



# INDEPENDENT DRIVE TEST REPORT

*For*

# Guwahati

JUNE

2019

EAST ZONE

**Key Performance Indicators: All TSPs have met the Drop Call Rate (DCR) benchmark of 2% except BSNL 3G . 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 Guwahati City & adjoining areas from 9:00 AM to 9:00 PM; 24<sup>th</sup> June 2019 to 28<sup>th</sup> June 2019. The drive test covered an drive route of 611 KMs & 7 hotspot over a period of five days. Approximately 978 calls were made for each of the 9 networks: three 2G networks, three 3G networks and three VoLTE network covering 4 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 24<sup>th</sup> June 2019 to 28<sup>th</sup> June 2019 covering various locations in Bhopal City & surrounding region. The performance of **Airtel, BSNL, Vodafone Idea Limited (VIL(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 Bhopal:

Independent Drive test was conducted for a period of five days from 24<sup>th</sup> June 2019 to 28<sup>th</sup> June 2019 in Bhopal 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 611 KMs over a period of four days from 25<sup>th</sup> June 2019 to 28<sup>th</sup> June 2019. Approximately 978 calls were made for each of the 9 networks: three 2G (Lock Mode) networks, three 3G (Dual mode) networks and three VoLTE network covering 4 unique TSPs.

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

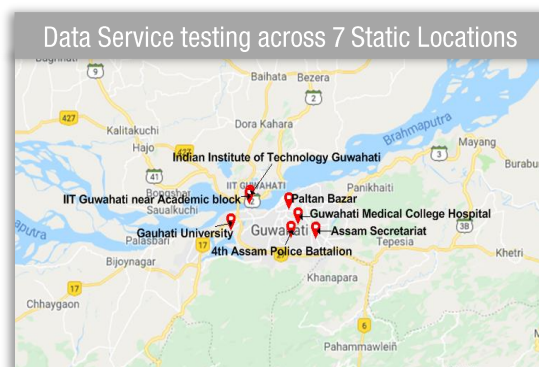
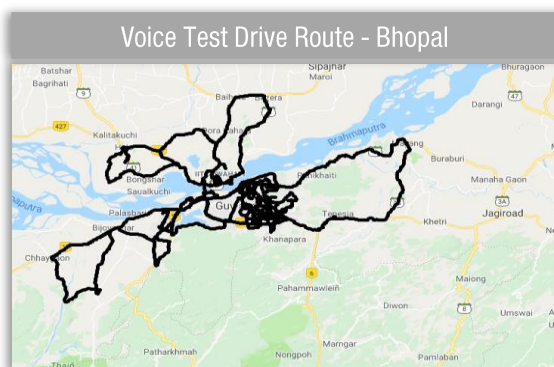
**Data Tests:** Data Tests were performed at 7 static locations for one day on 24<sup>th</sup> June 2019 ; three 2G (Lock mode) networks, three 3G (Dual mode) networks and three 4G (Free mode) networks covering 4 unique TSPs were tested.

\* 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.

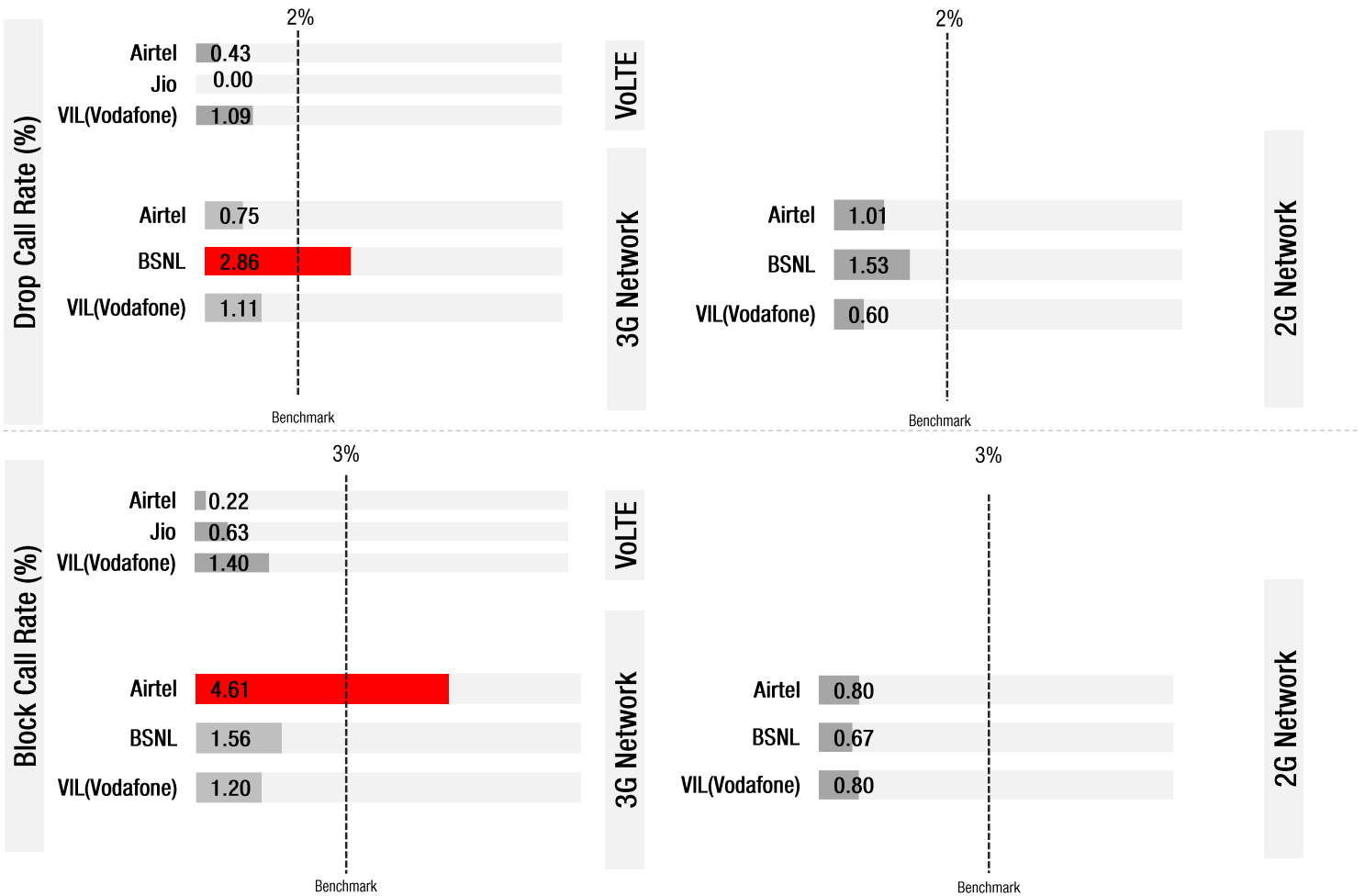
Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Video Streaming	130 sec clip
Latency	32 Bytes on www.google.com



# Voice Calls

## Key Observations

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



KPI	2G Networks		
	Airtel	BSNL	VIL(Vodafone)
SDCCH Congestion(<=1%)	0.30%	0.19%	0.20%
TCH Congestion (<=2%)	0.50%	0.48%	0.60%

KPI	3G Networks		
	Airtel	BSNL	VIL(Vodafone)
CSFB Failure %	0.41%	0.00%	0.00%
SDCCH Congestion%	0.10%	0.83%	0.10%
RRC Congestion%	3.48%	0.31%	0.80%
SDCCH & RRC Congestion(<=1%)	3.58%	1.14%	0.90%
TCH Congestion %	0.31%	0.21%	0.10%
RAB Congestion %	0.31%	0.21%	0.20%
TCH & RAB Congestion (<=2%)	0.62%	0.42%	0.30%

- a) All TSPs have met the 2% QoS benchmark of Drop Call Rate (DCR%) except BSNL 3G.
- b) Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's except Airtel 3G.

\*VIL= (Idea, Vodafone)

\*NA = Not Applicable

Not meeting Benchmark

# Voice Calls

## Key Observations

### Coverage

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

TSPs	2G		
	Airtel	BSNL	VIL(Vodafone)
Coverage%	78.02%	83.55%	82.02%

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

TSPs	3G			VoLTE		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Coverage %	85.30%	79.65%	85.59%	92.03%	93.76%	86.35%

c) Percentage of time spent on 3G network:

TSPs	3G		
	Airtel	BSNL	VIL(Vodafone)
Time Spent on 3G%	71.01	19.09%	67.07%

d) Percentage of RLT  $\geq$ 48:

TSPs	2G		
	Airtel	BSNL	VIL(Vodafone)
%RLT $\geq$ 48	0.00%	1.57%	0.00%

e) Average CST Second

TSPs	2G		
	Airtel	BSNL	VIL(Vodafone)
(Sec.)	2.83	2.41	2.57

TSPs	3G			VOLTE		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
(Sec.)	5.50	2.24	3.19	1.94	0.61	2.23

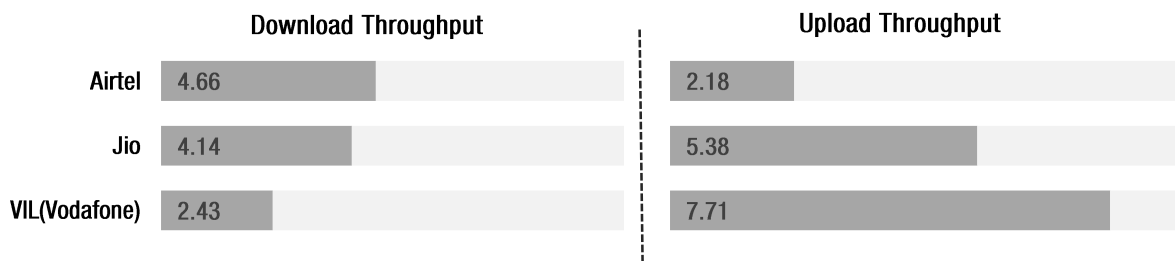
# Data Services Static

## Key Observations

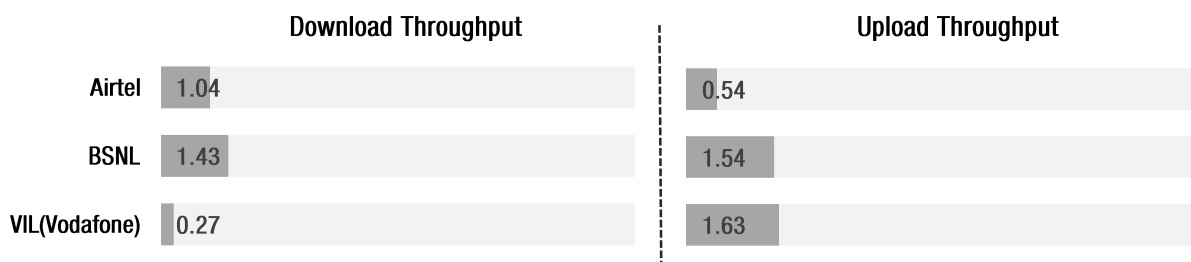
Data was tested at 7 locations .Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

### Data Download and Upload Performance (Mbps)

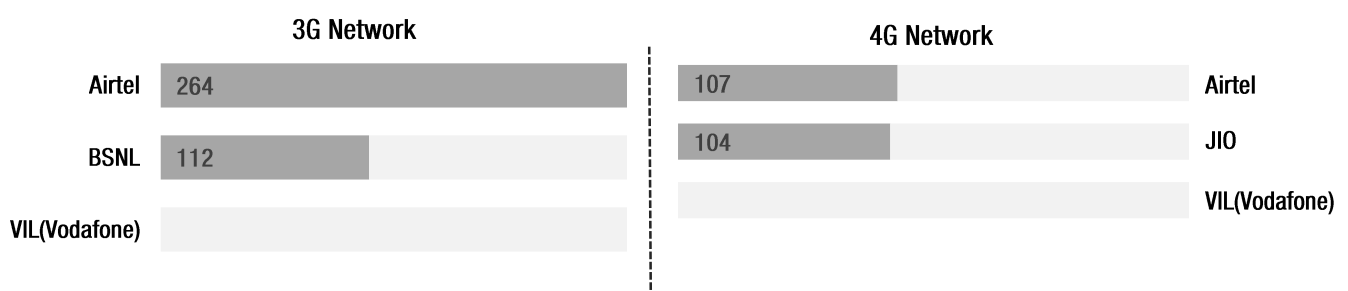
#### 4G Network:



#### 3G Network:



### Latency (msec)

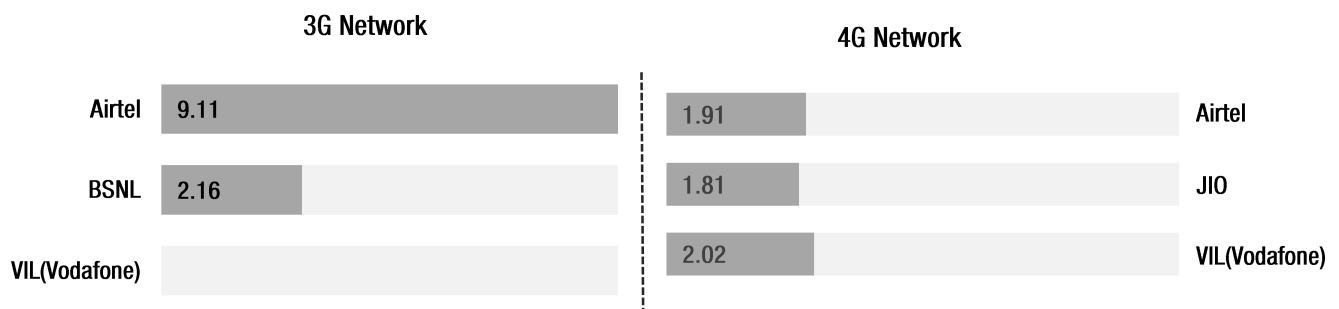


# Data Services Static

## Key Observations

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

Streaming (sec)

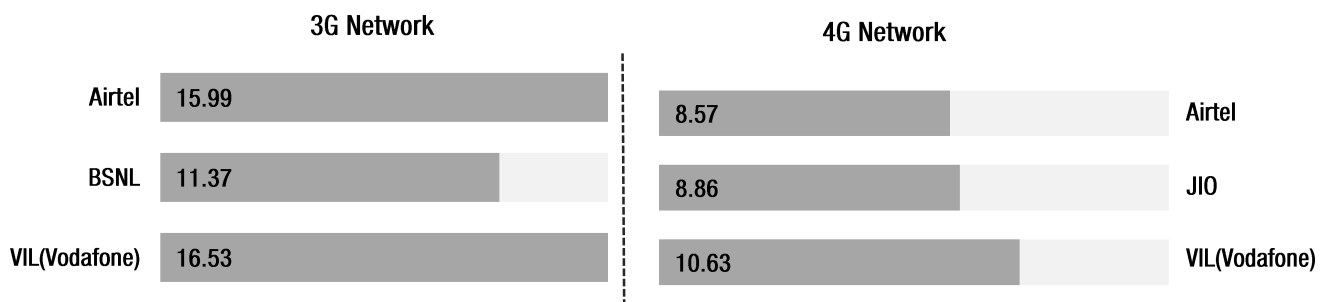


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

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

Video Streaming	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Avg. Initial Start Time (sec)	9.11	2.16	0.00	1.91	1.81	2.02
Avg. Interruption Time (sec)	0.00	0.00	0.00	0.00	0.00	0.00

### Web Page Download Time (sec)



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

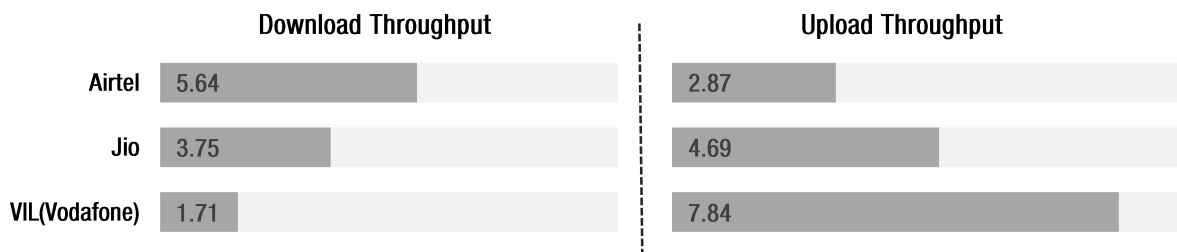
# Data Services Dynamic

## Key Observations

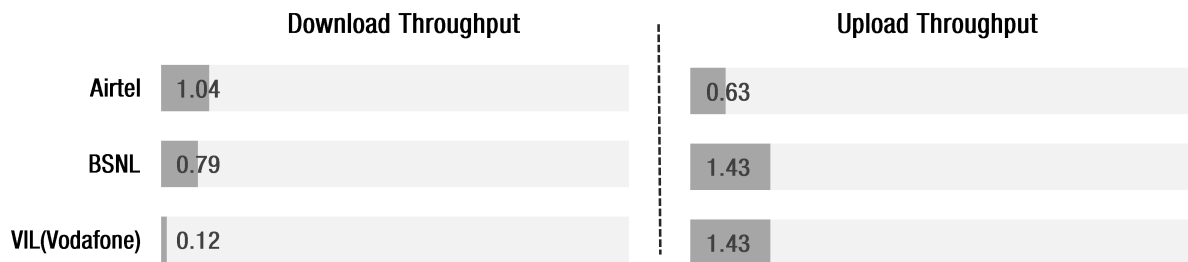
Data was tested between one location to another location .Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

### Data Download and Upload Performance (Mbps)

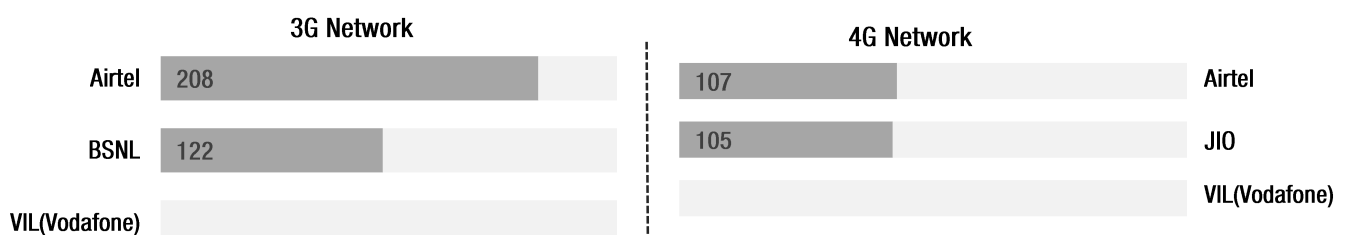
#### 4G Network:



#### 3G Network:



### Latency (msec)

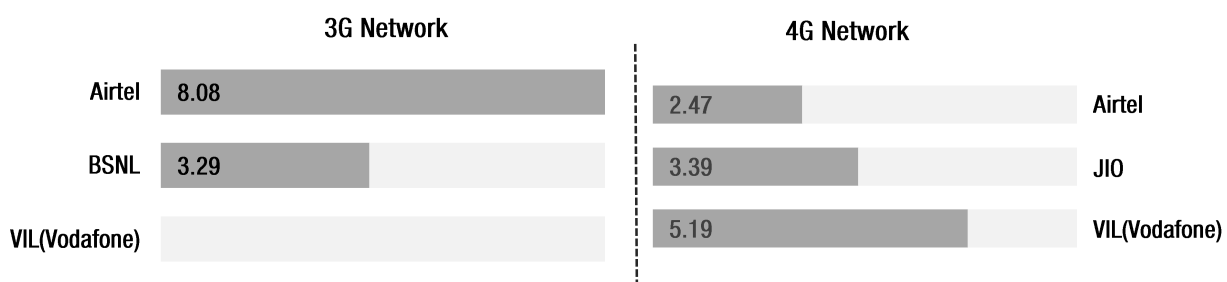


# Data Services Dynamic

## Key Observations

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

Streaming (sec)

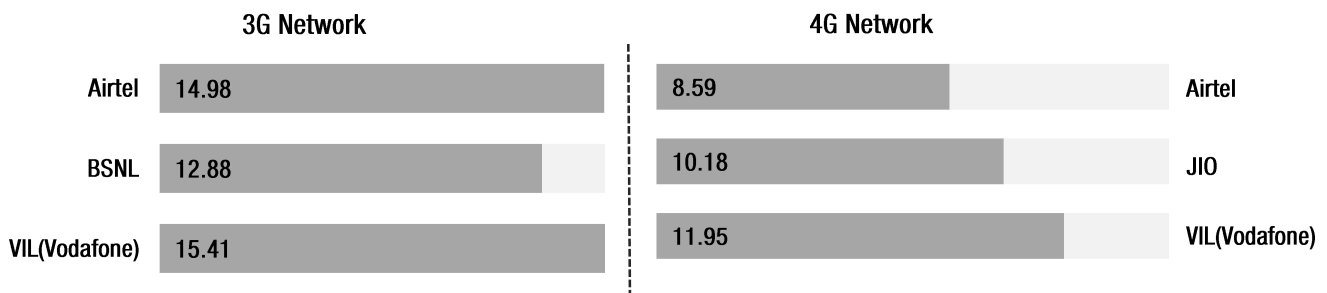


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

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

Video Streaming	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Avg. Initial Start Time (sec)	8.08	3.29	0.00	2.47	3.39	5.19
Avg. Interruption Time (sec)	0.00	0.00	0.00	0.00	0.00	0.00

### 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	VIL(Vodafone)
Call Attempt	1001	1052	1006
Blocked Call Rate (%)	0.80%	0.67%	0.80%
CSSR% (Accessibility)	99.20%	99.33%	99.20%
Drop Call Rate (%)	1.01%	1.53%	0.60%
Mobility HOSR (%)	96.85%	95.18%	97.63%
Rx Quality (%)	96.03%	96.72%	95.12%

Voice Call	3G			VoLTE		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Call Attempt	977	960	1002	924	953	930
Blocked Call Rate (%)	4.61%	1.56%	1.20%	0.22%	0.63%	1.40%
CSSR% (Accessibility)	95.39%	98.44%	98.80%	99.78%	99.37%	98.60%
Drop Call Rate (%)	0.75%	2.86%	1.11%	0.43%	0.00%	1.09%
Mobility HOSR (%)	99.87%	94.91%	99.78%	99.85%	99.38%	99.90%
Rx Quality (%)	94.96%	95.98%	87.81%	78.05%	80.67%	77.48%

# Summary

## City Level Summary(contd.)

Data Services Static	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	90.13	140.53	123.02
Upload Throughput (kbps)	44.17	62.00	49.09
Web Browsing Delay (sec)	18.50	17.62	16.47
Latency (msec)	333	239	T0

Data Services Static	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	1.04	1.43	0.27	4.66	4.14	2.43
Upload Throughput (Mbps)	0.54	1.54	1.63	2.18	5.38	7.71
Web Browsing Delay (sec)	15.99	11.37	16.53	8.57	8.86	10.63
Video Streaming Delay (sec)	9.11	2.16	T0	1.91	1.81	2.02
Latency (msec)	264	112	T0	107	104	T0

Data Services Dynamic	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	1.04	0.79	0.12	5.64	3.75	1.71
Upload Throughput (Mbps)	0.63	1.43	1.43	2.87	4.69	7.84
Web Browsing Delay (sec)	14.98	12.88	15.41	8.59	10.18	11.95
Video Streaming Delay (sec)	8.08	3.29	T0	2.47	3.39	5.19
Latency (msec)	208	122	T0	107	105	T0

\*T0=Timeout

# Summary

## City Level Summary(contd.)

4th Assam Police Battalion	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	T0	130.05	T0
Upload Throughput (kbps)	T0	72.47	T0
Web Browsing Delay (sec)	11.40	17.13	T0
Latency (msec)	T0	194	T0

4th Assam Police Battalion	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	0.08	0.82	0.16	5.53	7.14	0.93
Upload Throughput (Mbps)	0.62	1.70	2.47	1.71	8.14	11.12
Web Browsing Delay (sec)	19.43	15.76	13.90	7.56	8.22	8.84
Video Streaming Delay (sec)	T0	3.21	T0	1.28	0.91	0.98
Latency (msec)	286	123	T0	98	98	T0

Assam Secretariat	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	97.67	151.41	153.59
Upload Throughput (kbps)	T0	65.29	57.83
Web Browsing Delay (sec)	18.31	16.86	18.00
Latency (msec)	T0	230	T0

Assam Secretariat	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	0.28	1.63	0.15	3.67	5.05	5.03
Upload Throughput (Mbps)	0.59	1.60	2.02	1.06	9.37	9.05
Web Browsing Delay (sec)	18.42	13.23	17.82	9.12	7.87	7.79
Video Streaming Delay (sec)	9.78	1.99	T0	2.91	1.74	1.38
Latency (msec)	396	82	T0	103	105	T0

\*T0=Timeout

# Summary

## City Level Summary(contd.)

Guwahati University	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	22.07	109.35	52.23
Upload Throughput (kbps)	6.67	51.01	37.94
Web Browsing Delay (sec)	19.35	18.54	10.99
Latency (msec)	512	195	T0

Guwahati University	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	0.16	0.30	0.16	1.64	4.72	0.72
Upload Throughput (Mbps)	0.13	1.25	0.73	0.20	4.68	3.13
Web Browsing Delay (sec)	22.37	7.12	8.91	10.06	8.18	12.21
Video Streaming Delay (sec)	17.93	T0	T0	3.72	1.61	6.04
Latency (msec)	200	T0	T0	120	120	T0

Guwahati Medical College Hospital	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	113.75	121.00	163.13
Upload Throughput (kbps)	37.78	56.35	63.24
Web Browsing Delay (sec)	20.84	16.59	14.83
Latency (msec)	333	275	T0

Guwahati Medical College Hospital	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	2.36	2.25	0.26	6.66	3.65	1.40
Upload Throughput (Mbps)	0.62	1.85	1.35	3.73	3.57	8.50
Web Browsing Delay (sec)	12.10	10.43	15.75	9.32	9.04	11.87
Video Streaming Delay (sec)	6.18	1.59	T0	1.38	2.54	1.76
Latency (msec)	248	96	T0	112	102	T0

\*T0=Timeout

# Summary

## City Level Summary(contd.)

IIT Guwahati near Academic block	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	84.32	TO	94.96
Upload Throughput (kbps)	46.17	TO	35.55
Web Browsing Delay (sec)	17.48	TO	21.26
Latency (msec)	217	TO	TO

IIT Guwahati near Academic block	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	1.10	1.14	0.09	5.85	2.12	4.19
Upload Throughput (Mbps)	0.30	1.14	1.68	3.39	6.33	2.44
Web Browsing Delay (sec)	13.29	9.54	18.88	7.09	9.53	12.09
Video Streaming Delay (sec)	9.06	1.93	TO	0.90	1.29	1.18
Latency (msec)	367	118	TO	99	130	TO

Indian Institute of Technology Guwahati	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	90.76	TO	87.49
Upload Throughput (kbps)	61.05	TO	37.81
Web Browsing Delay (sec)	19.85	TO	14.29
Latency (msec)	362	TO	TO

Indian Institute of Technology Guwahati	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	1.07	0.73	0.19	6.91	5.24	2.39
Upload Throughput (Mbps)	0.70	1.01	1.56	3.77	2.77	13.91
Web Browsing Delay (sec)	13.74	9.20	19.13	6.80	8.94	10.39
Video Streaming Delay (sec)	7.97	1.54	TO	1.44	2.35	0.90
Latency (msec)	185	173	TO	109	87	TO

\*TO=Timeout

# Summary

## City Level Summary(contd.)

Paltan Bazar	2G		
	Airtel	BSNL	VIL(Vodafone)
Download Throughput (Kbps)	T0	180.46	163.09
Upload Throughput (kbps)	T0	61.21	62.18
Web Browsing Delay (sec)	14.67	19.51	17.66
Latency (msec)	T0	274	T0

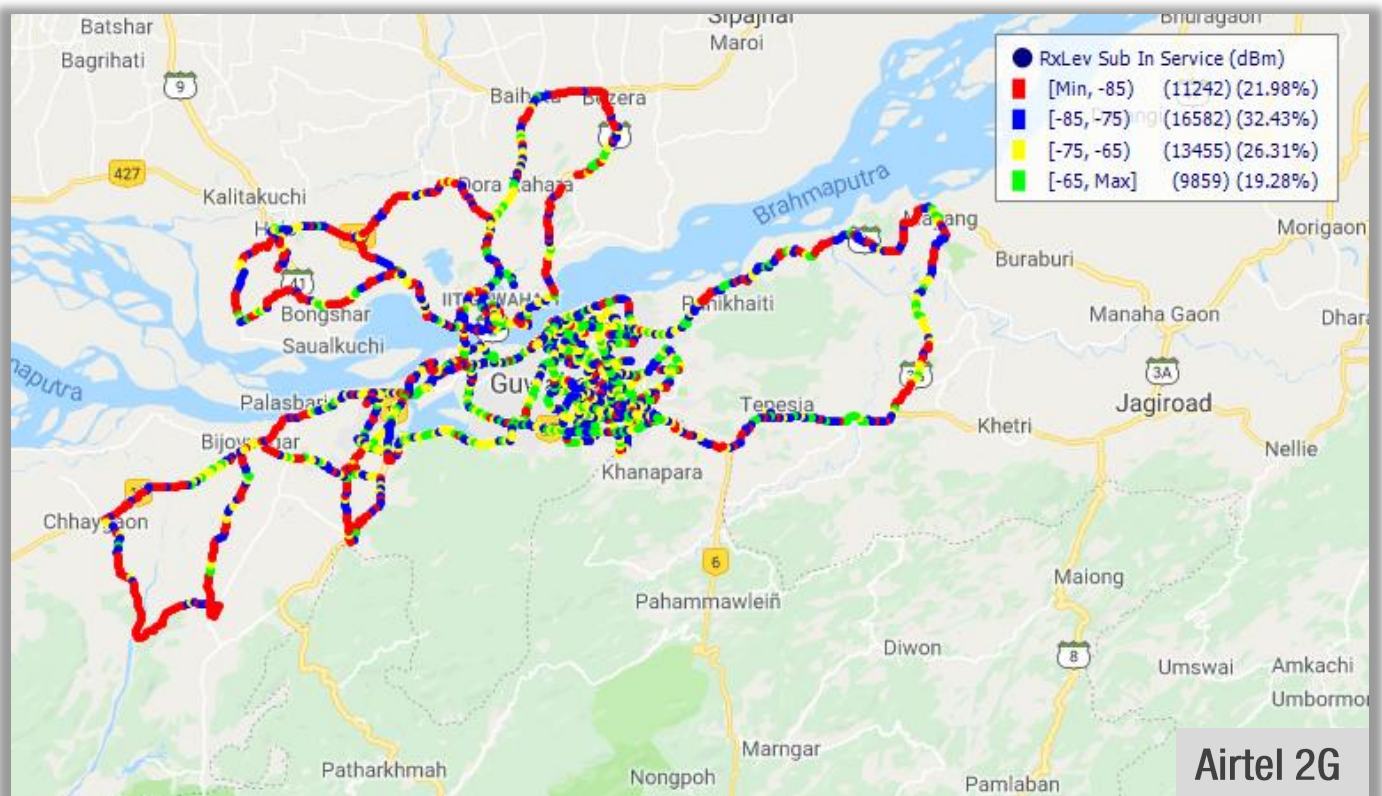
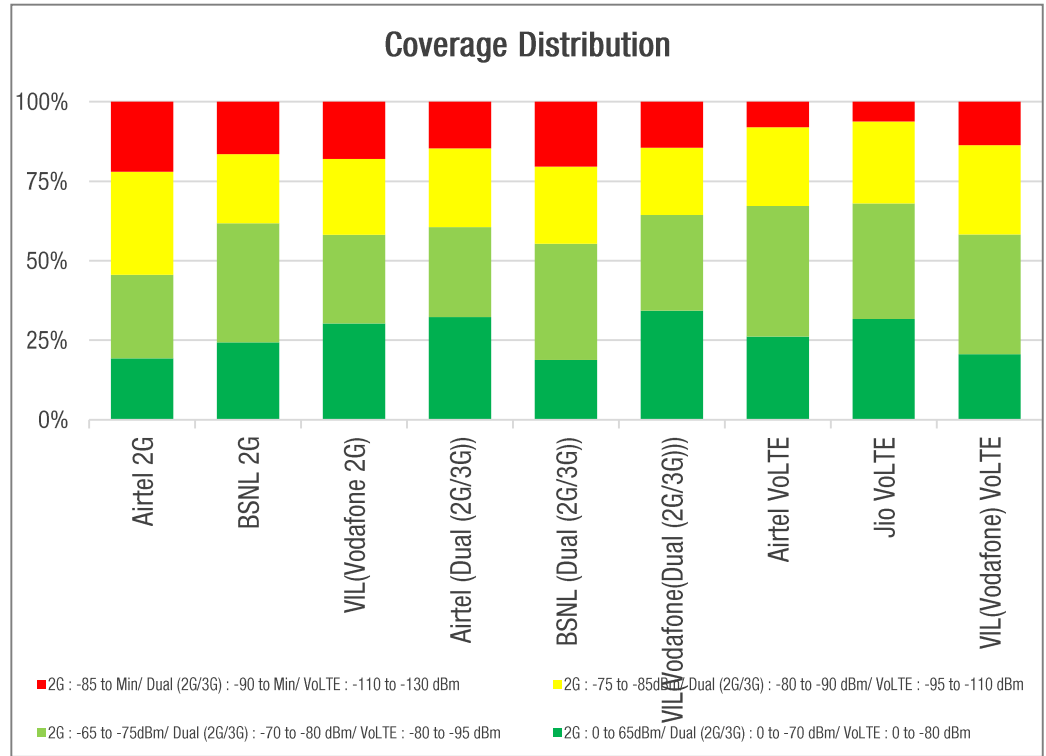
Paltan Bazar	3G			4G		
	Airtel	BSNL	VIL(Vodafone)	Airtel	Jio	VIL(Vodafone)
Download Throughput (Mbps)	1.96	2.78	0.65	2.37	2.84	2.31
Upload Throughput (Mbps)	0.67	2.25	1.67	1.54	3.98	7.88
Web Browsing Delay (sec)	12.90	12.08	16.45	10.05	10.25	11.28
Video Streaming Delay (sec)	10.54	2.71	T0	1.74	2.43	1.98
Latency (msec)	233	81	T0	111	101	T0

\*T0=Timeout

# I. Coverage Details

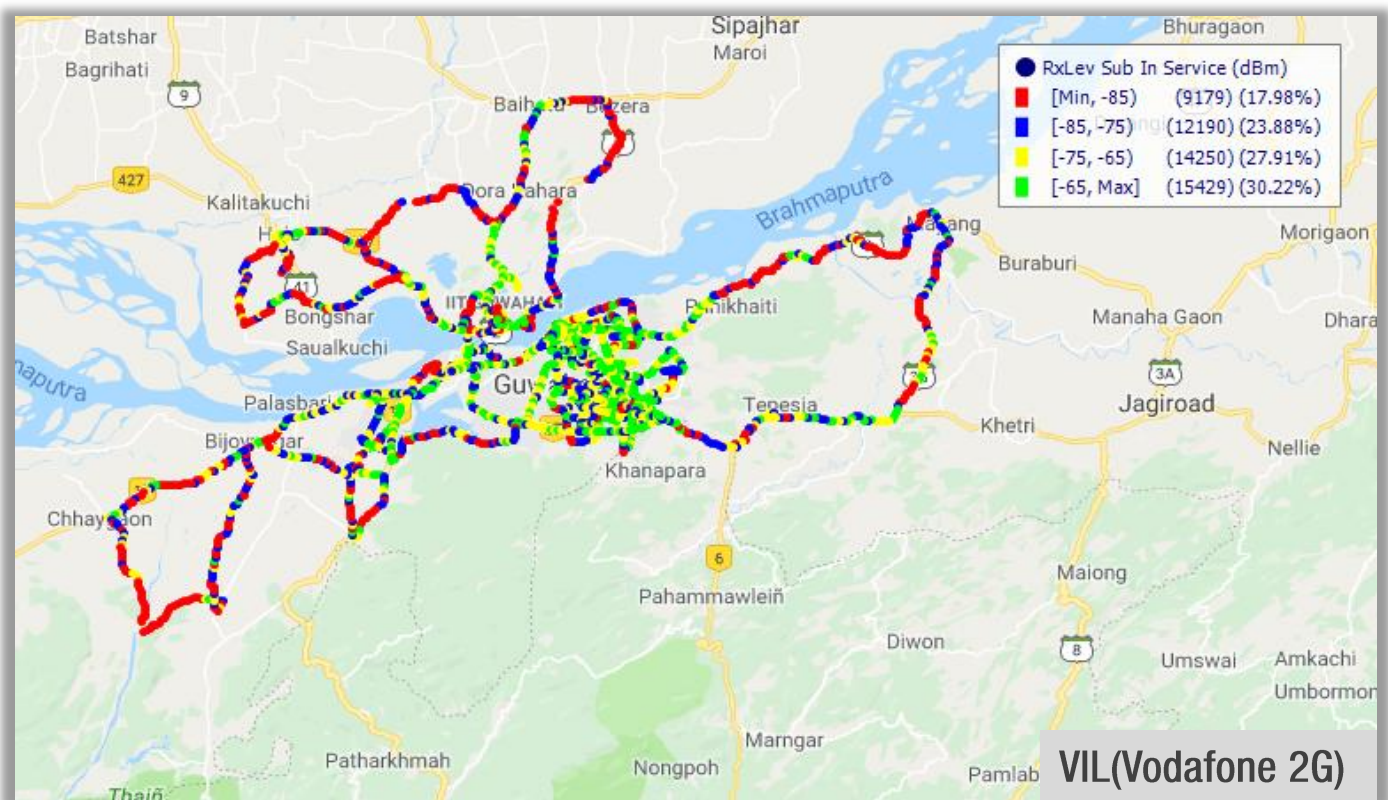
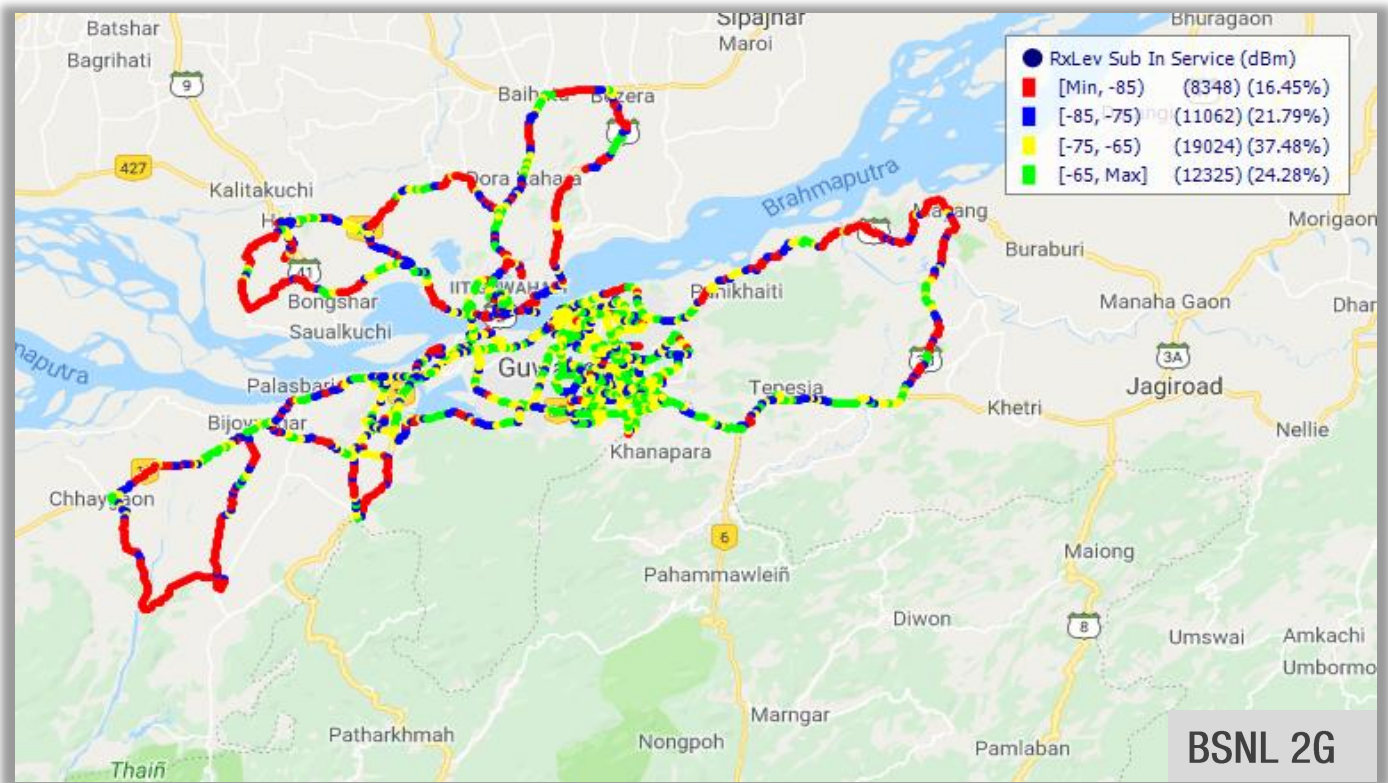
RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call/data session. The Coverage rate of an TSP is calculated on the basis of % of samples in which the Rx level  $\geq -85$  dBm, RSCP is  $\geq -90$  dBm & RSRP  $\geq -110$  dBm.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

TSP	Coverage Rate
Airtel 2G	78.02%
BSNL 2G	83.55%
VIL(Vodafone 2G)	82.02%
Airtel Dual (2G/3G)	85.30%
BSNL Dual (2G/3G)	79.65%
VIL(Vodafone Dual (2G/3G))	85.59%
Airtel (VoLTE)	92.03%
Jio (VoLTE)	93.76%
VIL(Vodafone) (VoLTE)	86.35%



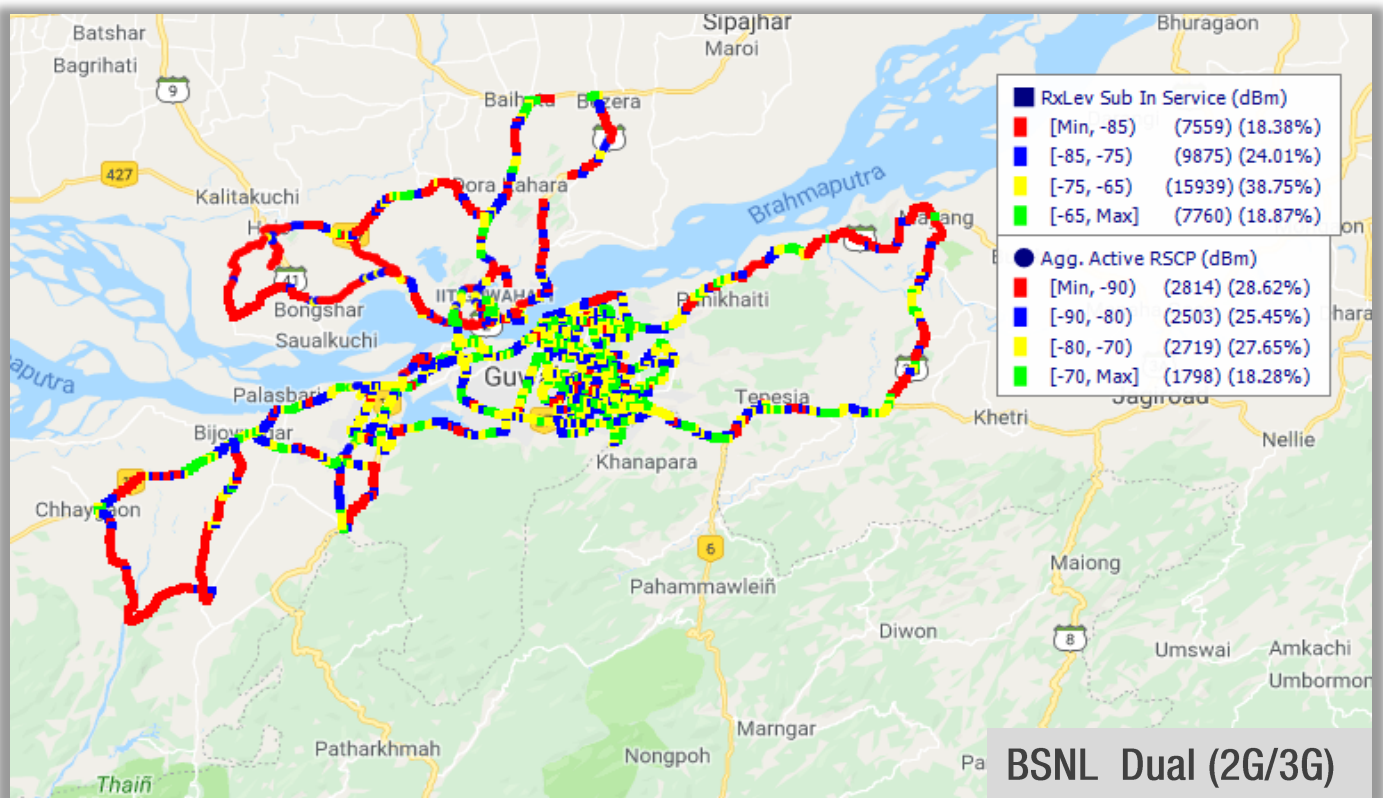
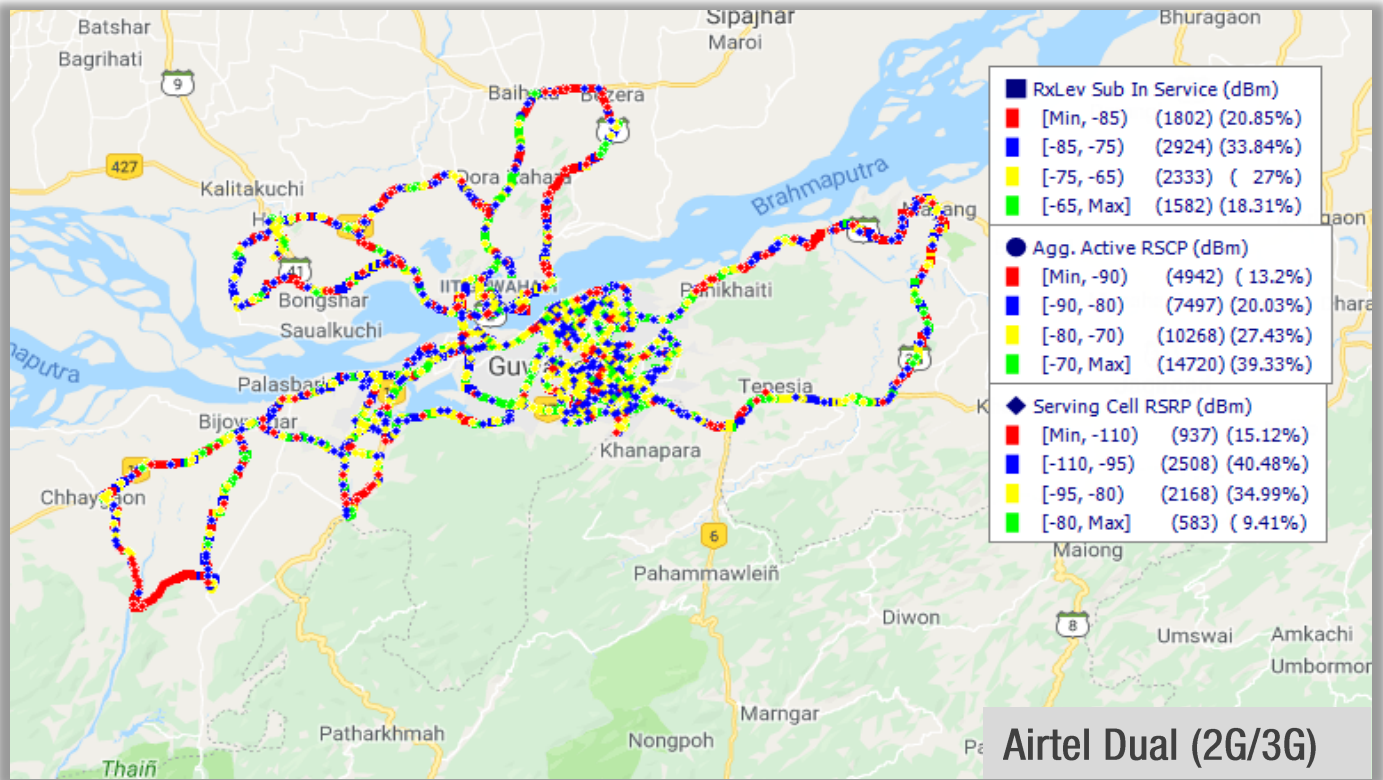


# I. Coverage Details (contd.)

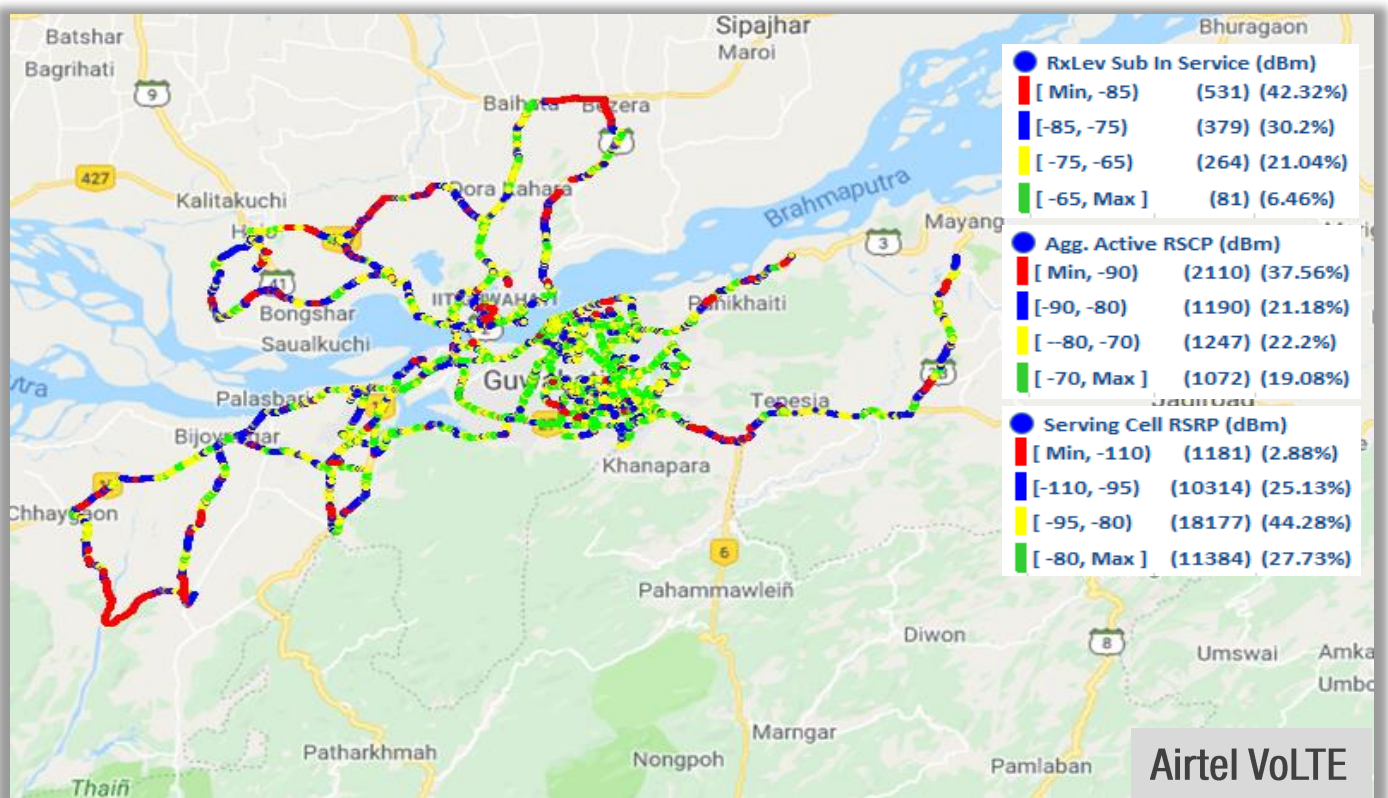
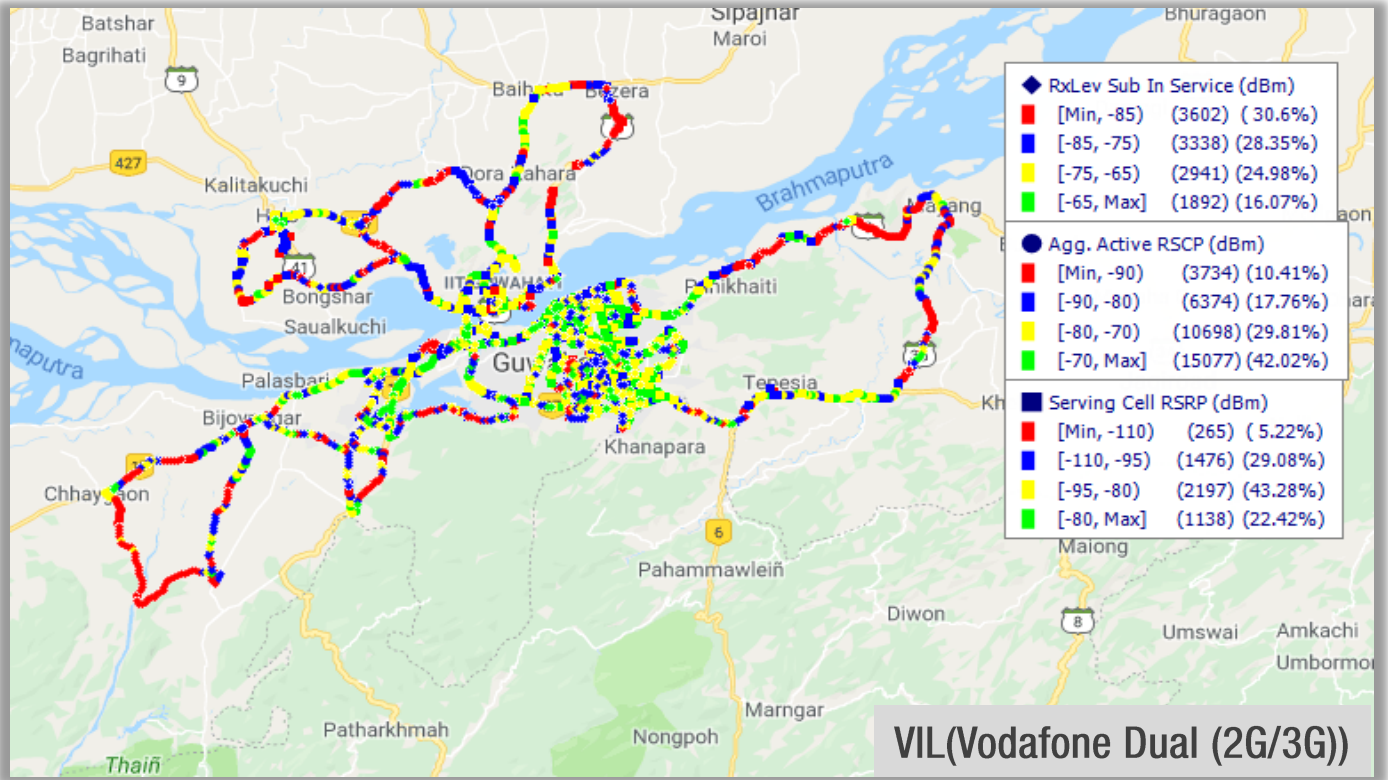




# I. Coverage Details (contd.)

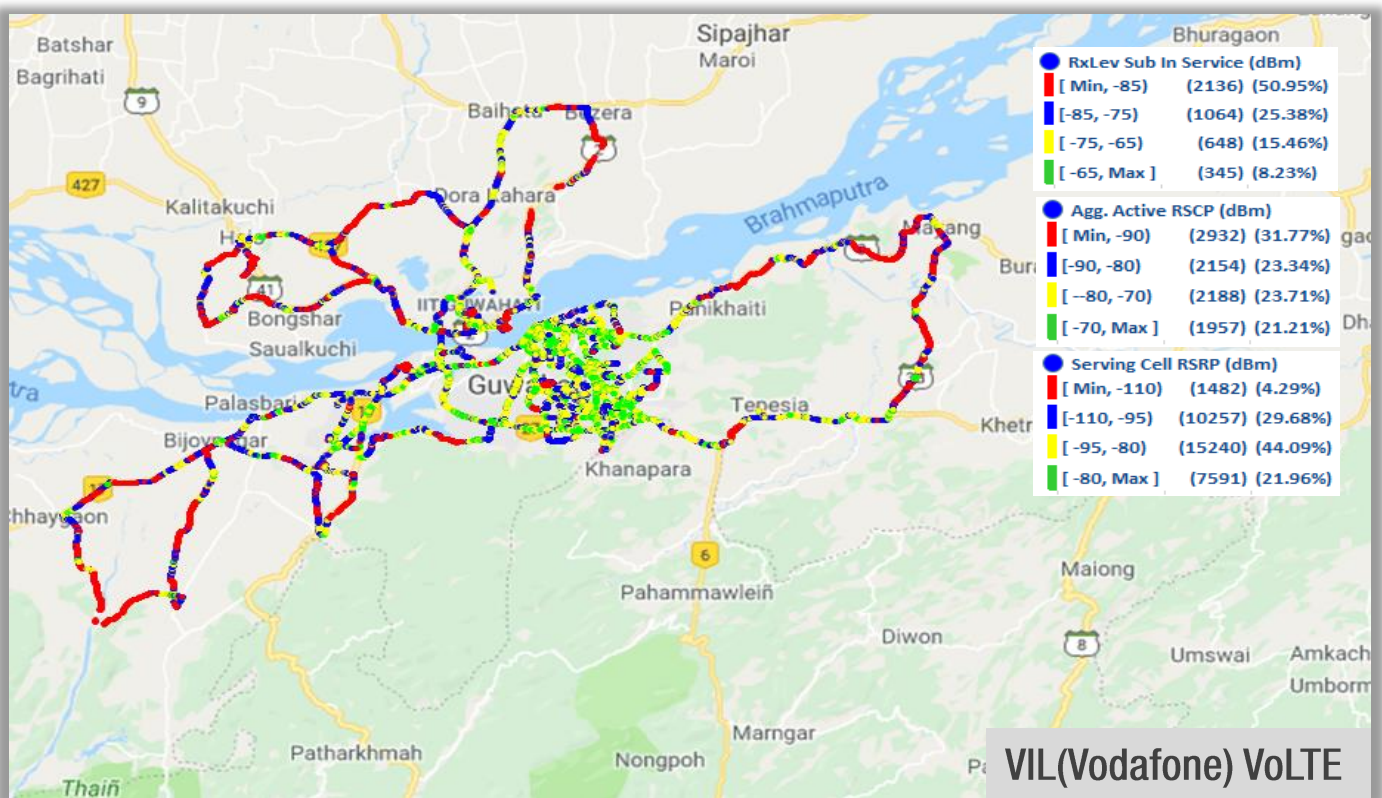
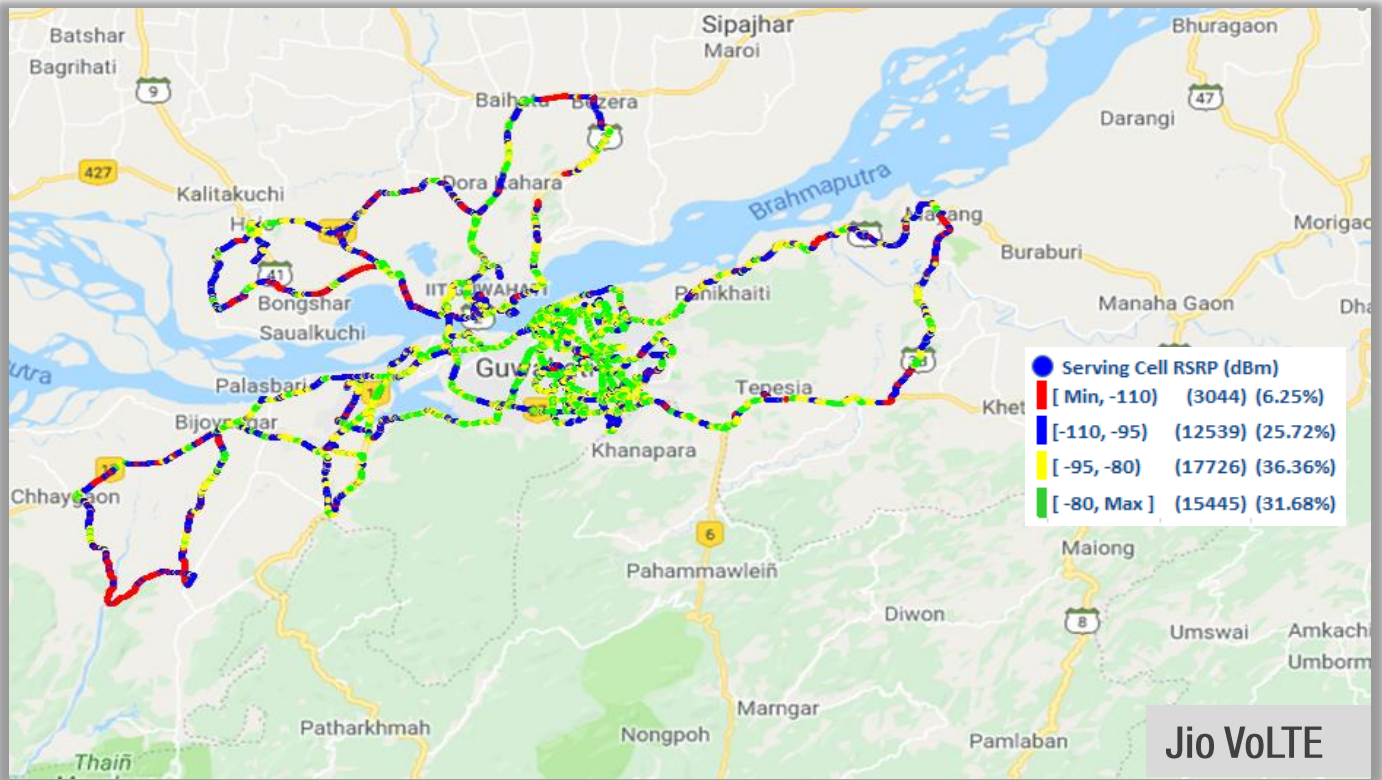


# I. Coverage Details (contd.)





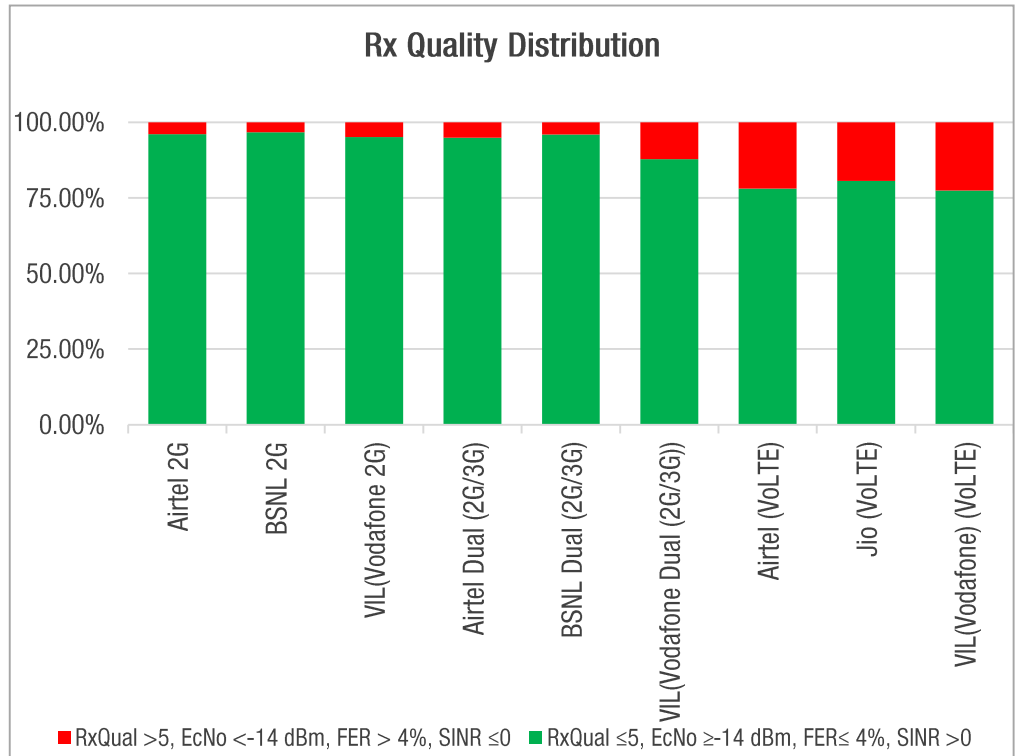
# I. Coverage Details (contd.)



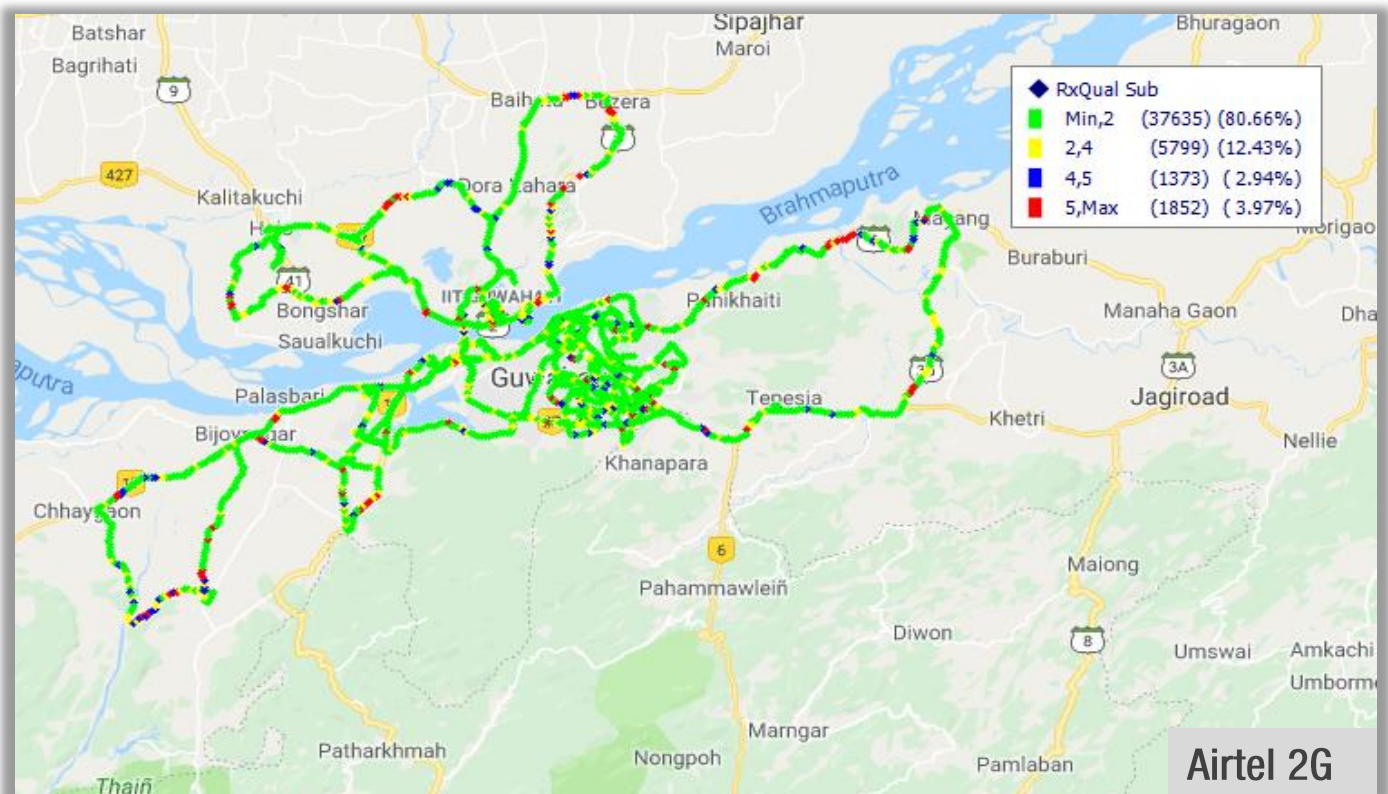
## II. Quality Details

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	96.03%
BSNL 2G	96.72%
VIL(Vodafone 2G)	95.12%
Airtel Dual (2G/3G)	94.96%
BSNL Dual (2G/3G)	95.98%
VIL(Vodafone Dual (2G/3G))	87.81%
Airtel (VoLTE)	78.05%
Jio (VoLTE)	80.67%
VIL(Vodafone) (VoLTE)	77.48%



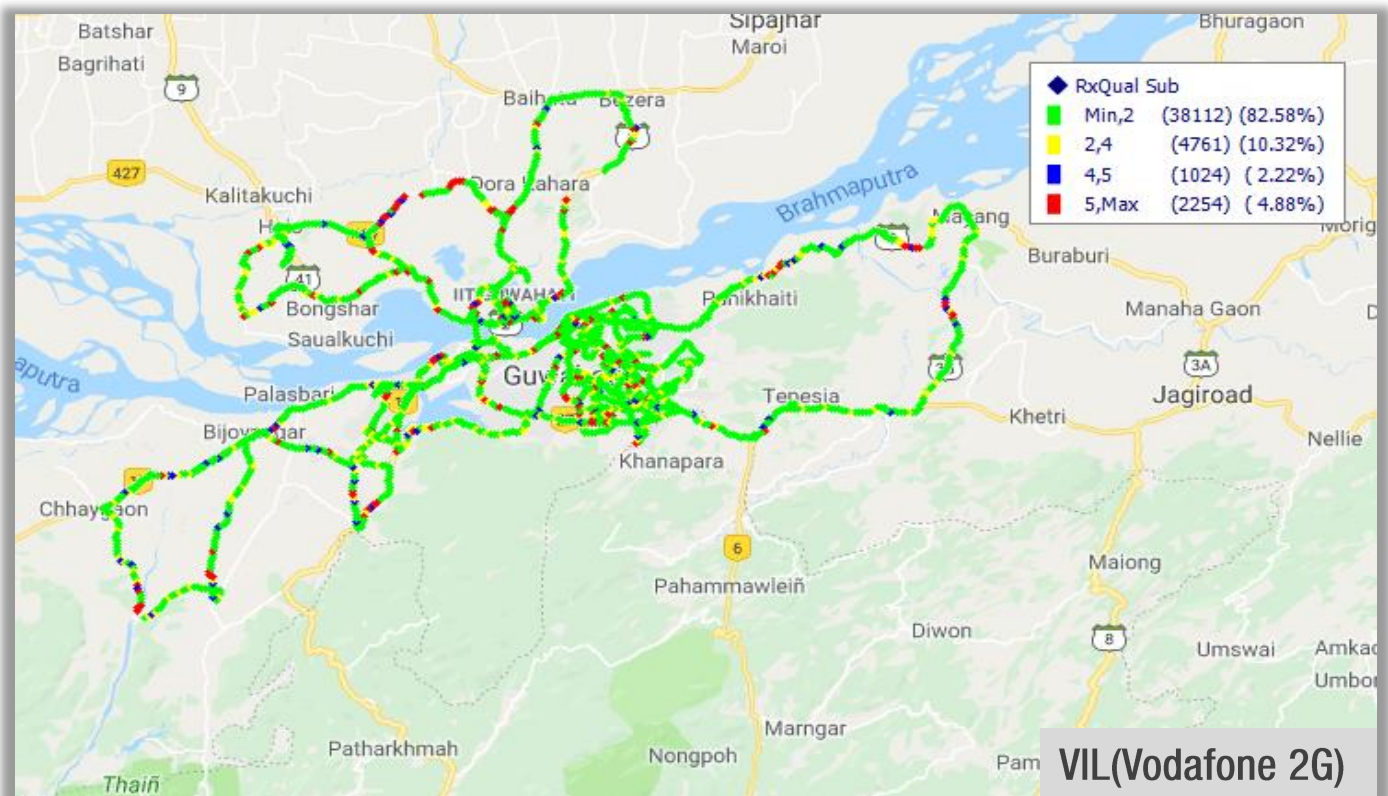
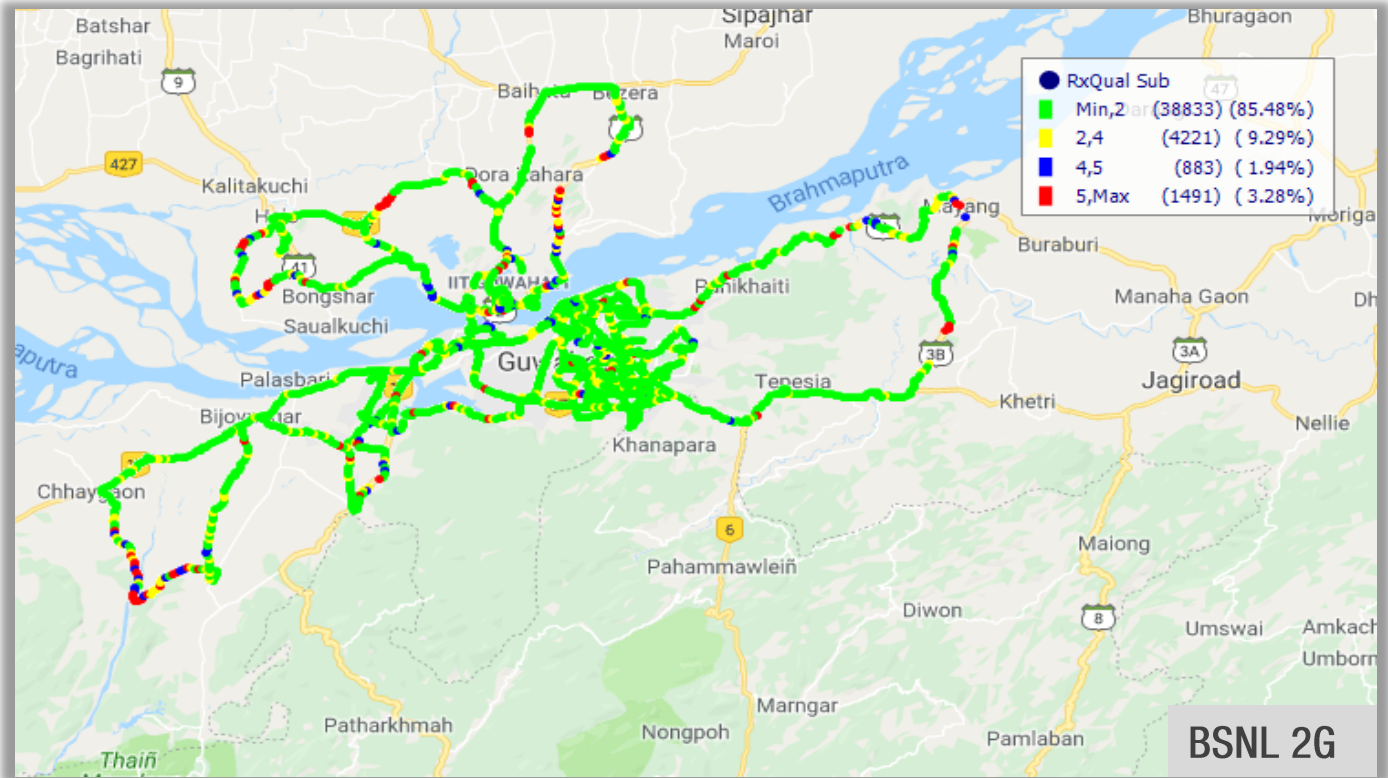
— TSPs not meeting the Benchmark



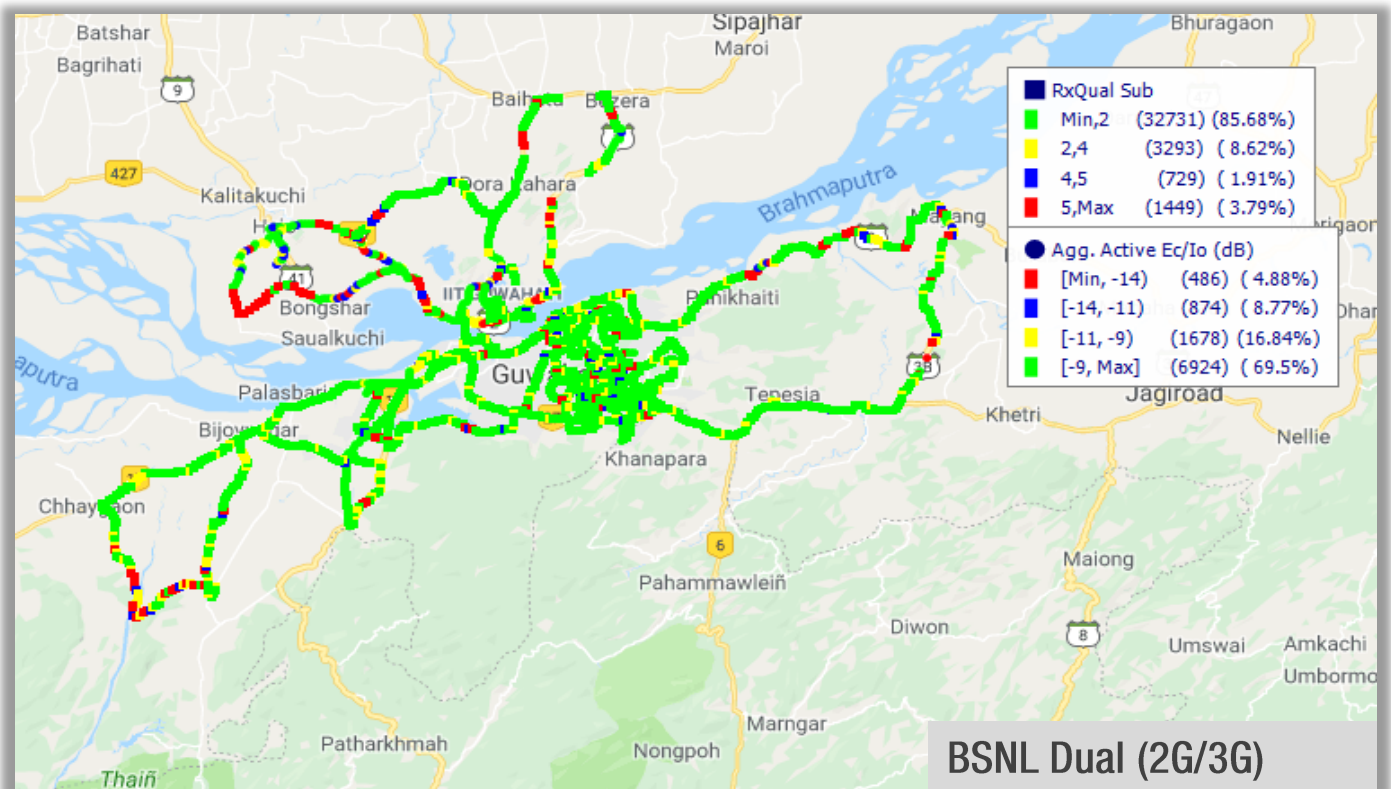
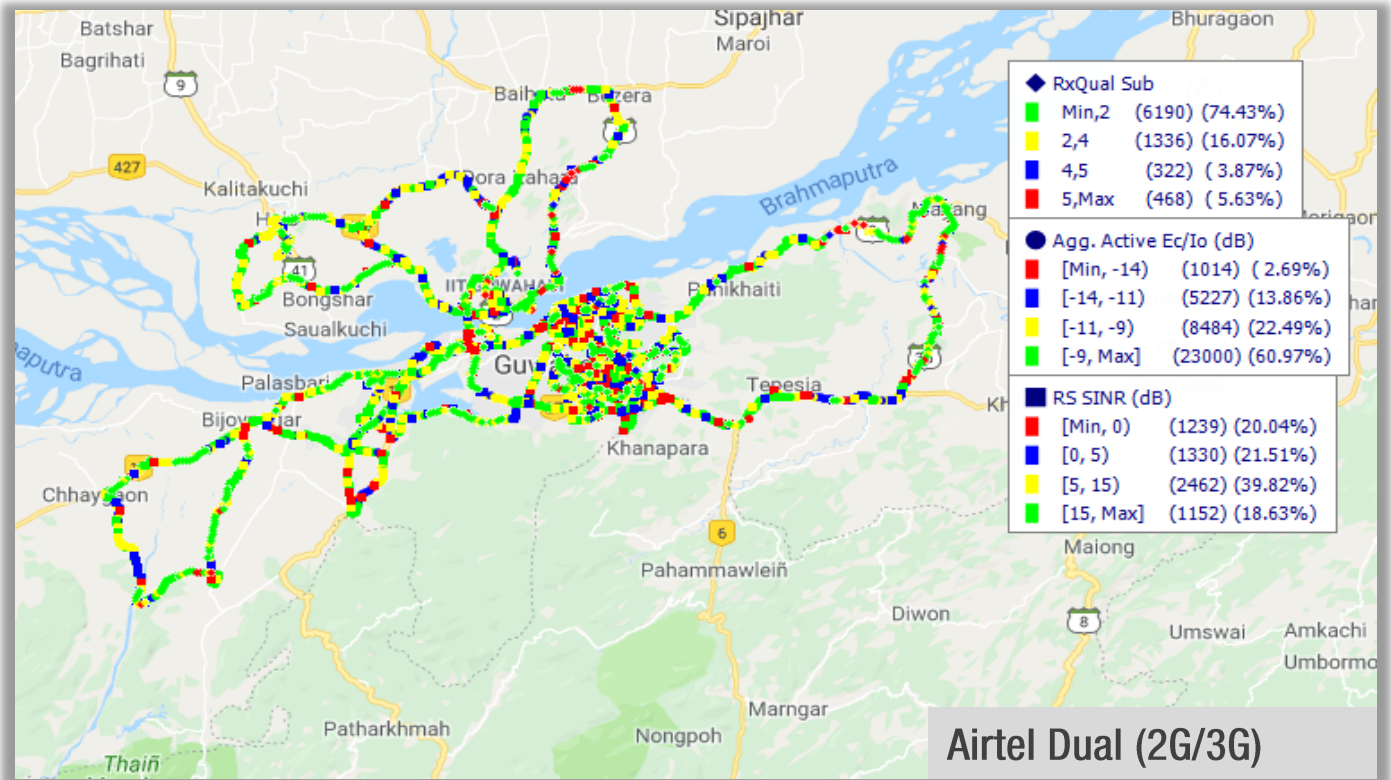
Airtel 2G



## II. Quality Details (contd.)

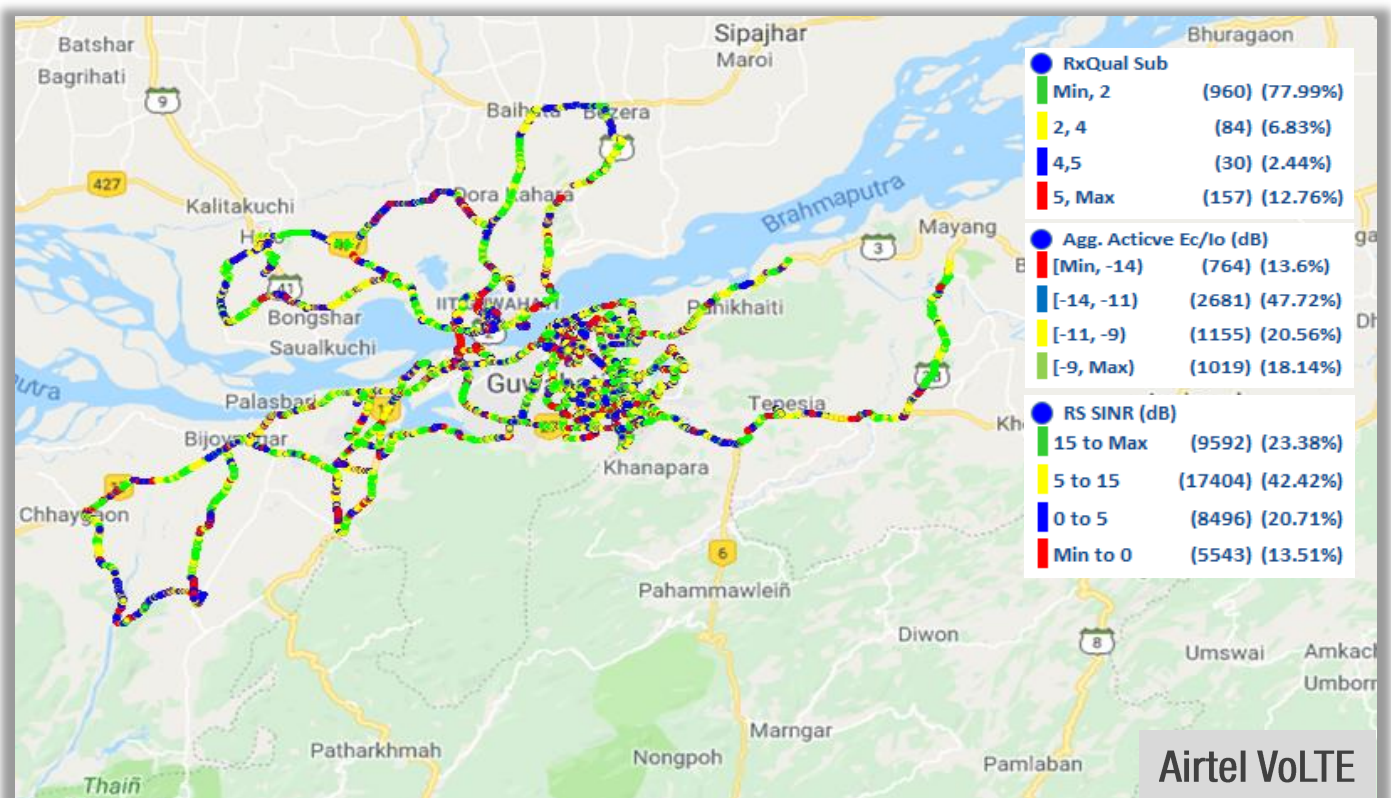
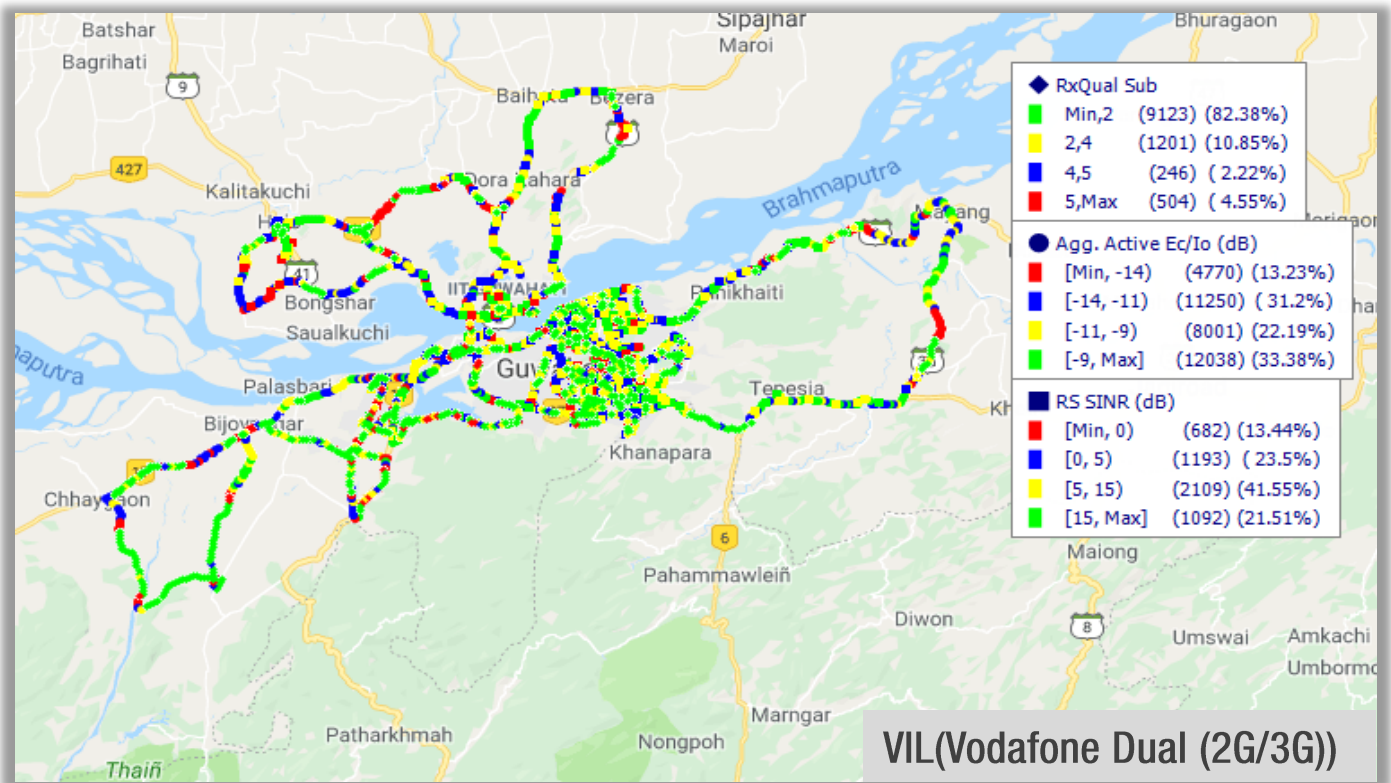


## II. Quality Details (contd.)

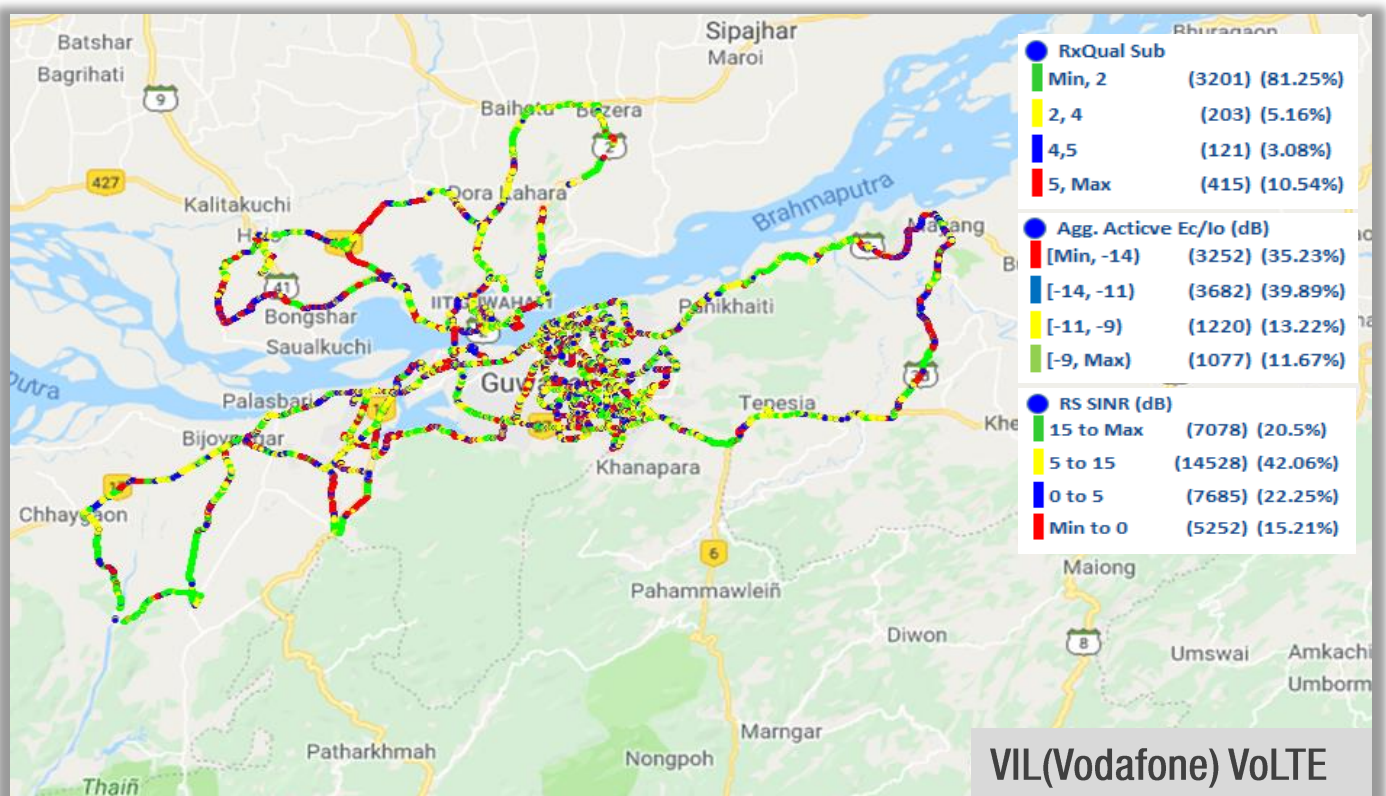
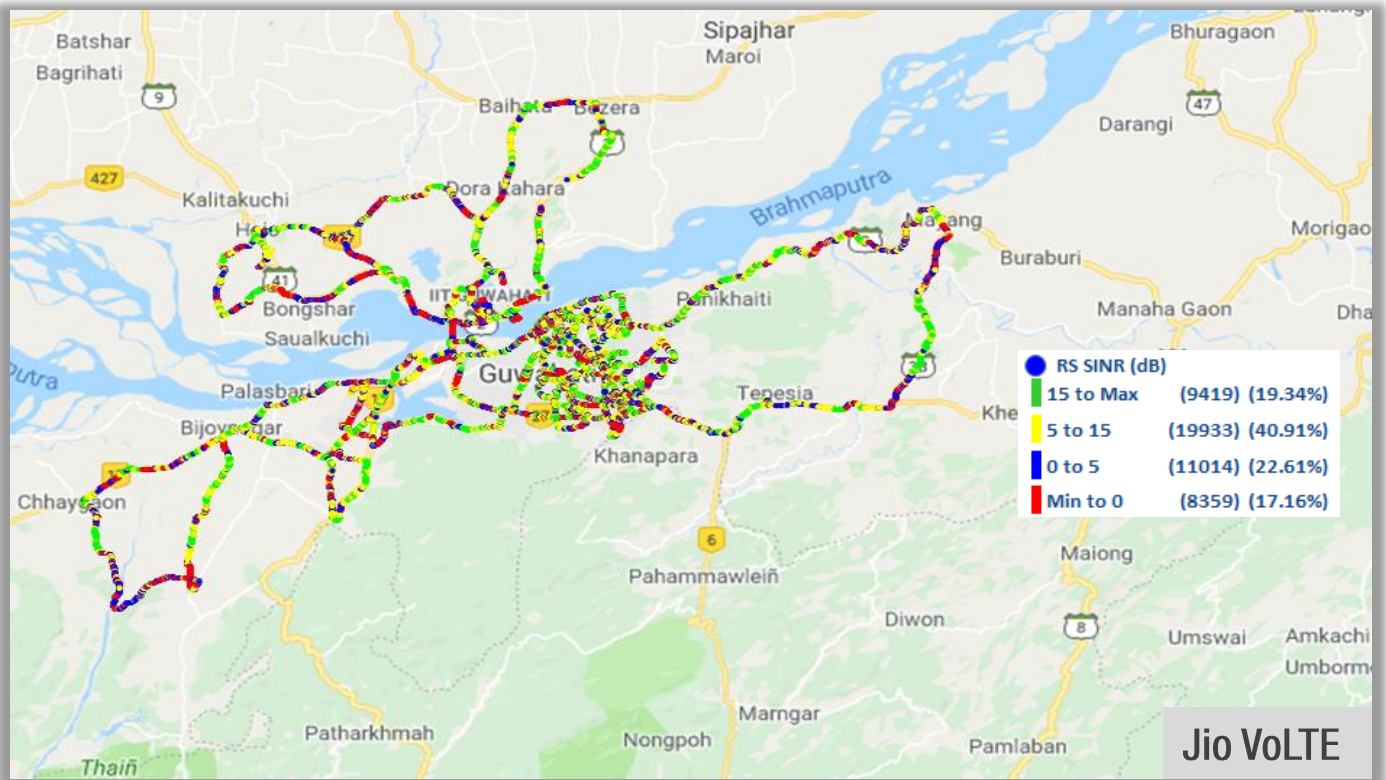




## II. Quality Details (contd.)



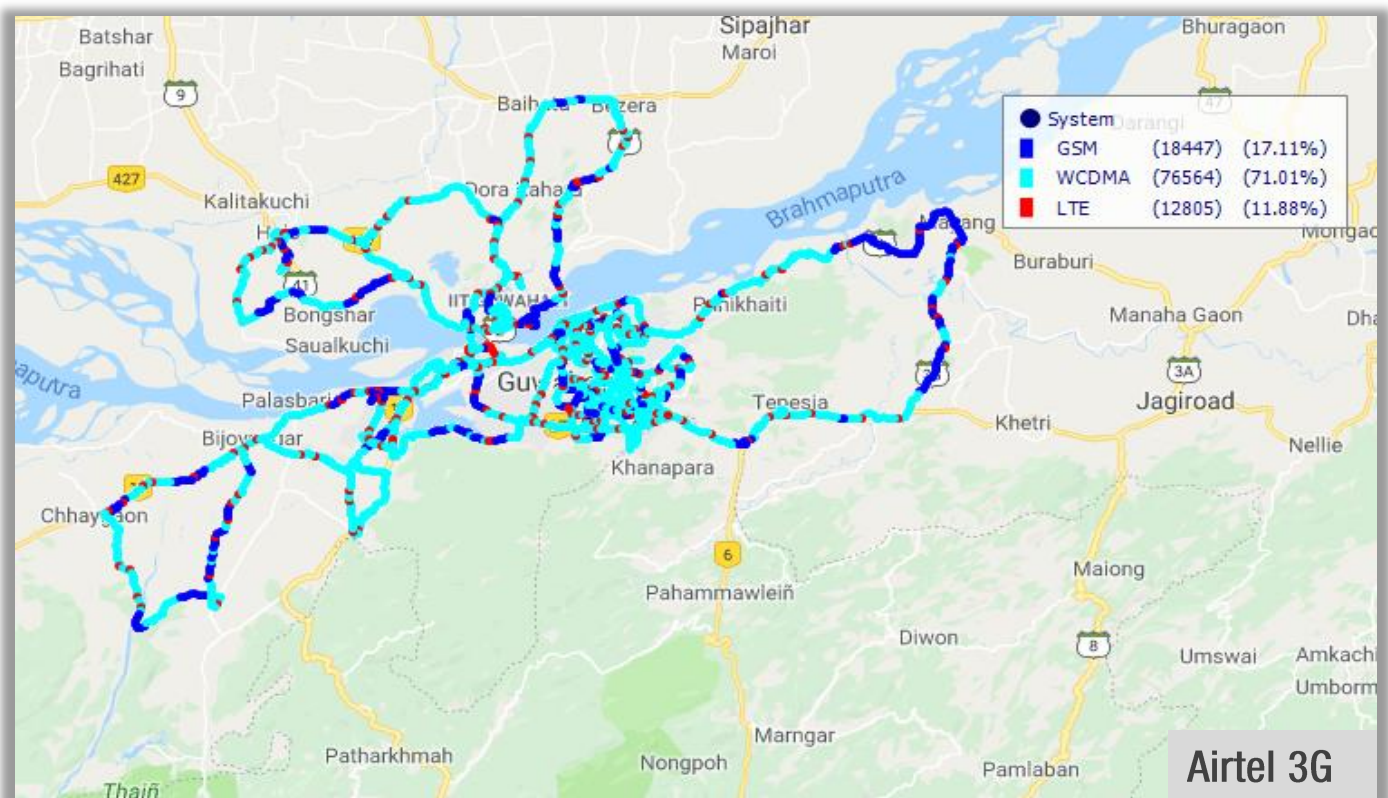
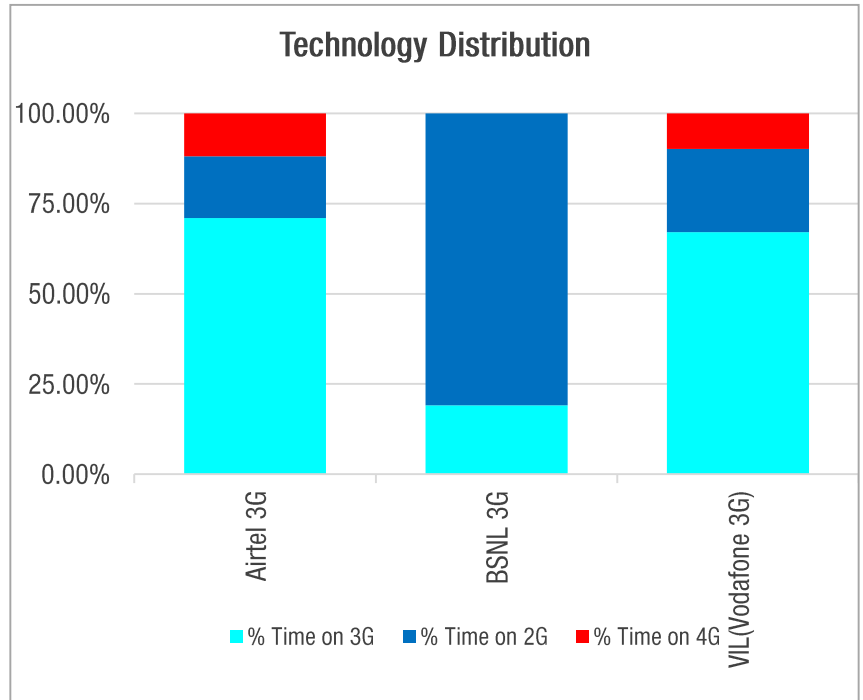
## II. Quality Details (contd.)





### III. Technology Details

TSP	% Time on 3G
Airtel 3G	71.01%
BSNL3G	19.09%
VIL(Vodafone 3G)	67.07%



### III. Technology Details(contd.)

