TRAI Audit Wireless Report for Bihar & Jharkhand Circle

QE March 2016

EAST ZONE

Prepared by:

IMRB | eTech

Submitted to:

TRAI
Telecom Regulatory Authority of India

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2 INTRODUCTION

2.1 ABOUT TRAI

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

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

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

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

2.2 OBJECTIVES

The primary objective of the Audit module is to-

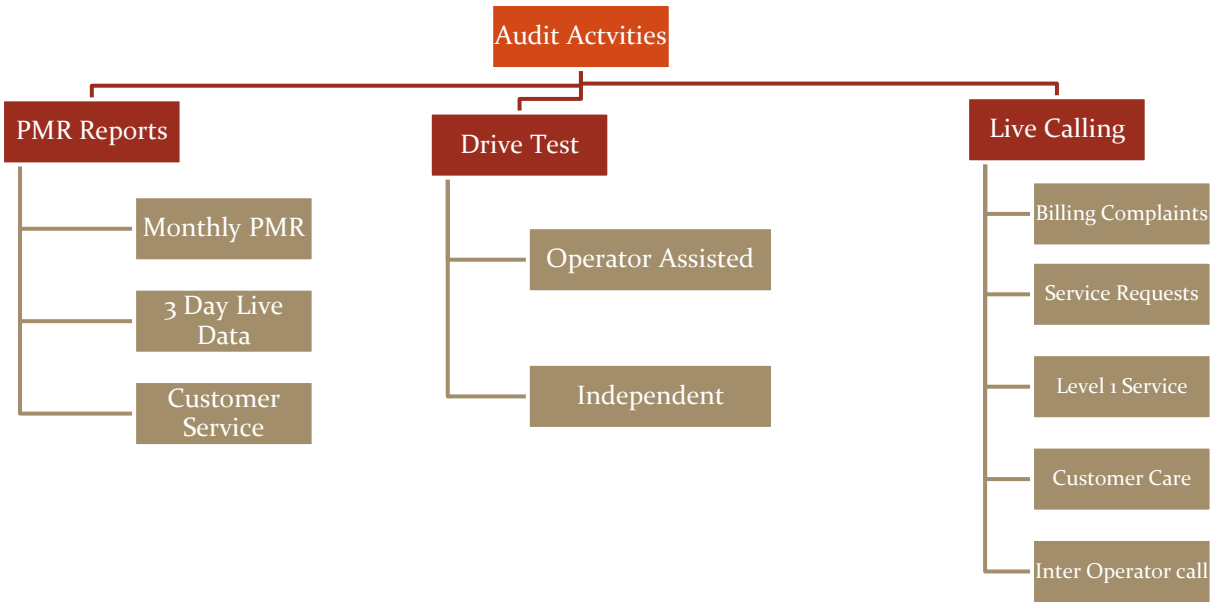
- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).
- This report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

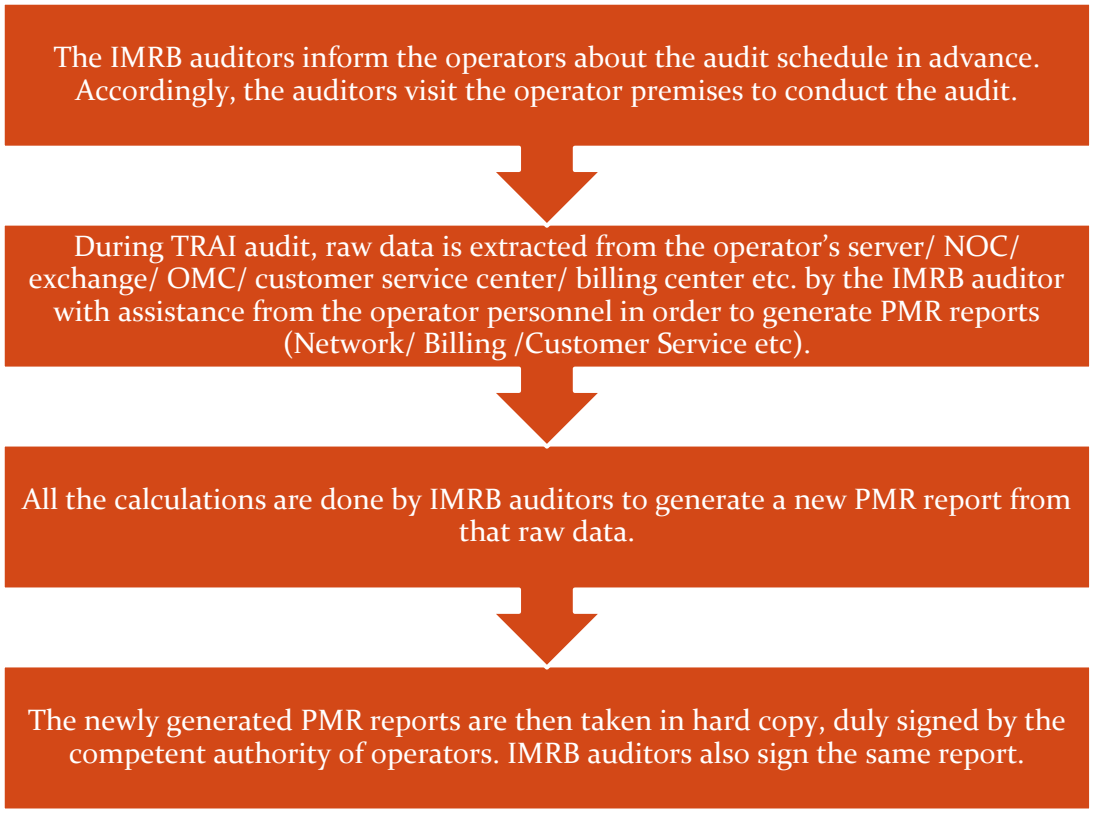


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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 PMR report for network parameters is taken for each month of the audit quarter and is extracted and verified in the first week of the subsequent month of the audit month. For example, January 2016 audit data was collected in the month of February 2016.

The PMR report for customer service parameters is extracted from Customer Service Center and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending March 2016 (JFM'16) was collected in the month of January 2016.

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

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

Let us understand these formats in detail.

2.4.1.2 MONTHLY PMR 2G

This involved calculation of the various 2G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of January, February and March 2016. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

Network Availability

- BTS accumulated downtime
- Worst affected BTS due to downtime

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good voice quality

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

2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

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

Network Related

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

2.4.1.4 MONTHLY PMR 3G

This involved calculation of the various 3G Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the IMRB representative with the assistance of the operator at the operator's premises for the month of January, February and March 2016. The performance of operators on various parameters was assessed against the benchmarks. Parameters include-

Network Availability

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

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good Circuit Switched Voice Quality

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

2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

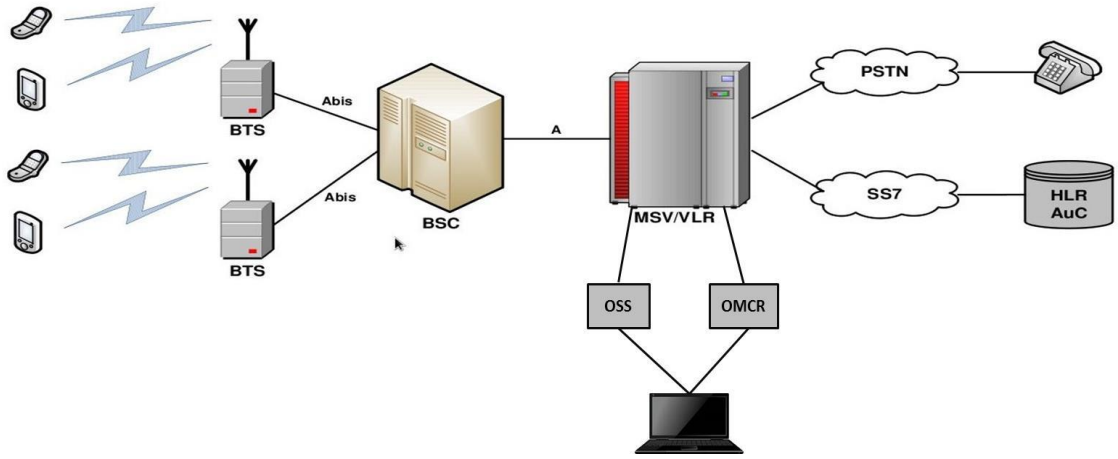
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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

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

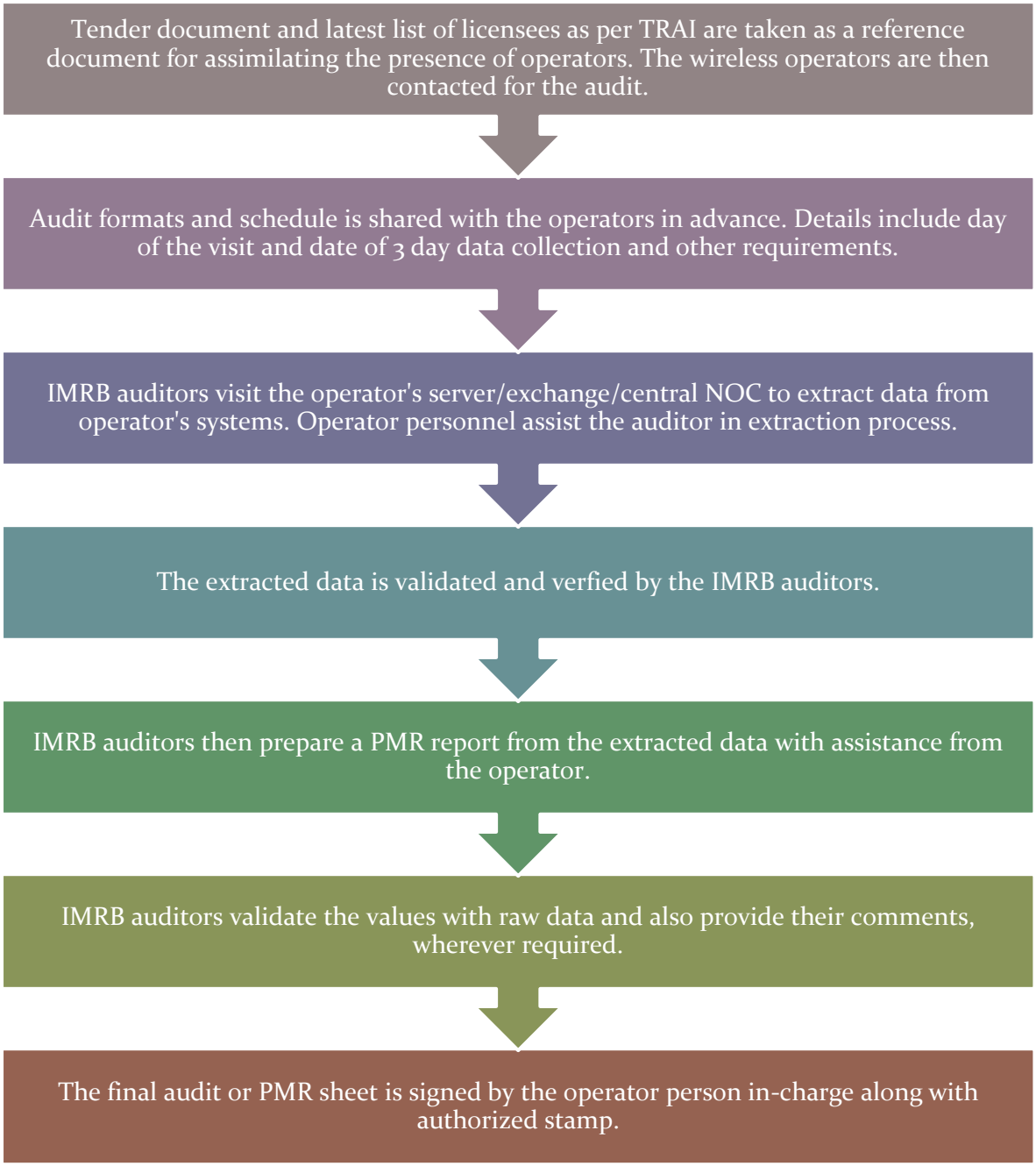
2.4.1.8 POINT OF DATA EXTRACTION

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



2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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



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

2.4.1.10 CALCULATION METHODOLOGY – NETWORK PARAMETERS 2G

Parameter	Calculation Methodology
BTS Accumulated Downtime	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month / (24 x Number of days in a month x Number of BTSs in the network in licensed service area) x 100
Worst Affected BTS Due to Downtime	(Number of BTSs having accumulated downtime greater than 24 hours in a month / Number of BTS in Licensed Service Area) * 100
Call Setup Success Rate	(Calls Established / Total Call Attempts) * 100
SDCCH/ Paging Channel Congestion	SDCCH / TCH Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = Number of attempts to establish SDCCH / TCH made on day 1 C1 = Average SDCCH / TCH Congestion % on day 1 A2 = Number of attempts to establish SDCCH / TCH made on day 2 C2 = Average SDCCH / TCH Congestion % on day 2 An = Number of attempts to establish SDCCH / TCH made on day n Cn = Average SDCCH / TCH Congestion % on day n
TCH Congestion	
POI Congestion	POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = POI traffic offered on all POIs (no. of calls) on day 1 C1 = Average POI Congestion % on day 1 A2 = POI traffic offered on all POIs (no. of calls) on day 2 C2 = Average POI Congestion % on day 2 An = POI traffic offered on all POIs (no. of calls) on day n Cn = Average POI Congestion % on day n
Call Drop Rate	Total Calls Dropped / Total Calls Established x 100
Worst Affected Cells having more than 3% TCH drop	Total number of cells having more than 3% TCH drop during CBBH/ Total number of cells in the LSA x 100
Connections with good voice quality	No. of voice samples with good voice quality / Total number of samples x 100

2.4.1.11 CALCULATION METHODOLOGY – NETWORK PARAMETERS 3G

Parameter	Calculation Methodology
Node Bs Accumulated Downtime	Sum of downtime of Node Bs in a month in hours i.e. total outage time of all Node Bs in hours during a month / (24 x Number of days in a month x Number of Node Bs in the network in licensed service area) x 100
Worst Affected Node Bs Due to Downtime	(Number of Node Bs having accumulated downtime greater than 24 hours in a month / Number of Node B in Licensed Service Area) * 100
Call Setup Success Rate	(RRC Established / Total RRC Attempts) * 100
RRC Congestion	RRC / RAB Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = Number of attempts to establish RRC/ RAB made on day 1 C1 = Average RRC/ RAB Congestion % on day 1 A2 = Number of attempts to establish RRC/ RAB made on day 2 C2 = Average RRC/ RAB Congestion % on day 2 An = Number of attempts to establish RRC/ RAB made on day n Cn = Average RRC/ RAB Congestion % on day n
Circuit Switched RAB Congestion	
POI Congestion	POI Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An) Where: A1 = POI traffic offered on all POIs (no. of calls) on day 1 C1 = Average POI Congestion % on day 1 A2 = POI traffic offered on all POIs (no. of calls) on day 2 C2 = Average POI Congestion % on day 2 An = POI traffic offered on all POIs (no. of calls) on day n Cn = Average POI Congestion % on day n
Circuit Switched Voice Drop Rate	No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released) x 100
Worst Affected Cells having more than 3% Circuit Switched Voice Drop Rate	Number of cells having CSV drop rate > 3% during CBBH in a month / Total number of cells in the licensed area) x 100
Connections with good Circuit switched voice quality	1- (Number of Faulty Transport Blocks In Uplink downlink After Selection Combining Speech / Total number of Transport Blocks In Uplink downlink After Selection Combining Speech)) x 100

2.4.1.12 3 DAY LIVE DATA

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

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

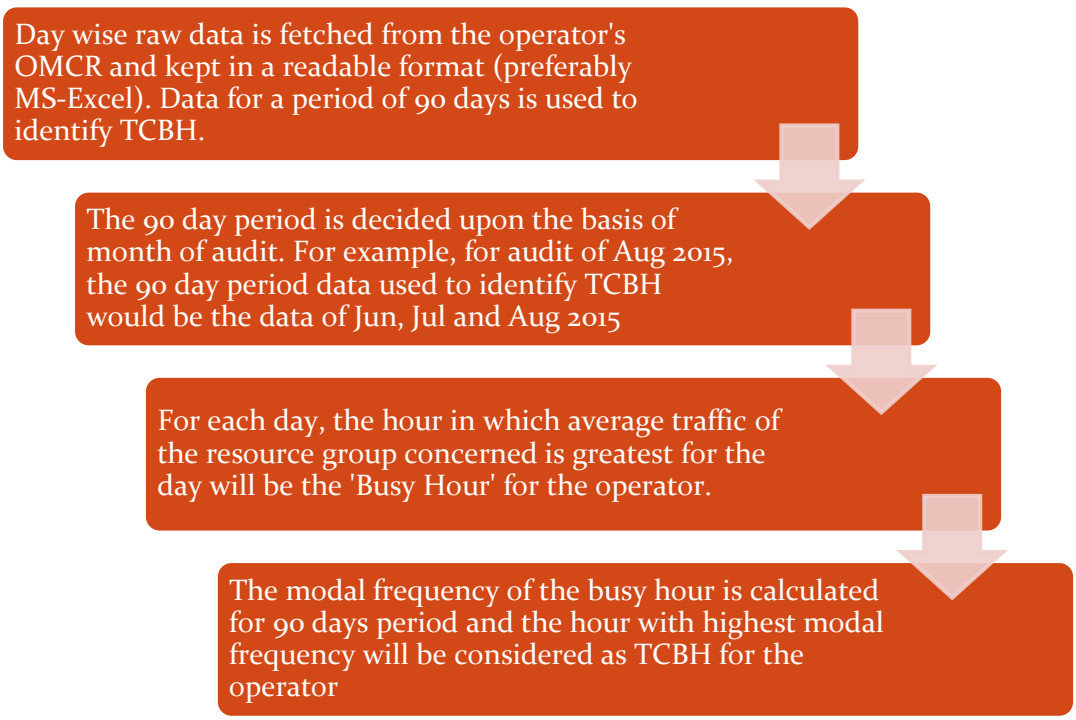
Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar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

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

2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

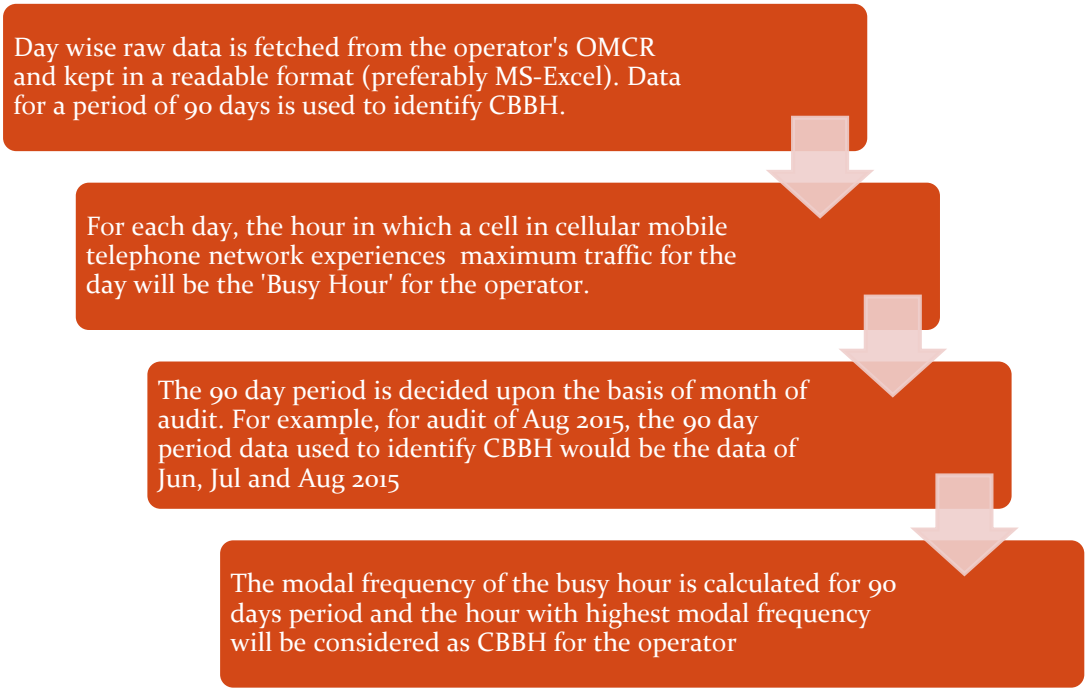
Step by step procedure to identify TCBH for an operator:



2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify CBBH for an operator:



2.4.1.15 CUSTOMER SERVICE PARAMETERS

The data to generate PMR report for customer service parameters is extracted at the operator premises and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending March 2016 (JFM'16) was collected in the month of January 2016. To extract the data for customer service parameters for the purpose of audit, IMRB auditors primarily visit the following locations/ departments/ offices at the operator's end.

- Central Billing Center
- Central Customer Service Center

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

The Customer Service Quality Parameters include the following:

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

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

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

2.4.1.16 AUDIT PARAMETERS – CUSTOMER SERVICE

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

2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

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

2.4.2 LIVE CALLING

2.4.2.1 SIGNIFICANCE AND METHODOLOGY

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

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 March 2016. The data considered for live calling was for the month prior to the month in which the live calling activity was being conducted. In this case, data of February 2016 was considered for live calling activity conducted in March 2016.

A detailed explanation of each parameter is explained below.

2.4.2.2 BILLING COMPLAINTS

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

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

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

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

TRAI benchmark-

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

2.4.2.3 SERVICE COMPLAINTS REQUESTS

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

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

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

2.4.2.4 LEVEL 1 SERVICE

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

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

In JFM'16, IMRB has tried contacting the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

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

- Post verifying the list, auditors do live calling by equally distributing the calls among the various numbers and update the results in the live calling sheet.

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

2.4.2.5 CUSTOMER CARE

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

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

The process for this parameter is stated below.

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

2.4.2.6 INTER OPERATOR CALL ASSESEMENT

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

2.4.3 VOICE DRIVE TEST – 2G & 3G

2.4.3.1 SIGNIFICANCE AND METHODOLOGY

Drive test, as the name suggests, is conducted to measure the performance of an operator in a moving vehicle in a specified network coverage area.
The main purpose of the drive test is to check the health of the mobile network of various operators in the area in terms of coverage (signal strength), voice quality, call drop rate, call set up success rate etc.

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

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test (No IDT conducted in JFM'16)

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

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

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

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

1. Normal SSA
2. Difficult SSA

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

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

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

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

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

2.4.3.3 INDEPENDENT DRIVE TEST – 2G & 3G

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

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

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

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

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

2.4.4 WIRELESS DATA DRIVE TEST – 2G & 3G

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

2.4.4.1 METHODOLOGY

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

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

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

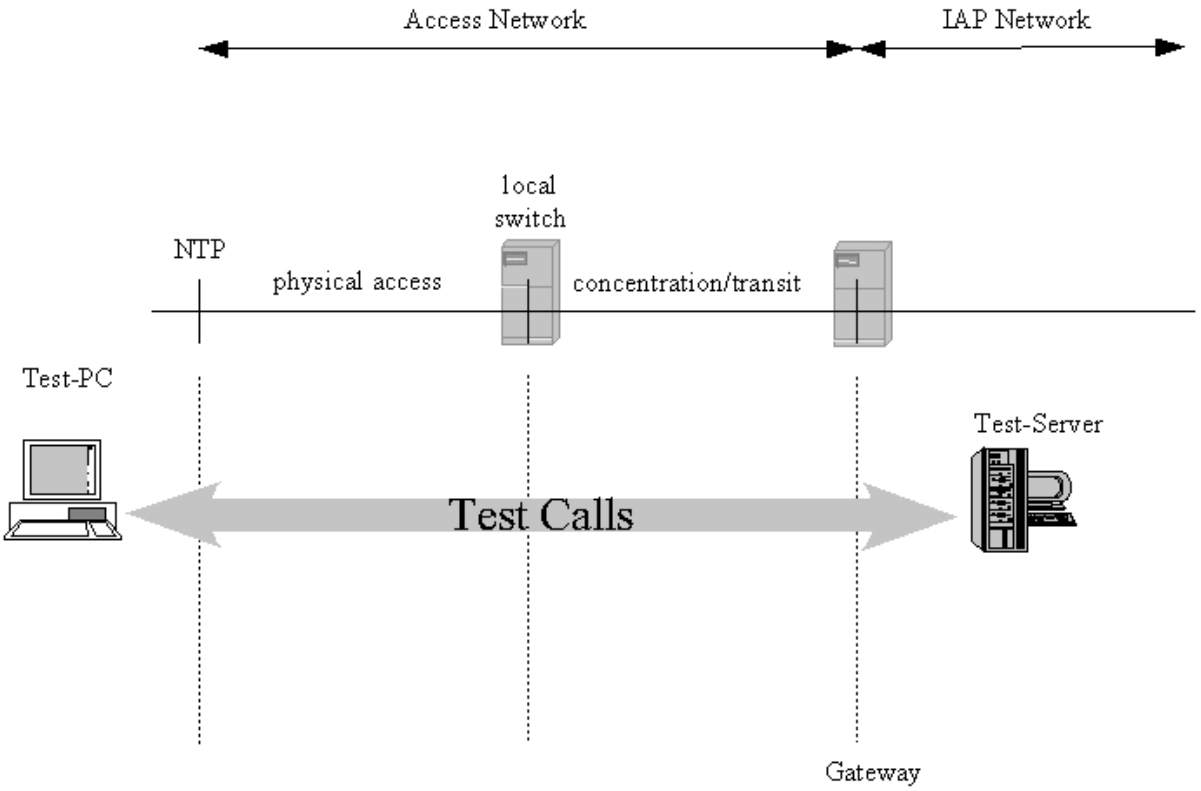


Figure for Measurement set-up

2.4.4.2 REQUIREMENTS FOR THE TEST-SERVER

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

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

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

- Maximum Segment Size between 1380 Bytes and 1460 Bytes.
- TCP RX Window Size > 4096 Bytes
- SACK (Selective Acknowledgement) enabled.
- TCP Fast Retransmit.
- TCP Fast Recovery enabled.
- Delayed ACK enabled (200ms).

2.4.4.3 TEST FILES

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

2.4.4.4 REPRESENTATIVENESS OR NUMBER OF TEST CALLS

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

2.4.4.5 PARAMETERS EVALUATED DURING DATA DRIVE TEST AT HOTSPOTS

2.4.4.5.1 SUCCESSFUL DATA TRANSMISSIONS DOWNLOAD ATTEMPTS

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

Measurement:

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

Successful data transmission download attempts =

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

2.4.4.5.2 SUCCESSFUL DATA TRANSMISSION UPLOAD ATTEMPTS

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

Measurement:

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

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

2.4.4.5.3 MINIMUM DOWNLOAD SPEED

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

Measurement:

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

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

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

Note- A1, A2, A3, A4 A5 & A6 are download speeds at 6 hotspots

2.4.4.5.4 AVERAGE THROUGHPUT FOR PACKET DATA

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

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

Measurement:

The average throughput for packet data should be calculated from all the test calls made according to the measurement setup.
Test calls are made to weigh the results according to the patterns of real traffic. Average throughput is calculated as the average of all such test calls.

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

2.4.4.5.5 LATENCY

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

Measurement:

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

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

2.5 OPERATORS COVERED 2G AND 3G

Name of Operator	Number of Subscriber as per VLR-2G
Aircel(DWL)	5660047
Airtel	26883216
BSNL Bihar/Jharkand	1718095
Idea	11468918
Reliance CDMA	1575061
Reliance GSM	No Service
TATA CDMA	178311
TATA GSM	951509
Telenor	6549452
Vodafone	10190128
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel 3G	370362
Airtel 3G	1011048
BSNL Bihar/Jharkand 3G	NDR

March'16 VLR data was considered for the number of subscribers.

2.6 COLOUR CODES TO READ THE REPORT

Not Meeting the benchmark

Best Performing Operator

3 EXECUTIVE SUMMARY-2G

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

3.1 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 2G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel(DWL)	1.21%	11.51%	84.52%	2.07%	15.13%	1.89%	14.65%	95.03%
Airtel	0.05%	0.13%	95.43%	0.77%	1.30%	1.63%	2.22%	95.79%
BSNL Bihar/Jharkand	1.88%	1.90%	92.41%	2.95%	1.37%	1.09%	6.55%	96.61%
Idea	0.54%	1.65%	96.20%	0.82%	1.86%	0.88%	2.69%	96.47%
Reliance CDMA	0.24%	1.39%	96.93%	NA	0.84%	0.19%	0.56%	97.24%
TATA CDMA	0.17%	0.00%	97.83%	NA	0.51%	0.36%	1.60%	98.25%
TATA GSM	0.10%	0.00%	97.86%	0.25%	0.70%	0.52%	2.51%	97.47%
Telenor	0.27%	0.60%	92.65%	1.66%	5.99%	0.96%	4.33%	94.75%
Vodafone	0.35%	1.27%	99.20%	0.47%	0.80%	0.73%	2.76%	97.89%

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 for Bihar & Jharkhand circle:

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.05%.

Worst Affected BTSs Due to Downtime:

Aircel failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for TATA GSM & CDMA at 0.00%.

Call Set-up Success Rate (CSSR):

Aircel, BSNL and Telenor failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.20%.

SDCCH/ Paging Chl. Congestion:

Aircel, BSNL and Telenor failed to meet the benchmark on SDCCH / Paging Channel Congestion. TATA GSM recorded the best SDCCH / Paging Channel Congestion

TCH Congestion:

Aircel and Telenor failed to meet the benchmark for TCH congestion, while TATA CDMA performed the best on TCH congestion.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Reliance CDM at 0.19%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel, Telenor and BSNL failed to meet the benchmark. Best performance was recorded for Reliance CDMA at 0.56%.

Voice Quality

Telenor failed to meet the benchmark. Best performance was recorded for TATA CDMA at 98.25%.

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

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

3.1.1 PMR DATA - JANUARY FOR 2G

January PMR								
Name of Service Provider Month January	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)	0.04%	14.11%	84.70%	1.51%	14.51%	1.77%	13.21%	95.05%
Airtel	0.05%	0.15%	95.43%	0.79%	1.33%	1.67%	2.33%	95.72%
BSNL Bihar/Jharkand	1.98%	1.82%	96.46%	8.22%	2.60%	1.48%	13.17%	96.80%
Idea	0.51%	1.28%	96.31%	0.73%	1.86%	0.91%	2.72%	96.30%
Reliance CDMA	0.32%	1.78%	96.90%	NA	0.87%	0.16%	0.44%	97.47%
Reliance GSM	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
TATA CDMA	0.18%	0.00%	97.53%	NA	0.67%	0.36%	1.17%	98.25%
TATA GSM	0.09%	0.00%	97.98%	0.20%	0.50%	0.52%	2.34%	97.52%
Telenor	0.19%	0.03%	91.95%	1.27%	6.53%	0.62%	1.24%	94.84%
Vodafone	0.32%	1.21%	99.20%	0.43%	0.80%	0.74%	2.77%	97.71%

3.1.2 PMR DATA – FEBRUARY FOR 2G

February PMR								
Name of Service Provider Month February	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)	1.82%	9.61%	84.51%	2.16%	15.67%	2.00%	15.57%	95.00%
Airtel	0.05%	0.13%	95.44%	0.74%	1.29%	1.71%	2.20%	95.73%
BSNL Bihar/Jharkand	1.95%	1.89%	96.14%	0.15%	0.09%	1.46%	6.86%	96.43%
Idea	0.51%	1.79%	96.17%	0.82%	1.92%	0.88%	2.67%	96.48%
Reliance CDMA	0.20%	1.39%	96.82%	NA	0.87%	0.22%	0.66%	97.38%
Reliance GSM	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
TATA CDMA	0.16%	0.00%	98.06%	NA	0.33%	0.35%	1.86%	98.25%
TATA GSM	0.11%	0.00%	97.80%	0.28%	0.80%	0.52%	2.60%	97.45%
Telenor	0.31%	0.76%	92.45%	2.19%	6.11%	1.01%	5.17%	94.73%
Vodafone	0.32%	1.32%	99.21%	0.46%	0.79%	0.74%	2.75%	97.93%

3.1.3 PMR DATA - MARCH FOR 2G

March PMR								
Name of Service Provider Month March	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)	1.81%	10.85%	84.33%	2.55%	15.22%	1.91%	15.20%	95.03%
Airtel	0.05%	0.12%	95.43%	0.79%	1.27%	1.52%	2.14%	95.91%
BSNL Bihar/Jharkand	1.83%	1.94%	84.64%	0.47%	1.42%	0.95%	2.73%	NDR
Idea	0.62%	1.86%	96.12%	0.92%	1.80%	0.85%	2.67%	96.62%
Reliance CDMA	0.18%	0.79%	97.06%	NA	0.79%	0.19%	0.63%	96.45%
Reliance GSM	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
TATA CDMA	0.17%	0.00%	97.91%	NA	0.53%	0.36%	1.77%	98.25%
TATA GSM	0.10%	0.00%	97.80%	0.28%	0.80%	0.52%	2.60%	97.45%
Telenor	0.31%	0.94%	93.56%	1.51%	5.33%	1.18%	6.22%	94.70%
Vodafone	0.41%	1.28%	99.20%	0.52%	0.80%	0.72%	2.75%	98.02%

3.2 3 DAY DATA – CONSOLIDATED FOR 2G

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

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel(DWL)	1.23%	0.00%	85.29%	1.84%	14.60%	1.85%	14.04%	95.03%
Airtel	0.05%	0.01%	95.46%	0.76%	1.28%	1.69%	2.31%	95.80%
BSNL Bihar/Jharkand	1.07%	1.15%	92.74%	3.37%	1.53%	1.01%	7.21%	95.50%
Idea	0.64%	0.03%	97.11%	0.90%	2.02%	0.97%	2.59%	96.62%
Reliance CDMA	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue
TATA CDMA	0.22%	0.00%	98.11%	NA	0.68%	0.31%	2.19%	98.25%
TATA GSM	0.14%	0.00%	98.41%	0.16%	0.22%	0.47%	0.11%	97.47%
Telenor	0.31%	0.32%	92.28%	2.18%	6.42%	1.16%	5.93%	94.70%
Vodafone	0.47%	0.00%	99.58%	0.48%	0.42%	0.65%	2.75%	97.89%

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

BTSs Accumulated Downtime:

All operators met the benchmark. Minimum BTS Accumulated downtime was recorded for Airtel at 0.05%.

Worst Affected BTSs Due to Downtime:

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

Call Set-up Success Rate (CSSR):

Aircel, BSNL and Telenor failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.58%.

SDCCH/ Paging Chl. Congestion:

Aircel, BSNL and Telenor failed to meet the benchmark on SDCCH / Paging Channel Congestion. TATA GSM recorded the best SDCCH / Paging Channel Congestion

TCH Congestion:

Aircel, Idea and Telenor failed to meet the benchmark for TCH congestion, while TATA GSM performed the best on TCH congestion.

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Tata CDMA at 0.31%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel, Telenor and BSNL failed to meet the benchmark. Best performance was recorded for Tata GSM at 0.11%.

Voice Quality

Telenor failed to meet the benchmark. Best performance was recorded for Vodafone at 98.33%.

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

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

3.2.1 3 DAY DATA - JANUARY FOR 2G

January 3 Day								
Name of Service Provider 3 Day January	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)	0.04%	0.00%	86.65%	0.98%	12.99%	1.70%	12.34%	95.10%
Airtel	0.07%	0.00%	95.46%	0.79%	1.35%	1.65%	2.38%	95.78%
BSNL Bihar/Jharkand	0.94%	1.82%	95.95%	9.49%	3.09%	1.71%	18.69%	95.79%
Idea	0.82%	0.00%	97.48%	0.79%	1.85%	1.04%	2.65%	96.32%
Reliance CDMA	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue
Reliance GSM	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
TATA CDMA	0.22%	0.00%	98.29%	NA	0.27%	0.31%	2.22%	98.25%
TATA GSM	0.23%	0.00%	98.58%	0.19%	0.25%	0.49%	0.10%	97.65%
Telenor	0.25%	0.00%	92.60%	3.06%	5.87%	1.07%	5.12%	95.02%
Vodafone	0.44%	0.00%	99.55%	0.53%	0.45%	0.69%	2.78%	98.06%

3.2.2 3 DAY DATA – FEBRUARY FOR 2G

February 3 Day								
Name of Service Provider 3 Day February	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)	1.95%	0.00%	84.36%	1.62%	16.48%	1.91%	15.71%	94.99%
Airtel	0.03%	0.03%	95.41%	0.73%	1.27%	1.72%	2.28%	95.79%
BSNL Bihar/Jharkand	0.70%	1.28%	95.97%	0.11%	0.09%	0.79%	6.34%	95.19%
Idea	0.53%	0.01%	96.34%	0.99%	2.69%	0.92%	2.56%	96.70%
Reliance CDMA	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue	Server issue
Reliance GSM	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
TATA CDMA	0.17%	0.00%	98.26%	NA	1.64%	0.33%	2.31%	98.25%
TATA GSM	0.10%	0.00%	98.33%	0.14%	0.21%	0.46%	0.11%	97.75%
Telenor	0.33%	0.00%	91.72%	1.70%	7.28%	1.27%	6.35%	94.57%
Vodafone	0.37%	0.00%	99.61%	0.49%	0.39%	0.61%	2.76%	98.44%

3.2.3 3 DAY DATA - MARCH FOR 2G

March PMR								
Name of Service Provider Month March	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)	1.81%	10.85%	84.33%	2.55%	15.22%	1.91%	15.20%	95.03%
Airtel	0.05%	0.12%	95.43%	0.79%	1.27%	1.52%	2.14%	95.91%
BSNL Bihar/Jharkand	1.83%	1.94%	84.64%	0.47%	1.42%	0.95%	2.73%	NDR
Idea	0.62%	1.86%	96.12%	0.92%	1.80%	0.85%	2.67%	96.62%
Reliance CDMA	0.18%	0.79%	97.06%	NA	0.79%	0.19%	0.63%	96.45%
Reliance GSM	No Service	No Service	No Service	No Service	No Service	No Service	No Service	No Service
TATA CDMA	0.17%	0.00%	97.91%	NA	0.53%	0.36%	1.77%	98.25%
TATA GSM	0.10%	0.00%	97.80%	0.28%	0.80%	0.52%	2.60%	97.45%
Telenor	0.31%	0.94%	93.56%	1.51%	5.33%	1.18%	6.22%	94.70%
Vodafone	0.41%	1.28%	99.20%	0.52%	0.80%	0.72%	2.75%	98.02%

3.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit Switched voice drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.39%	7.80%	88.93%	1.09%	1.24%	0.96%	9.16%	98.98%
Airtel 3G	0.02%	0.37%	99.27%	0.10%	0.69%	0.65%	2.56%	99.25%
BSNL Bihar/Jharkand 3G	0.82%	0.85%	92.89%	3.46%	0.96%	1.78%	3.74%	95.92%

Following are the parameter wise observations for wireless operators for Bihar & Jharkhand circle:

Node Bs downtime:

All operators met the benchmark for Node Bs downtime.

Worst affected Node Bs due to downtime:

Aircel failed to meet the benchmark for worst affected Node Bs due to downtime.

Call Set-up Success Rate (CSSR):

Aircel and BSNL failed to meet the benchmark for CSSR.

RRC Congestion:

Aircel and BSNL failed to meet the TRAI benchmark for RRC Congestion.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for Circuit Switched RAB Congestion.

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for Circuit Switched Voice Call Drop Rate.

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

Aircel and BSNL failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate

Circuit Switch Voice Quality:

All operators met the benchmark for Circuit Switch Voice Quality.

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

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

3.3.1 PMR DATA - JANUARY FOR 3G

January PMR 3G								
Name of Service Provider Month January	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit switched voice drop rate	Worst affected cells having more than 3% Circuit switched voice drop	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.23%	8.54%	76.55%	2.02%	1.83%	1.23%	11.77%	99.08%
Airtel 3G	0.01%	0.82%	99.65%	0.25%	1.66%	0.80%	2.60%	99.22%
BSNL Bihar/Jharkand 3G	1.01%	1.08%	93.32%	4.24%	1.02%	1.57%	3.70%	95.83%

3.3.2 PMR DATA – FEBRUARY FOR 3G

February PMR 3G								
Name of Service Provider Month February	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit switched voice drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.05%	6.18%	92.65%	0.91%	1.48%	0.93%	9.15%	98.89%
Airtel 3G	0.03%	0.10%	98.81%	0.03%	0.30%	NA	2.77%	98.91%
BSNL Bihar/Jharkand 3G	1.00%	1.01%	92.85%	0.06%	0.01%	1.88%	3.97%	96.00%

3.3.3 PMR DATA - MARCH FOR 3G

March PMR 3G								
Name of Service Provider Month March	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit switched voice drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.81%	8.66%	97.59%	0.35%	0.42%	0.79%	7.08%	98.97%
Airtel 3G	0.02%	0.06%	99.35%	0.02%	0.11%	0.65%	2.35%	99.63%
BSNL Bihar/Jharkand 3G	0.00%	0.00%	92.49%	6.09%	1.84%	1.88%	3.31%	NA

3.4 3 DAY DATA – CONSOLIDATED FOR 3G

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

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit Switched voice drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.60%	0.00%	87.99%	1.48%	1.53%	1.08%	8.01%	99.38%
Airtel 3G	0.16%	0.31%	99.00%	0.03%	0.68%	0.68%	2.52%	99.29%
BSNL Bihar/Jharkand 3G	0.41%	0.85%	93.39%	2.90%	0.70%	1.35%	3.86%	95.92%

Node Bs downtime:

All operators met the benchmark for Node Bs downtime.

Worst affected Node Bs due to downtime:

All operators met the benchmark for worst affected Node Bs due to downtime.

Call Set-up Success Rate (CSSR):

Aircel and BSNL failed to meet the benchmark for CSSR.

RRC Congestion:

Aircel and BSNL failed to meet the TRAI benchmark for RRC Congestion.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for Circuit Switched RAB Congestion.

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for Circuit Switched Voice Call Drop Rate.

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

Aircel and BSNL failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate

Circuit Switch Voice Quality:

All operators met the benchmark for Circuit Switch Voice Quality.

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

3.4.1 3 DAY DATA - JANUARY FOR 3G

January 3 Day 3G								
Name of Service Provider 3 Day January	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit switched voice drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.39%	0.00%	74.00%	3.60%	2.60%	1.55%	11.25%	99.55%
Airtel 3G	0.19%	0.72%	99.22%	0.09%	1.89%	0.86%	1.65%	99.60%
BSNL Bihar/Jharkand 3G	0.48%	1.08%	94.41%	3.18%	0.63%	0.74%	3.61%	95.83%

3.4.2 3 DAY DATA – FEBRUARY FOR 3G

February 3 Day 3G								
Name of Service Provider 3 Day February	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit switched voice drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	1.16%	0.00%	91.89%	0.40%	1.77%	0.86%	6.55%	98.96%
Airtel 3G	0.25%	0.06%	98.44%	0.00%	0.12%	NA	2.58%	98.63%
BSNL Bihar/Jharkand 3G	0.53%	1.01%	92.37%	0.07%	0.01%	1.78%	4.01%	96.00%

3.4.3 3 DAY DATA - MARCH FOR 3G

March 3 Day 3G								
Name of Service Provider 3 Day March	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Circuit switched voice drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel 3G	2.14%	0.00%	98.08%	0.44%	0.23%	0.98%	6.81%	98.98%
Airtel 3G	0.02%	0.00%	99.33%	0.01%	0.03%	0.65%	2.60%	99.63%
BSNL Bihar/Jharkand 3G	0.00%	0.00%	93.39%	5.44%	1.45%	1.47%	4.09%	NA

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel(DWL)	99.99%	99.50%	1.11%	NDR	99.97%	1.14%
Airtel	100.00%	NDR	NDR	NDR	NDR	NDR
BSNL Bihar/Jharkand	NDR	96.06%	NDR	NDR	96.28%	NDR
Idea	99.99%	98.77%	1.33%	NDR	98.06%	1.57%
Reliance CDMA	NDR	NDR	NDR	NDR	98.93%	1.44%
TATA CDMA	97.83%	NDR	NDR	100.00%	NDR	NDR
TATA GSM	100.00%	99.35%	1.89%	100.00%	99.95%	1.63%
Telenor	92.73%	98.56%	0.69%	95.44%	99.63%	1.12%
Vodafone	99.90%	99.01%	3.53%	NDR	NDR	NDR

NDR: - No Data Received

Following are the parameter wise observations for wireless operators for Bihar & Jharkhand circle:

Activation done within 4 hours:

Telenor failed to meet the benchmark for Activation done within 4 hours in PMR audit.

PDP Context activation success rate:

All operators met the benchmark for PDP Context activation success rate in monthly as well as live.

Drop Rate:

All operators met the benchmark for Drop Rate in monthly as well as live.

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel 3G	99.99%	99.50%	1.14%	NDR	99.97%	1.19%
Airtel 3G	NDR	92.80%	6.04%	NDR	NDR	NDR
BSNL Bihar/Jharkand 3G	NDR	95.11%	8.23%	NDR	96.27%	8.49%

Following are the parameter wise observations for wireless operators for Bihar & Jharkhand circle:

Activation done within 4 hours:

All operators met the benchmark for Activation done within 4 hours in monthly as well as live.

PDP Context activation success rate:

Airtel failed to meet the benchmark for PDP Context activation success rate in PMR audit.

Drop Rate:

Airtel 3G and BSNL 3G failed to meet the benchmark for Drop Rate in PMR and BSNL failed in live audit

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

3.7 LIVE CALLING DATA - CONSOLIDATED

Name of Service Provider	Metering and Billing		Response time to customer for assistance		Level 1 Service	Service Requests
	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to	Call answered	Complaint /Request attended to Satisfaction
Benchmark	98%	100%	≥ 95%	≥ 95%	≥ 95%	
Aircel(DWL)	88.00%	92.00%	100.00%	97.00%	85.00%	88.00%
Airtel	84.00%	0.00%	100.00%	93.00%	89.00%	84.00%
BSNL Bihar/Jharkand	78.00%	80.00%	100.00%	95.00%	86.33%	NA
Idea	80.00%	80.00%	100.00%	97.00%	85.33%	79.00%
Reliance CDMA	83.00%	87.00%	100.00%	100.00%	86.00%	76.00%
TATA CDMA	71.00%	75.00%	100.00%	98.00%	75.33%	76.00%
TATA GSM	73.33%	73.33%	100.00%	100.00%	86.67%	70.00%
Telenor	90.00%	90.00%	100.00%	100.00%	79.33%	NA
Vodafone	90.00%	90.00%	100.00%	98.00%	77.33%	88.00%

Resolution of billing complaints

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

Accessibility of Call Centre/Customer Care-IVR

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

Customer Care / Helpline Assessment (voice to voice)

Airtel failed to meet the benchmark for Customer Care / Helpline Assessment (voice to voice).

Level 1 Service

As per the live calling results all operators failed to meet the TRAI benchmark for level 1 service with calls being answered. The details of live calling done for the level 1 service have been provided in the annexure for each operator.

Complaint/Request Attended to Satisfaction

All operators performed satisfactorily in terms of satisfaction of the customers for service requests. Vodafone and Aircel recorded the best performance at 88%.

3.8 BILLING AND CUSTOMER CARE - CONSOLIDATED

Name of Service Provider	Metering and billing credibility		Billing Complaints		Response time to customer for assistance	Customer care	
	Postpaid Subscribers	Prepaid Subscribers	% of complaints resolved in 4 weeks	% of complaints resolved in 6 weeks	% of cases where credit/wavier is received within one week	Percentage of calls answered by the IVR	Percentage of calls answered by the operators (voice to
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel(DWL)	0.00%	0.06%	100.00%	100.00%	100.00%	93.18%	96.43%
Airtel	0.08%	0.01%	100.00%	100.00%	100.00%	99.28%	85.99%
BSNL Bihar/Jharkand	0.08%	0.00%	100.00%	100.00%	100.00%	92.98%	95.08%
Idea	0.18%	0.02%	100.00%	100.00%	100.00%	98.46%	99.92%
Reliance CDMA	0.07%	0.03%	100.00%	100.00%	100.00%	99.76%	95.49%
TATA CDMA	0.00%	0.00%	NA	NA	100.00%	NA	99.79%
TATA GSM	0.00%	0.00%	NA	NA	100.00%	95.60%	95.02%
Telenor	NA	0.00%	100.00%	100.00%	100.00%	99.70%	99.31%
Vodafone	0.02%	0.07%	100.00%	100.00%	100.00%	100.00%	95.79%

Metering and Billing Credibility – Post-paid Subscribers

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

Metering and Billing Credibility – Prepaid Subscribers

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

Resolution of billing complaints

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

BSNL and Aircel failed to meet the benchmark of 95% IVR call being attended. Vodafone recorded the best performance for the parameter.

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

Airtel failed to meet the TRAI specified benchmark of 95%. Idea recorded the best performance for the parameter.

3.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

Inter Operator Call Assessment										
Inter operator call Assessment To↓ From→	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Aircel(DWL)	NA	97.00%	94.00%	97.00%	95.00%	97.00%	95.00%	95.00%	97.00%	92.00%
Airtel	93.00%	NA	95.00%	98.00%	98.00%	93.00%	97.00%	97.00%	97.00%	98.00%
BSNL Bihar/Jharkand	95.00%	98.00%	NA	99.00%	97.00%	95.00%	94.00%	97.00%	97.00%	98.00%
Idea	97.00%	96.00%	92.00%	NA	99.00%	95.00%	97.00%	97.00%	97.00%	100.00%
Reliance CDMA	98.00%	98.00%	93.00%	97.00%	NA	98.00%	97.00%	98.00%	97.00%	98.00%
Reliance GSM	97.00%	97.00%	95.00%	97.00%	95.00%	NA	98.00%	98.00%	98.00%	98.00%
TATA CDMA	97.00%	98.00%	95.00%	97.00%	98.00%	97.00%	NA	95.00%	95.00%	97.00%
TATA GSM	92.00%	97.00%	95.00%	97.00%	98.00%	97.00%	95.00%	NA	96.00%	96.00%
Telenor	97.00%	98.00%	95.00%	97.00%	97.00%	95.00%	97.00%	96.00%	NA	99.00%
Vodafone	95.00%	99.00%	99.00%	97.00%	97.00%	97.00%	94.00%	98.00%	97.00%	NA

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

In the inter-operator call assessment, most of the operators faced problems in connecting to other operators.

3.10 PMR COMPARISON WITH IMRB AND OPERATORS DATA 2G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	BTSs Accumulated downtime (not available for service)		Worst affected BTSs due to downtime		Call Set-up Success Rate		SDCCH/ Paging Chl. Congestion		TCH Congestion		Call drop rate		Worst affected cells having more than 3%		Connection with good voice quality			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	1.94%	1.21%	11.52%	11.51%	84.52%	84.52%	2.07%	2.07%	15.13%	15.13%	1.89%	1.89%	14.66%	14.65%	95.03%	95.03%	0.00%	0.00%
Airtel	0.05%	0.05%	0.14%	0.13%	95.43%	95.43%	0.77%	0.77%	1.30%	1.30%	1.67%	1.63%	2.25%	2.22%	95.75%	95.79%	0.00%	0.00%
BSNL	1.93%	1.88%	1.91%	1.90%	96.55%	92.41%	0.49%	2.95%	0.45%	1.37%	1.59%	1.09%	5.11%	6.55%	97.35%	96.61%	0.00%	0.00%
Idea	0.55%	0.54%	1.65%	1.65%	96.20%	96.20%	0.82%	0.82%	1.85%	1.86%	0.88%	0.88%	2.69%	2.69%	96.47%	96.47%	0.00%	0.00%
RCOM CDMA	0.23%	0.24%	1.32%	1.39%	96.93%	96.93%	NA	NA	0.84%	0.84%	0.19%	0.19%	0.46%	0.56%	97.10%	97.24%	0.00%	0.00%
TATA CDMA	0.17%	0.17%	0.00%	0.00%	97.83%	97.83%	NA	NA	0.51%	0.51%	0.36%	0.36%	1.60%	1.60%	98.25%	98.25%	0.00%	0.00%
TATA GSM	0.10%	0.10%	0.00%	0.00%	97.88%	97.86%	0.30%	0.25%	0.70%	0.70%	0.61%	0.52%	2.45%	2.51%	97.46%	97.47%	0.00%	0.00%
Telenor	0.27%	0.27%	0.57%	0.60%	92.73%	92.65%	1.65%	1.66%	5.95%	5.99%	0.94%	0.96%	4.22%	4.33%	94.69%	94.75%	0.00%	0.00%
Vodafone	0.35%	0.35%	1.27%	1.27%	99.20%	99.20%	0.47%	0.47%	0.80%	0.80%	0.73%	0.73%	2.76%	2.76%	97.89%	97.89%	0.00%	0.00%

3.11 PMR COMPARISON WITH IMRB AND OPERATORS DATA 3G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	Node Bs downtime (not available for service)		Worst affected Node Bs due to downtime		CSSR		RRC Congestion		Circuit Switched RAB Congestion		Call drop rate		Worst affected cells having more than 3% Circuit switched		%Circuit Switch Voice Quality (CSV quality)			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	1.39%	1.39%	7.79%	7.80%	88.93%	88.93%	1.09%	1.09%	1.24%	1.24%	0.98%	0.96%	9.33%	9.16%	98.98%	98.98%	0.00%	0.00%
Airtel	0.03%	0.02%	0.09%	0.37%	98.83%	99.27%	0.06%	0.10%	0.51%	0.69%	0.62%	0.65%	2.09%	2.56%	98.96%	NA	0.00%	0.00%
BSNL	1.92%	0.82%	1.85%	0.85%	95.00%	92.89%	0.05%	3.46%	0.45%	0.96%	1.38%	1.78%	3.55%	3.74%	97.13%	95.92%	0.00%	0.00%

4 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- Aircel failed to meet the benchmark for worst affected BTSs due to downtime
- Aircel, BSNL and Telenor failed to meet the benchmark for CSSR
- Aircel, BSNL and Telenor failed to meet the benchmark on SDCCH / Paging Channel Congestion
- Aircel and Telenor failed to meet the benchmark for TCH congestion
- Aircel, Telenor and BSNL failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.
- Telenor failed to meet the benchmark for Voice quality.

3 Day Live Measurement (Network Parameters)

- Aircel, BSNL and Telenor failed to meet the benchmark for CSSR
- Aircel, BSNL and Telenor failed to meet the benchmark on SDCCH / Paging Channel Congestion
- Aircel, Idea and Telenor failed to meet the benchmark for TCH congestion
- Aircel, Telenor and BSNL failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.
- Telenor failed to meet the benchmark for Voice quality.

PMR & 3Days live Consolidated (Network Parameters) for 3G

- Aircel failed to meet the benchmark for worst affected Node Bs due to downtime in PMR audit.
- Aircel and BSNL failed to meet the benchmark for CSSR, RRC Congestion, worst affected cells having more than 3% Circuit switched voice drop rate in PMR and live audit.

Wireless data services for 2G and 3G

- Telenor 2G failed to meet the benchmark for Activation done within 4 hours in PMR audit.
- Airtel 3G failed to meet the benchmark for PDP Context activation success rate in PMR audit
- Airtel 3G and BSNL 3G failed to meet the benchmark for Drop Rate in PMR and BSNL failed in live audit.

Live Calling

- As per the consumers (live calling exercise) none of the operators was able to meet the benchmark of resolving 98% complaints within 4 weeks and 100% complaints within 6 weeks.
- Airtel failed to meet the benchmark for Customer Care / Helpline Assessment (voice to voice).
- As per the live calling results all operators failed to meet the TRAI benchmark for level 1 service with calls being answered.

Metering and billing credibility

- For the billing disputes of post-paid subscribers, it was observed that Idea failed to meet the TRAI benchmark for the parameter.
- BSNL and Aircel failed to meet the benchmark of 95% IVR call being attended.
- Airtel failed to meet the TRAI specified benchmark of Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds.

Drive test Voice for 2G

Devghar SSA

- BSNL, Reliance CDMA, Tata CDMA & GSM and Telenor did not meet the TRAI benchmark in outdoor locations.
- Aircel, BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.
- BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

Saharsa SSA

- Reliance CDMA and Telenor failed to meet the benchmark in outdoor locations; however BSNL and TATA GSM failed to meet the benchmark in Indoor as well as outdoor locations.
- Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.
- Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

Ranchi SSA

- BSNL, TATA CDMA and TATA GSM failed to meet the benchmark for voice quality in outdoor locations, however Reliance CDMA failed to meet the benchmark in Indoor as well as outdoor locations.
- BSNL and Reliance CDMA failed to meet the benchmark for CSSR in outdoor locations.
- Aircel failed to meet the benchmark for call drops in indoor locations; however BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

Arrah SSA

- BSNL failed to meet the benchmark for voice quality in indoor as well as outdoor locations; however Reliance CDMA, TATA CDMA, TATA GSM and Telenor did not meet the benchmark in outdoor locations.
- Aircel and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.
- Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

Bhagalpur SSA

- BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark in indoor as well as outdoor locations. TATA CDMA did not meet the benchmark in outdoor locations.
- Aircel, BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.
- BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

Katihar SSA

- Reliance CDMA, TATA CDMA, TATA GSM and Telenor failed to meet the benchmark for voice quality in outdoor locations. BSNL did not meet the benchmark in Indoor as well as outdoor locations.
- BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.

- BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

Drive test Voice for 3G

Devghar SSA

- Aircel 3G failed to meet the benchmark for voice quality in outdoor locations, however BSNL 3G failed to meet the benchmark in indoor as well as outdoor locations.
- Reliance 3G failed to meet the TRAI benchmark for CSSR in indoor as well as outdoor locations.
- Aircel 3G, BSNL 3G and Reliance 3G failed to meet the benchmark for call drop rates in outdoor locations.

Saharsa SSA

- Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.
- Reliance 3G failed to meet the benchmark in outdoor as well as indoor locations.
- Reliance 3G failed to meet the benchmark for call drop rate in outdoor as well as indoor locations, however BSNL 3G failed in outdoor locations only.

Ranchi SSA

- Aircel 3G and BSNL 3G failed to meet the benchmark for voice quality in outdoor as well as indoor locations.
- Aircel 3G failed to meet the benchmark for CSSR in outdoor as well as indoor locations, however Reliance 3G failed in outdoor locations.
- Aircel 3G, Reliance 3G and BSNL 3G failed to meet the benchmark for call drop rates in outdoor locations.

Arrah SSA

- Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.
- Reliance 3G failed to meet the benchmark for CSSR in outdoor locations.

Bhagalpur SSA

- Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.
- BSNL 3G and Reliance 3G failed to meet the benchmark for CSSR in outdoor locations.
- Aircel 3G failed to meet the benchmark for call drop rate in outdoor locations.

Katihar SSA

- Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.
- Reliance 3G failed to meet the benchmark for CSSR in outdoor locations.

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

5.1 BTS ACCUMULATED DOWNTIME

5.1.1 PARAMETER DESCRIPTION

- The parameter of network availability would be measured from following sub-parameters

    1. BTSs Accumulated downtime (not available for service)
    2. Worst affected BTSs due to downtime

1. **Definition - BTSs (Base Transceiver Station) accumulated downtime** (not available for service) shall basically measure the downtime of the BTSs, including its transmission links/circuits during the period of a month, but excludes all planned service downtime for any maintenance or software up gradation. For measuring the performance against the benchmark for this parameter the downtime of each BTS lasting more than 1 hour at a time in a day during the period of a month were considered.

2. **Computation Methodology –**
   BTS accumulated downtime (not available for service) = Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month / (24 x Number of days in a month x Number of BTSs in the network in licensed service area) x 100

3. **TRAI Benchmark –**

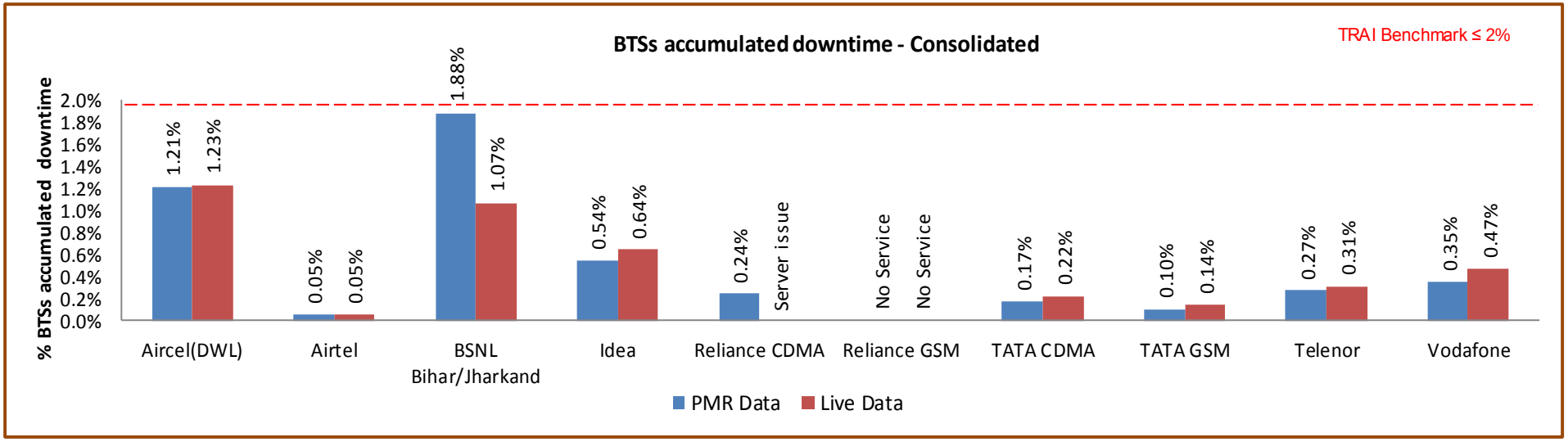
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

4. **Audit Procedure –**

    - The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited
    - All the BTS in service area were considered. Planned outages due to network up gradation, routine maintenance were not considered.

- Any outage as a result of force majeure were not considered at the time of calculation
- Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.
- List of operating sites with cell details and ids are taken from the operator.
- When there is any outage a performance report gets generated in line with that cell resulting and master base of the Accumulated downtime and worst affected BTS due to downtime.

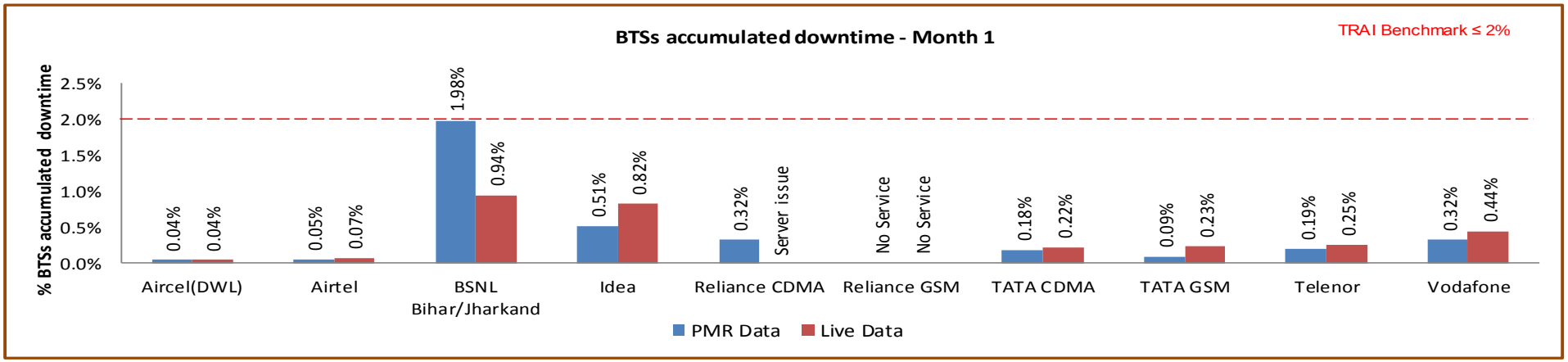
5.1.2 KEY FINDINGS - CONSOLIDATED



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

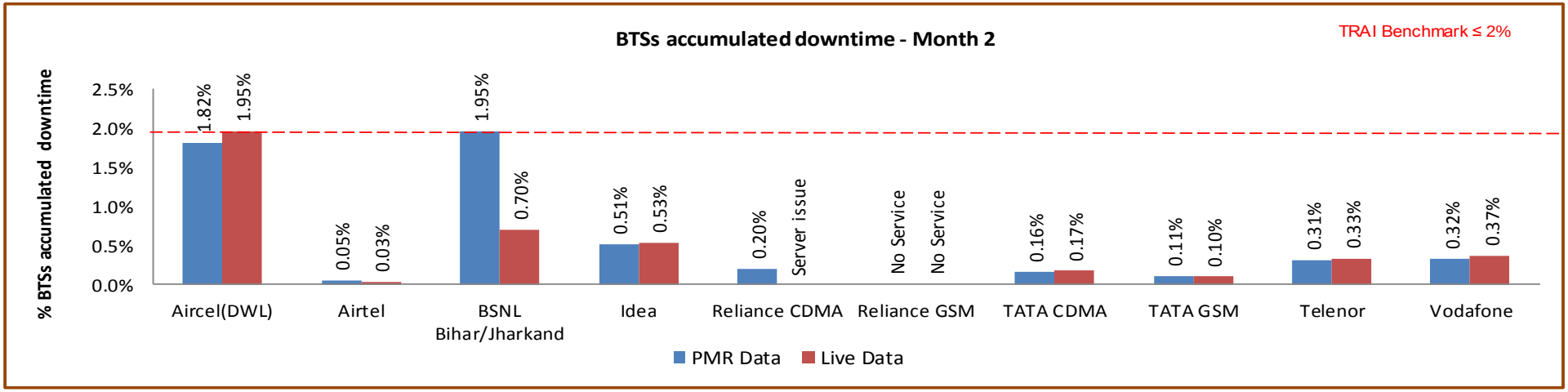
All operators met the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

5.1.2.1 KEY FINDINGS – MONTH 1



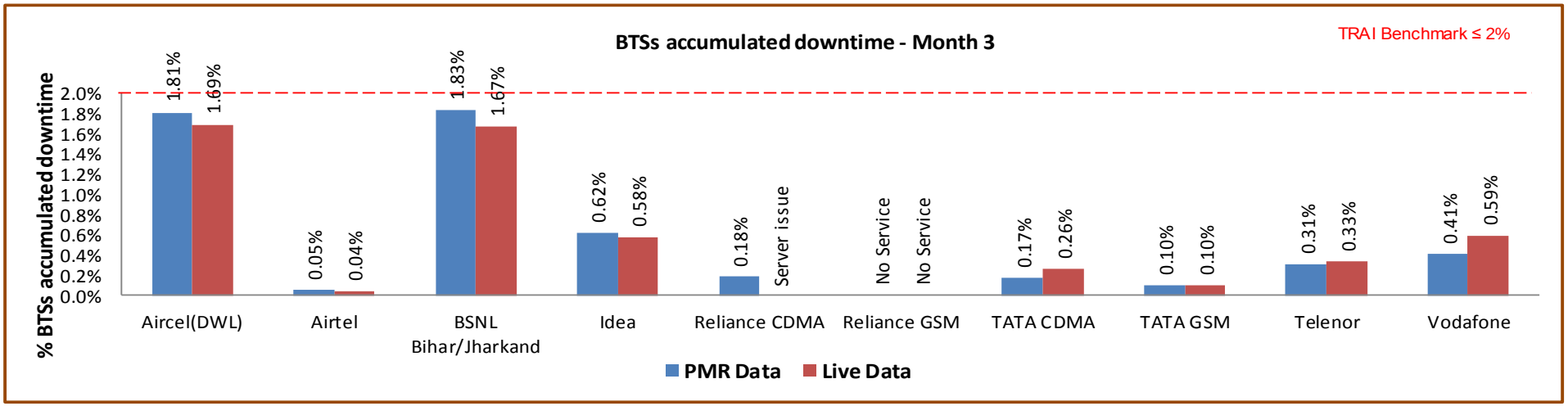
Data Source: Operations and Maintenance Center (OMC) of the operators

5.1.2.2 KEY FINDINGS – MONTH 2



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

5.1.2.3 KEY FINDINGS – MONTH 3



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

5.2 WORST AFFECTED BTS DUE TO DOWNTIME

5.2.1 PARAMETER DESCRIPTION

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

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

- **Computation Methodology –**

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

- **TRAI Benchmark –**

  a. Worst affected BTSs due to downtime ≤ 2%

- **Audit Procedure –**

  i. The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

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

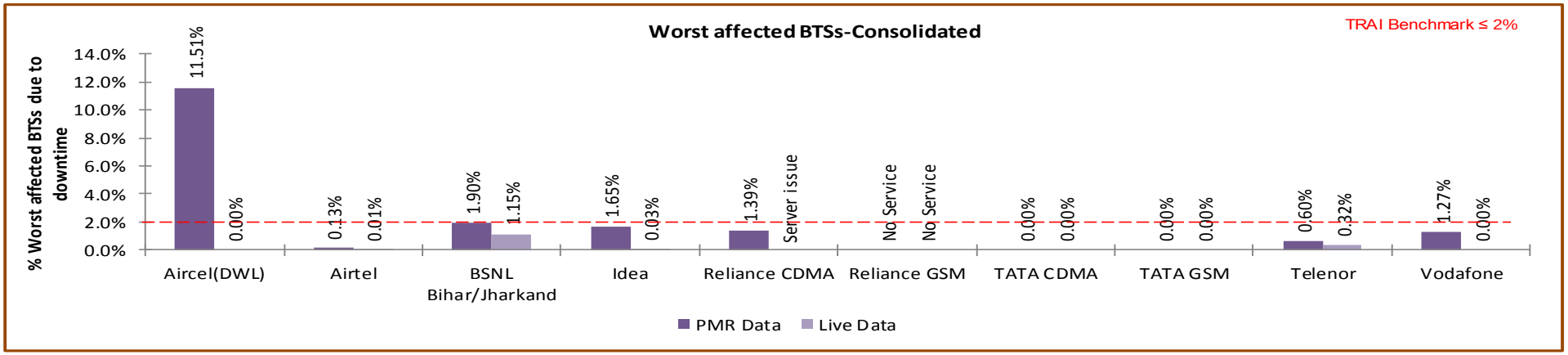
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  iv. Any outage as a result of force majeure was not considered at the time of calculation.

  v. List of operating sites with cell details and ids are taken from the operator.

  vi. All the BTS having down time greater than 24 hours is assessed and values of BTS accumulated downtime is computed in accordance.

5.2.2 KEY FINDINGS – CONSOLIDATED

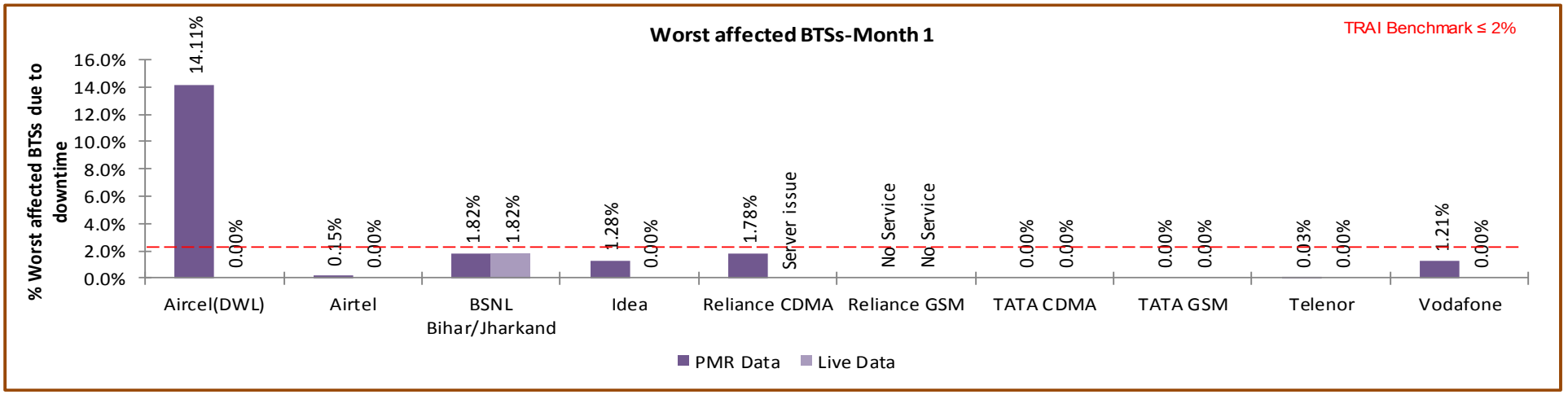


Data Source: Operations and Maintenance Center (OMC) of the operators

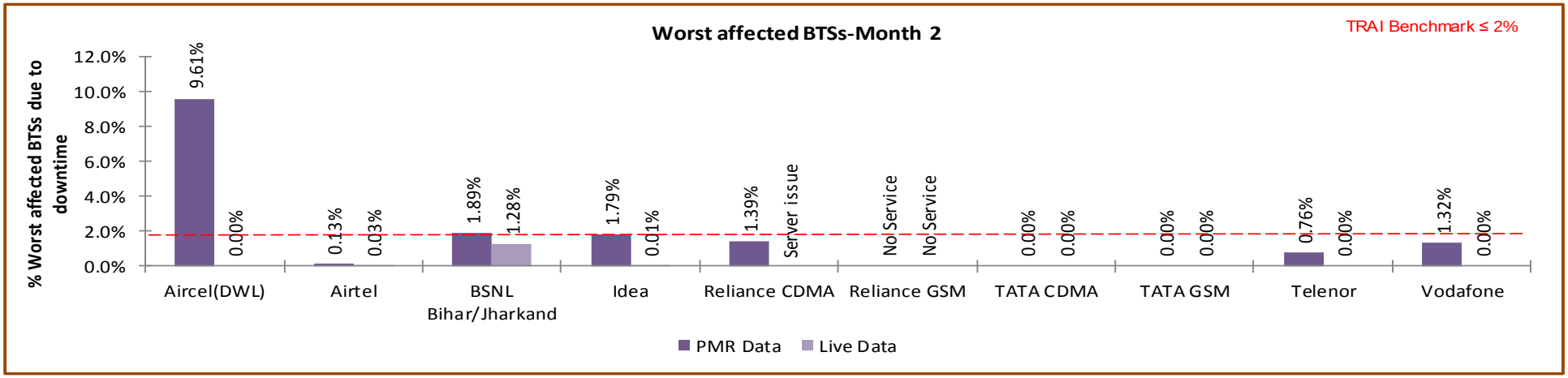
Aircel failed to meet the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

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

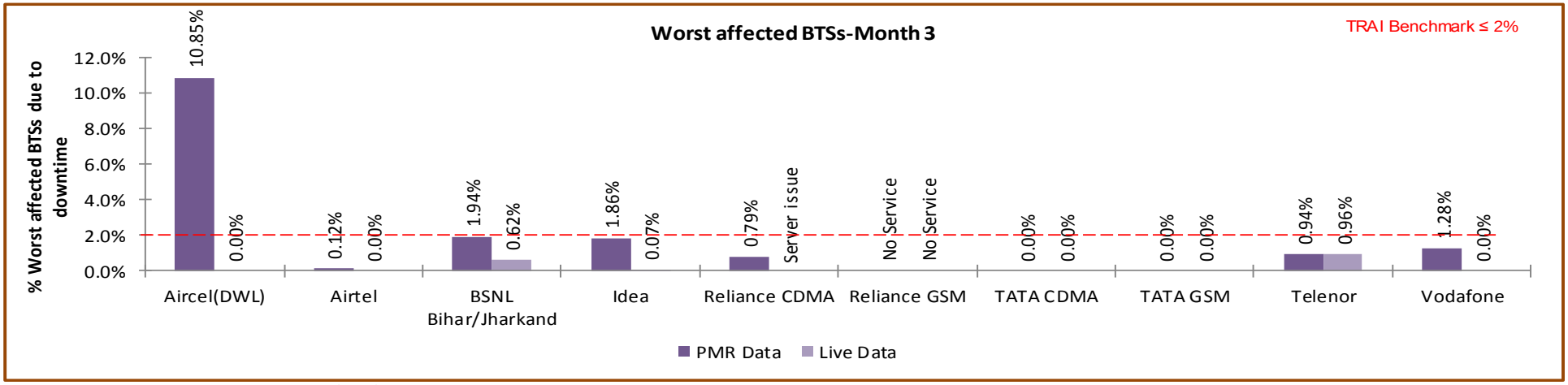
5.2.2.1 KEY FINDINGS – MONTH 1



5.2.2.2 KEY FINDINGS – MONTH 2



5.2.2.3 KEY FINDINGS – MONTH 3



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

5.3 CALL SET UP SUCCESS RATE

5.3.1 PARAMETER DESCRIPTION

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

   (Calls Established / Total Call Attempts) * 100

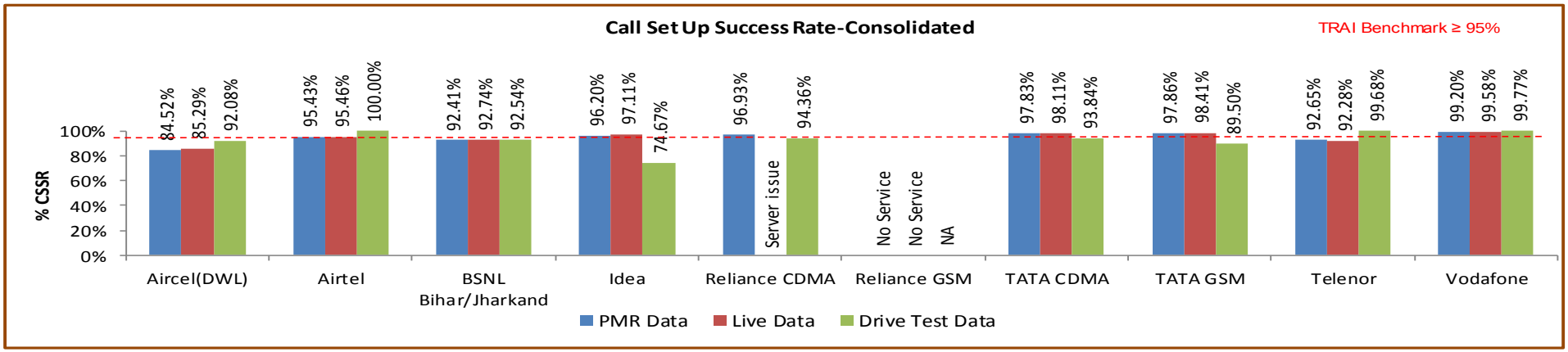
   Call Established means the following events have happened in call setup:-

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

3. **TRAI Benchmark ≥** 95%
4. **Audit Procedure –**

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

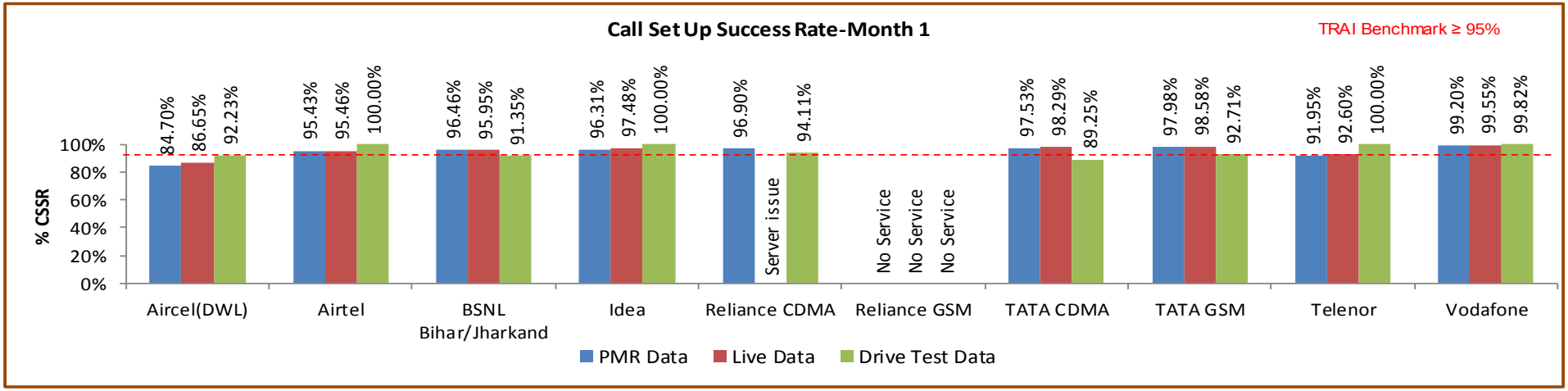
5.3.2 KEY FINDINGS - CONSOLIDATED



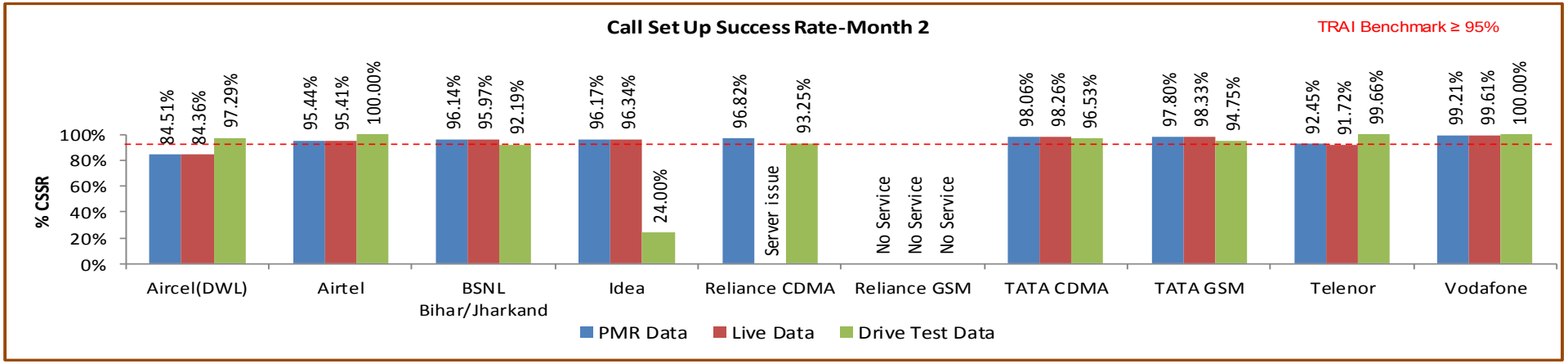
Data Source: Network Operations Center (NOC) of the operators

Aircel, BSNL and Telenor failed to meet the TRAI benchmark as per audit/PMR data. During drive test Aircel, BSNL, Idea, Reliance CDMA, Tata CDMA and Tata GSM failed to meet the benchmark.

5.3.2.1 KEY FINDINGS – MONTH 1

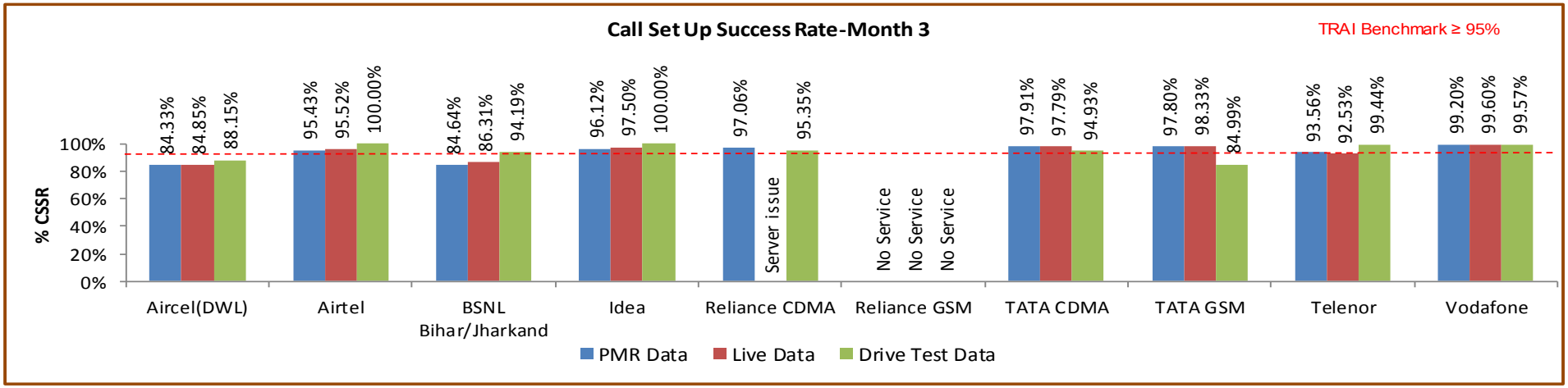


5.3.2.2 KEY FINDINGS – MONTH 2



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

5.3.2.3 KEY FINDINGS – MONTH 3



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

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

5.4.1 PARAMETER DESCRIPTION

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

   - SDCCH Level: Stand-alone dedicated control channel
   - TCH Level: Traffic Channel
   - POI Level: Point of Interconnect

2. **Computational Methodology:**

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

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

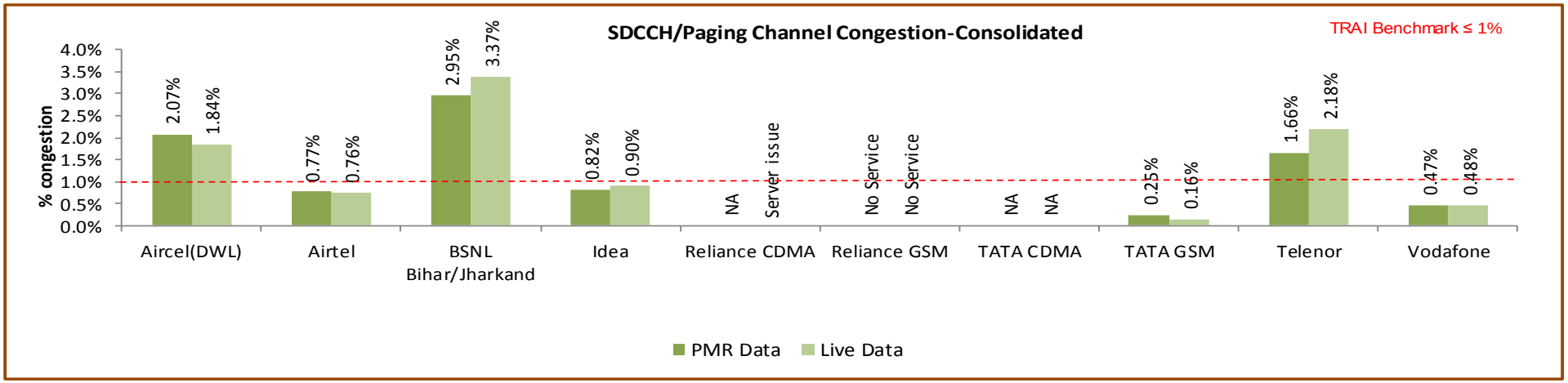
3. Benchmark:

- SDCCH Congestion: ≤ 1%, TCH Congestion: ≤ 2%, POI Congestion: ≤ 0.5%

4. Audit Procedure –

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

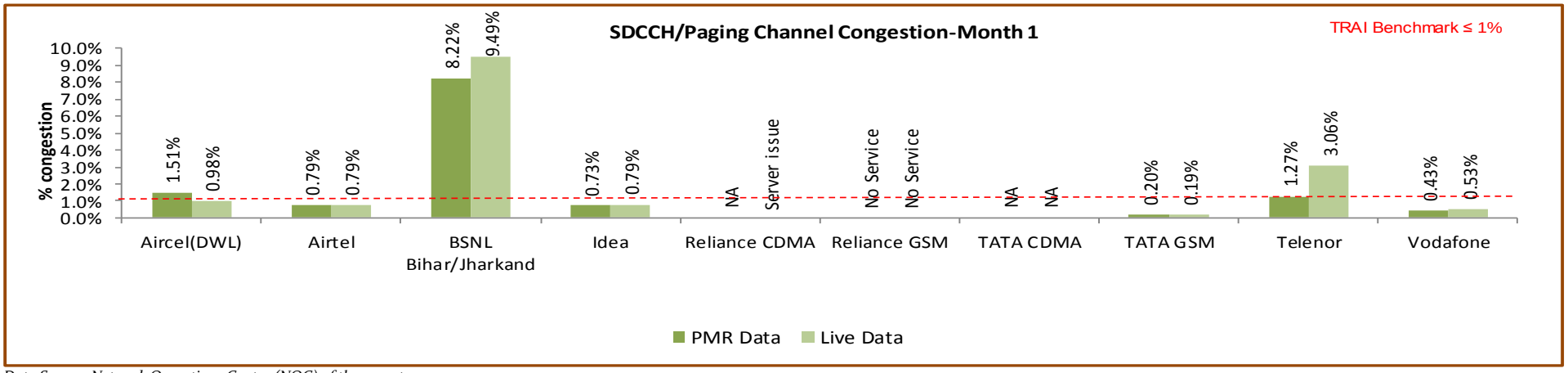
5.4.2 KEY FINDINGS - SDCCH/PAGING CHANNEL CONGESTION (CONSOLIDATED)



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

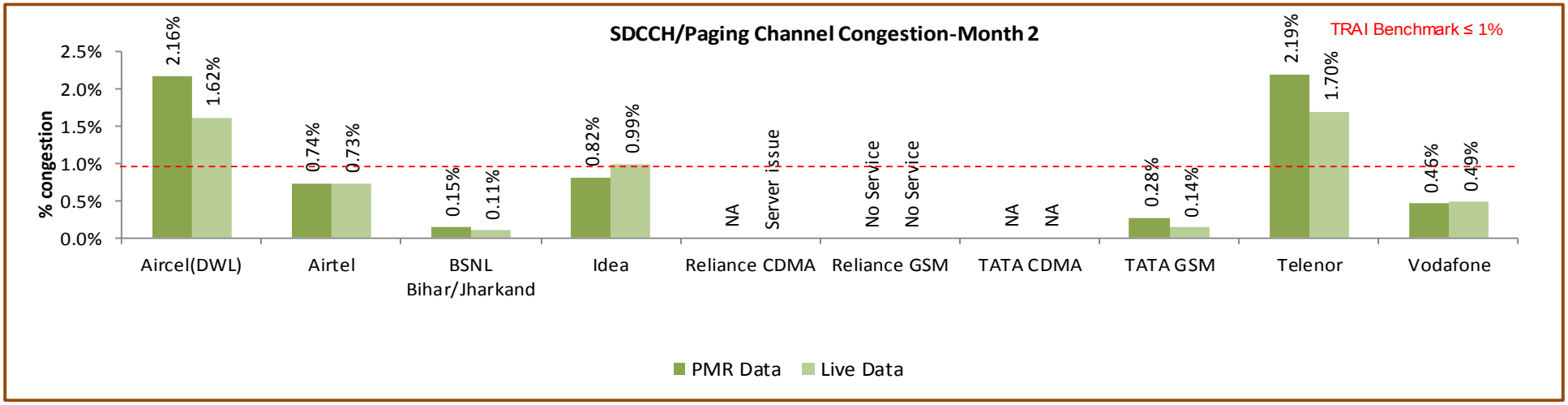
Aircel, BSNL and Telenor failed to meet the benchmark as per PMR/audit Data.
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

5.4.2.1 KEY FINDINGS – MONTH 1

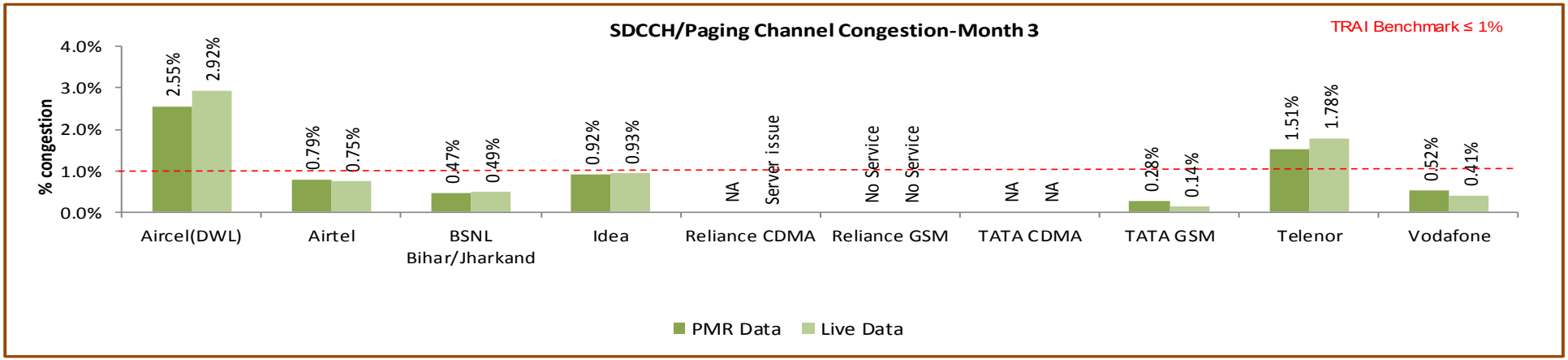


Data Source: Network Operations Center (NOC) of the operators

5.4.2.2 KEY FINDINGS – MONTH 2

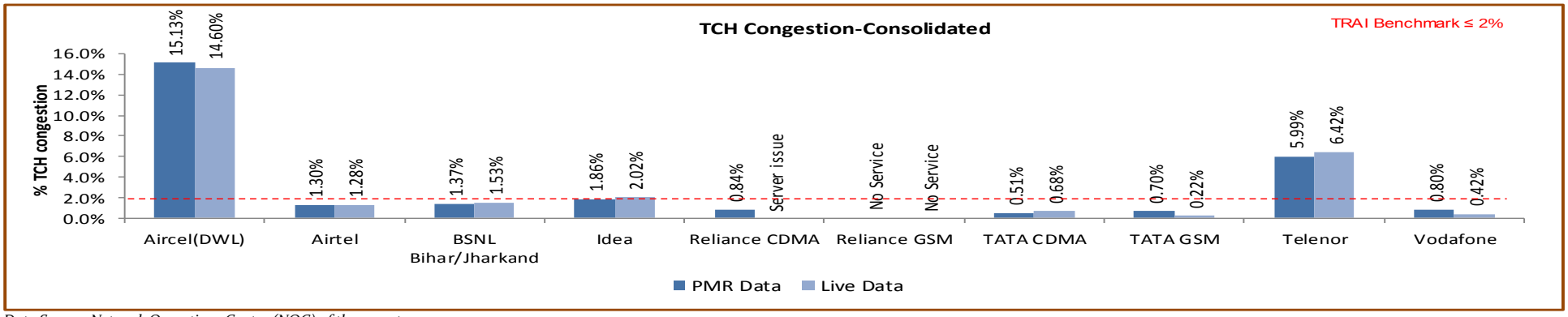


5.4.2.3 KEY FINDINGS – MONTH 3



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

5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)

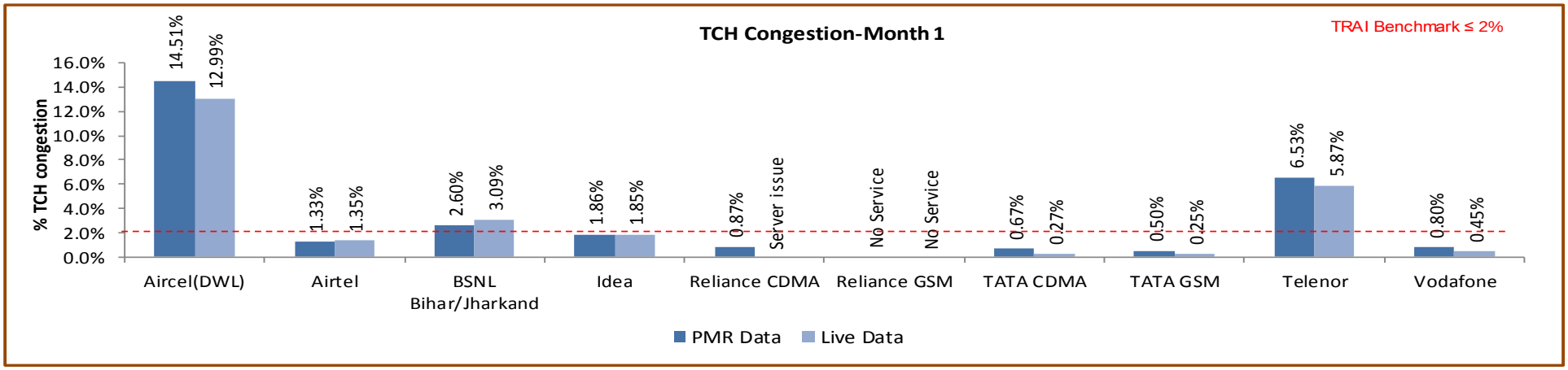


Data Source: Network Operations Center (NOC) of the operators

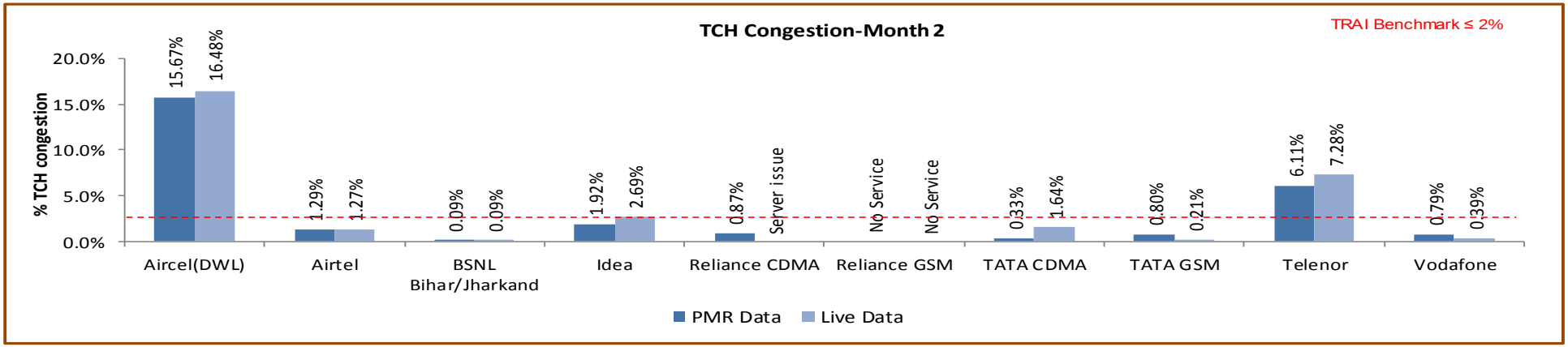
Aircel and Telenor failed to meet the benchmark as per audit/PMR report.

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

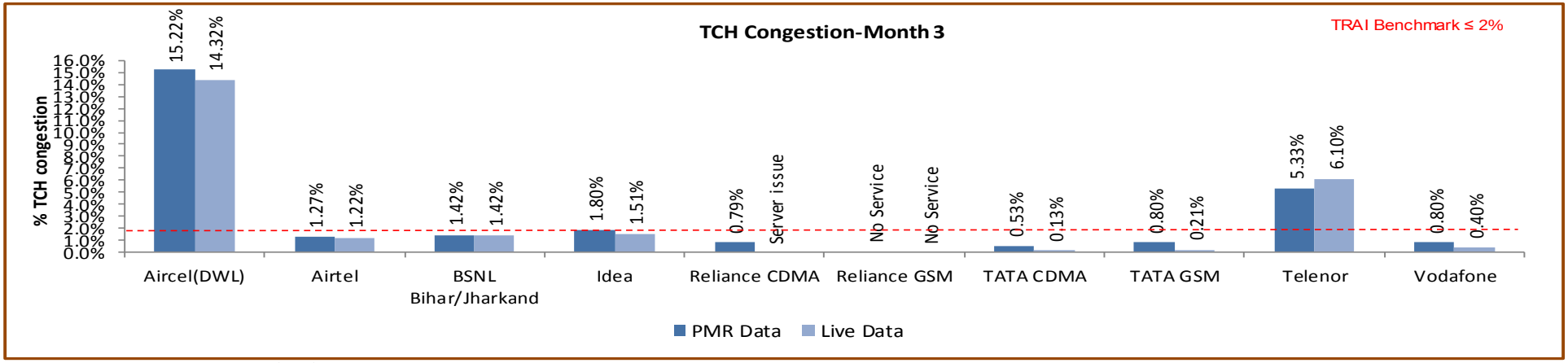
5.4.3.1 KEY FINDINGS – MONTH 1



5.4.3.2 KEY FINDINGS – MONTH 2



5.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	21	83	115	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		388441	2184896	118620	911179	188406	No Service	5228338	501121	234452	877741
Traffic served for all POIs (B)- in erlangs		245192	1351191	28478	585954	79753	No Service	532554	72109	169080	567021
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	21	83	Server issue	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		388419	1351155	118620	911179	Server issue	No Service	217847	30808	232412	875469
Traffic served for all POIs (B)- in erlangs		120479	748070	28478	574347	Server issue	No Service	22263	4155	143787	249725
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

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

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

5.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-January											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	821	21	83	109	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	736664	15538	305359	57700	No Service	1740819	10397	76491	289955
Traffic served for all POIs (B)- in erlangs		77008	494150	14236	192518	28110	No Service	174365	2721	52000	174265
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	821	21	83	Server issue	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	220542	15538	305359	Server issue	No Service	72534	10374	75571	288126
Traffic served for all POIs (B)- in erlangs		36138	128135	14236	184412	Server issue	No Service	7238	1385	51782	80880
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

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

5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-February											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkan	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	818	32	83	120	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129493	735594	59310	300461	65184	No Service	1740819	245362	79423	291078
Traffic served for all POIs (B)- in erlangs		83244	474839	14242	198673	28175	No Service	176884	34694	58145	179140
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkan	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	818	32	83	Server issue	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129491	417975	59310	300461	Server issue	No Service	72534	10217	79324	290686
Traffic served for all POIs (B)- in erlangs		42326	237733	14242	196433	Server issue	No Service	7311	1385	40524	85497
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

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

5.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-March											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	11	83	117	No Service	153	20	68	58
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	712638	43772	305359	65522	No Service	1746700	245362	78538	296709
Traffic served for all POIs (B)- in erlangs		84940	382202	0	194763	23469	No Service	181305	34694	58934	213616
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-March											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	11	83	Server issue	No Service	153	20	68	58
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	712638	43772	305359	Server issue	No Service	72779	10217	77517	296657
Traffic served for all POIs (B)- in erlangs		42014	382202	0	193502	Server issue	No Service	7714	1385	51481	83348
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

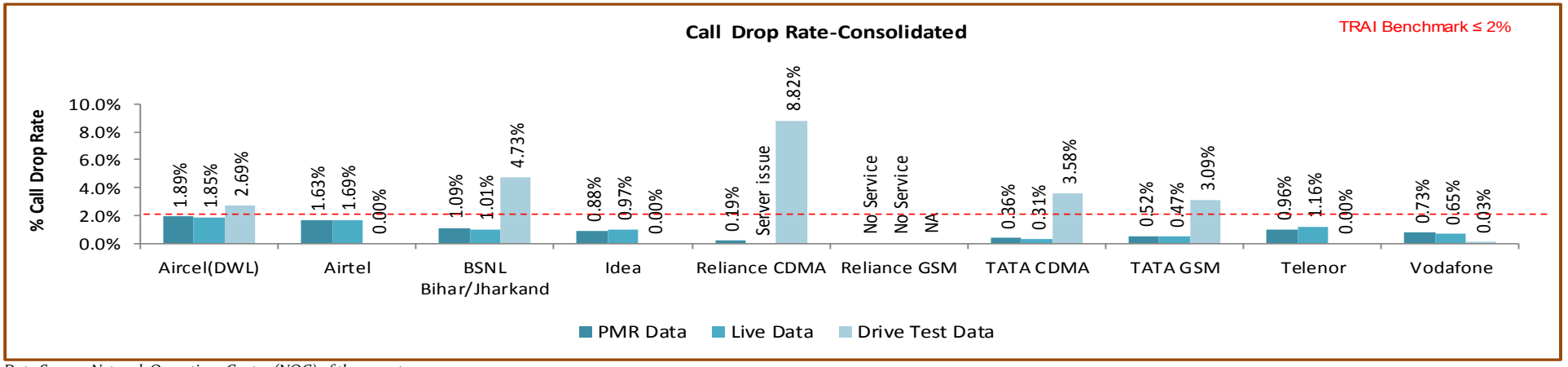
Data Source: Network Operations Center (NOC) of the operators

5.5 CALL DROP RATE

5.5.1 PARAMETER DESCRIPTION

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

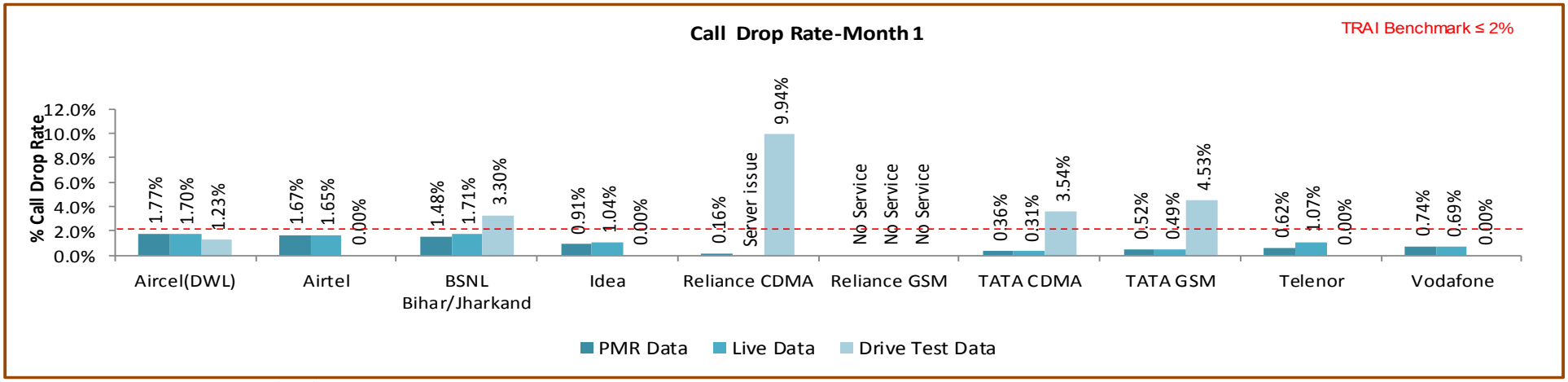
5.5.2 KEY FINDINGS - CONSOLIDATED



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

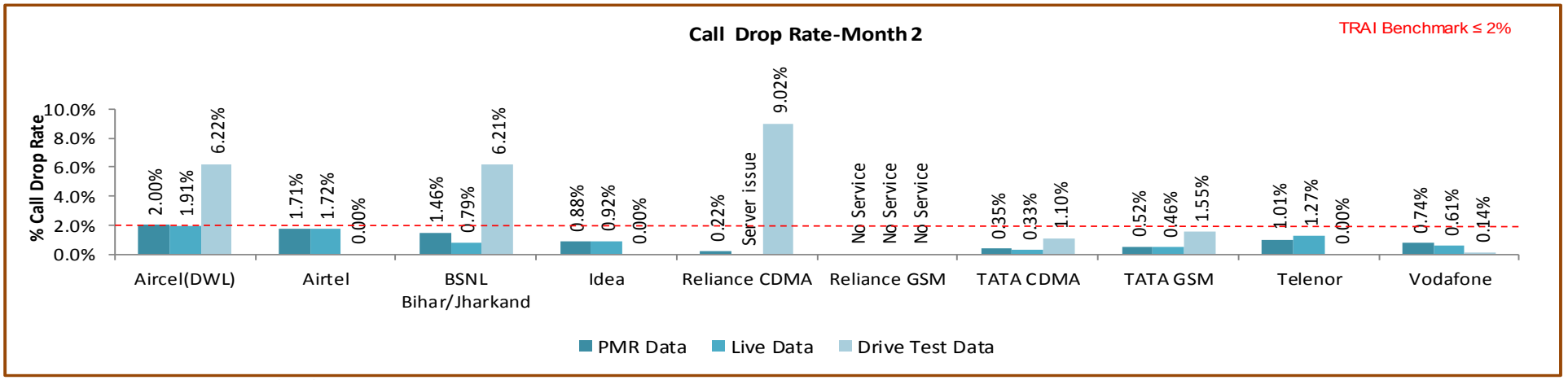
All operators met the benchmark for call drop rate during the audit. During drive test Aircel, BSNL, Reliance CDMA, Tata CDMA and Tata GSM failed to meet the benchmark.

5.5.2.1 KEY FINDINGS – MONTH 1



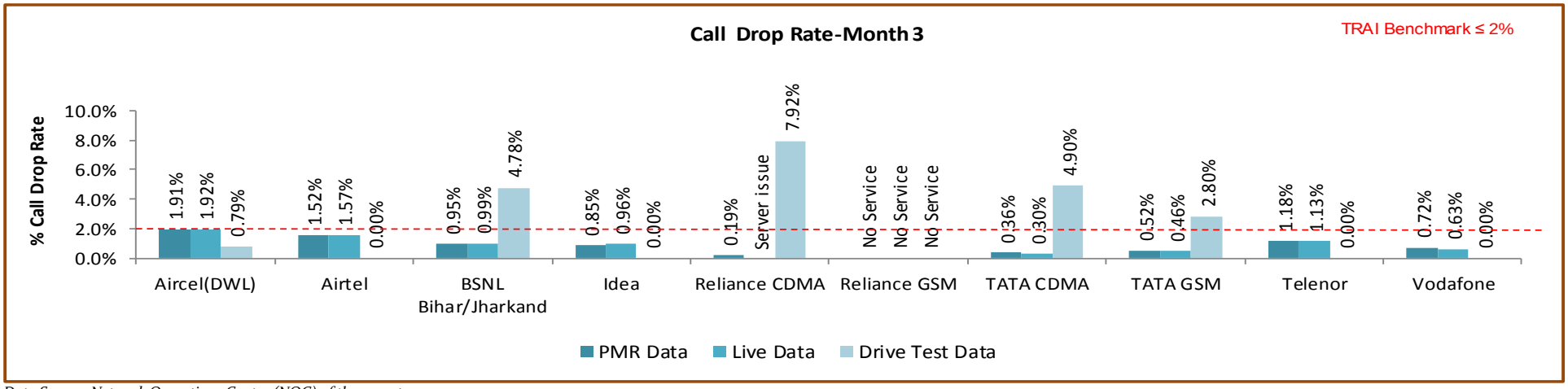
Data Source: Network Operations Center (NOC) of the operators

5.5.2.2 KEY FINDINGS – MONTH 2



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

5.5.2.3 KEY FINDINGS – MONTH 3



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

5.6 CELLS HAVING GREATER THAN 3% TCH DROP

5.6.1 PARAMETER DESCRIPTION

1. **Definition- Worst Affected Cells having more than 3% TCH drop** shall measure the ratio of total number of cells in the network to the ratio of cells having more than 3% TCH drop.

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

3. **TRAI Benchmark –**

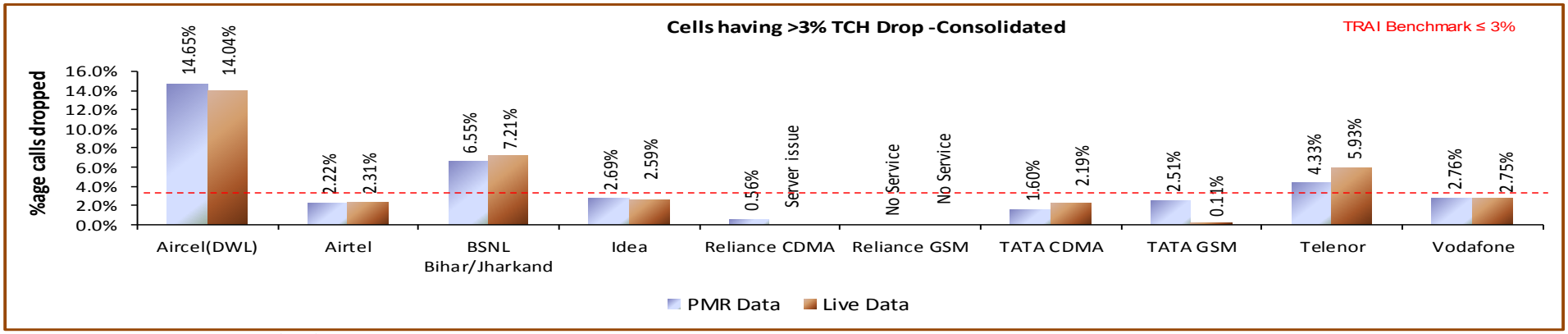
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

4. **Audit Procedure –**

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR would be conducted.

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

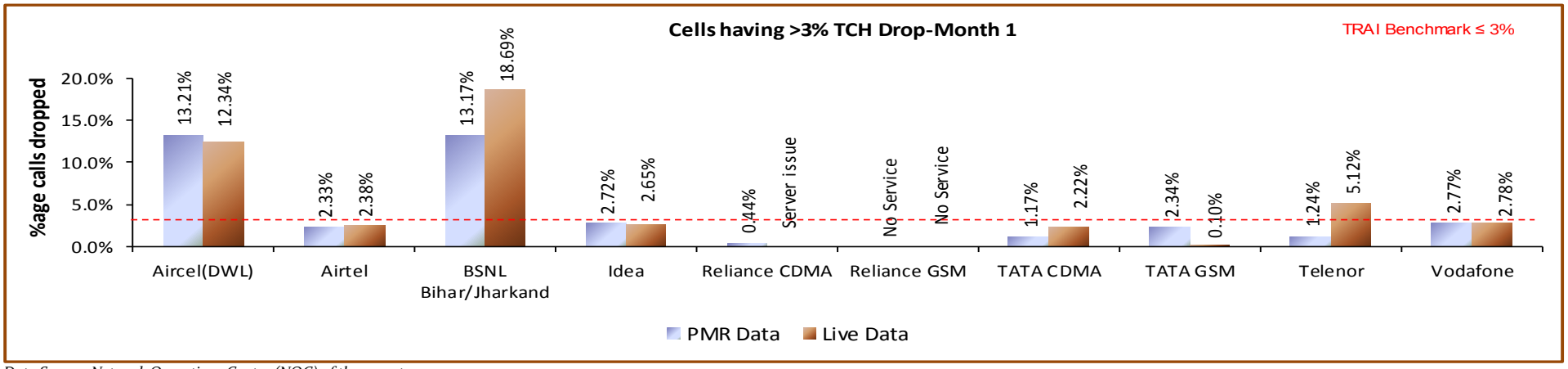
5.6.2 KEY FINDINGS - CONSOLIDATED



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

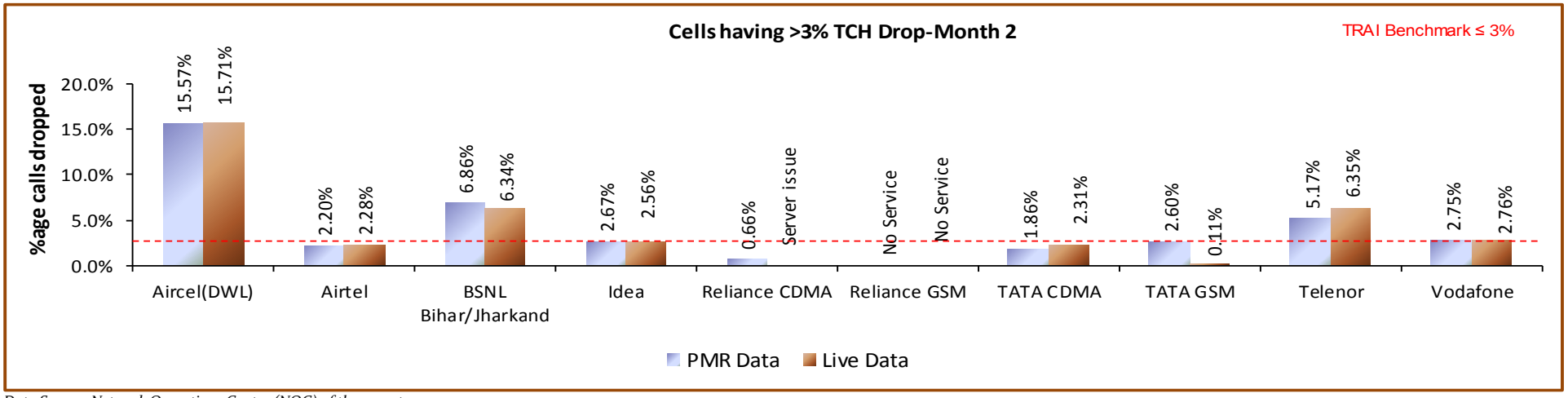
Aircel, BSNL and Telenor failed to meet the benchmark for Audit PMR.

5.6.2.1 KEY FINDINGS – MONTH 1



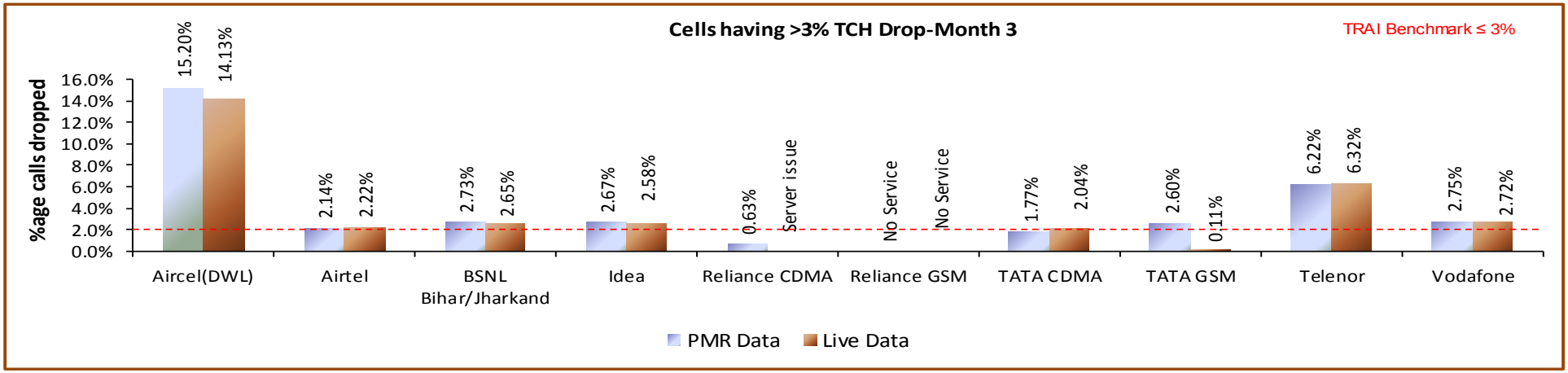
Data Source: Network Operations Center (NOC) of the operators

5.6.2.2 KEY FINDINGS – MONTH 2



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

5.6.2.3 KEY FINDINGS – MONTH 3



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

5.7 VOICE QUALITY

5.7.1 PARAMETER DESCRIPTION

1. **Definition:**

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

2. **Computational Methodology:**

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

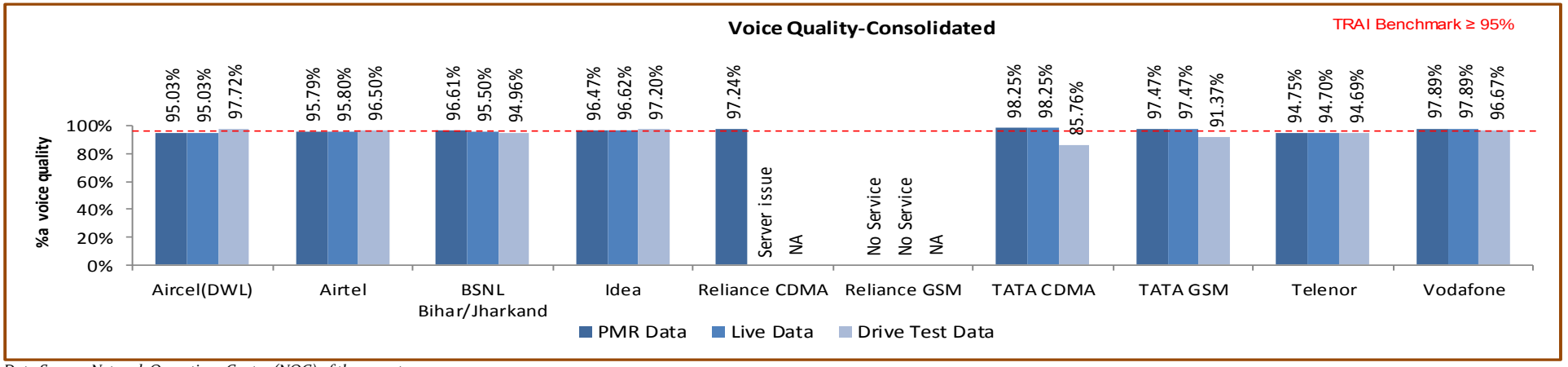
3. **TRAI Benchmark:** ≥ 95%

4. **Audit Procedure –**

   a. A sample of calls would be taken randomly from the total calls established.

   b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

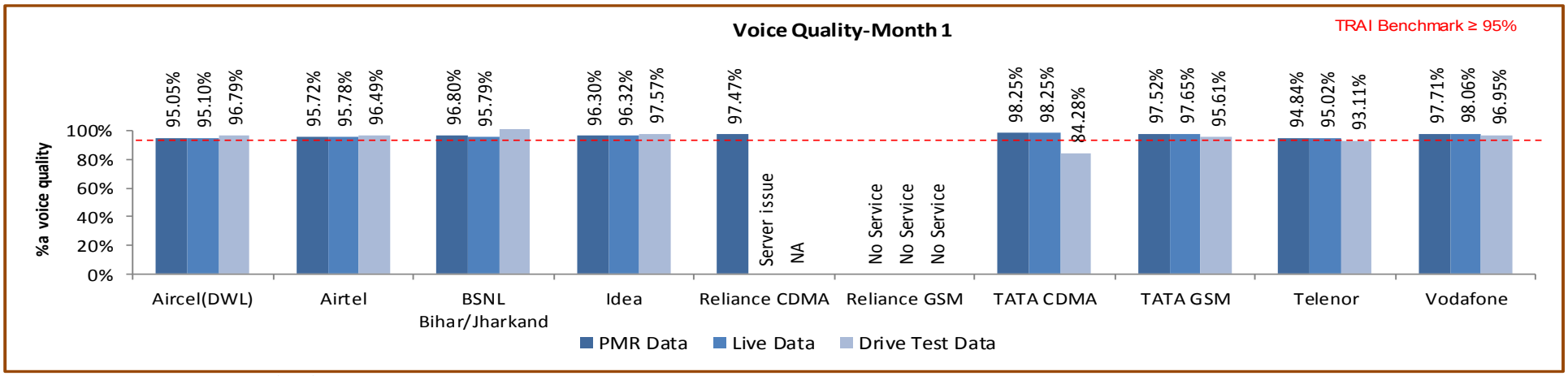
5.7.2 KEY FINDINGS



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

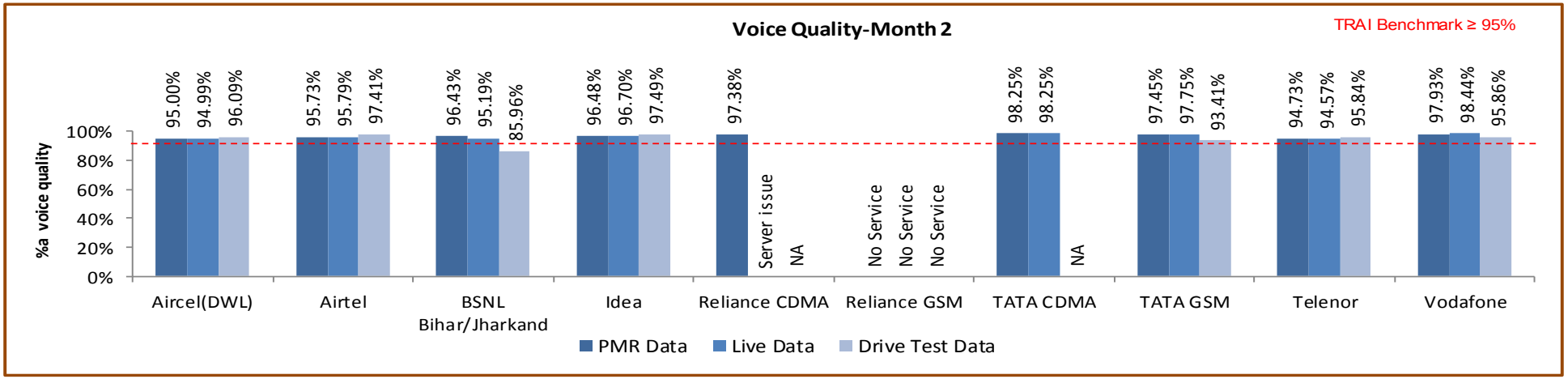
Telenor failed to meet the benchmark for Voice quality as per PMR data. During drive test BSNL, Tata GSM & CDMA and Telenor failed to meet the benchmark.

5.7.2.1 KEY FINDINGS – MONTH 1



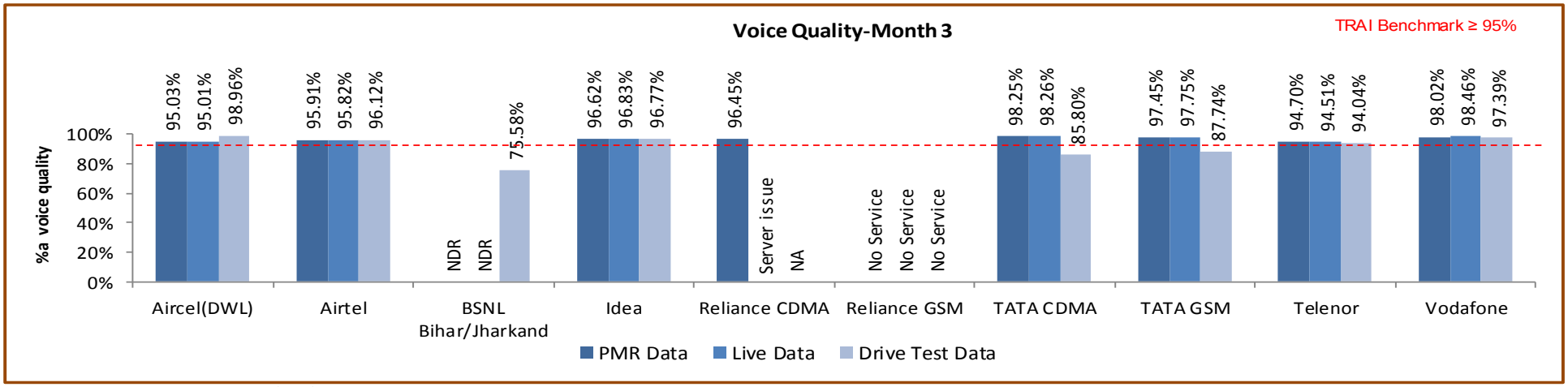
Data Source: Network Operations Center (NOC) of the operators

5.7.2.2 KEY FINDINGS – MONTH 2



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

5.7.2.3 KEY FINDINGS – MONTH 3



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

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

6.1 NODE BS DOWNTIME

6.1.1 PARAMETER DESCRIPTION

- The parameter of network availability would be measured from following sub-parameters

  1. Node Bs downtime (not available for service)

  2. Worst affected Node Bs due to downtime

- **Definition - Node Bs downtime (not available for service):** In the case of 3G networks, instead of BTS the nomenclature is Node B. The measurement methodology for the parameter Node B Accumulated downtime (not available for service) will be similar to the existing parameter for BTSs Accumulated downtime (not available for service).

- **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
- **Source of Data:** Network Operation Center (NOC) or a Central Server
- **Computation Methodology –**
  Node Bs downtime (not available for service) = Sum of downtime of Node Bs in a month in hours i.e. total outage time of all Node Bs in hours during a month / (24 x Number of days in a month x Number of Node Bs in the network in licensed service area) x 100

3. TRAI Benchmark –

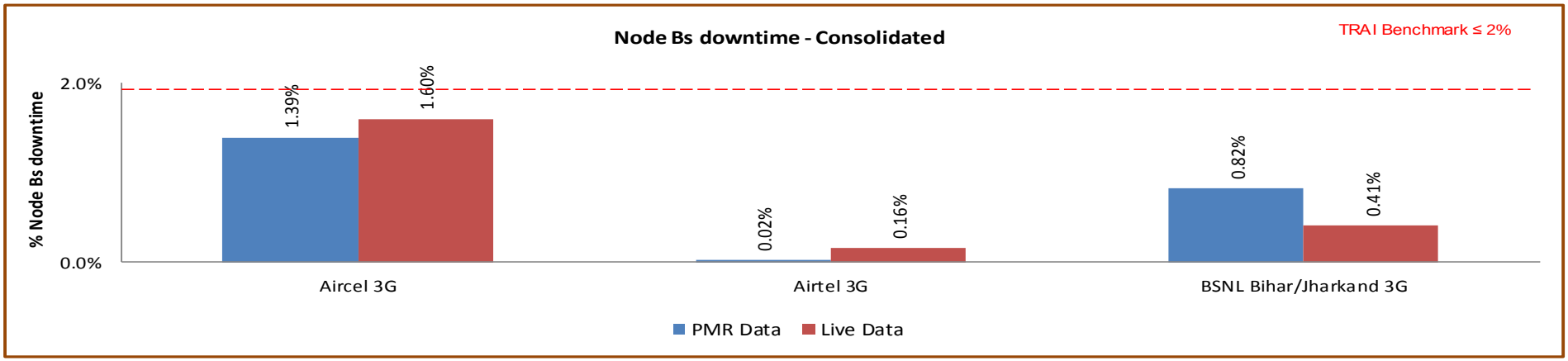
a. Node Bs downtime (not available for service) ≤ 2%

4. Audit Procedure –

- The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

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

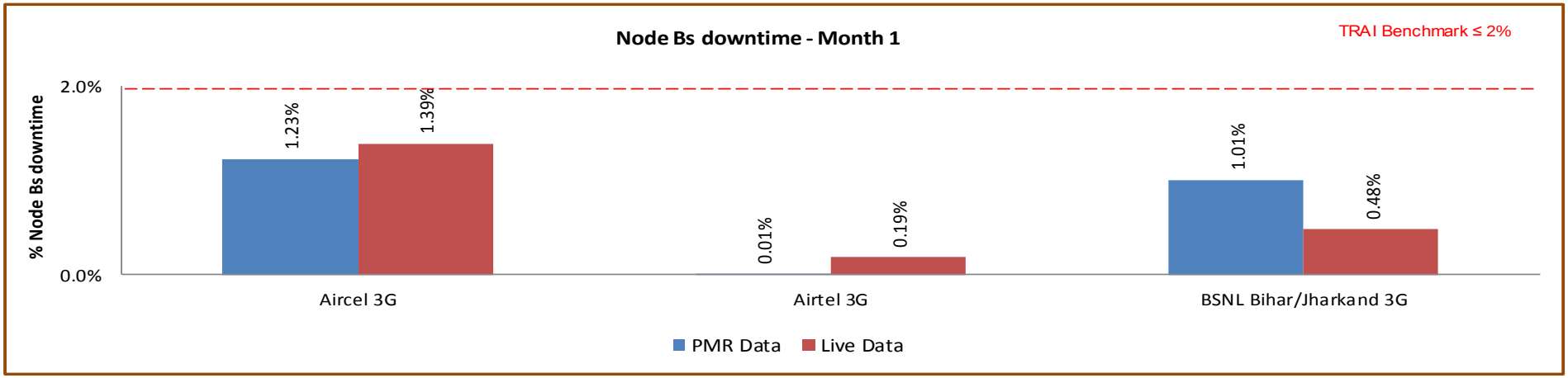
6.1.2 KEY FINDINGS - CONSOLIDATED



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

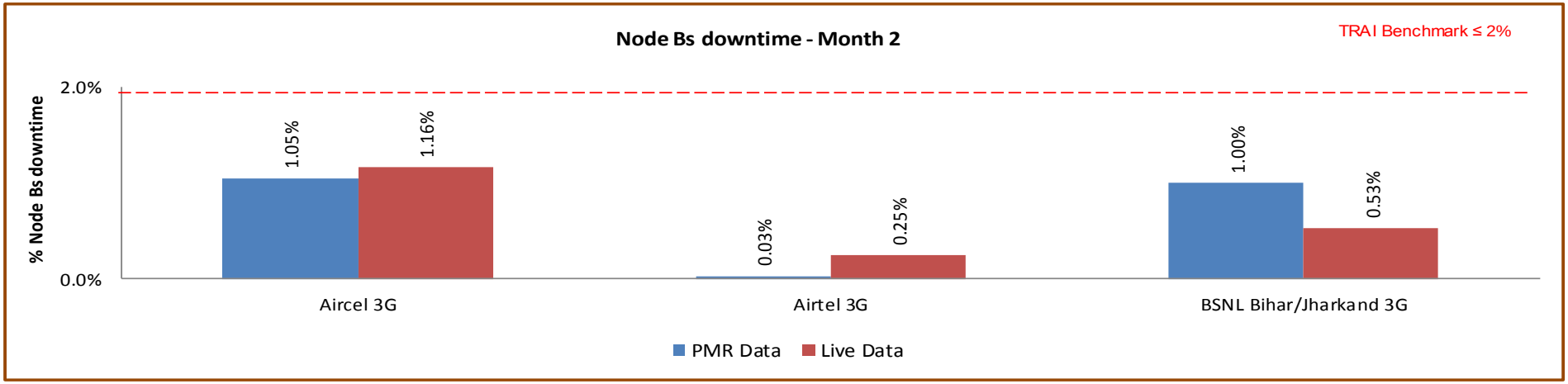
All operators met the benchmark for Node B downtime.

6.1.2.1 KEY FINDINGS – MONTH 1



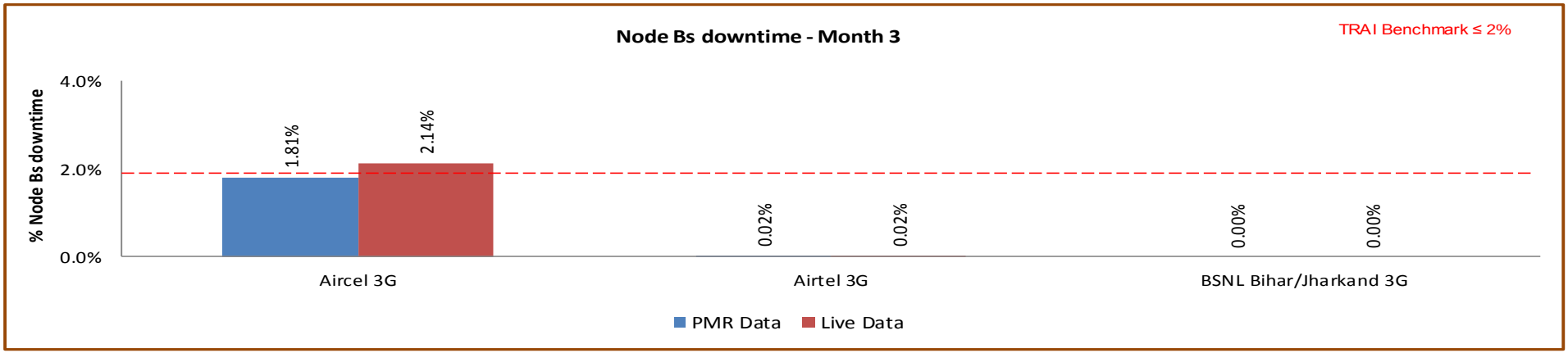
Data Source: Operations and Maintenance Center (OMC) of the operators

6.1.2.2 KEY FINDINGS – MONTH 2



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

6.1.2.3 KEY FINDINGS – MONTH 3



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

6.2 WORST AFFECTED NODE BS DUE TO DOWNTIME

6.2.1 PARAMETER DESCRIPTION

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

  For measuring the parameter "Percentage of worst affected Node Bs due to downtime" the downtime of each Node B lasting for more than 1 hour at a time in a day during the period of a month was considered.

- **Computation Methodology –**

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

- **TRAI Benchmark –**

  b. Worst affected Node Bss due to downtime ≤ 2%

- **Audit Procedure –**

  i. The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) was audited

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

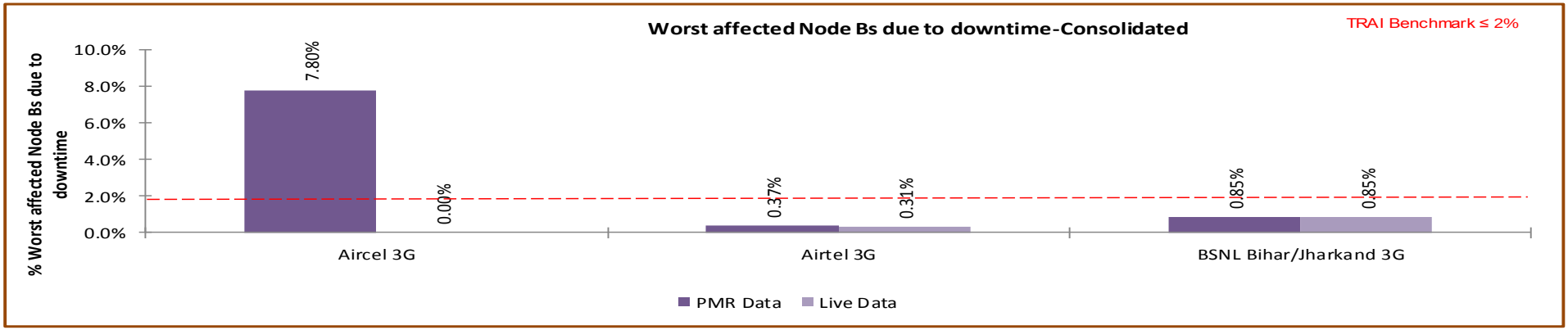
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  iv. Any outage as a result of force majeure was not considered at the time of calculation.

  v. List of operating sites with cell details and ids are taken from the operator.

  vi. All the Node Bs having down time greater than 24 hours is assessed and values of Node Bs accumulated downtime is computed in accordance.

6.2.2 KEY FINDINGS – CONSOLIDATED

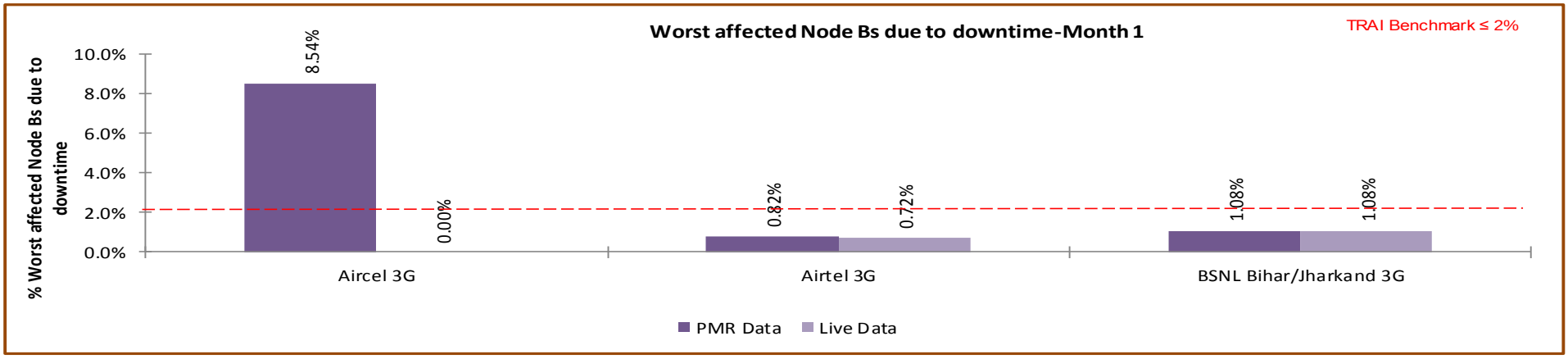


Data Source: Operations and Maintenance Center (OMC) of the operators

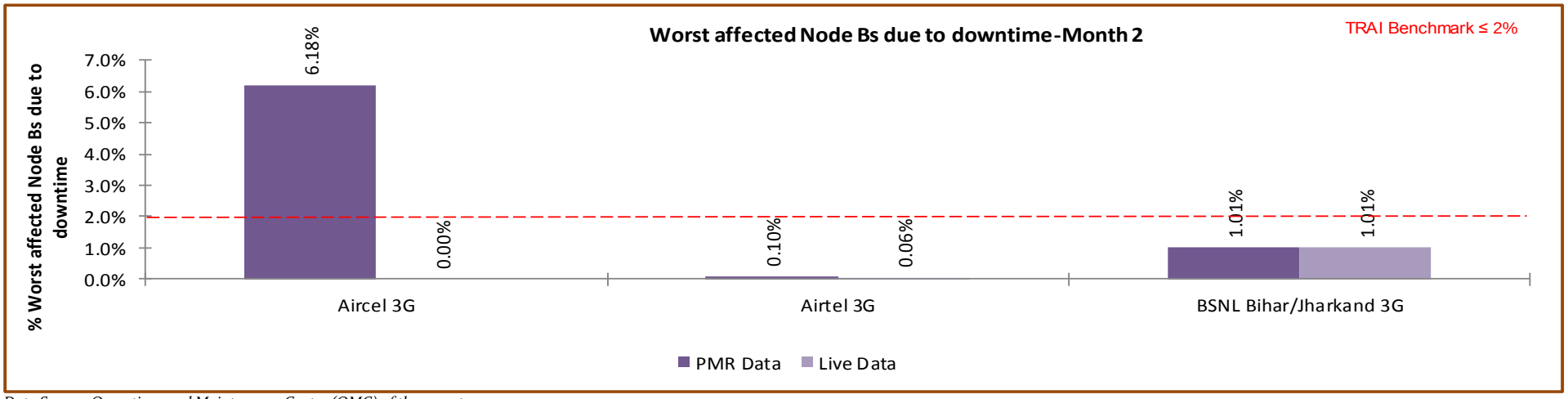
Aircel failed to meet the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

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

6.2.2.1 KEY FINDINGS – MONTH 1

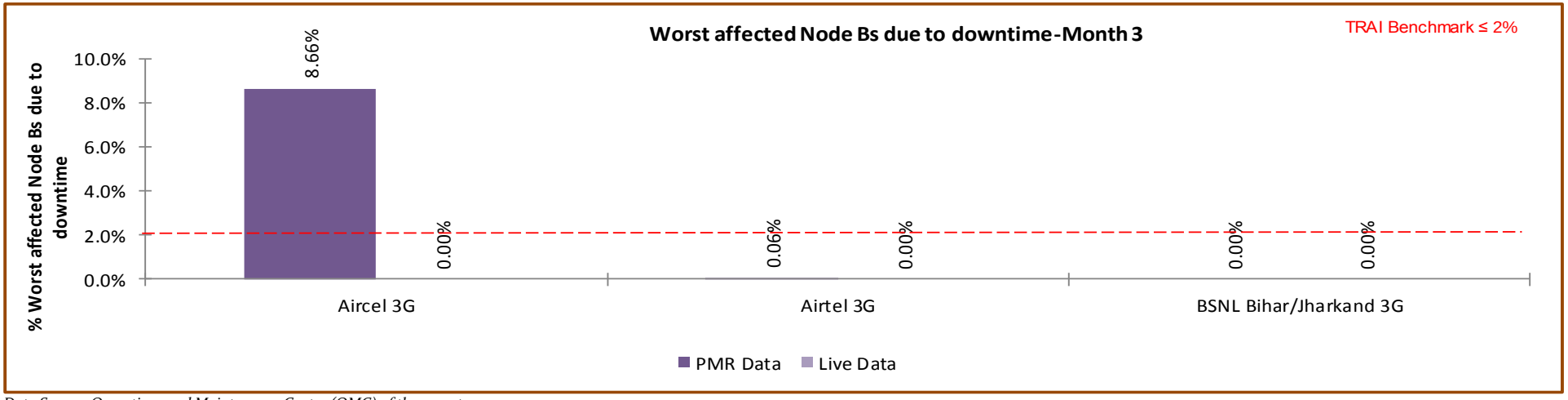


6.2.2.2 KEY FINDINGS – MONTH 2



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

6.2.2.3 KEY FINDINGS – MONTH 3



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

6.3 CALL SET UP SUCCESS RATE

6.3.1 PARAMETER DESCRIPTION

1. **Definition:** This parameter is same for 2G Networks as well as 3G Networks. However, the network elements involved in both the networks are different. Call Set-up Success Rate is defined as the ratio of Established Calls to Call Attempts. For establishing a call in 3G Networks, User Equipment (UE) accesses the Universal Terrestrial Radio Access Network (UTRAN) and establishes an RRC connection. Once RRC connection is established the Non Access Stratum (NAS) messages are exchanged between the UE and the Core Network (CN). The last step of the call setup is the establishment of a Radio Access Bearer (RAB) between the CN and the UE. However, any RAB abnormal release after RAB Assignment Response or Alerting/Connect message is to be considered as a dropped call.

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

4. **Computation Methodology-**
   (RRC Established / Total RRC Attempts) * 100

   RRC Established means the following events have happened in RRC setup:-

   - RRC attempt is made
   - The RRC established
   - The RRC is routed to the outward path of the concerned MSC

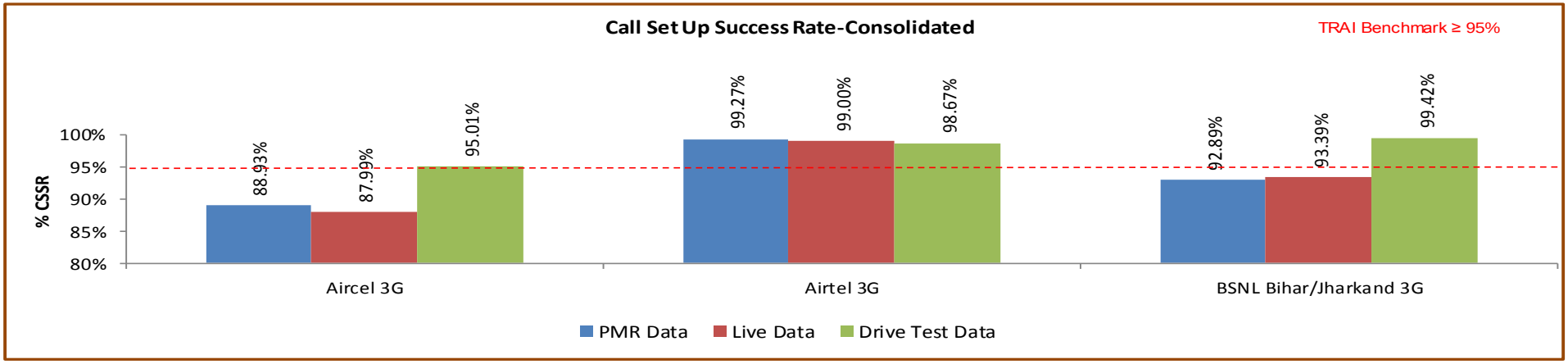
5. **TRAI Benchmark ≥** 95%

6. **Audit Procedure –**

   - The cell-wise data generated through counters/ MMC available in the switch for traffic measurements

- CSSR calculation should be measured using OMC generated data only
- Measurement should be only in Time Consistent Busy Hour (CBBH) period for all days of the week
- Counter data is extracted from the NOC of the operators.
- Total calls established include all calls established excluding RAB congestion.
  - The numerator and denominator values are derived from adding the counter values from the MSC.

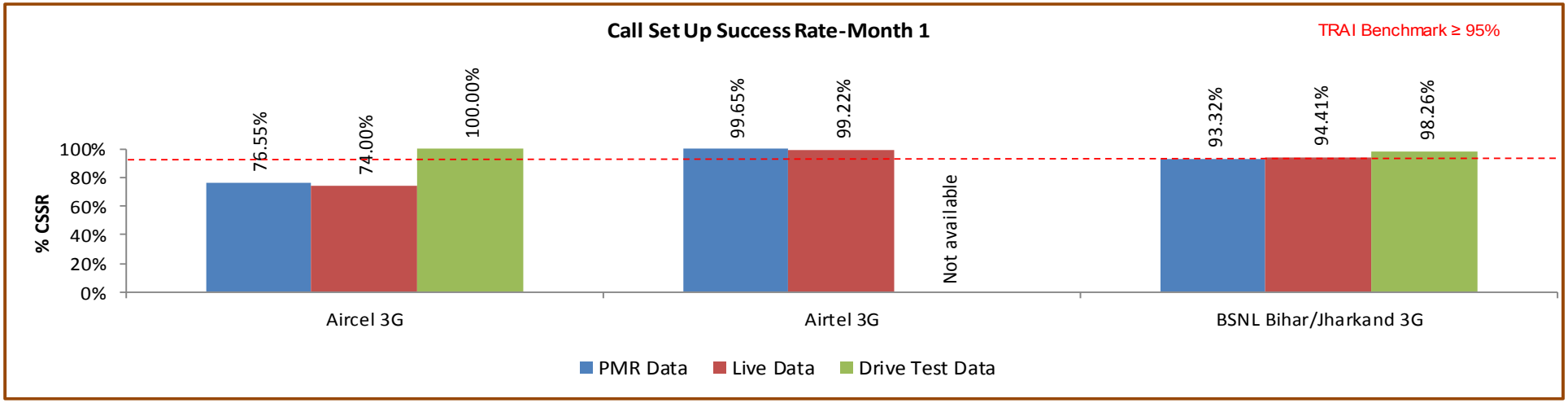
6.3.2 KEY FINDINGS - CONSOLIDATED



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

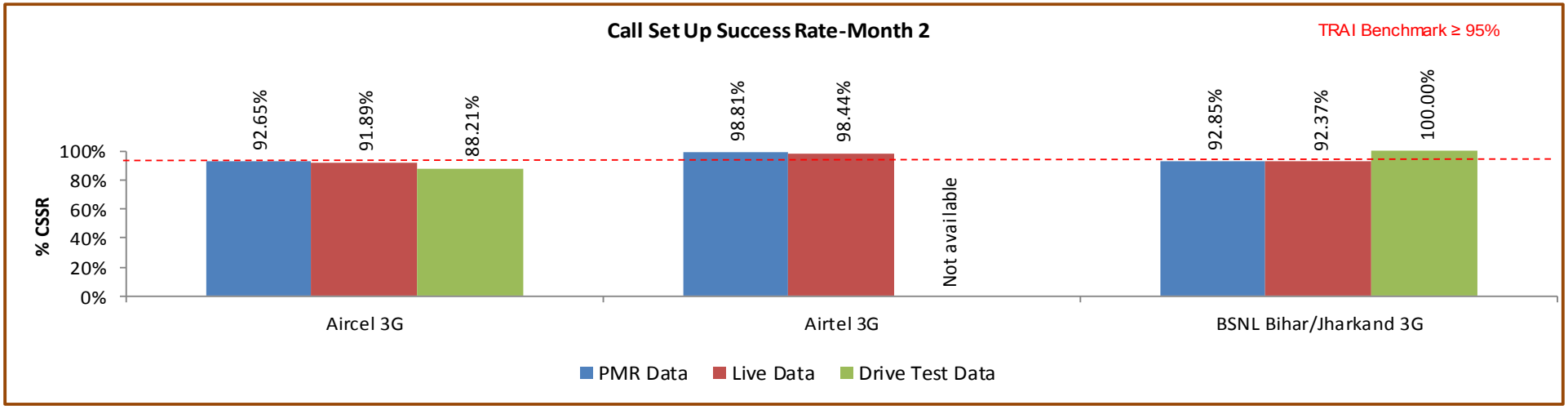
Aircel and BSNL failed to meet the TRAI benchmark as per audit/PMR data.

6.3.2.1 KEY FINDINGS – MONTH 1



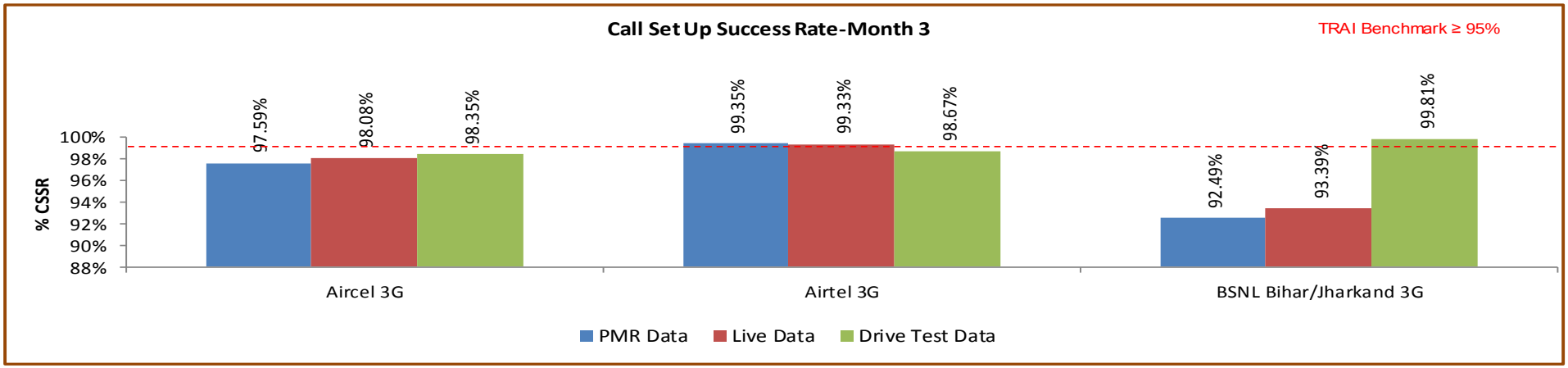
Data Source: Network Operations Center (NOC) of the operators

6.3.2.2 KEY FINDINGS – MONTH 2



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

6.3.2.3 KEY FINDINGS – MONTH 3



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

6.4 NETWORK CHANNEL CONGESTION- RRC CONGESTION/ CIRCUIT SWITCHED RAB CONGESTION

6.4.1 PARAMETER DESCRIPTION

1. **Definition (RRC Congestion):** This parameter has been amended to include RRC Congestion in 3G Networks.
2. **Definition (Circuit Switched RAB congestion):** Circuit Switched RAB congestion is similar to Traffic Channel Congestion. Therefore, the existing parameter has been amended to include RAB congestion in 3G Networks.
3. **Point of Interconnection (POI) Congestion:** This parameter denotes congestion at the outgoing traffic between two networks and is equally applicable for 2G networks and 3G networks.
    - RRC Level: Stand-alone dedicated control channel
    - RAB Level: Traffic Channel
    - POI Level: Point of Interconnect
4. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.
5. **Source of Data:** Network Operation Center (NOC) or a Central Server
6. **Computational Methodology:**
    - **RRC / RAB Congestion% = [(A1 x C1) + (A2 x C2) +.....+ (An x Cn)] / (A1 + A2 +...+ An)**
        - Where:-A1 = Number of attempts to establish RRC/ RAB made on day 1
        - C1 = Average RRC / RAB Congestion % on day 1
        - A2 = Number of attempts to establish RRC / RAB made on day 2
        - C2 = Average RRC / RAB Congestion % on day 2
        - An = Number of attempts to establish RRC / RAB made on day n
        - Cn = Average RRC / RAB Congestion % on day n

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

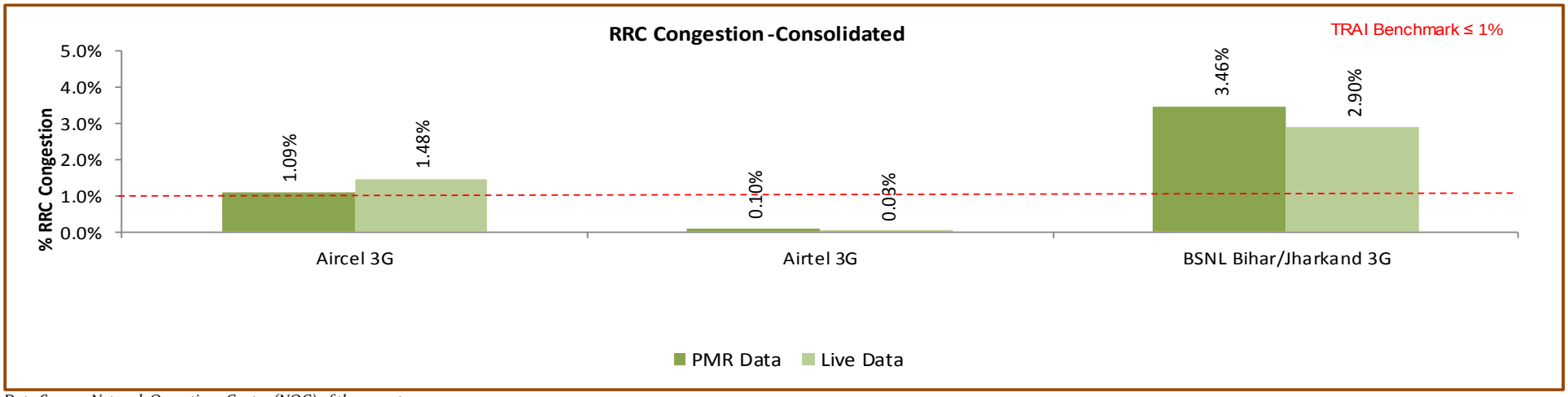
7. Benchmark:

- RRC Congestion: ≤ 1%, RAB Congestion: ≤ 2%, POI Congestion: ≤ 0.5%

8. Audit Procedure –

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

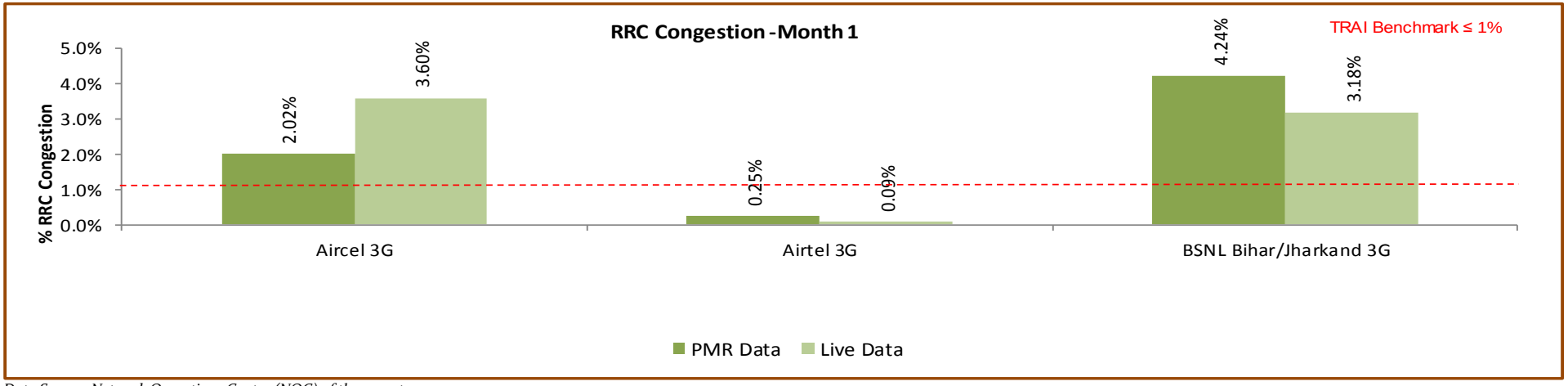
6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



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

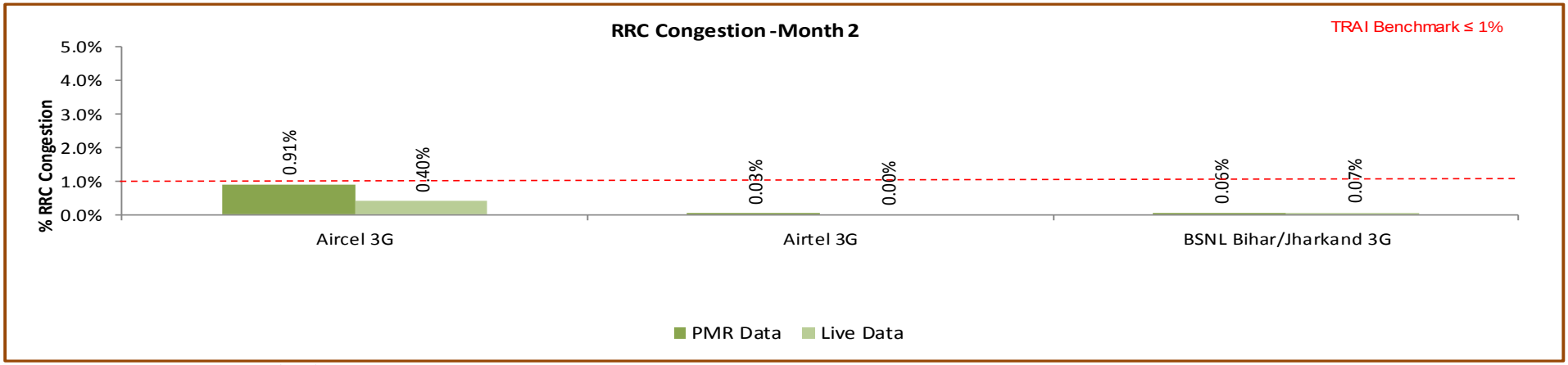
Aircel and BSNL failed to meet the TRAI benchmark for RRC congestion.

6.4.2.1 KEY FINDINGS – MONTH 1



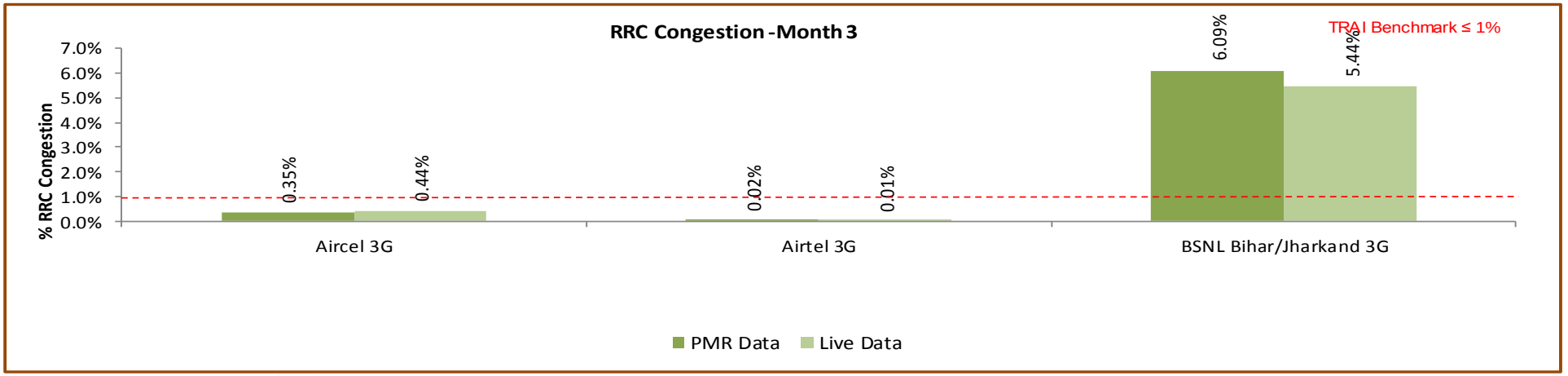
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



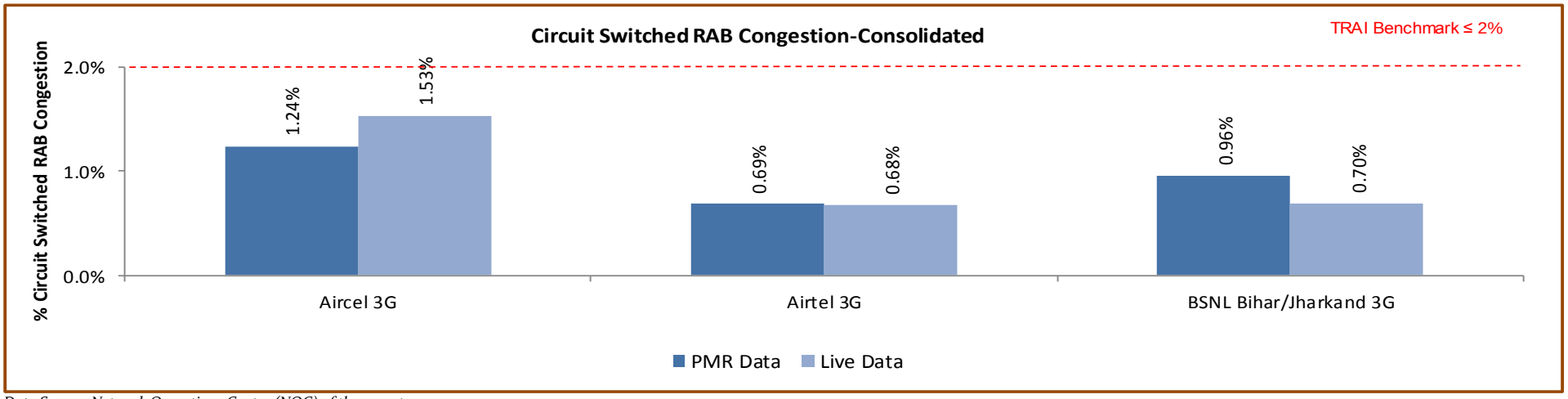
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3



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

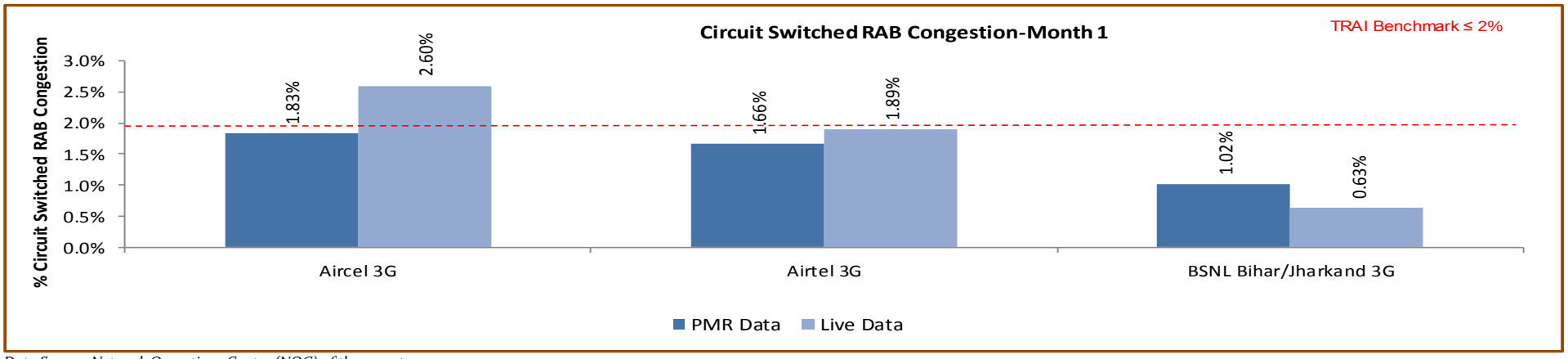
6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)



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

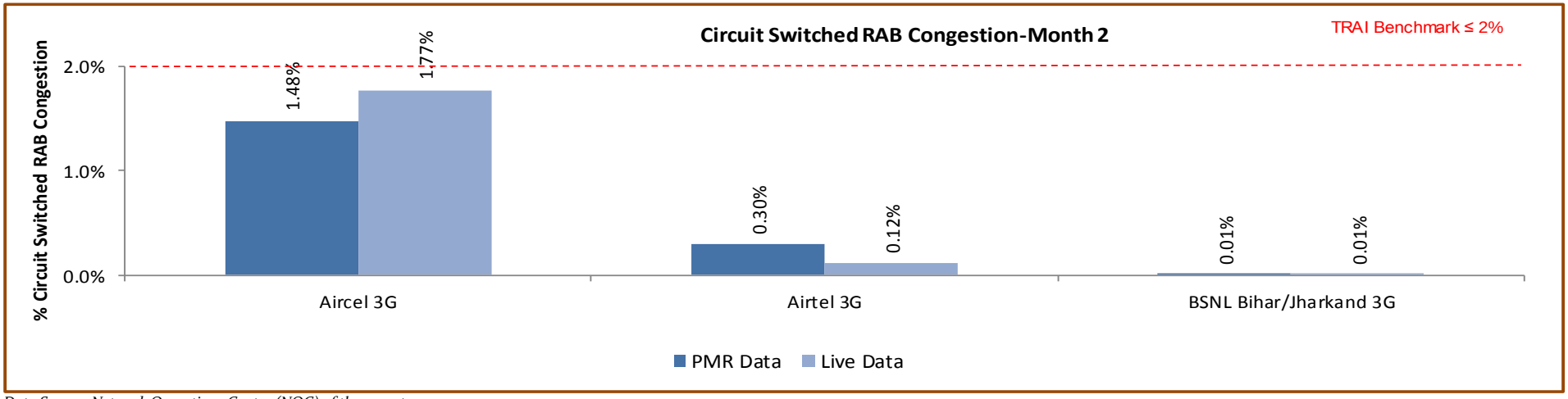
All operators met the benchmark as per audit/PMR report.

6.4.3.1 KEY FINDINGS – MONTH 1



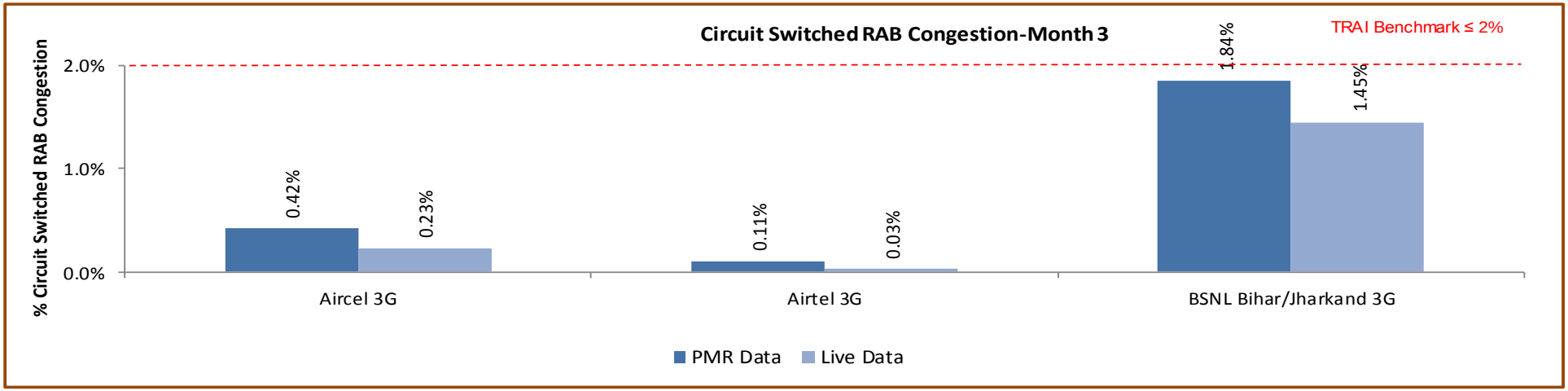
Data Source: Network Operations Center (NOC) of the operators

6.4.3.2 KEY FINDINGS – MONTH 2



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

6.4.3.3 KEY FINDINGS – MONTH 3



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

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

Audit Results for POI Congestion- PMR data				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	14
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		388441	0	31076
Traffic served for all POIs (B)- in erlangs		245192	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	14
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		388419	0	31076
Traffic served for all POIs (B)- in erlangs		120479	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

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

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

6.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-January				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	0	15538
Traffic served for all POIs (B)- in erlangs		77008	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	0	15538
Traffic served for all POIs (B)- in erlangs		36138	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

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

6.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-February				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129493	0	15538
Traffic served for all POIs (B)- in erlangs		83244	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129491	0	15538
Traffic served for all POIs (B)- in erlangs		42326	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

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

6.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-March				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	0
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	0	0
Traffic served for all POIs (B)- in erlangs		84940	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-March				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	0
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	0	0
Traffic served for all POIs (B)- in erlangs		42014	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

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

6.5 CIRCUIT SWITCHED VOICE DROP RATE

6.5.1 PARAMETER DESCRIPTION

1. **Definition** - The Call Drop Rate measures the inability of Network to maintain a call and is defined as the ratio of abnormal speech disconnects with respect to all speech disconnects (both normal and abnormal). In 3G Networks, a normal disconnect is initiated from the Mobile Switching Centre (MSC) at completion of the call by a RAB Disconnect message. An abnormal RAB disconnect can be initiated by either UTRAN or CN and includes Radio Link Failures, Uplink (UL) or Downlink (DL) interference or any other reason.

   - **Total No. of voice RAB abnormally released** = All calls ceasing unnaturally i.e. due to handover or due to radio loss
   - **No. of voice RAB normally released** = All calls that have RAB allocation during busy hour

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

4. **Computational Methodology:** **(No. of voice RAB normally released / (No. of voice RAB normally released + RAB abnormally released)x 100**

Key Performance Indicator Term	Definition
#RAB Normal Release(CSV)	Number of voice RAB normally Released
#RAB Abnormal Release(CSV)	Number of voice RAB abnormally Released

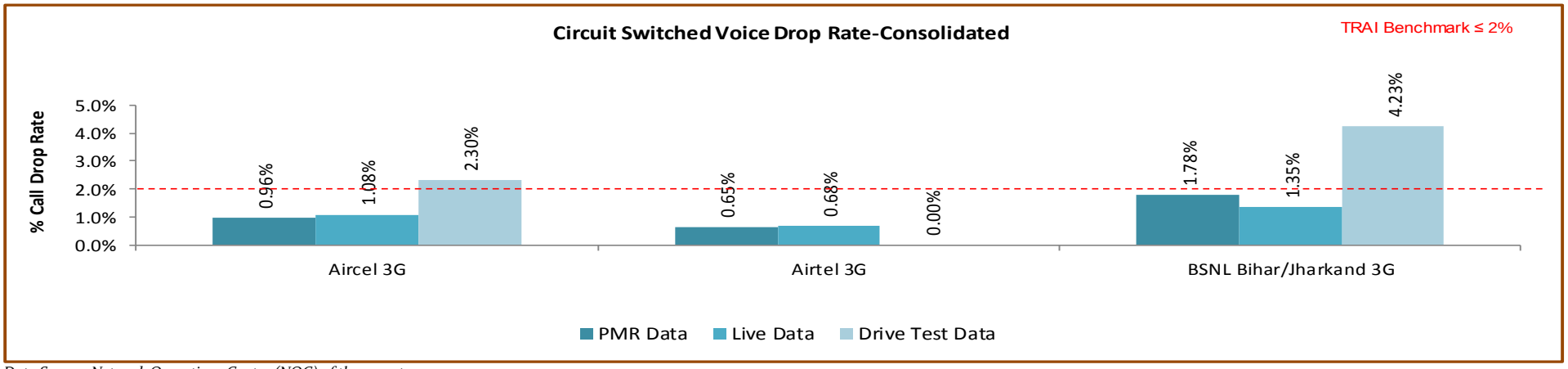
5. **TRAI Benchmark –**

   - Circuit switched voice drop rate ≤ 2%

6. **Audit Procedure –**

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was used
   - The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter.

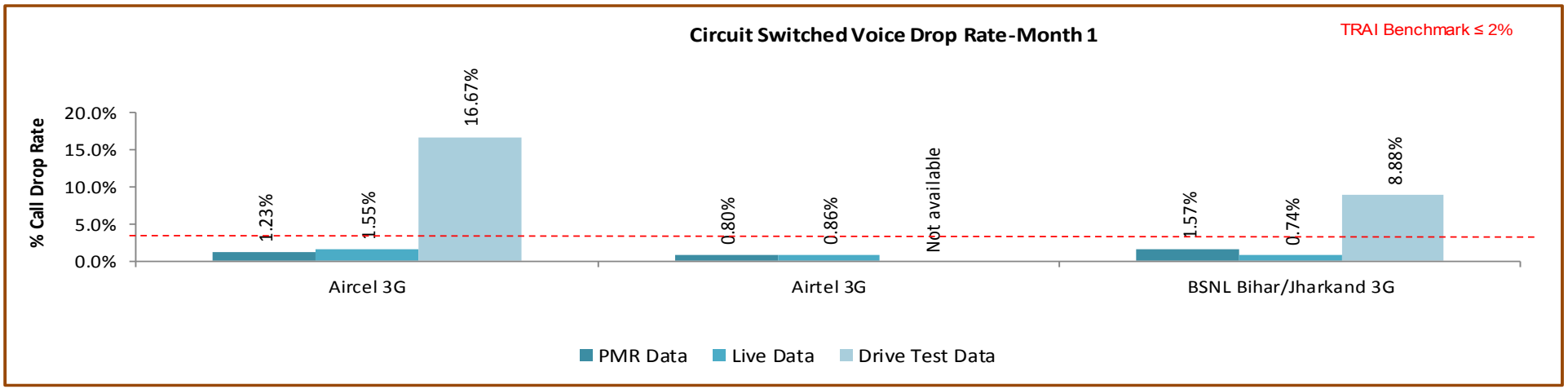
6.5.2 KEY FINDINGS - CONSOLIDATED



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

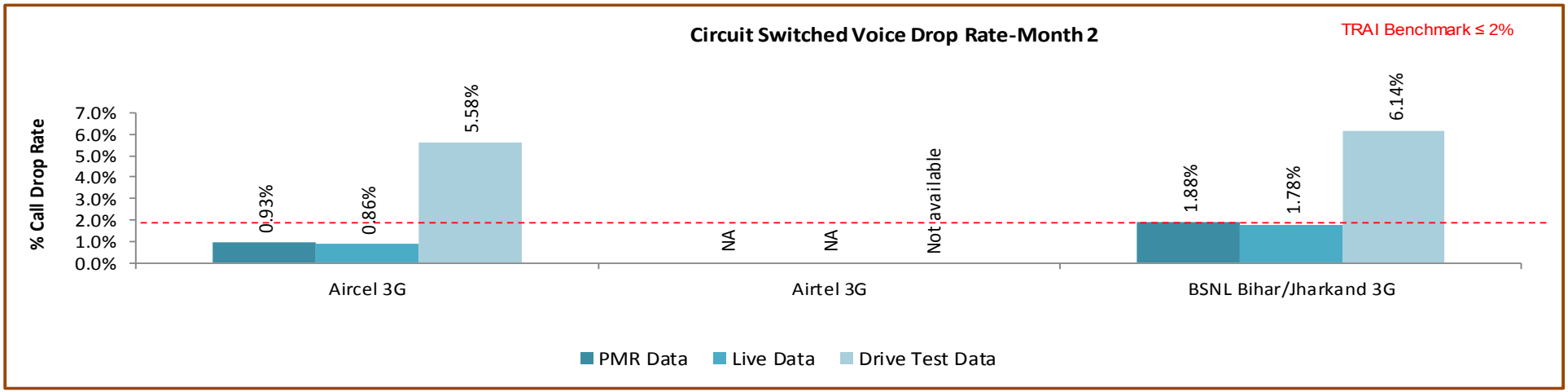
All operators met the benchmark for call drop rate during audit. During drive test Aircel 3G and BSNL 3G failed to meet the benchmark.

6.5.2.1 KEY FINDINGS – MONTH 1



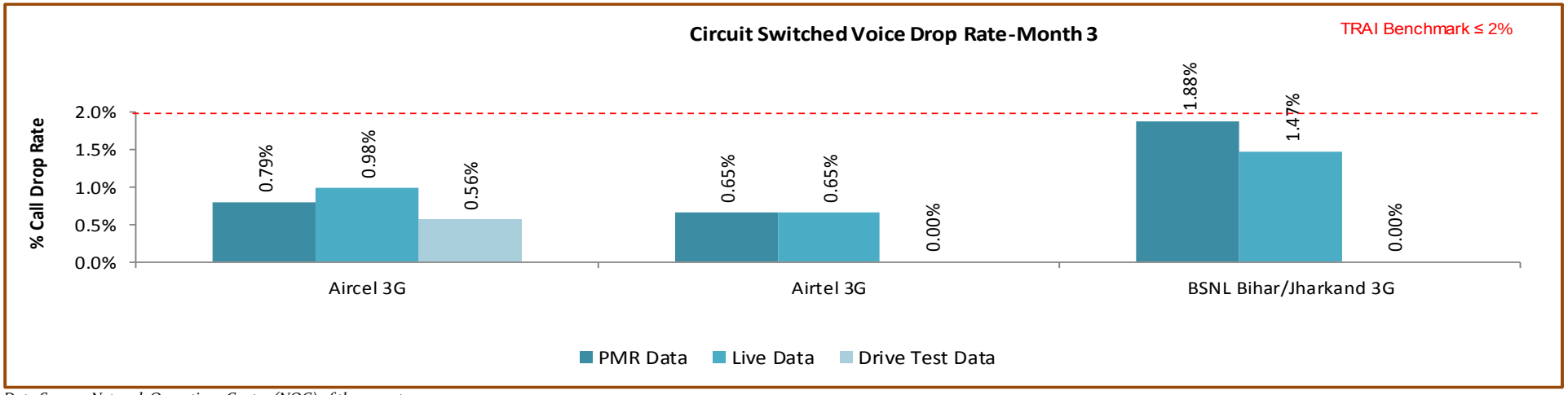
Data Source: Network Operations Center (NOC) of the operators

6.5.2.2 KEY FINDINGS – MONTH 2



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

6.5.2.3 KEY FINDINGS – MONTH 3



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

6.6 WORST AFFECTED CELLS HAVING MORE THAN 3% CIRCUIT SWITCHED VOICE DROP RATE

6.6.1 PARAMETER DESCRIPTION

1. **Definition- Cells having more than 3% circuit switch voice quality:** The existing parameter has been amended to cover 3G Networks to assess worst affected cells having more than 3% CSV Drop Rate.

2. **Data Extraction/collection methodology** - Data extraction to be done from appropriate counters. Auditors should be aware of counter details and definitions for each operator.

3. **Source of Data:** Network Operation Center (NOC) or a Central Server

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

5. **TRAI Benchmark** –

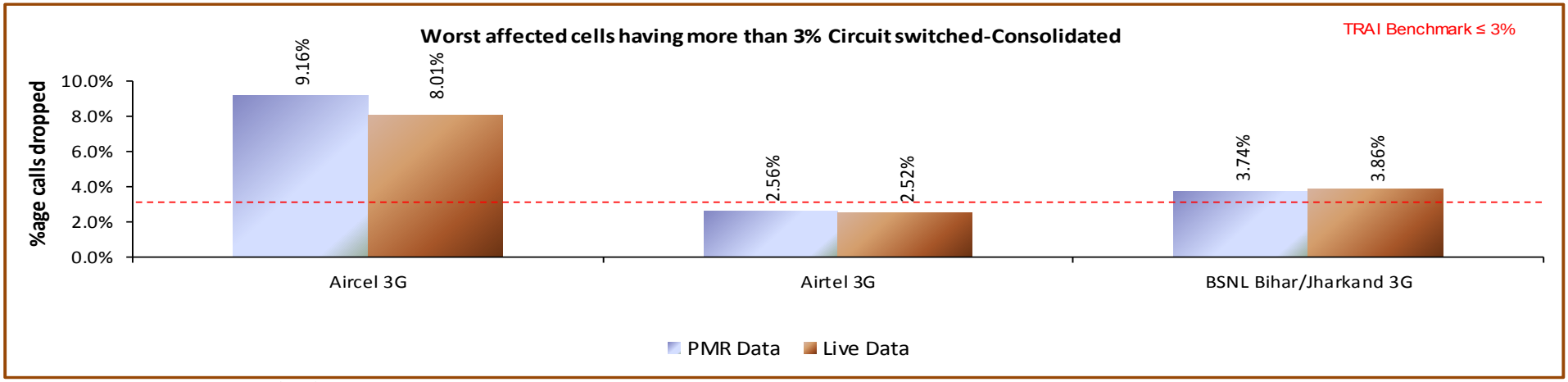
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

6. **Audit Procedure** –

   - Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR would be conducted.

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

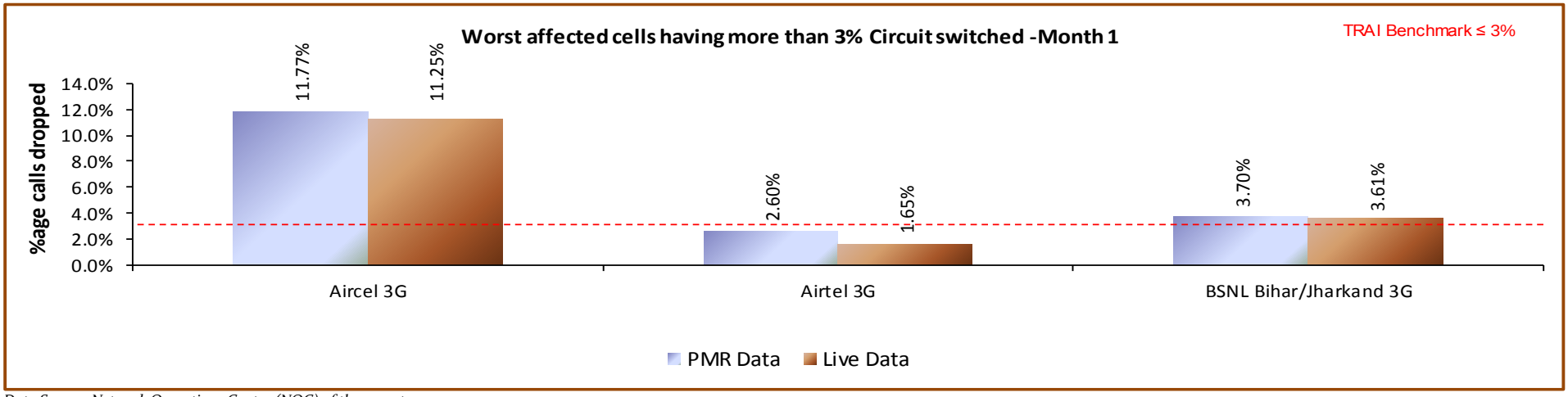
6.6.2 KEY FINDINGS - CONSOLIDATED



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

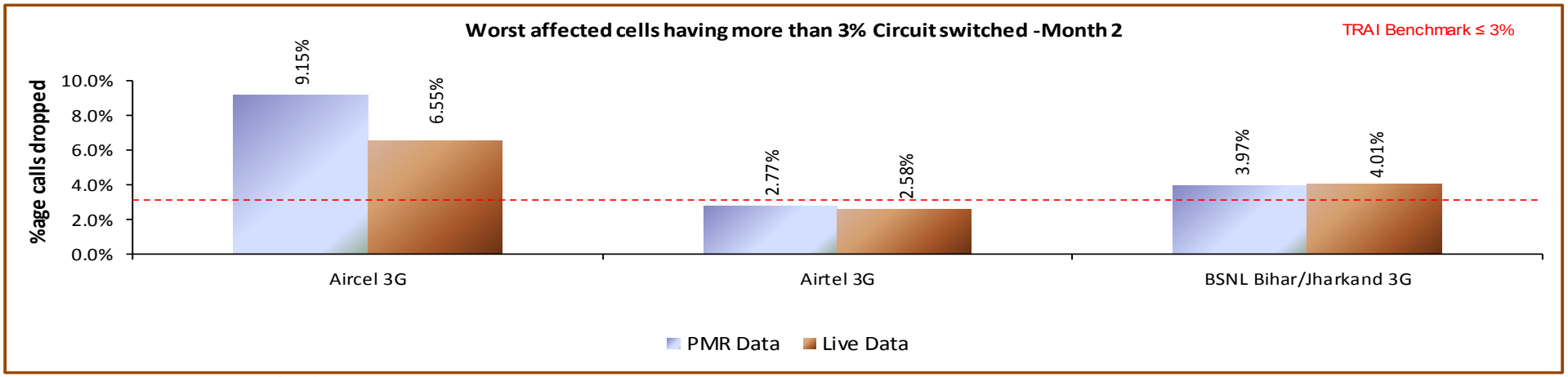
Aircel and BSNL failed to meet the benchmark during audit.

6.6.2.1 KEY FINDINGS – MONTH 1



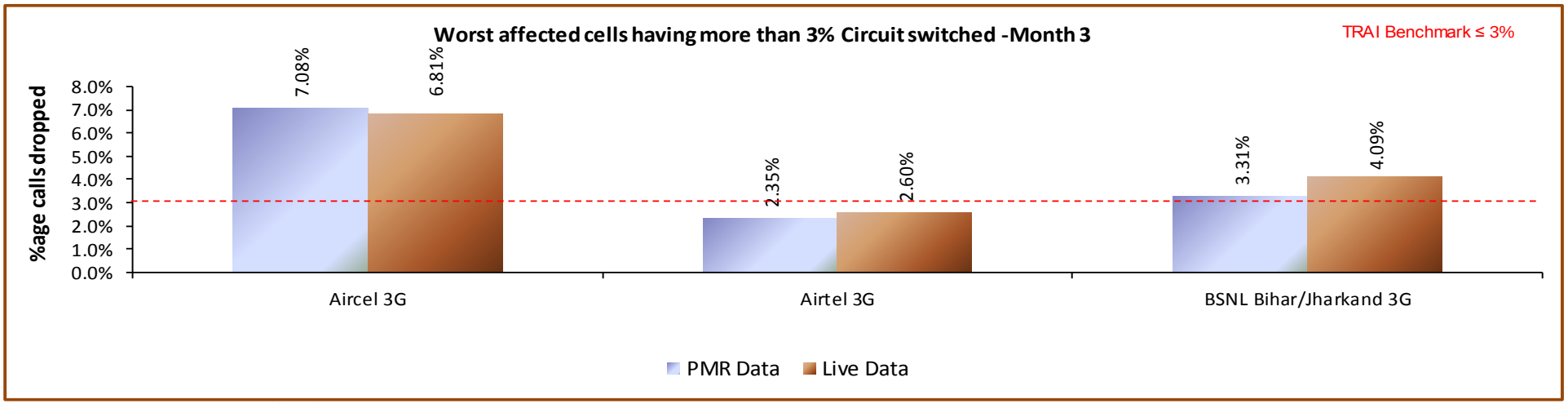
Data Source: Network Operations Center (NOC) of the operators

6.6.2.2 KEY FINDINGS – MONTH 2



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

6.6.2.3 KEY FINDINGS – MONTH 3



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

6.7 CIRCUIT SWITCH VOICE QUALITY

6.7.1 PARAMETER DESCRIPTION

5. **Definition:**

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

6. **Computational Methodology:**

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

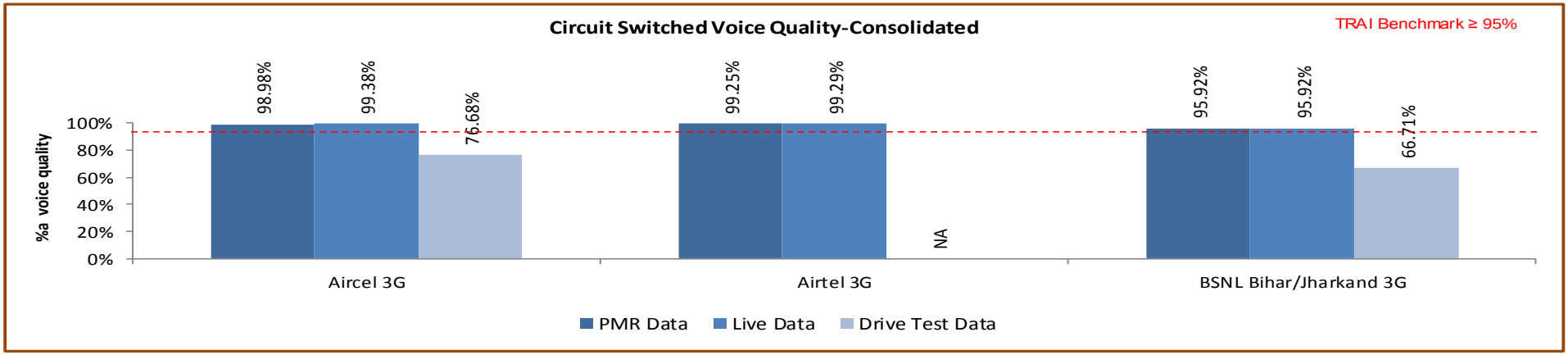
7. **TRAI Benchmark:** ≥ 95%

8. **Audit Procedure –**

   a. A sample of calls would be taken randomly from the total calls established.

   b. The operator should only be considering those calls which are meeting the desired benchmark of good voice quality.

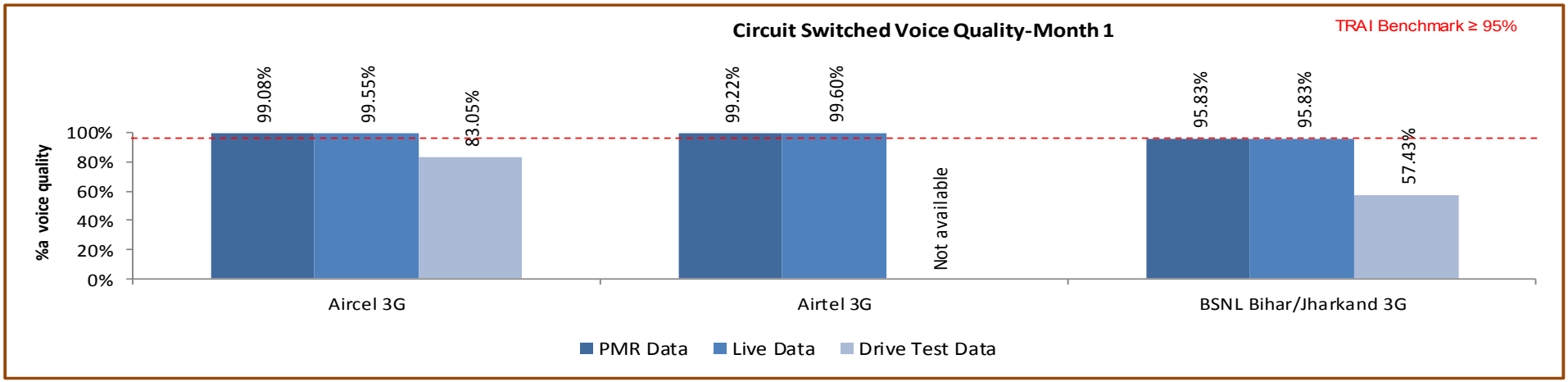
6.7.2 KEY FINDINGS



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

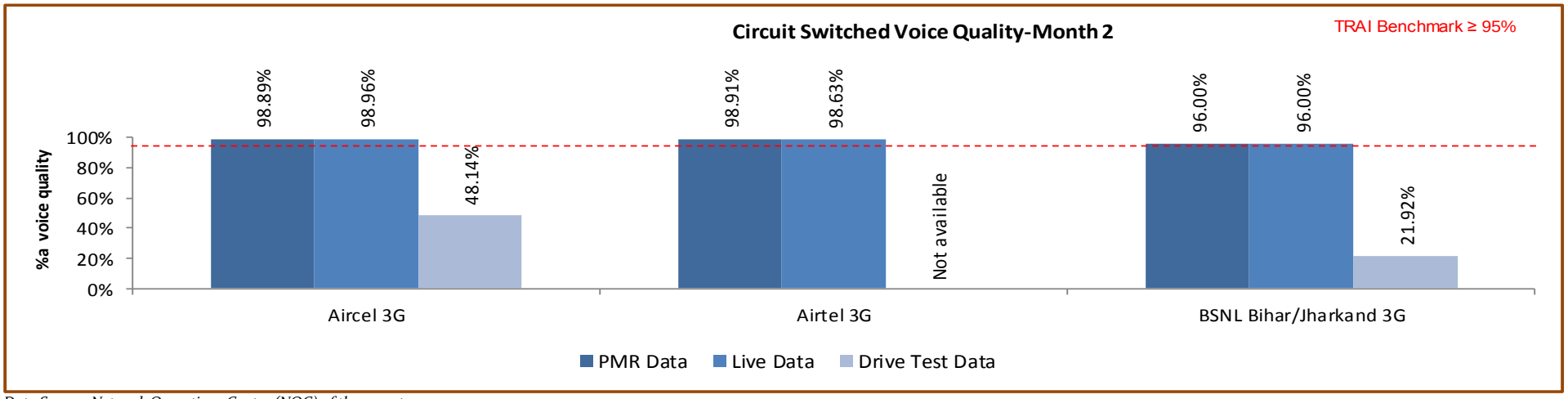
All operators met the TRAI benchmark at the time of audit. During drive test Aircel 3G and BSNL 3G failed to meet the benchmark.

6.7.2.1 KEY FINDINGS – MONTH 1



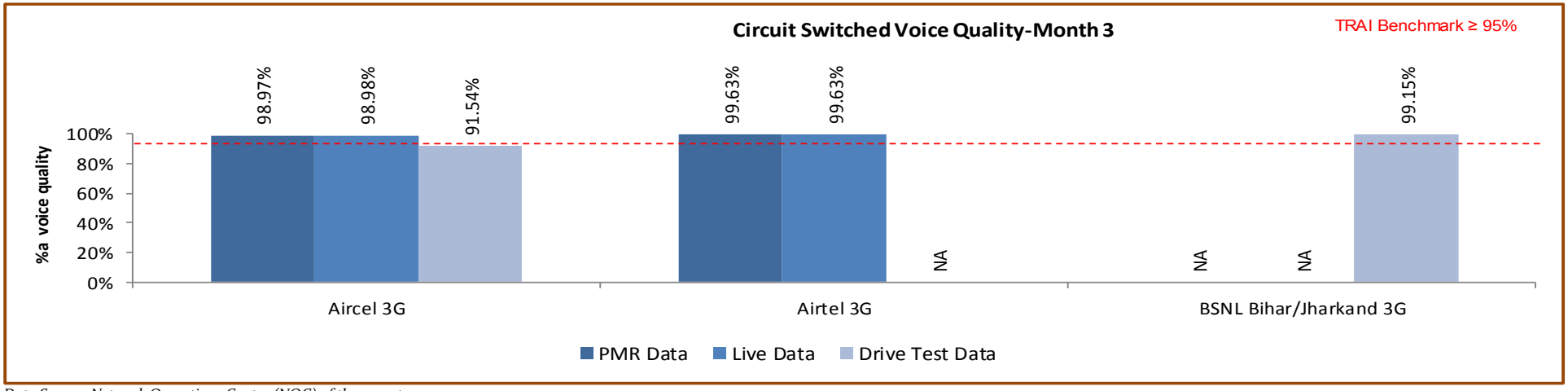
Data Source: Network Operations Center (NOC) of the operators

6.7.2.2 KEY FINDINGS – MONTH 2



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

6.7.2.3 KEY FINDINGS – MONTH 3



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

7 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES (2G & 3G)

7.1 SERVICE ACTIVATION /PROVISIONING FOR 2G & 3G

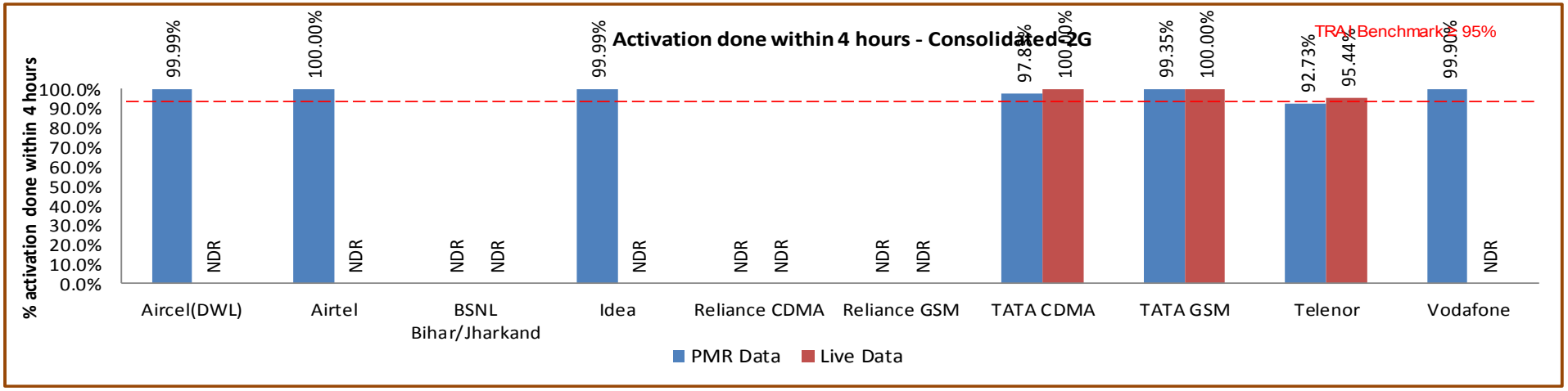
7.1.1 PARAMETER DESCRIPTION

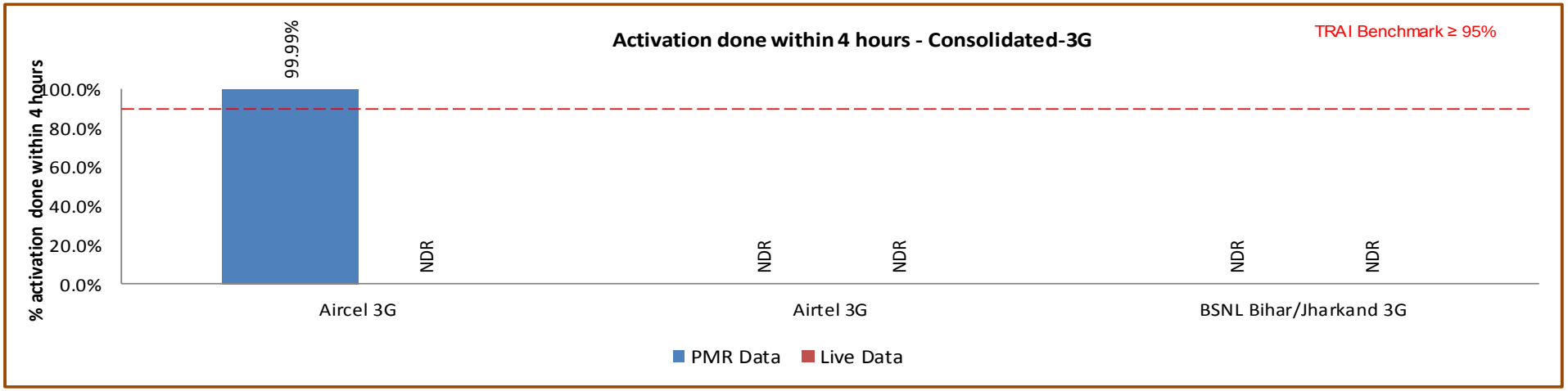
This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services. The service provider typically sends these settings to the subscriber's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

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

Benchmark :- >=95%

7.1.2 KEY FINDINGS





Telenor failed to meet the benchmark during audit for 2G.

7.2 PDP CONTEXT ACTIVATION SUCCESS RATE FOR 2G & 3G

7.2.1 PARAMETER DESCRIPTION

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

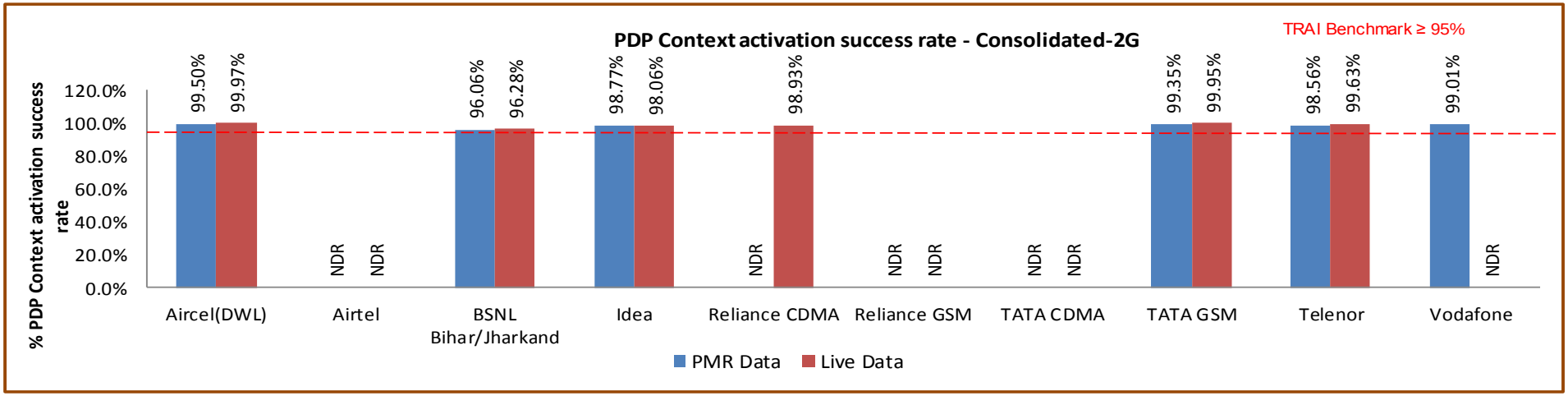
Measurement

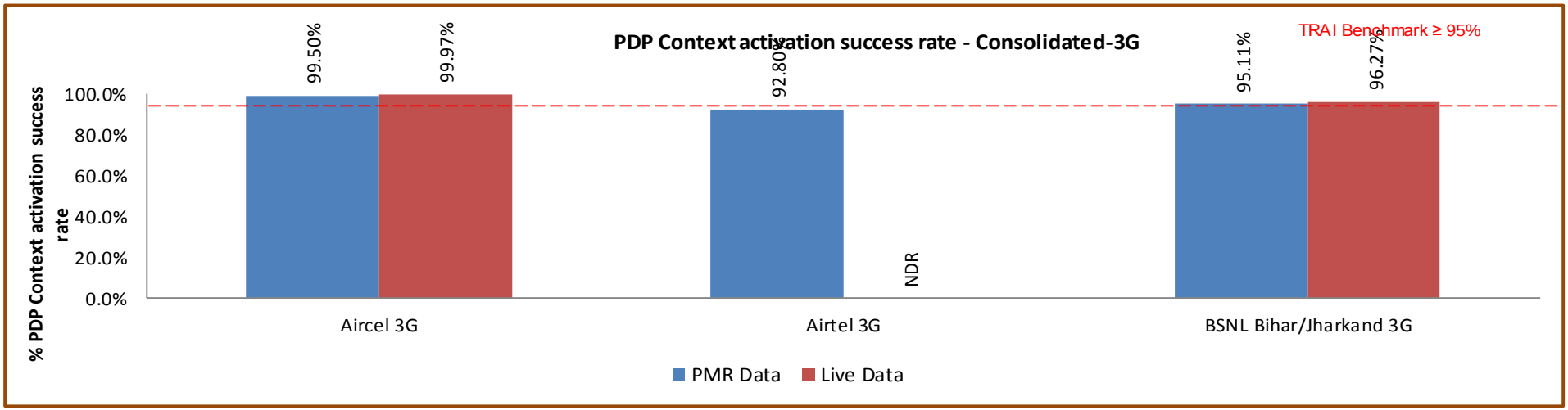
This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

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

Benchmark: >=95%

7.2.2 KEY FINDINGS





Airtel 3G failed to meet the benchmark during PMR audit.

7.3 DROP RATE FOR 2G & 3G

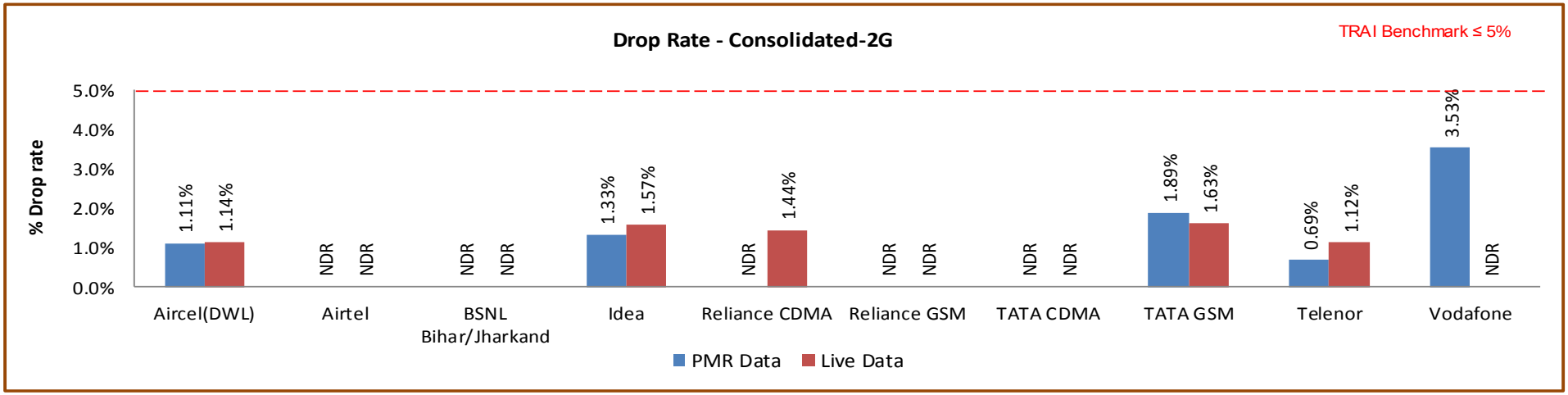
7.3.1 PARAMETER DESCRIPTION

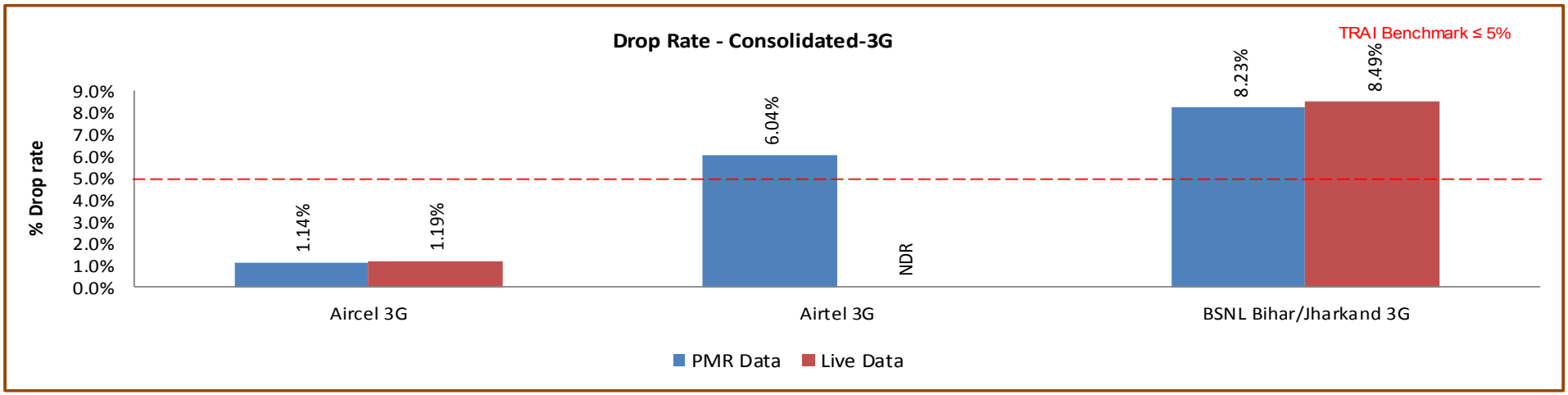
It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects (both normal and abnormal). An abnormal disconnect may happen because of Radio Link Failures, Uplink (UL) or Downlink (DL) interference, bad coverage, unsuccessful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

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

Benchmark: <=5%

7.3.2 KEY FINDINGS





Airtel 3G and BSNL 3G failed to meet the benchmark during audit.

8 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

8.1 METERING AND BILLING CREDIBILITY

The billing complaints for postpaid are calculated by averaging over one billing cycle in a quarter. For example, there are three billing cycles in a quarter, the data for each billing cycle is calculated separately and then averaged over.

The charging complaints for prepaid are calculated by taking all complaints in a quarter.

8.1.1 PARAMETER DESCRIPTION

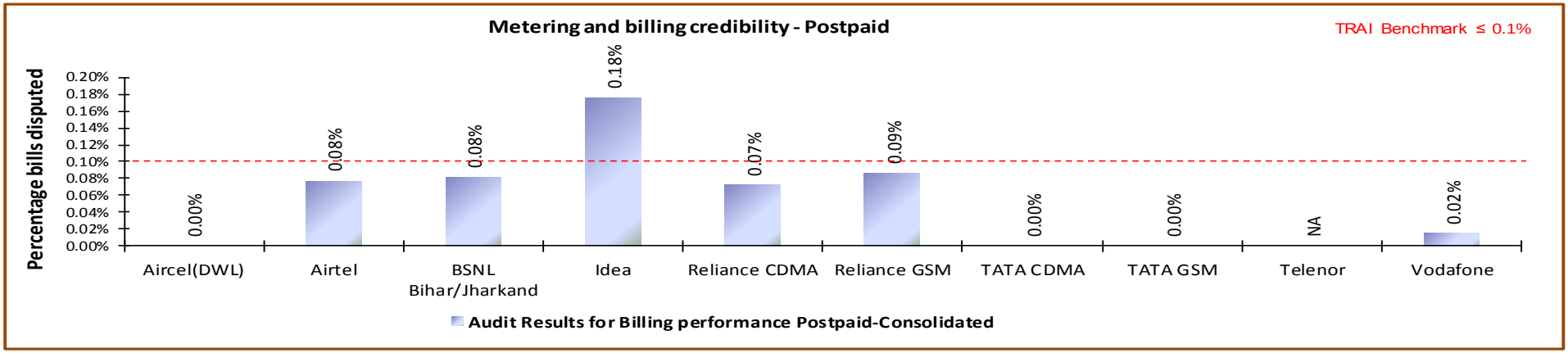
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

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

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

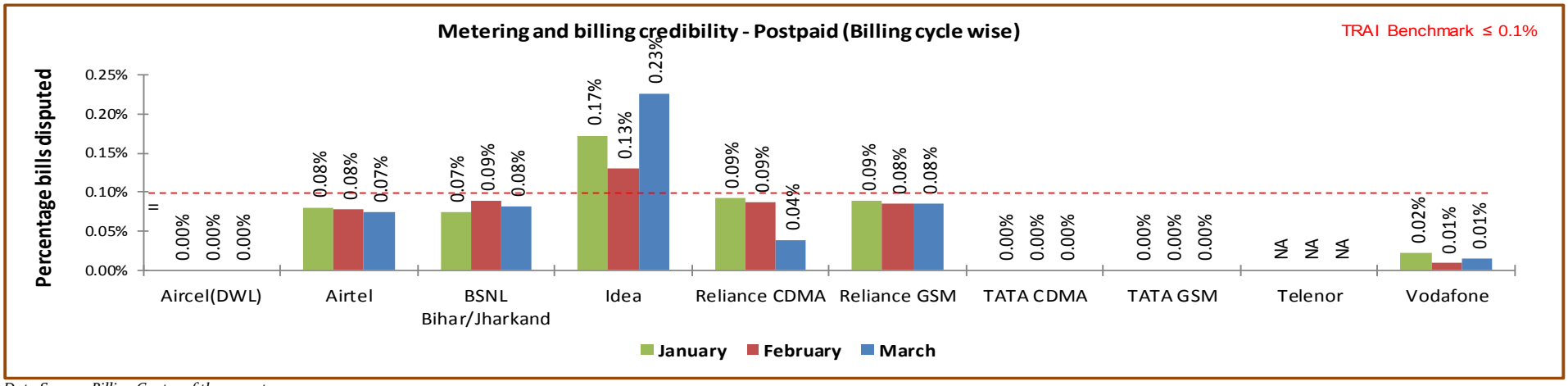
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would include printed bills, online bills and any other forms of bills generated
  - **Billing complaints here shall include only dispute related issues (including those that February arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.
  - **Charging complaints per 100 subscribers (Prepaid)** = (Total charging complaints received during the quarter/ Total number of subscribers reported by the operator at the end of the quarter) * 100
- TRAI Benchmark: <= 0.1%
- Audit Procedure:
  - Audit of billing complaint details for the complaints received during the quarter and used for arriving at the benchmark reported to TRAI would be conducted
    - For Postpaid, the total billing complaints would be audited by averaging over billing cycles in a quarter
    - For Prepaid, the data of total charging complaints in a quarter would be taken for the purpose of audit

8.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



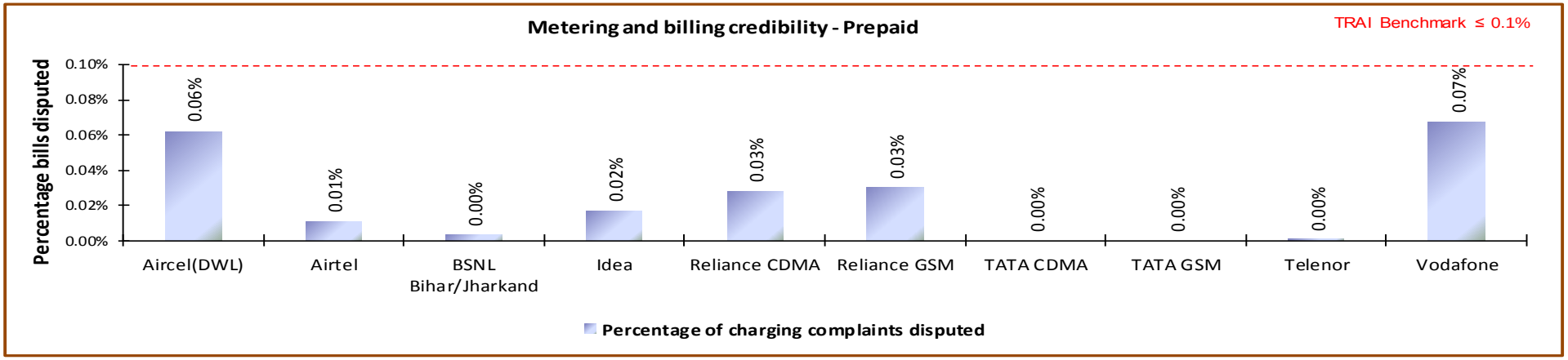
Data Source: Billing Center of the operators

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



Data Source: Billing Center of the operators

8.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)



Data Source: Billing Center of the operators

All operators met the benchmark for metering and billing credibility of prepaid subscribers.

8.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

8.2.1 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:

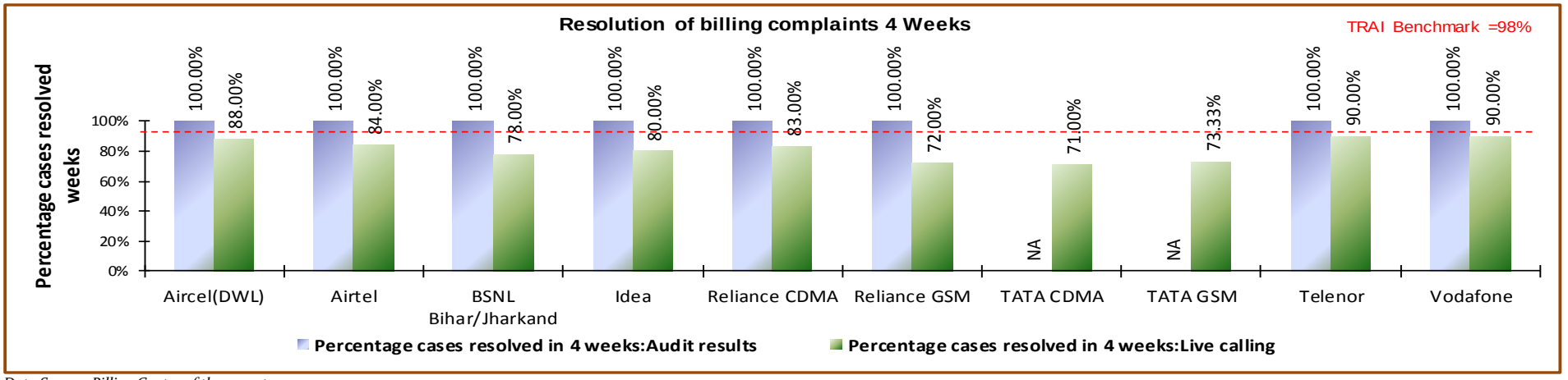
%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

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

- **Billing complaints here shall include only dispute related issues (including those that February arise because of a lack of awareness at the subscribers' end). It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally. Complaints raised by the consumers to operator are only considered as part of the calculation.
- The complaints that get marked as invalid by the operator are not considered for calculation as those complaints cannot be considered as resolved by the operator.
- *** Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.

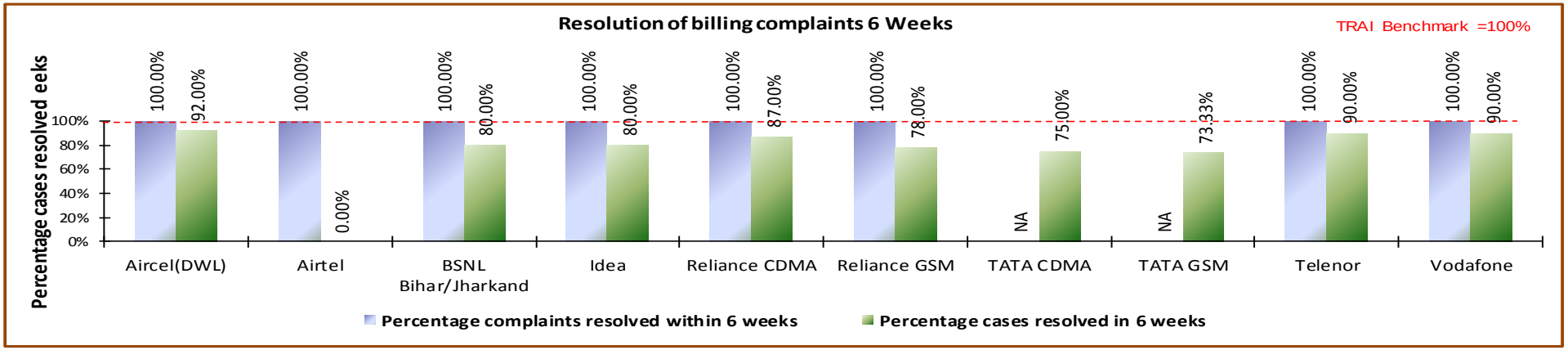
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

8.2.2 KEY FINDINGS - WITHIN 4 WEEKS



Data Source: Billing Center of the operators

8.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

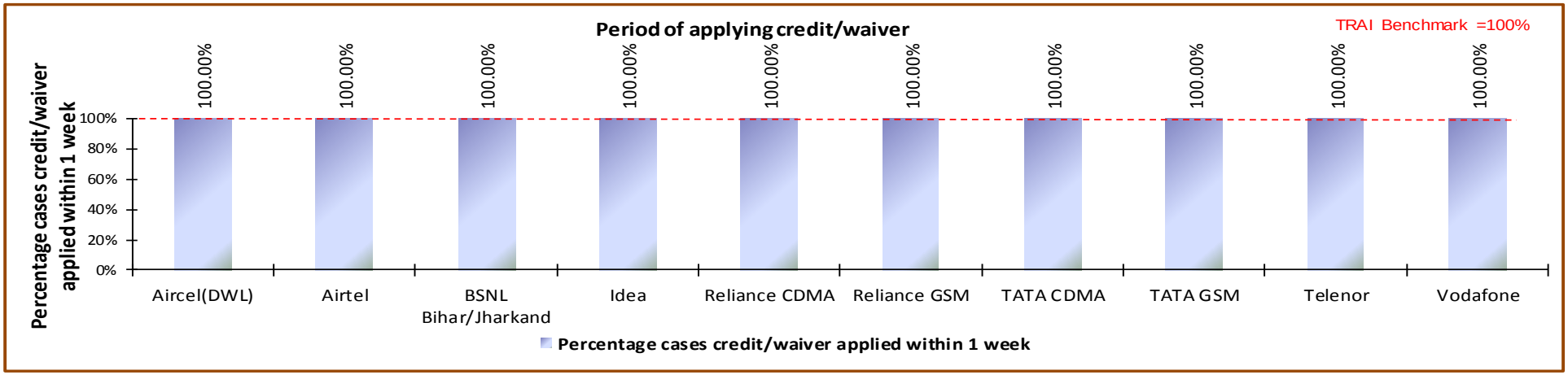
All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks and 6 weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the benchmark.

8.3 PERIOD OF APPLYING CREDIT/WAVIER

8.3.1 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

8.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

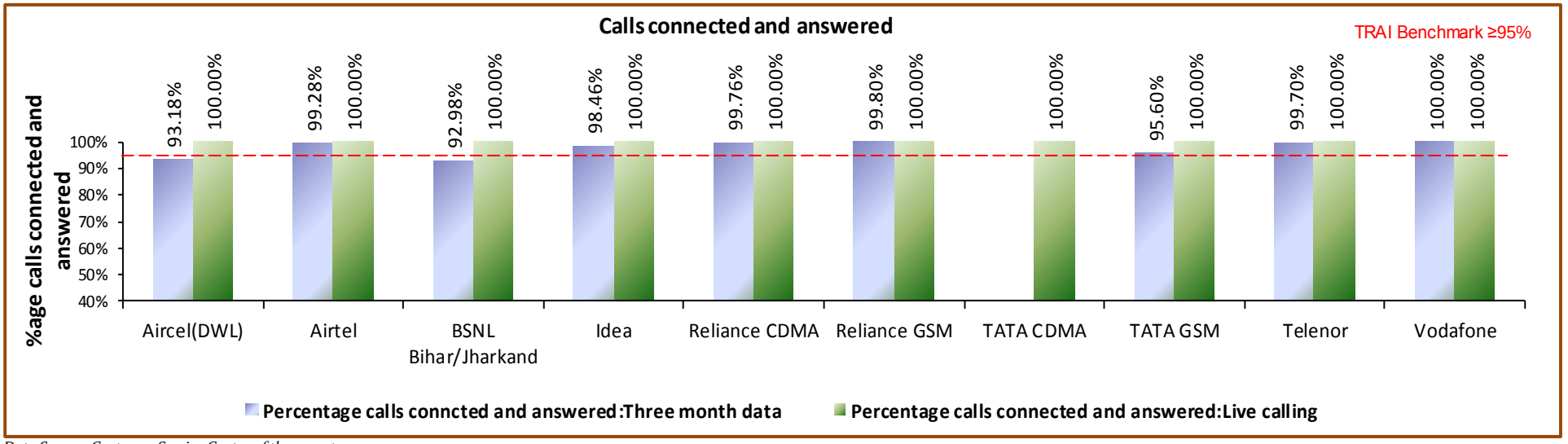
All operators met the benchmark for this parameter.

8.4 CALL CENTRE PERFORMANCE-IVR

8.4.1 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

8.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

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

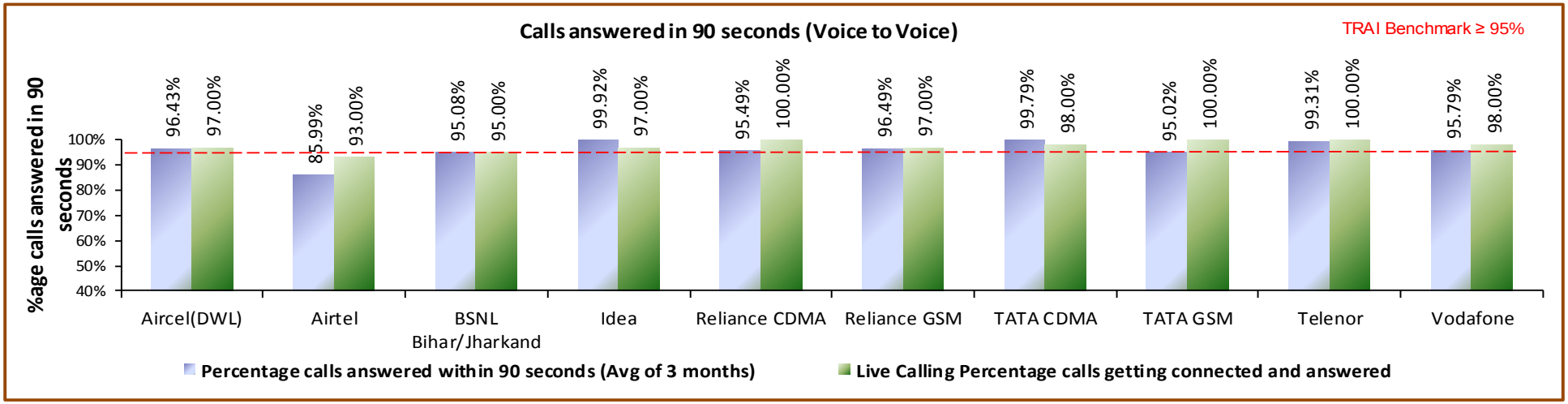
8.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

8.5.1 PARAMETER DESCRIPTION

- Computational Methodology:
  - Call centre performance Voice to Voice = (Number of calls answered by operator within 90 seconds/ All calls attempted to connect to the operator) * 100
- Audit Procedure:
  - Operators provide details of the following from their central call centre/ customer service database:
    - Total calls connected and answered by operator within 90 seconds
    - Total calls attempted to connect to the operator
  - Also live calling was done to test the calls answered within 90 seconds by the operator

Benchmark: 95% calls to be answered within 90 seconds

8.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

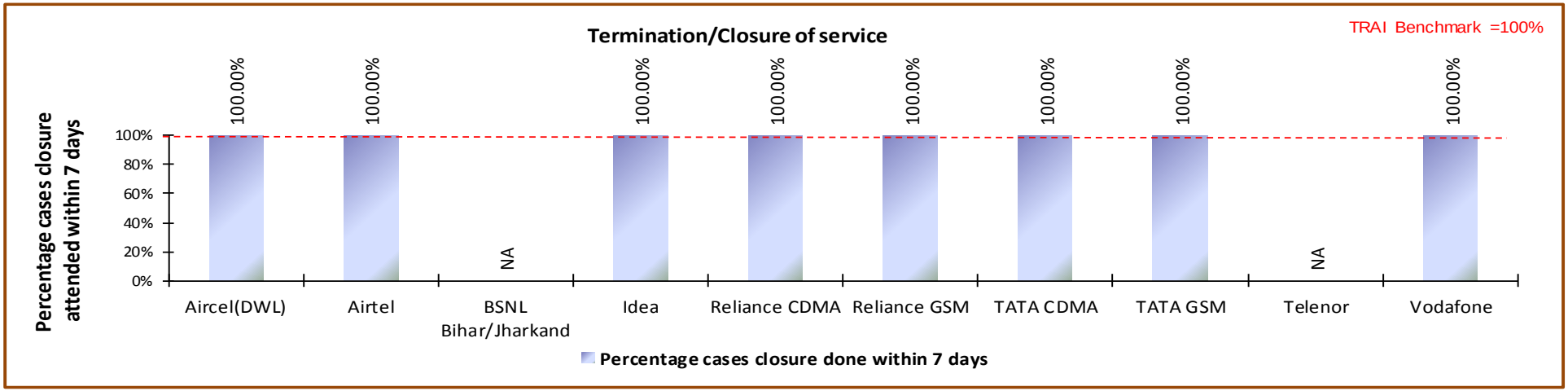
Airtel failed to meet the benchmark as per audit. However, as per live calling done to customers, the performance of Airtel failed to meet the benchmark.

8.6 TERMINATION/CLOSURE OF SERVICE

8.6.1 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

8.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

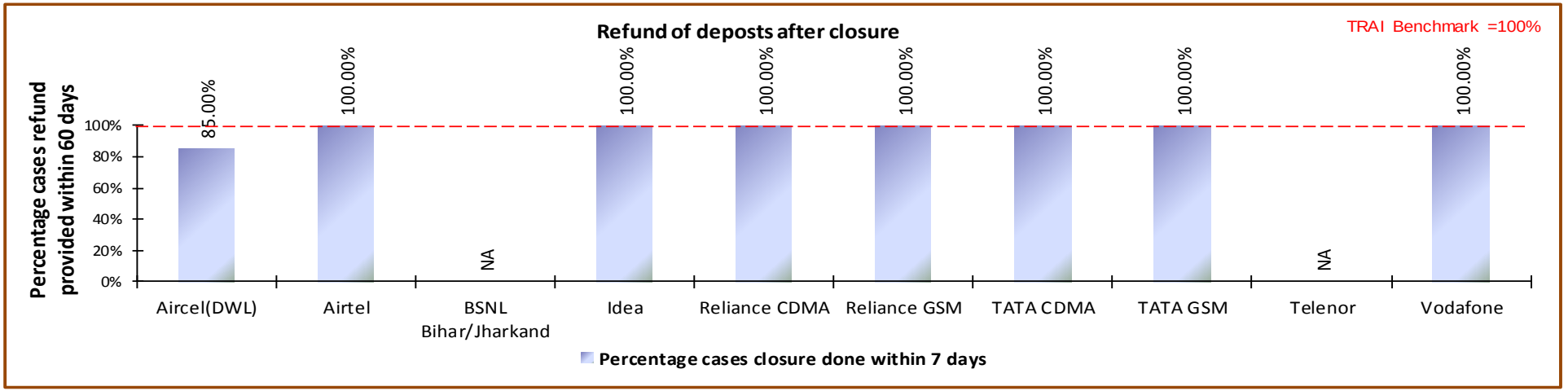
All operators met the TRAI benchmark for the parameter.

8.7 REFUND OF DEPOSITS AFTER CLOSURE

8.7.1 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

8.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Aircel failed to meet the TRAI benchmark for the parameter.

9 DETAILED FINDINGS - DRIVE TEST DATA

9.1 OPERATOR ASSISTED DRIVE TEST - VOICE

The drive test was conducted simultaneously for all the operators present in the Kolkata circle. As per the new directive given by TRAI headquarters, drive test in the quarter were conducted at a SSA level. SSAs have been defined in two categories by TRAI as per the criticality of the SSA.

3. Normal SSA
4. Difficult SSA

The drive test in Normal SSA was conducted for three days with minimum distance of 250 kilometers over three days. The drive test in difficult SSAs was conducted for six days with minimum distance of 500 kilometers over six days. The selection of routes ensured that the maximum towns, villages, highways are covered as part of drive test. The routes were selected post discussion with TRAI regional teams. The holding period for all test calls was 120 seconds and gap between calls was 10 seconds.

For measuring voice quality RxQual samples for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. RxQual greater than 5 meant that the sample was not of appropriate voice quality and for CDMA operators FERs of more than 4 were considered bad. Call drops were measured by the number of calls that were dropped to the total number of calls established during the drive test. Similarly CSSR was measured as the ratio of total calls established to the total call attempts made. Signal strength was measured in Dbm with strength > -75 dbm for indoor, -85 dbm for in-vehicle and > -95 dbm outdoor routes.

The schedule and operators involved in the operator assisted drive test for Bihar circle are given below.

Name of Operator	Name of Operator
Aircel(DWL)	Aircel(DWL)
Airtel	Airtel
BSNL Bihar/Jharkand	BSNL Bihar/Jharkand
Idea	Reliance CDMA
Reliance CDMA	
Reliance GSM	
TATA CDMA	
TATA GSM	
Telenor	
Vodafone	

9.1.1 DEVGHAR SSA

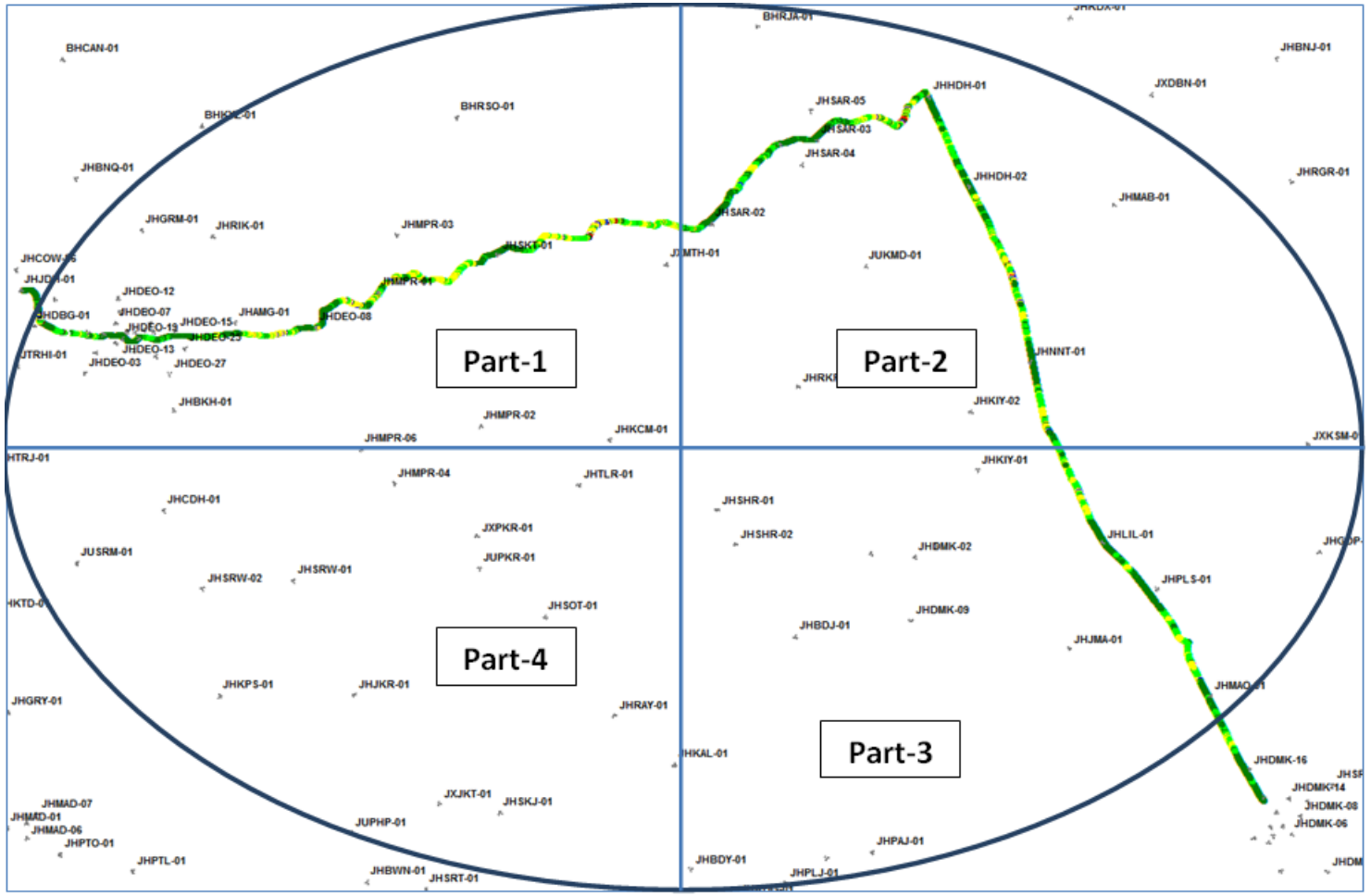
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
January	DEVGHAR	20/01/16	22/01/16	304

9.1.1.1 Route Details - DEVGHAR SSA

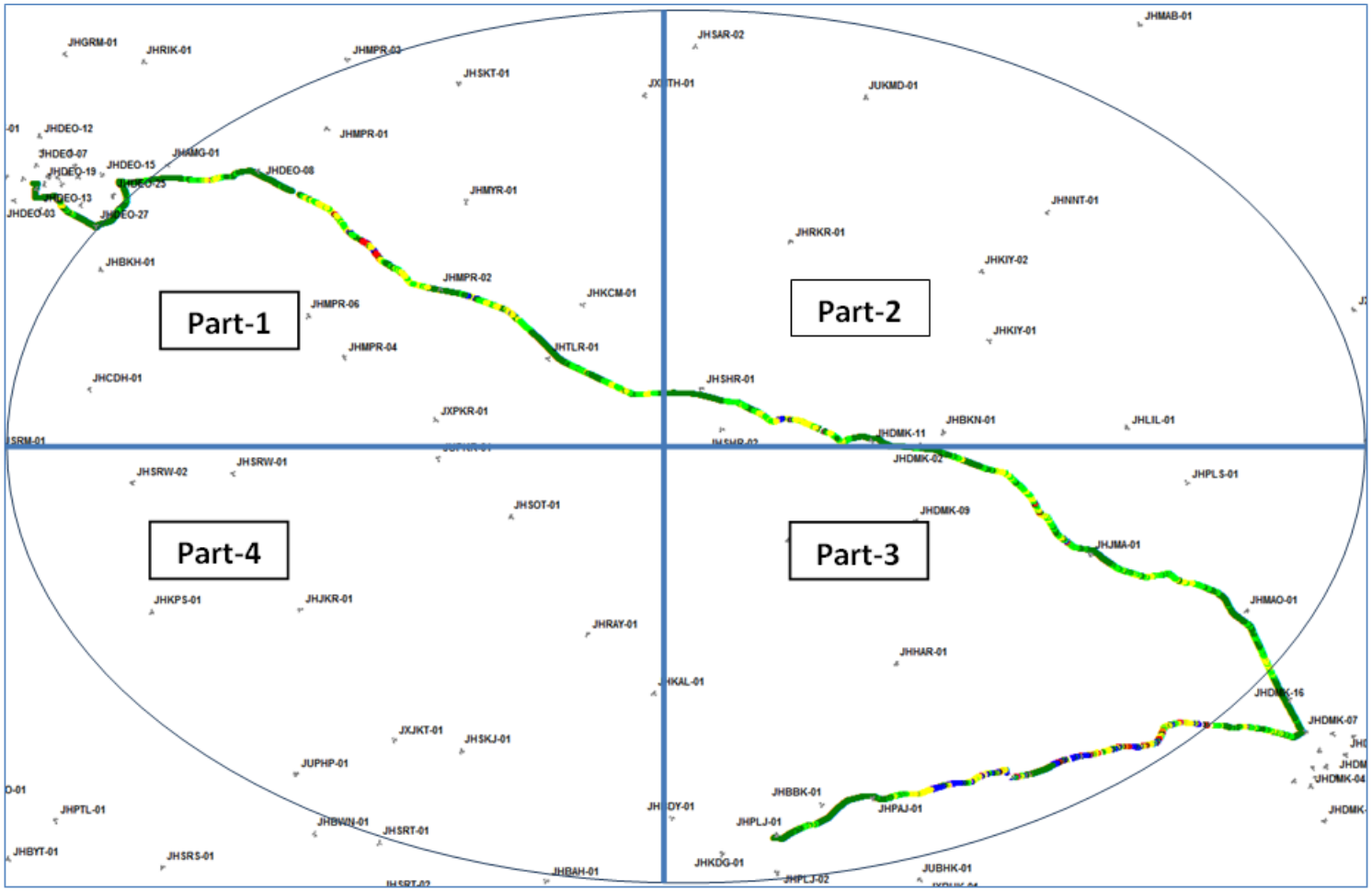
Category	Type of location	January		
		DEVGHAR		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Jasidhi Railway Station to Vaidnathpur to Maheshwara to Hausdiha to Dumka	Bigbazzar to Bazla Chowk to Kunda more to Vaidnathpur to Jarmundi to Basukinath more to Dumka to Palajori	Satsang chowk to Koriyasa to Kunda more to Surath to Merdhupur to Jagdishpur to Devipur to Rohini to Jagidhi
	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 February 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.

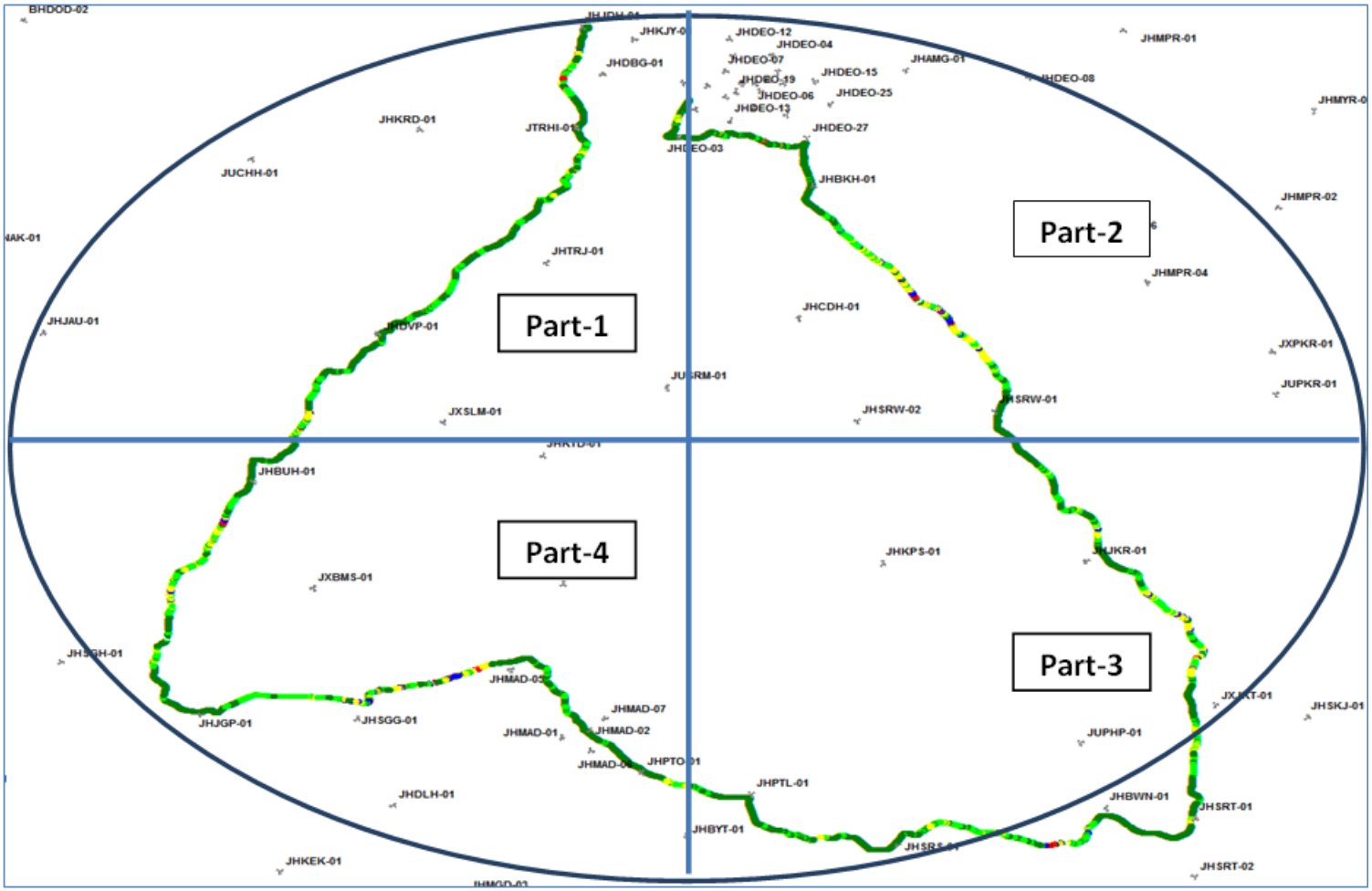
9.1.1.2 Route Map - DEVGHAR DAY 1



9.1.1.3 Route Map - DEVGHAR DAY 2



9.1.1.4 Route Map - DEVGHAR DAY 3



9.1.1.5 Drive Test Results - DEVGHAR SSA-2G

January																				
DEVGHAR	B'mark	Aircel(DWL)		Airtel		BSNL Bihar/Jharkand		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Telenor		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		19.31%	40.98%	99.99%	90.71%	18.95%	46.53%	71.58%	55.22%	69.89%	26.63%	No Service		67.25%	36.96%	67.06%	35.80%	99.37%	63.95%	66.08%	55.59%
0 to -85 dBm		63.78%	60.36%	100.00%	97.89%	65.07%	78.71%	99.49%	82.96%	98.62%	57.05%			69.34%	46.81%	98.49%	60.70%	100.00%	82.92%	97.94%	88.97%
0 to -95 dBm		94.28%	84.41%	100.00%	99.53%	100.00%	100.00%	99.96%	94.62%	100.00%	98.36%			72.18%	66.27%	99.79%	79.82%	100.00%	100.00%	100.00%	100.00%
Voice quality	≥ 95%	97.93%	96.13%	99.53%	97.54%	97.37%	85.46%	99.50%	97.22%	99.79%	87.31%			95.06%	76.33%	98.63%	85.03%	98.89%	92.27%	98.70%	97.19%
CSSR	≥ 95%	98.39%	86.08%	100.00%	100.00%	100.00%	86.14%	100.00%	100.00%	100.00%	90.82%			100.00%	91.67%	98.68%	82.16%	100.00%	100.00%	100.00%	99.45%
%age Blocked calls		0.00%	10.55%	0.00%	0.00%	1.69%	13.37%	0.00%	0.00%	0.00%	9.18%			0.00%	1.77%	0.00%	0.50%	0.00%	0.00%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	1.47%	0.00%	0.00%	1.69%	6.90%	0.00%	0.00%	1.79%	17.22%			0.00%	2.84%	0.00%	3.84%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	46.21%	100.00%	100.00%	100.00%	100.00%			100.00%	96.65%	98.65%	90.15%	100.00%	100.00%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

BSNL, Reliance CDMA, Tata CDMA & GSM and Telenor did not meet the TRAI benchmark in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.1.6 DRIVE TEST RESULTS - DEVGHAR SSA-3G

January									
DEVGHAR	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		NDR	79.30%	Not available		49.54%	39.68%	99.73%	12.04%
0 to -85 dBm			84.61%			58.40%	70.91%	100.00%	29.50%
0 to -95 dBm			89.73%			100.00%	100.00%	100.00%	49.69%
Voice quality	≥ 95%		86.98%			57.65%	57.17%	NDR	NDR
CSSR	≥ 95%		100.00%			100.00%	279.37%	60.00%	51.38%
%age Blocked calls			14.81%			0.00%	120.31%	66.67%	71.56%
Call drop rate	≤ 2%		16.67%			0.00%	33.33%	0.00%	2.17%
Hands off success rate			100.00%			92.86%	70.00%	NDR	NDR

Voice Quality

Aircel 3G failed to meet the benchmark in outdoor locations, however BSNL 3G failed to meet the benchmark in indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

Reliance 3G failed to meet the TRAI benchmark for CSSR in indoor as well as outdoor locations.

Call Drop Rate

Aircel 3G, BSNL 3G and Reliance 3G failed to meet the benchmark for call drop rates in outdoor locations.

9.1.1.1 Drive Test Results - DEVGHAR SSA-DATA- 2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed attemp	>80%	100%	100%	NDR	100%	NDR	No Service	NDR	NDR	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR	100%	NDR		NDR	NDR	100%	100%
Minimum download speed		622	86	NDR	94	NDR		NDR	NDR	44	NDR
Average throughput for Packet Data		228	99	NDR	108	NDR		NDR	NDR	111	125
Latency	<250ms	100	100	NDR	100	NDR		NDR	NDR	NDR	NDR

Note: BSNL, Reliance CDMA, Tata CDMA, Tata GSM did not submit the data.

All the parameters met the TRAI benchmark.

9.1.1.1 Drive Test Results - DEVGHAR SSA-DATA- 3G

Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G
Succesful Data Transmission download speed attempts	>80%	NDR	100%	100%
Succesful Data Transmission upload speed attempts	>75%	NDR	100%	100%
Minimum download speed		NDR	2615	241
Average throughput for Packet Data		NDR	3302	241
Latency	<250ms	NDR	100	NDR

Note: Aircel did not submit the data.

All the parameters met the TRAI benchmark.

9.1.2 SAHARSA SSA

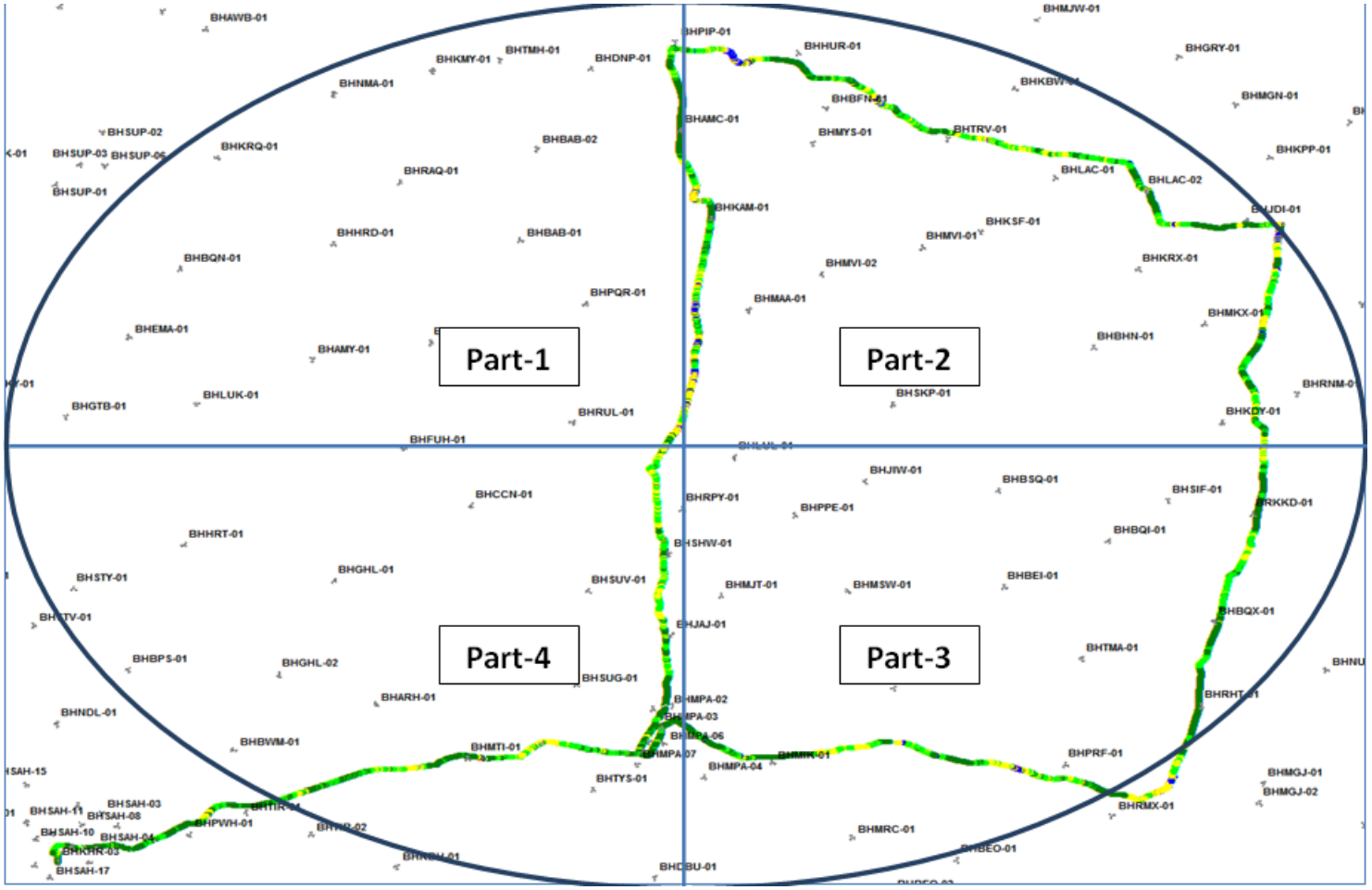
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
January	SAHARSA	27/01/16	29/01/16	325

9.1.2.1 ROUTE DETAILS - SAHARSA SSA

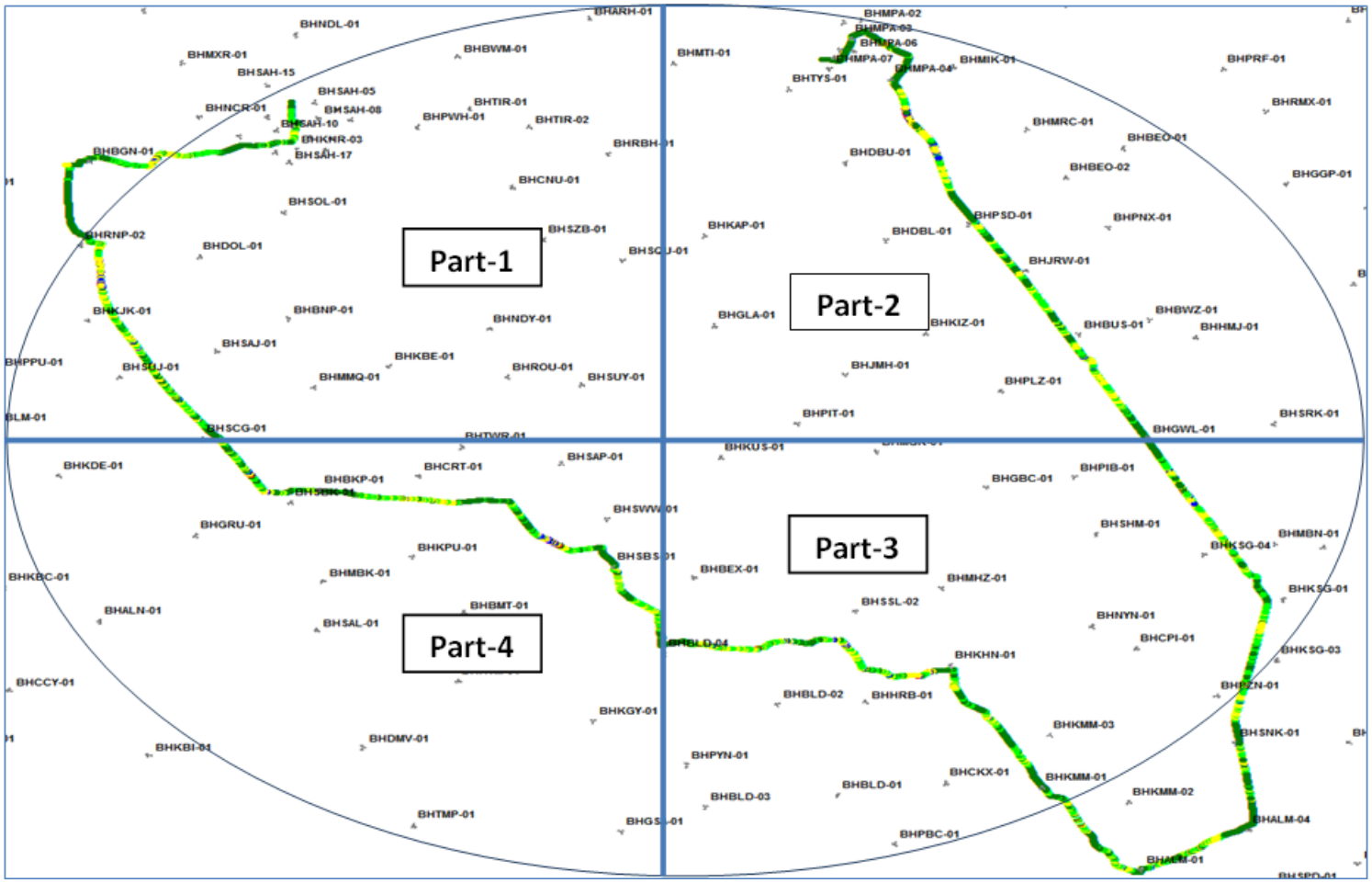
Category	Type of location	January		
		SAHARSA		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	1-Railway station-doli fuel 2-madhepura-singheshwar-pipra-triveniganj 3-jadia-kumarkhand-murliganj-madhepura	1-Dist. Court-bangaon Road 2-Simri baktiyarpur-alamnagar 3-udakishanganj-jalaiya-madhepura	1-Railway Station-shivpuri Railway crossing-hakpara 2-hakpara-bihara pachayat-supaul 3-supaul-Gamharia-
	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 February 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.

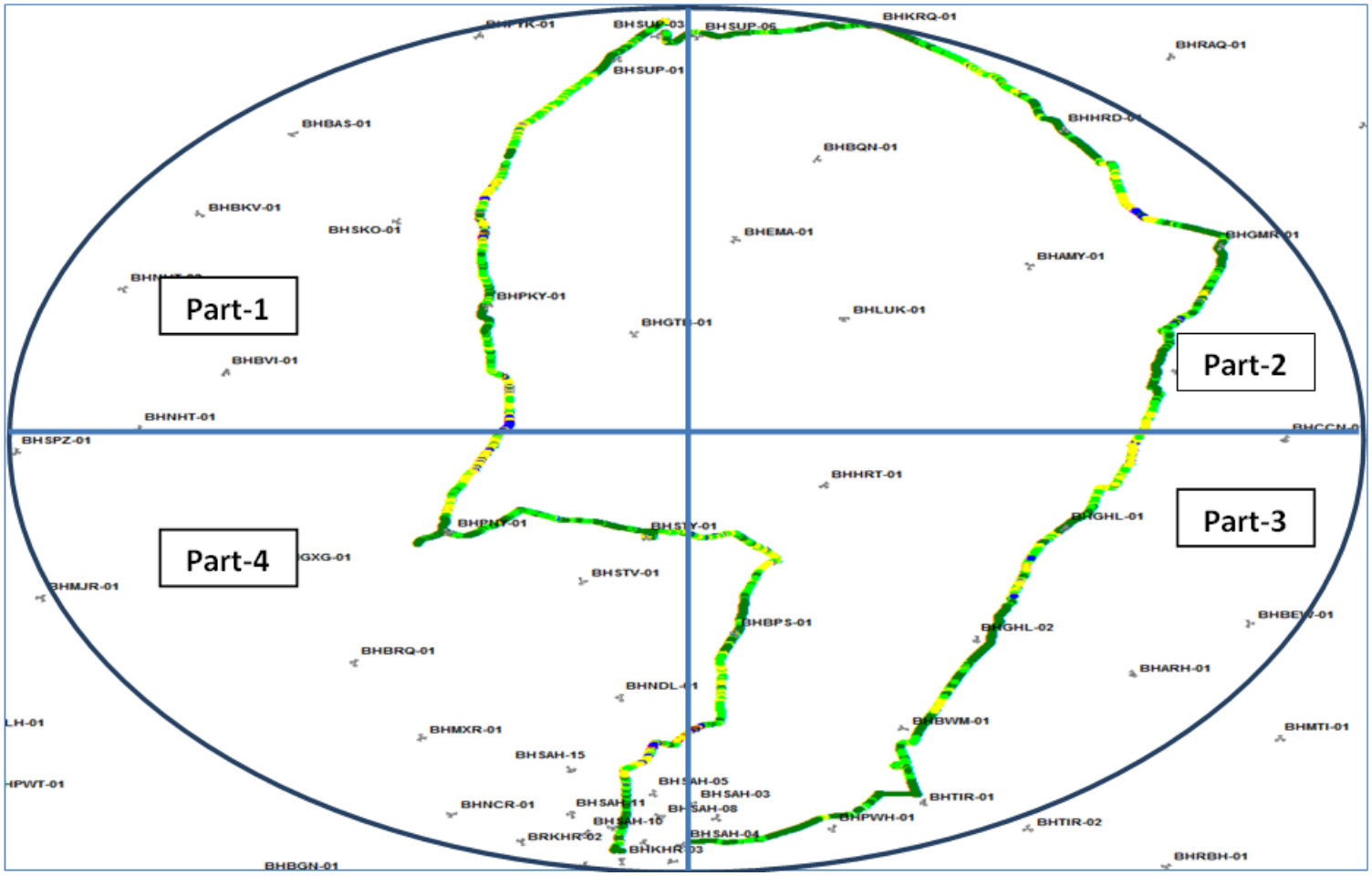
9.1.2.2 Route Map - SAHARSA DAY 1



9.1.2.3 Route Map - SAHARSA DAY 2



9.1.2.4 Route Map - SAHARSA DAY 3



9.1.2.5 Drive Test Results - SAHARSA SSA-2G

January																				
SAHARSA	B'mark	Aircel(DWL)		Airtel		BSNL Bihar/Jharkand		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Telenor		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		32.41%	15.80%	97.99%	82.43%	36.67%	35.76%	24.21%	34.18%	94.86%	20.45%	No Service		26.63%	8.98%	66.01%	30.12%	99.99%	49.37%	98.76%	52.80%
0 to -85 dBm		82.97%	39.28%	99.97%	98.13%	89.60%	79.78%	97.54%	84.25%	99.47%	48.20%			43.07%	18.23%	89.58%	46.55%	100.00%	75.92%	99.98%	88.45%
0 to -95 dBm		99.15%	77.33%	100.00%	99.93%	98.63%	90.65%	99.89%	97.74%	100.00%	84.05%			53.29%	36.10%	99.85%	71.54%	100.00%	100.00%	100.00%	100.00%
Voice quality	≥ 95%	98.73%	96.79%	97.34%	95.45%	88.54%	80.01%	99.20%	97.30%	99.87%	89.67%			NDR	NDR	89.82%	90.44%	98.71%	91.96%	98.93%	96.33%
CSSR	≥ 95%	100.00%	95.86%	100.00%	100.00%	100.00%	95.10%	100.00%	100.00%	100.00%	93.97%			100.00%	84.47%	100.00%	74.99%	100.00%	100.00%	100.00%	100.00%
%age Blocked calls		0.00%	4.14%	0.00%	0.00%	0.00%	3.50%	0.00%	0.00%	0.00%	6.03%			0.00%	28.60%	0.00%	39.40%	0.00%	0.00%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	1.84%	0.00%	0.00%	0.00%	1.93%	0.00%	0.00%	0.00%	8.72%			0.00%	5.66%	0.00%	11.91%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	98.48%	0.00%	64.89%	100.00%	95.97%	100.00%	100.00%	100.00%	100.00%			100.00%	89.87%	100.00%	99.42%	100.00%	99.44%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Reliance CDMA and Telenor failed to meet the benchmark in outdoor locations; however BSNL and TATA GSM failed to meet the benchmark in Indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.2.6 DRIVE TEST RESULTS - SAHARSA SSA-3G

January									
SAHARSA	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		NDR	22.54%	Not available		7.01%	14.96%	4.18%	10.51%
0 to -85 dBm			41.20%			62.75%	23.31%	40.42%	25.51%
0 to -95 dBm			59.13%			92.64%	66.89%	57.63%	46.73%
Voice quality	≥ 95%		73.02%			NDR	NDR	NDR	NDR
CSSR	≥ 95%		NDR			100.00%	96.27%	50.00%	20.74%
%age Blocked calls			NDR			0.00%	3.73%	50.00%	80.32%
Call drop rate	≤ 2%		NDR			0.00%	5.81%	20.00%	9.68%
Hands off success rate			NDR			NDR	NDR	NDR	NDR

Voice Quality

Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

Reliance 3G failed to meet the benchmark in outdoor as well as indoor locations.

Call Drop Rate

Reliance 3G failed to meet the benchmark for call drop rate in outdoor as well as indoor locations, however BSNL 3G failed in outdoor locations only.

9.1.2.7 Drive Test Results - SAHARSA SSA-DATA- 2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed attemp	>80%	100%	100%	NDR	100%	NDR	No Service	NDR	NDR	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR	100%	NDR		NDR	NDR	100%	100%
Minimum download speed		68	102	NDR	94	NDR		NDR	NDR	48	NDR
Average throughput for Packet Data		117	117	NDR	171	NDR		NDR	NDR	105	126
Latency	<250ms	100	100	NDR	100	NDR		NDR	NDR	NDR	NDR

Note: BSNL, Reliance CDMA, Tata CDMA, Tata GSM did not submit the data.

All the parameters met the TRAI benchmark.

9.1.2.8 Drive Test Results - SAHARSA SSA-DATA- 3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL
Succesful Data Transmission download speed attempts	>80%	NDR	100%	NDR
Succesful Data Transmission upload speed attempts	>75%	NDR	100%	NDR
Minimum download speed		NDR	2212	NDR
Average throughput for Packet Data		NDR	2633	NDR
Latency	<250ms	NDR	100	NDR

Note: Aircel, BSNL did not submit the data.

All the parameters met the TRAI benchmark.

9.1.3 RANCHI SSA

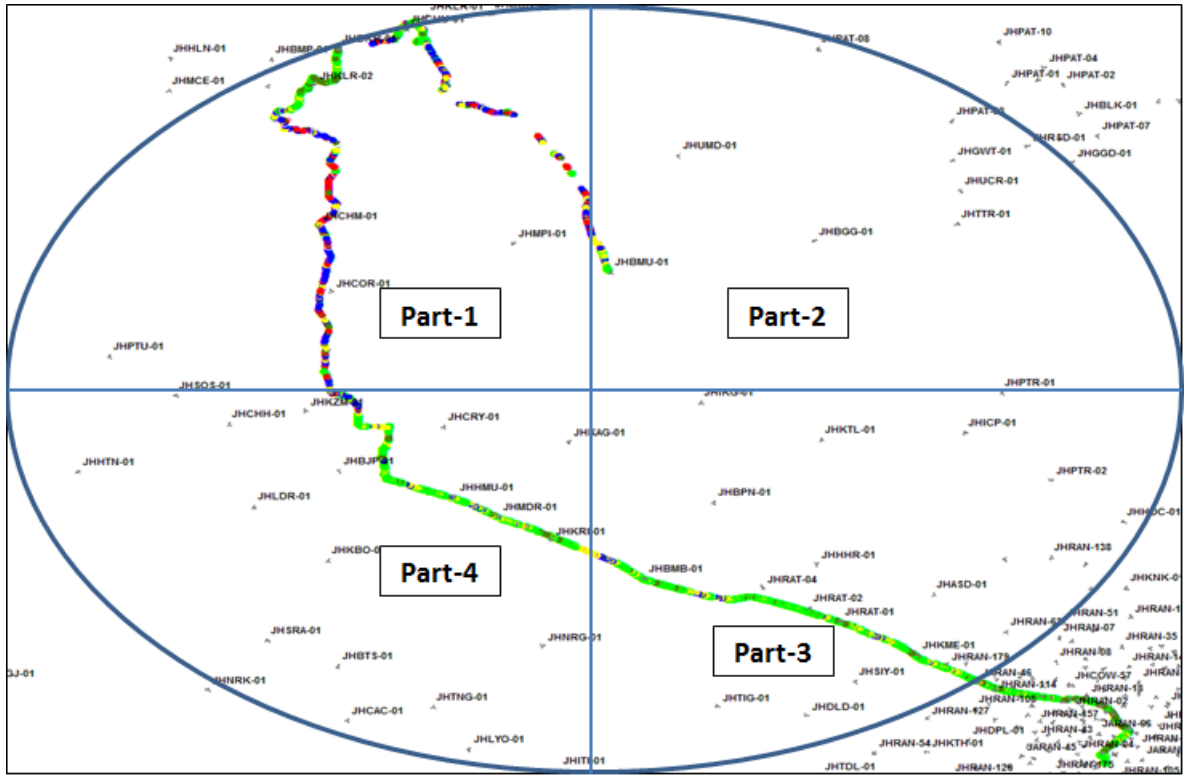
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
February	RANCHI	22/02/16	27/02/16	542

9.1.3.1 Route Details - RANCHI SSA

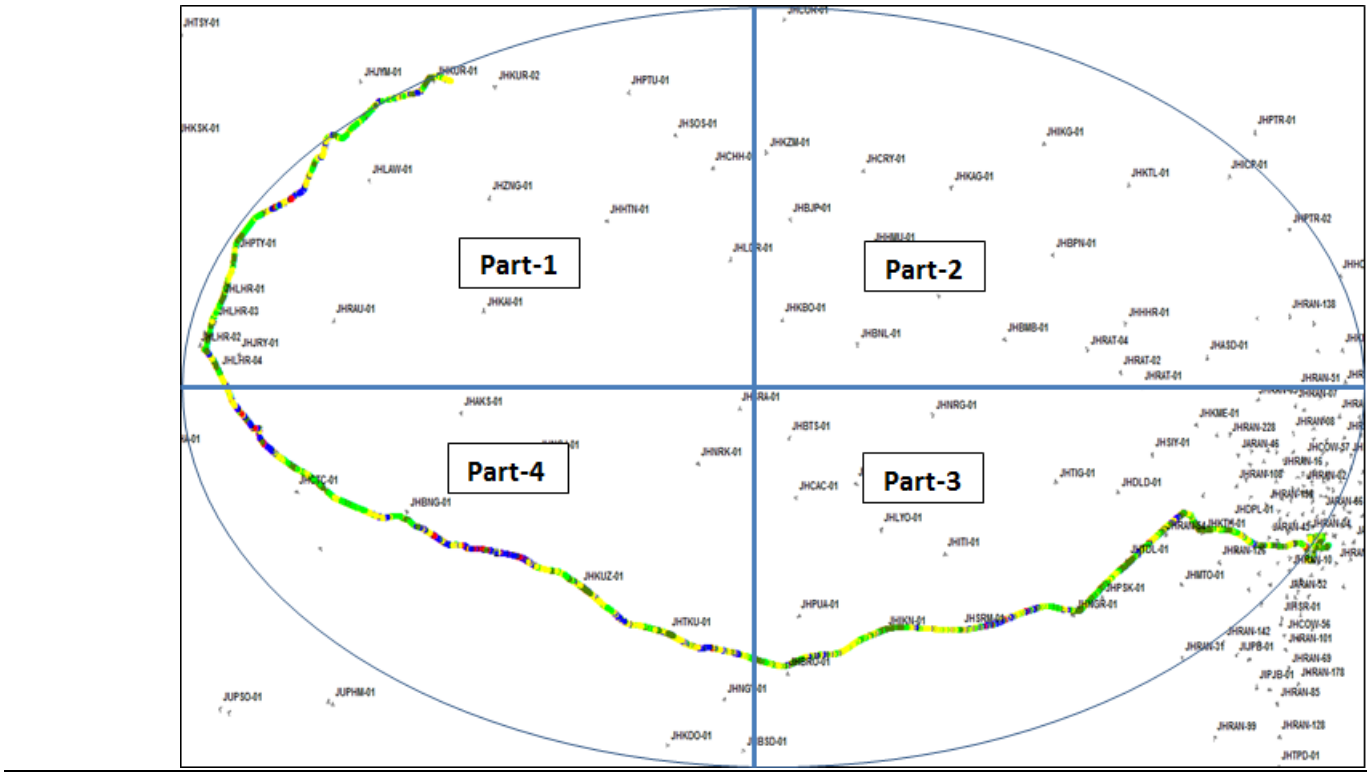
The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We February observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any findings in this report. IMRB submits detailed operator wise Drive Test reports separately.

Category	Type of location	February RANCHI					
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Outdoor	Major Roads	Ranchi Railway Station-Ratu Road-Pandra-Mandar-Karkat-Khelari-Churi-Burmu	Ranchi Railway Station-Argora Chowk-Kathal More-Saparom-Nagrii-Itki-Kuru-Bero-Murto-Chanho-Kuru	Sujata Chowk-Hinoo-Dhurwa-Simalia-Pithoria-Itki-Pithoria-Kanke-Ranchi(Sujata chowk)	Big Bazar-Kanta Toli-Namkum Chowk-Tomar-Bari-Namkum Chowk-Rampur-Lotang-	Argora Chowk-Birsa Chowk-Tupudana-Khunti-Torpa	Booty More-Kanta Toli-Tatisilwae-Angarah-Asri-Muri-Gola
	Highways						
	With in the City						
Indoor	Shopping complex						
	Office complex						

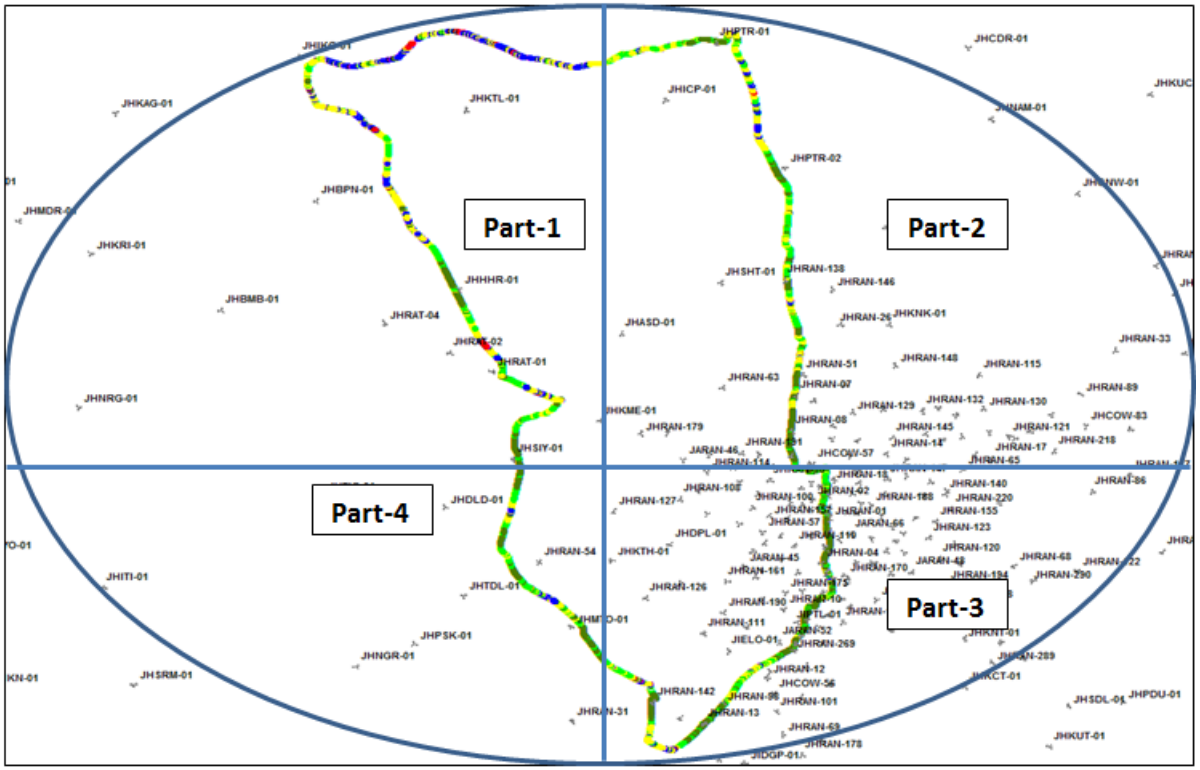
9.1.3.2 Route Map - RANCHI DAY 1



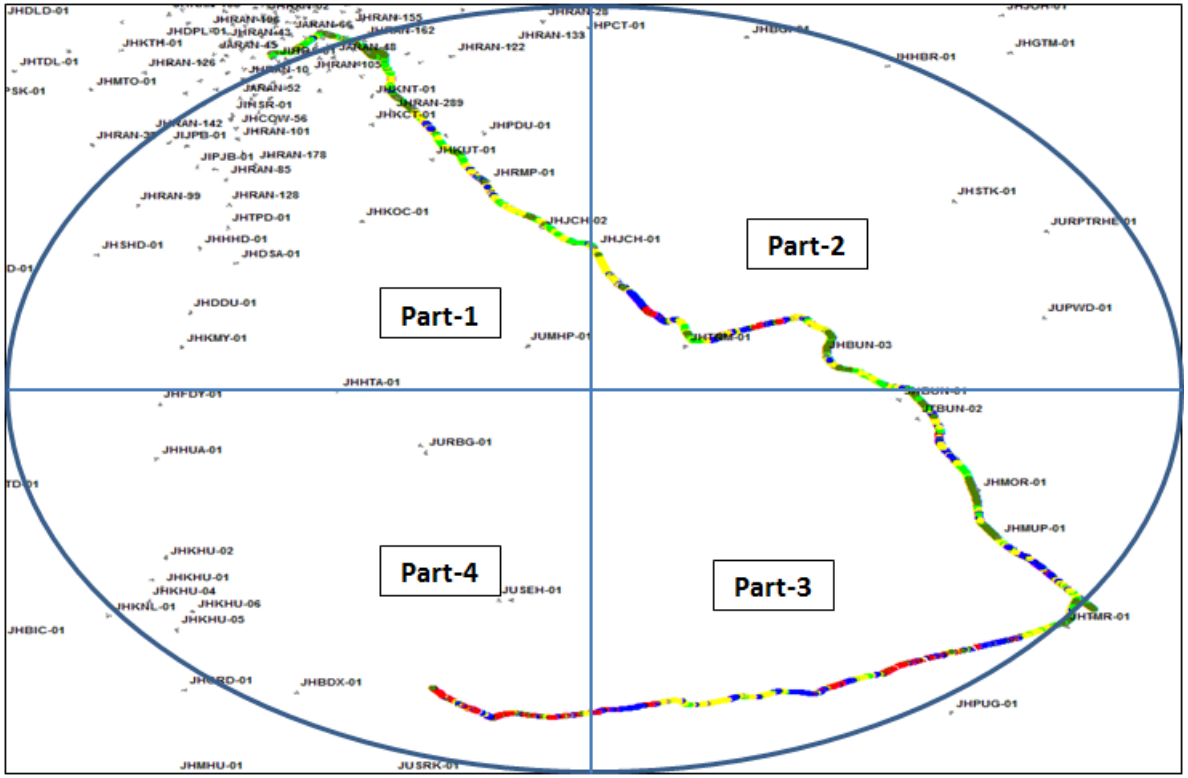
9.1.3.3 Route Map - RANCHI DAY 2



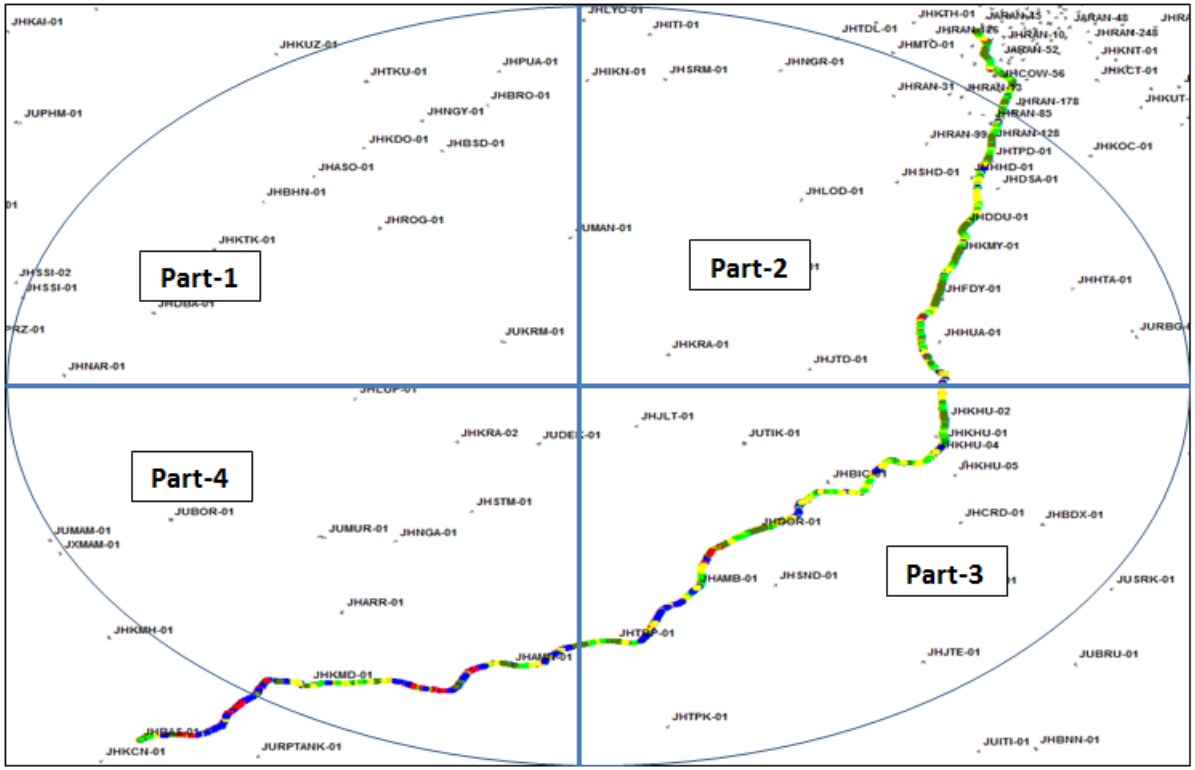
9.1.3.4 Route Map - RANCHI Day 3



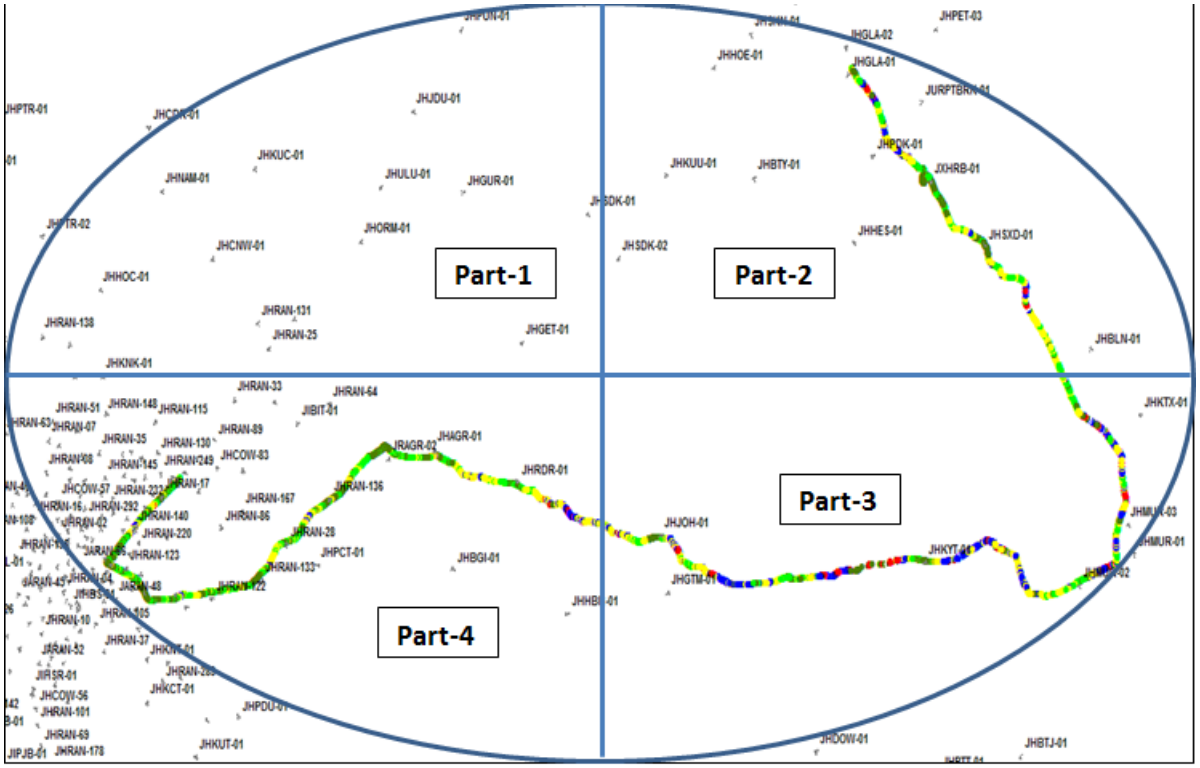
9.1.3.1 ROUTE MAP - RANCHI DAY 3



9.1.3.2 Route Map - RANCHI Day 3



9.1.3.3 Route Map - RANCHI Day 3



9.1.3.4 Drive Test Results - RANCHI SSA-2G

Ranchi	B'mark	Aircel(DWL)		Airtel		BSNL Bihar/Jharkand		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Telenor		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		72.60%	31.41%	91.34%	63.97%	84.59%	45.29%	79.66%	65.81%	86.36%	40.00%			78.42%	78.41%	88.67%	44.61%	70.28%	43.62%	96.22%	62.11%
0 to -85 dBm		99.47%	61.60%	99.93%	88.33%	99.69%	75.79%	96.15%	88.04%	100.00%	66.45%			92.22%	84.29%	99.56%	72.33%	90.24%	71.75%	99.97%	90.38%
0 to -95 dBm		99.94%	85.24%	100.00%	97.12%	100.00%	100.00%	97.45%	96.10%	100.00%	97.85%			92.35%	90.47%	99.98%	88.91%	100.00%	94.12%	100.00%	97.90%
Voice quality	≥ 95%	98.52%	95.68%	96.97%	97.52%	95.57%	82.69%	98.40%	97.28%	74.27%	45.51%	No Service		96.29%	91.85%	97.10%	92.11%	98.12%	95.23%	97.39%	95.79%
CSSR	≥ 95%	100.00%	96.61%	100.00%	100.00%	97.48%	90.81%	100.00%	100.00%	100.00%	91.35%			100.00%	96.07%	100.00%	95.00%	100.00%	99.63%	100.00%	100.00%
%age Blocked calls		0.00%	6.57%	0.00%	0.00%	2.52%	8.32%	0.00%	0.00%	0.00%	8.65%			0.00%	2.84%	0.00%	5.59%	0.00%	0.00%	0.00%	0.00%
Call drop rate	≤ 2%	23.81%	1.65%	0.00%	0.00%	0.00%	7.95%	0.00%	0.00%	0.00%	11.78%			0.00%	1.42%	0.00%	2.19%	0.00%	0.00%	0.00%	0.14%
Hands off success rate		100.00%	85.61%	100.00%	100.00%	100.00%	90.97%	100.00%	100.00%	100.00%	100.00%			100.00%	99.39%	100.00%	100.00%	100.00%	100.00%	100.00%	99.79%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

BSNL, TATA CDMA and TATA GSM failed to meet the benchmark for voice quality in outdoor locations, however Reliance CDMA failed to meet the benchmark in Indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

BSNL and Reliance CDMA failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

Aircel failed to meet the benchmark for call drops in indoor locations, however BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.3.5 DRIVE TEST RESULTS - RANCHI SSA-3G

Ranchi	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		20.37%	29.09%	Not available		43.27%	30.57%	79.85%	44.04%
0 to -85 dBm		99.11%	56.86%			76.24%	75.47%	99.44%	62.34%
0 to -95 dBm		100.00%	77.28%			100.00%	100.00%	99.99%	81.96%
Voice quality	≥ 95%	40.88%	51.68%			9.04%	30.32%	NDR	NDR
CSSR	≥ 95%	90.91%	86.16%			100.00%	128.25%	99.17%	89.83%
%age Blocked calls		0.00%	17.77%			0.84%	27.88%	0.83%	10.12%
Call drop rate	≤ 2%	0.00%	10.57%			0.00%	9.42%	0.00%	8.61%
Hands off success rate		100.00%	96.10%			100.00%	100.00%	100.00%	57.14%

Voice Quality

Aircel 3G and BSNL 3G failed to meet the benchmark for voice quality in outdoor as well as indoor locations.

Call Set Success Rate (CSSR)

Aircel 3G failed to meet the benchmark for CSSR in outdoor as well as indoor locations, however Reliance 3G failed in outdoor locations.

Call Drop Rate

Aircel 3G, Reliance 3G and BSNL 3G failed to meet the benchmark for call drop rates in outdoor locations.

9.1.3.6 Drive Test Results - RANCHI SSA-DATA- 2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed attemp	>80%	100%	100%	100%	100%	NDR		100%	100%	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	100%	100%	NDR		100%	100%	100%	100%
Minimum download speed		87	112	22	95	NDR	No Service	75	149	45	NDR
Average throughput for Packet Data		302	130	50	119	NDR		75	148	108	123
Latency	<250ms	100	100	100	100	NDR		100	100	100	100

Note: Reliance CDMA did not submit the data.

All the parameters met the TRAI benchmark.

9.1.3.7 Drive Test Results - RANCHI SSA-DATA- 3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL
Succesful Data Transmission download speed attempts	>80%	100%	100%	NDR
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR
Minimum download speed		1720	2615	NDR
Average throughput for Packet Data		6170	2860	NDR
Latency	<250ms	100	100	NDR

Note: BSNL did not submit the data.

All the parameters met the TRAI benchmark.

9.1.4 ARRAH SSA

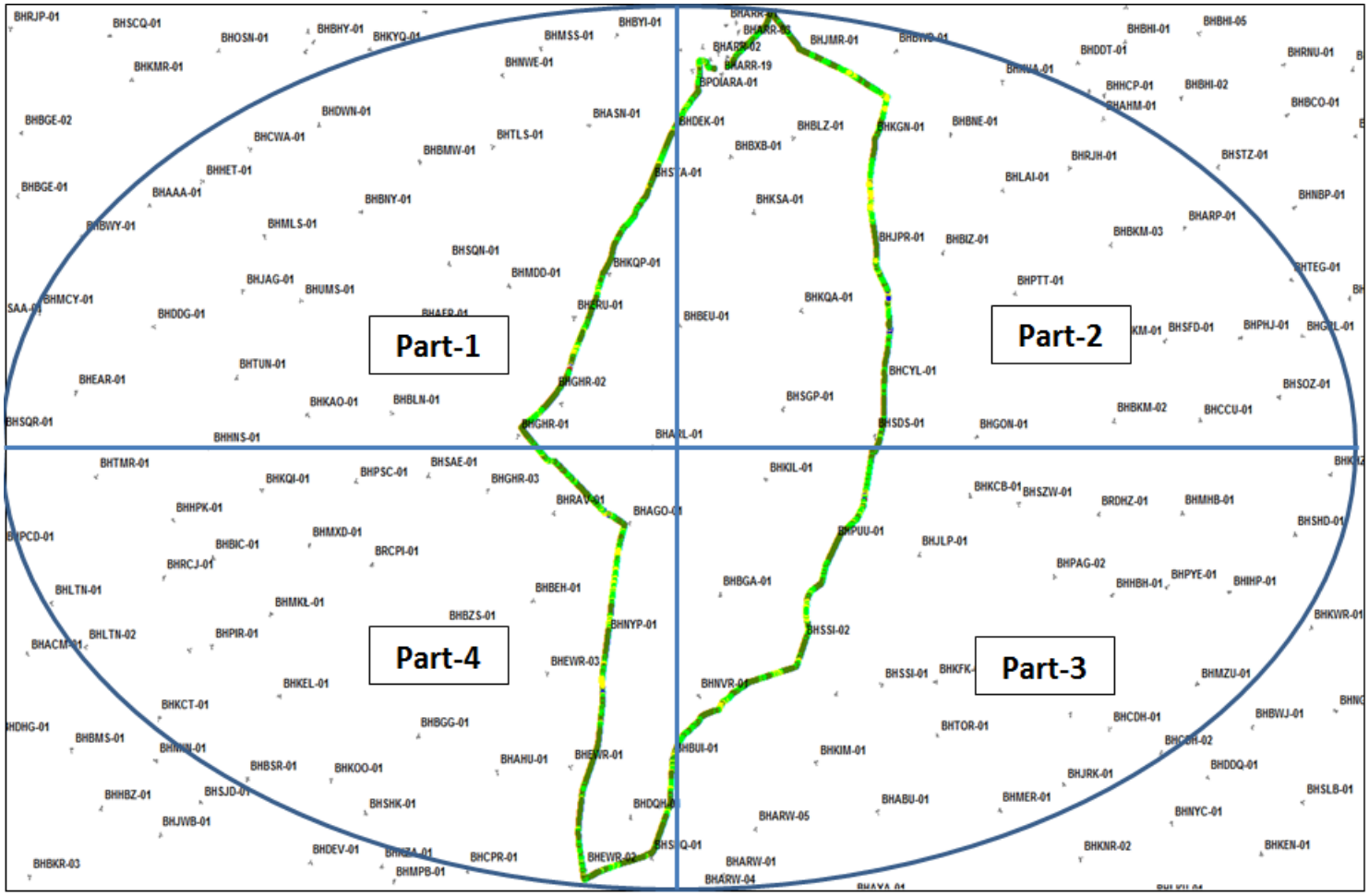
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
March	Arrah	31/3/16	04-02-2016	278

9.1.4.1 Route Details - ARRAH SSA

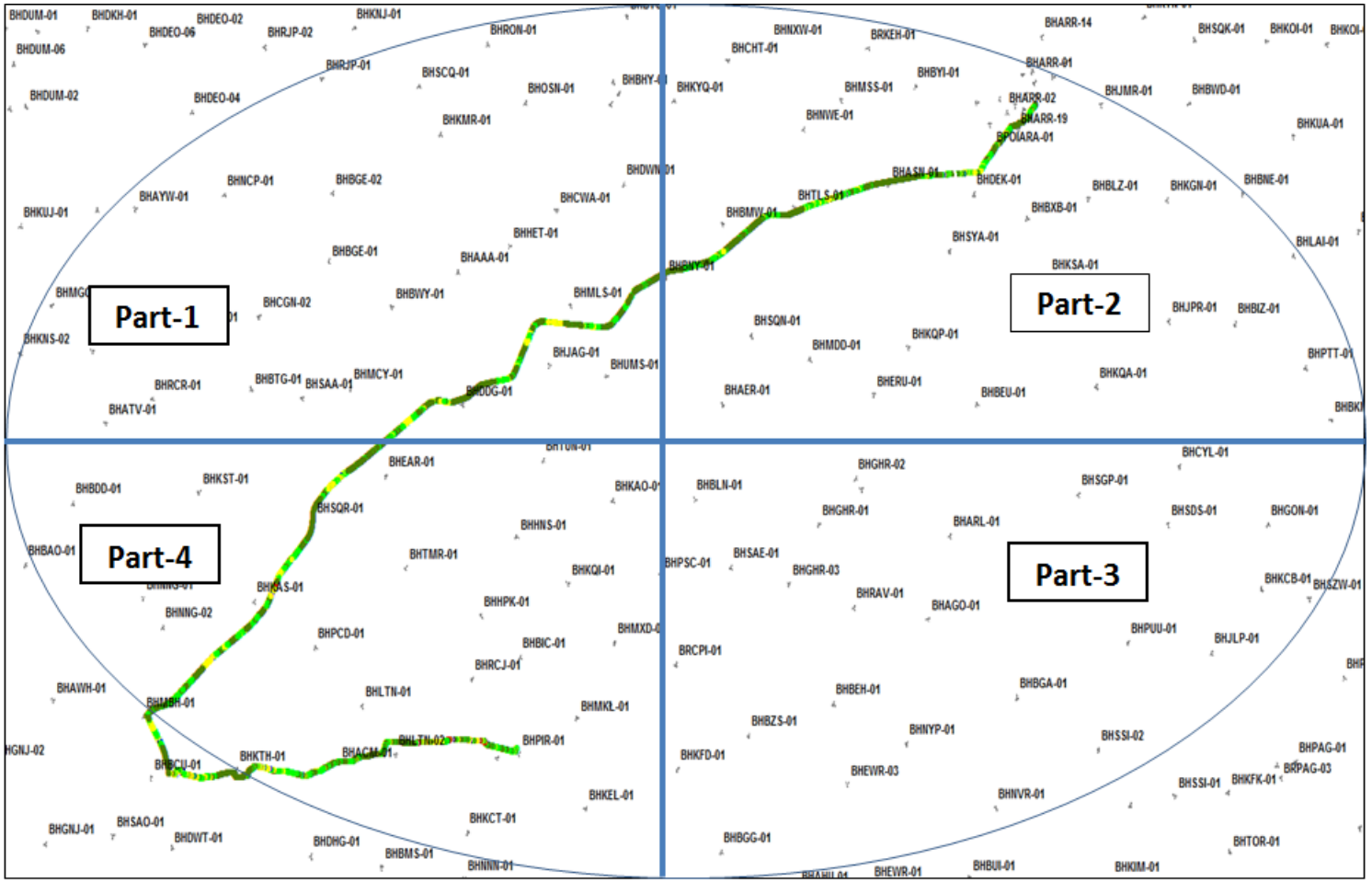
Category	Type of location	March		
		Arrah		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Railway Station-zero mile-garhani-sahar-sandesh-khangaon-arrah	Bus Stand-bihari mill-zero mile-maliyabag-babhnaul adda-koath-piro	Koilwar-Sapna more-chandwa more-sahpur-bihia-jagdishpur—dallipur-piro-garhani
	Highways			
	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 February 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.

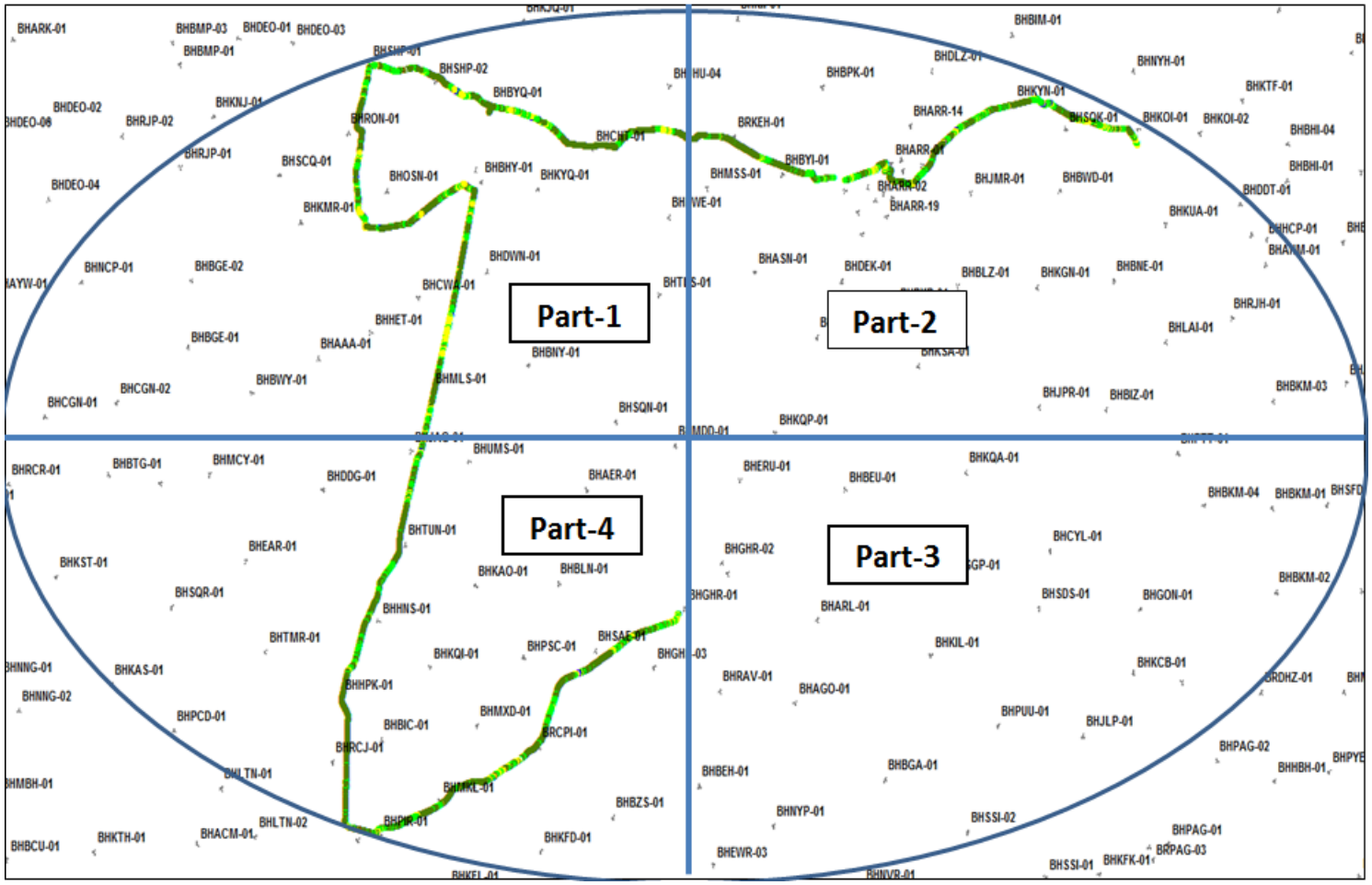
9.1.4.2 Route Map - ARRAH Day 1



9.1.4.3 Route Map - ARRAH Day 2



9.1.4.4 Route Map - ARRAH Day 3



9.1.4.5 Drive Test Results - ARRAH SSA-2G

ARRAH	B'mark	Aircel(DWL)		Airtel		BSNL Bihar/Jharkand		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Telenor		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		100.00%	94.79%	99.97%	88.91%	94.93%	37.19%	36.54%	46.44%	87.57%	37.61%	No Service		30.37%	23.00%	40.52%	16.65%	97.84%	54.09%	100.00%	73.67%
0 to -85 dBm		99.77%	82.95%	100.00%	98.90%	99.94%	68.84%	94.84%	85.53%	99.93%	74.38%			39.38%	46.92%	98.00%	47.39%	99.96%	86.95%	100.00%	88.59%
0 to -95 dBm		48.26%	62.99%	100.00%	99.52%	100.00%	80.04%	100.00%	100.00%	100.00%	97.62%			68.05%	71.05%	99.90%	79.58%	100.00%	100.00%	100.00%	96.59%
Voice quality	≥ 95%	97.71%	97.70%	99.48%	95.68%	81.10%	71.86%	98.67%	96.04%	98.99%	89.48%			95.92%	90.23%	97.90%	82.86%	99.23%	91.71%	98.58%	98.14%
CSSR	≥ 95%	100.00%	84.62%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	95.08%			100.00%	95.56%	100.00%	87.48%	100.00%	99.41%	100.00%	100.00%
%age Blocked calls		0.00%	6.04%	0.00%	0.00%	0.00%	NDR	0.00%	0.00%	0.00%	4.92%			0.00%	4.78%	0.00%	16.67%	0.00%	0.59%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	1.23%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.19%			0.00%	6.45%	0.00%	5.16%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	89.15%	100.00%	100.00%	100.00%	100.00%			100.00%	100.00%	100.00%	99.59%	100.00%	99.13%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

BSNL failed to meet the benchmark for voice quality in indoor as well as outdoor locations; however Reliance CDMA, TATA CDMA, TATA GSM and Telenor did not meet the benchmark in outdoor locations.

Call Set Success Rate (CSSR)

Aircel and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.4.6 DRIVE TEST RESULTS - ARRAH SSA-3G

ARRAH	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		67.91%	72.18%	87.63%	48.41%	Not participated		97.64%	56.55%
0 to -85 dBm		98.81%	77.07%	99.87%	86.15%			98.39%	63.25%
0 to -95 dBm		100.00%	82.25%	100.00%	97.37%			99.95%	68.91%
Voice quality	≥ 95%	98.60%	90.42%	99.98%	99.62%			NDR	NDR
CSSR	≥ 95%	100.00%	95.86%	100.00%	100.00%			100.00%	90.95%
%age Blocked calls		0.00%	36.55%	0.00%	0.00%			0.00%	37.10%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%			0.00%	1.28%
Hands off success rate		100.00%	100.00%	100.00%	100.00%			NDR	NDR

Voice Quality

Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

Reliance 3G failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

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

9.1.4.7 Drive Test Results - ARRAH SSA-DATA- 2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed attemp	>80%	100%	100%	NDR	100%	NDR	No Service	NDR	NDR	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR	100%	NDR		NDR	NDR	100%	100%
Minimum download speed		287	101	NDR	102	NDR		NDR	NDR	45	NDR
Average throughput for Packet Data		462	154	NDR	136	NDR		NDR	NDR	106	107
Latency	<250ms	100	100	NDR	100	NDR		NDR	NDR	NDR	100

Note: BSNL, Reliance CDMA, Tata CDMA, Tata GSM did not submit the data.

All the parameters met the TRAI benchmark.

9.1.4.8 Drive Test Results - ARRAH SSA-DATA- 3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL
Succesful Data Transmission download speed attempts	>80%	100%	100%	NDR
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR
Minimum download speed		805	1312	NDR
Average throughput for Packet Data		2257	2136	NDR
Latency	<250ms	100	100	NDR

Note: BSNL did not submit the data.

All the parameters met the TRAI benchmark.

9.1.5 BHAGALPUR SSA

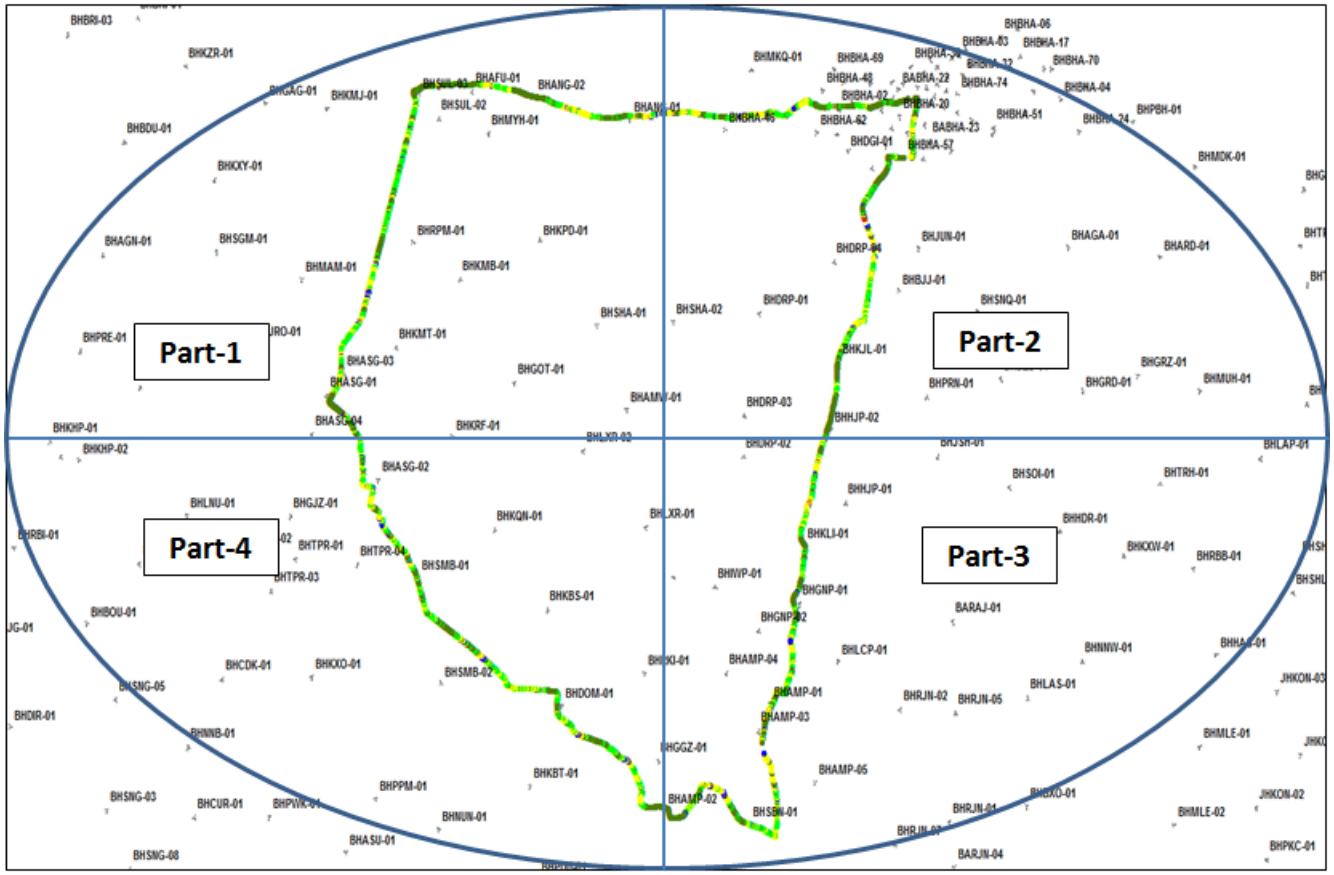
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
March	Bhagalpur	16/3/16	18/3/2016	305

9.1.5.1 Route Details - BHAGALPUR SSA

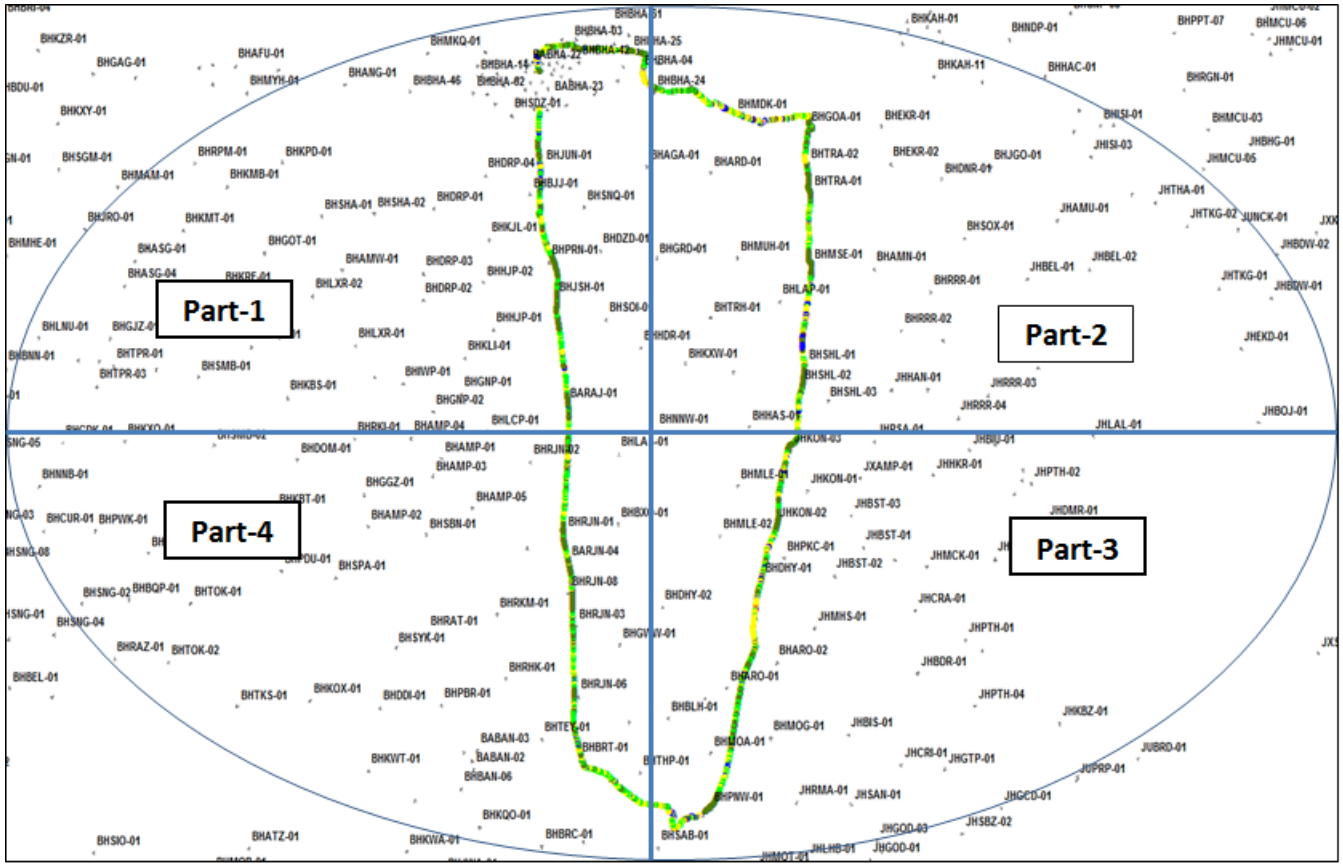
Category	Type of location	March		
		Bhagalpur		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Railway Station-Asargunj-amarpur-english more-bharko-shambhugunj-rahmatpur-sultangunj-	Railway station-manali-sabaur-ghogha-dhuraiya-panjwara-barahat-rajaun-baijani-	Railway station-postoffice-khachahri chauk-tilka manjhi-zero mile-tetri-nagauchia-
	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 February 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.

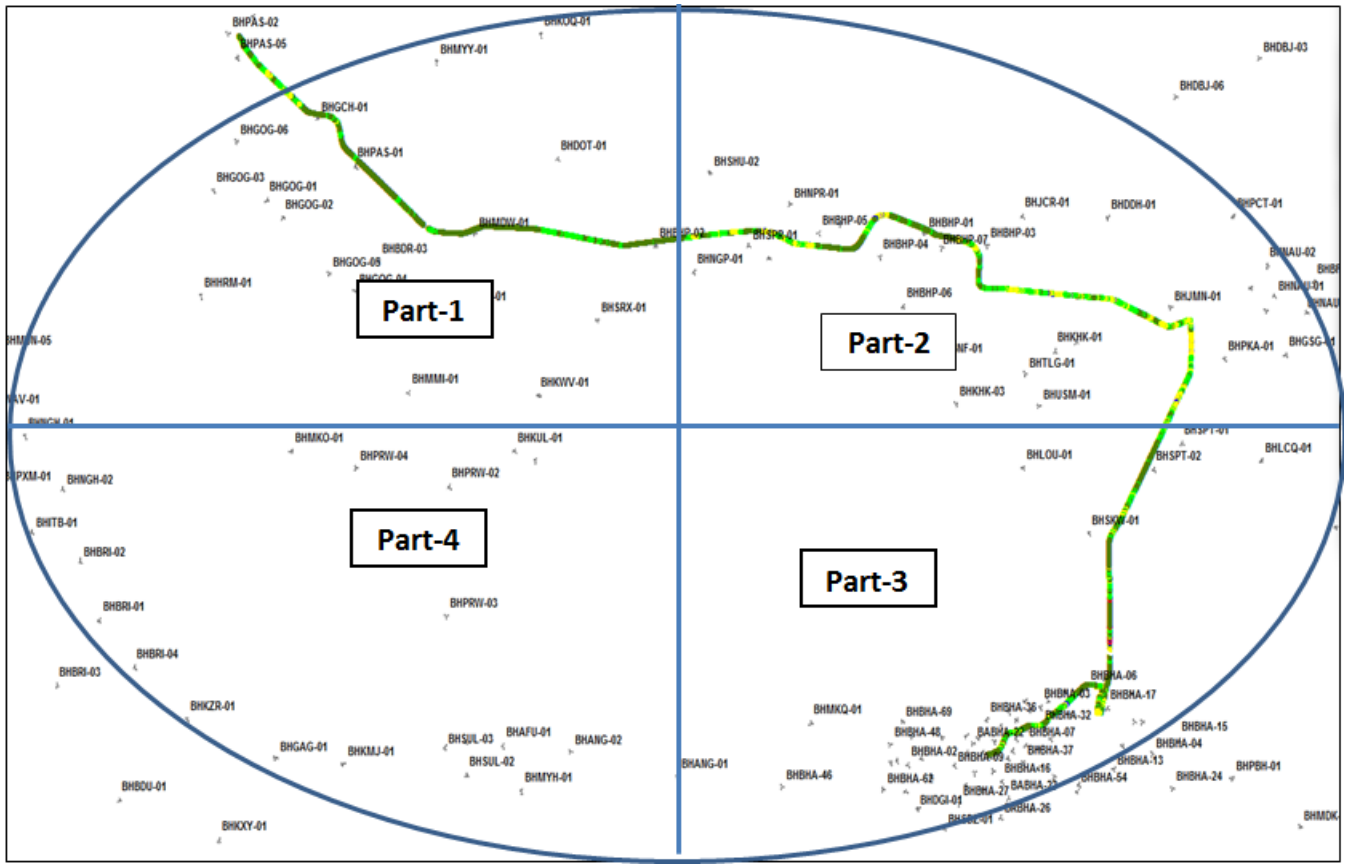
9.1.5.2 Route Map - BHAGALPUR Day 1



9.1.5.3 Route Map - BHAGALPUR DAY 2



9.1.5.4 Route Map - BHAGALPUR DAY 3



9.1.5.5 Drive Test Results - BHAGALPUR SSA-2G

Bhagalpur	B'mark	Aircel(DWL)		Airtel		BSNL Bihar/Jharkand		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Telenor		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		95.12%	45.52%	79.11%	71.76%	34.94%	41.74%	82.66%	40.46%	45.18%	31.39%	No Service		42.38%	34.99%	34.45%	22.79%	88.16%	49.32%	37.51%	25.41%
0 to -85 dBm		99.95%	68.02%	98.98%	96.36%	93.36%	69.02%	17.31%	48.18%	95.24%	54.52%			79.33%	69.64%	88.50%	59.61%	99.89%	79.53%	95.54%	74.36%
0 to -95 dBm		100.00%	90.81%	99.99%	99.72%	100.00%	92.10%	0.03%	11.36%	99.99%	99.07%			98.15%	93.76%	99.79%	84.47%	100.00%	100.00%	99.69%	94.42%
Voice quality	≥ 95%	96.18%	95.65%	96.92%	95.98%	88.54%	75.93%	99.17%	97.13%	93.71%	86.63%			98.17%	90.71%	90.01%	85.32%	98.97%	95.21%	97.73%	97.02%
CSSR	≥ 95%	100.00%	81.34%	100.00%	100.00%	100.00%	91.61%	100.00%	100.00%	98.08%	94.70%			100.00%	95.16%	100.00%	81.00%	100.00%	99.25%	100.00%	99.47%
%age Blocked calls		0.00%	8.08%	0.00%	0.00%	0.00%	8.39%	0.00%	0.00%	1.92%	5.30%			0.00%	4.50%	0.00%	26.00%	0.00%	0.77%	0.00%	0.53%
Call drop rate	≤ 2%	0.00%	1.33%	0.00%	0.00%	0.00%	6.69%	0.00%	0.00%	1.96%	13.60%			0.00%	5.00%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	96.41%	100.00%	100.00%	100.00%	70.50%	100.00%	100.00%	100.00%	100.00%			100.00%	100.00%	100.00%	98.00%	100.00%	99.02%	100.00%	98.99%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark in indoor as well as outdoor locations. TATA CDMA did not meet the benchmark in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.5.6 DRIVE TEST RESULTS - BHAGALPUR SSA-3G

Bhagalpur	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		97.91%	70.01%	Not available		7.01%	33.51%	98.53%	52.40%
0 to -85 dBm		99.99%	74.66%			62.75%	56.82%	99.85%	61.95%
0 to -95 dBm		100.00%	81.33%			92.64%	87.01%	100.00%	74.16%
Voice quality	≥ 95%	99.74%	92.05%			NDR	NDR	NDR	NDR
CSSR	≥ 95%	98.28%	84.26%			100.00%	93.33%	100.00%	83.33%
%age Blocked calls		0.00%	6.93%			0.00%	93.33%	0.00%	29.00%
Call drop rate	≤ 2%	0.00%	3.81%			0.00%	0.00%	0.00%	1.72%
Hands off success rate		100.00%	100.00%			NDR	NDR	100.00%	97.89%

Voice Quality

Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

BSNL 3G and Reliance 3G failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

Aircel 3G failed to meet the benchmark for call drop rate in outdoor locations.

9.1.5.7 Drive Test Results - BHAGALPUR SSA-DATA- 2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed attemp	>80%	100%	100%	NDR	100%	NDR	No Service	NDR	NDR	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR	100%	NDR		NDR	NDR	100%	100%
Minimum download speed		94	104	NDR	98	NDR		NDR	NDR	45	NDR
Average throughput for Packet Data		148	153	NDR	185	NDR		NDR	NDR	108	144
Latency	<250ms	100	100	NDR	100	NDR		NDR	NDR	NDR	100

Note: BSNL, Reliance CDMA, Tata CDMA, Tata GSM did not submit the data.

All the parameters met the TRAI benchmark.

9.1.5.8 Drive Test Results - BHAGALPUR SSA-DATA- 3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL
Succesful Data Transmission download speed attempts	>80%	100%	100%	NDR
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR
Minimum download speed		1088	914	NDR
Average throughput for Packet Data		2219	1318	NDR
Latency	<250ms	100	100	NDR

Note: BSNL did not submit the data.

All the parameters met the TRAI benchmark.

9.1.6 KATIHAR SSA

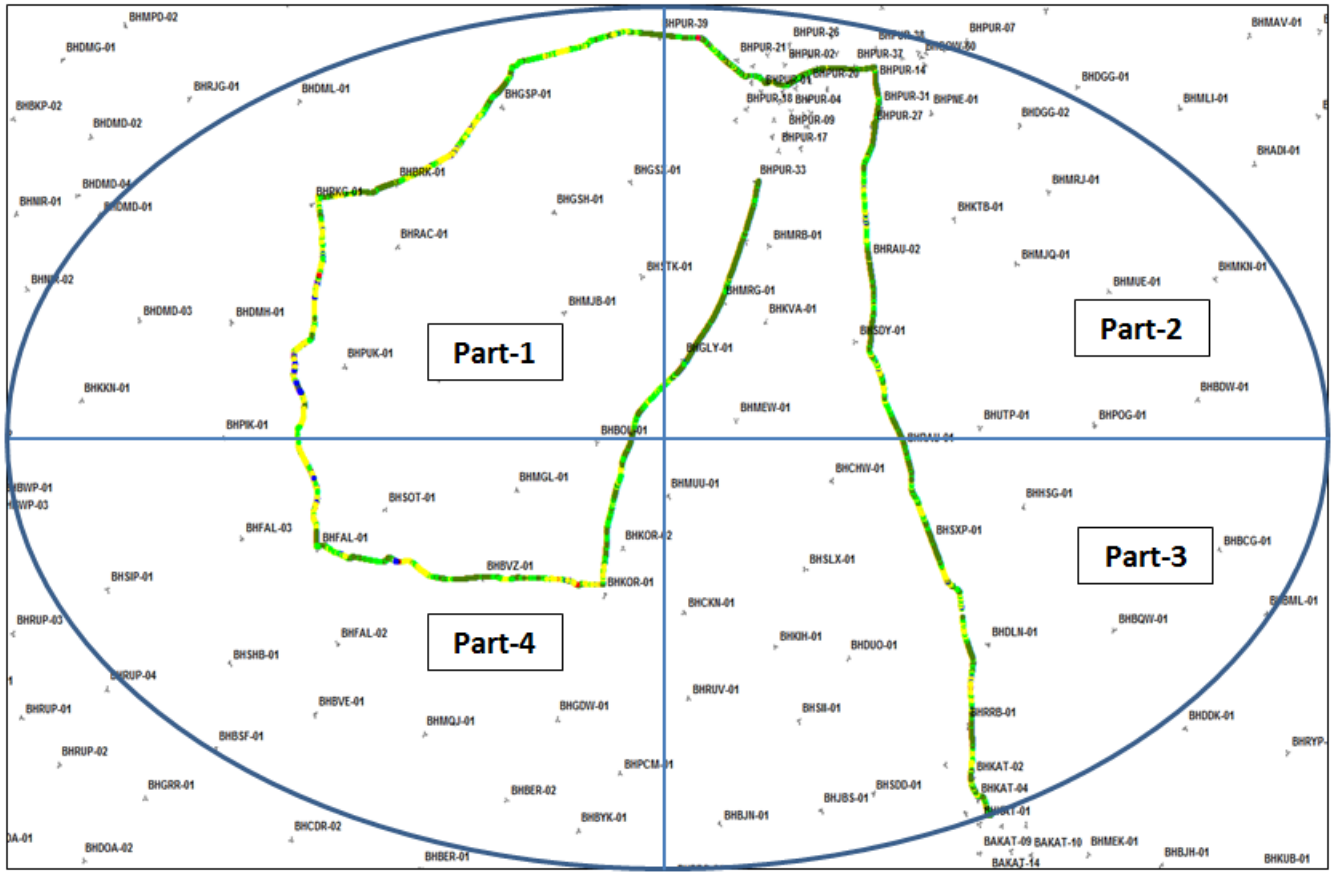
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
March	Katihar	28/3/2016	30/3/2016	310

9.1.6.1 Route Details - KATIHAR SSA

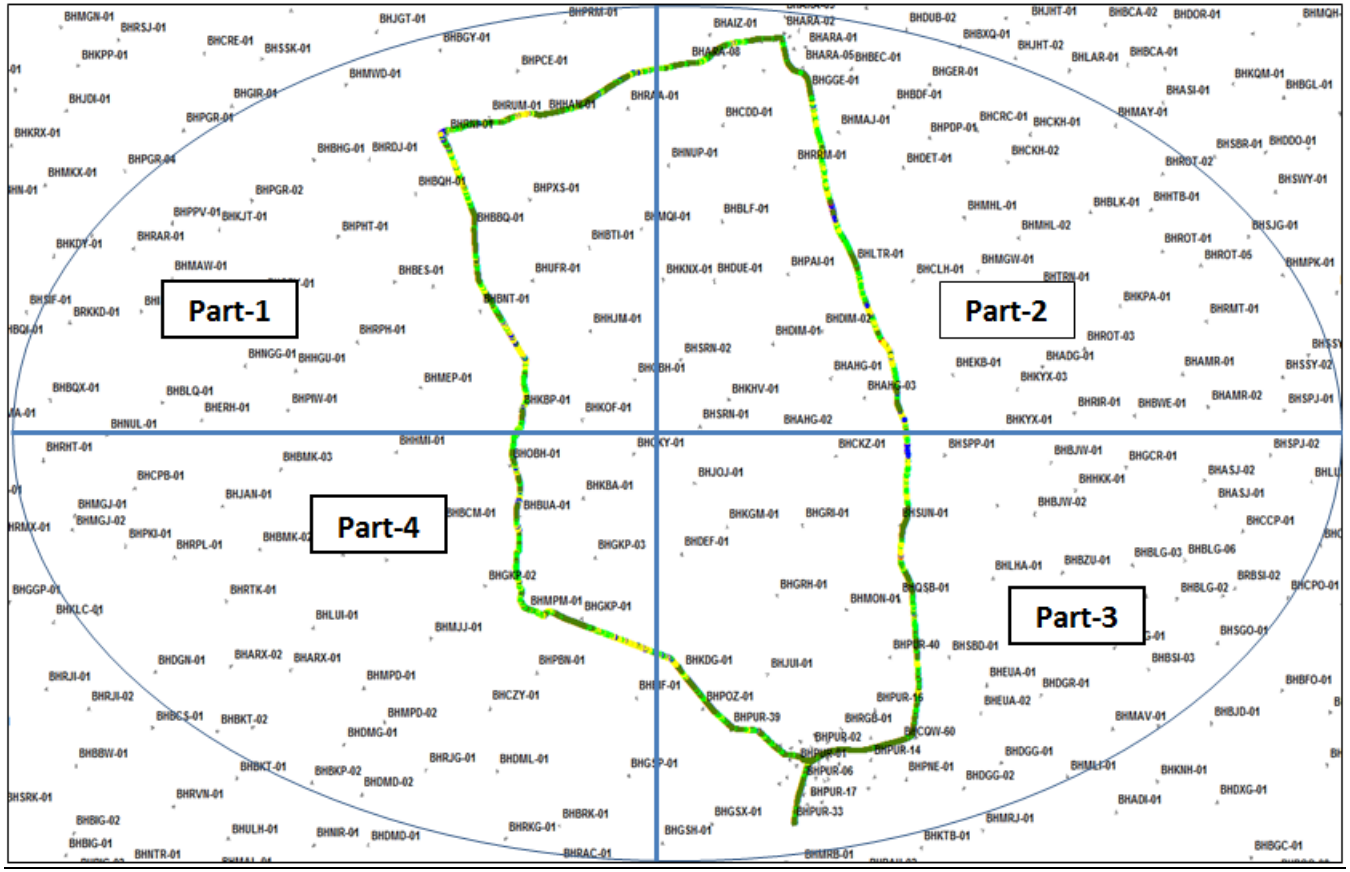
Category	Type of location	March		
		Katihar		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Railway Station-sirsa-purnea-mirganj-falka-korha-marnga-purnea	Maranga-line bazar-gulabbag-qusba-jalalgarh-sisauna-rajokhar-raniganj-kacheharibalua-K	Bus stand-mangal bazar-hardayal chauk-MG road-JP chauk-railway colony-district court-korha-fulwaria-
	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 February 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.

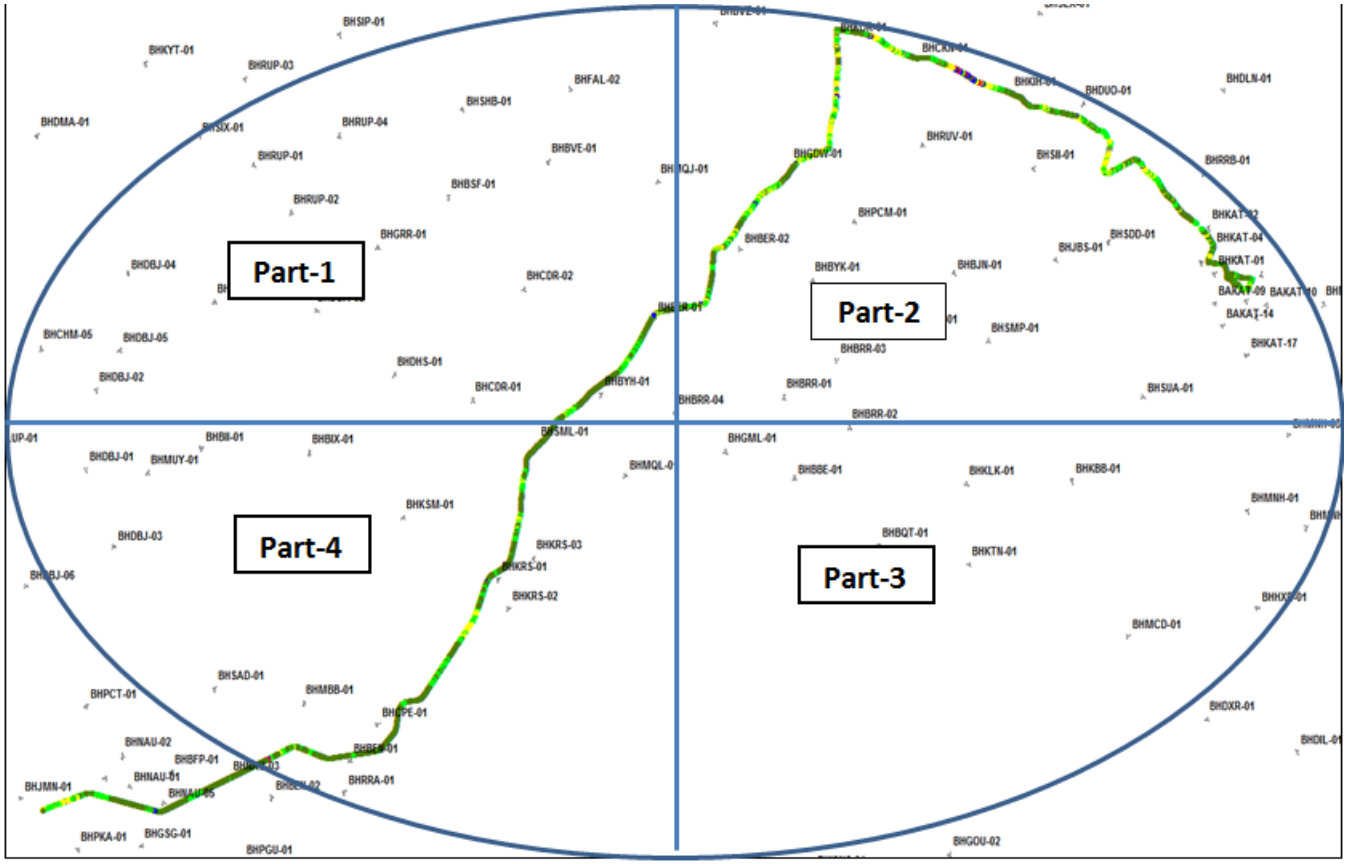
9.1.6.2 Route Map - KATIHAR Day 1



9.1.6.3 Route Map - KATIHAR Day 2



9.1.6.4 Route Map - KATIHAR Day 3



9.1.6.5 Drive Test Results - KATIHAR SSA-2G

Katihar	B'mark	Aircel(DWL)		Airtel		BSNL Bihar/Jharkand		Idea		Reliance CDMA		Reliance GSM		TATA CDMA		TATA GSM		Telenor		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		83.48%	45.39%	94.58%	84.02%	97.13%	33.12%	42.93%	58.06%	61.95%	20.96%	No Service		46.07%	25.87%	30.77%	22.92%	99.27%	44.63%	83.17%	35.04%
0 to -85 dBm		99.77%	69.53%	99.97%	98.09%	100.00%	61.50%	56.22%	30.80%	96.76%	44.70%			77.71%	44.53%	97.73%	58.55%	100.00%	78.91%	98.83%	73.77%
0 to -95 dBm		100.00%	89.81%	100.00%	99.81%	100.00%	84.51%	0.85%	11.14%	99.99%	94.44%			95.56%	65.61%	99.90%	82.71%	100.00%	100.00%	99.98%	94.21%
Voice quality	≥ 95%	96.08%	95.39%	97.41%	95.71%	94.74%	71.71%	96.95%	96.12%	99.71%	88.04%			95.77%	81.93%	98.06%	84.57%	98.81%	92.28%	97.11%	96.83%
CSSR	≥ 95%	100.00%	96.90%	100.00%	100.00%	100.00%	93.27%	100.00%	100.00%	100.00%	91.87%			100.00%	95.88%	100.00%	93.64%	100.00%	99.15%	100.00%	98.94%
%age Blocked calls		0.00%	3.10%	0.00%	0.00%	0.00%	6.73%	0.00%	0.00%	0.00%	8.13%			0.00%	3.61%	0.00%	13.14%	0.00%	0.85%	0.00%	0.35%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	6.19%	0.00%	0.00%	0.00%	5.31%			0.00%	6.00%	0.00%	3.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	97.85%	100.00%	100.00%	100.00%	97.78%	100.00%	100.00%	100.00%	100.00%			100.00%	100.00%	100.00%	100.00%	100.00%	99.32%	100.00%	97.95%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Reliance CDMA, TATA CDMA, TATA GSM and Telenor failed to meet the benchmark for voice quality in outdoor locations. BSNL did not meet the benchmark in Indoor as well as outdoor locations.

Call Set Success Rate (CSSR)

BSNL, Reliance CDMA and TATA GSM failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

BSNL, Reliance CDMA, TATA CDMA and TATA GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.6.6 DRIVE TEST RESULTS - KATIHAR SSA-3G

Katihar	B'mark	Aircel 3G		Airtel 3G		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		67.91%	77.81%	77.81%	55.21%	Not participated		98.81%	79.50%
0 to -85 dBm		99.02%	82.33%	99.70%	90.71%			98.82%	84.00%
0 to -95 dBm		100.00%	87.15%	100.00%	99.14%			99.10%	89.01%
Voice quality	≥ 95%	98.60%	92.53%	99.22%	98.92%			NDR	NDR
CSSR	≥ 95%	100.00%	96.03%	100.00%	100.00%			96.30%	87.50%
%age Blocked calls		0.00%	3.97%	0.00%	0.00%			5.77%	4.80%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%			0.00%	0.92%
Hands off success rate		100.00%	100.00%	100.00%	100.00%			100.00%	99.03%

Voice Quality

Aircel 3G failed to meet the benchmark for voice quality in outdoor locations.

Call Set Success Rate (CSSR)

Reliance 3G failed to meet the benchmark for CSSR in outdoor locations.

Call Drop Rate

All operators met the benchmark for call drop rates in outdoor as well as indoor locations.

9.1.6.7 Drive Test Results - KATIHAR SSA-DATA- 2G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed attemp	>80%	100%	100%	NDR	100%	NDR	No Service	NDR	NDR	100%	100%
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR	100%	NDR		NDR	NDR	100%	100%
Minimum download speed		71	107	NDR	92	NDR		NDR	NDR	44	NDR
Average throughput for Packet Data		140	155	NDR	139	NDR		NDR	NDR	102	129
Latency	<250ms	100	100	NDR	100	NDR		NDR	NDR	NDR	100

Note: BSNL, Reliance CDMA, Tata CDMA, Tata GSM did not submit the data.

All the parameters met the TRAI benchmark.

9.1.6.8 Drive Test Results - KATIHAR SSA-DATA- 3G

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL
Succesful Data Transmission download speed attempts	>80%	100%	100%	NDR
Succesful Data Transmission upload speed attempts	>75%	100%	100%	NDR
Minimum download speed		858	1232	NDR
Average throughput for Packet Data		1294	2107	NDR
Latency	<250ms	100	100	NDR

Note: BSNL did not submit the data.

All the parameters met the TRAI benchmark.

10 ANNEXURE – CONSOLIDATED-2G

10.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data											
	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		8859	29285	7750	23842	3531	No Service	1170	2883	11887	26637
Sum of downtime of BTSs in a month (in hours)		79661	11281	108415	95889	6371	No Service	1464	2120	23779	69054
BTSs accumulated downtime (not available for service)	≤ 2%	1.21%	0.05%	1.88%	0.54%	0.24%	No Service	0.17%	0.10%	0.27%	0.35%
Number of BTSs having accumulated downtime >24 hours		1020	39	147	393	49	No Service	0	0	71	338
Worst affected BTSs due to downtime	≤ 2%	11.51%	0.13%	1.90%	1.65%	1.39%	No Service	0.00%	0.00%	0.60%	1.27%
Live Measurement Results for Network Availability- 3 Day live data											
	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		8859	29156	7718	23793	Server issue	No Service	1170	2883	12054	26637
Sum of downtime of BTSs in a month (in hours)		7869	982	5925	10953	Server issue	No Service	185	292	2652	8955
BTSs accumulated downtime (not available for service)	≤ 2%	1.23%	0.05%	1.07%	0.64%	Server issue	No Service	0.22%	0.14%	0.31%	0.47%
Number of BTSs having accumulated downtime >24 hours		0	3	89	7	Server issue	No Service	0	0	39	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.01%	1.15%	0.03%	Server issue	No Service	0.00%	0.00%	0.32%	0.00%

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

10.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, SDCCH and TCH congestion- PMR data											
CSSR	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	84.52%	95.43%	92.41%	96.20%	96.93%	No Service	97.83%	97.86%	92.65%	99.20%
SDCCH/Paging channel congestion	≤ 1%	2.07%	0.77%	2.95%	0.82%	NA	No Service	NA	0.25%	1.66%	0.47%
TCH congestion	≤ 2%	15.13%	1.30%	1.37%	1.86%	0.84%	No Service	0.51%	0.70%	5.99%	0.80%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data											
CSSR	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	85.29%	95.46%	92.74%	97.11%	Server issue	No Service	98.11%	98.41%	92.28%	99.58%
SDCCH/Paging channel congestion	≤ 1%	1.84%	0.76%	3.37%	0.90%	Server issue	No Service	NA	0.16%	2.18%	0.48%
TCH congestion	≤ 2%	14.60%	1.28%	1.53%	2.02%	Server issue	No Service	0.68%	0.22%	6.42%	0.42%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data											
CSSR	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts		2008	2823	2063	4425	1916	0	3001	1962	2212	2998
Total number of successful calls established		1849	2823	1909	2516	1808	0	2816	1756	2205	2991
CSSR	≥ 95%	92.08%	100.00%	92.54%	74.67%	94.36%	NA	93.84%	89.50%	99.68%	99.77%
%age blocked calls		7.92%	0.00%	7.46%	25.33%	5.64%	NA	6.16%	10.50%	0.32%	0.23%

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

10.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		510041431	2656865560	135973086	979470502	194197441	No Service	36212956	79010919	711940273	892620546
Total number of calls dropped		9658471	43225151	1488289	8631237	361462	No Service	128936	407812	6827206	6559328
Call drop rate	≤ 2%	1.89%	1.63%	1.09%	0.88%	0.19%	No Service	0.36%	0.52%	0.96%	0.73%
Total number of cells in the network		26712	88044	23200	71958	10575	No Service	3776	8689	35380	80087
Total number of cells having more than 3% TCH		3914	1956	1520	1933	59	No Service	60	218	1530	2208
Worst affected cells having more than 3% TCH	≤ 3%	14.65%	2.22%	6.55%	2.69%	0.56%	No Service	1.60%	2.51%	4.33%	2.76%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		50981781	3752226523	22181899	88852335	Server issue	No Service	47898516	102216051	77173405	1107268872
Total number of calls dropped		945328	63236138	225030	864582	Server issue	No Service	150642	479356	894420	7147120
Call drop rate	≤ 2%	1.85%	1.69%	1.01%	0.97%	Server issue	No Service	0.31%	0.47%	1.16%	0.65%
Total number of cells in the network		26835	203446	23104	71498	Server issue	No Service	3776	8689	36246	80087
Total number of cells having more than 3% TCH		3768	4709	1665	1855	Server issue	No Service	83	9	2149	2204
Worst affected cells having more than 3% TCH	≤ 3%	14.04%	2.31%	7.21%	2.59%	Server issue	No Service	2.19%	0.11%	5.93%	2.75%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		1858	2823	1755	2516	1814	0	2818	1748	2196	3016
Total number of calls dropped		50	0	83	0	160	0	101	54	0	1
Call drop rate	≤ 2%	2.69%	0.00%	4.73%	0.00%	8.82%	NA	3.58%	3.09%	0.00%	0.03%

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

10.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data											
Voice quality	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		79093489891	531672007245	2510	179052841261	NA	No Service	1557447429721	14755646682	116207104664	160317821049
Total number of calls with good voice quality		75161351279	509312802485	2425	172730105740	NA	No Service	1530241216220	14382365230	110106216980	156929493655
%age calls with good voice quality	≥ 95%	95.03%	95.79%	96.61%	96.47%	97.24%	No Service	98.25%	97.47%	94.75%	97.89%
Live measurement results for Voice quality-3 Day data											
Voice quality	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		7759755966	53487681050	1110	16998733123	Server issue	No Service	130212949569	614818612	11952545704	6679909210
Total number of calls with good voice quality		7374112325	51239715780	1060	16423559801	Server issue	No Service	127939745748	599265218	11319388347	6538728902
%age calls with good voice quality	≥ 95%	95.03%	95.80%	95.50%	96.62%	Server issue	No Service	98.25%	97.47%	94.70%	97.89%
Drive test results for Voice quality (Average of three drive tests) - DT data											
Voice quality	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		3556243	5014602	1446084	4394778	0	0	1219329	3111719	3140061	6409788
Total number of calls with good voice quality		3475015	4839242	1373208	4271591	0	0	1045663	2843330	2973250	6196026
%age calls with good voice quality	≥ 95%	97.72%	96.50%	94.96%	97.20%	NA	NA	85.76%	91.37%	94.69%	96.67%

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

10.5 POI CONGESTION

Audit Results for POI Congestion- PMR data											
POI congestion	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	21	83	115	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		388441	2184896	118620	911179	188406	No Service	5228338	501121	234452	877741
Traffic served for all POIs (B)- in erlangs		245192	1351191	28478	585954	79753	No Service	532554	72109	169080	567021
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	21	83	Server issue	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		388419	1351155	118620	911179	Server issue	No Service	217847	30808	232412	875469
Traffic served for all POIs (B)- in erlangs		120479	748070	28478	574347	Server issue	No Service	22263	4155	143787	249725
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

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

10.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang										
Traffic in Erlang	Aircel(DWL)	Airtel	NL Bihar/Jharka	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Eqipped capacity of the network	161749.2673	847602.8888	277000	236422.6865	146000	No Service	75487.6	48977	222654.8892	266600.77
Total taffic handled in erlang during TCBH	155096.5551	693861.2495	110072	281796.4659	55349	No Service	11316.79	25066	239393.8158	248511.6946
Total no. of customers served (as per VLR)	5660047	26883216	1718095	11468918	1575061	No Service	178310.53	951509	6549452	10190128

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

11 ANNEXURE – CONSOLIDATED-3G

11.1 NETWORK AVAILABILITY

Audit Results for Network Availability- PMR data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		2871	16197	3881
Sum of downtime (i.e. total outage time) of Node Bs		29679	2356	23603
Node Bs downtime (not available for service)	≤ 2%	1.39%	0.02%	0.82%
Number of Node Bs having accumulated downtime of >24 hours in a month		224	60	33
Worst affected Node Bs due to downtime	≤ 2%	7.80%	0.37%	0.85%
Live Measurement Results for Network Availability- 3 Day live data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		2871	15901	3881
Sum of downtime (i.e. total outage time) of Node Bs		3304	1815	1145
Node Bs downtime (not available for service)	≤ 2%	1.60%	0.16%	0.41%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	49	33
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.31%	0.85%

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

11.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data				
	Benchmark	Aircel 3G	Airtel 3G	SNL Bihar/Jharkand 3G
CSSR	≥ 95%	88.93%	99.27%	92.89%
RRC Congestion	≤ 1%	1.09%	0.10%	3.46%
Circuit Switched RAB Congestion	≤ 2%	1.24%	0.69%	0.96%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data				
	Benchmark	Aircel 3G	Airtel 3G	SNL Bihar/Jharkand 3G
CSSR	≥ 95%	87.99%	99.00%	93.39%
RRC Congestion	≤ 1%	1.48%	0.03%	2.90%
Circuit Switched RAB Congestion	≤ 2%	1.53%	0.68%	0.70%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data				
CSSR	Benchmark	Aircel 3G	Airtel 3G	SNL Bihar/Jharkand 3G
Total number of RRC attempts (A)		842	75	1213
Total number of RRC established (B)		800	74	1206
Call setup success rate (B/A*100)	≥ 95%	95.01%	98.67%	99.42%
%age blocked calls		4.99%	1.33%	0.58%

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

11.3 CONNECTION MAINTENANCE (RETAINABILITY)

Audit Results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		23447030	38181271	69310952
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		224753	249614	1232620
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.96%	0.65%	1.78%
Total no. of cells in the licensed service area (B)		7812	34220	11588
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		715	875	433
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	9.16%	2.56%	3.74%

Live measurement results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		2338245	4039881	7358742
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		25311	27462	99575
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.08%	0.68%	1.35%
Total no. of cells in the licensed service area (B)		8077	33532	11643
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		647	845	450
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.01%	2.52%	3.86%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data				
Circuit switched voice drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		782	74	1206
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		18	0	51
Circuit switched voice drop rate (B/A*100)	≤ 2%	2.30%	0.00%	4.23%

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

11.4 VOICE QUALITY

Audit Results for Voice quality -PMR Data				
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		15788428470	0	245
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		15626692310	0	235
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.98%	99.25%	95.92%
Live measurement results for Voice quality-3 Day data				
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3868241880	0	245
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3844331873	0	235
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.38%	99.29%	95.92%
Drive test results for Voice quality (Average of three drive tests) - DT data				
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3579870	0	4518674
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2745162	0	3014386
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	76.68%	NA	66.71%

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

11.5 POI CONGESTION

Audit Results for POI Congestion- PMR data				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	14
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		388441	0	31076
Traffic served for all POIs (B)- in erlangs		245192	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	14
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		388419	0	31076
Traffic served for all POIs (B)- in erlangs		120479	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

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

11.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang			
Traffic in Erlang	Aircel 3G	Airtel 3G	IL Bihar/Jharkand
Eqipped capacity of the network	0	0	NDR
Total taffic handled in erlang during TCBH	6176.033765	23588.8449	NDR
Total no. of customers served (as per VLR)	370362	1011048	NDR

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

12 ANNEXURE – CUSTOMER SERVICES

12.1 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated											
Billing Performance	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Metering and billing credibility - Postpaid (Avg of 3 billing cycles)											
Metering and billing credibility - Postpaid											
Total bills generated during the period		3865	284092	76979	59968	180013	195863	24856	31398	0	277034
Total number of bills disputed		0	220	63	106	131	169	0	0	0	42
Total number of valid billing complaints		0	37	63	16	123	169	0	0	0	23
Total complaints considered invalid		0	183	0	90	8	0	0	0	0	19
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.00%	0.08%	0.08%	0.18%	0.07%	0.09%	0.00%	0.00%	NA	0.02%
January											
Total bills generated during the first billing cycle		1324	98455	25550	19140	60960	66135	8437	10527	0	86185
Total number of bills disputed in first billing cycle		0	79	19	33	56	59	0	0	0	19
Total number of valid billing complaints (billing cycle 1)		0	14	19	7	56	59	0	0	0	13
Total complaints considered invalid (billing cycle 1)		0	65	0	26	0	0	0	0	0	6
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.00%	0.08%	0.07%	0.17%	0.09%	0.09%	0.00%	0.00%	NA	0.02%

Data Source: Billing Center of the operators

February											
Total bills generated during the second billing cycle		1290	87278	25769	20010	59806	65003	8264	10501	0	87584
Total number of bills disputed in second billing cycle		0	68	23	26	52	55	0	0	0	8
Total number of valid billing complaints (billing cycle 2)		0	14	23	4	52	55	0	0	0	5
Total complaints considered invalid (billing cycle 2)		0	54	0	22	0	0	0	0	0	3
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.00%	0.08%	0.09%	0.13%	0.09%	0.08%	0.00%	0.00%	NA	0.01%
March											
Total bills generated during the third billing cycle		1251	98359	25660	20818	59247	64725	8155	10370	0	103265
Total number of bills disputed in third billing cycle		0	73	21	47	23	55	0	0	0	15
Total number of valid billing complaints (billing cycle 3)		0	9	21	5	15	55	0	0	0	5
Total complaints considered invalid (billing cycle 3)		0	64	0	42	8	0	0	0	0	10
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.00%	0.07%	0.08%	0.23%	0.04%	0.08%	0.00%	0.00%	NA	0.01%

Data Source: Billing Center of the operators

Metering and billing credibility - Prepaid											
Performance prepaid	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of charging complaints (valid) - sum of 3 months		2	524	138	1300	1393	2339	0	0	40	8207
Total complaints considered invalid (sum of 3 months)		12983	8357	60	4336	28	0	0	0	0	10637
Total number of charging complaints (sum of 3 months)		12985	8881	198	5636	1421	2339	0	0	40	18844
Total no of customers served (Sum of 3 months)		20953852	82178742	6281045	33218999	5058299	7812165	340519	1541898	25995775	27935816
Percentage of charging complaints disputed	≤ 0.1%	0.06%	0.01%	0.00%	0.02%	0.03%	0.03%	0.00%	0.00%	0.00%	0.07%

Data Source: Billing Center of the operators

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of billing/charging complaints		12985	9101	198	5742	1588	2508	NA	NA	40	18886
Total number of complaints resolved in favour of customer		2	561	138	1316	1552	2508	NA	NA	40	8230
Total complaints considered invalid		12983	8540	60	4426	36	0	NA	NA	0	10656
Number of complaints resolved in 4 weeks		2	561	138	1316	1552	2508	NA	NA	40	8230
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%
Number of complaints resolved in 6 weeks		2	561	0	1316	1552	2508	NA	NA	40	8230
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		2	561	0	1316	1516	2508	0	0	0	8230
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for resolution of billing complaints											
Resolution of billing complaints	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls made		100	100	100	100	100	100	100	15	100	100
Number of cases resolved in 4 weeks		88	84	78	80	83	72	71	11	90	90
Percentage cases resolved in 4 weeks	≥ 98%	88.00%	84.00%	78.00%	80.00%	83.00%	72.00%	71.00%	73.33%	90.00%	90.00%
Number of cases resolved in 6 weeks		92		80	80	87	78	75	11	90	90
Percentage cases resolved in 6 weeks	100.00%	92.00%	0.00%	80.00%	80.00%	87.00%	78.00%	75.00%	73.33%	90.00%	90.00%

Data Source: Billing Center of the operators

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of billing/charging complaints		12985	9101	198	5742	1588	2508	NA	NA	40	18886
Total number of complaints resolved in favour of customer		2	561	138	1316	1552	2508	NA	NA	40	8230
Total complaints considered invalid		12983	8540	60	4426	36	0	NA	NA	0	10656
Number of complaints resolved in 4 weeks		2	561	138	1316	1552	2508	NA	NA	40	8230
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%
Number of complaints resolved in 6 weeks		2	561	0	1316	1552	2508	NA	NA	40	8230
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		2	561	0	1316	1516	2508	0	0	0	8230
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

Live calling results for resolution of billing complaints											
Resolution of billing complaints	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls made		100	100	100	100	100	100	100	15	100	100
Number of cases resolved in 4 weeks		88	84	78	80	83	72	71	11	90	90
Percentage cases resolved in 4 weeks	≥ 98%	88.00%	84.00%	78.00%	80.00%	83.00%	72.00%	71.00%	73.33%	90.00%	90.00%
Number of cases resolved in 6 weeks		92		80	80	87	78	75	11	90	90
Percentage cases resolved in 6 weeks	100.00%	92.00%	0.00%	80.00%	80.00%	87.00%	78.00%	75.00%	73.33%	90.00%	90.00%

Data Source: Live calling made to customers

12.2 CUSTOMER CARE

Audit results for customer care (IVR and voice-to-Voice) -Consolidated											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts to customer care for assistance		33719109	9717349	78123	58160264	5548310	5027779	NA	262339	23045118	17359690
Number of calls getting connected and answered (electronically)		31418876	9647720	72637	57262260	5534754	5017476	NA	250799	22976070	17359690
Percentage calls getting connected and answered	≥ 95%	93.18%	99.28%	92.98%	98.46%	99.76%	99.80%	NA	95.60%	99.70%	100.00%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls received (3 months)		4841229	13129543	58270	12443932	996893	1361239	42060	374857	6983524	7659395
Total Number of calls answered within 90 seconds (3 months)		4668587	11290450	55405	12433654	951932	1313509	41971	356179	6935499	7536469
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	96.43%	85.99%	95.08%	99.92%	95.49%	96.49%	99.79%	95.02%	99.31%	95.79%

January											
Total calls received (Month 1)		1638302	4345361	16104	4184364	367804	424575	13958	142010	2399408	2707092
Total calls answered within 90 seconds (Month 1)		1595623	3996718	15301	4175906	330637	422375	13944	129735	2372874	2664423
% calls answered within 90 seconds (Month 1)	≥ 95%	97.39%	91.98%	95.01%	99.80%	89.89%	99.48%	99.90%	91.36%	98.89%	98.42%
February											
Total calls received (Month 2)		1518981	4086400	21688	3976762	323127	497601	13932	114347	2159791	2608963
Total calls answered within 90 seconds (Month 2)		1498423	3668681	20616	3975154	318721	476893	13912	112267	2151181	2560745
% calls answered within 90 seconds (Month 2)	≥ 95%	98.65%	89.78%	95.06%	99.96%	98.64%	95.84%	99.86%	98.18%	99.60%	96.83%
March											
Total calls received (Month 3)		1683946	4697782	20478	4282806	305962	439063	14170	118500	2424325	2343340
Total calls answered within 90 seconds (Month 3)		1574541	3625051	19488	4282594	302574	414241	14115	114177	2411444	2311301
% calls answered within 90 seconds (Month 3)	≥ 95%	93.50%	77.17%	95.17%	100.00%	98.89%	94.35%	99.61%	96.35%	99.47%	98.63%

Data Source: Customer Service Center of the operators

Live calling results for customer care (IVR)											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts to customer care for assistance		100	100	200	100	100	100	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	200	100	100	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Live calling results for customer care (Voice to Voice)											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls received		100	100	100	100	100	100	100	100	100	100
Total Number of calls getting connected and answered		97	93	95	97	100	97	98	100	100	98
Live Calling Percentage calls getting connected and answered	≥ 95%	97.00%	93.00%	95.00%	97.00%	100.00%	97.00%	98.00%	100.00%	100.00%	98.00%

12.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated											
Termination	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of closure request		15	2191	NA	456	399	540	240	653	NA	2275
Number of requests attended within 7 days		15	2191	NA	456	399	540	240	653	NA	2275
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%

Data Source: Customer Service Center of the operators

12.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated											
Refund	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of cases requiring refund of deposits		40	114	NA	204	1390	1317	19	22	NA	1253
Total number of cases where refund was made within 60 days		34	114	NA	204	1390	1317	19	22	NA	1253
Percentage cases in which refund was receive within 60 days	100.00%	85.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%

Data Source: Billing Center of the operators

12.5 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/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls made	100	100	NA	100	100	100	100	100	NA	100
Number of cases resolved to satisfaction	88	84	NA	79	76	82	76	70	NA	88
Percentage cases resolved in four weeks	88.00%	84.00%	NA	79.00%	76.00%	82.00%	76.00%	70.00%	NA	88.00%

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

12.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services											
Level 1 services		Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total no. of calls made		300	300	300	300	300	300	300	300	300	300
Calls answered		255	267	259	256	258	252	226	260	238	232
% of calls connected	≥ 95%	85.00%	89.00%	86.33%	85.33%	86.00%	84.00%	75.33%	86.67%	79.33%	77.33%

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

12.7 LEVEL 1 SERVICE CALLS MADE

All the numbers given in mandatory list in Section 2.4.2.4.1 were tested. The following table provides the numbers that are activated for each operator. A tick (✔) for an operator signifies that the number was active for the operator.

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

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		20	17
101	Fire	y		20	17
102	Ambulance	y		20	17
104	Health Information Helpline	y		20	17
108	Emergency and Disaster Management Helpline	y		20	17
138	All India Helpine for Passangers	y		20	17
1412	Public Road Transport Utility Service				

181	Chief Minister Helpline	y		20	17
182	Indian Railway Security Helpline	y		20	17
1033	Road Accident Management Service	y		20	17
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				
1070	Relief Commission for Natural Calamities				
1071	Air Accident Helpline				
1072	Rail Accident Helpline				
1073	Road Accident Helpline				

1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)				
10121	Women Helpline				
10127	National AIDS Helpline to NACO				
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board	y		20	17
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway	y		20	17

1514	National Career Service(NCS)				
15100	Free Legal Service Helpline	y		20	17
155304	Municipal Corporations				
155214	Labour Helpline	y		20	17
11203	Sashastra Seema Bal (SSB)	y		20	17
112012	National Do Not Call Registry	y		20	17
11212	Complaint of Electricity				
11216	Drinking Water Supply				
11250	Election Commission of India				
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		14	13

101	Fire	y		14	13
102	Ambulance	y		14	12
104	Health Information Helpline	y		15	13
108	Emergency and Disaster Management Helpline	y		15	13
138	All India Helpine for Passangers				
1412	Public Road Transport Utility Service	y		15	13
181	Chief Minister Helpline	y		14	12
182	Indian Railway Security Helpline	y		15	12
1033	Road Accident Management Service	y		14	13
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				

1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline	y		15	13
1070	Relief Commission for Natural Calamities				
1071	Air Accident Helpline				
1072	Rail Accident Helpline	y		15	13
1073	Road Accident Helpline	y		14	13
1077	Control Room for District Collector	y		14	12
10120	Call Alart (Crime Branch)				
10121	Women Helpline				
10127	National AIDS Helpline to NACO				
101212	Central Accident and Trauma Services (CATS)	y		14	13
10580	Educationa & Vocational Guidance and Counselling				

105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board				
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway				
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline	y		14	12
155304	Municipal Corporations				
155214	Labour Helpline	y		14	13
11203	Sashastra Seema Bal (SSB)	y		14	13
112012	National Do Not Call Registry	y		14	12
11212	Complaint of Electricity	y		14	13

11216	Drinking Water Supply	y		14	13
11250	Election Commission of India	y		14	13
BSNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		17	15
101	Fire	y		17	14
102	Ambulance	y		16	15
104	Health Information Helpline	y		17	15
108	Emergency and Disaster Management Helpline	y		16	14
138	All India Helpine for Passangers	y		17	14
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline				

182	Indian Railway Security Helpline	y		17	15
1033	Road Accident Management Service				
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				
1070	Relief Commission for Natural Calamities	y		17	14
1071	Air Accident Helpline	y		17	15
1072	Rail Accident Helpline	y		16	15
1073	Road Accident Helpline				
1077	Control Room for District Collector				

10120	Call Alart (Crime Branch)				
10121	Women Helpline				
10127	National AIDS Helpline to NACO	y		17	14
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board	y		17	15
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway				
1514	National Career Service(NCS)				

15100	Free Legal Service Helpline	y		17	14
155304	Municipal Corporations				
155214	Labour Helpline				
11203	Sashastra Seema Bal (SSB)	y		16	14
112012	National Do Not Call Registry	y		17	14
11212	Complaint of Electricity	y		17	14
11216	Drinking Water Supply	y		16	14
11250	Election Commission of India	y		16	14
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		17	15
101	Fire	y		18	15

102	Ambulance	y		17	15
104	Health Information Helpline	y		18	15
108	Emergency and Disaster Management Helpline	y		18	15
138	All India Helpine for Passangers	y		18	15
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline				
182	Indian Railway Security Helpline	y		17	15
1033	Road Accident Management Service	y		18	16
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				

1064	Anti Corruption Helpline	y		18	15
1070	Relief Commission for Natural Calamities	y		17	15
1071	Air Accident Helpline	y		18	15
1072	Rail Accident Helpline	y		18	15
1073	Road Accident Helpline				
1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)				
10121	Women Helpline				
10127	National AIDS Helpline to NACO				
101212	Central Accident and Trauma Services (CATS)	y		18	15
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				

10740	Central Pollution Control Board				
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway				
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline				
155304	Municipal Corporations				
155214	Labour Helpline				
11203	Sashastra Seema Bal (SSB)	y		17	15
112012	National Do Not Call Registry	y		18	15
11212	Complaint of Electricity	y		18	15
11216	Drinking Water Supply				

11250	Election Commission of India	y		17	15
Reliance CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		15	13
101	Fire	y		15	13
102	Ambulance	y		15	13
104	Health Information Helpline	y		15	13
108	Emergency and Disaster Management Helpline	y		15	13
138	All India Helpine for Passangers	y		15	13
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline				
182	Indian Railway Security Helpline	y		15	12

1033	Road Accident Management Service	y		15	12
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				
1070	Relief Commission for Natural Calamities	y		15	13
1071	Air Accident Helpline	y		15	13
1072	Rail Accident Helpline	y		15	13
1073	Road Accident Helpline				
1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)				

10121	Women Helpline				
10127	National AIDS Helpline to NACO	y		15	13
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board	y		15	13
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway	y		15	13
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline	y		15	13

155304	Municipal Corporations				
155214	Labour Helpline				
11203	Sashastra Seema Bal (SSB)	y		15	13
112012	National Do Not Call Registry	y		15	13
11212	Complaint of Electricity	y		15	13
11216	Drinking Water Supply	y		15	13
11250	Election Commission of India	y		15	13
TATA CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police				
101	Fire				
102	Ambulance				

104	Health Information Helpline	y		25	19
108	Emergency and Disaster Management Helpline				
138	All India Helpine for Passangers				
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline	y		25	19
182	Indian Railway Security Helpline				
1033	Road Accident Management Service	y		25	19
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				

1070	Relief Commission for Natural Calamities	y		25	18
1071	Air Accident Helpline	y		25	19
1072	Rail Accident Helpline	y		25	19
1073	Road Accident Helpline				
1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)				
10121	Women Helpline				
10127	National AIDS Helpline to NACO	y		25	19
101212	Central Accident and Trauma Services (CATS)	y		25	19
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board				

10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway				
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline	y		25	19
155304	Municipal Corporations				
155214	Labour Helpline				
11203	Sashastra Seema Bal (SSB)				
112012	National Do Not Call Registry				
11212	Complaint of Electricity	y		25	19
11216	Drinking Water Supply	y		25	19
11250	Election Commission of India	y		25	18

TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police				
101	Fire				
102	Ambulance				
104	Health Information Helpline	y		75	65
108	Emergency and Disaster Management Helpline	y		75	65
138	All India Helpine for Passangers	y		75	65
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline				
182	Indian Railway Security Helpline	y		75	65
1033	Road Accident Management Service				

1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				
1070	Relief Commission for Natural Calamities				
1071	Air Accident Helpline				
1072	Rail Accident Helpline				
1073	Road Accident Helpline				
1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)				
10121	Women Helpline				

10127	National AIDS Helpline to NACO				
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board				
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway				
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline				
155304	Municipal Corporations				

155214	Labour Helpline				
11203	Sashastra Seema Bal (SSB)				
112012	National Do Not Call Registry				
11212	Complaint of Electricity				
11216	Drinking Water Supply				
11250	Election Commission of India				

Telenor					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		27	22
101	Fire				
102	Ambulance				
104	Health Information Helpline	y		27	22

108	Emergency and Disaster Management Helpline	y		28	22
138	All India Helpine for Passangers	y		28	22
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline				
182	Indian Railway Security Helpline	y		28	22
1033	Road Accident Management Service	y		27	22
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				
1070	Relief Commission for Natural Calamities				

1071	Air Accident Helpline				
1072	Rail Accident Helpline				
1073	Road Accident Helpline				
1077	Control Room for District Collector				
10120	Call Alart (Crime Branch)				
10121	Women Helpline				
10127	National AIDS Helpline to NACO				
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board				
10741	Pollution Control Board				

1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway	y		27	21
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline	y		27	22
155304	Municipal Corporations				
155214	Labour Helpline				
11203	Sashastra Seema Bal (SSB)	y		27	21
112012	National Do Not Call Registry	y		27	21
11212	Complaint of Electricity				
11216	Drinking Water Supply				
11250	Election Commission of India	y		27	21
Vodafone					

Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		16	12
101	Fire	y		16	12
102	Ambulance	y		16	12
104	Health Information Helpline	y		16	12
108	Emergency and Disaster Management Helpline	y		16	12
138	All India Helpine for Passangers	y		15	12
1412	Public Road Transport Utility Service				
181	Chief Minister Helpline	y		16	12
182	Indian Railway Security Helpline	y		16	12
1033	Road Accident Management Service	y		16	12

1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'				
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti Corruption Helpline				
1070	Relief Commission for Natural Calamities	y		15	12
1071	Air Accident Helpline	y		15	12
1072	Rail Accident Helpline				
1073	Road Accident Helpline				
1077	Control Room for District Collector	y		16	12
10120	Call Alart (Crime Branch)				
10121	Women Helpline				

10127	National AIDS Helpline to NACO	y		16	12
101212	Central Accident and Trauma Services (CATS)				
10580	Educationa & Vocational Guidance and Counselling				
105812	Mother and Child Tracking (MCTH)				
10740	Central Pollution Control Board				
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway				
1514	National Career Service(NCS)				
15100	Free Legal Service Helpline	y		16	12
155304	Municipal Corporations				

155214	Labour Helpline	y		16	12
11203	Sashastra Seema Bal (SSB)	y		16	13
112012	National Do Not Call Registry	y		16	13
11212	Complaint of Electricity	y		15	13
11216	Drinking Water Supply				
11250	Election Commission of India	y		16	13

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

13 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

4	**Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)**	***The total no of dropped calls=*** **([Call Drops on Radio Interface in Stable State (Traffic Channel)] + [Call Drops on Radio Interface in Handover State (Traffic Channel)] + [Call Drops Due to No MR from MS for a Long Time (Traffic Channel)] + [Call Drops due to Abis Terrestrial Link Failure (Traffic Channel)] + [Call Drops due to Equipment Failure (Traffic Channel)] + [Call Drops due to Forced Handover (Traffic Channel)] + [Call Drops due to local switching Start Failure] + [Call Drops due to Failures to Return to Normal Call from local switching])/*Total no of calls successfully established (where traffic channel is allotted) =* ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)] +[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)])**
5	**Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area**	**Above formula with counters being used in CBBH.**
6	**Connection with good quality voice= (Connection with good quality voice/Total voice samples)%**	***Connection with good quality voice =*** **((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)) /*Total voice samples=* ((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHF (Receive Quality Rank 6)+Number of MRs on Downlink TCHF (Receive Quality Rank 7)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+:Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 6)+Number of MRs on Downlink TCHH (Receive Quality Rank 7))**

13.1.1 ERICSSON

Ericsson provides network support to Aircel, Airtel, Idea, BSNL and Reliance GSM in the circle.

Sl No.	KPI	Ericsson
1	**CSSR= (No of established Calls / No of Attempted Calls)%**	CSSR (No of established Calls / No of Attempted Calls)=(TCASSALL/TASSALL)*100
2	**SDCCH congestion= (SDCCH Failure/SDCCH attempts)%**	SDCCH congestion (SDCCH Failure/SDCCH attempts)% = (CCONGS/CCALLS)*100
3	**TCH congestion= (TCH Failures /TCH Attempts)%**	TCH congestion (TCH Failures /TCH Attempts)%= (CNRELCONG+TNRELCONG)/TASSALL)*100
4	**Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)**	Call Drop Rate (Total no dropped calls/No of established calls)%= (TNDROP)/TCASSALL*100
5	**Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area**	Above formula with counters being used in CBBH.
6	**Connection with good quality voice= (Connection with good quality voice/Total voice samples)%**	Connection with good quality voice (Connection with good quality voice samples 0-5 /Total voice samples)= 100 * (QUAL50DL + QUAL40DL + QUAL30DL + QUAL20DL + QUAL10DL + QUAL00DL) / (QUAL70DL + QUAL60DL + QUAL50DL + QUAL40DL + QUAL30DL + QUAL20DL + QUAL10DL + QUAL00DL)

Ericsson Counters

Counter	Counter Description
TCASSALL	Number of assignment complete messages on TCH for all MS classes
TASSALL	Number of first assignment attempts on TCH for all MS classes.
CNRELCONG	Number of released connections on SDCCH due to TCH or Transcoder (TRA) congestion.
TNRELCONG	Number of released TCH signalling connections due to transcoder resource congestion during immediate assignment on TCH
CCONGS	Congestion counter for SDCCH. Stepped per congested allocation attempt.
CCALLS	Channel allocation attempt counter on SDCCH.

TNDROP	The total number of dropped TCH Connections.
QUAL00DL	Number of quality 0 reported on downlink.
QUAL10DL	Number of quality 1 reported on downlink.
QUAL20DL	Number of quality 2 reported on downlink.
QUAL30DL	Number of quality 3 reported on downlink.
QUAL40DL	Number of quality 4 reported on downlink.
QUAL50DL	Number of quality 5 reported on downlink.
QUAL60DL	Number of quality 6 reported on downlink.
QUAL70DL	Number of quality 7 reported on downlink.

13.1.2 NSN (NOKIA SIEMENS NETWORKS)

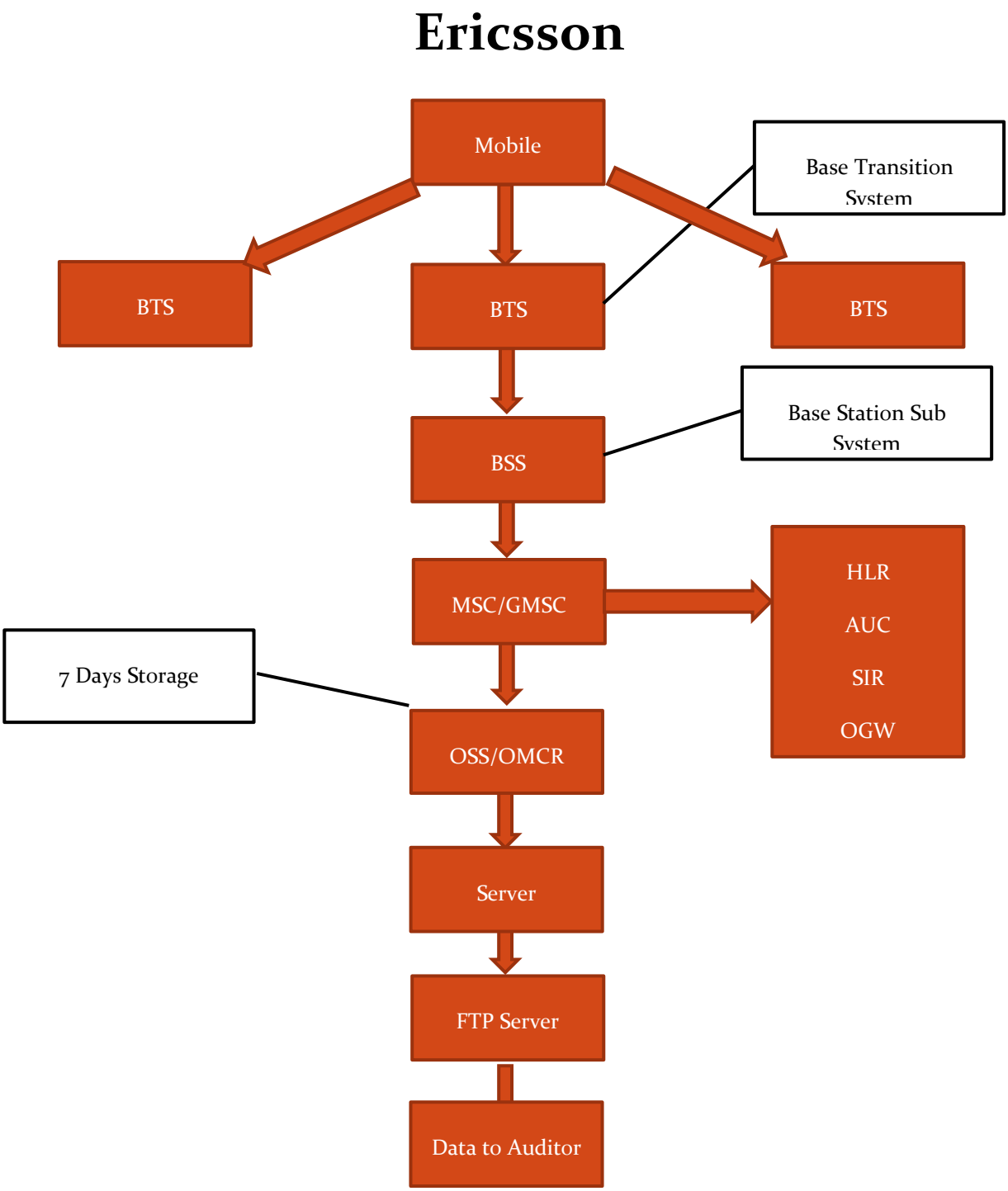
NSN provides network support to Vodafone in the circle.

Sl No.	KPI	NSN
1	CSSR= (No of established Calls / No of Attempted Calls)%	CSSR= 100-100*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON) + (SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL)+ (BLCK_8I_NOM)/ {(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	SDCCH congestion = (sdcch_busy_att - .tch_seiz_due_sdcch_con)/{(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
3	TCH congestion= (TCH Failures /TCH Attempts)%	TCH congestion = BLCK_8I_NOM / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)}
4	Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)	TCH Drop = (drop_after_tch_assign)-(tch_re_est_release) / {(TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC_I_SDCCH_TCH_AT)}
5	Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area	Above formula with counters being used in CBBH.
6	Connection with good quality voice= (Connection with good quality voice/Total voice samples)%	Connection with good quality voice= (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5) / (FREQ_DL_QUAL0+FREQ_DL_QUAL1+FREQ_DL_QUAL2+FREQ_DL_QUAL3+FREQ_DL_QUAL4+FREQ_DL_QUAL5+FREQ_DL_QUAL6+FREQ_DL_QUAL7)

13.2 BLOCK SCHEMATIC DIAGRAMS

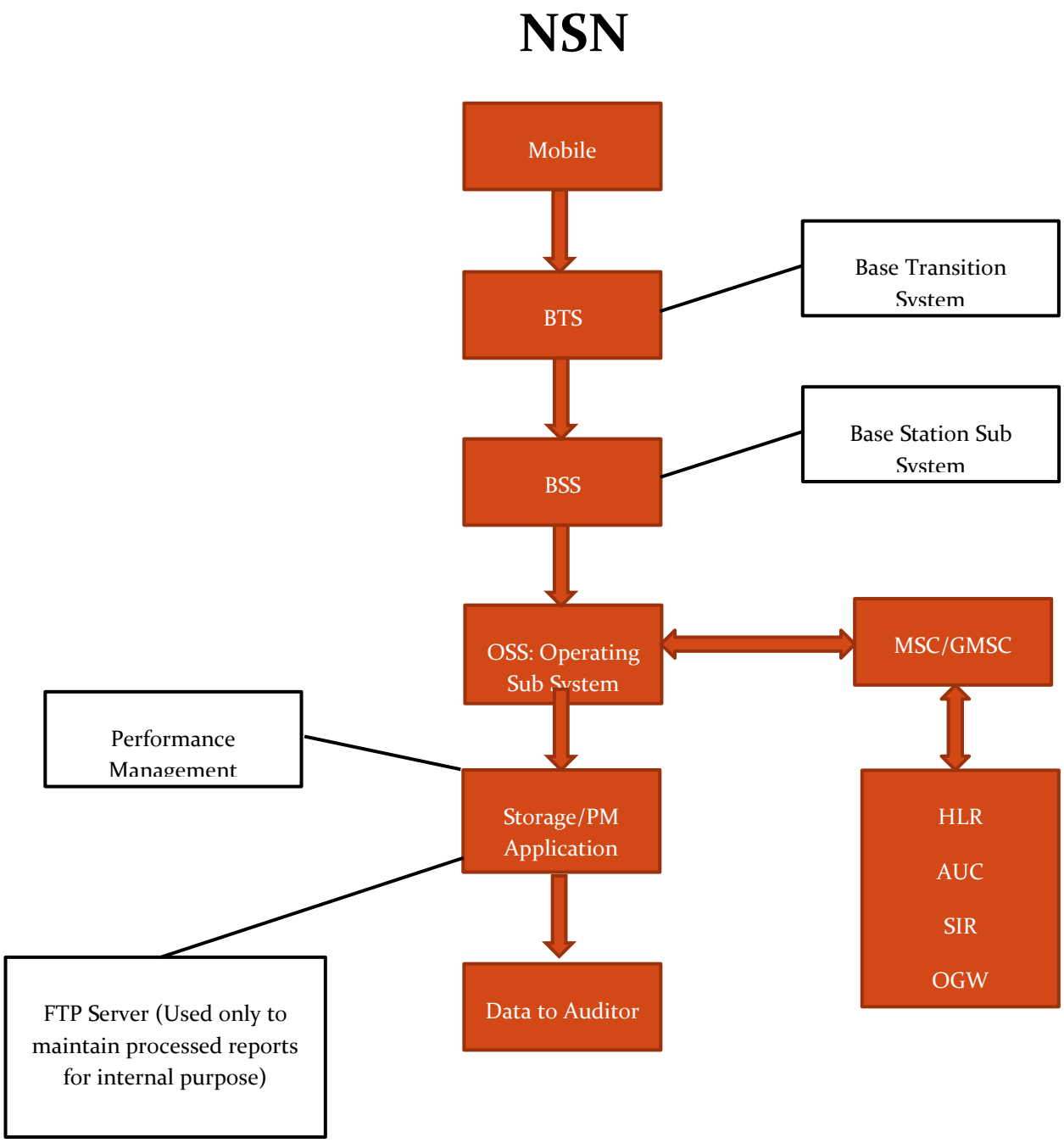
13.2.1 ERICSSON

Ericsson provides network support to Aircel, Airtel, Idea, BSNL and Reliance GSM in the circle.



13.2.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.



14 ANNEXURE – JANUARY -2G

1. Network Availability											
Audit Results for Network Availability- PMR data-January											
	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		2934	9649	1318	7871	1516	No Service	390	961	3635	8852
Sum of downtime of BTSs in a month (in hours)		767	3928	19378	29764	3568	No Service	516	620	5035	21320
BTSs accumulated downtime (not available for service)	≤ 2%	0.04%	0.05%	1.98%	0.51%	0.32%	No Service	0.18%	0.09%	0.19%	0.32%
Number of BTSs having accumulated downtime >24 hours		414	14	24	101	27	No Service	0	0	1	107
Worst affected BTSs due to downtime	≤ 2%	14.11%	0.15%	1.82%	1.28%	1.78%	No Service	0.00%	0.00%	0.03%	1.21%
Live Measurement Results for Network Availability- 3 Day live data-January											
	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		2934	9649	1318	7822	Server issue	No Service	390	961	3978	8852
Sum of downtime of BTSs in a month (in hours)		91	487	894	4599	Server issue	No Service	63	159	715	2794
BTSs accumulated downtime (not available for service)	≤ 2%	0.04%	0.07%	0.94%	0.82%	Server issue	No Service	0.22%	0.23%	0.25%	0.44%
Number of BTSs having accumulated downtime >24 hours		0	0	24	0	Server issue	No Service	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	1.82%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-January											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	84.70%	95.43%	96.46%	96.31%	96.90%	No Service	97.53%	97.98%	91.95%	99.20%
SDCCH/Paging channel congestion	≤ 1%	1.51%	0.79%	8.22%	0.73%	NA	No Service	NA	0.20%	1.27%	0.43%
TCH congestion	≤ 2%	14.51%	1.33%	2.60%	1.86%	0.87%	No Service	0.67%	0.50%	6.53%	0.80%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-January											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	86.65%	95.46%	95.95%	97.48%	Server issue	No Service	98.29%	98.58%	92.60%	99.55%
SDCCH/Paging channel congestion	≤ 1%	0.98%	0.79%	9.49%	0.79%	Server issue	No Service	NA	0.19%	3.06%	0.53%
TCH congestion	≤ 2%	12.99%	1.35%	3.09%	1.85%	Server issue	No Service	0.27%	0.25%	5.87%	0.45%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-January											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts		528	1090	798	785	543	No Service	791	617	730	1105
Total number of successful calls established		487	1090	729	785	511	No Service	706	572	730	1103
CSSR	≥ 95%	92.23%	100.00%	91.35%	100.00%	94.11%	No Service	89.25%	92.71%	100.00%	99.82%
%age blocked calls		7.77%	0.00%	8.65%	0.00%	5.89%	No Service	10.75%	7.29%	0.00%	0.18%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-January											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		156483100	839208856	17810453	328862707	77637044	No Service	11440014	26025613	211637665	288222181
Total number of calls dropped		2763744	13991319	262908	3003664	124150	No Service	41598	134538	1318686	2136290
Call drop rate	≤ 2%	1.77%	1.67%	1.48%	0.91%	0.16%	No Service	0.36%	0.52%	0.62%	0.74%
Total number of cells in the network		9044	29000	3929	23756	4522	No Service	1262	2899	10858	26612
Total number of cells having more than 3% TCH		1195	677	517	646	20	No Service	15	68	134	736
Worst affected cells having more than 3% TCH	≤ 3%	13.21%	2.33%	13.17%	2.72%	0.44%	No Service	1.17%	2.34%	1.24%	2.77%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-January											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		14411700	1615609122	1982481	29458894	Server issue	No Service	15979701	33067141	23648396	346170790
Total number of calls dropped		244656	26670850	33890	305259	Server issue	No Service	50271	163448	253282	2400477
Call drop rate	≤ 2%	1.70%	1.65%	1.71%	1.04%	Server issue	No Service	0.31%	0.49%	1.07%	0.69%
Total number of cells in the network		9098	86713	3929	23678	Server issue	No Service	1262	2900	11981	26612
Total number of cells having more than 3% TCH		1123	2068	734	627	Server issue	No Service	28	3	613	740
Worst affected cells having more than 3% TCH	≤ 3%	12.34%	2.38%	18.69%	2.65%	Server issue	No Service	2.22%	0.10%	5.12%	2.78%

4. Voice quality											
Audit Results for Voice quality -PMR Data-January											
Voice quality	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkand**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of sample calls		25705166456	170025661087	1250	60722434807	NA	No Service	515844448872	4945387562	36074555754	53851428869
Total number of calls with good voice quality		24433920247	162748114815	1210	58477818648	NA	No Service	506820681113	4822668556	34211329756	52619568932
%age calls with good voice quality	≥ 95%	95.05%	95.72%	96.80%	96.30%	97.47%	No Service	98.25%	97.52%	94.84%	97.71%
Live measurement results for Voice quality-3 Day data-January											
Voice quality	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkand**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of sample calls		2483818620	16058905061	570	5634661791	Server issue	No Service	22398203535	206057815	4082137980	2243809536
Total number of calls with good voice quality		2362045293	15380764673	546	5427208317	Server issue	No Service	22006753524	200944523	3878917431	2192482039
%age calls with good voice quality	≥ 95%	95.10%	95.78%	95.79%	96.32%	Server issue	No Service	98.25%	97.65%	95.02%	98.06%
Drive test results for Voice quality (Average of three drive tests) - DT data-January											
Voice quality	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkand**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of sample calls		905256	1859578	558346	1383481	0	No Service	31986	892609	44119	1987532
Total number of calls with good voice quality		876234	1794380	614766	1349897	0	No Service	26957	853452	41079	1926870
%age calls with good voice quality	≥ 95%	96.79%	96.49%	110.10%	97.57%	NA	No Service	84.28%	95.61%	93.11%	96.95%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-January											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	821	21	83	109	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	736664	15538	305359	57700	No Service	1740819	10397	76491	289955
Traffic served for all POIs (B)- in erlangs		77008	494150	14236	192518	28110	No Service	174365	2721	52000	174265
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	821	21	83	Server issue	No Service	153	20	68	57
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	220542	15538	305359	Server issue	No Service	72534	10374	75571	288126
Traffic served for all POIs (B)- in erlangs		36138	128135	14236	184412	Server issue	No Service	7238	1385	51782	80880
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

15 ANNEXURE – FEBRUARY-2G

1. Network Availability											
Audit Results for Network Availability- PMR data-February											
	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		2956	9752	3856	7919	1008	No Service	390	961	4089	8889
Sum of downtime of BTSs in a month (in hours)		38811	3771	54032	29078	1418	No Service	449	750	9179	20712
BTSs accumulated downtime (not available for service)	≤ 2%	1.82%	0.05%	1.95%	0.51%	0.20%	No Service	0.16%	0.11%	0.31%	0.32%
Number of BTSs having accumulated downtime >24 hours		284	13	73	142	14	No Service	0	0	31	117
Worst affected BTSs due to downtime	≤ 2%	9.61%	0.13%	1.89%	1.79%	1.39%	No Service	0.00%	0.00%	0.76%	1.32%
Live Measurement Results for Network Availability- 3 Day live data-February											
	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		2956	9752	3824	7919	Server issue	No Service	390	961	4029	8889
Sum of downtime of BTSs in a month (in hours)		4157	201	1940	3018	Server issue	No Service	49	66	961	2358
BTSs accumulated downtime (not available for service)	≤ 2%	1.95%	0.03%	0.70%	0.53%	Server issue	No Service	0.17%	0.10%	0.33%	0.37%
Number of BTSs having accumulated downtime >24 hours		0	3	49	1	Server issue	No Service	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.03%	1.28%	0.01%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-February											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkan**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
CSSR	≥ 95%	84.51%	95.44%	96.14%	96.17%	96.82%	No Service	98.06%	97.80%	92.45%	99.21%
SDCCH/Paging channel congestion	≤ 1%	2.16%	0.74%	0.15%	0.82%	NA	No Service	NA	0.28%	2.19%	0.46%
TCH congestion	≤ 2%	15.67%	1.29%	0.09%	1.92%	0.87%	No Service	0.33%	0.80%	6.11%	0.79%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-February											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkan**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
CSSR	≥ 95%	84.36%	95.41%	95.97%	96.34%	Server issue	No Service	98.26%	98.33%	91.72%	99.61%
SDCCH/Paging channel congestion	≤ 1%	1.62%	0.73%	0.11%	0.99%	Server issue	No Service	NA	0.14%	1.70%	0.49%
TCH congestion	≤ 2%	16.48%	1.27%	0.09%	2.69%	Server issue	No Service	1.64%	0.21%	7.28%	0.39%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-February											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkan**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of call attempts		628	445	576	2512	578	No Service	749	419	586	717
Total number of successful calls established		611	445	531	603	539	No Service	723	397	584	717
CSSR	≥ 95%	97.29%	100.00%	92.19%	24.00%	93.25%	No Service	96.53%	94.75%	99.66%	100.00%
%age blocked calls		2.71%	0.00%	7.81%	76.00%	6.75%	No Service	3.47%	5.25%	0.34%	0.00%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-February											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	SNL Bihar/Jharkan	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		163425780	863600959	19647394	318477581	59330723	No Service	12352736	26492653	231241664	292398548
Total number of calls dropped		3266657	14728879	286960	2789783	127703	No Service	42779	136637	2334784	2175906
Call drop rate	≤ 2%	2.00%	1.71%	1.46%	0.88%	0.22%	No Service	0.35%	0.52%	1.01%	0.74%
Total number of cells in the network		8804	29321	11543	23903	3028	No Service	1257	2895	12306	26726
Total number of cells having more than 3% TCH		1371	644	792	639	20	No Service	23	75	636	736
Worst affected cells having more than 3% TCH	≤ 3%	15.57%	2.20%	6.86%	2.67%	0.66%	No Service	1.86%	2.60%	5.17%	2.75%

Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-February											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	SNL Bihar/Jharkan	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		17042139	2044418948	4753437	31037726	Server issue	No Service	15630878	34574455	26679076	386760157
Total number of calls dropped		324902	35117642	37524	286357	Server issue	No Service	51007	157954	338779	2374183
Call drop rate	≤ 2%	1.91%	1.72%	0.79%	0.92%	Server issue	No Service	0.33%	0.46%	1.27%	0.61%
Total number of cells in the network		8818	87392	11447	23822	Server issue	No Service	1257	2895	12094	26726
Total number of cells having more than 3% TCH		1385	1990	726	610	Server issue	No Service	29	3	768	737
Worst affected cells having more than 3% TCH	≤ 3%	15.71%	2.28%	6.34%	2.56%	Server issue	No Service	2.31%	0.11%	6.35%	2.76%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-February											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	SNL Bihar/Jharkan	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		611	445	531	603	543	No Service	725	387	584	716
Total number of calls dropped		38	0	33	0	49	No Service	8	6	0	1
Call drop rate	≤ 2%	6.22%	0.00%	6.21%	0.00%	9.02%	No Service	1.10%	1.55%	0.00%	0.14%

4. Voice quality											
Audit Results for Voice quality -PMR Data-February											
Voice quality	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkan**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of sample calls		25675887201	162023031133	1260	57610656022	NA	No Service	509709182085	4905129560	38338215734	52299175859
Total number of calls with good voice quality		24391386151	155106793258	1215	55585586504	NA	No Service	500812616192	4779848337	36317642781	51216374804
%age calls with good voice quality	≥ 95%	95.00%	95.73%	96.43%	96.48%	97.38%	No Service	98.25%	97.45%	94.73%	97.93%
Live measurement results for Voice quality-3 Day data-February											
Voice quality	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkan**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of sample calls		2672010247	17553782677	540	5901085234	Server issue	No Service	53634934432	204380398	3984966749	2179132327
Total number of calls with good voice quality		2538176898	16814950614	514	5706465695	Server issue	No Service	52698411862	199160347	3768436038	2134015617
%age calls with good voice quality	≥ 95%	94.99%	95.79%	95.19%	96.70%	Server issue	No Service	98.25%	97.75%	94.57%	98.44%
Drive test results for Voice quality (Average of three drive tests) - DT data-February											
Voice quality	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkan**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of sample calls		857932	943141	842660	1071904	0	No Service	0	754436	1144449	2465292
Total number of calls with good voice quality		824386	918693	724372	1044955	0	No Service	0	704737	1096895	2363191
%age calls with good voice quality	≥ 95%	96.09%	97.41%	85.96%	97.49%	NA	No Service	NA	93.41%	95.84%	95.86%

16 ANNEXURE – MARCH-2G

PERFORMANCE REPORTS - PARAMETER WISE -Month 3											
1. Network Availability											
Audit Results for Network Availability- PMR data-March											
	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		2969	9884	2576	8052	1007	No Service	390	961	4163	8896
Sum of downtime of BTSs in a month (in hours)		40084	3582	35005	37047	1385	No Service	499	750	9565	27022
BTSs accumulated downtime (not available for service)	≤ 2%	1.81%	0.05%	1.83%	0.62%	0.18%	No Service	0.17%	0.10%	0.31%	0.41%
Number of BTSs having accumulated downtime >24 hours		322	12	50	150	8	No Service	0	0	39	114
Worst affected BTSs due to downtime	≤ 2%	10.85%	0.12%	1.94%	1.86%	0.79%	No Service	0.00%	0.00%	0.94%	1.28%
Live Measurement Results for Network Availability- 3 Day live data-March											
	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		2969	9755	2576	8052	Server issue	No Service	390	961	4047	8896
Sum of downtime of BTSs in a month (in hours)		3622	293	3091	3336	Server issue	No Service	73	66	976	3803
BTSs accumulated downtime (not available for service)	≤ 2%	1.69%	0.04%	1.67%	0.58%	Server issue	No Service	0.26%	0.10%	0.33%	0.59%
Number of BTSs having accumulated downtime >24 hours		0	0	16	6	Server issue	No Service	0	0	39	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.62%	0.07%	Server issue	No Service	0.00%	0.00%	0.96%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-March											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkand**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
CSSR	≥ 95%	84.33%	95.43%	84.64%	96.12%	97.06%	No Service	97.91%	97.80%	93.56%	99.20%
SDCCH/Paging channel congestion	≤ 1%	2.55%	0.79%	0.47%	0.92%	NA	No Service	NA	0.28%	1.51%	0.52%
TCH congestion	≤ 2%	15.22%	1.27%	1.42%	1.80%	0.79%	No Service	0.53%	0.80%	5.33%	0.80%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-March											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkand**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
CSSR	≥ 95%	84.85%	95.52%	86.31%	97.50%	Server issue	No Service	97.79%	98.33%	92.53%	99.60%
SDCCH/Paging channel congestion	≤ 1%	2.92%	0.75%	0.49%	0.93%	Server issue	No Service	NA	0.14%	1.78%	0.41%
TCH congestion	≤ 2%	14.32%	1.22%	1.42%	1.51%	Server issue	No Service	0.13%	0.21%	6.10%	0.40%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-March											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL Bihar/Jharkand**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of call attempts		852	1288	689	1128	795	No Service	1461	926	896	1176
Total number of successful calls established		751	1288	649	1128	758	No Service	1387	787	891	1171
CSSR	≥ 95%	88.15%	100.00%	94.19%	100.00%	95.35%	No Service	94.93%	84.99%	99.44%	99.57%
%age blocked calls		11.85%	0.00%	5.81%	0.00%	4.65%	No Service	5.07%	15.01%	0.56%	0.43%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-March											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		190132551	954055745	98515239	332130214	57229674	No Service	12420206	26492653	269060944	311999817
Total number of calls dropped		3628070	14504953	938421	2837790	109609	No Service	44559	136637	3173736	2247132
Call drop rate	≤ 2%	1.91%	1.52%	0.95%	0.85%	0.19%	No Service	0.36%	0.52%	1.18%	0.72%
Total number of cells in the network		8864	29723	7728	24299	3025	No Service	1257	2895	12216	26749
Total number of cells having more than 3% TCH		1348	635	211	648	19	No Service	22	75	760	736
Worst affected cells having more than 3% TCH	≤ 3%	15.20%	2.14%	2.73%	2.67%	0.63%	No Service	1.77%	2.60%	6.22%	2.75%

Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-March											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		19527942	92198453	15445981	28355715	Server issue	No Service	16287937	34574455	26845933	374337925
Total number of calls dropped		375770	1447646	153616	272966	Server issue	No Service	49364	157954	302359	2372460
Call drop rate	≤ 2%	1.92%	1.57%	0.99%	0.96%	Server issue	No Service	0.30%	0.46%	1.13%	0.63%
Total number of cells in the network		8919	29341	7728	23998	Server issue	No Service	1257	2895	12171	26749
Total number of cells having more than 3% TCH		1260	651	205	618	Server issue	No Service	26	3	769	726
Worst affected cells having more than 3% TCH	≤ 3%	14.13%	2.22%	2.65%	2.58%	Server issue	No Service	2.04%	0.11%	6.32%	2.72%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-March											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		759	1288	649	1128	758	No Service	1387	787	882	1197
Total number of calls dropped		6	0	31	0	60	No Service	68	22	0	0
Call drop rate	≤ 2%	0.79%	0.00%	4.78%	0.00%	7.92%	No Service	4.90%	2.80%	0.00%	0.00%

4. Voice quality											
Audit Results for Voice quality -PMR Data-March											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		27712436234	199623315025	NDR	60719750432	NA	No Service	531893798764	4905129560	41794333176	54167216321
Total number of calls with good voice quality		26336044881	191457894412	NDR	58666700588	NA	No Service	522607918915	4779848337	39577244443	53093549919
%age calls with good voice quality	≥ 95%	95.03%	95.91%	NDR	96.62%	96.45%	No Service	98.25%	97.45%	94.70%	98.02%
Live measurement results for Voice quality-3 Day data-March											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		2603927099	19874993312	NDR	5462986098	Server issue	No Service	54179811602	204380398	3885440975	2256967347
Total number of calls with good voice quality		2473890134	19044000493	NDR	5289885789	Server issue	No Service	53234580362	199160347	3672034878	2212231247
%age calls with good voice quality	≥ 95%	95.01%	95.82%	NDR	96.83%	Server issue	No Service	98.26%	97.75%	94.51%	98.46%
Drive test results for Voice quality (Average of three drive tests) - DT data-March											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		1793055	2211883	45078	1939393	0	No Service	1187343	1464674	1951493	1956964
Total number of calls with good voice quality		1774395	2126169	34070	1876739	0	No Service	1018706	1285141	1835276	1905965
%age calls with good voice quality	≥ 95%	98.96%	96.12%	75.58%	96.77%	NA	No Service	85.80%	87.74%	94.04%	97.39%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-March											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	11	83	117	No Service	153	20	68	58
No. of POIs not meeting benchmark		0	0	0	0	0	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	712638	43772	305359	65522	No Service	1746700	245362	78538	296709
Traffic served for all POIs (B)- in erlangs		84940	382202	0	194763	23469	No Service	181305	34694	58934	213616
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	0.00%	No Service	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-March											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL Bihar/Jharkand	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	819	11	83	Server issue	No Service	153	20	68	58
No. of POIs not meeting benchmark		0	0	0	0	Server issue	No Service	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	712638	43772	305359	Server issue	No Service	72779	10217	77517	296657
Traffic served for all POIs (B)- in erlangs		42014	382202	0	193502	Server issue	No Service	7714	1385	51481	83348
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	Server issue	No Service	0.00%	0.00%	0.00%	0.00%

17 ANNEXURE – JANUARY -3G

1. Network Availability				
Audit Results for Network Availability- PMR data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		2871	16197	3881
Sum of downtime (i.e. total outage time) of Node Bs		29679	2356	23603
Node Bs downtime (not available for service)	≤ 2%	1.39%	0.02%	0.82%
Number of Node Bs having accumulated downtime of >24 hours in a month		224	60	33
Worst affected Node Bs due to downtime	≤ 2%	7.80%	0.37%	0.85%
Live Measurement Results for Network Availability- 3 Day live data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		2871	15901	3881
Sum of downtime (i.e. total outage time) of Node Bs		3304	1815	1145
Node Bs downtime (not available for service)	≤ 2%	1.60%	0.16%	0.41%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	49	33
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.31%	0.85%

2. Connection Establishment (Accessibility)				
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data				
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
CSSR	≥ 95%	88.93%	99.27%	92.89%
RRC Congestion	≤ 1%	1.09%	0.10%	3.46%
Circuit Switched RAB Congestion	≤ 2%	1.24%	0.69%	0.96%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data				
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
CSSR	≥ 95%	87.99%	99.00%	93.39%
RRC Congestion	≤ 1%	1.48%	0.03%	2.90%
Circuit Switched RAB Congestion	≤ 2%	1.53%	0.68%	0.70%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data				
CSSR	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total number of RRC attempts (A)		842	75	1213
Total number of RRC established (B)		800	74	1206
Call setup success rate (B/A*100)	≥ 95%	95.01%	98.67%	99.42%
%age blocked calls		4.99%	1.33%	0.58%

3. Connection Maintenance (Retainability)				
Audit Results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data				
	Benchmark	Aircel 3G	Airtel 3G	SNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		23447030	38181271	69310952
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		224753	249614	1232620
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.96%	0.65%	1.78%
Total no. of cells in the licensed service area (B)		7812	34220	11588
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		715	875	433
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	9.16%	2.56%	3.74%

Live measurement results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		2338245	4039881	7358742
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		25311	27462	99575
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.08%	0.68%	1.35%
Total no. of cells in the licensed service area (B)		8077	33532	11643
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		647	845	450
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.01%	2.52%	3.86%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data				
Circuit switched voice drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		782	74	1206
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		18	0	51
Circuit switched voice drop rate (B/A*100)	≤ 2%	2.30%	0.00%	4.23%

4. Voice quality				
Audit Results for Voice quality -PMR Data				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		15788428470	0	245
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		15626692310	0	235
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.98%	99.25%	95.92%
Live measurement results for Voice quality-3 Day data				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3868241880	0	245
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3844331873	0	235
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.38%	99.29%	95.92%
Drive test results for Voice quality (Average of three drive tests) - DT data				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3579870	0	4518674
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2745162	0	3014386
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	76.68%	NA	66.71%

5. POI Congestion				
Audit Results for POI Congestion- PMR data				
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total number of working POIs		48	0	14
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		388441	0	31076
Traffic served for all POIs (B)- in erlangs		245192	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data				
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total number of working POIs		48	0	14
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		388419	0	31076
Traffic served for all POIs (B)- in erlangs		120479	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

18 ANNEXURE – FEBRUARY-3G

1. Network Availability				
Audit Results for Network Availability- PMR data-January				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		831	6351	1577
Sum of downtime (i.e. total outage time) of Node Bs		7629	531	11880
Node Bs downtime (not available for service)	≤ 2%	1.23%	0.01%	1.01%
Number of Node Bs having accumulated downtime of >24 hours in a month		71	52	17
Worst affected Node Bs due to downtime	≤ 2%	8.54%	0.82%	1.08%
Live Measurement Results for Network Availability- 3 Day live data-January				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		831	6351	1577
Sum of downtime (i.e. total outage time) of Node Bs		833	890	548
Node Bs downtime (not available for service)	≤ 2%	1.39%	0.19%	0.48%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	46	17
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.72%	1.08%

2. Connection Establishment (Accessibility)				
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-January				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
CSSR	≥ 95%	76.55%	99.65%	93.32%
RRC Congestion	≤ 1%	2.02%	0.25%	4.24%
Circuit Switched RAB Congestion	≤ 2%	1.83%	1.66%	1.02%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-January				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
CSSR	≥ 95%	74.00%	99.22%	94.41%
RRC Congestion	≤ 1%	3.60%	0.09%	3.18%
Circuit Switched RAB Congestion	≤ 2%	2.60%	1.89%	0.63%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-January				
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of RRC attempts (A)		16	Not available	344
Total number of RRC established (B)		16	Not available	338
Call setup success rate (B/A*100)	≥ 95%	100.00%	Not available	98.26%
%age blocked calls		0.00%	Not available	1.74%

3. Connection Maintenance (Retainability)				
Audit Results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -RMR data-January				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		6717314	658401	23177836
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		82770	5236	364357
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.23%	0.80%	1.57%
Total no. of cells in the licensed service area (B)		2304	2541	4731
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		271	66	175
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	11.77%	2.60%	3.70%
Live measurement results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-January				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		601255	658401	2410650
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		9320	5632	17850
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.55%	0.86%	0.74%
Total no. of cells in the licensed service area (B)		2338	2541	4731
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		263	42	171
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	11.25%	1.65%	3.61%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data-January				
Circuit switched voice drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		12	Not available	338
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		2	Not available	30
Circuit switched voice drop rate (B/A*100)	≤ 2%	16.67%	Not available	8.88%

4. Voice quality				
Audit Results for Voice quality -PMR Data-January				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		4931684164	NA	120
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		4886169957	NA	115
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.08%	99.22%	95.83%
Live measurement results for Voice quality-3 Day data-January				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2726702728	NA	120
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2714509747	NA	115
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.55%	99.60%	95.83%
Drive test results for Voice quality (Average of three drive tests) - DT data-January				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		591688	Not available	559449
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		491407	Not available	321296
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	83.05%	Not available	57.43%

5. POI Congestion				
Audit Results for POI Congestion- PMR data-January				
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129474	0	15538
Traffic served for all POIs (B)- in erlangs		77008	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-January				
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129464	0	15538
Traffic served for all POIs (B)- in erlangs		36138	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

19 ANNEXURE – MARCH-3G

1. Network Availability				
Audit Results for Network Availability- PMR data-February				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		954	4780	1578
Sum of downtime (i.e. total outage time) of Node Bs		7439	922	11723
Node Bs downtime (not available for service)	≤ 2%	1.05%	0.03%	1.00%
Number of Node Bs having accumulated downtime of >24 hours in a month		59	5	16
Worst affected Node Bs due to downtime	≤ 2%	6.18%	0.10%	1.01%
Live Measurement Results for Network Availability- 3 Day live data-February				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
(Number of Node Bs in the network in the licensed service area		954	4780	1578
Sum of downtime (i.e. total outage time) of Node Bs		800	856	597
Node Bs downtime (not available for service)	≤ 2%	1.16%	0.25%	0.53%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	3	16
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.06%	1.01%

2. Connection Establishment (Accessibility)				
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-February				
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
CSSR	≥ 95%	92.65%	98.81%	92.85%
RRC Congestion	≤ 1%	0.91%	0.03%	0.06%
Circuit Switched RAB Congestion	≤ 2%	1.48%	0.30%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-February				
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
CSSR	≥ 95%	91.89%	98.44%	92.37%
RRC Congestion	≤ 1%	0.40%	0.00%	0.07%
Circuit Switched RAB Congestion	≤ 2%	1.77%	0.12%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-February				
CSSR	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total number of RRC attempts (A)		280	Not available	342
Total number of RRC established (B)		247	Not available	342
Call setup success rate (B/A*100)	≥ 95%	88.21%	Not available	100.00%
%age blocked calls		11.79%	Not available	0.00%

3. Connection Maintenance (Retainability)				
Audit Results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -RMR data-February				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7445022	NDR	25047464
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		68998	NDR	471952
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.93%	NA	1.88%
Total no. of cells in the licensed service area (B)		2621	15314	4684
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		240	424	186
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	9.15%	2.77%	3.97%

Live measurement results for Circuit switched voice drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-February				
	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		865109	NDR	2871096
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		7463	NDR	51177
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.86%	NA	1.78%
Total no. of cells in the licensed service area (B)		2732	15614	4734
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		179	403	190
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	6.55%	2.58%	4.01%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data-February				
Circuit switched voice drop rate	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total calls successfully established (A) (Number of voice RAB normally released)		233	Not available	342
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		13	Not available	21
Circuit switched voice drop rate (B/A*100)	≤ 2%	5.58%	Not available	6.14%

4. Voice quality				
Audit Results for Voice quality -PMR Data-February				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		5687454645	NA	125
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		5624456716	NA	120
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.89%	98.91%	96.00%
Live measurement results for Voice quality-3 Day data-February				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		536270308	NA	125
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		530698622	NA	120
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.96%	98.63%	96.00%
Drive test results for Voice quality (Average of three drive tests) - DT data-February				
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL Bihar/Jharkand 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		1109474	Not available	1595765
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		534068	Not available	349769
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	48.14%	Not available	21.92%

5. POI Congestion				
Audit Results for POI Congestion- PMR data-February				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129493	0	15538
Traffic served for all POIs (B)- in erlangs		83244	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-February				
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL Bihar/Jharkand 3G
Total number of working POIs		48	0	21
No. of POIs not meeting benchmark		0	0	0
Total Capacity of all POIs (A) - in erlangs		129491	0	15538
Traffic served for all POIs (B)- in erlangs		42326	0	0
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%

20 ABBREVIATIONS

Following terms/abbreviations have been used in this report. This section provides meaning of the abbreviations used in the report.

1. TRAI – Telecom Regulatory Authority of India
2. QoS – Quality of Service
3. JFM'16 – Refers to the quarter of January , February and March 2016
4. IMRB – Refers to IMRB International, the audit agency for this report
5. SSA – Secondary Switching Area
6. NOC – Network Operation Center
7. OMC – Operations and Maintenance Center
8. MSC – Mobile Switching Center
9. PMR – Performance Monitoring Reports
10. TCBH – Time Consistent Busy Hour
11. CBBH - Cell Bouncing Busy Hour
12. BTS – Base Transceiver Station
13. CSSR – Call Setup Success Rate
14. TCH – Traffic Channel
15. SDCCH – Standalone Dedicated Control Channel
16. CDR – Call Drop Rate
17. FER – Frame Error Rate
18. SIM – Subscriber Identity Module
19. GSM – Global System for Mobile
20. CDMA – Code Division Multiple Access
21. NA – Not Applicable
22. NC – Non Compliance
23. POI – Point of Interconnection
24. IVR – Interactive Voice Response
25. STD – Standard Trunk Dialing
26. ISD – International Subscriber Dialing

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

✆+91 (124) 4217300

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