

Operator Assisted Drive Test Report

Rajgir-Nalanda-Nawada, Bihar

November, 2023

(RO, Kolkata)

Key Performance Indicators (KPIs):

The following TSPs could not meet the KPIs benchmark as stated below—

AIRTEL- Rx Quality in 2G & 4G (SINR) network.

BSNL-Drop Call Rate, Block Call Rate, Call Setup Success Rate and Rx Quality (Ec/No) in 3G network.

RJIO-Rx Quality in 4G (SINR) network.

VIL- Rx Quality in 2G & 4G (SINR) network.

The Operator Assisted Drive Test has been carried out by Regional Office, Kolkata with the help of Service Providers in Rajgir-Nalanda-Nawada and surrounding areas including National Highway (20) on 30th November 2023 and 1st December 2023 from 08.30 AM to 08.30 PM. The drive test covered drive route of 448 KMs (approx) over a period of 2 days. Approximately 449+ calls were made for each of the 7 networks: three 2G networks, one 3G network and three 4G networks covering four TSPs.

Overview

Voice
Summary

Data
Summary

Overview

Rajgir, meaning "The City of Kings," is a historic town in the district of Nalanda in Bihar.

Nalanda was a renowned *mahavihara* (Buddhist monastic university) in ancient Magadha (modern-day Bihar). Considered by historians to be the world's first residential university and among the greatest centers of learning in the ancient world, it was located near the city of Rajagriha (now Rajgir) and about 90 kilometres southeast of Pataliputra (now Patna).

Nawada district is one of the thirty-eight districts of the Indian state of Bihar. Nawada is its administrative headquarters. The district is the easternmost district of the Magadh division, one of the nine administrative divisions of Bihar.

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, Call Setup Success Rate, Drop Call Rate and Block Call Rate.

Data: Download Throughputs and Data File Success Rate.

Voice Tests: Calls were made for 90 secs duration with wait time of 5 secs between call in all technologies. Three 2G networks, one 3G network, Three 4G networks covering 4 unique TSPs were tested.

Data Tests: Dynamic Data Service Testing was performed along same route in all technologies. 500 KB file for 2G, 20MB file for 3G and 40MB file for 4G were downloaded from FTTP server in TSP's own server. Static Data Service Testing was also performed. Three 2G (Lock Mode) networks, one 3G (Lock Mode) network, Three LTE (Lock Mode) networks covering 4 unique TSPs were tested.

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

Technology/ TSP	AIRTEL	BSNL	RJIO	VODAFONE-IDEA
2G	YES	YES	NO	YES
3G	NO	YES	NO	NO
4G	YES	NO	YES	YES
TOOL USED	TEMS	NIMO	X-CAL	TEMS

Overview

Voice & Dynamic Data Test Drive Route



Drive Routes:Rajgir-Nalanda-Nawada

DAY-1–Rajgir Railway Station-Katari-KK University Campus-2-Sarbahda More-Khudaganj Police Station-Dhobidhiha-Islampur-Dariapur-Ekangarsarai-Hilsa police station-Daniawan Post office-Taraura-Hargopalpur-Chandi-Narsanda-GDM College, Harnaut-Government Dental Collage, Nalanda-Khajesarai Post Office-Muraora Branch Post office, Biharsharif-Railway Station, BiharSharif-National High School, Biharsharif-Hospital More-Laheri Police station-Police Line Biharsharif-Mohammadpur Po-Chorsua-Bijwanpur-Karampur-Giriyak Police Station-Rajgir Police Station-GD Public School, Rajgir-Pandu Pokhara, Rajgir-International Conventional Hall, Rajgir.

DAY-2–Rajgir Bus Stand-Brahmakund-Saptaprani Cave-Sawarn Bhandar & Jangal Safari Entrance Gate-Zoo Safari & Roopway Entrance -T Point-Gram Panchayat Bhawan Handia-Nadrikanj-Hisua Block Office-Narhat-Government Polytechnic Nawada-Khanwan, Nawada-Sirdala Post Office-Duphera-Rajauli-Akbarpur Primary Health Centre-Gobindapur Block Office-Jharkhand Boarder-Baksoti-Nemdarganj Post office-Pharaha-Nawada Railway Station-Gosain Bigha-Kunj-Roh-Rupau-Kewali-Kolhuar-Kawakol Block Office-Marawa-Pakri Barawan Police Station-Dhewadha Chhatarwar-Warisaliganj Railway Station-Khanpura-Giriyak Police Station-Rajgir Railway Station.

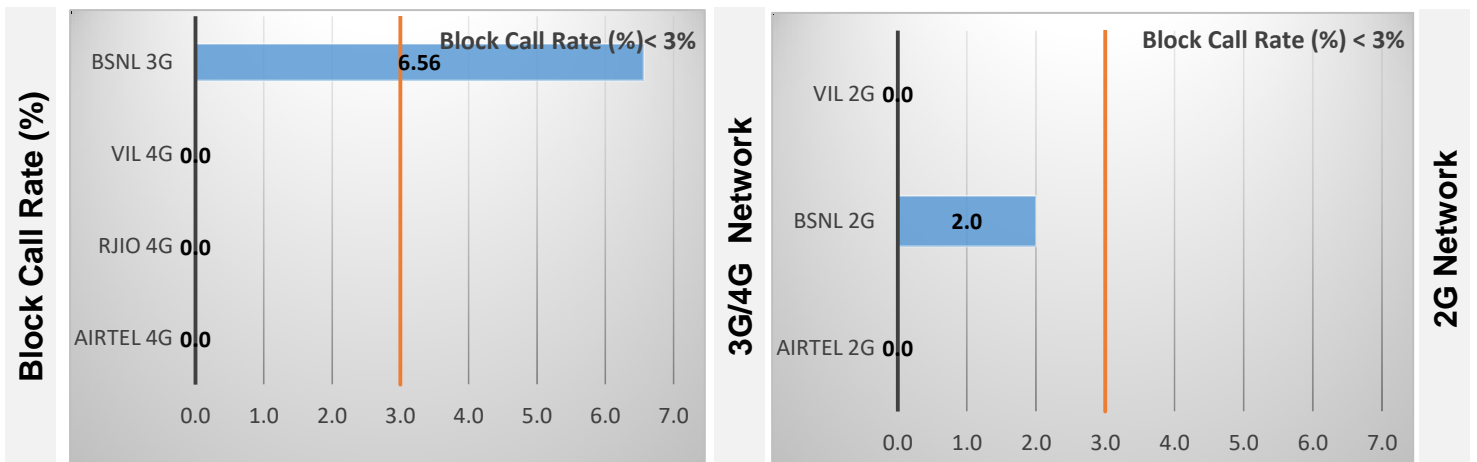
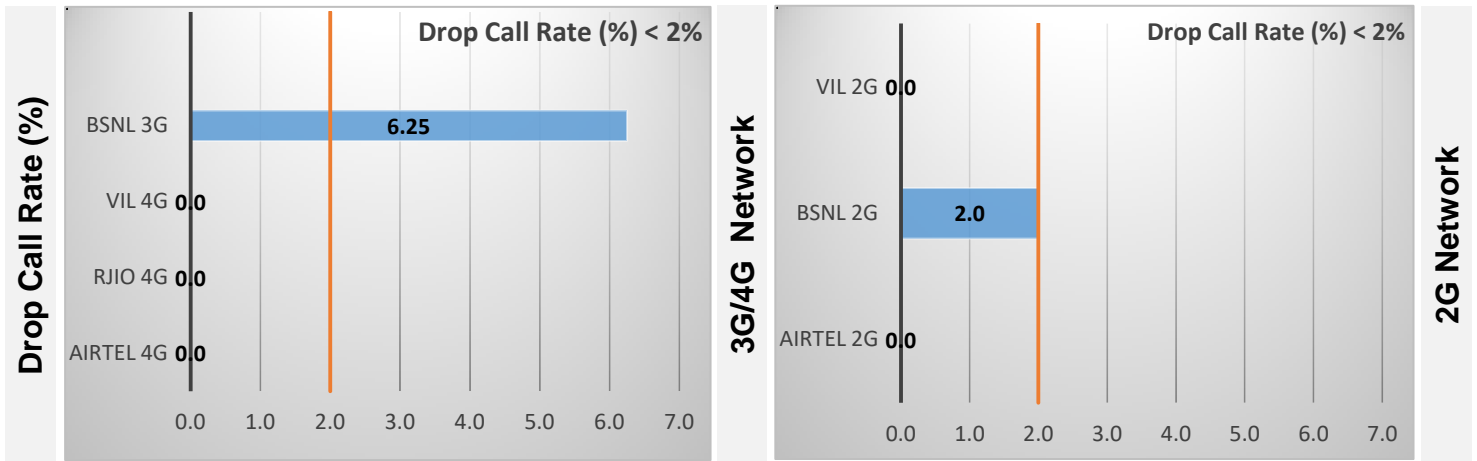
Data Service Test- Static Locations

Static Locations
Rajgir Railway Station
Rajgir-International Conventional Hall
Rajgir Bus Stand

Voice Calls

Key Observations

QoS compliance of the TSPs for Voice across technologies 2G/3G/4G-VoLTE:



KPIs	2G			3G	4G-VoLTE		
	AIRTEL	BSNL	VIL	BSNL	AIRTEL	RJIO	VIL
Drop Call Rate %	0.0	2.0	0.0	6.25	0.0	0.0	0.0
Block Call Rate %	0.0	2.0	0.0	6.56	0.0	0.0	0.0

- a) All TSPs have met the 2% QOS benchmark of Drop Call Rate (DCR%) except BSNL (3G) network.
- b) All TSPs have met the 3% QOS benchmark of Block Call Rate (BCR%) except BSNL (3G) network.

Coverage

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

TSPs	2G		
	AIRTEL	BSNL	VIL
Coverage %	92.0	72.14	65.91

b) Percentage of coverage samples for 3G \geq -90 dBm & 4G \geq -110 dBm.

TSPs	3G	4G		
	BSNL	AIRTEL	RJIO	VIL
Coverage	23.40	94.0	99.15	85.20

Summary

City Level Summary- Voice

Voice Call	2G		
	AIRTEL	BSNL	VIL
Call Attempt	554.0	569.0	372.0
Blocked Call Rate (%)	0.0	2.0	0.0
CSSR% (Accessibility)	100	98.0	100
Drop Call Rate (%)	0.0	2.0	0.0
Mobility HOSR (%)	96.03	96.80	97.60
Rx Quality (%)	93.0	95.29	90.75

Voice Call	3G/4G			
	BSNL 3G	AIRTEL 4G	RJIO 4G	VIL 4G
Call Attempt	256.0	616.0	589.0	191.0
Blocked Call Rate (%)	6.56	0.0	0.0	0.0
CSSR% (Accessibility)	93.75	100	100	100
Drop Call Rate (%)	6.25	0.0	0.0	0.0
Mobility HOSR (%)	100	99.23	99.67	98.97
Rx Quality (%)	77.67	92.0	86.80	91.55

Summary-Data Services Dynamic

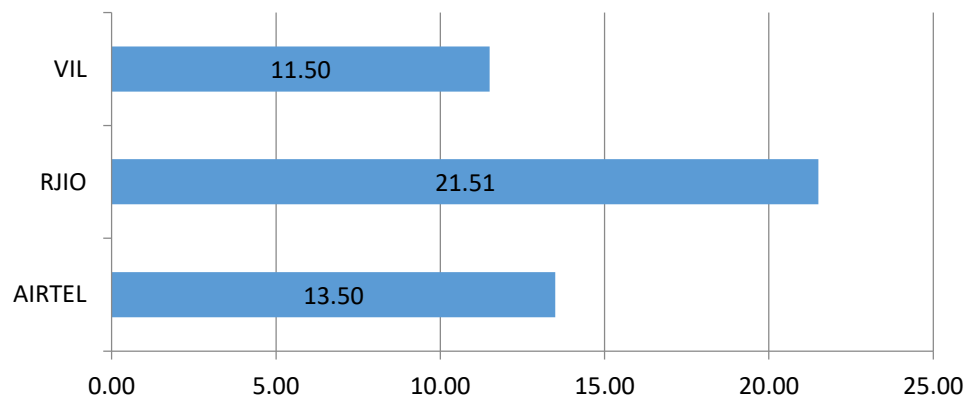
Key Observations

Dynamic Data was tested for 448 Kms. Download Throughput was tested.

Data Download Performance (Average Throughput in Mbps) - Dynamic Data Testing

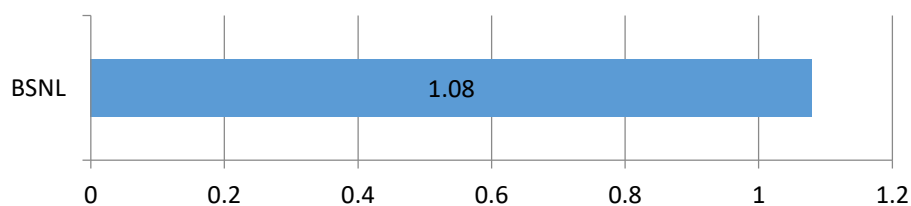
4G Network:

4G-Dynamic Download Average Throughput (Mbps)



3G Network:

3G-Dynamic Download Average Throughput (Mbps)



Summary-Data Services Static

City Level Summary-

Average Data Services Static	2G		
	AIRTEL	BSNL	VIL
Download Throughput (kbps)	119.0	63.0	148.30
Upload Throughput (kbps)	61.50	30.0	82.70
Web Browsing Delay (sec)	26.50	65.0	25.0
Latency (msec)	305	3371	185.0

Average Data Services Static	3G/ 4G			
	BSNL 3G	AIRTEL 4G	RJIO 4G	VIL 4G
Download throughput in Mbps	0.53	26.0	25.91	12.0
Upload Throughput in Mbps	0.28	22.0	3.29	9.50
Video streaming delay (secs)	***	10.0	0.70	7.50
Web Browsing Delay (secs)	67.0	3.50	3.17	5.50
Latency (msec)	211	82.5	77.44	82.50

*** TSP did not submit data

Summary-Data Services Static

Location Level Summary-

Location:-Rajgir Railway Station	2G		
	AIRTEL	BSNL	VIL
Download Throughput (kbps)	116.0	40.0	163.20
Upload Throughput (kbps)	64.0	0.0	75.40
Web Browsing Delay (sec)	29.0	25.40	24.0
Latency (msec)	320	1718	180

Location:-Rajgir Railway Station	3G/4G			
	BSNL 3G	AIRTEL 4G	RJIO 4G	VIL 4G
Download throughput in Mbps	1.23	29.0	14.19	13.0
Upload Throughput in Mbps	0.46	26.0	1.01	10.0
Video streaming delay (secs)	***	12.0	1.26	7.0
Web Browsing Delay (secs)	55.90	3.0	5.70	5.0
Latency (msec)	189	80	82.66	80

Location: Rajgir International Conventional Hall	2G		
	AIRTEL	BSNL	VIL
Download throughput in (kbps)	***	110.0	***
Upload Throughput in (kbps)	***	30.0	***
Web Browsing Delay (secs)	***	48.0	***
Latency (msec)	***	1740	***

Location: Rajgir International Conventional Hall	4G			
	BSNL 3G	AIRTEL 4G	RJIO 4G	VIL 4G
Download throughput in (mbps)	0.11	***	28.59	***
Upload Throughput in (mbps)	0.32	***	2.62	***
Video streaming delay (secs)	***	***	0.45	***
Web Browsing Delay (secs)	56.0	***	1.90	***
Latency (msec)	165	***	86	***

*** TSP did not submit data

Summary-Data Services Static

Location Level Summary-

Location: Rajgir Bus Stand	2G		
	AIRTEL	BSNL	VIL
Download throughput in (kbps)	122.0	39.0	133.50
Upload Throughput in (kbps)	59.0	0.0	90.0
Web Browsing Delay (secs)	24.0	121.0	26.0
Latency (msec)	290	6656	190

Location: Rajgir Bus Stand	4G			
	BSNL 3G	AIRTEL 4G	RJIO 4G	VIL 4G
Download throughput in (mbps)	0.27	23.0	34.94	11.0
Upload Throughput in (mbps)	0.07	18.0	6.24	9.0
Video streaming delay (secs)	***	8.0	0.40	8.0
Web Browsing Delay (secs)	89.0	4.0	1.92	6.0
Latency (msec)	280	85	63.66	85

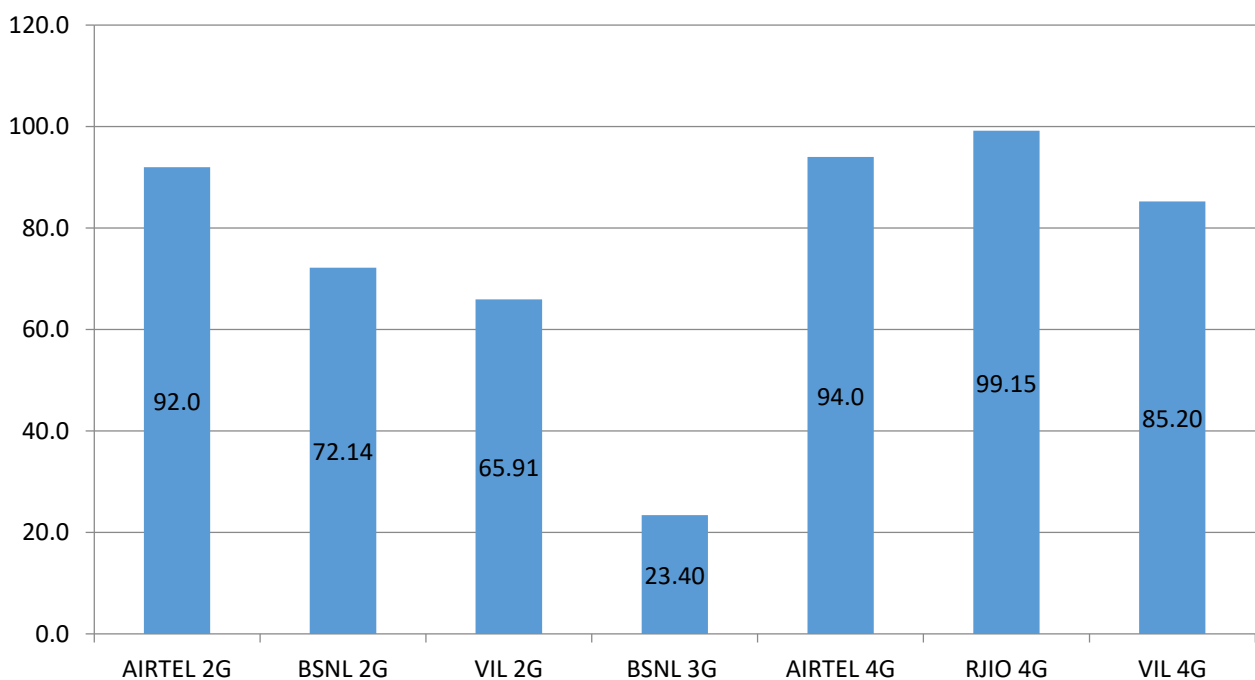
*** TSP did not submit data

I. Coverage Details

RF Coverage relates to the geographical footprint within the system that has sufficient RF signal strength to provide for a call session. The Coverage rate 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	92.0
BSNL 2G	72.14
VIL 2G	65.91
BSNL 3G	23.40
AIRTEL 4G	94.0
RJIO 4G	99.15
VIL 4G	85.20

Coverage Rate %



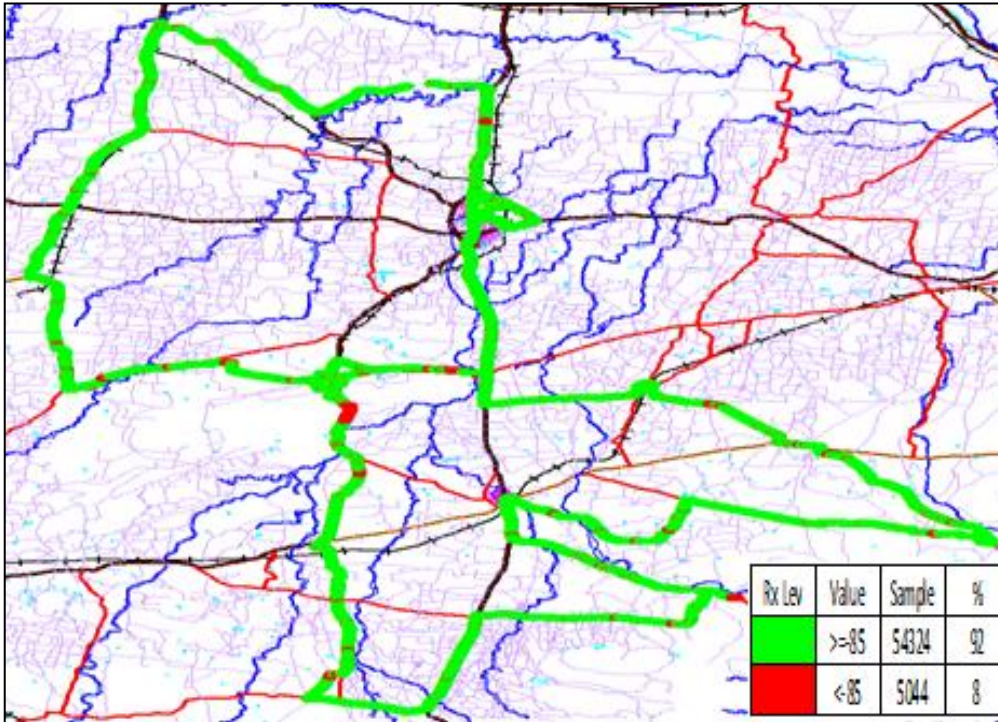
Note- Coverage is the percentage of samples having signal strength more than the threshold value (2G ≥ -85 dbm, 3G ≥ -90 dbm and 4G ≥ -110 dbm). However, these samples are only for the portion of the OADT routes where TSPs have coverage i.e 'no coverage' routes have been excluded.

I. Coverage Details

AIRTEL

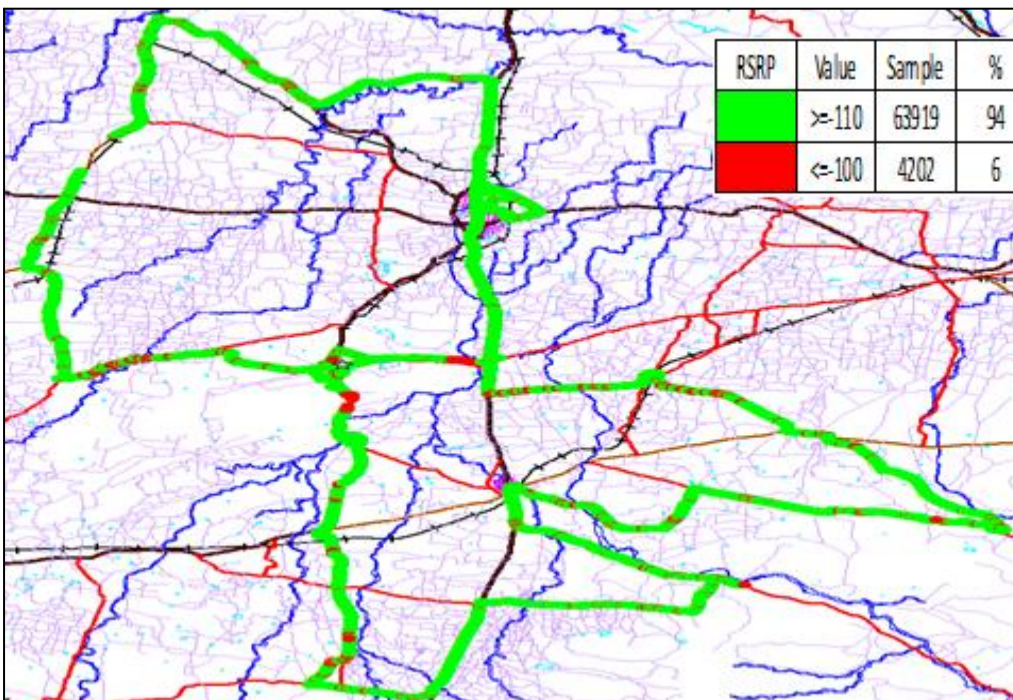
Technology	Coverage Rate %
2G	92.0
4G	94.0

2G



Overall Rx Level	Sample %
[Max >=-75]	35.0
[-75 >=-85)	57.0
[-85 >=-95)	7.0
[-95 >=Min)	1.0
Total	100

4G



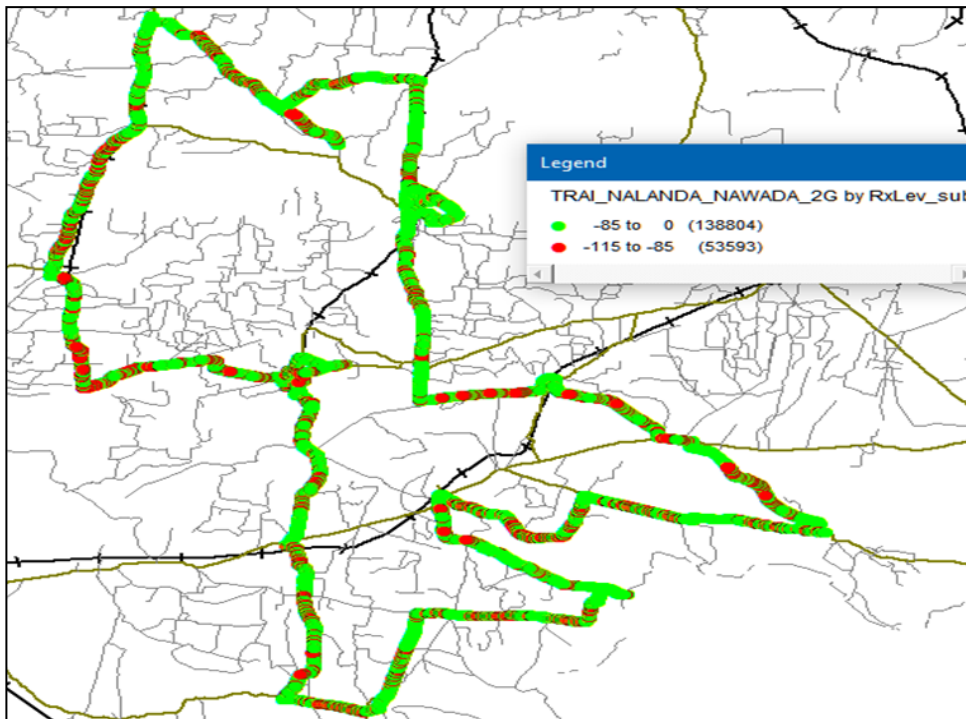
Overall RSRP	Sample %
[Max >=-80]	7.0
[-80 >=-90)	28.0
[-90 >=-110)	59.0
[-110 >=Min)	6.0
Total	100

I. Coverage Details

BSNL

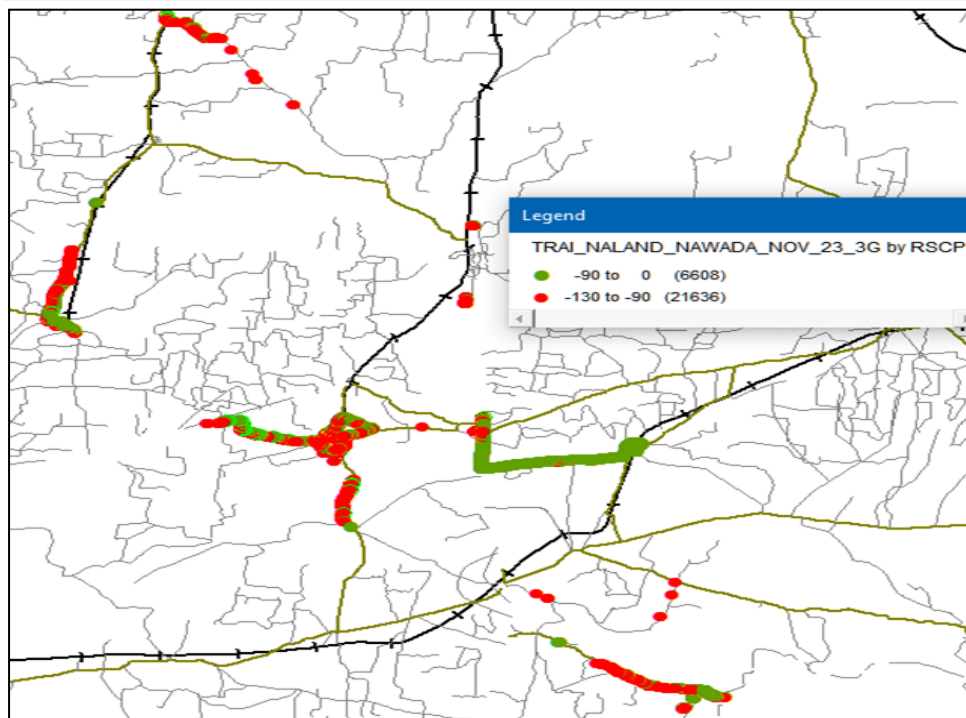
Technology	Coverage Rate %
2G	72.14
3G	23.40

2G



Overall RxLevel	Sample %
[Max >=-75]	56.99
[-75 >=-85]	15.15
[-85 >=-95]	19.29
[-95 >=Min]	8.57
Total	100

3G



Overall RSCP	Sample %
[Max >=-70]	8.08
[-70 >=-80]	4.21
[-80 >=-90]	11.11
[-90 >=Min]	76.6
Total	100

I. Coverage Details

RJIO

Technology	Coverage Rate %
4G	99.15

4G



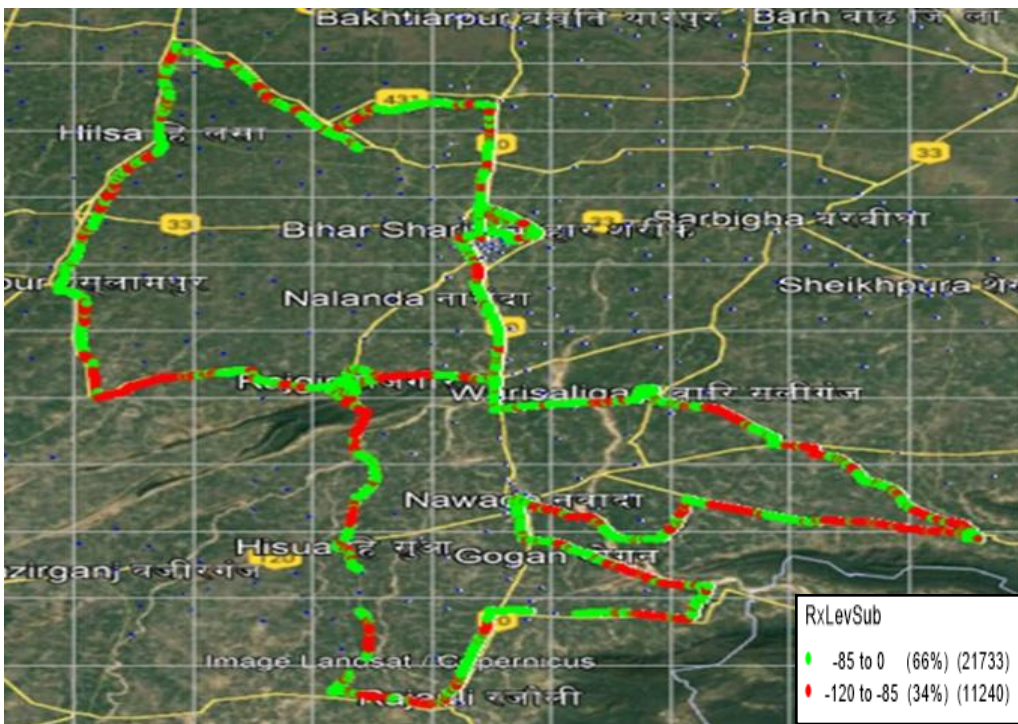
Overall RSRP	Sample %
[Max >= -80]	45.63
[-80 >= -90)	28.15
[-90 >= -110)	25.37
[-110 >= Min)	0.85
Total	100

I. Coverage Details

VIL

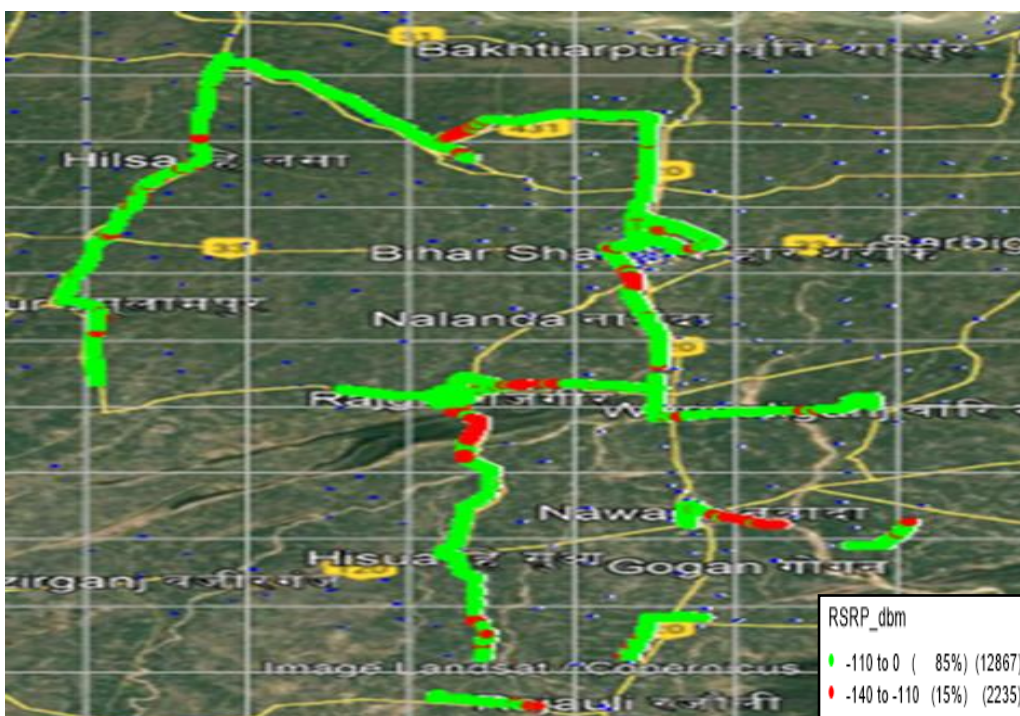
Technology	Coverage Rate %
2G	65.92
4G	85.20

2G



Overall RxLevel	Sample %
[Max >=-75]	35.29
[-75 >=-85)	30.63
[-85 >=-95)	23.17
[-95 =Min)	10.91
Total	100

4G



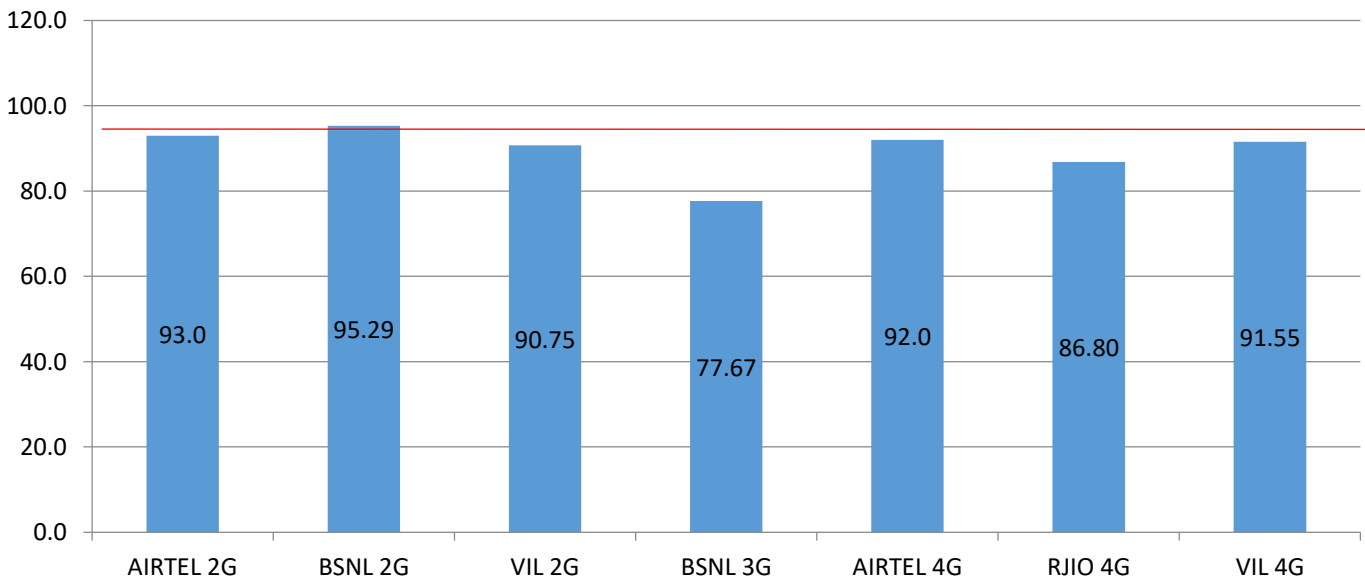
Overall RSRP	Sample %
[Max >=-80]	7.75
[-80 >=-90)	20.74
[-90 >=-110)	56.71
[-110 >=Min)	14.80
Total	100

II. Quality Details

For measuring voice quality, as per the QoS norms, Rx Quality ≤ 5 for GSM, Ec/No ≥ -14 dBm for 3G and 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	93.00
BSNL 2G	95.29
VIL 2G	90.75
BSNL 3G	77.67
AIRTEL 4G	92.00
RJIO 4G	86.80
VIL 4G	91.55

Rx Quality %

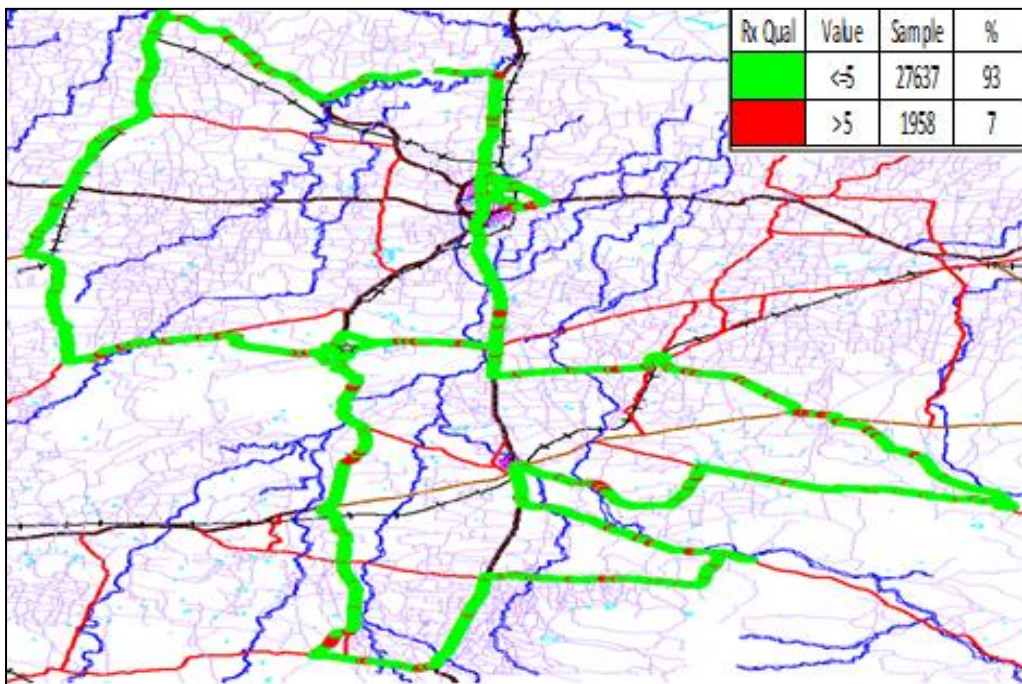


II. Quality Details

AIRTEL

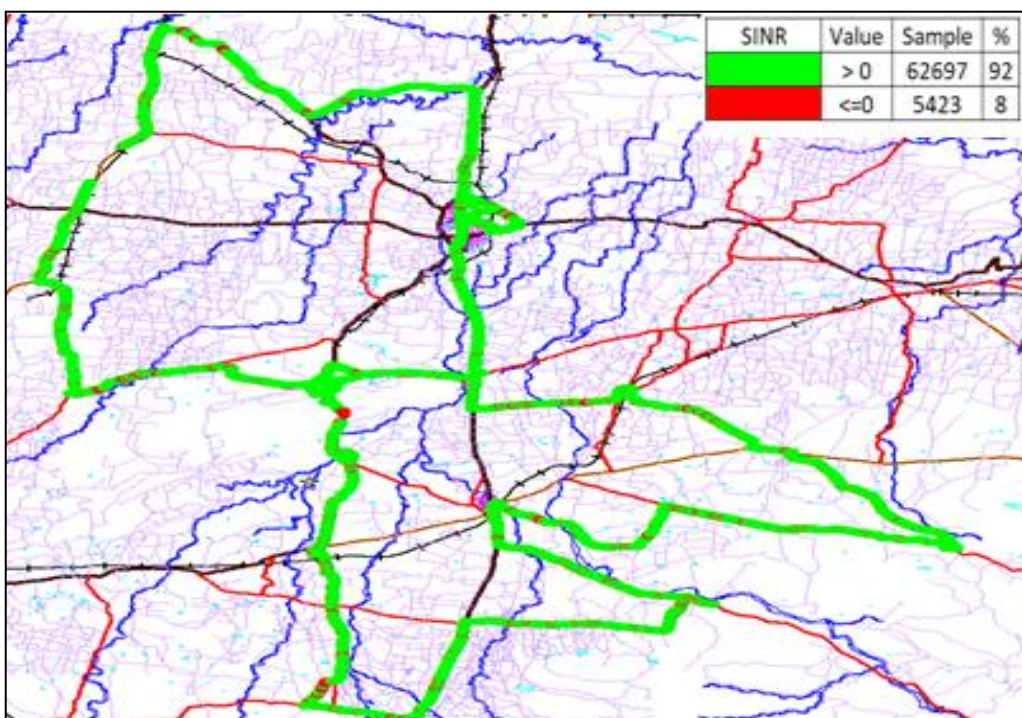
Technology	Rx Quality %
2G	93.00
4G	92.00

2G



Overall Rx Quality	Sample %
(Min <=2)	76.0
(2 <=3)	9.0
(3 <=4)	5.0
(4 <=5)	4.0
(5 <=Max)	7.0
Total	100

4G



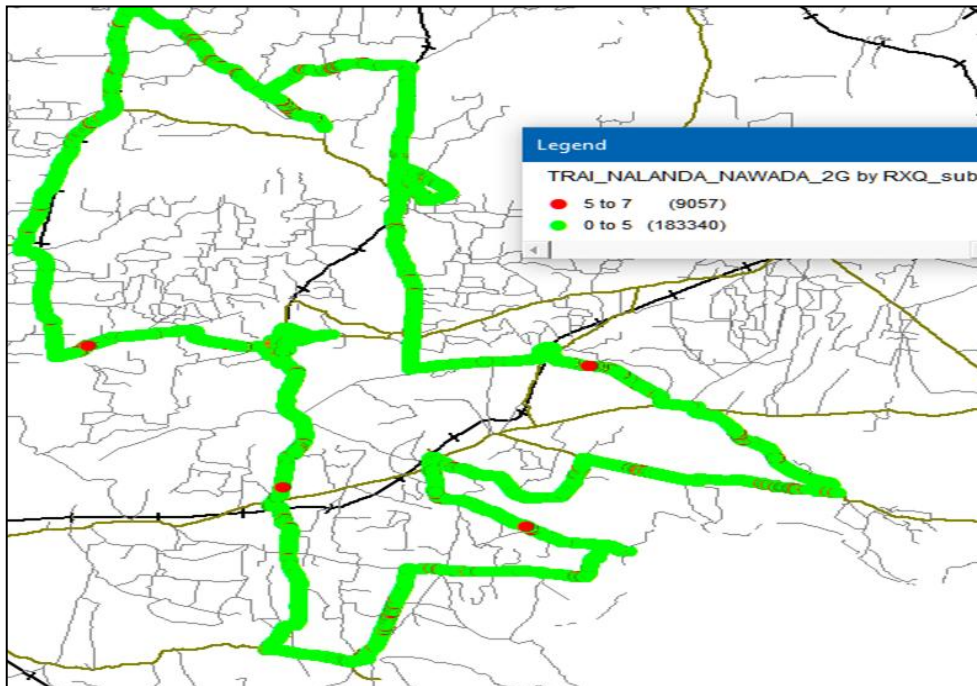
Overall SINR	Sample %
(Min <=0)	8.0
(0 <=5)	10.0
(5 <=10)	15.0
(10 <=15)	23.0
(15 <=Max)	45.0
Total	100

II. Quality Details

BSNL

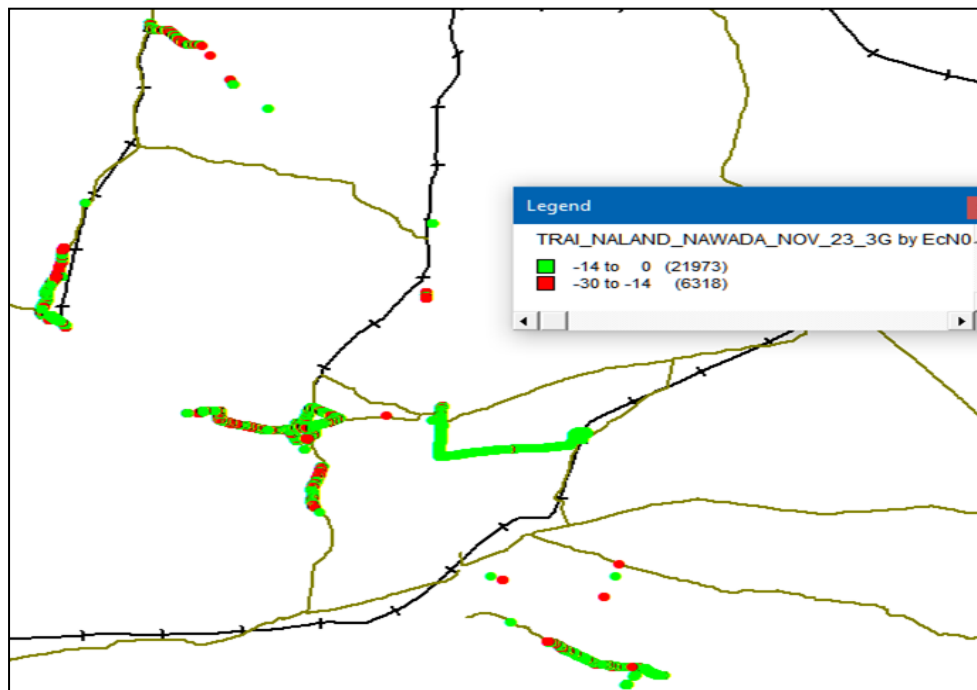
Technology	Rx Quality %
2G	95.29
3G	77.67

2G



Overall Rx Quality	Sample %
(Min <=2)	90.42
(2 <=3)	1.47
(3 <=4)	1.59
(4 <=5)	1.81
(5 <=Max)	4.71
Total	100

3G



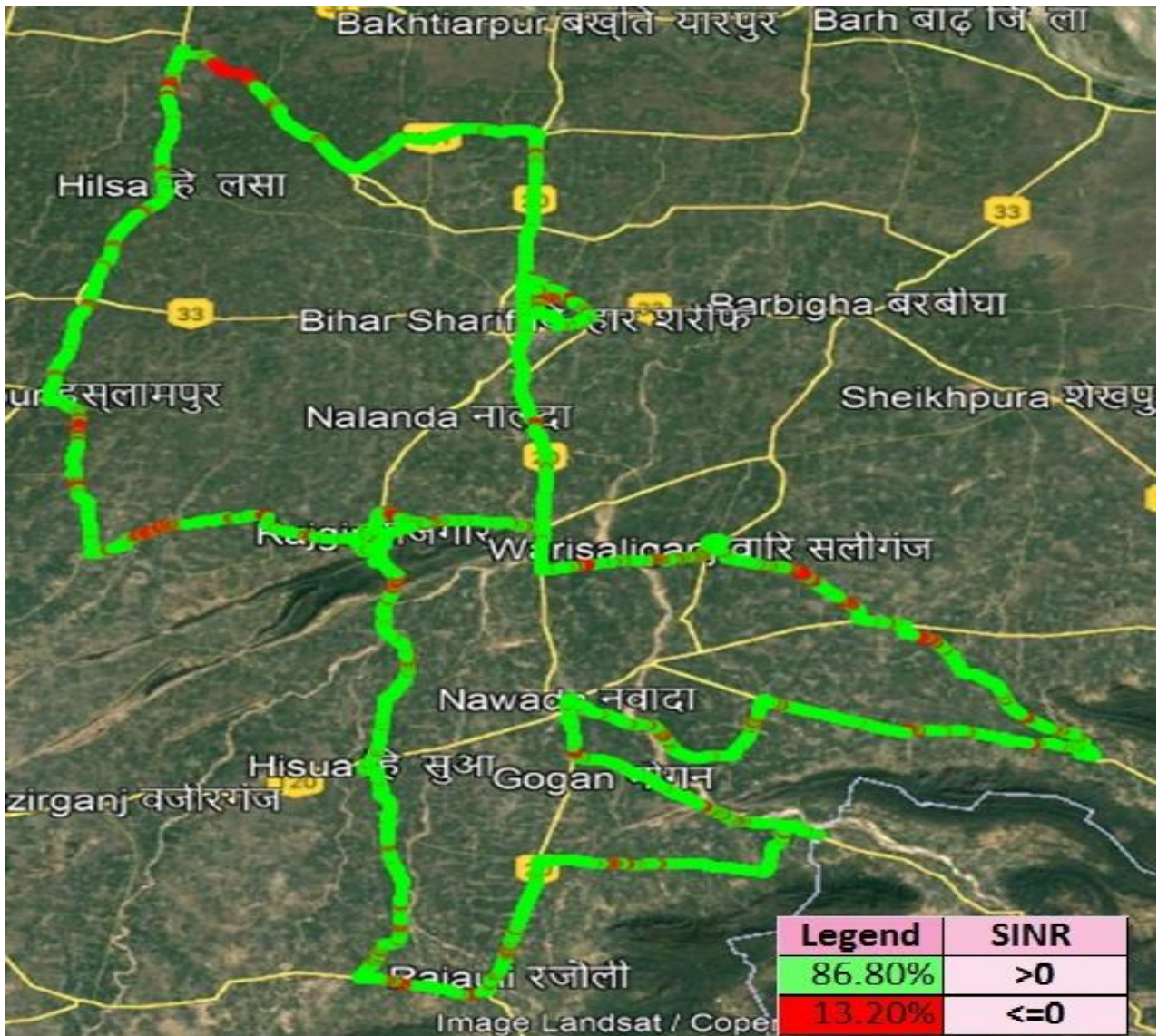
Overall Ec/No	Sample %
(Max <=-6)	15.77
(-6 <=-9)	17.83
(-9 <=-11)	23.76
(-11 <=-14)	20.31
(-14 <= Min)	22.33
Total	100

II. Quality Details

RJIO

Technology	Rx Quality %
4G	86.80

4G



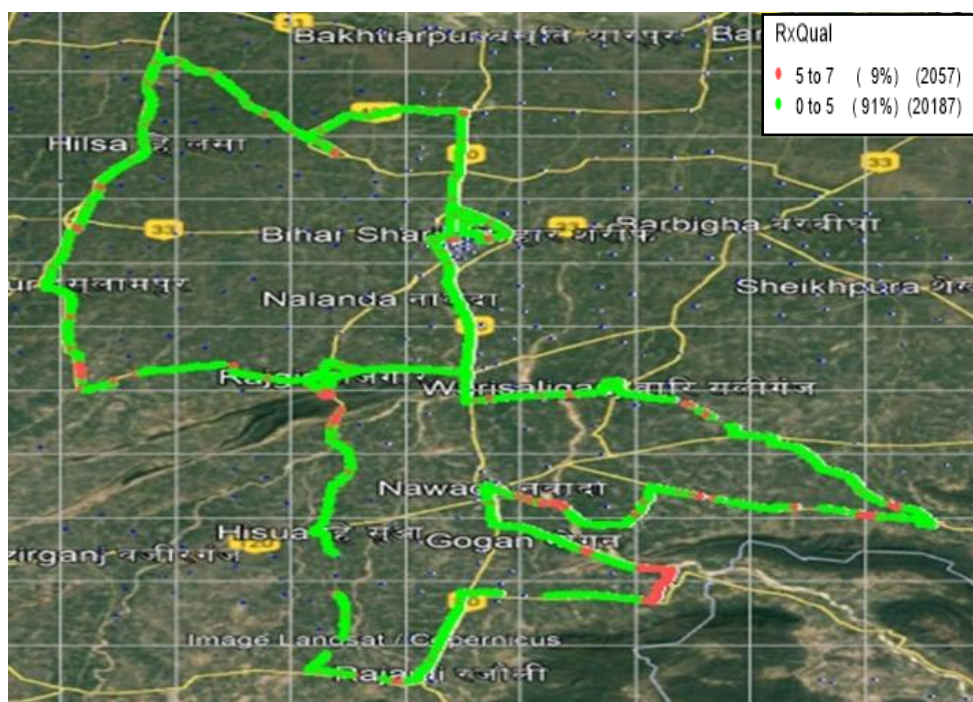
Overall SINR	Sample %
(Min <=0)	13.20
(0 <=5)	26.27
(5 <=10)	26.91
(10 <=15)	16.96
(15 <=Max)	16.66
Total	100

II. Quality Details

VIL

Technology	Rx Quality %
2G	90.75
4G	91.55

2G



Overall Rx Quality	Sample %
(Min <=2)	77.51
(2 <=3)	6.04
(3 <=4)	4.00
(4 <=5)	3.21
(5 <=Max)	9.25
Total	100

4G



Overall SINR	Sample %
(Min <=0)	8.45
(0 <=5)	15.35
(5 <=10)	22.15
(10 <=15)	20.45
(15 <=Max)	33.59
Total	100

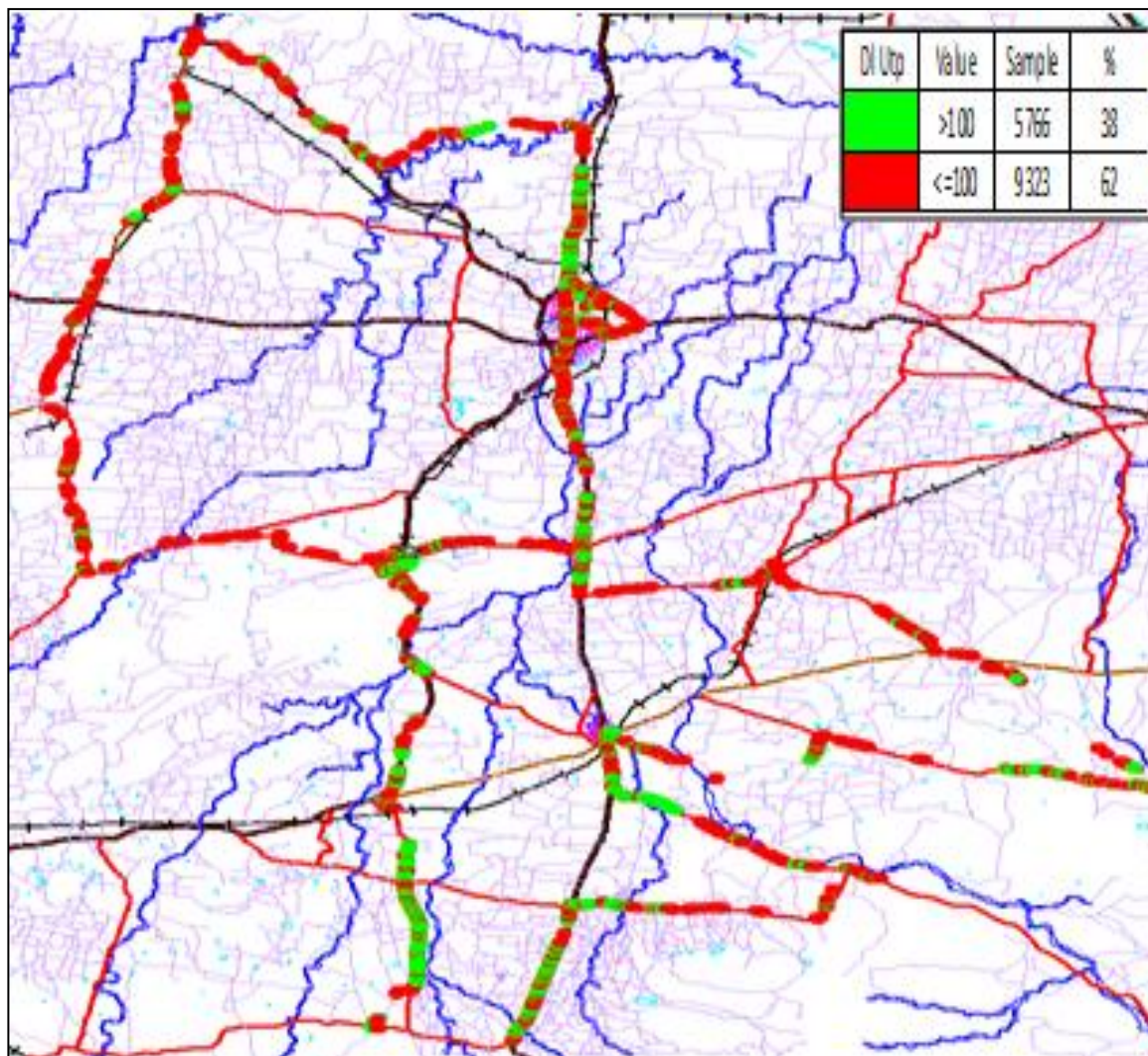
IV. Dynamic Data Test- 2G DL Details

AIRTEL

Dynamic Data Testing Complete 448 Kms

Data KPIs - Overall	2G
Average Download Throughput (Kbps)	133.00

2G



AVG. DOWNLOAD SPEED (Kbps)	133.00
% FILE TRANSFER COMPLETE	94.20
DL throughput	Sample %
0 to 50 Kbps	38.0
50 to 100 Kbps	24.0
100 to 200 Kbps	28.0
200 to 300 Kbps	9.0
>300 Kbps	1.0
Total	100

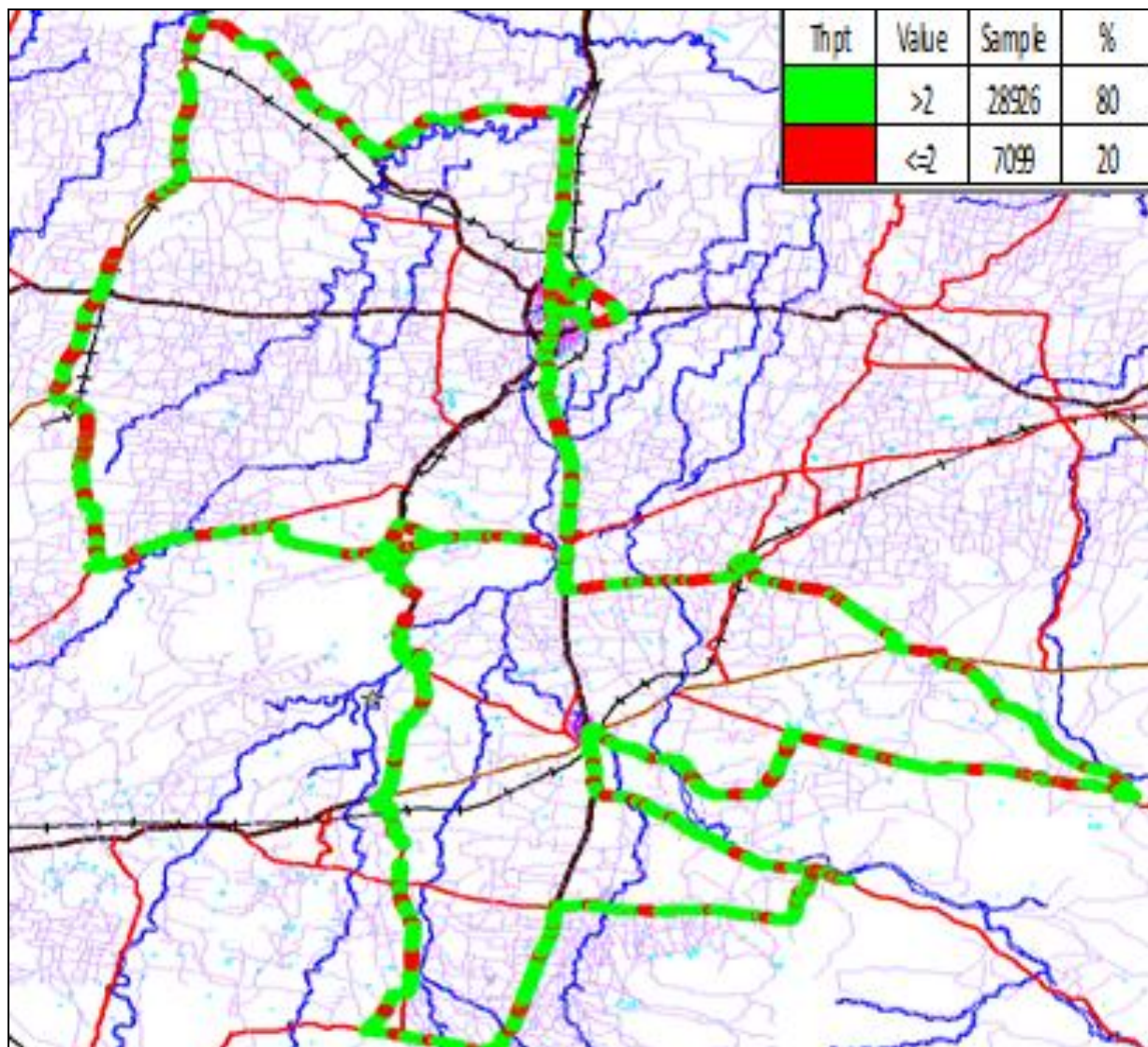
IV. Dynamic Data Test- 4G DL Details

AIRTEL

Dynamic Data Testing Complete 448 Kms

Data KPIs - Overall	4G
Average Download Throughput (Mbps)	13.50

4G



AVG. DOWNLOAD SPEED (Mbps)	13.50
% FILE TRANSFER COMPLETE	98.0
DL throughput	Sample %
0 to 1 Mbps	10.0
1 to 2 Mbps	9.0
2 to 5 Mbps	79.0
5 to 10 Mbps	1.0
>10 Mbps	0.0
Total	100

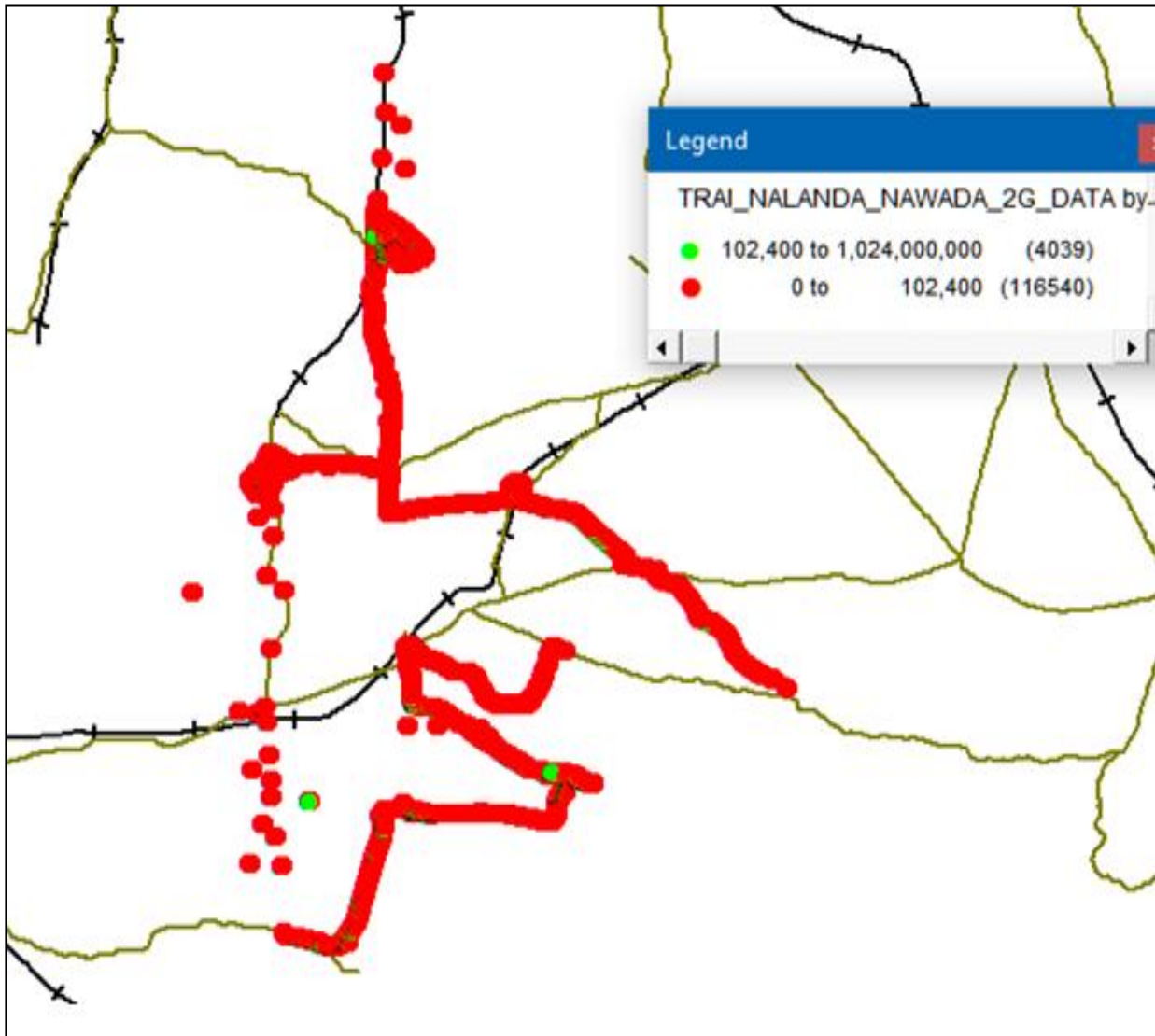
IV. Dynamic Data Test- 2G DL Details

BSNL

Dynamic Data Testing Complete 448 Kms

Data KPIs - Overall	2G
Average Download Throughput (Kbps)	57.59

2G



AVG. DOWNLOAD SPEED (Kbps)	57.59
% FILE TRANSFER COMPLETE	93.08
DL throughput	Sample %
0 to 50 Kbps	94.56
50 to 100 Kbps	2.09
100 to 200 Kbps	2.04
200 to 300 Kbps	0.71
>300 Kbps	0.60
Total	100

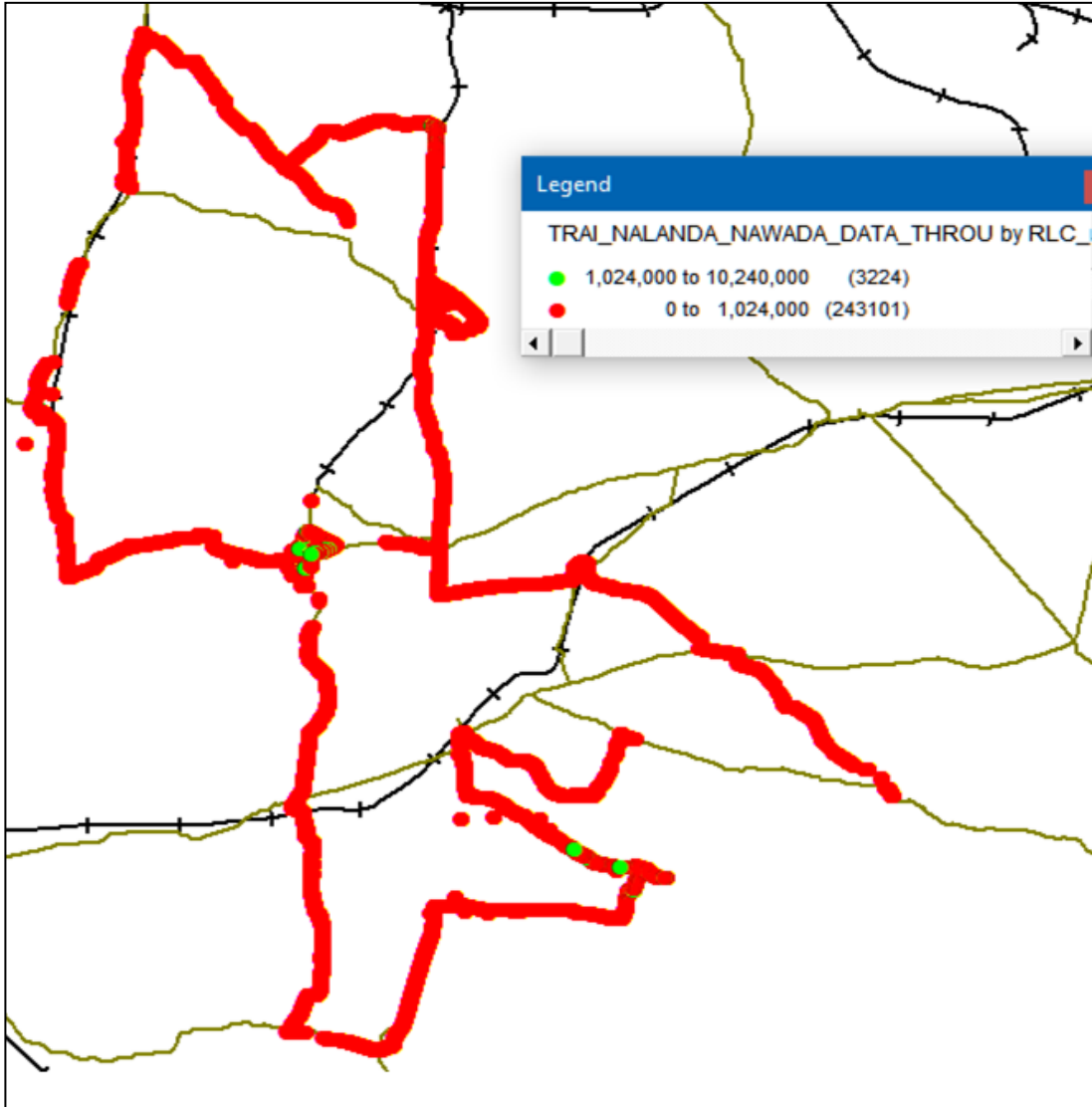
IV. Dynamic Data Test- 3G DL Details

BSNL

Dynamic Data Testing Complete 448 Kms

Data KPIs - Overall	3G
Average Download Throughput (Mbps)	1.08

3G



AVG. DOWNLOAD SPEED (Mbps)	1.08
% FILE TRANSFER COMPLETE	97.15
DL throughput	Sample %
0 to 0.5 Mbps	98.62
0.5 to 1 Mbps	0.07
1 to 2 Mbps	1.11
2 to 5 Mbps	0.20
>5 Mbps	0.0
Total	100

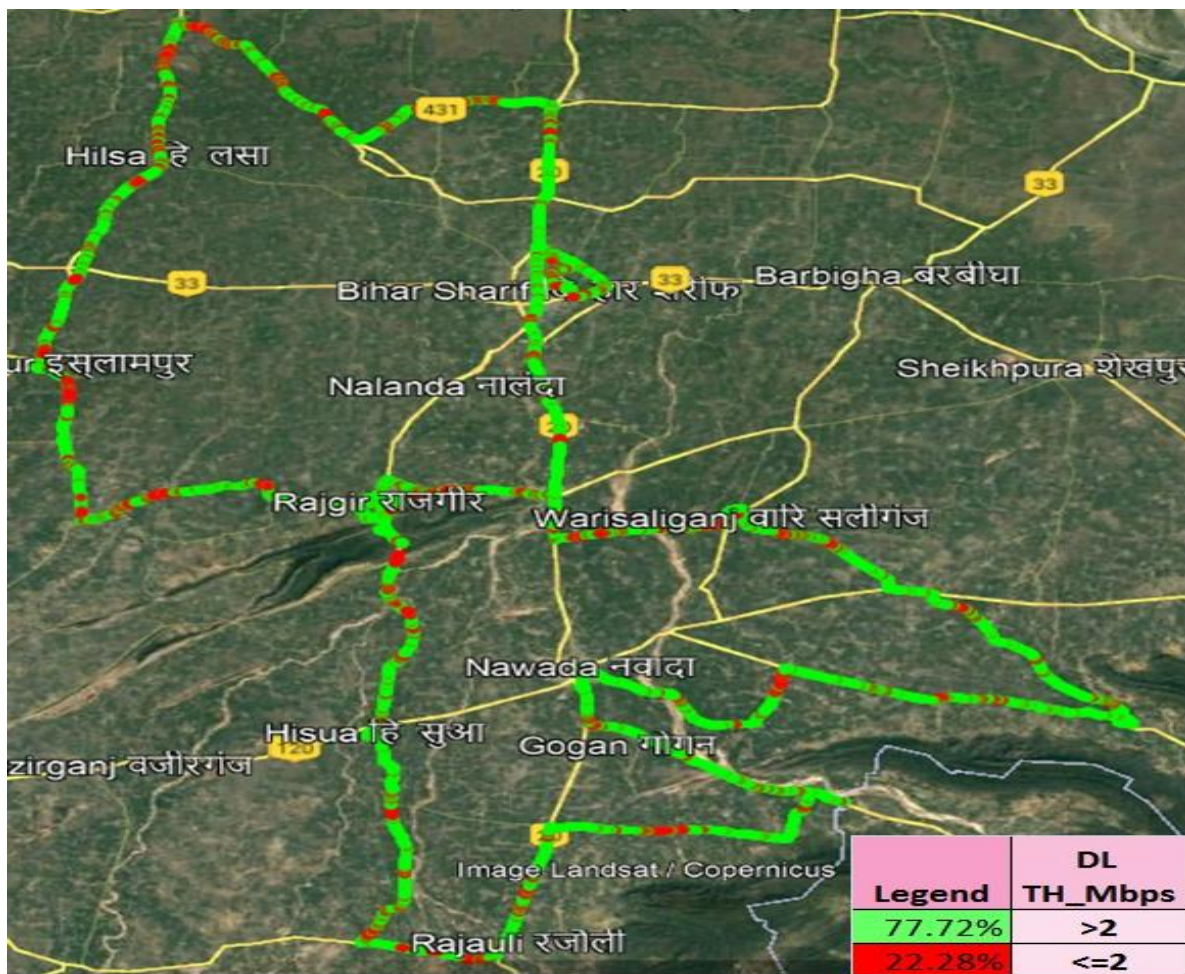
IV. Dynamic Data Test- 4G DL Details

RJIO

Dynamic Data Testing Complete 448 Kms

Data KPIs - Overall	4G
Average Download Throughput (Mbps)	21.51

4G



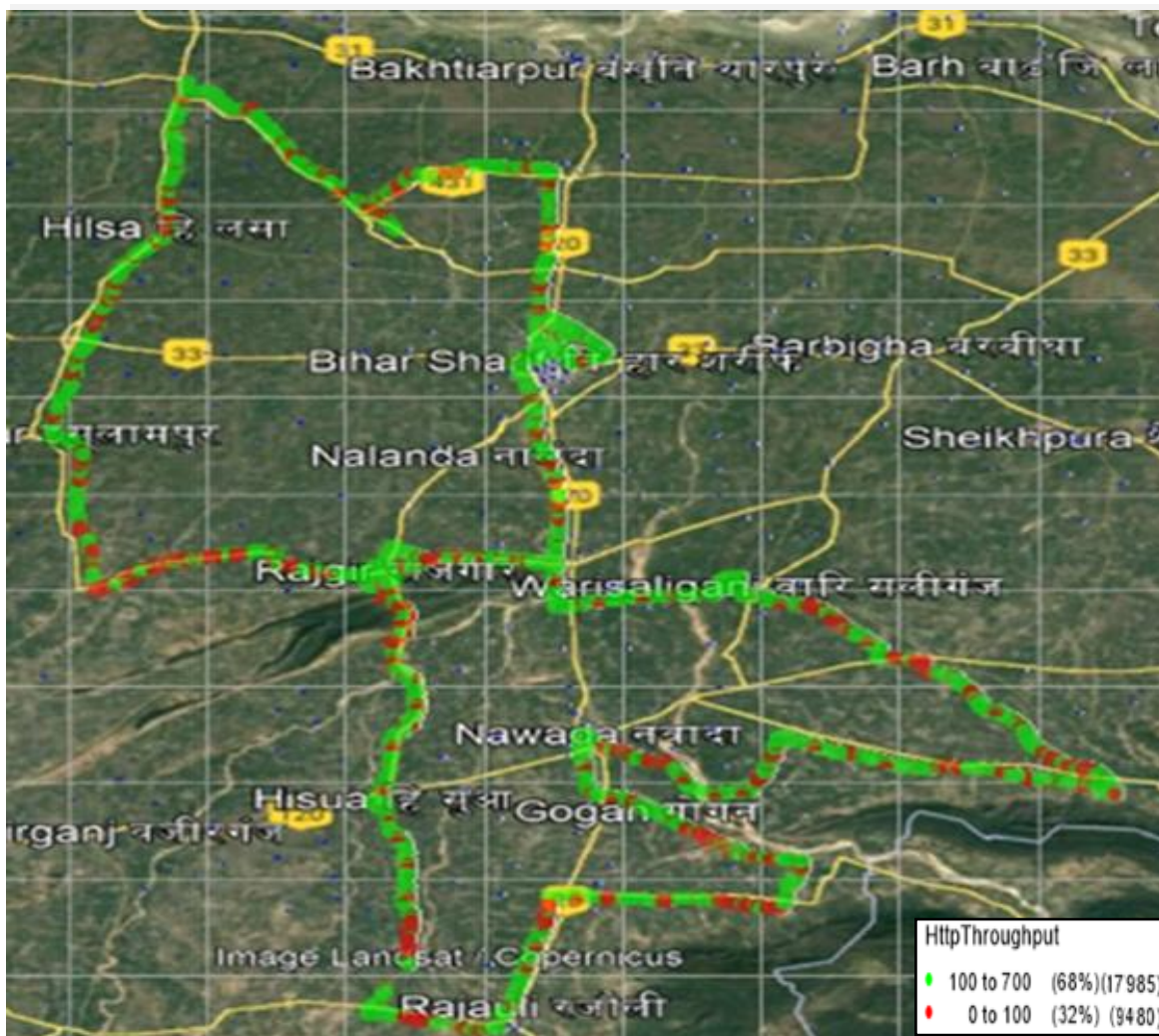
AVG. DOWNLOAD SPEED (Mbps)	21.51
% FILE TRANSFER COMPLETE	100
DL throughput	Sample %
0 to 1 Mbps	14.17
1 to 2 Mbps	8.11
2 to 5 Mbps	21.04
5 to 10 Mbps	22.72
>10 Mbps	33.96
Total	100

IV. Dynamic Data Test-2G DL Details

VIL

Dynamic Data Testing Complete 448 Kms

Data KPIs – Overall	2G
Average Download Throughput (Kbps)	164.0



AVG. DOWNLOAD SPEED (Kbps)	164.0
% FILE TRANSFER COMPLETE	100
DL throughput	Sample %
0 to 50 Kbps	24.45
50 to 100 Kbps	10.07
100 to 200 Kbps	35.96
200 to 300 Kbps	28.35
>300 Kbps	1.17
Total	100

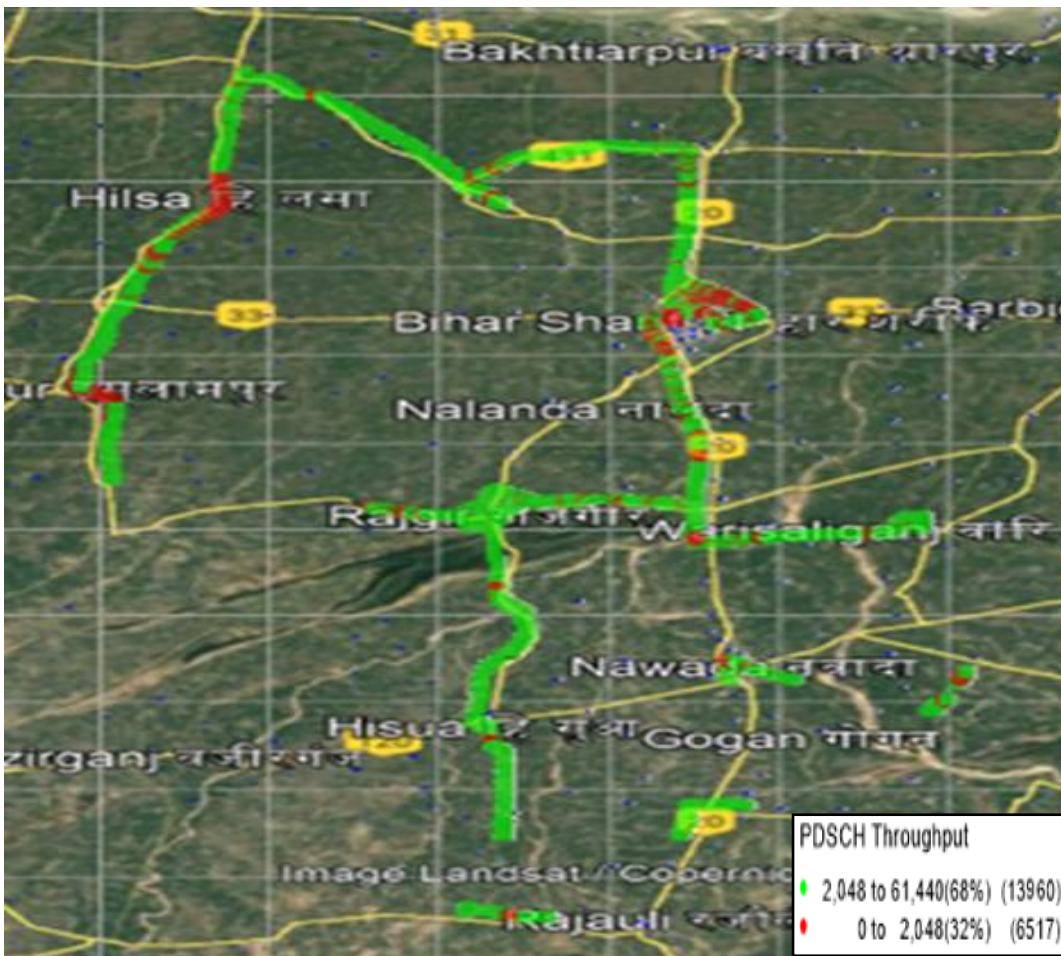
IV. Dynamic Data Test- 4G DL Details

VIL

Dynamic Data Testing Complete 448 Kms

Data KPIs – Overall	4G
Average Download Throughput (Mbps)	11.50

4G



AVG. DOWNLOAD SPEED (Mbps)	11.50
% FILE TRANSFER COMPLETE	100
DL throughput	Sample %
0 to 1 Mbps	22.26
1 to 2 Mbps	9.57
2 to 5 Mbps	16.66
5 to 10 Mbps	18.69
>10 Mbps	32.83
Total	100