TRAI Audit Wireless Report for Kolkata Circle

QE September 2016

EAST ZONE

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Submitted to:

TRAI

Telecom Regulatory Authority of India

(IS/ISO 9001-2008 Certified Organisation)

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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).

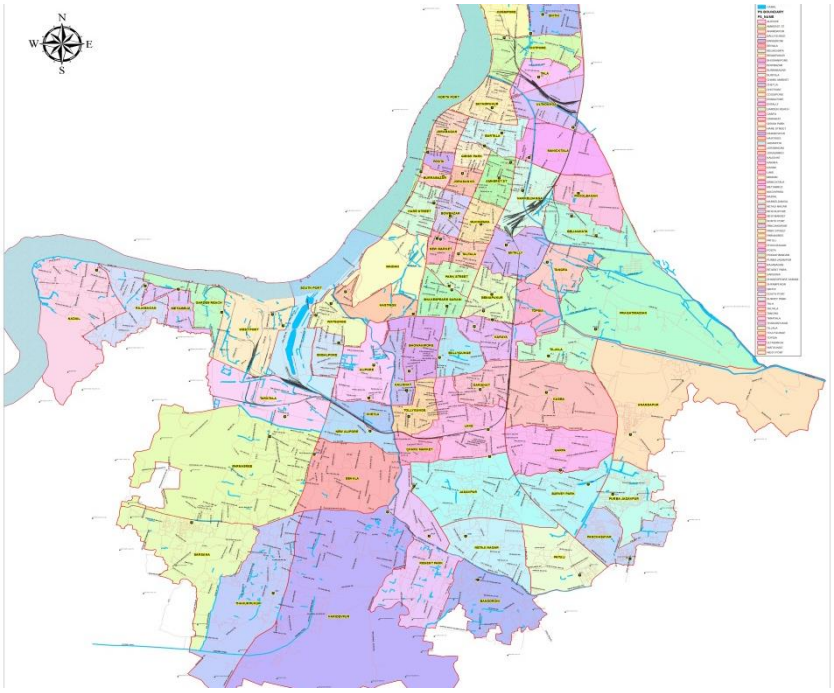
2.2 OBJECTIVES

The primary objective of the Audit module is to-

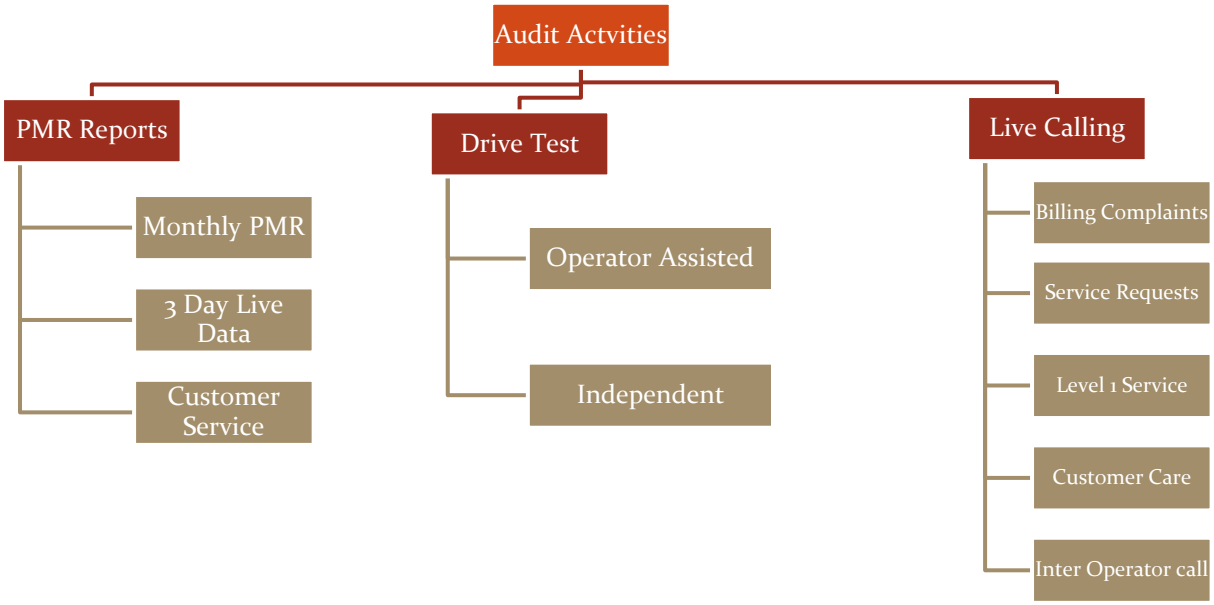
- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).
- This report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

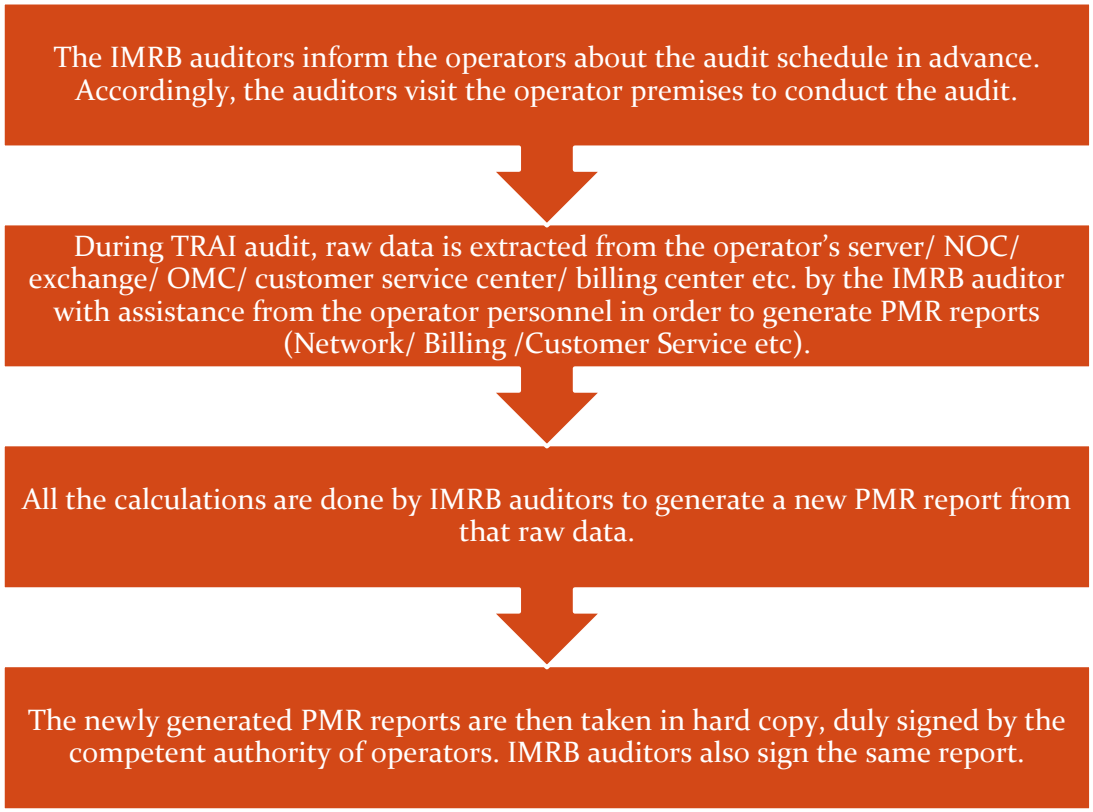


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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, July 2016 audit data was collected in the month of August 2016.

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 September 2016 (JAS'16) was collected in the month of October 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 July, August and September 2016. 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)**	**≤ 2%**
	Worst affected BTSs due to downtime	**≤ 2%**
Connection Establishment (Accessibility)	**Call Set-up Success Rate (within licensee's own network)**	**≥ 95%**
	SDCCH/ Paging Chl. Congestion (%age)	**≤ 1%**
	TCH Congestion (%age)	**≤ 2%**
Connection Maintenance (Retainability)	**Call Drop Rate (%age)**	**≤ 2%**
	Worst affected cells having more than 3% TCH drop	**≤ 3%**
	%age of connection with good voice quality	**≥ 95%**
	Point of Interconnection (POI)	**≤ 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 July, August and September 2016. 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-

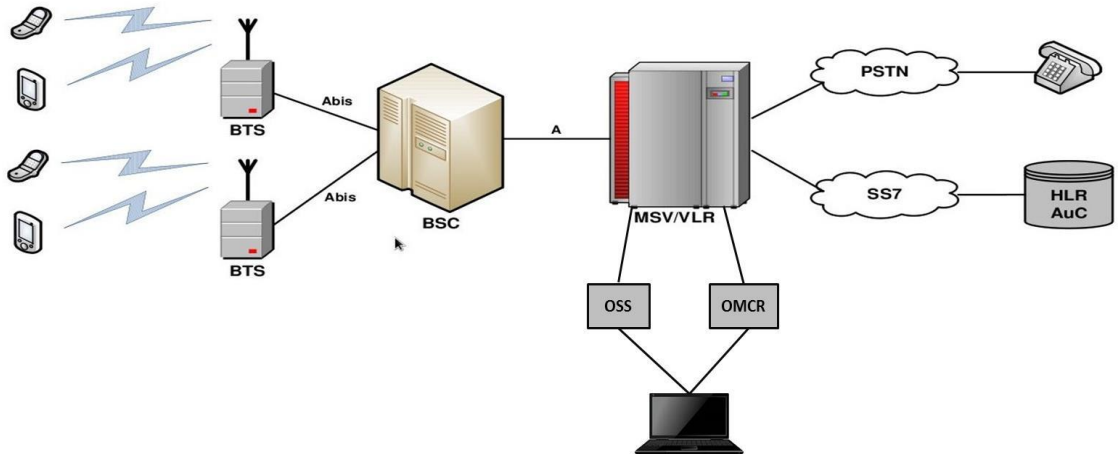
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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%

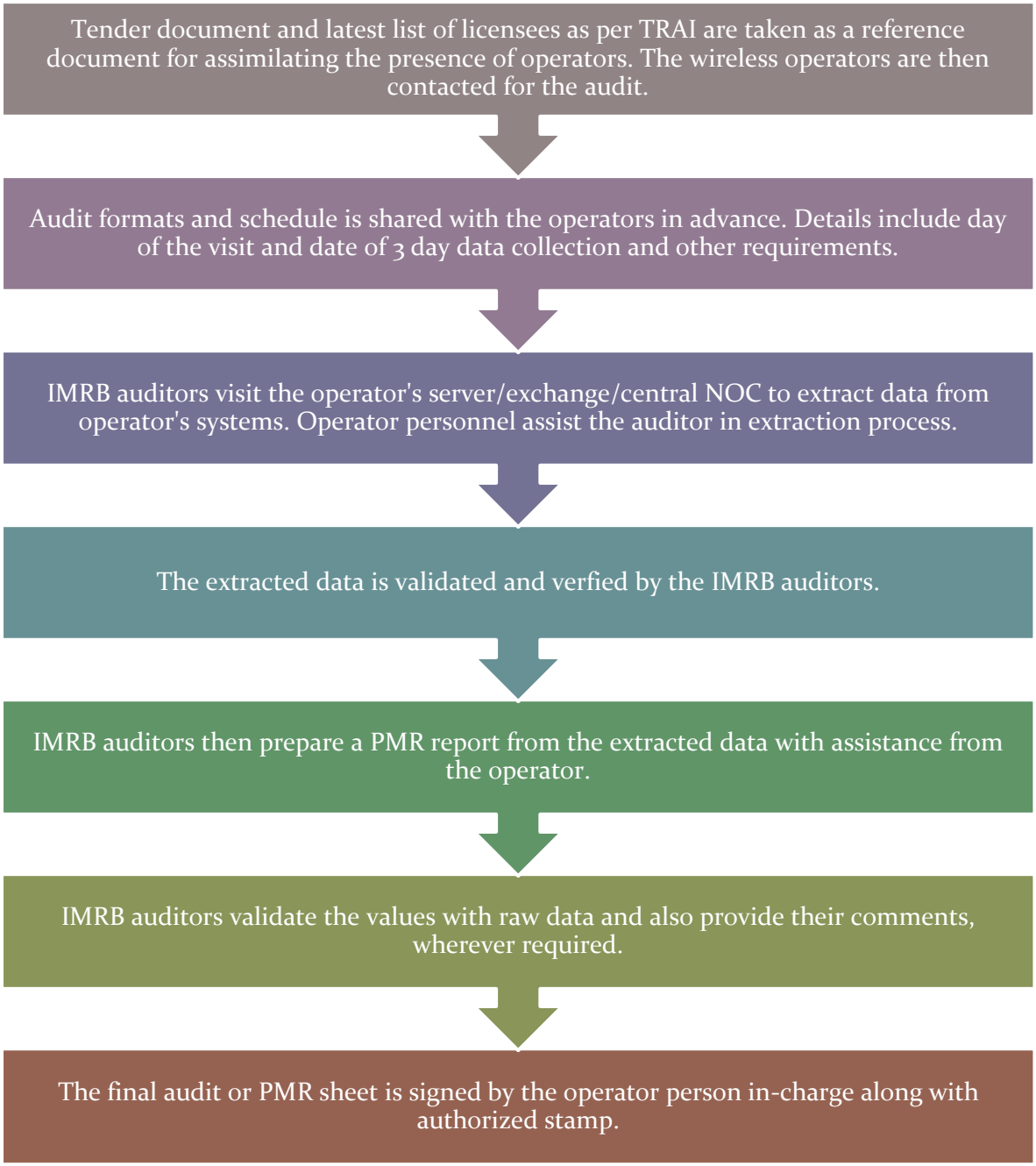
2.4.1.8 POINT OF DATA EXTRACTION

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
BTS Accumulated Downtime	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
Worst Affected BTS Due to Downtime	(Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) * 100
Call Setup Success Rate	(Calls Established / Total Call Attempts) * 100
SDCCH/ Paging Channel Congestion	SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = Number of attempts to establish SDCCH / TCH made on day 1 C1 = Average SDCCH / TCH Congestion % on day 1 A2 = Number of attempts to establish SDCCH / TCH made on day 2 C2 = Average SDCCH / TCH Congestion % on day 2 An = Number of attempts to establish SDCCH / TCH made on day n Cn = Average SDCCH / TCH Congestion % on day n
TCH Congestion	
POI Congestion	POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = POI traffic offered on all POIs (no. of calls) on day 1 C1 = Average POI Congestion % on day 1 A2 = POI traffic offered on all POIs (no. of calls) on day 2 C2 = Average POI Congestion % on day 2 An = POI traffic offered on all POIs (no. of calls) on day n Cn = Average POI Congestion % on day n
Call Drop Rate	Total Calls Dropped / Total Calls Established x 100
Worst Affected Cells having more than 3% TCH drop	Total number of cells having more than 3% TCH drop during CBBH/ Total number of cells in the LSA x 100
Connections with good voice quality	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
Node Bs Accumulated Downtime	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
Worst Affected Node Bs Due to Downtime	(Number of Node Bs having accumulated downtime greater than 24 hours in a month / Number of Node B in Licensed Service Area) * 100
Call Setup Success Rate	(RRC Established / Total RRC Attempts) * 100
RRC Congestion	RRC / RAB Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = Number of attempts to establish RRC/ RAB made on day 1 C1 = Average RRC/ RAB Congestion % on day 1 A2 = Number of attempts to establish RRC/ RAB made on day 2 C2 = Average RRC/ RAB Congestion % on day 2 An = Number of attempts to establish RRC/ RAB made on day n Cn = Average RRC/ RAB Congestion % on day n
Circuit Switched RAB Congestion	
POI Congestion	POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = POI traffic offered on all POIs (no. of calls) on day 1 C1 = Average POI Congestion % on day 1 A2 = POI traffic offered on all POIs (no. of calls) on day 2 C2 = Average POI Congestion % on day 2 An = POI traffic offered on all POIs (no. of calls) on day n Cn = Average POI Congestion % on day n
Circuit Switched Voice Drop Rate	No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released) x 100
Worst Affected Cells having more than 3% Circuit Switched Voice Drop Rate	Number of cells having CSV drop rate > 3% during CBBH in a month / Total number of cells in the licensed area) x 100
Connections with good Circuit switched voice quality	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.

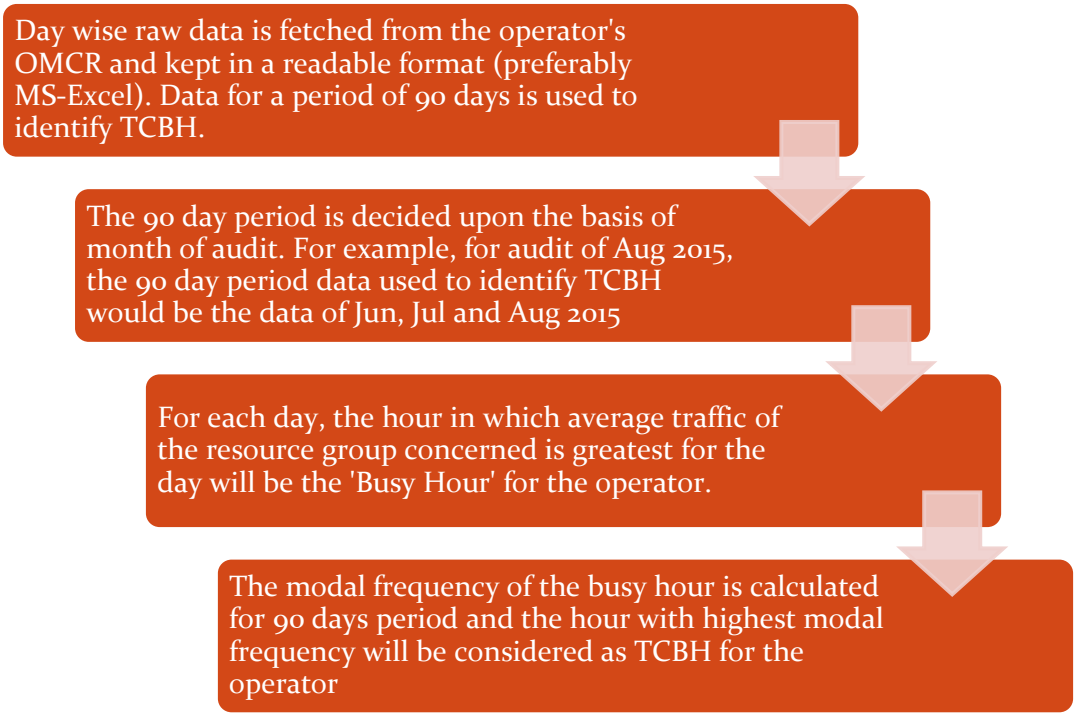
Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar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

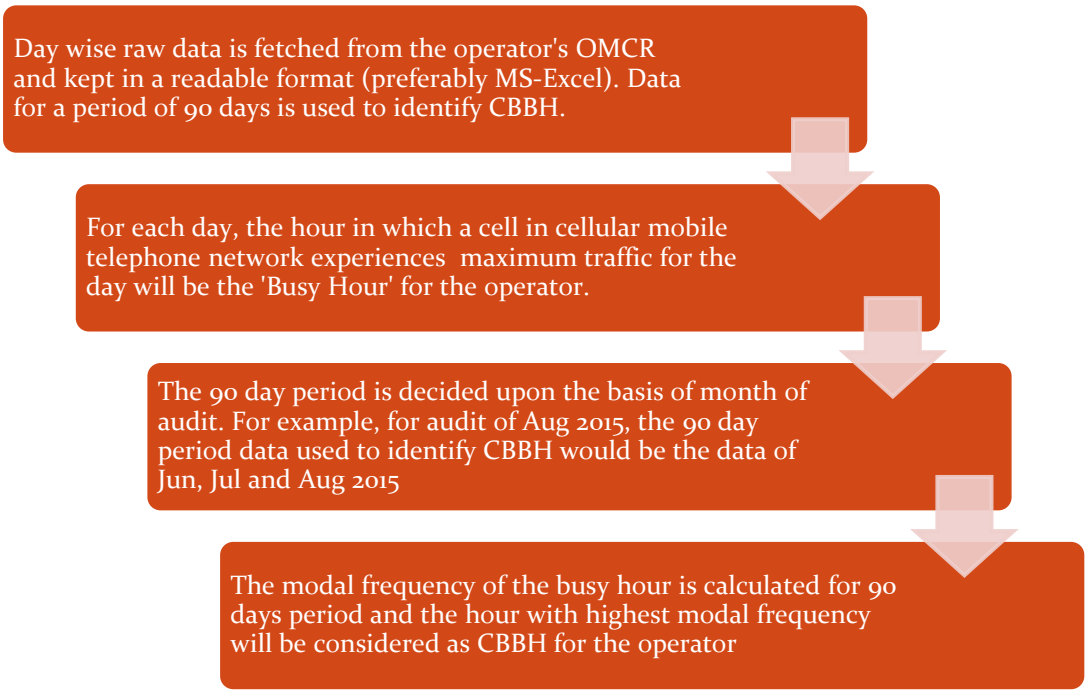
Step by step procedure to identify TCBH for an operator:



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:



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 September 2016 (JAS'16) was collected in the month of September 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	≤ 0.1%
No. of billing complaints received- Prepaid	≤ 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	≥ 95%
Percentage of calls answered by the operators (voice to voice) within 90 seconds	≥ 95%
Termination/ closure of service	≤ 7 days
Time taken for refund of deposits after closures within 60 days	100%

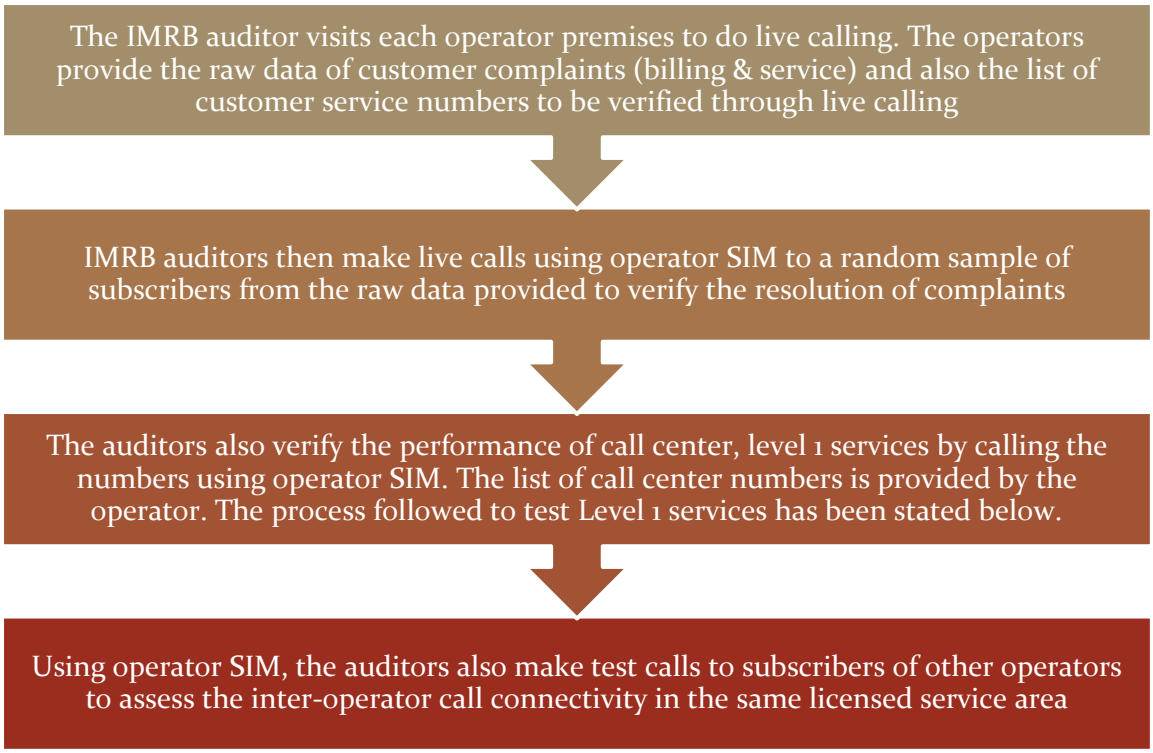
2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

Parameter	Calculation Methodology
Metering and billing credibility - Postpaid	Total billing complaints received during the relevant billing cycle / Total bills generated during the relevant billing cycle *100
Metering and billing credibility – Prepaid	Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter * 100
Resolution of billing/ charging complaints (Postpaid + Prepaid)	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
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
Call centre performance IVR (Calling getting connected and answered by IVR)	Number of calls connected and answered by IVR/ All calls attempted to IVR * 100
Call centre performance (Voice to Voice)	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
Time taken for termination/ closure of service	Number of closures done within 7 days/ total number of closure requests * 100
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

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 September 2016. 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 August 2016 was considered for live calling activity conducted in September 2016.

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 20th 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 JAS'16, 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 Helpine 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	Educationa & 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 (No IDT conducted)

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 according to the TRAI instruction; it 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)] x 100
- Voice quality (GSM)

- ✓ Total Rx Qual Samples– A
- ✓ Rx Qual samples with 0-5 value – B
- ✓ %age samples with good voice quality = B/A x 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 x 100
  - ✓ %age samples with FER bins having 0-4 value (forward FER) = C/A x 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) x 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) x 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.

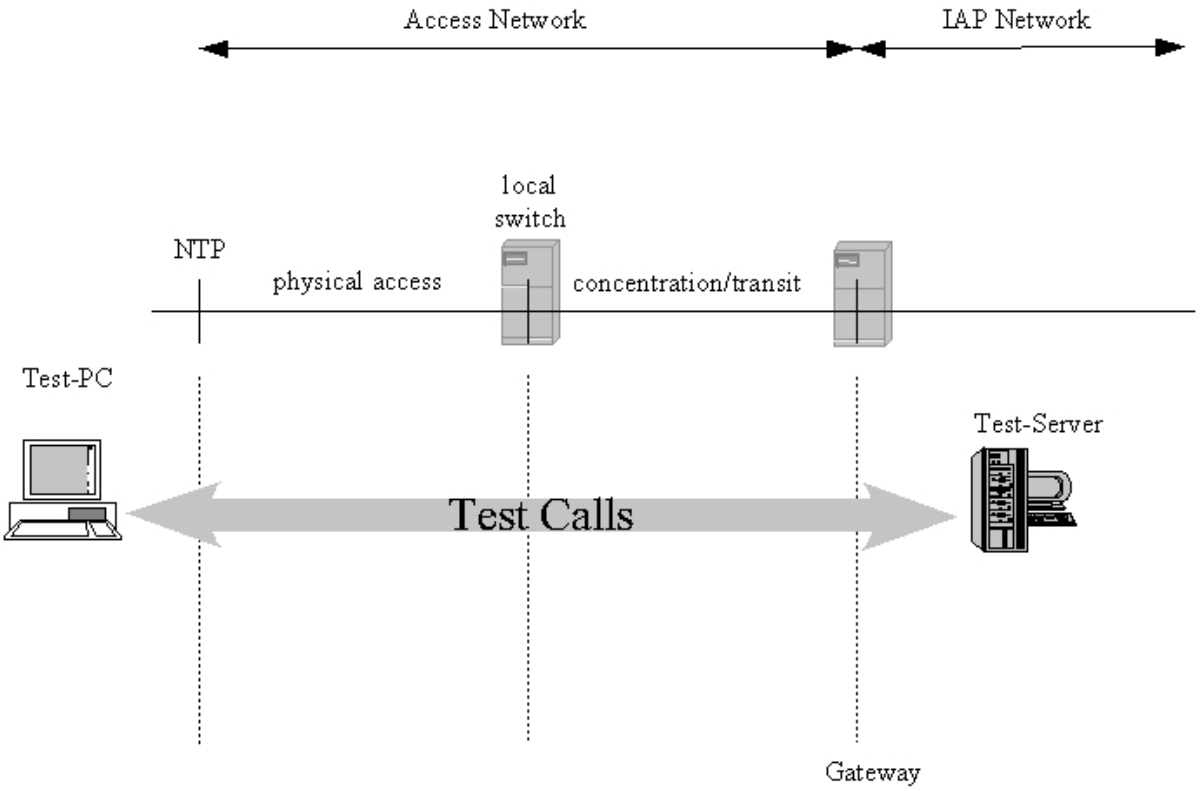


Figure for Measurement set-up

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 (200ms).

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.

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.

Minimum download speed (average of lower 10% of all test calls) =

$$\frac{\text{Download speed } (A1+A2+A3+A4+A5+A6)}{6} \times 100$$

Note- A1, A2, A3, A4 A5 & A6 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) = $\frac{\text{Total number of successful ping}}{\text{Total number of ping sent to the Test Server}} \times 100$

2.5 OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G
Aircel	2365096
Airtel	3957387
BSNL	703111
Idea	1965059
MTS	465131
Reliance CDMA	Service Closed
Reliance GSM	NDR
TATA CDMA	84112
TATA GSM	2181084
Vodafone	4266801
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel 3G	586159
Airtel 3G	663280
BSNL 3G	68643
Idea 3G	4192
Reliance 3G	NDR
Vodafone 3G	1023979

September'16 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 (%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	0.27%	0.98%	97.71%	0.43%	0.21%	0.81%	2.96%	97.45%
Airtel	0.02%	0.00%	99.34%	0.02%	0.02%	0.62%	2.43%	98.28%
BSNL	1.85%	2.71%	98.91%	0.79%	0.85%	1.20%	2.21%	99.82%
Idea	0.09%	0.30%	99.77%	0.09%	0.04%	0.27%	0.15%	97.03%
MTS	0.03%	0.00%	99.84%	NA	0.00%	0.57%	2.38%	99.90%
Reliance GSM	0.48%	1.45%	97.05%	0.15%	0.30%	0.00%	0.45%	98.90%
TATA CDMA	0.16%	0.48%	98.75%	NA	0.42%	0.56%	3.79%	99.16%
TATA GSM	0.15%	0.34%	99.31%	0.07%	0.12%	0.63%	2.42%	98.31%
Vodafone	0.09%	0.54%	99.54%	0.03%	0.46%	0.85%	2.87%	97.83%

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

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

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:

BSNL failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for Airtel and 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 99.84%.

SDCCH/ Paging Chl. Congestion:

All operators met the benchmark on SDCCH / Paging Channel Congestion. Airtel recorded the best SDCCH / Paging Channel Congestion with 0.02%.

TCH Congestion:

All operators met the benchmark on TCH congestion, while MTS performed the best on TCH congestion with 0.00%

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:

Tata CDMA failed to meet the benchmark for the parameter. Best performance was recorded for Idea at 0.15%.

Voice Quality

All operators met the benchmark for the parameter. Best performance was recorded for MTS at 99.90%.

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 - JULY FOR 2G

Name of Service Provider Month July	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	0.14%	0.43%	97.62%	0.42%	0.25%	0.84%	2.97%	97.40%
Airtel	0.01%	0.00%	99.28%	0.03%	0.04%	0.61%	2.44%	97.82%
BSNL	1.96%	2.77%	98.93%	0.88%	0.71%	1.24%	1.80%	99.82%
Idea	0.16%	0.43%	99.77%	0.10%	0.05%	0.23%	0.17%	96.53%
MTS	0.02%	0.00%	99.86%	NA	0.00%	0.58%	2.35%	99.87%
Reliance GSM	0.28%	1.41%	97.07%	0.09%	0.24%	0.00%	0.40%	98.92%
TATA CDMA	0.02%	0.00%	99.14%	NA	0.01%	0.55%	3.45%	99.20%
TATA GSM	0.11%	0.17%	99.30%	0.06%	0.15%	0.62%	2.41%	98.28%
Vodafone	0.08%	0.92%	99.55%	0.03%	0.45%	0.87%	2.93%	97.85%

3.1.2 PMR DATA – AUGUST FOR 2G

Name of Service Provider Month August	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	0.46%	1.68%	97.79%	0.54%	0.27%	0.81%	2.94%	97.44%
Airtel	0.03%	0.00%	99.28%	0.02%	0.01%	0.62%	2.42%	98.44%
BSNL	1.86%	2.85%	98.97%	0.55%	0.91%	1.13%	2.04%	99.82%
Idea	0.06%	0.21%	99.75%	0.11%	0.05%	0.29%	0.13%	96.60%
MTS	0.03%	0.00%	99.81%	NA	0.00%	0.59%	2.42%	99.91%
Reliance GSM	0.55%	1.96%	98.11%	0.15%	0.27%	0.13%	0.47%	98.88%
TATA CDMA	0.39%	0.71%	98.53%	NA	0.65%	0.57%	3.89%	99.20%
TATA GSM	0.17%	0.28%	99.32%	0.07%	0.10%	0.65%	2.43%	98.27%
Vodafone	0.11%	0.37%	99.50%	0.03%	0.50%	0.88%	2.90%	97.71%

3.1.3 PMR DATA - SEPTEMBER FOR 2G

Name of Service Provider Month September	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	0.23%	0.83%	97.74%	0.34%	0.12%	0.78%	2.97%	97.52%
Airtel	0.00%	0.00%	99.47%	0.02%	0.02%	0.65%	2.42%	98.56%
BSNL	1.79%	2.51%	98.83%	0.93%	0.92%	1.24%	2.79%	99.82%
Idea	0.07%	0.25%	99.80%	0.06%	0.04%	0.28%	0.14%	97.94%
MTS	0.04%	0.00%	99.86%	NA	0.00%	0.55%	2.36%	99.91%
Reliance GSM	0.65%	0.99%	95.98%	0.22%	0.38%	0.14%	0.48%	98.89%
TATA CDMA	0.08%	0.71%	98.59%	NA	0.61%	0.55%	4.03%	99.07%
TATA GSM	0.19%	0.56%	99.31%	0.07%	0.12%	0.62%	2.42%	98.39%
Vodafone	0.07%	0.33%	99.56%	0.04%	0.44%	0.79%	2.77%	97.93%

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
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.17%	0.06%	98.13%	0.30%	0.09%	0.71%	3.69%	97.30%
Airtel	0.01%	0.00%	99.34%	0.02%	0.02%	0.63%	2.43%	98.21%
BSNL	0.52%	0.37%	98.95%	0.66%	1.65%	1.08%	2.69%	98.83%
Idea	0.08%	0.10%	99.80%	0.16%	0.03%	0.25%	0.03%	97.20%
MTS	0.02%	0.00%	99.89%	NA	0.00%	0.46%	0.09%	99.31%
Reliance GSM	1.31%	0.00%	97.94%	0.10%	0.10%	0.11%	0.15%	99.04%
TATA CDMA	0.16%	0.00%	98.86%	NA	0.36%	0.52%	9.97%	99.15%
TATA GSM	0.10%	0.08%	99.37%	0.06%	0.10%	0.59%	2.59%	98.60%
Vodafone	0.09%	0.02%	99.67%	0.04%	0.33%	0.71%	2.86%	98.06%

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

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.01%.

Worst Affected BTSs Due to Downtime:

All operators met the benchmark. Minimum worst affected BTSs due to downtime.

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:

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, 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.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel and TATA CDMA (9.97%) 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 99.31%.

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

3.2.1 3 DAY DATA - JULY FOR 2G

Name of Service Provider 3 Day July	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%	98.09%	0.27%	0.11%	0.71%	3.55%	97.16%
Airtel	0.00%	0.00%	99.26%	0.03%	0.03%	0.64%	2.49%	97.84%
BSNL	0.46%	0.32%	98.82%	0.69%	1.82%	1.22%	2.84%	98.83%
Idea	0.14%	0.13%	99.79%	0.33%	0.04%	0.22%	0.02%	96.73%
MTS	0.01%	0.00%	99.89%	NA	0.00%	0.46%	0.09%	99.05%
Reliance GSM	0.17%	0.00%	97.70%	0.08%	0.06%	0.09%	0.38%	99.07%
TATA CDMA	0.00%	0.00%	99.10%	NA	0.01%	0.53%	10.22%	99.25%
TATA GSM	0.07%	0.00%	99.33%	0.06%	0.17%	0.58%	2.45%	98.60%
Vodafone	0.07%	0.00%	99.66%	0.05%	0.34%	0.76%	2.92%	98.13%

3.2.2 3 DAY DATA – AUGUST FOR 2G

Name of Service Provider 3 Day August	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	0.20%	0.04%	98.15%	0.38%	0.11%	0.74%	4.06%	97.83%
Airtel	0.02%	0.00%	99.27%	0.02%	0.03%	0.56%	2.40%	98.26%
BSNL	0.49%	0.32%	98.87%	0.64%	1.47%	1.17%	2.43%	98.83%
Idea	0.03%	0.04%	99.82%	0.08%	0.01%	0.23%	0.03%	96.76%
MTS	0.01%	0.00%	99.88%	NA	0.00%	0.49%	0.11%	99.79%
Reliance GSM	1.58%	0.00%	98.50%	0.06%	0.11%	0.12%	0.05%	99.03%
TATA CDMA	0.21%	0.00%	98.19%	NA	1.06%	0.49%	9.78%	99.23%
TATA GSM	0.08%	0.23%	99.43%	0.05%	0.04%	0.60%	2.62%	98.57%
Vodafone	0.09%	0.04%	99.68%	0.03%	0.32%	0.69%	2.79%	97.99%

3.2.3 3 DAY DATA - SEPTEMBER FOR 2G

Name of Service Provider 3 Day September	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	0.16%	0.13%	98.14%	0.26%	0.06%	0.68%	3.45%	97.85%
Airtel	0.00%	0.00%	99.48%	0.01%	0.01%	0.69%	2.41%	98.52%
BSNL	0.61%	0.47%	99.15%	0.64%	1.65%	0.84%	2.79%	98.83%
Idea	0.08%	0.13%	99.81%	0.08%	0.02%	0.28%	0.04%	98.06%
MTS	0.05%	0.00%	99.89%	NA	0.00%	0.43%	0.08%	99.78%
Reliance GSM	2.17%	0.00%	97.63%	0.16%	0.12%	0.11%	0.02%	99.02%
TATA CDMA	0.27%	0.00%	99.29%	NA	0.01%	0.55%	9.90%	98.98%
TATA GSM	0.15%	0.00%	99.36%	0.08%	0.07%	0.60%	2.70%	98.64%
Vodafone	0.10%	0.04%	99.68%	0.05%	0.32%	0.69%	2.88%	98.07%

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 3G	0.27%	0.96%	99.32%	0.31%	0.19%	0.31%	2.95%	97.89%
Airtel 3G	0.00%	0.00%	99.54%	0.00%	0.00%	0.34%	1.89%	99.00%
BSNL 3G	1.84%	4.04%	97.25%	0.59%	1.01%	1.36%	2.32%	99.82%
Idea 3G	0.11%	0.48%	99.91%	0.00%	0.01%	0.20%	0.39%	99.82%
Reliance 3G	0.20%	1.61%	97.47%	0.22%	0.03%	0.10%	0.26%	99.88%
Vodafone 3G	0.09%	0.42%	99.99%	0.01%	0.01%	0.31%	1.76%	98.76%

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

Node Bs downtime:

All operators met the benchmark. Minimum Node Bs Accumulated downtime was recorded for Airtel 3G at 0.00%.

Worst affected Node Bs due to downtime:

BSNL 3G failed to meet the benchmark. Minimum worst affected Node Bs due to downtime was recorded for Airtel 3G 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 for RRC congestion. Minimum RRC congestion was recorded for Airtel 3G at 0.00%.

Circuit Switched RAB Congestion:

All operators met the benchmark for Circuit Switched RAB congestion. Minimum Circuit Switched RAB congestion was recorded for Airtel 3G at 0.00%.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance 3G at 0.10%.

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

All operators met he benchmark for the parameter. Best performance was recorded for Reliance 3G at 0.26%.

Circuit Switch Voice Quality:

All operators met the benchmark for the parameter. Best performance was recorded for Reliance 3G at 99.88%.

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

3.3.1 PMR DATA - JULY FOR 3G

Name of Service Provider Month July	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 3G	0.14%	0.37%	99.28%	0.33%	0.20%	0.29%	2.95%	97.94%
Airtel 3G	0.01%	0.00%	99.54%	0.00%	0.00%	0.27%	1.87%	99.00%
BSNL 3G	1.89%	4.15%	98.68%	0.65%	0.63%	0.64%	2.79%	99.82%
Idea 3G	0.12%	0.11%	99.92%	0.00%	0.00%	0.24%	0.33%	99.82%
Reliance 3G	0.18%	0.89%	94.49%	0.09%	0.03%	0.08%	0.10%	99.89%
Vodafone 3G	0.08%	0.61%	99.98%	0.02%	0.01%	0.33%	1.87%	98.78%

3.3.2 PMR DATA – AUGUST FOR 3G

Name of Service Provider Month August	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 3G	0.46%	1.65%	99.28%	0.34%	0.21%	0.32%	2.93%	97.76%
Airtel 3G	0.01%	0.00%	99.53%	0.00%	0.00%	0.28%	1.93%	99.00%
BSNL 3G	1.95%	4.01%	95.40%	0.73%	1.46%	1.49%	2.09%	99.82%
Idea 3G	0.13%	0.84%	99.90%	0.00%	0.02%	0.18%	0.54%	99.81%
Reliance 3G	0.19%	2.37%	98.17%	0.21%	0.03%	0.10%	0.27%	99.87%
Vodafone 3G	0.12%	0.38%	99.99%	0.01%	0.00%	0.29%	1.71%	98.76%

3.3.3 PMR DATA - SEPTEMBER FOR 3G

Name of Service Provider Month September	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 3G	0.22%	0.86%	99.41%	0.28%	0.16%	0.31%	2.98%	97.98%
Airtel 3G	0.00%	0.00%	99.55%	0.00%	0.00%	0.27%	1.87%	99.00%
BSNL 3G	1.73%	3.97%	97.67%	0.40%	0.95%	1.96%	2.08%	99.82%
Idea 3G	0.10%	0.46%	99.91%	0.00%	0.02%	0.18%	0.29%	99.81%
Reliance 3G	0.24%	1.56%	99.73%	0.36%	0.03%	0.10%	0.41%	99.88%
Vodafone 3G	0.06%	0.27%	100.00%	0.00%	0.01%	0.30%	1.69%	98.76%

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 3G	0.16%	0.07%	99.35%	0.30%	0.14%	0.32%	2.91%	97.82%
Airtel 3G	0.00%	0.00%	99.54%	0.00%	0.01%	0.30%	1.78%	99.00%
BSNL 3G	0.68%	0.43%	94.93%	0.70%	1.35%	0.33%	0.45%	98.50%
Idea 3G	0.12%	0.09%	99.92%	0.00%	0.00%	0.19%	0.09%	99.82%
Reliance 3G	0.17%	0.00%	98.89%	0.10%	0.02%	0.10%	0.33%	99.84%
Vodafone 3G	0.09%	0.05%	99.98%	0.02%	0.01%	0.33%	1.85%	98.75%

Node Bs downtime:

All operators met the benchmark for the parameter. Minimum Node Bs Accumulated downtime was recorded for Airtel 3G at 0.00%.

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 Airtel 3G and Reliance 3G at .00%.

Call Set-up Success Rate (CSSR):

BSNL 3G failed to meet the benchmark for the parameter. The maximum CSSR was observed for Vodafone 3G with 99.98%.

RRC Congestion:

All operators met the benchmark for the parameter. Minimum RRC congestion was for Airtel 3G with 0.00%.

Circuit Switched RAB Congestion:

All operators met the benchmark for the parameter. Minimum Circuit Switched RAB congestion was for Idea 3G with 0.00%

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance 3G at 0.10%.

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 Idea 3G at 0.09%.

Circuit Switch Voice Quality:

All operators met the benchmark. Best performance was recorded for Reliance 3G at 99.84%.

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

3.4.1 3 DAY DATA - JULY FOR 3G

Name of Service Provider 3 Day July	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 3G	0.17%	0.00%	99.30%	0.34%	0.14%	0.32%	3.14%	97.86%
Airtel 3G	0.00%	0.00%	99.54%	0.00%	0.00%	0.27%	1.79%	99.00%
BSNL 3G	0.73%	0.43%	95.06%	0.69%	0.82%	0.31%	0.36%	98.50%
Idea 3G	0.13%	0.12%	99.92%	0.00%	0.00%	0.24%	0.12%	99.83%
Reliance 3G	0.09%	0.00%	96.81%	0.10%	0.01%	0.07%	0.06%	99.82%
Vodafone 3G	0.08%	0.00%	99.97%	0.03%	0.01%	0.38%	2.26%	98.74%

3.4.2 3 DAY DATA – AUGUST FOR 3G

Name of Service Provider 3 Day August	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 3G	0.22%	0.16%	99.27%	0.34%	0.17%	0.33%	2.99%	97.61%
Airtel 3G	0.01%	0.00%	99.53%	0.00%	0.00%	0.28%	1.89%	99.00%
BSNL 3G	0.68%	0.43%	94.04%	0.71%	1.61%	0.33%	0.51%	98.50%
Idea 3G	0.13%	0.05%	99.92%	0.00%	0.01%	0.18%	0.09%	99.81%
Reliance 3G	0.04%	0.00%	99.88%	0.13%	0.01%	0.07%	0.34%	99.84%
Vodafone 3G	0.09%	0.11%	99.99%	0.01%	0.01%	0.29%	1.59%	98.76%

3.4.3 3 DAY DATA - SEPTEMBER FOR 3G

Name of Service Provider 3 Day September	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	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	0.09%	0.05%	99.47%	0.23%	0.10%	0.30%	2.59%	98.01%
Airtel 3G	0.00%	0.00%	99.56%	0.00%	0.02%	0.27%	1.68%	99.00%
BSNL 3G	0.64%	0.43%	95.70%	0.71%	1.61%	0.33%	0.47%	98.50%
Idea 3G	0.10%	0.10%	99.93%	0.00%	0.00%	0.18%	0.08%	99.82%
Reliance 3G	0.37%	0.00%	99.98%	0.08%	0.04%	0.16%	0.60%	99.85%
Vodafone 3G	0.10%	0.04%	99.99%	0.01%	0.01%	0.32%	1.71%	98.76%

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
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel	99.96%	98.23%	1.31%	99.93%	99.97%	1.69%
Airtel	98.33%	99.35%	1.40%	99.66%	99.61%	1.40%
BSNL	96.88%	99.91%	NA	100.00%	99.95%	NA
Idea	99.98%	99.78%	1.27%	100.00%	99.82%	1.51%
MTS	99.08%	99.74%	1.72%	98.97%	99.57%	2.05%
Reliance GSM	99.98%	99.61%	0.54%	99.99%	99.79%	0.44%
TATA CDMA	96.83%	97.09%	1.46%	90.91%	97.21%	1.40%
TATA GSM	100.00%	99.92%	1.81%	100.00%	99.77%	1.23%
Vodafone	99.14%	99.89%	2.70%	98.46%	99.55%	2.68%

NA: - No data received from operators

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

Activation done within 4 hours:

During 3Days live Tata CDMA failed to meet the benchmark. Maximum Activation done within 4 hours was recorded for TATA GSM at 100.00%. However in 3day live maximum Activation done within 4 hours was recorded for TATA GSM and BSNL at 100.00%.

PDP Context activation success rate:

In PMR as well as 3Days live all operators met the benchmark. Maximum PDP content Activation success rate was recorded for Tata GSM at 99.94%. However in 3day live maximum PDP content Activation success rate was recorded for Aircel at 99.97%.

Drop Rate:

All operators met the benchmark in PMR as well as 3day live. The minimum drop rate was observed in PMR for Reliance GSM at 0.54% and 3days live for Reliance GSM at 0.44%

Note: - BSNL did not submit Drop rate data for both PMR as well as 3day live.

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
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel 3G	99.96%	98.23%	1.29%	99.93%	99.97%	1.02%
Airtel 3G	98.40%	99.97%	0.07%	99.66%	99.99%	0.07%
BSNL 3G	96.88%	99.96%	4.21%	100.00%	99.94%	3.99%
Idea 3G	99.98%	98.81%	1.80%	100.00%	98.95%	2.94%
Reliance 3G	99.98%	99.21%	0.67%	99.99%	99.07%	0.66%
Vodafone 3G	99.50%	98.61%	0.31%	99.92%	99.74%	0.32%

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

Activation done within 4 hours:

In PMR as well as 3days live all operators met the benchmark. Maximum Activation done within 4 hours was recorded for Reliance 3G at 99.98%. However in 3day live maximum Activation done within 4 hours was recorded for BSNL 3G at 100%.

PDP Context activation success rate:

In PMR as well as 3Days live all operators met the benchmark. Maximum PDP content Activation success rate was recorded for Airtel 3G at 99.97%. However in 3day live maximum PDP content Activation success rate was recorded for BSNL 3G at 99.99%.

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 Airtel 3G.

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
Benchmark	98%	100%	≥ 95%	≥ 95%	≥ 95%	
Aircel	98.00%	98.00%	100.00%	100.00%	76.00%	98.00%
Airtel	98.00%	98.00%	100.00%	92.00%	83.00%	97.00%
BSNL	98.00%	98.00%	100.00%	93.81%	88.33%	97.00%
Idea	98.00%	98.00%	90.00%	100.00%	90.00%	96.00%
MTS	95.00%	95.00%	100.00%	100.00%	91.67%	96.00%
Reliance GSM	99.00%	99.00%	100.00%	100.00%	93.67%	99.00%
TATA CDMA	100.00%	100.00%	100.00%	100.00%	94.33%	88.75%
TATA GSM	98.00%	98.00%	100.00%	100.00%	96.33%	94.00%
Vodafone	100.00%	100.00%	100.00%	100.00%	94.00%	100.00%

Resolution of billing complaints

As per the consumers (live calling exercise) MTS failed to meet the benchmark of resolving 98% complaints within 4 weeks and Aircel , Airtel, BSNL, Idea, MTS, Reliance GSM and TATA GSM failed to meet the benchmark of 100% complaints within 6 weeks.

Accessibility of Call Centre/Customer Care-IVR

For the IVR aspect, Idea failed to meet the TRAI benchmark of 95%, however most of the operators recording 100% for the parameter.

Customer Care / Helpline Assessment (voice to voice)

Airtel and BSNL failed to meet the TRAI benchmark of 95%, however most of the operators recording 100% for the parameter.

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 Tata GSM. 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.

Complaint/Request Attended to Satisfaction

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

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
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel	0.09%	0.03%	100.00%	100.00%	100.00%	95.20%	95.78%
Airtel	0.05%	0.04%	100.00%	100.00%	100.00%	82.68%	89.80%
BSNL	0.04%	0.03%	100.00%	100.00%	100.00%	95.38%	96.20%
Idea	0.51%	0.10%	100.00%	100.00%	100.00%	99.42%	99.25%
MTS	0.04%	0.04%	100.00%	100.00%	100.00%	99.25%	95.56%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	99.05%	93.42%
TATA CDMA	0.00%	0.00%	100.00%	100.00%	100.00%	NA	96.89%
TATA GSM	0.00%	0.00%	100.00%	100.00%	100.00%	98.80%	96.28%
Vodafone	0.07%	0.08%	100.00%	100.00%	100.00%	100.00%	97.65%

Metering and Billing Credibility – Post-paid Subscribers

For the billing disputes of post-paid subscribers, it was observed that Idea 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 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

Airtel failed to meet the TRAI benchmark of 95% IVR call being attended. Vodafone recorded the best performance for the parameter.

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

Airtel and Reliance GSM failed to meet the TRAI specified benchmark of 95%. Idea recorded the best performance for the parameter with 99.25%.

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%	NS	100.00%	100.00%	100.00%	100.00%
Airtel	100.00%	NA	100.00%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
BSNL	100.00%	100.00%	NA	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%
Idea	100.00%	100.00%	100.00%	NA	100.00%	NS	100.00%	100.00%	100.00%	100.00%
MTS	100.00%	100.00%	100.00%	100.00%	NA	NS	100.00%	100.00%	100.00%	100.00%
Reliance CDMA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Reliance GSM	100.00%	100.00%	100.00%	100.00%	100.00%	NS	NA	100.00%	100.00%	100.00%
TATA CDMA	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%
TATA GSM	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	100.00%	NA	100.00%
Vodafone	100.00%	100.00%	100.00%	100.00%	100.00%	NS	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.

3.10 COMPARISON BETWEEN IMRB AND OPERATOR'S DATA FOR PMR 2G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	BTSs Accumulated downtime (not available for service)		Worst affected BTSs due to downtime		Call Set-up Success Rate		SDCCH/ Paging Chl. Congestion		TCH Congestion		Call drop rate		Worst affected cells having more than 3%		Connection with good voice quality			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.28%	0.27%	0.98%	0.98%	97.71%	97.71%	0.43%	0.43%	0.21%	0.21%	0.81%	0.81%	2.96%	2.96%	97.45%	97.45%	0.00%	0.00%
Airtel	0.02%	0.02%	0.00%	0.00%	99.29%	99.34%	0.02%	0.02%	0.02%	0.02%	0.61%	0.62%	2.42%	2.43%	98.18%	98.28%	0.00%	0.00%
BSNL	1.87%	1.85%	2.71%	2.71%	98.91%	98.91%	0.79%	0.79%	0.85%	0.85%	1.20%	1.20%	2.21%	2.21%	99.82%	99.82%	0.00%	0.00%
Idea	0.09%	0.09%	0.30%	0.30%	99.77%	99.77%	0.09%	0.09%	0.04%	0.04%	0.26%	0.27%	0.15%	0.15%	97.02%	97.03%	0.00%	0.00%
MTS	0.03%	0.03%	0.00%	0.00%	99.84%	99.84%	0.00%	NA	0.00%	0.00%	0.57%	0.57%	2.37%	2.38%	99.90%	99.90%	0.00%	0.00%
RTL	0.49%	0.48%	1.34%	1.45%	97.07%	97.05%	0.15%	0.15%	0.30%	0.30%	0.13%	0.00%	0.46%	0.45%	98.89%	98.90%	0.00%	0.00%
TATA CDMA	0.16%	0.16%	0.24%	0.48%	98.75%	98.75%	0.00%	NA	0.42%	0.42%	0.56%	0.56%	3.79%	3.79%	99.16%	99.16%	0.67%	0.00%
TATA GSM	0.15%	0.15%	0.34%	0.34%	99.31%	99.31%	0.07%	0.07%	0.12%	0.12%	0.63%	0.63%	2.42%	2.42%	98.31%	98.31%	0.00%	0.00%
Vodafone	0.09%	0.09%	0.54%	0.54%	99.54%	99.54%	0.03%	0.03%	0.46%	0.46%	0.85%	0.85%	2.87%	2.87%	97.83%	97.83%	0.00%	0.00%

3.11 COMPARISON BETWEEN IMRB AND OPERATOR'S DATA FOR PMR 3G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	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%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.27%	0.27%	0.96%	0.96%	99.32%	99.32%	0.31%	0.31%	0.19%	0.19%	0.31%	0.31%	2.95%	2.95%	97.89%	97.89%	0.00%	0.00%
Airtel	0.01%	0.00%	0.00%	0.00%	99.54%	99.54%	0.00%	0.00%	0.00%	0.00%	0.27%	0.34%	1.90%	1.89%	99.00%	99.00%	0.00%	0.00%
BSNL	1.80%	1.84%	4.00%	4.04%	97.33%	97.25%	0.57%	0.59%	0.97%	1.01%	1.40%	1.36%	2.23%	2.32%	99.80%	99.82%	0.00%	0.00%
IDEA	0.12%	0.11%	0.47%	0.48%	99.91%	99.91%	0.00%	0.00%	0.01%	0.01%	0.20%	0.20%	0.39%	0.39%	99.81%	99.82%	0.00%	0.00%
RTL	0.19%	0.20%	1.21%	1.61%	98.01%	97.47%	0.23%	0.22%	0.03%	0.03%	0.10%	0.10%	0.26%	0.26%	99.89%	99.88%	0.00%	0.00%
Vodafone	0.09%	0.09%	0.42%	0.42%	99.90%	99.99%	0.01%	0.01%	0.01%	0.01%	0.31%	0.31%	1.76%	1.76%	98.94%	98.76%	0.00%	0.00%

Value calculated by Operator and IMRB match		Value calculated by Operator and IMRB do not match	

4 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- BSNL failed to meet the benchmark worst affected BTSs due to downtime
- TATA CDMA failed to meet the benchmark Worst Affected Cells Having More than 3% TCH Drop.

3 Day Live Measurement (Network Parameters) for 2G

- Aircel and TATA CDMA (9.97%) failed to meet the benchmark Worst Affected Cells Having More than 3% TCH Drop.

PMR and 3days live Consolidated (Network Parameters) for 3G

- BSNL 3G failed to meet the benchmark for worst affected Node Bs due to downtime during PMR audit.
- BSNL 3G failed to meet the benchmark for CSSR during live audit

Wireless data services for 2G

- Tata CDMA failed to meet the benchmark for Activation done within 4 hours.

Live Calling

- As per the consumers (live calling exercise) MTS failed to meet the benchmark of resolving 98% complaints within 4 weeks and Aircel , Airtel, BSNL, Idea, MTS, Reliance GSM and TATA GSM failed to meet 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 Tata GSM. The details of live calling done for the level 1 service have been provided in the annexure for each operator.
- For the IVR aspect, Idea failed to meet the TRAI benchmark of 95%, however most of the operators recording 100% for the parameter.
- Airtel and BSNL failed to meet the TRAI benchmark of 95%, however most of the operators recording 100% for the parameter Customer Care / Helpline Assessment (voice to voice)

Metering and billing credibility

- For the billing disputes of post-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter. TATA GSM & CDMA had the best performance with 0.00% billing disputes.
- Airtel failed to meet the TRAI benchmark of 95% IVR call being attended. Vodafone recorded the best performance for the parameter.
- Airtel and Reliance GSM failed to meet the TRAI specified benchmark of 95%. Idea recorded the best performance for the parameter with 99.25%
- All operators met the TRAI benchmark for termination/closure of services except Idea.
- All operators met the TRAI benchmark for refund of deposit after closure except Reliance GSM.

Drive Test (Operator Assisted) voice

- Aircel 2G failed to meet the benchmark for voice quality in outdoor locations and Reliance GSM failed in indoor as well as outdoor locations.

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

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) = 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

3. **TRAI Benchmark –**

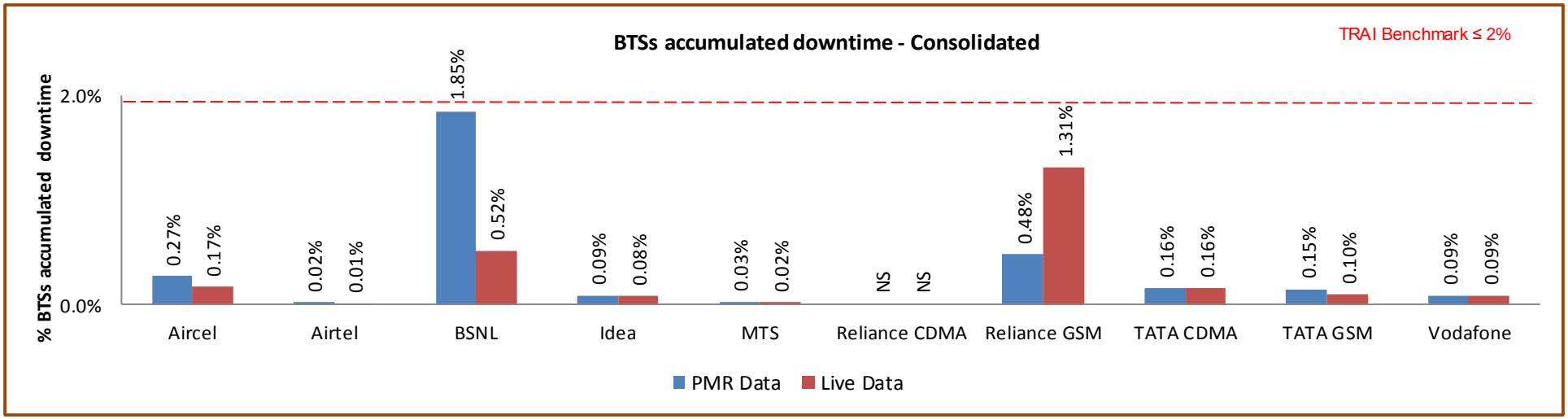
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

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.

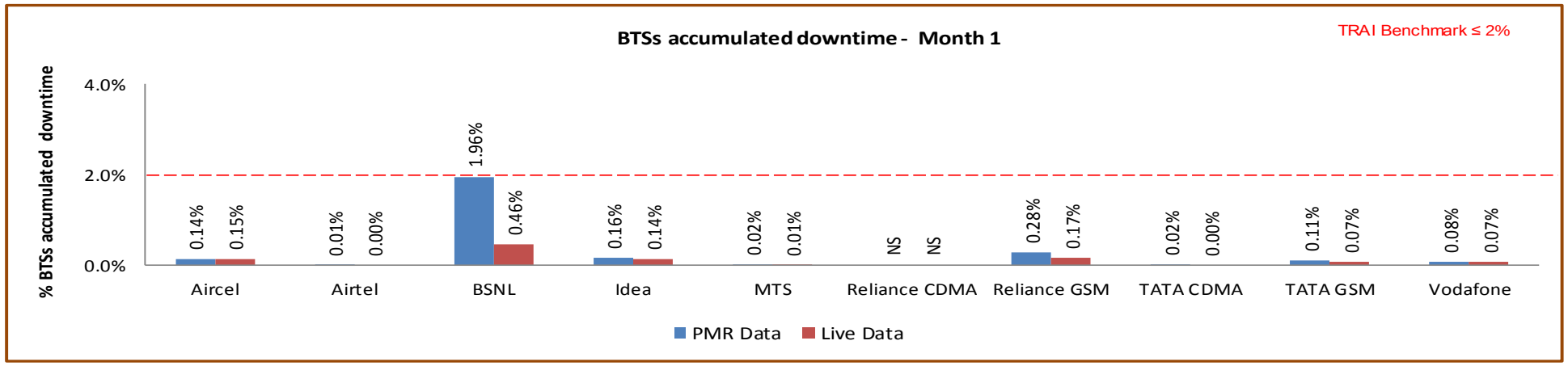
5.1.2 KEY FINDINGS - CONSOLIDATED



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

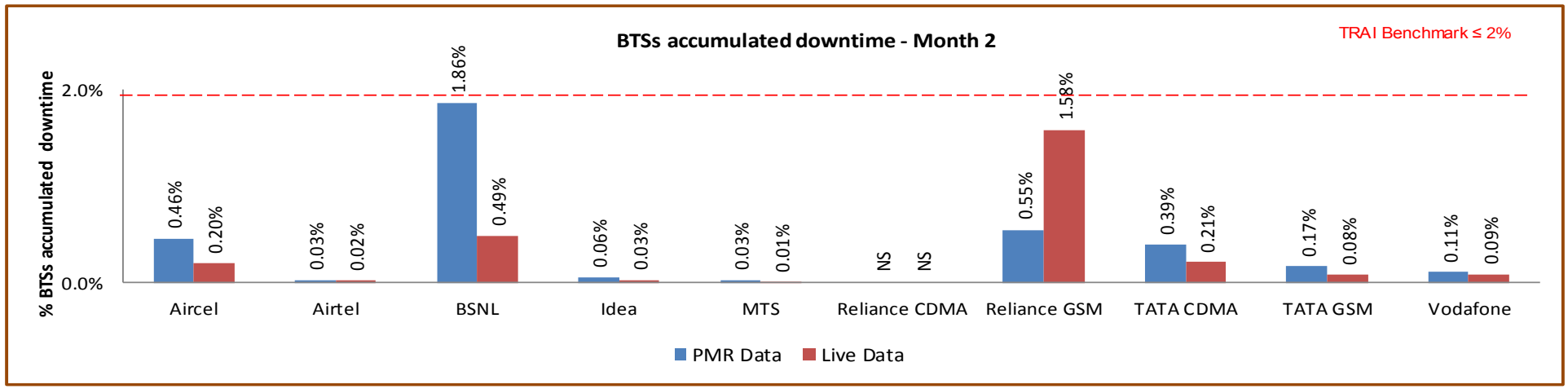
All operators met the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

5.1.2.1 KEY FINDINGS – JULY



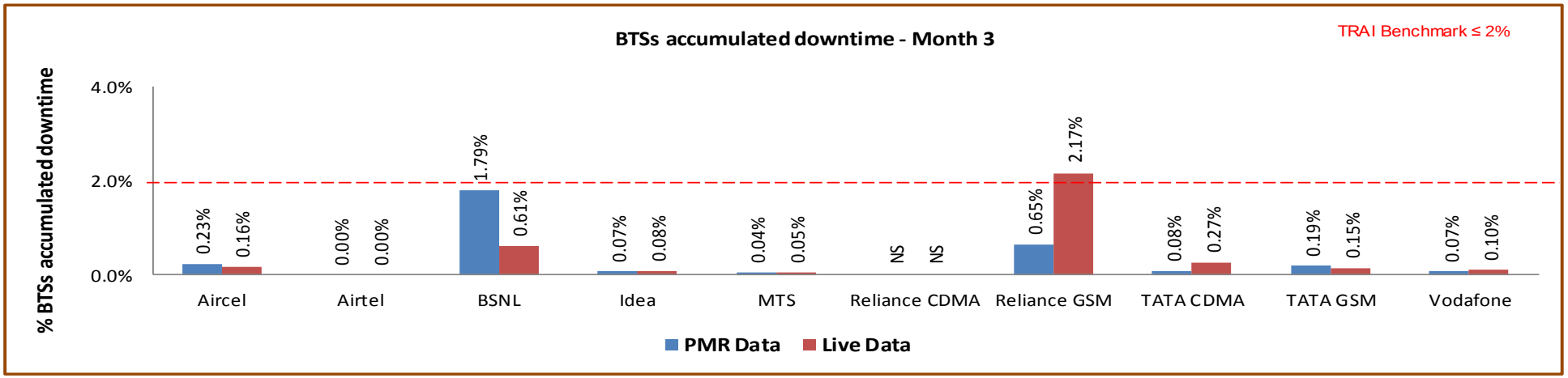
Data Source: Operations and Maintenance Center (OMC) of the operators

5.1.2.2 KEY FINDINGS – AUGUST



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

5.1.2.3 KEY FINDINGS – SEPTEMBER



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 –**

  a. Worst affected BTSs due to downtime ≤ 2%

- **Audit Procedure –**

  i. 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

  ii. All the BTS in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.

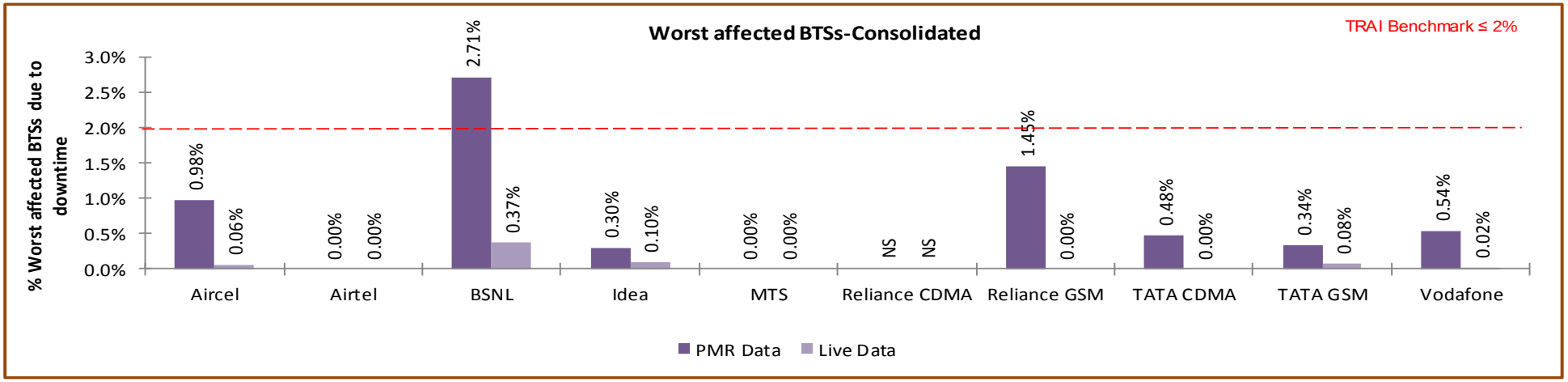
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  iv. 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

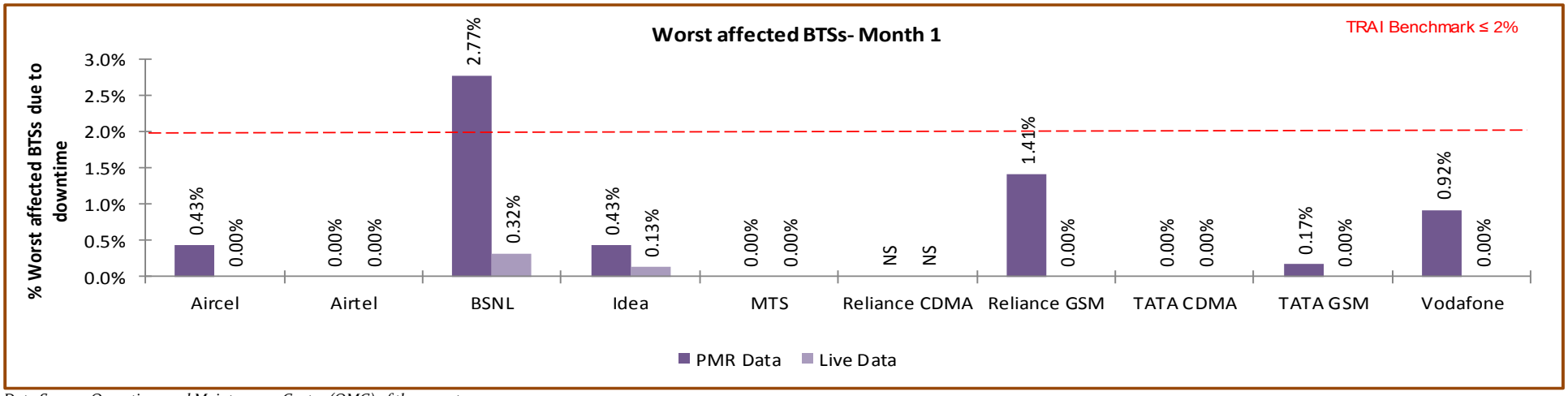


Data Source: Operations and Maintenance Center (OMC) of the operators

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

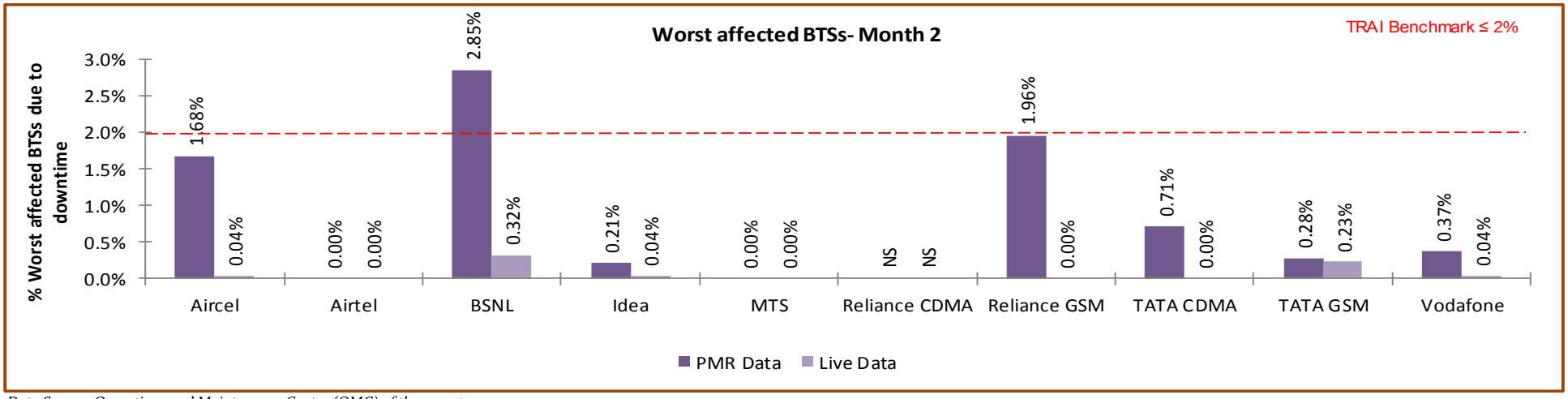
Significant difference was observed between PMR & live measurement data for Aircel, Idea, TATA (CDMA & GSM), BSNL and Vodafone. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

5.2.2.1 KEY FINDINGS – JULY



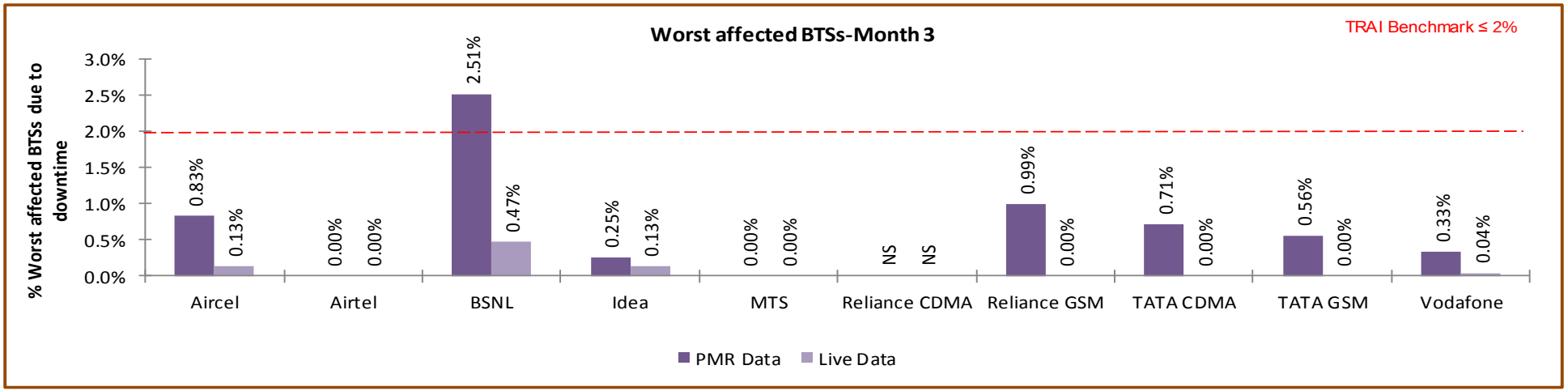
Data Source: Operations and Maintenance Center (OMC) of the operators

5.2.2.2 KEY FINDINGS – AUGUST



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

5.2.2.3 KEY FINDINGS – SEPTEMBER



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-**

   (Calls Established / Total Call Attempts) * 100

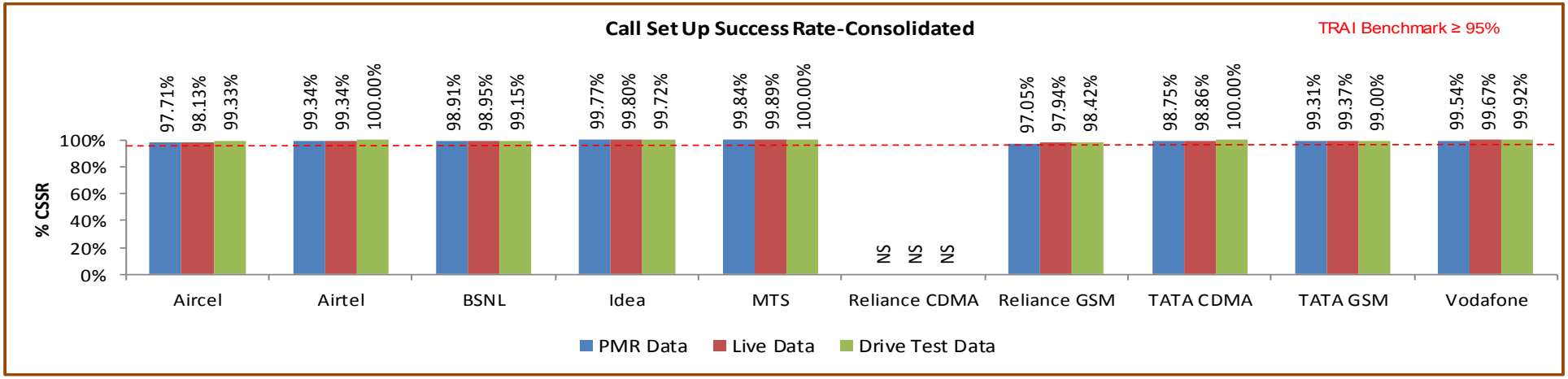
   Call Established means the following events have happened in call setup:-

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

3. **TRAI Benchmark ≥** 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.

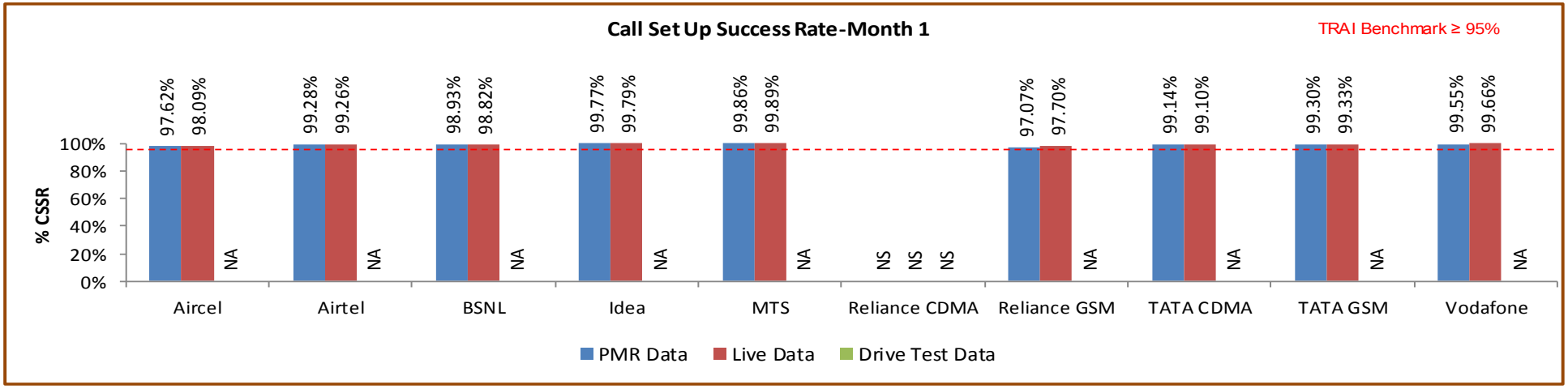
5.3.2 KEY FINDINGS - CONSOLIDATED



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

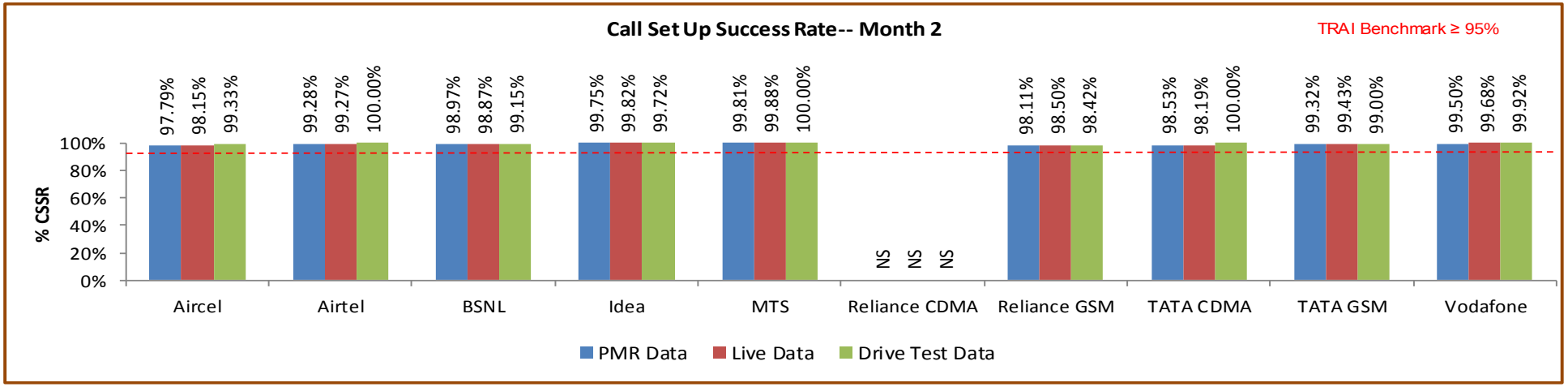
All operators met the TRAI benchmark as per audit/PMR data, 3days live and Drive test.

5.3.2.1 KEY FINDINGS – JULY



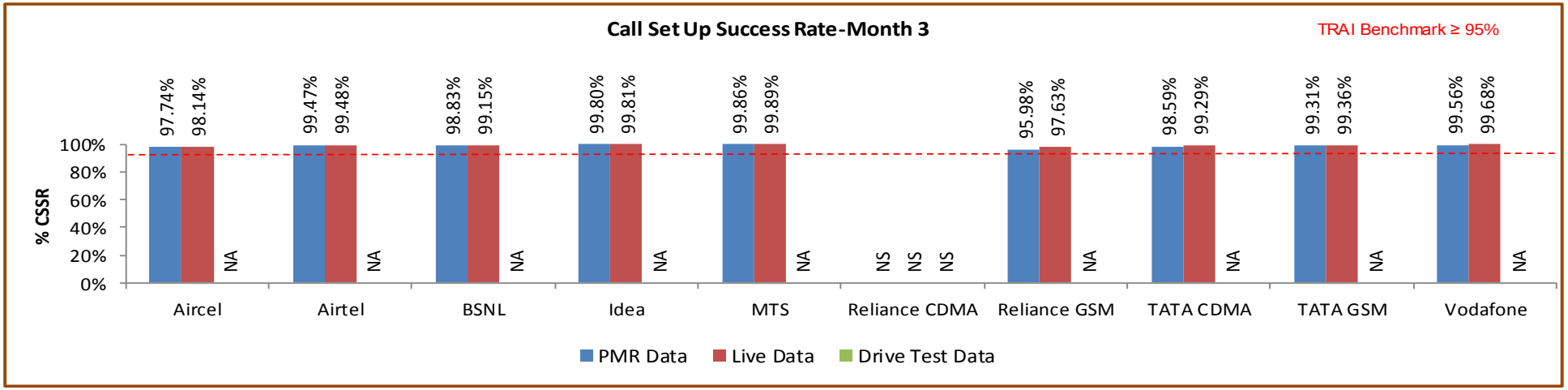
Data Source: Network Operations Center (NOC) of the operators

5.3.2.2 KEY FINDINGS – AUGUST



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

5.3.2.3 KEY FINDINGS – SEPTEMBER



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

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

5.4.1 PARAMETER DESCRIPTION

1. **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

2. **Computational Methodology:**

   - **SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
     - Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1
     - C1 = Average SDCCH / TCH Congestion % on day 1
     - A2 = Number of attempts to establish SDCCH / TCH made on day 2
     - C2 = Average SDCCH / TCH Congestion % on day 2
     - An = Number of attempts to establish SDCCH / TCH made on day n
     - Cn = Average SDCCH / TCH Congestion % on day n
   - **POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
     - Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1
     - C1 = Average POI Congestion % on day 1
     - A2 = POI traffic offered on all POIs (no. of calls) on day 2
     - C2 = Average POI Congestion % on day 2

- An = POI traffic offered on all POIs (no. of calls) on day n
- Cn = Average POI Congestion % on day n

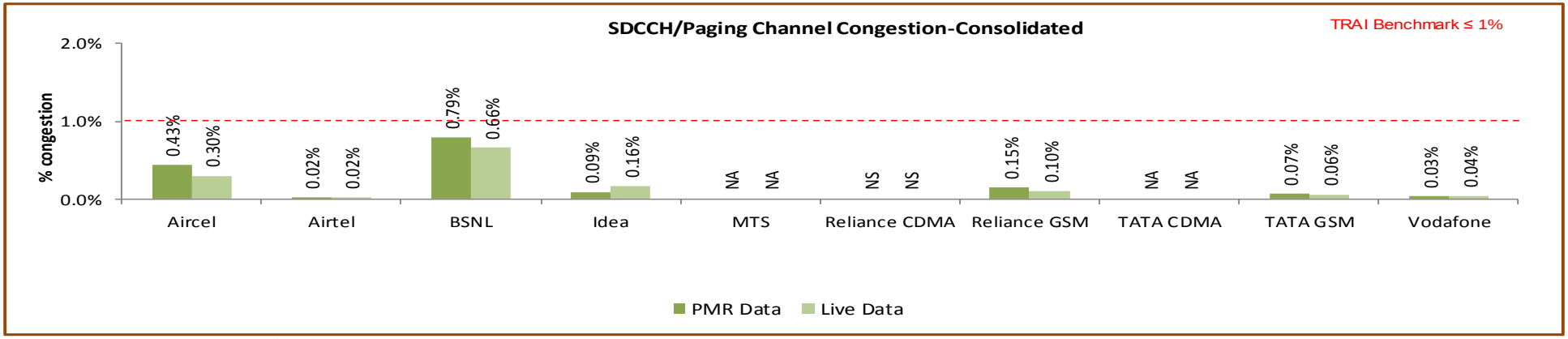
3. **Benchmark:**

   - SDCCH Congestion: ≤ 1%, TCH Congestion: ≤ 2%, POI Congestion: ≤ 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)



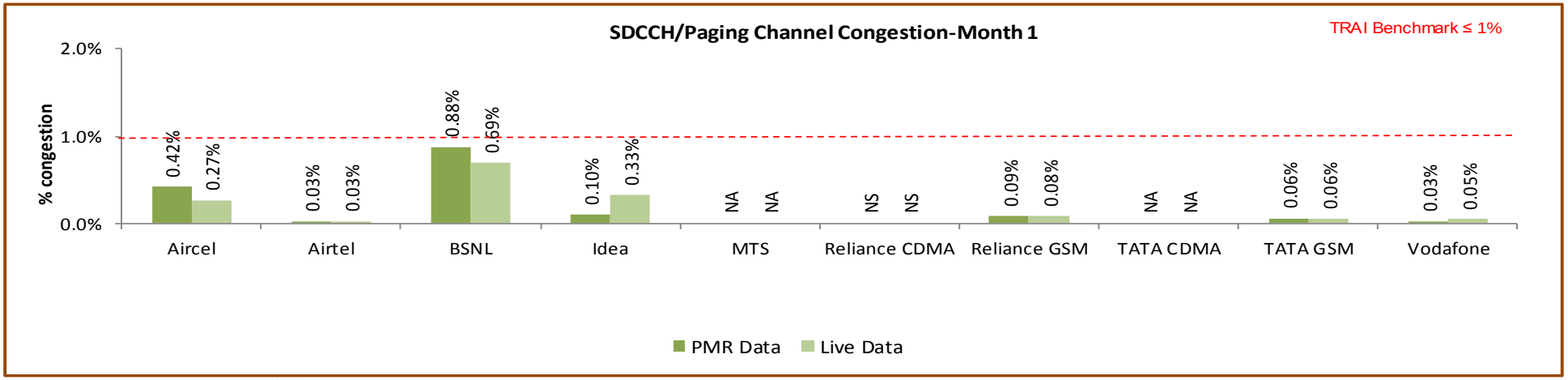
Data Source: Network Operations Center (NOC) of the operators

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

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

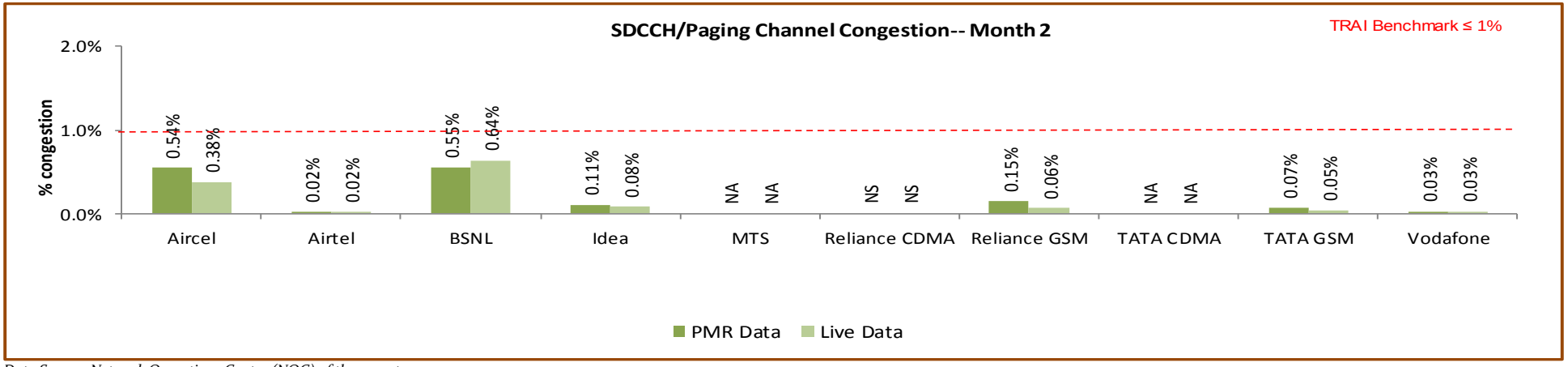
Significant difference was observed between PMR & live measurement data for BSNL and Aircel. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for 3 days.

5.4.2.1 KEY FINDINGS – JULY



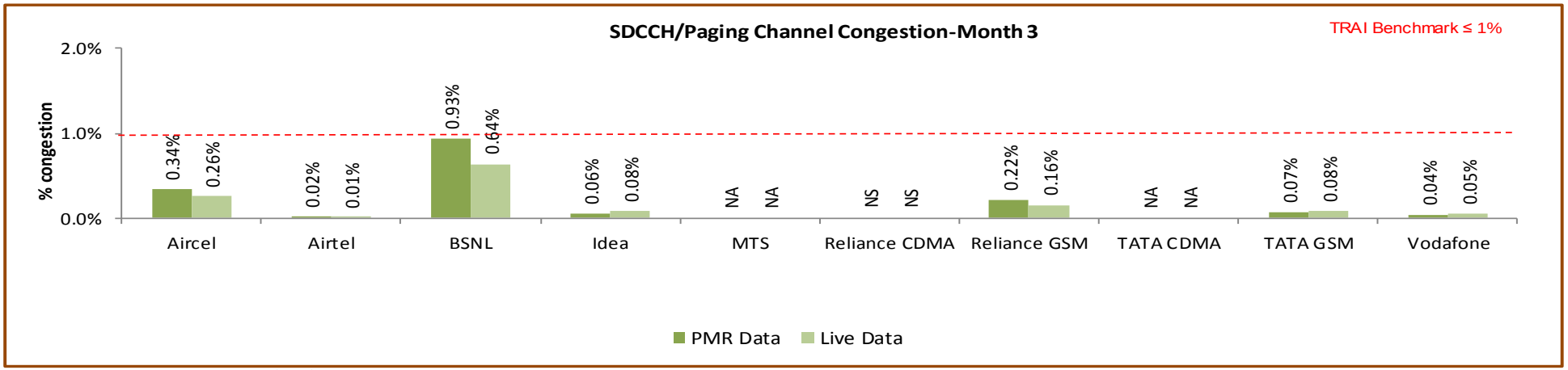
Data Source: Network Operations Center (NOC) of the operators

5.4.2.2 KEY FINDINGS – AUGUST



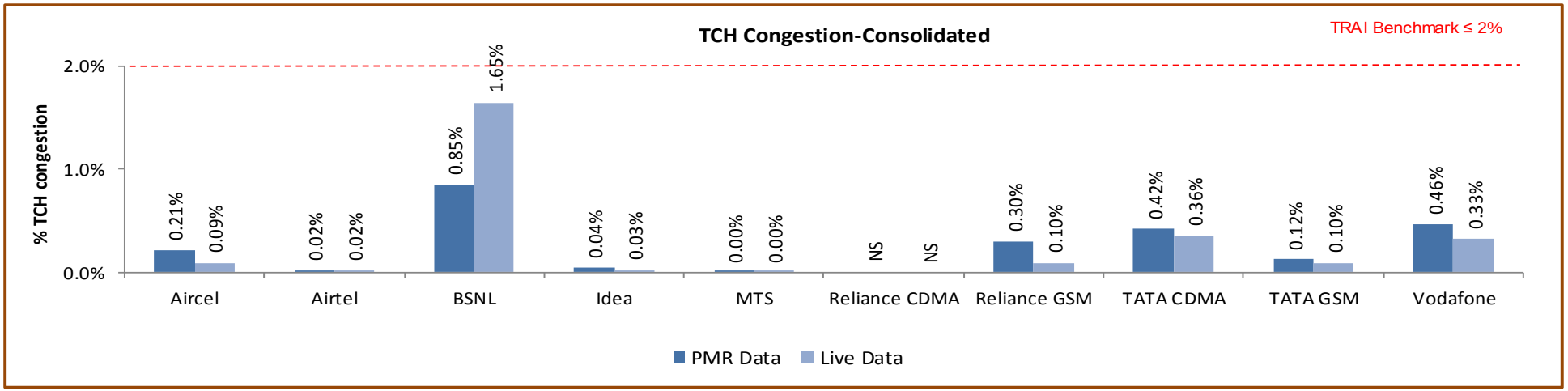
Data Source: Network Operations Center (NOC) of the operators

5.4.2.3 KEY FINDINGS – SEPTEMBER



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

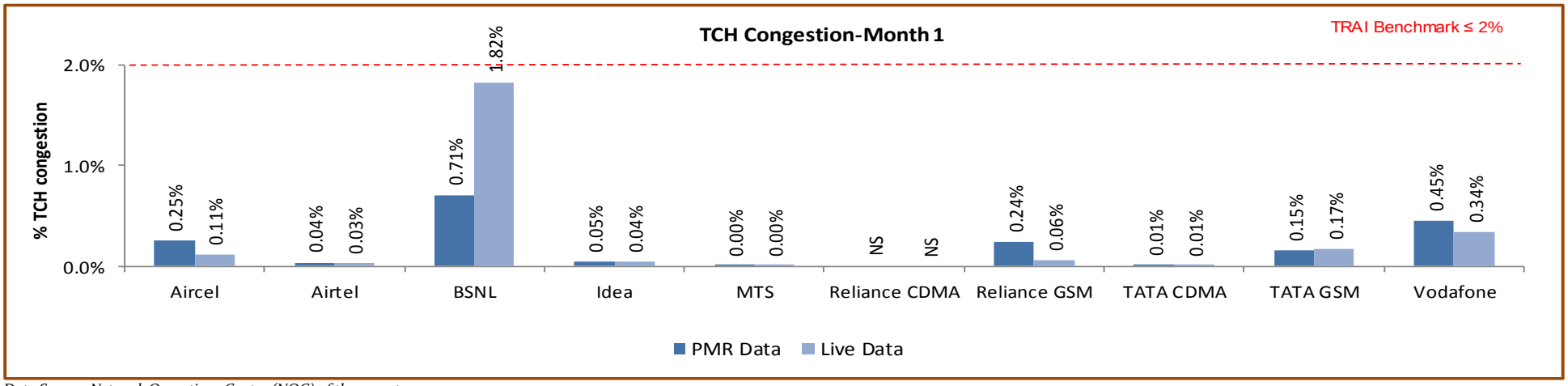
5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)



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

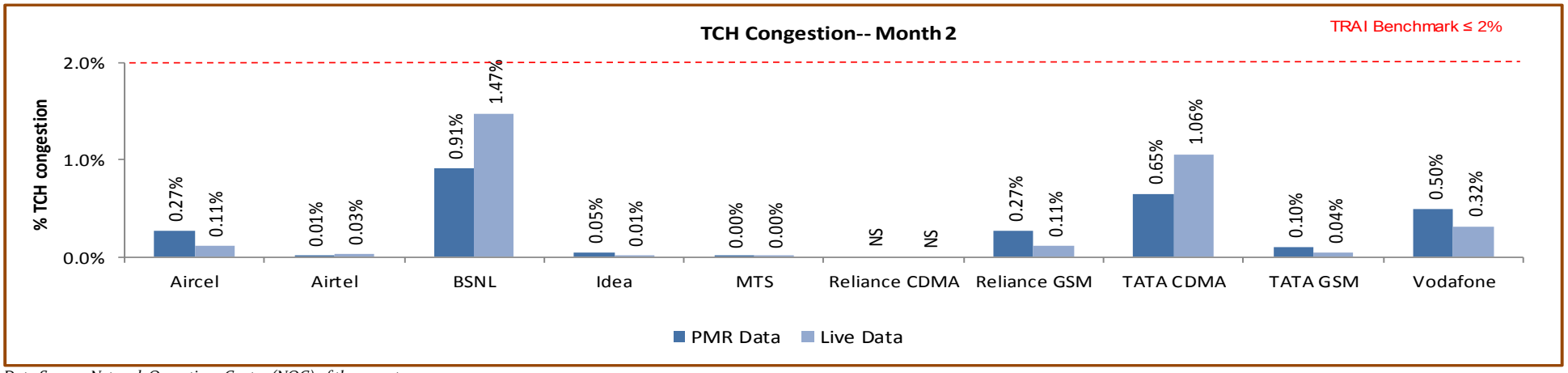
All operators met the benchmark as per audit/PMR report.

5.4.3.1 KEY FINDINGS – MONTH 1



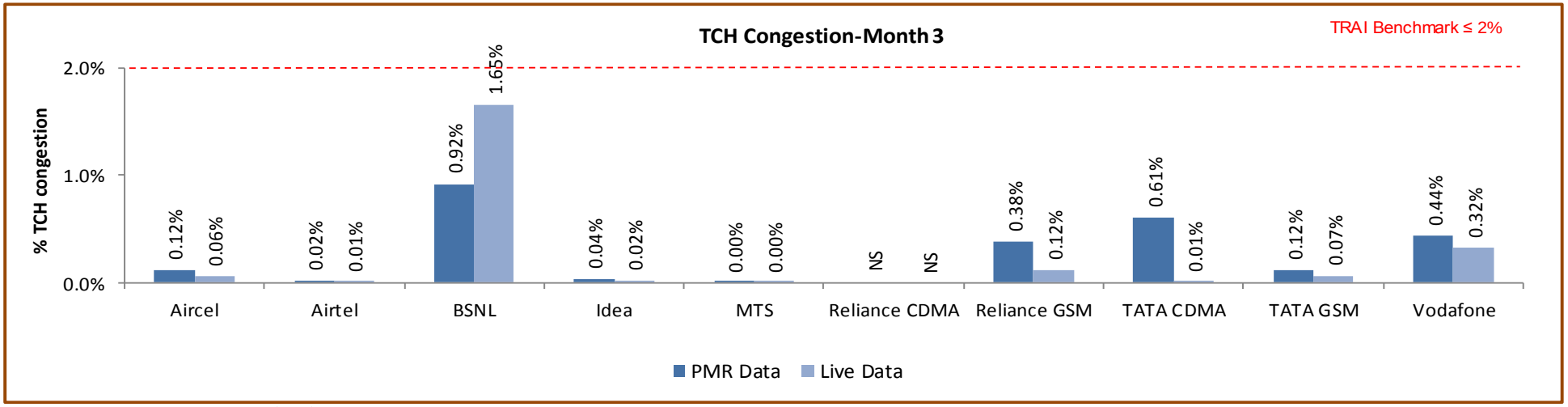
Data Source: Network Operations Center (NOC) of the operators

5.4.3.2 KEY FINDINGS – MONTH 2



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

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		50	31	76	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	2	0	0
Total Capacity of all POIs (A) - in erlangs		219802	231393	1277180	200444	105586	NS	35631	63507	40912	568430
Traffic served for all POIs (B)- in erlangs		89661	126557	33214	100180	31234	NS	20490	26311	22809	313229
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	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		50	31	76	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		218791	69253	157146	198417	105542	NS	35631	62954	40884	372879
Traffic served for all POIs (B)- in erlangs		47380	37601	32105	99527	22236	NS	20089	14967	11370	106601
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	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-July											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	77	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		72829	74798	411803	66003	35214	NS	11877	21071	13630	188984
Traffic served for all POIs (B)- in erlangs		30307	41786	10807	32432	10767	NS	7062	8868	7866	103390
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	77	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		71946	22855	52382	65153	35181	NS	11877	20861	13623	187534
Traffic served for all POIs (B)- in erlangs		15846	12317	10407	32420	10746	NS	7057	4915	3763	52320
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	76	90	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73297	76949	426466	66439	35181	NS	11877	21219	13643	186142
Traffic served for all POIs (B)- in erlangs		29807	42335	11211	33975	10522	NS	6918	8895	7609	105229
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	76	90	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73279	22982	52382	66185	35181	NS	11877	21113	13623	185345
Traffic served for all POIs (B)- in erlangs		15592	12597	10849	33742	10484	NS	6915	4953	3804	54281
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

5.4.4.3 KEY FINDINGS – MONTH 3

5. POI Congestion							
Audit Results for POI Congestion- PMR data-September							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	0	76	95	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73676	0	426466	68003	11877	193304
Traffic served for all POIs (B)- in erlangs		29546	0	11211	33772	6511	104610
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	76	95	29	NA
No. of POIs not meeting benchmark		0	0	0	0	0	NA
Total Capacity of all POIs (A) - in erlangs		73567	234156	52382	67079	11877	NA
Traffic served for all POIs (B)- in erlangs		15942	126872	10849	33364	6118	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NA

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:** (**Total Calls Dropped** / **Total Calls Established) x 100**

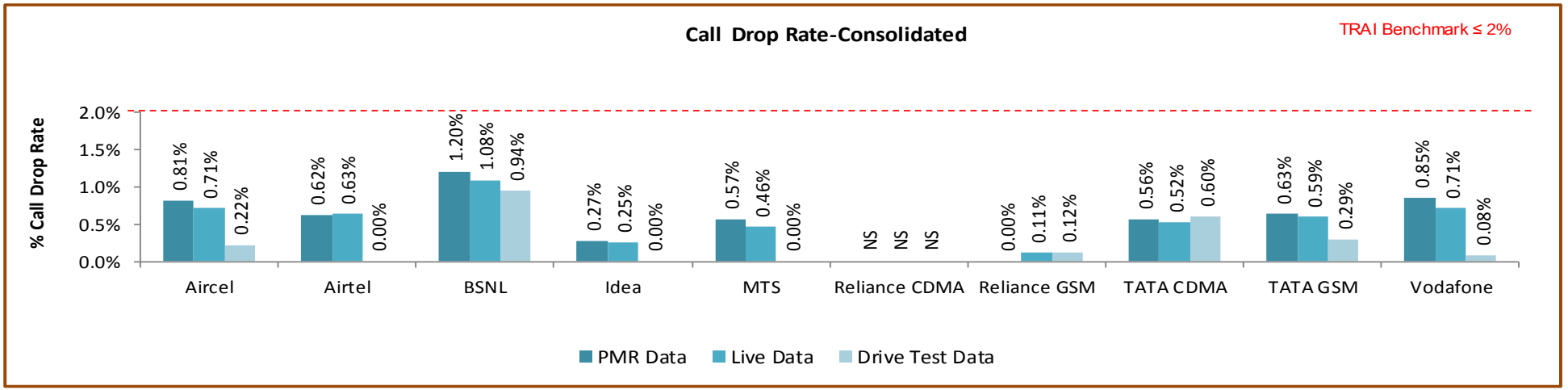
3. **TRAI Benchmark –**

   - Call drop rate ≤ 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.

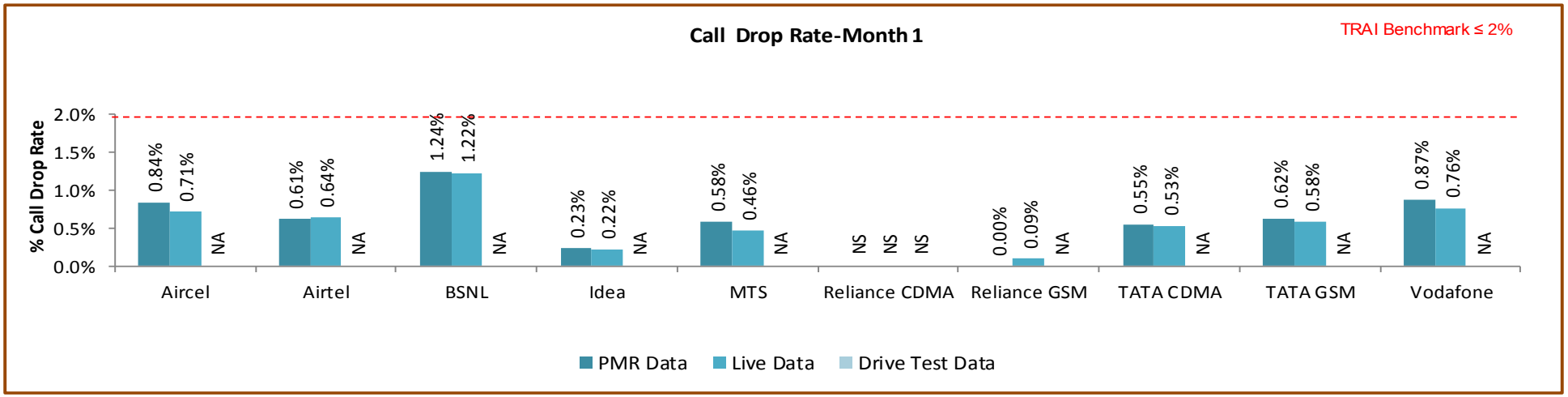
5.5.2 KEY FINDINGS - CONSOLIDATED



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

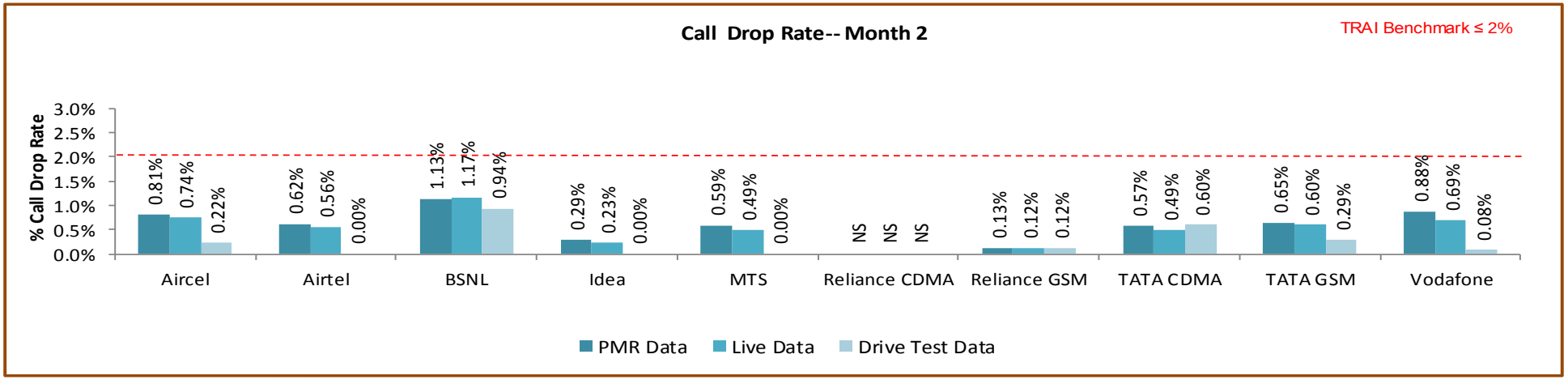
All operators met the benchmark for call drop rate during audit.

5.5.2.1 KEY FINDINGS – MONTH 1



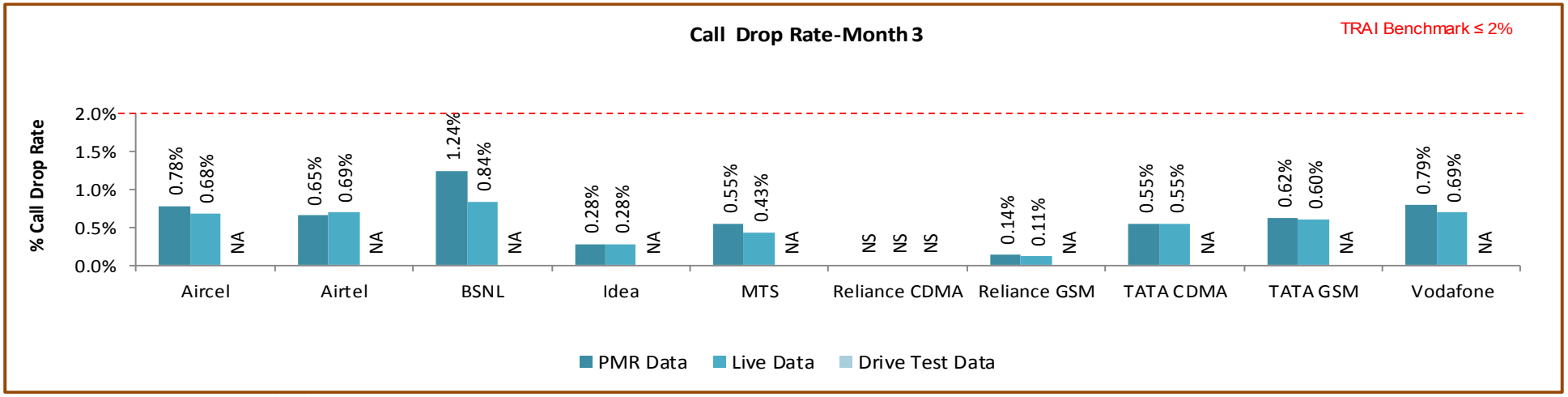
Data Source: Network Operations Center (NOC) of the operators

5.5.2.2 KEY FINDINGS – MONTH 2



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

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:** (**Total number of cells having more than 3% TCH drop during CBBH**/ **Total number of cells in the network) x 100**

3. **TRAI Benchmark –**

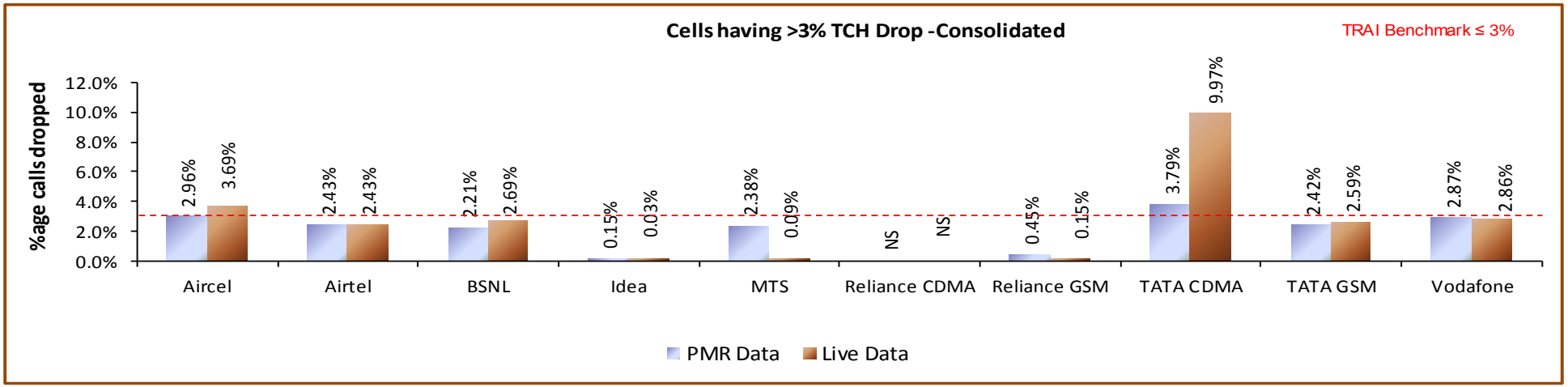
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

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

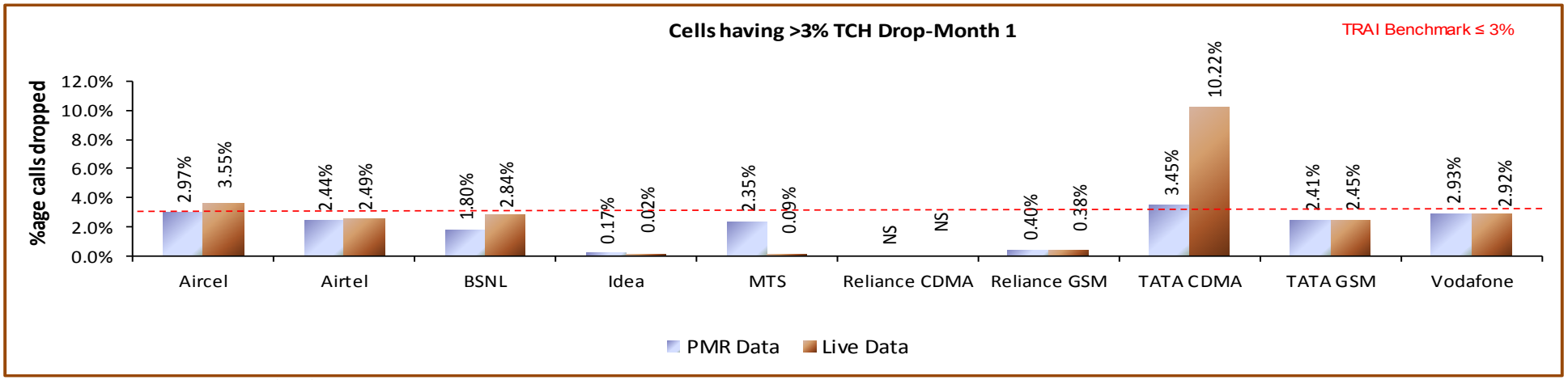


Data Source: Network Operations Center (NOC) of the operators

Aircel and TATA CDMA failed to meet the benchmark for cell having >3% TCH Drop rate in 3day live and Tata CDMA failed during PMR audit also.

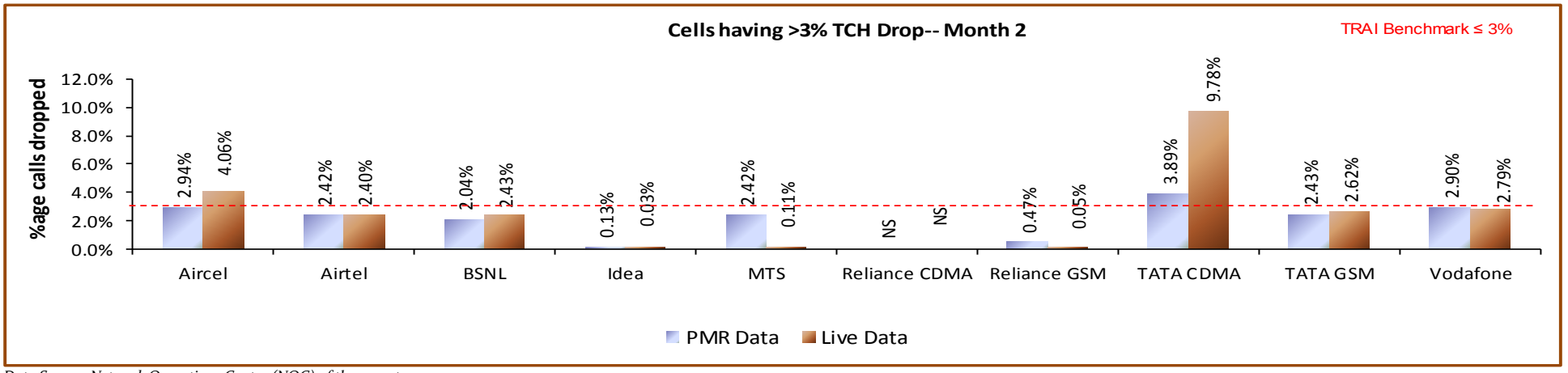
Significant difference was observed between PMR & live measurement data for MTS, BSNL, Reliance CDMA and TATA CDMA. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for 3 days

5.6.2.1 KEY FINDINGS – MONTH 1



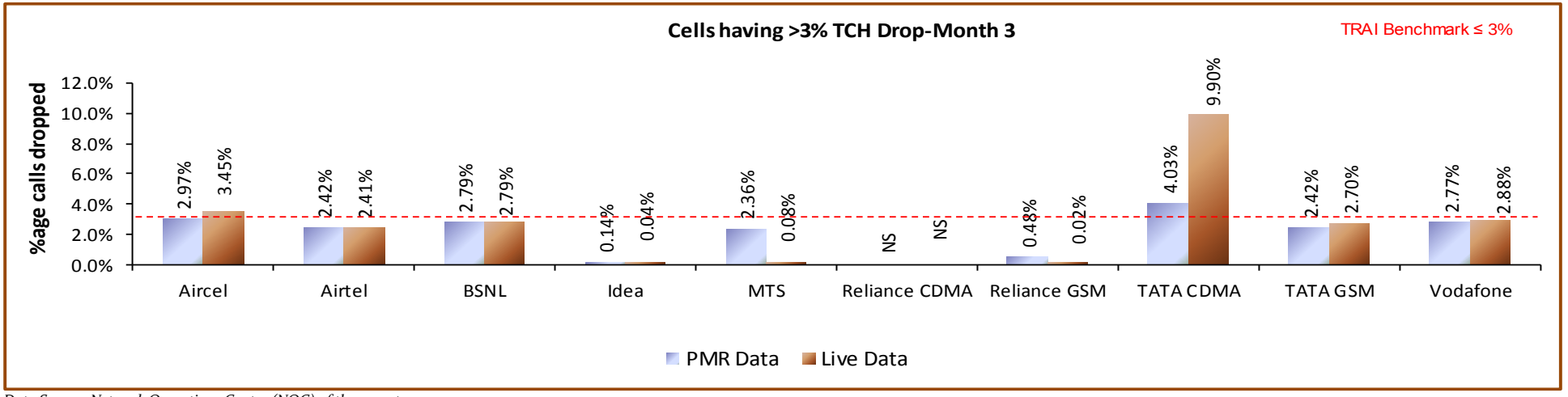
Data Source: Network Operations Center (NOC) of the operators

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 it FER value lies between 0 – 4 %

2. **Computational Methodology:**

   - **% Connections with good voice quality = (No. of voice samples with good voice quality / Total number of samples) x 100**

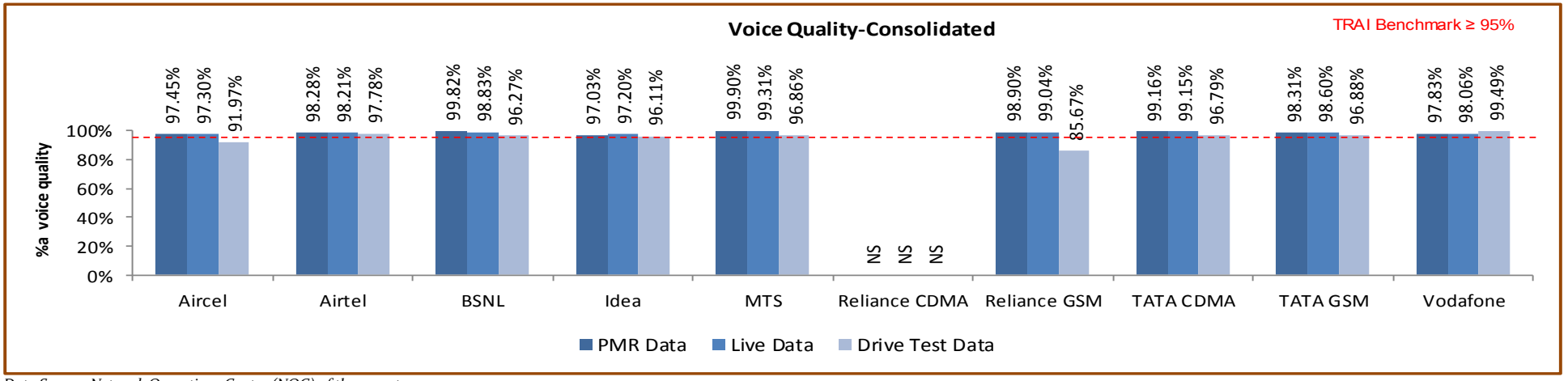
3. **TRAI Benchmark:** ≥ 95%

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.

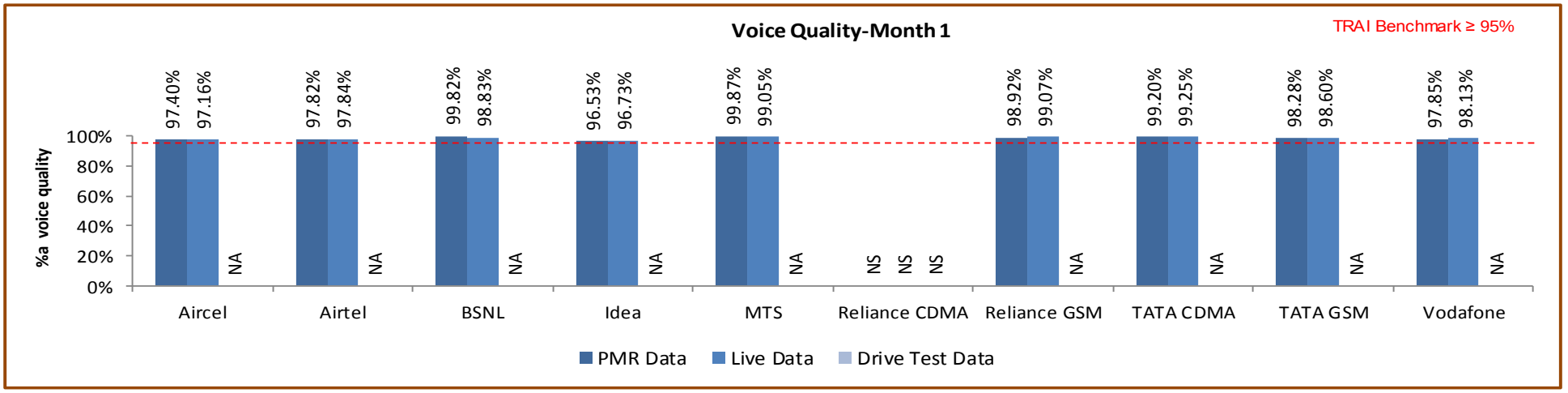
5.7.2 KEY FINDINGS



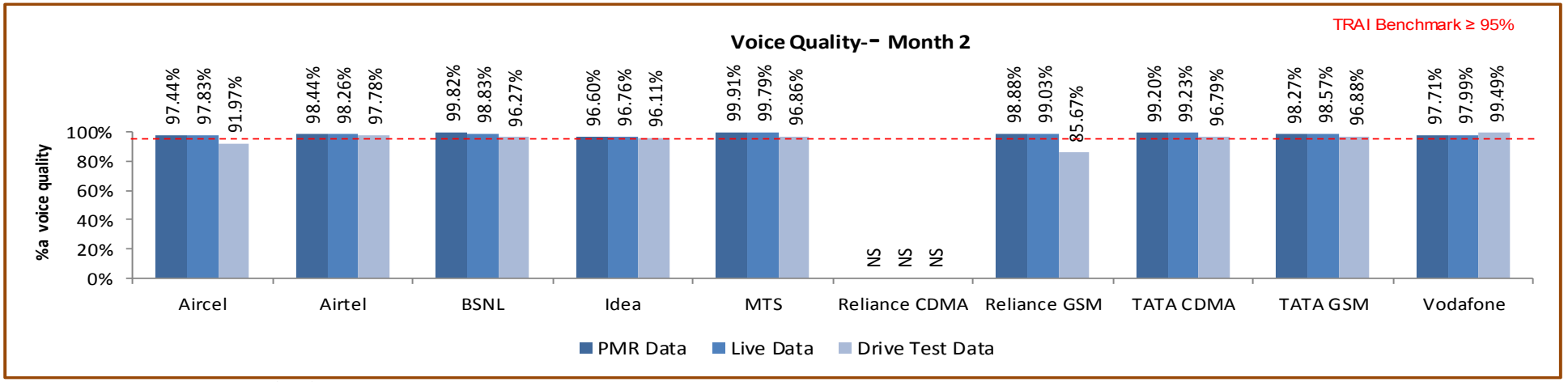
Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for Voice quality as per PMR audit. During drive test Aircel, Reliance GSM failed to meet the TRAI benchmark for voice quality.

5.7.2.1 KEY FINDINGS – MONTH 1

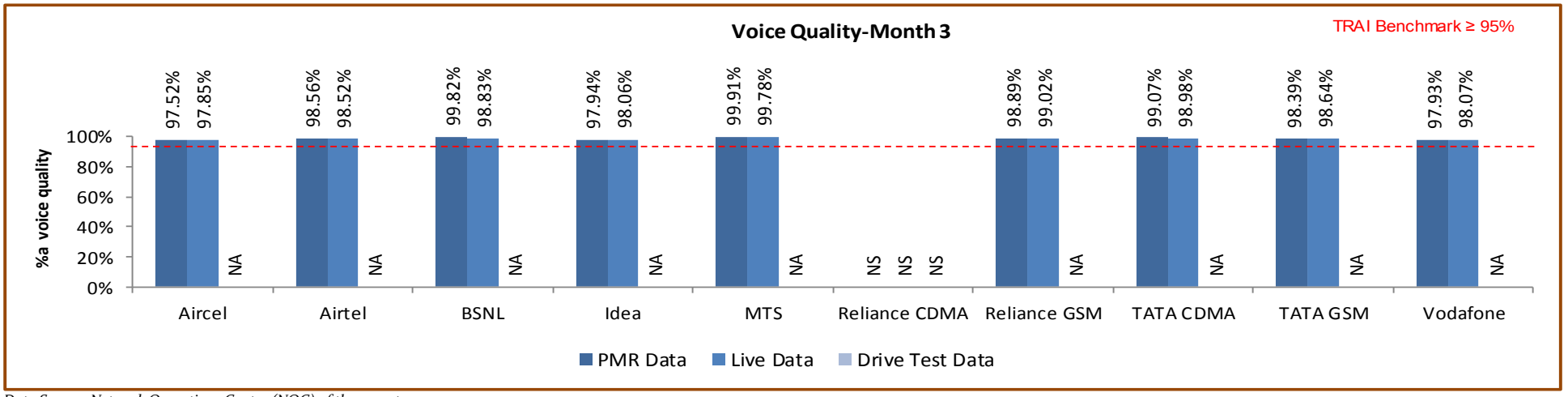


5.7.2.2 KEY FINDINGS – MONTH 2



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 –

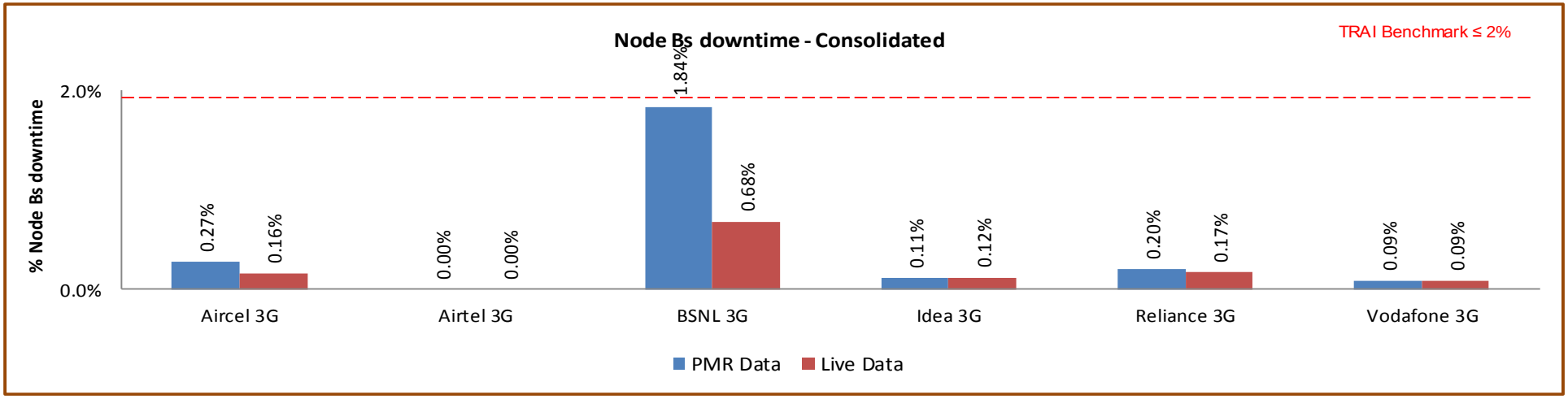
a. Node Bs downtime (not available for service) ≤ 2%

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

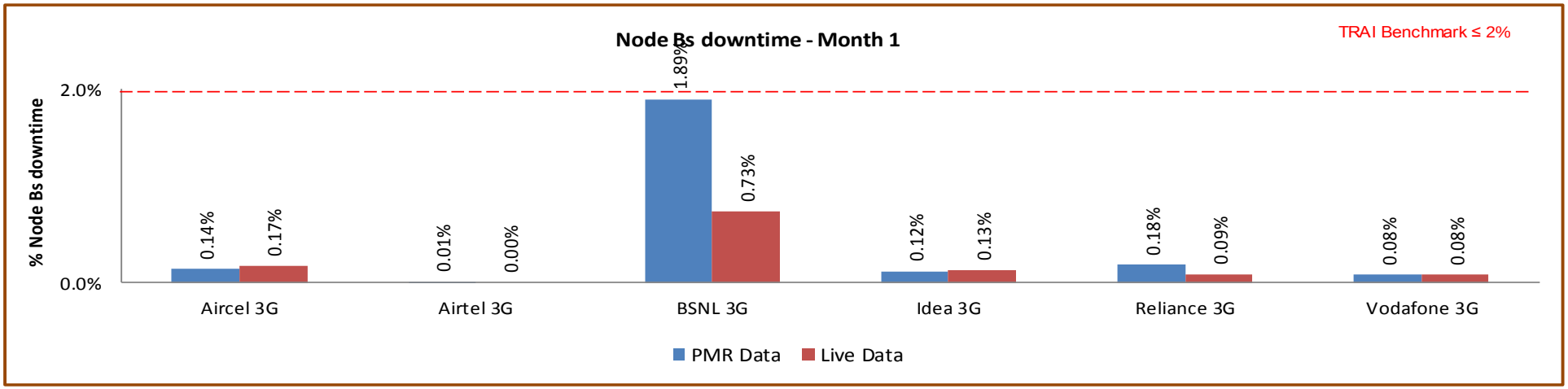


Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark for Node Bs down time in PMR audit data, rest of the operators are meeting the benchmark.

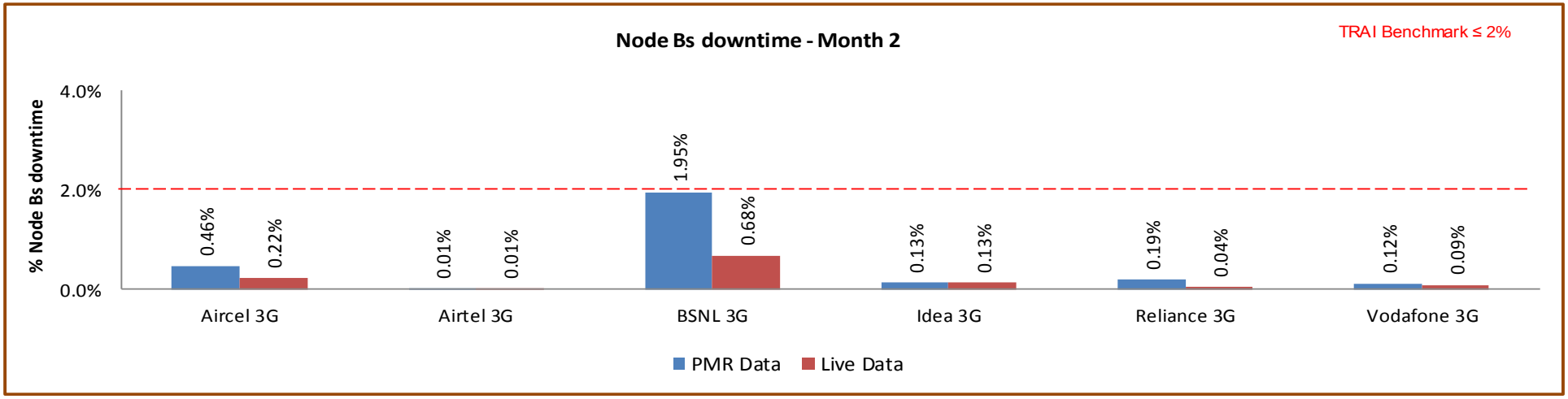
Significant difference was observed between PMR & live measurement data for BSNL 3G. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.1.2.1 KEY FINDINGS – MONTH 1



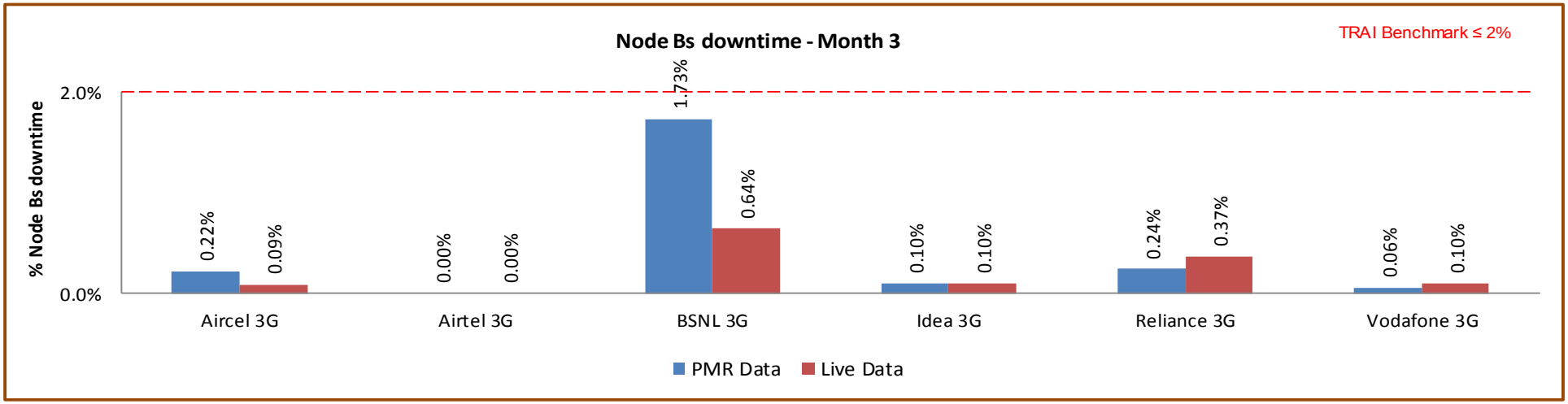
Data Source: Operations and Maintenance Center (OMC) of the operators

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 ≤ 2%

- **Audit Procedure –**

  i. 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

  ii. All the Node Bs in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.

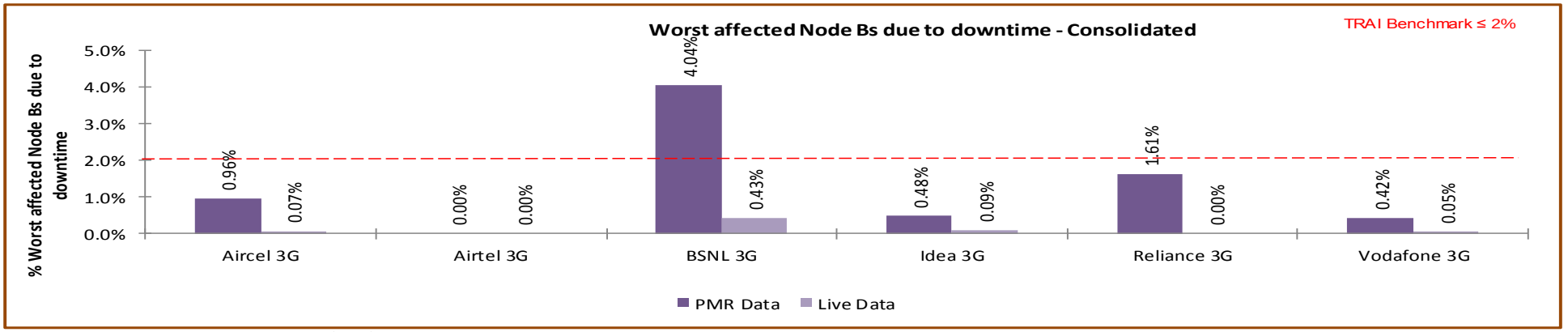
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  iv. 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 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

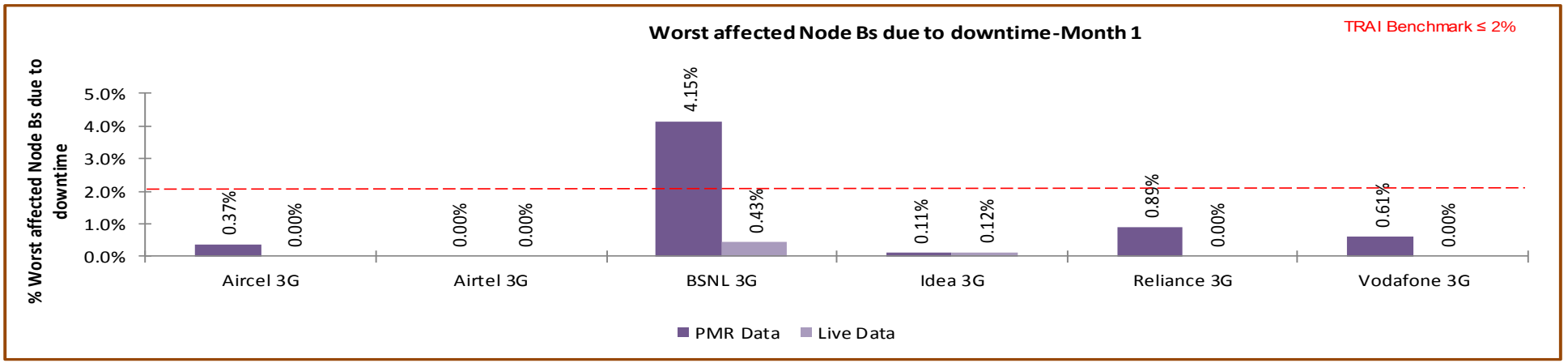


Data Source: Operations and Maintenance Center (OMC) of the operators

All operators met the benchmark for worst affected BTSs due to downtime as per audit/PMR data except BSNL 3G.

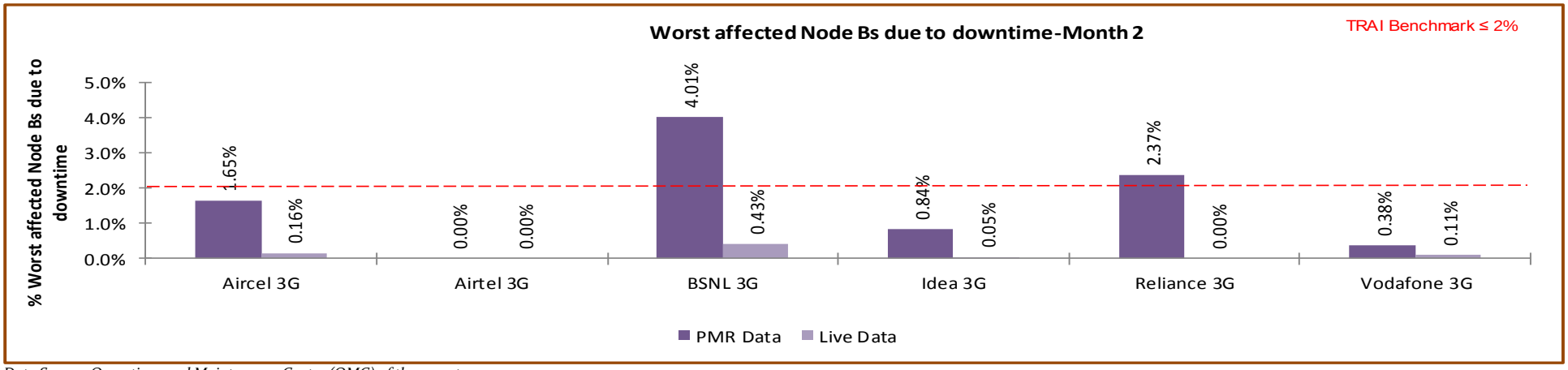
Significant difference was observed between PMR & live measurement data for Aircel, Vodafone, Idea and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.2.2.1 KEY FINDINGS – MONTH 1



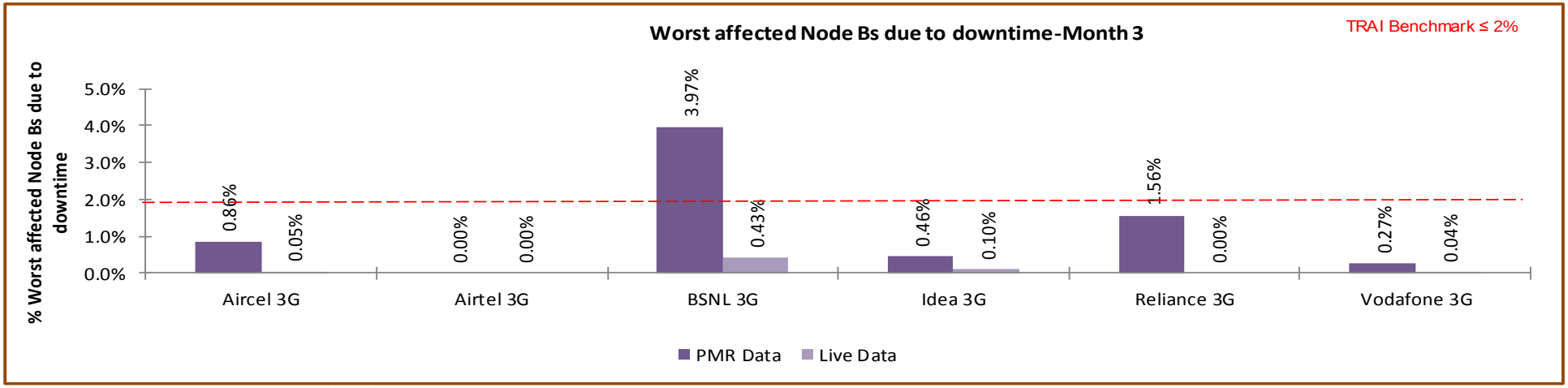
Data Source: Operations and Maintenance Center (OMC) of the operators

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-**
   (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

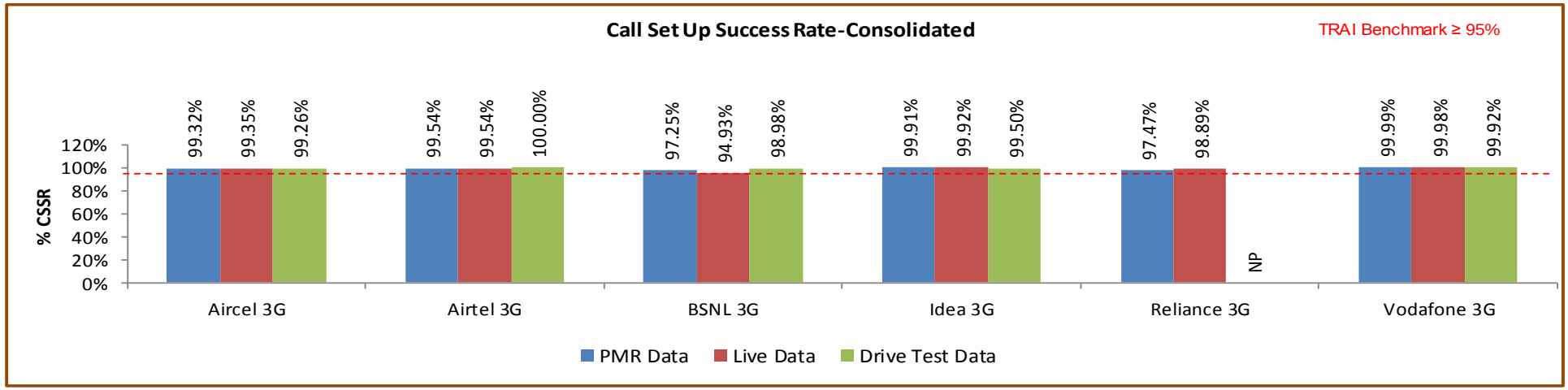
5. **TRAI Benchmark ≥** 95%

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.

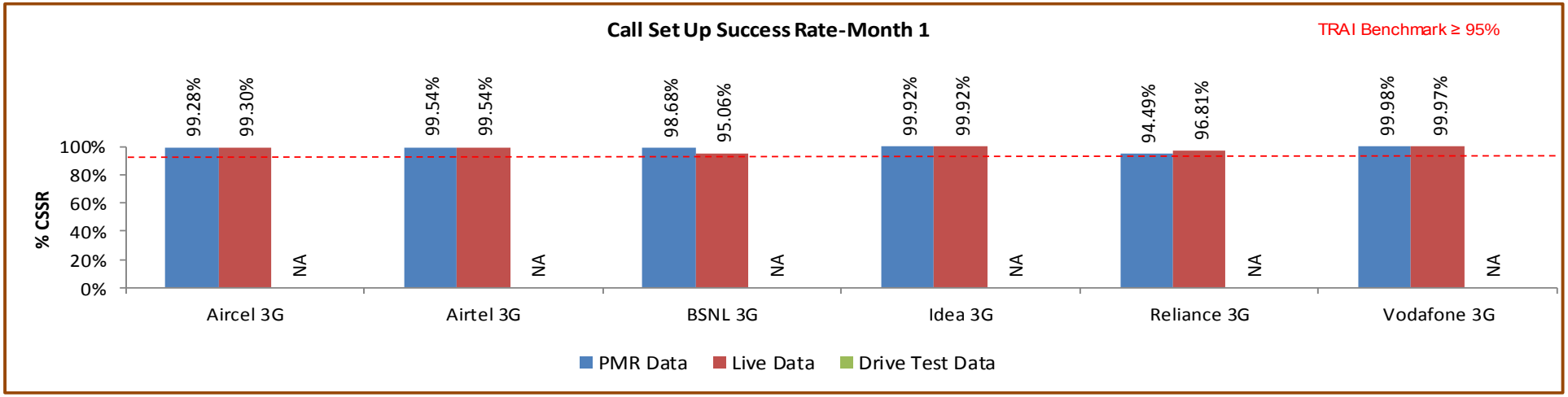
6.3.2 KEY FINDINGS - CONSOLIDATED



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

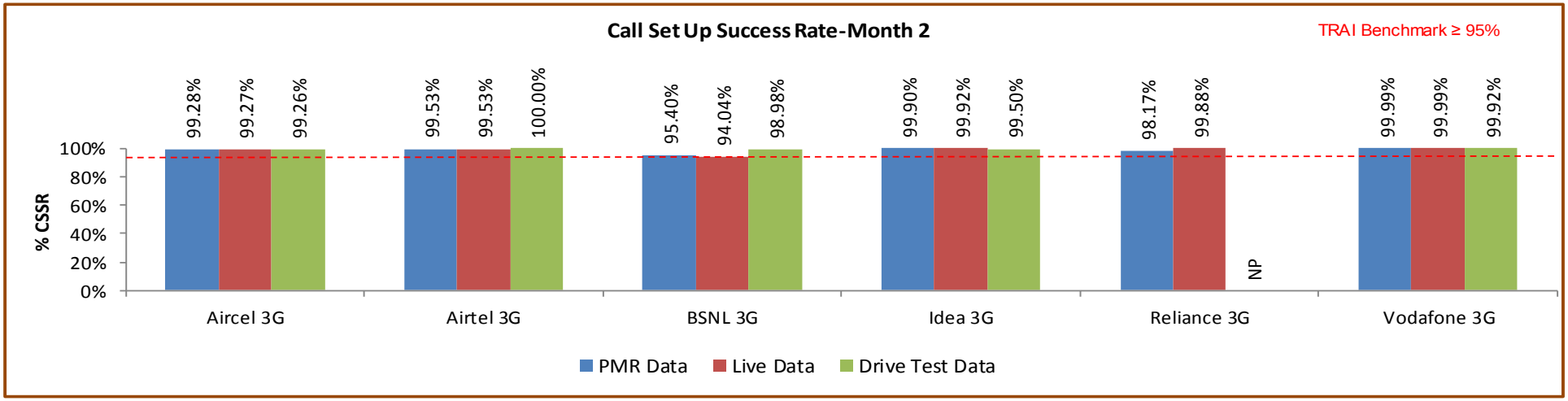
All operators met the TRAI benchmark as per audit/PMR data and drive test data except BSNL 3G as per live audit.

6.3.2.1 KEY FINDINGS – MONTH 1



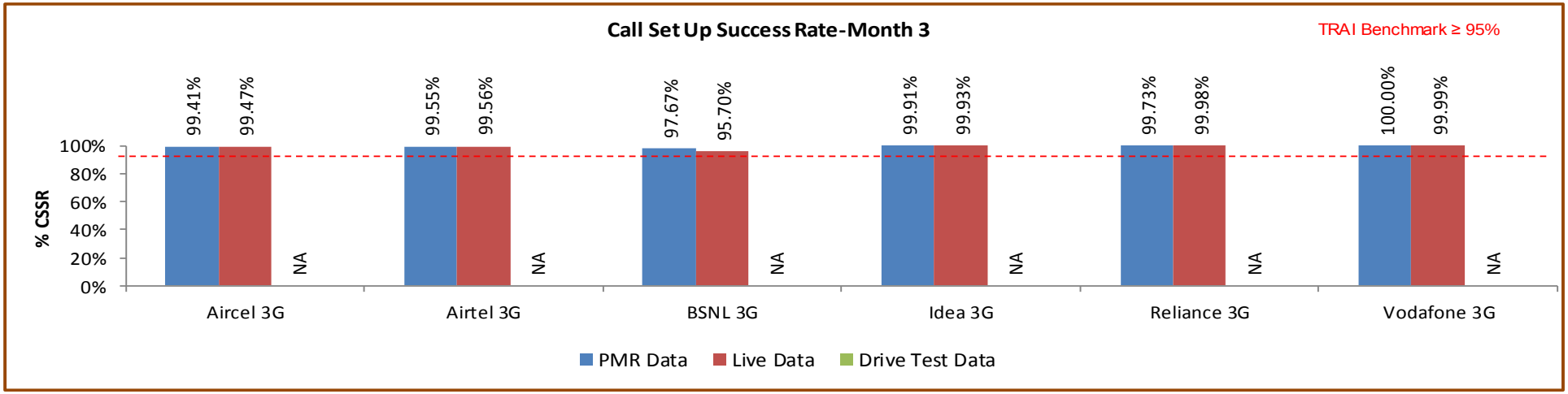
Data Source: Network Operations Center (NOC) of the operators

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:**
    - **RRC / RAB Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
        - Where:-A1 = Number of attempts to establish RRC/ RAB made on day 1
        - C1 = Average RRC / RAB Congestion % on day 1
        - A2 = Number of attempts to establish RRC / RAB made on day 2
        - C2 = Average RRC / RAB Congestion % on day 2
        - An = Number of attempts to establish RRC / RAB made on day n
        - Cn = Average RRC / RAB Congestion % on day n

- **POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
  - Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1
  - C1 = Average POI Congestion % on day 1
  - A2 = POI traffic offered on all POIs (no. of calls) on day 2
  - C2 = Average POI Congestion % on day 2
  - An = POI traffic offered on all POIs (no. of calls) on day n
  - Cn = Average POI Congestion % on day n

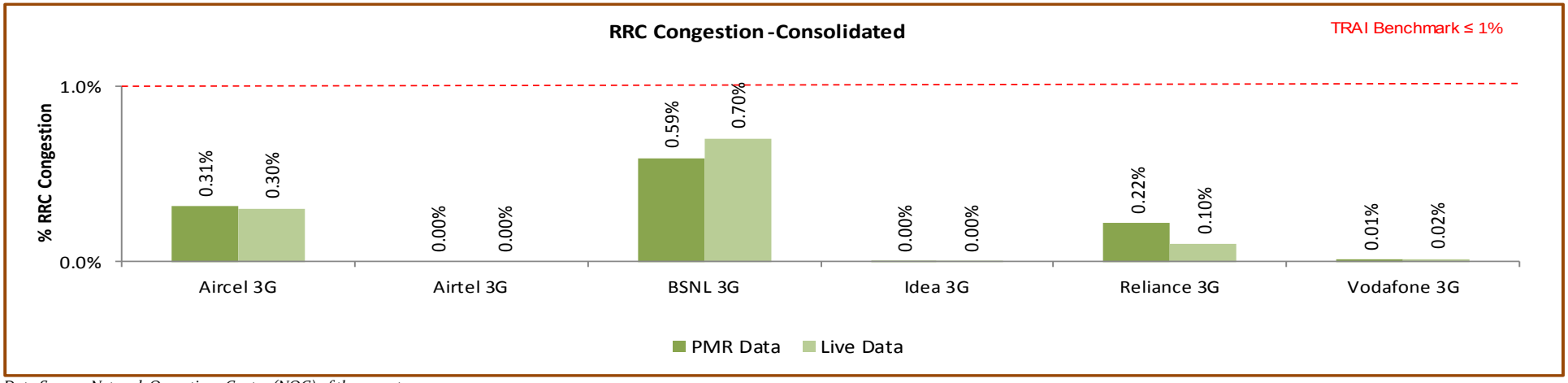
7. Benchmark:

- RRC Congestion: ≤ 1%, RAB Congestion: ≤ 2%, POI Congestion: ≤ 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

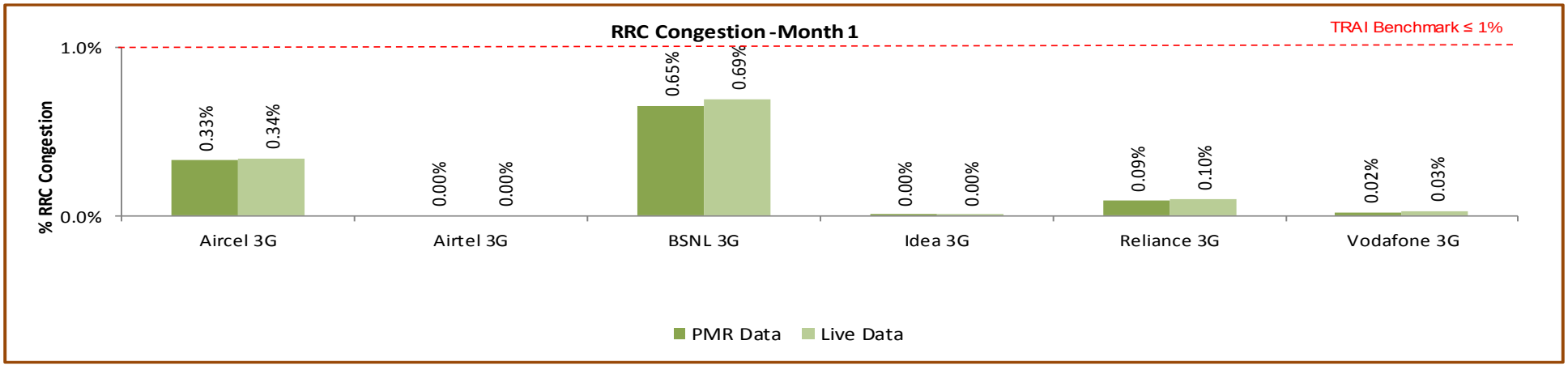
6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



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

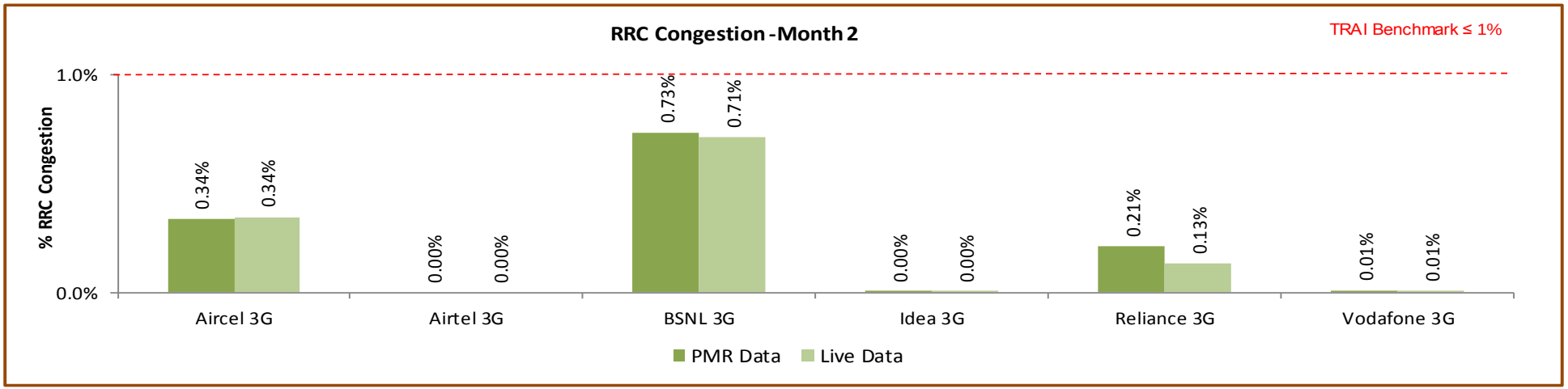
All operators met the benchmark for RRC Congestion.

6.4.2.1 KEY FINDINGS – MONTH 1



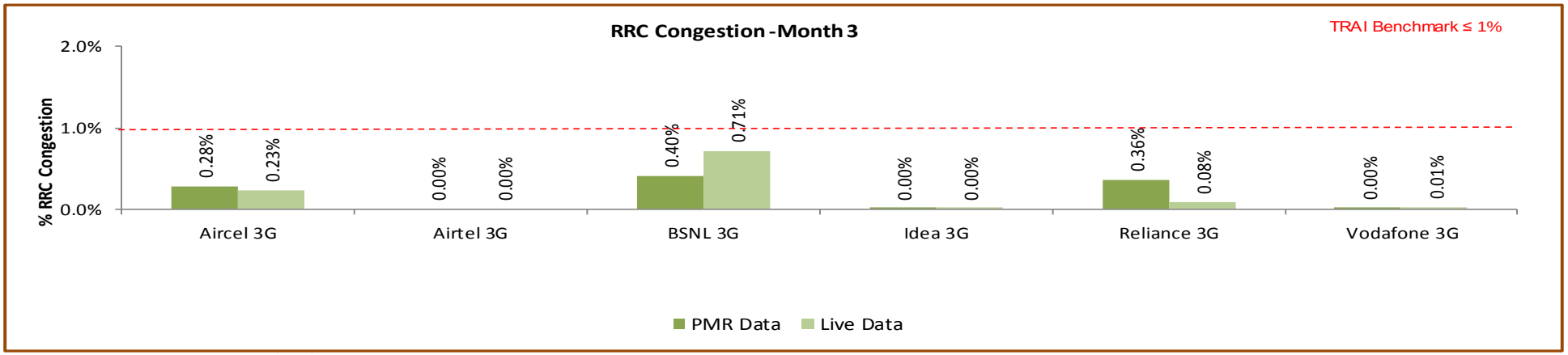
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



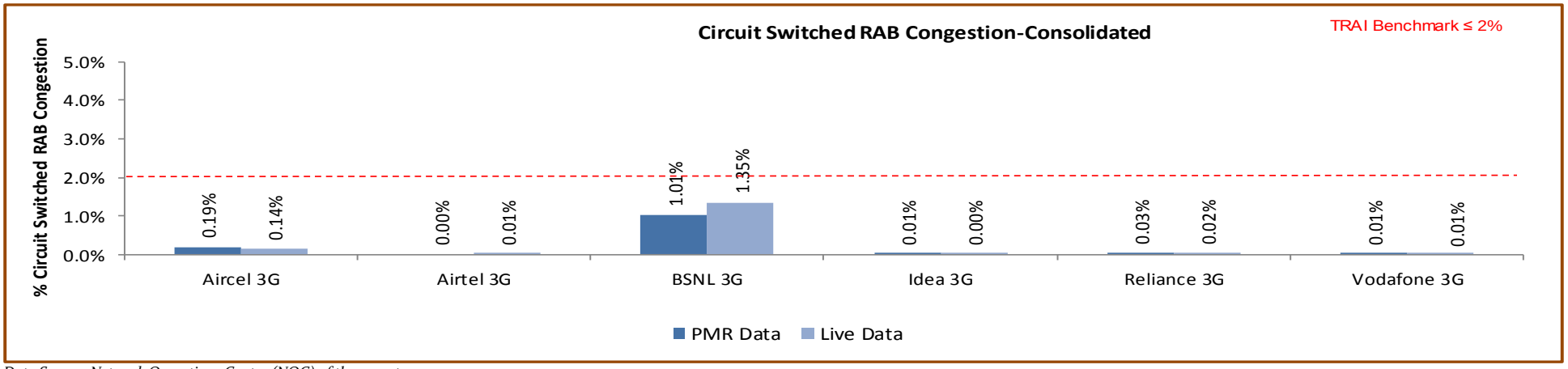
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3



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

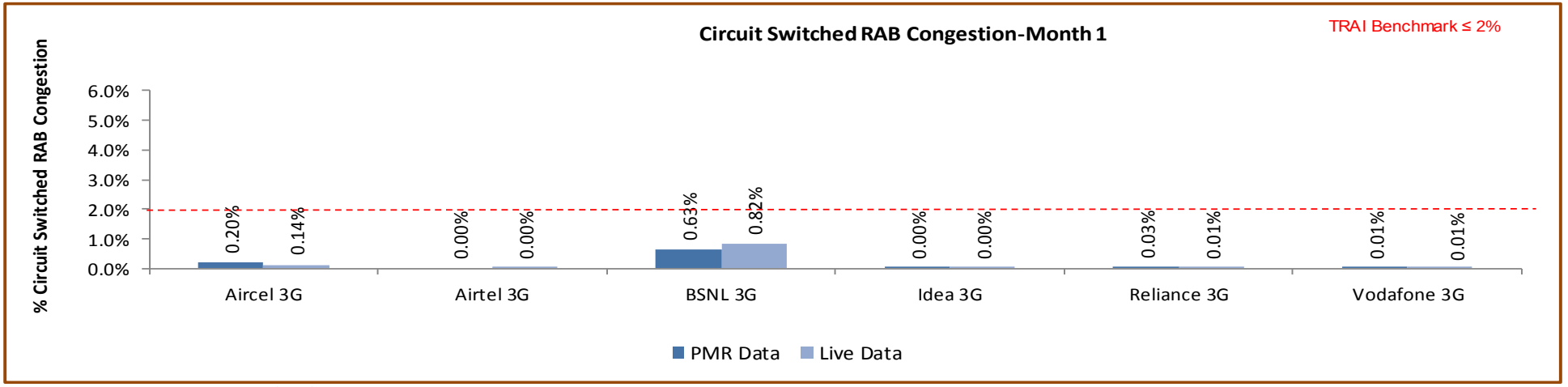
6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)



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

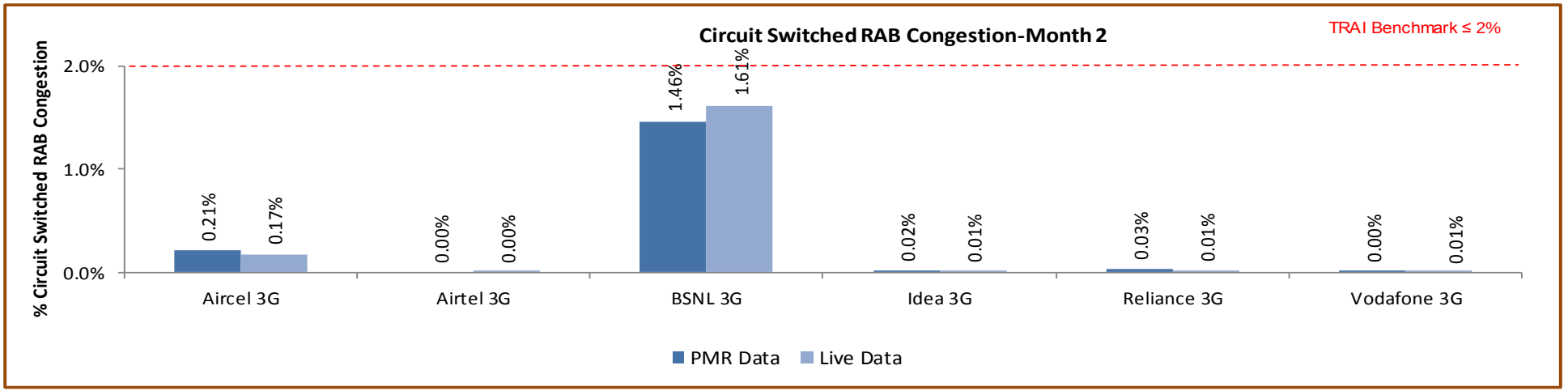
All operators met the benchmark as per audit/PMR & 3days live report.

6.4.3.1 KEY FINDINGS – MONTH 1



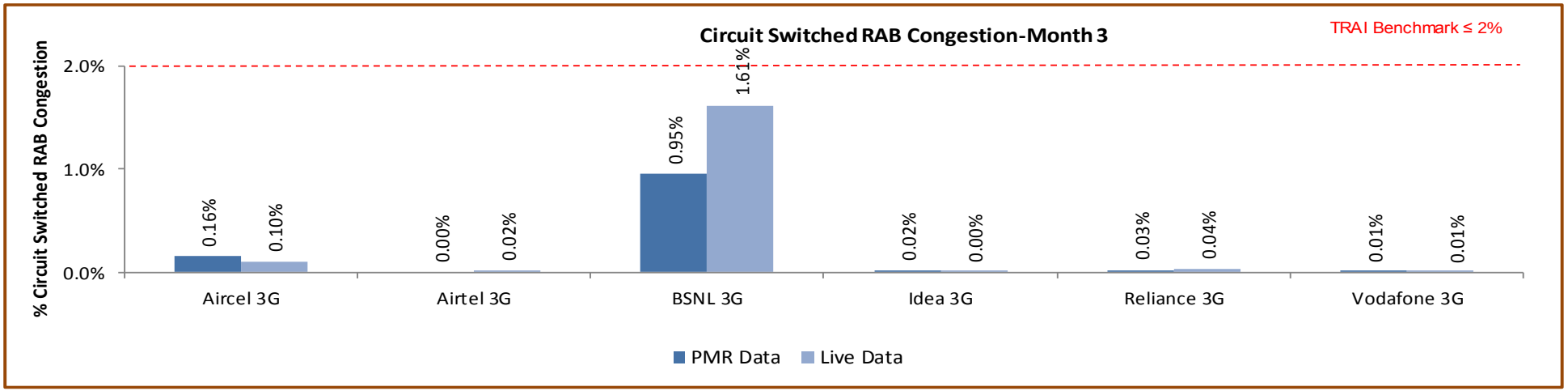
Data Source: Network Operations Center (NOC) of the operators

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:** (**No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released)x 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

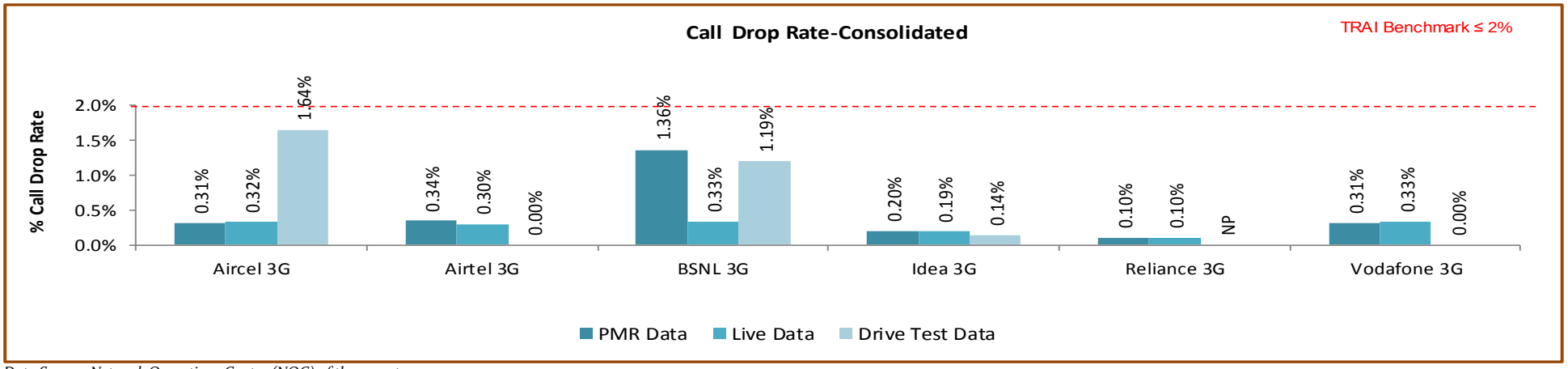
5. **TRAI Benchmark** –

   - Circuit switched voice drop rate ≤ 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

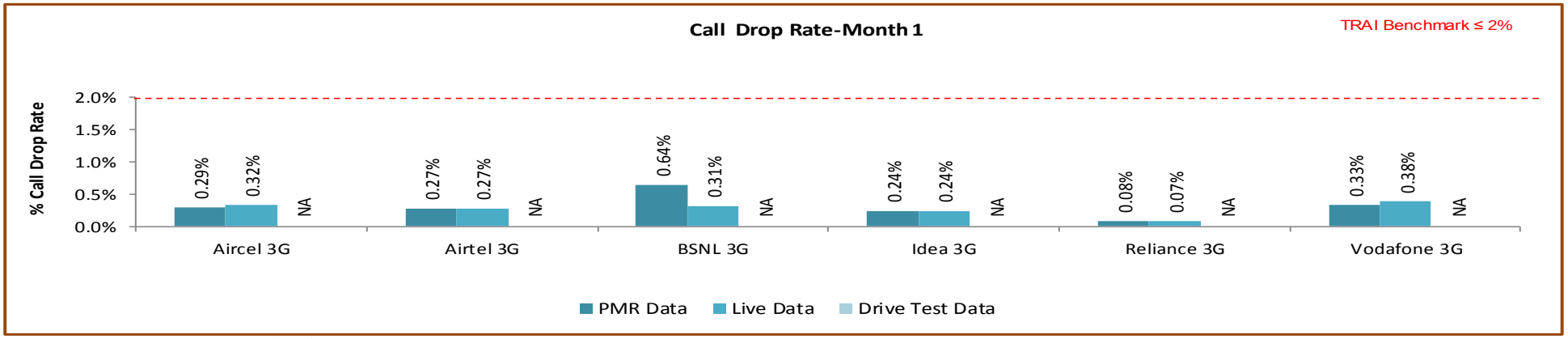


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark for call drop rate during audit.

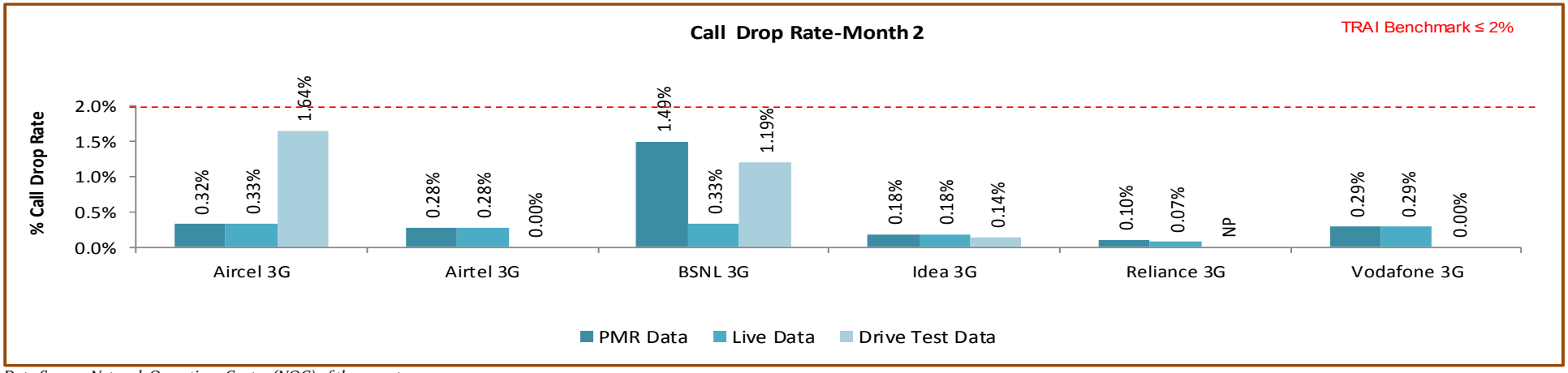
Significant difference was observed between PMR & live measurement data for Aircel and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.5.2.1 KEY FINDINGS – MONTH 1



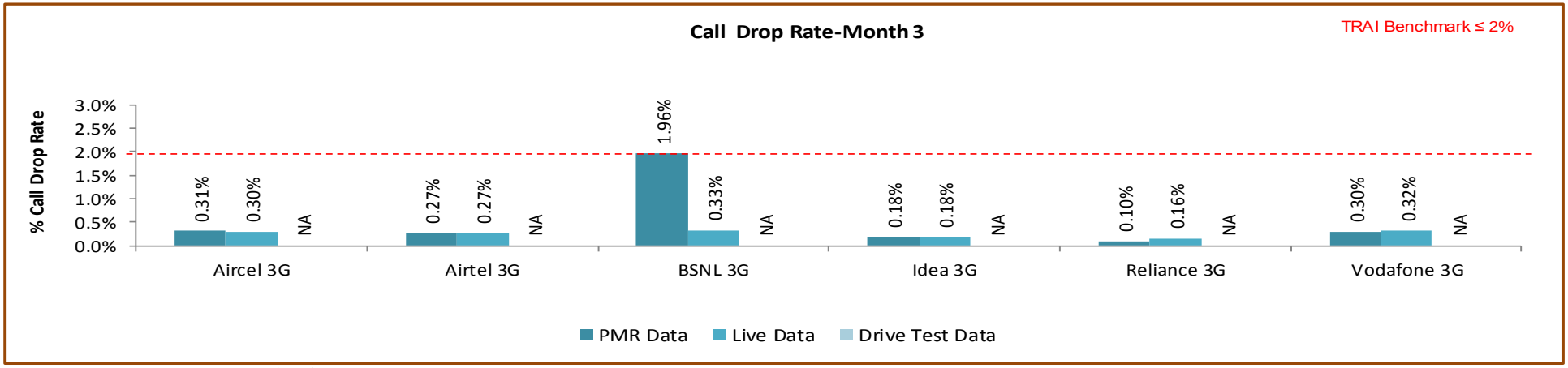
Data Source: Network Operations Center (NOC) of the operators

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:** (**Number of cells having CSV drop rate > 3% during CBBH in a month** / **Total number of cells in the licensed area) x 100**

5. **TRAI Benchmark** –

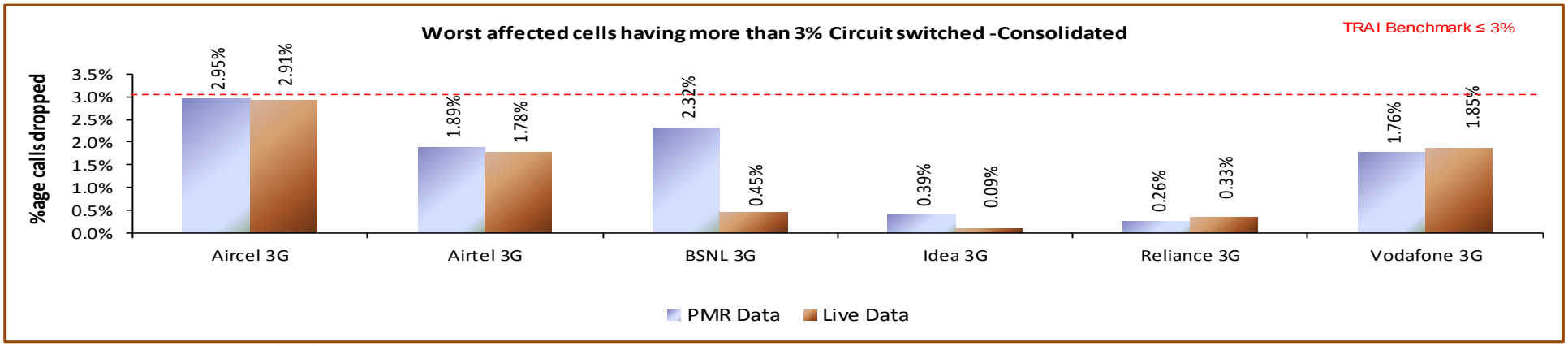
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

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

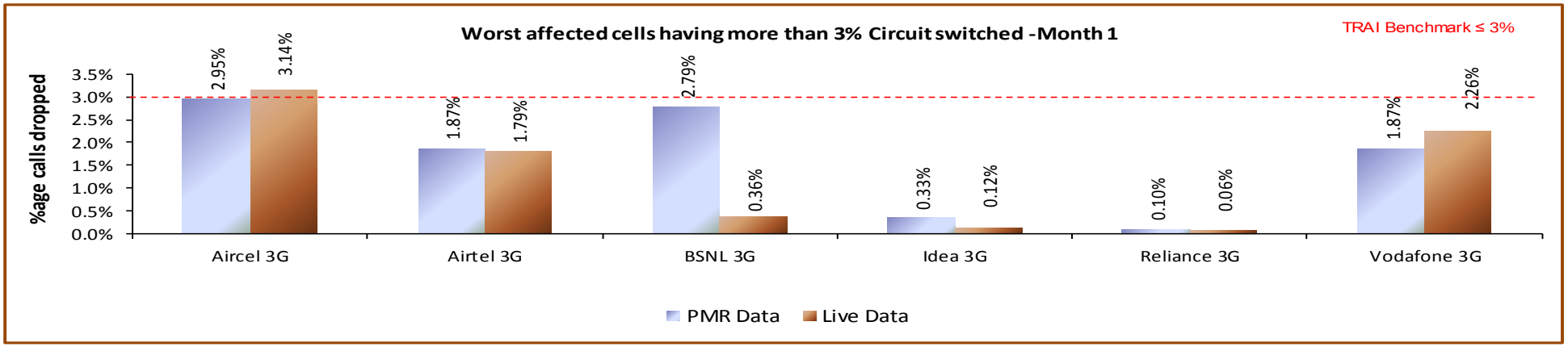


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark during audit PMR/live.

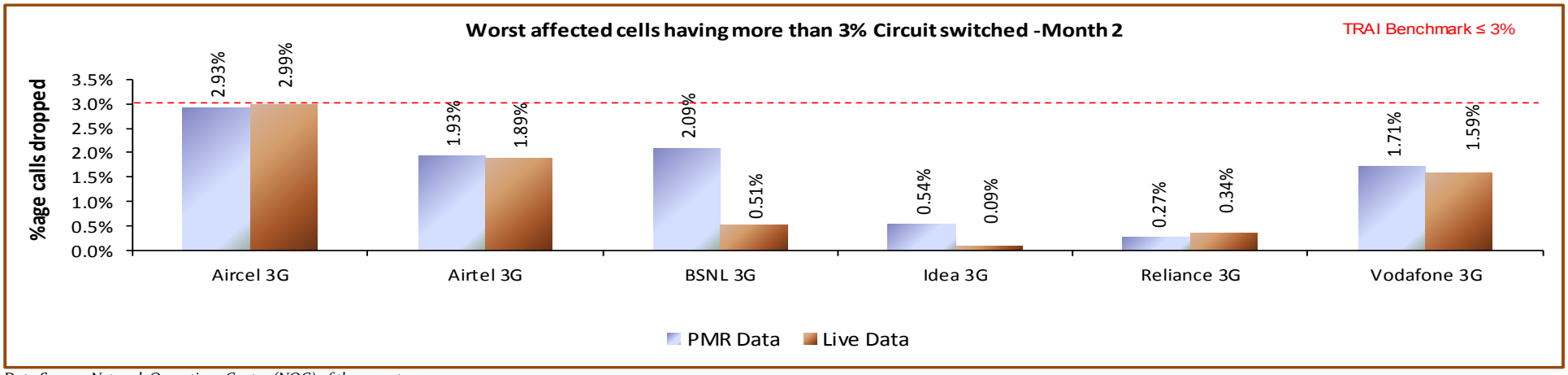
Significant difference was observed between PMR & live measurement data for Vodafone, Idea and BSNL. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.6.2.1 KEY FINDINGS – MONTH 1



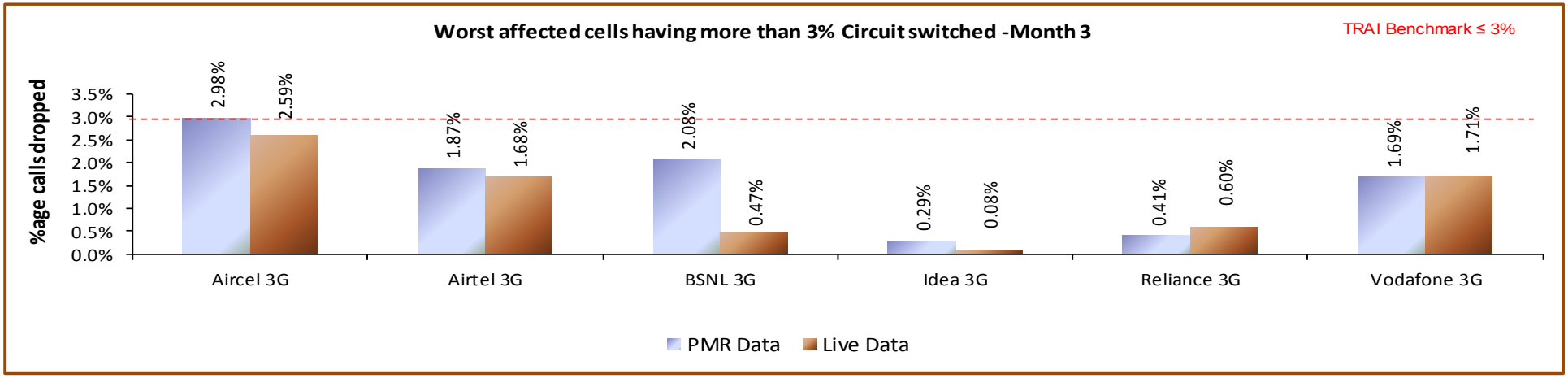
Data Source: Network Operations Center (NOC) of the operators

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 it FER value lies between 0 – 4 %

6. **Computational Methodology:**

   - **% Connections with good voice quality = (No. of voice samples with good voice quality / Total number of samples) x 100**

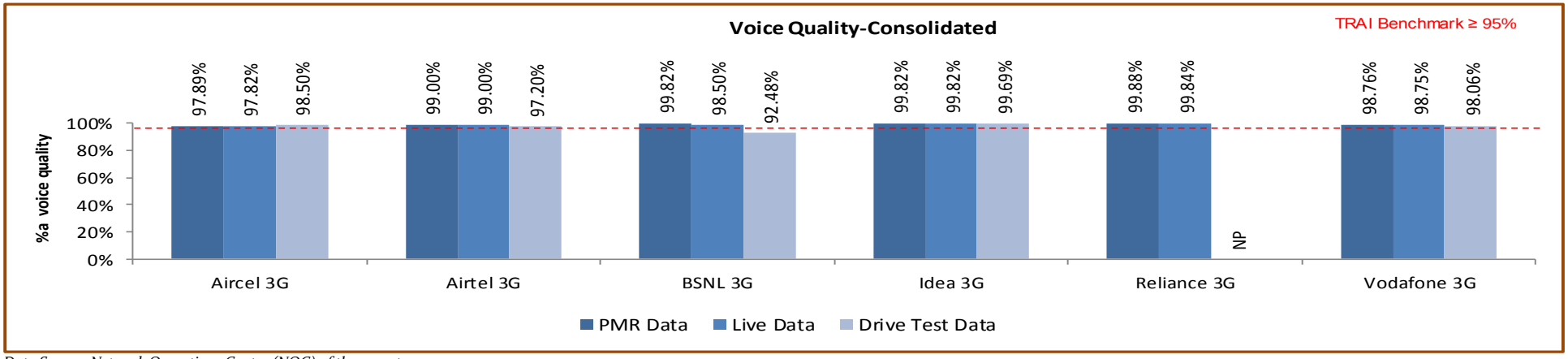
7. **TRAI Benchmark:** ≥ 95%

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

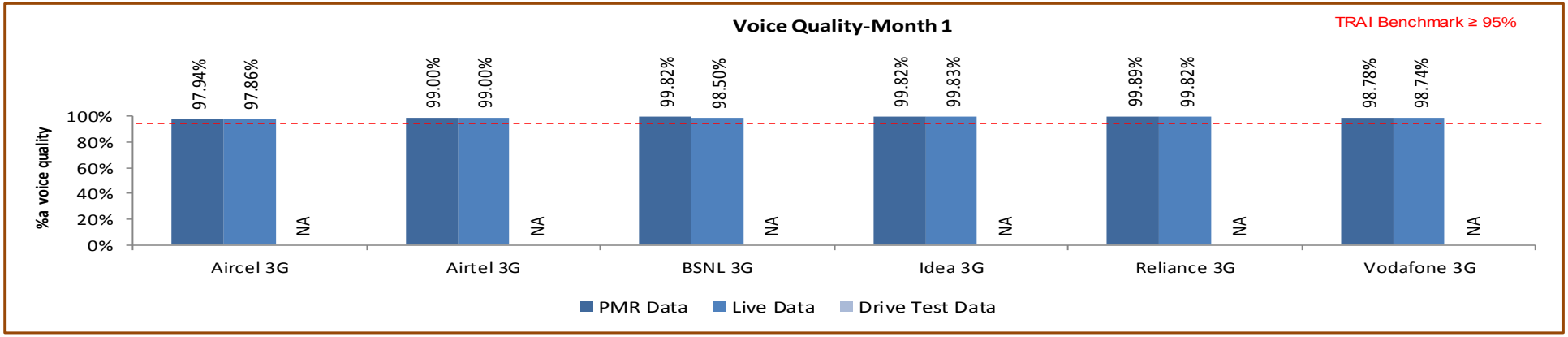


Data Source: Network Operations Center (NOC) of the operators

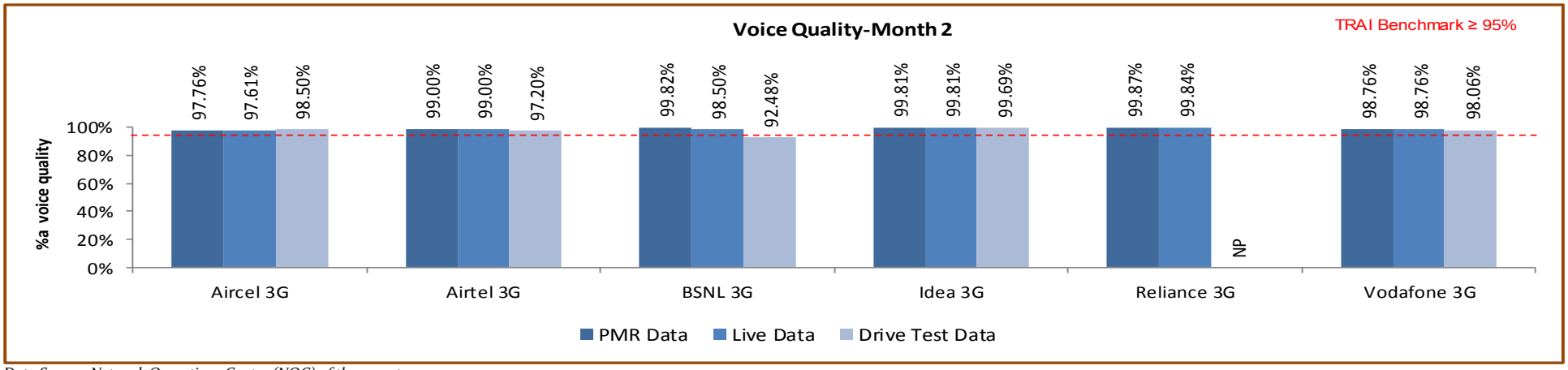
BSNL 3G failed to meet the benchmark during drive test.

Significant difference was observed between PMR & drive test for Aircel 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.

6.7.2.1 KEY FINDINGS – MONTH 1

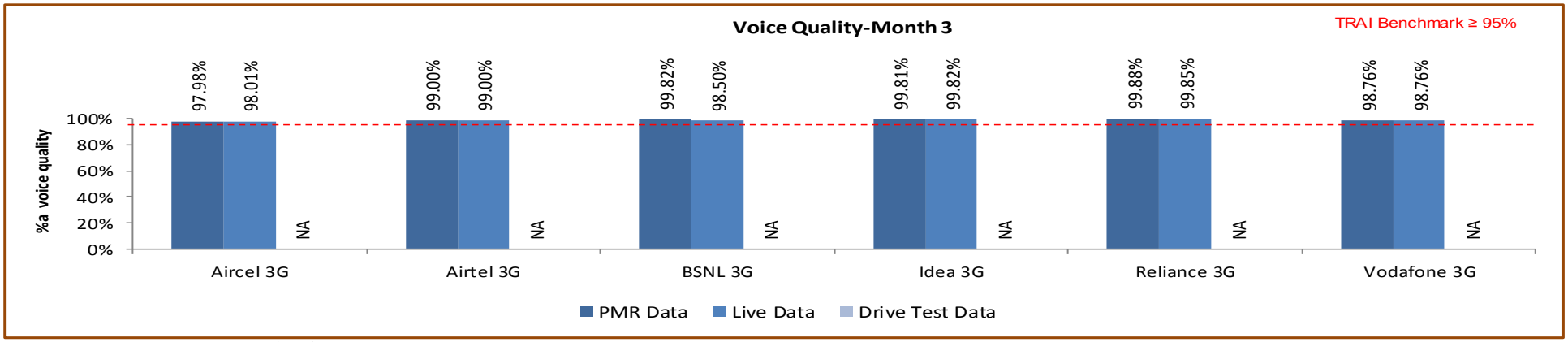


6.7.2.2 KEY FINDINGS – MONTH 2



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

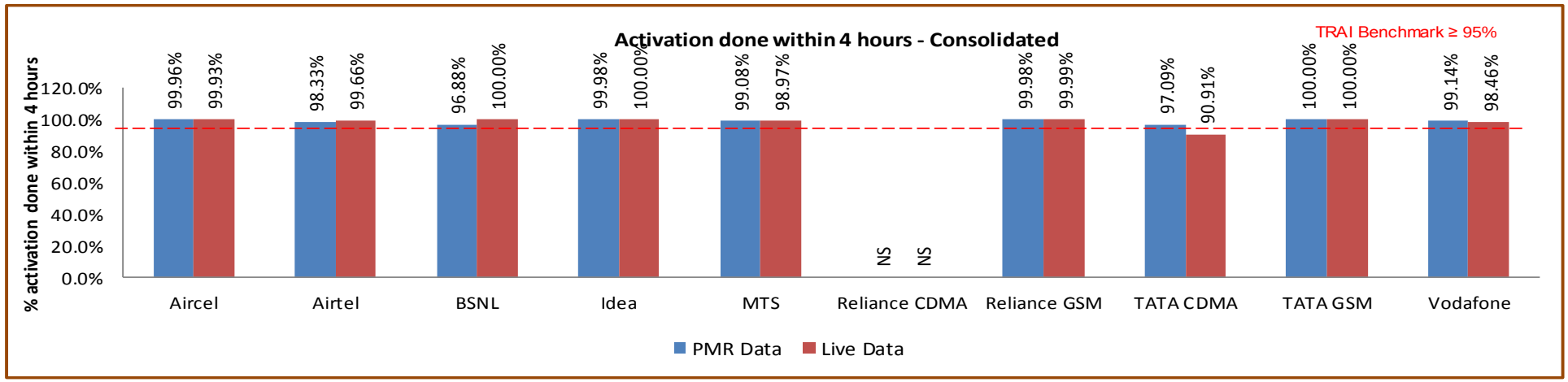
7 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES 2G

7.1 SERVICE ACTIVATION /PROVISIONING FOR 2G

7.1.1 PARAMETER DESCRIPTION

This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services. The service provider typically sends these settings to the subscriber's handset using SMS or WAP.

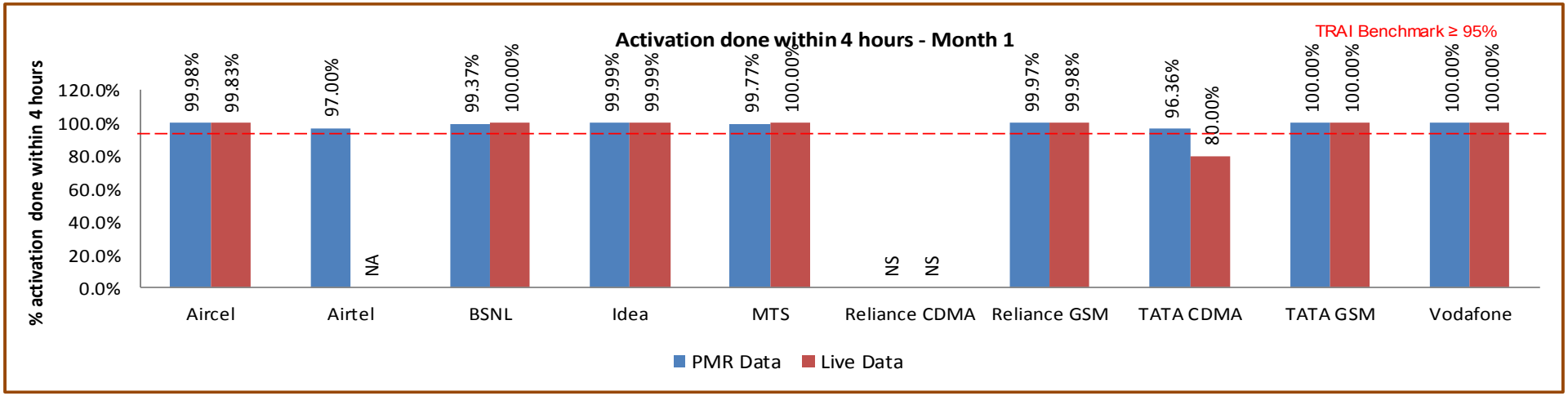
$$\text{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$



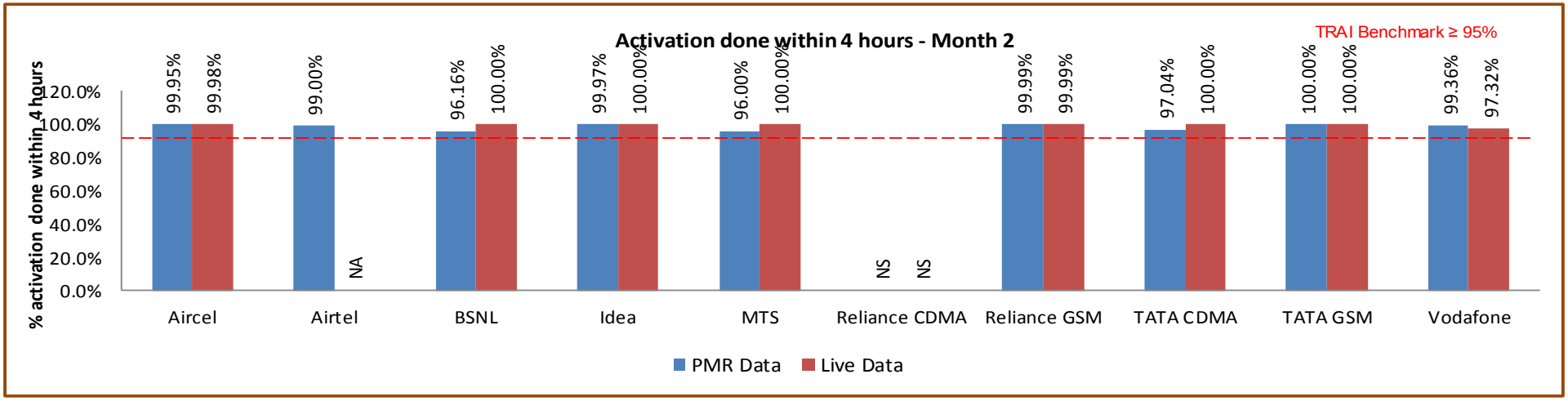
All operators met the benchmark for PMR as well as live audit except Tata CDMA during live audit.

Significant difference was observed between PMR & live measurement data for TATA CDMA 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.

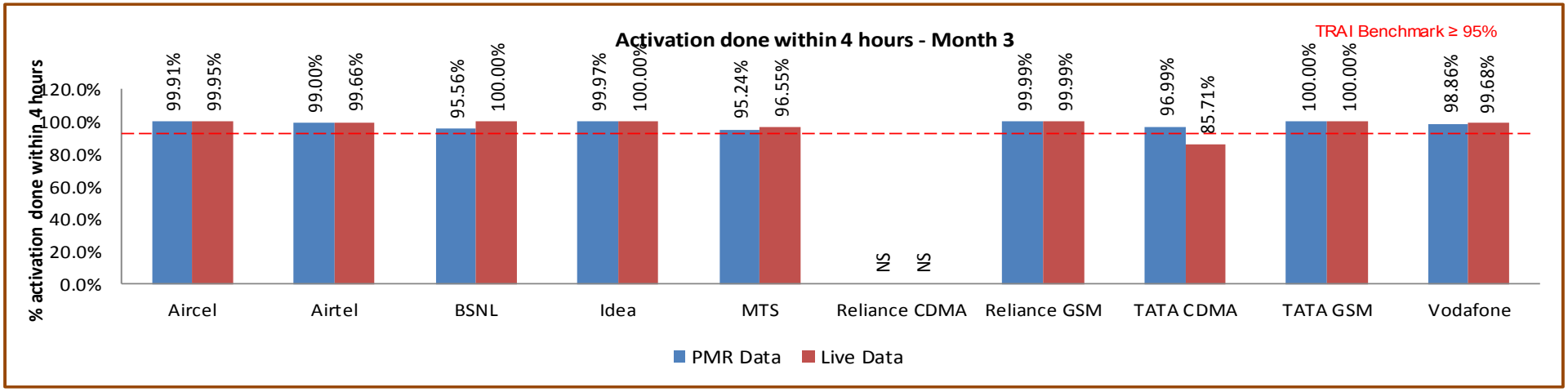
7.1.1.1 KEY FINDINGS – MONTH 1



7.1.1.2 KEY FINDINGS – MONTH 2



7.1.1.3 KEY FINDINGS – MONTH 3



7.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 2G

7.2.1 PARAMETER DESCRIPTION

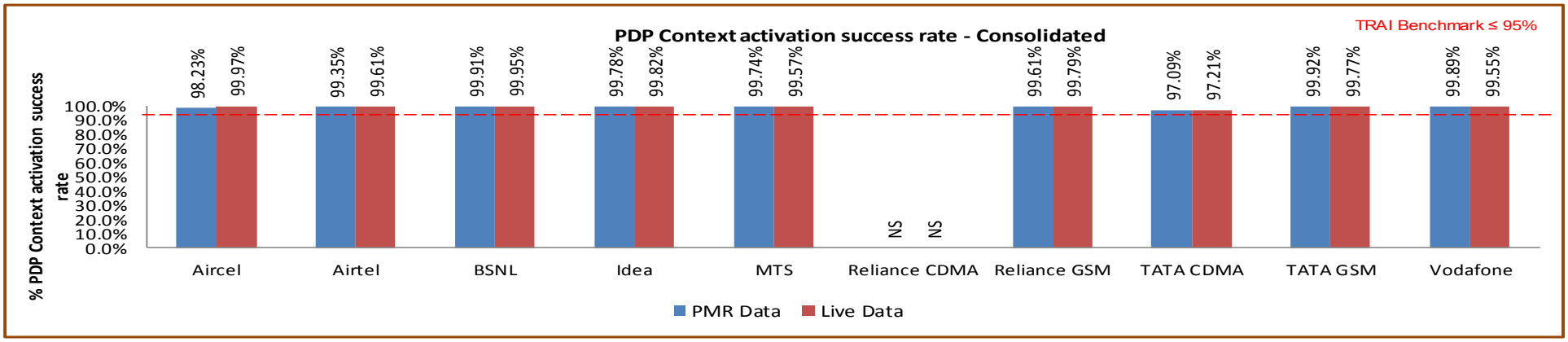
A Packet Data Protocol (PDP) context specifies access to an external packet-switching network. The data associated with the PDP context contains information such as the type of packet-switching network, the Mobile Station PDP (MS PDP) address that is the IP address, the reference of Gateway GPRS Support Node (GGSN), and the requested QoS. A PDP context is handled by the MS, Serving GPRS Support Node (SGSN) and GGSN and is identified by a mobile's PDP address within these entities. Several PDP contexts can be activated at the same time within a given MS.

Measurement

This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

$$\textbf{PDP Context Activation Success Rate (\%)} = \frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

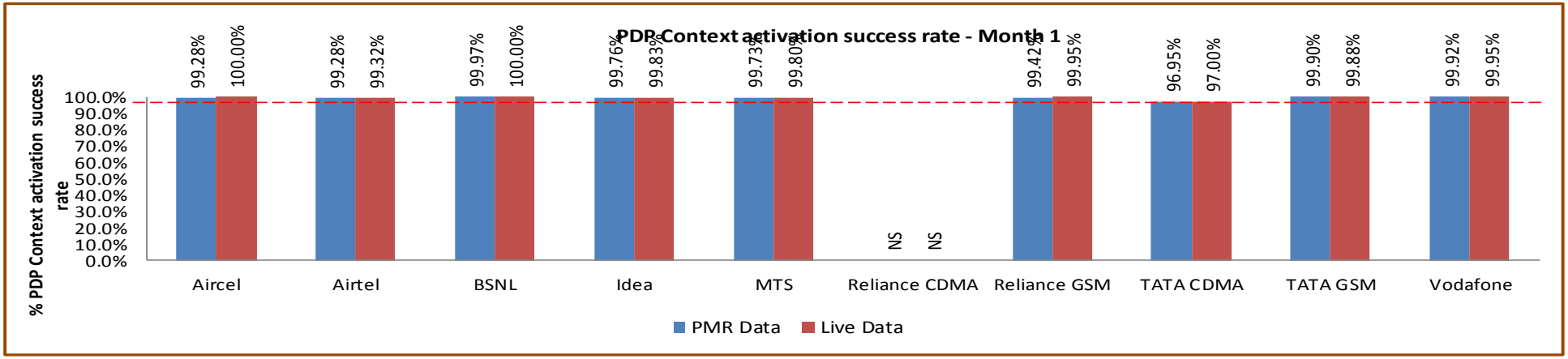
7.2.2 KEY FINDINGS



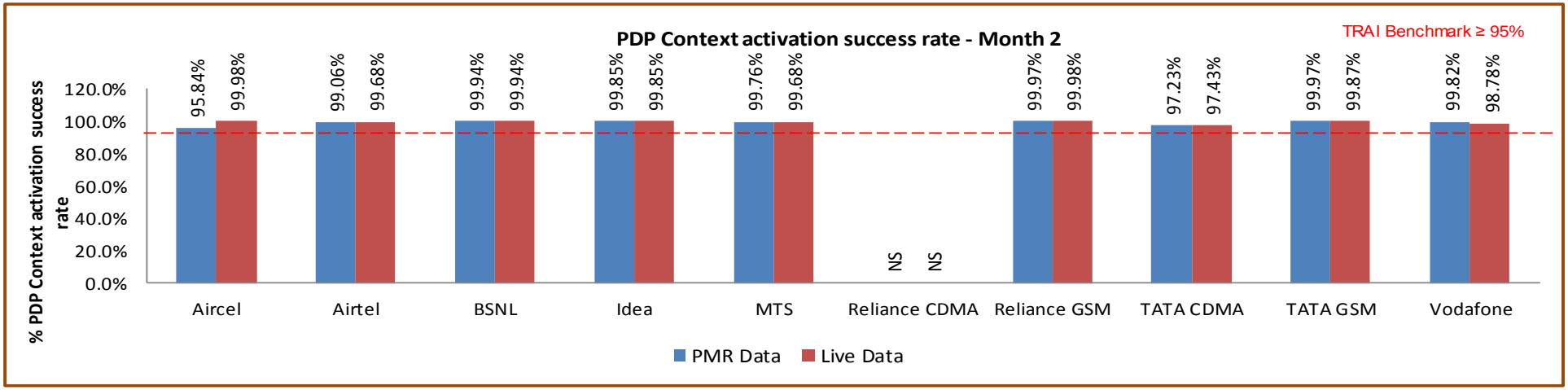
All operators met the benchmark for PMR as well as live audit

Significant difference was observed between PMR & live measurement data for Airtel, Idea and Reliance CDMA. 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.

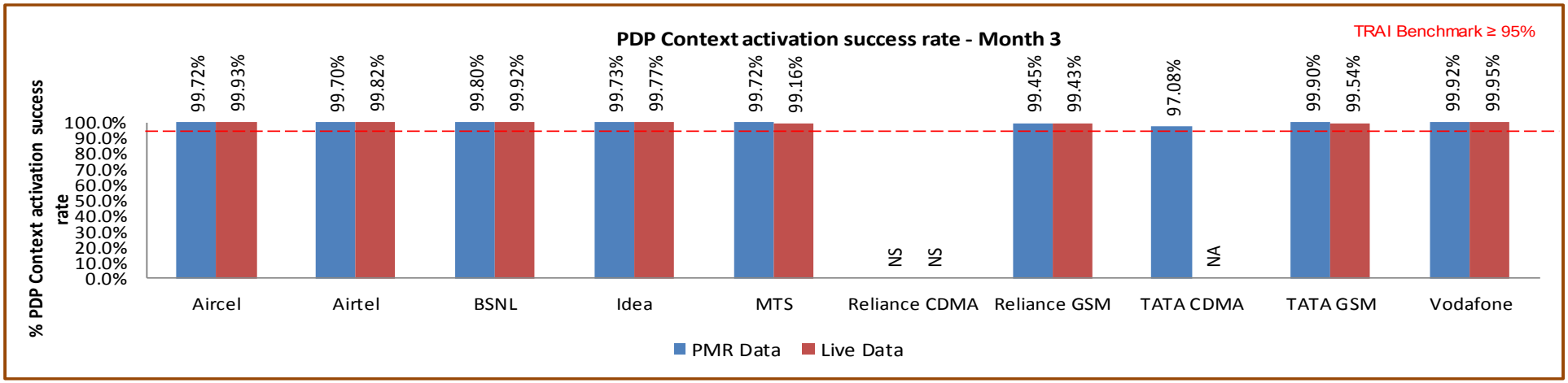
7.2.2.1 KEY FINDINGS – MONTH 1



7.2.2.2 KEY FINDINGS – MONTH 2



7.2.2.3 KEY FINDINGS – MONTH 3



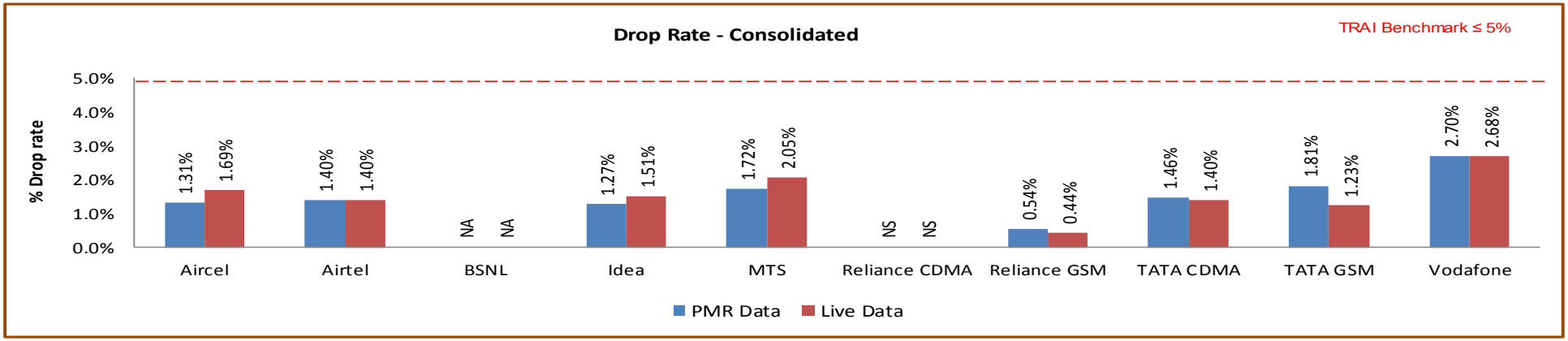
7.3 DROP RATE FOR 2G

7.3.1 PARAMETER DESCRIPTION

It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects (both normal and abnormal). An abnormal disconnect may happen because of Radio Link Failures, Uplink (UL) or Downlink (DL) interference, bad coverage, unsuccessful handovers or any other reason. The drop rate is to be measured for all generations of the technologies separately.

$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$

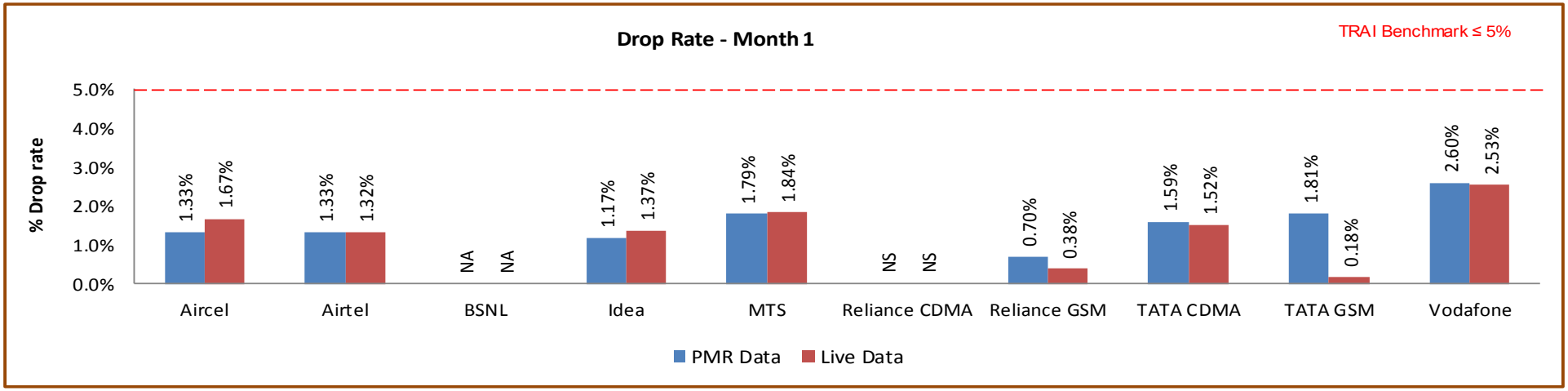
7.3.2 KEY FINDINGS



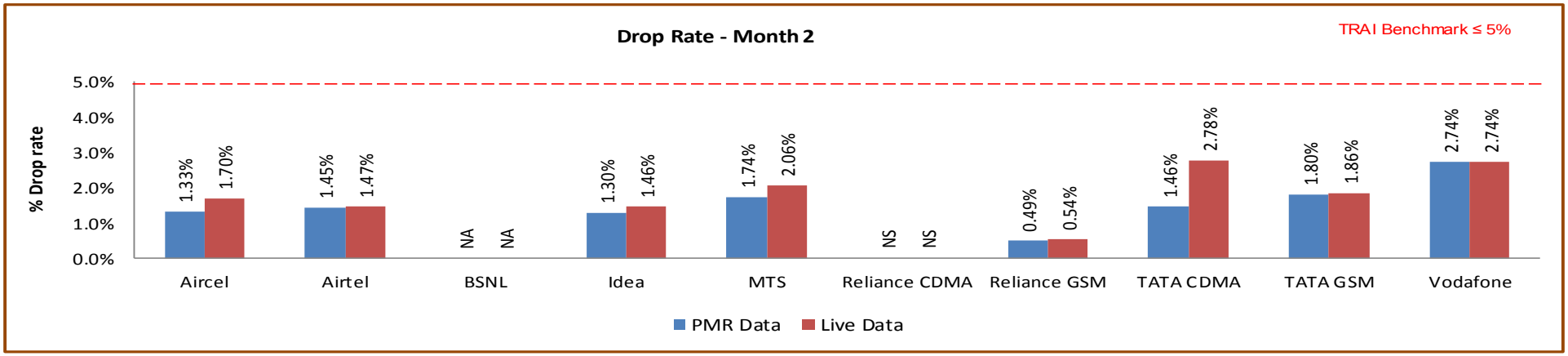
All operators met the benchmark for PMR as well as live audit.

Note: BSNL did not submit the data for % Drop Rate for both PMR and Live audit while Reliance CDMA did not submit the data for live audit.

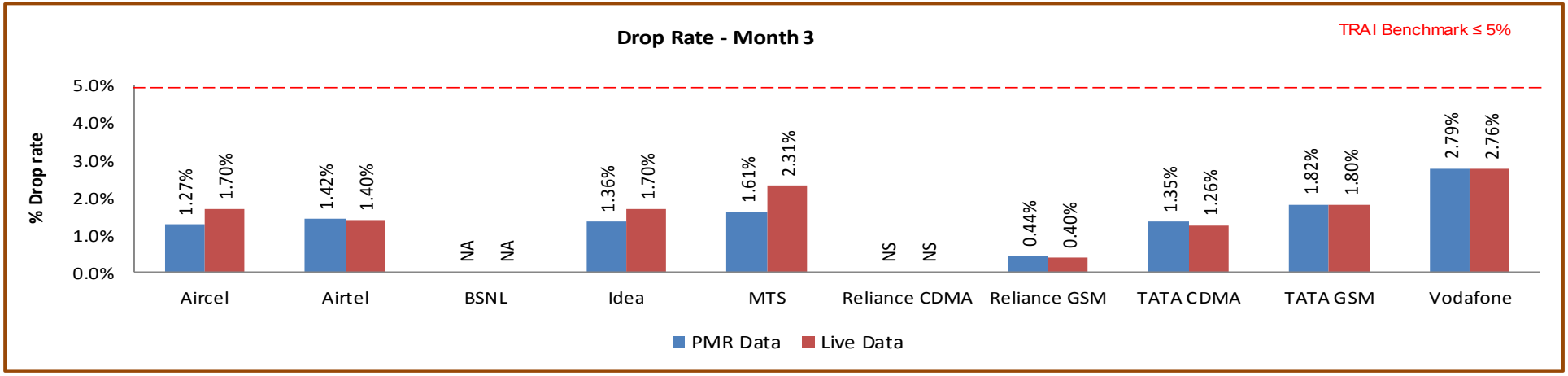
7.3.2.1 KEY FINDINGS – MONTH 1



7.3.2.2 KEY FINDINGS – MONTH 2



7.3.2.3 KEY FINDINGS – MONTH 3



8 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES 3G

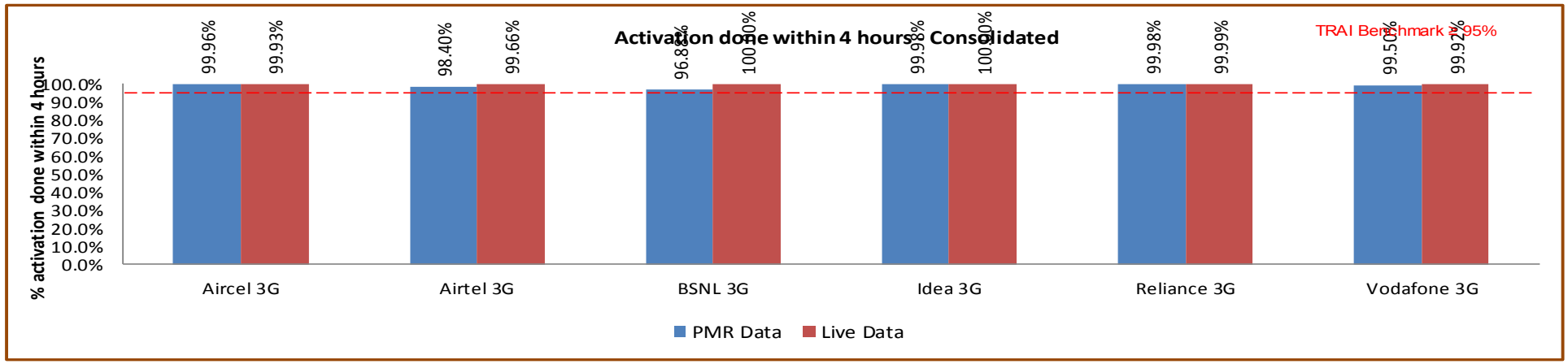
8.1 SERVICE ACTIVATION /PROVISIONING FOR 3G

8.1.1 PARAMETER DESCRIPTION

This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services. The service provider typically sends these settings to the subscriber's handset using SMS or WAP.

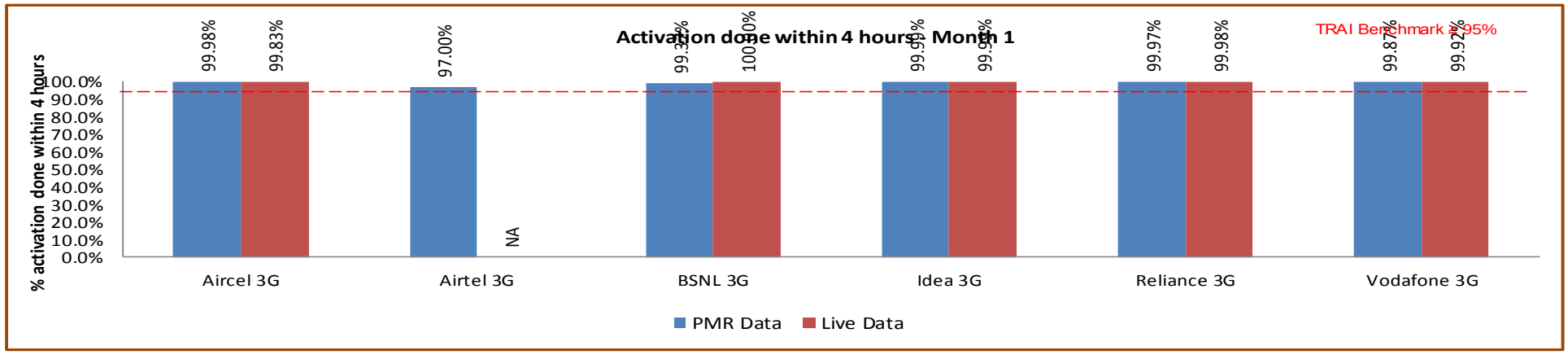
$$\text{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$

8.1.2 KEY FINDINGS

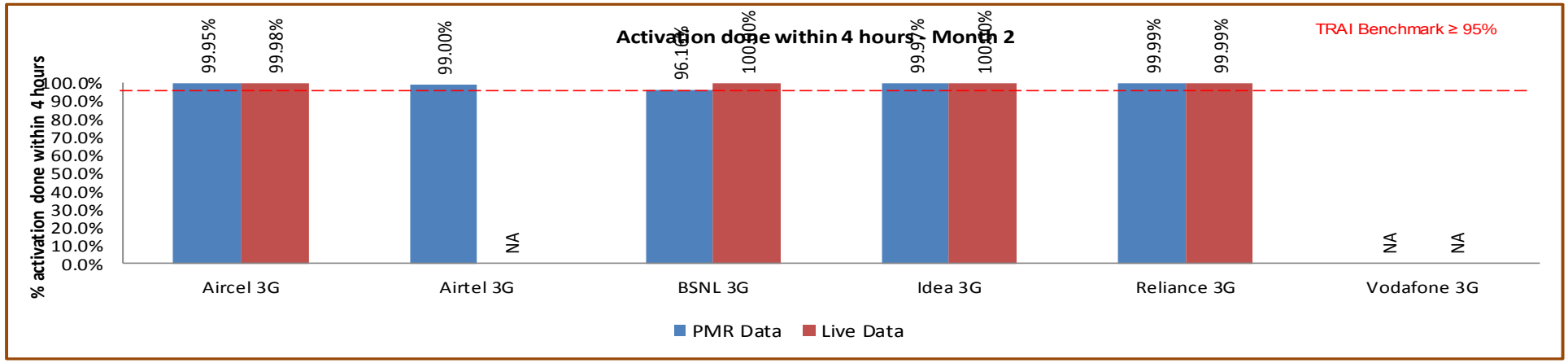


All operators met the benchmark for PMR as well as live audit.

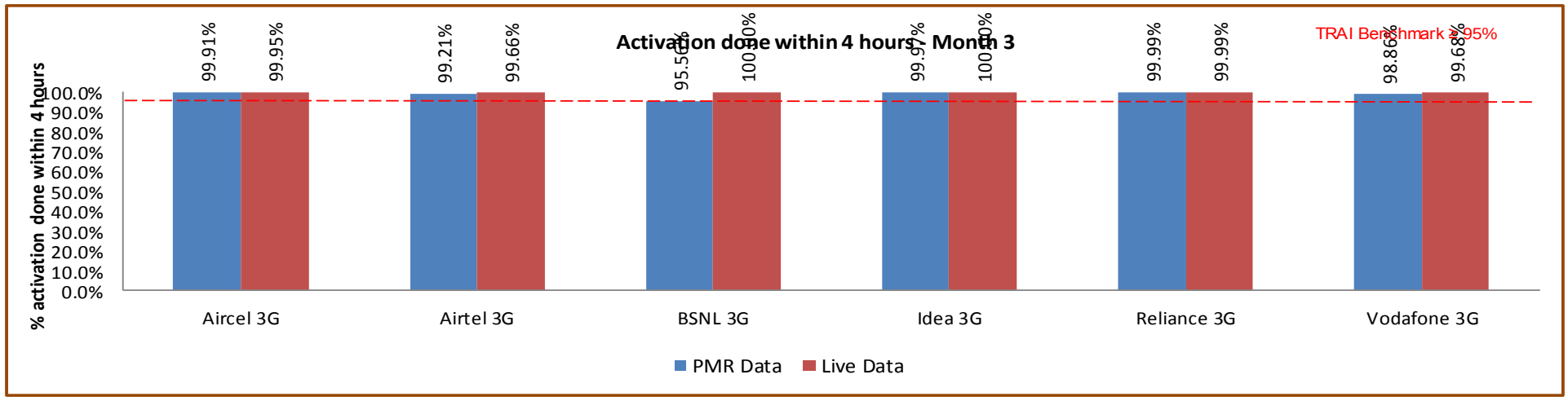
8.1.2.1 KEY FINDINGS – MONTH 1



8.1.2.2 KEY FINDINGS – MONTH 2



8.1.2.3 KEY FINDINGS – MONTH 3



8.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 3G

8.2.1 PARAMETER DESCRIPTION

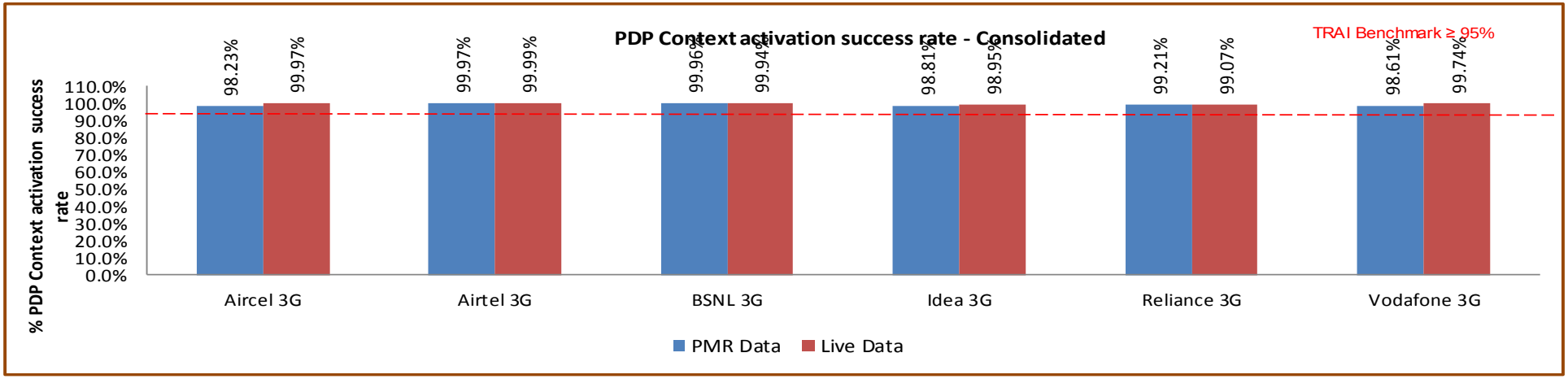
A Packet Data Protocol (PDP) context specifies access to an external packet-switching network. The data associated with the PDP context contains information such as the type of packet-switching network, the Mobile Station PDP (MS PDP) address that is the IP address, the reference of Gateway GPRS Support Node (GGSN), and the requested QoS. A PDP context is handled by the MS, Serving GPRS Support Node (SGSN) and GGSN and is identified by a mobile's PDP address within these entities. Several PDP contexts can be activated at the same time within a given MS.

Measurement

This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

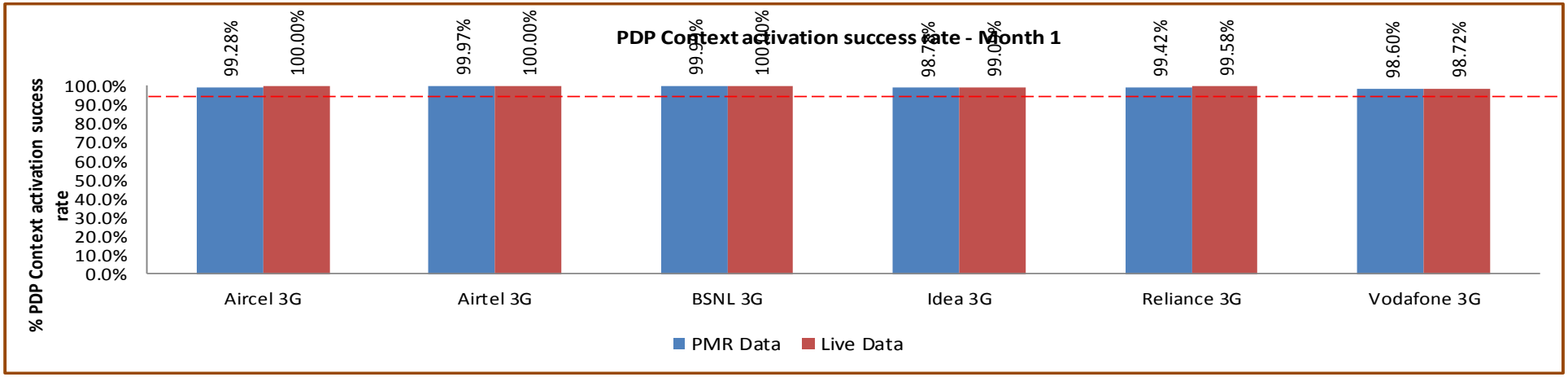
$$\textbf{PDP Context Activation Success Rate (\%)} = \frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

8.2.2 KEY FINDINGS

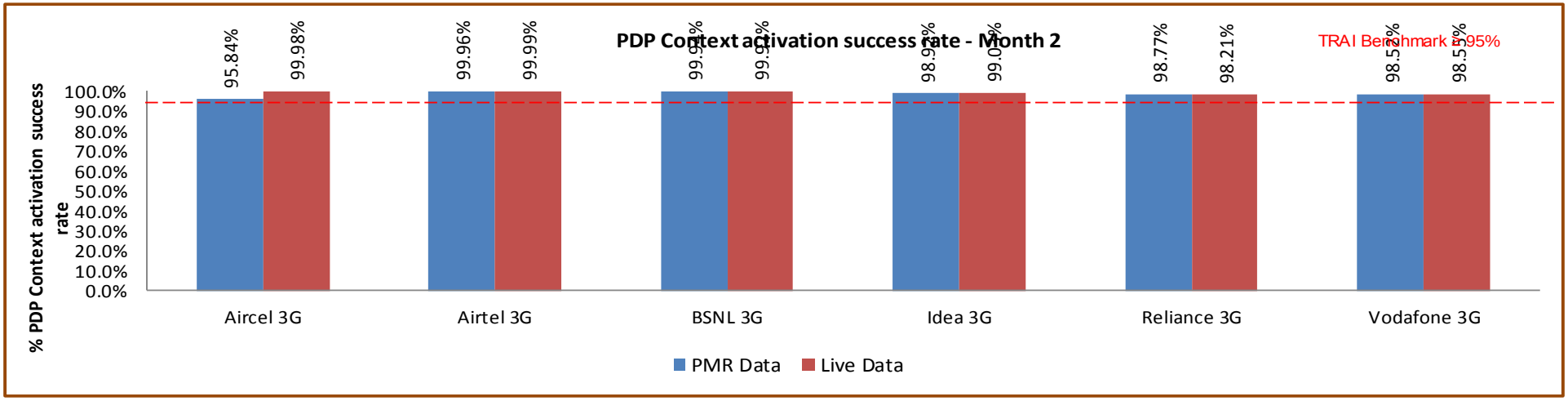


All operators met the benchmark for PMR as well as live audit, except BSNL 3G for live audit.

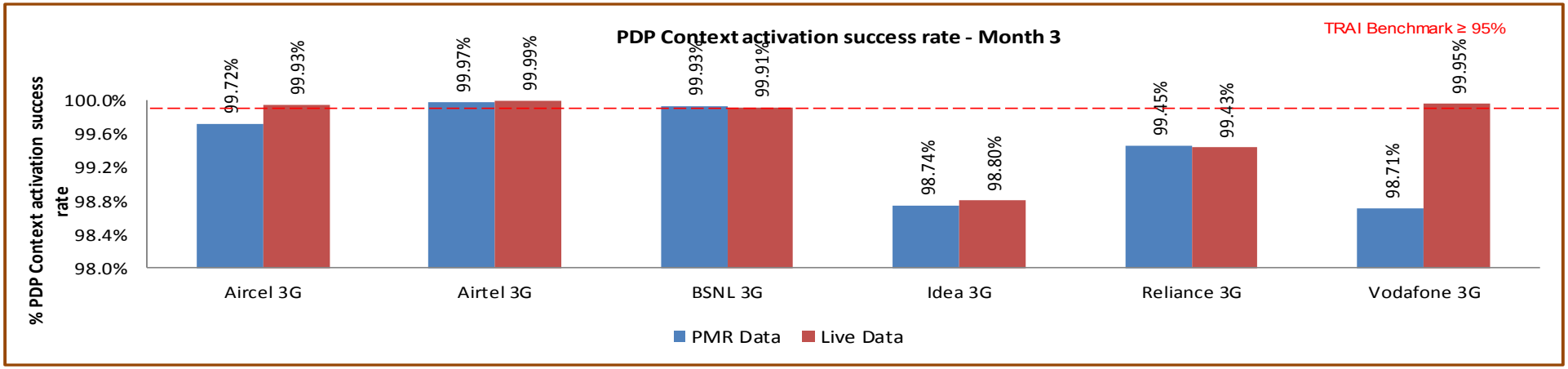
8.2.2.1 KEY FINDINGS – MONTH 1



8.2.2.2 KEY FINDINGS – MONTH 2



8.2.2.3 KEY FINDINGS – MONTH 3



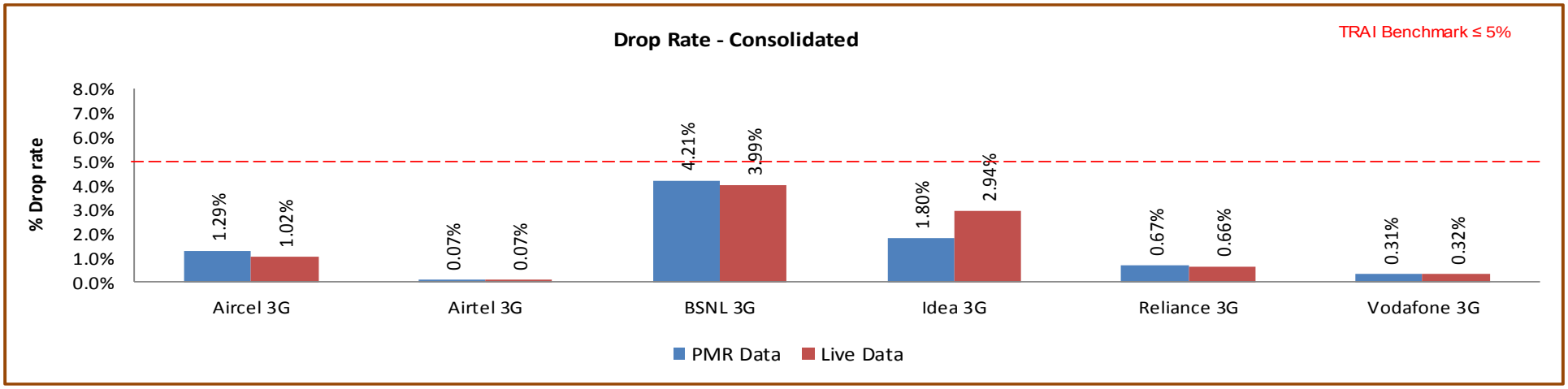
8.3 DROP RATE FOR 3G

8.3.1 PARAMETER DESCRIPTION

It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects (both normal and abnormal). An abnormal disconnect may happen because of Radio Link Failures, Uplink (UL) or Downlink (DL) interference, bad coverage, unsuccessful handovers or any other reason. The drop rate is to be measured for all generations of the technologies separately.

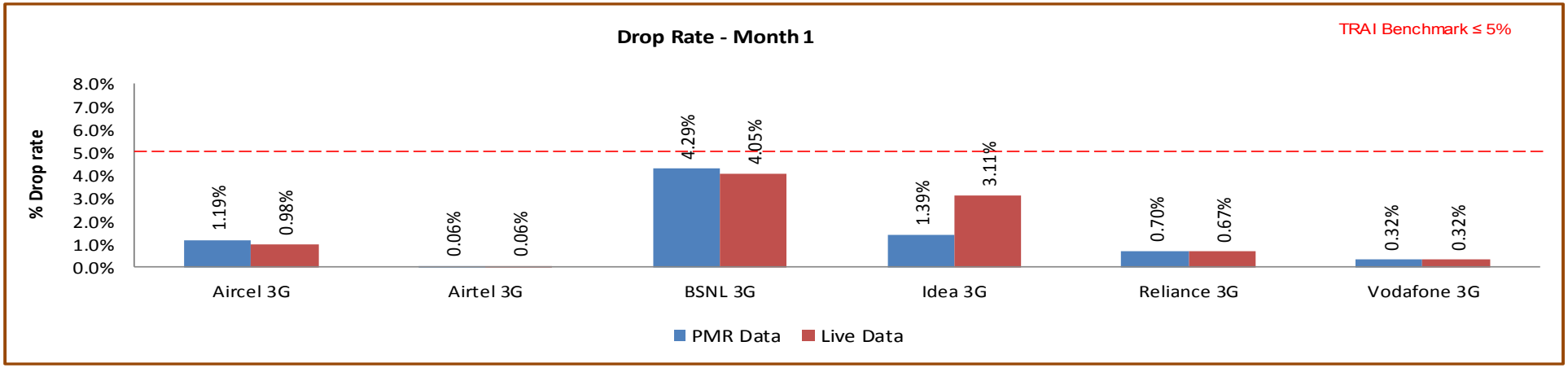
$$\textbf{Drop rate} = \frac{\text{No. of Dropped data Calls}}{\text{No. of Successful data calls}} \times 100$$

8.3.2 KEY FINDINGS

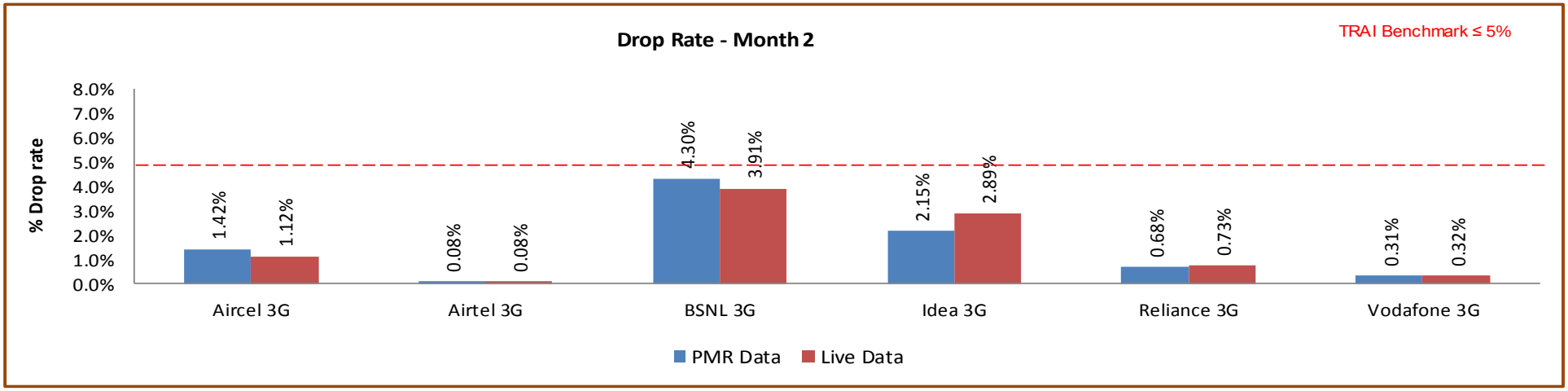


All operators met the benchmark for PMR as well as live audit.

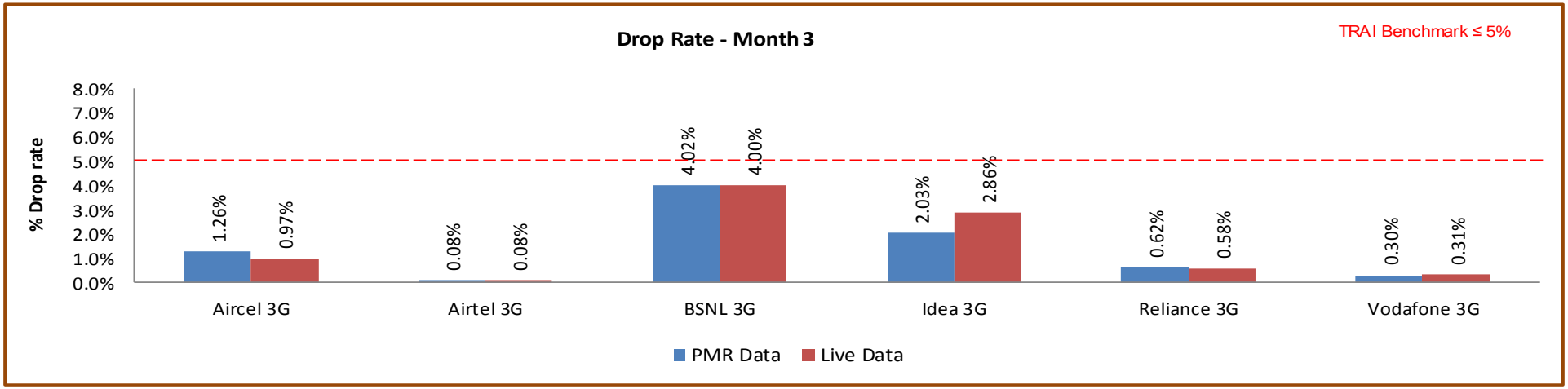
8.3.2.1 KEY FINDINGS – MONTH 1



8.3.2.2 KEY FINDINGS – MONTH 2



8.3.2.3 KEY FINDINGS – MONTH 3



9 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

9.1 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.

9.1.1 PARAMETER DESCRIPTION

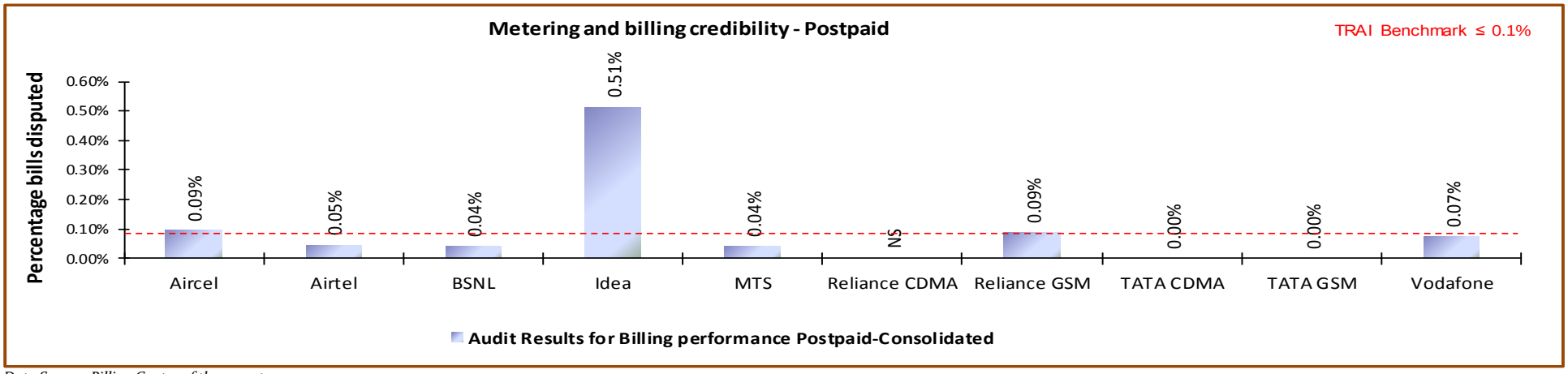
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

- 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.

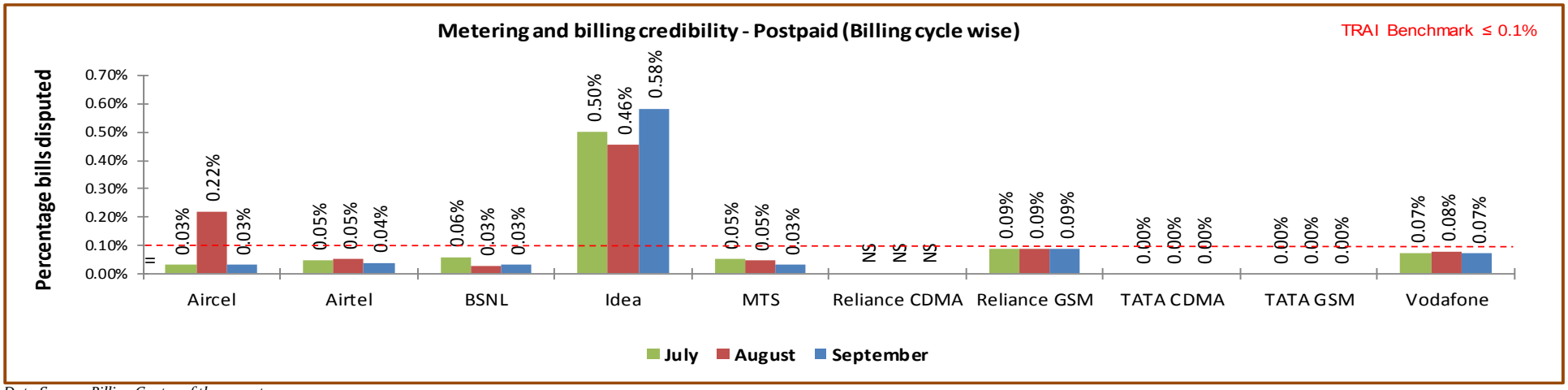
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Post-paid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated
  - **Billing complaints here shall include only dispute related issues (including those that 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.
  - **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

9.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



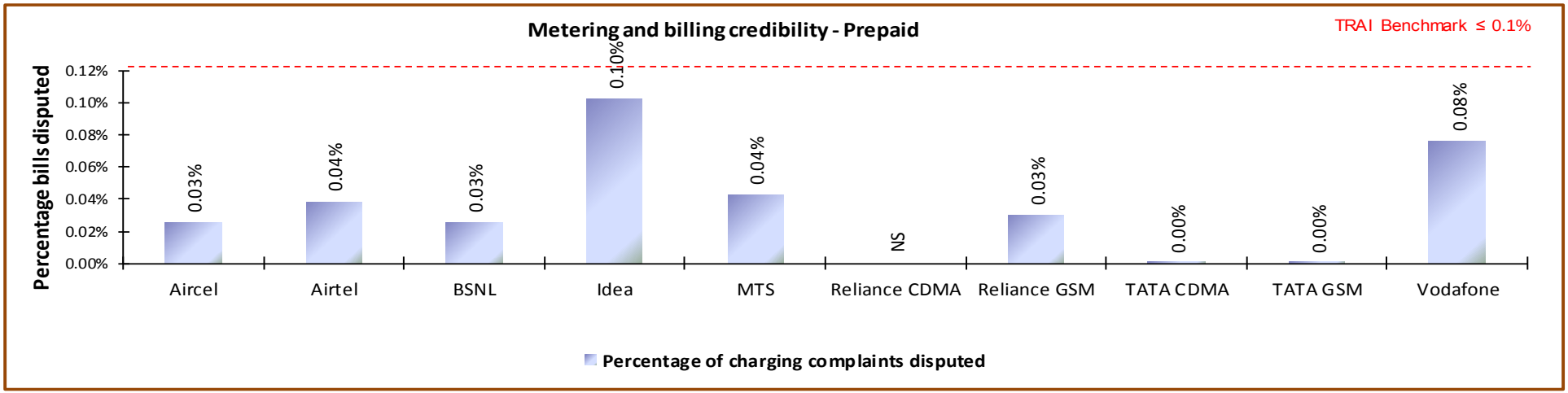
Data Source: Billing Center of the operators

Idea failed to meet the benchmark of 0.1% post-paid metering and billing credibility.



Data Source: Billing Center of the operators

9.1.3 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.

9.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

9.2.1 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 =

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

Resolution of billing complaints within 6 weeks:

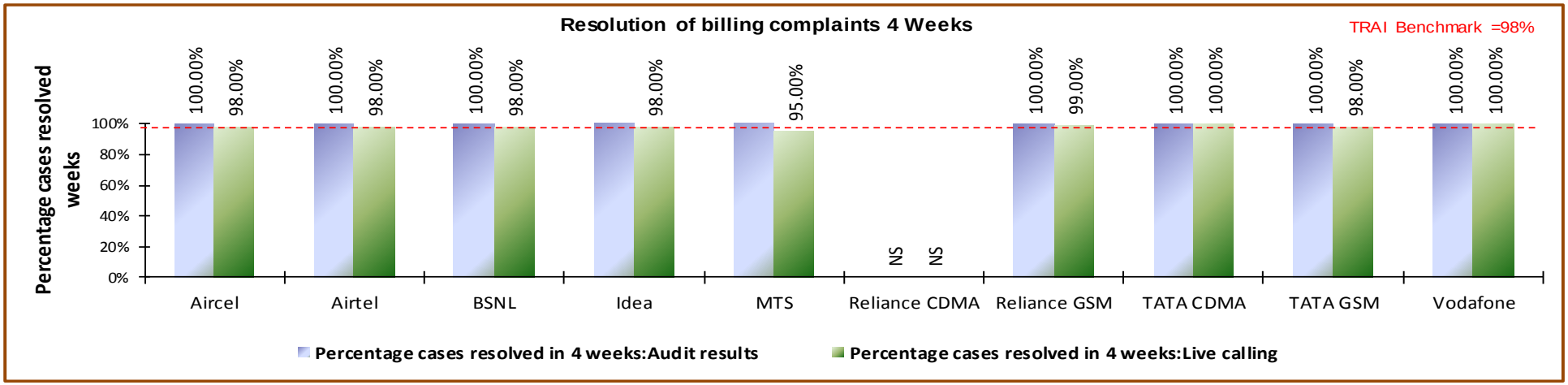
%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

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

- **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.

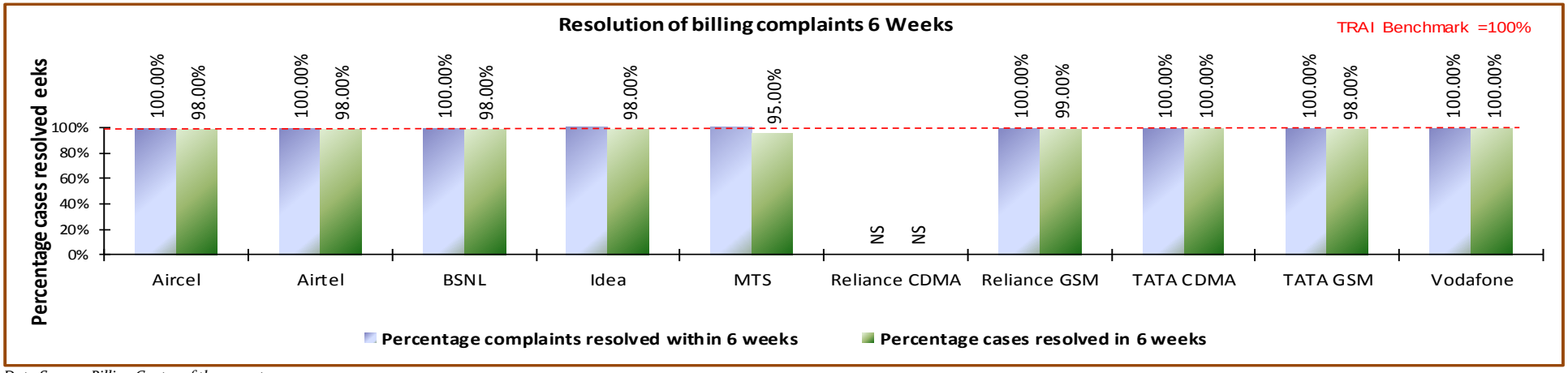
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

9.2.2 KEY FINDINGS - WITHIN 4 WEEKS



Data Source: Billing Center of the operators

9.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

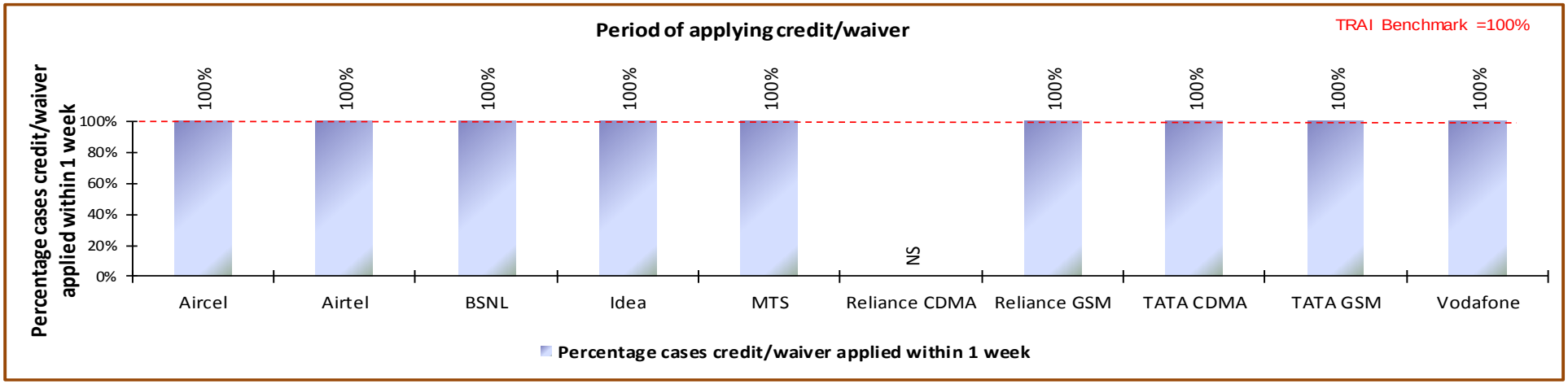
All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and 6 week; however in 3days live MTS fell slightly short of the benchmark of resolution of billing complaints within 4 weeks. As per live calling done to customers, the performance of Aircel, Airtel, BSNL, Idea, MTS, Reliance GSM and TATA GSM were observed to be slightly below the PMR data.

9.3 PERIOD OF APPLYING CREDIT/WAVIER

9.3.1 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

9.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

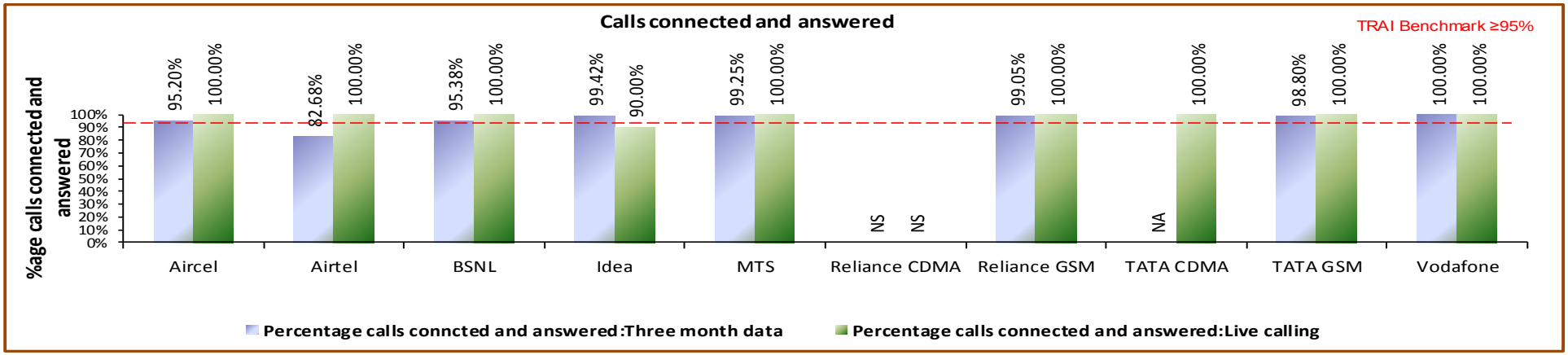
All operators met the benchmark for this parameter.

9.4 CALL CENTRE PERFORMANCE-IVR

9.4.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - **Call centre performance IVR = (Number of calls connected and answered by IVR/ All calls attempted to IVR) * 100**
- TRAI Benchmark: >= 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

9.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

As per PMR and live calling data, Airtel failed during PMR audit and Idea failed meet the benchmark during live calling.

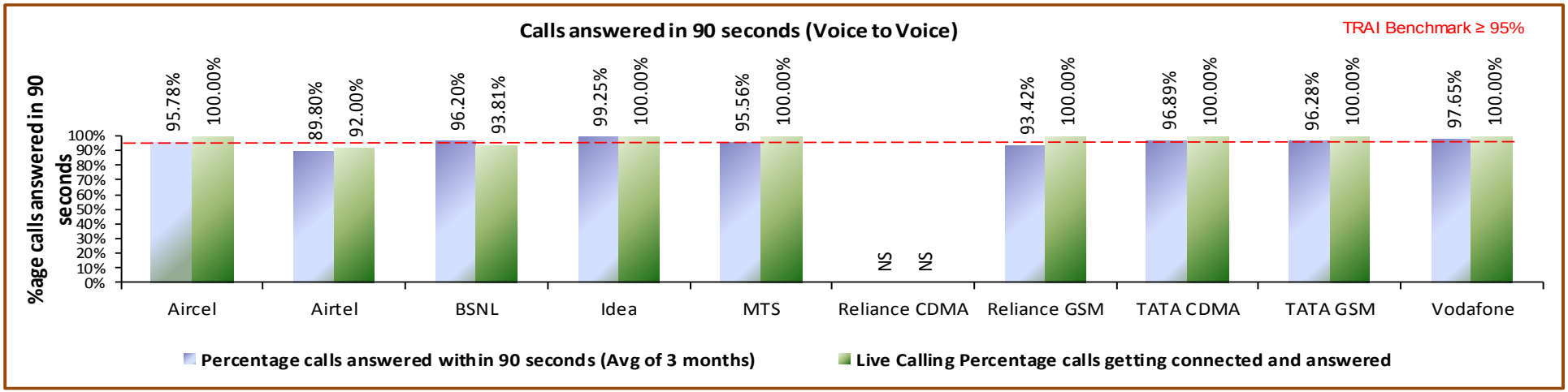
9.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

9.5.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 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

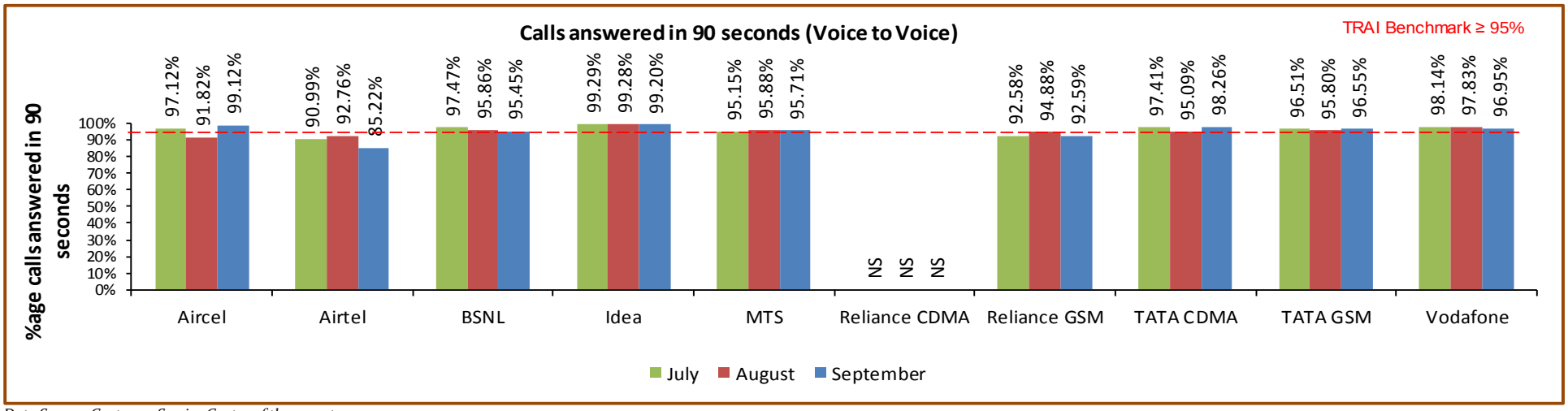
Benchmark: 95% calls to be answered within 90 seconds

9.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Airtel and Reliance GSM 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 except Airtel and BSNL.



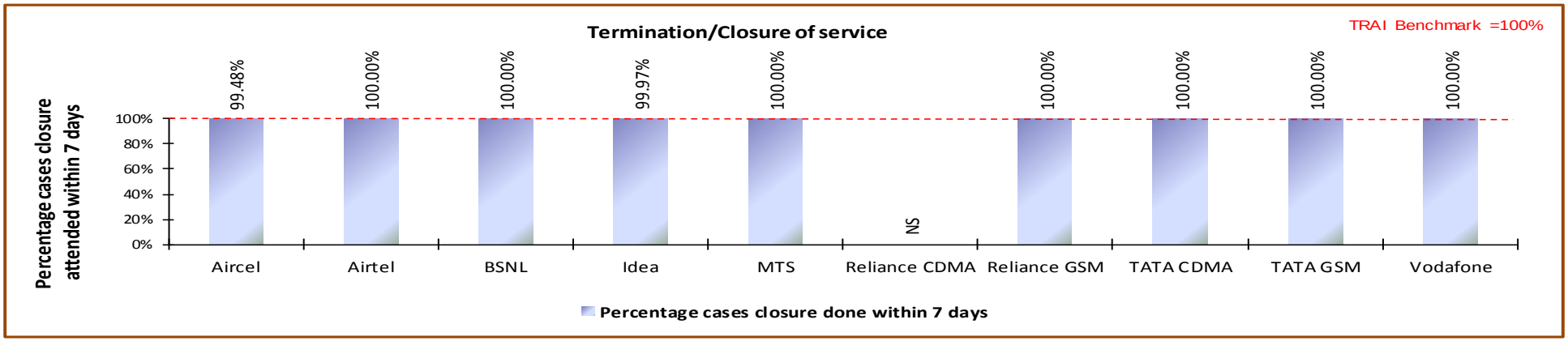
Data Source: Customer Service Center of the operators

9.6 TERMINATION/CLOSURE OF SERVICE

9.6.1 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

9.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

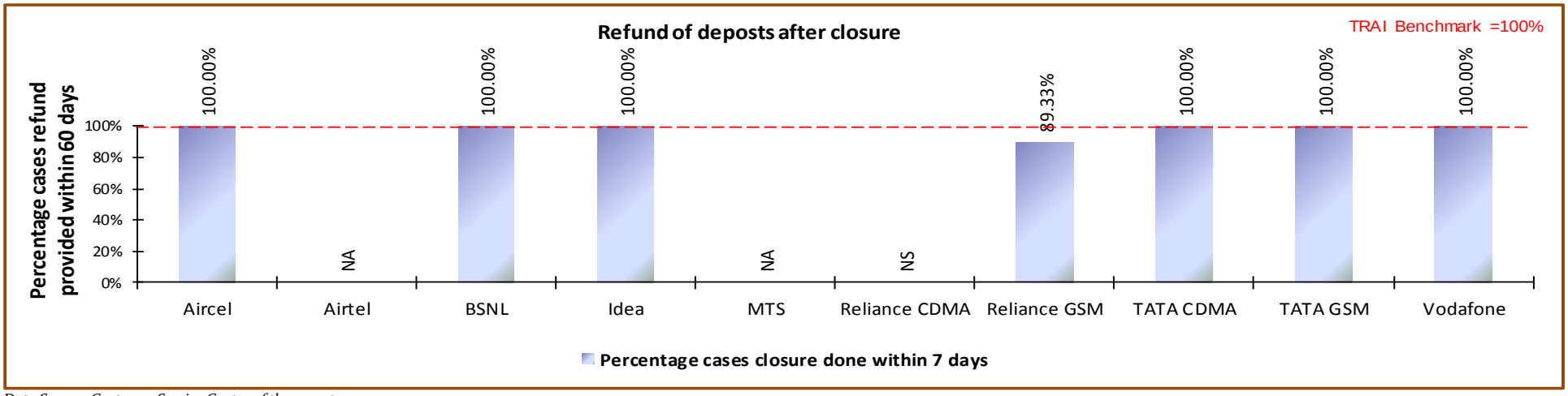
All operators met the TRAI benchmark for the parameter except Idea.

9.7 REFUND OF DEPOSITS AFTER CLOSURE

9.7.1 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

9.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

NA:- Not Applicable

All operators met the TRAI benchmark for the parameter except Reliance GSM.

10 DETAILED FINDINGS - DRIVE TEST DATA

10.1 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 3G
Airtel	Airtel 3G
BSNL	BSNL 3G
Idea	Idea 3G
MTS	Reliance 3G
Reliance CDMA	Vodafone 3G
Reliance GSM	
TATA CDMA	
TATA GSM	
Vodafone	

10.1.1 Kolkata SSA

Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
August	Kolkata	22-08-16	27-08-16	568

10.1.1.1 Route Details - Kolkata SSA

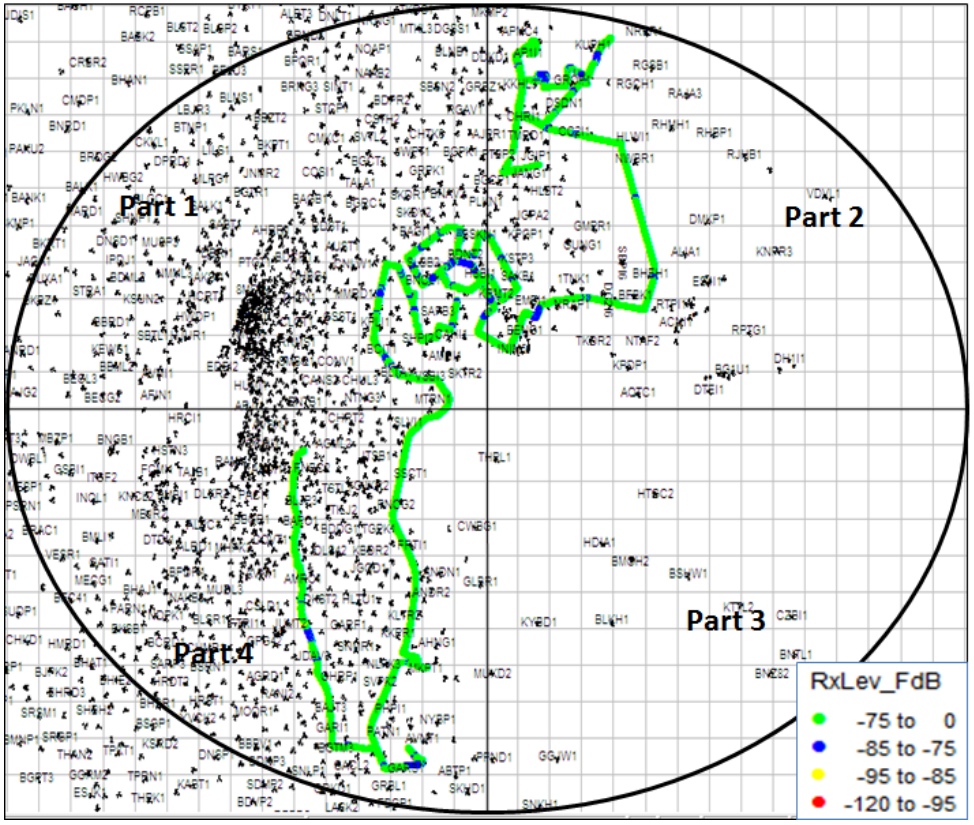
Category	Type of location	August					
		Kolkata					
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Outdoor	Major Roads	Baguiati-Kaikhali- 93 Bus route-Gopalpur-Narayanpur-Rajarhat-Atghara-Chinar Park-New Town-Haldiram-DumDum Airport-Akankha-Mother's Wax Museum-HIDCO-Rabindra Tirtha-Novotel-215 A Bus Stand-College More-Sector 5-SDF-Nicco Park-Karunamoyee-CA Island-PNB-BD Block-Purta Bhaban-Tank No.8- HUDCO-Kankurgachi-Phoolbagan-Beliaghata CIT More-Building More-E.M ByePass-Chingrighata-Science City-Avishikta-Mukundapur-Peerless Hospital-Techno City Panch pota-Chawk Garia-Dhalai Bridge-Patuli-Baisnabghata-Gangulibagan-Jadavpur-Dhakuria-Gariahat-Park Circus	Ballyghat-Dankuni-T.N.Mukherjee Rd-Makhla-Uttarpara-G.T.Road-Ballykhal-Ballybazar-Belur-Liluah-Liluah-Ghusuri-Salkia-Golbari-Howrah Court-Nityadhan Mukherjee Rd-Dalmia Park-Howrah District Library-Belilious Road-Dasnagar-Shanpur-Makardah-Amta Road-Baltikuri-Bankra-Salap More-NH 6-Ankurhati Check Post-Jangalpur-Dhulagar-Domjur-Jhapardah-Santragachi-Howrah N.S.Road-Kalibabur Bazaar-Panchanantalla Road-Howrah Maidan-Pilkhana-Salkia-Belur	Taratalla Mint-D.H. Road-Paharpur Cooling Towers-Mominpur-Ekbalpur-Kidderpur Crossing-Kar lMarx Sarani-Kidderpore Dock-BNR-Garden Reach-Metiabruz-Akra Rd-Maheshtalla-Santoshpur-Shakuntalla Park-Biren Roy Road West-B.L.Saha Road-James Long Sarani-Thakurpukur Bazar-M.G.Road-Thakurpukur Cancer Hospital-Kabardanga-Haridevpur-M.G.Road-Tollygunge-N.S.C Bose Road-Bansdroni-Ranikuthi-Naktalla-Kamalgazi-Narendrapur-Sonarpur-Rajpur-Chauhati More-Kodaliya-Baruipur-Harharitalla-Mullickpur-Baruipur Jugibattalla-Baruipur-Jhulpia-Amtalla-Pailan-Joka-Diamond Park-James Long Sarani-Satyen Roy Road-Taratalla	Baghbazar-Belgachia Road-R.G.Kar Hospital-Indra Biswas Road-Talapark-Paikpara-Raja Manindra Road-Duttabagan-Patipukur-Kalindi-Dumdum Road-Seven tanks-Chiriamore-Cossipur-Shyambazar 5 Point-Jessore Rd-Laketown -DumDum Park-Bangur Avenue-Nagerbazar-Shyamnagar-Jessore Road-DumDum 1 No Airport-Birati More-New Barrackpur-Madhyamgram-Barasat-Dukbugalow More-Colony More-Hatkhola More-Barasat-Barrackpur Road-Nilgunj Road-Wireless More-Kalyani Express Way-Jaffarpur-Mohanpur-Panpur-Naihati-Kalyani-Ghosh Para Rd-Kanchrapara-Halisahar-Naihati-Kankinara-Jagatdal-Shyamnagar-Barrackpur-Titagarh-Khardah-Sodepur-Ghola Rd-Amrabatti-H.B.Town-Ghola Nimta-Belgharia-Dunlop	CIT Road-Ladies Park-Park Circus-AJC Bose Road Flyover-SSKM Hospital-Rabindra Sadan-Theatre Rd-Park Street-J.L.Nehru Rd-Exide Crossing-Ashutosh Mukherjee Rd-S.P.Mukherjee Rd-Padmapukur-Hazra More-Southern Avenue-Golpark-Ballygunge Phari-Beck bagan-Ballygunge Circular Rd-Ritchie Rd-Monohar pukur Rd-Sarat Bose Rd-Chakraberia-Allenby Rd-Justice Chandra Madhab Rd-S.N.Pandit Rd-D.L.Khan-PTS Crossing-AJC Bose Rd-Topsia-Science City-Panchannagram-Ruby-Picnic Garden Rd-Gariahat Rd-Deshopriyo Park-RashBehari Avenue-Baker Rd-Belvedere Rd-Judges'Court Rd-Bhabani Bhaban-Alipur Crossing-DH Road- Thakurpukur-Bankrahat	Scottish College-Duff Street-Vivekananda Road-Beadon Street-Jorabagan-Nimtalla Ghat Street-Shovabazar Street-Jatindra Mohan Avenue-RajBallavPara-Bhupen Bose Avenue-Shyambazar 5 Point-A.P.C Road-Khanna-Manicktalla-Rajabazar-Sealdah-M.G.Road-College Street Crossing-Rabindra Sarani- Ganesh Talkies-Natun Bazaar-Rabindra Kanan-B.K.Pal Avenue-Central Avenue-Shovabazar Metro Stn-Jatindra Mohan Avenue-Girish Park Metro Stn-C.R.Avenue-M.G.Road Metro Stn-Central Metro Stn-Chandni Metro Stn-Esplanade-Eden Garden-Babughat-Strand Rd-Fairlie Place-Writers' Building-Dalhousie-Esplanade East-Park Street-Theatre Road-Loudon Street-Minto Park-Sarat Bose Road-Padmapukur-Hazra Crossing-Deshapriya Park-Rabindra Sarobar-Southern Avenue-Birla Planetarium-Park Street-Esplanade-Lenin Sarani-Wellington Square-Nirmal Chandra Street-College Street-Bidhan Sarani-Shyambazar-R.G.Kar Rd-Kolkata Stn-Canal East Road-Manicktalla Main Road-Kankurgachi-Ultadanga
	Highways						
	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 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.

10.1.1.2 Route Map - Kolkata DAY 1

Rx Level Plot – Day-1
Date of Drive Test - 22/08/2016
Name of the SDCAs covered – Kolkata

Day 1 KM - 82



Route Covered- Day 1

East Kolkata

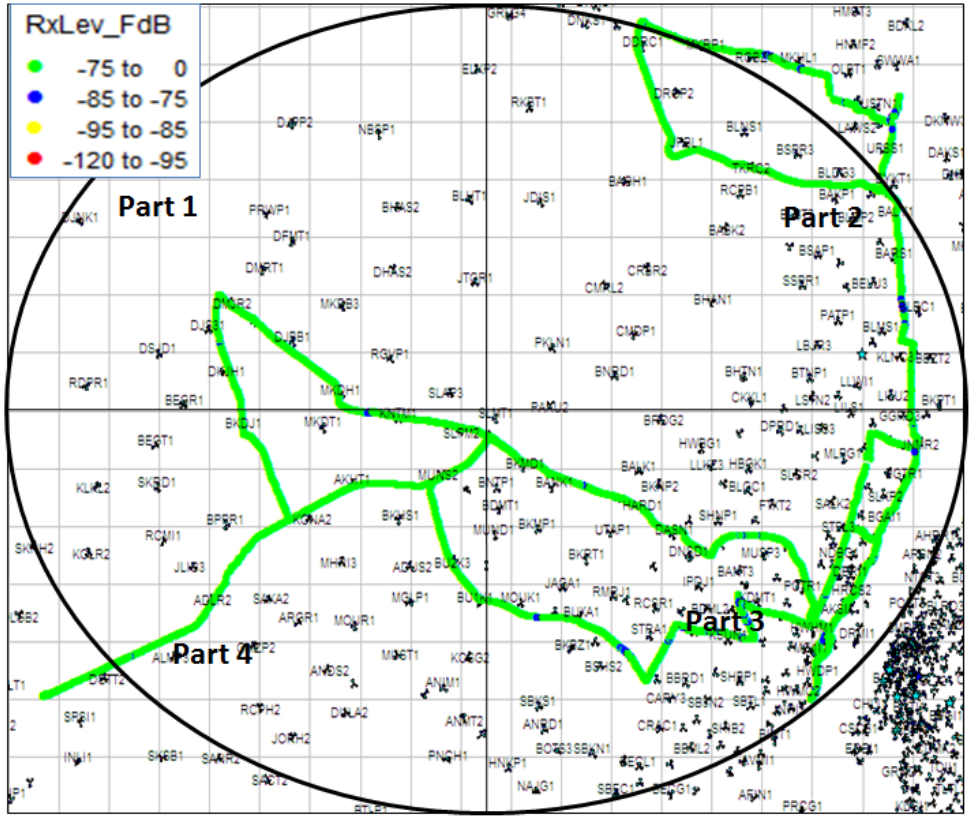
Baguiati-Kaikhali- 93 Bus route-Gopalpur-Narayanpur-Rajarhat-Atghara-Chinar Park-New Town-Haldiram-DumDum Airport-Akankha-Mother's Wax Museum-HIDCO-Rabindra Tirtha-Novotel-215 A Bus Stand-College More-Sector 5-SDF-Nicco Park-Karunamoyee-CA Island-PNB-BD Block-Purta Bhaban-Tank No.8- HUDCO-Kankurgachi-Phoolbagan-Beliaghata CIT More-Building More-E.M ByePass-Chingrighata-Science City-Avishikta-Mukundapur-Peerless Hospital-Techno City Panch pota-Chawk Garia-Dhalai Bridge-Patuli-Baisnabghata-Gangulibagan-Jadavpur-Dhakuria-Gariahat-Park Circus

1 GRID = 1 KM

10.1.1.3 Route Map - Kolkata DAY 2

Rx Level Plot – Day-2
Date of Drive Test - 23/08/2016
Name of the SDCAs covered – Kolkata

Day 2 KM - 86



Route Covered- Day 2

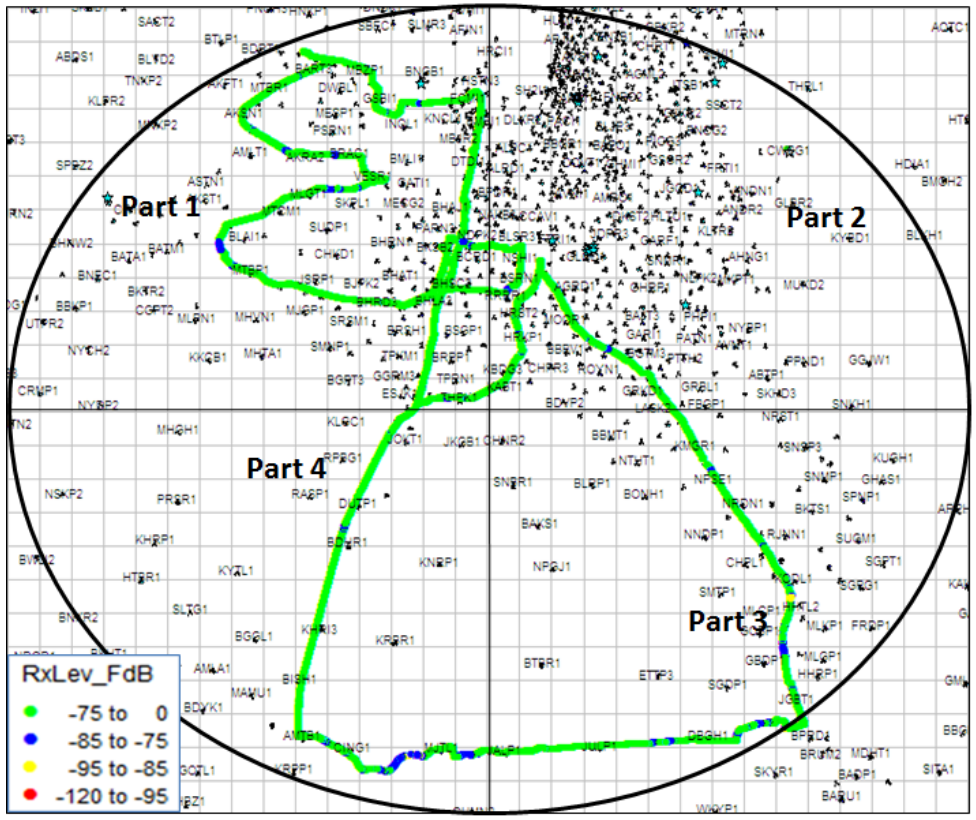
West Kolkata
Ballyghat-Dankuni-T.N.Mukherjee Rd-Makhla-Uttarpara-G.T.Road-Ballykhal-Ballybazar-Belur-Liluah-Liluah-Ghusuri-Salkia-Golbari-Howrah Court-Nityadhan Mukherjee Rd-Dalmia Park-Howrah District Library-Belilious Road-Dasnagar-Shanpur-Makardah-Amta Road-Baltikuri-Bankra-Salap More-NH 6-Ankurhati Check Post-Jangalpur-Dhulagar-Domjur-Jhapardah-Santragachi-Howrah N.S.Road-Kalibabur Bazaar-Panchanantalla Road-Howrah Maidan-Pilkhana-Salkia-Belur

1 GRID = 1 KM

10.1.1.4 ROUTE MAP - KOLKATA DAY 3

Rx Level Plot – Day-3
Date of Drive Test - 24/08/2016
Name of the SDCAs covered – Kolkata

Day 3 KM - 135



Route Covered- Day 3

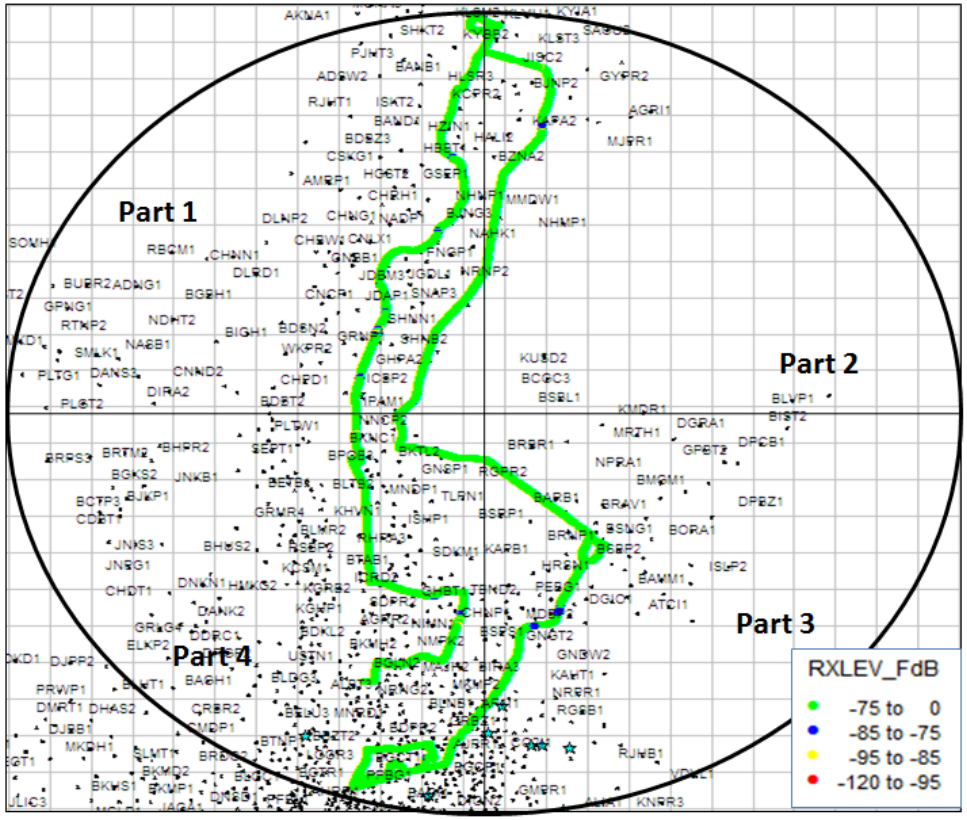
South Kolkata Outskirts
Taratalla Mint-D.H. Road-Paharpur Cooling Towers-Mominpur-Ekbalpur-Kidderpur Crossing-Kar IMarx Sarani-Kidderpore Dock-BNR-Garden Reach-Metiabruz-Akra Rd-Maheshtalla-Santoshpur-Shakuntalla Park-Biren Roy Road West-B.L.Saha Road-James Long Sarani-Thakurpukur Bazar-M.G.Road- Thakurpukur Cancer Hospital-Kabardanga-Haridevpur-M.G.Road-Tollygunge-N.S.C Bose Road-Bansdroni-Ranikuthi-Naktalla-Kamalgazi-Narendrapur-Sonarpur-Rajpur-Chauhati More-Kodaliya-Baruipur-Harharitalla-Mullickpur-Baruipur Jugibattalla-Baruipur-Jhulpia-Amtalla-Pailan-Joka-Diamond Park-James Long Sarani-Satyen Roy Road-Taratalla

1 GRID = 1KM

10.1.1.1 Route Map - Kolkata DAY 4

Rx Level Plot – Day-4
Date of Drive Test - 25/08/20156
Name of the SDCAs covered – Kolkata

Day 4 KM - 104



Route Covered- Day 4

North Kolkata

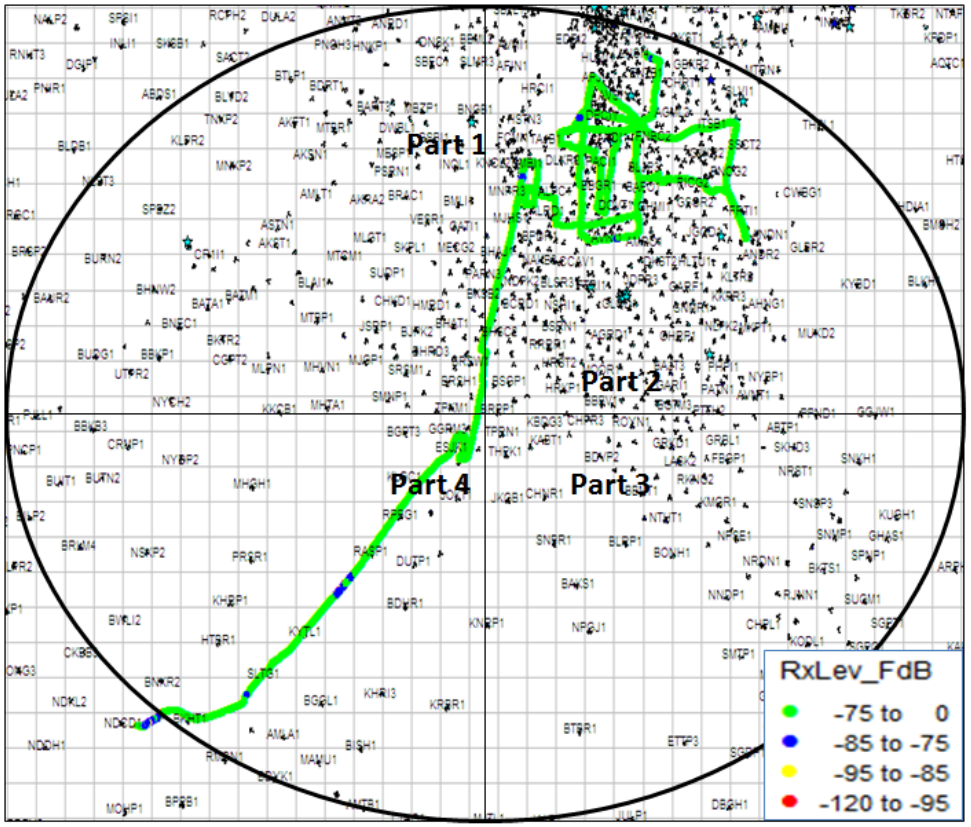
Baghbazar-Belgachia Road-R.G.Kar Hospital-Indra Biswas Road-Talapark-Paikpara-Raja Manindra Road-Duttabagan-Patipukur-Kalindi-Dumdum Road-Seven tanks-Chiriamore-Cossipur-Shyambazar 5 Point-Jessore Rd-Laketown -DumDum Park-Bangur Avenue-Nagerbazar-Shyamnagar-Jessore Road-DumDum 1 No Airport-Birati More-New Barrackpur-Madhyamgram-Barasat-Dukbugalow More-Colony More-Hatkhola More-Barasat-Barrackpur Road-Nilgunj Road-Wireless More-Kalyani Express Way-Jaffarpur-Mohanpur-Panpur-Naihati-Kalyani-Ghosh Para Rd-Kanchrapara-Halisahar-Naihati-Kankinara-Jagatdal-Shyamnagar-Barrackpur-Titagarh-Khardah-Sodepur-Ghola Rd-Amrabatti-H.B.Town-Ghola Nimta-Belgharia-Dunlop

1 GRID = 1 KM

10.1.1.2 Route Map - Kolkata DAY 5

Rx Level Plot – Day-5
Date of Drive Test - 26/08/2016
Name of the SDCAs covered – Kolkata

Day 1 KM - 81



Route Covered- Day 5

South Kolkata

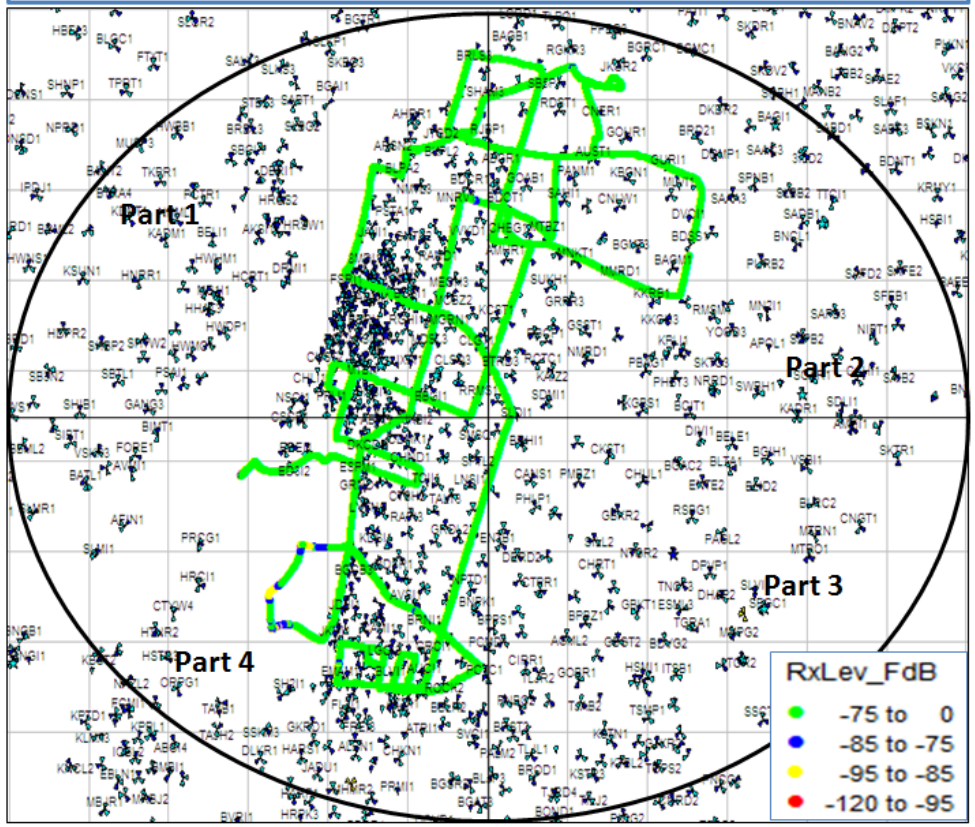
CIT Road-Ladies Park-Park Circus-AJC Bose Road Flyover-SSKM Hospital-Rabindra Sadan-Theatre Rd-Park Street-J.L.Nehru Rd-Exide Crossing-Ashutosh Mukherjee Rd-S.P.Mukherjee Rd-Padmapukur-Hazra More-Southern Avenue-Golpark-Ballygunge Phari-Beck bagan-Ballygunge Circular Rd-Ritchie Rd-Monohar pukur Rd-Sarat Bose Rd-Chakraberia-Allenby Rd-Justice Chandra Madhab Rd-S.N.Pandit Rd-D.L.Khan-PTS Crossing-AJC Bose Rd-Topsia-Science City-Panchannagram-Ruby-Picnic Garden Rd-Gariahat Rd-Deshopriyo Park-RashBehari Avenue-Baker Rd-Belvedere Rd-Judges'Court Rd-Bhabani Bhaban-Alipur Crossing-DH Road- Thakurpukur-Bankrahat

1 GRID = 0.5 KM

10.1.1.3 Route Map - Kolkata DAY 6

Rx Level Plot – Day-6
Date of Drive Test - 27/08/2016
Name of the SDCAs covered – Kolkata

Day 1 KM - 81



Route Covered- Day 6

Central Kolkata

CENTRAL KOLKATA-Scottish College-Duff Street-Vivekananda Road-Beadon Street-Jorabagan-Nimtalla Ghat Street-Shovabazar Street-Jatindra Mohan Avenue-RajBallavPara-Bhupen Bose Avenue-Shyambazar 5 Point-A.P.C Road-Khanna-Manicktalla-Rajabazar-Sealdah-M.G.Road-College Street Crossing-Rabindra Sarani- Ganesh Talkies-Natun Bazaar-Rabindra Kanan-B.K.Pal Avenue-Central Avenue-Shovabazar Metro Stn-Jatindra Mohan Avenue-Girish Park Metro Stn-C.R.Avenue-M.G.Road Metro Stn-Central Metro Stn-Chandni Metro Stn-Esplanade-Eden Garden-Babughat-Strand Rd-Fairlie Place-Writers' Building-Dalhousie-Esplanade East-Park Street-Theatre Road-Loudon Street-Minto Park-Sarat Bose Road-Padmapukur-Hazra Crossing-Deshapriya Park-Rabindra Sarobar-Southern Avenue-Birla Planetarium-Park Street-Esplanade-Lenin Sarani-Wellington Square-Nirmal Chandra Street-College Street-Bidhan Sarani-Shyambazar-R.G.Kar Rd-Kolkata Stn-Canal East Road-Manicktalla Main Road-Kankurgachi-Ultadanga

1 GRID = 1 KM

10.1.1.4 Drive Test Results - Kolkata SSA-2G

August																			
Kolkata	B'mark	Aircel		Airtel		BSNL		Idea		MTS		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
0 to -75 dBm		54.03%	89.00%	96.14%	95.81%	75.06%	71.75%	23.09%	71.18%	13.14%	77.98%	26.94%	48.77%	29.68%	65.30%	55.90%	79.27%	95.87%	99.63%
0 to -85 dBm		88.03%	98.36%	99.49%	99.55%	95.08%	93.57%	71.50%	96.32%	67.37%	98.57%	75.38%	87.95%	81.38%	96.39%	95.17%	96.19%	100.00%	99.84%
0 to -95 dBm		99.90%	99.74%	100.00%	100.00%	99.58%	99.40%	99.05%	99.86%	98.38%	99.97%	96.12%	99.63%	99.96%	99.97%	99.89%	99.55%	100.00%	100.00%
Voice quality	≥ 95%	96.85%	90.90%	98.77%	97.55%	96.53%	96.21%	98.98%	96.01%	97.78%	95.94%	92.36%	91.71%	98.00%	95.57%	98.57%	96.60%	99.21%	99.55%
CSSR	≥ 95%	100.00%	99.18%	100.00%	100.00%	99.60%	99.04%	100.00%	99.65%	100.00%	100.00%	98.66%	98.16%	100.00%	100.00%	100.00%	98.79%	100.00%	99.91%
%age Blocked calls		0.00%	0.82%	0.00%	0.00%	0.40%	0.96%	0.00%	0.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.03%	0.00%	0.09%
Call drop rate	≤ 2%	0.00%	0.28%	0.00%	0.00%	0.40%	1.07%	0.00%	0.00%	0.00%	0.00%	0.53%	1.19%	0.00%	0.75%	0.00%	0.35%	0.00%	0.09%
Hands off success rate		100.00%	98.46%	100.00%	98.56%	98.88%	95.99%	100.00%	98.53%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	97.53%	100.00%	99.98%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Aircel 2G failed to meet the benchmark for voice quality in outdoor locations and Reliance GSM failed in indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR in outdoor as well as indoor locations.

Call Drop Rate

All operators met the benchmark for call drop rate in outdoor locations.

10.1.1.1 Drive Test Results - Kolkata SSA-3G

Kolkata	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Idea 3G		Vodafone 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		9.36%	48.46%	98.39%	96.32%	62.29%	52.48%	3.58%	62.95%	92.07%	90.75%
0 to -85 dBm		32.64%	83.09%	99.82%	98.10%	86.17%	76.35%	57.80%	91.73%	99.87%	99.89%
0 to -95 dBm		72.73%	97.52%	100.00%	100.00%	95.63%	94.29%	98.02%	99.38%	100.00%	100.00%
Voice quality	≥ 95%	99.60%	98.27%	99.84%	96.86%	96.57%	95.71%	99.94%	99.67%	99.76%	97.75%
CSSR	≥ 95%	100.00%	99.09%	100.00%	100.00%	100.00%	99.14%	100.00%	99.40%	100.00%	99.91%
%age Blocked calls		0.00%	0.74%	0.00%	0.00%	0.00%	1.30%	0.00%	0.60%	0.00%	0.09%
Call drop rate	≤ 2%	0.00%	0.37%	0.00%	0.00%	0.37%	1.41%	0.00%	0.17%	0.00%	0.00%
Hands off success rate		100.00%	98.99%	100.00%	100.00%	97.64%	97.18%	100.00%	99.33%	100.00%	100.00%

Voice Quality

All operators met the benchmark for call drop rate in outdoor locations..

Call Set Success Rate (CSSR)

All operators met the benchmark for call drop rate in outdoor locations.

Call Drop Rate

All operators met the benchmark for call drop rate in outdoor locations.

10.1.1.1 Data Drive Test Results -Kolkata SSA -2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	MTS	RCOM GSM	TATA CDMA	TATA GSM	Vodafone
Succesful Data Transmission download speed attemp	>80%	100	100	95	100	100	100	100	100	100
Succesful Data Transmission upload speed attempts	>75%	100	100	94	100	100	100	100	100	100
Minimum download speed		103	117	54	137	374	70	932	70	109
Average throughput for Packet Data		151	178	65	167	783	102	1275	98	153
Latency	<250ms	100	100	98	100	100	100	100	NA	100

All operators met the TRAI benchmark.

10.1.1.2 Data Drive Test Results -Kolkata SSA -3G

Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Vodafone 3G
Succesful Data Transmission download speed attempts	>80%	100	100	95	100	100
Succesful Data Transmission upload speed attempts	>75%	100	100	94	100	100
Minimum download speed		2329	971	340	2047	2035
Average throughput for Packet Data		3571	1807	714	3165	4360
Latency	<250ms	100	100	98	100	100

All operators met the TRAI benchmark.

11 ANNEXURE – CONSOLIDATED-2G

11.1 NETWORK AVAILABILITY

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		7118	8642	3806	7062	1713	NS	4887	420	5327	8114
Sum of downtime of BTSs in a month (in hours)		14497	992	52357	4939	346	NS	17583	503	6137	5173
BTSs accumulated downtime (not available for service)	≤ 2%	0.27%	0.02%	1.85%	0.09%	0.03%	NS	0.48%	0.16%	0.15%	0.09%
Number of BTSs having accumulated downtime >24 hours		70	0	103	21	0	NS	71	2	18	44
Worst affected BTSs due to downtime	≤ 2%	0.98%	0.00%	2.71%	0.30%	0.00%	NS	1.45%	0.48%	0.34%	0.54%
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		7087	8642	3795	7047	1713	NS	4903	420	5328	8114
Sum of downtime of BTSs in a month (in hours)		865	41	1426	417	30	NS	4609	48	379	499
BTSs accumulated downtime (not available for service)	≤ 2%	0.17%	0.01%	0.52%	0.08%	0.02%	NS	1.31%	0.16%	0.10%	0.09%
Number of BTSs having accumulated downtime >24 hours		4	0	14	7	0	NS	0	0	4	2
Worst affected BTSs due to downtime	≤ 2%	0.06%	0.00%	0.37%	0.10%	0.00%	NS	0.00%	0.00%	0.08%	0.02%

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

11.2 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%	97.71%	99.34%	98.91%	99.77%	99.84%	NS	97.05%	98.75%	99.31%	99.54%
SDCCH/Paging channel congestion	≤ 1%	0.43%	0.02%	0.79%	0.09%	NA	NS	0.15%	NA	0.07%	0.03%
TCH congestion	≤ 2%	0.21%	0.02%	0.85%	0.04%	0.00%	NS	0.30%	0.42%	0.12%	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%	98.13%	99.34%	98.95%	99.80%	99.89%	NS	97.94%	98.86%	99.37%	99.67%
SDCCH/Paging channel congestion	≤ 1%	0.30%	0.02%	0.66%	0.16%	NA	NS	0.10%	NA	0.06%	0.04%
TCH congestion	≤ 2%	0.09%	0.02%	1.65%	0.03%	0.00%	NS	0.10%	0.36%	0.10%	0.33%
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		1347	1362	1288	1407	1357	NS	2474	1329	1407	1330
Total number of successful calls established		1338	1362	1277	1403	1357	NS	2435	1329	1393	1329
CSSR	≥ 95%	99.33%	100.00%	99.15%	99.72%	100.00%	NS	98.42%	100.00%	99.00%	99.92%
%age blocked calls		0.67%	0.00%	0.85%	0.28%	0.00%	NS	1.58%	0.00%	1.00%	0.08%

Data Source: Network Operations Center (NOC) of the operators and Data Source: Drive test reports submitted by operators to auditors

11.3 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		212202223	297157985	114927339	153053840	36182294	NS	271898056812160	3363398	183760346	353681433
Total number of calls dropped		1727907	1855921	1384426	407206	207232	NS	135904	18794	1159662	2994082
Call drop rate	≤ 2%	0.81%	0.62%	1.20%	0.27%	0.57%	NS	0.00%	0.56%	0.63%	0.85%
Total number of cells in the network		21326	25578	10208	21151	6585	NS	14658	1368	15840	21010
Total number of cells having more than 3% TCH		631	621	225	31	157	NS	66	52	384	602
Worst affected cells having more than 3% TCH	≤ 3%	2.96%	2.43%	2.21%	0.15%	2.38%	NS	0.45%	3.79%	2.42%	2.87%
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		274545433	29095878	53500889	197973103	50511125	NS	142722516	4526415	231934098	489154139
Total number of calls dropped		1946603	183134	579627	490707	232847	NS	152842	23641	1377174	3482925
Call drop rate	≤ 2%	0.71%	0.63%	1.08%	0.25%	0.46%	NS	0.11%	0.52%	0.59%	0.71%
Total number of cells in the network		21224	76606	10219	21095	6585	NS	14706	1368	15854	20999
Total number of cells having more than 3% TCH		783	1865	275	7	6	NS	22	136	411	601
Worst affected cells having more than 3% TCH	≤ 3%	3.69%	2.43%	2.69%	0.03%	0.09%	NS	0.15%	9.97%	2.59%	2.86%
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		1338	1362	1277	1403	1357	NS	2474	1329	1393	1329
Total number of calls dropped		3	0	12	0	0	NS	3	8	4	1
Call drop rate	≤ 2%	0.22%	0.00%	0.94%	0.00%	0.00%	NS	0.12%	0.60%	0.29%	0.08%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

11.4 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		42552051102	105463491765	18000	23518870959	201940	NS	16913825286	256675541	16745435328	51315392916
Total number of calls with good voice quality		41466203494	103646404517	17967	22819280573	201728	NS	16727070305	254514804	16463078886	50200071209
%age calls with good voice quality	≥ 95%	97.45%	98.28%	99.82%	97.03%	99.90%	NS	98.90%	99.16%	98.31%	97.83%
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		17132184144	10113992998	1800	2665044441	89648	NS	2289216937	28692530	3225148874	6305751367
Total number of calls with good voice quality		16670078647	9932785202	1779	2590476602	89028	NS	2267233327	28449785	3180037931	6183687268
%age calls with good voice quality	≥ 95%	97.30%	98.21%	98.83%	97.20%	99.31%	NS	99.04%	99.15%	98.60%	98.06%
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		358191	345144	2087739	1994513	NA	NS	128837	NA	2786997	92411
Total number of calls with good voice quality		329427	337483	2009929	1916906	NA	NS	110370	NA	2700177	91941
%age calls with good voice quality	≥ 95%	91.97%	97.78%	96.27%	96.11%	96.86%	NS	85.67%	96.79%	96.88%	99.49%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

11.5 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		50	31	76	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	2	0	0
Total Capacity of all POIs (A) - in erlangs		219802	231393	1277180	200444	105586	NS	35631	63507	40912	568430
Traffic served for all POIs (B)- in erlangs		89661	126557	33214	100180	31234	NS	20490	26311	22809	313229
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	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		50	31	76	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		218791	69253	157146	198417	105542	NS	35631	62954	40884	372879
Traffic served for all POIs (B)- in erlangs		47380	37601	32105	99527	22236	NS	20089	14967	11370	106601
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

11.6 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
Eqipped capacity of the network	103288	123361	136000	67832	50400	NS	88000	18737	99068	146335
Total taffic handled in erlang during TCBH	64799	83649	53473	46939	10334	NS	46778	2904	45673	103992
Total no. of customers served (as per VLR)	2339730	4002201	722384	2134655	422466	NS	4093229	82171	2143197	4339524

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

12 ANNEXURE – CONSOLIDATED-3G

12.1 NETWORK AVAILABILITY

1. Network Availability							
Audit Results for Network Availability- PMR data							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		5614	7220	2102	5664	4047	7854
Sum of downtime (i.e. total outage time) of Node Bs		11364	243	28701	4812	6023	5191
Node Bs downtime (not available for service)	≤ 2%	0.27%	0.00%	1.84%	0.11%	0.20%	0.09%
Number of Node Bs having accumulated downtime of >24 hours in a month		54	0	85	27	65	33
Worst affected Node Bs due to downtime	≤ 2%	0.96%	0.00%	4.04%	0.48%	1.61%	0.42%
Live Measurement Results for Network Availability- 3 Day live data							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		5592	7188	2094	5432	4047	7854
Sum of downtime (i.e. total outage time) of Node Bs		650	12	1029	466	481	522
Node Bs downtime (not available for service)	≤ 2%	0.16%	0.00%	0.68%	0.12%	0.17%	0.09%
Number of Node Bs having accumulated downtime of >24 hours in a month		4	0	9	5	0	4
Worst affected Node Bs due to downtime	≤ 2%	0.07%	0.00%	0.43%	0.09%	0.00%	0.05%

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

12.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	99.32%	99.54%	97.25%	99.91%	97.47%	99.99%
RRC Congestion	≤ 1%	0.31%	0.00%	0.59%	0.00%	0.22%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.19%	0.00%	1.01%	0.01%	0.03%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	99.35%	99.54%	94.93%	99.92%	98.89%	99.98%
RRC Congestion	≤ 1%	0.30%	0.00%	0.70%	0.00%	0.10%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.14%	0.01%	1.35%	0.00%	0.02%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data							
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		1354	1262	1274	1402	NP	1312
Total number of RRC established (B)		1344	1262	1261	1395	NP	1311
Call setup success rate (B/A*100)	≥ 95%	99.26%	100.00%	98.98%	99.50%	NP	99.92%
%age blocked calls		0.74%	0.00%	1.02%	0.50%	NP	0.08%

Data Source: Network Operations Center (NOC) of the operators and Data Source: Drive test reports submitted by operators to auditors

12.3 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 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		47955742	NDR	583821722	18786627	22430466	134686118
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		148091	NDR	7937364	36873	21362	412750
Call drop rate (B/A*100)	≤ 2%	0.31%	0.34%	1.36%	0.20%	0.10%	0.31%
Total no. of cells in the licensed service area (B)		16816	21829	5949	17121	12134	23244
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		497	413	138	66	32	408
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.95%	1.89%	2.32%	0.39%	0.26%	1.76%
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 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		62757801	6783288	6937114	24682240	30893931	176609136
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		198464	18527	22547	47554	30725	583629
Call drop rate (B/A*100)	≤ 2%	0.32%	0.30%	0.33%	0.19%	0.10%	0.33%
Total no. of cells in the licensed service area (B)		16752	65167	5907	16336	12135	23234
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		487	1163	26	15	40	431
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.91%	1.78%	0.45%	0.09%	0.33%	1.85%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data							
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		1344	1262	1265	1395	NP	1312
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		22	0	15	2	NP	0
Call drop rate (B/A*100)	≤ 2%	1.64%	0.00%	1.19%	0.14%	NP	0.00%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

12.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		162377017535	NA	18000	57631598500	NA	291027381404
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		158950047606	NA	17967	57524992988	NA	287433122027
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.89%	99.00%	99.82%	99.82%	99.88%	98.76%
Live measurement results for Voice quality-3 Day data							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		25412034208	NA	1800	7178799150	NA	41562360554
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		24858915367	NA	1773	7165952465	NA	41044461192
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.82%	99.00%	98.50%	99.82%	99.84%	98.75%
Drive test results for Voice quality (Average of three drive tests) - DT data							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2215989	1804813	1336829	5112377	NP	87713
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2182791	1754246	1236338	5096510	NP	86012
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.50%	97.20%	92.48%	99.69%	NP	98.06%

Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

12.5 POI CONGESTION

Audit Results for POI Congestion- PMR data							
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		50	31	76	93	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		219802	231393	1264735	200444	35631	568430
Traffic served for all POIs (B)- in erlangs		89661	126557	33229	100180	20490	313229
POI congestion	≤ 0.5%	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 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		50	31	76	93	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		219591	69253	157146	198417	35631	206169
Traffic served for all POIs (B)- in erlangs		47380	37601	32105	99427	19757	106601
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

12.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang							
Traffic in Erlang		Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Eqipped capacity of the network		0	NA	22120	0	88000	NA
Total taffic handled in erlang during TCBH		5706	28438	9582	0	46778	44201
Total no. of customers served (as per VLR)		569877	702525	70792	6662	4093229	950957

13 ANNEXURE – CUSTOMER SERVICES

13.1 METERING AND BILLING CREDIBILITY

Metering and billing credibility - Postpaid											
Total bills generated during the period		19160	1862625	240841	210589	104867	NS	310875	28916	127617	3291484
Total number of bills disputed		18	858	98	1083	45	NS	274	0	0	2464
Total number of valid billing complaints		0	224	98	134	21	NS	274	0	0	1124
Total complaints considered invalid		18	634	0	949	24	NS	0	0	0	1340
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.09%	0.05%	0.04%	0.51%	0.04%	NS	0.09%	0.00%	0.00%	0.07%
July											
Total bills generated during the first billing cycle		6322	612076	83100	68584	37199	NS	111044	9755	42640	1072798
Total number of bills disputed in first billing cycle		2	290	49	344	19	NS	97	0	0	787
Total number of valid billing complaints (billing cycle 1)		0	89	49	33	9	NS	97	0	0	329
Total complaints considered invalid (billing cycle 1)		2	201	0	311	10	NS	0	0	0	458
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.03%	0.05%	0.06%	0.50%	0.05%	NS	0.09%	0.00%	0.00%	0.07%
August											
Total bills generated during the second billing cycle		6384	619808	81416	70208	34709	NS	90000	9644	41783	1096948
Total number of bills disputed in second billing cycle		14	318	24	320	16	NS	80	0	0	879
Total number of valid billing complaints (billing cycle 2)		0	91	24	43	8	NS	80	0	0	443
Total complaints considered invalid (billing cycle 2)		14	227	0	277	8	NS	0	0	0	436
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.22%	0.05%	0.03%	0.46%	0.05%	NS	0.09%	0.00%	0.00%	0.08%
September											
Total bills generated during the third billing cycle		6454	630741	76325	71797	32959	NS	109831	9517	43194	1121738
Total number of bills disputed in third billing cycle		2	250	25	419	10	NS	97	0	0	798
Total number of valid billing complaints (billing cycle 3)		0	44	25	58	4	NS	97	0	0	352
Total complaints considered invalid (billing cycle 3)		2	206	0	361	6	NS	0	0	0	446
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.03%	0.04%	0.03%	0.58%	0.03%	NS	0.09%	0.00%	0.00%	0.07%

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		3205	2146	540	565	168	NS	3554	1	15	1748
Total complaints considered invalid (sum of 3 months)		1	3388	13	5836	23	NS	0	0	0	1837
Total number of charging complaints (sum of 3 months)		3206	5534	553	6401	191	NS	3554	1	15	3585
Total no of customers served (Sum of 3 months)		12630311	14377489	2155027	6267091	448520	NS	11862925	184236	2857712	4708438
Percentage of charging complaints disputed	≤ 0.1%	0.03%	0.04%	0.03%	0.10%	0.04%	NS	0.03%	0.00%	0.00%	0.08%

Data Source: Billing Center of the operators

Resolution of Billing Complaints

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		3224	6392	651	14269	236	NS	3828	1	15	6049
Total number of complaints resolved in favour of customer		1	2370	638	6785	189	NS	3828	1	15	2872
Total complaints considered invalid		3223	4022	13	7484	47	NS	0	0	0	3177
Number of complaints resolved in 4 weeks		1	2370	638	7484	236	NS	3828	1	15	2872
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	110.30%	124.87%	NS	100.00%	100.00%	100.00%	100.00%
Number of complaints resolved in 6 weeks		1	2370	638	7484	236	NS	3828	1	15	2872
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	110.30%	124.87%	NS	100.00%	100.00%	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		1	2370	638	7484	236	NS	3828	1	15	2872
Percentage cases in which credit/waiver was received within 1 week	100%	100%	100%	100%	100%	100%	NS	100%	100%	100%	100%
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	NS	100	4	100	100
Number of cases resolved in 4 weeks		98	98	98	98	95	NS	99	4	98	100
Percentage cases resolved in 4 weeks	≥ 98%	98.00%	98.00%	98.00%	98.00%	95.00%	NS	99.00%	100.00%	98.00%	100.00%
Number of cases resolved in 6 weeks		98	98	98	98	95	NS	99	4	98	100
Percentage cases resolved in 6 weeks	100.00%	98.00%	98.00%	98.00%	98.00%	95.00%	NS	99.00%	100.00%	98.00%	100.00%

Data Source: Billing Center of the operators

13.2 CUSTOMER CARE

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		10317926	965710	1783546	5109315	850803	NS	4388874	0	446765	7586747
Number of calls getting connected and answered (electronically)		9822444	798432	1701073	5079895	844402	NS	4347360	0	441393	7586747
Percentage calls getting connected and answered	≥ 95%	95.20%	82.68%	95.38%	99.42%	99.25%	NS	99.05%	NA	98.80%	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)		2622757	1475758	31997	1630359	248534	NS	1145021	26780	631060	2625288
Total Number of calls answered within 90 seconds (3 months)		2512009	1325182	30782	1618195	237487	NS	1069664	25946	607607	2563718
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	95.78%	89.80%	96.20%	99.25%	95.56%	NS	93.42%	96.89%	96.28%	97.65%
July											
Total calls received (Month 1)		872623	543734	9641	494362	92537	NS	356256	9127	219168	917953
Total calls answered within 90 seconds (Month 1)		847499	494751	9397	490854	88046	NS	329831	8891	211525	900867
% calls answered within 90 seconds (Month 1)	≥ 95%	97.12%	90.99%	97.47%	99.29%	95.15%	NS	92.58%	97.41%	96.51%	98.14%
August											
Total calls received (Month 2)		962141	479579	11246	594658	81905	NS	414809	9189	214536	861751
Total calls answered within 90 seconds (Month 2)		883473	444850	10780	590354	78529	NS	393574	8738	205532	843016
% calls answered within 90 seconds (Month 2)	≥ 95%	91.82%	92.76%	95.86%	99.28%	95.88%	NS	94.88%	95.09%	95.80%	97.83%
September											
Total calls received (Month 3)		787993	452445	11110	541339	74092	NS	373956	8464	197356	845584
Total calls answered within 90 seconds (Month 3)		781037	385581	10605	536987	70912	NS	346259	8317	190550	819835
% calls answered within 90 seconds (Month 3)	≥ 95%	99.12%	85.22%	95.45%	99.20%	95.71%	NS	92.59%	98.26%	96.55%	96.95%
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	300	100	NS	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	100	270	100	NS	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	90.00%	100.00%	NS	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		44	100	97	100	100	NS	100	100	100	100
Total Number of calls getting connected and answered		44	92	91	100	100	NS	100	100	100	100
Live Calling Percentage calls getting connected and answered	≥ 95%	100.00%	92.00%	93.81%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%

13.3 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		192	9877	3173	3092	2964	NS	2331	2961	1557	20694
Number of requests attended within 7 days		191	9877	3173	3091	2964	NS	2331	2961	1557	20694
Percentage cases in which termination done within 7 days	100.00%	99.48%	100.00%	100.00%	99.97%	100.00%	NS	100.00%	100.00%	100.00%	100.00%

Data Source: Customer Service Center of the operators

13.4 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		288	0	86	2775	NA	NS	2896	77	73	13572
Total number of cases where refund was made within 60 days		288	0	86	2775	NA	NS	2587	77	73	13572
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	NA	100.00%	100.00%	NA	NS	89.33%	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

13.5 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	NS	100	80	100	100
Number of cases resolved to satisfaction	98	97	97	96	96	NS	99	71	94	100
Percentage cases resolved in four weeks	98.00%	97.00%	97.00%	96.00%	96.00%	NS	99.00%	88.75%	94.00%	100.00%

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

13.6 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	NS	300	300	300	300
Calls answered		228	249	265	270	275	NS	281	283	289	282
% of calls connected	≥ 95%	76.00%	83.00%	88.33%	90.00%	91.67%	NS	93.67%	94.33%	96.33%	94.00%

13.7 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.

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.

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		18	14
101	Fire	Y		18	14
102	Ambulance	Y		18	14
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		18	14
138	All India Helpine for Passangers	Y		18	14
149	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		18	13
1071	Air Accident Helpline	Y		17	13
1072	Rail Accident Helpline		N		

1073	Road Accident Helpline	Y		18	14
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		18	14
1091	Women Helpline	Y		18	13
1097	National AIDS Helpline to NACO	Y		17	13
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		18	13
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		18	13
1909	National Do Not Call Registry	Y		17	13
1912	Complaint of Electricity	Y		17	13
1916	Drinking Water Supply	Y		17	13
1950	Election Commission of India	Y		17	13
Airtel					
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	Y		20	17

104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	17
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
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	17
1071	Air Accident Helpline	Y		20	17
1072	Rail Accident Helpline	Y		20	17
1073	Road Accident Helpline	Y		20	16
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		20	17
1091	Women Helpline	Y		20	16
1097	National AIDS Helpline to NACO	Y		20	17
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		
1903	Sashastra Seema Bal (SSB)	Y		20	16
1909	National Do Not Call Registry	Y		20	16
1912	Complaint of Electricity	Y		20	16
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
BSNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	18
101	Fire	Y		20	18
102	Ambulance	Y		20	18
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	18
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		20	17
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	Y		20	17
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti Corruption Helpline	Y		20	17

1070	Relief Commission for Natural Calamities	Y		20	18
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	18
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		20	18
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		
1903	Sashastra Seema Bal (SSB)	Y		20	18
1909	National Do Not Call Registry	Y		20	17
1912	Complaint of Electricity	Y		20	18
1916	Drinking Water Supply	Y		20	17
1950	Election Commission of India		N		
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected

100	Police	Y		20	18
101	Fire	Y		20	18
102	Ambulance	Y		20	18
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	18
149	Public Road Transport Utility Service	Y		20	18
181	Chief Minister Helpline	Y		20	18
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	18
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		20	18
1091	Women Helpline	Y		20	18
1097	National AIDS Helpline to NACO	Y		20	18
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		20	18
1912	Complaint of Electricity	Y		20	18
1916	Drinking Water Supply	Y		20	18
1950	Election Commission of India	Y		20	18
MTS					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	18
101	Fire	Y		18	17
102	Ambulance	Y		19	17
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		19	18
1033	Road Accident Management Service	Y		19	17
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		19	18
1072	Rail Accident Helpline	Y		19	17
1073	Road Accident Helpline	Y		19	17
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		18	17
1097	National AIDS Helpline to NACO	Y		19	17
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		19	17
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		19	17
1909	National Do Not Call Registry	Y		18	17
1912	Complaint of Electricity	Y		19	17
1916	Drinking Water Supply	Y		19	17
1950	Election Commission of India	Y		18	17

Reliance GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		25	24
101	Fire	Y		25	23
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers		N		
149	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		25	24
1071	Air Accident Helpline	Y		25	23
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		25	24
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		25	24
1097	National AIDS Helpline to NACO	Y		25	24
1099	Central Accident and Trauma Services (CATS)		N		

10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		25	23
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		25	23
1909	National Do Not Call Registry	Y		25	23
1912	Complaint of Electricity	Y		25	23
1916	Drinking Water Supply	Y		25	23
1950	Election Commission of India		N		
TATA CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		60	57
101	Fire		N		
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers		N		
149	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		60	57
1071	Air Accident Helpline	Y		60	57
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		60	56
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		60	56
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		
1903	Sashastra Seema Bal (SSB)		N		

1909	National Do Not Call Registry		N		
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	20
101	Fire		N		
102	Ambulance		N		
104	Health Information Helpline	Y		20	19
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		20	19
149	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		20	20
1071	Air Accident Helpline	Y		20	19
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		20	20
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		20	20

1091	Women Helpline	Y		20	19
1097	National AIDS Helpline to NACO	Y		20	19
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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	19
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		20	19
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		20	19
1912	Complaint of Electricity	Y		20	19
1916	Drinking Water Supply	Y		20	19
1950	Election Commission of India	Y		20	19
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		19	18
101	Fire	Y		18	18
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpine for Passangers	Y		18	17

149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		18	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		N		
1071	Air Accident Helpline	Y		19	18
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		19	17
1091	Women Helpline	Y		19	18
1097	National AIDS Helpline to NACO	Y		19	18
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educationa & Vocational Guidance and Counselling		N		
10589	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		19	18
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		18	18

155304	Municipal Corporations		N		
155214	Labour Helpline	Y		19	17
1903	Sashastra Seema Bal (SSB)	Y		19	18
1909	National Do Not Call Registry	Y		19	18
1912	Complaint of Electricity	Y		19	17
1916	Drinking Water Supply	Y		19	17
1950	Election Commission of India	Y		19	17

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

13.8 COUNTER DETAILS

Sl No.	KPI	Formula with Counter Description
1	CSSR= (No of established Calls / No of Attempted Calls)%	***No of established Calls =*** ([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)]))/***No of Attempted Calls =*** ([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)])
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	***SDCCH Failure=*** ([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)])/***SDCCH attempts =*** ([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)])
3	TCH congestion= (TCH Failures /TCH Attempts)%	***TCH Failures=*** ((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)])/***TCH Attempts =*** ([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)])

4	**Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)**	***The total no of dropped calls=*** **([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])/*Total no of calls successfully established (where traffic channel is allotted) =* ([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)])**
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)%**	***Connection with good quality voice =*** **((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)) /*Total voice samples=* ((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))**

13.8.1 ERICSSON

Ericsson provides network support to Vodafone, Aircel, BSNL, Reliance CDMA and Reliance GSM in the circle.

Sl No.	KPI	Ericsson
1	**CSSR= (No of established Calls / No of Attempted Calls)%**	CSSR (No of established Calls / No of Attempted Calls)=(TCASSALL/TASSALL)*100
2	**SDCCH congestion= (SDCCH Failure/SDCCH attempts)%**	SDCCH congestion (SDCCH Failure/SDCCH attempts)% = (CCONGS/CCALLS)*100
3	**TCH congestion= (TCH Failures /TCH Attempts)%**	TCH congestion (TCH Failures /TCH Attempts)%= (CNRELCONG+TNRELCONG)/TASSALL)*100
4	**Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)**	Call Drop Rate (Total no dropped calls/No of established calls)%= (TNDROP)/TCASSALL*100
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)%**	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.

13.8.2 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)%	CSSR= 100-100*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON) + (SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL)+ (BLCK_8I_NOM)/ {(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	SDCCH congestion = (sdcch_busy_att - .tch_seiz_due_sdcch_con)/{(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
3	TCH congestion= (TCH Failures /TCH Attempts)%	TCH congestion = BLCK_8I_NOM / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(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)	TCH Drop = (drop_after_tch_assign)-(tch_re_est_release) / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(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)%	Connection with good quality voice= (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5) / (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5+FREQ_DL_QUAL6+FREQ_DL_QUAL7)

13.8.3 HUAWEI

Huawei provides network support to Idea, Tata GSM, Tata CDMA and MTS in the circle.

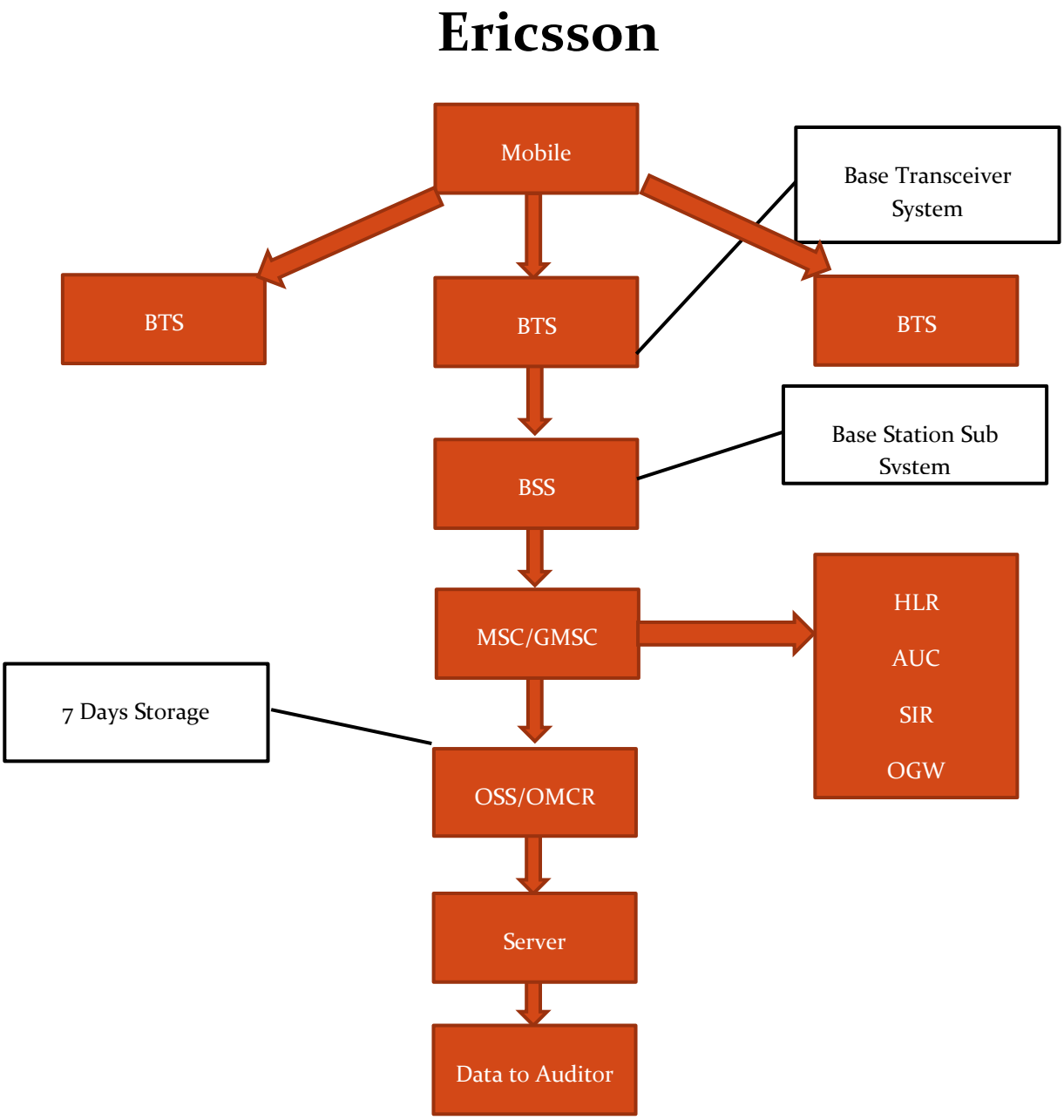
HUAWEI		
SR .NO	KPI	HUAWEI FORMULA
1	CALL SETUP SUCCES (NUM)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups] ([1157628567] + [1157628587] + [1157628568] + [1157628588])
2	CALL SETUP SUCCES (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]) x 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[%]

13.9 BLOCK SCHEMATIC DIAGRAMS

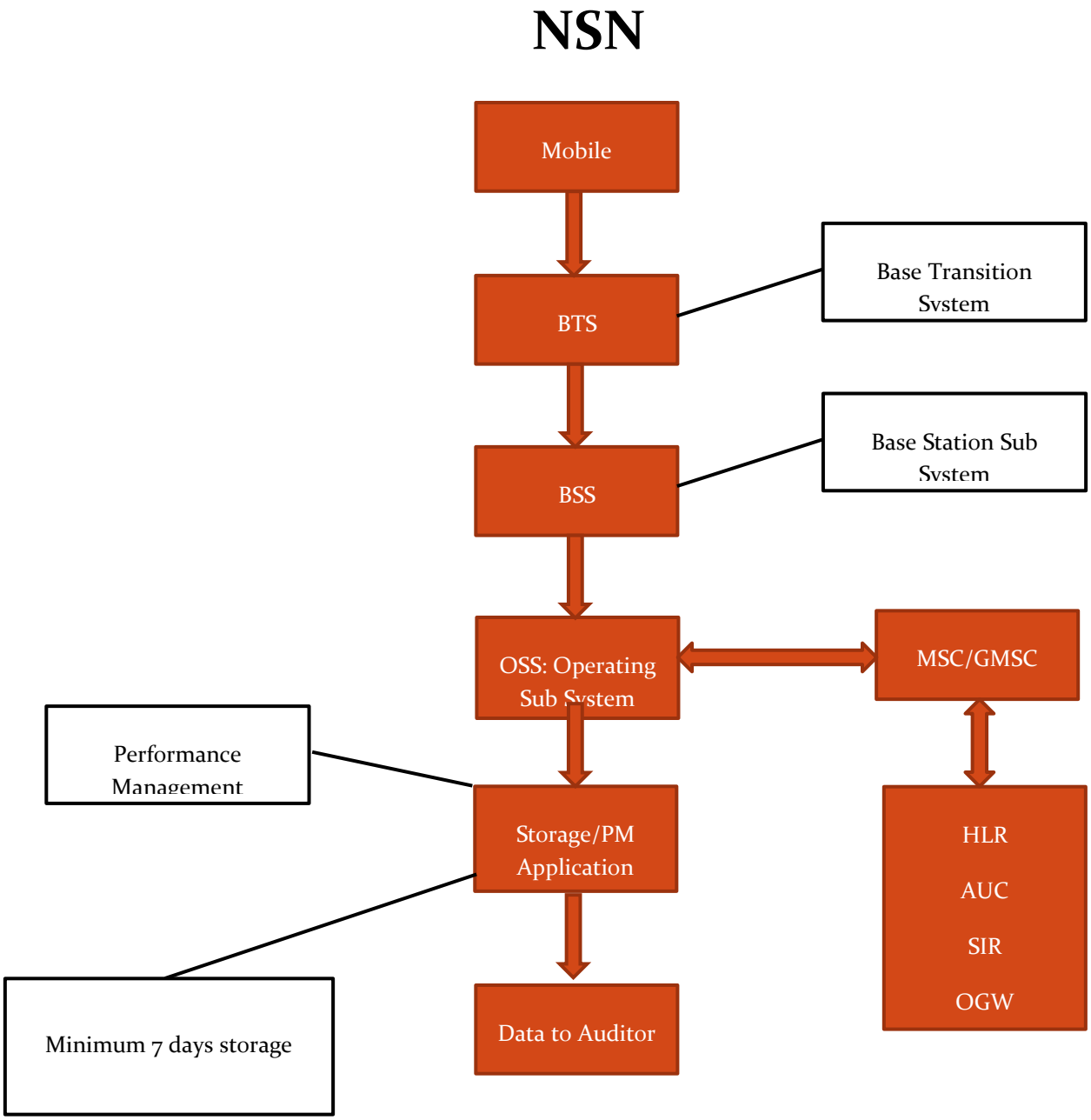
13.9.1 ERICSSON

Ericsson provides network support to Vodafone, Aircel, BSNL, Reliance CDMA and Reliance GSM in the circle.



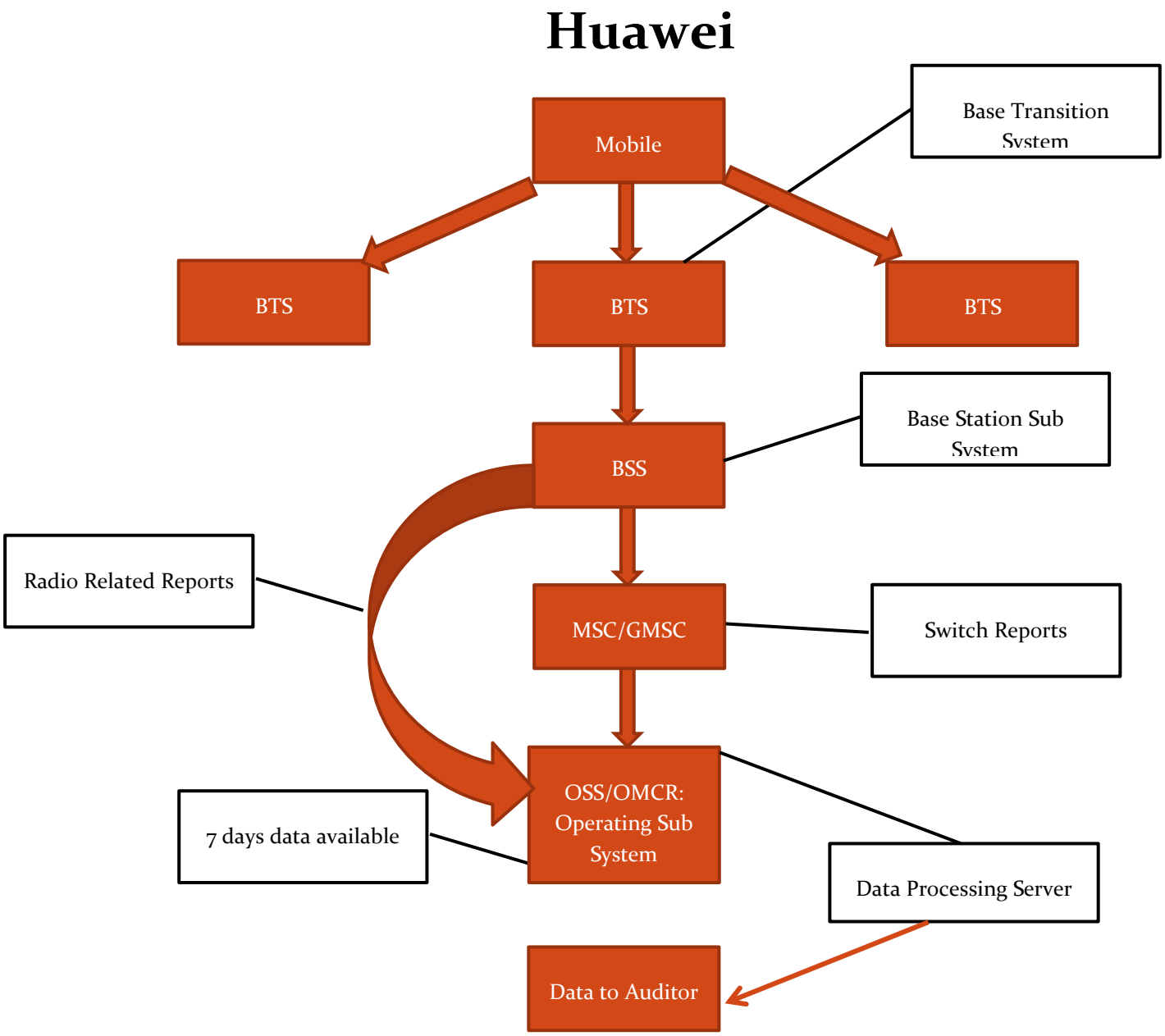
13.9.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel in the circle.



13.9.3 HUAWEI

Huawei provides network support to Idea, Tata GSM, Tata CDMA and MTS in the circle.



14 ANNEXURE – JULY -2G

1. Network Availability											
Audit Results for Network Availability- PMR data-July											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2328	2847	1265	2348	571	NS	1635	140	1774	2704
Sum of downtime of BTSs in a month (in hours)		2363	268	18425	2748	65	NS	3346	16	1437	1575
BTSs accumulated downtime (not available for service)	≤ 2%	0.14%	0.01%	1.96%	0.16%	0.02%	NS	0.28%	0.02%	0.11%	0.08%
Number of BTSs having accumulated downtime >24 hours		10	0	35	10	0	NS	23	0	3	25
Worst affected BTSs due to downtime	≤ 2%	0.43%	0.00%	2.77%	0.43%	0.00%	NS	1.41%	0.00%	0.17%	0.92%
Live Measurement Results for Network Availability- 3 Day live data-July											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2317	2853	1265	2341	571	NS	1635	140	1775	2705
Sum of downtime of BTSs in a month (in hours)		251	4	423	231	5	NS	202	0	94	128
BTSs accumulated downtime (not available for service)	≤ 2%	0.15%	0.00%	0.46%	0.14%	0.01%	NS	0.17%	0.00%	0.07%	0.07%
Number of BTSs having accumulated downtime >24 hours		0	0	4	3	0	NS	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.32%	0.13%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-July											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.62%	99.28%	98.93%	99.77%	99.86%	NS	97.07%	99.14%	99.30%	99.55%
SDCCH/Paging channel congestion	≤ 1%	0.42%	0.03%	0.88%	0.10%	NA	NS	0.09%	NA	0.06%	0.03%
TCH congestion	≤ 2%	0.25%	0.04%	0.71%	0.05%	0.00%	NS	0.24%	0.01%	0.15%	0.45%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-July											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	98.09%	99.26%	98.82%	99.79%	99.89%	NS	97.70%	99.10%	99.33%	99.66%
SDCCH/Paging channel congestion	≤ 1%	0.27%	0.03%	0.69%	0.33%	NA	NS	0.08%	NA	0.06%	0.05%
TCH congestion	≤ 2%	0.11%	0.03%	1.82%	0.04%	0.00%	NS	0.06%	0.01%	0.17%	0.34%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July											
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	NS	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-July											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		73075737	97901805	36729362	49342719	12648786	NS	271897987128979	1106384	63162452	118465822
Total number of calls dropped		615726	594495	456606	114816	73142	NS	39023	6114	393665	1029659
Call drop rate	≤ 2%	0.84%	0.61%	1.24%	0.23%	0.58%	NS	0.00%	0.55%	0.62%	0.87%
Total number of cells in the network		6973	8413	3405	7029	2195	NS	4904	456	5276	7001
Total number of cells having more than 3% TCH		207	205	61	12	52	NS	20	16	127	205
Worst affected cells having more than 3% TCH	≤ 3%	2.97%	2.44%	1.80%	0.17%	2.35%	NS	0.40%	3.45%	2.41%	2.93%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-July											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		91185187	9687069	18104204	61442135	16514913	NS	47137377	1494914	76057481	162993600
Total number of calls dropped		646375	62318	221540	137572	75299	NS	44519	7896	441237	1236752
Call drop rate	≤ 2%	0.71%	0.64%	1.22%	0.22%	0.46%	NS	0.09%	0.53%	0.58%	0.76%
Total number of cells in the network		6938	25295	3404	7002	2195	NS	4904	456	5282	6996
Total number of cells having more than 3% TCH		246	631	97	2	2	NS	19	47	130	204
Worst affected cells having more than 3% TCH	≤ 3%	3.55%	2.49%	2.84%	0.02%	0.09%	NS	0.38%	10.22%	2.45%	2.92%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-July											
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	NS	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA

4. Voice quality											
Audit Results for Voice quality -PMR Data-July											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		14540247863	34465353509	6000	7325462921	68045	NS	5775765303	91419352	5847484215	17050317900
Total number of calls with good voice quality		14161484563	33712297449	5989	7071075297	67956	NS	5713361592	90688201	5747191403	16683394786
%age calls with good voice quality	≥ 95%	97.40%	97.82%	99.82%	96.53%	99.87%	NS	98.92%	99.20%	98.28%	97.85%
Live measurement results for Voice quality-3 Day data-July											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		13479870703	3335836222	600	839140100	58040	NS	787654892	9801194	1086084345	2078805965
Total number of calls with good voice quality		13096658698	3263943618	593	811706945	57487	NS	780316546	9727399	1070831236	2039947224
%age calls with good voice quality	≥ 95%	97.16%	97.84%	98.83%	96.73%	99.05%	NS	99.07%	99.25%	98.60%	98.13%
Drive test results for Voice quality (Average of three drive tests) - DT data-July											
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	NS	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA

5. POI Congestion											
Audit Results for POI Congestion- PMR data-July											
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		50	31	77	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		72829	74798	411803	66003	35214	NS	11877	21071	13630	188984
Traffic served for all POIs (B)- in erlangs		30307	41786	10807	32432	10767	NS	7062	8868	7866	103390
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July											
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		50	31	77	93	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		71946	22855	52382	65153	35181	NS	11877	20861	13623	187534
Traffic served for all POIs (B)- in erlangs		15846	12317	10407	32420	10746	NS	7057	4915	3763	52320
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

15 ANNEXURE – AUGUST-2G

1. Network Availability											
Audit Results for Network Availability- PMR data-August											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2388	2888	1265	2352	571	NS	1634	140	1774	2705
Sum of downtime of BTSs in a month (in hours)		8194	626	17530	1062	129	NS	6705	410	2204	2251
BTSs accumulated downtime (not available for service)	≤ 2%	0.46%	0.03%	1.86%	0.06%	0.03%	NS	0.55%	0.39%	0.17%	0.11%
Number of BTSs having accumulated downtime >24 hours		40	0	36	5	0	NS	32	1	5	10
Worst affected BTSs due to downtime	≤ 2%	1.68%	0.00%	2.85%	0.21%	0.00%	NS	1.96%	0.71%	0.28%	0.37%
Live Measurement Results for Network Availability- 3 Day live data-August											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2385	2888	1265	2349	571	NS	1634	140	1774	2704
Sum of downtime of BTSs in a month (in hours)		344	34	444	48	4	NS	1857	21	97	181
BTSs accumulated downtime (not available for service)	≤ 2%	0.20%	0.02%	0.49%	0.03%	0.01%	NS	1.58%	0.21%	0.08%	0.09%
Number of BTSs having accumulated downtime >24 hours		1	0	4	1	0	NS	0	0	4	1
Worst affected BTSs due to downtime	≤ 2%	0.04%	0.00%	0.32%	0.04%	0.00%	NS	0.00%	0.00%	0.23%	0.04%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-August											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.79%	99.28%	98.97%	99.75%	99.81%	NS	98.11%	98.53%	99.32%	99.50%
SDCCH/Paging channel congestion	≤ 1%	0.54%	0.02%	0.55%	0.11%	NA	NS	0.15%	NA	0.07%	0.03%
TCH congestion	≤ 2%	0.27%	0.01%	0.91%	0.05%	0.00%	NS	0.27%	0.65%	0.10%	0.50%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-August											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	98.15%	99.27%	98.87%	99.82%	99.88%	NS	98.50%	98.19%	99.43%	99.68%
SDCCH/Paging channel congestion	≤ 1%	0.38%	0.02%	0.64%	0.08%	NA	NS	0.06%	NA	0.05%	0.03%
TCH congestion	≤ 2%	0.11%	0.03%	1.47%	0.01%	0.00%	NS	0.11%	1.06%	0.04%	0.32%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts		1347	1362	1288	1407	1357	NS	2474	1329	1407	1330
Total number of successful calls established		1338	1362	1277	1403	1357	NS	2435	1329	1393	1329
CSSR	≥ 95%	99.33%	100.00%	99.15%	99.72%	100.00%	NS	98.42%	100.00%	99.00%	99.92%
%age blocked calls		0.67%	0.00%	0.85%	0.28%	0.00%	NS	1.58%	0.00%	1.00%	0.08%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-August											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		72189675	99536129	39089369	52211295	12304580	NS	36175175	1149199	62425070	121169730
Total number of calls dropped		587534	612786	442625	150284	72503	NS	48480	6599	407149	1062114
Call drop rate	≤ 2%	0.81%	0.62%	1.13%	0.29%	0.59%	NS	0.13%	0.57%	0.65%	0.88%
Total number of cells in the network		7154	8545	3411	7045	2195	NS	4901	456	5277	7002
Total number of cells having more than 3% TCH		210	207	70	9	53	NS	23	18	128	203
Worst affected cells having more than 3% TCH	≤ 3%	2.94%	2.42%	2.04%	0.13%	2.42%	NS	0.47%	3.89%	2.43%	2.90%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-August											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		91465708	9840960	18367234	65977037	16936087	NS	45449177	1501552	78103846	160029309
Total number of calls dropped		678516	54725	214586	153545	83648	NS	52708	7353	472407	1100428
Call drop rate	≤ 2%	0.74%	0.56%	1.17%	0.23%	0.49%	NS	0.12%	0.49%	0.60%	0.69%
Total number of cells in the network		7145	25534	3404	7032	2195	NS	4901	456	5285	7001
Total number of cells having more than 3% TCH		290	614	83	2	2	NS	2	45	138	195
Worst affected cells having more than 3% TCH	≤ 3%	4.06%	2.40%	2.43%	0.03%	0.11%	NS	0.05%	9.78%	2.62%	2.79%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-August											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		1338	1362	1277	1403	1357	NS	2474	1329	1393	1329
Total number of calls dropped		3	0	12	0	0	NS	3	8	4	1
Call drop rate	≤ 2%	0.22%	0.00%	0.94%	0.00%	0.00%	NS	0.12%	0.60%	0.29%	0.08%

4. Voice quality											
Audit Results for Voice quality -PMR Data-August											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		14374613921	35329446176	6000	8322395220	68045	NS	5530208675	84557714	5945346878	17664106562
Total number of calls with good voice quality		14006088184	34778694081	5989	8039243466	67982	NS	5468005668	83880160	5842773987	17259008475
%age calls with good voice quality	≥ 95%	97.44%	98.44%	99.82%	96.60%	99.91%	NS	98.88%	99.20%	98.27%	97.71%
Live measurement results for Voice quality-3 Day data-August											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		1832267051	3408046874	600	898576270	15804	NS	670612376	9425164	1075960355	2075714774
Total number of calls with good voice quality		1792470418	3348592804	593	869460813	15771	NS	664135827	9352718	1060534884	2034006465
%age calls with good voice quality	≥ 95%	97.83%	98.26%	98.83%	96.76%	99.79%	NS	99.03%	99.23%	98.57%	97.99%
Drive test results for Voice quality (Average of three drive tests) - DT data-August											
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		358191	345144	2087739	1994513	NA	NS	128837	NA	2786997	92411
Total number of calls with good voice quality		329427	337483	2009929	1916906	NA	NS	110370	NA	2700177	91941
%age calls with good voice quality	≥ 95%	91.97%	97.78%	96.27%	96.11%	96.86%	NS	85.67%	96.79%	96.88%	99.49%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	76	90	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73297	76949	426466	66439	35181	NS	11877	21219	13643	186142
Traffic served for all POIs (B)- in erlangs		29807	42335	11211	33975	10522	NS	6918	8895	7609	105229
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	76	90	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73279	22982	52382	66185	35181	NS	11877	21113	13623	185345
Traffic served for all POIs (B)- in erlangs		15592	12597	10849	33742	10484	NS	6915	4953	3804	54281
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

16 ANNEXURE – SEPTEMBER-2G

1. Network Availability											
Audit Results for Network Availability- PMR data-September											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2402	2907	1276	2362	571	NS	1618	140	1779	2705
Sum of downtime of BTSs in a month (in hours)		3939	98	16402	1128	152	NS	7532	77	2496	1347
BTSs accumulated downtime (not available for service)	≤ 2%	0.23%	0.00%	1.79%	0.07%	0.04%	NS	0.65%	0.08%	0.19%	0.07%
Number of BTSs having accumulated downtime >24 hours		20	0	32	6	0	NS	16	1	10	9
Worst affected BTSs due to downtime	≤ 2%	0.83%	0.00%	2.51%	0.25%	0.00%	NS	0.99%	0.71%	0.56%	0.33%
Live Measurement Results for Network Availability- 3 Day live data-September											
	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		2385	2901	1265	2357	571	NS	1634	140	1779	2705
Sum of downtime of BTSs in a month (in hours)		270	3	559	138	21	NS	2549	28	188	190
BTSs accumulated downtime (not available for service)	≤ 2%	0.16%	0.00%	0.61%	0.08%	0.05%	NS	2.17%	0.27%	0.15%	0.10%
Number of BTSs having accumulated downtime >24 hours		3	0	6	3	0	NS	0	0	0	1
Worst affected BTSs due to downtime	≤ 2%	0.13%	0.00%	0.47%	0.13%	0.00%	NS	0.00%	0.00%	0.00%	0.04%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-September											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.74%	99.47%	98.83%	99.80%	99.86%	NS	95.98%	98.59%	99.31%	99.56%
SDCCH/Paging channel congestion	≤ 1%	0.34%	0.02%	0.93%	0.06%	NA	NS	0.22%	NA	0.07%	0.04%
TCH congestion	≤ 2%	0.12%	0.02%	0.92%	0.04%	0.00%	NS	0.38%	0.61%	0.12%	0.44%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-September											
CSSR	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	98.14%	99.48%	99.15%	99.81%	99.89%	NS	97.63%	99.29%	99.36%	99.68%
SDCCH/Paging channel congestion	≤ 1%	0.26%	0.01%	0.64%	0.08%	NA	NS	0.16%	NA	0.08%	0.05%
TCH congestion	≤ 2%	0.06%	0.01%	1.65%	0.02%	0.00%	NS	0.12%	0.01%	0.07%	0.32%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September											
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	NS	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-September											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		66936811	99720051	39108608	51499826	11228928	NS	33508006	1107815	58172824	114045881
Total number of calls dropped		524647	648640	485194	142106	61587	NS	48401	6081	358848	902309
Call drop rate	≤ 2%	0.78%	0.65%	1.24%	0.28%	0.55%	NS	0.14%	0.55%	0.62%	0.79%
Total number of cells in the network		7199	8620	3392	7077	2195	NS	4853	456	5287	7007
Total number of cells having more than 3% TCH		214	209	95	10	52	NS	23	18	128	194
Worst affected cells having more than 3% TCH	≤ 3%	2.97%	2.42%	2.79%	0.14%	2.36%	NS	0.48%	4.03%	2.42%	2.77%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-September											
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**BSNL**	**Idea**	**MTS**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		91894538	9567849	17029451	70553931	17060125	NS	50135962	1529949	77772771	166131230
Total number of calls dropped		621712	66091	143500	199590	73900	NS	55615	8392	463530	1145745
Call drop rate	≤ 2%	0.68%	0.69%	0.84%	0.28%	0.43%	NS	0.11%	0.55%	0.60%	0.69%
Total number of cells in the network		7141	25777	3411	7061	2195	NS	4901	456	5287	7002
Total number of cells having more than 3% TCH		246	620	95	3	2	NS	1	45	143	202
Worst affected cells having more than 3% TCH	≤ 3%	3.45%	2.41%	2.79%	0.04%	0.08%	NS	0.02%	9.90%	2.70%	2.88%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-September											
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	NS	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA

4. Voice quality											
Audit Results for Voice quality -PMR Data-September											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		13637189318	35668692080	6000	7871012818	65850	NS	5607851308	80698475	4952604235	16600968454
Total number of calls with good voice quality		13298630747	35155412987	5989	7708961810	65790	NS	5545703045	79946443	4873113496	16257667948
%age calls with good voice quality	≥ 95%	97.52%	98.56%	99.82%	97.94%	99.91%	NS	98.89%	99.07%	98.39%	97.93%
Live measurement results for Voice quality-3 Day data-September											
Voice quality	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1820046390	3370109902	600	927328071	15804	NS	830949669	9466172	1063104174	2151230628
Total number of calls with good voice quality		1780949531	3320248780	593	909308844	15770	NS	822780954	9369668	1048671811	2109733579
%age calls with good voice quality	≥ 95%	97.85%	98.52%	98.83%	98.06%	99.78%	NS	99.02%	98.98%	98.64%	98.07%
Drive test results for Voice quality (Average of three drive tests) - DT data-September											
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	NS	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NA	NS	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NA	NS	NA	NA	NA	NA

5. POI Congestion											
Audit Results for POI Congestion- PMR data-September											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	76	95	40	NS	29	42	30	45
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	2	0	0
Total Capacity of all POIs (A) - in erlangs		73676	79646	438911	68003	35191	NS	11877	21217	13638	193304
Traffic served for all POIs (B)- in erlangs		29546	42435	11196	33772	9945	NS	6511	8548	7335	104610
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September											
POI congestion	Benchmark	Aircel	Airtel	BSNL	Idea	MTS	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		50	31	76	95	40	NS	29	42	30	NA
No. of POIs not meeting benchmark		0	0	0	0	0	NS	0	0	0	NA
Total Capacity of all POIs (A) - in erlangs		73567	23416	52382	67079	35181	NS	11877	20979	13638	NA
Traffic served for all POIs (B)- in erlangs		15942	12688	10849	33364	1006	NS	6118	5098	3803	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	NA

17 ANNEXURE – JULY -3G

1. Network Availability							
Audit Results for Network Availability- PMR data-July							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		1872	2389	698	1800	1347	2618
Sum of downtime (i.e. total outage time) of Node Bs		1886	90	9812	1569	1783	1642
Node Bs downtime (not available for service)	≤ 2%	0.14%	0.01%	1.89%	0.12%	0.18%	0.08%
Number of Node Bs having accumulated downtime of >24 hours in a month		7	0	29	2	12	16
Worst affected Node Bs due to downtime	≤ 2%	0.37%	0.00%	4.15%	0.11%	0.89%	0.61%
Live Measurement Results for Network Availability- 3 Day live data-July							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		1860	2383	698	1689	1347	2618
Sum of downtime (i.e. total outage time) of Node Bs		233	0	365	161	87	146
Node Bs downtime (not available for service)	≤ 2%	0.17%	0.00%	0.73%	0.13%	0.09%	0.08%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	3	2	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.43%	0.12%	0.00%	0.00%

2. Connection Establishment (Accessibility)							
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-July							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	99.28%	99.54%	98.68%	99.92%	94.49%	99.98%
RRC Congestion	≤ 1%	0.33%	0.00%	0.65%	0.00%	0.09%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.20%	0.00%	0.63%	0.00%	0.03%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-July							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	99.30%	99.54%	95.06%	99.92%	96.81%	99.97%
RRC Congestion	≤ 1%	0.34%	0.00%	0.69%	0.00%	0.10%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.14%	0.00%	0.82%	0.00%	0.01%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July							
CSSR	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of RRC attempts (A)		NA	NA	NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA

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-July							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		15838151	NA	196972497	5046791	7900690	44215067
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		46386	NA	1254675	12234	6383	145246
Call drop rate (B/A*100)	≤ 2%	0.29%	0.27%	0.64%	0.24%	0.08%	0.33%
Total no. of cells in the licensed service area (B)		5606	7215	1954	5436	4036	7747
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		166	135	55	18	4	145
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.95%	1.87%	2.79%	0.33%	0.10%	1.87%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-July							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		20321825	2201182	2398213	6263306	10630397	59393064
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		64074	5947	7552	15147	7165	224458
Call drop rate (B/A*100)	≤ 2%	0.32%	0.27%	0.31%	0.24%	0.07%	0.38%
Total no. of cells in the licensed service area (B)		5572	21588	1954	5102	4037	7741
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		175	386	7	6	2	175
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	3.14%	1.79%	0.36%	0.12%	0.06%	2.26%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-July							
Call drop rate	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA	NA	NA

4. Voice quality							
Audit Results for Voice quality -PMR Data-July							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		56558593970	NA	6000	14830119500	NA	95920153886
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		55393194031	NA	5989	14803947823	NA	94747546342
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.94%	99.00%	99.82%	99.82%	99.89%	98.78%
Live measurement results for Voice quality-3 Day data-July							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		8887656806	NA	600	1809062100	NA	13996639353
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		8697727044	NA	591	1806024787	NA	13820782249
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.86%	99.00%	98.50%	99.83%	99.82%	98.74%
Drive test results for Voice quality (Average of three drive tests) - DT data-July							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA	NA	NA

5. POI Congestion							
Audit Results for POI Congestion- PMR data-July							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	77	93	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		72829	74798	411803	66003	11877	188984
Traffic served for all POIs (B)- in erlangs		30307	41786	10807	32432	7062	103390
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	77	93	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		72746	22855	52382	65153	11877	187534
Traffic served for all POIs (B)- in erlangs		15846	12317	10407	32320	6724	52320
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

18 ANNEXURE – AUGUST-3G

1. Network Availability							
Audit Results for Network Availability- PMR data-August							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1877	2397	698	1910	1350	2618
Sum of downtime (i.e. total outage time) of Node Bs		6380	127	10103	1838	1919	2372
Node Bs downtime (not available for service)	≤ 2%	0.46%	0.01%	1.95%	0.13%	0.19%	0.12%
Number of Node Bs having accumulated downtime of >24 hours in a month		31	0	28	16	32	10
Worst affected Node Bs due to downtime	≤ 2%	1.65%	0.00%	4.01%	0.84%	2.37%	0.38%
Live Measurement Results for Network Availability- 3 Day live data-August							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		1865	2394	698	1826	1350	2618
Sum of downtime (i.e. total outage time) of Node Bs		298	11	341	169	38	179
Node Bs downtime (not available for service)	≤ 2%	0.22%	0.01%	0.68%	0.13%	0.04%	0.09%
Number of Node Bs having accumulated downtime of >24 hours in a month		3	0	3	1	0	3
Worst affected Node Bs due to downtime	≤ 2%	0.16%	0.00%	0.43%	0.05%	0.00%	0.11%

2. Connection Establishment (Accessibility)							
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-August							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	99.28%	99.53%	95.40%	99.90%	98.17%	99.99%
RRC Congestion	≤ 1%	0.34%	0.00%	0.73%	0.00%	0.21%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.21%	0.00%	1.46%	0.02%	0.03%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-August							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	99.27%	99.53%	94.04%	99.92%	99.88%	99.99%
RRC Congestion	≤ 1%	0.34%	0.00%	0.71%	0.00%	0.13%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.17%	0.00%	1.61%	0.01%	0.01%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August							
CSSR	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of RRC attempts (A)		1354	1262	1274	1402	NP	1312
Total number of RRC established (B)		1344	1262	1261	1395	NP	1311
Call setup success rate (B/A*100)	≥ 95%	99.26%	100.00%	98.98%	99.50%	NP	99.92%
%age blocked calls		0.74%	0.00%	1.02%	0.50%	NP	0.08%

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-August							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		16438096	NA	193854506	6232828	7655774	45926605
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		52704	NA	2891652	11361	7879	134676
Call drop rate (B/A*100)	≤ 2%	0.32%	0.28%	1.49%	0.18%	0.10%	0.29%
Total no. of cells in the licensed service area (B)		5621	7250	1999	5773	4049	7745
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		165	140	42	31	11	132
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.93%	1.93%	2.09%	0.54%	0.27%	1.71%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-August							
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		20771780	2325799	2269451	7927412	9820292	58560682
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		68852	6473	7497	13991	6799	172644
Call drop rate (B/A*100)	≤ 2%	0.33%	0.28%	0.33%	0.18%	0.07%	0.29%
Total no. of cells in the licensed service area (B)		5587	21696	1954	5436	4049	7746
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		167	410	10	5	14	123
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.99%	1.89%	0.51%	0.09%	0.34%	1.59%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-August							
Call drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Idea 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		1344	1262	1265	1395	NP	1312
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		22	0	15	2	NP	0
Call drop rate (B/A*100)	≤ 2%	1.64%	0.00%	1.19%	0.14%	NP	0.00%

4. Voice quality							
Audit Results for Voice quality -PMR Data-August							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		55086824289	NA	6000	19399555000	NA	98865818580
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		53851550943	NA	5989	19363151202	NA	97635158931
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.76%	99.00%	99.82%	99.81%	99.87%	98.76%
Live measurement results for Voice quality-3 Day data-August							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		8525728152	NA	600	2306887300	NA	13729224922
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		8322021264	NA	591	2302573209	NA	13559182287
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.61%	99.00%	98.50%	99.81%	99.84%	98.76%
Drive test results for Voice quality (Average of three drive tests) - DT data-August							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2215989	1804813	1336829	5112377	NP	87713
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2182791	1754246	1236338	5096510	NP	86012
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.50%	97.20%	92.48%	99.69%	NP	98.06%

5. POI Congestion							
Audit Results for POI Congestion- PMR data-August							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	76	90	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73297	76949	426466	66439	11877	186142
Traffic served for all POIs (B)- in erlangs		29807	42335	11211	33975	6918	105229
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	76	90	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73279	22982	52382	66185	11877	18635
Traffic served for all POIs (B)- in erlangs		15592	12597	10849	33742	6915	54281
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

19 ANNEXURE – SEPTEMBER-3G

1. Network Availability							
Audit Results for Network Availability- PMR data-September							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		1865	2434	706	1954	1350	2618
Sum of downtime (i.e. total outage time) of Node Bs		3098	26	8786	1405	2321	1177
Node Bs downtime (not available for service)	≤ 2%	0.22%	0.00%	1.73%	0.10%	0.24%	0.06%
Number of Node Bs having accumulated downtime of >24 hours in a month		16	0	28	9	21	7
Worst affected Node Bs due to downtime	≤ 2%	0.86%	0.00%	3.97%	0.46%	1.56%	0.27%
Live Measurement Results for Network Availability- 3 Day live data-September							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		1867	2411	698	1917	1350	2618
Sum of downtime (i.e. total outage time) of Node Bs		119	1	323	136	356	197
Node Bs downtime (not available for service)	≤ 2%	0.09%	0.00%	0.64%	0.10%	0.37%	0.10%
Number of Node Bs having accumulated downtime of >24 hours in a month		1	0	3	2	0	1
Worst affected Node Bs due to downtime	≤ 2%	0.05%	0.00%	0.43%	0.10%	0.00%	0.04%

2. Connection Establishment (Accessibility)							
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-September							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	99.41%	99.55%	97.67%	99.91%	99.73%	100.00%
RRC Congestion	≤ 1%	0.28%	0.00%	0.40%	0.00%	0.36%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.16%	0.00%	0.95%	0.02%	0.03%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-September							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	99.47%	99.56%	95.70%	99.93%	99.98%	99.99%
RRC Congestion	≤ 1%	0.23%	0.00%	0.71%	0.00%	0.08%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.10%	0.02%	1.61%	0.00%	0.04%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September							
CSSR	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of RRC attempts (A)		NA	NA	NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NA	NA

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-September							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		15679495	NA	192994719	7507008	6874002	44544446
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		49001	NA	3791037	13278	7100	132828
Call drop rate (B/A*100)	≤ 2%	0.31%	0.27%	1.96%	0.18%	0.10%	0.30%
Total no. of cells in the licensed service area (B)		5589	7364	1996	5912	4049	7752
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		166	138	42	17	17	131
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.98%	1.87%	2.08%	0.29%	0.41%	1.69%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-September							
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		21664196	2256307	2269451	10491522	10443242	58655390
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		65538	6107	7497	18416	16761	186527
Call drop rate (B/A*100)	≤ 2%	0.30%	0.27%	0.33%	0.18%	0.16%	0.32%
Total no. of cells in the licensed service area (B)		5593	21883	1999	5798	4049	7747
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		145	367	9	4	24	132
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.59%	1.68%	0.47%	0.08%	0.60%	1.71%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-September							
Call drop rate	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA	NA	NA

4. Voice quality							
Audit Results for Voice quality -PMR Data-September							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		50731599276	NA	6000	23401924000	NA	96241408938
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		49705302632	NA	5989	23357893963	NA	95050416754
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.98%	99.00%	99.82%	99.81%	99.88%	98.76%
Live measurement results for Voice quality-3 Day data-September							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		7998649250	NA	600	3062849750	NA	13836496279
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		7839167059	NA	591	3057354469	NA	13664496656
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.01%	99.00%	98.50%	99.82%	99.85%	98.76%
Drive test results for Voice quality (Average of three drive tests) - DT data-September							
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA	NA	NA

5. POI Congestion							
Audit Results for POI Congestion- PMR data-September							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	76	95	29	45
No. of POIs not meeting benchmark		0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		73676	79646	426466	68003	11877	193304
Traffic served for all POIs (B)- in erlangs		29546	42435	11211	33772	6511	104610
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September							
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Idea 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		50	31	76	95	29	NA
No. of POIs not meeting benchmark		0	0	0	0	0	NA
Total Capacity of all POIs (A) - in erlangs		73567	23416	52382	67079	11877	NA
Traffic served for all POIs (B)- in erlangs		15942	12688	10849	33364	6118	NA
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	NA

20 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. JAS'16 – Refers to the quarter of July , August and September 2016
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. SDCCH – 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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