

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

Report: January – February – March, 2012



Prepared for: **Telecom Regulatory Authority of India**

By: **eTech Group@IMRB**

A specialist unit of IMRB International

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 module for various circles within the Zones, due the sheer scale of data collection, has been distributed across various quarterly periods. IMRB International Auditors carried out Audits across Orissa, Bihar & Jharkhand, West Bengal, North-East, Assam and Kolkata circles. **This report details the performance of various service providers in Kolkata 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 20th March, 2009. The parameters for Broadband Service have been specified in the TRAI notification for Quality of Services of Broadband Service Regulation, 2006

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 Kolkata circle that was covered in period of January - March 2012. 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 2012.



***This report
highlights the Audit
Module findings for
Kolkata 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 various parameters

- 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 Centers (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 Kolkata circle

	Name of Operator	Month of Audit
Operator 1	Vodafone	January, 2012
Operator 2	BSNL	January, 2012
Operator 3	Reliance GSM	January, 2012
Operator 4	Reliance CDMA	January, 2012
Operator 5	Airtel	January, 2012
Operator 6	Uninor	January, 2012
Operator 7	Idea	January, 2012
Operator 8	MTS	January, 2012
Operator 9	Aircel	January, 2012
Operator 10	Tata CDMA	January, 2012
Operator 11	TATA GSM	January, 2012

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
A	Network Performance							
A (i)	BTS accumulated down time	Yes	Yes	Yes				
A (ii)	Call setup success rate (within licensee own network)	Yes	Yes	Yes	Yes		Yes	Yes
A (iii)	Blocked Call Rate	Yes	Yes	Yes	Yes		Yes	Yes
A (iv)	Call Drop rate	Yes	Yes	Yes	Yes		Yes	Yes
A (v)	% Connections with good voice quality	Yes	Yes	Yes			Yes	Yes
A (vi)	Service Coverage	Yes	Yes	Yes			Yes	Yes
A (vii)	PoI Congestion	Yes	Yes	Yes				
B	Customer Helpline							
B (i)	Response time to the customer for assistance	Yes	Yes	Yes		Yes		
C	Billing Complaints							
C (i)	Billing complaints per 100 bills issued	Yes	Yes	Yes				
C (ii)	%age of billing complaints resolved within 4 weeks	Yes	Yes	Yes		Yes		
C (iii)	Period of all refunds/payments due to customers from date of resolution as in (ii) above	Yes	Yes	Yes		Yes		

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 January 2012 to March 2012 in Kolkata 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: Cellular Mobile Services

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)	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%				
Vodafone	19:00 - 20:00	2369	684	0.04%	2	0.08%	99.63%	0.10%	0.37%	0.72%	55	5889	0.93%	98.45%	0	40	126384	86742	3541314
BSNL	19:00 - 20:00	1245	4260	0.46%	21	1.69%	98.60%	0.04%	0.01%	1.74%	135	3370	4.01%	99.74%	0	106	80000	56482	790913
Reliance GSM	19:00 - 20:00	1636	1071	0.09%	6	0.37%	99.26%	0.03%	0.04%	0.59%	4	4908	0.08%	98.49%	0	8	64000	43293	2305515
Reliance CDMA	19:00 - 20:00	486	218	0.06%	0	0.00%	99.37%	0.00%	0.28%	0.48%	5	1458	0.34%	98.64%	0	14	84000	45362	1281704
Airtel	19:00 - 20:00	2039	221	0.01%	1	0.05%	99.55%	0.05%	0.08%	0.75%	6	5654	0.11%	98.55%	0	38	118537	75837	3274809
Uninor	19:00 - 20:00	1034	516	0.07%	0	0.00%	98.93%	0.21%	0.11%	1.66%	75	3097	2.42%	97.25%	2	77	33408	33806	855761
Idea	19:00 - 20:00	1675	1443	0.12%	12	0.72%	98.91%	0.18%	0.30%	0.84%	31	4922	0.63%	95.03%	0	62	32393	21843	875707
MTS	19:00 - 20:00	518	0	0.00%	0	0.00%	99.76%	0.00%	0.01%	0.58%	12	1650	0.73%	99.27%	0	44	50400	14279	419865
Aircel	19:00 - 20:00	2082	92	0.01%	0	0.00%	97.87%	0.11%	0.04%	0.60%	69	5924	1.16%	97.84%	0	40	72898	21011	883053
TATA GSM	19:00 - 20:00	579	127	0.03%	0	0.00%	99.01%	0.00%	0.03%	0.76%	8	1905	0.42%	99.20%	0	72	213692	53687	663729
Tata CDMA	19:00 - 20:00	1566	17	0.03%	0	0.00%	98.30%	0.05%	0.05%	0.87%	5081	139534	3.64%	98.23%	0	45	72345	28861	1334399

** 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 Kolkata 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
Vodafone	20:00-21:00 hrs	20:00-21:00 hrs
BSNL	21:00-22:00 hrs	21:00-22:00 hrs
Reliance GSM	19:00-20:00 hrs	19:00-20:00 hrs
Reliance CDMA	19:00-20:00 hrs	19:00-20:00 hrs
Airtel	20:00-21:00 hrs	20:00-21:00 hrs
Uninor	21:00-22:00 hrs	21:00-22:00 hrs
Idea Cellular	19:00-20:00 hrs	19:00-20:00 hrs
MTS	20:00-21:00 hrs	20:00-21:00 hrs
Aircel	21:00-22:00 hrs	21:00-22:00 hrs
TATA Indicom (CDMA)	20:00-21:00 hrs	20:00-21:00 hrs
TATA Docomo (GSM)	20:00-21:00 hrs	20:00-21:00 hrs

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

BTSs Accumulated Downtime:

In the Kolkata circle, BSNL experienced the highest outage (4260 hours) in the month of audit. Also BSNL had maximum number of worst affected BTSs (21) in the service area.

Call Set-up Success Rate (CSSR):

All the operators were comfortably meeting the benchmark on this parameter. During the audits the maximum CSSR was observed for IDEA with 99.76% 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 for Traffic channel congestion are meeting the TRAI specified benchmarks on the congestion parameters. MTS 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. There were almost no POIs with congestion more than the benchmark ($\leq 0.5\%$) except for 2 POIs for Uninor.

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 were found to be meeting the TRAI specified benchmark. The lowest call drop rate was of RCOM at 0.48% while the highest was for BSNL at 1.74%.

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 service providers were measuring this parameter as per the TRAI guidelines.

Customer Care / Helpline Assessment

For the accessibility of customer care aspect all the service providers meet the TRAI benchmark. Uninor and TATA Docomo GSM (for percentage calls answered within 60 seconds) did not meet the benchmark for the month of audit.

Billing performance

Percentage of complaints for billing disputes in the case of prepaid connections was not met by BSNL. Apart from that, all the operators were found to be meeting the benchmark of $\leq 0.1\%$ complaints registered per 100 bills issued and the benchmark of 100% billing complaints being resolved within 4 weeks. In all cases where customers were due for refund, all the service providers meet the TRAI benchmark of 100% with 1 week.

Inter operator calls assessment

Inter operator call Assessment To↓ From→	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Vodafone	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
BSNL	100%	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%
Reliance GSM	100%	99%	NA	100%	100%	100%	100%	100%	100%	100%	100%
Reliance CDMA	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%	100%
Airtel	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%
Uninor	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%
Idea	100%	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%
MTS	100%	99%	100%	100%	100%	100%	100%	NA	100%	100%	100%
Aircel	100%	100%	100%	100%	100%	100%	100%	100%	NA	100%	100%
Tata CDMA	100%	100%	100%	100%	100%	100%	100%	100%	100%	NA	100%
Tata GSM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	NA

 The maximum problem faced by the calling operator to other operators

The above test calls were made in Kolkata. 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. BSNL faced a slight issue while connecting to Reliance GSM and MTS with 99% of the calls getting completed.

Results of Operator assisted Drive test

The drive test was conducted simultaneously for all the operators present in the Kolkata circle. There was in total of three drive tests conducted in the circle. These tests were conducted in the city of Kolkata. 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 Kolkata 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-vehicle and > -95 dbm outdoor routes.

The drive test in the Kolkata circle was conducted along the following route:

	Type of location	Kolkata
Outdoor	Periphery of the city	South City Mall-Mominpur-New Alipur-2nd Hoogly Bridge-NH2-NH6-Nebedita Setu-Dunlop
	Congested area	Shyambazar, Sealdah, M G Road, Howrah, Howrah Maidan, Howrah Kadamtala
	Across the city	Park Circus-Science City-Exide-Tollygunj-Ranikuthi-Golf green-South City. Dunlop to Shyam Bazar
Indoor	Office complex	CESE Building
	Shopping complex	South City Mall

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

Drive Test – Kolkata

	B'mark	Vodafone		BSNL		Reliance GSM		Reliance CDMA		Airtel		Uninor		Idea		MTS		Aircel		Tata CDMA		TATA GSM	
		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%	98.12%	97.14%	99.06%	99.92%	52.88%	98.75%	99.99%	98.58%	99.11%	95.42%	98.20%	95.74%	98.04%	95.05%	99.71%	97.10%	98.25%	94.33%	98.18%	95.72%	97.40%	96.11%
CSSR	≥ 95%	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%
%age Blocked calls		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%
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%	0.67%	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%	99.52%	100.00%	100.00%	100.00%	99.49%

Not meeting the benchmark


Drive Test Conclusions:

Drive test was conducted by IMRB with the help of service providers to measure this parameter. In the drive test it was found that all the operators meet the TRAI benchmark on CSSR, blocked call rate, Call Drop Rate, Hands off Success Rate.

1. Reliance GSM does not meet the TRAI benchmark on Voice Quality for Indoor routes.
2. MTS and Aircel do not meet the TRAI benchmark on Voice Quality for Outdoor routes.

Summary of Live Measurement Results – Cellular Mobile Services

Name of Service Provider	Network Availability		Connection Establishment (Accessibility)			Connection Maintenance (Retainability)		
	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 (%age)	TCH Congestion (%age)	Call Drop Rate (%age)	Worst affected cells having more than 3% TCH drop	%age of connection with good voice quality
Benchmark	≤ 2%	≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%	≤ 5%	≥ 95%
Vodafone	0.03%	0.00%	99.63%	0.22%	0.37%	0.69%	2.20%	98.48%
BSNL	0.62%	0.08%	98.62%	0.00%	0.01%	1.66%	3.08%	98.00%
Reliance GSM	0.05%	0.00%	99.43%	0.10%	0.02%	0.46%	0.02%	98.52%
Reliance CDMA	0.05%	0.00%	99.39%	0.00%	0.15%	0.42%	1.09%	98.67%
Airtel	0.02%	0.00%	99.62%	0.04%	0.06%	0.64%	0.12%	98.75%
Uninor	0.02%	0.00%	98.87%	0.21%	0.11%	1.62%	2.39%	97.16%
Idea	0.10%	0.18%	99.15%	0.15%	0.13%	0.80%	0.28%	97.05%
MTS	0.00%	0.00%	99.80%	0.00%	0.00%	0.39%	1.80%	98.94%
Aircel	0.02%	0.00%	98.23%	0.17%	0.03%	0.52%	1.27%	98.10%
TATA GSM	0.02%	0.00%	98.84%	0.00%	0.00%	0.56%	3.55%	97.28%
Tata CDMA	0.00%	0.00%	98.30%	0.04%	0.03%	0.86%	4.06%	98.35%

 Not meeting the benchmark

During the three day live measurement, all operators were found to be meeting the TRAI benchmark on all the network parameters.

Summary of Live Calling Results – Cellular Mobile Services

Name of Service Provider	Metering and Billing	Response time to customer for assistance	
	%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	100%	≥ 95%	≥ 90%
Vodafone	96.00%	100.00%	100.00%
BSNL	93.00%	100.00%	100.00%
Reliance GSM	93.00%	100.00%	100.00%

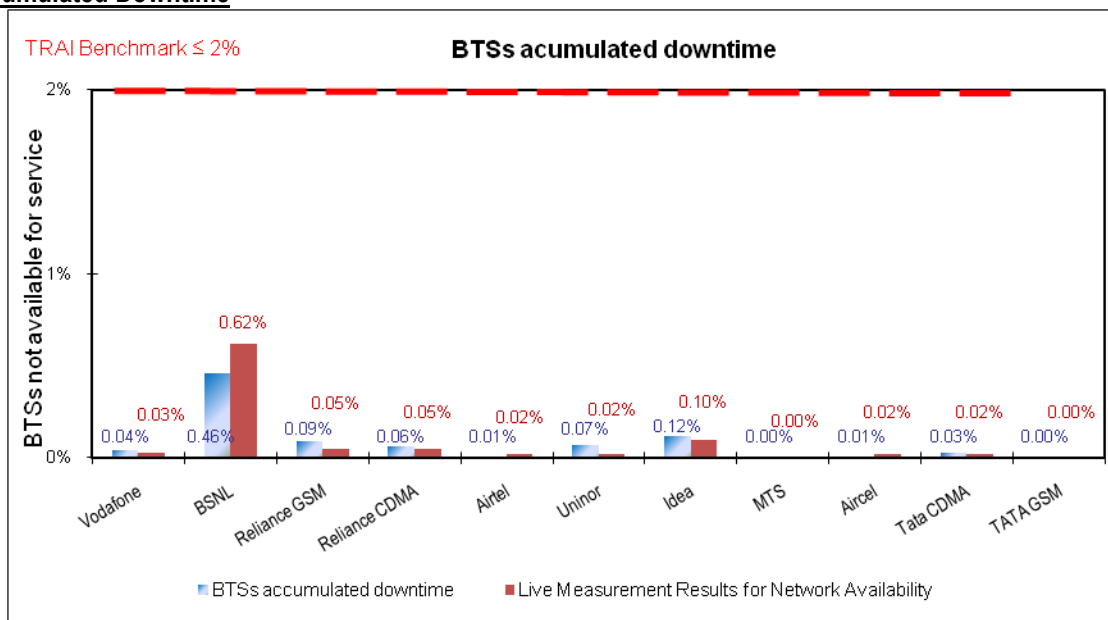
Reliance CDMA	93.00%	100.00%	100.00%
Airtel	98.00%	100.00%	99.00%
Uninor	100.00%	100.00%	100.00%
Idea	92.00%	100.00%	98.00%
MTS	85.00%	100.00%	98.00%
Aircel	93.00%	100.00%	100.00%
Tata CDMA	92.00%	100.00%	100.00%
TATA GSM	93.00%	100.00%	100.00%

However during live calling for Metering & Billing parameter of complaint resolution within 4 weeks none of the operator except Uninor was found to be meeting specified benchmark.

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



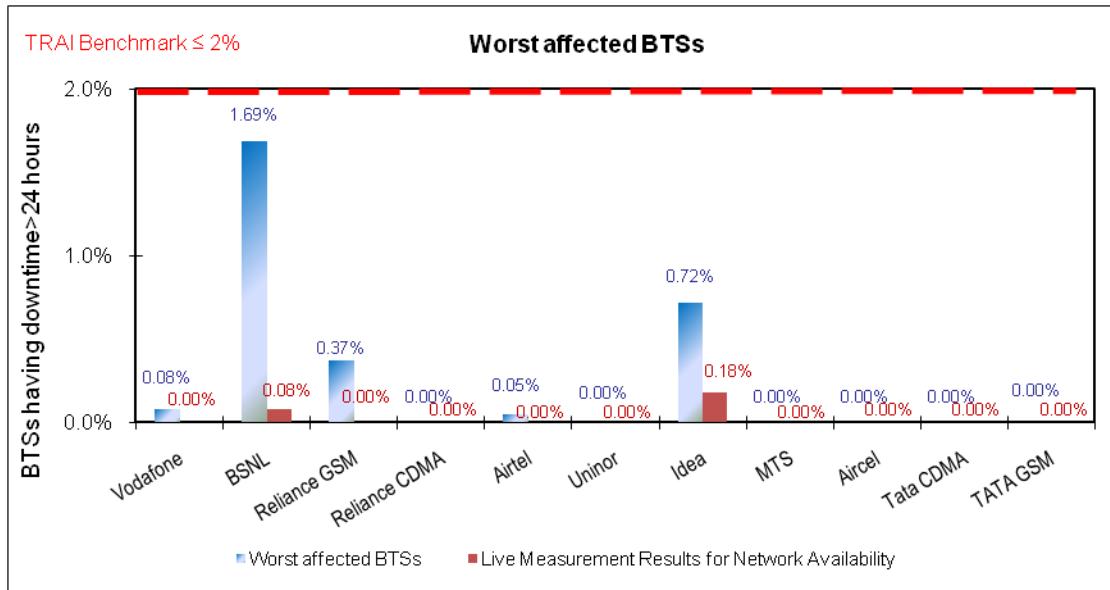
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

Worst Affected BTSs



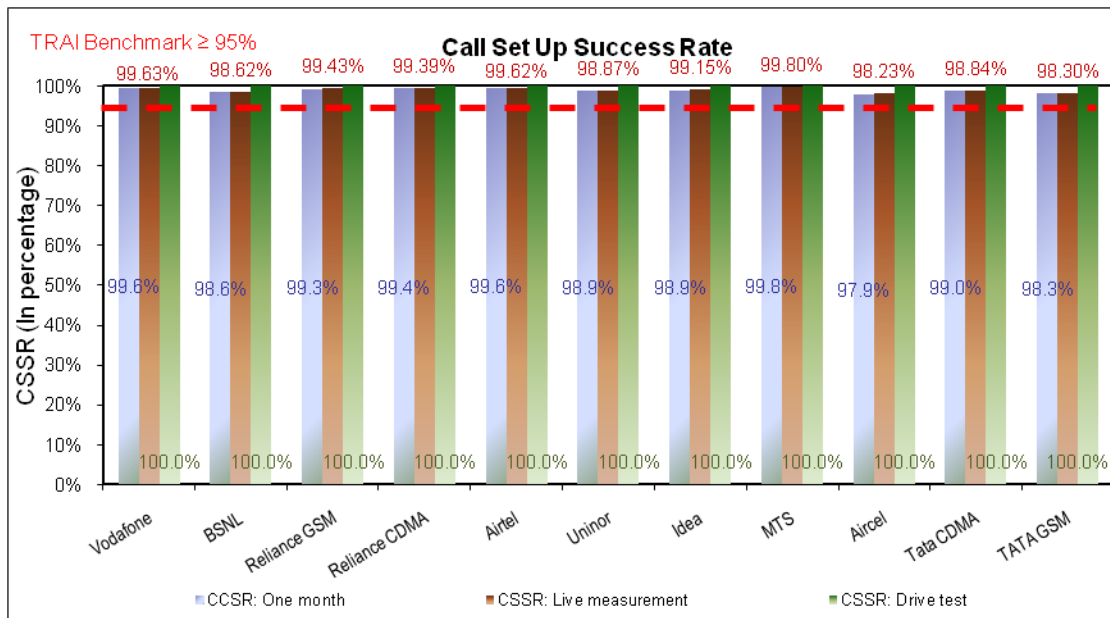
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

Call Set-up Success Rate (CSSR)



One month

All the operators meet the benchmark

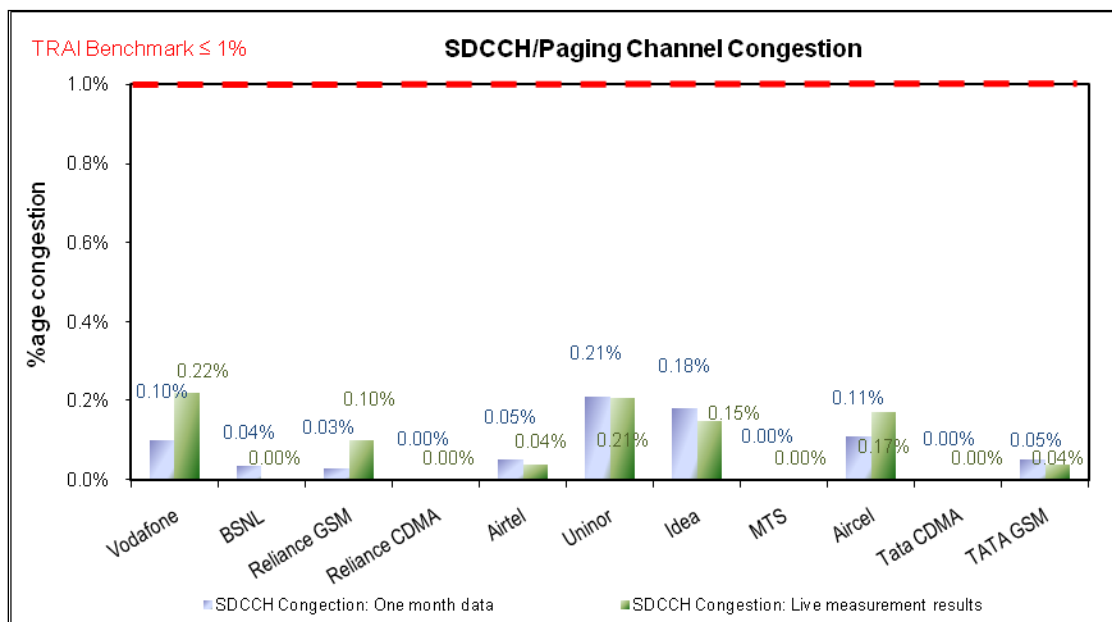
Live measurement

All the operators meet the benchmark

Drive test

All the operators meet the benchmark

SDCCH / Paging Channel Congestion



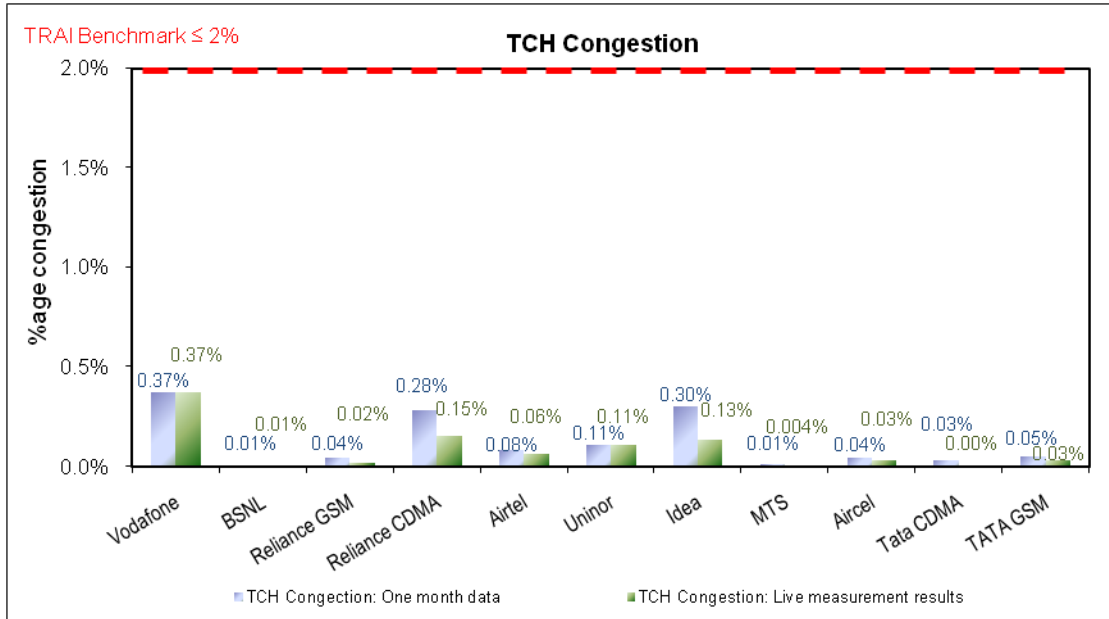
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

TCH Congestion



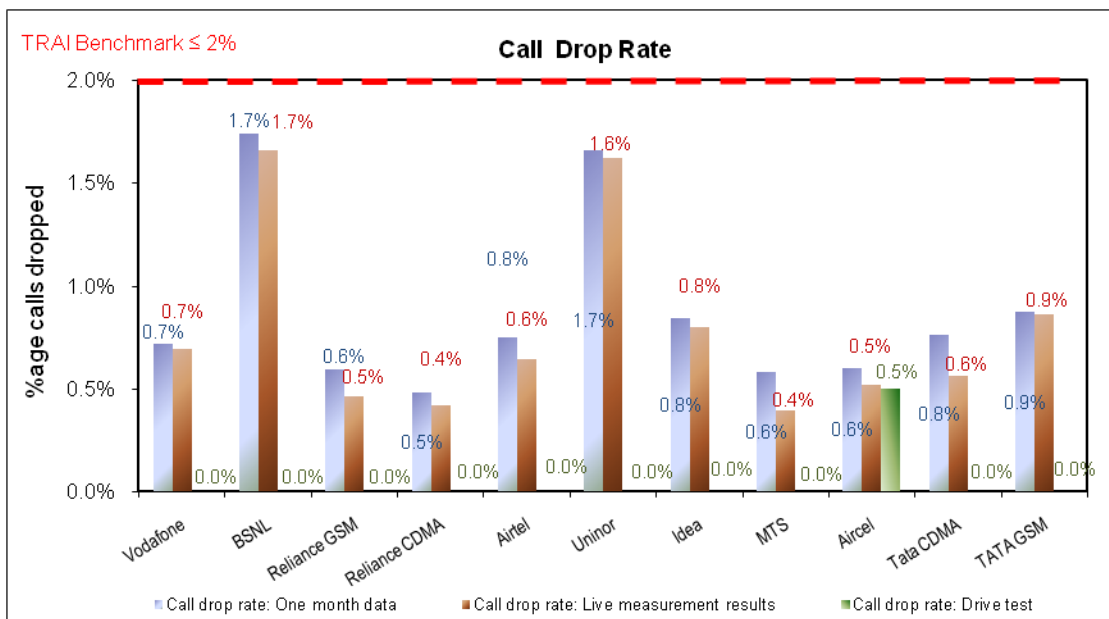
One month

All the operators meet the benchmark

Live measurement

All the operators meet the benchmark

Call Drop Rate



One month

All the operators meet the benchmark

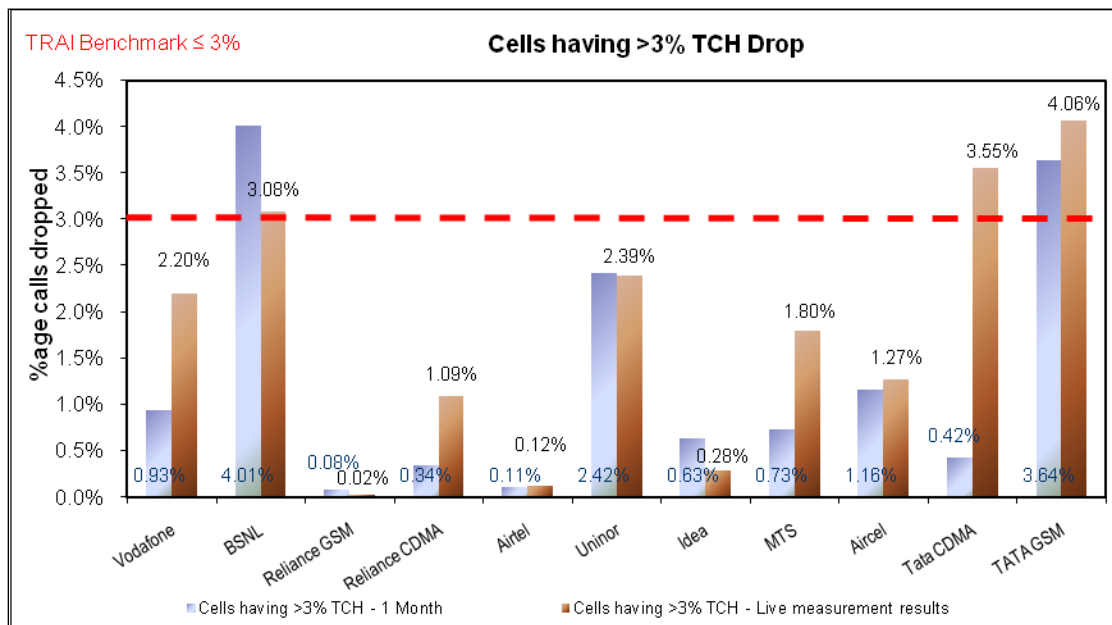
Live measurement

All the operators meet the benchmark

Drive test

All the operators meet the benchmark

Cells with more than 3% TCH Drop Rate



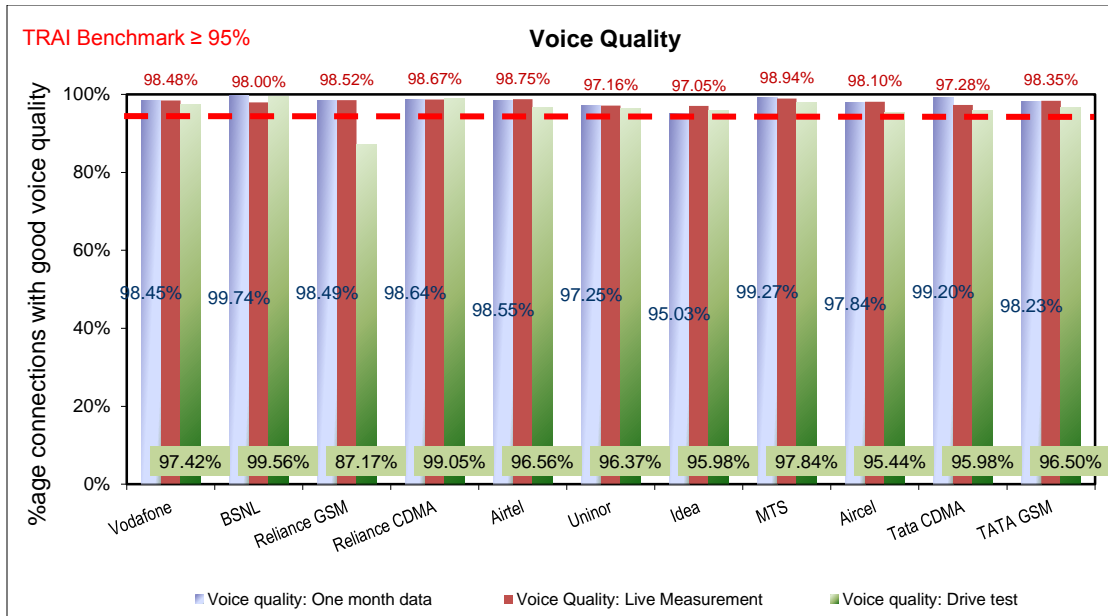
One month

Operator(s) meeting benchmark: Vodafone, Reliance GSM, Reliance CDMA, Airtel, Uninor, Idea, MTS, Aircel, Tata CDMA
 Operator(s) not meeting the benchmark: BSNL, TATA GSM

Live measurement

Operator(s) meeting benchmark: Vodafone, Reliance GSM, Reliance CDMA, Airtel, Uninor, Idea, MTS, Aircel
 Operator(s) not meeting the benchmark: BSNL, Tata CDMA, TATA GSM

Voice quality



One month

All the operators meet the benchmark

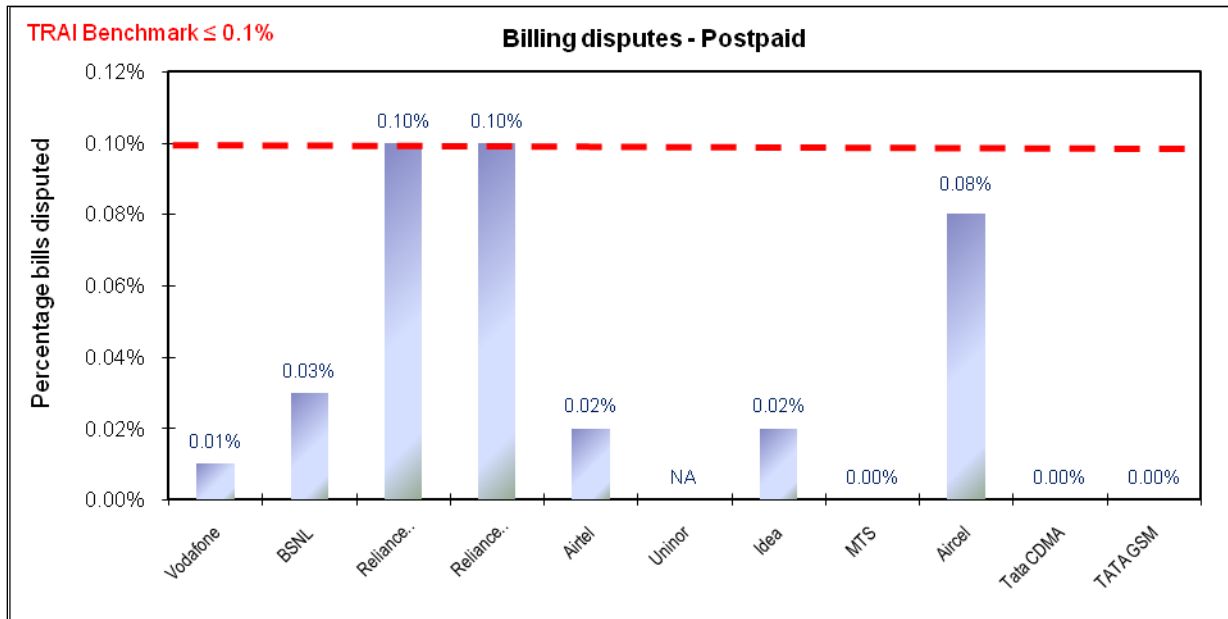
Live measurement

All the operators meet the benchmark

Drive test

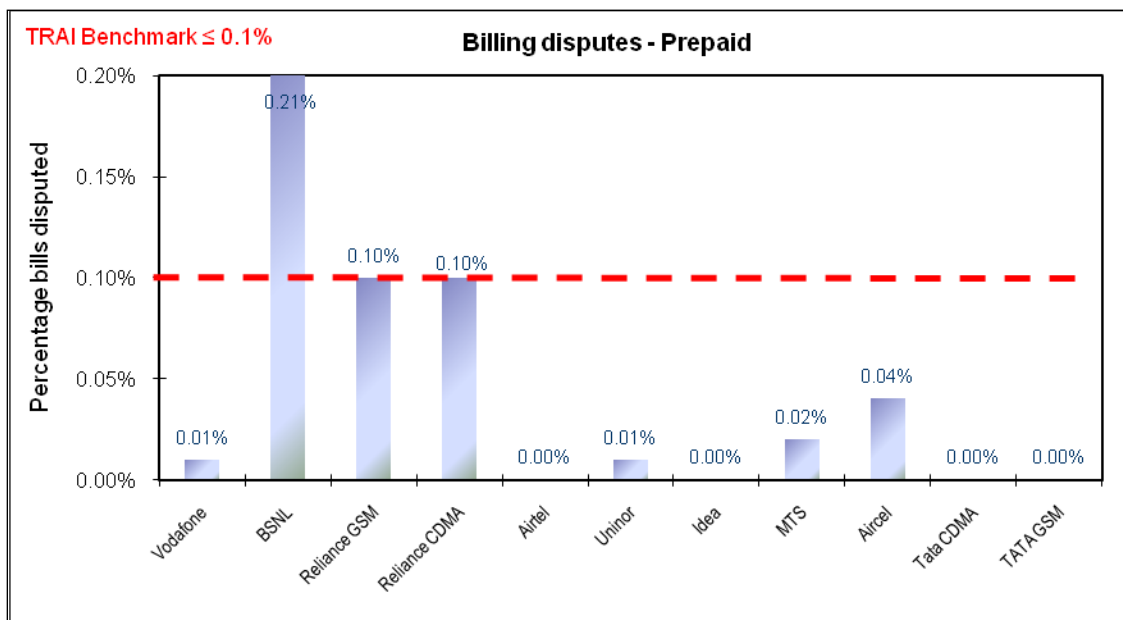
Operator(s) meeting benchmark: Vodafone, BSNL, Reliance CDMA, Airtel, Uninor, Idea, Aircel, Tata CDMA, TATA GSM
 Operator(s) not meeting the benchmark: Reliance GSM, MTS

Billing Disputes - Postpaid



All the operators meet the benchmark

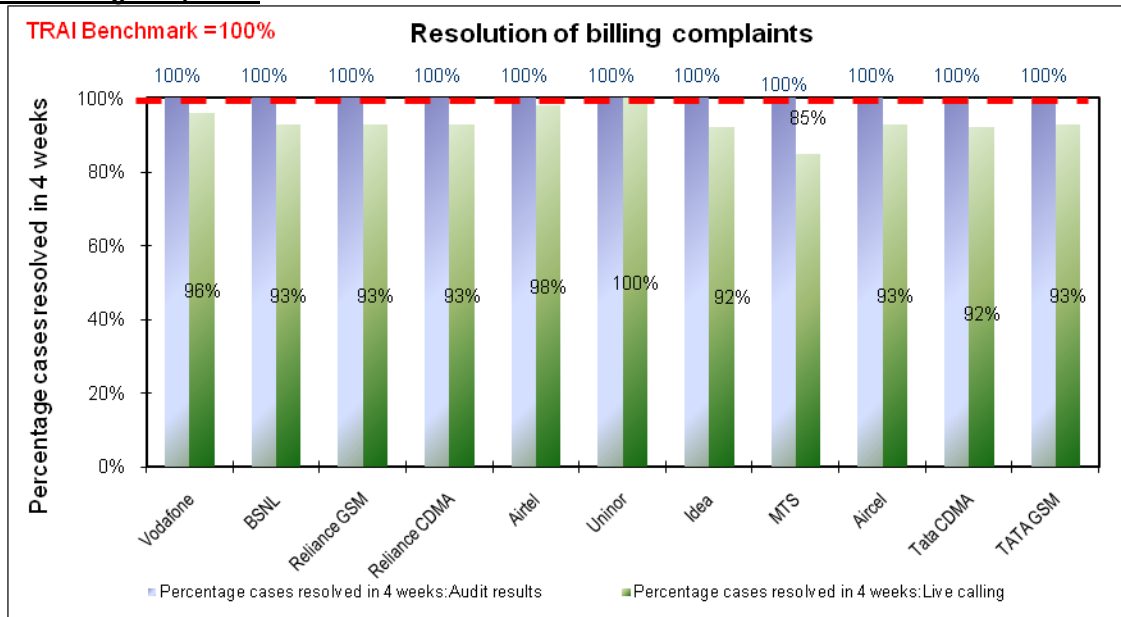
Complaints - Prepaid



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

Operator(s) not meeting the benchmark: BSNL

Resolution of billing complaints



One month

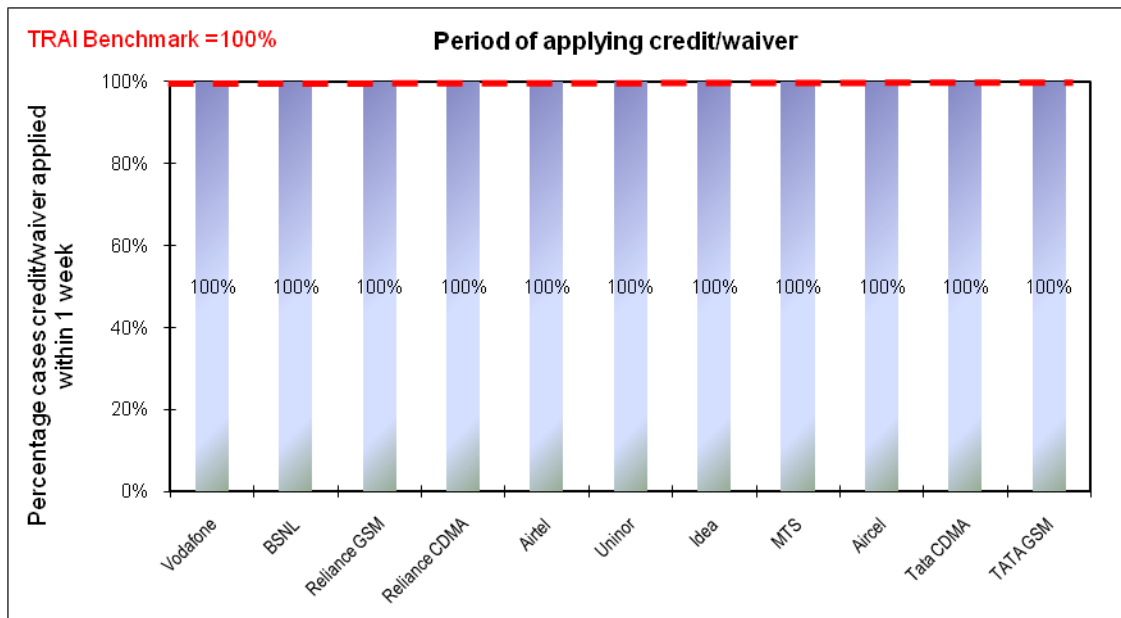
All the operators meet the benchmark

Live calling

Operator(s) meeting benchmark: Uninor

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

Period of applying credit / waiver

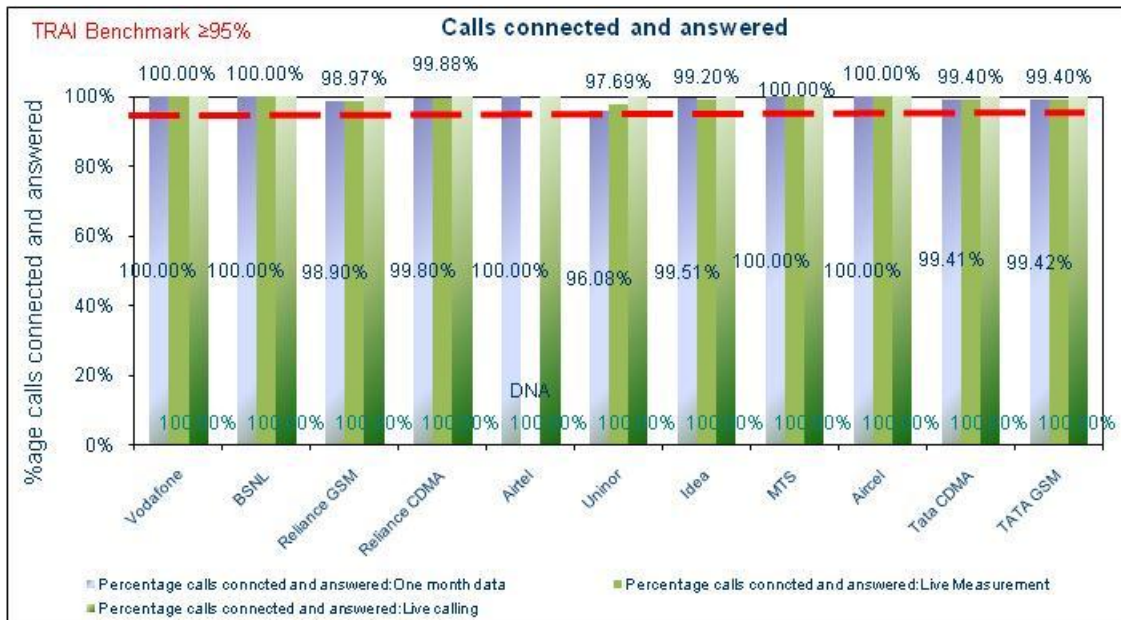


All the operators meet the benchmark

Live calling for billing Complaints

Resolution of billing complaints	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total Number of calls made		100	100	100	100	100	100	100	100	100	100	100
Number of cases resolved in 4 weeks		96	93	93	93	98	100	92	85	93	92	93
Percentage cases resolved in four weeks	100%	96%	93%	93%	93%	98%	100%	92%	85%	93%	92%	93%

Customer Care / Helpline: Calls answered



One month

All the operators meet the benchmark

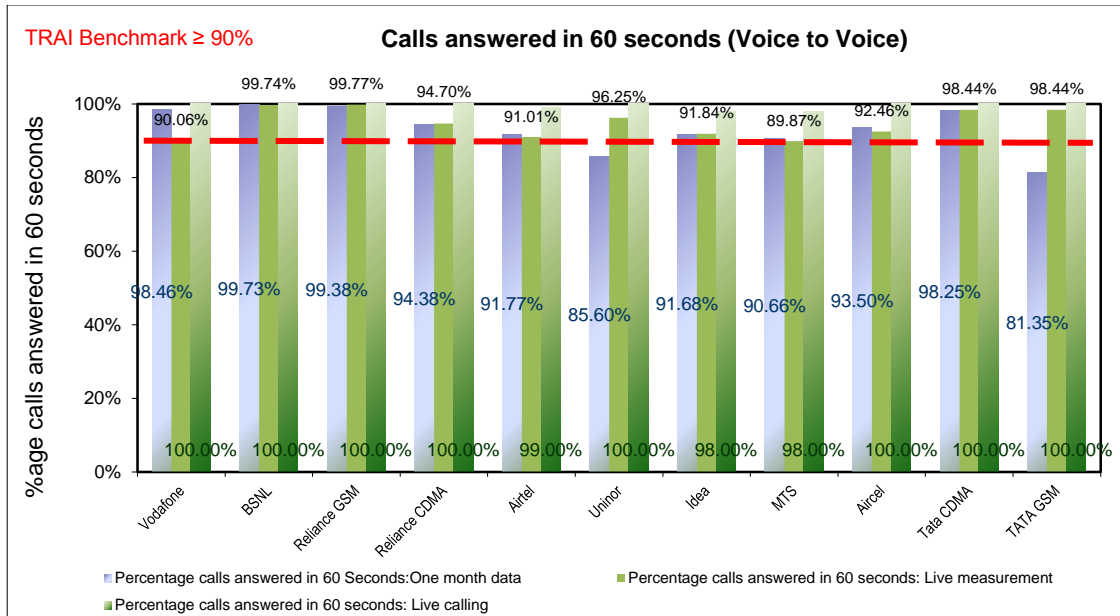
Live measurement

All the operators meet the benchmark

Live calling

All the operators meet the benchmark

Customer Care / Helpline: Calls answered voice to voice



One month

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

Operator(s) not meeting the benchmark: Uninor, TATA GSM

Live measurement

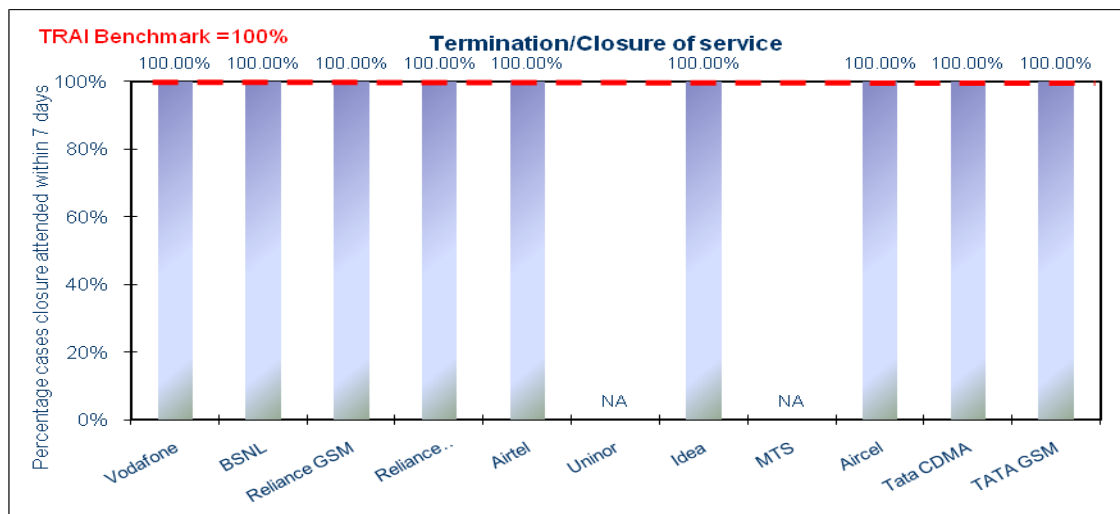
Operator(s) meeting benchmark: Vodafone, BSNL, Reliance GSM, Reliance CDMA, Airtel, Uninor, Idea, Aircel, Tata CDMA, TATA GSM

Operator(s) not meeting the benchmark: MTS

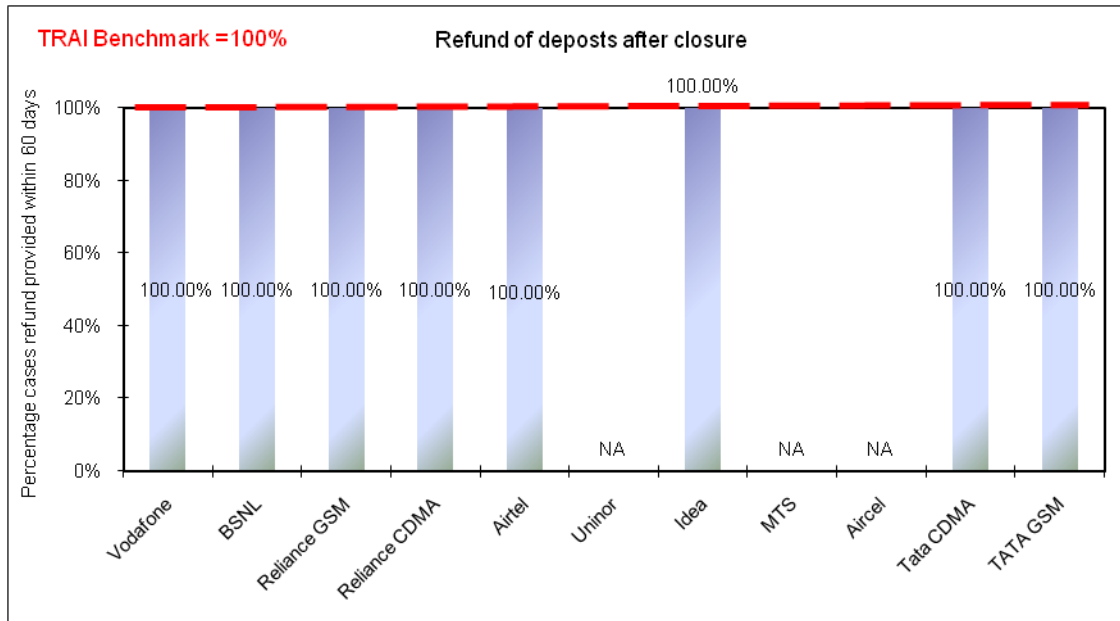
Live calling

All the operators meet the benchmark

Termination / Closure of service



All the operators meet the benchmark
Refund of deposits



All the operators meet the benchmark

Inter operator calls assessment

Inter operator call Assessment To↓ From→	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Vodafone	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
BSNL	100%	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%
Reliance GSM	100%	99%	NA	100%	100%	100%	100%	100%	100%	100%	100%
Reliance CDMA	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%	100%
Airtel	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%
Uninor	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%
Idea	100%	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%
MTS	100%	99%	100%	100%	100%	100%	100%	NA	100%	100%	100%
Aircel	100%	100%	100%	100%	100%	100%	100%	100%	NA	100%	100%
Tata CDMA	100%	100%	100%	100%	100%	100%	100%	100%	100%	NA	100%
Tata GSM	100%	100%	100%	100%	100%	100%	100%	100%	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. BSNL faced a slight issue while connecting to Reliance GSM and MTS with 99% of the calls getting completed.

7.0 Compliance reports: Results of Verification of PMR

7.1 Cellular Mobile services

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 BTSSs having accumulated downtime of >24 hours in a month	Worst affected BTSSs 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	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	
Benchmark			≤ 2%		≤ 2%	≥ 95%	≤ 1%	≤ 2%	≤ 2%			≤ 5%	≥ 95%					
Vodafone	PMR	2374	658	0.03%	1	0.04%	99.57%	0.19%	0.43%	0.96%	101	5887	1.69%	98.30%	0	127151	91502.0	3305226
	IMRB	2367	658	0.04%	1	0.04%	99.57%	0.19%	0.43%	0.96%	101	5887	1.72%	98.30%	0	127151	91502.0	3366658
BSNL	PMR	1243	7282	0.78%	24	1.92%	99.20%	0.82%	0.93%	0.95%	165	3319	4.97%	100.00%	0	56000	57503.7	753607
	IMRB	1243	7282	0.79%	24	1.93%	98.55%	0.01%	0.01%	1.94%	165	3319	4.97%	99.44%	0	80000	57504.0	753607
Reliance GSM	PMR	1553	0	0.00%	0	0.00%	99.71%	0.26%	0.10%	0.03%	3	4614	0.07%	98.59%	0	64000	38837.3	DNA
	IMRB	1553	0	0.00%	0	0.00%	99.71%	0.26%	0.10%	0.03%	3	4614	0.07%	98.59%	0	64000	38837.2	2032924
Reliance CDMA	PMR	470	214	0.06%	0	0.00%	99.76%	0.10%	0.27%	0.66%	7	470	1.49%	99.41%	0	84000	47064.4	DNA
	IMRB	470	214	0.06%	0	0.00%	99.76%	0.00%	0.27%	0.66%	7	470	1.49%	99.41%	0	84000	47424.7	1264249
Airtel	PMR	2011	757	0.07%	4	0.20%	99.27%	0.07%	0.10%	1.00%	10	5529	0.20%	98.37%	0	117129	78695.3	3131103
	IMRB	2011	757	0.05%	4	0.22%	99.28%	0.05%	0.10%	0.96%	10	5529	0.18%	98.36%	0	117128	78695.0	3130541
Uninor	PMR	1032	531	0.07%	0	0.00%	98.86%	0.25%	0.22%	1.81%	89	3094	2.89%	96.90%	0	33219	31503.7	766177
	IMRB	1032	531	0.07%	0	0.00%	98.86%	0.25%	0.22%	1.81%	89	3094	2.89%	97.50%	0	33219	31503.2	766177
Idea	PMR	1632	925	0.08%	9	0.58%	98.52%	0.12%	0.49%	0.83%	90	4792	1.93%	98.07%	0	31926	16429.7	691043
	IMRB	1632	925	0.08%	9	0.57%	98.52%	0.12%	0.49%	0.83%	92	4792	1.93%	98.07%	0	31928	16429.6	691043
MTS	PMR	465	0	0.00%	0	0.00%	98.66%	0.00%	0.10%	0.73%	16	1464	0.95%	98.39%	0	50400	13739.7	405813
	IMRB	465	0	0.00%	0	0.00%	98.66%	0.00%	0.10%	0.73%	14	1464	0.95%	98.39%	0	50400	13739.7	405813
Aircel	PMR	2080	213	0.02%	0	0.00%	97.96%	0.14%	0.03%	0.68%	75	5907	1.27%	97.78%	0	73203	20800.9	836169
	IMRB	2080	213	0.02%	0	0.00%	97.96%	0.14%	0.03%	0.68%	75	5907	1.27%	97.78%	0	73202	20800.7	836169
Tata CDMA	PMR	579	141	0.03%	0	0.00%	99.25%	0.00%	0.04%	0.87%	48	1908	2.50%	97.32%	0	212708	54531	736488
	IMRB	579	141	0.03%	0	0.00%	99.25%	0.00%	0.04%	0.87%	48	1908	2.50%	97.32%	0	212708	54531	736488

Quality of Service – Audit module report for Kolkata Circle

TATA GSM	PMR	1451	136	0.01%	0	0.00%	97.98%	0.09%	0.11%	0.99%	63	4217	1.50%	97.75%	0	63321	24902	1112527
	IMRB	1451	135	0.01%	0	0.00%	97.98%	0.09%	0.11%	0.99%	63	4217	1.50%	97.75%	0	63321	24902	1112527

Non- network Parameters

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 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 billing (post-paid) and charging, credit / validity complaints (pre paid) resolved in favor of customer during the quarter	No. of complaints disposed on account of not considered as valid complaints during the quarter	Percentage of complaints received during the quarter which were adjusted to customer's account from the date of resolution of complaint	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		
Vodafone	PMR	0%	1256467	88	0.0%	1429	4030833	100%	1517	1517	747	770	100%	100%	284005	237487	84.47%	100%	10653	10651	100%
	IMRB	0%	1256467	88	0.0%	1429	4030833	100%	1517	1517	747	770	100%	100%	14310244	14310244	76.00%	100%	10653	10651	100%
BSNL	PMR	0%	387130	115	0.00%	3745	2190434	100%	3648	3648	3648	0	100%	100%	19883	18729	90.00%	100%	1840	1840	100%
	IMRB	0%	367130	115	0.00%	3745	2190434	100%	3648	3648	3648	0	100%	100%	19883	18729	90.00%	100%	1840	1840	100%
Reliance GSM	PMR	0.09%	42387	40	0.04%	1367	3326753	100%	4142	4142	1401	2741	100%	99.00%	7877796	7795471	96.00%	100%	269	269	100%
	IMRB	0.09%	60686	54	0.09%	2913	3163719	100%	8794	8794	6417	2377	100%	99.00%	4861370	4932070	93.07%	100%	189	189	100%
Reliance CDMA	PMR	0%	413439	341	0%	1231	1943445	100%	4035	4035	1982	2053	100%	100%	1748621	1745719	92.00%	100%	1395	1395	100%
	IMRB	0.10%	403783	387	0.10%	1965.67	1993176	100%	6284	6284	5914	370	100.00%	99.75%	1955597	1950776	97.40%	100.00%	1395	1395	100.00%
Airtel	PMR	0.020%	699051	167	0.02%	2,119	13085360	100%	2286	22669	2286	20383	100%	100%	27268082	26887612	99%	100%	4891	4891	100%
	IMRB	0.020%	699051	167	0.02%	2119	13085360	100%	2286	22669	2286	20383	100%	100%	27268082	26887612	99%	100%	4891	4891	100%
Uninor	PMR	DNA	DNA	DNA	0.00%	231	1387354	100%	231	231	DNA	DNA	DNA	97%	550719	535588	89%	DNA	DNA	DNA	100%
	IMRB	DNA	DNA	DNA	0.02%	231	1387354	100%	231	231	DNA	DNA	DNA	97%	550719	535586	89%	DNA	DNA	DNA	DNA
Idea	PMR	0%	18248	7	0.01%	170	2580592	100%	1990	1990	177	1813	100%	99%	489793	484114	87%	100%	608	608	100%
	IMRB	0%	18248	7	0.01%	170	2580592	100%	1990	1990	177	1813	100%	99%	489793	484114	87%	100%	642	642	100%
MTS	PMR	0.00%	1799	0	0.00%	216	703859	100%	216	216	216	0	100%	100%	90071	82331	90%	DNA	DNA	DNA	DNA
	IMRB	DNA	1799	DNA	0.03%	216	703859	100%	216	216	216	0	100%	100%	90071	82331	90%	DNA	DNA	DNA	DNA

Quality of Service – Audit module report for Kolkata Circle

Aircel	PMR	0.01%	37609	4	0.17%	2843	1662820	100%	2847	2843	733	2105	100%	100%	211703	190290	88.88%	100%	407	407	100%
	IMRB	0.01%	37609	4	0.17%	2843	1633713	100%	2847	2847	737	2110	100%	100	202868	1847435	89.63%	100%	407	407	100%
Tata CDMA	PMR	0%	252492	16	0.00%	53	1410109	100%	2585	2586	69	2517	100%	99%	398148	395209	95%	100%	7167	7167	100%
	IMRB	0%	252492	16	0.00%	53	1410109	100%	2585	2586	69	2517	100%	99%	398148	395209	95%	100%	7167	7167	100%
TATA GSM	PMR	0.03%	33505	208	0.00%	6706	1643796	100%	6914	6914	11	6903	100%	99%	830022	822928	96%	100%	998	998	100%
	IMRB	0.0300%	33505	208	0.00%	6706	1643796	100%	6914	6914	11	6903	100%	99%	830022	822928	96%	100%	998	998	100%



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. The figures reported by all the operators on all parameters completely match the figures obtained on verification except for Reliance CDMA and GSM on Response time for assistance benchmark and for Reliance CDMA and GSM for metering and billing parameters as well.
2. Vodafone, Uninor, Idea and Aircel do not meet the benchmark for Percentage of calls answered by the operators (voice to voice) within 60
3. Aircel does not meet Metering and Billing credibility benchmark for prepaid.

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%
Vodafone	0.04%	0.08%	99.63%	0.10%	0.37%	0.72%	0.93%	98.45%	0.01%	0.01%	100.00%	100.00%	100.00%	98.46%	100.00%	100.00%
BSNL	0.46%	1.69%	98.60%	0.04%	0.01%	1.74%	4.01%	99.74%	0.03%	0.21%	100.00%	100.00%	100.00%	99.73%	100.00%	100.00%
Reliance GSM	0.09%	0.37%	99.26%	0.03%	0.04%	0.59%	0.08%	98.49%	0.10%	0.10%	100.00%	100.00%	98.90%	99.38%	100.00%	100.00%
Reliance CDMA	0.06%	0.00%	99.37%	0.00%	0.28%	0.48%	0.34%	98.64%	0.10%	0.10%	100.00%	100.00%	99.80%	94.38%	100.00%	100.00%
Airtel	0.01%	0.05%	99.55%	0.05%	0.08%	0.75%	0.11%	98.55%	0.02%	0.00%	100.00%	100.00%	100.00%	91.77%	100.00%	100.00%
Uninor	0.07%	0.00%	98.93%	0.21%	0.11%	1.66%	2.42%	97.25%	NA	0.01%	100.00%	100.00%	96.08%	85.60%	NA	NA
Idea	0.12%	0.72%	98.91%	0.18%	0.30%	0.84%	0.63%	95.03%	0.02%	0.00%	100.00%	100.00%	99.51%	91.68%	100.00%	100.00%
MTS	0.00%	0.00%	99.76%	0.00%	0.01%	0.58%	0.73%	99.27%	0.00%	0.02%	100.00%	100.00%	100.00%	90.66%	NA	NA
Aircel	0.01%	0.00%	97.87%	0.11%	0.04%	0.60%	1.16%	97.84%	0.08%	0.04%	100.00%	100.00%	100.00%	93.50%	100.00%	NA
Tata CDMA	0.03%	0.00%	99.01%	0.00%	0.03%	0.76%	0.42%	99.20%	0.00%	0.00%	100.00%	100.00%	99.41%	98.25%	100.00%	100.00%
TATA GSM	0.00%	0.00%	98.30%	0.05%	0.05%	0.87%	3.64%	98.23%	0.00%	0.00%	100.00%	100.00%	99.42%	81.35%	100.00%	100.00%

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
Vodafone	All POI's meeting TRAI specified benchmark					
BSNL	All POI's meeting TRAI specified benchmark					
Reliance GSM	All POI's meeting TRAI specified benchmark					
Reliance CDMA	All POI's meeting TRAI specified benchmark					
Airtel	All POI's meeting TRAI specified benchmark					
Uninor	Kolkata (Sept)	60	1053	8.4	21	On eve of the soccer game between Argentina and Venezuela held on Kolkata, an additional promo was introduced for lucky draw competition and an Airtel fix number was given as the offered number, so on 31st Aug and 1st Sept, the two EI's with Airtel fix was highly utilized and traffic fail occurred
	Kolkata (July)	30	669	7.38	7	Overflow traffic of TCL ILD
MTS	All POI's meeting TRAI specified benchmark					
Aircel	All POI's meeting TRAI specified benchmark					
Tata CDMA	All POI's meeting TRAI specified benchmark					
TATA GSM	All POI's meeting TRAI specified benchmark					

9.3 Parameter wise performance reports for Cellular Mobile services

1. Network Availability

Audit Results for Network Availability

	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Number of BTSs in the licensed service area		2369	1245	1636	486	2039	1034	1675	518	2082	579	1566
Sum of downtime of BTSs in a month (in hours)		684	4260	1071	218	221	516.47	1443	0	91.76	127	17.26
BTSs accumulated downtime (not available for service)	≤ 2%	0.04%	0.46%	0.09%	0.06%	0.01%	0.07%	0.12%	0.00%	0.01%	0.03%	0.00%
Number of BTSs having accumulated downtime >24 hours		2	21	6	0	1	0	12	0	0	0	0
Worst affected BTSs due to downtime	≤ 2%	0.08%	1.69%	0.37%	0.00%	0.05%	0.00%	0.72%	0.00%	0.00%	0.00%	0.00%

	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Number of BTSs in the licensed service area		2369	1245	1658	491	2039	1033	1675	519	2082	579	1566
Sum of downtime of BTSs in 3 days (in hours)		57.17	556	63	19	25.56	17.31	121.56	0	37	7.6	0
BTSs accumulated downtime (not available for service)	≤ 2%	0.03%	0.62%	0.05%	0.05%	0.02%	0.02%	0.10%	0.00%	0.02%	0.02%	0.00%
Number of BTSs having		0	1	0	0	0	0	3	0	0	0	0

accumulated downtime >24 hours												
Worst affected BTSs due to downtime	≤ 2%	0.00%	0.08%	0.00%	0.00%	0.00%	0.00%	0.18%	0.00%	0.00%	0.00%	0.00%

2. Connection Establishment (Accessibility)

Audit Results for CSSR, SDCCH and TCH congestion

CSSR	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
CSSR	≥ 95%	99.63%	98.60%	99.26%	99.37%	99.55%	98.93%	98.91%	99.76%	97.87%	99.01%	98.30%

SDCCH congestion	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
SDCCH/Paging channel congestion	≤ 1%	0.10%	0.04%	0.03%	0.00%	0.05%	0.21%	0.18%	0.00%	0.11%	0.00%	0.05%

TCH congestion	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
TCH congestion	≤ 2%	0.37%	0.01%	0.04%	0.28%	0.08%	0.11%	0.30%	0.01%	0.04%	0.03%	0.05%

Live measurement results for CSSR, SDCCH and TCH congestion

CSSR	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
CSSR	≥ 95%	99.63%	98.62%	99.43%	99.39%	99.62%	98.87%	99.15%	99.80%	98.23%	98.84%	98.30%

SDCCH congestion	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
SDCCH/Paging channel congestion	≤ 1%	0.22%	0.00%	0.10%	0.00%	0.04%	0.21%	0.15%	0.00%	0.17%	0.00%	0.04%

TCH congestion	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
TCH congestion	≤ 2%	0.37%	0.01%	0.02%	0.15%	0.06%	0.11%	0.13%	0.004%	0.03%	0.00%	0.03%

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

CSSR	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of call attempts		210	210	210	210	210	210	210	210	210	210	228
Total number of successful calls established		210	210	210	210	210	210	210	210	210	210	228
CSSR	≥ 95%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Blocked calls	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
%age blocked calls		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

3. Connection Maintenance (Retainability)**Audit Results for Call drop rate and for number of cells having more than 3% TCH**

Call drop rate	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of calls established		111457730	724531	27006728	33323030	108964461	29410735	29241729	19333251	27707046	16635131	37116706
Total number of calls dropped		800415	12631	158208	160153	815180	488765	245849	111250	167545	125976	322953
Call drop rate	≤ 2%	0.72%	1.74%	0.59%	0.48%	0.75%	1.66%	0.84%	0.58%	0.60%	0.76%	0.87%

Cells having more than 3% TCH	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of cells in the network		5889	3370	4908	1458	5654	3097	4922	1650	5924	1905	139534
Total number of cells having more than 3% TCH		55	135	4	5	6	75	31	12	69	8	5081
Worst affected cells having more than 3% TCH	≤ 3%	0.93%	4.01%	0.08%	0.34%	0.11%	2.42%	0.63%	0.73%	1.16%	0.42%	3.64%

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

Call drop rate	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of calls established		11711094	790038	54471161	47191921	11359400	3121598	39001023	26787565	38200964	1938618	3627216
Total number of calls dropped		80635	13086	251516	196690	72168	50583	313903	104129	200243	10846	31255
Call drop rate	≤ 2%	0.69%	1.66%	0.46%	0.42%	0.64%	1.62%	0.80%	0.39%	0.52%	0.56%	0.86%

Cells having more than 3% TCH	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of cells in the network		17667	3345	4974	1473	16969	3094	4922	1665	5928	5714	13561
Total number of cells having more than 3% TCH		388	103	1	16	20	74	14	30	75	203	551
Worst affected cells having more than 3% TCH	≤ 3%	2.20%	3.08%	0.02%	1.09%	0.12%	2.39%	0.28%	1.80%	1.27%	3.55%	4.06%

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

Call drop rate	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of calls established		210	210	210	210	210	210	210	210	200	210	228
Total number of calls dropped		0	0	0	0	0	0	0	0	1	0	0
Call drop rate	≤ 2%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.50%	0.00%	0.00%

4. Voice quality**Audit & Live measurement Results for Voice quality**

Voice quality	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of sample calls		15000489624	7000	7660931106	92909509	21102482904	6464008299	3783547791	19333251	4246293352	10382	4957151300
Total number of calls with good voice quality		14768174567	6982	7544958339	91649935	20796562707	6286465102	3595502825	19191396	4154382247	10299	4869558933
%age calls with good voice quality	≥ 95%	98.45%	99.74%	98.49%	98.64%	98.55%	97.25%	95.03%	99.27%	97.84%	99.20%	98.23%

Voice quality	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of sample calls		1578986176	700	11590881798	142322816	2880442260	656440704	5783643413	26787565	5640723163	882	489436528
Total number of calls with good voice quality		1555034630	686	11419067749	140426401	2844404578	637825151	5613069455	26502546	5533519781	858	481346331
%age calls with good voice quality	≥ 95%	98.48%	98.00%	98.52%	98.67%	98.75%	97.16%	97.05%	98.94%	98.10%	97.28%	98.35%

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

Voice quality	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of sample calls		60101	232174	18515	20510	48189	59389	466365	12127	361983	466365	58559
Total number of calls with good voice quality		58552	231160	16139	20316	46531	57232	447634	11865	345471	447634	56511
%age calls with good voice quality	≥ 95%	97.42%	99.56%	87.17%	99.05%	96.56%	96.37%	95.98%	97.84%	95.44%	95.98%	96.50%

5. POI Congestion

Audit Results for POI Congestion

POI congestion	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of working POIs		40	106	8	14	38	75	62	44	40	72	45
No. of POIs not meeting benchmark		0	0	0	0	0	2	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		77872	738810	437440	826774	66938	880227.75	32486	549300	32568	37802	12532
Traffic served for all POIs (B)- in erlangs		35078	17930	277510	368888	31951	405361.56	19863	285416	13914	17037	6290
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

Live measurement results for POI congestion

POI congestion	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of working POIs		40	106	8	14	38	77	62	44	40	72	45
No. of POIs not meeting benchmark		0	0	0	0	0	0	0	0	0	0	0
Total Capacity of all POIs (A) - in erlangs		232403	749744	42251.52383	88298.95994	201959	76866	33881	47442	31683	2749881	37597
Traffic served for all POIs (B)- in erlangs		139900	19240	29746.41992	38406.47833	103648	39751	21725.85	22294	14198	578528	19082
POI congestion	≤ 0.5%	0.00	0.00	0.00	0.00	0.00	0.00	NA	0.00	0.00	0.00	0.00

6. Inter Operator Call Assessment

Inter operator call Assessment To↓ From→	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Vodafone	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
BSNL	100%	NA	100%	100%	100%	100%	100%	100%	100%	100%	100%
Reliance GSM	100%	99%	NA	100%	100%	100%	100%	100%	100%	100%	100%
Reliance CDMA	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%	100%
Airtel	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%
Uninor	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%

Idea	100%	100%	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%
MTS	100%	99%	100%	100%	100%	100%	100%	100%	NA	100%	100%	100%
Aircel	100%	100%	100%	100%	100%	100%	100%	100%	100%	NA	100%	100%
Tata CDMA	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	NA	100%
Tata GSM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	NA

7. Metering and Billing credibility

 The maximum problem faced by the calling operator to other operators

Audit Results for billing performance

Billing Performance	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Billing disputes - Postpaid												
Total bills generated during the period		465561	114784	22835	132516	255476	NA	8487	3751	13436	122755	12604
Total number of bills disputed		33	30	22	132	57	NA	2	0	11	6	0
Percentage bills disputed	≤ 0.1%	0.01%	0.03%	0.10%	0.10%	0.02%	NA	0.02%	0.00%	0.08%	0.00%	0.00%
Billing disputes - Prepaid												
Number of complaints related to charging, credit & validity		557	4699	3163	1993	167	221	49	123	751	38	46
Total number of prepaid customers in that period		4000025	2244102	3174708	2009282	4314924	1699234	1195794	812656	1764553	1076513	1805690
Percentage of complaints	≤ 0.1%	0.01%	0.21%	0.10%	0.10%	0.00%	0.01%	0.00%	0.02%	0.04%	0.00%	0.00%
Resolution of billing complaints												
Total number of billing/charging complaints		847	7086	3236	2256	2300	221	989	123	1342	463	479
Total complaints considered invalid		257	2357	51	131	2076	0	937	0	580	419	433
Number of complaints resolved in 4 weeks from date of receipt for complaints listed in 5.3.1		590	4729	3185	2125	224	221	52	123	762	44	46
Percentage complaints resolved within 4 weeks of date of receipt	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Period of applying credit / waiver												
Total number of complaints where credit/waiver is required		333	2372	3185	1994	224	221	51	123	182	44	46
Percentage cases in which credit/waiver was received within 1 week	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Live calling results for resolution of billing complaints

Resolution of billing complaints	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total Number of calls made		100	100	100	100	100	100	100	100	100	100	100
Number of cases resolved in 4 weeks		96	93	93	93	98	100	92	85	93	92	93
Percentage cases resolved in four weeks	100%	96%	93%	93%	93%	98%	100%	92%	85%	93%	92%	93%

8. Customer Care**Audit results for customer care**

Customer Care Assessment	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of call attempts to customer care for assistance		3169321	465690	3480953	960530	1764277	206820	257210	745419	1913363	831689	4054111
Number of calls getting connected and answered (electronically)		3169321	465690	3442644	958568	1764269	198705	255937	745419	1913363	826745	4030460
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	98.90%	99.80%	100.00%	96.08%	99.51%	100.00%	100.00%	99.41%	99.42%
Number of calls getting transferred to the operator (voice to voice)		989707	16493	705137	367034	3865710	595314	336984	384186	841157	175977	874206
Number of calls answered by operator (voice to voice) within 60 seconds		974439	16449	700774	346419	3547621	509574	308933	348303	786464	172897	711167
Percentage calls answered within 60 seconds (V2V)	≥ 90%	98.46%	99.73%	99.38%	94.38%	91.77%	85.60%	91.68%	90.66%	93.50%	98.25%	81.35%

Live measurement results for customer care

Customer Care Assessment	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of call attempts to customer care for assistance		321328	45660	284871	80933	DNA	180745	15980	61934	76956	76106	76106
Number of calls getting connected and answered (electronically)		321328	45660	281942	80835	DNA	176575	15852	61934	76956	75647	75647
Percentage calls getting connected and answered	≥ 95%	100.00%	100.00%	98.97%	99.88%	DNA	97.69%	99.20%	100.00%	100.00%	99.40%	99.40%
Number of calls getting transferred to the operator (voice to voice)		103266	2299	59933	30228	378491	58947	36942	57378	82598	16383	16383
Number of calls answered by operator (voice to voice) within 60 seconds		93001	2293	59794	28626	344474	56739	33929	51563	76370	16127	16127
Percentage calls answered within 60 seconds (V2V)	≥ 90%	90.06%	99.74%	99.77%	94.70%	91.01%	96.25%	91.84%	89.87%	92.46%	98.44%	98.44%

Live calling results for customer care

Customer Care Assessment	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total Number of calls made		100	100	100	100	100	100	100	100	100	100	100
Total Number of calls getting connected and answered		100	100	100	100	100	100	100	100	100	100	100
Percentage calls getting connected and answered	≥ 95%	100.00%	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	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total Number of calls made		100	100	100	100	100	100	100	100	100	100	100
Total Number of calls answered within 60 seconds		100	100	100	100	99	100	98	98	100	100	100
Percentage calls answered within 60 seconds	≥ 90%	100.00%	100.00%	100.00%	100.00%	99.00%	100.00%	98.00%	98.00%	100.00%	100.00%	100.00%

60 seconds

Following are the details of the numbers at which the calls above were made

<u>Operator</u>	Kolkata
Aircel	121
Airtel	121
BSNL	9433024365
Idea	12345
MTS	91531555155
Reliance CDMA	*222/*333
Reliance GSM	*222/*333
Tata Indicom	9231012345
Tata Docomo	9038012345
Vodafone	111
Uninor	9062090620

9. Termination / closure of service

Audit results for termination / closure of service

Termination	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of closure request		3169	1179	216	573	1745	NA	253	0	222	2026	314
Number of requests attended within 7 days		3169	1179	216	573	1745	NA	253	NA	222	2026	314
Percentage cases in which termination done within 7 days	100%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	NA	100.00%	100.00%	100.00%

Audit results for refund of deposits

Refund	Benchmark	Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total number of cases requiring refund of deposits		1379	50	231	219	282	NA	23	0	0	121	23

Total number of cases where refund was made within 60 days		1379	50	231	219	282	NA	23	NA	NA	121	23
Percentage cases in which refund was receive within 60 days	100%	100.00%	100.00%	100.00%	100.00%	100.00%	NA	100.00%	NA	NA	100.00%	100.00%

11. Additional Network Related parameters

Audit Results for Total Traffic Handled in Erlang

Traffic in Erlang		Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Equipped capacity of the network		126384	80000	64000	84000	118537	33408	32393	50400	72898	213692	72345
Total traffic handled in erlang during TCBH		86742	56482	43293	45362	75837	33805.63	21843	14279	21011	53687	28861

Total number of customers as per VLR

		Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total no. of customers served (as per VLR)		3541314	790913	2305515	1281704	3274809	855761	875707	419865	883053	663729	1334399

Level 1 services		Vodafone	BSNL	Reliance GSM	Reliance CDMA	Airtel	Uninor	Idea	MTS	Aircel	Tata CDMA	TATA GSM
Total no. of calls made		150	150	150	150	150	150	150	150	150	150	150
Calls answered in 60 sec		150	150	150	150	150	150	150	150	150	150	150
Calls answered after 60 sec		0	0	0	0	0	0	0	0	0	0	0
