



INDEPENDENT DRIVE TEST REPORT

For

Gwalior

March 2018

WEST ZONE

Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2% except BSNL 3G & Tata CDMA. All TSPs have met the Call Setup Success Rate (CSSR) of 95%.

The Independent Drive Test has been carried out by M/s PhiMetrics Technologies Pvt. Ltd. on behalf of TRAI in Gwalior City & adjoining areas from 9:00 AM to 9:00 PM; 19th March to 23rd March 2018. The drive test covered an drive route of 640 KMs & 6 hotspot over a period of 5 days. Approximately 720 calls were made for each of the 12 networks: five 2G networks, five 3G networks, one CDMA Network and one LTE network covering 6 unique TSPs

Overview

Voice Summary

Data Summary

Overview

Overview:

Telecom Regulatory Authority of India has been entrusted with the task of laying down the standards of quality of service to be provided by the service providers and ensuring its enforcement; and also TRAI is responsible for conducting the periodical audit of such services provided by the service providers so as to protect the interest of the consumers of telecommunications service

TRAI is regularly monitoring the performance of Telecom Service Providers (TSP) against the benchmarks for the various Quality of Service (QoS) parameters laid down by the Authority. TSPs submit Performance Monitoring Reports to TRAI every quarter. TRAI also undertakes audit and assessment of Quality of Service through independent agencies to verify the Quality of Service claimed. The Audit agencies conduct sample 'Drive tests' across various cities in the country as part of audit and assessment of the TSPs' performance.

In view of complaints on call drops and other network quality issues, on behalf of TRAI, an Independent Drive Test (IDT) was conducted by PhiMetrics Technologies Pvt. Ltd. From **19th March to 23rd March 2018** covering various locations in Gwalior City & surrounding region. The performance of **Airtel, BSNL, Idea, Tata, Vodafone and Jio** were monitored across various technologies (2G, 3G, CDMA and 4G). The drive test route was defined on the basis of several factors that include - areas from where call drop complaints are commonly received; areas of heavy usage; residential areas away from arterial roads; office areas; areas where previous Drive tests showed network issues; etc.

The test results obtained from these drive tests were utilized to assess the network quality for Voice and Data services in terms of **Voice: Coverage, Quality, Handover Success Rate, Call Setup Success Rate, Drop Call Rate and Block Call Rate.**

Date: Download and Upload Throughputs, Web Browsing Delay, Video Streaming Delay and Latency

Drive Test Details For Gwalior:

Independent Drive test was conducted for a period of 5 days from 19th March to 23rd March 2018 in Gwalior city & surrounding areas from 9:00 AM to 9:00 PM. Calls were made for 90 sec duration with wait time of 10 sec between calls in all technologies.

Voice Tests: The drive test covered a drive route of approximately 640 KMs over a period of 4 days from 19th March to 22nd March 2018. Approximately 720 calls were made for each of the 12 networks: five 2G (Lock Mode) networks, five 3G (Dual mode) networks, one CDMA Network and one VoLTE network covering 7 unique TSPs.

* In case of multiple call failure in similar geo location in given period of 60sec has been counted as one call failure

Data Tests: Data Tests were performed at 6 static locations for 2 day on 22nd March 2018 & 23rd March 2018; five 2G (Lock mode) networks, five 3G (Dual mode) networks and Three 4G (Free mode) networks covering 6 unique TSPs were tested.

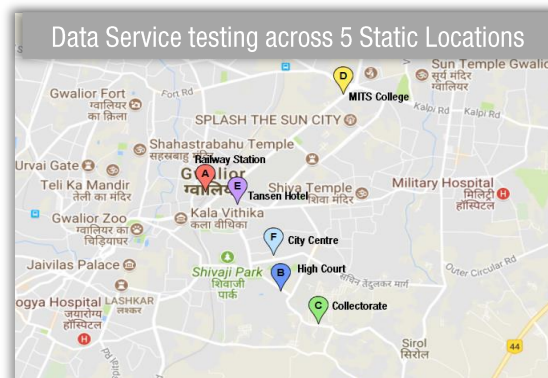
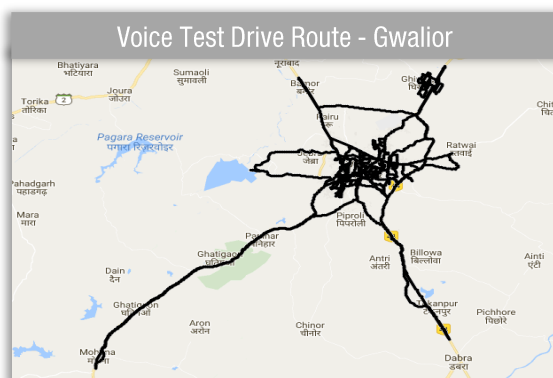
* Outlier values are discarded to calculate the Data KPI's

* For Voice and Data KPI's, 2G measurement is done with UE locked on 2G, 3G measurement is done with UE in Dual mode (2G & 3G) and 4G measurement is done with UE in Free Mode.

* 3G KPI's which are calculated from UE in Dual Mode (2G & 3G) includes samples and events of 2G.

* 4G KPI's which are calculated from the UE in Free Mode included samples and events of 2G & 3G.

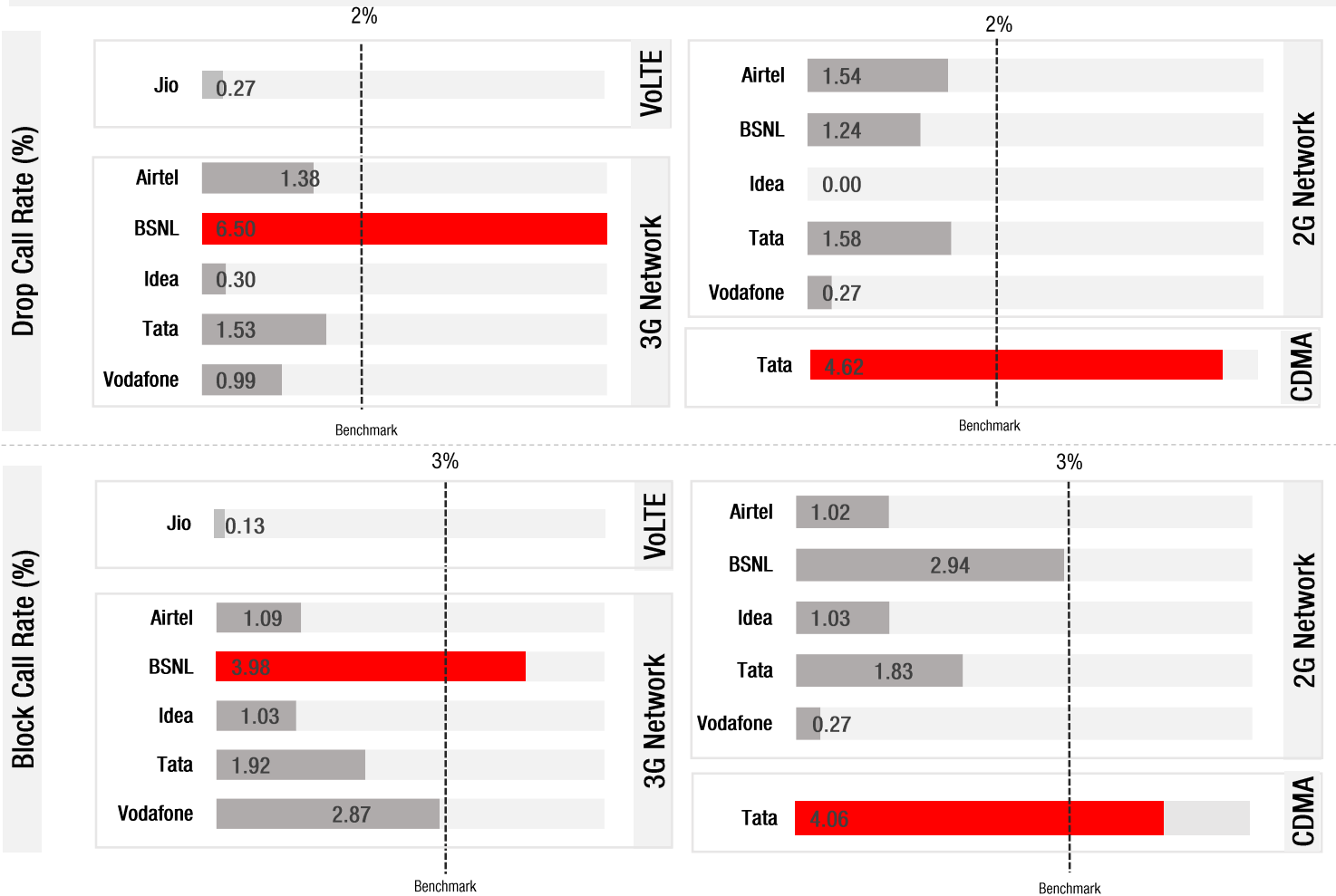
Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Video Streaming	130 sec clip
Latency	32 Bytes on www.google.com



Voice Calls

Key Observations

QoS compliance of the TSPs in Gwalior for Voice across technologies 2G/3G/4G-VolTE is given below:



KPI	2G Networks				
	Airtel	BSNL	Idea	Tata	Vodafone
SDCCH Congestion%	0.13%	0.27%	0.29%	0.28%	0.13%
TCH Congestion %	0.89%	2.67%	0.74%	1.55%	0.14%

KPI	3G Networks*				
	Airtel	BSNL	Idea	Tata	Vodafone
SDCCH Congestion%	0.27%	0.13%	0.14%	0.00%	0.00%
RRC Congestion%	0.27%	1.99%	0.59%	0.96%	0.41%
SDCCH & RRC Congestion%	0.54%	2.12%	0.73%	0.96%	0.41%
TCH Congestion %	0.27%	0.00%	0.15%	0.41%	0.00%
RAB Congestion %	0.28%	1.86%	0.15%	0.55%	2.46%
TCH & RAB Congestion %	0.55%	1.86%	0.30%	0.96%	2.46%

* Calls may move to 2G network, hence both technologies are covered

a) All TSPs have met the 2% QoS benchmark of Drop Call Rate (DCR%). Except BSNL 3G & Tata CDMA.

b) Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's except BSNL 3G & Tata CDMA.

Not meeting Benchmark

Voice Calls

Key Observations

Coverage

a) Percentage of coverage samples for 2G \geq -85 dBm.

TSPs	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Coverage%	91.99%	75.84%	91.00%	91.33%	84.62%	46.79%

b) Percentage of coverage samples for 2G \geq -85 dBm, 3G \geq -90 dBm & LTE \geq -110 dBm.

TSPs	3G					VoLTE
	Airtel	BSNL	Idea	Tata	Vodafone	Jio
Coverage %	83.70%	67.28%	91.24%	82.45%	90.44%	97.49%

c) Percentage of time spent on 3G network:

TSPs	3G				
	Airtel	BSNL	Idea	Tata	Vodafone
Time Spent on 3G%	46.64%	71.31%	64.12%	57.80%	71.85%

d) Percentage of RLT \geq 48:

TSPs	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
%RLT \geq 48	0.00%	0.00%	0.00%	0.00%	0.00%

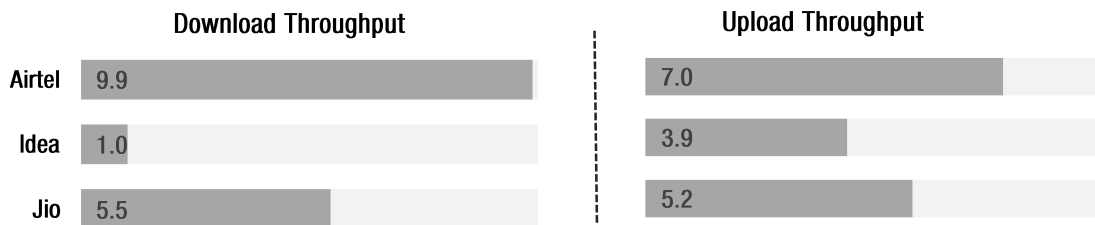
Data Services

Key Observations

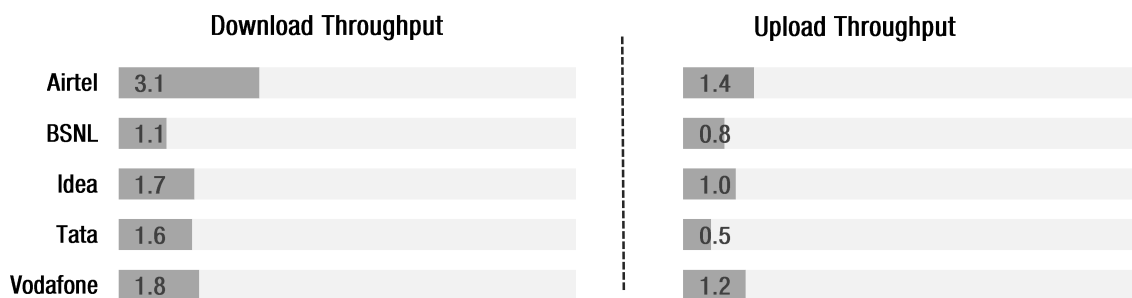
Data was tested at 6 locations viz City Centre, Collectorate, High Court, MITS College, Railway Station & Tansen Hotel. Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

Data Download and Upload Performance (Mbps)

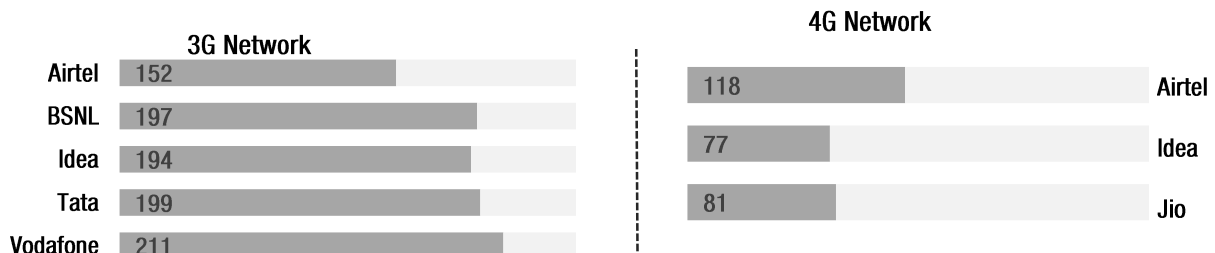
4G Network:



3G Network:



Latency (msec)

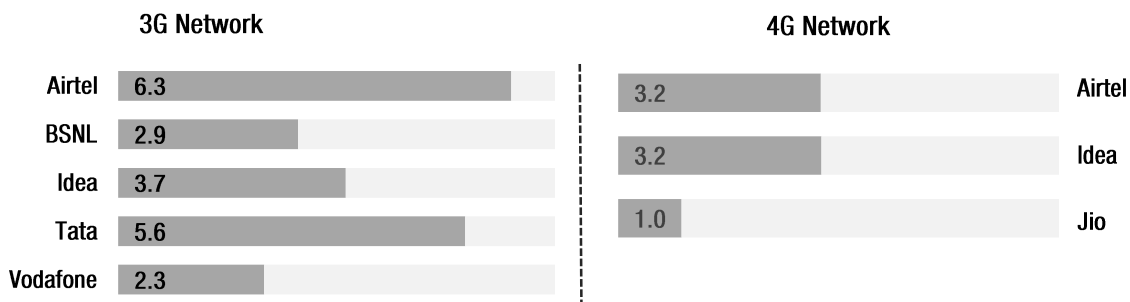


Data Services

Key Observations

Video Streaming Performance (130 sec YouTube video sample sizes)

Streaming (sec)

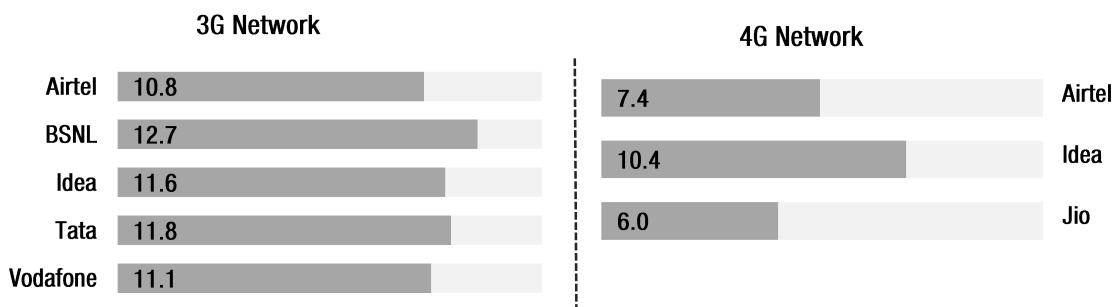


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

- Initial Start time
- Interruption time while playing the video.

Video Streaming	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Avg. Initial Start Time (sec)	4.7	2.9	3.2	3.3	2.1	2.2	2.6	1.0
Avg. Interruption Time (sec)	1.6	-	0.5	2.3	0.2	1.0	0.6	-

Web Page Download Time (sec)



Web browsing experience is the average time taken to fully load the websites tested.

Summary

City Level Summary

Voice Call	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata *
Call Attempt	786	748	682	710	746	542
Blocked Call Rate (%)	1.0%	2.9%	1.0%	1.8%	0.3%	4.1%
CSSR% (Accessibility)	99.0%	97.1%	99.0%	98.2%	99.7%	95.9%
Drop Call Rate (%)	1.5%	1.2%	0.0%	1.6%	0.3%	4.6%
Mobility HOSR (%)	97.5%	93.0%	97.2%	98.6%	98.4%	100.0%
Rx Quality (%)	96.8%	97.6%	97.8%	97.0%	99.0%	89.9%

Voice Call	3G					VoLTE
	Airtel	BSNL	Idea	Tata	Vodafone	Jio
Call Attempt	734	753	682	731	731	751
Blocked Call Rate (%)	1.1%	4.0%	1.0%	1.9%	2.9%	0.1%
CSSR% (Accessibility)	98.9%	96.0%	99.0%	98.1%	97.1%	99.9%
Drop Call Rate (%)	1.4%	6.5%	0.3%	1.5%	1.0%	0.3%
Mobility HOSR (%)	99.6%	98.0%	99.5%	98.1%	99.7%	99.8%
Rx Quality (%)	95.0%	91.8%	93.3%	74.6%	93.5%	86.4%

Summary

City Level Summary(contd.)

Data Services	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	89.0	75.1	107.7	81.3	95.9	96.7
Upload Throughput (kbps)	88.6	102.8	114.6	68.6	91.3	117.7
Web Browsing Delay (sec)	27.2	22.6	24.9	24.9	25.9	135.0
Latency (msec)	640	626	229	729	274	424

Data Services	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	3.1	1.1	1.7	1.6	1.8	9.9	1.0	5.5
Upload Throughput (Mbps)	1.4	0.8	1.0	0.5	1.2	7.0	3.9	5.2
Web Browsing Delay (sec)	10.8	12.7	11.6	11.8	11.1	7.4	10.4	6.0
Video Streaming Delay (sec)	6.3	2.9	3.7	5.6	2.3	3.2	3.2	1.0
Latency (msec)	152	197	194	199	211	118	77	81

Summary

City Level Summary(contd.)

City Centre	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	69.14	112.49	51.11	37.33	138.91	100.5
Upload Throughput (kbps)	69.07	86.94	101.73	37.74	98.84	119.1
Web Browsing Delay (sec)	30.51	18.09	33.75	19.66	32.43	149.0
Latency (msec)	628	617	243	729	255	441

City Centre	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	1.75	1.30	1.74	0.67	1.87	10.17	1.30	4.15
Upload Throughput (Mbps)	1.31	0.89	1.76	0.97	0.94	6.81	8.37	5.54
Web Browsing Delay (sec)	9.95	12.84	10.83	11.56	10.64	6.27	9.71	6.63
Video Streaming Delay (sec)	2.23	4.67	4.53	13.91	1.59	1.25	1.64	1.53
Latency (msec)	167	217	106	193	111	170	66	78

Collectorate	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	126.56	95.65	125.52	143.70	108.09	91.4
Upload Throughput (kbps)	104.86	122.93	104.41	83.99	125.45	Fail
Web Browsing Delay (sec)	30.66	20.63	26.09	21.65	26.33	1.2
Latency (msec)	661	603	216	764	275	437

Collectorate	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	2.93	0.83	2.15	2.29	3.62	15.37	0.57	5.62
Upload Throughput (Mbps)	0.54	1.37	0.67	0.47	2.66	10.69	1.91	6.98
Web Browsing Delay (sec)	10.89	13.44	12.48	9.27	9.54	6.33	14.05	6.00
Video Streaming Delay (sec)	2.11	1.55	1.76	2.91	1.06	0.74	6.31	0.66
Latency (msec)	95	130	235	160	226	103	85	102

Summary

City Level Summary(contd.)

High Court	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	118.82	61.96	134.64	121.02	106.70	93.5
Upload Throughput (kbps)	145.25	129.67	112.41	117.64	77.68	120.2
Web Browsing Delay (sec)	17.33	33.65	21.21	27.97	28.41	148.4
Latency (msec)	686	572	240	845	251	362

High Court	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	5.34	1.47	1.78	3.95	1.55	2.89	0.62	6.44
Upload Throughput (Mbps)	1.38	0.88	1.66	0.94	1.18	1.32	4.48	3.55
Web Browsing Delay (sec)	8.35	12.87	10.08	6.12	12.40	11.70	9.61	5.40
Video Streaming Delay (sec)	3.52	3.35	2.30	1.20	1.97	5.54	2.66	0.67
Latency (msec)	88	141	118	151	303	86	80	76

MITS College	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	46.09	83.23	120.75	41.53	63.24	90.5
Upload Throughput (kbps)	58.26	100.50	87.95	61.58	107.53	Fail
Web Browsing Delay (sec)	29.60	13.94	23.35	32.16	17.87	1.2
Latency (msec)	528	697	254	586	334	433

MITS College	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	0.28	0.69	1.06	0.09	1.02	7.07	1.28	4.99
Upload Throughput (Mbps)	0.51	0.64	0.29	0.43	0.39	3.17	0.70	3.56
Web Browsing Delay (sec)	15.99	13.11	15.06	10.20	12.74	8.63	9.97	7.08
Video Streaming Delay (sec)	15.18	1.47	5.05	-	2.06	3.50	2.68	1.00
Latency (msec)	119	183	313	258	114	77	78	75

Summary

City Level Summary(contd.)

Railway Station	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	31.54	55.69	66.14	26.54	95.80	100.7
Upload Throughput (kbps)	26.75	138.67	134.72	21.42	79.07	113.8
Web Browsing Delay (sec)	27.00	21.39	17.61	15.40	28.11	148.3
Latency (msec)	705	637	208	603	254	673

Railway Station	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	0.69	1.38	1.79	0.04	0.98	6.93	1.52	4.53
Upload Throughput (Mbps)	1.05	0.58	0.98	0.13	1.29	8.69	4.59	7.04
Web Browsing Delay (sec)	13.07	10.72	10.55	31.20	11.93	6.66	9.71	6.41
Video Streaming Delay (sec)	13.95	1.94	5.89	-	5.57	6.10	2.94	1.43
Latency (msec)	189	219	124	404	224	181	78	81

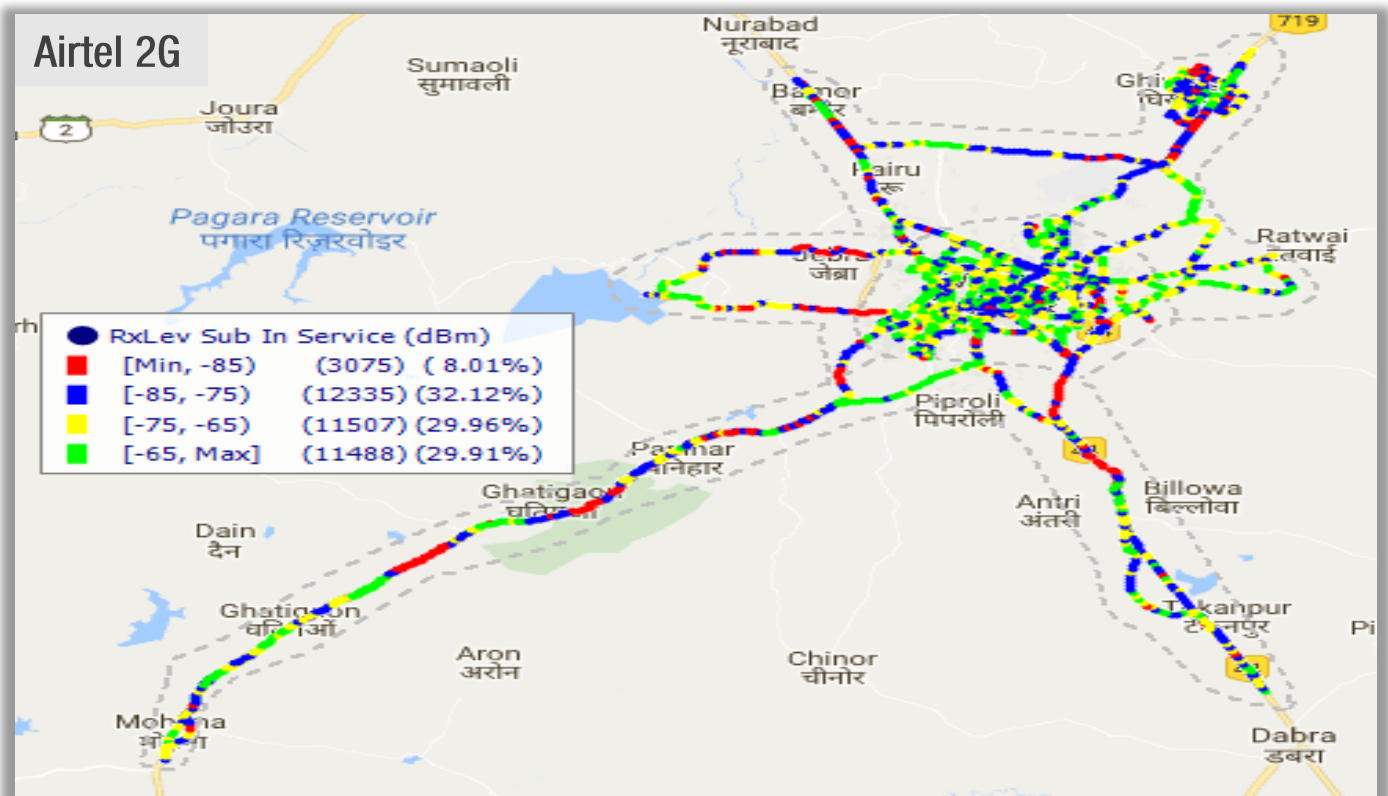
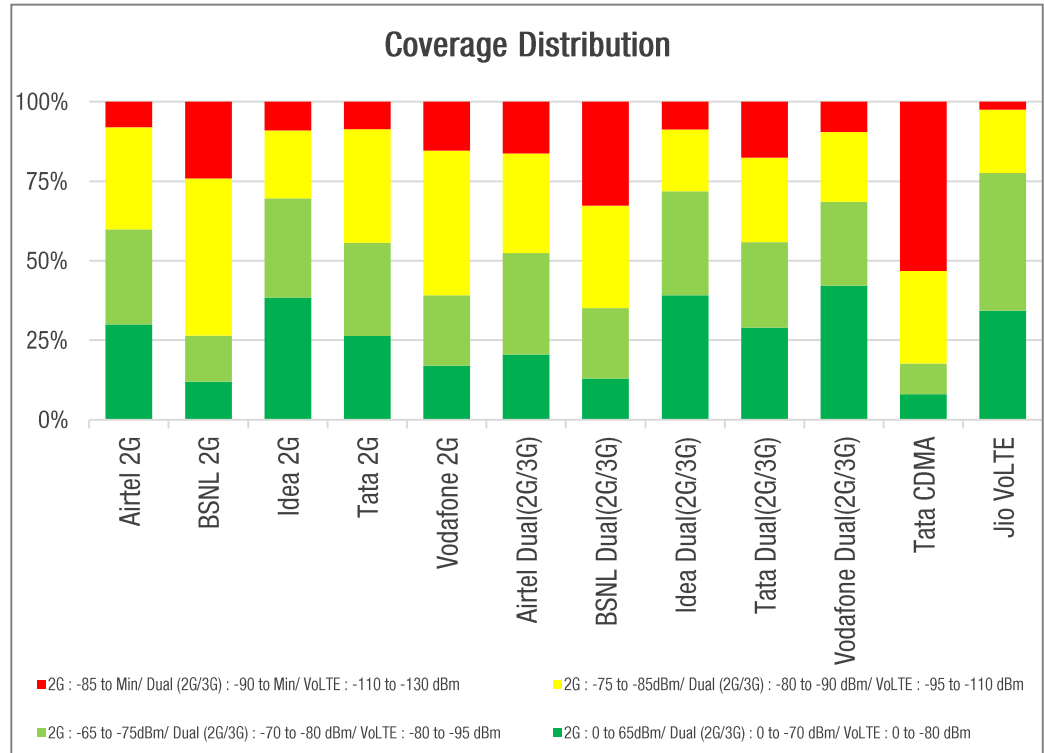
Tansen Hotel	2G					CDMA
	Airtel	BSNL	Idea	Tata	Vodafone	Tata
Download Throughput (Kbps)	141.89	24.91	147.76	103.03	66.05	104.9
Upload Throughput (kbps)	127.11	38.21	146.31	73.65	59.09	Fail
Web Browsing Delay (sec)	27.95	27.71	26.59	27.14	20.79	208.4
Latency (msec)	641	652	214	865	277	390

Tansen Hotel	3G					4G		
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio
Download Throughput (Mbps)	7.58	0.65	1.51	-	1.59	17.11	0.87	7.21
Upload Throughput (Mbps)	3.52	0.49	0.82	0.01	0.86	11.28	3.60	4.64
Web Browsing Delay (sec)	6.77	13.39	10.54	16.55	9.30	5.06	9.20	4.33
Video Streaming Delay (sec)	0.85	5.95	2.38	-	1.81	1.33	3.12	0.75
Latency (msec)	252	305	254	173	260	88	78	72

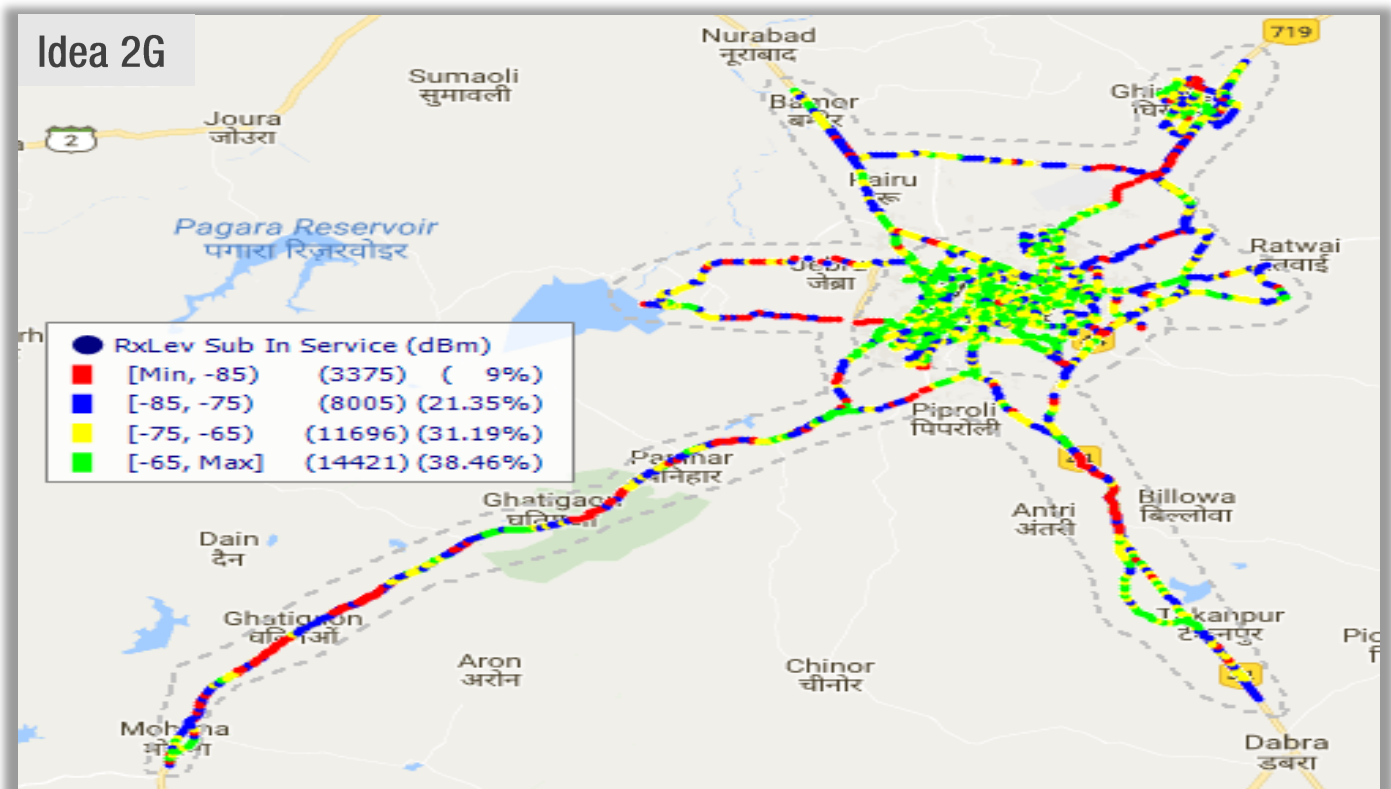
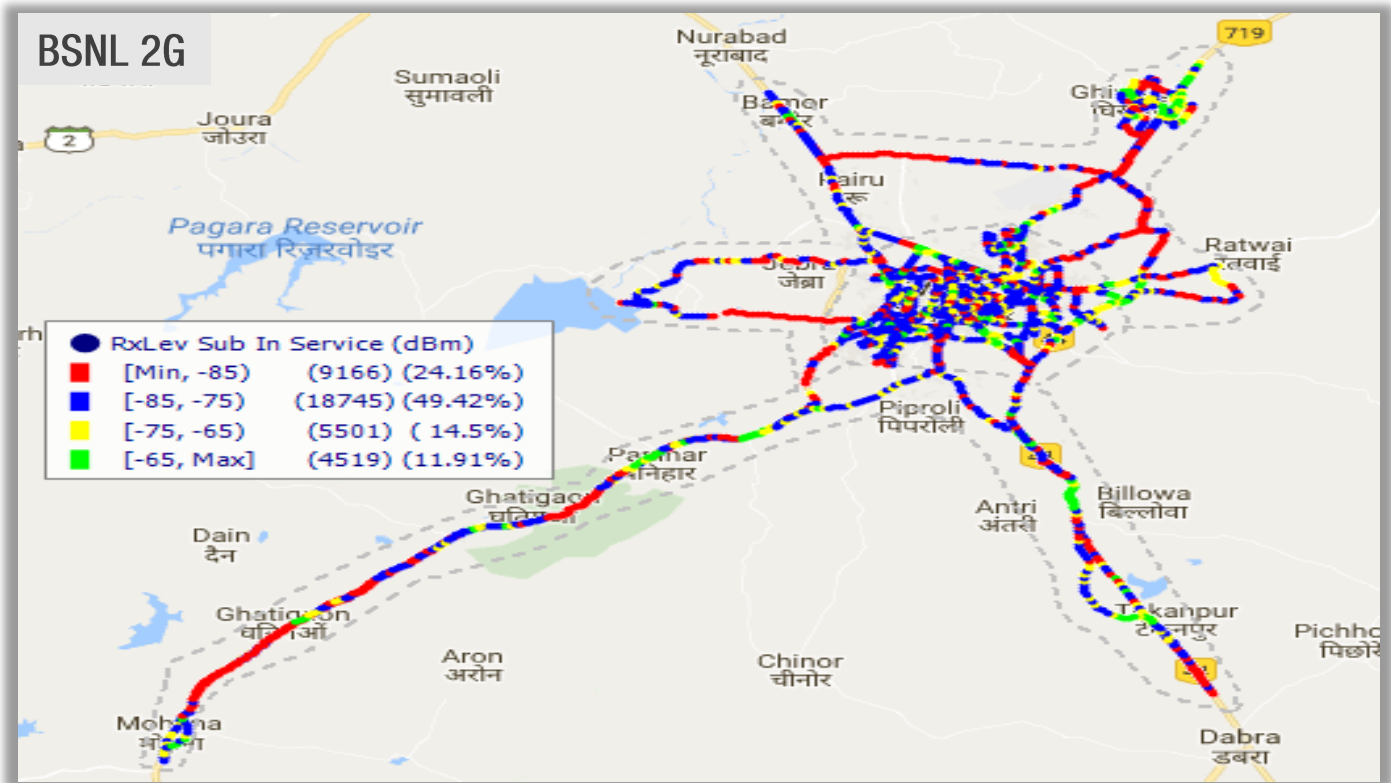
I. Coverage Details

RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call/data session. The Coverage rate of an TSP is calculated on the basis of % of samples in which the Rx level ≥ -85 dBm, RSCP is ≥ -90 dBm & RSRP ≥ -110 dBm. The details are as follows.

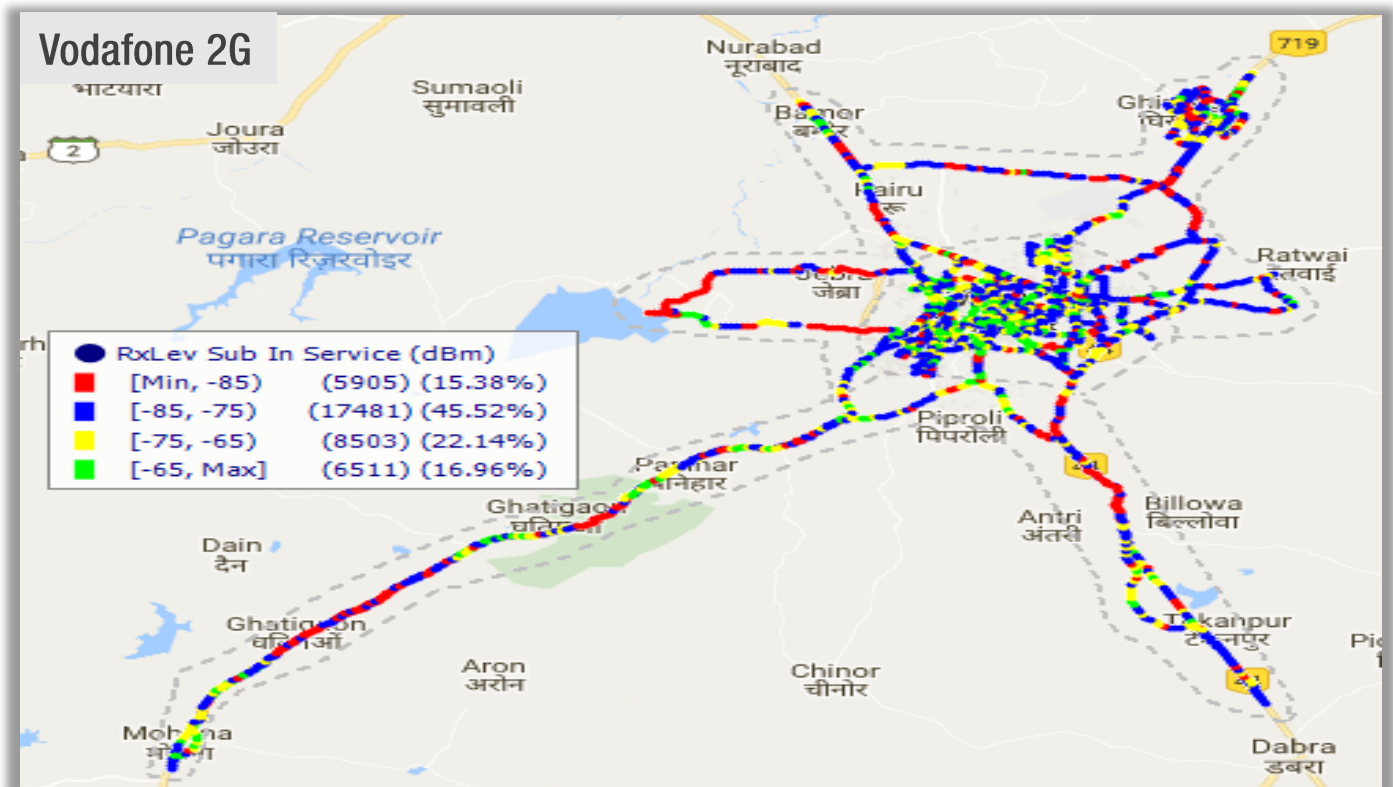
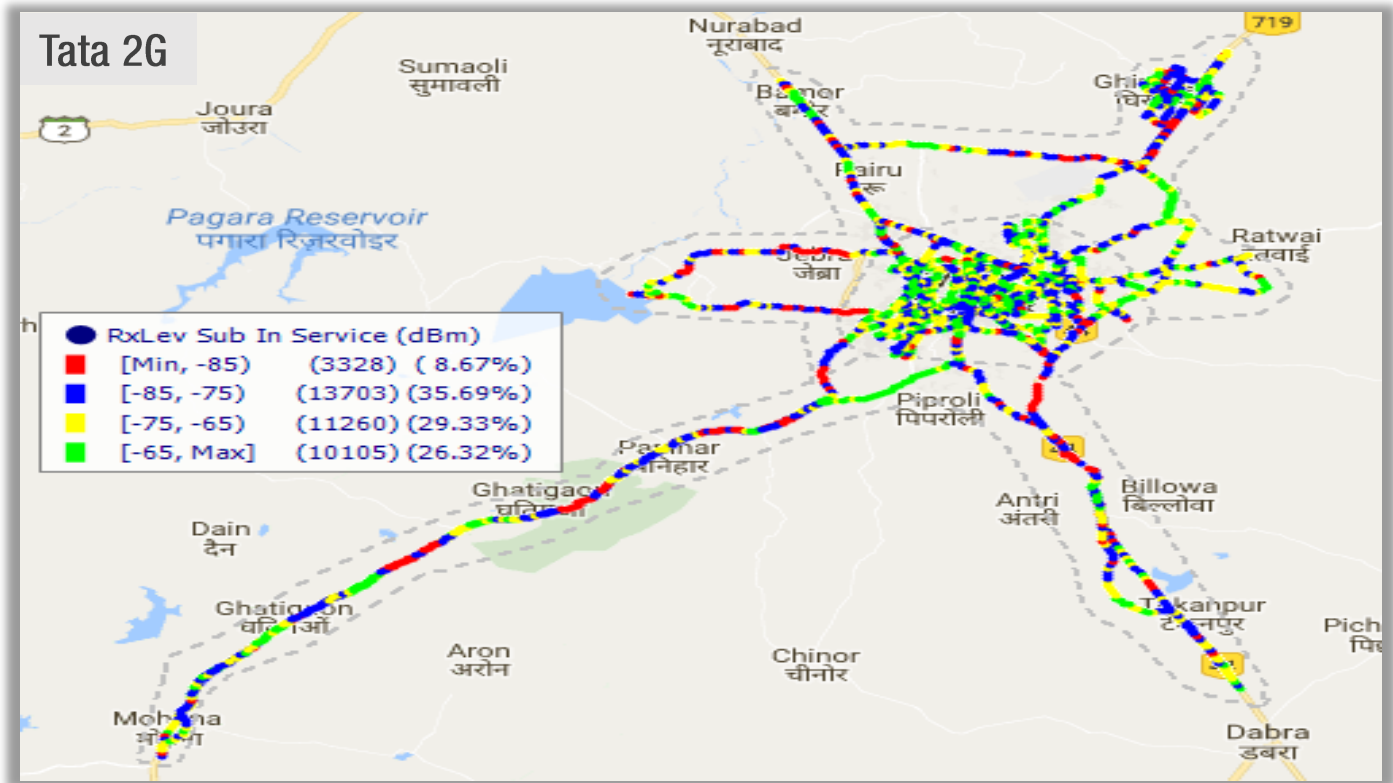
TSP	Coverage Rate
Airtel 2G	91.99%
BSNL 2G	75.84%
Idea 2G	91.00%
Tata 2G	91.33%
Vodafone 2G	84.62%
Airtel Dual(2G/3G)	83.70%
BSNL Dual(2G/3G)	67.28%
Idea Dual(2G/3G)	91.24%
Tata Dual(2G/3G)	82.45%
Vodafone Dual(2G/3G)	90.44%
Tata CDMA	46.79%
Jio VoLTE	97.49%



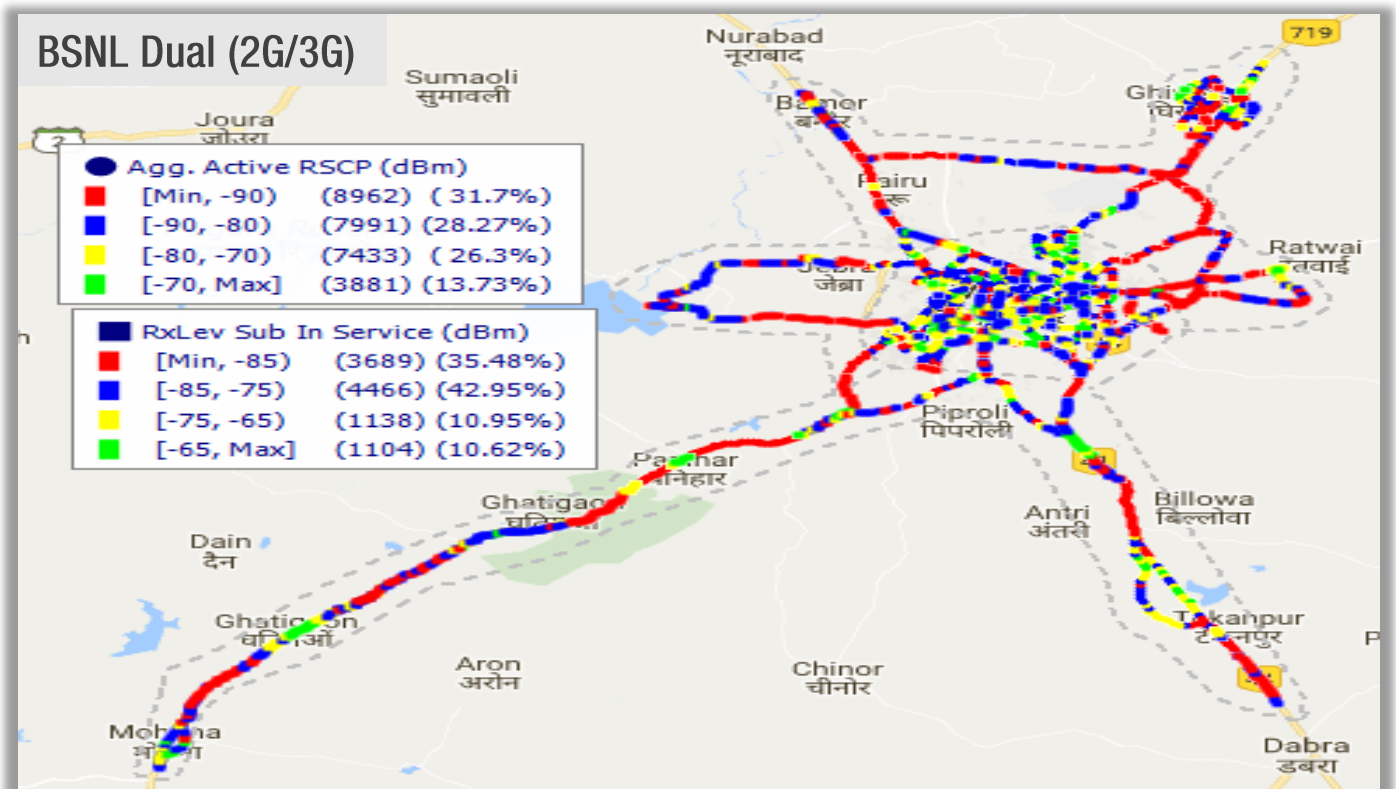
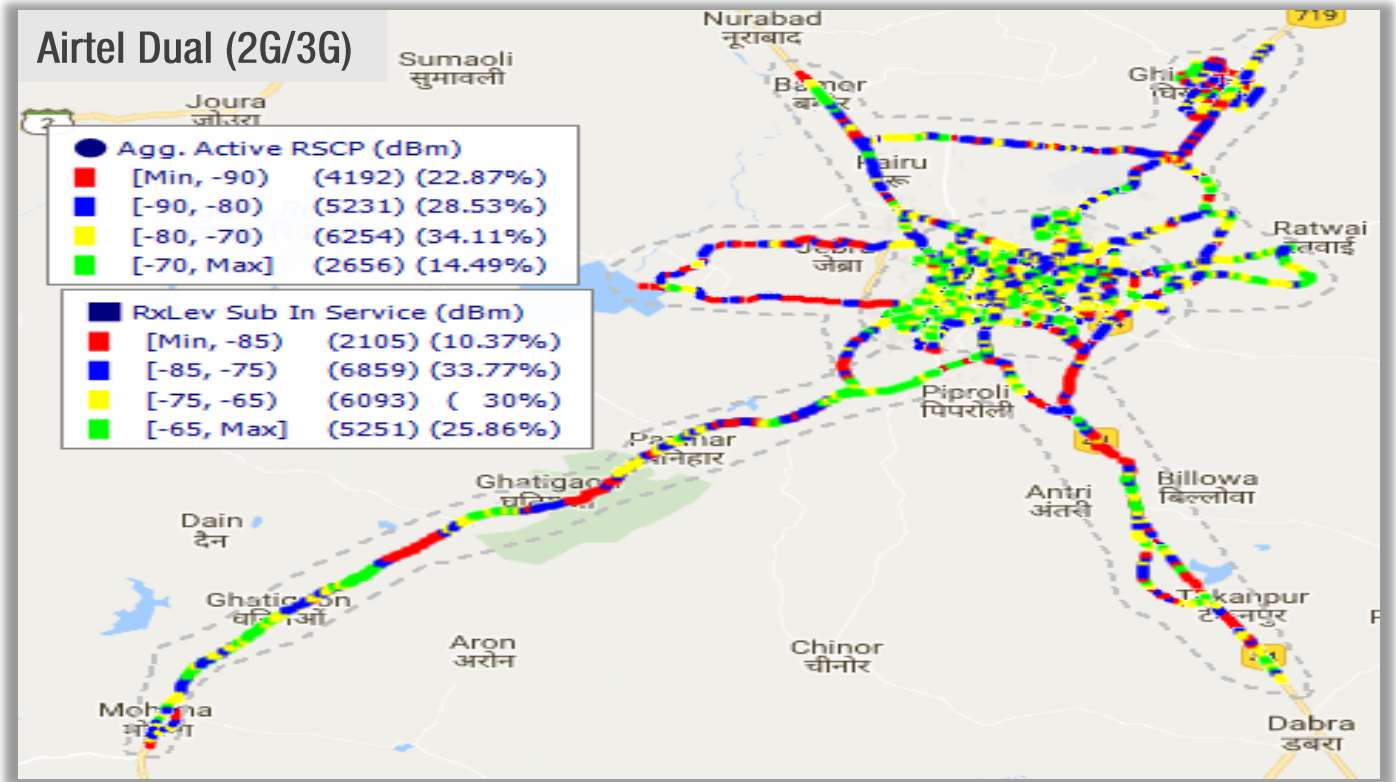
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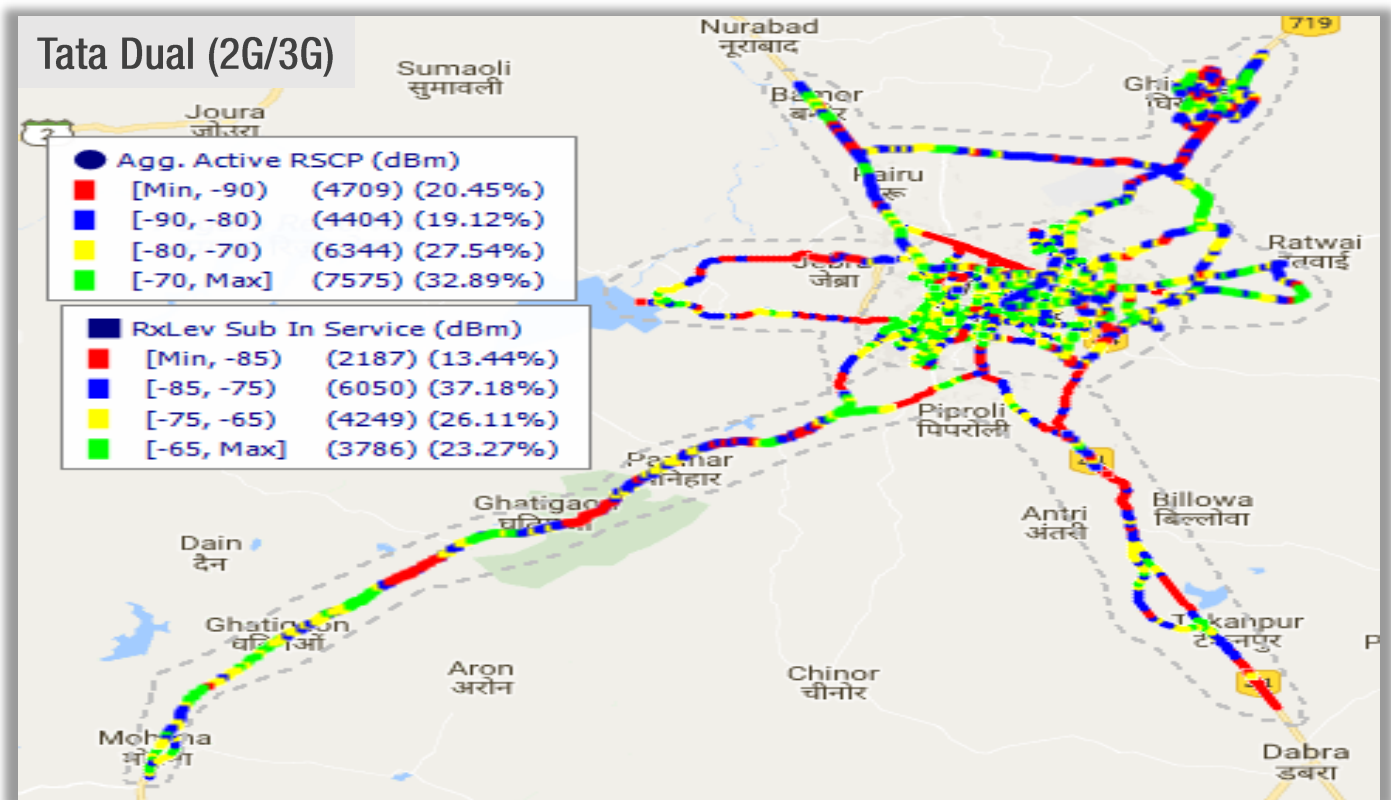
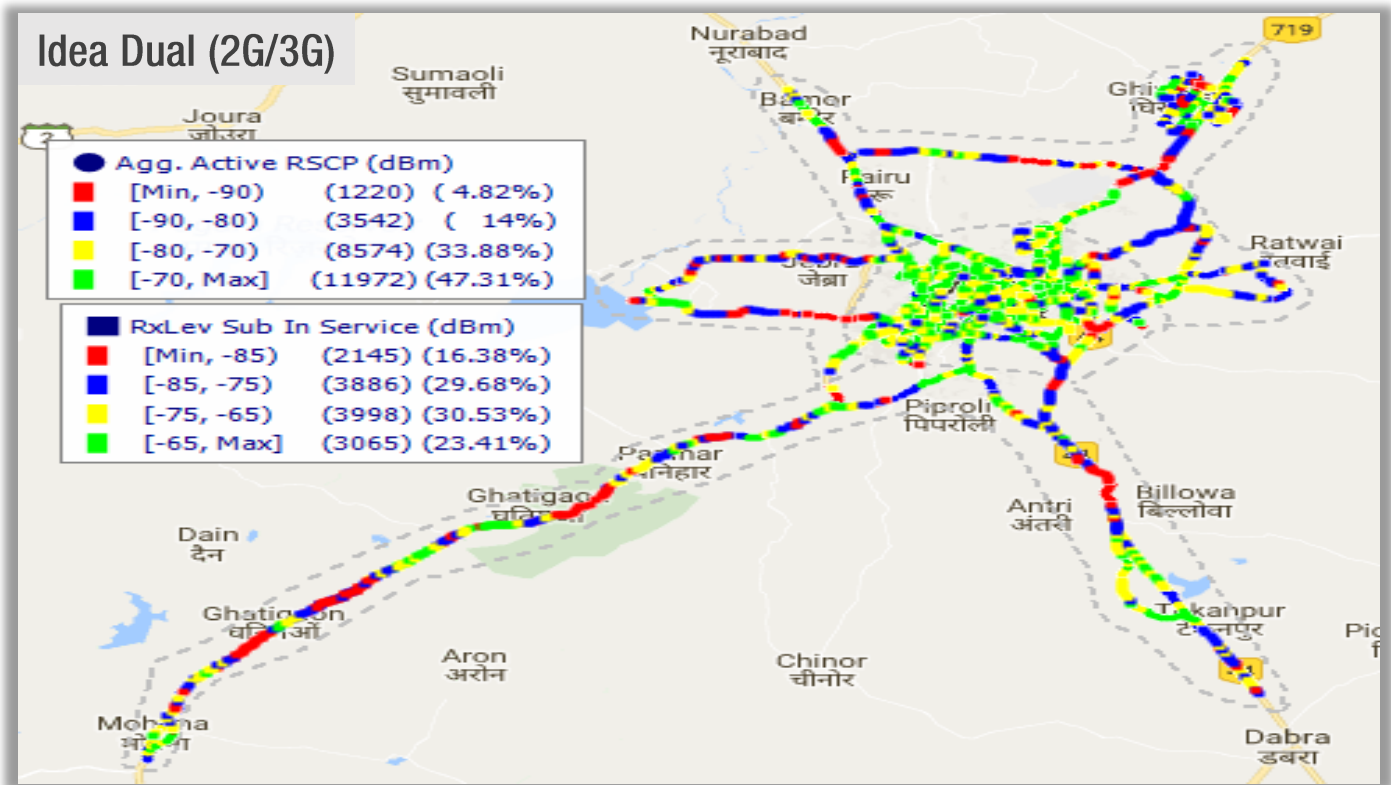
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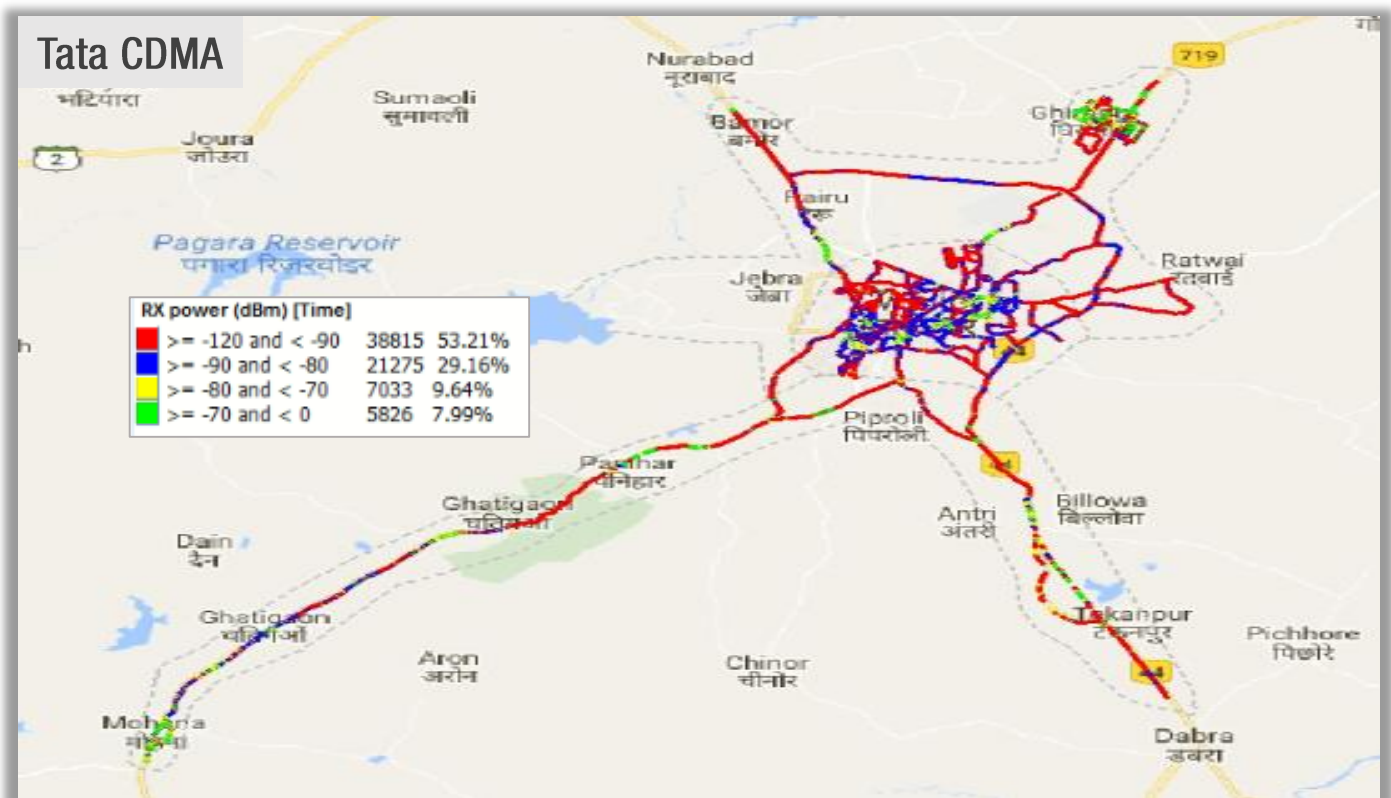
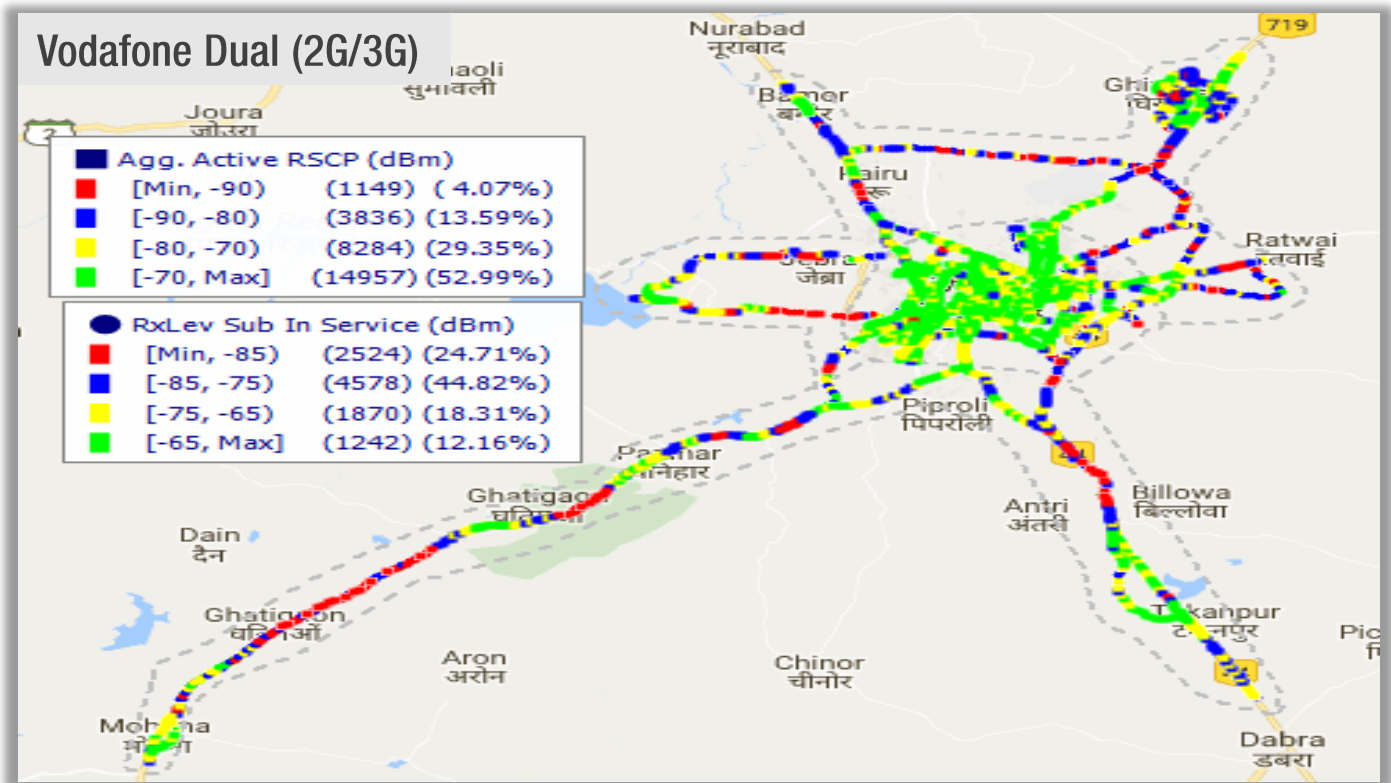
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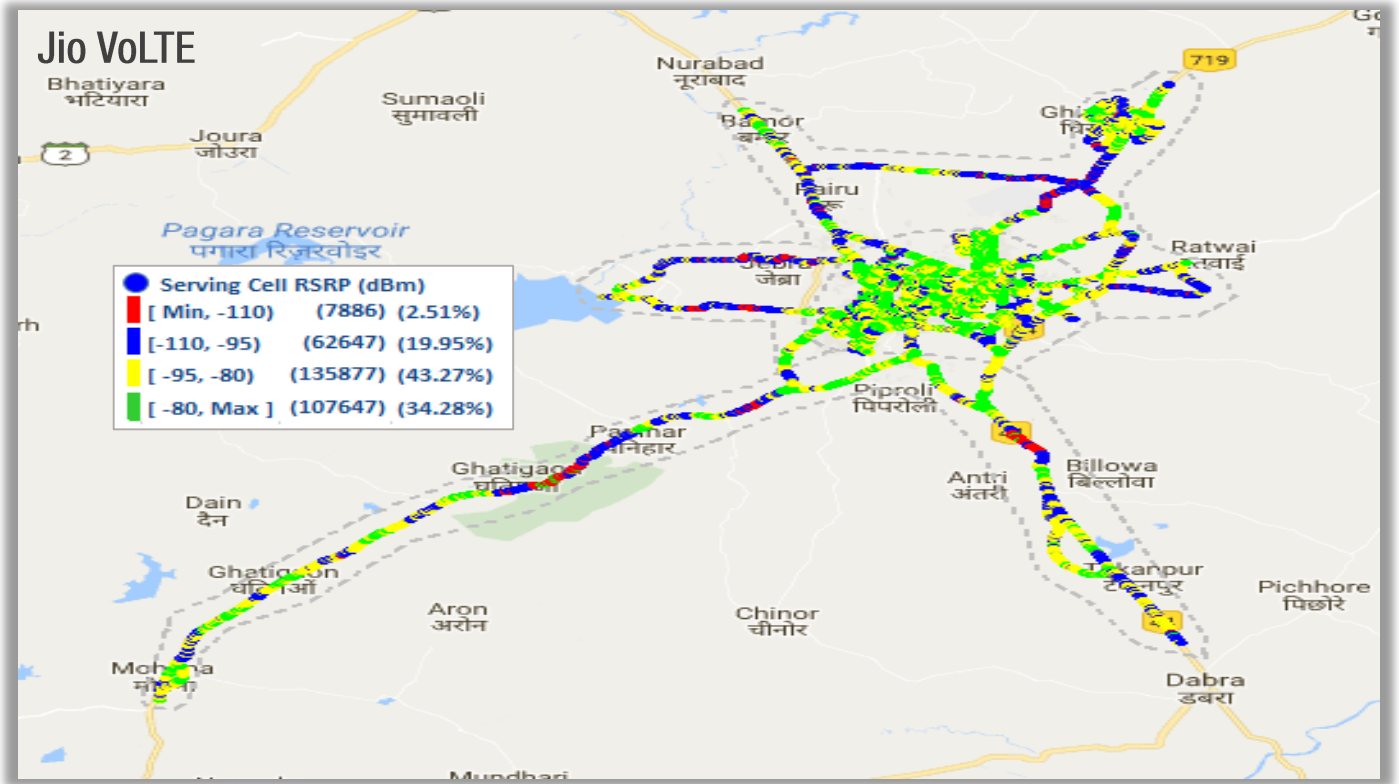
I. Coverage Details (contd.)



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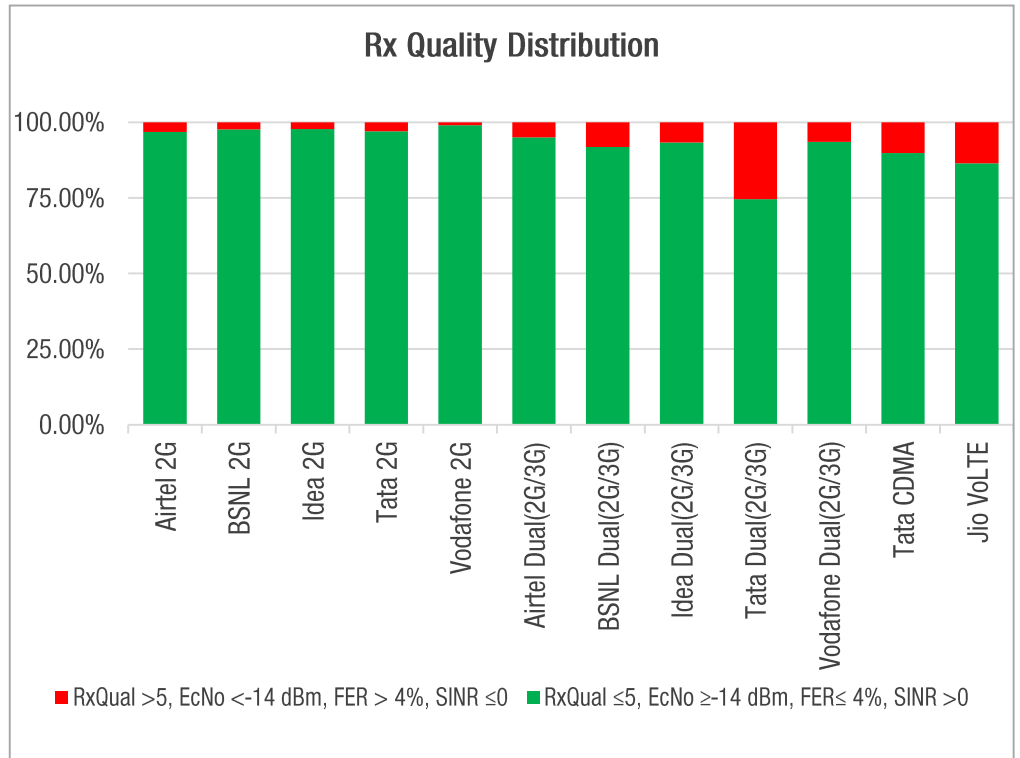
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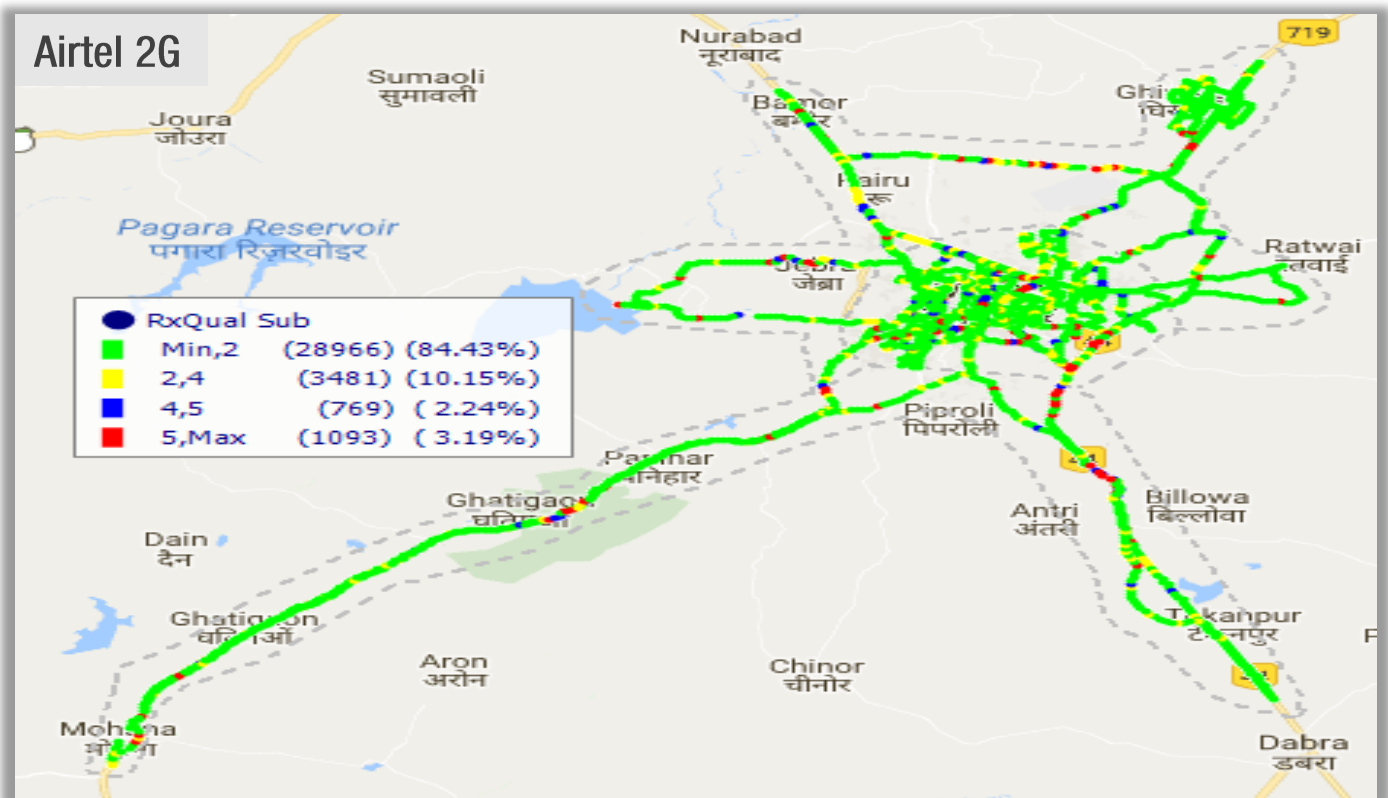
II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual ≤ 5 for GSM TSPs, EcNo ≥ -14 dBm for 3G TSP sand SINR > 0 in case of VoLTE is considered to be good, where as quality beyond this benchmark is considered to be bad. The benchmark should usually be $\geq 95\%$.

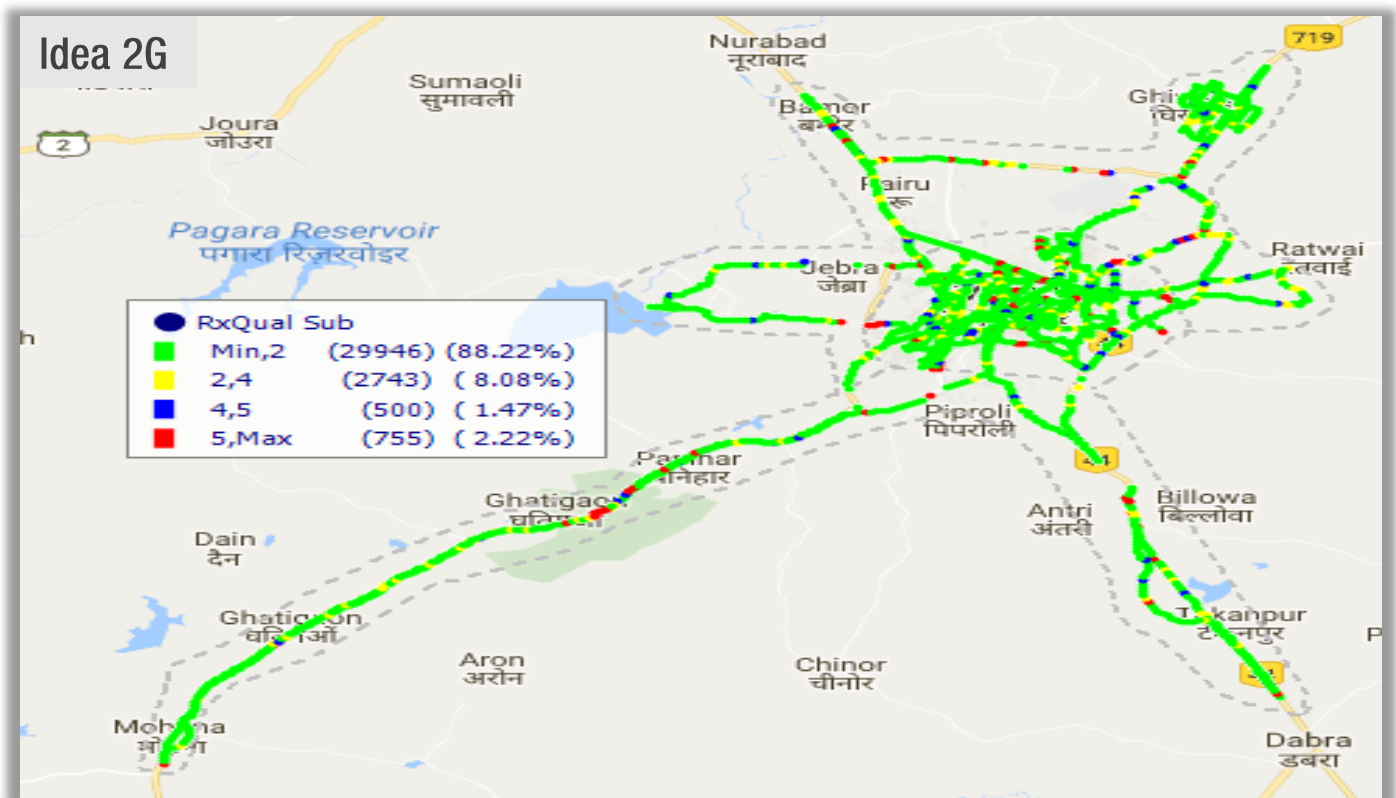
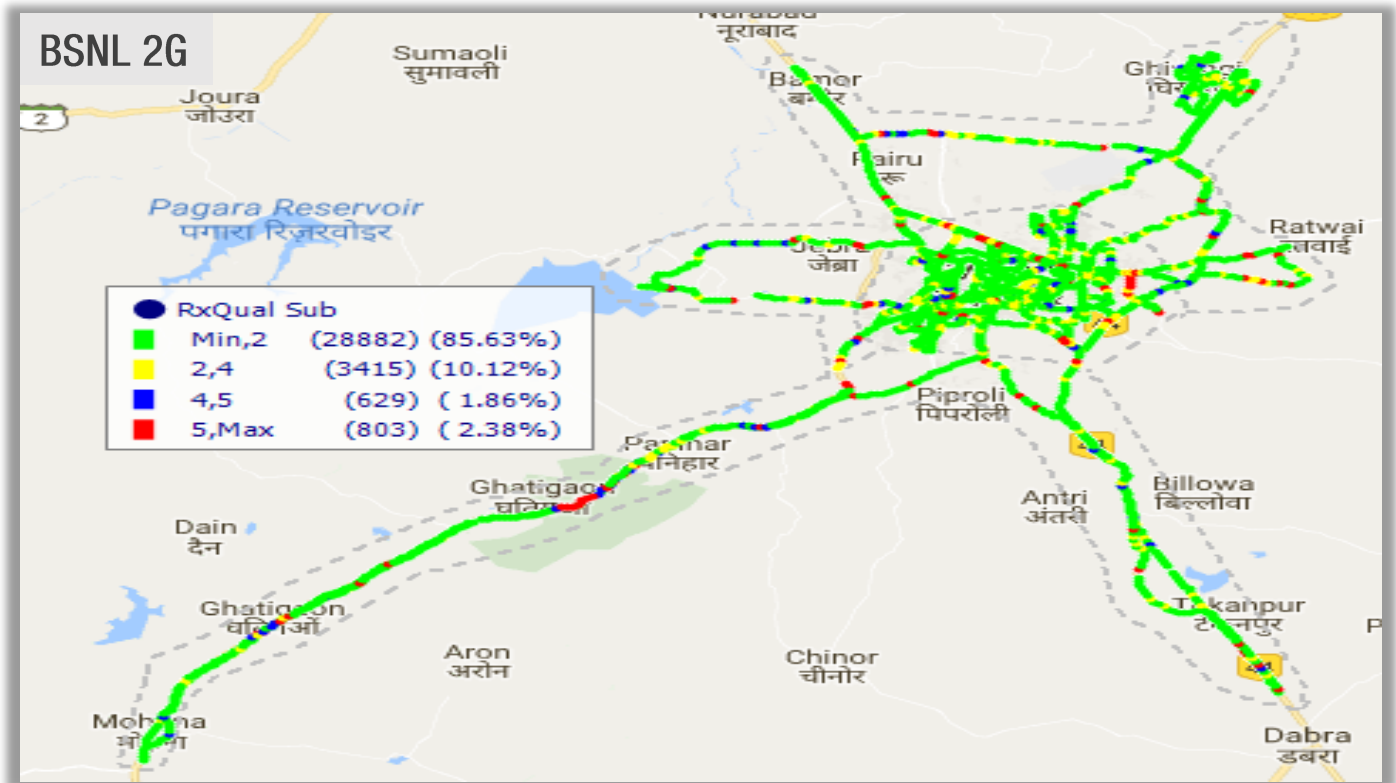
TSP	Rx Quality
Airtel 2G	96.81%
BSNL 2G	97.62%
Idea 2G	97.78%
Tata 2G	97.05%
Vodafone 2G	99.03%
Airtel Dual(2G/3G)	94.98%
BSNL Dual(2G/3G)	91.82%
Idea Dual(2G/3G)	93.30%
Tata Dual(2G/3G)	74.62%
Vodafone Dual(2G/3G)	93.49%
Tata CDMA	89.86%
Jio VoLTE	86.43%



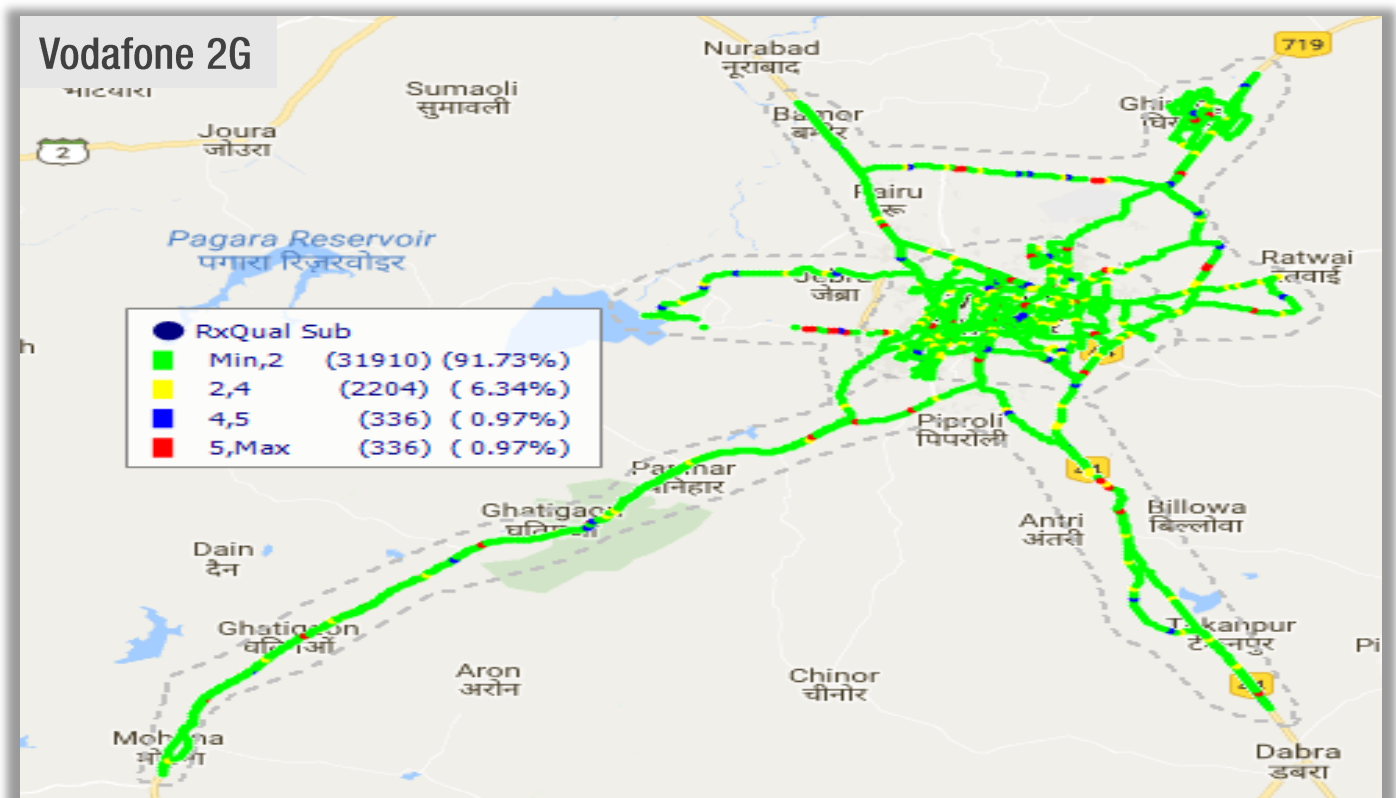
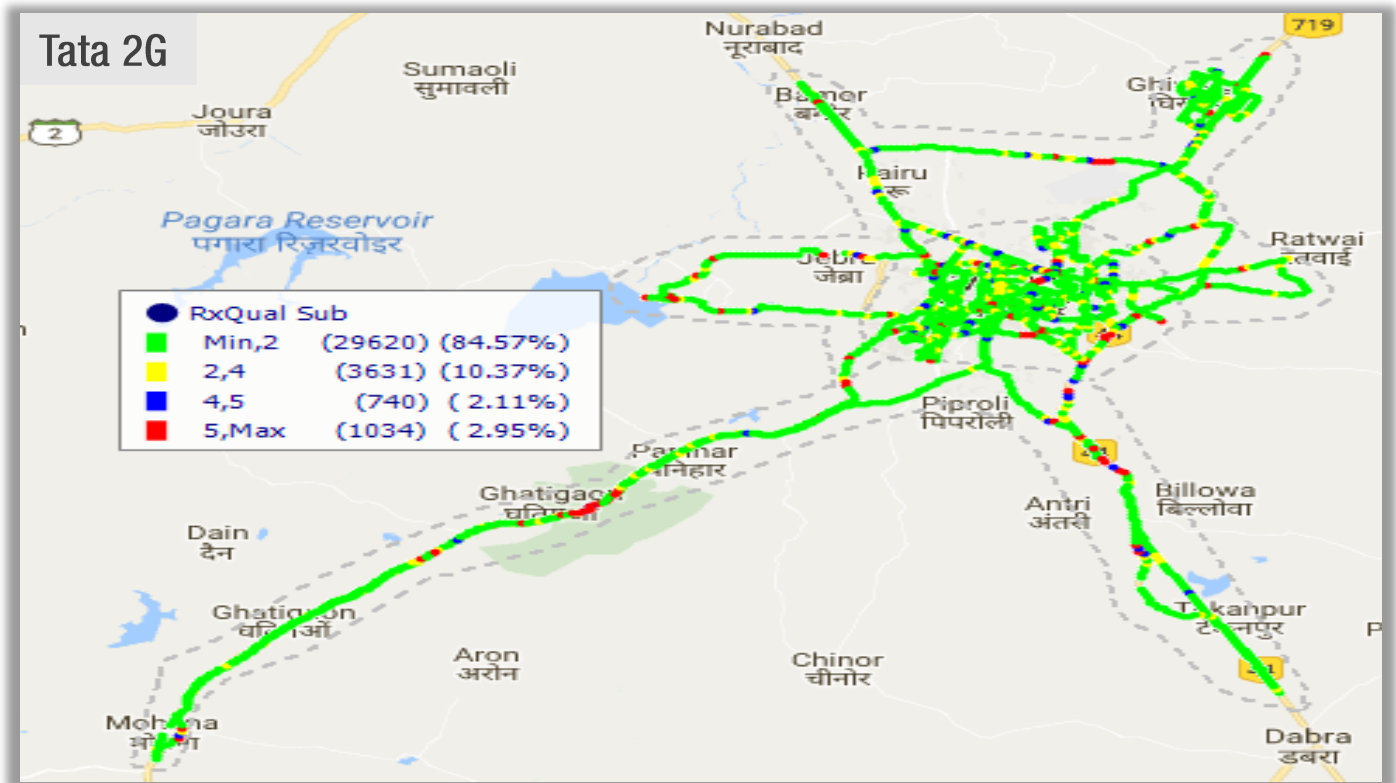
— TSPs not meeting the Benchmark



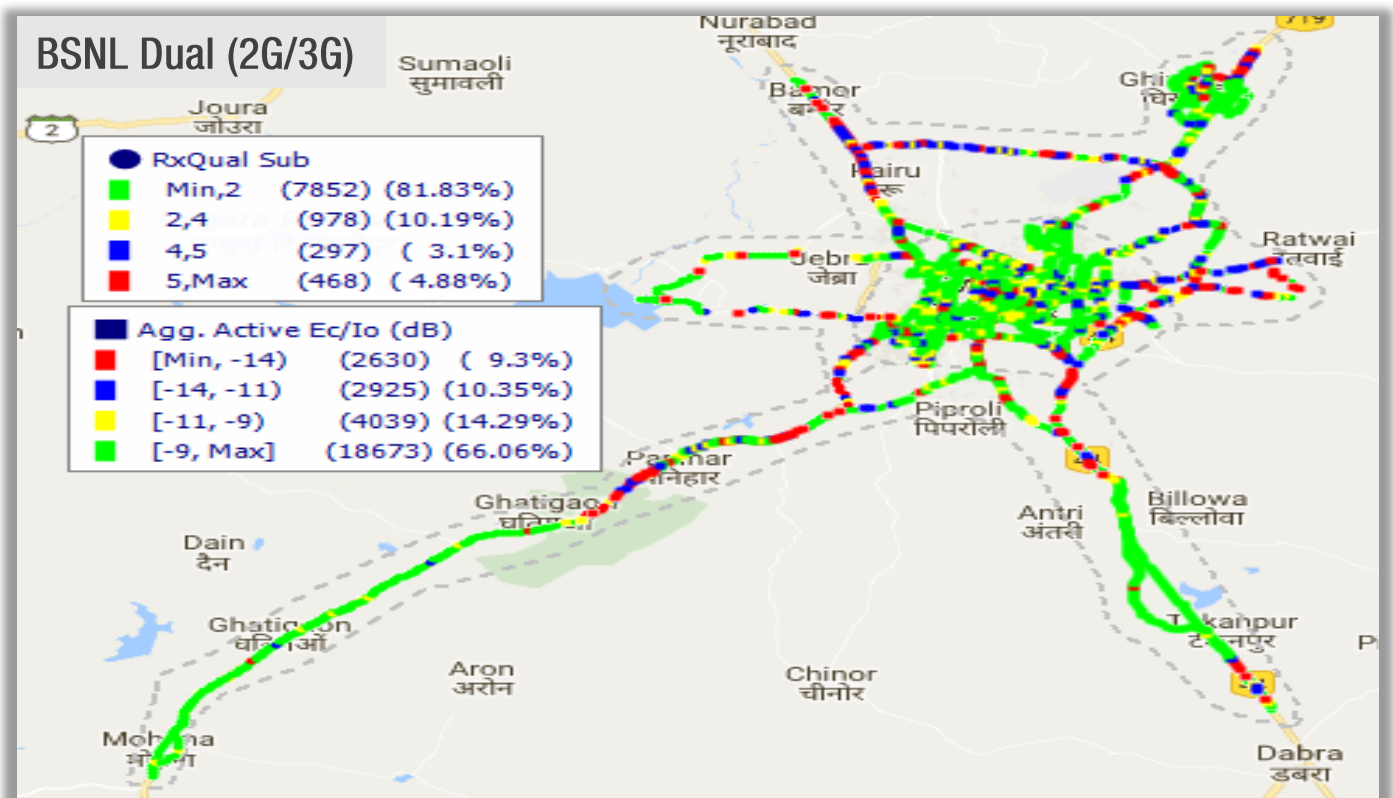
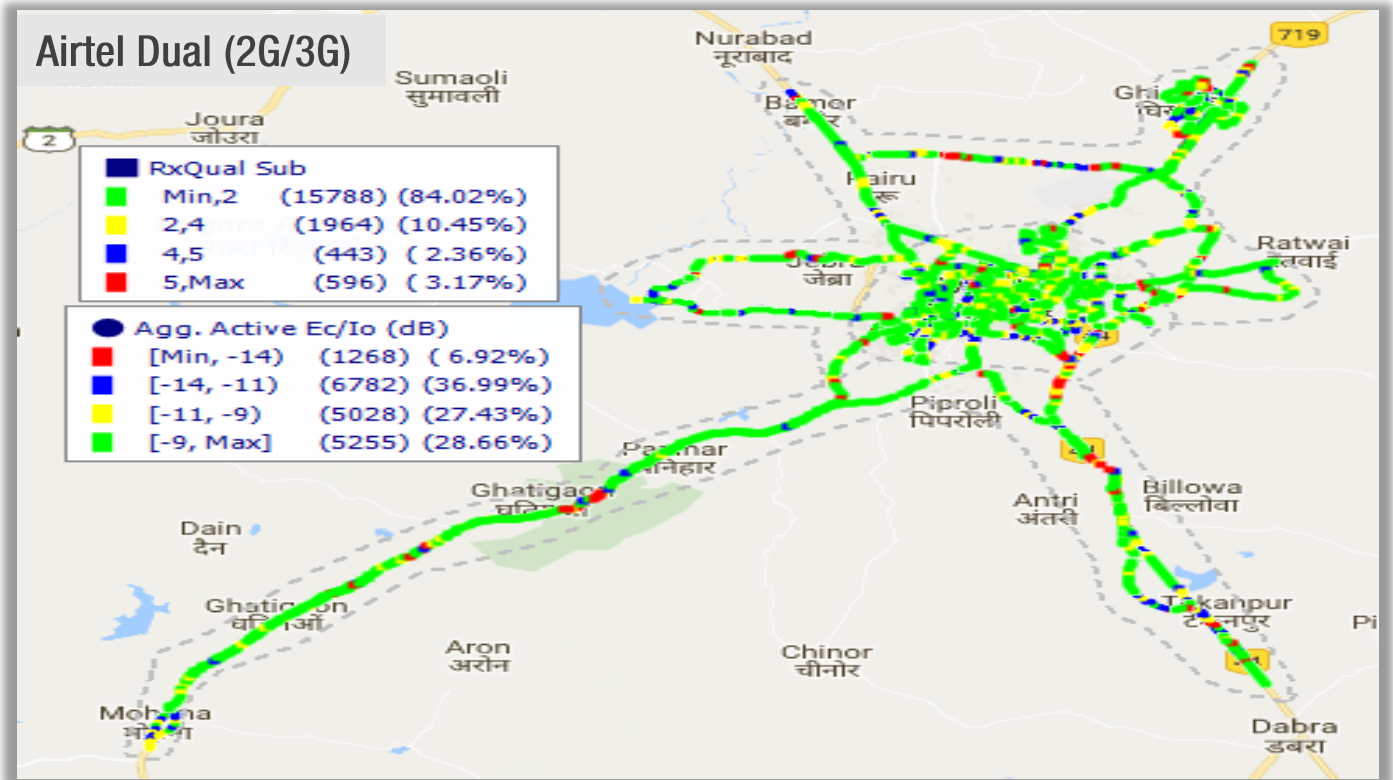
II. Quality Details (contd.)



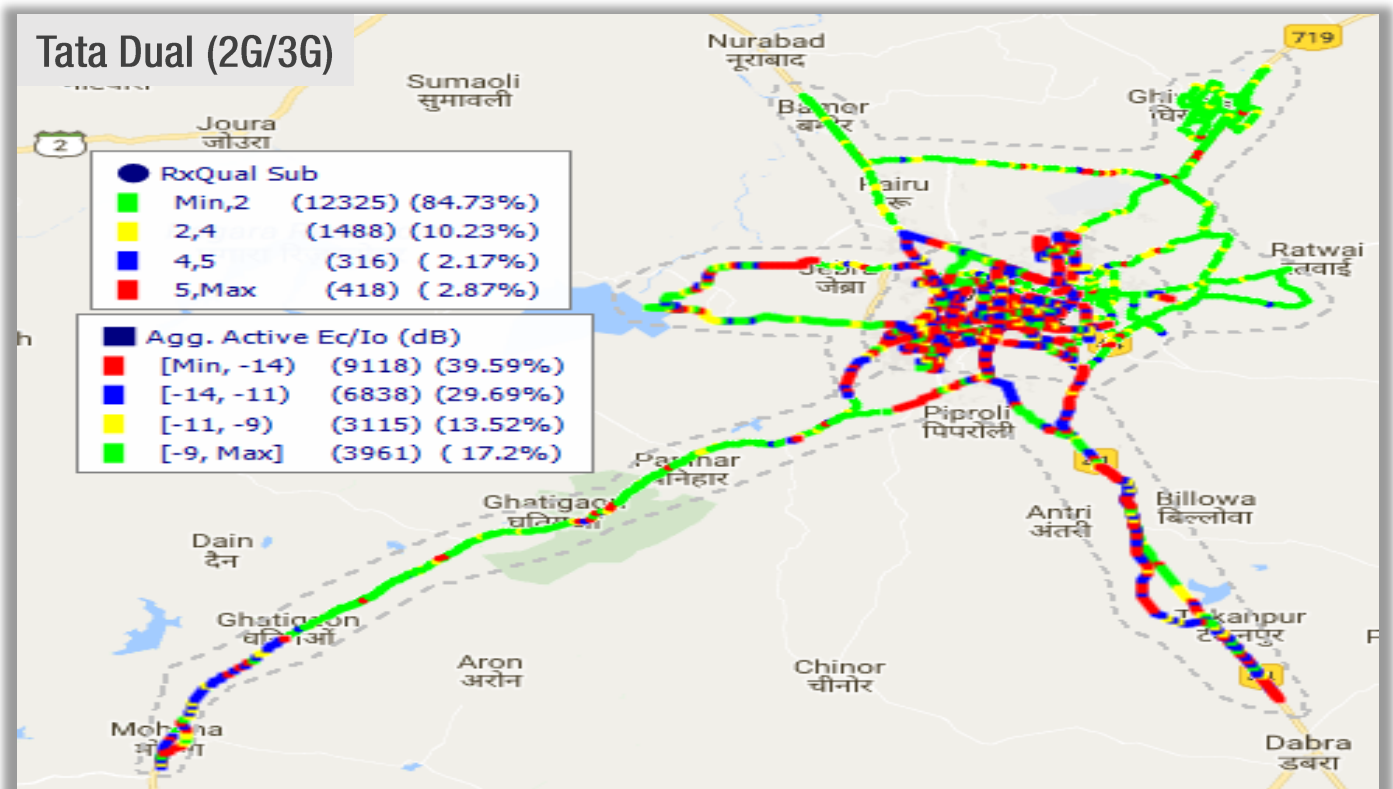
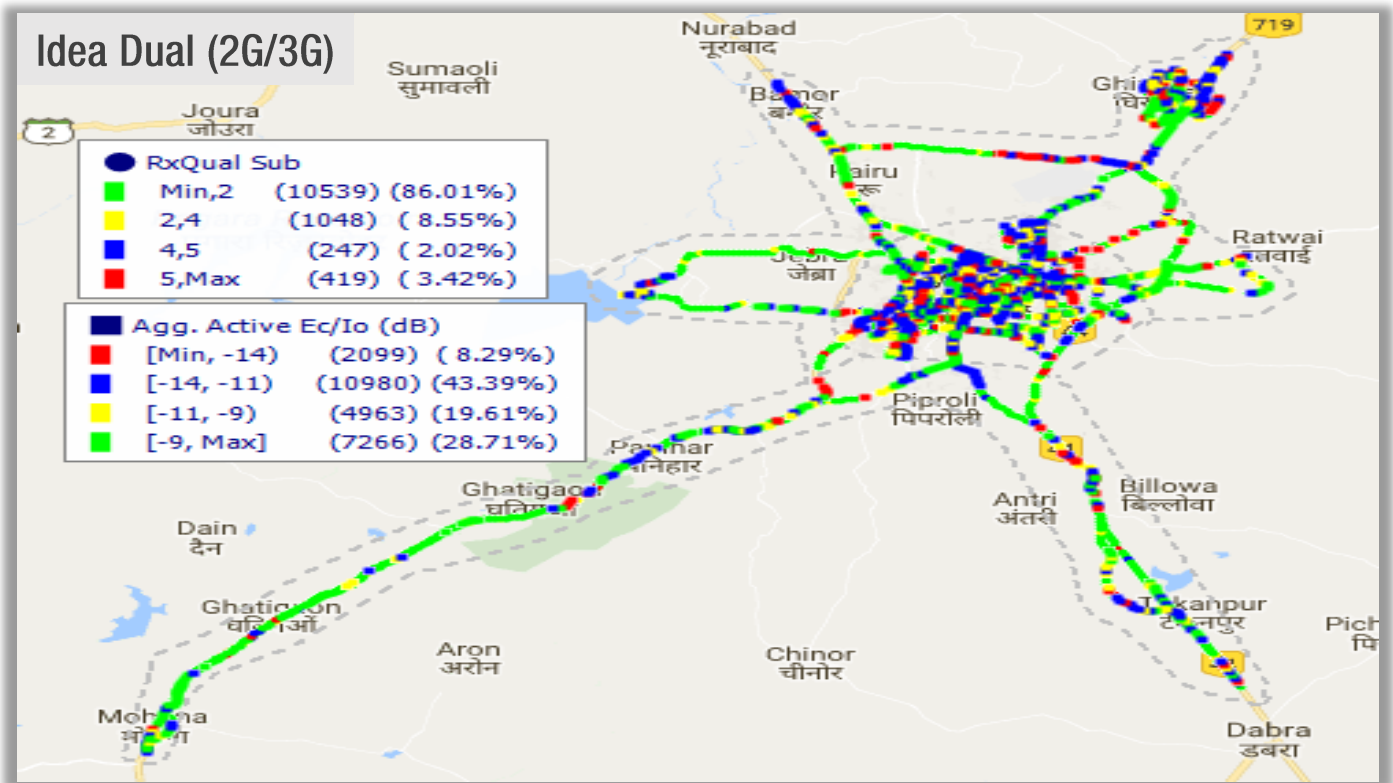
II. Quality Details (contd.)



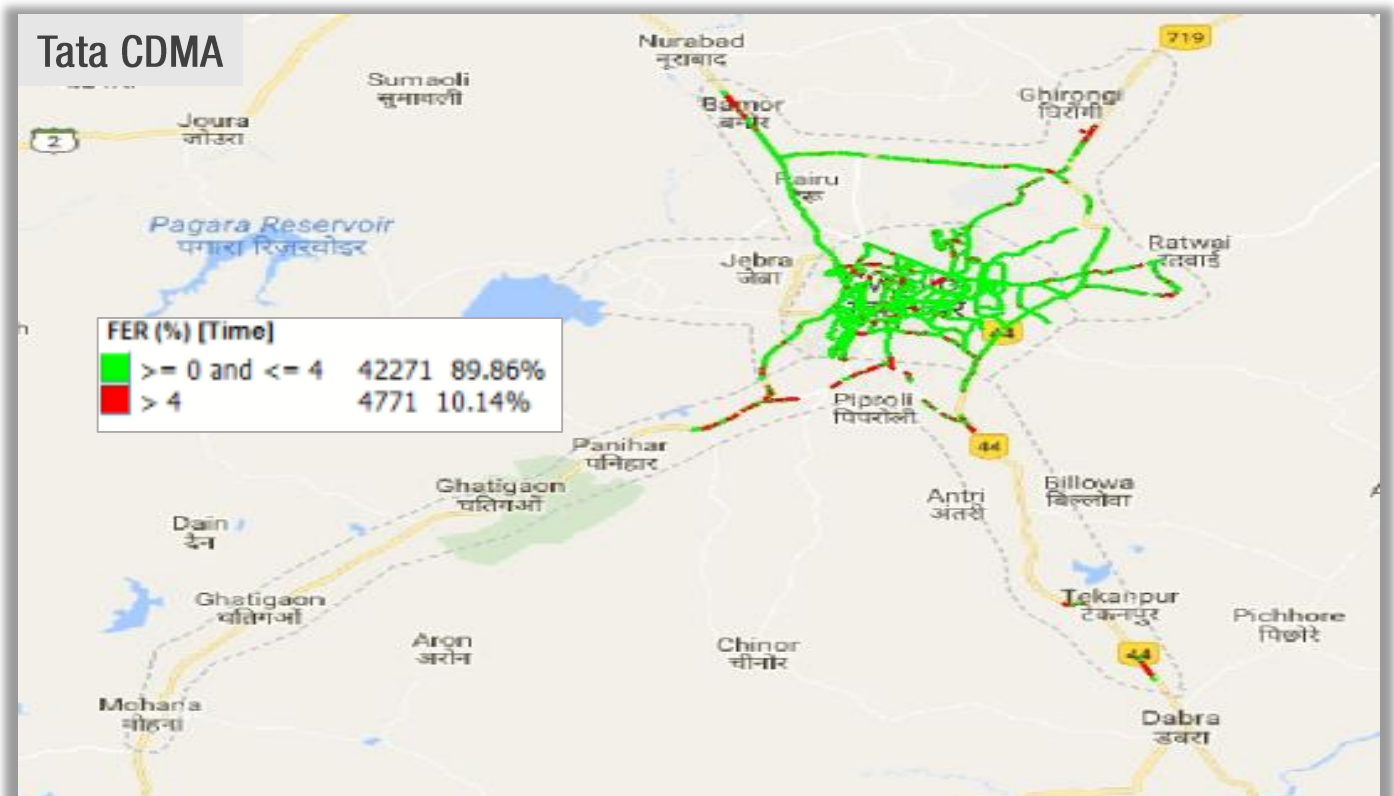
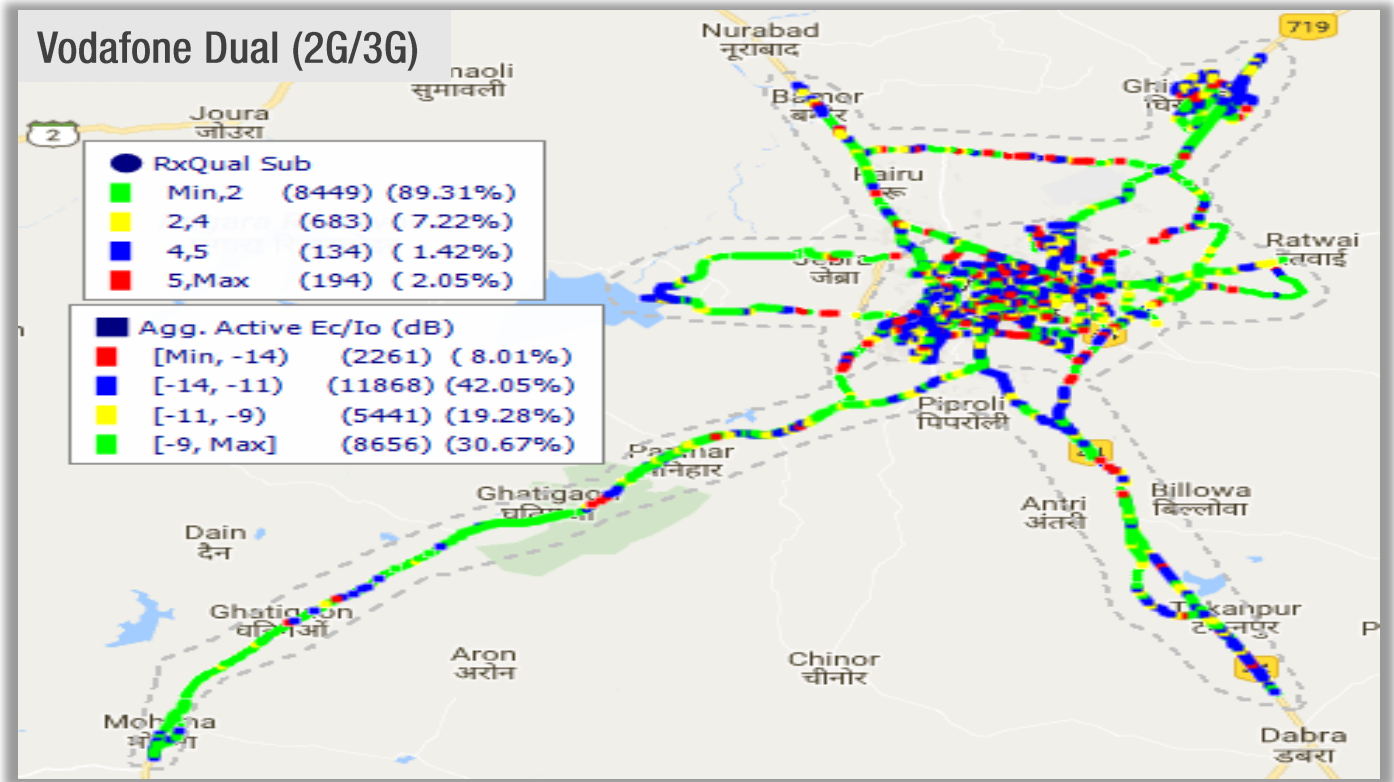
II. Quality Details (contd.)



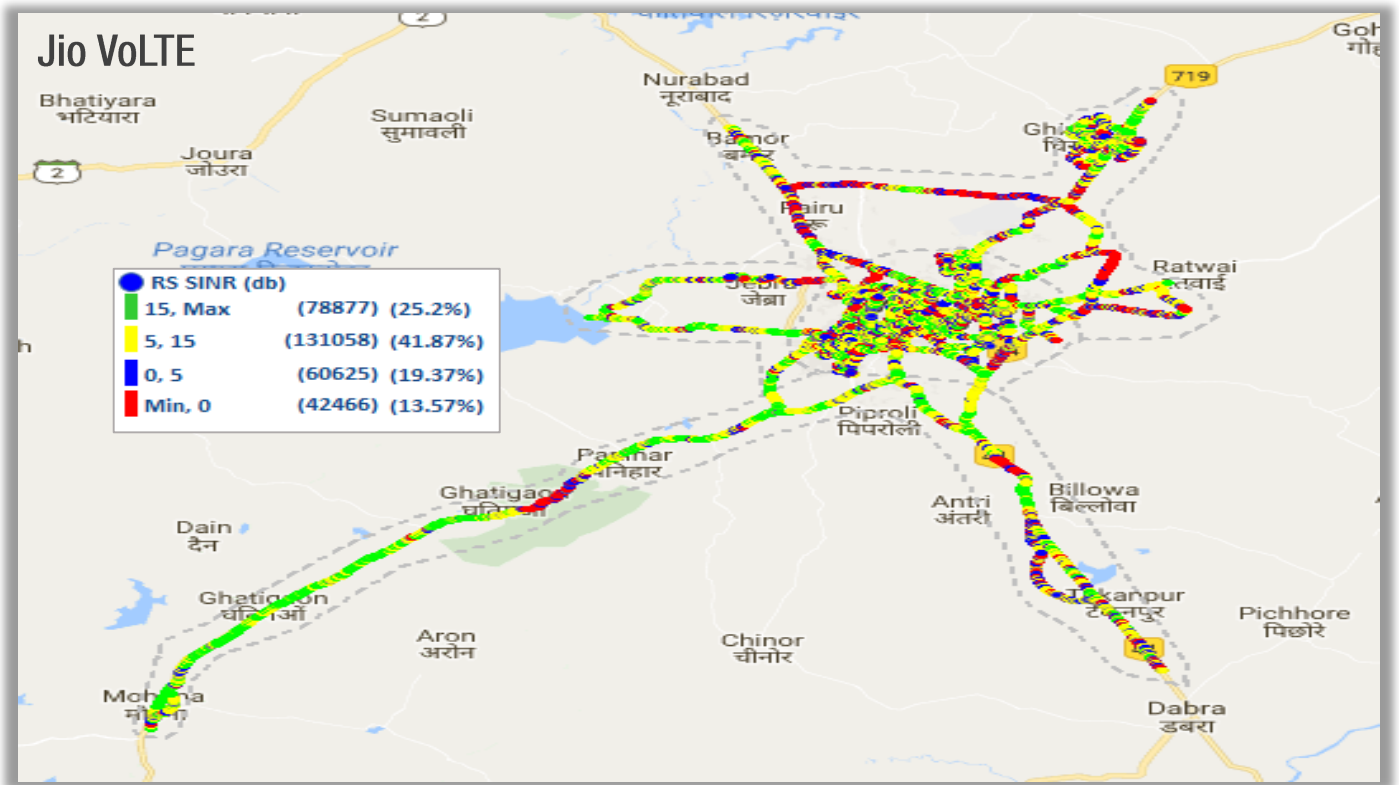
II. Quality Details (contd.)



II. Quality Details (contd.)

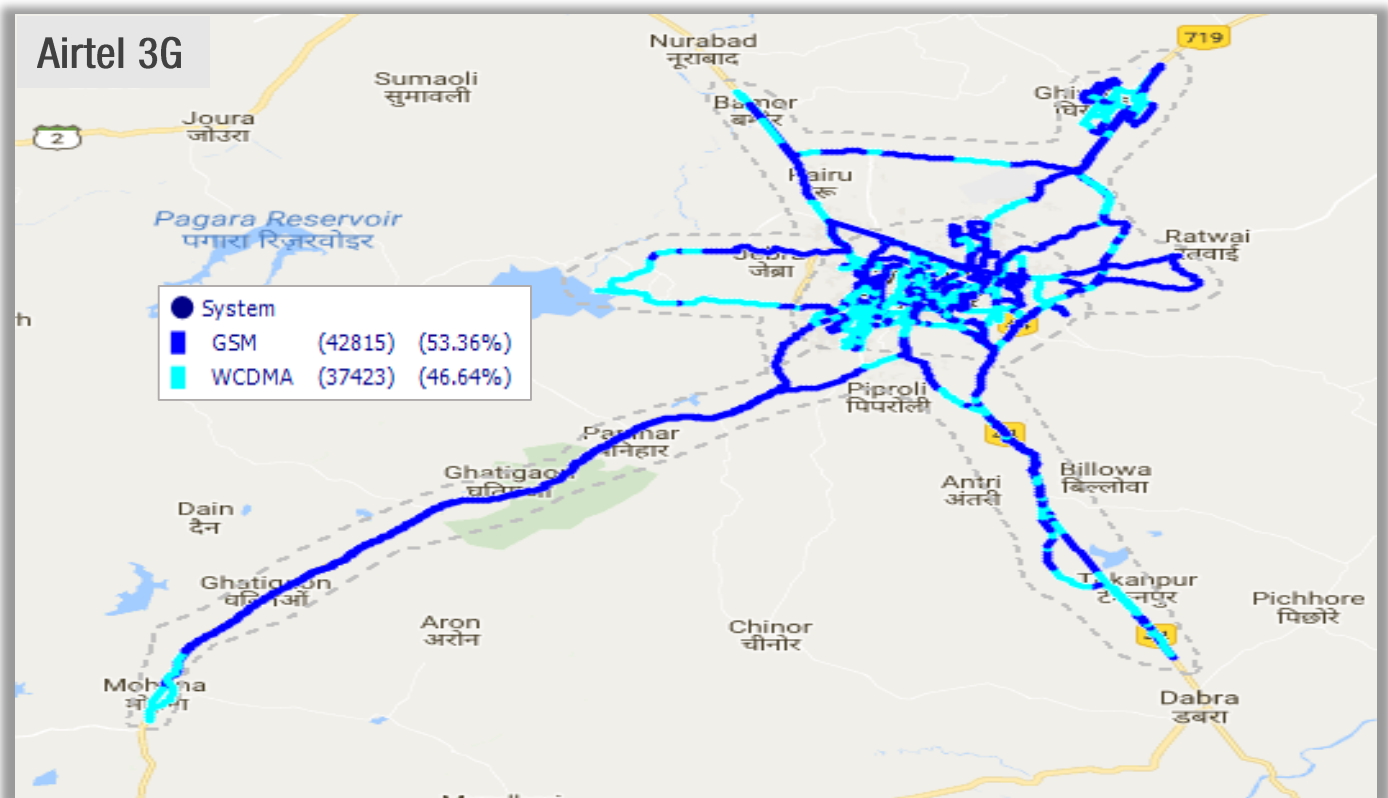
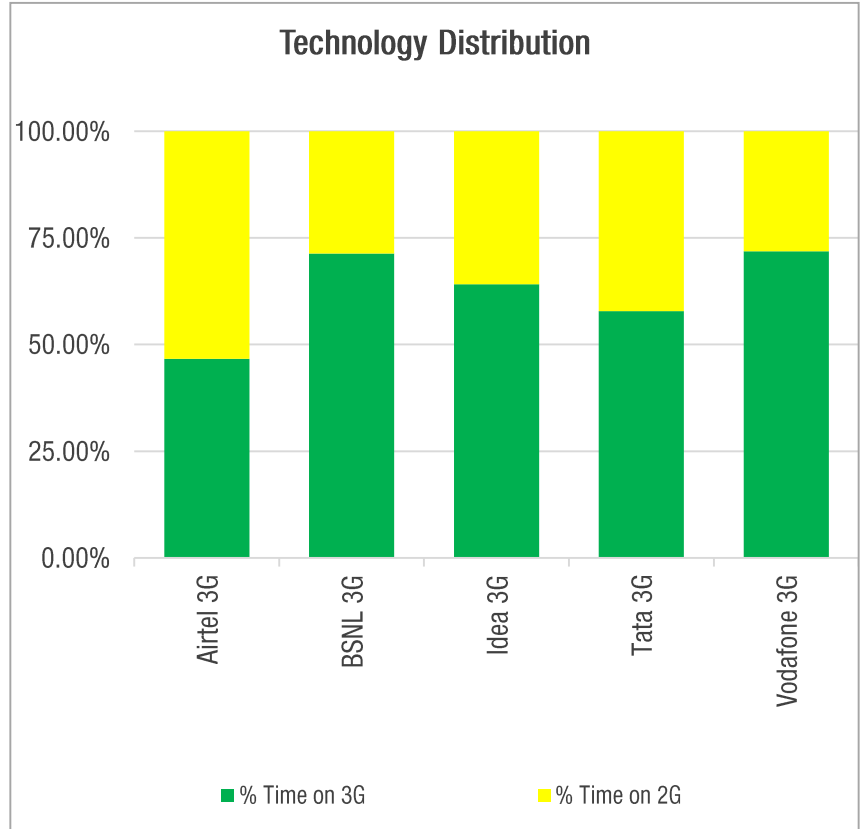


I. Coverage Details (contd.)

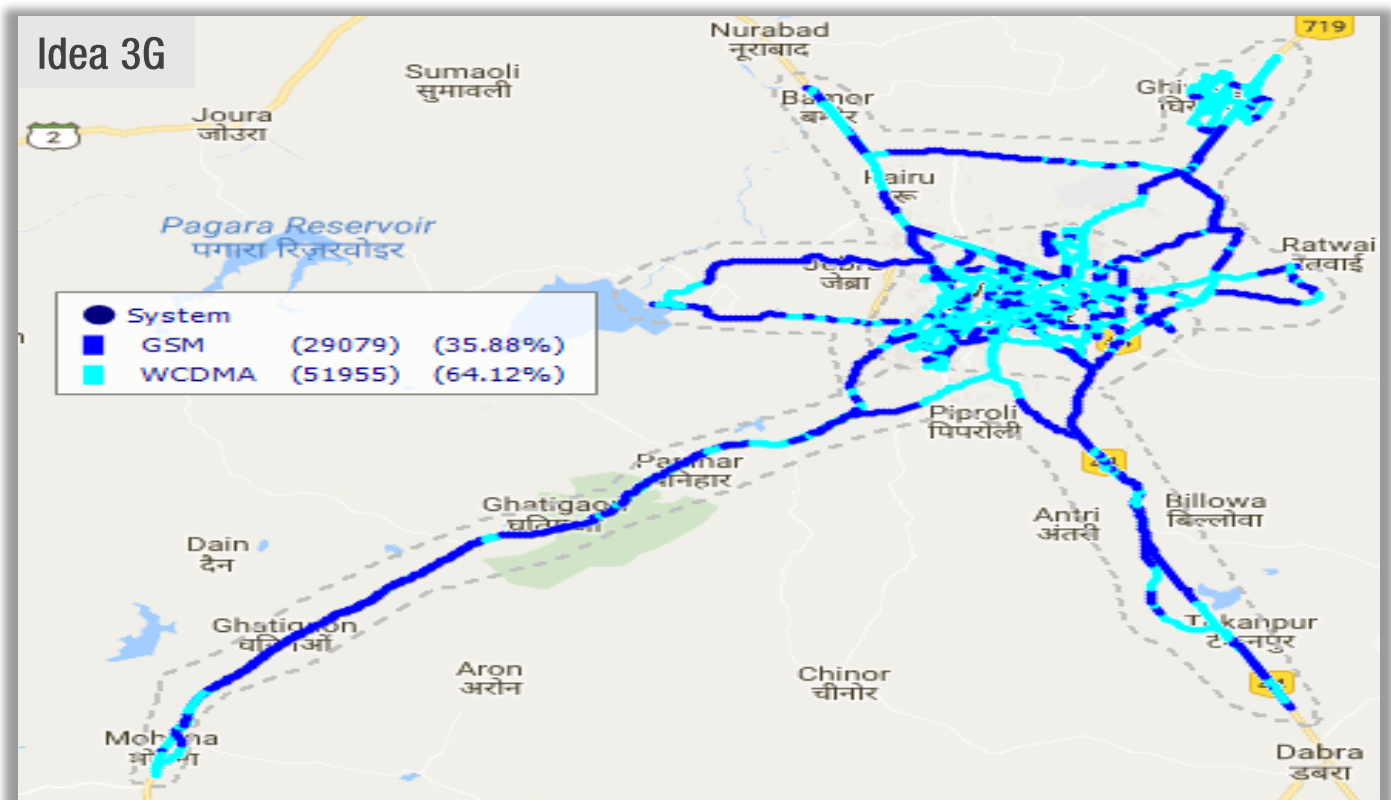
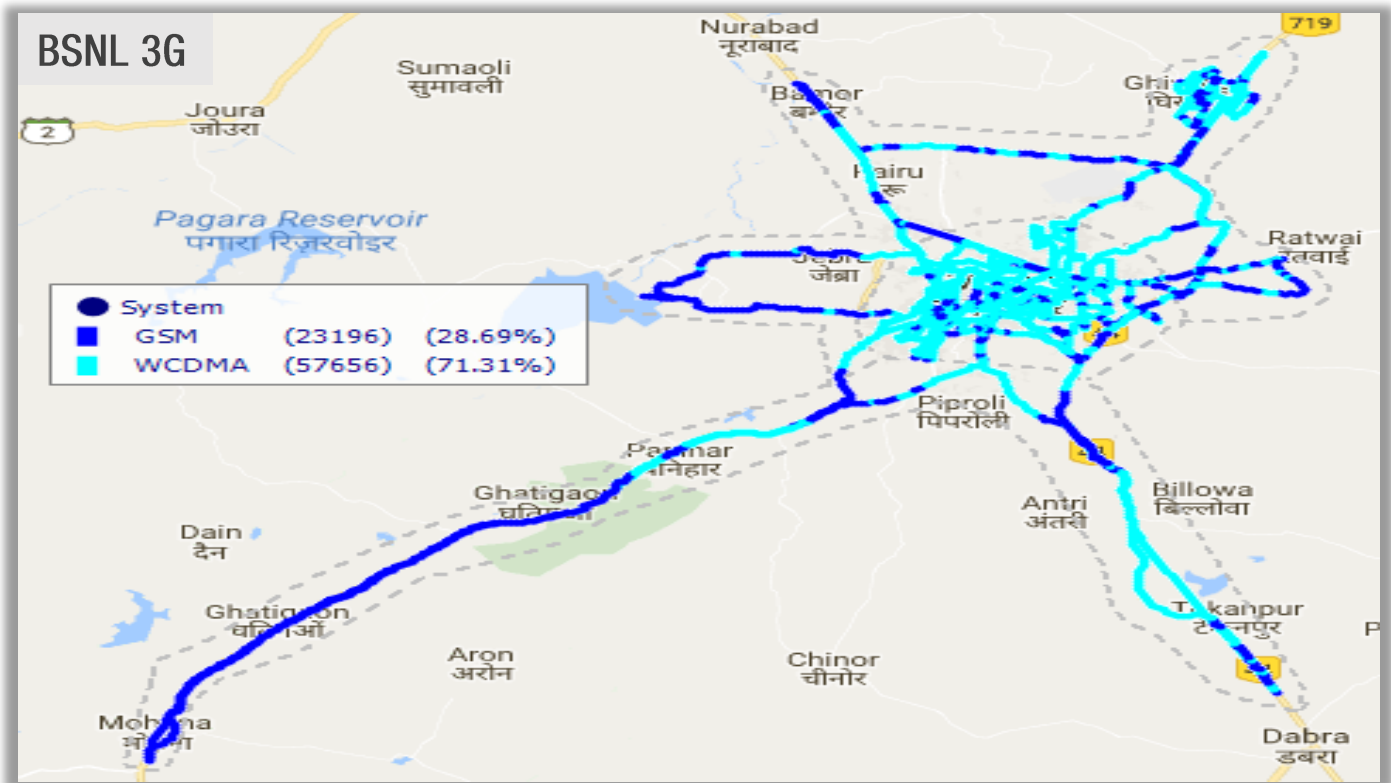


III. Technology Details

TSP	% Time on 3G
Airtel 3G	46.64%
BSNL3G	71.31%
Idea 3G	64.12%
Tata 3G	57.80%
Vodafone 3G	71.85%



III. Technology Details(contd.)



III. Technology Details(contd.)

