

# Objective Assessment of Quality of Services for (QoS) for Cellular Mobile (Wireless) Service Providers

## Bihar & Jharkhand Circle

Report: July–August - September - 2011



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## Preface

TRAI, the regulatory watch dog for the Quality of Service for the telecom services – Basic (Wireline), Cellular Mobile (Wireless) and Broadband has commissioned this study with the objective of measuring Quality of Services under the parameters as per the published notifications.

The Audit module would assess the Quality of Service of telecom operators Basic (Wireline), Cellular Mobile (Wireless) and Broadband services) by auditing the service level records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI.

The Audit modules for various circles within the Zones, due the sheer scale of data collection, have been distributed across various quarterly periods. IMRB International Auditors carried out Audits across Orissa, Bihar & Jharkhand, West Bengal, North-East, Assam and Kolkata circles in the third quarter of 2011. **This report details the performance of various service providers in Bihar & Jharkhand circle against Quality of Services benchmarks for various parameters laid down by TRAI in respective regulations for Cellular (Mobile) services.**

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## **1.0 Background**

The Telecom Regulatory Authority of India (TRAI) has a critical mandate to protect the interest of telecom consumers in addition to various other functions bestowed upon it. As part of the license conditions to telecom operators, it has the power and authority to measure the Quality of Service provided by various govt. (BSNL & MTNL) and private telecom operators. The parameters that need to be measured for Basic (Wireline) and Cellular Mobile (Wireless) services have been specified in the TRAI notification on Quality of Services of Basic (Wireline) and Cellular Mobile (Wireless) services dated 20<sup>th</sup> March, 2009. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006

IMRB has been carrying out this exercise for TRAI since December 2007 to assess the quality of services being provided by Basic (Wireline), Cellular Mobile (Wireless) and Broadband service providers.

**Audit module:** To assess the quality of service of telecom operators Basic (Wireline), Cellular Mobile (Wireless) and Broadband services by auditing the service level records maintained by the operators, conducting drive tests as well as live measurements and comparing them with quality of service benchmarks stipulated by TRAI

This report highlights the findings for the Audit module for Bihar & Jharkhand circle that was covered in period of July-Sep 2011. The verification of records maintained by various operators of Cellular Mobile (Wireless) service was undertaken by the auditors of IMRB International during the period Jan-Mar 2011.



***This report highlights the Audit Module findings for Bihar & Jharkhand circle for Cellular Mobile services***

## **2.0 Objectives and Methodology**

The primary objective of the Audit module is to Audit and Assess the Quality of Services being rendered by Basic (Wireline), Cellular Mobile (Wireless), and Broadband service against the parameters notified by TRAI. (The parameters of Quality of Services (QoS) have been specified by in the respective regulations published by TRAI). Following are the key activities undertaken by Auditors during the Audit process conducted at the operator's premises



***All Network related and Non network related parameters notified by TRAI in various regulations were Audited***

- 1. Verification of the data submitted by service providers:** This involved verification of the quarterly Performance Monitoring Reports (PMR's) and monthly Point of Interconnect (POI) Congestion reports being submitted by various service providers. The raw data in the records maintained by service providers was audited to assess the book keeping methodology.
- 2. Live measurement for three days:** Network performance of service providers was assessed for three days in the month in which the Audit was carried out. Live figures from the server/ NMS software were recorded for various network related parameters.
- 3. Data verification for the month in which Audits were carried out:** Subsequent to the visits for Audit during the live measurement at various Exchanges/ISP Nodes/Exchanges, data for all the network and Non network related parameters was collected from various service providers for the complete month in which the Audit was carried out. Raw data/records pertaining to these were also verified on sample basis to check the veracity of data provided by the operators.
- 4. Drive tests:** Operator assisted drive test were conducted in three cities as per the norms stated in the tender.
- 5. Live calling:** Live testing was done on a sample basis to check efficiency of the customer care, inter operator call assessment, Back check calls for service provisioning and fault repair

- Any changes or discrepancies found in the methodology were reported to the service providers and changes were suggested by IMRB Auditors.
- PMR verification was done as per the new parameters being reported to TRAI by all operators.
- Live measurement and 1 month data collection was done as per the new regulations published by TRAI on 20th March, 2009.
- Separate formats were designed each for Basic (Wireline), Cellular mobile (Wireless) and Broadband services to collect the information on various parameters

### **3.0 Sampling methodology**

#### **3.1 Sampling for Cellular Mobile (Wireless) service providers**

Data pertaining to 100% of the Gateway MSC's (GMSC's) and Mobile Switching Centres (MSC's) of all the Cellular Mobile Service Providers or Unified Access Service Providers (UASP) was collected and verified in specified circles/service areas. Following are the various operators covered in Bihar & Jharkhand circle

	<b>Name of Operator</b>
Operator 1	Tata Docomo
Operator 2	S Tel
Operator 3	Aircel
Operator 4	Etisalat
Operator 5	Vodafone
Operator 6	Videocon
Operator 7	BSNL
Operator 8	Reliance GSM
Operator 9	Reliance CDMA
Operator 10	Idea
Operator 11	MTS
Operator 12	Tata CDMA
Operator 13	Airtel
Operator 14	Uninor

## 4.0 Audit methodology

### 4.1 Cellular Mobile Services

In a nutshell the following activities were done while auditing for various parameters for Cellular Mobile Services:

S.no	Parameter	AS REPORTED IN PMR	AS FOUND IN ACTUAL RECORDS AFTER VERIFICATION	AS FOUND IN VERIFICATION FOR THE MONTH OF AUDIT	AS FOUND IN 3 DAY LIVE MEASUREMENT DATA	LIVE CALLING	OPERATOR ASSISTED DRIVE TESTS	INDEPENDENT DRIVE TESTS
<b>A</b>	<b>Network Performance</b>							
<b>A (i)</b>	BTS accumulated down time	Yes	Yes	Yes				
<b>A (ii)</b>	Call setup success rate (within licensee own network)	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (iii)</b>	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (iv)</b>	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
<b>A (v)</b>	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
<b>A (vi)</b>	Service Coverage	Yes	Yes	Yes			Yes	Yes
<b>A (vii)</b>	PoI Congestion	Yes	Yes	Yes				
<b>B</b>	<b>Customer Helpline</b>							
<b>B (i)</b>	Response time to the customer for assistance	Yes	Yes	Yes		Yes		
<b>C</b>	<b>Billing Complaints</b>							
<b>C (i)</b>	Billing complaints per 100 bills issued	Yes	Yes	Yes				
<b>C (ii)</b>	%age of billing complaints resolved within 4 weeks	Yes	Yes	Yes		Yes		
<b>C (iii)</b>	Period of all refunds/payments due to customers from date of resolution as in (ii) above	Yes	Yes	Yes		Yes		

{Note: A more detailed explanation of parameter wise audit methodology for Cellular Mobile services is explained in Annexure}

## **5.0 Executive Summary**

The objective assessment of Quality of Services (QoS) was carried out by IMRB International for all the Cellular mobile service providers during the period starting from July 2011 to September 2011 in Bihar & Jharkhand circle. The executive summary encapsulates the key findings of the Audit by providing: -

- “Service provider performance report” for Cellular mobile service , which gives a glimpse of the performance of various operators against the benchmark specified by TRAI, during the month in which the Audit was carried out by IMRB Auditors
- “Parameter wise critical findings” for Cellular mobile services: This indicates key observations and findings from different activities carried out during the Audit process



### 5.1 Service provider performance report based on one month data verification

Name of Service Provider	Time Consistent Busy Hour (TCBH)	Network Availability					Connection Establishment (Accessibility)			Connection Maintenance (Retainability)				POI		Network Traffic Capacity and Utilization			
		Total no. of BTSs in the licensed service area	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month	BTSs Accumulated downtime (not available for service) (%age)	No. of BTSs having accumulated downtime of >24 hours in a month	Worst affected BTSs due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging Chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Total No. of cells exceeding 3% TCH drop (call drop)	Total no. of cells in the network	Worst affected cells having more than 3% TCH drop (call drop) rate (%age)	%age of connection with good voice quality	POI Congestion (No. of POIs not meeting the benchmark) Note :2)	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handled in TCBH in erlang	Total no. of customers served (as per VLR) on last day of the month
Benchmark				≤ 2%		≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%	≤ 0.5%				
Tata Docomo	19:00 - 20:00	1992	1463	0.10%	6	0.30%	97.56%	0.38%	0.22%	0.40%	60	5970	1.01%	96.57%	0	29	87830	30454	1211555
S Tel	19:00 - 20:00	1525	49253	4.34%	28	1.84%	98.00%	0.92%	1.85%	0.51%	208	4572	4.55%	96.44%	1	68	37448	15365	805437
Aircel	19:00 - 20:00	3405	32516	1.28%	266	7.81%	98.00%	0.43%	0.96%	1.47%	666	10203	6.53%	95.58%	0	126	199708	53733	2110611
Etisalat	19:00 - 20:00	63	116	0.25%	0	0.00%	95.00%	0.07%	0.01%	0.59%	8	189	4.23%	98.40%	0	26	1399	85	5349
Vodafone	19:00 - 20:00	6061	40111	0.89%	86	1.42%	88.63%	3.76%	7.10%	2.17%	2753	18054	15.25%	96.08%	0	51	176399	145363	4769568
Videocon	19:00 - 20:00	12	82	0.92%	0	0.00%	99.00%	0.31%	0.00%	0.88%	0	36	0.00%	99.28%	0	19	5000	167671	2425
BSNL	20:00 - 21:00	3316	59291	2.40%	170	5.13%	97.59%	0.45%	1.03%	1.14%	372	8752	4.25%	97.20%	2	202	262600	152018	3580122
Reliance GSM	20:00 - 21:00	2934	748	0.03%	11	0.37%	98.00%	0.81%	1.02%	1.14%	210	8802	2.39%	99.02%	0	22	148000	106336	3282132
Reliance CDMA	19:00 - 20:00	2423	9602	0.53%	42	1.73%	99.65%	0.00%	0.97%	0.80%	51	2423	2.10%	96.69%	0	30	262000	93565	2181774
Idea	19:00 - 20:00	4336	63415	1.97%	82	1.89%	98.00%	0.74%	1.56%	1.75%	374	12974	2.88%	95.38%	0	85	123003	104626	4240560
MTS	20:00 - 21:00	1333	18133	1.83%	11	0.83%	98.78%	0.00%	0.18%	1.01%	122	3998	3.05%	98.41%	0	48	60711	15035	409597
Tata CDMA	19:00 - 20:00	1043	988	0.13%	4	0.38%	99.54%	0.00%	0.18%	0.47%	27	3177	0.85%	99.13%	0	242	292658	50665	942742
Airtel	19:00 - 20:00	7115	3882	0.07%	36	0.51%	98.00%	0.85%	0.83%	1.17%	499	20739	2.41%	98.62%	0	48	590115	488539	14958363
Uninor	19:00 - 20:00	2289	33139	1.95%	47	2.05%	95.85%	0.44%	2.08%	1.94%	338	6853	4.93%	96.46%	12	63	75343	64212	1300226

\*Details pertaining to these are obtained through operator done drive tests. Results of the operator assisted drive tests are explained in detail in critical findings

\*\* Methodology not in line with QoS

■ Figures provided on All India basis

■ Not meeting the benchmark

B'mark = TRAI Benchmark, DNA = Details not available, NA: Not Applicable

### Critical findings: Cellular Mobile Services

The audit for cellular mobile service providers were conducted at their respective MSCs in the Bihar & Jharkhand circle apart from Reliance Communication whose audit was conducted at their central NOC at Mumbai.

The audit involved a three stage verification process which consisted of auditing the records of the service providers and verifying the data submitted to TRAI. The second step involved a three day live measurement of all the network parameters. Finally basis the three day live measurement the auditors needed to find out the busy hour for the service provider and collect the hourly data for this busy hour for the month in which the audit was conducted.

### Busy Hour of Various Service Providers

Service Provider	Reported Time Consistent Busy Hour	Network Busy Hour found in 3 day live measurement
Tata Docomo	20:00 – 21:00	20:00 – 21:00
S Tel	19:00 – 20:00	19:00 – 20:00
Aircel	20:00 – 21:00	20:00 – 21:00
Etisalat	20:00 – 21:00	19:00 – 20:00
Vodafone	20:00 – 21:00	20:00 – 21:00
Videocon	20:00 – 21:00	20:00 – 21:00
BSNL	19:00 – 20:00	19:00 – 20:00
Reliance GSM	20:00 – 21:00	20:00 – 21:00
Reliance CDMA	20:00 – 21:00	20:00 – 21:00
Idea	20:00 – 21:00	20:00 – 21:00
MTS	19:00 – 20:00	19:00 – 20:00
Tata CDMA	20:00 – 21:00	20:00 – 21:00
Airtel	19:00 – 20:00	19:00 – 20:00
Uninor	19:00 – 20:00	19:00 – 20:00

The TCBH reported by all the service providers matched the network busy hour calculated by IMRB auditors for the Bihar & Jharkhand circle.

#### BTSS Accumulated Downtime:

In the Bihar & Jharkhand circle, S-tel and BSNL did not meet the TRAI benchmark for BTS accumulated downtime parameter. Aircel experienced the highest outage (266 BTS had more than 24 hours of accumulated downtime) hours in the month of audit followed by BSNL (170 BTSs). Also Aircel, Uninor and BSNL were found to be not meeting TRAI specified benchmark for worst affected BTSs due to downtime.

#### Call Set-up Success Rate (CSSR):

All the operators except Vodafone were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for Reliance CDMA with 99.65% of their calls getting completed. All the operators were found to be calculating the parameter as per the norm specified by TRAI. CSSR was established as the ratio of total number of successful call attempts (establishment) to the total number of call attempts made.

#### Network Congestion parameters:

SDCCH / Paging Channel Congestion, TCH and POI are part of the network congestion parameters. All the operators except Vodafone are meeting the TRAI specified benchmarks on SDCCH/Paging Channel Congestion and TCH. Etisalat leads the way in network congestion parameters with almost negligible paging as well as traffic channel congestion. The calculation methodology of these parameters was found to be in complete accordance with what has been specified by TRAI. Both RCOM CDMA and Tata Teleservices measure paging channel utilization. When the value of this parameter is less than 100%, it is counted as 0% congestion. There were 2 POIs of STel, 1 POI of BSNL and 12 POIs of Uninor with congestion more than the benchmark ( $\leq 0.5\%$ ).

Call Drop Rate:

During the audit it was found that all the service providers were measuring this parameter as per the TRAI guidelines. The call drop rate was measured as the ratio of total calls dropped to the total number of call attempts for all operators. Also, all of service providers except Vodafone were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of Tata Docomo at 0.4% while the highest was for Vodafone at 2.17%.

Connections with good voice quality:

All the operators are measuring this parameter via their periodic drive tests. However, for some operators these parameters can be obtained at their switch as well. During the audit it was found that all the operators were measuring this parameter as per the TRAI guidelines and all the operators meet the TRAI benchmark for voice quality.

Customer Care / Helpline Assessment

For the percentage of calls answered by operator in 60 seconds aspect all the service providers meet the TRAI benchmark except Aircel, BSNL, Reliance GSM and Reliance CDMA. All the operators were meeting TRAI benchmark for the accessibility parameter.

Billing performance

All the operators except Tata Docomo and BSNL were found to be meeting the benchmark of  $\leq 0.1\%$  complaints registered per 100 bills issued except for Tata Docomo. The benchmark of 100% billing complaints being resolved within 4 weeks was being met by all the operators. In all cases where customers were due for refund, all the service providers were meeting the TRAI benchmark of 100%.

Inter operator calls assessment

Inter operator call Assessment To↓ From →	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Tata Docomo	NA	99%	100%	100%	100%	93%	96%	95%	95%	98%	99%	98%	94%	98%
S Tel	100%	NA	100%	100%	99%	94%	100%	96%	98%	97%	99%	100%	98%	97%
Aircel	100%	99%	NA	100%	98%	95%	100%	99%	98%	100%	93%	98%	100%	99%
Etisalat	100%	100%	100%	NA	100%	96%	100%	100%	100%	100%	100%	100%	100%	100%
Vodafone	100%	100%	99%	100%	NA	95%	97%	99%	100%	99%	100%	100%	100%	99%
Videocon	100%	100%	100%	100%	99%	NA	100%	100%	98%	100%	99%	100%	100%	93%
BSNL	100%	100%	95%	100%	100%	93%	NA	96%	98%	99%	96%	100%	100%	99%
Reliance GSM	100%	100%	100%	100%	98%	93%	99%	NA	100%	100%	97%	100%	100%	96%
Reliance CDMA	100%	99%	100%	100%	100%	92%	99%	100%	NA	98%	100%	100%	99%	96%
Idea	100%	99%	100%	100%	98%	94%	99%	99%	100%	NA	100%	100%	99%	98%
MTS	100%	98%	92%	100%	99%	98%	97%	97%	98%	99%	NA	100%	100%	
Tata CDMA	100%	99%	100%	100%	100%	94%	96%	100%	100%	100%	99%	NA	98%	99%
Airtel	100%	100%	100%	100%	100%	95%	97%	99%	100%	100%	99%	100%	NA	91%
Uninor	100%	100%	100%	100%	98%	94%	100%	98%	100%	98%	98%	100%	100%	NA

 The maximum problem faced by the calling operator to other operators

In the inter-operator call assessment, calls were made from the test SIMs of service provider whose audit was being conducted to all the other service providers. Except Tata Docomo and Etisalat all the other operators found it difficult connecting to some or the other operator. Though, it was found that most of the operators found it difficult connecting to Tata Docomo number.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Bihar & Jharkhand circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the cities of Bhagalpur, Jamshedpur and Gaya. IMRB auditors were present in vehicles of every operator. A sample of 15 – 30 test calls were made along each of the routes. The holding period for all test calls was between 120 seconds to 180 seconds. The drive test vehicle across all routes plied at a speed of less than 20 km per hour. Taking into consideration the route that was taken for the drive test; most of the major areas Bihar & Jharkhand telecom circles were covered.

For measuring voice quality RxQual samples for GSM operators and Frame Error Rate (FERs) for CDMA service providers were measured. RxQual greater than 5 meant that the sample was not of appropriate voice quality and for CDMA operators FERs of more than 4 were considered bad. Call drops were measured by the number of calls that were dropped to the total number of calls established during the drive test. Similarly CSSR was measured as the ratio of total calls established to the total call attempts made. Signal strength was measured in Dbm with strength > -75dbm for indoor, -85 dms for in-vehile and > -95 dbm outdoor routes.

The drive tests in the Bihar & Jharkhand circle were conducted in the cities of Bhagalpur, Jamshedpur and Gaya was conducted along the following route:

	Type of location	Bhagalpur	Jamshedpur	Gaya
Outdoor	Peiphery of the city	Railway station-Tatarpur-Sahibganj-Tilkamjni Chowk,Bhagalpur	Railway Station to Gamharia,Jamshedpur	Shyam Krishna Market to Vishnu pad Temple Gaya
	Congested area	Kotwali chowk – Railway station- Ajanta Chowk,Bhagalpur	Pardi to Sakshi,Jamshedpur	G.B Road to Rai Kashinath Mode,Gaya
	Across the city	Tilkamjni chowk-Ghanta ghar- Khalibagh chowk- Kotwali,Bhagalpur	Sakshi to Dimna ,Jamshedpur	Railway Station to Kishori Mohan Complex,Gaya
Indoor	Office complex	Angar complex,Bhagalpur	LIC Building (Bistupur),Jamshedpur	S B College,Gaya
	Shopping complex	Railway station,bhagalpur	Big Bazaar (Dimna Road),Jamshedpur	Railway Station,Gaya

Etisalat & Videocon did not participate in the Drive test conducted due to unavailability of their network in these cities

The tables given below gives a glimpse of the results of the operator assisted drive test:

**Drive Test – Bhagalpur**

	B'mark	Tata Docomo		S Tel		Aircel		Vodafone		BSNL		Reliance GSM		Reliance CDMA		Idea		MTS		Tata CDMA		Airtel		Uninor	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	99.35%	98.05%	97.65%	97.65%	99.18%	98.58%	97.28%	96.62%	96.08%	92.71%	99.75%	96.74%	98.70%	93.44%	96.11%	97.23%	94.24%	97.76%	94.70%	94.04%	97.69%	96.36%	99.43%	97.00%
CSSR	≥ 95%	98.44%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.36%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.37%
%age Blocked calls		1.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.64%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.63%

Quality of Service – Audit module report for Bihar & Jharkhand Circle

Call drop rate	≤ 2%	0.00%	1.89%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	97.78%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**Drive Test – Jamshedpur**

	B'mark	Tata Docomo		S Tel		Aircel		Vodafone		BSNL		Reliance GSM		Reliance CDMA		Idea		MTS		Tata CDMA		Airtel		Uninor	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	98.71%	95.35%	99.64%	98.49%	98.33%	98.11%	98.00%	97.02%	95.84%	94.52%	91.79%	91.57%	82.43%	87.37%	96.19%	93.77%	98.39%	96.93%	58.83%	54.21%	99.21%	96.50%	99.11%	97.61%
CSSR	≥ 95%	100.00%	96.13%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	96.67%	94.23%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
%age Blocked calls		0.00%	3.87%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.33%	5.77%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.68%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

**Drive Test – Gaya**

	B'mark	Tata Docomo		S Tel		Aircel		Vodafone		BSNL		Reliance GSM		Reliance CDMA		Idea		MTS		Tata CDMA		Airtel		Uninor	
		In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor	In door	Outdoor
Voice quality	≥ 95%	99.16%	98.69%	98.81%	94.97%	95.71%	95.74%	98.89%	96.25%	98.22%	92.70%	99.15%	97.66%	99.85%	92.98%	97.24%	94.20%	95.14%	94.17%	93.32%	93.03%	97.81%	96.31%	96.26%	95.92%
CSSR	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	99.37%	100.00%	99.38%	100.00%	100.00%	100.00%	99.35%	100.00%	100.00%	100.00%	100.00%	100.00%	99.34%	100.00%	100.00%
%age Blocked calls		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.63%	0.00%	0.62%	0.00%	0.00%	0.00%	0.65%	0.00%	0.00%	0.00%	0.00%	0.00%	0.66%	0.00%	0.00%
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Hands off success rate		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Not meeting the benchmark

Following were the areas where the signal strength was found to be inadequate for the operators:

### ALL SERVICE PROVIDERS

**Bhagalpur:** There was interference and low signal strength recorded for all operators in the outdoor areas near railway station, while in the indoor areas inadequate coverage was not found in any of the areas.

**Jamshedpur:** There was interference and low signal strength recorded for all the operators in the outdoor areas near Jubli park, Adityapur, Jugsalai while in the indoor areas there was no inadequate coverage or interference recorded.

**Gaya:** There was interference and low signal strength recorded for all operators in the outdoor areas near ghantaghar, batamore while in the indoor areas interference and inadequate coverage was recorded in SB College.

### Conclusions:

Drive test was conducted by IMRB with the help of service providers to measure this parameter. BSNL, Tata CDMA and Reliance CDMA in all the three cities were not meeting the TRAI benchmark on voice quality. In the drive test it was also found that S-tel and MTS in Gaya, Reliance GSM in Jamshedpur, Idea in Jamshedpur and Gaya are not meeting benchmark on voice quality parameter.

### Summary of Live Measurement Results – Cellular Mobile Services

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			Metering and Billing	Response time to customer for assistance	
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging Chl. Congestion (%)	TCH Congestion (%)	Call Drop Rate (%)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality	%age complaints resolved within 4 weeks	Accessibility of call centre/customer care	Percentage of calls answered by the operators (voice to voice) within 60 seconds
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	100%	≥ 95%	≥ 90%
Tata Docomo	0.00%	0.00%	97.00%	0.40%	0.71%	0.96%	0.90%	97.90%	100.00%	100.00%	100.00%
S Tel	0.17%	0.00%	98.70%	0.71%	1.30%	0.54%	4.18%	97.70%	96.67%	100.00%	100.00%
Aircel	0.19%	0.71%	99.00%	0.14%	0.36%	1.33%	8.43%	97.59%	80.00%	100.00%	56.00%
Etisalat	0.04%	0.00%	95.00%	0.28%	0.05%	0.34%	3.17%	NA	NA	NA	NA
Vodafone	0.89%	1.42%	95.18%	1.98%	5.06%	1.79%	5.31%	97.11%	NA	100.00%	100.00%
Videocon	0.16%	0.00%	98.65%	0.60%	0.47%	1.30%	0.00%	NA	NA	100.00%	94.00%
BSNL	1.80%	4.12%	90.32%	0.40%	0.96%	0.87%	4.94%	94.43%	73.47%	100.00%	60.00%
Reliance GSM	0.00%	0.00%	98.50%	0.72%	0.77%	0.91%	1.68%	95.78%	76.67%	100.00%	70.00%
Reliance CDMA	0.04%	0.00%	99.00%	0.00%	1.20%	1.07%	0.74%	92.69%	80.00%	100.00%	94.00%
Idea	0.07%	0.00%	97.00%	0.58%	1.70%	1.30%	2.75%	95.56%	66.67%	100.00%	76.00%
MTS	5.51%	0.00%	99.52%	0.00%	0.10%	0.07%	3.77%	96.16%	100.00%	100.00%	94.00%
Tata CDMA	0.00%	0.00%	99.75%	0.00%	0.27%	0.63%	0.00%	81.12%	NA	100.00%	100.00%
Airtel	0.01%	0.00%	97.84%	0.76%	0.72%	0.82%	2.75%	96.88%	100.00%	100.00%	94.00%
Uninor	0.13%	0.00%	95.38%	0.25%	1.85%	1.97%	4.73%	97.20%	86.67%	100.00%	98.00%

Not meeting the benchmark

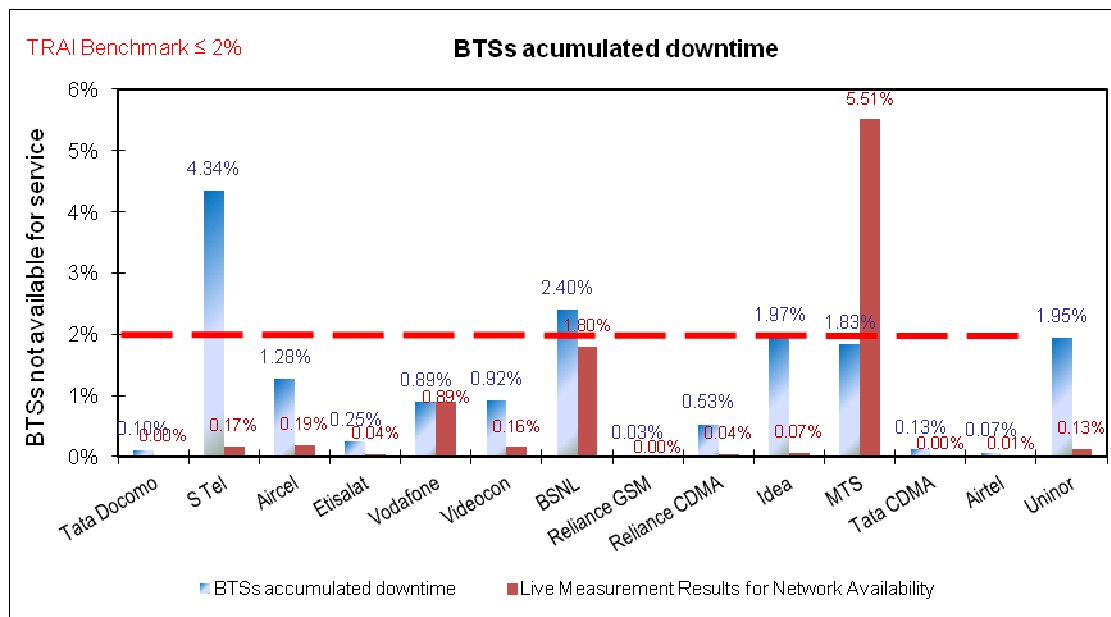
During the three day live measurement, it was found that:

- All operators except MTS were found to be meeting the TRAI benchmark for BTS Accumulated Downtime parameter.
- BSNL does not meet the TRAI benchmark for worst affected BTS due to Downtime and CSSR parameter.
- Vodafone does not meet the TRAI benchmark for SDCCH and TCH congestion parameter.
- Aircel and Vodafone do not meet the TRAI benchmark for worst affected cells having more than 3% TCH drop parameter.
- All operators except Vodafone were found to be meeting the TRAI benchmark for Traffic Channel congestion parameter.
- BSNL, Tata CDMA and Reliance CDMA were not meeting the TRAI benchmark for voice quality.
- All the operators except S-Tel, Aircel, BSNL, Reliance CDMA, Reliance GSM and Idea were found to be meeting the % of complaints resolved within 4 weeks parameter.
- All the operators except Aircel, BSNL, Reliance GSM and Idea were found to be not meeting the TRAI benchmark for Percentage of calls answered by the operators (voice to voice) within 60 seconds.

## **6.0 Detailed findings – Includes comparison between Live calling/Live measurements and One month data collection**

### **6.1 Graphical/Tabular Representations for Cellular Mobile Services**

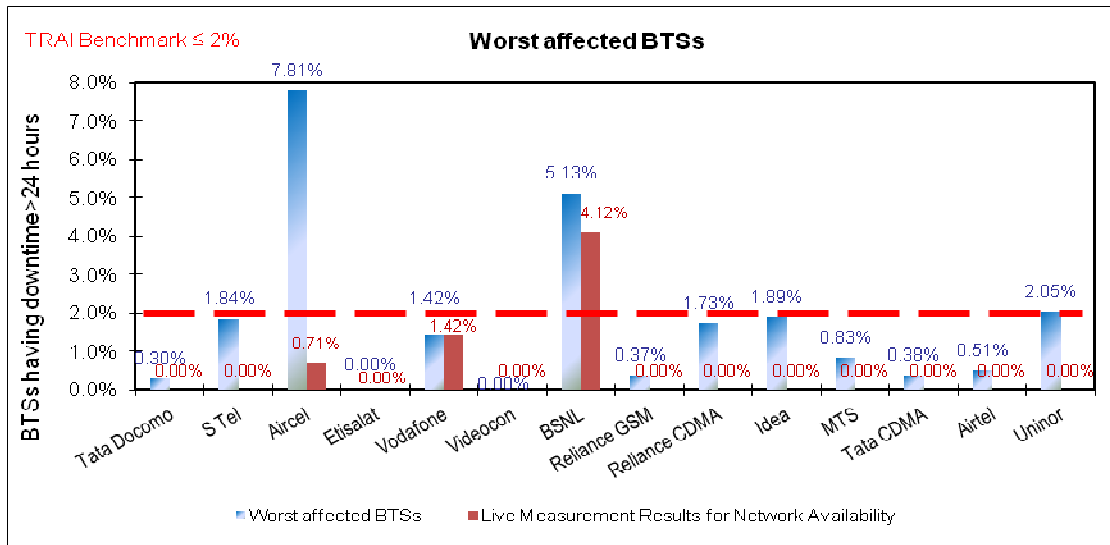
#### **BTSs Accumulated Downtime**



Operator(s) meeting benchmark: Tata Docomo, Aircel, Etisalat, Vodafone, Videocon, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

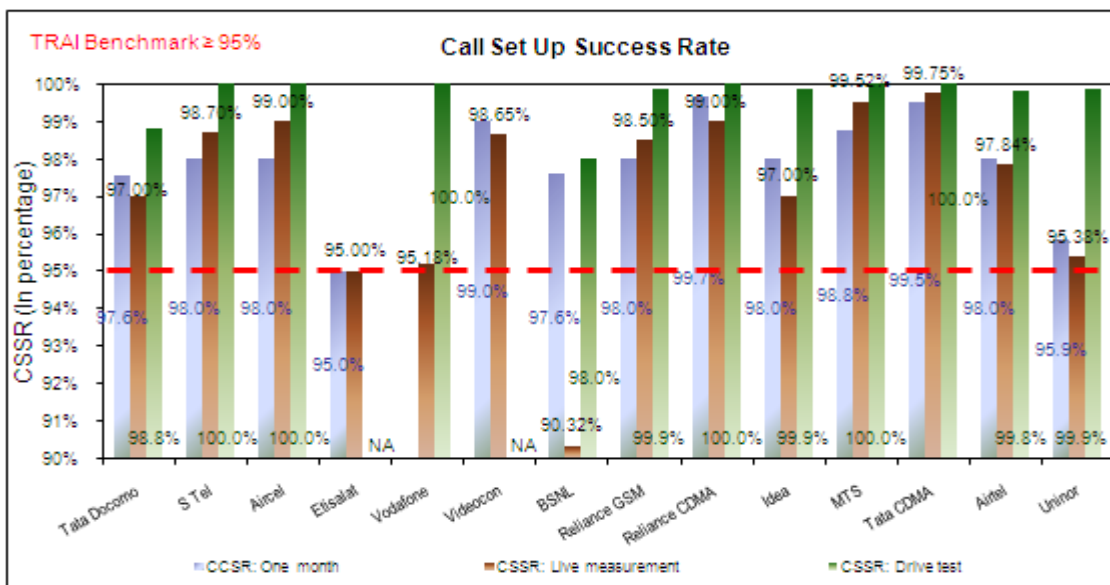
Operator(s) not meeting the benchmark: S Tel, BSNL

**Worst Affected BTSs**



Operator(s) meeting benchmark: Tata Docomo, S Tel, Etisalat, Vodafone, Videocon, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel  
 Operator(s) not meeting the benchmark: Aircel, BSNL, Uninor

**Call Set-up Success Rate (CSSR)**



**One month**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor  
 Operator(s) not meeting the benchmark: Vodafone

**Live measurement**

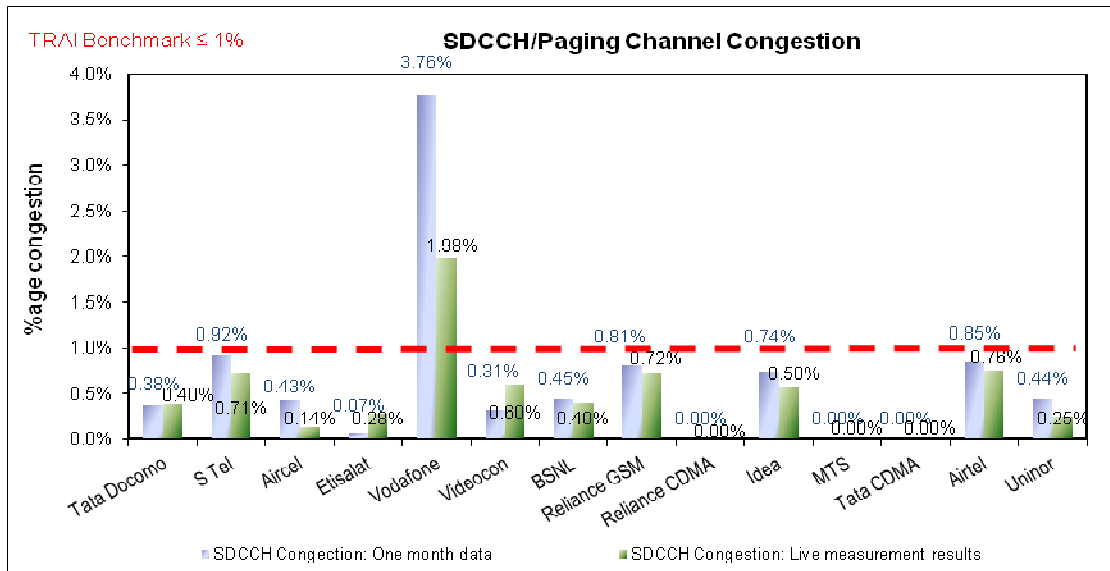
All the operators meet the benchmark



**Drive test**

All the operators meet the benchmark

**SDCCH / Paging Channel Congestion**



**One month**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

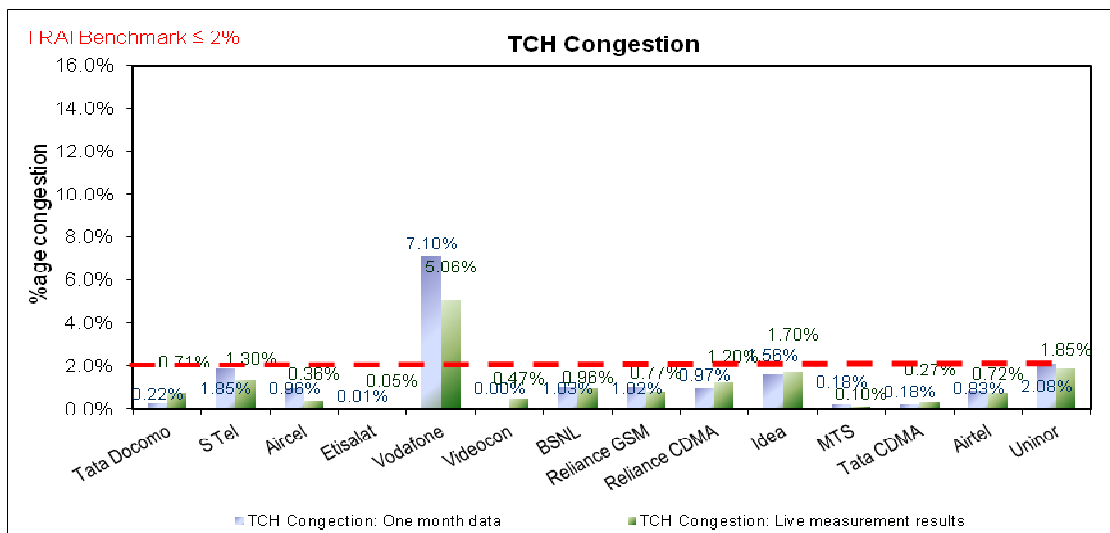
Operator(s) not meeting the benchmark: Vodafone

**Live measurement**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

Operator(s) not meeting the benchmark: Vodafone

**TCH Congestion**



**One month**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel

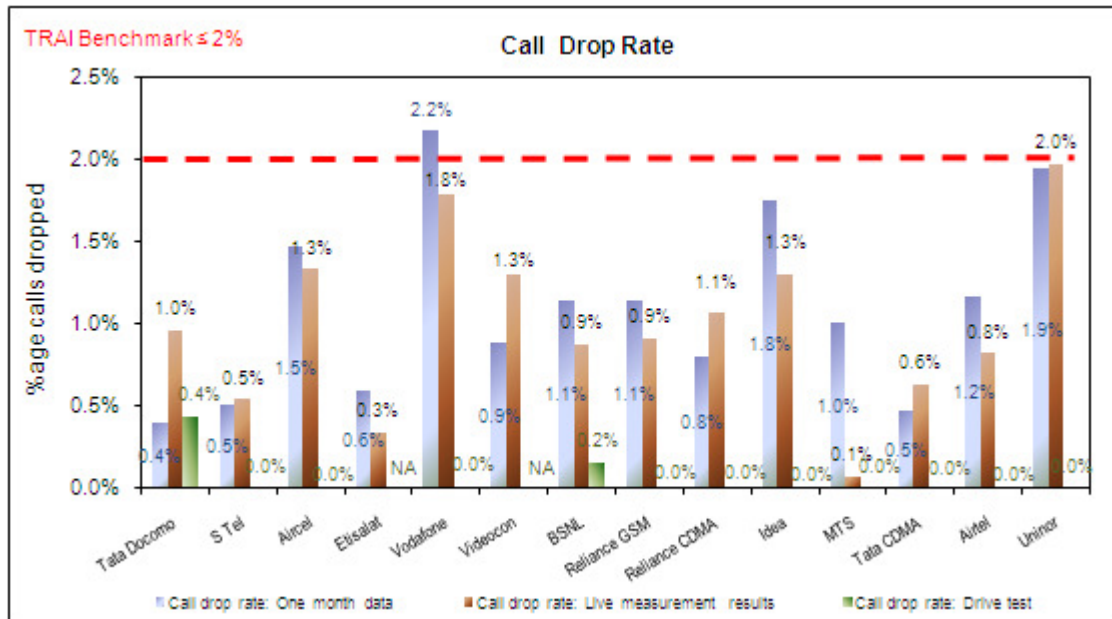
Operator(s) not meeting the benchmark: Vodafone, Uninor

**Live measurement**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

Operator(s) not meeting the benchmark: Vodafone

**Call Drop Rate**



**One month**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

Operator(s) not meeting the benchmark: Vodafone

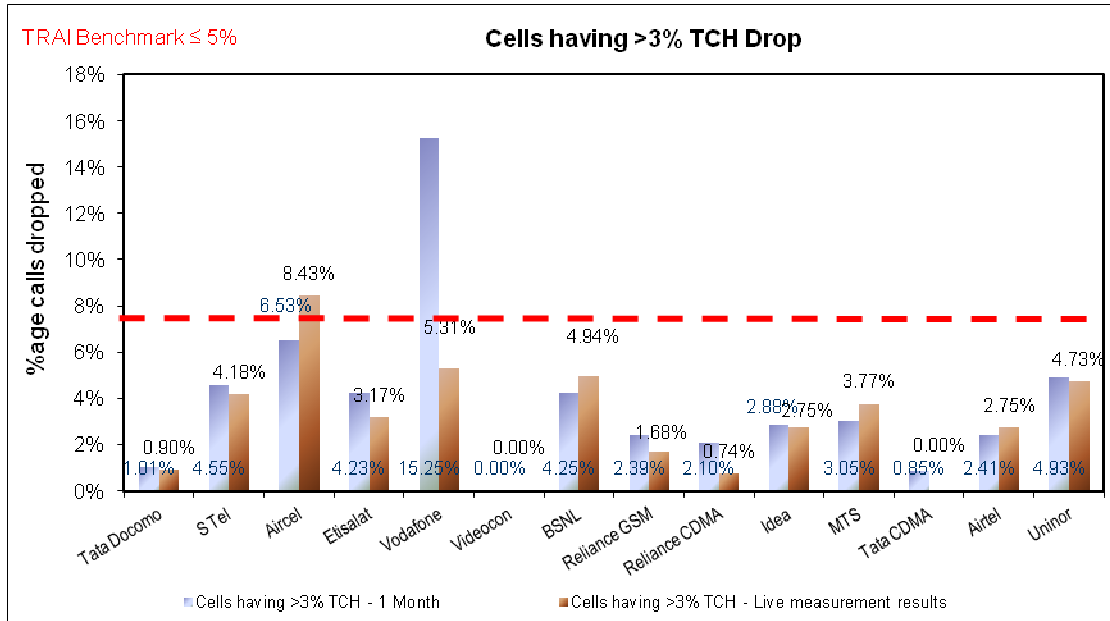
**Live measurement**

All the operators meet the benchmark

**Drive test**

All the operators meet the benchmark

**Cells with more than 3% TCH Drop Rate**



**One month**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

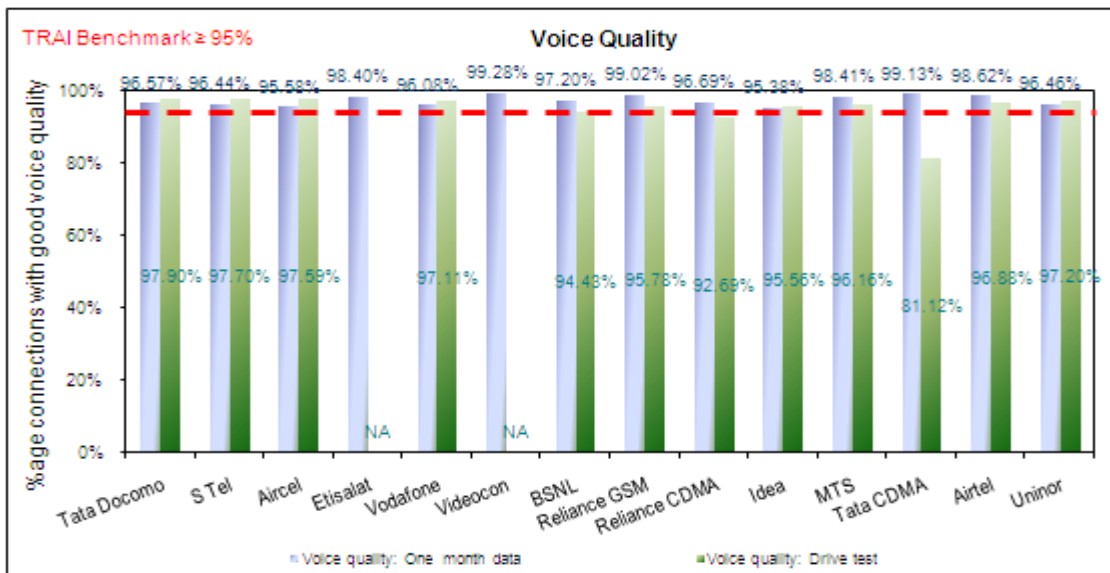
Operator(s) not meeting the benchmark: Aircel, Vodafone

**Live measurement**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Etisalat, Videocon, BSNL, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

Operator(s) not meeting the benchmark: Aircel, Vodafone

**Voice quality**



**One month**

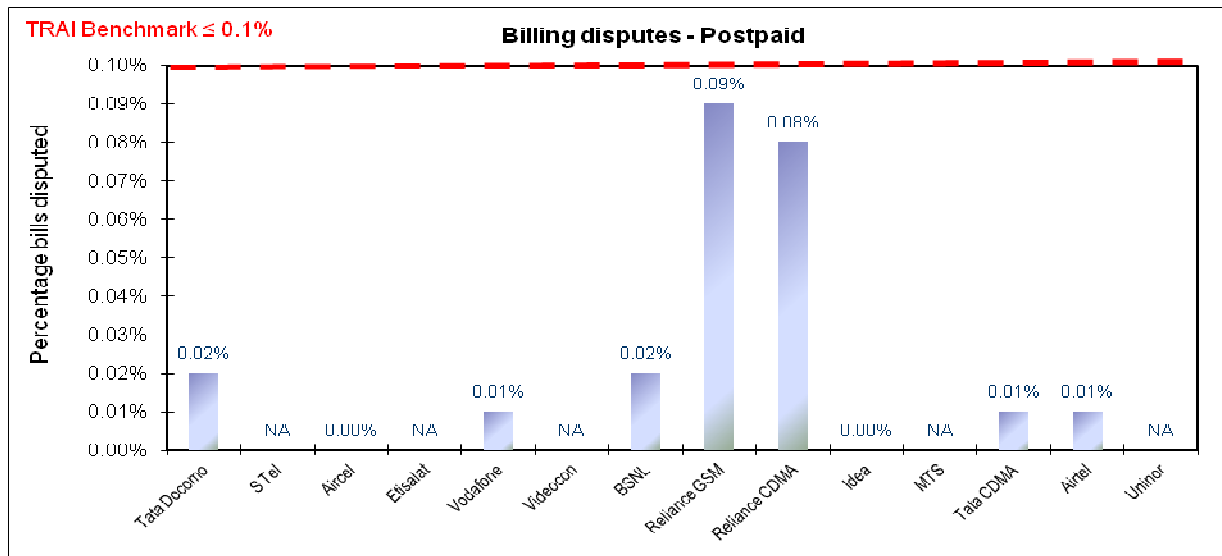
All the operators meet the benchmark

**Live measurement (Drive test)**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Aircel, Vodafone, Reliance GSM, Idea, MTS, Airtel, Uninor

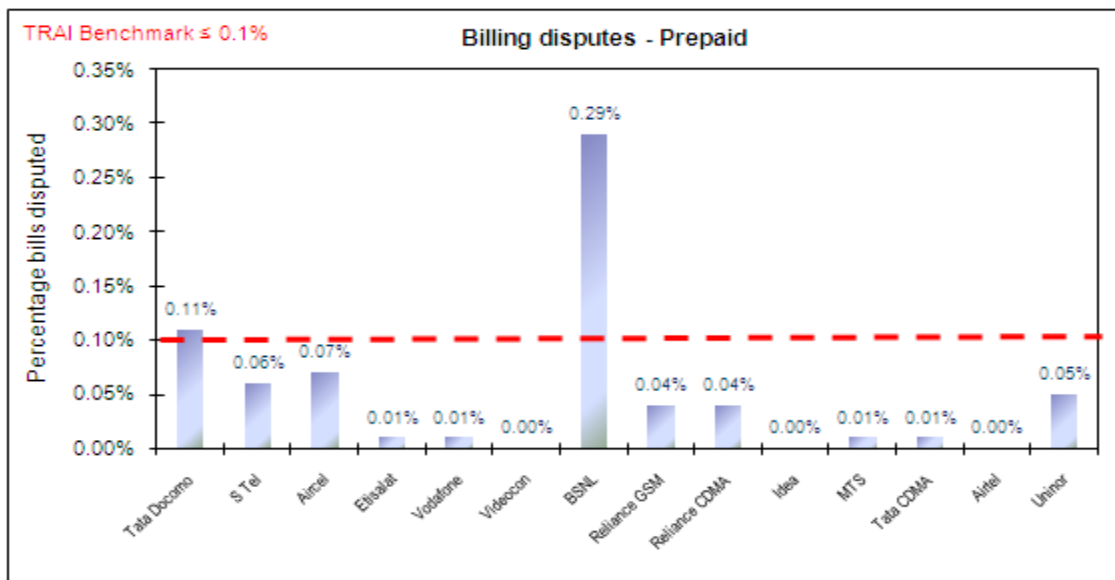
Operator(s) not meeting the benchmark: BSNL, Reliance CDMA, Tata CDMA

**Billing Disputes - Postpaid**



All the operators meet the benchmark

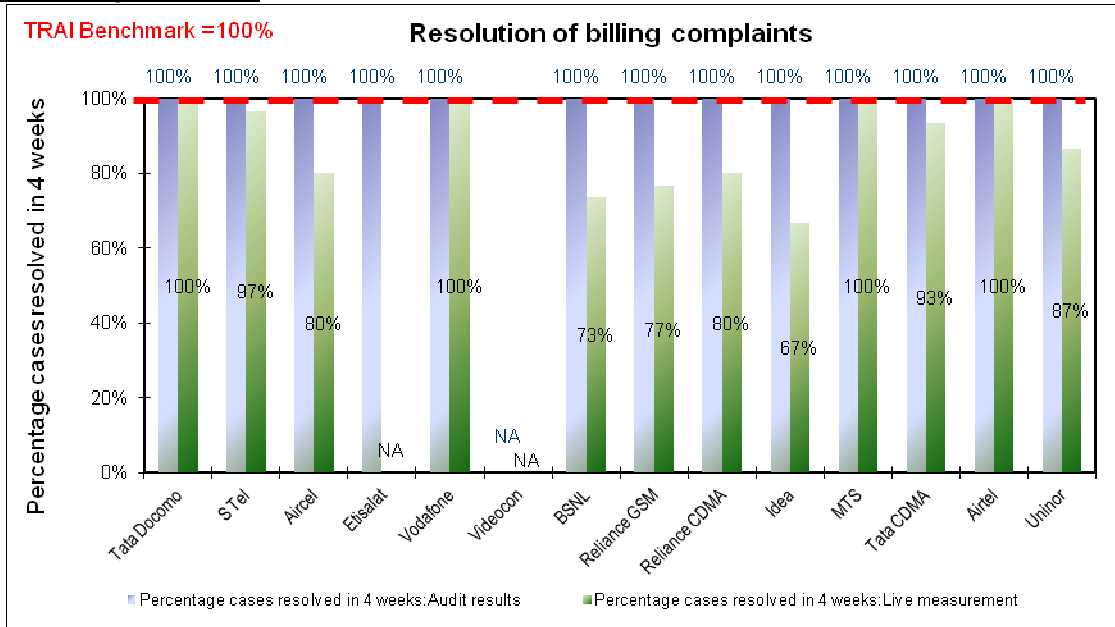
**Complaints - Prepaid**



Operator(s) meeting benchmark: S Tel, Aircel, Etisalat, Vodafone, Videocon, Reliance GSM, Reliance CDMA, Idea, MTS, Tata CDMA, Airtel, Uninor

Operator(s) not meeting the benchmark: Tata Docomo, BSNL

**Resolution of billing complaints**



**One month**

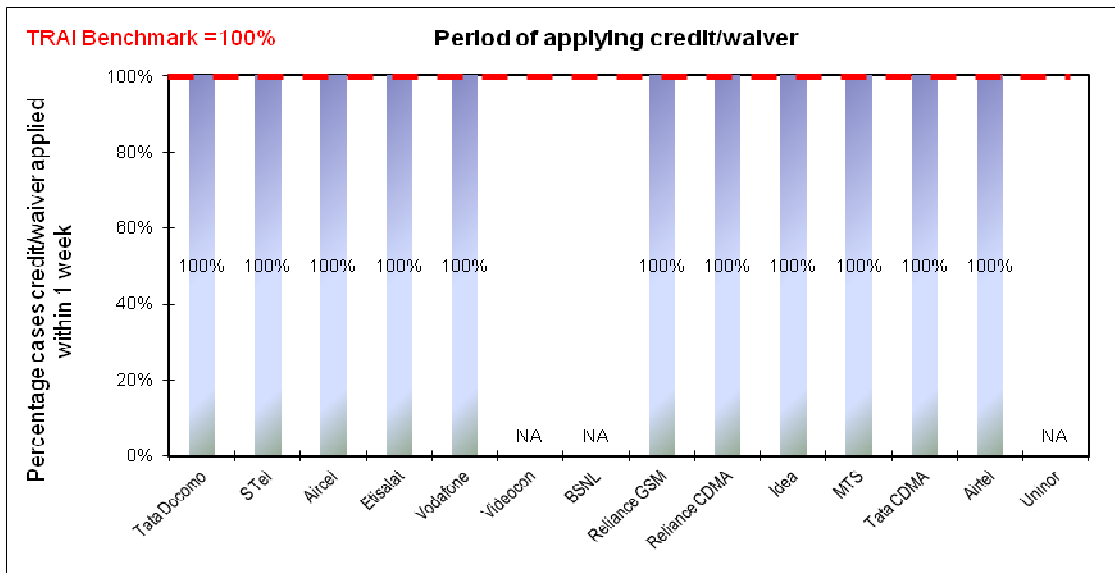
All the operators meet the benchmark

**Live measurement**

Operator(s) meeting benchmark: Tata Docomo, Vodafone, MTS, Airtel

Operator(s) not meeting the benchmark: S Tel, Aircel, BSNL, Reliance GSM, Reliance CDMA, Idea, Tata CDMA, Uninor

**Period of applying credit / waiver**



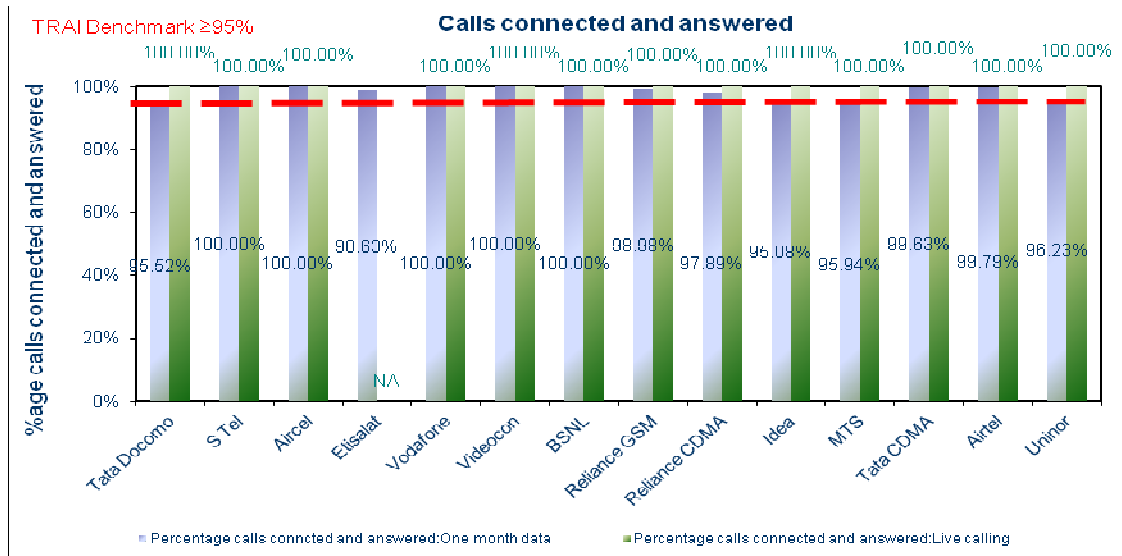
All the operators meet the benchmark

**Live calling for billing Complaints**

Resolution of billing complaints	Benchmark	Tata Docomo	S Tel	Airtel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total Number of calls made		2	30	30	0	30	0	49	30	30	30	30	30	2	30
Number of cases resolved in 4 weeks		2	29	24	0	30	0	36	23	24	20	30	28	2	26
Percentage cases resolved in four weeks	100%	100%	97%	80%	NA	100%	NA	73%	77%	80%	67%	100%	93%	100%	87%

\*No billing complaints available for Etisalat and Videocon for live calling

**Customer Care / Helpline: Calls answered**



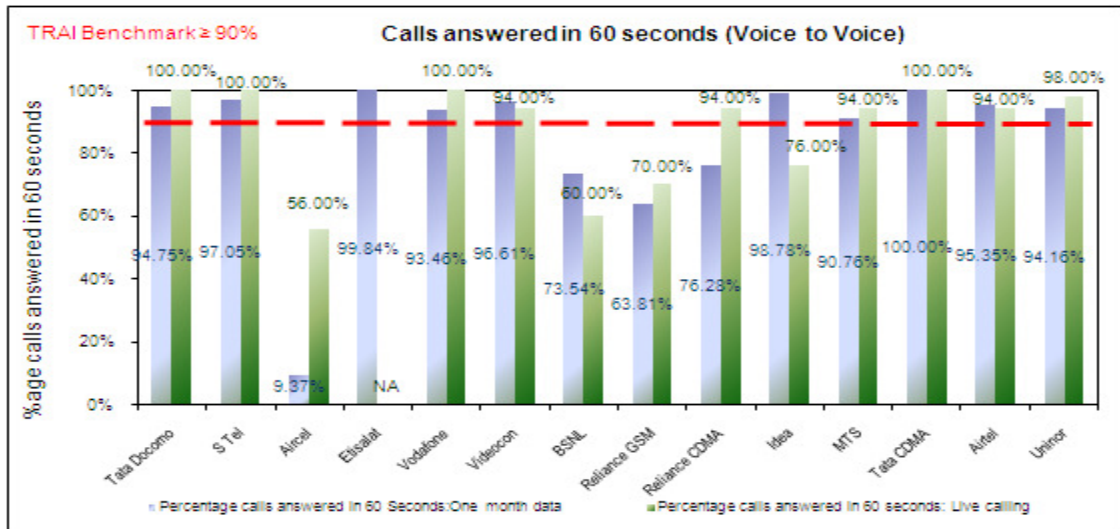
**One month**

All the operators meet the benchmark

**Live measurement**

All the operators meet the benchmark

**Customer Care / Helpline: Calls answered voice to voice**



**One month**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Etisalat, Vodafone, Videocon, Idea, MTS, Tata CDMA, Airtel, Uninor

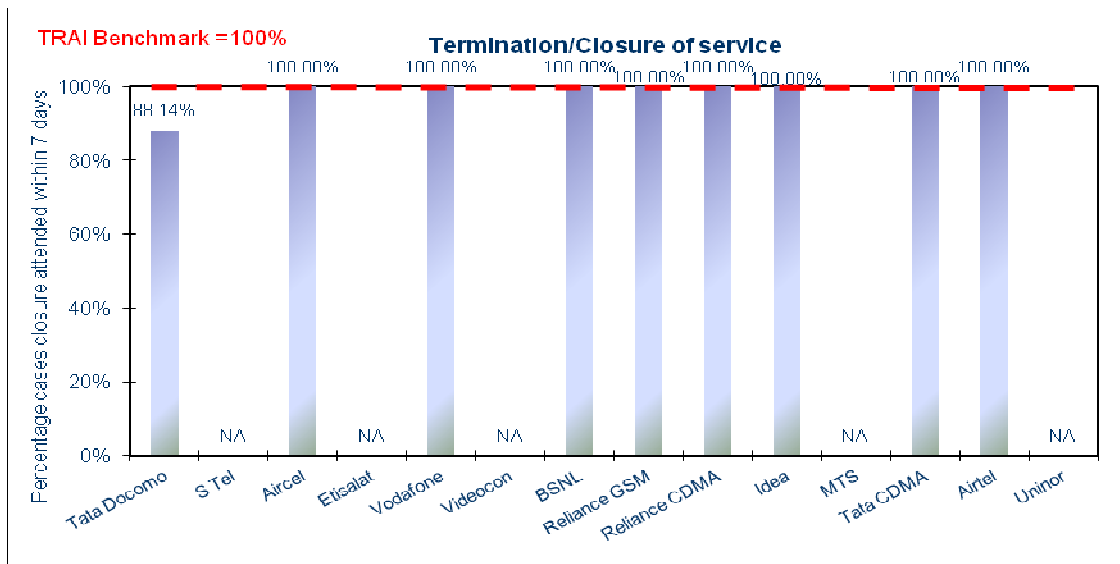
Operator(s) not meeting the benchmark: Aircel, BSNL, Reliance GSM, Reliance CDMA

**Live measurement**

Operator(s) meeting benchmark: Tata Docomo, S Tel, Vodafone, Videocon, Reliance CDMA, MTS, Tata CDMA, Airtel, Uninor

Operator(s) not meeting the benchmark: Aircel, BSNL, Reliance GSM, Idea

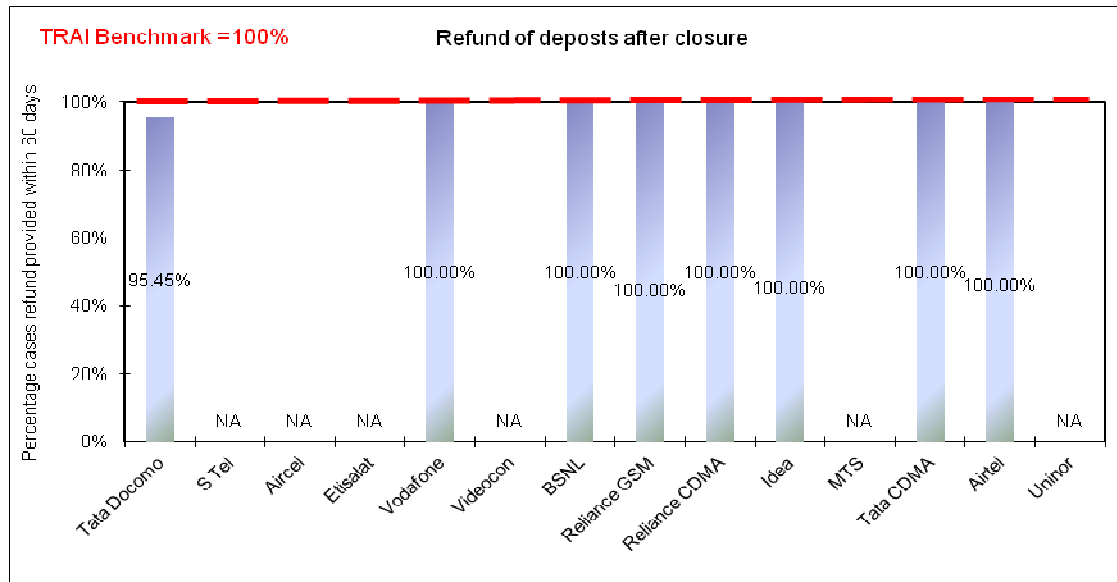
**Termination / Closure of service**



Operator(s) meeting benchmark: Aircel, Vodafone, BSNL, Reliance GSM, Reliance CDMA, Idea, Tata CDMA, Airtel

Operator(s) not meeting the benchmark: Tata Docomo

**Refund of deposits**



Operator(s) meeting benchmark: Vodafone, BSNL, Reliance GSM, Reliance CDMA, Idea, Tata CDMA, Airtel  
 Operator(s) not meeting the benchmark: Tata Docomo

Inter operator calls assessment

Inter operator call Assessment To↓ From →	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Tata Docomo	NA	99%	100%	100%	100%	93%	96%	95%	95%	98%	99%	98%	94%	98%
S Tel	100%	NA	100%	100%	99%	94%	100%	96%	98%	97%	99%	100%	98%	97%
Aircel	100%	99%	NA	100%	98%	95%	100%	99%	98%	100%	93%	98%	100%	99%
Etisalat	100%	100%	100%	NA	100%	96%	100%	100%	100%	100%	100%	100%	100%	100%
Vodafone	100%	100%	99%	100%	NA	95%	97%	99%	100%	99%	100%	100%	100%	99%
Videocon	100%	100%	100%	100%	99%	NA	100%	100%	98%	100%	99%	100%	100%	93%
BSNL	100%	100%	95%	100%	100%	93%	NA	96%	98%	99%	96%	100%	100%	99%
Reliance GSM	100%	100%	100%	100%	98%	93%	99%	NA	100%	100%	97%	100%	100%	96%
Reliance CDMA	100%	99%	100%	100%	100%	92%	99%	100%	NA	98%	100%	100%	99%	96%
Idea	100%	99%	100%	100%	98%	94%	99%	99%	100%	NA	100%	100%	99%	98%
MTS	100%	98%	92%	100%	99%	98%	97%	97%	98%	99%	NA	100%	100%	
Tata CDMA	100%	99%	100%	100%	100%	94%	96%	100%	100%	100%	99%	NA	98%	99%
Airtel	100%	100%	100%	100%	100%	95%	97%	99%	100%	100%	99%	100%	NA	91%
Uninor	100%	100%	100%	100%	98%	94%	100%	98%	100%	98%	98%	100%	100%	NA

The maximum problem faced by the calling operator to other operators

In the inter-operator call assessment, calls were made from the test SIMs of service provider whose audit was being conducted to all the other service providers. Except Tata Docomo and Etisalat all the other operators found it difficult connecting to some or the other operator. Though, it was found that most of the operators found it difficult connecting to Tata Docomo number.



## 7.0 Compliance reports: Results of Verification of PMR

### 7.1 Compliance Report Month 1: January 2011

Name of Service Provider	Network Availability					Connection Establishment			Connection Maintenance (Retainability)				POI		Network Traffic Capacity				
	Total no. of BTSs in the licensed service area	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month	BTSs Accumulated downtime (not available for service) (%age)	No. of BTSs having accumulated downtime of >24 hours in a month	Worst affected BTSs due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Total No. of cells exceeding 3% TCH drop (call drop)	Total no. of cells in the network	Worst affected cells having more than 3% TCH drop (call drop) rate (%age)	%age connection with good voice quality	Point of interconnection (POI) Congestion	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handled in TCHB in erlang	Total no. of customer serves (as per VLR) on last day of the month	
<b>Benchmark</b>			≤ 2%		≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%						
Tata Docomo	PMR	1963	66	0.00%	0	0.00%	97.20%	0.07%	0.50%	1.05%	215	5945	3.52%	96.26%	0	20	60704	22667	1048747
	IMRB	1983	66	0.45%	0	0.00%	97.20%	0.07%	0.50%	1.05%	215	5945	3.62%	96.26%	0	20	60704	22667	1046747
S Tel	PMR	1507	21500	1.92%	26	1.73%	98.39%	0.67%	0.03%	0.00%	187	4521	4.14%	97.06%	4	54	33633	12015	541664
	IMRB	1507	21500	1.92%	26	1.73%	98.39%	0.67%	0.03%	0.00%	187	4521	4.14%	97.06%	4	54	33633	12015	541664
Aircel	PMR	3397	10063	0.4%	75	2.21%	98.2%	0.16%	1.06%	1.47%	1309	10178	12.86%	95.60%	1	121	193606	58603	2549687
	IMRB	3397	10063	0.4%	75	2.21%	98.2%	0.16%	1.06%	1.47%	1309	10178	12.86%	95.60%	1	121	193606	58603	2549687
Etisalat	PMR	40	1550	5.21%	1	2.50%	99.80%	0.05%	0.00%	0.11%	3	120	2.50%	96.88%	0	20	349.2	17.58	1453
	IMRB	40	1550	5.21%	1	2.50%	99.80%	0.05%	0.00%	0.11%	3	120	2.50%	98.88%	0	20	349.2	17.68	1453
Vodafone	PMR	5363	22626	0.56%	97	1.80%	96.45%	0.65%	2.52%	1.32%	1446	16074	9%	96.71%	0	46	140116	110598	3653151
	IMRB	5363	22626	0.56%	97	1.80%	96.45%	0.65%	2.52%	1.32%	1446	16074	9%	96.71%	0	46	140116	110397	3653151
Videocon	PMR	12	103	1.15%	0	0.00%	99.36%	0.43%	0.12%	0.78%	1	36	2.78%	99.15%	0	28	10000	23	2233
	IMRB	12	103	1.15%	0	0.00%	99.36%	0.43%	0.12%	1.26%	1	36	2.78%	99.15%	0	28	10000	23	2233
BSNL	PMR	3252	63769	0.85%	167	1.6%	97.00%	0.55%	1.20%	1.45%	463	9596	5.14%	97.0%	0	211	262600	174768	3346178
	IMRB	3252	63769	0.85%	167	1.6%	97.00%	0.55%	1.20%	1.45%	463	9596	5.14%	97.0%	0	211	262600	174768	3346178
Reliance GSM	PMR	2934	5578	0.26%	53	1.81%	99.00%	0.88%	1.86%	1.37%	295	8802	3.36%	95.85%	0	22	148000	95168	DNA
	IMRB	2934	5578	0.26%	53	1.81%	99.00%	0.88%	1.86%	1.37%	295	8802	3.36%	95.85%	0	22	148000	95168	DNA
Reliance CDMA	PMR	2423	13335	0.74%	46	1.90%	97.00%	0.0%	1.55%	0.69%	10	2423	0.42%	95.31%	0	39	262000	85601	DNA
	IMRB	2423	13335	0.74%	46	1.90%	97.00%	0.0%	1.55%	0.69%	10	2423	0.42%	95.31%	0	39	262000	85601	DNA
Idea	PMR	3967	32266	1.09%	51	1.29%	98.07%	0.61%	1.57%	1.27%	431	11867	3.63%	96.00%	0	85	104084	104090	3307046
	IMRB	3967	32265	1.09%	51	1.34%	98.07%	0.61%	1.57%	1.27%	431	11867	3.63%	96.00%	0	85	104084	104090	3307046

MTS	PMR	1295	17958	1.86%	22	1.70%	99.00%	0.00%	0.02%	0.16%	24	3885	0.62%	99.19%	0	36	60711	6441	252360
	IMRB	1295	17959	1.86%	22	1.70%	99.00%	0.00%	0.02%	0.16%	24	3885	0.62%	98.90%	0	36	60711	8441	252360
Tata CDMA	PMR	1088	581	0.07%	0	0.00%	99.77%	0.00%	0.00%	0.19%	0	3306	0.00%	99.72%	0	224	180206	46455	1114382
	IMRB	1088	581	0.07%	0	0.00%	99.77%	0.00%	0.00%	0.19%	0	3306	0.00%	99.72%	0	224	180206	46455	1114362
Airtel	PMR	6799	4402	0.09%	29	0.43%	97.66%	0.87%	1.35%	1.47%	581	20340	2.86%	95.96%	0	655	541063	475056	13888552
	IMRB	6799	4402	0.09%	29	0%	98%	0.87%	1.35%	1.47%	581	20340	2.86%	96%	0	655	541063	475056	13888552
Uninor	PMR	1958	11539	0.79%	4	0.20%	96.36%	0%	1%	1.57%	304	5889	5.10%	95.61%	0	65	66892.00	38848	719664
	IMRB	1958	11539	0.79%	4	0.20%	96.36%	0.28%	1%	1.57%	304	5889	5.10%	95.61%	0	65	66892	38848	719664

## 7.2 Compliance Report Month 2: February 2011

Name of Service Provider	Network Availability					Connection Establishment			Connection Maintenance (Retainability)				POI		Network Traffic Capacity				
	Total no. of BTSs in the licensed service area	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month	BTSS accumulated downtime (not available for service) (%age)	No. of BTSS having accumulated downtime of >24 hours in a month	Worst affected BTSS due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Total No. of cells exceeding 3% TCH drop (call drop)	Total no. of cells in the network	Worst affected cells having more than 3% TCH drop (call drop) rate (%age)	%age connection with good voice quality	Point of interconnection (POI) Congestion	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handled in TCHB in erlang	Total no. of customer serves (as per VLR) on last day of the month	
<b>Benchmark</b>			≤ 2%		≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%						
Tata Docomo	PMR	1964	173	0.01%	2	0.10%	97.00%	0.15%	0.69%	0.75%	145	5977	2.43%	96.13%	0	21	63289	25695	1114421
	IMRB	1994	173	0.01%	2	0.10%	97.00%	0.15%	0.69%	0.75%	145	5977	2.43%	96.00%	0	21	63289	25694	1114421
S Tel	PMR	1518	18567	1.82%	23	1.52%	98.57%	0.32%	0.63%	0.43%	189	4554	4.15%	96.90%	1	57	36454	12230	559754
	IMRB	1518	18567	1.82%	23	1.52%	98.57%	0.32%	0.63%	0.43%	189	4554	4.15%	96.90%	1	57	36454	12230	559754
Aircel	PMR	3415	11436	0.5%	148	4.33%	98.00%	0.39%	1.00%	1.18%	1039	10233	10.15%	95.69%	0	126	198875	62203	2369444
	IMRB	3415	11436	0.5%	148	4.33%	98.0%	0.39%	1.00%	1.18%	1039	10233	10.15%	95.69%	0	126	198875	62203	2369444
Etisalat	PMR	40	1350	0.05%	6	0.15%	97.00%	2.25%	0.06%	0.40%	4	120	3.54%	98.94%	0	20	865.42	40.82	1725
	IMRB	40	1350	0.05%	6	0.15%	97.00%	2.25%	0.06%	0.40%	4	120	3.33%	98.94%	0	20	865.42	40.82	1725
Vodafone	PMR	5498	22288	0.60%	94	1.70%	94.69%	1.49%	3.42%	1.40%	1281	16479	7.70%	96.00%	0	47	145570	122043	3868653
	IMRB	5498	22288	0.60%	94	1.70%	94.69%	1.49%	3.42%	1.40%	1281	16479	7.70%	96.00%	0	47	145570	122043	3868653
Videocon	PMR	12	136	1.69%	0	0.00%	98.91%	0.40%	0.01%	0.76%	0	36	0.00%	99.00%	8	37	10000	18.87	1775
	IMRB	12	136	1.69%	0	0.00%	98.91%	0.40%	0.01%	1.16%	0	36	0.00%	99.00%	8	37	10000	18.87	1775
BSNL	PMR	3275	65194	1.33%	170	1.74%	97.00%	0.53%	1.22%	1.39%	473	9735	5.23%	97.0%	0	209	262600	156089	3471198

Reliance GSM	IMRB	3275	65194	1.33%	170	1.74%	97.00%	0.53%	1.22%	1.39%	473	9735	5.23%	97.0%	0	209	262600	156089	3471198
	PMR	2934	4534	0.22%	23	0.78%	96.75%	0.89%	1.22%	1.45%	194	8802	2.20%	95.87%	0	22	148000	95919	DNA
Reliance CDMA	IMRB	2934	4534	0.22%	23	0.78%	96.75%	0.89%	1.22%	1.44%	194	8802	2.20%	95.87%	0	22	148000	95919	DNA
	PMR	2423	10452	0.64%	26	1.07%	99.60%	DNA	1.92%	0.92%	22	2423	0.90%	95.25%	0	39	262000	86365	DNA
Idea	IMRB	2423	10452	0.64%	26	1.07%	99.60%	DNA	1.92%	0.92%	22	2423	0.90%	95.25%	0	39	262000	86365	DNA
	PMR	4037	47651	1.76%	57	1.41%	98.0%	0.85%	1.94%	1.32%	421	12077	3.49%	96.00%	0	85	105906	105640	3499258
MTS	IMRB	4037	47651	1.76%	57	1.41%	98.0%	0.85%	1.94%	1.32%	421	12077	3.48%	96.00%	0	85	105906	105640	3499258
	PMR	1295	14862	1.71%	15	1.16%	99.21%	0.00%	0.00%	0.77%	92	3885	2.37%	99.50%	0	36	60711	9118	266590
Tata CDMA	IMRB	1295	14862	1.71%	15	1.16%	99.21%	0.00%	0.00%	0.77%	92	3885	2.37%	99.50%	0	36	60711	9118	266590
	PMR	1045	805	0.11%	1	0.09%	99.76%	0.00%	0.04%	0.32%	0	3177	0.00%	99.76%	0	227	173633	47582	1127685
Airtel	IMRB	1045	805	0.11%	1	0.09%	99.76%	0.00%	0.04%	0.32%	0	3177	0.00%	99.76%	0	227	173633	47582	1127685
	PMR	6946	4206	0.09%	32	0.46%	97.95%	0.76%	1.17%	1.62%	589	20315	2.90%	96.87%	0	660	551481	500705	14339885
Uninor	IMRB	6946	4206	0.09%	32	0%	97.95%	0.76%	1.17%	1.62%	589	20315	2.90%	97%	0	660	551481	500705	14339885
	PMR	1978	10700	0.72%	2	0.10%	95.92%	0.50%	1%	1.82%	312	5943	5.24%	96.41%	0	66	66886	49083	858825
	IMRB	1978	10700	0.72%	2	0.10%	95.92%	0.50%	1%	1.82%	312	5943	5.24%	96.41%	0	66	66886	49083	858825

### 7.3 Compliance Report Month 3: March 2011

Name of Service Provider	Network Availability					Connection Establishment			Connection Maintenance (Retainability)				POI		Network Traffic Capacity				
	Total no. of BTSs in the licensed service area	Sum of downtime of BTSs in a month in hours i.e. total outage time of all BTSs in hours during a month	BTSS Accumulated downtime (not available for service) (%age)	No. of BTSS having accumulated downtime of >24 hours in a month	Worst affected BTSS due to downtime (%age)	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging chl. Congestion (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Total No. of cells exceeding 3% TCH drop (call drop)	Total no. of cells in the network	Worst affected cells having more than 3% TCH drop (call drop) rate (%age)	%age connection with good voice quality	Point of interconnection (POI) Congestion	Total number of working POI Service Area wise	Equipped Capacity of Network in respect of Traffic in erlang	Total traffic handled in TCHB in erlang	Total no. of customer serves (as per VLR) on last day of the month	
<b>Benchmark</b>			≤ 2%		≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%						
Tata Docomo	PMR	2002	207	0.01%	0	0.00%	97.53%	0.19%	0.70%	0.43%	66	5974	1.10%	96.92%	0	21	65839	28388	1158819
	IMRB	2002	207	0.01%	0	0.00%	97.53%	0.19%	0.70%	0.43%	108	5975	1.81%	96.92%	0	21	65839	28388	1158819
S Tel	PMR	1522	21000	1.85%	28	1.84%	98.69%	0.57%	1.58%	0.44%	176	4566	3.85%	96.75%	1	59	36894	12500	552874
	IMRB	1522	21000	1.85%	30	1.97%	98.69%	0.57%	1.58%	0.44%	176	4566	3.85%	96.75%	1	59	36894	12500	552874
Aircel	PMR	3433	28700	1.1%	319	9.29%	97.94%	0.33%	1.19%	1.21%	1011	10288	9.82%	95.51%	0	126	199159	62578	2237431
	IMRB	3433	28700	1.1%	319	9.29%	97.94%	0.33%	1.18%	1.21%	1011	10288	9.83%	95.52%	0	126	199159	62578	2237431

Quality of Service – Audit module report for Bihar & Jharkhand Circle


Etisalat	PMR	60	2176	4.87%	4	6.67%	99.54%	0.15%	0.00%	0.51%	7	180	3.89%	96.74%	0	30	1309	80.2	1792
	IMRB	60	2176	4.87%	4	6.67%	99.54%	0.15%	0.00%	0.51%	7	180	3.89%	96.74%	0	30	1309	80.2	1792
Vodafone	PMR	5742	25653	0.60%	81	1.41%	93.90%	1.63%	4.02%	1.39%	NA	NA	8.49%	95.89%	0	48	154923	130702	4168984
	IMRB	5742	25653	0.60%	81	1.41%	93.90%	1.63%	4.02%	1.39%	NA	NA	8.49%	95.89%	0	48	154923	130702	4168984
Videocon	PMR	12	122	1.37%	0	0.00%	99.25%	0.10%	0.02%	0.91%	0	36	0.00%	99.19%	0	24	10000	10.64	2003
	IMRB	12	122	1.37%	0	0.00%	99.25%	0.10%	0.02%	0.91%	0	36	0.00%	99.19%	0	24	10000	10.64	20003
BSNL	PMR	3294	66395	1.33%	175	1.77%	97.00%	0.53%	1.25%	1.88%	477	9792	5.20%	97.00%	0	200	262600	152972	3562462
	IMRB	3294	66395	1.33%	175	1.77%	97.00%	0.53%	1.25%	1.88%	477	9792	5.20%	97.00%	0	200	262600	152972	3562462
Reliance GSM	PMR	2934	3551	0.16%	25	0.85%	96.79%	0.88%	1.42%	1.48%	202	8802	2.29%	95.45%	0	22	DNA	DNA	DNA
	IMRB	2934	3551	0.16%	25	0.85%	96.79%	0.88%	1.42%	1.48%	202	8802	2.29%	95.45%	0	22	DNA	DNA	DNA
Reliance CDMA	PMR	2423	12031	0.66%	33	1.36%	99.00%	DNA	1.86%	0.98%	19	2423	0.78%	95.44%	0	30	DNA	DNA	DNA
	IMRB	2423	12031	0.66%	33	1.36%	99.00%	DNA	1.86%	0.98%	19	2423	0.78%	95.44%	0	30	DNA	DNA	DNA
Idea	PMR	4143	49639	1.61%	62	1.50%	98.0%	0.89%	1.81%	1.81%	489	12394	3.94%	95.23%	0	85	110975	101672	3797112
	IMRB	4143	49639	1.61%	62	1.50%	98.0%	0.89%	1.81%	1.81%	489	12394	3.94%	95.23%	0	85	110975	101672	3797112
MTS	PMR	1295	12466	1.29%	15	1.16%	99.16%	DNA	0.10%	0.74%	70	3885	1.80%	98.90%	0	37	60711	9183.61	291171
	IMRB	1295	12466	1.29%	15	1.16%	99.16%	DNA	0.10%	0.74%	70	3885	1.80%	98.90%	0	37	60711	9183.61	291171
Tata CDMA	PMR	1045	780	0.10%	1	0.10%	99.78%	DNA	0.03%	0.22%	0	3177	0.00%	99.81%	0	227	173633	47871	1111101
	IMRB	1045	780	0.10%	1	0.10%	99.78%	DNA	0.03%	0.22%	0	3177	0.00%	99.81%	0	227	173633	47871	1111101
Airtel	PMR	7039	4606	0.10%	38	0.50%	97.00%	0.90%	1.80%	1.90%	594	20644	2.90%	96.40%	0	DNA	571947	473007	14629736
	IMRB	7039	4606	0.10%	38	0.50%	97.00%	0.90%	1.80%	1.90%	594	20644	2.90%	96.40%	0	DNA	571947	473007	14629736
Uninor	PMR	1989	10072	0.68%	1	0.05%	96.11%	0.38%	1.45%	1.53%	293	5976	4.90%	96.47%	0	66	65659	57874	976179
	IMRB	1989	10072	0.68%	1	0.05%	96.11%	0.38%	1.45%	1.53%	293	5976	4.90%	96.47%	0	66	65659	57874	976179

### 7.4 Cellular Mobile services: Compliance Report January – March 2011


Name of Service Provider		Metering and Billing											Response time to the customer for assistance				Termination/ closure of service				
		Metering and billing credibility - post paid	No. of bills issued during the period	No. of bills disputed including billing complaints during the period	Metering and billing credibility - pre paid	No. of charging / credit / validity complaints during the quarter	Total no. of pre-paid customers at the end of the quarter	Resolution of billing/charging complaints	No. of billing (post-paid) complaints credit / validity (pre-paid) resolved within 4 weeks during the quarter	Total no. of billing (post-paid) and charging, credit / validity (pre-paid) complaints received during the quarter	No. of complaints resolved in favour of the customer during the quarter	No. of complaints disposed on account of not considered as valid complaints during the quarter	adjustment to customer/s account from the date of resolution of complaints	Accessibility of call centre/ customer care	Total no. of call attempts to call centre / customer care nos. during TCBH (Note)	No. of calls connected and answered successfully to call centre / customer care nos. during TCBH (Note)	Percentage of calls answered by the operators (voice to voice) within 60 seconds	%age request for Termination / Closure of service complied within 7 days	Total No. of request for Termination / Closure of service received during the quarter	No. of requests for Termination / Closure of service complied within 7 days during the quarter	Time taken for refund of deposits after closure
Benchmark		< 0.1%			< 0.1%		100% within 4 weeks					100% Within 1 week	≥ 95%			≥ 90%	100% within 7 days			100% within 60 days	
Tata Docomo	PMR	0.03%	10647	43	0.00%	2691	3233988	100%	2734	2734	3	2731	100%	97%	1656674	1545208	58%	100%	158	158	100%
	IMRB	0.10%	10639	11	0.00%	2691	3233988	100%	2734	2734	0	2734	100%	97%	1656674	1545208	93%	85%	137	117	89%
S Tel	PMR	NA	NA	NA	0.00%	1271	1510671	100%	1271	1271	16	1255	100%	98%	1255038	1223711	98.00%	NA	NA	NA	NA
	IMRB	NA	NA	NA	0.00%	1271	1510671	100%	1271	1271	16	1255	100%	98%	1255038	1223711	98.00%	NA	NA	NA	NA
Aircel	PMR	0.00%	3870	0	0.28%	12577	4537788	100%	12577	12577	7677	4400	100%	100%	409811	303742	77%	100%	142	142	100%
	IMRB	0.00%	6388	0	0.53%	23514	4405127	100%	23514	23514	14779	7735	100%	100%	409811	303742	77%	100%	269	269	100%
Etisalat	PMR	NA	NA	NA	0.40%	59	14020	100%	59	59	0	59	100%	99%	10840	6585	99%	NA	0	0	NA
	IMRB	NA	NA	NA	0.40%	59	14020	100%	59	59	0	59	100%	99%	10840	6585	99%	NA	0	0	NA
Vodafone	PMR	0.09%	23430	20	0.02%	3068	5003893	100%	3088	3088	3088	1709	100%	100%	549714	442233	93%	100%	920	920	100%
	IMRB	0.09%	23430	20	0.02%	3068	5003893	100%	3088	3088	3088	1709	100%	100%	549714	442233	93%	100%	920	920	100%
Videocon	PMR	NA	NA	NA	0.09%	11	12278	100%	11	11	0	11	100%	100%	600	600	100%	NA	NA	NA	NA
	IMRB	NA	NA	NA	0.09%	11	12278	100%	11	11	0	11	100%	100%	600	600	100%	NA	NA	NA	NA
BSNL	PMR	0.03%	66437	22	0.09%	3869	1556148	100%	3591	3591	3591	0	100%	100%	1166	1108	93.4%	100%	513	513	100%
	IMRB	0.03%	66437	22	0.09%	3869	1556148	100%	3591	3591	3591	0	100%	100%	1166	1108	93.4%	100%	513	513	100%
Reliance GSM	PMR	0.10%	20014	21	0.03%	1445	4726304	100%	4367	4367	515	515	100%	63%	742355	466250	67%	100%	28	28	100%
	IMRB	0.10%	20014	21	0.03%	1445	4726304	100%	4367	4367	515	515	100%	63%	742355	466250	67%	100%	28	28	100%
Reliance CDMA	PMR	0.10%	234927	238	0.08%	2807	3535665	100%	8659	8659	708	708	100%	91%	8064186	7304338	96%	100%	591	591	100%
	IMRB	0.10%	234927	238	0.08%	2807	3535665	100%	8659	8659	708	708	100%	91%	8064186	7304338	96%	100%	591	591	100%

Idea	PMR	0.02%	20171	4	0.48%	621	13040633	100%	3698	3698	567	3131	100%	96%	3350742	3225785	98%	100%	342	342	100%
	IMRB	0.02%	20171	4	0.48%	621	13040633	100%	3698	3698	567	3131	100%	96%	3350742	3225785	100%	100%	342	342	100%
MTS	PMR	NA	NA	NA	0.08%	611	788238	100%	611	611	500	111	100%	100%	46583	45910	90%	0%	0	0	0%
	IMRB	NA	NA	NA	0.08%	611	788238	100%	611	611	500	111	100%	100%	46583	45910	90%	0%	0	0	0%
Tata CDMA	PMR	0.02%	105844	26	0.02%	462	2750177	100%	1631	1634	488	1146	100.00%	97%	1034711	1006401	94%	100%	1926	1926	99%
	IMRB	0.02%	105844	26	0.02%	462	2750177	100%	1634	1634	488	1146	100.00%	97%	1034711	1006401	94%	100%	1926	1926	99%
Airtel	PMR	0%	67433	3	0%	19	55530297	100%	22	46228	22	46206	100%	93%	189901764	176507480	91%	100%	256	256	100%
	IMRB	0%	67433	3	0%	19	55530297	100%	22	46228	22	46206	100%	93%	189901764	176507480	91%	100%	256	256	100%
Uninor	PMR	NA	NA	NA	NA	NA	2954606	100%	1442	1442	NA	NA	NA	NA	1907300	1795917	94%	NA	NA	NA	NA
	IMRB	NA	NA	NA	NA	NA	2954606	100%	1442	1442	NA	NA	NA	NA	1907300	1795917	94%	NA	NA	NA	NA

 Figures do not match with those reported in PMR

 Figures verified on all India basis

B'mark = TRAI Benchmark, DNA = Details not available

 Not meeting benchmark

## 8.0 Conclusions

### 8.1 Cellular Mobile services

1. Aircel does not meet the benchmark for Worst affected BTSs due to downtime, Worst affected cells having more than 3% TCH drop rate, Metering and billing credibility and Percentage of calls answered by the operators (voice to voice) within 60 seconds..
2. Etisalat does not meet the benchmark for BTS accumulated downtime, Worst affected cells having more than 3% TCH drop rate and Metering and billing credibility.
3. Vodafone does not meet the benchmark for CSSR, SDCCH, TCH congestion and Worst affected cells having more than 3% TCH drop rate
4. BSNL does not meet the benchmark for Worst affected cells having more than 3% TCH drop rate
5. Uninor does not meet the benchmark for Worst affected cells having more than 3% TCH drop rate
6. Tata Docomo does not meet the benchmark for Percentage of calls answered by the operators (voice to voice) within 60 seconds.
7. Idea does not meet the benchmark for Metering and billing credibility and Percentage of calls answered by the operators (voice to voice) within 60 seconds.
8. Reliance GSM does not meet the benchmark for Percentage of calls answered by the operators (voice to voice) within 60 seconds and accessibility of call centre.
9. Reliance CDMA does not meet the benchmark for accessibility of call centre.
10. Airtel does not meet the benchmark for accessibility of call centre.

## 9.0 Annexure - I

### 9.1 Service provider performance report based on one month data

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)			Metering and Billing				Response time to customer for assistance		Termination / closure of service	
	BTSs Accumulated downtime (not available for service)	Worst affected BTSs due to downtime	Call Set-up Success Rate (within licensee's own network)	SDCCH/Paging Chl. Congestion	TCH Congestion	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality	Metering and billing credibility (Postpaid)	Metering and billing credibility (Prepaid)	%age complaints resolved within 4 weeks	Period of applying credit/waiver less than 1 week	Accessibility of call centre/customer care	Percentage of calls answered by operators within 60 sec	%age requests for Termination complied within 7 days	Refund of deposits after closure within 60 days
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%	≤ 0.1%	≤ 0.1%	100%	100%	≥ 95%	≥ 90%	100%	100%
Tata Docomo	0.10%	0.30%	97.56%	0.38%	0.22%	0.40%	1.01%	96.57%	0.02%	0.11%	100.00%	100.00%	95.52%	94.75%	88.14%	95.45%
S Tel	4.34%	1.84%	98.00%	0.92%	1.85%	0.51%	4.55%	96.44%	NA	0.06%	100.00%	100.00%	100.00%	97.05%	NA	NA
Aircel	1.28%	7.81%	98.00%	0.43%	0.96%	1.47%	6.53%	95.58%	0.00%	0.07%	100.00%	100.00%	100.00%	9.37%	100.00%	NA
Etisalat	0.25%	0.00%	95.00%	0.07%	0.01%	0.59%	4.23%	98.40%	NA	0.01%	100.00%	100.00%	98.63%	99.84%	NA	NA
Vodafone	0.89%	1.42%	88.63%	3.76%	7.10%	2.17%	15.25%	96.08%	0.01%	0.01%	100.00%	100.00%	100.00%	93.46%	100.00%	100.00%
Videocon	0.92%	0.00%	99.00%	0.31%	0.00%	0.88%	0.00%	99.28%	NA	0.00%	NA	NA	100.00%	96.61%	NA	NA
BSNL	2.40%	5.13%	97.59%	0.45%	1.03%	1.14%	4.25%	97.20%	0.02%	0.29%	100.00%	NA	100.00%	73.54%	100.00%	100.00%
Reliance GSM	0.03%	0.37%	98.00%	0.81%	1.02%	1.14%	2.39%	99.02%	0.09%	0.04%	100.00%	100.00%	98.98%	63.81%	100.00%	100.00%
Reliance CDMA	0.53%	1.73%	99.65%	0.00%	0.97%	0.80%	2.10%	96.69%	0.08%	0.04%	100.00%	100.00%	97.89%	76.28%	100.00%	100.00%
Idea	1.97%	1.89%	98.00%	0.74%	1.56%	1.75%	2.88%	95.38%	0.00%	0.00%	100.00%	100.00%	95.08%	98.78%	100.00%	100.00%
MTS	1.83%	0.83%	98.78%	0.00%	0.18%	1.01%	3.05%	98.41%	NA	0.01%	100.00%	100.00%	95.94%	90.76%	NA	NA
Tata CDMA	0.13%	0.38%	99.54%	0.00%	0.18%	0.47%	0.85%	99.13%	0.01%	0.01%	100.00%	100.00%	99.63%	100.00%	100.00%	100.00%
Airtel	0.07%	0.51%	98.00%	0.85%	0.83%	1.17%	2.41%	98.62%	0.01%	0.00%	100.00%	100.00%	99.79%	95.35%	100.00%	100.00%
Uninor	1.95%	2.05%	95.85%	0.44%	2.08%	1.94%	4.93%	96.46%	NA	0.05%	100.00%	NA	96.23%	94.16%	NA	NA

### 9.2 Monthly Point of Interconnection (POI) Congestion Report

Name of the Service Provider	Name of POI not meeting the benchmark	Total No. of circuits on POI	Total No. of call attempts on POI	Total traffic served on POI (Erlang)	% of Congestion POI	Action already taken/ action plan for meeting the benchmark
Tata Docomo	All POI's meeting TRAI specified benchmark					
S Tel	Airtel Marwari	308	11863	291.96	1.15	55 E1s augmentation plan
Aircel	All POI's meeting TRAI specified benchmark					
Etisalat	All POI's meeting TRAI specified benchmark					
Vodafone	All POI's meeting TRAI specified benchmark					
Videocon	All POI's meeting TRAI specified benchmark					
BSNL	Tata GSM	155	22941	154	58.4	D/N is issued for augmentation of 15 E1s
	Bharti UASL	3344	151911	2504	28.32	28E1s of M/s Bharti were down due to cable fault at Bharti end.
Reliance GSM	All POI's meeting TRAI specified benchmark					
Reliance CDMA	All POI's meeting TRAI specified benchmark					

Idea	All POI's meeting TRAI specified benchmark				
MTS	All POI's meeting TRAI specified benchmark				
Tata CDMA	All POI's meeting TRAI specified benchmark				
Airtel	All POI's meeting TRAI specified benchmark				
Uninor	Aircel (I/O) Patna	154	36919	153.3	58.4
	Airtel GSM GCS 3 (O) Patna	92	47694	91.9	90.2
	BSNL L1 (I/O)	513	400790	507.7	93.8
	Airtel GSM GCS 2 (O) Patna	154	47682	153.8	84.6
	TATA GSM(O) Patna	154	16171	152.1	28.7
	TTSL NLD (I/O) Patna	834	42624	739.0	2.7
	Airtel POI Bhagalpur (O)	154	47597	153.8	84.5
	Airtel O/G (Biscomaan) Patna	215	47673	214.6	77.0
	Airtel GCS 4, Muzaffarpur ( O )	185	47650	184.7	80.5
	Airtel GCS 5, Muzaffarpur ( O )	309	95238	308.8	83.8
	Airtel Muzaffarpur GCS 6	463	142829	462.7	84.5
	Airtel Marwari Awas	153	40257	152.9	81.5

### 9.3 Parameter wise performance reports for Cellular Mobile services

#### 1. Network Availability

#### Audit Results for Network Availability

	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Number of BTSs in the licensed service area		1992	1525	3405	63	6061	12	3316	2934	2423	4336	1333	1043	7115	2289
Sum of downtime of BTSs in a month (in hours)		1463	49253	32516	116	40111	82	59291	748	9602	63415	18133	988	3882	33139
BTSs accumulated downtime (not available for service)	≤ 2%	0.10%	4.34%	1.28%	0.25%	0.89%	0.92%	2.40%	0.03%	0.53%	1.97%	1.83%	0.13%	0.07%	1.95%
Number of BTSs having accumulated downtime >24 hours		6	28	266	0	86	0	170	11	42	82	11	4	36	47
Worst affected BTSs due to downtime	≤ 2%	0.30%	1.84%	7.81%	0.00%	1.42%	0.00%	5.13%	0.37%	1.73%	1.89%	0.83%	0.38%	0.51%	2.05%

#### Live Measurement Results for Network Availability

	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Number of BTSs in the licensed service area		1999	1525	3404	63	6061	12	3325	2934	2423	4336	1333	1029	6952	2311
Sum of downtime of BTSs in a month (in hours)		40	1921.50	4752	21	40111	14	44645	47	748	2154	54628	0	372	2163
BTSs accumulated downtime (not available for service)	≤ 2%	0.00%	0.17%	0.19%	0.04%	0.89%	0.16%	1.80%	0.00%	0.04%	0.07%	5.51%	0.00%	0.01%	0.13%
Number of BTSs having accumulated downtime >24 hours		0	0	24	0	86	0	137	0	0	0	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.00%	0.71%	0.00%	1.42%	0.00%	4.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%



**2. Connection Establishment (Accessibility)**

**Audit Results for CSSR, SDCCH and TCH congestion**

CSSR	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
CSSR	≥ 95%	97.56%	98.00%	98.00%	95.00%	88.63%	99.00%	97.59%	98.00%	99.65%	98.00%	98.78%	99.54%	98.00%	95.85%

SDCCH congestion	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
SDCCH/Paging channel congestion	≤ 1%	0.38%	0.92%	0.43%	0.07%	3.76%	0.31%	0.45%	0.81%	0.00%	0.74%	0.00%	0.00%	0.85%	0.44%

TCH congestion	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
TCH congestion	≤ 2%	0.22%	1.85%	0.96%	0.01%	7.10%	0.00%	1.03%	1.02%	0.97%	1.56%	0.18%	0.18%	0.83%	2.08%

**Live measurement results for CSSR, SDCCH and TCH congestion**

CSSR	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
CSSR	≥ 95%	97.00%	98.70%	99.00%	95.00%	95.18%	98.65%	90.32%	98.50%	99.00%	97.00%	99.52%	99.75%	97.84%	95.38%

SDCCH congestion	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
SDCCH/Paging channel congestion	≤ 1%	0.40%	0.71%	0.14%	0.28%	1.98%	0.60%	0.40%	0.72%	0.00%	0.58%	0.00%	0.00%	0.76%	0.25%

TCH congestion	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
TCH congestion	≤ 2%	0.71%	1.30%	0.36%	0.05%	5.06%	0.47%	0.96%	0.77%	1.20%	1.70%	0.10%	0.27%	0.72%	1.85%

**Drive test results for CSSR (Average of three drive tests) and blocked calls**

CSSR	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of call attempts		686	633	631	NA	678	NA	DNA	726	675	659	626	630	641	654
Total number of successful calls established		678	633	631	NA	678	NA	DNA	725	675	658	626	630	640	653
CSSR	≥ 95%	98.83%	100.00%	100.00%	NA	100.00%	NA	DNA	99.86%	100.00%	99.85%	100.00%	100.00%	99.84%	99.85%

Blocked calls	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
%age blocked calls		1.17%	0.00%	0.00%	NA	0.00%	NA	DNA	0.14%	0.00%	0.15%	0.00%	0.00%	0.16%	0.15%

**3. Connection Maintenance (Retainability)**

**Audit Results for Call drop rate and for number of cells having more than 3% TCH**

Call drop rate	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of		85925535	24935099	116055	147153	DNA	3881	DNA	35371589	59212394	163220484	28072164	65990344	740939894	54956190

calls established																
Total number of calls dropped		345869	127169	1702	863	DNA	34	DNA	401839	474453	2850551	283528	309160	8698238	1066151	
Call drop rate	≤ 2%	0.40%	0.51%	1.47%	0.59%	2.17%	0.88%	1.14%	1.14%	0.80%	1.75%	1.01%	0.47%	1.17%	1.94%	

Cells having more than 3% TCH	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of cells in the network		5970	4572	10203	189	18054	36	8752	8802	2423	12974	3998	3177	20739	6853
Total number of cells having more than 3% TCH		60	208	666	8	2753	0	372	210	51	374	122	27	499	338
Worst affected cells having more than 3% TCH	≤ 5%	1.01%	4.55%	6.53%	4.23%	15.25%	0.00%	4.25%	2.39%	2.10%	2.88%	3.05%	0.85%	2.41%	4.93%

**Live measurement results for Call drop rate and for number of cells having more than 3% TCH**

Call drop rate	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of calls established		16630129	4032219	48345	10392	DNA	1463	13437089	32259282	25109614	13083438	21484547	71057912	24115468	6123495
Total number of calls dropped		160296	21757	643	35	DNA	19	116442	293830	268673	169861	15255	450521	198785	120633
Call drop rate	≤ 2%	0.96%	0.54%	1.33%	0.34%	1.79%	1.30%	0.87%	0.91%	1.07%	1.30%	0.07%	0.63%	0.82%	1.97%

Cells having more than 3% TCH	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of cells in the network		5991	4572	10173	189	18619	36	8801	8802	2423	13253	4005	3180	20813	6920
Total number of cells having more than 3% TCH		54	191	858	6	989	0	435	148	18	365	151	0	573	327
Worst affected cells having more than 3% TCH	≤ 5%	0.90%	4.18%	8.43%	3.17%	5.31%	0.00%	4.94%	1.68%	0.74%	2.75%	3.77%	0.00%	2.75%	4.73%

**Drive test results for Call drop rate (Average of three drive tests)**

Call drop rate	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of calls established		678	633	631	NA	678	NA	DNA	725	675	658	626	630	640	653
Total number of calls dropped		3	0	0	NA	0	NA	DNA	0	0	0	0	0	0	0
Call drop rate	≤ 2%	0.44%	0.00%	0.00%	NA	0.00%	NA	DNA	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

**4. Voice quality**

**Audit Results for Voice quality**

Voice quality	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of sample calls		13856899790	24935099	286574924	13844171	NA	1211819	DNA	1541456270	65285577	23684362412	63	12132	106791276299	2377638554334
Total number of calls with good voice		13381608382	24047409	273900235	13622222	NA	1203042	DNA	1526415573	63121465	22590886435	62	12026	105320163600	2293393832957

quality																
%age calls with good voice quality	≥ 95%	96.57%	96.44%	95.58%	98.40%	96.08%	99.28%	97.20%	99.02%	96.69%	95.38%	98.41%	99.13%	98.62%	96.46%	

### Drive test results for Voice quality (Average of three drive tests)

Voice quality	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of sample calls		1190745	1098108	1205051	NA	1273342	NA	999269	60129	65922	994550	38211	146400	1233832	1303229
Total number of calls with good voice quality		1165693	1072813	1175994	NA	1236576	NA	943584	57590	61104	950392	36743	118753	1195311	1266763
%age calls with good voice quality	≥ 95%	97.90%	97.70%	97.59%	NA	97.11%	NA	94.43%	95.78%	92.69%	95.56%	96.16%	81.12%	96.88%	97.20%

### 5. POI Congestion

#### Audit Results for POI Congestion

POI congestion	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of working POIs		29	68	126	26	51	19	202	22	30	85	48	242	48	63
No. of POIs not meeting benchmark		0	1	0	0	0	0	2	0	0	0	0	0	0	12
Total Capacity of all POIs (A) - in erlangs		26487	18389	62446	1124.85	120705	341	64000	17732	32486	144834.48	15542	81887	470646	29689
Traffic served for all POIs (B)- in erlangs		17428	11409	33869	58.21	91009	117	23264	10101	24322	82033.28	5431	39938	295370	23049
POI congestion	≤ 0.5%	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

### Live measurement results for POI congestion

#### 6. Inter Operator Call Assessment

Inter operator call Assessment To ↓ From →	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Tata Docomo	NA	99%	100%	100%	100%	93%	96%	95%	95%	98%	99%	98%	94%	98%
S Tel	100%	NA	100%	100%	99%	94%	100%	96%	98%	97%	99%	100%	98%	97%
Aircel	100%	99%	NA	100%	98%	95%	100%	99%	98%	100%	93%	98%	100%	99%
Etisalat	100%	100%	100%	NA	100%	96%	100%	100%	100%	100%	100%	100%	100%	100%
Vodafone	100%	100%	99%	100%	NA	95%	97%	99%	100%	99%	100%	100%	100%	99%
Videocon	100%	100%	100%	100%	99%	NA	100%	100%	98%	100%	99%	100%	100%	93%
BSNL	100%	100%	95%	100%	100%	93%	NA	96%	98%	99%	96%	100%	100%	99%
Reliance GSM	100%	100%	100%	100%	98%	93%	99%	NA	100%	100%	97%	100%	100%	96%
Reliance CDMA	100%	99%	100%	100%	100%	92%	99%	100%	NA	98%	100%	100%	99%	96%
Idea	100%	99%	100%	100%	98%	94%	99%	99%	100%	NA	100%	100%	99%	98%
MTS	100%	98%	92%	100%	99%	98%	97%	97%	98%	99%	NA	100%	100%	
Tata CDMA	100%	99%	100%	100%	100%	94%	96%	100%	100%	100%	99%	NA	98%	99%
Airtel	100%	100%	100%	100%	100%	95%	97%	99%	100%	100%	99%	100%	NA	91%
Uninor	100%	100%	100%	100%	98%	94%	100%	98%	100%	98%	98%	100%	100%	NA

 The maximum problem faced by the calling operator to other operators

7. Metering and Billing credibility

**Audit Results for Billing performance**

Billing Performance	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
<b>Billing diputes - Postpaid</b>															
Total bills generated during the period		4690	NA	1491	NA	9163	NA	21821	5875	67240	7089	NA	36913	23021	NA
Total number of bills disputed		1	NA	0	NA	1	NA	5	5	51	0	NA	2	3	NA
Percentage bills disputed	≤ 0.1%	0.02%	NA	0.00%	NA	0.01%	NA	0.02%	0.09%	0.08%	0.00%	NA	0.01%	0.01%	NA
<b>Billing diputes - Prepaid</b>															
Number of complaints related to charging, credit & validity		3737	1138	3765	2	373	0	4669	1981	1222	139	135	73	0	1442
Total number of prepaid customers in that period		3381019	2035252	5060975	30421	5301771	17390	1594477	5202586	3435466	4874952	1096076	981442	20569062	2954606
Percentage of complaints	≤ 0.1%	0.11%	0.06%	0.07%	0.01%	0.01%	0.00%	0.29%	0.04%	0.04%	0.00%	0.01%	0.01%	0.00%	0.05%
<b>Resolution of billing complaints</b>															
Total number of billing/charging complaints		13	1138	4420	2	1415	0	3011	1986	1273	654	135	745	2548	1442
Total complaints considered invalid		13	580	2278	0	513	0	0	1802	999	518	12	670	2546	0
Number of complaints resolved in 4 weeks from date of receipt for complaints listed in 5.3.1		13	1138	4420	2	902	0	3011	1986	1273	654	123	745	2	1442
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%	100%	100%
<b>Period of applying credit / waiver</b>															
Total number of complaints where credit/waiver is required		1	558	2132	2	399	0	0	184	274	136	123	75	2	0
Percentage cases in which credit/waiver was received within 1 week	100%	100%	100%	100%	100%	100%	NA	NA	100%	100%	100%	100%	100%	100%	NA

**Live calling results for resolution of billing complaints**

Resolution of billing complaints	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total Number of calls made		2	30	30	0	30	NA	49	30	30	30	30	30	2	30
Number of cases resolved in 4 weeks		2	29	24	0	30	NA	36	23	24	20	30	28	2	26
Percentage cases resolved in four weeks	100%	100%	97%	80%	NA	100%	NA	73%	77%	80%	67%	100%	93%	100%	87%

8. Customer Care

**Audit results for customer care**

Customer Care Assessment	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of call attempts to customer care for assistance		5541961	NA	5142435	4529	152470	5026	644677	2544725	543969	1278158	303256	222147	44187235	5472338
Number of calls getting connected and answered (electronically)		5293426	NA	5142435	4467	152470	5026	644677	2518896	532481	1215241	290950	221331	44095962	5265916
Percentage calls getting	≥ 95%	95.52%	100.00%	100.00%	98.63%	100.00%	100.00%	100.00%	98.98%	97.89%	95.08%	95.94%	99.63%	99.79%	96.23%

connected and answered															
Number of calls getting transferred to the operator (voice to voice)		518386	478489	18883228	2447	152470	2594	284076	1746073	634954	2653239	303256	215483	6746945	1907300
Number of calls answered by operator (voice to voice) within 60 seconds		491196	464355	1768706	2443	142504	2506	208922	1114255	484360	2620753	275222	215483	6433296	1795917
Percentage calls answered within 60 seconds (V2V)	≥ 90%	94.75%	97.05%	9.37%	99.84%	93.46%	96.61%	73.54%	63.81%	76.28%	98.78%	90.76%	100.00%	95.35%	94.16%

### Live calling results for customer care

Customer Care Assessment	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total Number of calls received		50	50	50	NA	50	50	50	50	50	50	50	50	50	50
Total Number of calls getting connected and answered		50	50	50	NA	50	50	50	50	50	50	50	50	50	50
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

### Live calling results for customer care (Voice to Voice)

Customer Care Assessment	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total Number of calls received		50	50	50	NA	50	50	50	50	50	50	50	50	50	50
Total Number of calls answered within 60 seconds		50	50	28	NA	50	47	30	35	47	38	47	50	47	49
Percentage calls answered within 60 seconds	≥ 90%	100.00%	100.00%	56.00%	NA	100.00%	94.00%	60.00%	70.00%	94.00%	76.00%	94.00%	100.00%	94.00%	98.00%

### 9. Termination / closure of service

#### Audit results for termination / closure of service

Termination	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of closure request		59	NA	2	NA	203	NA	231	26	273	170	NA	770	115	NA
Number of requests attended within 7 days		52	NA	2	NA	203	NA	231	26	273	170	NA	770	115	NA
Percentage cases in which termination done within 7 days	100%	88.14%	NA	100.00%	NA	100.00%	NA	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	NA

#### Audit results for refund of deposits

Refund	Benchmark	Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total number of cases requiring refund of deposits		154	NA	0	NA	22	NA	48	98	289	15	NA	73	9	NA
Total number of cases where refund was made within 60 days		147	NA	0	NA	22	NA	48	98	289	15	NA	73	9	NA
Percentage cases in which refund was receive within 60 days	100%	95.45%	NA	NA	NA	100.00%	NA	100.00%	100.00%	100.00%	100.00%	NA	100.00%	100.00%	NA

11. Additional Network Related parameters

Audit Results for Total Traffic Handled in Erlang

Traffic in Erlang		Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Equipped capacity of the network		87830	37448	199708	1398.79	176399	5000	262600	148000	262000	123003	60711	292658	590115	75343
Total traffic handled in erlang during TCBH		30454	15365	53733	85.03	145363	167671	152018	106336	93565	104626	15035	50665	488539	64212

Total number of customers as per VLR

		Tata Docomo	S Tel	Aircel	Etisalat	Vodafone	Videocon	BSNL	Reliance GSM	Reliance CDMA	Idea	MTS	Tata CDMA	Airtel	Uninor
Total no. of customers served (as per VLR)		1211555	805437	2110611	5349	4769568	2425	3580122	3282132	2181774	4240560	409597	942742	14958363	1300226

## 10.0 Annexure – II Detailed Explanation of Audit methodology (Parameter wise)

### 10.1 Cellular Mobile services

1. Accumulated Downtime of the Network	
Computational Methodology as per QoS definition	<p>BTSS accumulated downtime (not available for service) shall basically measure the downtime of the BTSS, including its transmission links/circuits during the period of a month, but excludes all planned service downtime for any maintenance or software upgradation.</p> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>BTSS Accumulated downtime = <math>\frac{\text{Sum of downtime of BTSSs in a month in hours}}{24 \times \text{No. of days in the month} \times \text{No. of BTSSs in the network in the licensed service area}} \times 100</math></li> <li>Worst affected BTSSs due to downtime = <math>\frac{\text{No. of BTSSs having accumulated downtime } &gt; 24 \text{ hours in a month}}{\text{Total No. of BTSSs in the network in the licensed service area}} \times 100</math></li> </ul>
Benchmark	<ul style="list-style-type: none"> <li>BTSS Accumulated downtime (not available for service) <math>\leq 2\%</math></li> <li>Worst affected BTSSs due to downtime <math>\leq 2\%</math></li> </ul>
Audit Procedure	<p><b>IMRB</b> auditors collected and verified data pertaining to:</p> <p>The fault alarm details at the OMC (MSC) for the network outages (due to own network elements and infrastructure service provider end outages) used for arriving at the benchmark reported to TRAI were audit</p>

2. Call Set-Up Success Rate (CSSR)	
Computational Methodology as per QoS definition	<p>The ratio of calls established to total calls is known CSSR.</p> <p>Call Established means the following events have happened in call setup:-</p> <ul style="list-style-type: none"> <li>call attempt is made</li> <li>the TCH is allocated</li> <li>the call is routed to the outward path of the concerned MSC</li> </ul> <p>Computational Methodology: <math>\text{Calls Established} / \text{Total Call Attempts} \times 100</math></p>
Benchmark	> 95%
Audit Procedure	<p><b>IMRB</b> auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>The cell-wise data generated through counters/ MMC available in the switch for traffic measurements was verified by the auditors</li> <li>CSSR calculation was measured using OMC generated data only</li> <li>Measurement was done only in Time Consistent Busy Hour (TCBH) period for all days of the week</li> </ul>

3. Network Congestion Parameters	
<b>Computational Methodology as per QoS definition</b>	<p>It means a call is not connected because there is no free channel to serve the call attempt. This parameter represents congestion in the network. It happens at three levels:</p> <ul style="list-style-type: none"> <li>↳ SDCCH Level: Stand-alone dedicated control channel</li> <li>↳ TCH Level: Traffic Channel</li> <li>↳ POI Level: Point of Interconnect</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ <b>SDCCH / TCH Congestion% = <math>[(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math></b> <ul style="list-style-type: none"> <li>● Where:-A1 = Number of attempts to establish SDCCH / TCH made on day 1</li> <li>● C1 = Average SDCCH / TCH Congestion % on day 1</li> <li>● A2 = Number of attempts to establish SDCCH / TCH made on day 2</li> <li>● C2 = Average SDCCH / TCH Congestion % on day 2</li> <li>● An = Number of attempts to establish SDCCH / TCH made on day n</li> <li>● Cn = Average SDCCH / TCH Congestion % on day n</li> </ul> </li> <li>↳ <b>POI Congestion% = <math>[(A1 \times C1) + (A2 \times C2) + \dots + (An \times Cn)] / (A1 + A2 + \dots + An)</math></b> <ul style="list-style-type: none"> <li>● Where:-A1 = POI traffic offered on all POIs (no. of calls) on day 1</li> <li>● C1 = Average POI Congestion % on day 1</li> <li>● A2 = POI traffic offered on all POIs (no. of calls) on day 2</li> <li>● C2 = Average POI Congestion % on day 2</li> <li>● An = POI traffic offered on all POIs (no. of calls) on day n</li> <li>● Cn = Average POI Congestion % on day n</li> </ul> </li> </ul>
<b>Benchmark</b>	<p><b>SDCCH Congestion: ≤ 1%</b>  <b>TCH Congestion: ≤ 2%</b>  <b>POI Congestion: ≤ 0.5%</b></p>
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of the details of SDCCH and TCH congestion percentages computed by the operator (using OMC–Switch data only) was conducted</li> <li>↳ The operator should be measuring this parameter during Time consistent busy hour (TCBH) only SDCCH</li> <li>↳ The POI details were verified from the switch for all the links of the operators</li> </ul>

4. Call Drop Rate	
<b>Computational Methodology as per QoS definition</b>	<p>The dropped call rate is the ratio of successfully originated calls that were found to drop to the total number of successfully originated calls that were correctly released</p> <ul style="list-style-type: none"> <li>↳ <b>Total calls dropped</b> = All calls ceasing unnaturally i.e. due to handover or due to radio loss</li> <li>↳ <b>Total calls established</b> = All calls that have TCH allocation during busy hour</li> </ul> <p><b>Computational Methodology:</b>                      Total Calls Dropped / Total Calls Established x 100</p>
<b>Benchmark</b>	<p>≤ 2%</p>
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↳ Audit of traffic data of the relevant quarter kept in OMC-R at MSCs and used for arriving at CDR was conducted.</li> <li>↳ The operator should only be considering those calls which are dropped during Time consistent busy hour (TCBH) for all days of the relevant quarter</li> </ul>



<b>5. Connections with Good Voice Quality</b>	
<b>Computational Methodology as per QoS definition</b>	<p>Definition:</p> <ul style="list-style-type: none"> <li>↳ for GSM service providers the calls having a value of 0 – 4 are considered to be of good quality (on a seven point scale)</li> <li>↳ For CDMA the measure of voice quality is Frame Error Rate (FER). FER is the probability that a transmitted frame will be received incorrectly. Good voice quality of a call is considered when it FER value lies between 0 – 4 %</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↳ <b>% Connections with good voice quality</b> = (No. of voice samples with good voice quality / Total number of samples) x 100</li> </ul>
<b>Benchmark</b>	<b>≥ 95%</b>
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified records pertaining to:</b></p> <p>Audit would be conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) and used to arrive at the benchmarks reported to TRAI.</p> <p>Procedures that were to be followed by operator for obtaining relevant details for computing this parameter were audited</p> <ul style="list-style-type: none"> <li>↳ Operator to conduct <u>at least one</u> drive test using standard drive test equipment every week during TCBH</li> <li>↳ Each drive test should evenly cover the following 5 types of locations:</li> <li>↳ <b>3 Outdoor</b> (Periphery of the city, Congested Area, Across the City), and <b>2 Indoor</b> (Office Complex and Shopping Complex)</li> <li>↳ 2 minute long calls to be initiated and held throughout the drive test</li> <li>↳ The speed of the vehicle should be kept at around 50km/hr. (around 30 km/hr in case of geographically small cities) – This was ensured during the drive tests conducted by IMRB Auditors</li> <li>↳ RxQual / FER samples generated during the drive test collected by the operator were verified</li> <li>↳ <i>Measurements using Engineering handsets were not acceptable</i></li> <li>↳ All the operators were not maintaining this data at the switch level</li> </ul>

<b>6. Service Coverage</b>	
<p><b>Computational Methodology as per QoS definition</b></p>	<p>Definition:</p> <ul style="list-style-type: none"> <li>↪ The level of signal available in a particular part of a city is known as signal strength.</li> </ul> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>↪ Service Coverage for route type x = <math>[(N1 \times CSS1) + (N2 \times CSS2) + \dots + (Nn \times CSSn)] / (N1 + N2 + \dots + Nn)</math></li> <li>↪ Where:-N1 = Number of calls on type of route x made in drive test 1</li> <li>↪ CSS1 = Average coverage signal strength on type of route x in drive test 1 (in dBm)</li> <li>↪ N2 = Number of calls on type of route x made in drive test 2</li> <li>↪ CSS2 = Average coverage signal strength on type of route x in drive test 2 (in dBm)</li> <li>↪ Nn = Number of calls on type of route x made in drive test n</li> <li>↪ CSSn = Average coverage signal strength on type of route x in drive test n (in dBm)</li> </ul>
<p><b>Benchmark</b></p>	<p><b>Indoor &gt;= -75 dBm</b>  <b>In-vehicle &gt;= -85 dBm</b>  <b>Outdoor – in city &gt;= -95 dBm</b></p>
<p><b>Audit Procedure</b></p>	<p><b>IMRB Auditors collected and verified call centre records pertaining to:</b></p> <ul style="list-style-type: none"> <li>↪ Audit was conducted based on the details of periodic drive tests conducted at different part of the network during Time consistent busy hour (TCBH) which were used to arrive at the benchmarks reported to TRAI.</li> <li>↪ Procedures were verified that were to be followed by operator for obtaining relevant details for computing this parameter:-             <ul style="list-style-type: none"> <li>↪ Operator to conduct at least one drive test using standard drive test equipment* every week during Time consistent busy hour (TCBH).</li> <li>↪ Each drive test should evenly cover the following 5 types of locations: –                 <ul style="list-style-type: none"> <li>↪ 3 Outdoor (Periphery of the city, Congested Area, Across the City), and</li> <li>↪ 2 Indoor (Office Complex and Shopping Complex)</li> </ul> </li> </ul> </li> <li>↪ <i>Measurements using Engineering handsets were not acceptable</i></li> </ul>

7. Response time to customer	
<b>Computational Methodology</b>	<p><b>To connect to Customer care:</b> The time taken to connect a person (as soon as he presses call) to the IVR of the service provider</p> <p><b>To connect to operator:</b> The time taken to connect a person (as soon as he presses 9) to the customer care executive</p> <p><b>Computational Methodology:</b></p> <ul style="list-style-type: none"> <li>• % age of calls getting connected =  <math display="block">\frac{\text{Total number of calls getting connected} \times 100}{\text{Total number of calls made}}</math> </li> <li>• % age of calls answered within 60 sec (voice to voice) =  <math display="block">\frac{\text{Total number of calls answered within 60 seconds} \times 100}{\text{Total number of calls made}}</math> </li> </ul>
<b>Benchmark</b>	<ul style="list-style-type: none"> <li>↪ % age of calls getting connected and answered ≥ 95%</li> <li>↪ % age of calls answered by operator (voice to voice) within 60 seconds ≥ 90%</li> </ul>
<b>Audit Procedure</b>	<p>-IMRB auditors made test calls from the exchanges to the operator's customer care / helpline / toll free numbers. They will record the time taken to connect a customer's call both to the IVR as well as to a customer care executive.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p> <p>- Time to answer the call by the operator should be taken from the time auditor has pressed the requisite button for being assisted by the operator.</p> <p><b>Live calling: -</b></p> <p>- Overall sample size is 2*50 calls per service provider per circle at different points of time, evenly distributed across the selected exchanges – 50 calls between 1000 HRS to 1300 HRS and 50 calls between 1500 HRS to 1700 HRS</p> <p>- Time to answer the call by the operator was assessed from the time interviewer pressed the requisite button for being assisted by the operator.</p> <p>- All the supplementary services that have any kind of human intervention are to be covered here. It also includes the IVR assisted services.</p>

<b>8.1 Billing complaints per 100 bills issued</b>	
<b>Computational Methodology as per QoS definition</b>	<p>Billing complaints includes any of the following complaints related to billing from the point of view of customer:</p> <ul style="list-style-type: none"> <li>• Local call charges billed as STD/ISD or vice-versa</li> <li>• Toll free numbers charged</li> <li>• Wrong roaming charges</li> <li>• Call made/received disputed</li> <li>• Wrongly charged extra for some service (SIM replacement charged twice, service not used but charged etc.)</li> <li>• Cheque submitted on time but charged penalty for paying beyond due date (in case customer is not at fault i.e. all those that operator cannot prove that he/she is not lying)</li> <li>• Payment made but not reflected (may be wrongly adjusted to another customer etc.)</li> </ul> <p><b>Billing complaints per 100 bills issued</b> = Total billing complaints** received during the relevant quarter / Total bills generated* during the relevant quarter</p> <p>* All types of bills generated for customers i.e. printed bills, online bills and any other forms of bills generated are to be included</p> <p>** <u>Only</u> dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.</p>
<b>Benchmark</b>	< 0.1% billing complaints per 100 bills
<b>Audit Procedure</b>	<p><b>IMRB</b> auditors collected and verified data pertaining to</p> <ul style="list-style-type: none"> <li>- Number of bills generated</li> <li>- Number of billing complaints received</li> <li>- %age complaints per 100 bills</li> </ul>

<b>8.2 Resolution of billing complaints</b>	
<b>Computational Methodology as per QoS definition</b>	<p><b>%age of billing complaints resolved within 4 weeks</b>=(Complaints resolved in 4 weeks from date of receipt / Total billing complaints received during the relevant period) x 100</p> <p><u>Only</u> dispute related issues (including those that may arise because of a lack of awareness at the subscribers' end) are to be included. It does not include any provisional issues (such as delayed dispatch of billing statements, etc.) in which the operator has opened a ticket internally.</p> <p>Date of resolution in this case would refer to the date when a communication has taken place from the operator's end to inform the complainant about the final resolution of the issue / dispute.</p>
<b>Benchmark</b>	100% cases to be resolved within 4 weeks
<b>Audit Procedure</b>	<p><b>IMRB Auditors collected and verified data pertaining to</b></p> <ul style="list-style-type: none"> <li>- Total number of billing complaints/bills disputed</li> <li>- Number of complaints resolved in 4 weeks</li> </ul> <p><b>Live calling :-</b>  <b>Overall 100 number of live calls</b> made in a licensed service area/circle for each service provider. However in certain cases the sample could not be achieved as bills disputed (prior to the month of Audit) were found to be less than 100</p>

<b>8.3 Period of refunds / payments due to customers</b>	
<b>Computational Methodology as per QoS definition</b>	<b>Period of all refunds = Maximum value of 'Time taken to refund'</b> where:-Time taken to refund = Date of refund – date of complaint resolution
<b>Benchmark</b>	100% cases in less than 1 week
<b>Audit Procedure</b>	<p><b>Audit of refund details and complaints (only those resulting in refunds) resolution details used for arriving at the figures reported to TRAI to be conducted.</b></p> <p><b>Operator to provide details of:-</b></p> <ul style="list-style-type: none"> <li>• <b><u>Dates of resolution</u> of all billing complaints resolved in favour of customer and resulting in requirement of a refund by the operator</b></li> <li>• <b><u>Dates of refund</u> pertaining to all billing complaints received during the relevant quarter</b></li> </ul> <p><b>Also random live checks of all subscribers entitled for refund were conducted</b></p>

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