

**REPORT**  
**ON**  
**AUDIT & ASSESSMENT OF QUALITY OF SERVICE**  
**OF**  
**CELLULAR MOBILE TELEPHONE SERVICE**  
**FOR**  
**SOUTH ZONE – CHENNAI CIRCLE**

***Report Period: January 2012 – March 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 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 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.

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 Chennai 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. This has resulted in high value for 'Cell exceeding 3% TCH drop' parameter for some of the service providers.

## CHAPTER 2: EXECUTIVE SUMMARY

### I. Preface

This report highlights the findings for the audit & assessment of Quality of Service of Cellular Mobile Services in Chennai Circle in 1stquarter (January -March 2012). The primary data collection and verification of records (PMR data verification – quarterly) maintained by various operators was undertaken during the period July– September 2011.

Following are the various operators covered in Chennai 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
<b>GSM Operators</b>			
1	Aircel Ltd	February- 2012	1900-2000 hrs
2	Airtel Ltd	February- 2012	1900-2000 hrs
3	BSNL	February- 2012	1900-2000 hrs
4	Reliance Communication (GSM)	February- 2012	2000-2100 hrs
5	Tata Communications (GSM)	February- 2012	1900-2000 hrs
6	Vodafone	February- 2012	1900-2000 hrs
<b>CDMA Operators</b>			
7	Reliance Communication (CDMA)	February- 2012	1900-2000 hrs
8	Tata Communications (CDMA)	February- 2012	1900-2000 hrs

All the NSS and BSS systems were considered for audit and assessment for the TCBH hours of individual operators.

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

3 days Live Data Audit		Bench- mark	Aircel	Airtel	BSNL	Rcom GSM	TATA GSM	V-fone	Rcom CDMA	TATA CDMA
S/ N	Name of Parameter									
1	<b>Network Availability</b>									
	a) BTS Accumulated Downtime	<=2%	1.64%	0.02%	1.57%	0.16%	0.00%	0.08%	0.16%	0.00%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.00%	1.26%	0.00%	0.00%	0.00%	0.00%	0.00%
2	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR (Call Setup Success Rate)	>=95%	99.09%	99.10%	96.72%	99.84%	99.47%	99.61%	99.39%	99.53%
	b) SDCCH/PAGING congestion	<=1%	0.16%	0.12%	0.19%	0.01%	0.07%	0.07%	0.00%	0.00%
	c) TCH congestion	<=2%	0.57%	0.13%	0.60%	0.02%	0.03%	0.13%	0.12%	0.01%
3	<b>Connection maintenance (Retainability)</b>									
	a) CDR	<=2%	0.43%	0.73%	0.64%	0.28%	0.93%	0.52%	0.35%	0.20%
	b) Worst affected cells>3% TCH drop	<=3%	0.79%	0.90%	2.23%	0.03%	4.54%	1.07%	0.63%	0.00%
	c) Good voice quality	>=95%	98.54%	97.55%	97.07%	99.45%	98.25%	98.72%	98.72%	NA
4	<b>No of POI's having congestion &gt;0.5%</b>		0	0	0	0	0	0	0	0
5	<b>Response time to customers for assistance</b>									
	a) Accessibility of call centre/Customer Care	>=95%	98.47%	INCLUDE D IN TN CIRCLE REPORT	100%	INCLUDE D IN TN REPORT	99.36%	55.00%	98.80%	99.27%
	b) % call answered by operators(voice to voice) within 60 sec.	>=90%	93.78%		90.62%		95.44%	98.53%	95.24%	96.94%
<b>NA: Not Applicable, NP: Data Not Provided</b>										

From the 3 days live data assessment, it is found that all the operators are meeting the network parameters.

Deviations in Network Parameters found for the parameter "Worst affected cells>3% TCH drop" with Tata GSM (4.54%).

Deviations in Customer care Parameters found for the parameter "Accessibility of call centre/Customer Care >=95%" with Vodafone (55%).

One Month Data Audit		Bench- mark	Aircel	Airtel	BSNL	Rcom GSM	TATA GSM	V-fone	Rcom CDMA	TATA CDMA
S/N	Name of Parameter									
(A)	<b>Network Service Quality Parameter</b>									
1	<b>Network Availability</b>									
	a) BTS Accumulated Downtime	<=2%	1.98%	0.02%	0.73%	0.17%	0.13%	0.17%	0.26%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.04%	7.98%	0.10%	0.78%	1.51%	0.00%	0.00%
	c) Total no. of BTSs in the licensed service area		1932	2362	1904	1019	1532	1915	421	293
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		26653	352	9622	1199	1337	2319	758	29
	e) No. of BTSs having accumulated downtime of >24 hours in a month		0	1	152	1	12	29	0	0
2	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR (Call Setup Success Rate)	>=95%	98.92%	99.70%	97.06%	99.84%	99.46%	99.54%	99.35%	99.40%
	b) SDCCH/PAGING congestion	<=1%	0.25%	0.04%	0.33%	0.01%	0.08%	0.09%	0.00%	0.00%
	c) TCH congestion	<=2%	0.72%	0.07%	0.51%	0.01%	0.04%	0.18%	0.20%	0.02%
3	<b>Connection maintenance (Retainability)</b>									
	a) CDR	<=2%	0.46%	0.43%	0.63%	0.28%	0.86%	0.50%	0.34%	0.22%
	b) Worst affected cells>3% TCH drop	<=3%	1.19%	0.75%	2.55%	0.03%	4.27%	1.22%	0.63%	0.00%
	c) Good voice quality	>=95%	98.51%	98.98%	97.27%	99.45%	98.22%	98.73%	98.71%	NA
4	<b>No of POI's having congestion &gt;0.5%</b>		0	0	0	0	0	0	0	0
(B)	<b>Customer Service Quality Parameters</b>									
5	<b>Metering/billing credibility-Post paid</b>	<= 0.1%	0.02%	0.01%	0.05%		0.33%	0.02%	0.05%	0.14%
6	<b>Metering /billing credibility-Pre paid</b>	<= 0.1%	0.01%	0.02%	0.02%		0.00%	0.02%	0.02%	0.01%
7	<b>Resolution of billing/ charging complaints</b>	100% within 4 weeks	100%	100%	100%		100%	100%	100%	100%
	a) Period of applying credit/waiver/adjustment to the customer's account from the date of resolutions of complaints	<=1 week	100%	100%	100%		100%	100%	100%	100%
8	<b>Response time to customers for assistance</b>									
	a) Accessibility of call centre/Customer Care	>=95%	98.30%	INCLUDED IN TN CIRCLE REPORT	100%		99.36%	62.00%	99.20%	97.95%
	b) % call answered by operators(voice to voice) within 60 sec.	>=90%	81.63%	INCLUDED IN TN CIRCLE REPORT	92.51%		94.78%	98.46%	92.83%	95.82%
9	<b>Termination/closure of service</b>	<=7days	100%	100%	100%		100%	100%	100%	100%
10	<b>Time taken for refunds of deposits after closures.</b>	100% within 60 days	100%	100%	100%		98%	100%	100%	100%

NA: Not Applicable, NP: Data Not Provided

From the Month Data Assessment, it is found that all the operators are meeting the network parameters

Deviation in Network Parameters found in cases 1. "Worst affected BTSs due to downtime with BSNL (7.98%) & 2. "Worst affected cells>3% TCH drop" with Tata GSM (4.27%). Deviations in Customer care Parameters found in following cases: 1. "Metering/billing credibility-Post paid <= 0.1%" with Tata GSM (0.33%) & Tata CDMA (0.14%), 2. "Accessibility of call centre/Customer Care >=95%" with Vodafone (62%) & % call answered by operators (voice to voice) within 60 sec. (>=90%) with Aircel (81.63%) 3."Time taken for refunds of deposits after closures 100% within 60 days" with Tata GSM (98%).



### Operator-Assisted Drive Test

The Operator Assisted Drive Test was conducted in and around Chennai for all the operators. Route covered was about around 110Km and for all the operators the same route was followed. The speed limit of 30Km/hr was maintained throughout the Drive Test. In Chennai, zones were selected for covering different density areas (High, Medium & Low dense areas).

S/N	Parameter	City Name	Aircel	Airtel	BSNL	Idea	RCOM GSM	TATA GSM	Uninor	Vi-Con	V-fone	MTS	RCOM CDMA	TATA CDMA
			GSM Operators									CDMA Operators		
1.1	Blocked Call Rate (<=3%)	Chennai	1.91	0	0	0	0	0.59	0.67	1.14	2.13	0	0	0
1.2	Dropped Call Rate (<=2%)	Chennai	0	0	0	0	0	0	0	0	0	0	0	0
1.3	Percentage of connections with good voice quality (=>95%)	Chennai												
	(i) 0-4 (w/o frequency hopping)	Chennai										99.15	97.92	99.07
	(ii) 0-5 ( with frequency hopping)	Chennai	97.28	95.00	92.49	95.80	97.00	96.02	100	96.12	95.06			
1.4	Call Setup Success Rate (>=95%)	Chennai	98.09	100	100	96.93	100	99	99.33	98.86	97.87	100	100	100

Key observations as could be derived from the table are as under:

- "Percentage of connections with good voice quality (=>95%) benchmark is not met by BSNL.

All other parameters are found in order. For Idea though CSSR is 96.93% no blocked calls. This is due to sudden disconnection of ongoing call while changing to new log file from one cluster to other.

### -Independent Drive test (Not in this quarter)

## CHAPTER-3: AUDIT-PMR DATA VERIFICATION RESULTS

## I. Cellular Mobile Telephone Service

PMR		Bench- mark	Audit	Aircel	Airtel	BSNL	Rcom GSM	TATA GSM	V-fone	Rcom CDMA	TATA CDMA	
S/N	Name of Parameter			GSM Operators						CDMA Operators		
(A)	<b>Network Service Quality Parameter</b>											
1	<b>Network Availability</b>											
	BTS Accumulated Downtime	<=2%	Reported	0.80%	0.09%	0.30%	0.10%	0.03%	0.00%	0.16%	0.02%	
			Verified	0.80%	0.09%	0.30%	0.10%	0.03%	0.00%	0.16%	0.02%	
	Worst affected BTSs due to downtime	<=2%	Reported	0.92%	0.41%	1.53%	0.00%	0.02%	0.02%	0.00%	0.00%	
	Verified		0.92%	0.41%	1.53%	0.00%	0.02%	0.02%	0.00%	0.00%		
2	<b>Connection Establishment (Accessibility)</b>											
	CSSR (Call Setup Success Rate)	>=95%	Reported	97.79%	99.13%	98.67%	99.77%	97.17%	99.45%	99.71%	99.48%	
			Verified	97.79%	99.13%	98.67%	99.77%	97.17%	99.45%	99.71%	99.48%	
	SDCCH/PAGING congestion	<=1%	Reported	0.33%	0.11%	0.20%	0.04%	0.18%	0.17%	0.01%	0.00%	
			Verified	0.33%	0.11%	0.20%	0.04%	0.18%	0.17%	0.01%	0.00%	
	TCH congestion	<=2%	Reported	0.79%	0.13%	0.23%	0.07%	0.17%	0.15%	0.02%	0.01%	
	Verified		0.79%	0.13%	0.23%	0.07%	0.17%	0.15%	0.02%	0.01%		
3	<b>Connection maintenance (Retainability)</b>											
	CDR	<=2%	Reported	0.44%	0.83%	0.67%	0.22%	0.81	0.56%	0.37%	0.16%	
			Verified	0.44%	0.83%	0.67%	0.22%	0.81	0.56%	0.37%	0.16%	
	Worst affected cells>3% TCH drop	<=3%	Reported	0.54%	0.50%	1.73%	0.40%	0.92%	1.58%	0.89%	0.00%	
			Verified	0.54%	0.50%	1.73%	0.40%	0.92%	1.58%	0.89%	0.00%	
	Good voice quality	>=95%	Reported	98.50%	97.45%	100%	99.39%	98.02%	98.81%	99.23%	99.48%	
			Verified	98.50%	97.45%	100%	99.39%	98.02%	98.81%	99.23%	99.48%	
	4	<b>No. of POI's having congestion &gt;0.5%</b>	<=0.5%	Reported	0	0	0	0	0	0	0	0
Verified				0	0	0	0	0	0	0	0	
(B)	<b>Customer Service Quality Parameters</b>											
5	<b>Metering/billing credibility-Post paid</b>	<= 0.1%	Reported	0.05%	0.01%	0.10%	0.10%	0.00%	0.01%	0.05%	0.00%	
			Verified	0.05%	0.01%	0.10%	0.10%	0.00%	0.01%	0.05%	0.00%	
6	<b>Metering /billing credibility-Pre paid</b>	<= 0.1%	Reported	0.03%	0.04%	0.10%	0.08%	0.00%	0.04%	0.02%	0.01%	
			Verified	0.03%	0.04%	0.10%	0.08%	0.00%	0.04%	0.02%	0.01%	
7	<b>Resolution of billing/ charging complaints</b>	100% within 4 weeks	Reported	100%	100%	100%	100.00%	0.00%	100.00%	100.00%	100.00%	
			Verified	100%	100%	100%	100.00%	0.00%	100.00%	100.00%	100.00%	
	Period of applying credit/waiver/adjustment to the customer's account from the date of resolutions of complaints	<=1 week	Reported	100%	100%	100%	100.00%	0.00%	100.00%	100.00%	100.00%	
			Verified	100%	100%	100%	100.00%	0.00%	100.00%	100.00%	100.00%	
8	<b>Response time to customers for assistance</b>											
		Accessibility of call centre/Customer Care	>=95%	Reported	100%	INCLU DED IN	99%	99.12%	0.00%	100.00%	99.73%	0.00%
				Verified	100%		99%	99.12%	0.00%	100.00%	99.73%	NA

	% call answered by operators(voice to voice) within 60 sec.	$\geq 90\%$	Reported	90.63%	<b>TN REPOR TS</b>	86%	74.00%	0.00%	94.75%	89.23%	0.00%
			Verified	90.63%		86%	74.00%	0.00%	94.75%	89.23%	NA
<b>9</b>	<b>Termination/closure of service</b>										
	No. of requests for Termination / Closure of service complied within 7 days during the quarter	$\leq 7$ days	Reported	100%	100%	100%	100%	0.00%	100.00%	100.00%	0.00%
			Verified	100%	100%	100%	100%	0.00%	100.00%	100.00%	NA
<b>10</b>	<b>Time taken for refunds of deposits after closures.</b>	<i>100% within 60 days</i>	Reported	100%	100%	100%	100%	0.00%	100.00%	100.00%	0.00%
			Verified	100%	100%	100%	100%	0.00%	100.00%	100.00%	NA

**Critical Analysis (PMR Verification):**

The figures proved by all the operators match the figures obtained on verification except very minor changes.

## CHAPTER-4: DETAILED FINDINGS & ANALYSIS

### I. Cellular Mobile Telephone Service.

#### (A) MSC Audit

##### (1) 3 Days Live measurement Data Assessment & Summarized Findings

S/N	Name of Parameter	Benchmark	Aircel	Airtel	BSNL	Rcom GSM	TATA GSM	V-fone	Rcom CDMA	TATA CDMA
			GSM Operators							CDMA Operators
<b>A</b>	<b>Network Service Quality Parameter</b>									
<b>1</b>	<b>Network Availability</b>									
	a) BTS Accumulated Downtime	<=2%	1.64%	0.02%	1.57%	0.16%	0.00%	0.08%	0.16%	0.00%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.00%	1.26%	0.00%	0.00%	0.00%	0.00%	0.00%
	c) Total no. of BTSs in the licensed service area		1932	2362	1904	1019	1532	1915	421	293
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		2277	31	2150	114	0	115	50	0
	e) No. of BTSs having accumulated downtime of >24 hours in a month		0	0	24	0	0	0	0	0
<b>1</b>	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR	>=95%	99.09%	99.10%	96.72%	99.84%	99.47%	99.61%	99.39%	99.53%
	b) SDCCH/PAGING congestion	<=1%	0.16%	0.12%	0.19%	0.01%	0.07%	0.07%	0.00%	0.00%
	c) TCH congestion	<=2%	0.57%	0.13%	0.60%	0.02%	0.03%	0.13%	0.12%	0.01%
<b>2</b>	<b>Connection maintenance</b>									
	a) CDR	<=2%	0.43%	0.73%	0.64%	0.28%	0.93%	0.52%	0.35%	0.20%
	b) Cells having > 3% TCH drop	<=3%	0.79%	0.90%	2.23%	0.03%	4.54%	1.07%	0.63%	0.00%
	c) Good voice quality	>=95%	98.54%	97.55%	97.07%	99.45%	98.25%	98.72%	98.72%	NA
	d) No. of cells > 3% TCH drop		42	52	123	1	191	56	8	0
	e) Total no. of cells in the network		5,284	5,768	5,523	3,057	4,211	5,230	1,263	843
<b>3</b>	<b>No of POI's having congestion &gt;0.5%</b>		0	0	0	0	0	0	0	0
	a) Name of POI not meeting the benchmark		Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
	b) Total No. of call attempts on POI (Avg.)		1,578,887	2,752,011	1,357,639	31,220	54,000	1,167,751	157,905	109,910

	c) Total traffic served on POI (Erlang) (Avg.)		31,882	79,811	56,173	522	1,253	48,086	6,436	2,968
	d) Total No. of circuits on POI		56,342	113,499	222,446	2,292	2,828	85,463	17,793	7,640
	e) Total number of working POI Service Area wise		78	135	81	NP	4	27	NP	41
	f) Equipped Capacity of Network in respect of Traffic in erlang		131,434	188,790	91,128	36,000	57,617	82,435	56,000	5,083
	g) Total traffic handled in TCBH in erlang		62,619	118,520	30,287	NP	57,153	66,192	NP	5,013
<b>(B)</b>	<b>Customer Service Quality Parameters</b>									
<b>4</b>	<b>Response time to customers for assistance</b>									
	a) Accessibility of call centre	>=95%	98.47%	INCLUDED IN TN CIRCLE REPORT	100%	INCLUDED IN TN REPORT	99.36%	55.00%	98.80%	99.27%
	b) % of call answered by operators(voice to voice) within 60 sec	>=90%	93.78%		90.62%		95.44%	98.53%	95.24%	96.94%
	c) No. of call attempts to call centre / customer care nos. during TCBH (Avg)		10,765		981		40,773	8,574	5,521	1,763
	d) No. of calls connected and answered successfully to call centre / customer care nos. during TCBH (Avg)		10,095		889		38,914	8,448	5,258	1,709
	<b>NA: Not Applicable, NP: Data Not Provided</b>									

### Parameter-wise Findings (Live Data Assessment):

The parameter wise key takeout's for the Cellular Mobile Telephone Services providers in Chennai Service Area are as given below:-

- **BTS accumulated downtime (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values lying between 0.0% and 1.64%.
- **Worst affected BTSs due to downtime (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values lying between 0% and 1.26%.
- **Call Setup Success Rate (CSSR) (benchmark  $\geq 95\%$ ):** All operators are meeting the benchmark with values lying between 96.72% and 99.84%.
- **SDCCH/PAGING Channel congestion (benchmark  $\leq 1\%$ ):** All operators are meeting the benchmark with values lying between 0.00% and 0.19%.  
*Note: CDMA operators have provided the data for Paging Channel congestion and GSM Operators provided SDCCH Channel congestion.*
- **TCH congestion (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values lying between 0.01% and 0.60%.
- **Call Drop Rate (CDR) (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values lying between 0.20% and 0.93%.
- **Cell exceeding 3% TCH drop (benchmark  $\leq 3\%$ ):** All the operators are satisfying the benchmark except Tata GSM (4.54%) with values lying between 0% and 2.23%.
- **Connections with good voice quality (benchmark  $\geq 95\%$ ):** GSM operators are meeting the benchmark with values lying between 97.07% and 99.45%. For this parameter, Tata CDMA values are not generated.
- **POI Congestion (benchmark  $\leq 0.5\%$ ):** All the operators are meeting the benchmark. 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.
- **%age of call answered by operator (electronically) (benchmark  $>95$ ):** All the operators are meeting the benchmark except Vodafone (55%) with values lying between 98.47% and 100%. For Airtel & Rcom GSM it is included in TN reports.
- **%age of call answered by operator (Voice to voice) (benchmark  $>90\%$ ):** All the operators are meeting the benchmark with values lying between 90.62% and 98.53%. For Airtel & Rcom GSM it is included in TN reports.

## (2) One Month Audit Data Report & Summarized Findings

S/N	Name of Parameter	Bench-mark	Aircel	Airtel	BSNL	Rcom GSM	TATA GSM	V-fone	Rcom CDMA	TATA CDMA
			GSM Operators						CDMA Operators	
(A)	<b>Network Service Quality Parameter</b>									
1	<b>Network Availability</b>									
	a) BTS Accumulated Downtime	<=2%	1.98%	0.02%	0.73%	0.17%	0.13%	0.17%	0.26%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.04%	7.98%	0.10%	0.78%	1.51%	0.00%	0.00%
	c) Total no. of BTSs in the licensed service area		1,932	2,362	1,904	1,019	1,532	1,915	421	293
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		26,653	352	9,622	1,199	1,337	2,319	758	29
	e) No. of BTSs having accumulated downtime of >24 hours in a month		0	1	152	1	12	29	0	0
2	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR (Call Setup Success Rate)	>=95%	98.92%	99.70%	97.06%	99.84%	99.46%	99.54%	99.35%	99.40%
	b) SDCCH/PAGING congestion	<=1%	0.25%	0.04%	0.33%	0.01%	0.08%	0.09%	0.00%	0.00%
	c) TCH congestion	<=2%	0.72%	0.07%	0.51%	0.01%	0.04%	0.18%	0.20%	0.02%
3	<b>Connection maintenance (Retainability)</b>									
	a) CDR	<=2%	0.46%	0.43%	0.63%	0.28%	0.86%	0.50%	0.34%	0.22%
	b) Worst affected cells>3% TCH drop	<=3%	1.19%	0.75%	2.55%	0.03%	4.27%	1.22%	0.63%	0.00%
	c) Good voice quality	>=95%	98.51%	98.98%	97.27%	99.45%	98.22%	98.73%	98.71%	NA
	d) Total No. of cells exceeding 3% TCH drop (call drop)		63	43	141	1	180	64	8	0
	e) Total no. of cells in the network		5,284	5,768	5,523	3,057	4,211	5,230	1,263	843
4	<b>No of POI's having congestion &gt;0.5%</b>		0	0	0	0	0	0	0	0
	a) Name of POI not meeting the benchmark		NA	NA	NA	NA	NA	NA	NA	NA
	b) Total No. of call attempts on POI (Avg.)		1,541,001	2,822,276	1,332,738	34,498	51,368	1,749,349	151,572	99,970
	c) Total traffic served on POI (Erlang) (Avg.)		31,665	65,385	54,916	560	1,001	39,092	6,051	2,714
	d) Total No. of circuits on POI		56,342	113,499	222,446	2,292	3,852	87,248	17,793	7,766
	e) Total number of working POI Service Area wise		78	135	81	NP	4	27	NP	41
5	<b>Network Data</b>									
	a) Equipped Capacity of Network Erlang		131,434	188,790	91,128	36,000	57,617	82,435	56,000	5,083
	b) Total traffic in TCBH in Erlang (Avg.)		62,396	121,101	29,252	34,974	57,288	64,952	23,431	4,684
	c) Total no. of customers served (as per VLR) on last day of the month		1,799,432	3,222,302	908,764	1,061,114	678,292	1,786,745	714,002	440,507

(B)	Customer Service Quality Parameters										
6	<b>Metering/billing credibility-Post paid</b>	<= 0.1%	0.02%	0.01%	0.05%		0.33%	0.02%	0.05%	0.14%	
	a) No. of bills issued during the period		335,399	601,326	138,778		38,205	330,814	261,025	176,329	
	b) No. of bills disputed including billing complaints during the period		59	54	64		127	55	141	252	
7	<b>Metering /billing credibility-Pre paid</b>	<= 0.1%	0.01%	0.02%	0.02%		0.00%	0.02%	0.02%	0.01%	
	a) No. of charging / credit / validity complaints during the quarter		300	605	279		186	385	213	31	
	b) Total no. of pre-paid customers at the end of the quarter		4,237,021	3,272,923	1,483,948		4,535,574	1,883,647	971,260	312,730	
8	<b>Resolution of billing/ charging complaints</b>	100% within 4 weeks	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		359	3,614	343		313	440	354	283	
	b) Total no. of billing (post paid) and charging, credit / validity (pre paid) complaints received during the quarter		359	3,614	343		313	440	354	283	
	c) No. of billing complaints (post paid) and charging, credit/ validity complaints (pre paid) resolved in favour of the customer during the quarter		340	659	323		4	440	156	1	
	d) No. of complaints disposed on account of not considered as valid complaints during the quarter		19	2,955	20	INCLUDE D IN TN CIRCLE REPORT	309	0	198	282	
	e) Period of applying credit/waiver/adjustment to the customer's account from the date of resolutions of complaints	<=1 week	100%	100%	100%		100%	100%	100%	100%	
9	<b>Response time to customers for assistance</b>										
	a) Accessibility of call centre/Customer Care	>=95%	98.30%		100%			99.36%	62.00%	99.20%	97.95%
	b) % call answered by operators(voice to voice) within 60 sec.	>=90%	81.63%	INCLUDE D IN TN CIRCLE REPORT	92.51%			94.78%	98.46%	92.83%	95.82%
	c) Total no. of call attempts to call centre & customer care nos. during TCBH (Avg.).		9,724		1,162			42,292	8,118	5,568	2,083
	d) No. of calls connected and answered successfully to call centre & customer care nos. during TCBH (Avg.).		7,938		1,075		40,086	7,993	5,169	1,996	
						100%	100%	100%	100%		
10	<b>Termination/closure of service</b>	<=7days	100%		100%	100%					
	a) Total No. of requests for Termination / Closure of service received during the quarter		1,617	4,583	790		650	3,863	969	2,418	
	b) No. of requests for Termination / Closure of service complied within 7 days during the quarter		1,617	4,583	790		650	3,863	969	2,418	
11	<b>Time taken for refunds of deposits after closures.</b>	100% within 60 days	100%	100%	100%		98%	100%	100%	100%	
NA: Not Applicable, NP: Data Not Provided											



## Parameter-wise Findings (Month Data Assessment):

The parameter wise key takeout's for the Cellular Mobile Telephone Services providers in Chennai Service Area are as given below:-

- **BTS accumulated downtime (benchmark <=2%):** All operators are meeting the benchmark with values lying between 0.01% and 1.98%.
- **Worst affected BTSs due to downtime (benchmark <= 2%):** All operators are meeting the benchmark except BSNL (7.98%) with values lying between 0% and 1.51%.
- **Call setup success rate (benchmark >= 95%):** All operators are meeting the benchmark with values lying between 97.06% and 99.84%.
- **SDCCH/PAGING Channel congestion (benchmark <= 1%):** All operators are meeting the benchmark with values lying between 0.00% and 0.33%. Reliance CDMA & Tata CDMA have not provided the data.  
*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 0.01% and 0.72%.
- **Call drop rate (benchmark <= 2%):** All operators are meeting the benchmark with values lying between 0.22% and 0.86%.
- **Cell exceeding 3% TCH drop (benchmark <= 3%):** All the operators are satisfying the benchmark with value in between 0% and 2.55% except Tata GSM with values (4.27%).
- **Connections with good voice quality (benchmark >= 95%):** CDMA service providers have declared that the parameter is not system generated. All operators are meeting the benchmark with values lying between 97.27% and 99.45%.
- **POI Congestion (benchmark <= 0.5%):** All the operators are meeting the benchmark. 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.
- **%age of call answered by operator (electronically) (benchmark >95%):** Vodafone (62%) is not meeting the benchmark.
- **%age of call answered by operator (Voice to voice) (benchmark >90%):** Aircel (81.63%) is not meeting the benchmark.
- **Metering and billing credibility-Post paid (benchmark <= 0.1%):** Tata GSM (0.33%) & Tata CDMA (0.14%) are not meeting the benchmark.
- **Metering and billing credibility-Pre paid (benchmark <= 0.1%):** All the operators are meeting the meeting the benchmark.
- **Resolution of billing/ charging complaints (benchmark 100% within 4 weeks):** All operators are meeting the benchmark.
- **Termination/Closure of service (Benchmark <= 7 days):** All operators have satisfied the benchmark.
- **Time taken for refunds of deposits after closures (benchmark 100% within <=60 days):** Tata GSM (98%) is not meeting the benchmark. Rests of the operators are meeting the benchmark.

### 3) Sample Coverage

Switches/BSC/BTS details of operators:

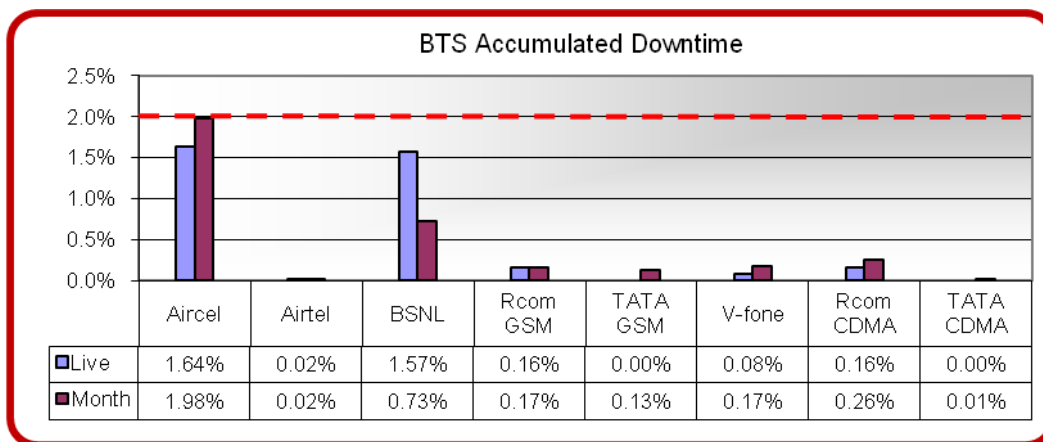
Sl.	Name of Service Provider	No. of MSC/GMSC	No. of BSC	No. of BTS
<b>GSM Operators</b>				
1	Aircel Ltd	12	16	1932
2	Airtel Ltd	17	25	2362
3	BSNL	6	28	1904
4	Reliance Communication (GSM)	1	4	1019
5	Tata Communications (GSM)	2	10	1532
6	Vodafone	4	34	1915
<b>CDMA Operators</b>				
7	Reliance Communication (CDMA)	3	-	421
8	Tata Communications (CDMA)	1	2	293

### 4) Performance (Graphical Representation)

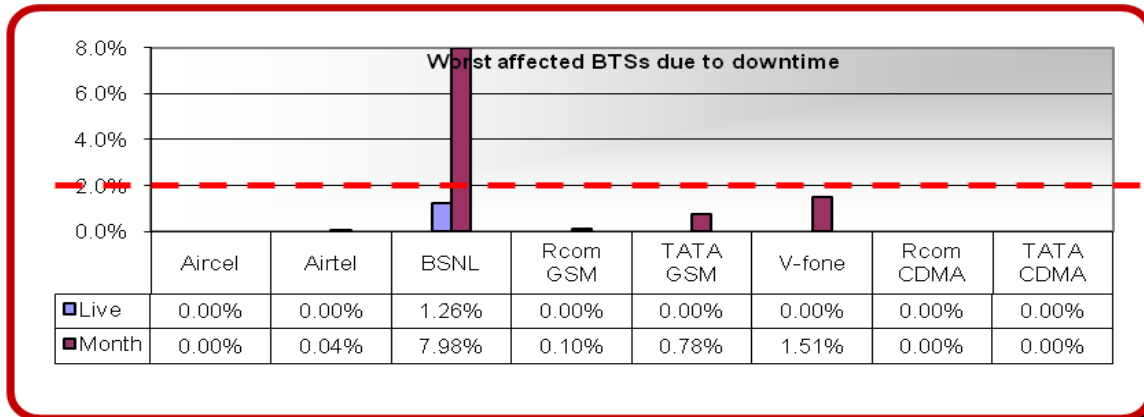
**Comparison between Live measurements and One month data Audit – Cellular Mobile Telephone Services**

#### A) NETWORK PERFORMANCE

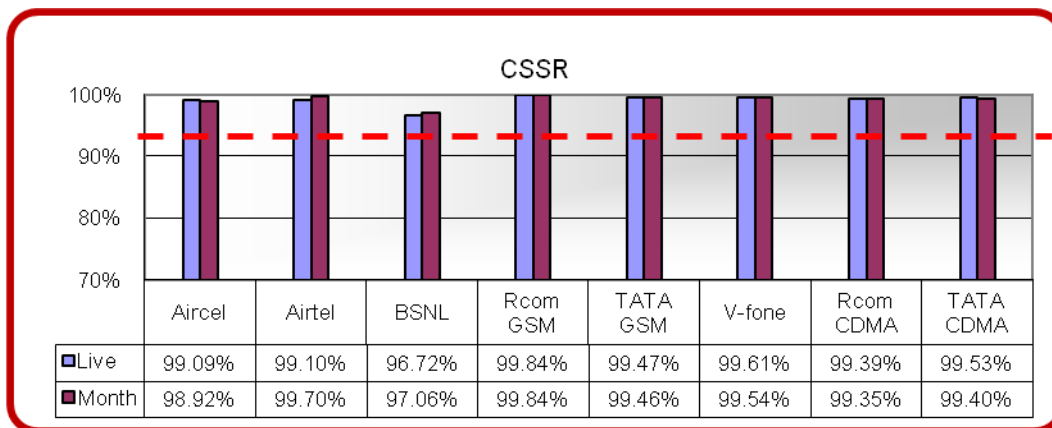
**BTS Accumulated Downtime:** All operators are meeting the TRAI benchmarks ( $\leq 2\%$ ) for both one month data and 3 days live data taken in the month of audit.



**Worst affected BTSs due to downtime:** All operators are meeting the TRAI benchmarks ( $\leq 2\%$ ) for both one month data and 3 days live data taken in the month of audit except for BSNL in month audit.

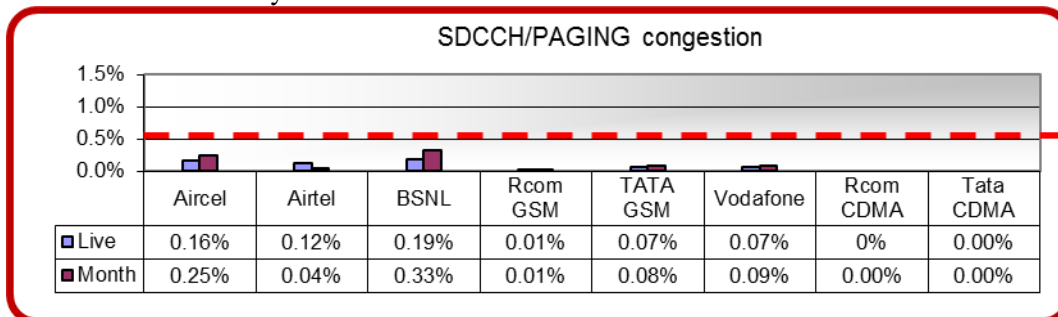


**Call Setup Success Rate (CSSR):** All operators are meeting the TRAI benchmarks ( $\geq 95\%$ ) for Both one month data and 3 days live data taken in the month of audit

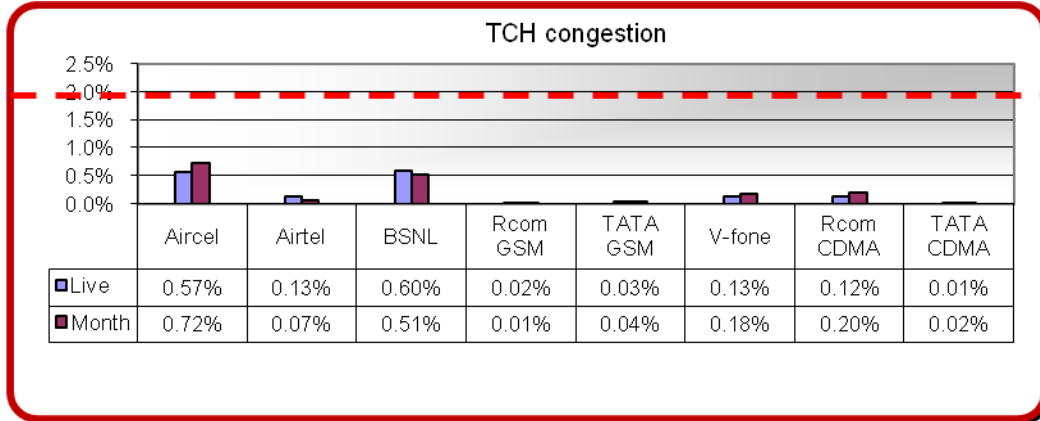


**Blocked call rate:**

**SDCCH congestion:** All operators are meeting the TRAI benchmarks ( $\leq 1\%$ ) for both one month. Data and 3 days live data taken in the month of audit.

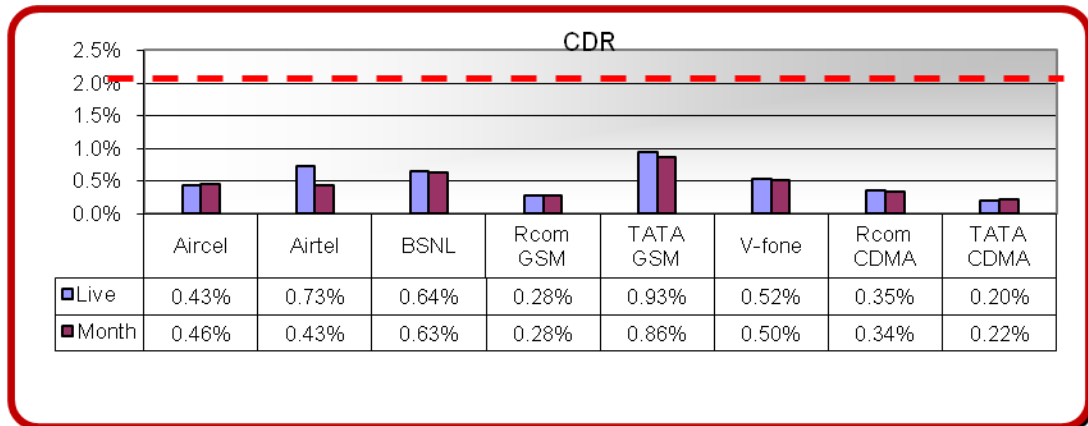


**TCH congestion:** All operators are meeting the TRAI benchmarks ( $\leq 2\%$ ) for both one month data and 3 days live data taken in the month of audit.

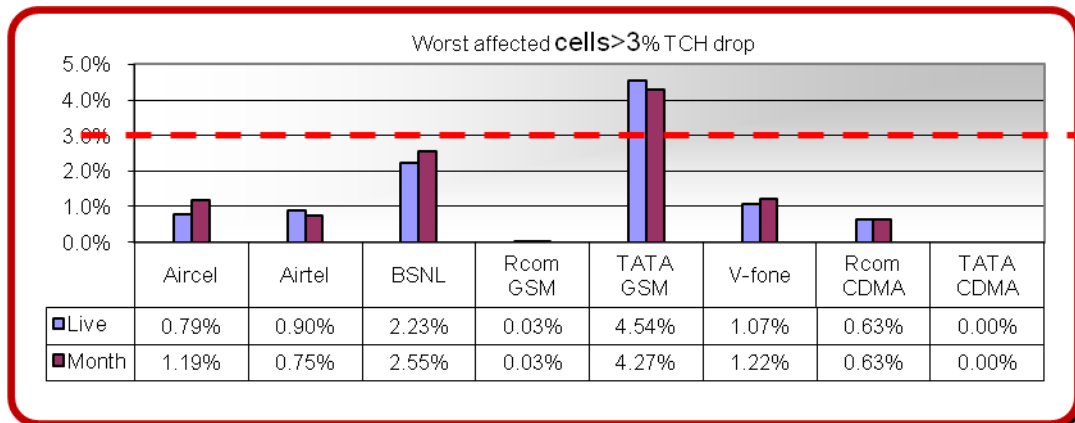


**Connection Maintainability (Retainability):**

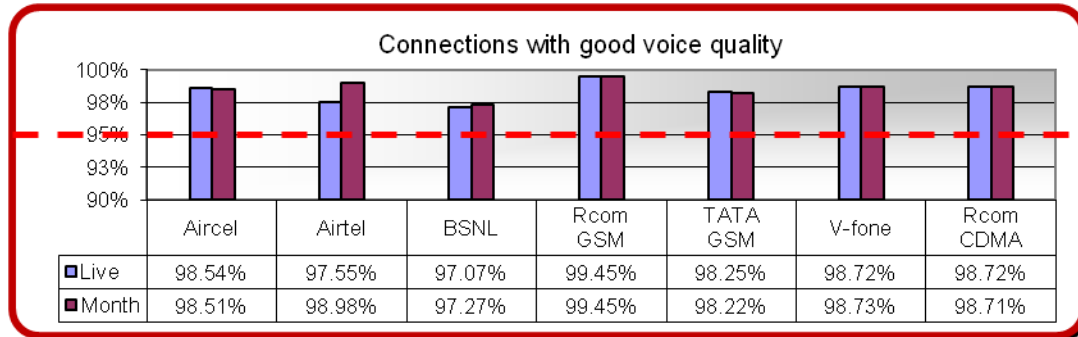
**Call Drop Rate (CDR):** All operators are meeting the TRAI benchmarks ( $\leq 2\%$ ) for both one month data and 3 days live data taken in the month of audit.



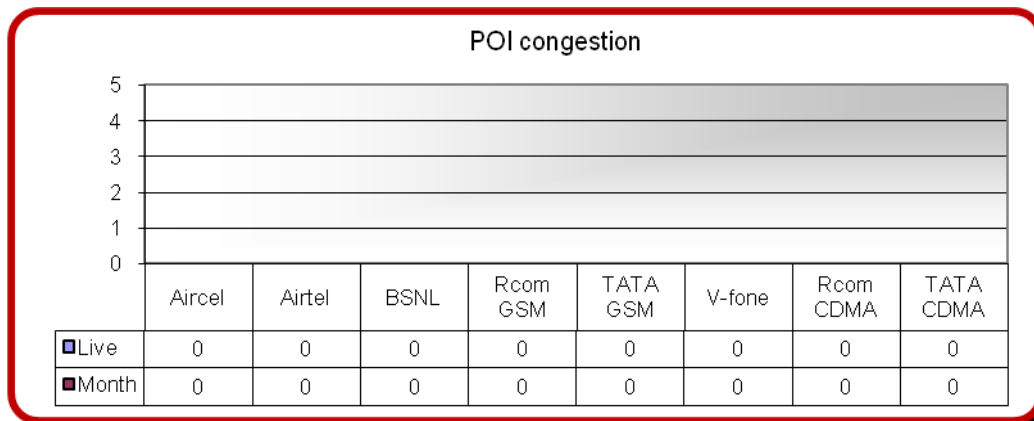
**Worst affected Cell exceeding 3% TCH Drop:** For both live and month data, all the operators are meeting the benchmark except Tata GSM.



**Percentage of connections with good voice quality (benchmark  $\geq 95\%$ ):** All operators are meeting the TRAI benchmarks ( $\geq 95\%$ ) for both one month data and 3 days live data taken in the month of audit. For this parameter, Tata CDMA value is not system generated.



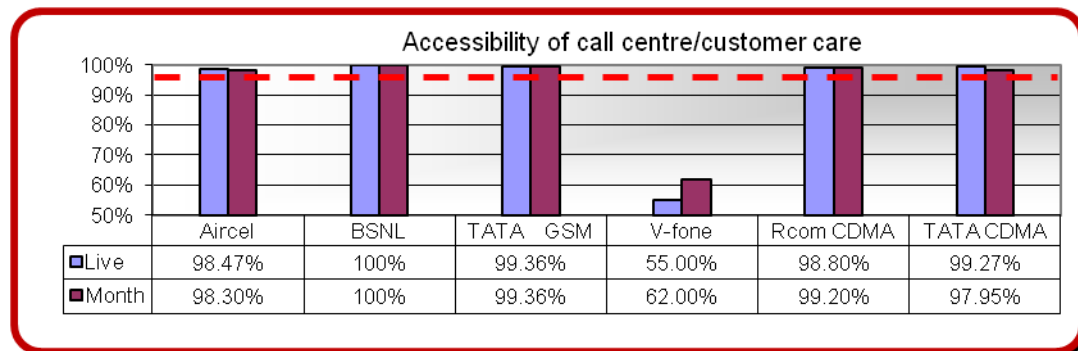
**POI Congestion:** All operators are meeting the TRAI benchmarks ( $\geq 0.5\%$ ) in both live & month data.



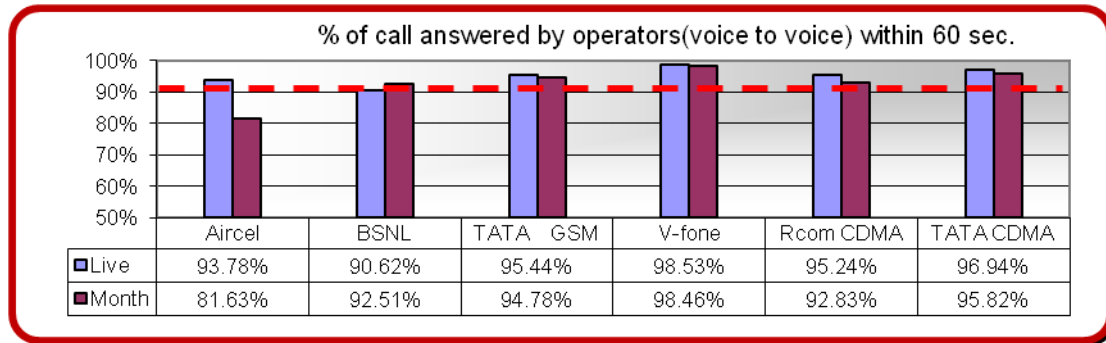
**B) CUSTOMER SERVICE QUALITY PARAMETERS**

**Response time to the customer for assistance:**

**Percentage of call answered (Electronically):** Vodafone for live & month is not meeting the benchmark. Rests of the operators are meeting the benchmark. Reports of Airtel & Rcom GSM are included in TN circle.



**Percentage of call answered by operators (Voice to voice) within 60 sec:** AIRCEL is not meeting the benchmark ( $\geq 90\%$ ) for month data taken in the month of audit. Reports of Airtel & Rcom GSM are included in TN circle.



### 5) Critical Analysis

From the data tables it is found that all the operators are meeting the network parameters except for BSNL in “Worst affected BTSs due to downtime” for month data audit and Tata GSM for both live and month in “Worst affected cells>3% TCH drop”.

In case of POI congestion, all the operators are found to be performing very well in terms of meeting the benchmark ( $\leq 0.5\%$ ).

Performance related to customer care data is found to be satisfactory.

For the parameter “Metering/billing credibility-Post paid” Tata GSM & Tata CDMA are not meeting the benchmark.

For the parameter “accessibility of call centre” Vodafone for 3 days live and month data audit is not meeting the benchmark.

For the parameter “% call answered by operators(voice to voice) within 60 sec” except for Aircel in month data audit all other operators are meeting the. Reports of Airtel & Rcom GSM are included in TN circle.

For the parameter “Time taken for refunds of deposits after closures” Tata GSM is not meeting the benchmark

**(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 based on live calling for billing complaints**

Calling Operator	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom CDMA	Tata CDMA
Total No. of Calls Attempted	125	120	115	NA	109	105	110	119
Total No. of calls Answered	100	100	100	NA	100	100	100	100
Cases resolved with 4 weeks	100	100	100	NA	100	100	100	100
%age of cases resolved	100%	100%	100%	NA	100%	100%	100%	100%

**Note:** During the verification in some cases we could not get answer from subscriber; however those whom we contacted have confirmed their complaint and subsequently solved by the operator. Rcom GSM complaints included in Tamil Nadu.

**3) Live calling to call centre**

Calling Operator	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom CDMA	Tata CDMA
Call Centre No.	121	121	1503	333	*121	111	*333	*121
Total No. of Calls Attempted	100	100	100	100	100	100	100	100
Total No. of calls connected to IVR	100	100	100	100	100	100	100	100
Calls got connected to agent within 60 Sec	100	100	89	100	100	100	100	100
%age of calls got answered	100%	100%	89%	100%	100%	100%	100%	100%

**NOTE:** Calls were made from the Operators place. Except BSNL (89%) for all other operators 100% cases connected within 60seconds. 100 calls total made i.e. 50 each for **Prepaid and Post paid**.

#### 4) Level 1 Live calling

Emergency calls were made at Operators Office at Chennai for each category and for 100, 101 and 108 calls made from different part of Chennai. Below given is the success rate.

Emergency no.	No. of calls made	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom CDMA	Tata CDMA	
100	3	3	3	3	3	3	3	3	3	<b>Police</b>
101	3	3	3	3	3	3	3	3	3	<b>Fire service</b>
102	1	1	1	1	1	1	1	1	1	<b>Ambulance</b>
108	3	3	3	3	3	3	3	3	3	<b>Emergency Ambulance</b>
139	7	7	7	7	7	7	7	7	7	<b>Railway Enquiry</b>

#### 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 confirmed that the operators had made refunds / adjustments to subscribers in 100% cases as claimed by their records.

Call centre test calls were made 100 numbers for each service Pre paid and Post paid from operator's office in Chennai. It was found that all the operators are achieving 100% except BSNL (89%).

Level 1 service calls were made from operator's office in Chennai and city area. It was found that these numbers were active and working as per requirement.



**(C) Inter operator call assessment****(1) Sample coverage**

A sample of 2x50 test calls per Service Providers within the licensed service area (Chennai Circle) were made between 1900 to 2000 hrs so that TCBH hours for all the operators were covered.

**(2) Performance based on live measurement**

<b>Calling Operator</b>	<b>Aircel</b>	<b>Airtel</b>	<b>BSNL</b>	<b>Rcom GSM</b>	<b>Tata GSM</b>	<b>V-fone</b>	<b>Rcom GSM</b>	<b>Tata CDMA</b>
<b>Aircel</b>	-	100%	100%	100%	100%	100%	100%	100%
<b>Airtel</b>	100%	-	100%	100%	100%	100%	100%	100%
<b>BSNL</b>	100%	99%	-	100%	100%	100%	100%	100%
<b>Rcom GSM</b>	100%	100%	100%	-	100%	100%	100%	100%
<b>Tata GSM</b>	100%	100%	100%	100%	-	100%	100%	100%
<b>V-fone</b>	100%	100%	99%	100%	100%	-	100%	100%
<b>Rcom CDMA</b>	100%	100%	100%	100%	100%	100%	-	100%
<b>Tata CDMA</b>	100%	100%	100%	100%	100%	100%	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 in Chennai for all the operators. Route covered was 200Km on city areas within the speed limit of 30Km/hr.

**DRIVE TEST LOCATIONS**

**CHENNAI CIRCLE:**

HIGH DENSE : PH ROAD, ANNA NAGAR, KOYEMBEDU, VADAPALANI, KK NAGAR, EKKATUTHANGAL, KATHIPARA, MOUNT ROAD, T.NAGAR, GREAMS ROAD, EGMORE

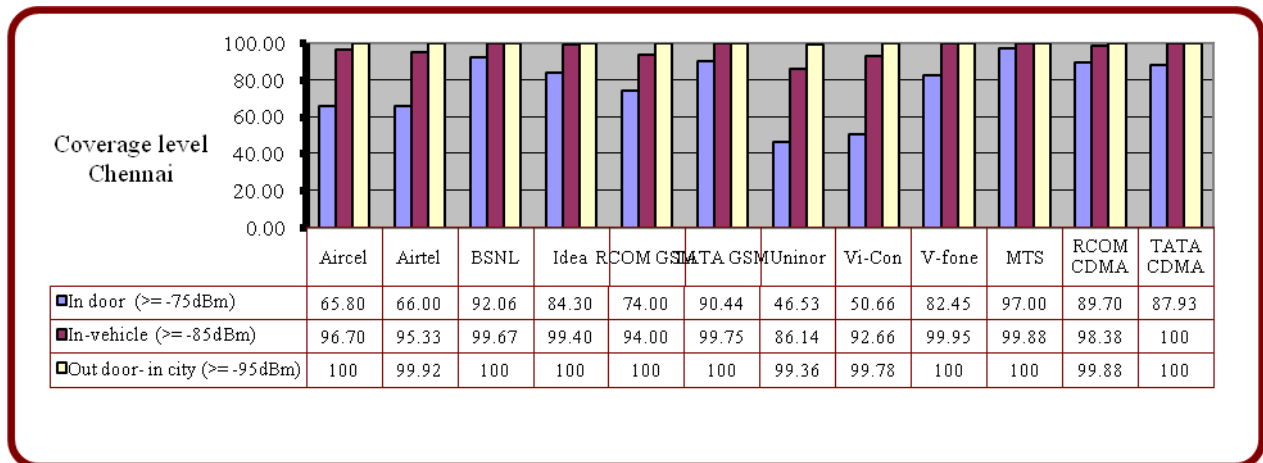
MEDIUM DENSE : ALANDUR, PALLAVARAM, TAMBARAM, VELACHERY, TARAMANI, THIRUVANMIYUR, ADYAR

LOW DENSE : VANDALUR, SELAIYUR, MEDAVAKKAM, PALLIKARANAI

## Performance (for the respective city)

SN	Parameter	City Name	Aircel	Airtel	BSNL	Idea	Rcom GSM	TATA GSM	Uninor	Vi-Con	V-fone	MTS	RCOM CDMA	TATA CDMA
			GSM Operators									CDMA Operators		
1.1	Call Attempts (in Nos.)	Chennai	157	157	182	163	187	170	149	176	141	186	162	180
1.2	Blocked Call Rate (<=3%)	Chennai	1.91	0	0	0	0	0.59	0.67	1.14	2.13	0	0	0
1.3	Dropped Call Rate (<=2%)	Chennai	0	0	0	0	0	0	0	0	0	0	0	0
1.4	Percentage of connections with good voice quality (=>95%)	Chennai												
	(i) 0-4 (w/o frequency hopping)	Chennai										99.15	97.92	99.07
	(ii) 0-5 ( with frequency hopping)	Chennai	97.28	95.00	92.49	95.80	97.00	96.02	100	96.12	95.06			
1.5	Service Coverage	Chennai												
	In door (>= -75dBm) (in %)	Chennai	65.80	66.00	92.06	84.30	74.00	90.44	46.53	50.66	82.45	97.00	89.70	87.93
	In-vehicle (>= -85dBm)(in %)	Chennai	96.70	95.33	99.67	99.40	94.00	99.75	86.14	92.66	99.95	99.88	98.38	100
	Outdoor- in city (>= -95dBm)(in %)	Chennai	100	99.92	100	100	100	100	99.36	99.78	100	100	99.88	100
1.6	Call Setup Success Rate (>=95%)	Chennai	98.09	100	100	96.93	100	99.41	99.33	98.86	97.87	100	100	100

## Graphical Representation



### (3) Critical Analysis

The drive test data was found to be satisfactory for most of the operators. However, only for the parameter “Percentage of connections with good voice quality ( $\Rightarrow 95\%$ )” BSNL did not meet the bench mark

### (E) Independent Drive Test

1) Not conducted for this quarter.

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

From live, month and PMR findings, it can be concluded that on an average, performance of the operators in the service area (Chennai) is satisfactory for **Network Parameters**. Operators have (MEANING) parameters like BTS Accumulated Downtime & Worst affected cells  $> 3\%$  TCH drop.

**POI congestion** is found to be satisfying for all the operators for both month and live measurement.

Under **Customer Service Quality** section, benchmark for the parameter “Accessibility of call centre/Customer Care” it is found satisfying except for Vodafone. All the operators have been requested to maintain effective call centre response to customers.

Regarding **Metering/Billing Credibility** most of the operators are meeting the benchmark except TATA GSM & CDMA in Post-Paid services.

From Drive **Tests**, it is found that overall performance of the operators is good. However, only in parameter “Percentage of connections with good voice quality ( $\Rightarrow 95\%$ )” BSNL was found not meeting the benchmark.

