



TELECOM REGULATORY AUTHORITY OF INDIA

Regional Office – Bhopal

Operator Assisted Drive Test (OADT)

Lucknow (UPE) SSA

(Lucknow City, Rural Area of Lucknow SSA & Highways of Lucknow SSA)

21st, 22nd, 23rd, 25th & 26th October 2021

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 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 audits and assessments of Quality of Service to verify the Quality of Service claimed.

TRAI Regional Office Bhopal has conducted the drive test of Lucknow SSA with the help of telecom Service Providers of UPE from 21st Oct to 26th Oct. 2021 (5 Day) covering various locations in Lucknow SSA

Technical Details for drive test in Lucknow SSA:

A. Voice -

- i. 2G – measurement – UE Locked in 2G
- ii. 3G – measurement – UE in Dual mode (2G and 3G)
- iii. 4G – measurement – UE in Free mode

Calls were made for the 90-sec duration with a wait time of 10 sec between calls in all technologies.

B. Dynamic data – repeat data file download (to check throughput on entire route)

- I. 2G – measurement – UE Locked in 2G file size- 500KB
- II. 3G – measurement – UE in 3G File Size- 20MB
- III. 4G – measurement – UE in LTE File Size- 40MB

C. Static Data: Download and Upload Throughputs, Web Browsing Delay, Video Streaming Delay and Latency

- i. Download- 2G - 500KB ,3G - 20 MB, 4G - 40MB
- ii. Upload - 2G -100KB ,3G - 5 MB, 4G - 10MB
- iii. Web browsing - 3 links of e-commerce websites
<https://www.amazon.in>, <https://www.flipkart.com>,
<https://paytm.com>.
- iv. Video Streaming – 130 sec clip (only in 3G and LTE)
- v. Latency – 32 Bytes on www.google.com.

Available network in Lucknow SSA

- 2G Network –Airtel, BSNL and VIL
- 3G Network – BSNL
- VoLTE Network – Airtel, RJio and VIL

Approximate Calls for Voice

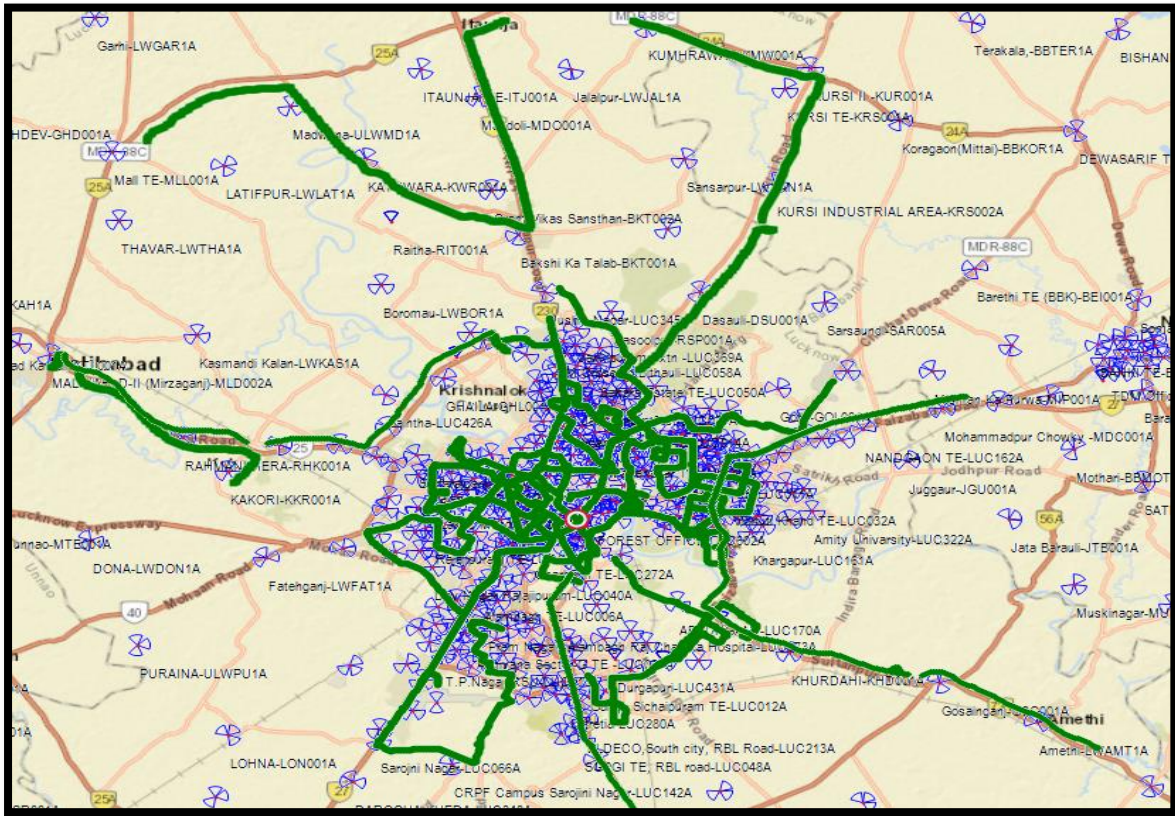
- Airtel - (2G- 802+VoLTE-829)- Total 1631
- BSNL- (2G- 840+3G-750)- Total 1590
- Jio- VoLTE- 719 Total -719
- VIL- (2G-592 +VoLTE-640) Total 1232

Route KM Covered for Voice & data- 617 KM

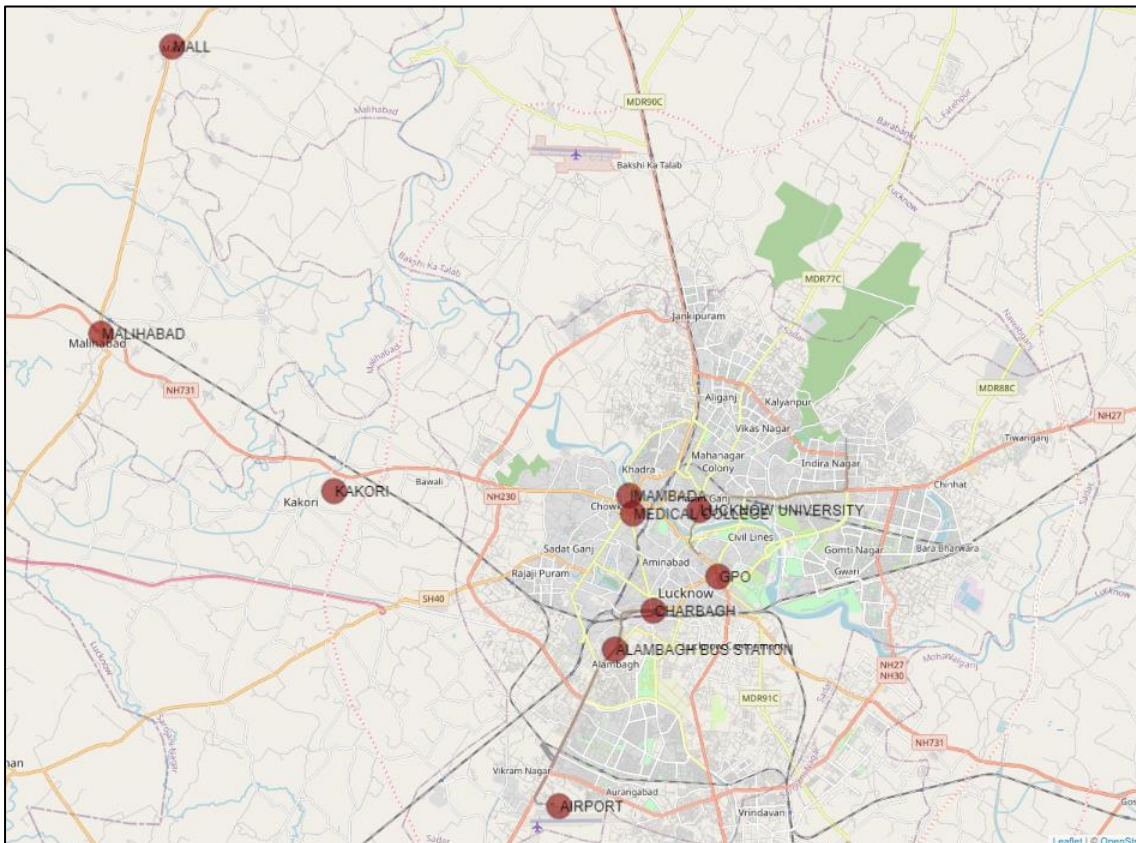
Hotspots locations for static Data Testing

1. GPO HAZRATGANJ
2. AIRPORT
3. CHARBAGH
4. ALAMABAGH BUS STATION
5. IMAMBADA
6. MEDICAL COLLEGE
7. LUCKNOW UNIVERSITY
8. KAKORI
9. MALIHABAD
10. MALL

Voice & data drive test route (Map)

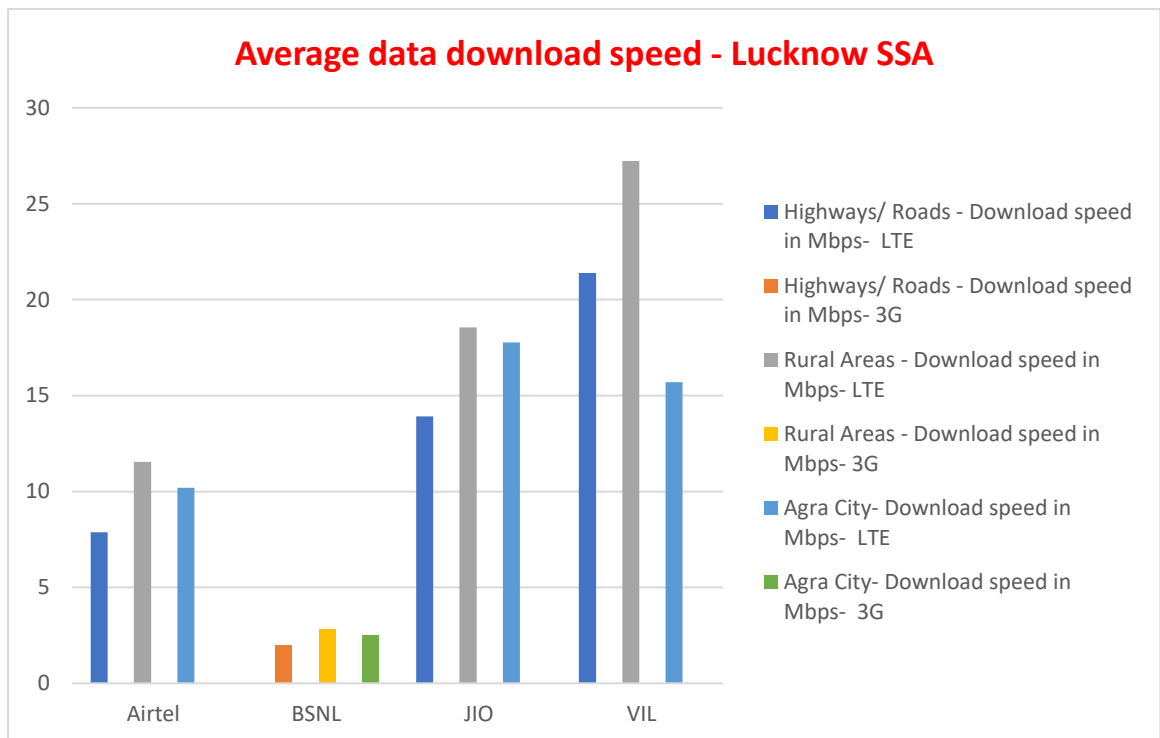


Data testing hotspot locations (Map)



Key observations from Drive test

- Drive test completed for the TSP Airtel, BSNL, JIO & VIL for all available technologies offered by TSPs in Lucknow SSA.
- With Voice , data download also tested throughout the drive test routes.



- In 10 locations (hotspots) static data testing also conducted for all offered technologies. Data services found satisfactory.
- TRAI Benchmark achievement by TSPs during the drive test. Most of the important benchmark achieved by the TSPs Except Rx Quality in VoLTE could not be achieved by any TSP.

Key observations from Drive test

TRAI Benchmark

Block call rate %	≤3%
Drop call rate %	≤2%
CSSR %	≥95 %
SDCCH /RRC Congestion	≤1%
TCH/ RAB Congestion	≤2%
Down Link (DL) Packet Drop Rate or DL-PDR	≤2%
Mobility HOSR %-	≥95%
Good RX Quality %	≥95%
Value of radio link timeout (RLT)	≤ 48
PDP Context Activation Success Rate %	≥95 %

Detailed observations

Key observations of Voice Call

Voice call summary (Lucknow City)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Call attempts	548	668	NA	407
Block call rate %	0	1.6	NA	0.25
CSSR %	100	98.4	NA	99.75
Drop call rate %	0	1.98	NA	0.00
Mobility HOSR %	99.99	97.01	NA	98.63
RX Quality %	96.24	95.01	NA	94.38
Average CST (Sec)	4.31	3.3		3.82

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Call attempts	NA	496	NA	NA
Block call rate %	NA	0.60	NA	NA
CSSR %	NA	99.40	NA	NA
Drop call rate %	NA	1.83	NA	NA
Mobility HOSR %	NA	96.86	NA	NA
RX Quality %	NA	94.45	NA	NA
Average CST(Sec)	NA	2.9		NA

TSP (For VolTE)	Airtel	BSNL	JIO	VIL
Call attempts	565	NA	515	422
Block call rate %	0	NA	0.00	0.23
CSSR %	100	NA	100	99.77
Drop call rate %	0	NA	0.00	0.00
Mobility HOSR %	100	NA	99.07	99.50
RX Quality %	83.71	NA	88.63	86
Average CST (Sec)	1.36	NA	2.68	2.76

Technology	Parameter	Airtel	BSNL	JIO	VIL
2G	SDCCH Congestion (<=1%)	0.00	0.2	NA	0.493
	TCH Congestion (<=2%)	0.00	1.98	NA	0.025
3G	CSFB Failure %	NA	NA	NA	NA
	SDCCH Congestion %	NA	0	NA	NA
	RRC Congestion %	NA	0	NA	NA
	SDCCH and RRC Congestion % (<=1%)	NA	0	NA	NA
	TCH Congestion %	NA	0	NA	NA
	RAB Congestion %	NA	0	NA	NA
	TCH and RAB Congestion % (<=2%)	NA	0	NA	NA

Coverage

1. Percentage of Coverage sample of 2G >= - 85 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	93.91	88.7	NA	96.11

2. Percentage of Coverage sample of 3G >= - 90 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	NA	82.24	NA	NA

3. Percentage of Coverage sample of VoLTE >= -110 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	99.59	NA	99.43	98.1

4. Percentage of time spent on 3G Network

TSP	Airtel	BSNL	JIO	VIL
Time spent %	NA	73.24	NA	NA

5. Percentage of time spent on VoLTE Network

TSP	Airtel	BSNL	JIO	VIL
Time spent %	99.72	NA	100	97.6

6. Percentage of RLT >= 48

TSP	Airtel	BSNL	JIO	VIL
Percentage of RLT >=48	0	0	NA	0

Voice call summary

(Rural Area/ Forest Area e.g., Villages/ Tourist places/ Block or Tehsil)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Call attempts	85	53	NA	37
Block call rate %	0	3.7	NA	0.00
CSSR %	100	96.3	NA	100
Drop call rate %	0	1.88	NA	0.00
Mobility HOSR %	100	100	NA	100
RX Quality %	96.77	88.94	NA	91.72
Average CST Sec	4.34	3.37		3.47

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Call attempts	NA	162	NA	NA
Block call rate %	NA	1.2	NA	NA
CSSR %	NA	98.8	NA	NA
Drop call rate %	NA	2.4	NA	NA
Mobility HOSR %	NA	94.35	NA	NA
RX Quality %	NA	93.23	NA	NA
Average CST Sec	NA	3.1	NA	NA

TSP (For VolTE)	Airtel	BSNL	JIO	VIL
Call attempts	88	NA	83	69
Block call rate %	0	NA	0	0.00
CSSR %	100	NA	100	98.55
Drop call rate %	0	NA	0	0.00
Mobility HOSR %	100	NA	98.07	95.31
RX Quality %	90.28	NA	89.22	79.51
Average CST Sec	1.94	NA	1.60	2.89

Technology	Parameter	Airtel	BSNL	JIO	VIL
2G	SDCCH Congestion (<=1%)	0.00	0.3	NA	0.10
	TCH Congestion (<=2%)	0.00	1.88	NA	0.00
3G	CSFB Failure %	NA	NA	NA	NA
	SDCCH Congestion %	NA	2.4	NA	NA
	RRC Congestion %	NA	2.4	NA	NA
	SDCCH and RRC Congestion % (<=1%)	NA	2.4	NA	NA
	TCH Congestion %	NA	0	NA	NA
	RAB Congestion %	NA	0	NA	NA
	TCH and RAB Congestion % (<=2%)	NA	0	NA	NA

Coverage

1. Percentage of Coverage sample of 2G >= - 85 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	92.21	53.1	NA	79.02

2. Percentage of Coverage sample of 3G >= - 90 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	NA	57.06	NA	NA

3. Percentage of Coverage sample of VoLTE >= -110 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	93.27	NA	96.55	86

4. Percentage of time spent on 3G Network

TSP	Airtel	BSNL	JIO	VIL
Time spent %	NA	72.62	NA	NA

5. Percentage of time spent on VoLTE Network

TSP	Airtel	BSNL	JIO	VIL
Time spent %	100	NA	100	86.99

6. Percentage of RLT >= 48

TSP	Airtel	BSNL	JIO	VIL
Percentage of RLT >=48	0	0	NA	0

Voice call summary

(National Highway/ State Highway/ Important connecting roads)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Call attempts	169	119	NA	148
Block call rate %	0	5	NA	0.00
CSSR %	100	95	NA	100
Drop call rate %	0	1.8	NA	0.00
Mobility HOSR %	97.32	85.88	NA	98.78
RX Quality %	96.06	87.52	NA	91.08
Average CST Sec	4.06	3.31	NA	3.72

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Call attempts	NA	92	NA	NA
Block call rate %	NA	2.0	NA	NA
CSSR %	NA	98.0	NA	NA
Drop call rate %	NA	2.6	NA	NA
Mobility HOSR %	NA	95.61	NA	NA
RX Quality %	NA	95.19	NA	NA
Average CST (Sec)	NA	3.2	NA	NA

TSP (For VoLTE)	Airtel	BSNL	JIO	VIL
Call attempts	176	NA	121	149
Block call rate %	0	NA	0	0.00
CSSR %	100	NA	100	98.65
Drop call rate %	0	NA	0	0.00
Mobility HOSR %	100	NA	98.75	99.64
RX Quality %	82.33	NA	85.95	89.98
Average CST(Sec)	1.33	NA	1.33	2.67

Technology	Parameter	Airtel	BSNL	JIO	VIL
2G	SDCCH Congestion (<=1%)	0.00	0.4	NA	0.49
	TCH Congestion (<=2%)	0.00	1.8	NA	0.25
3G	CSFB Failure %	NA	NA	NA	NA
	SDCCH Congestion %	NA	3.1	NA	NA
	RRC Congestion %	NA	3.1	NA	NA
	SDCCH and RRC Congestion % (<=1%)	NA	3.1	NA	NA
	TCH Congestion %	NA	0	NA	NA
	RAB Congestion %	NA	0	NA	NA
	TCH and RAB Congestion % (<=2%)	NA	0	NA	NA

Coverage

1. Percentage of Coverage sample of 2G >= - 85 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	92.07	57.1	NA	93.26

2. Percentage of Coverage sample of 3G >= - 90 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	NA	82.4	NA	NA

3. Percentage of Coverage sample of VoLTE >= -110 dBm

TSP	Airtel	BSNL	JIO	VIL
Coverage %	97.28	NA	98.72	95

4. Percentage of time spent on 3G Network

TSP	Airtel	BSNL	JIO	VIL
Time spent %	NA	71.22	NA	NA

5. Percentage of time spent on VoLTE Network

TSP	Airtel	BSNL	JIO	VIL
Time spent %	100	NA	100	95.94

6. Percentage of RLT >= 48

TSP	Airtel	BSNL	JIO	VIL
Percentage of RLT >=48	0	0	NA	0

Summary Data report Dynamic

Lucknow City

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Average Download throughput in Kbps	30.17	198.92	NA	NA
PDP Success rate %	99.61	100	NA	NA
PDP Drop Rate %	0.39	3	NA	NA

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Average Download throughput in Mbps	NA	2.522	NA	NA
PDP Success rate %	NA	100	NA	NA
PDP Drop Rate %	NA	1.73	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Average Download throughput in Mbps	10.19	NA	17.77	15.7
PDP Success rate %	99.45	NA	97.05	97.17
PDP Drop Rate %	0.55	NA	0.23	2.83

Data speed samples

TSP (For 2G)	Total samples	< 100 Kbps	100-150Kbps	150-200Kbps	>200Kbps
Airtel	NA	NA	NA	NA	NA
BSNL	48311556	63.00%	18.93%	13.57%	4.49%
JIO	NA	NA	NA	NA	NA
VIL	NA	NA	NA	NA	NA

TSP (For 3G)	Total samples	< 1 Mbps	1-5 Mbps	5-10 Mbps	>10Mbps
Airtel	NA	NA	NA	NA	NA
BSNL	48251901	50.97%	36.68%	11.62%	0.73%
JIO	NA	NA	NA	NA	NA
VIL	NA	NA	NA	NA	NA

TSP (For LTE)	Total samples	< 2Mbps	2-5 Mbps	5-10 Mbps	>10Mbps
Airtel	128399	12.68%	8.89%	14.73%	63.68%
BSNL	NA	NA	NA	NA	NA
JIO	44495	15.62%	11.49%	20.73%	52.16%
VIL	8018476	69.43%	10.86%	7.98%	11.73%

(Rural Area/ Forest Area e.g., Villages/ Tourist places/ Block or Tehsil)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Average Download throughput in Kbps	61.89	148.6	NA	NA
PDP Success rate %	99.61	100	NA	NA
PDP Drop Rate %	0.39	0	NA	NA

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Average Download throughput in Mbps	NA	2.84	NA	NA
PDP Success rate %	NA	100	NA	NA
PDP Drop Rate %	NA	1.5	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Average Download throughput in Mbps	11.54	NA	18.56	27.23
PDP Success rate %	99.45	NA	96.33	96.92
PDP Drop Rate %	0.55	NA	0	3.08

Data speed samples

TSP (For 2G)	Total samples	< 100 Kbps	100-150Kbps	150-200Kbps	>200Kbps
Airtel	NA	NA	NA	NA	NA
BSNL	4143137	72.72%	19.51%	7.73%	0.05%
JIO	NA	NA	NA	NA	NA
VIL	NA	NA	NA	NA	NA

TSP (For 3G)	Total samples	< 1 Mbps	1-5 Mbps	5-10 Mbps	>10Mbps
Airtel	NA	NA	NA	NA	NA
BSNL	4203398	53.91%	29.77%	15.70%	0.62%
JIO	NA	NA	NA	NA	NA
VIL	NA	NA	NA	NA	NA

TSP (For LTE)	Total samples	< 2Mbps	2-5 Mbps	5-10 Mbps	>10Mbps
Airtel	17568	20.57%	7.86%	10.13%	61.42%
BSNL	NA	NA	NA	NA	NA
JIO	6923	22.92%	19.15%	21.83%	36.10%
VIL	7621443	94.82%	0.63%	1.15%	3.40%

National Highway/ State Highway/ Important connecting roads

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Average Download throughput in Kbps	43.90	116.1	NA	NA
PDP Success rate %	99.61	100	NA	NA
PDP Drop Rate %	0.39	0	NA	NA

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Average Download throughput in Mbps	NA	1.97	NA	NA
PDP Success rate %	NA	100	NA	NA
PDP Drop Rate %	NA	1.9	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Average Download throughput in Mbps	7.88	NA	13.92	21.39
PDP Success rate %	99.45	NA	97.24	96.17
PDP Drop Rate %	0.55	NA	0.98	3.83

Data speed samples

TSP (For 2G)	Total samples	< 100 Kbps	100-150Kbps	150-200Kbps	>200Kbps
Airtel	NA	NA	NA	NA	NA
BSNL	7428398	72.27%	15.44%	9.64%	2.66%
JIO	NA	NA	NA	NA	NA
VIL	NA	NA	NA	NA	NA

TSP (For 3G)	Total samples	< 1 Mbps	1-5 Mbps	5-10 Mbps	>10Mbps
Airtel	NA	NA	NA	NA	NA
BSNL	3399656	67.75%	24.40%	7.64%	0.21%
JIO	NA	NA	NA	NA	NA
VIL	NA	NA	NA	NA	NA

TSP (For LTE)	Total samples	< 2Mbps	2-5 Mbps	5-10 Mbps	>10Mbps
Airtel	49453	19.52%	16.37%	15.58%	48.51%
BSNL	NA	NA	NA	NA	NA
JIO	10605	22.03%	26.02%	23.90%	28.05%
VIL	3002710	61.68%	7.24%	8.61%	22.47%

Data Service Static (on Hotspots)

Hotspot -1 (Location - GPO HAZRATGANJ)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	32.46	209.05	NA	106.23
Upload Throughput in Kbps	18.24	98.64	NA	33.36
Web browsing delay in second	NA	28.3	NA	0.47 Sec
Latency in (msec)	552.58	289	NA	188

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	5.24	NA	NA
Upload Throughput in Mbps	NA	0.658	NA	NA
Video streaming delay in sec	NA	3.4	NA	NA
Web browsing delay in second	NA	11.2	NA	NA
Latency in (msec)	NA	133	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	13.64	NA	10.6	3.95
Upload Throughput in Mbps	10.26	NA	12.5	7.38
Video streaming delay in sec	NA	NA	1.3	0.67
Web browsing delay in second	NA	NA	3.2	0.101
Latency in (msec)	88.50	NA	75.8	63

Hotspot -2 (Location - AMAUSI AIRPORT)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	26.50	203.62	NA	56.20
Upload Throughput in Kbps	17.90	101.2	NA	43.57
Web browsing delay in second	NA	25.4	NA	0.43
Latency in (msec)	410.51	301	NA	96

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	4.62	NA	NA
Upload Throughput in Mbps	NA	0.655	NA	NA
Video streaming delay in sec	NA	2.9	NA	NA
Web browsing delay in second	NA	10.6	NA	NA
Latency in (msec)	NA	125	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	13.62	NA	10.6	12.39
Upload Throughput in Mbps	8.16	NA	12.5	6.01
Video streaming delay in sec	NA	NA	2.2	0.46
Web browsing delay in second	NA	NA	3.2	0.07
Latency in (msec)	65.20	NA	75.8	56

Hotspot -3 (Location - RAILWAY STATION CHARBAGH)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	132.03	180.65	NA	107.92
Upload Throughput in Kbps	35.70	99.54	NA	115.14
Web browsing delay in second	NA	26.2	NA	0.77
Latency in (msec)	261.88	295	NA	206

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	5.38	NA	NA
Upload Throughput in Mbps	NA	0.703	NA	NA
Video streaming delay in sec	NA	2.7	NA	NA
Web browsing delay in second	NA	9.9	NA	NA
Latency in (msec)	NA	117	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	17.36	NA	10.1	15.21
Upload Throughput in Mbps	8.73	NA	13.9	4.32
Video streaming delay in sec	NA	NA	1.2	0.53
Web browsing delay in second	NA	NA	3.03	0.079
Latency in (msec)	86.32	NA	73.6	61

Hotspot -4 (Location - BUS STAND ALAM BAGH)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	42.50	198.4	NA	119.08
Upload Throughput in Kbps	18.28	105.23	NA	110.83
Web browsing delay in second	NA	28.4	NA	0.56
Latency in (msec)	460.52	308	NA	89

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	4.9	NA	NA
Upload Throughput in Mbps	NA	0.652	NA	NA
Video streaming delay in sec	NA	3.1	NA	NA
Web browsing delay in second	NA	11.2	NA	NA
Latency in (msec)	NA	127	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	10.55	NA	16.0	14.67
Upload Throughput in Mbps	9.15	NA	11.0	5.68
Video streaming delay in sec	NA	NA	1.3	0.63
Web browsing delay in second	NA	NA	2.9	0.072
Latency in (msec)	57.30	NA	61.4	81

Hotspot -5 (Location - IMAMBADA)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	47.32	187.24	NA	71.2
Upload Throughput in Kbps	18.77	99.85	NA	54.86
Web browsing delay in second	NA	29.8	NA	5.06
Latency in (msec)	629.5	310	NA	135.5

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	5.7	NA	NA
Upload Throughput in Mbps	NA	0.708	NA	NA
Video streaming delay in sec	NA	2.6	NA	NA
Web browsing delay in second	NA	9.8	NA	NA
Latency in (msec)	NA	119	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	11.42	NA	25.5	17.37
Upload Throughput in Mbps	3.69	NA	16.7	14.09
Video streaming delay in sec	NA	NA	1.2	0.28
Web browsing delay in second	NA	NA	3.07	0.079
Latency in (msec)	58.41	NA	59.9	71

Hotspot -6 (Location - KGMU)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	38.39	211.8	NA	36.58
Upload Throughput in Kbps	16.97	101.4	NA	63.23
Web browsing delay in second	NA	26.4	NA	6.43
Latency in (msec)	531.76	286	NA	148

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	5.3	NA	NA
Upload Throughput in Mbps	NA	0.648	NA	NA
Video streaming delay in sec	NA	3.1	NA	NA
Web browsing delay in second	NA	11.5	NA	NA
Latency in (msec)	NA	129	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	8.84	NA	27.2	20.91
Upload Throughput in Mbps	9.59	NA	17.0	12.16
Video streaming delay in sec	NA	NA	1.2	0.4
Web browsing delay in second	NA	NA	2.8	0.09
Latency in (msec)	58.89	NA	93.9	79

Hotspot -7 (Location - LUCKNOW UNIVERSITY)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	70.55	209.15	NA	74.71
Upload Throughput in Kbps	30.32	106.48	NA	40.95
Web browsing delay in second	NA	23.4	NA	4.91
Latency in (msec)	200.94	279	NA	215

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	6.01	NA	NA
Upload Throughput in Mbps	NA	0.721	NA	NA
Video streaming delay in sec	NA	2.8	NA	NA
Web browsing delay in second	NA	10.9	NA	NA
Latency in (msec)	NA	122	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	32.03	NA	11.7	41.26
Upload Throughput in Mbps	24.17	NA	12.5	16.97
Video streaming delay in sec	NA	NA	1.2	0.27
Web browsing delay in second	NA	NA	3.57	0.052
Latency in (msec)	66.40	NA	145.3	59

Hotspot -8 (Location - KAKORI)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	37.82	176.41	NA	78.03
Upload Throughput in Kbps	17.94	89.54	NA	26.9
Web browsing delay in second	NA	28.9	NA	5.39
Latency in (msec)	520.9	305	NA	236

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	4.53	NA	NA
Upload Throughput in Mbps	NA	0.504	NA	NA
Video streaming delay in sec	NA	3.4	NA	NA
Web browsing delay in second	NA	13.4	NA	NA
Latency in (msec)	NA	131	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	68.38	NA	30.1	35.01
Upload Throughput in Mbps	25.95	NA	12.3	17.03
Video streaming delay in sec	NA	NA	1.3	0.57
Web browsing delay in second	NA	NA	2.73	0.047
Latency in (msec)	37.60	NA	75.1	70

Hotspot -9 (Location - MALIHABAD)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	32.07	182.4	NA	98.85
Upload Throughput in Kbps	16.01	90.43	NA	24.60
Web browsing delay in second	NA	27.8	NA	3.50
Latency in (msec)	515.67	302	NA	111

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	3.42	NA	NA
Upload Throughput in Mbps	NA	0.489	NA	NA
Video streaming delay in sec	NA	3.9	NA	NA
Web browsing delay in second	NA	14.8	NA	NA
Latency in (msec)	NA	137	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	18.48	NA	12.8	9.74
Upload Throughput in Mbps	23.33	NA	14.1	15.42
Video streaming delay in sec	NA	NA	1.2	0.40
Web browsing delay in second	NA	NA	3.1	0.048
Latency in (msec)	60.19	NA	77.8	70

Hotspot -10 (Location - MALL)

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	25.13	179.53	NA	112.58
Upload Throughput in Kbps	17.01	91.72	NA	71.29
Web browsing delay in second	NA	29.7	NA	3.58
Latency in (msec)	455.29	301	NA	108.25

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	2.9	NA	NA
Upload Throughput in Mbps	NA	0.499	NA	NA
Video streaming delay in sec	NA	4.6	NA	NA
Web browsing delay in second	NA	16.7	NA	NA
Latency in (msec)	NA	139	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	12.73	NA	6.6	5.17
Upload Throughput in Mbps	16.22	NA	7.7	9.62
Video streaming delay in sec	NA	NA	1.2	0.60
Web browsing delay in second	NA	NA	3.5	0.037
Latency in (msec)	105.23	NA	75.8	60

Summary Data report static

TSP (For 2G)	Airtel	BSNL	JIO	VIL
Download throughput in Kbps	48.47	193.83	NA	86.1
Upload Throughput in Kbps	20.71	98.40	NA	58.5
Web browsing delay in second	NA	27.43	NA	3.1
Latency in (msec)	743.95	297.60	NA	153.3

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	NA	4.80	NA	NA
Upload Throughput in Mbps	NA	0.62	NA	NA
Video streaming delay in sec	NA	3.25	NA	NA
Web browsing delay in second	NA	12.0	NA	NA
Latency in (msec)	NA	127.9	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Download throughput in Mbps	20.70	NA	16.12	17.98
Upload Throughput in Mbps	13.92	NA	13.02	10.66
Video streaming delay in sec	NA	NA	1.34	0.481
Web browsing delay in second	NA	NA	3.11	0.068
Latency in (msec)	68.40	NA	81.43	67

Streaming delay

TSP (For 3G)	Airtel	BSNL	JIO	VIL
Average Initial Start Time (Sec)	NA	1.09	NA	NA
Average Interruption time in Second	NA	1.1	NA	NA

TSP (For LTE)	Airtel	BSNL	JIO	VIL
Average Initial Start Time (Sec)	NA	NA	3.21	0.494
Average Interruption time in Second	NA	NA	0.052	0.497

Data speed testing by “traimyspeed” app

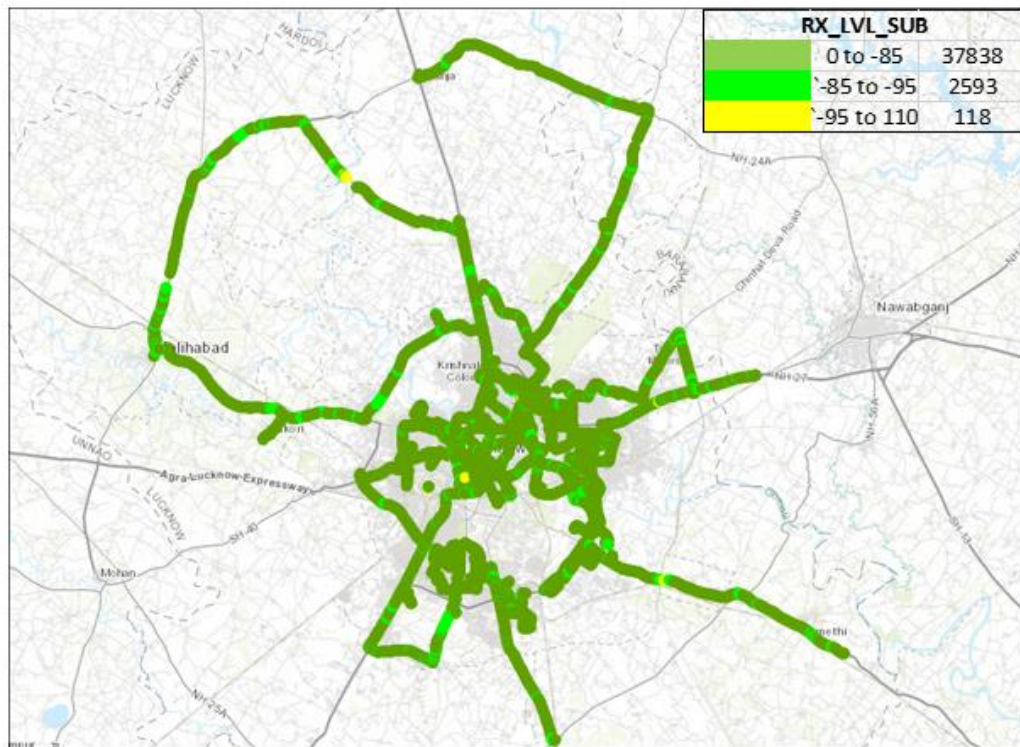
Hotspot		Airtel	BSNL	RJio	VIL
GPO HAZRATGANJ	2G download in Mbps	0.21	0.19	NA	0.07
	2G upload in Mbps	0.02	0.092	NA	0.03
	3G download in Mbps	NA	5.46	NA	
	3G upload in Mbps	NA	0.598	NA	
	4G download in Mbps	17.36	NA	12.51	31.02
	4G upload in Mbps	8.73	NA	12.36	25.43
AMAUSI AIRPORT	2G download in Mbps	0.25	0.21	NA	0.112
	2G upload in Mbps	0.14	0.11	NA	0.09
	3G download in Mbps	NA	4.55	NA	
	3G upload in Mbps	NA	0.642	NA	
	4G download in Mbps	13.62	NA	14.61	38.77
	4G upload in Mbps	8.16	NA	14.08	19.52
RAILWAY STATION CHARBAGH	2G download in Mbps	0.02	0.17	NA	0.92
	2G upload in Mbps	0.02	0.086	NA	0.03
	3G download in Mbps	NA	5.29	NA	
	3G upload in Mbps	NA	0.65	NA	
	4G download in Mbps	13.64	NA	14.75	30.58
	4G upload in Mbps	10.26	NA	23.34	5.64
BUS STAND ALAM BAGH	2G download in Mbps	0.00	0.18	NA	0.121
	2G upload in Mbps	0.01	0.01	NA	0.06

	3G download in Mbps	NA	4.7	NA	
	3G upload in Mbps	NA	0.568	NA	
	4G download in Mbps	10.55	NA	36.30	23.80
	4G upload in Mbps	9.15	NA	8.36	5.11
IMAMBADA	2G download in Mbps	0.02	0.17	NA	0.130
	2G upload in Mbps	0.03	0.097	NA	0.04
	3G download in Mbps	NA	5.4	NA	
	3G upload in Mbps	NA	0.688	NA	
	4G download in Mbps	11.42	NA	34.90	35.66
	4G upload in Mbps	3.69	NA	29.08	3.85
KGMU	2G download in Mbps	0.25	0.23	NA	0.115
	2G upload in Mbps	0.14	0.1	NA	0.5
	3G download in Mbps	NA	5.4	NA	
	3G upload in Mbps	NA	0.701	NA	
	4G download in Mbps	8.84	NA	60.47	31.71
	4G upload in Mbps	9.59	NA	38.85	5.47
LUCKNOW UNIVERSITY	2G download in Mbps	0.25	0.21	NA	0.13
	2G upload in Mbps	0.03	0.099	NA	0.07
	3G download in Mbps	NA	5.9	NA	
	3G upload in Mbps	NA	0.643	NA	
	4G download in Mbps	32.03	NA	32.37	26.77
	4G upload in Mbps	24.17	NA	7.93	22.38
KAKORI	2G download in Mbps	0.02	0.162	NA	0.10
	2G upload in Mbps	0.01	0.087	NA	0.06
	3G download in Mbps	NA	4.34	NA	
	3G upload in Mbps	NA	0.498	NA	
	4G download in Mbps	68.38	NA	15.74	79.10
	4G upload in Mbps	25.95	NA	9.41	37.76
MALIHABAD	2G download in Mbps	0.02	0.19	NA	0.14
	2G upload in Mbps	0.03	0.09	NA	0.08
	3G download in Mbps	NA	2.89	NA	
	3G upload in Mbps	NA	0.452	NA	
	4G download in Mbps	18.48	NA	19.66	62.88
	4G upload in Mbps	23.33	NA	23.44	9.32

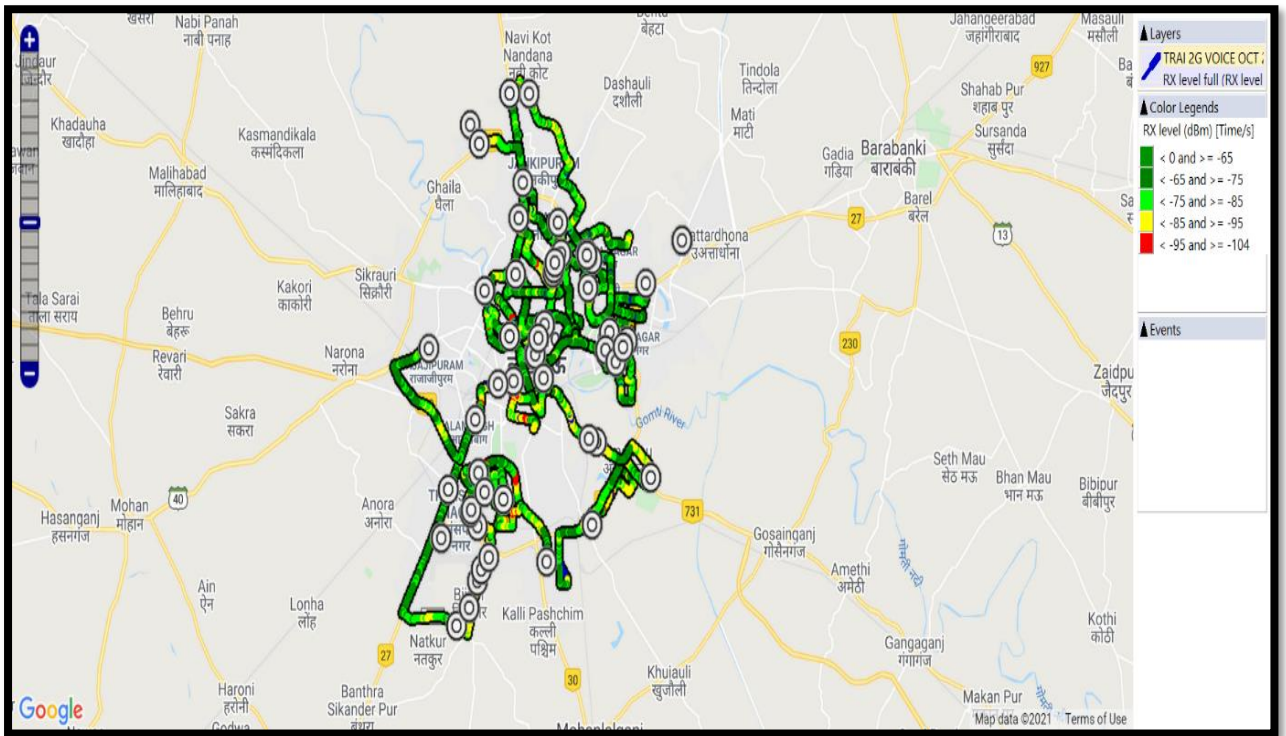
MALL	2G download in Mbps	0.02	0.162	NA	0.110
	2G upload in Mbps	0.02	0.094	NA	0.06
	3G download in Mbps	NA	2.7	NA	
	3G upload in Mbps	NA	0.486	NA	
	4G download in Mbps	12.73	NA	34.34	20.54
	4G upload in Mbps	16.22	NA	4.39	20.19

Coverage plots

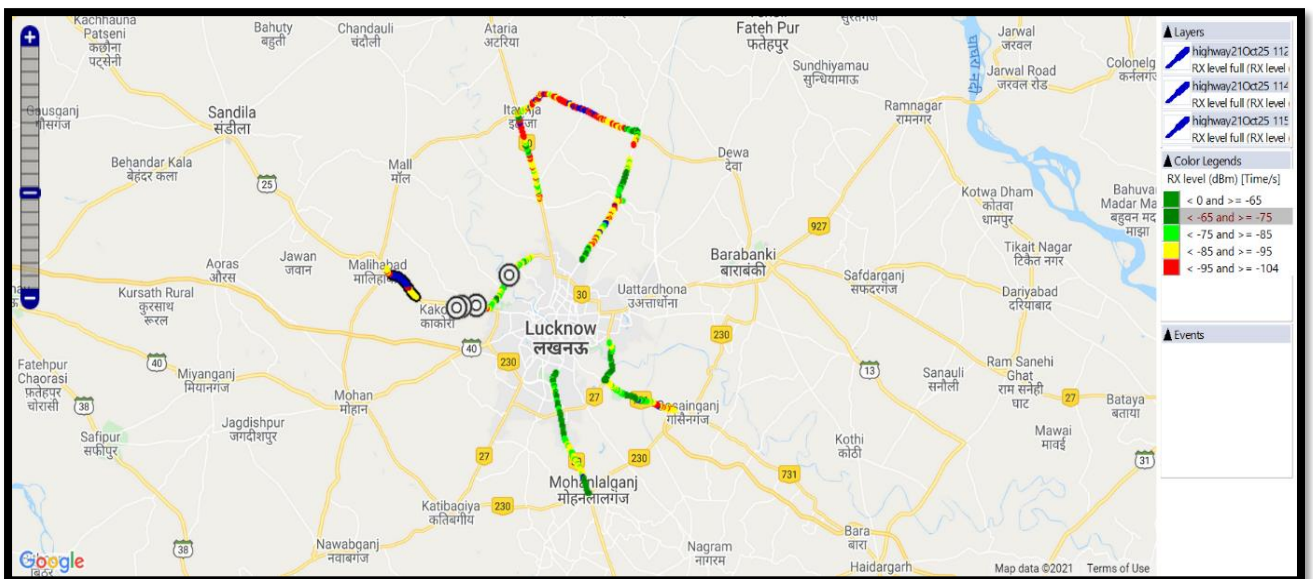
1. 2G Airtel



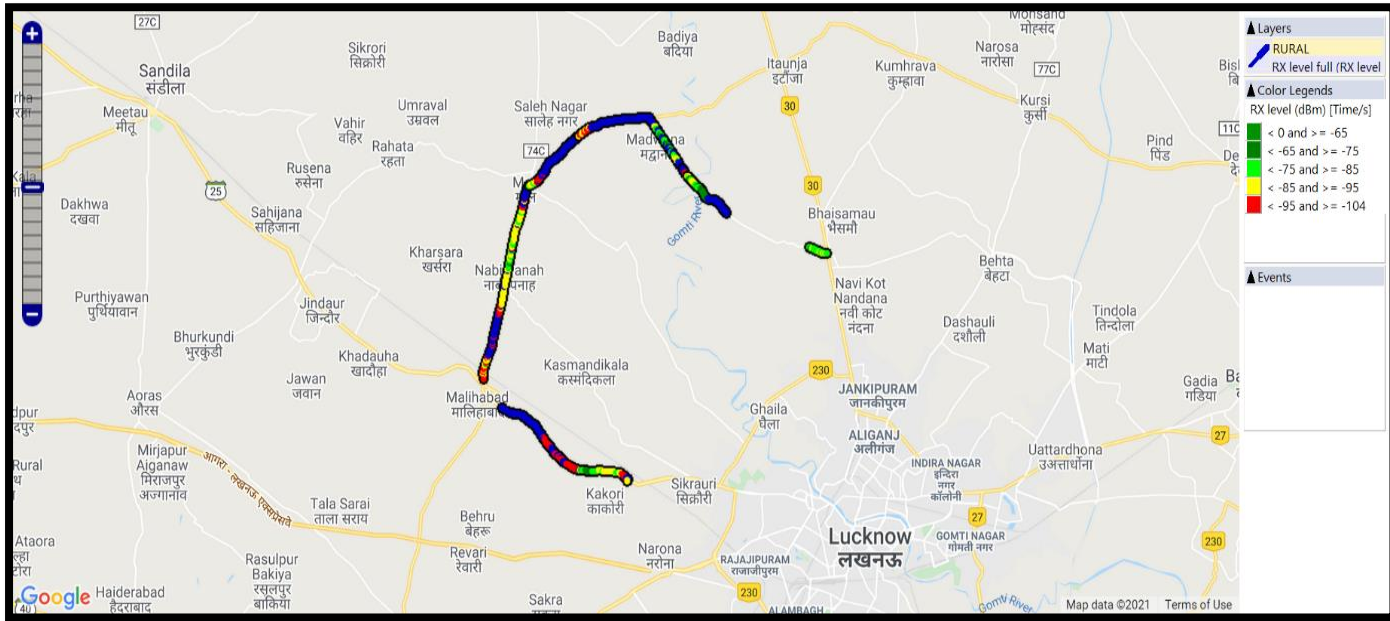
BSNL 2G VOICE CITY RX LEVEL



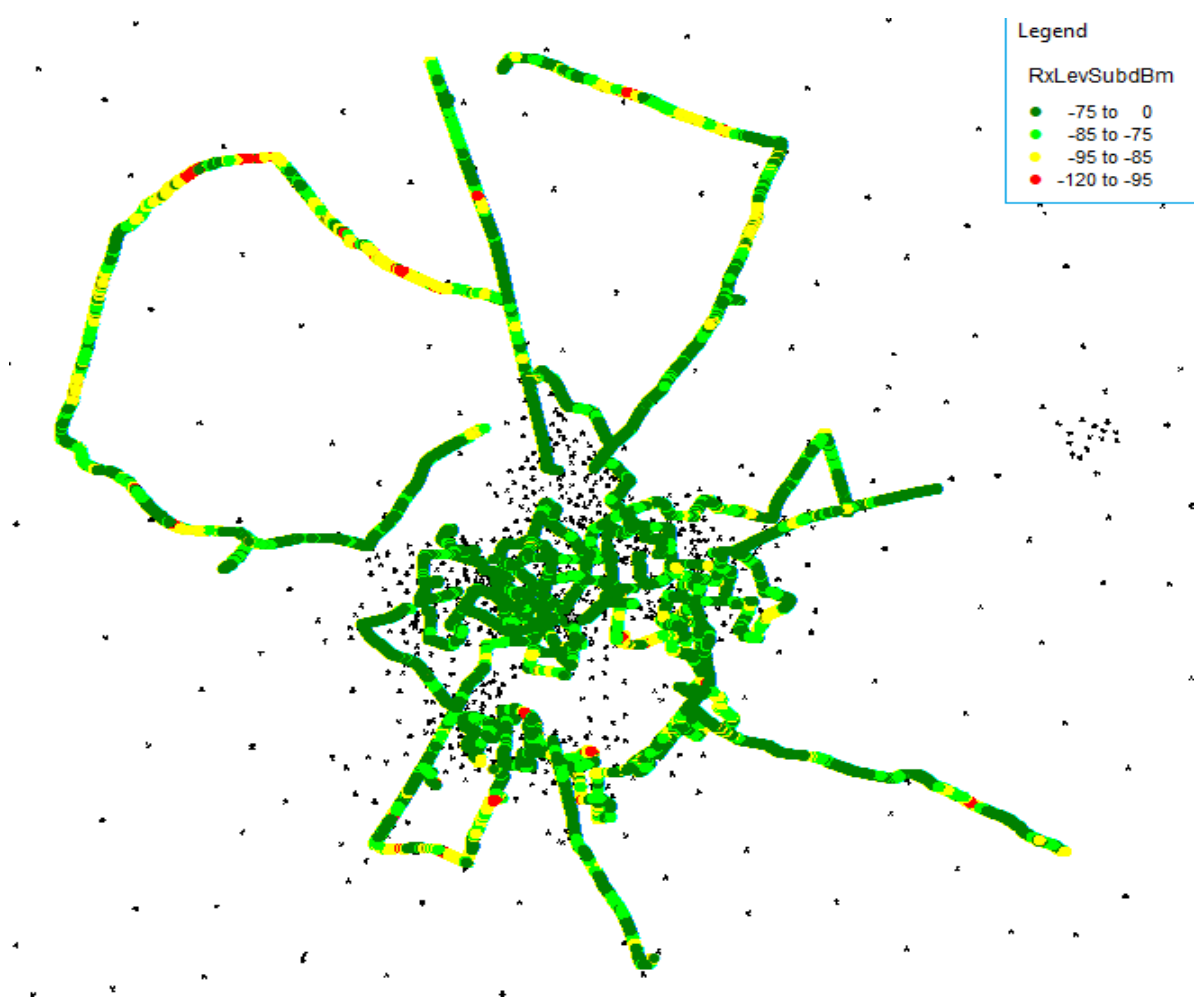
BSNL 2G VOICE HIGHWAY RX LEVEL



BSNL 2G VOICE RURAL RX LEVEL

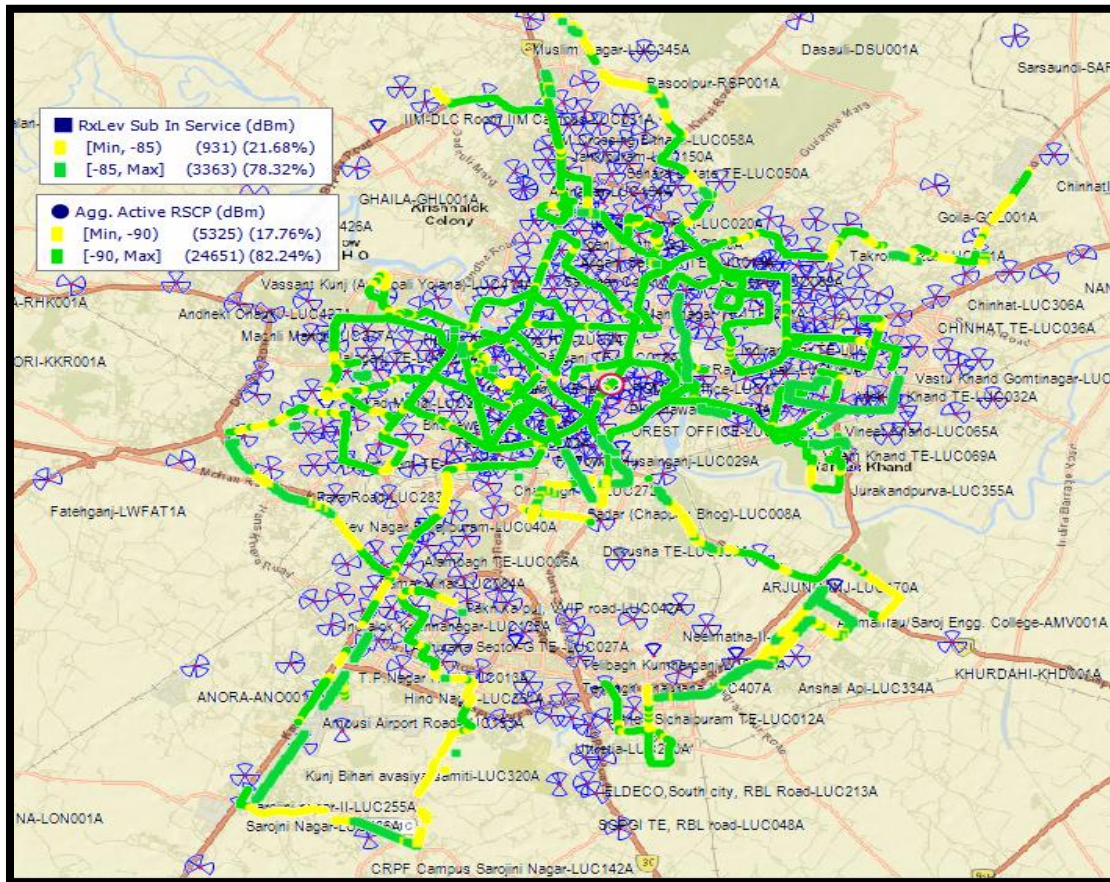


VIL

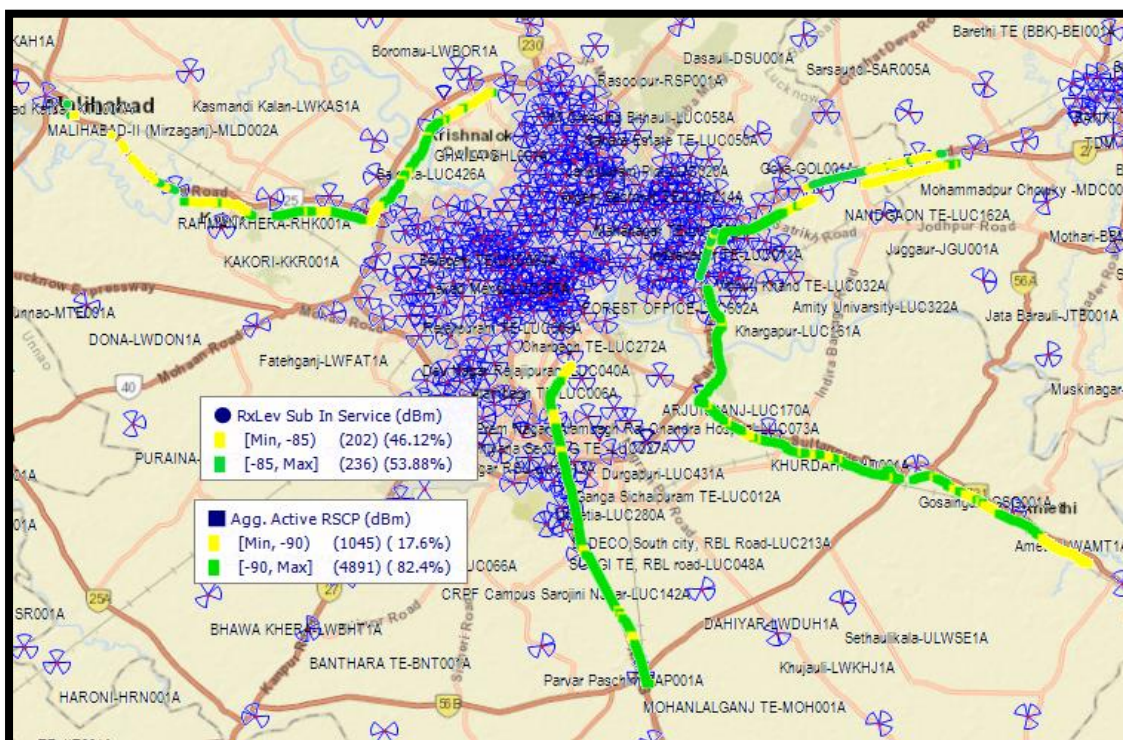


2. 2G/3G dual

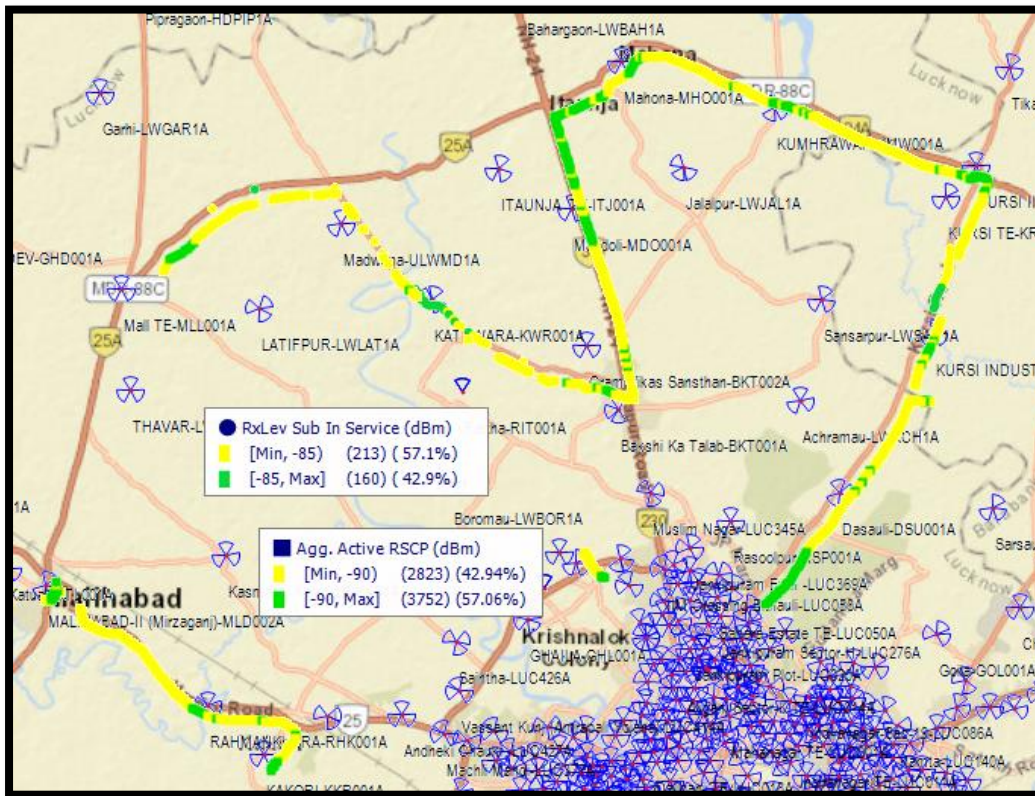
BSNL 2G/3G dual VOICE CITY RX LEVEL



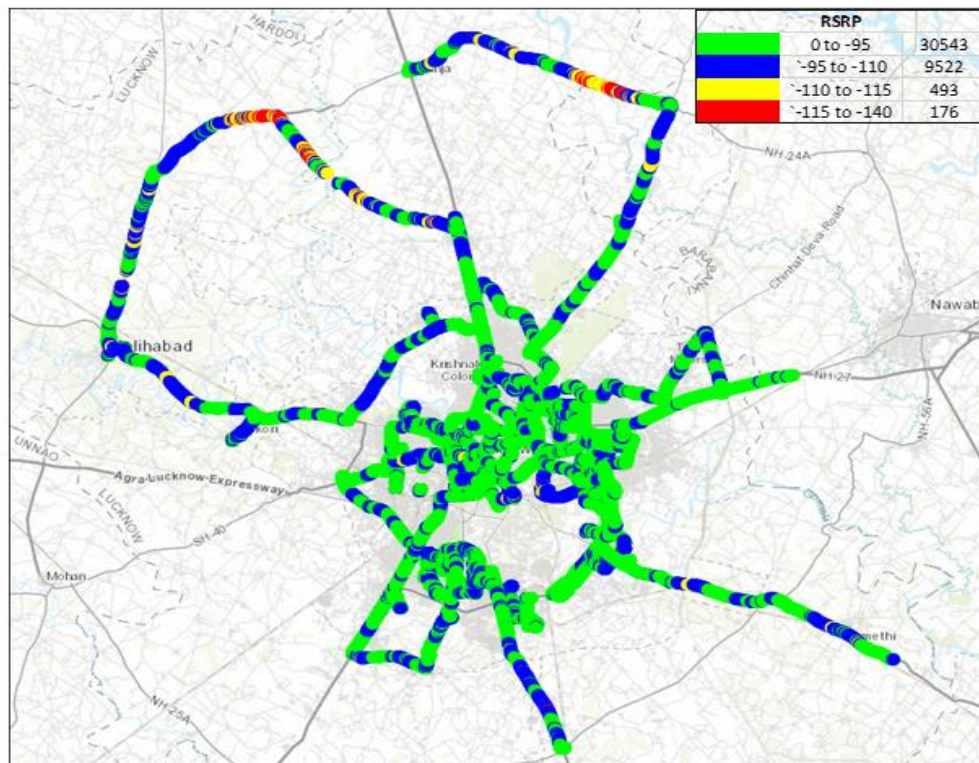
BSNL 2G/3G dual VOICE HIGHWAY RX LEVEL



BSNL 2G/3G dual VOICE RURAL RX LEVEL

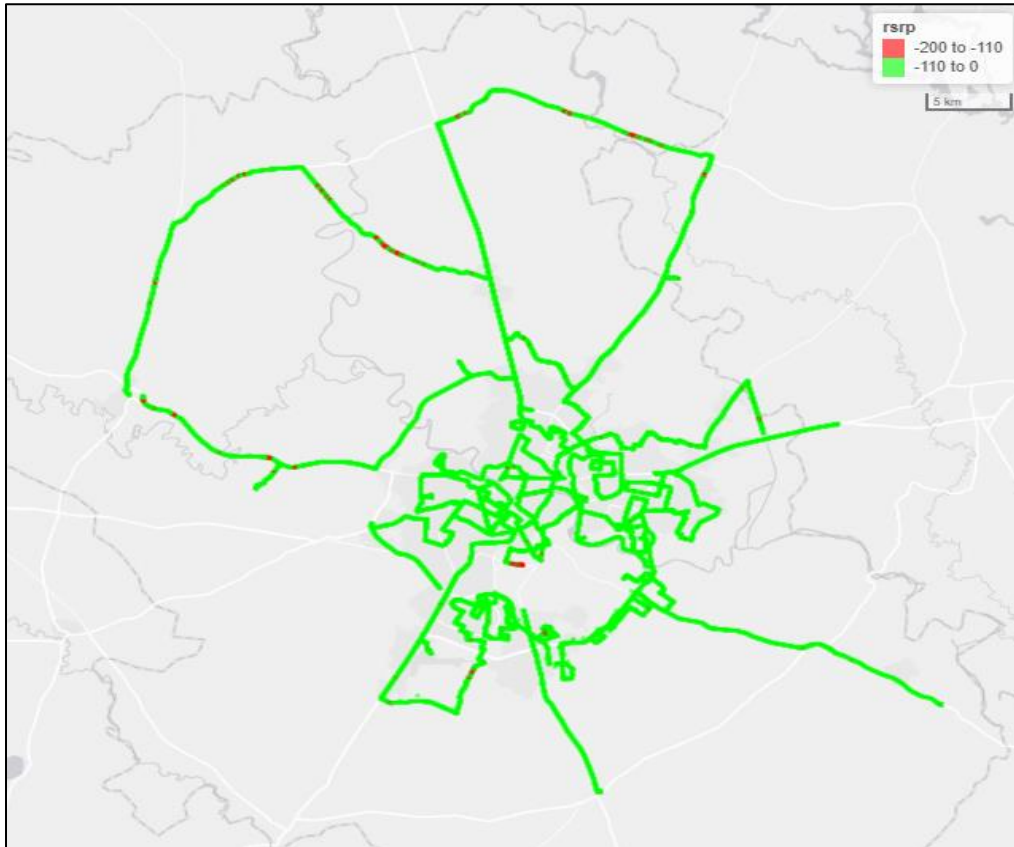


3. VoLTE (Free) Airtel



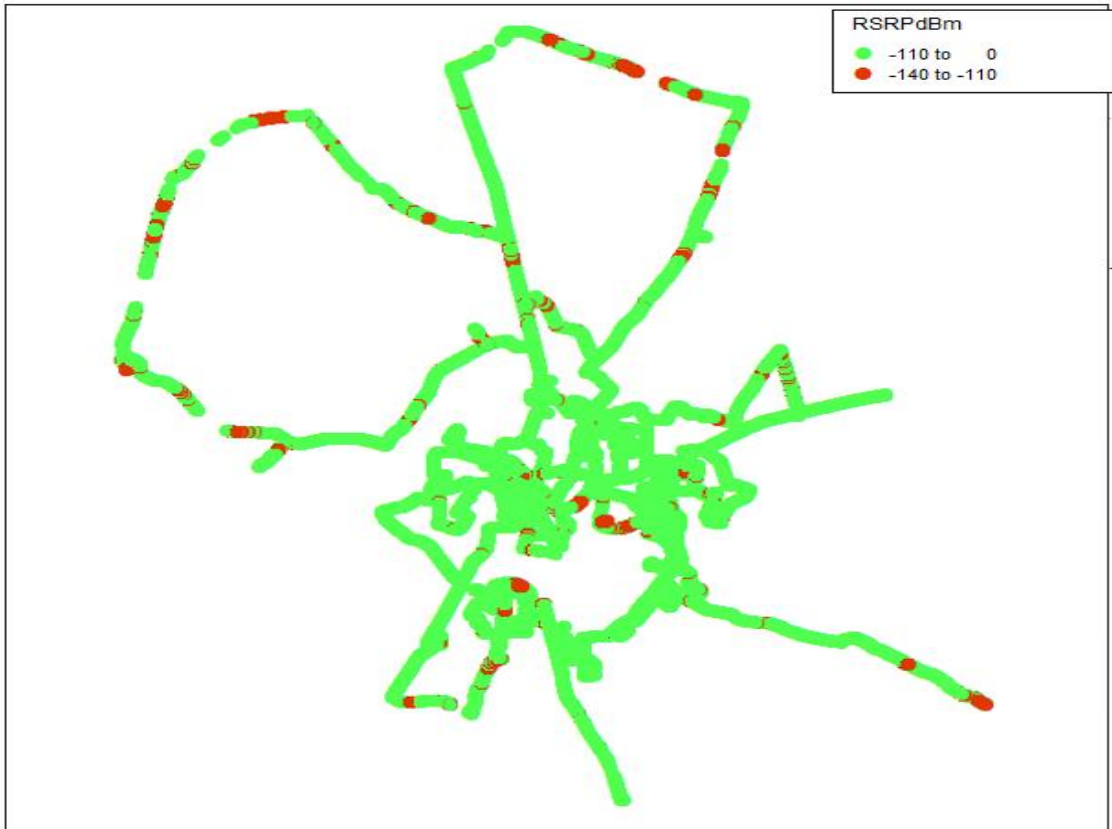
Investigate

JIO



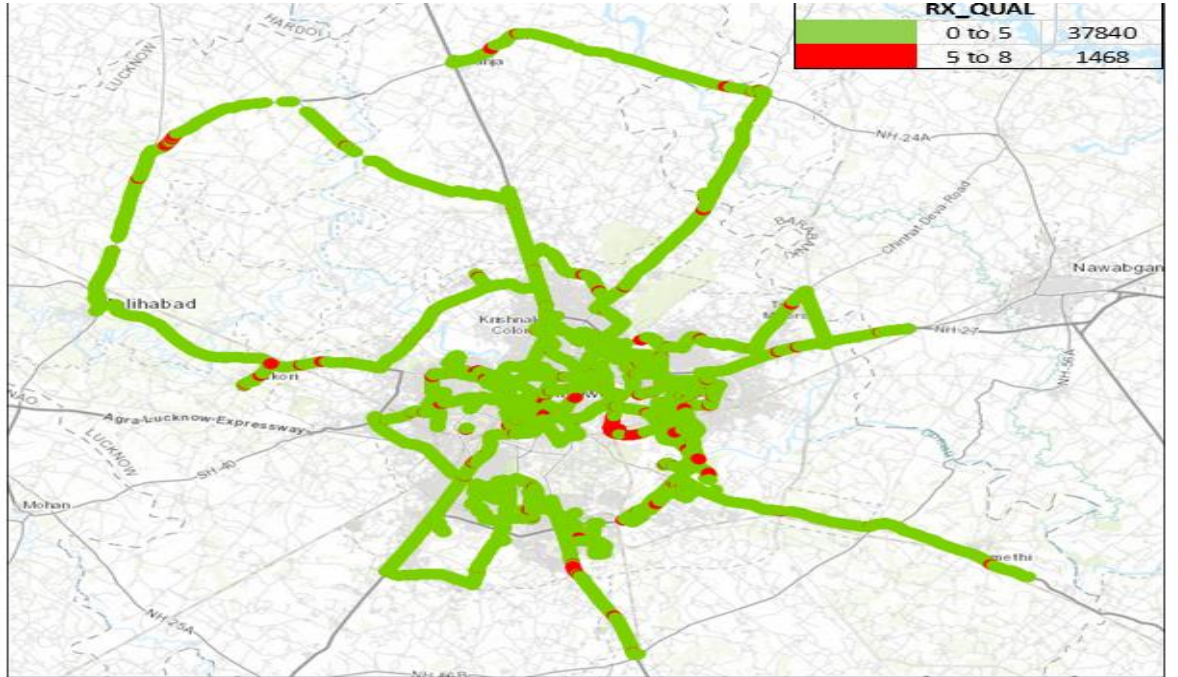
VIL

VIL

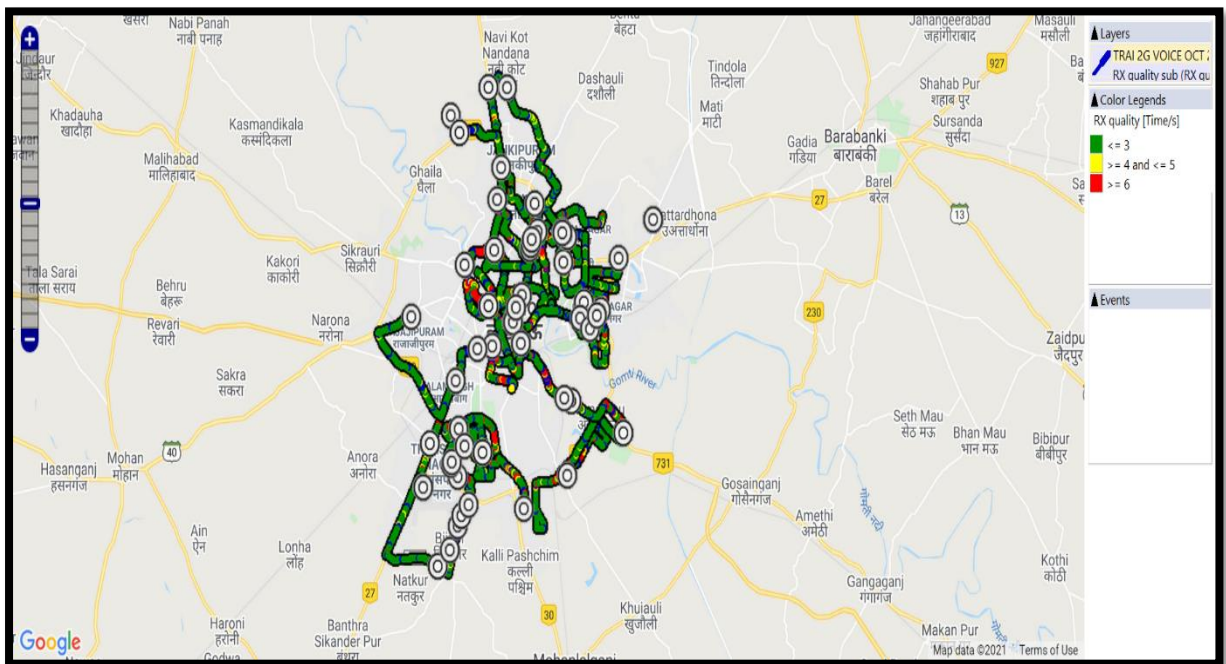


Quality plots

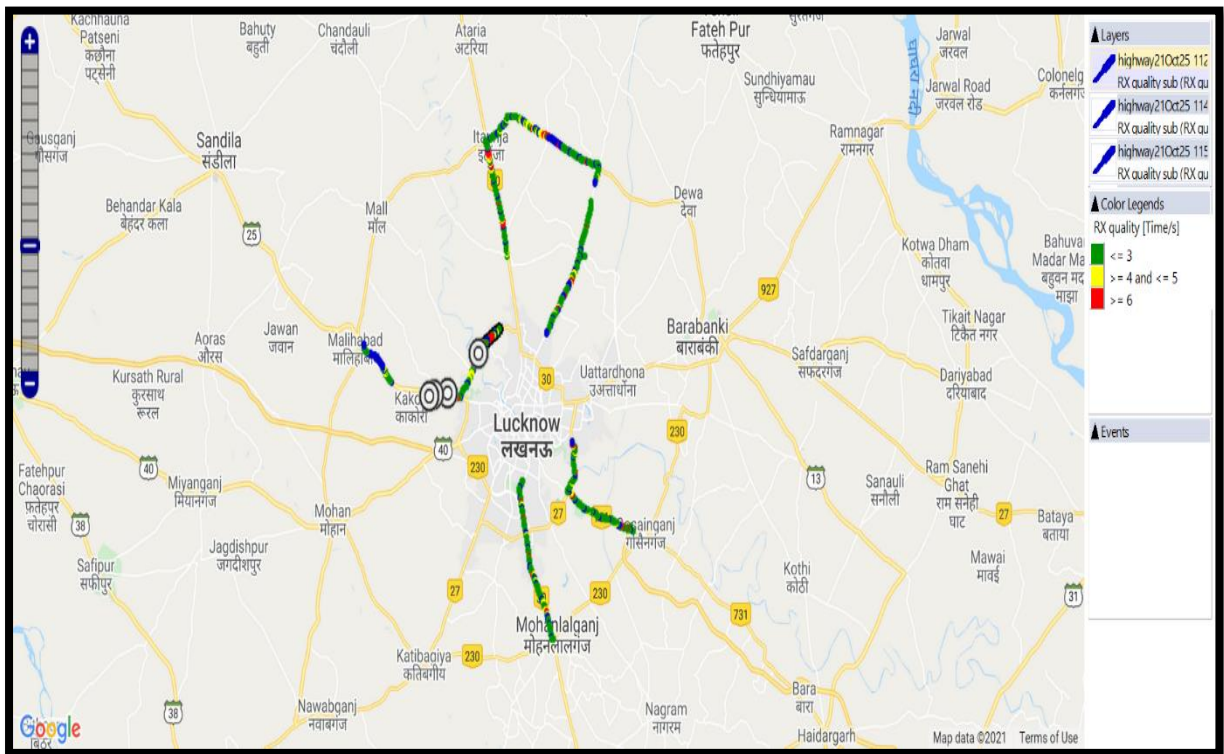
1. 2G Airtel



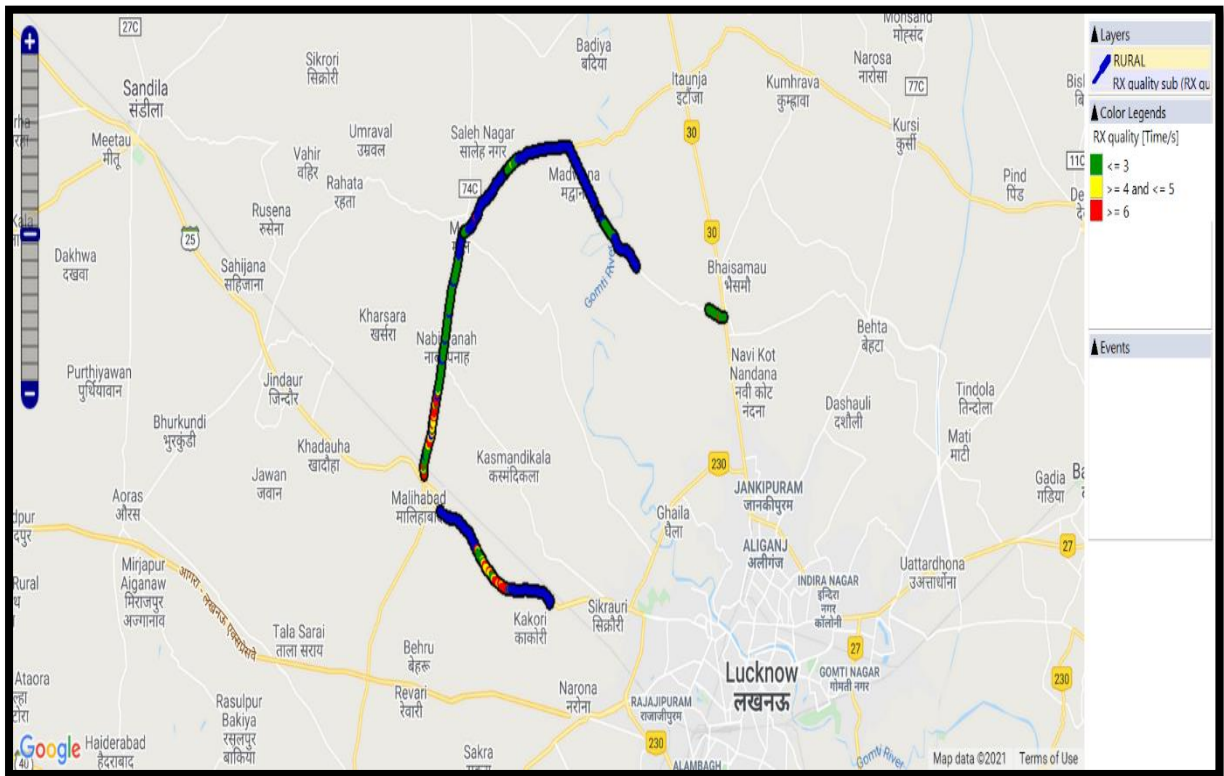
BSNL BSNL 2G VOICE CITY RX QUALITY



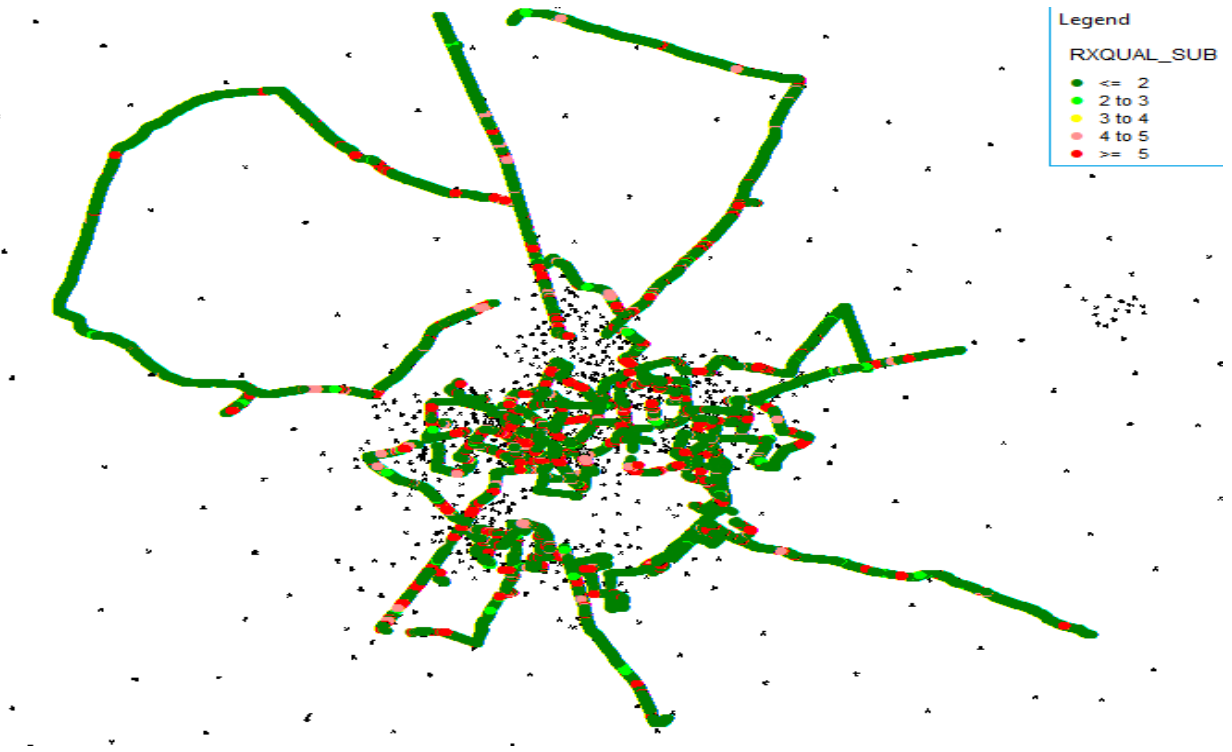
BSNL 2G VOICE HIGHWAY RX QUALITY



BSNL 2G VOICE RURAL RX QUALITY



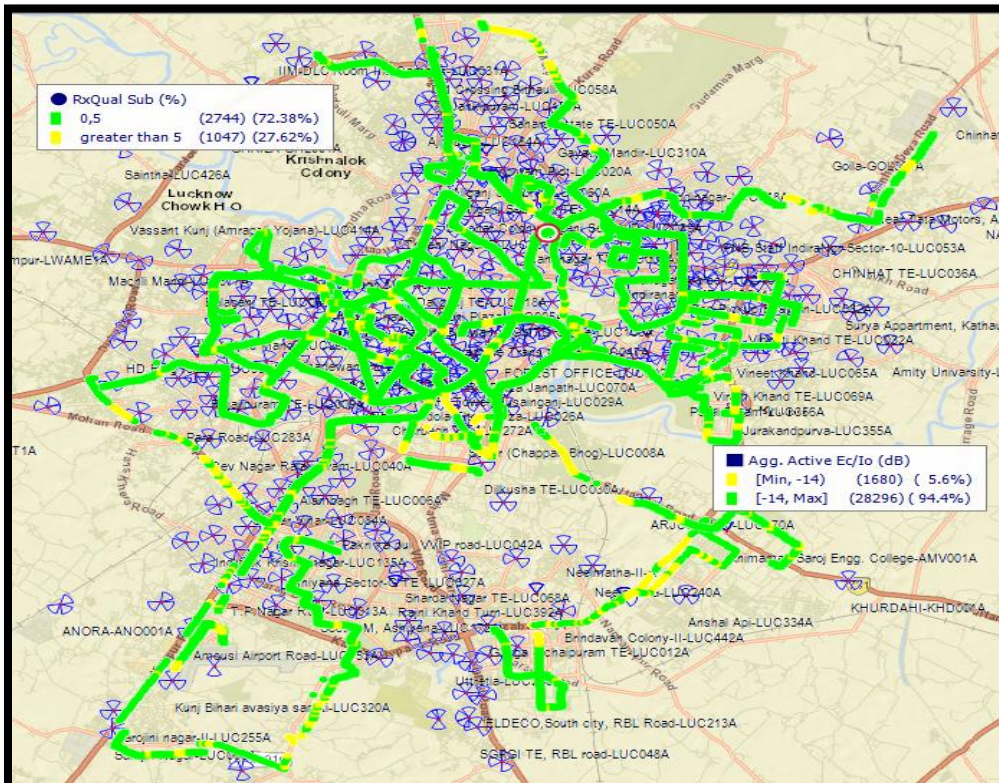
VIL



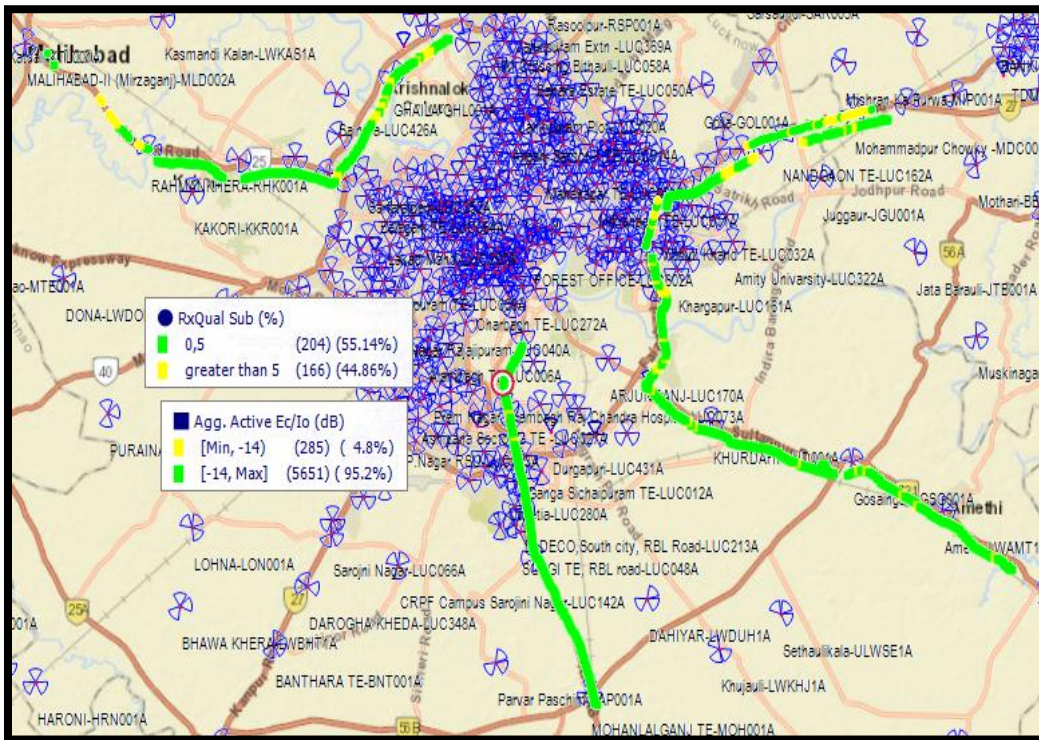
2. 2G/3G dual

BSNL

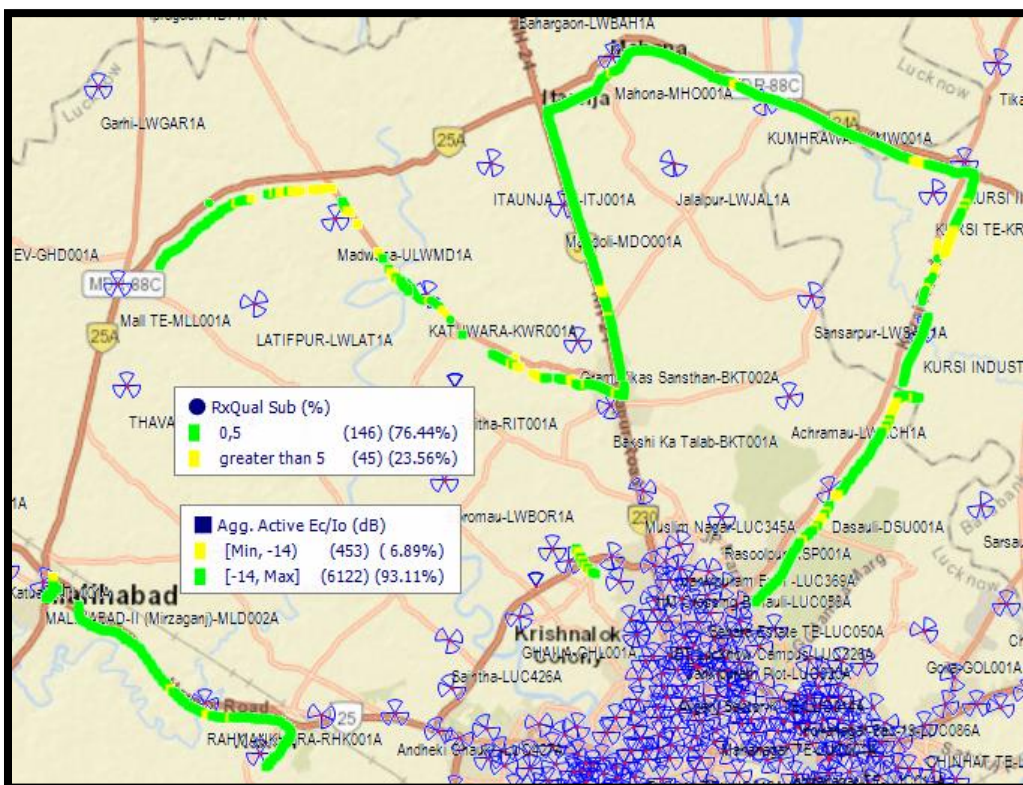
BSNL 2G3G Dual mode VOICE CITY RX Quality



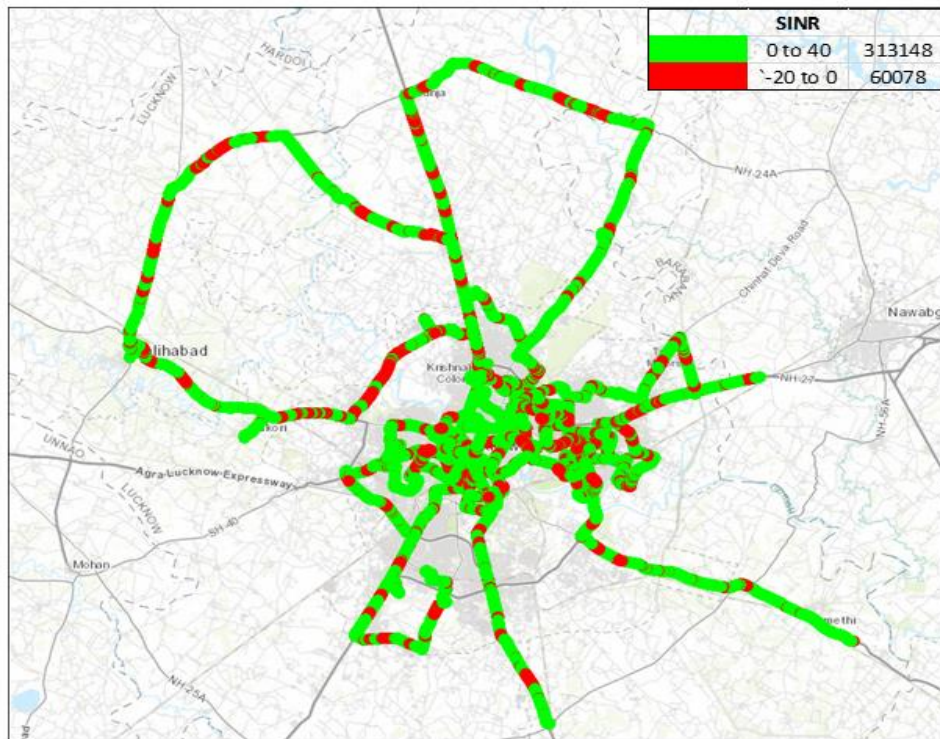
BSNL 2G3G Dual mode VOICE Highway RX Quality



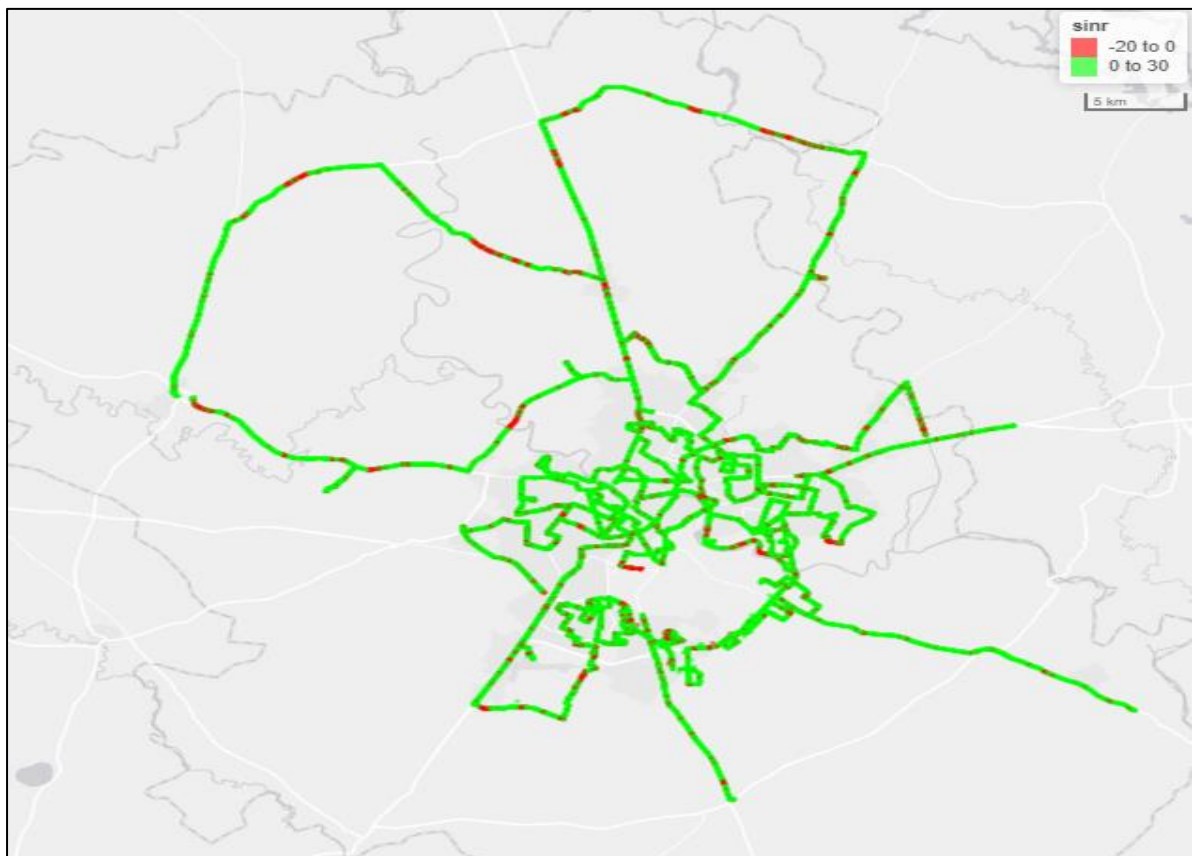
BSNL 2G3G Dual mode VOICE Rural RX Quality



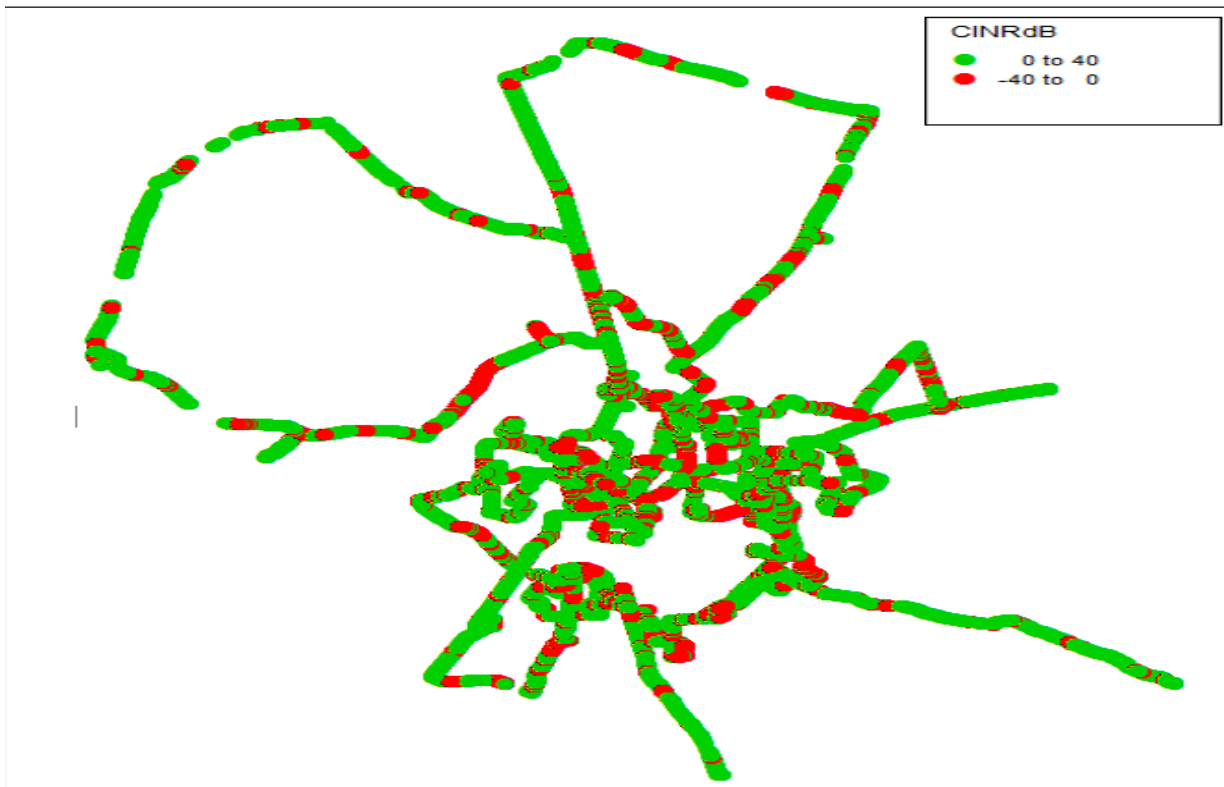
VoLTE (Free) -Airtel



JIO

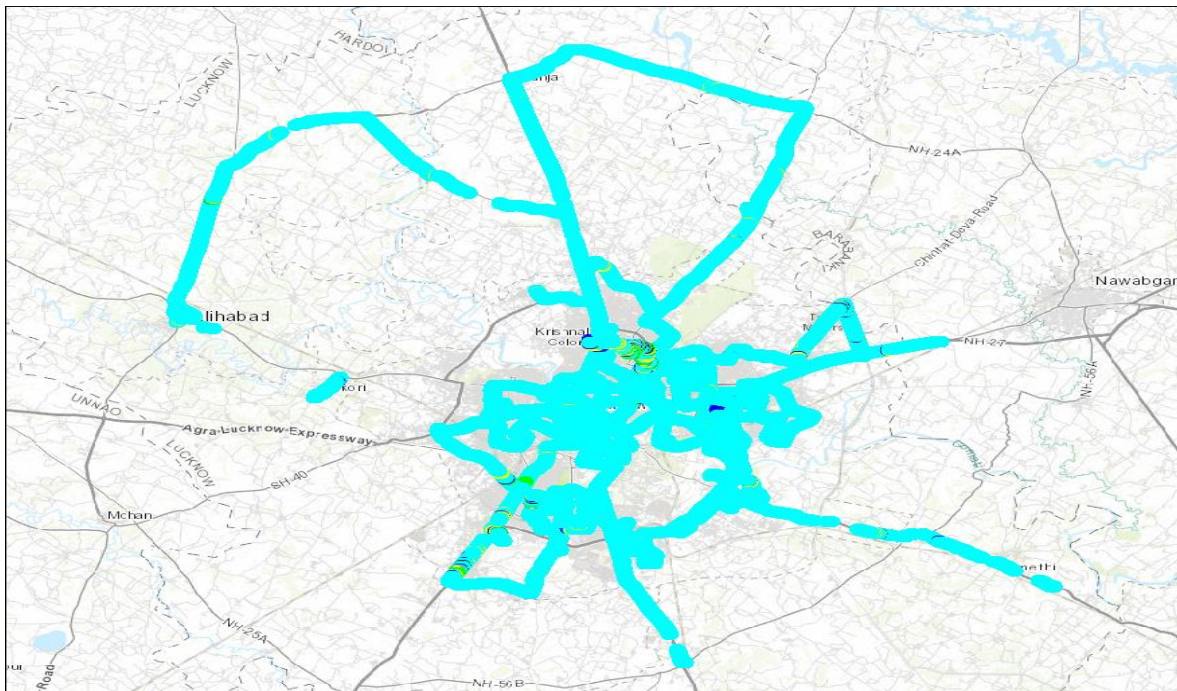


VIL

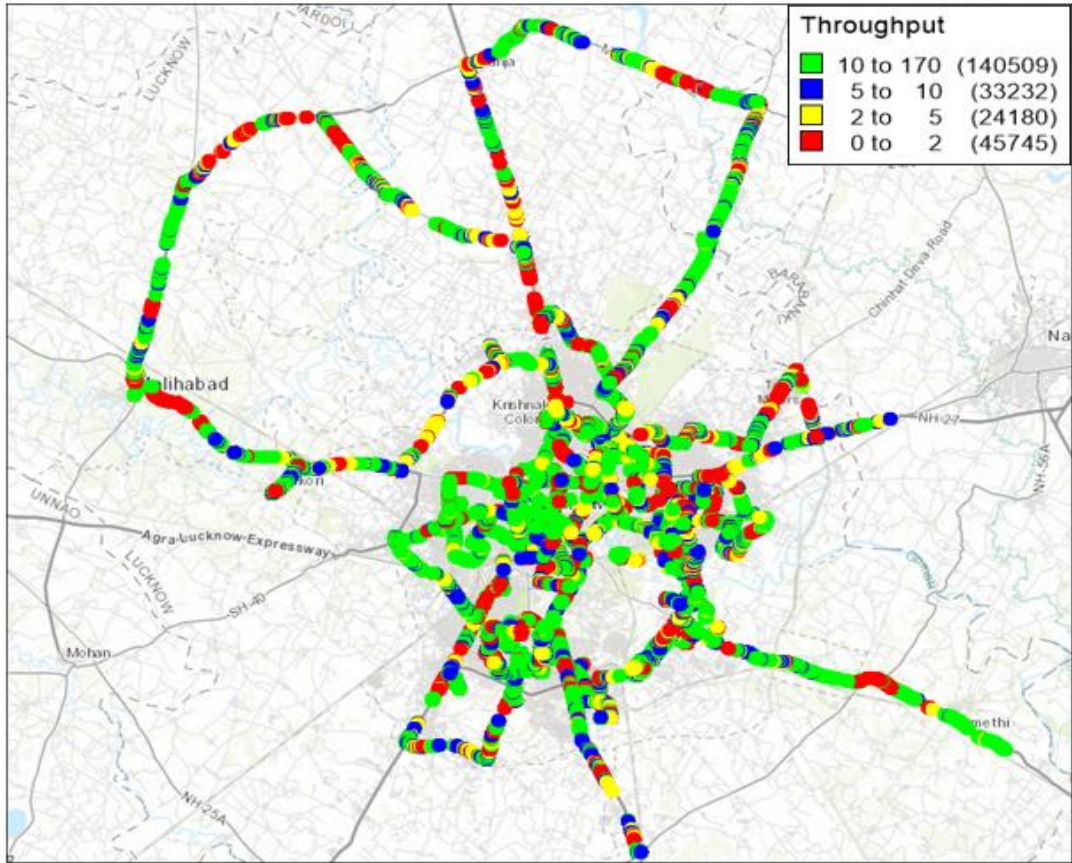


Data plot

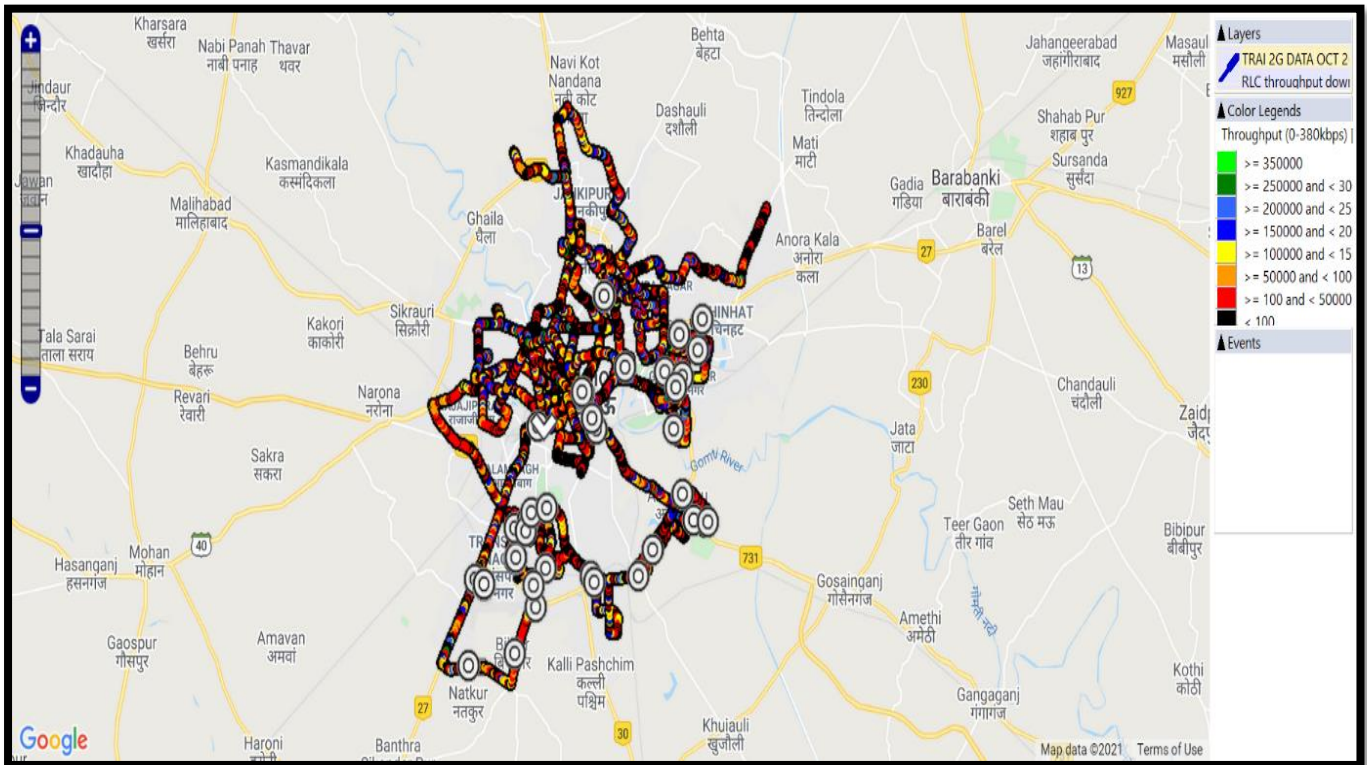
Airtel 2G



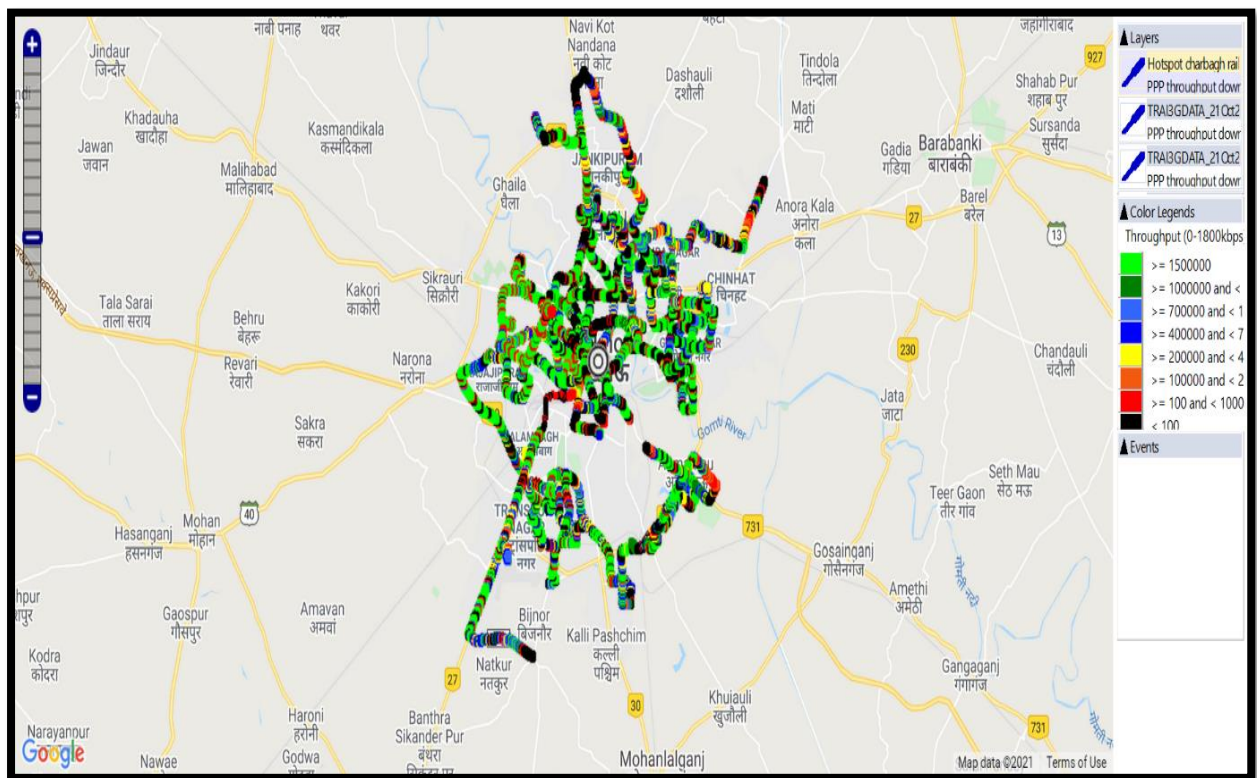
Airtel LTE



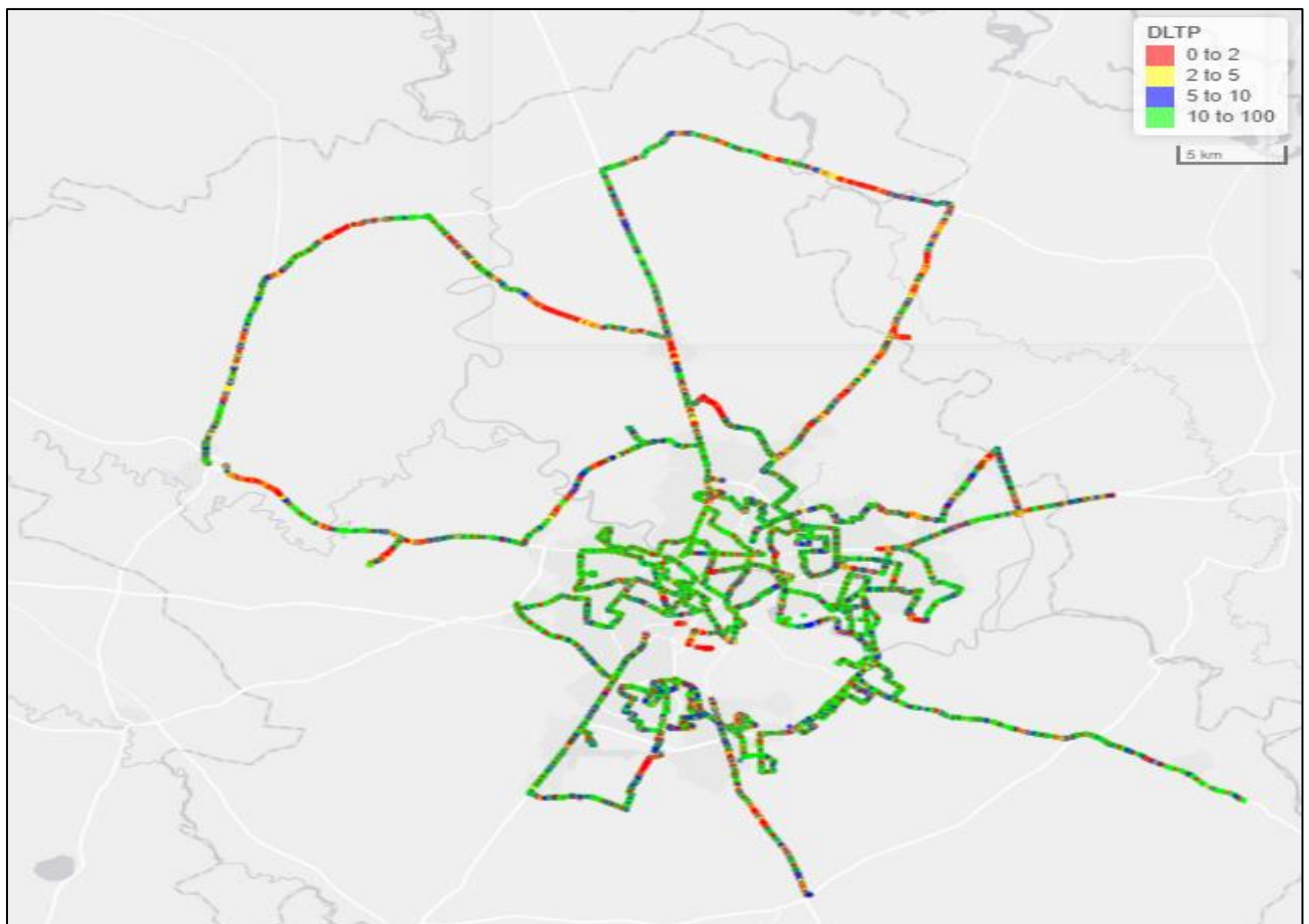
BSNL 2G Data Plot:



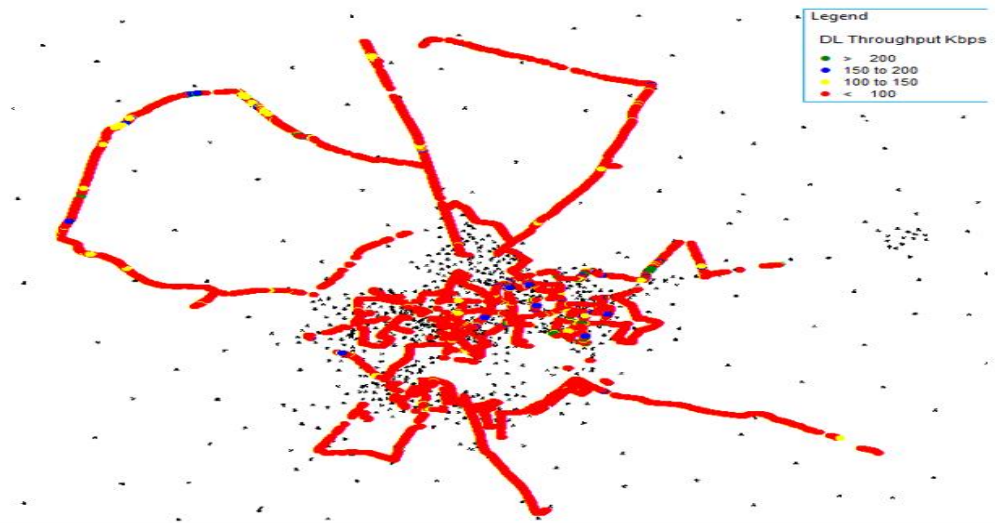
BSNL 3G data Plot:



JIO LTE



VIL 2G



VIL LTE

