TRAI Audit Wireless Report for Mumbai Circle

WEST ZONE

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Submitted to:

TRAI

Telecom Regulatory Authority of India

(IS/ISO 9001-2008 Certified Organisation)

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2 INTRODUCTION

2.1 ABOUT TRAI

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

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

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

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

2.2 OBJECTIVES

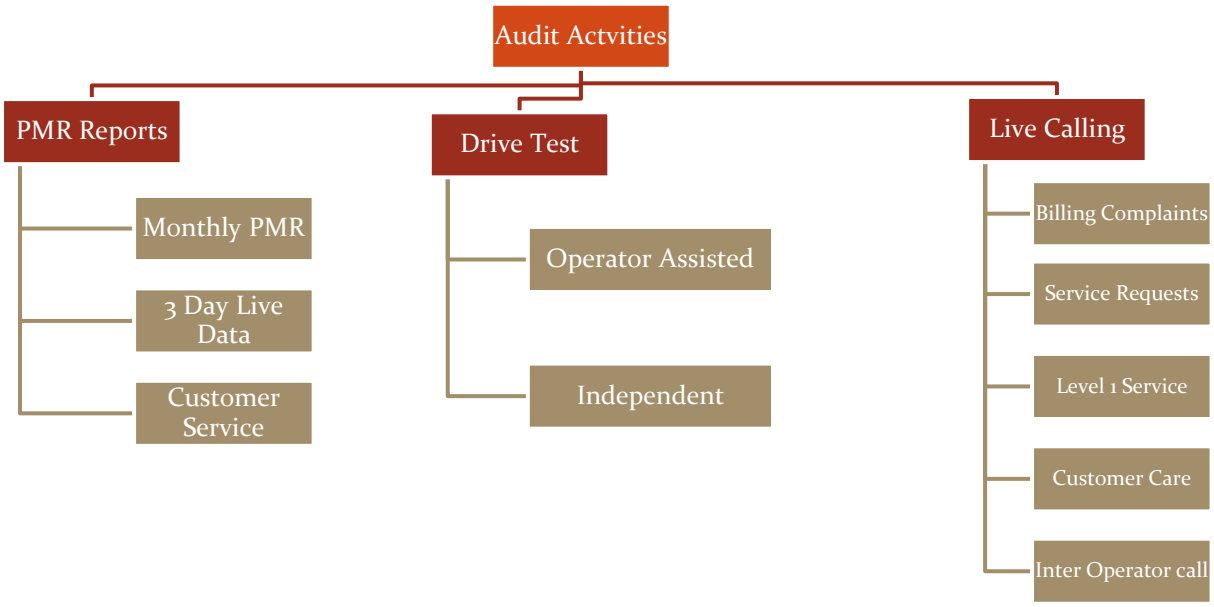
The primary objective of the Audit module is to-

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

2.3 COVERAGE

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

2.4 FRAMEWORK USED

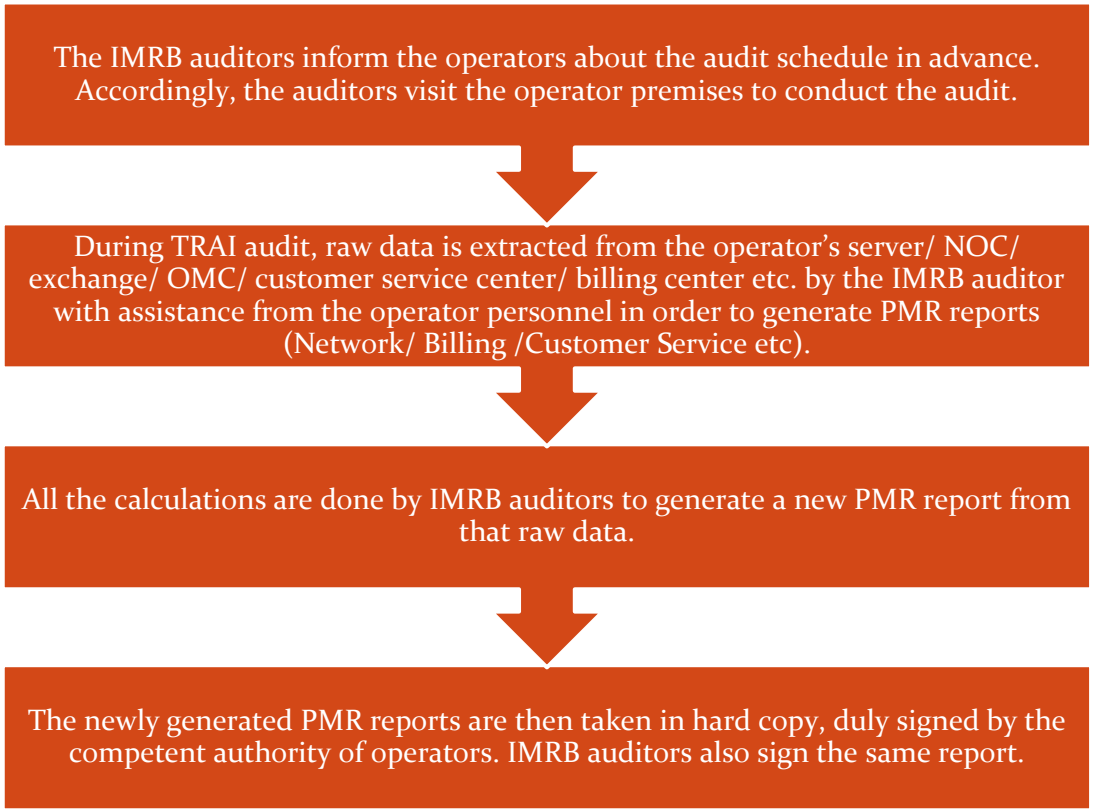


Let's discuss each of the activity in detail and the methodology adopted for each of the module.

2.4.1 PMR REPORTS

2.4.1.1 SIGNIFICANCE AND METHODOLOGY

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



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

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

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

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

Let us understand these formats in detail.

2.4.1.2 MONTHLY PMR 2G

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

Network Availability

- BTS accumulated downtime
- Worst affected BTS due to downtime

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good voice quality

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

2.4.1.3 AUDIT PARAMETERS – NETWORK 2G

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

Network Related

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

2.4.1.4 MONTHLY PMR 3G

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

Network Availability

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

Connection Establishment (Accessibility)

- Call Set Up success Rate (CSSR)

Network Congestion Parameters

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

Connection Maintenance

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

Voice Quality

- % Connections with good Circuit Switched Voice Quality

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

2.4.1.5 AUDIT PARAMETERS – NETWORK 3G

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

Network Related

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

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

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

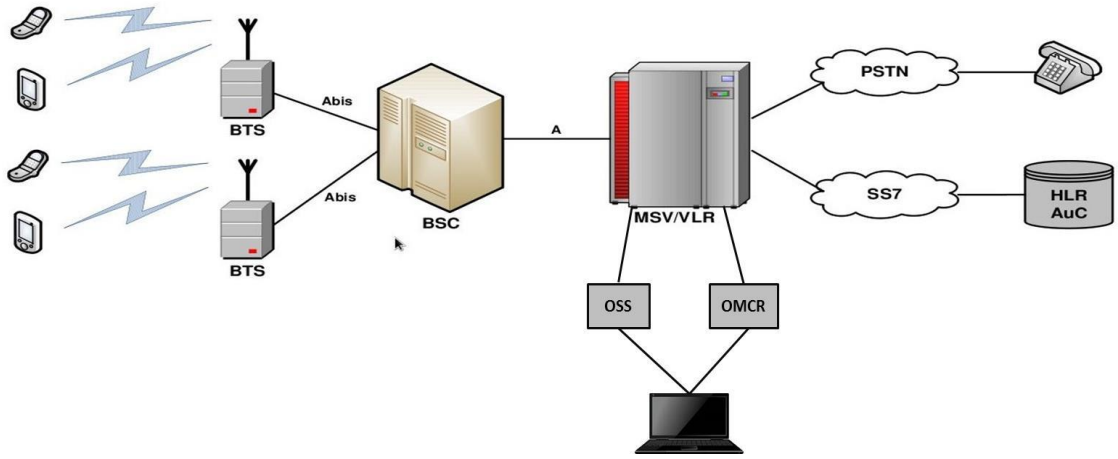
- Services Activation/ provisioning:- Activation done within 4 hours ≥ 95%
- PDP Context activation success rate:- PDP Context activation success rate ≥ 95%
- Drop Rate:- Drop Rate ≤ 5%

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

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

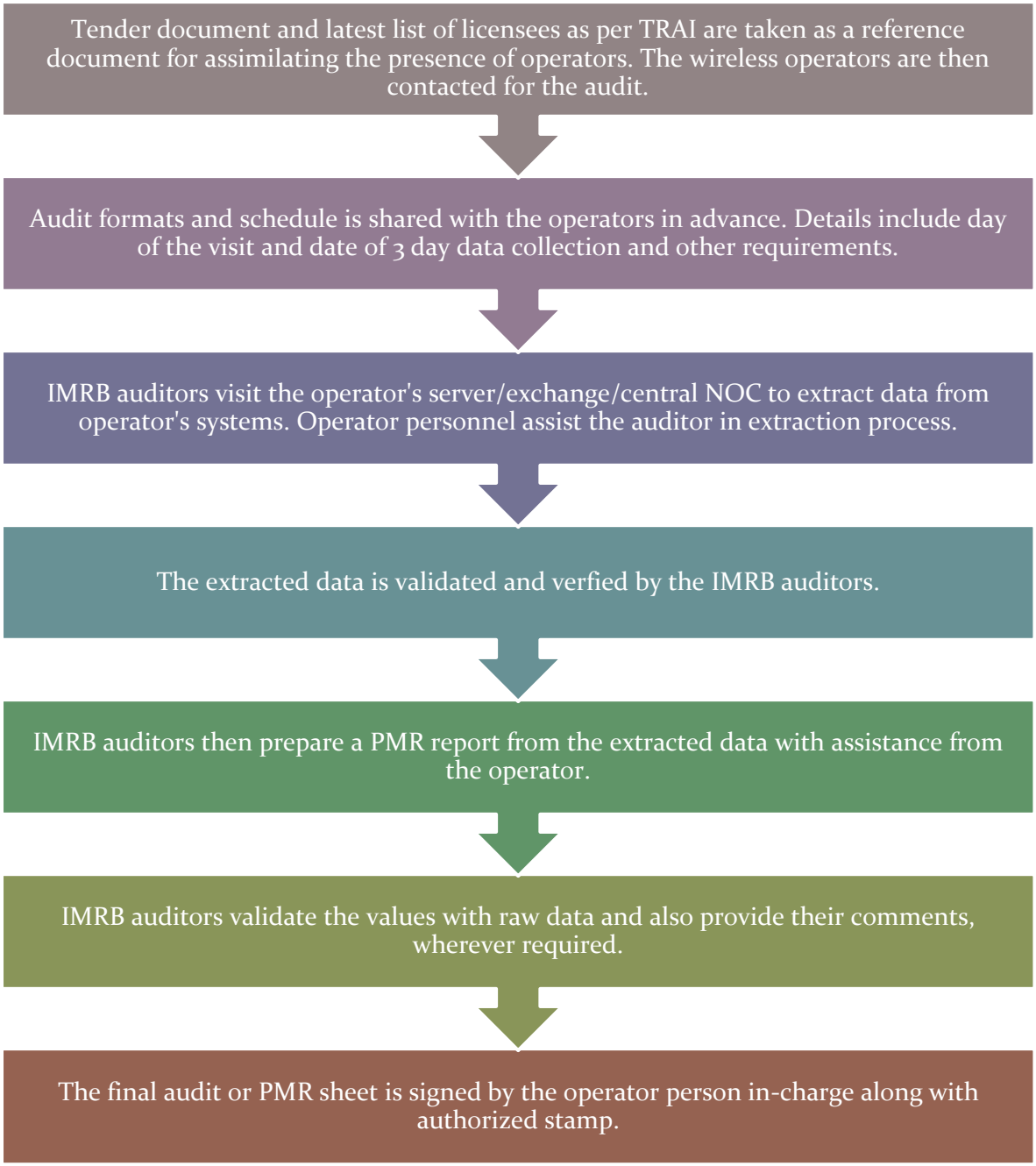
2.4.1.8 POINT OF DATA EXTRACTION

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



2.4.1.9 STEP BY STEP AUDIT PROCEDURE

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



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

2.4.1.10 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.

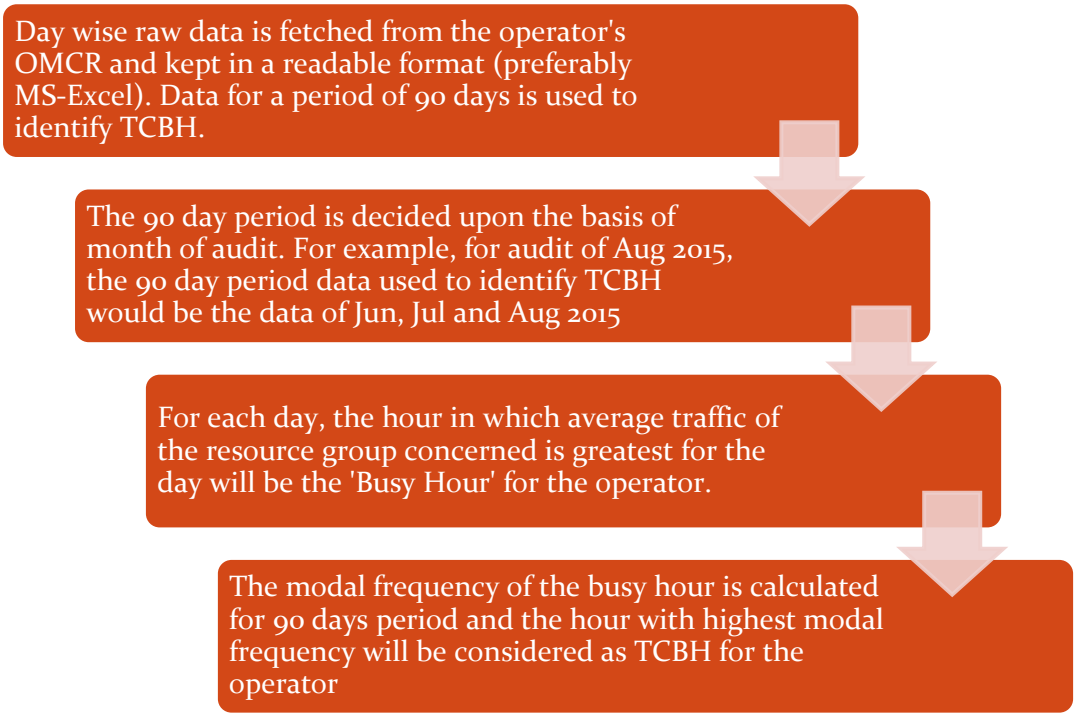
The 3 day live measurement was conducted for network parameters (2G & 3G) and wireless data services (2G & 3G).

S. No.	Name of Service Provider	Date of Live Measurement Audit		
GSM		**Jul-16**	**Aug-16**	**Sep-16**
1	Aircel	July 05, 06, 07	Aug 04, 05, 06	Sept 01, 02, 03
2	Airtel	July 01, 02, 04	Aug 01, 02, 03	Sept 05, 06, 07
3	Idea	July 01, 02, 04	Aug 01, 02, 03	Sept 01, 02, 03
4	MTNL	July 01, 02, 04	Aug 01, 02, 03	Sept 05, 06, 07
5	Rcom	July 01, 02, 04	Aug 01, 02, 03	Sept 05, 06, 07
6	TATA	July 05, 06, 07	Aug 04, 05, 06	Sept 01, 02, 03
7	Vodafone	July 05, 06, 07	Aug 04, 05, 06	Sept 01, 02, 03
CDMA Operators				
8	TATA	July 05, 06, 07	Aug 04, 05, 06	Sept 01, 02, 03
3G Operators				
9	Airtel	July 01, 02, 04	Aug 01, 02, 03	Sept 05, 06, 07
10	MTNL	July 01, 02, 04	Aug 01, 02, 03	Sept 05, 06, 07
11	Reliance	July 01, 02, 04	Aug 01, 02, 03	Sept 05, 06, 07
12	Vodafone	July 05, 06, 07	Aug 04, 05, 06	Sept 01, 02, 03

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.

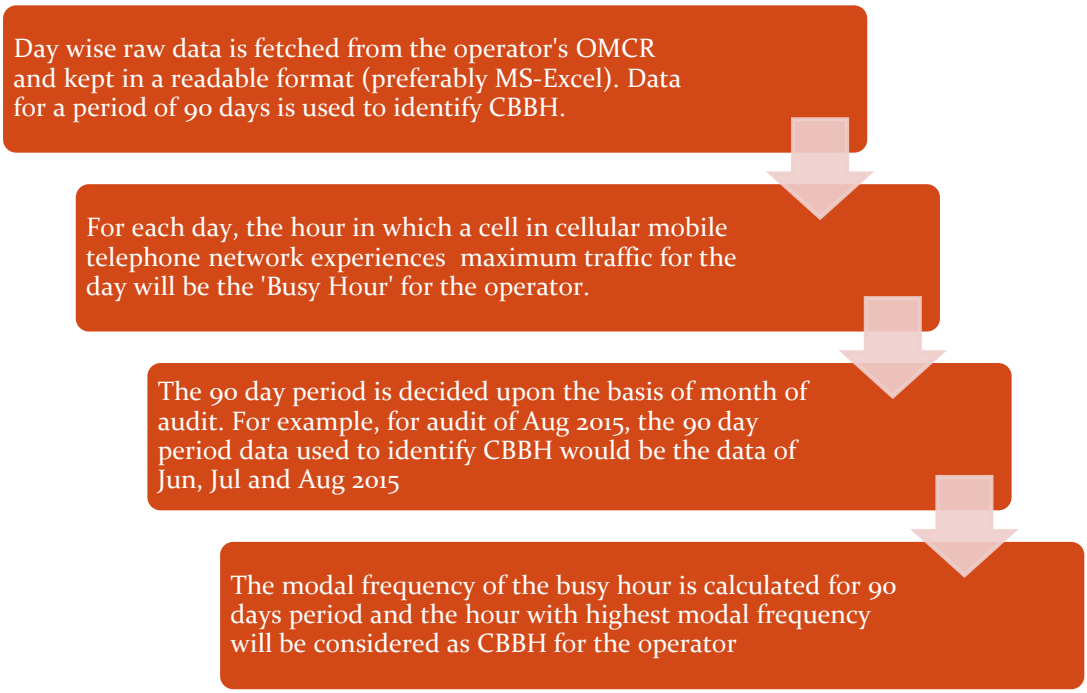
Step by step procedure to identify TCBH for an operator:



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%

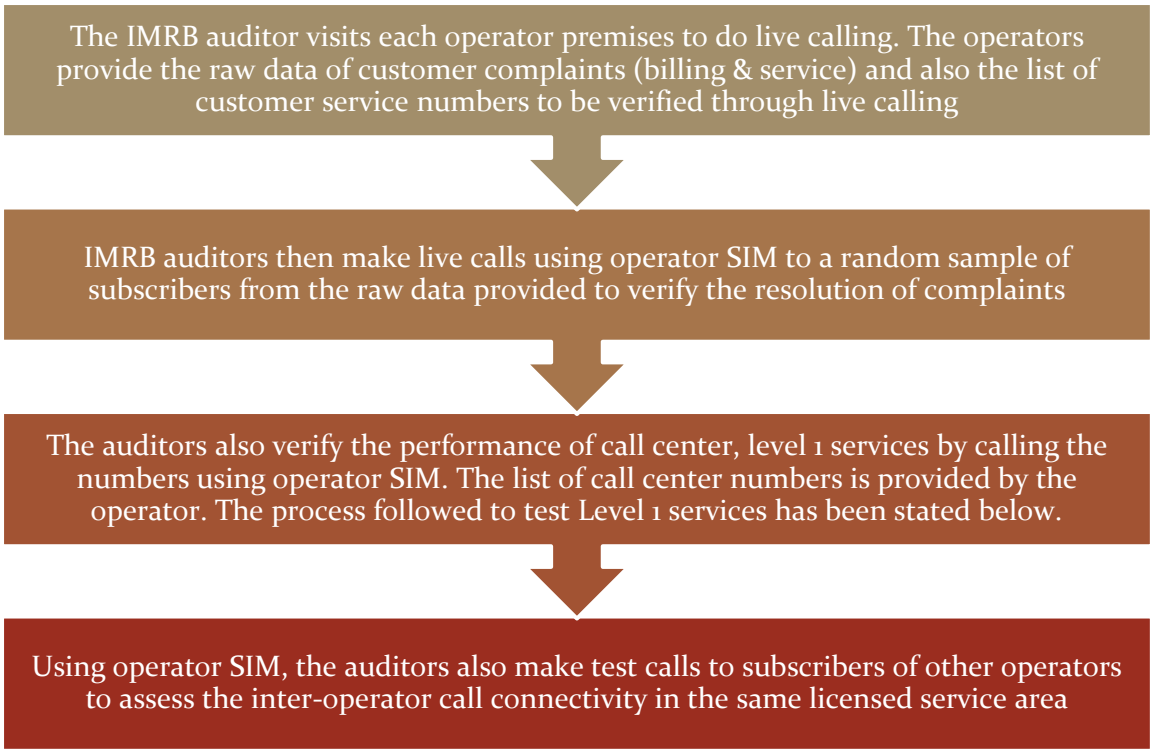
2.4.1.17 CALCULATION METHODOLOGY – CUSTOMER SERVICE PARAMETERS

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 Office New Delhi, 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 and SSA list was finalized by TRAI office New Delhi.
- 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 Office New Delhi.
- 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 and SSA list was finalized by TRAI office New Delhi.
- 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 SSA list was finalized by TRAI office New Delhi.
- 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.

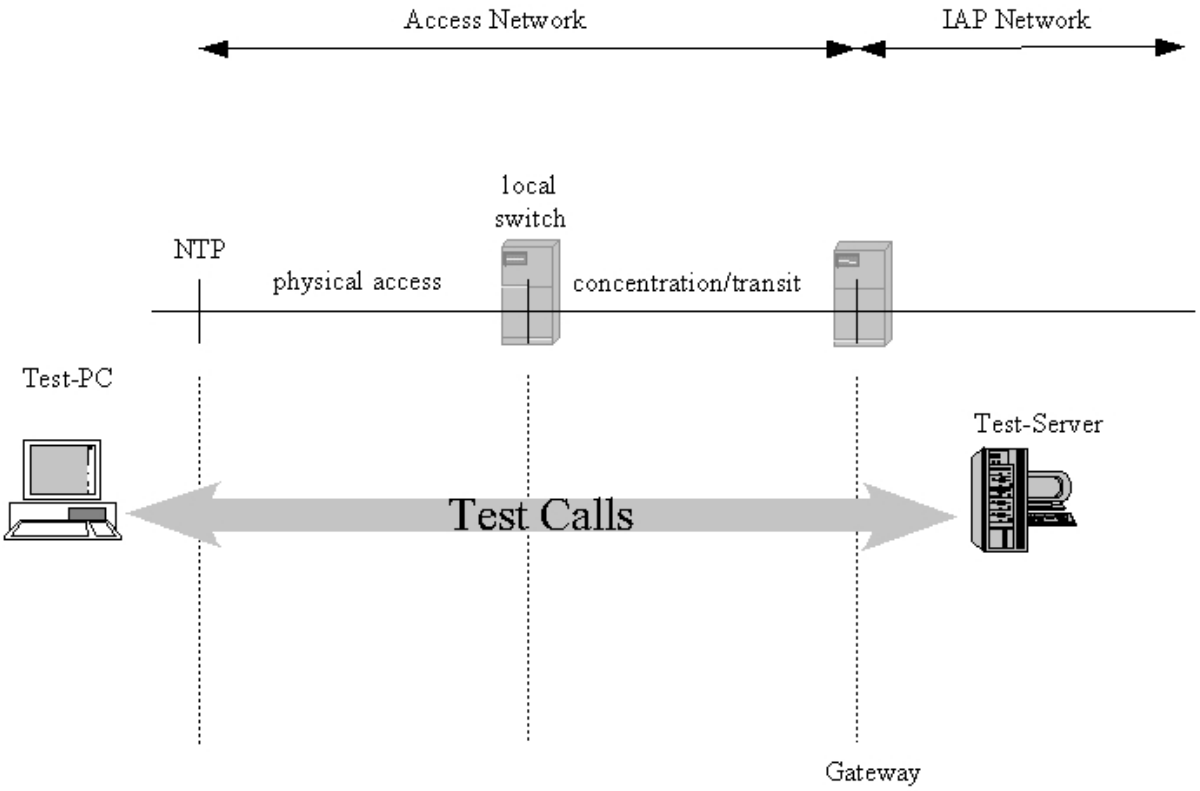


Figure for Measurement set-up

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	1688509
Airtel	3852592
Idea	3910222
MTNL	745639
Reliance GSM	4759168
TATA CDMA	20830
TATA GSM	60707
Vodafone	4870213
Name of Operator	**Number of Subscriber as per VLR-3G**
Airtel 3G	1921585
MTNL 3G	171243
Reliance 3G	4759168
Vodafone 3G	2652861

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 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- Aircel and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

3 Day Live Measurement (Network Parameters)

- Aircel and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

3 Day Live Measurement (Network Parameters) 3G

- MTNL 3G failed to meet benchmark for Node Bs downtime (not available for service).

Wireless data services 2G

- All operators met the TRAI benchmark for PDP context activation success rate in PMR Audit except Aircel for Live audit.

Live Calling

- As per the consumers (live calling exercise) MTNL failed to meet the benchmark of complaint resolving within 4 week of 98%.
- All the operators met the TRAI benchmark for level 1 service except MTNL, Reliance GSM, TATA CDMA and TATA GSM.

Metering and billing credibility

- For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter.
- For the prepaid customers, Idea, Vodafone and MTNL failed to meet the benchmark of charging disputes Metering and Billing Credibility – Prepaid Subscribers.
- Airtel, Reliance GSM and Vodafone failed to meet the TRAI specified benchmark for Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds.

Operator Assisted Drive test 2G

- Aircel, Idea, MTNL, Vodafone, Reliance GSM, failed to meet the benchmark for voice quality in outdoor locations. While MTNL failed to meet the benchmark for voice quality in indoor locations also.
- MTNL and Reliance GSM failed to meet the benchmark of call drop rate in outdoor location.

Operator Assisted Drive test 3G

- MTNL 3G and Reliance GSM failed to meet the benchmark for Voice quality in outdoor location
- MTNL 3G failed to meet he benchmark for CSSR in outdoor location.
- MTNL 3G met the benchmark for call drop rate in outdoor locations.

4 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 Mumbai circle, with a parameter wise performance evaluation as compared to TRAI benchmark.

4.1 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 2G

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.11%	0.46%	97.65%	0.23%	0.62%	1.04%	5.56%	96.83%
Airtel	0.06%	0.00%	99.58%	0.03%	0.05%	0.80%	1.72%	100.00%
Idea	0.08%	0.10%	99.17%	0.15%	0.49%	1.01%	1.60%	96.67%
MTNL	0.75%	1.15%	97.89%	0.36%	0.14%	1.59%	2.15%	96.52%
Reliance GSM	0.05%	0.44%	99.60%	0.13%	0.32%	0.00%	0.50%	99.20%
TATA CDMA	0.07%	0.00%	99.22%	NA	0.02%	0.44%	1.69%	99.09%
TATA GSM	0.11%	0.00%	99.28%	0.03%	0.04%	0.46%	1.92%	97.78%
Vodafone	0.16%	0.00%	99.27%	0.08%	0.73%	1.12%	3.76%	97.72%

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

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

BTSs Accumulated Downtime:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators with 0.05%.

Worst Affected BTSs Due to Downtime:

All the operators met the TRAI benchmark, operators like Airtel, TATA CDMA & GSM and Vodafone performed better than other operators at 0.00%

Call Set-up Success Rate (CSSR):

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators at 99.60%

SDCCH/ Paging Chl. Congestion:

All the operators met the TRAI benchmark, Airtel performed better than other operators at 0.03%

TCH Congestion:

All the operators met the TRAI benchmark. TATA CDMA performed better than other operators at 0.02%

Call Drop Rate:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators at 0.00%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel and Vodafone failed to meet the TRAI Benchmark, Reliance GSM was best among other operators with 0.50%.

Voice Quality

All the operators met the TRAI Benchmark, Airtel was best among other operators with 100.00%.

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.

4.1.1 PMR DATA - JULY FOR 2G

Name of Service Provider Month July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.12%	0.61%	97.31%	0.28%	0.61%	1.20%	7.18%	96.40%
Airtel	0.05%	0.00%	99.90%	0.03%	0.08%	0.82%	1.78%	102.42%
Idea	0.08%	0.08%	98.98%	0.15%	0.63%	1.07%	1.74%	96.27%
MTNL	0.89%	1.12%	98.07%	0.37%	0.14%	1.68%	2.14%	96.48%
Reliance GSM	0.07%	0.78%	99.47%	0.20%	0.22%	0.19%	0.39%	99.37%
TATA CDMA	0.08%	0.00%	99.20%	NA	0.02%	0.46%	1.78%	99.08%
TATA GSM	0.00%	0.00%	99.34%	0.04%	0.05%	0.46%	1.92%	97.81%
Vodafone	0.19%	0.00%	99.21%	0.07%	0.79%	1.18%	4.04%	97.64%

4.1.2 PMR DATA – AUGUST FOR 2G

Name of Service Provider Month August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.09%	0.25%	97.69%	0.25%	0.71%	1.02%	5.49%	96.75%
Airtel	0.06%	0.00%	99.92%	0.02%	0.04%	0.81%	1.71%	97.65%
Idea	0.08%	0.05%	99.23%	0.15%	0.47%	0.99%	1.48%	96.75%
MTNL	0.76%	1.22%	97.89%	0.37%	0.11%	1.53%	2.34%	96.50%
Reliance GSM	0.04%	0.23%	99.63%	0.11%	0.36%	0.00%	0.50%	99.20%
TATA CDMA	0.09%	0.00%	99.22%	NA	0.02%	0.43%	1.55%	99.08%
TATA GSM	0.31%	0.00%	99.28%	0.03%	0.04%	0.46%	1.95%	97.72%
Vodafone	0.17%	0.00%	99.25%	0.09%	0.75%	1.15%	4.10%	97.74%

4.1.3 PMR DATA - SEPTEMBER FOR 2G

Name of Service Provider Month September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.12%	0.51%	97.96%	0.16%	0.54%	0.90%	4.02%	97.35%
Airtel	0.06%	0.00%	98.92%	0.03%	0.02%	0.76%	1.67%	97.61%
Idea	0.10%	0.16%	99.30%	0.16%	0.39%	0.96%	1.60%	96.98%
MTNL	0.59%	1.12%	97.70%	0.35%	0.16%	1.57%	1.98%	96.58%
Reliance GSM	0.04%	0.32%	99.70%	0.07%	0.39%	0.25%	0.61%	99.03%
TATA CDMA	0.04%	0.00%	99.25%	NA	0.02%	0.42%	1.74%	99.10%
TATA GSM	0.01%	0.00%	99.21%	0.02%	0.03%	0.45%	1.89%	97.82%
Vodafone	0.14%	0.00%	99.35%	0.09%	0.65%	1.03%	3.14%	97.79%

4.2 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	0.14%	0.02%	97.48%	0.26%	0.62%	1.09%	5.94%	96.69%
Airtel	0.05%	0.00%	99.89%	0.04%	0.34%	0.85%	1.70%	99.35%
Idea	0.08%	0.00%	99.13%	0.14%	0.52%	1.01%	1.58%	96.50%
MTNL	0.58%	0.00%	97.77%	0.47%	0.15%	1.53%	2.19%	96.57%
Reliance GSM	0.06%	0.08%	99.61%	0.15%	0.24%	0.00%	0.43%	99.26%
TATA CDMA	0.10%	0.00%	99.27%	NA	0.00%	0.45%	1.73%	99.15%
TATA GSM	0.21%	0.00%	99.35%	0.01%	0.00%	0.49%	1.95%	97.82%
Vodafone	0.18%	0.00%	99.24%	0.06%	0.76%	1.15%	4.00%	97.71%

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

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

BTSs Accumulated Downtime:

All the operators met the TRAI benchmark, Airtel performed better than other operators with 0.05%.

Worst Affected BTSs Due to Downtime:

All the operators met the TRAI benchmark, most of the operators performed 0.00%.

Call Set-up Success Rate (CSSR):

All the operators met the TRAI benchmark, Airtel performed better than other operators at 99.89%.

Excluding Airtel, all other operators were found to be calculating the parameter as per the norm specified by TRAI, as given in parameter description section. Airtel is using a formula that has not been specified by TRAI or the counter definitions provided by their network service provider (Ericsson). However, this report presents the appropriate CSSR value for Airtel, which was calculated by using the proper counter details (provided in section 8.15.1) by the IMRB auditor during audit.

SDCCH/ Paging Chl. Congestion:

All the operators met the TRAI benchmark, TATA GSM performed better than other operators at 0.01%.

TCH Congestion:

All the operators met the TRAI benchmark, TATA GSM performed better than other operators at 0.00%.

Call Drop Rate:

All the operators met the TRAI benchmark, Reliance GSM performed better than other operators at 0.00%.

Worst Affected Cells Having More than 3% TCH Drop:

Aircel and Vodafone failed to meet the TRAI Benchmark, Reliance GSM was best among other operators with 0.43%.

Voice Quality

All the operators met the TRAI Benchmark, Reliance GSM was best among other operators with 99.35%.

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

4.2.1 3 DAY DATA - JULY FOR 2G

Name of Service Provider 3 Day July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.15%	0.05%	96.95%	0.36%	0.94%	1.29%	7.69%	96.25%
Airtel	0.07%	0.00%	99.85%	0.06%	0.13%	0.92%	1.75%	102.60%
Idea	0.09%	0.00%	98.82%	0.11%	0.79%	0.98%	1.73%	96.18%
MTNL	0.66%	0.00%	97.77%	0.57%	0.16%	1.55%	2.31%	96.50%
Reliance GSM	0.10%	0.00%	99.53%	0.19%	0.26%	0.21%	0.50%	99.35%
TATA CDMA	0.04%	0.00%	99.24%	NA	0.00%	0.45%	1.82%	99.10%
TATA GSM	0.00%	0.00%	99.40%	0.01%	0.00%	0.50%	1.95%	97.85%
Vodafone	0.17%	0.00%	99.16%	0.05%	0.84%	1.19%	4.04%	97.65%

4.2.2 3 DAY DATA – AUGUST FOR 2G

Name of Service Provider 3 Day August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.18%	0.00%	97.49%	0.22%	0.48%	1.08%	6.33%	96.47%
Airtel	0.05%	0.00%	99.89%	0.04%	0.88%	0.88%	1.77%	97.63%
Idea	0.08%	0.00%	99.16%	0.14%	0.50%	1.11%	1.50%	96.28%
MTNL	0.66%	0.00%	97.77%	0.57%	0.16%	1.55%	2.31%	96.50%
Reliance GSM	0.05%	0.23%	99.50%	0.23%	0.27%	0.00%	0.34%	99.39%
TATA CDMA	0.01%	0.00%	99.26%	NA	0.01%	0.45%	1.59%	99.20%
TATA GSM	0.06%	0.00%	99.21%	0.00%	0.00%	0.49%	1.98%	97.75%
Vodafone	0.03%	0.00%	99.20%	0.06%	0.80%	1.23%	4.80%	98.10%

4.2.3 3 DAY DATA - SEPTEMBER FOR 2G

Name of Service Provider 3 Day September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/ Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Aircel	0.08%	0.00%	97.99%	0.19%	0.43%	0.87%	3.78%	97.36%
Airtel	0.04%	0.00%	99.93%	0.02%	0.02%	0.74%	1.58%	97.71%
Idea	0.08%	0.00%	99.42%	0.16%	0.28%	0.95%	1.51%	97.00%
MTNL	0.42%	0.00%	97.77%	0.26%	0.13%	1.47%	1.95%	96.74%
Reliance GSM	0.04%	0.00%	99.80%	0.03%	0.19%	0.23%	0.45%	99.04%
TATA CDMA	0.02%	0.00%	99.30%	NA	0.00%	0.44%	1.78%	99.15%
TATA GSM	0.00%	0.00%	99.45%	0.01%	0.00%	0.47%	1.92%	97.87%
Vodafone	0.10%	0.00%	99.36%	0.07%	0.64%	1.04%	3.18%	97.90%

4.3 PMR DATA – 3 MONTHS- CONSOLIDATED FOR 3G

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

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.21%	0.00%	98.77%	0.01%	0.02%	0.38%	1.80%	99.42%
MTNL 3G	0.64%	1.16%	98.45%	0.60%	0.31%	1.61%	2.56%	98.87%
Reliance 3G	0.24%	1.37%	99.58%	0.12%	0.06%	0.11%	0.37%	99.69%
Vodafone 3G	0.14%	0.00%	99.76%	0.00%	0.00%	0.67%	2.10%	98.80%

Following are the parameter wise observations for wireless operators for circle: Mumbai.

Node Bts downtime:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed was best with 0.14%.

Worst affected Node Bs due to downtime:

All operators met the TRAI benchmark, Airtel 3G and Vodafone 3G performed best among other operators with 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the TRAI benchmark for 3G services, Vodafoen3G performed best among other operators with 99.76%.

RRC Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among other operators with 0.00%.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among other operators with 0.00%.

Circuit Switched Voice Call Drop Rate:

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among other operators with 0.11%.

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

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among other operators with 0.37%.

Circuit Switch Voice Quality:

All operators met the TRAI benchmark for 3G services, MTNL 3G performed best among other operators with 98.87%.

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

4.3.1 PMR DATA - JULY FOR 3G

Name of Service Provider Month July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Airtel 3G	0.06%	0.00%	98.81%	0.02%	0.03%	0.40%	1.90%	99.32%
MTNL 3G	0.71%	1.15%	98.13%	0.71%	0.33%	1.69%	2.49%	98.84%
Reliance 3G	0.20%	1.37%	99.89%	0.09%	0.03%	0.10%	0.31%	99.70%
Vodafone 3G	0.07%	0.00%	99.81%	0.00%	0.00%	0.40%	2.16%	98.85%

4.3.2 PMR DATA – AUGUST FOR 3G

Name of Service Provider Month August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Airtel 3G	0.08%	0.00%	98.81%	0.01%	0.03%	0.38%	1.78%	99.42%
MTNL 3G	0.61%	1.01%	98.28%	0.72%	0.45%	1.66%	2.59%	98.87%
Reliance 3G	0.14%	1.06%	99.61%	0.10%	0.06%	0.09%	0.33%	99.68%
Vodafone 3G	0.15%	0.00%	99.73%	0.00%	0.00%	1.15%	2.09%	97.74%

4.3.3 PMR DATA - SEPTEMBER FOR 3G

Name of Service Provider Month September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤2%	≤2%	≥95%	≤1%	≤2%	≤2%	≤3%	≥95%
Airtel 3G	0.07%	0.00%	98.69%	0.01%	0.01%	0.36%	1.73%	99.51%
MTNL 3G	0.61%	1.30%	98.94%	0.36%	0.17%	1.49%	2.60%	98.90%
Reliance 3G	0.39%	1.67%	99.23%	0.16%	0.08%	0.12%	0.46%	99.69%
Vodafone 3G	0.19%	0.00%	99.75%	0.00%	0.00%	0.44%	2.05%	98.84%

4.4 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.

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

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.20%	0.00%	98.85%	0.03%	0.04%	0.42%	1.93%	99.47%
MTNL 3G	2.37%	0.00%	98.26%	0.71%	0.51%	1.67%	2.62%	98.87%
Reliance 3G	0.25%	0.36%	99.90%	0.07%	0.03%	0.12%	0.45%	99.69%
Vodafone 3G	0.10%	0.00%	99.76%	0.00%	0.00%	0.39%	2.09%	98.83%

Following are the parameter wise observations for wireless operators for circle: Mumbai.

Node Bs downtime:

All operators met the TRAI benchmark for 3G services except MTNL 3G. Vodafone3G performed best among the other operators.

Worst affected Node Bs due to downtime:

All operators met the TRAI benchmark, Airtel 3G, Vodafone 3G and MTNL 3G performed best among the other operators with 0.00%.

Call Set-up Success Rate (CSSR):

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among the other operators with 99.90%.

RRC Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among the other operators with 0.00%.

Circuit Switched RAB Congestion:

All operators met the TRAI benchmark for 3G services, Vodafone 3G performed best among the other operators with 0.00%.

Circuit Switched Voice Call Drop Rate:

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among the other operators with 0.12%.

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

All operators met the TRAI benchmark for 3G services, Reliance 3G performed best among the other operators with 0.45%.

Circuit Switch Voice Quality:

All operators met the TRAI benchmark for 3G services, MTNL 3G performed best among the other operators with 98.87%.

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.

4.4.1 3 DAY DATA - JULY FOR 3G

Name of Service Provider 3 Day July	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.09%	0.00%	98.74%	0.05%	0.07%	0.49%	2.15%	99.49%
MTNL 3G	0.87%	0.00%	97.80%	0.83%	0.67%	1.80%	2.61%	98.85%
Reliance 3G	0.40%	0.00%	99.86%	0.09%	0.02%	0.13%	0.33%	99.68%
Vodafone 3G	0.01%	0.00%	99.81%	0.00%	0.00%	0.39%	2.40%	98.84%

4.4.2 3 DAY DATA – AUGUST FOR 3G

Name of Service Provider 3 Day August	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.07%	0.00%	98.81%	0.03%	0.05%	0.43%	1.97%	99.41%
MTNL 3G	0.87%	0.00%	97.80%	0.83%	0.67%	1.80%	2.61%	98.85%
Reliance 3G	0.19%	1.06%	99.91%	0.10%	0.04%	0.11%	0.43%	NA
Vodafone 3G	0.07%	0.00%	99.72%	0.00%	0.00%	0.40%	2.09%	98.81%

4.4.3 3 DAY DATA - SEPTEMBER FOR 3G

Name of Service Provider 3 Day September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.04%	0.00%	98.99%	0.01%	0.01%	0.34%	1.69%	99.50%
MTNL 3G	0.63%	0.00%	99.18%	0.46%	0.20%	1.41%	2.65%	98.91%
Reliance 3G	0.17%	0.00%	99.94%	0.02%	0.01%	0.13%	0.60%	99.69%
Vodafone 3G	0.16%	0.00%	99.75%	0.00%	0.00%	0.39%	1.78%	98.83%

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

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

Name of Service Provider	Wireless Data-PMR			Wireless Data-Live Data		
	Activation done within 4 hours	PDP Context activation success rate	Drop Rate	Activation done within 4 hours	PDP Context activation success rate	Drop Rate
Benchmark	≥ 95%	≥ 95%	≤ 5%	≥ 95%	≥ 95%	≤ 5%
Aircel	99.96%	95.46%	1.63%	NDR	94.85%	1.66%
Airtel	98.58%	97.63%	4.81%	NDR	NDR	NDR
Idea	100.00%	99.68%	0.22%	NDR	99.73%	0.22%
MTNL	100.00%	99.86%	0.14%	NDR	98.85%	1.16%
Reliance GSM	100.00%	99.90%	3.88%	100.00%	99.95%	NDR
TATA CDMA	98.48%	NDR	NDR	NDR	NDR	NDR
TATA GSM	98.21%	96.83%	2.83%	NDR	NDR	NDR
Vodafone	99.98%	98.22%	3.31%	99.12%	99.91%	3.36%

NDR: - No Data Received

All operators met the TRAI benchmark for Activation done within 4hrs in PMR as well as live audit.

All operators met the TRAI benchmark for PDP context activation success rate in PMR Audit except Aircel for Live audit.

All operators met the TRAI benchmark for Drop rate in PMR audit as well as 3days live.

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

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

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%
Airtel 3G	98.58%	98.00%	0.19%	NDR	NDR	NDR
MTNL 3G	NDR	99.86%	0.14%	NDR	98.85%	1.16%
Reliance 3G	100.00%	99.55%	NDR	NDR	99.95%	NDR
Vodafone 3G	99.66%	99.55%	0.46%	99.25%	99.43%	1.74%

NDR: - No Data Received

All operators met the TRAI benchmark for Activation done within 4hrs in PMR as well as live audit. Vodafone performed the best for both PMR and Live audit.

All operators met the TRAI benchmark for PDP context activation success rate in PMR as well as live Audit. MTNL 3G performed best for PMR audit and Reliance 3G performed best in Live audit

All operators met the TRAI benchmark for Drop rate in PMR as well as 3days live Audit. MTNL 3G performed best for both PMR and Live audit.

4.7 LIVE CALLING DATA - CONSOLIDATED

Name of Service Provider	Metering and Billing		Response time to customer for assistance		Level 1 Service	Service Requests
	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	Accessibility of call centre/ customer care	Percentage of calls answered by the operators (voice to	Call answered	Complaint /Request attended to Satisfaction
Benchmark	98%	100%	≥ 95%	≥ 95%	≥ 95%	
Aircel	100.00%	100.00%	100.00%	99.00%	95.67%	100.00%
Airtel	100.00%	100.00%	100.00%	100.00%	95.00%	100.00%
Idea	99.00%	100.00%	100.00%	100.00%	95.33%	100.00%
MTNL	96.00%	100.00%	100.00%	98.00%	88.33%	100.00%
Reliance GSM	98.00%	100.00%	100.00%	98.00%	85.33%	100.00%
TATA CDMA	NA	NA	100.00%	96.00%	89.67%	NA
TATA GSM	100.00%	100.00%	100.00%	97.00%	92.00%	NA
Vodafone	98.00%	100.00%	100.00%	100.00%	96.33%	100.00%

Resolution of billing complaints

As per the consumers (live calling exercise) all operators met the benchmark of resolving 98% complaints within 4 weeks except MTNL.

Level 1 Service

All the operators met the TRAI benchmark for level 1 services except MTNL, Reliance GSM, TATA CDMA and TATA GSM.

Accessibility of Call Centre/Customer Care-IVR

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

Customer Care / Helpline Assessment (voice to voice)

All operators met the benchmark for the parameter.

Complaint/Request Attended to Satisfaction

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

4.8 BILLING AND CUSTOMER CARE - CONSOLIDATED

Name of Service Provider	Metering and billing credibility		Billing Complaints		Response time to customer for assistance	Customer care	
	Postpaid Subscribers	Prepaid Subscribers	% of complaints resolved in 4 weeks	% of complaints resolved in 6 weeks	% of cases where credit/wavier is received within one week	Percentage of calls answered by the IVR	Percentage of calls answered by the operators (voice to voice) within 90
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	≥ 100%	≥ 100%	≥ 95%	≥ 95%
Aircel	0.00%	0.00%	100.00%	100.00%	100.00%	99.11%	97.73%
Airtel	0.06%	0.10%	100.00%	100.00%	100.00%	99.46%	90.65%
Idea	0.26%	0.24%	100.00%	100.00%	100.00%	99.50%	98.91%
MTNL	0.04%	0.11%	100.00%	100.00%	100.00%	100.00%	95.75%
Reliance GSM	0.09%	0.03%	100.00%	100.00%	100.00%	99.12%	81.87%
TATA CDMA	0.00%	0.00%	NA	NA	NA	100.00%	99.80%
TATA GSM	0.00%	0.00%	100.00%	100.00%	100.00%	98.19%	95.48%
Vodafone	0.55%	0.27%	99.99%	100.00%	100.00%	99.73%	94.06%

NA: Not applicable

Metering and Billing Credibility – Post-paid Subscribers

For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter.

Metering and Billing Credibility – Prepaid Subscribers

For the prepaid customers Idea, MTNL and Vodafone failed to meet the benchmark of charging disputes. Aircel and TATA CDMA performed best.

Resolution of billing complaints

All operators met the TRAI benchmark of resolution of billing complaints within 4 week and 6 weeks

Note: There were no complaints of TATA CDMA during audit period.

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

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

Customer Care Percentage of calls answered by the IVR

All operators met the benchmark of 95% IVR call being attended. MTNL and TATA CDMA recorded the best performance for the parameter.

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

Airtel, Reliance GSM and Vodafone failed to meet the TRAI specified benchmark of 95%. TATA CDMA recorded the best performance for the parameter.

4.9 INTER OPERATOR CALL ASSESSMENT - CONSOLIDATED

6. Inter Operator Call Assessment									
Inter operator call Assessment To↓ From→	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Aircel	NA	97.000%	94.000%	97.000%	NS	97.000%	92.000%	98.000%	93.000%
Airtel	97.000%	NA	95.000%	98.000%	NS	97.000%	93.000%	96.000%	95.000%
Idea	97.000%	95.000%	NA	99.000%	NS	97.000%	95.000%	98.000%	97.000%
MTNL	97.000%	97.000%	95.000%	NA	NS	97.000%	95.000%	97.000%	98.000%
Reliance CDMA	NS	NS	NS	NS	NS	NS	NS	NS	NS
Reliance GSM	97.000%	97.000%	94.000%	93.000%	NS	NA	95.000%	97.000%	97.000%
TATA CDMA	98.000%	98.000%	97.000%	95.000%	NS	97.000%	NA	98.000%	92.000%
TATA GSM	95.000%	98.000%	97.000%	95.000%	NS	97.000%	95.000%	NA	97.000%
Vodafone	96.000%	95.000%	98.000%	98.000%	NS	95.000%	97.000%	96.000%	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, none of the operators faced any problems in connecting to other operator

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

Name of Service Provider	Network Availability				Connection Establishment (Accessibility)						Connection Maintenance (Retainability)						Point of Interconnection (POI) Congestion	
	BTSs Accumulated downtime (not available for service)		Worst affected BTSs due to downtime		Call Set-up Success Rate		SDCCH/ Paging Chl. Congestion		TCH Congestion		Call drop rate		Worst affected cells having more than 3%		Connection with good voice quality			
Benchmark	≤ 2%		≤ 2%		≥ 95%		≤ 1%		≤ 2%		≤ 2%		≤ 3%		≥ 95%		≤ 0.5%	
	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB	Operators	IMRB
Aircel	0.00%	0.11%	0.46%	0.46%	97.65%	97.65%	0.23%	0.23%	0.62%	0.62%	1.04%	1.04%	5.56%	5.56%	96.83%	96.83%	0.00%	0.00%
Airtel	0.06%	0.06%	0.00%	0.00%	99.80%	99.58%	0.03%	0.03%	0.06%	0.05%	0.81%	0.80%	1.74%	1.72%	97.64%	100.00%	0.00%	0.00%
Idea	0.09%	0.08%	0.10%	0.10%	99.17%	99.17%	0.15%	0.15%	0.49%	0.49%	1.01%	1.01%	1.60%	1.60%	96.66%	96.67%	1.00%	0.00%
MTNL GSM	0.75%	0.75%	1.15%	1.15%	98.22%	97.89%	0.36%	0.36%	0.14%	0.14%	1.59%	1.59%	2.15%	2.15%	96.52%	96.52%	0.00%	0.00%
RCOM GSM	0.05%	0.05%	0.44%	0.44%	99.60%	99.60%	0.13%	0.13%	0.33%	0.32%	0.19%	0.00%	0.50%	0.50%	99.20%	99.20%	0.00%	0.00%
TATA CDMA	0.07%	0.07%	0.00%	0.00%	99.22%	99.22%	0.00%	NA	0.02%	0.02%	0.44%	0.44%	1.70%	1.69%	99.09%	99.09%	0.00%	0.00%
TATA GSM	0.35%	0.11%	0.00%	0.00%	99.28%	99.28%	0.03%	0.03%	0.04%	0.04%	0.46%	0.46%	1.93%	1.92%	97.78%	97.78%	0.00%	0.00%
Vodafone	0.16%	0.16%	0.00%	0.00%	99.27%	99.27%	0.08%	0.08%	0.73%	0.73%	1.12%	1.12%	3.73%	3.76%	97.72%	97.72%	0.00%	0.00%

4.11 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
Airtel 3G	0.08%	0.21%	0.00%	0.00%	98.80%	98.77%	0.01%	0.01%	0.03%	0.02%	0.39%	0.38%	1.83%	1.80%	99.39%	99.42%	0.00%	0.00%
MTNL 3G	0.64%	0.64%	1.17%	1.16%	96.74%	98.45%	0.59%	0.60%	0.32%	0.31%	1.63%	1.61%	2.77%	2.56%	98.87%	98.87%	0.00%	0.00%
Reliance 3G	0.25%	0.24%	1.37%	1.37%	99.58%	99.58%	0.12%	0.12%	0.06%	0.06%	0.11%	0.11%	0.37%	0.37%	99.69%	99.69%	0.00%	0.00%
Vodafone 3G	0.14%	0.14%	0.00%	0.00%	99.76%	99.76%	0.00%	0.00%	0.00%	0.00%	0.41%	0.67%	1.63%	2.10%	98.84%	98.80%	0.00%	0.00%

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

5 CRITICAL FINDINGS

PMR Consolidated (Network Parameters) for 2G

- Aircel and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

3 Day Live Measurement (Network Parameters)

- Aircel and Vodafone failed to meet the benchmark for worst affected cells having more than 3% TCH drop rate.

3 Day Live Measurement (Network Parameters) 3G

- MTNL 3G failed to meet benchmark for Node Bs downtime (not available for service).

Wireless data services 2G

- All operators met the TRAI benchmark for PDP context activation success rate in PMR Audit except Aircel for Live audit.

Live Calling

- As per the consumers (live calling exercise) MTNL failed to meet the benchmark of complaint resolving within 4 week of 98%.
- All the operators met the TRAI benchmark for level 1 service except MTNL, Reliance GSM, TATA CDMA and TATA GSM.

Metering and billing credibility

- For the billing disputes of post-paid subscribers, it was observed that Idea and Vodafone failed to meet the TRAI benchmark for the parameter.
- For the prepaid customers, Idea, Vodafone and MTNL failed to meet the benchmark of charging disputes Metering and Billing Credibility – Prepaid Subscribers.
- Airtel, Reliance GSM and Vodafone failed to meet the TRAI specified benchmark for Customer Care Percentage of calls answered by the operators (Voice to Voice) within 90 seconds.

Operator Assisted Drive test 2G

- Aircel, Idea, MTNL, Vodafone, Reliance GSM, failed to meet the benchmark for voice quality in outdoor locations. While MTNL failed to meet the benchmark for voice quality in indoor locations also.
- MTNL and Reliance GSM failed to meet the benchmark of call drop rate in outdoor location.

Operator Assisted Drive test 3G

- MTNL 3G and Reliance GSM failed to meet the benchmark for Voice quality in outdoor location
- MTNL 3G failed to meet he benchmark for CSSR in outdoor location.
- MTNL 3G met the benchmark for call drop rate in outdoor locations.

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

6.1 BTS ACCUMULATED DOWNTIME

6.1.1 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 –**

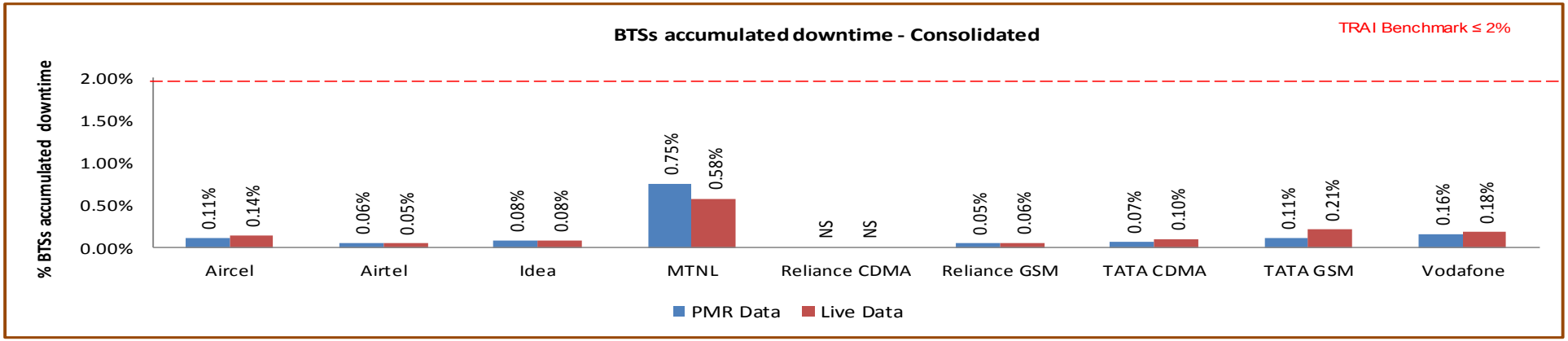
    a. BTSs Accumulated downtime (not available for service) ≤ 2%

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.

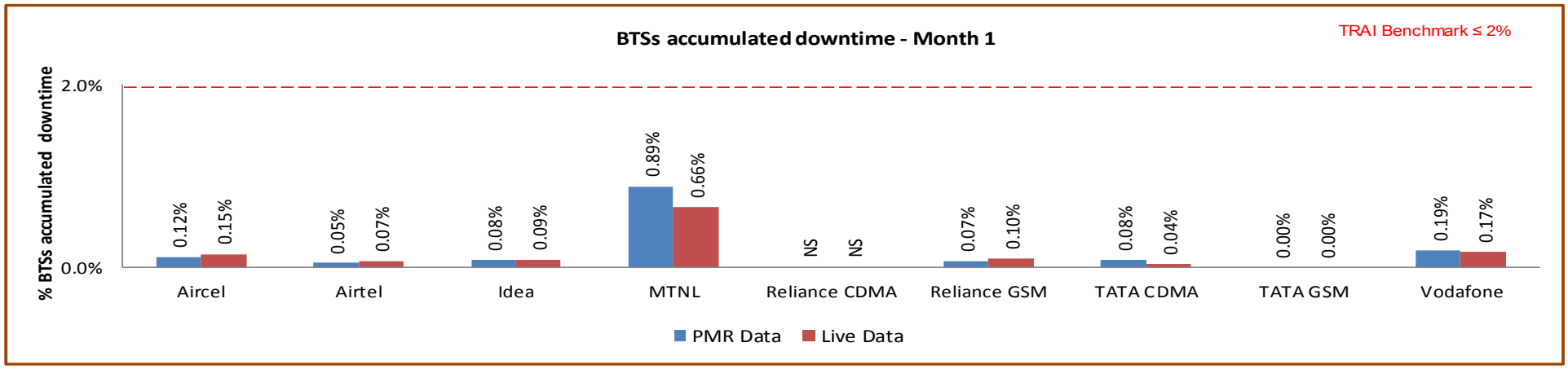
6.1.2 KEY FINDINGS - CONSOLIDATED



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

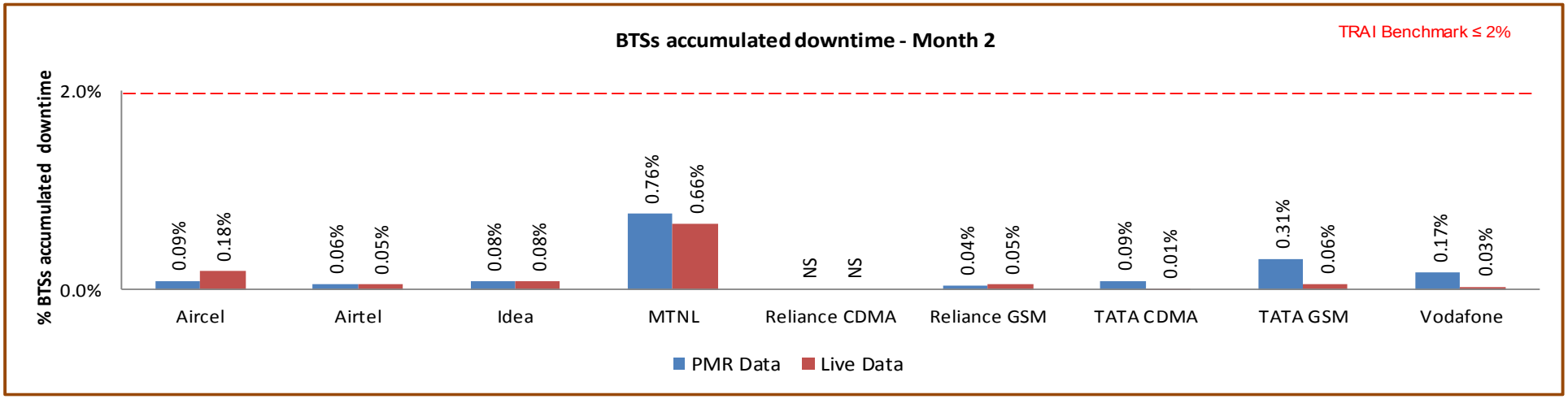
All the Operators met the TRAI benchmark.

6.1.2.1 KEY FINDINGS – MONTH 1



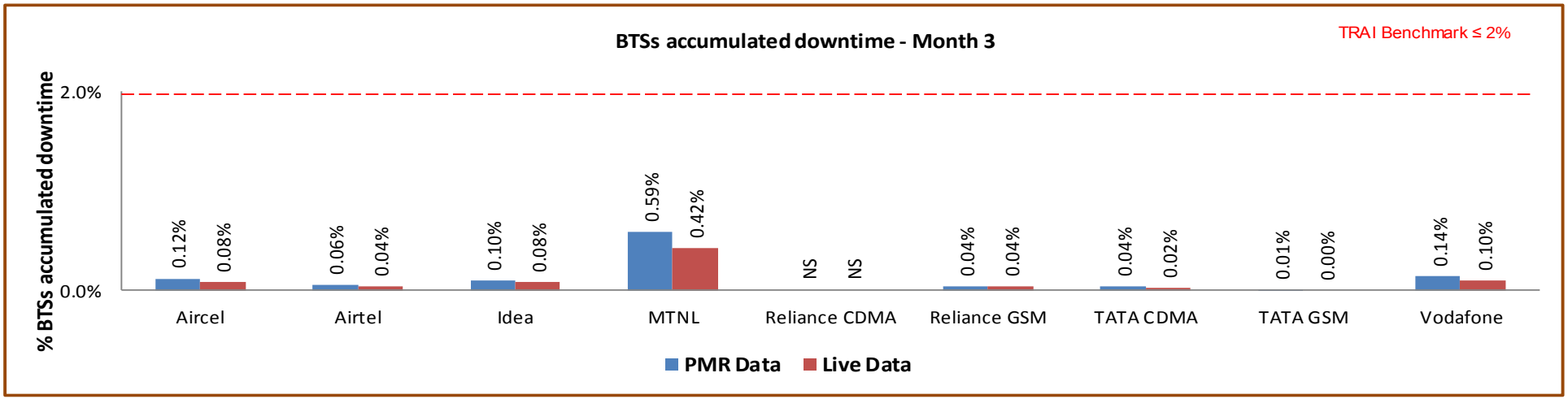
Data Source: Operations and Maintenance Center (OMC) of the operators

6.1.2.2 KEY FINDINGS – MONTH 2



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

6.1.2.3 KEY FINDINGS – MONTH 3



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

6.2 WORST AFFECTED BTS DUE TO DOWNTIME

6.2.1 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.

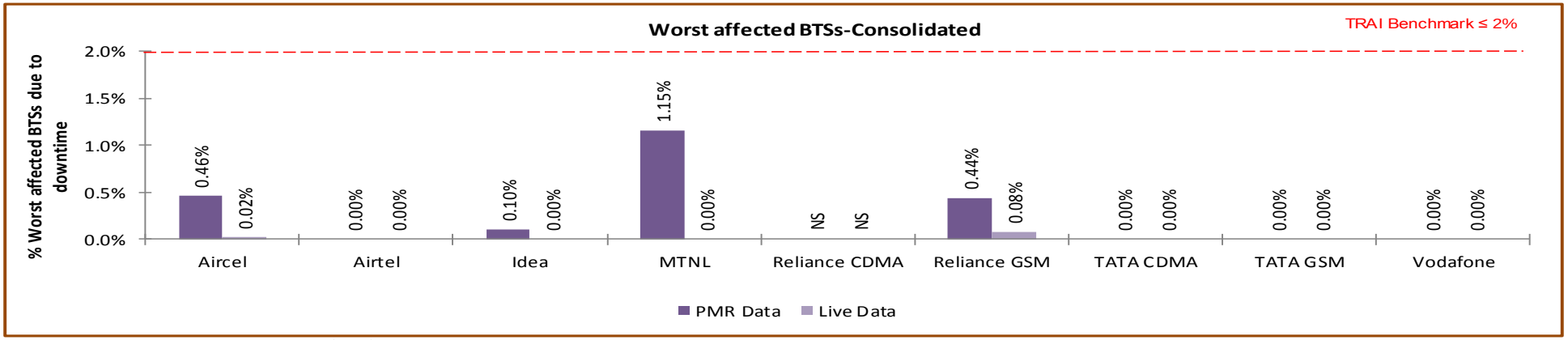
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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.

6.2.2 KEY FINDINGS – CONSOLIDATED

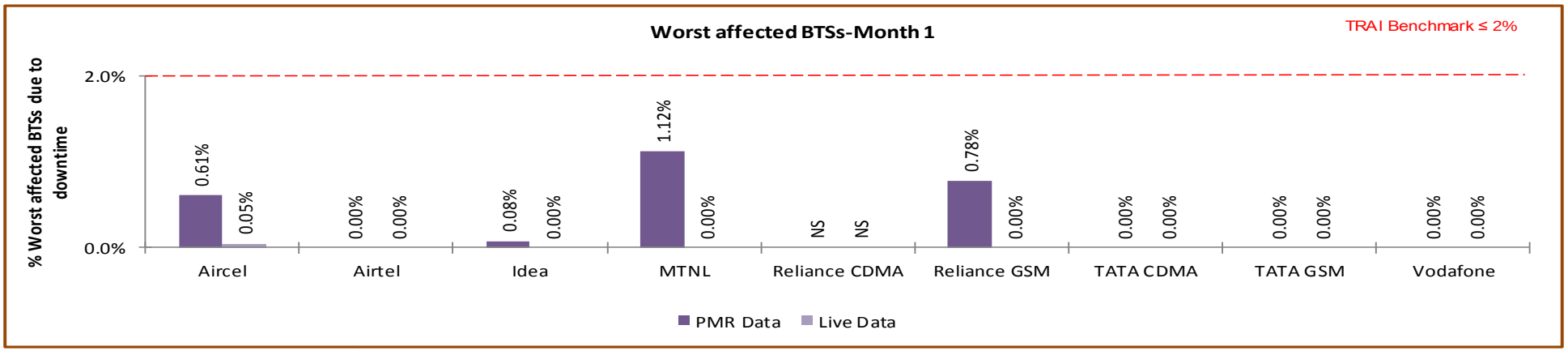


Data Source: Operations and Maintenance Center (OMC) of the operators

All the Operators met the TRAI benchmark.

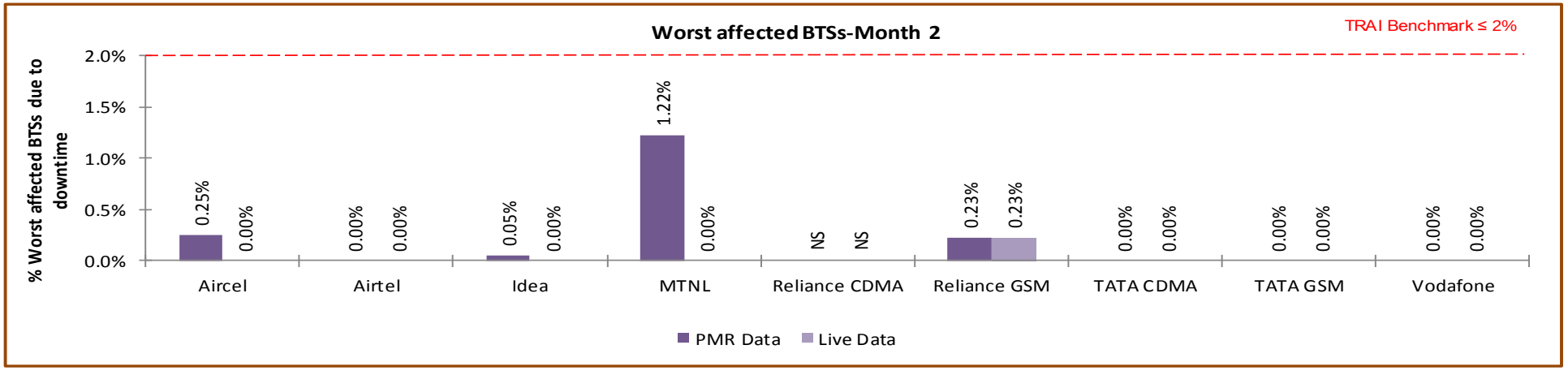
Significant difference was observed between PMR & live measurement data for MTNL, Reliance CDMA and Reliance GSM. The possible reason for the variation could be the difference in time frame of data as PMR data is for 30 days and live measurement data is for three days.

6.2.2.1 KEY FINDINGS – MONTH 1



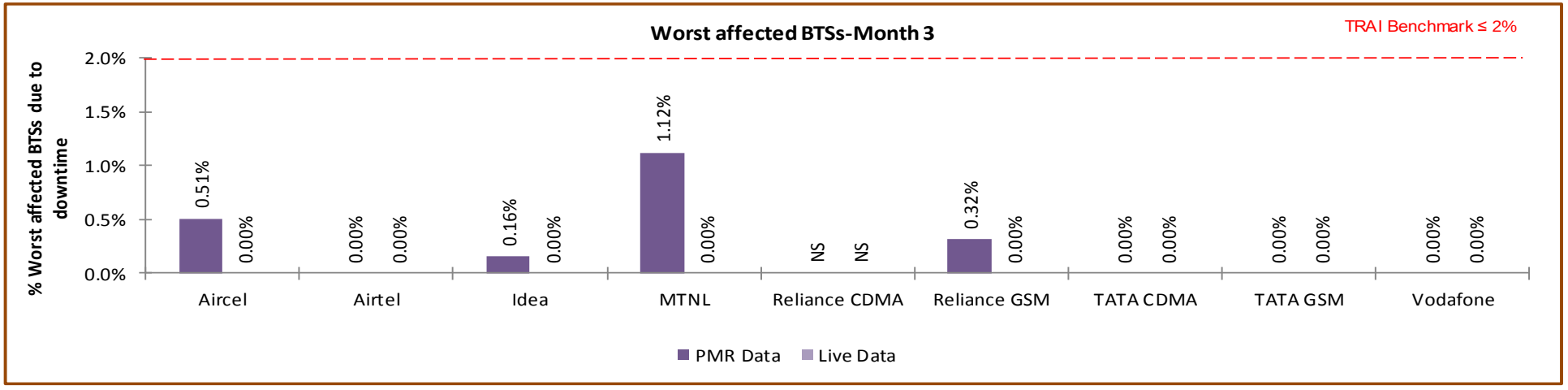
Data Source: Operations and Maintenance Center (OMC) of the operators

6.2.2.2 KEY FINDINGS – MONTH 2



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

6.2.2.3 KEY FINDINGS – MONTH 3



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

6.3 CALL SET UP SUCCESS RATE

6.3.1 PARAMETER DESCRIPTION

1. **Definition:** 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

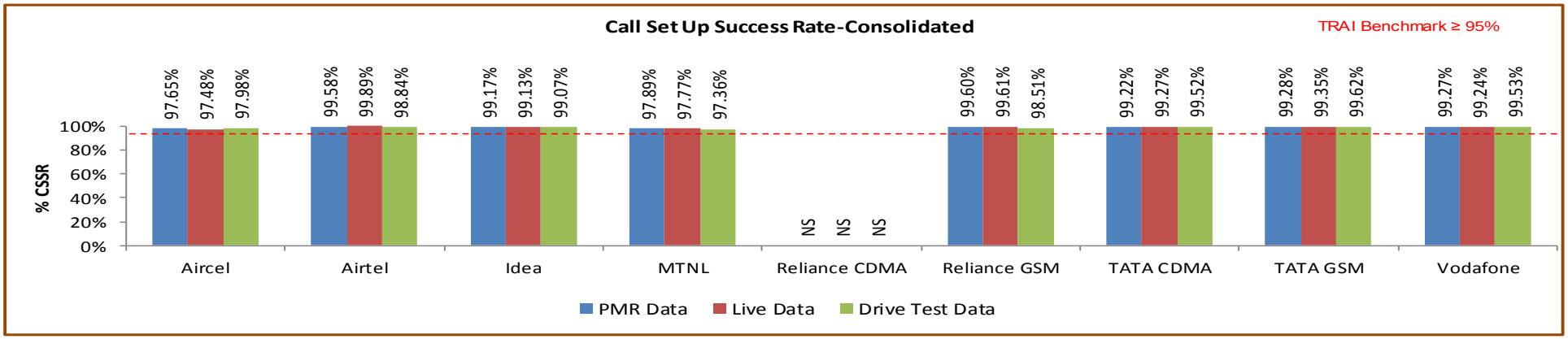
   Call Established means the following events have happened in call setup:-

   - 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.

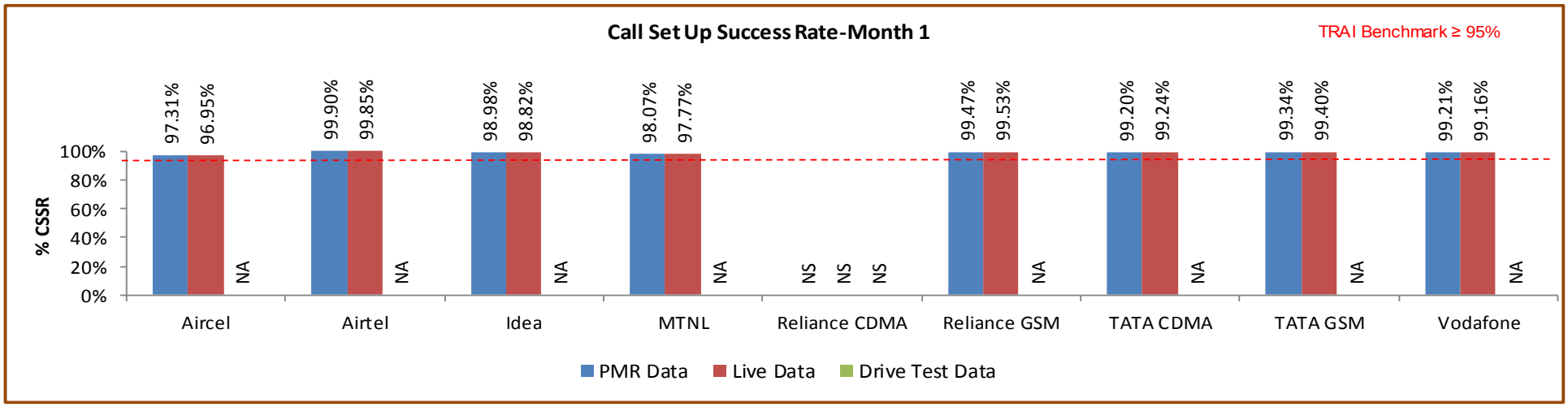
6.3.2 KEY FINDINGS - CONSOLIDATED



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

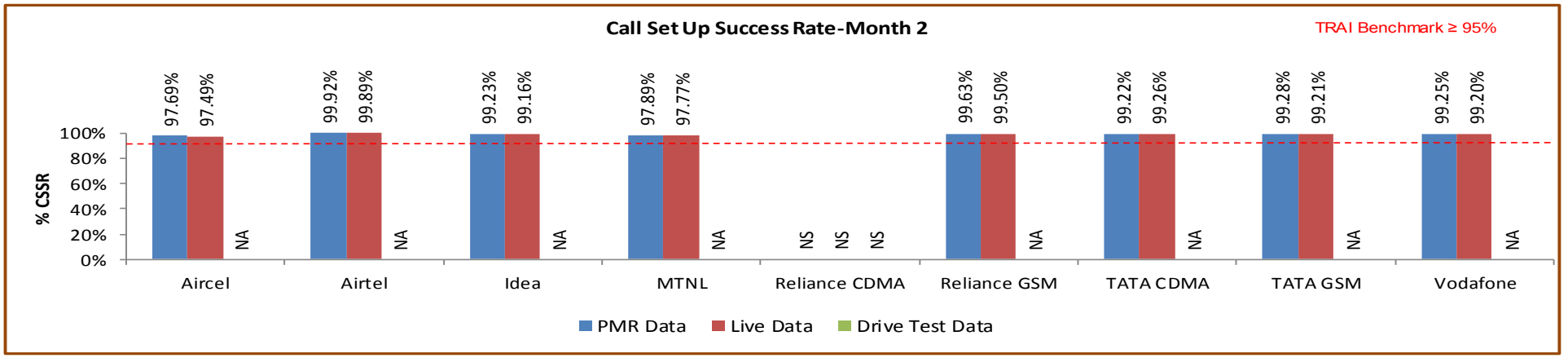
All the Operators met the TRAI benchmark.

6.3.2.1 KEY FINDINGS – MONTH 1



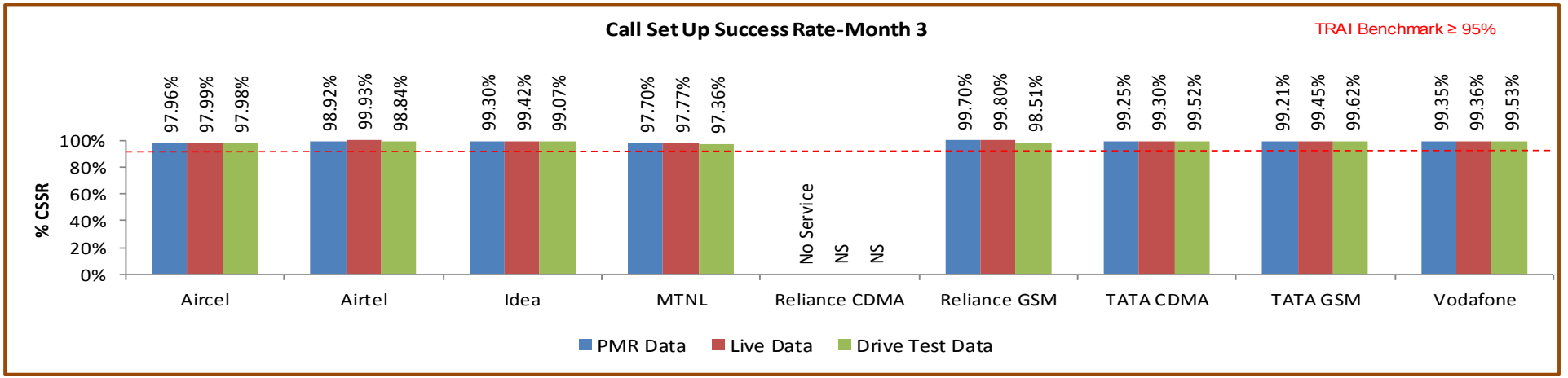
Data Source: Network Operations Center (NOC) of the operators

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- PAGING CHANNEL /TCH CONGESTION/POI

6.4.1 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

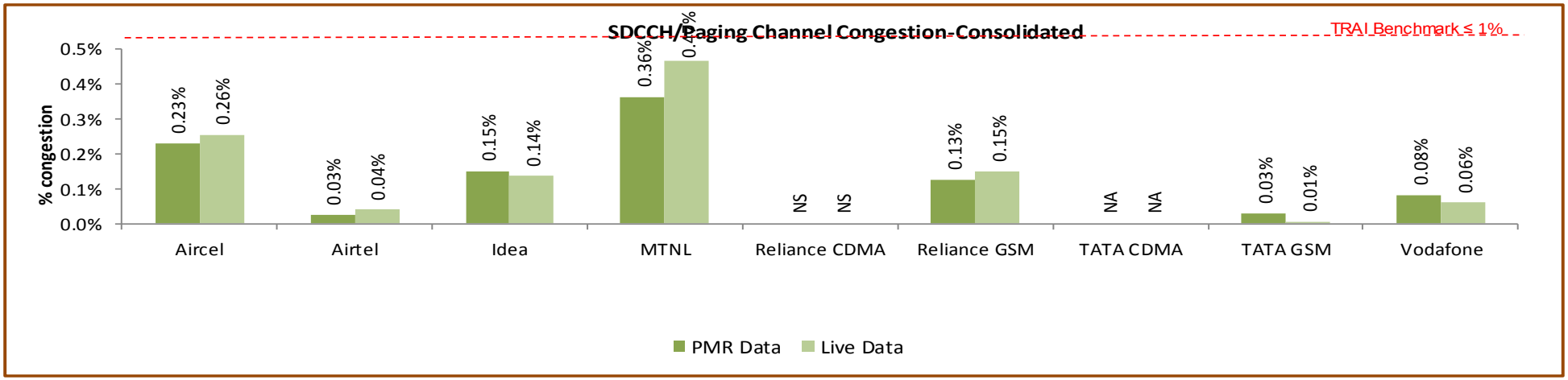
3. Benchmark:

- 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

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

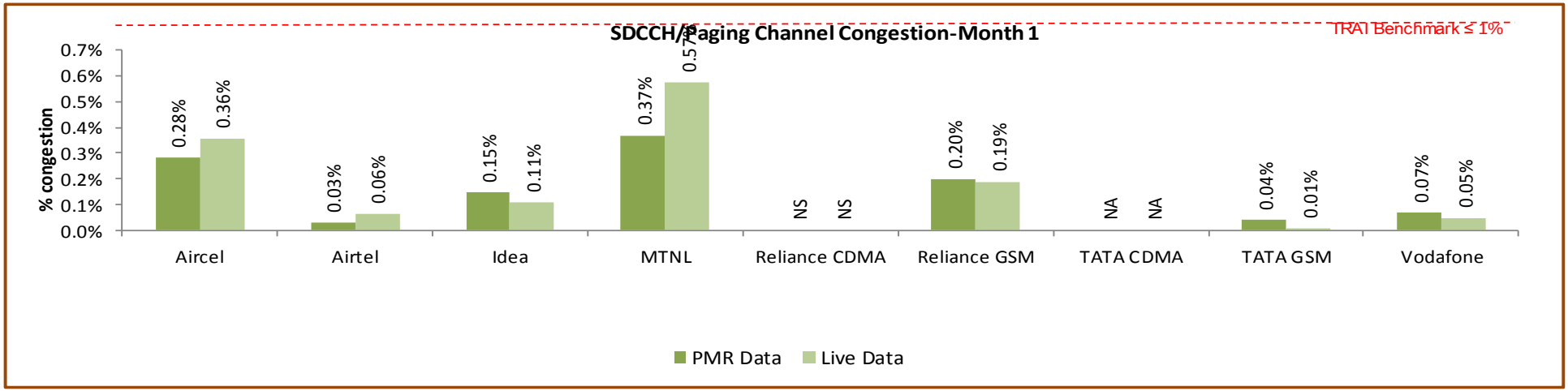


Data Source: Network Operations Center (NOC) of the operators

All operators met the benchmark as per PMR/audit.

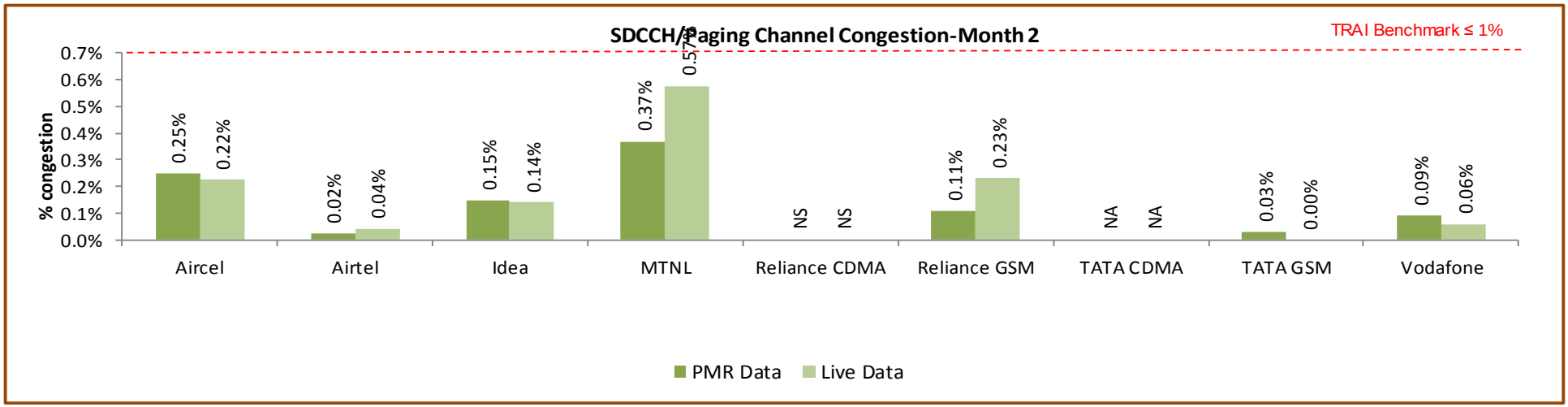
NA: SDCCH/ Paging channel congestion not applicable for CDMA operators. Hence, it has been reported as NA for Reliance CDMA and TATA CDMA.

6.4.2.1 KEY FINDINGS – MONTH 1



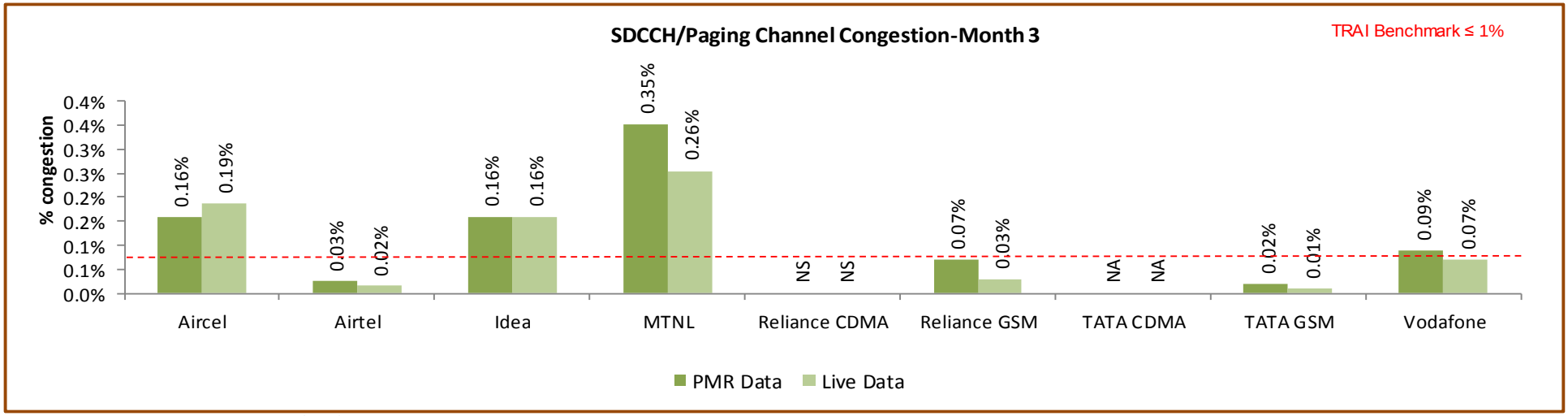
Data Source: Network Operations Center (NOC) of the operators

6.4.2.2 KEY FINDINGS – MONTH 2



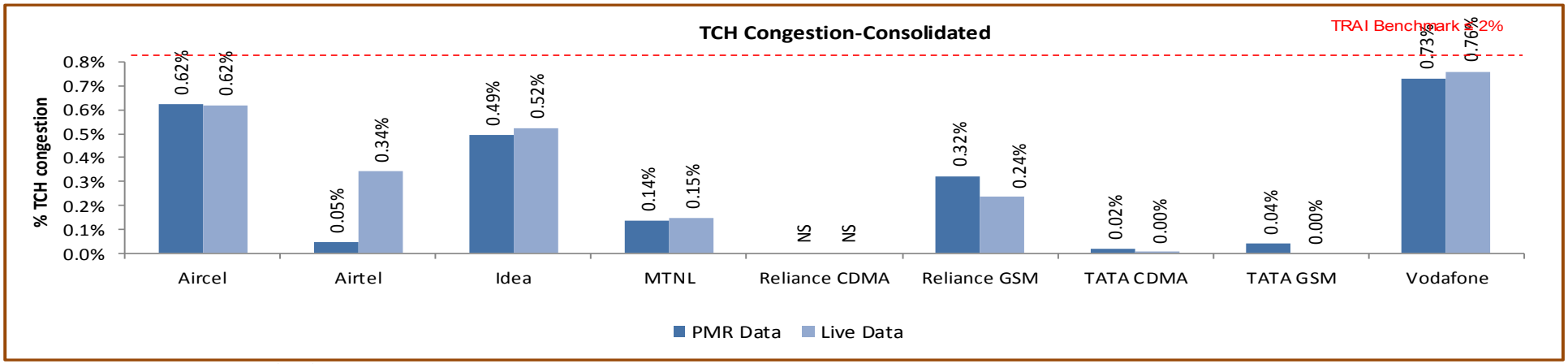
Data Source: Network Operations Center (NOC) of the operators

6.4.2.3 KEY FINDINGS – MONTH 3



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

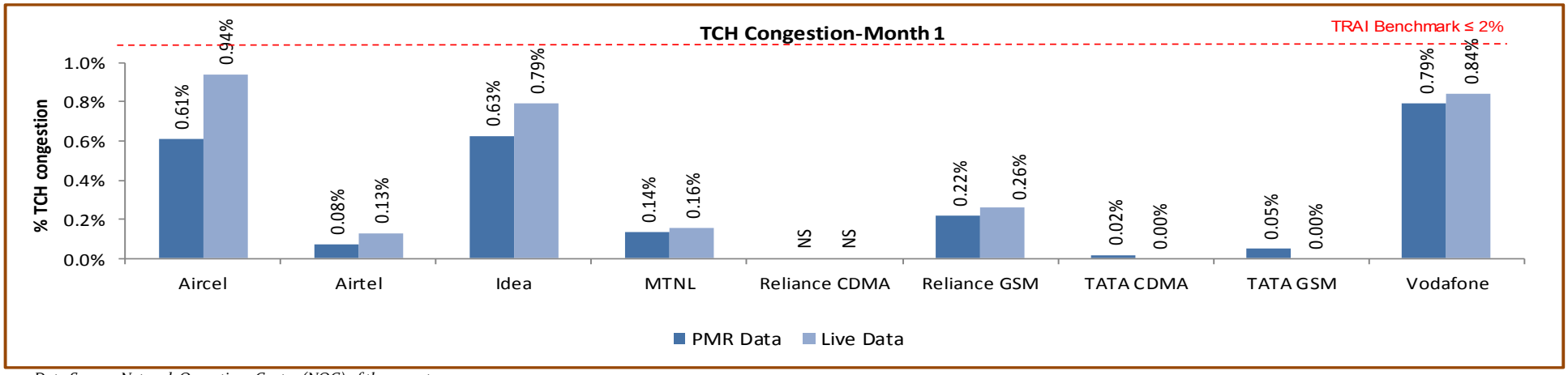
6.4.3 KEY FINDINGS – TCH CONGESTION (CONSOLIDATED)



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

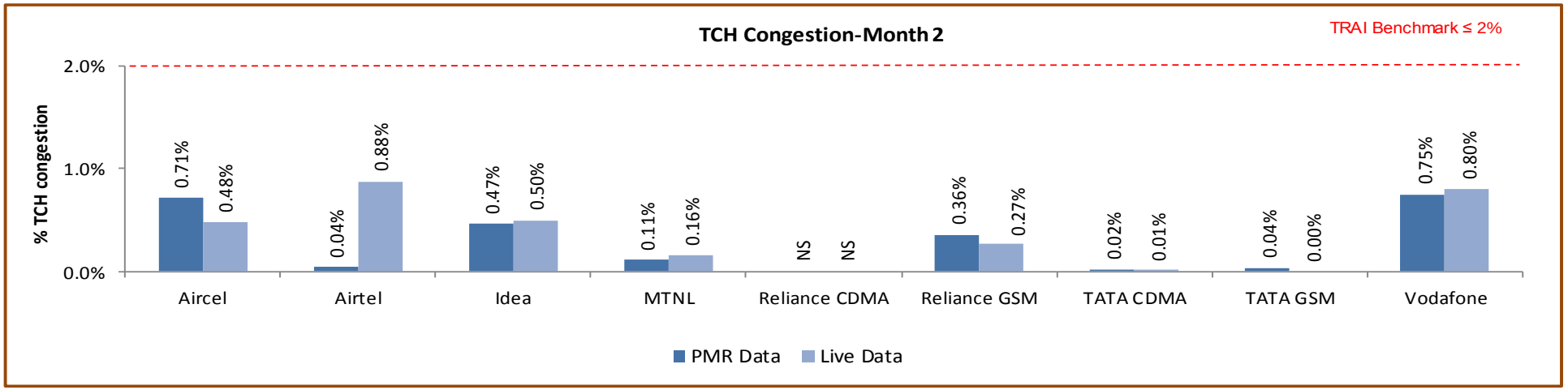
All operators met the benchmark as per PMR/audit Data.

6.4.3.1 KEY FINDINGS – MONTH 1



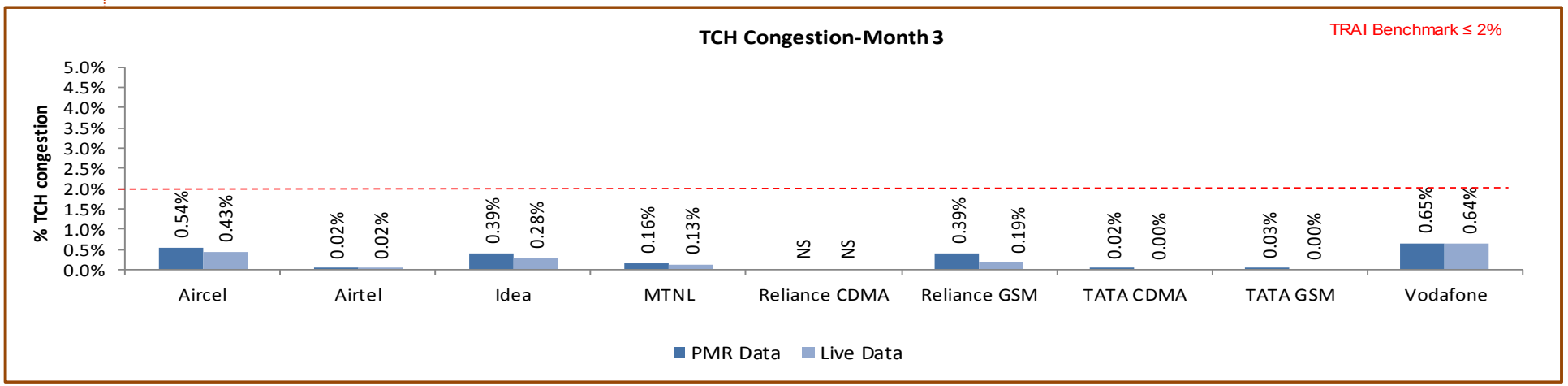
Data Source: Network Operations Center (NOC) of the operators

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

5. POI Congestion										
Audit Results for POI Congestion- PMR data										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		105	296	296	31	NS	94	153	153	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	4
Total Capacity of all POIs (A) - in erlangs		240651	421294	480898	45540	NS	141257	319595	319595	892377
Traffic served for all POIs (B)- in erlangs		100032	291888	253584	20808	NS	89223	305957	305957	449349
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		104	295	296	31	NS	93	151	151	325
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	3
Total Capacity of all POIs (A) - in erlangs		240230	419458	481644	45540	NS	140519	315539	315539	890645
Traffic served for all POIs (B)- in erlangs		97655	285947	255936	11226	NS	77813	302095	302095	333177
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

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

6.4.4.1 KEY FINDINGS – MONTH 1

5. POI Congestion										
Audit Results for POI Congestion- PMR data-July										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		105	293	288	31	NS	92	146	146	324
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	1
Total Capacity of all POIs (A) - in erlangs		80164	139613	161338	15180	NS	46700	108940	108940	295380
Traffic served for all POIs (B)- in erlangs		32690	95930	81151	6990	NS	29273	104330	104330	144610
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		103	292	288	31	NS	92	146	146	324
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		79837	138750	161032	15180	NS	46699	105902	105902	295038
Traffic served for all POIs (B)- in erlangs		31363	94009	83789	3871	NS	20042	101442	101442	88461
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

6.4.4.2 KEY FINDINGS – MONTH 2

5. POI Congestion										
Audit Results for POI Congestion- PMR data-August										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		105	296	299	31	NS	94	156	156	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		80252	140548	163287	15180	NS	47282	105357	105357	296583
Traffic served for all POIs (B)- in erlangs		34172	98692	86808	6920	NS	29991	100825	100825	150991
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		105	296	299	31	NS	93	152	152	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	1
Total Capacity of all POIs (A) - in erlangs		80160	140534	163287	15180	NS	47116	105330	105330	296282
Traffic served for all POIs (B)- in erlangs		32810	98222	86808	3871	NS	30217	100794	100794	87774
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

6.4.4.3 KEY FINDINGS – MONTH 3

5. POI Congestion										
Audit Results for POI Congestion- PMR data-September										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		105	297	300	31	NS	94	158	158	328
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	3
Total Capacity of all POIs (A) - in erlangs		80234	141134	156273	15181	NS	47275	105298	105298	300414
Traffic served for all POIs (B)- in erlangs		33170	97265	85625	6898	NS	29959	100802	100802	153748
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September										
POI congestion	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of working POIs		105	297	300	31	NS	95	155	155	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	2
Total Capacity of all POIs (A) - in erlangs		80234	140174	157325	15180	NS	46704	104307	104307	299325
Traffic served for all POIs (B)- in erlangs		33483	93716	85340	3483	NS	27554	99859	99859	156942
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

6.5 CALL DROP RATE

6.5.1 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**

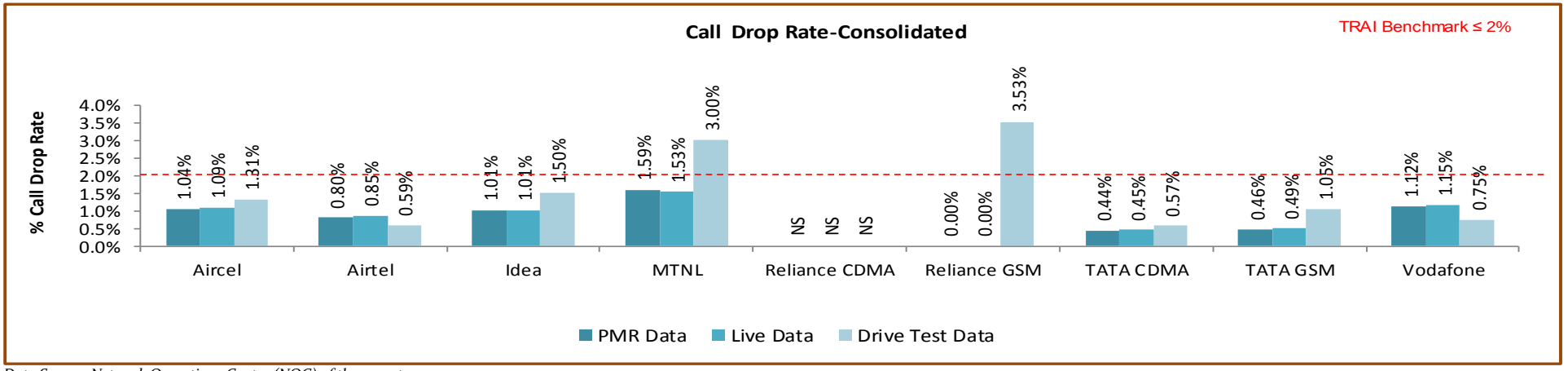
3. **TRAI Benchmark –**

   - 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.

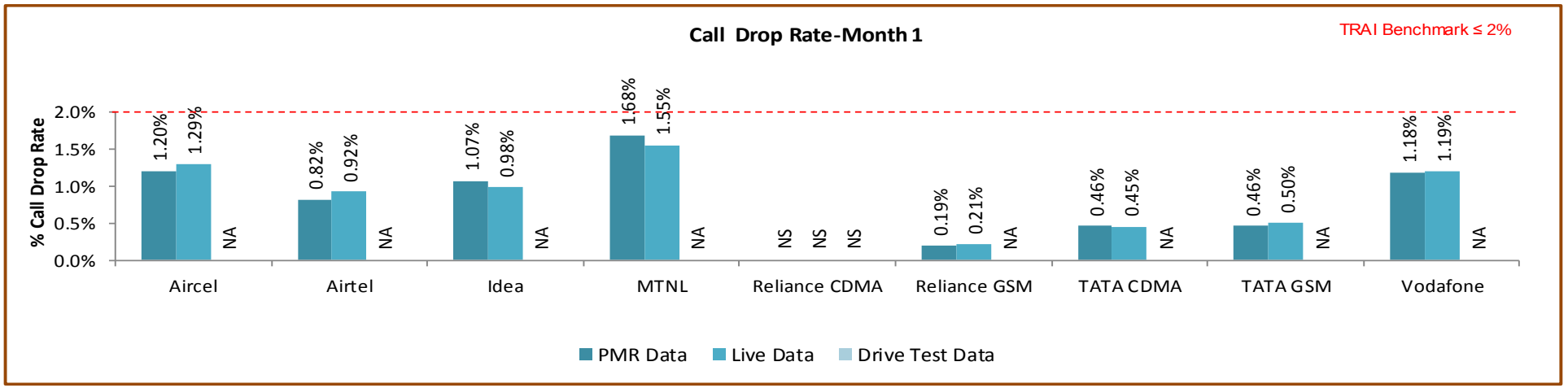
6.5.2 KEY FINDINGS - CONSOLIDATED



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

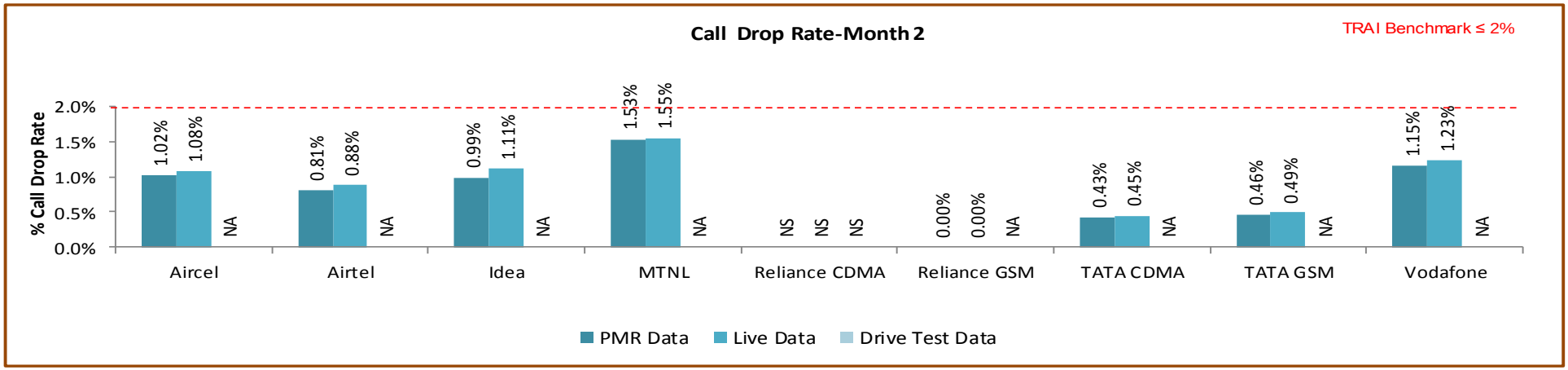
MTNL and Reliance GSM failed to meet the benchmark for call drop rate during drive test.

6.5.2.1 KEY FINDINGS – MONTH 1



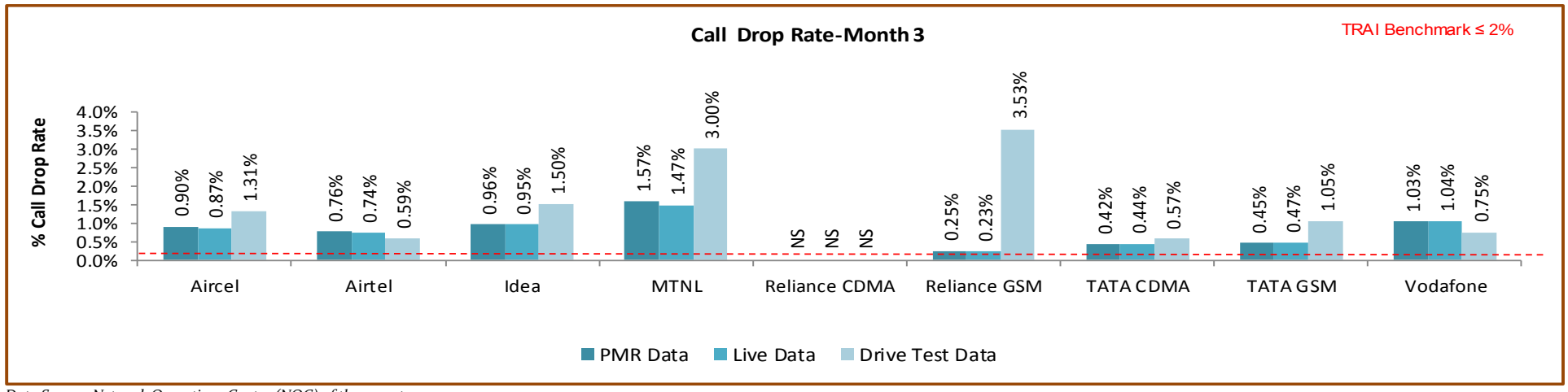
Data Source: Network Operations Center (NOC) of the operators

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 CELLS HAVING GREATER THAN 3% TCH DROP

6.6.1 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 –**

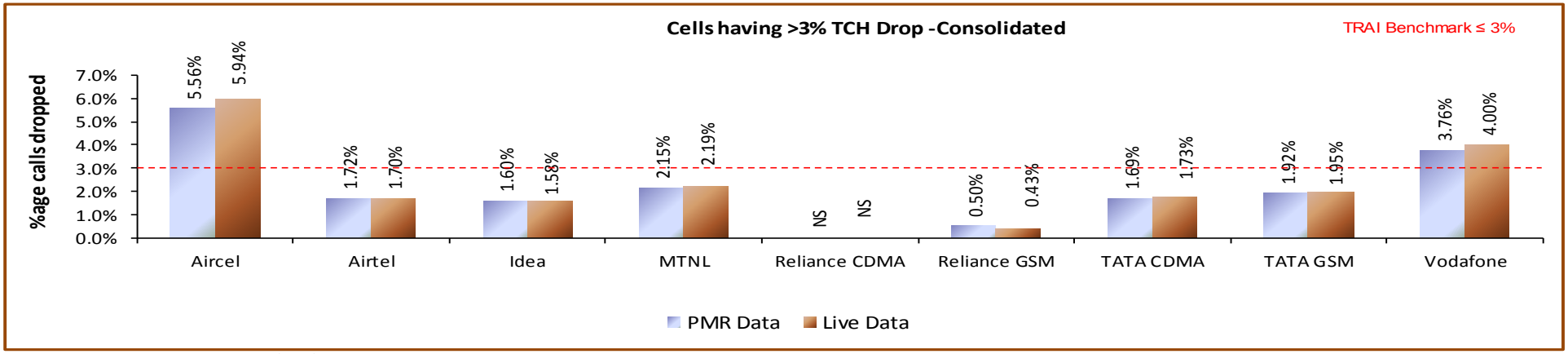
   - Worst affected cells having more than 3% TCH drop rate ≤ 3%

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.

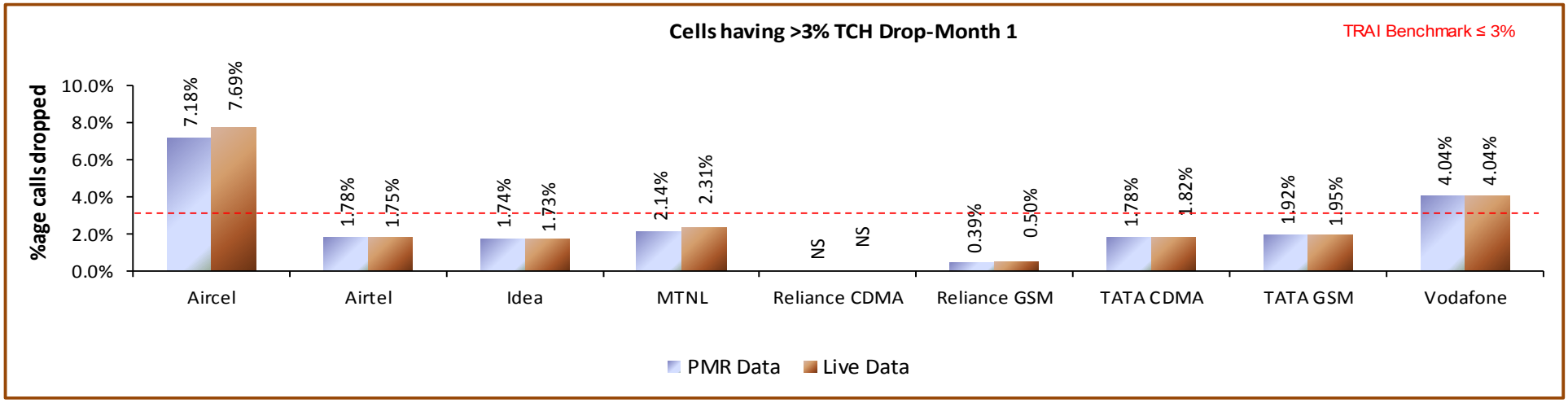
6.6.2 KEY FINDINGS - CONSOLIDATED



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

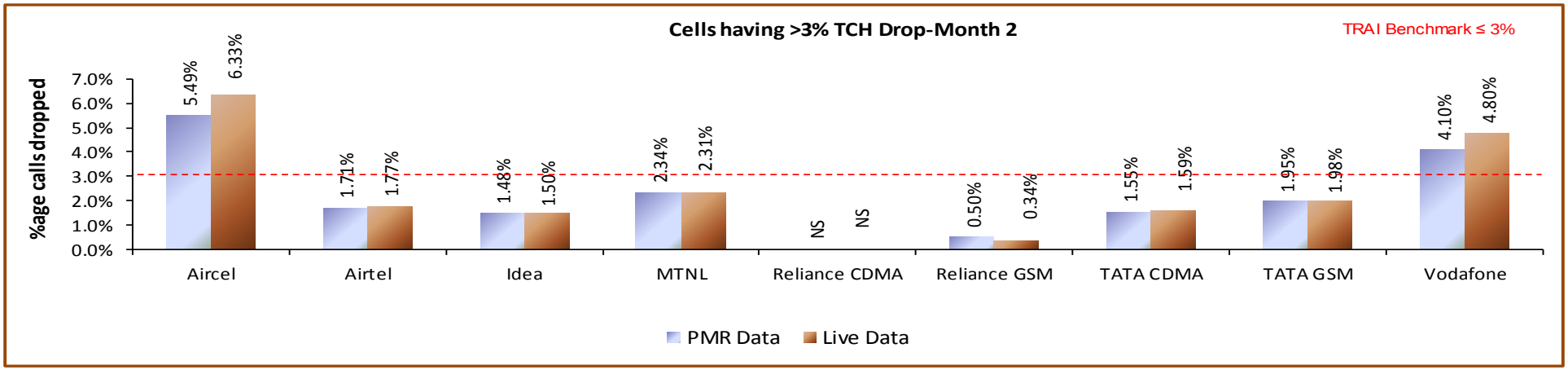
Aircel and Vodafone failed to meet the benchmark as per PMR/audit Data.

6.6.2.1 KEY FINDINGS – MONTH 1



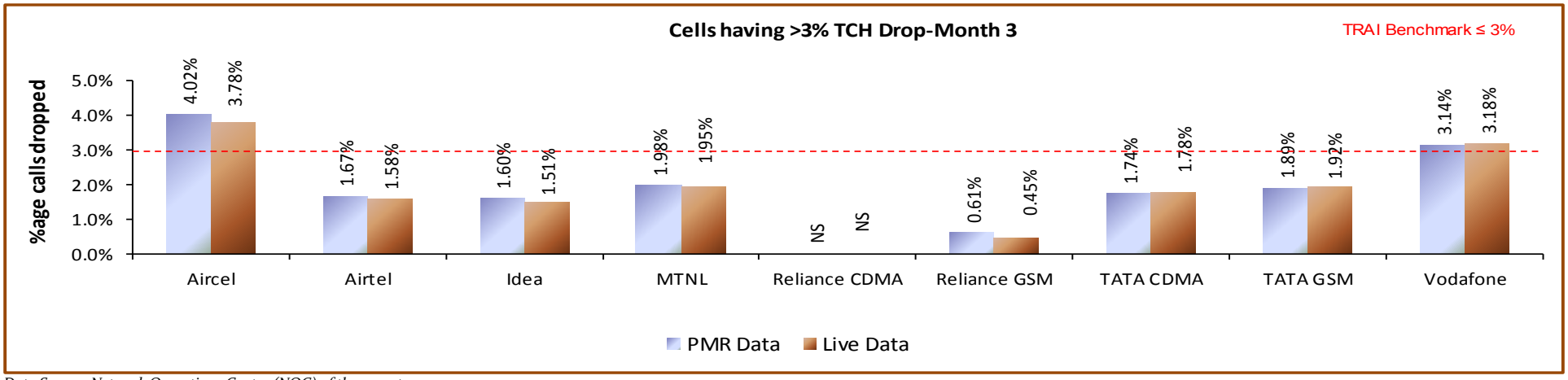
Data Source: Network Operations Center (NOC) of the operators

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 VOICE QUALITY

6.7.1 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**

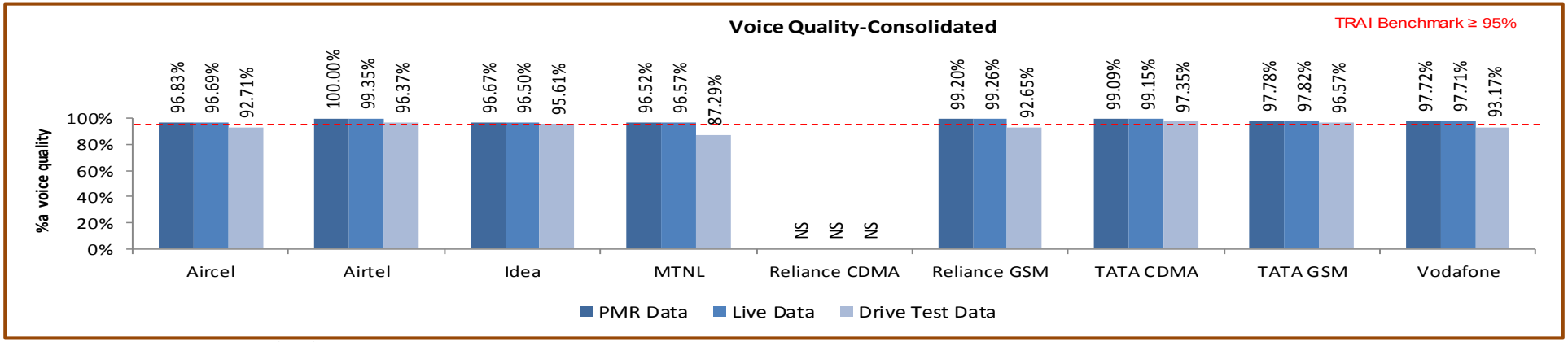
3. **TRAI Benchmark:** ≥ 95%

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.

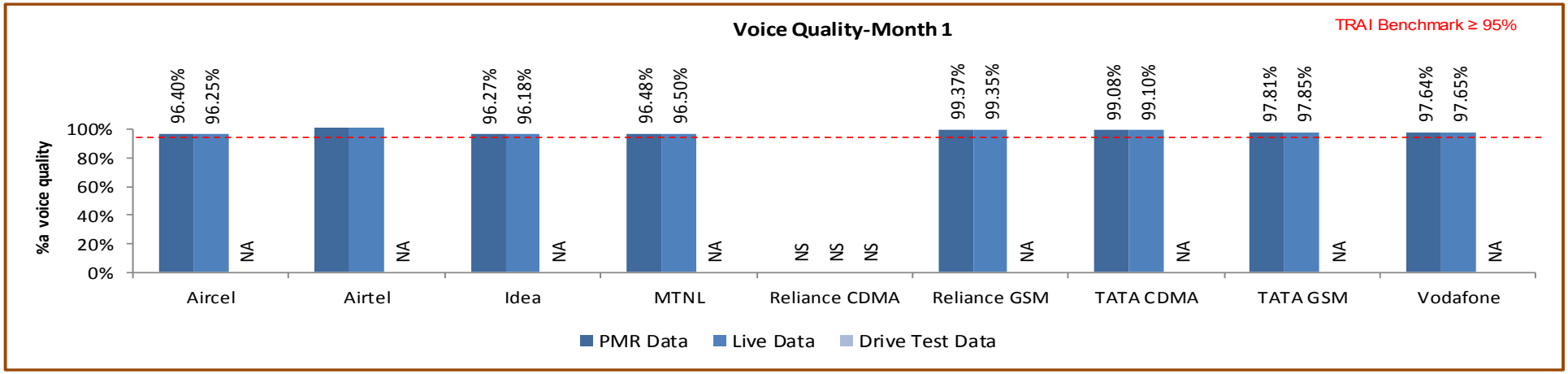
6.7.2 KEY FINDINGS



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

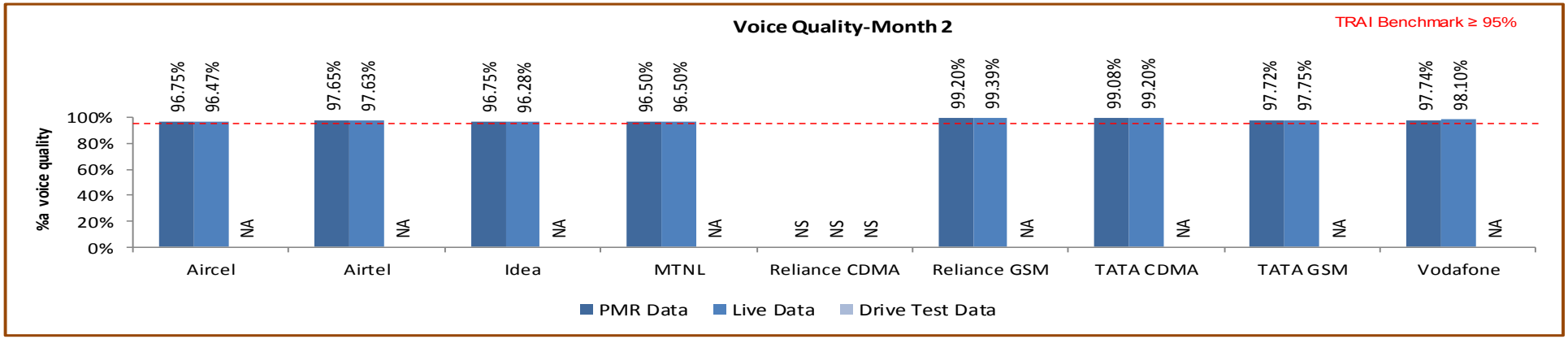
All operators met the benchmark as per PMR audit, however during drive test Aircel, MTNL, Reliance GSM and Vodafone failed to meet the TRAI benchmark for voice quality.

6.7.2.1 KEY FINDINGS – MONTH 1



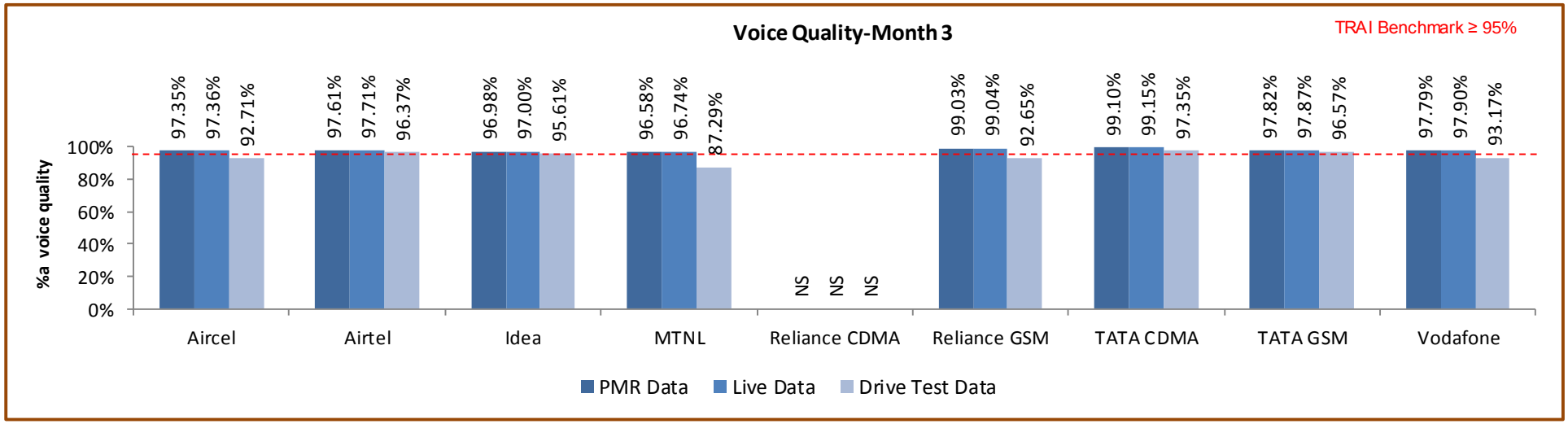
Data Source: Network Operations Center (NOC) of the operators

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 - COMPARISON BETWEEN PMR DATA, 3 DAY LIVE DATA AND LIVE CALLING DATA FOR 3G

7.1 NODE BS DOWNTIME

7.1.1 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 –

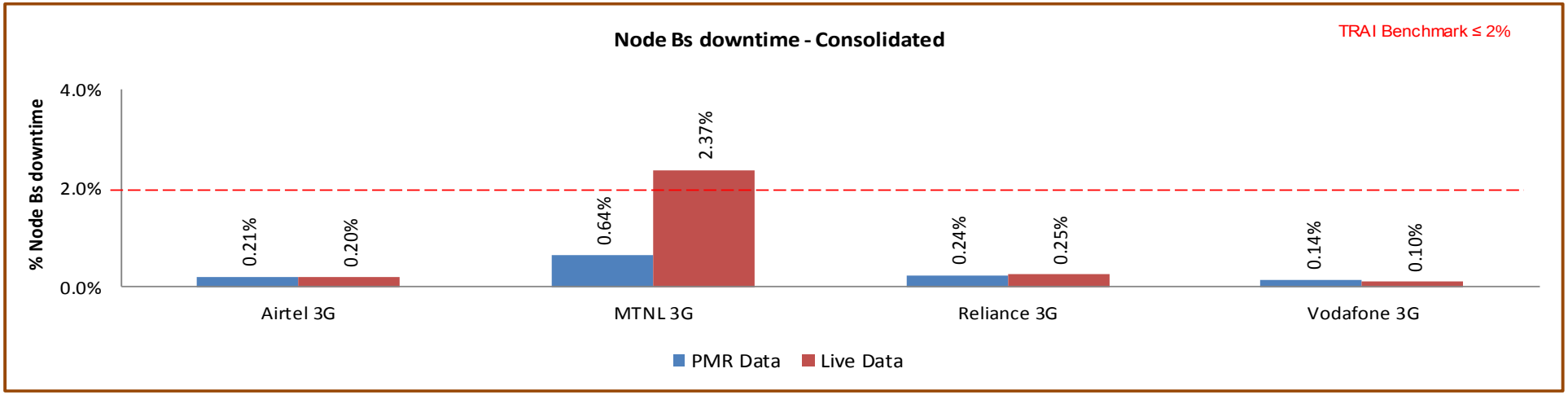
a. Node Bs downtime (not available for service) ≤ 2%

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.

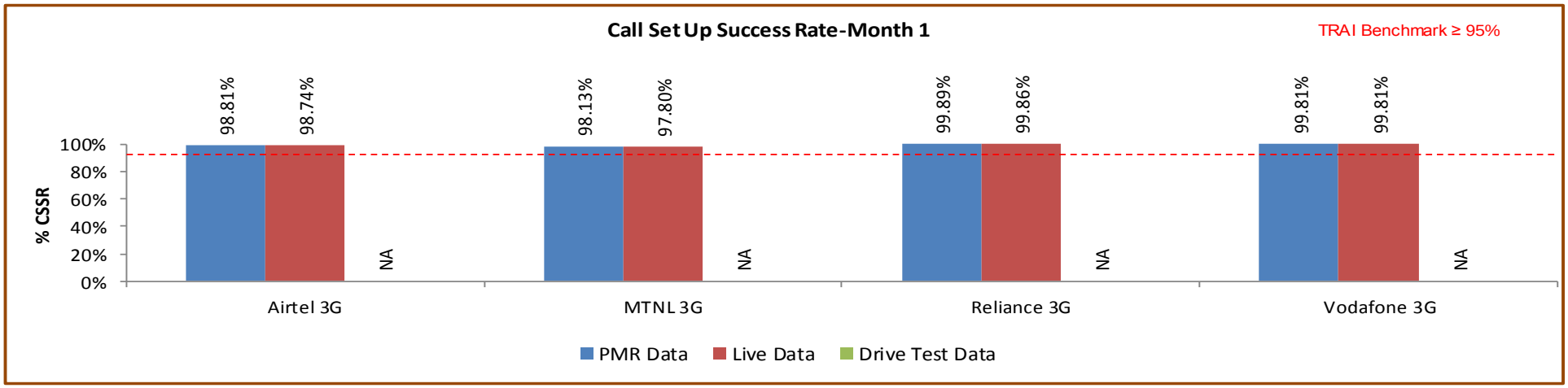
7.1.2 KEY FINDINGS - CONSOLIDATED



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

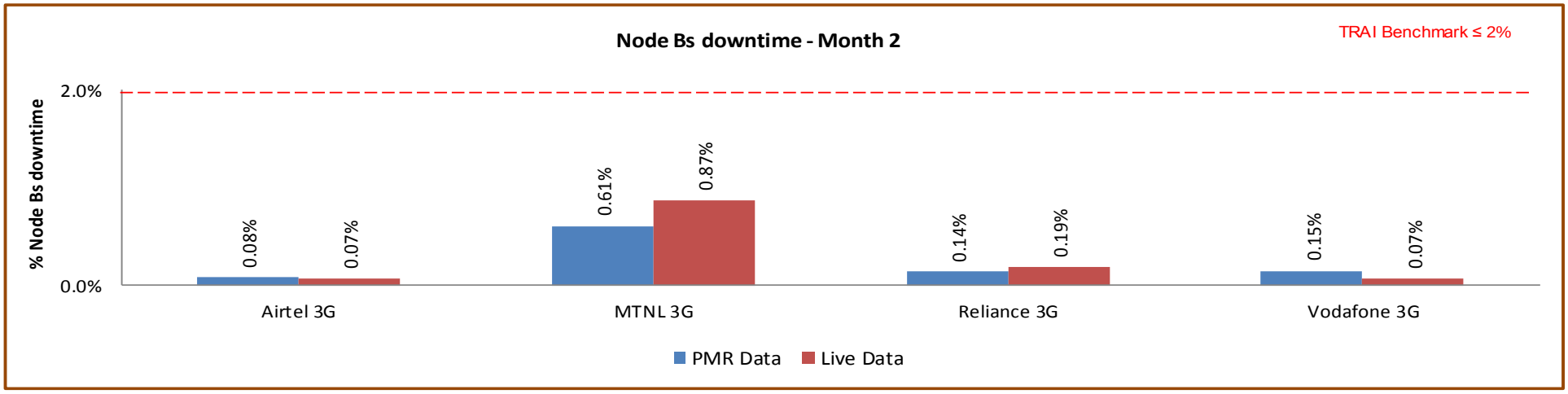
MTNL 3G failed to meet the benchmark as per PMR/audit Data.

7.1.2.1 KEY FINDINGS – MONTH 1



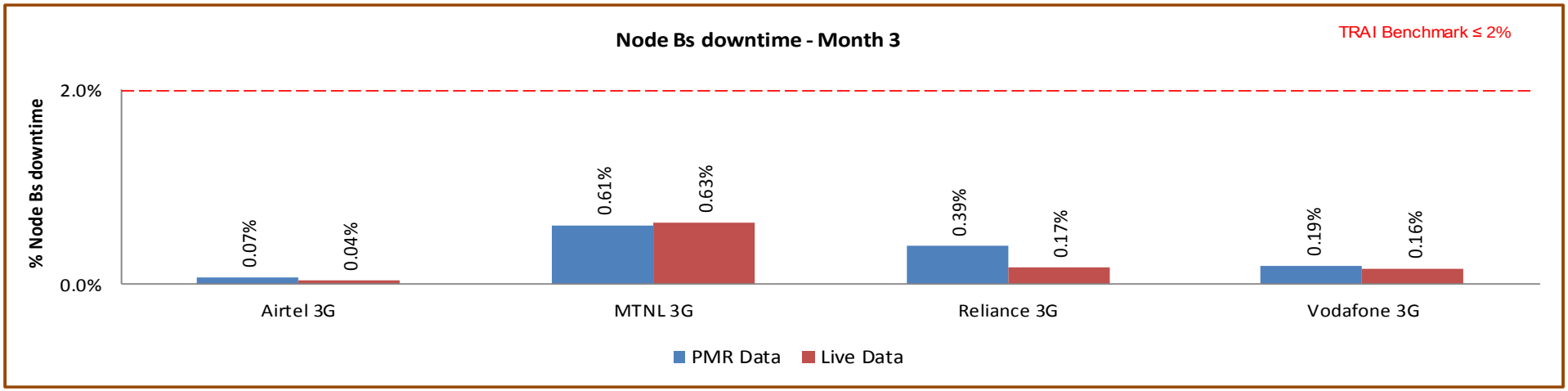
Data Source: Operations and Maintenance Center (OMC) of the operators

7.1.2.2 KEY FINDINGS – MONTH 2



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

7.1.2.3 KEY FINDINGS – MONTH 3



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

7.2 WORST AFFECTED NODE BS DUE TO DOWNTIME

7.2.1 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.

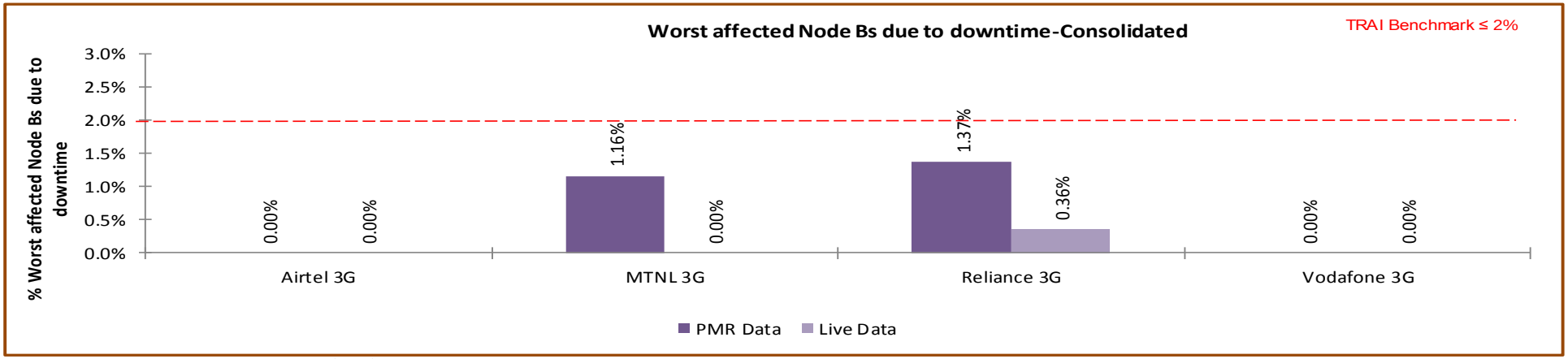
  iii. Data is extracted from system log of the server of the operator. This data is in raw format which is further processed to arrive at the cumulative values.

  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.

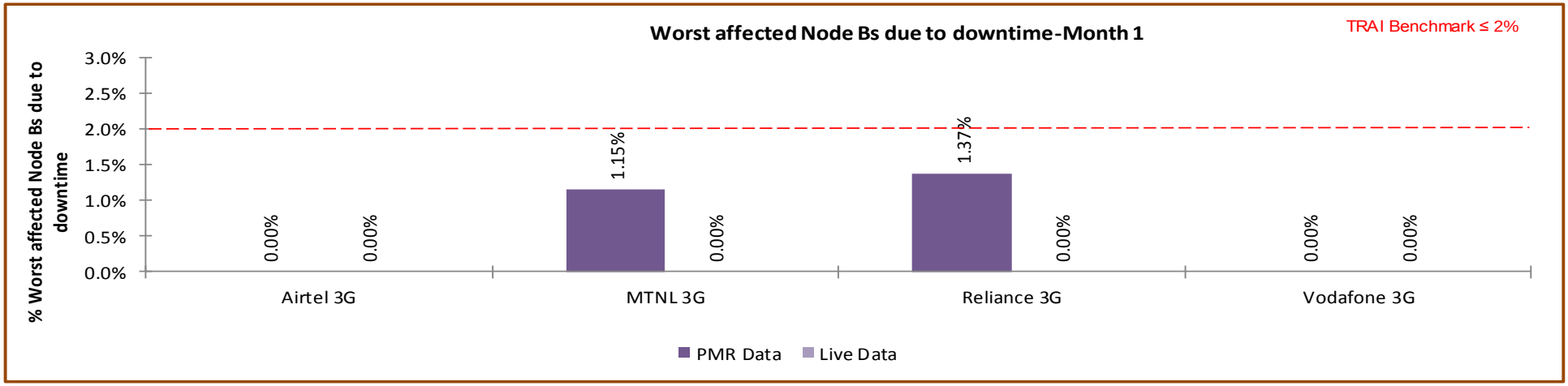
7.2.2 KEY FINDINGS – CONSOLIDATED



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

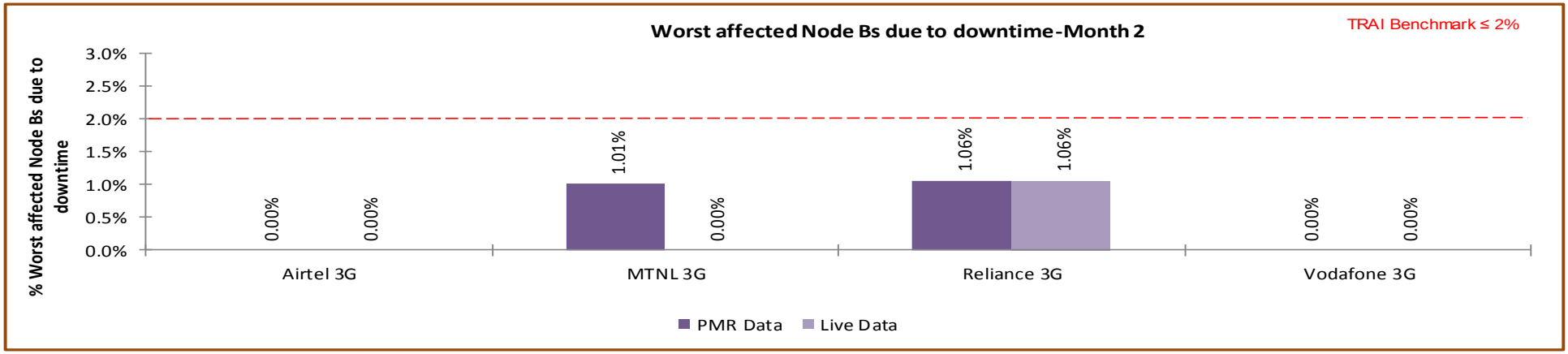
All operators met the benchmark as per PMR/audit Data.

7.2.2.1 KEY FINDINGS – MONTH 1



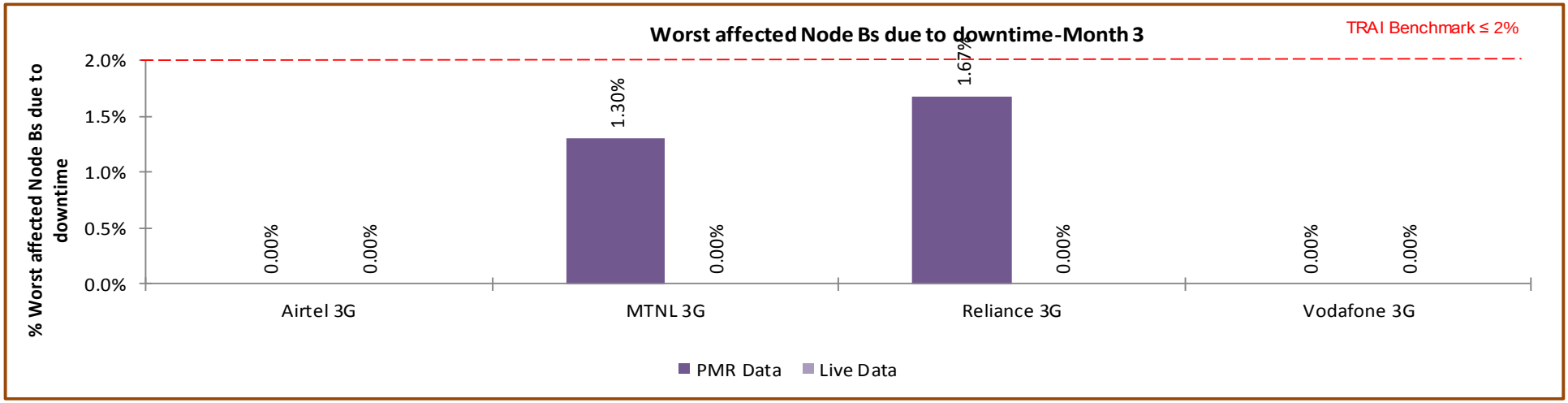
Data Source: Operations and Maintenance Center (OMC) of the operators

7.2.2.2 KEY FINDINGS – MONTH 2



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

7.2.2.3 KEY FINDINGS – MONTH 3



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

7.3 CALL SET UP SUCCESS RATE

7.3.1 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

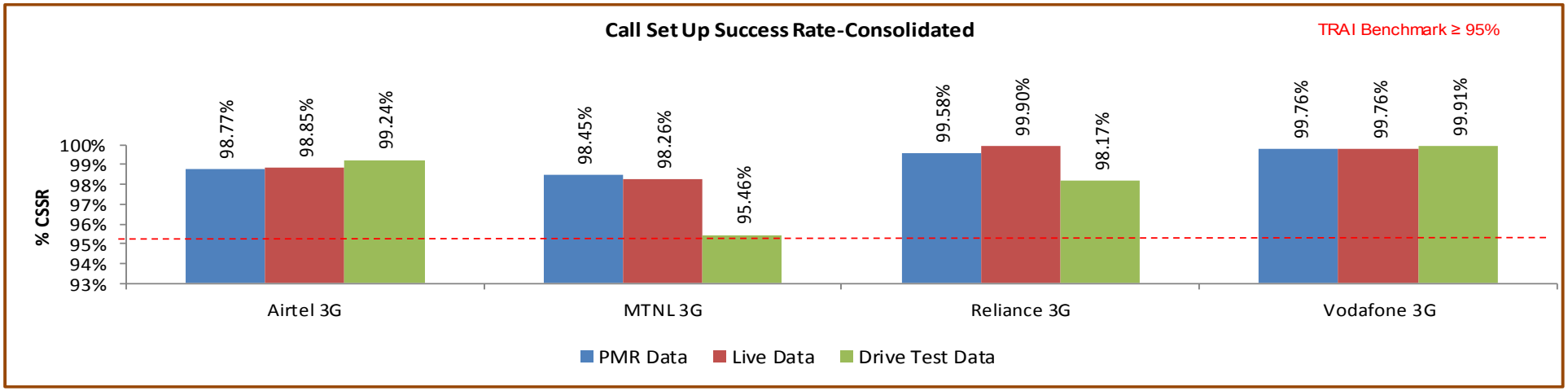
5. **TRAI Benchmark ≥** 95%

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.

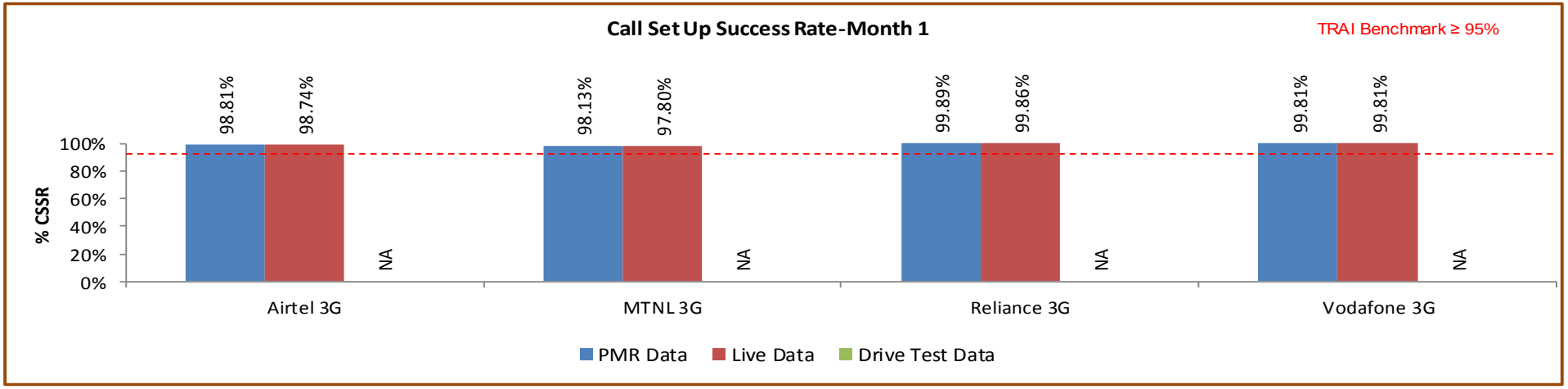
7.3.2 KEY FINDINGS - CONSOLIDATED



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

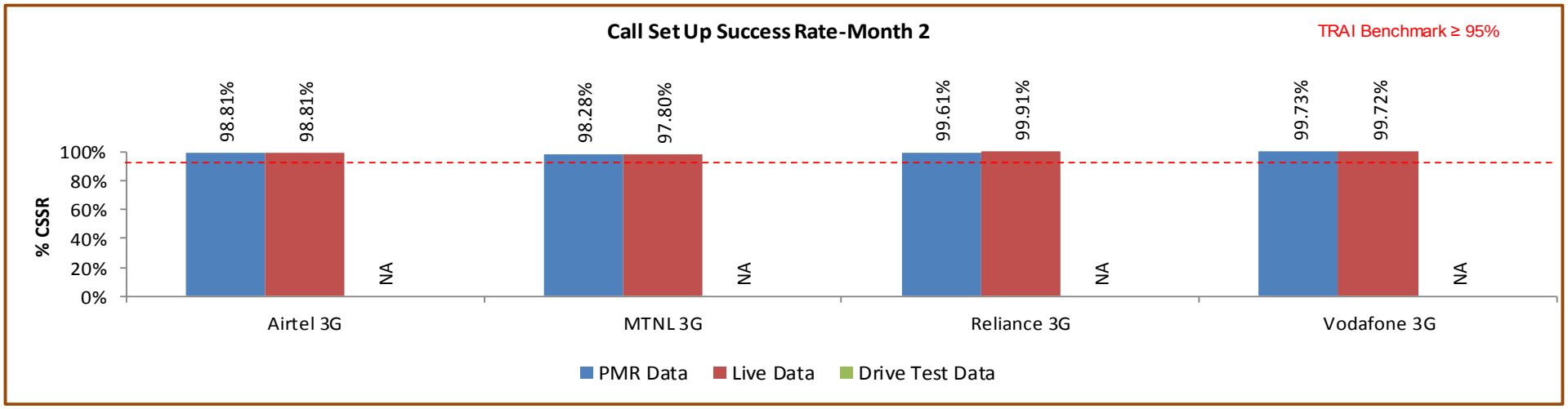
All operators met the benchmark as per PMR/audit and drive test

7.3.2.1 KEY FINDINGS – MONTH 1



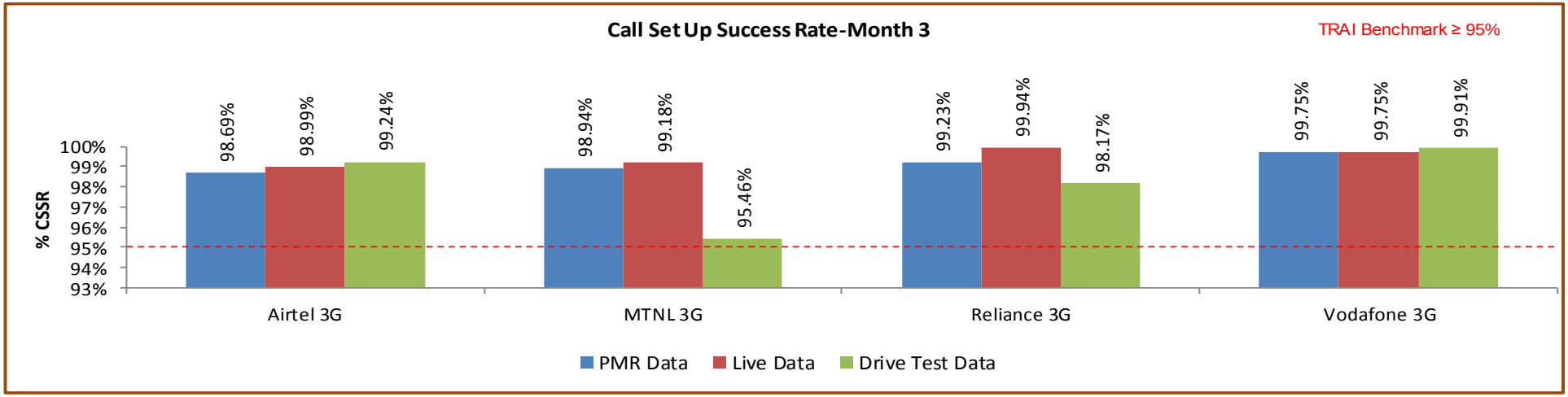
Data Source: Network Operations Center (NOC) of the operators

7.3.2.2 KEY FINDINGS – MONTH 2



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

7.3.2.3 KEY FINDINGS – MONTH 3



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

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

7.4.1 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

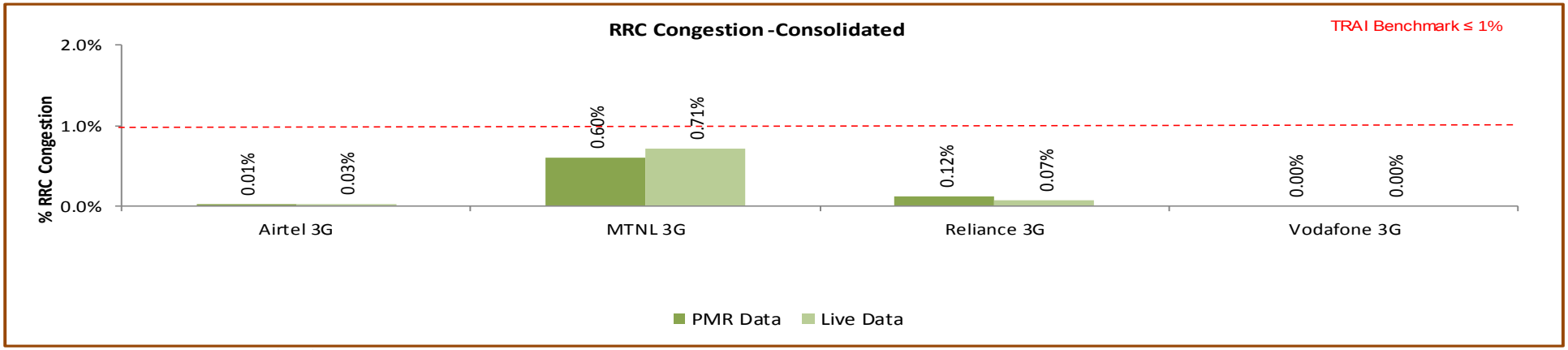
7. Benchmark:

- 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

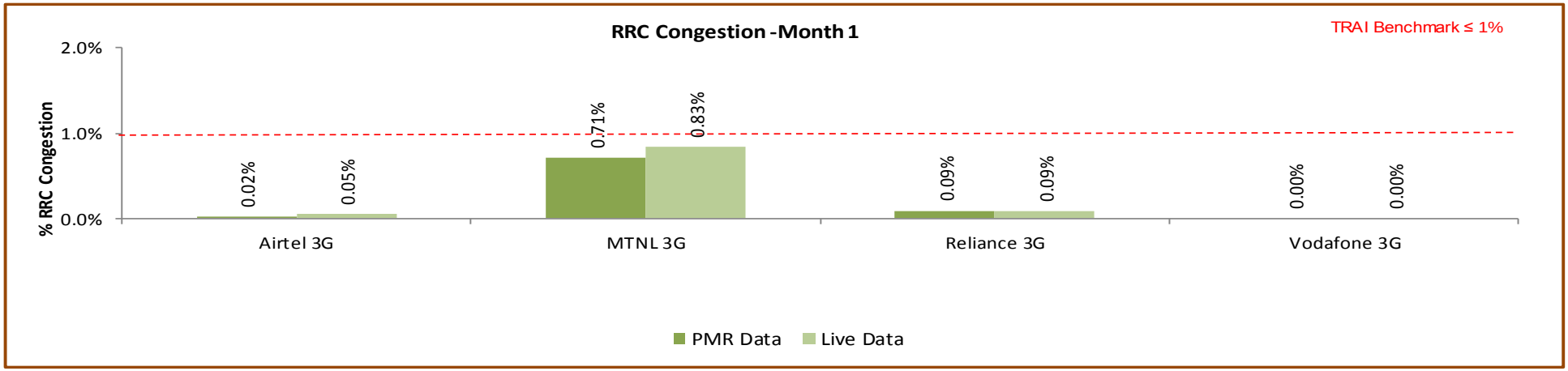
7.4.2 KEY FINDINGS - RRC CONGESTION (CONSOLIDATED)



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

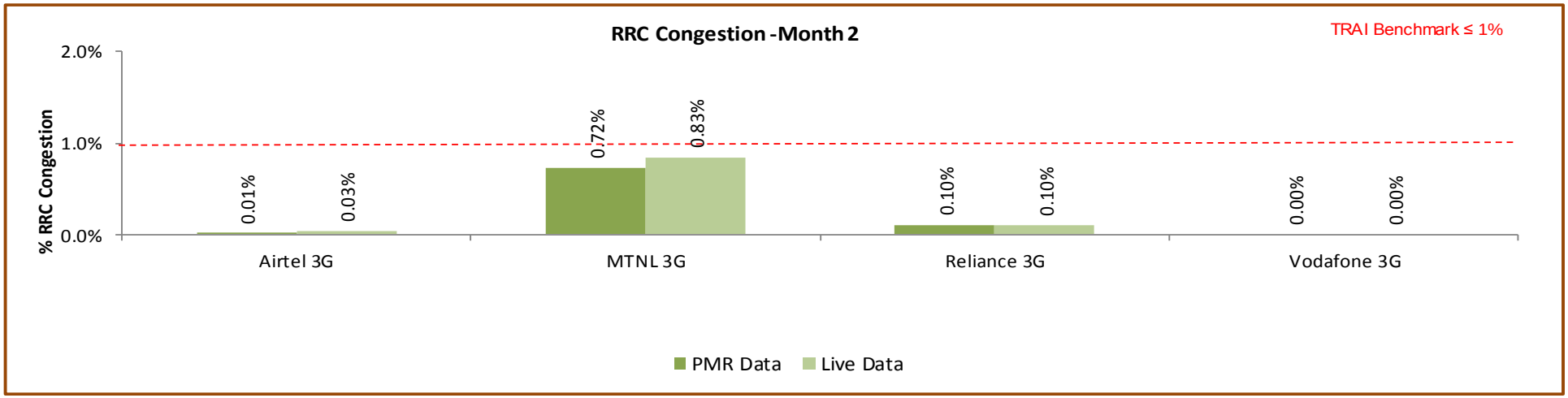
All operators met the benchmark as per PMR/audit Data.

7.4.2.1 KEY FINDINGS – MONTH 1



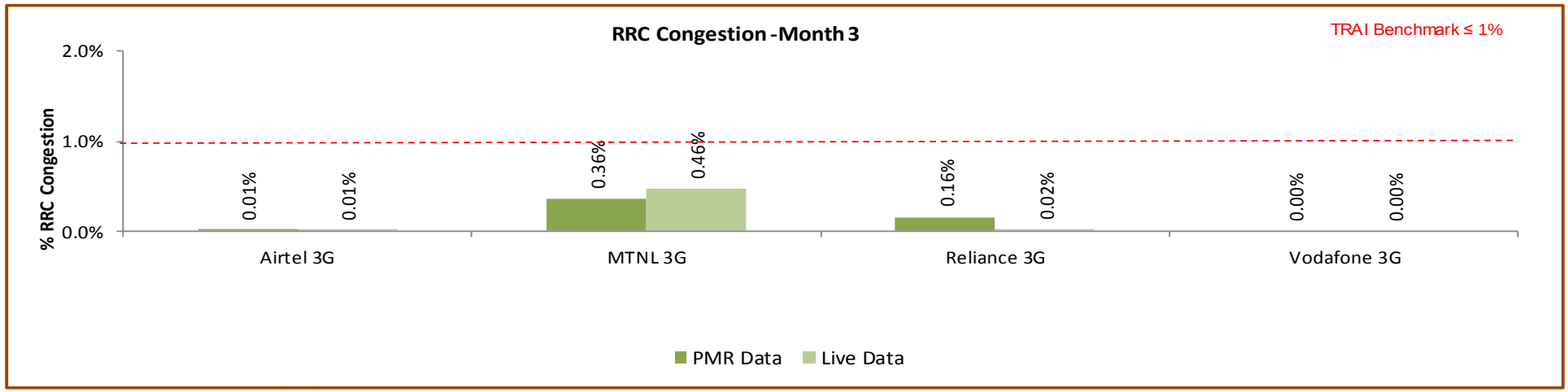
Data Source: Network Operations Center (NOC) of the operators

7.4.2.2 KEY FINDINGS – MONTH 2



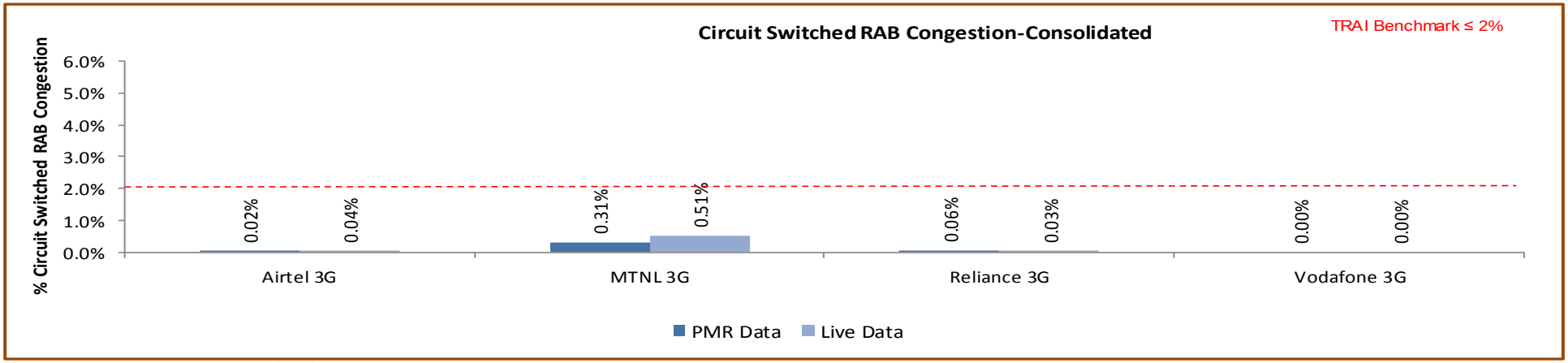
Data Source: Network Operations Center (NOC) of the operators

7.4.2.3 KEY FINDINGS – MONTH 3



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

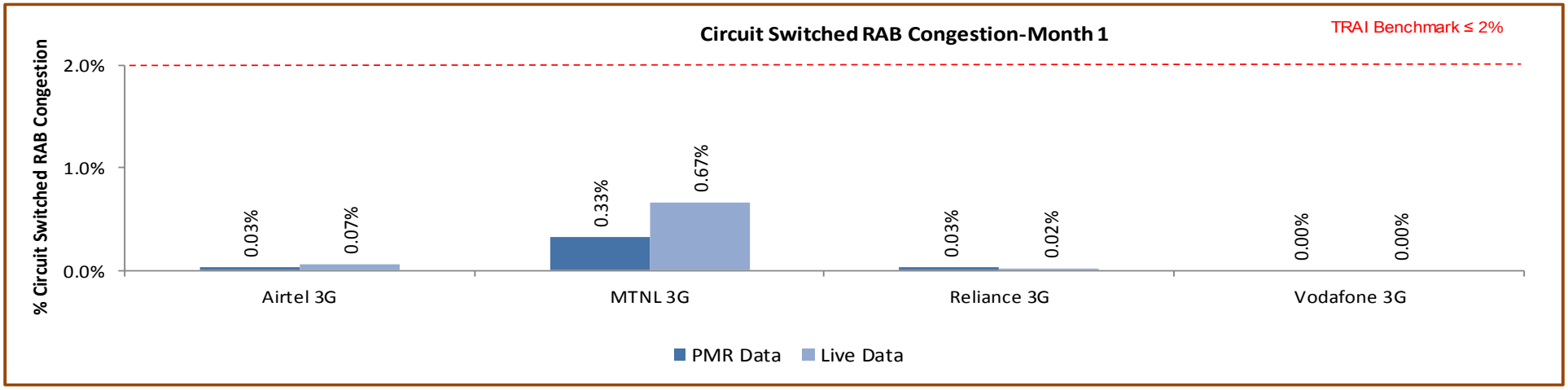
7.4.3 KEY FINDINGS – CIRCUIT SWITCHED RAB CONGESTION (CONSOLIDATED)



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

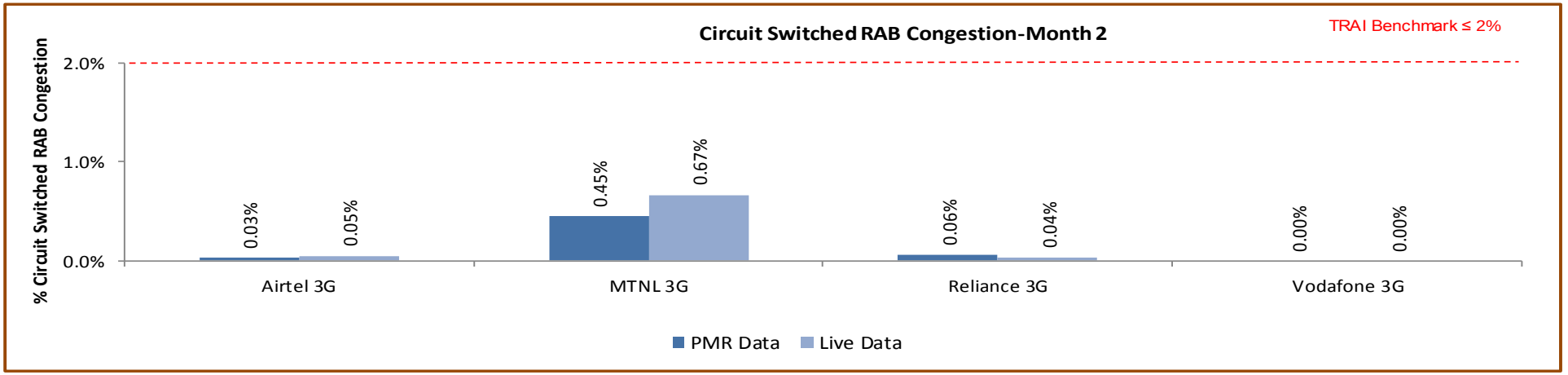
All operators met the benchmark as per PMR/audit Data.

7.4.3.1 KEY FINDINGS – MONTH 1



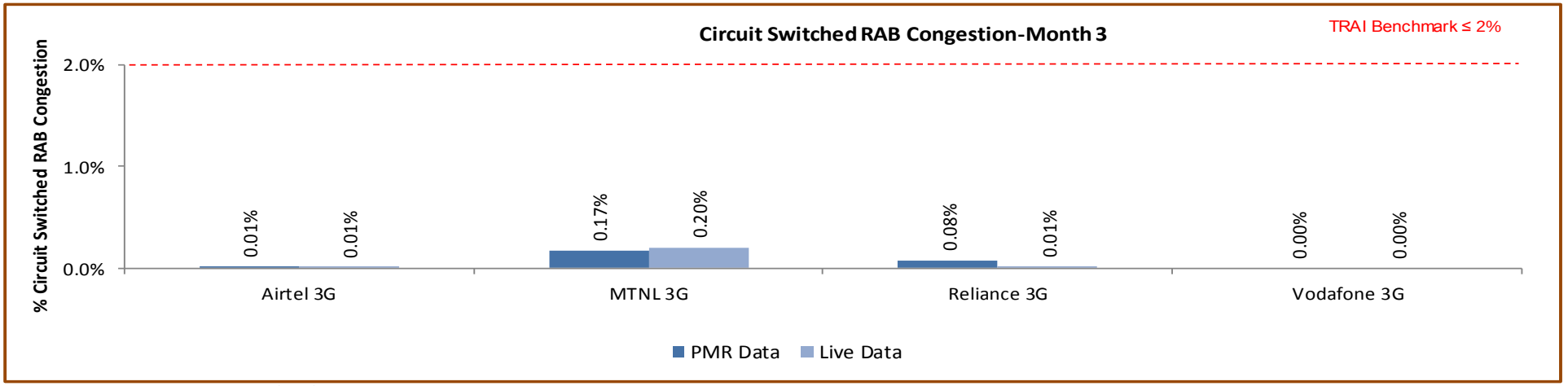
Data Source: Network Operations Center (NOC) of the operators

7.4.3.2 KEY FINDINGS – MONTH 2



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

7.4.3.3 KEY FINDINGS – MONTH 3



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

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

5. POI Congestion					
Audit Results for POI Congestion- PMR data					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		296	31	94	326
No. of POIs not meeting benchmark		0	0	0	4
Total Capacity of all POIs (A) - in erlangs		421294	45540	141214	892377
Traffic served for all POIs (B)- in erlangs		291888	20808	89574	449349
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		295	31	93	325
No. of POIs not meeting benchmark		0	0	0	3
Total Capacity of all POIs (A) - in erlangs		419458	45540	140519	890645
Traffic served for all POIs (B)- in erlangs		285947	11226	67813	333177
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.

7.4.4.1 KEY FINDINGS – MONTH 1

5. POI Congestion					
Audit Results for POI Congestion- PMR data-July					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		293	31	92	324
No. of POIs not meeting benchmark		0	0	0	1
Total Capacity of all POIs (A) - in erlangs		139613	15180	46700	295380
Traffic served for all POIs (B)- in erlangs		95930	6990	29273	144610
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**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		292	31	92	324
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		138750	15180	46699	295038
Traffic served for all POIs (B)- in erlangs		94009	3871	20042	88461
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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

7.4.4.2 KEY FINDINGS – MONTH 2

5. POI Congestion					
Audit Results for POI Congestion- PMR data-August					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		296	31	94	326
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		140548	15180	47282	296583
Traffic served for all POIs (B)- in erlangs		98692	6920	29991	150991
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**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		296	31	93	326
No. of POIs not meeting benchmark		0	0	0	1
Total Capacity of all POIs (A) - in erlangs		140534	15180	47116	296282
Traffic served for all POIs (B)- in erlangs		98222	3871	20217	87774
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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

7.4.4.3 KEY FINDINGS – MONTH 3

5. POI Congestion					
Audit Results for POI Congestion- PMR data-September					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		297	31	96	328
No. of POIs not meeting benchmark		0	0	0	3
Total Capacity of all POIs (A) - in erlangs		141134	15181	47232	300414
Traffic served for all POIs (B)- in erlangs		97265	6898	30310	153748
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**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		297	31	95	326
No. of POIs not meeting benchmark		0	0	0	2
Total Capacity of all POIs (A) - in erlangs		140174	15180	46704	299325
Traffic served for all POIs (B)- in erlangs		93716	3483	27554	156942
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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

7.5 CIRCUIT SWITCHED VOICE DROP RATE

7.5.1 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

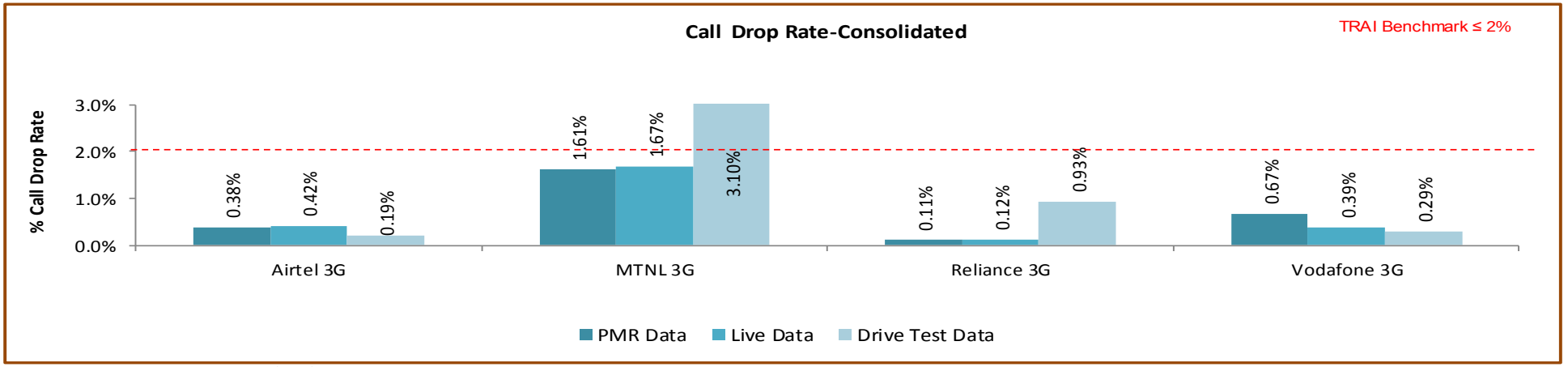
5. **TRAI Benchmark –**

   - 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.

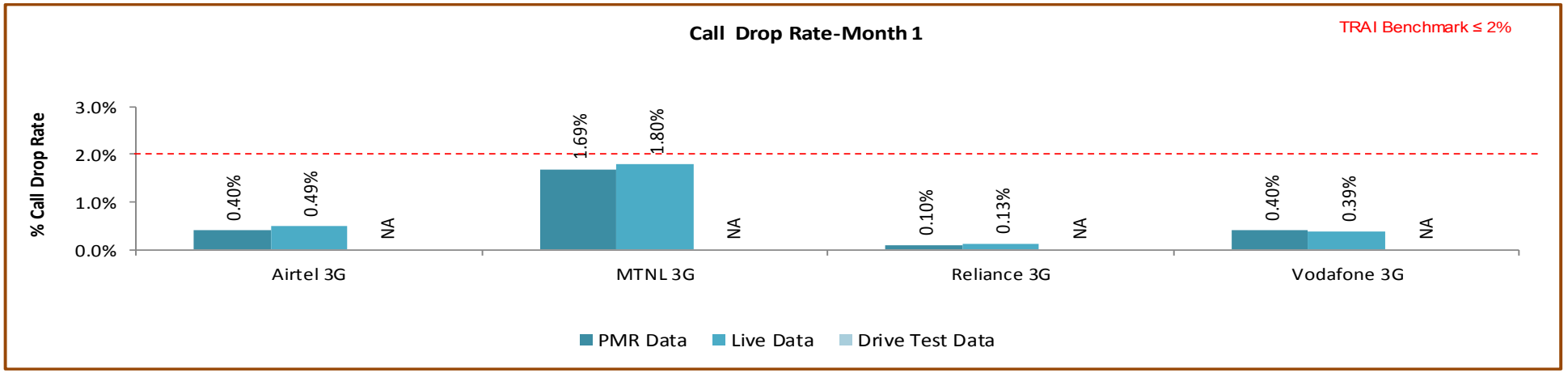
7.5.2 KEY FINDINGS - CONSOLIDATED



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

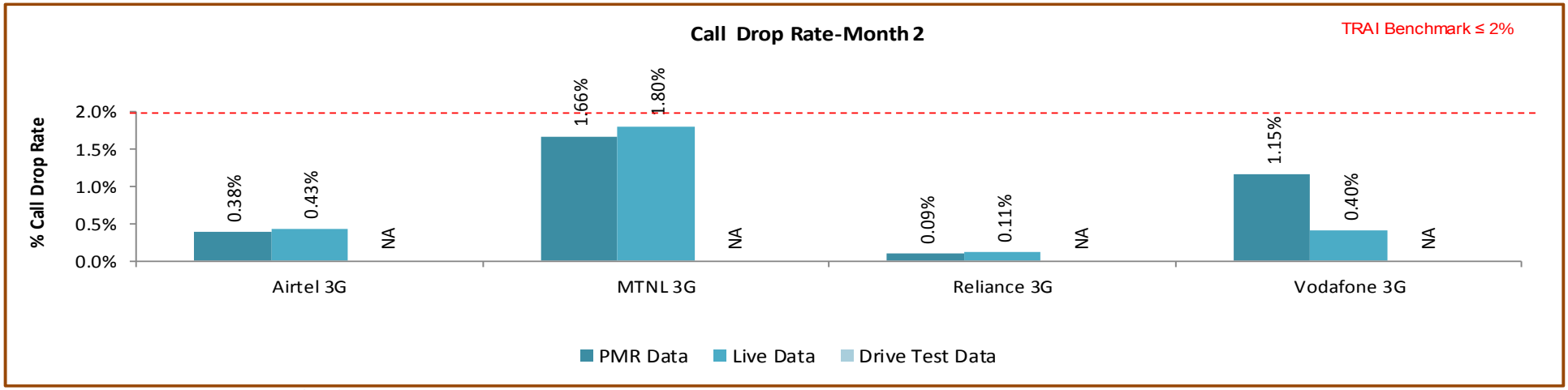
All operators met the benchmark as per PMR audit data. During drive test MTNL 3G failed to meet the TRAI benchmark for Drive Test.

7.5.2.1 KEY FINDINGS – MONTH 1



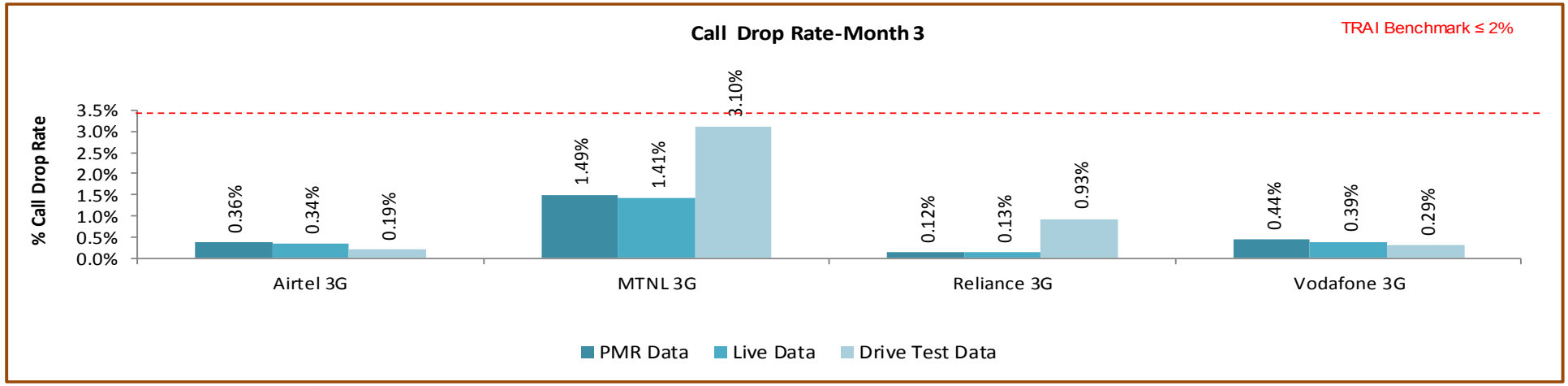
Data Source: Network Operations Center (NOC) of the operators

7.5.2.2 KEY FINDINGS – MONTH 2



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

7.5.2.3 KEY FINDINGS – MONTH 3



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

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

7.6.1 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** –

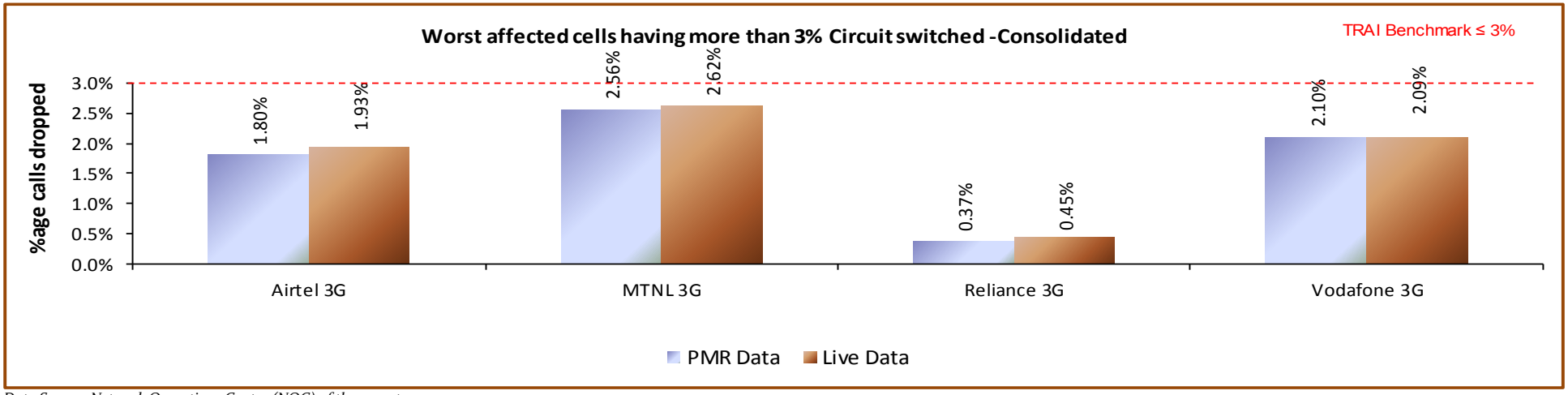
   - Worst affected cells having CSV drop rate > 3% during CBBH in a month ≤ 3%

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.

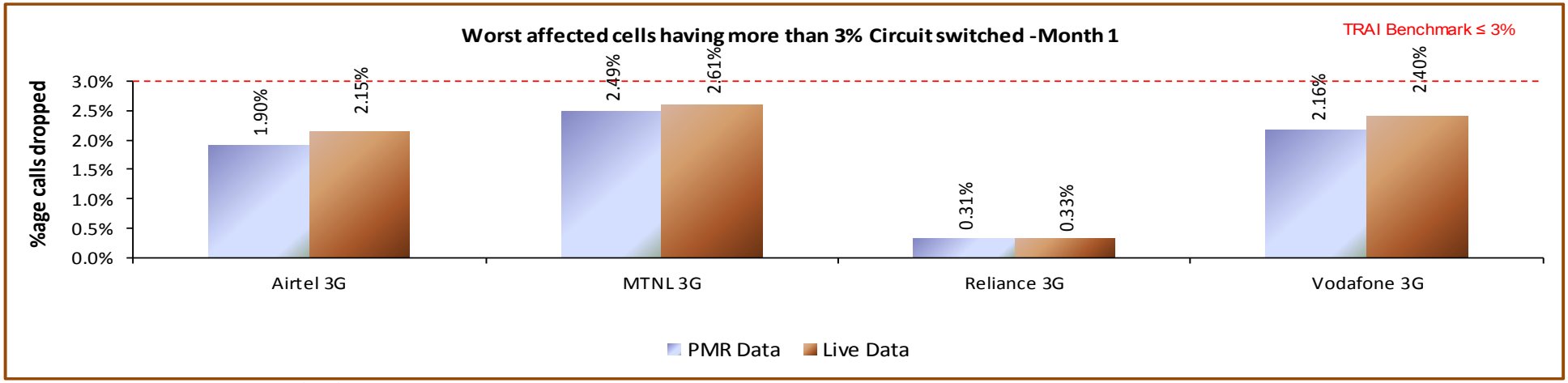
7.6.2 KEY FINDINGS - CONSOLIDATED



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

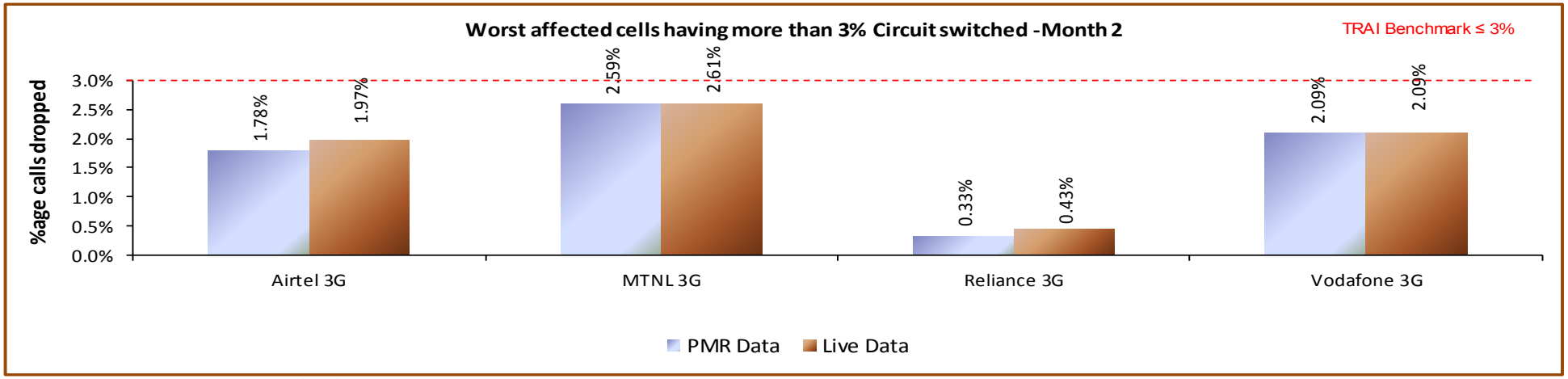
All operators met the benchmark as per PMR/audit Data.

7.6.2.1 KEY FINDINGS – MONTH 1



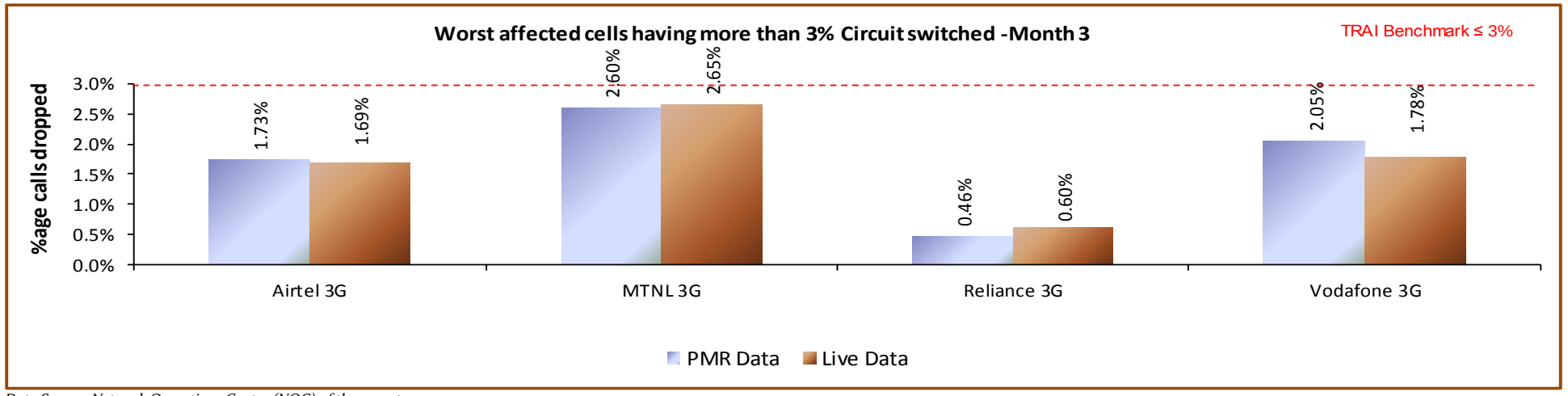
Data Source: Network Operations Center (NOC) of the operators

7.6.2.2 KEY FINDINGS – MONTH 2



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

7.6.2.3 KEY FINDINGS – MONTH 3



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

7.7 CIRCUIT SWITCH VOICE QUALITY

7.7.1 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**

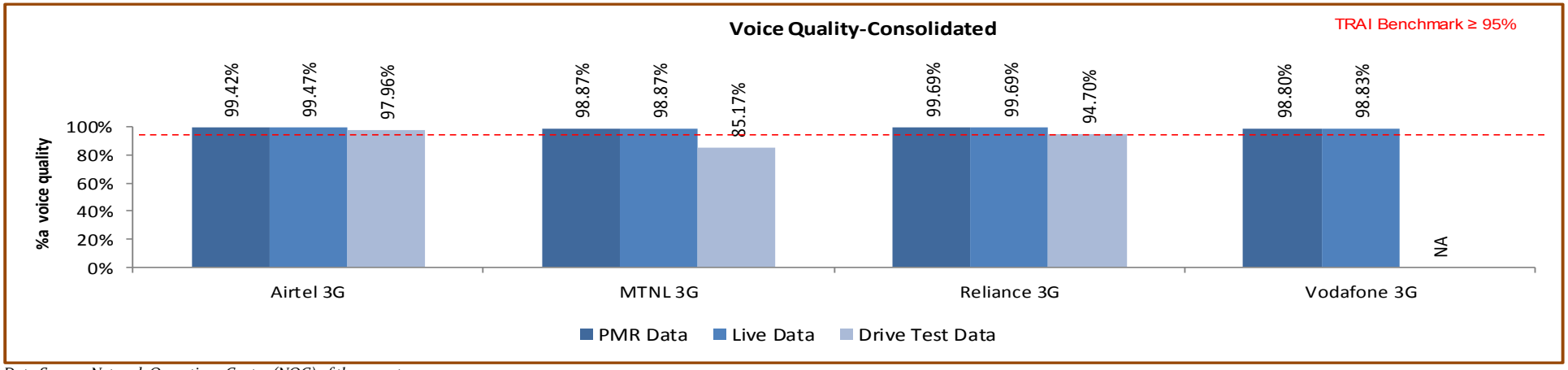
7. **TRAI Benchmark:** ≥ 95%

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.

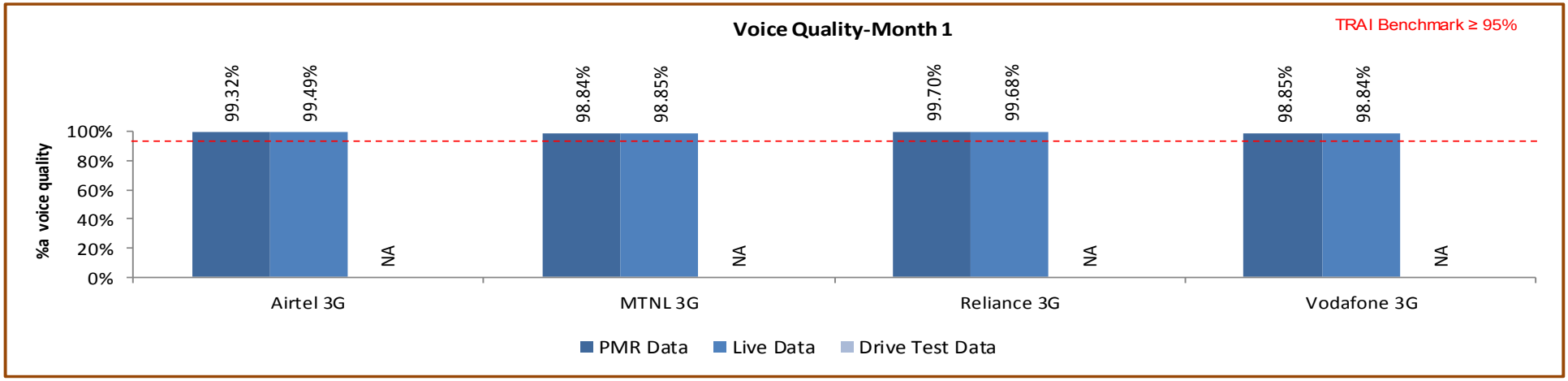
7.7.2 KEY FINDINGS



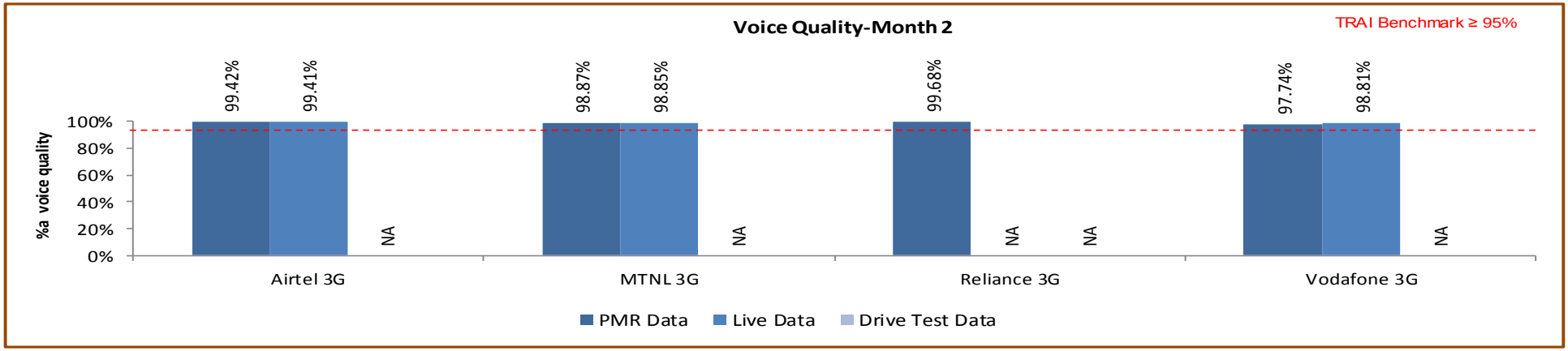
Data Source: Network Operations Center (NOC) of the operators

MTNL3G and Reliance3G failed to meet the benchmark for voice quality during drive test data.

7.7.2.1 KEY FINDINGS – MONTH 1

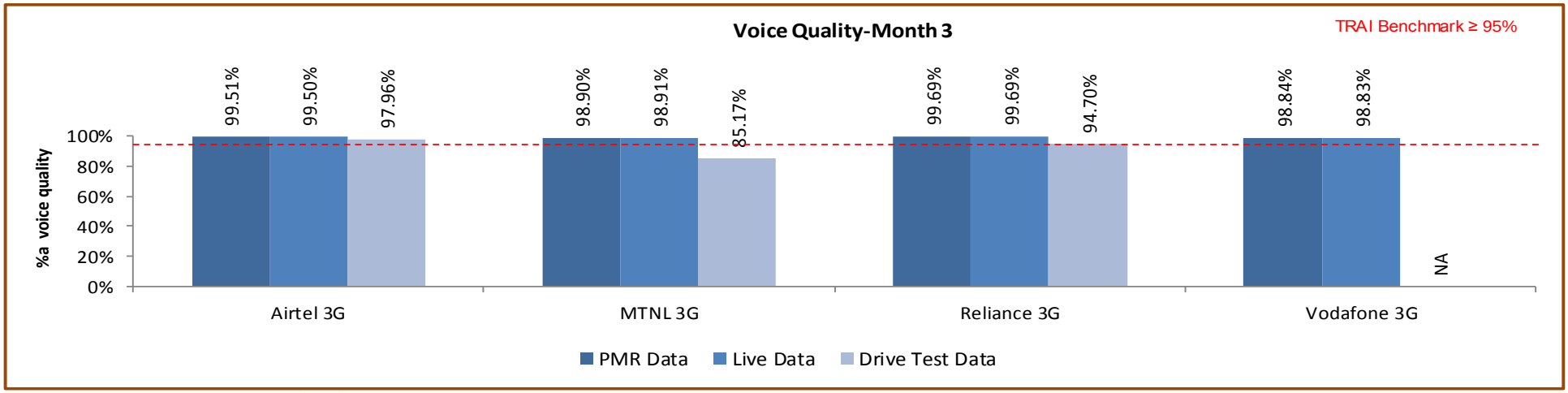


7.7.2.2 KEY FINDINGS – MONTH 2



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

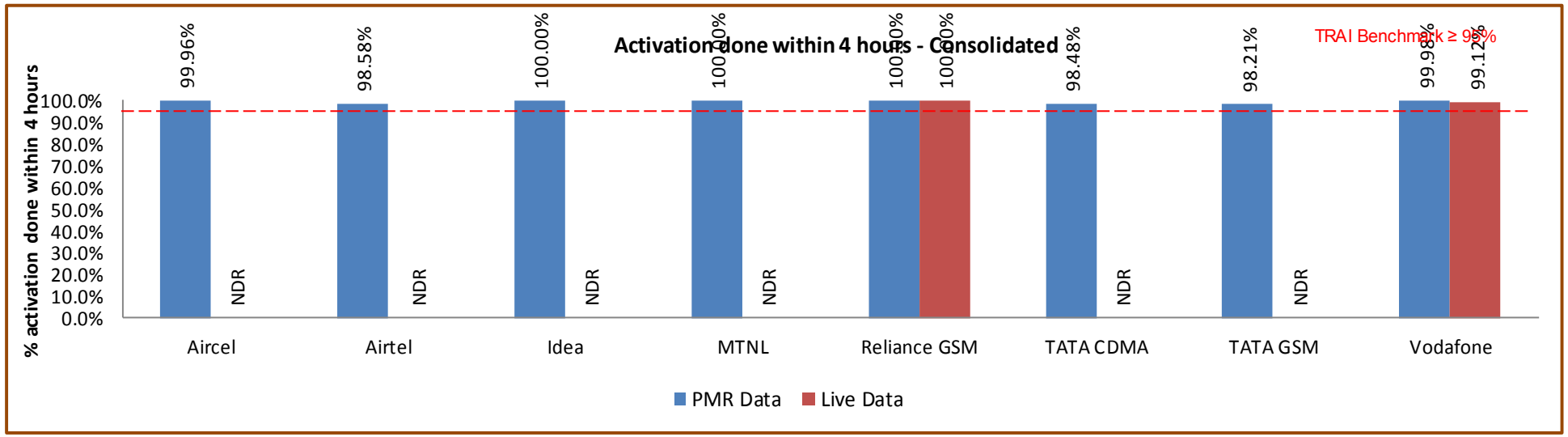
7.7.2.3 KEY FINDINGS – MONTH 3



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

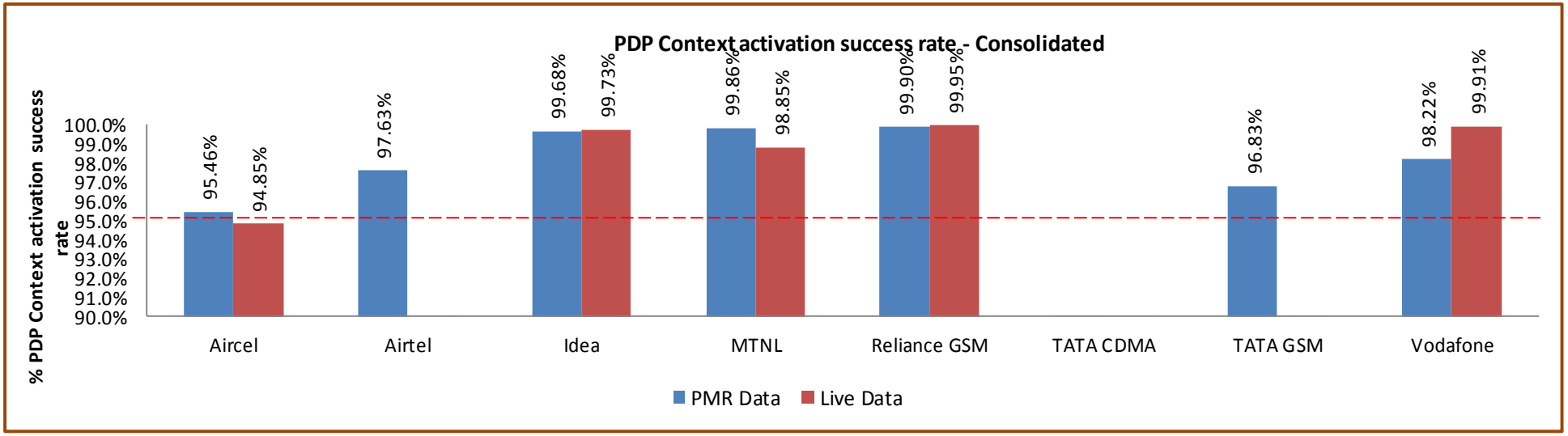
8 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES PMR AND LIVE (2G)

8.1 ACTIVATION DONE WITHIN 4 HOURS



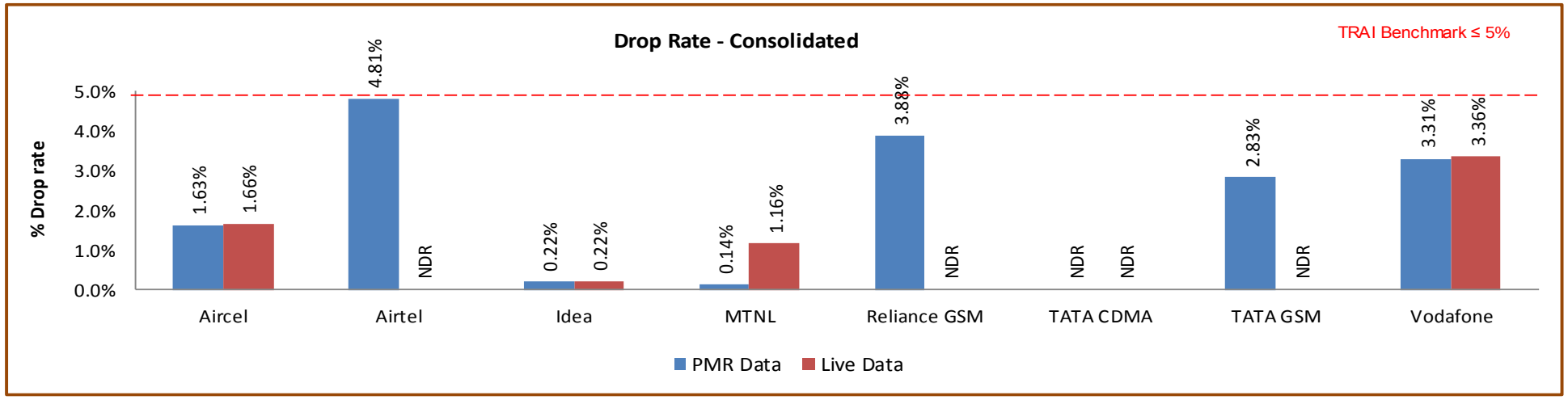
All operators met the benchmark for Activation done within 4 hours.

8.2 PDP CONTEXT ACTIVATION RATE



All operators met the benchmark for PDP context activation success rate except Airtel.

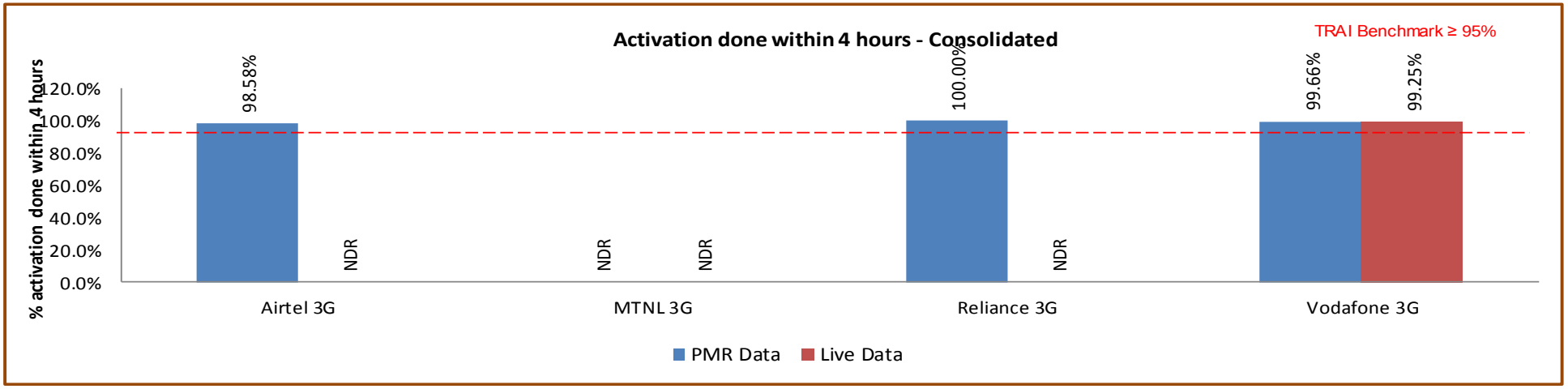
8.3 DROP RATE



All operators met the benchmark for Drop rate.

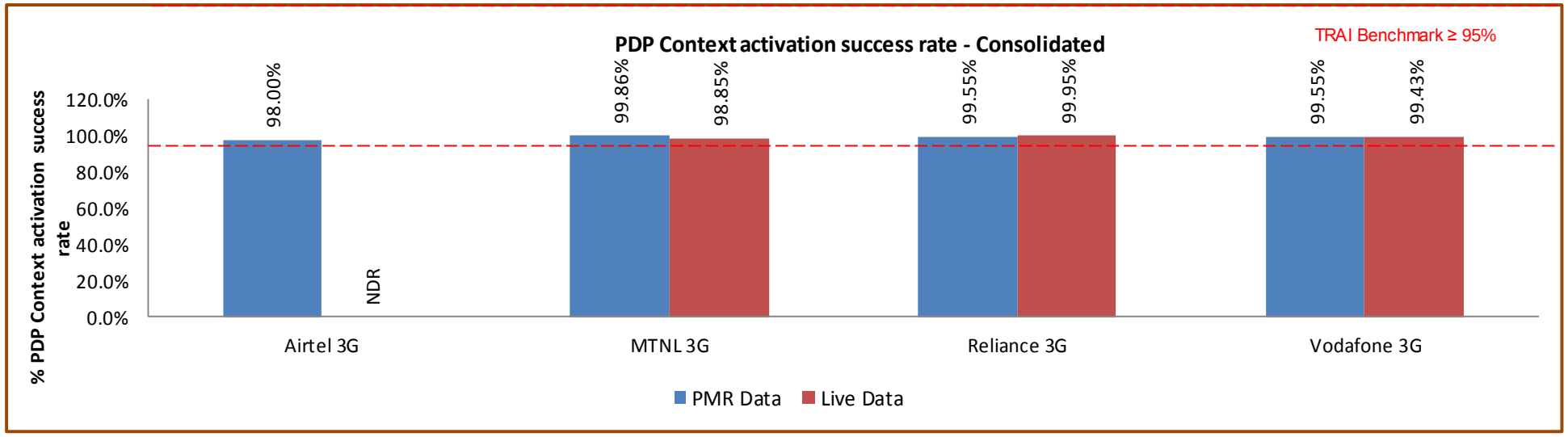
9 PARAMETER DESCRIPTION & DETAILED FINDINGS - WIRELESS DATA SERVICES PMR AND LIVE (3G)

9.1 ACTIVATION DONE WITHIN 4 HOURS



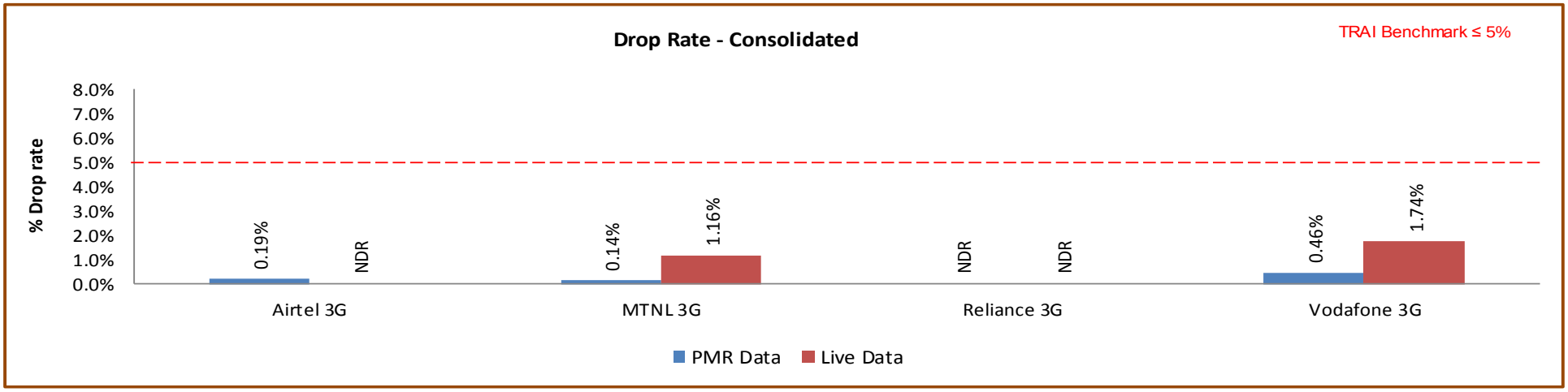
All operators met the benchmark for Activation done within 4 hours.

9.2 PDP CONTEXT ACTIVATION RATE



All operators met the benchmark for PDP context success rate.

9.3 DROP RATE



All operators met the benchmark for Drop rate

10 PARAMETER DESCRIPTION AND DETAILED FINDINGS – NON-NETWORK PARAMETERS

10.1 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.

10.1.1 PARAMETER DESCRIPTION

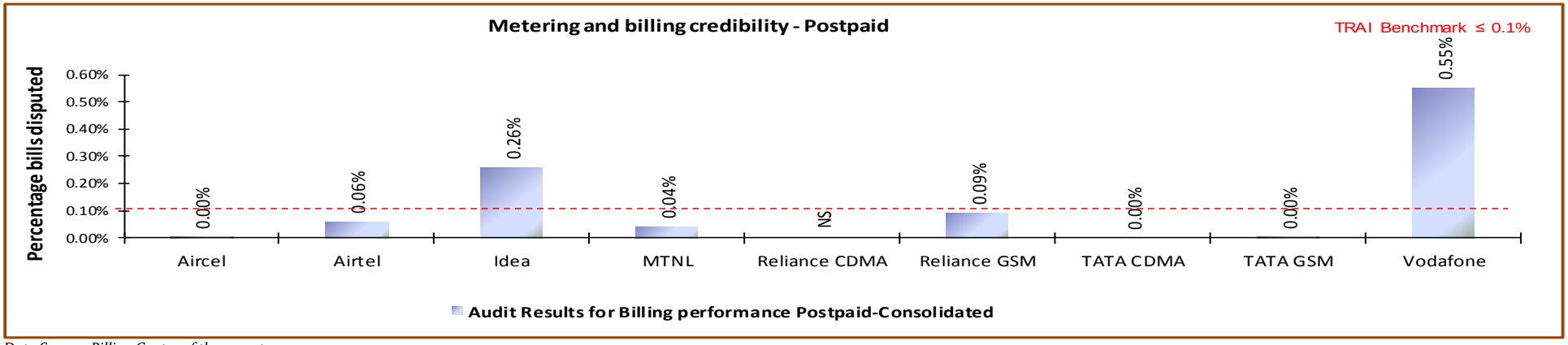
All the complaints related to billing/ charging as per clause 3.7.2 of QoS regulation of 20th December, 2009 were covered. The types of billing complaints covered are listed below.

- 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.

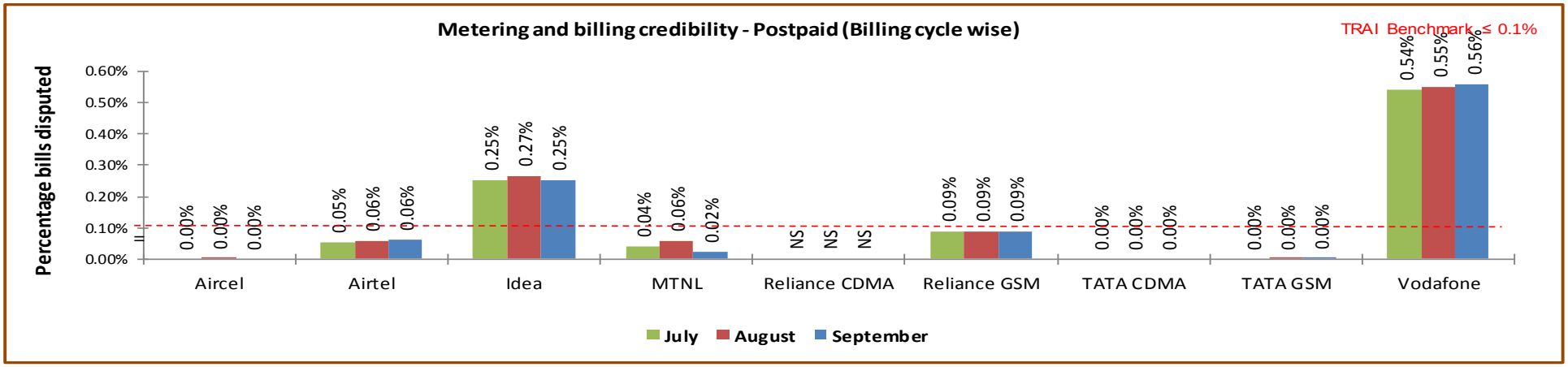
- Computational Methodology:
  - **Billing complaints per 100 bills issued (Postpaid)** = (Total billing complaints** received during the relevant billing cycle / Total bills generated* during the relevant billing cycle)*100
  - *Operator to include all types of bills generated for customers. This would 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

10.1.2 KEY FINDINGS – METERING AND BILLING CREDIBILITY (POSTPAID)



Data Source: Billing Center of the operators

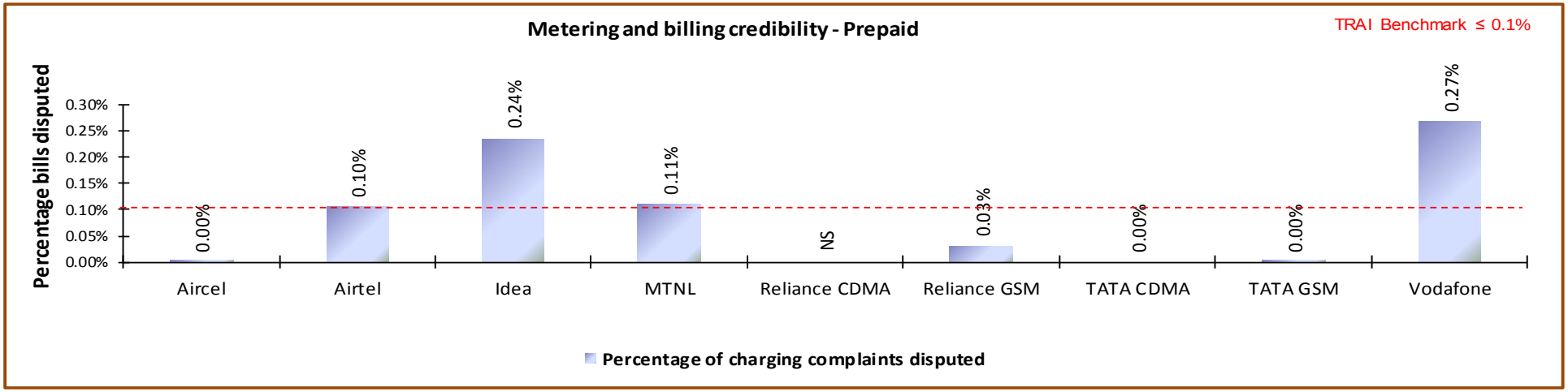
Idea and Vodafone failed to meet the benchmark of 0.1% post-paid metering and billing credibility.



Data Source: Billing Center of the operators

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

10.1.3 KEY FINDINGS - METERING AND BILLING CREDIBILITY (PREPAID)



Data Source: Billing Center of the operators

Idea, Vodafone failed to meet the benchmark for metering and billing credibility of prepaid subscribers.

10.2 RESOLUTION OF BILLING/ CHARGING COMPLAINTS

10.2.1 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.

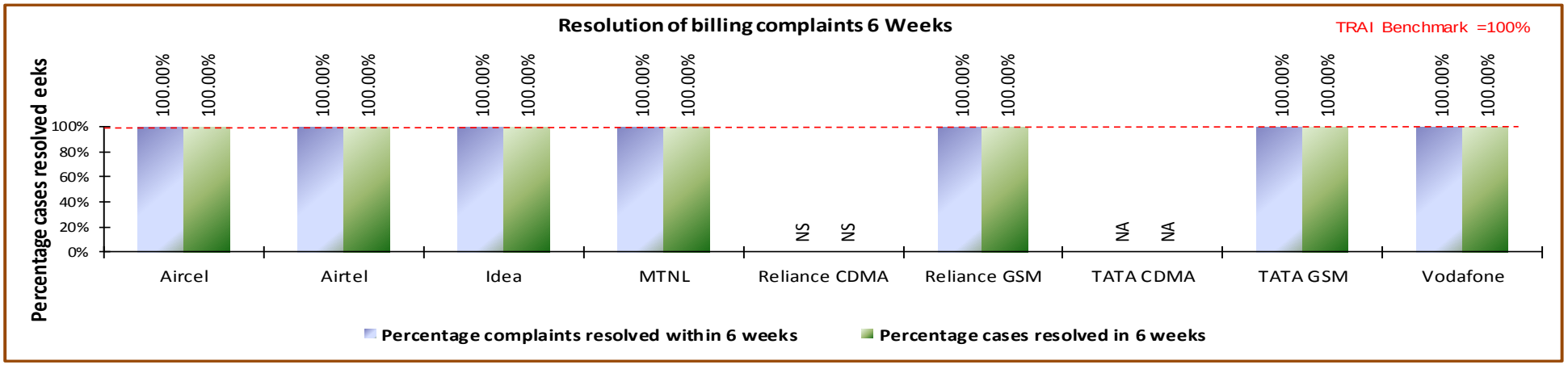
10.2.2 KEY FINDINGS - WITHIN 4 WEEKS

Name of Service Provider 3 Day September	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	Node Bs downtime (not available for service)	Worst affected Node Bs due to downtime	CSSR	RRC Congestion	Circuit Switched RAB Congestion	Call drop rate	Worst affected cells having more than 3% Circuit switched voice drop rate	%Circuit Switch Voice Quality (CSV quality)
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 3%	≥ 95%
Airtel 3G	0.04%	0.00%	98.99%	0.01%	0.01%	0.34%	1.69%	99.50%
MTNL 3G	0.63%	0.00%	99.18%	0.46%	0.20%	1.41%	2.65%	98.91%
Reliance 3G	0.17%	0.00%	99.94%	0.02%	0.01%	0.13%	0.60%	99.69%
Vodafone 3G	0.16%	0.00%	99.75%	0.00%	0.00%	0.39%	1.78%	98.83%

Data Source: Billing Center of the operator

All operators meet the benchmark for the parameter Resolution of billing complaints 4 weeks except MTNL.

10.2.3 KEY FINDINGS WITHIN 6 WEEKS



Data Source: Billing Center of the operators

All operators met the TRAI benchmark of resolution of billing complaints within 4 weeks except MTNL as per 3 days live calling, while as per PMR, Vodafone failed to meet the benchmark of resolution of billing complaints within 6 Weeks. However, as per live calling done to customers, the performance of all operators was observed to be much below the PMR data.

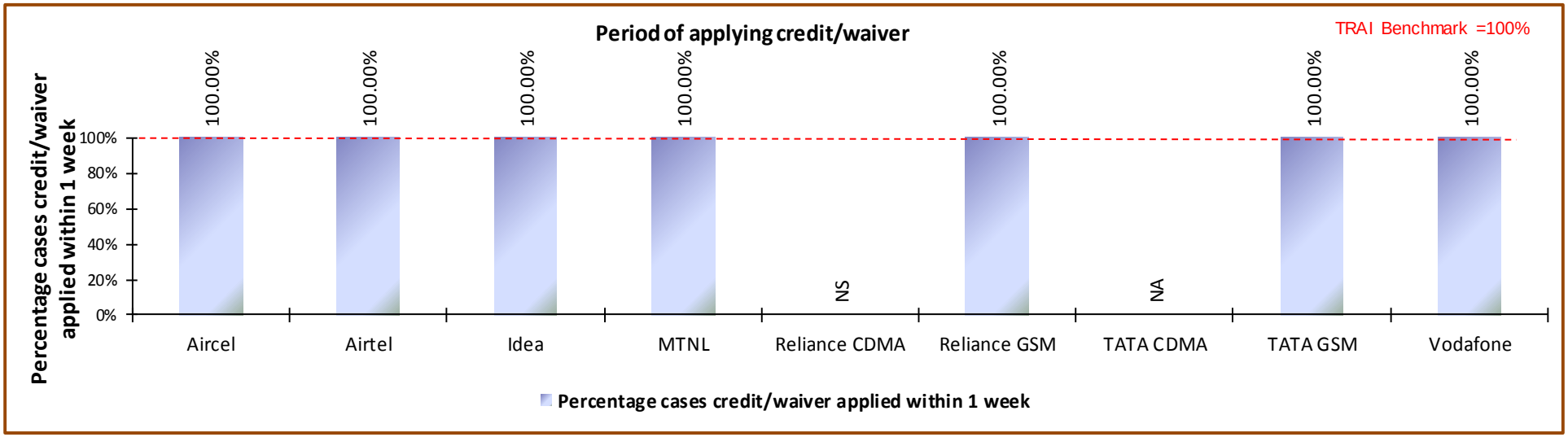
All operators met the TRAI benchmark for Live calling with 6 Weeks.

10.3 PERIOD OF APPLYING CREDIT/WAVIER

10.3.1 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

10.3.2 KEY FINDINGS



Data Source: Billing Center of the operators

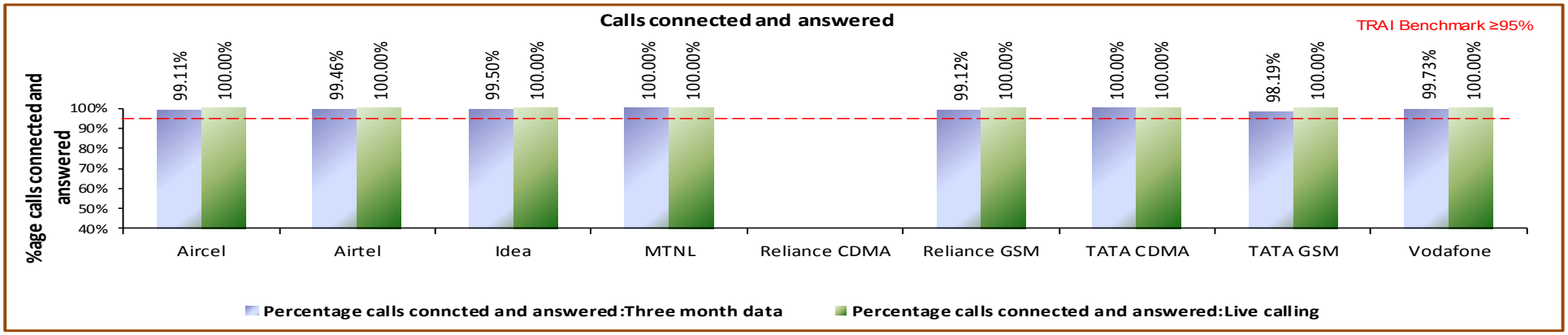
All operators met the benchmark for this parameter.

10.4 CALL CENTRE PERFORMANCE-IVR

10.4.1 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

10.4.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

As per PMR data, all operators met the benchmark

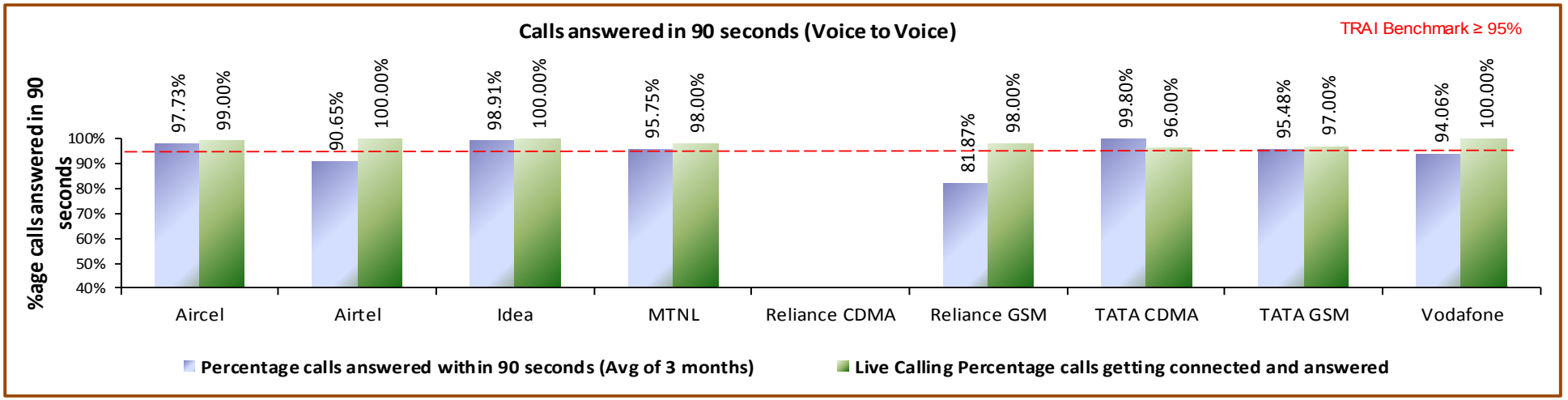
10.5 CALL CENTRE PERFORMANCE-VOICE TO VOICE

10.5.1 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

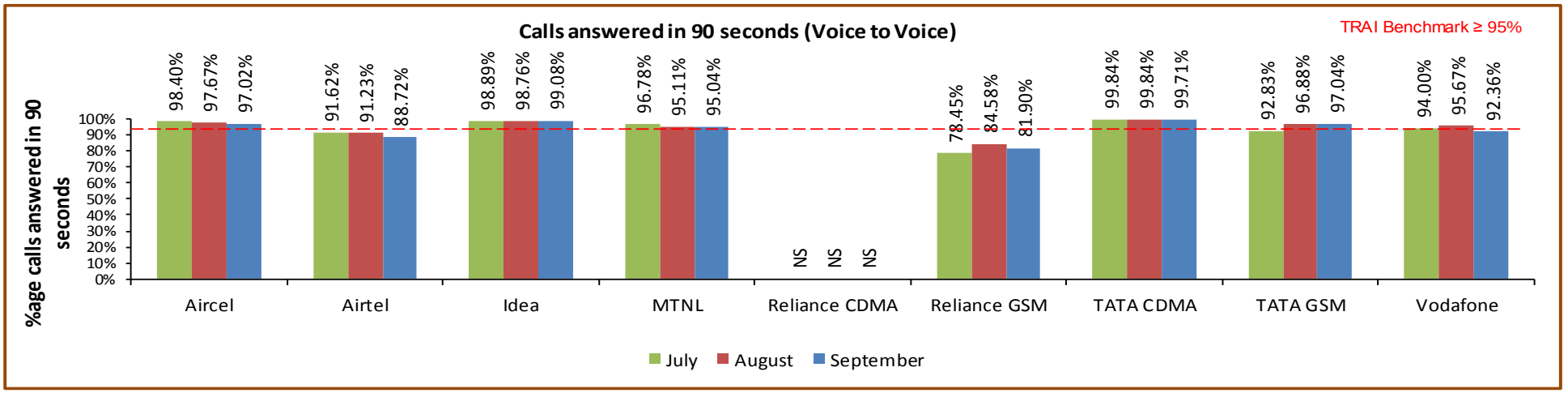
Benchmark: 95% calls to be answered within 90 seconds

10.5.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

Airtel, Reliance GSM and Vodafone failed to meet the benchmark as per PMR audit.



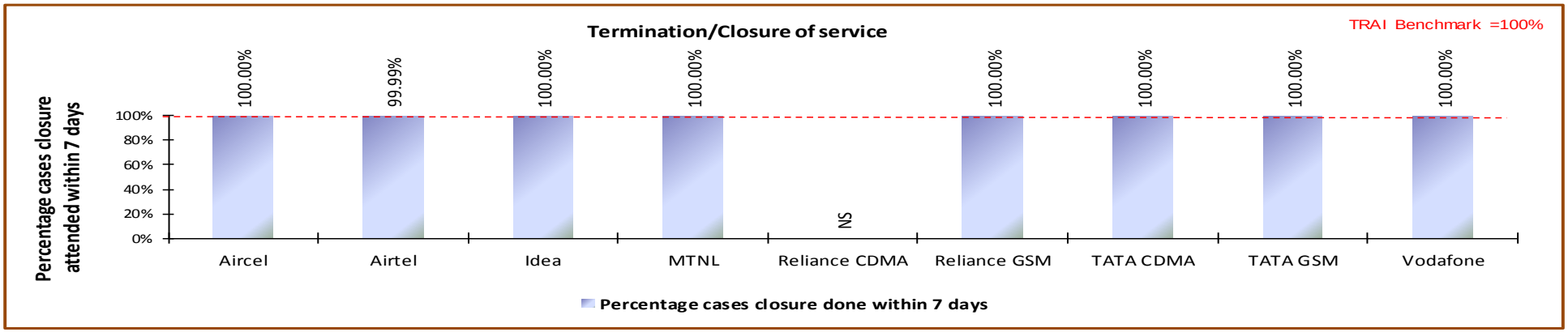
Airtel, Reliance failed to meet the benchmark. TATA GSM failed to meet the benchmark for July and Vodafone failed to meet the benchmark for September.

10.6 TERMINATION/CLOSURE OF SERVICE

10.6.1 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

10.6.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

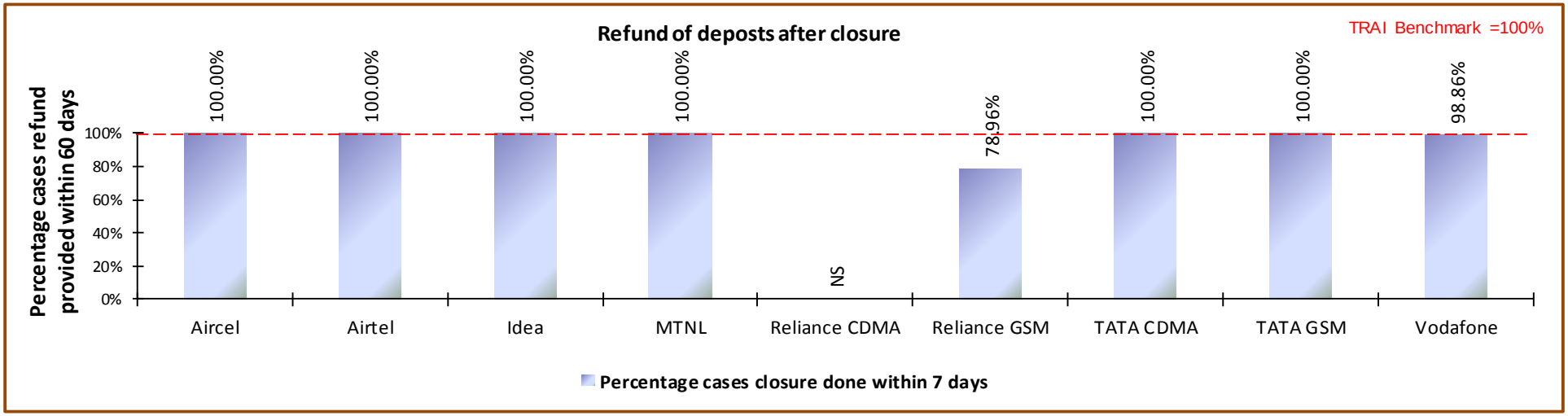
Airtel failed to meet the TRAI benchmark for the parameter.

10.7 REFUND OF DEPOSITS AFTER CLOSURE

10.7.1 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

10.7.2 KEY FINDINGS



Data Source: Customer Service Center of the operators

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

11 DETAILED FINDINGS - DRIVE TEST DATA

11.1 OPERATOR ASSISTED DRIVE TEST - VOICE

The drive test was conducted simultaneously for all the operators present in the Mumbai 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 Mumbai circle are given below.

11.1.1 Mumbai SSA

Month	Name of SSA Covered	Start date	End Date	Kilometer Travelled
September	Mumbai	22/09/16	28/09/16	512

11.1.1.1 Route Details - Mumbai SSA

Category	Type of location	September					
		Mumbai					
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
Outdoor	Major Roads	Link Road,Malad, Boriwali,Mira Bhayander,Uttan,Gorai	Eastern Express Highway, JVLR, Ghodbunder Road, Kalyan, Titwala	Lokhandwala ,Andheri,SCLR,Mankhurd, Vashi,Kharghar,Mumbra , Airoli,LBS, Ghatkoper	Link Road,Dadar, Mahim, Marine Drive,CST, Navy Nagar, J J Flyover	Eastern Express Highway,LBS Road,Dr. Ambedkar Road,Dr. Rajendra Prasad Road.	S V Road, Worli Sea Link, Walkeshver, Dadar, Western Express Highway, International Airport.
Outdoor	Highways						
Outdoor	With in the City						
Indoor	Shopping complex						
Indoor	Office complex						

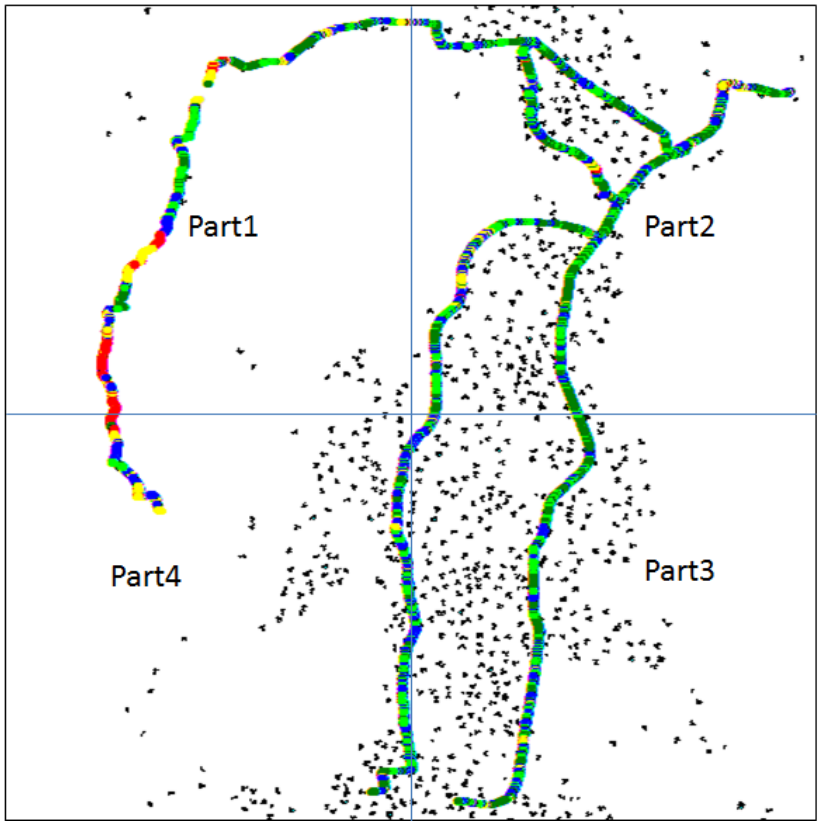
The route maps given in the report are provided for the purpose of identifying the routes traversed during the drive tests. We observe three different colours (Red/Green/Yellow) of the lines, which signify signal strength; however these maps are for a single operator and have not been referred to any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

11.1.1.1 Route Map - Mumbai DAY 1

Rx Level Plot –Day-1

Date of Drive Test- 22/09/2016

Name of the SDCAs covered –Link Road,Malad,Boriwali,Mira Bhayander,Uttan,Gorai.



Route Covered- day 1

1 Link Road

2 Western Express Highway

3 Uttan Road

4 Mira Road

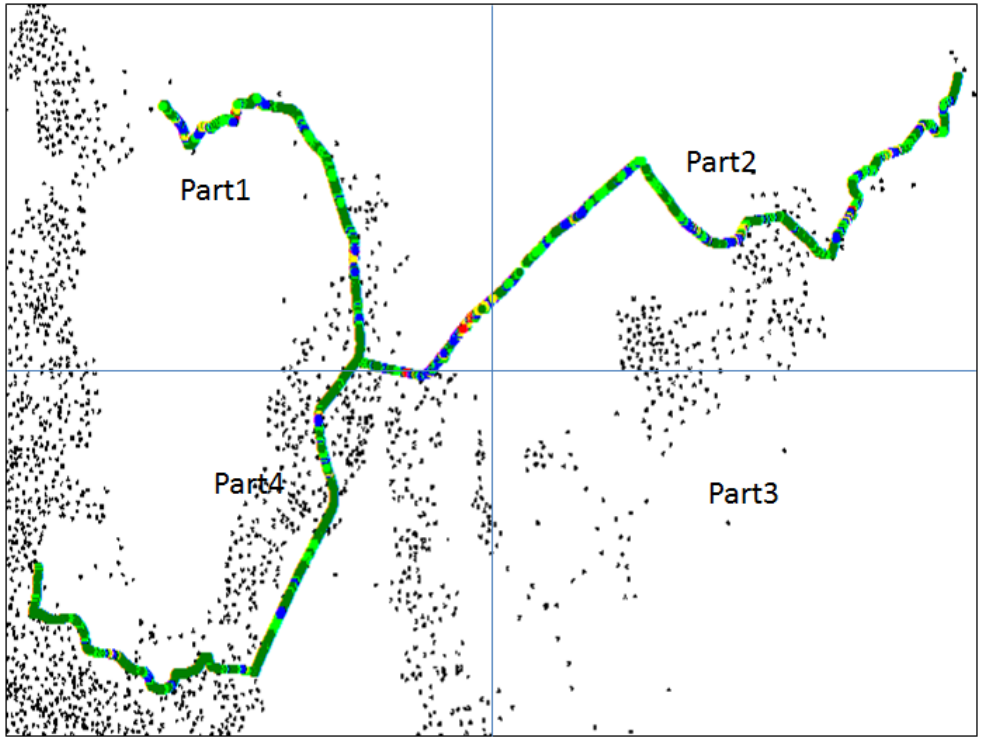
-65 to 0
-75 to -65
-85 to -75
-95 to -85
-120 to -95

11.1.1.2 Route Map - Mumbai DAY 2

Rx Level Plot –Day-2

Date of Drive Test- 23/09/2016

Name of the SDCAs covered – Eastern Express highway, JVLR,Ghodbunder Kalyan,Titwala.



Route Covered- day 3

1 Eastern Express highway

2 JVLR

3 Ghodbunder road

4 kalyan fata

5 titwala road

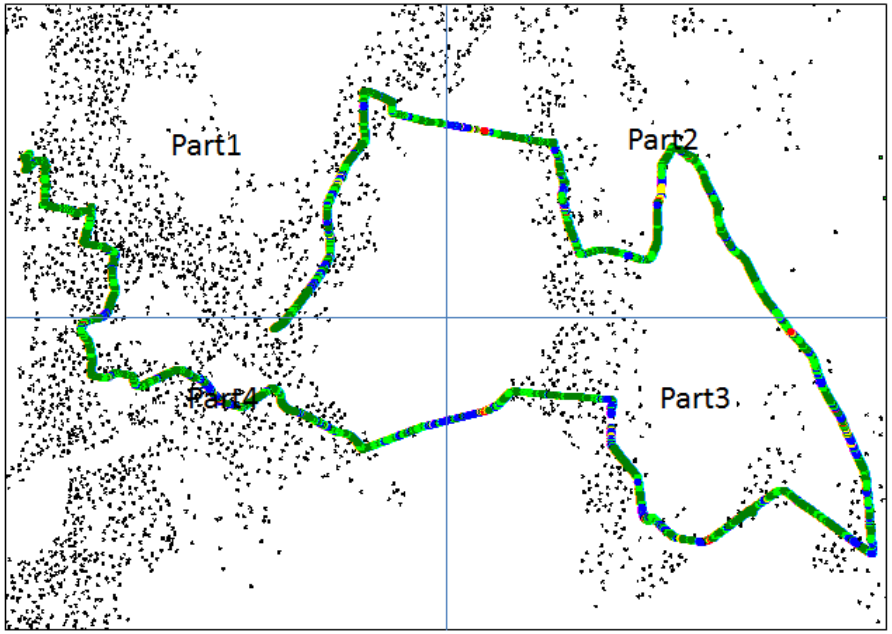
-65 to 0
-75 to -65
-85 to -75
-95 to -85
-120 to -95

11.1.1.3 Route Map - Mumbai DAY 3

Rx Level Plot –Day-3

Date of Drive Test- 24/05/2016

Name of the SDCAs covered –lokhandwala,andheri,SCLR,Mankhurd,vashi,kharghar,mumbra,airoli,LBS,ghatkoper.



Route Covered- day 6

1 S V Road

2 Western Express Highway

3 Mankhurd Road

4 Panvel Highway

5 Mumbra road

6 Thane Belapur Road

7 LBS road

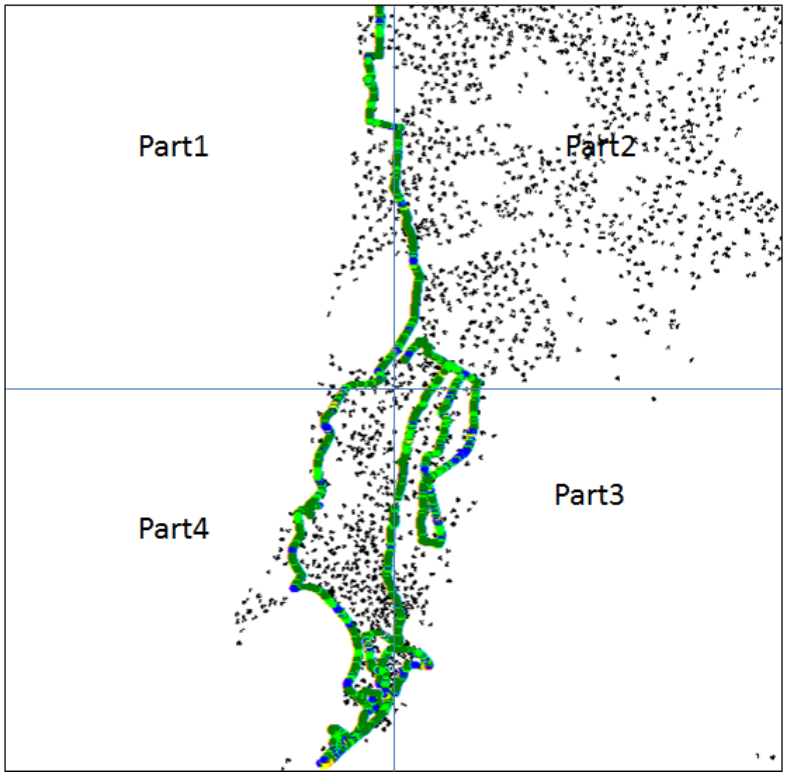
-65 to 0
-75 to -65
-85 to -75
-95 to -85
-120 to -95

11.1.1.4 Route Map - Mumbai DAY 4

Rx Level Plot –Day4

Date of Drive Test- 26/05/2016

Name of the SDCAs covered – link road,dadar,mahim,marin drive,cst,navi nagar,j j flyover.



Route Covered- day 5

1.Link road

2.Senapati bapat road

3.Marin drive road

4 J J flyover road

5 Pedder Road

6 4 Rasta Road

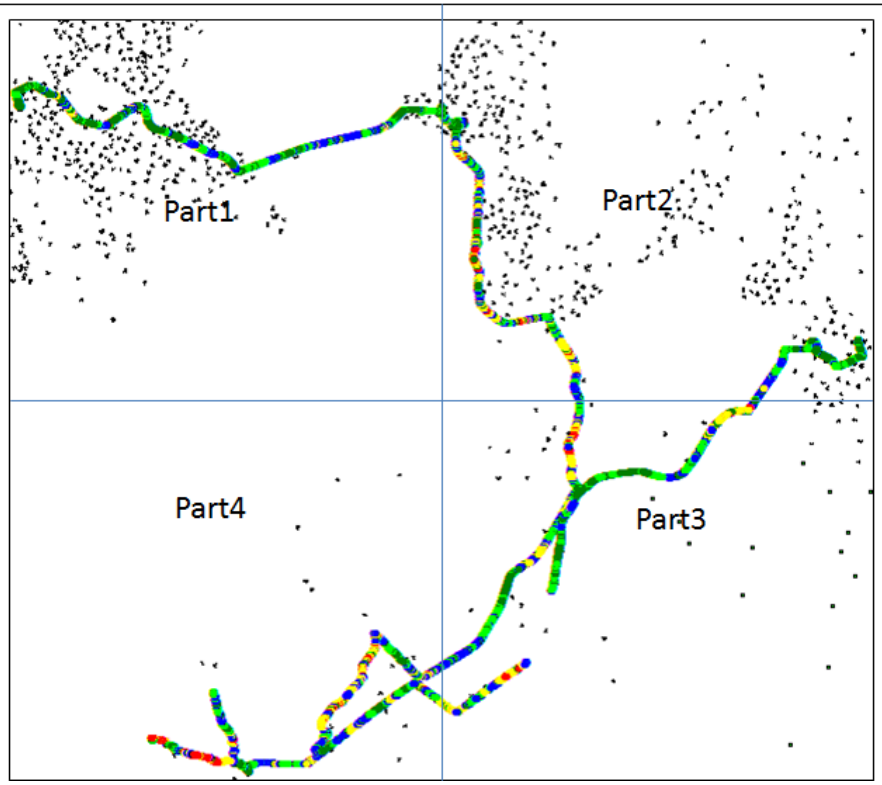
-65 to 0
-75 to -65
-85 to -75
-95 to -85
-120 to -95

11.1.1.5 Route Map - Mumbai DAY 5

Rx Level Plot –Day-5

Date of Drive Test- 27/05/2016

Name of the SDCAs covered – Eastern Express highway,mulund airoli road, vashi road,thane belapur road,sion panvel express hihway, goregoan mulund link road,panvel



Route Covered- day 6

1.eastern express highway

2.Thane belapur road

3.Washi road

4.Sion panvel road

5.Mulund airoli road

6.Uran road

7.Panvel road

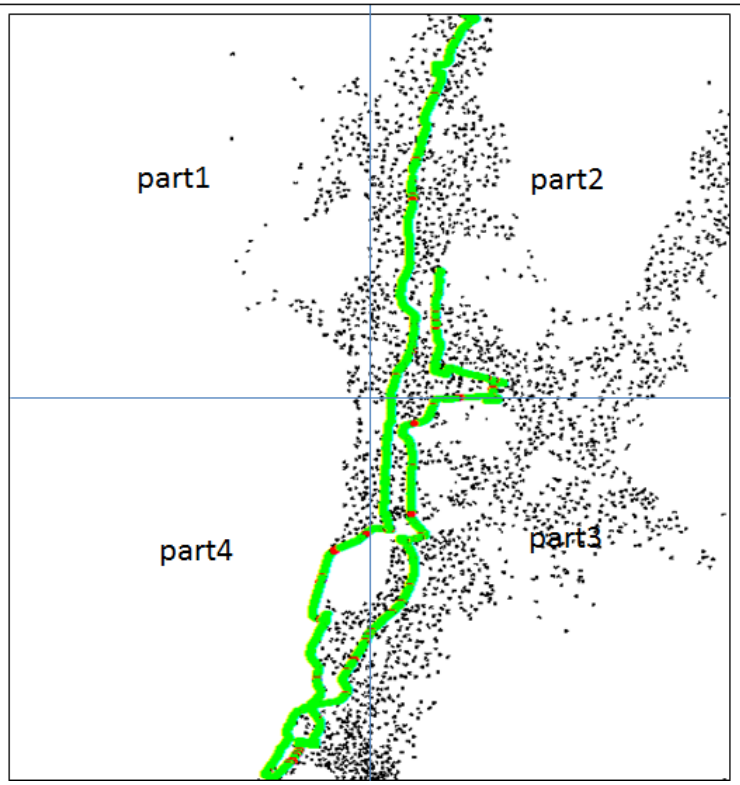
-65 to 0
-75 to -65
-85 to -75
-95 to -85
-120 to -95

11.1.1.6 ROUTE MAP - MUMBAI DAY 6

Rx Quality Plot –Day-6

Date of Drive Test- 28/05/2016

Name of the SDCAs covered –s v road,worli sea link,walkeshver,dadar,western express hwy,international airport.



Route Covered- day 4

1 s v road

2 sea link

3 pedder road

4 walkeshver road

5 senapati bapat road

6 western express hwy

7 airport road

7
6
0 to 5

11.1.1.7 Drive Test Results - Mumbai SSA-2G

September																			
Mumbai	B'mark	Aircel		Airtel		Idea		MTNL		RCOM CDMA		RCOM GSM		TATA CDMA		TATA GSM		Vodafone	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		58.55%	45.48%	88.33%	80.15%	83.72%	62.22%	31.50%	28.75%			100.00%	67.45%	67.92%	52.49%	100.00%	76.79%	83.92%	71.56%
0 to -85 dBm		96.60%	83.05%	98.14%	95.32%	99.76%	91.59%	87.78%	71.76%			100.00%	88.05%	96.66%	85.36%	100.00%	94.90%	99.07%	93.54%
0 to -95 dBm		99.63%	95.59%	100.00%	100.00%	99.99%	98.96%	99.07%	96.06%			100.00%	97.10%	99.94%	97.43%	0.00%	99.30%	100.00%	99.17%
Voice quality	≥ 95%	97.62%	92.54%	98.40%	95.86%	98.72%	94.89%	92.97%	85.91%			100.00%	92.36%	98.22%	96.48%	99.01%	96.57%	97.58%	92.03%
CSSR	≥ 95%	100.00%	97.41%	100.00%	98.84%	100.00%	98.80%	100.00%	96.59%	NS		100.00%	98.18%	100.00%	99.52%	100.00%	99.50%	100.00%	99.40%
%age Blocked calls		0.00%	1.77%	0.00%	1.16%	0.00%	0.96%	0.00%	2.64%			0.00%	1.82%	0.00%	0.48%	0.00%	0.38%	0.00%	0.60%
Call drop rate	≤ 2%	0.00%	1.70%	0.00%	0.59%	0.00%	1.94%	0.00%	3.00%			0.00%	4.32%	0.00%	0.57%	0.00%	1.07%	0.00%	0.96%
Hands off success rate		100.00%	97.36%	97.37%	97.74%	100.00%	97.60%	100.00%	96.94%			100.00%	97.81%	100.00%	99.99%	100.00%	97.10%	100.00%	98.81%

Data Source: Drive test reports submitted by operators to auditors

Voice Quality

Aircel, Idea, MTNL and Reliance GSM and Vodafone failed to meet the benchmark for voice quality in outdoor locations. While MTNL failed to meet the benchmark for voice quality in indoor locations.

Call Set Success Rate (CSSR)

All operators met the benchmarks of CSSR.

Call Drop Rate

All operators met the benchmark of call drop rate except MTNL and Reliance GSM for Outdoor Locations.

11.1.1.1 Drive Test Results - Mumbai SSA-3G

September									
Mumbai	B'mark	Airtel 3G		MTNL 3G		Reliance 3G		Vodafone 3G	
Parameter's		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
0 to -75 dBm		99.15%	87.16%	60.47%	24.21%	100.00%	67.52%	82.43%	53.83%
0 to -85 dBm		99.58%	97.25%	98.78%	55.01%	100.00%	86.23%	99.00%	75.48%
0 to -95 dBm		100.00%	100.00%	99.80%	94.70%	100.00%	94.66%	99.97%	90.76%
Voice quality	≥ 95%	99.69%	97.77%	97.89%	81.77%	100.00%	94.61%	NA	NA
CSSR	≥ 95%	100.00%	99.24%	100.84%	94.31%	100.00%	97.75%	99.58%	100.00%
%age Blocked calls		0.00%	0.76%	0.83%	2.47%	0.00%	2.25%	0.00%	0.73%
Call drop rate	≤ 2%	0.00%	0.19%	0.00%	3.10%	0.00%	1.15%	0.00%	0.37%
Hands off success rate		100.00%	98.59%	99.47%	94.12%	100.00%	100.00%	NA	NA

Voice Quality

MTNL 3G and Reliance 3G failed to meet the benchmark for Voice quality in outdoor locations.

Call Set Success Rate (CSSR)

All operators met the benchmark for CSSR except MTNL 3G for outdoor locations..

Call Drop Rate

MTNL 3G met the benchmark for call drop rate in outdoor locations.

11.1.1.1 Data Drive Test Results - Mumbai SSA-2G

Name of the Parameter	Bench Mark	Aircel	Airtel	Idea	MTNL	RCOM CDMA	RCOM GSM	TATA CDMA	TATA GSM	Vodafone
Succesful Data Transmission download speed attempts	>80%	100	100	100	100	100	100	100	100	99
Succesful Data Transmission upload speed attempts	>75%	100	100	100	100	100	100	100	100	100
Minimum download speed		91	125	123	23	256	256	84	85	168
Average throughput for Packet Data		139	165	164	70	451	451	99	121	190
Latency	<250ms	100	100	100	100	100	100	100	100	100

All operators met the TRAI benchmark for data drive test.

11.1.1.2 Data Drive Test Results - Mumbai SSA-3G

Name of the Parameter	Bench Mark	Airtel 3G	MTNL 3G	Vodafone 3G
Succesful Data Transmission download speed attempts	>80%	100	100	100
Succesful Data Transmission upload speed attempts	>75%	100	100	100
Minimum download speed		2782	96	4802
Average throughput for Packet Data		5904	493	7057
Latency	<250ms	NDR	100	100

All operators met the TRAI benchmark for data drive test.

12 ANNEXURE – CONSOLIDATED-2G

12.1 NETWORK AVAILABILITY

1. Network Availability										
Audit Results for Network Availability- PMR data										
	Benchmark	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Number of BTSs in the licensed service area		5917	12731	11316	2950	NS	6571	2793	8806	15024
Sum of downtime of BTSs in a month (in hours)		4793	5380	7126	16472	NS	2305	1412	7039	18215
BTSs accumulated downtime (not available for service)	≤ 2%	0.11%	0.06%	0.08%	0.75%	NS	0.05%	0.07%	0.11%	0.16%
Number of BTSs having accumulated downtime >24 hours		27	0	11	34	NS	29	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.46%	0.00%	0.10%	1.15%	NS	0.44%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data										
	Benchmark	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Number of BTSs in the licensed service area		5903	12636	11316	2949	NS	6545	2793	8806	15024
Sum of downtime of BTSs in a month (in hours)		582	486	660	1225	NS	299	197	1328	1917
BTSs accumulated downtime (not available for service)	≤ 2%	0.14%	0.05%	0.08%	0.58%	NS	0.06%	0.10%	0.21%	0.18%
Number of BTSs having accumulated downtime >24 hours		1	0	0	0	NS	5	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.02%	0.00%	0.00%	0.00%	NS	0.08%	0.00%	0.00%	0.00%

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

12.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

2. Connection Establishment (Accessibility)										
Audit Results for CSSR, SDCCH and TCH congestion- PMR data										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.65%	99.58%	99.17%	97.89%	NS	99.60%	99.22%	99.28%	99.27%
SDCCH/Paging channel congestion	≤ 1%	0.23%	0.03%	0.15%	0.36%	NS	0.13%	NA	0.03%	0.08%
TCH congestion	≤ 2%	0.62%	0.05%	0.49%	0.14%	NS	0.32%	0.02%	0.04%	0.73%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.48%	99.89%	99.13%	97.77%	NS	99.61%	99.27%	99.35%	99.24%
SDCCH/Paging channel congestion	≤ 1%	0.26%	0.04%	0.14%	0.47%	NS	0.15%	NA	0.01%	0.06%
TCH congestion	≤ 2%	0.62%	0.34%	0.52%	0.15%	NS	0.24%	0.00%	0.00%	0.76%
Drive test results for CSSR (Average of three month drive tests) and blocked calls- Drive Test Data										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts		1088	1031	1074	1060	NS	1007	1046	1053	1072
Total number of successful calls established		1066	1019	1064	1032	NS	992	1041	1049	1067
CSSR	≥ 95%	97.98%	98.84%	99.07%	97.36%	NS	98.51%	99.52%	99.62%	99.53%
%age blocked calls		2.02%	1.16%	0.93%	2.64%	NS	1.49%	0.48%	0.38%	0.47%

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

12.3 CONNECTION MAINTENANCE (RETAINABILITY)

3. Connection Maintenance (Retainability)										
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		165631655	319627296	12303518	110822335	NS	7323810978	NA	NA	474234031
Total number of calls dropped		1722481	2549374	124049	1765529	NS	296462	NA	NA	5330288
Call drop rate	≤ 2%	1.04%	0.80%	1.01%	1.59%	NS	0.00%	0.44%	0.46%	1.12%
Total number of cells in the network		17642	35837	32281	7932	NS	19728	7690	25005	38623
Total number of cells having more than 3% TCH		981	617	518	171	NS	98	130	481	1452
Worst affected cells having more than 3% TCH	≤ 3%	5.56%	1.72%	1.60%	2.15%	NS	0.50%	1.69%	1.92%	3.76%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		16623046	31215550	12367240	10541137	NS	689990740	NA	NA	49149267
Total number of calls dropped		180437	264429	124850	161061	NS	27295	NA	NA	566791
Call drop rate	≤ 2%	1.09%	0.85%	1.01%	1.53%	NS	0.00%	0.45%	0.49%	1.15%
Total number of cells in the network		17579	35532	32274	7923	NS	19156	7690	25005	38537
Total number of cells having more than 3% TCH		1043	604	509	174	NS	82	133	487	1543
Worst affected cells having more than 3% TCH	≤ 3%	5.94%	1.70%	1.58%	2.19%	NS	0.43%	1.73%	1.95%	4.00%
Drive test results for Call drop rate (Average of three month drive tests) - Drive Test Data										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		1065	1019	1064	1032	NS	992	1046	1049	1067
Total number of calls dropped		14	6	16	31	NS	35	6	11	8
Call drop rate	≤ 2%	1.31%	0.59%	1.50%	3.00%	NS	3.53%	0.57%	1.05%	0.75%

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

12.4 VOICE QUALITY

4. Voice quality (Average of 3 months)										
Audit Results for Voice quality -PMR Data										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		31688015667	58534641403	1573237309	16004065066	NS	20941881105	NA	NA	58915465834
Total number of calls with good voice quality		30683457569	58531911596	1520796695	15446801268	NS	20774701117	NA	NA	57573646180
%age calls with good voice quality	≥ 95%	96.83%	100.00%	96.67%	96.52%	NS	99.20%	99.09%	97.78%	97.72%
Live measurement results for Voice quality-3 Day data										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		3175799189	5702110802	4712881821	1517031443	NS	1937096105	NA	NA	5884760509
Total number of calls with good voice quality		3070801836	5665139142	4547699019	1464977060	NS	1922809827	NA	NA	5750219372
%age calls with good voice quality	≥ 95%	96.69%	99.35%	96.50%	96.57%	NS	99.26%	99.15%	97.82%	97.71%
Drive test results for Voice quality (Average of three month drive tests) - DT data										
Voice quality	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of sample calls		1497684	1951952	251564	1226053	NS	1542498	NA	4266295	238431
Total number of calls with good voice quality		1388436	1881157	240516	1070255	NS	1429125	NA	4119966	222135
%age calls with good voice quality	≥ 95%	92.71%	96.37%	95.61%	87.29%	NS	92.65%	97.35%	96.57%	93.17%

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

12.5 POI CONGESTION

5. POI Congestion										
Audit Results for POI Congestion- PMR data										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		105	296	296	31	NS	94	153	153	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	4
Total Capacity of all POIs (A) - in erlangs		240651	421294	480898	45540	NS	141257	319595	319595	892377
Traffic served for all POIs (B)- in erlangs		100032	291888	253584	20808	NS	89223	305957	305957	449349
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		104	295	296	31	NS	93	151	151	325
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	3
Total Capacity of all POIs (A) - in erlangs		240230	419458	481644	45540	NS	140519	315539	315539	890645
Traffic served for all POIs (B)- in erlangs		97655	285947	255936	11226	NS	77813	302095	302095	333177
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

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

13 ANNEXURE – CONSOLIDATED-3G

13.1 NETWORK AVAILABILITY

1. Network Availability					
Audit Results for Network Availability- PMR data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4081	2076	6151	15909
Sum of downtime (i.e. total outage time) of Node Bs		6523	9896	11072	16361
Node Bs downtime (not available for service)	≤ 2%	0.21%	0.64%	0.24%	0.14%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	24	84	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.16%	1.37%	0.00%
Live Measurement Results for Network Availability- 3 Day live data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4063	693	6152	15909
Sum of downtime (i.e. total outage time) of Node Bs		589	1184	1112	1196
Node Bs downtime (not available for service)	≤ 2%	0.20%	2.37%	0.25%	0.10%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	22	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	0.36%	0.00%

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

13.2 CONNECTION ESTABLISHMENT (ACCESSIBILITY)

2. Connection Establishment (Accessibility)					
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data					
	Benchmark	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	98.77%	98.45%	99.58%	99.76%
RRC Congestion	≤ 1%	0.01%	0.60%	0.12%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.02%	0.31%	0.06%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data					
	Benchmark	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	98.85%	98.26%	99.90%	99.76%
RRC Congestion	≤ 1%	0.03%	0.71%	0.07%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.04%	0.51%	0.03%	0.00%
Drive test results for CSSR (Average of three month drive tests) and blocked calls- Drive Test Data					
CSSR	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of RRC attempts (A)		1054	1013	984	1165
Total number of RRC established (B)		1046	967	966	1164
Call setup success rate (B/A*100)	≥ 95%	99.24%	95.46%	98.17%	99.91%
%age blocked calls		0.76%	4.54%	1.83%	0.09%

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

13.3 CONNECTION MAINTENANCE (RETAINABILITY)

3. Connection Maintenance (Retainability)					
Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		240285389	12769584	72539426	455684413
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		919571	206012	77043	3061117
Call drop rate (B/A*100)	≤ 2%	0.38%	1.61%	0.11%	0.67%
Total no. of cells in the licensed service area (B)		54950	5997	17993	62185
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		991	154	66	1304
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.80%	2.56%	0.37%	2.10%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		24156504	1181242	7401613	47577691
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		101343	19785	9092	187655
Call drop rate (B/A*100)	≤ 2%	0.42%	1.67%	0.12%	0.39%
Total no. of cells in the licensed service area (B)		54566	6009	18120	61773
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		1055	158	82	1289
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.93%	2.62%	0.45%	2.09%
Drive test results for Call drop rate (Average of three month drive tests) - Drive Test Data					
Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		1046	967	966	1044
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		2	30	9	3
Call drop rate (B/A*100)	≤ 2%	0.19%	3.10%	0.93%	0.29%

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

13.4 VOICE QUALITY

4. Voice quality					
Audit Results for Voice quality -PMR Data					
Voice quality	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	23759671304	NA	447798057306
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	23490663389	NA	442406615030
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.42%	98.87%	99.69%	98.80%
Live measurement results for Voice quality-3 Day data					
Voice quality	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	2428805742	NA	65004451224
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	2401274672	NA	64241852749
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.47%	98.87%	99.69%	98.83%
Drive test results for Voice quality (Average of three month drive tests) - DT data					
Voice quality	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3421251	217495	3975595	0
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3351380	185236	3764969	0
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.96%	85.17%	94.70%	NA

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

13.5 POI CONGESTION

5. POI Congestion					
Audit Results for POI Congestion- PMR data					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		296	31	94	326
No. of POIs not meeting benchmark		0	0	0	4
Total Capacity of all POIs (A) - in erlangs		421294	45540	141214	892377
Traffic served for all POIs (B)- in erlangs		291888	20808	89574	449349
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		295	31	93	325
No. of POIs not meeting benchmark		0	0	0	3
Total Capacity of all POIs (A) - in erlangs		419458	45540	140519	890645
Traffic served for all POIs (B)- in erlangs		285947	11226	67813	333177
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

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

14 ANNEXURE – CUSTOMER SERVICES

14.1 METERING AND BILLING CREDIBILITY

Audit Results for Billing performance Postpaid-Consolidated										
Billing Performance	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Metering and billing credibility - Postpaid (Avg of 3 billing cycles)										
Metering and billing credibility - Postpaid										
Total bills generated during the period		85001	3162247	2203329	388943	NS	1513523	64667	298406	8672629
Total number of bills disputed		1	1860	5674	161	NS	1358	0	3	47717
Total number of valid billing complaints		1	320	484	111	NS	1358	0	3	35938
Total complaints considered invalid		0	1540	5190	50	NS	0	0	0	11779
Percentage bills disputed (Avg of 3 billing cycles)	≤ 0.1%	0.00%	0.06%	0.26%	0.04%	NS	0.09%	0.00%	0.00%	0.55%
July										
Total bills generated during the first billing cycle		28864	1031130	776401	129951	NS	490689	22393	98265	2851416
Total number of bills disputed in first billing cycle		0	563	1968	54	NS	440	0	0	15420
Total number of valid billing complaints (billing cycle 1)		0	110	189	37	NS	440	0	0	12532
Total complaints considered invalid (billing cycle 1)		0	453	1779	17	NS	0	0	0	2888
Percentage bills disputed (first billing cycle)	≤ 0.1%	0.00%	0.05%	0.25%	0.04%	NS	0.09%	0.00%	0.00%	0.54%

Data Source: Billing Center of the operators

August										
Total bills generated during the second billing cycle		28374	1094764	716983	129760	NS	512531	21624	99888	2891834
Total number of bills disputed in second billing cycle		1	646	1911	78	NS	460	0	1	15920
Total number of valid billing complaints (billing cycle 2)		1	138	166	52	NS	460	0	1	12614
Total complaints considered invalid (billing cycle 2)		0	508	1745	26	NS	0	0	0	3306
Percentage bills disputed (second billing cycle)	≤ 0.1%	0.00%	0.06%	0.27%	0.06%	NS	0.09%	0.00%	0.00%	0.55%
September										
Total bills generated during the third billing cycle		27763	1036353	709945	129232	NS	510303	20650	100253	2929379
Total number of bills disputed in third billing cycle		0	651	1795	29	NS	458	0	2	16377
Total number of valid billing complaints (billing cycle 3)		0	72	129	22	NS	458	0	2	10792
Total complaints considered invalid (billing cycle 3)		0	579	1666	7	NS	0	0	0	5585
Percentage bills disputed (third billing cycle)	≤ 0.1%	0.00%	0.06%	0.25%	0.02%	NS	0.09%	0.00%	0.00%	0.56%
Metering and billing credibility - Prepaid										
Performance prepaid	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of charging complaints (valid) - sum of 3 months		6	1920	799	36	NS	3791	0	1	15249
Total complaints considered invalid (sum of 3 months)		0	12696	7596	3766	NS	0	0	0	1442
Total number of charging complaints (sum of 3 months)		6	14616	8395	3802	NS	3791	0	1	16691
Total no of customers served (Sum of 3 months)		2907574	13979439	3564358	3460974	NS	12648028	584582	2598516	6254469
Percentage of charging complaints disputed	≤ 0.1%	0.00%	0.10%	0.24%	0.11%	NS	0.03%	0.00%	0.00%	0.27%

Data Source: Billing Center of the operators

Resolution of Billing Complaints

Resolution of billing complaints (Postpaid+Prepaid)-Consolidated										
Billing Performance	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of billing/charging complaints		7	2240	14069	3963	NS	5149	0	4	51187
Total number of complaints resolved in favour of customer		7	2240	1283	147	NS	5149	0	4	51187
Total complaints considered invalid		0	14236	12786	3816	NS	0	0	0	13221
Number of complaints resolved in 4 weeks		7	2240	1283	147	NS	5149	0	4	51184
Percentage complaints resolved within 4 weeks	≥ 98%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	99.99%
Number of complaints resolved in 6 weeks		7	2240	1283	147	NS	5149	0	4	51187
Percentage complaints resolved within 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%
Period of applying credit / waiver										
Total number of complaints where credit/waiver is required		7	2240	1283	111	NS	5149	0	4	4576
Percentage cases in which credit/waiver was received within 1 week	100%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%
Live calling results for resolution of billing complaints										
Resolution of billing complaints	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total Number of calls made		7	100	100	100	NS	100	0	4	100
Number of cases resolved in 4 weeks		7	100	99	96	NS	98	0	4	98
Percentage cases resolved in 4 weeks	≥ 98%	100.00%	100.00%	99.00%	96.00%	NS	98.00%	NA	100.00%	98.00%
Number of cases resolved in 6 weeks		7	100	100	100	NS	100	0	4	100
Percentage cases resolved in 6 weeks	100.00%	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	100.00%	100.00%

Data Source: Billing Center of the operators

14.2 CUSTOMER CARE

Customer Care										
Audit results for customer care (IVR and voice-to-Voice) -Consolidated										
Customer Care Assessment	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts to customer care for assistance		8991343	1064512	12362275	435859	NS	7037358	1	461494	10819187
Number of calls getting connected and answered (electronically)		8911470	1058722	12300381	435859	NS	6975374	1	453160	10789859
Percentage calls getting connected and answered	≥ 95%	99.11%	99.46%	99.50%	100.00%	NS	99.12%	100.00%	98.19%	99.73%
Audit results for customer care (voice-to-Voice)- (Avg of 3 months)-Consolidated										
Customer Care Assessment	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total Number of calls received (3 months)		1913684	2586053	2601868	435859	NS	1517679	55066	691815	4492685
Total Number of calls answered within 90 seconds (3 months)		1870334	2344283	2573488	417314	NS	1242599	54958	660529	4225665
Percentage calls answered within 90 seconds (Avg of 3 months)	≥ 95%	97.73%	90.65%	98.91%	95.75%	NS	81.87%	99.80%	95.48%	94.06%
July										
Total calls received (Month 1)		692464	986780	892779	169836	NS	441316	19903	248140	1505001
Total calls answered within 90 seconds (Month 1)		681392	904113	882907	164371	NS	346222	19872	230336	1414694
% calls answered within 90 seconds (Month 1)	≥ 95%	98.40%	91.62%	98.89%	96.78%	NS	78.45%	99.84%	92.83%	94.00%
August										
Total calls received (Month 2)		631135	846362	871852	155311	NS	555284	18629	221028	1556789
Total calls answered within 90 seconds (Month 2)		616457	772158	861070	147717	NS	469637	18600	214138	1489344
% calls answered within 90 seconds (Month 2)	≥ 95%	97.67%	91.23%	98.76%	95.11%	NS	84.58%	99.84%	96.88%	95.67%
September										
Total calls received (Month 3)		590085	752911	837237	110712	NS	521079	16534	222647	1430895
Total calls answered within 90 seconds (Month 3)		572485	668012	829511	105226	NS	426740	16486	216055	1321627
% calls answered within 90 seconds (Month 3)	≥ 95%	97.02%	88.72%	99.08%	95.04%	NS	81.90%	99.71%	97.04%	92.36%
Live calling results for customer care (IVR)										
Customer Care Assessment	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts to customer care for assistance		100	100	100	100	NS	100	100	100	100
Number of calls getting connected and answered (electronically)		100	100	100	100	NS	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%
Live calling results for customer care (Voice to Voice)										
Customer Care Assessment	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total Number of calls received		100	100	100	100	NS	100	100	100	100
Total Number of calls getting connected and answered		99	100	100	98	NS	98	96	97	100
Live Calling Percentage calls getting connected and answered	≥ 95%	99.00%	100.00%	100.00%	98.00%	NS	98.00%	96.00%	97.00%	100.00%

Data Source: Customer Service Center of the operators

14.3 TERMINATION / CLOSURE OF SERVICE

Audit results for termination / closure of service-Consolidated										
Termination	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of closure request		341	16951	15373	13632	NS	2712	2116	2311	22547
Number of requests attended within 7 days		341	16950	15373	13632	NS	2712	2116	2311	22547
Percentage cases in which termination done within 7 days	100.00%	100.00%	99.99%	100.00%	100.00%	NS	100.00%	100.00%	100.00%	100.00%

Data Source: Customer Service Center of the operators

14.4 TIME TAKEN FOR REFUND OF DEPOSITS AFTER CLOSURE

Audit results for refund of deposits-Consolidated										
Refund	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of cases requiring refund of deposits		909	1177	2545	639	NS	7663	331	93	11501
Total number of cases where refund was made within 60 days		909	1177	2545	639	NS	6051	331	93	11370
Percentage cases in which refund was receive within 60 days	100.00%	100.00%	100.00%	100.00%	100.00%	NS	78.96%	100.00%	100.00%	98.86%

Data Source: Billing Center of the operators

14.5 LIVE CALLING RESULTS FOR RESOLUTION OF SERVICE REQUESTS

Live calling results for resolution of service requests									
Resolution of service requests	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total Number of calls made	7	100	100	100	NS	100	0	4	100
Number of cases resolved to satisfaction	7	100	100	100	NS	100	0	4	100
Percentage cases resolved in four weeks	100.00%	100.00%	100.00%	100.00%	NS	100.00%	NA	NA	100.00%

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

NA: Data to conduct live calling for customer care was not available at the customer service center. Hence, live calling for the parameter has not been conducted for the operator.

14.6 LIVE CALLING RESULTS FOR LEVEL 1 SERVICES

Live calling for level 1 services										
Level 1 services		Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total no. of calls made		300	300	300	300	NS	300	300	300	300
Calls answered		287	285	286	265	NS	256	269	276	289
% of calls connected	≥ 95%	95.67%	95.00%	95.33%	88.33%	NS	85.33%	89.67%	92.00%	96.33%

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

14.7 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

Aircel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	y		20	17
101	Fire	y		20	17
102	Ambulance				
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline				
138	All India Helpline for Passengers	y		20	17
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	y		20	17
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service	y		20	17
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'	y		20	17
1056	Emergency Medical Services				
106X	State of the Art Hospitals				
1063	Public Grievance Cell DoT Hq				
1064	Anti-Corruption Helpline	y		20	17
1070	Relief Commission for Natural Calamities	y		20	17
1071	Air Accident Helpline				

1072	Rail Accident Helpline				
1073	Road Accident Helpline	y		20	17
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline				
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)	y		20	17
10580	Educational & Vocational Guidance and Counselling	y		20	17
10589	Mother and Child Tracking (MCTH)		N		
10740	Central Pollution Control Board	y		20	17
10741	Pollution Control Board				
1511	Police Related Service for all Metro Railway Project				
1512	Prevention of Crime in Railway	y		20	17
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations	y		20	17
155214	Labour Helpline		N		
1903	Sash Astra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	y		20	17
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
Airtel					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		22	21
101	Fire	Y		21	20

102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		22	21
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		22	21
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		21	20
1071	Air Accident Helpline	Y		22	20
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		21	21
1090	Call Alart (Crime Branch)	Y		21	20
1091	Women Helpline	Y		21	20
1097	National AIDS Helpline to NACO	Y		22	20
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		21	20
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline				
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sash Astra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		21	20
1912	Complaint of Electricity	Y		21	20
1916	Drinking Water Supply	Y		22	20
1950	Election Commission of India		N		
Idea					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		22	20
101	Fire	Y		21	19
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		22	19
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		22	20
1033	Road Accident Management Service		N		

1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		21	19
1071	Air Accident Helpline	Y		22	19
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline		N		
1077	Control Room for District Collector	Y		21	19
1090	Call Alart (Crime Branch)	Y		21	19
1091	Women Helpline	Y		21	19
1097	National AIDS Helpline to NACO	Y		22	19
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		21	19
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline				
155304	Municipal Corporations		N		
155214	Labour Helpline		N		

1903	Sash Astra Seema Bal (SSB)		N		
1909	National Do Not Call Registry	Y		21	19
1912	Complaint of Electricity	Y		21	19
1916	Drinking Water Supply	Y		22	19
1950	Election Commission of India		N		
MTNL					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		27	24
101	Fire	Y		28	24
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		28	25
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		27	24
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		27	24
1071	Air Accident Helpline	Y		28	24
1072	Rail Accident Helpline		N		

1073	Road Accident Helpline	Y		27	24
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		27	24
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	Y		27	24
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		27	24
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sash Astra Seema Bal (SSB)		N		
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		27	24
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
Reliance GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		27	24
101	Fire	Y		28	23
102	Ambulance		N		

104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline		N		
138	All India Helpline for Passengers	Y		28	23
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline		N		
182	Indian Railway Security Helpline	Y		27	23
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		27	24
1071	Air Accident Helpline	Y		28	24
1072	Rail Accident Helpline		N		
1073	Road Accident Helpline	Y		27	23
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		27	23
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 (		N		

	MCTH)				
10740	Central Pollution Control Board	Y		27	23
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		27	23
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sash Astra Seema Bal (SSB)		N		
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		27	23
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		
TATA CDMA					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		17	14
101	Fire	Y		17	13
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		17	14
138	All India Helpline for Passengers	Y		17	14
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		17	14
182	Indian Railway Security Helpline	Y		17	14
1033	Road Accident Management Service	Y		17	13

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	13
1071	Air Accident Helpline		N		
1072	Rail Accident Helpline	Y		16	13
1073	Road Accident Helpline	Y		16	13
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)	Y		17	13
1091	Women Helpline	Y		16	13
1097	National AIDS Helpline to NACO	Y		16	13
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	Y		17	13
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		16	13
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		

1903	Sash Astra Seema Bal (SSB)	Y		17	13
1909	National Do Not Call Registry	Y		16	13
1912	Complaint of Electricity		N		
1916	Drinking Water Supply		N		
1950	Election Commission of India	Y		17	13
TATA GSM					
Level 1 Number	Type of Service	Working	Not Working	Calls Made	Calls Connected
100	Police	Y		27	24
101	Fire	Y		28	24
102	Ambulance		N		
104	Health Information Helpline		N		
108	Emergency and Disaster Management Helpline	Y		28	25
138	All India Helpline for Passengers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		27	24
182	Indian Railway Security Helpline		N		
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services		N		
106X	State of the Art Hospitals		N		
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline		N		
1070	Relief Commission for Natural Calamities	Y		27	25
1071	Air Accident Helpline	Y		28	25
1072	Rail Accident Helpline		N		

1073	Road Accident Helpline	Y		27	24
1077	Control Room for District Collector		N		
1090	Call Alart (Crime Branch)		N		
1091	Women Helpline	Y		27	24
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	Y		27	24
10741	Pollution Control Board		N		
1511	Police Related Service for all Metro Railway Project		N		
1512	Prevention of Crime in Railway	Y		27	24
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline		N		
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sash Astra Seema Bal (SSB)		N		
1909	National Do Not Call Registry		N		
1912	Complaint of Electricity	Y		27	24
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		14	12
101	Fire	Y		14	12
102	Ambulance				

104	Health Information Helpline				
108	Emergency and Disaster Management Helpline	Y		14	12
138	All India Helpline for Passengers		N		
149	Public Road Transport Utility Service		N		
181	Chief Minister Helpline	Y		14	12
182	Indian Railway Security Helpline	Y		13	12
1033	Road Accident Management Service		N		
1037	Public Grievance Cell DoT Hq as 'Telecom Consumer Grievance Redressal Helpline'		N		
1056	Emergency Medical Services				
106X	State of the Art Hospitals	Y		14	12
1063	Public Grievance Cell DoT Hq		N		
1064	Anti-Corruption Helpline	Y		13	13
1070	Relief Commission for Natural Calamities	Y		14	13
1071	Air Accident Helpline	Y		14	12
1072	Rail Accident Helpline	Y		13	12
1073	Road Accident Helpline	Y		14	12
1077	Control Room for District Collector	Y		13	12
1090	Call Alart (Crime Branch)	Y		14	13
1091	Women Helpline	Y		14	12
1097	National AIDS Helpline to NACO		N		
1099	Central Accident and Trauma Services (CATS)	Y		14	13
10580	Educational & Vocational Guidance and Counselling		N		
10589	Mother and Child Tracking (		N		

	MCTH)				
10740	Central Pollution Control Board	Y		13	13
10741	Pollution Control Board	Y		14	13
1511	Police Related Service for all Metro Railway Project	Y	N	13	
1512	Prevention of Crime in Railway	Y		13	12
1514	National Career Service(NCS)		N		
15100	Free Legal Service Helpline	Y		13	12
155304	Municipal Corporations		N		
155214	Labour Helpline		N		
1903	Sash Astra Seema Bal (SSB)				
1909	National Do Not Call Registry	Y		14	13
1912	Complaint of Electricity	Y		14	13
1916	Drinking Water Supply		N		
1950	Election Commission of India		N		

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

15 COUNTER DETAILS

Sl No.	KPI	Formula with Counter Description
1	CSSR= (No of established Calls / No of Attempted Calls)%	***No of established Calls =*** ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)] +[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)]))/***No of Attempted Calls =*** ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Changeable)])
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	***SDCCH Failure=*** ([Channel Assignment Failures (All Channels Busy or Channels Unconfigured) in Immediate Assignment Procedure (SDCCH)] + [Failed Internal Intra-Cell Handovers (No Channel Available) (SDCCH)] + [Number of Unsuccessful Incoming Internal Inter-Cell Handovers (No Channel Available) (SDCCH)] + [Failed Incoming External Inter-Cell Handovers (No Channel Available) (SDCCH)])/***SDCCH attempts =*** ([Channel Assignment Requests in Immediate Assignment Procedure (SDCCH)] + [Internal Intra-Cell Handover Requests (SDCCH)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)])
3	TCH congestion= (TCH Failures /TCH Attempts)%	***TCH Failures=*** ((Failed TCH Seizures due to Busy TCH (Signaling Channel)+([Failed Assignments (First Assignment, No Channel Available in Assignment Procedure)]+[Failed Assignments (First Assignment, No Channel Available in Directed Retry Procedure)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Assignment)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Directed Retry)])/***TCH Attempts =*** ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type

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))**

15.1.1 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.

15.1.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.

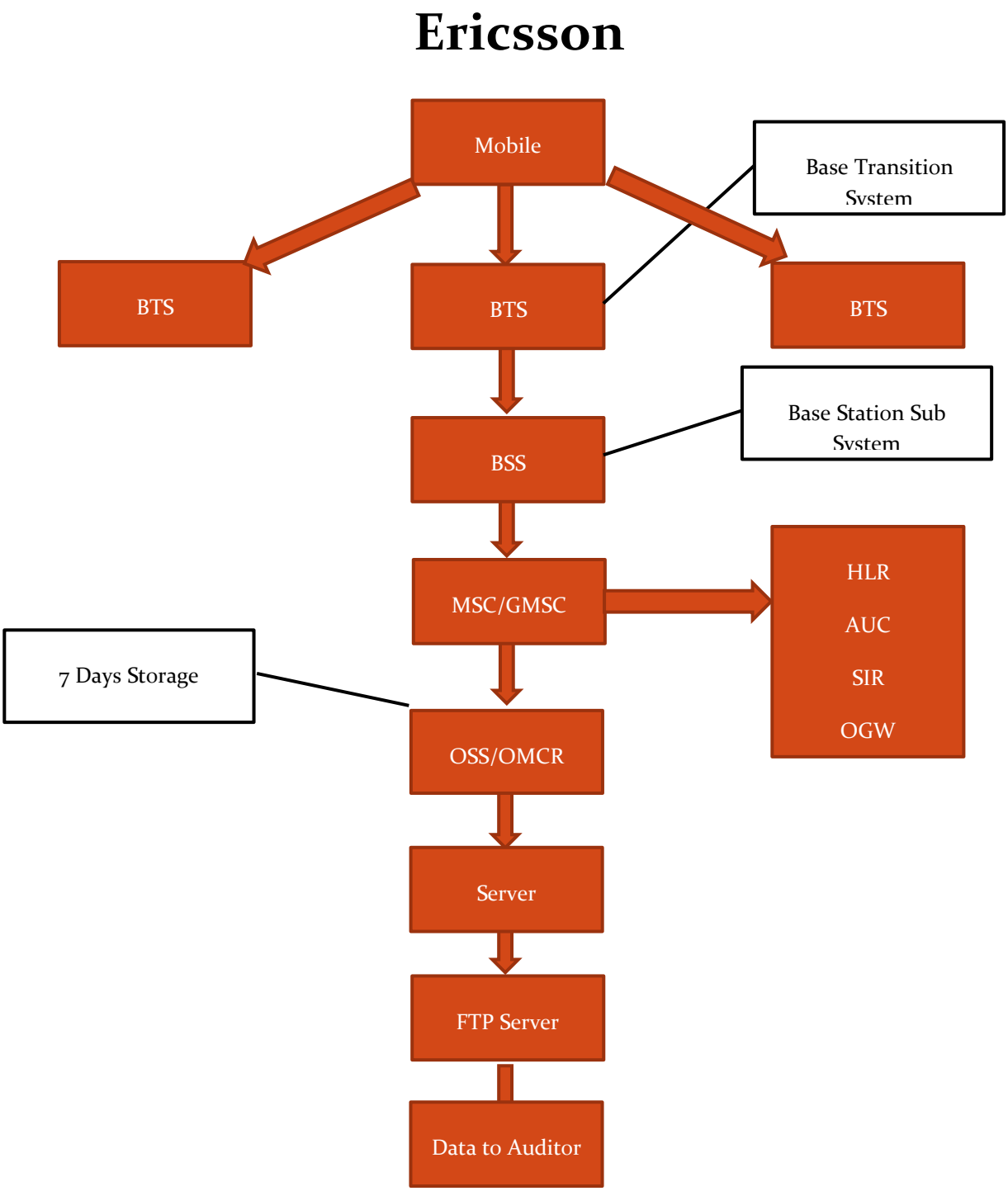
Sl No.	KPI	NSN
1	CSSR= (No of established Calls / No of Attempted Calls)%	CSSR= 100-100*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON) + (SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_USER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCCH_BTS_FAIL)+(SDCCH_LAPD_FAIL)+ (BLCK_8I_NOM)/ {(CH_REQ_MSG_REC)+(PACKET_CH_REQ)}-{(GHOST_CCCH_RES)-(REJ_SEIZ_ATT_DUE_DIST)}
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)

15.2 BLOCK SCHEMATIC DIAGRAMS

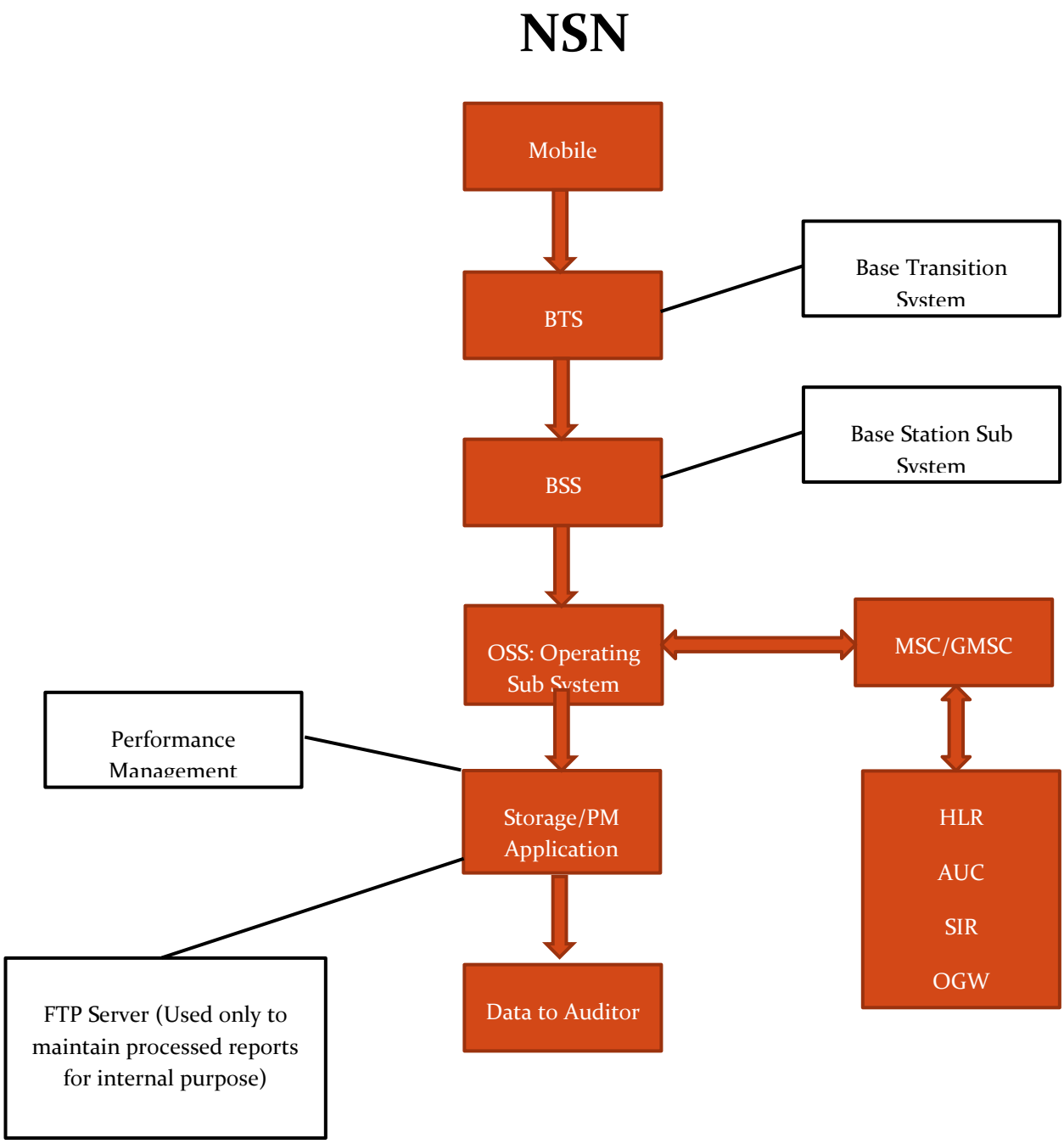
15.2.1 ERICSSON

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



15.2.2 NSN (NOKIA SIEMENS NETWORKS)

NSN provides network support to Vodafone in the circle.



16 ANNEXURE – JULY -2G

1. Network Availability										
Audit Results for Network Availability- PMR data-July										
	Benchmark	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Number of BTSs in the licensed service area		1974	4213	3750	983	NS	2190	931	2936	5001
Sum of downtime of BTSs in a month (in hours)		1768	1709	2205	6531	NS	1091	554	20	6890
BTSs accumulated downtime (not available for service)	≤ 2%	0.12%	0.05%	0.08%	0.89%	NS	0.07%	0.08%	0.00%	0.19%
Number of BTSs having accumulated downtime >24 hours		12	0	3	11	NS	17	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.61%	0.00%	0.08%	1.12%	NS	0.78%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-July										
	Benchmark	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Number of BTSs in the licensed service area		1966	4222	3750	982	NS	2169	931	2936	5001
Sum of downtime of BTSs in a month (in hours)		216	209	244	464	NS	153	29	0	630
BTSs accumulated downtime (not available for service)	≤ 2%	0.15%	0.07%	0.09%	0.66%	NS	0.10%	0.04%	0.00%	0.17%
Number of BTSs having accumulated downtime >24 hours		1	0	0	0	NS	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.05%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)										
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-July										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.31%	99.90%	98.98%	98.07%	NS	99.47%	99.20%	99.34%	99.21%
SDCCH/Paging channel congestion	≤ 1%	0.28%	0.03%	0.15%	0.37%	NS	0.20%	NA	0.04%	0.07%
TCH congestion	≤ 2%	0.61%	0.08%	0.63%	0.14%	NS	0.22%	0.02%	0.05%	0.79%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-July										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	96.95%	99.85%	98.82%	97.77%	NS	99.53%	99.24%	99.40%	99.16%
SDCCH/Paging channel congestion	≤ 1%	0.36%	0.06%	0.11%	0.57%	NS	0.19%	NA	0.01%	0.05%
TCH congestion	≤ 2%	0.94%	0.13%	0.79%	0.16%	NS	0.26%	0.00%	0.00%	0.84%
Drive test results for CSSR and blocked calls- Drive Test Data-July										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts		NA	NA	NA	NA	NS	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NS	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NS	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NS	NA	NA	NA	NA

3. Connection Maintenance (Retainability)										
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-July										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		55037261	106294358	4085937	37228022	NS	44725533	NA	NA	157266056
Total number of calls dropped		661780	874455	43751	623729	NS	87206	NA	NA	1860926
Call drop rate	≤ 2%	1.20%	0.82%	1.07%	1.68%	NS	0.19%	0.46%	0.46%	1.18%
Total number of cells in the network		5878	11833	10719	2640	NS	6575	2582	8326	12805
Total number of cells having more than 3% TCH		422	211	186	57	NS	25	46	160	517
Worst affected cells having more than 3% TCH	≤ 3%	7.18%	1.78%	1.74%	2.14%	NS	0.39%	1.78%	1.92%	4.04%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-July										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		5816665	10859442	3941192	3685788	NS	4430352	NA	NA	16916372
Total number of calls dropped		75148	100195	38550	57159	NS	9360	NA	NA	202089
Call drop rate	≤ 2%	1.29%	0.92%	0.98%	1.55%	NS	0.21%	0.45%	0.50%	1.19%
Total number of cells in the network		5849	11847	10719	2639	NS	6018	2582	8326	12767
Total number of cells having more than 3% TCH		450	207	185	61	NS	30	47	162	515
Worst affected cells having more than 3% TCH	≤ 3%	7.69%	1.75%	1.73%	2.31%	NS	0.50%	1.82%	1.95%	4.04%
Drive test results for Call drop rate - Drive Test Data-July										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		NA	NA	NA	NA	NS	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NS	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NS	NA	NA	NA	NA

4. Voice quality										
Audit Results for Voice quality -PMR Data-July										
Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		10457884828	19266824265	518423609	5426716149	NS	6896918954	NA	NA	20175355929
Total number of calls with good voice quality		10081777563	19733053841	499070590	5235625912	NS	6853565352	NA	NA	19698456584
%age calls with good voice quality	≥ 95%	96.40%	102.42%	96.27%	96.48%	NS	99.37%	99.08%	97.81%	97.64%
Live measurement results for Voice quality-3 Day data-July										
Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1087623477	1947559418	1540803089	530466666	NS	627870256	NA	NA	2036466059
Total number of calls with good voice quality		1046840443	1998107255	1481927363	511877286	NS	623773503	NA	NA	1988584063
%age calls with good voice quality	≥ 95%	96.25%	102.60%	96.18%	96.50%	NS	99.35%	99.10%	97.85%	97.65%
Drive test results for Voice quality - DT data-July										
Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NS	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NS	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NS	NA	NA	NA	NA

5. POI Congestion										
Audit Results for POI Congestion- PMR data-July										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		105	293	288	31	NS	92	146	146	324
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	1
Total Capacity of all POIs (A) - in erlangs		80164	139613	161338	15180	NS	46700	108940	108940	295380
Traffic served for all POIs (B)- in erlangs		32690	95930	81151	6990	NS	29273	104330	104330	144610
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-July										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		103	292	288	31	NS	92	146	146	324
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		79837	138750	161032	15180	NS	46699	105902	105902	295038
Traffic served for all POIs (B)- in erlangs		31363	94009	83789	3871	NS	20042	101442	101442	88461
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

17 ANNEXURE – AUGUST-2G

1. Network Availability										
Audit Results for Network Availability- PMR data-August										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1974	4257	3768	984	NS	2211	931	2940	5013
Sum of downtime of BTSs in a month (in hours)		1274	1830	2187	5598	NS	630	603	6877	6186
BTSs accumulated downtime (not available for service)	≤ 2%	0.09%	0.06%	0.08%	0.76%	NS	0.04%	0.09%	0.31%	0.17%
Number of BTSs having accumulated downtime >24 hours		5	0	2	12	NS	5	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.25%	0.00%	0.05%	1.22%	NS	0.23%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-August										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1971	4169	3768	982	NS	2211	931	2940	5013
Sum of downtime of BTSs in a month (in hours)		250	164	211	464	NS	84	45	1328	944
BTSs accumulated downtime (not available for service)	≤ 2%	0.18%	0.05%	0.08%	0.66%	NS	0.05%	0.01%	0.06%	0.03%
Number of BTSs having accumulated downtime >24 hours		0	0	0	0	NS	5	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%	NS	0.23%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)										
Audit Results for CSSR, SDCCH and TCH congestion- PMR data-August										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.69%	99.92%	99.23%	97.89%	NS	99.63%	99.22%	99.28%	99.25%
SDCCH/Paging channel congestion	≤ 1%	0.25%	0.02%	0.15%	0.37%	NS	0.11%	NA	0.03%	0.09%
TCH congestion	≤ 2%	0.71%	0.04%	0.47%	0.11%	NS	0.36%	0.02%	0.04%	0.75%
Live measurement results for CSSR, SDCCH and TCH congestion- 3 Day Data-August										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
CSSR	≥ 95%	97.49%	99.89%	99.16%	97.77%	NS	99.50%	99.26%	99.21%	99.20%
SDCCH/Paging channel congestion	≤ 1%	0.22%	0.04%	0.14%	0.57%	NS	0.23%	NA	0.00%	0.06%
TCH congestion	≤ 2%	0.48%	0.88%	0.50%	0.16%	NS	0.27%	0.01%	0.00%	0.80%
Drive test results for CSSR and blocked calls- Drive Test Data-August										
CSSR	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of call attempts		NA	NA	NA	NA	NS	NA	NA	NA	NA
Total number of successful calls established		NA	NA	NA	NA	NS	NA	NA	NA	NA
CSSR	≥ 95%	NA	NA	NA	NA	NS	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA	NS	NA	NA	NA	NA

3. Connection Maintenance (Retainability)										
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-August										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		56561657	107105678	4122300	37816160	NS	7235494870	NA	NA	156803766
Total number of calls dropped		575747	867465	40836	579330	NS	100953	NA	NA	1807647
Call drop rate	≤ 2%	1.02%	0.81%	0.99%	1.53%	NS	0.00%	0.43%	0.46%	1.15%
Total number of cells in the network		5882	11984	10766	2645	NS	6638	2581	8338	12917
Total number of cells having more than 3% TCH		323	205	159	62	NS	33	40	163	530
Worst affected cells having more than 3% TCH	≤ 3%	5.49%	1.71%	1.48%	2.34%	NS	0.50%	1.55%	1.95%	4.10%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-August										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		5294821	10057453	4039682	3685788	NS	681465189	NA	NA	16064816
Total number of calls dropped		57275	88268	44689	57159	NS	8443	NA	NA	197152
Call drop rate	≤ 2%	1.08%	0.88%	1.11%	1.55%	NS	0.00%	0.45%	0.49%	1.23%
Total number of cells in the network		5870	11732	10766	2639	NS	6638	2581	8338	12854
Total number of cells having more than 3% TCH		372	208	161	61	NS	22	41	165	617
Worst affected cells having more than 3% TCH	≤ 3%	6.33%	1.77%	1.50%	2.31%	NS	0.34%	1.59%	1.98%	4.80%
Drive test results for Call drop rate - Drive Test Data-August										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		NA	NA	NA	NA	NS	NA	NA	NA	NA
Total number of calls dropped		NA	NA	NA	NA	NS	NA	NA	NA	NA
Call drop rate	≤ 2%	NA	NA	NA	NA	NS	NA	NA	NA	NA

4. Voice quality

Audit Results for Voice quality -PMR Data-August

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		10926492487	20107557875	532539587	5381924839	NS	7235494870	NA	NA	19950040346
Total number of calls with good voice quality		10571060884	19634393542	515215414	5193574495	NS	7177380647	NA	NA	19500105459
%age calls with good voice quality	≥ 95%	96.75%	97.65%	96.75%	96.50%	NS	99.20%	99.08%	97.72%	97.74%

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

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1027478352	1910317932	1546816648	530466666	NS	681465189	NA	NA	1916869206
Total number of calls with good voice quality		991219145	1865077345	1489201037	511877286	NS	677314724	NA	NA	1871809230
%age calls with good voice quality	≥ 95%	96.47%	97.63%	96.28%	96.50%	NS	99.39%	99.20%	97.75%	98.10%

Drive test results for Voice quality - DT data-August

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		NA	NA	NA	NA	NS	NA	NA	NA	NA
Total number of calls with good voice quality		NA	NA	NA	NA	NS	NA	NA	NA	NA
%age calls with good voice quality	≥ 95%	NA	NA	NA	NA	NS	NA	NA	NA	NA

5. POI Congestion										
Audit Results for POI Congestion- PMR data-August										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		105	296	299	31	NS	94	156	156	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		80252	140548	163287	15180	NS	47282	105357	105357	296583
Traffic served for all POIs (B)- in erlangs		34172	98692	86808	6920	NS	29991	100825	100825	150991
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-August										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		105	296	299	31	NS	93	152	152	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	1
Total Capacity of all POIs (A) - in erlangs		80160	140534	163287	15180	NS	47116	105330	105330	296282
Traffic served for all POIs (B)- in erlangs		32810	98222	86808	3871	NS	30217	100794	100794	87774
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

18 ANNEXURE – SEPTEMBER-2G

1. Network Availability										
Audit Results for Network Availability- PMR data-September										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1969	4261	3798	983	NS	2170	931	2930	5010
Sum of downtime of BTSs in a month (in hours)		1751	1841	2734	4344	NS	584	255	142	5139
BTSs accumulated downtime (not available for service)	≤ 2%	0.12%	0.06%	0.10%	0.59%	NS	0.04%	0.04%	0.01%	0.14%
Number of BTSs having accumulated downtime >24 hours		10	0	6	11	NS	7	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.51%	0.00%	0.16%	1.12%	NS	0.32%	0.00%	0.00%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-September										
	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Number of BTSs in the licensed service area		1966	4245	3798	985	NS	2165	931	2930	5010
Sum of downtime of BTSs in a month (in hours)		115	112	205	298	NS	62	123	0	343
BTSs accumulated downtime (not available for service)	≤ 2%	0.08%	0.04%	0.08%	0.42%	NS	0.04%	0.02%	0.00%	0.10%
Number of BTSs having accumulated downtime >24 hours		0	0	0	0	NS	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

3. Connection Maintenance (Retainability)										
Audit Results for Call drop rate and for number of cells having more than 3% TCH-PMR data-September										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		54032737	106227260	4095282	35778153	NS	43590575	NA	NA	160164209
Total number of calls dropped		484954	807454	39462	562470	NS	108303	NA	NA	1661715
Call drop rate	≤ 2%	0.90%	0.76%	0.96%	1.57%	NS	0.25%	0.42%	0.45%	1.03%
Total number of cells in the network		5882	12020	10796	2647	NS	6515	2527	8341	12901
Total number of cells having more than 3% TCH		236	201	173	52	NS	40	44	158	405
Worst affected cells having more than 3% TCH	≤ 3%	4.02%	1.67%	1.60%	1.98%	NS	0.61%	1.74%	1.89%	3.14%
Live measurement results for Call drop rate and for number of cells having more than 3% TCH- 3 Day data-September										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		5511560	10298655	4386366	3169561	NS	4095199	NA	NA	16168079
Total number of calls dropped		48014	75966	41611	46743	NS	9492	NA	NA	167550
Call drop rate	≤ 2%	0.87%	0.74%	0.95%	1.47%	NS	0.23%	0.44%	0.47%	1.04%
Total number of cells in the network		5860	11953	10789	2645	NS	6500	2527	8341	12916
Total number of cells having more than 3% TCH		222	189	163	52	NS	29	45	160	411
Worst affected cells having more than 3% TCH	≤ 3%	3.78%	1.58%	1.51%	1.95%	NS	0.45%	1.78%	1.92%	3.18%
Drive test results for Call drop rate - Drive Test Data-September										
Call drop rate	**Benchmark**	**Aircel**	**Airtel**	**Idea**	**MTNL**	**Reliance CDMA**	**Reliance GSM**	**TATA CDMA**	**TATA GSM**	**Vodafone**
Total number of calls established		1065	1019	1064	1032	NS	992	1046	1049	1067
Total number of calls dropped		14	6	16	31	NS	35	6	11	8
Call drop rate	≤ 2%	1.31%	0.59%	1.50%	3.00%	NS	3.53%	0.57%	1.05%	0.75%

4. Voice quality

Audit Results for Voice quality -PMR Data-September

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		10303638352	19633423596	522274113	5195424078	NS	6809467281	NA	NA	18790069559
Total number of calls with good voice quality		10030619122	19164464213	506510691	5017600861	NS	6743755118	NA	NA	18375084137
%age calls with good voice quality	≥ 95%	97.35%	97.61%	96.98%	96.58%	NS	99.03%	99.10%	97.82%	97.79%

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

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1060697360	1844233452	1625262084	456098111	NS	627760660	NA	NA	1931425244
Total number of calls with good voice quality		1032742248	1801954542	1576570619	441222488	NS	621721600	NA	NA	1889826079
%age calls with good voice quality	≥ 95%	97.36%	97.71%	97.00%	96.74%	NS	99.04%	99.15%	97.87%	97.90%

Drive test results for Voice quality - DT data-September

Voice quality	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of sample calls		1497684	1951952	251564	1226053	NS	1542498	NA	4266295	238431
Total number of calls with good voice quality		1388436	1881157	240516	1070255	NS	1429125	NA	4119966	222135
%age calls with good voice quality	≥ 95%	92.71%	96.37%	95.61%	87.29%	NS	92.65%	97.35%	96.57%	93.17%

5. POI Congestion										
Audit Results for POI Congestion- PMR data-September										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		105	297	300	31	NS	94	158	158	328
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	3
Total Capacity of all POIs (A) - in erlangs		80234	141134	156273	15181	NS	47275	105298	105298	300414
Traffic served for all POIs (B)- in erlangs		33170	97265	85625	6898	NS	29959	100802	100802	153748
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%
Live Measurement Results for POI Congestion- 3 Day data-September										
POI congestion	Benchmark	Aircel	Airtel	Idea	MTNL	Reliance CDMA	Reliance GSM	TATA CDMA	TATA GSM	Vodafone
Total number of working POIs		105	297	300	31	NS	95	155	155	326
No. of POIs not meeting benchmark		0	0	0	0	NS	0	0	0	2
Total Capacity of all POIs (A) - in erlangs		80234	140174	157325	15180	NS	46704	104307	104307	299325
Traffic served for all POIs (B)- in erlangs		33483	93716	85340	3483	NS	27554	99859	99859	156942
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%	NS	0.00%	0.00%	0.00%	0.00%

19 ANNEXURE – JULY -3G

1. Network Availability					
Audit Results for Network Availability- PMR data-July					
	Benchmark	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		4040	693	2039	5279
Sum of downtime (i.e. total outage time) of Node Bs		1870	3638	2998	2809
Node Bs downtime (not available for service)	≤ 2%	0.06%	0.71%	0.20%	0.07%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	8	28	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.15%	1.37%	0.00%
Live Measurement Results for Network Availability- 3 Day live data-July					
	Benchmark	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
(Number of Node Bs in the network in the licensed service area		4062	693	2040	5279
Sum of downtime (i.e. total outage time) of Node Bs		274	435	582	315
Node Bs downtime (not available for service)	≤ 2%	0.09%	0.87%	0.40%	0.01%
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%

3. Connection Maintenance (Retainability)					
Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-July					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		81954506	4072725	21839402	148253176
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		331450	68702	22569	595209
Call drop rate (B/A*100)	≤ 2%	0.40%	1.69%	0.10%	0.40%
Total no. of cells in the licensed service area (B)		18026	1999	6050	20496
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		342	50	19	443
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.90%	2.49%	0.31%	2.16%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-July					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		8305624	399386	2409612	14982206
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		40349	7195	3063	58769
Call drop rate (B/A*100)	≤ 2%	0.49%	1.80%	0.13%	0.39%
Total no. of cells in the licensed service area (B)		18104	2003	6000	20498
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		388	52	20	491
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	2.15%	2.61%	0.33%	2.40%
Drive test results for Call drop rate - Drive Test Data-July					
Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA

5. POI Congestion					
Audit Results for POI Congestion- PMR data-July					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		293	31	92	324
No. of POIs not meeting benchmark		0	0	0	1
Total Capacity of all POIs (A) - in erlangs		139613	15180	46700	295380
Traffic served for all POIs (B)- in erlangs		95930	6990	29273	144610
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**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		292	31	92	324
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		138750	15180	46699	295038
Traffic served for all POIs (B)- in erlangs		94009	3871	20042	88461
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

20 ANNEXURE – AUGUST-3G

1. Network Availability

Audit Results for Network Availability- PMR data-August

	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4088	693	2072	5304
Sum of downtime (i.e. total outage time) of Node Bs		2581	3142	2177	5943
Node Bs downtime (not available for service)	≤ 2%	0.08%	0.61%	0.14%	0.15%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	7	22	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	1.01%	1.06%	0.00%

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

	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
(Number of Node Bs in the network in the licensed service area		4013	693	2072	5304
Sum of downtime (i.e. total outage time) of Node Bs		210	435	283	275
Node Bs downtime (not available for service)	≤ 2%	0.07%	0.87%	0.19%	0.07%
Number of Node Bs having accumulated downtime of >24 hours in a month		0	0	22	0
Worst affected Node Bs due to downtime	≤ 2%	0.00%	0.00%	1.06%	0.00%

2. Connection Establishment (Accessibility)					
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-August					
	Benchmark	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	98.81%	98.28%	99.61%	99.73%
RRC Congestion	≤ 1%	0.01%	0.72%	0.10%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.03%	0.45%	0.06%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-August					
	Benchmark	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
CSSR	≥ 95%	98.81%	97.80%	99.91%	99.72%
RRC Congestion	≤ 1%	0.03%	0.83%	0.10%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.05%	0.67%	0.04%	0.00%
Drive test results for CSSR and blocked calls- Drive Test Data-August					
CSSR	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of RRC attempts (A)		NA	NA	NA	NA
Total number of RRC established (B)		NA	NA	NA	NA
Call setup success rate (B/A*100)	≥ 95%	NA	NA	NA	NA
%age blocked calls		NA	NA	NA	NA

3. Connection Maintenance (Retainability)

Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-August

	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		80886421	4473621	25835041	156803766
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		310222	74225	23733	1807647
Call drop rate (B/A*100)	≤ 2%	0.38%	1.66%	0.09%	1.15%
Total no. of cells in the licensed service area (B)		18370	1999	6076	20995
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		327	52	20	438
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.78%	2.59%	0.33%	2.09%

Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-August

	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		8208459	399386	2542179	16119535
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		35024	7195	2817	64308
Call drop rate (B/A*100)	≤ 2%	0.43%	1.80%	0.11%	0.40%
Total no. of cells in the licensed service area (B)		17954	2003	6044	20557
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		353	52	26	429
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.97%	2.61%	0.43%	2.09%

Drive test results for Call drop rate - Drive Test Data-August

Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		NA	NA	NA	NA
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		NA	NA	NA	NA
Call drop rate (B/A*100)	≤ 2%	NA	NA	NA	NA

4. Voice quality

Audit Results for Voice quality -PMR Data-August

Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	8277552908	NA	19950040346
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	8183802292	NA	19500105459
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.42%	98.87%	99.68%	97.74%

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

Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	867175207		21870418248
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	857187857		21609240499
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.41%	98.85%	NA	98.81%

Drive test results for Voice quality - DT data-August

Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	NA	NA	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	NA	NA	NA	NA

5. POI Congestion					
Audit Results for POI Congestion- PMR data-August					
POI congestion	**Benchmark**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		296	31	94	326
No. of POIs not meeting benchmark		0	0	0	0
Total Capacity of all POIs (A) - in erlangs		140548	15180	47282	296583
Traffic served for all POIs (B)- in erlangs		98692	6920	29991	150991
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**	**Airtel 3G**	**MTNL 3G**	**Reliance 3G**	**Vodafone 3G**
Total number of working POIs		296	31	93	326
No. of POIs not meeting benchmark		0	0	0	1
Total Capacity of all POIs (A) - in erlangs		140534	15180	47116	296282
Traffic served for all POIs (B)- in erlangs		98222	3871	20217	87774
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

21 ANNEXURE – SEPTEMBER-3G

2. Connection Establishment (Accessibility)					
Audit Results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- PMR data-September					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.69%	98.94%	99.23%	99.75%
RRC Congestion	≤ 1%	0.01%	0.36%	0.16%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.01%	0.17%	0.08%	0.00%
Live measurement results for CSSR, RRC Congestion and Circuit Switched RAB Congestion- 3 Day Data-September					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
CSSR	≥ 95%	98.99%	99.18%	99.94%	99.75%
RRC Congestion	≤ 1%	0.01%	0.46%	0.02%	0.00%
Circuit Switched RAB Congestion	≤ 2%	0.01%	0.20%	0.01%	0.00%
Drive test results for CSSR and blocked calls- Drive Test Data-September					
CSSR	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of RRC attempts (A)		1054	1013	984	1165
Total number of RRC established (B)		1046	967	966	1164
Call setup success rate (B/A*100)	≥ 95%	99.24%	95.46%	98.17%	99.91%
%age blocked calls		0.76%	4.54%	1.83%	0.09%

3. Connection Maintenance (Retainability)					
Audit Results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate -PMR data-September					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		77444462	4223238	24864983	150627471
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		277899	63085	30741	658261
Call drop rate (B/A*100)	≤ 2%	0.36%	1.49%	0.12%	0.44%
Total no. of cells in the licensed service area (B)		18554	1999	5867	20694
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		321	52	27	423
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.73%	2.60%	0.46%	2.05%
Live measurement results for Call drop rate and Worst affected cells having more than 3% Circuit switched voice drop rate - 3 Day data-September					
	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		7642421	382470	2449822	16475950
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		25970	5395	3212	64578
Call drop rate (B/A*100)	≤ 2%	0.34%	1.41%	0.13%	0.39%
Total no. of cells in the licensed service area (B)		18508	2003	6076	20718
No. of affected cells having CSV call drop rate >3% during (CBBH) in a month (A)		313	53	36	369
Worst affected cells having more than 3% Circuit switched voice drop rate (A/B*100)	≤ 3%	1.69%	2.65%	0.60%	1.78%
Drive test results for Call drop rate - Drive Test Data-September					
Call drop rate	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total calls successfully established (A) (Number of voice RAB normally released)		1046	967	966	1044
Total calls dropped after establishment (B) (Number of voice RAB abnormally released)		2	30	9	3
Call drop rate (B/A*100)	≤ 2%	0.19%	3.10%	0.93%	0.29%

4. Voice quality

Audit Results for Voice quality -PMR Data-September

Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	7835328918	NA	218309057788
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	7749048372	NA	215781070030
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.51%	98.90%	99.69%	98.84%

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

Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	694455328	NA	22464045936
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		NA	686898958	NA	22201442530
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	99.50%	98.91%	99.69%	98.83%

Drive test results for Voice quality - DT data-September

Voice quality	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3421251	217495	3975595	NA
Faulty Transport Blocks InUplink downlink After Selection Combining Speech-10Sec		3351380	185236	3764969	NA
%Circuit Switch Voice Quality (CSV quality) (B/A*100)	≥ 95%	97.96%	85.17%	94.70%	NA

5. POI Congestion

Audit Results for POI Congestion- PMR data-September

POI congestion	Benchmark	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		297	31	96	328
No. of POIs not meeting benchmark		0	0	0	3
Total Capacity of all POIs (A) - in erlangs		141134	15181	47232	300414
Traffic served for all POIs (B)- in erlangs		97265	6898	30310	153748
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	Airtel 3G	MTNL 3G	Reliance 3G	Vodafone 3G
Total number of working POIs		297	31	95	326
No. of POIs not meeting benchmark		0	0	0	2
Total Capacity of all POIs (A) - in erlangs		140174	15180	46704	299325
Traffic served for all POIs (B)- in erlangs		93716	3483	27554	156942
POI congestion	≤ 0.5%	0.00%	0.00%	0.00%	0.00%

22 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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