PHISTREAM
EMPOWERING LEADERSHIP, TRANSFORMING BUSINESS

TRAI
सत्यमेव जयते
Telecom Regulatory Authority of India
(IS/ISO 9001-2008 Certified Organisation)



AUDIT & ASSESSMENT OF QUALITY OF SERVICE

NORTH ZONE – HIMACHAL PRADESH CIRCLE
CELLULAR MOBILE TELEPHONE SERVICE (CMTS)
(APRIL TO JUNE 2016)

PREPARED BY:

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1. INTRODUCTION

1.1. 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 Junket 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 June 20, 2009 and Quality of Service of Broadband Service Regulations, 2006 (11 of 2006) dated April 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).

1.2. ABOUT PHISTREAM CONSULTING PRIVATE LIMITED

Phistream Consulting Private Limited is an ISO:9001 certified company who are one of the pioneers in the field of technical audit, quality assurance and third party inspection services. Established more than a decade ago in 2004, we aspire to provide longer term savings based on year-on-year productivity. With our size, we are nimble and aspire to being a full service partner for providing consultancy services.

We have been helping our clients by determining the best solutions and enabling businesses to enjoy the benefits of top-notch support without distracting their team from the main business focus. Our business analysts have enough experience to get involved at the requirements gather stage through consulting work handing off a detailed requirements document to our operations staff who in turn can train our support and maintenance resources for ongoing engagement.

In keeping with our goal of being a one stop quality assurance and consulting partner, our specialists employ a strategy and consulting-based implementation methodology and capitalize on strong program governance to offer a wide range of services for various industry verticals.

1.3. OBJECTIVES

The primary objective of the Audit module is to:

- Audit and Assess the Quality of Services being rendered by Cellular Mobile (Wireless) 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 Himachal Pradesh circle.

1.4. COVERAGE

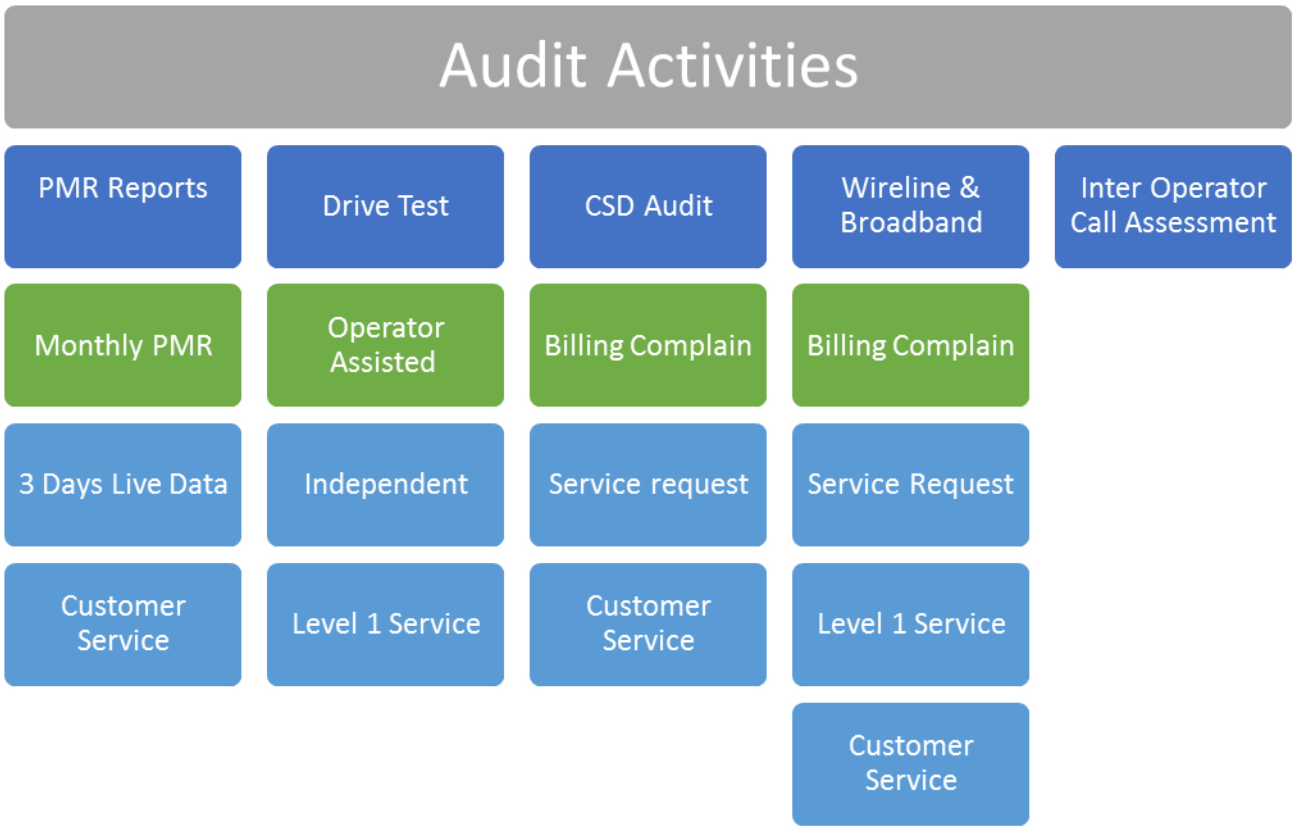
The audit was conducted in Himachal Pradesh Circle covering all SSAs (Secondary Switching Areas).

Image Source: Wikipedia

1.5. SSA List

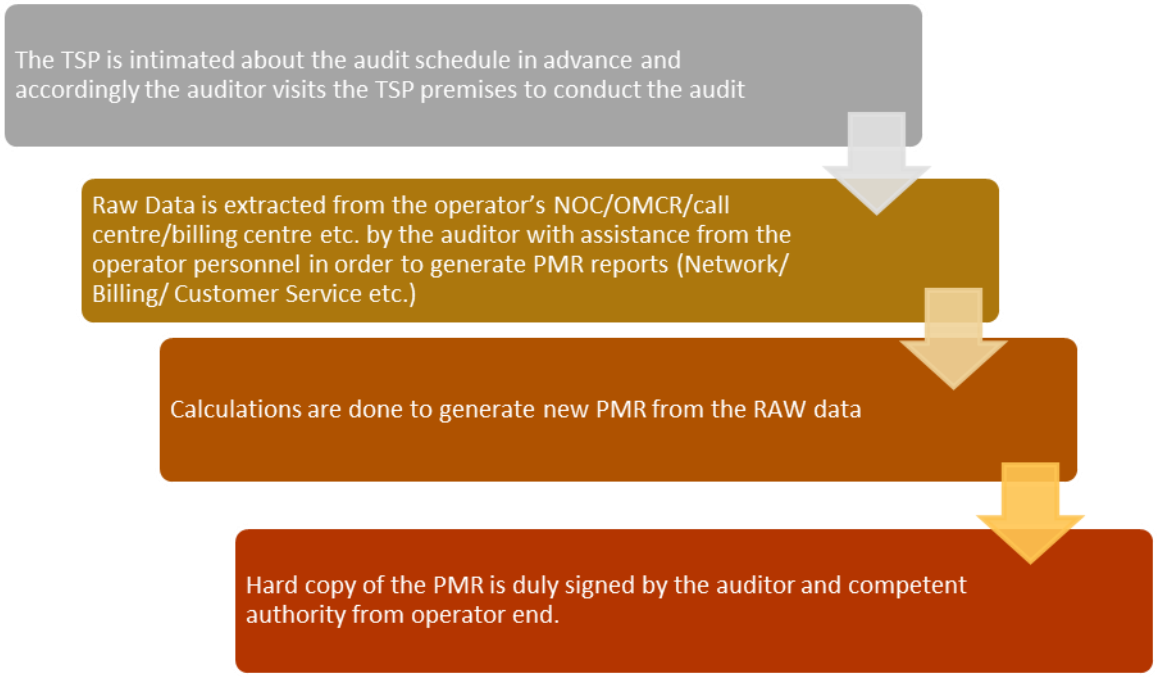
S. No.	Circle	SSA Name	SDCA Name
1	HP	Hamirpur	Amb
2	HP	Hamirpur	Bilaspur
3	HP	Hamirpur	Hamirpur
4	HP	Hamirpur	Una
5	HP	Kandra (dharamsala)	Pangi (killar)
6	HP	Kangra (dharamsala)	Bharmour
7	HP	Kangra (dharamsala)	Chamba
8	HP	Kangra (dharamsala)	Churah (tissa)
9	HP	Kangra (dharamsala)	Dehra gopipur
10	HP	Kangra (dharamsala)	Kangra (dharamsala)
11	HP	Kangra (dharamsala)	Nurpur
12	HP	Kangra (dharamsala)	Palampur
13	HP	Kullu	Banjar
14	HP	Kullu	Kullu
15	HP	Kullu	Lahul (keylong)
16	HP	Kullu	Nirmand
17	HP	Kullu	Spiti (kaza)
18	HP	Kullu	Udaipur
19	HP	Mandi	Jogindernagar
20	HP	Mandi	Mandi
21	HP	Mandi	Sundernagar
22	HP	Shimla	Kalpa
23	HP	Shimla	Pooh
24	HP	Shimla	Rampur bushahar
25	HP	Shimla	Rohru
26	HP	Shimla	Shimla
27	HP	Shimla	Theog
28	HP	Solan	Arki
29	HP	Solan	Nahan
30	HP	Solan	Nalagarh
31	HP	Solan	Paonta
32	HP	Solan	Rajgarh
33	HP	Solan	Solan

1.6. FRAMEWORK USED



2. PMR REPORTS

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, April 2016 audit data was collected in the month of May 2016.

The PMR report for customer service parameters is extracted from Customer Service Centre and verified once every quarter in the subsequent month of the last month of the quarter. For example, data for quarter ending June 2016 was collected in the month of June 2016.

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

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

Let us understand these formats in details.

2.1. MONTHLY PMR

This involved calculation of the various Quality of Service network parameters through monthly Performance Monitoring Reports (PMR). The PMR reports were generated from the data extracted from operator's systems by the auditor with the assistance of the operator at the operator's premises for the month of April, May and June 2016. The performance of operators on various parameters was assessed against the benchmarks.

Parameters includes:

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

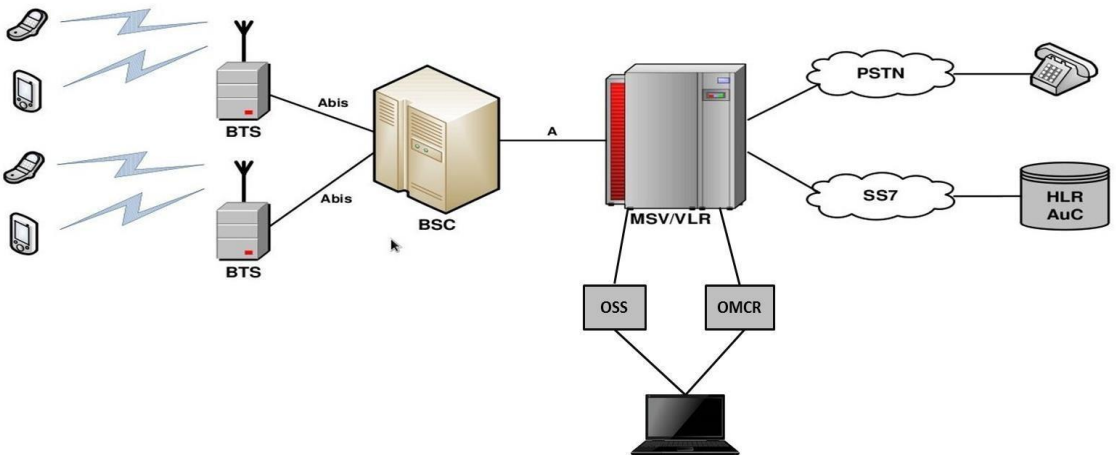
2.2. Audit Parameter: Network

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

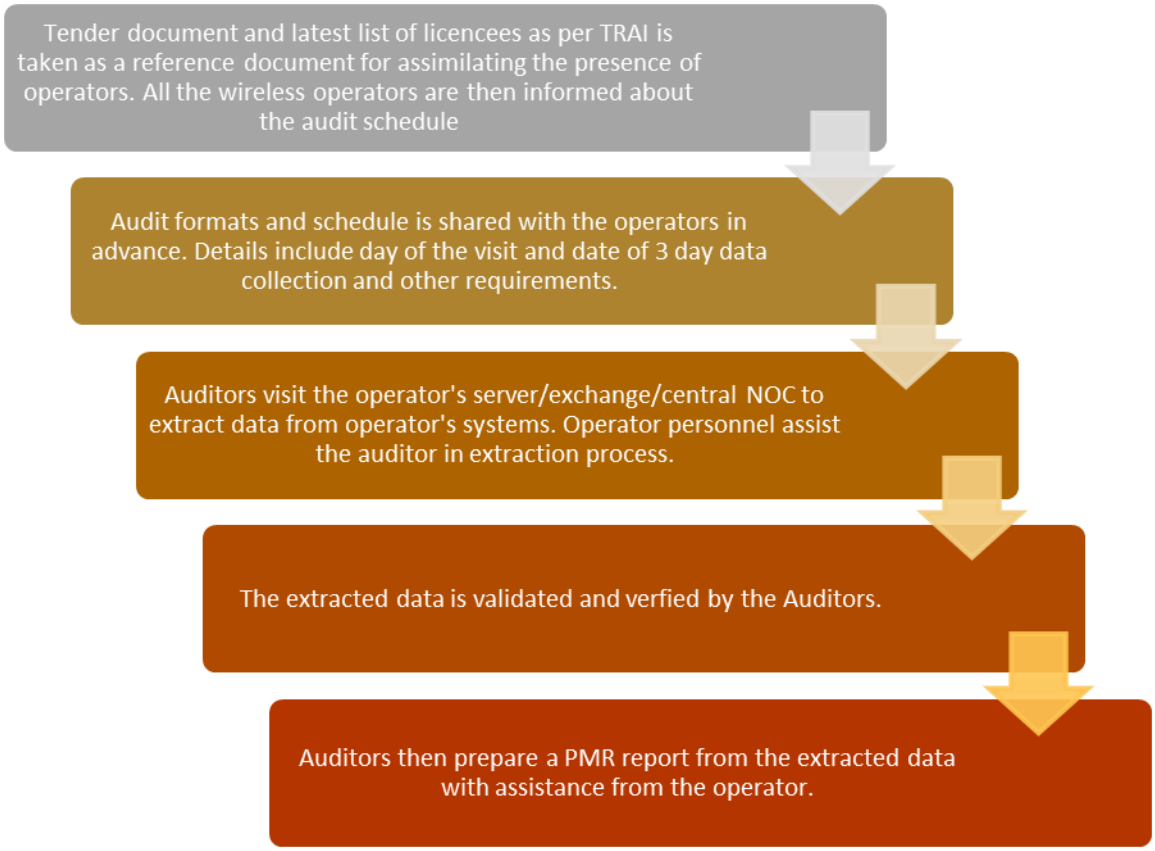
Network Availability	
BTSs Accumulated downtime (not available for service)	≤ 2%
Worst affected BTSs due to downtime	≤ 2%
Connection Establishment (Accessibility)	
Call Set-up Success Rate (within licensee's own network)	≥ 95%
SDCCH/ Paging Channel Congestion	≤ 1 %
TCH Congestion	≤ 2%
Connection Maintenance (Retainability)	
Call Drop Rate	≤ 2%
Worst affected cells having more than 3% TCH drop (call drop) rate	≤ 3%
Connections with good voice quality	≥ 95%
Point of Interconnection	
(POI) Congestion (on individual POI)	≤ 0.5%

2.3. Data Extraction Points

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



2.4. AUDIT PROCEDURE



Extracted data is calculated as per the counter details provided by the operators. The details of counters have been provided in the report. The calculation methodology for each parameter has been stated in the table given below:

2.5. Network Calculation Methodology

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
TCH Congestion	C2 = Average SDCCH / TCH Congestion % on day 2 An = Number of attempts to establish SDCCH / TCH made on day n Cn = Average SDCCH / TCH Congestion % on day n
POI Congestion	POI Congestion% = [(A1 x C1) + (A2 x C2) +…….+ (An x Cn)] / (A1 + A2 +…+ An) Where: A1 = POI traffic offered on all POIs (no. of calls) on day 1 C1 = Average POI Congestion % on day 1 A2 = POI traffic offered on all POIs (no. of calls) on day 2 C2 = Average POI Congestion % on day 2 An = POI traffic offered on all POIs (no. of calls) on day n Cn = Average POI Congestion % on day n
Call Drop Rate	Total Calls Dropped / Total Calls Established x 100
Worst Affected Cells having more than 3% TCH drop	Total number of cells having more than 3% TCH drop during CBBH/ Total number of cells in the LSA x 100
Connections with good voice quality	No. of voice samples with good voice quality / Total number of samples x 100

2.6. 3G VOICE

S. No.	Name of Parameter	Definition	Formula	Benchmark
1	Network Availability			
a.	Total no. of Node B's in LSA	Total no. of Node B's Licensed in LSA		
b.	Total downtime of all Node B's	When all the sector(s) of a Node B's are down for > 60 minutes at an instant in a whole day		
c.	No. of Worst Affected Node B's	Node B'ss having more than 24 hours of Downtime in 3 Days	No. of Node B's having accumulated downtime of >24 hours in a month ((No. of Node B's having Accumulated Downtime of > 24 hrs in a month) / Total no. of BTSs in the licensed service area)*100	<=2%
d.	Node B's accumulated downtime	Node B's downtime more than 24 hr in 3 days	Total no. of Node B's in the Licensed Service Area Sum of downtime of Node B's in a month in hours i.e. total outage time of all Node B's in hours in a month [(Sum of downtime of Node B's in a month in hrs)/(24* no. of days in the month*no. of Node B's in the licensed service area)]*100	<=2%
2	Connection Establishment (Accessibility)			
a.	Call Setup Success Rate:	It is the % of total no. of call established to the total no. of call attempt	Total No. of Voice Call Attempts Total No. of Voice Call Establishment CSSR (Call Setup Success Rate = (Total No. of Voice Call Attempts/ Total No. of Voice Call Establishment)*100)	>=95%
b.	RRC Congestion:	RRC Congestion rate is the % of Total No. of RRC Failed Calls to the Total no. of RRC Assigned Calls	RRC Attempts (RRC Connection Access) (A) RRC Failed (RRC Connection Access Failed) (B) RRC Congestion (%) [B/A]*100	<=1%
c.	RAB Congestion:	RAB Congestion rate is the % of Total No. of RAB Failed Calls to the Total no. of RAB Assigned Calls	RAB Attempts (RAB Setup Access) (C) RAB Failed (RAB Setup Access Failed) (D) RAB Congestion (%) [D/C]*100	<=2%
3	Connection Maintenance (Retainability)			
a.	Circuit Switched Voice Drop Rate	It is the % of total no. of Dropped Calls to the total no. of Calls Established	Total Established Calls (A) Calls Dropped after Establishment (B) Call Drop Rate [B/A]*100	<=2%
b.	Worst affected cells	It is the % of total no. of	Total No. of Cells (Sector)	<=3%

	having more than 3% Circuit Switched Voice Drop Rate:	Cells having > 3% Circuit Switched Voice drop to the total no. cells	Total No. of Cells exceeding 3% Circuit Switched Voice Drop Rate in CBBH (Cell Bouncing Busy Hour)	
			% of cells having more than 3% Circuit Switched Voice Drop Rate [(No. of cells having Circuit Switched Voice Drop Rate > 3% during CBBH in 31 days*100) / Total no. of cells in the licensed service area]	
c.	Percentage of connections with Good Circuit Switched Voice Quality	It can be defined as the % of Good Voice Quality Samples to the total No. of Quality Samples	Percentage of connection with Good Circuit Switched Voice Quality	*>=95%*
4	Total No. of POI's in Month having >=0.5% POI congestion	Total no. Of POI's which are exceeding the POI congession more than 0.5 %.	Total No. of call attempts on POI	<=0.5%
			Total traffic served on all POIs (Erlang)	
			Total No. of circuits on all individual POIs	
			Total number of working POI Service Area wise	
			Capacity of all POIs	
			No. of all POI's having >=0.5% POI congestion	
			Name of POI not meeting the benchmark (having >=0.5% POI congestion)	

2.7. 2G & 3G WIRELESS

S. No.	Name of Parameter	Definition	Formula	Benchmark
1	Service Activation/ Provisioning	This refers to the activation of services after activation of the SIM. This involves programming the various databases with the customer's information and any gateways to standard Internet chat or mail services or any data services.	Total No. of Subscribers for Service Activation (A)	*Within 4 Hours with 95% Success Rate*
			Total Service Activations provided within 4 Hours (B)	
			Service Activation / Provisioning = (B/A) * 100	
2	PDP Context Activation Success Rate	PDP Context Activation Success Rate is the ratio of total number of successfully completed PDP context activations to the total attempts of context activation	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)	>=95%
			Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)	
			PDP Context Activation Success Rate =(B/A) *100	
3	Drop Rate	It measures the inability of Network to maintain a connection and is defined as the ratio of abnormal disconnects w.r.t. all disconnects.	RNC originated PS Domain Iu Connection Setup Success (A)	<=5%
			RNC originated PS Domain Iu Connection Release (B)	
			Drop Rate = (B/A) * 100	

3. 3 DAYS LIVE DATA

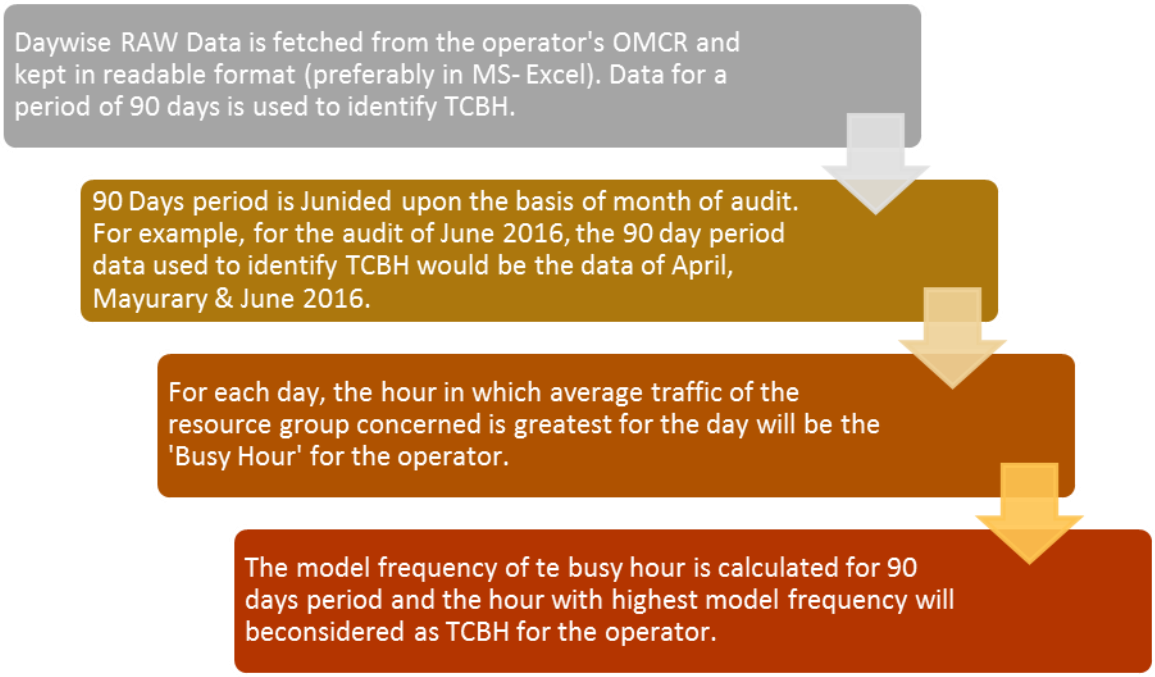
The main purpose of 3 day live measurement is to evaluate the network parameters on intraday basis. While the monthly PMR report provides an overall view of the performance of QoS parameters, the 3 day live data helps looking at intraday performance on the network parameters discussed earlier. All the 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 Q0S 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.

3.1. 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.



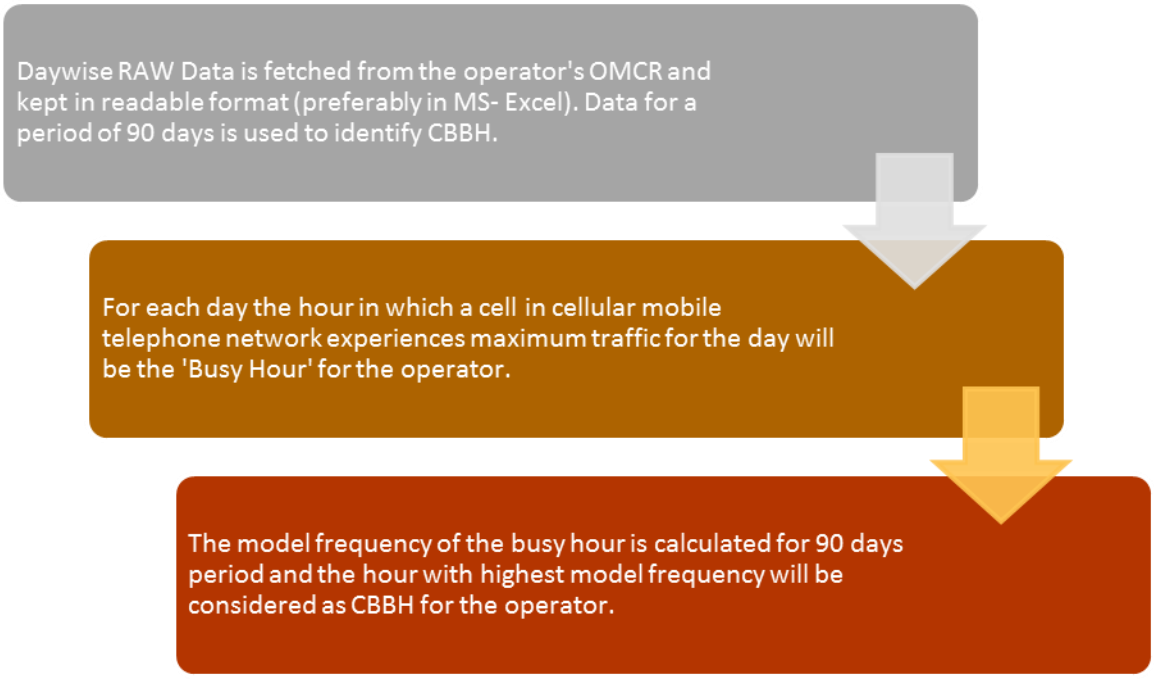
During audit, the auditors identified from the raw data that the TCBH for the operators in Apr– May – Jun 2016 was the time period as given below:

Aircel	Airtel	BSNL	Idea	RCOM GSM	RCOM CDMA	TTSL GSM	TTSL CDMA	Vodafone
19:00-20:00	19:00-20:00	19:00-20:00	19:00-20:00	19:00-20:00	19:00-20:00	19:00-20:00	19:00-20:00	19:00-20:00

3.2. 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:



4. 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 June 2016 was collected in the month of June 2016. To extract the data for customer service parameters for the purpose of audit, 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 (post-paid 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 the report.

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

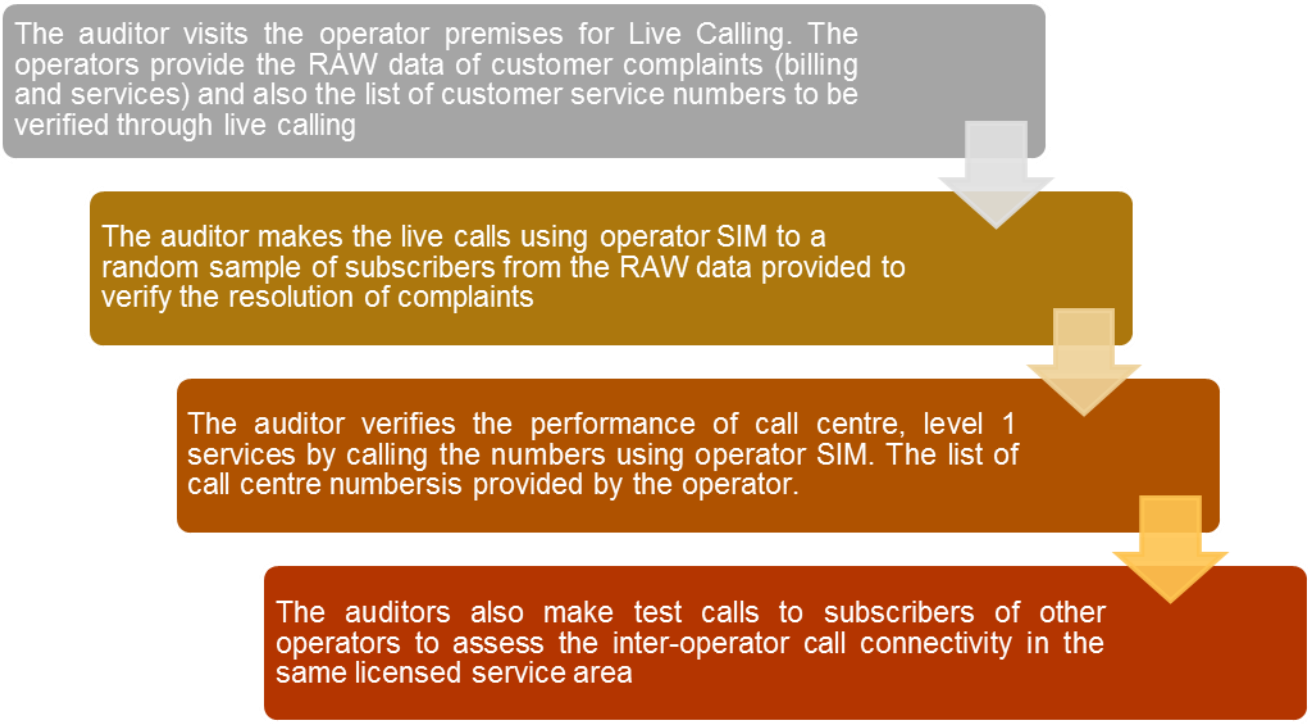
4.1. AUDIT PARAMETERS: CUSTOMER SERVICE

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%

4.2. Calculation Methodology: Customer Service Parameter

Parameter	Calculation Methodology
Metering and billing credibility : Post-paid	Total billing complaints received during the relevant billing cycle / Total bills generated during the relevant billing cycle *100
Metering and billing credibility : Pre-paid	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 (Post-paid + Pre-paid)	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

4.3. Live Calling: Significance and Methodology



Live calling activity was carried out during the period of June 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 April 2016 was considered for live calling activity conducted in May 2016.
A detailed explanation of each parameter is explained below:

4.4. 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 the 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 June, 2016 were considered as population for selection of samples.

TRAI Benchmark: Resolution of billing/ charging complaints: 98% within 4 weeks, 100% within 6 weeks.

4.5. 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 auditors.

4.6. Level 1

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

Level 1 Services include services such as police, fire, ambulance (Emergency services). Test calls were made from operator SIMs. A total of 150 test calls were made per service provider in the quarter.

While most of the Level 1 services are toll free, it has been observed that some Level 1 services may not be toll free. In April, May and June'15, auditor has tried contacting the list of Level 1 services provided by TRAI as per the NNP (National Numbering Plan).

4.7. Process to Test Level 1 Service

- During the operator assisted drive test, auditors ask the operator authorized personnel to make 5 calls in each SDCA on the Level 1 Service numbers provided by TRAI. The list contains a description of the numbers along with dialling code.

- Operators might also provide a 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 Number Details
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 - AIIMS
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 Educational& 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

4.8. Customer Care

Live calling is done to verify response time for customer assistance is done to verify the performance of call centre 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.

4.9. Inter Operator Call Assessment

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.

Inter Operator Call Assessment	Aircel	Airtel	BSNL	Idea	Reliance GSM	Reliance CDMA	TTSL GSM	TTSL CDMA	Vodafone
Aircel	-	100%	100%	100%	100%	100%	100%	100%	100%
Airtel	100%	-	100%	100%	100%	100%	100%	100%	100%
BSNL	100%	100%	-	100%	100%	100%	100%	100%	100%
Idea	100%	100%	100%	-	100%	100%	100%	100%	100%
Reliance GSM	100%	100%	100%	100%	-	100%	100%	100%	100%
Reliance CDMA	100%	100%	100%	100%	100%	-	100%	100%	100%
TTSL GSM	100%	100%	100%	100%	100%	100%	-	100%	100%
TTSL CDMA	100%	100%	100%	100%	100%	100%	100%	-	100%
Vodafone	100%	100%	100%	100%	100%	100%	100%	100%	-

5. Drive Test: Significance and Methodology

Drive test, as the name suggests, is conducted to measure the outdoor coverage in a moving vehicle in a specified network coverage area.

The main purpose of the drive test is to check the health of the mobile network of various operators in the area in terms of coverage (signal strength), voice quality, call drop rate, call set up success rate etc.

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

There are two types of drive test 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 PhiStream conducts the drive test on solitary basis and uses its own hardware. Operators generally do not have any knowledge of the independent drive test being conducted.

5.1. Operator Assisted Drive Test

Himachal Pradesh circle consist of total 6 SSA's and each SSA needs to be audit in the span of 12 months.
The methodology adopted for the drive test:

- 3 consecutive days drive test in each SSA. SSA would be defined as per DOT guidelines and month wise SSA list is finalized by regional TRAI office.
- On an average, a minimum of 80 kilometres are covered each day
- 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 and we can start from the point from where we had left last day (if possible).
- The route was classified as – Within City, Major Roads, Highways, Shopping complex/ Mall and Office Complex/ Government Building
- There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- The speed of the vehicle was kept at around 30 km/hr.
- The holding period of each test call was 120 seconds.
- A test call was generated 10 seconds after the previous test call is completed.
- Height of the antenna was kept uniform in case of all service providers.

5.2. INDEPENDENT DRIVE TEST

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

- A minimum of 80 kilometres was traversed during the independent drive test in a SSA. The SSA would be defined as per BSNL and SSA list will be finalized by regional TRAI office.
- 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 – Within city, Major Roads, Highways, Shopping complex/ Mall and Office Complex/ Government Building
- There were no fixed calls which we need to do for within city, major roads and highways, but a minimum of 30 calls in each route, i.e., within city, major roads and highways on each day. For indoors, 20 calls each for shopping and office complex each day preferably in relatively bigger city.
- The drive test covered selected cities and adjoining towns/rural areas where the service provider has commenced service, including congested areas and indoor sites.
- The drive test of each mobile network was conducted between 10 am and 8 pm on weekdays.
- The Vehicle used in the drive tests was equipped with the test tool that automatically generates calls on the mobile telephone networks.
- The speed of the vehicle was kept at around 30 km/hr.
- The holding period of each test call was 120 seconds.
- A test call was generated 10 seconds after the previous test call is completed.
- Height of the antenna was kept uniform in case of all service providers.

5.3. PARAMETERS EVALUATED DURING DRIVE TEST

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

- Coverage-Signal strength (GSM)
  - Total calls made (A)
  - Number of calls with signal strength between 0 to -75 dBm
  - Number of calls with signal strength between 0 to -85 dBm
  - Number of calls with signal strength between 0 to -95 dBm

- Coverage-Signal strength (CDMA)
  - Total Ec/Io BINS (A)
  - Total Ec/Io BINS with less than –15 (B)
  - Low Interference = [1 - (B/A)] x 100

- Voice quality (GSM)
  - Total RxQual Samples– A
  - RxQual samples with 0-5 value – B
  - %age samples with good voice quality = B/A x 100

- Voice quality (CDMA)
  - Total FER BINs (forward FER) – A
  - FER BINs with 0-2 value (forward FER) – B
  - FER BINs with 0-4 value (forward FER) – C
  - %age samples with FER bins having 0-2 value (forward FER) = B/A x 100
  - %age samples with FER bins having 0-4 value (forward FER) = C/A x 100
  - No. of FER samples with value > 4 = [A-C]

- Call setup success rate
  - Total number of call attempts – A
  - Total Calls successfully established – B
  - Call success rate (%age) = (B/A) x 100

- Blocked calls
  - 100% - Call Set up Rate

- Call drop rate
  - Total Calls successfully established – A
  - Total calls dropped after being established – B
  - Call Drop Rate (%age) = (B/A) x 100

6. EXECUTIVE SUMJUNY

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

6.1. OPERATORS COVERED

Name of Operator	Number of Subscriber (Up to June 30th, 2016)
AIRCEL	1106951
AIRTEL	2886253
BSNL	1797379
IDEA	830850
RCOM CDMA	152912
RCOM GSM	1615095
TTSL CDMA	24660
TTSL GSM	45913
VODAFONE	736329

TSP	No. of Cells	BTS	BSC	MSC+GMSC	Node B	RNC
AIRCEL	2193	735	8	2	NA	NA
AIRTEL	4650	1600	16	6	1424	5
BSNL	3615	1241	18	4+1	300	6
IDEA	3449	1152	7	3	600	2
RCOM CDMA	860	287	DNA	1	NA	NA
RCOM GSM	2250	751	12	2	170	2
TTSL CDMA	422	130	1	1	NA	NA
TTSL GSM	15	5	1	1	NA	NA
VODAFONE	2542	835	10	1	NA	NA

Note: Node B & RNC is marked as Not Applicable (N.A.) for the services providers who do not have 3G services licence in the circle.

6.2. AUDIT SCHEDULE

Operator	(3 Days Live) April 2016	April 2016	May 2016	June 2016
Airtel	8th Apr 2016	6th May 2016	10th Jun 2016	8th Jul 2016
Vodafone	13th Apr 2016	16th May 2016	15th Jun 2016	13th Jul 2016
Idea	11th Apr 2016	9th May 2016	9th Jun 2016	11th Jul 2016
Reliance	21st Apr 2016	5th May 2016	11th Jun 2016	21st Jul 2016
BSNL	14th Apr 2016	10th May 2016	16th May 2016	14th Jul 2016
Aircel	16th Apr 2016	7th May 2016	15th Jun 2016	16th Jul 2016
Tata Teleservices	19th Apr 2016	10th May 2016	7th Jun 2016	19th Jul 2016

Note: Audit schedule mentioned above is for the PMR audit for the last month. 3 day live monitoring for the current month was carried along with the PMR audit.

Colour codes to read the report:

	Not meeting the benchmark
NA	Data not applicable
DNA	Data not available at TSP premises

6.3. 2G VOICE PMR DATA: APRIL

Apr-16										
Network Parameters		Name of Service Provider								
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.12%	0.03%	1.98%	0.07%	0.07%	0.08%	0.00%	0.00%	0.03%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.14%	0.19%	1.85%	0.17%	0.00%	0.40%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.65%	98.75%	98.45%	99.49%	99.05%	95.53%	99.40%	99.86%	99.93%
	SDDCH/Paging chl. Congestion	≤ 1%	0.02%	0.14%	0.74%	0.10%	NA	0.22%	0.00%	0.00%	0.02%
	TCH Congestion	≤ 2%	0.18%	0.31%	1.92%	0.07%	0.09%	0.28%	0.00%	0.00%	0.07%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.12%	0.59%	1.95%	0.90%	0.08%	0.30%	0.09%	0.07%	0.57%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	9.84%	0.32%	2.82%	2.08%	17.09%	1.21%	1.69%	0.44%	2.43%
	%age of connection with good voice quality	≥ 95%	95.48%	97.79%	95.03%	97.46%	99.85%	96.69%	98.10%	97.64%	97.72%

6.4. 2G VOICE PMR DATA: MAY

Network Parameters		May-16									
		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.21%	0.02%	1.99%	0.25%	NA	0.10%	0.01%	0.00%	0.09%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	0.12%	1.93%	0.95%	NA	0.13%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.38%	98.54%	98.28%	99.30%	NA	95.45%	99.28%	99.56%	99.82%
	SDDCH/Paging chl. Congestion	≤ 1%	0.12%	0.32%	0.98%	0.09%	NA	0.42%	0.00%	0.00%	0.33%
	TCH Congestion	≤ 2%	0.43%	0.41%	1.72%	0.34%	NA	0.32%	0.02%	0.00%	0.18%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.14%	0.62%	1.97%	0.93%	NA	0.32%	0.10%	0.15%	0.53%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	10.16%	0.45%	2.87%	2.01%	NA	1.23%	2.02%	0.00%	2.43%
	%age of connection with good voice quality	≥ 95%	95.43%	97.75%	95.03%	97.68%	NA	96.80%	98.09%	97.83%	97.64%

6.5. 2G VOICE PMR DATA: JUNE

Network Parameters		Jun-16									
		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.18%	0.03%	1.95%	0.20%	NA	0.14%	0.00%	0.00%	0.09%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.14%	0.19%	1.93%	0.87%	NA	1.33%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.48%	98.80%	98.42%	99.52%	NA	95.84%	99.24%	99.62%	99.79%
	SDDCH/Paging chl. Congestion	≤ 1%	0.05%	0.22%	0.99%	0.05%	NA	0.30%	0.00%	0.00%	0.10%
	TCH Congestion	≤ 2%	0.32%	0.30%	1.58%	0.13%	NA	0.43%	0.03%	0.00%	0.21%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.31%	0.61%	1.82%	1.21%	NA	0.35%	0.12%	0.00%	0.61%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	10.47%	0.56%	2.59%	2.20%	NA	1.27%	1.86%	0.22%	2.37%
	%age of connection with good voice quality	≥ 95%	95.32%	97.75%	95.03%	98.00%	NA	96.60%	98.07%	95.95%	97.27%

6.6. 2G VOICE PMR DATA: CONSOLIDATED

Consolidated											
Network Parameters		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.17%	0.03%	1.97%	0.17%	0.07%	0.10%	0.00%	0.00%	0.07%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.09%	0.17%	1.90%	0.67%	0.00%	0.62%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.50%	98.69%	98.38%	99.44%	99.05%	95.61%	99.30%	99.68%	99.85%
	SDDCH/Paging chl. Congestion	≤ 1%	0.06%	0.22%	0.91%	0.08%	#DIV/0!	0.31%	0.00%	0.00%	0.15%
	TCH Congestion	≤ 2%	0.31%	0.34%	1.74%	0.18%	0.09%	0.35%	0.02%	0.00%	0.15%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.19%	0.60%	1.91%	1.01%	0.08%	0.32%	0.10%	0.07%	0.57%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	10.16%	0.44%	2.76%	2.10%	17.09%	1.24%	1.85%	0.22%	2.41%
	%age of connection with good voice quality	≥ 95%	95.41%	97.76%	95.03%	97.71%	99.85%	96.70%	98.09%	97.14%	97.54%

- AIRCEL has parameter value of 10.16% and failed to meet the benchmark of ≤ 3% Worst Affected cell having more than 3% TCH drop
- RCOM CDMA has parameter value of 17.09% and failed to meet the benchmark of ≤ 3% Worst Affected cell having more than 3% TCH drop

6.7. 2G VOICE 3 DAYS LIVE DATA

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

6.8. 2G VOICE 3 DAYS LIVE DATA: APRIL

Apr-16											
Network Parameters		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.07%	0.07%	0.18%	0.12%	0.10%	0.15%	0.00%	0.00%	0.07%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	0.00%	0.16%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.33%	98.71%	97.99%	99.55%	99.02%	96.25%	99.31%	99.52%	99.93%
	SDDCH/Paging chl. Congestion	≤ 1%	0.38%	0.17%	0.62%	0.06%	NA	0.15%	0.00%	0.00%	0.00%
	TCH Congestion	≤ 2%	0.50%	0.34%	2.05%	0.01%	0.06%	0.37%	0.00%	0.00%	0.07%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.14%	0.60%	1.99%	0.93%	0.09%	0.30%	0.09%	0.00%	0.59%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	10.52%	0.39%	2.82%	1.97%	0.50%	1.07%	1.34%	NA	2.48%
	%age of connection with good voice quality	≥ 95%	95.30%	97.78%	94.96%	96.60%	99.82%	96.67%	98.11%	98.33%	97.77%

6.9. 2G VOICE 3 DAYS LIVE DATA: MAY

Network Parameters		May-16									
		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.11%	0.05%	0.22%	0.29%	NA	0.14%	0.14%	0.00%	0.15%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	0.00%	0.24%	0.00%	NA	0.00%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.48%	98.65%	98.39%	99.33%	NA	94.52%	99.28%	99.56%	99.85%
	SDDCH/Paging chl. Congestion	≤ 1%	0.08%	0.32%	1.32%	0.02%	NA	0.74%	0.00%	0.00%	0.07%
	TCH Congestion	≤ 2%	0.34%	0.35%	1.61%	0.32%	NA	0.57%	0.02%	0.00%	0.15%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.02%	0.64%	1.94%	0.94%	NA	0.37%	0.10%	0.15%	0.63%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	9.39%	0.35%	2.87%	1.63%	NA	0.89%	2.02%	0.00%	2.47%
	%age of connection with good voice quality	≥ 95%	95.30%	97.72%	95.10%	97.31%	NA	96.53%	98.09%	97.83%	97.77%

6.10. 2G VOICE 3 DAYS LIVE DATA: JUNE

Network Parameters		Jun-16									
		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.19%	0.06%	1.76%	0.31%	NA	0.25%	0.02%	0.00%	0.04%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	0.00%	0.16%	0.00%	NA	0.00%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.60%	98.78%	98.51%	99.64%	NA	95.50%	99.34%	99.46%	99.76%
	SDDCH/Paging chl. Congestion	≤ 1%	0.06%	0.22%	0.72%	0.01%	NA	0.33%	0.00%	0.00%	0.03%
	TCH Congestion	≤ 2%	0.20%	0.29%	1.49%	0.01%	NA	0.48%	0.01%	0.00%	0.24%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.25%	0.65%	1.33%	1.25%	NA	0.38%	0.11%	0.00%	0.53%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	9.55%	0.61%	2.80%	2.61%	NA	1.32%	1.90%	NA	2.39%
	%age of connection with good voice quality	≥ 95%	95.33%	97.72%	96.73%	97.06%	NA	96.28%	98.16%	96.05%	97.51%

6.11. 2G VOICE 3 DAYS LIVE DATA: CONSOLIDATED

Consolidated											
Network Parameters		Name of Service Provider									
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.12%	0.06%	0.72%	0.24%	0.10%	0.18%	0.05%	0.00%	0.09%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	0.00%	0.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.47%	98.71%	98.30%	99.51%	99.02%	95.42%	99.31%	99.52%	99.85%
	SDDCH/Paging chl. Congestion	≤ 1%	0.18%	0.23%	0.89%	0.03%	NA	0.41%	0.00%	0.00%	0.03%
	TCH Congestion	≤ 2%	0.35%	0.33%	1.72%	0.11%	0.06%	0.48%	0.01%	0.00%	0.15%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.14%	0.63%	1.75%	1.04%	0.09%	0.35%	0.10%	0.05%	0.58%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	9.82%	0.45%	2.83%	2.07%	0.50%	1.09%	1.75%	0.00%	2.44%
	%age of connection with good voice quality	≥ 95%	95.31%	97.74%	95.59%	96.99%	99.82%	96.49%	98.12%	97.40%	97.68%

- AIRCEL has parameter value of 9.82% and failed to meet the benchmark of ≤ 3% Worst Affected cell having more than 3% TCH drop

6.12. 3G VOICE PMR: CONSOLIDATED

Consolidated						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM GSM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.13%	1.39%	0.26%	0.06%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.21%	1.66%	0.22%	0.39%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.00%	97.85%	99.23%	96.66%
	RRC Congestion:	≤ 1%	0.05%	0.69%	0.50%	0.17%
	RAB Congestion:	≤ 2%	0.01%	0.39%	0.19%	0.09%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.63%	0.99%	1.73%	0.13%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.12%	2.67%	2.24%	0.50%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.91%	99.67%	97.55%	99.91%

6.13. 3G VOICE PMR: APRIL

Apr-16						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM GSM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.13%	1.45%	0.10%	0.05%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.21%	1.67%	0.00%	0.59%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	98.96%	97.62%	99.19%	98.35%
	RRC Congestion:	≤ 1%	0.04%	0.72%	0.33%	0.13%
	RAB Congestion:	≤ 2%	0.02%	0.41%	0.18%	0.00%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.66%	1.00%	1.72%	0.03%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.14%	2.68%	2.33%	0.05%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.84%	99.66%	97.63%	99.93%

6.14. 3G VOICE PMR: MAY

May-16						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM GSM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.11%	1.48%	0.53%	0.07%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.21%	1.66%	0.50%	0.59%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.00%	97.66%	99.18%	98.29%
	RRC Congestion:	≤ 1%	0.04%	0.68%	0.60%	0.13%
	RAB Congestion:	≤ 2%	0.01%	0.39%	0.24%	0.26%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.65%	1.00%	1.79%	0.09%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.15%	2.67%	2.16%	0.32%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.94%	99.67%	97.26%	99.92%

6.15. 3G VOICE PMR: JUNE

Jun-16						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM GSM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.14%	1.24%	0.16%	0.06%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.20%	1.63%	0.17%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.05%	98.25%	99.33%	93.35%
	RRC Congestion:	≤ 1%	0.06%	0.67%	0.56%	0.26%
	RAB Congestion:	≤ 2%	0.01%	0.38%	0.16%	0.01%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.57%	0.98%	1.66%	0.27%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.08%	2.66%	2.22%	1.11%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.94%	99.68%	97.77%	99.88%

6.16. 3G VOICE 3 DAYS LIVE DATA: CONSOLIDATED

Consolidated						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.46%	DNA	0.15%	0.12%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	DNA	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.07%	97.20%	99.15%	97.23%
	RRC Congestion:	≤ 1%	0.01%	0.64%	0.53%	0.25%
	RAB Congestion:	≤ 2%	0.01%	0.41%	0.28%	0.00%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.62%	1.00%	1.78%	0.13%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.16%	2.65%	1.98%	0.62%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.89%	99.67%	97.91%	99.89%

6.17. 3G VOICE 3 DAYS LIVE DATA: APRIL

Apr-16						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.54%	DNA	0.09%	0.02%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	DNA	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	98.94%	97.12%	98.80%	98.23%
	RRC Congestion:	≤ 1%	0.03%	0.65%	0.54%	0.12%
	RAB Congestion:	≤ 2%	0.02%	0.36%	0.53%	0.00%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.66%	1.02%	1.68%	0.04%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.40%	2.68%	2.09%	0.00%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.77%	99.68%	98.10%	99.92%

6.18. 3G VOICE 3 DAYS LIVE DATA: MAY

May-16						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.46%	DNA	0.17%	0.12%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	DNA	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.10%	96.52%	99.26%	99.62%
	RRC Congestion:	≤ 1%	0.01%	0.60%	0.61%	0.57%
	RAB Congestion:	≤ 2%	0.00%	0.44%	0.21%	0.00%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.61%	1.01%	1.90%	0.03%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.05%	2.64%	1.72%	0.13%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.95%	99.69%	97.66%	99.92%

6.19. 3G VOICE 3 DAYS LIVE DATA: JUNE

Jun-16						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.39%	DNA	0.19%	0.22%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.00%	DNA	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.18%	97.95%	99.39%	93.83%
	RRC Congestion:	≤ 1%	0.00%	0.68%	0.43%	0.05%
	RAB Congestion:	≤ 2%	0.00%	0.42%	0.11%	0.00%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.58%	0.96%	1.78%	0.32%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.04%	2.63%	2.13%	1.74%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.94%	99.65%	97.98%	99.84%

6.20. PMR MONTHLY 2G WIRELESS DATA - CONSOLIDATED

Consolidated											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		111886	DNA	159	47150.33333	1	58144.33333	DNA	1	5367.666667
ii)	Total Service Activations provided within 4 Hours (B)		111831	DNA	159	47149.33333	1	58139.66667	DNA	1	5197.666667
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	0.99941445	DNA	1	0.999969266	1	0.999952916	DNA	1	0.980925496
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		59018204.33	11233452.33	66669923.31	48604778.33	DNA	DNA	8175594.333	132.6666667	409761906
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		58584842.67	11230582.67	66651037.54	47889676	DNA	DNA	7888149.667	132.6666667	407908796
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	0.994594677	0.99974763	0.999716272	0.985685766	0.976313333	0.997335054	0.964851812	1	0.995698719
3	Drop Rate										
i)	TBF originated PS Domain Iu Connection Setup Success (A)		653932246.3	2520976010	DNA	1025743189	943883	305579538	531890.6667	47225.66667	DNA
ii)	TBF originated PS Domain Iu Connection Release (B)		6212606.333	30241796.33	DNA	6829494.333	2656	14699978.67	5190	87.66666667	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.009484296	0.011915851	0.013608812	0.006650953	0.002813908	0.048110995	0.009870776	0.001719982	DNA

6.21. PMR MONTHLY 2G WIRELESS DATA - APRIL

Apr-16											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		65384	DNA	127	32537	1	23568	DNA	1	3356
ii)	Total Service Activations provided within 4 Hours (B)		65329	DNA	127	32534	1	23568	DNA	1	3355
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	99.92%	DNA	100.00%	99.99%	100.00%	100.00%	DNA	100.00%	99.97%
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		119001585	12653597	66279054.8	45204727	DNA	DNA	7865175	137	22560361
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		117913171	12649971	66264483.3	44851270	DNA	DNA	7592060	137	22474105
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.09%	99.97%	99.98%	99.22%	97.63%	99.92%	96.53%	100.00%	99.62%
3	Drop Rate										
i)	TBF originated PS Domain Iu Connection Setup Success (A)		588312937	2172098758	DNA	939900809	943883	283348391	544587	25694	DNA
ii)	TBF originated PS Domain Iu Connection Release (B)		5403258	24158521	DNA	6187068	2656	13704118	3940	45	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.92%	1.11%	1.33%	0.66%	0.28%	4.84%	0.72%	0.18%	DNA

6.22. PMR MONTHLY 2G WIRELESS DATA - MAY

May-16											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		112688	DNA	167	53240	NA	37192	DNA	DNA	9099
ii)	Total Service Activations provided within 4 Hours (B)		112602	DNA	167	53240	NA	37191	DNA	DNA	8596
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	99.92%	DNA	100.00%	100.00%	NA	100.00%	DNA	DNA	94.47%
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		33359451	10784465	69398698	48861131	NA	DNA	8408074	102	643850446
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		33216659	10781283	69378550	48425434	NA	DNA	8107240	102	640973002
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.57%	99.97%	99.97%	99.11%	NA	99.41%	96.42%	100.00%	99.55%
3	Drop Rate										
i)	TBF originated PS Domain Iu Connection Setup Success (A)		679605896	2555903137	DNA	1034383240	NA	314481022	556818	41789	DNA
ii)	TBF originated PS Domain Iu Connection Release (B)		6450715	29717367	DNA	6716047	NA	14863072	5070	45	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.95%	1.16%	1.37%	0.65%	NA	4.73%	0.91%	0.11%	DNA

6.23. PMR MONTHLY 2G WIRELESS DATA - JUNE

Jun-16											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		157586	DNA	183	55674	NA	113673	DNA	1	3648
ii)	Total Service Activations provided within 4 Hours (B)		157562	DNA	183	55674	NA	113660	DNA	1	3642
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	99.98%	DNA	100.00%	100.00%	NA	99.99%	DNA	100.00%	99.84%
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		24693577	10262295	64332017.12	51748477	NA	DNA	8253534	159	562874911
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		24624698	10260494	64310079.38	50392324	NA	DNA	7965149	159	560279281
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.72%	99.98%	99.97%	97.38%	NA	99.88%	96.51%	100.00%	99.54%
3	Drop Rate										
i)	TBF originated PS Domain Iu Connection Setup Success (A)		693877906	2834926135	DNA	1102945518	NA	318909201	494267	74194	DNA
ii)	TBF originated PS Domain Iu Connection Release (B)		6783846	36849501	DNA	7585368	NA	15532746	6560	173	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.98%	1.30%	1.38%	0.69%	NA	4.87%	1.33%	0.23%	DNA

6.24. PMR 3 DAY LIVE 2G WIRELESS DATA - CONSOLIDATED

Consolidated											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		111886	DNA	159	47150.33333	1	58144.33333	DNA	1	5367.666667
ii)	Total Service Activations provided within 4 Hours (B)		111831	DNA	159	47149.33333	1	58139.66667	DNA	1	5197.666667
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	0.99941445	DNA	1	0.999969266	1	0.999952916	DNA	1	0.980925496
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		59018204.33	11233452.33	66669923.31	48604778.33	DNA	DNA	8175594.333	132.6666667	409761906
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		58584842.67	11230582.67	66651037.54	47889676	DNA	DNA	7888149.667	132.6666667	407908796
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	0.994594677	0.99974763	0.999716272	0.985685766	0.976313333	0.997335054	0.964851812	1	0.995698719
3	Drop Rate										
i)	TBF originated PS Domain Iu Connection Setup Success (A)		653932246.3	2520976010	DNA	1025743189	943883	305579538	531890.6667	47225.66667	DNA
ii)	TBF originated PS Domain Iu Connection Release (B)		6212606.333	30241796.33	DNA	6829494.333	2656	14699978.67	5190	87.66666667	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.009484296	0.011915851	0.013608812	0.006650953	0.002813908	0.048110995	0.009870776	0.001719982	DNA

6.25. PMR 3 DAY LIVE 2G WIRELESS DATA - APRIL

Apr-16											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		DNA	DNA	14	3693	5	4355	DNA	DNA	DNA
ii)	Total Service Activations provided within 4 Hours (B)		DNA	DNA	14	3693	5	4355	DNA	DNA	DNA
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	DNA	1	100.00%	100.00%	100.00%	DNA	DNA	DNA
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		11435881	1248125	6503755.59	4381883	NP	NP	793625	10	63126677
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		11255006	1247809	6503263.87	4329525	NP	NP	765895	10	62580325
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	98.41835535	99.974682	99.99%	98.81%	97.51%	99.76%	96.51%	100.00%	99.13%
3	Drop Rate										
i)	RNC originated PS Domain Iu Connection Setup Success (A)		45228074	215989339	NA	100654592	125616	27947178	65202	6567	DNA
ii)	RNC originated PS Domain Iu Connection Release (B)		350063	2406330	NA	670690	230	1329245	354	3	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.77%	1.11%	1.33%	0.67%	0.18%	4.76%	0.54%	0.05%	DNA

6.26. PMR 3 DAY LIVE 2G WIRELESS DATA - MAY

May-16											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		DNA	DNA	12	3693	NA	3442	DNA	DNA	DNA
ii)	Total Service Activations provided within 4 Hours (B)		DNA	DNA	12	3693	NA	3442	DNA	DNA	DNA
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	DNA	100.00%	100.00%	NA	100.00%	DNA	DNA	DNA
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		2492766	1092411	6531381.895	4932842	NA	NP	8408074	102	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		2492024	1092173	6529096.377	4889477	NA	NP	8107240	102	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.97%	99.98%	99.97%	99.12%	NA	99.82%	96.42%	100.00%	DNA
3	Drop Rate										
i)	RNC originated PS Domain Iu Connection Setup Success (A)		66501591	259369924	NA	100497975	NA	27815731	556818	41789	DNA
ii)	RNC originated PS Domain Iu Connection Release (B)		612820	3078644	NA	677795	NA	1353794	5070	45	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.92%	1.19%	1.35%	0.67%	NA	4.87%	0.91%	0.11%	DNA

6.27. PMR 3 DAY LIVE 2G WIRELESS DATA – JUNE

Jun-16											
Cellular Mobile Telephone Services											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Service Activation/ Provisioning										
i)	Total No. of Subscribers for Service Activation (A)		DNA	DNA	15	5316	NA	5498	DNA	DNA	DNA
ii)	Total Service Activations provided within 4 Hours (B)		DNA	DNA	15	5316	NA	5498	DNA	DNA	DNA
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	DNA	100.00%	100.00%	NA	100.00%	DNA	DNA	DNA
2	PDP Context Activation Success Rate										
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		2423040	1013118	6315655.773	5285141	NA	DNA	875025	21	18924904.33
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		2422377	1012976	6314129.616	5129851	NA	DNA	843752	21	18839375.67
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.97%	99.99%	99.98%	97.06%	NA	99.84%	96.43%	100.00%	99.55%
3	Drop Rate										
i)	RNC originated PS Domain Iu Connection Setup Success (A)		69257318	280577215	DNA	113099543	NA	32154373	65739	7843	DNA
ii)	RNC originated PS Domain Iu Connection Release (B)		654220	3803866	DNA	757739	NA	1561784	543	1	DNA
iii)	Drop Rate = (B/A) * 100	<=5%	0.94%	1.36%	1.52%	0.67%	NA	4.86%	0.83%	0.01%	DNA

6.28. PMR MONTHLY 3G WIRELESS DATA - CONSOLIDATED

Consolidated						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	385.6666667	47150.33333	75432.5
ii)	Total Service Activations provided within 4 Hours (B)		DNA	385.6666667	47149.33333	75425.5
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	100.00%	99.99%
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		3228948.333	31647997.74	26781360.33	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		3227778.667	31642230.73	26282055.67	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.96%	99.98%	98.13%	98.27%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		232091215.7	DNA	85826005.33	10131071.33
ii)	RNC originated PS Domain Iu Connection Release (B)		1237255.667	DNA	2120903.667	85142
iii)	Drop Rate = (B/A) * 100	<=5%	0.54%	1.36%	2.46%	0.84%

6.29. PMR MONTHLY 3G WIRELESS DATA - APRIL

Apr-16						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	324	32537	DNA
ii)	Total Service Activations provided within 4 Hours (B)		DNA	324	32534	DNA
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	99.99%	DNA
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		3372327	29348086.6	24664198	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		3369724	29343759.5	24212460	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.92%	99.99%	98.17%	98.12%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		227120108	DNA	79537456	9926231
ii)	RNC originated PS Domain Iu Connection Release (B)		1276618	DNA	1717016	65028
iii)	Drop Rate = (B/A) * 100	<=5%	0.56%	1.33%	2.16%	0.66%

6.30. PMR MONTHLY 3G WIRELESS DATA - MAY

May-16						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	343	53240	37192
ii)	Total Service Activations provided within 4 Hours (B)		DNA	343	53240	37191
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	100.00%	100.00%
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		3205679	32977192.26	28650119	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		3204778	32971867.09	28166306	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.97%	99.98%	98.31%	98.11%
3	3					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		251892238	DNA	92792764	9797485
ii)	RNC originated PS Domain Iu Connection Release (B)		1097411	DNA	2328108	83569
iii)	Drop Rate = (B/A) * 100	<=5%	0.44%	1.38%	2.51%	0.85%

6.31. PMR MONTHLY 3G WIRELESS DATA - JUNE

Jun-16						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	490	55674	113673
ii)	Total Service Activations provided within 4 Hours (B)		DNA	490	55674	113660
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	100.00%	99.99%
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		3108839	32618714.32	27029764	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		3108834	32611065.59	26467401	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	100.00%	99.98%	97.92%	98.59%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		217261301	DNA	85147796	10669498
ii)	RNC originated PS Domain Iu Connection Release (B)		1337738	DNA	2317587	106829
iii)	Drop Rate = (B/A) * 100	<=5%	0.62%	1.38%	2.72%	1.00%

6.32. PMR 3 DAY LIVE 3G WIRELESS DATA - CONSOLIDATED

Consolidated						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	37	4234	4432
ii)	Total Service Activations provided within 4 Hours (B)		DNA	37	4234	4432
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	100.00%	100.00%
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		249736	3253801	2696880	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		249562	3253502	2650913	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.95%	99.99%	98.28%	98.23%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		21428886	DNA	8953154	953560
ii)	RNC originated PS Domain Iu Connection Release (B)		127707	DNA	222742	8860
iii)	Drop Rate = (B/A) * 100	<=5%	0.60%	1.43%	2.47%	0.92%

6.33. PMR 3 DAY LIVE 3G WIRELESS DATA - APRIL

Apr-16						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	11	3693	4355
ii)	Total Service Activations provided within 4 Hours (B)		DNA	11	3693	4355
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	100.00%	100.00%
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		342255	3150235	2295183	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		341975	3150034	2253649	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.92%	99.99%	98.19%	97.80%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		22312763	DNA	8166767	1040440
ii)	RNC originated PS Domain Iu Connection Release (B)		128800	DNA	175416	8401
iii)	Drop Rate = (B/A) * 100	<=5%	0.58%	1.42%	2.15%	0.81%

6.34. PMR 3 DAY LIVE 3G WIRELESS DATA - MAY

May-16						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	45	3693	3442
ii)	Total Service Activations provided within 4 Hours (B)		DNA	45	3693	3442
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100.00%	100.00%	100
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		303157	3112678	2766682	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		302916	3112226	2710896	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	99.92%	99.99%	97.98%	98.25%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		20686252	DNA	9362046	757340
ii)	RNC originated PS Domain Iu Connection Release (B)		119556	DNA	250633	6663
iii)	Drop Rate = (B/A) * 100	<=5%	0.58%	1.35%	2.68%	0.88%

6.35. PMR 3 DAY LIVE 3G WIRELESS DATA - JUNE

Jun-16						
Cellular Mobile Telephone Services						
S. No.	Name of Parameter	Benchmark	AIRTEL	BSNL	IDEA	RCOM
Network Service Quality Parameter						
1	Service Activation/ Provisioning					
i)	Total No. of Subscribers for Service Activation (A)		DNA	54	5316	5498
ii)	Total Service Activations provided within 4 Hours (B)		DNA	54	5316	5498
iii)	Service Activation / Provisioning = (B/A) * 100	*Within 4 Hours with 95% Success Rate*	DNA	100%	100%	100.00%
2	PDP Context Activation Success Rate					
i)	Total No. of PDP Context Activation Requests (from SGSN to GGSN) (A)		103796	3498490	3028774	DNA
ii)	Total No. of PDP Context Activation Success (path created b/w SGSN and GGSN) (B)		103796	3498245	2988194	DNA
iii)	PDP Context Activation Success Rate =(B/A) *100	>=95%	100.00%	99.99%	98.66%	98.66%
3	Drop Rate					
i)	RNC originated PS Domain Iu Connection Setup Success (A)		21287642	DNA	9330649	1062900
ii)	RNC originated PS Domain Iu Connection Release (B)		134765	DNA	242177	11515
iii)	Drop Rate = (B/A) * 100	<=5%	0.63%	1.52%	2.60%	1.08%

6.36. POI CONGESTION: CONSOLIDATED

Consolidated											
Monthly TRAI Network Performance Report of Cellular Mobile Telephone Service - Network Service											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Network Availability										
7	Total No. of POI's in Month having < = 0.5% POI congestion										
	Total No. of call attempts on POI		238429.03	783082.62	696908.11	182950.71	7466.7917	231012.13	51804.908	1485.4483	519886.67
	Total traffic served on all POIs (Erlang)		6154.187	24078.537	11523.265	6592.6398	143.3275	4316.5315	975.65224	27.439425	11912.346
	Total No. of circuits on all individual POIs		14618	41792.937	20200	13726.988	2094	14175.323	6088.6667	183	26904.378
	Total number of working POI Service Area wise		27.666667	37.333333	34	20	13	21.988889	55	1	61
	Capacity of all POIs		13573.778	41375.008	18180	13122.065	1396.2786	12938.741	5058.304	150.00958	25678.87
	No. of all POI's having >=0.5% POI congestion		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	Name of POI not meeting the benchmark (having >=0.5% POI congestion)		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

6.37. POI CONGESTION: APRIL

Apr-16											
Monthly TRAI Network Performance Report of Cellular Mobile Telephone Service - Network Service											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Network Availability										
7	Total No. of POI's in Month having < = 0.5% POI congestion										
	Total No. of call attempts on POI		227146.1	805781.3	747098.0667	193896.1333	7467	228407.52	51519	1502	511306
	Total traffic served on all POIs (Erlang)		5849.424074	24734.286	11807.29887	6888.587963	143	4271.288399	960	27	11710
	Total No. of circuits on all individual POIs		14414	41504.83333	20200	13730	2094	14401	6089	183	26763
	Total number of working POI Service Area wise		27	37	34	20	13	22	55	1	61
	Capacity of all POIs		13392	41090	18180	13125	1396	12954	5059	150	25626
	No. of all POI's having >=0.5% POI congestion		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	Name of POI not meeting the benchmark (having >=0.5% POI congestion)		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

6.38. POI CONGESTION: MAY

May-16											
Monthly TRAI Network Performance Report of Cellular Mobile Telephone Service - Network Service											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Network Availability										
7	Total No. of POI's in Month having < = 0.5% POI congestion										
	Total No. of call attempts on POI		252044	775323	703765	183825	NA	227997	50116	1428	510147
	Total traffic served on all POIs (Erlang)		6199	24052	11551	6626	NA	4307	993	28	12139
	Total No. of circuits on all individual POIs		14720	41596	20200	13728	NA	14087	6089	183	27016
	Total number of working POI Service Area wise		28	38	34	20	NA	22	55	1	61
	Capacity of all POIs		13665	41180	18180	13123	NA	12932	5059	150	25655
	No. of all POI's having >=0.5% POI congestion		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	Name of POI not meeting the benchmark (having >=0.5% POI congestion)		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

6.39. POI CONGESTION: JUNE

Jun-16											
Monthly TRAI Network Performance Report of Cellular Mobile Telephone Service - Network Service											
S. No.	Name of Parameter	Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Service Quality Parameter											
1	Network Availability										
7	Total No. of POI's in Month having < = 0.5% POI congestion										
	Total No. of call attempts on POI		236097	768143	639861.1667	171131	NA	236632	53780	1526.689655	538207.3667
	Total traffic served on all POIs (Erlang)		6414.27	23450	11211.07801	6263.469333	NA	4372	973.6348765	27.70137931	11888.33
	Total No. of circuits on all individual POIs		14720	42278.3	20200	13722.9	NA	14038	6088	183	26934.2
	Total number of working POI Service Area wise		28	37	34	20	NA	22	55	1	61
	Capacity of all POIs		13664.74	41856	18180.00	13118.12	NA	12931	5057.714844	150	25756
	No. of all POI's having >=0.5% POI congestion		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
	Name of POI not meeting the benchmark (having >=0.5% POI congestion)		NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL

7. CUSTOMER SERVICE DELIVERY

7.1. BILLING AND CUSTOMER CARE

Name of Service Provider	Metering and Billing credibility		Billing Complaints			Termination & Closures	Time taken for refund of deposits after closures: Benchmark	Response time to customer for assistance	
	Postpaid Subscribers	Prepaid Subscribers	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	%age of where credit/waiver is received within one week	% of Termination/ Closure of service within 7 days (100 %)	Cleared over a period of <60 days (100%)	%age of calls answered by the IVR	%age of call answered by the operators (voice to voice) within 90 seconds
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	= 100%	= 100%	= 100%	= 100%	≥ 95%	≥ 95%
AIRCEL	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.23%	96.75%
AIRTEL	0.01%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	93.81%
BSNL	0.01%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	97.36%
IDEA	0.02%	0.02%	100.00%	100.00%	100.00%	100.00%	100.00%	99.32%	99.66%
RCOM CDMA	0.08%	0.01%	100.00%	100.00%	100.00%	100.00%	52.53%	95.88%	97.77%
RCOM GSM	0.09%	0.09%	100.00%	100.00%	100.00%	100.00%	67.86%	99.30%	96.62%
TTSL CDMA	0.00%	0.00%	NA	NA	100.00%	100.00%	100.00%	99.93%	98.03%
TTSL GSM	0.00%	0.00%	NA	NA	100.00%	100.00%	100.00%	98.03%	99.83%
VODAFONE	0.12%	0.03%	100.00%	100.00%	100.00%	100.00%	DNA	100.00%	98.98%

Name of Service Provider	Customer Care & Grievances Redressal	
	% of Complaints addressed at call center level	% of Complaints addressed by Appellate Authority
Benchmark		
AIRCEL	100.00%	NIL
AIRTEL	100.00%	100.00%
BSNL	98.48%	NIL
IDEA	82.09%	NIL
RCOM CDMA	100.00%	NIL
RCOM GSM	100.00%	100.00%
TTSL CDMA	100.00%	NIL
TTSL GSM	97.47%	100.00%
VODAFONE	8.50%	NIL

7.2. LIVE CALLING DATA: CONSOLIDATED

Name of Service Provider	Metering and Billing (Service Request)				Response time to customer for Assistanse	
	Total Calls Attempted	No. of Subscribers reached	Compalints/ Request attended to satisfaction	% of Complaints/ Request attended to satisfaction	Accessibility of call centre / Customer care	%age of call answered by the operators (voice to voice) within 90 seconds
Benchmark					**≥ 95%**	**≥ 95%**
AIRCEL	187	134	130	97.01%	100.00%	100.00%
AIRTEL	58	18	18	100.00%	100.00%	97.00%
BSNL	49	49	47	95.92%	100.00%	98.00%
IDEA	154	74	72	97.30%	100.00%	100.00%
RCOM CDMA	NA	NA	NA	NA	NA	NA
RCOM GSM	425	216	212	98.15%	100.00%	98.00%
TTSL CDMA	0	0	0	100.00%	100.00%	100.00%
TTSL GSM	0	0	0	100.00%	100.00%	100.00%
VODAFONE	0	0	0	100.00%	100.00%	100.00%

7.3. 3 DAYS LIVE CALL CENTRE DATA

Response time to customer assistance						
OPERATOR	**Total no of calls attempted to customer care/Call center**	**Total no. of calls successfully established to customer care/Call center**	**% age of Accessibility of Call centre**	**Total Calls reached to operator for (Voice to Voice)**	**Total number of calls answered by the operator (Voice to voice) within 90 seconds**	**% age calls answered by the operator within 90 seconds**
	AVERAGE					
OPERATOR			>=95%			>=95%
AIRCEL	32182	31610	98.22%	13303	12908	97.03%
AIRTEL	25795	25795	100.00%	30583	30002	98.10%
BSNL	1447	1447	100.00%	1885	1885	100.00%
IDEA	38180	37942	99.38%	13936	13678	98.15%
RCOM CDMA	NA	NA	NA	NA	NA	NA
RCOM GSM	67345	66997	99.48%	12950	12673	97.86%
TTSL CDMA	DNA	DNA	DNA	158	158	100.00%
TTSL GSM	DNA	DNA	DNA	198	198	100.00%
VODAFONE	33106	33106	100.00%	13051	13023	99.79%

8. L1 CALLING DATA

L1 Calling data covers all the SDCA covered across the one operator assisted drive tests:

- Solan: 15th June to 17th June 2016

8.1. SOLAN

AIRCEL					
SR. NO.	**EMERGENCY NUMBER**	**CALLS MADE**	**Nalagarh**	**Nahan**	**Arki**
1	100	5	√	√	√
2	101	5	√	√	√
3	102	5	√	√	√
4	104	5	√	√	√
5	108	5	√	√	√
6	138	5	√	√	√
7	149	5	×	×	×
8	181	5	√	√	√
9	182	5	×	×	×
10	1033	5	√	√	√
11	1037	5	×	×	×
12	1056	5	×	×	×
13	1060	5	×	×	×
14	1063	5	×	×	×
15	1064	5	√	√	√
16	1070	5	×	×	×
17	1071	5	×	×	×
18	1072	5	×	×	×
19	1073	5	×	×	×
20	1077	5	×	×	×
21	1090	5	×	×	×
22	1091	5	√	√	√
23	1097	5	√	√	√
24	1099	5	×	×	×
25	10580	5	×	×	×
26	10589	5	×	×	×
27	10740	5	×	×	×
28	10741	5	×	×	×
29	1511	5	×	×	×
30	1512	5	×	×	×
31	1514	5	×	×	×
32	15100	5	√	√	√
33	155304	5	×	×	×
34	155214	5	√	√	√
35	1903	5	√	√	√
36	1909	5	√	√	√
37	1912	5	×	×	×
38	1916	5	×	×	×
39	1950	5	√	√	√

AIRTEL								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	Baddi	Nauni	Nahan	Paunta Sahib	Jatoli Mandir Solan	Arki
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	√	√	√	√	√	√
5	108	5	√	√	√	√	√	√
6	138	5	√	√	√	√	√	√
7	149	5	×	×	×	×	×	×
8	181	5	√	√	√	√	√	√
9	182	5	√	√	√	√	√	√
10	1033	5	√	√	√	√	√	√
11	1037	5	×	×	×	×	×	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	×	×	×	×
14	1063	5	√	√	√	√	√	√
15	1064	5	×	×	×	×	×	×
16	1070	5	√	√	√	√	√	√
17	1071	5	√	√	√	√	√	√
18	1072	5	√	√	√	√	√	√
19	1073	5	√	√	√	√	√	√
20	1077	5	√	√	√	√	√	√
21	1090	5	×	×	×	×	×	×
22	1091	5	√	√	√	√	√	√
23	1097	5	√	√	√	√	√	√
24	1099	5	√	√	√	√	√	√
25	10580	5	x	x	x	x	x	x
26	10589	5	×	×	×	×	×	×
27	10740	5	√	√	√	√	√	√
28	10741	5	√	√	√	√	√	√
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	×	×
31	1514	5	×	×	×	×	×	×
32	15100	5	√	√	√	√	√	√
33	155304	5	×	×	×	×	×	×
34	155214	5	×	×	×	×	×	×
35	1903	5	√	√	√	√	√	√
36	1909	5	√	√	√	√	√	√
37	1912	5	√	√	√	√	√	√
38	1916	5	√	√	√	√	√	√
39	1950	5	×	×	×	×	×	×

BSNL								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	BADDI	NAUNI	NEAR DO SARKA	PAONTA SAHIB GURUD WARA	JATOLI MANDIR	ARKI BUS STAND
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	√	√	√	√	√	√
5	108	5	√	√	√	√	√	√
6	138	5	×	×	×	×	×	×
7	149	5	×	×	×	×	×	×
8	181	5	×	×	×	×	×	×
9	182	5	×	×	×	×	×	×
10	1033	5	√	√	√	√	√	√
11	1037	5	×	×	×	×	×	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	×	×	×	×
14	1063	5	×	×	×	×	×	×
15	1064	5	×	×	×	×	×	×
16	1070	5	√	√	√	√	√	√
17	1071	5	×	×	×	×	×	×
18	1072	5	×	××	×	×	×	×
19	1073	5	√	√	√	√	√	√
20	1077	5	×	×	×	×	×	×
21	1090	5	×	×	×	×	×	×
22	1091	5	√	√	√	√	√	√
23	1097	5	√	√	√	√	√	√
24	1099	5	×	×	×	×	×	×
25	10580	5	×	×	×	×	×	×
26	10589	5	×	×	×	×	×	×
27	10740	5	×	×	×	×	×	×
28	10741	5	×	×	×	×	×	×
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	×	×
31	1514	5	×	×	×	×	×	×
32	15100	5	×	×	×	×	×	×
33	155304	5	×	×	×	×	×	×
34	155214	5	×	×	×	×	×	×
35	1903	5	√	√	√	√	√	√
36	1909	5	√	√	√	√	√	√
37	1912	5	√	√	√	√	√	√
38	1916	5	×	×	×	×	×	×
39	1950	5	×	×	×	×	×	×

IDEA								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	BUS STAND-BADDI	NAUNI UNIVERSITY-SOLAN	NAHAN	GURUDWARA-PONTA SAHIB	JATOLI	BUS STAND-ARKI
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	×	×	×	×	√	√
5	108	5	√	√	√	√	√	√
6	138	5	×	×	×	×	×	×
7	149	5	×	×	×	×	×	×
8	181	5	×	×	×	×	×	×
9	182	5	×	×	×	×	×	×
10	1033	5	√	√	√	√	√	√
11	1037	5	×	×	×	×	×	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	×	×	×	×
14	1063	5	√	√	√	√	√	√
15	1064	5	×	×	×	×	×	×
16	1070	5	×	×	×	×	×	×
17	1071	5	×	×	×	×	×	×
18	1072	5	√	√	√	√	√	√
19	1073	5	√	√	√	√	√	√
20	1077	5	√	√	√	√	√	√
21	1090	5	×	×	×	×	×	×
22	1091	5	√	√	√	√	√	√
23	1097	5	√	√	√	√	√	√
24	1099	5	×	×	×	×	×	×
25	10580	5	×	×	×	×	×	×
26	10589	5	×	×	×	×	×	×
27	10740	5	×	×	×	×	×	×
28	10741	5	×	×	×	×	×	×
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	×	×
31	1514	5	×	×	×	×	×	×
32	15100	5	√	√	√	√	√	√
33	155304	5	×	×	×	×	×	×
34	155214	5	×	×	×	×	×	×
35	1903	5	√	√	√	√	√	√
36	1909	5	√	√	√	√	√	√
37	1912	5	√	√	√	√	√	√
38	1916	5	×	×	×	×	×	×
39	1950	5	√	√	√	√	√	√

RCOM								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	NALAGARH	RAJGARH	NAHAN	PONTA SAHIB	SOLAN	ARKI
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	√	√	√	√	√	√
5	108	5	√	√	√	√	√	√
6	138	5	√	√	√	√	√	√
7	149	5	×	×	×	×	×	×
8	181	5	×	×	×	×	×	×
9	182	5	√	√	√	√	√	√
10	1033	5	√	√	√	√	√	√
11	1037	5	×	×	×	×	×	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	×	×	×	×
14	1063	5	×	×	×	×	×	×
15	1064	5	×	×	×	×	×	×
16	1070	5	√	√	√	√	√	√
17	1071	5	×	×	×	×	×	×
18	1072	5	√	√	√	√	√	√
19	1073	5	×	×	×	×	×	×
20	1077	5	√	√	√	√	√	√
21	1090	5	×	×	×	×	×	×
22	1091	5	√	√	√	√	√	√
23	1097	5	×	×	×	×	×	×
24	1099	5	×	×	×	×	×	×
25	10580	5	×	×	×	×	×	×
26	10589	5	×	×	×	×	×	×
27	10740	5	×	×	×	×	×	×
28	10741	5	×	×	×	×	×	×
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	×	×
31	1514	5	×	×	×	×	×	×
32	15100	5	√	√	√	√	√	√
33	155304	5	×	×	×	×	×	×
34	155214	5	×	×	×	×	×	×
35	1903	5	√	√	√	√	√	√
36	1909	5	√	√	√	√	√	√
37	1912	5	√	√	√	√	√	√
38	1916	5	√	√	√	√	√	√
39	1950	5	√	√	√	√	√	√

TATA CDMA								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	Nalagarh	Rajgarh	Nahan	Ponta Sahib	Solan	Arki
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	×	×	×	×	×	×
5	108	5	√	√	√	√	√	√
6	138	5	√	√	√	√	√	√
7	149	5	×	×	×	×	×	×
8	181	5	×	×	×	×	×	×
9	182	5	×	×	×	×	×	×
10	1033	5	√	√	√	√	√	√
11	1037	5	×	×	×	×	×	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	×	×	×	×
14	1063	5	×	×	×	×	×	×
15	1064	5	√	√	√	√	√	√
16	1070	5	×	×	×	×	×	×
17	1071	5	×	×	×	×	×	×
18	1072	5	√	√	√	√	√	√
19	1073	5	×	×	×	×	×	×
20	1077	5	×	×	×	×	×	×
21	1090	5	×	×	×	×	×	×
22	1091	5	√	√	√	√	√	√
23	1097	5	×	×	×	×	×	×
24	1099	5	×	×	×	×	×	×
25	10580	5	×	×	×	×	×	×
26	10589	5	×	×	×	×	×	×
27	10740	5	×	×	×	×	×	×
28	10741	5	×	×	×	×	×	×
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	×	×
31	1514	5	×	×	×	×	×	×
32	15100	5	√	√	√	√	√	√
33	155304	5	×	×	×	×	×	×
34	155214	5	×	×	×	×	×	×
35	1903	5	√	√	√	√	√	√
36	1909	5	×	×	×	×	×	×
37	1912	5	×	×	×	×	×	×
38	1916	5	×	×	×	×	×	×
39	1950	5	×	×	×	×	×	×

TATA GSM								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	Nalagarh	Rajgarh	Nahan	Ponta Sahib	Solan	Arki
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	×	×	×	×	×	×
5	108	5	√	√	√	√	√	√
6	138	5	√	√	√	√	√	√
7	149	5	×	×	×	×	×	×
8	181	5	×	×	×	×	×	×
9	182	5	×	×	×	×	×	×
10	1033	5	√	√	√	√	√	√
11	1037	5	×	×	×	×	×	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	×	×	×	×
14	1063	5	×	×	×	×	×	×
15	1064	5	√	√	√	√	√	√
16	1070	5	×	×	×	×	×	×
17	1071	5	×	×	×	×	×	×
18	1072	5	√	√	√	√	√	√
19	1073	5	×	×	×	×	×	×
20	1077	5	×	×	×	×	×	×
21	1090	5	×	×	×	×	×	×
22	1091	5	√	√	√	√	√	√
23	1097	5	×	×	×	×	×	×
24	1099	5	×	×	×	×	×	×
25	10580	5	×	×	×	×	×	×
26	10589	5	×	×	×	×	×	×
27	10740	5	×	×	×	×	×	×
28	10741	5	×	×	×	×	×	×
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	×	×
31	1514	5	×	×	×	×	×	×
32	15100	5	√	√	√	√	√	√
33	155304	5	×	×	×	×	×	×
34	155214	5	×	×	×	×	×	×
35	1903	5	√	√	√	√	√	√
36	1909	5	×	×	×	×	×	×
37	1912	5	×	×	×	×	×	×
38	1916	5	×	×	×	×	×	×
39	1950	5	×	×	×	×	×	×

VODAFONE								
SR. NO.	EMERGENCY NUMBER	CALLS MADE	Day 1 Baddi	Day 1 Nauni	Day 2 Nahan	Day 2 Paonta Sahib	Day 3 Solan Jatoli Mandir	Day 3 Arki
1	100	5	√	√	√	√	√	√
2	101	5	√	√	√	√	√	√
3	102	5	√	√	√	√	√	√
4	104	5	√	×	×	×	√	×
5	108	5	√	×	×	×	√	×
6	138	5	√	×	×	×	√	×
7	149	5	×	×	×	×	×	×
8	181	5	√	×	×	×	√	×
9	182	5	√	×	×	×	√	×
10	1033	5	×	√	√	√	√	×
11	1037	5	×	√	√	√	√	×
12	1056	5	×	×	×	×	×	×
13	1060	5	×	×	√	×	×	×
14	1063	5	×	×	×	×	√	×
15	1064	5	√	×	×	×	√	×
16	1070	5	√	×	×	×	×	×
17	1071	5	×	×	×	×	×	×
18	1072	5	√	×	×	×	√	×
19	1073	5	√	×	×	×	√	×
20	1077	5	√	√	√	√	×	×
21	1090	5	×	×	×	×	×	×
22	1091	5	√	×	×	×	×	×
23	1097	5	√	×	×	×	√	×
24	1099	5	×	×	×	×	×	×
25	10580	5	×	×	×	×	×	×
26	10589	5	×	×	×	×	×	×
27	10740	5	×	×	×	×	×	×
28	10741	5	×	×	×	×	×	×
29	1511	5	×	×	×	×	×	×
30	1512	5	×	×	×	×	√	×
31	1514	5	×	×	×	×	×	×
32	15100	5	√	×	×	×	√	×
33	155304	5	×	×	×	×	×	×
34	155214	5	√	×	×	×	√	×
35	1903	5	×	×	×	×	×	×
36	1909	5	√	×	×	×	√	×
37	1912	5	√	×	×	×	√	×
38	1916	5	√	×	×	×	√	×
39	1950	5	√	×	×	×	√	×

9. Operator Assisted Drive Test

The drive test was conducted simultaneously for all the operators present in the Himachal Pradesh circle. As per the new directive given by TRAI headquarters, drive test for the month of April, May and June, 2016 were conducted at a SSA level. Drive test was conducted for three days in each SSA and the selection of routes ensured that the maximum towns, villages, highways are covered as part of drive test. The routes were selected on basis of the complaints received from the customers. The auditors were present in vehicles of every operator. The holding period for all test calls was 120 seconds and the 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 > -75dbm for indoor, -85 dbm for in-vehicle and > -95 dbm outdoor routes. Below is the schedule and operators involved in the drive test for the Himachal Pradesh circle.

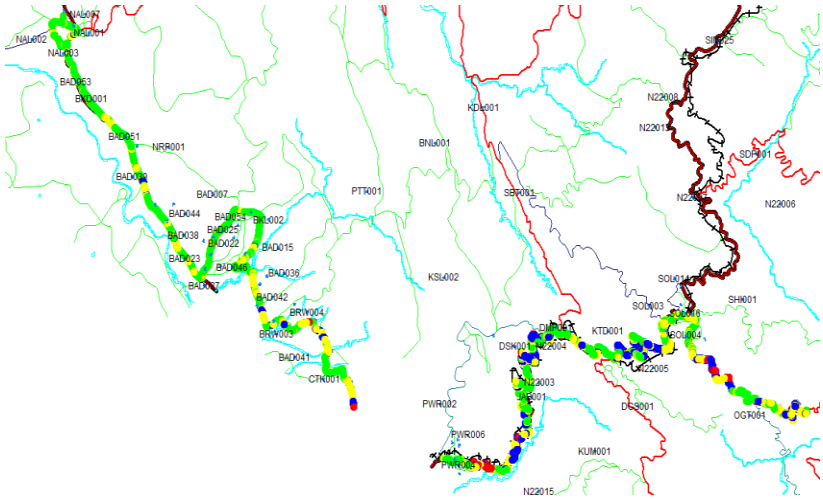
9.1. JUNE: SOLAN SSA

Month	Name of SSA covered	Drive Test Schedule
June 2016	Solan	June 15, 2016 to June 17, 2016

9.2. Distance Covered: SOLAN SSA

Drive Test Distance Covered	Day 1	Day 2	Day 3
Solan SSA	170 km	200 km	130 km

9.3. Route Map: Solan SSA: Day 1



Route Covered- Day1

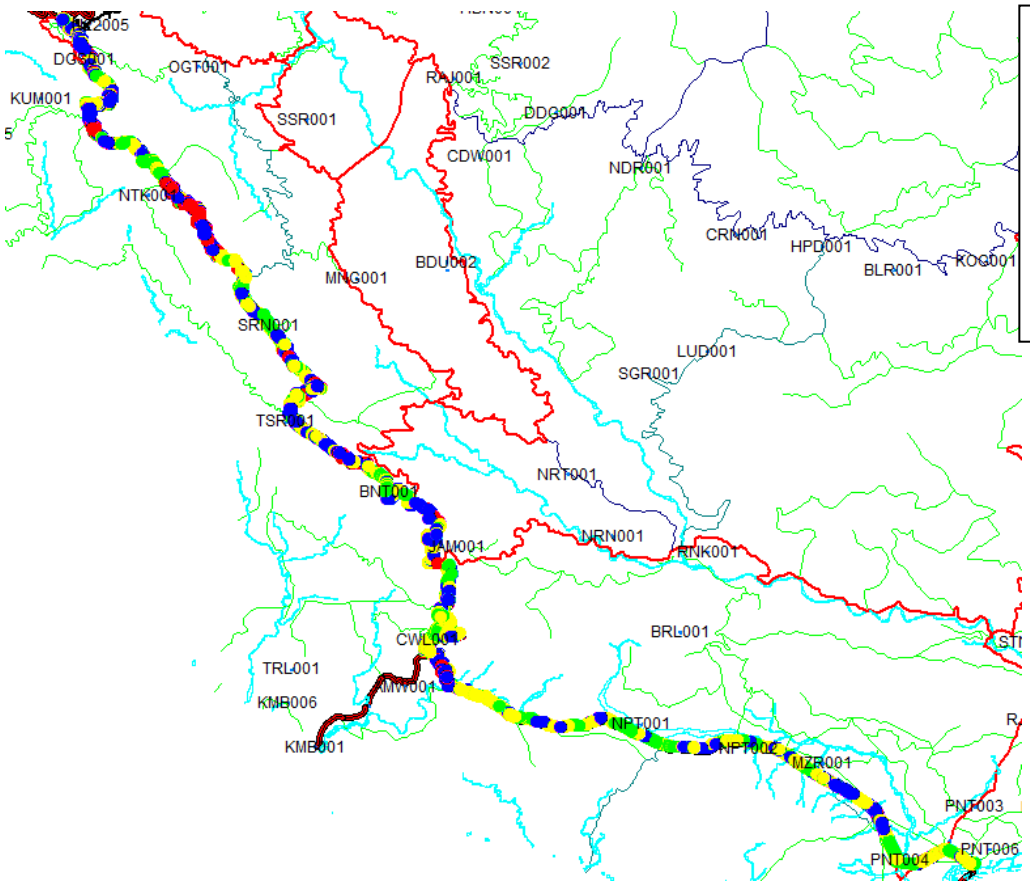
1 Nalagarh-Baddi

2 Chitkara-Parwano

3 Jabli-Dharampur

4 Solan -Oachghat

9.4. ROUTE MAP: SOLAN SSA: DAY 2



Route Covered- Day 2

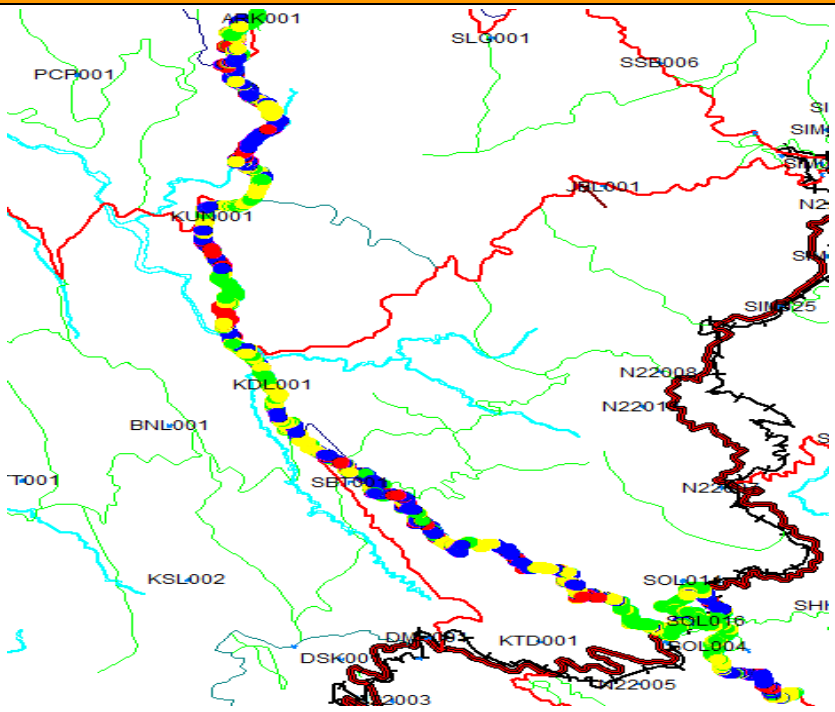
1 Kumarhatt-Nainatikkar

2 Sarahan-Banuti

3 Nahan-Cheerwala

4. Dhaulakuan-Paonta Sahib

9.5. Route Map: SOLAN SSA: Day 3



9.6. Drive Test Outcome

	Aircel	Airtel	BSNL	IDEA	RCOM GSM	TTSL GSM	TTSL CDMA	Vodafone
Total Calls Attempt (A)	530	585	434	520	577	390	291	544
Total Calls Blocked (B)	4	2	3	4	2	2	0	4
Blocked Call Rate in % (B*100/A)	0.75%	0.34%	0.69%	0.77%	0.35%	0.51%	0.00%	1.00%
Total Calls Established ('C)	526	583	431	516	575	388	291	540
Total Calls Drop (D)	2	0	4	7	0	2	1	0
Dropped Calls Rate in % (D*100/C)	0.38%	0.00%	0.93%	1.36%	0.00%	0.52%	0.34%	0.00%
Call Setup Success Rate in % (C*100/A)	99.25%	99.66%	99.31%	99.23%	99.65%	99.49%	100.00%	99.26%
Handover Success Rate % (total HO Success * 100/Total HO attempt)	98.43%	97.99%	99.56%	98.3%	99.33%	99%	100.00%	100%

10. COUNTER DETAILS

S. No.	KPI	Formula with Counter Description
1	CSSR= (No of established Calls / No of Attempted Calls)%	*No of established Calls* = ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)] +[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)]))/*No of Attempted Calls* = ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Changeable)])
2	SDCCH congestion= (SDCCH Failure/SDCCH attempts)%	*SDCCH Failure*= ([Channel Assignment Failures (All Channels Busy or Channels Unconfigured) in Immediate Assignment Procedure (SDCCH)] + [Failed Internal Intra-Cell Handovers (No Channel Available) (SDCCH)] + [Number of Unsuccessful Incoming Internal Inter-Cell Handovers (No Channel Available) (SDCCH)] + [Failed Incoming External Inter-Cell Handovers (No Channel Available) (SDCCH)])/*SDCCH attempts* = ([Channel Assignment Requests in Immediate Assignment Procedure (SDCCH)] + [Internal Intra-Cell Handover Requests (SDCCH)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Number of Incoming Internal Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-900/850/810)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (900/850/810-1800/1900)] + [Incoming External Inter-Cell Handover Requests (SDCCH) (1800/1900-900/850/810)])
3	TCH congestion= (TCH Failures /TCH Attempts)%	*TCH Failures*= ((Failed TCH Seizures due to Busy TCH (Signaling Channel)+([Failed Assignments (First Assignment, No Channel Available in Assignment Procedure)]+[Failed Assignments (First Assignment, No Channel Available in Directed Retry Procedure)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Assignment)]+[Failed Assignments (Reconnection to Old Channels, No Channel Available in Directed Retry)])/*TCH Attempts* = ([Assignment Requests (Signaling Channel) (TCH)] + [Assignment Requests (Signaling Channel) (SDCCH)] + [Assignment Requests (TCHF Only)] + [Assignment Requests (TCHH Only)] + [Assignment Requests (TCHF Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHH Preferred, Channel Type Unchangeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Unchangeable)] + [Assignment Requests (TCHF Preferred, Channel Type Changeable)] + [Assignment Requests (TCHH Preferred, Channel Type Changeable)] + [Assignment Requests (TCHF or TCHH, Channel Type Changeable)])
4	Call Drop Rate= (The total no of dropped calls*100)/Total no of calls successfully established (where traffic channel is allotted)	*The total no of dropped calls*= ([Call Drops on Radio Interface in Stable State (Traffic Channel)] + [Call Drops on Radio Interface in Handover State (Traffic Channel)] + [Call Drops Due to No MR from MS for a Long Time (Traffic Channel)] + [Call Drops due to Abis Terrestrial Link Failure (Traffic Channel)] + [Call Drops due to Equipment Failure (Traffic Channel)] + [Call Drops due to Forced Handover (Traffic Channel)] + [Call Drops due to local switching Start Failure] + [Call Drops due to Failures to Return to Normal Call from local switching])/*Total no of calls successfully established (where traffic channel is allotted)* = ([Assignment Requests]-([Failed Assignments (Signaling Channel)]+[Failed Assignments during MOC on the A Interface (Including Directed

		Retry)]+[Failed Assignments during MTC on the A Interface (Including Directed Retry)]+[Failed Assignments during Emergency Call on the A Interface (Including Directed Retry)] +[Failed Assignments during Call Re-establishment on the A Interface (Including Directed Retry)]+[Failed Mode Modify Attempts (MOC) (TCHF)]+[Failed Mode Modify Attempts (MTC) (TCHF)]+[Failed Mode Modify Attempts (Emergency Call) (TCHF)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHF)]+[Failed Mode Modify Attempts (MOC) (TCHH)]+[Failed Mode Modify Attempts (MTC) (TCHH)]+[Failed Mode Modify Attempts (Call Re-establishment) (TCHH)])
5	**Call Drop Rate= (No of cells having call drop rate >3% during CBBH in a month*100)/Total no of cells in the licensed service area**	**Above formula with counters being used in CBBH.**
6	**Connection with good quality voice= (Connection with good quality voice/Total voice samples)%**	***Connection with good quality voice* = ((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)) /*Total voice samples*= ((Number of MRs on Downlink TCHF (Receive Quality Rank 0)+Number of MRs on Downlink TCHF (Receive Quality Rank 1)+Number of MRs on Downlink TCHF (Receive Quality Rank 2)+Number of MRs on Downlink TCHF (Receive Quality Rank 3)+Number of MRs on Downlink TCHF (Receive Quality Rank 4)+Number of MRs on Downlink TCHF (Receive Quality Rank 5)+Number of MRs on Downlink TCHF (Receive Quality Rank 6)+Number of MRs on Downlink TCHF (Receive Quality Rank 7)+Number of MRs on Downlink TCHH (Receive Quality Rank 0)+:Number of MRs on Downlink TCHH (Receive Quality Rank 1)+Number of MRs on Downlink TCHH (Receive Quality Rank 2)+Number of MRs on Downlink TCHH (Receive Quality Rank 3)+Number of MRs on Downlink TCHH (Receive Quality Rank 4)+Number of MRs on Downlink TCHH (Receive Quality Rank 5)+Number of MRs on Downlink TCHH (Receive Quality Rank 6)+Number of MRs on Downlink TCHH (Receive Quality Rank 7))**

10.1. ERICSSON

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**	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 +

	samples)%	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

10.2. NSN (NOKIA SIEMENS NETWORK)

S 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)

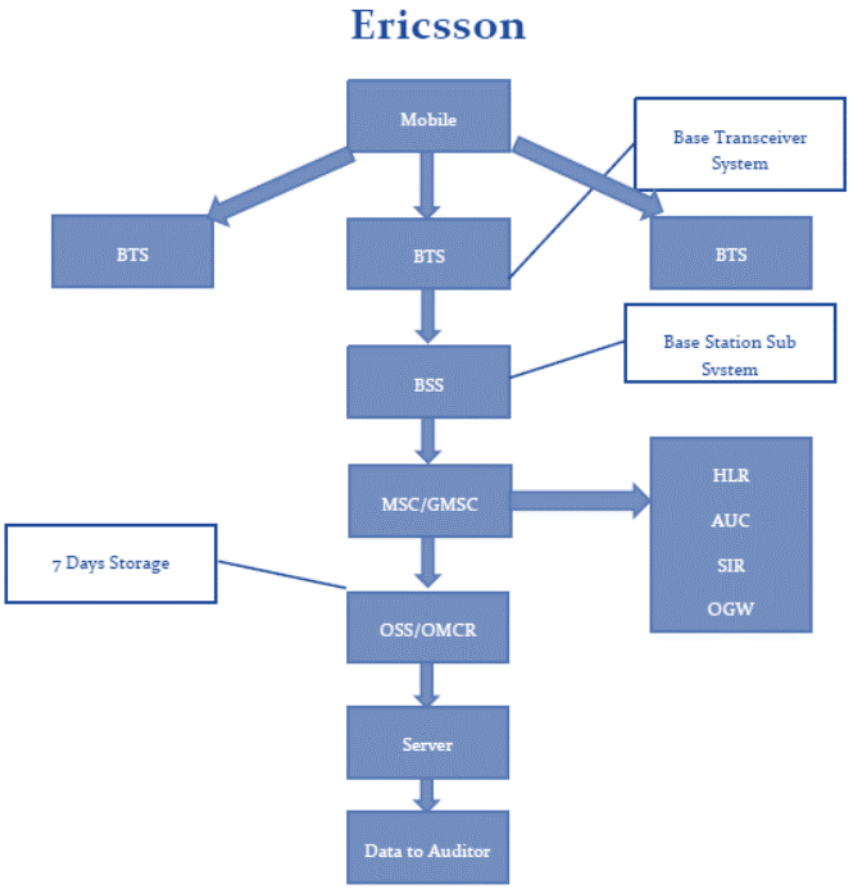
10.3. HUAWEI

S .NO	KPI	HUAWEI FORMULA
1	CALL SETUP SUCCES (NUM)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups] ([1157628567] + [1157628587] + [1157628568] + [1157628588])
2	CALL SETUP SUCCES (DEN)	[CS IS-95 Orig Attempts + CS IS-2000 Orig Attempts + CS IS-95 Term Attempts + CS IS-2000 Term Attempts] ([1157628553] + [1157628573] + [1157628554] + [1157628574])

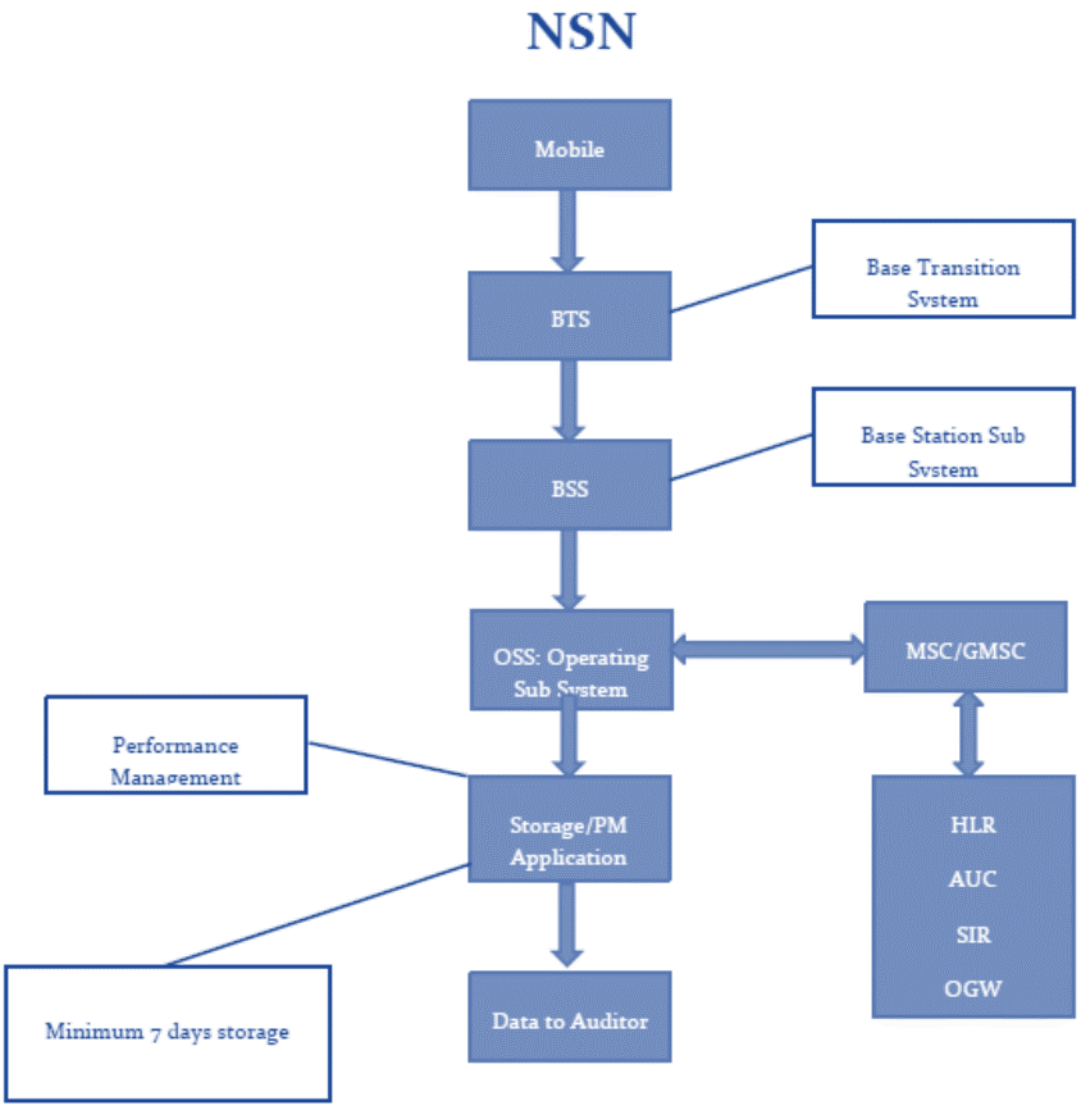
3	CALL SETUP SUCCESS RATE (%)	CALL SETUP SUCCES (NUM) / CALL SETUP SUCCES (DEN) * 100\
4	CALL DROP RATE (NUM)	[CS IS-95 Call Drops (Too many Erasure frames) + CS IS-2000 Call Drops (Too many Erasure frames) + CS IS-95 Call Drops (No reverse frame received) + CS IS-2000 Call Drops (No reverse frame received) + CS IS-95 Call Drops (Abis interface abnormal) + CS IS-2000 Call Drops (Abis interface abnormal) + CS IS-95 Call Drops (A2 interface abnormal) + CS IS-2000 Call Drops (A2 interface abnormal) + CS IS-95 Call Drops (HHO fail) + CS IS-2000 Call Drops (HHO fail) + CS IS-95 Call Drops (Other causes) + CS IS-2000 Call Drops (Other causes)] ([1157628608] + [1157628614] + [1157628609] + [1157628615] + [1157628610] + [1157628616] + [1157628611] + [1157628617] + [1157628612] + [1157628618] + [1157628613] + [1157628619])
5	CALL DROP RATE(DEN)	[Successful CS IS-95 Orig Call Setups + Successful CS IS-2000 Orig Call Setups + Successful CS IS-95 Term Call Setups + Successful CS IS-2000 Term Call Setups + CS IS-95 Successful Incoming Hard HOs + CS IS-2000 Successful Incoming Hard HOs] [1157628619]) x 100/([1157628567] + [1157628587] + [1157628568] + [1157628588] + [1157628569] + [1157628589])]
6	Call DROP Rate	CALL DROP RATE (NUM) / CALL DROP RATE(DEN) * 100\
7	RF BLOCK RATE (NUM)	{[(TCH Assignment Requests-CS Orig-IS95[Times] + TCH Assignment Requests-CS Orig-IS2000[Times] + TCH Assignment Requests-CS Term-IS95[Times] + TCH Assignment Requests-CS Term-IS2000[Times]) - (Successful TCH Assignments-CS Orig-IS95[Times] + Successful TCH Assignments-CS Orig-IS2000[Times] + Successful TCH Assignments-CS Term-IS95[Times] + Successful TCH Assignments-CS Term-IS2000[Times])] {[(1157628621 + 1157628628 + 1157628635+ 1157628642)
8	RF BLOCK RATE (DEN)	[((TCH Assignment Requests-CS Orig-IS95[Times] + TCH Assignment Requests-CS Orig-IS2000[Times] + TCH Assignment Requests-CS Term-IS95[Times] + TCH Assignment Requests-CS Term-IS2000[Times]))]} [(1157628621 + 1157628628 + 1157628635+ 1157628642)]}
9	RF BLOCK RATE	RF BLOCK RATE (NUM) / RF BLOCK RATE (DEN) *100
10	Call Quality (RFER)	CS Reverse Link Average FER of Carrier[%

11. BLOCK SCHEMATIC DIAGRAM

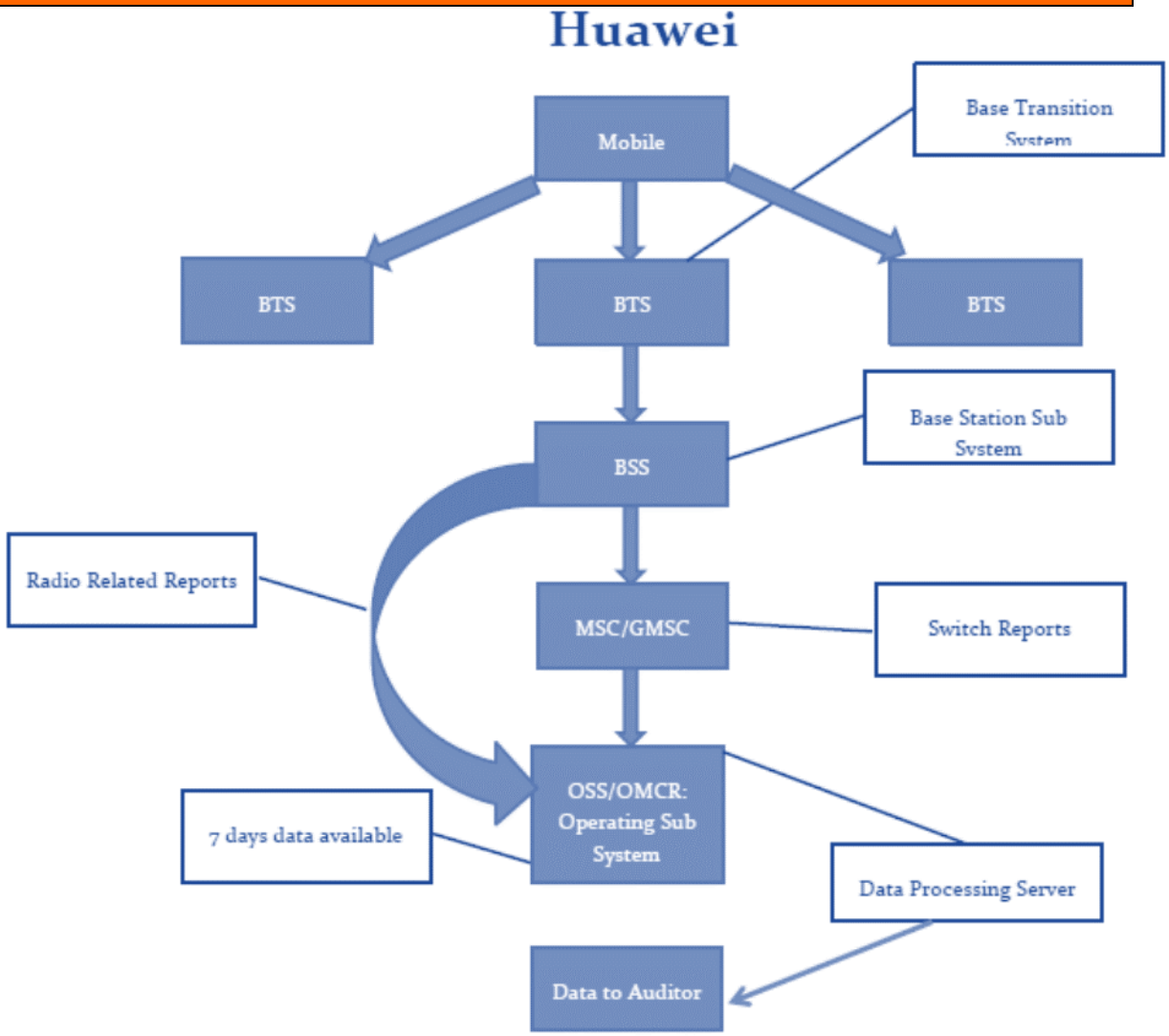
11.1. ERICSSON



11.2. NSN


NSN
Mobile
BTS
Base Transition Svstem
BSS
Base Station Sub Svstem
OSS: Operating Sub System
MSC/GMSC
Performance Management
Storage/PM Application
HLR
AUC
SIR
OGW
Minimum 7 days storage
Data to Auditor

11.3. HUAWEI


Huawei
Mobile
Base Transition System
BTS
BTS
BTS
Base Station Sub System
BSS
Radio Related Reports
MSC/GMSC
Switch Reports
OSS/OMCR: Operating Sub System
7 days data available
Data Processing Server
Data to Auditor

12. ABBREVIATIONS

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

- TRAI – Telecom Regulatory Authority of India
- PCPL – Phistream Consulting Private Limited
- QoS – Quality of Service
- AMJ'16 – Refers to the quarter of April, May and June 2016
- SSA – Secondary Switching Area
- NOC – Network Operation Center
- OMC – Operations and Maintenance Center
- MSC – Mobile Switching Center
- PMR – Performance Monitoring Reports
- TCBH – Time Consistent Busy Hour
- CBBH - Cell Bouncing Busy Hour
- BTS – Base Transceiver Station
- CSSR – Call Setup Success Rate
- TCH – Traffic Channel
- SDCCH – Standalone Dedicated Control Channel
- CDR – Call Drop Rate
- FER – Frame Error Rate
- SIM – Subscriber Identity Module
- GSM – Global System for Mobile
- CDMA – Code Division Multiple Access
- NA – Not Applicable
- NC – Non Compliance
- POI – Point of Interconnection
- IVR – Interactive Voice Response
- STD – Standard Trunk Dialling
- ISD – International Subscriber Dialling

13. ANNEXURE

13.1. 2G VOICE PMR DATA: CONSOLIDATED

Consolidated										
Network Parameters		Name of Service Provider								
		Benchmark	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.17%	0.03%	1.97%	0.17%	0.07%	0.10%	0.00%	0.00%	0.07%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.09%	0.17%	1.90%	0.67%	0.00%	0.62%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.50%	98.69%	98.38%	99.44%	99.05%	95.61%	99.30%	99.68%	99.85%
	SDDCH/Paging chl. Congestion	≤ 1%	0.06%	0.22%	0.91%	0.08%	#DIV/0!	0.31%	0.00%	0.00%	0.15%
	TCH Congestion	≤ 2%	0.31%	0.34%	1.74%	0.18%	0.09%	0.35%	0.02%	0.00%	0.15%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	1.19%	0.60%	1.91%	1.01%	0.08%	0.32%	0.10%	0.07%	0.57%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	10.16%	0.44%	2.76%	2.10%	17.09%	1.24%	1.85%	0.22%	2.41%
	%age of connection with good voice quality	≥ 95%	95.41%	97.76%	95.03%	97.71%	99.85%	96.70%	98.09%	97.14%	97.54%

13.2. 3G VOICE PMR: CONSOLIDATED

Consolidated						
Network Parameters		Name of Service Provider				
		Benchmark	AIRTEL	BSNL	IDEA	RCOM GSM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	0.13%	1.39%	0.26%	0.06%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	0.21%	1.66%	0.22%	0.39%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	99.00%	97.85%	99.23%	96.66%
	RRC Congestion:	≤ 1%	0.05%	0.69%	0.50%	0.17%
	RAB Congestion:	≤ 2%	0.01%	0.39%	0.19%	0.09%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	0.63%	0.99%	1.73%	0.13%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	1.12%	2.67%	2.24%	0.50%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	98.91%	99.67%	97.55%	99.91%

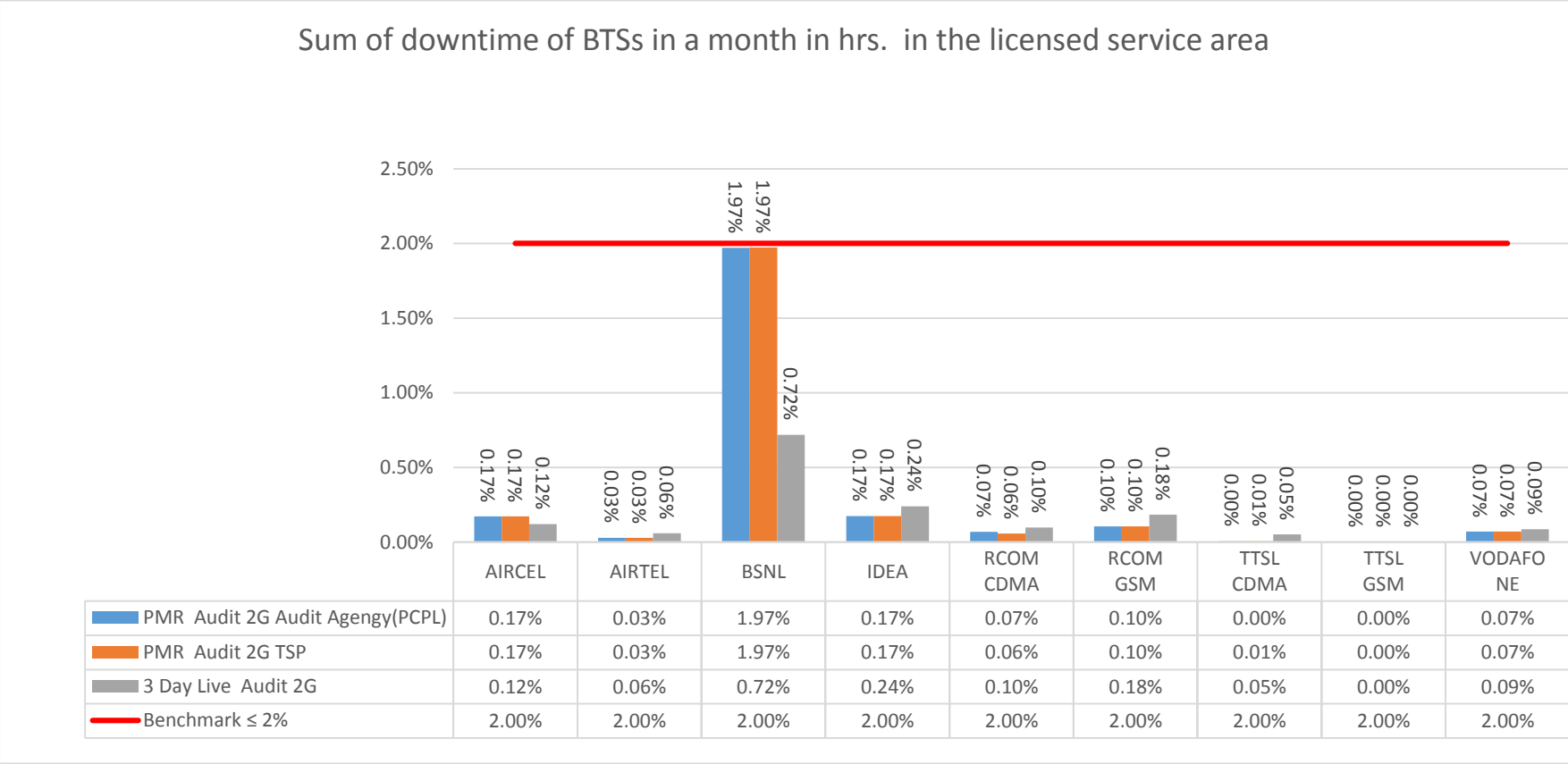
13.3. BILLING AND CUSTOMER CARE

Name of Service Provider	Metering and Billing credibility		Billing Complaints			Termination & Closures	Time taken for refund of deposits after closures: Benchmark	Response time to customer for assistance	
	Postpaid Subscribers	Prepaid Subscribers	%age complaints resolved within 4 weeks	%age complaints resolved within 6 weeks	%age of where credit/waiver is received within one week	% of Termination/ Closure of service within 7 days (100 %)	Cleared over a period of <60 days (100%)	%age of calls answered by the IVR	%age of call answered by the operators (voice to voice) within 90 seconds
Benchmark	≤ 0.1%	≤ 0.1%	≥ 98%	= 100%	= 100%	= 100%	= 100%	≥ 95%	≥ 95%
AIRCEL	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.23%	96.75%
AIRTEL	0.01%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	93.81%
BSNL	0.01%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	97.36%
IDEA	0.02%	0.02%	100.00%	100.00%	100.00%	100.00%	100.00%	99.32%	99.66%
RCOM CDMA	0.08%	0.01%	100.00%	100.00%	100.00%	100.00%	52.53%	95.88%	97.77%
RCOM GSM	0.09%	0.09%	100.00%	100.00%	100.00%	100.00%	67.86%	99.30%	96.62%
TTSL CDMA	0.00%	0.00%	NA	NA	100.00%	100.00%	100.00%	99.93%	98.03%
TTSL GSM	0.00%	0.00%	NA	NA	100.00%	100.00%	100.00%	98.03%	99.83%
VODAFONE	0.12%	0.03%	100.00%	100.00%	100.00%	100.00%	DNA	100.00%	98.98%

13.4. PMR Comparison (TSP vs. Audit Agency): Network Parameters

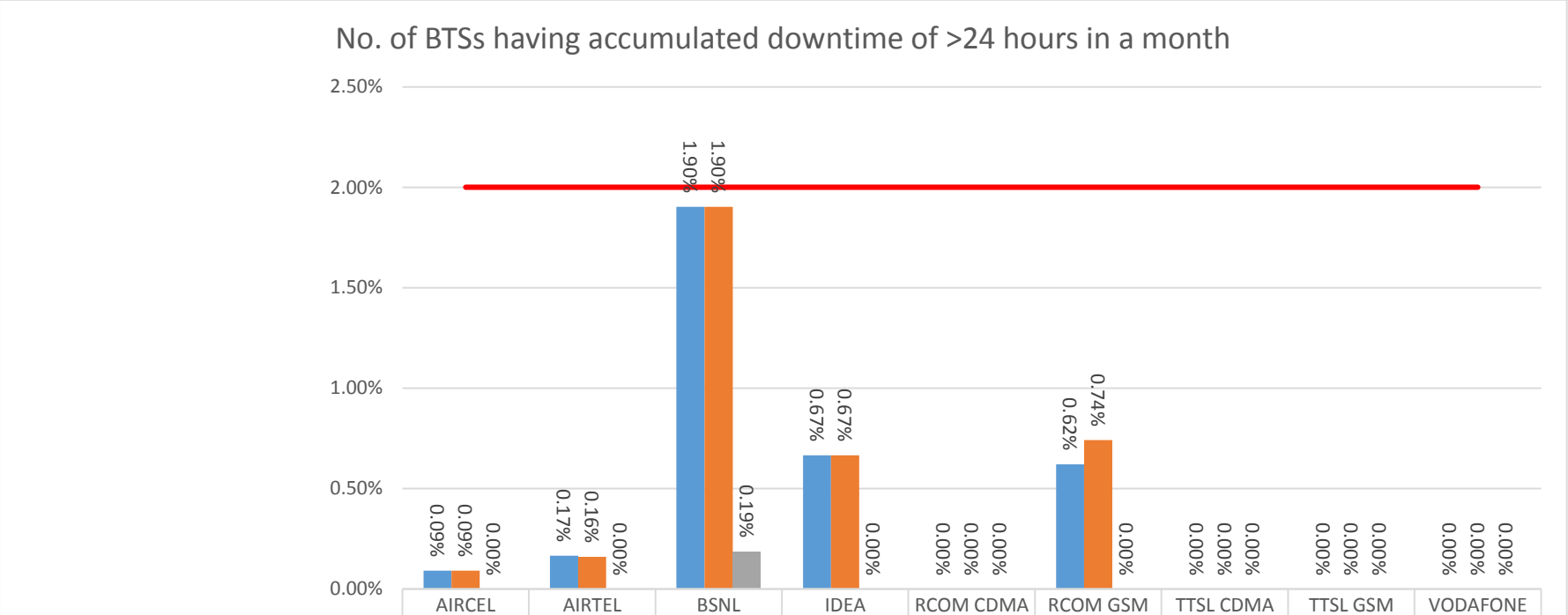
PMR Report Comparison between Audit Agency and TSP												
Network Parameters		Name of Service Provider										
		Benchmark		AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	Agency	0.17%	0.03%	1.97%	0.17%	0.07%	0.10%	0.00%	0.00%	0.07%
			TSP	0.17%	0.03%	1.97%	0.17%	0.06%	0.10%	0.01%	0.00%	0.07%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	Agency	0.09%	0.17%	1.90%	0.67%	0.00%	0.62%	0.00%	0.00%	0.00%
			TSP	0.09%	0.16%	1.90%	0.67%	0.00%	0.74%	0.00%	0.00%	0.00%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	Agency	99.50%	98.69%	98.38%	99.44%	99.05%	95.61%	99.30%	99.68%	99.85%
			TSP	99.50%	98.66%	98.38%	99.44%	99.06%	95.47%	99.31%	99.68%	99.85%
	SDDCH/Paging chl. Congestion	≤ 1%	Agency	0.06%	0.22%	0.91%	0.08%	0.00%	0.31%	0.00%	0.00%	0.15%
			TSP	0.06%	0.23%	0.90%	0.08%	0.00%	0.32%	0.00%	0.00%	0.15%
	TCH Congestion	≤ 2%	Agency	0.31%	0.34%	1.74%	0.18%	0.09%	0.35%	0.02%	0.00%	0.15%
			TSP	0.31%	0.35%	1.81%	0.18%	0.10%	0.35%	0.02%	0.00%	0.15%
Connection Maintenance (Retainability)	Call Drop Rate (%age)	≤ 2%	Agency	1.19%	0.60%	1.91%	1.01%	0.08%	0.32%	0.10%	0.07%	0.57%
			TSP	1.19%	0.60%	1.83%	1.01%	0.08%	0.32%	0.10%	0.07%	0.57%
	Worst Affected cell having more than 3% TCH drop	≤ 3%	Agency	10.16%	0.44%	2.76%	2.10%	17.09%	1.24%	1.85%	0.22%	2.41%
			TSP	10.16%	0.40%	2.76%	2.10%	0.58%	1.24%	1.86%	0.22%	2.40%
	%age of connection with good voice quality	≥ 95%	Agency	95.41%	97.76%	95.03%	97.71%	99.85%	96.70%	98.09%	97.14%	97.54%
			TSP	95.41%	97.77%	95.02%	97.71%	99.84%	96.66%	98.09%	97.14%	97.54%

13.4.1. SUM OF DOWNTIME OF BTSS IN A MONTH IN HRS. IN THE LICENSED SERVICE



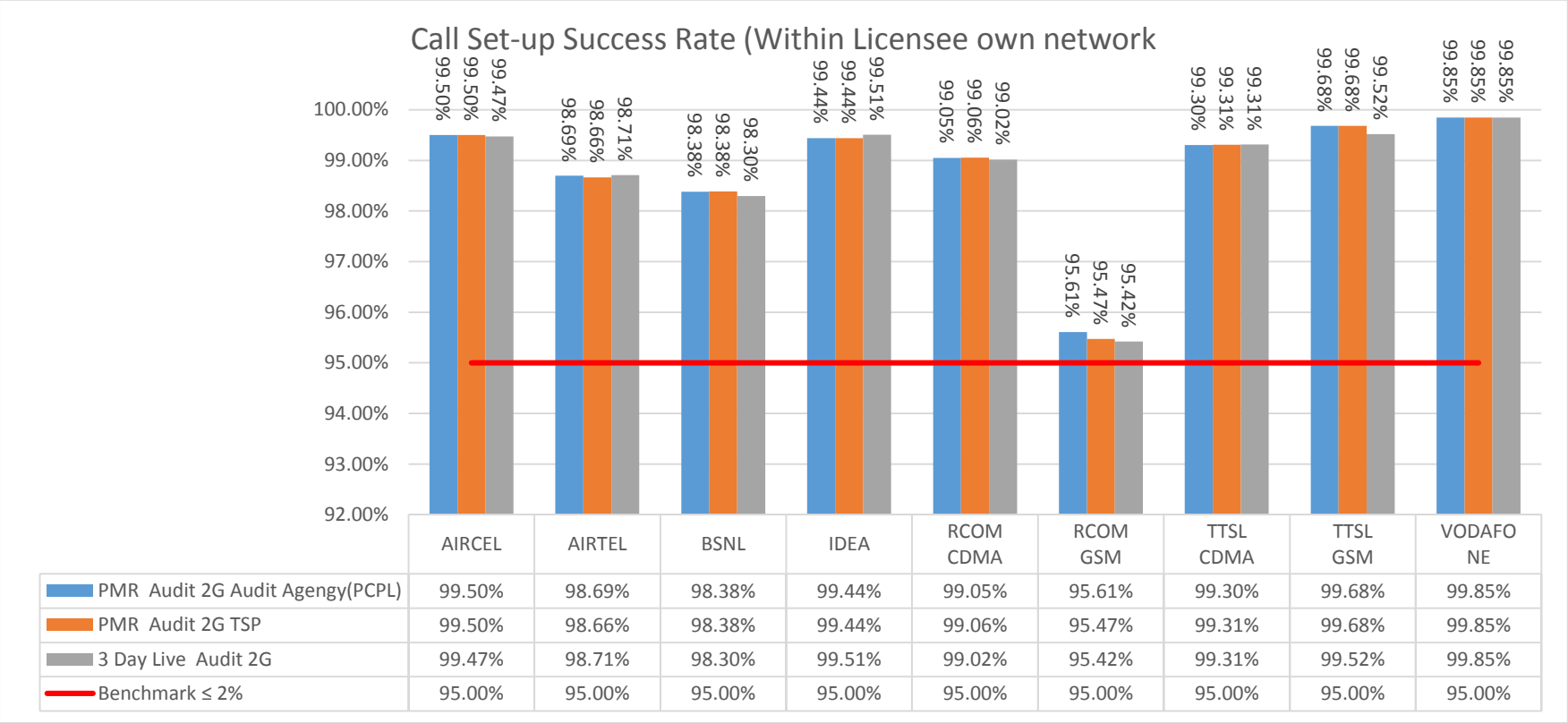
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	0.17%	0.03%	1.97%	0.17%	0.07%	0.10%	0.00%	0.00%	0.07%
PMR Audit 2G TSP	0.17%	0.03%	1.97%	0.17%	0.06%	0.10%	0.01%	0.00%	0.07%
3 Day Live Audit 2G	0.12%	0.06%	0.72%	0.24%	0.10%	0.18%	0.05%	0.00%	0.09%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

13.4.2. NO. OF BTSS HAVING ACCUMULATED DOWNTIME OF >24 HOURS IN A MONTH



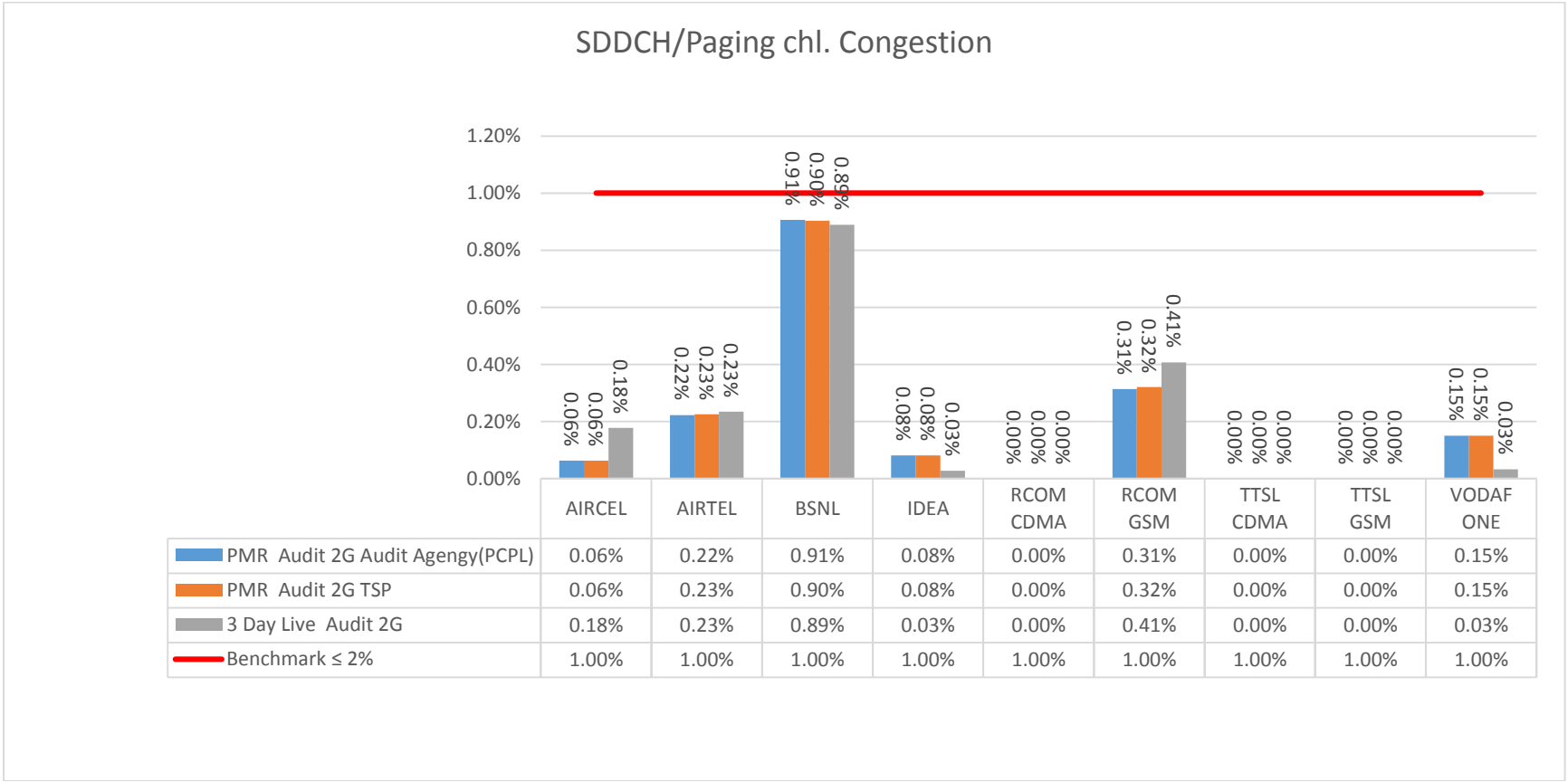
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	0.09%	0.17%	1.90%	0.67%	0.00%	0.62%	0.00%	0.00%	0.00%
PMR Audit 2G TSP	0.09%	0.16%	1.90%	0.67%	0.00%	0.74%	0.00%	0.00%	0.00%
3 Day Live Audit 2G	0.00%	0.00%	0.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

13.4.3. CALL SET-UP SUCCESS RATE (WITHIN LICENSEE OWN NETWORK)



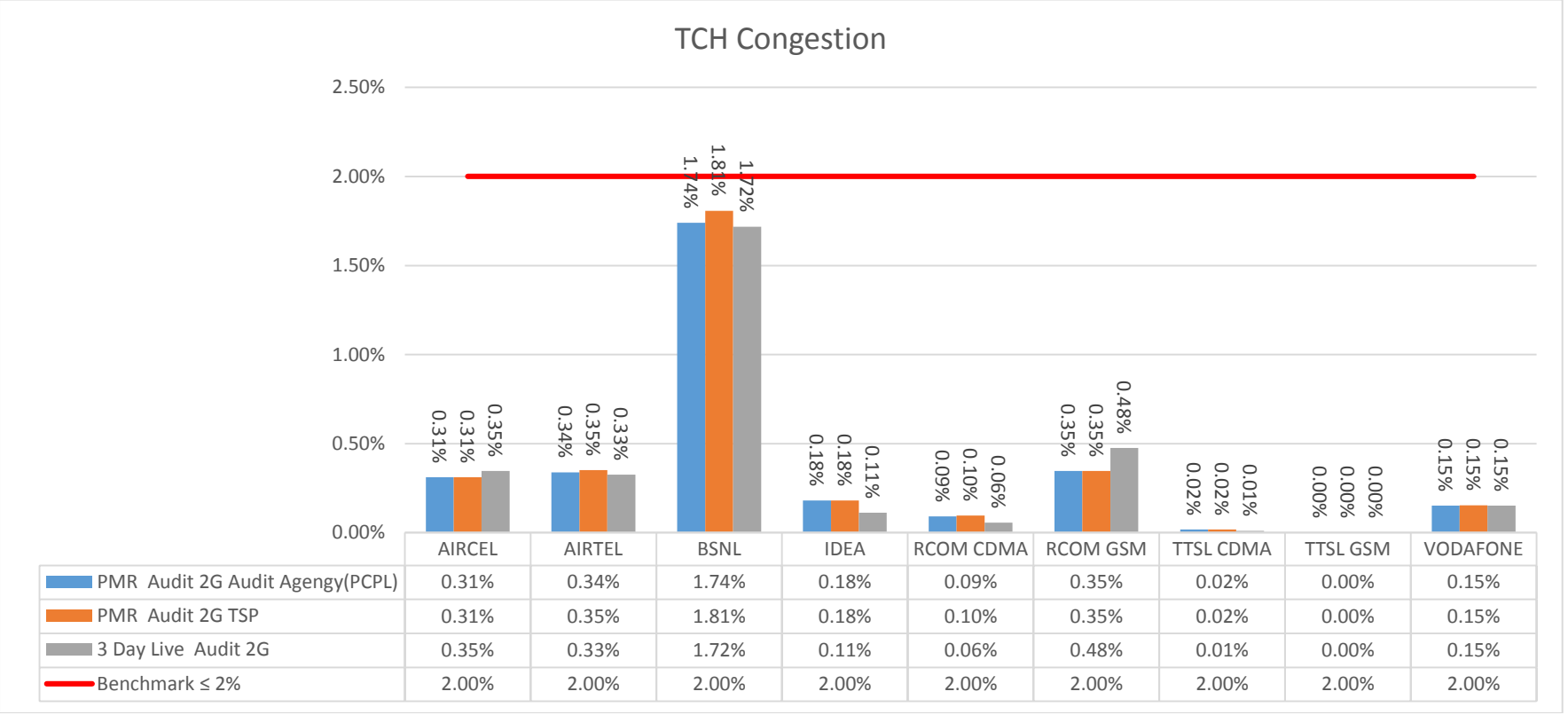
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	99.50%	98.69%	98.38%	99.44%	99.05%	95.61%	99.30%	99.68%	99.85%
PMR Audit 2G TSP	99.50%	98.66%	98.38%	99.44%	99.06%	95.47%	99.31%	99.68%	99.85%
3 Day Live Audit 2G	99.47%	98.71%	98.30%	99.51%	99.02%	95.42%	99.31%	99.52%	99.85%
Benchmark ≤ 2%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%

13.4.4. SDDCH/PAGING CHL. CONGESTION



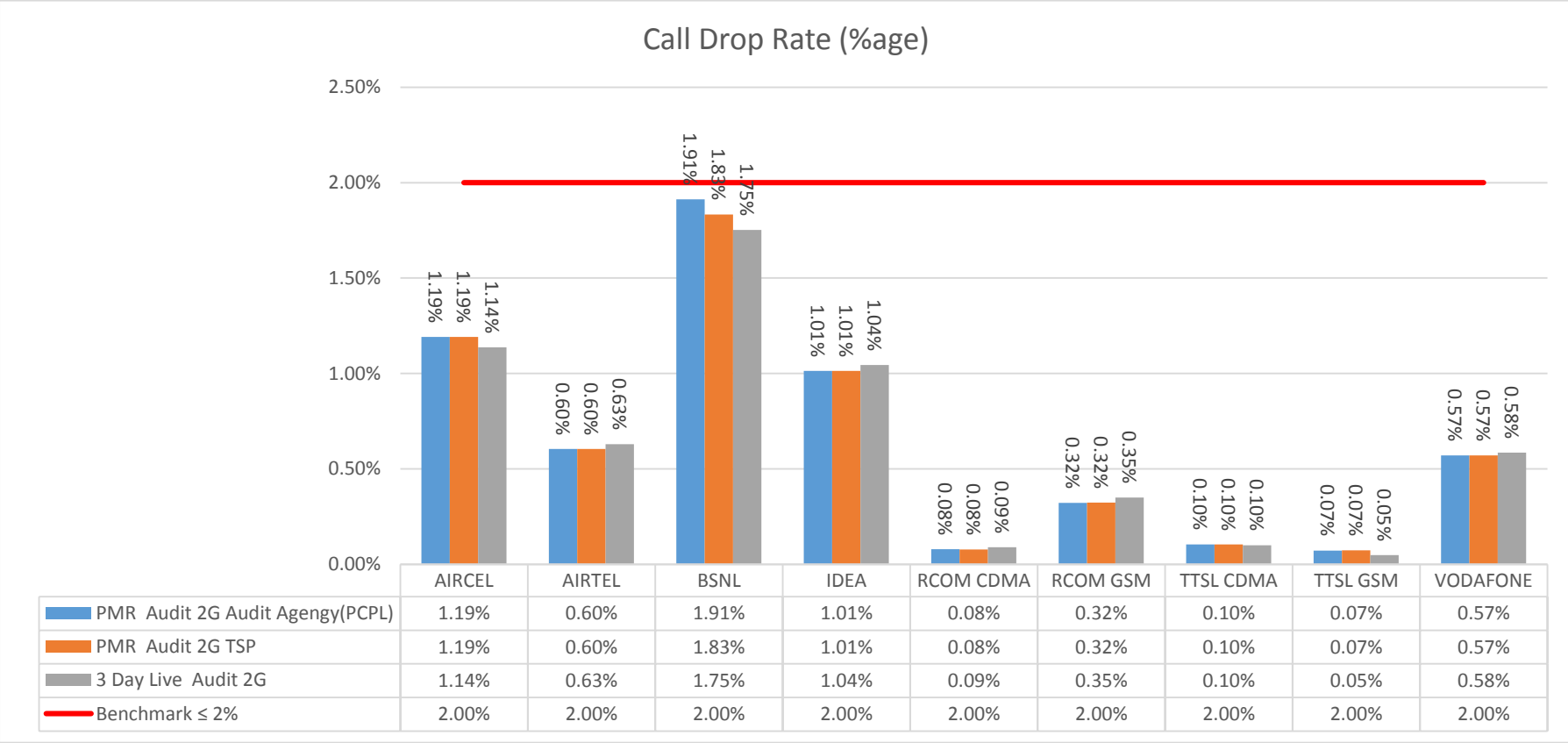
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	0.06%	0.22%	0.91%	0.08%	0.00%	0.31%	0.00%	0.00%	0.15%
PMR Audit 2G TSP	0.06%	0.23%	0.90%	0.08%	0.00%	0.32%	0.00%	0.00%	0.15%
3 Day Live Audit 2G	0.18%	0.23%	0.89%	0.03%	0.00%	0.41%	0.00%	0.00%	0.03%
Benchmark ≤ 2%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%

13.4.5. TCH CONGESTION



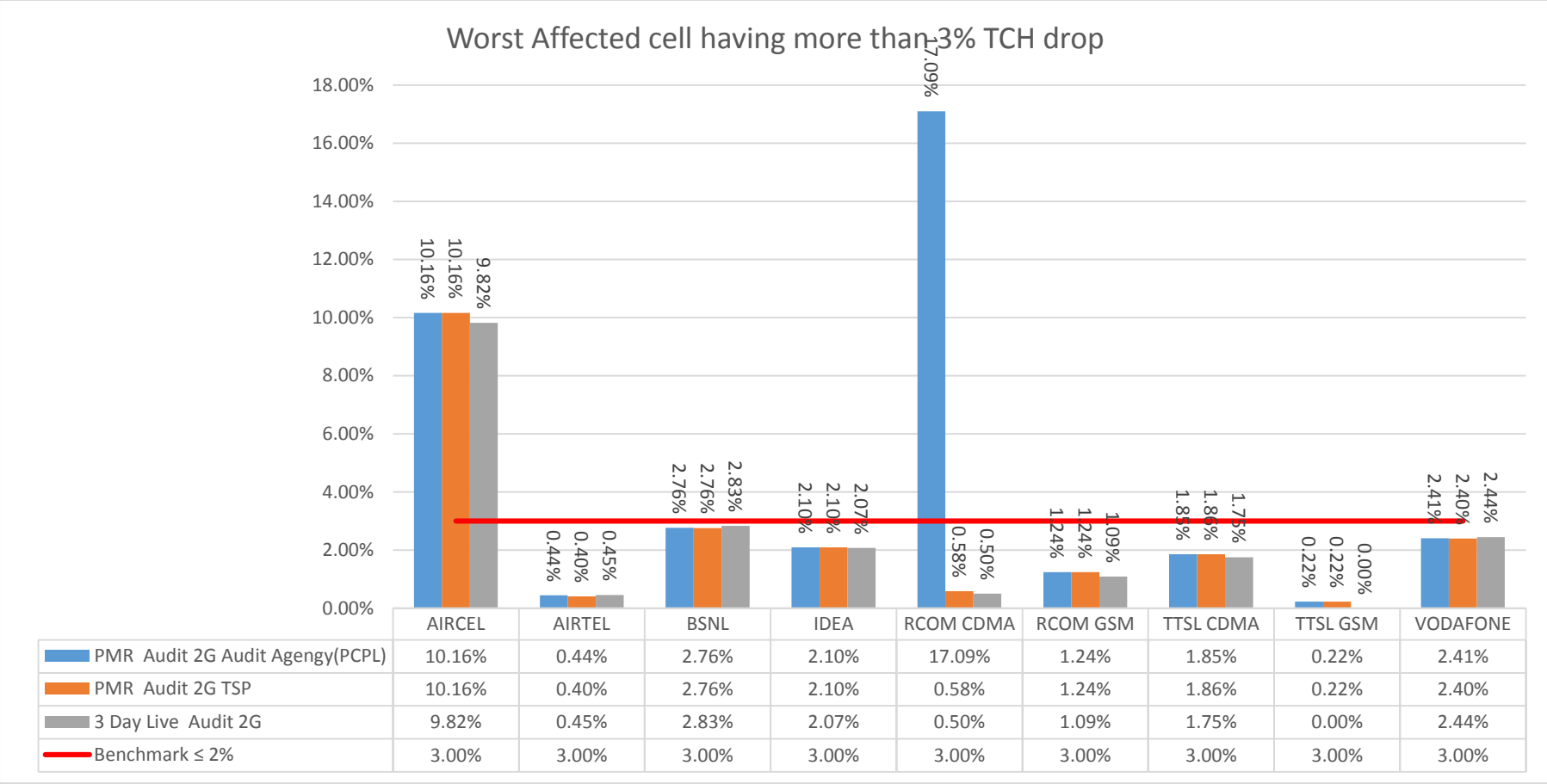
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	0.31%	0.34%	1.74%	0.18%	0.09%	0.35%	0.02%	0.00%	0.15%
PMR Audit 2G TSP	0.31%	0.35%	1.81%	0.18%	0.10%	0.35%	0.02%	0.00%	0.15%
3 Day Live Audit 2G	0.35%	0.33%	1.72%	0.11%	0.06%	0.48%	0.01%	0.00%	0.15%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

13.4.6. CALL DROP RATE (%AGE)



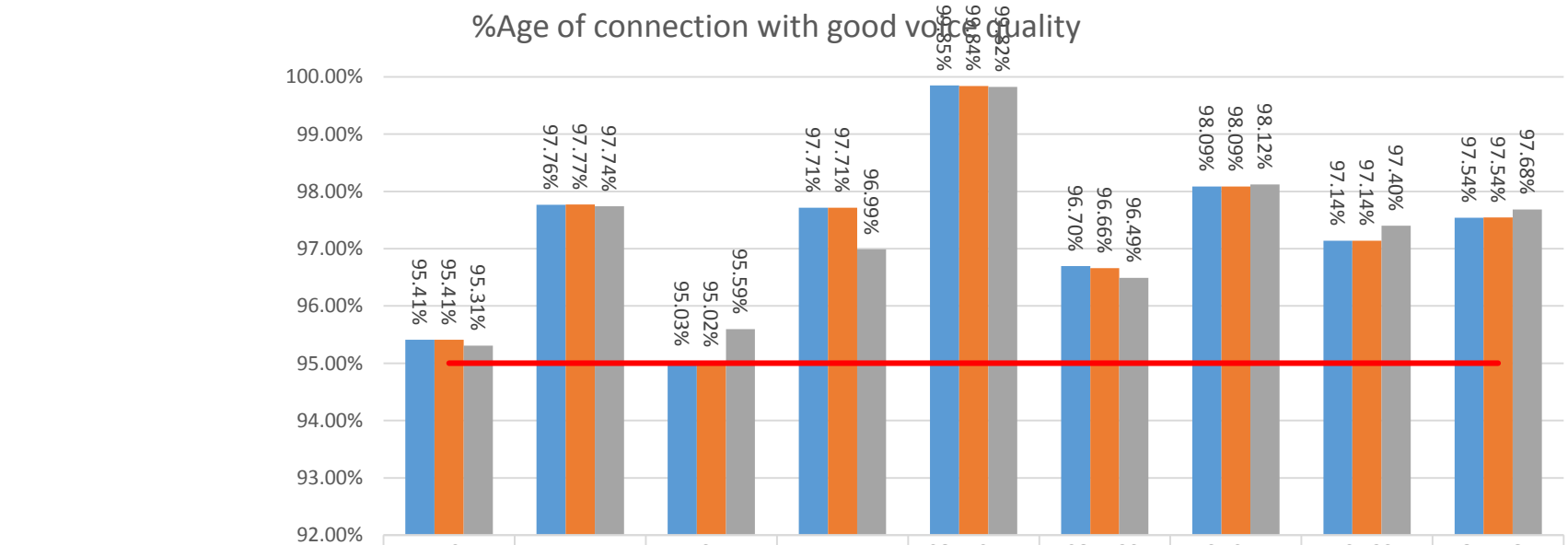
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	1.19%	0.60%	1.91%	1.01%	0.08%	0.32%	0.10%	0.07%	0.57%
PMR Audit 2G TSP	1.19%	0.60%	1.83%	1.01%	0.08%	0.32%	0.10%	0.07%	0.57%
3 Day Live Audit 2G	1.14%	0.63%	1.75%	1.04%	0.09%	0.35%	0.10%	0.05%	0.58%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%

13.4.7. WORST AFFECTED CELL HAVING MORE THAN 3% TCH DROP



	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	10.16%	0.44%	2.76%	2.10%	17.09%	1.24%	1.85%	0.22%	2.41%
PMR Audit 2G TSP	10.16%	0.40%	2.76%	2.10%	0.58%	1.24%	1.86%	0.22%	2.40%
3 Day Live Audit 2G	9.82%	0.45%	2.83%	2.07%	0.50%	1.09%	1.75%	0.00%	2.44%
Benchmark ≤ 2%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%

13.4.8. %AGE OF CONNECTION WITH GOOD VOICE QUALITY

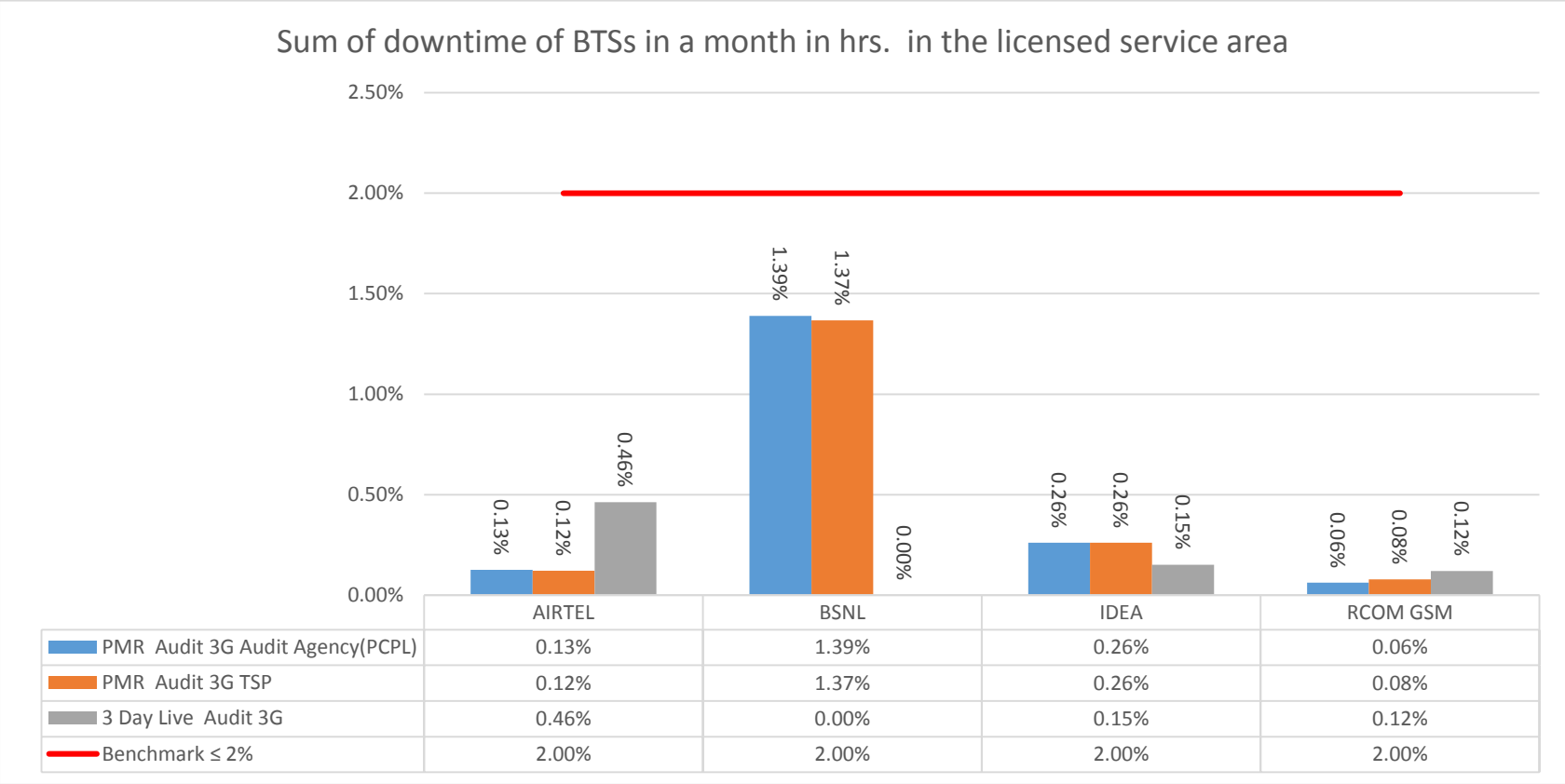


	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
PMR Audit 2G Audit Agengy(PCPL)	95.41%	97.76%	95.03%	97.71%	99.85%	96.70%	98.09%	97.14%	97.54%
PMR Audit 2G TSP	95.41%	97.77%	95.02%	97.71%	99.84%	96.66%	98.09%	97.14%	97.54%
3 Day Live Audit 2G	95.31%	97.74%	95.59%	96.99%	99.82%	96.49%	98.12%	97.40%	97.68%
Benchmark ≤ 2%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%	95.00%

13.5. PMR Comparison (TSP vs. Audit Agency): Network Parameters

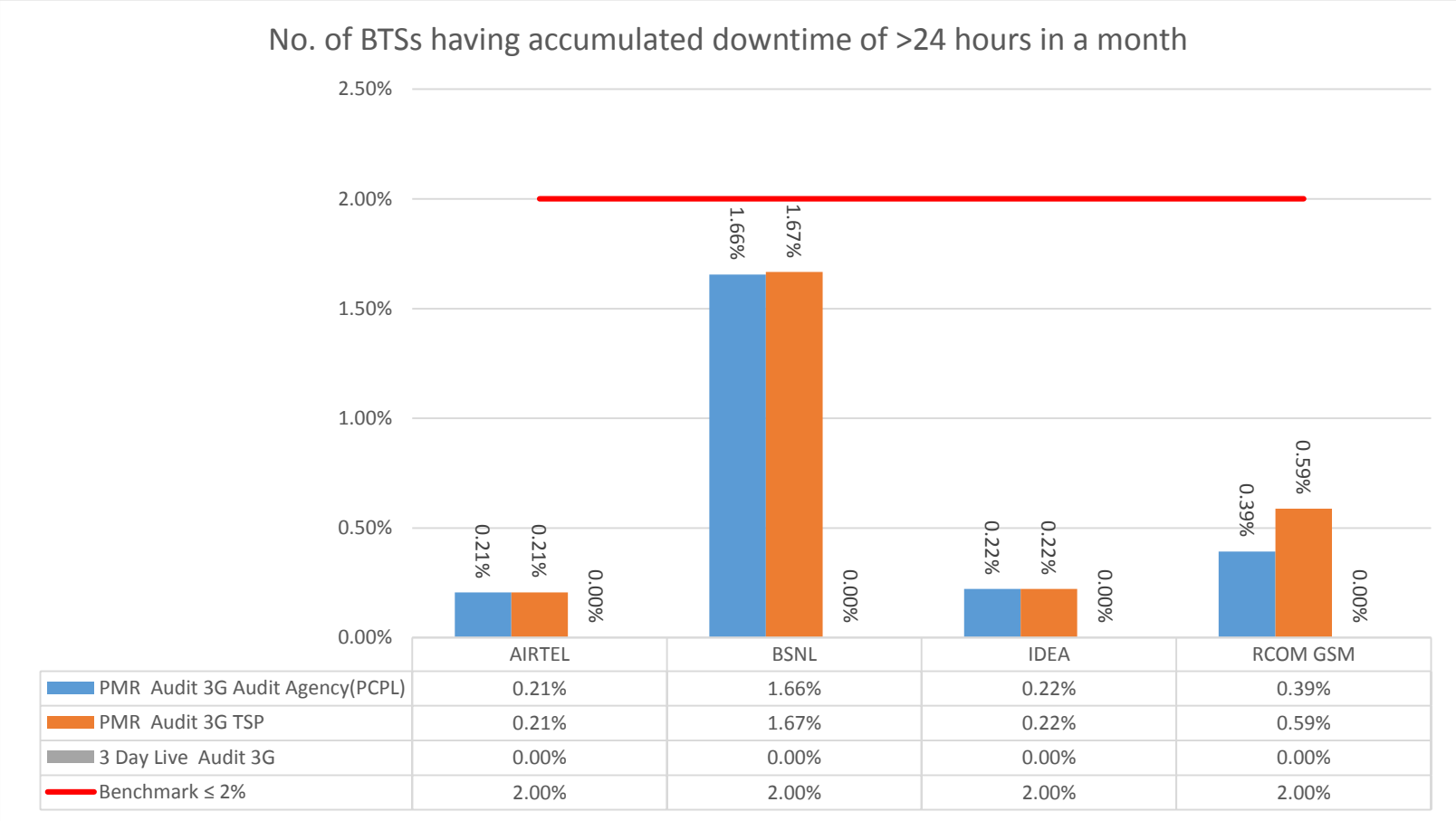
PMR Report Comparison between Audit Agency and TSP							
Network Parameters		Name of Service Provider					
		Benchmark		AIRTEL	BSNL	IDEA	RCOM GSM
Network Availability	Sum of downtime of BTSs in a month in hrs. in the licensed service area	≤ 2%	Agency	0.13%	1.39%	0.26%	0.06%
			TSP	0.12%	1.37%	0.26%	0.08%
	No. of BTSs having accumulated downtime of >24 hours in a month	≤ 2%	Agency	0.21%	1.66%	0.22%	0.39%
			TSP	0.21%	1.67%	0.22%	0.59%
Connection Establishment (Accessibility)	Call Set-up Success Rate (Within Licensee own network	≥ 95%	Agency	99.00%	97.85%	99.23%	96.66%
			TSP	98.99%	98.00%	99.23%	96.69%
	RRC Congestion:	≤ 1%	Agency	0.05%	0.69%	0.50%	0.17%
			TSP	0.04%	0.63%	0.50%	0.13%
	RAB Congestion:	≤ 2%	Agency	0.01%	0.39%	0.19%	0.09%
			TSP	0.01%	0.33%	0.19%	0.13%
Connection Maintenance (Retainability)	Circuit Switched Voice Drop Rate	≤ 2%	Agency	0.63%	0.99%	1.73%	0.13%
			TSP	0.65%	0.97%	1.73%	0.13%
	Worst affected cells having more than 3% Circuit Switched Voice Drop Rate:	≤ 3%	Agency	1.12%	2.67%	2.24%	0.50%
			TSP	1.14%	2.60%	2.24%	0.67%
	Percentage of connections with Good Circuit Switched Voice Quality	≥ 95%	Agency	98.91%	99.67%	97.55%	99.91%
			TSP	98.90%	98.10%	97.55%	98.56%

13.5.1. SUM OF DOWNTIME OF BTSS IN A MONTH IN HRS. IN THE LICENSED SERVICE AREA



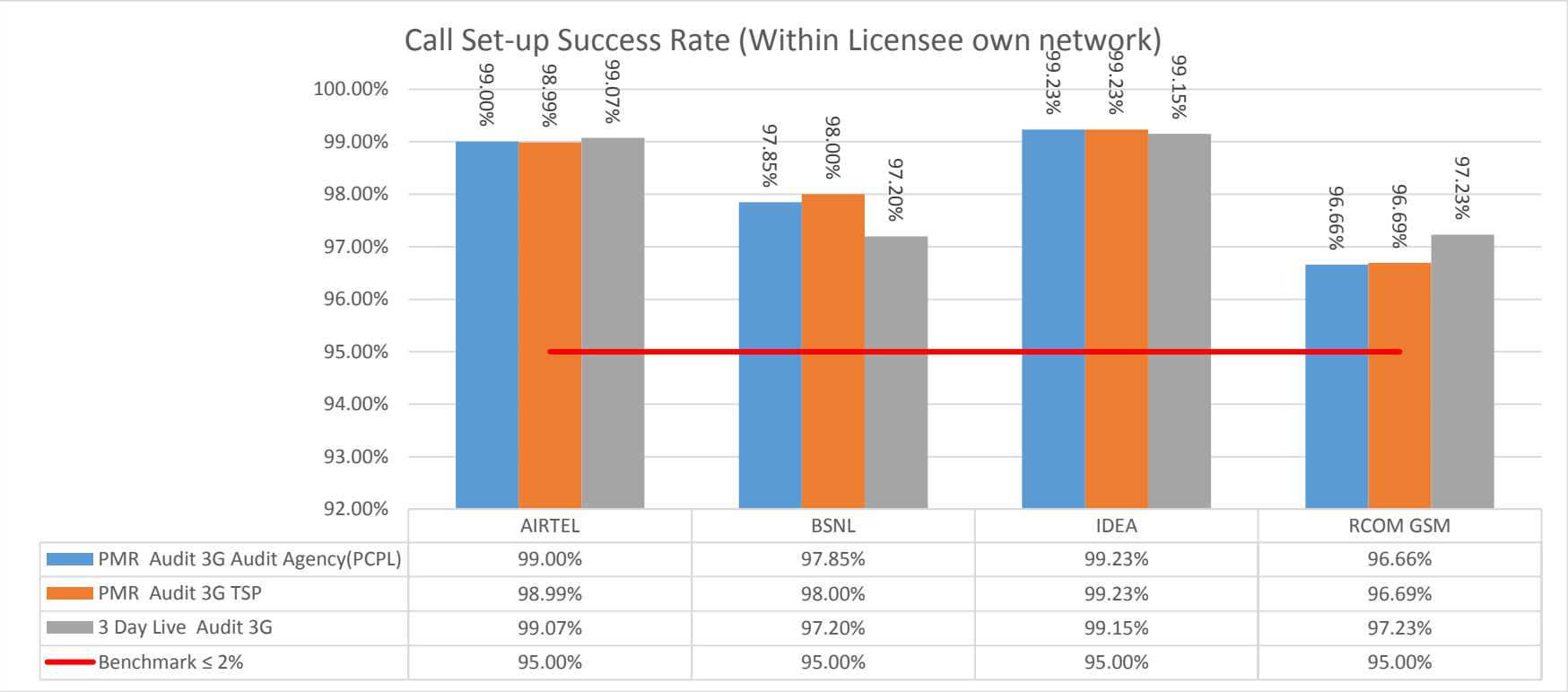
	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	0.13%	1.39%	0.26%	0.06%
PMR Audit 3G TSP	0.12%	1.37%	0.26%	0.08%
3 Day Live Audit 3G	0.46%	0.00%	0.15%	0.12%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%

13.5.2. NO. OF BTSS HAVING ACCUMULATED DOWNTIME OF >24 HOURS IN A MONTH



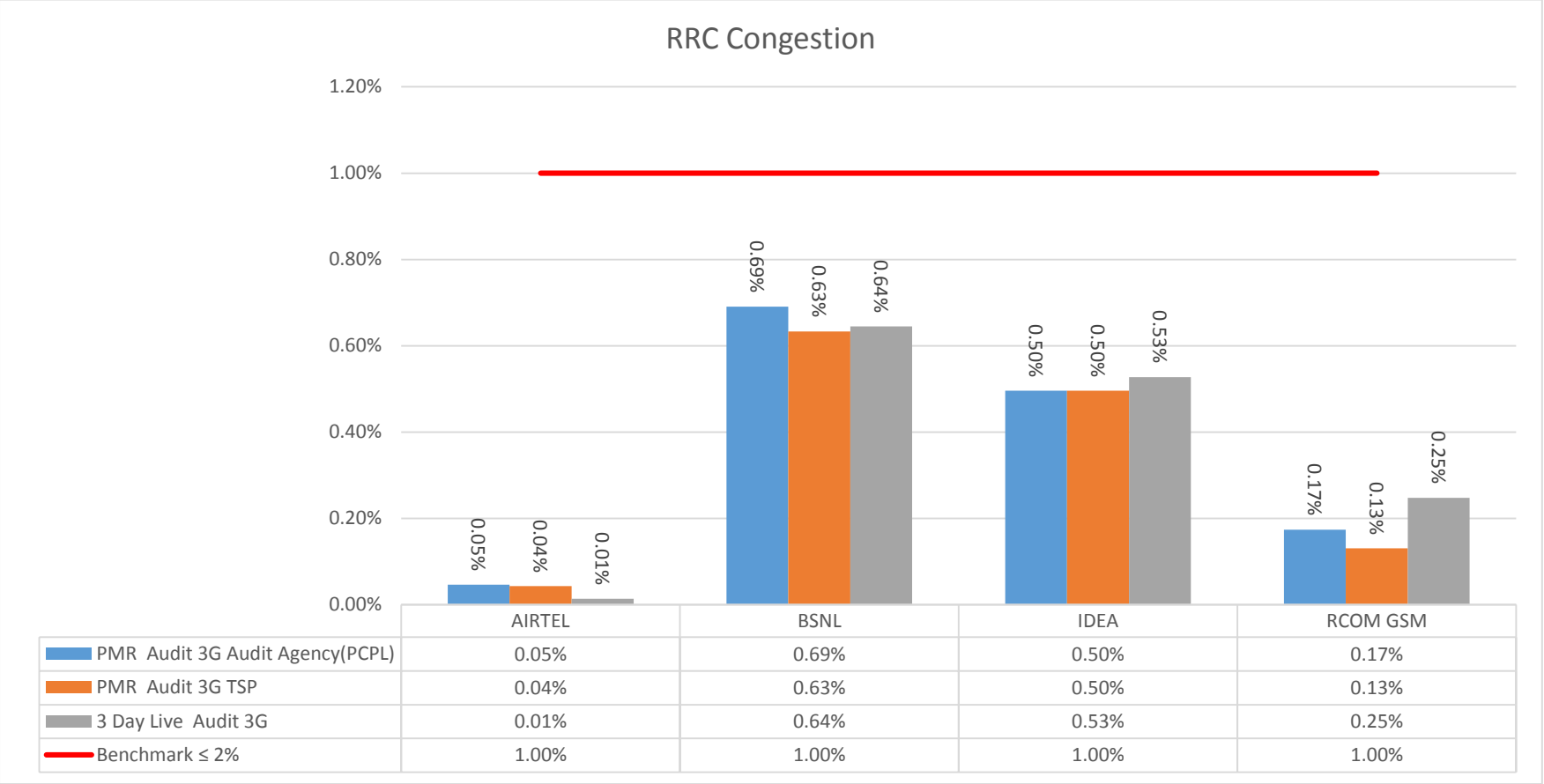
	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	0.21%	1.66%	0.22%	0.39%
PMR Audit 3G TSP	0.21%	1.67%	0.22%	0.59%
3 Day Live Audit 3G	0.00%	0.00%	0.00%	0.00%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%

13.5.3. CALL SET-UP SUCCESS RATE (WITHIN LICENSEE OWN NETWORK)



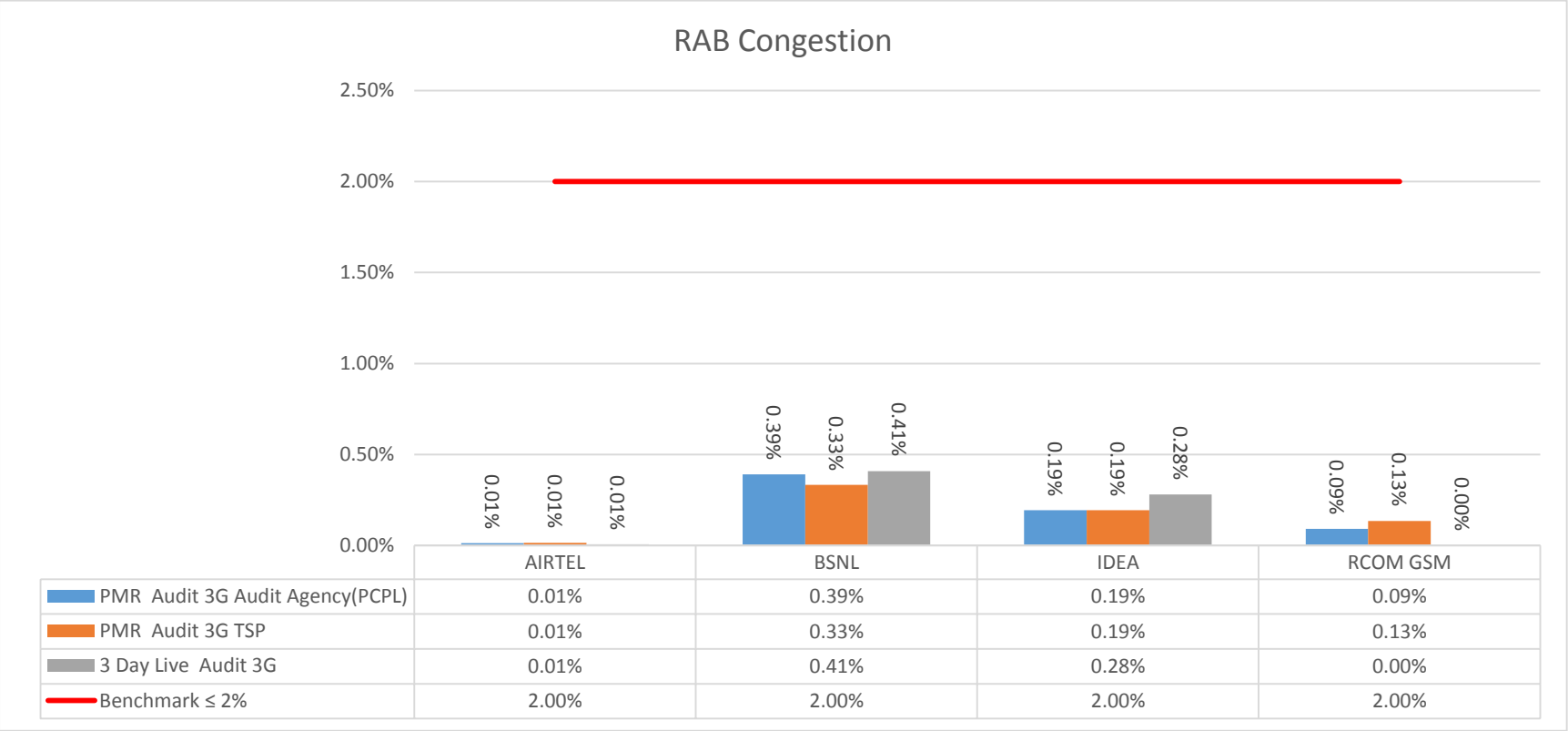
	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	99.00%	97.85%	99.23%	96.66%
PMR Audit 3G TSP	98.99%	98.00%	99.23%	96.69%
3 Day Live Audit 3G	99.07%	97.20%	99.15%	97.23%
Benchmark ≤ 2%	95.00%	95.00%	95.00%	95.00%

13.5.4. RRC CONGESTION



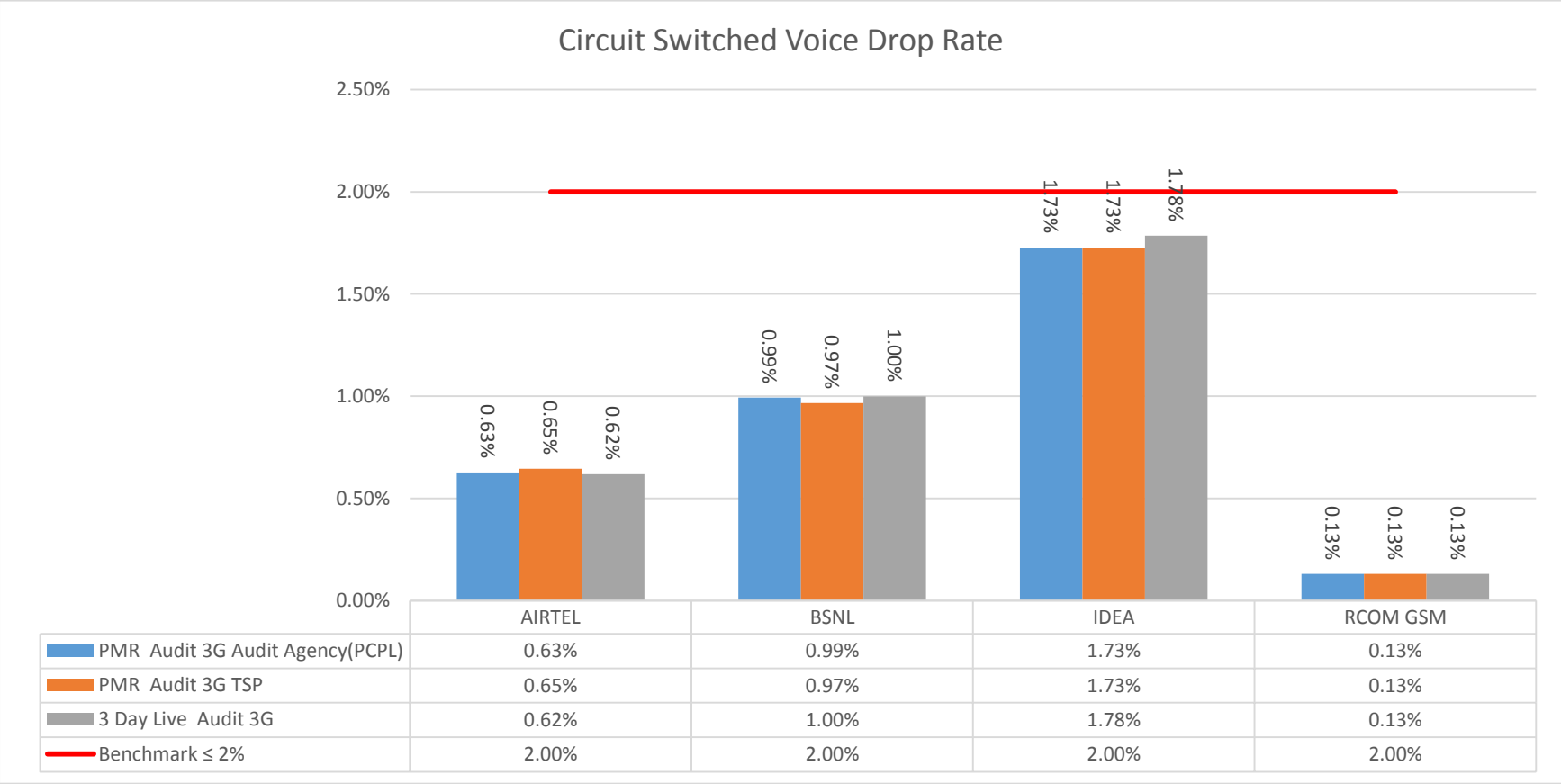
	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	0.05%	0.69%	0.50%	0.17%
PMR Audit 3G TSP	0.04%	0.63%	0.50%	0.13%
3 Day Live Audit 3G	0.01%	0.64%	0.53%	0.25%
Benchmark ≤ 2%	1.00%	1.00%	1.00%	1.00%

13.5.5. RAB CONGESTION



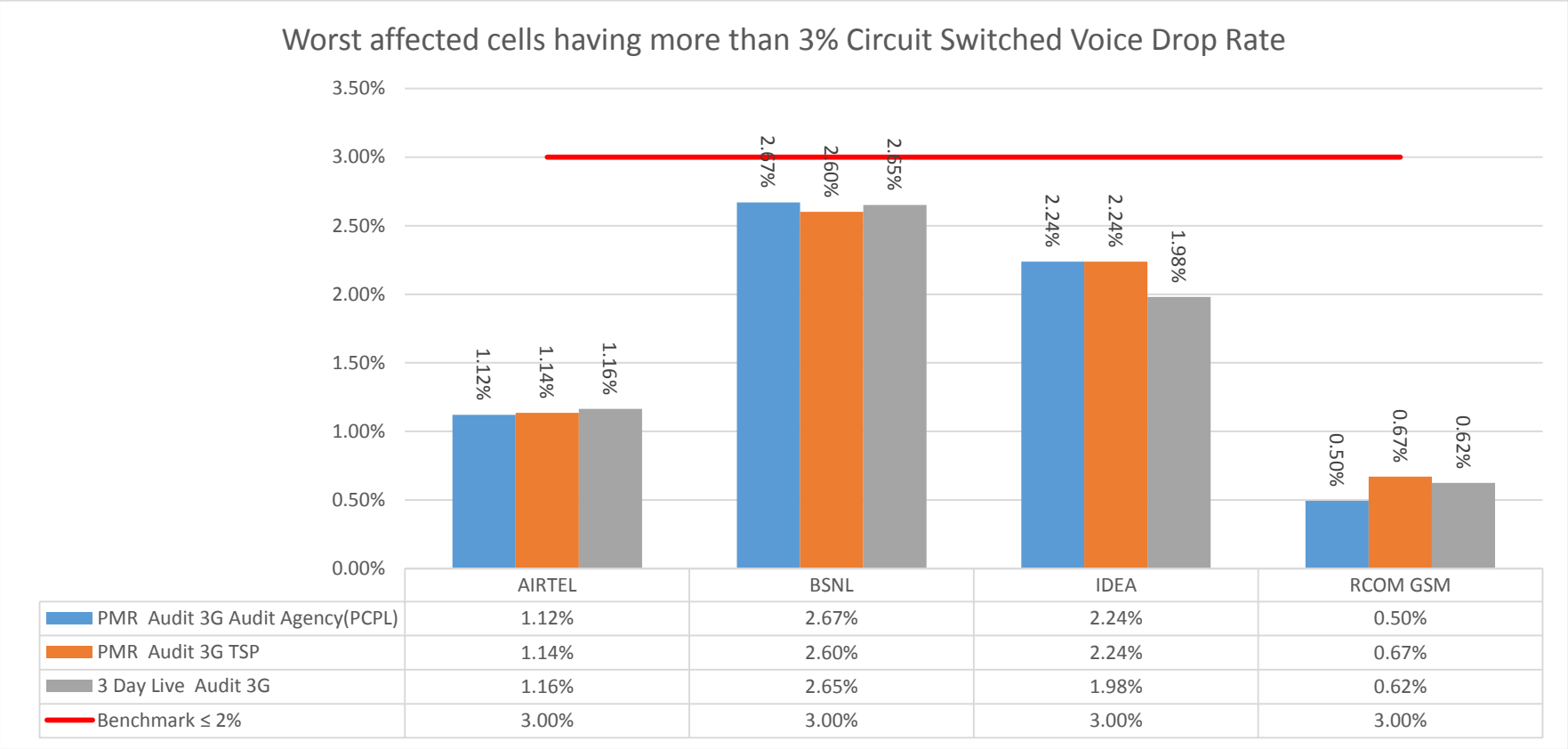
	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	0.01%	0.39%	0.19%	0.09%
PMR Audit 3G TSP	0.01%	0.33%	0.19%	0.13%
3 Day Live Audit 3G	0.01%	0.41%	0.28%	0.00%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%

13.5.6. CIRCUIT SWITCHED VOICE DROP RATE



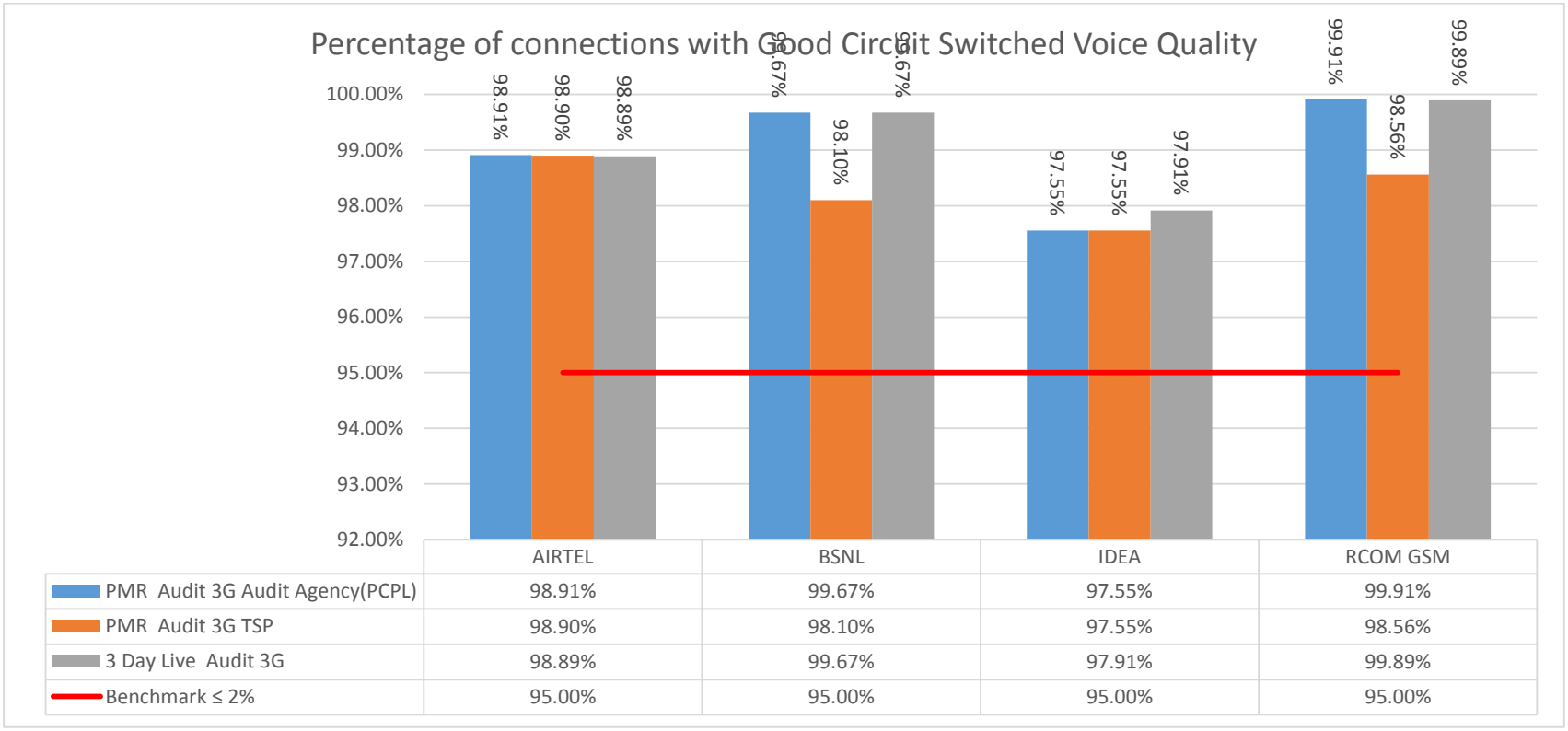
	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	0.63%	0.99%	1.73%	0.13%
PMR Audit 3G TSP	0.65%	0.97%	1.73%	0.13%
3 Day Live Audit 3G	0.62%	1.00%	1.78%	0.13%
Benchmark ≤ 2%	2.00%	2.00%	2.00%	2.00%

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



	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	1.12%	2.67%	2.24%	0.50%
PMR Audit 3G TSP	1.14%	2.60%	2.24%	0.67%
3 Day Live Audit 3G	1.16%	2.65%	1.98%	0.62%
Benchmark ≤ 2%	3.00%	3.00%	3.00%	3.00%

13.5.8. PERCENTAGE OF CONNECTIONS WITH GOOD CIRCUIT SWITCHED VOICE QUALITY

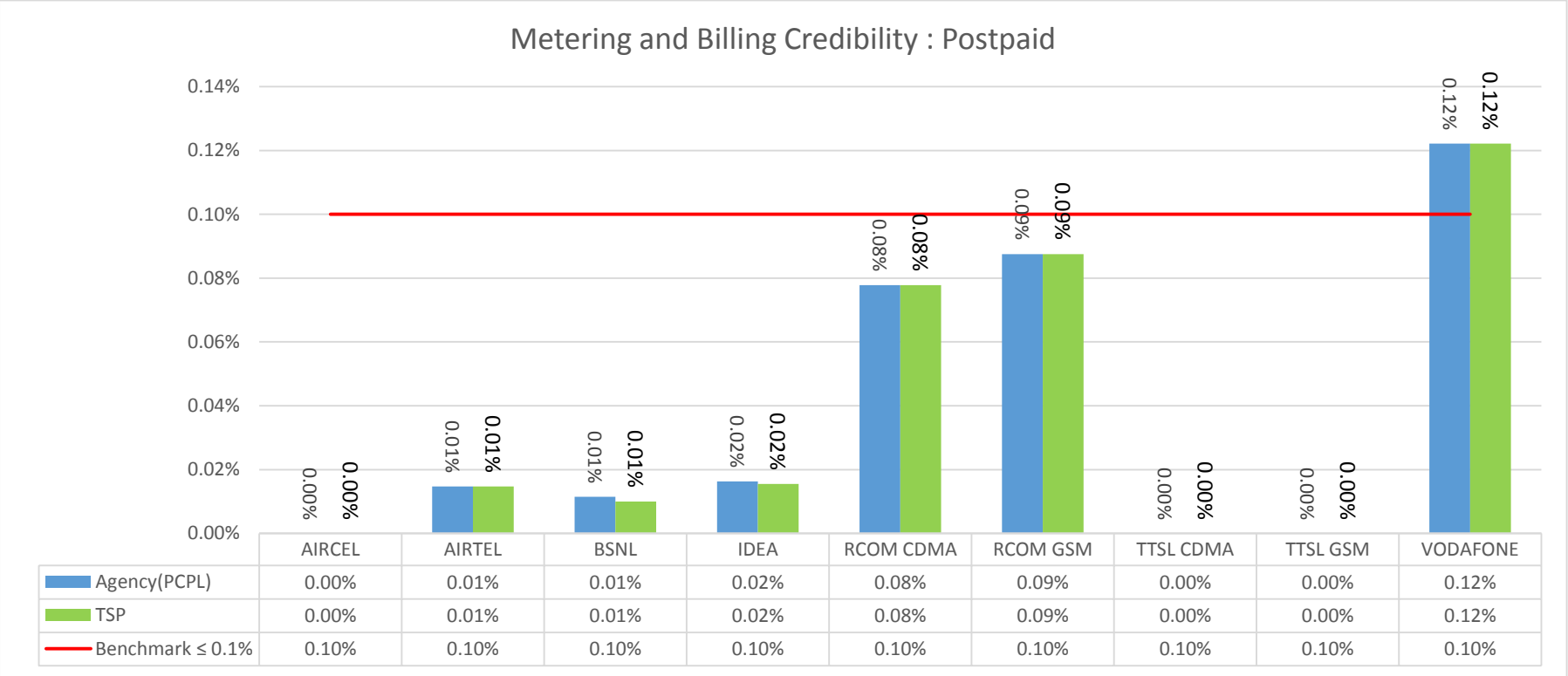


	AIRTEL	BSNL	IDEA	RCOM GSM
PMR Audit 3G Audit Agency(PCPL)	98.91%	99.67%	97.55%	99.91%
PMR Audit 3G TSP	98.90%	98.10%	97.55%	98.56%
3 Day Live Audit 3G	98.89%	99.67%	97.91%	99.89%
Benchmark ≤ 2%	95.00%	95.00%	95.00%	95.00%

13.6. PMR Comparison (TSP vs. Audit Agency): CSD Parameters

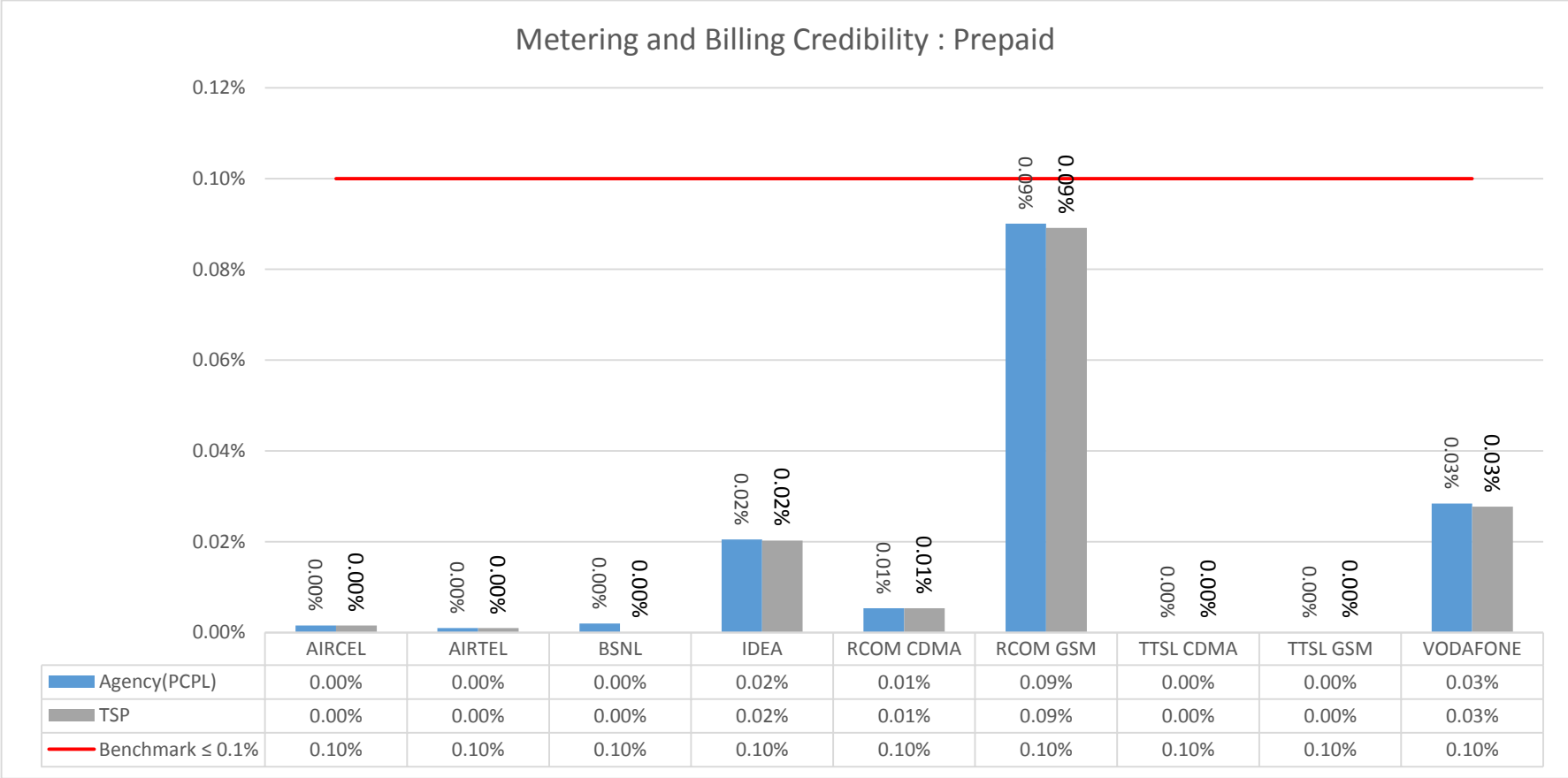
Name of Service Provider	Metering and Billing credibility				Billing Complaints						Termination & Closures		Time taken for refund of deposits after closures: Benchmark		Response time to customer for assistance			
	Postpaid Subscribers		Prepaid Subscribers		%age complaints resolved within 4 weeks		%age complaints resolved within 6 weeks		%age of where credit/waiver is received within one week		% of Termination/ Closure of service within 7 days (100 %)		Cleared over a period of <60 days (100%)		%age of calls answered by the IVR		%age of call answered by the operators (voice to voice) within 90 seconds	
Benchmark	≤ 0.1%		≤ 0.1%		≥ 98%		= 100%		= 100%		= 100%		= 100%		≥ 95%		≥ 95%	
	Agency	TSP	Agency	TSP	Agency	TSP	Agency	TSP	Agency	TSP	Agency	TSP	Agency	TSP	Agency	TSP	Agency	TSP
AIRCEL	0.00%	0.00%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.23%	98.23%	96.75%	96.75%
AIRTEL	0.01%	0.01%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.99%	99.99%	93.81%	93.81%
BSNL	0.01%	0.01%	0.00%	0.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	97.36%	99.99%
IDEA	0.02%	0.02%	0.02%	0.02%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.32%	99.32%	99.66%	99.66%
RCOM CDMA	0.08%	0.08%	0.01%	0.01%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	52.53%	74.30%	95.88%	95.88%	97.77%	97.77%
RCOM GSM	0.09%	0.09%	0.09%	0.09%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	67.86%	67.86%	99.30%	99.30%	96.62%	96.62%
TTSL CDMA	0.00%	0.00%	0.00%	0.00%	NA	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.93%	100.00%	98.03%	99.89%
TTSL GSM	0.00%	0.00%	0.00%	0.00%	NA	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	98.03%	98.03%	99.83%	99.83%
VODAFONE	0.12%	0.12%	0.03%	0.03%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	DNA	100.00%	100.00%	100.00%	98.98%	99.60%

13.6.1. METERING AND BILLING CREDIBILITY : POSTPAID



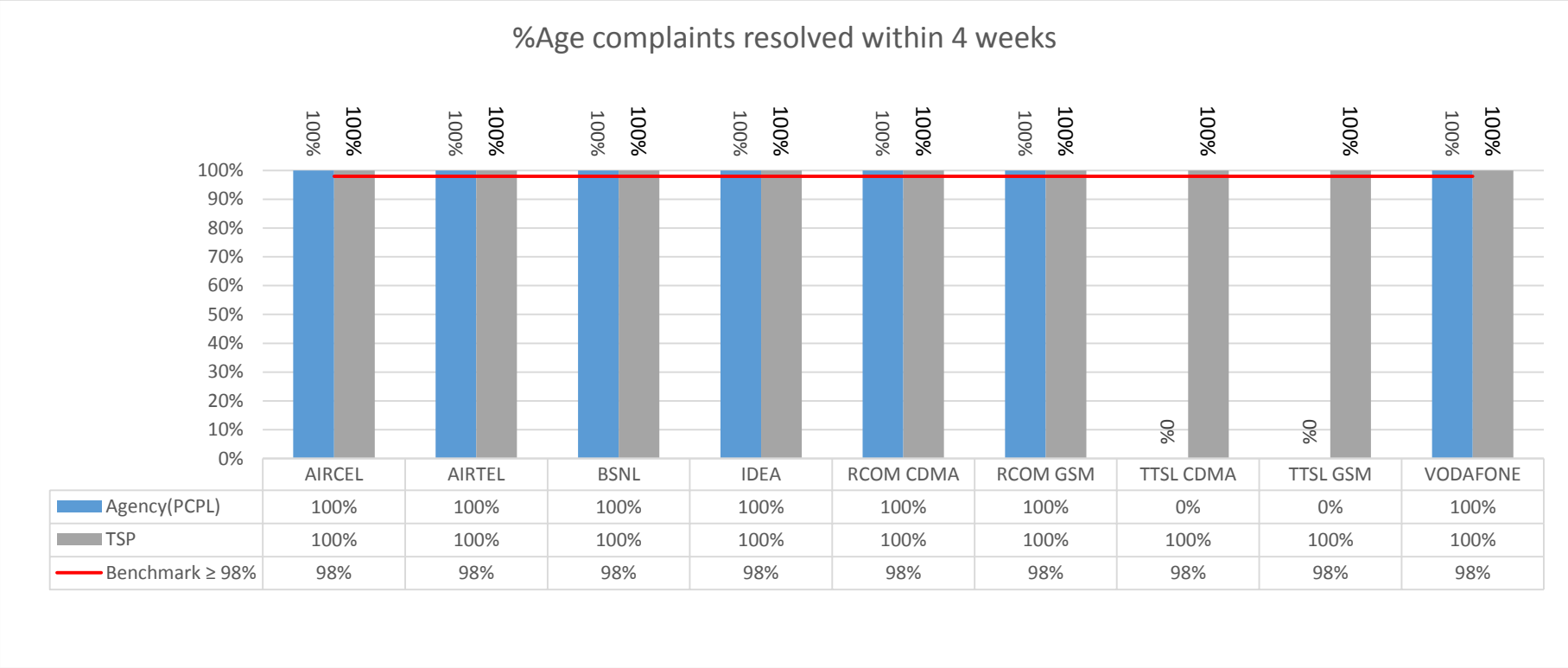
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	0.00%	0.01%	0.01%	0.02%	0.08%	0.09%	0.00%	0.00%	0.12%
TSP	0.00%	0.01%	0.01%	0.02%	0.08%	0.09%	0.00%	0.00%	0.12%
Benchmark ≤ 0.1%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%

13.6.2. METERING AND BILLING CREDIBILITY : PREPAID



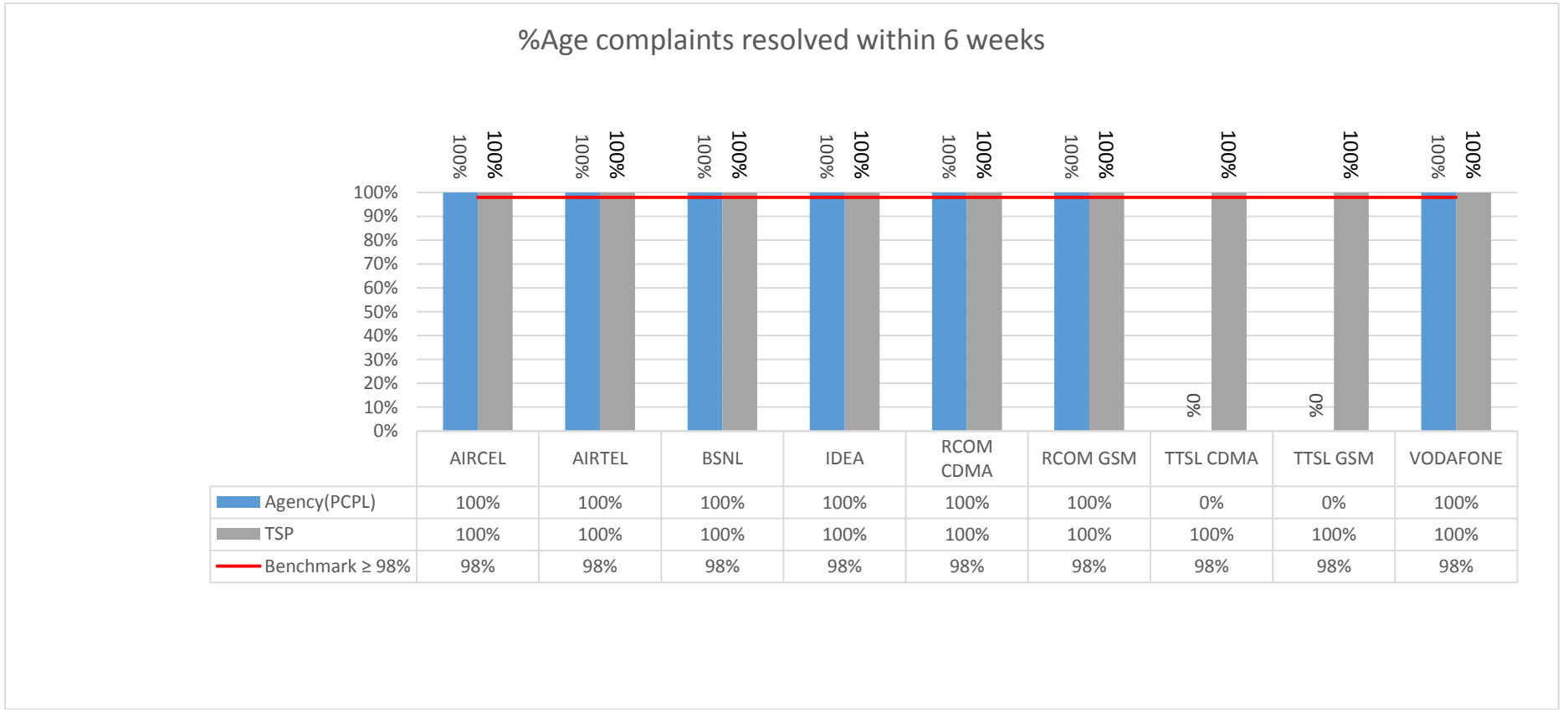
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	0.00%	0.00%	0.00%	0.02%	0.01%	0.09%	0.00%	0.00%	0.03%
TSP	0.00%	0.00%	0.00%	0.02%	0.01%	0.09%	0.00%	0.00%	0.03%
Benchmark ≤ 0.1%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%

13.6.3. %AGE COMPLAINT RESOLVED WITHIN 4 WEEKS



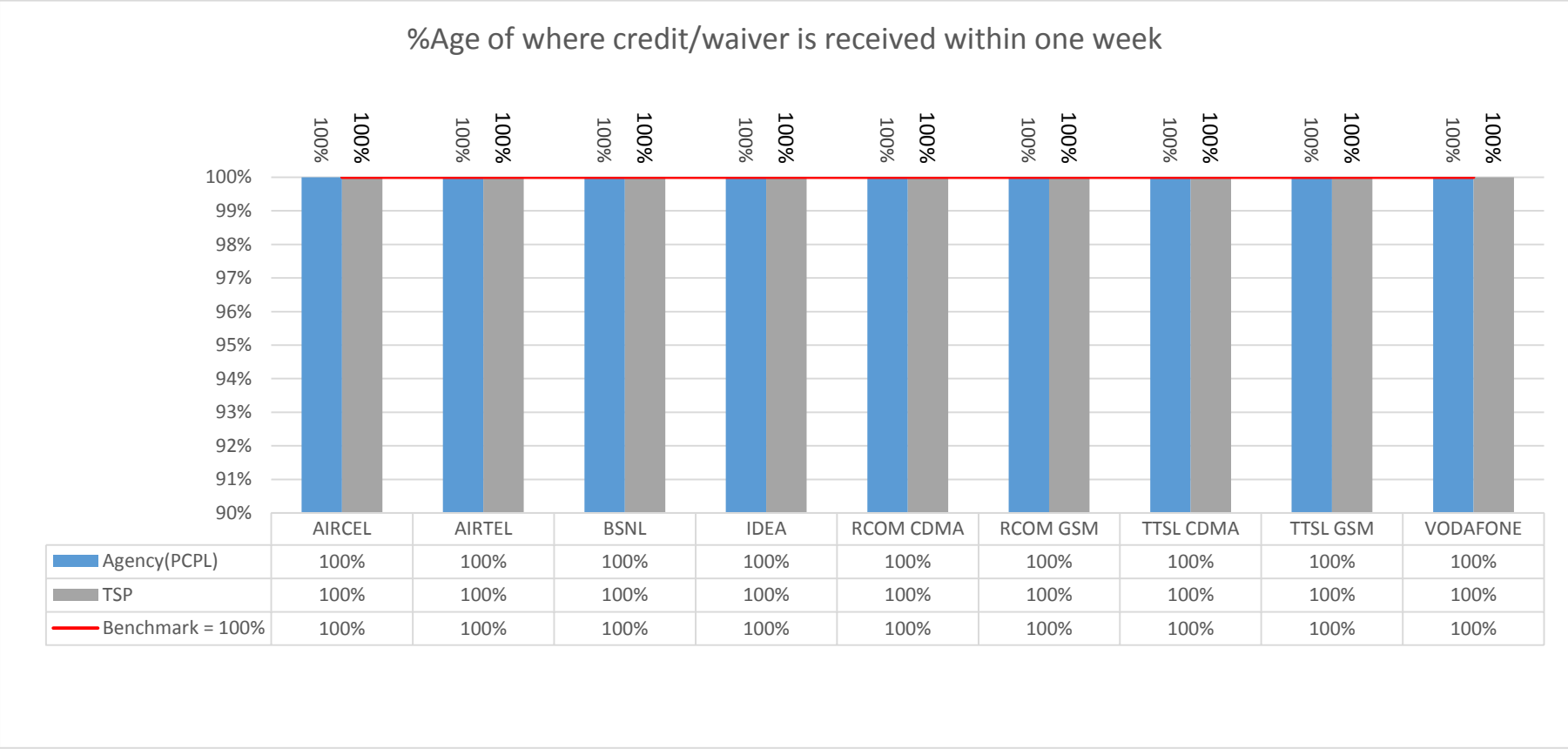
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	100%	100%	100%	100%	100%	100%	0%	0%	100%
TSP	100%	100%	100%	100%	100%	100%	100%	100%	100%
Benchmark ≥ 98%	98%	98%	98%	98%	98%	98%	98%	98%	98%

13.6.4. %AGE COMPLAINTS RESOLVED WITHIN 6 WEEKS



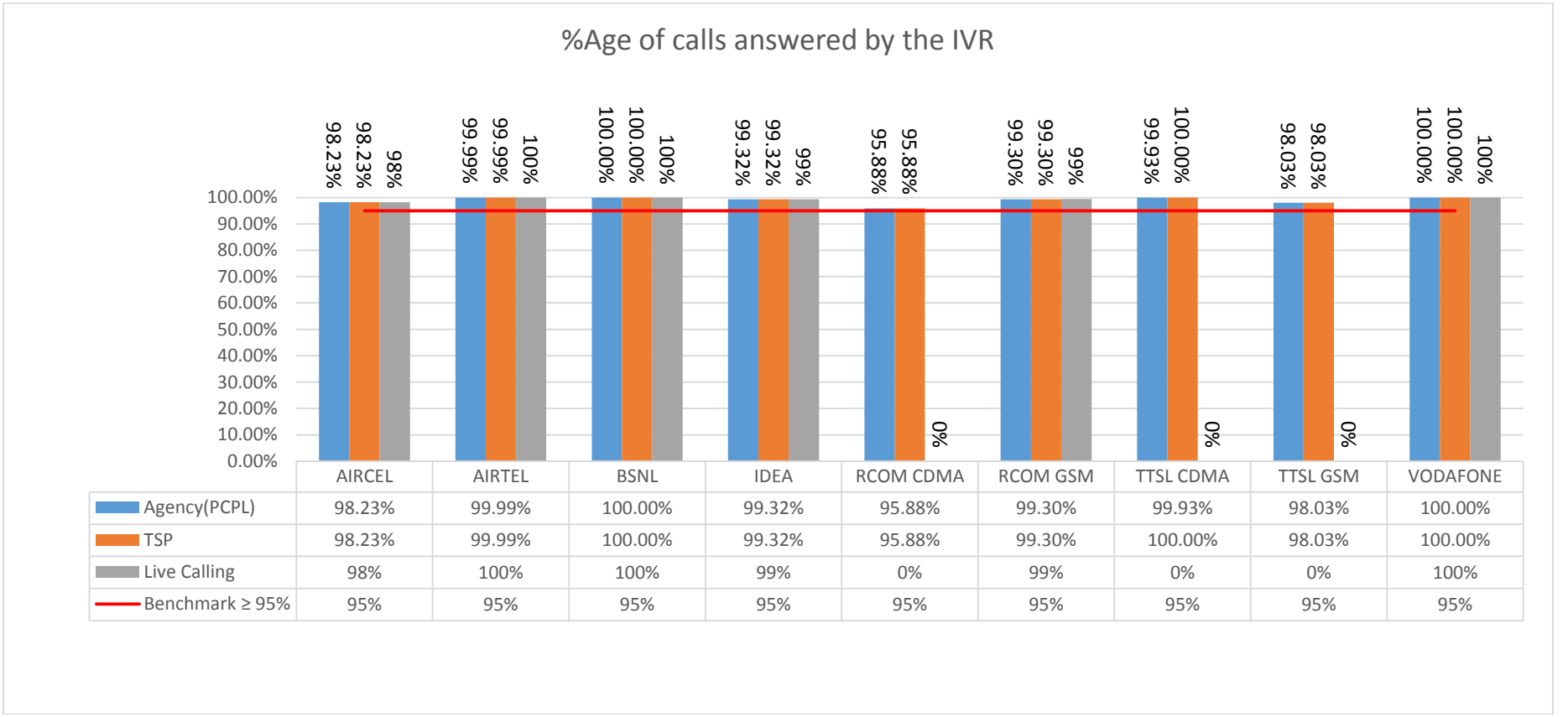
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	100%	100%	100%	100%	100%	100%	0%	0%	100%
TSP	100%	100%	100%	100%	100%	100%	100%	100%	100%
Benchmark ≥ 98%	98%	98%	98%	98%	98%	98%	98%	98%	98%

13.6.5. %AGE OF WHERE CREDIT/WAIVER IS RECEIVED WITHIN ONE WEEK



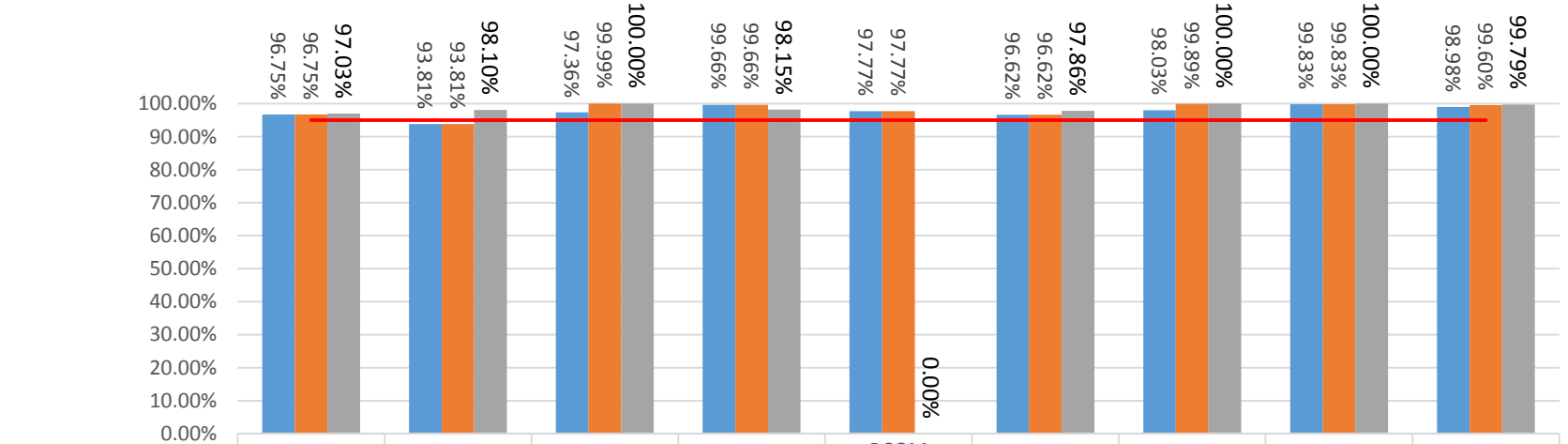
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	100%	100%	100%	100%	100%	100%	100%	100%	100%
TSP	100%	100%	100%	100%	100%	100%	100%	100%	100%
Benchmark = 100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

13.6.6. %AGE OF CALLS ANSWERED BY THE IVR



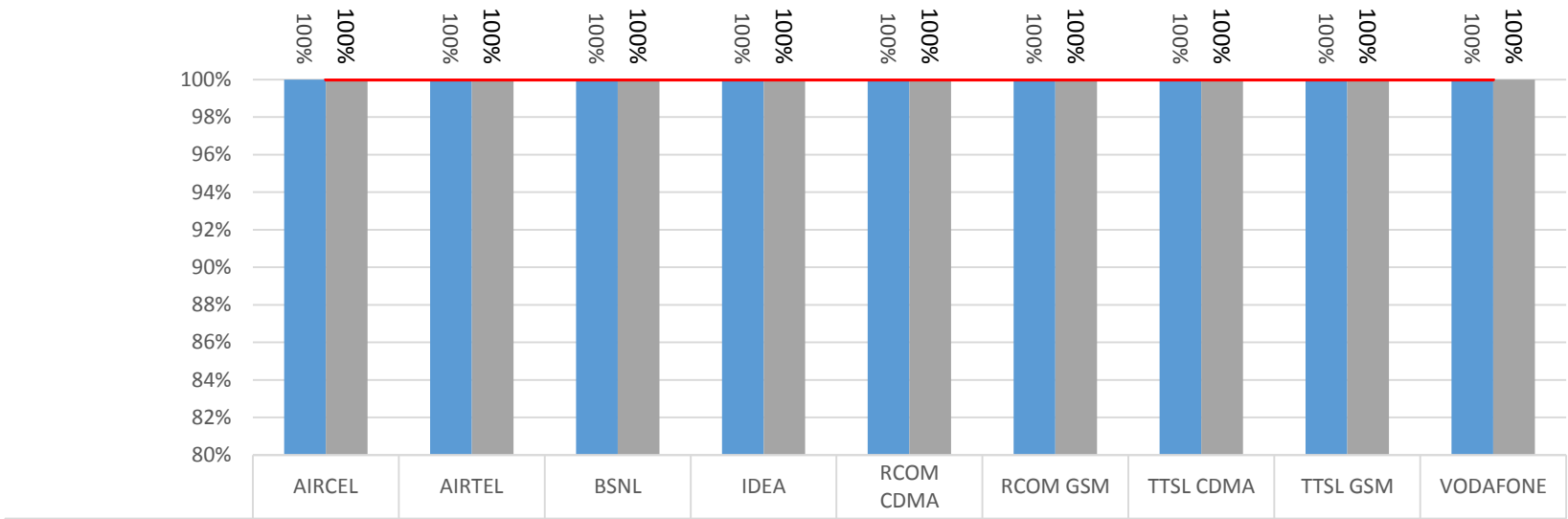
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	98.23%	99.99%	100.00%	99.32%	95.88%	99.30%	99.93%	98.03%	100.00%
TSP	98.23%	99.99%	100.00%	99.32%	95.88%	99.30%	100.00%	98.03%	100.00%
Live Calling	98%	100%	100%	99%	0%	99%	0%	0%	100%
Benchmark ≥ 95%	95%	95%	95%	95%	95%	95%	95%	95%	95%

13.6.7. %AGE OF CALLS ANSWERED BY THE OPERATORS (VOICE TO VOICE) WITHIN 90 SECONDS



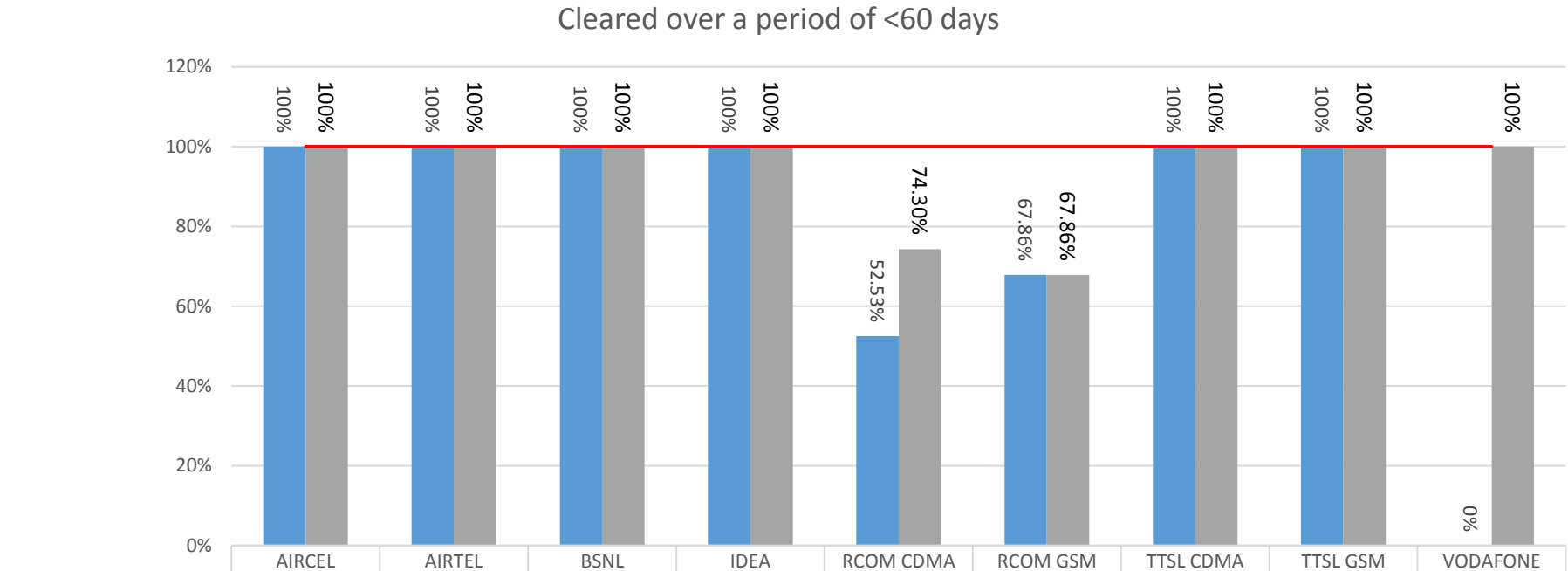
	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	96.75%	93.81%	97.36%	99.66%	97.77%	96.62%	98.03%	99.83%	98.98%
TSP	96.75%	93.81%	99.99%	99.66%	97.77%	96.62%	99.89%	99.83%	99.60%
Live Calling	97.03%	98.10%	100.00%	98.15%	0.00%	97.86%	100.00%	100.00%	99.79%
Benchmark ≥ 95%	95%	95%	95%	95%	95%	95%	95%	95%	95%

13.6.8. %AGE OF TERMINATION/CLOSURE OF SERVICE WITHIN 7 DAYS



	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	100%	100%	100%	100%	100%	100%	100%	100%	100%
TSP	100%	100%	100%	100%	100%	100%	100%	100%	100%
Benchmark = 100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

13.6.9. CLEARED OVER A PERIOD OF <60 DAYS



	AIRCEL	AIRTEL	BSNL	IDEA	RCOM CDMA	RCOM GSM	TTSL CDMA	TTSL GSM	VODAFONE
Agency(PCPL)	100%	100%	100%	100%	52.53%	67.86%	100%	100%	0%
TSP	100%	100%	100%	100%	74.30%	67.86%	100%	100%	100%
Benchmark = 100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

14. KEY FINDINGS

NETWORK FINDINGS:

- AIRCEL has parameter value of 10.16% and failed to meet the benchmark of ≤ 3% Worst Affected cell having more than 3% TCH drop
- RCOM CDMA has parameter value of 17.09% and failed to meet the benchmark of ≤ 3% Worst Affected cell having more than 3% TCH drop

CUSTOMER SERVICE DELIVERY:

- AIRCEL has parameter value of 93.81% and failed to meet the benchmark of ≥ 95% percentage of call answered by the operators (voice to voice) within 90 seconds
- RCOM CDMA has parameter value of 52.53% and failed to meet the benchmark of = 100% refund of deposits cleared over a period of <60 days
- RCOM GSM has parameter value of 67.86% and failed to meet the benchmark of = 100% refund of deposits cleared over a period of <60 days

PHISTREAM
EMPOWERING LEADERSHIP, TRANSFORMING BUSINESS

TRAI
सत्यमेव जयते
Telecom Regulatory Authority of India
(IS/ISO 9001-2008 Certified Organisation)



AUDIT & ASSESSMENT OF QUALITY OF SERVICE

NORTH ZONE – HIMACHAL PRADESH CIRCLE

WIRELINE & BROADBAND SERVICES (APRIL TO JUNE 2016)

PREPARED BY:

PHISTREAM CONSULTING PRIVATE LIMITED
(An ISO – 9001:2008 Certified Company)
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Email: info@phistream.com

TABLE OF CONTENTS

1. INTRODUCTION

1.1. 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 Junket 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 June 20, 2009 and Quality of Service of Broadband Service Regulations, 2006 (11 of 2006) dated April 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).

1.2. ABOUT PHISTREAM CONSULTING PRIVATE LIMITED

Phistream Consulting Private Limited is an ISO:9001 certified company who are one of the pioneers in the field of technical audit, quality assurance and third party inspection services. Established more than a decade ago in 2004, we aspire to provide longer term savings based on year-on-year productivity. With our size, we are nimble and aspire to being a full service partner for providing consultancy services.

We have been helping our clients by determining the best solutions and enabling businesses to enjoy the benefits of top-notch support without distracting their team from the main business focus. Our business analysts have enough experience to get involved at the requirements gather stage through consulting work handing off a detailed requirements document to our operations staff who in turn can train our support and maintenance resources for ongoing engagement.

In keeping with our goal of being a one stop quality assurance and consulting partner, our specialists employ a strategy and consulting-based implementation methodology and capitalize on strong program governance to offer a wide range of services for various industry verticals.

1.3. OBJECTIVES

The primary objective of the Audit module is to:

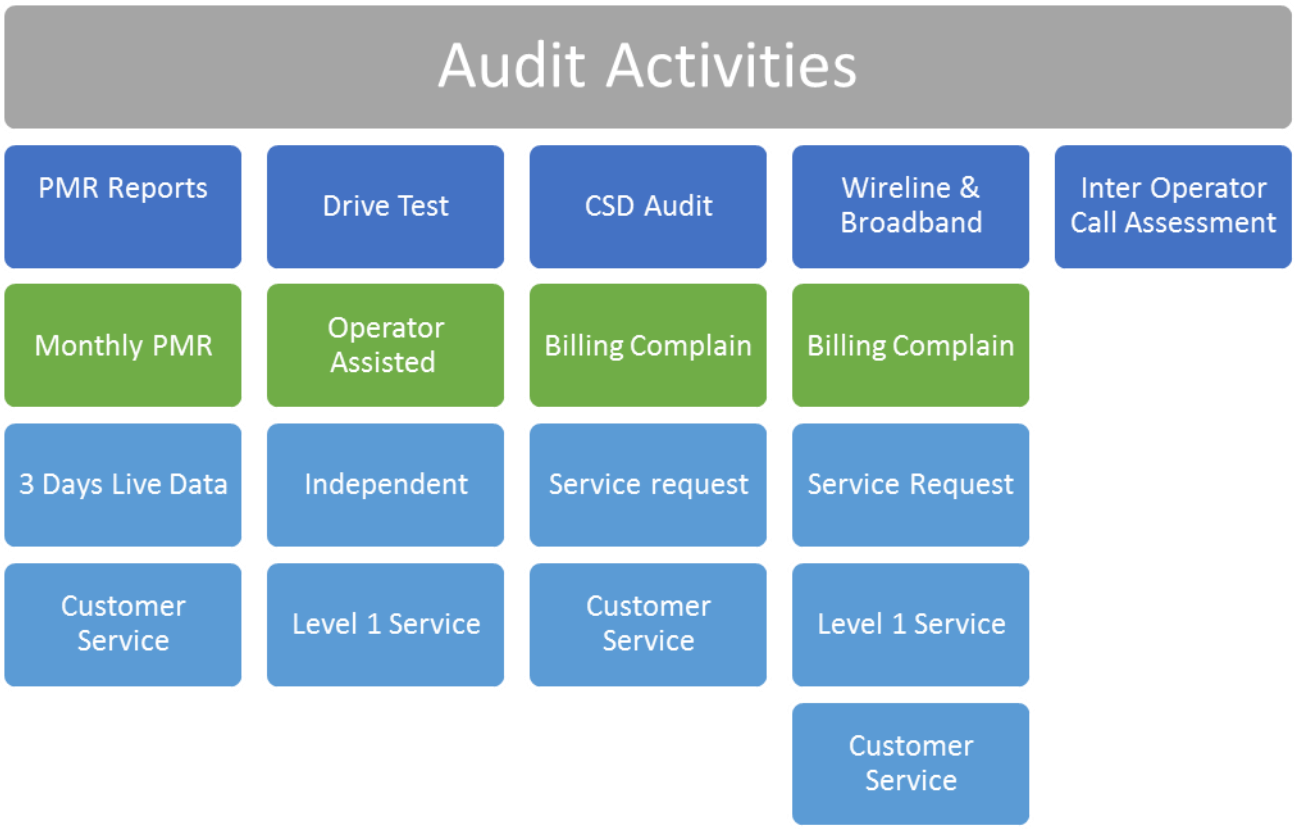
- Audit and Assess the Quality of Services being rendered by Cellular Mobile (Wireless) service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI).

1.4. COVERAGE

The audit was conducted in Himachal Pradesh Circle covering all SSAs (Secondary Switching Areas).

Image Source: Wikipedia

1.5. FRAMEWORK USED



2. Basic Telephone Service (Wireline) and Broadband Services

2.1. Wireline Service Parameter

S. No.	Name of Parameter	Benchmark
1	Fault incidences (Fault incidences subscribers / month)	≤ 7
2	Fault repair by next working day	For urban areas: By next working day: ≥85% and within 5 days: 100%. For rural and hilly areas: By next working day: ≥75% and within 7days: 100%. Rent Rebate: Faults pending for >3 days and ≤7 days: Rent rebate for 7 days. Faults pending for >7 days and ≤15 days: Rent rebate for 15 days. Faults pending for> 15 days: rent rebate for one month.
3	Mean Time To Repair (MTTR)	≤ 10 Hrs
4	Point of Interconnection (POI) Congestion (on individual POI)	≤ 0.5%
5	Metering and billing credibility – post paid	Not more than 0.1% of bills issued should be disputed over a billing cycle
6	Metering and billing credibility –- pre-paid	Not more than 1 complaint per 1000 customers, i.e. 0.1% complaints for metering, charging, credit, and validity
7	Resolution of billing / charging complaints	≥ 98% within 4 weeks 100% within 6 weeks
8	Period of applying credit/ waiver/ adjustment to customer's account from the date of resolution of complaints	Within one week of resolution of complaint
9	Response Time to the customer for assistance	
	(a) Accessibility of call centre/ customer care	≥ 95%
	(b)Percentage of calls answered by the operators (voice to voice) within 60 seconds	≥ 95%
10	Termination/ closure of service	≤ 7
11	Time taken for refund of deposits after closures	100% within 60 days.

2.2. BROADBAND SERVICE PARAMETER

S. No.	Name of Parameter	Benchmark
1	Service provisioning\ Activation	100% cases in ≤ 15 working days (subject to technical feasibility). In all cases where payment towards installation charge & security deposit is taken and the Broadband connection is not provided within 15 working days, a credit at the rate ofRs.10/ per day, subject to a maximum of installation charge or equivalent usage allowance shall be given to the customer, at the time of issue of first bill.
2	Fault Repair\Restoration Time	By next working day: > 90% and within 3 working days: 99% Rebate: (a) Faults Pending for > 3 working days and < 7 working days: rebate equivalent to 7 days of minimum monthly charge or equivalent usage allowance (b) Faults Pending for > 7 working days and < 15 working days: rebate equivalent to 15 days of minimum monthly charge or equivalent usage allowance (c) Faults Pending for > 15 working to one month of minimum monthly usage allowance.
3	Billing Performance	
	• Billing complaints per 100 bills issued	<2%
	• %age of Billing Complaints Resolved	100% within 4 weeks
	• Time taken for refund of deposits after closure	100% within 60 days
4	Response time to the customer assitance	% age of calls answered by operator (Voice to Voice) Within 60 seconds > 60% Within 90 seconds > 80%
5	Bandwidth Utilization/ throughput	
	a) Bandwidth Utilization	
	i) POP to ISP Gateway Node (Intra – Network) Links.	<80% link(s)/route bandwidth utilization during peak hours (TCBH).
	ii) ISP Gateway Node to IGSP / NIXI upstream links for international connectivity.	
	b) Broadband connection speed (download).	Subscribed Broadband Connection Speed to be met >80% from ISP Node to User.
6	Service Availability / Uptime for all users	> 98%
7	Packet Loss (for wired broadband access)	<1%
8	Network Latency (for wired broadband access)	
	• User reference point at POP\ ISP gateway node to international gateway.	<120 msec
	• User reference point at ISP Gateway Node to international nearest NAP port abroad.	<350 msec
	• User reference point at ISP Gateway Node to international nearest NAP port abroad	<800 msec

9	Customer perception of services	
a	% satisfied with the provision of services.	>90%
b	% satisfied with the billing performance.	>90%
c	% satisfied with help services	>90%
d	% satisfied with network performance, reliability and availability	>85%
e	% satisfied with maintainability	>85%
f	% satisfied with Overall customer satisfaction	>85%
g	% satisfied Customer satisfaction with offered supplementary services such as allocation of static/fixed IP addresses, email-id's.	>85%

3. EXECUTIVE SUMMARY : BASIC (WIRELINE)

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

3.1. BASIC (WIRELINE)

The QoS audit for basic (wire line) service was undertaken for assessment of quarterly performance of the service providers for quarter ended June-2016.

Sampling has been done for each service provider separately as per TRAI Guideline. In an LSA, sample has been included all POPs located in 10% of SDCAs in the LSA or 10 SDCAs, whichever is more, subject to maximum of the number of SDCAs covered by the service provider in the LSA. SDCAs selected should be evenly spread over the LSA and shall include major population centers. List and details of POPs shall be obtained from NOC/ISP Node of the operators. The performance of the Service providers against each parameter has been evaluated by taking average of performance value of each parameter for all the exchanges of the respective service providers. The averaged value of each parameter has been tabulated as follows.

Sr. No	Service Provider	Circle	Audit Location	Total Exchange (Urban+Rural)	No. of Urban/Rural Exchanges Covered for audit	Total SDCA Coverd for audit
1	BSNL	J&K	Shimla & Kullu SSA	1109	42	6
2	RCL	J&K	DAKC Mumbai	1	1	1
Total Exchanges at present				**1110**	**43**	**7**

3.2. SERVICE PROVIDER PERFORMANCE REPORT BASED ON QUARTERLY MEASUREMENT DATA VERIFICATION FOR BASIC TELEPHONE SERVICE (WIRELINE) PROVIDERS

AVERAGED AUDITED DATA FOR WIRELINE (BASIC) SERVICES – HP CIRCLE					
Sl. No.	Parameters	Benchmark	Audit Period	BSNL	RCL
1	**Fault incidences**				
	(No. of faults/100 subscribers /month)	< 7%	Quarterly	**12.67%**	0.00%
2	**Faults Repair/Restoration Time**				
	Fault repair by next working day(Urban Area)	>85%	Quarterly	**80.18%**	**No Fault Found**
	% of fault repair within 5 days (Urban Area)	100%	Quarterly	**100%**	**No Fault Found**
	Fault repair by next working day(Rural & hilly Area)	>75%	Quarterly	**97.90%**	**NA**
	% of fault repair within 7 days(Rural & hilly Area)	100%	Quarterly	**100.00%**	**NA**
	Mean time to Repair(MTTR)	≤10 Hrs	Quarterly	**8.79**	**NA**
3	**Rent Rebate**				
	Fault pending > 3 days & <7 days	Rebate for 7 days	Quarterly	494	0
	Fault Pending > 7 days & < 15 days	Rebate for 15 days	Quarterly	27	0
	Fault pending > 15 days	Rebate for 1 month	Quarterly	2	0
4	**Metering & Billing Performance**				

	% of disputed Bills over bills issued (Post Paid)	< 0.1%	Quarterly	0.00%	0.00%
	% of Pre-paid Charging Complaints	< 0.1%	Quarterly	DNA	DNA
	% of billing complaints resolved within 4 weeks	98% within 4 weeks	Quarterly	100.00%	100.00%
	% of billing complaints resolved within 6 weeks	100% within 6 weeks	Quarterly	100.00%	100.00%
	Period of all refunds/payments from the date of resolution of complaints within 1weeks	<=1 week	Quarterly	Within 1 Week	Within 1 Week
5	**POI Congestion**				
	No. of POI's having congestion >0.5%		Quarterly	0	0
6	**Response Time to customer for assistance**				
	Accessibility of Call centre/customer Care	>=95%	Quarterly	100.00%	96.80%
	% age of calls answered by operator(voice to voice) within 90 seconds	>=95%	Quarterly	**95%**	98.70%
7	**Customer care(promptness in attending to customers request)**				
	Termination / Closures	100%	Quarterly	100.00%	100.00%
	Time taken for refunds of deposit after closures	100%	Quarterly	100.00%	100.00%

- **NA-Not Applicable**

3.3. SERVICE PROVIDER PERFORMANCE REPORT BASED ON 3 DAYS LIVE MEASUREMENT DATA VERIFICATION FOR BASIC TELEPHONE SERVICE (WIRELINE) PROVIDERS

3 DAYS LIVE MEASUREMENT DATA FOR WIRELINE (BASIC) SERVICES - HP CIRCLE					
S/No.	**Parameters**	**Benchmark**	**Period**	**BSNL**	**RCL**
1	**POI Congestion**				
	No. of POI's having congestion >0.5%	≤0.5%	*Live*	0	0
2	**Response Time to customer for assistance**				
	Accessibility of Call centre/customer Care	≥95%	*Live*	100.00%	97.96%
	% age of calls answered by operator(voice to voice) within 90 seconds	≥95%	*Live*	100.00%	98.80%

3.4. KEY FINDINGS: BASIC TELEPHONE SERVICES (WIRELINE)

Fault Incidences: The audit of the service providers revealed that the performance of the service providers was well within the benchmark. BSNL is having **12.67%** fault has been reported which is not in benchmark.

Fault Repair/Restoration Time: For this parameter, **Only BSNL failed to meet the benchmark of fault repair by next working day and restoration time both in urban & rural areas**. The performance of BSNL was **80.18%** for 'Fault repaired by next working day'.

Mean Time to Repair: For this parameter, the performance of the service providers was found well within the compliance benchmarks.
Metering and Billing performance: For this parameter, the performance of the service providers was found well within the compliance benchmarks.

Period of refund/adjustment from date of resolution of complaints: The performance of the service providers was within the benchmark of <=1 week.

Response Time to Customer for assistance: For percentage of calls getting connected to call center, both operators met the benchmark.

Termination/Closures: For this parameter, the performance of the service providers was found well within the compliance benchmarks

3.5. INTER OPERATOR CALL ASSESSMENT (WIRELINE)

Inter operator call assessment with a sample of 2x50 test calls for each Service provider operating in HP Circle service area during the time 1000 to 1300 Hrs and 1500 to 1700 was carried out by auditors. The test calls were made from one operator to another within the same licensed area to judge the ease of connectivity amongst the operators

INTER OPERATOR CALL ASSESSMENT BASED ON LIVE MEASUREMENT									
Calling Operators	**Total No. of calls Made**	**Circle**	**Vodafone**	**Idea Cellular**	**Airtel**	**TTSL**	**Aircel**	**BSNL**	**RCL**
Vodafone	100	HP	--	100	100	100	100	100	100
Idea Cellular	100	HP	100	--	100	100	100	100	100
Airtel	100	HP	100	100	--	100	100	100	100
TTSL	100	HP	100	100	100	--	100	100	100
Aircel	100	HP	100	100	100	100	--	100	100
BSNL	100	HP	100	100	100	100	100	--	100
RCL	100	HP	100	100	100	100	100	100	--

The result of the testing revealed that the inter connection performance among the operators was quite satisfactory as there was hardly any problem in interconnection from one operator to other operators.

3.6. LEVEL-1 LIVE CALLING (WIRELINE)

SR. N.	EMERGENCY NUMBER	CIRCLE	BSNL	RCL
1	100	HP	√	√
2	101	HP	√	√
3	102	HP	√	√
4	104	HP	√	√
5	108	HP	√	√
6	138	HP	√	√
7	149	HP	×	×
8	181	HP	√	√
9	182	HP	√	√
10	1033	HP	√	√
11	1037	HP	×	×
12	1056	HP	×	×
13	1060	HP	×	×

14	1063	HP	×	×
15	1064	HP	×	×
16	1070	HP	×	×
17	1071	HP	×	×
18	1072	HP	√	√
19	1073	HP	×	×
20	1077	HP	×	×
21	1090	HP	×	×
22	1091	HP	×	×
23	1097	HP	√	√
24	1099	HP	×	×
25	10580	HP	×	×
26	10589	HP	×	×
27	10740	HP	×	×
28	10741	HP	×	×
29	1511	HP	×	×
30	1512	HP	×	×
31	1514	HP	×	×
32	15100	HP	√	√
33	155304	HP	×	×
34	155214	HP	×	×
35	1903	HP	√	√
36	1909	HP	√	√
37	1912	HP	√	√
38	1916	HP	×	×
39	1950	HP	√	√

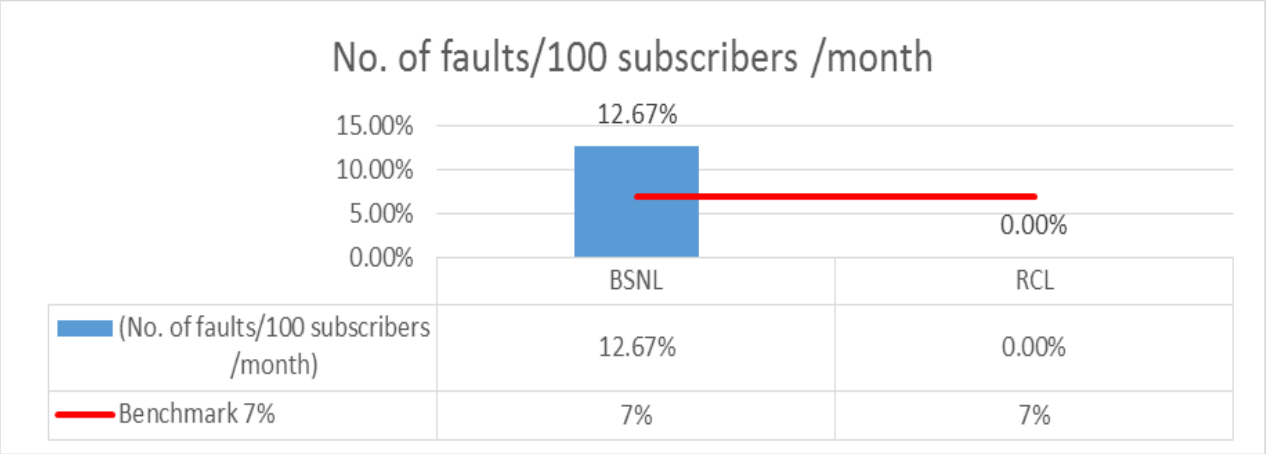
To assess the availability and efficiency of level 1 services such as police, fire, ambulance (emergency services) offered by various service providers, the calls were made from telephone provided by the service providers. In HP circle, these services were found functional in the networks of both the service providers.

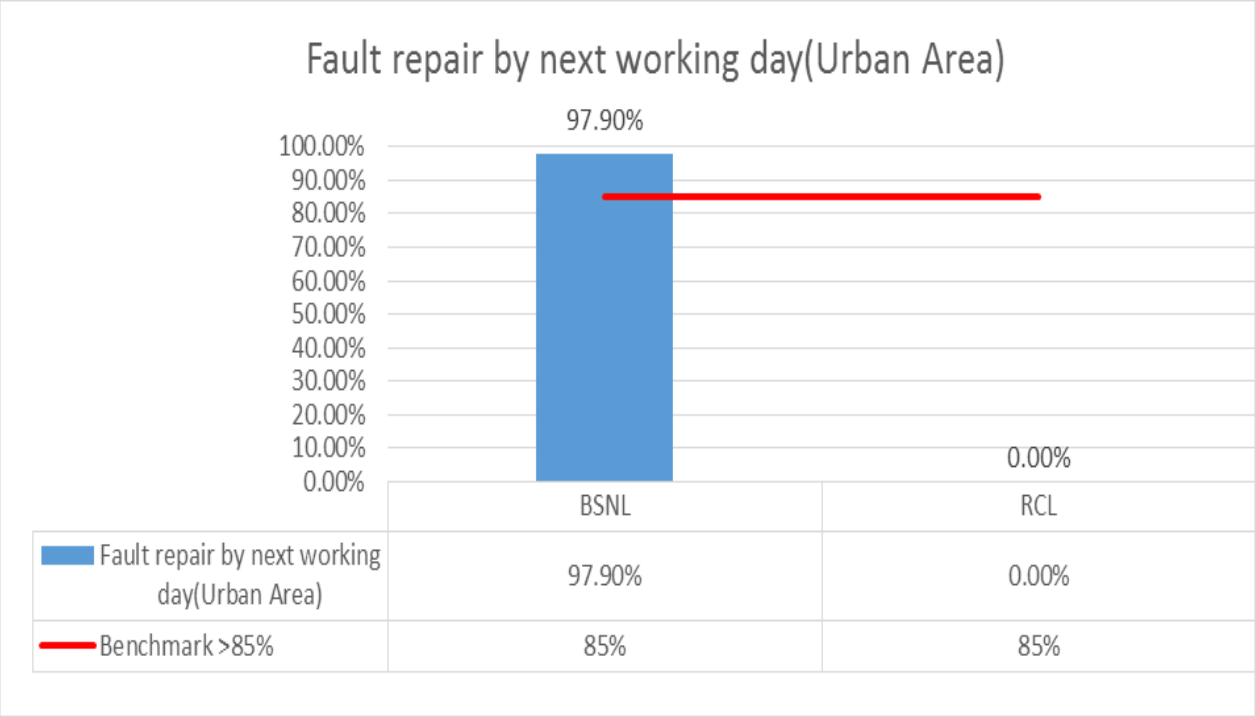
3.7. CUSTOMER CARE / HELPLINE ASSESSMENT (WIRELINE SERVICES)

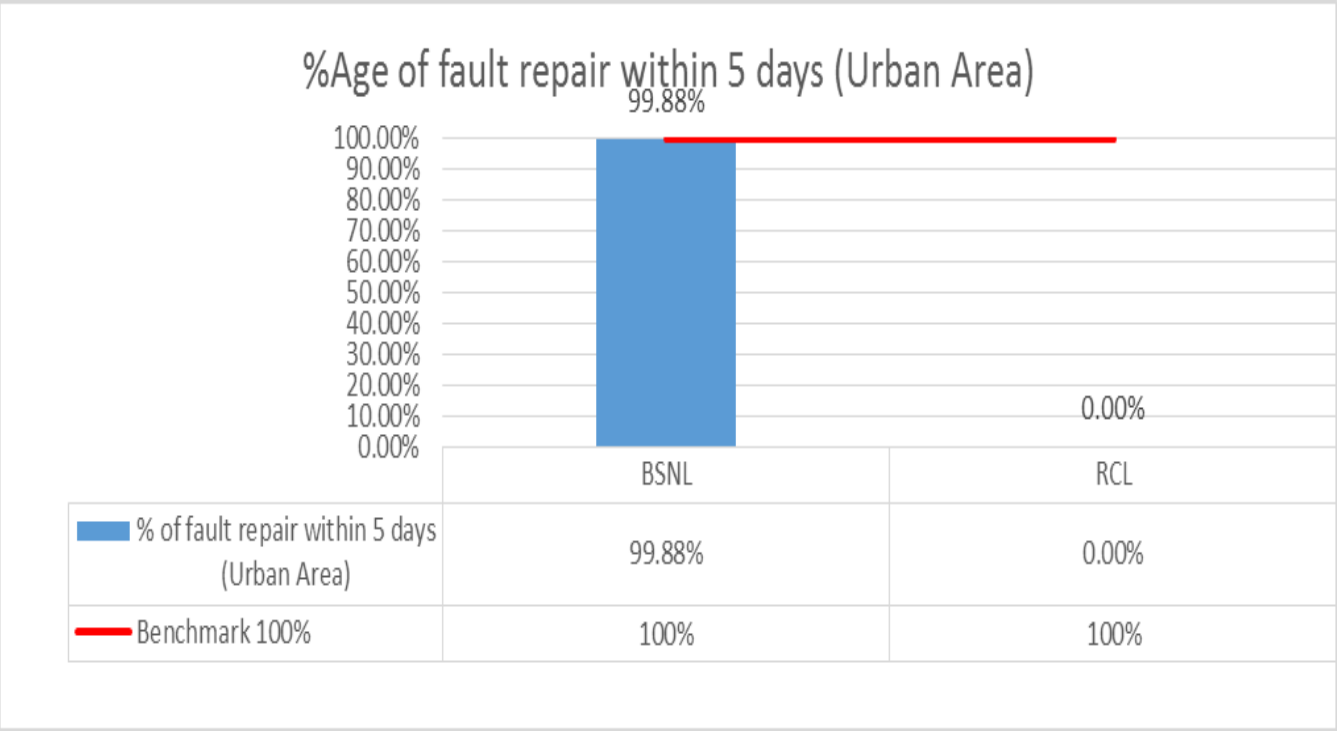
LIVE CALLING TO CALL CENTRE			
Parameter	**Circle**	**BSNL**	**RCL**
A) Total no of calls attempted to customer care/Call center	HP	100	100
B) Total no. of calls successfully established to customer care/Call center	HP	100	100
C) % Accessibility of Call centre /customer Care	HP	100.00%	100.00%
(Total call attempt*100/ Total call successfully established)			
D) Total Calls reached to agent desk for Voice to Voice (Total call attempt)	HP	100	100
E) Total number of calls answered by the operator (Voice to voice) within 90 seconds	HP	100	100
F) % age of calls answered by the operators (voice to voice) within 90 seconds	HP	100.00%	100.00%

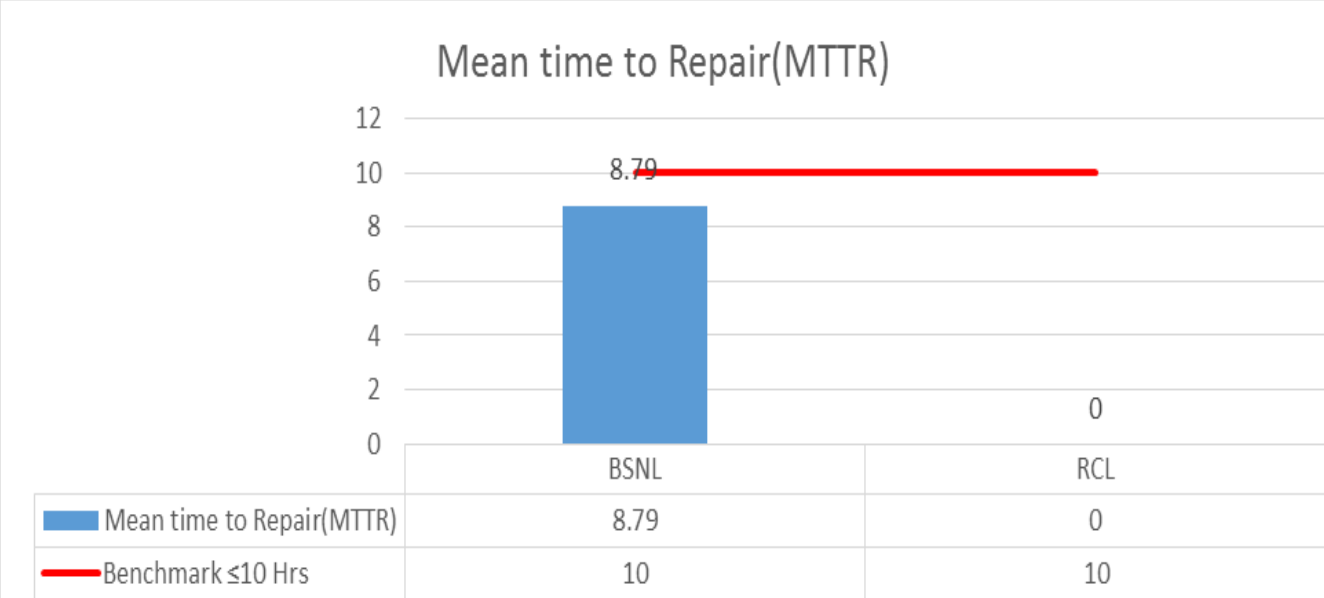
In case of calls answered by operators (voice to voice), when test calls were made to the call centers of different service providers, 100% of calls were answered by the call center operators of BSNL and RCL

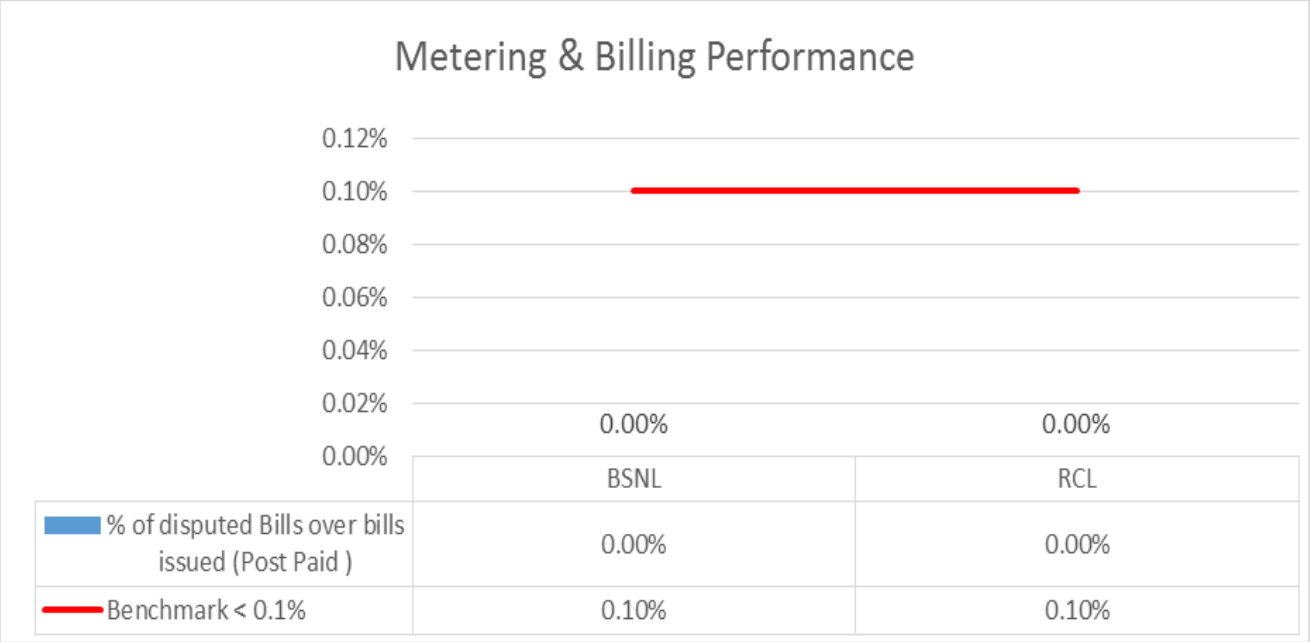
3.8. GRAPHICAL REPRESENTATION

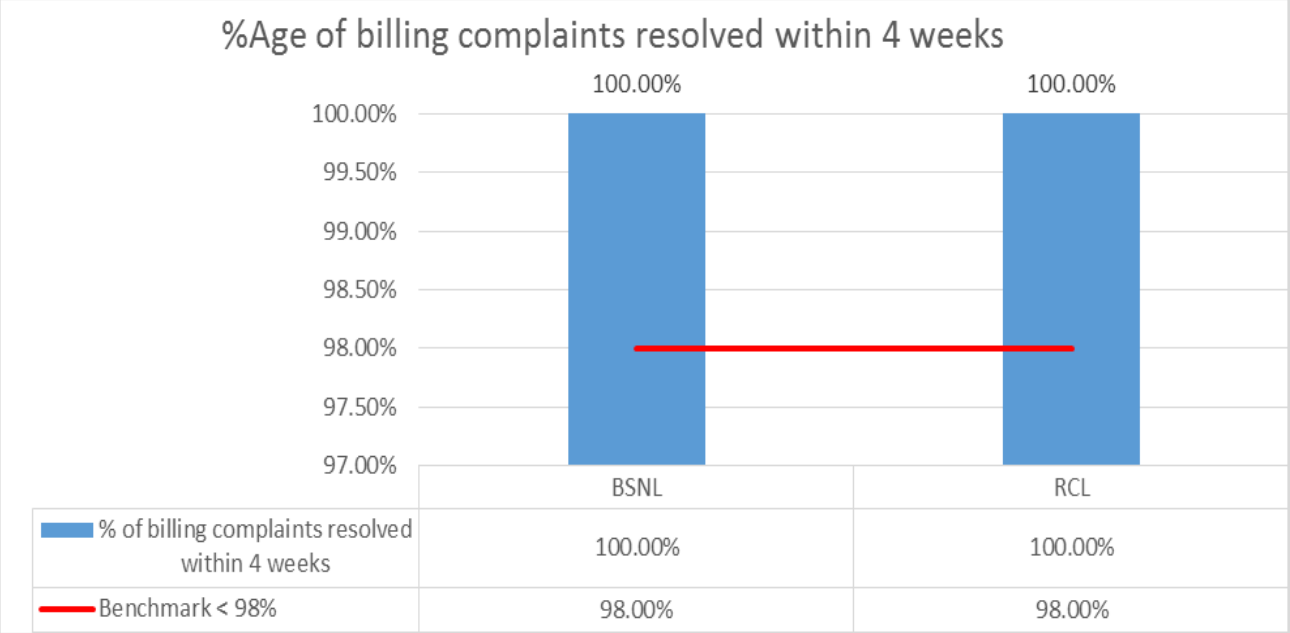


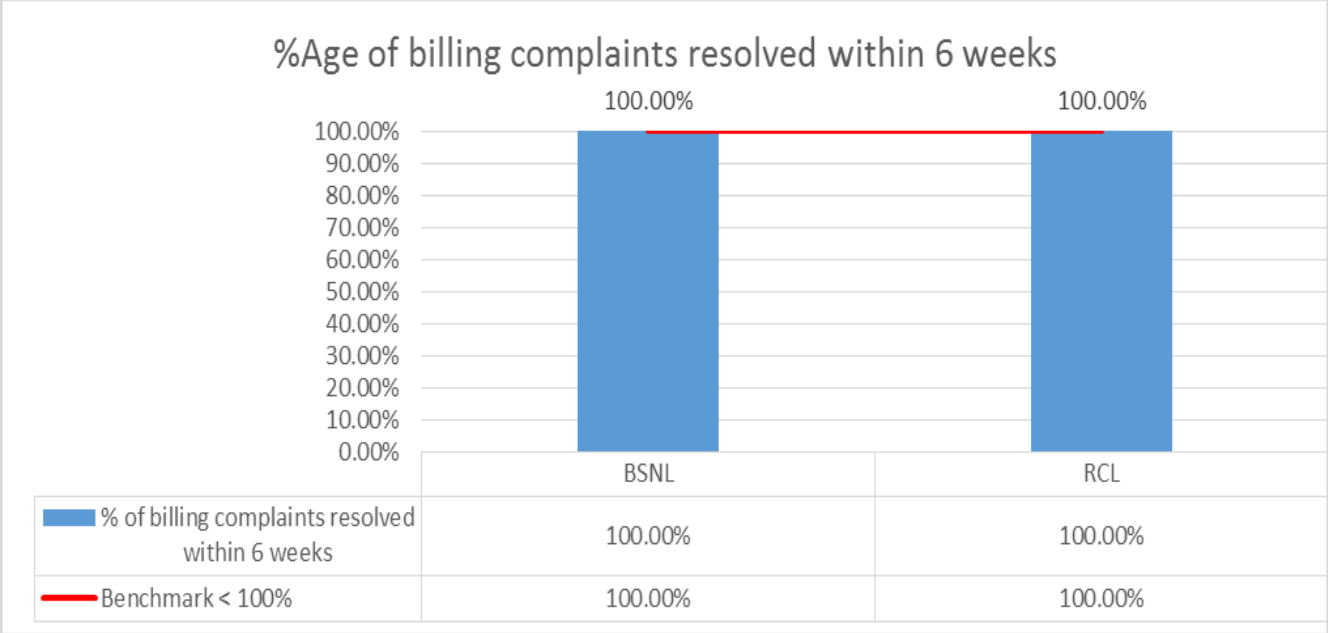


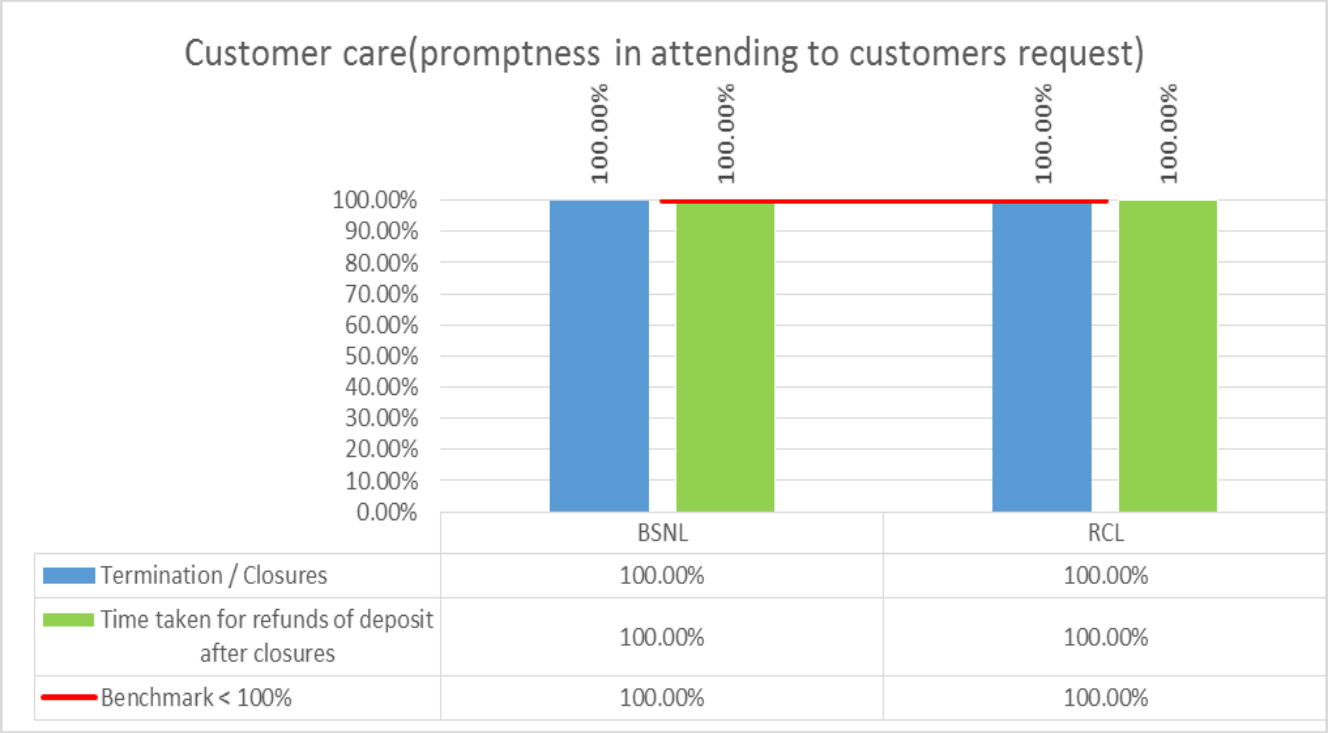

%Age of fault repair within 5 days (Urban Area)
99.88%
0.00%
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
BSNL
RCL
% of fault repair within 5 days (Urban Area)
99.88%
0.00%
Benchmark 100%
100%
100%

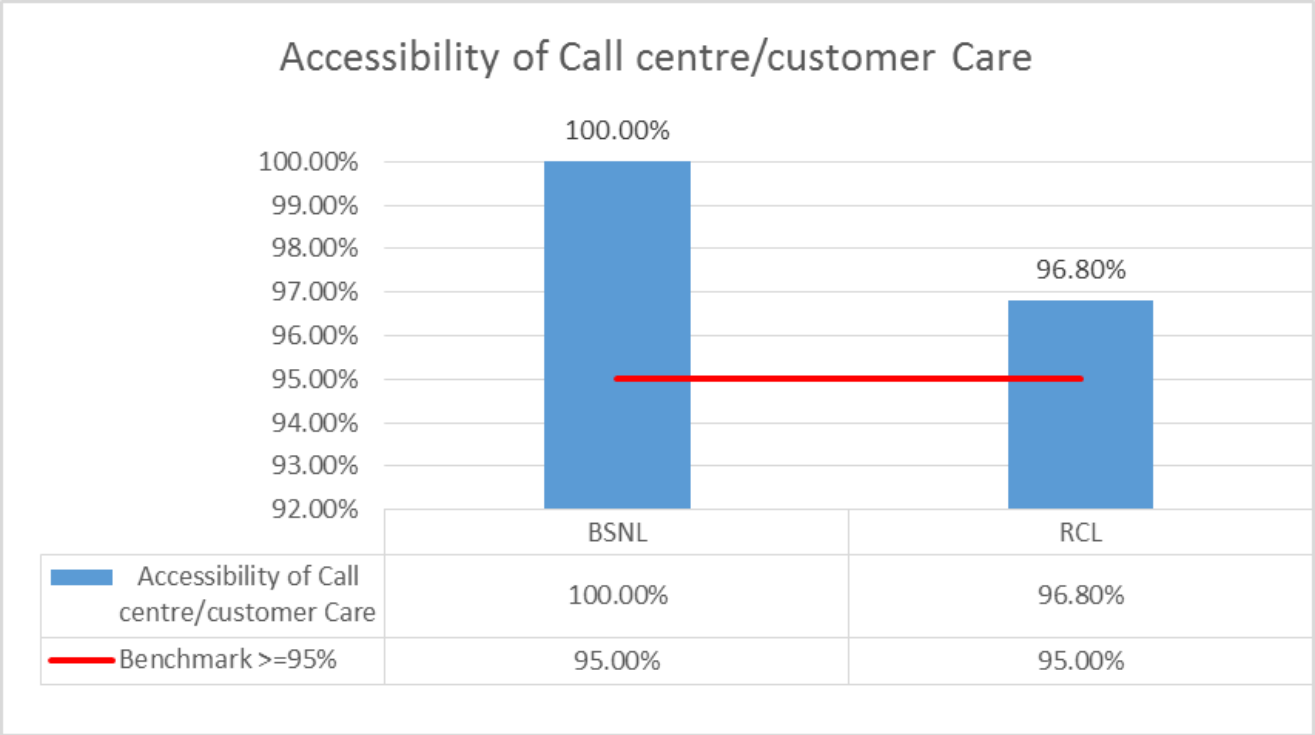

Mean time to Repair(MTTR)
8.79
0
12
10
8
6
4
2
0
BSNL
RCL
Mean time to Repair(MTTR)
8.79
0
Benchmark ≤10 Hrs
10
10

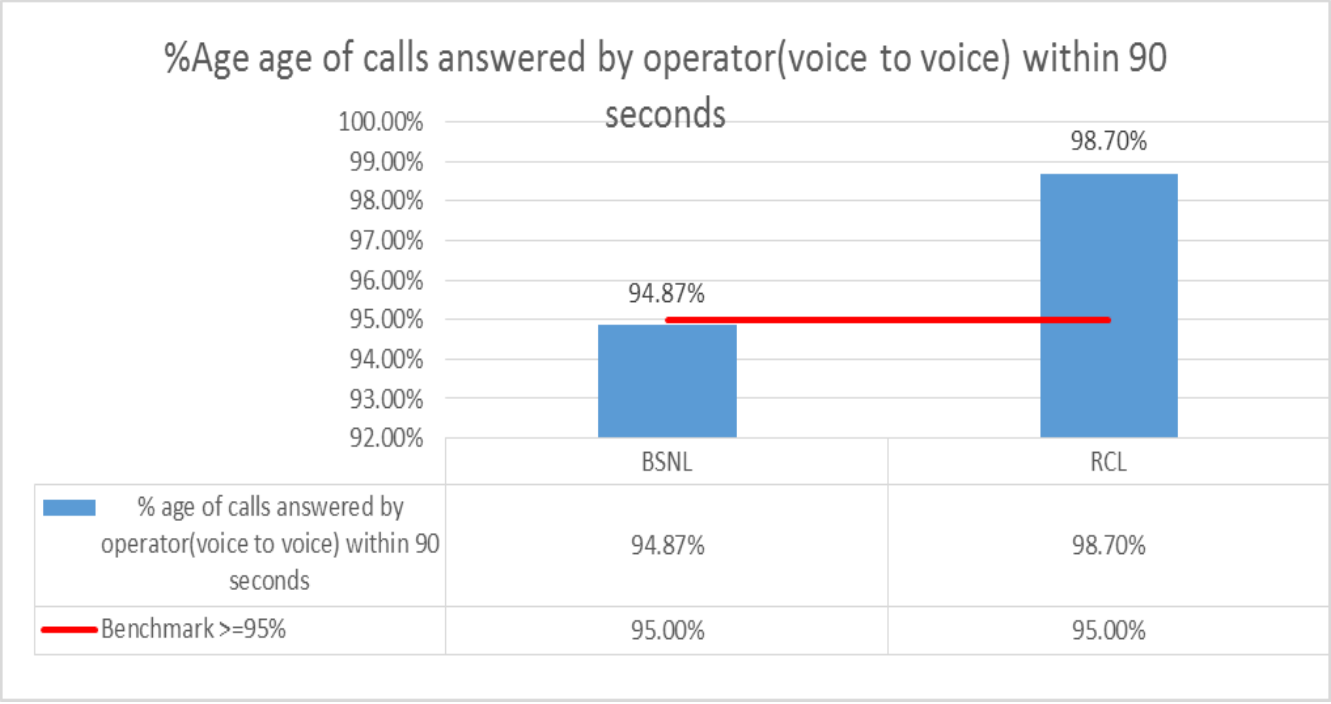

Metering & Billing Performance
0.12%
0.10%
0.08%
0.06%
0.04%
0.02%
0.00%
0.00%
0.00%
BSNL
RCL
% of disputed Bills over bills issued (Post Paid)
0.00%
0.00%
Benchmark < 0.1%
0.10%
0.10%


%Age of billing complaints resolved within 4 weeks
100.00%
100.00%
100.00%
99.50%
99.00%
98.50%
98.00%
97.50%
97.00%
BSNL
RCL
% of billing complaints resolved within 4 weeks
100.00%
100.00%
Benchmark < 98%
98.00%
98.00%


%Age of billing complaints resolved within 6 weeks
100.00%
100.00%
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
BSNL
RCL
% of billing complaints resolved within 6 weeks
100.00%
100.00%
Benchmark < 100%
100.00%
100.00%


Customer care(promptness in attending to customers request)
100.00%
100.00%
100.00%
100.00%
100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
BSNL
RCL
Termination / Closures
100.00%
100.00%
Time taken for refunds of deposit after closures
100.00%
100.00%
Benchmark < 100%
100.00%
100.00%


Accessibility of Call centre/customer Care
100.00%
96.80%
100.00%
99.00%
98.00%
97.00%
96.00%
95.00%
94.00%
93.00%
92.00%
BSNL
RCL
Accessibility of Call centre/customer Care
100.00%
96.80%
Benchmark >=95%
95.00%
95.00%


%Age age of calls answered by operator(voice to voice) within 90 seconds
98.70%
94.87%
100.00%
99.00%
98.00%
97.00%
96.00%
95.00%
94.00%
93.00%
92.00%
BSNL
RCL
% age of calls answered by operator(voice to voice) within 90 seconds
94.87%
98.70%
Benchmark >=95%
95.00%
95.00%

4. EXECUTIVE SUMMARY: BROADBAND

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

4.1. QUALITY OF SERVICE AUDIT OF BROADBAND SERVICE PROVIDERS

Phistream has to conduct the audit and assessment of Quality of Service of Broadband Service only in respect of the service providers who are having broadband subscriber base of more than 10,000 subscribers in their licensed service area as per TRAI guideline; Sampling shall be done for each service provider separately. In an LSA, sample shall include all POPs located in 10% of SDCAs in the LSA or 10 SDCAs, whichever is more, subject to maximum of the number of SDCAs covered by the service provider in the LSA. SDCAs selected should be evenly spread over the LSA and shall include major population centers. List and details of POPs shall be obtained from NOC/ISP Node of the operators. A service areal circle in the contracted Zone shall be audited only once in a year.

Discussion with the private broadband service providers reveals that there is no concept of their PoPs on SDCA basis; they are maintaining their entire data on centralized basis so audit has been done for the centralized data.

Audit was done for the following Broadband service Providers in HP circle.

S. NO.	NAME OF BROADBAND SERVICE PROVIDER	LOCATION OF AUDIT
1	**BSNL**	BSNL OFFICE SHIMLA & KULLU
2	**RELIANCE COMMUNICATION LIMITED (RCL)**	DAKC, MUMBAI

4.2. QUARTERLY MEASUREMENT DATA FOR BROADBAND SERVICE PROVIDERS

AVERAGED QUARTERLY (April to June 16) AUDIT DATA FOR BROADBAND SERVICES – HIMACHAL PRADESH CIRCLE					
Broadband Audit Data		Bench- mark	Circle Name	BSNL	RCL
S/N	Name of Parameter				
1	**Service Provisioning/Activation Time**				
	A) No of connections registered during the period		HP	853	7
	B) Total number of connections provided within 15 days of registration on demand during the period		HP	850	7
	C) % age of connections provided within 15 days of registration on demand (subject to technical feasibility)	*<15 days*	HP	**99.65%**	**100.00%**
	D)Total number of connections provided after 15 days of registration on demand		HP	3	0
	E) %age of connections provided after 15 days of registration on demand		HP	**0.35%**	**0.00%**
	F) In all cases where payment towards installation charge & SD is taken and the Broadband connection is not provided within 15 working days	*Credit @ Rs.10/ per day.*	HP	0	0
2	**Fault Repair/Restoration Time**				
	A) Total number of faults registered during the period		HP	2912	0
	B) Total number of faults repaired by next working day		HP	2102	0
	C) % age of faults repaired by next working day	*>90%*	HP	**72.18%**	**100.00%**
	D) Total number of faults repaired within three working days		HP	2622	0
	E)% age of faults repaired within three working days	*≥99%*	HP	**90.04%**	**100.00%**
3	**Rent Rebate**				
	A) Faults Pending for > 3 working days and < 7 working days: (Rebate equivalent to 7 days of minimum monthly charge or equivalent usage allowance)		HP	0	0
	B) Faults Pending for > 7 working days and < 15 working days: (Rebate equivalent to 15 days of minimum monthly charge or equivalent usage allowance)		HP	0	0
	C) Faults Pending for > 15 working days:(Rebate equivalent to one month of minimum monthly charge or equivalent usage allowance)		HP	0	0
4	**Billing Performance**				
	A) Total bills generated during period		HP	1962	180
	B) Total complaints received from customers/ Bills disputed		HP	0	0
	C) Billing complaints per 100 bills issued	*<2%*	HP	**0.00%**	**0.00%**
	D) Total number of complaints resolved in 4 weeks from date of receipt		HP	0	0
	E) %age billing complaints resolved in 4 weeks	*100%*	HP	**100.00%**	**100.00%**

	F) Total number of cases requiring refund of deposits after closure		HP	0	0
	G) Total number of cases where refund was made in <60 days		HP	0	0
	H) Percentage cases in which refund received within 60 days	*100%*	HP	**100.00%**	**100.00%**
5	**Response time to the customer for assistance % age of calls answered by operator (Voice to Voice)**				
	A) Total number of calls received by the operator		HP	11006	98281
	B) Total number of calls answered by the operator within 60 seconds		HP	11006	93118
	C) % age calls answered by the operator in 60 seconds	*>60%*	HP	**100.00%**	**94.75%**
	D) Total number of calls answered by the operator within 90 seconds		HP	11006	93864
	E) % age calls answered by the operator within 90 seconds	*>80%*	HP	**100.00%**	**95.51%**
6	**Bandwidth Utilization/ Throughput:**				
6.1	**POP to ISP Gateway Node [Intra-network] Link(s)**				
	A) Total Bandwidth Available at the link for the period days		HP	30720	116000
	B) Total Bandwidth utilized during the period during TCBH (In Mpbs)		HP	16077	45571
	C) % age Bandwidth utilized during the period	*<80%*	HP	**52.33%**	**39.29%**
6.2	**A) ISP Gateway Node to IGSP / NIXI Node upstream Link(s) for International connectivity**				
	A) Total number of upstream links for International connectivity		HP	DNA	12
	B) Number of Links having Bandwidth utilization > 90% during TCBH		HP	DNA	0
	C) Total international bandwidth available from ISP Node to IGSP/NIXI/NAP (Mbps)		HP	DNA	116000
	D) Total international bandwidth utilization during peak hours (TCBH) in Mpbs		HP	DNA	47571
	E) %age International Bandwidth utilization during peak hours (TCBH)	*<80%*	HP	DNA	**41.01%**
6.3	**Broadband Connection Speed (download) - from ISP Node to User**				
	A) Total committed download speed to the sample subscribers (In mpbs)		HP	10	3
	B) Total average download speed observed for the sample subscribers during TCBH (In Mpbs)		HP	9.5	2.734
	C) % age subscribed speed available to the subscriber during TCBH	*>80%*	HP	**95.00%**	**91.13%**
7	**Service Availability/Uptime**				
	A) Total operational Hours		HP	2184	2184
	B) Total downtime (In hours)		HP	0.5	0
	C) Total time when the service was available (In Hrs)		HP	2183.5	2184

	D) % age of Service availability uptime	*>98%*	HP	**99.98%**	**100.00%**
8	**Packet Loss**				
	A) Total number of ping packets transmitted		HP	3000	91000
	B) Total number of ping packets lost		HP	2	484
	C) % age packet loss	*<1%*	HP	**0.07%**	**0.52%**
9	**Network latency (for wired broadband access)**				
9.1	Network Latency from User reference point at POP/ISP Node to IGSP/NIXI gateway				
	A) Total number of ping packets transmitted		HP	3000	3000
	B) Total round trip time for all the ping packets transmitted during the period		HP	81	93
	C) Average round trip tip time for all the ping transmitted	*<120 ms*	HP	**27**	**31**
9.2	**Network Latency from User reference point at ISP Node to nearest NAP Port abroad (Terrestrial)**				
	A) Total number of ping packets transmitted		HP	3000	3000
	B) Total round trip time for all the ping packets transmitted during the period		HP	195	21
	C) Average round trip tip time for all the ping transmitted	*<350 ms*	HP	**65**	**7**
9.3	**Network Latency from User reference point at ISP Node to nearest NAP Port abroad (Satellite)**				
	A) Total number of ping packets transmitted		HP	DNA	DNA
	B) Total round trip time for all the ping packets transmitted during the period		HP	DNA	DNA
	C) Average round trip tip time for all the ping transmitted	*<800 ms*	HP	DNA	DNA

4.3. SERVICE PROVIDER PERFORMANCE REPORT BASED ON 3 DAYS MEASUREMENT DATA VERIFICATION FOR BROADBAND SERVICE PROVIDERS

3 DAYS LIVE DATA FOR BROADBAND SERVICES – HIMACHAL PRADESH CIRCLE					
	3 days live Broadband Audit Data			BSNL	RCL
S/ N	Name of Parameter	Bench- mark	Circle Name		
	Response time to the customer for assistance % age of calls answered by operator (Voice to Voice)				
	A) Total number of calls received by the operator		*HP*	DNA	3674
	B) Total number of calls answered by the operator within 60 seconds		*HP*	DNA	3593
	C) % age calls answered by the operator in 60 seconds	*>60%*	*HP*	**DNA**	**97.80%**
	D) Total number of calls answered by the operator within 90 seconds		*HP*	DNA	3629
1	E) % age calls answered by the operator within 90 seconds	*>80%*	*HP*	**DNA**	**98.78%**
2	**Bandwidth Utilization/ Throughput:**				
	POP to ISP Gateway Node [Intra-network] Link(s)				
	A) Total Bandwidth Available at the link for the period days		*HP*	30720	116000
	B) Total Bandwidth utilized during the period during TCBH (In Mpbs)		*HP*	15869.95	58990
2.1	C) % age Bandwidth utilized during the period	*<80%*	*HP*	**51.66%**	**50.85%**
	A) ISP Gateway Node to IGSP / NIXI Node upstream Link(s) for International connectivity				
	A) Total number of upstream links for International connectivity		*HP*	DNA	12
	B) Number of Links having Bandwidth utilization > 90% during TCBH		*HP*	DNA	0
	C) Total international bandwidth available from ISP Node to IGSP/NIXI/NAP		*HP*	DNA	116000
	D) Total international bandwidth utilization during peak hours (TCBH) in Mpbs		*HP*	DNA	58990
2.2	E) %age International Bandwidth utilization during peak hours (TCBH)	*<80%*	*HP*	**DNA**	**50.85%**
	Broadband Connection Speed (download) - from ISP Node to User				
	A) Total committed download speed to the sample subscribers (In mpbs)		*HP*	8	1
	B) Total average download speed observed for the sample subscribers during TCBH (In Mpbs)		*HP*	7.72	0.94
2.3	C) % age subscribed speed available to the subscriber during TCBH	*>80%*	*HP*	**96.50%**	**94.00%**
	Packet Loss				
	A) Total number of ping packets transmitted		*HP*	3000	3000
	B) Total number of ping packets lost		*HP*	0	0
3	C) % age packet loss	*<1%*	*HP*	**0.00%**	**0.00%**
4	**Network latency (for wired broadband access)**				
	Network Latency from User reference point at POP/ISP Node to IGSP/NIXI gateway				
	A) Total number of ping packets transmitted		*HP*	3000	3000
	B) Total round trip time for all the ping packets transmitted during the period		*HP*	90	5.42
4.1	C) Average round trip tip time for all the ping transmitted	*<120 ms*	*HP*	**30**	**1.8**
	Network Latency from User reference point at ISP Node to nearest NAP Port abroad (Terrestrial)				
	A) Total number of ping packets transmitted		*HP*	8824	3000
	B) Total round trip time for all the ping packets transmitted during the period		*HP*	**181.93**	5.43
4.2	C) Average round trip tip time for all the ping transmitted	*<350 ms*	*HP*	**60.64**	**1.81**
	Network Latency from User reference point at ISP Node to nearest NAP Port abroad (Satellite)				
	A) Total number of ping packets transmitted		*HP*	DNA	DNA
4.3	B) Total round trip time for all the ping packets transmitted during the period		*HP*	DNA	DNA

	C) Average round trip tip time for all the ping transmitted	*<800 ms*	*HP*	DNA	DNA
	Service Availability/Uptime				
	A) Total operational Hours		*HP*	72	72
	B) Total downtime (In hours)		*HP*	0.09	0
	C) Total time when the service was available (In Hrs)		*HP*	71.91	72
5	D) % age of Service availability uptime	*>98%*	*HP*	**99.88%**	**100.00%**

NA: Not Applicable

4.4. KEY FINDINGS: BROADBAND SERVICES

Service Provisioning / Activation Time: The audit of the service providers revealed that all Broadband service providers were well within the benchmark for this parameter.

Fault Repair/Restoration Time: With regards to this parameter the performance of the service providers was within TRAI norms except **BSNL**, its achievement level was **72.18%** for fault Repair by next working day and **90.04%** by three working days.

Billing Performance: For this parameter also the performance of the service providers was found well within the compliance benchmarks.

Response Time to Customer for assistance by operator (Voice to Voice): For percentage of calls getting connected to call center and answered, all service providers were found meeting the benchmark for this parameter.

Bandwidth Utilization/ Throughput: All the service providers were found using Multiple Router Traffic Grapher (MRTG) and also it was observed that all service providers were reporting combined bandwidth utilization for corporate customers and household customers.
The performance of service providers with respect of these parameters was found satisfactory i.e. within benchmark during quarterly audit as well as 3 days live measurement.

Service Availability/Uptime: All service providers were found meeting the benchmark for this parameter.

Packet Loss and Network Latency: It was observed that most of the operators were measuring packet loss and latency by conducting ping test on random basis for their internal assessment.

4.5. CUSTOMER CARE / HELPLINE ASSESSMENT

LIVE CALLING TO CALL CENTRE FOR BROADBAND SERVICES			
PARAMETER	**CIRCLE**	**BSNL**	**RCL**
Total No. of calls Attempted	*HP*	100	100
Total number of calls answered by the operator within 60 seconds	*HP*	100	100
% age calls answered by the operator in 60 seconds (> 60%)	*HP*	**100.00%**	**100.00%**
Total number of calls answered by the operator within 90 seconds	*HP*	100	100
% age calls answered by the operator within 90 seconds (>80%)	*HP*	**100.00%**	**100.00%**

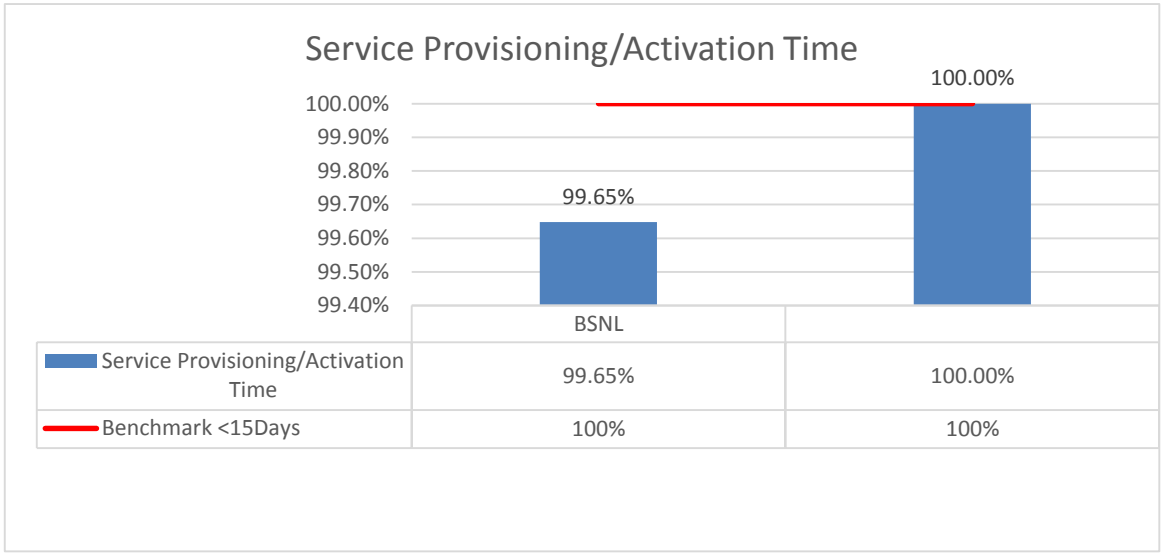
4.6. LIVE CALLING FOR BILLING COMPLIANTS

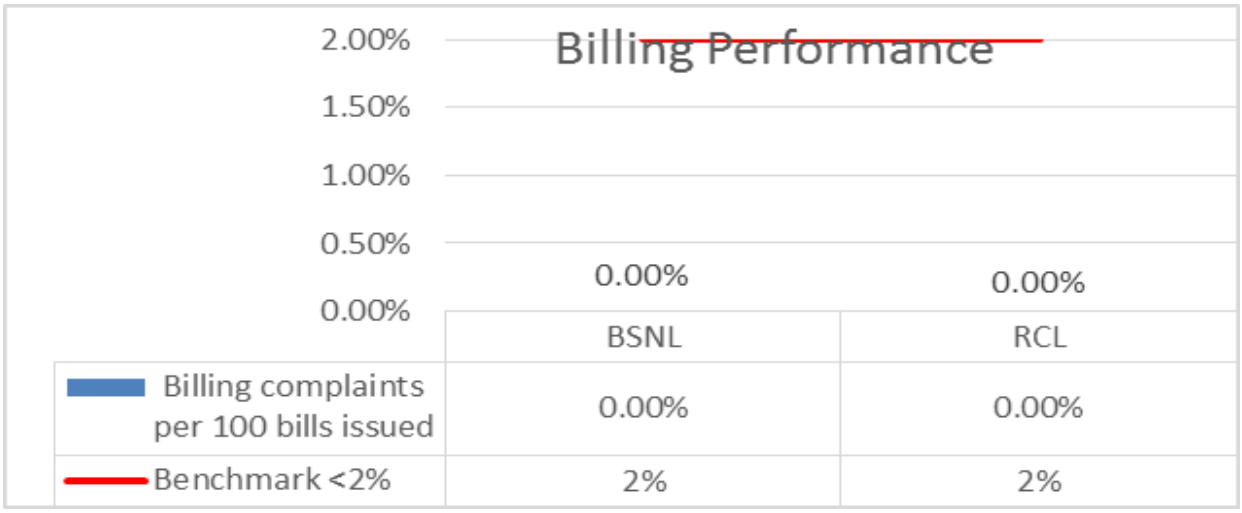
TELEPHONIC INTERVIEW FOR BILLING COMPLAINTS			
PARAMETER	**CIRCLE**	**BSNL**	**RCL**
Total No. of Billing complaints received/ Call verified	*HP*	0	0
Total No. of calls Answered	*HP*	0	0
Cases resolved within 4 weeks	*HP*	0	0
%age of cases resolved	*HP*	NA	NA

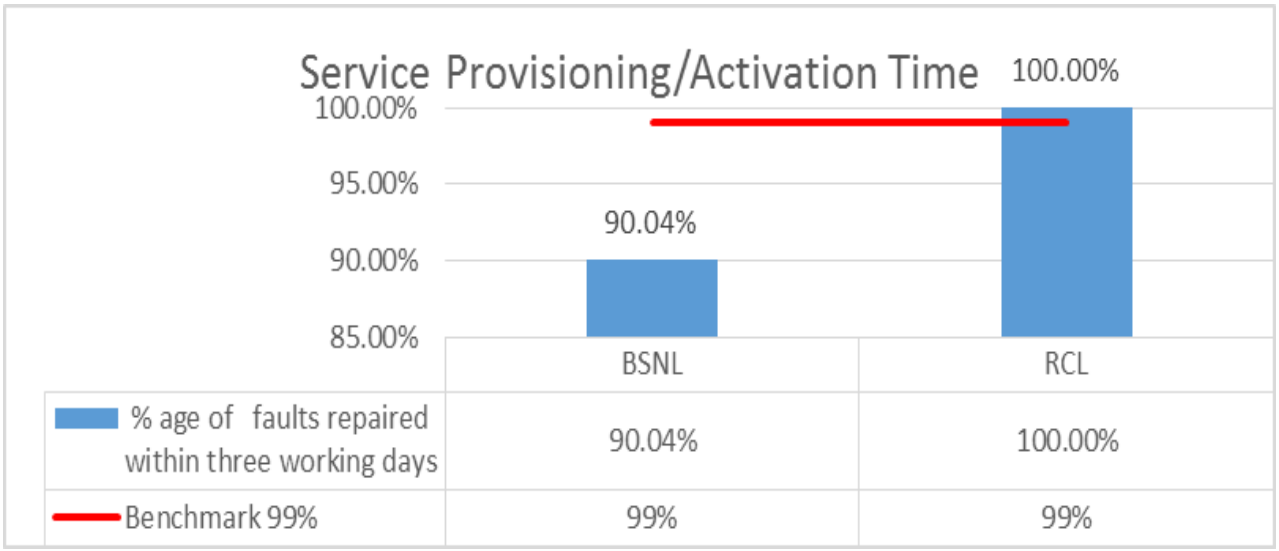
NA: Not Applicable

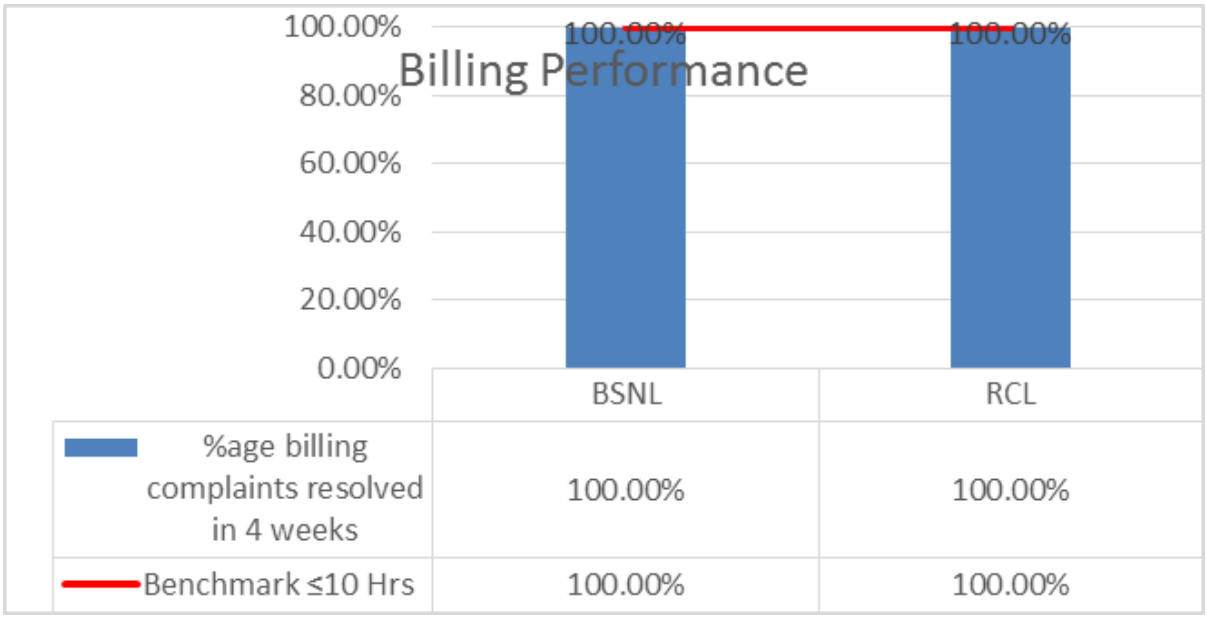
To test the Service Providers performance on billing related complaints and their resolutions, auditors conducted a customer feedback calling the effected customers. However, in one case, the number of customers contacted for verification was very less due to less number of billing complaints and in other cases the billing complaints were Zero. In case of the operators having billing complaints, the customers reported their satisfaction on resolution of the billing complaints.

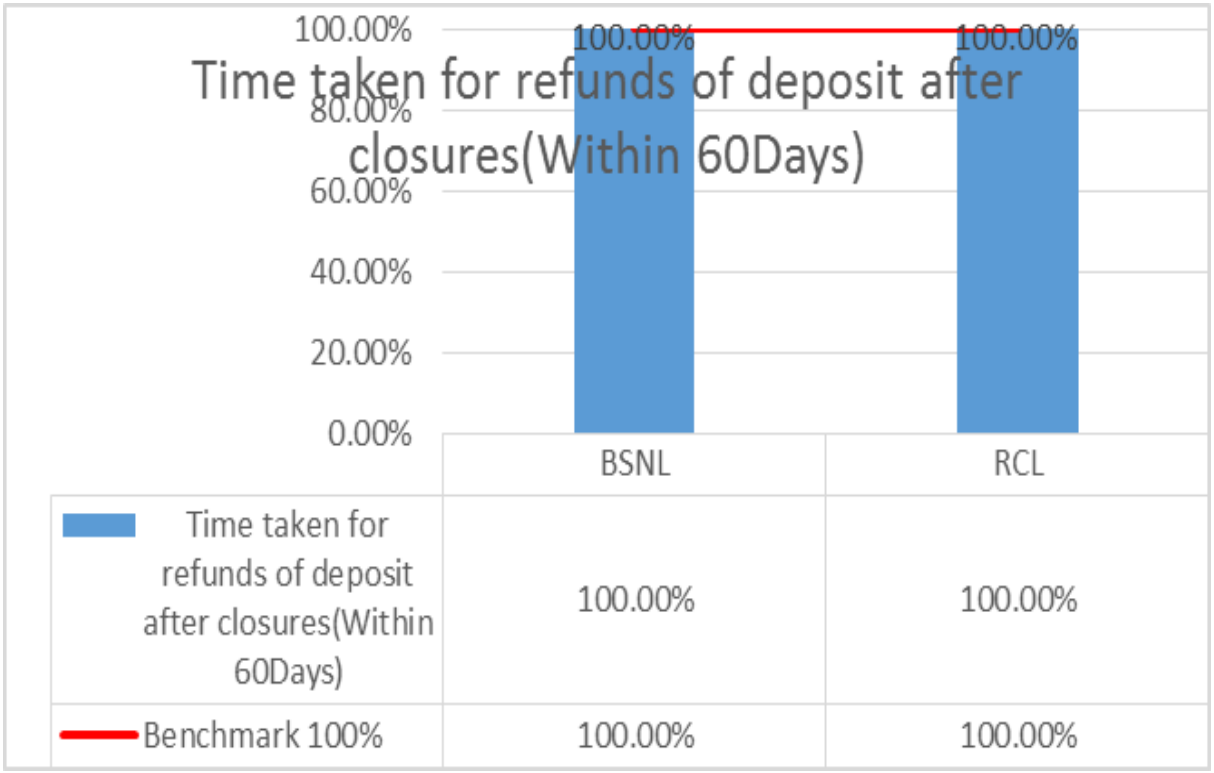
4.7. GRAPHICAL REPRESENTATION

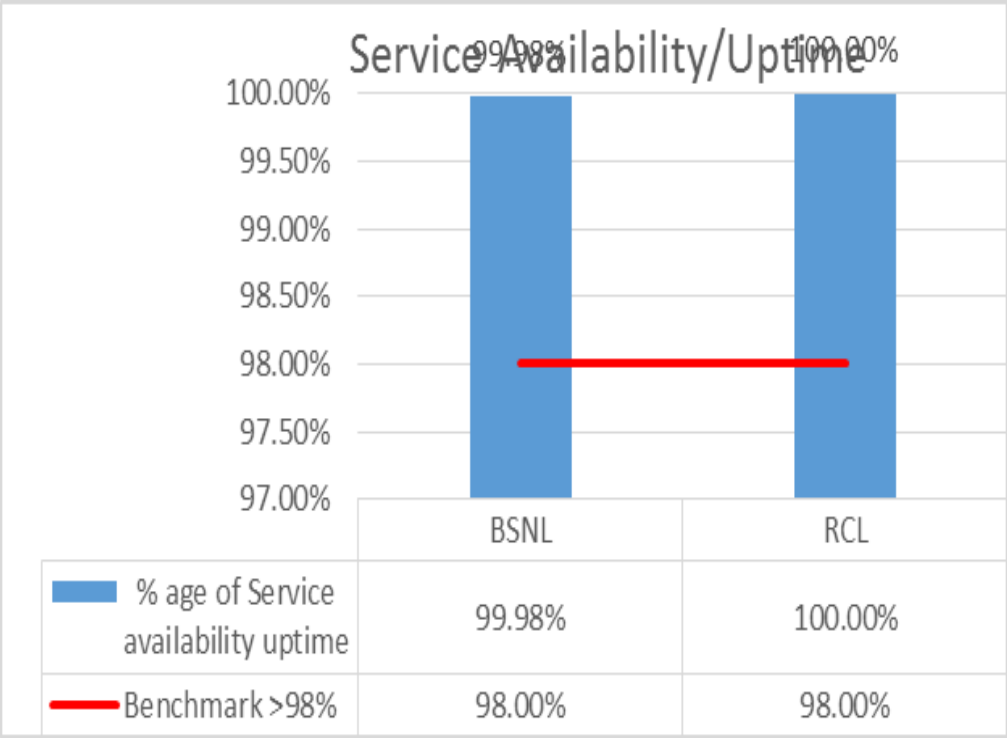


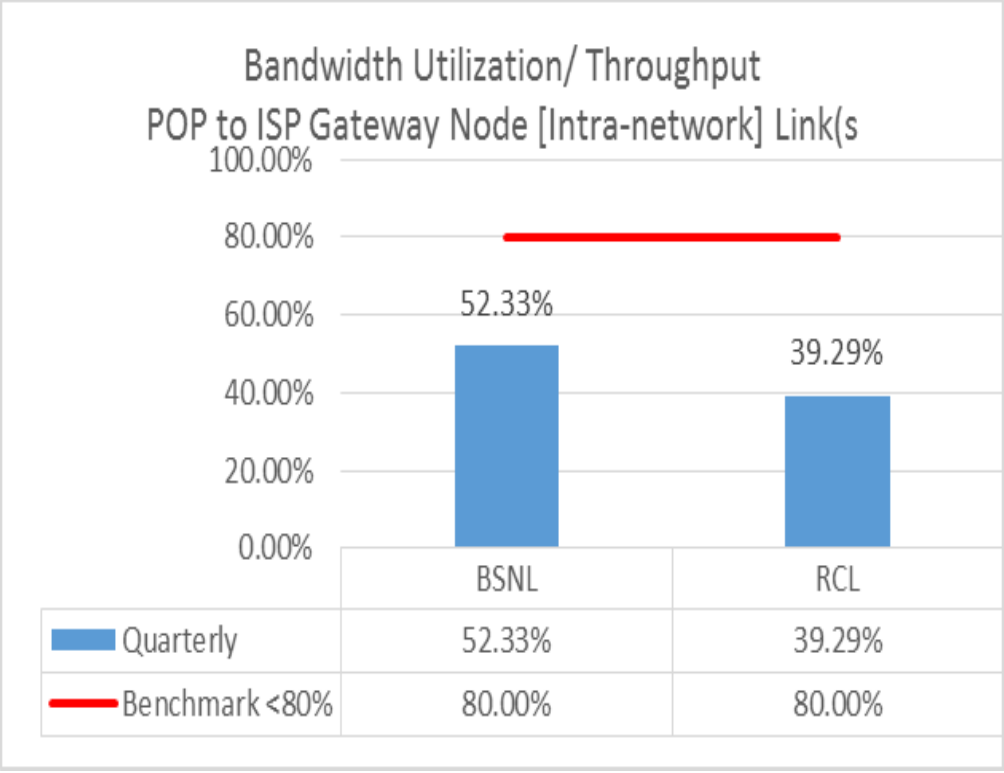

Billing Performance
2.00%
1.50%
1.00%
0.50%
0.00%
0.00%
0.00%
BSNL
RCL
Billing complaints per 100 bills issued
0.00%
0.00%
Benchmark <2%
2%
2%

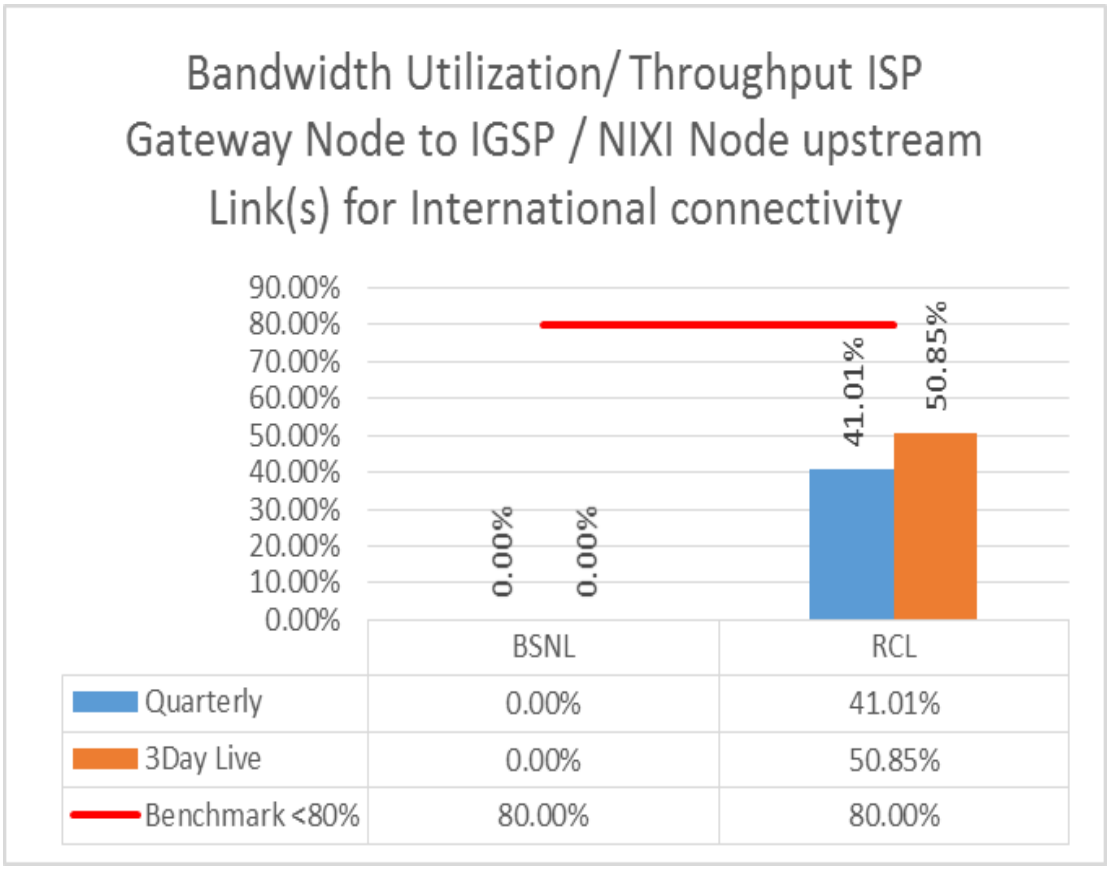

Service Provisioning/Activation Time
100.00%
100.00%
95.00%
90.00%
85.00%
90.04%
BSNL
RCL
% age of faults repaired within three working days
90.04%
100.00%
Benchmark 99%
99%
99%


Billing Performance
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
100.00%
100.00%
BSNL
RCL
%age billing complaints resolved in 4 weeks
100.00%
100.00%
Benchmark ≤10 Hrs
100.00%
100.00%

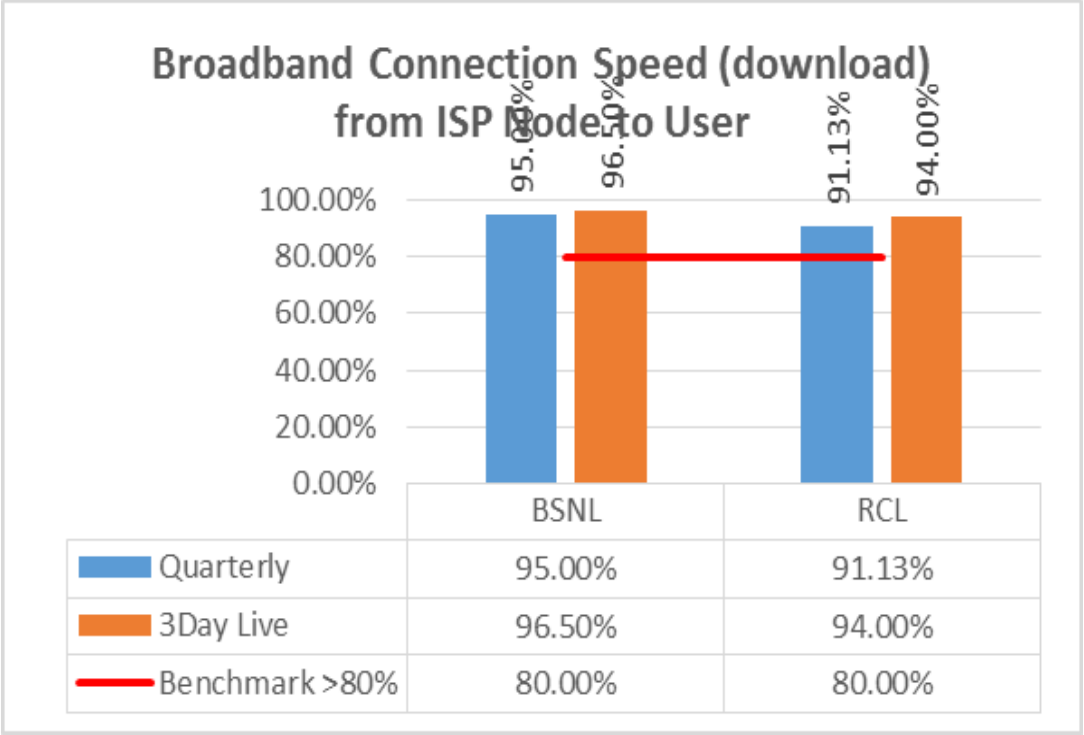

Time taken for refunds of deposit after closures(Within 60Days)
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
100.00%
100.00%
BSNL
RCL
Time taken for refunds of deposit after closures(Within 60Days)
100.00%
100.00%
Benchmark 100%
100.00%
100.00%


Service Availability/Uptime
99.98%
100.00%
100.00%
99.50%
99.00%
98.50%
98.00%
97.50%
97.00%
BSNL
RCL
% age of Service availability uptime
99.98%
100.00%
Benchmark >98%
98.00%
98.00%

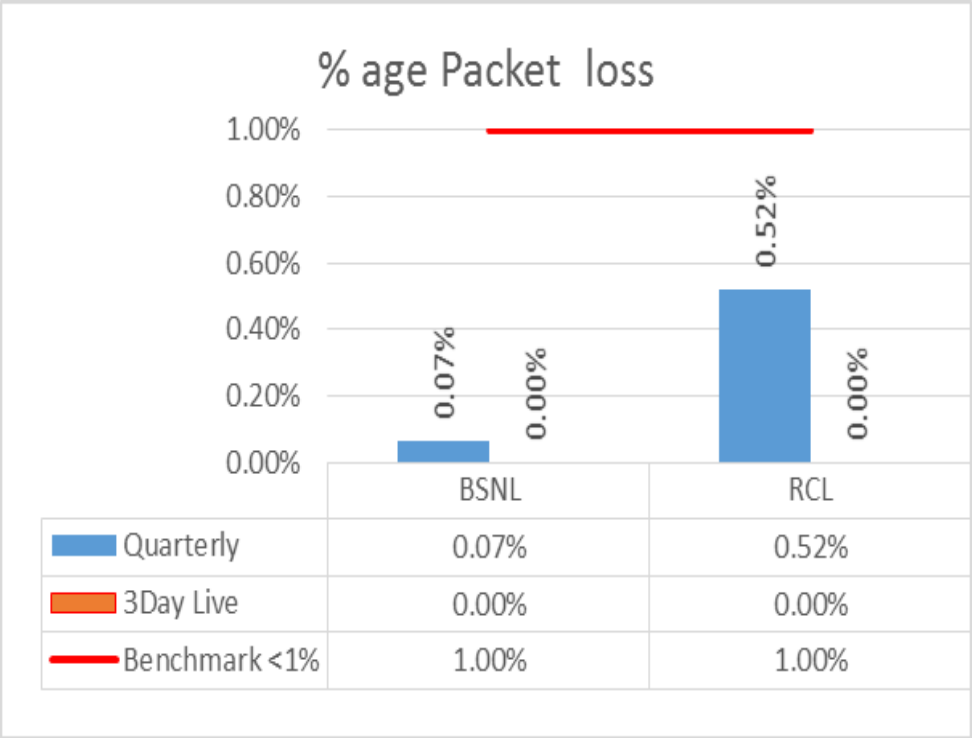

Bandwidth Utilization/ Throughput
POP to ISP Gateway Node [Intra-network] Link(s
100.00%
80.00%
60.00%
40.00%
20.00%
0.00%
52.33%
39.29%
BSNL
RCL
Quarterly
52.33%
39.29%
Benchmark <80%
80.00%
80.00%



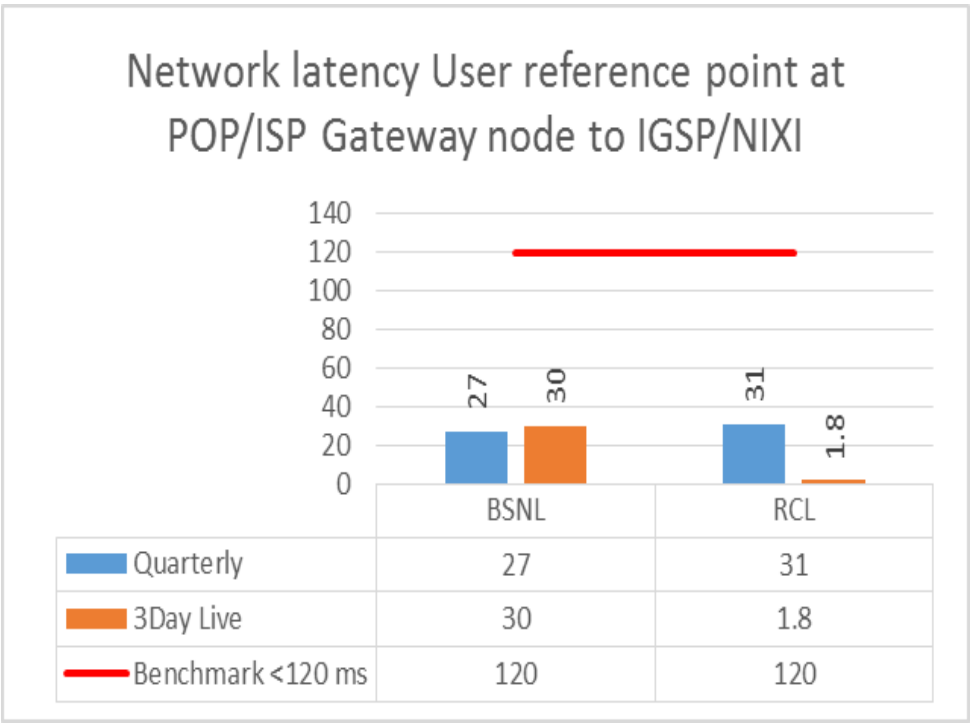
	BSNL	RCL
Quarterly	0.00%	41.01%
3Day Live	0.00%	50.85%
Benchmark <80%	80.00%	80.00%



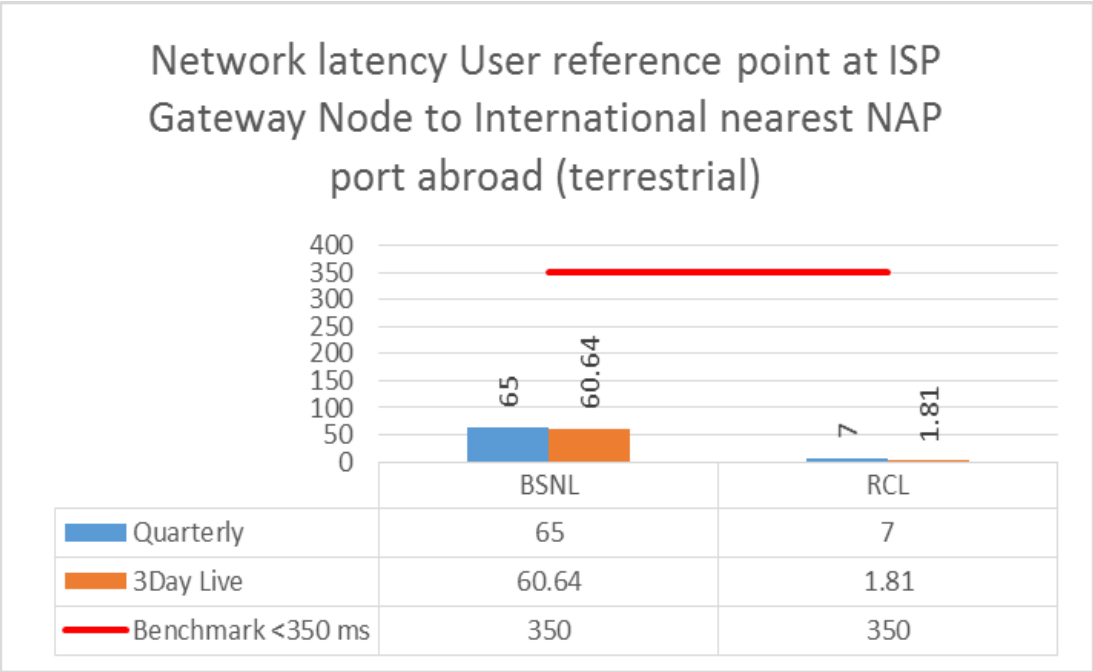
	BSNL	RCL
Quarterly	95.00%	91.13%
3Day Live	96.50%	94.00%
Benchmark >80%	80.00%	80.00%



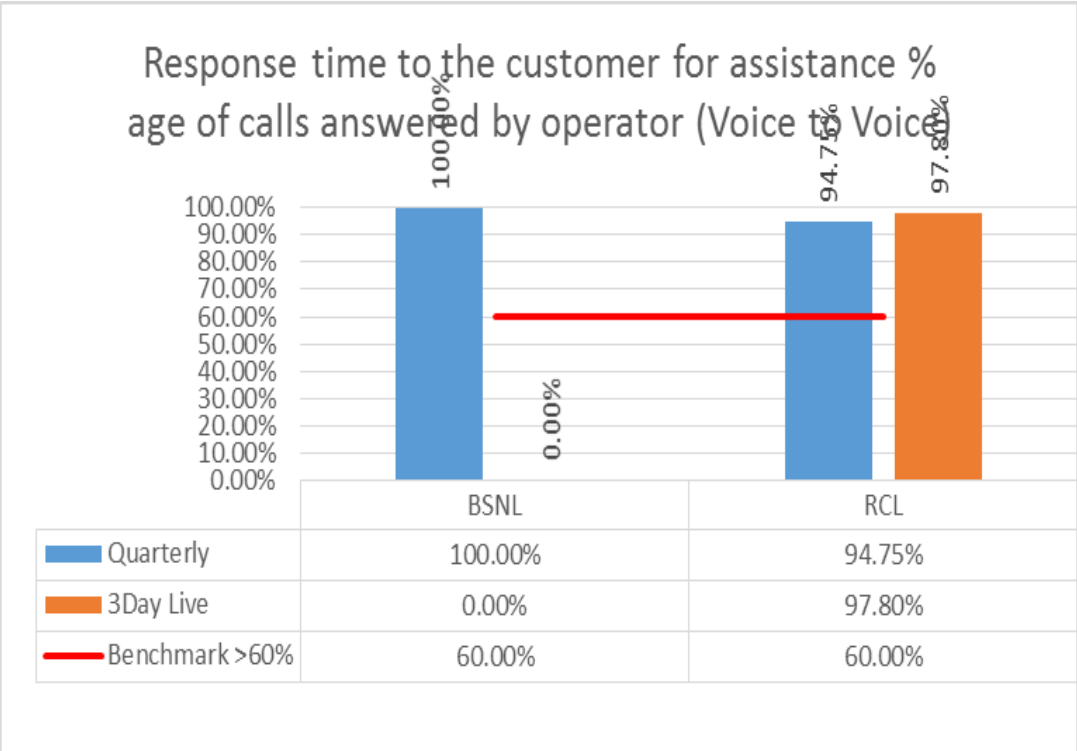
	BSNL	RCL
Quarterly	0.07%	0.52%
3Day Live	0.00%	0.00%
Benchmark <1%	1.00%	1.00%



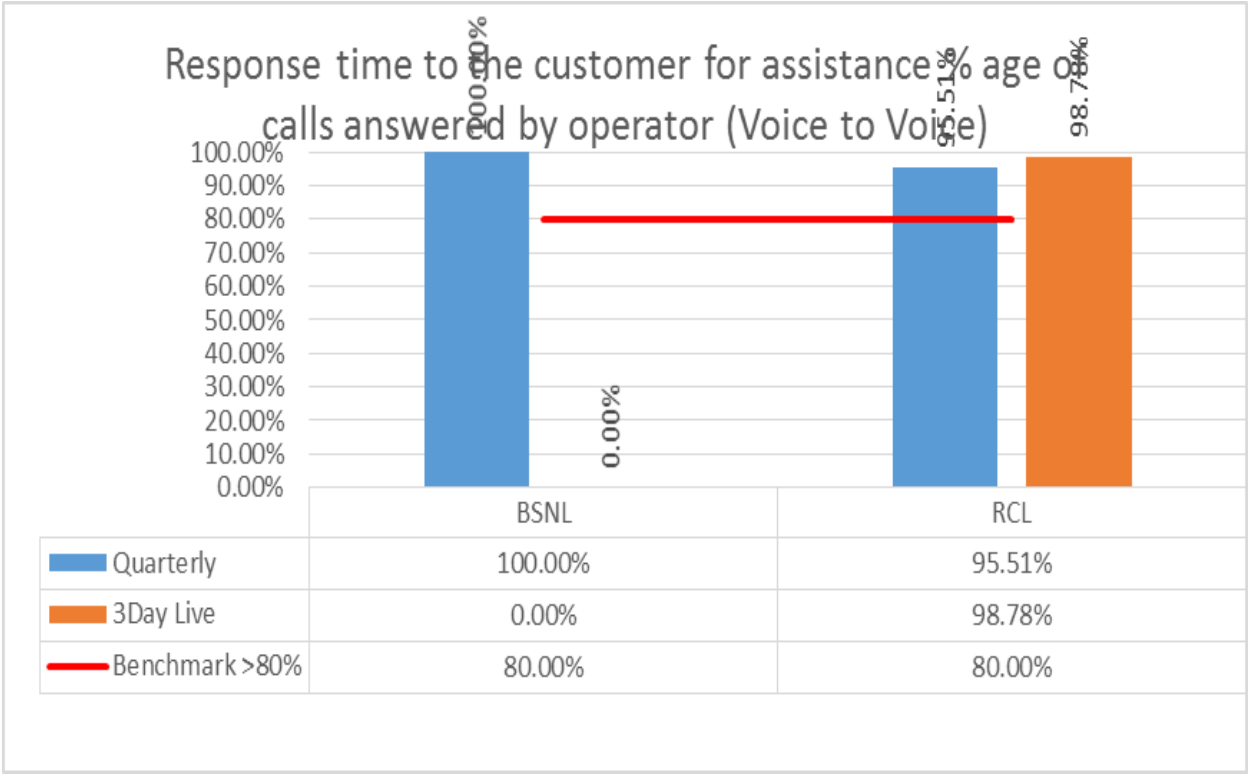
	BSNL	RCL
Quarterly	27	31
3Day Live	30	1.8
Benchmark <120 ms	120	120



	BSNL	RCL
Quarterly	65	7
3Day Live	60.64	1.81
Benchmark <350 ms	350	350



	BSNL	RCL
Quarterly	100.00%	94.75%
3Day Live	0.00%	97.80%
Benchmark >60%	60.00%	60.00%



	BSNL	RCL
Quarterly	100.00%	95.51%
3Day Live	0.00%	98.78%
Benchmark >80%	80.00%	80.00%

5. ABBREVIATIONS

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

- TRAI – Telecom Regulatory Authority of India
- PCPL – Phistream Consulting Private Limited
- QoS – Quality of Service
- AMJ'16 – Refers to the quarter of April, May and June 2016
- SSA – Secondary Switching Area
- NOC – Network Operation Centre
- OMC – Operations and Maintenance Centre
- MSC – Mobile Switching Center
- PMR – Performance Monitoring Reports
- TCBH – Time Consistent Busy Hour
- CBBH - Cell Bouncing Busy Hour
- BTS – Base Transceiver Station
- CSSR – Call Setup Success Rate
- TCH – Traffic Channel
- SDCCH – Standalone Dedicated Control Channel
- CDR – Call Drop Rate
- FER – Frame Error Rate
- SIM – Subscriber Identity Module
- GSM – Global System for Mobile
- CDMA – Code Division Multiple Access
- NA – Not Applicable
- NC – Non Compliance
- POI – Point of Interconnection
- IVR – Interactive Voice Response
- STD – Standard Trunk Dialling
- ISD – International Subscriber Dialling