



**REPORT**  
**ON**  
**AUDIT & ASSESSMENT OF QUALITY OF SERVICE**  
**OF**  
**CELLULAR MOBILE TELEPHONE SERVICE**  
**FOR**  
**TELECOM REGULATORY AUTHORITY OF INDIA**  
**WEST ZONE – MUMBAI METRO SERVICE AREA**  
**(APRIL 2014 – JUNE 2014)**

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## PREFACE

The Telecom Regulatory Authority of India (TRAI), was established in 1997 by an Act of Parliament, called the Telecom Regulatory Authority of India Act, 1997, to regulate telecom services. The Authority's mission is to ensure that the interest of consumers are protected and at the same time to nurture conditions for growth of telecommunications, broadcasting and cable services in a manner and at a pace which will enable India to play a leading role in emerging global information society.

The Authority, in exercise of its functions as per the provisions in the TRAI Act, has been entrusted to measure the Quality of Service provided by the Service Providers from time to time and to compare them with the benchmarks so as to assess the level of performance. In pursuance of this, TRAI has appointed **M/s TUV-SUD South Asia Pvt. Ltd.** to carry out "Audit and Assessment of Quality of Service" provided by Basic (Wire line), Cellular Mobile and Broadband service providers in terms of the benchmarks specified in the respective regulations, in North and West Zones.

TUV-SUD South Asia carried out QoS audit as per the norms of TRAI in all the eight circles / services areas of the North Zone and four circles of the West Zone. This report details the performance of the various service providers in **Mumbai Metro circle** against the QoS bench marks laid down by TRAI in the respective regulations.

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## **1. BACKGROUND**



## 1. BACKGROUND

Telecom Regulatory Authority of India has been entrusted to “lay down the standards of quality of service to be provided by the service providers and ensure the quality of service and conduct the periodical survey of such service provided by the service providers so as to protect interest of the consumers of telecommunication services” vide sub-clause (v) of clause (b) of sub-section (1) of section 11 of the Telecom Regulatory Authority of India Act, 1997 (24 of 1997).

The purpose of laying down Quality of Service Parameters is to:

- i) Create conditions for consumer satisfaction by making known the quality of service, which the Service provider is required to provide, and the user has a right to expect.
- ii) Measure the Quality of Service provided by the Service Providers from time to time and to compare them with the norms so as to assess the level of performance.
- iii) Generally protect the interests of consumers of telecommunication services.

TRAI, the regulatory watch dog for the Quality of Service for the telecom services – Basic (Wire line), Cellular Mobile (Wireless) and Broadband has commissioned **M/s TUV-SUD South Asia Pvt. Ltd.** for conducting audit and assessment of quality of service of service providers, in terms of the benchmarks specified in the “The Standards of Quality of Service of Basic Telephone Service (Wire line) and Cellular Mobile Telephone Service Regulations, 2009 (7 of 2009) dated 20<sup>th</sup> March, 2009 and the Quality of Service of Broadband Service Regulations, 2006 (11 of 2006) dated 6<sup>th</sup> October, 2006 on zonal basis for **North Zone and West Zone** comprising of the following Telecom Circles/Metro Service Areas:

**North Zone:** Delhi, Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Rajasthan, Uttar Pradesh-East and Uttar Pradesh-West (including Uttarakhand). For the cellular mobile telephone service the service area of Delhi includes Ghaziabad, Faridabad, Noida and Gurgaon.

**West Zone:** Mumbai, Maharashtra (including Goa and excluding Mumbai), Gujarat and Madhya Pradesh (including Chhattisgarh).

The Audit exercise would assess the Quality of Service of telecom operators providing Basic (Wire line), Cellular Mobile (Wireless) and Broadband services by auditing the relevant QoS records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI. The audit would be carried out by **TUV-SUD South Asia** every quarter across all the Circles/Service areas of North and West Zones for Cellular Mobile Service. However, in respect of Basic telephone service (wireline) and Broadband service, a circle would be audited once in a year.

## **2. OBJECTIVES AND METHODOLOGY**



## **2. OBJECTIVES AND METHODOLOGY**

The primary objective is to audit and assess the Quality of Service being rendered by Basic, Cellular Mobile & Broadband service providers against the parameters notified by TRAI.

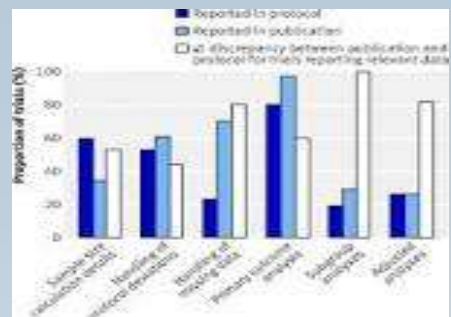
The audit and assessment of Quality of Service is carried out by **TUV SUD South Asia across all the Circles/Service areas of North and West Zones for Cellular Mobile Service. Apart from this, QoS audit for Basic (Wire line) and Broadband Services is also undertaken for Punjab, Rajasthan & Gujarat circles during the quarter April – June 2014.**

The Scope of work as per the Terms of Reference (TOR) includes the following:

- i) Preparation of Performance Monitoring reports (PMRs) and uploading in the system.
- ii) Live measurements of the performance of Service Providers (SPs) against the benchmarks for three days during each audit.
- iii) Monthly audit based on one month data of the SPs.
- iv) Drive test of the RF networks.
- v) Audit of the performance of call centers with respect to their accessibility and percentage of calls answered by the operators and random customer feedback by calling the customers to get feedback of the services provided by the service providers.
- vi) Transfer of data generated by the RF drive test/Live measurements / PMR/ monthly audit to the server located at TRAI premises on real time basis.



### 3. SAMPLE SIZE



### 3. SAMPLE SIZE

#### 3.1 SAMPLING FOR CELLULAR MOBILE (WIRELESS) SERVICE PROVIDERS

- 100% of the Gateway MSC's (GMSC's) and Mobile Switching Centers (MSC's) of all the Cellular Mobile Service Providers or Unified Access Service Providers (UASP) were covered for audit in specified circles/service areas. Following are the various operators covered in Mumbai Metro circle

Sl. No.	Name of Service Provider	Dates of live measurement Audit			Audit Location
		April-14	May-14	June-14	
<b>GSM Operators</b>					
1	<b>AIRCEL</b>	9th to 11th April'14	7th to 9th May'14	4th to 6th June'14	Aircel Limited, Opus Center, Opp. Hotel Tunga Paradise, Near Speez,Andheri(E)
2	<b>AIRTEL</b>	9th to 11th April'14	5th to 7th May'14	4th to 6th June'14	7th Floor, Interface 7, Near IJMIMA Tower, Behind Infinity Mall, Malad (West), Mumbai-400064
3	<b>MTNL</b>	9th to 11th April'14	6th to 8th May'14	4th to 6th June'14	OMC-R unit, 10th Floor, Prabhadevi Telecom Bldg., V.S. Marg, Dadar(W),Mumbai-400028
4	<b>LOOP MOBILE</b>	9th to 11th April'14	5th to 7th May'14	4th to 6th June'14	7th Floor,Loop Mobile ,127 Manmala Tank Road,Taikalwadi,Mahim west,Mumbai
5	<b>TATA GSM</b>	9th to 11th April'14	5th to 7th May'14	4th to 6th June'14	Tata Teleservices (Maharashtra )limited Premco House A-26,Street No 3 MIDC Marol,Andheri East Mumbai 400093
6	<b>IDEA</b>	9th to 11th April'14	5th to 7th May'14	4th to 6th June'14	3rd Floor Windsor ,Kalina CST Road,Santacruz East,Mumbai
7	<b>RCOM GSM</b>	9th to 11th April'14	5th to 7th May'14	3rd to 5th June'14	Reliance Infocom infrastructure Pvt ltd 1 st Floor A 8 Building,MBP Mahape 400701
8	<b>VODAFONE</b>	9th to 11th April'14	6th to 8th May'14	4th to 6th June'14	Skyline ikon, Near Mittal Industrial Estate, Andheri Kurla Road, Marol Naka, Andheri (E), Mumbai-59
<b>CDMA Operators</b>					
9	<b>RCOM CDMA</b>	9th to 11th April'14	5th to 7th May'14	3rd to 5th June'14	Reliance Infocom infrastructure Pvt Ltd, 1 st Floor A 8 Building,MBP Mahape 400701
10	<b>TATA CDMA</b>	9th to 11th April'14	5th to 7th May'14	4th to 6th June'14	Tata Teleservices (Maharashtra )limited Premco House A-26,Street No 3 MIDC Marol,Andheri East Mumbai 400093

For all the above operators, audit was conducted in all the three months of the Quarter ended June 2014.

**The data generated by monthly PMR and 3-days live measurements audit for the period April 2014 to June 2014 has been successfully uploaded to the server located at TRAI premises.**

### 3.2 SAMPLING FOR BASIC (WIRELIN) SERVICES

- The QoS audit for basic (wireline) service is to be done for the number of exchanges spread over in about 10% of SDCAs with each service providers in specified circles. As per the clause 17.3 of the tender document, the QoS audit of Basis Telephone Service (Wireline) in a service area / circle is to be done only once in a year. **Since it has already been done during the QE March 2014, hence QoS audit of Wireline service in Mumbai circle is not required to be done during QE June-14.**

### 3.3 SAMPLING FOR BROADBAND SERVICE PROVIDERS

- TUV-SUD South Asia 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, for 5% of Point of Presence (PoPs) spread over in 10% SDCAs in specified Telecom Circle. As per the clause 17.3 of the tender document, the QoS audit of Broadband service in a service area / circle is to be done only once in a year. **Since it has already been done during the QE March 2014, hence QoS audit of broadband service in Mumbai circle is not required to be done during QE June-14.**

## **4. EXECUTIVE SUMMARY**



## 4. EXECUTIVE SUMMARY

The executive summary put in a nutshell the key findings of the Audit by providing: -

- “Service provider performance report” for Cellular mobile, Basic (wire line) and Broadband services , which gives a foretaste of the performance of various operators against the benchmark specified by TRAI, during the months in which the Audit was carried out by TUV-SUD Auditors.
- “Parameter wise critical findings” for Cellular mobile, Basic (wire line) and Broadband services: This indicates key observations and findings from different activities carried out during the Audit process.
- TUV-SUD conducted audit involved a 3 stage verification process which consisted of auditing the records of the service providers and verifying the data submitted to TRAI. The second step involved a three day live measurement of all the network parameters. On the basis of the three days live measurement, the auditors checked the busy hour of the day for the service provider and collected the data for this busy hour for the month in which the audit was conducted Finally, the performance of the service providers was also gauged by conducting drive tests in three select SSAs per service provider per quarter.
- The three stage audit / verification viz audit of the records, live measurements and drive tests of all the cellular mobile operators was repeated every month. In case of Basic (Wire line) and Broadband, this exercise is required to be carried out on quarterly basis.

### Essence of compliance report of service providers with respect to the QoS:

(i) From **months audit & 3 days live findings**, it can be concluded that on an average, performance of the operators in the Mumbai Metro Service area is satisfactory for **Network Parameters** except for one parameter namely **‘Worst affected cells > 3% TCH drop’** which could not be met by **Aircel** with its quarterly average performance as **5.18%**. In case of live measurements, **Aircel** repeated the similar non-compliance for the same parameter with its average performance as **5.11%**. **Tata (GSM)** also failed to meet the benchmark for the same parameter during monthly audit as well as live measurements in the month of June-14. However, they performed within norms on an average of the quarter.

(ii) With regard to the **Customer Service Quality Parameters**, it is revealed that the parameters namely ‘Metering and Billing Credibility, Response Time to Customers, Termination of Service and Time taken for refunds’ have been largely met by the operators. However, for parameter ‘Resolution of Billing Complaints’, **Tata (GSM)** and **Tata (CDMA)** remained marginally below the benchmark with their performance as **99.81% and 99.30%** respectively. Whereas, with regard to the parameter **‘Calls answered by Operators (voice to voice) within 60 seconds, Airtel, RCOM (GSM) and RCOM (CDMA)** have not met the benchmark with their achieved performance as **87.82%, 40.96% and 43.06%** respectively, against the benchmark of **>=90%**.

In case of parameter **‘Time taken for refunds’**, **Aircel, Tata(GSM) and Tata(CDMA)** remained marginally short of benchmark with their achieved level as **97.12%, 99.38% and 99.59%** respectively. **MTNL** was very marginally underperformed (**99.90%**) for parameter **‘Termination/closure within 7days’**.

The results of three days live measurements also exposed that for parameter **‘Calls connection to operators (Voice to voice) within 60 seconds’**, performance of **Airtel, RCOM (GSM) and RCOM (CDMA)** was **87.50 %, 88.17% and 89.14%** respectively.

(iii) Based on the analysis of the **drive test results**, it was revealed that **MTNL, Idea, RCOM (GSM), RCOM (CDMA)** and Loop Mobile repeated their non-complied performance for the parameters **Call drop rate and Voice quality** across the three SSAs where the drive tests were conducted during the quarter. These operators need improvement in their networks to remove the deficiencies with respect to non-complied parameters.

## **5. PMR AUDIT REPORT**



## 5. PMR AUDIT REPORTS:

### 5.1 MONTHLY PMR:

#### 5.1.1 BUSY HOUR OF VARIOUS SERVICE PROVIDERS:

Sl. No.	Name of Service Provider	Month of Audit	Network TCBH Hour
<b>GSM Operators</b>			
1	AIRTEL	June-14	20 Hrs-21 Hrs
2	AIRCEL	June-14	20 Hrs-21 Hrs
3	MTNL	June-14	19 Hrs-20 Hrs
4	IDEA	June-14	20 Hrs-21 Hrs
5	RCOM GSM	June-14	19 Hrs-20 Hrs
6	TATA GSM	June-14	19 Hrs-20 Hrs
7	LOOP MOBILE	June-14	19 Hrs-20 Hrs
8	VODAFONE	June-14	20 Hrs-21 Hrs
<b>CDMA Operators</b>			
9	RCOM CDMA	June-14	19 Hrs-20 Hrs
10	TATA CDMA	June-14	11 Hrs-12 Hrs

The TCBH reported by all the service providers matched the network busy hour calculated by TUV auditors for the Mumbai Metro circle.

#### 5.1.2 SWITCHES/BSC/BTS DETAILS OF SERVICE PROVIDERS:

Sl. No.	Name of Service Provider	No. of MSC + GMSC	No. of BSC	No. of BTS	NSS make	BSS make
<b>GSM Operators</b>						
1	AIRTEL	13	72	3817	NSN	NSN
2	AIRCEL	3	20	1856	NSN	NSN
3	MTNL	5	46	993	Alcatel	Motorola & Alcatel
4	IDEA	8	32	3219	Ericsson	Ericsson
5	RCOM GSM	3	11	2301	Huawei	Huawei
6	TATA GSM	3	15	2793	Huawei	Huawei
7	LOOP MOBILE	3	23	2045	Huawei	Huawei & ZTE
8	VODAFONE	21	63	4320	Ericsson	Ericsson
<b>CDMA Operators</b>						
9	RCOM CDMA	8	NA	878	Lucent, ZTE & Ericsson	Lucent
10	TATA CDMA	5	6	949	Huawei	Huawei

5.1.3 QOS PERFORMANCE OF MONTHLY PMR – APRIL-14 MONTH:

CELLULAR MOBILE TELEPHONE SERVICES MUMBAI METRO CIRCLE- APRIL-14 MONTH													
PMR Generation Data		Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Apr-14	0.00%	0.08%	0.59%	0.05%	0.17%	0.01%	0.01%	0.01%	0.23%	0.02%
	b) Worst affected BTSs due to downtime	<=2%	Apr-14	0.00%	0.26%	1.20%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Apr-14	99.99%	98.24%	97.46%	98.29%	99.63%	99.57%	99.28%	99.56%	98.73%	98.99%
	b) SDCCH/PAGING Channel congestion	<=1%	Apr-14	0.00%	0.06%	0.19%	0.56%	0.03%	0.08%	0.02%	0.02%	0.00%	0.00%
	c) TCH congestion	<=2%	Apr-14	0.00%	0.40%	0.06%	0.97%	0.08%	0.18%	0.02%	0.44%	0.01%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Apr-14	0.27%	0.91%	1.09%	1.91%	0.44%	0.64%	0.60%	0.82%	0.50%	0.63%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Apr-14	0.00%	5.27%	1.88%	2.80%	0.03%	1.32%	0.83%	2.35%	0.08%	2.58%
	c) Connections with good voice quality	>=95%	Apr-14	99.97%	97.57%	95.80%	96.10%	98.17%	98.58%	98.11%	97.48%	99.79%	99.12%
4	No. of POI's having >=0.5% POI congestion		Apr-14	0	0	0	0	0	0	0	0	0	0



5.1.4 QOS PERFORMANCE OF MONTHLY PMR – MAY-14 MONTH:

CELLULAR MOBILE TELEPHONE SERVICES MUMBAI METRO CIRCLE- MAY-14 MONTH													
PMR Generation Data		Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators							CDMA Operators		
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	May-14	0.00%	0.09%	0.64%	0.08%	0.32%	0.02%	0.01%	0.01%	0.38%	0.02%
	b) Worst affected BTSs due to downtime	<=2%	May-14	0.00%	0.27%	1.41%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	May-14	99.99%	98.56%	98.24%	98.60%	99.58%	99.60%	99.29%	99.63%	98.59%	99.00%
	b) SDCCH/PAGING Channel congestion	<=1%	May-14	0.00%	0.07%	0.27%	0.40%	0.07%	0.07%	0.02%	0.03%	0.00%	0.00%
	c) TCH congestion	<=2%	May-14	0.00%	0.17%	0.04%	0.70%	0.12%	0.16%	0.01%	0.37%	0.02%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	May-14	0.27%	0.84%	1.08%	1.83%	0.49%	0.61%	0.59%	0.78%	0.65%	0.58%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	May-14	0.00%	5.12%	1.32%	2.77%	0.02%	1.35%	0.87%	2.17%	0.19%	2.35%
	c) Connections with good voice quality	>=95%	May-14	99.97%	97.86%	96.40%	95.68%	98.78%	98.68%	98.17%	97.44%	99.79%	99.17%
4	No. of POI's having >=0.5% POI congestion		May-14	0	0	0	0	0	0	0	0	0	0

5.1.5 QOS PERFORMANCE OF MONTHLY PMR – JUNE-14 MONTH:

CELLULAR MOBILE TELEPHONE SERVICES MUMBAI METRO CIRCLE- JUNE-14 MONTH													
PMR Generation Data		Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Jun-14	0.00%	0.09%	0.65%	0.08%	0.04%	0.01%	0.01%	0.00%	0.36%	0.03%
	b) Worst affected BTSs due to downtime	<=2%	Jun-14	0.00%	0.43%	1.31%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Jun-14	99.99%	98.39%	98.08%	98.10%	99.60%	99.57%	99.10%	99.56%	97.69%	98.98%
	b) SDCCH/PAGING Channel congestion	<=1%	Jun-14	0.00%	0.10%	0.17%	0.49%	0.03%	0.08%	0.02%	0.03%	0.00%	0.00%
	c) TCH congestion	<=2%	Jun-14	0.00%	0.45%	0.08%	1.17%	0.08%	0.21%	0.02%	0.44%	0.04%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Jun-14	0.27%	0.89%	1.12%	1.88%	0.46%	0.63%	0.62%	0.86%	0.76%	0.62%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Jun-14	0.02%	5.14%	1.78%	2.79%	0.03%	6.16%	0.96%	2.57%	0.08%	2.55%
	c) Connections with good voice quality	>=95%	Jun-14	99.97%	97.80%	96.10%	95.39%	98.83%	98.68%	98.10%	97.25%	99.79%	99.09%
4	No. of POI's having >=0.5% POI congestion		Jun-14	0	0	0	0	0	0	0	0	0	0

**5.1.6 QOS PERFORMANCE OF QUARTERLY PMR –AVERAGE OF QE- JUNE-14 (APRIL TO JUNE MONTHS AUDITED DATA)**

QUARTERLY QOS PERFORMANCE (AVERAGE OF THREE MONTHS) OF MUMBAI METRO CIRCLE													
PMR Generation Data		Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators									CDMA Operators
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Quarterly	0.00%	0.09%	0.63%	0.07%	0.18%	0.01%	0.01%	0.01%	0.32%	0.02%
	b) Worst affected BTSs due to downtime	<=2%	Quarterly	0.00%	0.32%	1.31%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Quarterly	99.99%	98.40%	97.93%	98.33%	99.60%	99.58%	99.22%	99.58%	98.34%	98.99%
	b) SDCCH/PAGING Channel congestion	<=1%	Quarterly	0.00%	0.08%	0.21%	0.48%	0.04%	0.08%	0.02%	0.03%	0.00%	0.00%
	c) TCH congestion	<=2%	Quarterly	0.00%	0.34%	0.06%	0.95%	0.09%	0.18%	0.02%	0.42%	0.02%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Quarterly	0.27%	0.88%	1.10%	1.87%	0.46%	0.63%	0.60%	0.82%	0.64%	0.61%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Quarterly	0.01%	5.18%	1.66%	2.79%	0.03%	2.94%	0.89%	2.36%	0.12%	2.49%
	c) Connections with good voice quality	>=95%	Quarterly	99.97%	97.74%	96.10%	95.72%	98.59%	98.65%	98.13%	97.39%	99.79%	99.13%
4	No. of POI's having >=0.5% POI congestion		Quarterly	0	0	0	0	0	0	0	0	0	0

### 5.1.7 KEY FINDINGS ON MONTHLY PMR AUDIT REPORTS:

The audit of network related parameters for cellular mobile service providers was conducted at their respective MSCs in the circle.

TUV conducted audit for cellular mobile operators based on **three stage audit / verification viz audit of the records, live measurements and drive tests. This exercise has been repeated every month for CMSPs.**

#### **Network Service Quality Parameters:**

- **Network Availability**

- i. BTS Accumulated Downtime (Not Available for Service):
- ii. Worst affected BTSs due to downtime

For measuring the performance against the benchmark for this parameter, down time of each BTS lasting for more than 1 hour at a time in a day during the period of a month has been taken for computation.

In Mumbai Metro circle, **all the operators were found meeting benchmark** on the above parameters 'BTS accumulated downtime' and 'worst affected BTSs due to down time' in all the three months of the quarter.

- **Connection Establishment (Accessibility)**

- i. Call Set-up Success Rate(CSSR)

CSSR includes complete signaling in the call set up process and does not aim to measure the performance of the called exchange or that of the Point of Interconnection (POI). CSSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made. All the operators were found to be calculating the parameter as per the TRAI's specified norms.

**All the operators were comfortably meeting the benchmark on this parameter.**

- **Parameters related to Network Congestion:**

The parameters namely SDCCH / Paging Channel Congestion, TCH and POI are prescribed with the aim of measuring the congestion in the network.

In CDMA system, there is no direct counter defined for reporting Paging Channel Congestion as reported by Tata Teleservices. However, they have a defined counter for Paging Channel Occupancy Ratio (PCH Average Using Ratio) which is used to determine the Paging Channel Occupancy which on an average is < 50% on all sites in the network. When the value of this parameter is less than 100%, it is counted as 0% congestion. Thus, there is no congestion on the paging channel in CDMA system.

With respect to this parameter, the performance of the operators is quite satisfactory as **all operators met the TRAI specified benchmarks on the congestion parameters.** There was no congestion on individual POI links between a service provider vis-à-vis other service providers.

- **Connection Maintenance (Retainability)**

- i. Call Drop Rate:

This parameter gives a reliable measurement of the mobile network used by the service provider for maintaining a call once it has been correctly established. Failures in coverage, network congestion and network failures have important impact on this parameter.

The audit of this parameter revealed that all the service providers were measuring this parameter as per the TRAI guidelines. Also, **all the service providers were found to be meeting the TRAI specified benchmark**. The lowest call drop rate (0.27%) was for Airtel during the quarter.

- ii. Worst affected cells having more than 3% TCH drops

Worst affected cells are defined as cells in which the call drop rate exceeds 3% during cell Bouncing Busy Hour (CBBH) or at any other hour of a day.

The audit with respect to this parameter revealed that all the operators except **Aircel** were in compliance of the benchmark for this parameter. The quarterly average performance of **Aircel** with respect to this parameter was **5.18%**.

- iii. Connections with good voice quality:

All operators were found to have met the bench mark for the parameter 'Good Voice Quality'

**3-DAYS LIVE MEASUREMENT DATA VERIFICATION FOR  
CELLULAR MOBILE SERVICE PROVIDERS  
(NETWORK SERVICE QUALITY PARAMETER)**



**5.2 LIVE MEASUREMENT DATA (3-DAYS) FOR CELLULAR MOBILE SERVICE PROVIDERS (NETWORK SERVICE QUALITY PARAMETER):**

**5.2.1 LIVE MEASUREMENT DATA (3-DAYS) – APRIL-14 MONTH:**

CELLULAR MOBILE TELEPHONE SERVICES MUMBAI METRO CIRCLE- APRIL-14 MONTH													
Live measurement Data		Bench- mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators							CDMA Operators		
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Live data	0.00%	0.07%	0.64%	0.06%	0.50%	0.00%	0.00%	0.00%	0.60%	0.00%
	b) Worst affected BTSs due to downtime	<=2%	Live data	0.00%	0.00%	0.10%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Live data	99.99%	98.17%	97.18%	98.32%	99.63%	99.58%	99.27%	99.53%	98.95%	98.95%
	b) SDCCH/PAGING Channel congestion	<=1%	Live data	0.00%	0.03%	0.23%	0.60%	0.02%	0.11%	0.02%	0.02%	0.00%	0.00%
	c) TCH congestion	<=2%	Live data	0.00%	0.25%	0.06%	0.93%	0.05%	0.16%	0.02%	0.47%	0.01%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Live data	0.28%	0.92%	1.13%	1.95%	0.43%	0.65%	0.65%	0.90%	0.40%	0.67%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Live data	0.00%	5.35%	1.87%	2.80%	0.00%	1.32%	0.82%	2.58%	0.04%	2.34%
	c) Connections with good voice quality	>=95%	Live data	99.97%	97.60%	95.50%	96.44%	98.97%	98.58%	98.09%	97.38%	99.78%	99.10%
4	No. of POI having >=0.5% congestion		Live data	0	0	0	0	0	0	0	0	0	0

5.2.2 LIVE MEASUREMENT DATA (3-DAYS) – MAY-14 MONTH:

CELLULAR MOBILE TELEPHONE SERVICES MUMBAI METRO CIRCLE- MAY-14 MONTH													
Live measurement Data		Bench-mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators						CDMA Operators			
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Live data	0.00%	0.12%	1.05%	0.05%	0.64%	0.00%	0.00%	0.02%	0.68%	0.03%
	b) Worst affected BTSs due to downtime	<=2%	Live data	0.00%	0.05%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Live data	99.99%	98.63%	97.85%	98.58%	99.58%	99.60%	99.26%	99.54%	98.03%	99.00%
	b) SDCCH/PAGING Channel congestion	<=1%	Live data	0.00%	0.03%	0.14%	0.48%	0.14%	0.08%	0.02%	0.18%	0.00%	0.00%
	c) TCH congestion	<=2%	Live data	0.00%	0.03%	0.04%	0.72%	0.09%	0.14%	0.02%	0.46%	0.04%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Live data	0.27%	0.81%	1.13%	1.89%	0.46%	0.64%	0.63%	0.85%	0.59%	0.57%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Live data	0.00%	4.84%	2.11%	2.78%	0.02%	1.36%	0.86%	2.15%	0.08%	1.96%
	c) Connections with good voice quality	>=95%	Live data	99.97%	97.92%	96.20%	95.44%	98.85%	98.56%	98.13%	97.36%	99.77%	98.84%
4	No. of POI having >=0.5% congestion		Live data	0	0	0	0	0	0	0	0	0	0



5.2.3 LIVE MEASUREMENT DATA (3-DAYS) – JUNE-14 MONTH:

CELLULAR MOBILE TELEPHONE SERVICES MUMBAI METRO CIRCLE- JUNE-14 MONTH													
Live measurement Data		Bench- mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators						CDMA Operators			
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Live data	0.00%	0.07%	0.70%	0.08%	0.17%	0.02%	0.00%	0.01%	0.29%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	Live data	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Live data	99.99%	98.53%	98.26%	98.55%	99.59%	99.57%	98.27%	99.64%	97.47%	99.03%
	b) SDCCH/PAGING Channel congestion	<=1%	Live data	0.00%	0.01%	0.33%	0.45%	0.03%	0.10%	0.02%	0.01%	0.00%	0.00%
	c) TCH congestion	<=2%	Live data	0.00%	0.10%	0.05%	0.72%	0.07%	0.15%	0.02%	0.36%	0.06%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Live data	0.27%	0.87%	1.11%	1.90%	0.43%	0.70%	0.65%	0.86%	0.71%	0.59%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Live data	0.00%	5.14%	1.77%	2.81%	0.00%	6.79%	0.88%	2.40%	0.04%	1.93%
	c) Connections with good voice quality	>=95%	Live data	99.97%	97.86%	96.00%	95.58%	98.80%	98.59%	98.11%	97.32%	99.76%	98.91%
4	No. of POI having >=0.5% congestion		Live data	0	0	0	0	0	0	0	0	0	0

**5.2.4 QUARTERLY QOS PERFORMANCE OF 3-DAYS LIVE MEASUREMENT AUDITED DATA (AVERAGE OF APRIL TO JUNE)**

QUARTERLY QOS PERFORMANCE OF 3-DAYS LIVE MEASUREMENT (AVERAGE OF THREE MONTHS) – MUMBAI CIRCLE													
Live measurement Data		Bench- mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/N	Name of Parameter			GSM Operators						CDMA Operators			
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) BTS Accumulated Downtime	<=2%	Quarterly	0.00%	0.09%	0.80%	0.06%	0.44%	0.01%	0.00%	0.01%	0.52%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	Quarterly	0.00%	0.02%	0.07%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Quarterly	99.99%	98.44%	97.76%	98.48%	99.60%	99.58%	98.93%	99.57%	98.15%	98.99%
	b) SDCCH/PAGING Channel congestion	<=1%	Quarterly	0.00%	0.02%	0.23%	0.51%	0.06%	0.10%	0.02%	0.07%	0.00%	0.00%
	c) TCH congestion	<=2%	Quarterly	0.00%	0.13%	0.05%	0.79%	0.07%	0.15%	0.02%	0.43%	0.04%	0.02%
<b>Connection maintenance (Retainability)</b>													
3	a) CDR (Call Drop Rate)	<=2%	Quarterly	0.27%	0.87%	1.12%	1.91%	0.44%	0.66%	0.64%	0.87%	0.57%	0.61%
	b) Worst affected cells>3% TCH drop (Call drop) rate	<=3%	Quarterly	0.00%	5.11%	1.92%	2.80%	0.01%	3.16%	0.85%	2.38%	0.05%	2.08%
	c) Connections with good voice quality	>=95%	Quarterly	99.97%	97.79%	95.90%	95.82%	98.87%	98.58%	98.11%	97.35%	99.77%	98.95%
4	No. of POI having >=0.5% congestion		Quarterly	0	0	0	0	0	0	0	0	0	0

**5.2.5 KEY FINDING ON 3 DAYS LIVE MEASUREMENTS:**

From three days live assessment, it is found that the performance of all operators is satisfactory as they are largely meeting the benchmarks except for the parameter ‘Worst affected cells> 3 % TCH drops’. This parameter was not met by **Aircel** in the months of **Apr-14 (5.35%), May (4.84%) & Jun-14 (5.14%)**. Its performance was also beyond the benchmark when calculated taking average of three months of the quarter (5.11%).

5.2.6 DETAILED NETWORK DATA ASSESSMENT OF CELLULAR MOBILE TELEPHONE SERVICES:

TABLE: 1

Detailed Network Data Assessment of Cellular Mobile Telephone Services- Mumbai Metro Circle- April-14 month

S/N	Name of Parameter	Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA Cellular	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
				GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) Total no. of BTSs in the licensed service area		Apr-14	3911	1914	997	3182	2317	2768	2061	4248	881	907
	b) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		Apr-14	18	1083	4262	1044	2879	109	177	196	1433	119
	c) BTS Accumulated Downtime	<=2%	Apr-14	0.00%	0.08%	0.59%	0.05%	0.17%	0.01%	0.01%	0.01%	0.23%	0.02%
	d) No. of BTSs having accumulated downtime of >24 hours in a month		Apr-14	0	5	12	3	0	0	0	0	0	0
	e) Worst affected BTSs due to downtime	<=2%	Apr-14	0.00%	0.26%	1.20%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Apr-14	99.99%	98.24%	97.46%	98.29%	99.63%	99.57%	99.28%	99.56%	98.73%	98.99%
	b) SDCCCH/PAGING Congestion	<=1%	Apr-14	0.00%	0.06%	0.19%	0.56%	0.03%	0.08%	0.02%	0.02%	0.00%	0.00%
	c) TCH congestion	<=2%	Apr-14	0.00%	0.40%	0.06%	0.97%	0.08%	0.18%	0.02%	0.44%	0.01%	0.02%
<b>Connection Maintenance (Retainability)</b>													
3	a) Call Drop Rate (CDR)	<=2%	Apr-14	0.27%	0.91%	1.09%	1.91%	0.44%	0.64%	0.60%	0.82%	0.50%	0.63%
	b) Worst affected cells>3% TCH drop	<=3%	Apr-14	0.00%	5.27%	1.88%	2.80%	0.03%	1.32%	0.83%	2.35%	0.08%	2.58%
	c) % of connections with good voice quality	>=95%	Apr-14	99.97%	97.57%	95.80%	96.10%	98.17%	98.58%	98.11%	97.48%	99.79%	99.12%
	d) Total No. of cells exceeding 3% TCH drop (call drop)		Apr-14	0	293	50	257	2	99	49	240	2	67
	e) Total no. of cells (Sector) in the licensed service area		Apr-14	10121	5565	2663	9166	6315	7499	5919	10234	2643	2600
<b>No. of POI's having &gt;=0.5% POI congestion</b>													
4	No. of POI's having >=0.5% POI congestion		Apr-14	0	0	0	0	0	0	0	0	0	0
	Name of POI not meeting the benchmark		Apr-14	0	0	0	0	0	0	0	0	0	0
<b>Network Data</b>													
5	a) Equipped Capacity of Network in Erlang		Apr-14	180606	64084	37627.00	121835	72000	106400	145902	263050	168000	319800
	b) Total traffic in TCBH in erlang (Avg.)		Apr-14	102732	35443	15711	96087	63172	43256	46313	175308	112975	45419
	c) Total no. of customers served (as per VLR) on last day of the month		Apr-14	3824022	1118372	785898	2953523	3046333	1475274	1281285	6177034	3009885	595360

TABLE: 2

Detailed Network Data Assessment of Cellular Mobile Telephone Services-3 days live- Mumbai Metro Circle- April-14 month

S/N	Name of Parameter	Bench- mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA Cellular	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
				GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) Total no. of BTSs in the licensed service area		Live data	3890	1919	1000	3181	2329	2727	2068	4228	888	959
	b) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		Live data	4	95	458	131	837	0	6	10	381	2
	c) BTS Accumulated Downtime	<=2%	Live data	0.00%	0.07%	0.64%	0.06%	0.50%	0.00%	0.00%	0.00%	0.60%	0.00%
	d) No. of BTSs having accumulated downtime of >24 hours in a month		Live data	0	0	1	1	0	0	0	0	0	0
	e) Worst affected BTSs due to downtime	<=2%	Live data	0.00%	0.00%	0.10%	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Live data	99.99%	98.17%	97.18%	98.32%	99.63%	99.58%	99.27%	99.53%	98.95%	98.95%
	b) SDCCH/PAGING Congestion	<=1%	Live data	0.00%	0.03%	0.23%	0.60%	0.02%	0.11%	0.02%	0.02%	0.00%	0.00%
	c) TCH congestion	<=2%	Live data	0.00%	0.25%	0.06%	0.93%	0.05%	0.16%	0.02%	0.47%	0.01%	0.02%
<b>Connection Maintenance (Retainability)</b>													
3	a) Call Drop Rate (CDR)	<=2%	Live data	0.28%	0.92%	1.13%	1.95%	0.43%	0.65%	0.65%	0.90%	0.40%	0.67%
	b) Worst affected cells>3% TCH drop	<=3%	Live data	0.00%	5.35%	1.87%	2.80%	0.00%	1.32%	0.82%	2.58%	0.04%	2.34%
	c) % of connections with good voice quality	>=95%	Live data	99.97%	97.60%	95.50%	96.44%	98.97%	98.58%	98.09%	97.38%	99.78%	99.10%
	d) Total No. of cells exceeding 3% TCH drop (call drop)		Live data	0	298	50	257	0	104	49	264	1	61
	e) Total no. of cells (Sector) in the licensed service area		Live data	10106	5574	2674	9169	6245	7884	5960	10225	2602	2602
<b>No. of POI's having &gt;=0.5% POI congestion</b>													
4	No. of POI's having >=0.5% POI congestion		Live data	0	0	0	0	0	0	0	0	0	0
	Name of POI not meeting the benchmark		Live data	0	0	0	0	0	0	0	0	0	0

TABLE: 3

Detailed Network Data Assessment of Cellular Mobile Telephone Services- Mumbai Metro Circle- May-14 month													
S/N	Name of Parameter	Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
				GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) Total no. of BTSs in the licensed service area		May-14	3804	1867	996	3193	2302	2767	2059	4263	878	954
	b) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		May-14	17	1309	4750	1882	5541	425	177	193	2476	166
	c) BTS Accumulated Downtime	<=2%	May-14	0.00%	0.09%	0.64%	0.08%	0.32%	0.02%	0.01%	0.01%	0.38%	0.02%
	d) No. of BTSs having accumulated downtime of >24 hours in a month		May-14	0	5	14	9	0	0	0	0	0	0
	e) Worst affected BTSs due to downtime	<=2%	May-14	0.00%	0.27%	1.41%	0.28%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	May-14	99.99%	98.56%	98.24%	98.60%	99.58%	99.60%	99.29%	99.63%	98.59%	99.00%
	b) SDCCCH/PAGING Congestion	<=1%	May-14	0.00%	0.07%	0.27%	0.40%	0.07%	0.07%	0.02%	0.03%	0.00%	0.00%
	c) TCH congestion	<=2%	May-14	0.00%	0.17%	0.04%	0.70%	0.12%	0.16%	0.01%	0.37%	0.02%	0.02%
<b>Connection Maintenance (Retainability)</b>													
3	a) Call Drop Rate (CDR)	<=2%	May-14	0.27%	0.84%	1.08%	1.83%	0.49%	0.61%	0.59%	0.78%	0.65%	0.58%
	b) Worst affected cells>3% TCH drop	<=3%	May-14	0.00%	5.12%	1.32%	2.77%	0.02%	1.35%	0.87%	2.17%	0.19%	2.35%
	c) % of connections with good voice quality	>=95%	May-14	99.97%	97.86%	96.40%	95.68%	98.78%	98.68%	98.17%	97.44%	99.79%	99.17%
	d) Total No. of cells exceeding 3% TCH drop (call drop)		May-14	0	279	35	254	1	102	51	225	5	61
	e) Total no. of cells (Sector) in the licensed service area		May-14	10125	5454	2656	9168	6243	7580	5848	10345	2643	2597
<b>No. of POI's having &gt;=0.5% POI congestion</b>													
4	No. of POI's having >=0.5% POI congestion		May-14	0	0	0	0	0	0	0	0	0	0
	Name of POI not meeting the benchmark		May-14	0	0	0	0	0	0	0	0	0	0
<b>Network Data</b>													
5	a) Equipped Capacity of Network in Erlang		May-14	176693	61197	37627	121919	72000	107451	145599	261615	168000	105821
	b) Total traffic in TCBH in erlang (Avg.)		May-14	94588	33344	13438	88235	55957	37586	42062	159962	100215	46523
	c) Total no. of customers served (as per VLR) on last day of the month		May-14	3738794	1089276	751004	2869904	2926820	1413213	1281285	5988606	2880825	546503

TABLE: 4

Detailed Network Data Assessment of Cellular Mobile Telephone Services-3 days live- Mumbai Metro Circle- May-14 month													
S/N	Name of Parameter	Bench- mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
				GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
<b>Network Availability</b>													
1	a) Total no. of BTSs in the licensed service area		Live data	3907	1914	996	3177	2319	2760	2061	4248	881	958
	b) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		Live data	3	160	750	113	1069	3	7	48	431	19
	c) BTS Accumulated Downtime	<=2%	Live data	0.00%	0.12%	1.05%	0.05%	0.64%	0.00%	0.00%	0.02%	0.68%	0.03%
	d) No. of BTSs having accumulated downtime of >24 hours in a month		Live data	0	1	1	0	0	0	0	0	0	0
	e) Worst affected BTSs due to downtime	<=2%	Live data	0.00%	0.05%	0.10%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
<b>Connection Establishment (Accessibility)</b>													
2	a) CSSR (Call Setup Success Rate)	>=95%	Live data	99.99%	98.63%	97.85%	98.58%	99.58%	99.60%	99.26%	99.54%	98.03%	99.00%
	b) SDCCH/PAGING Congestion	<=1%	Live data	0.00%	0.03%	0.14%	0.48%	0.14%	0.08%	0.02%	0.18%	0.00%	0.00%
	c) TCH congestion	<=2%	Live data	0.00%	0.03%	0.04%	0.72%	0.09%	0.14%	0.02%	0.46%	0.04%	0.02%
<b>Connection Maintenance (Retainability)</b>													
3	a) Call Drop Rate (CDR)	<=2%	Live data	0.27%	0.81%	1.13%	1.89%	0.46%	0.64%	0.63%	0.85%	0.59%	0.57%
	b) Worst affected cells>3% TCH drop	<=3%	Live data	0.00%	4.84%	2.11%	2.78%	0.02%	1.36%	0.86%	2.15%	0.08%	1.96%
	c) % of connections with good voice quality	>=95%	Live data	99.97%	97.92%	96.20%	95.44%	98.85%	98.56%	98.13%	97.36%	99.77%	98.84%
	d) Total No. of cells exceeding 3% TCH drop (call drop)		Live data	0	269	56	255	1	103	50	222	2	51
	e) Total no. of cells (Sector) in the licensed service area		Live data	10120	5559	2656	9165	6219	7548	5795	10312	2573	2604
<b>No. of POI's having &gt;=0.5% POI congestion</b>													
4	No. of POI's having >=0.5% POI congestion		Live data	0	0	0	0	0	0	0	0	0	0
	Name of POI not meeting the benchmark		Live data	0	0	0	0	0	0	0	0	0	0

**TABLE: 5**

<b>Detailed Network Data Assessment of Cellular Mobile Telephone Services- Mumbai Metro Circle- June-14 month</b>													
S/N	Name of Parameter	Bench- mark	Audit Period	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
				GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
1	<b>Network Availability</b>												
	a) Total no. of BTSs in the licensed service area		Jun-14	3817	1856	993	3219	2301	2793	2045	4320	878	949
	b) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		Jun-14	22	1190	4635	1855	622	191	184	123	2261	184
	c) BTS Accumulated Downtime	<=2%	Jun-14	0.00%	0.09%	0.65%	0.08%	0.04%	0.01%	0.01%	0.00%	0.36%	0.03%
	d) No. of BTSs having accumulated downtime of >24 hours in a month		Jun-14	0	8	13	3	0	0	0	0	0	0
e) Worst affected BTSs due to downtime	<=2%	Jun-14	0.00%	0.43%	1.31%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2	<b>Connection Establishment (Accessibility)</b>												
	a) CSSR (Call Setup Success Rate)	>=95%	Jun-14	99.99%	98.39%	98.08%	98.10%	99.60%	99.57%	99.10%	99.56%	97.69%	98.98%
	b) SDCCH/PAGING Congestion	<=1%	Jun-14	0.00%	0.10%	0.17%	0.49%	0.03%	0.08%	0.02%	0.03%	0.00%	0.00%
c) TCH congestion	<=2%	Jun-14	0.00%	0.45%	0.08%	1.17%	0.08%	0.21%	0.02%	0.44%	0.04%	0.02%	
3	<b>Connection Maintenance (Retainability)</b>												
	a) Call Drop Rate (CDR)	<=2%	Jun-14	0.27%	0.89%	1.12%	1.88%	0.46%	0.63%	0.62%	0.86%	0.76%	0.62%
	b) Worst affected cells>3% TCH drop	<=3%	Jun-14	0.02%	5.14%	1.78%	2.79%	0.03%	6.16%	0.96%	2.57%	0.08%	2.55%
	c) % of connections with good voice quality	>=95%	Jun-14	99.97%	97.80%	96.10%	95.39%	98.83%	98.68%	98.10%	97.25%	99.79%	99.09%
	d) Total No. of cells exceeding 3% TCH drop (call drop)		Jun-14	2	279	47	258	2	472	56	268	2	66
e) Total no. of cells (Sector) in the licensed service area		Jun-14	10154	5425	2647	9241	6248	7665	5863	10425	2634	2587	
4	<b>No. of POI's having &gt;=0.5% POI congestion</b>												
	No. of POI's having >=0.5% POI congestion		Jun-14	0	0	0	0	0	0	0	0	0	0
	Name of POI not meeting the benchmark		Jun-14	0	0	0	0	0	0	0	0	0	0
5	<b>Network Data</b>												
	a) Equipped Capacity of Network in Erlang		Jun-14	172667	61107	37627	121859	72000	108501	144668	268833	168000	105821
	b) Total traffic in TCBH in erlang (Avg.)		Jun-14	100830	36994	15844	94929	69276	38896	41589	164067	105423	53661
c) Total no. of customers served (as per VLR) on last day of the month		Jun-14	4106365	1278539	823050	3224464	2969943	1541906	1247649	6590446	2926649	580269	

TABLE: 6

Detailed Network Data Assessment of Cellular Mobile Telephone Services-3 days live- Mumbai Circle- June-14 month													
S/N	Name of Parameter	Bench- mark	Average of 3 Days	AIRTEL	AIRCEL	MTNL	IDEA Cellular	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
				GSM Operators								CDMA Operators	
<b>Network Service Quality Parameter</b>													
1	<b>Network Availability</b>												
	a) Total no. of BTSs in the licensed service area		Live data	2801	1864	996	3206	2302	2778	2059	4263	878	954
	b) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		Live data	4	98	500	179	279	32	7	21	185	6
	c) BTS Accumulated Downtime	<=2%	Live data	0.00%	0.07%	0.70%	0.08%	0.17%	0.02%	0.00%	0.01%	0.29%	0.01%
	d) No. of BTSs having accumulated downtime of >24 hours in a month		Live data	0	0	0	0	0	0	0	0	0	0
e) Worst affected BTSs due to downtime	<=2%	Live data	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2	<b>Connection Establishment (Accessibility)</b>												
	a) CSSR (Call Setup Success Rate)	>=95%	Live data	99.99%	98.53%	98.26%	98.55%	99.59%	99.57%	98.27%	99.64%	97.47%	99.03%
	b) SDCCH/PAGING Congestion	<=1%	Live data	0.00%	0.01%	0.33%	0.45%	0.03%	0.10%	0.02%	0.01%	0.00%	0.00%
c) TCH congestion	<=2%	Live data	0.00%	0.10%	0.05%	0.72%	0.07%	0.15%	0.02%	0.36%	0.06%	0.02%	
3	<b>Connection Maintenance (Retainability)</b>												
	a) Call Drop Rate (CDR)	<=2%	Live data	0.27%	0.87%	1.11%	1.90%	0.43%	0.70%	0.65%	0.86%	0.71%	0.59%
	b) Worst affected cells>3% TCH drop	<=3%	Live data	0.00%	5.14%	1.77%	2.81%	0.00%	6.79%	0.88%	2.40%	0.04%	1.93%
	c) % of connections with good voice quality	>=95%	Live data	99.97%	97.86%	96.00%	95.58%	98.80%	98.59%	98.11%	97.32%	99.76%	98.91%
	d) Total No. of cells exceeding 3% TCH drop (call drop)		Live data	0	280	47	259	0	519	52	250	1	50
e) Total no. of cells (Sector) in the licensed service area		Live data	10157	5445	2656	9230	6183	7638	5911	10413	2563	2588	
4	<b>No. of POI's having &gt;=0.5% POI congestion</b>												
	No. of POI's having >=0.5% POI congestion		Live data	0	0	0	0	0	0	0	0	0	0
	Name of POI not meeting the benchmark		Live data	0	0	0	0	0	0	0	0	0	0



## **CUSTOMER SERVICE QUALITY (CSD) PARAMETERS**



### 5.3 CUSTOMER SERVICE QUALITY PARAMETERS MEASUREMENT FOR CMTS:

#### 5.3.1 CUSTOMER SERVICE DELIVERY (CSD) AUDITED DATA FOR CELLULAR MOBILE SERVICES (QUARTERLY MONTHLY AVERAGE):

**CSD Data for Cellular Mobile Telephone Services-QE June-14 (Average of Three Months)**

Quarterly CSD Audit Data		Bench- mark	Circle Name	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/ N	Name of Parameter			GSM Operators							CDMA Operators		
<b>Metering &amp; Billing Credibility -Post Paid</b>													
1	A) No. of bills issued during the quarter		Mumbai Metro	559415	27417	138215	474034	143579	94659	349829	2044054	444663	103781
	B) No. of bills disputed including billing complaints during the quarter		Mumbai Metro	83	0	34	410	138	0	32	1189	440	1
	C)% of billing complaints during the quarter	<= 0.1%	Mumbai Metro	0.01%	0.00%	0.02%	0.09%	0.10%	0.00%	0.01%	0.06%	0.10%	0.00%
<b>Metering &amp; Billing Credibility -Pre Paid</b>													
2	A) Total No. of Pre-paid customers at the end of the quarter		Mumbai Metro	3592112	2064811	1020446	2928039	2798533	2303900	2524178	5663582	2526898	749529
	B) Total No. of complaints relating to charging, Credit and Validity during the quarter		Mumbai Metro	125	2	69	545	2794	0	98	292	413	0
	C) % of Pre-paid Charging Complaints	<= 0.1%	Mumbai Metro	0.00%	0.00%	0.01%	0.02%	0.10%	0.00%	0.00%	0.01%	0.02%	0.00%
<b>Resolution of Billing/Charging Complaints and Period of applying credit/Waiver/Adjustment to customers account from the date of resolution of complaints</b>													
3	A) No. of Billing/Charging/Credit/Validity Complaints received during the quarter		Mumbai Metro	208	2	34	2835	2932	514	130	1481	853	96
	B) No. of billing complaints for Post paid customers/Charging/Credit /Validity complaints for pre-paid customers resolved within 4 weeks during the quarter		Mumbai Metro	208	2	34	2835	2932	513	130	1481	853	95
	C) % of billing complaints (for post paid customer) / Charging/Credit/Validity (for Pre paid customer) resolved within 4 weeks	100 % within 4 week	Mumbai Metro	100.00%	100.00%	100.00%	100.00%	100.00%	99.81%	100.00%	100.00%	100.00%	99.30%
	D) % of Period of applying credit/Waiver/Adjustment to customers account from the date of resolution of complaints	<=1 week	Mumbai Metro	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%



**CSD Data for Cellular Mobile Telephone Services-QE June-14 (Average of Three Months)**

Quarterly CSD Audit Data		Bench- mark	Circle Name	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA	
S/ N	Name of Parameter			GSM Operators							CDMA Operators			
<b>Response time to customers for assistance</b>														
4	A) Total no of calls attempted to customer care/Call center		Mumbai Metro	351068	2811897	NP	201341	2037153	178325	908932	4886929	486250	63193	
	B) Total no. of calls successfully established to customer care/Call center		Mumbai Metro	336668	2782778	NP	201341	2020969	177110	903351	4886100	483651	62995	
	C) % Accessibility of Call centre /customer Care (Total call successfully established *100/ Total call attempt)	>=95%			95.90%	98.96%	NP	100.00%	99.21%	99.32%	99.39%	99.98%	99.47%	99.69%
	D) Total Calls reached to agent desk for Voice to Voice (Total call attempt)				864199	564875	329111	983865	370267	254487	902164	1569673	97103	46955
	E) Total number of calls answered by the operator (Voice to voice) within 60 seconds				758916	516632	315654	891249	151676	240539	900512	1452660	41816	45362
	F) % age of calls answered by operator (voice to voice) (Total call successfully established within 60 Sec *100/ Total call attempt)	>=90%			87.82%	91.46%	95.91%	90.59%	40.96%	94.52%	99.82%	92.55%	43.06%	96.61%
<b>Termination/closure of service</b>														
5	A) Total No. of requests for Termination / Closure of service received during the quarter		Mumbai Metro	3826	142	4136	3086	906	491	916	7050	1738	166	
	B) No. of requests for Termination / Closure of service complied within 7 days during the quarter		Mumbai Metro	3826	142	4132	3086	906	491	916	7050	1738	166	
	C) % of Termination/ Closure of service within 7 days	<=7days	Mumbai Metro	100.00%	100.00%	99.90%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	
<b>Time taken for refunds of deposits after closures.</b>														
6	A) No. of Payments/ Refunds due during the quarter		Mumbai Metro	1617	35	235	878	483	269	194	1285	726	162	
	B) No. of Payments/ Refunds Cleared during the quarter		Mumbai Metro	1617	34	235	878	483	267	194	1285	726	161	
	C) Time taken for refunds of deposits after closures.	100% within 60 days	Mumbai Metro	100.00%	97.12%	100.00%	100.00%	100.00%	99.38%	100.00%	100.00%	100.00%	99.59%	

• NP-Not Provided: MTNL also has not provided data for the parameter "Accessibility of call center / Customer care" due to IVR system was not functional at the time of audit.

5.3.2 3 DAYS LIVE CSD AUDITED DATA FOR CELLULAR MOBILE SERVICES:

CSD 3 DAYS LIVE DATA FOR CELLULAR MOBILE TELEPHONE SERVICES-AVERAGE OF 3 DAYS													
3 days live CSD Audit Data		Bench- mark	Circle Name	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
S/ N	Name of Parameter			GSM Operators							CDMA Operators		
<b>Response time to customers for assistance</b>													
1	Total no of calls attempted to customer care/Call center		Mumbai Metro	10846	103129	NP	7532	57779	6245	31700	168461	15896	2347
	Total no. of calls successfully established to customer care/Call center		Mumbai Metro	10846	102130	NP	7532	57476	6210	31507	168460	15843	2343
	% Accessibility of Call centre /customer Care (Total call successfully established *100 / Total call attempt)	>=95%	Mumbai Metro	100.00%	99.03%	NP	100.00%	99.48%	99.44%	99.39%	100.00%	99.67%	99.82%
2	Total Calls reached to agent desk for Voice to Voice (Total call attempt)		Mumbai Metro	30596	20096	10397	37448	15793	6528	31222	58656	3122	1518
	Total number of calls answered by the operator (Voice to voice) within 60 seconds		Mumbai Metro	26771	18852	9927	34929	13925	6137	30922	56146	2783	1449
	% age of calls answered by operator(voice to voice) (Total call successfully established within 60 Sec.*100 / Total call attempt)	>=90%	Mumbai Metro	87.50%	93.81%	95.48%	93.27%	88.17%	94.01%	99.04%	95.72%	89.14%	95.50%

NP: \* MTNL also has not provided data for the parameter "Accessibility of call center / Customer care" due to IVR system was not functional at the time of audit.

### 5.3.3 KEY FINDINGS ON CUSTOMER SERVICE DELIVERY (CSD) PARAMETERS

#### 1. Metering and billing credibility-(Post paid & Pre-paid)

The performance of the service providers with respect to the parameter metering and billing credibility for both post-paid and pre-paid is well within the prescribed bench mark of  $\leq 0.1\%$ .

#### 2. Resolution of Billing complaints and applying credits -

- i. Resolution of billing /charging complaints
- ii. Period of applying credit/waiver/adjustment to customer's account from the date of resolution of complaints

All operators have 100 % resolved the billing complaints within stipulated period of 4 weeks except **Tata(GSM)** and **Tata(CDMA)** as they remained marginally below the benchmark with their performance as **99.81%** and **99.30%** respectively.

Apart from this, all service providers also have met the benchmark of 100 % refund in one week, where customers were due for credit / adjustment.

#### 3. Response Time to the Customer for assistance

- i. Accessibility of call centre/customer care
- ii. Percentage of calls answered by Operators (Voice to Voice)

All service providers are in compliance of the parameter accessibility of call center. However, **Airtel, RCOM (GSM) and RCOM (CDMA)** have not met the benchmark of **Calls answered by Operators (voice to voice) within 60 seconds**. They have achieved their performance as **87.82%**, **40.96%** and **43.06%** respectively.

#### 4. Termination/Closure of Service

In case of this parameters also, only one operator namely **MTNL** was not found to have settled 100 % closure/termination within 7 days. Their performance with respect to this parameter was **99.90%**.

#### 5. Time Taken for Refund of deposits after closures

All operators except **Aircel, Tata (GSM) and Tata (CDMA)**, were found to have complied with the benchmark of 100% refund of deposits within 60 days of closure. The performance of these operators was **97.12%**, **99.38%** and **99.59%** respectively.

The results for **three days live measurements** reveal that all operators have met the benchmarks for the parameters 'Accessibility to call center.' However, in case of calls connection to operators (Voice to voice) within 60 seconds, performance of **Airtel, RCOM (GSM) and RCOM (CDMA)** was **87.50%**, **88.17%** and **89.14%** respectively, against the benchmark of  $\geq 90\%$ .

## **6. LIVE CALLING ASSESSMENT**



## 6. LIVE CALLING ASSESSMENT:

### 6.1 INTER OPERATOR CALLS ASSESSMENT:

Inter operator call assessment with a sample of 2x50 test calls for each Service provider operating in Mumbai Metro service area during the time 1100 to 1400 Hrs and 1600 to 1900 was carried out by TUV 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. While doing this exercise, the radio part, the switch part and POI in between the two operators are involved. Congestion in any of these network elements could result in congestion in the network.

INTER OPERATOR CALL ASSESSMENT BASED ON LIVE MEASUREMENT											
CALLING OPERATORS	CIRCLE NAME	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
AIRTEL	Mumbai Metro	--	100%	100%	100%	100%	100%	100%	100%	100%	100%
AIRCEL	Mumbai Metro	100%	--	95%	100%	100%	97%	100%	100%	100%	100%
MTNL	Mumbai Metro	100%	100%	--	100%	100%	100%	100%	100%	100%	100%
IDEA	Mumbai Metro	100%	94%	100%	--	93%	100%	100%	100%	100%	100%
RCOM GSM	Mumbai Metro	100%	100%	95%	100%	--	93%	100%	100%	100%	100%
TATA GSM	Mumbai Metro	100%	92%	100%	100%	96%	--	100%	100%	100%	100%
LOOP MOBILE	Mumbai Metro	100%	100%	100%	100%	100%	100%	--	100%	100%	100%
VODAFONE	Mumbai Metro	100%	100%	100%	100%	100%	100%	100%	--	100%	100%
RCOM CDMA	Mumbai Metro	100%	100%	100%	100%	100%	100%	100%	100%	--	100%
TATA CDMA	Mumbai Metro	100%	100%	100%	100%	100%	100%	100%	100%	100%	--

The result of the testing revealed that the inter connection performance among the operators was quite satisfactory. However, in case where calls attempted from Aircel to MTNL & Tata (GSM) successful interconnection was 95.0% and 97%, Idea to Aircel & RCOM (GSM) was 94% and 93%, RCOM GSM to MTNL & Tata (GSM) was 95% and 93% and Tata (GSM) to Aircel & RCOM (GSM) was 92% & 96%. Thus there was no remarkable problem in interconnection from one operator to other operators.

## 6.2 CUSTOMER CARE / HELPLINE ASSESSMENT:

LIVE CALLING TO CALL CENTRE											
Parameter	Circle Name	AIRTEL	AIRCEL	MTNL	IDEA	RCOM GSM	TATA GSM	LOOP MOBILE	VODAFONE	RCOM CDMA	TATA CDMA
Total No. of calls Attempted	Mumbai Metro	100	100	100	100	100	100	100	100	100	100
Total No. of calls connected to IVR	Mumbai Metro	100	100	NA	100	100	100	100	100	100	100
Calls got connected to agent within 60 Sec	Mumbai Metro	92	100	95	100	91	100	100	100	93	100
%age of calls got answered	Mumbai Metro	92.00%	100.00%	95.00%	100.00%	91.00%	100.00%	100.00%	100.00%	93.00%	100.00%

In case of calls answered by operators (voice to voice) within 60 seconds when test calls were made to the call centers, Airtel, MTNL, RCOM (GSM) and RCOM (CDMA) could connect 92%, 95%, 91% and 93% respectively of calls to the operator within 60 Seconds.

## 6.3 LIVE CALLING ASSESSMENT FOR BILLING COMPLAINTS:

TELEPHONIC INTERVIEW FOR BILLING COMPLAINTS											
Parameter	Circle Name	AIRCEL	AIRTEL	MTNL	IDEA	RCOM (GSM)	TATA (GSM)	LOOP	VODAFONE	RCOM (CDMA)	TATA (CDMA)
Total No. of calls Attempted	Mumbai	6	100	100	100	100	100	100	100	100	100
Total No. of calls Answered	Mumbai	6	80	78	87	85	88	90	90	86	79
Resolution of Billing Complaints	Mumbai	6	80	78	87	85	88	90	90	86	79
%age of cases resolved	Mumbai	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

To test the Service Providers performance on billing related complaints and their resolutions, TUV-SUD auditors conducted a customer feedback calling for about random 100 nos. of customers. However, in some cases, the number of customers contacted for verification was less due to fewer number of billing complaints. During live calling, some of the customers did not attend the calls while few others reported that their complaints have been resolved but not sure of duration of their resolution. However, most of the customers expressed their satisfaction on resolution of the billing complaints.



**6.4 LEVEL -1 CALLING ASSESSMENT:**

Emergency no.	SSA Name	SDCA Name	No. of calls made	AIRCEL	AIRTEL	MTNL	IDEA	RCOM (GSM)	TATA (GSM)	LOOP	VODAFONE	RCOM (CDMA)	TATA (CDMA)
100, 101, 102, 103, 1098	Thane	Thane	17	17	17	17	17	17	17	17	17	17	17
100, 101, 102, 103, 1098			17	17	17	17	17	17	17	17	17	17	17
100, 101, 102, 103, 1098			17	17	17	17	17	17	17	17	17	17	17
100, 101, 102, 103, 1098	Central Mumbai	Central Mumbai	17	17	17	17	17	17	17	17	17	17	17
100, 101, 102, 103, 1098			17	17	17	17	17	17	17	17	17	17	17
100, 101, 102, 103, 1098			17	17	17	17	17	17	17	17	17	17	17
100, 101, 102, 103, 1098	New Mumbai	New Mumbai	16	16	16	16	16	16	16	16	16	16	16
100, 101, 102, 103, 1098			16	16	16	16	16	16	16	16	16	16	16
100, 101, 102, 103, 1098			16	16	16	16	16	16	16	16	16	16	16

To assess the availability and efficiency of level 1 services such as police, fire, ambulance, women help line and child help line (emergency services) offered by various mobile service providers, the calls were made during the drive test (April14 - June14) in different SDCA. In Mumbai Metro service area, these services were found functional in the networks of all the service providers.

## 7. DRIVE TEST



## **7. OPERATOR ASSISTED DRIVE TEST**

In terms of TRAI's letter dated 21<sup>st</sup> January, 2014, the drive tests were conducted for three consecutive days in one select SSA each month in each service area. Thus, the drive tests were carried out in three SSA's namely **Thane, Central Mumbai and New Mumbai** in the months of April, May and June 2014 respectively. The total route Kms covered during drive tests in respective SSAs was **205 Kms, 319 Kms and 320 Kms**. The performance of the operators has been highlighted below in the tables. The drive test was conducted simultaneously for all the operators following the same route of drive tests. The holding period for all test calls was 120 seconds. The drive test vehicle across all routes plied at a speed of about 30-50 km per hour

For measuring voice quality, Rx Qual samples on a scale from 0 to 7 for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. As per the QoS norms, Rx Qual between 0- 5 for GSM operators and between 0-4 % FER value for CDMA operators is considered to be good, where as Rx Qual beyond this benchmark is considered to be 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 at street level with strength  $\geq -75$  dBm for in-door coverage and  $\geq -85$  dBm for in-vehicle.

7.1 OPERATOR ASSISTED DRIVE TEST: THANE AREA (APRIL-14)

DRIVE TEST TABLE – 1

S/N	Parameter	Days of drive test	AIRCEL	AIRTEL	MTNL	TATA GSM	IDEA	RCOM GSM	LOOP MOBILE	VODAFONE	TATA CDMA	RCOM CDMA	
			OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR
1	Call Attempts	Day-1	103	102	106	100	101	118	116	99	116	110	
		Day-2	107	103	106	96	124	112	114	99	115	112	
		Day-3	110	92	91	99	106	110	104	102	121	113	
		Overall SSA	320	297	303	295	331	340	334	300	352	335	
2	Blocked Call Rate	Day-1	1.94%	0.00%	0.94%	1.00%	0.00%	0.00%	2.58%	0.00%	0.00%	0.00%	
		Day-2	1.87%	0.00%	1.89%	1.04%	0.81%	1.79%	2.63%	0.00%	0.00%	0.00%	
		Day-3	0.91%	0.00%	2.20%	3.03%	1.89%	0.00%	0.10%	0.00%	0.00%	0.88%	
		Overall SSA	1.56%	0.00%	1.65%	1.69%	0.91%	0.59%	2.10%	0.00%	0.00%	0.30%	
3	Dropped Call Rate (<=2%)	Day-1	0.00%	0.00%	3.81%	0.00%	0.99%	0.00%	0.88%	0.00%	0.00%	0.00%	
		Day-2	1.87%	0.00%	0.96%	0.00%	0.81%	0.00%	0.00%	0.00%	1.74%	0.89%	
		Day-3	0.00%	0.00%	3.37%	1.04%	0.97%	1.81%	0.00%	0.00%	1.65%	5.36%	
		Overall SSA	0.63%	0.00%	2.68%	0.34%	0.92%	0.59%	0.31%	0.00%	1.14%	2.10%	
4	Percentage connections with good voice quality (=>95%)												
	(a) 0-4 (w/o frequency hopping for CDMA Operators)	Day-1	NA	NA	NA	NA	NA	NA	NA	NA	NA	97.54%	91.36%
		Day-2	NA	NA	NA	NA	NA	NA	NA	NA	NA	97.00%	89.73%
		Day-3	NA	NA	NA	NA	NA	NA	NA	NA	NA	96.47%	85.48%
		Overall SSA	NA	NA	NA	NA	NA	NA	NA	NA	NA	97.00%	88.72%
	(b) 0-5 ( with frequency hopping for GSM Operators)	Day-1	95.36%	95.32%	94.93%	96.23%	85.90%	94.74%	94.65%	95.03%	NA	NA	
		Day-2	95.12%	95.31%	94.70%	95.18%	87.00%	93.69%	94.50%	95.02%	NA	NA	
		Day-3	95.77%	95.11%	93.45%	95.14%	86.10%	94.12%	95.72%	95.11%	NA	NA	
Overall SSA		95.46%	95.25%	94.41%	95.53%	86.40%	94.29%	94.94%	95.06%	NA	NA		

## AUDIT & ASSESSMENT OF QOS FOR QE-JUNE-2014-MUMBAI METRO CIRCLE



S/N	Parameter	Days of drive test	AIRCEL	AIRTEL	MTNL	TATA GSM	IDEA	RCOM GSM	LOOP MOBILE	VODAFONE	TATA CDMA	RCOM CDMA
			OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR	OUTDOOR
<b>Service Coverage</b>												
5	In door (>= -75dBm)	Day-1	88.29%	85.72%	48.44%	95.54%	98.47%	59.07%	81.07%	73.74%	100%	88.86%
		Day-2	84.90%	86.93%	37.53%	95.71%	97.17%	62.85%	79.59%	77.89%	99.00%	92.32%
		Day-3	93.42%	90.29%	30.31%	96.06%	98.41%	58.08%	82.90%	72.88%	98.00%	87.37%
		Overall SSA	88.93%	87.60%	39.19%	95.77%	98.00%	60.02%	81.19%	86.02%	99.00%	89.58%
	In-vehicle (>= -85dBm)	Day-1	97.92%	97.00%	88.66%	99.74%	99.99%	88.03%	98.09%	95.91%	100%	99.86%
		Day-2	97.82%	97.33%	81.99%	99.47%	99.87%	91.09%	97.16%	98.15%	100%	100%
		Day-3	98.89%	98.45%	75.88%	99.28%	99.94%	87.12%	98.22%	96.84%	100%	99.81%
		Overall SSA	98.22%	97.58%	82.50%	99.50%	99.93%	88.76%	97.82%	99.15%	100%	99.89%
	Outdoor- in city (>= -95dBm)	Day-1	99.84%	100%	97.16%	100%	100%	97.78%	99.83%	100%	100%	100%
		Day-2	99.78%	100%	96.90%	100%	100%	99.21%	99.87%	100%	100%	100%
		Day-3	99.67%	100%	93.21%	100%	100%	97.51%	99.84%	100%	100%	100%
		Overall SSA	99.76%	100%	95.89%	100%	100%	98.17%	99.85%	100%	100%	100%
6	Call Setup Success Rate (>=95%)	Day-1	98.06%	100%	99.06%	99.00%	100%	100%	97.41%	100%	100%	100%
		Day-2	98.13%	100%	98.11%	98.96%	99.19%	98.21%	97.37%	100%	100%	100%
		Day-3	99.09%	100%	97.80%	96.97%	97.17%	100%	99.04%	100%	100%	99.12%
		Overall SSA	98.44%	100%	98.35%	98.31%	98.80%	99.40%	97.90%	100%	100%	99.70%
7	Hand Over Success Rate (HOSR)	Day-1	97.18%	99.29%	98.49%	99.42%	97.66%	100%	99.02%	98.94%	100%	100%
		Day-2	94.51%	99.68%	98.21%	99.09%	99.32%	99.67%	99.64%	99.17%	100%	100%
		Day-3	98.67%	99.62%	100%	98.84%	98.38%	98.83%	100%	99.02%	100%	100%
		Overall SSA	96.71%	99.54%	98.86%	99.12%	98.44%	99.50%	99.19%	98.99%	100%	100%

\*NA: Not Applicable

N.B - All the data as mentioned in the above table has been taken for outdoor drive test as Indoor drive test was not allowed by the respective authorities.

7.2 OPERATOR ASSISTED DRIVE TEST: CENTRAL MUMBAI (MAY-14)

DRIVE TEST TABLE – 2

S/N	Parameter	Classification of Route covered	AIRCEL		AIRTEL		MTNL		TATA GSM		IDEA		RCOM GSM		LOOP MOBILE		VODAFONE		TATA CDMA		RCOM CDMA		
			OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR
1	Call Attempts	Major Roads	168	23	149	23	152	27	149	23	144	23	153	23	142	23	129	24	132	23	149	23	
		Highways	92	25	90	25	85	29	77	25	78	25	94	25	80	25	89	24	74	25	86	25	
		Within City	302	26	298	25	272	25	259	25	273	25	313	25	256	25	275	24	236	25	307	25	
		Overall SSA	562	74	537	73	509	81	485	73	495	73	560	73	478	73	493	72	442	73	542	73	
2	Blocked Call Rate	Major Roads	1.19%	0.00%	0.00%	0.00%	1.32%	0.00%	2.68%	0.00%	1.39%	0.00%	0.65%	0.00%	3.52%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.67%	0.00%
		Highways	1.09%	0.00%	0.00%	0.00%	1.18%	0.00%	2.60%	0.00%	0.00%	0.00%	0.00%	0.00%	2.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Within City	1.66%	0.00%	0.00%	0.00%	0.74%	0.00%	3.09%	0.00%	2.20%	0.00%	2.24%	0.00%	1.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.33%	0.00%
		Overall SSA	1.42%	0.00%	0.00%	0.00%	0.98%	0.00%	2.89%	0.00%	1.62%	0.00%	1.43%	0.00%	2.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.37%	0.00%
3	Dropped Call Rate (<=2%)	Major Roads	1.81%	0.00%	0.00%	0.00%	2.05%	3.70%	0.00%	0.00%	1.41%	0.00%	0.66%	0.00%	1.46%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.38%	0.00%
		Highways	1.09%	0.00%	0.00%	0.00%	1.19%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.28%	0.00%	0.00%	0.00%	1.35%	0.00%	3.49%	0.00%	
		Within City	1.32%	0.00%	0.00%	0.00%	1.50%	0.00%	0.00%	0.00%	1.13%	0.00%	0.98%	0.00%	1.98%	0.00%	0.00%	0.00%	0.00%	0.00%	1.31%	0.00%	
		Overall SSA	1.43%	0.00%	0.00%	0.00%	1.61%	1.23%	0.00%	0.00%	1.03%	0.00%	0.72%	0.00%	1.71%	0.00%	0.00%	0.00%	0.23%	0.00%	2.22%	0.00%	
4	Percentage connections with good voice quality (=>95%)																						
	(a) 0-4 (w/o frequency	Major Roads	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96.85%	98.01%	96.29%	99.52%
		Highways	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	97.05%	97.98%	93.12%	99.78%

**AUDIT & ASSESSMENT OF QOS FOR QE-JUNE-2014-MUMBAI METRO CIRCLE**

S/N	Parameter	Classification of Route covered	AIRCEL		AIRTEL		MTNL		TATA GSM		IDEA		RCOM GSM		LOOP MOBILE		VODAFONE		TATA CDMA		RCOM CDMA	
			OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR
	hopping for CDMA Operators)	Within City	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96.94%	98.81%	96.65%	99.52%
		Overall SSA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96.93%	98.26%	96.01%
(b) 0-5 ( with frequency hopping for GSM Operators)		Major Roads	94.81%	98.51%	95.67%	98.44%	94.77%	99.06%	96.43%	98.32%	88.56%	97.60%	93.08%	95.95%	95.85%	99.50%	94.40%	96.30%	NA	NA	NA	NA
		Highways	96.34%	94.66%	95.53%	97.94%	94.99%	97.66%	96.80%	99.95%	89.85%	95.80%	93.10%	99.85%	95.67%	95.30%	94.93%	97.26%	NA	NA	NA	NA
		Within City	95.91%	94.49%	95.72%	96.09%	95.42%	96.66%	96.42%	98.37%	88.48%	98.40%	93.48%	99.25%	95.03%	100%	95.23%	97.59%	NA	NA	NA	NA
		Overall SSA	95.70%	95.81%	95.67%	97.42%	95.16%	97.79%	96.63%	98.89%	88.72%	97.20%	93.31%	99.25%	95.43%	98.21%	94.96%	97.05%	NA	NA	NA	NA
<b>Service Coverage</b>																						
	In door (>= - 75dBm)	Major Roads	91.24%	99.81%	95.40%	100%	30.06%	72.00%	95.79%	99.61%	93.14%	87.68%	70.47%	44.05%	84.87%	82.70%	82.01%	59.54%	100%	100%	77.27%	57.39%
		Highways	95.72%	100%	97.42%	100%	40.30%	60.00%	96.10%	100%	98.43%	94.94%	81.96%	99.59%	94.29%	99.80%	91.18%	97.67%	99.77%	100%	87.86%	100%
		Within City	89.57%	100%	88.16%	99.95%	29.59%	56.25%	95.92%	99.32%	98.50%	95.61%	59.29%	98.42%	73.53%	100%	80.13%	84.59%	98.56%	100%	66.09%	96.95%
		Overall SSA	92.18%	99.95%	90.73%	99.98%	31.49%	62.75%	95.94%	99.64%	96.94%	92.74%	65.89%	80.69%	81.82%	94.17%	82.61%	80.60%	99.44%	100%	72.58%	84.78%
5	In-vehicle (>= - 85dBm)	Major Roads	98.26%	100%	98.07%	100%	67.75%	94.77%	98.81%	100%	99.56%	99.97%	93.79%	98.93%	97.99%	99.70%	80.09%	99.79%	100%	100%	96.75%	100%
		Highways	99.48%	100%	99.72%	100%	72.48%	84.17%	99.23%	100%	99.96%	99.79%	98.31%	100%	99.05%	100%	90.44%	100%	100%	100%	96.05%	100%
		Within City	98.63%	100%	98.02%	100%	66.39%	81.17%	99.10%	100%	99.94%	99.91%	88.76%	100%	95.81%	100%	78.04%	99.73%	100%	100%	89.29%	100%
		Overall SSA	98.79%	100%	98.39%	100%	67.79%	86.70%	99.04%	100%	99.84%	99.89%	91.63%	99.64%	97.26%	99.90%	80.81%	99.84%	100%	100%	92.40%	100%
	Outdoor-in city (>= - 95dBm)	Major Roads	99.74%	100%	100%	100%	88.37%	98.17%	100%	100%	100%	100%	99.71%	100%	99.91%	100%	100%	100%	100%	100%	99.88%	100%
		Highways	99.80%	100%	100%	100%	90.00%	90.19%	100%	100%	100%	100%	99.99%	100%	99.82%	100%	100%	100%	100%	100%	100%	100%
		Within City	99.77%	100%	100%	100%	88.49%	93.71%	100%	100%	100%	100%	98.57%	100%	99.80%	100%	100%	100%	100%	100%	98.16%	100%
		Overall SSA	99.77%	100%	100%	100%	88.70%	94.02%	100%	100%	100%	100%	99.10%	100%	99.84%	100%	100%	100%	100%	100%	98.92%	100%

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S/N	Parameter	Classification of Route covered	AIRCEL		AIRTEL		MTNL		TATA GSM		IDEA		RCOM GSM		LOOP MOBILE		VODAFONE		TATA CDMA		RCOM CDMA		
			OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	
6	Call Setup Success Rate (>=95%)	Major Roads	98.81%	100%	100%	100%	96.05%	100%	97.40%	100%	98.61%	100%	99.35%	100%	96.48%	100%	100%	100%	100%	100%	100%	99.33%	100%
		Highways	98.91%	100%	100%	100%	98.82%	100%	96.91%	100%	100%	100%	100%	100%	97.50%	100%	100%	100%	100%	100%	100%	100%	100%
		Within City	98.34%	100%	100%	100%	98.16%	100%	99.25%	100%	97.44%	100%	97.76%	100%	98.44%	100%	100%	100%	100%	100%	100%	99.67%	100%
		Overall SSA	98.58%	100%	100%	100%	97.64%	100%	97.66%	100%	98.18%	100%	98.57%	100%	97.70%	100%	100%	100%	100%	100%	100%	99.63%	100%
7	Hand Over Success Rate (HOSR)	Major Roads	99.22%	100%	99.04%	100%	97.25%	100%	98.97%	97.30%	98.17%	100%	98.64%	100%	98.69%	100%	99.60%	100%	100%	100%	100%	NP	NP
		Highways	96.88%	100%	98.99%	100%	100%	100%	98.15%	100%	97.73%	100%	98.52%	100%	98.77%	98.08%	100%	100%	100%	100%	100%	NP	NP
		Within City	97.55%	100%	99.15%	100%	98.69%	100%	98.10%	100%	96.60%	100%	98.23%	100%	98.35%	100%	99.73%	100%	100%	100%	100%	NP	NP
		Overall SSA	97.93%	100%	99.08%	100%	98.54%	100%	98.30%	98.15%	97.27%	100%	98.39%	100%	98.53%	99.36%	99.75%	100%	100%	100%	100%	NP	NP

\*NA: Not Applicable



7.3 OPERATOR ASSISTED DRIVE TEST: NEW MUMBAI (JUNE-14)

DRIVE TEST TABLE – 3

SN	Parameter	Classification of routes covered	AIRCEL		AIRTEL		MTNL		TATA GSM		IDEA		RCOM GSM		LOOP MOBILE		VODAFONE		TATA CDMA		RCOM CDMA	
			OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR
1	Call Attempts	Major Roads	98	30	89	30	89	31	99	31	92	30	86	30	78	30	93	29	77	30	89	30
		Highways	151	30	145	30	133	30	113	30	148	30	155	30	131	30	143	30	148	30	151	30
		Within City	184	30	151	30	163	30	185	30	193	30	188	30	159	30	183	30	201	30	178	30
		Overall SSA	433	90	385	90	385	91	397	91	433	90	429	90	368	90	419	89	426	90	418	90
2	Blocked Call Rate	Major Roads	0.00%	0.00%	0.00%	0.00%	3.37%	0.00%	7.07%	0.00%	0.00%	0.00%	1.16%	0.00%	2.94%	0.00%	1.08%	0.00%	0.00%	0.00%	0.00%	0.00%
		Highways	1.99%	0.00%	0.00%	0.00%	1.50%	0.00%	1.77%	0.00%	0.00%	0.00%	4.52%	0.00%	3.05%	0.00%	0.00%	0.00%	6.76%	0.00%	1.99%	0.00%
		Within City	1.09%	0.00%	0.00%	0.00%	3.07%	0.00%	0.54%	0.00%	1.04%	0.00%	0.53%	0.00%	0.63%	0.00%	0.00%	0.00%	1.99%	0.00%	1.69%	0.00%
		Overall SSA	1.15%	0.00%	0.00%	0.00%	2.60%	0.00%	2.52%	0.00%	0.46%	0.00%	2.10%	0.00%	1.96%	0.00%	0.24%	0.00%	3.29%	0.00%	1.44%	0.00%
3	Dropped Call Rate (<=2%)	Major Roads	2.04%	0.00%	0.00%	0.00%	4.65%	0.00%	0.00%	0.00%	1.09%	0.00%	2.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.25%	0.00%
		Highways	0.66%	0.00%	0.00%	0.00%	9.16%	0.00%	0.00%	0.00%	1.35%	0.00%	2.03%	0.00%	0.79%	0.00%	0.00%	0.00%	8.11%	0.00%	4.64%	0.00%
		Within City	1.09%	0.00%	0.00%	0.00%	4.43%	0.00%	0.00%	0.00%	0.00%	0.00%	1.07%	0.00%	0.63%	0.00%	0.00%	0.00%	1.49%	0.00%	1.69%	0.00%
		Overall SSA	1.15%	0.00%	0.00%	0.00%	6.13%	0.00%	0.00%	0.00%	0.70%	0.00%	1.66%	0.00%	0.55%	0.00%	0.00%	0.00%	3.52%	0.00%	2.87%	0.00%
4	Percentage connections with good voice quality (=>95%)																					
	(a) 0-4 (w/o frequency)	Major Roads	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96.33%	97.52%	97.01%	99.89%
	Highways	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95.40%	98.93%	93.55%	99.59%

## AUDIT & ASSESSMENT OF QOS FOR QE-JUNE-2014-MUMBAI METRO CIRCLE

S/N	Parameter	Classification of routes covered	AIRCEL		AIRTEL		MTNL		TATA GSM		IDEA		RCOM GSM		LOOP MOBILE		VODAFONE		TATA CDMA		RCOM CDMA	
			OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR
	hopping for CDMA Operators)	Within City	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96.02%	97.87%	95.50%	100%
		Overall SSA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95.88%	98.11%	95.14%
(b) 0-5 (with frequency hopping for GSM Operators)	Major Roads	95.45%	<b>93.37%</b>	95.63%	99.42%	<b>89.63%</b>	<b>88.89%</b>	96.09%	96.60%	<b>85.78%</b>	95.45%	<b>93.32%</b>	98.81%	95.92%	99.50%	<b>94.86%</b>	96.69%	NA	NA	NA	NA	
	Highways	96.05%	97.43%	96.11%	99.41%	<b>90.48%</b>	95.36%	96.37%	99.99%	<b>87.67%</b>	<b>93.45%</b>	<b>91.99%</b>	99.49%	95.48%	98.86%	95.46%	<b>93.14%</b>	NA	NA	NA	NA	
	Within City	95.66%	<b>86.12%</b>	95.87%	97.91%	<b>91.14%</b>	95.98%	96.21%	97.60%	<b>89.62%</b>	97.81%	<b>93.72%</b>	98.12%	95.34%	98.60%	95.26%	<b>94.64%</b>	NA	NA	NA	NA	
	Overall SSA	95.76%	<b>92.26%</b>	95.90%	98.90%	<b>90.56%</b>	<b>93.06%</b>	96.23%	98.05%	<b>88.14%</b>	95.78%	<b>93.04%</b>	98.76%	95.56%	99.00%	95.24%	<b>94.83%</b>	NA	NA	NA	NA	
<b>Service Coverage</b>																						
5	In door (>= -75dBm)	Major Roads	90.83%	97.76%	72.26%	100%	31.83%	65.74%	95.45%	96.39%	99.57%	99.96%	60.78%	63.19%	77.96%	58.31%	70.20%	38.18%	99.63%	100%	93.20%	100%
		Highways	76.01%	100%	57.40%	94.00%	16.57%	46.79%	95.32%	100%	95.18%	99.85%	39.84%	52.20%	60.89%	69.20%	46.50%	91.04%	84.45%	100%	69.02%	98.05%
		Within City	83.62%	89.76%	68.01%	57.00%	26.32%	32.05%	95.93%	100%	99.18%	100%	47.42%	88.49%	62.39%	50.00%	65.49%	67.51%	97.37%	100%	89.47%	100%
		Overall SSA	81.74%	95.78%	66.13%	91.73%	24.38%	49.30%	95.62%	98.79%	97.90%	99.94%	47.55%	68.11%	66.33%	59.16%	60.08%	65.50%	93.85%	100%	83.04%	99.50%
5	In-vehicle (>= -85dBm)	Major Roads	98.23%	99.98%	90.95%	100%	85.91%	94.62%	98.79%	99.98%	99.91%	100%	88.72%	99.51%	97.01%	97.01%	99.44%	97.91%	100%	100%	99.94%	100%
		Highways	93.28%	100%	83.11%	96.00%	66.12%	99.34%	98.69%	100%	99.79%	100%	72.27%	98.61%	94.53%	99.90%	83.44%	99.95%	98.39%	100%	87.65%	100%
		Within City	96.46%	100%	92.15%	89.00%	79.78%	98.56%	100%	100%	99.95%	100%	77.88%	95.02%	95.83%	99.90%	92.99%	99.58%	99.37%	100%	99.67%	100%
		Overall SSA	95.80%	99.99%	89.02%	97.26%	76.69%	97.18%	99.20%	99.99%	99.89%	100%	78.17%	98.03%	95.70%	98.94%	90.06%	99.14%	99.30%	100%	95.46%	100%
5	Outdoor-in city (>= -95dBm)	Major Roads	99.64%	99.99%	100%	100%	96.80%	98.46%	100%	100%	100%	100%	98.58%	100%	99.84%	99.91%	99.82%	99.99%	100%	100%	100%	100%
		Highways	98.94%	100%	100%	100%	91.18%	99.41%	100%	100%	100%	100%	52.40%	100%	99.88%	100%	99.22%	100%	100%	100%	100%	100%
		Within City	99.49%	100%	100%	100%	94.81%	99.42%	100%	100%	100%	100%	95.48%	99.66%	99.82%	100%	99.75%	100%	100%	100%	100%	100%
		Overall SSA	99.31%	100%	100%	100%	94.07%	99.03%	100%	100%	100%	100%	95.05%	99.90%	99.85%	99.97%	99.59%	100%	100%	100%	100%	100%

**AUDIT & ASSESSMENT OF QOS FOR QE-JUNE-2014-MUMBAI METRO CIRCLE**

S/N	Parameter	Classification of routes covered	AIRCEL		AIRTEL		MTNL		TATA GSM		IDEA		RCOM GSM		LOOP MOBILE		VODAFONE		TATA CDMA		RCOM CDMA	
			OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR	OUTDOOR	INDOOR
6	Call Setup Success Rate (>=95%)	Major Roads	100%	100%	100%	100%	96.63%	100%	92.93%	100%	100%	100%	98.84%	100%	98.59%	100%	99.46%	99.99%	100%	100%	100%	100%
		Highways	98.01%	100%	100%	100%	98.50%	100%	98.23%	100%	100%	100%	95.48%	100%	96.18%	100%	99.41%	100%	93.24%	100%	98.01%	100%
		Within City	98.91%	100%	100%	100%	96.93%	100%	99.46%	100%	98.45%	100%	99.47%	100%	98.81%	100%	99.71%	100%	98.01%	100%	98.31%	100%
		Overall SSA	98.95%	100%	100%	100%	97.40%	100%	97.48%	100%	99.31%	100%	97.90%	100%	97.76%	100%	99.66%	100%	96.71%	100%	98.56%	100%
7	Hand Over Success Rate (HOSR)	Major Roads	99.63%	100%	98.88%	100%	97.91%	78.87%	98.09%	98.41%	97.14%	100%	99.63%	100%	96.92%	81.82%	99.19%	100%	100%	100%	100%	100%
		Highways	96.74%	100%	99.21%	100%	94.88%	100%	98.54%	100%	98.82%	100%	94.39%	100%	97.96%	100%	98.24%	100%	100%	100%	100%	100%
		Within City	99.77%	100%	98.44%	100%	92.20%	100%	98.31%	100%	98.28%	100%	99.77%	100%	98.31%	100%	99.44%	99.44%	100%	100%	100%	100%
		Overall SSA	98.82%	100%	98.79%	100%	94.44%	82.95%	98.32%	99.06%	98.15%	100%	98.57%	100%	97.53%	96.15%	99.03%	99.65%	100%	100%	100%	100%

\*NA: Not Applicable

7.4 DETAIL OF THE ROUTES COVERED DURING THE DRIVE TESTS:

DRIVE TEST TABLE: 4

DRIVE TEST ROUTE OF APRIL TO JUNE - 14 – MUMBAI METRO CIRCLE

Name of SSA	Drive test Period	Day 1		Day 2		Day 3	
		Name of SDCA Covered	Route Covered	Name of SDCA Covered	Route Covered	Name of SDCA Covered	Route Covered
THANE	April-14	Thane / 69 KM	ANAND NAGAR,CHECK NAKA,SERVICE ROAD KOPARI,THANE-EAST,MULUND COLONY , MULUND WEST,NEAR TALAOPALI,JAMBHALI NAKA MARKET,THANE WEST,OPPOSITE BAFNA MOTORS, GHODBUNDER ROAD, THANE (W).	Thane / 71 KM	R MALL, L. B. S. ROAD, MULUND W,NEAR SAAZ CINEMA, BHANDUP (W),KOKNESHWAR COMPLEX GORAINAGAR KALWA(W),DONGRI PADA, GHODANDER ROAD, THANE WEST	Thane / 65 KM	LAZARUS SCHOOL,NEAR THANE MUNICIPAL SCHOOL ,THANE(W),BHAKTI MANDIR ROAD , PANCH PAKHADI,JUST BUILDING INDIRA NAGAR RUPA DEVI PADA WAGLE ESTATE,KAUSA, OLD MUMBAI PUNE ROAD, KAUSA, MUMBRA ,THANE(W)
CENTRAL MUMBAI	May-14	Central Mumbai/101 KM	AMBEDKAR ROAD(MATUNGA TO GHATKOPER),ANTOP HILL SANGAM NAGAR,LBS MARG GHATKOPAR,MANKHURD-GOVANDI LINK ROAD  <b>INDOOR:</b> WELLINKAR COLLEGE	Mumbai Central/114 KM	JOGESHWARI-VIKROLI LINK ROAD,BANDRA-GOREGAON WESTERN EXPRESS HIGHWAY,ANDHERI-KURLA LINK ROAD, JUHUTARA ROAD  <b>INDOOR:</b> HUB MALL	Mumbai Central/104 KM	BKC,SV ROAD-CARTER ROAD BANDRA,SV ROAD GOREGAON TO BANDRA,LINK ROAD GOREGAON  <b>INDOOR:</b> MEGA MALL OSHIWARA
NEW MUMBAI	June-14	Navi Mumbai / 106 KM	VASHI-NERUL-KOPARKHERANE - TURBHE-GHANSOLI-AIROLI-RABALE-VASHI  <b>INDOOR:</b> RAGHULILLA MALL	Navi Mumbai/ 110KM	VASHI-NERUL-URAN-PANVEL-KAMOTHE-KHARAGHAR - BELAPUR-TURBHE-VASHI  <b>INDOOR:</b> DREAM MALL / Little world mall, Khargar	Navi Mumbai / 104 KM	VSHI -NERUL -URAN -PANVEL-KHARGHAR-BELAPUR-TURBHE-MAHAPE-VASHI  <b>INDOOR:</b> K MALL/Channel residency,Panvel

**7.5 SSA WISE DRIVE TEST OBSERVATION:**

**DRIVE TEST TABLE: 5**

**DRIVE TEST OBSERVATION OF THANE SSA (APRIL-14)**

S NO	Name of SP	Day 1 Observation	Day 2 Observation	Day 3 Observation
1	AIRTEL	Observed poor voice quality patch at station road Thane (Stated due to water body multiple signal reflection); jambhli naka road , kishan nagar	Manjhiwada and Thana east station Road observed poor voice quality (Stated due to water body multiple signal reflection)	Poor Voice quality observed Jabhali naka road & station road (Due to water body Reflection)
2	AIRCEL	--	Observed Poor Voice quality issue near kamal park due to hilly terrain	Observed Poor Voice quality issue near indira nagar Thane -Mumbra Road
3	MTNL	Observed Poor Voice quality issue near Mulund , Adarsh Nagar, Ashwani Chembar Site	Observed Poor Voice quality issue near LBS Marg & Eastern Express Highway	Poor Rx Level Found in Shivila , Nasheman, Hajivaris ; Poor Voice quality found at LBS Marg & Eastern Express Highway
4	IDEA CELLULAR	Observed Poor voice Quality At LBS Marg, Thane West (Idea Stated that this happened Due to Site was down)	Observed Poor voice Quality At Subhash Nagar Road (Idea Stated that this happened Due to Site was down)	Observed Poor voice Quality At LBS Marg, Thane West (Idea Stated that this happened Due to Site Hardware faulty)
5	LOOP MOBILE	Poor Rx level observed at Brahmand Road , Pokharan Road, Laxmi Park, jatashankar - dosa road, sarjini naidu road ; observed poor voice quality at pokharan road and sarjini naidu road	Poor Rx level observed at Hiranandani estate, chendani bunder road, subhash road; Poor Rx quality at Dr. Rajendra Prasad Road	Poor Rx Level Found in Nateshwar Mahadev Mandir Road; Poor Rx quality at Eastern Exprees Highway, kopri Road, RetiBandar Mumbra
6	VODAFONE	Rx Level at Neel Kant Green, Patlipada, Upvan Lake Road ; Poor Rx quality at pokharan road , shakti mill,GMLR fly Over	Poor Rx Quality At GB Road, Mumbra Nasik Highway, Gajanan koli marg, Akruti Mall	Poor Rx Quality at barabangla road(Siddharth nagar), dhokli balkun road , kaamgar Hospital, Power Nagar
7	TATA GSM	--	Poor Quality near Parsik Pond road (TATA GSM does Not provide Plots As per TRAI Guideline)	Poor Quality near Parsik Pond road (TATA GSM does Not provide Plots As per TRAI Guideline)
8	TATA CDMA	--	--	Poor Quality near Mumbra flyover & Parsik Pond road (TATA CDMA does Not provide Plots As per TRAI Guideline)
9	RCOM GSM	Poor Rx level And Quality observed at Dhavle House Happy Valley, Misalwadi - Upvan lake, keshv Pada	Poor Rx level And Quality observed at Ram Nagar Subhash Road	Poor Rx level And Quality observed at D- Mart Thane, Wagle Indutrial Estate , Moreshwar Parsik Nagar
10	RCOM CDMA	--	--	Poor Voice Quality at Waghle Industrial Estate( Rajasthan Minerals & jayant Industries) kalwa Mumbra Road, Retibandar Area

DRIVE TEST TABLE: 6

DRIVE TEST OBSERVATION OF CENTRAL MUMBAI SSA (MAY-14)

S.No	Name of SP	Day 1 Observation	Day 2 Observation	Day 3 Observation
1	AIRTEL	--	ABHISEKCHS_ODF,EXCLUSIVE_IDU near JVLR & W Express road	--
2	AIRCEL	Observed poor voice quality at Eastern Express highway, Salt pan Road, Wadala E.	Observed poor voice quality at Bandra E,D.N. Nagar Andheri W	Observed poor voice quality at Vile Parle , Juhu W
3	MTNL	Observed poor voice quality at Jeejabai Bhosle Road ,Sewri Chembur Road	Observed poor voice quality at Jvlr road , Andheri ghatkopar road	Observed poor voice quality at SV Road
4	IDEA CELLULAR	Observed poor voice quality at Deonar Mankhurd,Ghatkopar	Observed poor voice quality at Kurla CST Road,Poonam Nagar Near JVLR.	Observed poor voice quality at Bharat Nagar,Hill Road, Near SV Road
5	LOOP MOBILE	Observed poor voice quality at Chembur & Wadala	Observed poor voice quality at Bandra to Aarey Flyover,Wellingkar road,BKC	Observed poor voice quality at Jogeswari,Bandra,Khar,BKC
6	VODAFONE	Observed poor voice quality at Sangamnagar,Wadala,Chunnabhati,Parvel Highway	Observed poor voice quality at Juhu JVPD Road,Andheri Kurla road-Opp Courtyard Marriott ,Lokandwala back road facing towards marshy land, highway Near Andheri Parsipanchayt road, WEHighway Near Nesco compound Goregoan	Observed poor voice quality at Bandstand ,Bandra
7	TATA GSM	Observed poor voice quality at Amber CHS_Chunabhatti,	Observed poor voice quality at SIDHESHWAR _Bandra(E)	Observed poor voice quality at Nasir Hussain House_Bandra(E)
8	TATA CDMA	--	--	--
9	RCOM GSM	Mankhurd Bus Stop,MLR Subway,BKC Flyway,Vijaydurg	Chintanamani plaza, Kuber villa , Green field,JVLR Flyover-2	--
10	RCOM CDMA	Observed poor voice quality at Chembur gopal road,Bandra West,Wadala	Observed poor voice quality at Andheri market road,court road	Observed poor voice quality at Jogeshwari East

DRIVE TEST TABLE: 7

DRIVE TEST OBSERVATION OF NAVI MUMBAI SSA (JUNE-14)

S. NO	Name of SP	Day 1 Observation	Day 2 Observation	Day 3 Observation
1	AIRTEL	Observed poor voice quality patches at Gurudwara sec 15 airoli, mahape vilalge	Observed poor Rx-Level at Hotel shritin park ,Mayr tendal Homes due to flyover interference /Observed poor voice quality at Baban Mahtre MIDC Road, Nirmla devi marg	Observed poor voice quality at Gangasagar MIDC ROAD,prathamdarshan Road Vijay marg
2	AIRCEL	Observed poor Rx quality at Thana-Panvel expressway & near Ghansoli, Koparkhairane, near inorbit mall	Observed poor Rx quality at Nerul station, Kharghar highway	--
3	MTNL	Observed poor voice quality near SOMESHWAR,AIROLI, sitamani society, palmbeach road	Observed poor Voice quality at Palm Beach road, Nilkanth Plaza,Nerul highway,new panvel flyover,panvel uran road,and dongari	Observed poor voice quality at palm Beach road,uran highway, kharghar station
4	IDEA CELLULAR	observed poor Rx Quality at some part of Thane Belapur Highway,Palm Beach road	Observed poor Voice quality at Palm Beach road	Observed poor Voice Quality at Seawoods Station
5	LOOP MOBILE	observed poor Rx Level & Rx Quality atVashi Sector 9A,vashi Sector 10	Obseved Poor Rx Quality at kharghar Sector 35,uran road	Observed Poor Rx Quality at ChinchPada_Uran Road.
6	VODAFONE	Observed poor Voice Quality at Palm Beach road, near inorbit mall vashi, near anand nicketan society, alok industries ghansoli, koparkhairane	Observed poor voice Quality at Gujarat Ambuja cements Uran, Kharghar Tata memorial,	Observed poor voice Quality at Gujarat Ambuja cements Uran, palm beach road
7	TATA GSM	observed poor Rx Level at Palm Beach road	Observed poor Rx Level at Jasaigaon ,Uran.Poor voice quality kharghar Sector 21	Observed Poor Voice quality at Thana Naka,Panvel
8	TATA CDMA	observed poor voice quality in some part of Airoli	Observed Poor Rx Level at Uran	Observed Poor Rx Level at Uran Road
9	RCOM GSM	Observed poor Rx Quality at nerul sector 10 &13, Koparkhairane sector 19 & 23, Shree gajanan Krrupa sadan Nerul,Avalon Int Schl Vashi	Observed poor Rx Quality at Palm beach road,uran,Rajanpada,gaikwad House nerul	Observed poor Rx Level at Taloja, Uran, mumbai -pune old express way
10	RCOM CDMA	Observed poor voice quality at Sai krupa Nerul,	Observed poor Rx quality at Panvel-Uran Highway, Belapur-Uran Highway. Manjari Paradise Sanpada,Hansraj complex vashi highway,	Observed poor Rx quality at Panvel-Uran Highway, Belapur-Uran Highway, Padmavati Chsl old panvel,ujwal new panvel

## 7.6 KEY FINDINGS ON DRIVE TEST:

The key observations that could be derived from the results of the drive tests are as under –

- (i) **In the Month of April-14**, drive tests were conducted across **Thane** SSA. The analysis of the drive test results conducted during the three days in Thane SSA revealed that **MTNL, Idea, RCOM (GSM), RCOM (CDMA) and Loop Mobile** with respect to parameter **Voice Quality** remained under performed with their performance as **94.41%, 86.40%, 94.29%, 94.94% and 88.72%** respectively. Further, **MTNL and RCOM (CDMA)** were failed to meet the benchmark of **Call drop rate** with their performance as **2.68%, 2.10%** respectively.
- (ii) **In the Month of May-14**, drive tests were conducted across **Central Mumbai** SSA for three consecutive days. The performance of **Idea, RCOM (GSM) and Vodafone** on over all SSA basis was not in compliance for parameter '**Voice Quality**' with their achieved level as **88.72%, 93.31% and 94.96%** respectively. Further, performance of **RCOM (CDMA)** for parameter **CDR** was **2.22%**.
- (iii) **In the month of June-14**, drive tests were conducted across **Navi Mumbai** SSA. The analysis of the drive test results at SSA level revealed that **Aircel, MTNL, Idea, RCOM (GSM) and Vodafone** remained underperformed for the parameter **Good Voice Quality** with their performance as **92.26% (Indoor), 90.50%(Outdoor) / 93.06%(Indoor), 88.14%, 93.04%, and 94.83%** respectively. Apart from this **MTNL, Tata (CDMA) and RCOM (CDMA)** also failed to meet the benchmark of **Call Drop rate** having achieved their level as **6.13%, 3.52% and 2.87%** respectively on over all SSA basis.

*Thus, MTNL, Idea, RCOM (GSM), RCOM (CDMA) and Loop Mobile repeated their non-complied performance for the parameters Call drop rate and Voice quality across the three SSAs where the drive tests were conducted during the quarter. These operators need improvement in their networks to remove the deficiencies with respect to non-complied parameters.*

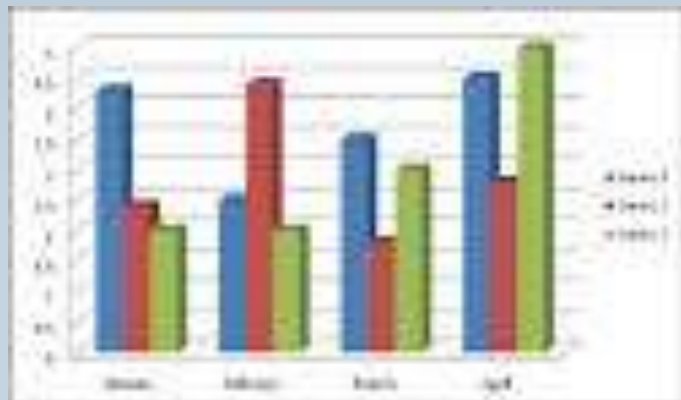


## 8. GRAPHICAL REPRESENTATION (CELLULAR MOBILE SERVICE PROVIDERS)

### AVERAGED QUARTERLY PMR

V/S

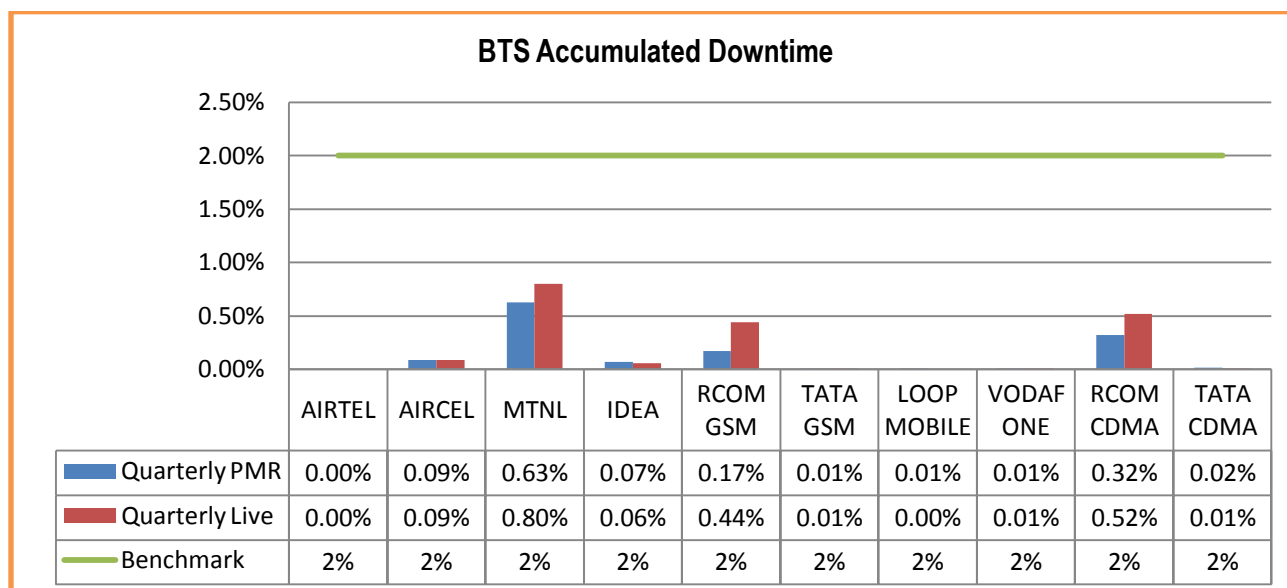
### AVERAGED QUARTERLY 3-DAYs LIVE MEASURMENT



## 8. GRAPHICAL REPRESENTATION:

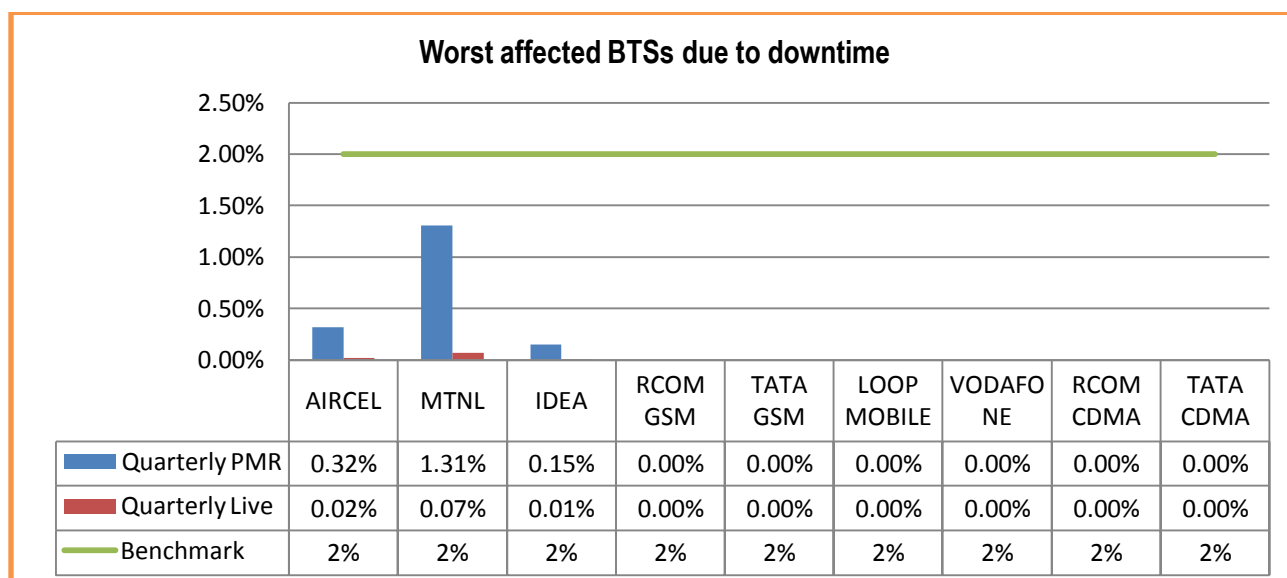
Graphical Representation of Performance of the Cellular Mobile Service Providers (PMR) V/S 3-Days Live Measurement (Quarterly Average Data):

### 1) BTS ACCUMULATED DOWNTIME:



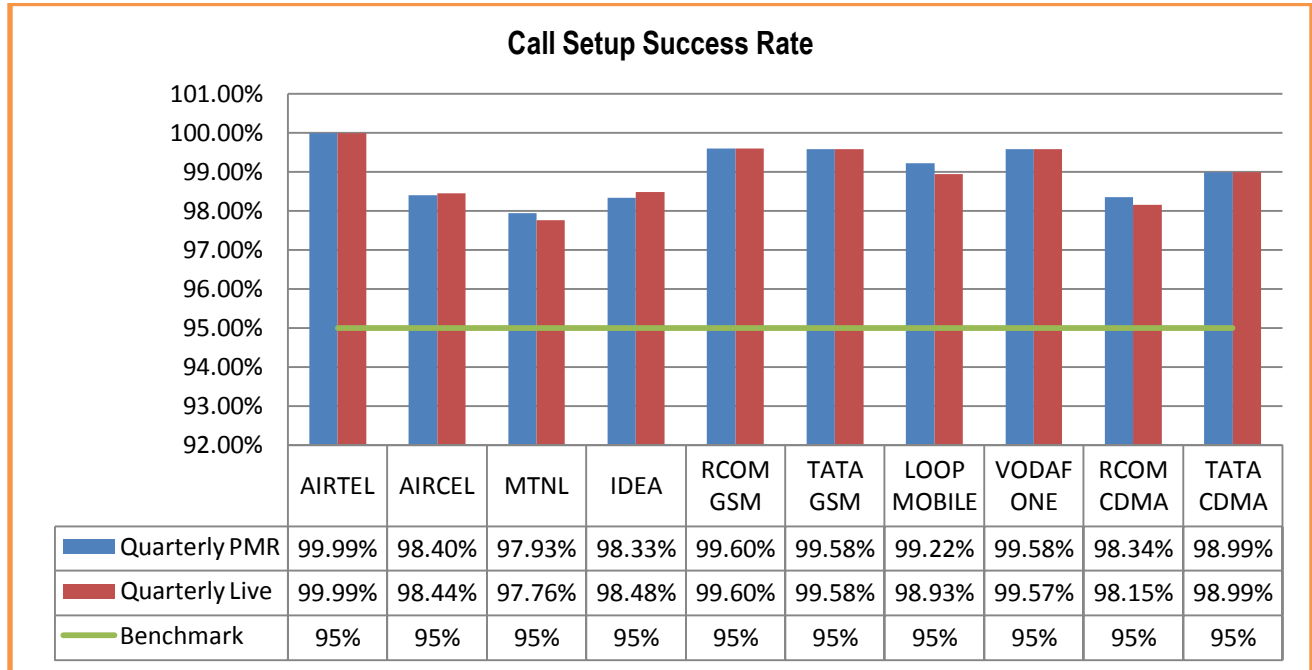
All operators are meeting the benchmarks.

### 2) WORST AFFECTED BTSs DUE TO DOWNTIME:



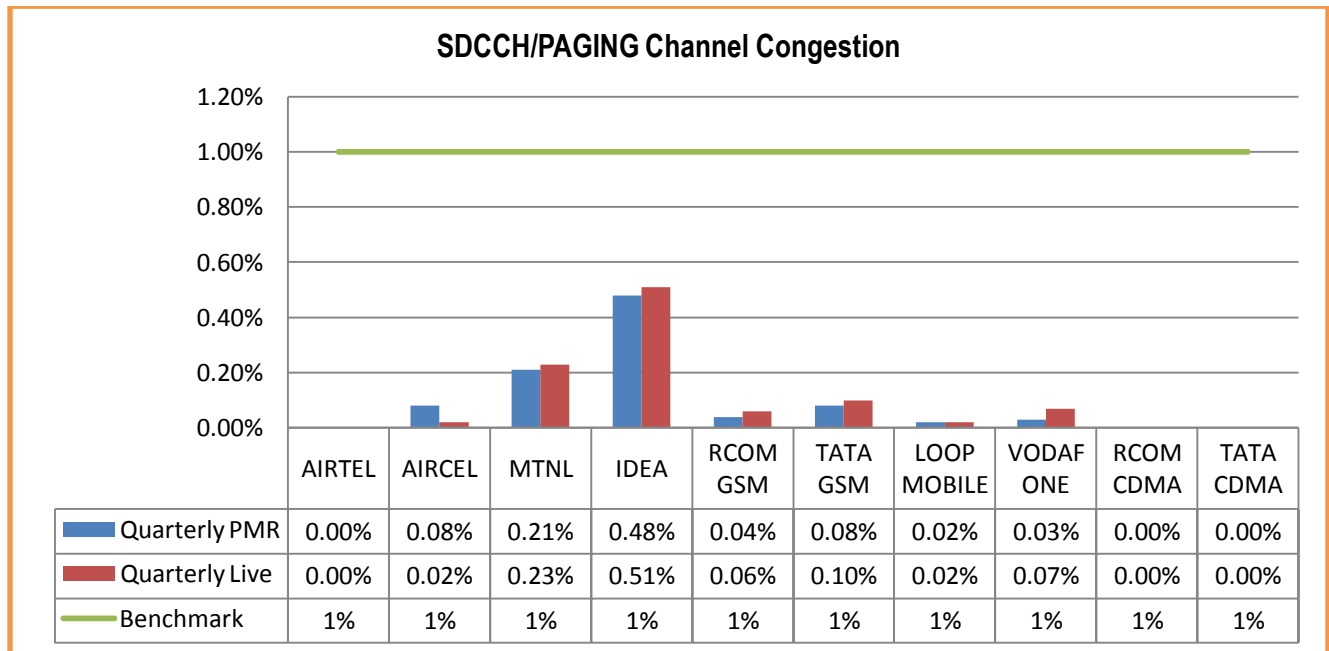
All operators are meeting the benchmarks.

3) CALL SETUP SUCCESS RATE:



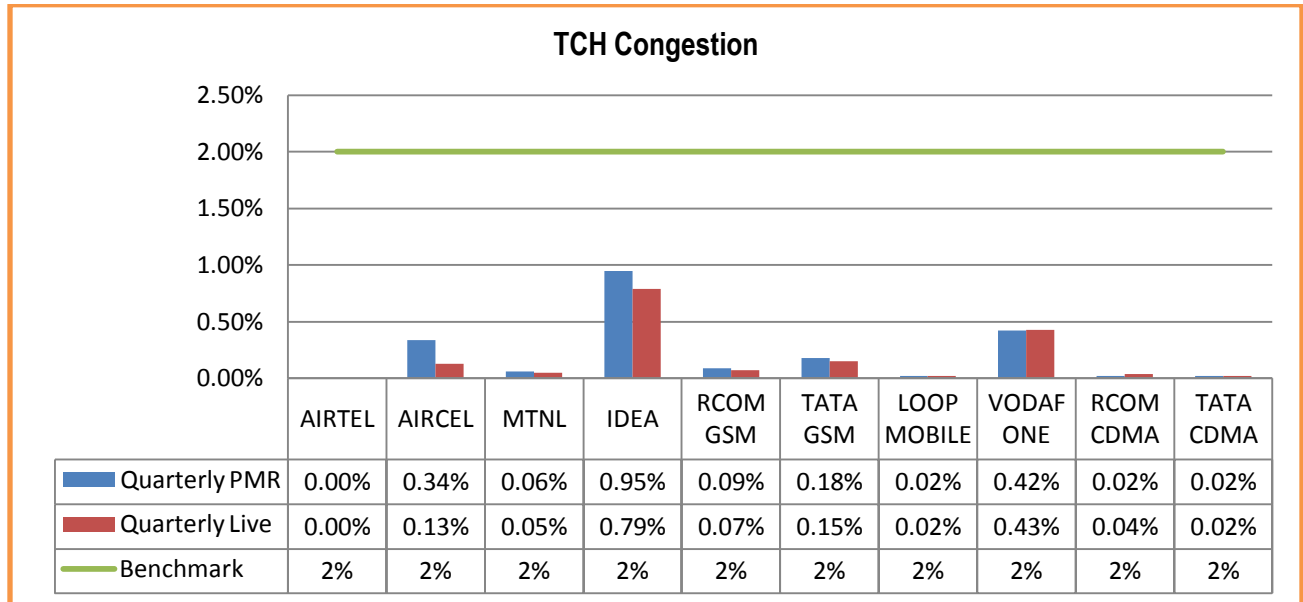
All operators are meeting the benchmarks.

4) SDCCH/PAGING CHANNEL CONGESTION:



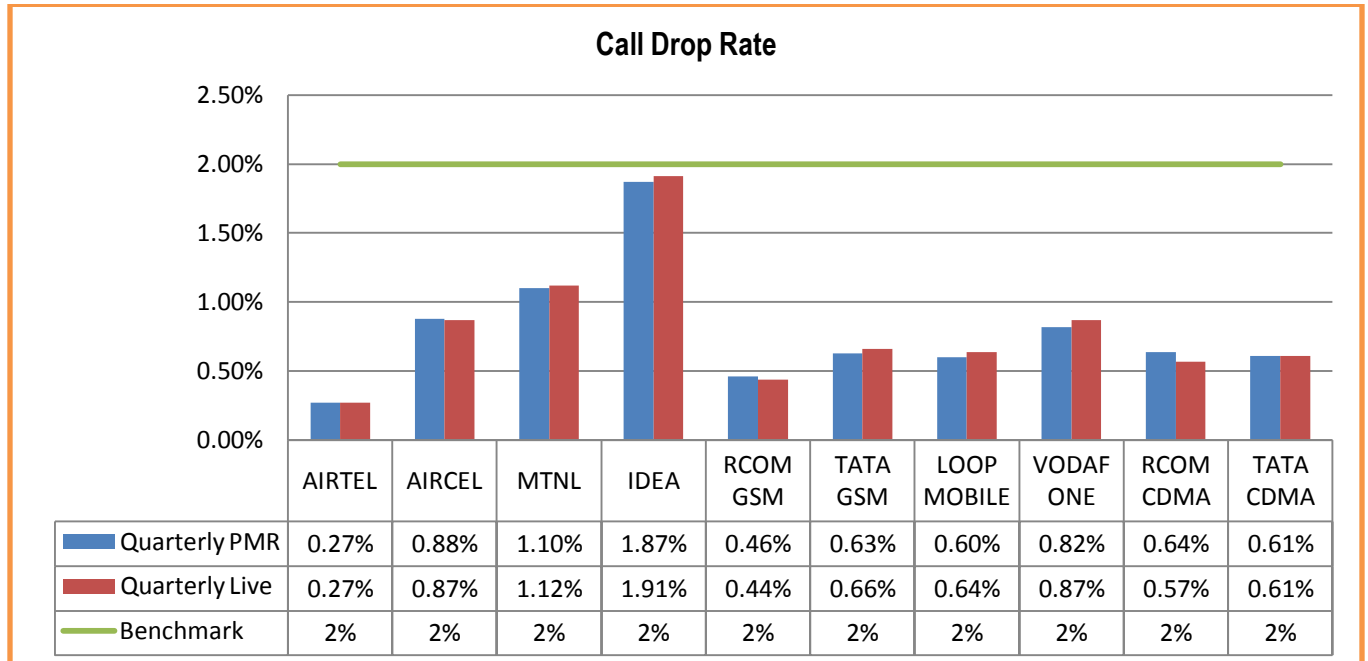
All operators are meeting the benchmarks.

5) TCH CONGESTION:



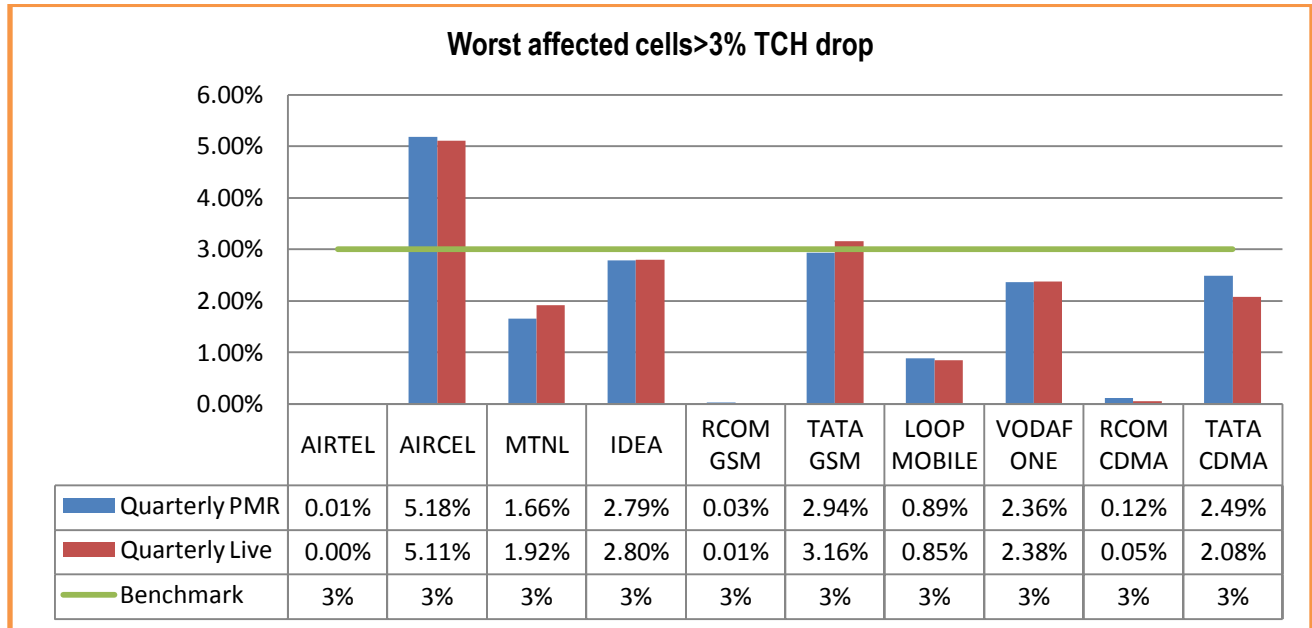
All operators are meeting the benchmarks.

6) CALL DROP RATE:



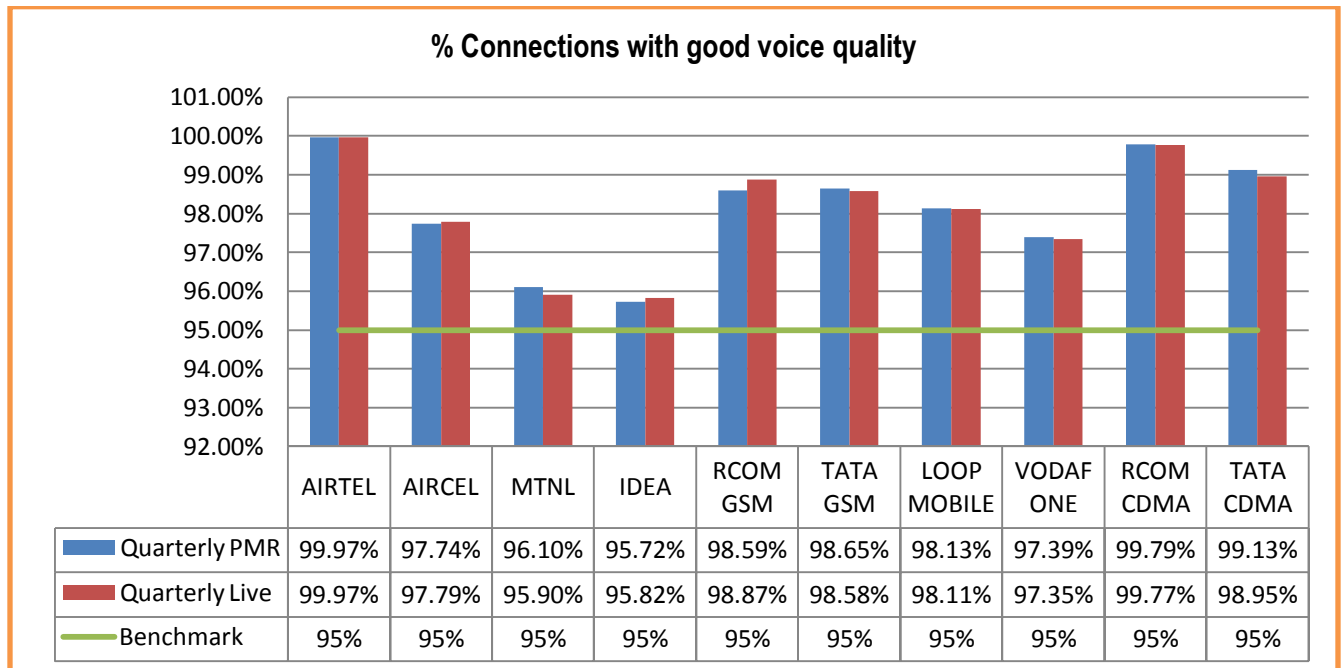
All operators are meeting the benchmarks.

7) WORST AFFECTED CELLS>3% TCH DROP :



All operators are meeting the benchmarks except Aircel. Tata GSM also failed to meet the benchmark during 3 days live measurement.

8) PERCENTAGE OF CONNECTIONS WITH GOOD VOICE QUALITY:



All operators are meeting the benchmarks.