



INDEPENDENT DRIVE TEST REPORT

For

Shillong

February 2019

EAST ZONE

Key Performance Indicators: All TSPs have fail to met the Drop Call Rate (DCR) benchmark of 2% except Jio VoLTE. All TSPs have met the Call Setup Success Rate (CSSR) of 95% except Airtel 3G.

The Independent Drive Test has been carried out by M/s PhiMetrics Technologies Pvt. Ltd. on behalf of TRAI in Shillong City & adjoining areas from 9:00 AM to 9:00 PM; 6th February to 8th February 2019. The drive test covered an drive route of 225 KMs & 6 hotspot over a period of 3 days. Approximately 355 calls were made for each of the 10 networks: four 2G networks, four 3G networks and two LTE 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 **6th February to 8th February 2019** covering various locations in Shillong City & surrounding region. The performance of **Airtel, BSNL, Vodafone Idea Limited (VIL(Idea, 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 Shillong:

Independent Drive test was conducted for a period of three days from 6th February to 8th February 2019 in Shillong 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 225 KMs over a period of two days from 6th February to 7th February 2019. Approximately 355 calls were made for each of the 10 networks: four 2G (Lock Mode) networks, four 3G (Free Mode) networks and two 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 6 static locations for one days on 6th February 2019 ; five 2G (Lock mode) networks, five 3G (Dual mode) networks and four 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 (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.

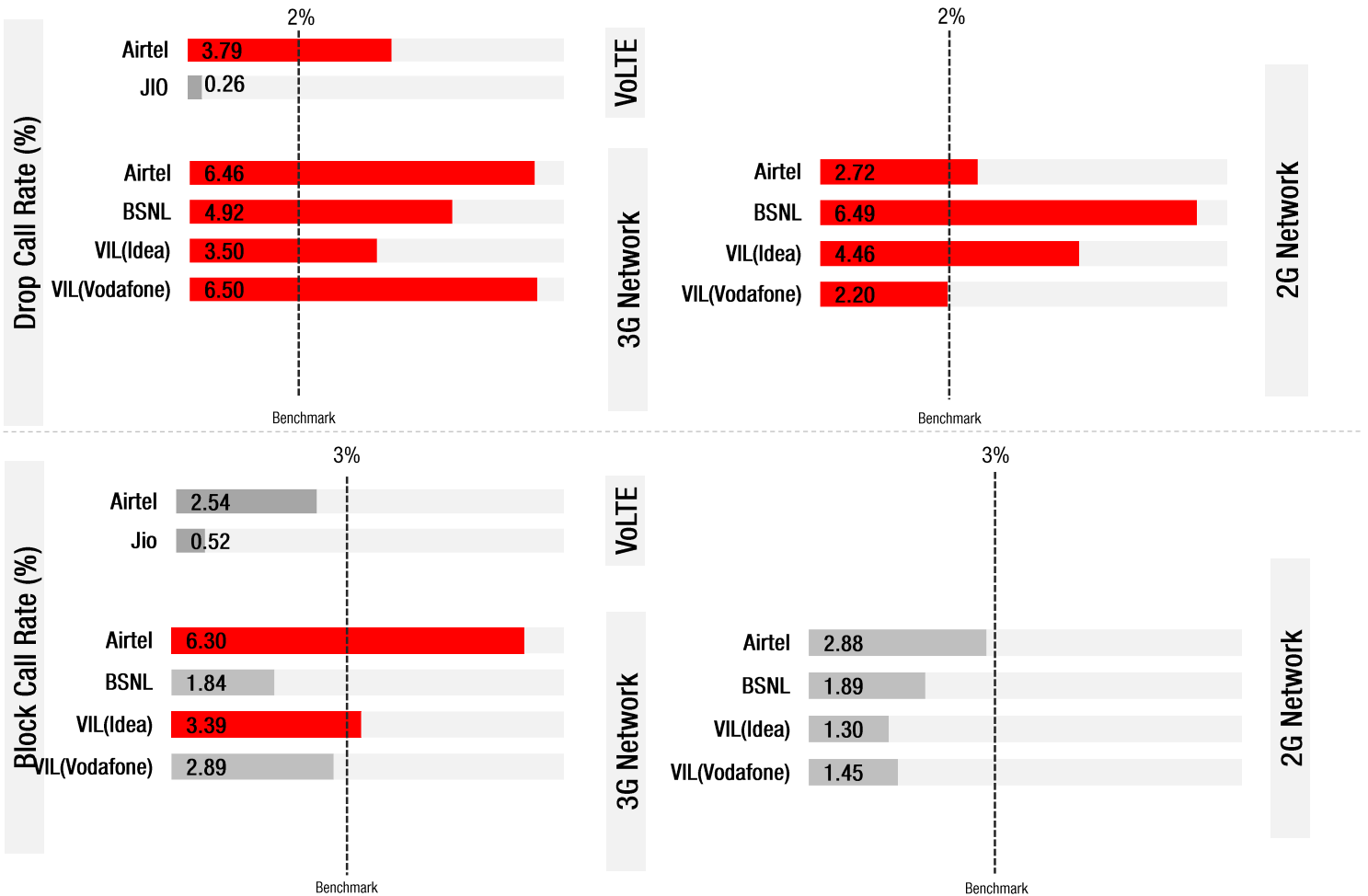
Service	Specifications
Download	2G (Locked) - 500KB, 3G (Dual) - 20 MB, 4G (Free) - 40 MB
Upload	2G (Locked) - 100KB, 3G (Dual) - 5 MB, 4G (Free) - 10 MB
Web Browsing	3 links of e/m commerce website www.amazon.in, www.flipkart.com and PayTm
Video Streaming	130 sec clip
Latency	32 Bytes on www.google.com



Voice Calls

Key Observations

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



KPI	2G Networks			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
SDCCH Congestion%	1.44%	1.18%	1.04%	0.48%
TCH Congestion %	1.44%	0.71%	0.26%	0.97%

KPI	3G Networks			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
CSFB Failure %	0.97%	NA	0.53%	1.05%
SDCCH Congestion%	1.21%	1.15%	0.00%	0.26%
RRC Congestion%	2.91%	0.23%	2.08%	1.32%
SDCCH & RRC Congestion%	4.12%	1.38%	2.08%	1.58%
TCH Congestion %	0.48%	0.46%	0.78%	0.26%
RAB Congestion %	0.73%	0.00%	0.00%	0.00%
TCH & RAB Congestion %	1.21%	0.46%	0.78%	0.26%

- All TSPs have fail to met the 2% QOS benchmark of Drop Call Rate (DCR%) except Jio VoLTE.
- Call Block Rate (CBR%) benchmark of 3% was achieved by all TSP's except Airtel 3G & VIL(Idea) 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(Idea)	VIL(Vodafone)
Coverage%	69.92%	70.45%	55.02%	65.96%

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

TSPs	3G				VoLTE	
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio
Coverage %	69.67%	70.60%	67.76%	68.03%	76.29%	86.50%

c) Percentage of time spent on 3G network:

TSPs	3G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Time Spent on 3G%	48.63%	7.75%	48.57%	49.64%

d) Percentage of RLT \geq 48:

TSPs	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
%RLT \geq 48	0.00%	2.48%	0.00%	0.00%

e) Average CST Second

TSPs	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
CST(sec)	2.56	2.60	3.15	3.10

TSPs	3G				VOLTE	
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio
CST(sec)	6.23	2.53	4.24	4.46	3.40	0.58

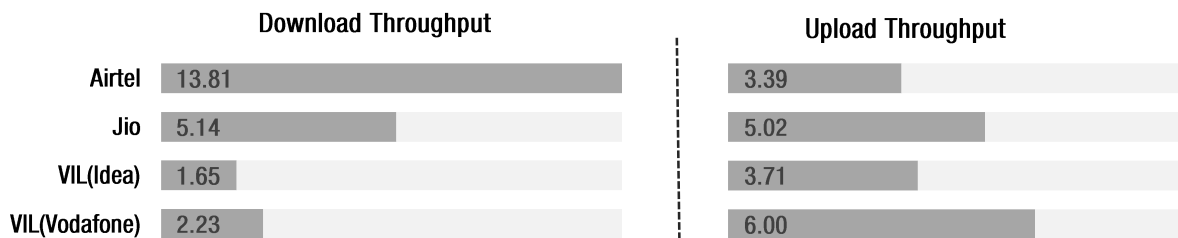
Data Services Static

Key Observations

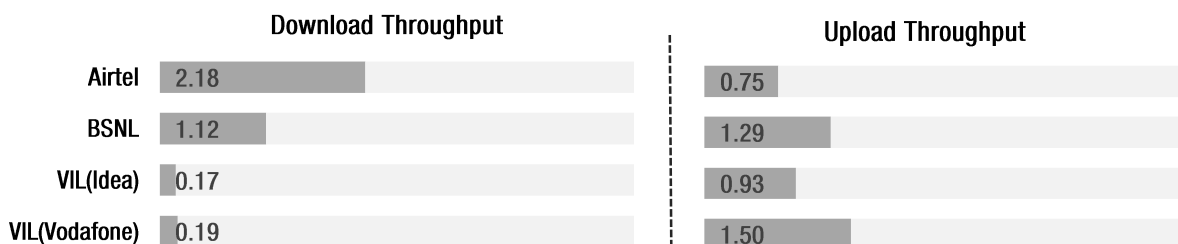
Data was tested at 6 locations .Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

Data Download and Upload Performance (Mbps)

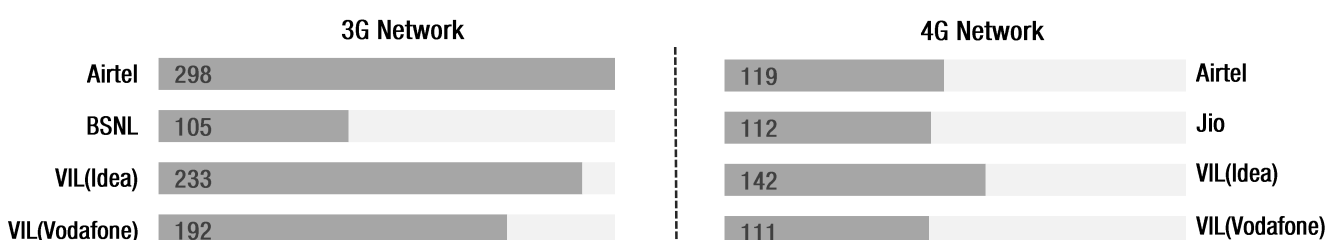
4G Network:



3G Network:



Latency (msec)

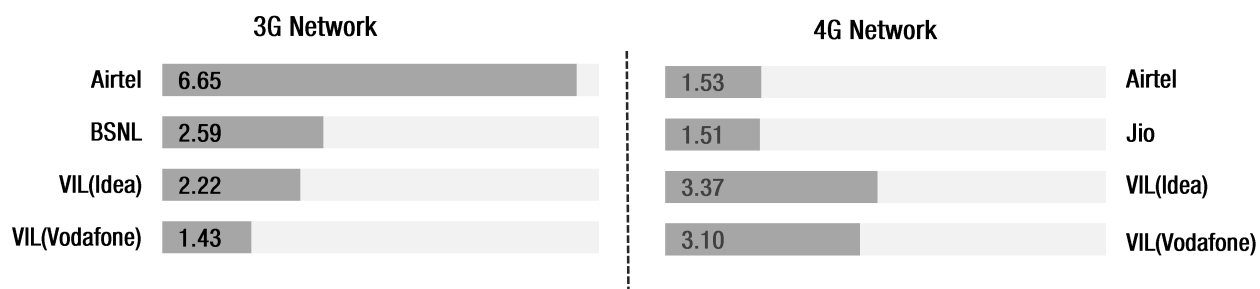


Data Services Static

Key Observations

Video Streaming Performance (130 sec YouTube video sample sizes)

Streaming (sec)

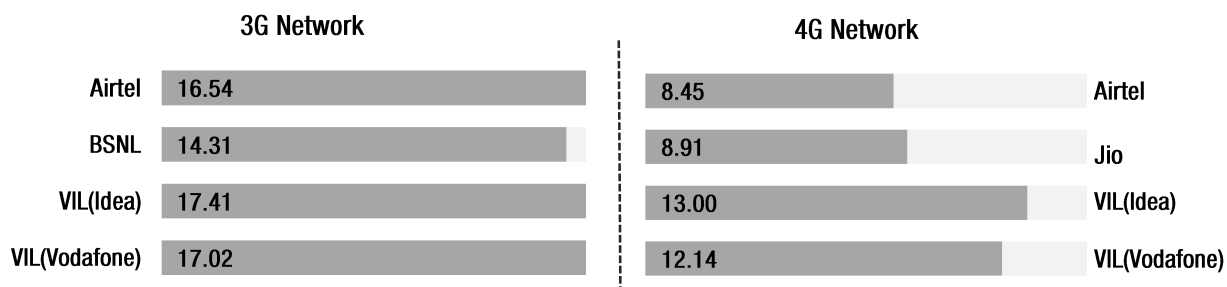


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

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

Video Streaming	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Avg. Initial Start Time (sec)	6.65	2.59	2.22	1.43	1.53	1.51	3.37	3.10
Avg. Interruption Time (sec)	0.00	0.00	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.

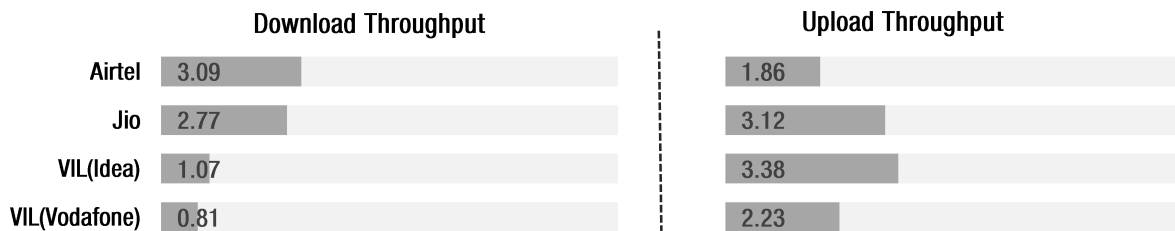
Data Services Dynamic

Key Observations

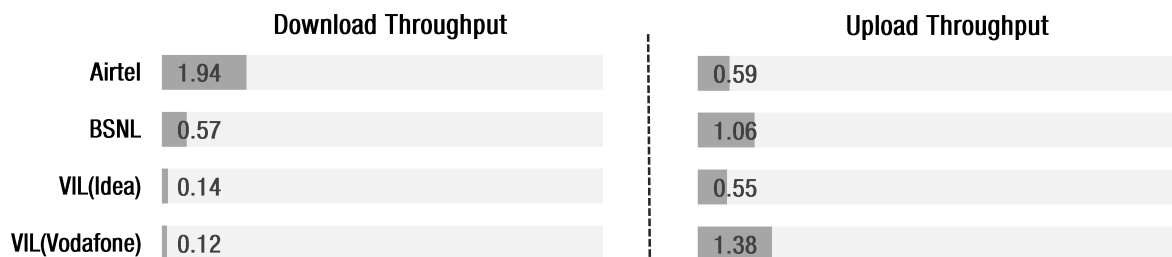
Data was tested between one location to another location .Following services were tested: Data Download/Upload, Latency (www.google.com), Video Streaming (YouTube) and Web browsing (Flipkart, Amazon, PayTm)

Data Download and Upload Performance (Mbps)

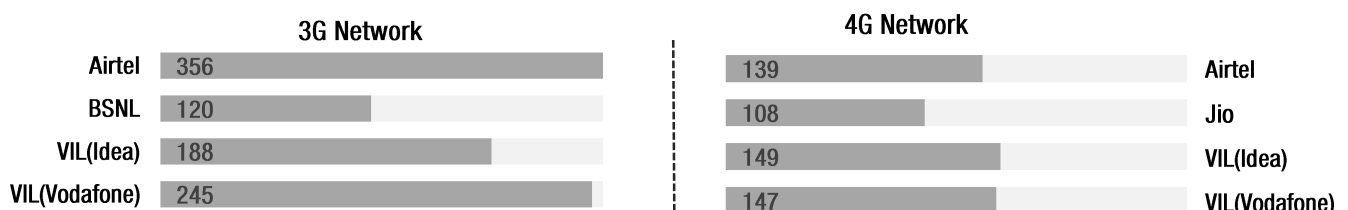
4G Network:



3G Network:



Latency (msec)

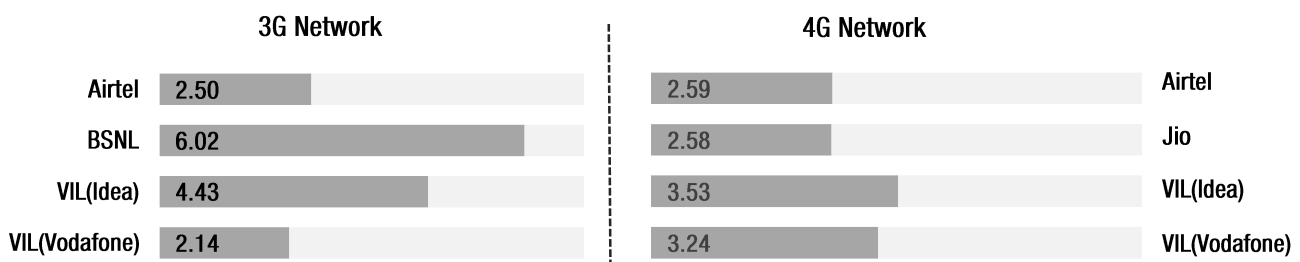


Data Services Dynamic

Key Observations

Video Streaming Performance (130 sec YouTube video sample sizes)

Streaming (sec)

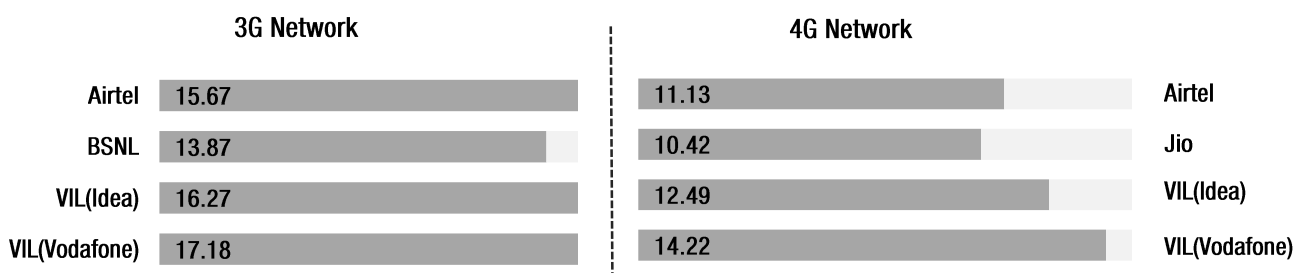


Streaming Delay further broken into 2 parameters which form the end-user perception to assess consistency on Video streaming.

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

Video Streaming	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Avg. Initial Start Time (sec)	2.50	6.02	4.43	2.14	2.59	2.58	3.53	3.24
Avg. Interruption Time (sec)	0.00	0.00	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(Idea)	VIL(Vodafone)
Call Attempt	417	424	386	415
Blocked Call Rate (%)	2.88%	1.89%	1.30%	1.45%
CSSR% (Accessibility)	97.12%	98.11%	98.70%	98.55%
Drop Call Rate (%)	2.72%	6.49%	4.46%	2.20%
Mobility HOSR (%)	96.93%	92.44%	99.02%	95.05%
Rx Quality (%)	89.15%	91.46%	93.53%	94.16%

Voice Call	3G				VoLTE	
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio
Call Attempt	413	435	384	380	350	375
Blocked Call Rate (%)	6.30%	1.84%	3.39%	2.89%	2.54%	0.52%
CSSR% (Accessibility)	93.70%	98.16%	96.61%	97.11%	97.46%	99.48%
Drop Call Rate (%)	6.46%	4.92%	3.50%	6.50%	3.79%	0.26%
Mobility HOSR (%)	99.13%	96.77%	98.67%	98.85%	99.20%	99.38%
Rx Quality (%)	80.69%	90.91%	79.96%	79.55%	67.83%	76.00%

Summary

City Level Summary(contd.)

Data Services Static	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	111.06	140.84	92.34	104.17
Upload Throughput (kbps)	126.21	102.68	103.66	138.73
Web Browsing Delay (sec)	30.60	41.26	24.77	28.57
Latency (msec)	472	307	480	375

Data Services Static	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	2.18	1.12	0.17	0.19	13.81	5.14	1.65	2.23
Upload Throughput (Mbps)	0.75	1.29	0.93	1.50	3.39	3.71	5.02	6.00
Web Browsing Delay (sec)	16.54	14.31	17.41	17.02	8.45	8.91	13.00	12.14
Video Streaming Delay (sec)	6.65	2.59	2.22	1.43	1.53	1.51	3.37	3.10
Latency (msec)	298	105	233	192	119	112	142	111

Data Services Dynamic	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	1.94	0.57	0.14	0.12	3.09	2.77	1.07	0.81
Upload Throughput (Mbps)	0.59	1.06	0.55	1.38	1.86	3.12	3.38	2.23
Web Browsing Delay (sec)	15.67	13.87	16.27	17.18	11.13	10.42	12.49	14.22
Video Streaming Delay (sec)	2.50	6.02	4.43	2.14	2.59	2.58	3.53	3.24
Latency (msec)	356	120	188	245	139	108	149	147

Summary

City Level Summary(contd.)

BSNL Office	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	90.55	60.19	80.57	72.34
Upload Throughput (kbps)	123.81	103.72	67.08	125.24
Web Browsing Delay (sec)	31.46	39.28	18.18	30.74
Latency (msec)	470	269	529	378

BSNL Office	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	3.83	2.40	0.27	0.17	4.23	5.35	2.71	3.36
Upload Throughput (Mbps)	0.52	2.46	1.42	1.31	5.29	5.16	6.07	5.71
Web Browsing Delay (sec)	13.16	11.60	22.98	19.43	9.81	9.93	11.39	10.04
Video Streaming Delay (sec)	T0	1.32	2.03	1.64	3.31	0.91	1.34	1.04
Latency (msec)	354	98	144	158	111	89	133	98

High Court	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	71.60	48.85	68.16	65.98
Upload Throughput (kbps)	73.54	65.31	84.17	125.45
Web Browsing Delay (sec)	28.14	50.49	24.86	30.92
Latency (msec)	474	255	546	477

High Court	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	0.20	0.92	0.12	0.19	13.65	5.10	2.35	2.74
Upload Throughput (Mbps)	0.42	1.05	0.50	1.32	2.55	5.13	5.12	4.80
Web Browsing Delay (sec)	19.38	16.30	16.82	18.99	9.79	9.12	13.19	12.33
Video Streaming Delay (sec)	10.45	4.45	4.77	1.33	1.18	0.76	1.52	1.15
Latency (msec)	251	100	276	170	117	111	148	110

*T0=Timeout

Summary

City Level Summary(contd.)

Nehu	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	101.02	167.89	125.23	172.68
Upload Throughput (kbps)	139.46	118.93	191.59	191.59
Web Browsing Delay (sec)	45.64	42.47	24.78	33.48
Latency (msec)	497	322	488	317

Nehu	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	0.76	0.88	0.09	0.23	15.05	4.26	1.71	3.41
Upload Throughput (Mbps)	0.94	1.58	1.91	2.15	4.74	2.77	4.52	8.88
Web Browsing Delay (sec)	25.55	12.69	17.40	15.68	8.03	10.64	9.45	12.05
Video Streaming Delay (sec)	3.20	2.94	1.39	1.42	1.33	4.30	0.91	1.91
Latency (msec)	258	92	248	235	102	156	155	94

NIT Meghalaya	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	101.01	38.74	19.49	34.32
Upload Throughput (kbps)	94.27	42.80	18.00	38.17
Web Browsing Delay (sec)	40.12	45.53	32.40	25.70
Latency (msec)	484	531	482	398

NIT Meghalaya	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	3.20	0.10	0.06	0.09	13.65	6.30	0.13	0.19
Upload Throughput (Mbps)	1.49	0.43	0.07	1.62	1.23	3.81	2.75	3.89
Web Browsing Delay (sec)	16.81	23.33	20.25	18.17	11.38	7.57	13.37	15.47
Video Streaming Delay (sec)	19.54	T0	1.47	1.23	1.43	0.86	2.92	4.80
Latency (msec)	526	160	327	393	140	105	154	135

*T0=Timeout

Summary

City Level Summary(contd.)

Police Bazar	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	84.53	75.38	102.61	130.35
Upload Throughput (kbps)	134.57	79.99	130.77	164.22
Web Browsing Delay (sec)	19.10	52.41	28.90	34.57
Latency (msec)	550	348	480	349

Police Bazar	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	0.16	2.33	0.27	0.32	14.83	4.63	2.77	3.41
Upload Throughput (Mbps)	0.57	1.65	1.26	1.29	3.55	1.76	8.53	9.44
Web Browsing Delay (sec)	17.67	11.70	16.30	16.36	7.73	9.84	12.39	10.82
Video Streaming Delay (sec)	8.72	1.16	2.09	1.73	1.00	0.99	0.80	1.32
Latency (msec)	245	95	302	227	118	117	123	106

Ramkrishna Mission	2G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)
Download Throughput (Kbps)	204.48	398.12	154.06	171.93
Upload Throughput (kbps)	191.59	410.54	130.33	187.74
Web Browsing Delay (sec)	18.21	16.54	19.96	15.83
Latency (msec)	348	101	364	339

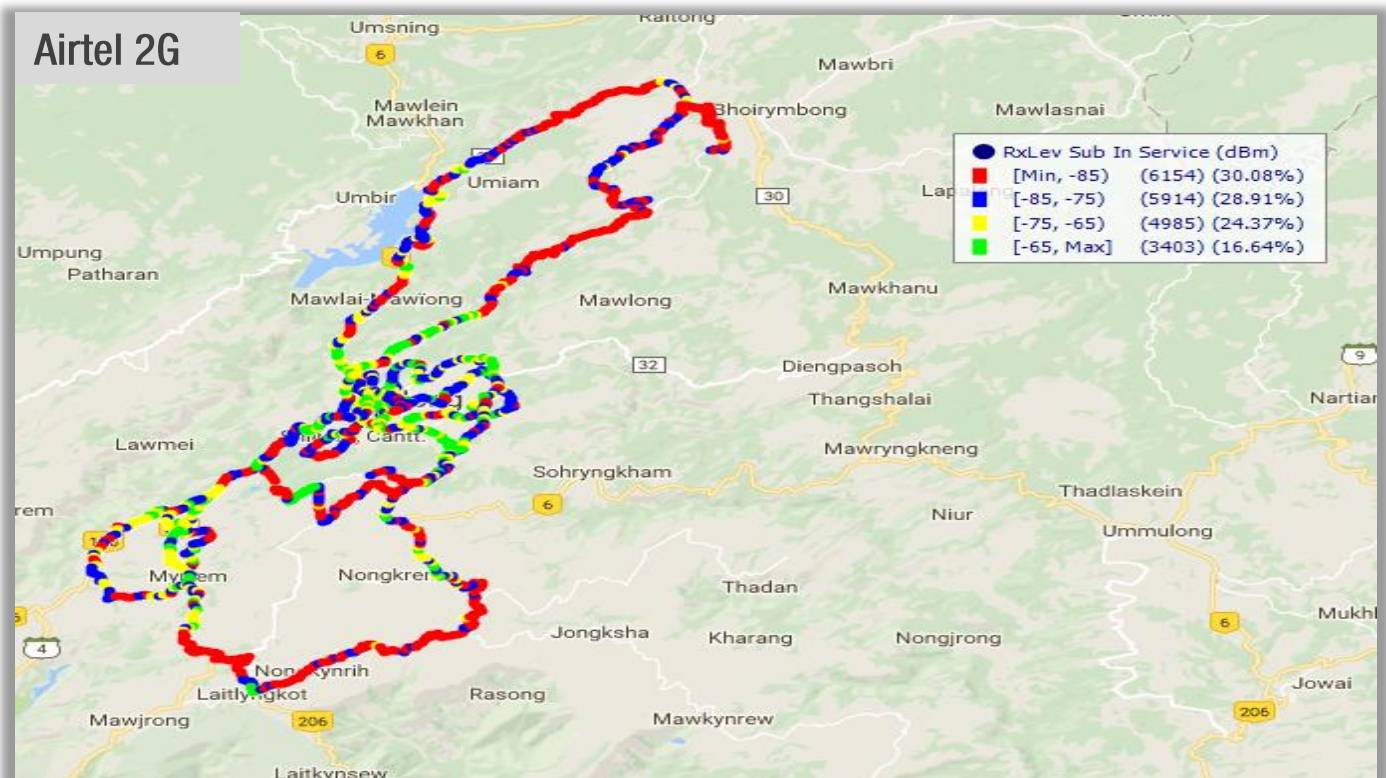
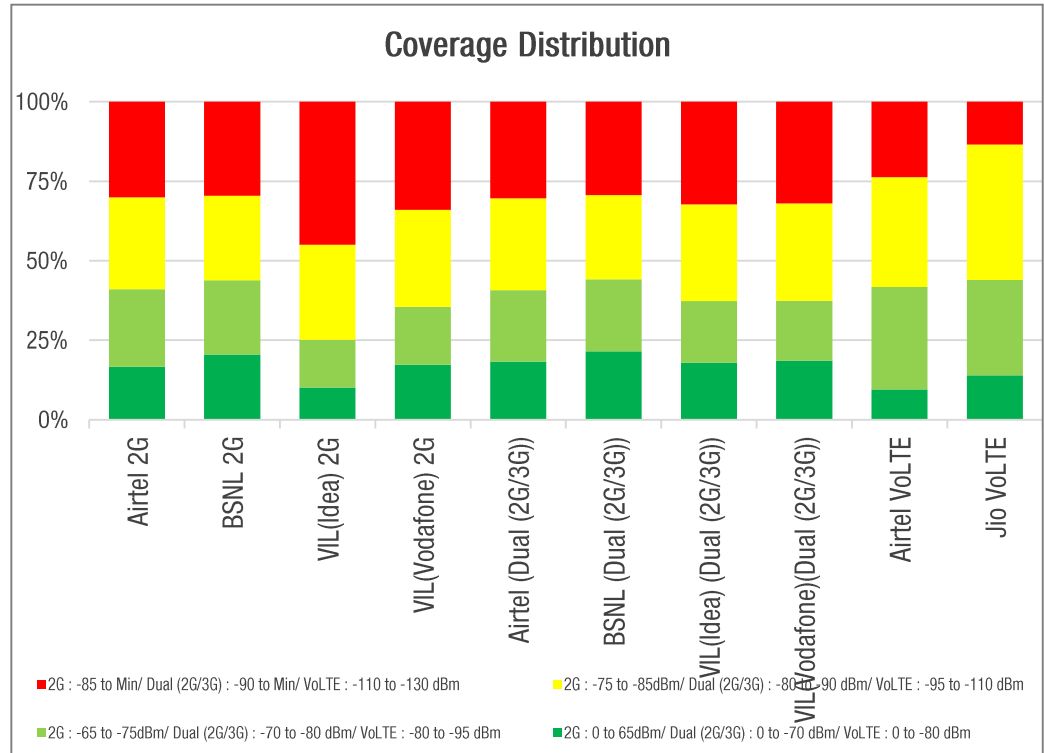
Ramkrishna Mission	3G				4G			
	Airtel	BSNL	VIL(Idea)	VIL(Vodafone)	Airtel	Jio	VIL(Idea)	VIL(Vodafone)
Download Throughput (Mbps)	3.32	0.13	0.18	0.14	15.38	5.20	0.24	0.26
Upload Throughput (Mbps)	0.63	0.29	0.15	1.28	2.98	3.62	3.14	3.29
Web Browsing Delay (sec)	9.09	13.63	10.82	13.71	4.15	6.38	18.29	12.42
Video Streaming Delay (sec)	1.31	TO	1.63	1.08	0.84	1.23	17.45	8.36
Latency (msec)	209	149	155	125	121	103	142	126

*TO=Timeout

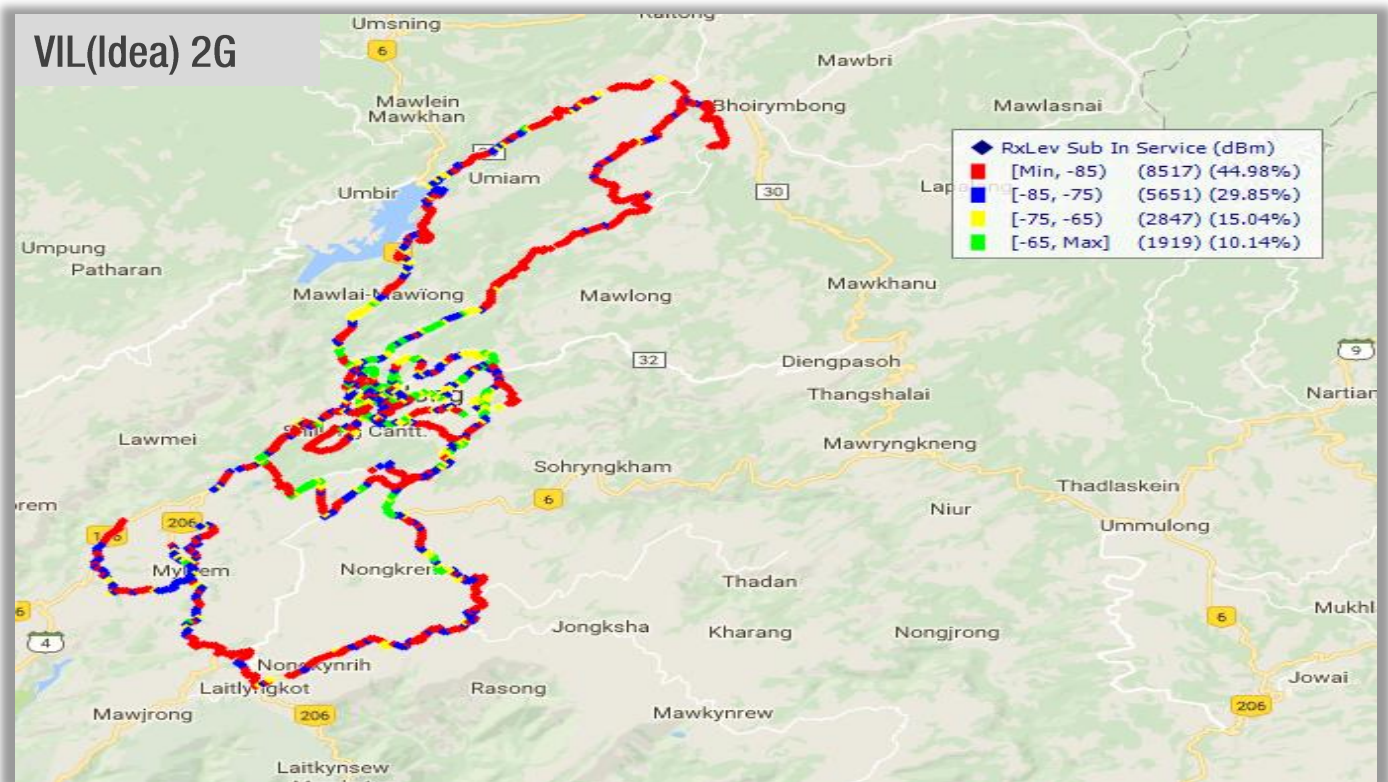
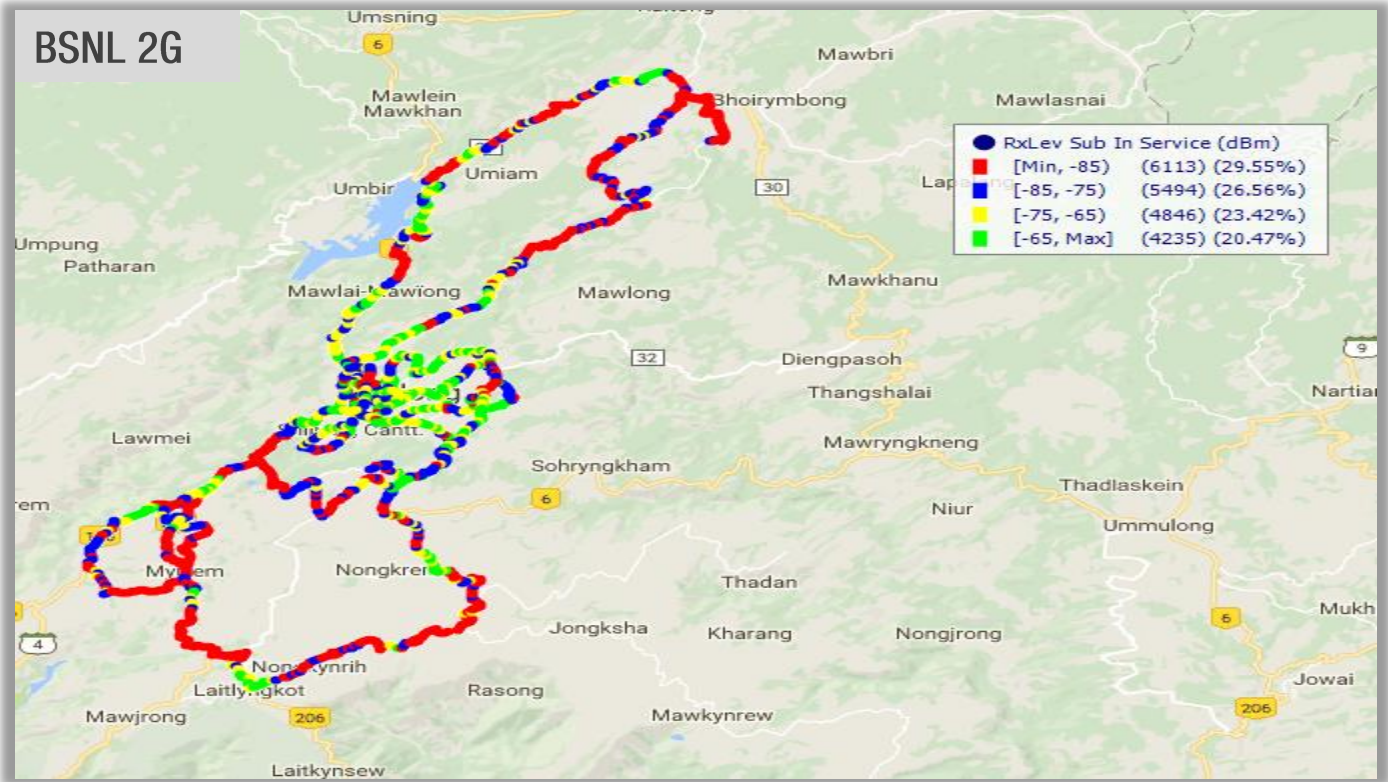
I. Coverage Details

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

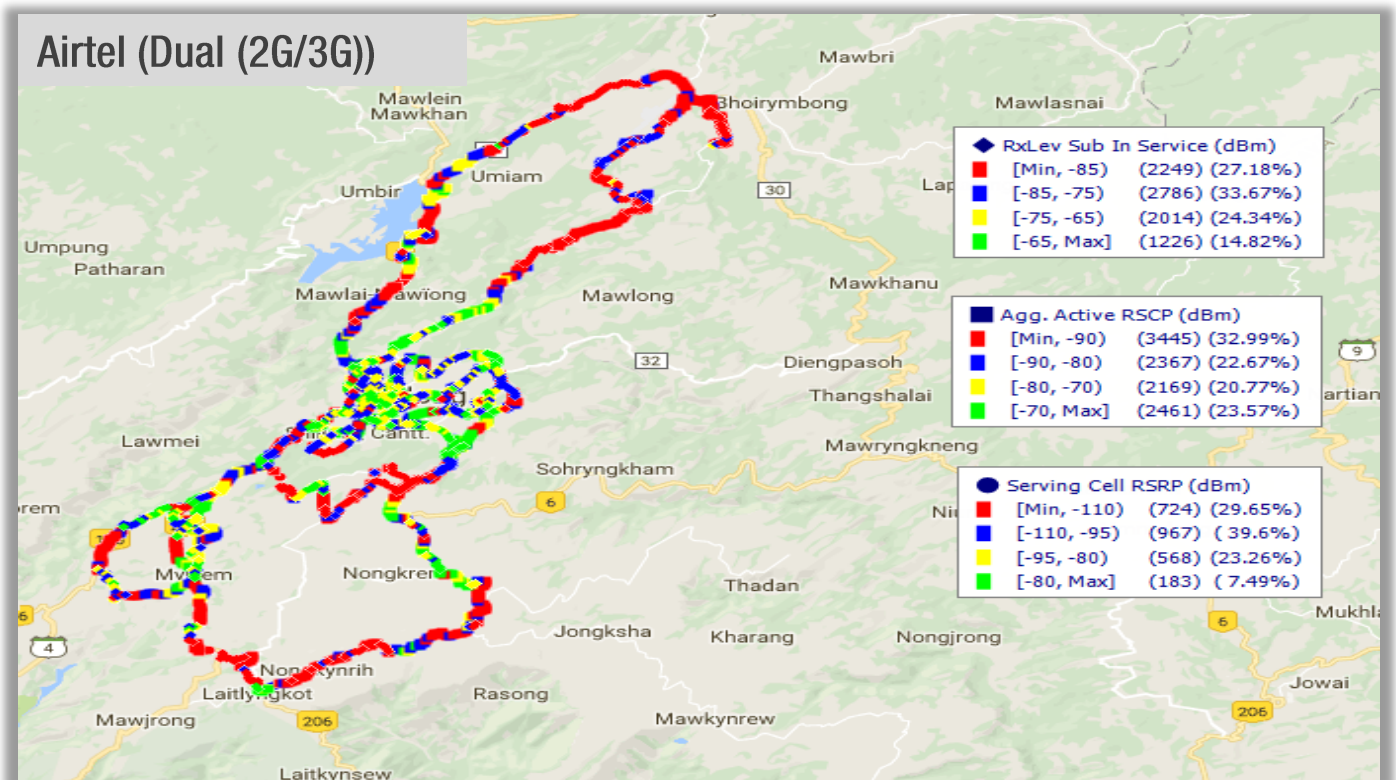
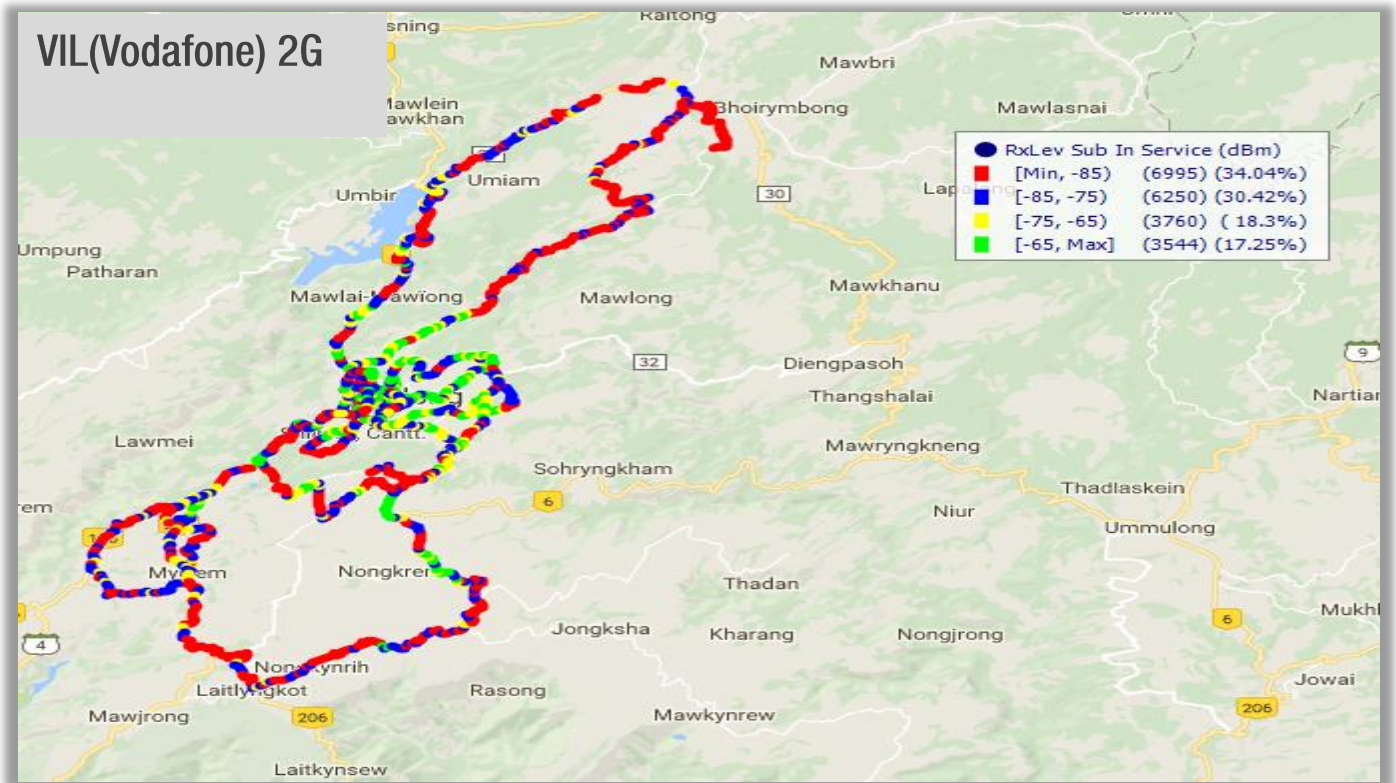
TSP	Coverage Rate
Airtel 2G	69.92%
BSNL 2G	70.45%
VIL(Idea) 2G	55.02%
VIL(Vodafone) 2G	65.96%
Airtel (Dual (2G/3G))	69.67%
BSNL (Dual (2G/3G))	70.60%
VIL(Idea) (Dual (2G/3G))	67.76%
VIL(Vodafone)(Dual (2G/3G))	68.03%
Airtel VoLTE	76.29%
Jio VoLTE	86.50%



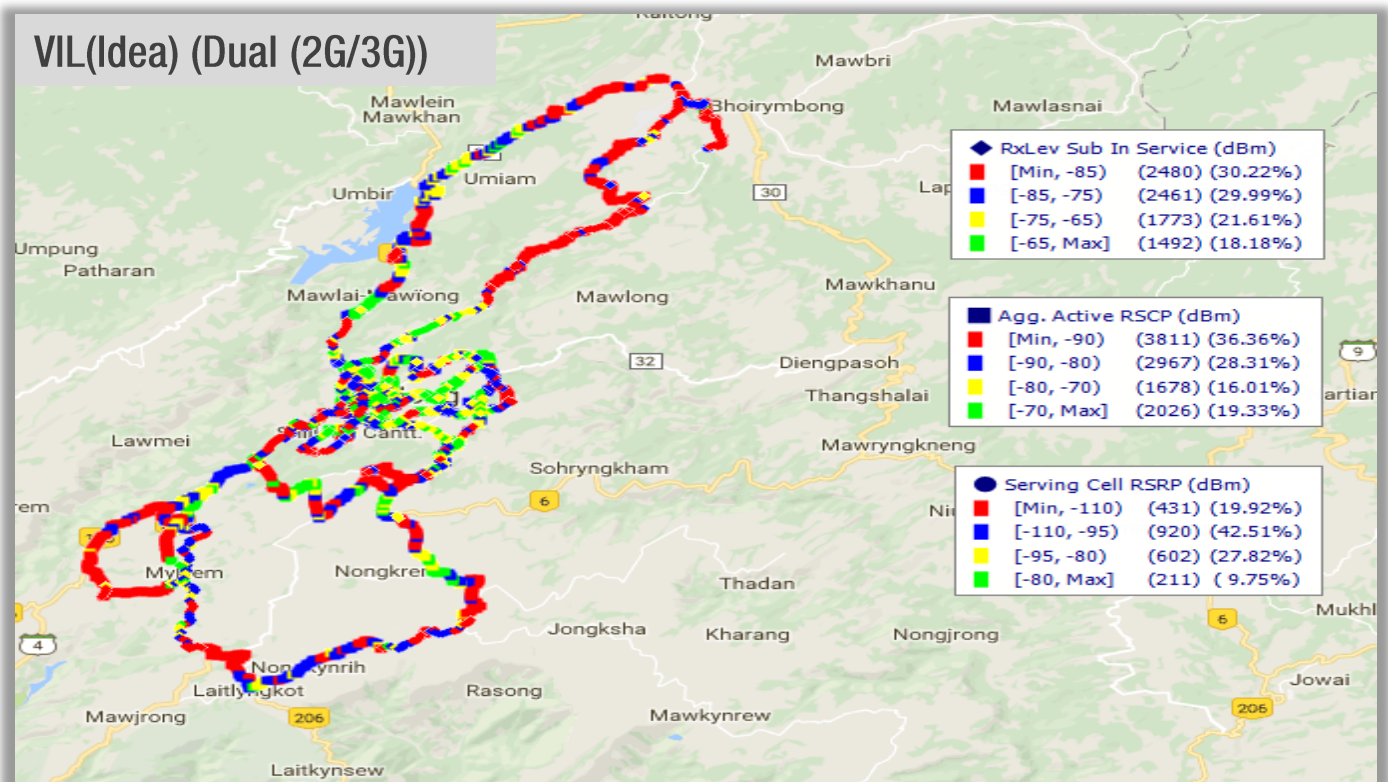
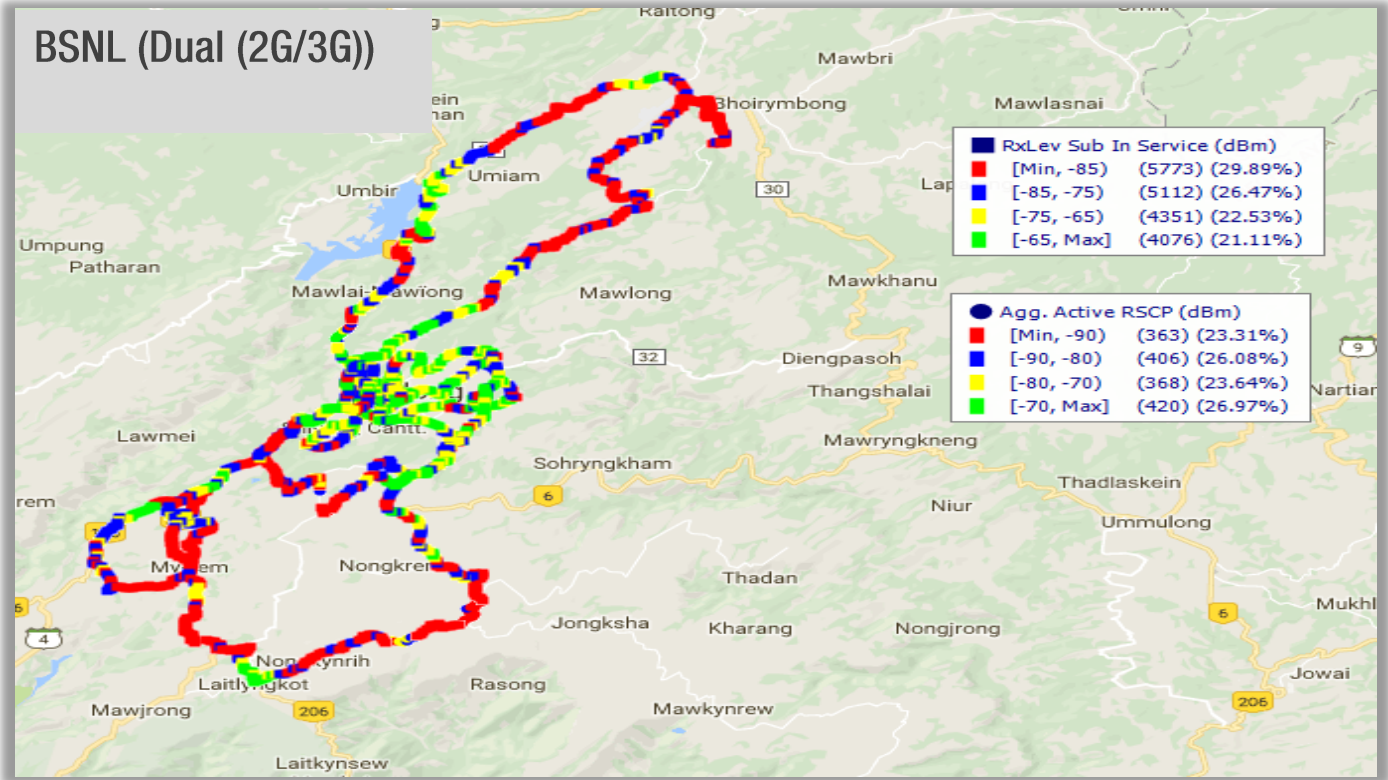
I. Coverage Details (contd.)



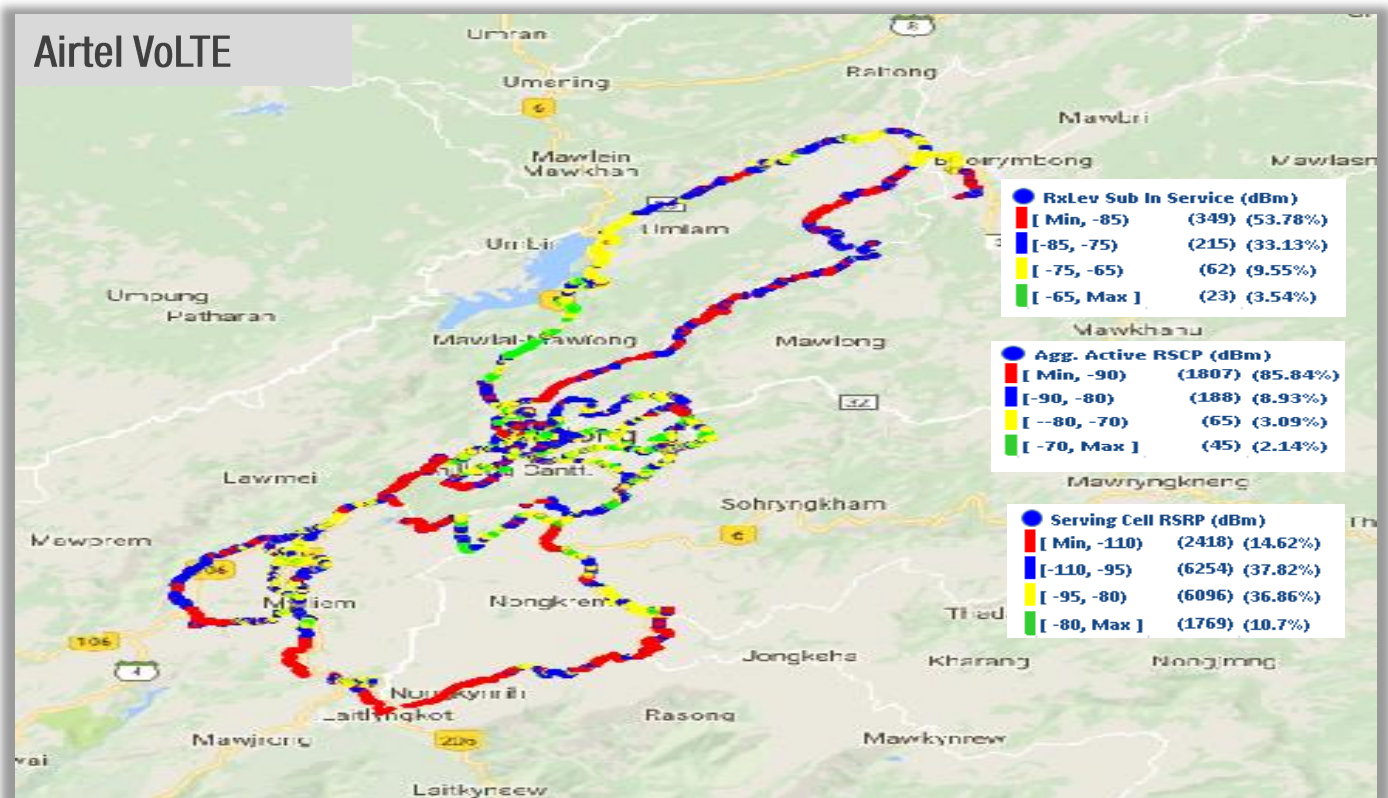
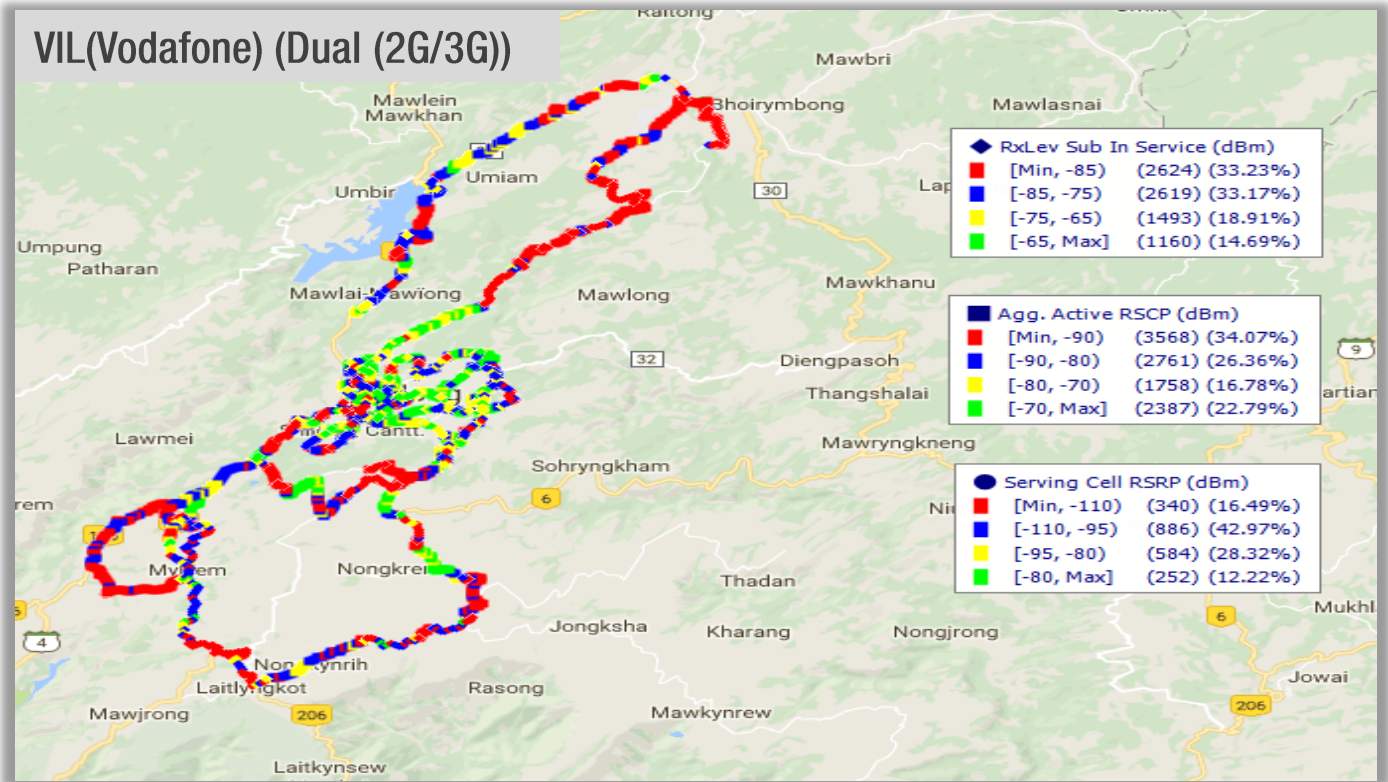
I. Coverage Details (contd.)



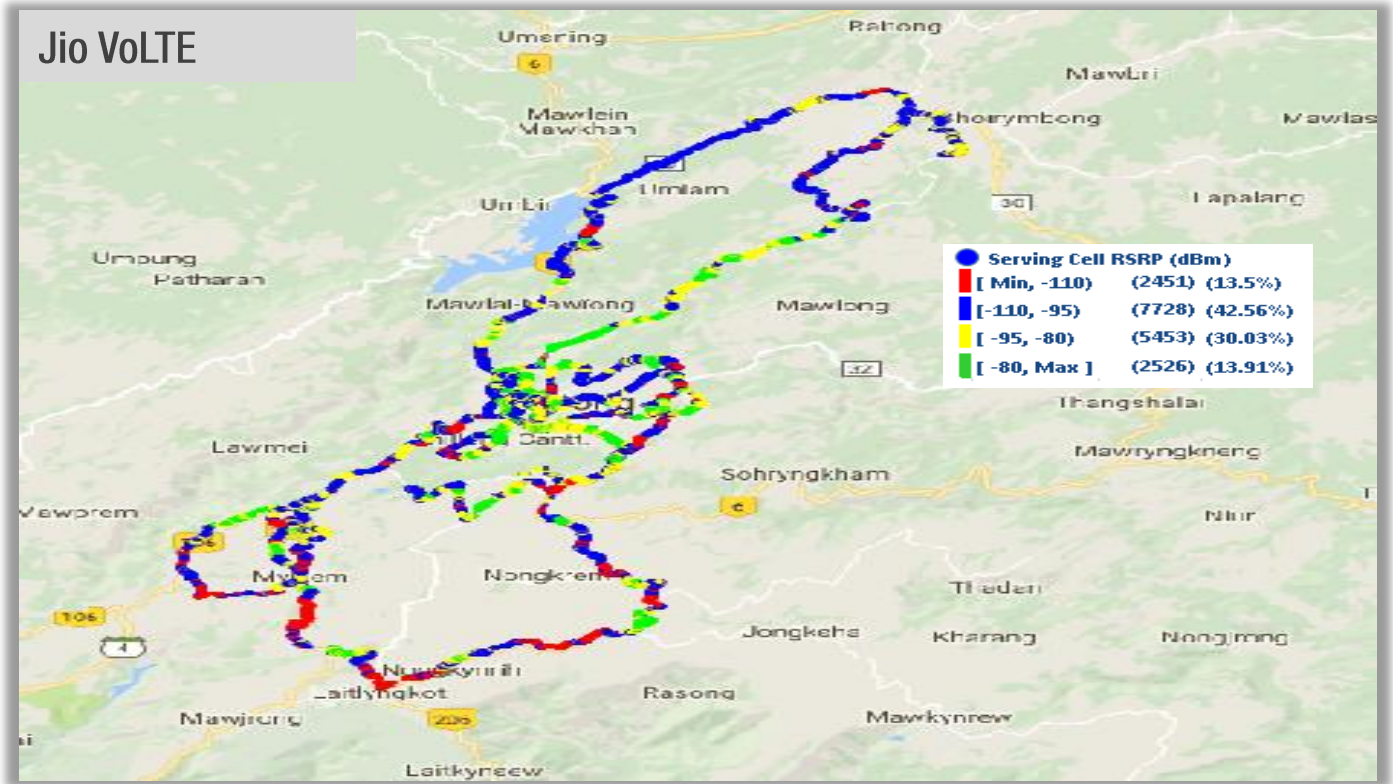
I. Coverage Details (contd.)



I. Coverage Details (contd.)



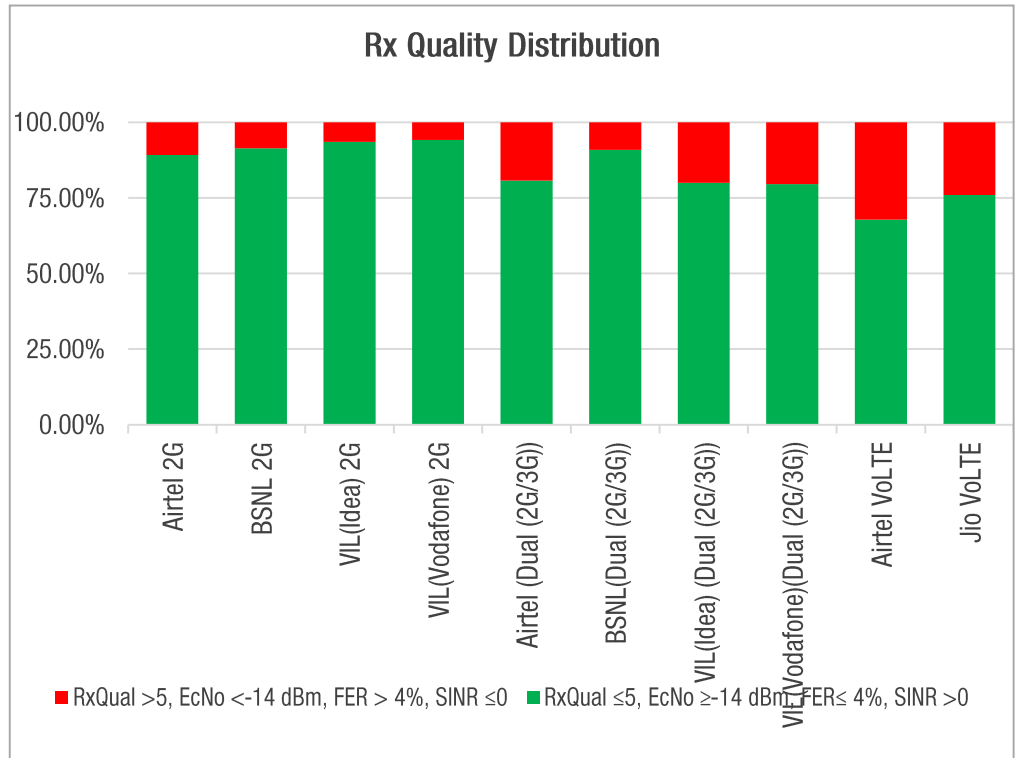
I. Coverage Details (contd.)



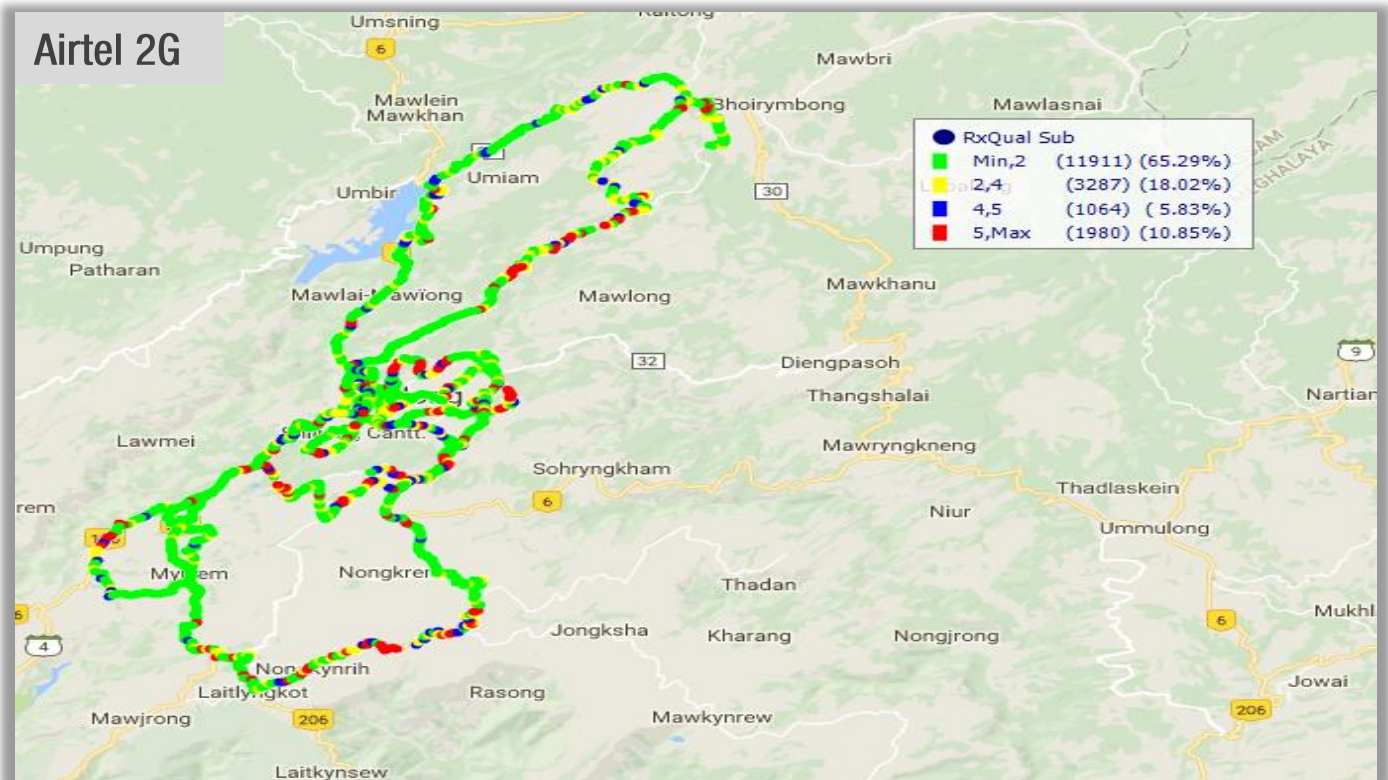
II. Quality Details

For measuring voice quality, as per the QoS norms, RxQual ≤ 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 $\geq 95\%$.

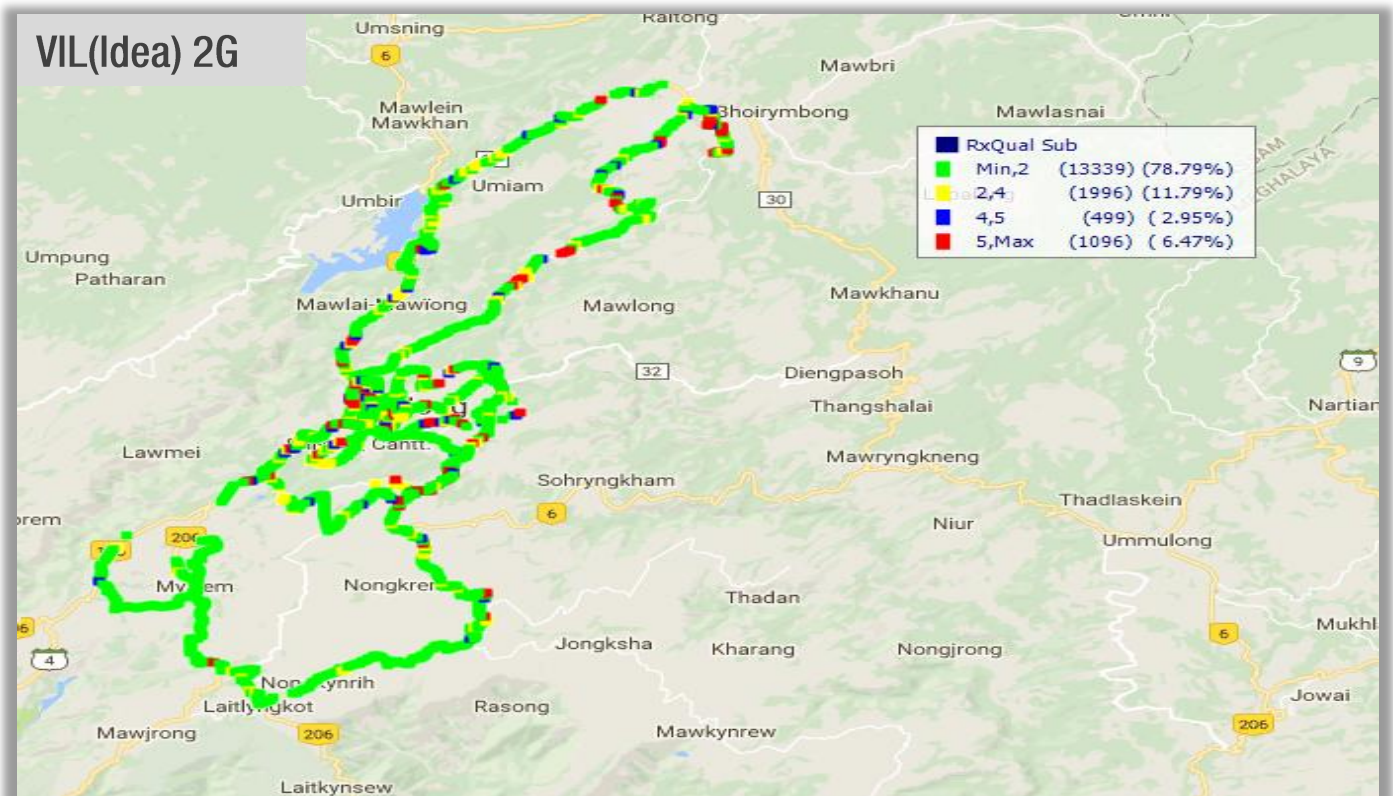
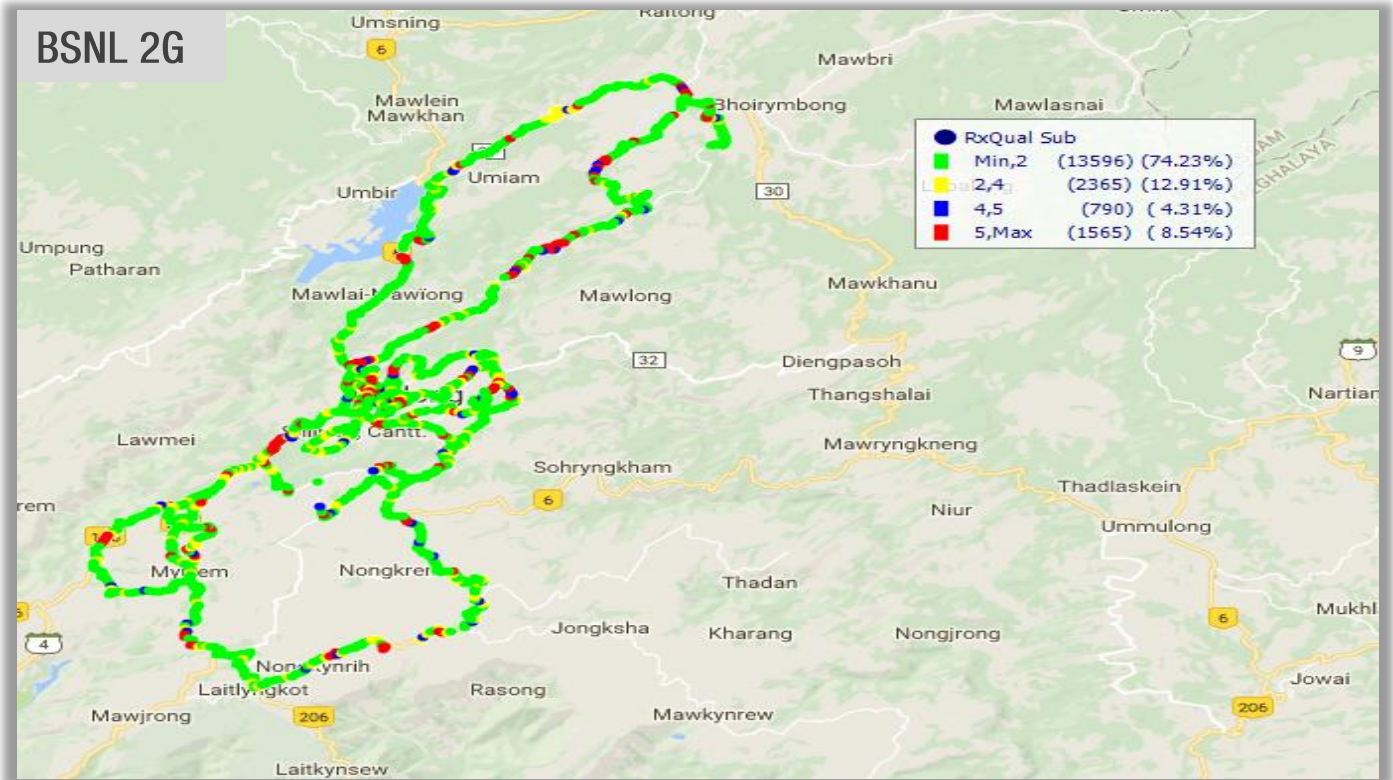
TSP	Rx Quality
Airtel 2G	89.15%
BSNL 2G	91.46%
VIL(Idea) 2G	93.53%
VIL(Vodafone) 2G	94.16%
Airtel (Dual (2G/3G))	80.69%
BSNL (Dual (2G/3G))	90.91%
VIL(Idea) (Dual (2G/3G))	79.96%
Vodafone(Dual (2G/3G))	79.55%
Airtel VoLTE	67.83%
Jio VoLTE	76.00%



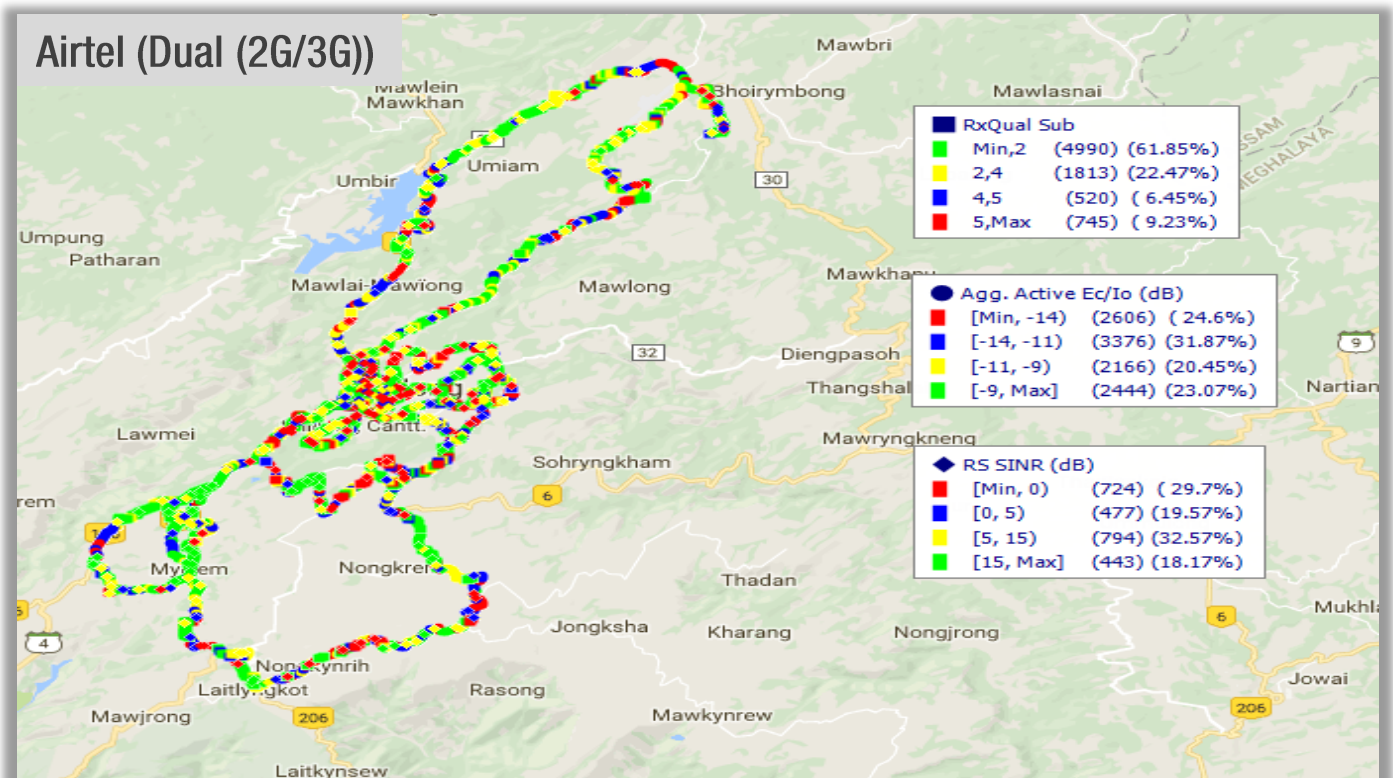
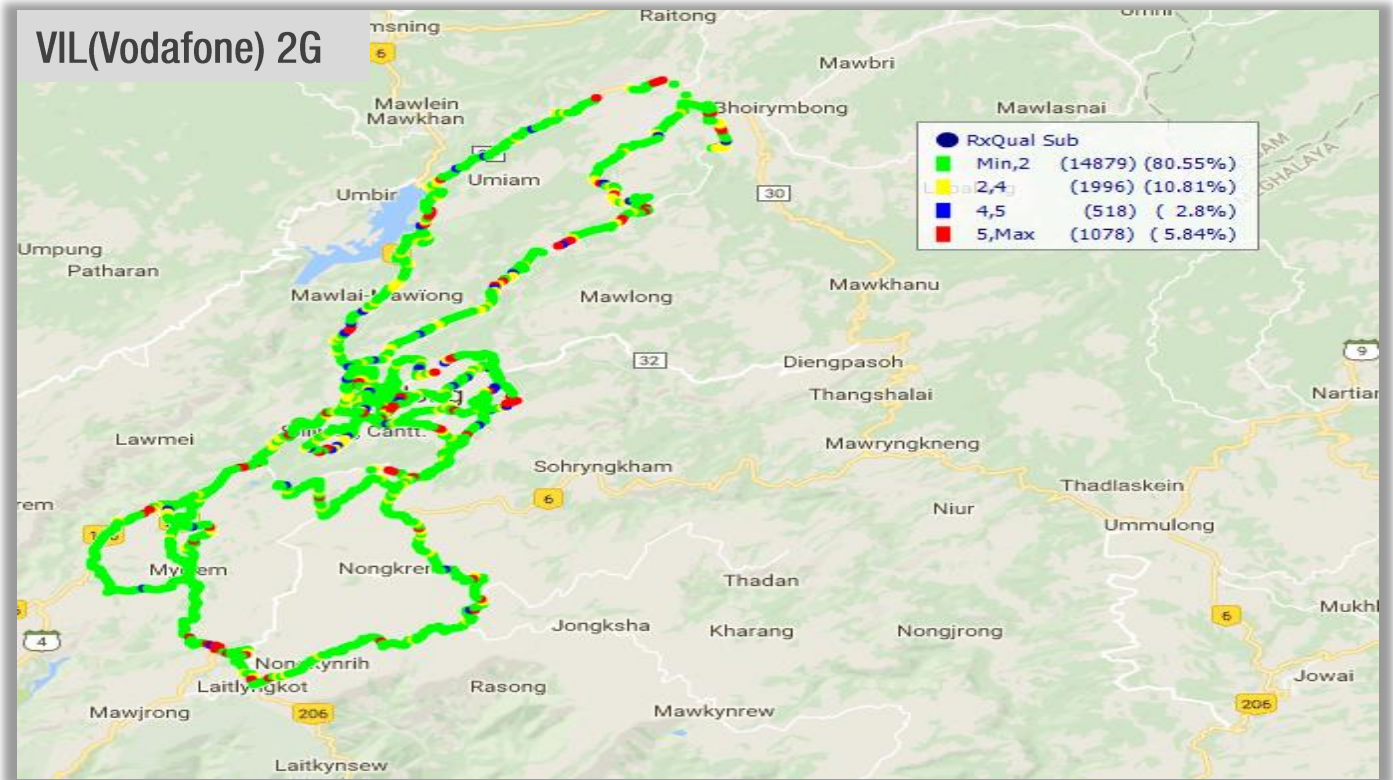
— TSPs not meeting the Benchmark



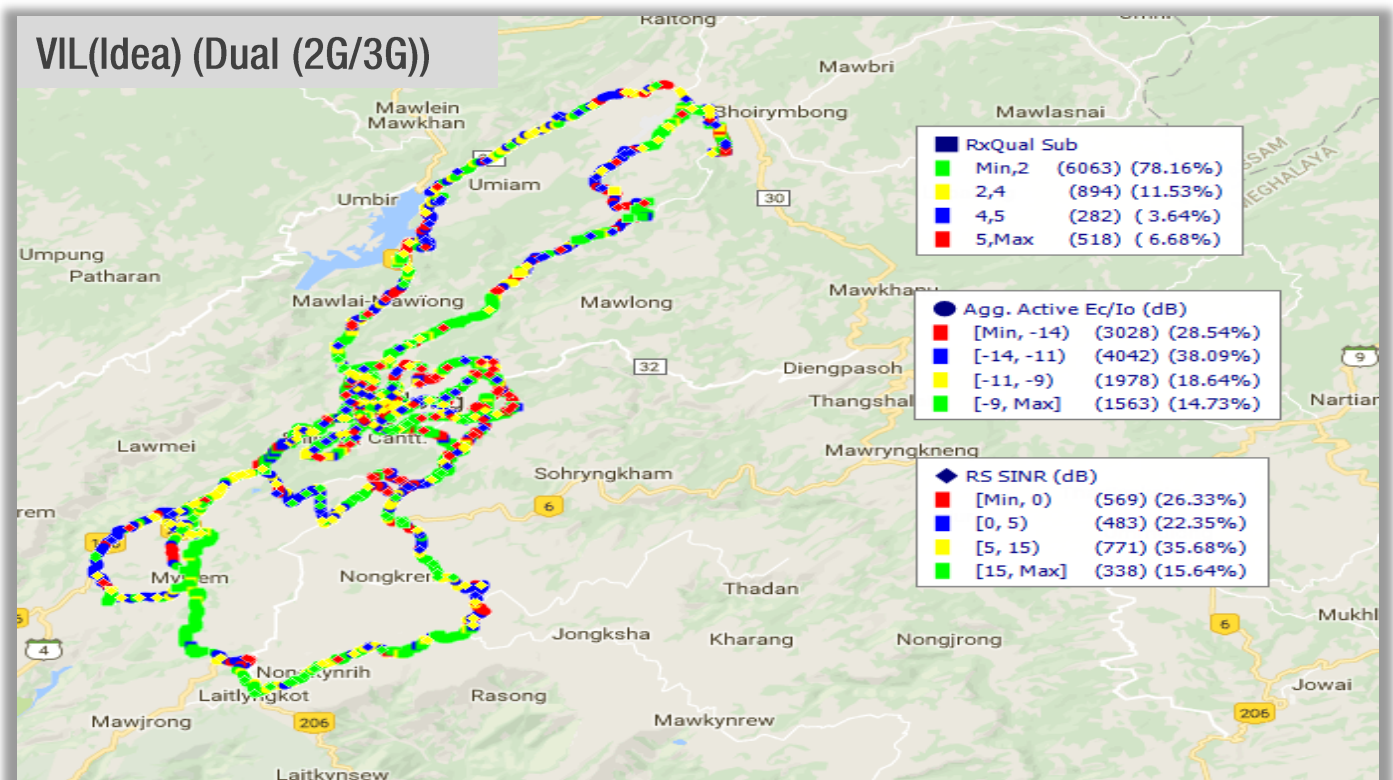
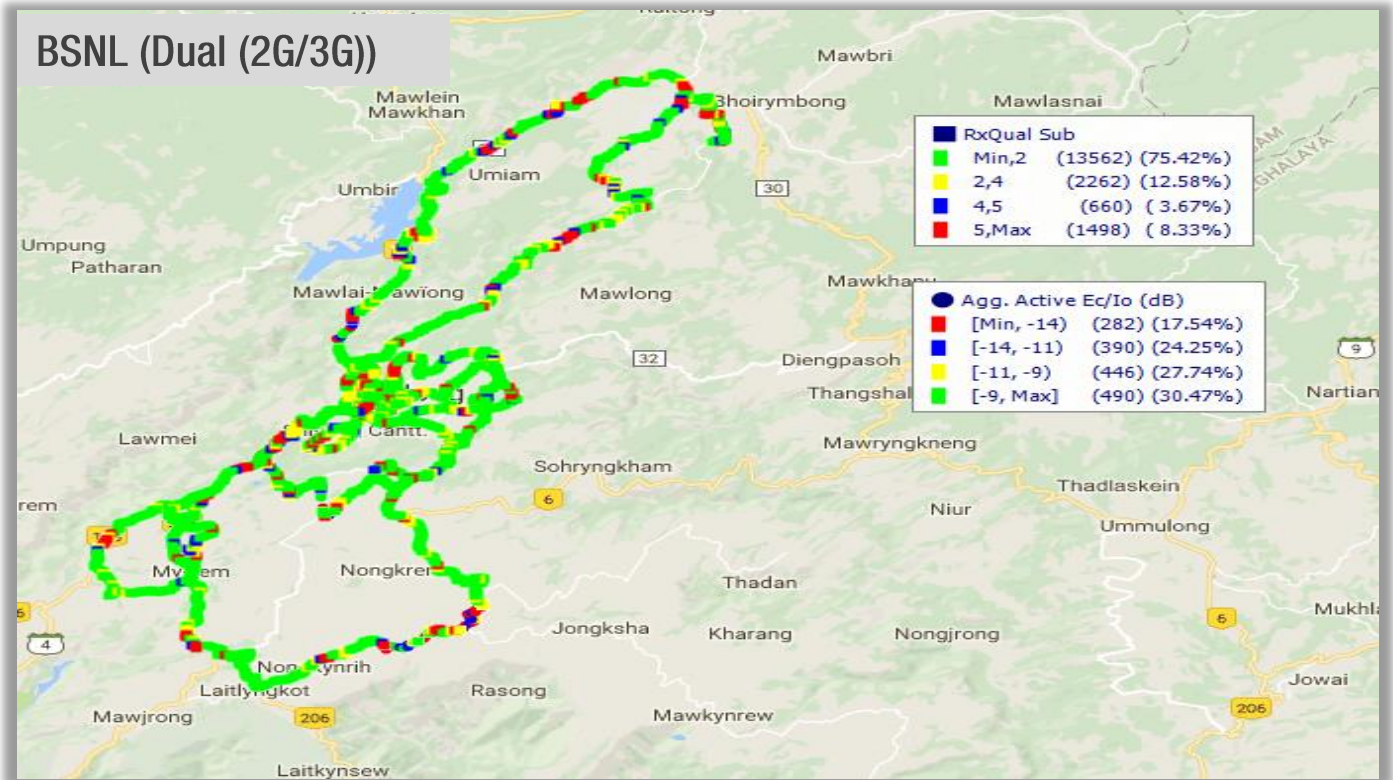
II. Quality Details (contd.)



II. Quality Details (contd.)

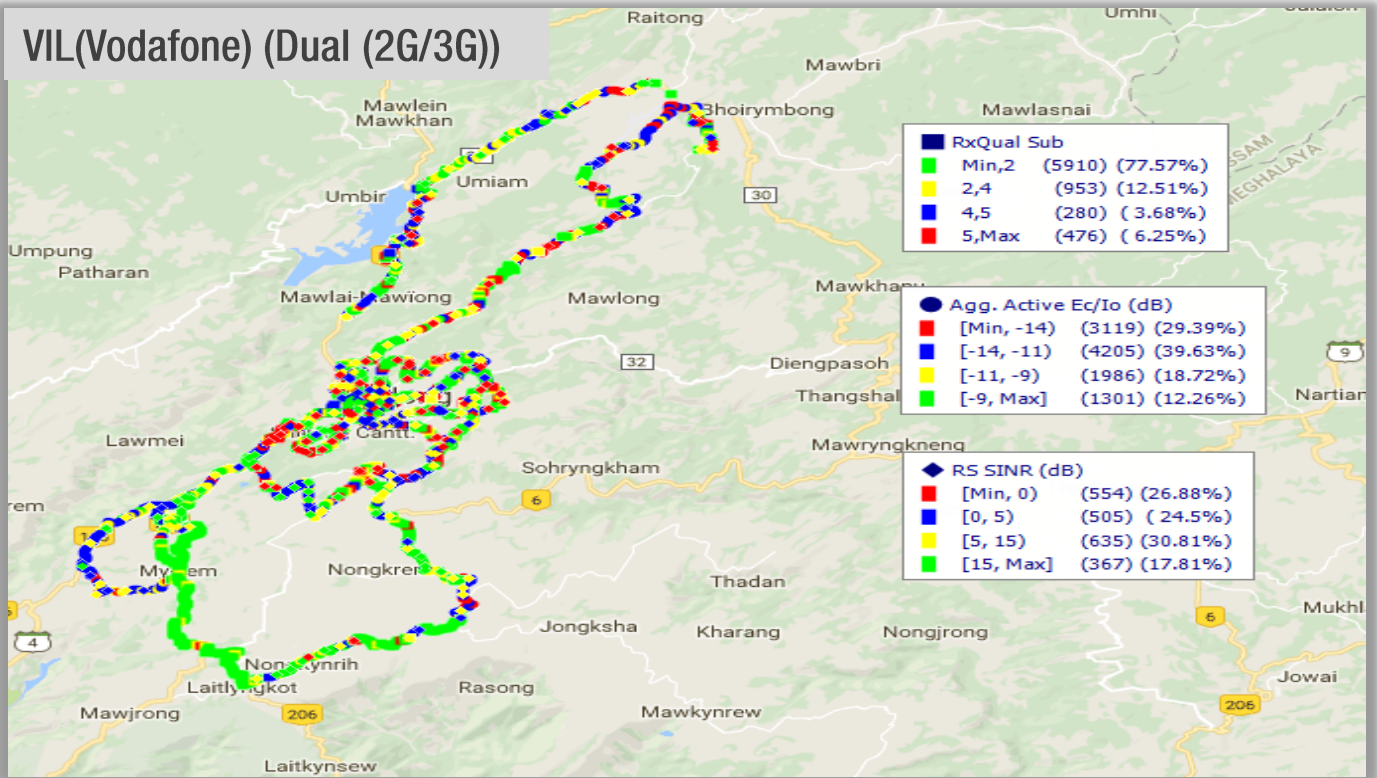


II. Quality Details (contd.)

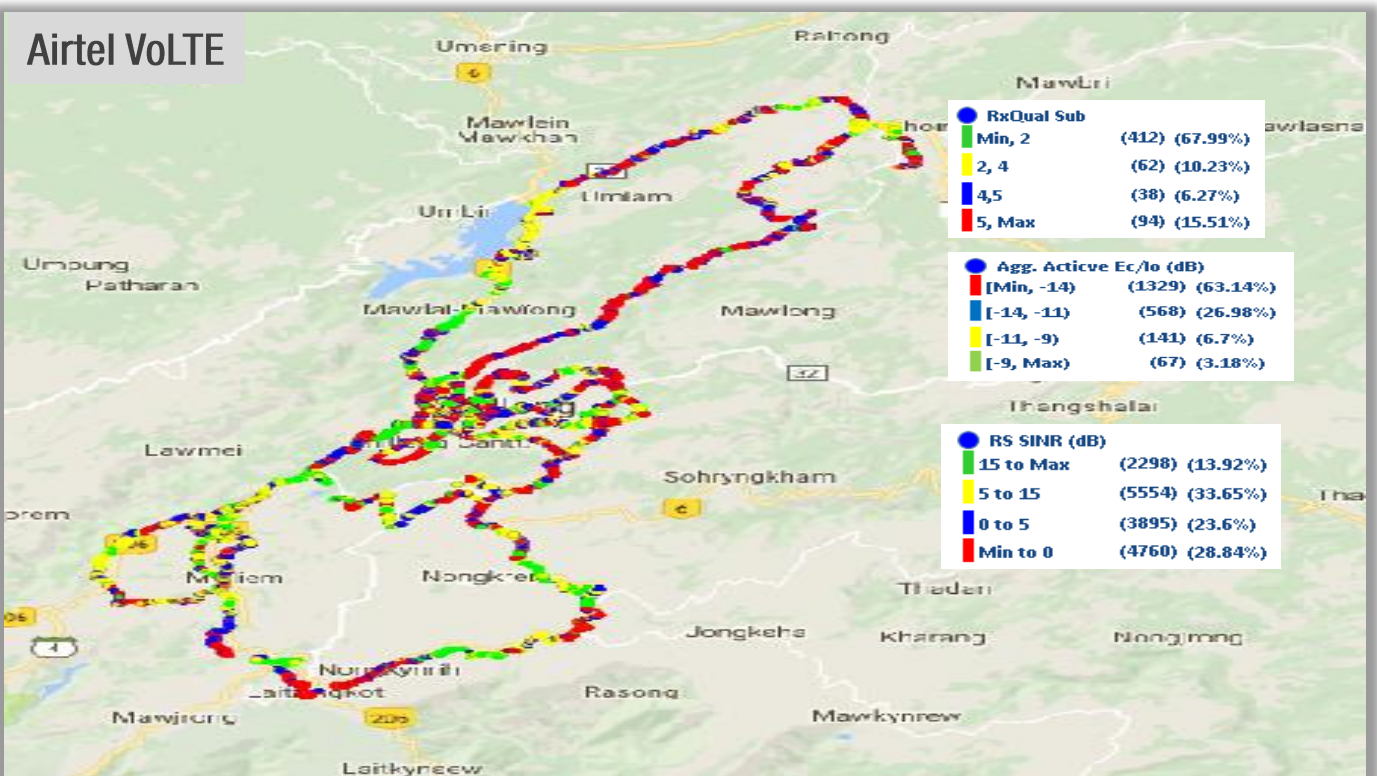


II. Quality Details (contd.)

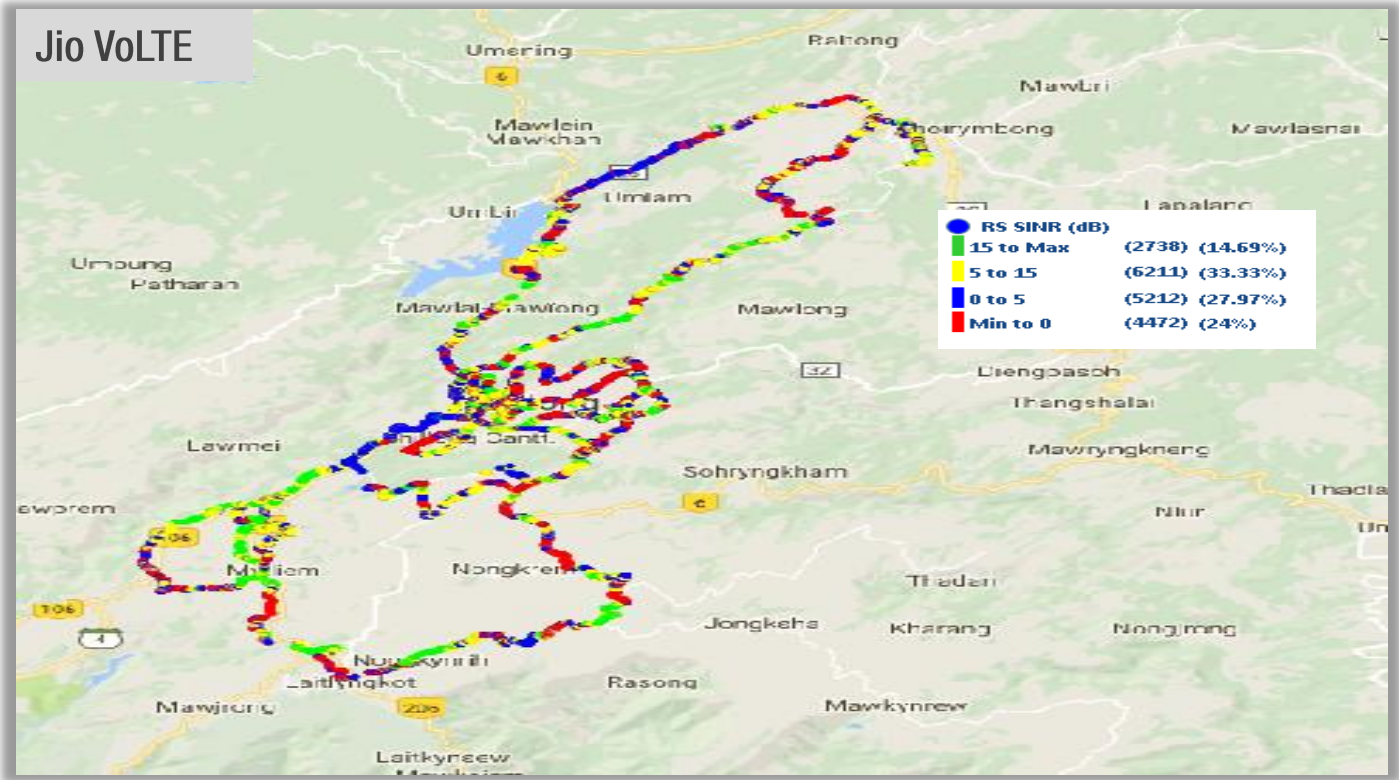
VIL(Vodafone) (Dual (2G/3G))



Airtel VoLTE

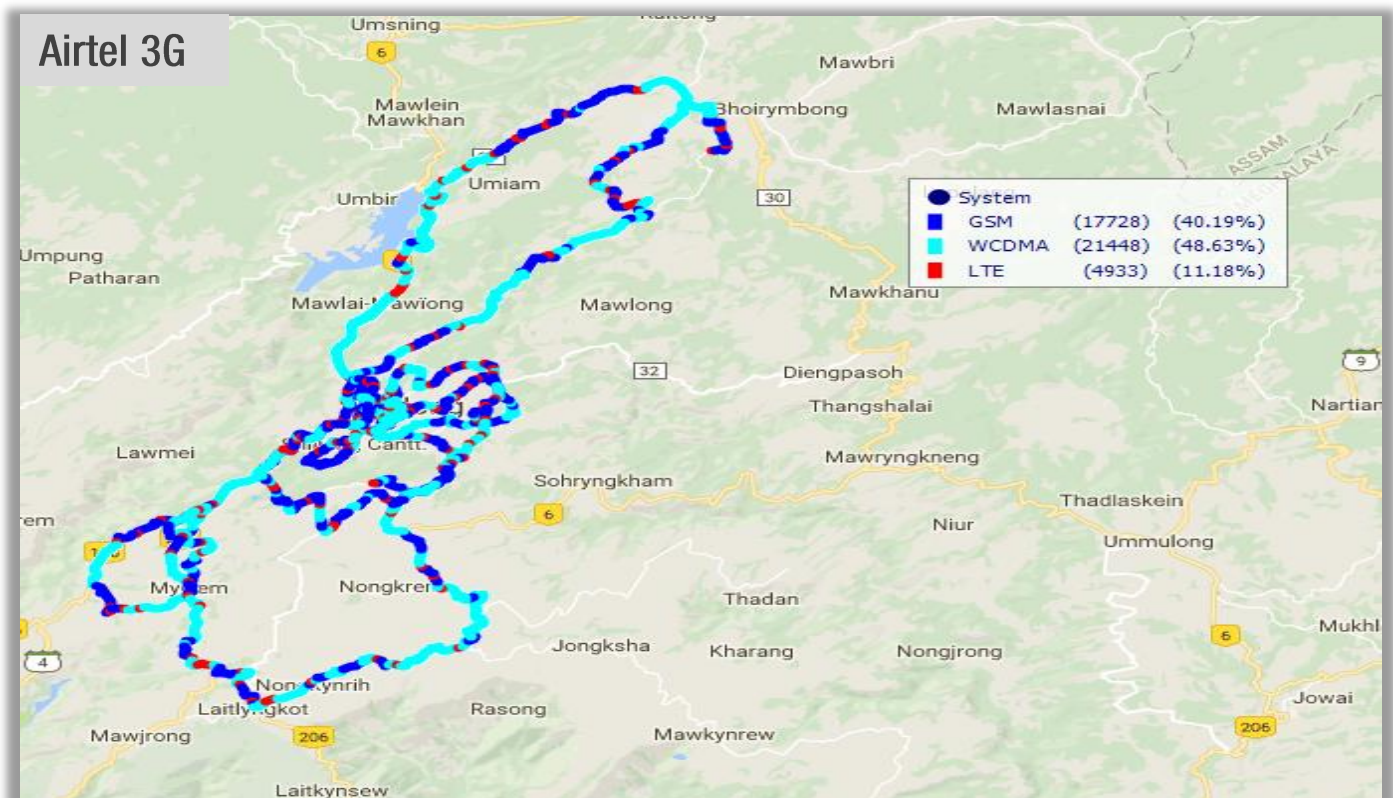
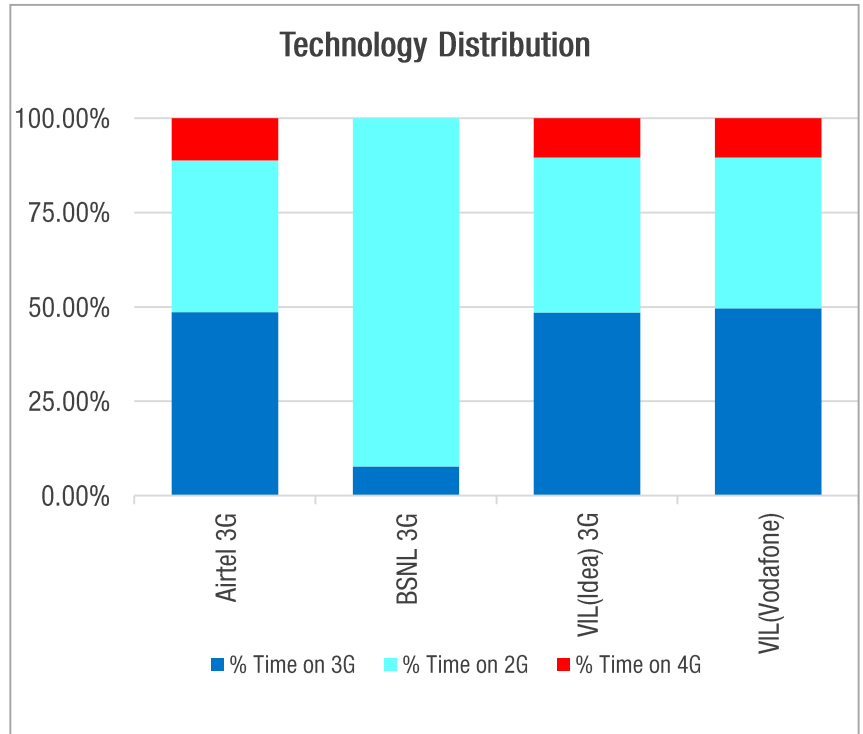


II. Quality Details (contd.)

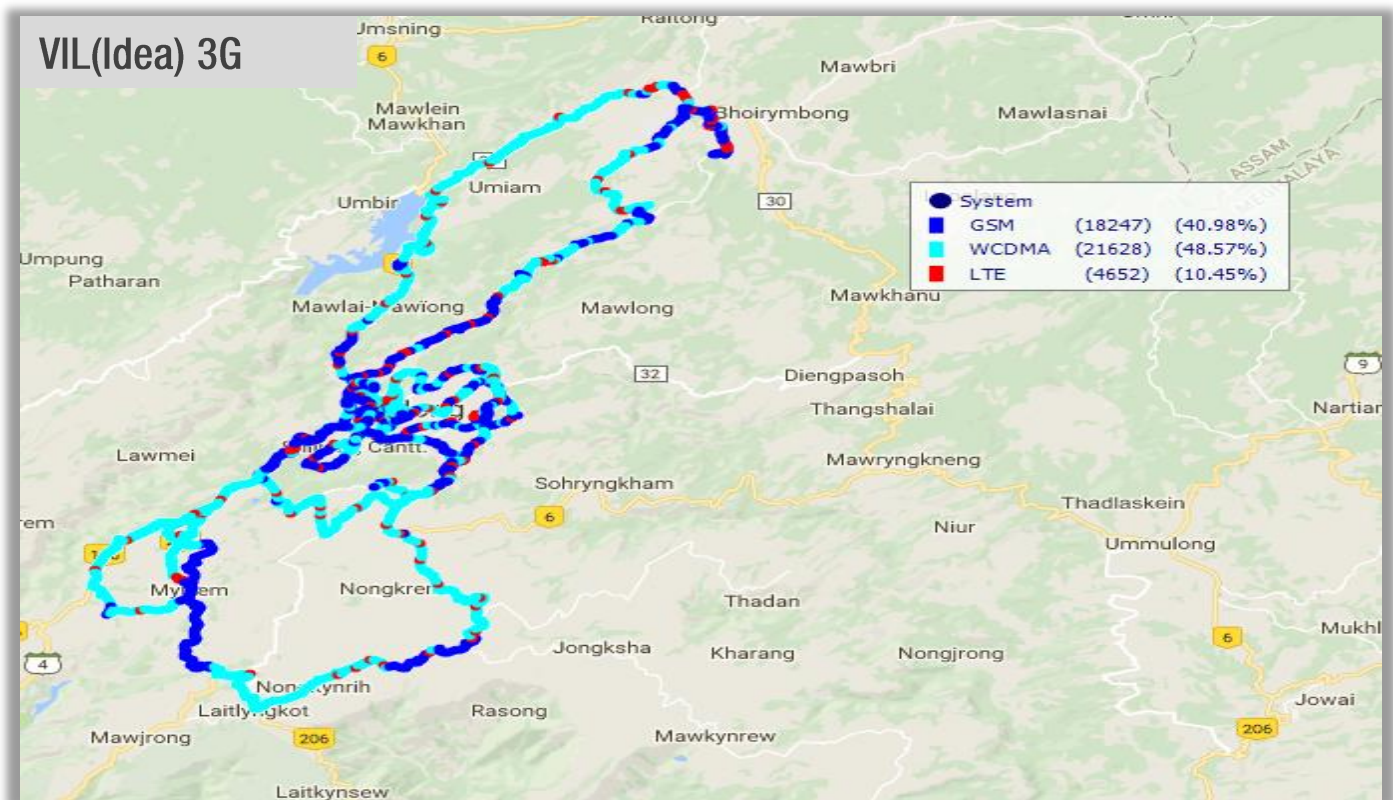
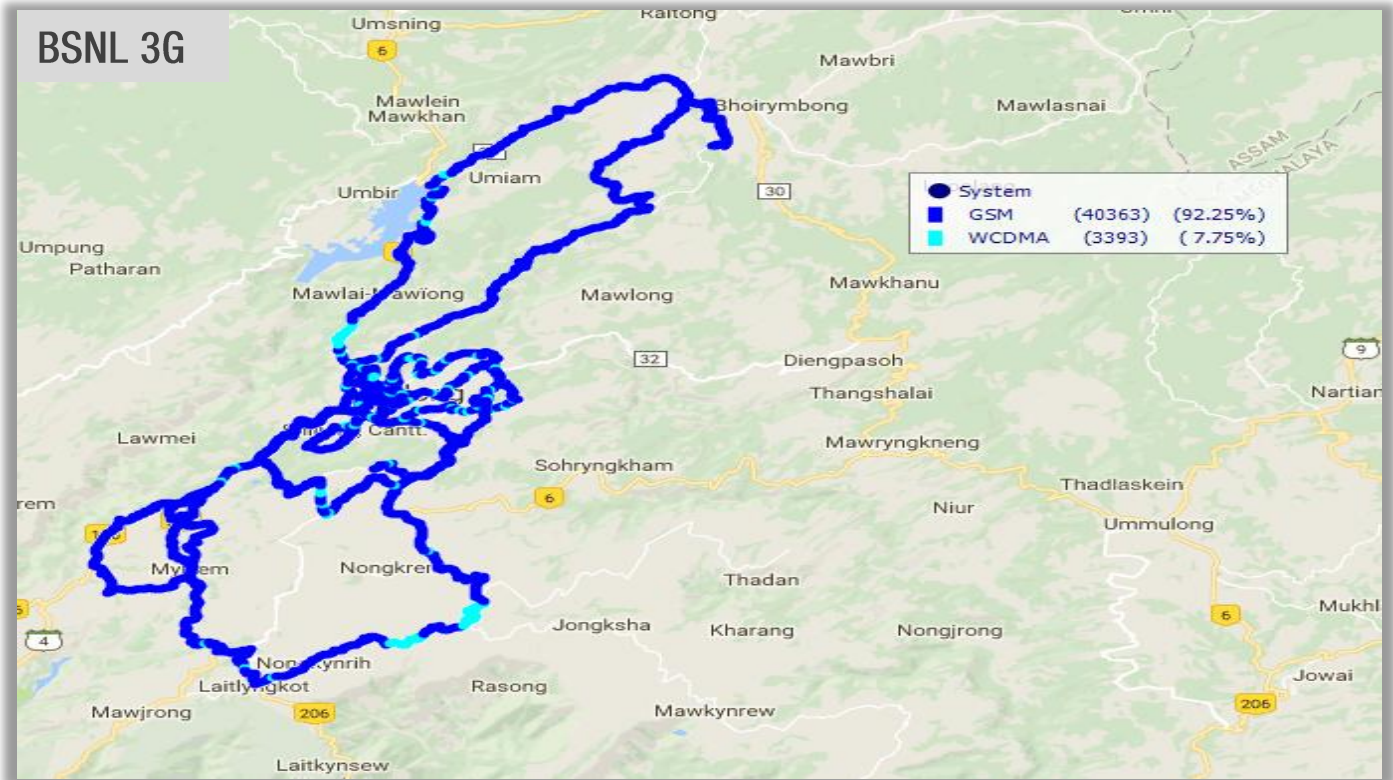


III. Technology Details

TSP	% Time on 3G
Airtel 3G	48.63%
BSNL3G	7.75%
VIL(Idea) 3G	48.57%
VIL(Vodafone) 3G	49.64%



III. Technology Details(contd.)



III. Technology Details(contd.)

