TRAI Audit Wireless Report for Bihar & Jharkhand Circle

QE September 2016

EAST ZONE

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Submitted to:

TRAI

Telecom Regulatory Authority of India

(IS/ISO 9001-2008 Certified Organisation)

1 TABLE OF CONTENTS

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-

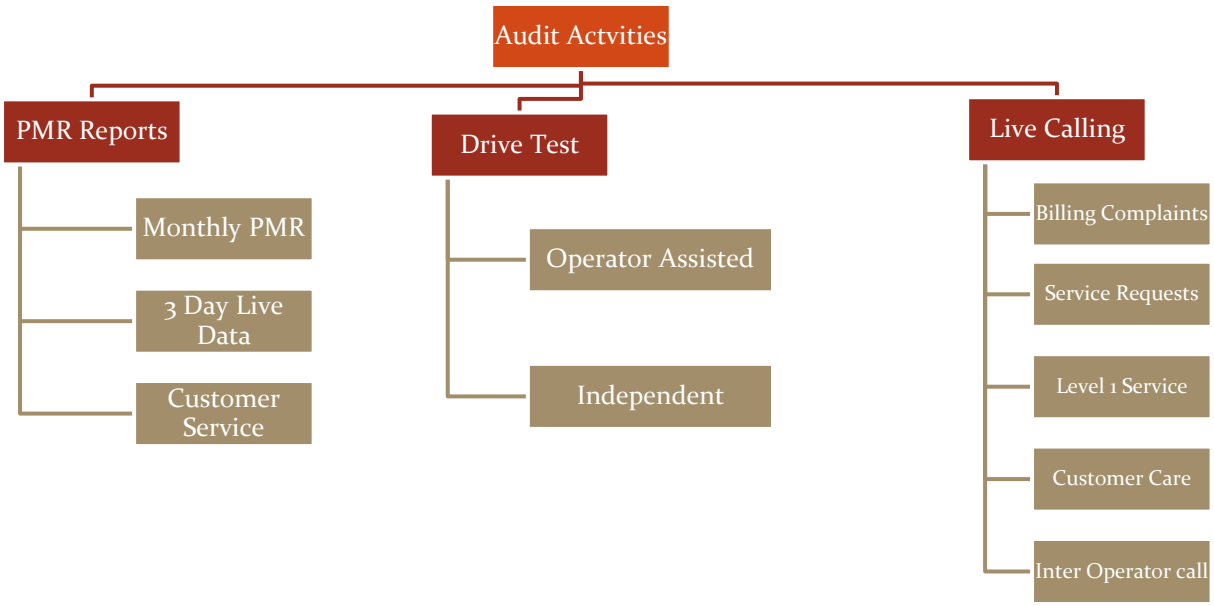
- Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).
- This report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

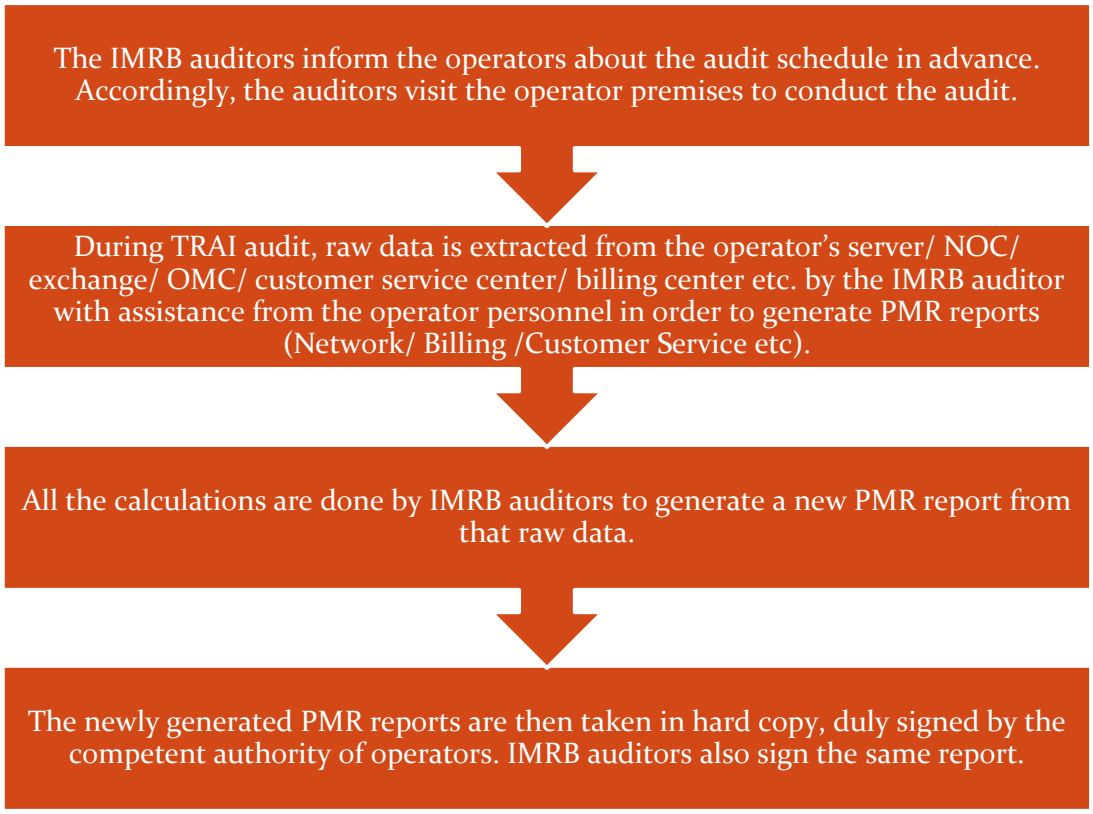


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

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

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

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

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

Let us understand these formats in detail.

2.4.1.2 MONTHLY PMR 2G

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

Network Availability

- BTS accumulated downtime
- Worst affected BTS due to downtime

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good voice quality

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

2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

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

Network Related

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

2.4.1.4 MONTHLY PMR 3G

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

Network Availability

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

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good Circuit Switched Voice Quality

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

2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

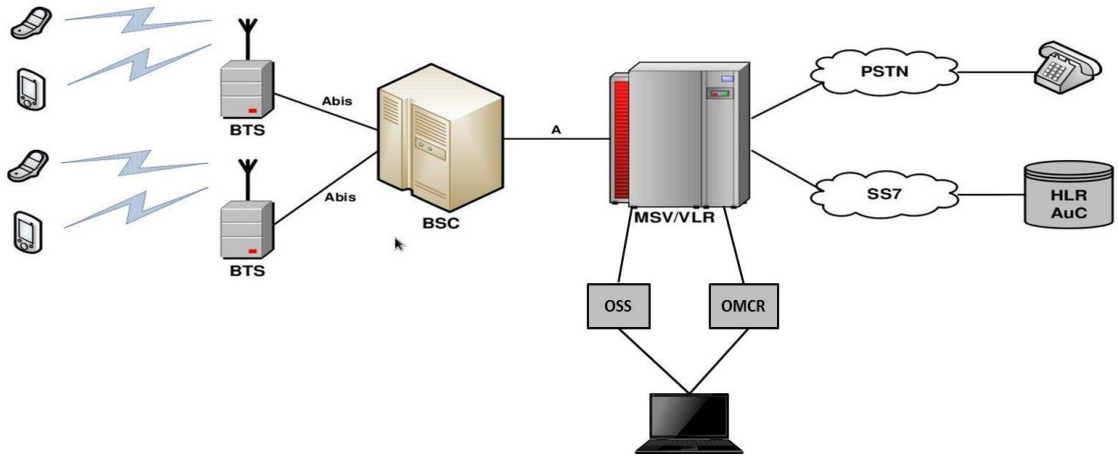
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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

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

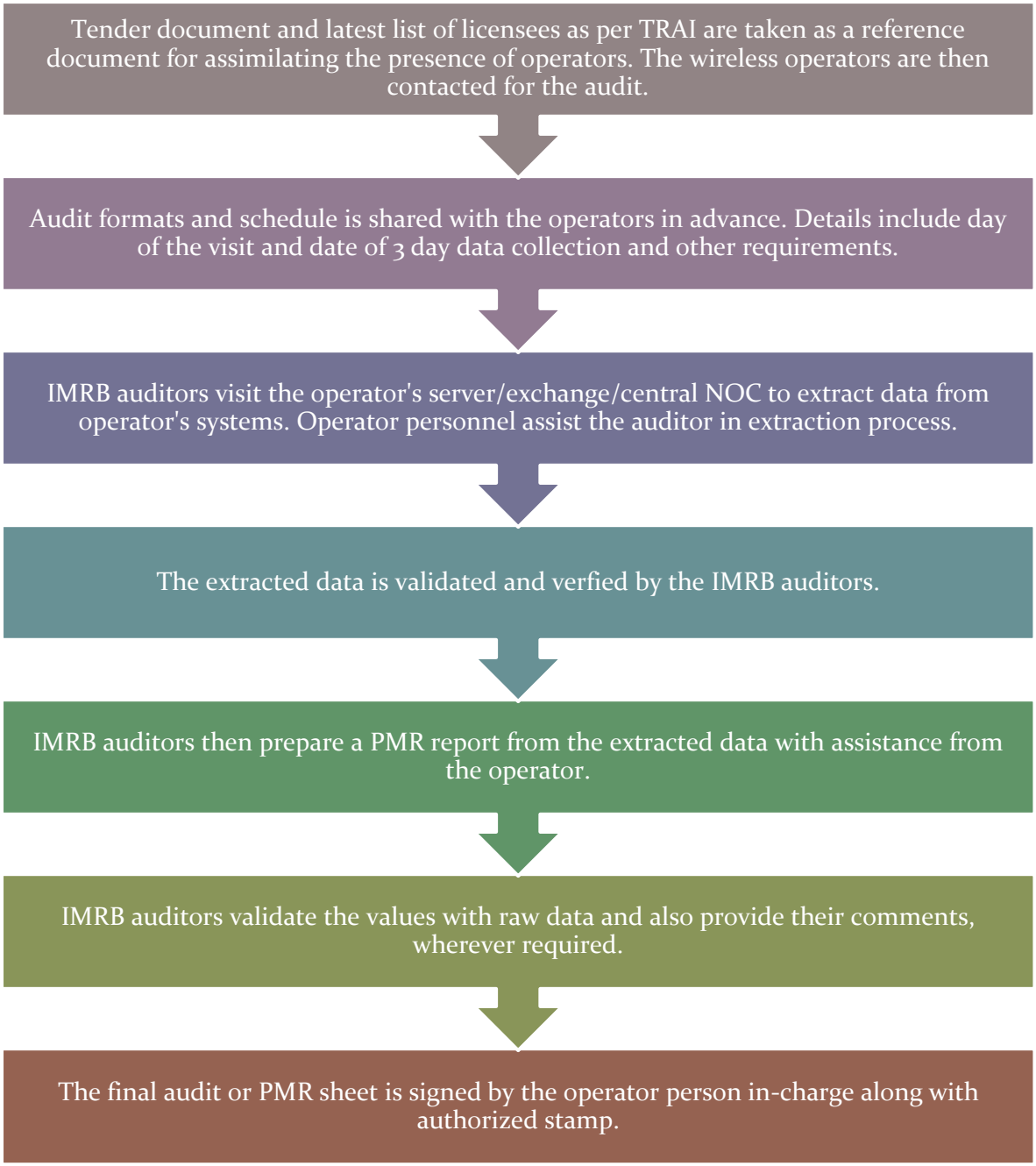
2.4.1.8 POINT OF DATA EXTRACTION

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



2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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



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

2.4.1.10 CALCULATION METHODOLOGY – NETWORK PARAMETERS 2G

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

2.4.1.11 CALCULATION METHODOLOGY – NETWORK PARAMETERS 3G

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

2.4.1.12 3 DAY LIVE DATA

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

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

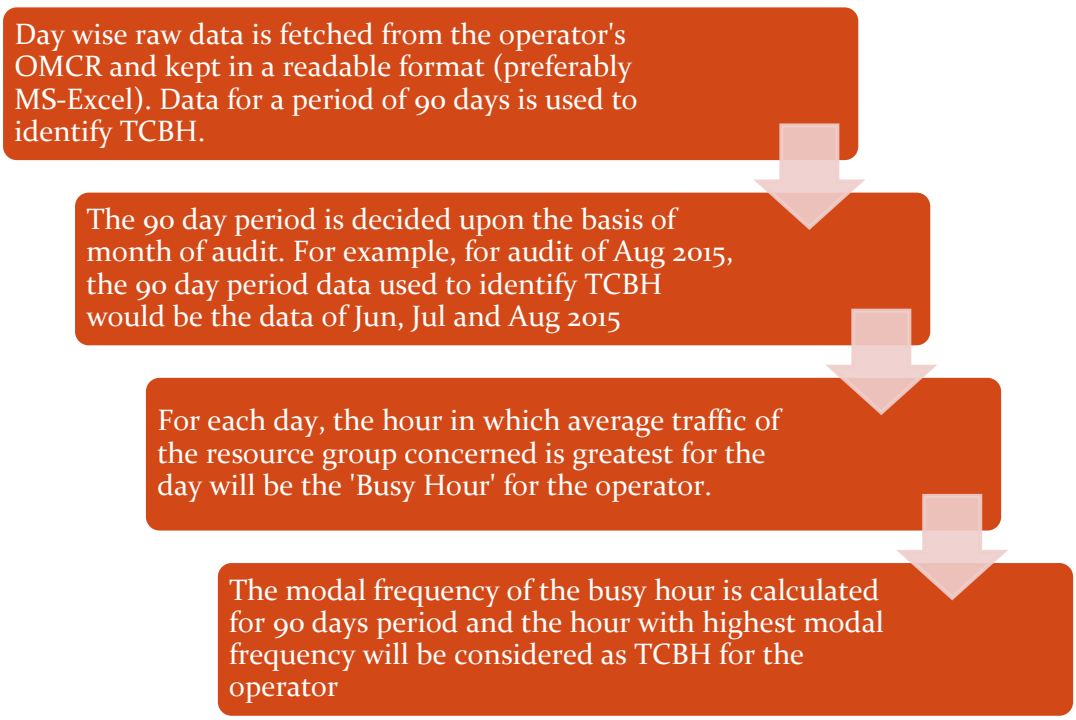
Network related parameters were evaluated for a period of 3 days in each month. 3 day live audit was conducted for 3 consecutive weekdays for each month. The data was extracted from each operator's server/ NOC etc. at the end of the 3rd day. The extracted data is then used to create a report (similar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

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

2.4.1.13 TCBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

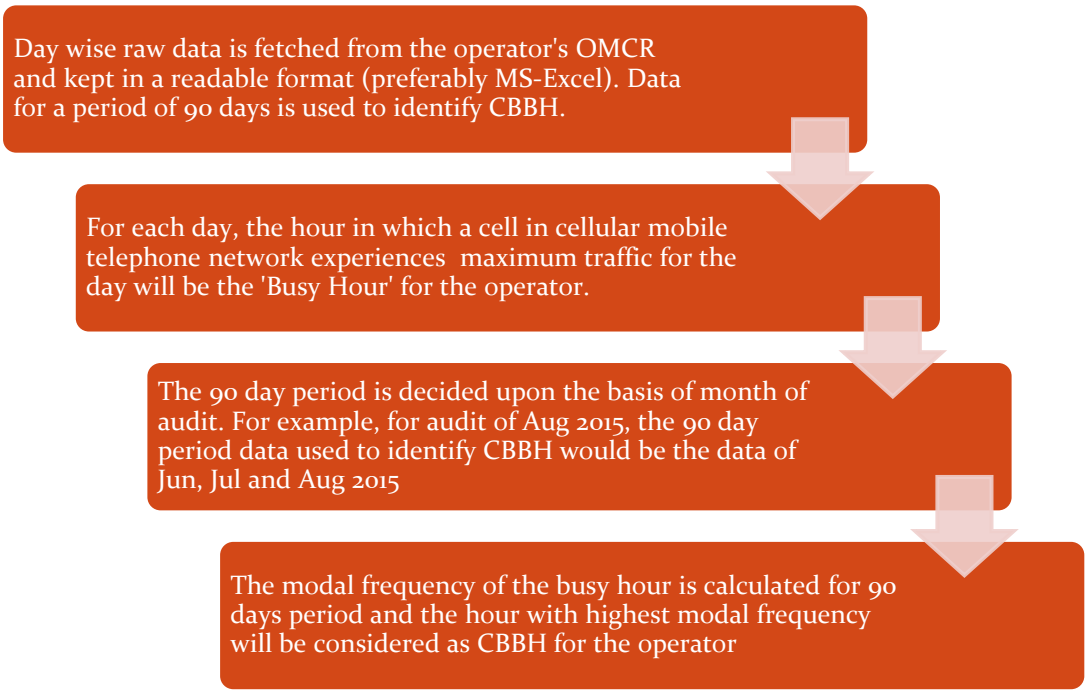
Step by step procedure to identify TCBH for an operator:



2.4.1.14 CBBH – SIGNIFICANCE AND SELECTION METHODOLOGY

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

Step by step procedure to identify CBBH for an operator:



2.4.1.15 CUSTOMER SERVICE PARAMETERS

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

- Central Billing Center
- Central Customer Service Center

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

The Customer Service Quality Parameters include the following:

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

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

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

2.4.1.16 AUDIT PARAMETERS – CUSTOMER SERVICE

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

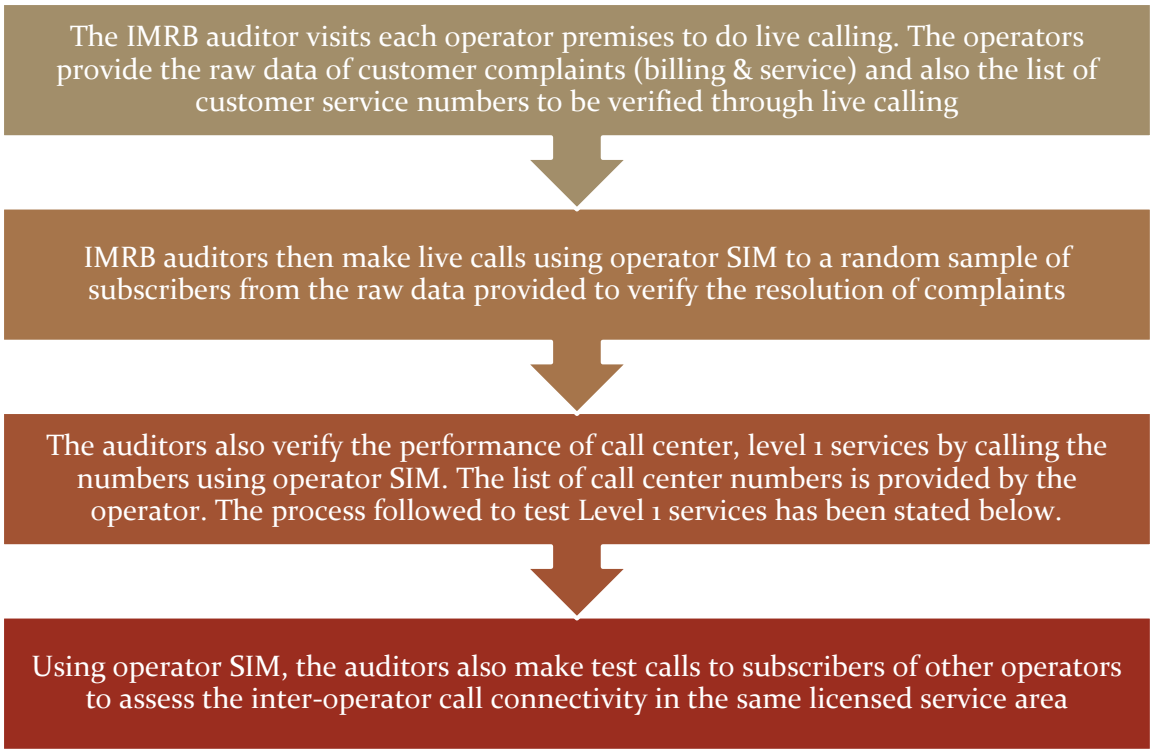
2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

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

2.4.2 LIVE CALLING

2.4.2.1 SIGNIFICANCE AND METHODOLOGY

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



Live calling activity was carried out during the period of September 2016. The data considered for live calling was for the month prior to the month in which the live calling activity was being conducted. In this case, data of August 2016 was considered for live calling activity conducted in September 2016.

A detailed explanation of each parameter is explained below.

2.4.2.2 BILLING COMPLAINTS

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

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

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

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

TRAI benchmark-

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

2.4.2.3 SERVICE COMPLAINTS REQUESTS

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

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

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

2.4.2.4 LEVEL 1 SERVICE

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

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

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

2.4.2.4.1 PROCESS TO TEST LEVEL 1 SERVICES

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

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

2.4.2.5 CUSTOMER CARE

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

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

The process for this parameter is stated below.

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

2.4.2.6 INTER OPERATOR CALL ASSESEMENT

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

2.4.3 VOICE DRIVE TEST – 2G & 3G

2.4.3.1 SIGNIFICANCE AND METHODOLOGY

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

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

IMRB conducted two types of drive tests as mentioned below.

- Operator Assisted Drive Test
- Independent Drive Test

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.

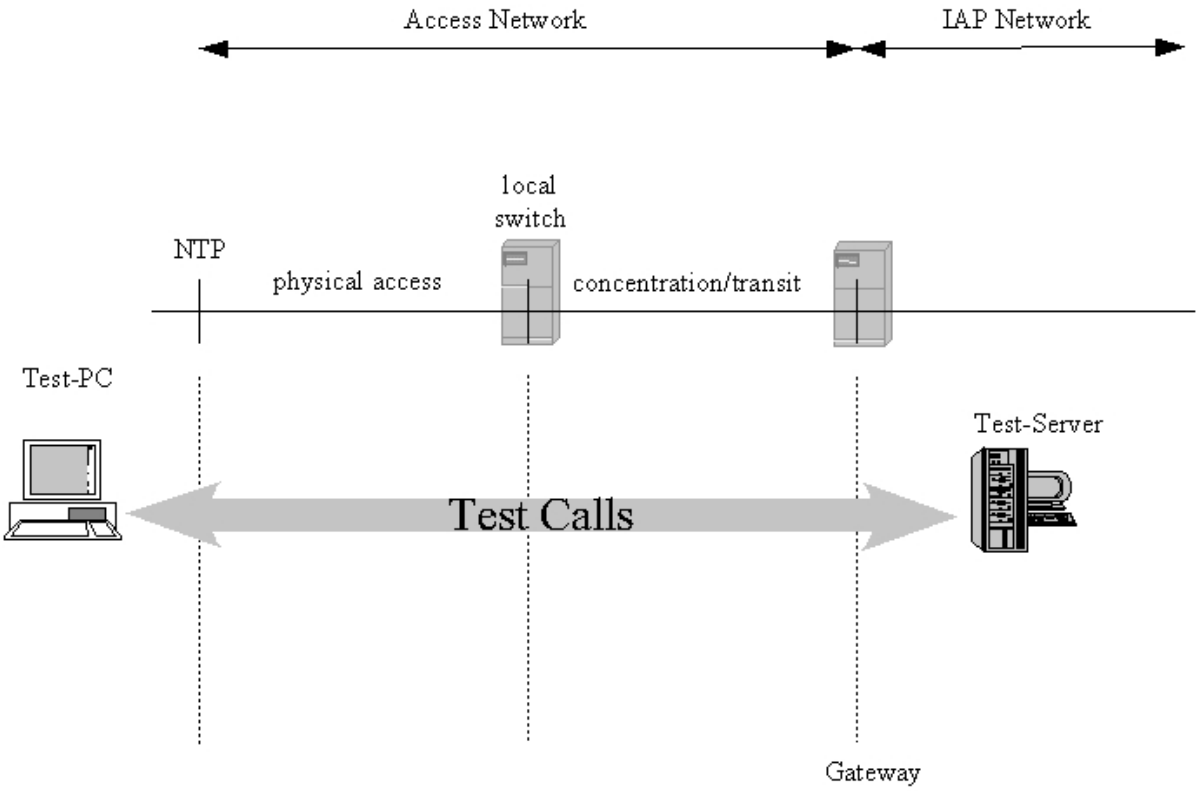


Figure for Measurement set-up

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)	5625842
Airtel	26528122
BSNL	2531269
Idea	11209356
Reliance CDMA	NS
Reliance GSM	NS
TATA CDMA	155351
TATA GSM	912303
Telenor	6977754
Vodafone	9709827
Name of Operator	**Number of Subscriber as per VLR-3G**
Aircel 3G	476608
Airtel 3G	1402178
BSNL 3G	67477
Reliance 3G	NDR

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

2.6 COLOUR CODES TO READ THE REPORT

Not Meeting the benchmark

Best Performing Operator

3 EXECUTIVE SUMMARY-2G

The objective assessment of Quality of Service (QoS) carried out by IMRB gives an insight into the overall performance of various operators in the 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)	1.64%	9.99%	88.74%	0.86%	11.47%	1.95%	15.08%	95.17%
Airtel	0.07%	0.26%	95.96%	0.71%	1.58%	1.50%	2.75%	95.92%
BSNL	1.75%	1.95%	94.01%	5.24%	2.02%	1.05%	3.45%	96.47%
Idea	1.01%	1.79%	97.01%	0.83%	1.83%	1.08%	2.67%	96.43%
TATA CDMA	0.22%	0.00%	97.82%	NA	0.55%	0.27%	1.33%	98.26%
TATA GSM	0.21%	0.14%	97.91%	0.69%	0.56%	0.64%	2.90%	97.42%
Telenor	0.26%	0.60%	97.46%	0.79%	1.84%	1.17%	6.05%	96.43%
Vodafone	0.41%	1.16%	99.38%	0.15%	0.62%	0.93%	2.88%	97.90%

NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for 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 0.07%.

Worst Affected BTSs Due to Downtime:

Aircel (9.99%) failed to meet the benchmark. Minimum worst affected BTSs due to downtime was recorded for TATA CDMA at 0.00%.

Call Set-up Success Rate (CSSR):

Aircel (DWL), BSNL failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.38%.

SDCCH/ Paging Chl. Congestion:

BSNL (5.24%) failed to meet the benchmark on SDCCH / Paging Channel Congestion. Vodafone recorded the best SDCCH / Paging Channel Congestion at 0.15%

TCH Congestion:

Aircel (11.47%) and BSNL failed to meet the benchmark for TCH congestion, while TATA CDMA performed the best on TCH congestion at 0.55%

Call Drop Rate:

All operators met the benchmark for the parameter. Minimum call drop rate was recorded for Tata CDMA at 0.27%

Worst Affected Cells Having More than 3% TCH Drop:

Aircel (15.08%), Telenor and BSNL failed to meet the benchmark. Best performance was recorded for Tata CDMA at 1.33%.

Voice Quality

All operators met the benchmark for the parameter. Best performance was recorded for TATA CDMA at 98.26%.

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

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

3.1.1 PMR DATA - JULY FOR 2G

Name of Service Provider Month July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Aircel(DWL)	1.94%	10.23%	89.03%	0.97%	11.16%	2.00%	16.18%	94.81%
Airtel	0.06%	0.15%	95.24%	0.73%	1.62%	1.48%	2.82%	95.61%
BSNL	1.81%	1.98%	97.08%	6.17%	1.44%	0.75%	2.21%	96.46%
Idea	1.10%	1.83%	97.35%	0.80%	1.79%	1.07%	2.71%	96.47%
TATA CDMA	0.20%	0.00%	98.08%	NA	0.46%	0.36%	2.21%	98.25%
TATA GSM	0.15%	0.00%	97.73%	0.53%	0.75%	0.64%	3.23%	97.36%
Telenor	0.32%	0.77%	97.22%	0.96%	1.98%	1.11%	5.85%	95.79%
Vodafone	0.36%	0.97%	99.31%	0.15%	0.69%	0.94%	2.86%	97.96%

3.1.2 PMR DATA – AUGUST FOR 2G

Name of Service Provider Month August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Aircel(DWL)	1.65%	8.86%	87.73%	0.87%	12.57%	1.99%	14.91%	95.20%
Airtel	0.08%	0.39%	95.78%	0.69%	1.55%	1.53%	2.64%	95.86%
BSNL	1.77%	1.96%	92.06%	5.14%	2.54%	1.11%	5.02%	96.52%
Idea	0.99%	1.77%	96.27%	0.76%	1.88%	1.06%	2.66%	96.34%
TATA CDMA	0.27%	0.00%	97.68%	NA	0.64%	0.22%	0.85%	98.26%
TATA GSM	0.27%	0.21%	97.84%	1.04%	0.54%	0.66%	2.88%	97.38%
Telenor	0.27%	0.73%	97.40%	0.76%	1.89%	1.21%	6.19%	96.51%
Vodafone	0.43%	1.26%	99.33%	0.18%	0.67%	0.94%	2.86%	97.86%

3.1.3 PMR DATA - SEPTEMBER FOR 2G

Name of Service Provider Month September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel(DWL)	1.43%	10.88%	89.45%	0.74%	10.67%	1.84%	14.17%	95.52%
Airtel	0.08%	0.24%	96.85%	0.70%	1.57%	1.50%	2.80%	96.32%
BSNL	1.78%	1.93%	92.89%	4.41%	2.07%	1.22%	3.15%	96.43%
Idea	1.02%	1.76%	97.41%	0.94%	1.83%	1.10%	2.68%	96.50%
TATA CDMA	0.21%	0.00%	97.71%	NA	0.56%	0.22%	0.91%	98.26%
TATA GSM	0.22%	0.21%	98.17%	0.52%	0.38%	0.63%	2.59%	97.55%
Telenor	0.21%	0.29%	97.76%	0.65%	1.64%	1.20%	6.10%	97.00%
Vodafone	0.47%	1.26%	99.50%	0.11%	0.50%	0.92%	2.91%	97.88%

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)	1.77%	0.00%	87.52%	0.76%	12.98%	2.11%	15.48%	95.26%
Airtel	0.11%	0.01%	95.95%	0.73%	1.28%	1.29%	2.77%	95.83%
BSNL	0.59%	0.72%	92.53%	2.00%	0.85%	0.48%	2.54%	96.35%
Idea	1.22%	0.02%	98.46%	0.84%	0.60%	1.02%	2.77%	96.25%
TATA CDMA	0.19%	0.00%	98.24%	NA	0.18%	0.19%	0.58%	98.26%
TATA GSM	0.20%	0.00%	98.59%	0.73%	0.19%	0.53%	0.12%	97.44%
Telenor	0.29%	0.03%	97.43%	0.81%	1.86%	1.12%	5.28%	96.21%
Vodafone	0.35%	0.00%	99.45%	0.24%	0.55%	0.87%	4.35%	98.25%

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 0.11%

Worst Affected BTSs Due to Downtime:

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

Call Set-up Success Rate (CSSR):

Aircel and BSNL failed to meet the benchmark for CSSR. The maximum CSSR was observed for Vodafone with 99.45%

SDCCH/ Paging Chl. Congestion:

BSNL failed to meet the benchmark on SDCCH / Paging Channel Congestion. Vodafone recorded the best SDCCH / Paging Channel Congestion at 0.24%

TCH Congestion:

Aircel (12.98%) failed to meet the benchmark for TCH congestion, while TATA CDMA performed the best on TCH congestion at 0.18%

Call Drop Rate:

Aircel failed to meet the benchmark for the parameter. Minimum call drop rate was recorded for Tata CDMA at 0.19%

Worst Affected Cells Having More than 3% TCH Drop:

Aircel (15.48%), Telenor and Vodafone failed to meet the benchmark. Best performance was recorded for Tata GSM at 0.12%

Voice Quality

All operators met the benchmark for the parameter. Best performance was recorded for Tata CDMA at 98.26%

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 - JULY FOR 2G

Name of Service Provider 3 Day July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Aircel(DWL)	2.23%	0.00%	87.88%	0.93%	12.65%	2.25%	18.86%	94.83%
Airtel	0.05%	0.00%	95.55%	0.76%	1.56%	1.51%	2.67%	95.41%
BSNL	0.75%	0.68%	95.64%	0.06%	0.01%	0.32%	2.05%	95.56%
Idea	1.30%	0.02%	98.08%	0.74%	0.49%	1.07%	2.90%	96.86%
TATA CDMA	0.18%	0.00%	98.49%	NA	0.12%	0.21%	0.15%	98.25%
TATA GSM	0.18%	0.00%	98.58%	0.84%	0.16%	0.55%	0.15%	97.13%
Telenor	0.39%	0.05%	97.16%	1.03%	2.01%	1.08%	5.22%	95.55%
Vodafone	0.15%	0.00%	99.44%	0.26%	0.56%	0.88%	NA	98.16%

3.2.2 3 DAY DATA – AUGUST FOR 2G

Name of Service Provider 3 Day August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Aircel(DWL)	1.89%	0.00%	86.21%	0.94%	14.61%	2.41%	16.06%	95.23%
Airtel	0.09%	0.00%	96.21%	0.78%	1.22%	1.16%	2.96%	95.67%
BSNL	0.57%	0.69%	95.06%	0.10%	0.04%	0.59%	3.47%	96.57%
Idea	1.26%	0.00%	98.18%	1.14%	0.77%	1.01%	2.64%	97.10%
TATA CDMA	0.12%	0.00%	98.33%	NA	0.29%	0.18%	1.52%	98.25%
TATA GSM	0.22%	0.00%	98.50%	0.43%	0.27%	0.55%	0.12%	97.57%
Telenor	0.31%	0.02%	97.26%	0.73%	2.02%	1.04%	4.81%	96.12%
Vodafone	0.44%	0.00%	99.38%	0.29%	0.62%	0.87%	2.91%	98.20%

3.2.3 3 DAY DATA - SEPTEMBER FOR 2G

Name of Service Provider 3 Day September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Aircel(DWL)	1.21%	0.00%	88.47%	0.42%	11.69%	1.61%	11.59%	95.71%
Airtel	0.18%	0.04%	96.10%	0.67%	1.06%	1.21%	2.67%	95.89%
BSNL	0.47%	0.79%	86.89%	5.83%	2.50%	0.51%	2.14%	96.95%
Idea	1.09%	0.02%	99.13%	0.62%	0.55%	0.98%	2.79%	96.11%
TATA CDMA	0.28%	0.00%	97.90%	NA	0.13%	0.19%	0.04%	98.26%
TATA GSM	0.21%	0.00%	98.69%	0.94%	0.14%	0.50%	0.10%	97.69%
Telenor	0.17%	0.02%	97.86%	0.68%	1.53%	1.25%	5.81%	96.95%
Vodafone	0.46%	0.00%	99.54%	0.17%	0.46%	0.86%	2.91%	98.32%

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	1.18%	7.67%	97.88%	0.37%	0.47%	0.77%	7.97%	98.56%
Airtel 3G	0.04%	0.28%	99.11%	0.03%	0.19%	0.59%	2.36%	99.25%
BSNL 3G	1.07%	1.08%	95.52%	1.79%	0.61%	1.01%	1.58%	96.06%
Reliance 3G	0.11%	0.17%	98.43%	0.02%	0.02%	0.05%	0.10%	98.25%

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. Minimum Node Bs downtime was recorded for Airtel 3G at 0.04%

Worst affected Node Bs due to downtime:

Aircel 3G (7.67%) failed to meet the benchmark for worst affected Node Bs due to downtime. Minimum Worst affected Node Bs due to downtime was recorded for Reliance 3G at 0.17%

Call Set-up Success Rate (CSSR):

All operators met the benchmark for CSSR. Maximum CSSR was recorded for Airtel 3G at 99.11%

RRC Congestion:

BSNL 3G failed to meet the TRAI benchmark for RRC Congestion. Minimum RRC congestion was recorded for Reliance 3G at 0.02%

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for Circuit Switched RAB Congestion. Minimum Circuit Switched RAB congestion was recorded for Reliance 3G at 0.02%

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for Circuit Switched Voice Call Drop Rate. Minimum Circuit Switched Voice Call Drop Rate was recorded for Reliance 3G at 0.05%

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

Aircel 3G (7.97%) failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate. Minimum Worst affected cells having more than 3 % Circuit switched voice drop rate was recorded for Reliance 3G at 0.10%

Circuit Switch Voice Quality:

All operators met the benchmark for Circuit Switch Voice Quality. Highest Circuit Switch Voice Quality was recorded for Airtel 3G at 99.25%.

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.

3.3.1 PMR DATA - JULY FOR 3G

Name of Service Provider Month July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	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	1.12%	7.60%	97.78%	0.41%	0.56%	0.72%	7.21%	98.53%
Airtel 3G	0.04%	0.24%	99.43%	0.03%	0.09%	0.52%	2.28%	98.46%
BSNL 3G	1.38%	1.40%	95.96%	0.00%	0.00%	1.07%	1.98%	96.08%
Reliance 3G	0.24%	0.51%	97.22%	0.02%	0.02%	0.01%	0.00%	99.85%

3.3.2 PMR DATA – AUGUST FOR 3G

Name of Service Provider Month August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	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	1.22%	8.12%	97.88%	0.37%	0.53%	0.80%	8.46%	98.57%
Airtel 3G	0.05%	0.33%	99.25%	0.03%	0.10%	0.63%	2.32%	98.34%
BSNL 3G	0.00%	0.00%	95.17%	4.05%	1.04%	1.05%	0.00%	96.00%
Reliance 3G	0.07%	0.00%	98.57%	0.03%	0.02%	0.06%	0.30%	99.84%

3.3.3 PMR DATA - SEPTEMBER FOR 3G

Name of Service Provider Month September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	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	1.25%	7.28%	98.00%	0.34%	0.32%	0.78%	8.23%	98.58%
Airtel 3G	0.04%	0.27%	98.65%	0.03%	0.37%	0.64%	2.49%	98.38%
BSNL 3G	1.12%	1.08%	95.43%	1.33%	0.77%	0.90%	1.70%	96.06%
Reliance 3G	0.03%	0.00%	99.52%	0.01%	0.01%	0.08%	0.00%	96.67%

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	1.20%	0.00%	97.68%	0.45%	0.59%	0.78%	8.30%	98.59%
Airtel 3G	0.06%	0.02%	99.45%	0.02%	0.07%	0.50%	2.38%	99.19%
BSNL 3G	0.54%	1.08%	95.81%	1.70%	0.61%	1.01%	1.05%	96.01%
Reliance 3G	NDR	NDR	97.61%	0.02%	0.01%	0.04%	0.00%	NA

Node Bs downtime:

All operators met the benchmark for Node Bs downtime. Minimum Node Bs downtime was recorded for Airtel 3G at 0.06%

Worst affected Node Bs due to downtime:

All operators met the benchmark for worst affected Node Bs due to downtime. Minimum was recorded for Aircel 3G at 0.00%

Call Set-up Success Rate (CSSR):

All operators met the benchmark as per the parameter. Maximum was recorded for Airtel at 99.45%

RRC Congestion:

BSNL 3G failed to meet the TRAI benchmark for RRC Congestion. Minimum RRC Congestion was recorded for Airtel 3G at 0.02%

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for Circuit Switched RAB Congestion. Minimum Circuit Switched RAB Congestion was recorded for Reliance 3G at 0.01%

Circuit Switched Voice Call Drop Rate:

All operators met the benchmark for Circuit Switched Voice Call Drop Rate. Minimum Circuit Switched Voice Call Drop Rate was recorded for Reliance 3G at 0.04%

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

Aircel 3G (8.30%) failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate. Minimum Worst affected cells having more than 3% circuit switched voice drop rate was recorded for Reliance at 0.00%

Circuit Switch Voice Quality:

All operators met the benchmark for Circuit Switch Voice Quality. Maximum Circuit Switched Voice Quality was recorded for Airtel 3G at 99.19%

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

3.4.1 3 DAY DATA - JULY FOR 3G

Name of Service Provider 3 Day July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	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	0.66%	0.00%	97.46%	0.49%	0.96%	0.77%	8.56%	98.49%
Airtel 3G	0.05%	0.04%	99.43%	0.02%	0.05%	0.53%	2.73%	98.84%
BSNL 3G	0.79%	1.40%	96.74%	0.01%	0.00%	1.06%	0.93%	96.00%
Reliance 3G	0.16%	0.00%	92.98%	0.04%	0.01%	0.01%	0.00%	NA

3.4.2 3 DAY DATA – AUGUST FOR 3G

Name of Service Provider 3 Day August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	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	1.59%	0.00%	97.45%	0.63%	0.42%	0.78%	8.04%	98.63%
Airtel 3G	0.05%	0.00%	99.46%	0.01%	0.08%	0.44%	1.85%	98.88%
BSNL 3G	0.00%	0.00%	95.41%	3.82%	1.03%	1.05%	0.00%	96.00%
Reliance 3G	0.08%	0.00%	99.86%	0.02%	0.02%	0.08%	0.00%	NA

3.4.3 3 DAY DATA - SEPTEMBER FOR 3G

Name of Service Provider 3 Day September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	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	1.36%	0.00%	98.14%	0.23%	0.39%	0.80%	8.29%	98.65%
Airtel 3G	0.07%	0.02%	99.46%	0.02%	0.08%	0.52%	2.56%	99.06%
BSNL 3G	0.40%	1.08%	95.28%	1.27%	0.80%	0.91%	1.71%	96.03%
Reliance 3G	0.03%	0.00%	99.99%	0.00%	0.01%	0.06%	0.00%	NA

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

Wireless Data 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%	97.91%	1.39%	NP	89.89%	1.38%
Airtel	98.88%	99.92%	3.48%	NP	99.92%	3.03%
BSNL	NP	97.30%	NP	NP	96.41%	NP
Idea	99.98%	98.42%	1.69%	NP	98.62%	1.67%
TATA CDMA	96.67%	97.09%	0.73%	94.12%	97.07%	0.63%
TATA GSM	100.00%	99.95%	0.91%	100.00%	99.96%	0.92%
Telenor	98.20%	99.00%	0.93%	99.81%	99.24%	0.70%
Vodafone	NP	99.64%	3.95%	NP	NP	NP

NP: - No Data Received,

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

Activation done within 4 hours:

Tata CDMA failed to meet the benchmark for Activation done within 4 hours in live audit data. Maximum Activation done within 4 hours was recorded for TATA GSM in PMR and Live data.

PDP Context activation success rate:

Aircel failed to meet the benchmark for PDP Context activation success rate in live audit. Maximum PDP Context activation success rate was recorded for TATA GSM in PMR and live audit data

Drop Rate:

All operators met the benchmark for Drop Rate in monthly as well as live. Minimum Drop Rate was recorded for Tata CDMA in PMR and live audit data.

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

Wireless Data 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%	97.91%	1.59%	NP	89.89%	1.44%
Airtel 3G	99.03%	99.90%	0.05%	NP	99.87%	0.06%
BSNL 3G	NP	90.33%	13.24%	NP	95.19%	8.87%
Reliance 3G	99.99%	98.78%	NP	NP	98.71%	NP

NP: - No data received

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. Maximum Activation done within 4 hours was recorded for Aircel 3G for PMR audit.

PDP Context activation success rate:

BSNL 3G failed to meet the benchmark for PDP Context activation success rate for PMR and Aircel 3G for live audit. Maximum PDP Context activation success rate was recorded for Aircel 3G in PMR and Airtel 3G for live audit.

Drop Rate:

BSNL 3G failed to meet the benchmark for Drop Rate in PMR as well as in live audit. Minimum Drop Rate was recorded for Airtel 3G in PMR as well as Live audit.

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

3.7 LIVE CALLING DATA - CONSOLIDATED

Live Calling

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 voice) within 90 seconds	Call answered	Complaint /Request attended to Satisfaction
Benchmark	98%	100%	≥ 95%	≥ 95%	≥ 95%	
Aircel(DWL)	74.00%	76.00%	100.00%	100.00%	96.33%	88.00%
Airtel	84.00%	84.00%	100.00%	100.00%	94.00%	81.00%
BSNL	89.00%	89.00%	100.00%	98.00%	94.00%	86.00%
Idea	87.00%	87.00%	100.00%	99.00%	89.67%	94.00%
TATA CDMA	NA	NA	100.00%	100.00%	92.67%	92.00%
TATA GSM	NA	NA	100.00%	100.00%	91.67%	83.00%
Telenor	NA	NA	100.00%	100.00%	85.67%	NA
Vodafone	90.00%	90.00%	100.00%	100.00%	96.67%	95.00%

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 all the operators recording 100% for the parameter.

Customer Care / Helpline Assessment (voice to voice)

All operators met the benchmark for Customer Care / Helpline Assessment (voice to voice). Maximum Customer care/ Helpline Assessment (Voice to Voice) was recorded for all operators at 100.00% except BSNL and Idea.

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 except Aircel and Vodafone. 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. Idea recorded the best performance at 93.00%.

3.8 BILLING AND CUSTOMER CARE - CONSOLIDATED

Billing and Customer Care

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 voice) within 90 seconds
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel(DWL)	0.00%	0.03%	100.00%	100.00%	100.00%	93.59%	96.42%
Airtel	0.09%	0.02%	100.00%	100.00%	100.00%	98.81%	97.24%
BSNL	0.00%	0.00%	100.00%	100.00%	100.00%	98.90%	96.07%
Idea	0.17%	0.02%	100.00%	100.00%	100.00%	99.41%	99.92%
TATA CDMA	0.01%	0.00%	66.67%	66.67%	100.00%	97.15%	99.62%
TATA GSM	0.00%	0.00%	NA	NA	100.00%	97.15%	97.90%
Telenor	NA	0.00%	100.00%	100.00%	100.00%	99.71%	98.65%
Vodafone	0.02%	0.03%	100.00%	100.00%	100.00%	100.00%	97.82%

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 (DWL), BSNL and Tata GSM 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 and Telenor 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 except Tata CDMA.

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

Aircel failed to meet the benchmark of 95% IVR call being attended. Vodafone recorded the best performance for the parameter at 100.00%

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

All operators met the TRAI specified benchmark of 95%. Vodafone 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	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Aircel(DWL)	NA	100.00%	98.00%	100.00%	NS	99.00%	100.00%	95.00%	99.00%	100.00%
Airtel	99.00%	NA	100.00%	100.00%	NS	100.00%	97.00%	98.00%	100.00%	96.00%
BSNL	94.00%	93.00%	NA	99.00%	NS	97.00%	92.00%	96.00%	95.00%	96.00%
Idea	99.00%	98.00%	96.00%	NA	NS	96.00%	95.00%	98.00%	98.00%	98.00%
Reliance CDMA	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Reliance GSM	92.00%	94.00%	92.00%	92.00%	NS	NA	94.00%	92.00%	88.00%	94.00%
TATA CDMA	95.00%	98.00%	94.00%	97.00%	NS	94.00%	NA	100.00%	92.00%	93.00%
TATA GSM	95.00%	97.00%	96.00%	96.00%	NS	94.00%	100.00%	NA	94.00%	93.00%
Telenor	97.00%	100.00%	96.00%	100.00%	NS	100.00%	100.00%	97.00%	NA	96.00%
Vodafone	98.00%	99.00%	100.00%	99.00%	NS	100.00%	97.00%	99.00%	99.00%	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 COMPARISON BETWEEN IMRB AND OPERATOR'S DATA FOR PMR 2G

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	BTSs Accumulated downtime (not available for service)		Worst affected BTSs due to downtime		Call Set-up Success Rate		SDCCH/ Paging Chl. Congestion		TCH Congestion		Call drop rate		Worst affected cells having more than 3%		Connection with good voice quality			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	1.65%	1.64%	9.99%	9.99%	88.74%	88.74%	0.86%	0.86%	11.47%	11.47%	1.94%	1.95%	15.08%	15.08%	95.18%	95.17%	0.00%	0.00%
Airtel	0.07%	0.07%	0.27%	0.26%	95.66%	95.96%	0.71%	0.71%	1.58%	1.58%	1.50%	1.50%	2.74%	2.75%	95.80%	95.92%	0.00%	0.00%
BSNL	1.84%	1.75%	1.96%	1.95%	96.72%	94.01%	0.42%	5.24%	0.36%	2.02%	1.40%	1.05%	2.70%	3.45%	97.30%	96.47%	0.00%	0.00%
Idea	1.02%	1.01%	1.79%	1.79%	97.01%	97.01%	0.83%	0.83%	1.83%	1.83%	1.08%	1.08%	2.66%	2.67%	96.44%	96.43%	0.00%	0.00%
TATA CDMA	0.23%	0.22%	0.00%	0.00%	97.82%	97.82%	0.00%	NA	0.55%	0.55%	0.27%	0.27%	1.32%	1.33%	98.26%	98.26%	0.00%	0.00%
TATA GSM	0.21%	0.21%	0.14%	0.14%	97.91%	97.91%	0.69%	0.69%	0.48%	0.56%	0.64%	0.64%	2.90%	2.90%	97.43%	97.42%	0.00%	0.00%
Telenor	0.26%	0.26%	0.60%	0.60%	97.46%	97.46%	0.79%	0.79%	1.84%	1.84%	1.18%	1.17%	6.05%	6.05%	96.43%	96.43%	0.67%	0.00%
Vodafone	0.41%	0.41%	1.16%	1.16%	99.38%	99.38%	0.15%	0.15%	0.62%	0.62%	0.93%	0.93%	2.88%	2.88%	97.90%	97.90%	0.00%	0.00%

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

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	Node Bs downtime (not available for service)		Worst affected Node Bs due to downtime		CSSR		RRC Congestion		Circuit Switched RAB Congestion		Call drop rate		Worst affected cells having more than 3% Circuit switched		%Circuit Switch Voice Quality (CSV quality)			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	1.20%	1.18%	7.67%	7.67%	97.89%	97.88%	0.37%	0.37%	0.47%	0.47%	0.77%	0.77%	7.97%	7.97%	98.56%	98.56%	0.00%	0.00%
Airtel	0.04%	0.04%	0.28%	0.28%	99.26%	99.11%	0.03%	0.03%	0.13%	0.19%	0.58%	0.59%	2.32%	2.36%	98.40%	99.25%	0.00%	0.00%
BSNL	1.90%	1.07%	1.83%	1.08%	95.83%	95.52%	0.30%	1.79%	0.72%	0.61%	1.48%	1.01%	2.87%	1.58%	96.82%	96.06%	0.00%	0.00%
rtl	0.11%	0.11%	0.17%	0.17%	98.43%	98.43%	0.02%	0.02%	0.02%	0.02%	0.05%	0.05%	0.26%	0.10%	99.85%	98.25%	0.00%	0.00%

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

4 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- Aircel failed to meet the benchmark for worst affected BTSs due to downtime and it has very high value as 9.99%.
- Aircel and BSNL failed to meet the benchmark for CSSR
- Aircel (5.24%) failed to meet the benchmark on SDCCH / Paging Channel Congestion
- Aircel (11.47%) and BSNL 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, in which Aircel has very high value as 15.08%.

3 Day Live Measurement (Network Parameters)

- Aircel and BSNL failed to meet the benchmark for CSSR
- BSNL failed to meet the benchmark on SDCCH / Paging Channel Congestion
- Aircel failed to meet the benchmark for TCH congestion, in which Aircel has very high value as 12.98%.
- Aircel failed to meet the benchmark for the parameter call drop rate.
- Aircel, Telenor and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate, in which Aircel has very high value as 15.48%.

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

- Aircel 3G (7.67%) failed to meet the benchmark for worst affected Node Bs due to downtime in PMR audit.
- BSNL 3G failed to meet the benchmark for RRC Congestion in PMR as well as 3days live audit.
- Aircel 3G failed to meet the benchmark for worst affected cells having more than 3% Circuit switched voice drop rate in PMR and live audit. During PMR the value was 7.97% and during live audit it was 8.30%.

Wireless data services for 2G and 3G

- Tata CDMA failed to meet the benchmark for Activation done within 4 hours during live audit.
- BSNL 3G failed during PMR audit and Aircel 2G & 3G failed to meet the benchmark for PDP Context activation success rate during live audit
- BSNL 3G failed to meet the benchmark for Drop Rate in PMR as well as 3days 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.
- 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.
- Tata CDMA failed to meet TRAI benchmark for resolution of billing complaints within 4 weeks and 6 weeks.
- Aircel failed to meet the benchmark of 95% IVR call being attended.

Drive Test Voice 2G

- In Chapra BSNL and TATA CDMA did not meet the TRAI benchmark for voice quality in outdoor locations and Aircel,Tata GSM did not meet the TRAI benchmark in indoor as well as outdoor location.
- In Chapra SSA TATA CDMA & GSM failed to meet the benchmark for CSSR in outdoor locations; however BSNL failed in indoor as well as outdoor location.
- In Chapra SSA TATA CDMA failed to meet the benchmark for call drop rate in outdoor locations; however BSNL failed in indoor as well as outdoor location.
- In Sasaram SSA Aircel, BSNL and Tata GSM failed to meet the benchmark for voice quality in indoor as well as outdoor locations. Telenor did not meet the benchmark in outdoor locations.
- In Sasaram SSA TATA GSM failed to meet the benchmark for CSSR in outdoor locations.
- In Sasaram SSA Aircel and BSNL failed to meet the benchmark for call drop rate in outdoor locations and BSNL failed to meet the benchmark for Call Drop Rate in both Indoor and outdoor locations.
- In Darbhanga SSA Tata GSM and Telenor failed to meet the benchmark for voice quality in indoor as well as outdoor locations, however Aircel failed in indoor and BSNL failed in outdoor locations.
- In Darbhanga SSA Aircel, BSNL and Tata GSM failed to meet the benchmark for CSSR in outdoor locations.
- In Darbhanga SSA BSNL failed to meet the benchmark for call drop rate in outdoor locations.
- In Dhanbad SSA Aircel and Reliance CDMA failed to meet the benchmark for CSSR in outdoor locations.
- In Gaya SSA BSNL and Tata GSM failed to meet the benchmark for voice quality in indoor as well as outdoor locations. Aircel, TATA CDMA and Vodafone did not meet the benchmark in outdoor locations.
- In Gaya SSA Aircel, Tata CDMA and Tata GSM failed to meet the benchmark for CSSR in outdoor locations.

Drive Test Voice 3G

- In Chapra SSA BSNL 3G failed to meet the benchmark for Voice Quality in outdoor locations and Aircel 3G failed to meet the benchmark in outdoor as well as indoor location.
- In Chapra SSA BSNL 3G failed to meet the benchmark for Call Set Success Rate in outdoor location.
- In Chapra SSA Aircel 3G and BSNL 3G failed to meet the benchmark for Call Drop Rate in outdoor locations.
- In Sasaram SSA Aircel failed to meet the benchmark for voice quality in indoor as well as outdoor locations
- In Sasaram SSA BSNL 3G failed to meet the benchmark for CSSR in indoor as well as outdoor locations.
- In Sasaram SSA BSNL 3G failed to meet the benchmark for call drop rate in outdoor locations.

- In Darbhanga SSA Aircel 3G failed to meet the benchmark for Voice quality in outdoor locations.
- In Darbhanga SSA BSNL 3G failed to meet the benchmark for CSSR in outdoor locations.
- In Darbhanga SSA Aircel 3G and BSNL 3G failed to meet the benchmark for drop rate in outdoor locations.
- In Gaya SSA Aircel 3G and BSNL 3G failed to meet the benchmark for Voice quality in outdoor as well as indoor locations.
- In Gaya SSA Reliance 3G failed to meet the benchmark for CSSR in indoor and BSNL failed in outdoor locations.
- In Gaya SSA, Aircel 3G and Reliance 3G failed to meet the benchmark for Call Drop Rate in outdoor location.

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 –**

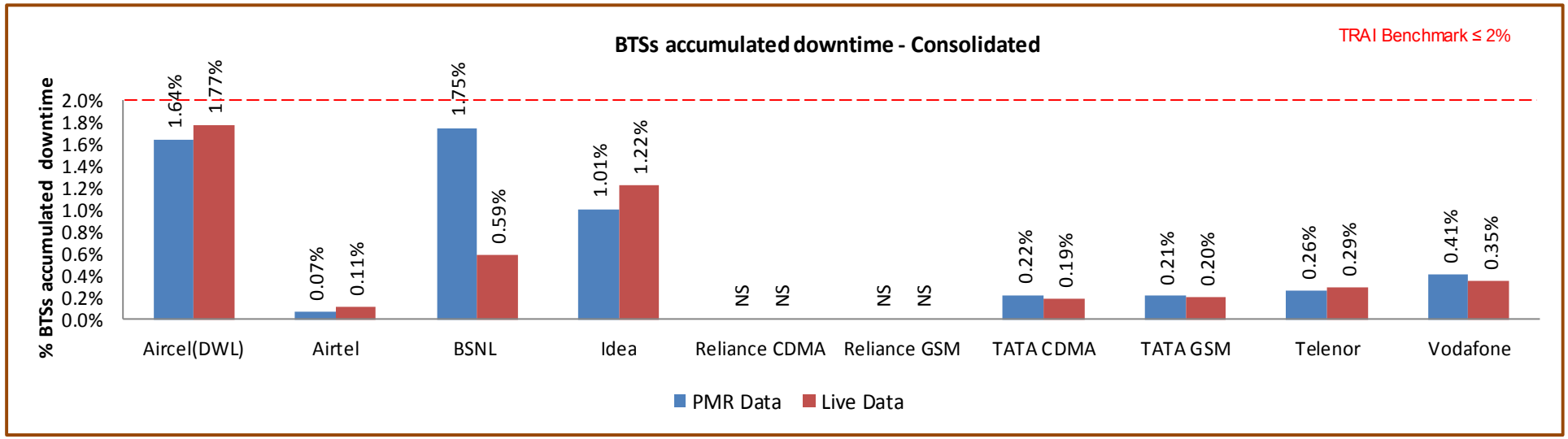
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

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.

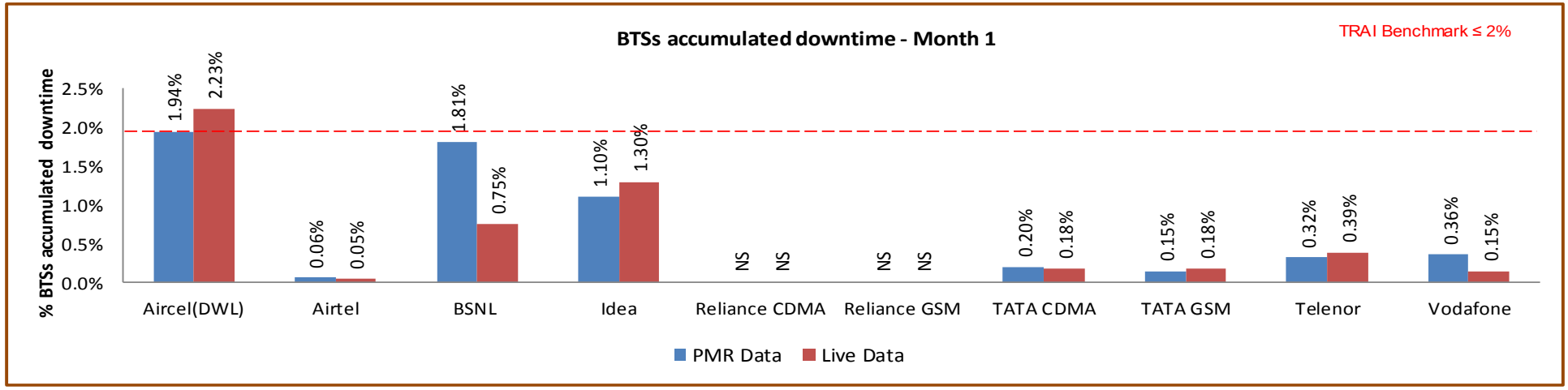
5.1.2 KEY FINDINGS - CONSOLIDATED



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

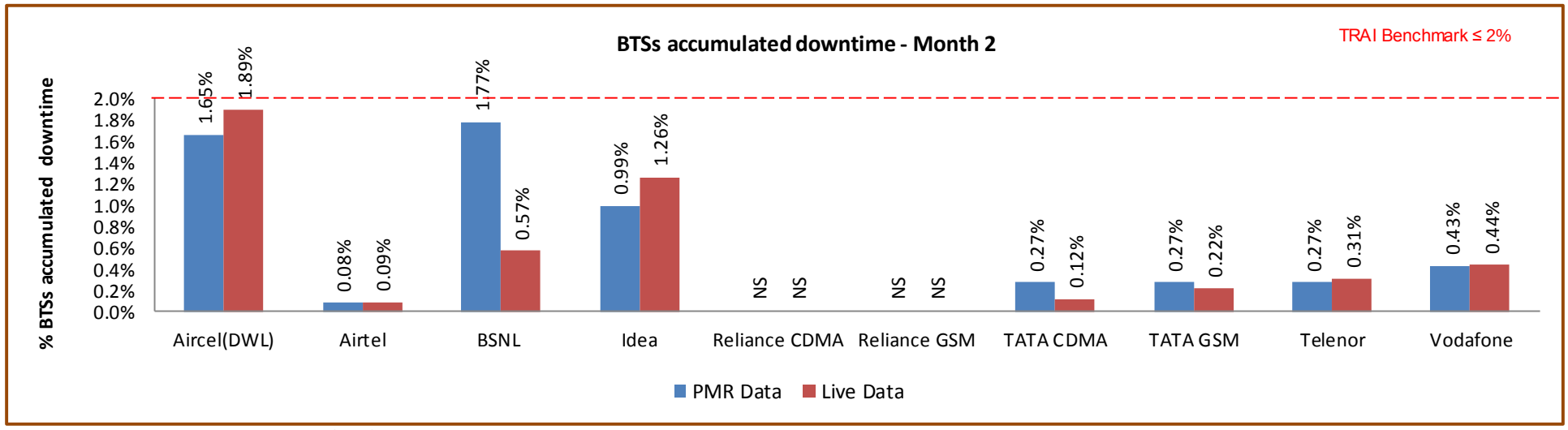
All operators met the benchmark on aspect of BTS accumulated downtime as per audit/PMR data.

5.1.2.1 KEY FINDINGS – MONTH 1



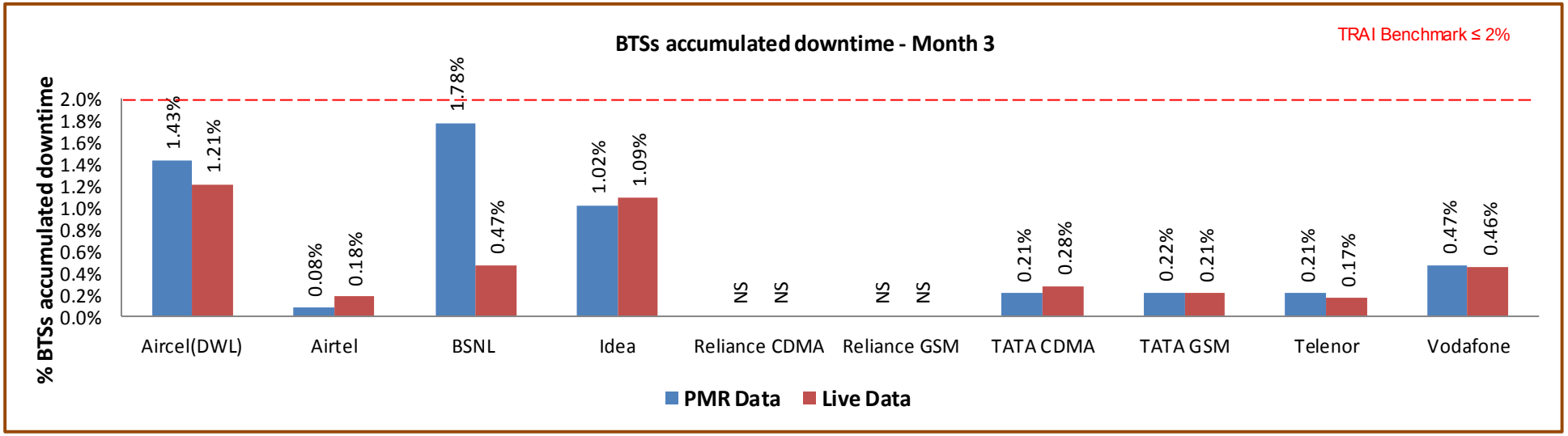
Data Source: Operations and Maintenance Center (OMC) of the operators

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.

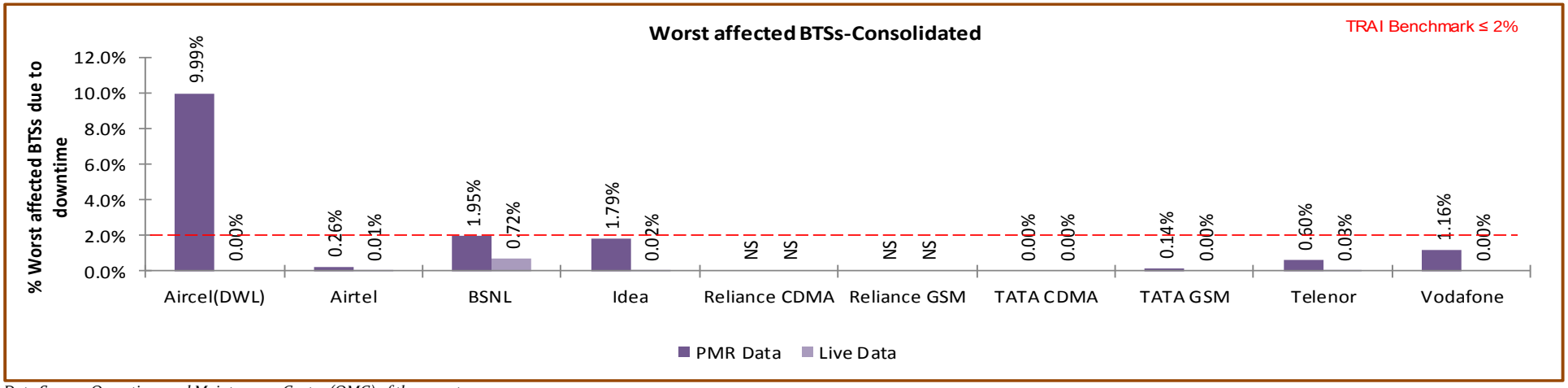
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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

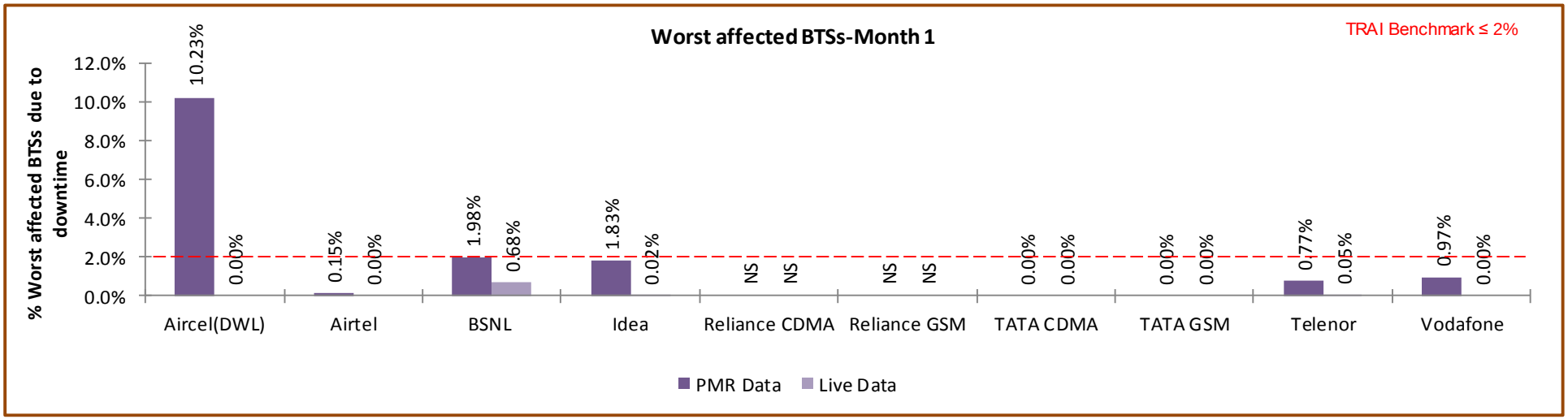


Data Source: Operations and Maintenance Center (OMC) of the operators

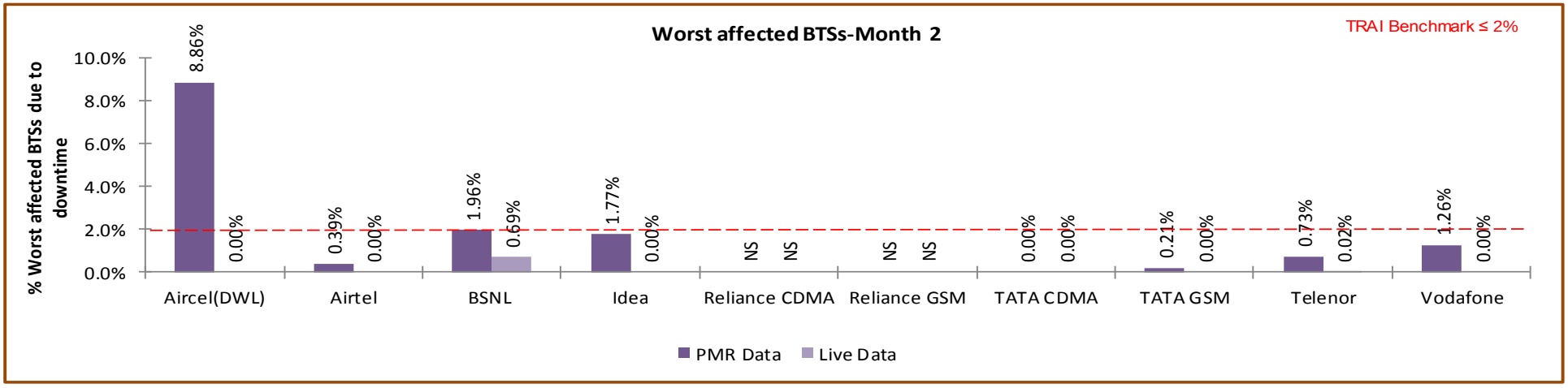
Aircel failed to meet the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

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.

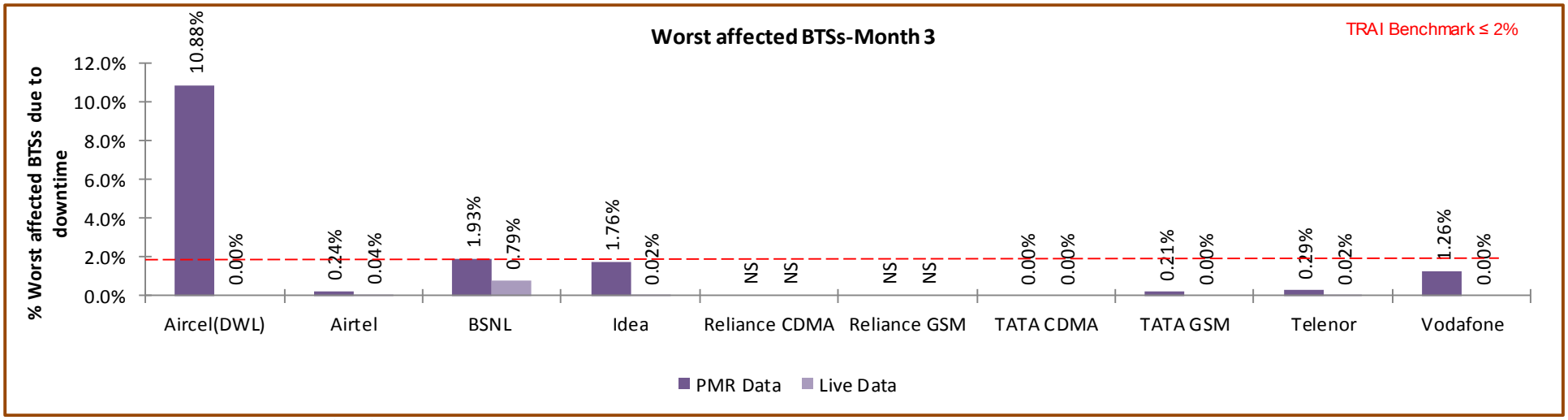
5.2.2.1 KEY FINDINGS – MONTH 1



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

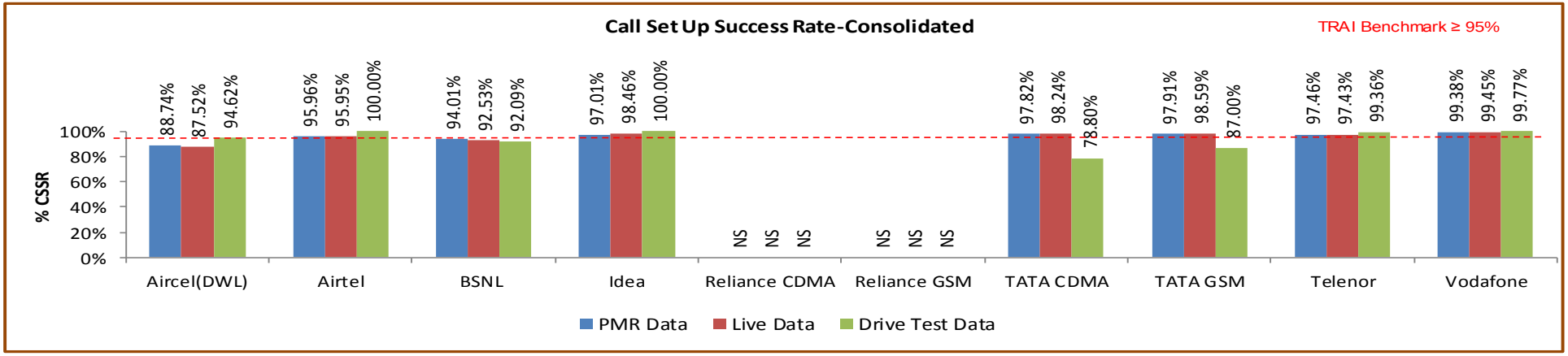
   Call Established means the following events have happened in call setup:-

   - 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.

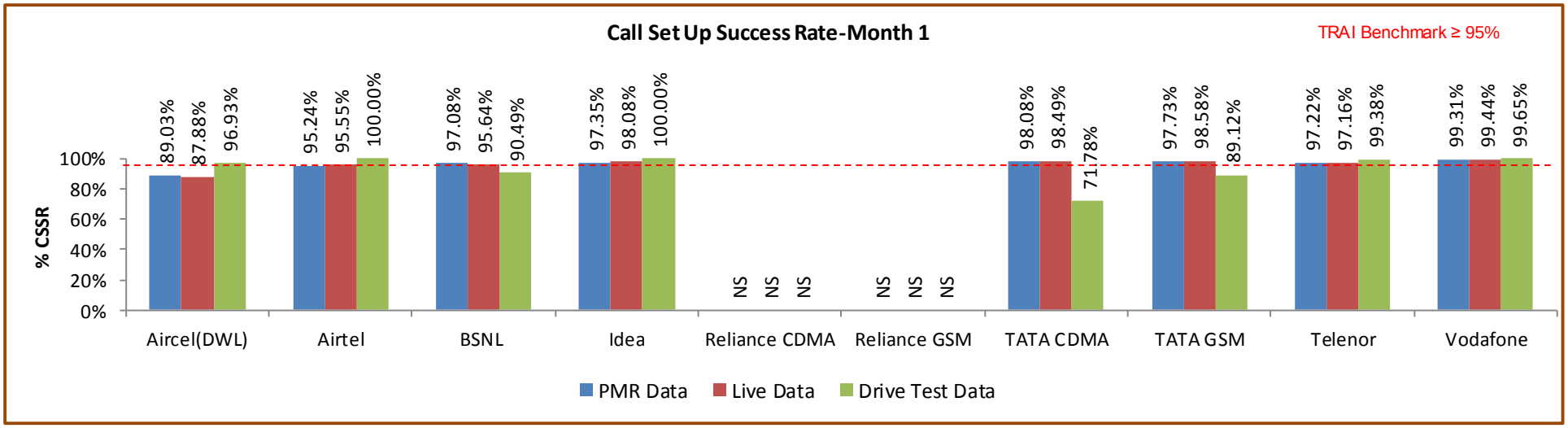
5.3.2 KEY FINDINGS - CONSOLIDATED



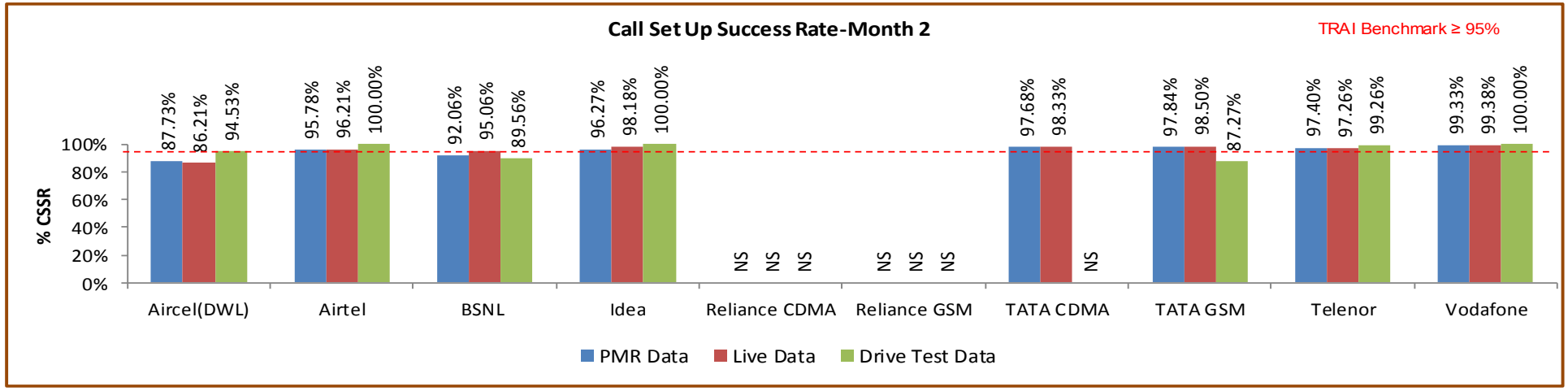
Data Source: Network Operations Center (NOC) of the operators

Aircel, BSNL failed to meet the TRAI benchmark as per audit/PMR data, live data and during drive test Aircel, BSNL, Tata CDMA and TATA GSM failed.

5.3.2.1 KEY FINDINGS – MONTH 1

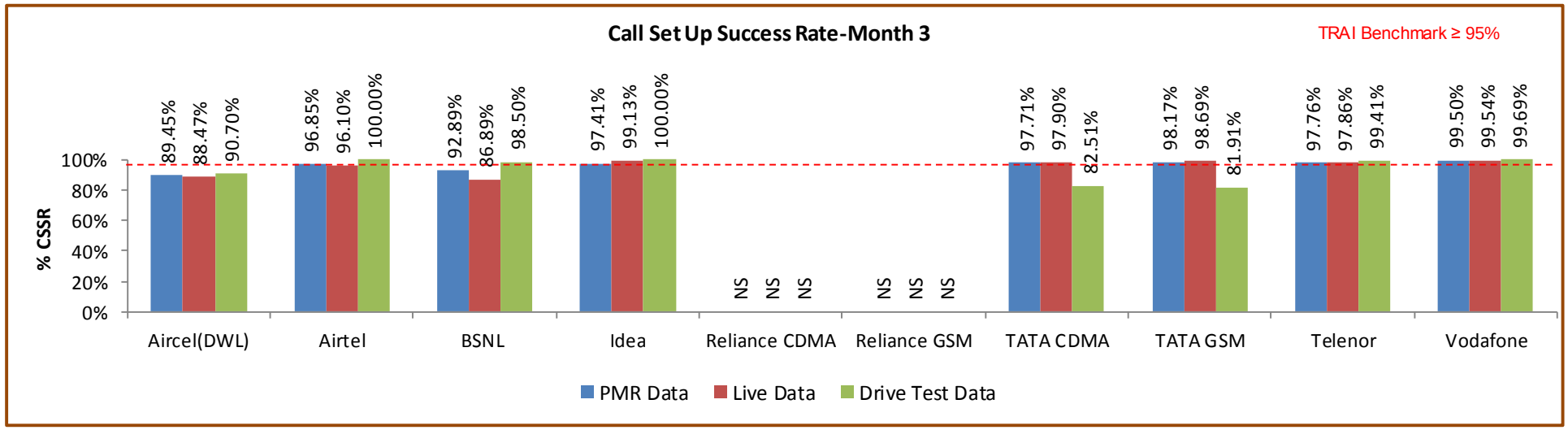


5.3.2.2 KEY FINDINGS – MONTH 2



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

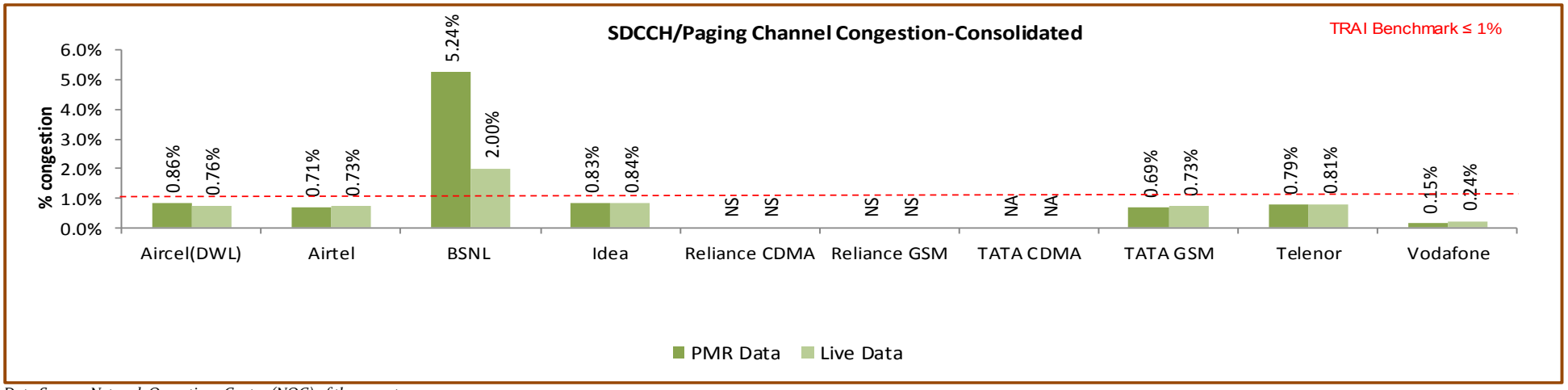
3. Benchmark:

- 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

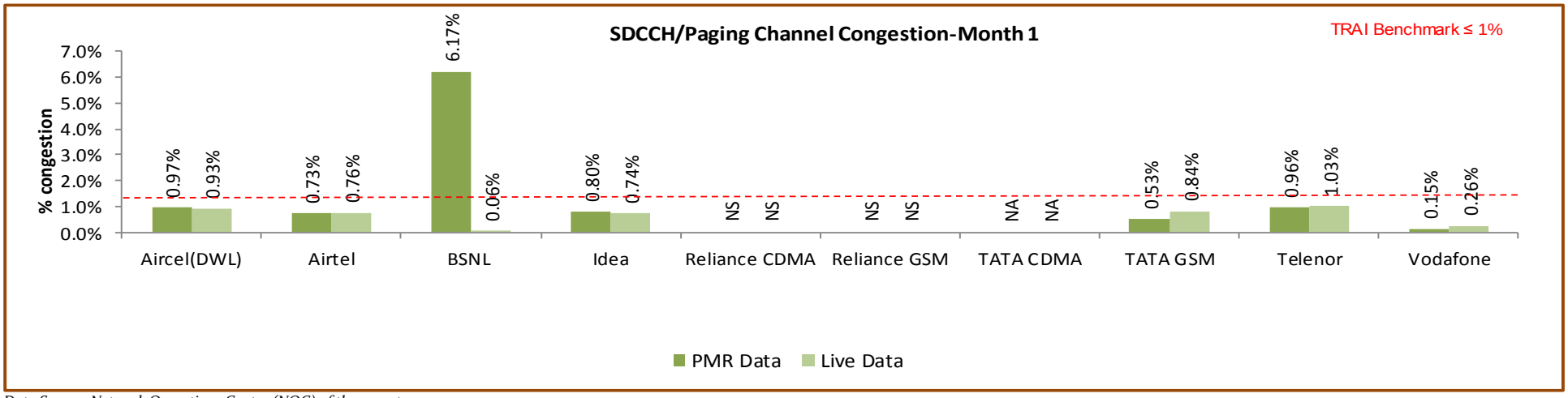
5.4.2 KEY FINDINGS - SDCCH/PAGING CHANNEL CONGESTION (CONSOLIDATED)



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

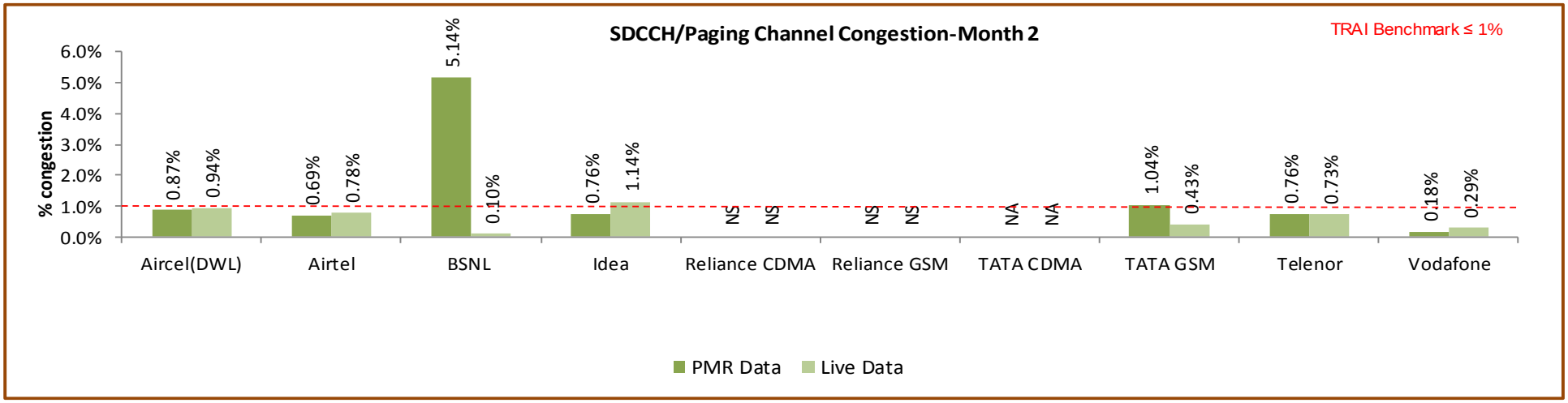
BSNL failed to meet the benchmark as per PMR & Live audit and Idea failed to meet benchmark as per Live audit only.
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators.

5.4.2.1 KEY FINDINGS – MONTH 1

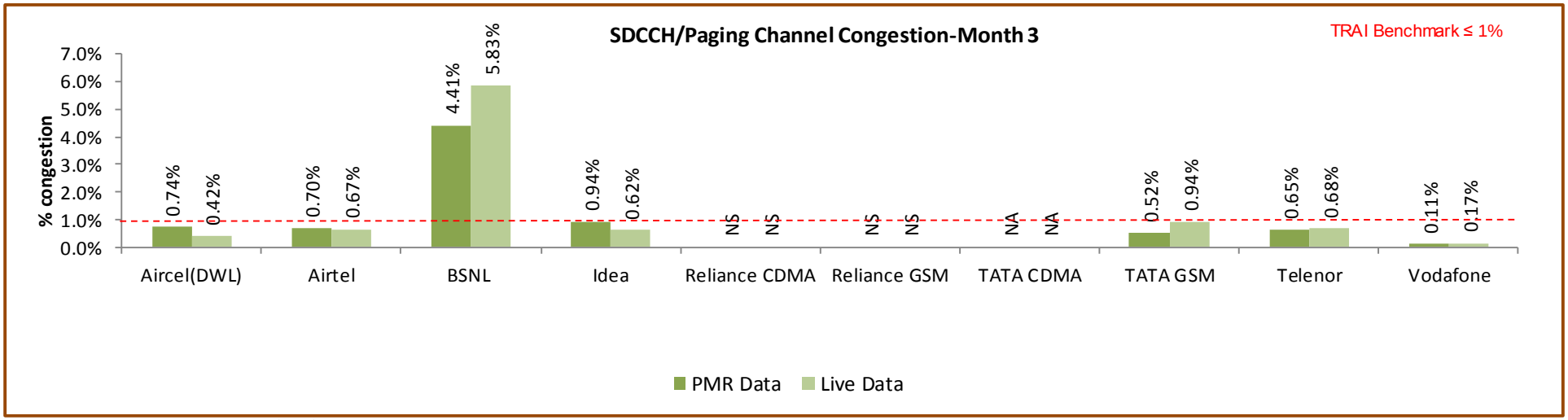


Data Source: Network Operations Center (NOC) of the operators

5.4.2.2 KEY FINDINGS – MONTH 2

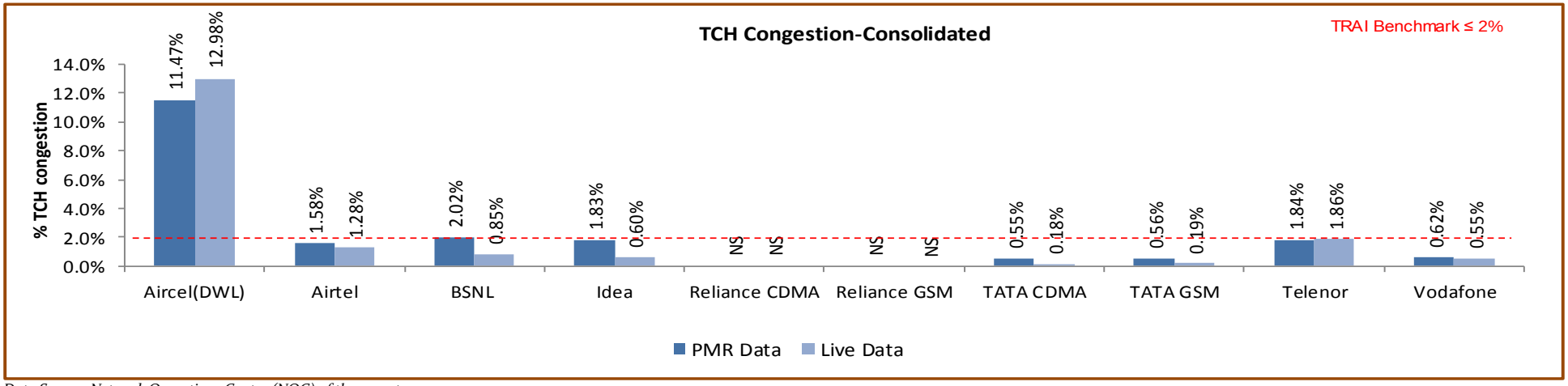


5.4.2.3 KEY FINDINGS – MONTH 3



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

5.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)

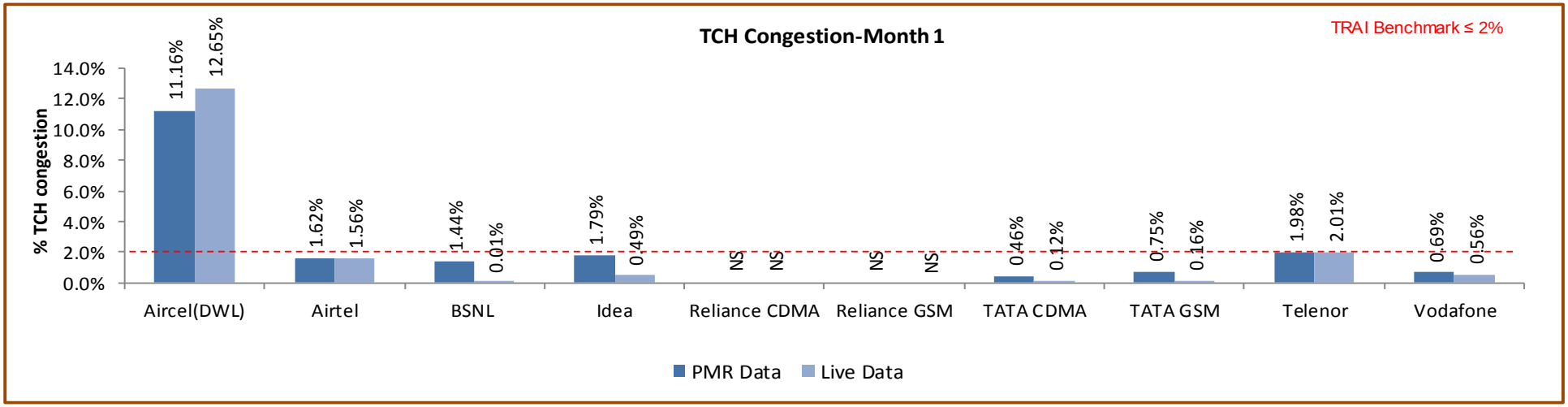


Data Source: Network Operations Center (NOC) of the operators

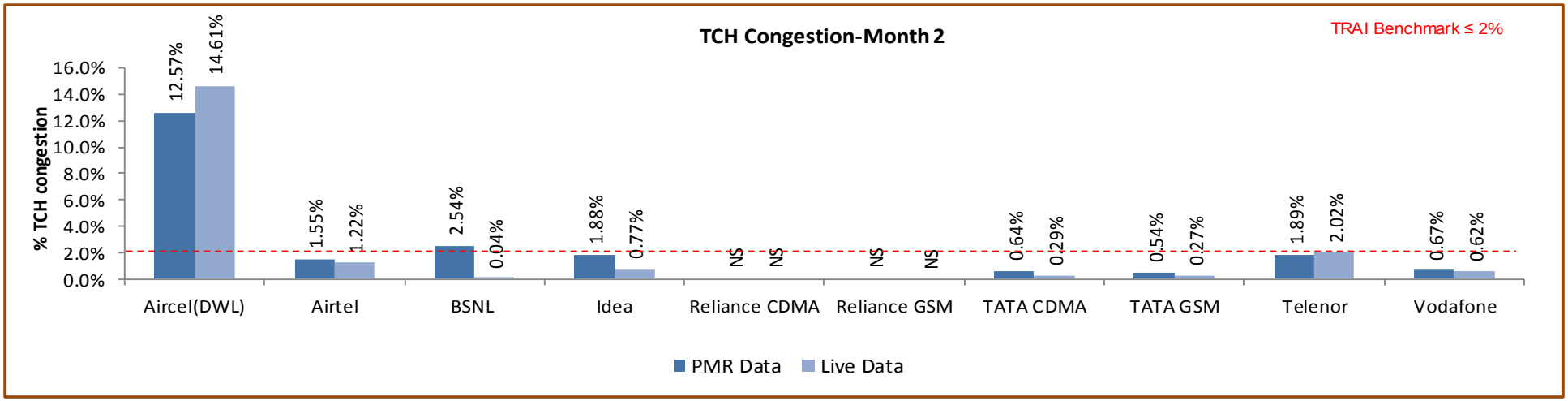
Aircel and BSNL failed to meet the benchmark as per audit/PMR report and Aircel failed to meet the benchmark as per audit/ Live Data.

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.

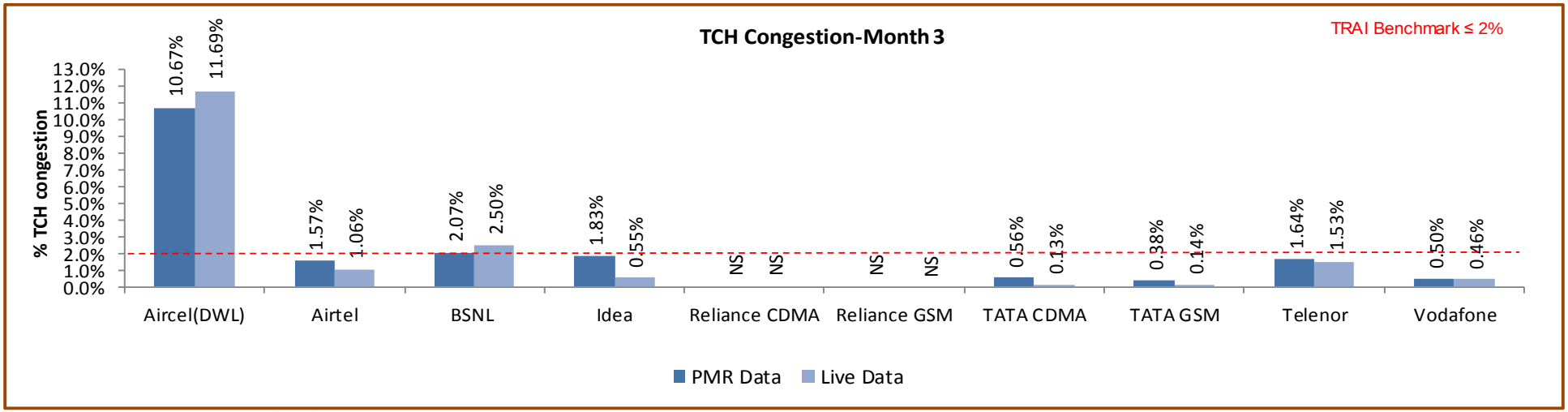
5.4.3.1 KEY FINDINGS – MONTH 1



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

5. POI Congestion											
Audit Results for POI Congestion- PMR data											
POI congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of working POIs		48	824	28	83	NS	NS	152	27	22	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		393764	2262596	134158	957519	NS	NS	5112655	930005	487746	894137
Traffic served for all POIs (B)- in erlangs		248991	2650751	42716	564505	NS	NS	497405	143369	254860	506353
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of working POIs		48	824	28	83	NS	NS	152	27	22	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		391899	1563966	177930	957519	NS	NS	210493	39784	547213	887717
Traffic served for all POIs (B)- in erlangs		117895	1036999	42716	563593	NS	NS	19857	6053	215385	241544
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%

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

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

5.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-July											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	817	21	83	NS	NS	153	27	25	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131207	784934	15538	313200	NS	NS	1746725	307786	91350	297860
Traffic served for all POIs (B)- in erlangs		87398	1693678	14239	186790	NS	NS	182451	46697	68528	170109
POI congestion	≤0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	817	21	83	NS	NS	152	27	25	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131114	744519	59310	313200	NS	NS	70183	13643	90942	291240
Traffic served for all POIs (B)- in erlangs		39931	480426	14239	182011	NS	NS	6687	2061	68309	78737
POI congestion	≤0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%

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

5.4.4.2 KEY FINDINGS – MONTH 2

Audit Results for POI Congestion- PMR data-August											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	825	32	83	NS	NS	152	27	21	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133057	734862	59310	318250	NS	NS	1682965	317436	149888	297368
Traffic served for all POIs (B)- in erlangs		85105	476664	14238	187396	NS	NS	157477	46987	118107	169493
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	825	32	83	NS	NS	152	27	21	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133043	81809	59310	318250	NS	NS	70183	13379	95216	297209
Traffic served for all POIs (B)- in erlangs		39872	65501	14238	186662	NS	NS	6603	1878	77062	81348
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%

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

5.4.4.3 KEY FINDINGS – MONTH 3

Audit Results for POI Congestion- PMR data-September										
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Tel
Total number of working POIs		48	829	32	83	NS	NS	152	27	
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	
Total Capacity of all POIs (A) - in erlangs		129500	742799	59310	326069	NS	NS	1682965	304784	24
Traffic served for all POIs (B)- in erlangs		76488	480410	14239	190319	NS	NS	157477	49684	68
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.
Live Measurement Results for POI Congestion- 3 Day data-September										
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Tel
Total number of working POIs		48	829	32	83	NS	NS	152	27	
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	
Total Capacity of all POIs (A) - in erlangs		127742	737638	59310	326069	NS	NS	70128	12762	36
Traffic served for all POIs (B)- in erlangs		38091	491071	14239	194920	NS	NS	6567	2114	70
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.

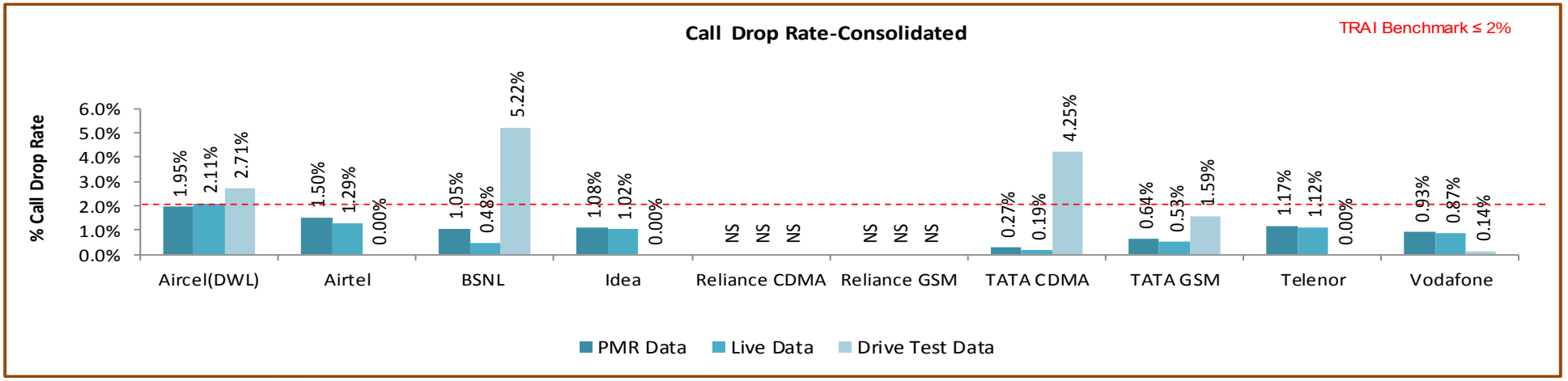
Data Source: Network Operations Center (NOC) of the operators

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.

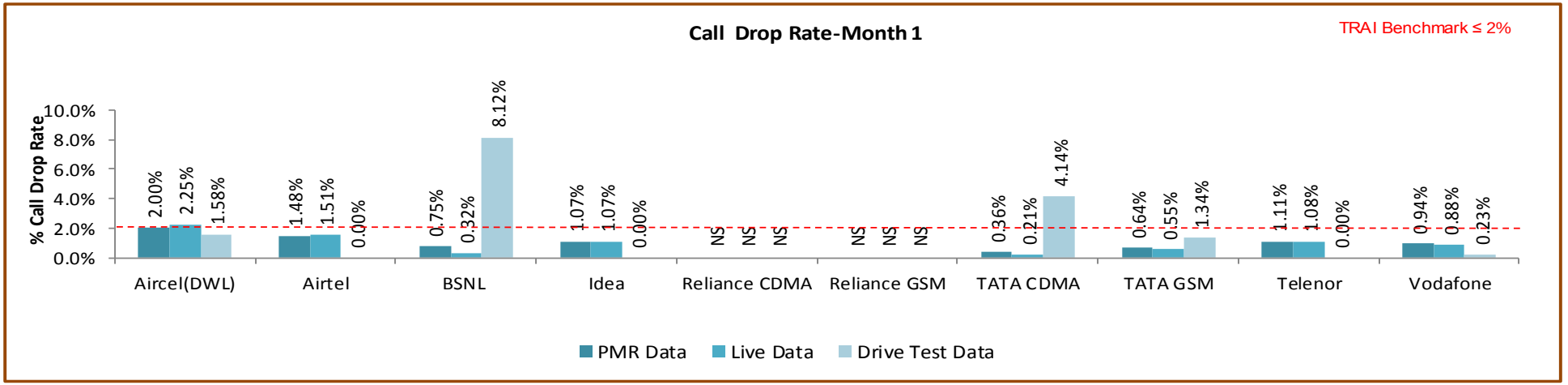
5.5.2 KEY FINDINGS - CONSOLIDATED



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

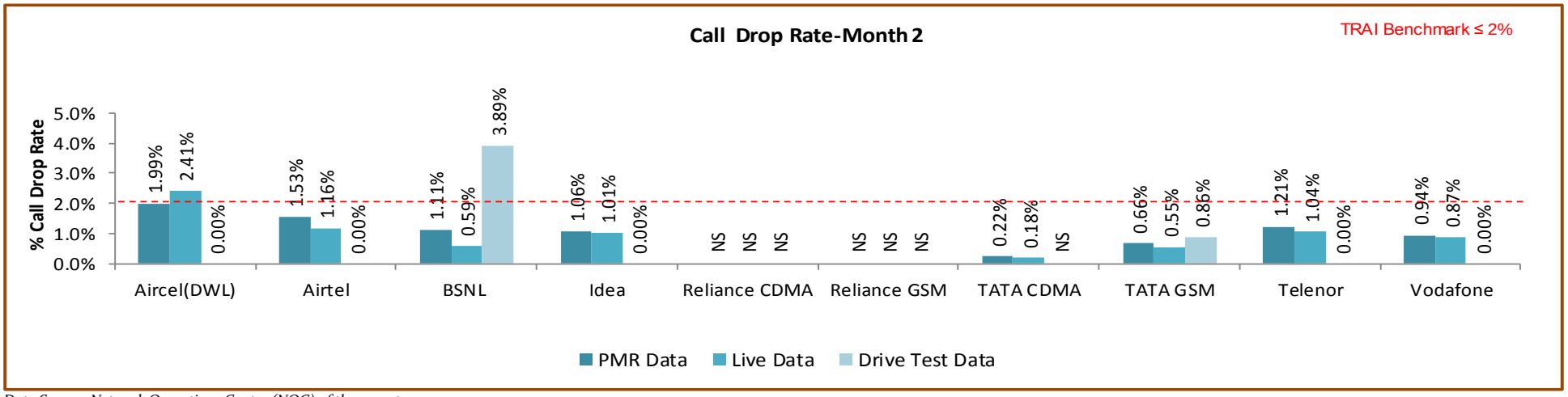
Aircel failed to meet the benchmark for call drop rate during the live audit. During drive test Aircel, BSNL and Tata CDMA failed to meet the benchmark.

5.5.2.1 KEY FINDINGS – MONTH 1



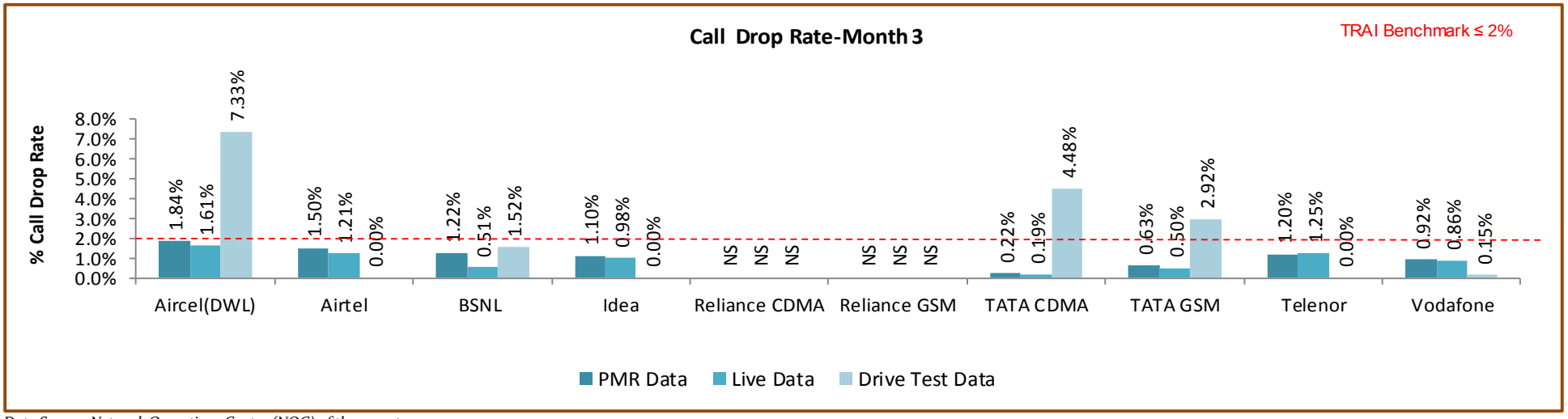
Data Source: Network Operations Center (NOC) of the operators

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 –**

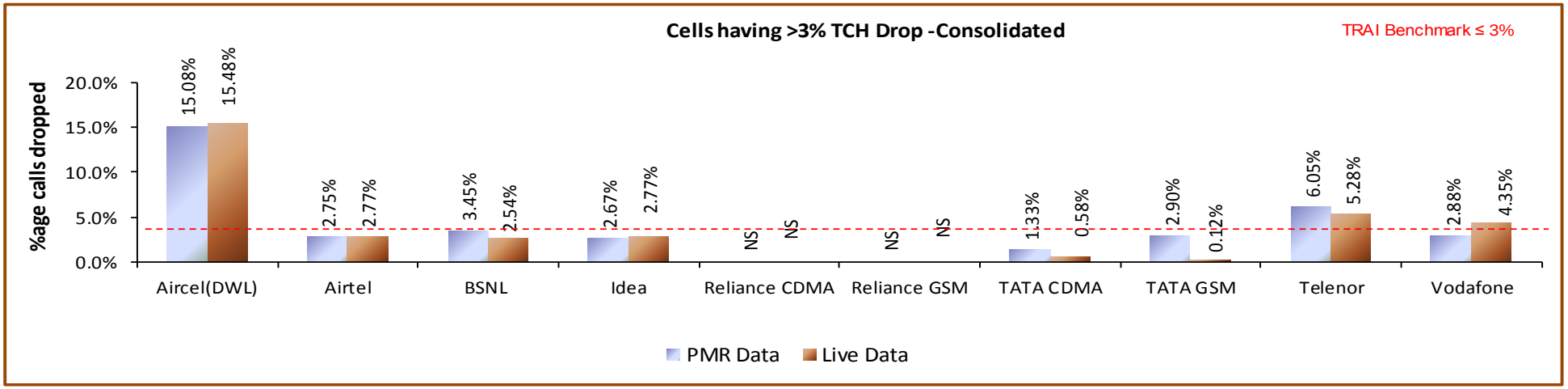
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

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.

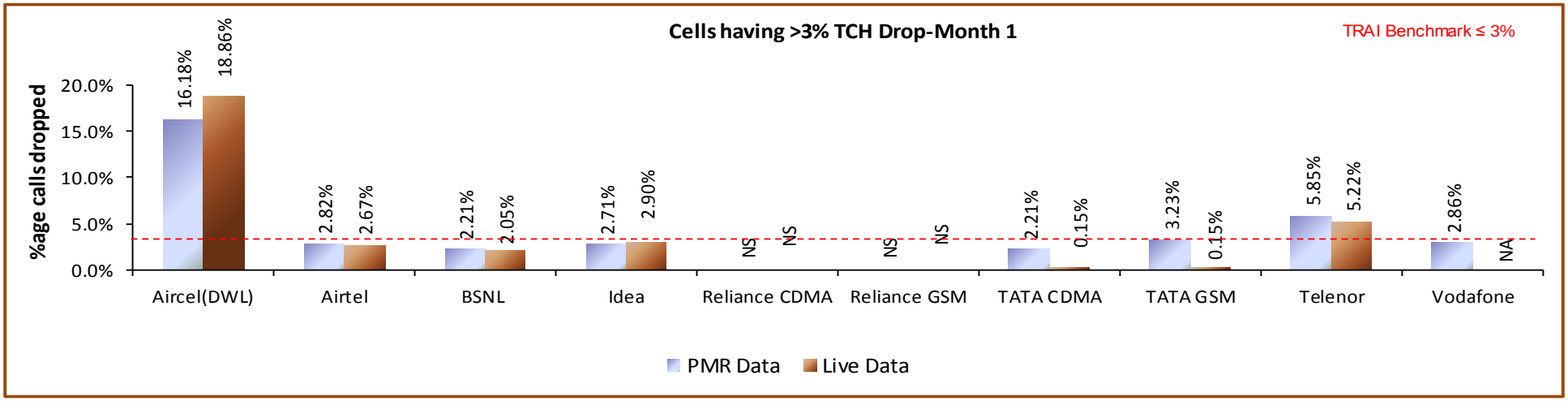
5.6.2 KEY FINDINGS - CONSOLIDATED



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

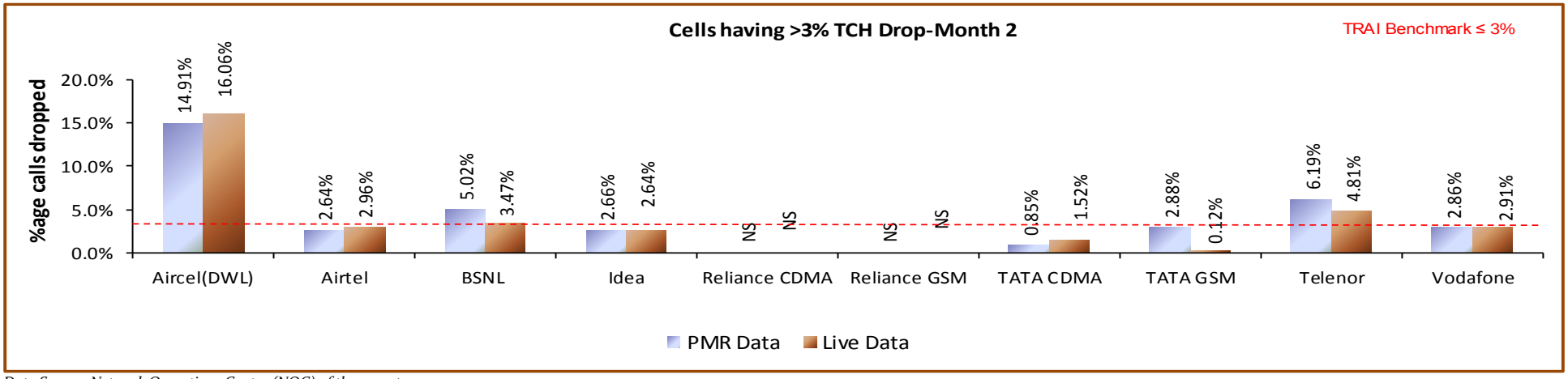
Aircel, BSNL and Telenor failed to meet the benchmark for Audit PMR. However Aircel, Vodafone and Telenor failed during live audit.

5.6.2.1 KEY FINDINGS – MONTH 1



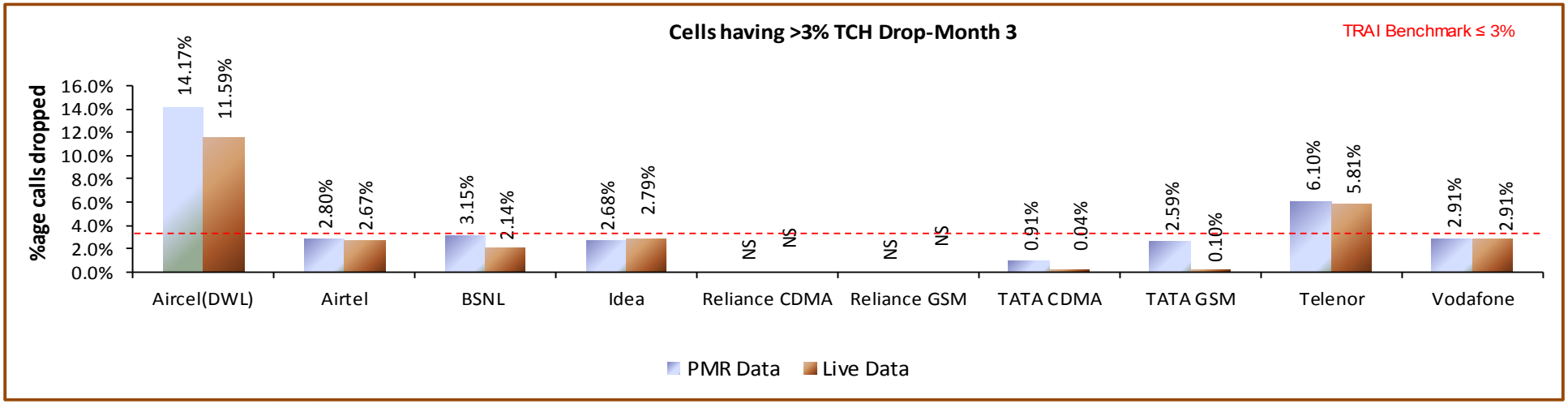
Data Source: Network Operations Center (NOC) of the operators

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**

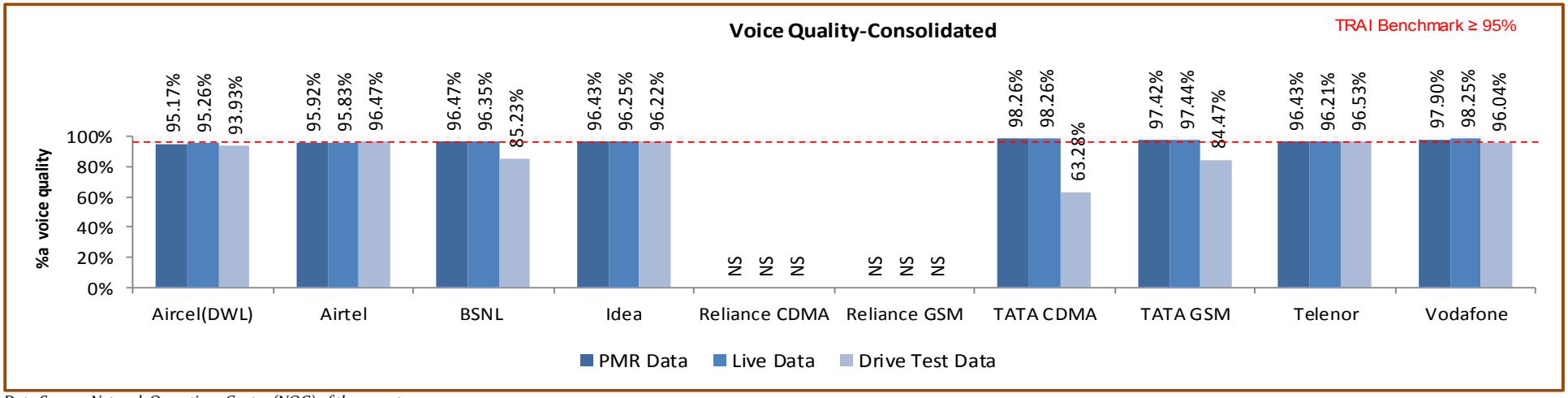
3. **TRAI Benchmark:** ≥ 95%

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.

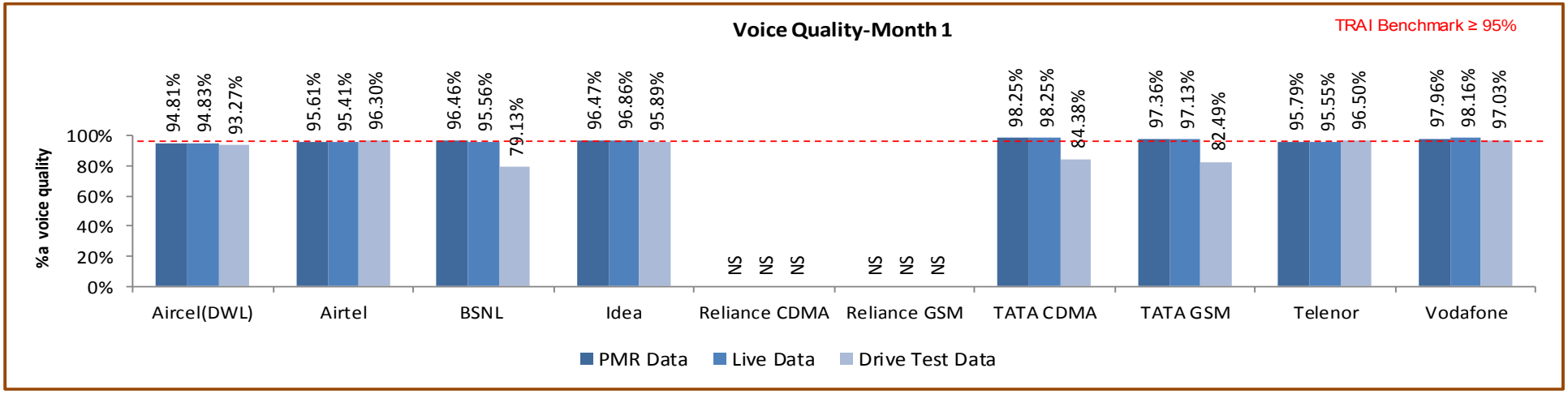
5.7.2 KEY FINDINGS



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

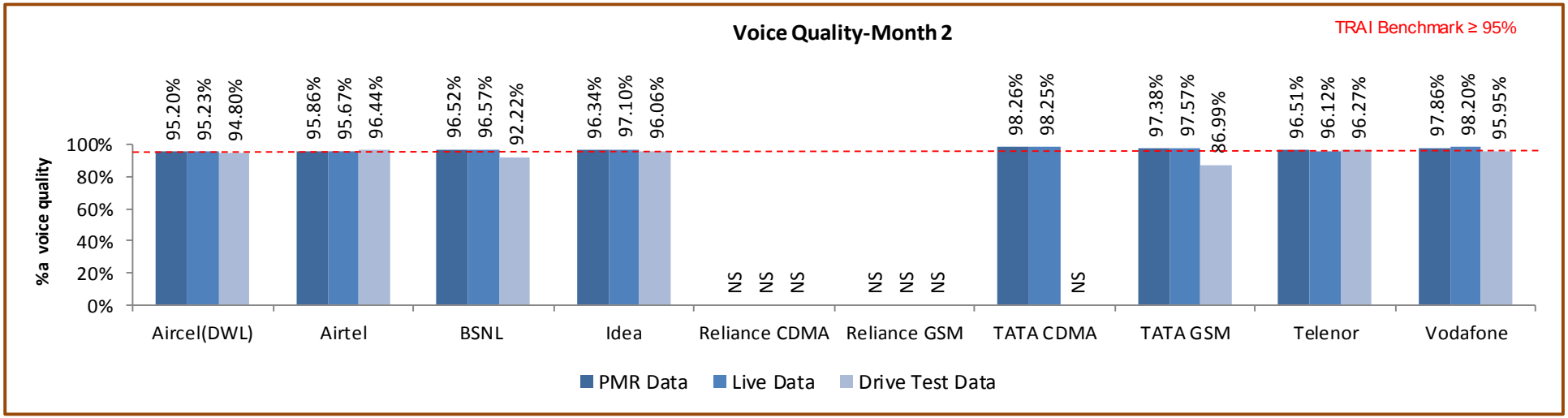
Aircel, BSNL, TATA CDMA and TATA GSM failed to meet the benchmark for Voice quality during drive test.

5.7.2.1 KEY FINDINGS – MONTH 1



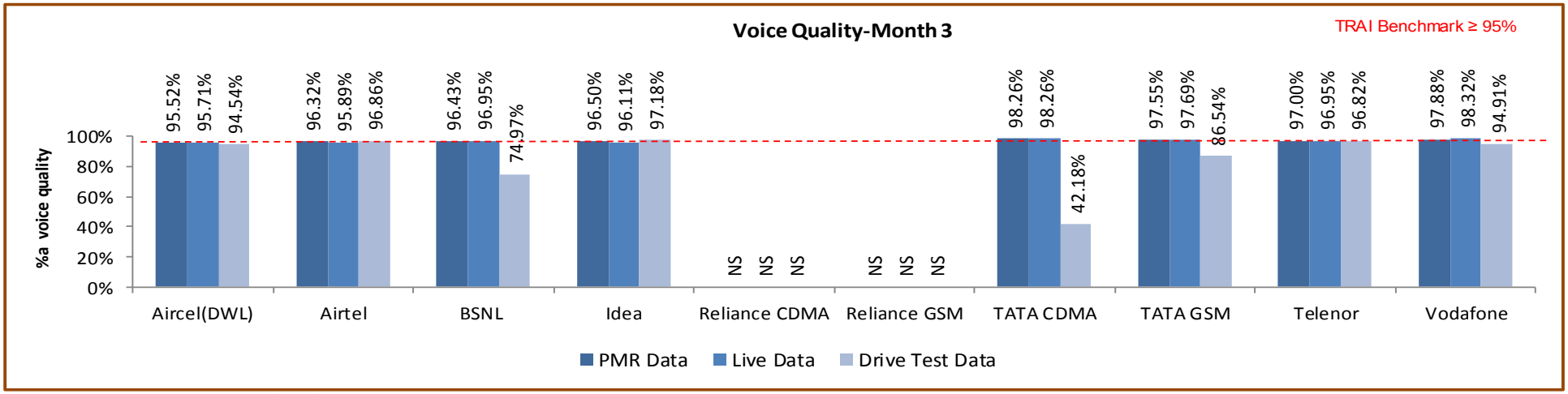
Data Source: Network Operations Center (NOC) of the operators

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 –

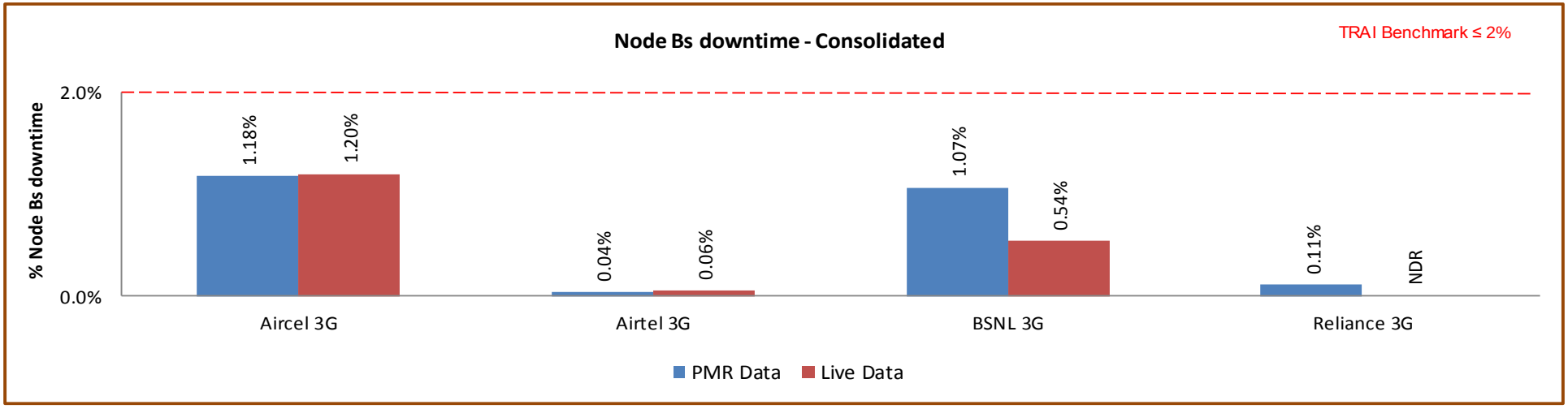
a. Node Bs downtime (not available for service) ≤ 2%

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.

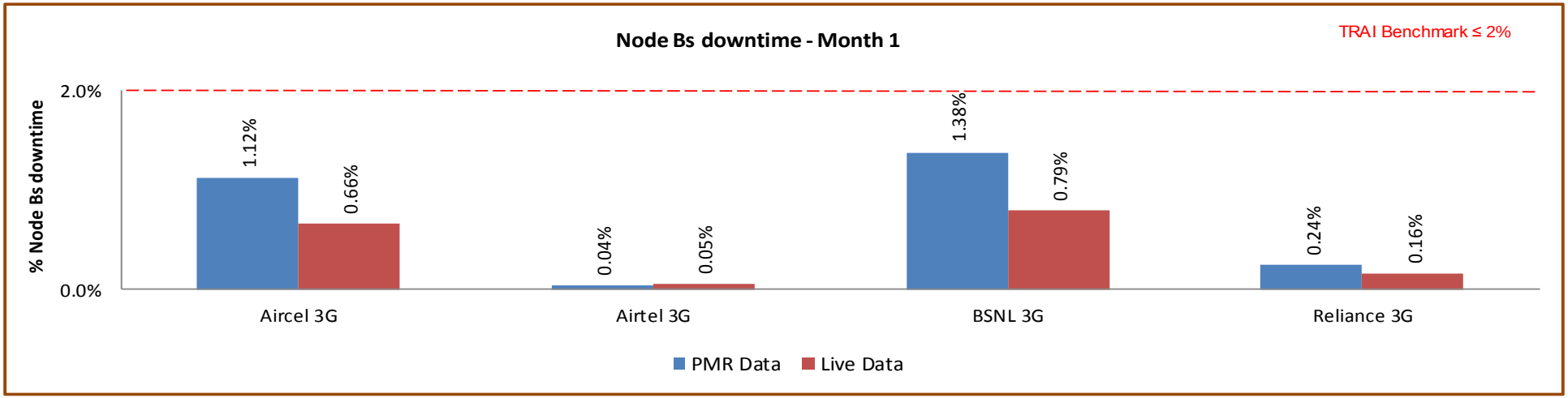
6.1.2 KEY FINDINGS - CONSOLIDATED



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

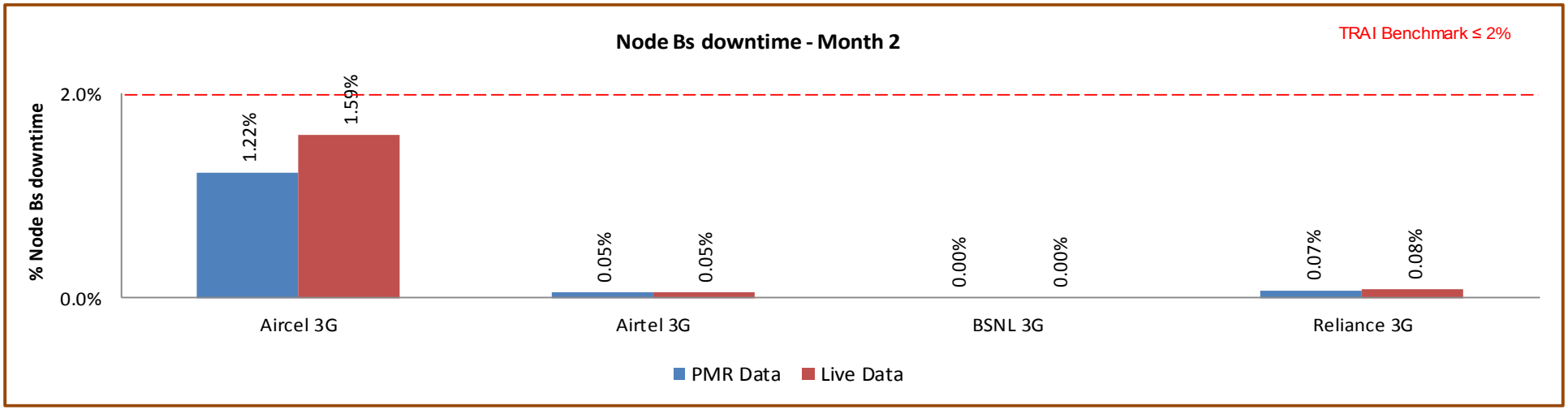
All operators met the benchmark for Node B downtime.

6.1.2.1 KEY FINDINGS – MONTH 1



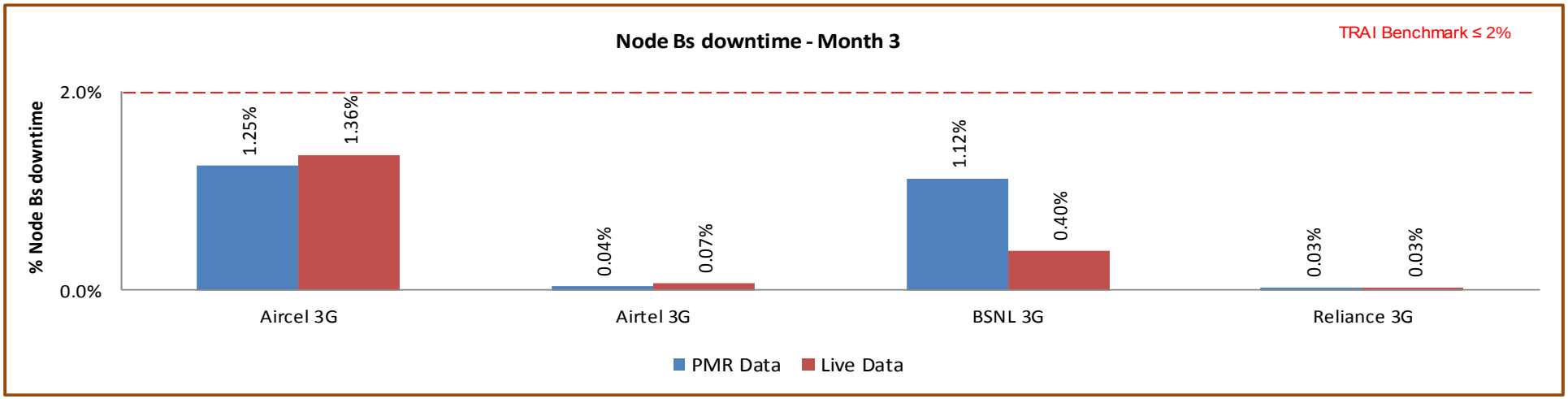
Data Source: Operations and Maintenance Center (OMC) of the operators

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.

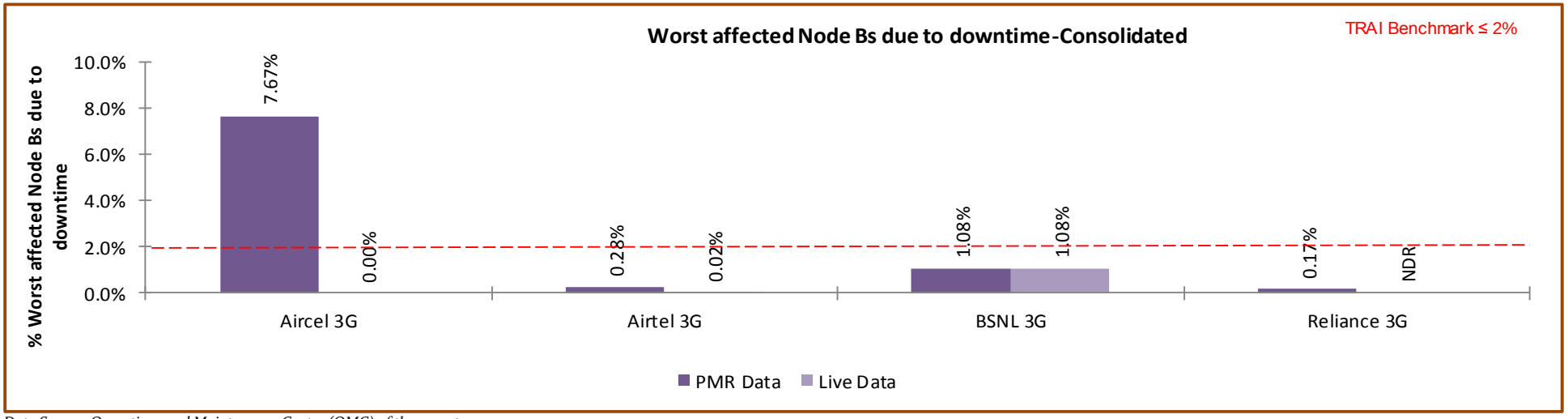
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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

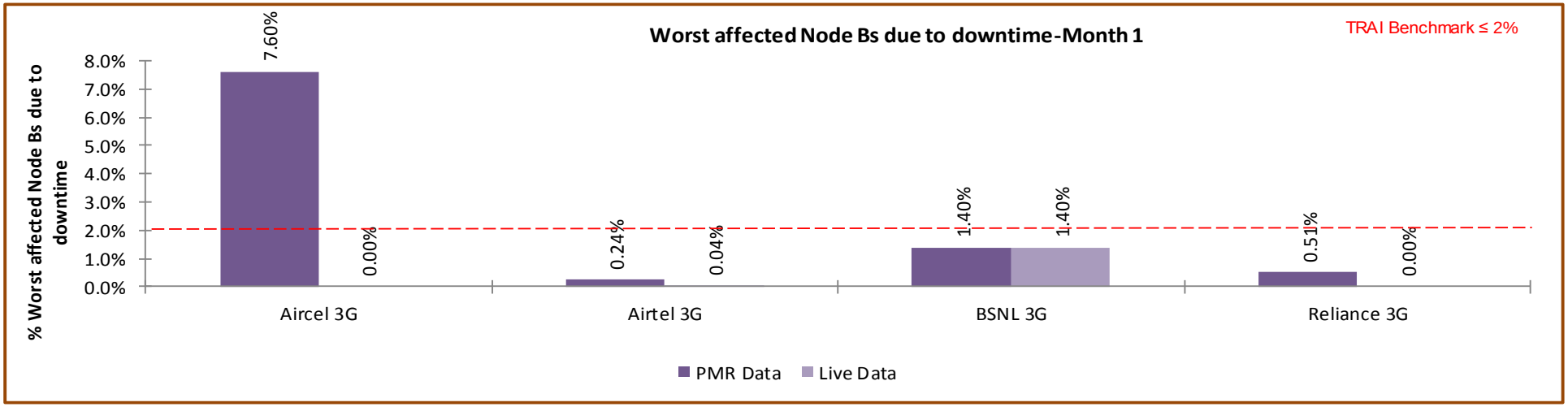


Data Source: Operations and Maintenance Center (OMC) of the operators

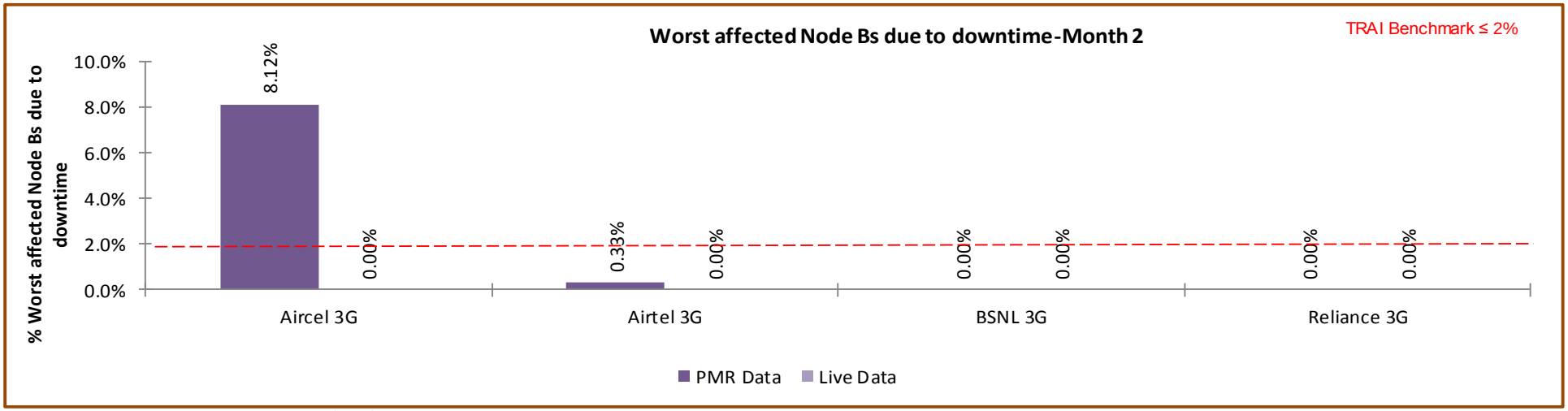
Aircel failed to meet the benchmark for worst affected BTSs due to downtime as per audit/PMR data.

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

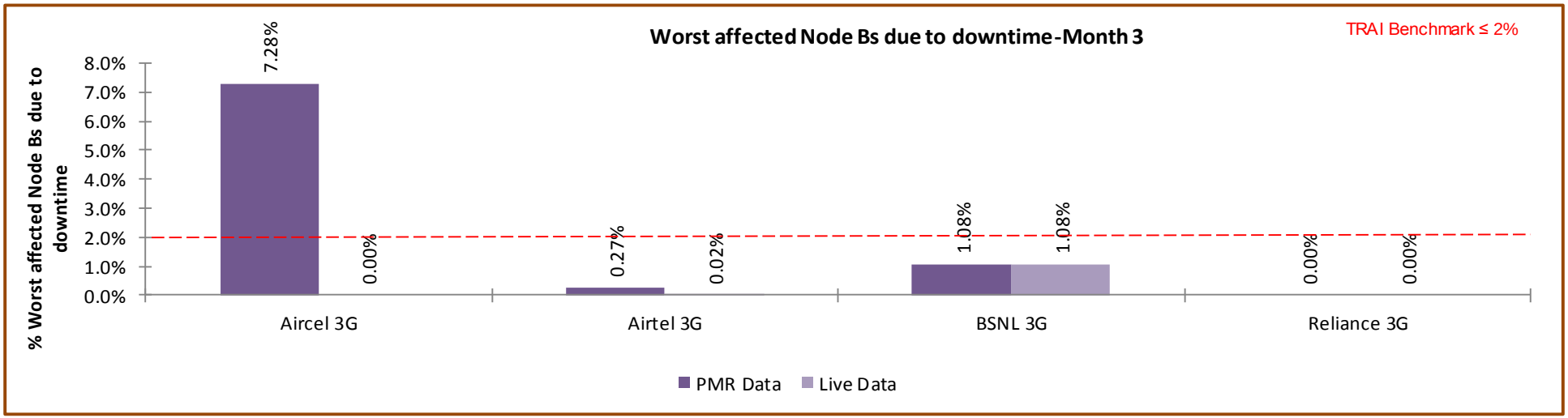


6.2.2.2 KEY FINDINGS – MONTH 2



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

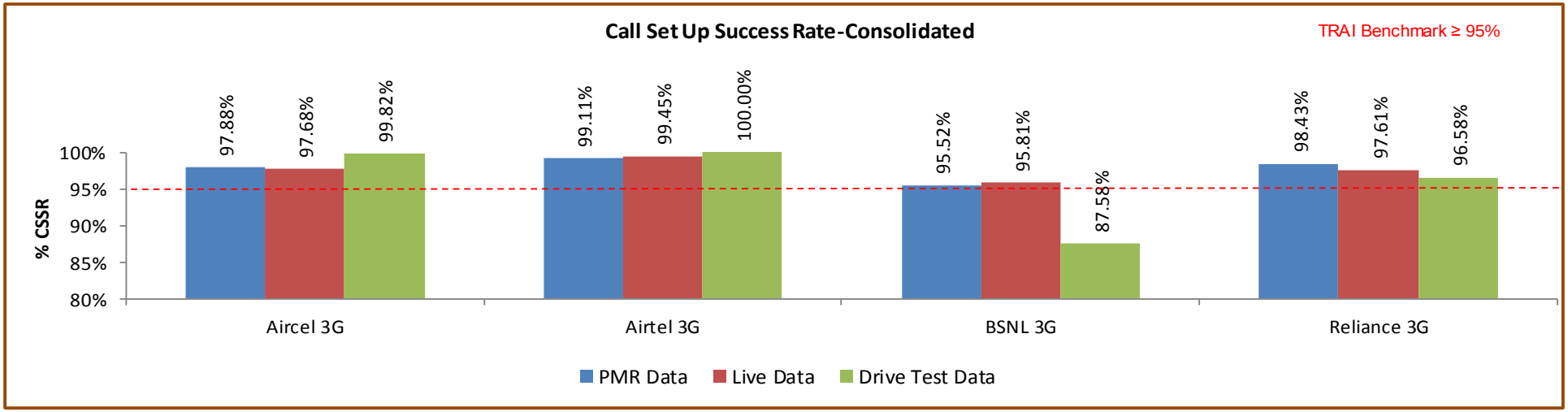
5. **TRAI Benchmark ≥** 95%

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.

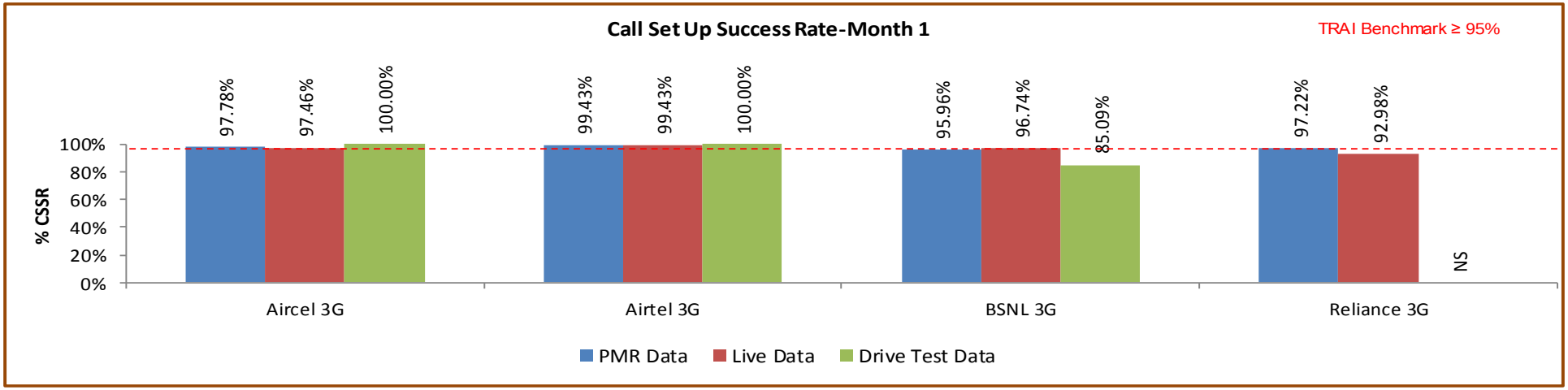
6.3.2 KEY FINDINGS - CONSOLIDATED



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

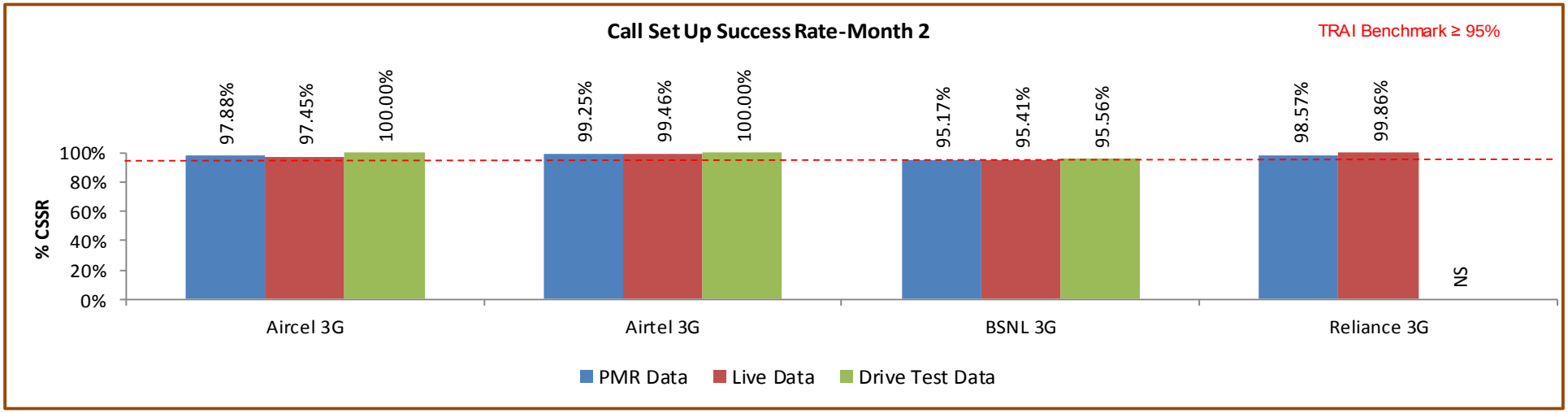
All operators met the TRAI benchmark as per audit/PMR data. During drive test BSNL 3G failed to meet the TRAI benchmark.

6.3.2.1 KEY FINDINGS – MONTH 1



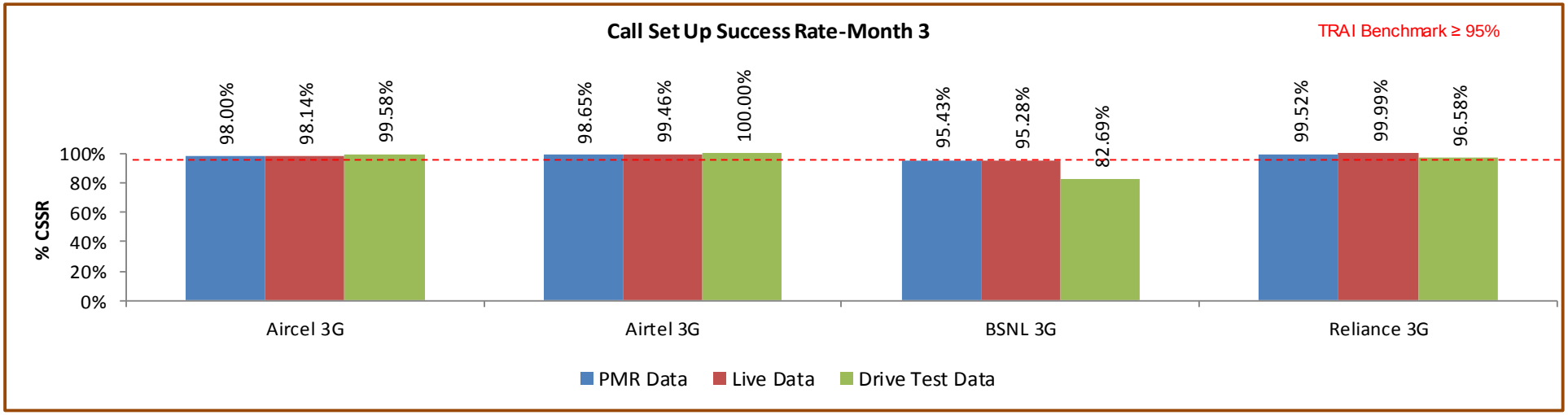
Data Source: Network Operations Center (NOC) of the operators

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

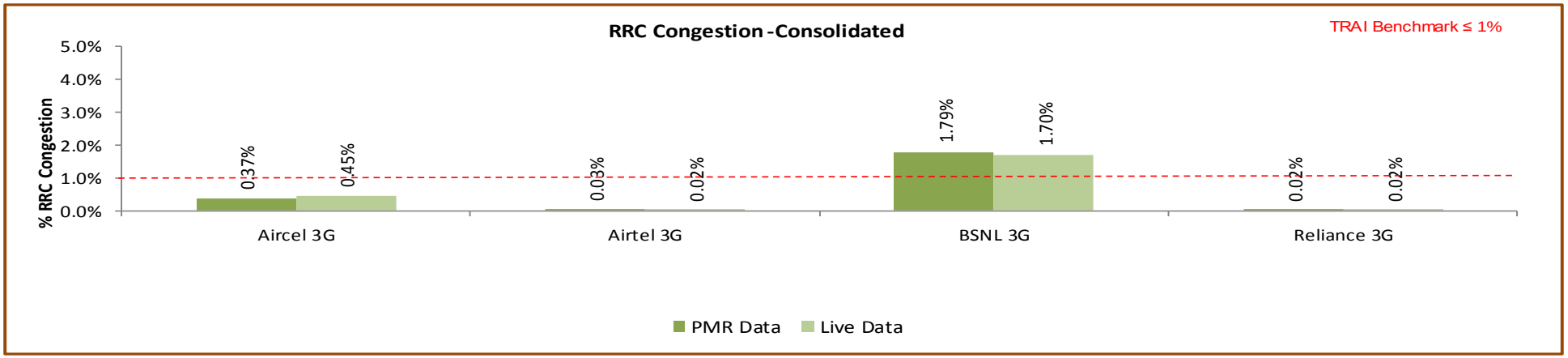
7. Benchmark:

- 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

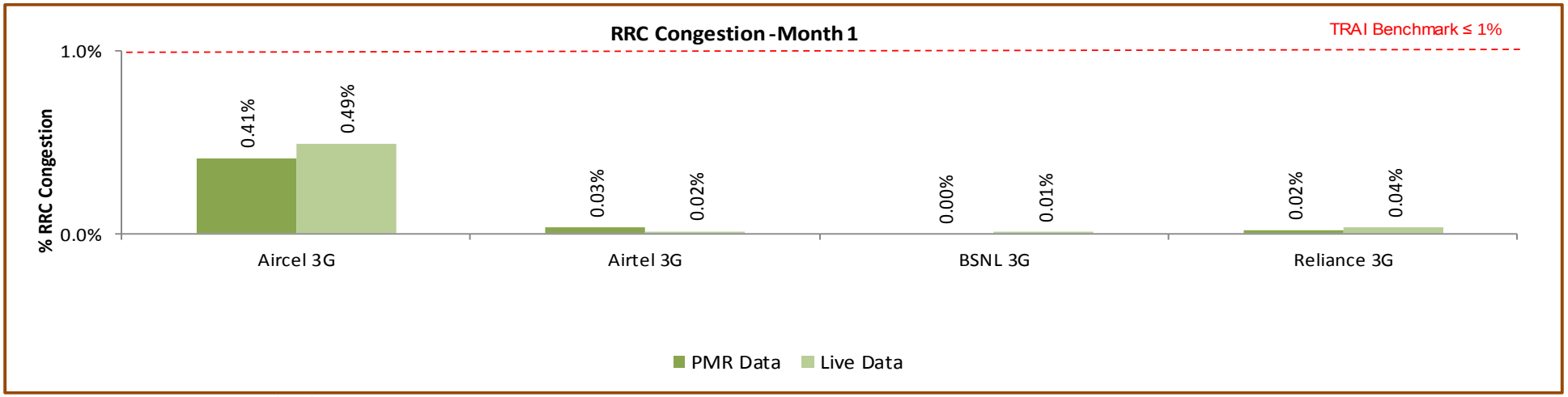
6.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



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

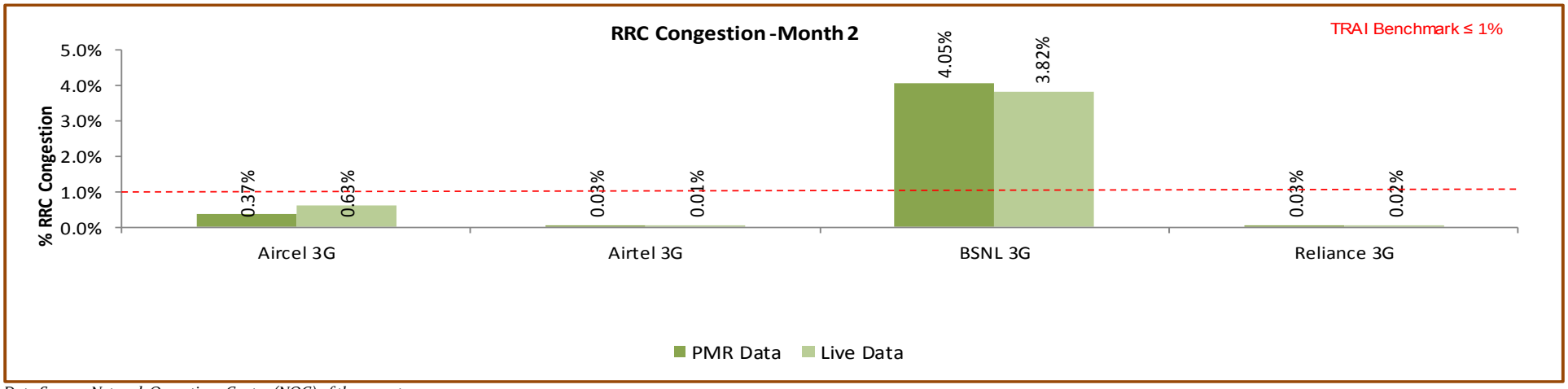
BSNL 3G failed to meet the TRAI benchmark for RRC congestion.

6.4.2.1 KEY FINDINGS – MONTH 1



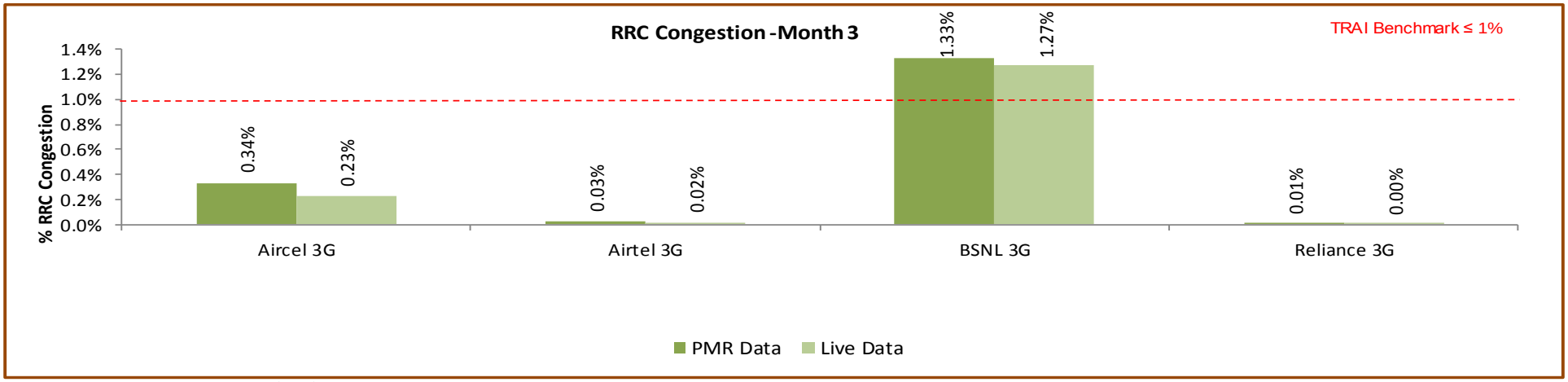
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



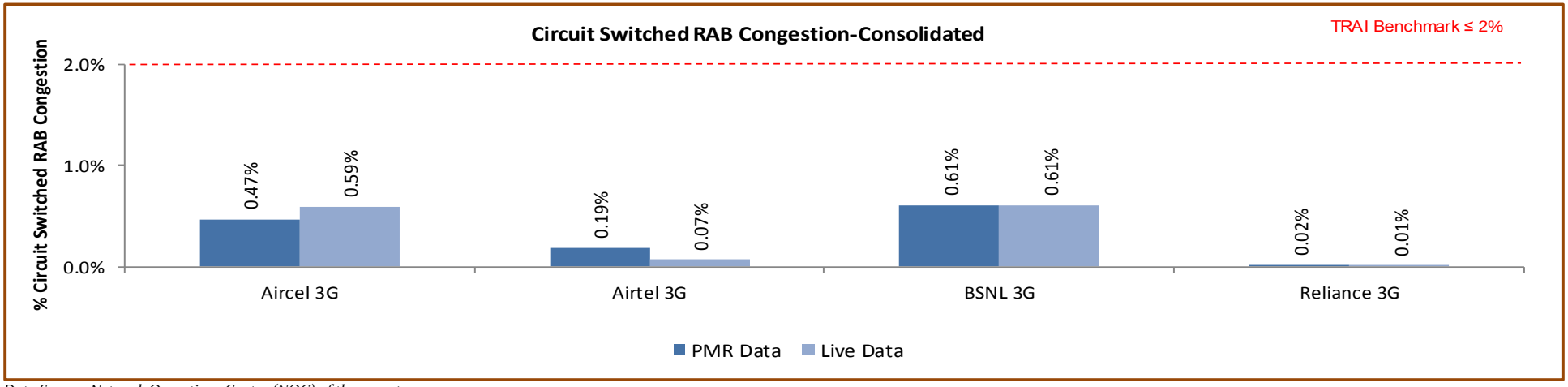
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3



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

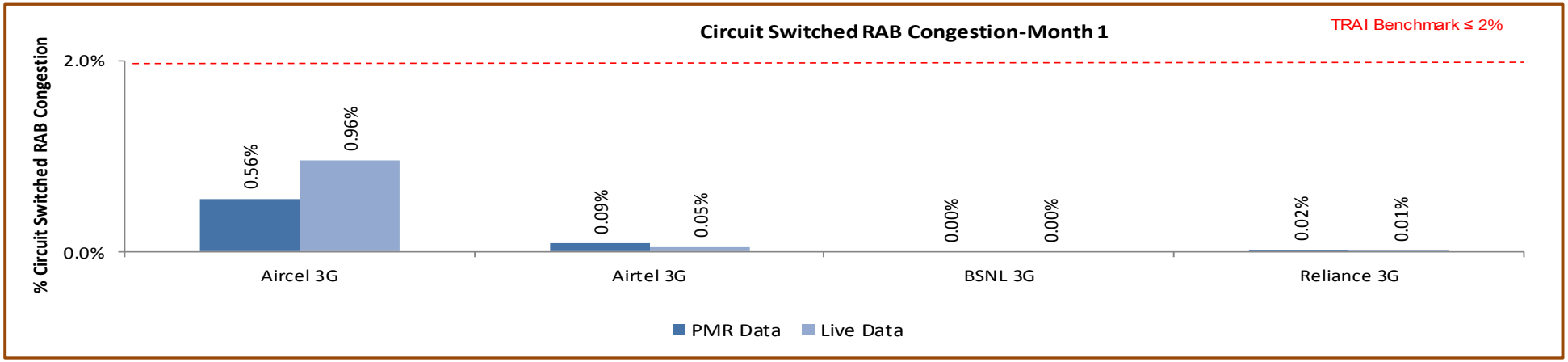
6.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)



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

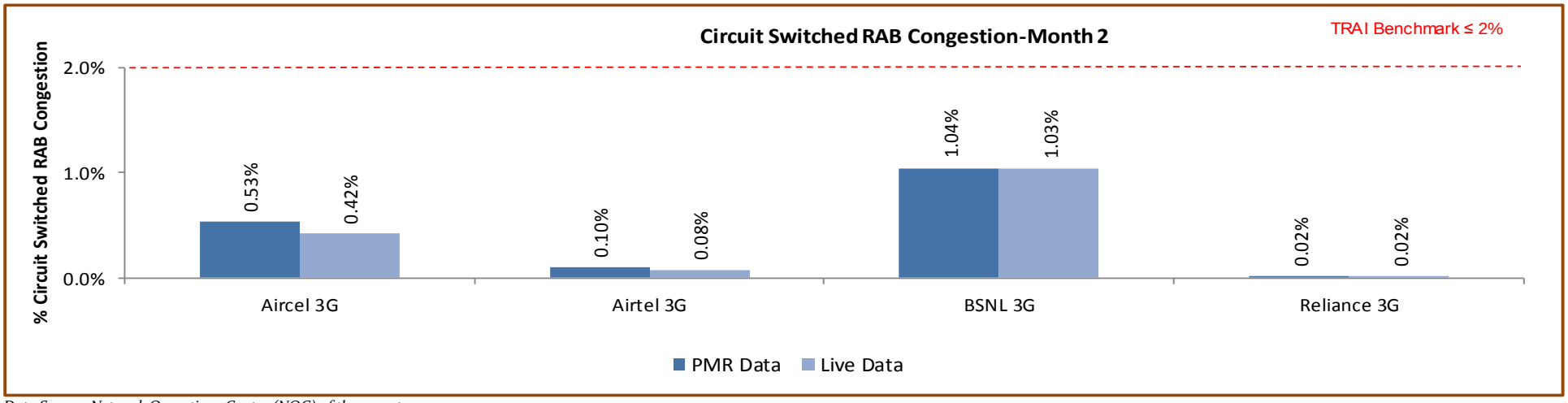
All operators met the benchmark as per audit/PMR report and live data.

6.4.3.1 KEY FINDINGS – MONTH 1



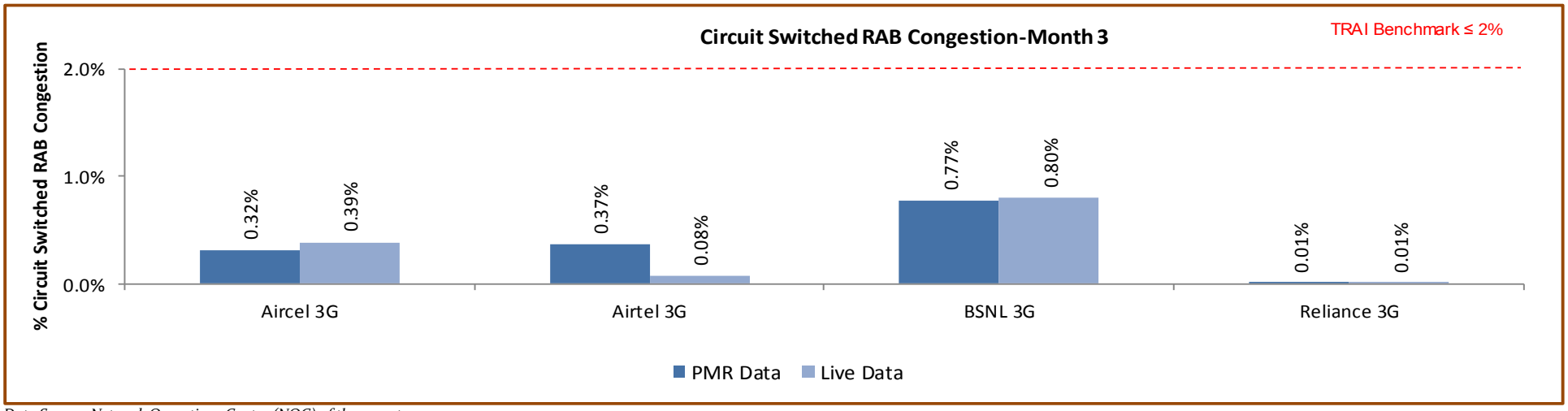
Data Source: Network Operations Center (NOC) of the operators

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 3G**	**Reliance 3G**
Total number of working POIs		48	824	28	180
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		393764	2262596	62152	102816
Traffic served for all POIs (B)- in erlangs		248991	2650751	0	23442
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	824	28	178
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		391899	1563966	62152	311442
Traffic served for all POIs (B)- in erlangs		117895	1036999	0	71946
POI congestion	≤ 0.5%	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.

6.4.4.1 KEY FINDINGS – MONTH 1

Audit Results for POI Congestion- PMR data-July					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	817	42	171
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131207	784934	31076	101426
Traffic served for all POIs (B)- in erlangs		87398	1693678	0	22816
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	817	42	171
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131114	744519	31076	100309
Traffic served for all POIs (B)- in erlangs		39931	480426	0	22588
POI congestion	≤ 0.5%	0.00%	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-August					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	825	21	198
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133057	734862	15538	102820
Traffic served for all POIs (B)- in erlangs		85105	476664	0	23488
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	825	21	198
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133043	81809	15538	102547
Traffic served for all POIs (B)- in erlangs		39872	65501	0	23484
POI congestion	≤ 0.5%	0.00%	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-September					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	829	21	171
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129500	742799	15538	104203
Traffic served for all POIs (B)- in erlangs		76488	480410	0	24022
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	829	21	165
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		127742	737638	15538	108586
Traffic served for all POIs (B)- in erlangs		38091	491071	0	25873
POI congestion	≤ 0.5%	0.00%	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

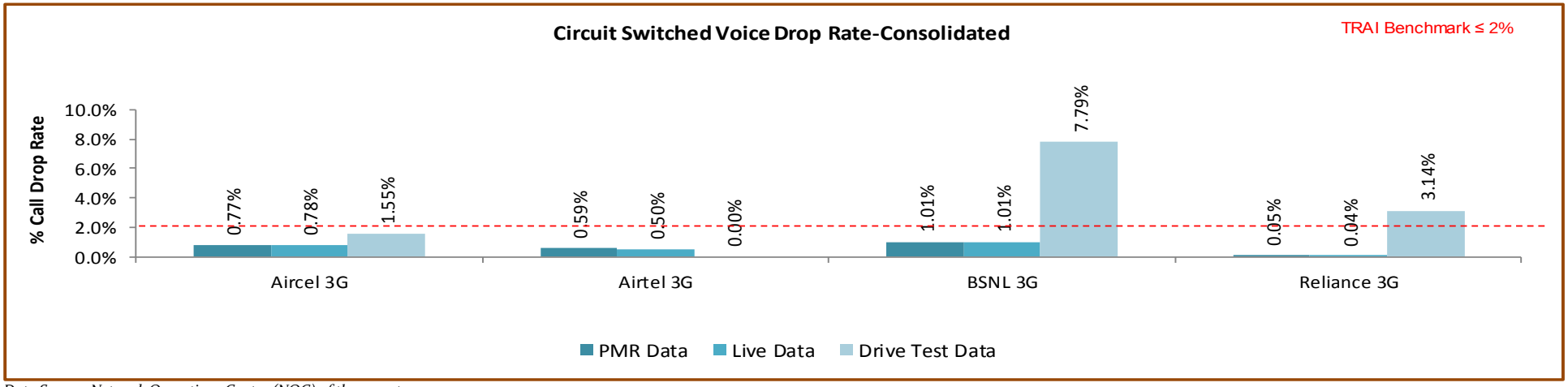
5. **TRAI Benchmark –**

   - 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.

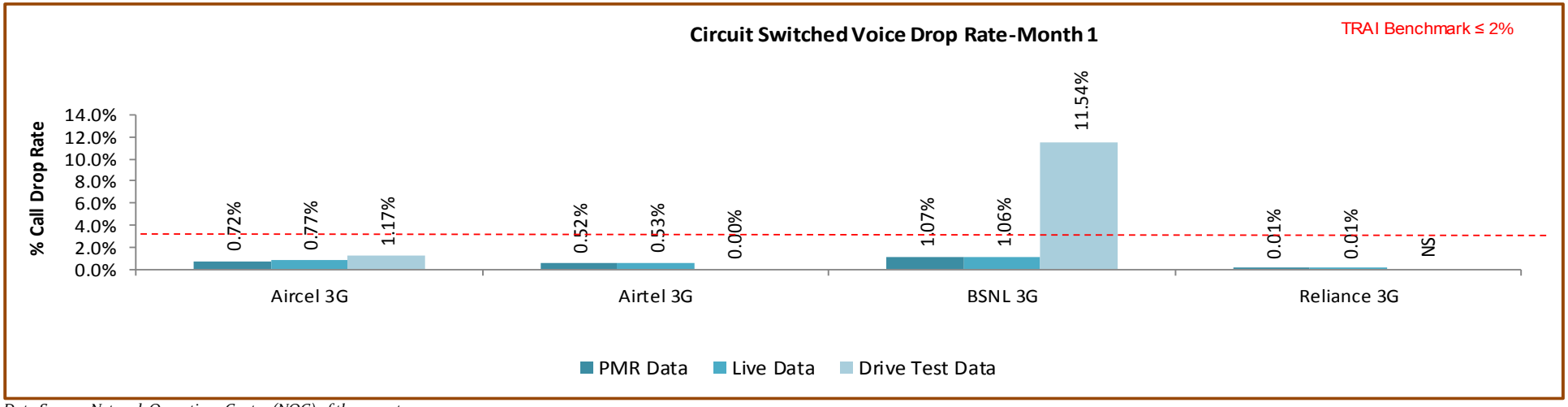
6.5.2 KEY FINDINGS - CONSOLIDATED



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

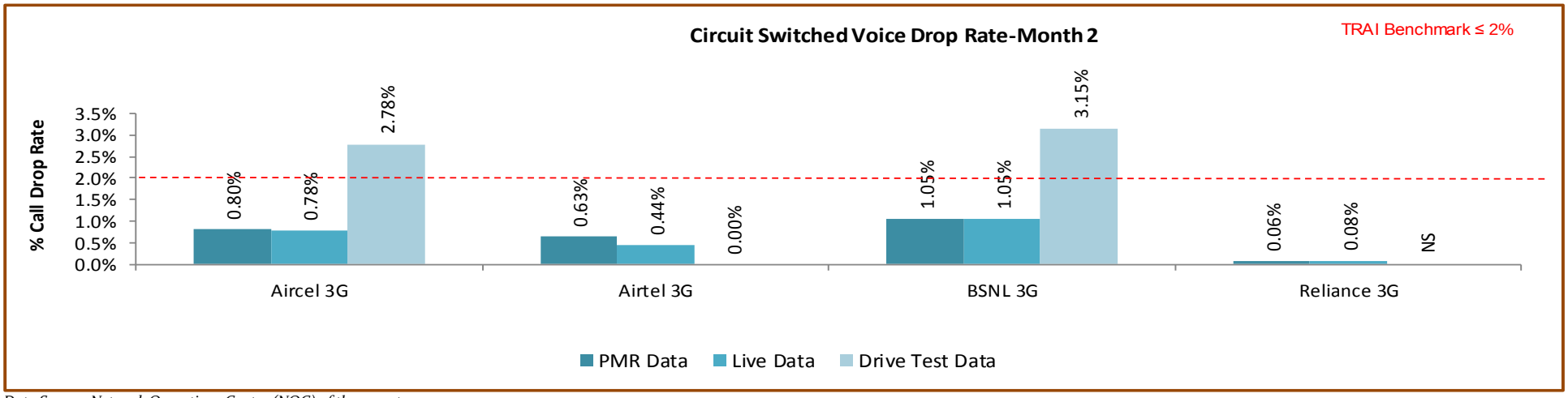
All operators met the benchmark for call drop rate during audit. During drive test BSNL 3G and Reliance 3G failed to meet the TRAI benchmark.

6.5.2.1 KEY FINDINGS – MONTH 1



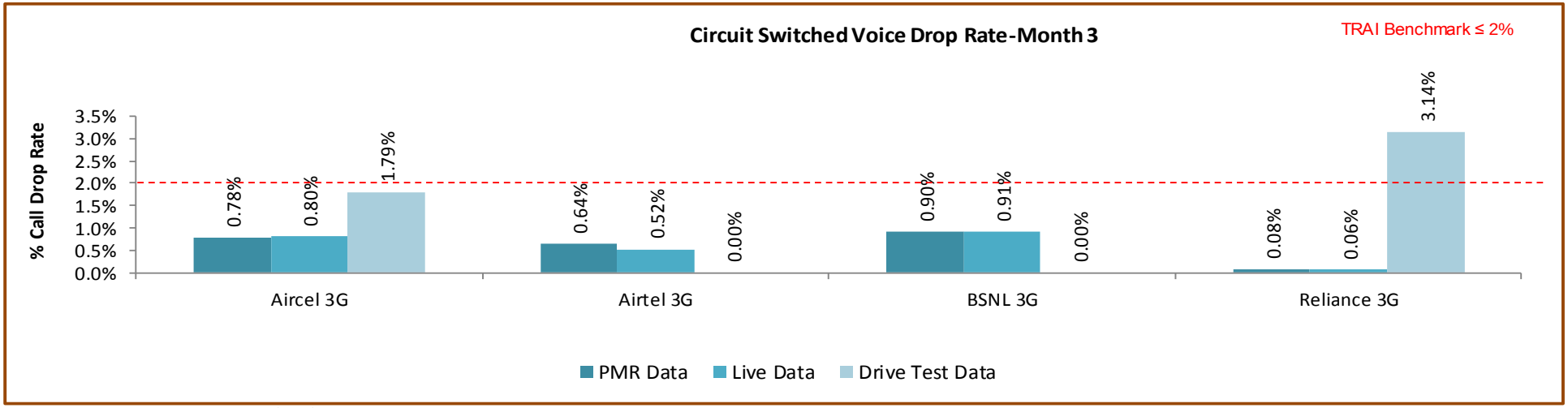
Data Source: Network Operations Center (NOC) of the operators

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** –

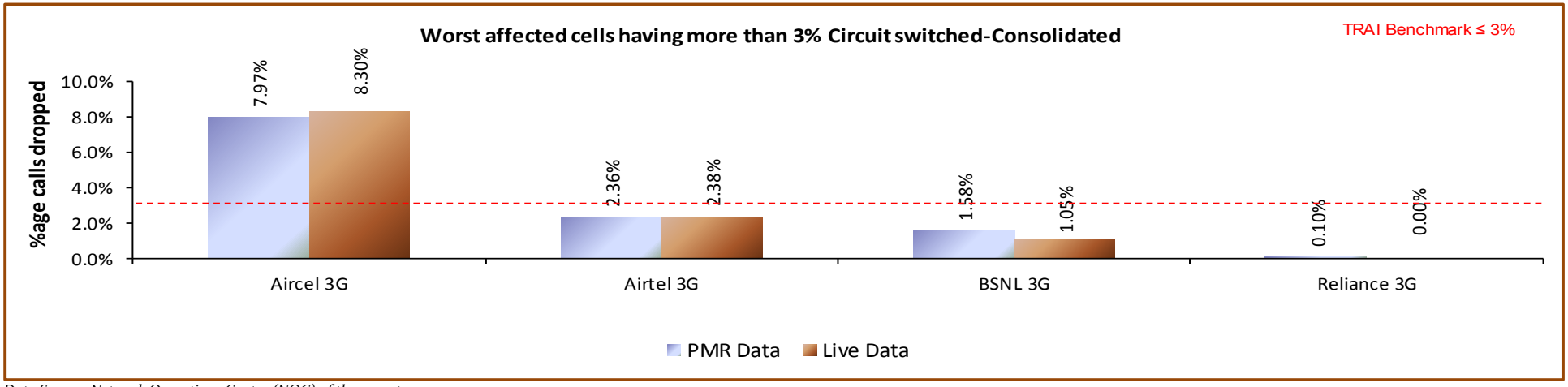
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

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.

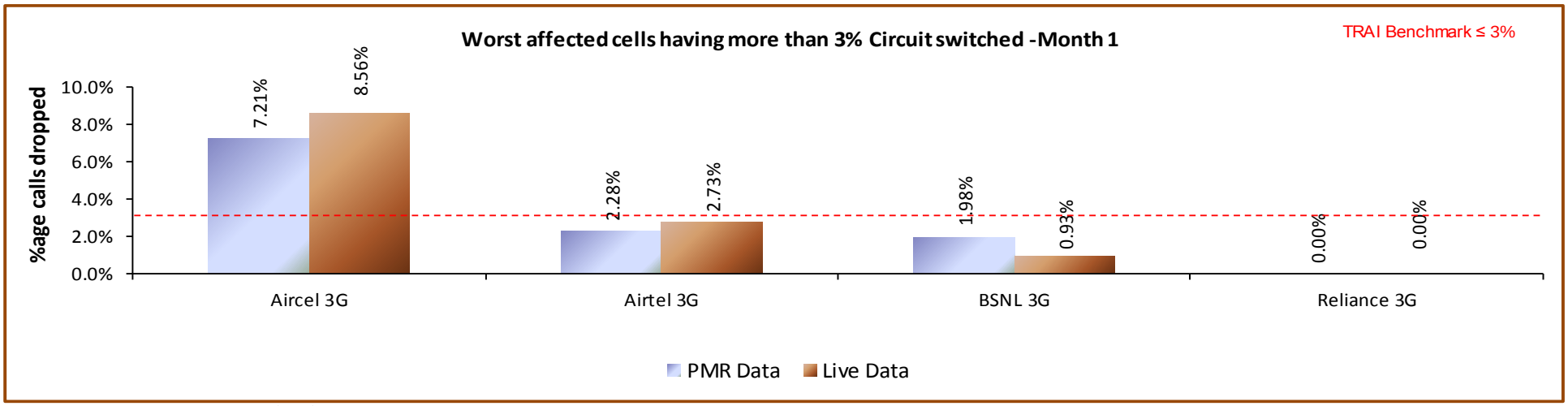
6.6.2 KEY FINDINGS - CONSOLIDATED



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

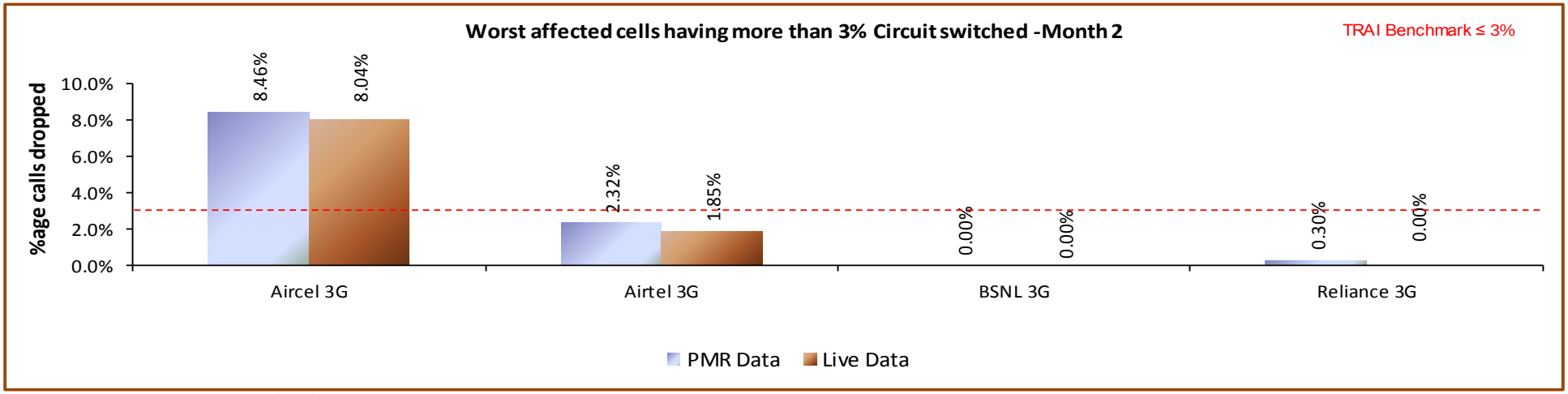
Aircel 3G failed to meet the benchmark during PMR and live audit

6.6.2.1 KEY FINDINGS – MONTH 1



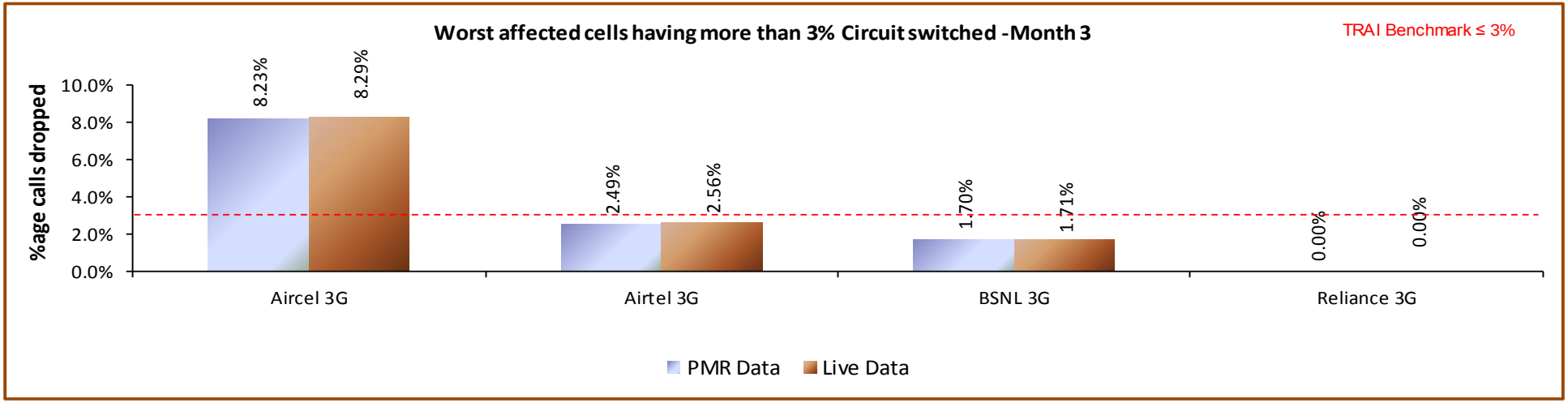
Data Source: Network Operations Center (NOC) of the operators

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**

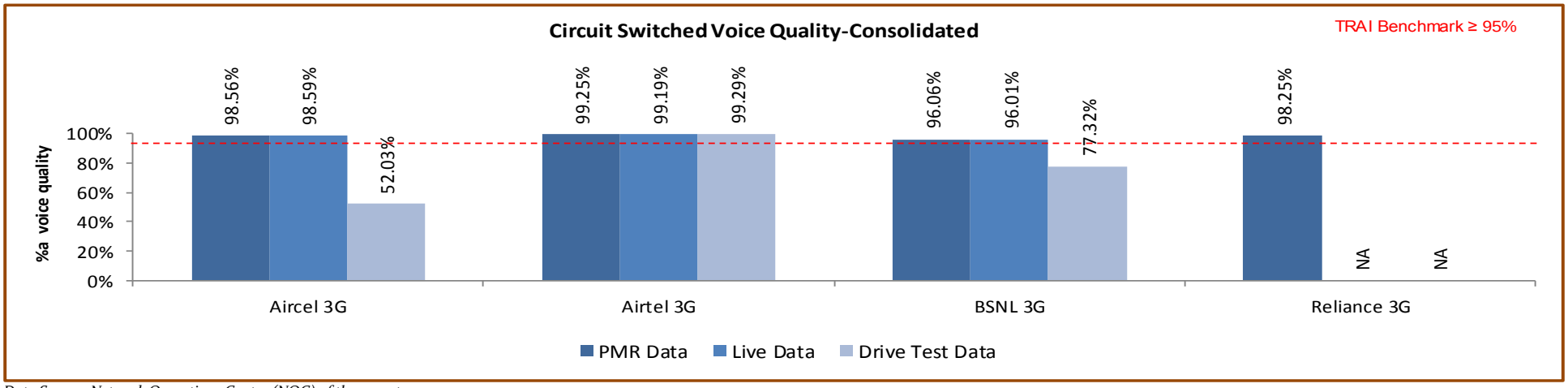
7. **TRAI Benchmark:** ≥ 95%

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.

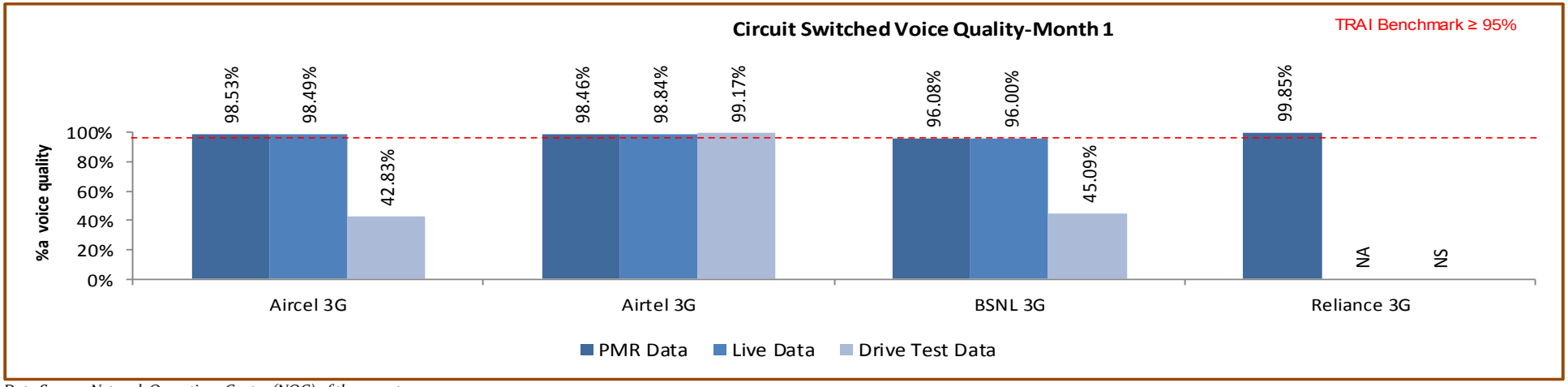
6.7.2 KEY FINDINGS



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

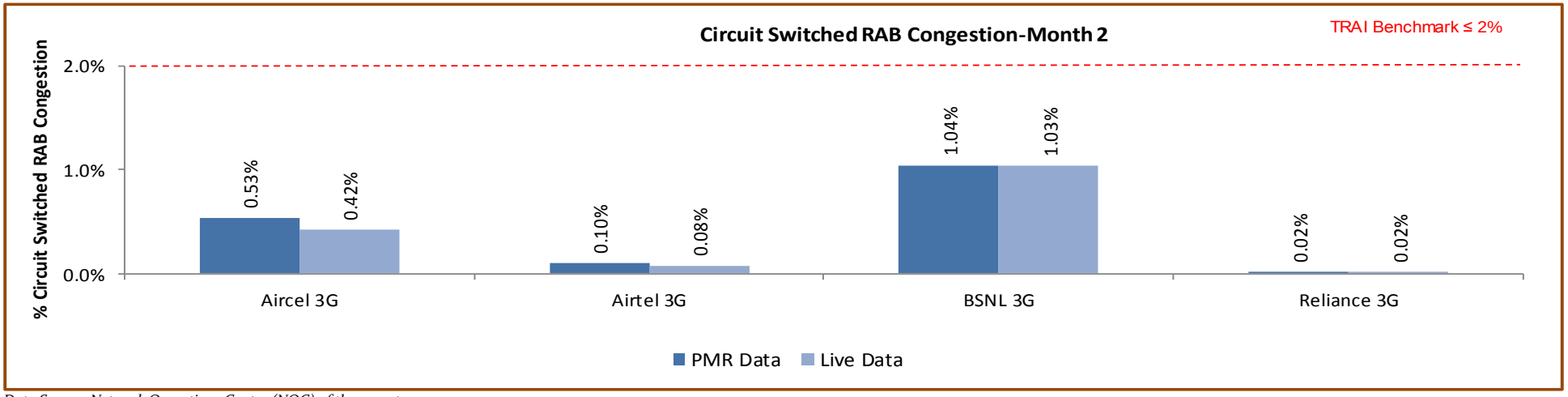
All operators met the TRAI benchmark as per PMR audit. During drive test Aircel 3G and BSNL 3G failed to meet the TRAI benchmark.

6.7.2.1 KEY FINDINGS – MONTH 1



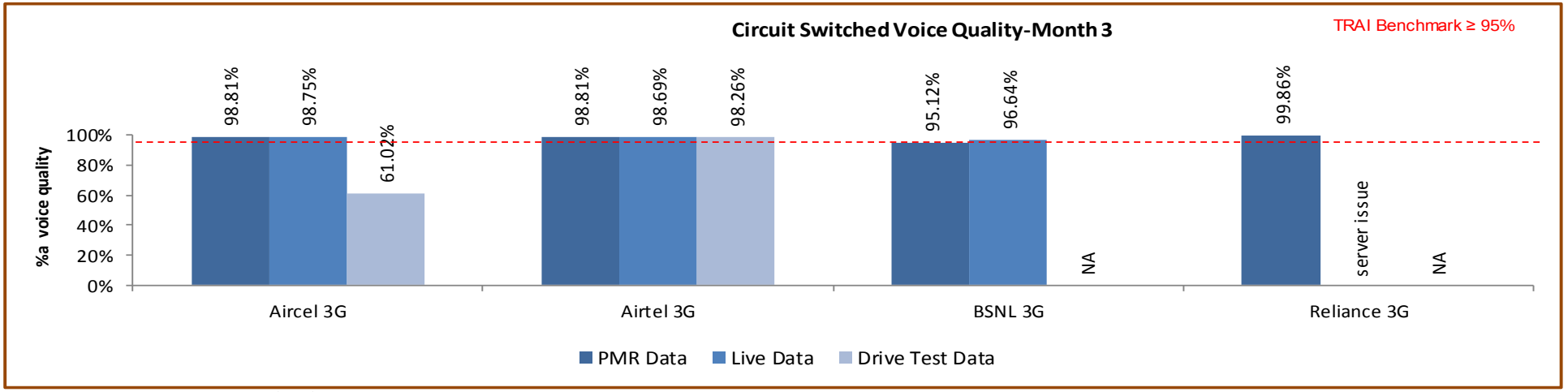
Data Source: Network Operations Center (NOC) of the operators

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

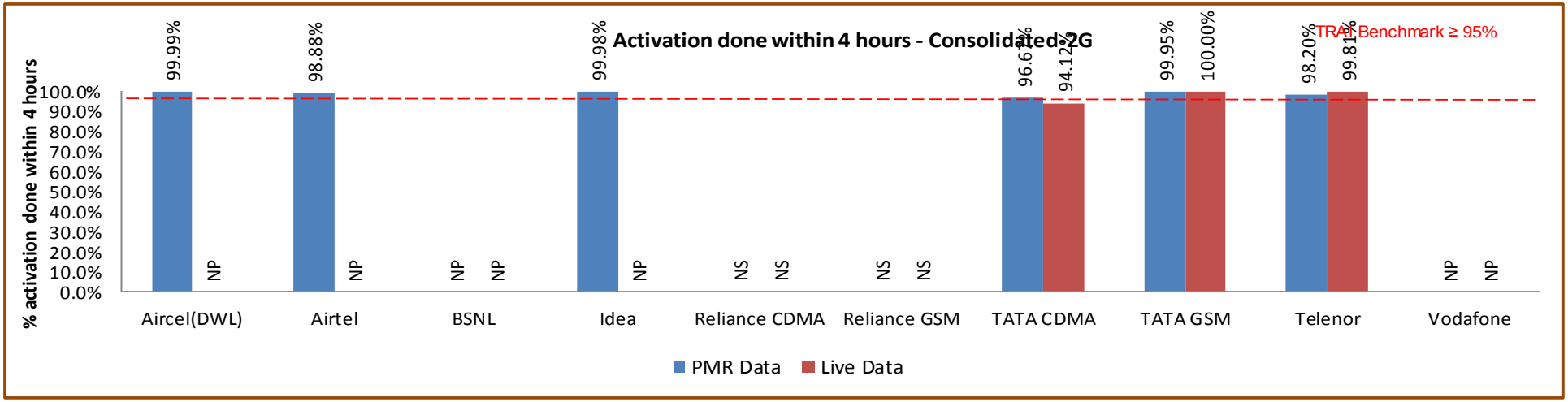
7.1.1 PARAMETER DESCRIPTION

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.

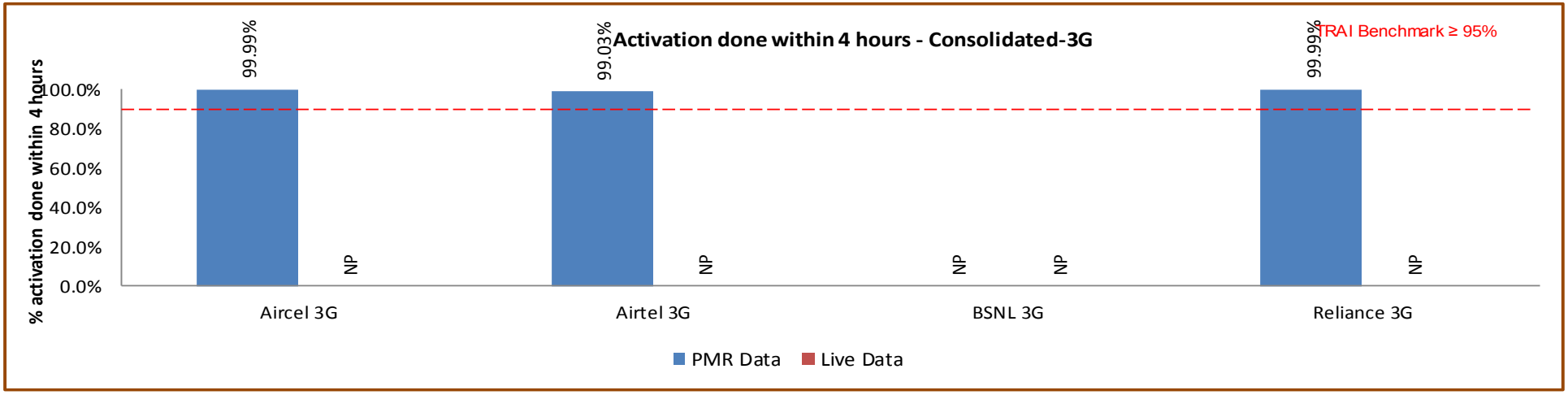
$$\textbf{\% activation done within 4 hours} = \frac{\text{Total Time Taken for Activation}}{\text{Total request time made}} \times 100$$

Benchmark :- >=95%

7.1.2 KEY FINDINGS



Tata CDMA failed to meet the benchmark during audit for 2G in live data



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

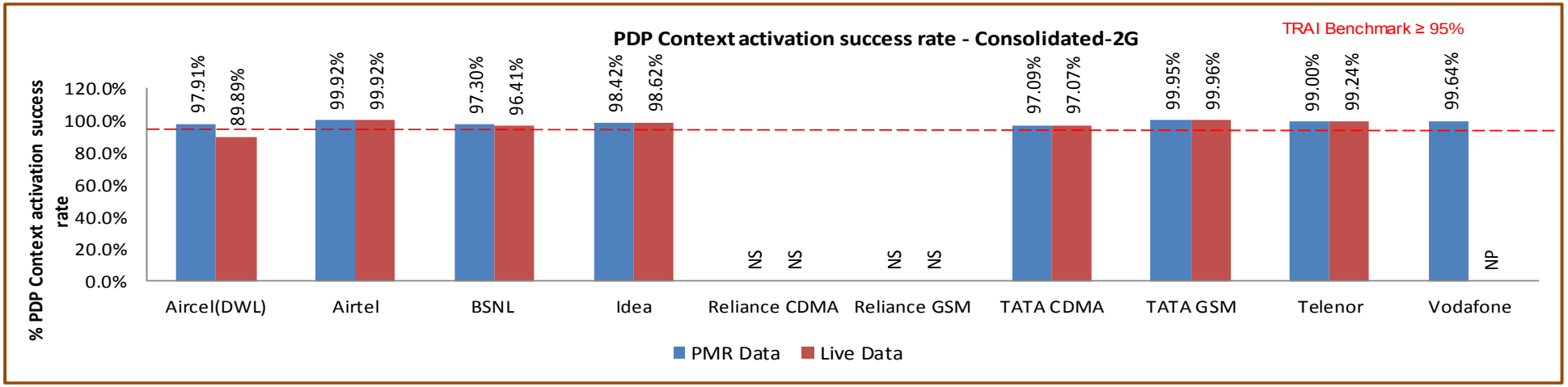
This measurement provides the number of successfully completed PDP context activations. For these context activations, the GGSN is updated successfully and a report of PDP context activation success is generated at GGSN.

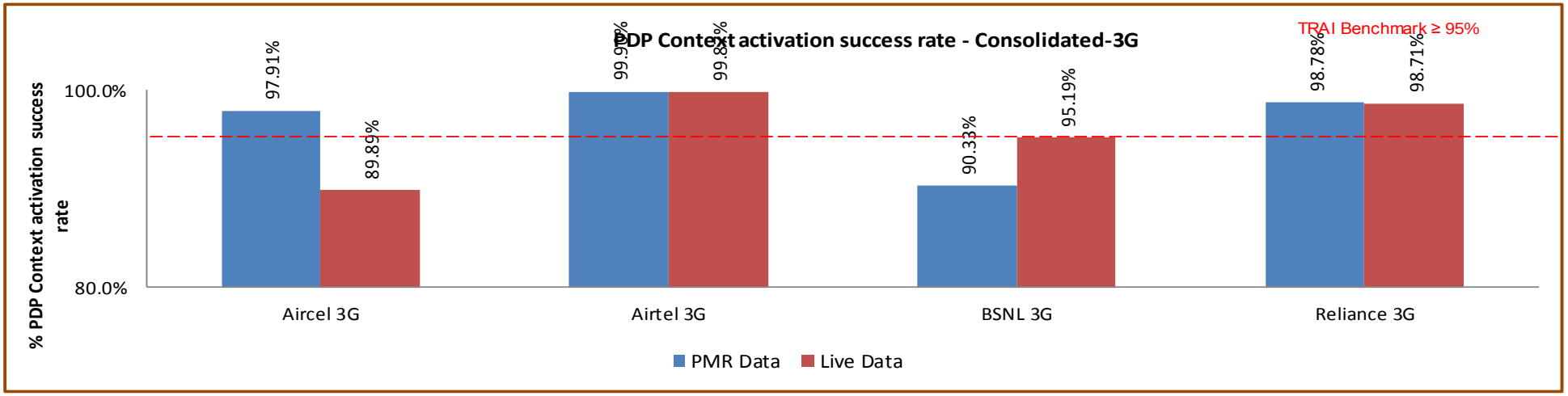
PDP Context Activation Success Rate (%) =

$$\frac{\text{Number of successfully completed PDP context activations}}{\text{Total attempts of context activation}} \times 100$$

Benchmark: >=95%

7.2.2 KEY FINDINGS





Aircel failed to meet the benchmark for PDP context activation success rate during live data audit for 2G & 3G; however BSNL failed during live audit.

7.3 DROP RATE FOR 2G & 3G

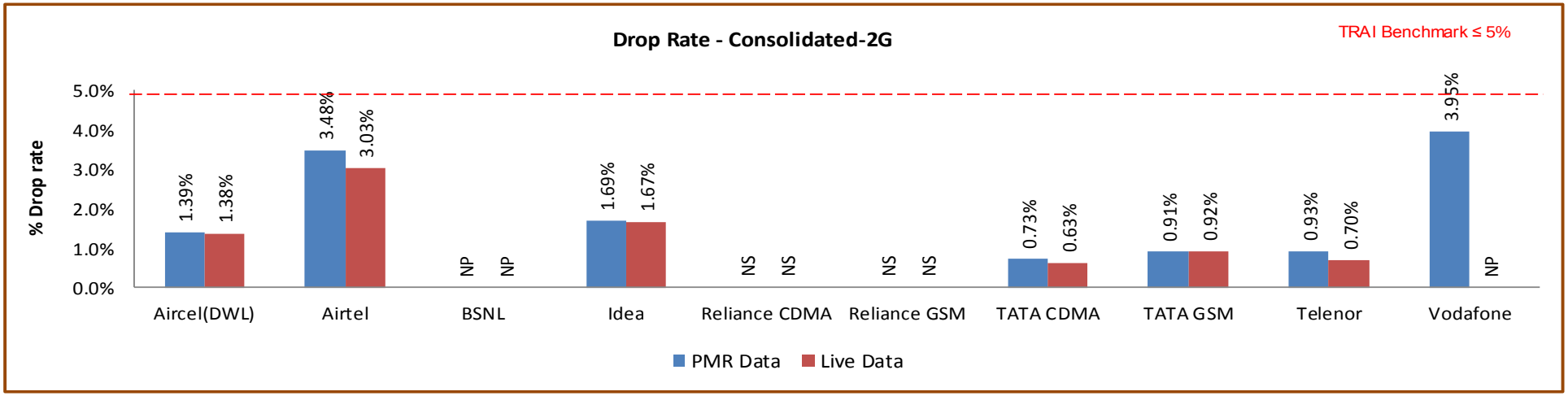
7.3.1 PARAMETER DESCRIPTION

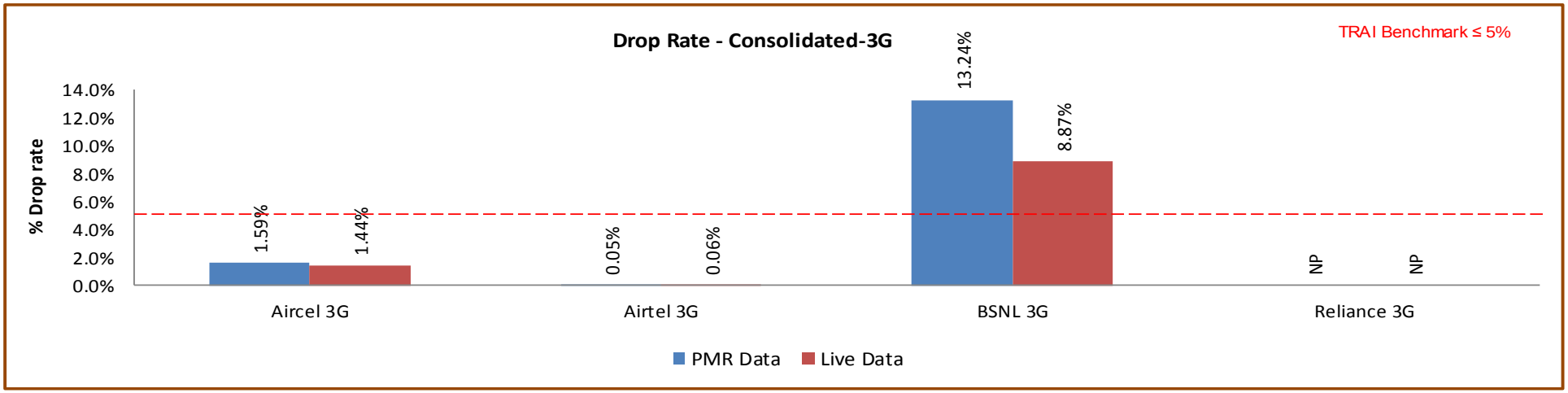
It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects (both normal and abnormal). An abnormal disconnect may happen because of Radio Link Failures, Uplink (UL) or Downlink (DL) interference, bad coverage, unsuccessful 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





BSNL 3G failed to meet the benchmark for drop rate during PMR and live data 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

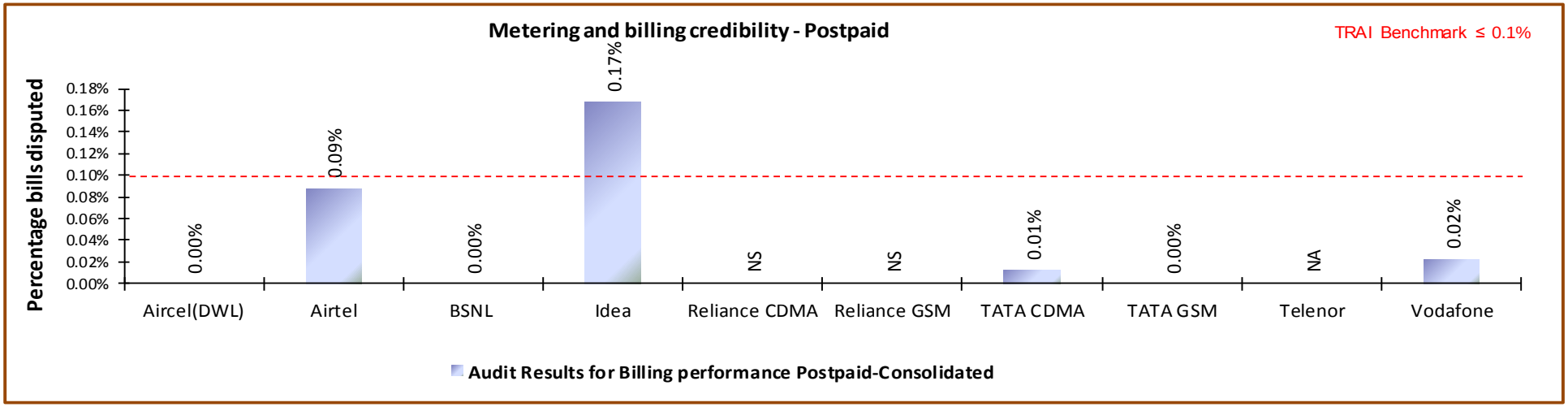
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

- 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.

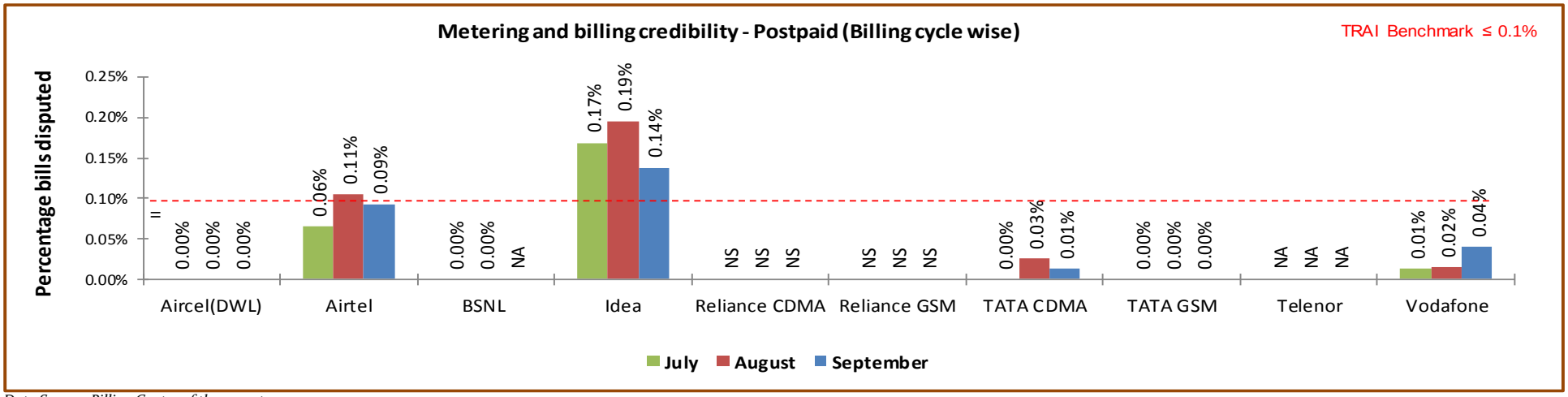
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would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

8.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



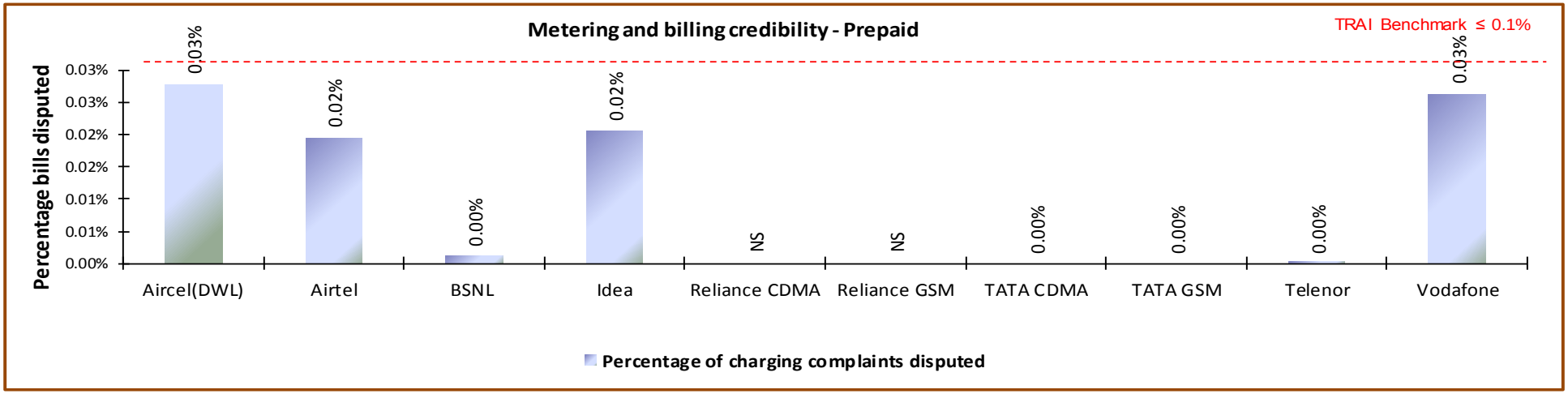
Data Source: Billing Center of the operators

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:

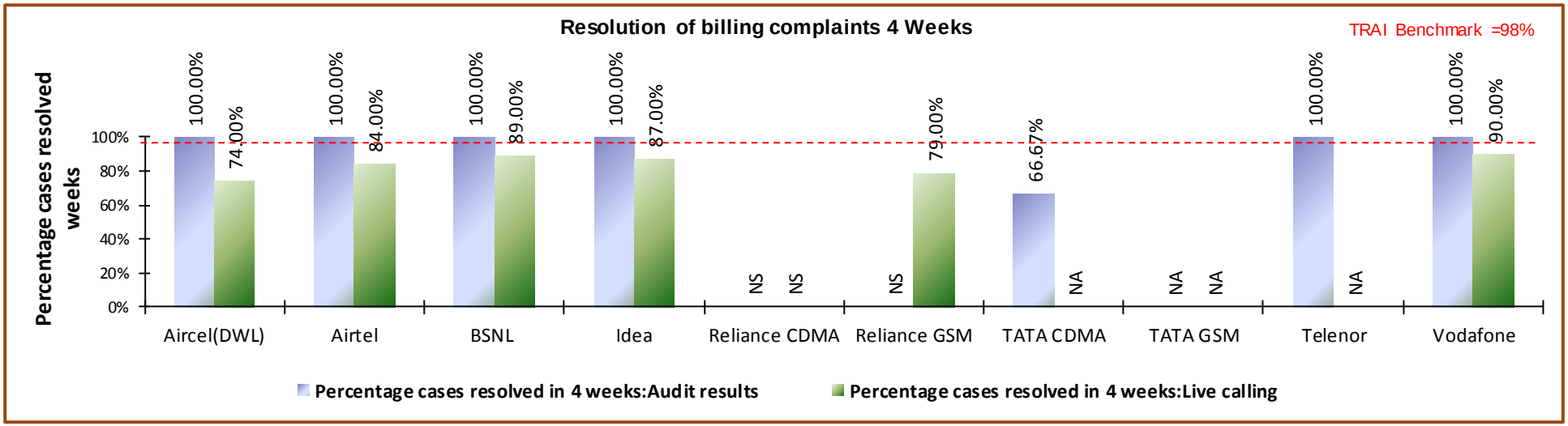
%age of billing complaints (for post-paid customers)/ charging, credit & validity (for pre-paid customers) resolved within 6 weeks =

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

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

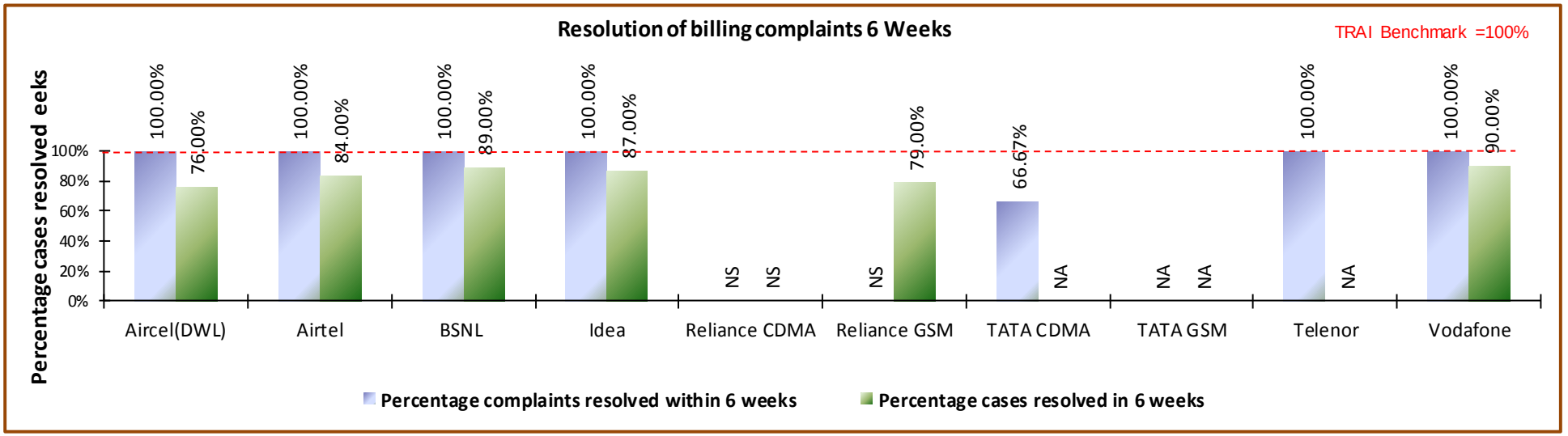
Benchmark: 98% complaints resolved within 4 weeks, 100% within 6 weeks.

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

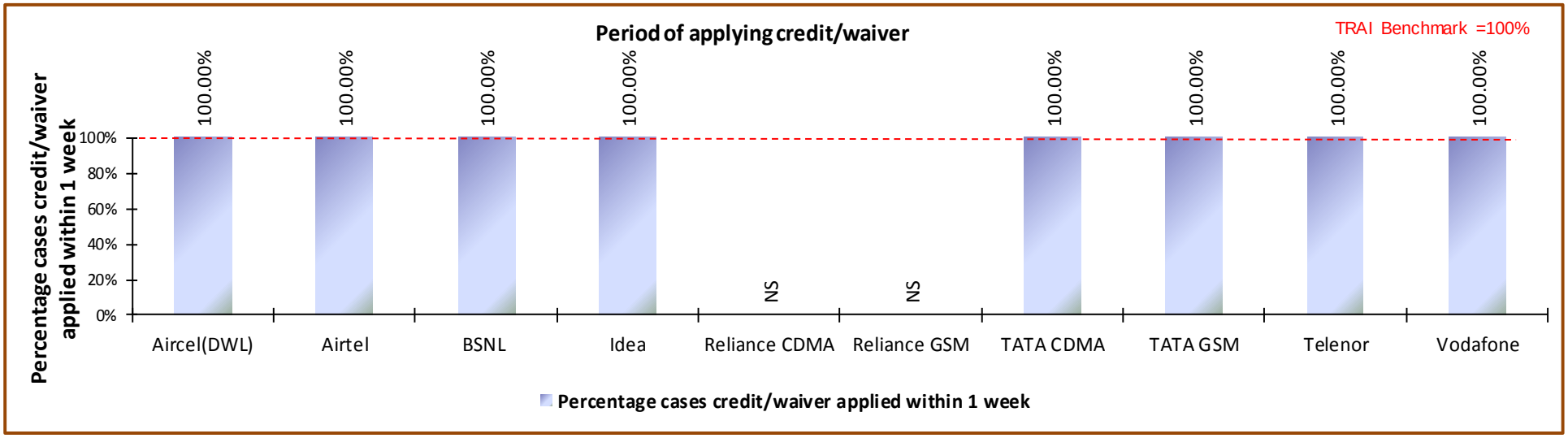
Tata CDMA failed to meet the TRAI benchmark of resolution of billing complaints within 4 and 6 weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the benchmark.

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

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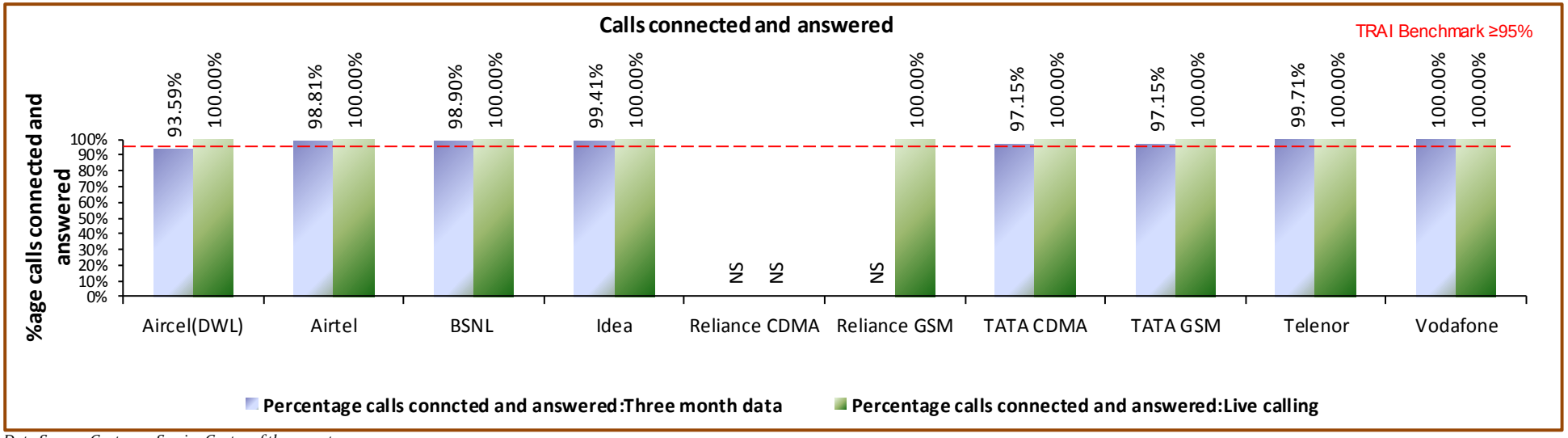


Data Source: Customer Service Center of the operators

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

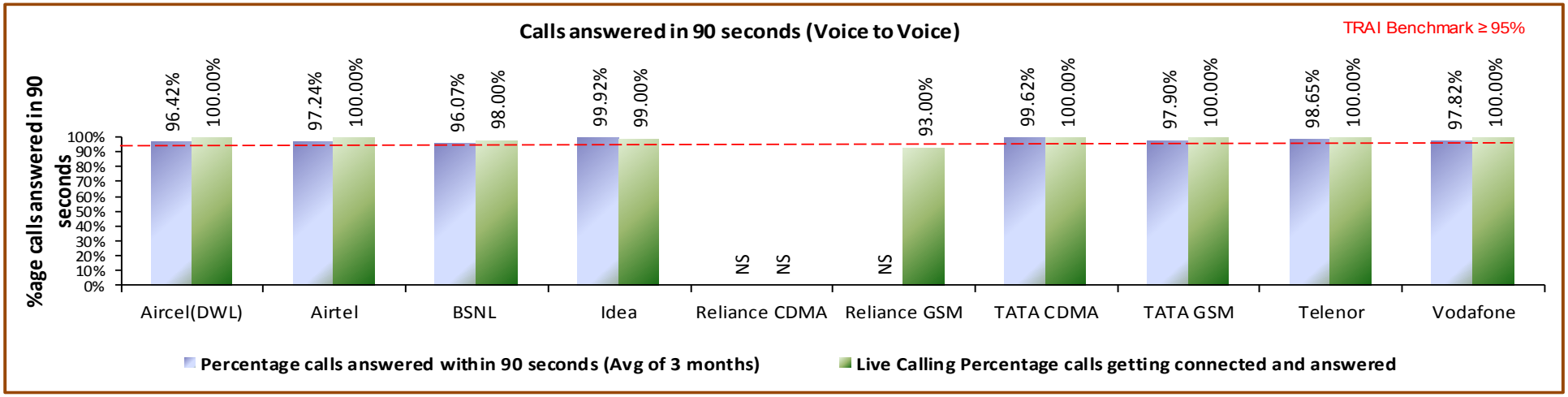
8.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

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

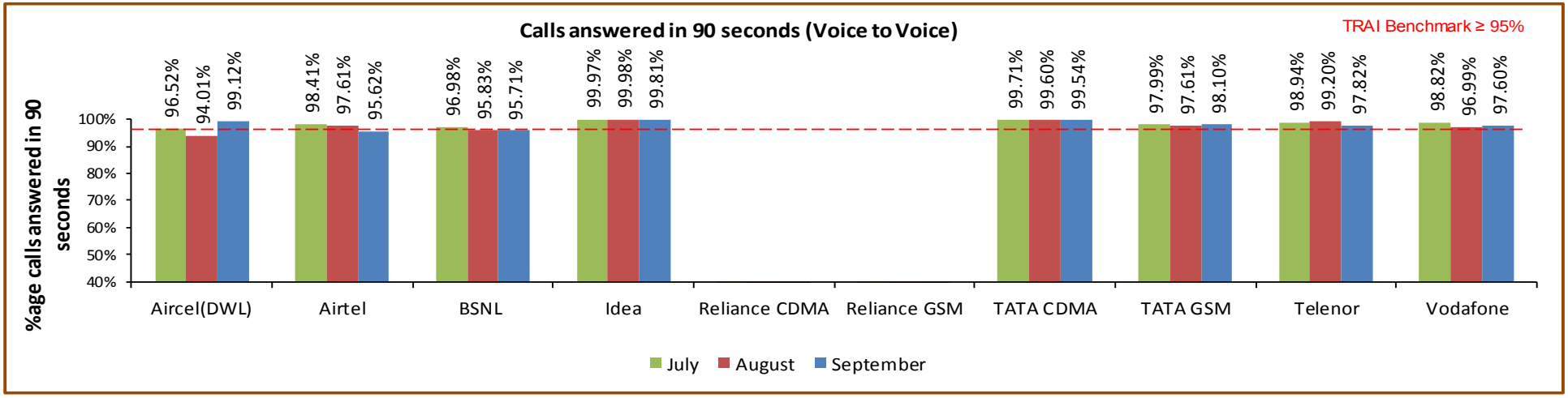
Benchmark: 95% calls to be answered within 90 seconds

8.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Reliance GSM failed to meet the benchmark as per audit/ Percentage calls answered within 90 seconds (Avg. of 3 months). However, as per live calling done to customers, the performance of all operators met the benchmark.

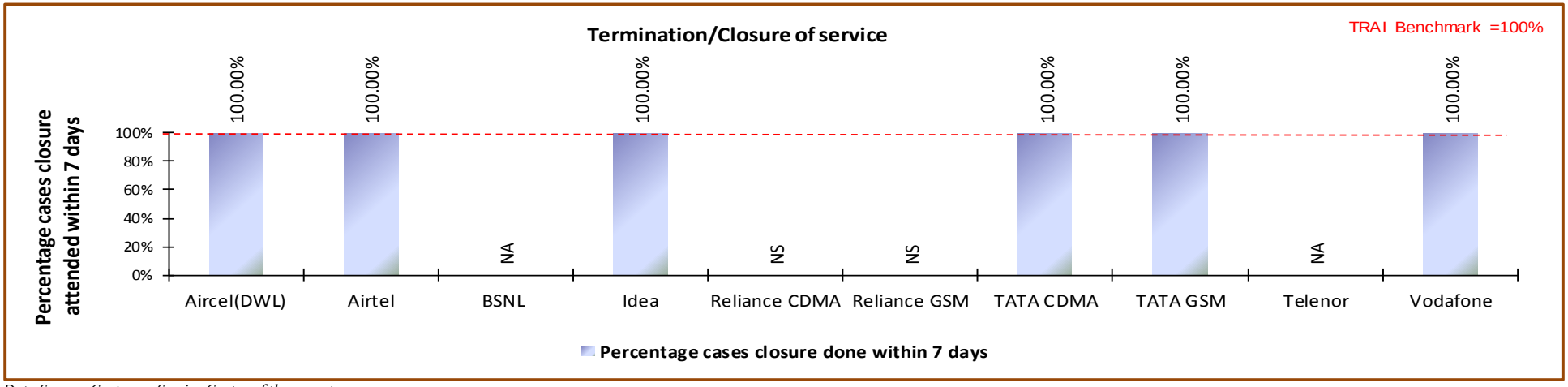


8.6 TERMINATION/CLOSURE OF SERVICE

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

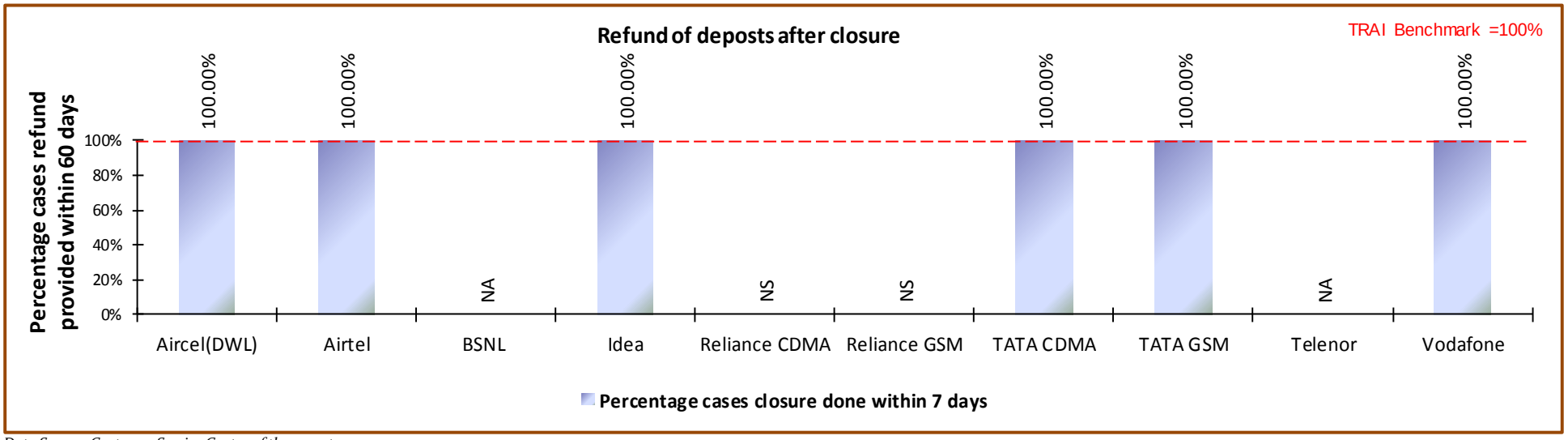
All operators met the TRAI benchmark for the parameter.

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

All operators met 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) 3G
Airtel	Airtel 3G
BSNL	BSNL 3G
Idea	Reliance 3G
Reliance CDMA	
Reliance GSM	
TATA CDMA	
TATA GSM	
Telenor	
Vodafone	

9.1.1 CHAPRA SSA

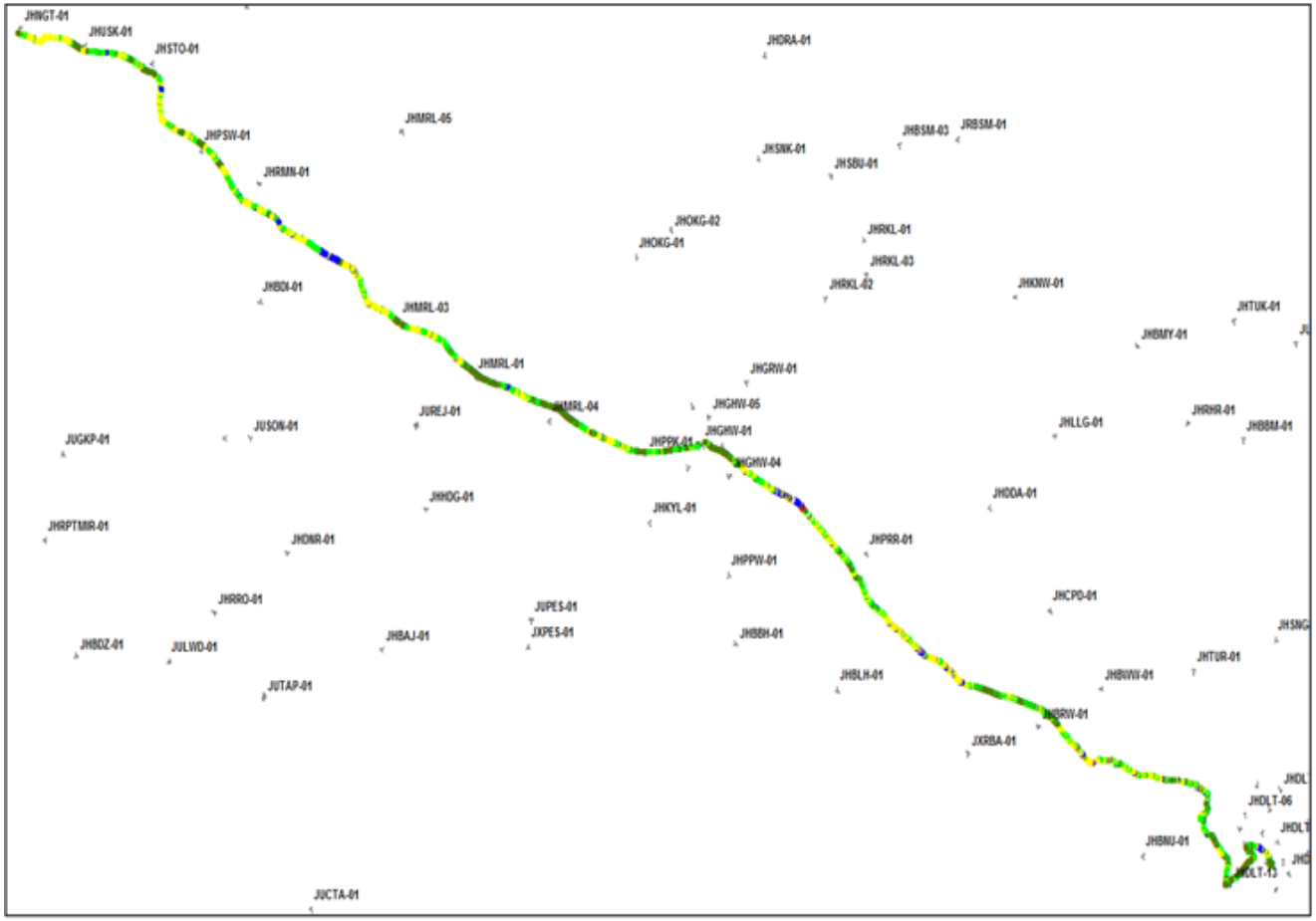
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
July	Chapra	20/07/16	22/07/16	337

9.1.1.1 Route Details – CHAPRA SSA

Category	Type of location	July		
		Chapra		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	1.Chapra Rly stn.-Garkha 2.Garkha- Sonho-Parsha-Driyapur. 3.Dariyapur –Dighwara-Mishroliya 4.Mishroliya- Ismaiyalpur-Abadhpura-Chapra Station	1.Baniyapur- Anandpur-Basantpur 2.Basantpur-Mashrakh –Isuapur—Gaura. 3.Gaura Bazar-Lohra-Salha-Chapra. 4.Chapra-Khanda-Bishanpura – Baniyapur	1.Chanpur – Hathauri-Siwan 2.Siwan-Maharajgnaj-Ekma 3.Ekma-Chapra-Rivilganj... 4.Asaraf- Siswan
	Highways			
	With in the City			
Indoor	Shopping complex			
	Office complex			

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

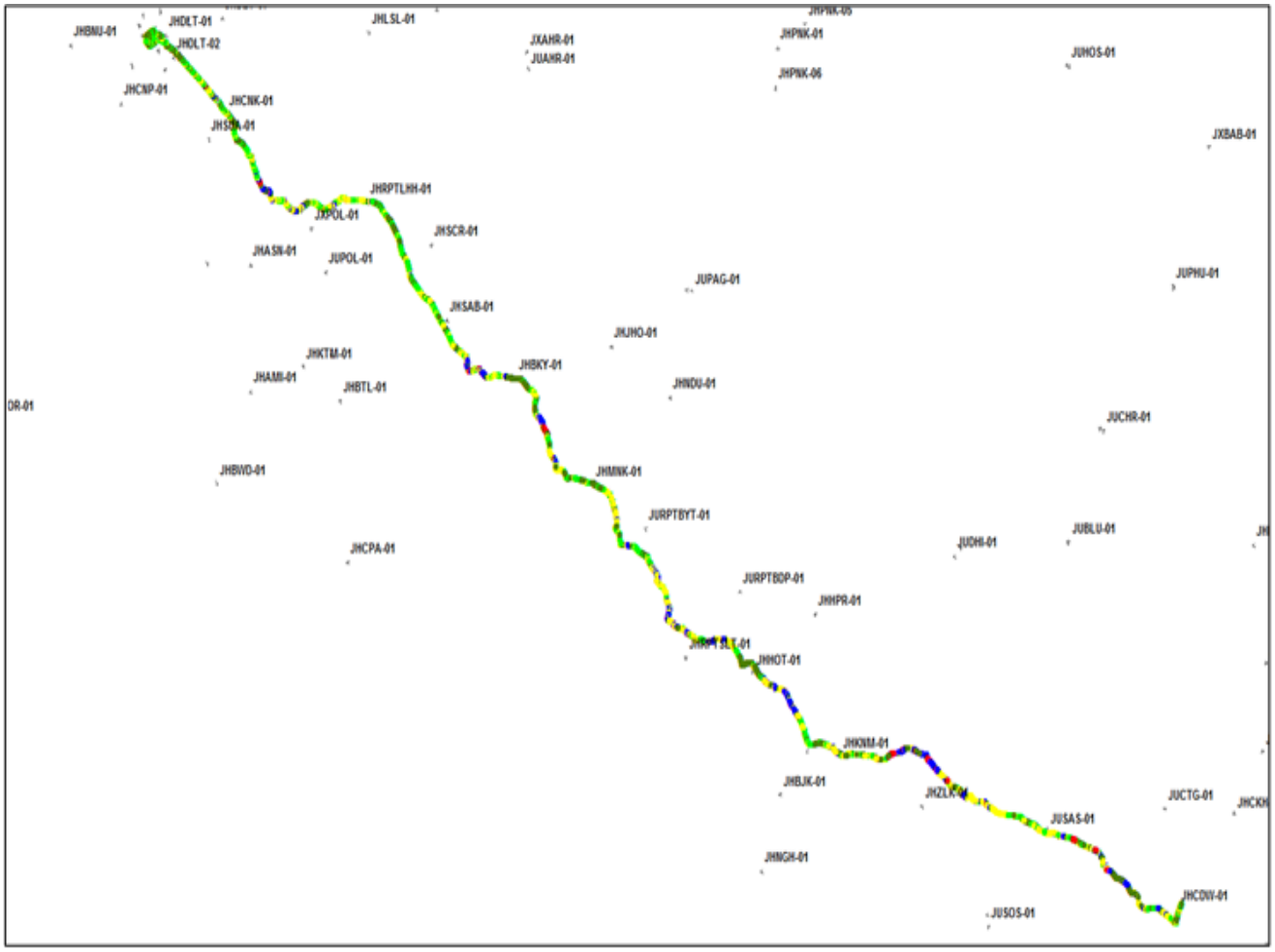
9.1.1.2 Route Map - CHAPRA DAY 1



Route Covered Day-1

Daltonganj-Shahpur-Meral-Ramna-NagarUntari-Jangipur

9.1.1.3 Route Map - CHAPRA DAY 2

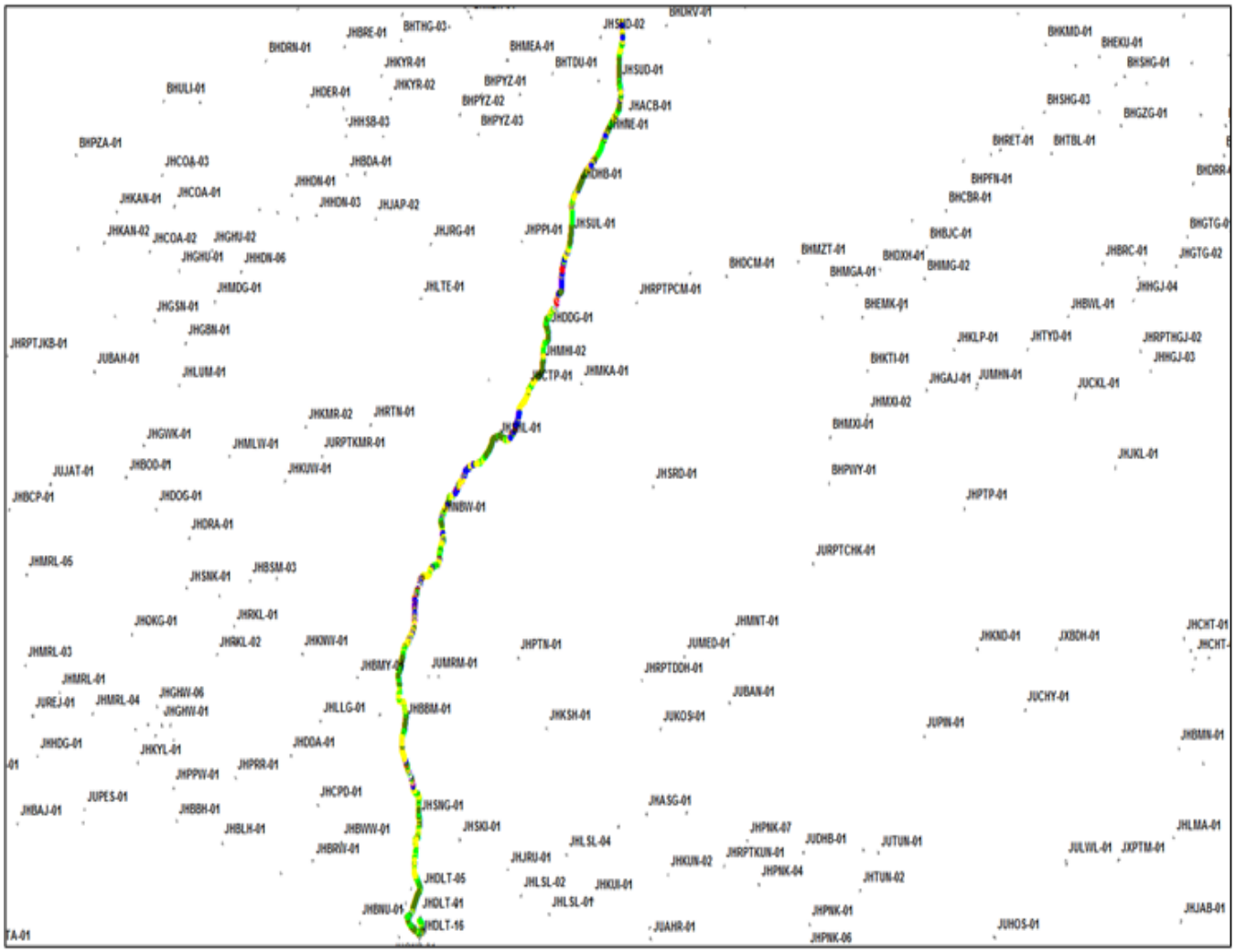


Route Covered

Day-2

Daltonganj-Polpol-Satbarwa-Manika-Matnog-Latehar-Bari-Chandwa

9.1.1.4 Route Map - CHAPRA DAY 3



Route Covered Day-3

Redma Chowk-Rajhara -Nawa Bazar Patan Rd-Shidog-Chhatarpur-Hariharganj

9.1.1.5 Drive Test Results - CHAPRA SSA-2G

July																	
Chapra	B'mark	Aircel(DWL)		Airtel		BSNL		Idea		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
0 to -75 dBm		31.33%	47.56%	67.42%	78.74%	0.00%	10.84%	5.38%	8.24%	99.99%	38.59%	45.44%	46.79%	71.69%	42.34%	79.69%	64.86%
0 to -85 dBm		97.61%	82.51%	99.45%	97.68%	85.71%	27.37%	78.73%	41.59%	100.00%	64.03%	96.65%	80.37%	98.97%	74.77%	99.88%	88.20%
0 to -95 dBm		99.97%	96.78%	100.00%	99.83%	14.29%	37.94%	100.00%	100.00%	100.00%	100.00%	99.99%	95.58%	100.00%	100.00%	100.00%	98.60%
Voice quality	≥ 95%	93.83%	93.41%	96.12%	96.52%	100.00%	88.77%	96.64%	95.66%	99.63%	69.12%	94.19%	82.09%	98.80%	96.96%	98.61%	98.23%
CSSR	≥ 95%	100.00%	95.78%	100.00%	100.00%	80.22%	88.35%	100.00%	100.00%	100.00%	66.72%	100.00%	85.35%	100.00%	99.26%	100.00%	100.00%
%age Blocked calls		0.00%	4.22%	0.00%	0.00%	19.78%	11.65%	0.00%	0.00%	0.00%	11.85%	0.00%	16.21%	0.00%	0.74%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.44%	0.00%	0.00%	15.07%	11.66%	0.00%	0.00%	0.00%	11.98%	0.00%	0.92%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	91.81%	100.00%	100.00%	100.00%	74.33%	100.00%	100.00%	100.00%	91.52%	100.00%	97.03%	100.00%	98.71%	100.00%	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

BSNL and TATA CDMA did not meet the TRAI benchmark for voice quality in outdoor locations. Aircel, Tata GSM did not meet the TRAI benchmark in indoor as well as outdoor location.

Call Set Success Rate (CSSR)

TATA CDMA & GSM failed to meet the benchmark for CSSR in outdoor locations; however BSNL failed in indoor as well as outdoor location

Call Drop Rate

TATA CDMA failed to meet the benchmark for call drop rate in outdoor locations; however BSNL failed in indoor as well as outdoor location

9.1.1.6 DRIVE TEST RESULTS – CHAPRA SSA-3G

July									
Chapra	B'mark	Aircel 3G		Airtel		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		18.19%	34.63%	78.62%	57.10%	0.00%	9.30%	No Service	
0 to -85 dBm		67.27%	58.19%	100.00%	88.67%	50.00%	15.12%		
0 to -95 dBm		96.42%	89.29%	100.00%	99.53%	50.00%	74.42%		
Voice quality	≥ 95%	51.25%	56.09%	99.58%	98.95%	100.00%	44.91%		
CSSR	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	73.26%		
%age Blocked calls		0.00%	1.52%	0.00%	0.00%	0.00%	26.74%		
Call drop rate	≤ 2%	0.00%	3.08%	0.00%	0.00%	0.00%	14.29%		
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%		

Voice Quality

BSNL 3G failed to meet the benchmark for Voice Quality in outdoor locations and Aircel 3G failed to meet the benchmark in outdoor as well as indoor location.

Call Set Success Rate (CSSR)

BSNL 3G failed to meet the benchmark for Call Set Success Rate in outdoor location.

Call Drop Rate

Aircel 3G and BSNL 3G failed to meet the benchmark for Call Drop Rate in outdoor locations.

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

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed att	>80%	100	100	NA	100	NA	100	100
Succesful Data Transmission upload speed attem	>75%	100	100		100		100	100
Minimum download speed		95	106		110		47	NA
Average throughput for Packet Data		108	129		219		106	160
Latency	<250ms	100	100		100		NA	100

All the parameters met the TRAI benchmark.

9.1.1.2 Drive Test Results – CHAPRA SSA-DATA- 3G

July				
Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G
Succesful Data Transmission download speed attempts	>80%	100	100	NA
Succesful Data Transmission upload speed attempts	>75%	100	100	
Minimum download speed		996	1769	
Average throughput for Packet Data		1159	2495	
Latency	<250ms	100	100	

All the parameters met the TRAI benchmark.

9.1.2 SASARAM SSA

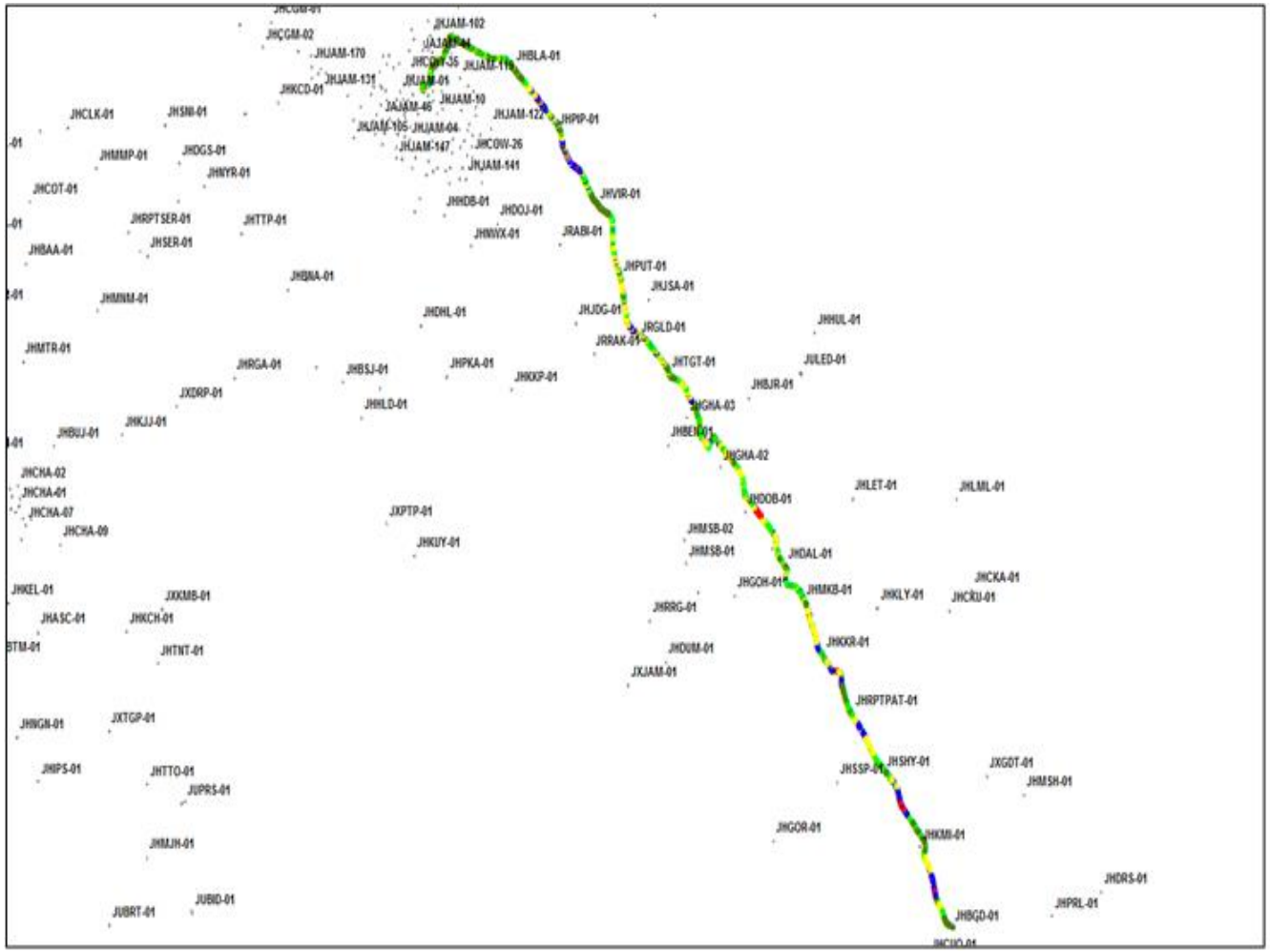
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
July	Sasaram	27/07/16	29/07/16	296

9.1.2.1 ROUTE DETAILS -SASARAM SSA

Category	Type of location	July		
		Sasaram		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	1.Durgawati-Mohania-Pusauli. 2.Pusauli-Amirtha-Kudra. 3.Kudra-Chenari-Shivsager-kumhu gate-Faijalganj-Railway satation.	1.Ramgarh-Mohania-Lahurbari. 2.Lahurbari – Kochas - Kargahar. 3.Kargahar – Lalganj Nahar – kuraich – Post office chowk – Vishal Mega Mart	1.Sasaram - Barwat Market-Naukha – Udaypur. 2.Udaypur –Dharupur – Karakat - Burhwal – Nashirganj. 3.Nashirganj –Amiyawar – Dehari on sone . 4.Dehari on sone – Karwandiya - Sasaram.
	Highways			
	With in the City			
Indoor	Shopping complex			
	Office complex			

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

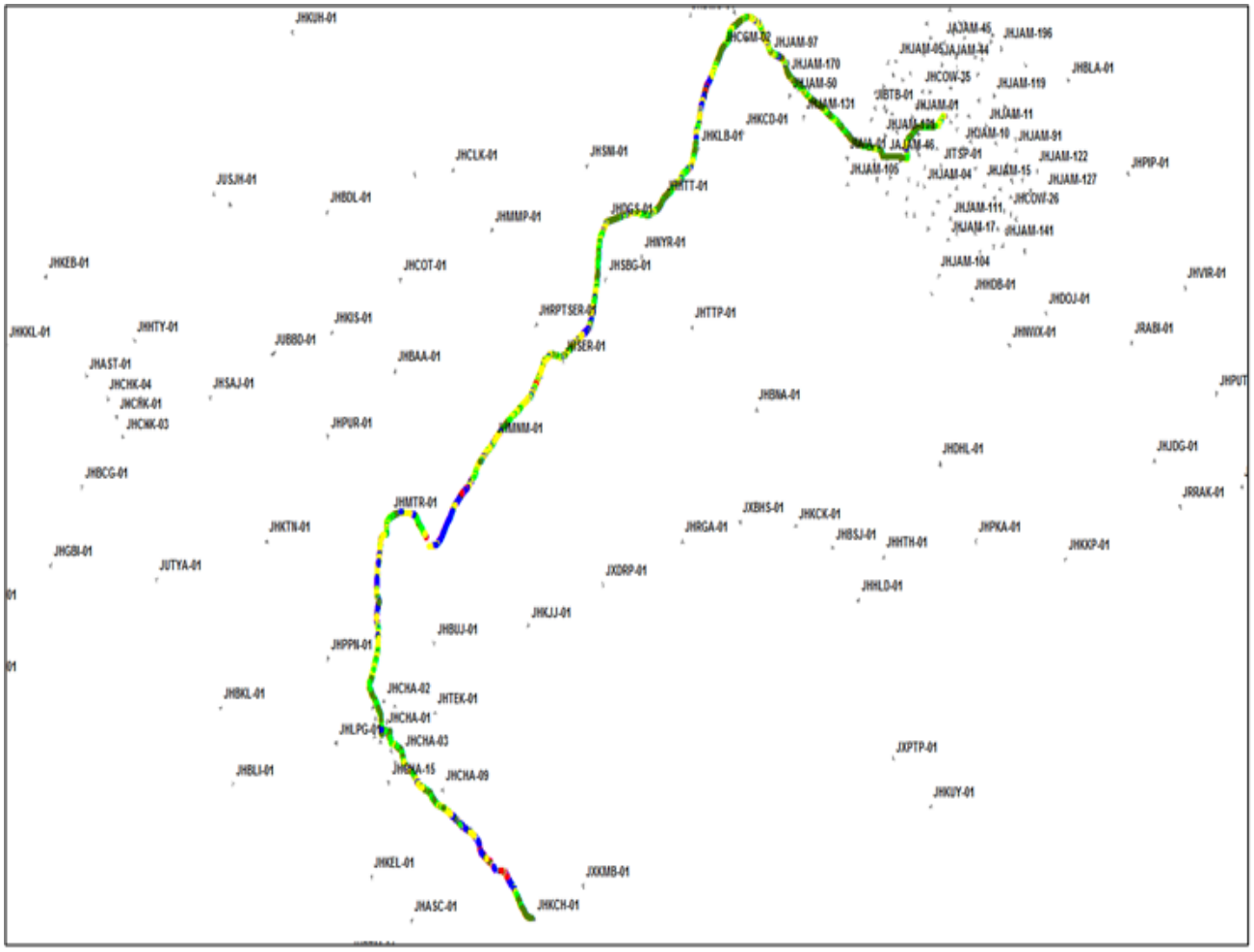
9.1.2.2 Route Map - SASARAM DAY 1



Route Covered Day-1

V2 Mall-Mango bus stand-dimna chauk-ghatshila-dalbhumgarh-kokpara-jharia-baharagora

9.1.2.3 Route Map - SASARAM DAY 2

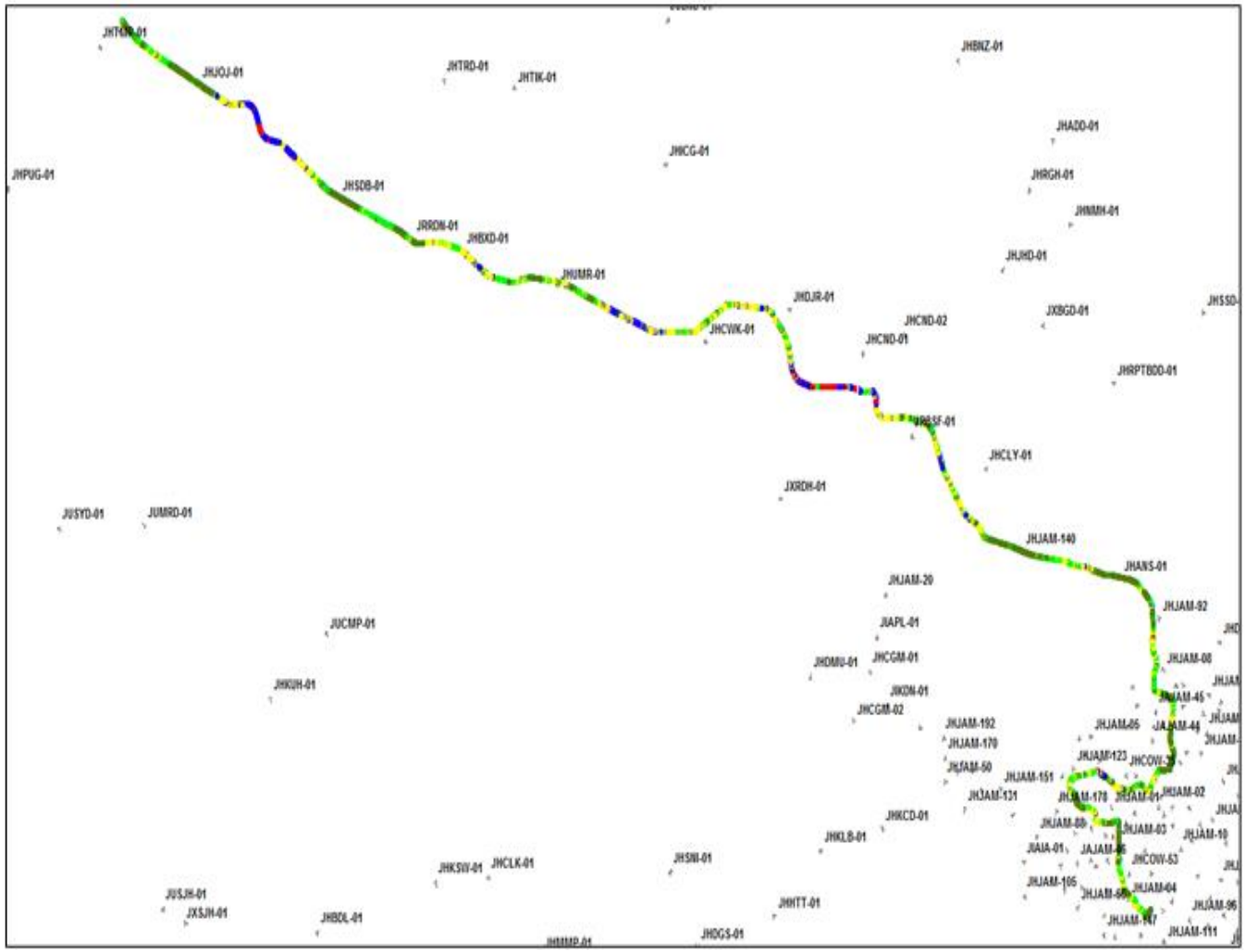


Route Covered

Day-2

Sakchi Bus stand-adityapur-usha more-kandra-nandidih-saraikela-chaibasa-kockcho

9.1.2.4 Route Map - SASARAM DAY 3



Route Covered

Day-3

Chhota gobindpur-jamshedpur-pardih-mardhan-tamar

9.1.2.5 Drive Test Results SASARAM SSA-2G

July																	
Sasaram	B'mark	Aircel(DWL)		Airtel		BSNL		Idea		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
0 to -75 dBm		3.24%	29.11%	63.14%	75.29%	97.60%	48.12%	42.05%	38.74%	28.49%	20.40%	22.89%	30.59%	31.50%	47.41%	27.84%	73.66%
0 to -85 dBm		87.39%	55.91%	95.50%	96.84%	98.84%	79.63%	97.01%	87.38%	29.17%	28.63%	74.09%	53.97%	79.12%	86.40%	93.80%	93.59%
0 to -95 dBm		99.79%	84.98%	99.93%	99.77%	99.90%	96.25%	100.00%	100.00%	100.00%	100.00%	97.80%	81.22%	100.00%	100.00%	99.94%	98.44%
Voice quality	≥ 95%	92.50%	93.09%	97.97%	95.72%	88.79%	75.38%	97.97%	95.63%	NA	NA	78.19%	80.86%	98.78%	94.51%	98.85%	96.14%
CSSR	≥ 95%	100.00%	96.39%	100.00%	100.00%	98.33%	95.17%	100.00%	100.00%	NA	NA	100.00%	88.05%	100.00%	99.22%	100.00%	99.09%
%age Blocked calls		0.00%	3.61%	0.00%	0.00%	1.67%	4.83%	0.00%	0.00%	NA	NA	0.00%	11.80%	0.00%	0.78%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	4.38%	0.00%	0.00%	0.00%	3.52%	0.00%	0.00%	NA	NA	0.00%	1.84%	0.00%	0.00%	0.00%	0.61%
Hands off success rate		96.77%	98.59%	100.00%	100.00%	100.00%	98.85%	100.00%	100.00%	NA	NA	100.00%	98.74%	100.00%	97.85%	100.00%	99.49%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Aircel, BSNL and Tata GSM failed to meet the benchmark for voice quality in indoor as well as outdoor locations. Telenor did not meet the benchmark in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

Aircel and BSNL failed to meet the benchmark for call drop rate in outdoor locations and BSNL failed to meet the benchmark for Call Drop Rate in both Indoor and outdoor locations.

9.1.2.6 DRIVE TEST RESULTS -SASARAM SSA-3G

July									
Sasaram	B'mark	Aircel 3G		Airtel		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		0.00%	10.16%	95.40%	50.33%	0.00%	12.75%	No Service	
0 to -85 dBm		11.60%	38.26%	100.00%	82.81%	6.76%	35.53%		
0 to -95 dBm		94.59%	58.04%	100.00%	96.47%	76.29%	65.55%		
Voice quality	≥ 95%	18.78%	44.19%	99.88%	98.95%	NA	NA		
CSSR	≥ 95%	100.00%	100.00%	100.00%	100.00%	85.42%	93.10%		
%age Blocked calls		0.00%	2.63%	0.00%	0.00%	15.22%	17.65%		
Call drop rate	≤ 2%	0.00%	1.35%	0.00%	0.00%	0.00%	27.27%		
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%		

Note: - BSNL did not submitted voice quality data.

Voice Quality

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

Call Set Success Rate (CSSR)

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

Call Drop Rate

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

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

Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed att	>80%	100	100	NA	100	NA	100	100
Succesful Data Transmission upload speed attem	>75%	100	100		100		100	100
Minimum download speed		133	104		117		48	NA
Average throughput for Packet Data		143	130		125		106	118
Latency	<250ms	100	100		100		NA	100

All the parameters met the TRAI benchmark.

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

July				
Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G
Succesful Data Transmission download speed attempts	>80%	100	100	NA
Succesful Data Transmission upload speed attempts	>75%	100	100	
Minimum download speed		1291	2388	
Average throughput for Packet Data		1476	3041	
Latency	<250ms	100	100	

All the parameters met the TRAI benchmark.

9.1.3 DARBHANGA SSA

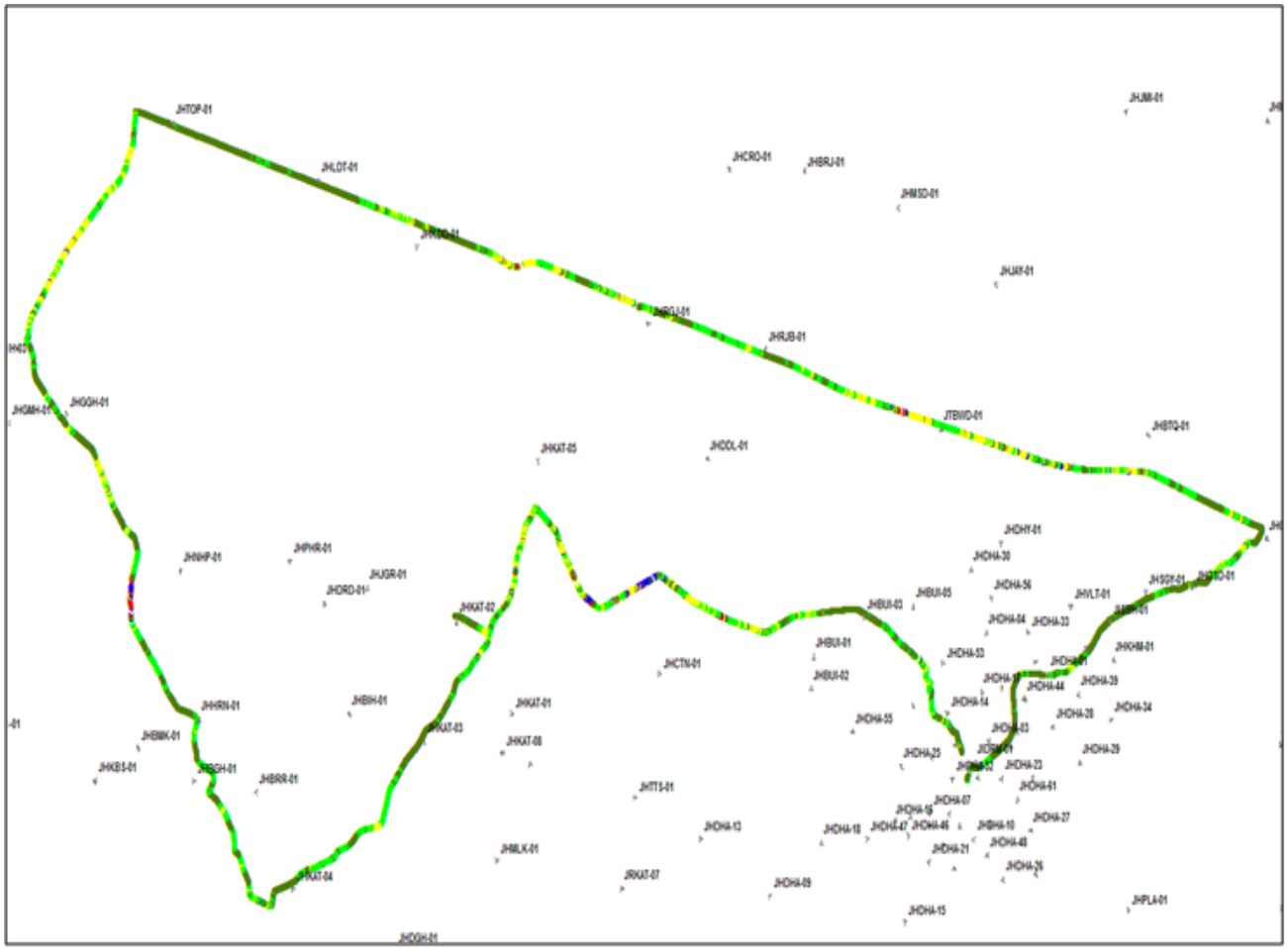
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
August	Darbhanga	22/08/16	24/08/16	340

9.1.3.1 Route Details - DARBHANGA SSA

Category	Type of location	August		
		Darbhanga		
		Day 1	Day 2	Day 3
Outdoor	Major Roads	Delhi More –Kalyanpur – Samstipur	Behera – Beheri – Singhia,	Rampatti- Rajnagar – Kaluahi – Loha- Rahika – Delhimore
	Highways	Samastipur – Tejpur – Musrigharari – Samastipur	Singhiya – Rosera – Samastipur	Kakarghati – Manighachi – Naruar- Kothiya – Rampatti
	With in the City	Railway Station - Delhi More	Railway Station – MalPatti	Rly Station – DelhiMore – Kakarghati -
Indoor	Shopping complex			
	Office complex			

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

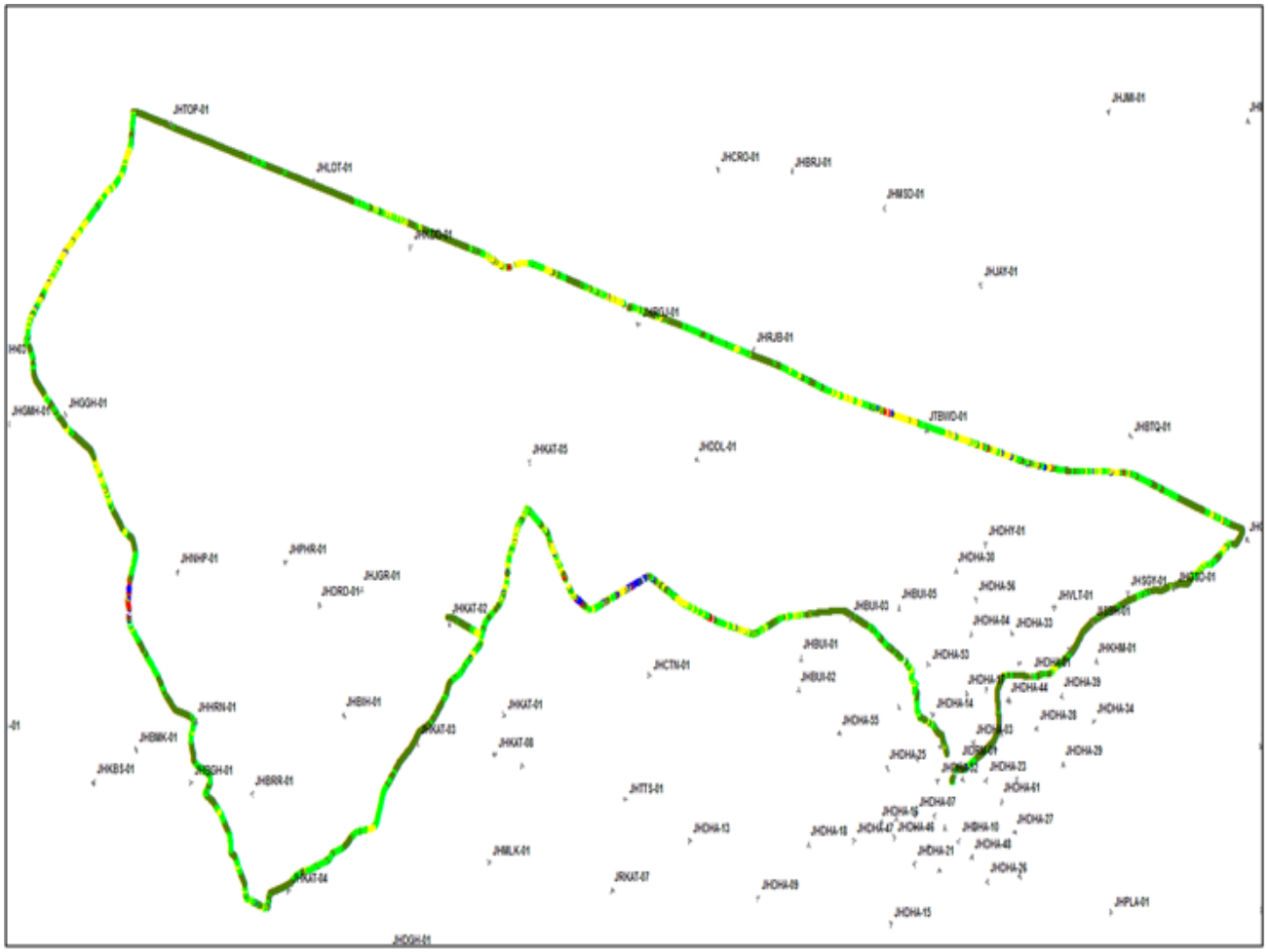
9.1.3.2 Route Map - DARBHANGA DAY 1



Route Covered Day-1

Railway station-jharkhand more-srindih-gomoh-topchanchi-govindpur-saraidhella

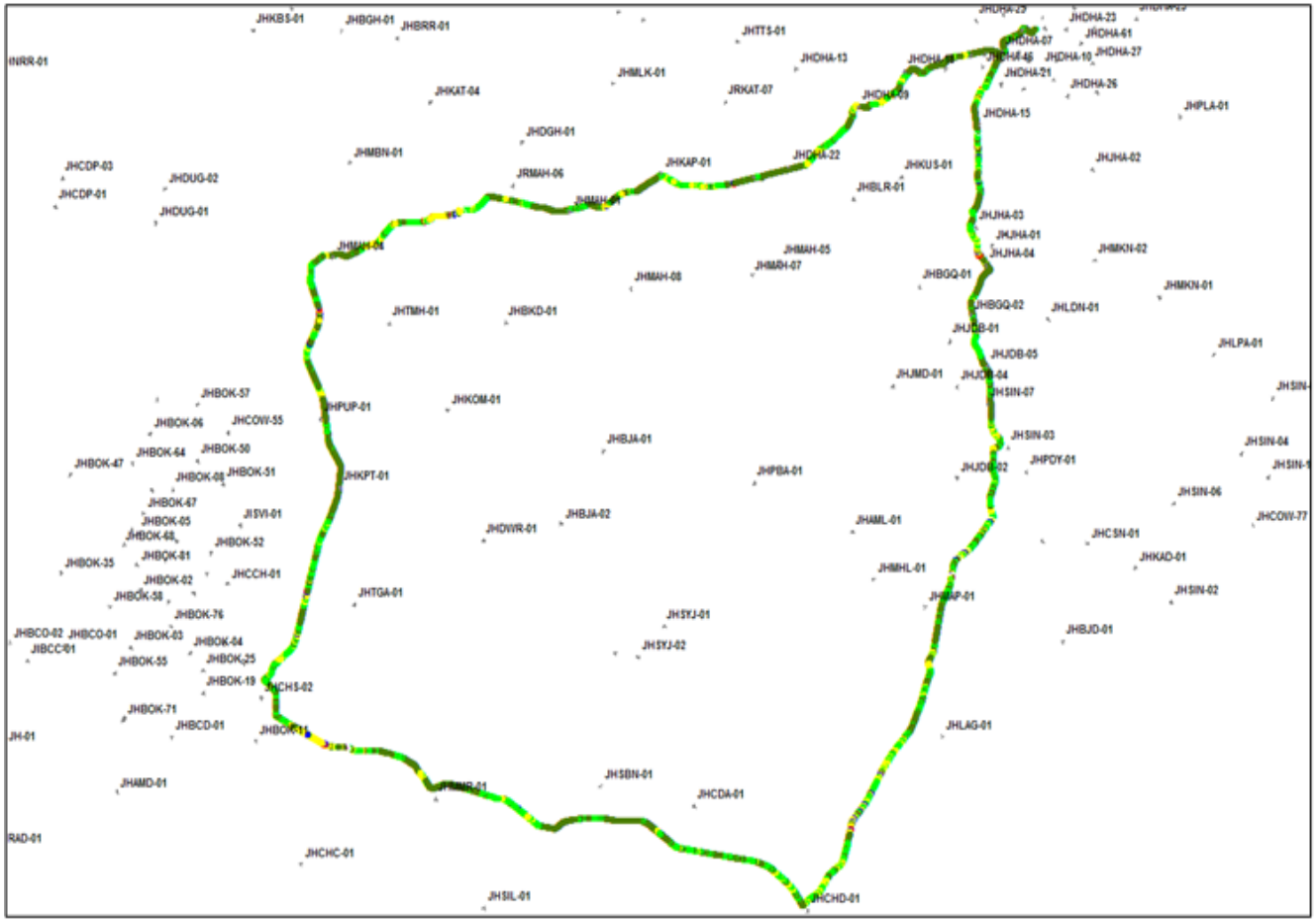
9.1.3.3 Route Map - DARBHANGA DAY 2



Route Covered Day-1

Railway station-jharkhand more-srindih-gomoh-topchanchi-govindpur-saraidhella

9.1.3.4 Route Map - DARBHANGA DAY 3



Route Covered Day-3

Railway station-jhariya-indira chauk-jorapokhar-pupni-mahda-kakendra-bankmore-bara gurudwara

9.1.3.5 Drive Test Results - DARBHANGA SSA-2G

August																	
Darbhanga	B'mark	Aircel(DWL)		Airtel		BSNL		Idea		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
0 to -75 dBm		70.74%	26.24%	86.56%	45.47%	98.48%	36.92%	93.34%	44.54%	NS		35.14%	22.96%	83.40%	47.48%	84.85%	55.41%
0 to -85 dBm		98.91%	67.23%	98.94%	79.21%	1.48%	31.13%	99.93%	89.26%			97.24%	60.36%	98.80%	82.82%	99.92%	88.86%
0 to -95 dBm		100.00%	90.82%	99.94%	96.52%	0.04%	31.95%	100.00%	100.00%			99.89%	83.14%	100.00%	100.00%	100.00%	99.04%
Voice quality	≥ 95%	93.92%	95.07%	97.26%	96.29%	97.29%	91.09%	96.94%	95.89%			90.46%	84.86%	98.68%	95.66%	98.89%	95.71%
CSSR	≥ 95%	100.00%	92.82%	100.00%	100.00%	100.00%	91.52%	100.00%	100.00%			100.00%	80.52%	100.00%	99.05%	100.00%	100.00%
%age Blocked calls		0.00%	7.18%	0.00%	0.00%	0.00%	6.27%	0.00%	0.00%			0.00%	16.63%	0.00%	0.95%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	3.76%	0.00%	0.00%			0.00%	1.11%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		92.56%	92.02%	100.00%	100.00%	100.00%	89.53%	100.00%	99.42%			100.00%	97.48%	100.00%	98.45%	NA	100.00%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Tata GSM and Telenor failed to meet the benchmark for voice quality in indoor as well as outdoor locations, however Aircel failed in indoor and BSNL failed in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

BSNL failed to meet the benchmark for call drop rate in outdoor locations.

9.1.3.6 DRIVE TEST RESULTS - DARBHANGA SSA-3G

August									
Darbhanga	B'mark	Aircel 3G		Airtel		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		NA	18.14%	100.00%	71.54%	17.79%	28.71%	No Service	
0 to -85 dBm		NA	62.17%	100.00%	90.13%	42.17%	34.37%		
0 to -95 dBm		NA	83.74%	100.00%	98.32%	40.03%	36.92%		
Voice quality	≥ 95%	NA	67.13%	99.75%	99.31%	NA	NA		
CSSR	≥ 95%	NA	100.00%	100.00%	100.00%	100.00%	92.73%		
%age Blocked calls		NA	2.70%	0.00%	0.00%	0.00%	5.42%		
Call drop rate	≤ 2%	NA	2.78%	0.00%	0.00%	0.00%	4.89%		
Hands off success rate		NA	100.00%	100.00%	100.00%	NA	NA		

Note: - BSNL 3G not submitted voice quality data.

Voice Quality

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

Call Set Success Rate (CSSR)

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

Call Drop Rate

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

9.1.3.7 Drive Test Results - DARBHANGA SSA-DATA- 2G

August								
Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed att	>80%	100	100	NA	100	NA	100	100
Succesful Data Transmission upload speed attem	>75%	100	100		100		100	100
Minimum download speed		110	119		94		48	NA
Average throughput for Packet Data		122	159		171		106	102
Latency	<250ms	100	100		100		NA	100

All the parameters met the TRAI benchmark.

9.1.3.8 Drive Test Results - DARBHANGA SSA-DATA- 3G

August				
Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G
Succesful Data Transmission download speed attempts	>80%	NS	100	NA
Succesful Data Transmission upload speed attempts	>75%		100	
Minimum download speed			1270	
Average throughput for Packet Data			1492	
Latency	<250ms		100	

All the parameters met the TRAI benchmark.

9.1.4 GAYA SSA

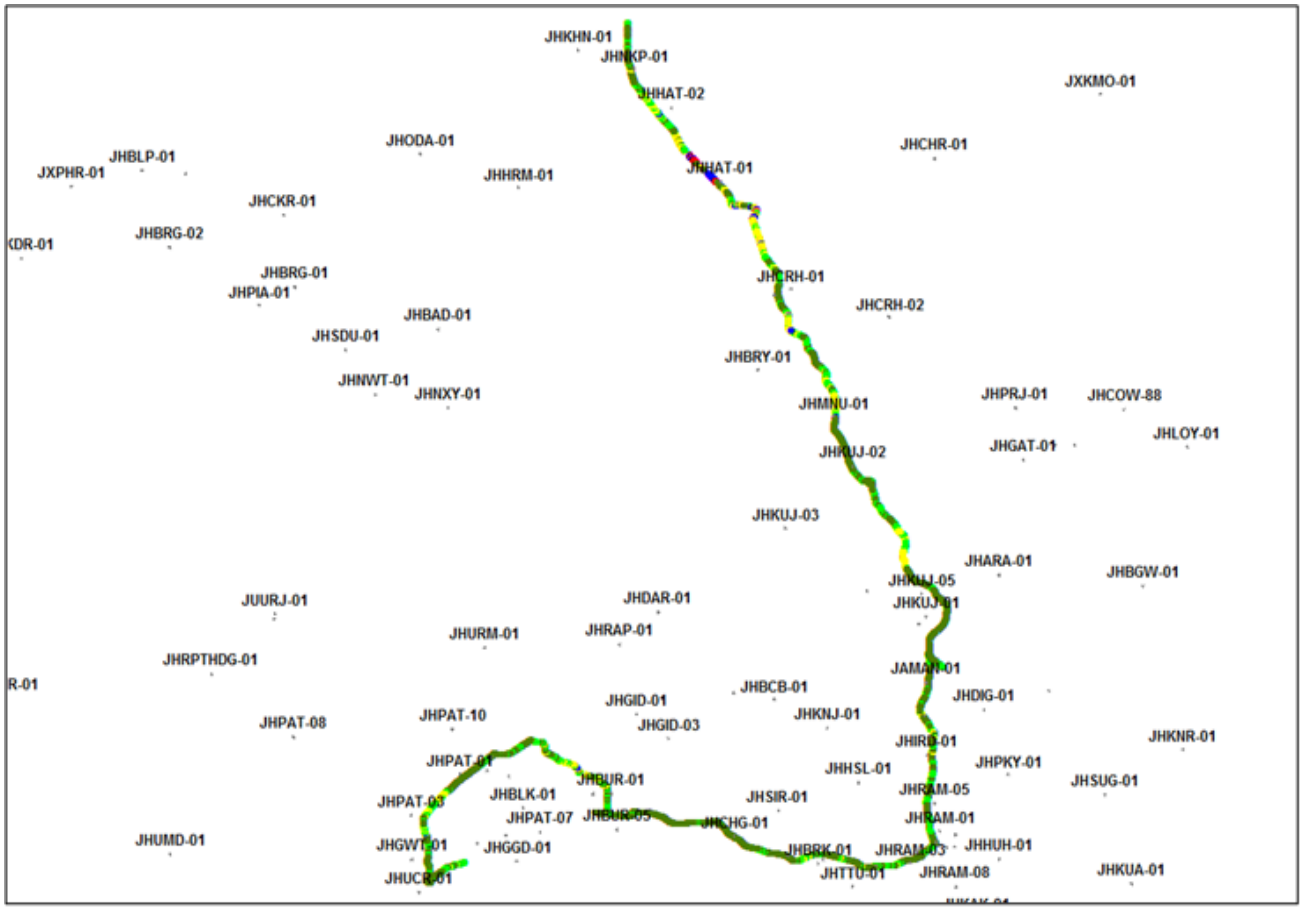
Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
September	Gaya	21/9/2016	23/9/2016	302

9.1.4.1 Route Details -GAYA SSA

Type of location	September		
	Gaya		
	Day 1	Day 2	Day 3
Major Roads Highways With in the City Shopping complex Office complex	Gaya Railway station-bodhgaya more-dobhi-sherghati-gurua-guraru-pali-utren-gaya	APR mall-gandhi maidan-manpur-sarbadha-islampur-hulasgunj-khijarsarai-manpur	Gaya Railway station-chakand-makhdumpur-tehta-jehanabad-kinjar-arwal

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

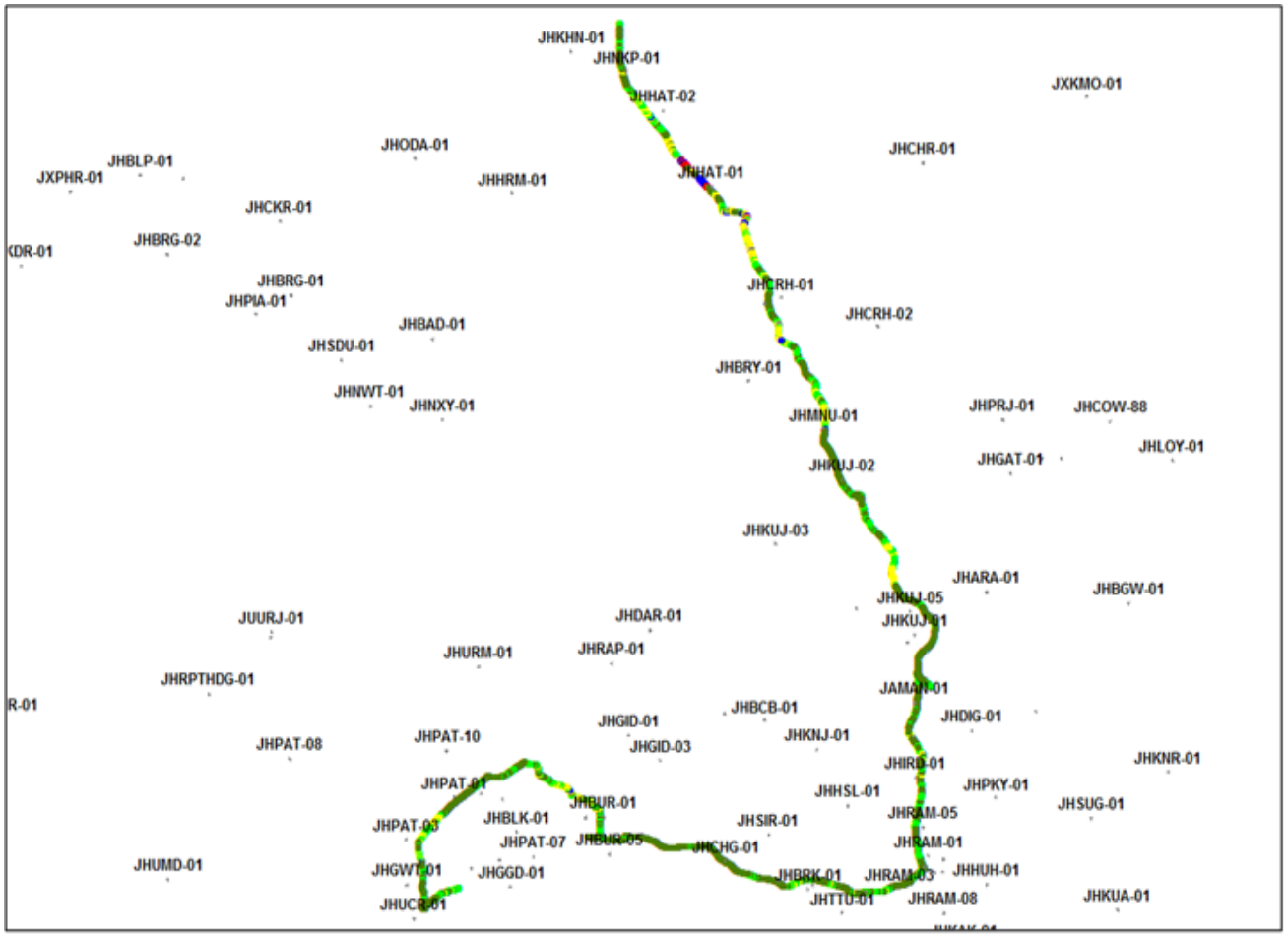
9.1.4.2 Route Map - GAYA DAY 1



Route Covered Day-1

Hazaribag private bus stand-demo tand-morangi-ramgarh-saundra basti-labga

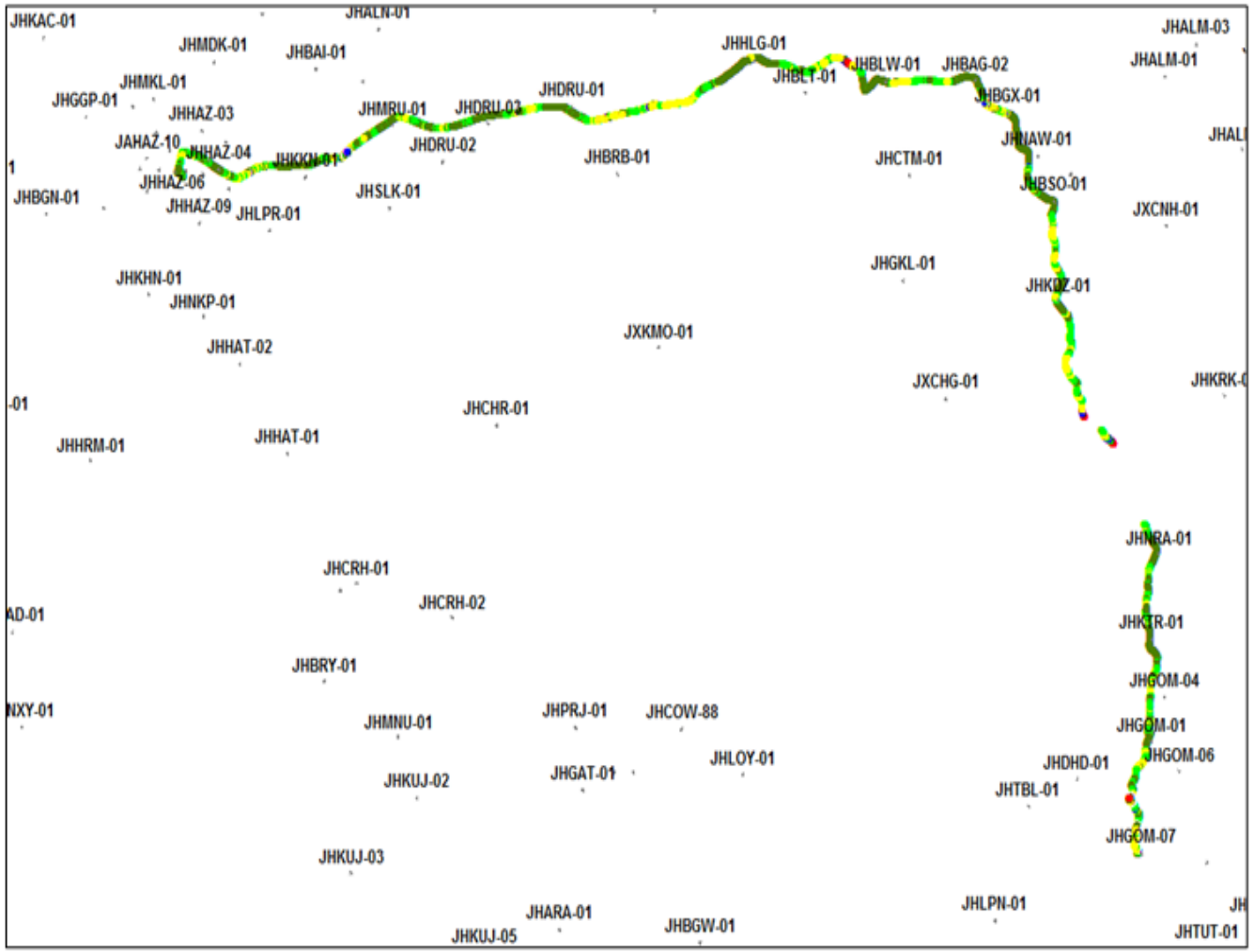
9.1.4.3 Route Map - GAYA DAY 2



Route Covered Day-1

Hazaribag private bus stand-demo tand-morangi-ramgarh-saundra basti-labga

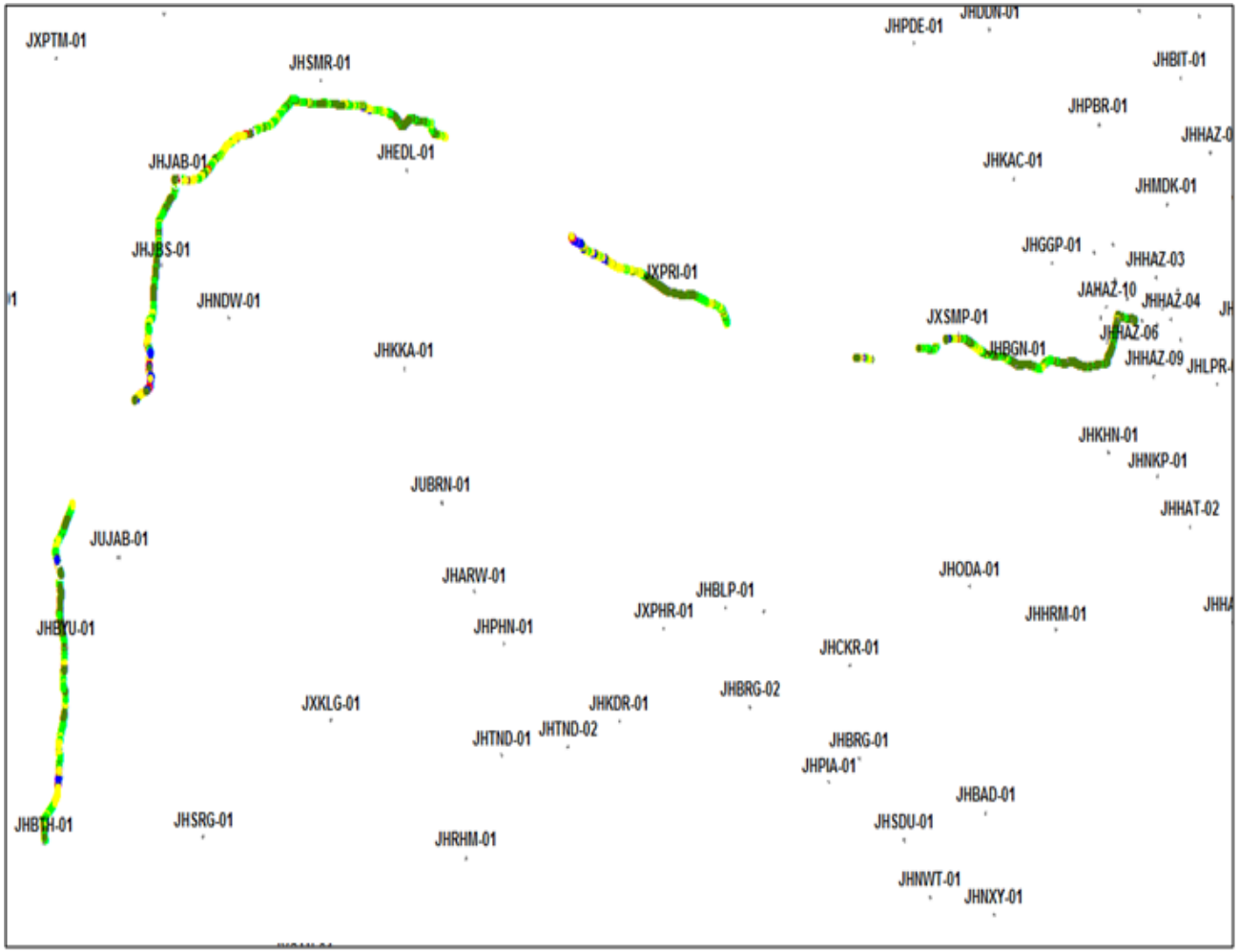
9.1.4.4 Route Map - GAYA DAY 3



Route Covered Day-3

Hazaribag Private bus tsand-singhari-bishnugarh-ansari nagar-gumia-hosir

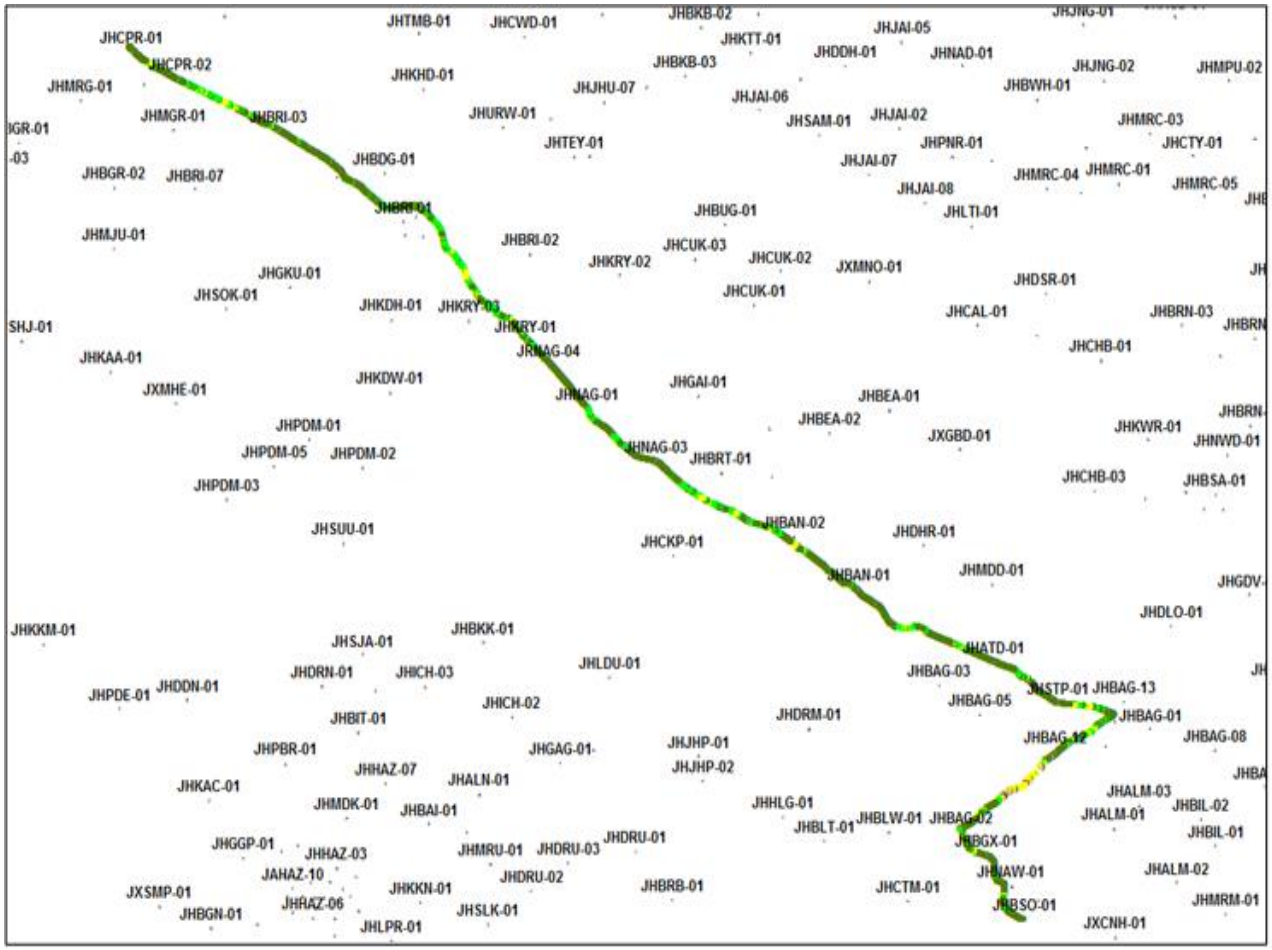
9.1.4.5 ROUTE MAP – GAYA DAY 4



Route Covered Day-4

Khirgaon chauk-kadwa-rewali-simaria khurd-jabra-bariatu-balumath

9.1.4.6 Route Map - GAYA DAY 5

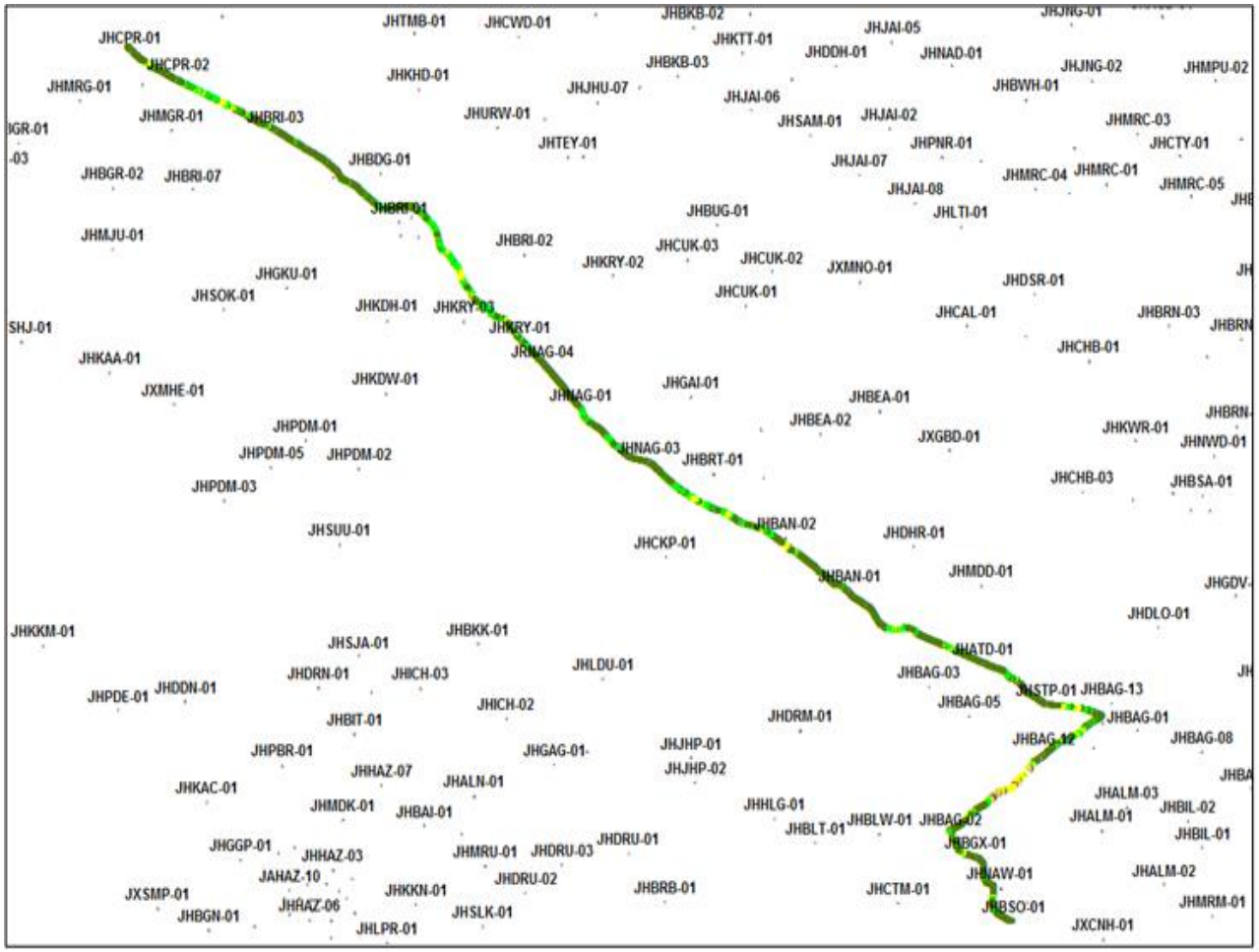


Route Covered

Day-5

Banaso-bishnugarh-bagodar-gorhar-borakatha-barhi-chouparan

9.1.4.7 Route Map - GAYA DAY 6



Route Covered

Day-5

Banaso-bishnugarh-bagodar-gorhar-borakatha-barhi-chouparan

9.1.4.8 Drive Test Results - GAYA SSA-2G

Gaya	B'mark	Aircel(DWL)		Airtel		BSNL		Idea		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
0 to -75 dBm		85.49%	34.43%	98.98%	73.54%	72.17%	45.45%	20.94%	34.78%	NA	7.21%	76.82%	31.18%	53.49%	51.10%	36.88%	35.28%
0 to -85 dBm		99.79%	67.55%	99.99%	93.66%	98.65%	74.23%	94.05%	82.37%	NA	25.44%	99.72%	59.46%	98.69%	86.59%	95.85%	83.74%
0 to -95 dBm		100.00%	91.42%	100.00%	99.43%	92.74%	94.08%	100.00%	100.00%	NA	100.00%	100.00%	83.72%	100.00%	100.00%	99.99%	97.89%
Voice quality	≥ 95%	99.37%	93.64%	99.12%	96.44%	71.94%	76.20%	97.93%	97.03%	NA	42.18%	87.57%	85.93%	98.46%	96.47%	97.34%	94.68%
CSSR	≥ 95%	100.00%	88.28%	100.00%	100.00%	100.00%	98.24%	100.00%	100.00%	NA	18.81%	100.00%	77.39%	100.00%	99.29%	100.00%	99.66%
%age Blocked calls		0.00%	11.72%	0.00%	0.00%	0.00%	1.76%	0.00%	0.00%	NA	62.98%	0.00%	12.95%	0.00%	0.71%	0.00%	0.51%
Call drop rate	≤ 2%	0.00%	9.48%	0.00%	0.00%	0.00%	1.79%	0.00%	0.00%	NA	1.94%	0.00%	3.42%	0.00%	0.00%	0.00%	0.17%
Hands off success rate		100.00%	97.80%	100.00%	100.00%	100.00%	92.78%	100.00%	100.00%	NA	97.14%	100.00%	98.47%	100.00%	99.42%	100.00%	99.80%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

BSNL and Tata GSM failed to meet the benchmark for voice quality in indoor as well as outdoor locations. Aircel, TATA CDMA and Vodafone did not meet the benchmark in outdoor locations.

Call Set Success Rate (CSSR)

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

Call Drop Rate

Aircel and Tata GSM failed to meet the benchmark for call drop rate in outdoor locations.

9.1.4.9 DRIVE TEST RESULTS - GAYA SSA-3G

September									
Gaya	B'mark	Aircel 3G		Airtel		BSNL 3G		Reliance 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		98.21%	23.25%	82.38%	32.05%	47.93%	15.37%	97.79%	85.37%
0 to -85 dBm		100.00%	53.69%	99.84%	75.02%	87.58%	26.01%	99.02%	87.50%
0 to -95 dBm		100.00%	77.14%	100.00%	96.43%	96.07%	48.21%	100.00%	89.72%
Voice quality	≥ 95%	91.51%	54.70%	100.00%	99.10%	93.40%	67.58%	NA	NA
CSSR	≥ 95%	100.00%	99.44%	100.00%	100.00%	NA	82.69%	89.86%	99.39%
%age Blocked calls		0.00%	0.00%	0.00%	0.00%	100.00%	17.31%	17.65%	4.93%
Call drop rate	≤ 2%	0.00%	2.47%	0.00%	0.00%	NA	NA	0.00%	4.44%
Hands off success rate		NA	100.00%	100.00%	100.00%	NA	NA	NA	NA

Note: - Reliance 3G not submitted voice quality data.

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)

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

Call Drop Rate

Aircel 3G and Reliance 3G failed to meet the benchmark for Call Drop Rate in outdoor location.

9.1.4.10 Drive Test Results - GAYA SSA-DATA- 2G

September								
Name of the Parameter	Bench Mark	Aircel	Airtel	BSNL	Idea	TATA GSM	Telenor	Vodafone
Succesful Data Transmission download speed att	>80%	100	100	NA	100	NA	100	100
Succesful Data Transmission upload speed attem	>75%	100	100		100		100	100
Minimum download speed		110	148		117		47	NA
Average throughput for Packet Data		122	165		219		106	116
Latency	<250ms	100	100		100		100	100

All the parameters met the TRAI benchmark.

9.1.4.11 Drive Test Results - GAYA SSA-DATA- 3G

September				
Name of the Parameter	Bench Mark	Aircel 3G	Airtel 3G	BSNL 3G
Succesful Data Transmission download speed attempts	>80%	NS	100	NA
Succesful Data Transmission upload speed attempts	>75%		100	
Minimum download speed			2349	
Average throughput for Packet Data			2885	
Latency	<250ms		100	

All the parameters met the TRAI benchmark.

10 ANNEXURE – CONSOLIDATED-2G

10.1 NETWORK AVAILABILITY

1. Network Availability											
Audit Results for Network Availability- PMR data											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		9600	29552	13147	25479	NS	NS	1156	2886	12429	26714
Sum of downtime of BTSs in a month (in hours)		116856	15978	170828	192096	NS	NS	1912	4465	24249	81074
BTSs accumulated downtime (not available for service)	≤ 2%	1.64%	0.07%	1.75%	1.01%	NS	NS	0.22%	0.21%	0.26%	0.41%
Number of BTSs having accumulated downtime >24 hours		959	77	257	455	NS	NS	0	4	74	310
Worst affected BTSs due to downtime	≤ 2%	9.99%	0.26%	1.95%	1.79%	NS	NS	0.00%	0.14%	0.60%	1.16%
Live Measurement Results for Network Availability- 3 Day live data											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		9600	29610	13147	25303	NS	NS	1156	2886	12470	26714
Sum of downtime of BTSs in a month (in hours)		12243	2344	5604	22136	NS	NS	160	423	2583	6705
BTSs accumulated downtime (not available for service)	≤ 2%	1.77%	0.11%	0.59%	1.22%	NS	NS	0.19%	0.20%	0.29%	0.35%
Number of BTSs having accumulated downtime >24 hours		0	4	95	4	NS	NS	0	0	4	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.01%	0.72%	0.02%	NS	NS	0.00%	0.00%	0.03%	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	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	88.74%	95.96%	94.01%	97.01%	NS	NS	97.82%	97.91%	97.46%	99.38%
SDCCH/Paging channel congestion	≤ 1%	0.86%	0.71%	5.24%	0.83%	NS	NS	NA	0.69%	0.79%	0.15%
TCH congestion	≤ 2%	11.47%	1.58%	2.02%	1.83%	NS	NS	0.55%	0.56%	1.84%	0.62%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	87.52%	95.95%	92.53%	98.46%	NS	NS	98.24%	98.59%	97.43%	99.45%
SDCCH/Paging channel congestion	≤ 1%	0.76%	0.73%	2.00%	0.84%	NS	NS	NA	0.73%	0.81%	0.24%
TCH congestion	≤ 2%	12.98%	1.28%	0.85%	0.60%	NS	NS	0.18%	0.19%	1.86%	0.55%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts		1078	1811	1706	1534	NS	NS	585	1231	1258	2168
Total number of successful calls established		1020	1811	1571	1534	NS	NS	461	1071	1250	2163
CSSR	≥ 95%	94.62%	100.00%	92.09%	100.00%	NS	NS	78.80%	87.00%	99.36%	99.77%
%age blocked calls		5.38%	0.00%	7.91%	0.00%	NS	NS	21.20%	13.00%	0.64%	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	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		504916008	2351313705	70333971	925883834	NS	NS	34800287	70614073	871245333	702617993
Total number of calls dropped		9847701	35344780	737411	9961772	NS	NS	94178	454976	10216962	6558023
Call drop rate	≤ 2%	1.95%	1.50%	1.05%	1.08%	NS	NS	0.27%	0.64%	1.17%	0.93%
Total number of cells in the network		28627	88780	39318	1582768	NS	NS	3742	8694	38512	80345
Total number of cells having more than 3% TCH		4316	2444	1355	42238	NS	NS	50	252	2329	2310
Worst affected cells having more than 3% TCH	≤ 3%	15.08%	2.75%	3.45%	2.67%	NS	NS	1.33%	2.90%	6.05%	2.88%
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	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		48240845	3112980221	15294819	1114449417	NS	NS	45937011	97044194	89366776	927919492
Total number of calls dropped		1015870	40284855	73227	11363350	NS	NS	88248	518941	999967	8067438
Call drop rate	≤ 2%	2.11%	1.29%	0.48%	1.02%	NS	NS	0.19%	0.53%	1.12%	0.87%
Total number of cells in the network		28734	88944	39327	76338	NS	NS	3729	8694	37386	53568
Total number of cells having more than 3% TCH		4449	2460	997	2117	NS	NS	22	11	1974	2329
Worst affected cells having more than 3% TCH	≤ 3%	15.48%	2.77%	2.54%	2.77%	NS	NS	0.58%	0.12%	5.28%	4.35%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		1034	1811	1571	1545	NS	NS	212	1071	1250	2166
Total number of calls dropped		28	0	82	0	NS	NS	9	17	0	3
Call drop rate	≤ 2%	2.71%	0.00%	5.22%	0.00%	NS	NS	4.25%	1.59%	0.00%	0.14%

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	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		90370401270	953471974151	3795	171143043460	NS	NS	115659658354	14813938894	146477444516	135184197984
Total number of calls with good voice quality		86006757091	914591969768	3661	165041083896	NS	NS	113641803358	14432326312	141244616622	132342577121
%age calls with good voice quality	≥ 95%	95.17%	95.92%	96.47%	96.43%	NS	NS	98.26%	97.42%	96.43%	97.90%
Live measurement results for Voice quality-3 Day data											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		8885327650	431455644783	1590	74883095630	NS	NS	57819466500	11186364622	14509302695	96087533729
Total number of calls with good voice quality		8463734400	413471650697	1532	72077810991	NS	NS	56810883039	10900232358	13959645531	94409066791
%age calls with good voice quality	≥ 95%	95.26%	95.83%	96.35%	96.25%	NS	NS	98.26%	97.44%	96.21%	98.25%
Drive test results for Voice quality (Average of three drive tests) - DT data											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		1952003	2999399	90714	2581759	NS	NS	NA	1926126	2132840	6126346
Total number of calls with good voice quality		1833431	2893658	77317	2484280	NS	NS	NA	1626904	2058869	5883639
%age calls with good voice quality	≥ 95%	93.93%	96.47%	85.23%	96.22%	NS	NS	63.28%	84.47%	96.53%	96.04%

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	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	824	28	83	NS	NS	152	27	22	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		393764	2262596	134158	957519	NS	NS	5112655	930005	487746	894137
Traffic served for all POIs (B)- in erlangs		248991	2650751	42716	564505	NS	NS	497405	143369	254860	506353
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	824	28	83	NS	NS	152	27	22	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		391899	1563966	177930	957519	NS	NS	210493	39784	547213	887717
Traffic served for all POIs (B)- in erlangs		117895	1036999	42716	563593	NS	NS	19857	6053	215385	241544
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	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	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Eqipped capacity of the network	173900	863381	410100	237430	NS	NS	69741	48868	243704	263390
Total taffic handled in erlang during TCBH	158391	799910	120746	267909	NS	NS	9734.5	21777	277257	231356
Total no. of customers served (as per VLR)	5625842	26528122	2531269	11209356	NS	NS	155351	912303	6977754	9709827

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

11 ANNEXURE – CONSOLIDATED-3G

11.1 NETWORK AVAILABILITY

1. Network Availability					
Audit Results for Network Availability- PMR data					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		3339	16352	4642	2339
Sum of downtime (i.e. total outage time) of Node Bs		29366	5284	36806	1944
Node Bs downtime (not available for service)	≤ 2%	1.18%	0.04%	1.07%	0.11%
Number of Node Bs having accumulated downtime of >24 hours in a month		256	46	50	4
Worst affected Node Bs due to downtime	≤ 2%	7.67%	0.28%	1.08%	0.17%
Live Measurement Results for Network Availability- 3 Day live data					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		3339	16228	4642	NDR
Sum of downtime (i.e. total outage time) of Node Bs		2896	661	1800	NDR
Node Bs downtime (not available for service)	≤ 2%	1.20%	0.06%	0.54%	NDR
Number of Node Bs having accumulated downtime of >24 hours in a month		0	3	50	NDR
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.02%	1.08%	NDR

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	BSNL 3G	Reliance 3G
CSSR	≥ 95%	97.88%	99.11%	95.52%	98.43%
RRC Congestion	≤ 1%	0.37%	0.03%	1.79%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.47%	0.19%	0.61%	0.02%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data					
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
CSSR	≥ 95%	97.68%	99.45%	95.81%	97.61%
RRC Congestion	≤ 1%	0.45%	0.02%	1.70%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.59%	0.07%	0.61%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data					
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of RRC attempts (A)		563	1067	467	234
Total number of RRC established (B)		562	1067	409	226
Call setup success rate (B/A*100)	≥ 95%	99.82%	100.00%	87.58%	96.58%
%age blocked calls		0.18%	0.00%	12.42%	3.42%

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 3G	Reliance 3G
Total calls successfully established (A) (Number of voice RAB normally released)		33985003	106260035	57920025	15639650
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		260196	632189	585855	7584
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.77%	0.59%	1.01%	0.05%
Total no. of cells in the licensed service area (B)		9787	54728	13926	6945
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		780	1293	220	7
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.97%	2.36%	1.58%	0.10%
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 3G	Reliance 3G
Total calls successfully established (A) (Number of voice RAB normally released)		3383298	161279476	5823073	17844728
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		26382	804458	58544	7955
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.78%	0.50%	1.01%	0.04%
Total no. of cells in the licensed service area (B)		9839	54098	11748	6945
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		816	1287	124	0
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.30%	2.38%	1.05%	0.00%
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 3G	Reliance 3G
Total calls successfully established (A) (Number of voice RAB normally released)		517	1067	321	191
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		8	0	25	6
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.55%	0.00%	7.79%	3.14%

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 3G	Reliance 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		88437075735	NA	507	91630340332
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		87165494818	NA	487	90026101207
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.56%	99.25%	96.06%	98.25%
Live measurement results for Voice quality-3 Day data					
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		8917226325	NA	1128	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		8791327328	NA	1083	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.59%	99.19%	96.01%	NA
Drive test results for Voice quality (Average of three drive tests) - DT data					
Voice quality	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2574322	5185506	97728	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		1339517	5148458	75564	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	52.03%	99.29%	77.32%	NA

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 3G	Reliance 3G
Total number of working POIs		48	824	28	180
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		393764	2262596	62152	102816
Traffic served for all POIs (B)- in erlangs		248991	2650751	0	23442
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of working POIs		48	824	28	178
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		391899	1563966	62152	311442
Traffic served for all POIs (B)- in erlangs		117895	1036999	0	71946
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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

11.6 ADDITIONAL NETWORK RELATED PARAMETERS

Audit Results for Total Traffic Handled in Erlang				
Traffic in Erlang	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Eqipped capacity of the network	0	NA	17668	NDR
Total taffic handled in erlang during TCBH	9211	27781	6260	NDR
Total no. of customers served (as per VLR)	476608	1402178	67477	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	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		3239	253738	75681	69502	NS	NS	23724	29739	0	362412
Total number of bills disputed		0	217	0	116	NS	NS	3	0	0	82
Total number of valid billing complaints		0	38	0	11	NS	NS	3	0	0	23
Total complaints considered invalid		0	179	0	105	NS	NS	0	0	0	59
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.00%	0.09%	0.00%	0.17%	NS	NS	0.01%	0.00%	NA	0.02%
July											
Total bills generated during the first billing cycle		1100	98474	24909	22506	NS	NS	7974	9755	0	118100
Total number of bills disputed in first billing cycle		0	64	0	38	NS	NS	0	0	0	15
Total number of valid billing complaints (billing cycle 1)		0	8	0	1	NS	NS	0	0	0	10
Total complaints considered invalid (billing cycle 1)		0	56	0	37	NS	NS	0	0	0	5
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.00%	0.06%	0.00%	0.17%	NS	NS	0.00%	0.00%	NA	0.01%

Data Source: Billing Center of the operators

August											
Total bills generated during the second billing cycle		1075	70378	25148	23134	NS	NS	7881	9666	0	123099
Total number of bills disputed in second billing cycle		0	74	0	45	NS	NS	2	0	0	19
Total number of valid billing complaints (billing cycle 2)		0	20	0	5	NS	NS	2	0	0	2
Total complaints considered invalid (billing cycle 2)		0	54	0	40	NS	NS	0	0	0	17
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.00%	0.11%	0.00%	0.19%	NS	NS	0.03%	0.00%	NA	0.02%
September											
Total bills generated during the third billing cycle		1064	84886	25624	23862	NS	NS	7869	10318	0	121213
Total number of bills disputed in third billing cycle		0	79	0	33	NS	NS	1	0	0	48
Total number of valid billing complaints (billing cycle 3)		0	10	0	5	NS	NS	1	0	0	11
Total complaints considered invalid (billing cycle 3)		0	69	0	28	NS	NS	0	0	0	37
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.00%	0.09%	NA	0.14%	NS	NS	0.01%	0.00%	NA	0.04%

Data Source: Billing Center of the operators

Metering and billing credibility - Prepaid											
Performance prepaid	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of charging complaints (valid) - sum of 3 months		50	6408	62	1028	NS	NS	0	0	7	6111
Total complaints considered invalid (sum of 3 months)		6063	10986	27	5755	NS	NS	0	0	0	1219
Total number of charging complaints (sum of 3 months)		6113	17394	89	6783	NS	NS	0	0	7	7330
Total no of customers served (Sum of 3 months)		21929421	88860324	7990806	32921971	NS	NS	336917	1440726	29128004	27818339
Percentage of charging complaints disputed	≤ 0.1%	0.03%	0.02%	0.00%	0.02%	NS	NS	0.00%	0.00%	0.00%	0.03%

Data Source: Billing Center of the operators

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated											
Billing Performance	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of billing/charging complaints		6113	17611	89	6899	NS	NS	3	0	7	7412
Total number of complaints resolved in favour of customer		50	6446	62	1039	NS	NS	3	0	7	6134
Total complaints considered invalid		6063	11165	27	5860	NS	NS	0	0	0	1278
Number of complaints resolved in 4 weeks		50	6446	62	1039	NS	NS	2	0	7	6134
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	NS	NS	66.67%	NA	100.00%	100.00%
Number of complaints resolved in 6 weeks		50	6446	62	1039	NS	NS	2	0	7	6134
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	NS	NS	66.67%	NA	100.00%	100.00%
Period of applying credit / waiver											
Total number of complaints where credit/waiver is required		50	6446	89	1039	NS	NS	3	0	7	6134
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	NS	NS	100.00%	100.00%	100.00%	100.00%

Data Source: Billing Center of the operators

Data Source: Billing Center of the operators

Live calling results for resolution of billing complaints											
Resolution of billing complaints	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls made		100	100	100	100	NS	100	0	38	0	100
Number of cases resolved in 4 weeks		74	84	89	87	NS	79	0	31	0	90
Percentage cases resolved in 4 weeks	≥ 98%	74.00%	84.00%	89.00%	87.00%	NS	79.00%	NA	NA	NA	90.00%
Number of cases resolved in 6 weeks		76	84	89	87	NS	79	0	31	0	90
Percentage cases resolved in 6 weeks	100.00%	76.00%	84.00%	89.00%	87.00%	NS	79.00%	NA	NA	NA	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	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts to customer care for assistance		40587208	9066097	68820	63076777	NS	NS	246211	246211	23740705	12977153
Number of calls getting connected and answered (electronically)		37986003	8958358	68061	62704997	NS	NS	239204	239204	23671806	12977153
Percentage calls getting connected and answered	≥ 95%	93.59%	98.81%	98.90%	99.41%	NS	NS	97.15%	97.15%	99.71%	100.00%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls received (3 months)		5673297	9864638	55295	11891710	NS	NS	43095	284332	6793203	5422714
Total Number of calls answered within 90 seconds (3 months)		5470074	9592853	53123	11881965	NS	NS	42933	278357	6701513	5304328
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	96.42%	97.24%	96.07%	99.92%	NS	NS	99.62%	97.90%	98.65%	97.82%

July											
Total calls received (Month 1)		2007744	3415790	13933	3740704	NS	NS	16468	100306	2188396	1859996
Total calls answered within 90 seconds (Month 1)		1937845	3361500	13512	3739670	NS	NS	16421	98292	2165099	1838090
% calls answered within 90 seconds (Month 1)	≥ 95%	96.52%	98.41%	96.98%	99.97%	NS	NS	99.71%	97.99%	98.94%	98.82%
August											
Total calls received (Month 2)		1979893	3259953	19639	4100009	NS	NS	13844	95042	2323232	1791443
Total calls answered within 90 seconds (Month 2)		1861390	3182172	18820	4099102	NS	NS	13788	92769	2304636	1737540
% calls answered within 90 seconds (Month 2)	≥ 95%	94.01%	97.61%	95.83%	99.98%	NS	NS	99.60%	97.61%	99.20%	96.99%
September											
Total calls received (Month 3)		1685660	3188895	21723	4050997	NS	NS	12783	88984	2281575	1771275
Total calls answered within 90 seconds (Month 3)		1670839	3049181	20791	4043193	NS	NS	12724	87296	2231778	1728698
% calls answered within 90 seconds (Month 3)	≥ 95%	99.12%	95.62%	95.71%	99.81%	NS	NS	99.54%	98.10%	97.82%	97.60%

Data Source: Customer Service Center of the operators

Live calling results for customer care (IVR)											
Customer Care Assessment	Benchmark	Aircel(DWL)	Airtel	BSNL	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	NS	100	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	200	100	NS	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	100.00%	NS	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	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls received		100	100	200	100	NS	100	100	100	100	100
Total Number of calls getting connected and answered		100	100	196	99	NS	93	100	100	100	100
Live Calling Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	98.00%	99.00%	NS	93.00%	100.00%	100.00%	100.00%	100.00%

12.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated											
Termination	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of closure request		9	3738	0	498	NS	NS	947	257	0	3916
Number of requests attended within 7 days		9	3738	0	498	NS	NS	947	257	0	3916
Percentage cases in which termination done within 7 days	100.00%	100.00%	100.00%	NA	100.00%	NS	NS	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	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of cases requiring refund of deposits		19	200	0	154	NS	NS	24	28	0	1478
Total number of cases where refund was made within 60 days		19	200	0	154	NS	NS	24	28	0	1478
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	NA	100.00%	NS	NS	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	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total Number of calls made	100	100	200	100	NS	27	100	100	0	100
Number of cases resolved to satisfaction	88	81	172	94	NS	24	92	83	0	95
Percentage cases resolved in four weeks	88.00%	81.00%	86.00%	94.00%	NS	88.89%	92.00%	83.00%	NA	95.00%

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	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total no. of calls made		300	300	600	300	NS	300	300	300	300	300
Calls answered		289	282	564	269	NS	273	278	275	257	290
% of calls connected	≥ 95%	96.33%	94.00%	94.00%	89.67%	NS	91.00%	92.67%	91.67%	85.67%	96.67%

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		15	15
101	Fire	Y		15	14
102	Ambulance	Y		15	15
104	Health Information Helpline	Y		15	14
108	Emergency and Disaster Management Helpline	Y		15	15
138	All India Helpline for Passengers	Y		15	14
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		15	15
182	Indian Railway Security Helpline	Y		15	14
1033	Road Accident Management Service	Y		15	14
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		15	14
1071	Air Accident Helpline	Y		15	14
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		

1077	Control Room for District Collector	Y		15	14
1090	Call Alert (Crime Branch)	Y		15	14
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		15	15
1099	Central Accident and Trauma Services (CATS)	Y		15	15
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		15	14
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		15	15
155304	Municipal Corporations		N		
155214	Labour Helpline	Y		15	15
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		15	15
1916	Drinking Water Supply	Y		15	14
1950	Election Commission of India		N		
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		14	13
101	Fire	Y		14	12
102	Ambulance	Y		14	13
104	Health Information Helpline	Y		14	13
108	Emergency and Disaster Management Helpline	Y		14	13

138	All India Helpline for Passengers	Y		13	12
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		14	13
182	Indian Railway Security Helpline	Y		14	12
1033	Road Accident Management Service	Y		14	12
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		13	13
1073	Road Accident Helpline	Y		13	13
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline	Y		14	13
1097	National AIDS Helpline to NACO	Y		13	13
1099	Central Accident and Trauma Services (CATS)	Y		14	13
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		14	13
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		14	13

155304	Municipal Corporations		N		
155214	Labour Helpline	Y		13	13
1903	Sashastra Seema Bal (SSB)	Y		14	13
1909	National Do Not Call Registry	Y		13	13
1912	Complaint of Electricity	Y		13	13
1916	Drinking Water Supply	Y		14	13
1950	Election Commission of India	Y		13	13
BSNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	16
101	Fire	Y		17	17
102	Ambulance	Y		17	17
104	Health Information Helpline	Y			
108	Emergency and Disaster Management Helpline	Y		17	17
138	All India Helpline for Passengers	Y		16	16
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N	17	17
182	Indian Railway Security Helpline	Y		16	16
1033	Road Accident Management Service	Y		17	17
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		17	17
1071	Air Accident Helpline	Y			
1072	Rail Accident Helpline	Y		16	16
1073	Road Accident Helpline		N	17	17

1077	Control Room for District Collector		N	17	17
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline	Y		16	16
1097	National AIDS Helpline to NACO	Y		16	16
1099	Central Accident and Trauma Services (CATS)	Y			
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N	17	17
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N	17	17
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		17	17
1912	Complaint of Electricity	Y		17	17
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y			
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		20	18
101	Fire	Y		20	18
102	Ambulance	Y		20	18
104	Health Information Helpline	Y		20	18
108	Emergency and Disaster Management Helpline	Y		20	18

138	All India Helpline for Passengers	Y		20	17
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		20	18
1033	Road Accident Management Service	Y		20	18
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline	Y		20	18
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline	Y		20	18
1072	Rail Accident Helpline	Y		20	18
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		20	18
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		

155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		20	18
1909	National Do Not Call Registry	Y		20	18
1903	Sashastra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		19	17
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		19	17
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	15
101	Fire	Y		16	15
102	Ambulance	Y		15	15
104	Health Information Helpline	Y		16	14
108	Emergency and Disaster Management Helpline	Y		16	14
138	All India Helpline for Passengers	Y		16	15
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		16	15
182	Indian Railway Security Helpline	Y		16	14
1033	Road Accident Management Service	Y		15	15
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		16	14
1071	Air Accident Helpline	Y		16	15

1072	Rail Accident Helpline	Y		16	15
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		16	14
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		16	15
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		15	14
155304	Municipal Corporations		N		
155214	Labour Helpline	Y		16	14
1903	Sashastra Seema Bal (SSB)	Y		16	14
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		15	14
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		16	14
Telenor					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		43	37
101	Fire	Y		43	36
102	Ambulance	Y		43	37

104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		43	37
138	All India Helpline for Passengers	Y		43	37
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities		N		
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector		N		
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		

1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sashastra Seema Bal (SSB)	Y		42	36
1909	National Do Not Call Registry	Y		43	37
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
Vodafone					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		16	16
101	Fire	Y		16	15
102	Ambulance	Y		15	15
104	Health Information Helpline	Y		16	15
108	Emergency and Disaster Management Helpline	Y		16	16
138	All India Helpine for Passangers	Y		16	16
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		16	15
182	Indian Railway Security Helpline	Y		16	15
1033	Road Accident Management Service	Y		16	15
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		

1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		16	16
1071	Air Accident Helpline	Y		16	15
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		15	15
1090	Call Alert (Crime Branch)		N		
1091	Women Helpline		N		
1097	National AIDS Helpline to NACO	Y		16	16
1099	Central Accident and Trauma Services (CATS)		N		
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board		N		
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway		N		
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		16	15
155304	Municipal Corporations		N		
155214	Labour Helpline	Y		16	15
1903	Sashastra Seema Bal (SSB)	Y		15	15
1909	National Do Not Call Registry	Y		16	15
1912	Complaint of Electricity	Y		16	15
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		15	15

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)

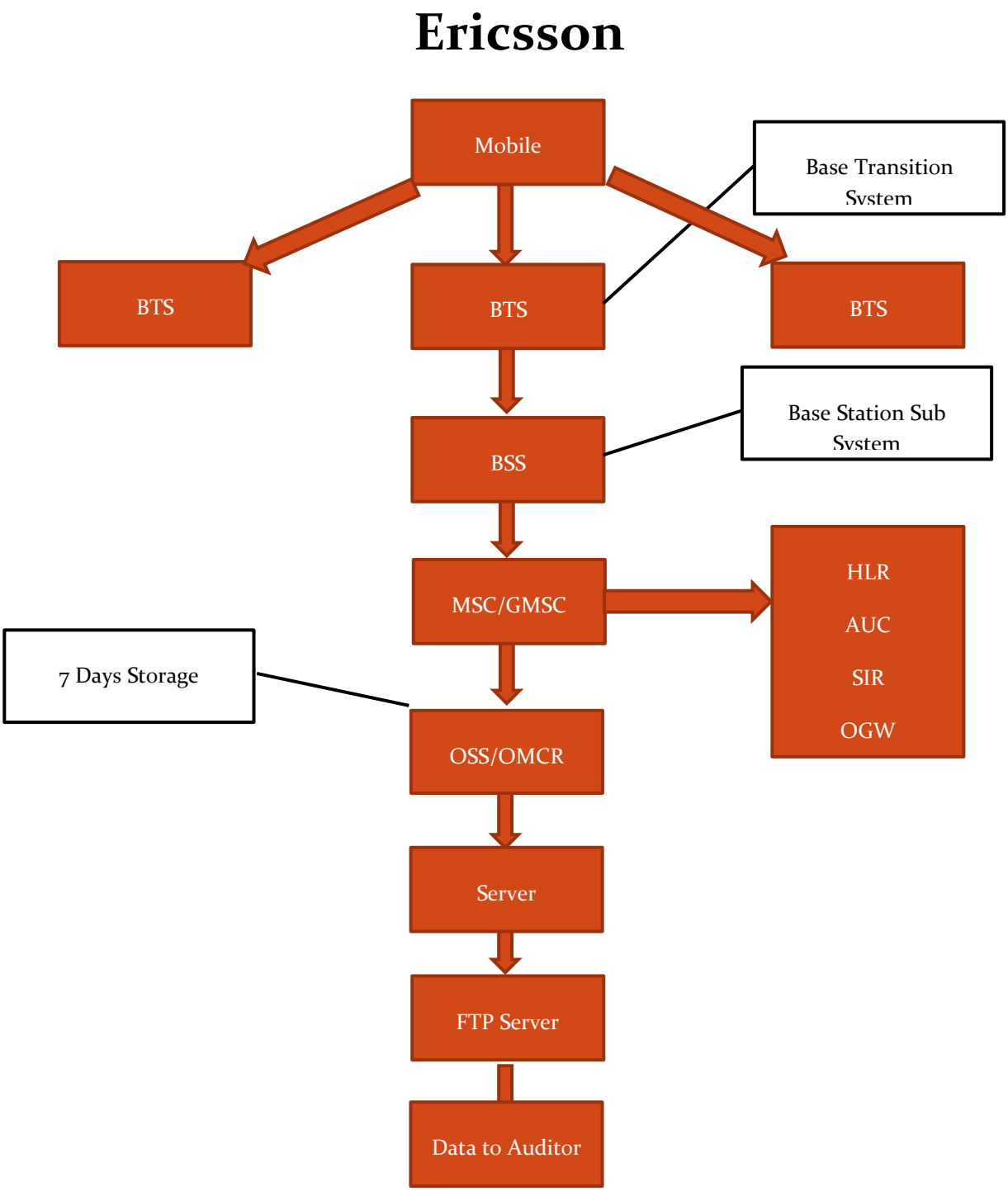
NSN provides network support to Vodafone in the circle.

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

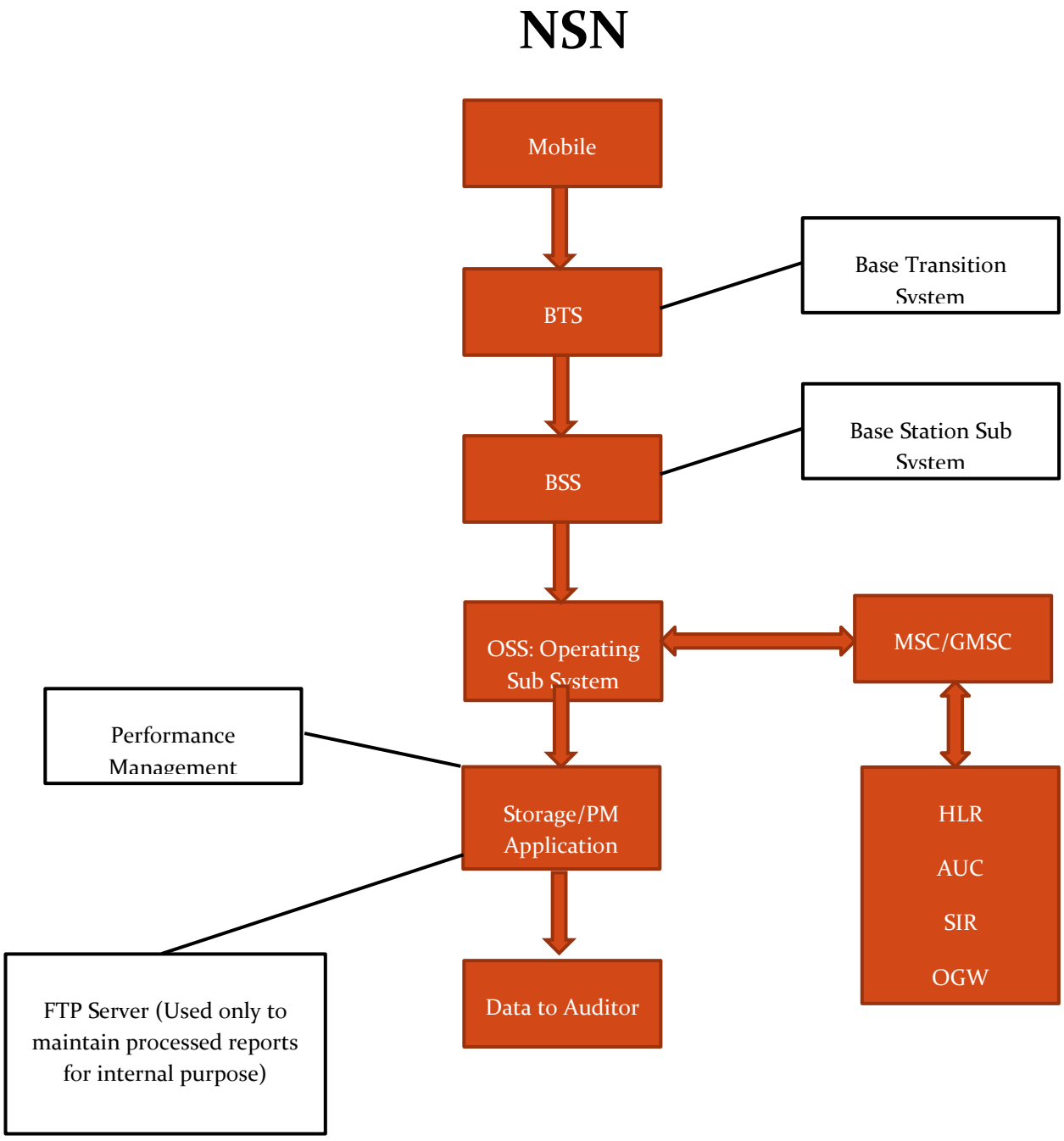
13.2.1 ERICSSON

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 – JULY -2G

1. Network Availability											
Audit Results for Network Availability- PMR data-July											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		3157	9881	4146	8409	NS	NS	390	962	4165	8904
Sum of downtime of BTSs in a month (in hours)		45543	4522	55846	68719	NS	NS	581	1098	10038	23793
BTSs accumulated downtime (not available for service)	≤ 2%	1.94%	0.06%	1.81%	1.10%	NS	NS	0.20%	0.15%	0.32%	0.36%
Number of BTSs having accumulated downtime >24 hours		323	15	82	154	NS	NS	0	0	32	86
Worst affected BTSs due to downtime	≤ 2%	10.23%	0.15%	1.98%	1.83%	NS	NS	0.00%	0.00%	0.77%	0.97%
Live Measurement Results for Network Availability- 3 Day live data-July											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		3157	9931	4146	8353	NS	NS	390	962	4163	8904
Sum of downtime of BTSs in a month (in hours)		5062	373	2247	7844	NS	NS	51	126	1162	984
BTSs accumulated downtime (not available for service)	≤ 2%	2.23%	0.05%	0.75%	1.30%	NS	NS	0.18%	0.18%	0.39%	0.15%
Number of BTSs having accumulated downtime >24 hours		0	0	28	2	NS	NS	0	0	2	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.68%	0.02%	NS	NS	0.00%	0.00%	0.05%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-July											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	89.03%	95.24%	97.08%	97.35%	NS	NS	98.08%	97.73%	97.22%	99.31%
SDCCH/Paging channel congestion	≤ 1%	0.97%	0.73%	6.17%	0.80%	NS	NS	NA	0.53%	0.96%	0.15%
TCH congestion	≤ 2%	11.16%	1.62%	1.44%	1.79%	NS	NS	0.46%	0.75%	1.98%	0.69%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-July											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	87.88%	95.55%	95.64%	98.08%	NS	NS	98.49%	98.58%	97.16%	99.44%
SDCCH/Paging channel congestion	≤ 1%	0.93%	0.76%	0.06%	0.74%	NS	NS	NA	0.84%	1.03%	0.26%
TCH congestion	≤ 2%	12.65%	1.56%	0.01%	0.49%	NS	NS	0.12%	0.16%	2.01%	0.56%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts		521	928	789	830	NS	NS	202	671	647	868
Total number of successful calls established		505	928	714	830	NS	NS	145	598	643	865
CSSR	≥ 95%	96.93%	100.00%	90.49%	100.00%	NS	NS	71.78%	89.12%	99.38%	99.65%
%age blocked calls		3.07%	0.00%	9.51%	0.00%	NS	NS	28.22%	10.88%	0.62%	0.35%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-July											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		182440546	846328128	19653469	308651258	NS	NS	12364363	25628349	313302891	227234340
Total number of calls dropped		3644851	12528710	148004	3315721	NS	NS	44374	164097	3488990	2138885
Call drop rate	≤ 2%	2.00%	1.48%	0.75%	1.07%	NS	NS	0.36%	0.64%	1.11%	0.94%
Total number of cells in the network		9405	29670	12413	25370	NS	NS	1257	2898	12491	26777
Total number of cells having more than 3% TCH		1521	837	274	688	NS	NS	28	94	730	764
Worst affected cells having more than 3% TCH	≤ 3%	16.18%	2.82%	2.21%	2.71%	NS	NS	2.21%	3.23%	5.85%	2.86%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-July											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		16968415	1038591694	4663139	361475292	NS	NS	14759544	32588304	31894378	242517534
Total number of calls dropped		382325	15705813	14781	3869103	NS	NS	30356	179980	345339	2133299
Call drop rate	≤ 2%	2.25%	1.51%	0.32%	1.07%	NS	NS	0.21%	0.55%	1.08%	0.88%
Total number of cells in the network		9466	29830	12413	25205	NS	NS	1257	2899	12476	0
Total number of cells having more than 3% TCH		1786	795	254	730	NS	NS	2	4	652	768
Worst affected cells having more than 3% TCH	≤ 3%	18.86%	2.67%	2.05%	2.90%	NS	NS	0.15%	0.15%	5.22%	NA
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-July											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		505	928	714	830	NS	NS	145	598	643	865
Total number of calls dropped		8	0	58	0	NS	NS	6	8	0	2
Call drop rate	≤ 2%	1.58%	0.00%	8.12%	0.00%	NS	NS	4.14%	1.34%	0.00%	0.23%

4. Voice quality											
Audit Results for Voice quality -PMR Data-July											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		30291727924	321410920508	1270	57129170058	NS	NS	40282988917	5180658724	49125064525	42431090113
Total number of calls with good voice quality		28720153121	307304525636	1225	55111184065	NS	NS	39579578535	5043841393	47057701685	41567280934
%age calls with good voice quality	≥ 95%	94.81%	95.61%	96.46%	96.47%	NS	NS	98.25%	97.36%	95.79%	97.96%
Live measurement results for Voice quality-3 Day data-July											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		3029456514	33503363775	540	5934872433	NS	NS	5265895318	4857902254	4663403129	33989922310
Total number of calls with good voice quality		2872830888	31964676519	516	5748350668	NS	NS	5173994002	4718552160	4455986237	33363099593
%age calls with good voice quality	≥ 95%	94.83%	95.41%	95.56%	96.86%	NS	NS	98.25%	97.13%	95.55%	98.16%
Drive test results for Voice quality (Average of three drive tests) - DT data-July											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		1033924	1486614	18208	1370456	NS	NS	NA	1028158	1058138	2352945
Total number of calls with good voice quality		964326	1431545	14408	1314167	NS	NS	NA	848168	1021054	2283004
%age calls with good voice quality	≥ 95%	93.27%	96.30%	79.13%	95.89%	NS	NS	84.38%	82.49%	96.50%	97.03%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-July											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	817	21	83	NS	NS	153	27	25	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131207	784934	15538	313200	NS	NS	1746725	307786	91350	297860
Traffic served for all POIs (B)- in erlangs		87398	1693678	14239	186790	NS	NS	182451	46697	68528	170109
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	817	21	83	NS	NS	152	27	25	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131114	744519	59310	313200	NS	NS	70183	13643	90942	291240
Traffic served for all POIs (B)- in erlangs		39931	480426	14239	182011	NS	NS	6687	2061	68309	78737
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%

15 ANNEXURE – AUGUST-2G

1. Network Availability											
Audit Results for Network Availability- PMR data-August											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		3218	9804	4176	8485	NS	NS	390	962	4102	8905
Sum of downtime of BTSs in a month (in hours)		38138	5970	53292	60483	NS	NS	764	1857	8010	27439
BTSs accumulated downtime (not available for service)	≤ 2%	1.65%	0.08%	1.77%	0.99%	NS	NS	0.27%	0.27%	0.27%	0.43%
Number of BTSs having accumulated downtime >24 hours		285	38	82	150	NS	NS	0	2	30	112
Worst affected BTSs due to downtime	≤ 2%	8.86%	0.39%	1.96%	1.77%	NS	NS	0.00%	0.21%	0.73%	1.26%
Live Measurement Results for Network Availability- 3 Day live data-August											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		3218	9800	4176	8434	NS	NS	390	962	4164	8905
Sum of downtime of BTSs in a month (in hours)		4378	665	1715	7628	NS	NS	34	150	918	2800
BTSs accumulated downtime (not available for service)	≤ 2%	1.89%	0.09%	0.57%	1.26%	NS	NS	0.12%	0.22%	0.31%	0.44%
Number of BTSs having accumulated downtime >24 hours		0	0	29	0	NS	NS	0	0	1	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.69%	0.00%	NS	NS	0.00%	0.00%	0.02%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-August											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	87.73%	95.78%	92.06%	96.27%	NS	NS	97.68%	97.84%	97.40%	99.33%
SDCCH/Paging channel congestion	≤ 1%	0.87%	0.69%	5.14%	0.76%	NS	NS	NA	1.04%	0.76%	0.18%
TCH congestion	≤ 2%	12.57%	1.55%	2.54%	1.88%	NS	NS	0.64%	0.54%	1.89%	0.67%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-August											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
CSSR	≥ 95%	86.21%	96.21%	95.06%	98.18%	NS	NS	98.33%	98.50%	97.26%	99.38%
SDCCH/Paging channel congestion	≤ 1%	0.94%	0.78%	0.10%	1.14%	NS	NS	NA	0.43%	0.73%	0.29%
TCH congestion	≤ 2%	14.61%	1.22%	0.04%	0.77%	NS	NS	0.29%	0.27%	2.02%	0.62%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August											
CSSR	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of call attempts		256	456	517	364	NS	NS	NS	267	271	652
Total number of successful calls established		242	456	463	364	NS	NS	NS	233	269	652
CSSR	≥ 95%	94.53%	100.00%	89.56%	100.00%	NS	NS	NS	87.27%	99.26%	100.00%
%age blocked calls		5.47%	0.00%	10.44%	0.00%	NS	NS	NS	12.73%	0.74%	0.00%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-August											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		172979517	801378866	27930790	308430319	NS	NS	11900941	23976820	282682689	259548218
Total number of calls dropped		3448481	12266667	310778	3261086	NS	NS	26539	158589	3414433	2429246
Call drop rate	≤ 2%	1.99%	1.53%	1.11%	1.06%	NS	NS	0.22%	0.66%	1.21%	0.94%
Total number of cells in the network		9584	29467	12499	787787	NS	NS	1257	2896	12294	26784
Total number of cells having more than 3% TCH		1428	779	627	20956	NS	NS	11	83	761	766
Worst affected cells having more than 3% TCH	≤ 3%	14.91%	2.64%	5.02%	2.66%	NS	NS	0.85%	2.88%	6.19%	2.86%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-August											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		16160584	1034471598	5689938	378007378	NS	NS	15863012	32911209	29144892	351891083
Total number of calls dropped		389570	12042276	33357	3825554	NS	NS	28926	179962	301804	3059241
Call drop rate	≤ 2%	2.41%	1.16%	0.59%	1.01%	NS	NS	0.18%	0.55%	1.04%	0.87%
Total number of cells in the network		9607	29433	12508	25442	NS	NS	1257	2897	12486	26784
Total number of cells having more than 3% TCH		1543	873	434	671	NS	NS	19	4	600	780
Worst affected cells having more than 3% TCH	≤ 3%	16.06%	2.96%	3.47%	2.64%	NS	NS	1.52%	0.12%	4.81%	2.91%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-August											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		256	456	463	375	NS	NS	NS	233	269	655
Total number of calls dropped		0	0	18	0	NS	NS	NS	2	0	0
Call drop rate	≤ 2%	0.00%	0.00%	3.89%	0.00%	NS	NS	NS	0.86%	0.00%	0.00%

4. Voice quality											
Audit Results for Voice quality -PMR Data-August											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		31090407934	326262954604	1265	58402651047	NS	NS	39213118796	5087917757	50014293869	48401707319
Total number of calls with good voice quality		29597004082	312743788767	1221	56267769553	NS	NS	38528966991	4954599994	48266694424	47363539578
%age calls with good voice quality	≥ 95%	95.20%	95.86%	96.52%	96.34%	NS	NS	98.26%	97.38%	96.51%	97.86%
Live measurement results for Voice quality-3 Day data-August											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		2896990193	34112442007	525	6336589696	NS	NS	4902596185	587522349	5015655560	5692631834
Total number of calls with good voice quality		2758811457	32635203661	507	6152761164	NS	NS	4816986133	573260050	4820954065	5590006319
%age calls with good voice quality	≥ 95%	95.23%	95.67%	96.57%	97.10%	NS	NS	98.25%	97.57%	96.12%	98.20%
Drive test results for Voice quality (Average of three drive tests) - DT data-August											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		435081	762527	49581	627503	NS	NS	NS	360897	485920	1855456
Total number of calls with good voice quality		412463	735415	45723	602751	NS	NS	NS	313961	467774	1780222
%age calls with good voice quality	≥ 95%	94.80%	96.44%	92.22%	96.06%	NS	NS	NS	86.99%	96.27%	95.95%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-August											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	825	32	83	NS	NS	152	27	21	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133057	734862	59310	318250	NS	NS	1682965	317436	149888	297368
Traffic served for all POIs (B)- in erlangs		85105	476664	14238	187396	NS	NS	157477	46987	118107	169493
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	825	32	83	NS	NS	152	27	21	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133043	81809	59310	318250	NS	NS	70183	13379	95216	297209
Traffic served for all POIs (B)- in erlangs		39872	65501	14238	186662	NS	NS	6603	1878	77062	81348
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%

16 ANNEXURE – SEPTEMBER-2G

1. Network Availability											
Audit Results for Network Availability- PMR data-September											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		3225	9867	4825	8585	NS	NS	376	962	4162	8905
Sum of downtime of BTSs in a month (in hours)		33175	5486	61690	62895	NS	NS	566	1510	6202	29841
BTSs accumulated downtime (not available for service)	≤ 2%	1.43%	0.08%	1.78%	1.02%	NS	NS	0.21%	0.22%	0.21%	0.47%
Number of BTSs having accumulated downtime >24 hours		351	24	93	151	NS	NS	0	2	12	112
Worst affected BTSs due to downtime	≤ 2%	10.88%	0.24%	1.93%	1.76%	NS	NS	0.00%	0.21%	0.29%	1.26%
Live Measurement Results for Network Availability- 3 Day live data-September											
	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Number of BTSs in the licensed service area		3225	9879	4825	8516	NS	NS	376	962	4143	8905
Sum of downtime of BTSs in a month (in hours)		2803	1306	1642	6664	NS	NS	75	147	503	2920
BTSs accumulated downtime (not available for service)	≤ 2%	1.21%	0.18%	0.47%	1.09%	NS	NS	0.28%	0.21%	0.17%	0.46%
Number of BTSs having accumulated downtime >24 hours		0	4	38	2	NS	NS	0	0	1	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.04%	0.79%	0.02%	NS	NS	0.00%	0.00%	0.02%	0.00%

2. Connection Establishment (Accessibility)											
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-September											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
CSSR	≥ 95%	89.45%	96.85%	92.89%	97.41%	NS	NS	97.71%	98.17%	97.76%	99.50%
SDCCH/Paging channel congestion	≤ 1%	0.74%	0.70%	4.41%	0.94%	NS	NS	NA	0.52%	0.65%	0.11%
TCH congestion	≤ 2%	10.67%	1.57%	2.07%	1.83%	NS	NS	0.56%	0.38%	1.64%	0.50%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-September											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
CSSR	≥ 95%	88.47%	96.10%	86.89%	99.13%	NS	NS	97.90%	98.69%	97.86%	99.54%
SDCCH/Paging channel congestion	≤ 1%	0.42%	0.67%	5.83%	0.62%	NS	NS	NA	0.94%	0.68%	0.17%
TCH congestion	≤ 2%	11.69%	1.06%	2.50%	0.55%	NS	NS	0.13%	0.14%	1.53%	0.46%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September											
CSSR	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of call attempts		301	427	400	340	NS	NS	383	293	340	648
Total number of successful calls established		273	427	394	340	NS	NS	67	240	338	646
CSSR	≥ 95%	90.70%	100.00%	98.50%	100.00%	NS	NS	17.49%	81.91%	99.41%	99.69%
%age blocked calls		9.30%	0.00%	1.50%	0.00%	NS	NS	82.51%	18.09%	0.59%	0.31%

3. Connection Maintenance (Retainability)											
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-September											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		149495945	703606711	22749712	308802257	NS	NS	10534983	21008904	275259753	215835435
Total number of calls dropped		2754369	10549403	278629	3384965	NS	NS	23265	132290	3313539	1989892
Call drop rate	≤ 2%	1.84%	1.50%	1.22%	1.10%	NS	NS	0.22%	0.63%	1.20%	0.92%
Total number of cells in the network		9638	29643	14406	769611	NS	NS	1228	2900	13727	26784
Total number of cells having more than 3% TCH		1366	829	453	20594	NS	NS	11	75	838	779
Worst affected cells having more than 3% TCH	≤ 3%	14.17%	2.80%	3.15%	2.68%	NS	NS	0.91%	2.59%	6.10%	2.91%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-September											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		15111846	1039916929	4941742	374966747	NS	NS	15314455	31544681	28327506	333510875
Total number of calls dropped		243975	12536766	25089	3668693	NS	NS	28966	158999	352824	2874898
Call drop rate	≤ 2%	1.61%	1.21%	0.51%	0.98%	NS	NS	0.19%	0.50%	1.25%	0.86%
Total number of cells in the network		9661	29681	14406	25691	NS	NS	1215	2898	12424	26784
Total number of cells having more than 3% TCH		1120	792	309	716	NS	NS	1	3	722	780
Worst affected cells having more than 3% TCH	≤ 3%	11.59%	2.67%	2.14%	2.79%	NS	NS	0.04%	0.10%	5.81%	2.91%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-September											
Call drop rate	**Benchmark**	**Aircel(DWL)**	**Airtel**	**BSNL**	**Idea**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Telenor**	**Vodafone**
Total number of calls established		273	427	394	340	NS	NS	67	240	338	646
Total number of calls dropped		20	0	6	0	NS	NS	3	7	0	1
Call drop rate	≤ 2%	7.33%	0.00%	1.52%	0.00%	NS	NS	4.48%	2.92%	0.00%	0.15%

Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-June											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		17110205	82065004	5239445	377483316	server issue	No Service	14803336	35135788	30415541	362757478
Total number of calls dropped		333453	1202730	24262	3471064	server issue	No Service	52694	183185	339096	3010826
Call drop rate	≤ 2%	1.95%	1.47%	0.46%	0.92%	server issue	No Service	0.36%	0.52%	1.11%	0.83%
Total number of cells in the network		9124	89058	12362	24995	server issue	No Service	1257	2878	12472	26763
Total number of cells having more than 3% TCH		1408	2370	338	636	server issue	No Service	30	4	735	767
Worst affected cells having more than 3% TCH	≤ 3%	15.43%	2.66%	2.73%	2.54%	server issue	No Service	2.39%	0.14%	5.89%	2.86%
Drive test results for Call drop rate (Average of three drive tests) - Drive Test Data-June											
Call drop rate	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of calls established		812	1254	344	866	Closed	No Service	27	615	714	1127
Total number of calls dropped		3	0	19	0	Closed	No Service	5	16	0	0
Call drop rate	≤ 2%	0.37%	0.00%	5.52%	0.00%	Closed	No Service	18.52%	2.60%	0.00%	0.00%

4. Voice quality											
Audit Results for Voice quality -PMR Data-September											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		28988265412	305798099039	1260	55611222355	NS	NS	36163550641	4545362413	47338086122	44351400552
Total number of calls with good voice quality		27689599888	294543655365	1215	53662130278	NS	NS	35533257832	4433884925	45920220513	43411756609
%age calls with good voice quality	≥ 95%	95.52%	96.32%	96.43%	96.50%	NS	NS	98.26%	97.55%	97.00%	97.88%
Live measurement results for Voice quality-3 Day data-September											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		2958880943	363839839001	525	62611633501	NS	NS	47650974997	5740940019	4830244006	56404979585
Total number of calls with good voice quality		2832092055	348871770517	509	60176699159	NS	NS	46819902904	5608420148	4682705229	55455960879
%age calls with good voice quality	≥ 95%	95.71%	95.89%	96.95%	96.11%	NS	NS	98.26%	97.69%	96.95%	98.32%
Drive test results for Voice quality (Average of three drive tests) - DT data-September											
Voice quality	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of sample calls		482998	750258	22925	583800	NS	NS	NA	537071	588782	1917945
Total number of calls with good voice quality		456642	726698	17186	567362	NS	NS	NA	464775	570041	1820413
%age calls with good voice quality	≥ 95%	94.54%	96.86%	74.97%	97.18%	NS	NS	42.18%	86.54%	96.82%	94.91%

5. POI Congestion											
Audit Results for POI Congestion- PMR data-September											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	829	32	83	NS	NS	152	27	21	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129500	742799	59310	326069	NS	NS	1682965	304784	246508	298909
Traffic served for all POIs (B)- in erlangs		76488	480410	14239	190319	NS	NS	157477	49684	68224	166751
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September											
POI congestion	Benchmark	Aircel(DWL)	Airtel	BSNL	Idea	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Telenor	Vodafone
Total number of working POIs		48	829	32	83	NS	NS	152	27	21	62
No. of POIs not meeting benchmark		0	0	0	0	NS	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		127742	737638	59310	326069	NS	NS	70128	12762	361055	299268
Traffic served for all POIs (B)- in erlangs		38091	491071	14239	194920	NS	NS	6567	2114	70013	81458
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	NS	0.00%	0.00%	0.00%	0.00%

17 ANNEXURE – JULY -3G

1. Network Availability					
Audit Results for Network Availability- PMR data-July					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		1105	5425	2432	780
Sum of downtime (i.e. total outage time) of Node Bs		9178	1620	24882	1365
Node Bs downtime (not available for service)	≤ 2%	1.12%	0.04%	1.38%	0.24%
Number of Node Bs having accumulated downtime of >24 hours in a month		84	13	34	4
Worst affected Node Bs due to downtime	≤ 2%	7.60%	0.24%	1.40%	0.51%
Live Measurement Results for Network Availability- 3 Day live data-July					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		1105	5363	2432	780
Sum of downtime (i.e. total outage time) of Node Bs		527	175	1376	88
Node Bs downtime (not available for service)	≤ 2%	0.66%	0.05%	0.79%	0.16%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	2	34	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.04%	1.40%	0.00%

2. Connection Establishment (Accessibility)					
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-July					
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
CSSR	≥ 95%	97.78%	99.43%	95.96%	97.22%
RRC Congestion	≤ 1%	0.41%	0.03%	0.00%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.56%	0.09%	0.00%	0.02%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-July					
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
CSSR	≥ 95%	97.46%	99.43%	96.74%	92.98%
RRC Congestion	≤ 1%	0.49%	0.02%	0.01%	0.04%
Circuit Switched RAB Congestion	≤ 2%	0.96%	0.05%	0.00%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-July					
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of RRC attempts (A)		286	452	228	NS
Total number of RRC established (B)		286	452	194	NS
Call setup success rate (B/A*100)	≥ 95%	100.00%	100.00%	85.09%	NS
%age blocked calls		0.00%	0.00%	14.91%	NS

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-July					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		11830133	38421115	21221167	5109667
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		84915	200270	227500	630
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.72%	0.52%	1.07%	0.01%
Total no. of cells in the licensed service area (B)		3235	17915	7296	2330
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		233	408	145	0
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	7.21%	2.28%	1.98%	0.00%
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-July					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		1175990	50554972	2104577	6972978
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		9028	270346	22274	813
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.77%	0.53%	1.06%	0.01%
Total no. of cells in the licensed service area (B)		3280	17597	5118	2330
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		281	480	48	0
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.56%	2.73%	0.93%	0.00%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data-July					
Circuit switched voice drop rate	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		257	452	182	NS
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		3	0	21	NS
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.17%	0.00%	11.54%	NS

4. Voice quality					
Audit Results for Voice quality -PMR Data-July					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		28050442693	NA	255	45535334500
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		27638148852	NA	245	45465401679
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.53%	98.46%	96.08%	99.85%
Live measurement results for Voice quality-3 Day data-July					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3066665565	NA	375	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3020237297	NA	360	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.49%	98.84%	96.00%	NA
Drive test results for Voice quality (Average of three drive tests) - DT data-July					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		1405162	2241034	621	NS
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		601773	2222422	280	NS
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	42.83%	99.17%	45.09%	NS

5. POI Congestion					
Audit Results for POI Congestion- PMR data-July					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	817	42	171
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131207	784934	31076	101426
Traffic served for all POIs (B)- in erlangs		87398	1693678	0	22816
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	817	42	171
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		131114	744519	31076	100309
Traffic served for all POIs (B)- in erlangs		39931	480426	0	22588
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

18 ANNEXURE – AUGUST-3G

1. Network Availability					
Audit Results for Network Availability- PMR data-August					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		1108	5450	726	777
Sum of downtime (i.e. total outage time) of Node Bs		10047	1944	0	419
Node Bs downtime (not available for service)	≤ 2%	1.22%	0.05%	0.00%	0.07%
Number of Node Bs having accumulated downtime of >24 hours in a month		90	18	0	0
Worst affected Node Bs due to downtime	≤ 2%	8.12%	0.33%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-August					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		1108	5405	726	777
Sum of downtime (i.e. total outage time) of Node Bs		1267	212	0	44
Node Bs downtime (not available for service)	≤ 2%	1.59%	0.05%	0.00%	0.08%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	0	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)					
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-August					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
CSSR	≥ 95%	97.88%	99.25%	95.17%	98.57%
RRC Congestion	≤ 1%	0.37%	0.03%	4.05%	0.03%
Circuit Switched RAB Congestion	≤ 2%	0.53%	0.10%	1.04%	0.02%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-August					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
CSSR	≥ 95%	97.45%	99.46%	95.41%	99.86%
RRC Congestion	≤ 1%	0.63%	0.01%	3.82%	0.02%
Circuit Switched RAB Congestion	≤ 2%	0.42%	0.08%	1.03%	0.02%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-August					
CSSR	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of RRC attempts (A)		37	359	135	NS
Total number of RRC established (B)		37	359	129	NS
Call setup success rate (B/A*100)	≥ 95%	100.00%	100.00%	95.56%	NS
%age blocked calls		0.00%	0.00%	4.44%	NS

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-August					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		11649927	30858172	18543215	5280973
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		93048	194350	195364	2959
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.80%	0.63%	1.05%	0.06%
Total no. of cells in the licensed service area (B)		3252	18311	2178	2298
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		275	424	0	7
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.46%	2.32%	0.00%	0.30%
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-August					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		1159343	52989934	1856430	3545449
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		8986	231333	19411	2909
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.78%	0.44%	1.05%	0.08%
Total no. of cells in the licensed service area (B)		3216	18096	2178	2298
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		259	335	0	0
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.04%	1.85%	0.00%	0.00%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data-August					
Circuit switched voice drop rate	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		36	359	127	NS
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		1	0	4	NS
Circuit switched voice drop rate (B/A*100)	≤ 2%	2.78%	0.00%	3.15%	NS

4. Voice quality					
Audit Results for Voice quality -PMR Data-August					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		30140322323	NA	125	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		29709185485	NA	120	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.57%	98.34%	96.00%	99.84%
Live measurement results for Voice quality-3 Day data-August					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2699967073	NA	375	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		2663096427	NA	360	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.63%	98.88%	96.00%	NA
Drive test results for Voice quality (Average of three drive tests) - DT data-August					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		162297	1699825	NA	NS
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		108957	1689705	NA	NS
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	67.13%	99.40%	NA	NS

5. POI Congestion					
Audit Results for POI Congestion- PMR data-August					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	825	21	198
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133057	734862	15538	102820
Traffic served for all POIs (B)- in erlangs		85105	476664	0	23488
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	825	21	198
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		133043	81809	15538	102547
Traffic served for all POIs (B)- in erlangs		39872	65501	0	23484
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

19 ANNEXURE – SEPTEMBER-3G

1. Network Availability					
Audit Results for Network Availability- PMR data-September					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		1126	5477	1484	782
Sum of downtime (i.e. total outage time) of Node Bs		10141	1720	11924	160
Node Bs downtime (not available for service)	≤ 2%	1.25%	0.04%	1.12%	0.03%
Number of Node Bs having accumulated downtime of >24 hours in a month		82	15	16	0
Worst affected Node Bs due to downtime	≤ 2%	7.28%	0.27%	1.08%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-September					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
(Number of Node Bs in the network in the licensed service area		1126	5460	1484	782
Sum of downtime (i.e. total outage time) of Node Bs		1102	274	424	17
Node Bs downtime (not available for service)	≤ 2%	1.36%	0.07%	0.40%	0.03%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	1	16	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.02%	1.08%	0.00%

2. Connection Establishment (Accessibility)					
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-September					
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
CSSR	≥ 95%	98.00%	98.65%	95.43%	99.52%
RRC Congestion	≤ 1%	0.34%	0.03%	1.33%	0.01%
Circuit Switched RAB Congestion	≤ 2%	0.32%	0.37%	0.77%	0.01%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-September					
	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
CSSR	≥ 95%	98.14%	99.46%	95.28%	99.99%
RRC Congestion	≤ 1%	0.23%	0.02%	1.27%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.39%	0.08%	0.80%	0.01%
Drive test results for CSSR (Average of three drive tests) and blocked calls- Drive Test Data-September					
CSSR	Benchmark	Aircel 3G	Airtel 3G	BSNL 3G	Reliance 3G
Total number of RRC attempts (A)		240	256	104	234
Total number of RRC established (B)		239	256	86	226
Call setup success rate (B/A*100)	≥ 95%	99.58%	100.00%	82.69%	96.58%
%age blocked calls		0.42%	0.00%	17.31%	3.42%

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-September					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		10504943	36980748	18155643	5249010
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		82233	237569	162991	3995
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.78%	0.64%	0.90%	0.08%
Total no. of cells in the licensed service area (B)		3301	18502	4452	2317
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		272	461	76	0
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.23%	2.49%	1.70%	0.00%
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-September					
	Benchmark	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		1047965	57734570	1862066	7326301
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		8368	302779	16859	4233
Circuit switched voice drop rate (B/A*100)	≤ 2%	0.80%	0.52%	0.91%	0.06%
Total no. of cells in the licensed service area (B)		3343	18405	4452	2317
No. of affected cells having CSV Circuit switched voice drop rate >3% during (CBBH) in a month (A)		277	472	76	0
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	8.29%	2.56%	1.71%	0.00%
Drive test results for Circuit switched voice drop rate (Average of three drive tests) - Drive Test Data-September					
Circuit switched voice drop rate	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total calls successfully established (A) (Number of voice RAB normally released)		224	256	12	191
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		4	0	0	6
Circuit switched voice drop rate (B/A*100)	≤ 2%	1.79%	0.00%	0.00%	3.14%

4. Voice quality					
Audit Results for Voice quality -PMR Data-September					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		30246310719	NA	127	46095005832
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		29818160481	NA	122	44560699528
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.58%	98.38%	96.06%	96.67%
Live measurement results for Voice quality-3 Day data-September					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3150593687	NA	378	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3107993604	NA	363	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	98.65%	99.06%	96.03%	NA
Drive test results for Voice quality (Average of three drive tests) - DT data-September					
Voice quality	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		1006863	1244647	97107	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		628787	1236331	75284	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	62.45%	99.33%	77.53%	NA

5. POI Congestion					
Audit Results for POI Congestion- PMR data-September					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	829	21	171
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		129500	742799	15538	104203
Traffic served for all POIs (B)- in erlangs		76488	480410	0	24022
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September					
POI congestion	**Benchmark**	**Aircel 3G**	**Airtel 3G**	**BSNL 3G**	**Reliance 3G**
Total number of working POIs		48	829	21	165
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		127742	737638	15538	108586
Traffic served for all POIs (B)- in erlangs		38091	491071	0	25873
POI congestion	≤ 0.5%	0.00%	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. JAS'16 – Refers to the quarter of July , August and September 2016
4. IMRB – Refers to IMRB International, the audit agency for this report
5. SSA – Secondary Switching Area
6. NOC – Network Operation Center
7. OMC – Operations and Maintenance Center
8. MSC – Mobile Switching Center
9. PMR – Performance Monitoring Reports
10. TCBH – Time Consistent Busy Hour
11. CBBH - Cell Bouncing Busy Hour
12. BTS – Base Transceiver Station
13. CSSR – Call Setup Success Rate
14. TCH – Traffic Channel
15. SDCCH – Standalone Dedicated Control Channel
16. CDR – Call Drop Rate
17. FER – Frame Error Rate
18. SIM – Subscriber Identity Module
19. GSM – Global System for Mobile
20. CDMA – Code Division Multiple Access
21. NA – Not Applicable
22. NC – Non Compliance
23. POI – Point of Interconnection
24. IVR – Interactive Voice Response
25. STD – Standard Trunk Dialing
26. ISD – International Subscriber Dialing

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