EAST ZONE

TRAI AUDIT WIRELESS REPORT-BIHAR & JHARKHAND CIRCLE – OND'14 QUARTER

Prepared By -

IMRB International | eTech

Prepared For-

TRAI

सत्यमेव जयते

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 March 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 Bihar Circle.

2.3   COVERAGE

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

Image Source: BSNL website

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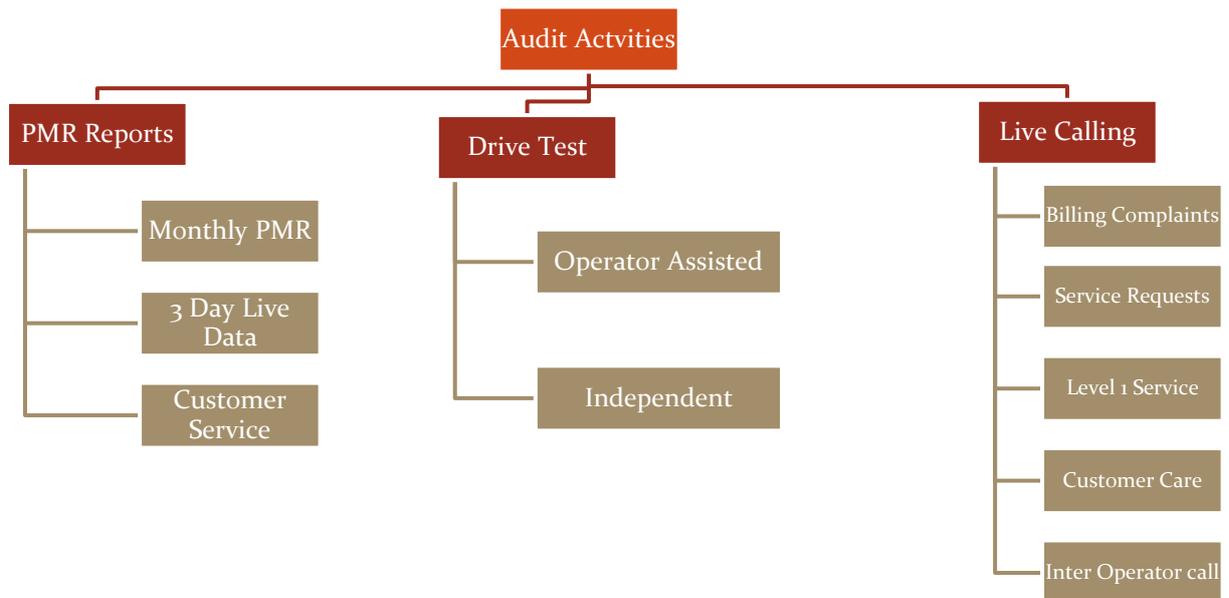
Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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 IMRB auditors inform the operators about the audit schedule in advance. As per schedule, the auditors visit the operator premises to conduct the audit.

> During TRAI audit, raw data is extracted from the operator's server/ NOC/ exchange/ OMC/ customer service center/ billing center etc. by the IMRB auditor with assistance from the operator personnel in order to generate PMR reports (Network/ Billing /Customer Service etc).

> All the calculations are done by IMRB auditors to generate a new PMR report from that raw data.

> The newly created PMR reports are then taken in hard copy, duly signed by the competent authority of operators. IMRB auditors also sign the same report.

The PMR report for network parameters is taken for each month of the audit quarter and is generally extracted and verified in the first week of the subsequent month of the audit month. For example, November 2014 audit data was collected in the month of December 2014.

The PMR report for customer service parameters is extracted from Customer Service Center and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending December 2014 (OND'14) was collected in the month of Jan 2014.

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

- Monthly PMR (Network Parameters)
- 3 Day Live Measurement Data (Network Parameters)
- Customer Service Data

Let us understand these formats in detail.

2.4.1.2   MONTHLY PMR

This involved calculation of the various Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems in presence of IMRB representative at the operator's premises for the month of Oct, Nov and Dec 2014. 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 4 of the report. The benchmark values for each parameter have been given in the table below.

2.4.1.3   AUDIT PARAMETERS - NETWORK

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

Network Related

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 Channel Congestion	≤ 1%
TCH Congestion	≤ 2%
Connection Maintenance (Retainability)	
Call Drop Rate	≤ 2%
Worst affected cells having more than 3% TCH drop (call drop) rate	≤ 3%
Connections with good voice quality	≥ 95%
Point of Interconnection	
(POI) Congestion (on individual POI)	≤ 0.5%

2.4.1.4   POINT OF DATA EXTRACTION

The data is extracted from a terminal/computer connected to OMCR & OSS on the operator network.
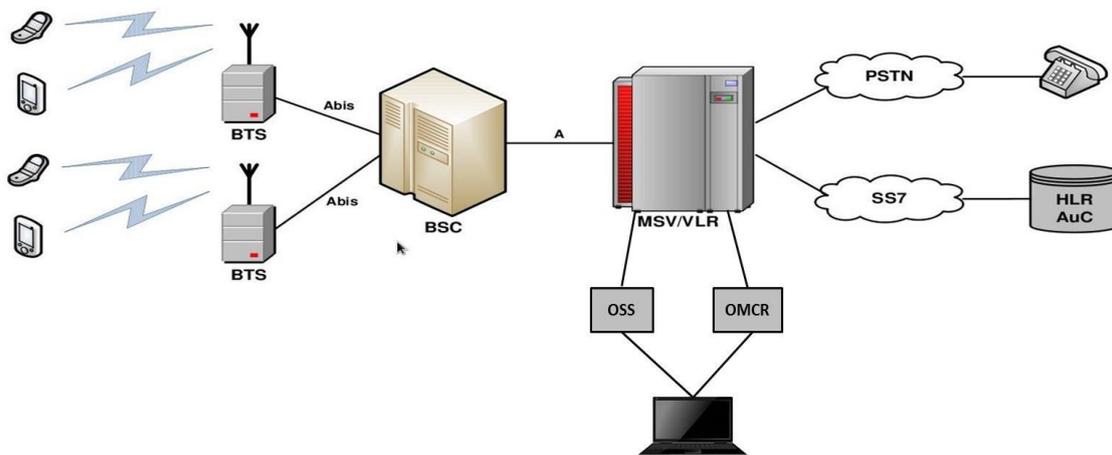
2.4.1.5 STEP BY STEP AUDIT PROCEDURE

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

All the operators operating in the Wireless domain are informed about the Audit. Tender document is taken as a reference document for assimilating the presence of operators.

⬇

Audit formats and schedule is shared with the operators in advance. It includes day of the visit and date of 3 day data collection and other requirements.

⬇

IMRB auditors visit the operator's server/exchange/central NOC to extract data from operator's systems. Operator personnel assist the auditor in extraction process.

⬇

The extracted data is validated and verfied by the IMRB auditors.

⬇

IMRB auditors then prepare a PMR report from the extracted data with assistance from the operator.

⬇

IMRB auditors validate the values with raw data and also provide their comments, wherever required.

⬇

The final audit or PMR sheet is signed by the operator person in-charge along with authorized stamp.

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.

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2.4.1.6   CALCULATION METHODOLOGY – NETWORK PARAMETERS

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
TCH Congestion	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	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 |

2.4.1.7   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.

2.4.1.8   TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify TCBH for an operator:

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

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

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

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During audit, the auditors identified from the raw data that the TCBH for the operators in OND'14 was the time period as given below.

Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
19:00 - 20:00	20:00 - 21:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	20:00 - 21:00	19:00 - 20:00	18:00 - 19:00	19:00 - 20:00	19:00 - 20:00

2.4.1.9 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify CBBH for an operator:

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

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

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

During audit, the auditors identified from the raw data that the CBBH for the operators in OND'14 was the time period as given below.

Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
19:00 - 20:00	20:00 - 21:00	20:00 - 21:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	19:00 - 20:00	20:00 - 21:00

2.4.1.10 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 Dec 2014 (OND'14) was collected in the month of Jan 2014. 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.

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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 5 of the report. The benchmark values for each parameter have been given in the table below.

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2.4.1.11 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%

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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.

> The IMRB auditor visits each operator premises to do live calling. The operators provide the raw data of customer complaints (billing & service) and also the list of customer service numbers to be verified through live calling

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

> The auditors also verify the performance of call center, level 1 services by calling the numbers using operator SIM. The list of call center numbers is provided by the operator. The process followed to test Level 1 services has been stated below.

> Using operator SIM, the auditors also make test calls to subscribers of other operators to assess the inter-operator call connectivity in the same licensed service area

Live calling activity was carried out during the period of Dec 2014. 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 Nov 2014 was considered for live calling activity conducted in Dec 2014.

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 March, 2009 were considered as population for selection of samples. A complete list of the same has been provided in Section 5.1.1.

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 150 test calls were made per service provider in the quarter.

While most of the Level 1 services are toll free, it has been observed that some Level 1 services may not be toll free. In OND'14, 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	State Heath Information Helpline
108	Emergency and Disaster Management Helpline
181	Chief Minister Helpline
1033	Road Accident Management Service
1056	Emergency Medical Service
1063	Public Grievance Cell of DOT
1064	Anti Corruption Helpline
1070	Relief Commissioner for Natural Calamities
1071	Air Accident Helpline
1072	Rail Accident Helpline
1073	Road Accident Information
1077	Control Room for District Collector
1091	Women Crisis Response Center
1098	Child Helpline
1099	Central Accident & Trauma Helpline
1909	National Do Not Call Registry
1916	Drinking Water Supply
1947	Unique Identification Authority of India
1950	Election Commission of India
15100	Free Legal Service Helpline
155214	Labour Helpline
106X	State of Art Hospitals (The actual code has to be confirmed from the operator as per presence of hospitals in the circle. We have to check for all hospitals as per avaialbility of list with operator, For example 1066 is for Apollo)

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

ᕫ Calls getting connected and answered within 60 seconds by operator's IVR.

ᕫ % 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.

ᕫ Overall sample size is 100 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS.

ᕫ Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.

ᕫ 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   DRIVE TEST

2.4.3.1   SIGNIFICANCE AND METHODOLOGY

Drive test, as the name suggests, is conducted to measure the outdoor coverage 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.
ᕫ Operator Assisted Drive Test
ᕫ Independent Drive Test

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

2.4.3.2   OPERATOR ASSISTED DRIVE TEST

A total of 3 SSA were selected and audited in each quarter, 1 SSA in each month. The methodology adopted for the drive test-

- ꙮ 3 consecutive days drive test in one SSA every month. SSA would be defined as per BSNL and month wise SSA list will be finalized by regional TRAI office.
- ꙮ On an average, a minimum of 100 kilometers were covered each day
- ꙮ 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.
- ꙮ Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI.
- ꙮ 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 and we can start from the point from where we had left last day (if possible).
- ꙮ The route was classified as-
    - o With In city
    - o Major Roads
    - o Highways
    - o Shopping complex/ Mall
    - o Office Complex/ Government Building
- ꙮ 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.
- ꙮ The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- ꙮ The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- ꙮ The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- ꙮ The speed of the vehicle was kept at around 30 km/hr.
- ꙮ The holding period of each test call was 120 seconds.
- ꙮ A test call was generated 10 seconds after the previous test call is completed.
- ꙮ Height of the antenna was kept uniform in case of all service providers.

2.4.3.3   INDEPENDENT DRIVE TEST

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

- ꙮ A minimum of 100 kilometers was traversed during the independent drive test in a SSA. The SSA would be defined as per BSNL and SSA list will be finalized by regional TRAI office.
- ꙮ 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.
- ꙮ Special emphasis was given to those areas where the number of complaints received were on the higher side, if provided by TRAI.
- ꙮ 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).
- ꙮ The route was classified as-

- o With In city
- o Major Roads
- o Highways
- o Shopping complex/ Mall
- o 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 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.

✥ Height of the antenna was kept uniform in case of all service providers.

2.4.3.4 PARAMETERS EVALUATED DURING DRIVE TEST

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 RxQual Samples– A
    - ✓ RxQual 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

2.5   OPERATORS COVERED

Name of Operator	Number of Subscriber as per VLR
Aircel(DWL)	4552137
Airtel	22619832
BSNL (Bihar & Jharkhand)	2675226
Idea	7794534
Reliance CDMA	2430369
Reliance GSM	6094295
Tata CDMA	584189
Tata GSM	1876433
Uninor	6862147
Vodafone	7528520

Dec'14 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

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

3.1   PMR DATA – 3 MONTHS CONSOLIDATED

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(DWL)	4.84%	29.34%	93.64%	0.94%	5.91%	1.65%	12.47%	95.00%
Airtel	0.08%	0.26%	98.17%	0.94%	1.22%	1.88%	2.35%	95.74%
BSNL (Bihar & Jharkhand)	13.88%	27.12%	97.72%	8.14%	4.44%	1.79%	12.66%	97.72%
Idea	0.55%	1.87%	98.34%	0.67%	1.06%	1.08%	2.77%	96.48%
Reliance CDMA	0.38%	1.13%	97.97%	NA	0.02%	0.35%	1.59%	99.81%
Reliance GSM	0.08%	0.29%	95.96%	0.79%	0.06%	0.51%	0.13%	97.84%
Tata CDMA	0.14%	0.00%	97.93%	NA	0.31%	0.83%	4.08%	98.21%
Tata GSM	0.12%	0.56%	98.63%	0.16%	0.21%	0.53%	2.53%	97.37%
Uninor	0.28%	1.07%	98.27%	0.39%	1.03%	0.53%	1.86%	93.26%
Vodafone	0.42%	1.85%	99.51%	0.23%	0.49%	0.91%	4.48%	97.44%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for Reliance CDMA and Tata CDMA.

Following are the parameter wise observations for Wireless Operators in Bihar circle:

BTSs Accumulated Downtime:

Aircel and BSNL did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.08%.

Worst Affected BTSs Due to Downtime:

Aircel and BSNL failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for Tata CDMA at 0.00%.

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Call Set-up Success Rate (CSSR):

Aircel did not meet the benchmark for CSSR. During the audits, the maximum CSSR was observed for Vodafone with 99.51%.
All the operators were found to be calculating the parameter as per the norm specified by TRAI, as given in parameter description section.

Network Congestion parameters:

BSNL failed to meet the benchmark on SDCCH / Paging Channel Congestion as well as TCH congestion. Aircel did not meet the benchmark for TCH congestion.

Vodafone recorded the best performance on SDCCH / Paging Channel Congestion while Reliance CDMA recorded the best performance on TCH congestion.

The calculation methodology (given in parameter description section) followed by the operators was found to be in complete accordance with what has been specified by TRAI.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance CDMA at 0.35%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel, BSNL, Tata CDMA and Vodafone failed to meet the benchmark for the parameter. Best performance was recorded for Reliance GSM at 0.13%.

Voice Quality

Uninor failed to meet the benchmark. Best performance was recorded for Reliance CDMA at 99.81%.

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

3.2 3 DAY DATA – CONSOLIDATED

A three day live measurement was conducted to measure the QoS provided by the operators. It was seen from the live data collected, that the performance of the operators across all parameter more or less corroborated with the audit data collected.

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(DWL)	4.48%	0.00%	94.81%	0.36%	4.77%	1.54%	8.26%	95.11%
Airtel	0.09%	0.00%	98.09%	0.97%	1.17%	1.88%	2.34%	95.76%
BSNL (Bihar & Jharkhand)	10.71%	3.14%	98.20%	8.37%	3.99%	1.83%	8.03%	98.10%
Idea	0.54%	0.07%	98.58%	0.63%	0.85%	0.97%	2.75%	96.35%
Reliance CDMA	0.30%	0.00%	98.23%	NA	0.02%	0.30%	0.00%	99.82%
Reliance GSM	0.09%	0.00%	95.82%	1.45%	0.09%	0.51%	0.00%	97.83%
Tata CDMA	0.12%	0.00%	98.09%	NA	0.18%	0.55%	4.35%	98.20%
Tata GSM	0.12%	0.00%	98.99%	0.17%	0.13%	0.48%	4.59%	97.65%
Uninor	0.27%	0.00%	98.42%	0.29%	0.93%	0.53%	1.90%	93.37%
Vodafone	0.43%	0.00%	99.60%	0.17%	0.40%	0.89%	4.53%	97.50%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for Reliance CDMA and Tata CDMA.

Following is a parameter wise review of the performance of the operators:

BTSs Accumulated Downtime:

During 3 day live measurement, Aircel and BSNL did not meet the benchmark. Minimum BTS Accumulated downtime was recorded for Reliance GSM at 0.09%.

Worst Affected BTSs Due to Downtime:

BSNL failed to meet the benchmark while all other operators performed well on this parameter.

Call Set-up Success Rate (CSSR):

Aircel did not meet the benchmark for CSSR. During the live measurement, the maximum CSSR was observed for Vodafone with 99.60%.

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All the operators were found to be calculating the parameter as per the norm specified by TRAI, as given in parameter description section.

Network Congestion parameters:

BSNL failed to meet the benchmark on SDCCH / Paging Channel Congestion as well as TCH congestion. Aircel did not meet the benchmark for TCH congestion.

Vodafone recorded the best performance on SDCCH / Paging Channel Congestion while Reliance CDMA recorded the best performance on TCH congestion.

The calculation methodology (given in parameter description section) followed by the operators was found to be in complete accordance with what has been specified by TRAI.

Call Drop Rate:

All operators met the benchmark for call drop rate. Minimum call drop rate was recorded for Reliance CDMA at 0.30%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel, BSNL, Tata CDMA, Tata GSM and Vodafone failed to meet the benchmark for the parameter. Best performance was recorded for Reliance CDMA and Reliance GSM at 0.00%.

Voice Quality

Uninor failed to meet the benchmark. Best performance was recorded for Reliance CDMA at 99.82%.

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

3.3 LIVE CALLING DATA - CONSOLIDATED

Name of Service Provider	Metering and Billing		Service Requests	Level 1 Service	Response time to customer for assistance	
	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	Complaint /Request attended to Satisfaction	Call answered in 60 seconds	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to voice) within 90 seconds
Benchmark	≥ 98%	≥ 100%		≥ 95%	≥ 95%	≥ 95%
Aircel(DWL)	NA	NA	82.00%	97.33%	100.00%	99.00%
Airtel	70.00%	72.00%	81.00%	98.00%	100.00%	93.00%
BSNL (Bihar & Jharkhand)	67.00%	83.50%	74.00%	95.67%	100.00%	95.00%
Idea	47.00%	78.00%	82.00%	100.00%	100.00%	95.00%
Reliance CDMA	74.00%	88.00%	83.00%	92.67%	100.00%	80.00%
Reliance GSM	78.00%	83.00%	74.00%	95.33%	100.00%	94.00%
Tata CDMA	74.00%	92.00%	82.00%	100.00%	100.00%	100.00%
Tata GSM	59.00%	71.00%	80.00%	94.00%	99.00%	95.00%
Uninor	61.00%	81.00%	76.00%	89.33%	100.00%	100.00%
Vodafone	68.00%	70.00%	86.00%	91.33%	100.00%	94.00%

NA: Aircel reported zero billing complaints. Hence, 'resolution of billing complaints' parameter is not applicable for the operator.

Resolution of billing complaints

As per the consumers (live calling exercise) none of the operators was able to meet the benchmark of 98% within 4 weeks and 100% within 6 weeks.

Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests. Vodafone recorded the highest satisfaction at 86%.

Level 1 Service

Reliance CDMA, Tata GSM, Uninor and Vodafone failed to meet the TRAI benchmark for level 1 service with calls being answered within 60 seconds. The details of live calling done for the level 1 service have been provided in the annexure for each operator.

Accessibility of Call Centre/Customer Care-IVR

For the IVR aspect all the service providers meet the TRAI benchmark.

Customer Care / Helpline Assessment

Airtel, Reliance CDMA, Reliance GSM and Vodafone failed to meet TRAI benchmark of answering 95% of calls answered by the call centres (voice to voice) within 90 seconds.

3.4 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 operators IVR within 60 seconds	Percentage of calls answered by the operators (voice to voice) within 90 seconds
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel(DWL)	0.00%	0.00%	NA	NA	NA	89.90%	97.21%
Airtel	0.05%	0.04%	100.00%	100.00%	100.00%	99.28%	97.73%
BSNL (Bihar & Jharkhand)	0.00%	0.01%	100.00%	100.00%	100.00%	67.23%	91.91%
Idea	0.47%	0.06%	100.00%	100.00%	100.00%	97.03%	92.43%
Reliance CDMA	0.13%	0.02%	100.00%	100.00%	100.00%	98.96%	91.70%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	98.78%	92.19%
Tata CDMA	0.00%	0.01%	100.00%	100.00%	100.00%	98.99%	91.65%
Tata GSM	0.00%	0.04%	100.00%	100.00%	100.00%	95.67%	94.08%
Uninor	NA	0.03%	100.00%	100.00%	100.00%	96.59%	99.24%
Vodafone	0.06%	0.18%	99.76%	99.76%	100.00%	100.00%	97.51%

Note: Uninor does not have postpaid service in Bihar, hence it is recorded as NA in metering and billing of postpaid subscribers.

NA: Aircel reported zero billing complaints. Hence, 'resolution of billing complaints' and 'period of applying credit/waiver' parameters are not applicable for the operator.

Metering and billing credibility – Postpaid Subscribers

Idea and Reliance CDMA did not meet the TRAI benchmark for postpaid metering and billing credibility. Aircel, Tata CDMA and Tata GSM recorded the best performance with 0.00% disputes.

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Metering and billing credibility – Prepaid Subscribers

Vodafone failed to meet the TRAI benchmark for prepaid metering and billing credibility. Aircel performed the best on this parameter.

Resolution of billing complaints

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks. Vodafone missed the benchmark of resolving 100% complaints within 6 weeks.

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 within 60 seconds

Aircel and BSNL did not meet the benchmark of 95% of its IVR call being attended within 60 seconds. Vodafone recorded the best performance for the parameter.

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

BSNL, Idea, Reliance CDMA, Reliance GSM, Tata CDMA and Tata GSM failed to meet the TRAI specified benchmark of 95%.

3.5 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment										
Inter operator call Assessment To↓ From→	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Aircel(DWL)	NA	99.00%	92.00%	99.00%	94.00%	80.00%	94.00%	95.00%	94.00%	99.00%
Airtel	96.00%	NA	93.00%	94.00%	91.00%	91.00%	91.00%	94.00%	95.00%	94.00%
BSNL (Bihar & Jharkhand)	94.00%	90.00%	NA	99.00%	94.00%	95.00%	96.00%	95.00%	94.00%	9600.00%
Idea	98.00%	96.00%	92.00%	NA	94.00%	94.00%	94.00%	97.00%	92.00%	95.00%
Reliance CDMA	97.00%	99.00%	88.00%	100.00%	NA	96.00%	99.00%	96.00%	93.00%	99.00%
Reliance GSM	96.00%	96.00%	84.00%	96.00%	96.00%	NA	95.00%	97.00%	99.00%	94.00%
Tata CDMA	%	100.00%	100.00%	99.00%	100.00%	97.00%	NA	97.00%	98.00%	99.00%
Tata GSM	98.00%	100.00%	100.00%	96.00%	98.00%	98.00%	99.00%	NA	99.00%	100.00%
Uninor	96.00%	99.00%	99.00%	98.00%	94.00%	92.00%	100.00%	98.00%	NA	99.00%
Vodafone	100.00%	93.00%	99.00%	99.00%	96.00%	99.00%	96.00%	100.00%	98.00%	NA

Most of the operators faced issues while connecting to other operators.

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

4 PARAMETER DESCRIPTION & DETAILED FINDINGS - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA

4.1 BTS ACCUMULATED DOWNTIME

4.1.1 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.

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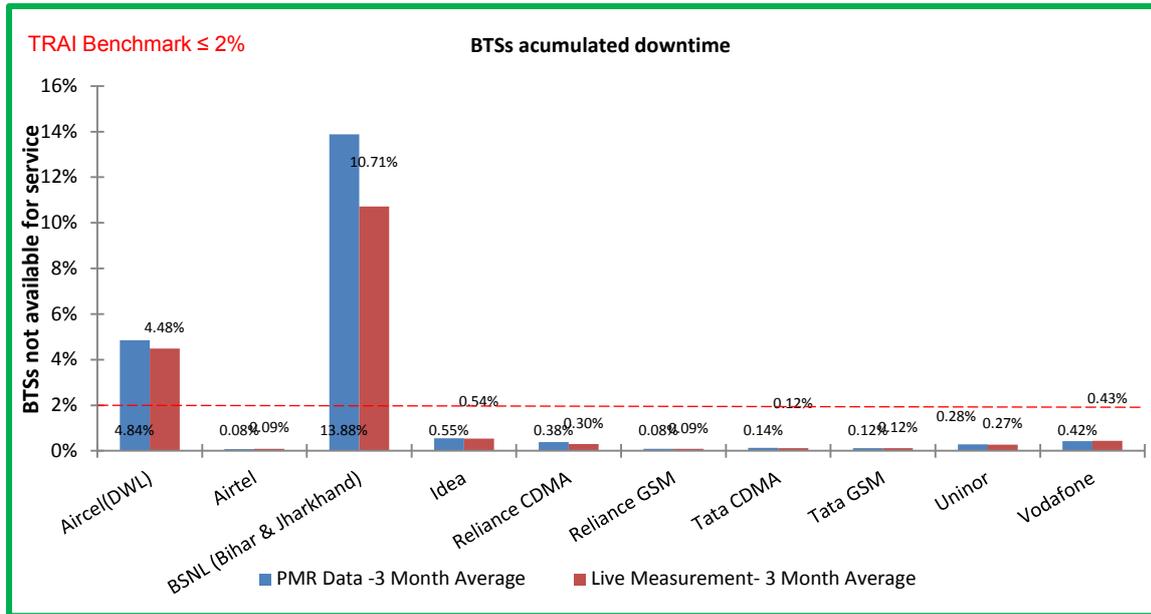
Data Source: Operations and Maintenance Center (OMC) of the operators

Aircel and BSNL did not meet the benchmark during audit.

4.1.2.1 KEY FINDINGS – MONTH 1
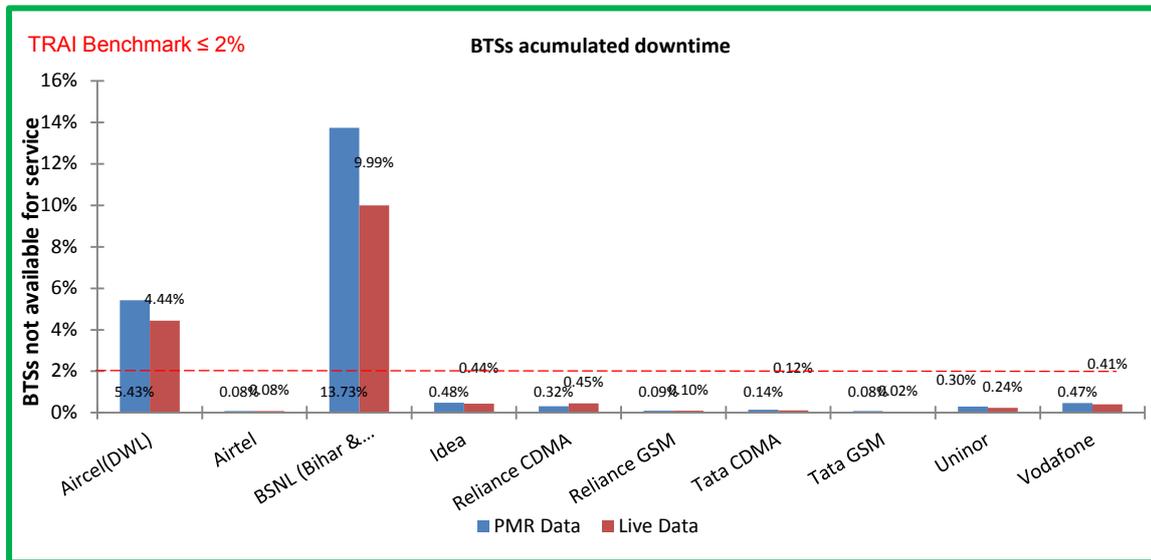
Data Source: Operations and Maintenance Center (OMC) of the operators

4.1.2.2   KEY FINDINGS – MONTH 2

TRAI Benchmark ≤ 2%   BTSs acumulated downtime
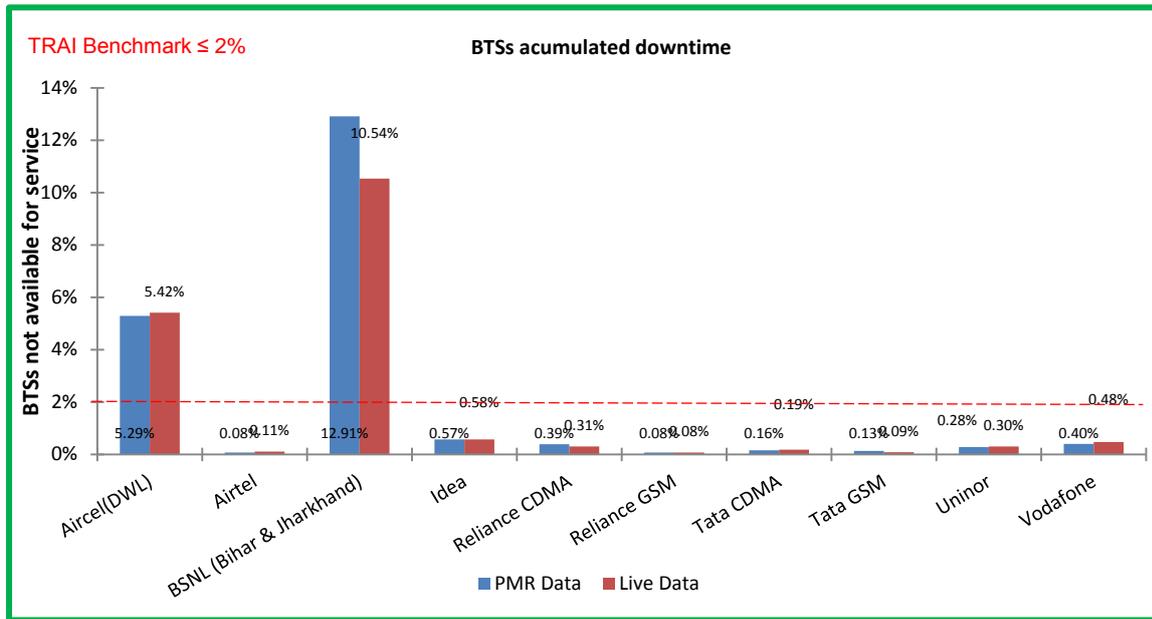
Data Source: Operations and Maintenance Center (OMC) of the operators

4.1.2.3   KEY FINDINGS – MONTH 3

TRAI Benchmark ≤ 2%   BTSs acumulated downtime
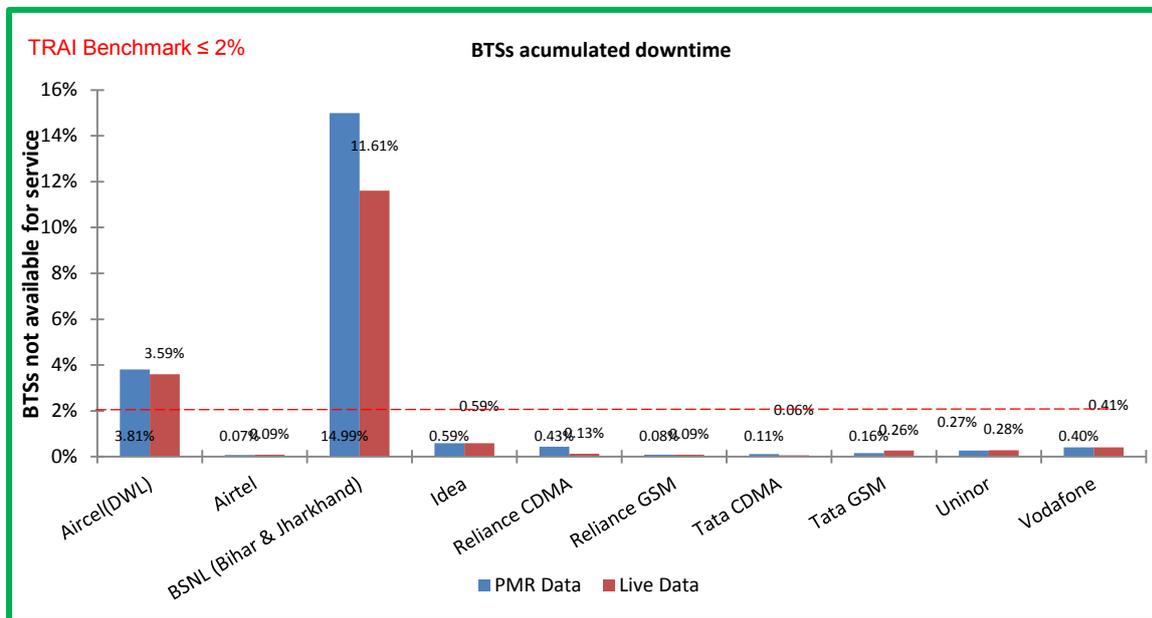
Data Source: Operations and Maintenance Center (OMC) of the operators

4.2 WORST AFFECTED BTS DUE TO DOWNTIME

4.2.1 PARAMETER DESCRIPTION

1. **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.

2. **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

3. **TRAI Benchmark –**

   a. Worst affected BTSs due to downtime ≤ 2%

4. **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.
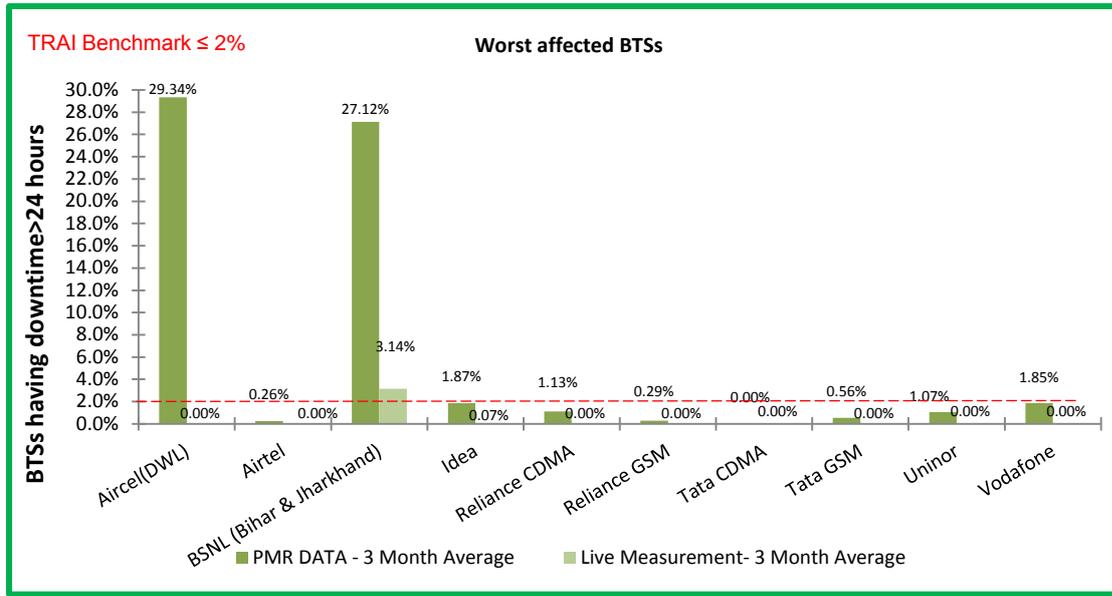
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4.2.2   KEY FINDINGS

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

Aircel and BSNL failed to meet the benchmark.

Significant difference was observed between PMR & live measurement data for the above mentioned operators. 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.

4.2.2.1   KEY FINDINGS – MONTH 1
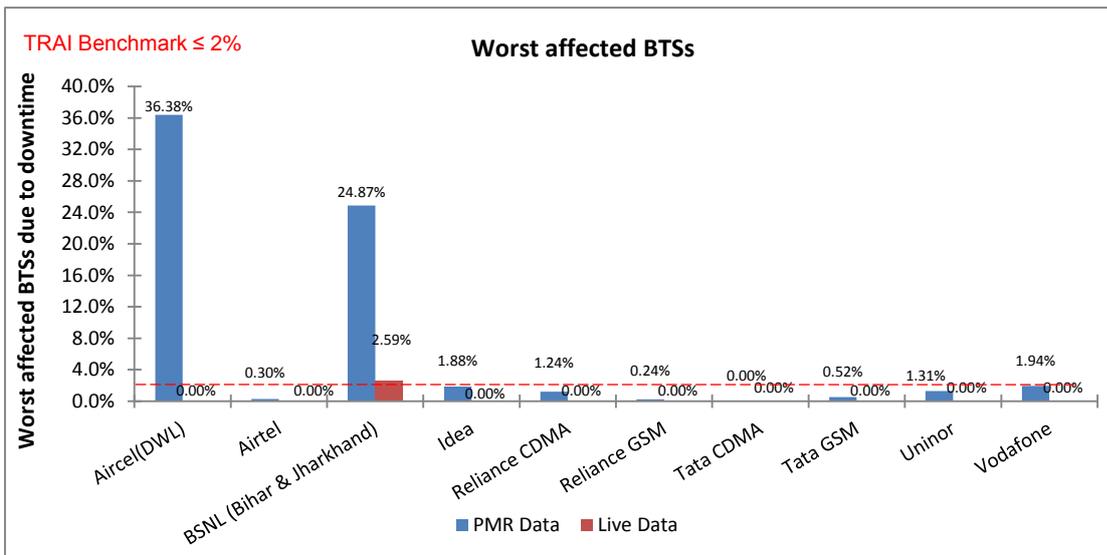
Data Source: Operations and Maintenance Center (OMC) of the operators

4.2.2.2 KEY FINDINGS – MONTH 2
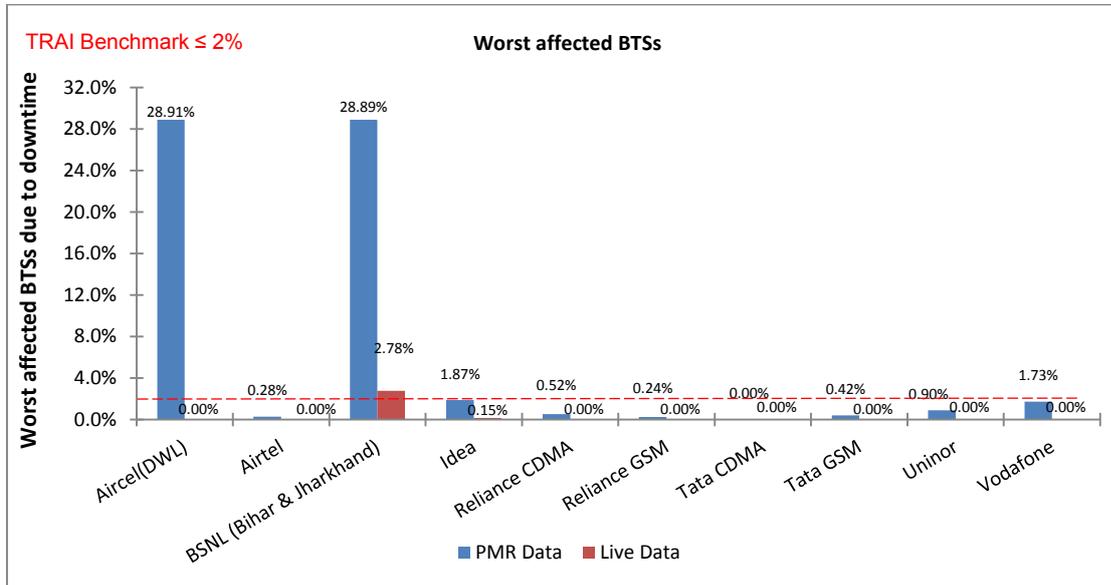
Data Source: Operations and Maintenance Center (OMC) of the operators

4.2.2.3 KEY FINDINGS – MONTH 3
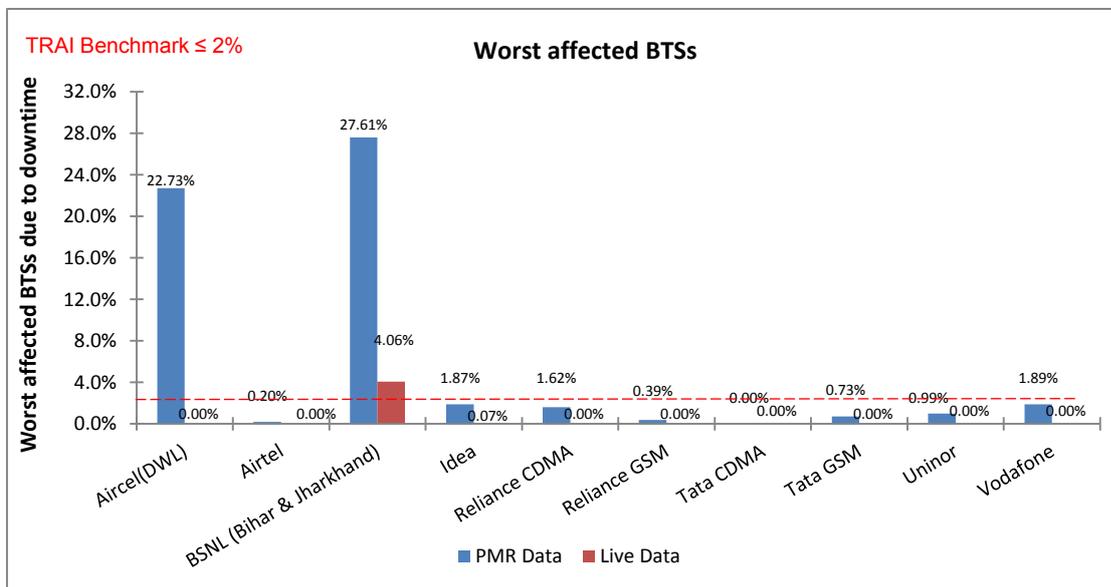
Data Source: Operations and Maintenance Center (OMC) of the operators

4.3 CALL SET UP SUCCESS RATE

4.3.1 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.
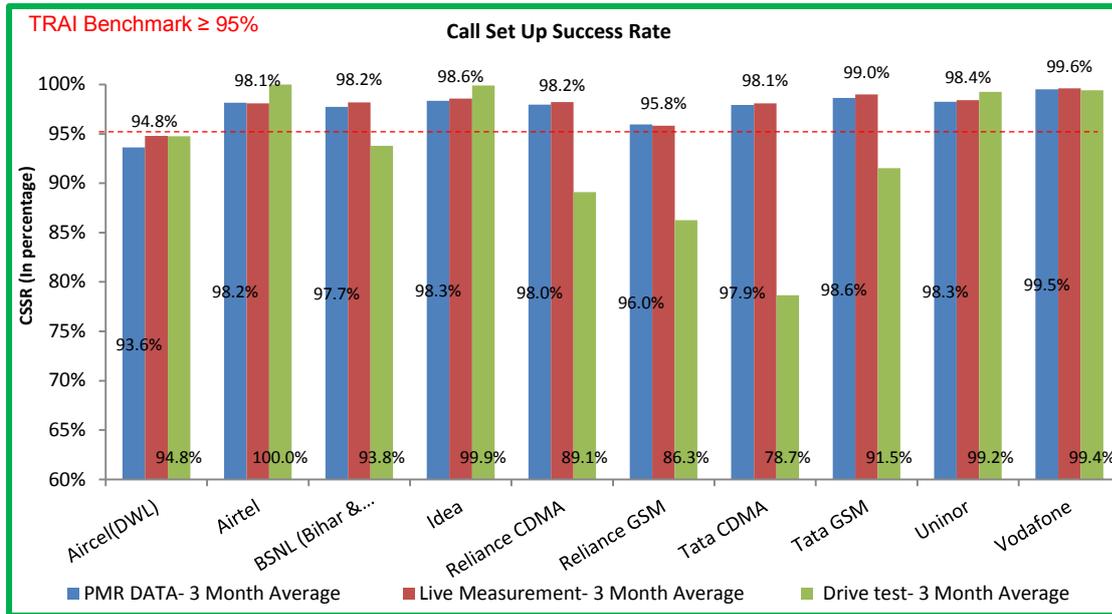
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4.3.2   KEY FINDINGS

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

Aircel failed to meet the TRAI benchmark during audit.

4.3.2.1   KEY FINDINGS – MONTH 1
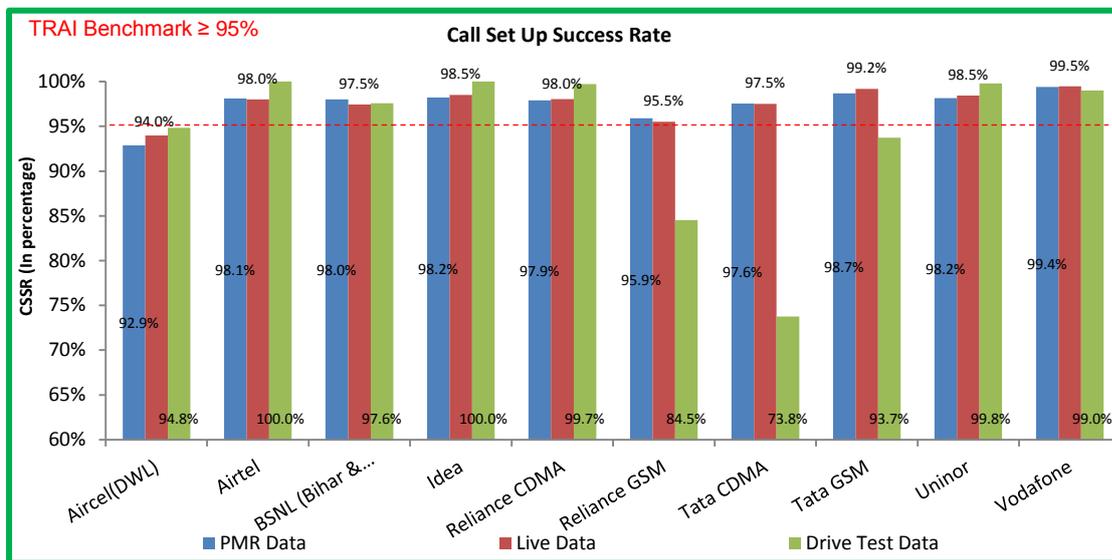
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

4.3.2.2 KEY FINDINGS – MONTH 2
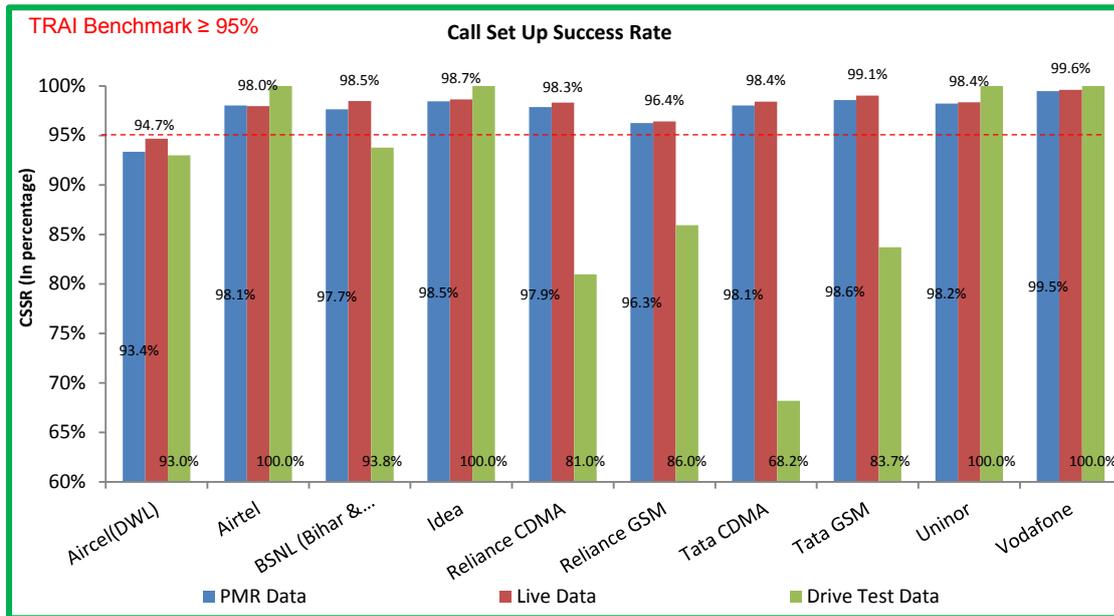
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

4.3.2.3 KEY FINDINGS – MONTH 3
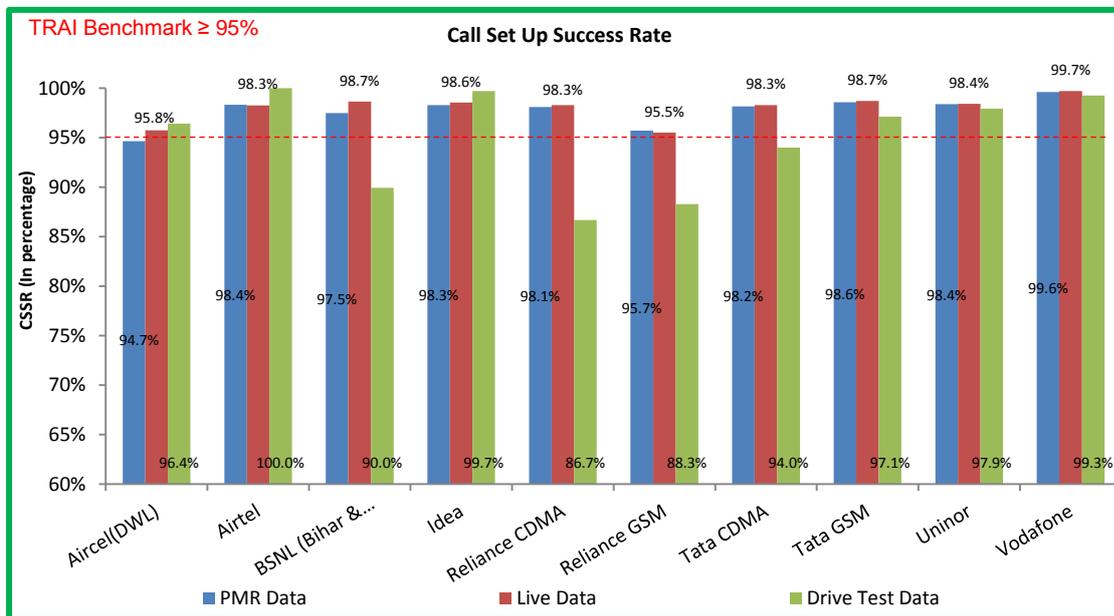
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

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

4.4.1 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%** = $[(A_1 \times C_1) + (A_2 \times C_2) + ... + (A_n \times C_n)] / (A_1 + A_2 + ... + A_n)$

     - Where:-A_1 = Number of attempts to establish SDCCH / TCH made on day 1

     - C_1 = Average SDCCH / TCH Congestion % on day 1

     - A_2 = Number of attempts to establish SDCCH / TCH made on day 2

     - C_2 = Average SDCCH / TCH Congestion % on day 2

     - A_n = Number of attempts to establish SDCCH / TCH made on day n

     - C_n = Average SDCCH / TCH Congestion % on day n

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

     - Where:-A_1 = POI traffic offered on all POIs (no. of calls) on day 1

     - C_1 = Average POI Congestion % on day 1

     - A_2 = POI traffic offered on all POIs (no. of calls) on day 2

     - C_2 = Average POI Congestion % on day 2

     - A_n = POI traffic offered on all POIs (no. of calls) on day n

     - C_n = Average POI Congestion % on day n

3. **Benchmark:**

   ↳ SDCCH Congestion: ≤ 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

4.4.2 KEY FINDINGS - SDCCH/PAGING CHANNEL CONGESTION
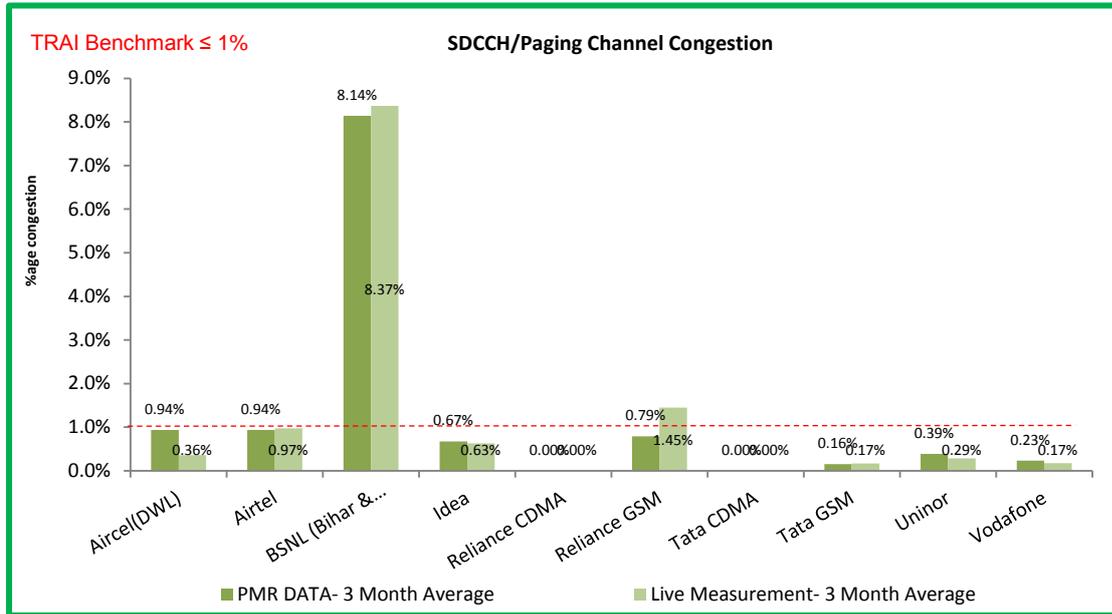
Data Source: Network Operations Center (NOC) of the operators

BSNL failed to meet the TRAI benchmark as per PMR report.

4.4.2.1 KEY FINDINGS – MONTH 1
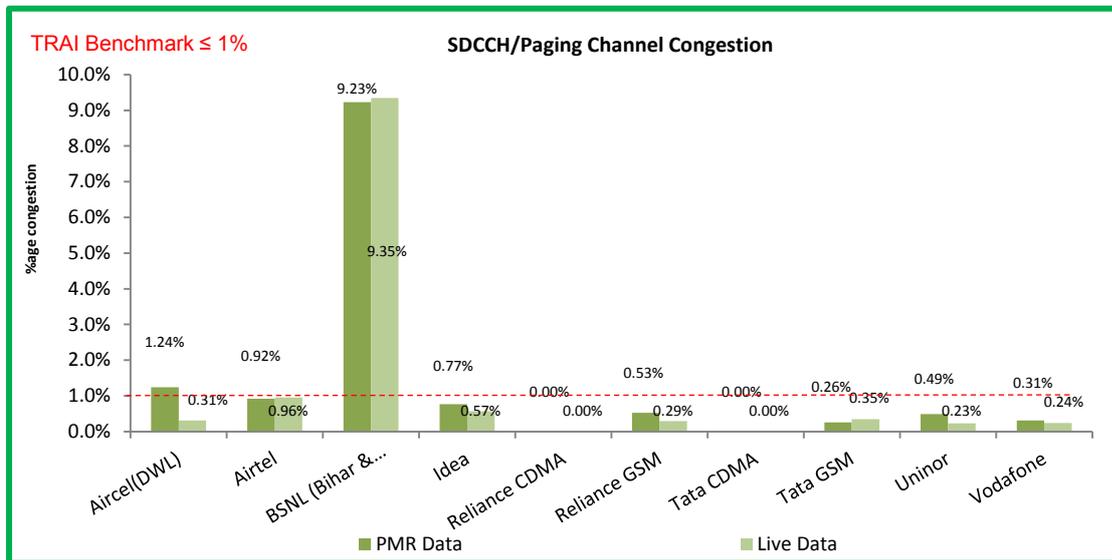
Data Source: Network Operations Center (NOC) of the operators

4.4.2.2 KEY FINDINGS – MONTH 2
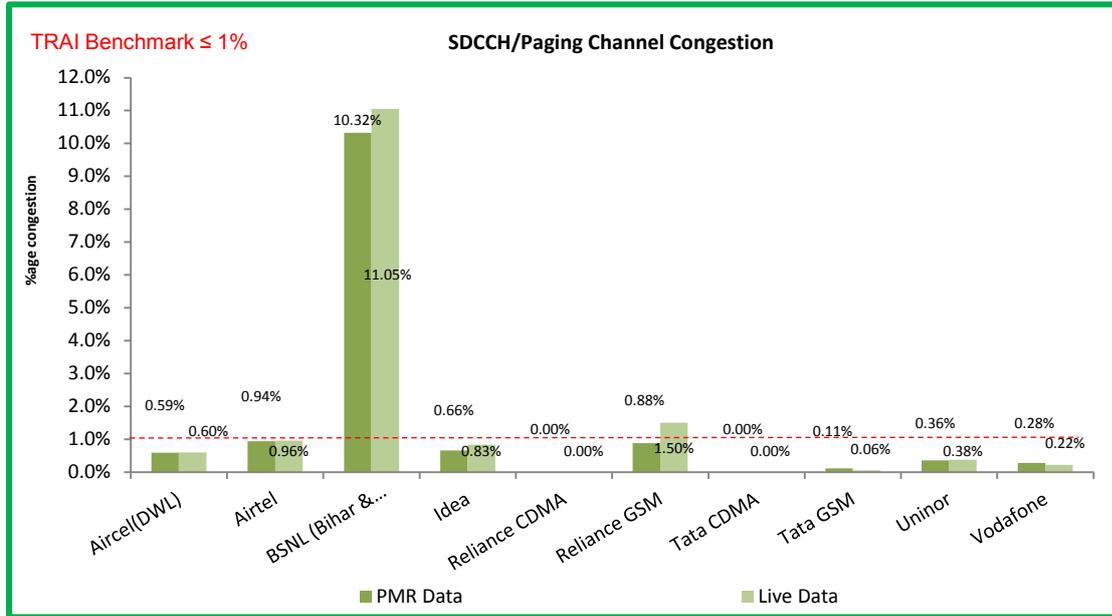
Data Source: Network Operations Center (NOC) of the operators

4.4.2.3 KEY FINDINGS – MONTH 3
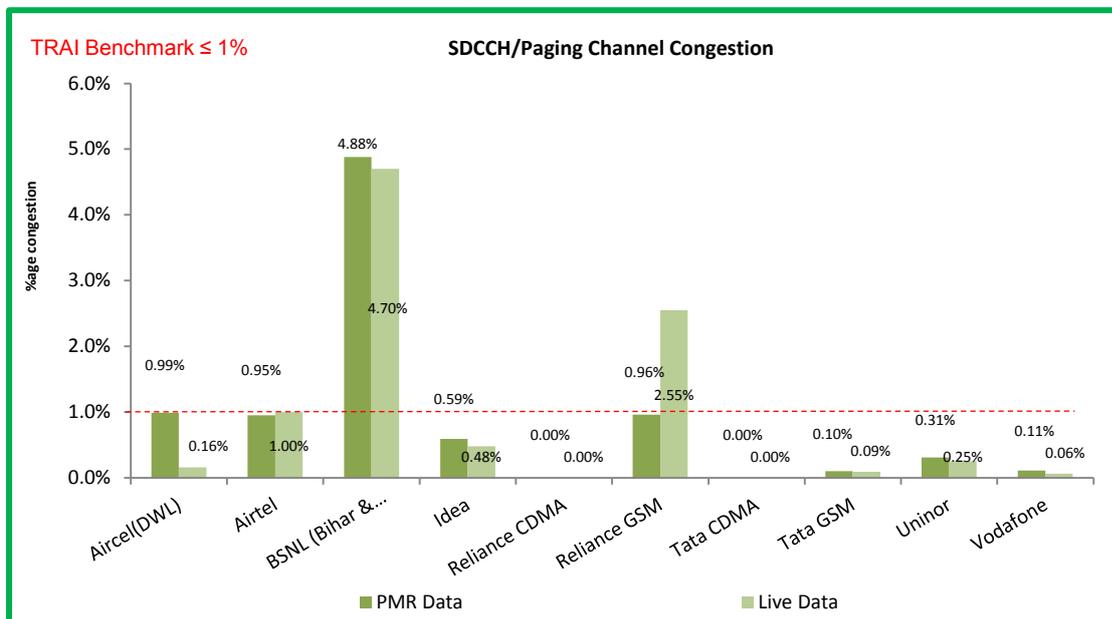
Data Source: Network Operations Center (NOC) of the operators

4.4.3   KEY FINDINGS – TCH CONGESTION
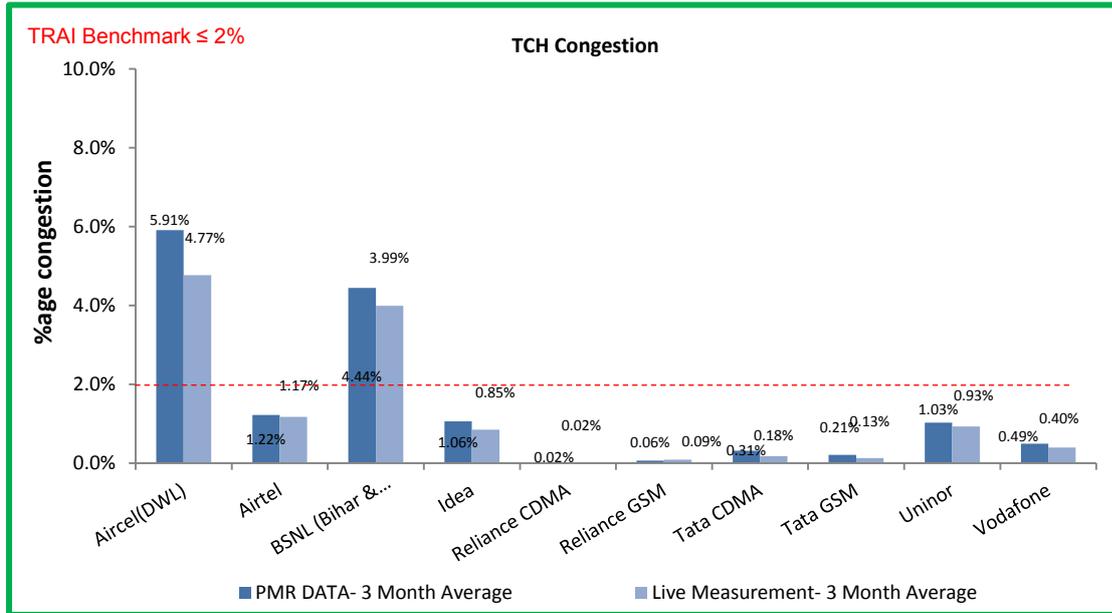
Data Source: Network Operations Center (NOC) of the operators

Aircel and BSNL failed to meet the benchmark as per PMR data.

4.4.3.1   KEY FINDINGS – MONTH 1
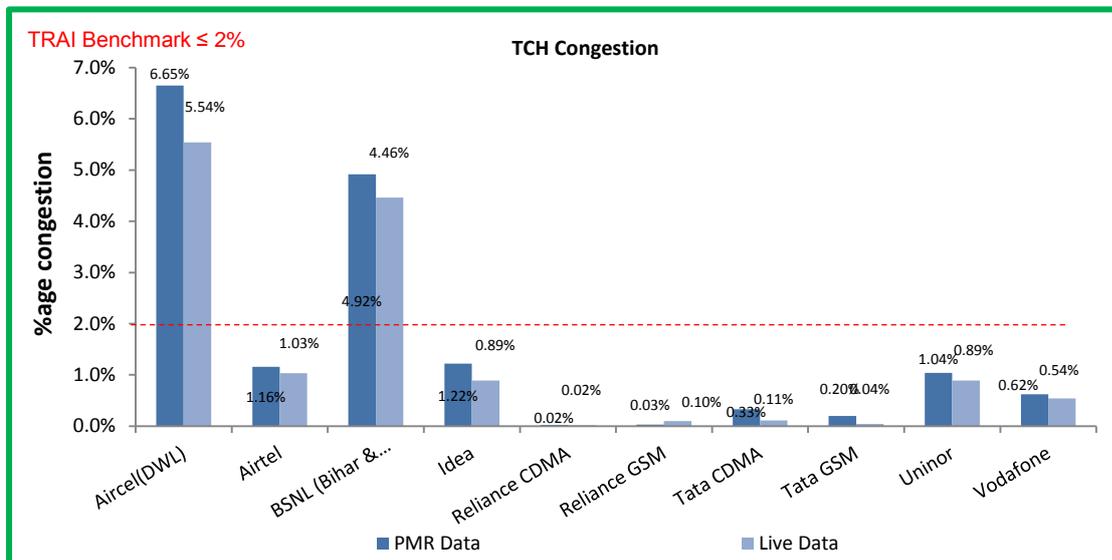
Data Source: Network Operations Center (NOC) of the operators

4.4.3.2   KEY FINDINGS – MONTH 2

TRAI Benchmark ≤ 2%
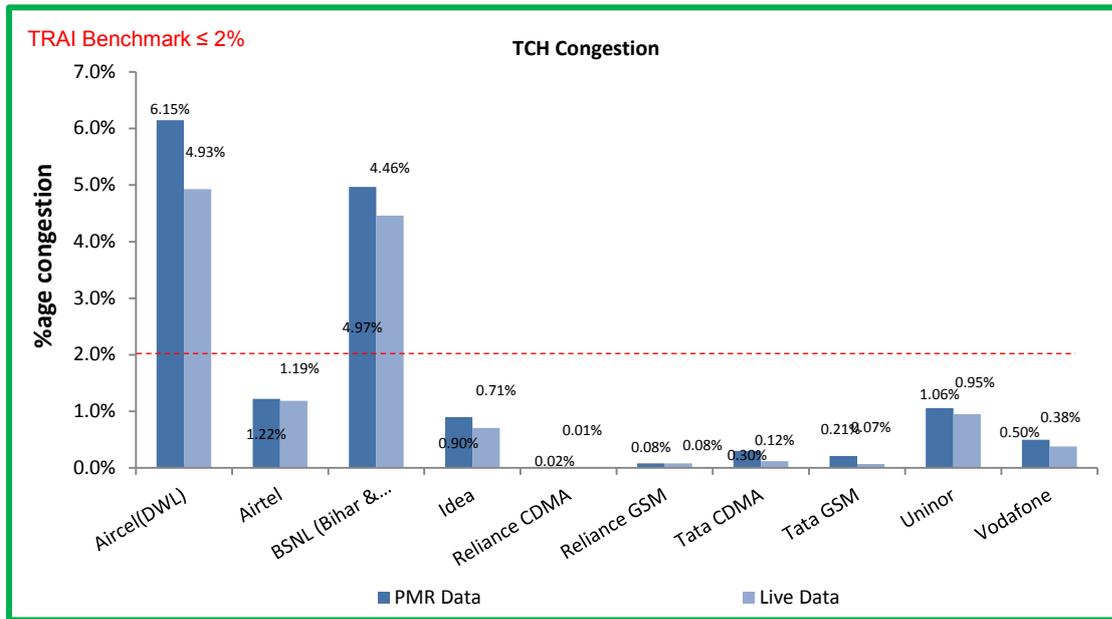
TCH Congestion

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

4.4.3.3   KEY FINDINGS – MONTH 3

TRAI Benchmark ≤ 2%
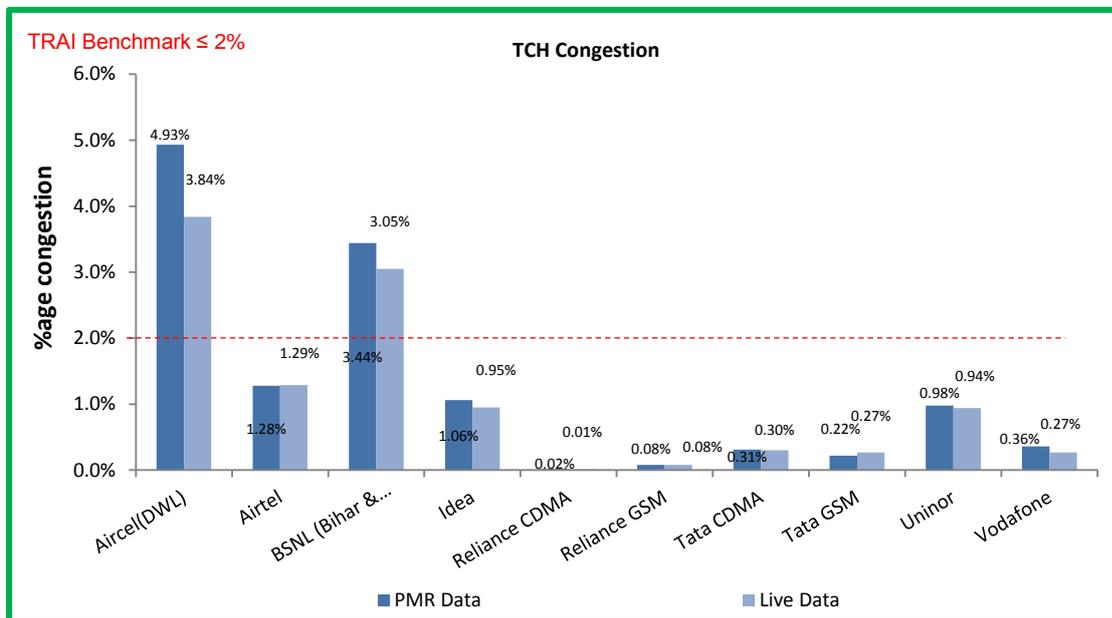
TCH Congestion

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

4.4.4   KEY FINDINGS – POI CONGESTION

Audit Results for POI Congestion-Consolidated											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Average number of working POIs		50	801	330	78	106	94	210	19	62	57
Average No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Average Capacity of all POIs (A) - in erlangs		112026	483087	15471	237895	48986	71524	77396	10608	68607	232949
Average Traffic served for all POIs (B)- in erlangs		65990	583901	1523773	131146	16895	17057	22036	3522	48318	118999
Average POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion-Consolidated											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Average number of working POIs		50	801	337	78	106	127	210	19	62	57
Average No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Average Capacity of all POIs (A) - in erlangs		111937	2012789	15538	236071	49442	71495	77396	10606	69045	237317
Average Traffic served for all POIs (B)- in erlangs		64884	1178062	163583	128979	71209	17114	22192	3551	47864	116782
Average POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

All the operators met the benchmark of POI congestion as per PMR data.

4.4.4.1   KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-October										
POI congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
Total number of working POIs		50	798	325	78	107	19	211	19	62	57
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111557	634249	15338	234296	49780	67120	78577	10620	66949	232492
Traffic served for all POIs (B)- in erlangs		65329	393567	14211	130643	16632	13423	21422	3505	46587	117414
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion- 3 Day data-October										
POI congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
Total number of working POIs		50	798	325	78	107	119	211	19	62	57
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111371	1915506	15538	234212	49711	67785	78577	10600	67953	237856
Traffic served for all POIs (B)- in erlangs		64816	1215794	14211	129642	17473	13726	21715	3505	47317	117963
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

4.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-November										
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	800	319	78	104	117	210	19	62	58
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111649	434257	15538	237001	47449	67396	77092	10620	69059	229218
Traffic served for all POIs (B)- in erlangs		66732	682811	2124123	129847	16374	14168	22876	3505	49916	121467
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion- 3 Day data-November										
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	800	341	78	104	117	210	19	62	58
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111649	1965163	15538	237001	48840	67304	77092	10614	69227	236956
Traffic served for all POIs (B)- in erlangs		65760	1144369	248876	129123	178669	14177	23052	3728	49181	119142
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

4.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-December										
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	805	345	78	106	145	210	19	62	57
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		112873	380756	15538	242387	49729	80055	76518	10585	69814	237136
Traffic served for all POIs (B)- in erlangs		65909	675324	2432984	132947	17678	23581	21809	3555	48451	118117
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion- 3 Day data-December										
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	805	346	78	106	145	209	19	62	57
No. of POIs not meeting benchmark		0	NA	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		112791	2157697	15538	237001	49774	79394	76518	10604	69956	237140
Traffic served for all POIs (B)- in erlangs		64077	1174024	227661	128172	17485	23440	21809	3421	47095	113242
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

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4.5   CALL DROP RATE

4.5.1   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.

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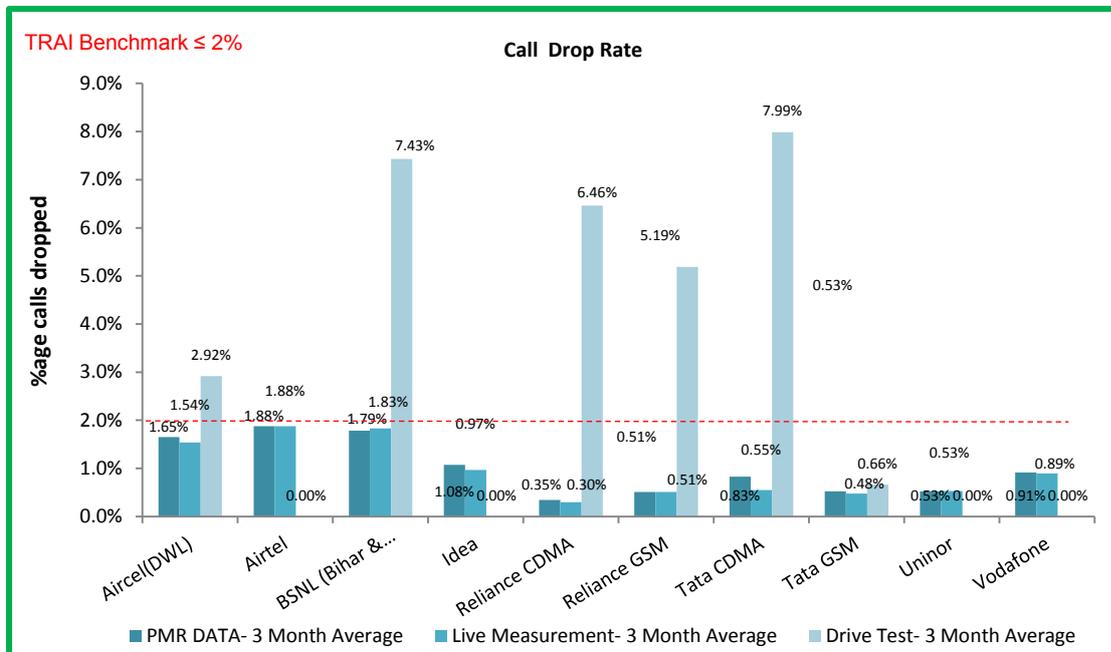
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

All operators met the call drop rate benchmark during audit.

The drive test results are showing high call drop rate for Aircel, BSNL, Reliance CDMA, Reliance GSM and Tata CDMA.

4.5.2.1 KEY FINDINGS – MONTH 1
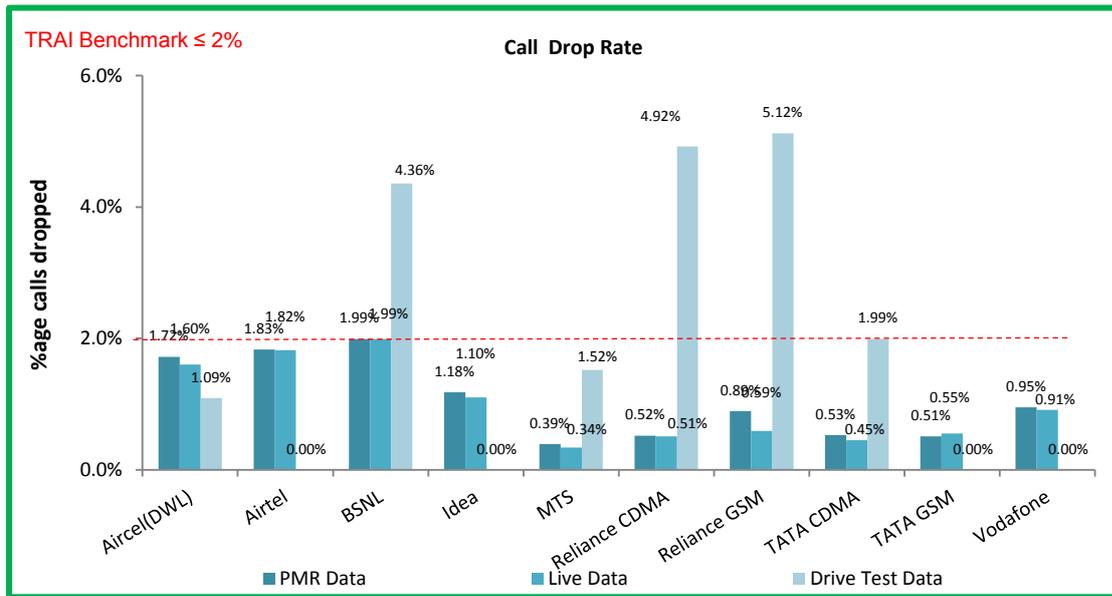
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

4.5.2.2 KEY FINDINGS – MONTH 2
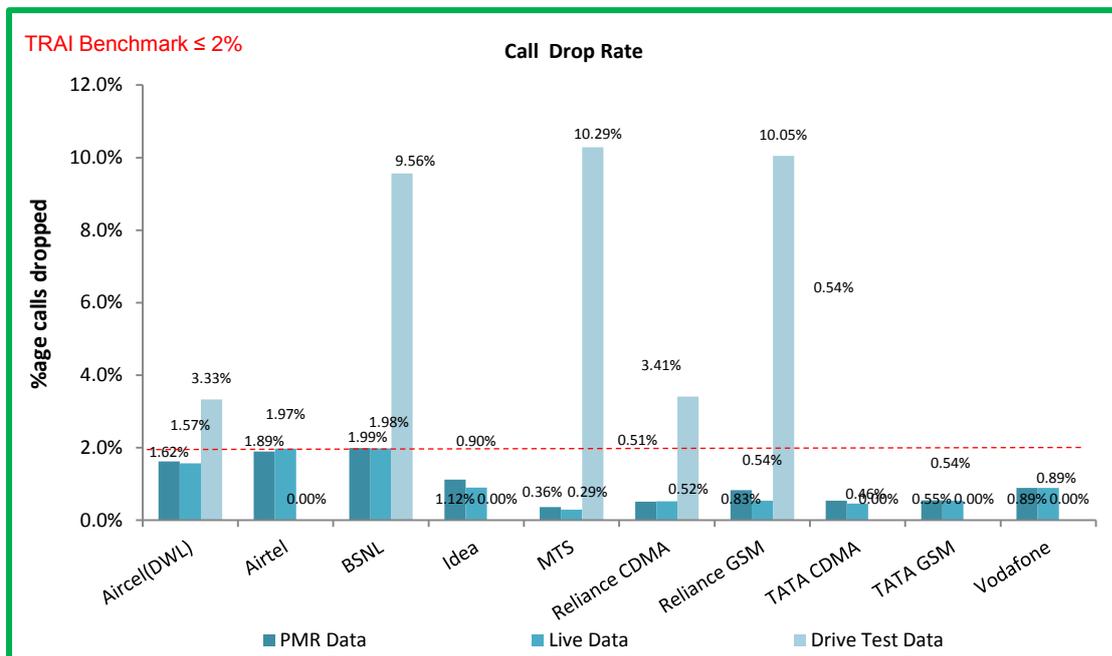
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors
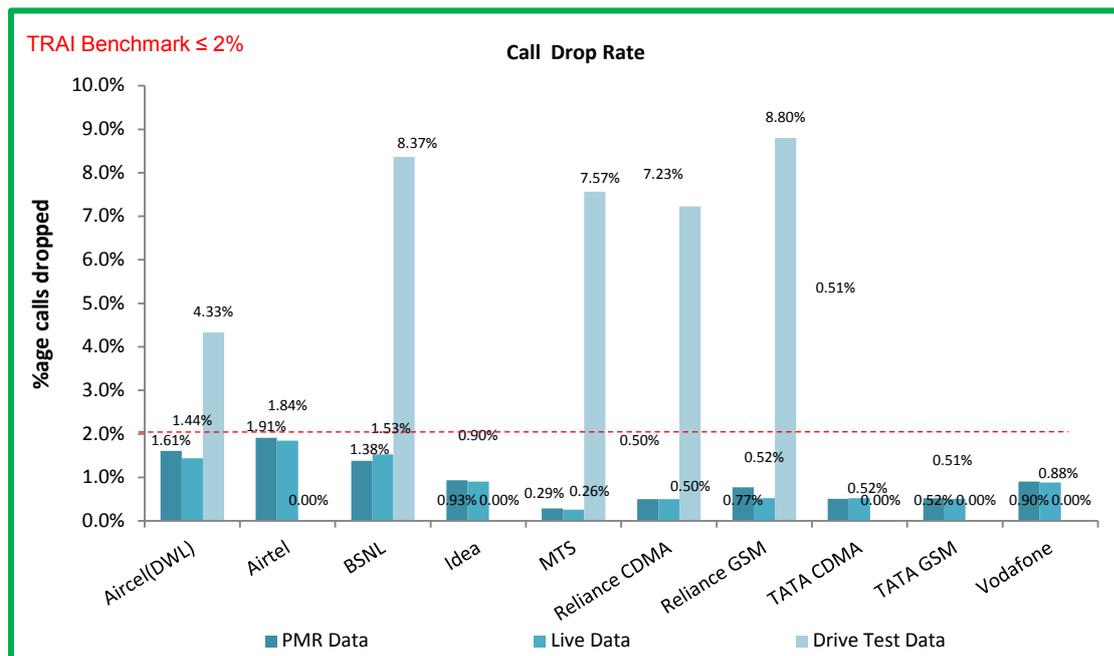
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

4.6   CELLS HAVING GREATER THAN 3% TCH DROP

4.6.1   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.

4.6.2   KEY FINDINGS

TRAI Benchmark ≤ 3%   **Cells having >3% TCH Drop**

Legend: ■ PMR Data - Three Month Average   ■ Live measurement results-Three Month Average
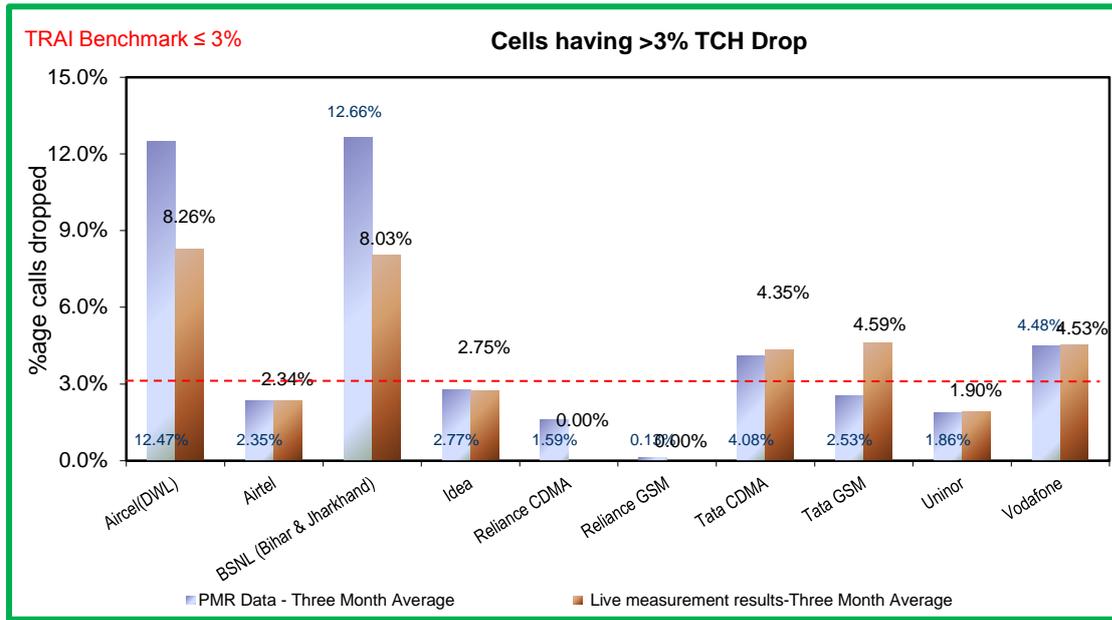
Data Source: Network Operations Center (NOC) of the operators

Aircel, BSNL, Tata CDMA and Vodafone failed to meet the benchmark for the parameter as per PMR data.

4.6.2.1   KEY FINDINGS – MONTH 1

TRAI Benchmark ≤ 3%   **Cells having >3% TCH Drop**

Legend: ■ PMR Data   ■ Live Data
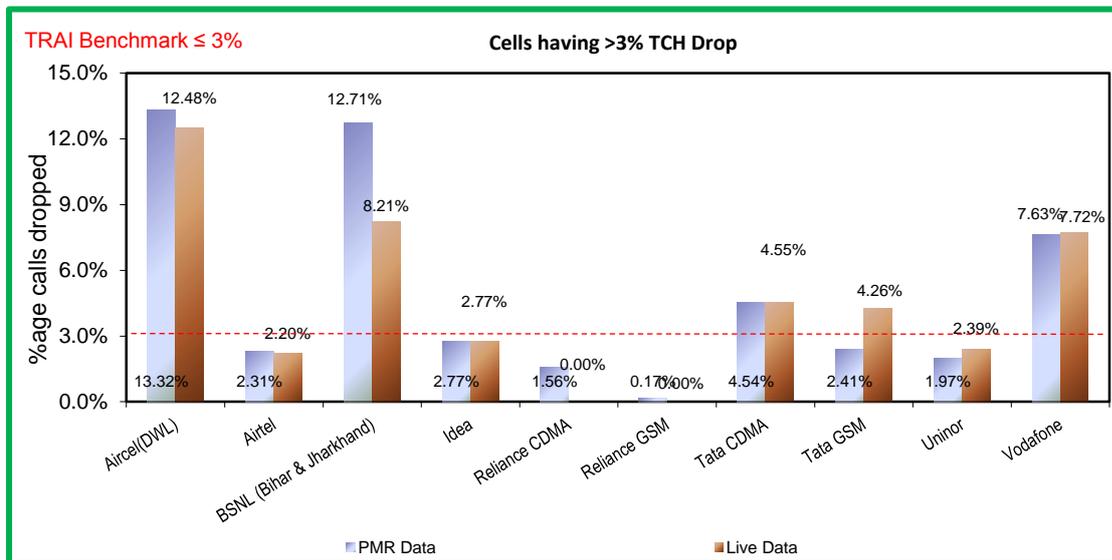
Data Source: Network Operations Center (NOC) of the operators

4.6.2.2   KEY FINDINGS – MONTH 2
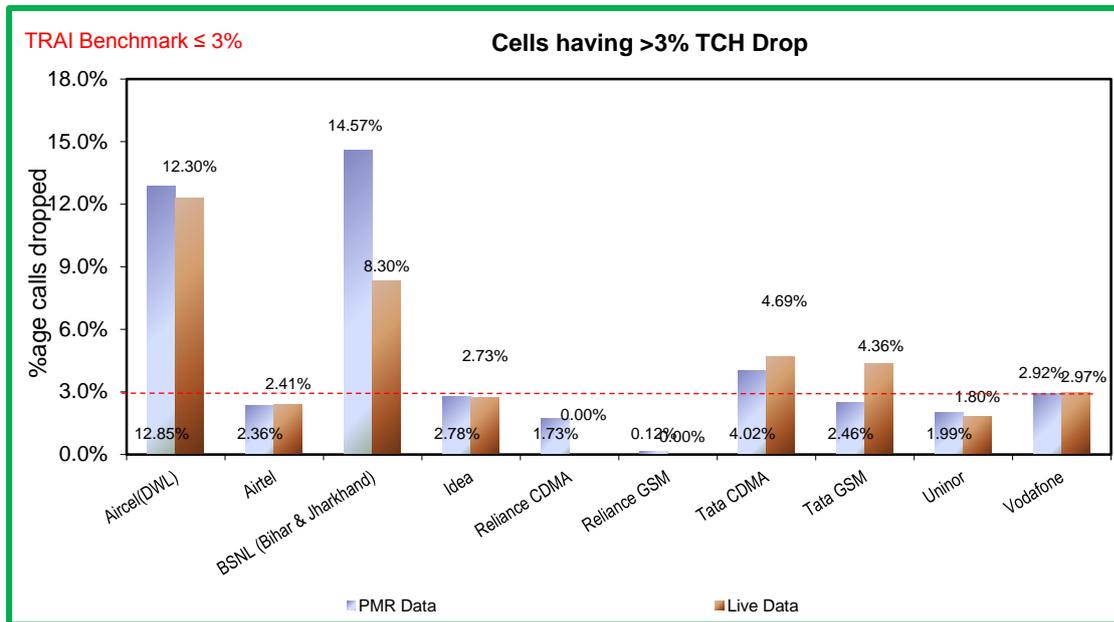
Data Source: Network Operations Center (NOC) of the operators

4.6.2.3   KEY FINDINGS – MONTH 3
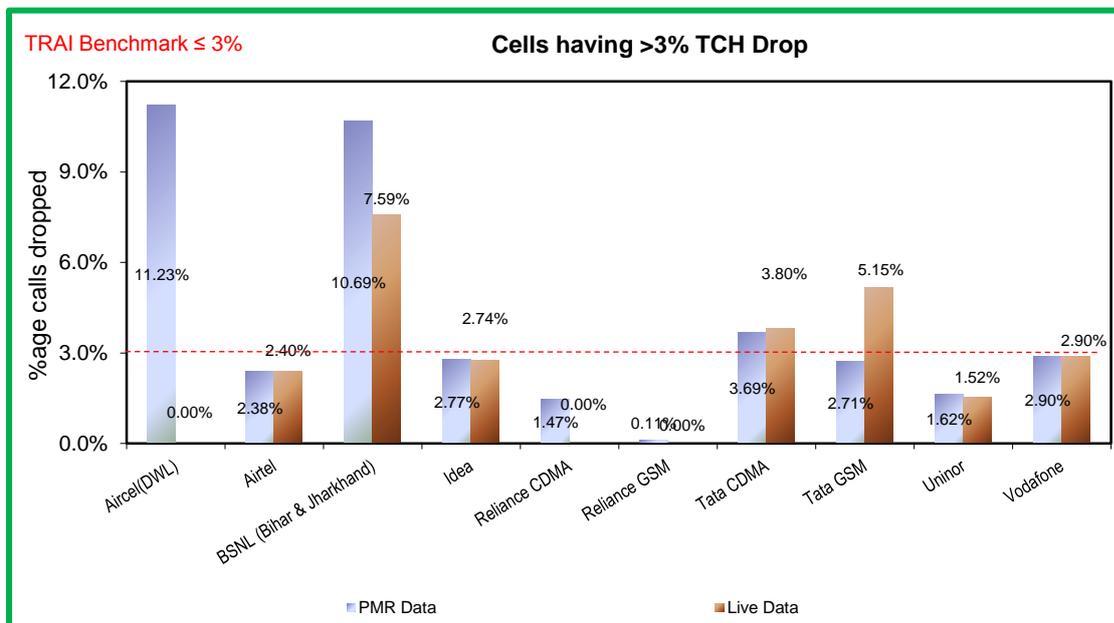
Data Source: Network Operations Center (NOC) of the operators

4.7   VOICE QUALITY

4.7.1   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.

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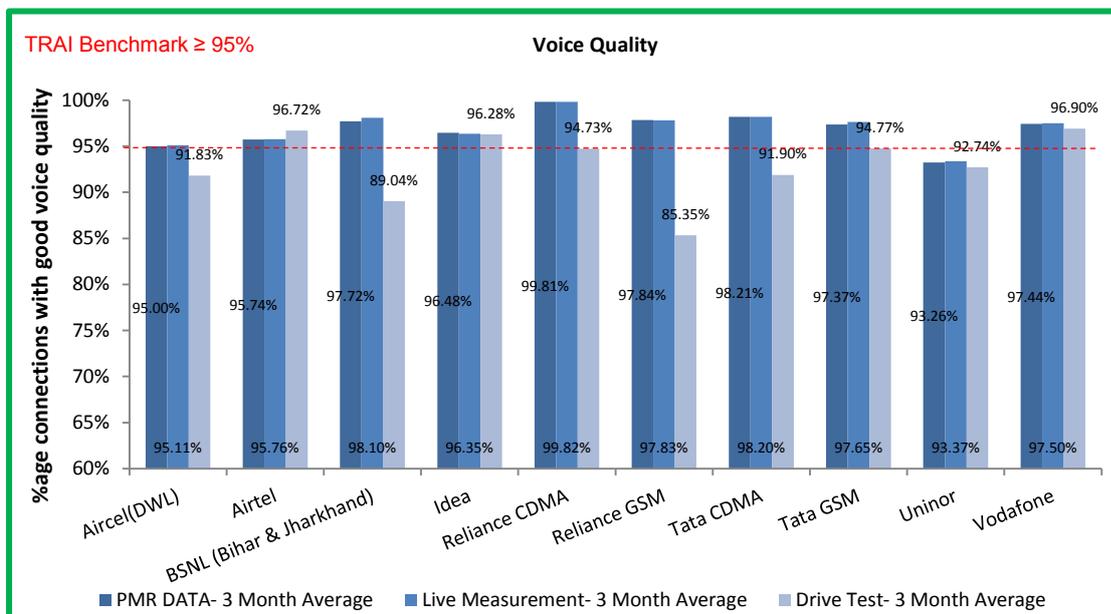
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

Uninor failed to meet the benchmark for voice quality during audit.

4.7.2.1   KEY FINDINGS – MONTH 1
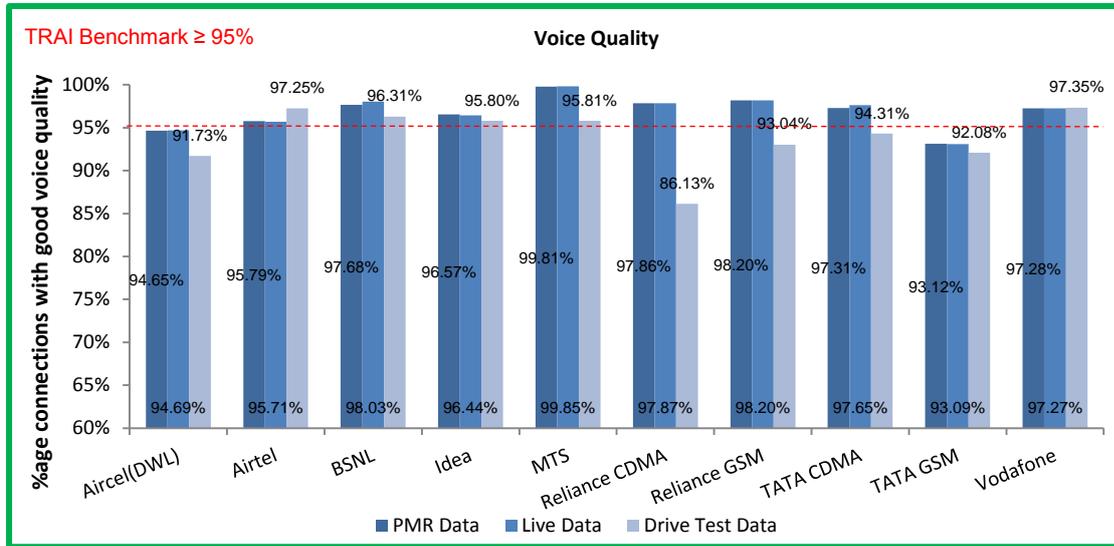
TRAI Benchmark ≥ 95%

Voice Quality

%age connections with good voice quality

Operator	PMR Data	Live Data	Drive Test Data
Aircel(DWL)	94.69%	94.65%	91.73%
Airtel	95.71%	95.79%	97.25%
BSNL	98.03%	97.68%	96.31%
Idea	96.44%	96.57%	95.80%
MTS	99.85%	99.81%	95.81%
Reliance CDMA	97.87%	97.86%	86.13%
Reliance GSM	98.20%	98.20%	93.04%
TATA CDMA	97.65%	97.31%	94.31%
TATA GSM	93.09%	93.12%	92.08%
Vodafone	97.27%	97.28%	97.35%

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

4.7.2.2   KEY FINDINGS – MONTH 2
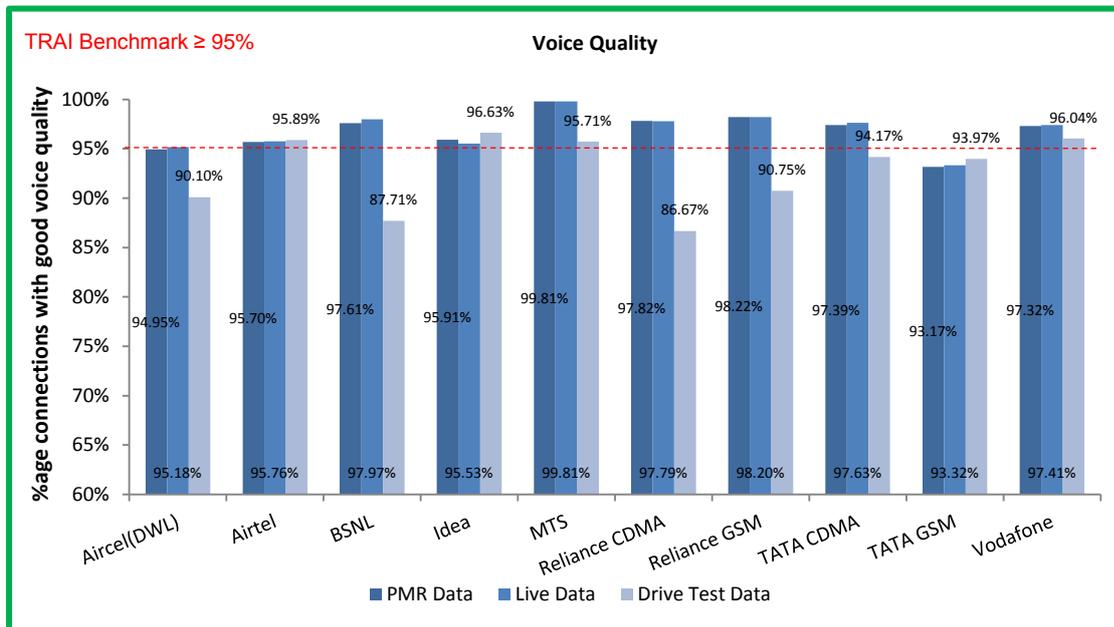
TRAI Benchmark ≥ 95%

Voice Quality

%age connections with good voice quality

Operator	PMR Data	Live Data	Drive Test Data
Aircel(DWL)	95.18%	94.95%	90.10%
Airtel	95.76%	95.70%	95.89%
BSNL	97.97%	97.61%	87.71%
Idea	95.53%	95.91%	96.63%
MTS	99.81%	99.81%	95.71%
Reliance CDMA	97.79%	97.82%	86.67%
Reliance GSM	98.20%	98.22%	90.75%
TATA CDMA	97.63%	97.39%	94.17%
TATA GSM	93.32%	93.17%	93.97%
Vodafone	97.41%	97.32%	96.04%

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

4.7.2.3   KEY FINDINGS – MONTH 3
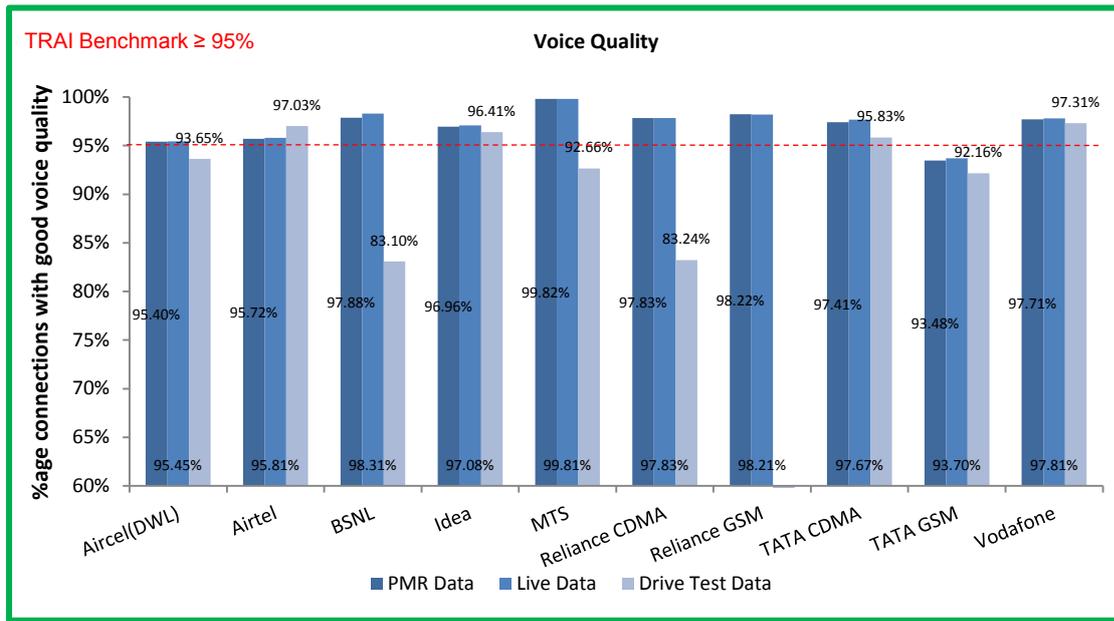
Data Source: Network Operations Center (NOC) of the operators and Drive test reports submitted by operators to auditors

5 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

5.1 METERING AND BILLING CREDIBILITY

The billing complaints for postpaid are calculated by averaging over a 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.

5.1.1 PARAMETER DESCRIPTION

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

- Payments made and not credited to the subscriber account

- Payment made on time but late payment charge levied wrongly

- 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:

    - **Metering and billing credibility (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100

 ᴥ *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated

 ᴥ **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.

 ᴥ **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

 ➲ TRAI Benchmark: <= 0.1%

 ➲ Audit Procedure:

 ᴥ 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

 ᴥ For Prepaid, the data of total charging complaints in a quarter would be taken for the purpose of audit

5.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)
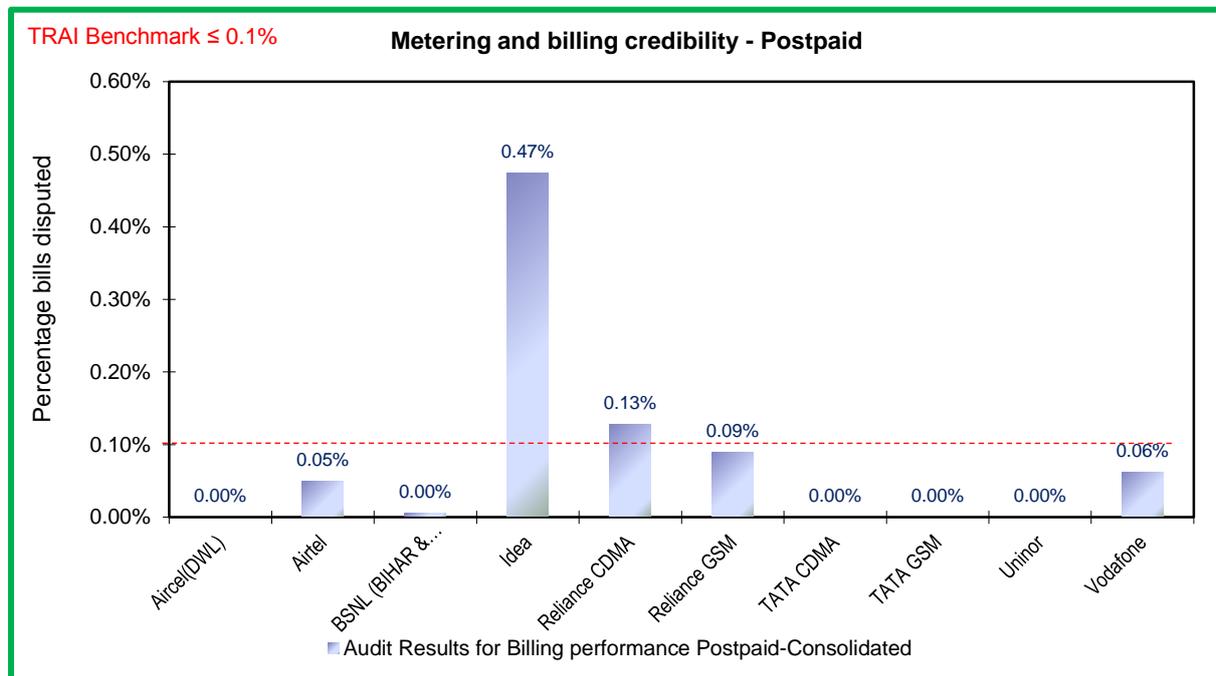
Data Source: Billing Center of the operators

Idea and Reliance CDMA failed to meet the benchmark for the parameter.
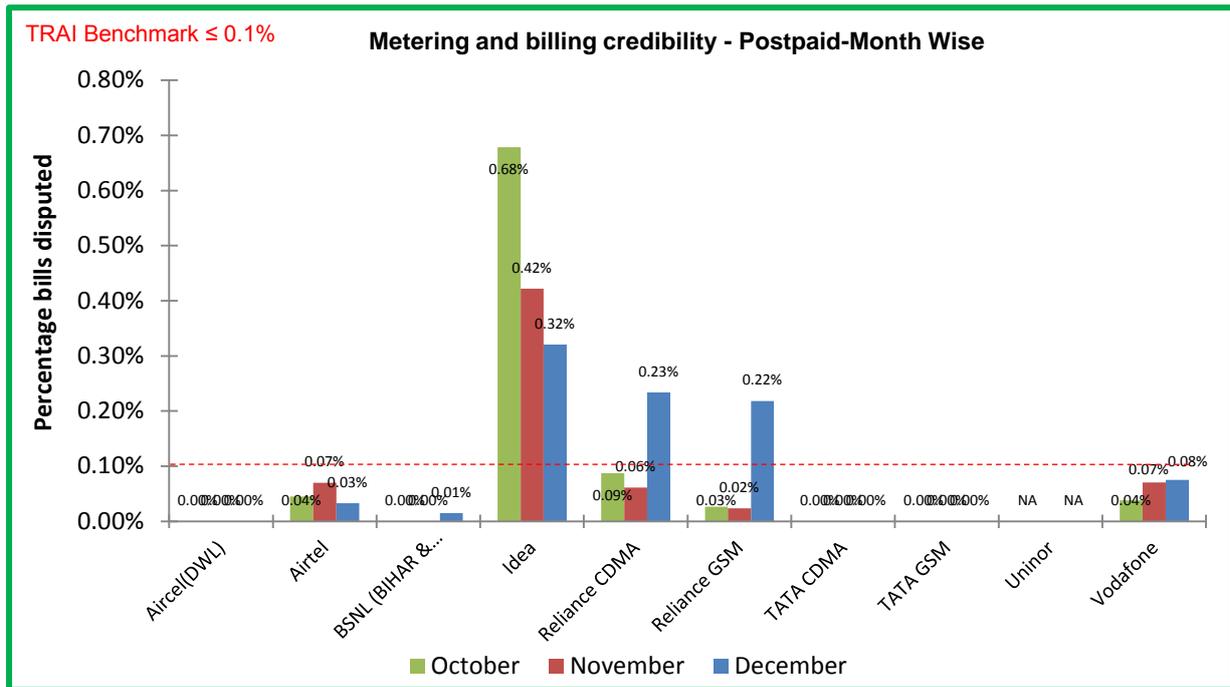
Metering and billing credibility - Postpaid-Month Wise

TRAI Benchmark ≤ 0.1%

Data Source: Billing Center of the operators

5.1.3   KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)

Metering and billing credibility - Prepaid

TRAI Benchmark ≤ 0.1%

Data Source: Billing Center of the operators
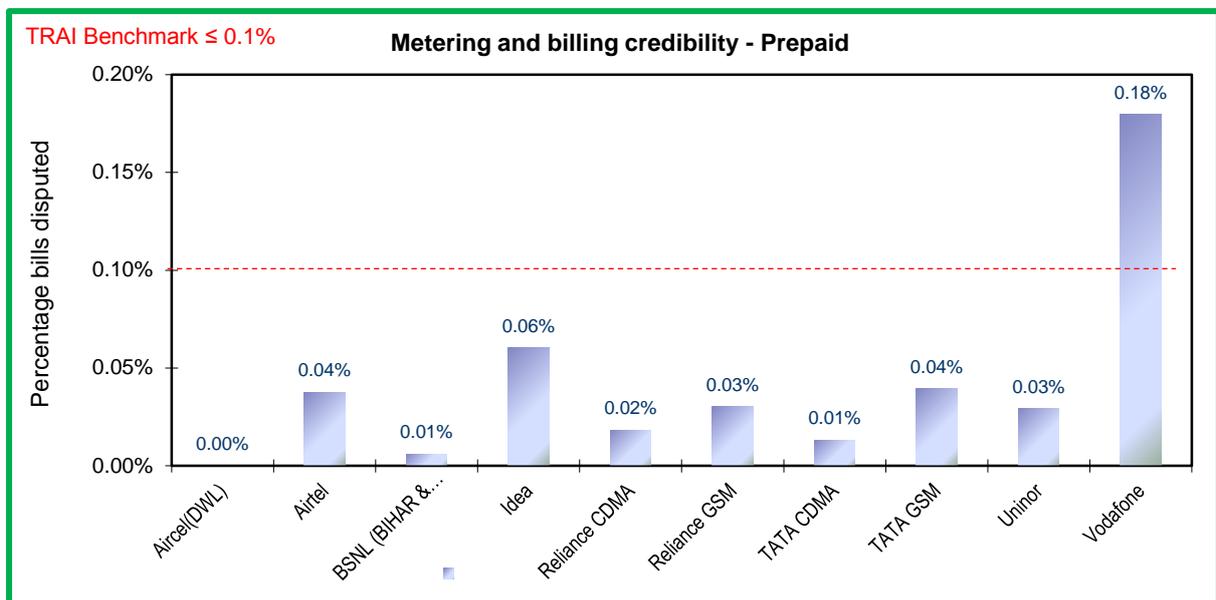
Vodafone failed to meet the TRAI benchmark for the parameter.

5.2   RESOLUTION OF BILLING COMPLAINTS

5.2.1   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.**

- ⊃ ***** 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.

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5.2.2 KEY FINDINGS
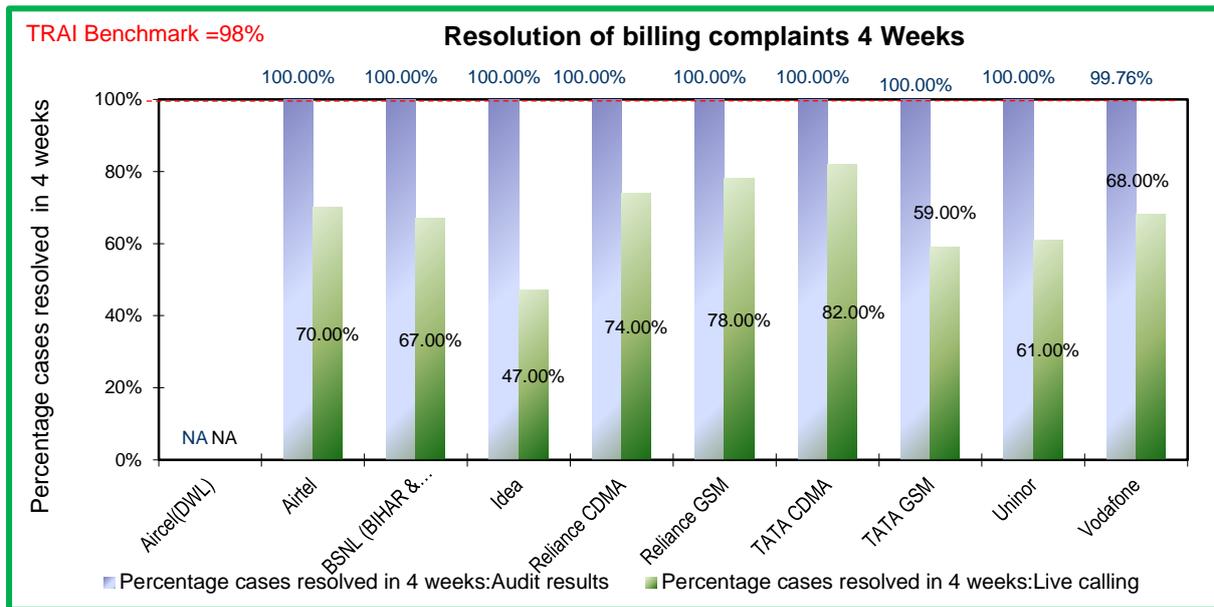
Data Source: Billing Center of the operators
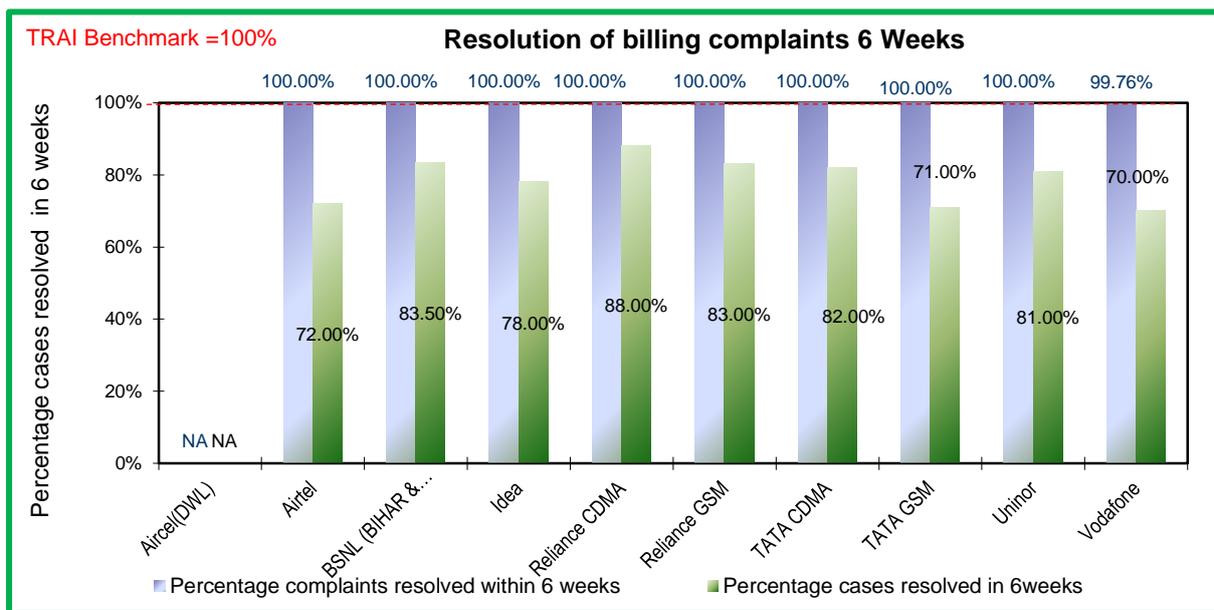
Data Source: Billing Center of the operators

The audit results showed that all the operators met the TRAI benchmark for resolution of complaints within 4 weeks. Vodafone missed the benchmark for resolving complaints within 6 weeks.

However, as per live calling done to customers, the performance of all operators was observed to be far inferior to the performance as per PMR data.

NA: Aircel reported zero billing complaints. Hence, 'resolution of billing complaints' parameter is not applicable for the operator.

5.3 PERIOD OF APPLYING CREDIT/WAVIER

5.3.1 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

5.3.2 KEY FINDINGS
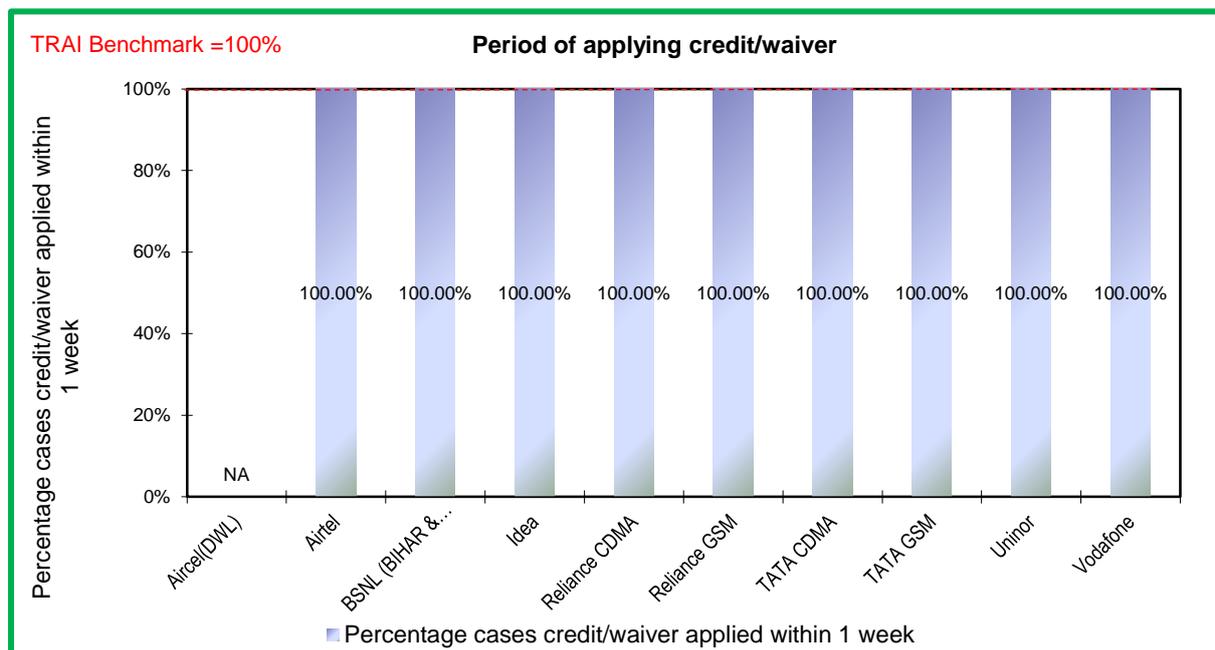
Data Source: Billing Center of the operators

All the operators met the TRAI benchmark.

NA: Aircel reported zero billing complaints. Hence, 'period of applying credit/waiver' parameter is not applicable for the operator.

5.4   CALL CENTRE PERFORMANCE-IVR

5.4.1   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

5.4.2   KEY FINDINGS
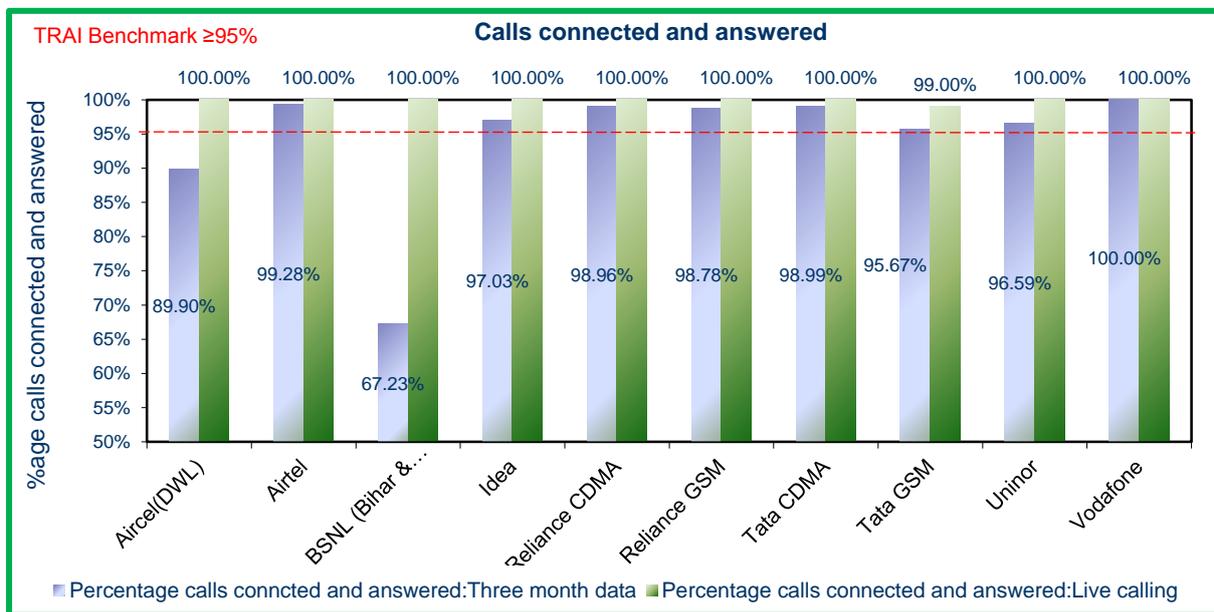
Data Source: Billing Center of the operators

Aircel and BSNL failed to meet the benchmark as per audit data.

5.5   CALL CENTRE PERFORMANCE-VOICE TO VOICE

5.5.1   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

5.5.2   KEY FINDINGS
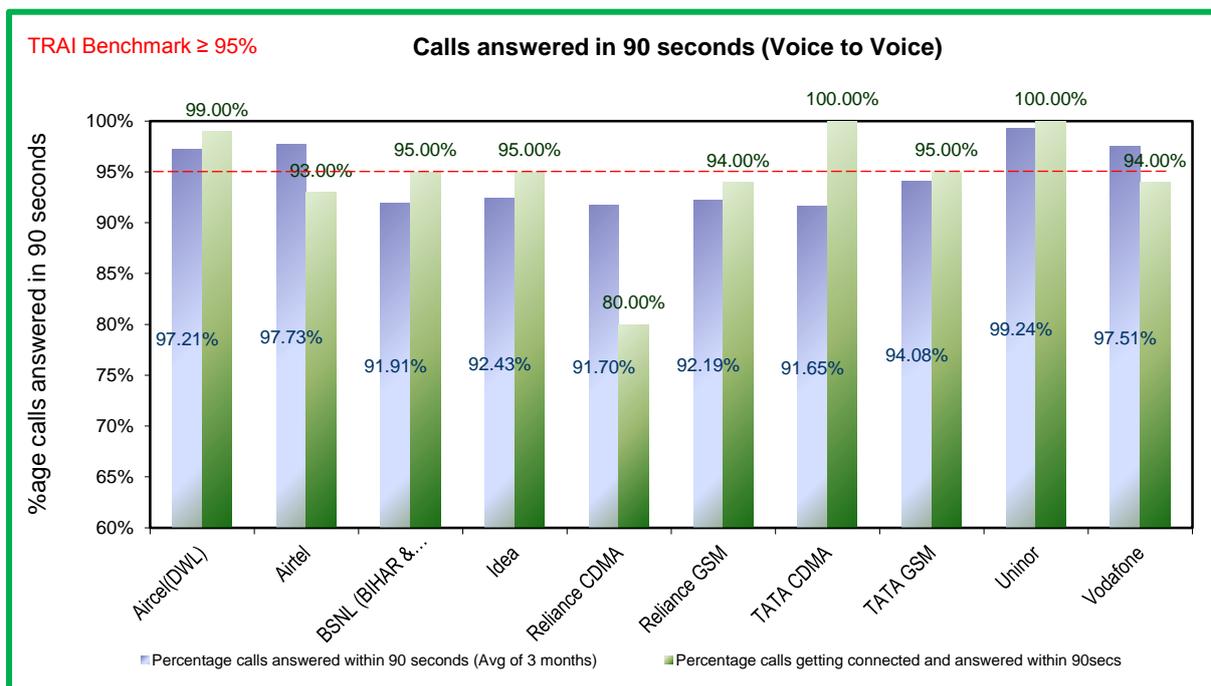
Data Source: Customer Service Center of the operators

BSNL, Idea, Reliance CDMA, Reliance GSM, Tata CDMA and Tata GSM failed to meet the benchmark during audit for Calls answered (Voice to Voice) as per audit.

Calls answered in 90 seconds (Voice to Voice)-Month Wise

TRAI Benchmark ≥ 95%
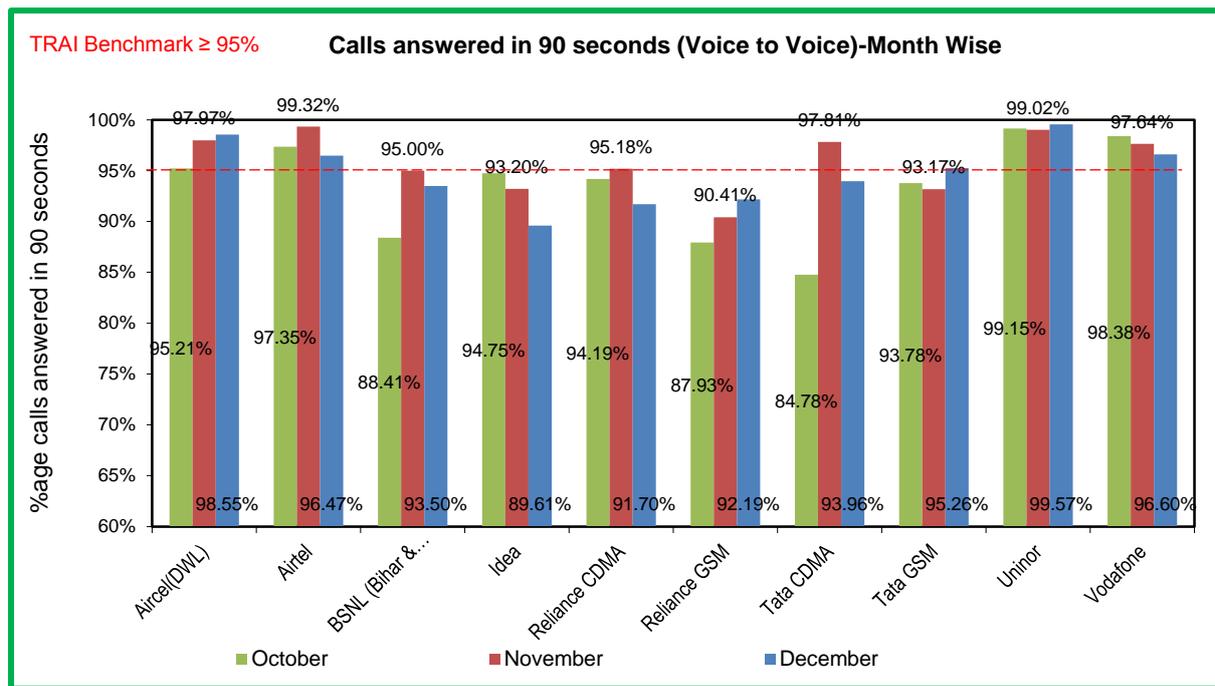
Data Source: Customer Service Center of the operators

5.6   TERMINATION/CLOSURE OF SERVICE

5.6.1   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

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5.6.2 KEY FINDINGS
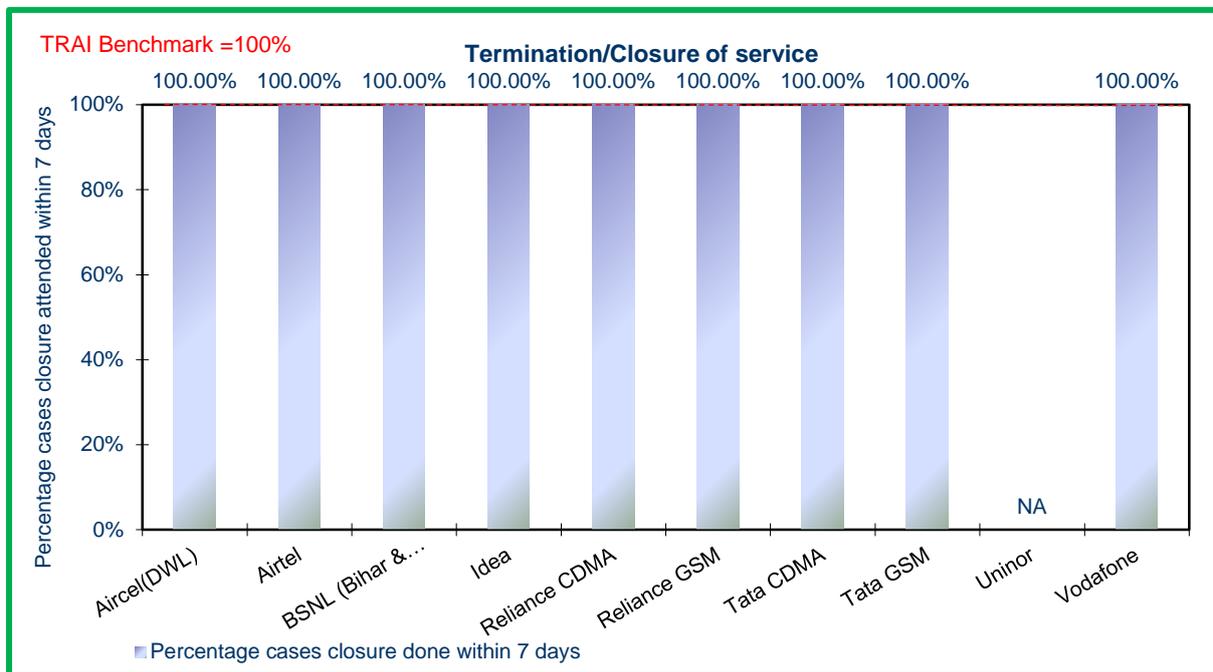
Data Source: Customer Service Center of the operators

All the operators met the benchmark.

NA: Uninor does not have postpaid service available in the circle.

5.7 REFUND OF DEPOSITS AFTER CLOSURE

5.7.1 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

5.7.2 KEY FINDINGS
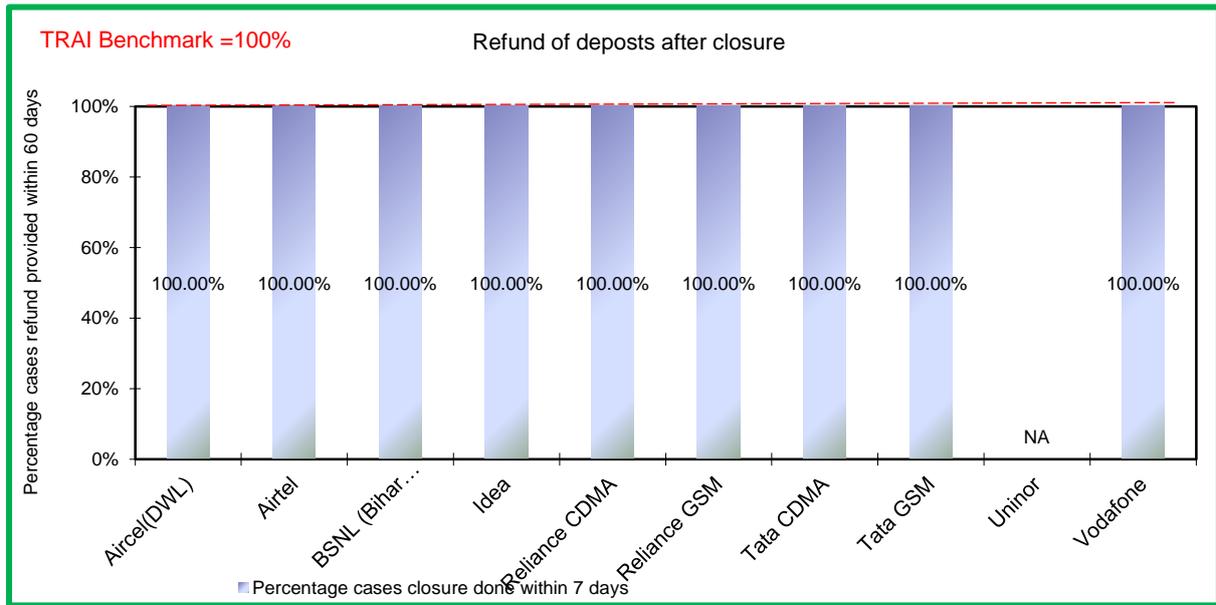
Data Source: Billing Center of the operators

All operators met the TRAI benchmark for the parameter.

NA: Uninor does not have postpaid service available in the circle.

6   DETAILED FINDINGS - DRIVE TEST DATA

6.1   OPERATOR ASSISTED DRIVE TEST

The drive test was conducted simultaneously for all the operators present in the Bihar circle. As per the new directive given by TRAI headquarters, drive test for the month of October, November and December, 2014 were conducted at a SSA level. Drive test was conducted for three days in each SSA and the selection of routes ensured that the maximum towns, villages, highways are covered as part of drive test. The routes were selected on basis of the complaints received from the customers. IMRB auditors were present in vehicles of every operator. 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 Bihar circle are given below.

	Name of Operator
Operator 1	Aircel(DWL)
Operator 2	Airtel
Operator 3	BSNL
Operator 4	Idea
Operator 5	Reliance CDMA
Operator 6	Reliance GSM
Operator 7	TATA CDMA
Operator 8	TATA GSM
Operator 9	Uninor
Operator 10	Vodafone

Month	Name of SSA Covered	Date of Drive Test
October	Sasaram	15th to 17th October 2014
November	Deoghar	25th to 27th November 2014
December	Hazaribagh	22nd to 24th December 2014

6.1.1 OCTOBER – SASARAM SSA

Month	Name of SSA Covered	Date of Drive Test
October	Sasaram	15th to 17th October 2014

6.1.1.1   ROUTE DETAILS – SASARAM SSA

Category	Type of location	Bihar-October		
		Sasaram		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Darigaon, Baddi, Alampur, Sadhokar, Jararhi, Ugahni, Malahipur, Doia, Chenari, Lanji sawar, Baheri, Belaon, Bhikhampura, Saitha, Bhabja, Chanipur, Biddi, Muri, Manihari	Salimpur, Karakat, Itwa, Jamua Village, Gorari, Sukahra, Dehri, balia, Dhos road, Amiyawar, Paduri, Parsawan, Dharihat, Sahji, Makrain, Dehri, Suara, Karwandiya	Tiwari Dehariya, Lahurbari, Dhanattarpur, Dangri, Rupinbandh, Laheri, Kochas, Bikarmaganj
	Highways	Durgawati Bazar, Sarangpur, Dirkhili, Usari, Mohania	Badari, Nokha, Sanjhauli, Bikramganj	Kusani, Saraiya, Pachphokhri, Kurda, Amritha, Pusauli, Mohania
	With in the City	Sasaram, Badokhara, Shivpur Sikariya	Sasaram, Mokar, Karma Adampur	Sasaram, Auwan, Muradabad Khurd
Indoor	Shopping complex	V mart	NA	NA
	Office complex	NA	Court	NA

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We may 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.

6.1.1.2   KIILOMETERS TRAVELLED– SASARAM SSA

Drive Test - Kilometers Travelled	Day 1	Day 2	Day 3	Total
Sasaram	107	103	109	319

6.1.1.3 ROUTE MAP SASARAM DAY 1
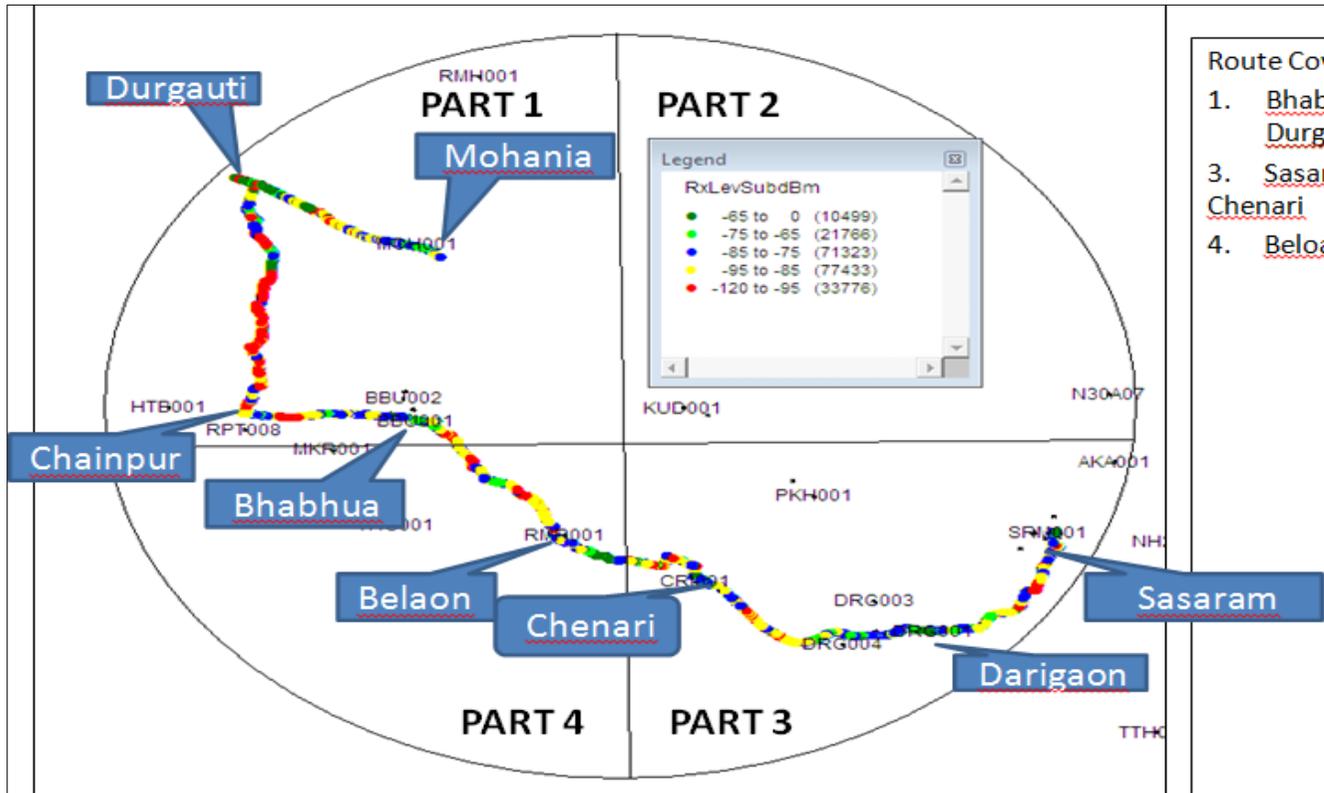
6.1.1.4   ROUTE MAP SASARAM DAY 2
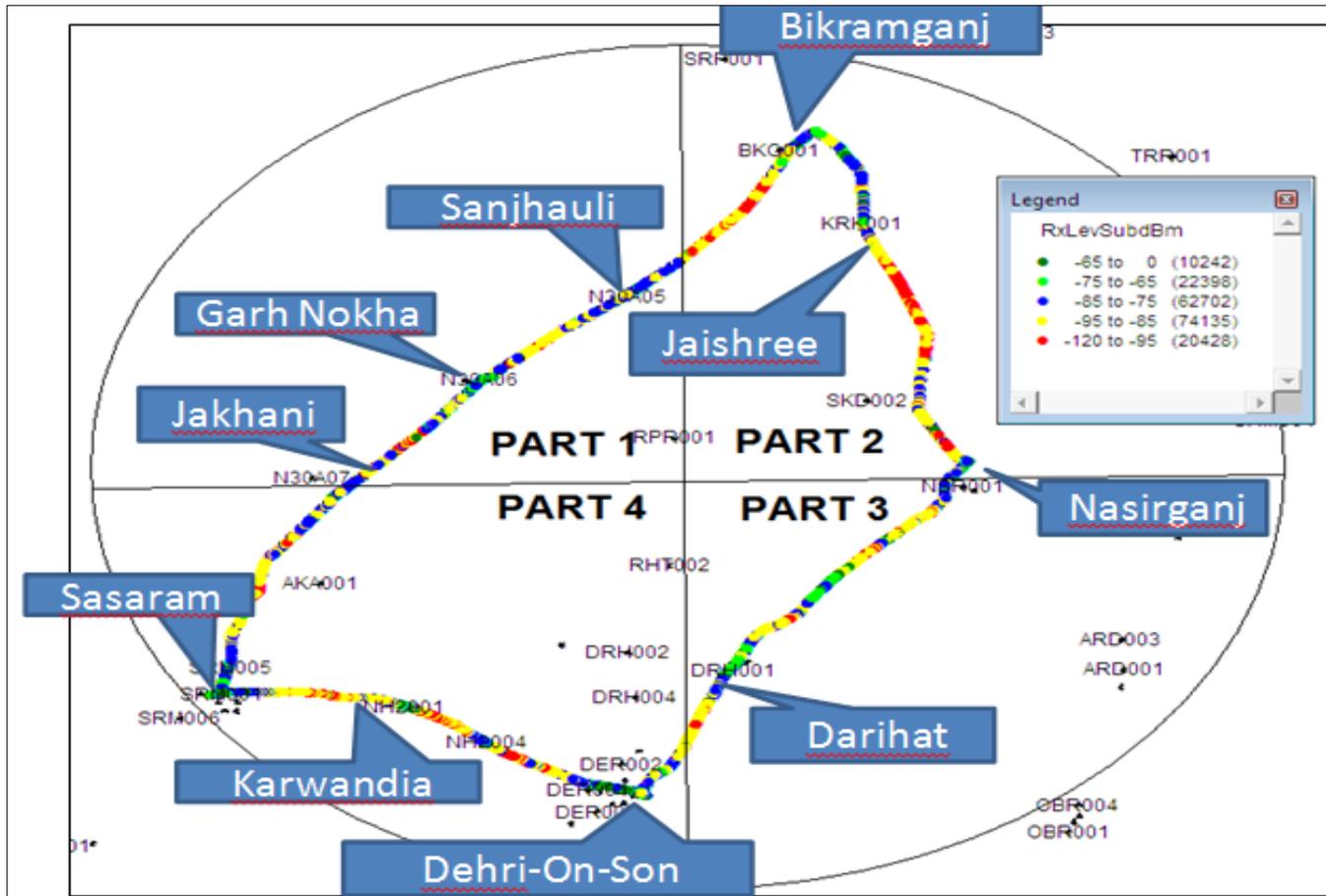
6.1.1.5 ROUTE MAP SASARAM DAY 3
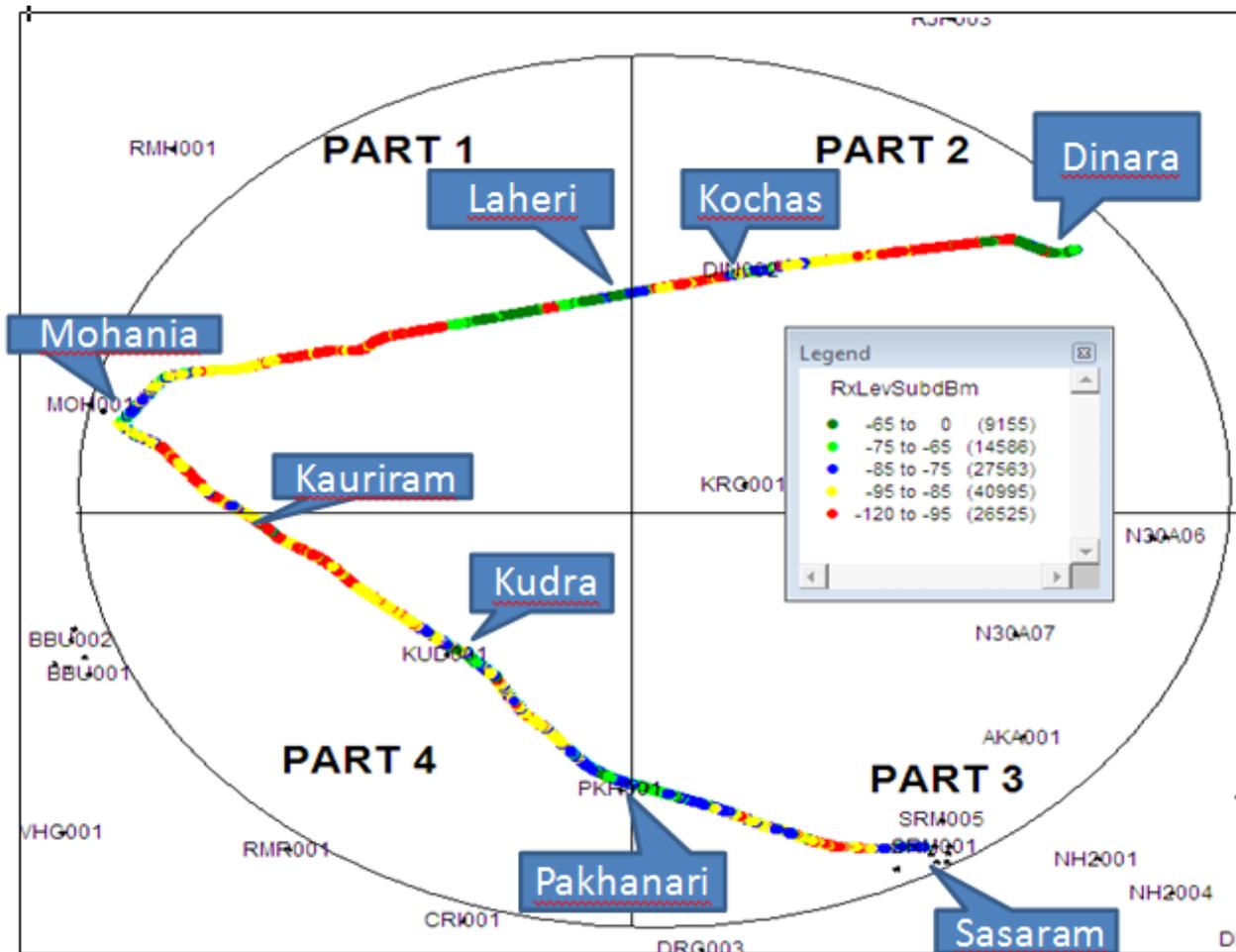
6.1.1.6 DRIVE TEST RESULTS – SASARAM SSA

Executive Summary																				
	B'mark	Aircel(DWL)		Airtel		BSNL		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Uninor		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		20.09%	23.24%	83.33%	56.28%	85.00%	37.94%	77.41%	79.45%	95.42%	21.20%	98.00%	70.00%	82.12%	23.90%	40.50%	40.51%	99.93%	62.32%	42.65%	53.47%
0 to -85 dBm		92.13%	58.81%	99.53%	89.26%	100.00%	78.72%	99.25%	97.70%	100.00%	50.76%	99.50%	91.56%	56.30%	45.08%	99.58%	71.38%	100.00%	89.64%	94.85%	85.52%
0 to -95 dBm		100.00%	100.00%	100.00%	98.83%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.78%	100.00%	77.57%	99.98%	78.55%	100.00%	100.00%	99.86%	97.67%
Voice quality	≥ 95%	96.54%	91.18%	98.42%	96.67%	99.02%	96.72%	97.32%	95.77%	100.00%	91.62%	98.40%	87.25%	97.91%	88.17%	96.53%	93.74%	99.48%	90.93%	99.33%	97.17%
CSSR	≥ 95%	100.00%	94.93%	100.00%	100.00%	100.00%	97.35%	100.00%	100.00%	100.00%	99.39%	100.00%	84.66%	100.00%	79.23%	100.00%	92.69%	100.00%	99.84%	100.00%	99.32%
%age Blocked calls		0.00%	3.02%	0.00%	0.00%	0.00%	2.65%	0.00%	0.00%	0.00%	0.61%	0.00%	12.77%	0.00%	1.86%	0.00%	7.31%	0.00%	0.16%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.97%	0.00%	0.00%	0.00%	4.71%	0.00%	0.00%	0.00%	1.79%	0.00%	5.71%	0.00%	5.29%	0.00%	2.32%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	82.93%	100.00%	99.13%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.34%	NA	100.00%	100.00%	99.75%

Data Source: Drive test reports submitted by operators to auditors

NA: Hands off success rate data not provided by Uninor in indoor location due to technical issue in operator's system

Voice Quality

Aircel, Reliance CDMA, Reliance GSM, TATA CDMA, Tata GSM and Uninor failed to meet the benchmark in outdoor locations. All operators met the benchmark at indoor locations.

Call Set Success Rate (CSSR)

Aircel, Reliance GSM, Tata CDMA and Tata GSM were not able to meet the CSSR benchmark in outdoor areas. All operators met the benchmark at indoor locations.

Call Drop Rate

BSNL, Reliance GSM, TATA CDMA and Tata GSM failed to meet the benchmark in outdoor locations. All operators met the benchmark at indoor locations.

6.1.2 NOVEMBER – DEOGHAR SSA

Month	Name of SSA Covered	Date of Drive Test
November	Deoghar	25th to 27th November 2014

6.1.2.1 ROUTE DETAILS – DEOGHAR SSA

Category	Type of location	Bihar-November		
		Deoghar		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Dumka to khaga	Nonihat – Basukinath mandir-paljori-sarath-deoghr	Madhupur to Kunda more
	Highways	Vaidnathpur , chopar More to Dumka	Chopar More to Hasdia-Noni hath	Satsang Nagar to Bharail to Madhupur
	With in the City	Deoghr rly.stn. , tower chaowk to vaidnathpur	DC office to Tower Chaowk – Baidyanathpur – Chopper More	Tower Chaowk Satsang Nagr- Kunda more to Jesidih
Indoor	Shopping complex	BigBAZAR		NA
	Office complex	DC Office		NA

The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We may 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.

6.1.2.2 KILOMETERS TRAVELLED– DEOGHAR SSA

Drive Test - Kilometers Travelled	Day 1	Day 2	Day 3	Total
Deoghar	118	163	104	385

6.1.2.3   ROUTE MAP DEOGHAR DAY 1
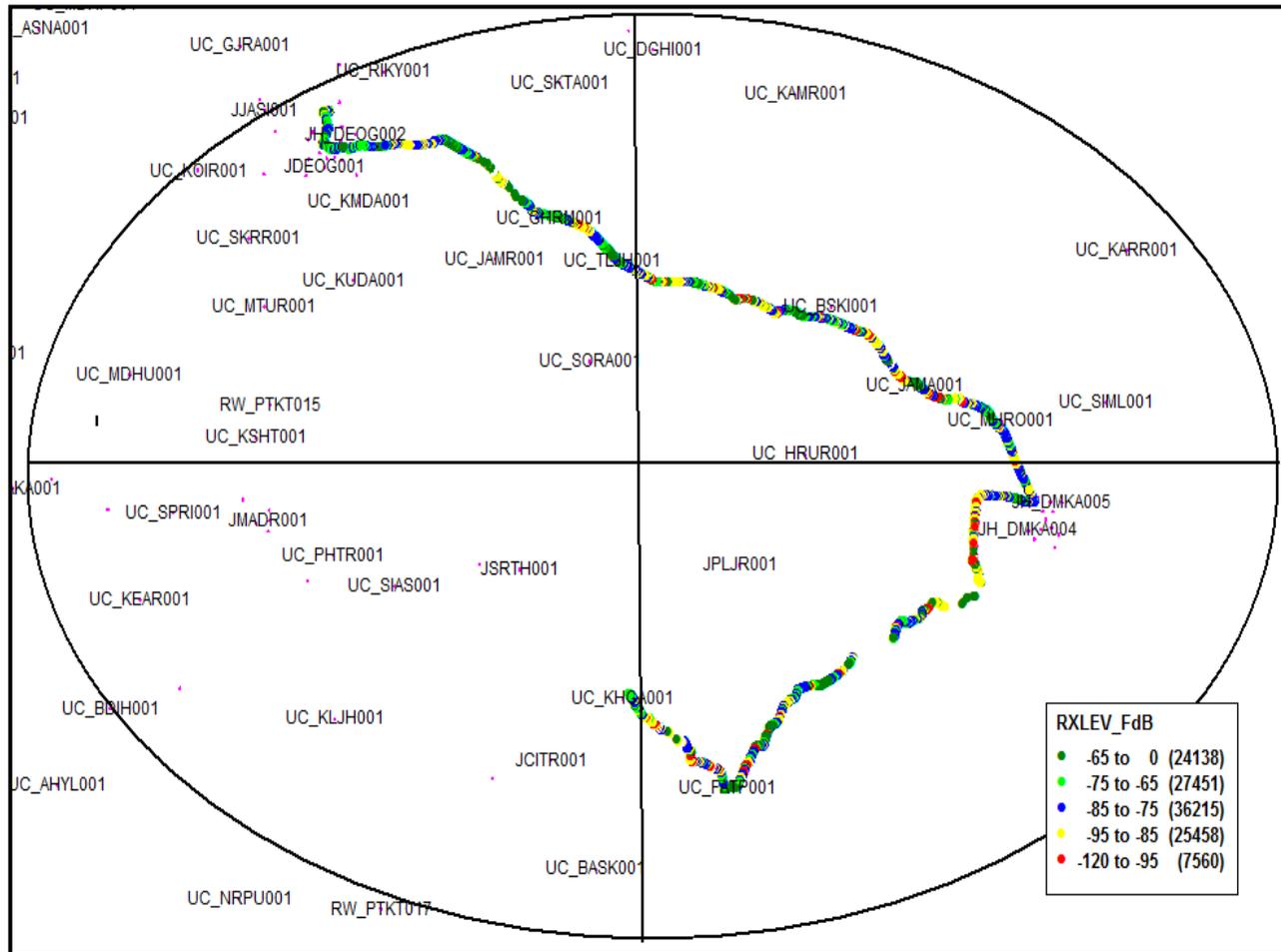
6.1.2.4 ROUTE MAP DEOGHAR DAY 2
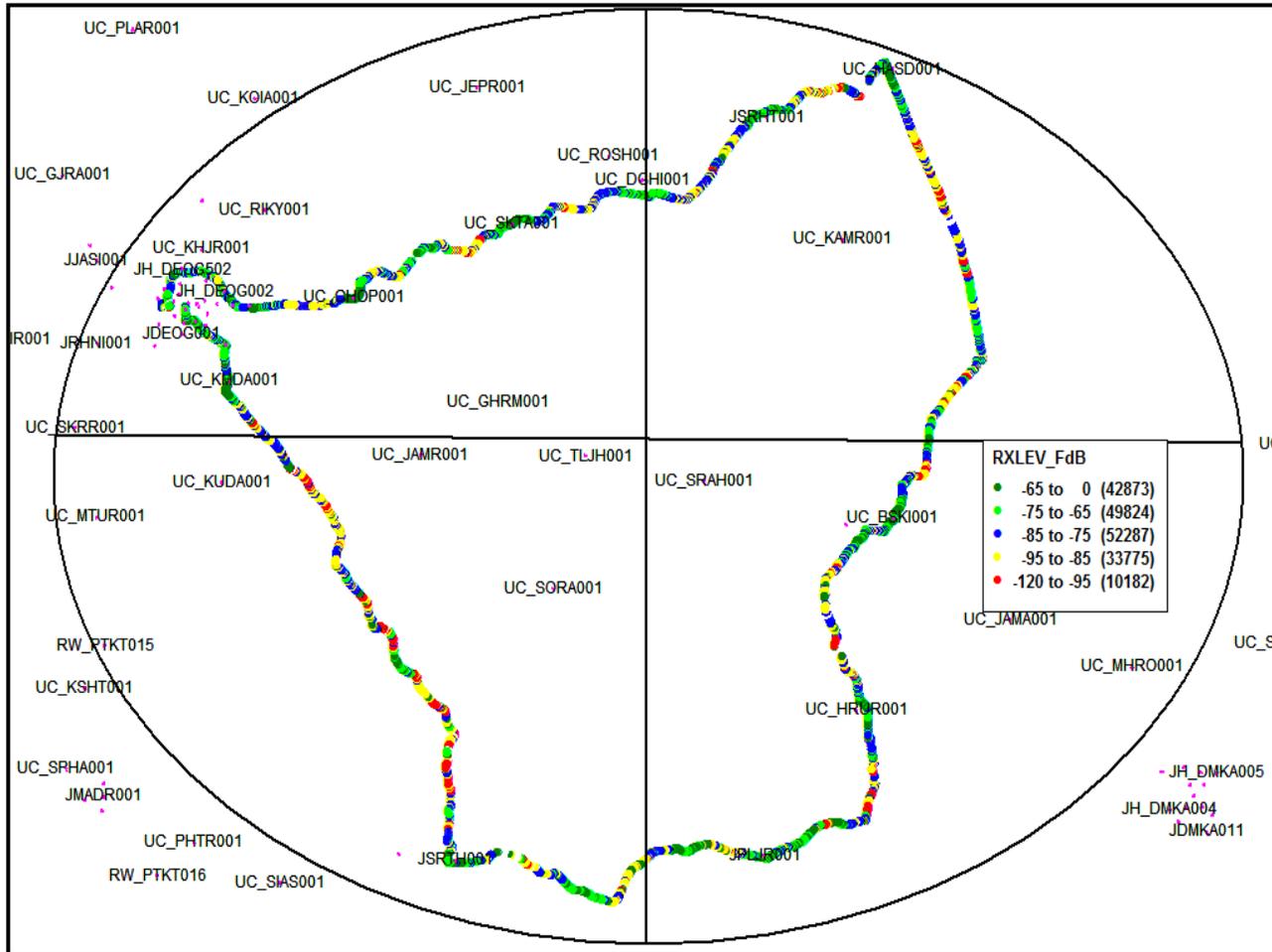
6.1.2.5   ROUTE MAP DEOGHAR DAY 3
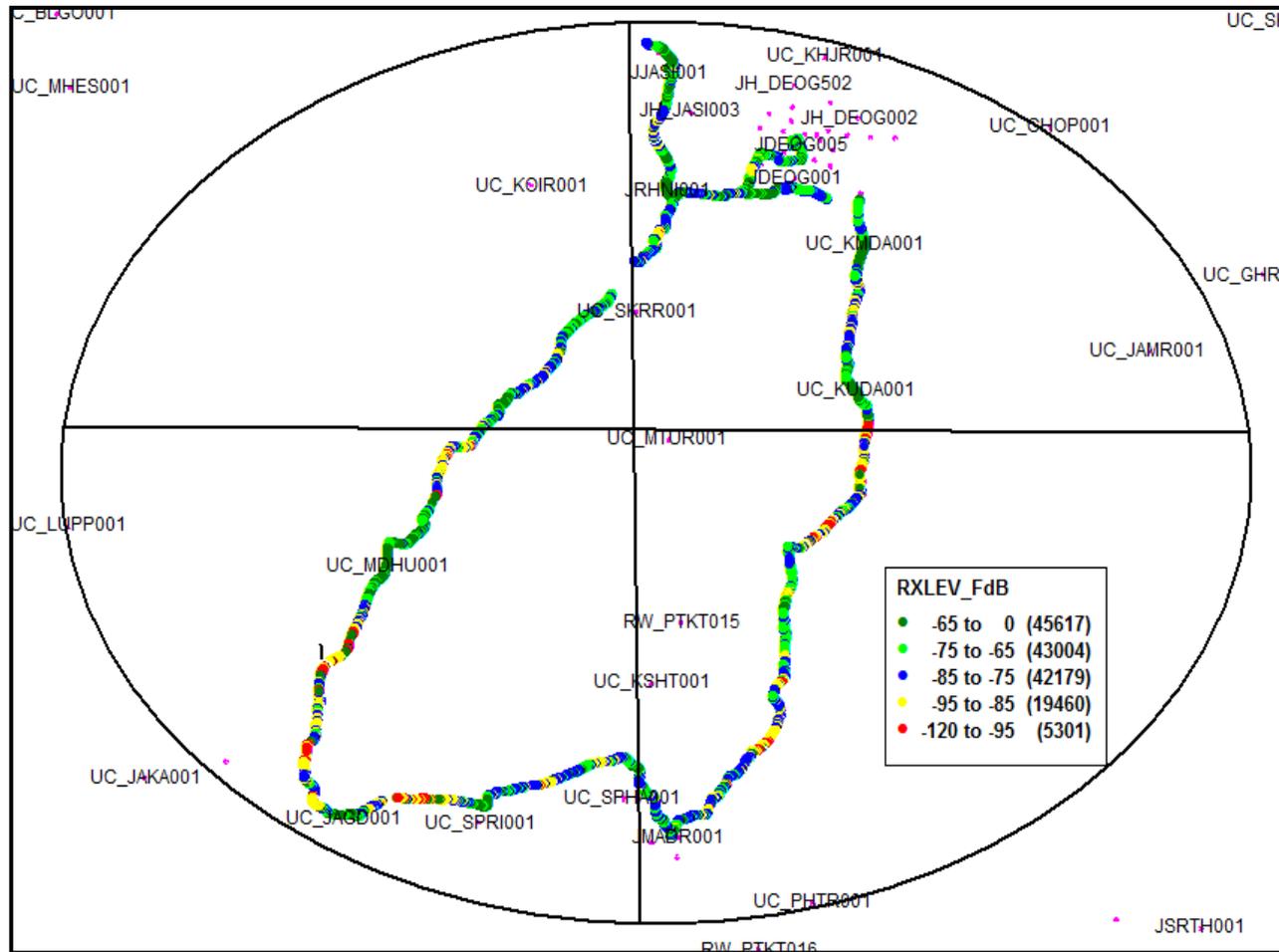
6.1.2.6 DRIVE TEST RESULTS – DEOGHAR SSA

Parameter's	B'mark	Aircel(DWL)		Airtel		BSNL		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Uninor		Vodafone	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		2.96%	26.83%	99.74%	82.16%	11.46%	49.84%	42.41%	58.43%	20.47%	15.97%	60.42%	25.59%	54.39%	16.00%	72.68%	34.97%	81.03%	59.90%	48.41%	52.20%
0 to -85 dBm		42.70%	64.08%	99.86%	95.64%	0.00%	0.00%	98.55%	79.97%	88.14%	37.41%	94.48%	50.79%	72.52%	35.12%	99.73%	62.44%	99.81%	79.94%	93.75%	80.97%
0 to -95 dBm		100.00%	100.00%	100.00%	100.00%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	64.82%	100.00%	81.36%	100.00%	100.00%	99.94%	95.74%
Voice quality	≥ 95%	96.94%	88.87%	98.58%	95.76%	88.82%	88.02%	98.69%	96.13%	97.96%	93.45%	98.60%	86.38%	96.91%	84.59%	99.45%	93.19%	96.58%	92.29%	97.04%	95.85%
CSSR	≥ 95%	100.00%	93.60%	100.00%	100.00%	93.94%	94.27%	100.00%	100.00%	100.00%	85.96%	100.00%	85.22%	100.00%	66.06%	100.00%	85.43%	100.00%	100.00%	100.00%	100.00%
%age Blocked calls		0.00%	4.53%	0.00%	0.00%	6.06%	5.70%	0.00%	0.00%	0.00%	14.04%	0.00%	14.78%	0.00%	0.00%	0.00%	10.15%	0.00%	0.85%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	3.42%	0.00%	0.00%	0.00%	9.05%	0.00%	0.00%	0.00%	9.26%	0.00%	3.71%	0.00%	20.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	56.94%	80.45%	100.00%	98.72%	100.00%	100.00%	100.00%	98.17%	100.00%	100.00%	100.00%	97.73%	100.00%	100.00%	100.00%	99.15%

Data Source: Drive test reports submitted by operators to auditors

NA: Hands off success rate data not provided by Uninor in indoor location due to technical issue in operator's system.

Voice Quality

Aircel, BSNL, Reliance CDMA, Reliance GSM, Tata CDMA, Tata GSM and Uninor failed to meet the benchmark in outdoor locations. BSNL failed to meet the benchmark at indoor locations.

Call Set Success Rate (CSSR)

Aircel, BSNL, Reliance CDMA, Reliance GSM, Tata CDMA and Tata GSM failed to meet the benchmark in outdoor locations. BSNL failed to meet the benchmark at indoor locations.

Call Drop Rate

Aircel, BSNL, Reliance CDMA, Reliance GSM and Tata CDMA failed to meet the benchmark in outdoor locations.

6.1.3   DECEMBER – HAZARIBAGH SSA

Month	Name of SSA Covered	Date of Drive Test
December	Hazaribagh	22nd to 24th December 2014

6.1.3.1   ROUTE DETAILS – HAZARIBAGH SSA

Category	Type of location	Bihar-December		
		Hazaribagh		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	District More, Patratu Chowk, Ramgarh, Gola, Peterwar	New Bus stand, Amrit Nagar, Barkatha, Barhi	Bus stand, Airport, Koderma, Piprakothi
	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 may 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.

6.1.3.2   KILOMETERS TRAVELLED– HAZARIBAGH SSA

Drive Test - Kilometers Travelled	Day 1	Day 2	Day 3	Total
Hazaribagh	102	106	105	313

6.1.3.3 ROUTE MAP HAZARIBAGH DAY 1
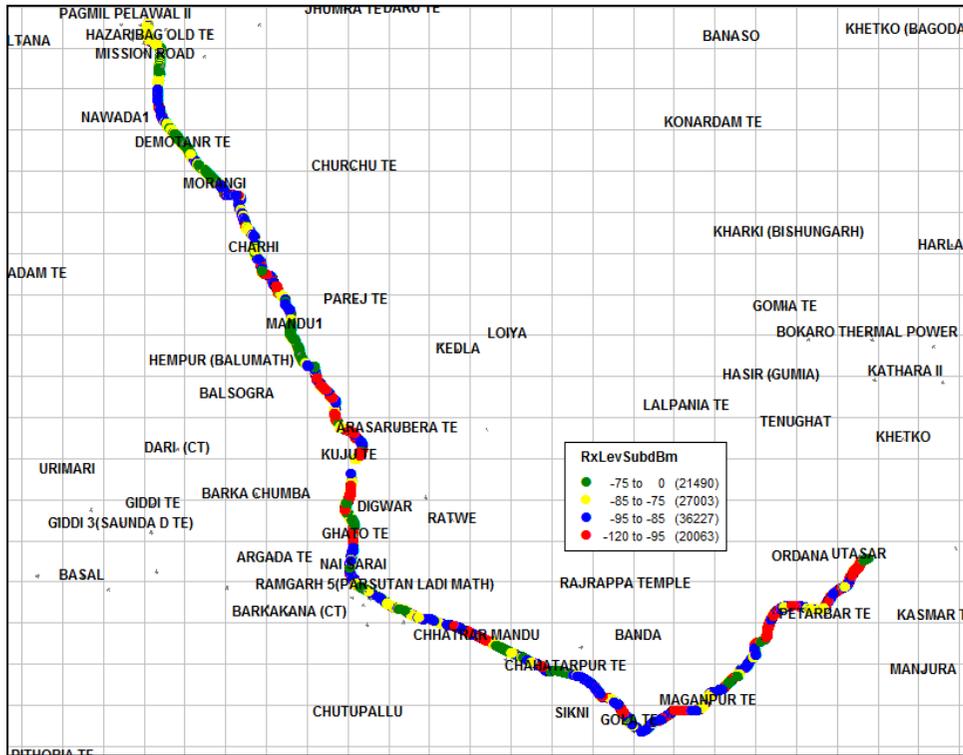
6.1.3.4 ROUTE MAP HAZARIBAGH DAY 2
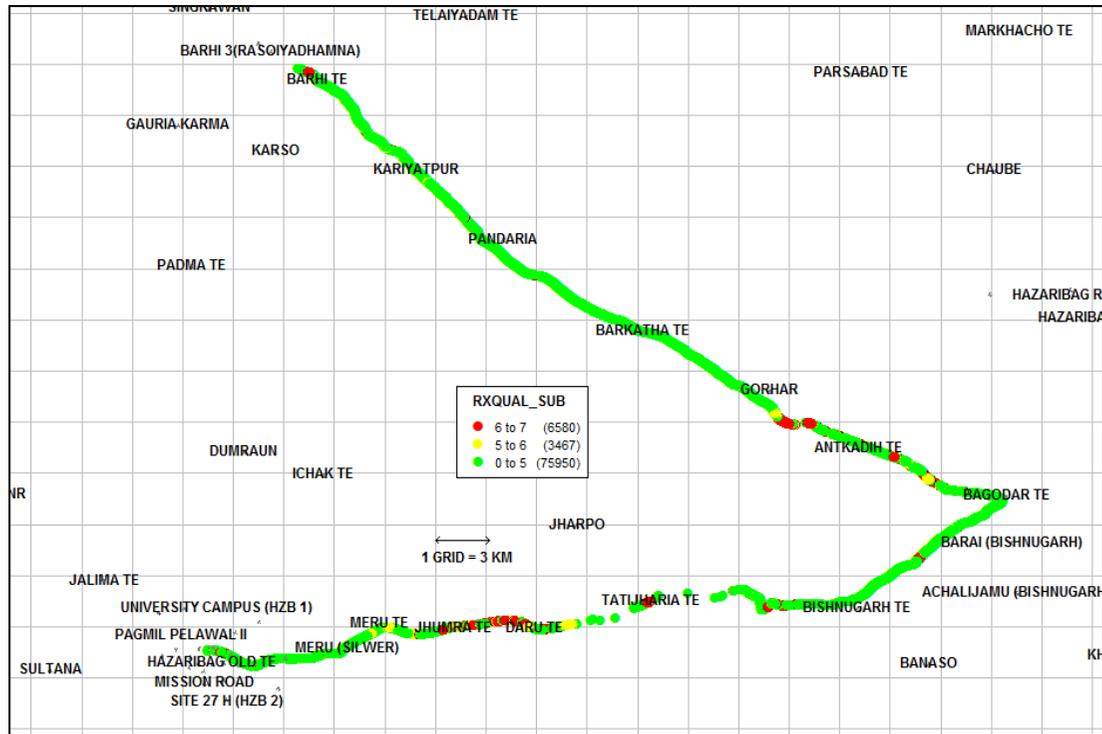
6.1.3.5   ROUTE MAP HAZARIBAGH DAY 3
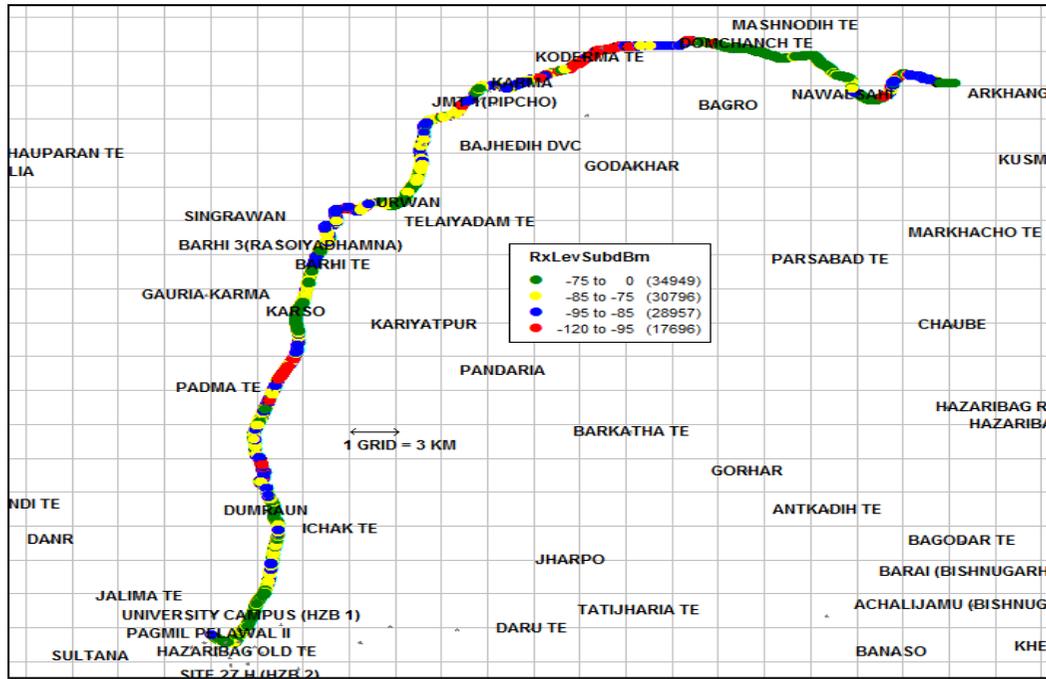
6.1.3.6   DRIVE TEST RESULTS – HAZARIBAGH SSA

Executive Summary																				
	B'mark	**Aircel(DWL)**		**Airtel**		**BSNL**		**Idea**		**Reliance CDMA**		**Reliance GSM**		**TATA CDMA**		**TATA GSM**		**Uninor**		**Vodafone**	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		55.74%	38.89%	74.75%	67.23%	24.04%	36.71%	92.85%	65.67%	100.00%	23.10%	100.00%	52.20%	9.68%	21.47%	89.86%	59.48%	99.80%	68.18%	18.01%	48.57%
0 to -85 dBm		95.90%	81.15%	99.19%	92.97%	77.77%	64.13%	99.87%	90.11%	118.00%	52.99%	100.00%	75.18%	92.94%	42.95%	99.67%	85.01%	100.00%	83.51%	89.16%	82.87%
0 to -95 dBm		100.00%	100.00%	100.00%	99.14%	99.29%	86.62%	100.00%	100.00%	118.43%	100.00%	100.00%	100.00%	99.77%	61.13%	100.00%	94.70%	100.00%	100.00%	99.73%	95.31%
Voice quality	≥ 95%	97.53%	93.45%	98.41%	96.69%	94.51%	80.63%	97.43%	96.19%	99.00%	86.33%	98.36%	84.89%	91.59%	75.64%	96.55%	95.49%	96.70%	90.07%	99.43%	96.84%
CSSR	≥ 95%	100.00%	96.30%	100.00%	100.00%	100.00%	92.10%	100.00%	99.65%	100.00%	78.64%	100.00%	89.92%	100.00%	95.39%	100.00%	97.47%	100.00%	97.53%	100.00%	99.45%
%age Blocked calls		0.00%	3.21%	0.00%	0.00%	50.00%	12.41%	0.00%	0.00%	0.00%	10.25%	0.00%	10.08%	0.00%	0.00%	0.00%	2.53%	0.00%	1.11%	0.00%	0.55%
Call drop rate	≤ 2%	0.00%	3.58%	0.00%	0.00%	1.32%	8.13%	0.00%	0.00%	0.00%	6.72%	0.00%	7.19%	0.00%	10.79%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	50.78%	100.00%	99.89%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.56%	100.00%	98.52%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

NA: Hands off success rate data not provided by Uninor in indoor location due to technical issue in operator's system.

Voice Quality

Aircel, BSNL, Reliance CDMA, Reliance GSM, Tata CDMA and Uninor failed to meet the benchmark in outdoor locations. BSNL and Tata CDMA failed to meet the benchmark in indoor locations.

Call Set Success Rate (CSSR)

BSNL, Reliance CDMA and Reliance GSM were not able to meet the CSSR benchmark in outdoor areas.

Call Drop Rate

Aircel, BSNL, Reliance CDMA, Reliance GSM and Tata CDMA failed to meet the benchmark in outdoor locations.

7   CRITICAL FINDINGS

PMR Consolidated (Network Parameters)

Aircel & BSNL are the key concern operators as these failed to meet the benchmark for majority of the network parameters.

3 Day Live Measurement (Network Parameters)

Aircel & BSNL are the key concern operators as these failed to meet the benchmark for majority of the network parameters.

For the 'Worst affected BTSs due to downtime', significant difference was observed between PMR & live measurement data for the above mentioned operators. 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.

Live Calling

None of the operators met the benchmark for resolving billing complaints. Also, for level 1 calls being answered within 60 seconds, Airtel, BSNL, Reliance CDMA, Tata GSM, Uninor and Vodafone failed to meet the TRAI benchmark.

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

Billing and Customer Care

Aircel and BSNL failed to meet the benchmark of answering IVR calls within 60 seconds.

BSNL, Idea, Reliance CDMA, Reliance GSM, Tata CDMA and Tata GSM failed to meet the TRAI specified benchmark of 95% for calls answered by the operators (voice to voice).

Metering and billing credibility: Idea and Reliance CDMA failed to meet the TRAI benchmark for postpaid while Vodafone failed to meet the benchmark for prepaid.

Operators have been reporting majority of complaints made by customers as invalid. This has been observed mainly for Airtel, Idea, Tata CDMA, Tata GSM and Vodafone. In the audit process, there is no mechanism in place to further probe this phenomenon. However, IMRB is of the opinion that this needs to be further investigated and operators should provide detailed explanation of reasons for reporting majority of their complaints as invalid to TRAI.

Inter-Operator Call Assessment

Most of the operators faced issues while connecting to other operators.

Drive Test (Operator Assisted)

Reliance GSM, Tata CDMA and Tata GSM failed to meet the benchmark for all key parameters such as Voice Quality, CSSR and Call Drop Rate in Sasaram SSA.

Aircel, BSNL, Reliance CDMA, Reliance GSM and Tata CDMA failed to meet the benchmark for all key parameters in Deoghar SSA.

BSNL, Reliance CDMA and Reliance GSM failed to meet the benchmark for all key parameters in Hazaribagh SSA.

8 ANNEXURE - CONSOLIDATED

8.1 NETWORK AVAILABILITY

Audit Results for Network Availability-Consolidated											
	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Number of BTSs in the licensed service area		8416	27242	10709	20391	4624	10110	1221	2889	9641	24453
Sum of downtime of BTSs in a month (in hours)		303011	15236	1105991	83347	13121	6336	1239	2647	20133	76818
BTSs accumulated downtime (not available for service)	≤ 2%	4.84%	0.08%	13.88%	0.55%	0.38%	0.08%	0.14%	0.12%	0.28%	0.42%
Number of BTSs having accumulated downtime >24 hours		2467	70	2905	382	52	29	0	16	103	453
Worst affected BTSs due to downtime	≤ 2%	29.34%	0.26%	27.12%	1.87%	1.13%	0.29%	0.00%	0.56%	1.07%	1.85%

Live Measurement- BTSs accumulated downtime-Consolidated											
	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Number of BTSs in the licensed service area		8416	27175	10709	20391	4624	10110	1221	2889	9634	24453
Sum of downtime of BTSs in a month (in hours)		27157	1789	82664	7867	991	631	112	260	1878	7637
(not available for service)	≤ 2%	4.48%	0.09%	10.71%	0.54%	0.30%	0.09%	0.12%	0.12%	0.27%	0.43%
Number of BTSs having accumulated downtime >24 hours		0	0	337	15	0	0	0	0	0	0
Live Mesurement - Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	3.14%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

8.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion-Consolidated										
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
CSSR	≥ 95%	93.64%	98.17%	97.72%	98.34%	97.97%	95.96%	97.93%	98.63%	98.27%	99.51%
SDCCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
SDCCH/Paging channel congestion	≤ 1%	0.94%	0.94%	8.14%	0.67%	0.00%	0.79%	0.00%	0.16%	0.39%	0.23%
TCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
TCH congestion	≤ 2%	5.91%	1.22%	4.44%	1.06%	0.02%	0.06%	0.31%	0.21%	1.03%	0.49%
Live measurement results for CSSR, SDCCH and TCH congestion-Consolidated										
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
CSSR	≥ 95%	94.81%	98.09%	98.20%	98.58%	98.23%	95.82%	98.09%	98.99%	98.42%	99.60%
SDCCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
SDCCH/Paging channel congestion	≤ 1%	0.36%	0.97%	8.37%	0.63%	0.00%	1.45%	0.00%	0.17%	0.29%	0.17%
TCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
TCH congestion	≤ 2%	4.77%	1.17%	3.99%	0.85%	0.02%	0.09%	0.18%	0.13%	0.93%	0.40%

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

Drive test results for CSSR (Average of three drive tests) and blocked calls-Consolidated											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of call attempts		1236	1379	1168	1336	2035	1454	1135	1174	1119	975
Total number of successful calls established		1168	1379	1105	1335	1856	1250	872	1068	1111	969
CSSR	≥ 95%	94.75%	100.00%	93.77%	99.91%	89.12%	86.26%	78.66%	91.52%	99.25%	99.42%
Blocked calls	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
%age blocked calls		5.25%	0.00%	6.23%	0.09%	10.88%	13.74%	21.34%	8.48%	0.75%	0.58%

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

Data Source: Drive test reports submitted by operators to auditors

8.3   CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-Consolidated

Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		397457119	1754518815	7185401224	712352750	182512933	416901264	55065197	81251028	579739809	702582072
Total number of calls dropped		6574827	32840675	141320393	7689288	631075	2128422	458793	426809	3057951	6433196
Call drop rate	≤ 2%	1.65%	1.88%	1.79%	1.08%	0.35%	0.51%	0.83%	0.53%	0.53%	0.91%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		25164	81941	31971	61422	13872	30330	3900	8545	28942	73435
Total number of cells having more than 3% TCH		3137	1926	4044	1703	220	40	159	216	538	3284
Worst affected cells having more than 3% TCH	≤ 3%	12.47%	2.35%	12.66%	2.77%	1.59%	0.13%	4.08%	2.53%	1.86%	4.48%

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

Live measurement results for Call drop rate and for number of cells having more than 3% TCH-Consolidated											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		12646915	3965005031	20404238	66118265	19269936	38449915	79118862	102983770	55543873	66418999
Total number of calls dropped		194555	74486807	396727	641898	57122	195584	438155	487365	295491	592945
Call drop rate	≤ 2%	1.54%	1.88%	1.83%	0.97%	0.30%	0.51%	0.55%	0.48%	0.53%	0.89%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		25233	245823	31971	61422	13872	30336	3900	8549	28922	73435
Total number of cells having more than 3% TCH		2077	5743	2568	1686	0	0	170	393	549	3316
Worst affected cells having more than 3% TCH	≤ 3%	8.26%	2.34%	8.03%	2.75%	0.00%	0.00%	4.35%	4.59%	1.90%	4.53%

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

Drive test results for Call drop rate (Average of three drive tests)-Consolidated											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		1169	1379	1105	1335	1871	1250	1112	1068	1111	968
Total number of calls dropped		34	0	78	0	96	63	87	8	0	0
Call drop rate	≤ 2%	2.92%	0.00%	7.43%	0.00%	6.46%	5.19%	7.99%	0.66%	0.00%	0.00%

Data Source: Drive test reports submitted by operators to auditors

8.4   VOICE QUALITY

Audit Results for Voice quality -Consolidated										
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		57733184778	475838396483	19543	124513556477	NA	23106640601	163277945227	14106962415	96077990571	128184855249
Total number of calls with good voice quality		54852592346	455578012571	19098	120147506994	NA	22606506313	160358848841	13735932550	89605740088	124897227554
%age calls with good voice quality	≥ 95%	95.00%	95.74%	97.72%	96.48%	99.81%	97.84%	98.21%	97.37%	93.26%	97.44%

Live measurement results for Voice quality-Consolidated										
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		1915390946	46473509834	4112	12096212068	NA	2175551399	203432517185	16932322901	9559387909	12404210394
Total number of calls with good voice quality		1821781752	44498186914	4034	11655690617	NA	2128206666	199778012995	16535051655	8925959760	12093285546
%age calls with good voice quality	≥ 95%	95.11%	95.76%	98.10%	96.35%	99.82%	97.83%	98.20%	97.65%	93.37%	97.50%

Drive test results for Voice quality (Average of three drive tests)-Consolidated										
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		1913908	2658745	1470825	2404136	NA	384697	NA	1861941	2142727	1666089
Total number of calls with good voice quality		1754170	2564235	1275449	2314160	NA	327519	NA	1763155	1985069	1614291
%age calls with good voice quality	≥ 95%	91.83%	96.72%	89.04%	96.28%	94.73%	85.35%	91.90%	94.77%	92.74%	96.90%

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

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NA: On the aspect of Voice quality, auditors could get only the overall value from Reliance CDMA. Current equipment used by Reliance does not have capability to fetch these parameters.

8.5   POI CONGESTION

Audit Results for POI Congestion-Consolidated											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Average number of working POIs		50	801	330	78	106	94	210	19	62	57
Average No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Average Capacity of all POIs (A) - in erlangs		112026	483087	15471	237895	48986	71524	77396	10608	68607	232949
Average Traffic served for all POIs (B)- in erlangs		65990	583901	1523773	131146	16895	17057	22036	3522	48318	118999
Average POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion-Consolidated											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Average number of working POIs		50	801	337	78	106	127	210	19	62	57
Average No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Average Capacity of all POIs (A) - in erlangs		111937	2012789	15538	236071	49442	71495	77396	10606	69045	237317
Average Traffic served for all POIs (B)- in erlangs		64884	1178062	163583	128979	71209	17114	22192	3551	47864	116782
Average POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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

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8.6   TOTAL CALL MADE DURING THE DRIVE TEST-VOICE QUALITY

October									
Voice quality	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls	631342	545165	6418	917334	NA	206841	NA	675443	872973	629075
November									
Voice quality	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls	734165	1473603	1135931	876672	NA	38640	NA	656856	608854	567681
December									
Voice quality	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls	548401	639977	328476	610130	NA	139216	NA	529642	660900	469333

Data Source: Drive test reports submitted by operators to auditors

8.7 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated											
Billing Performance	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (BIHAR & JHARKHAND)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Uninor**	**Vodafone**
Metering and Billing Credibility - Postpaid (Avg of 3 billing cycles)											
Total bills generated during the period		4444	232738	299140	72655	225362	127136	31867	33046	NA	148688
Total number of bills disputed		0	114	15	339	287	115	0	0	NA	92
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.00%	0.05%	0.00%	0.47%	0.13%	0.09%	0.00%	0.00%	NA	0.06%
October											
Total bills generated during the first billing cycle		1497	75751	103338	22987	75333	41391	10899	10659	NA	47377
Total number of bills disputed in first billing cycle		0	34	0	156	66	11	0	0	NA	18
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.00%	0.04%	0.00%	0.68%	0.09%	0.03%	0.00%	0.00%	NA	0.04%
November											
Total bills generated during the second billing cycle		1466	77464	95729	23453	75252	42712	10554	10845	NA	49589
Total number of bills disputed in second billing cycle		0	54	0	99	46	10	0	0	NA	35
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.00%	0.07%	0.00%	0.42%	0.06%	0.02%	0.00%	0.00%	NA	0.07%

Data Source: Billing Center of the operators

December											
Total bills generated during the third billing cycle		1481	79523	100073	26215	74777	43033	10414	11542	NA	51722
Total number of bills disputed in third billing cycle		0	26	15	84	175	94	0	0	NA	39
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.00%	0.03%	0.01%	0.32%	0.23%	0.22%	0.00%	0.00%	NA	0.08%

Data Source: Billing Center of the operators

Metering and Billing Credibility - Prepaid											
Performance prepaid	Benchmark	Aircel(DWL)	Airtel	BSNL (BIHAR & JHARKHAND)	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Uninor	Vodafone
Total number of charging complaints		0	8928	158	4184	457	1830	73	726	1909	14094
Total no of customers served		4671550	23766627	2667808	6952438	2509989	6105880	560964	1854980	6517205	7842173
Percentage of charging complaints disputed	≤ 0.1%	0.00%	0.04%	0.01%	0.06%	0.02%	0.03%	0.01%	0.04%	0.03%	0.18%

Data Source: Billing Center of the operators

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Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (BIHAR & JHARKHAND)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Uninor**	**Vodafone**
Total number of billing/charging complaints		0	9042	173	4523	744	1945	73	726	1909	14186
Total number of complaints resolved in favour of customer		0	3601	173	2061	579	1945	0	0	1909	4509
Total complaints considered invalid		0	5441	0	2462	165	0	73	726	0	9677
Number of complaints resolved in 4 weeks		NA	3601	173	2061	579	1945	0	0	1909	4498
Percentage complaints resolved within 4 weeks	98.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.76%
Number of complaints resolved in 6 weeks		NA	3601	173	2061	579	1945	0	0	1909	4498
Percentage complaints resolved within 6 weeks	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.76%
Period of applying credit / waiver-Consolidated											
Total number of complaints where credit/waiver is required		NA	3601	30	2061	372	1924	0	0	NA	4509
Percentage cases in which credit/waiver was received within 1 week	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

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Operators have been reporting majority of complaints made by customers as invalid. This has been observed mainly for Airtel, Idea, Tata CDMA, Tata GSM and Vodafone. In the audit process, there is no mechanism in place to further probe this phenomenon. However, IMRB is of the opinion that this needs to be further investigated and operators should provide detailed explanation of reasons for reporting majority of their complaints as invalid to TRAI.

NA: Aircel reported zero billing complaints. Hence, 'resolution of billing complaints' and 'period of applying credit/waiver' parameters are not applicable for the operator.

Live calling results for resolution of billing complaints											
Resolution of billing complaints	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total Number of calls made		NA	100	200	100	100	100	100	100	100	100
Number of cases resolved in 4 weeks		NA	70	134	47	74	78	82	59	61	68
Percentage cases resolved in four weeks	98.00%	NA	70.00%	67.00%	47.00%	74.00%	78.00%	82.00%	59.00%	61.00%	68.00%
Number of cases resolved in 6 weeks		NA	72	167	78	88	83	82	71	81	70
Percentage cases resolved in 6weeks	100.00%	NA	72.00%	83.50%	78.00%	88.00%	83.00%	82.00%	71.00%	81.00%	70.00%

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

NA: There were zero billing complaints for Aircel. Hence, live calling was not conducted for the operator.

8.8   CUSTOMER CARE

Audit results for customer care (IVR)-Consolidated											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of call attempts to customer care for assistance		23726929	87989966	993567	28894743	2249732	5113777	104701	520249	27887680	21410684
Number of calls getting connected and answered (electronically)		21330198	87352651	667931	28036307	2226365	5051344	103645	497708	26937996	21410684
Percentage calls getting connected and answered	≥ 95%	89.90%	99.28%	67.23%	97.03%	98.96%	98.78%	98.99%	95.67%	96.59%	100.00%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total Number of calls received (3 months)		4709895	14016446	1868425	10546378	349613	1435989	99564	674117	7185179	7682161
Total Number of calls answered within 90 seconds (3 months)		4578417	13698622	1717212	9747578	320600	1323780	91251	634230	7130865	7491159
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	97.21%	97.73%	91.91%	92.43%	91.70%	92.19%	91.65%	94.08%	99.24%	97.51%
October											
Total calls received (Month 1)		1614078	4904318	747641	3418189	312896	1397481	38287	226208	2362583	2477263
Total calls answered within 90 seconds (Month 1)		1536685	4774518	660976	3238570	294716	1228831	32459	212139	2342470	2437124
% calls answered within 90 seconds (Month 1)	≥ 95%	95.21%	97.35%	88.41%	94.75%	94.19%	87.93%	84.78%	93.78%	99.15%	98.38%

November										
Total calls received (Month 2)		1569867	4678423	556547	3383584	319773	1466129	31539	219687	2423991	2521276
Total calls answered within 90 seconds (Month 2)		1537984	4646703	528701	3153614	304365	1325484	30849	204689	2400133	2461762
% calls answered within 90 seconds (Month 2)	≥ 95%	97.97%	99.32%	95.00%	93.20%	95.18%	90.41%	97.81%	93.17%	99.02%	97.64%
December										
Total calls received (Month 3)		1525950	4433705	564237	3744605	349613	1435989	29738	228222	2398605	2683622
Total calls answered within 90 seconds (Month 3)		1503748	4277401	527535	3355394	320600	1323780	27943	217402	2388262	2592273
% calls answered within 90 seconds (Month 3)	≥ 95%	98.55%	96.47%	93.50%	89.61%	91.70%	92.19%	93.96%	95.26%	99.57%	96.60%

Data Source: Customer Service Center of the operators

Live calling results for customer care (IVR)											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of call attempts to customer care for assistance		100	100	100	100	100	100	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	100	100	100	100	100	99	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.00%	100.00%	100.00%

Live calling results for customer care (Voice to Voice)											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total Number of calls received		100	100	100	100	100	100	100	100	100	100
Total Number of calls getting connected and answered		99	93	95	95	80	94	100	95	100	94
Percentage calls getting connected and answered within 90secs	≥ 95%	99.00%	93.00%	95.00%	95.00%	80.00%	94.00%	100.00%	95.00%	100.00%	94.00%

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

8.9 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated											
Termination	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of closure request		12	786	196	309	147	278	412	546	NA	1232
Number of requests attended within 7 days		12	786	196	309	147	278	412	546	NA	1232
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%

Data Source: Customer Service Center of the operators

Note: Uninor does not offer postpaid services in the circle.

8.10 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated											
Refund	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cases requiring refund of deposits		90	109	191	73	389	545	66	47	NA	318
Total number of cases where refund was made within 60 days		90	109	191	73	389	545	66	47	NA	318
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%

Data Source: Customer Service Center of the operators

Note: - Uninor does not offer postpaid services in the circle.

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8.11   ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang										
Traffic in Erlang	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Eqipped capacity of the network	158733	737624	359600	199909	146000	235000	71427	49193	159450	237584
Total taffic handled in erlang during TCBH	118467	565539	121486	195723	70790	126834	16319	22647	189174	194681
Total no. of customers served (as per VLR)	4552137	22619832	2675226	7794534	2430369	6094295	584189	1876433	6862147	7528520

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

8.12   LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests										
Resolution of service requests	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total Number of calls made	100	100	100	100	100	100	100	100	100	100
Number of cases resolved to satisfaction	82	81	74	82	83	74	82	80	76	86
Percentage cases resolved in four weeks	82.00%	81.00%	74.00%	82.00%	83.00%	74.00%	82.00%	80.00%	76.00%	86.00%

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

8.13 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services											
Level 1 services	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total no. of calls made		150	150	300	150	150	150	150	150	150	150
Calls answered in 60 sec		146	147	287	150	139	143	150	141	134	137
% of calls connected in 60 seconds	≥ 95%	97.33%	98.00%	95.67%	100.00%	92.67%	95.33%	100.00%	94.00%	89.33%	91.33%

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

8.14   DETAILS - LEVEL 1 SERVICES CALLS

Level 1 Service No	Category	Aircel	Airtel	BSNL Patna	BSNL Ranchi	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Uninor	Vodafone
100	I	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
101	I	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
102	I	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
104	I	✔	✔		✔			✔	✔		✔	
108	I	✔	✔	✔		✔				✔		✔
181	I	✔										
1033	I		✔	✔	✔	✔	✔	✔	✔		✔	✔
1056	I											
1063	I											
1064	I					✔						
1066	I		✔			✔						
1068	I					✔						
1070	I			✔		✔		✔	✔	✔		✔
1071	I						✔	✔				
1072	I					✔	✔	✔	✔		✔	
1073	I											
1077	I			✔								✔
1091	I	✔	✔	✔								
1099	I		✔	✔		✔	✔	✔				
1909	I	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔
1916	I											
1947	I				✔	✔					✔	
1950	I		✔		✔	✔	✔	✔	✔	✔	✔	✔
15100	I			✔						✔	✔	✔
155214	I											

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

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

Live calls were made to the active numbers to test the calls answered within 60 seconds. The details of the same have been given below for each operator.

Aircel				Airtel				BSNL Patna				BSNL Ranchi			
Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect
100	25	25	0	100	12	12	0	100	16	16	0	100	21	21	0
101	25	23	2	101	12	12	0	101	12	12	0	101	16	16	0
102	12	12	0	102	12	9	3	102	14	13	1	102	20	20	0
104	13	13	0	104	13	13	0	108	14	14	0	104	19	19	0
108	14	14	0	108	12	12	0	1033	14	8	6	1033	19	19	0
181	11	11	0	1033	12	12	0	1070	14	14	0	1909	19	19	0
1091	25	24	1	1066	13	13	0	1077	15	15	0	1947	19	19	0
1909	25	24	1	1091	13	13	0	1091	13	13	0	1950	17	17	0
				1098	12	12	0	1098	12	12	0				
				1099	13	13	0	1099	10	10	0				
				1909	13	13	0	1909	9	3	6				
				1950	13	13	0	15100	7	7	0				

Reliance CDMA				Reliance GSM				TATA CDMA				TATA GSM			
Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect
100	9	9	0	100	13	13	0	100	17	17	0	100	16	16	0
101	10	9	1	101	13	13	0	101	17	17	0	101	18	11	7
102	9	7	2	102	14	12	2	102	17	17	0	102	18	18	0
1033	10	10	0	104	13	13	0	104	17	17	0	108	17	16	1
1070	19	18	1	1033	13	13	0	1033	17	17	0	1070	16	16	0
1071	19	17	2	1070	14	14	0	1070	17	17	0	1098	17	17	0
1072	19	19	0	1071	14	13	1	1072	16	16	0	1909	14	14	0
1099	19	18	1	1072	14	13	1	1098	16	16	0	1950	20	19	1
1909	19	16	3	1099	14	11	3	1950	16	16	0	15100	14	14	0
1950	17	16	1	1909	14	14	0								
				1950	14	14	0								

Idea				Uninor				Vodafone			
Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect	Level 1 sevice No	Total calls made	Able to connect	Not able to connect
100	9	9	0	100	15	10	5	100	9	9	0
101	9	9	0	101	15	9	4	101	9	9	0
102	9	9	0	102	15	15	0	102	9	4	5
108	9	9	0	104	15	15	0	108	9	9	0
166	8	8	0	1033	15	15	0	117	9	9	0
1033	9	9	0	1072	15	15	0	1033	7	5	2
1064	9	9	0	1909	15	15	0	1070	9	9	0
1068	8	8	0	1947	15	12	3	1077	9	9	0
1070	9	9	0	1950	15	13	2	1098	9	8	1
1072	9	9	0	15100	15	15	0	1322	8	8	0
1098	9	9	0					1909	9	9	0
1099	9	9	0					1950	9	8	1
1322	8	8	0					15100	8	8	0
1909	9	9	0					15101	10	9	1
1947	9	9	0					15102	8	8	0
1950	9	9	0					155210	10	10	0
1961	9	9	0					155222	9	6	3

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

8.15   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)])

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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))

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8.15.1 ERICSSON

Ericsson provides network support to Aircel, Uninor, BSNL and Tata GSM in the circle.

SI 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.

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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.

8.15.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Airtel, Vodafone and Idea 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)

8.15.3 HUAWEI

Huawei provides network support to Reliance CDMA in the circle.

HUAWEI CDMA		
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[%]

8.15.4 ZTE

ZTE provides network support to Tata CDMA in the circle.

1. Connection Establishment (Accessibility)

A. CALL SETUP SUCCESS RATE:

KPI is calculated as Average over the month at TCBH

$$((1-C900060053/(C900060003+C900060010+C900060038))*(1-((C900060005+C900060011+C900060039)/(C900060003+C900060010+C900060038)))*(1-(C900060020+C900060031+C900060043+C900060047)/(C900060019+C900060030+C900060042+C900060046))*(1-(C900060018+C900060029+C900060037+C900060135+C900060200+C900060211)/(C900060017+C900060028+C900060036+C900060018+C900060029+C900060037+C900060235+C900060199+C900060210+C900060135+C900060200+C900060211)))*100$$

Where,

C900060053	Number of SDCCH drops
C900060003	Number of SDCCH seizure attempts for assignment
C900060010	Number of signaling TCH/F seizure attempts for assignment
C900060038	Number of signaling TCH/H seizure attempts for assignment
C900060005	Number of SDCCH seizure failure for assignment
C900060011	Number of signaling TCH/F seizure failure for assignment
C900060039	Number of signaling TCH/H seizure failure for assignment
C900060020	Number of voice TCH/F seizure failure for assignment
C900060031	Number of data TCH/F seizure failure for assignment
C900060043	Number of voice TCH/H seizure failure for assignment
C900060047	Number of data TCH/H seizure failure for assignment
C900060019	Number of voice TCH/F seizure attempts for assignment
C900060030	Number of data TCH/F seizure attempts for assignment
C900060042	Number of voice TCH/H seizure attempts for assignment
C900060046	Number of data TCH/H seizure attempts for assignment
C900060018	Number of signaling TCH/F assignment failure for assignment
C900060029	Number of voice TCH/F assignment failure for assignment

C900060037   Number of data TCH/F assignment failure

C900060135   Number of signaling TCH/H assignment failure

C900060200   Number of Voice TCH/H assignment failure

C900060211   Number of data TCH/H assignment failure

C900060017   Number of signaling TCH/F assignment success for assignment

C900060028   Number of voice TCH/F assignment success

C900060036   Number of data TCH/F assignment success

C900060235   Number of signaling TCH/H assignment success

C900060199   Number of Voice TCH/H assignment success

C900060210   Number of data TCH/H assignment success

B. SDCCH BLOCKING:

KPI is calculated as Average over the month at TCBH

(C900060005+C900060011+C900060039)/(C900060003+C900060010+C900060038)

Where,

C900060005   Number of SDCCH seizure failure for assignment

C900060011   Number of signaling TCH/F seizure failure for assignment

C900060039   Number of signaling TCH/H seizure failure for assignment

C900060003   Number of SDCCH seizure attempts for assignment

C900060010   Number of signaling TCH/F seizure attempts for assignment

C900060038   Number of signaling TCH/H seizure attempts for assignment

C. TCH BLOCKING:

KPI is calculated as Average over the month at TCBH

(C900060020+C900060031+C900060043+C900060047)/(C900060019+C900060030+C900060042+C900060046)

Where,

C900060020   Number of voice TCH/F seizure failure for assignment

C900060031   Number of data TCH/F seizure failure for assignment

C900060043   Number of voice TCH/H seizure failure for assignment

C900060047   Number of data TCH/H seizure failure for assignment

C900060019   Number of voice TCH/F seizure attempts for assignment

C900060030   Number of data TCH/F seizure attempts for assignment

C900060042   Number of voice TCH/H seizure attempts for assignment

C900060046   Number of data TCH/H seizure attempts for assignment

2. Connection Maintenance (Retainability)

A. TCH drop:

KPI is calculated as Average over the month at TCBH

$$(C900060054+C900060055)/(C900060028+C900060036+C900060199+C900060210+C900060098+C900060102-(C900960094+C900060095))$$

Where,

C900060054   Number of TCH/F drops

C900060055   Number of TCH/H drops

C900060028   Number of voice TCH/F assignment success

C900060036   Number of data TCH/F assignment success

C900060199   Number of Voice TCH/H assignment success

C900060210   Number of data TCH/H assignment success

C900060098   Number of BSC-controlled inter-cell incoming handover success

C900060102   Number of MSC-controlled incoming handover success

C900060094   Number of BSC-controlled inter-cell outgoing handover success

C900060095   Number of MSC-controlled outgoing handover

C900060030   Number of data TCH/F seizure attempts for assignment

C900060042   Number of voice TCH/H seizure attempts for assignment

C900060046   Number of data TCH/H seizure attempts for assignment

2. Connection Maintenance (Retainability)

A. TCH drop:

KPI is calculated as Average over the month at TCBH

(C900060054+C900060055)/(C900060028+C900060036+C900060199+C900060210+C900060098+C900060102
-(C900060094+C900060095))

Where,

C900060054   Number of TCH/F drops

C900060055   Number of TCH/H drops

C900060028   Number of voice TCH/F assignment success

C900060036   Number of data TCH/F assignment success

C900060199   Number of Voice TCH/H assignment success

C900060210   Number of data TCH/H assignment success

C900060098   Number of BSC-controlled inter-cell incoming handover success

C900060102   Number of MSC-controlled incoming handover success

C900060094   Number of BSC-controlled inter-cell outgoing handover success

C900060095   Number of MSC-controlled outgoing handover

B. Total No. of cells exceeding 3% TCH drop (call drop):

Total no of cells with TCH drop>3%

C. Total No. of cells in the Network:

Active cell from last day of the month.

D. Worst affected cells having more than 3% TCH drop (call drop) rate:

(Total no. of cells with TCH drop>3%/Total no. of cells of on air sites)*100

E. %age of Connection with Good Voice Quality:

KPI is calculated as Average over the month at TCBH

$$(C900060074+C900060075+C900060076+C900060077+C900060078+C900060079)/(C900060074+C900060075+C900060076+C900060077+C900060078+C900060079+C900060080+C900060081)*100$$

Where,

C900060074	Number of samples with DL RQ = 0
C900060075	Number of samples with DL RQ = 1
C900060076	Number of samples with DL RQ = 2
C900060077	Number of samples with DL RQ = 3
C900060078	Number of samples with DL RQ = 4
C900060079	Number of samples with DL RQ = 5
C900060079	Number of samples with DL RQ = 5
C900060080	Number of samples with DL RQ = 6
C900060081	Number of samples with DL RQ = 7

9 ANNEXURE – OCTOBER

1. Network Availability

	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Audit Results for Network Availability- PMR data-October											
Number of BTSs in the licensed service area		2790	9051	3551	6798	1538	3368	405	963	3197	8086
Sum of downtime of BTSs in a month (in hours)		112781	5235	362829	24458	3628	2155	411	588	7020	28489
BTSs accumulated downtime (not available for service)	≤ 2%	5.43%	0.08%	13.73%	0.48%	0.32%	0.09%	0.14%	0.08%	0.30%	0.47%
Number of BTSs having accumulated downtime		1015	27	883	128	19	8	0	5	42	157

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>24 hours											
Worst affected BTSs due to downtime	≤ 2%	36.38%	0.30%	24.87%	1.88%	1.24%	0.24%	0.00%	0.52%	1.31%	1.94%

Live Measurement Results for Network Availability- 3 Day live data-October

	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Number of BTSs in the licensed service area		2790	9051	3551	6798	1538	3368	405	963	3193	8086
Sum of downtime of BTSs in a month (in hours)		8922	544	25550	2138	503	238	36	17	545	2372
BTSs accumulated downtime (not available for service)	≤ 2%	4.44%	0.08%	9.99%	0.44%	0.45%	0.10%	0.12%	0.02%	0.24%	0.41%
Number of BTSs having accumulate		0	0	92	0	0	0	0	0	0	0

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d downtime >24 hours										
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	2.59%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-October

CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
CSSR	≥ 95%	92.87%	98.10%	98.00%	98.23%	97.90%	95.89%	97.56%	98.68%	98.15%	99.38%

SDCCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
SDCCH/Paging channel congestion	≤ 1%	1.24%	0.92%	9.23%	0.77%	0.00%	0.53%	0.00%	0.26%	0.49%	0.31%

TCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
TCH congestion	≤ 2%	6.65%	1.16%	4.92%	1.22%	0.02%	0.03%	0.33%	0.20%	1.04%	0.62%

Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-October										
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
CSSR	≥ 95%	93.99%	98.01%	97.45%	98.52%	98.04%	95.51%	97.50%	99.19%	98.45%	99.46%

SDCCH congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
SDCCH/Paging channel congestion	≤ 1%	0.31%	0.96%	9.35%	0.57%	0.00%	0.29%	0.00%	0.35%	0.23%	0.24%

TCH congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
TCH congestion	≤ 2%	5.54%	1.03%	4.46%	0.89%	0.02%	0.10%	0.11%	0.04%	0.89%	0.54%

Drive test results for CSSR (Average of three drive tests) and blocked calls-October- Drive Test Data										
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
Total number of call attempts		386	484	494	510	986	601	442	429	491	406
Total number of successful		366	484	482	510	983	508	326	402	490	402

calls established											
CSSR	≥ 95%	94.82%	100.00%	97.57%	100.00%	99.70%	84.53%	73.76%	93.71%	99.80%	99.01%

Blocked calls	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
%age blocked calls		5.18%	0.00%	2.43%	0.00%	0.30%	15.47%	26.24%	6.29%	0.20%	0.99%

3. Connection Maintenance (Retainability)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-October-PMR data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		136301656	666205333	3474993009	249082531	61684087	1294767698	19500286	26916028	207121993	250556993
Total number of calls dropped		2348505	12163541	69152361	2930687	240971	673299	172635	142255	1063538	2389484
Call drop rate	≤ 2%	1.72%	1.83%	1.99%	1.18%	0.39%	0.52%	0.89%	0.53%	0.51%	0.95%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		8365	27223	10601	20471	4614	10104	1300	2854	9596	24283
Total number of cells having more than 3% TCH		1114	629	1347	567	72	17	59	69	189	1853
Worst affected cells having more than 3% TCH	≤ 3%	13.32%	2.31%	12.71%	2.77%	1.56%	0.17%	4.54%	2.41%	1.97%	7.63%

Live measurement results for Call drop rate and for number of cells having more than 3% TCH-October- 3 Day data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		4443328	1381857346	10150857	22932306	6516220	10084469	28288686	35186461	18757228	23349636
Total number of calls dropped		70988	25164050	202002	252742	21880	51135	167577	157308	102233	212136

Call drop rate	≤ 2%	1.60%	1.82%	1.99%	1.10%	0.34%	0.51%	0.59%	0.45%	0.55%	0.91%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		8365	81669	10601	20471	4614	10110	1300	2852	9585	24283
Total number of cells having more than 3% TCH		1044	1793	870	567	0	0	59	122	229	1875
Worst affected cells having more than 3% TCH	≤ 3%	12.48%	2.20%	8.21%	2.77%	0.00%	0.00%	4.55%	4.26%	2.39%	7.72%

Drive test results for Call drop rate (Average of three drive tests)-October - Drive Test Data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		366	484	482	510	986	508	430	402	490	402
Total		4	0	21	0	15	25	22	8	0	0

number of calls dropped											
Call drop rate	≤ 2%	1.09%	0.00%	4.36%	0.00%	1.52%	4.92%	5.12%	1.99%	0.00%	0.00%

4. Voice quality

Audit Results for Voice quality -PMR Data-October											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		18476691589	209666438751	6463	41378601120	NA	7200223011	55209886299	4596220623	30196600151	43078861461
Total number of calls with good voice quality		17488334138	200837404648	6313	39960918467	NA	7046163011	54217203478	4472530068	28119025777	41907575131
%age calls with good voice quality	≥ 95%	94.65%	95.79%	97.68%	96.57%	99.81%	97.86%	98.20%	97.31%	93.12%	97.28%

Live measurement results for Voice quality-3 Day data-October											
Voice	Benchma	Aircel(DWL)	Airtel	BSNL	Idea	Reliance	Reliance	Tata CDMA	Tata GSM	Uninor	Vodafone

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quality	rk			(Bihar & Jharkhand)		CDMA	GSM				
Total number of sample calls		624236459	20537419267	1369	4025354580	NA	593157902	67338155130	5578270610	3035605787	4161923533
Total number of calls with good voice quality		591072532	19655874838	1342	3882176497	NA	580530064	66124644557	5447413770	2825789773	4048161961
%age calls with good voice quality	≥ 95%	94.69%	95.71%	98.03%	96.44%	99.85%	97.87%	98.20%	97.65%	93.09%	97.27%

Drive test results for Voice quality (Average of three drive tests) - DT data-October											

Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		631342	545165	6418	917334	NA	206841	NA	675443	872973	629075
Total number of calls with good voice quality		579114	530184	6181	878838	NA	178151	NA	637040	803820	612374
%age calls	≥ 95%	91.73%	97.25%	96.31%	95.80%	95.81%	86.13%	93.04%	94.31%	92.08%	97.35%

with good voice quality										

5. POI Congestion

POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	798	325	78	107	19	211	19	62	57
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111557	634249	15338	234296	49780	67120	78577	10620	66949	232492
Traffic served for all POIs (B)- in erlangs		65329	393567	14211	130643	16632	13423	21422	3505	46587	117414
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

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Live Measurement Results for POI Congestion- 3 Day data-October											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	798	325	78	107	119	211	19	62	57
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111371	1915506	15538	234212	49711	67785	78577	10600	67953	237856
Traffic served for all POIs (B)- in erlangs		64816	1215794	14211	129642	17473	13726	21715	3505	47317	117963
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

10 ANNEXURE – NOVEMBER

1. Network Availability

	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Audit Results for Network Availability- PMR data-November											
Number of BTSs in the licensed service area		2802	9062	3558	6798	1543	3371	408	963	3214	8114
Sum of downtime of BTSs in a month (in hours)		110180	5184	341795	29071	4532	2130	487	928	6598	23867
BTSs accumulated downtime (not available for service)	≤ 2%	5.29%	0.08%	12.91%	0.57%	0.39%	0.08%	0.16%	0.13%	0.28%	0.40%
Number of BTSs having accumulated downtime >24 hours		810	25	1028	127	8	8	0	4	29	140

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	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Worst affected BTSs due to downtime	≤ 2%	28.91%	0.28%	28.89%	1.87%	0.52%	0.24%	0.00%	0.42%	0.90%	1.73%

Live Measurement Results for Network Availability- 3 Day live data-November											
	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Number of BTSs in the licensed service area		2802	9062	3558	6798	1543	3371	408	963	3210	8114
Sum of downtime of BTSs in a month (in hours)		10930	686	27013	2836	348	186	57	62	693	2823
BTSs accumulated downtime (not available for service)	≤ 2%	5.42%	0.11%	10.54%	0.58%	0.31%	0.08%	0.19%	0.09%	0.30%	0.48%
Number of BTSs having accumulated		0	0	99	10	0	0	0	0	0	0

downtime >24 hours											
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	2.78%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-November

CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
CSSR	≥ 95%	93.38%	98.05%	97.66%	98.46%	97.88%	96.27%	98.06%	98.61%	98.24%	99.50%

SDCCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
SDCCH/Paging channel congestion	≤ 1%	0.59%	0.94%	10.32%	0.66%	0.00%	0.88%	0.00%	0.11%	0.36%	0.28%

TCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
TCH congestion	≤ 2%	6.15%	1.22%	4.97%	0.90%	0.02%	0.08%	0.30%	0.21%	1.06%	0.50%

Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-November

CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
CSSR	≥ 95%	94.68%	97.98%	98.49%	98.67%	98.34%	96.43%	98.44%	99.06%	98.37%	99.62%

SDCCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
SDCCH/Paging channel congestion	≤ 1%	0.60%	0.96%	11.05%	0.83%	0.00%	1.50%	0.00%	0.06%	0.38%	0.22%

TCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
TCH congestion	≤ 2%	4.93%	1.19%	4.46%	0.71%	0.01%	0.08%	0.12%	0.07%	0.95%	0.38%

Drive test results for CSSR (Average of three drive tests) and blocked calls-November- Drive Test Data

CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of call attempts		515	583	435	463	636	477	409	430	289	298
Total number of successful		479	583	408	463	515	410	279	360	289	298

calls established											
CSSR	≥ 95%	93.01%	100.00%	93.79%	100.00%	80.97%	85.95%	68.22%	83.72%	100.00%	100.00%

Blocked calls	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
%age blocked calls		6.99%	0.00%	6.21%	0.00%	19.03%	14.05%	31.78%	16.28%	0.00%	0.00%

3. Connection Maintenance (Retainability)

Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Audit Results for Call drop rate and for number of cells having more than 3% TCH-November-PMR data											
Total number of calls established		130984485	555198360	34638811 21	229012696	61219574	14232967 9	17847771	25012682	187229672	227538810
Total number of calls dropped		2127075	10482198	68771356	2568756	220184	725280	148957	135450	1021945	2029537
Call drop rate	≤ 2%	1.62%	1.89%	1.99%	1.12%	0.36%	0.51%	0.83%	0.54%	0.55%	0.89%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		8387	27257	10622	20471	4629	10113	1300	2846	9648	24367
Total number of cells having more than 3% TCH		1078	644	1548	569	80	12	52	70	192	712
Worst affected cells having more than 3% TCH	≤ 3%	12.85%	2.36%	14.57%	2.78%	1.73%	0.12%	4.02%	2.46%	1.99%	2.92%

Live measurement results for Call drop rate and for number of cells having more than 3% TCH-November- 3 Day data

Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		4170576	1396408147	8396923	21399558	6703454	14971440	27139742	34279211	18965438	22232361
Total number of calls dropped		65654	27456419	166259	193185	19326	77545	146601	157286	101758	196980

Call drop rate	≤ 2%	1.57%	1.97%	1.98%	0.90%	0.29%	0.52%	0.54%	0.46%	0.54%	0.89%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		8401	81771	10622	20471	4629	10113	1300	2844	9637	24367
Total number of cells having more than 3% TCH		1033	1969	882	558	0	0	61	124	173	723
Worst affected cells having more than 3% TCH	≤ 3%	12.30%	2.41%	8.30%	2.73%	0.00%	0.00%	4.69%	4.36%	1.80%	2.97%

Drive test results for Call drop rate (Average of three drive tests)-November - Drive Test Data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		480	583	408	463	515	410	398	360	289	298
Total		16	0	39	0	53	14	40	0	0	0

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number of calls dropped											
Call drop rate	≤ 2%	3.33%	0.00%	9.56%	0.00%	10.29%	3.41%	10.05%	0.00%	0.00%	0.00%

4. Voice quality

Audit Results for Voice quality -PMR Data-November											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		1931903442 0	150836571 330	6479	403373732 76	NA	78696598 63	546520923 22	46762257 31	325864751 08	422129646 42
Total number of calls with good voice quality		183442453 61	144345300 280	6324	386888381 92	NA	76980631 81	536767064 07	45543142 83	303616436 26	410806233 32
%age calls with good voice quality	≥ 95%	94.95%	95.70%	97.61%	95.91%	99.81%	97.82%	98.22%	97.39%	93.17%	97.32%

Live measurement results for Voice quality-3 Day data-November											
Voice	Benchma	Aircel(DWL)	Airtel	BSNL	Idea	Reliance	Reliance	Tata CDMA	Tata GSM	Uninor	Vodafone

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quality	rk			(Bihar & Jharkhand)		CDMA	GSM				
Total number of sample calls		644519951	15167260576	1381	3954605623	NA	806211530	69741575870	5716537751	3264563790	4183780683
Total number of calls with good voice quality		613480252	14524261766	1353	3777649341	NA	788359318	68486349718	5581311184	3046335393	4075619598
%age calls with good voice quality	≥ 95%	95.18%	95.76%	97.97%	95.53%	99.81%	97.79%	98.20%	97.63%	93.32%	97.41%

Drive test results for Voice quality (Average of three drive tests) - DT data-November

Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		734165	1473603	1135931	876672	NA	38640	NA	656856	608854	567681
Total number of calls with good voice quality		661468	1413100	996294	847104	NA	33490	NA	618572	572142	545205
%age calls	≥ 95%	90.10%	95.89%	87.71%	96.63%	95.71%	86.67%	90.75%	94.17%	93.97%	96.04%

with good voice quality										

5. POI Congestion

Audit Results for POI Congestion- PMR data-November											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	800	319	78	104	117	210	19	62	58
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111649	434257	15538	237001	47449	67396	77092	10620	69059	229218
Traffic served for all POIs (B)- in erlangs		66732	682811	2124123	129847	16374	14168	22876	3505	49916	121467
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion- 3 Day data-November											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of working POIs		50	800	341	78	104	117	210	19	62	58
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		111649	1965163	15538	237001	48840	67304	77092	10614	69227	236956
Traffic served for all POIs (B)- in erlangs		65760	1144369	248876	129123	178669	14177	23052	3728	49181	119142
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

11 ANNEXURE – DECEMBER

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1. Network Availability

	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Audit Results for Network Availability- PMR data-December											
Number of BTSs in the licensed service area		2824	9129	3600	6795	1543	3371	408	963	3230	8253
Sum of downtime of BTSs in a month (in hours)		80050	4817	401367	29819	4961	2051	341	1131	6515	24462
BTSs accumulated downtime (not available for service)	≤ 2%	3.81%	0.07%	14.99%	0.59%	0.43%	0.08%	0.11%	0.16%	0.27%	0.40%
Number of BTSs having accumulated downtime >24 hours		642	18	994	127	25	13	0	7	32	156
Worst	≤ 2%	22.73%	0.20%	27.61%	1.87%	1.62%	0.39%	0.00%	0.73%	0.99%	1.89%

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affected BTSs due to downtime											

Live Measurement Results for Network Availability- 3 Day live data-December											
	Benchmark	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
Number of BTSs in the licensed service area		2824	9062	3600	6795	1543	3371	408	963	3231	8253
Sum of downtime of BTSs in a month (in hours)		7305	559	30101	2893	141	207	19	181	640	2442
BTSs accumulated downtime (not available for service)	≤ 2%	3.59%	0.09%	11.61%	0.59%	0.13%	0.09%	0.06%	0.26%	0.28%	0.41%
Number of BTSs having accumulated downtime		0	0	146	5	0	0	0	0	0	0

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>24 hours										
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	4.06%	0.07%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data-December											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
CSSR	≥ 95%	94.67%	98.35%	97.51%	98.32%	98.12%	95.72%	98.17%	98.60%	98.41%	99.64%

SDCCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
SDCCH/Paging channel congestion	≤ 1%	0.99%	0.95%	4.88%	0.59%	0.00%	0.96%	0.00%	0.10%	0.31%	0.11%

TCH congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
TCH congestion	≤ 2%	4.93%	1.28%	3.44%	1.06%	0.02%	0.08%	0.31%	0.22%	0.98%	0.36%

Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-December											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
CSSR	≥ 95%	95.75%	98.28%	98.65%	98.56%	98.32%	95.53%	98.32%	98.71%	98.43%	99.73%

SDCCH congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
SDCCH/Paging channel congestion	≤ 1%	0.16%	1.00%	4.70%	0.48%	0.00%	2.55%	0.00%	0.09%	0.25%	0.06%

TCH congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
TCH congestion	≤ 2%	3.84%	1.29%	3.05%	0.95%	0.01%	0.08%	0.30%	0.27%	0.94%	0.27%

Drive test results for CSSR (Average of three drive tests) and blocked calls-December- Drive Test Data											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
Total number of call		335	312	239	363	413	376	284	315	339	271

attempts											
Total number of successful calls established		323	312	215	362	358	332	267	306	332	269
CSSR	≥ 95%	96.42%	100.00%	89.96%	99.72%	86.68%	88.30%	94.01%	97.14%	97.94%	99.26%

Blocked calls	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
%age blocked calls		3.58%	0.00%	10.04%	0.28%	13.32%	11.70%	5.99%	2.86%	2.06%	0.74%

3. Connection Maintenance (Retainability)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-December-PMR data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		130170978	533115122	2465270 94	234257523	59609272	14509478 7	17717140	29322318	185388144	224486269
Total number of		2099247	10194936	3396676	2189845	169920	729843	137201	149104	972468	2014175

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calls dropped										
Call drop rate	≤ 2%	1.61%	1.91%	1.38%	0.93%	0.29%	0.50%	0.77%	0.51%	0.52%	0.90%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		8412	27461	10748	20480	4629	10113	1300	2845	9698	24785
Total number of cells having more than 3% TCH		945	653	1149	567	68	11	48	77	157	719
Worst affected cells having more than 3% TCH	≤ 3%	11.23%	2.38%	10.69%	2.77%	1.47%	0.11%	3.69%	2.71%	1.62%	2.90%

Live measurement results for Call drop rate and for number of cells having more than 3% TCH-December- 3 Day data

Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total		4033011	1186739538	1856458	21786401	6050262	13394006	23690434	33518098	17821207	20837002

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	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
number of calls established											
Total number of calls dropped		57913	21866338	28466	195971	15916	66904	123977	172771	91500	183829
Call drop rate	≤ 2%	1.44%	1.84%	1.53%	0.90%	0.26%	0.50%	0.52%	0.52%	0.51%	0.88%

Cells having more than 3% TCH	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of cells in the network		8467	82383	10748	20480	4629	10113	1300	2853	9700	24785
Total number of cells having more than 3% TCH		0	1981	816	561	0	0	49	147	147	718
Worst affected cells having more than 3% TCH	≤ 3%	0.00%	2.40%	7.59%	2.74%	0.00%	0.00%	3.80%	5.15%	1.52%	2.90%

Drive test results for Call drop rate (Average of three drive tests)-December - Drive Test Data

Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of calls established		323	312	215	362	370	332	284	306	332	268
Total number of calls dropped		14	0	18	0	28	24	25	0	0	0
Call drop rate	≤ 2%	4.33%	0.00%	8.37%	0.00%	7.57%	7.23%	8.80%	0.00%	0.00%	0.00%

4. Voice quality

Audit Results for Voice quality -PMR Data-December

Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		19937458769	11533538602	6601	42797582081	NA	8036757727	53415966606	4834516061	33294915312	42893029146
Total number of calls with		19020012847	11039530765 43	6461	41497750335	NA	7862280121	52464938956	47090881 99	31125070685	41909029091

good voice quality										
%age calls with good voice quality	≥ 95%	95.40%	95.72%	97.88%	96.96%	99.82%	97.83%	98.22%	97.41%	93.48%	97.71%

Live measurement results for Voice quality-3 Day data-December

Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
Total number of sample calls		646634536	10768829991	1362	4116251865	NA	776181967	66352786185	5637514540	3259218332	4058506178
Total number of calls with good voice quality		617228968	10318050310	1339	3995864779	NA	759317284	65167018720	5506326701	3053834594	3969503987
%age calls with good voice quality	≥ 95%	95.45%	95.81%	98.31%	97.08%	99.81%	97.83%	98.21%	97.67%	93.70%	97.81%

Drive test results for Voice quality (Average of three drive tests) - DT data-December

Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone

				d)							
Total number of sample calls		548401	639977	328476	610130	NA	139216	NA	529642	660900	469333
Total number of calls with good voice quality		513588	620951	272974	588218	NA	115878	NA	507543	609107	456712
%age calls with good voice quality	≥ 95%	93.65%	97.03%	83.10%	96.41%	92.66%	83.24%	NA	95.83%	92.16%	97.31%

5. POI Congestion

POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL (Bihar & Jharkhand)	Idea	Reliance CDMA	Reliance GSM	Tata CDMA	Tata GSM	Uninor	Vodafone
				Audit Results for POI Congestion- PMR data-December							
Total number of working POIs		50	805	345	78	106	145	210	19	62	57
No. of POIs not		0	0	0	0	0	0	0	0	0	0

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meeting benchmark											
Total Capacity of all POIs (A) - in erlangs		112873	380756	15538	242387	49729	80055	76518	10585	69814	237136
Traffic served for all POIs (B)- in erlangs		65909	675324	2432984	132947	17678	23581	21809	3555	48451	118117
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Live Measurement Results for POI Congestion- 3 Day data-December											
POI congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL (Bihar & Jharkhand)**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**Tata CDMA**	**Tata GSM**	**Uninor**	**Vodafone**
Total number of working POIs		50	805	346	78	106	145	209	19	62	57
No. of POIs not meeting benchmark		0	NA	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A)		112791	2157697	15538	237001	49774	79394	76518	10604	69956	237140

- in erlangs											
Traffic served for all POIs (B)- in erlangs		64077	1174024	227661	128172	17485	23440	21809	3421	47095	113242
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

12 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.   OND'14 – Refers to the quarter of October, November and December 2014
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