REPORT

ON

AUDIT & ASSESSMENT OF QUALITY OF SERVICE

OF

CELLULAR MOBILE TELEPHONE SERVICES

FOR

KARNATAKA CIRCLE
(SOUTH ZONE)

Report Period: Jan 2012 – Mar 2012

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CHAPTER-1: INTRODUCTION

I.   Background

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

In pursuance of above objective TRAI has issued from time to time a large number of regulations, orders and directives to deal with issues coming before it and provided the required direction to the evolution of Indian telecom market from a Government owned monopoly to a multi-operator multi service open competitive market.

The directions, orders and regulations issued cover a wide range of subjects including tariff, interconnection and quality of service as well as governance of the Authority.

The purpose of lying 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 has been carrying out regular reviews of the status of quality of service of the networks of all operators. In continuation to these efforts, TRAI has selected through bidding process TCIL as the Audit Agency to audit and assess the Quality of Service rendered by the service providers' namely Basic (Wireline) Services, Cellular Mobile Telephone (Wireless) Services and Broadband Services. The Audit for various telecom circles within the Zones has been distributed across four quarterly periods.

The parameters that need to be measured for Basic and Cellular Mobile Services have been specified in the TRAI notification on Quality of Service of Basic (Wireline) and Cellular Mobile (wireless) Services, 2009. The parameters for Broadband Services have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006.

II.   Objectives and Methodology

The primary objective is to audit and assess the Quality of Service being rendered by Basic, Cellular Mobile & Broadband services against the parameters notified by TRAI. The audit and assessment of Quality of Service is conducted for all the basic service providers, unified access service providers, cellular mobile service providers and ISPs (Internet Service Provider) for basic wireline, Cellular Mobile Telephone Services and broadband service. TCIL has undertaken the following audit works as per the Terms of Reference (TOR):

i)   Verification of the data submitted by the service providers to TRAI as part of QoS monitoring reports i.e. Quarterly Performance Monitoring Reports (PMRs) and monthly Point of Interconnection (POI) Congestion Reports with reference to the records maintained by the service provider.

ii)   Verification of the performance of service providers against the Quality of Service benchmarks laid down by TRAI using live measurement for 3 days during the month in which the audit and assessment is carried out.

iii)   Verification of the performance of service providers against the Quality of Service benchmarks laid down by TRAI using the data for the entire month during which the live measurement is carried out.

iv)   Drive tests of the mobile networks both operators assisted and independent drive test (as and where required).

v)   Billing and call center's data verification.

vi)   Live testing of the efficiency of the call center / customer care help line.

vii)   Level 1 (Emergency nos.) calling

To fulfill the above mentioned Scope of Work audit was performed on different Systems, Facilities and Field data collection.

Systems audited:-
1. Network Switching Centre (NSS)
2. Base Station Subsystem(BSS)
3. Billing Applications
4. Customer Care applications

Facilities audited:-
1. Billing documents.
2. Customer Care records.

Field data collections carried out:-
1. RF network coverage including KPIs (Key Performance Index)
2. Inter Operator Call Assessment
3. Checking of Customer Billing/Refund Complaints (Random sample)
4. Customer Care efficiency
5. The live calling was made to assess the quality of services for Inter Operator Call Assessment, Customer Billing/Refund Complaints and Customer Care efficiency.

In order to carry out the above scope of work:-

✓ TCIL auditors visited all the NSS (Network Sub System) and BSS (Base-station Sub System) to check data for all the operators in their respective service area.

✓ All the NSS and BSS data for the relevant details were collected either directly from the centralized NOC or through a remote access to the NOC.

✓ The Radio parameters were audited/verified from the data collected from OMC-R (Operation and Maintenance Center – Radio, as part of BSS data).

✓ The Drive test was conducted in high, low and medium dense areas including highways, commercial complex and residential areas and special attention was paid for the areas for which TRAI has received complaints.

✓ The POI and other network related parameters were audited/verified from the data collected from the OMC-S (Operation and Maintenance Center – Switch as part of NSS data).

✓ The data related to Billing and Customer care was checked for the previous month and verified with the customers by calling them on random basis. The process of registration and handling of the complaints was also studied for the various operators. Call centre number were called for measuring the efficiency of the call centre.

✓ The inter operator call assessment test was carried out during the time period as is specified in the tender document. TCBH (Time Consistent Busy Hour) is taken after observation of the traffic consistently for 3 days prior to the audit activity.

✓ Data has been collected for busy hour of network in case of live assessment & month of audit for all service providers & verified that service providers are providing busy hour data only for QoS service. We found that TCBH hour is matching with network busy hour as provided by service providers for Karnataka circle. But for parameters such as 'Worst affected cell exceeding 3% TCH drop' and 'BTSs accumulated down time' CBBH (Cell Bouncing Busy Hour) was taken instead of TCBH (Time Consistent Busy Hours) as per the TRAI new regulation 2009.

CHAPTER-2: EXECUTIVE SUMMARY

I. Preface

This report highlights the findings for the audit & assessment of Quality of Service of Cellular Mobile Services in Karnataka Circle in 1st quarter (Jan – Mar 2012). The primary data collection and verification of records (PMR data verification – quarterly) maintained by various operators was undertaken during the period July – Sept 2011.

Following are the various operators covered in Karnataka circle (South Zone) for Cellular Mobile (Wireless) services QoS audit & assessment. The Month of audit & TCBH information is also given below:

Sl.	Name of Service Provider	Month of Audit	TCBH Hour
GSM Operators			
1	Aircel Ltd	Feb-2012	1900-2000 Hrs
2	Airtel Ltd	Feb-2012	1900-2000 Hrs
3	BSNL	Feb-2012	1900-2000 Hrs
4	Idea	Feb-2012	2000-2100 Hrs
5	Reliance Communication (GSM)	Feb-2012	2100-2200 Hrs
6	Tata Communications (GSM)	Feb-2012	1900-2000 Hrs
7	Uninor	Feb-2012	1900-2000 Hrs
8	Videocon	Feb-2012	1900-2000 Hrs
9	Vodafone	Feb-2012	1900-2000 Hrs
CDMA Operators			
10	MTS (CDMA)	Feb-2012	1900-2000 Hrs
11	Reliance Communication (CDMA)	Feb-2012	2100-2200 Hrs
12	Tata Communications (CDMA)	Feb-2012	1900-2000 Hrs

Note: Etisalat has stopped their operations in Karnataka circle. Hence their reports are not considered.

II. Findings from Quality of Service Audit (Operator wise for each parameter)
(A) Cellular Mobile Telephone Services

S/N	3 days Live Data Audit — Name of Parameter	Bench-mark	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
			GSM Operators									CDMA		
1	**Network Availability**													
	a) BTS accumulated downtime	<= 2%	0.06%	0.21%	1.25%	0.03%	0.18%	0.05%	0.07%	0.00%	0.01%	0.12%	0.03%	0.26%
	b) Worst affected BTSs due to downtime	<= 2%	0.00%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.09%
2	**Connection Establishment (Accessibility)**													
	a) CSSR (Call Setup Success Rate)	>=95%	99.57%	99.33%	99.10%	98.28%	99.74%	97.99%	99.17%	100.00%	98.62%	99.25%	99.25%	98.40%
	b) SDCCH/PAGING congestion	<=1%	0.02%	0.19%	0.26%	0.55%	0.01%	0.17%	0.07%	0.03%	0.81%	0.00%	0.00%	0.00%
	c) TCH congestion	<=2%	0.01%	0.29%	0.77%	1.45%	0.02%	0.51%	0.05%	0.00%	0.41%	0.11%	0.01%	1.06%
3	**Connection maintenance (retainability)**													
	a) CDR	<=2%	0.65%	0.42%	1.13%	1.12%	0.44%	0.71%	1.16%	0.00%	0.55%	0.47%	0.16%	0.78%
	b) Worst affected cells>3% TCH drop	<=3%	3.00%	2.20%	2.48%	1.12%	0.02%	5.59%	1.46%	0.00%	1.86%	0.82%	0.00%	3.04%
	c) Good voice quality	>=95%	98.67%	99.20%	NR	97.18%	99.20%	98.35%	98.42%	98.10%	98.89%	98.43%	NR	NR
4	**POI congestion**	<=0.5%	0	0	0	2	0	0	1	0	0	0	0	0
5	**Response time to customers for assistance**													
	a) Accessibility of call centre/Customer Care	>=95%	99.00%	100.00%	100.00%	99.00%	99.00%	100.00%	98.00%	100.00%	100.00%	98.00%	100.00%	100.00%
	b) % call answered by operators(voice to voice) within 60 sec.	>=90%	94.00%	94.00%	93.00%	99.00%	86.00%	95.24%	98.00%	100.00%	99.00%	93.00%	98.00%	96.00%

NA: Not Applicable, NR: Not Received

Observations:

From the 3 days live data assessment, it is found that the operators are meeting most of the network parameters, except the following:
a) For the parameter "Worst affected cells>3% TCH drop", Aircel, TATA GSM, MTS are found not meeting the benchmark
b) For the parameter "% of call answered by operator (Voice to voice)", Rcom GSM is found not meeting the benchmark.
c) In case of POI parameter Idea, Uninor is found to have individual POIs with congestions as shown in the table.
d) For the parameter "Good Voice Quality", the BSNL, Tata CDMA, MTS are confirmed that the parameter is not system generated.

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One Month data Assessment:

S/N	Name of Parameter	Bench-mark	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
	One Month Data Audit								GSM Operators				CDMA	
(A)	**Network Service Quality Parameter**													
1	**Network Availability**													
	a) BTS Accumulated Downtime	<=2%	0.05%	0.24%	1.28%	0.03%	0.36%	0.08%	0.04%	0.20%	0.02%	0.32%	0.03%	0.19%
	b) Worst affected BTSs due to downtime	<=2%	0.10%	0.74%	2.73%	0.08%	0.76%	0.15%	0.00%	0.00%	0.03%	0.21%	0.00%	0.35%
2	**Connection Establishment (Accessibility)**													
	a) CSSR (Call Setup Success Rate)	>=95%	99.54%	99.49%	99.08%	98.26%	99.74%	98.03%	99.08%	99.61%	98.91%	99.21%	99.34%	98.80%
	b) SDCCH/PAGING congestion	<=1%	0.02%	0.08%	0.25%	0.43%	0.02%	0.11%	0.07%	0.51%	0.27%	0.00%	0.00%	0.00%
	c) TCH congestion	<=2%	0.02%	0.20%	0.76%	1.11%	0.02%	0.55%	0.05%	0.00%	0.65%	0.13%	0.01%	0.68%
3	**Connection maintenance (retainability)**													
	a) CDR	<=2%	0.67%	0.40%	1.17%	1.12%	0.45%	0.70%	1.16%	0.00%	0.64%	0.50%	0.14%	0.72%
	b) Worst affected cells>3% TCH drop	<=3%	1.49%	2.00%	2.74%	1.12%	0.01%	2.72%	1.52%	0.00%	1.78%	0.66%	0.00%	0.80%
	c) Good voice quality	>=95%	98.67%	99.15%	NR	97.20%	99.21%	98.41%	98.45%	99.62%	98.81%	98.41%	NR	NR
4	**POI congestion**	<=0.5%	0	0	0	1	0	0	5	0	0	0	0	0
(B)	**Customer Service Quality Parameters**													
5	**Metering/billing credibility-Post paid**	<=0.1%	0.04%	0.02%	0.04%	0.19%	0.10%	1.20%	NA	NA	0.08%	0.09%	0.37%	0.02%
6	**Metering /billing credibility-Pre paid**	<=0.1%	0.03%	0.00%	0.02%	0.01%	0.08%	0.00%	0.00%	0.00%	0.06%	0.02%	0.00%	0.00%
7	**Resolution of billing/ charging complaints**	100% within 4 weeks	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	a) Period of applying credit/waiver/ adjustment to the customers account from the date of resolutions of complaints	<=1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	NA	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week
8	**Response time to customers for assistance**													
	a) Accessibility of call centre/Customer Care	>=95%	100.00%	100.00%	100.00%	98.00%	99.00%	100.00%	97.00%	100.00%	100.00%	98.00%	100.00%	99.13%

	b) % call answered by operators(voice to voice) within 60 sec.	>=90 %	97.00%	91.00%	93.00%	97.00%	79.00%	99.64%	96.00%	100.00%	99.00%	87.00%	98.00%	96.00%
9	**Termination/closure of service**	<=7days	100.00%	100.00%	100.00%	97.50%	100.00%	100.00%	NA	NA	100.00%	100.00%	100.00%	100.00%
10	**Time taken for refunds of deposits after closures.**	*100% within 60 days*	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%	100.00%	NA

NA: Not Applicable, NR: Not Received

Observations:

From the month data assessment, it is found that the operators are meeting most of the network parameters with some exceptional cases as given below:

For the parameter "Worst affected BTSs due to downtime" it is found that BSNL is not meeting the benchmark with a value of 2.73% respectively.

In case of POI parameter, there is no congestion found overall on the POI, but cases were found where Idea, Uninor individual POIs are showing high utilization/usage. Some are in the range of over 100% though causing no traffic failure due to overflow technique i.e. the extra traffic is carried over by some other operating POI as has been designed to do so.

Performance related to customer care data is not found to be satisfactory for the parameter "calls answered by operators (voice-to-voice)" for Rcom GSM, Rcom CDMA are below benchmark performance is observed in case of Rcom GSM (79%), Rcom CDMA (87%) respectively.

The "Metering/billing credibility -postpaid" benchmark is not meeting by Idea, Tata GSM, Tata CDMA with a values of 0.19%, 1.2%, 0.37% respectively.

In case of parameter "termination/closure of service", Idea is having below benchmark performance.

Operator-Assisted Drive Test

SN	Parameter	City Name	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Vodafone	Rcom CDMA	Tata CDMA	MTS
			GSM Operators								CDMA Operators		
1.1	Blocked Call Rate (<=3%)	Mandya	0.00%	0.00%	1.19%	0.00%	1.00%	1.11%	0.00%	0.00%	0.00%	0.79%	1.96%
		Mysore	0.62%	1.95%	3.36%	1.00%	1.00%	1.04%	1.82%	1.72%	0.00%	0.00%	1.60%
		Bijapur	0.00%	0.27%	3.28%	4.00%	2.00%	4.66%	1.09%	2.76%	0.00%	0.00%	0.00%
1.2	Dropped Call Rate (<=2%)	Mandya	0.00%	0.00%	0.00%	1.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
		Mysore	0.00%	0.00%	2.01%	0.00%	0.00%	0.00%	0.61%	0.86%	0.00%	0.00%	0.00%
		Bijapur	0.55%	0.28%	1.60%	4.96%	0.50%	1.55%	0.54%	2.07%	0.85%	0.00%	0.00%
1.3	Percentage of connections with good voice quality (=>95%)												
	(i) 0-4 (w/o frequency hopping)	Mandya									99.86%	99.95%	99.67%
		Mysore									99.00%	98.83%	98.87%
		Bijapur									97.57%	98.67%	99.18%
	(ii) 0-5 (with frequency hopping)	Mandya	96.69%	95.69%	97.70%	93.75%	98.28%	94.78%	95.87%	93.00%			
		Mysore	95.74%	96.03%	95.26%	90.01%	95.93%	95.30%	95.27%	93.00%			
		Bijapur	95.69%	95.11%	96.00%	97.08%	86.05%	91.06%	94.02%	95.00%			
1.4	Call Setup Success Rate (>=95%)	Mandya	100	100	98.81	100	99.09	98.89	100	100	100	99.21	98.04
		Mysore	99.38	98.05	100	99.28	99.35	98.96	98.18	98.27	100	100	98.4
		Bijapur	100	99.73	96.72	95.65	98.48	95.34	98.91	97.24	100	100	100

Observations:

- "Block Call rate" parameter is not meeting the benchmark for BSNL in Mysore & Bijapur towns, Idea in Bijapur town, Tata GSM in Bijapur town.
- "Drop call rate" parameter is not meeting the benchmark for BSNL in Mysore town, Idea in Bijapur town, Vodafone in Bijapur town.
- "Percentage of connection with good voice quality" parameter is not meeting the benchmark by Idea (Mandya & Mysore), Rcom GSM (Bijapur), Tata GSM (Mandya, Bijapur), Uninor (Bijapur) Vodafone (Mandya, Mysore).

Independent Drive Test

Parameter	AIRCEL	UNINOR	VODAFONE	RCOM	AIRTEL	IDEA	TATA
	Bidar		Kolar	Karwar	Dharwad		Madikeri
Call Attempts	119	85	115	139	114	103	33
Block Call Rate (<= 3%)	0.00%	0.00%	0.87%	0.72%	0.00%	0.62%	6.06%
Drop Call Rate (<= 2%)	0.00%	0.00%	0.00%	0.00%	0.88%	0.97%	0.00%
Percentage of Connections with good voice quality (>= 95%)	96.81%	96.23%	93.00%	95.93%	95.33%	97.03%	96.20%
Service Coverage							
Indoor (>= -75dbm) (%)	52.35	75.18	64.94	51.29	91.13	65.55	54.91
In-Vehicle (>= -85dbm) (%)	89.42	97.02	96.74	80.46	97.54	94.33	80.48
Outdoor -in City (>= -95dbm) (%)	94.19	99.22	99.91	96.26	100	99.25	100
Call Setup Success Rate (>= 95%)	100	100	99.13	99.28	100	99.38	93.94
Handover Success Rate(in percentage)	98.81%	100%	100%	100%	98.64%	100%	100%

Observations:
- Vodafone is not meeting the benchmark of "Good voice quality" parameters in Kolar city.
- TATA is not meeting the benchmark of "Block Call rate" & "Call setup Success rate" parameters in Madikeri city.

CHAPTER-3: PMR Data Verification Results

I. Cellular Mobile Telephone Service

S/N	Name of Parameter	Bench-mark	Audit	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
	PMR							GSM Operators					CDMA Operators		
(A)	Network Service Quality Parameter														
1	Network Availability														
	BTS Accumulated Downtime	<=2%	Reported	0.14	0.16	1.01	0.05	0.13	0.07	0.04	0.23	0.02	0.07	0.02	0.17
			Verified	0.14	0.16	1.01	0.05	0.13	0.07	0.04	0.23	0.02	0.07	0.02	0.17
	Worst affected BTSs due to downtime	<=2%	Reported	0.64	0.07	1.76	0.14	0.16	0.19	0.00	0.00	0.00	0.10	0.00	0.23
			Verified	0.64	0.07	1.76	0.14	0.16	0.19	0.00	0.00	0.00	0.10	0.00	0.23
2	Connection Establishment (Accessibility)														
	CSSR (Call Setup Success Rate)	>=95%	Reported	99.42	98.68	98.90	97.89	99.74	98.10	99.10	99.10	99.40	99.83	99.34	97.76
			Verified	99.42	98.68	98.90	97.89	99.74	98.10	99.10	99.10	99.40	99.83	99.34	97.76
	SDCCH/PAGING congestion	<=1%	Reported	0.03	0.41	0.12	0.16	0.03	0.07	0.03	0.19	0.09	0.01	0.00	0.00
			Verified	0.03	0.41	0.12	0.16	0.03	0.07	0.03	0.19	0.09	0.01	0.00	0.00
	TCH congestion	<=2%	Reported	0.06	0.44	0.60	0.65	0.22	0.48	0.02	0.24	0.28	0.01	0.04	0.44
			Verified	0.06	0.44	0.60	0.65	0.22	0.48	0.02	0.24	0.28	0.01	0.04	0.44
3	Connection maintenance (retainability)														
	CDR	<=2%	Reported	0.43	0.76	1.35	1.16	0.29	0.82	1.12	0.77	0.68	0.32	0.35	0.98
			Verified	0.43	0.76	1.35	1.16	0.29	0.82	1.12	0.77	0.68	0.32	0.35	0.98
	Worst affected cells>3% TCH drop	<=3%	Reported	1.65	2.89	3.60	1.17	0.93	3.18	2.07	0.00	2.22	0.83	0.39	2.98
			Verified	1.65	2.89	3.60	1.17	0.93	3.18	2.07	0.00	2.22	0.83	0.39	2.98
	Good voice quality	>=95%	Reported	98.57	98.77	98.60	97.05	99.16	97.87	98.66	99.37	98.69	99.46	98.86	99.51
			Verified	98.57	98.77	98.60	97.05	99.16	97.87	98.66	99.37	98.69	99.46	98.86	99.51
4	POI congestion	<=0.5%	Reported	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Verified	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(B)	Customer Service Quality Parameters														
5	Metering/billing credibility-Post	<= 0.1%	Reported	0.05	0.02	0.00	0.12	0.10	0.01	0.00	0.00	0.08	0.07	0.01	0.00

	paid		Verified	0.05	0.02	0.00	0.12	0.10	0.01	0.00	0.00	0.08	0.07	0.01	0.00
6	Metering /billing credibility-Pre paid	<= 0.1%	Reported	0.11	0.00	0.00	0.02	0.09	0.00	0.07	0.00	0.08	0.03	0.02	0.00
			Verified	0.11	0.00	0.00	0.02	0.09	0.00	0.07	0.00	0.08	0.03	0.02	0.00
7	Resolution of billing/ charging complaints	100% within 4 weeks	Reported	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
			Verified	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
	Period of applying credit/waiver/adjustment to the customers account from the date of resolutions of complaints	<=1 week	Reported	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00
			Verified	100.00	100.00	100.00	100.00	100.00	100.00	0.00	100.00	100.00	100.00	100.00	100.00
8	Response time to customers for assistance														
	Accessibility of call centre/Customer Care	>=95%	Reported	100.00	100.00	96.00	95.76	99.14	100.00	98.18	100.00	100.00	98.26	99.00	98.02
			Verified	100.00	100.00	96.00	95.76	99.14	100.00	98.18	100.00	100.00	98.26	99.00	98.02
	% call answered by operators(voice to voice) within 60 sec.	>=90%	Reported	91.96	82.00	90.00	78.47	59.00	92.00	88.71	98.37	67.16	72.10	95.00	95.04
			Verified	91.96	82.00	90.00	78.47	59.00	92.00	88.71	98.37	67.16	72.10	95.00	95.04
9	Termination/closure of service														
	No.of requests for Termination / Closure of service complied within 7 days during the quarter	<=7days	Reported	100.00	100.00	100.00	96.47	100.00	100.00	0.00	0.00	100.00	100.00	100.00	0.00
			Verified	100.00	100.00	100.00	96.47	100.00	100.00	0.00	0.00	100.00	100.00	100.00	0.00
10	Time taken for refunds of deposits after closures.	100% within 60 days	Reported	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00	99.00	0.00
			Verified	100.00	100.00	100.00	100.00	100.00	100.00	0.00	0.00	100.00	100.00	99.00	0.00

Critical Analysis (PMR Verification):
A).All the operator's data is almost matching with the PMR data.

Chapter -4 Detailed Findings & Analysis

I. Cellular Mobile Telephone Service
(A) MSC Audit
(1) 3days live data assessment & summarized findings

S/N	Name of Parameter	Benchmark	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
			GSM Operators									CDMA		
A	**Network Service Quality Parameter**													
1	**Network Availability**													
	a). BTS accumulated downtime	<= 2%	0.06%	0.21%	1.25%	0.03%	0.18%	0.05%	0.07%	0.00%	0.01%	0.12%	0.03%	0.26%
	b). Worst affected BTSs due to downtime	<= 2%	0.00%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.09%
	c). Total no of BTSs in the licensed service area		2860	8410	5014	5108	3299	5275	2149	30	7833	1870	951	1159
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during the 3days Live		117.79	1289	4521.48	107	435	185.06	102.6	0	61	156	20.54	219.26
	e) No. of BTSs having accumulated downtime of >24 hours in 3days Live		0	0	15	0	0	0	0	0	1	0	0	1
2	**Connection Establishment (Accessibility)**													
	a) CSSR	>=95%	99.57%	99.33%	99.10%	98.28%	99.74%	97.99%	99.17%	100.00%	98.62%	99.25%	99.25%	98.40%
	b) SDCCH/PAGING congestion	<=1%	0.02%	0.19%	0.26%	0.55%	0.01%	0.17%	0.07%	0.03%	0.81%	0.00%	0.00%	0.00%
	c) TCH congestion	<=2%	0.01%	0.29%	0.77%	1.45%	0.02%	0.51%	0.05%	0.00%	0.41%	0.11%	0.01%	1.06%
3	**Connection maintenance**													
	a) CDR	<=2%	0.65%	0.42%	1.13%	1.12%	0.44%	0.71%	1.16%	0.00%	0.55%	0.47%	0.16%	0.78%
	b) Cells having > 3% TCH drop	<=3%	3.00%	2.20%	2.48%	1.12%	0.02%	5.59%	1.46%	0.00%	1.86%	0.82%	0.00%	3.04%
	c) Good voice quality	>=95%	98.67%	99.20%	NR	97.18%	99.20%	98.35%	98.42%	98.10%	98.89%	98.43%	NR	NR
	d) No. of cells > 3% TCH drop		250	515	371	169	2	862	91	0	425	46	0	142
	e) Total no. of cells in the network		8323	23413	14931	15110	9897	15418	6245	90	22874	5610	2938	4658
4	**POI congestion**	<=0.5%	0	0	0	2	0	0	1	0	0	0	0	0

	a) Name of POI not meeting the benchmark												
	b) Total No. of circuits on POI		83070	212781	23050	142384	459932	11541	38059	540	125220	2168698	68960	43462
	c) Avg No. of call attempts on POI		471703	6422227	1048509	101289	6833491	470109	685624.2	75	3410198	13049711	1627798	927427
	d) Avg traffic served on POI (Erlang)		11730.65	12452	27730.99	7130.5	172622	7075	35457	612.77	80308	635465.8	37376.72	20653.47
	e) Total number of working POI Service Area wise		82710.16	153	41	53	23	12	94	16	193	81	128	60
	f) Equipped Capacity of Network in respect of Traffic in erlang		79666	220770	299245	164761.96	108000	275284	67848.86	5000	204658.13	230000	257152	118706
	g) Total traffic handled in TCBH in erlang		20333	125446	108278	1575602.4	96691	118025	37562.4	0.1	178330	65773	47246.8	41205.3
(B)	**Customer Service Quality Parameters**													
5	**Response time to customers for assistance**													
	a) Accessibility of call centre	>=95%	99.00%	100.00%	100.00%	99.00%	99.00%	100.00%	98.00%	100.00%	100.00%	98.00%	100.00%	100.00%
	b) % of call answered by operators(voice to voice) within 60 sec	>=90%	94.00%	94.00%	93.00%	99.00%	86.00%	95.24%	98.00%	100.00%	99.00%	93.00%	98.00%	96.00%

NA: Not Applicable, NR: Not Received

Parameter-wise Findings (Live Data Assessment):

The parameter wise key takeouts for the Cellular Mobile Telephone Services providers in Karnataka Service Area are as given below:-

- **BTS Accumulated downtime (benchmark <=2%):** All operators are meeting the benchmark with values lying between 0% and 1.25%
- **Worst affected BTSs due to downtime (benchmark <=2%):** All the operators are meeting the benchmark with is specified by TRAI.
- **Call setup success rate (benchmark >=95%):** All operators are meeting the benchmark with values lying between 97.99% and 100%.
- **SDCCH/PAGING Channel congestion (benchmark <= 1%):** All operators are meeting the benchmark with values lying between 0% and 0.81%.
- **TCH congestion (benchmark <= 2%):** All operators are meeting the benchmark with values lying between 0% and 1.45%.
- **Call drop rate (benchmark <= 2%):** All operators are meeting the benchmark with values lying between 0% and 1.16%.
- **Cell exceeding 3% TCH drop (benchmark <= 3%):** Except for Aircel with a value of 3%, Tata GSM with a value of 5.59%, MTS with a value of 3.04% rest of the operators are satisfying the benchmark with value in between 0% and 2.48%.
- **Connections with good voice quality (benchmark >= 95%):** Tata CDMA, MTS & BSNL has declared that the parameter is not system generated. Rests of the operators are meeting the benchmark with values lying between 97.18% and 99.2%.
- **POI Congestion (benchmark <= 0.5%):** There was no congestion found overall on the POI, but Idea, Uninor cases were found where individual POIs are showing high utilization/usage. Some are in the range of over 100% though causing no traffic failure due to overflow technique i.e. the extra traffic is carried over by some other operating POI as has been designed to do so.
- **%age of call answered by operator (electronically) (benchmark >95):** All operators are meeting the benchmark with values in between 96% and 100%.
- **%age of call answered by operator (Voice to voice) (benchmark >90%): %):** Except for Rcom GSM with a value of 86% respectively, rest of the operators are satisfying the benchmark with value in between 93% and 100%.

(2) One Month audit data report & Summarized findings:

S/N	Name of Parameter	Benchmark	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
			GSM Operators									CDMA Operators		
(A)	**Network Service Quality Parameter**													
1	**Network Availability**													
	a) BTS Accumulated Downtime	*<=2%*	0.05%	0.24%	1.28%	0.03%	0.36%	0.08%	0.04%	0.20%	0.02%	0.32%	0.03%	0.19%
	b) Worst affected BTSs due to downtime	*<=2%*	0.10%	0.74%	2.73%	0.08%	0.76%	0.15%	0.00%	0.00%	0.03%	0.21%	0.00%	0.35%
	c) Total no. of BTSs in the licensed service area		2860	8410	5014	5108	3299	5275	2149	30	7833	1870	951	1159
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		937.83	14321	46144	1096	8630	2886.88	592.02	42.67	1085	4163	238.39	1597
	e) No. of BTSs having accumulated downtime of >24 hours in a month		3	62	137	4	25	8	0	0	2	4	0	4
2	**Connection Establishment (Accessibility)**													
	a) CSSR (Call Setup Success Rate)	*>=95%*	99.54%	99.49%	99.08%	98.26%	99.74%	98.03%	99.08%	99.61%	98.91%	99.21%	99.34%	98.80%
	b) SDCCH/PAGING congestion	*<=1%*	0.02%	0.08%	0.25%	0.43%	0.02%	0.11%	0.07%	0.51%	0.27%	0.00%	0.00%	0.00%
	c) TCH congestion	*<=2%*	0.02%	0.20%	0.76%	1.11%	0.02%	0.55%	0.05%	0.00%	0.65%	0.13%	0.01%	0.68%
3	**Connection maintenance (retainability)**													
	a) CDR	*<=2%*	0.67%	0.40%	1.17%	1.12%	0.45%	0.70%	1.16%	0.00%	0.64%	0.50%	0.14%	0.72
	b) Worst affected cells>3% TCH drop	*<=3%*	1.49%	2.00%	2.74%	1.12%	0.01%	2.72%	1.52%	0.00%	1.78%	0.66%	0.00%	0.80%
	c) Good voice quality	*>=95%*	98.67%	99.15%	NR	97.20%	99.21%	98.41%	98.45%	99.62%	98.81%	98.41%	NR	NR
	d) Total No. of cells exceeding 3% TCH drop (call drop)		124	469	409	170	1	421	95	0	408	37	0	38
	e) Total no. of cells in the network		8323	23413	14931	15110	9897	15418	6245	90	22874	5610	2938	4658
4	**POI congestion**	*<=0.5%*	0	0	0	1	0	0	5	0	0	0	0	0
	a) Name of POI not meeting the benchmark													

	b) Total No. of call attempts on POI (Avg.)		465657	6676332	1039056	172026	6833491	537175	685624	105	3315584	13049711	1520921.6	948204
	c) Total traffic served on POI (Erlang) (Avg.)		11632.37	125832	28978	3373.32	172621.87	7958	21658.25	1942.7	78885	635465.8	34397.84	20491.94
	d) Total No. of circuits on POI		83070	212781	23050	142384	459932	11541	38059	540	125220	2168698	68960	43462
	e) Total number of working POI Service Area wise		36	153	41	53	23	12	94	16	193	81	128	60
	f) Capacity of POI		82710.16	221407	20476	139088	421689	9259.74	34781.54	355.17	120668	720143.46	63428.77	40892.1
5	**Network Data**													
	a) Equipped Capacity of Network Erlang		79666	220770	299245	164761.96	108000	275284	67848.86	5000	204658.13	230000	257152	118706
	b) Total traffic in TCBH in erlang (Avg.)		20333	125445.9	108278	143685.99	96691	118025	37562.4	0.1	178330	65773	47246.8	41205.29
	c) Total no. of customers served (as per VLR) on last day of the month		833903	14331678	3617701	5138110	3410174	3714380	1038190	48	5187434	1855774	735837	1315615
(B)	**Customer Service Quality Parameters**													
6	**Metering/billing credibility-Post paid**	*<= 0.1%*	0.04%	0.02%	0.04%	0.19%	0.10%	1.20%	NA	NA	0.08%	0.09%	0.37%	0.02%
	a) No. of bills issued during the period		6938	996768	135150	192087	60916	49494	NA	NA	443321	264684	190650	16263
	b) No. of bills disputed including billing complaints during the period		3	170	53	357	60	593	NA	NA	356	248	698	4
7	**Metering /billing credibility-Pre paid**	*<= 0.1%*	0.03%	0.00%	0.02%	0.01%	0.08%	0.00%	0.00%	0.00%	0.06%	0.02%	0.00%	0.00%
	a) No. of charging / credit / validity complaints during the quarter		586	224	1524	430	3608	99	70	0	3819	529	18	124
	b) Total no. of pre-paid customers at the end of the quarter		1754022	18991253	6395785	5480157	4615738	7144125	1713966	11900	6258655	3097482	653063	1917858
8	**Resolution of billing/ charging complaints**	*100% within 4 weeks*	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	a) No. of billing/(post paid) and charging, credit/validity (pre paid) complaints resolved within 4 weeks during the quarter		589	394	1577	787	3668	612	70	0	4175	777	716	128

	Benchmark												
b) Total no. of billing (post paid) and charging, credit / validity (pre paid) complaints received during the quarter		646	394	1577	787	3668	612	70	0	4175	777	716	128
c) No. of billing complaints (post paid) and charging, credit/ validity complaints (pre paid) resolved in favour of the customer during the quarter		589	394	53	306	1229	6	70	0	4137	259	3	112
d) No. of complaints disposed on account of not considered as valid complaints during the quarter		57	0	0	481	2439	606	0	0	38	518	713	16
e) Period of applying credit/waiver/adjustment to the customers account from the date of resolutions of complaints	<=1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week	NA	100% with in 1 week	100% with in 1 week	100% with in 1 week	100% with in 1 week
9 Response time to customers for assistance													
a) Accessibility of call centre/Customer Care	>=95%	100.00%	100.00%	100.00%	98.00%	99.00%	100.00%	97.00%	100.00%	100.00%	98.00%	100.00%	99.13%
b) % call answered by operators(voice to voice) within 60 sec.	>=90%	97.00%	91.00%	93.00%	97.00%	79.00%	99.64%	96.00%	100.00%	99.00%	87.00%	98.00%	96.00%
c) Total no. of call attempts to call centre & customer care nos. during TCBH (Avg.).		12088	5109724	38584	2000926	410111	794900	365791	111	207782	146544	34391	32176
d) No. of calls connected and answered successfully to call centre & customer care nos. during TCBH (Avg.).		11688	4639248	35728	1666506	325927	792046	349652	111	206181	128313	33820	30965
10 Termination/closure of service	<=7days	100.00%	100.00%	100.00%	97.50%	100.00%	100.00%	NA	NA	100.00%	100.00%	100.00%	100.00%
a) Total No. of requests for Termination / Closure of service received during the quarter		340	5338	535	367	167	1218	NA	NA	6622	1751	3511	210
b) No.of requests for Termination / Closure of service complied within 7 days during the quarter		340	5338	535	358	167	1218	NA	NA	6622	1751	3511	210
11 Time taken for refunds of deposits after closures.	100% within 60 days	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	NA	100.00%	100.00%	100.00%	NA

NA: Not Applicable, NR: Not Received

Parameter-wise Findings (Month Data Assessment):

The parameter wise key takeouts for the Cellular Mobile Telephone Services providers in Karnataka Service Area are as given below:-
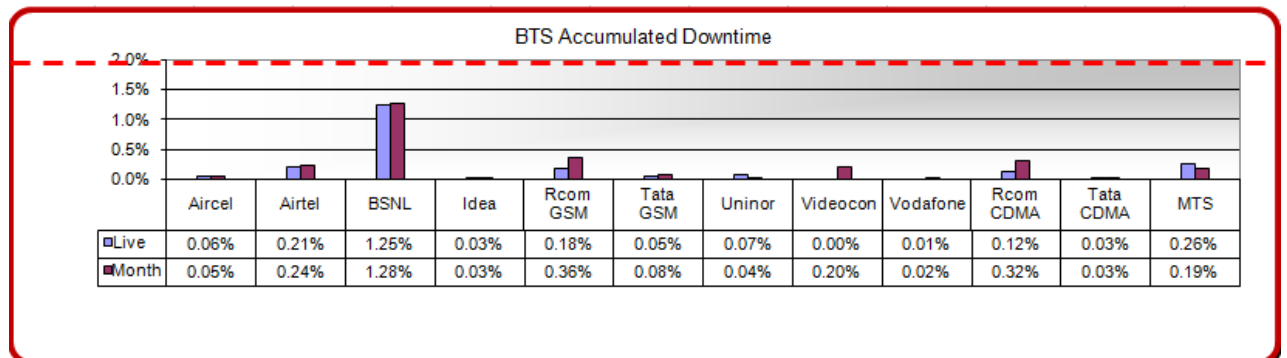
➢ **BTS accumulated downtime (benchmark <=2%):** All operators are meeting the benchmark with values lying between 0.02% and 1.28%.

➢ **Worst affected BTSs due to downtime (benchmark <= 2%):** Except for BSNL with a value of 2.73% rest of all operators are meeting the benchmark with values lying between 0% and 0.76%.

➢ **Call setup success rate (benchmark >= 95%):** All operators are meeting the benchmark with values lying between 98.03% and 99.74%.

➢ **SDCCH/PAGING Channel congestion (benchmark <= 1%):** All operators are meeting the benchmark wit values lying between 0% and 0.43%.
Note: CDMA operators have provided the data for Paging Channel congestion and GSM operators provided SDCCH Channel congestion.

➢ **TCH congestion (benchmark <= 2%):** All operators are meeting the benchmark with values lying between 0% and 1.11%.

➢ **Call drop rate (benchmark <= 2%):** All operators are meeting the benchmark with values lying between 0.08% and 1.17%.

➢ **Cell exceeding 3% TCH drop (benchmark <= 3%):** All the operators are satisfying the benchmark with value in between 0% and 2.74%.

➢ **Connections with good voice quality (benchmark >= 95%):** BSNL, Tata CDMA, MTS are declared that the parameter is not system generated. Rests of the operators are meeting the benchmark with values lying between 97.2% and 99.62%.

➢ **POI Congestion (benchmark <= 0.5%):** All the operators are meeting the benchmark provided by TRAI. There was no congestion found overall on the POI, but Idea, Uninor cases were found where individual POIs are showing high utilization/usage. Some are in the range of over 100% though causing no traffic failure due to overflow technique i.e. the extra traffic is carried over by some other operating POI as has been designed to do so.

➢ **%age of call answered by operator (electronically) (benchmark >95):** All operators are meeting the benchmark with values lying between 97% to 100%.

➢ **%age of call answered by operator (Voice to voice) (benchmark >90%):** Except for Rcom GSM, Rcom CDMA with a values of 79%, 87% respectively. Rest of all operators are meeting the benchmark with values lying between 91% to 100%.

➢ **Metering and billing credibility-Post paid (benchmark <= 0.1%):** Except for Idea, TATA GSM, Tata CDMA with a values of 0.19%, 1.2%, 0.37% rest of all the operators are meeting the benchmark.

➢ **Metering and billing credibility-Pre paid (benchmark <= 0.1%):** All the operators are meeting the benchmark with values lying between 0% and 0.08%.

➢ **Resolution of billing/ charging complaints (benchmark 100% within 4 weeks):** All the operators are meeting the benchmark.

➢ **Termination/Closure of service (Benchmark <= 7 days):** Except for Idea with a value of 97.5% rest of the all operators have satisfied the benchmark.

➢ **Time taken for refunds of deposits after closures (benchmark 100% within <=60 days):** All operators have satisfied the benchmark.

(3) Sample Coverage

Switches/BSC/BTS details of operators:

Sl.	Name of Service Provider	No. of MSC+GMSC	No. of BSC	No. of BTS
	GSM Operators			
1	Aircel Ltd	3	20	2860
2	Airtel Ltd	56	100	8410
3	BSNL	12	104	5014
4	Idea	9	46	5108
5	Reliance Communication (GSM)	4	18	3299
6	Tata Communications (GSM)	11	32	5275
7	Uninor	3	14	2129
8	Videocon	1	2	30
9	Vodafone	12	98	7833
	CDMA Operators			
10	MTS (CDMA)	2	5	1171
11	Reliance Communication (CDMA)	10	6	1870
12	Tata Communications (CDMA)	9	11	951

(4) Performance (Graphical Representation)

Comparison between Live measurements and One month data Audit – Cellular Mobile Telephone Services

A)   NETWORK PERFORMANCE

I. BTS accumulated downtime: All operators are meeting the TRAI benchmarks (<= 2 %) for both one month data and 3 days live data taken in the month of audit.

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	0.06%	0.21%	1.25%	0.03%	0.18%	0.05%	0.07%	0.00%	0.01%	0.12%	0.03%	0.26%
Month	0.05%	0.24%	1.28%	0.03%	0.36%	0.08%	0.04%	0.20%	0.02%	0.32%	0.03%	0.19%

II. Worst affected BTSs due to downtime: Except for BSNL for Monthly audit data, rest of **all** operators are meeting the TRAI benchmarks (<= 2 %) for both one month data and 3 days live data taken in the month of audit.

Worst affectd BTSs due to Downtime

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	0.00%	0.00%	0.30%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.09%
Month	0.10%	0.74%	2.73%	0.08%	0.76%	0.15%	0.00%	0.00%	0.03%	0.21%	0.00%	0.35%
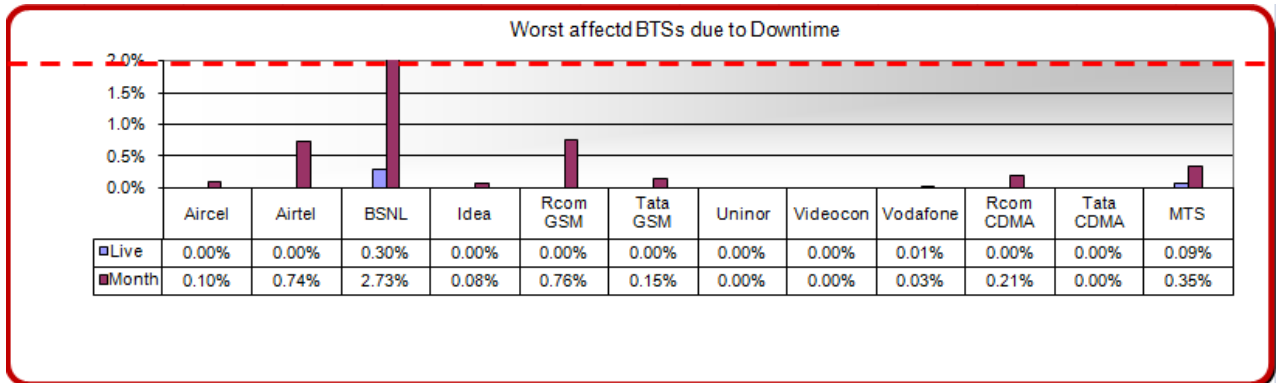
III. Call setup success rate: All operators are meeting the TRAI benchmarks (>= 95 %) for both one month data and 3 days live data taken in the month of audit.

CSSR

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	99.57%	99.33%	99.10%	98.28%	99.74%	97.99%	99.17%	100.00%	98.62%	99.25%	99.25%	98.40%
Month	99.54%	99.49%	99.08%	98.26%	99.74%	98.03%	99.08%	99.61%	98.91%	99.21%	99.34%	98.80%
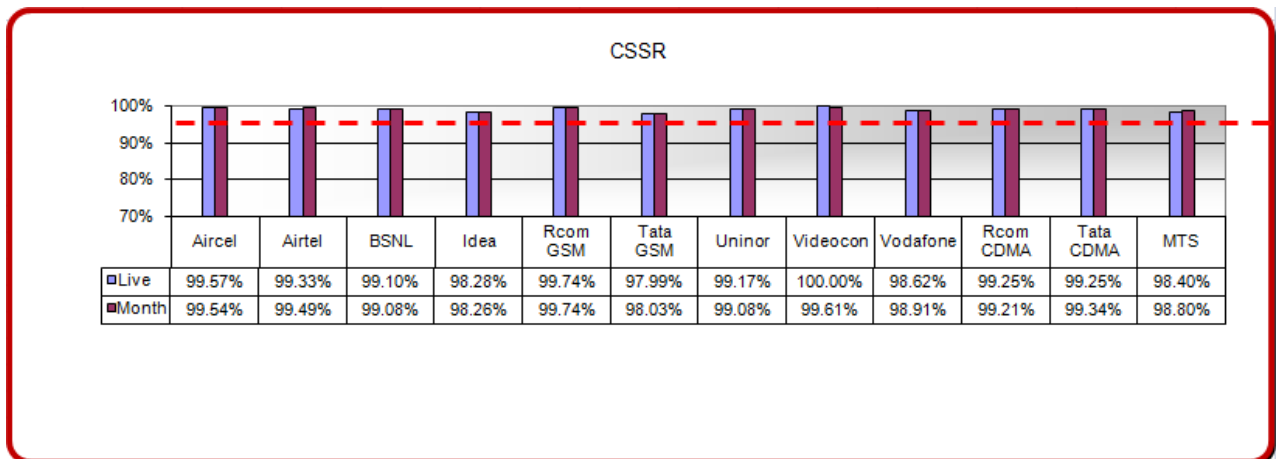
IV. Blocked call rate:
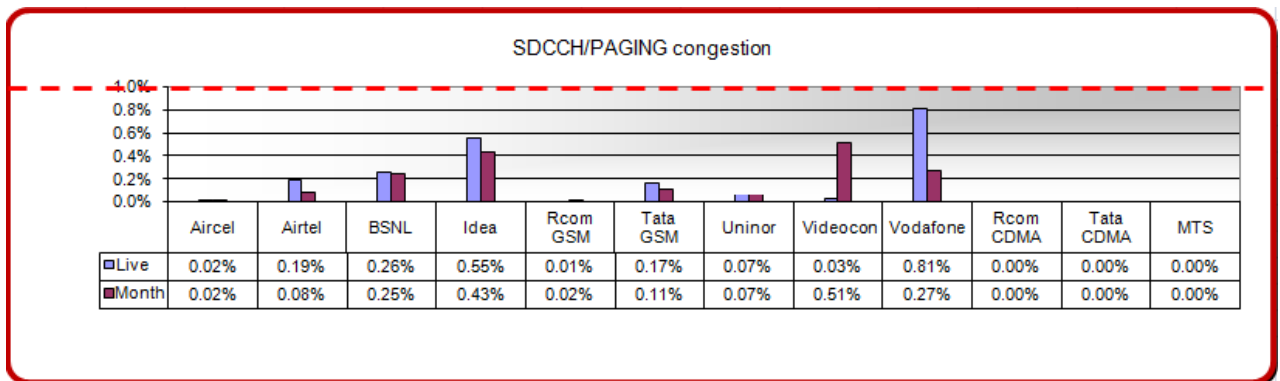**SDCCH/Paging congestion (%):** All operators are meeting the TRAI benchmarks (<= 1 %) for both one month data and 3 days live data taken in the month of audit.

SDCCH/PAGING congestion

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	0.02%	0.19%	0.26%	0.55%	0.01%	0.17%	0.07%	0.03%	0.81%	0.00%	0.00%	0.00%
Month	0.02%	0.08%	0.25%	0.43%	0.02%	0.11%	0.07%	0.51%	0.27%	0.00%	0.00%	0.00%

TCH congestion (%): All operators are meeting the TRAI benchmarks (<= 2%) for both one month data and 3 days live data taken in the month of audit.

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	0.01%	0.29%	0.77%	1.45%	0.02%	0.51%	0.05%	0.00%	0.41%	0.11%	0.01%	1.06%
Month	0.02%	0.20%	0.76%	1.11%	0.02%	0.55%	0.05%	0.00%	0.65%	0.13%	0.01%	0.68%

TCH congestion chart

V. Connection Maintainability (Retainability):

Call drop rate (%): All operators are meeting the TRAI benchmarks (<=2%) for both one month data and 3 days live data taken in the month of audit.

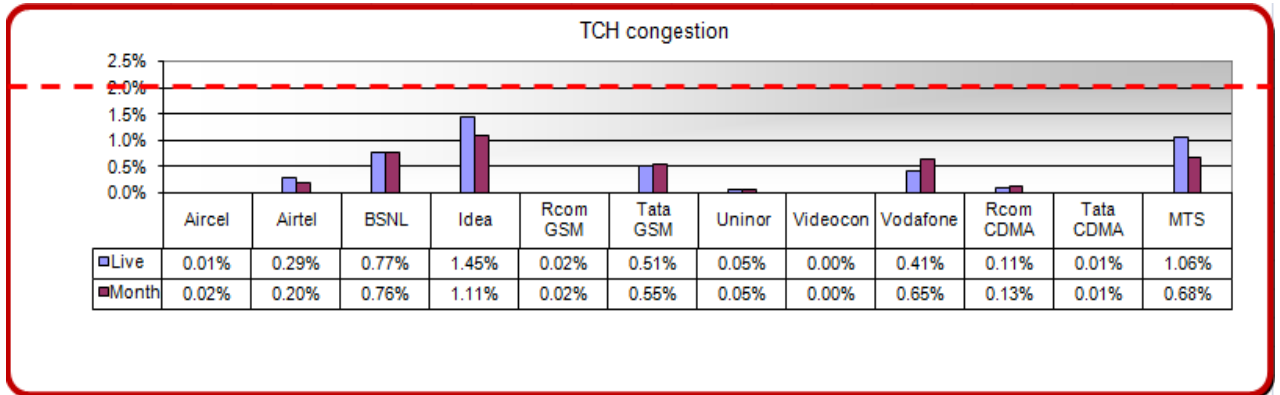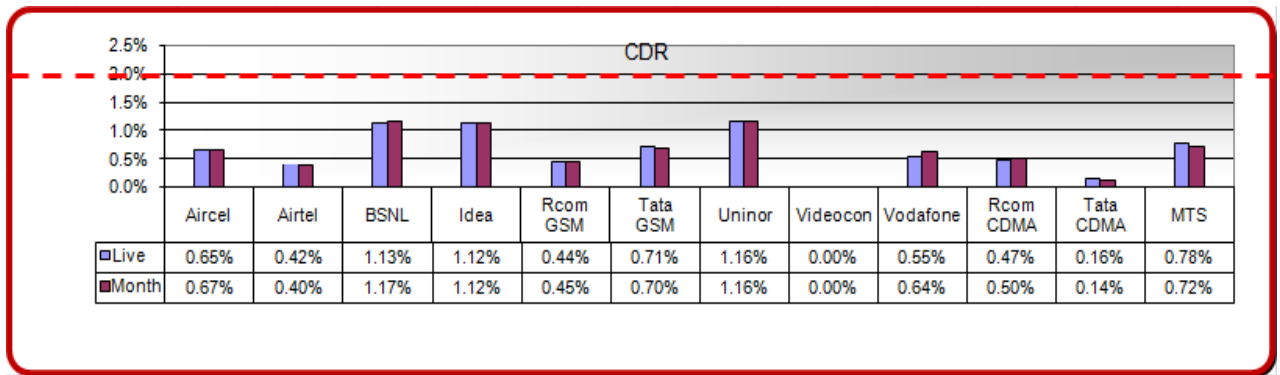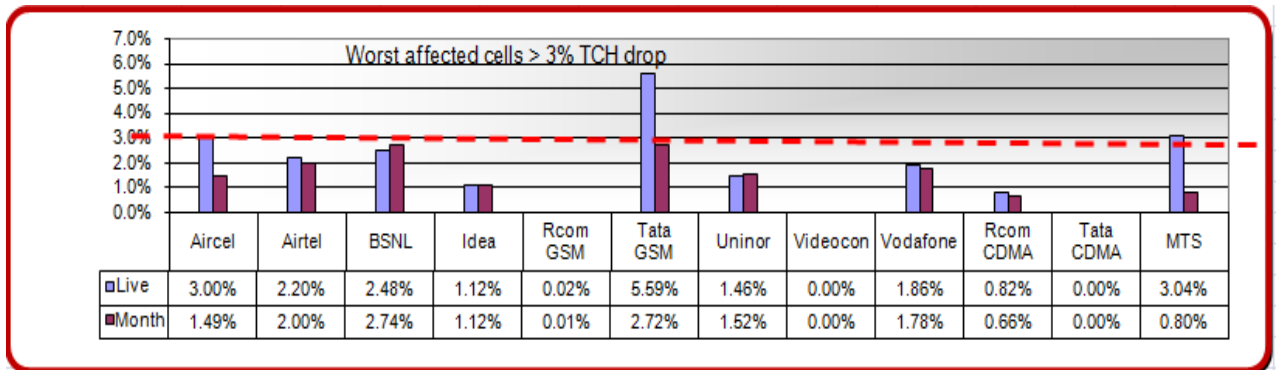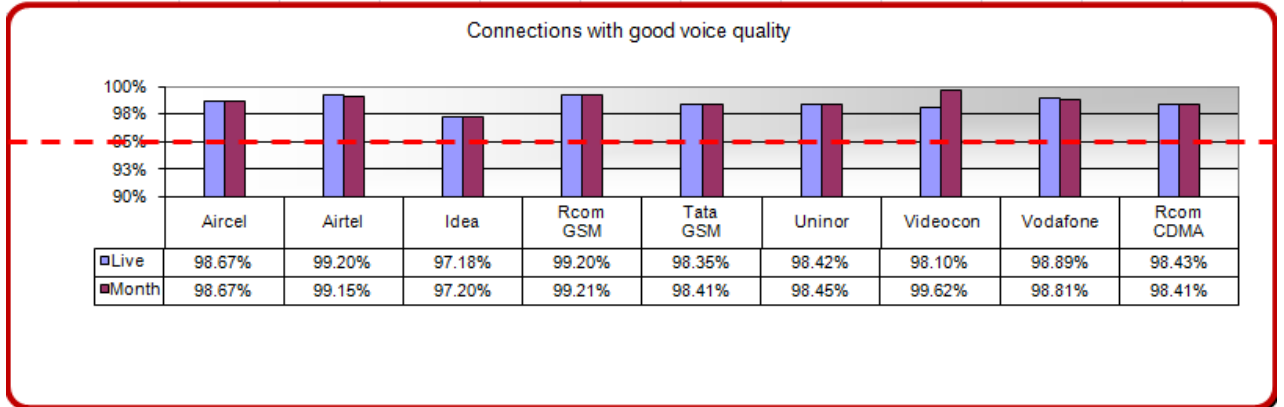|	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	0.65%	0.42%	1.13%	1.12%	0.44%	0.71%	1.16%	0.00%	0.55%	0.47%	0.16%	0.78%
Month	0.67%	0.40%	1.17%	1.12%	0.45%	0.70%	1.16%	0.00%	0.64%	0.50%	0.14%	0.72%

CDR chart

Worst affected Cell exceeding 3% TCH Drop: Aircel, Tata GSM, MTS are not meeting the benchmark for live audit data with a values of 3%, 5.59%, 3.04% respectively. Rests of the operators are meeting the benchmark for both cases.

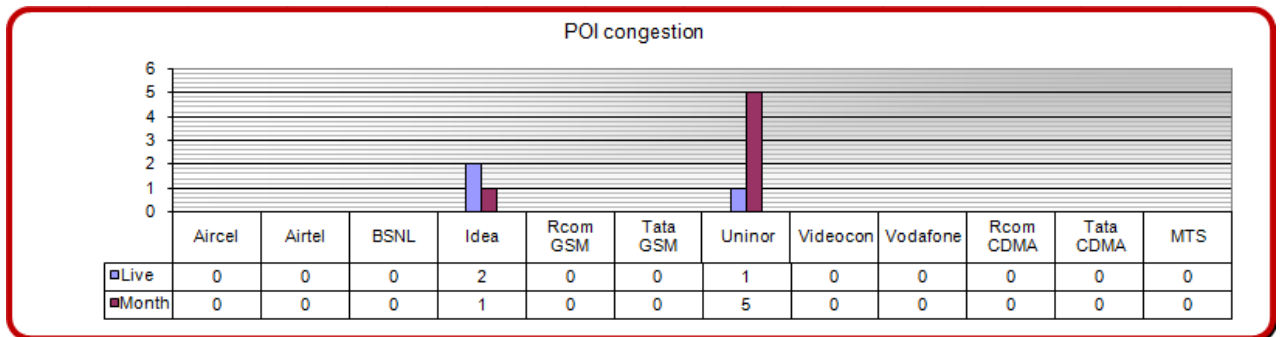|	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	3.00%	2.20%	2.48%	1.12%	0.02%	5.59%	1.46%	0.00%	1.86%	0.82%	0.00%	3.04%
Month	1.49%	2.00%	2.74%	1.12%	0.01%	2.72%	1.52%	0.00%	1.78%	0.66%	0.00%	0.80%

Worst affected cells > 3% TCH drop chart

Percentage of connections with good voice quality (benchmark >= 95%): All operators are meeting the TRAI benchmarks (=> 95%) for both one month data and 3 days live data taken in the month of audit. Tata CDMA, MTS & BSNL has declared that this parameter is not system generated.

Connections with good voice quality

	Aircel	Airtel	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA
Live	98.67%	99.20%	97.18%	99.20%	98.35%	98.42%	98.10%	98.89%	98.43%
Month	98.67%	99.15%	97.20%	99.21%	98.41%	98.45%	99.62%	98.81%	98.41%

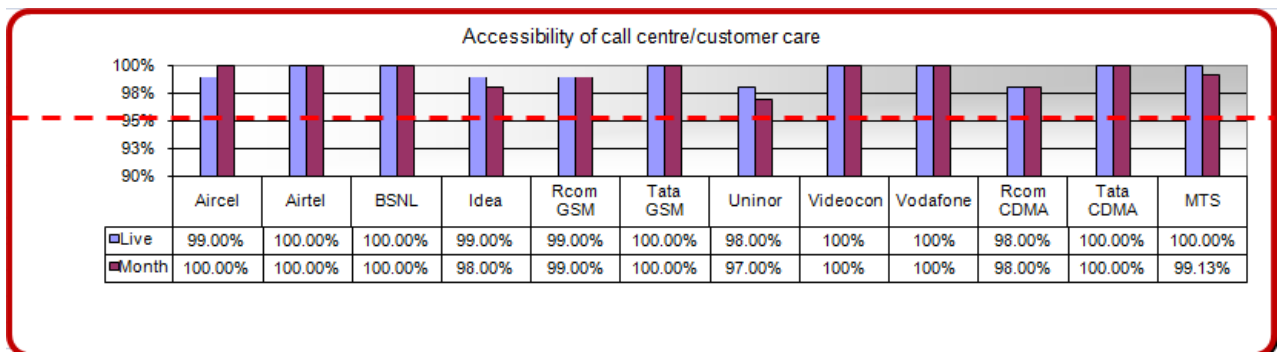**No. of POI having > 0.5% Congestion:**

In case of Idea, Uninor there was no congestion found overall on the POI, but cases were found where individual POIs are showing high utilization/usage. Some are in the range of over 100% though causing no traffic failure due to overflow technique i.e. the extra traffic is carried over by some other operating POI as has been designed to do so.
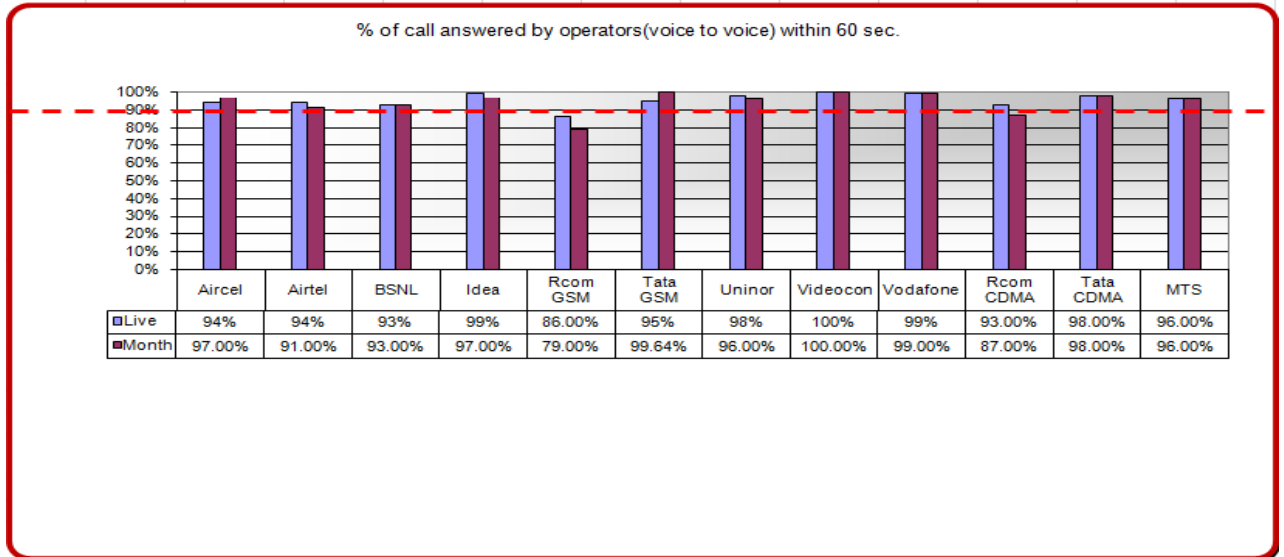

POI congestion

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	0	0	0	2	0	0	1	0	0	0	0	0
Month	0	0	0	1	0	0	5	0	0	0	0	0

B)   CUSTOMER SERVICE QUALITY PARAMETERS

(I)   Response time to the customer for assistance:

Percentage of call answered (Electronically): All operators are meeting the TRAI benchmarks (>= 95%) for both one month data and 3 days live data taken in the month of audit with a values in between 96% to 100%

Accessibility of call centre/customer care

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	99.00%	100.00%	100.00%	99.00%	99.00%	100.00%	98.00%	100%	100%	98.00%	100.00%	100.00%
Month	100.00%	100.00%	100.00%	98.00%	99.00%	100.00%	97.00%	100%	100%	98.00%	100.00%	99.13%

Percentage of call answered by operators (Voice to voice) within 60 sec: Rcom GSM is not meeting the benchmark for both live & month audit data similarly Rcom CDMA is showing below benchmark for month audit data. Rests of the operators are meeting the benchmark.

% of call answered by operators(voice to voice) within 60 sec.

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Videocon	Vodafone	Rcom CDMA	Tata CDMA	MTS
Live	94%	94%	93%	99%	86.00%	95%	98%	100%	99%	93.00%	98.00%	96.00%
Month	97.00%	91.00%	93.00%	97.00%	79.00%	99.64%	96.00%	100.00%	99.00%	87.00%	98.00%	96.00%

(5). Critical Analysis

The above comparative study between live data & month data shows similar trends in both the cases. However, inconsistency in live & month data was found for parameters like

- "Worst affected BTSs due to downtime" benchmark is not meeting by BSNL for month audit data.
- "Worst affected cells >3% TCH drop" benchmark is not meeting by Aircel, Tata GSM, MTS.
- "Metering/billing credibility for postpaid" benchmark is not meeting by Tata GSM, Tata CDMA.
- "%age of calls answered by operator" benchmark is not meeting by Rcom GSM, Rcom CDMA..
- "Termination/ closure of service" benchmark is not meeting by Idea.

(B) Redressal

1. **Sample coverage**

   A sample of billing complaints was taken for each operator and calls were made for assessing the resolution of billing/charging complaints within 4 weeks as claimed by the respective operators.

2. **Performance (live calling for billing complaints)**

Calling Operator	Aircel	Airtel	Idea	Reliance (GSM)	Tata (GSM)	Uninor	Vodafone	Reliance (CDMA)	Tata (CDMA)	Sistema (MTS)
Total No. of calls attempted	19	26	17	12	19	13	24	12	15	9
Total No. of calls	8	10	10	6	10	6	10	6	7	3
Cases resolved with 4 weeks	8	10	10	6	10	6	10	6	7	3
%age of cases resolved	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Note: The difference between call attempts and call answer is because of either Switch off, Number busy, no response or out of reach in the Network.

3. **Live calling to call centre**

Calling Operator	Aircel	Airtel	BSNL	Idea	Tata GSM	Uninor	Videocon	Vodafone	MTS	Tata CDMA
Total No. of Calls Attempted	100	100	100	100	100	100	100	100	100	100
Total No. of calls connected to IVR	99	100	100	99	100	98	100	100	100	100
Calls got connected to agent within 60 Sec	94	94	93	99	95	98	100	99	96	98
%age of calls got answered	94%	94%	93%	100%	95%	100%	100%	99%	96%	98%

4. Level 1 live calling

Emergency no.	No.of Calls	AIRCEL	AIRTEL	BSNL	IDEA	RCOM GSM	TATA GSM	VODAFONE	UNINOR	RCOM CDMA	TATA CDMA	MTS
NALGONDA TOWN												
100	3	3	3	3	3	3	3	3	3	3	3	3
101	3	3	3	3	3	3	3	3	3	3	3	3
108 (instead of 102 now 108 is available in AP)	3	3	3	3	3	3	3	3	3	3	3	3
ELURU TOWN												
100	3	3	3	3	3	3	3	3	3	3	3	3
101	3	3	3	3	3	3	3	3	3	3	3	3
108 (instead of 102 now 108 is available in AP)	3	3	3	3	3	3	3	3	3	3	3	3
ANANTHAPUR TOWN												
100	3	3	3	3	3	3	3	3	3	3	3	3
101	3	3	3	3	3	3	3	3	3	3	3	3
108 (instead of 102 now 108 is available in AP)	3	3	3	3	3	3	3	3	3	3	3	3

(Andhra Pradesh Circle)

5. Critical Analysis

Random numbers were selected from the operators' database of billing/metering complaints and calls were made to the customers to get their feedback for complaint Redressal. It was found that the operators had made refunds in 100% cases as claimed by their records.

In case of Call centre live calling all operators IVR calls are mostly get connected.

For emergency, Level 1 calling is done in all 3 drive test cities. All the operators are found to be functional in the respective towns.

(C) Inter operator call assessment

1. Sample coverage

A sample of 2x50 test calls per Service Providers with in the licensed service area (Karnataka Circle) were made between 1100 to 1400 hrs and between 1600 to 1900 hrs so that TCBH hours for all the operators were covered.

2. Performance based on live measurement

Calling Operator	Aircel	Airtel	BSNL	Idea	Reliance (GSM)	Tata (GSM)	Uninor	Videocon	Vodafone	Reliance (CDMA)	Tata (CDMA)	Sistema (MTS)
Aircel	-	100%	99%	100%	99%	100%	100%	100%	100%	100%	100%	100%
Airtel	100%	-	100%	98%	96%	97%	96%	100%	100%	100%	99%	100%
BSNL	100%	99%	-	97%	100%	99%	96%	100%	99%	100%	100%	100%
Idea	100%	96%	98%	-	100%	99%	100%	100%	97%	99%	100%	100%
Reliance (GSM)	100%	100%	99%	100%	-	100%	98%	100%	100%	100%	100%	100%
Tata (GSM)	100%	99%	98%	100%	99%	-	99%	100%	100%	100%	99%	100%
Uninor	100%	99%	97%	95%	98%	100%	-	97%	100%	100%	100%	100%
Videocon	100%	100%	99%	100%	99%	100%	99%	-	100%	95%	100%	99%
Vodafone	100%	97%	98%	98%	100%	100%	100%	100%	-	100%	98%	100%
Reliance (CDMA)	100%	100%	99%	100%	100%	96%	100%	99%	100%	-	100%	100%
Tata (CDMA)	100%	99%	100%	97%	100%	100%	98%	97%	99%	100%	-	100%
Sistema (MTS)	100%	100%	96%	98%	100%	97%	100%	100%	100%	99%	100%	-

3. Critical Analysis

In the inter-operator call assessment test, calls were made from one operator to other operators so as to check congestion on both the operators' network. In such cases, the radio part, switch part & the POI in-between the operators are involved and hence if any congestion is found in the network, it may be due to any of these parts. The result shows that there is not much congestion on the operator networks.

(D). Drive test of the mobile network of service providers

1)   Sample Coverage

The Operator Assisted Drive Test was conducted at Karnataka for all the operators. Route covered was about around 80-100Km depending on city areas within the speed limit of 30Km/hr.

Drive Test Locations

MANDYA

LOW DENSE: Kalahalli road, APMC market road, Kalegowda school road, PES Kyanthegere layout, Cauvery yana, Holalu road, Mehdevi Kabristan, kalikamba temple.

MEDIUM DENSE: Muncipal high school ashok nagar, Kuvempu nagar, Kuvempu nagar park, Old tank road, Karsawadi main road, Sri balmuri ganapathi temple, Hindu graveyard, Mandya education society, St joseph church, Hrishchandra ghat, bandigowda layout, Law college road.

HIGH DENSE: Gandhi nagar, Hoshalli road, Shankar nagar road, Ganesha temple, Shilpa Nursing Home, Mandya diagnostic centre, Carmel convent school, Vinobha road, Vidya nagar, Mandya medical college.

MYSORE

LOW DENSE: Casa del Gobioreno, St phenomenacathedral, State road hunsur flood of light, Hotel jadegaru.

MEDIUM DENSE: Columbia asia hospital, JSS medical college, Manjesh, Royal mysore walks, Sri guru raghavendra mandir, Vijaya bank, Youth hostel, Sujatha residency, Ramakrishna vidyashala, Vinayaka nagar, SK continental, temple tree palace.

HIGH DENSE: GRS fantasy park, White Orchid resort, Mysore palace, Market, Masjid e azam evening, KR circle, Vishwanava road, Palaisde mysore2, Ree feel cartige store, TK layout park, Srirampura.

BIJAPUR

LOW DENSE: Freedom fighters colony, Gevar chand nagar, Maruthi nagar, Govt Hospital, Bothara colony, Treasury colony, Banjara high school road.

MEDIUM DENSE: Bijapur fort, Gagan mahal, Jama mosque, Sufi tomb, BLDEACET campus, BLDEA teachers colony, Sainik school, PWD guest house, Gulgambaz, Kendriya Vidyalaya, Anand nagar, Lakshmi nagar.
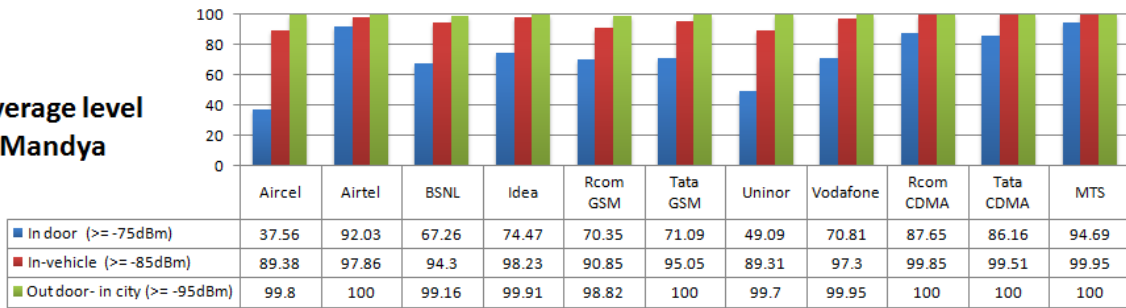
HIGH DENSE: BSNL office, court, Medical college, KSRTC bus stand, Railway station, Gulbarga road, Athani roads and Town market.

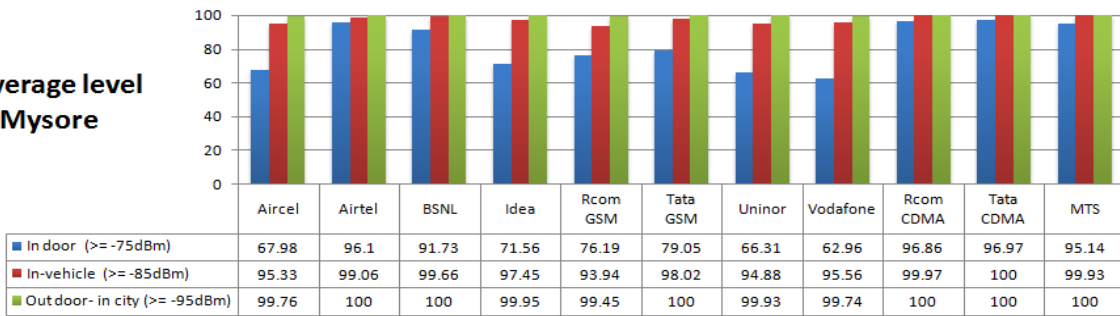**2) Performance of Operated assisted Drive test measurements:**

SN	Parameter	City Name	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Vodafone	Rcom CDMA	Tata CDMA	MTS
			GSM Operators								CDMA Operators		
1.1	Call Attempts	Mandya	106	130	84	92	110	90	115	83	77	126	102
		Mysore	161	154	149	139	154	96	165	116	126	130	127
		Bijapur	182	364	122	161	197	193	184	145	234	152	193
1.2	Blocked Call Rate (<=3%)	Mandya	0.00%	0.00%	1.19%	0%	0.91%	1.11%	0.00%	0.00%	0.00%	0.79%	1.96%
		Mysore	0.62%	1.95%	3.36%	0.72%	0.65%	1.04%	1.82%	1.72%	0.00%	0.00%	1.60%
		Bijapur	0.00%	0.27%	3.28%	4.35%	1.52%	4.66%	1.09%	2.76%	0.00%	0.00%	0.00%
1.3	Dropped Call Rate (<=2%)	Mandya	0.00%	0.00%	0.00%	1.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0.00%
		Mysore	0.00%	0.00%	2.01%	0.00%	0.00%	0.00%	0.61%	0.86%	0.00%	0.00%	0.00%
		Bijapur	0.55%	0.28%	1.60%	4.96%	0.50%	1.55%	0.54%	2.07%	0.85%	0%	0.00%
1.4	Percentage of connections with good voice quality (=>95%)												
	(i) 0-4 (w/o frequency hopping)	Mandya									99.86%	99.95%	99.67%
		Mysore									99.00%	98.83%	98.87%
		Bijapur									97.57%	98.67%	99.18%
	(ii) 0-5 (with frequency hopping)	Mandya	96.69%	96%	97.70%	93.75%	98.28%	94.78%	95.87%	93%			
		Mysore	95.74%	96.03%	95.26%	90.01%	95.93%	95.30%	95.27%	93.00%			
		Bijapur	95.69%	95.11%	96.00%	97.08%	86.05%	91.06%	94.02%	95.00%			
1.5	Service Coverage												
	In door (>= -75dBm)	Mandya	37.56	92.03	67.26	74.47	70.35	71.09	49.09	70.81	87.65	86.16	94.69
		Mysore	67.98	96.1	91.73	71.56	76.19	79.05	66.31	62.96	96.86	96.97	95.14
		Bijapur	63.02	88.62	91.89	66.09	47.42	72.04	72.76	58.21	50.19	91.52	391.9
	In-vehicle (>= -85dBm)	Mandya	89.38	97.86	94.3	98.23	90.85	95.05	89.31	97.3	99.85	99.51	99.95
		Mysore	95.33	99.06	99.66	97.45	93.94	98.02	94.88	95.56	99.97	100	99.93
		Bijapur	93.58	99.33	98.93	96.25	72.92	92.49	94.17	91.39	85.44	98.13	72.57
	Out door- in city (>= -95dBm)	Mandya	99.8	100	99.16	99.91	98.82	100	99.7	99.95	100	100	100
		Mysore	99.76	100	100	99.95	99.45	100	99.93	99.74	100	100	100
		Bijapur	99.36	100	100	99.92	100	100	99.35	99.12	100	100	100
1.6	Call Setup Success Rate (>=95%)	Mandya	100	100	98.81	100	99.09	98.89	100	100	100	99.21	98.04
		Mysore	99.38	98.05	96.64	99.28	99.35	98.96	98.18	98.27	100	100	98.4
		Bijapur	100	99.73	96.72	95.65	98.48	95.34	98.91	97.24	100	100	100

Graphical Representation:

Coverage level Mandya

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Vodafone	Rcom CDMA	Tata CDMA	MTS
■ In door (>= -75dBm)	37.56	92.03	67.26	74.47	70.35	71.09	49.09	70.81	87.65	86.16	94.69
■ In-vehicle (>= -85dBm)	89.38	97.86	94.3	98.23	90.85	95.05	89.31	97.3	99.85	99.51	99.95
■ Out door- in city (>= -95dBm)	99.8	100	99.16	99.91	98.82	100	99.7	99.95	100	100	100

Coverage level Mysore

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Vodafone	Rcom CDMA	Tata CDMA	MTS
■ In door (>= -75dBm)	67.98	96.1	91.73	71.56	76.19	79.05	66.31	62.96	96.86	96.97	95.14
■ In-vehicle (>= -85dBm)	95.33	99.06	99.66	97.45	93.94	98.02	94.88	95.56	99.97	100	99.93
■ Out door- in city (>= -95dBm)	99.76	100	100	99.95	99.45	100	99.93	99.74	100	100	100

Coverage level Bijapur

	Aircel	Airtel	BSNL	Idea	Rcom GSM	Tata GSM	Uninor	Vodafone	Rcom CDMA	Tata CDMA	MTS
■ In door (>= -75dBm)	63.02	88.62	91.89	66.09	47.42	72.04	72.76	58.21	50.19	91.52	391.9
■ In-vehicle (>= -85dBm)	93.58	99.33	98.93	96.25	72.92	92.49	94.17	91.39	85.44	98.13	72.57
■ Out door- in city (>= -95dBm)	99.36	100	100	99.92	100	100	99.35	99.12	100	100	100

3. Critical Analysis

The drive test data was found to be satisfactory for most of the parameters. However, a few deviations found are listed below:

- "Block Call rate" benchmark is not meeting by BSNL in Mysore & Bijapur (with values of 3.36%, 3.28%), Idea in Bijapur (with a value of 4.35%), Tata GSM in Bijapur (with a value of 4.66%) respectively.
- "Drop Call rate" benchmark is not meeting by BSNL in Mysore (with avalue of 2.01%), Idea in Bijapur (with a value of 4.96%), Vodafone in Bijapur (with a value of 2.07%) respectively.
- "Connections with good quality" benchmark is not meeting by BSNL in Mandya & Mysore (with a values of 93.75%, 90.01%), Rcom GSM in Bijapur (with a value of 86.05%), Tata GSM in Mandya & Bijapur (with a values of 94.78%, 91.06%), Uninor in Bijapur (with a value of 94.02%), Vodafone in Mandya & Mysore (with a values of 93%, 93%) respectively.
- "Call Setup Success Rate" benchmark is not meeting by Idea & Tata GSM in Tumkur city.

(E) Independent Drive Test

The Independent Drive Test was conducted in Karnataka for 5 different Cities namely *"Bidar,Kolar, Karwar, Dharwad, Madikeri "*. All the service providers city wise radio coverage with call testings were performed individually through drive test activity on different days. Route covered was about around 90kms for Bidar (Aircel,Uninor), 70kms for Kolar (Vodafone), 70kms for Rcom GSM (Karwar), 90kms for Dharwad (Airtel, Idea) and 50kms for Madikeri (Tata GSM) depending on city areas within the speed limit of 30Km/hr.

Drive Test Locations and Service provider's name:

1)	Bidar	:	AIRCEL, UNINOR
2)	Kolar	:	VODAFONE
3)	Karwar	:	RCOM GSM
4)	Dharwad	:	AIRTEL, IDEA
5)	Madikeri	:	TATA GSM

1. Sample Coverage

Area Coverage details:

1) **BIDAR:** Gandhi Gunj, Bidar Istitute of Medical Science,GuruNayak Dev Engg.College,Old Airport Colony, KSRTC Bus Stand, Railway Station road, Market road, Sangameswara Colony, Akka MahaDevi Colony, Bidar Fort, Nandi Nagar, Allam Prabhu Nagar, Rampura Colony, Dhrga pur, Multani Colony, Talghat, Taloedi.

2) **KOLAR:** Chinthamani circle, Bus stop, Market area, Medical college, RTO office.

3) **KARWAR:** KHB colony, Arga karwar, Majali, Kaiga, Binaga, Nandangadda, MG road, Kajubag, Sea bird, Sadhashivgadh, Kadra Karwar, railway station road, Nandur, Seaport, Binacal seaport.

4) **DHARWAD:** New bus tand, Kittur chennamma park, Sadankeri, Dasankoppa, Srinagar, Nirmal nagar, Sapthapur, SDM dental college, Gandhi nagar, Rajathgiri, Tollanka,

Narayanapur, Subhash road, CBT market, Mangalwarpet, Dharwad-Saundatti road, Dharwad- Hubli bypass road, Dharwad-Belgaum road, Kelgeri .

5) MADIKERI: Dassawal road, GT circle, Chikpet, Mysore road, Raja seat road, Kavli beedi, Ranipet, Convert junction, Mutton market, Mahadevpet, Bus stand, Mangalore road, Gaali bedu road, Habi falls road, Somwarpeta road.

2. *Performance measurement of Independent drive test in Karnataka circle*

SN	Parameter	AIRCEL	UNINOR	VODAFONE	RCOM	AIRTEL	IDEA	TATA
		Bidar		Kolar	Karwar	Dharwad		Madikeri
1.1	Call Attempts	119	85	115	139	114	103	33
1.2	Block Call Rate (<= 3%)	0.00%	0.00%	0.87%	0.72%	0.00%	0.62%	6.06%
1.3	Drop Call Rate (<= 2%)	0.00%	0.00%	0.00%	0.00%	0.88%	0.97%	0.00%
1.4	Percentage of Connections with good voice quality (>= 95%)	96.81%	96.23%	93.00%	95.93%	95.33%	97.03%	96.20%
1.5	Service Coverage							
	Indoor (>= -75dbm)	52.35	75.18	64.94	51.29	91.13	65.55	54.91
	In-Vehicle (>= -85dbm)	89.42	97.02	96.74	80.46	97.54	94.33	80.48
	Outdoor -in City (>= -95dbm)	94.19	99.22	99.91	96.26	100	99.25	100
1.6	Call Setup Success Rate (>= 95%)	100	100	99.13	99.28	100	99.38	93.94
1.7	Handover Success Rate	98.81	100	100	100	98.64	100	100

Graphical Representation:

	AIRCEL	UNINOR	VODAFONE	RCOM	AIRTEL	IDEA	TATA
Indoor (>= -75dbm)	52.35	75.18	64.94	51.29	91.13	65.55	54.91
In-Vehicle (>= -85dbm)	89.42	97.02	96.74	80.46	97.54	94.33	80.48
Outdoor -in City (>= -95dbm)	94.19	99.22	99.91	96.26	100	99.25	100
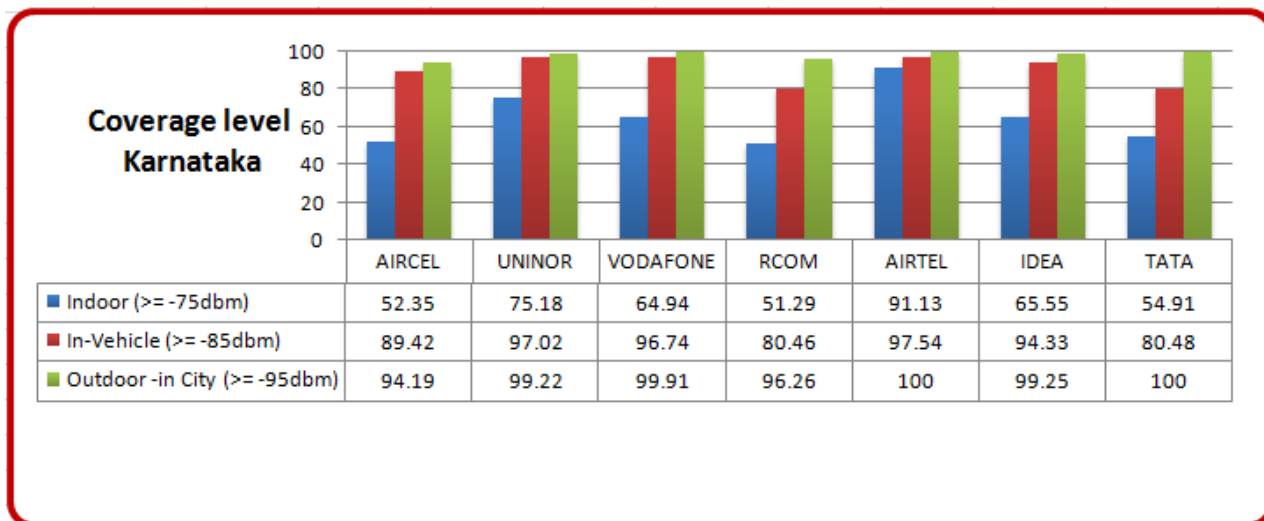
3. Critical Analysis

All the operators meeting the benchmark according to the guidelines given by TRAI, the service coverage is also found satisfactory. In the drive test, we considered high preference to railway stations, bus stations, Govt hospitals, crowded areas like market, Highways & major roads with in the town.

Name of Operator	AIRCEL	UNINOR	VODAFONE	RCOM	AIRTEL	IDEA	TATA
Name of the City	Bidar		Kolar	Karwar	Dharwad		Madikeri
No. of Sites covering the City	13	14	14	12	32	22	6

While in Bidar town, Aircel & Uninor are meeting all the benchmarks provided by TRAI. The Bidar town is covered with 13 no. of BTSs by Aircel & 14 no.of BTSs by Uninor. The drive test is done with in municipal boundary & when we are moving out from the boundary, the coverage levels are going weak as they don't have any continuity sites.

In Kolar town, the Vodafone is not meeting the benchmark for "good voice quality". The Kolar town is covered with 14 no.of sites by Vodafone.

Rcom GSM is meeting all the benchmarks in Karwar town. The drive test is done with in municipal boundary. Rcom GSM is covering the Karwar town with 12 no.of sites.

While in Dharwad town, both Airtel & Idea are meeting all the benchmarks provided by TRAI. Airtel is covering the town with 32 no. of sites & Idea is covering with 22 no. of sites.

In Madikeri town, TATA GSM is not meeting the benchmarks for "Block call rate", & "CSSR" parameters. TATA GSM is covering the Madikeri town with 6 no.of sites.

In Karnataka circle, all operators are providing the satisfactory coverage levels within the town municipal premises. When we going the outside the boundary, the coverage levels are becoming poor because there is no continuity sites in their respective cities.

(F). Compliance report (Status of service providers with respect to the QoS)

From live, month, PMR and Drive Tests findings, it can be concluded that on an average, performance of the operators in the service area (Karnataka) is by and large satisfactory for **Network Parameters**. However, the benchmark of "Worst affected BTSs due to downtime" is not met by BSNL, "worst affected cells >3% TCH drop" is not met by Aircel, Tata GSM, MTS.

Under **Customer Service Quality Parameter, "operator answered calls (voice-to-voice) within 60 seconds"** parameter is not meeting by Rcom GSM, Rcom CDMA.

Regarding **Metering/Billing Credibility** issues, Tata GSM & Tata CDMA are showing below benchmark values for Post-paid connections.

Regarding **Termination/Closure of Service** issues, Idea is showing below benchmark with a value of 97.5% i.e., beyond 7days.

During **Operated assisted Drive Tests**, the benchmark of "Good voice quality" is not meeting by Idea (Mandya, Mysore), Rcom GSM (Bijapur), Tata GSM (Mandya, Bijapur), Uninor (Bijapur), Vodafone (Mandya, Mysore).

The "Block Call rate" parameter is not meeting by BSNL (Mysore, Bijapur), Idea (bijapur), Tata GSM (bijapur).

The "Drop Call rate" parameter is not meeting by BSNL (Mysore), Idea (bijapur), Vodafone (bijapur).

Duting **Independent drive tests**, Vodafone is not meeting the benchmark of "Good voice quality".

Tata Docomo is not meeting the benchmarks of "Block Call rate", "Call setup success rate".