777
Traffic served for all POIs (B)- in erlangs		26873	39338	11178	31518	10941	2873	4887	9232	6910	94981
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-December											
POI congestion	Benchmark	AirceI	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		49	32	79	94	40	12	29	41	31	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		68064	243250	450031	55925	36807	8153	250096	22263	12895	189650
Traffic served for all POIs (B)- in erlangs		14209	117250	11615	30799	10660	1502	85900	5393	3699	49970
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

## 15 ANNEXURE – OCTOBER -3G

Audit Results for Network Availability- PMR data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		1430	NDR	663	2598
Sum of downtime (i.e. total outage time) of Node Bs		2301	NDR	14851	794
Node Bs downtime (not available for service)	≤ 2%	0.22%	NDR	3.01%	0.04%
Number of Node Bs having accumulated downtime of >24 hours in a month		10	NDR	48	4
Worst affected Node Bs due to downtime	≤ 2%	0.70%	NDR	7.24%	0.15%
Live Measurement Results for Network Availability- 3 Day live data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		1430	NDR	NDR	2593
Sum of downtime (i.e. total outage time) of Node Bs		117	NDR	NDR	153
Node Bs downtime (not available for service)	≤ 2%	0.11%	NDR	NDR	0.08%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	NDR	NDR	2
Worst affected Node Bs due to downtime	≤ 2%	0.00%	NDR	NDR	0.08%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	99.03%	NDR	98.76%	99.99%
RRC Congestion	≤ 1%	0.58%	NDR	1.24%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.16%	NDR	0.83%	0.15%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	97.98%	NDR	NDR	100.00%
RRC Congestion	≤ 1%	2.09%	NDR	NDR	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.09%	NDR	NDR	0.00%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of RRC attempts (A)		NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		10959533	NDR	NA	35355006
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		35480	NDR	NA	114725
Call drop rate (B/A*100)	≤ 2%	0.32%	NDR	NA	0.32%
Total no. of cells in the licensed service area (B)		4266	NDR	1943	7573
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		113	NDR	6	162
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.65%	NDR	0.31%	2.13%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		16662264	NDR	NDR	375287362
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		59076	NDR	NDR	162543
Call drop rate (B/A*100)	≤ 2%	0.35%	NDR	NDR	0.04%
Total no. of cells in the licensed service area (B)		4267	NDR	NDR	7573
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		85	NDR	NDR	7
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.00%	NDR	NDR	0.09%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-October					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Call drop rate					
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-October					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		52975561954	NDR	NDR	45820613855
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		52380557191	NDR	NDR	45500304700
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.88%	NDR	NDR	99.30%
Live measurement results for Voice quality-3 Day data-October					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		6192602218	NDR	NDR	4844320963
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		6120687871	NDR	NDR	4796604530
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.84%	NDR	NDR	98.84%
Drive test results for Voice quality (Average of three drive tests) - DT data-October					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-October					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		42	NDR	77	49
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		68443	NDR	56220	358965
Traffic served for all POIs (B)- in erlangs		26259	NDR	11364	179811
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-October					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		42	NDR	77	49
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		68443	NDR	56220	359411
Traffic served for all POIs (B)- in erlangs		14376	NDR	11364	79670
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%

## 16 ANNEXURE – NOVEMBER-3G

Audit Results for Network Availability- PMR data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		1572	NDR	668	2613
Sum of downtime (i.e. total outage time) of Node Bs		1180	NDR	14088	1005
Node Bs downtime (not available for service)	≤ 2%	0.10%	NDR	2.83%	0.05%
Number of Node Bs having accumulated downtime of >24 hours in a month		6	NDR	42	6
Worst affected Node Bs due to downtime	≤ 2%	0.38%	NDR	6.29%	0.23%
Live Measurement Results for Network Availability- 3 Day live data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		1430	NDR	668	2598
Sum of downtime (i.e. total outage time) of Node Bs		215	NDR	489	50
Node Bs downtime (not available for service)	≤ 2%	0.21%	NDR	1.02%	0.03%
Number of Node Bs having accumulated downtime of >24 hours in a month		3	NDR	10	0
Worst affected Node Bs due to downtime	≤ 2%	0.21%	NDR	1.50%	0.00%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	98.98%	NDR	99.81%	99.99%
RRC Congestion	≤ 1%	0.54%	NDR	0.19%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.12%	NDR	1.26%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	98.19%	NDR	94.06%	99.99%
RRC Congestion	≤ 1%	98.13%	NDR	0.34%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.08%	NDR	1.69%	0.15%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR					
Total number of RRC attempts (A)		NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		13262716	NDR	4891857	36750483
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		40960	NDR	34891	121074
Call drop rate (B/A*100)	≤ 2%	0.31%	NDR	0.71%	0.33%
Total no. of cells in the licensed service area (B)		4686	NDR	1613	7645
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		119	NDR	128	162
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.54%	NDR	7.94%	2.12%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		1378277	NDR	478483	3835503
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		4287	NDR	3760	12246
Call drop rate (B/A*100)	≤ 2%	0.31%	NDR	0.79%	0.34%
Total no. of cells in the licensed service area (B)		4675	NDR	1607	7573
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		120	NDR	66	7
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.57%	NDR	4.13%	0.09%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-November					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Call drop rate					
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA

Audit Results for Voice quality -PMR Data-November					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		51434482482	NDR	6000	82195230391
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		50863335146	NDR	5986	81249235423
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.89%	NDR	99.77%	98.85%
Live measurement results for Voice quality-3 Day data-November					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		4957159332	NDR	6000	8431044940
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		4901756659	NDR	5986	8335982583
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.86%	NDR	99.77%	98.87%
Drive test results for Voice quality (Average of three drive tests) - DT data-November					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA

Audit Results for POI Congestion- PMR data-November					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		49	NDR	77	45
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		69375	NDR	465723	186378
Traffic served for all POIs (B)- in erlangs		26476	NDR	11288	90044
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-November					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		42	NDR	77	45
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		68471	NDR	485641	186518
Traffic served for all POIs (B)- in erlangs		14944	NDR	12411	51779
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%

## 17 ANNEXURE – DECEMBER-3G

Audit Results for Network Availability- PMR data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		1630	NDR	697	2618
Sum of downtime (i.e. total outage time) of Node Bs		2235	NDR	13990	963
Node Bs downtime (not available for service)	≤ 2%	0.18%	NDR	2.70%	0.05%
Number of Node Bs having accumulated downtime of >24 hours in a month		15	NDR	39	2
Worst affected Node Bs due to downtime	≤ 2%	0.92%	NDR	5.60%	0.08%
Live Measurement Results for Network Availability- 3 Day live data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
(Number of Node Bs in the network in the licensed service area		1607	NDR	668	2613
Sum of downtime (i.e. total outage time) of Node Bs		170	NDR	907	120
Node Bs downtime (not available for service)	≤ 2%	0.15%	NDR	1.89%	0.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	NDR	12	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	NDR	1.80%	0.00%

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	98.25%	NDR	95.70%	99.98%
RRC Congestion	≤ 1%	0.98%	NDR	1.14%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.25%	NDR	5.50%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
CSSR	≥ 95%	97.70%	NDR	96.23%	99.97%
RRC Congestion	≤ 1%	2.23%	NDR	0.70%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.21%	NDR	2.76%	0.02%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of RRC attempts (A)		838	NDR	1259	1359
Total number of RRC established (B)		838	NDR	1238	1359
Call setup success rate (B/A*100)	≥ 95%	100.00%	NDR	98.33%	100.00%
%age blocked calls		0.00%	NDR	1.67%	0.00%

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		14364392	NDR	116366133	39057931
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		49635	NDR	1405150	132175
Call drop rate (B/A*100)	≤ 2%	0.35%	NDR	1.21%	0.34%
Total no. of cells in the licensed service area (B)		4880	NDR	2215	7669
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		144	NDR	48	163
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.95%	NDR	2.17%	2.12%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total calls successfully established (A) (Number of voice RAB normally released)		1440345	NDR	2185037	3871472
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		4798	NDR	7886	13412
Call drop rate (B/A*100)	≤ 2%	0.35%	NDR	0.36%	0.37%
Total no. of cells in the licensed service area (B)		4872	NDR	2212	7661
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		135	NDR	11	175
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.77%	NDR	0.48%	2.28%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-December					
	Benchmark	Aircel	Airtel	BSNL	Vodafone
Call drop rate					
Total calls successfully established (A) (Number of voice RAB normally released)		1228	NDR	1237	1359
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		6	NDR	15	0
Call drop rate (B/A*100)	≤ 2%	0.49%	NDR	1.21%	0.00%

Audit Results for Voice quality -PMR Data-December					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		71878062792	NDR	6000	87048226242
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		71863687179	NDR	5986	86047171640
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.98%	NDR	99.77%	98.85%
Live measurement results for Voice quality-3 Day data-December					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		6744590800	NDR	600	8566787451
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		6639196252	NDR	594	8468659204
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.44%	NDR	99.00%	98.85%
Drive test results for Voice quality (Average of three drive tests) - DT data-December					
Voice quality	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		601533	NDR	1923043	116580
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		557944	NDR	1756572	110736
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	92.75%	NDR	91.34%	94.99%

Audit Results for POI Congestion- PMR data-December					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		49	NDR	79	45
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		68263	NDR	444621	189777
Traffic served for all POIs (B)- in erlangs		26873	NDR	11178	94981
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-December					
POI congestion	Benchmark	Aircel	Airtel	BSNL	Vodafone
Total number of working POIs		49	NDR	79	45
No. of POIs not meeting benchmark		0	NDR	0	0
Total Capacity of all POIs (A) - in erlangs		1678902	NDR	450031	189180
Traffic served for all POIs (B)- in erlangs		350549	NDR	11615	50230
POI congestion	≤ 0.5%	0.00%	NDR	0.00%	0.00%

## 18 ABBREVIATIONS

Following terms/abbreviations have been used in this report. This section provides meaning of the abbreviations used in the report.

1. TRAI – Telecom Regulatory Authority of India
2. QoS – Quality of Service
3. AMJ'15 – Refers to the quarter of October , November and December 2015
4. IMRB – Refers to IMRB International, the audit agency for this report
5. SSA – Secondary Switching Area
6. NOC – Network Operation Center
7. OMC – Operations and Maintenance Center
8. MSC – Mobile Switching Center
9. PMR – Performance Monitoring Reports
10. TCBH – Time Consistent Busy Hour
11. CBBH - Cell Bouncing Busy Hour
12. BTS – Base Transceiver Station
13. CSSR – Call Setup Success Rate
14. TCH – Traffic Channel
15. SDCCCH – Standalone Dedicated Control Channel
16. CDR – Call Drop Rate
17. FER – Frame Error Rate
18. SIM – Subscriber Identity Module
19. GSM – Global System for Mobile
20. CDMA – Code Division Multiple Access
21. NA – Not Applicable
22. NC – Non Compliance
23. POI – Point of Interconnection
24. IVR – Interactive Voice Response
25. STD – Standard Trunk Dialing
26. ISD – International Subscriber Dialing



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