



# INDEPENDENT DRIVE TEST REPORT

*For*

# Jalandhar

## 2018

## August

## NORTH ZONE

**Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2%. 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 Jalandhar City & adjoining areas from 9:00 AM to 9:00 PM; 27<sup>th</sup> August to 31<sup>st</sup> August 2018. The drive test covered an drive route of 555 KMs & 5 hotspot over a period of 5 days. Approximately 830 calls were made for each of the 11 networks: five 2G networks, five 3G networks 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 **27<sup>th</sup> August to 31<sup>st</sup> August 2018** covering various locations in Jalandhar City & surrounding region. The performance of **Airtel, BSNL, Idea, Tata, Vodafone and Jio** were monitored across various technologies (2G, 3G, 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.**

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

## Drive Test Details For Jalandhar:

Independent Drive test was conducted for a period of 5 days from 27<sup>th</sup> August to 31<sup>st</sup> August 2018 in Jalandhar 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 555 KMs over a period of 4 day from 27<sup>th</sup> August to 30<sup>th</sup> August 2018. Approximately 830 calls were made for each of the 11 networks: five 2G (Lock Mode) networks, five 3G (Dual mode) networks and one VoLTE network covering 6 unique TSPs.

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

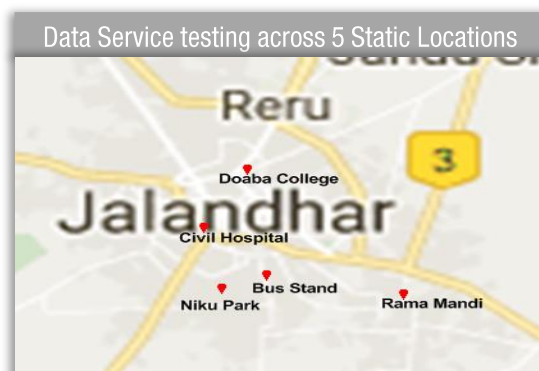
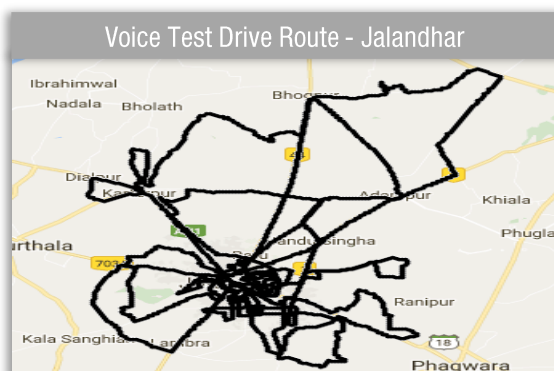
**Data Tests:** Data Tests were performed at 5 static locations for 1 day on 31<sup>th</sup> August 2018; five 2G (Lock mode) networks, five 3G (Dual mode) networks and Four 4G (Free mode) networks covering 6 unique TSPs were tested.

\* 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.

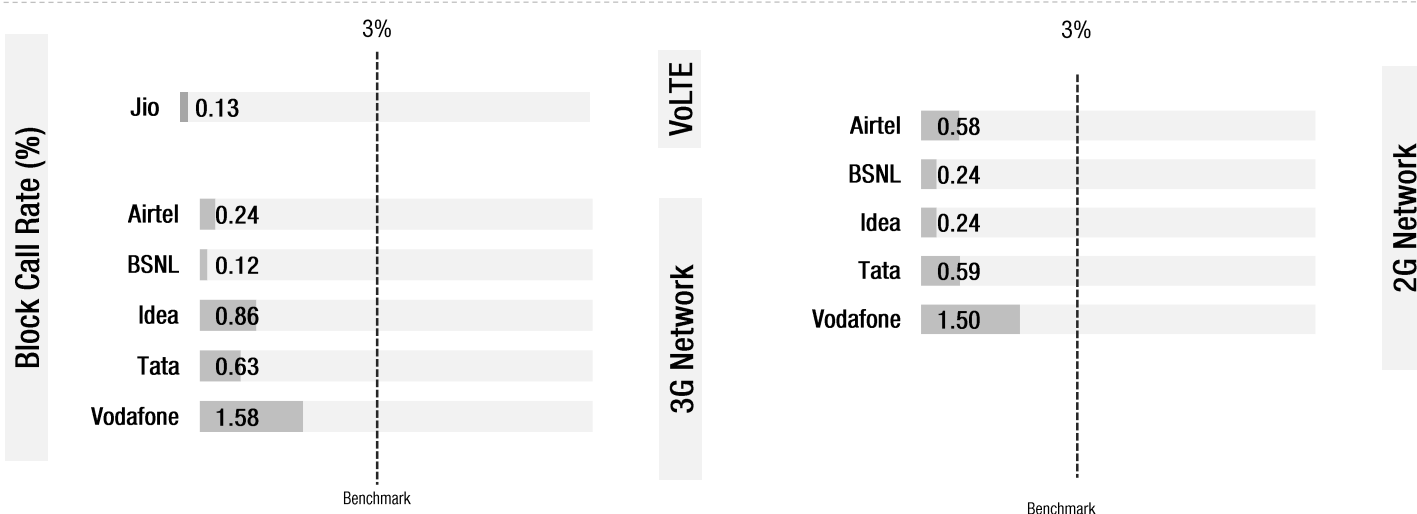
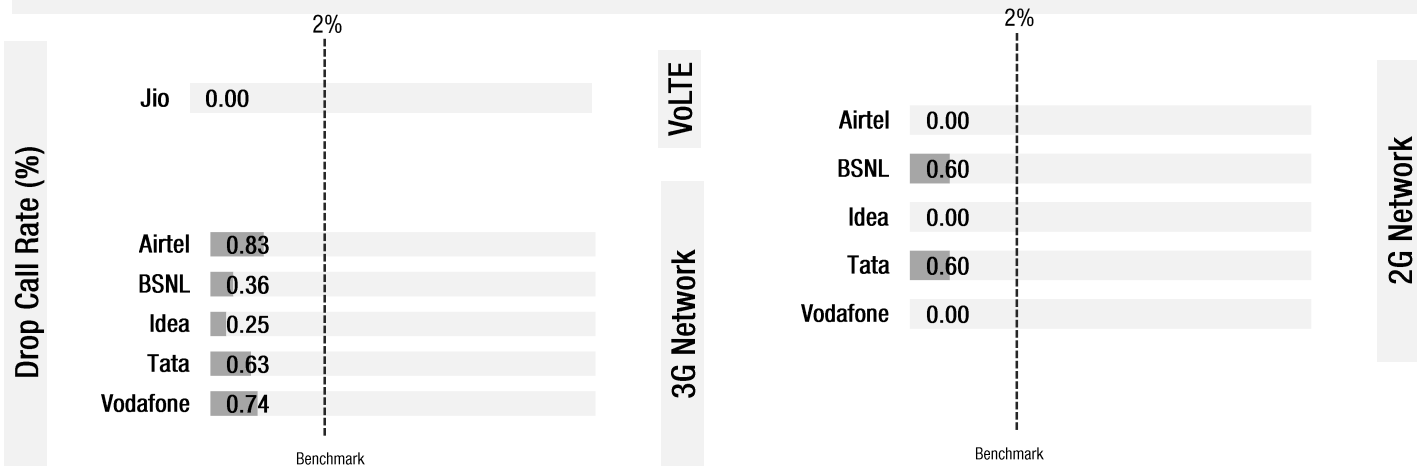
Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Video Streaming	130 sec clip
Latency	32 Bytes on www.google.com



# Voice Calls

## Key Observations

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



KPI	2G Networks				
	Airtel	BSNL	Idea	Tata	Vodafone
SDCCH Congestion%	0.58%	0.12%	0.00%	0.59%	0.00%
TCH Congestion %	0.00%	0.12%	0.24%	0.00%	1.50%

KPI	3G Networks				
	Airtel	BSNL	Idea	Tata	Vodafone
CSFB Failure %	0.00%		0.86%		0.24%
SDCCH Congestion%	0.24%	0.00%	0.00%	0.38%	0.12%
RRC Congestion%	0.00%	0.00%	0.00%	0.00%	0.49%
SDCCH & RRC Congestion%	0.24%	0.00%	0.00%	0.38%	0.61%
TCH Congestion %	0.00%	0.12%	0.00%	0.00%	0.49%
RAB Congestion %	0.00%	0.00%	0.00%	0.25%	0.24%
TCH & RAB Congestion %	0.00%	0.12%	0.00%	0.25%	0.73%

- All TSPs have met the 2% QOS benchmark of Drop Call Rate (DCR%) .
- Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's.

Not meeting Benchmark

# Voice Calls

## Key Observations

### Coverage

a) Percentage of coverage samples for 2G  $\geq$  -85 dBm & CDMA  $\geq$  -90 dbm.

TSPs	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Coverage%	98.10%	83.40%	78.48%	95.71%	74.88%

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 %	98.77%	87.25%	87.36%	88.47%	66.64%	97.87%

c) Percentage of time spent on 3G network:

TSPs	3G				
	Airtel	BSNL	Idea	Tata	Vodafone
Time Spent on 3G%	85.29%	5.41%	79.02%	82.98%	55.49%

d) Percentage of RLT  $\geq$ 48:

TSPs	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
%RLT $\geq$ 48	0.00%	36.71%	0.00%	0.00%	0.00%

e) Average CST Second

TSPs	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
CST(sec)	2.65	2.00	3.53	2.40	2.89

TSPs	3G					VoLTE
	Airtel	BSNL	Idea	Tata	Vodafone	Jio
CST(sec)	4.91	6.13	5.35	3.99	6.07	0.46

# Data Services Static

## Key Observations

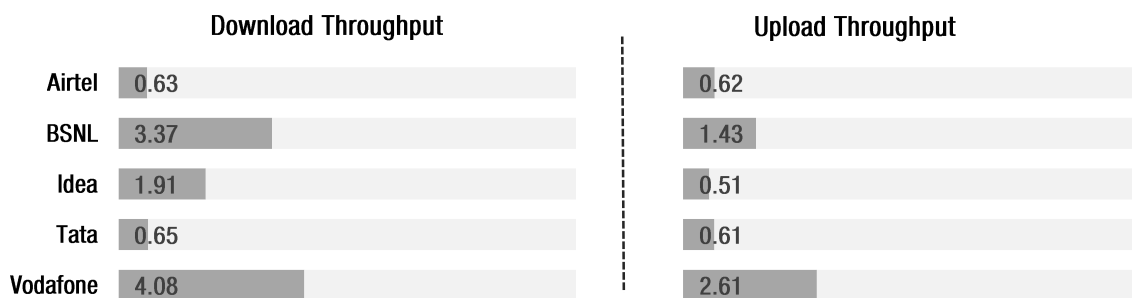
Data was tested at 5 locations .Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

### Data Download and Upload Performance (Mbps)

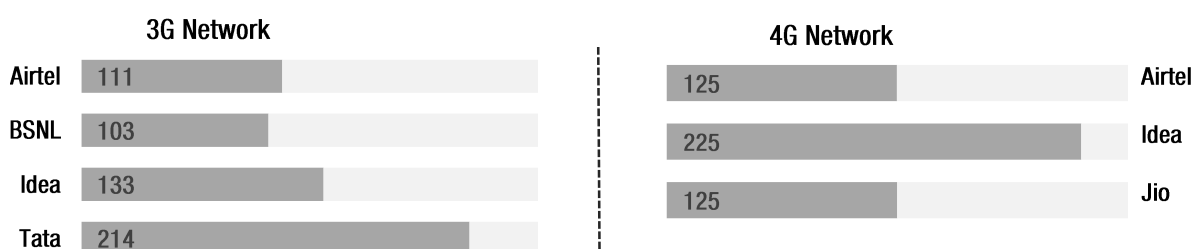
#### 4G Network:



#### 3G Network:



### Latency (msec)

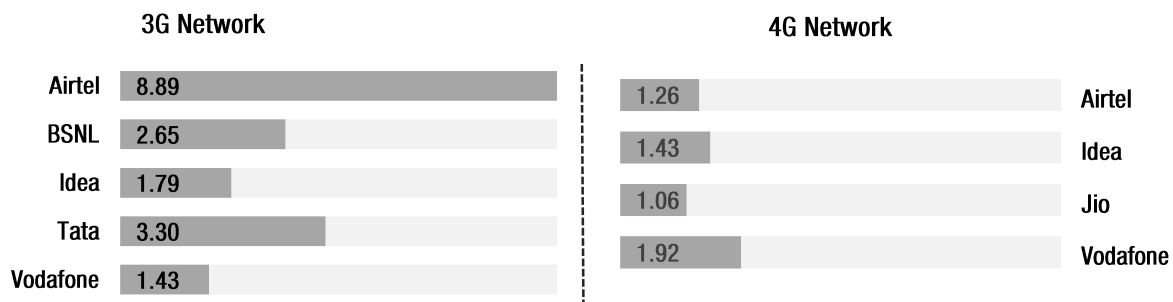


# Data Services Static

## Key Observations

### Video Streaming Performance (130 sec YouTube video sample sizes)

Streaming (sec)

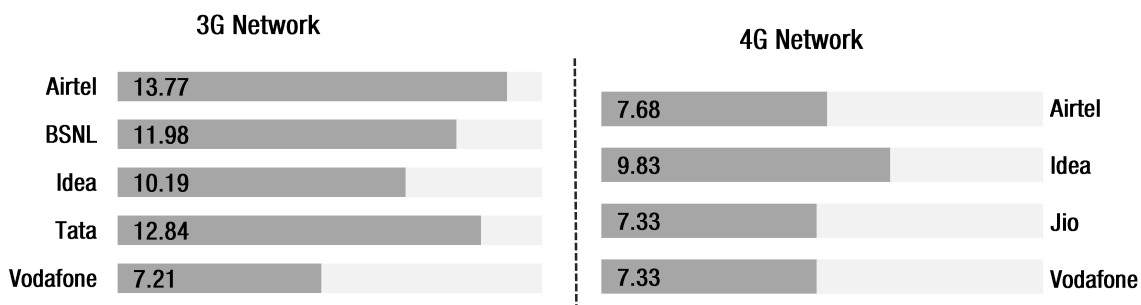


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

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

Video Streaming	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Avg. Initial Start Time (sec)	3.98	1.85	1.79	2.71	1.43	0.99	1.43	1.06	1.73
Avg. Interruption Time (sec)	4.90	0.80		0.59		0.27			0.20

### Web Page Download Time (sec)



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

# Data Services Dynamic

## Key Observations

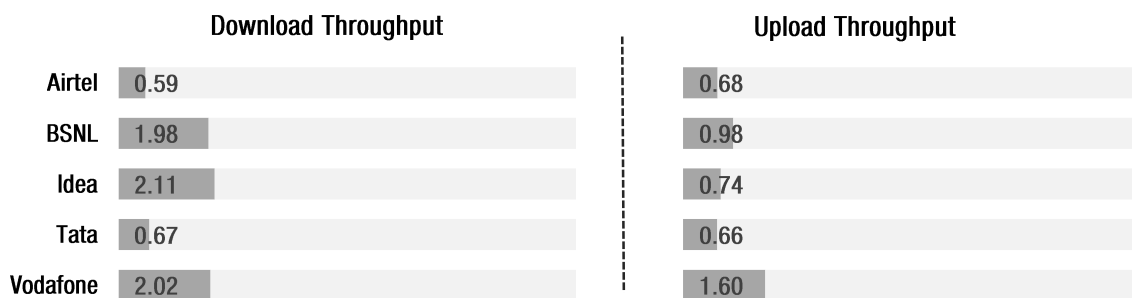
Data was tested between one location to another location .Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

### Data Download and Upload Performance (Mbps)

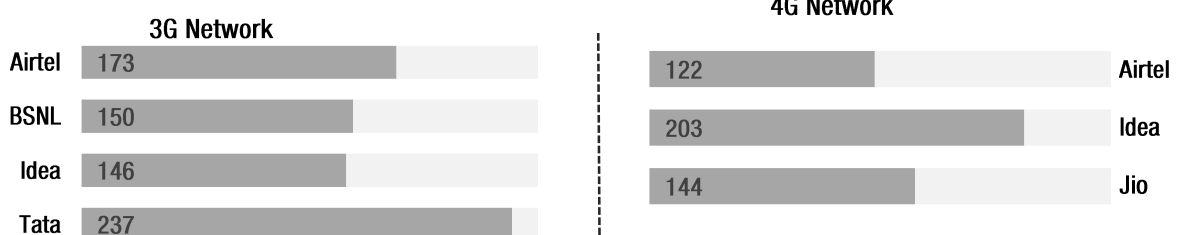
#### 4G Network:



#### 3G Network:



### Latency (msec)

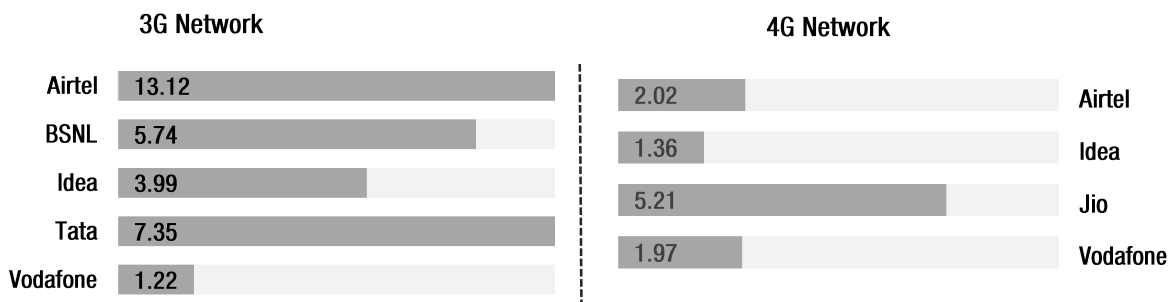


# Data Services Dynamic

## Key Observations

### Video Streaming Performance (130 sec YouTube video sample sizes)

Streaming (sec)

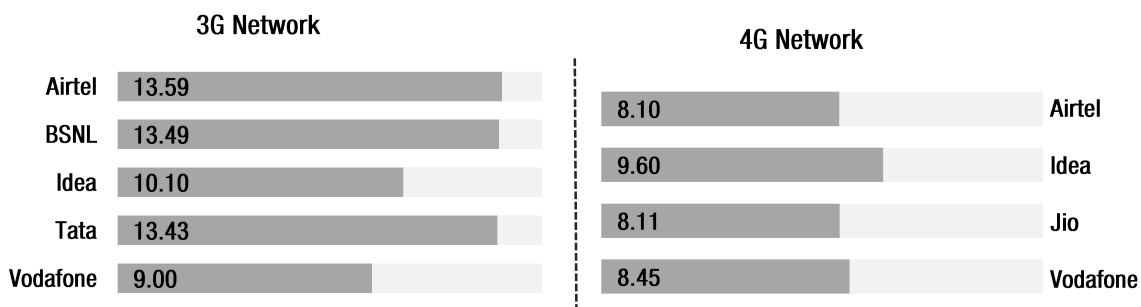


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

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

Video Streaming	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Avg. Initial Start Time (sec)	6.24	5.74	3.99	3.53	1.22	2.02	1.36	3.75	1.61
Avg. Interruption Time (sec)	6.88			3.82				1.46	0.36

### 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				
	Airtel	BSNL	Idea	Tata	Vodafone
Call Attempt	856	838	833	844	864
Blocked Call Rate (%)	0.58%	0.24%	0.24%	0.59%	1.50%
CSSR% (Accessibility)	99.42%	99.76%	99.76%	99.41%	98.50%
Drop Call Rate (%)	0.00%	0.60%	0.00%	0.60%	0.00%
Mobility HOSR (%)	98.70%	98.09%	99.29%	96.98%	99.03%
Rx Quality (%)	97.77%	97.21%	98.93%	96.89%	98.40%

Voice Call	3G					VoLTE
	Airtel	BSNL	Idea	Tata	Vodafone	Jio
Call Attempt	842	837	810	798	824	771
Blocked Call Rate (%)	0.24%	0.12%	0.86%	0.63%	1.58%	0.13%
CSSR% (Accessibility)	99.76%	99.88%	99.14%	99.37%	98.42%	99.87%
Drop Call Rate (%)	0.83%	0.36%	0.25%	0.63%	0.74%	0.00%
Mobility HOSR (%)	100.00%	98.10%	99.98%	100.00%	99.96%	99.28%
Rx Quality (%)	95.93%	98.08%	93.07%	95.60%	94.96%	82.36%

# Summary

## City Level Summary(contd.)

### Data Test - Stationary

Data Services	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Download Throughput (Kbps)	102.23	109.77	124.99	38.93	108.89
Upload Throughput (kbps)	83.77	99.18	82.09	36.38	148.29
Web Browsing Delay (sec)	37.52	26.00	26.35	24.58	39.60
Latency (msec)	419	271	574	611	

Data Services	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	0.63	3.37	1.91	0.65	4.08	7.56	3.25	6.55	5.21
Upload Throughput (Mbps)	0.62	1.43	0.51	0.61	2.61	6.40	1.89	6.66	6.51
Web Browsing Delay (sec)	13.77	11.98	10.19	12.84	7.21	7.68	9.83	7.33	7.33
Video Streaming Delay (sec)	8.89	2.65	1.79	3.30	1.43	1.26	1.43	1.06	1.92
Latency (msec)	111	103	133	214		125	225	125	

### Data Test - Mobility

Data Services	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	0.59	1.98	2.11	0.67	2.02	8.70	3.08	5.04	2.56
Upload Throughput (Mbps)	0.68	0.98	0.74	0.66	1.60	4.34	1.27	4.90	5.42
Web Browsing Delay (sec)	13.59	13.49	10.10	13.43	9.00	8.10	9.60	8.11	8.45
Video Streaming Delay (sec)	13.12	5.74	3.99	7.35	1.22	2.02	1.36	5.21	1.97
Latency (msec)	173	150	146	237		122	203	144	

# Summary

## City Level Summary(contd.)

Bus Stand	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Download Throughput (Kbps)	138.74	93.14	142.78	45.01	118.21
Upload Throughput (kbps)	102.44	91.99	103.82	45.89	165.15
Web Browsing Delay (sec)	20.10	18.87	27.32	31.82	40.75
Latency (msec)	492	197	638	649	

Bus Stand	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	-	3.15	1.55	0.09	2.65	7.71	3.31	4.18	1.84
Upload Throughput (Mbps)	-	1.40	0.44	0.07	2.22	8.77	0.12	4.68	6.78
Web Browsing Delay (sec)	-	12.43	12.42	21.51	7.78	6.66	9.59	6.85	8.23
Video Streaming Delay (sec)	-	1.70	1.56	-	1.34	0.92	1.34	0.84	2.05
Latency (msec)	-	124	131	573		79	179	122	

Civil Hospital	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Download Throughput (Kbps)	85.06	85.73	109.49	26.23	49.66
Upload Throughput (kbps)	43.27	100.40	82.80	27.85	123.16
Web Browsing Delay (sec)	39.07	28.92	23.33	18.67	36.37
Latency (msec)	389	285	592	697	

Civil Hospital	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	0.12	0.43	1.04	0.55	2.82	5.01	5.83	1.23	4.35
Upload Throughput (Mbps)	0.41	1.54	0.09	0.68	2.09	2.54	1.46	1.08	5.74
Web Browsing Delay (sec)	14.53	12.02	10.30	14.44	8.24	7.76	11.52	12.31	7.03
Video Streaming Delay (sec)		1.77	1.82	5.74	1.75	2.92	1.42	3.31	1.22
Latency (msec)	100	125	129	173		104	182	108	

# Summary

## City Level Summary(contd.)

Doaba College	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Download Throughput (Kbps)	115.61	155.56	130.09	60.19	96.92
Upload Throughput (kbps)	95.94	107.52	116.44	47.60	139.46
Web Browsing Delay (sec)	48.86	31.30	28.33	12.66	42.18
Latency (msec)	415	337	450	588	

Doaba College	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	0.41	4.12	3.57	0.45	4.65	8.12	3.04	12.26	3.21
Upload Throughput (Mbps)	0.47	1.74	0.78	0.40	3.09	9.91	3.11	6.98	5.70
Web Browsing Delay (sec)	15.31	11.68	6.85	6.77	7.67	7.41	9.81	6.01	7.74
Video Streaming Delay (sec)	1.71	1.51	1.54	2.08	1.49	0.84	2.10	1.02	2.45
Latency (msec)	193	108	121	99		101	168	152	

Niku Park	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Download Throughput (Kbps)	98.07	147.25	74.96	21.45	143.28
Upload Throughput (kbps)	115.07	116.87	34.62	36.94	167.30
Web Browsing Delay (sec)	35.20	26.41	23.85	31.29	38.06
Latency (msec)	560	321	625	514	

Niku Park	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	0.24	7.96	1.01	0.21	3.54	9.74	2.66	7.20	5.28
Upload Throughput (Mbps)	0.62	1.78	0.09	0.55	3.09	1.61	3.88	12.43	6.40
Web Browsing Delay (sec)	14.23	11.83	10.62	13.55	5.88	7.82	8.33	5.99	5.77
Video Streaming Delay (sec)	13.43	0.98	2.06		1.18	0.63	1.21	0.60	1.11
Latency (msec)	87	104	131	501		238	188	115	

# Summary

## City Level Summary(contd.)

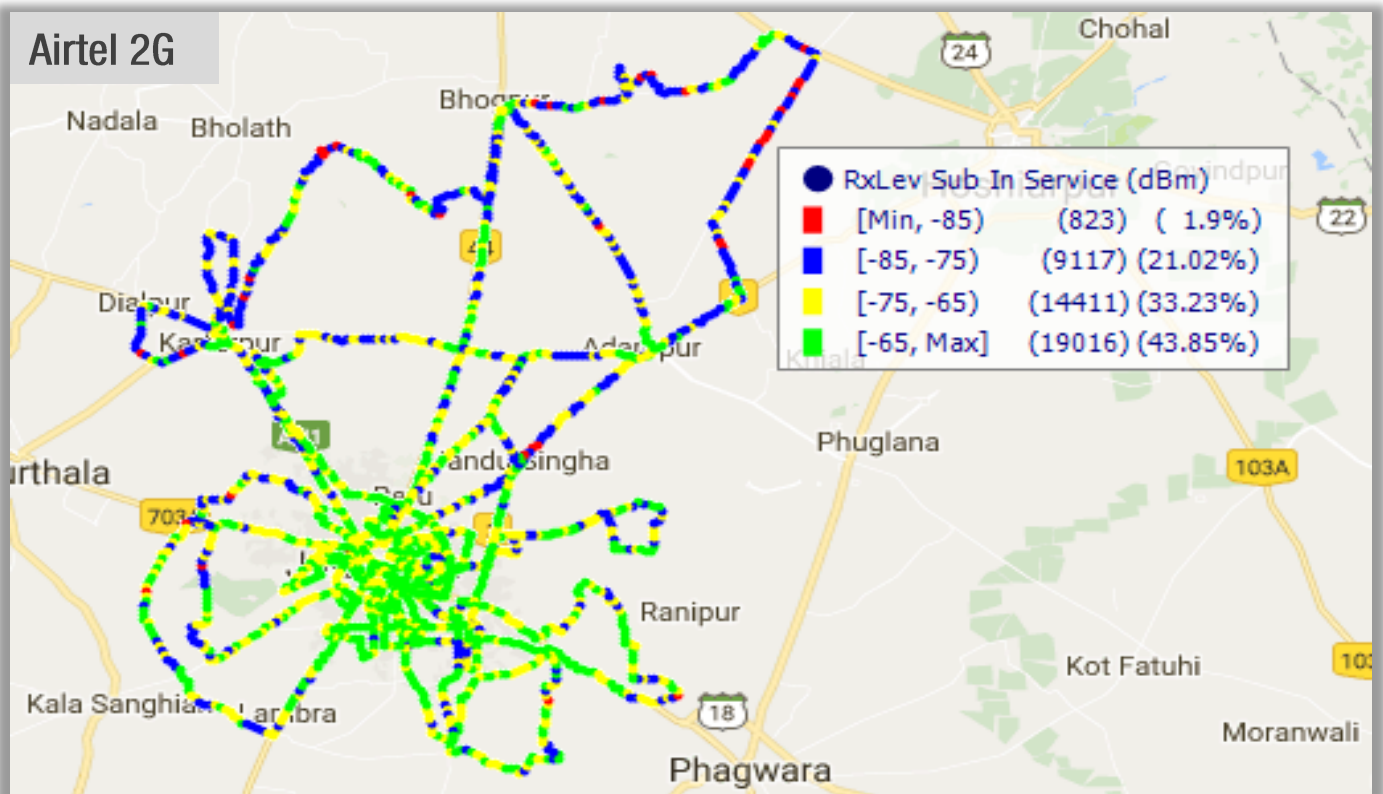
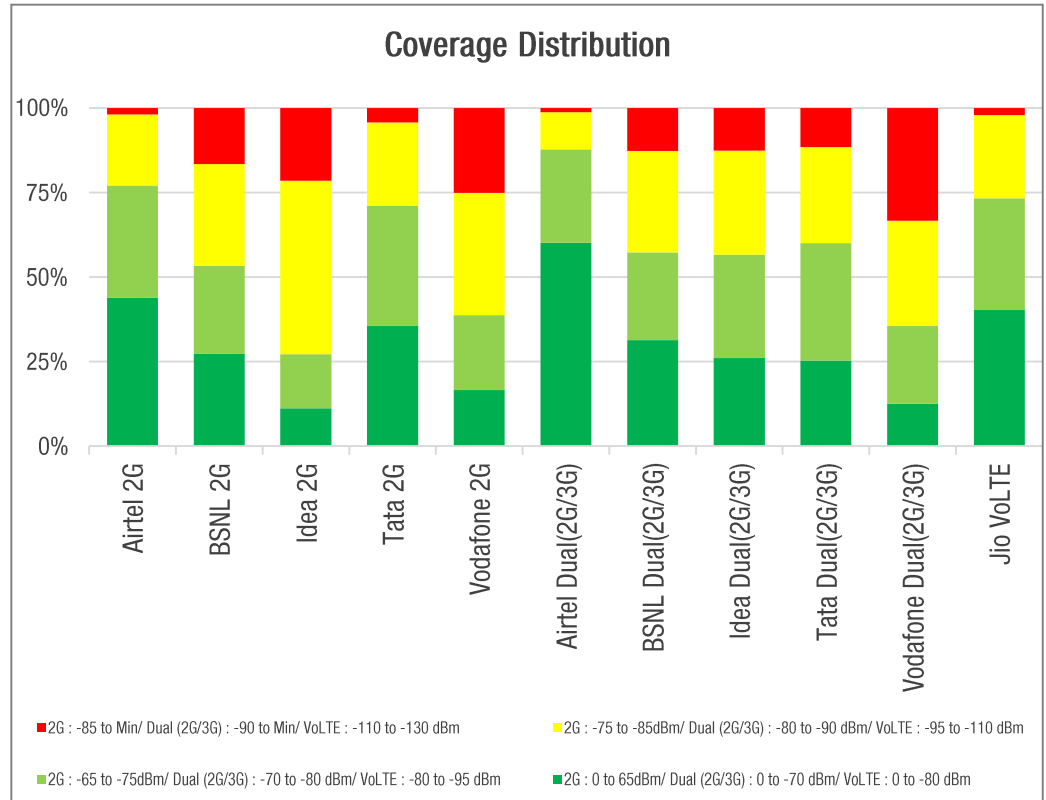
Rama Mandi	2G				
	Airtel	BSNL	Idea	Tata	Vodafone
Download Throughput (Kbps)	87.96	82.43	145.79	35.96	136.37
Upload Throughput (kbps)	72.95	79.10	72.77	23.78	146.39
Web Browsing Delay (sec)	38.61	24.40	28.69	27.46	40.42
Latency (msec)	309	199	583	645	

Rama Mandi	3G					4G			
	Airtel	BSNL	Idea	Tata	Vodafone	Airtel	Idea	Jio	Vodafone
Download Throughput (Mbps)	1.75	1.18	2.38	1.56	6.74	6.35	1.39	8.10	11.36
Upload Throughput (Mbps)	0.98	0.67	1.15	0.91	2.56	7.88	0.88	8.15	7.93
Web Browsing Delay (sec)	11.26	11.96	10.72	9.78	6.48	8.66	10.03	5.52	7.86
Video Streaming Delay (sec)	6.73	7.30	1.89	2.08	1.39	0.97	1.32	1.00	2.77
Latency (msec)	75	56	154	109		102	402	128	

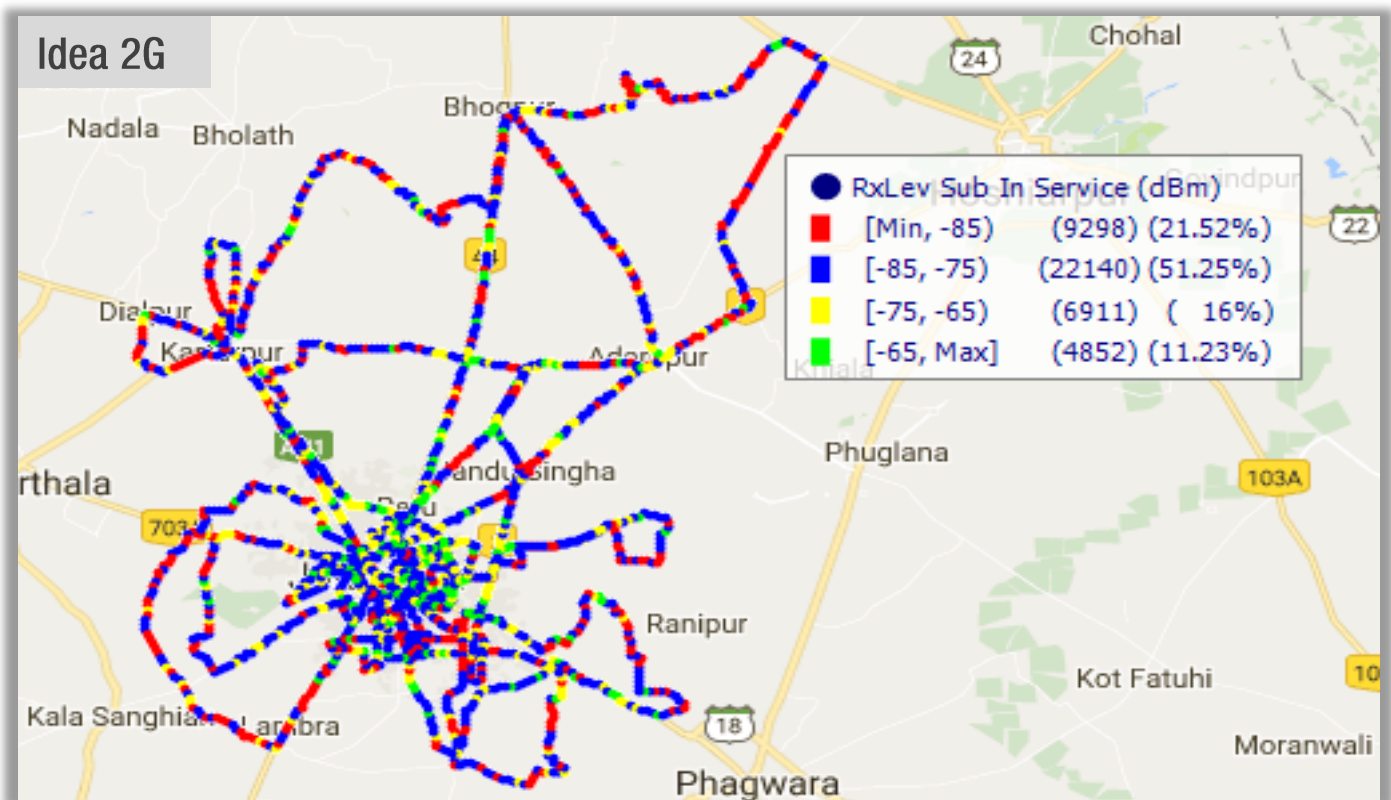
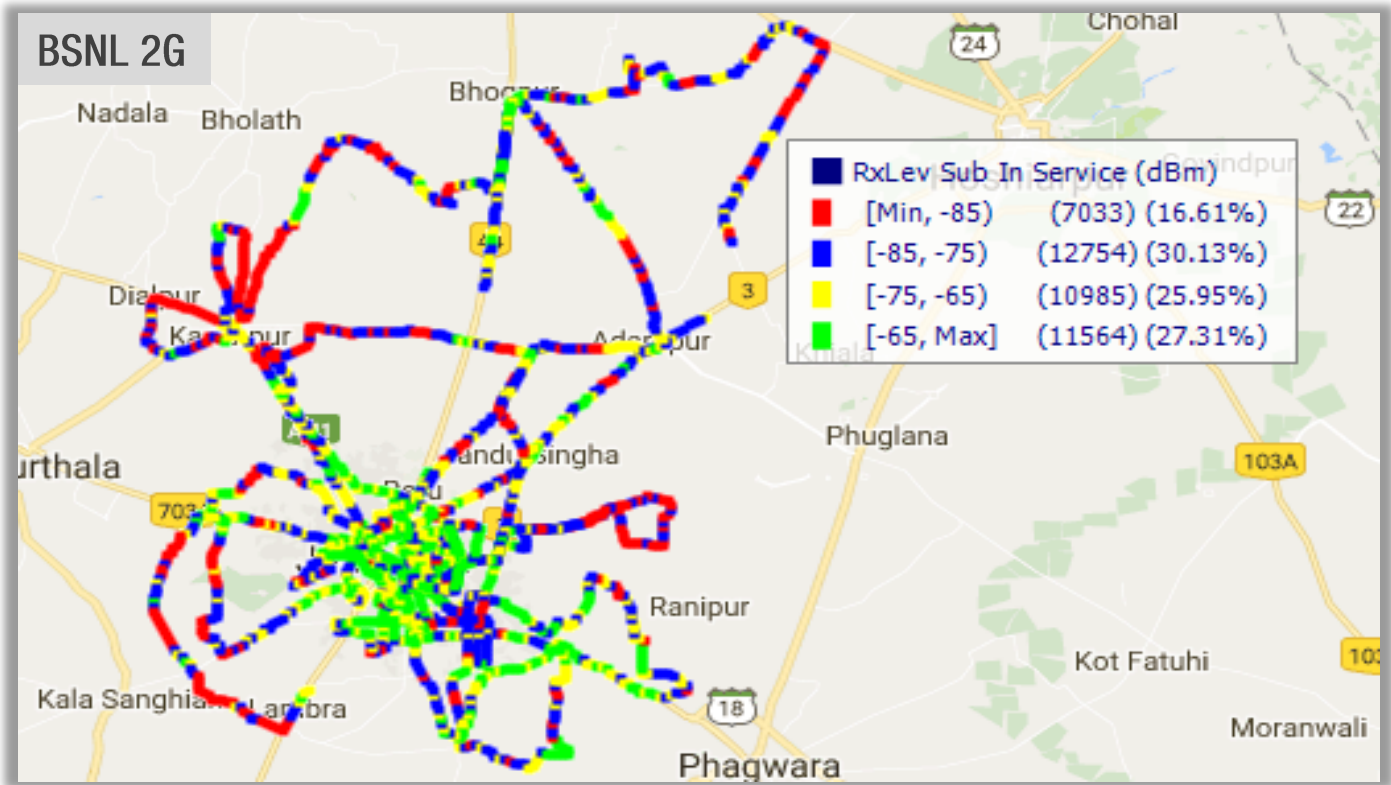
# I. Coverage Details

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  $\geq -85$  dBm, RSCP is  $\geq -90$  dBm & RSRP  $\geq -110$  dBm. The details are as follows.

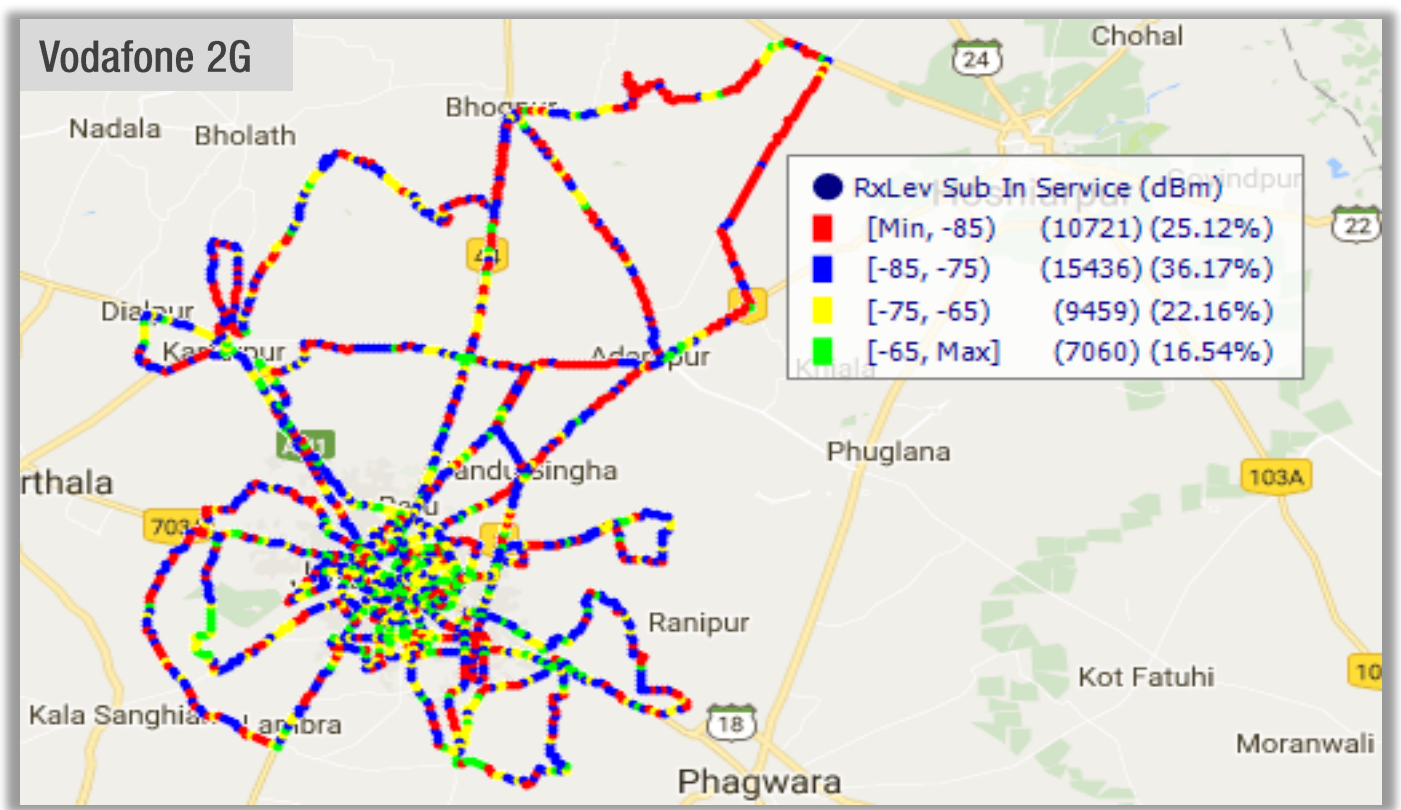
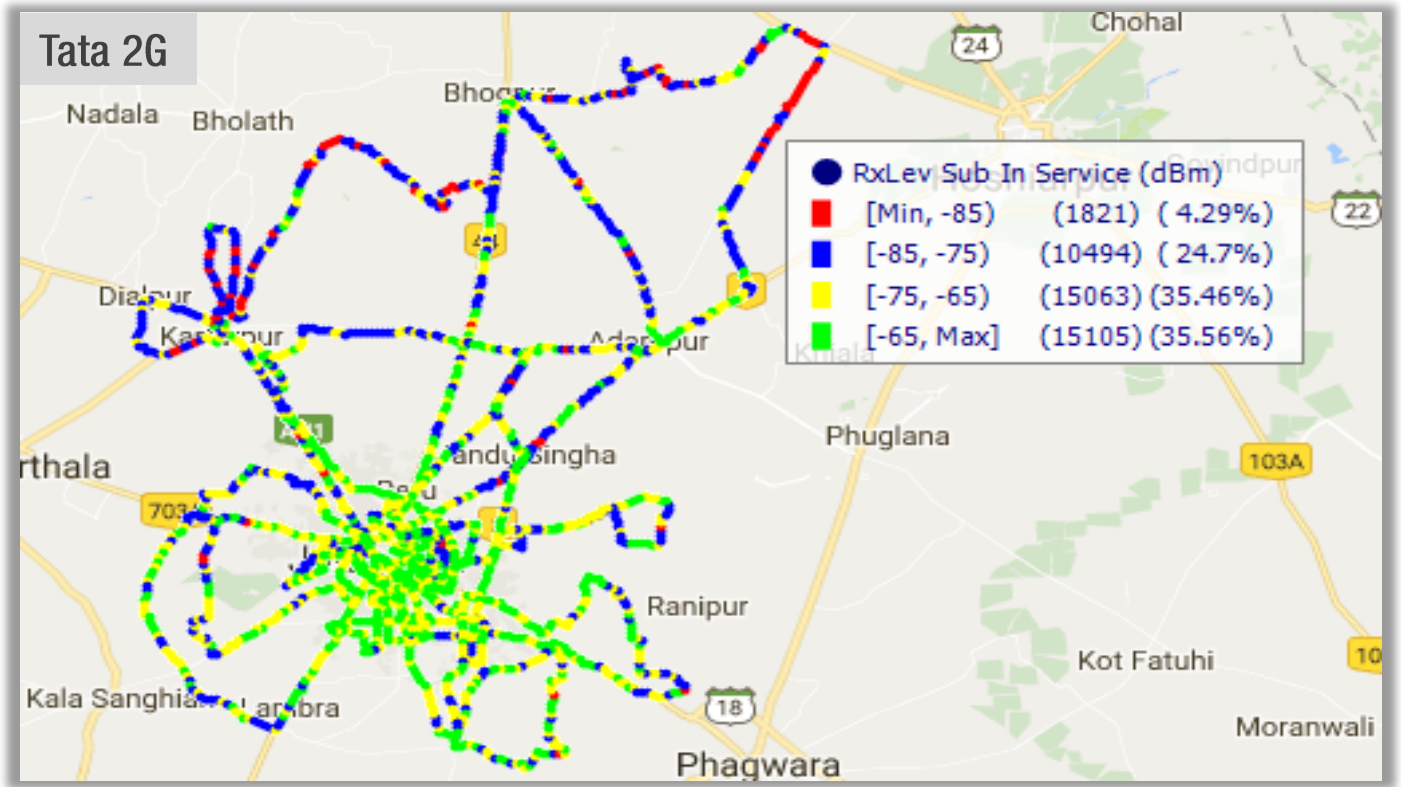
TSP	Coverage Rate
Airtel 2G	98.10%
BSNL 2G	83.40%
Idea 2G	78.48%
Tata 2G	95.71%
Vodafone 2G	74.88%
Airtel Dual(2G/3G)	98.77%
BSNL Dual(2G/3G)	87.25%
Idea Dual(2G/3G)	87.36%
Tata Dual(2G/3G)	88.47%
Vodafone Dual(2G/3G)	66.64%
Jio VoLTE	97.87%



# I. Coverage Details (contd.)

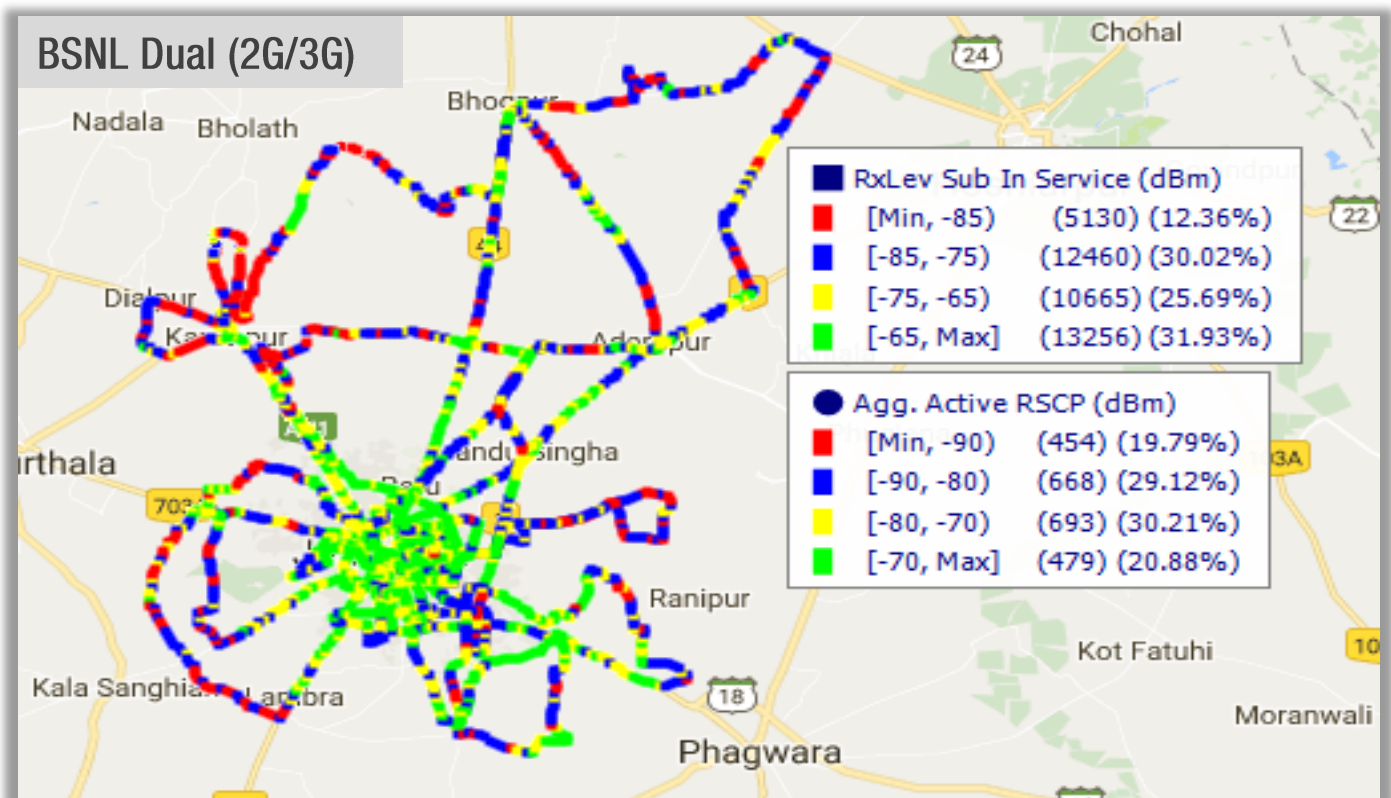
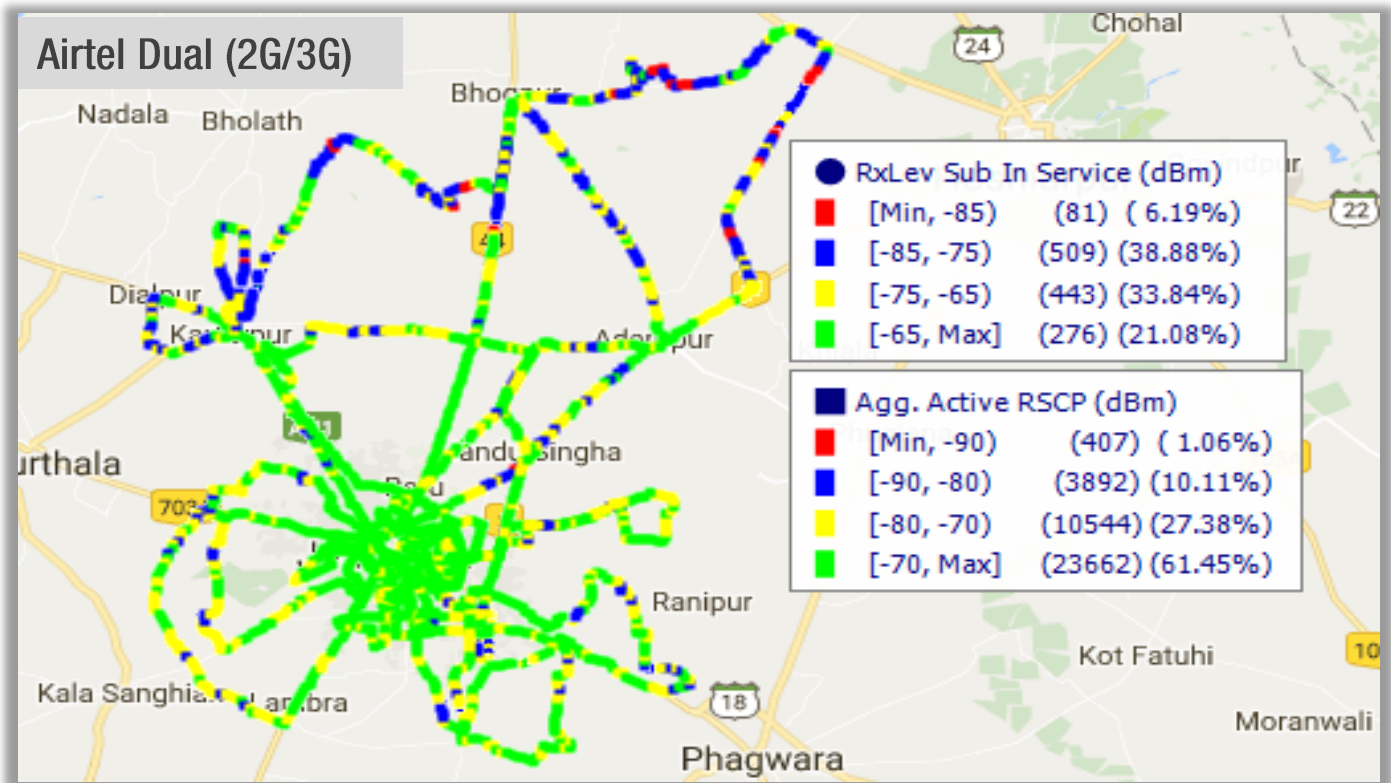


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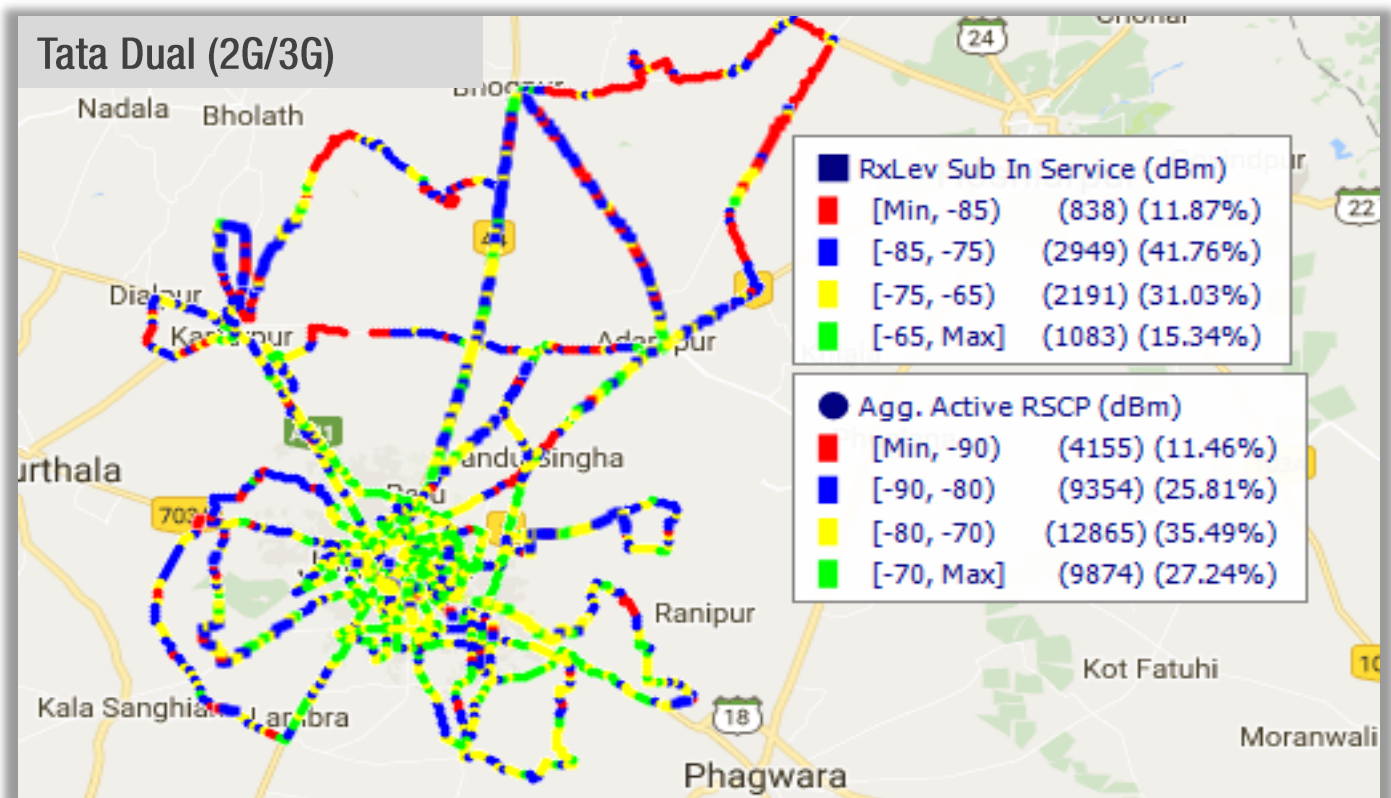
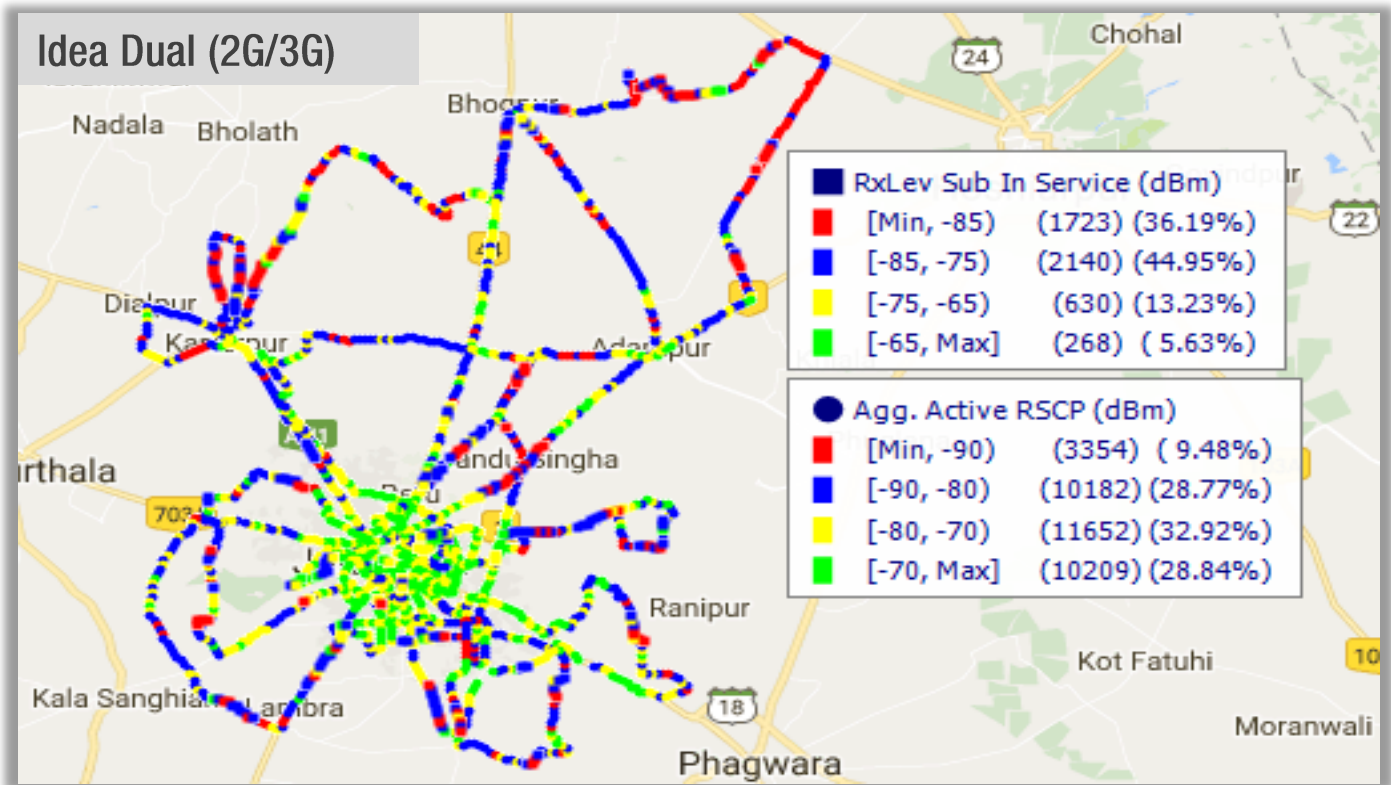




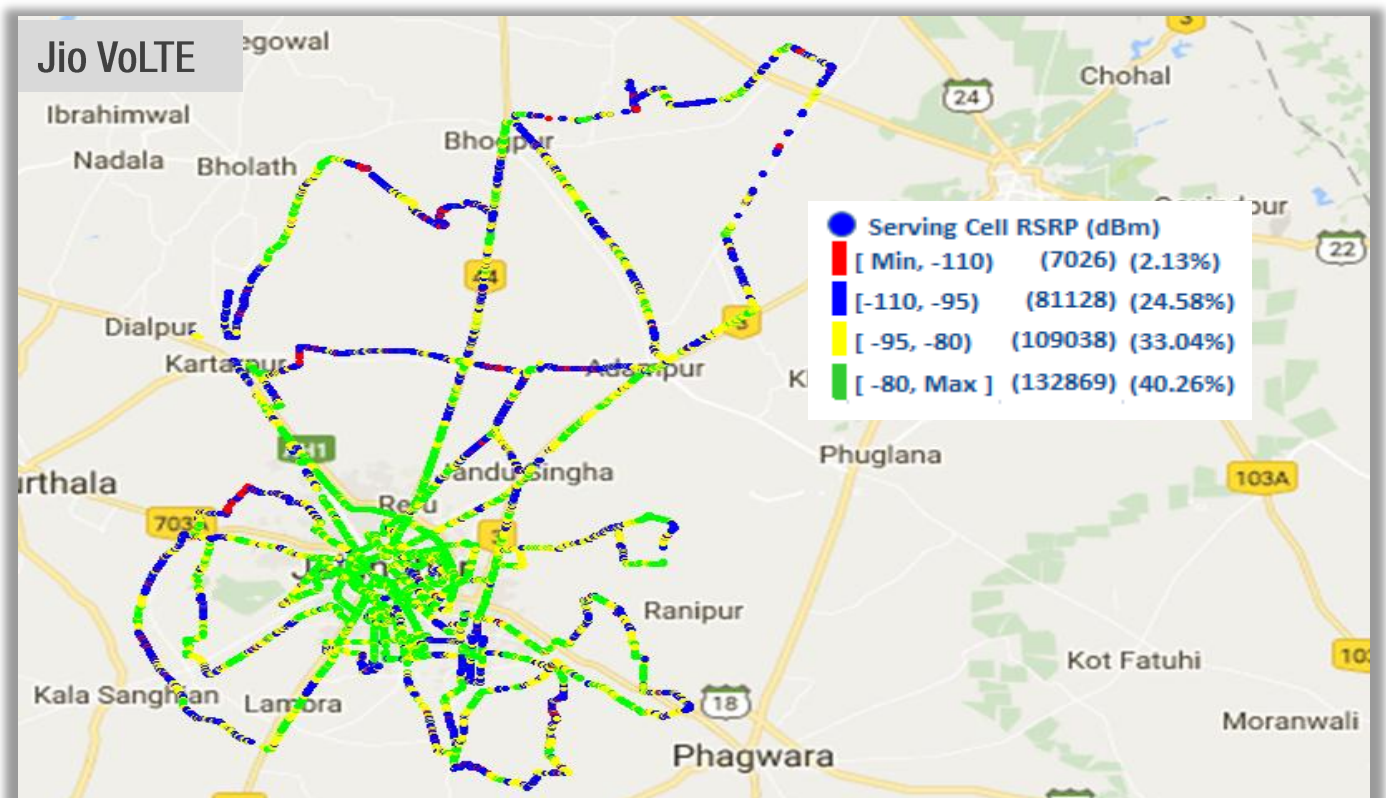
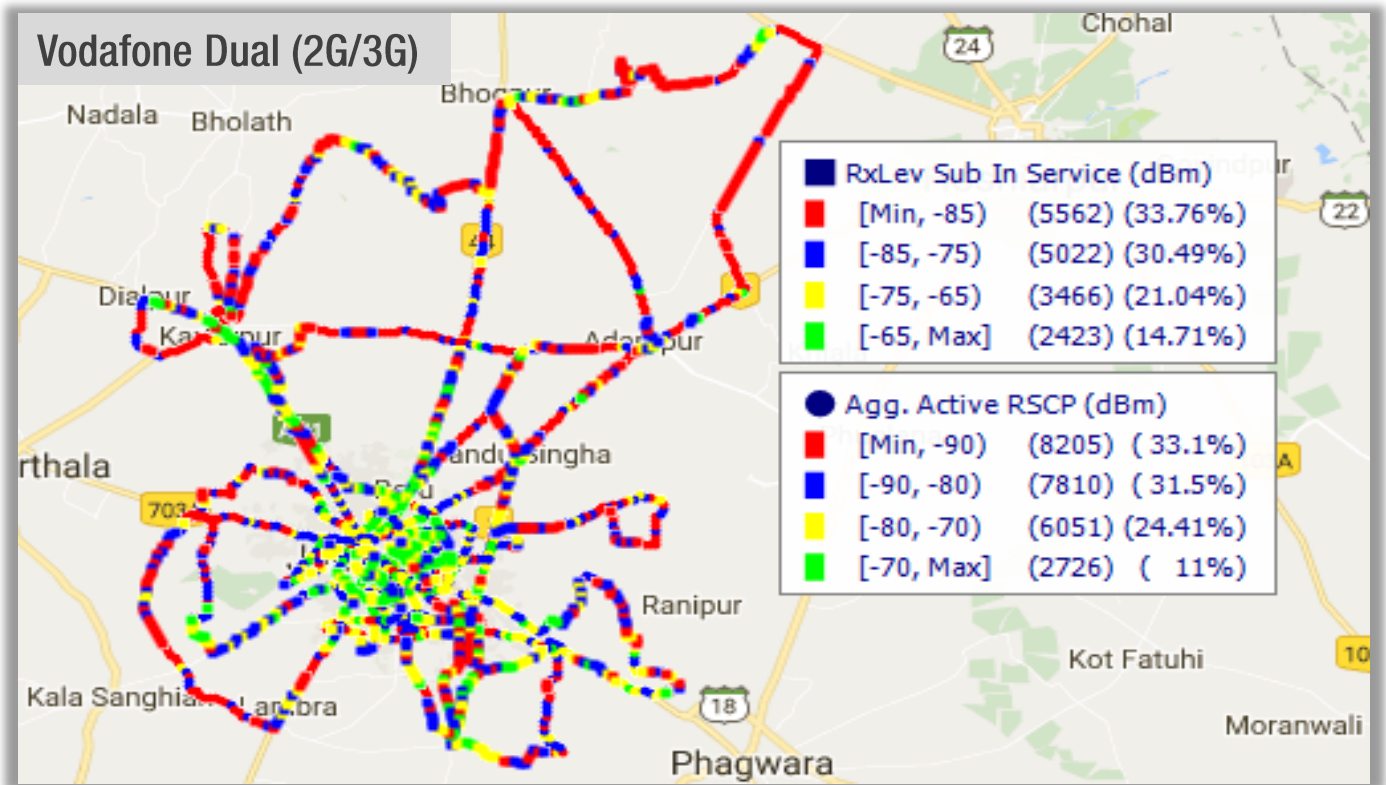
# I. Coverage Details (contd.)



# I. Coverage Details (contd.)



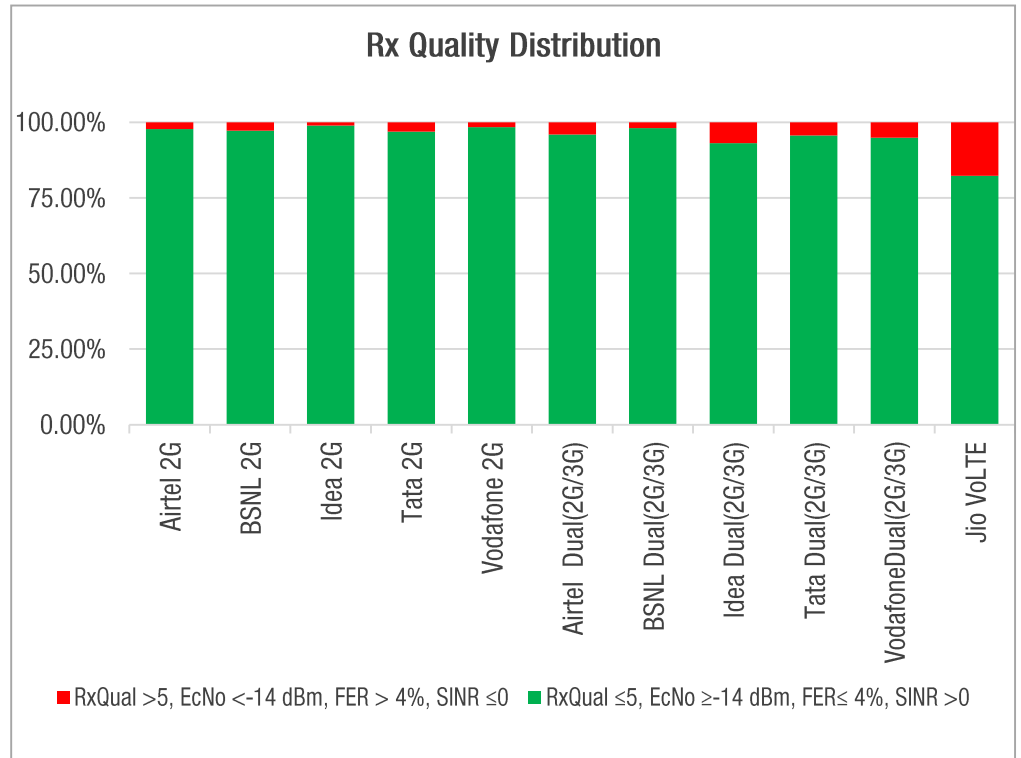
# I. Coverage Details (contd.)



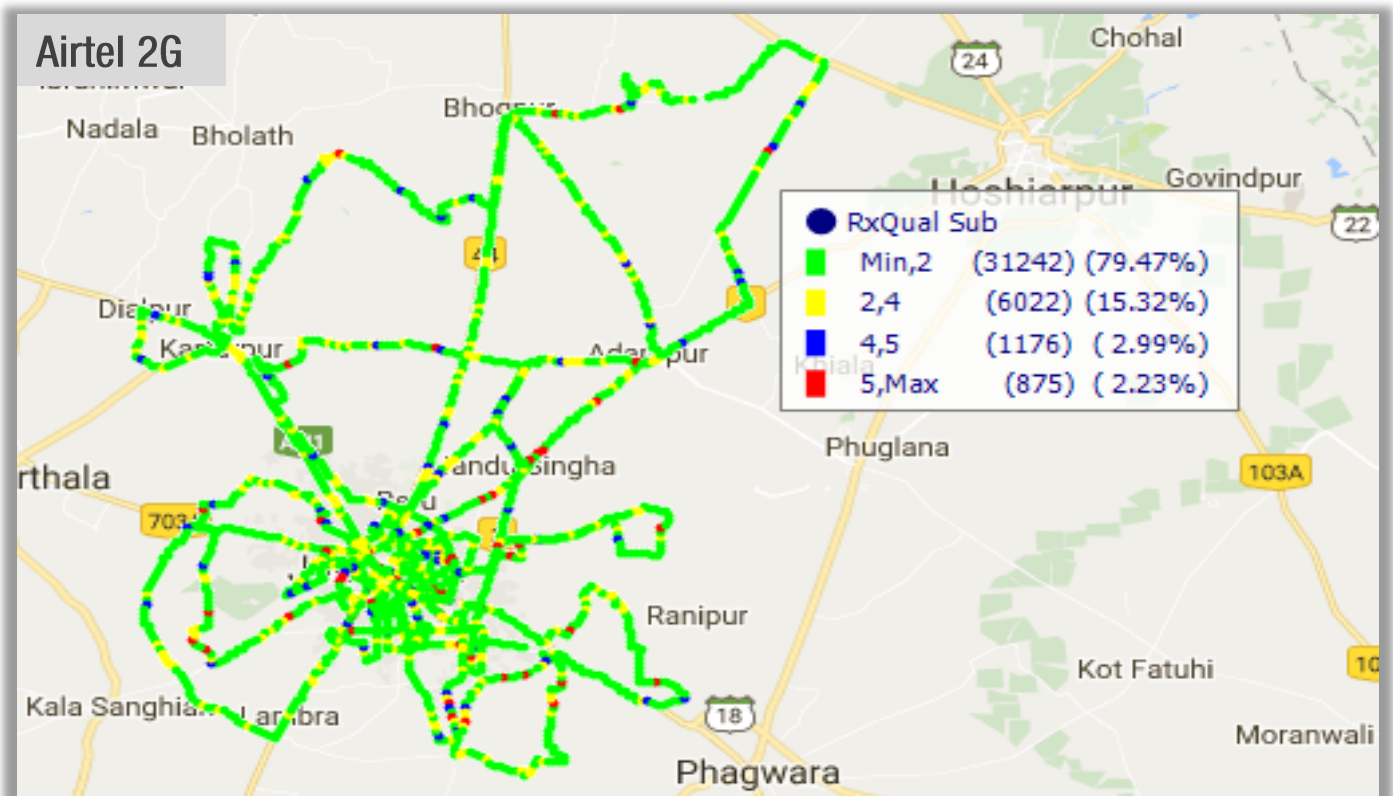
## II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual  $\leq 5$  for GSM TSPs, EcNo  $\geq -14$  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  $\geq 95\%$ .

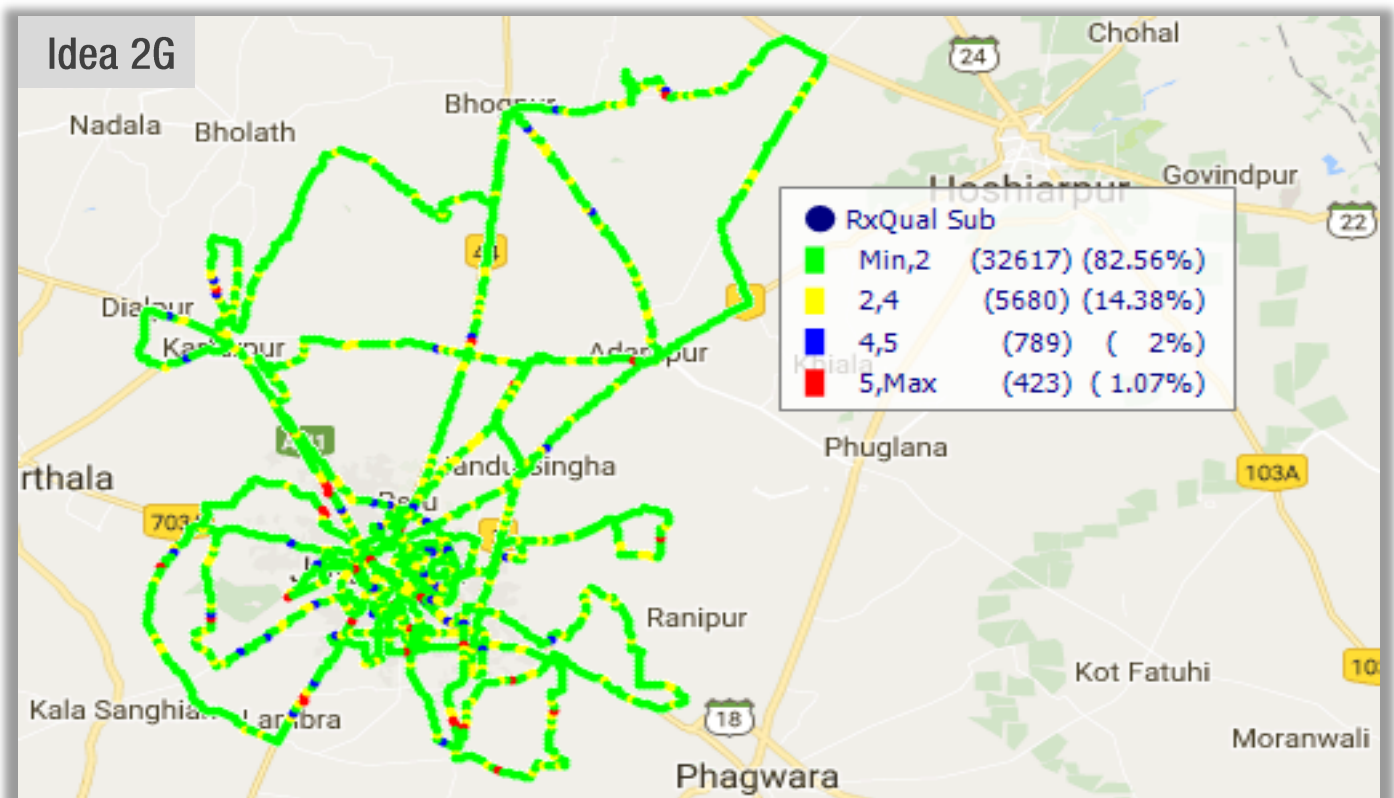
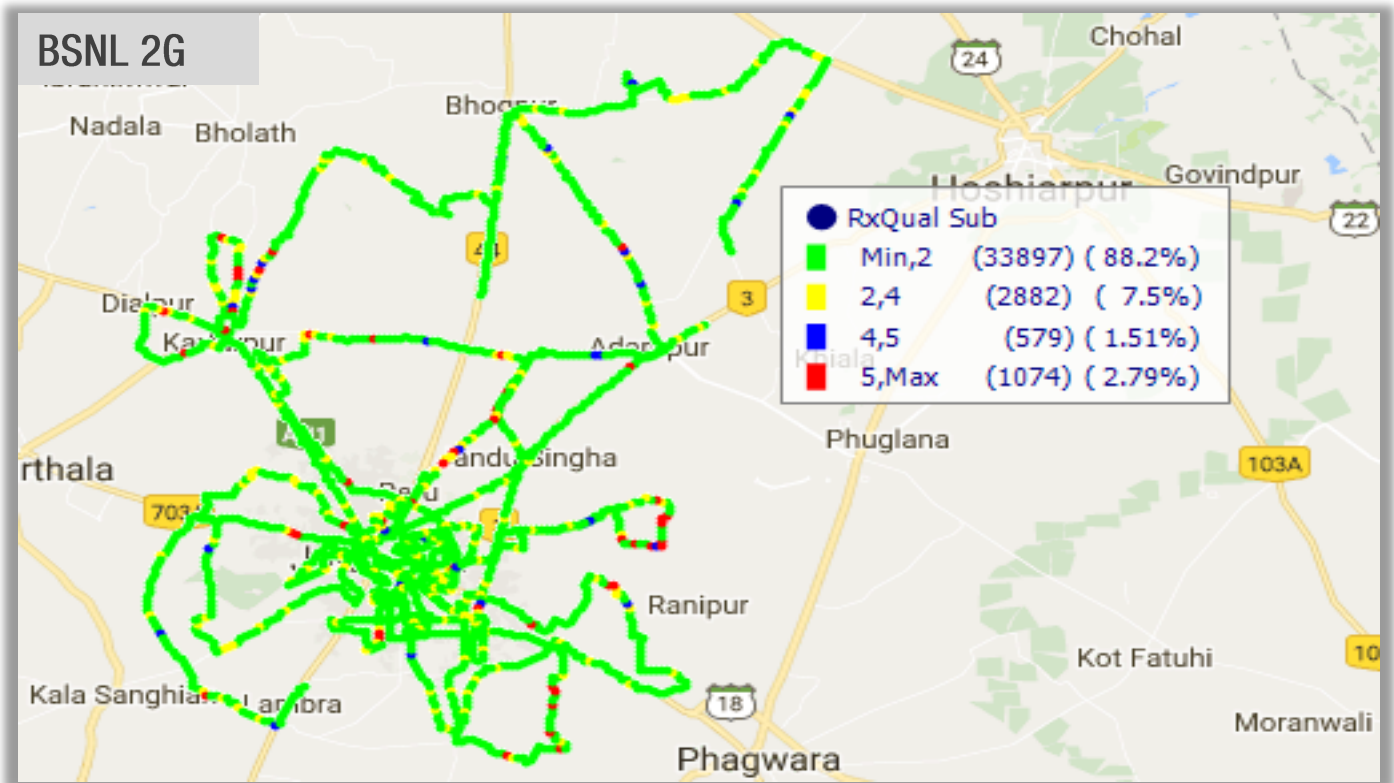
TSP	Rx Quality
Airtel 2G	97.77%
BSNL 2G	97.21%
Idea 2G	98.93%
Tata 2G	96.89%
Vodafone 2G	98.40%
Airtel Dual(2G/3G)	95.93%
BSNL Dual(2G/3G)	98.08%
Idea Dual(2G/3G)	93.07%
Tata Dual(2G/3G)	95.60%
Vodafone Dual(2G/3G)	94.96%
Jio VoLTE	82.36%



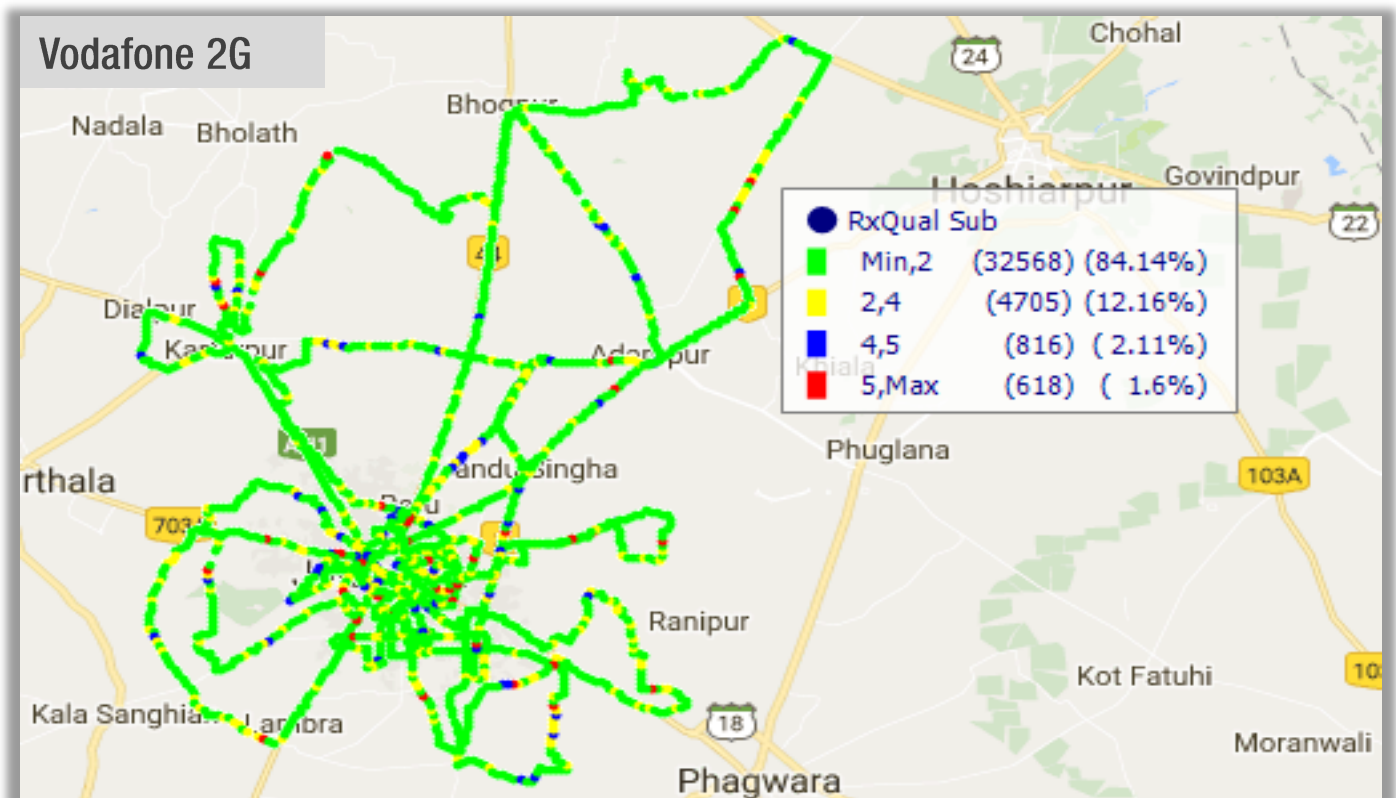
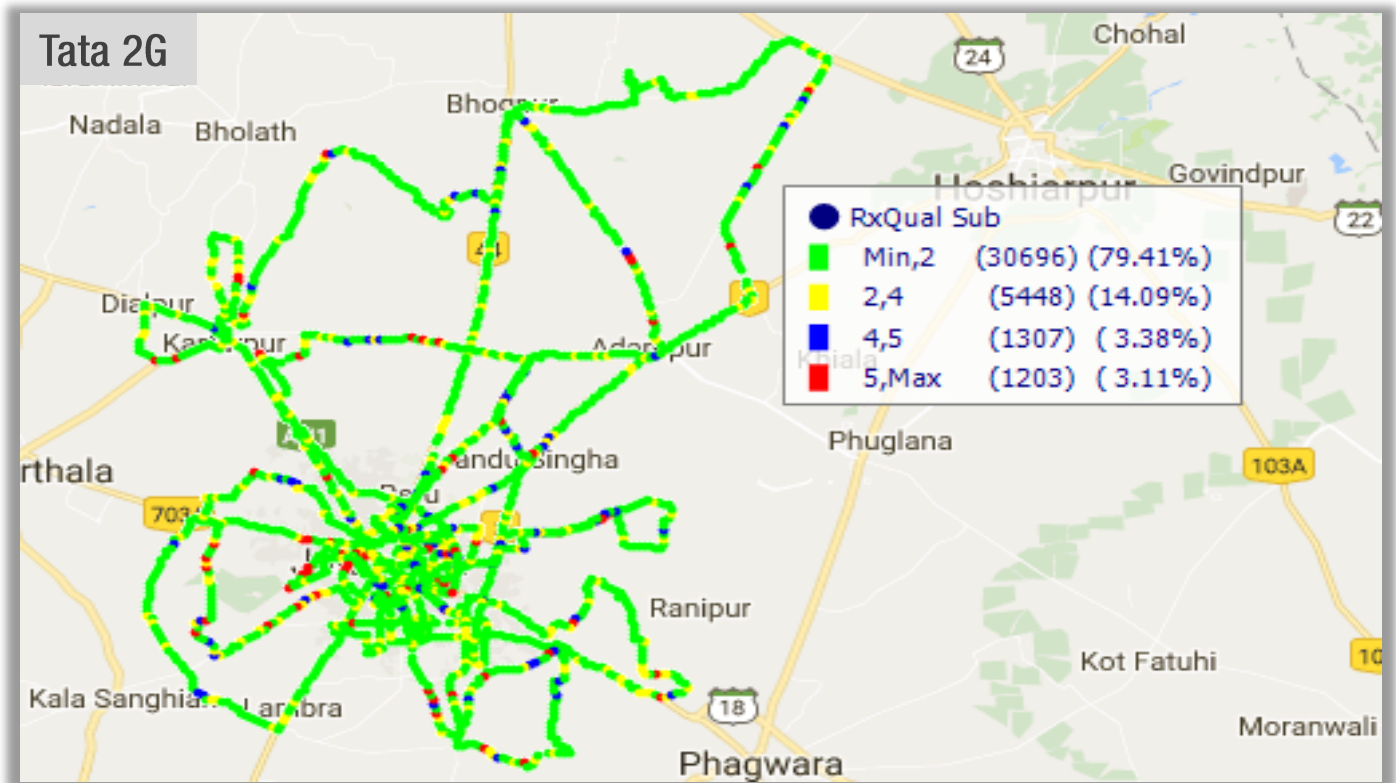
— TSPs not meeting the Benchmark



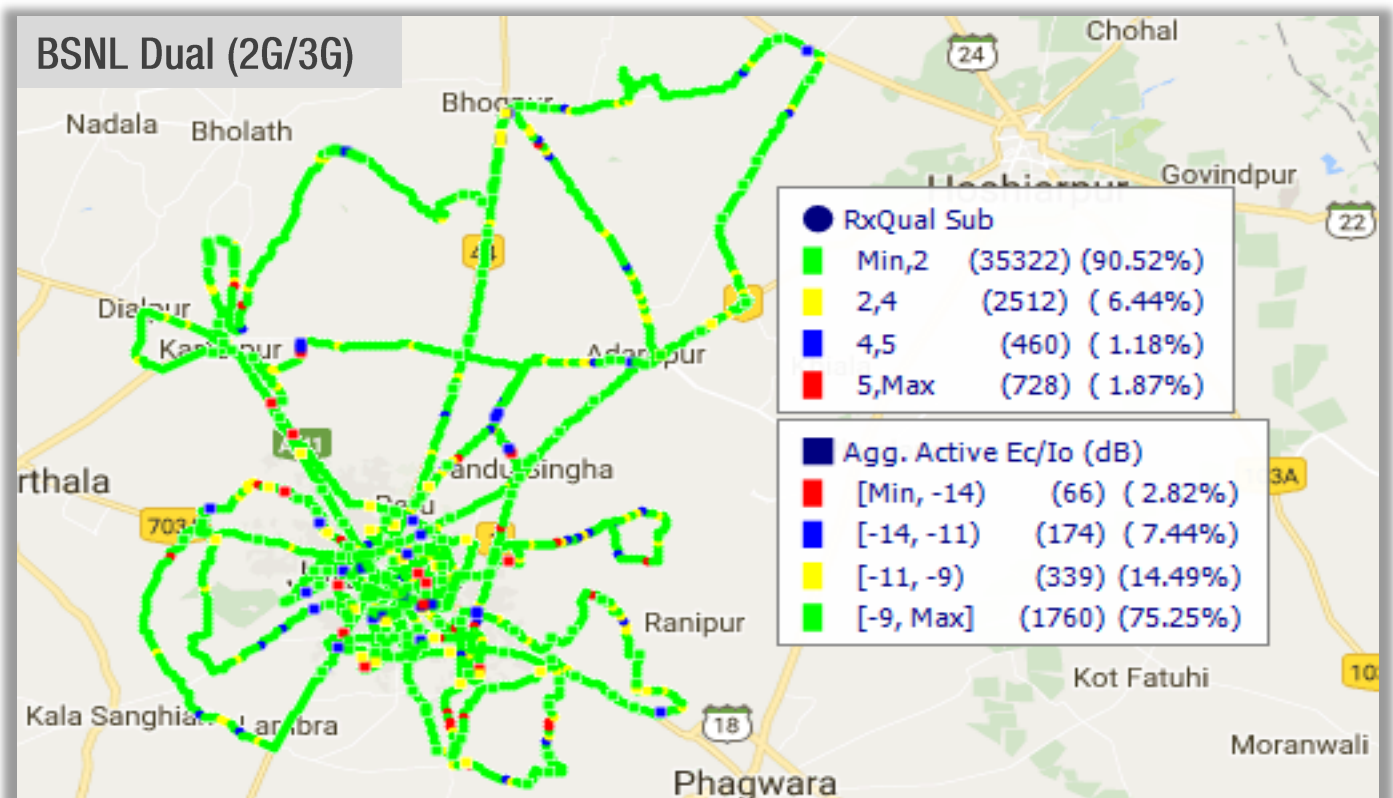
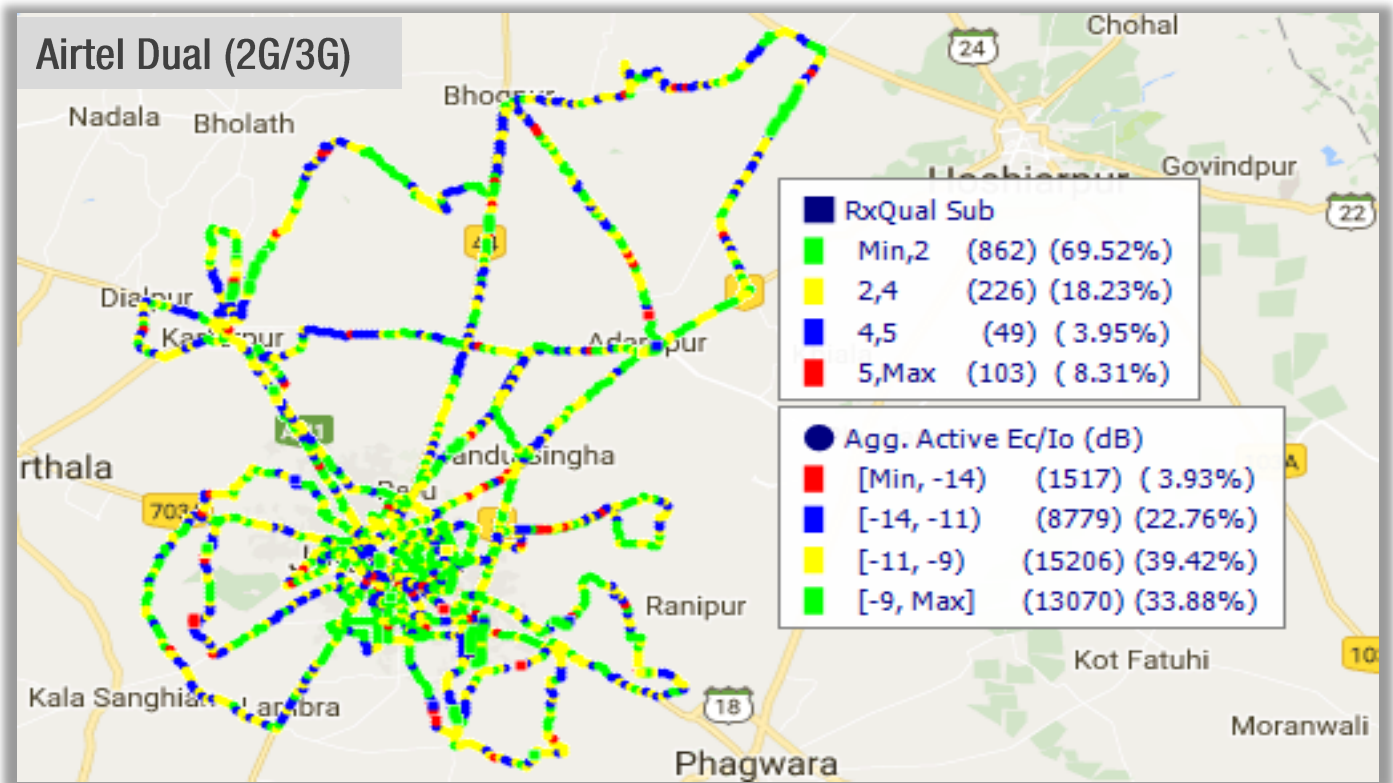
## II. Quality Details (contd.)



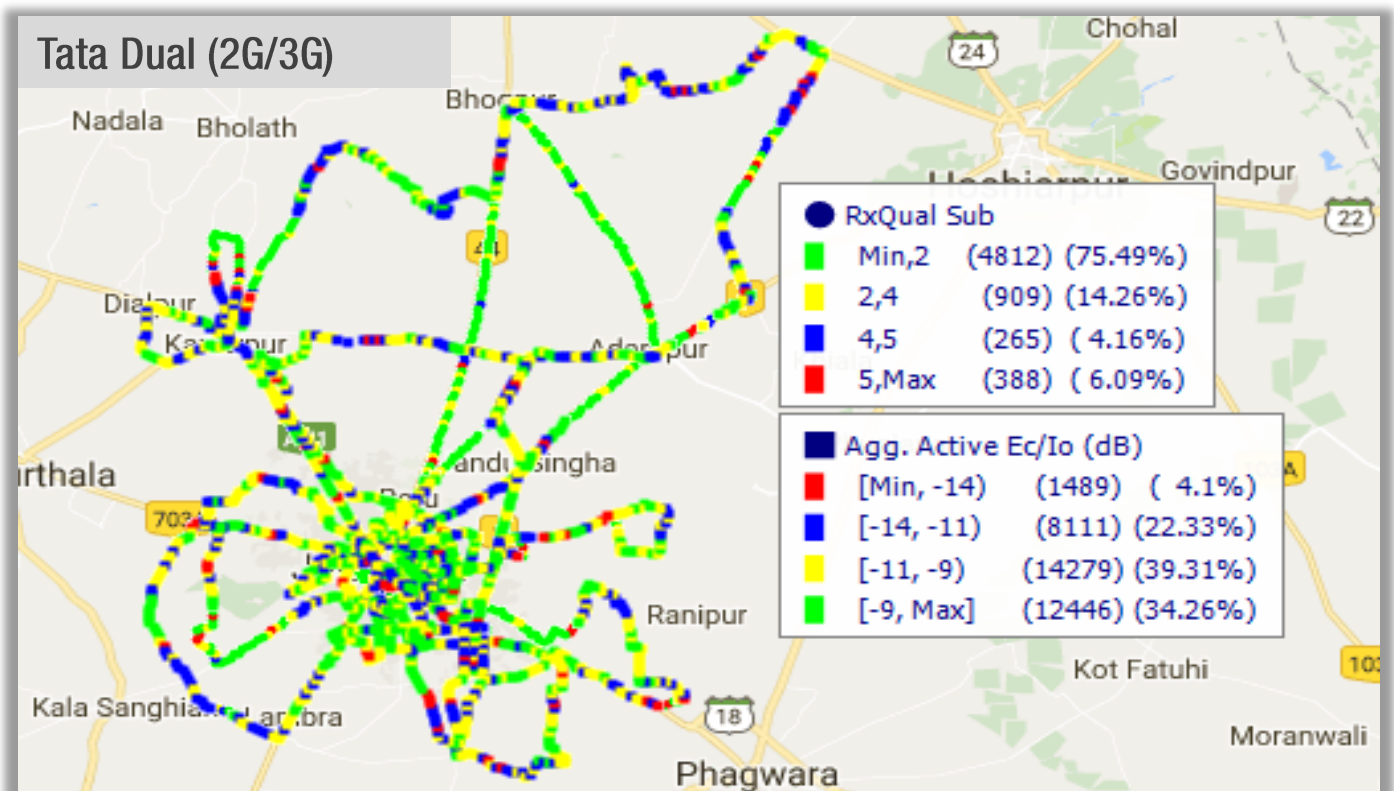
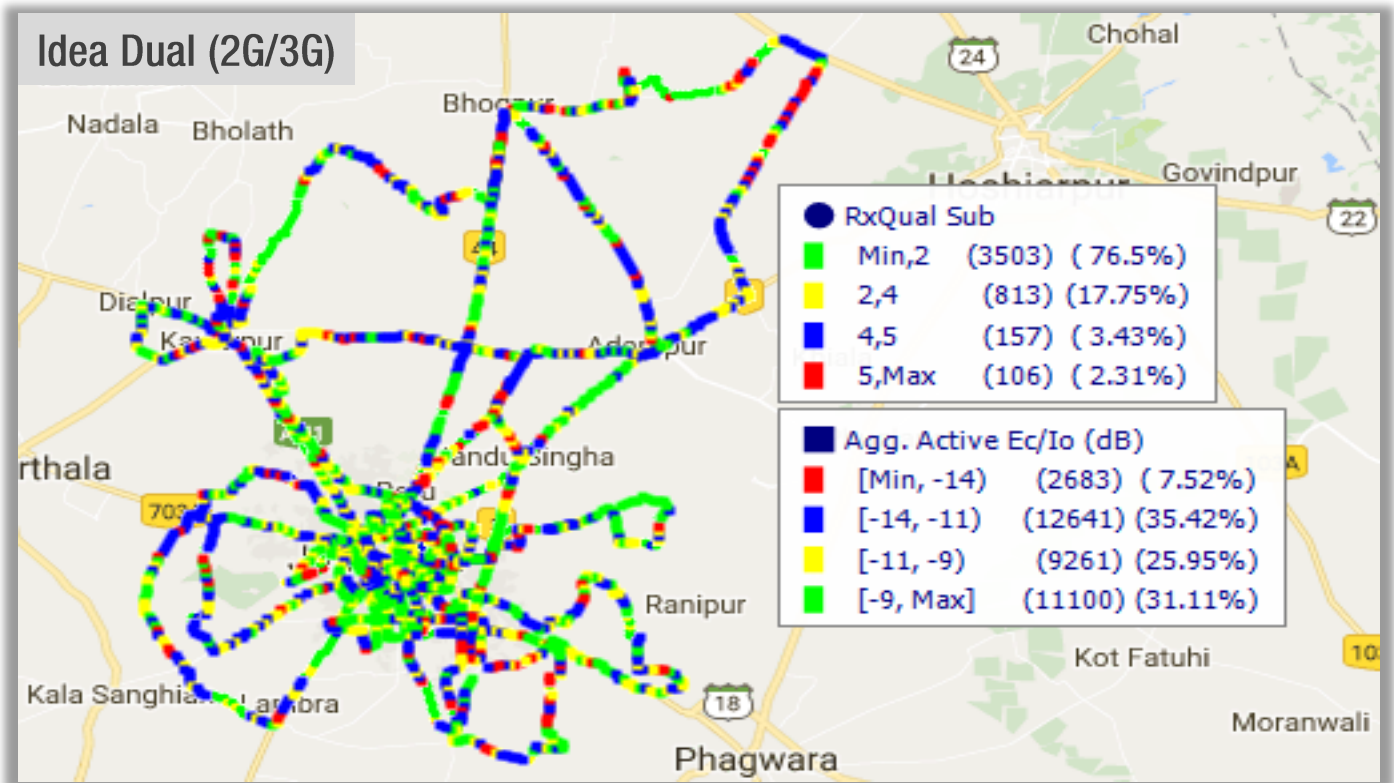
## II. Quality Details (contd.)



## II. Quality Details (contd.)

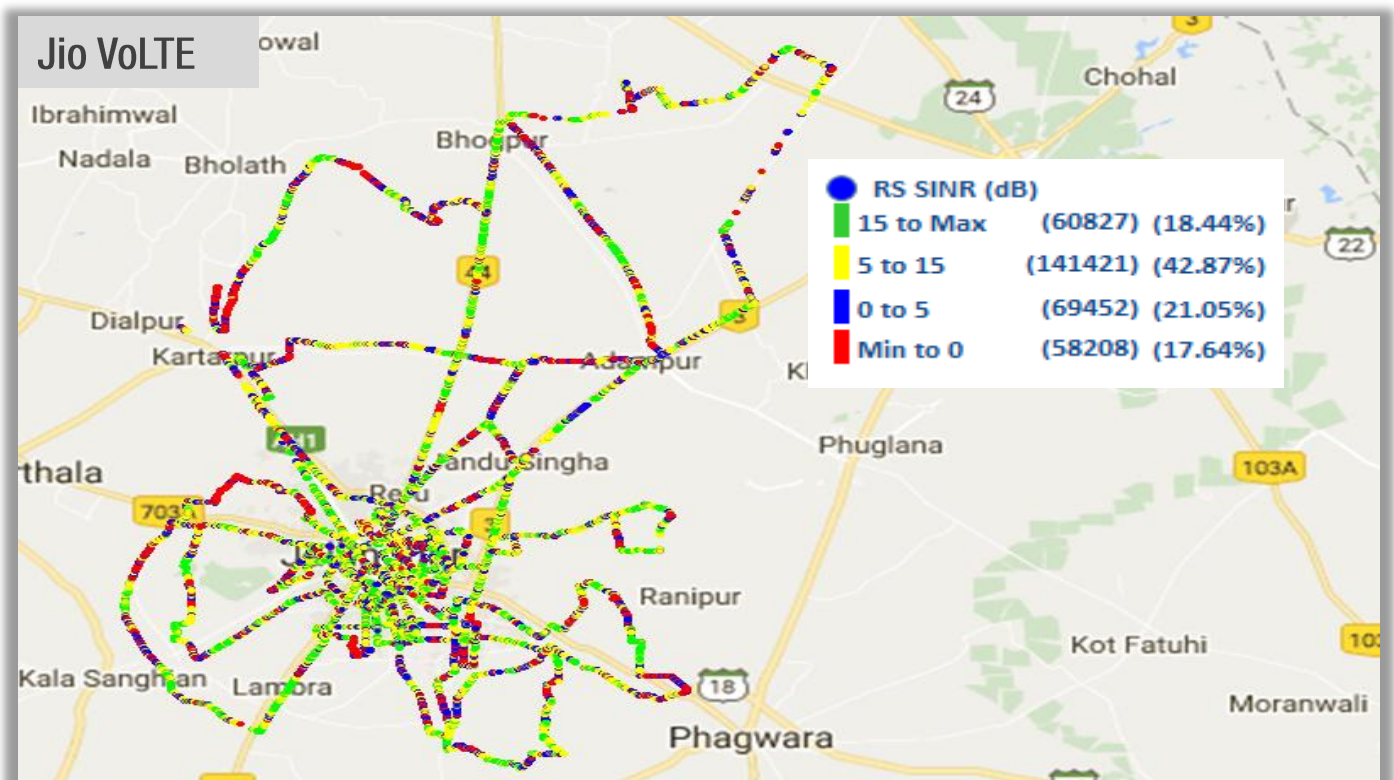
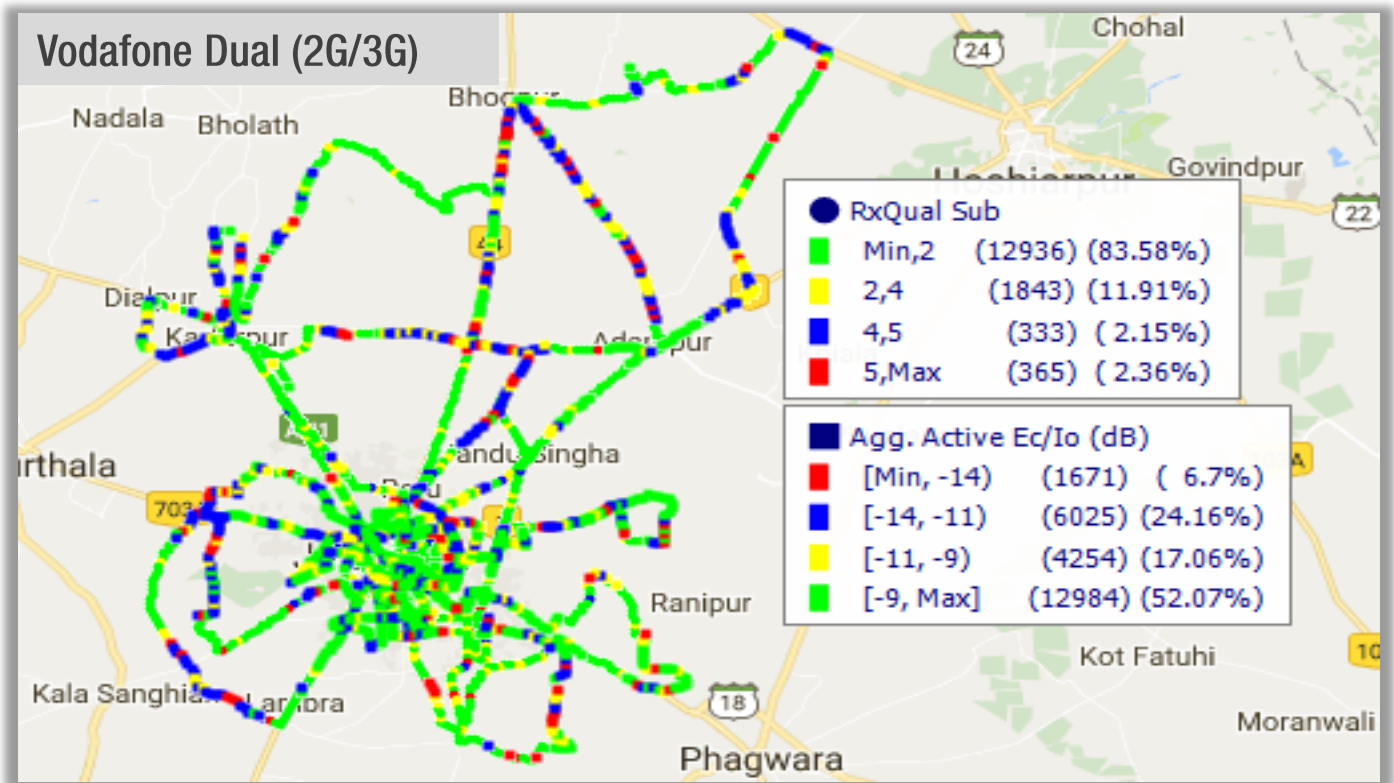


## II. Quality Details (contd.)



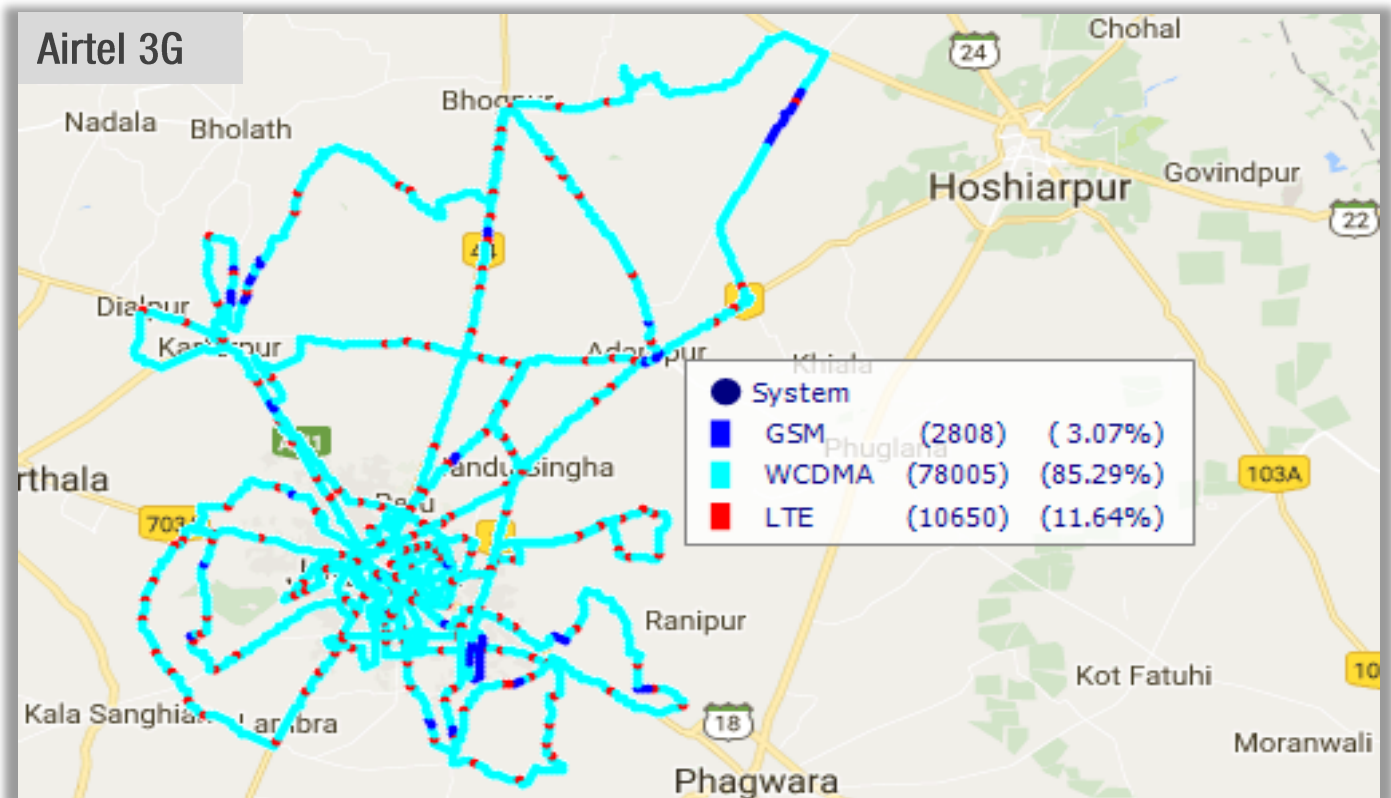
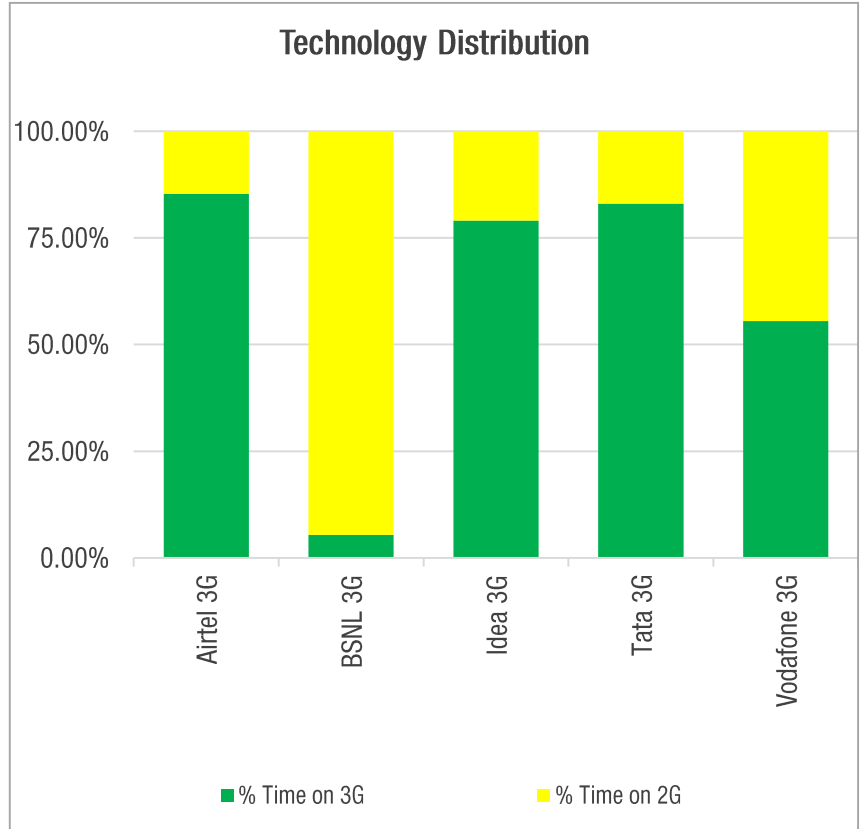


## II. Quality Details (contd.)

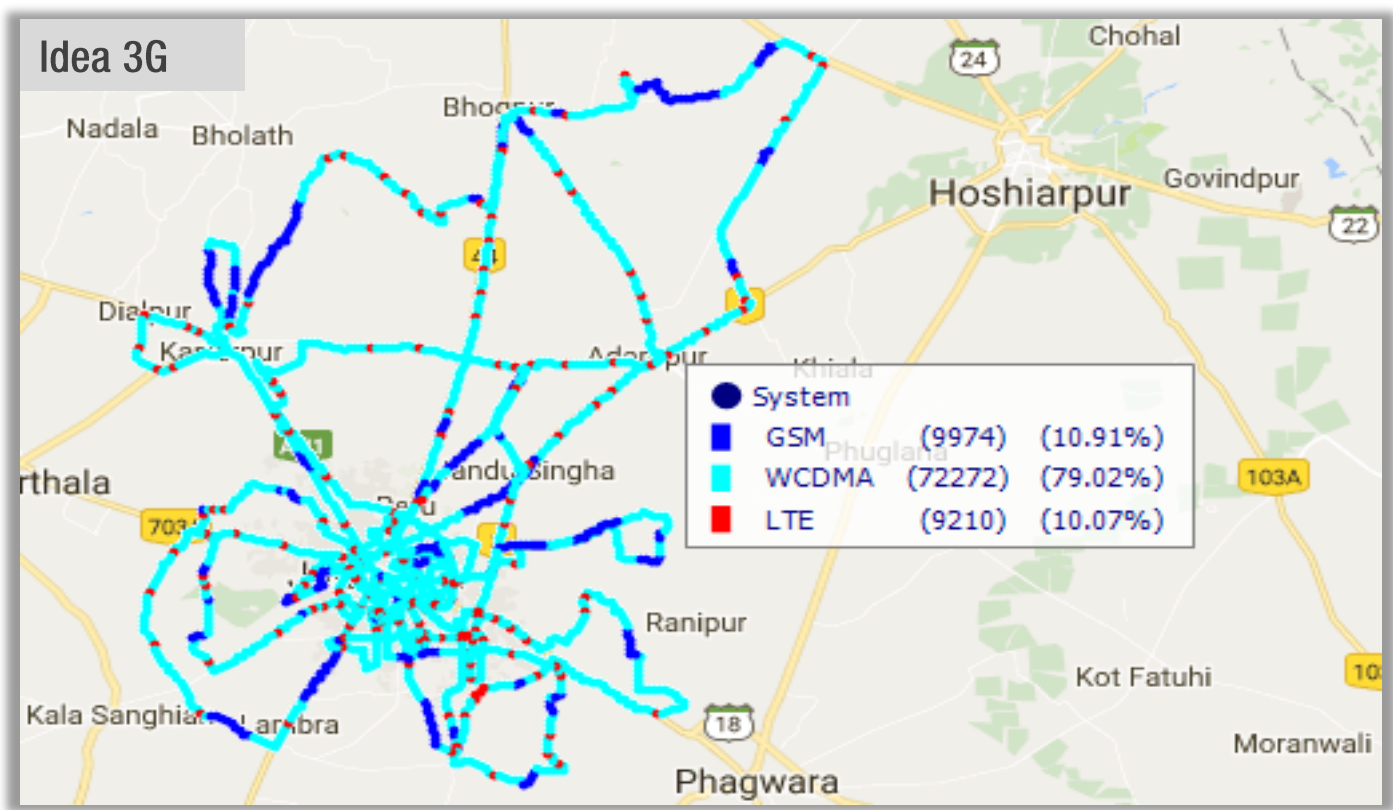
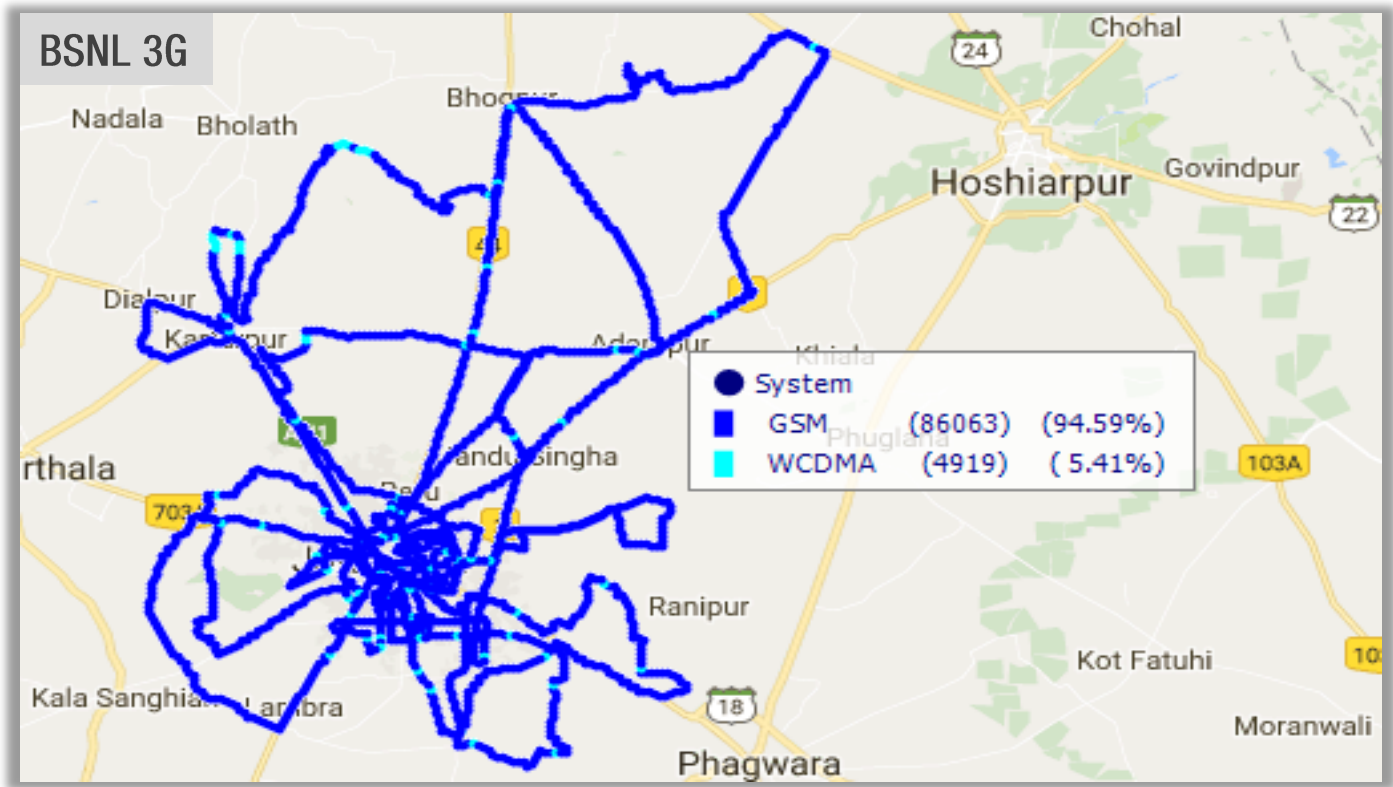


### III. Technology Details

TSP	% Time on 3G
Airtel 3G	85.29%
BSNL3G	5.41%
Idea 3G	79.02%
Tata 3G	82.98%
Vodafone 3G	55.49%



### III. Technology Details<sub>(contd.)</sub>



### III. Technology Details<sub>(contd.)</sub>

