

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

***Report Period: July 2011 – September 2011***

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## **Table of Contents**

### **CHAPTER-1: Introduction**

- I. Background
- II. Objectives and Methodology

### **CHAPTER-2: Executive Summary**

- I. Preface
- II. Findings from Quality of Service Audit (Operator wise for each parameter)

- (A) Cellular Mobile Telephone Service Providers

- 3 days Live Data Audit
- One Month Data Audit
- Operator Assisted Drive Test
- Independent Drive Test
- 

- (B) Basic Telephone Service (Wireline) Providers

**-Not conducted for this quarter**

- (C) Broadband Service Providers

**-Not conducted for this quarter**

### **CHAPTER-3: Audit-PMR data verification results**

- I. Cellular Mobile Telephone Service
- II. Basic Service (wireline service)
- III. Broadband Service Providers

### **CHAPTER-4: Detailed Findings & Analysis**

- I. Cellular Mobile Telephone Service

- (A) **MSC audit**

- 1) 3 days live measurement data assessment & summarized findings
- 2) One month audit data report & summarized findings
- 3) Sample coverage
- 4) Performance (Graphical Representation)
- 5) Critical Analysis

- (B) **Redressal**

- 1) Sample coverage
- 2) Performance based on live measurement for three days
- 3) Live Calling to Call Centre
- 4) Level 1 Calling
- 5) Critical Analysis

- (C) **Inter operator call assessment**

- 1) Sample coverage
- 2) Performance based on live measurement
- 3) Critical Analysis

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

- 1) Sample Coverage
- 2) Performance (for the respective cities)
- 3) Critical Analysis

**(E) Independent Drive Test**

- 1) Sample Coverage
- 2) Performance (for the respective cities)
- 3) Critical Analysis

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

## 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 3rd quarter (July-September 2011). The primary data collection and verification of records (PMR data verification – quarterly) maintained by various operators was undertaken during the period January – March 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	July-2011	1900-2000 hrs
2	Airtel Ltd	July-2011	1900-2000 hrs
3	BSNL	July-2011	1900-2000 hrs
4	Reliance Communication (GSM)	July-2011	1900-2000 hrs
5	Tata Communications (GSM)	July-2011	1900-2000 hrs
6	Vodafone	July-2011	1900-2000 hrs
<b>CDMA Operators</b>			
7	Reliance Communication (CDMA)	July-2011	1900-2000 hrs
8	Tata Communications (CDMA)	July-2011	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

3 days Live Data Audit										
S/N	Name of Parameter	Bench-mark	Aircel	Airtel	BSNL	Rcom GSM	TATA GSM	V-fone	Rcom CDMA	TATA CDMA
GSM Operators								CDMA Operators		
1	Network Availability									
	a) BTS Accumulated Downtime	<=2%	0.14%	0.11%	1.10%	1.10%	0.02%	0.01%	1.63%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.00%	1.48%	0.00%	0.00%	0.00%	0.00%	0.00%
2	Connection Establishment (Accessibility)									
	a) CSSR (Call Setup Success Rate)	>=95%	98.80%	99.22%	96.62%	99.95%	99.35%	99.49%	99.82%	99.54%
	b) SDCCH/PAGING congestion	<=1%	0.23%	0.04%	0.83%	0.01%	0.10%	0.09%	0.00%	0.00%
	c) TCH congestion	<=2%	0.81%	0.09%	0.51%	0.02%	0.14%	0.21%	0.02%	0.02%
3	Connection maintenance (retainability)									
	a) CDR	<=2%	0.44%	0.85%	0.79%	0.24%	0.76%	0.56%	0.31%	0.11%
	b) Worst affected cells>3% TCH drop	<=3%	0.93%	0.70%	2.56%	0.43%	3.65%	1.41%	0.86%	0.00%
	c) Good voice quality	>=95%	98.43%	97.44%	98.72%	99.50%	98.16%	98.83%	NP	NP
4	No of POI having congestion >=5%	<=0.5%	0	0	0	0	0	0	0	0
5	Response time to customers for assistance									
	a) Accessibility of call centre/Customer Care	>=95%	92.2%	INCLUDED IN TN CIRCLE REPORT	100.0%	98.9%	47.8%	66.1%	100.0%	INCLUDED IN TN CIRCLE REPORT
	b) % call answered by operators(voice to voice) within 60 sec.	>=90%	98.9%		83.4%	63.9%	93.7%	94.2%	85.7%	

NA: Not Applicable, NP: Data Not Provided

From the 3 days live data assessment, it is found that most of the operators are meeting the network parameters. Deviation found only with TATA GSM in not meeting the benchmark for 'Worst affected cells>3% TCH drop'. RCOM CDMA & TATA CDMA does not have system generated reports for the parameter "Good voice quality".

Customer care data is found to be not satisfactory for most of the operators. Aircel, TATA GSM & VODAFONE for the parameter "Accessibility of call centre/Customer Care" and BSNL & RCOM GSM for the parameter "calls answered by operators (voice-to-voice)" are not meeting the benchmark.



One Month Data Audit		Bench- mark	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>									
	a) BTS Accumulated Downtime	<=2%	0.21%	0.10%	0.28%	0.11%	0.02%	0.01%	0.16%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.70%	1.65%	0.00%	0.07%	0.05%	0.00%	0.00%
	c) Total no. of BTSs in the licensed service area		1931	2294	1821	1001	1357	1899	347	265
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		3053	1708	3831	795	225	210	406	10
	e) No. of BTSs having accumulated downtime of >24 hours in a month		0	16	30	0	1	1	0	0
2	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR (Call Setup Success Rate)	>=95%	98.89%	99.14%	97.47%	99.85%	99.31%	99.44%	99.71%	99.78%
	b) SDCCH/PAGING congestion	<=1%	0.34%	0.13%	0.48%	0.03%	0.14%	0.20%	0.00%	0.00%
	c) TCH congestion	<=2%	0.72%	0.09%	0.42%	0.05%	0.17%	0.14%	0.02%	0.02%
3	<b>Connection maintenance (retainability)</b>									
	a) CDR	<=2%	0.42%	0.82%	0.61%	0.24%	0.75%	0.54%	0.37%	0.13%
	b) Worst affected cells>3% TCH drop	<=3%	0.86%	0.87%	2.26%	0.43%	3.62%	1.52%	0.86%	0.00%
	c) Good voice quality	>=95%	98.47%	97.47%	98.59%	99.41%	98.16%	98.84%	NP	NP
4	<b>No of POI having congestion &gt;=.5%</b>	<=0.5%	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%	0.05%	0.03%	0.03%	0.10%	0.26%	0.01%	0.05%	0.45%
6	<b>Metering /billing credibility-Pre paid</b>	<= 0.1%	0.01%	0.08%	0.00%	0.09%	0.02%	0.05%	0.02%	0.53%
7	<b>Resolution of billing/ charging complaints</b>	100% within 4 weeks	100%	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%	100%
8	<b>Response time to customers for assistance</b>									
	a) Accessibility of call centre/Customer Care	>=95%	95.77%	INCLU DED IN TN CIRCLE REPOR T	100.00%	99.06%	71.28%	65.76%	99.95%	INCLUDE D IN TN CIRCLE REPORT
	b) % call answered by operators(voice to voice) within 60 sec.	>=90%	96.98%		71.53%	67.95%	97.82%	91.50%	88.09%	
9	<b>Termination/closure of service</b>	<=7days	100%		100%	100%	NA	100%	100%	
10	<b>Time taken for refunds of deposits after closures.</b>	100% within 60 days	100%		100%	100%	81%	100%	100%	

NA: Not Applicable, NP: Data Not Provided

From the month data assessment, it is found that most of the operators are meeting the network parameters . Deviations are found under the Network Parameter for the parameter 'Worst affected cells>3% TCH drop' for TATA GSM only. RCOM CDMA & TATA CDMA does not have system generated reports for the parameter “Good voice quality”.

Performance related to customer care, data is found to be satisfactory for most of the operators except for:

1. TATA GSM & TTSL CDMA for the parameter "Metering/billing credibility-Post paid" and TTSL CDMA for" Metering /billing credibility-Pre paid".
2. TATA GSM & VODAFONE for the parameter "Accessibility of call centre/Customer Care".
3. BSNL, RCOM GSM, & CDMA for “calls answered by operators (voice-to-voice)” and TATA GSM for “Termination/closure of service”

### Operator-Assisted Drive Test

The Operator Assisted Drive Test was conducted in and around Chennai for all the operators. Route covered was about around 140 Km 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).

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	Blocked Call Rate (<=3%)	Chennai	0.00	1.23	1.78	1.17	0.50	0.00	1.16	0.00	0.00	0.00	0.50	0.55
1.2	Dropped Call Rate (<=2%)	Chennai	1.37	0.00	2.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
1.3	Percentage of connections with good voice quality (>=95%)	Chennai												
	(i) 0-4 (w/o frequency hopping)	Chennai										99.51	95.74	99.33
	(ii) 0-5 ( with frequency hopping)	Chennai	97.93	94.78	97.10	95.00	95.68	95.33	96.08	95.79	95.61			
1.4	Call Setup Success Rate (>=95%)	Chennai	100	98.77	98.22	98.83	99.5	100	98.84	100	100	100	100	99.33

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

- 'Drop Call rate' benchmarks is not met by BSNL.
- For the parameter 'Percentage of connections with good voice quality ' it is found that AIRTEL is not meeting the benchmark.

### CHAPTER-3: AUDIT-PMR VERIFICATION

#### 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										
(A)	<b>Network Service Quality Parameter</b>										
1	<b>Network Availability</b>										
	BTS Accumulated Downtime	<=2%	Reported	0.07%	0.04%	0.83%	0.04%	0.01%	0.04%	0.05%	0.01%
			Verified	0.12%	0.04%	0.25%	0.04%	0.01%	0.04%	0.05%	0.01%
	Worst affected BTSs due to downtime	<=2%	Reported	0.00%	0.00%	6.10%	0.00%	0.00%	0.02%	0.00%	0.00%
Verified			0.00%	0.00%	0.53%	0.00%	0.00%	0.02%	0.00%	0.00%	
2	<b>Connection Establishment (Accessibility)</b>										
	CSSR (Call Setup Success Rate)	>=95%	Reported	97.91%	99.05%	100%	99.77%	98.03%	99.33%	99.56%	99.80%
			Verified	97.91%	99.05%	100%	99.77%	98.03%	99.49%	99.56%	99.80%
	SDCCH/PAGING congestion	<=1%	Reported	0.59%	0.17%	0.20%	0.04%	0.05%	0.16%	0.00%	0.00%
			Verified	0.59%	0.17%	0.20%	0.04%	0.06%	0.16%	0.00%	0.00%
	TCH congestion	<=2%	Reported	0.49%	0.16%	0.27%	0.11%	0.04%	0.17%	0.26%	0.00%
Verified			0.49%	0.16%	0.27%	0.11%	0.05%	0.17%	0.26%	0.00%	
3	<b>Connection maintenance (retainability)</b>										
	CDR	<=2%	Reported	0.40%	0.75%	0.70%	0.37%	0.61%	0.66%	0.49%	0.12%
			Verified	0.40%	0.75%	0.70%	0.37%	0.61%	0.58%	0.49%	0.12%
	Worst affected cells>3% TCH drop	<=5%	Reported	0.35%	0.59%	2.10%	0.65%	0.60%	1.17%	0.96%	0.00%
			Verified	0.35%	0.59%	2.10%	0.65%	0.53%	1.32%	0.96%	0.00%
	Good voice quality	>=95%	Reported	98.52%	97.77%	100%	98.84%	98.39%	98.45%	97.96%	99.92%
Verified			98.52%	97.77%	100%	98.84%	98.39%	98.87%	97.96%	99.92%	
4	<b>POI congestion</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	0.33%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
			Verified	0.33%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	0.01%
6	<b>Metering /billing credibility-Pre paid</b>	<= 0.1%	Reported	0.01%	0.08%	0.10%	0.00%	0.00%	0.05%	0.03%	0.16%
			Verified	0.01%	0.08%	0.11%	0.00%	0.00%	0.05%	0.03%	0.16%

PMR		Benchmark	Audit	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	V-fone	Rcom CDMA	Tata CDMA
S/N	Name of Parameter			GSM Operators						CDMA Operators	
7	<b>Resolution of billing/ charging complaints</b>	100% within 4 weeks	Reported	100%	100%	100%	100%	0.00%	100%	100%	100%
			Verified	100%	100%	100%	100%	0.00%	100%	100%	100%
	Period of applying credit/waiver/adjustment to the customers account from the date of resolutions of complaints	<=1 week	Reported	100%	100%	100%	100%	0.00%	100%	100%	100%
			Verified	100%	100%	100%	100%	0.00%	100%	100%	100%
8	<b>Response time to customers for assistance</b>										
	Accessibility of call centre/Customer Care	>=95%	Reported	100%	<b>INCLUDED IN TN REPORTS</b>	95%	0.00%	0.00%	100%	0.00%	0.00%
			Verified	100%		95%	0.00%	0.00%	100%	0.00%	0.00%
	% call answered by operators(voice to voice) within 60 sec.	>=90%	Reported	56.89 %		90%	0.00%	0.00%	91%	94%	0.00%
			Verified	56.89 %		90%	0.00%	0.00%	91%	94%	0.00%
9	<b>Termination/closure of service</b>										
	No.of requests for Termination / Closure of service complied within 7 days during the quarter	<=7days	Reported	100%	100%	100%	100%	0.00%	100%	100%	0.00%
			Verified	100%	100%	100%	100%	0.00%	100%	100%	0.00%
10	<b>Time taken for refunds of deposits after closures.</b>	100% within 60 days	Reported	100%	100%	100%	100%	0.00%	100%	100%	NA
			Verified	100%	100%	100%	100%	0.00%	100%	100%	NA

**Critical Analysis (PMR Verification):**

- The figures proved by all the operators are match the figures obtained on verification except very minor changes.
- Aircel is not meeting the benchmark for "Metering/Billing Credibility-Postpaid".
- BSNL & Tata CDMA is not meeting the benchmark for "Metering/Billing Credibility- Prepaid.
- "% call answered by operators (voice to voice) within 60 sec." benchmark is not met by Aircel.

## CHAPTER-4: DETAILED FINDINGS & ANALYSIS

### I. Cellular Mobile Telephone Service

#### (A) MSC Audit

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

S/N	Name of Parameter	Benchmark	Aircel	Airtel	BSNL	Rcom GSM	TTSL GSM	V-fone	Rcom CDMA	TTSL 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%	0.14%	0.11%	1.10%	1.10%	0.02%	0.01%	1.63%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.00%	1.48%	0.00%	0.00%	0.00%	0.00%	0.00%
	c) Total no. of BTSs in the licensed service area		1931	2294	1821	1001	1357	1899	347	265
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		189.75	177	1438.15	795	15	19.46	406	2.55
	e) No. of BTSs having accumulated downtime of >24 hours in a month		0	0	27	0	0	0	0	0
<b>1</b>	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR	>=95%	98.80%	99.22%	96.62%	99.95%	99.35%	99.49%	99.82%	99.54%
	b) SDCCH/PAGING congestion	<=1%	0.23%	0.04%	0.83%	0.01%	0.10%	0.09%	0.00%	0.00%
	c) TCH congestion	<=2%	0.81%	0.09%	0.51%	0.02%	0.14%	0.21%	0.02%	0.02%
<b>2</b>	<b>Connection maintenance</b>									
	a) CDR	<=2%	0.44%	0.85%	0.79%	0.24%	0.76%	0.56%	0.31%	0.11%
	b) Cells having > 3% TCH drop	<=3%	0.93%	0.70%	2.56%	0.43%	3.65%	1.41%	0.86%	0.00%
	c) Good voice quality	>=95%	98.43%	97.44%	98.72%	99.50%	98.16%	98.83%	NP	NP
	d) No. of cells > 3% TCH drop		49	39	136	13	142	73	3	0
	e) Total no. of cells in the network		5,260	5,603	5,312	3,003	3,895	5,188	347	813

S/N	Name of Parameter	Benchmark	Aircel	Airtel	BSNL	Rcom GSM	TTSL GSM	V-fone	Rcom CDMA	TTSL CDMA
			GSM Operators							CDMA Operators
<b>3</b>	<b>No of POI having congestion</b>	$\leq 0.5\%$	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.)		1,706,814	2,342,656	11,000	219,601	44,328	38,800	219,601	100,465
	c) Total traffic served on POI (Erlang) (Avg.)		31,466	58,062	427	7,455	804	1,069	7,455	2,927
	d) Total No. of circuits on POI		60,140	108,648	152,002	20,702	1,482	84,576	20,702	7,732
	e) Total number of working POI Service Area wise		78	133	70	NP	4	29	NP	41
	f) Equipped Capacity of Network in respect of Traffic in erlang		137,408	185,017	115,334	NP	53,542	82,415	NP	21,463
	g) Total traffic handled in TCBH in erlang		63,717	120,712	427	NP	17,923	62,956	NP	4,510
<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	$\geq 95\%$	92.23%	INCLUDED IN TN CIRCLE REPORT	100.00%	98.92%	47.80%	66.06%	99.95%	INCLUDED IN TN CIRCLE REPORT
	b) % of call answered by operators(voice to voice) within 60 sec	$\geq 90\%$	98.94%		83.40%	63.94%	93.67%	94.24%	85.66%	
	c) No. of call attempts to call centre / customer care nos. during TCBH (Avg)		13,287		247	5,873	22,841	8,693	3,458	
	d) No. of calls connected and answered successfully to call centre / customer care nos. during TCBH (Avg)		13,146		206	3,755	21,396	8,192	2,962	

NA: Not Applicable, NP: Data Not Provided

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

The parameter wise key takeouts 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 laying between 0.01% and 1.63%.
- **Worst affected BTSs due to downtime (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values laying between 0% and 1.48%.
- **Call Setup Success Rate (CSSR) (benchmark  $\geq 95\%$ ):** All operators are meeting the benchmark with values laying between 96.62% and 99.95%.
- **SDCCH/PAGING Channel congestion (benchmark  $\leq 1\%$ ):** All operators are meeting the benchmark with values laying between 0.01% and 0.83%.  
*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 laying between 0.02% and 0.81%.
- **Call Drop Rate (CDR) (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values laying between 0.11% and 0.85%.
- **Cell exceeding 3% TCH drop (benchmark  $\leq 3\%$ ):** All the operators are satisfying the benchmark except Tata GSM (3.65%) with values laying between 0% and 2.56%.
- **Connections with good voice quality (benchmark  $\geq 95\%$ ):** CDMA service providers have declared that the parameter is not system generated. GSM operators are meeting the benchmark with values laying between 99.50% and 97.44%.
- **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  $>95$ ):** Aircel (92.23%), Tata GSM (47.80) & Vodafone (66.06) are not meeting the benchmark. For Airtel & Tata CDMA it is included in TN reports.
- **%age of call answered by operator (Voice to voice) (benchmark  $>90\%$ ):** BSNL (83.40%), RCOM GSM (63.94%) & RCOM CDMA (85.66%) are not meeting the benchmark.



## (2) Month Data Assessment & Summarized Findings

S/N	Name of Parameter	Benchmark	Aircel	Airtel	BSNL	Rcom GSM	TTSL GSM	V-fone	Rcom CDMA	TTSL CDMA
			GSM Operators						CDMA Operators	
(A)	<b>Network Service Quality Parameter</b>									
1	<b>Network Availability</b>									
	a) BTS Accumulated Downtime	<=2%	0.21%	0.10%	0.28%	0.11%	0.02%	0.01%	0.16%	0.01%
	b) Worst affected BTSs due to downtime	<=2%	0.00%	0.70%	1.65%	0.00%	0.07%	0.05%	0.00%	0.00%
	c) Total no. of BTSs in the licensed service area		1,931	2,294	1,821	1,001	1,357	1,899	347	265
	d) Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month		3,053	1,708	3,831	795	225	210	406	10
	e) No. of BTSs having accumulated downtime of >24 hours in a month		0	0	27	0	0	0	0	0
2	<b>Connection Establishment (Accessibility)</b>									
	a) CSSR (Call Setup Success Rate)	>=95%	98.89%	99.14%	97.47%	99.85%	99.31%	99.44%	99.71%	99.78%
	b) SDCCH/PAGING congestion	<=1%	0.34%	0.13%	0.48%	0.03%	0.14%	0.20%	0.00%	0.00%
	c) TCH congestion	<=2%	0.72%	0.09%	0.42%	0.05%	0.17%	0.14%	0.02%	0.02%
3	<b>Connection maintenance (retainability)</b>									
	a) CDR	<=2%	0.42%	0.82%	0.61%	0.24%	0.75%	0.54%	0.37%	0.13%
	b) Worst affected cells>3% TCH drop	<=3%	0.86%	0.87%	2.26%	0.43%	3.62%	1.52%	0.86%	0.00%
	c) Good voice quality	>=95%	98.47%	97.47%	98.59%	99.41%	98.16%	98.84%	NP	NP
	d) Total No. of cells exceeding 3% TCH drop (call drop)		45	49	120	13	141	79	3	0
	e) Total no. of cells in the network		5,260	5,603	5,312	3,003	3,895	5,188	347	813

4	<b>No of POI having congestion</b>	$\leq 0.5\%$	0	0	0	0	0	0	0	0
	a) Name of POI not meeting the benchmark		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	b) Total No. of call attempts on POI (Avg.)		1,671,273	2,388,030	10,330	204,229	43,266	69,268	204,229	89,742
	c) Total traffic served on POI (Erlang) (Avg.)		29,874	57,791	408	6,746	789	1,676	6,746	2,501
	d) Total No. of circuits on POI		60,202	108,648	152,002	20,394	1,482	84,576	20,394	7,732
	e) Total number of working POI Service Area wise		78	133	70	NP	4	29	NP	41
5	<b>Network Data</b>									
	a) Equipped Capacity of Network Erlang		137,408	185,017	115,334	NP	53,542	82,415	NP	21,463
	b) Total traffic in TCBH in erlang (Avg.)		60,349	116,740	408	NP	17,336	62,121	NP	4,215
	c) Total no. of customers served (as per VLR) on last day of the month		1,733,109	2,966,220	883,100	NP	590,824	1,654,304	NP	516,863
<b>(B) Customer Service Quality Parameters</b>										
6	<b>Metering/billing credibility-Post paid</b>	$\leq 0.1\%$	0.05%	0.03%	0.03%	0.10%	0.26%	0.01%	0.05%	0.45%
	a) No. of bills issued during the period		361,927	310,321	139,415	48,268	19,521	297,612	210,757	52,550
	b) No. of bills disputed including billing complaints during the period		171	94	36	48	50	22	95	234
7	<b>Metering /billing credibility-Pre paid</b>	$\leq 0.1\%$	0.01%	0.08%	0.00%	0.09%	0.02%	0.05%	0.02%	0.53%
	a) No. of charging / credit / validity complaints during the quarter		305	2,119	0	4,270	951	1,139	152	479
	b) Total no. of pre-paid customers at the end of the quarter		3,945,458	2,788,343	1,258,597	4,540,737	3,816,831	2,177,247	956,152	90,685
8	<b>Resolution of billing/ charging complaints</b>	100% within 4 weeks	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		476	5,436	36	4,318	1,001	1,161	247	713

	b) Total no. of billing (post paid) and charging, credit / validity (pre paid) complaints received during the quarter		476	5,436	36	4,318	1,001	1,161	247	713
	c) No. of billing complaints (post paid) and charging, credit/ validity complaints (pre paid) resolved in favour of the customer during the quarter		36	2,213	36	80	40	1,161	54	48
	d) No. of complaints disposed on account of not considered as valid complaints during the quarter		440	3,223	-	4,238	961	0	193	665
	e) Period of applying credit/waiver/adjustment to the customers account from the date of resolutions of complaints	<i>&lt;=1 week</i>	100%	100%	100%	100%	100%	100%	100%	100%
<b>9</b>	<b>Response time to customers for assistance</b>									
	a) Accessibility of call centre/Customer Care	<i>&gt;=95%</i>	95.77%	INCLUDED IN TN CIRCLE REPORT	100.00%	99.06%	71.28%	65.76%	99.95%	INCLUDED IN TN CIRCLE REPORT
	b) % call answered by operators(voice to voice) within 60 sec.	<i>&gt;=90%</i>	96.98%		71.53%	67.95%	97.82%	91.50%	88.09%	
	c) Total no. of call attempts to call centre & customer care nos. during TCBH (Avg.).		26,719		2,072	5,579	3,354	8,534	3,309	
	d) No. of calls connected and answered successfully to call centre & customer care nos. during TCBH (Avg.).		25,911		1,482	3,791	3,281	7,809	2,915	
<b>10</b>	<b>Termination/closure of service</b>	<i>&lt;=7days</i>	100%	100%	100%	100%	NA	100%	100%	
	a) Total No. of requests for Termination / Closure of service received during the quarter		1,940	4,408	623	334	NA	4,084	873	
	b) No. of requests for Termination / Closure of service complied within 7 days during the quarter		1,940	4,408	623	334	NA	4,084	873	
<b>11</b>	<b>Time taken for refunds of deposits after closures.</b>	<i>100% within 60 days</i>	100%	100%	100%	100%	81%	100%	100%	

NA: Not Applicable, NP: Data Not Provided

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

The parameter wise key takeouts 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 laying between 0.01% and 0.28%.
- **Worst affected BTSs due to downtime (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values laying between 0% and 1.65%.
- **Call setup success rate (benchmark  $\geq 95\%$ ):** All operators are meeting the benchmark with values laying between 97.47% and 99.85%.
- **SDCCH/PAGING Channel congestion (benchmark  $\leq 1\%$ ):** All operators are meeting the benchmark with values laying between 0.03% and 0.48%.  
*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 laying between 0.02% and 0.72%.
- **Call drop rate (benchmark  $\leq 2\%$ ):** All operators are meeting the benchmark with values laying between 0.13% and 0.82%.
- **Cell exceeding 3% TCH drop (benchmark  $\leq 3\%$ ):** All the operators are satisfying the benchmark with value in between 0% and 2.26% except Tata GSM with values 3.62%.
- **Connections with good voice quality (benchmark  $\geq 95\%$ ):** CDMA service providers have declared that the parameter is not system generated All operators are meeting the benchmark with values laying between 97.47% and 99.41%.
- **POI Congestion (benchmark  $\leq 0.5\%$ ):** 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  $>95\%$ ):** Except for Tata GSM (71.28%), Vodafone (65.76%), all operators are meeting the benchmark.
- **%age of call answered by operator (Voice to voice) (benchmark  $>90\%$ ):** BSNL (71.53% RCOM GSM (67.95%) & RCOM CDMA (88.09%) are not meeting the benchmark.
- **Metering and billing credibility-Post paid (benchmark  $\leq 0.1\%$ ):** Tata GSM & Tata CDMA are not meeting the benchmark.
- **Metering and billing credibility-Pre paid (benchmark  $\leq 0.1\%$ ):** Except for Tata CDMA all operators are meeting the benchmark.
- **Resolution of billing/ charging complaints (benchmark 100% within 4 weeks):** All operators are meeting the benchmark.
- **Termination/Closure of service (Benchmark  $\leq 7$  days):** All operators have satisfied the benchmark.
- **Time taken for refunds of deposits after closures (benchmark 100% within  $\leq 60$  days):** All operators have satisfied the benchmark except Tata GSM (81%).

**(3) Sample Coverage**

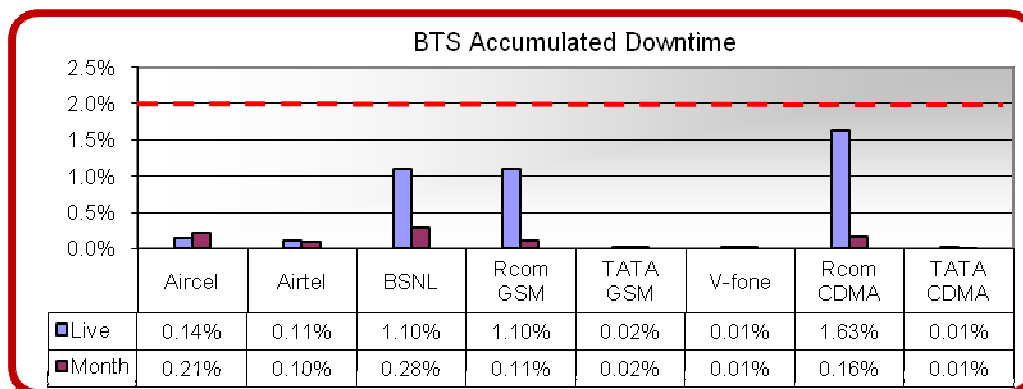
Switches/BSC/BTS details of operators:

Sl.	Name of Service Provider	No. of MSC/GMSC	No. of BSC	No. of BTS
<b>GSM Operators</b>				
1	Aircel Ltd	12	16	1931
2	Airtel Ltd	17	25	2294
3	BSNL	6	28	1821
4	Reliance Communication (GSM)	1	4	1001
5	Tata Communications (GSM)	1	13	1357
6	Vodafone	4	34	1899
<b>CDMA Operators</b>				
7	Reliance Communication (CDMA)	3	-	347
8	Tata Communications (CDMA)	1	2	265

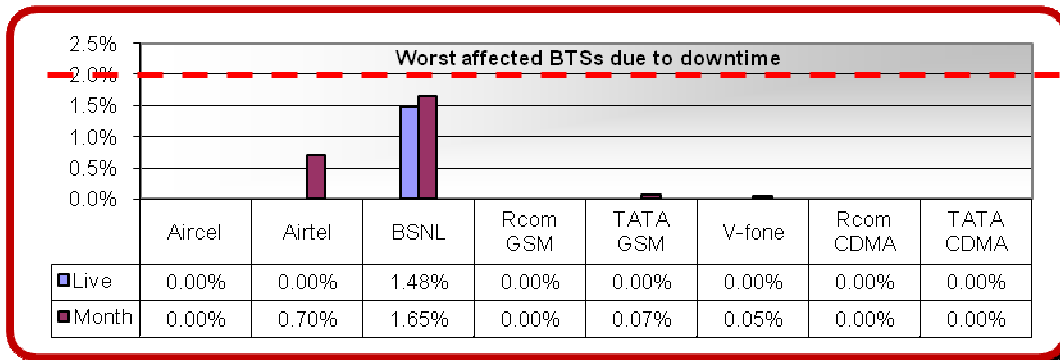
**(4) Performance (Graphical Representation)****Comparison between Live measurements and One month data Audit – Cellular Mobile Telephone Services**

## A) NETWORK PERFORMANCE

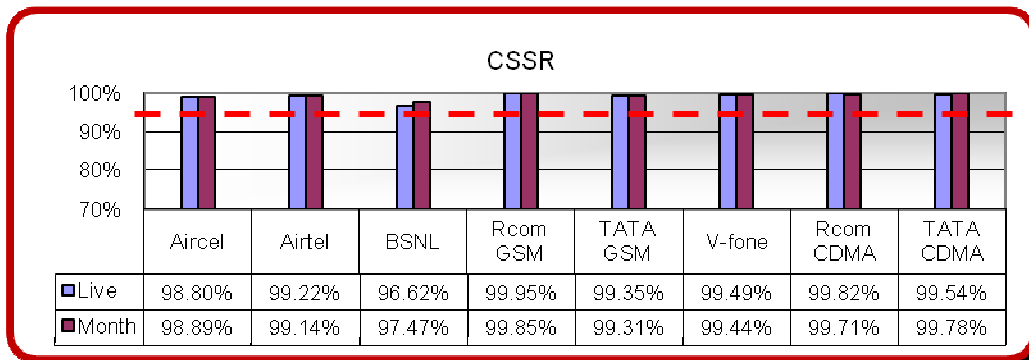
- I. **BTS Accumulated Downtime:** All operators are meeting the TRAI benchmarks ( $\leq 2\%$ ) for both one month data and 3 days live data taken in the month of audit



**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

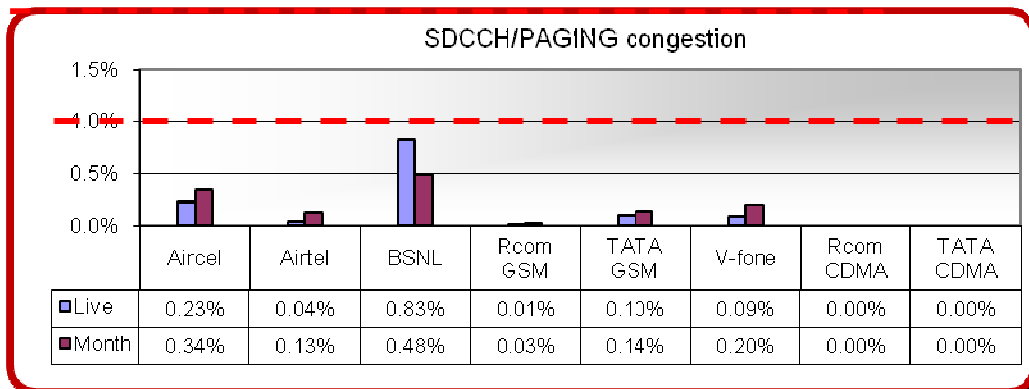


**II. Call Setup Success Rate (CSSR):** All operators are meeting the TRAI benchmarks ( $\geq 95\%$ ) for both one month data and 3 days live data taken in the month of audit

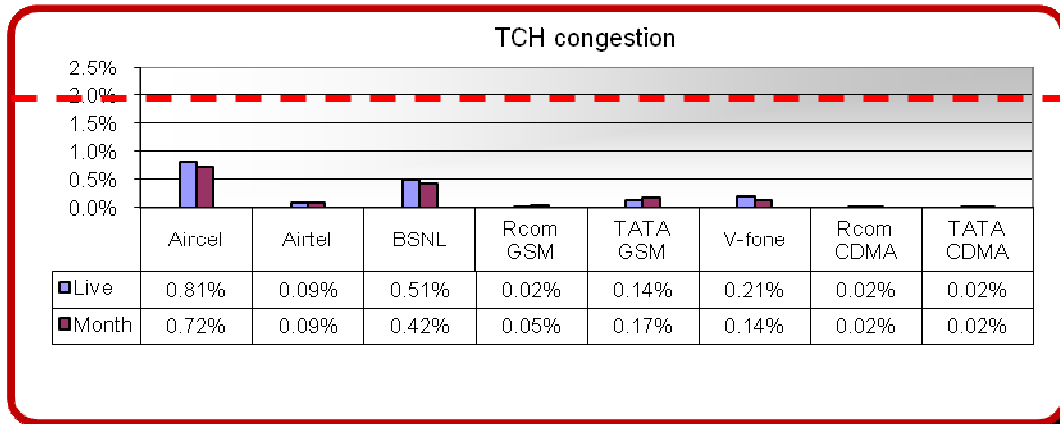


**Blocked call rate:**

**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.

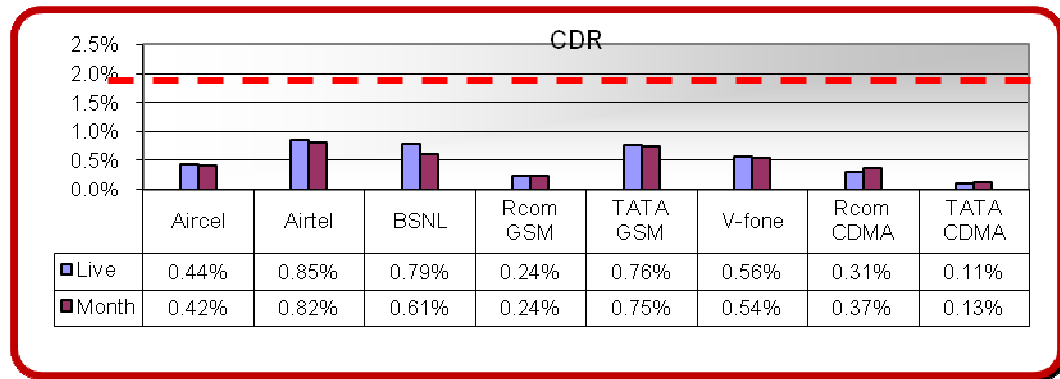


**TCH congestion:** All operators are meeting the TRAI benchmarks ( $\leq 2\%$ ) for both one month data and 3 days live data taken in the month of audit.

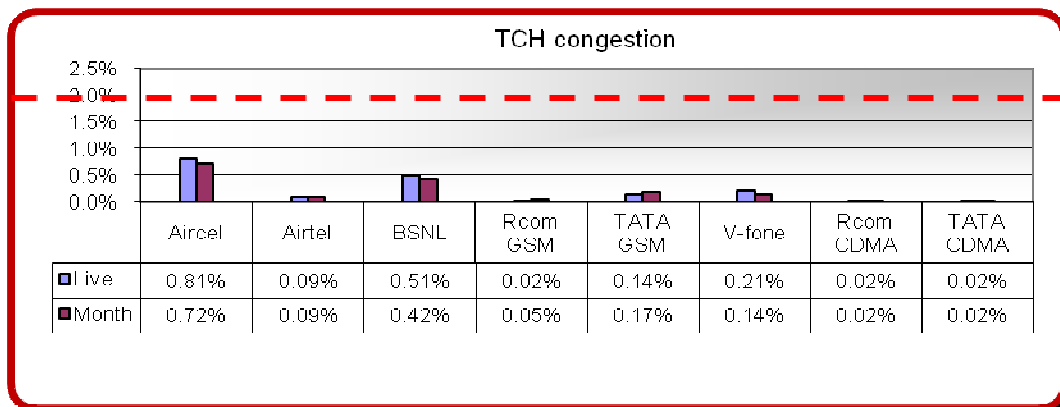


**III. Connection Maintainability (Retainability):**

**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.

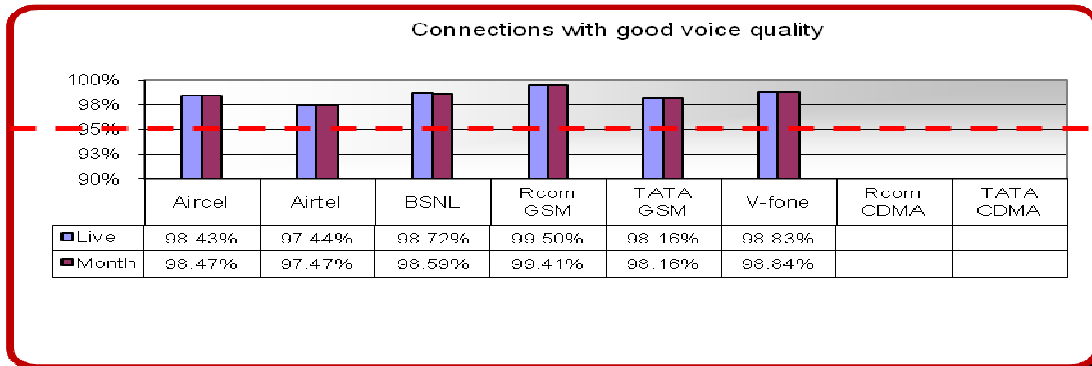


**Worst affected Cell exceeding 3% TCH Drop:** For both live and month data, all the operators are meeting the benchmark except Tata GSM. In all cases data shows consistency for both live measurement and month data audit.

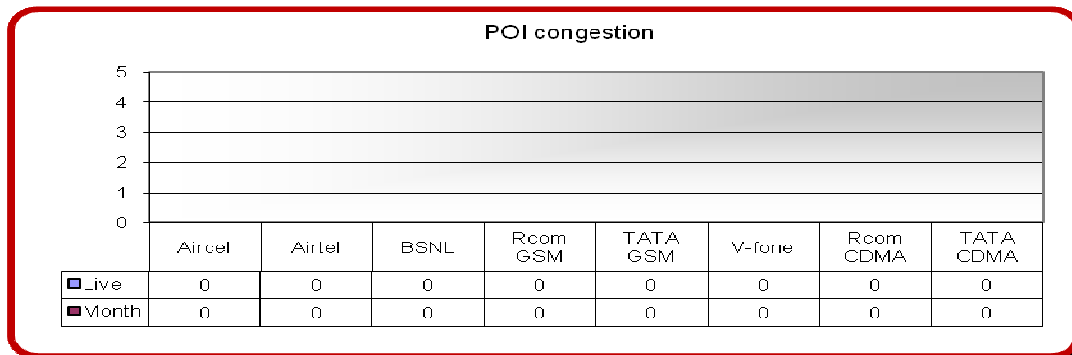


**Percentage of connections with good voice quality (benchmark  $\geq 95\%$ ):** All operators are meeting the TRAI benchmarks ( $\geq 95\%$ ) for both one month data and 3 days live data taken in

the month of audit. RCOM CDMA and TATA CDMA are not having system generated reports.



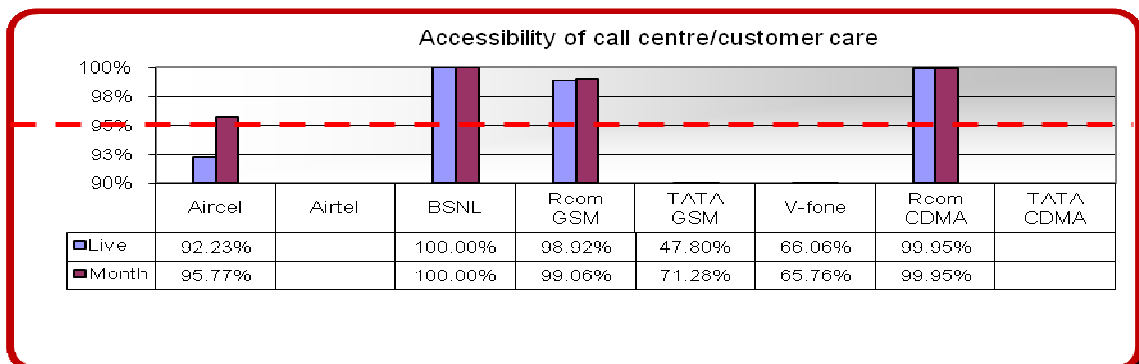
IV. **POI Congestion:** All operators are meeting the TRAI benchmarks ( $\Rightarrow 0.5\%$ ) in both live & month data.



B) CUSTOMER SERVICE QUALITY PARAMETERS

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

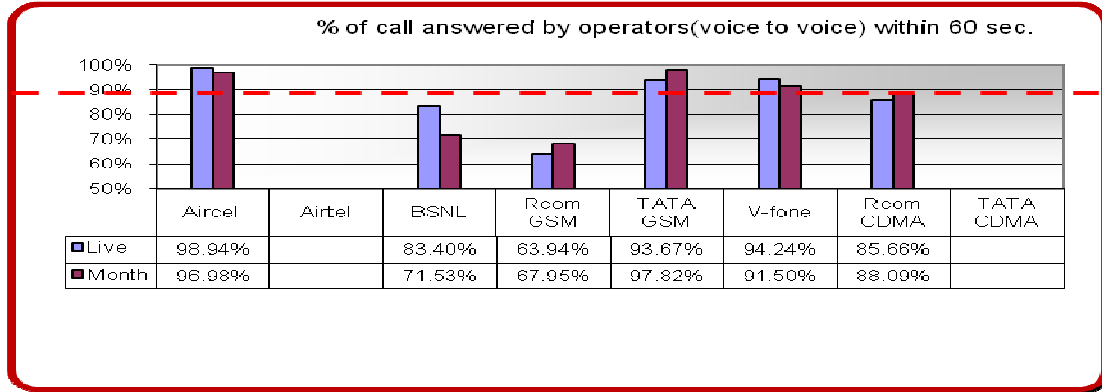
**Percentage of call answered (Electronically):** Aircel, TATA GSM & Vodafone for live audit and TATA GSM & Vodafone for month data audit are not meeting the benchmark. Reports of Airtel & TATA CDMA are included in TN circle.



**Percentage of call answered by operators (Voice to voice) within 60 sec:** BSNL, RCOM GSM & RCOM CDMA are not meeting the benchmark ( $\geq 90\%$ ) for both one month data



and 3 days live data taken in the month of audit. Reports of Airtel & TATA CDMA 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 Tata GSM in “Worst affected cells>3% TCH drop”.

Performance related to customer care data is not found to be very satisfactory.

For the parameter “accessibility of call centre” Aircel, TATA GSM & Vodafone for live audit and TATA GSM & Vodafone for month data audit are not meeting the benchmark.

For the parameter “% call answered by operators(voice to voice) within 60 sec” BSNL, RCOM GSM & RCOM CDMA are not meeting the benchmark for both one month data and 3 days live data taken in the month of audit. Reports of Airtel & TATA CDMA are included in TN circle.

In case of POI congestion, all the operators are found to be performing quite well in terms of meeting the benchmark (<= 0.5%).

**(B) Redressal****i. 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.

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

Calling Operator	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom CDMA	Tata CDMA
<b>Total No of calls Attempted</b>	36	93	12	14	15	26	13	14
<b>Total No. of calls Answered</b>	35	87	7	10	10	21	10	10
<b>Cases resolved with 4 weeks</b>	35	87	7	10	10	21	10	10
<b>%age of cases resolved</b>	100%	100%	100%	100%	100%	100%	100%	100%

**iii. LIVE CALLING TO CALL CENTRE**

Calling Operator	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom CDMA	Tata CDMA
<b>Total No. of Calls Attempted</b>	100	100	100	100	100	100	100	100
<b>Total No. of calls connected to IVR</b>	100	99	86	100	100	100	100	100
<b>Calls got connected to agent within 60 Sec</b>	100	99	86	100	98	100	100	100
<b>%age of calls got answered</b>	100%	99%	86%	100%	98%	100%	100%	100%

**iv. LEVEL-1 CALLING**

Emergency no.		No. of calls made	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom CDMA	Tata CDMA
100	police	5	5	5	5	5	5	5	5	5
101	Fire	5	5	5	5	5	5	5	5	5
102	Ambulance	5	5	5	5	5	5	5	5	5
139	Railway	5	5	5	5	5	5	5	5	5

**v. 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. It is also being noted that billing complaints of all the customers are resolved within the time limit by every operator.

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

A sample of 2x50 test calls per Service Providers with in 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**

Calling Operator	Aircel	Airtel	BSNL	Rcom GSM	Tata GSM	Vodafone	Rcom GSM	Tata CDMA
<b>Aircel</b>	-	100%	100%	100%	100%	100%	100%	99%
<b>Airtel</b>	100%	-	100%	100%	100%	97%	100%	100%
<b>BSNL</b>	100%	99%	-	100%	100%	100%	99%	100%
<b>Rcom GSM</b>	100%	100%	100%	-	100%	100%	100%	100%
<b>Tata GSM</b>	100%	100%	100%	100%	-	100%	100%	100%
<b>Vodafone</b>	98%	100%	100%	100%	100%	-	100%	100%
<b>Rcom CDMA</b>	100%	100%	100%	100%	99%	100%	-	100%
<b>Tata CDMA</b>	100%	100%	98%	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 at Chennai for all the operators. Route covered was about around 140Km on city areas within the speed limit of 30Km/hr.

**DRIVE TEST LOCATIONS**

**CHENNAI CIRCLE:**

High Dense: Kilpauk, Egmore, Triplicane, Royapettah, Mylapore, Mandaveli, Adyar, Thiuvanmaiur, Velacherry, Guindy, Avadi, Ambattur, Padi, Villivakkam,

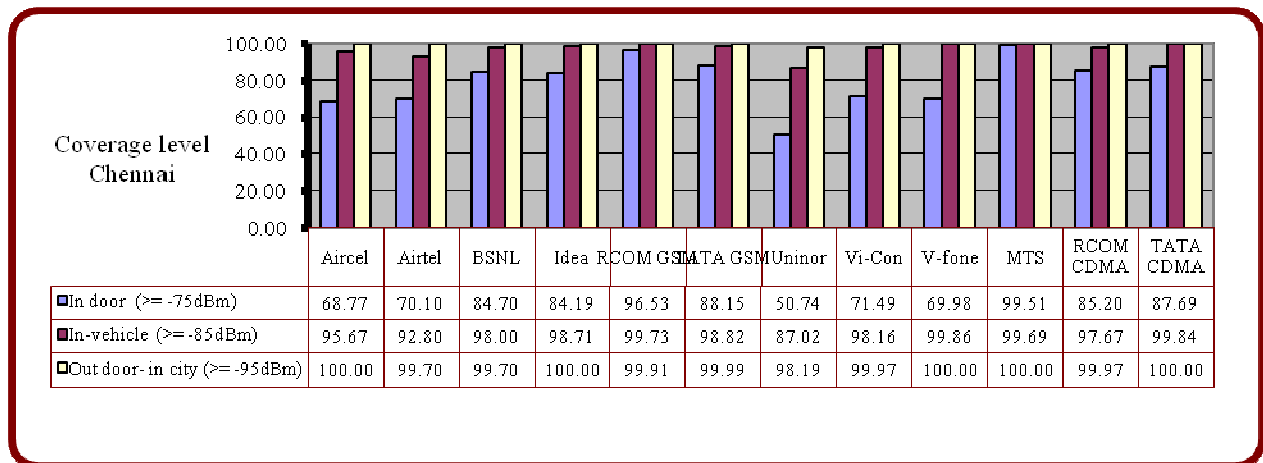
Medium Dense: Kelambakkam, Siruseri, Navalur, Sholinganallur, Thoraipakkam, Perungudi, Nandambakkam, Manapakkam, Kattupakkam, Kumananchavady, Ponnammalle

Low Dense: Palavakkam, Neelangerai, Injambakkam, Muttukadu, Kovalam, Bangalore Highway, Sennerkuppam, Agraharam, avadi - ponammalle Bypass

2) Performance (for the respective cities) - Operator Assisted Drive Test

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	Chennai	146	163	169	171	202	178	173	176	162	169	202	182	
1.2	Blocked Call Rate (<=3%)		0	1.23	1.78	1.17	0.50	0	1.16	0	0	0	0.50	0.55	
1.3	Dropped Call Rate (<=2%)		1.37	0	2.96	0	0	0	0	0	0	0	0.50	0	
1.4	Percentage of connections with good voice quality (=>95%)														
	(i) 0-4 (w/o frequency hopping)												99.51	95.74	99.33
	(ii) 0-5 ( with frequency hopping)		97.93	94.78	97.10	95.00	95.68	95.33	96.08	95.79	95.61				
1.5	Service Coverage														
	In door (>= -75dBm)		68.77	70.10	84.70	84.19	96.53	88.15	50.74	71.49	69.98	99.51	85.20	87.69	
	In-vehicle (>= -85dBm)		95.67	92.80	98.00	98.71	99.73	98.82	87.02	98.16	99.86	99.69	97.67	99.84	
	Out door- in city (>= -95dBm)		100	99.70	99.70	100	99.91	99.99	98.19	99.97	100	100	99.97	100	
1.6	Call Setup Success Rate (>=95%)	100	98.77	98.22	98.83	99.5	100	98.84	100	100	100	100	99.33		

## Graphical Representation



### (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:

- Drop Call rate' parameter was not meet by BSNL.
- Percentage of connections with good voice quality 'parameter was not meet by AIRTEL

### (E) Independent Drive Test

.....NOT APPLICABLE

### (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 found satisfactory for **Network Parameters**.

**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 “operator answered calls (voice-to-voice) within 60 seconds” it is found not satisfying for at least three operators. All the operators need to take care so that there will be positive improvement in this regard.

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

During **Drive Tests**, it is noticed from the report overall performance of the operators is found **satisfactory** except few issues. In **dropped call rate** except **BSNL** all have met the benchmark. In ‘**Good voice quality**’ only **AIRTEL** has slightly deviated from the required benchmark.