



TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Madhya Pradesh LSA

March 2026

Contents

- 1. Introduction 3
- 2. Executive Summary (LSA) 3
 - 2.1 Drive test details 3
 - 2.2 Drive test routes 4
 - 2.3 Summary of areas covered 4
 - 2.4 Telecom service providers detected frequency bands 5
 - 2.5 Performance against key QoS parameters 5
- 3. QoS performance analysis-LSA level 7
 - 3.1 Overview 7
 - 3.2 Voice performance 7
 - 3.3 Data performance 10
- 4. Detailed QoS performance analysis 12
 - 4.1 Overview 12
 - 4.2 City 12
 - 4.2.1 Sagar 12
 - 4.2.1.1 Drive test route 12
 - 4.2.1.2 Areas covered 12
 - 4.2.1.3 Voice performance 12
 - 4.2.1.4 Data performance 21
 - 4.2.2 Raigarh 25
 - 4.2.2.1 Drive test route 25
 - 4.2.2.2 Areas covered 25
 - 4.2.2.3 Voice performance 25
 - 4.2.2.4 Data performance 33
 - 4.3 Hotspots 37
 - 4.3.1 Locations 37
 - 4.3.2 Hotspot covered 37
 - 4.3.3 Voice performance 37
 - 4.3.4 Data performance (Auto-selection mode 5G/4G/3G/2G) 41
 - 4.3.5 Data performance (5G Only & 4G Only Download & Upload Speed) 46
 - 4.4 Walk Test 50
 - 4.4.1 Walk test locations 50
 - 4.4.2 Walk Test Covered 50
 - 4.4.3 Voice Performance 50

4.4.4 Data Performance.....	51
5. Voice & Data Key finding	53
5.1 Overall Voice.....	53
5.2 Overall Data	53
5.3 Operator wise Key Findings	54
6. Annexure	59
6.1.1 City	59
7. Appendix	70
7.1 Appendix-I	70
7.1.1 Drive test setup	70
7.1.2 Drive test Methodology	72
7.2 Appendix-II	74
7.2.1 Network Performance Parameters for Voice calls	74
7.2.2 Network Performance Parameters Data tests	75

1. Introduction

TRAI Act, 1997 mandates the Authority to ensure the services delivered through various telecommunications networks meet the required quality standards prescribed, to protect the interest of the consumers of telecommunication services. TRAI is also responsible for conducting the periodical audit of such services provided by the service providers so as to protect the interests of the consumers of telecommunications services.

Accordingly, TRAI has engaged M/s RedMango Analytics Pvt. Ltd. to undertake assessment of Quality of Service of mobile service through Independent Drive Test (IDT).

In IDT, the performance of all service providers providing service in a Licensed Service Area (LSA) through various technologies (like 2G/ 3G/ 4G/ 5G) for voice and data are measured by conducting drive test. The drive test routes are finalised based on various objective criteria like reported network performance, consumer complaints etc. Methodology adopted for conducting IDT is elaborated in **APPENDIX-I**.

2. Executive Summary (LSA)

2.1 Drive test details

This report covers the findings of the IDT undertaken in Madhya Pradesh License Service Area (LSA) during the month of March-2026 under the supervision of TRAI Regional Office (RO) Bhopal. Details of route/area covered during the IDT are as given below:

S. No	Drive test route	Type of route	Distance covered (KMs)	From date	To date
1	Sagar and Raigarh	City	383.4	16-Mar-2026	21-Mar-2026
2	Sagar and Raigarh	Inter Operator Calling	71.7 & 7 Locations	17-Mar-2026	20-Mar-2026
3	Sagar and Raigarh	Hotspot	16 Locations	16-Mar-2026	21-Mar-2026
4	Sagar and Raigarh	Walk Test	9.7	16-Mar-2026	21-Mar-2026

Table-1: Drive test summary

Note-

- Data testing was also carried out with inter-operator calling during the dynamic drive test.
- Inter-operator calling tests were conducted in both static and dynamic scenarios.

2.2 Drive test routes

The map provides overview of drive test routes indicating city drive, Inter-operator call test, hotspots and walktest as per the legends shown on the map.

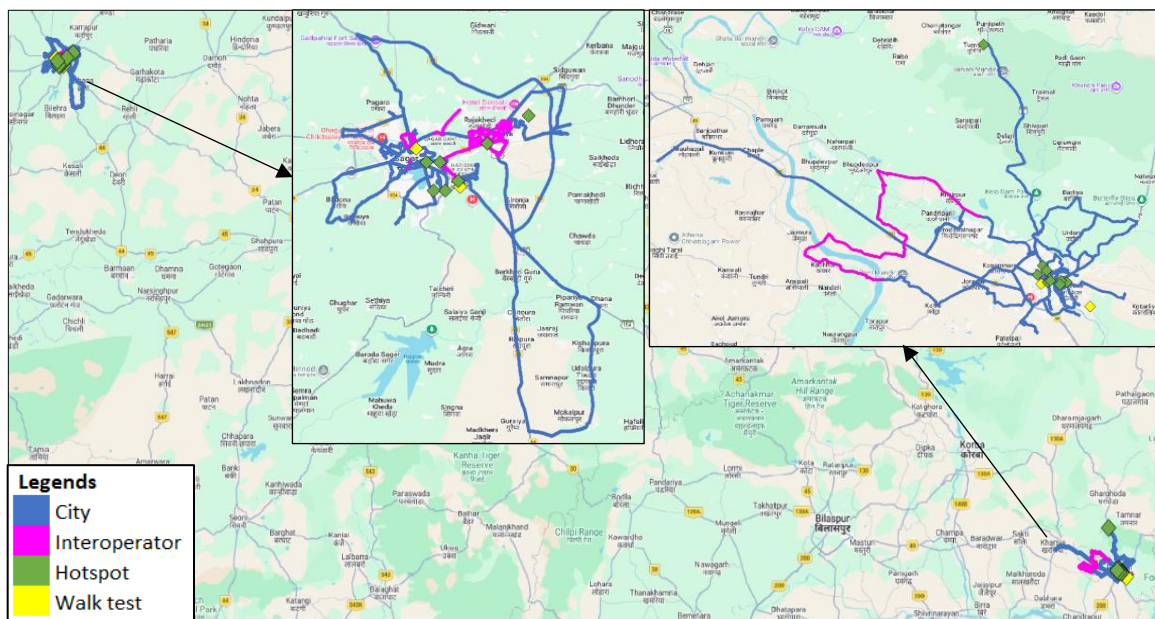


Figure-1: Drive test routes

2.3 Summary of areas covered

a) City-

Sagar- Gopal ganj, Berkhari Guru, udaipura Tiwari, Pipariya Ramwan, Sironja, Bamhori bika, Lidhorahat, Bamora, Makronia, Makronia muhal, Guru amar das nagar, Gadoli khurd, Anand Nagar, Badona, Rajauya, Keshav Ganj, Motinagar and Katra bazar etc.

Raigarh- khairpur, Mauhpali, Kachhar, Kotra, Kosamnara, Kelo Vihar, Urdana, Barliya, Tumidih, Chandni chowk, Darogapara and Chakradhar Nagar etc.

b) Hotspot

1. Carmel Convent Hr. Sec School Raigarh
2. Collectorate Sagar
3. Dr. Hari Singh Gaur University Sagar
4. Government Engineering College Sagar
5. Government Polytechnic College Sagar
6. Kirodimal Arts & Science College Raigarh
7. Kirodimal Govt District Hospital Raigarh
8. Kirodimal Polytechnic College Raigarh
9. Makroniya Chauraha Sagar
10. Medical College Sagar
11. O.P. Jindal University (OPJU) Raigarh
12. Raigarh Bus Stand
13. Raigarh Collectorate
14. Sagar Bus Stand
15. Shanichari Bazaar Raigarh
16. Uttam International School Raigarh

c) Walk Test

1. Dr. Hari Singh Gaur University Sagar
2. Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh
3. Raigarh Railway Station
4. Sagar Railway Station

2.4 Telecom service providers detected frequency bands

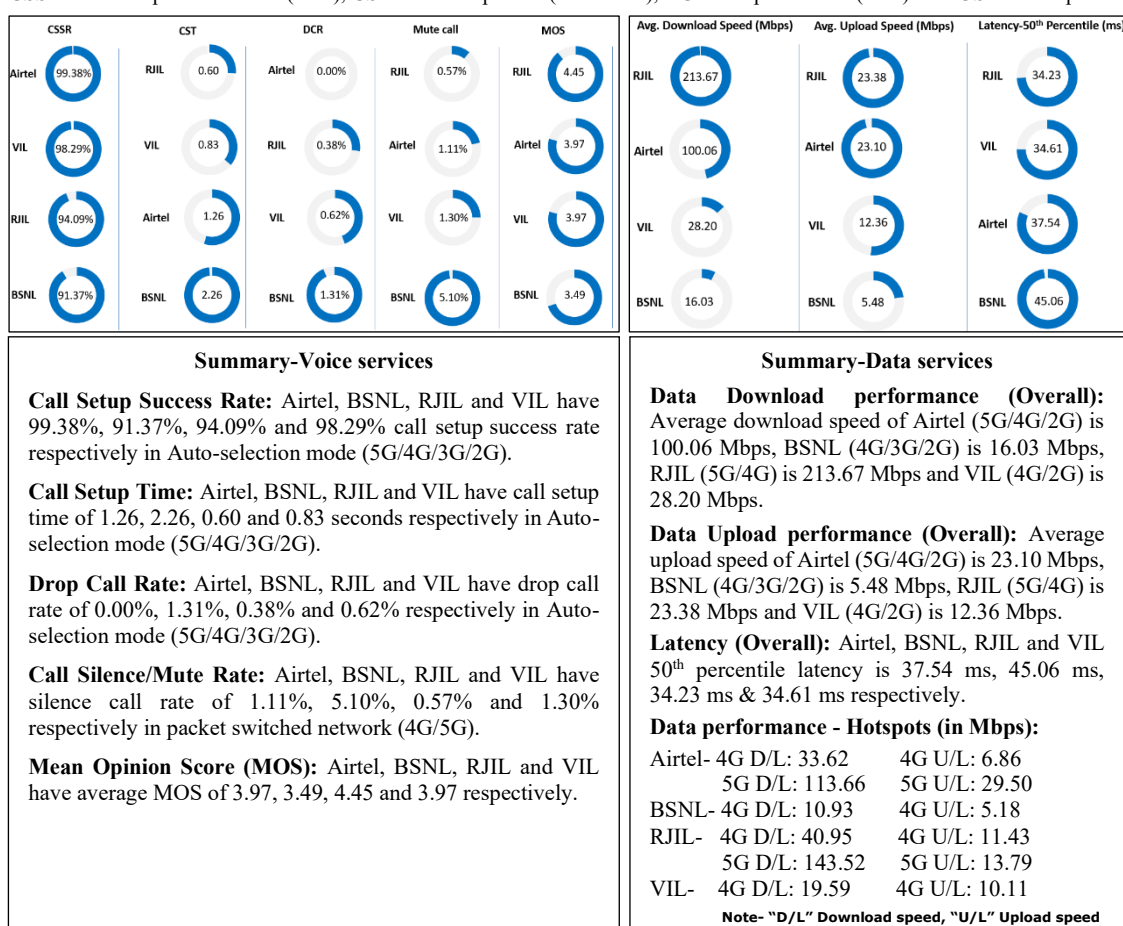
Technologies covered during the IDT and frequency bands in use are summarised in table below:

S.no.	Name of TSP	Technology	Frequency Bands (In MHz)
1	Bharti Airtel Ltd.	2G	1800
2	Bharti Airtel Ltd.	4G	850,1800,2100,2300
3	Bharti Airtel Ltd.	5G	3500
4	BSNL	2G	900
5	BSNL	3G	2100
6	BSNL	4G	700,2100
7	Reliance JIO Infocomm Ltd.	4G	850,1800,2300
8	Reliance JIO Infocomm Ltd.	5G	700,3500
9	Vodafone Idea Ltd.	2G	900,1800
10	Vodafone Idea Ltd.	4G	900,1800,2300,2500

Table-2: Telecom service provider (TSP) covered in IDT

2.5 Performance against key QoS parameters

CSSR: Call Setup Success Rate (in %), CST: Call Setup Time (in seconds), DCR: Drop Call Rate (in %) & MOS: Mean Opinion Score.



- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **voice** testing has been observed in 1.81%, 10.66%, 2.81% & 6.28% of the **Sagar City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 55 to 58** as per the **Section 6.1** under Para-6 (Annexure)}
- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **data** testing has been observed in 8.91%, 12.55%, 10.35% & 13.05% of the **Sagar City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 59 to 62** as per the **Section 6.1** under Para-6 (Annexure)}
- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **voice** testing has been observed in 5.28%, 27.56%, 1.51% & 12.26% of the **Raigarh City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 66 to 69** as per the **Section 6.1** under Para-6 (Annexure)}
- The Poor signal strength in auto-selection mode (5G/4G/3G/2G) during **data** testing has been observed in 11.32%, 19.73%, 12.65% & 26.19% of the **Raigarh City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 70 to 73** as per the **Section 6.1** under Para-6 (Annexure)}

QoS Performance Analysis- Madhya Pradesh LSA

3. QoS performance analysis-LSA level

3.1 Overview

This section provides summary of overall QoS performance of the telecom service provider's network in the LSA by aggregating the results of drive tests conducted in the Madhya Pradesh LSA during the month of March-2026 covering city drive, hotspots and walk test. (Refer Table-1)

3.2 Voice performance

(a) **Voice Call Performance in 3G/2G network mode only:** 3G/2G network mode testing has been done to reflect experience for respective users as they have only 3G/2G compatible handsets.

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	545	603	562
Call Setup Success Rate %	98.72	89.39	97.86
Drop Call Rate %	0.19	8.35	0.00
Call Setup Time-Average (Second)	4.73	3.46	3.26
Handover Success Rate %	98.10	99.76	98.05

Table-3: Summary of voice call performance in 3G/2G network mode only.

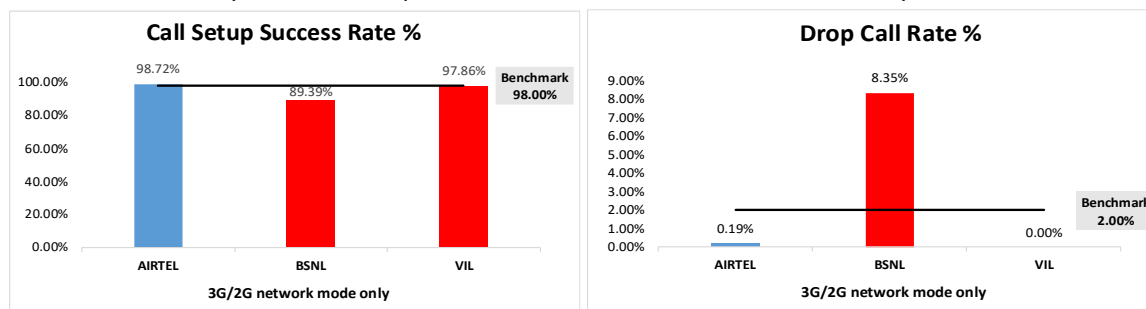


Figure-2: Call setup success rate and drop call rate performance.

Number of unique cell Id's covered in Voice test- Technology wise			
Technology	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
3G	NA	101	NA
2G	416	49	354

Table-4: Technology wise number of network cell Id's latched during drive test.

Note-

- RJIL does not have 3G/2G network.
- NA- Service provider doesn't provide services in respective technology.

(b) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	804	834	829	817
Call Setup Success Rate %	99.38	91.37	94.09	98.29
Drop Call Rate %	0.00	1.31	0.38	0.62
Call Setup Time-Average (Second)	1.26	2.26	0.60	0.83
Handover Success Rate %	99.97	99.81	99.86	99.97

Table-5: Summary of voice call performance in network auto-selection mode.

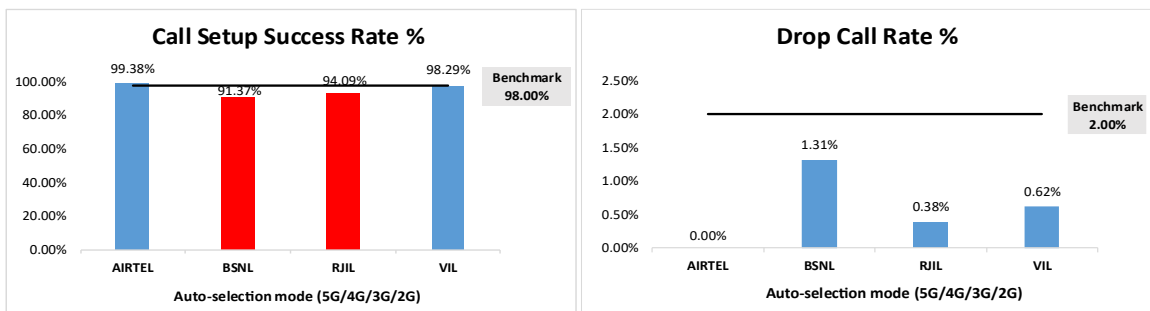


Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	541	451	528	539
Number of silences call for >4 Sec	6	23	3	7
Silence Call Rate %	1.11	5.10	0.57	1.30
Number of silence instances for >4 Sec	12	28	3	8
Number of silence instances for >3 Sec	18	48	5	12
Number of silence instances for >2 sec	30	72	13	25
RTP Jitter (4G & 5G) in ms	4.96	7.85	14.98	12.15
Packet loss Rate Downlink %	0.92	3.84	1.27	0.92
Packet loss Rate Uplink %	1.00	3.41	1.10	0.83

Table-6: Summary of silence instances & packet loss rate for mobile to mobile calls.

Number of unique cell Id's covered in Voice test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
5G	0	NA	652	NA
4G	938	254	431	740
3G	NA	28	NA	NA
2G	0	46	NA	44

Table-7: Technology wise number of network cell Id's latched during drive test.

Note-
<ul style="list-style-type: none"> • NA- Service provider doesn't provide services in respective technology. • 0- No cell Id's were found in respective technology.

(c) Mean Opinion Score (MOS) performance for speech quality:

Mean opinion score indicates quality of speech observed during the drive test across different technologies. This parameter has been calculated for mobile-to-mobile calls made within same operator network in auto mode (5G/4G/3G/2G). As per ITU-T Recommendation P.863.1, MOS values means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls table-6	3203	2508	3109	3185
Speech Quality (Average MOS)	3.97	3.49	4.45	3.97
Number of samples with MOS >=4 to <5 (Excellent)	2632	1288	2721	2234
Number of samples with MOS >=3 to <4 (Good)	430	610	223	768
Number of samples with MOS >=2 to <3 (Fair)	68	304	71	104
Number of samples with MOS >=1 to <2 (Poor)	73	306	94	79
%age of samples with MOS >=4 to <5 (Excellent)	82.17%	51.36%	87.52%	70.14%
%age of samples with MOS >=3 to <4 (Good)	13.42%	24.32%	7.17%	24.11%
%age of samples with MOS >=2 to <3 (Fair)	2.12%	12.12%	2.28%	3.27%
%age of samples with MOS >=1 to <2 (Poor)	2.28%	12.20%	3.02%	2.48%

Table-8: Summary of speech quality (MOS) samples.

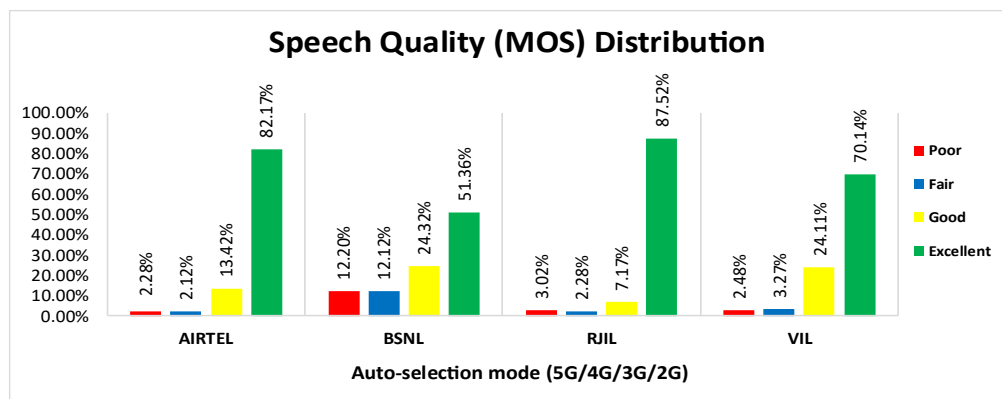


Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance: To check the performance of inter-service providers call setup success rate, total 356 to 405 inter operator calls were attempted at Seven locations which are Sargar Railway Station Sagar, Civil line Sagar, Chakra Ghat Sagar, Katra Bajar Sagar, Ganj chowk Raigarh, Subhash Chowk Raigarh and Galaxy Mall Raigarh. Additionally, testing was conducted during dynamic drive tests in Sagar and Raigarh cities. The call setup success rate and call setup time observation is as below.

Call Setup Success Rate %				
From Service Provider	To Service Provider			
	AIRTEL	BSNL	RJIL	VIL
AIRTEL	NA	83.70	98.49	100.00
BSNL	94.32	NA	93.09	97.02
RJIL	98.71	81.46	NA	98.77
VIL	100.00	84.80	94.72	NA

Table-9: Call setup success rate across service providers

Note-

- NA- Only inter-operator calls were measured during test.

Call setup time average (seconds)				
From Service Provider	To Service Provider			
	AIRTEL	BSNL	RJIL	VIL
AIRTEL	NA	3.09	1.41	2.62
BSNL	3.47	NA	2.72	2.92
RJIL	1.70	2.36	NA	2.26
VIL	1.62	2.69	1.97	NA

Table-10: Call setup time across service providers.

Note-

- NA- Only inter-operator calls were measured during test.

3.3 Data performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	100.06	16.03	213.67	28.20
	80th Percentile	171.56	25.24	370.08	41.41
	20th Percentile	24.93	5.44	26.18	11.44
Upload Throughput (Mbits/s)	Average	23.10	5.48	23.38	12.36
	80th Percentile	43.25	9.61	41.78	23.51
	20th Percentile	4.39	1.33	4.54	2.54
Latency (ms)	50th Percentile	37.54	45.06	34.23	34.61

Table-11: Summary of data performance in network auto-selection mode.

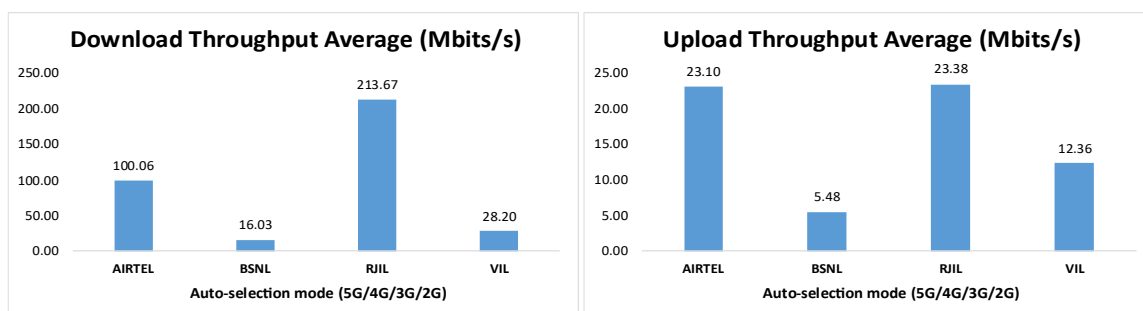


Figure- 5: Download and Upload throughput

Number of unique cell Id's covered in Data test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
5G	0	NA	587	NA
4G	982	288	348	681
3G	NA	13	NA	NA
2G	2	12	NA	17

Table-12: Technology wise number of network cell Id's latched during drive test.

Note-

- NA- Service provider doesn't provide services in respective technology.
- 0- No cell Id's were found in respective technology.

Detailed QoS Performance Analysis

4. Detailed QoS performance analysis

4.1 Overview

This section covers analysis on performance of various categories of drives like city, hotspots and walk tests for all telecom service providers, the results of drive tests conducted are shown individually for respective areas/locations.

4.2 City

Drive test has been conducted from 16th March 2026 to 21st March 2026 in Sagar and Raigarh city. (Refer Table-1)

4.2.1 Sagar

4.2.1.1 Drive test route

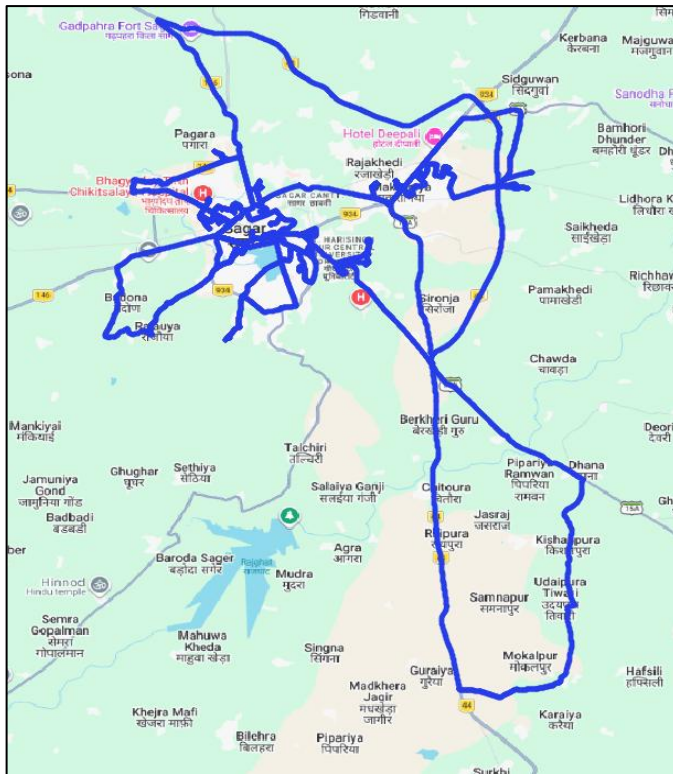


Figure- 6: Drive test routes

4.2.1.2 Areas covered

Gopal ganj, Berkhari Guru, udaipura Tiwari, Pipariya Ramwan, Sironja, Bamhori bika, Lidhorahat, Bamora, Makronia, Makronia muhal, Guru amar das nagar, Gadoli khurd, Anand Nagar, Badona, Rajauya, Keshav Ganj, Motinagar and Katra bazar etc.

4.2.1.3 Voice performance

(a) Voice Call Performance in 3G/2G network mode only: 3G/2G network mode testing has been done to reflect experience for respective users as they have only 3G/2G compatible handsets.

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	284	304	293
Call Setup Success Rate %	99.30	92.43	97.61
Drop Call Rate %	0.00	2.14	0.00
Call Setup Time-Average (Second)	4.67	3.40	3.04
Handover Success Rate %	98.14	99.66	98.75

Table-13: Summary of voice call performance in 3G/2G network mode only.

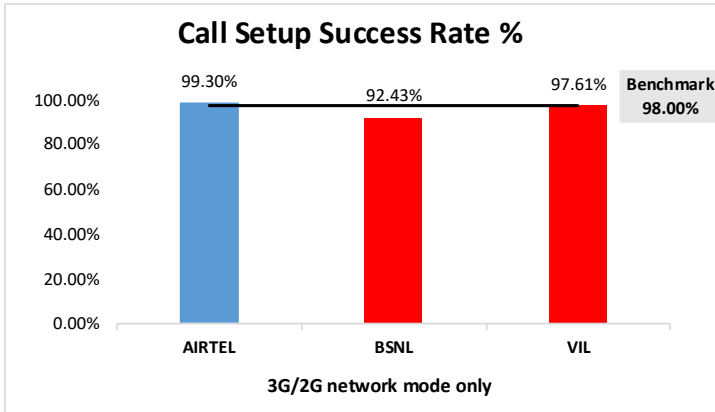


Figure-7: Performance for call setup success rate.

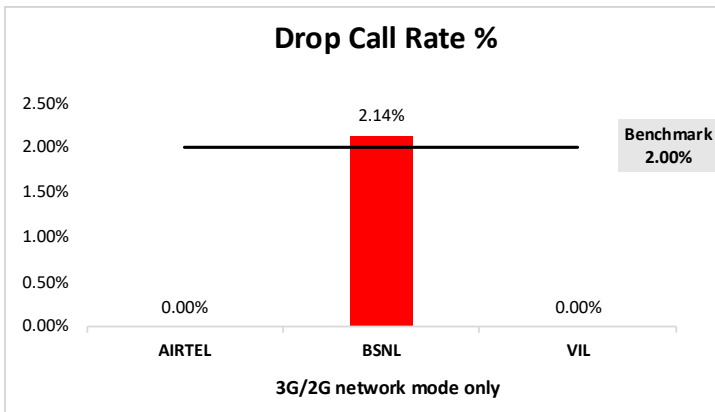


Figure-8: Performance for drop call rate.

(b) Network Technology: This section represent time spent on various network technologies.

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	91.45%	NA
2G	99.98%	7.25%	99.83%
Limited Service	0.02%	1.30%	0.17%

Table-14: Time spent on technology during drive test 3G/2G network mode.

Note-

- NA- Service provider doesn't provide services in respective technology.

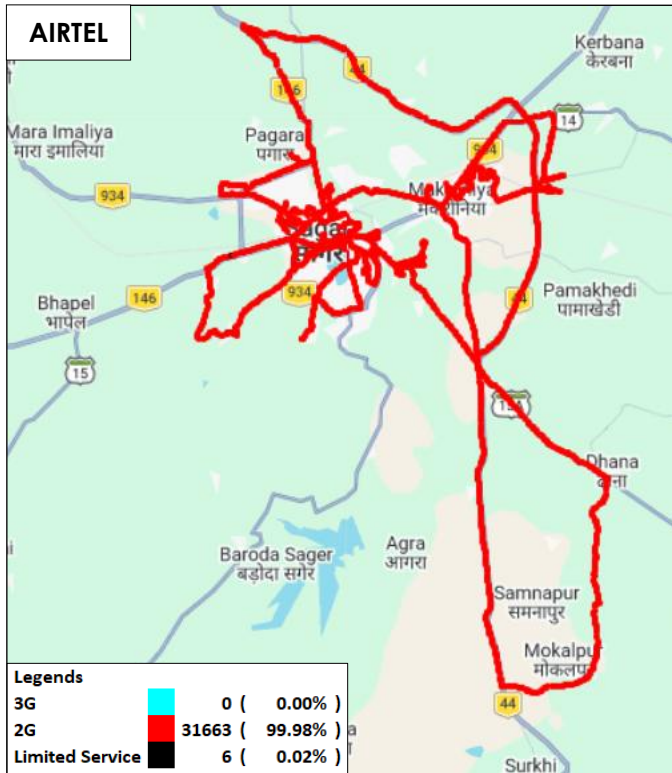


Figure-9: Serving technology plots 3G/2G network mode - AIRTEL.

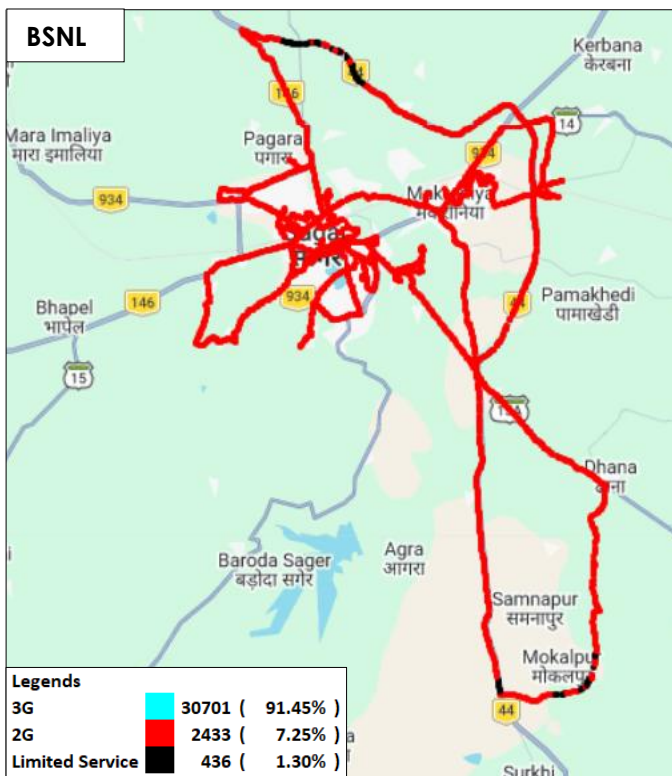


Figure-10: Serving technology plots 3G/2G network mode - BSNL.

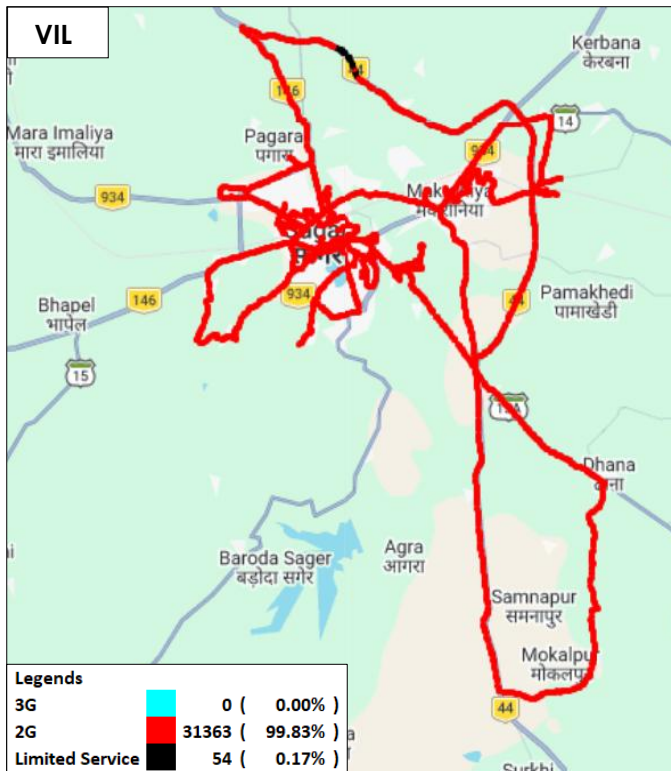


Figure-11: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 52, 53 & 54 for map view)

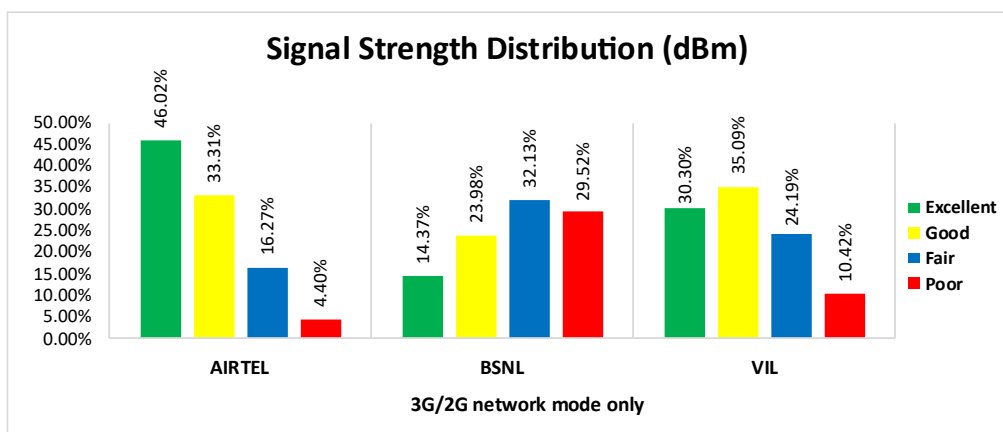


Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 46% of samples falling in the excellent signal strength category.
- BSNL has 14% of samples falling in the excellent signal strength category.
- VIL has 30% of samples falling in the excellent signal strength category.

(d) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	295	317	295	303
Call Setup Success Rate %	100.00	85.17	99.66	97.03
Drop Call Rate %	0.00	1.85	0.00	1.70
Call Setup Time Average (Second)	1.25	1.91	0.60	0.83
Handover Success Rate %	99.92	100.00	99.95	99.93

Table-15: Summary of voice call performance in network auto-selection mode.

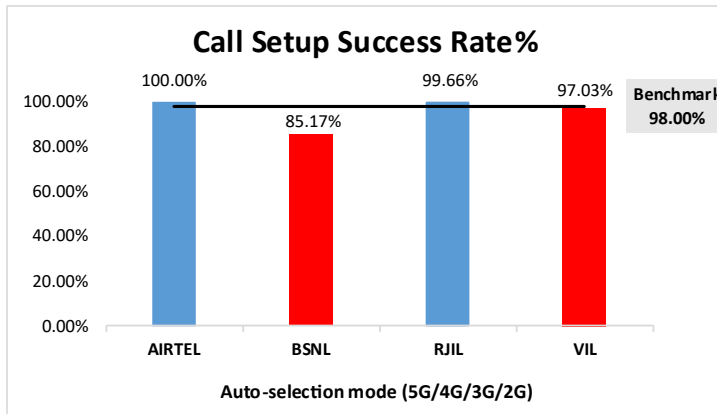


Figure-13: Performance for call setup success rate.

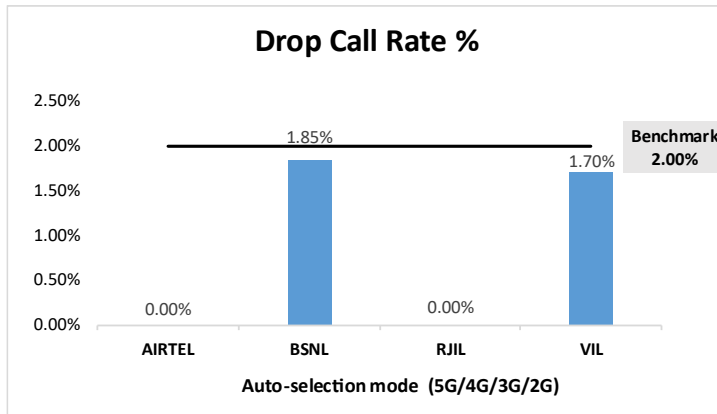


Figure-14: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	281	237	284	281
Number of silences call for >4 Sec	1	6	1	4
Silence Call Rate %	0.36	2.53	0.35	1.42
Number of silence instances for >4 Sec	2	6	1	4
Number of silence instances for >3 Sec	4	9	3	5
Number of silence instances for >2 sec	7	20	5	8
RTP Jitter (4G & 5G) in ms	4.18	7.88	16.87	7.81
Packet loss Rate Downlink %	0.46	3.53	1.37	0.80
Packet loss Rate Uplink %	0.48	3.07	1.29	0.78

Table-16: Summary of silence instances & packet loss rate for mobile to mobile call.

(e) Mean Opinion Score (MOS) performance for speech quality:

Mean opinion score indicate quality of speech observed during the drive test across different technologies. This parameter has been calculated for mobile to mobile calls made within same operator network in auto mode (5G/4G/3G/2G). As per ITU-T Recommendation P.863.1, MOS value means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-16	1659	1295	1674	1654
Speech Quality (Average MOS)	4.01	3.55	4.46	4.04
Number of samples with MOS >=4 to <5 (Excellent)	1404	698	1462	1294
Number of samples with MOS >=3 to <4 (Good)	204	314	117	275
Number of samples with MOS >=2 to <3 (Fair)	29	146	45	47
Number of samples with MOS >=1 to <2 (Poor)	22	137	50	38
%age of samples with MOS >=4 to <5 (Excellent)	84.63%	53.90%	87.34%	78.23%
%age of samples with MOS >=3 to <4 (Good)	12.30%	24.25%	6.99%	16.63%
%age of samples with MOS >=2 to <3 (Fair)	1.75%	11.27%	2.69%	2.84%
%age of samples with MOS >=1 to <2 (Poor)	1.33%	10.58%	2.99%	2.30%

Table-17: Summary of speech quality (MOS) samples.

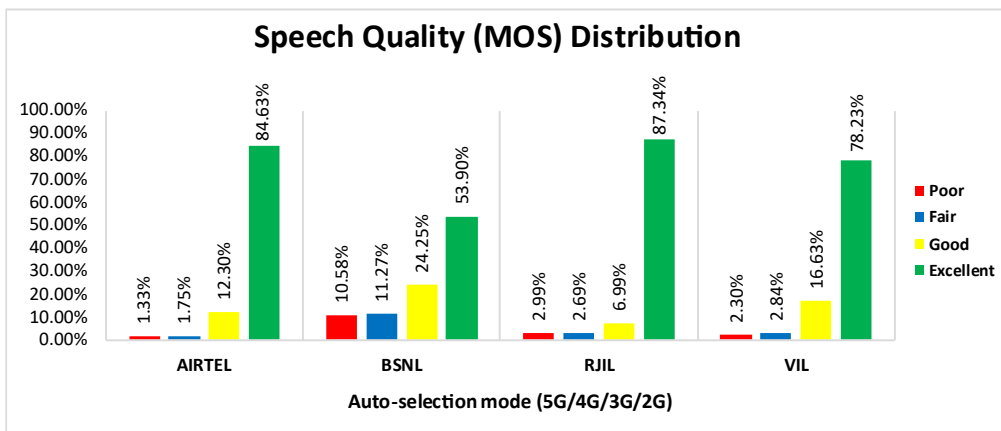


Figure-15: Distribution of samples in MOS range.

(f) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	8.53%	NA	77.46%	NA
4G	91.47%	93.61%	22.54%	96.96%
3G	NA	2.85%	NA	NA
2G	0.00%	2.42%	NA	2.44%
Limited Service	0.00%	1.12%	0.00%	0.60%

Table-18: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) voice.

Note-

- NA- Service provider doesn't provide services in respective technology.

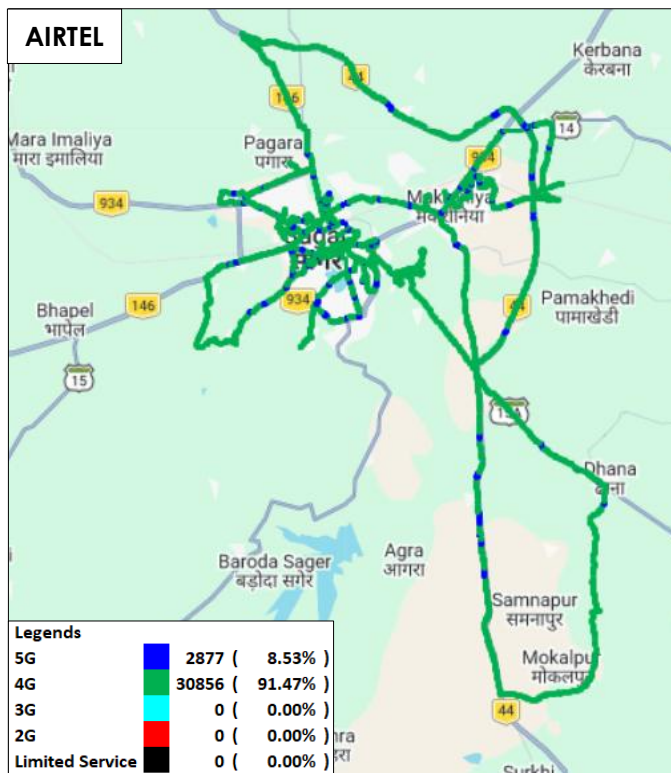


Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

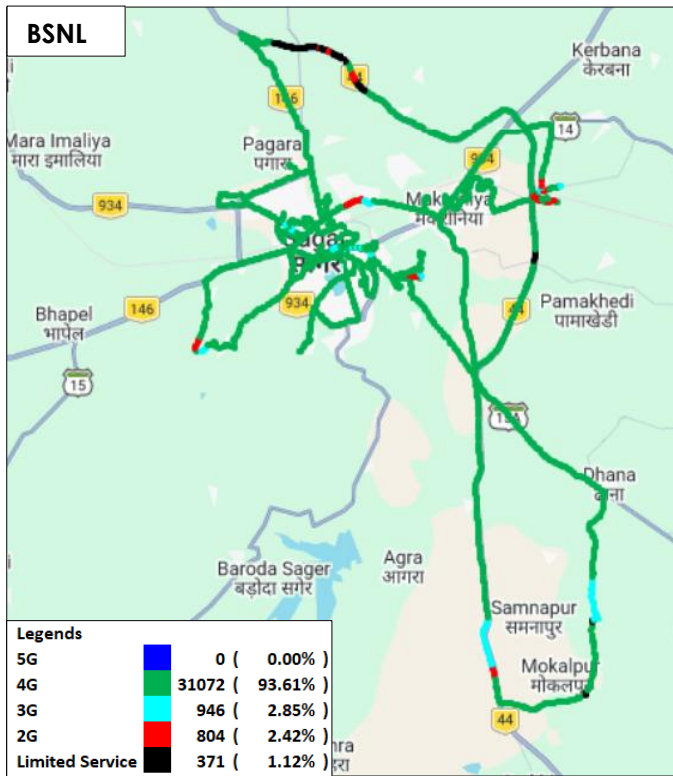


Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

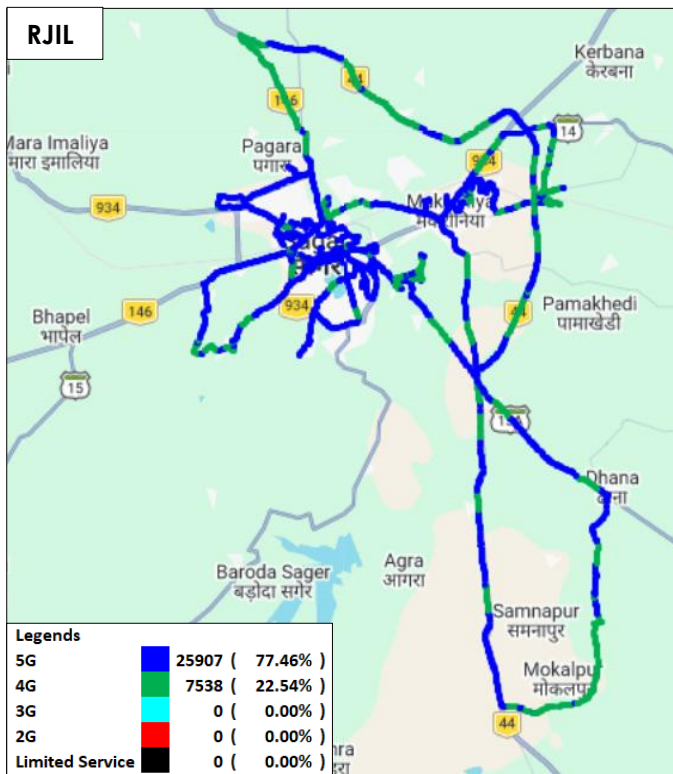


Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

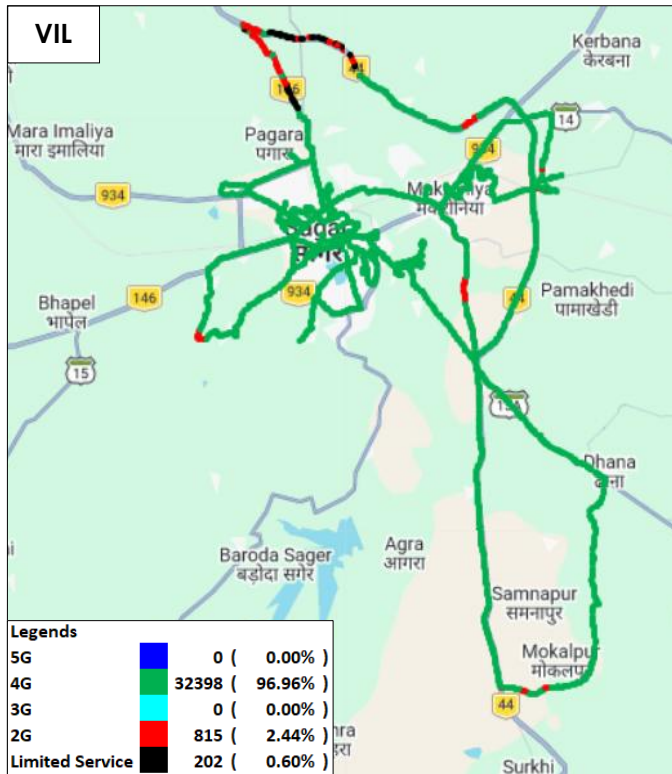


Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-55, 56, 57 & 58 for map view)

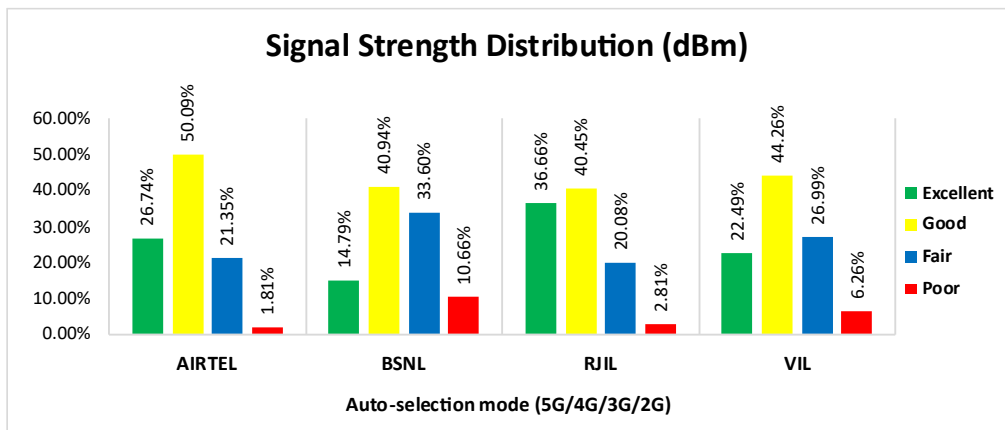


Figure-20: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 27% of samples falling in the excellent signal strength category.
- BSNL has 15% of samples falling in the excellent signal strength category.
- RJIL has 37% of samples falling in the excellent signal strength category.
- VIL has 22% of samples falling in the excellent signal strength category.

4.2.1.4 Data performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	98.22	15.73	277.28	35.85
	80th Percentile	182.66	25.01	434.76	55.61
	20th Percentile	20.94	5.52	83.61	13.49
Upload Throughput (Mbits/s)	Average	22.20	4.73	28.71	10.55
	80th Percentile	40.98	7.68	48.28	19.43
	20th Percentile	4.33	1.21	7.47	2.37
Latency (ms)	50th Percentile	38.94	44.68	27.94	35.18

Table-19: Summary of Data performance in network auto-selection mode.

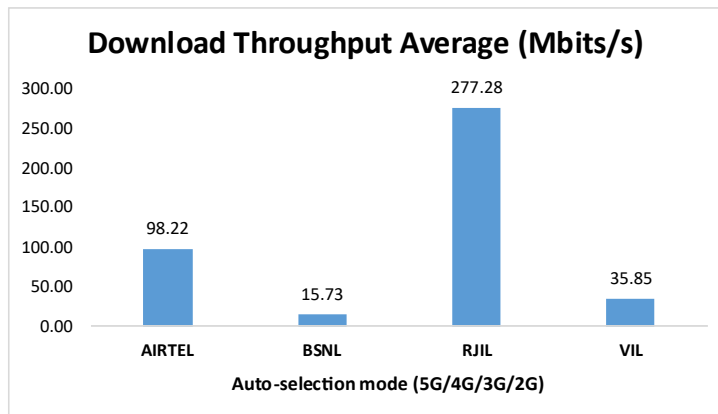


Figure- 21: Download throughput

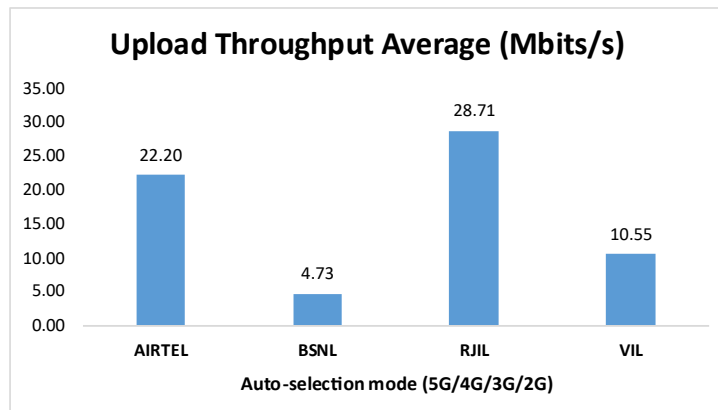


Figure- 22: Upload throughput.

(b) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	53.91%	NA	89.28%	NA
4G	46.04%	95.10%	10.60%	98.12%
3G	NA	2.74%	NA	NA
2G	0.01%	0.67%	NA	0.11%
Limited Service	0.03%	1.49%	0.12%	1.77%

Table-20: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) data.

Note-

- NA- Service provider doesn't provide services in respective technology.

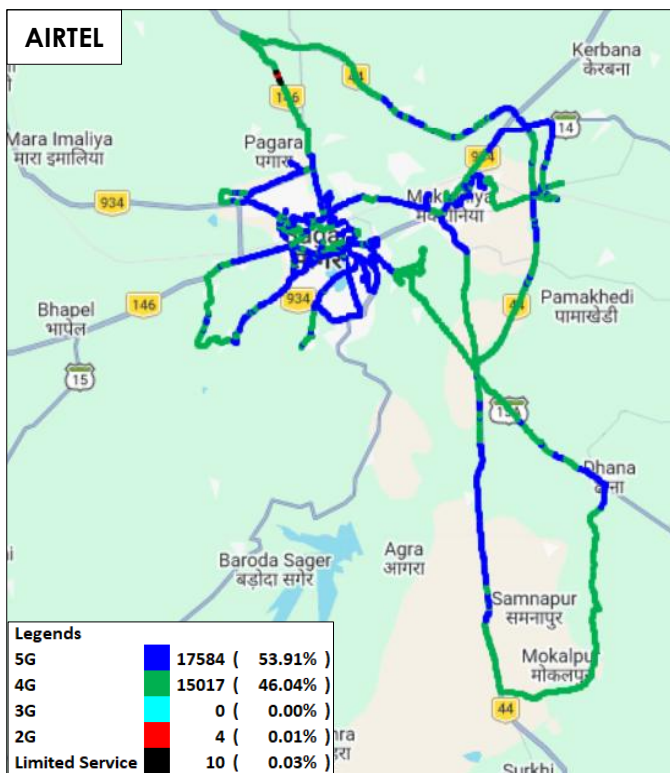


Figure-23: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data -AIRTEL.

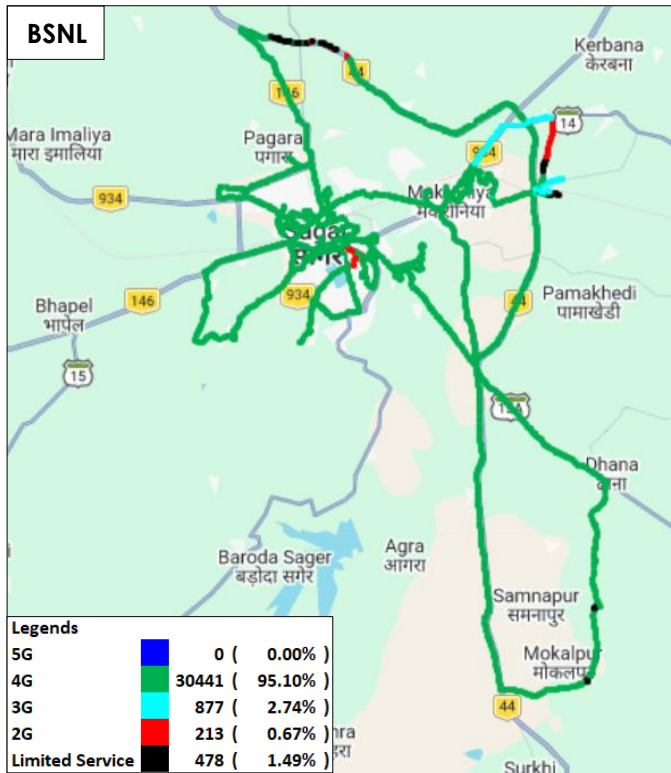


Figure-24: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data-BSNL.

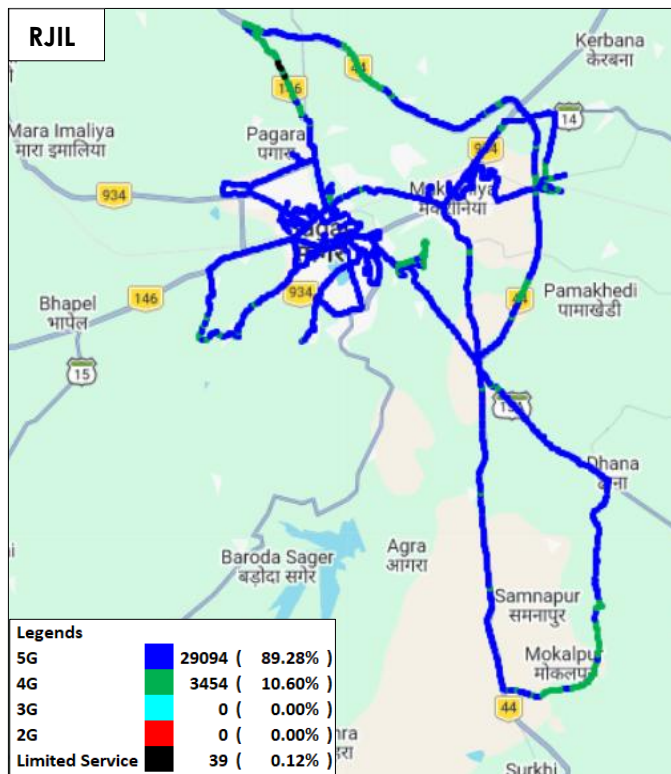


Figure-25: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data- RJIL.

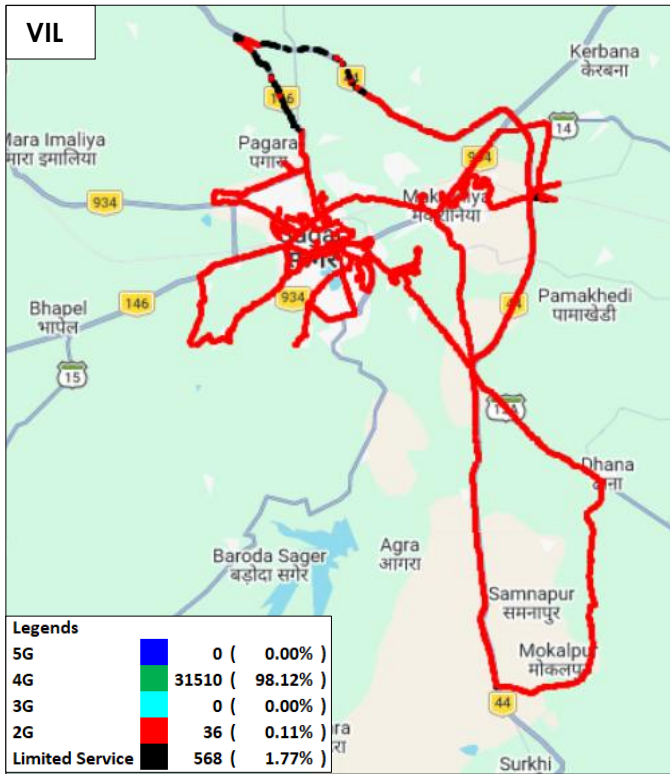


Figure-26: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data- VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-59, 60, 61 & 62 for map view)

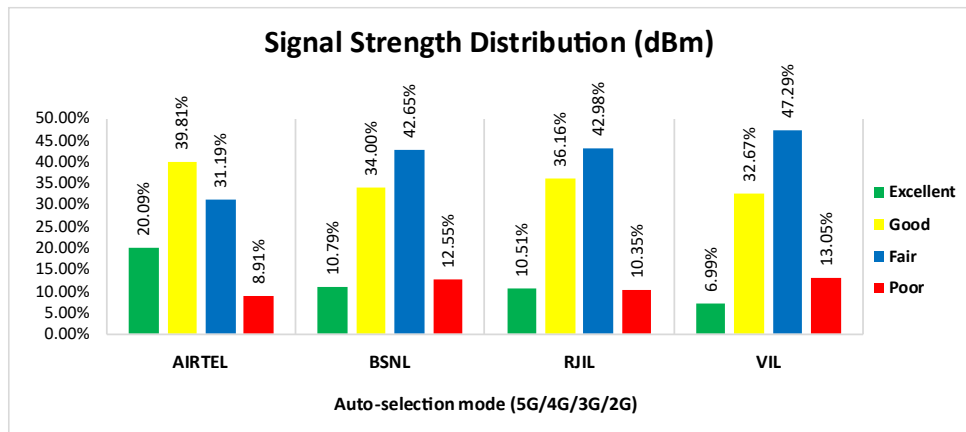


Figure-27: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 20% of samples falling in the excellent signal strength category.
- BSNL has 11% of samples falling in the excellent signal strength category.
- RJIL has 11% of samples falling in the excellent signal strength category.
- VIL has 7% of samples falling in the excellent signal strength category.

4.2.2 Raigarh

4.2.2.1 Drive test route

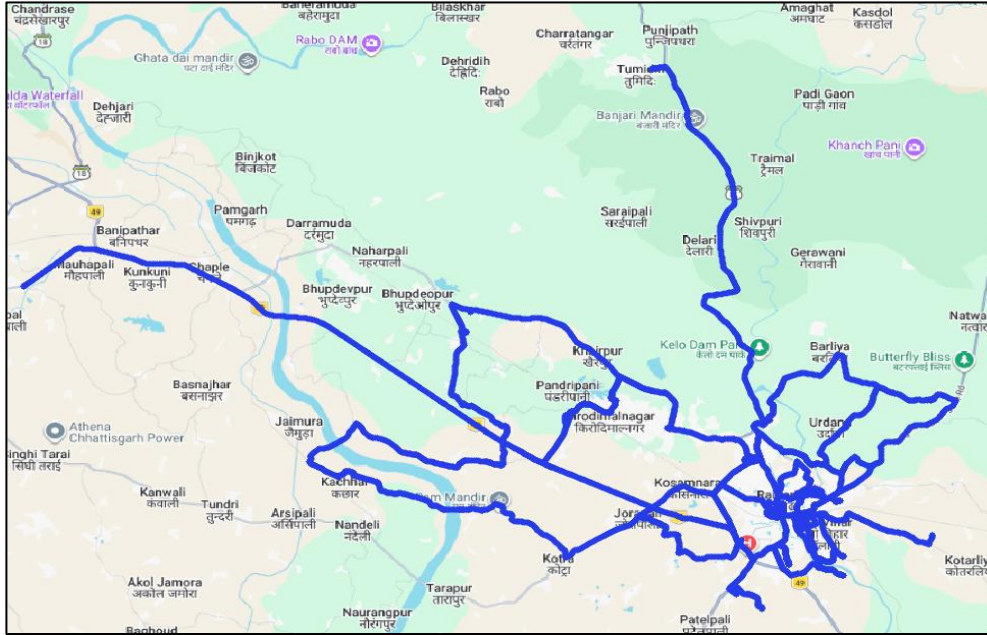


Figure- 28: Drive test routes

4.2.2.2 Areas covered

khairpur, Mauhpali, Kachhar, Kotra, Kosamnara, Kelo Vihar, Urdana, Barliya, Tumidih, Chandni chowk, Darogapara and Chakradhar Nagar etc.

4.2.2.3 Voice performance

(a) **Voice Call Performance in 3G/2G network mode only:** 3G/2G network mode testing has been done to reflect experience for respective users as they have only 3G/2G compatible handsets.

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	261	299	269
Call Setup Success Rate %	98.08	86.29	98.14
Drop Call Rate %	0.39	15.12	0.00
Call Setup Time-Average (Second)	4.79	3.52	3.48
Handover Success Rate %	98.04	100.00	96.65

Table-21: Summary of voice call performance in 3G/2G network mode only.

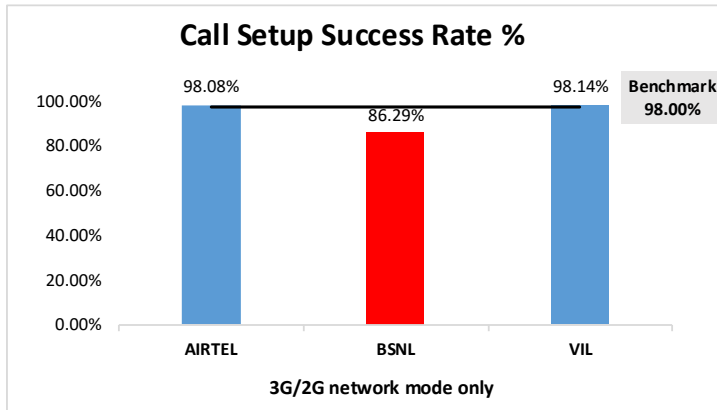


Figure-29: Performance for call setup success rate.

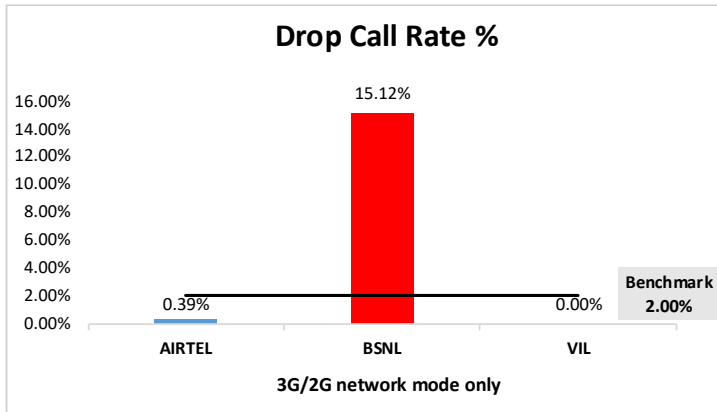


Figure-30: Performance for drop call rate.

(c) Network Technology: This section represent time spent on various network technologies.

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	71.88%	NA
2G	99.68%	26.09%	99.93%
Limited Service	0.32%	2.03%	0.07%

Table-22: Time spent on technology during drive test 3G/2G network mode.

Note-

- NA- Service provider doesn't provide services in respective technology.

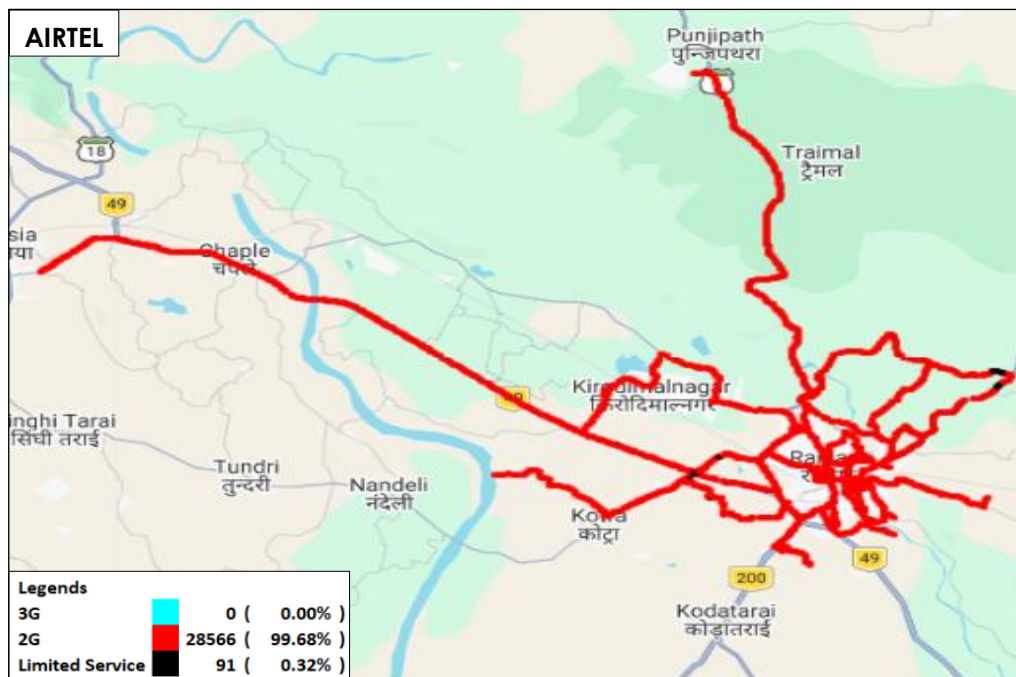


Figure-31: Serving technology plots 3G/2G network mode - AIRTEL.

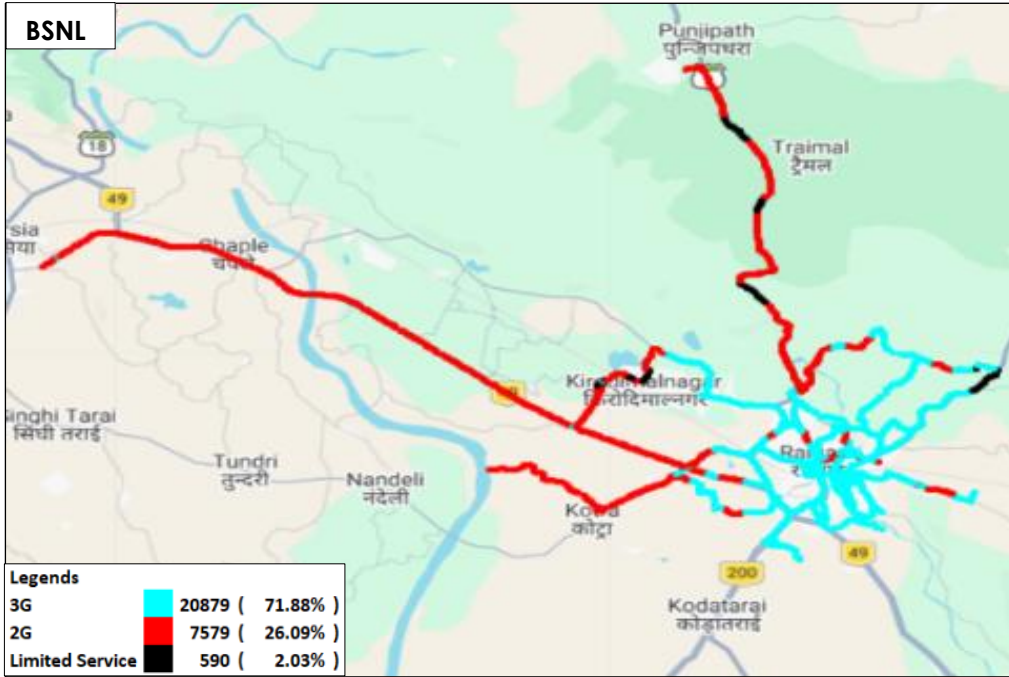


Figure-32: Serving technology plots 3G/2G network mode - BSNL.

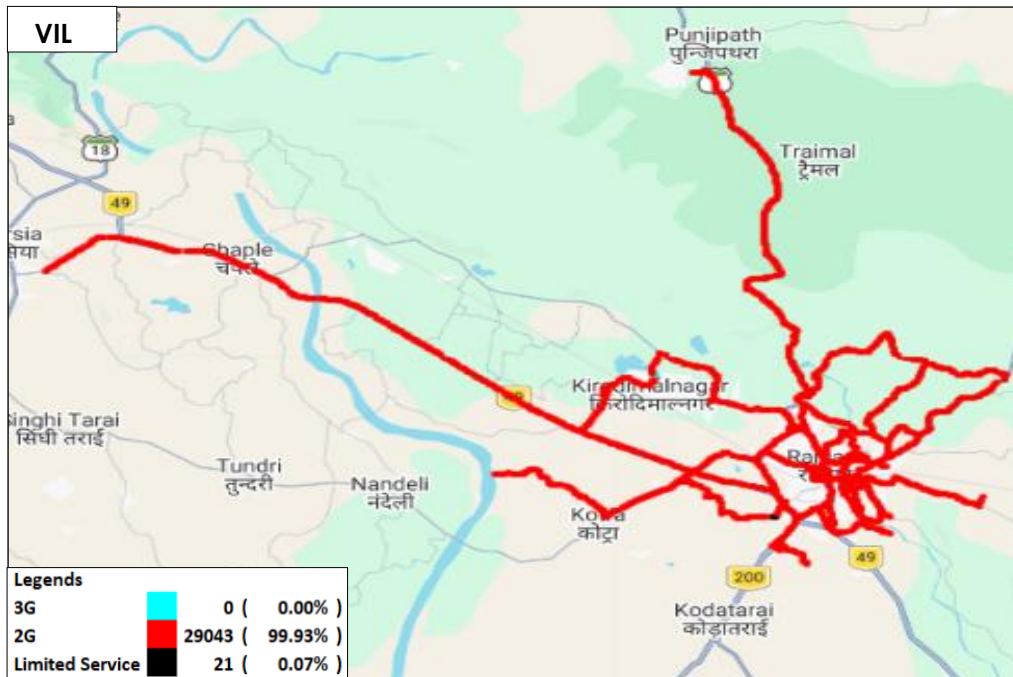


Figure-33: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 63, 64 & 65 for map view)

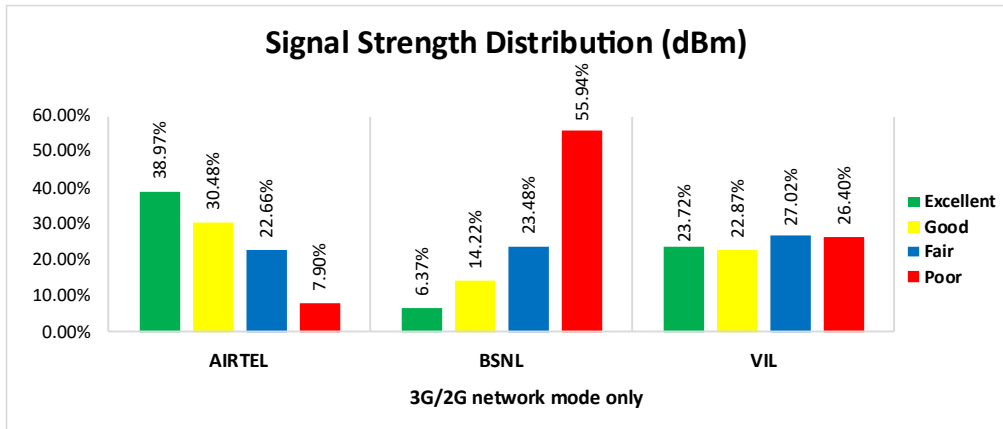


Figure-34: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 39% of samples falling in the excellent signal strength category.
- BSNL has 6% of samples falling in the excellent signal strength category.
- VIL has 24% of samples falling in the excellent signal strength category.

(d) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	276	285	298	280
Call Setup Success Rate %	98.19	91.23	85.23	98.93
Drop Call Rate %	0.00	1.54	0.39	0.00
Call Setup Time Average (Second)	1.30	3.21	0.58	0.87
Handover Success Rate %	100.00	99.63	99.95	100.00

Table-23: Summary of voice call performance in network auto-selection mode.

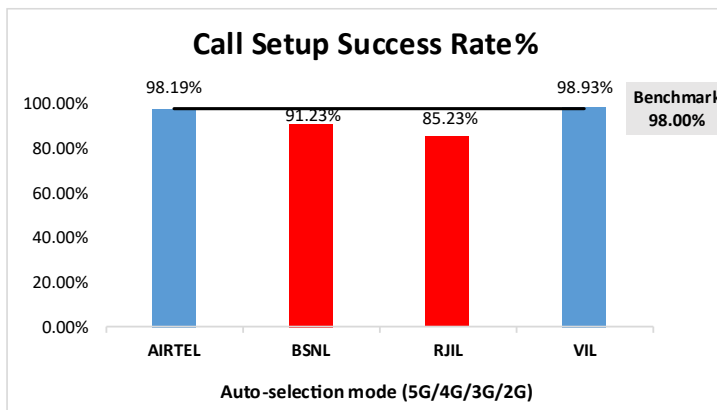


Figure-35: Performance for call setup success rate.

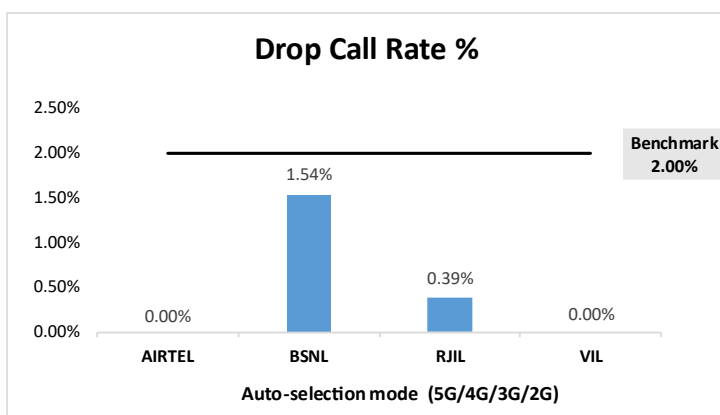


Figure-36: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	260	214	244	258
Number of silences call for >4 Sec	5	19	2	3
Silence Call Rate %	1.92	8.88	0.82	1.16
Number of silence instances for >4 Sec	10	22	2	4
Number of silence instances for >3 Sec	14	39	2	7
Number of silence instances for >2 sec	23	52	8	17
RTP Jitter (4G & 5G) in ms	5.82	7.81	12.76	16.87
Packet loss Rate Downlink %	1.42	4.19	1.15	1.05
Packet loss Rate Uplink %	1.55	3.81	0.88	0.88

Table-24: Summary of silence instances & packet loss rate for mobile to mobile call.

(e) Mean Opinion Score (MOS) performance for speech quality:

Mean opinion score indicate quality of speech observed during the drive test across different technologies. This parameter has been calculated for mobile to mobile calls made within same operator network in auto mode (5G/4G/3G/2G). As per ITU-T Recommendation P.863.1, MOS value means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-24	1544	1213	1435	1531
Speech Quality (Average MOS)	3.92	3.43	4.45	3.90
Number of samples with MOS >=4 to <5 (Excellent)	1228	590	1259	940
Number of samples with MOS >=3 to <4 (Good)	226	296	106	493
Number of samples with MOS >=2 to <3 (Fair)	39	158	26	57
Number of samples with MOS >=1 to <2 (Poor)	51	169	44	41
%age of samples with MOS >=4 to <5 (Excellent)	79.53%	48.64%	87.74%	61.40%
%age of samples with MOS >=3 to <4 (Good)	14.64%	24.40%	7.39%	32.20%
%age of samples with MOS >=2 to <3 (Fair)	2.53%	13.03%	1.81%	3.72%
%age of samples with MOS >=1 to <2 (Poor)	3.30%	13.93%	3.07%	2.68%

Table-25: Summary of speech quality (MOS) samples.

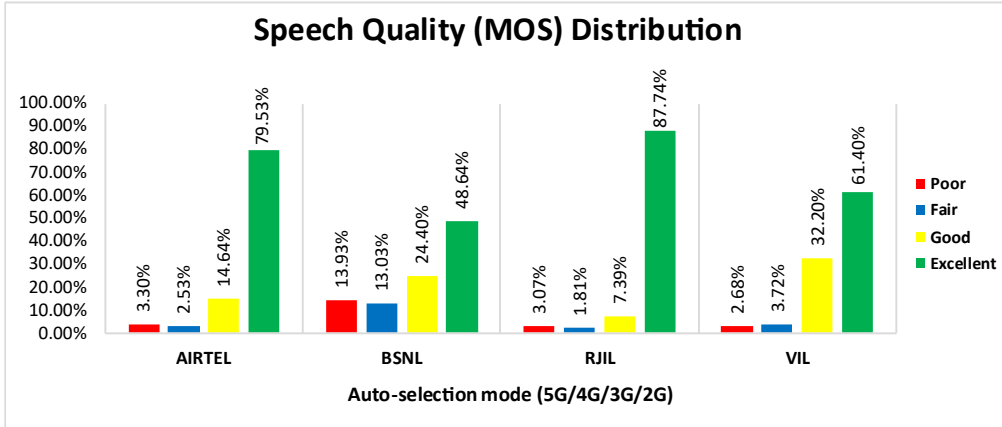


Figure-37: Distribution of samples in MOS range.

(f) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	22.62%	NA	86.06%	NA
4G	77.30%	58.92%	13.92%	96.05%
3G	NA	3.02%	NA	NA
2G	0.00%	37.34%	NA	3.74%
Limited Service	0.08%	0.72%	0.02%	0.21%

Table-26: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) voice.

Note-

- NA- Service provider doesn't provide services in respective technology.

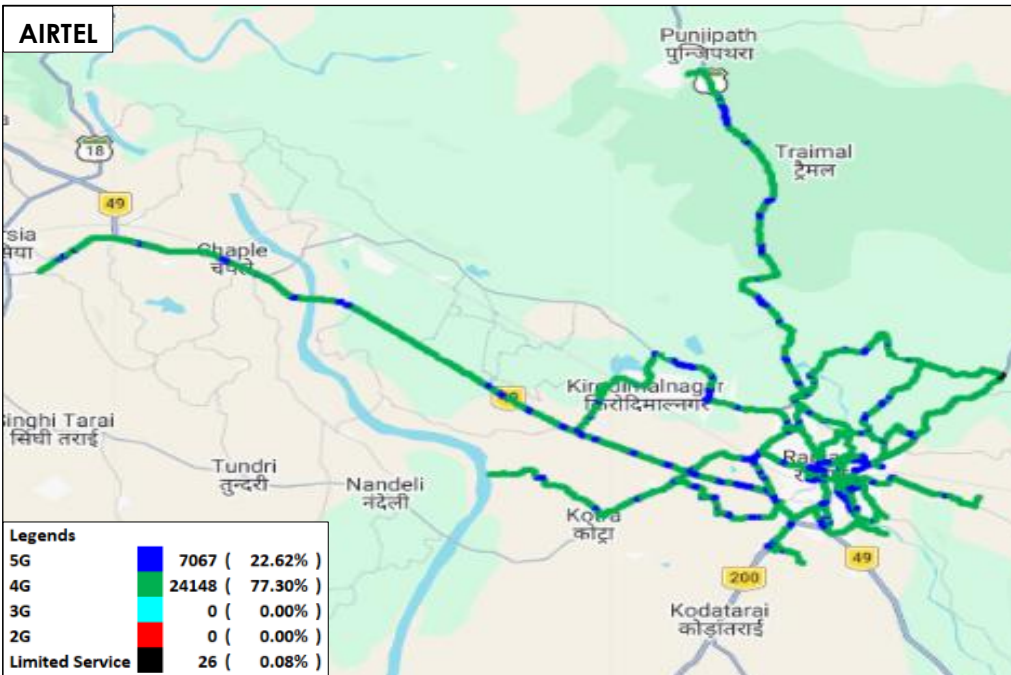


Figure-38: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

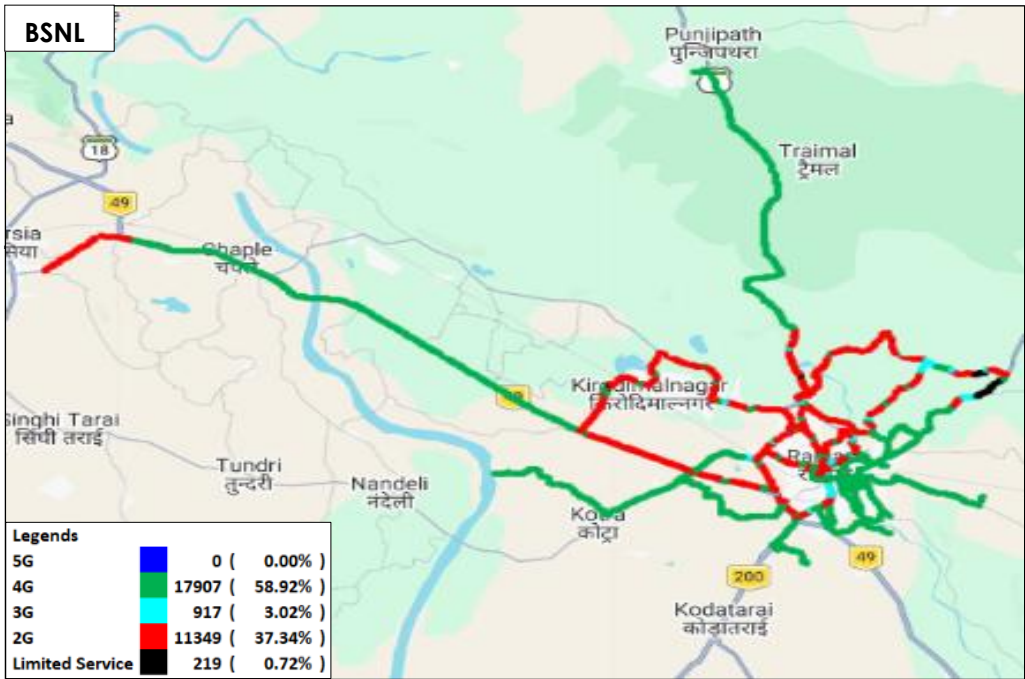


Figure-39: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

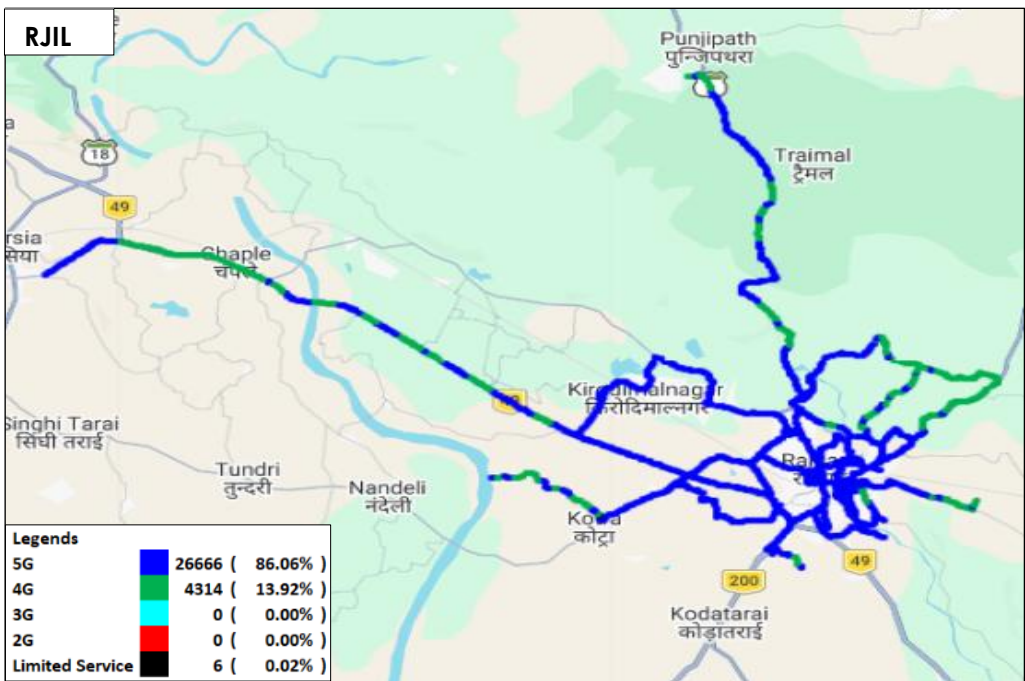


Figure-40: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

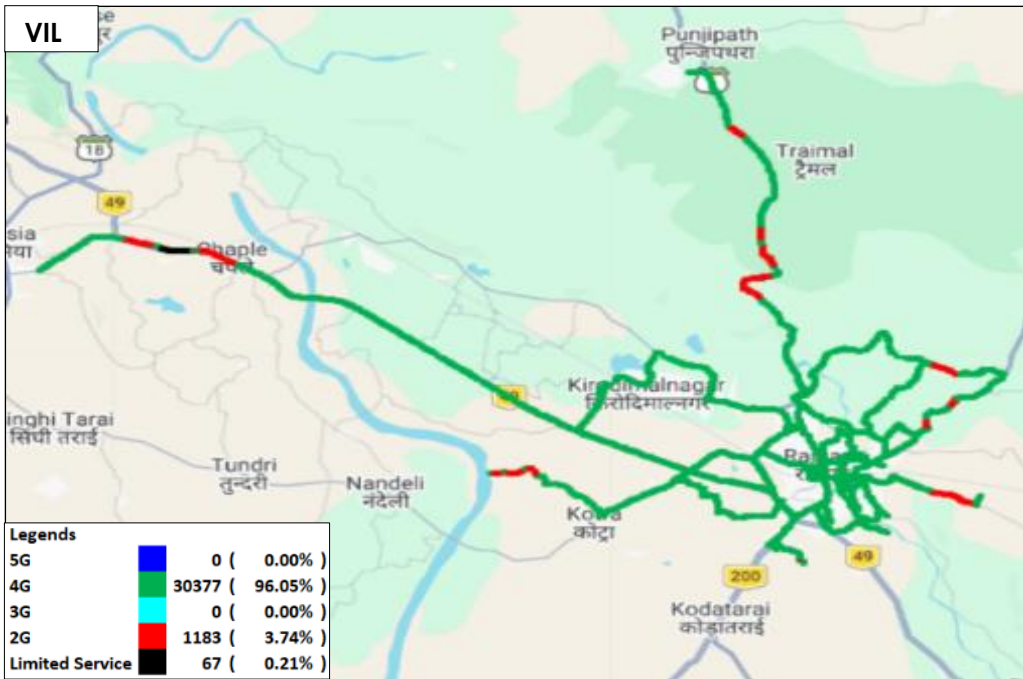


Figure-41: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-66, 67, 68 & 69 for map view)

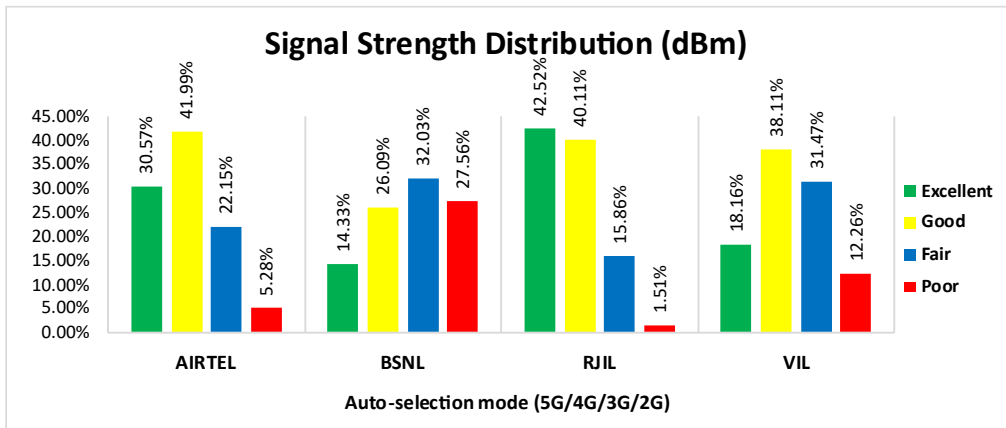


Figure-42: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 31% of samples falling in the excellent signal strength category.
- BSNL has 14% of samples falling in the excellent signal strength category.
- RJIL has 43% of samples falling in the excellent signal strength category.
- VIL has 18% of samples falling in the excellent signal strength category.

4.2.2.4 Data performance

(b) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	98.78	16.08	172.64	21.72
	80th Percentile	168.02	27.16	330.50	33.37
	20th Percentile	17.82	4.13	8.24	10.70
Upload Throughput (Mbits/s)	Average	22.21	5.40	19.84	13.06
	80th Percentile	43.09	10.01	36.22	23.86
	20th Percentile	3.66	1.25	2.99	2.65
Latency (ms)	50th Percentile	38.77	45.20	35.95	33.25

Table-27: Summary of Data performance in network auto-selection mode.

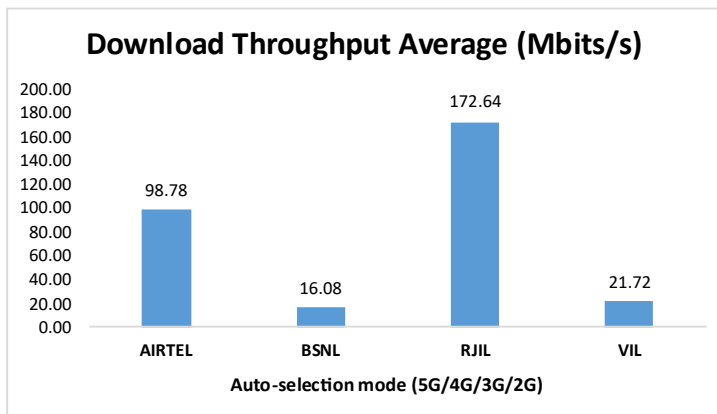


Figure- 43: Download throughput

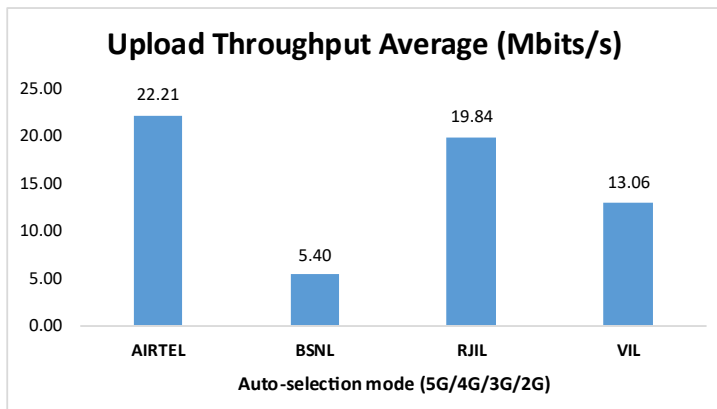


Figure- 44: Upload throughput

(b) Network Technology: This section represents time spent on various network technologies.

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	63.87%	NA	79.97%	NA
4G	36.03%	97.18%	20.03%	96.57%
3G	NA	0.16%	NA	NA
2G	0.02%	1.86%	NA	1.79%
Limited Service	0.08%	0.81%	0.00%	1.64%

Table-28: Time spent on technology during drive test in auto-selection mode (5G/4G/3G/2G) data.

Note-

- NA- Service provider doesn't provide services in respective technology.

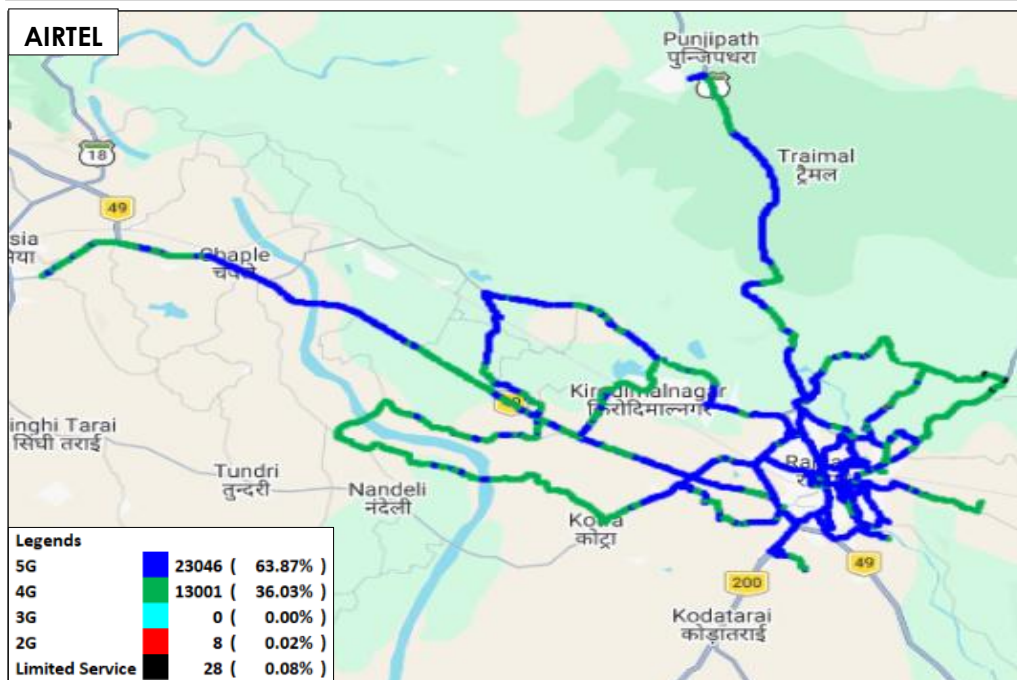


Figure-45: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

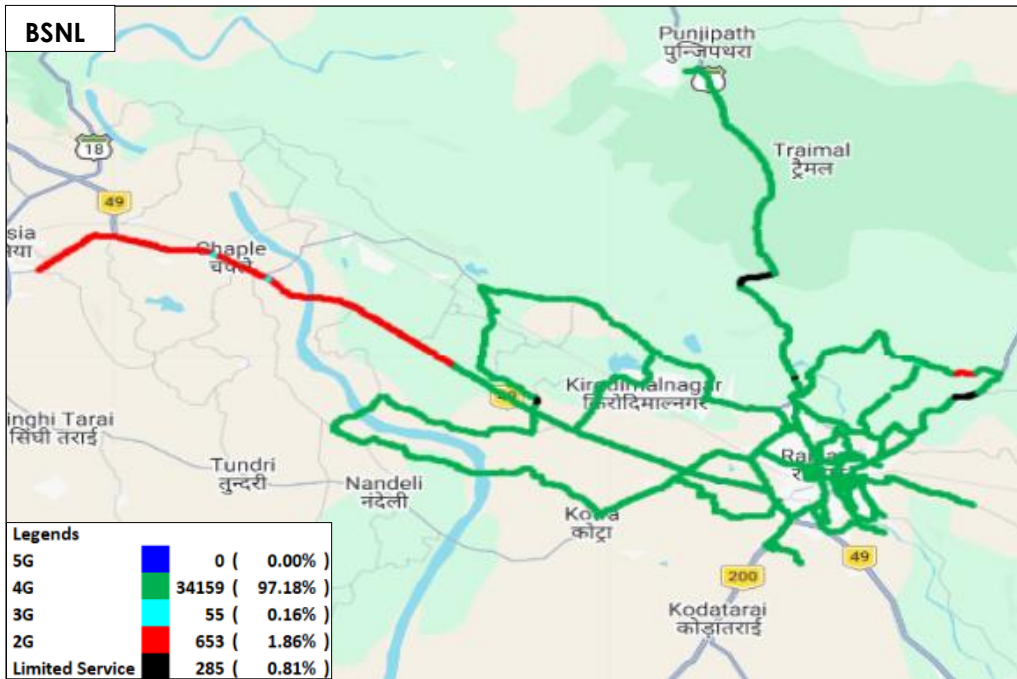


Figure-46: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

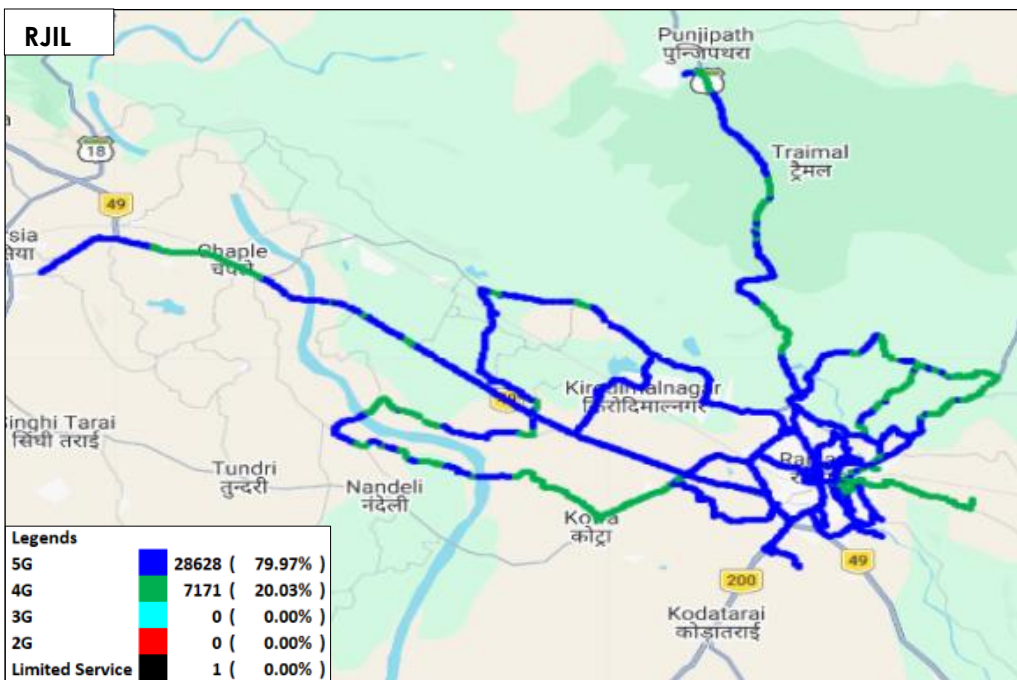


Figure-47: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

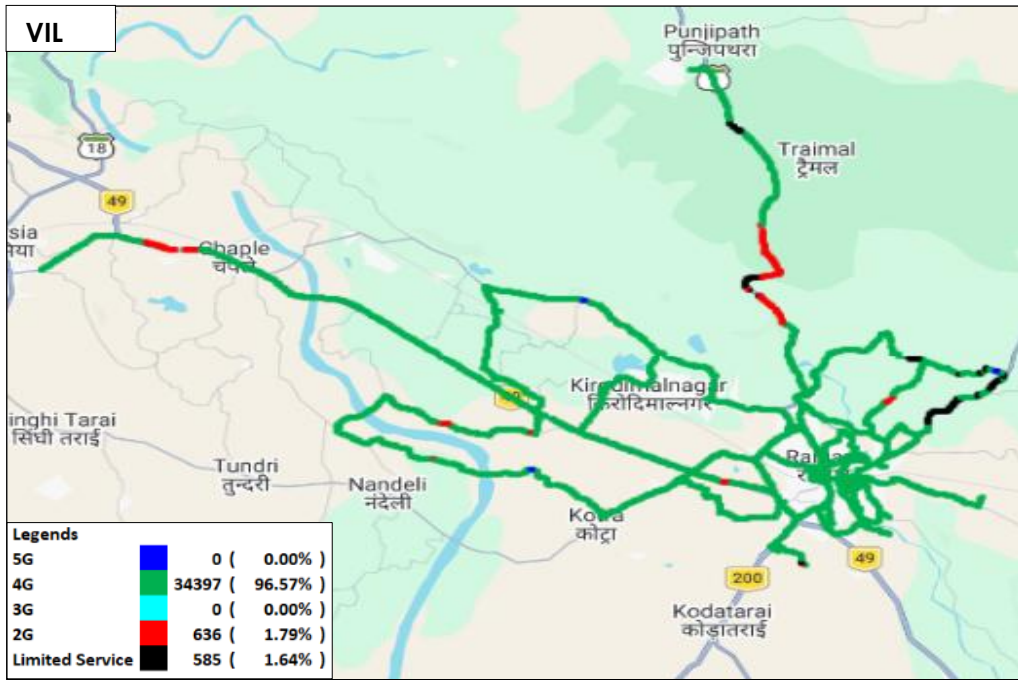


Figure-48: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-70, 71, 72 & 73 for map view)

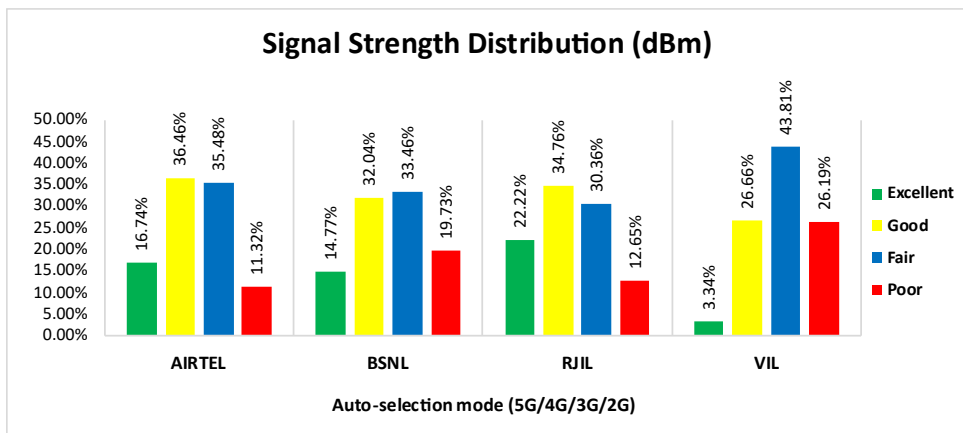


Figure-49: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 16% of samples falling in the excellent signal strength category.
- BSNL has 15% of samples falling in the excellent signal strength category.
- RJIL has 22% of samples falling in the excellent signal strength category.
- VIL has 3% of samples falling in the excellent signal strength category.

4.3 Hotspots

Hotspot testing has been done from 16th March 2026 to 21st March 2026. Sixteen locations have been tested in the cities. (Refer Table-1)

4.3.1 Locations

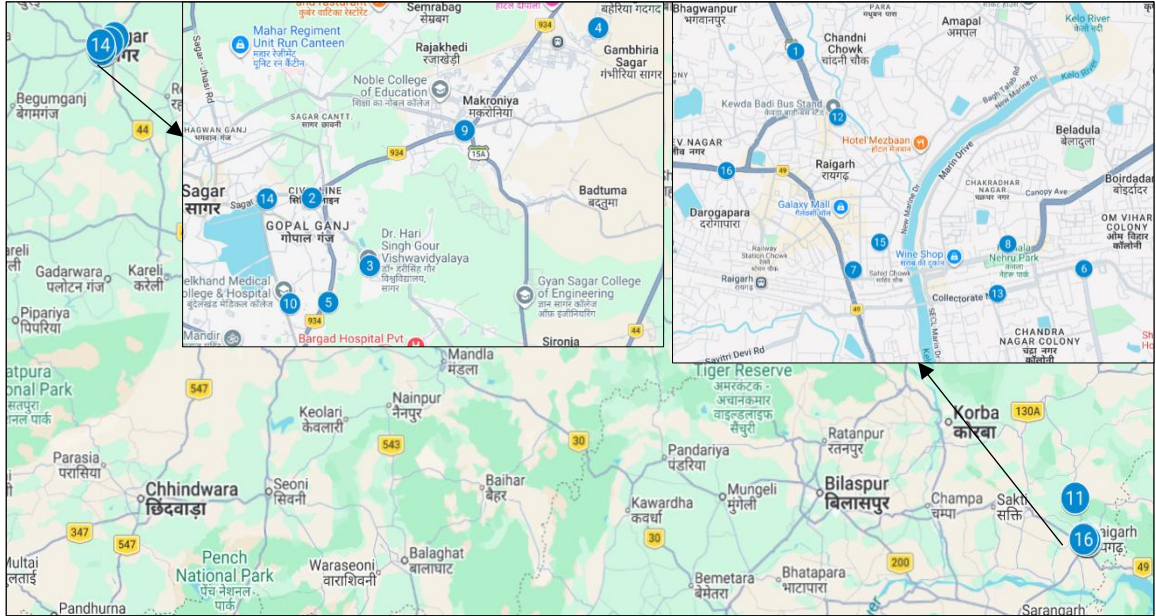


Figure- 50: Hotspot locations

4.3.2 Hotspot covered

1. Carmel Convent Hr. Sec School Raigarh
2. Collectorate Sagar
3. Dr. Hari Singh Gaur University Sagar
4. Government Engineering College Sagar
5. Government Polytechnic College Sagar
6. Kirodimal Arts & Science College Raigarh
7. Kirodimal Govt District Hospital Raigarh
8. Kirodimal Polytechnic College Raigarh
9. Makroniya Chauraha Sagar
10. Medical College Sagar
11. O.P. Jindal University (OPJU) Raigarh
12. Raigarh Bus Stand
13. Raigarh Collectorate
14. Sagar Bus Stand
15. Shanichari Bazaar Raigarh
16. Uttam International School Raigarh

4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	160	160	160	160
Call Setup Success Rate %	100.00	100.00	100.00	98.75
Drop Call Rate %	0.00	0.63	0.00	0.00
Call Setup Time-Average (Second)	1.24	1.70	0.58	0.82

Table-29: Overall summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Carmel Convent Hr. Sec School Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	10.00	0.00	0.00
Call Setup Time-Average (Second)	1.21	2.28	0.52	0.79

Table-30: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Collectorate Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.27	1.09	0.51	0.84

Table-31: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Dr. Hari Singh Gaur University Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.21	1.11	0.92	0.67

Table-32: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Government Engineering College Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.24	1.10	0.58	0.65

Table-33: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Government Polytechnic College Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.23	1.60	0.52	0.80

Table-34: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Kirodimal Arts & Science College Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.26	1.94	0.54	0.85

Table-35: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Kirodimal Govt District Hospital Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.19	1.64	0.64	0.73

Table-36: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Kirodimal Polytechnic College Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.32	1.81	0.54	0.77

Table-37: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Makroniya Chauraha Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.24	1.23	0.50	0.68

Table-38: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Medical College Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.2	1.22	0.52	0.82

Table-39: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

O.P. Jindal University (OPJU) Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.21	1.71	0.64	0.69

Table-40: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Raigarh Bus Stand				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.21	1.75	0.44	0.71

Table-41: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Raigarh Collectorate				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.22	2.35	0.58	0.81

Table-42: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Sagar Bus Stand				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	80.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.18	2.95	0.59	2.02

Table-43: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Shanichari Bazaar Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.46	1.76	0.54	0.74

Table-44: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

Uttam International School Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.23	1.73	0.71	0.79

Table-45: Summary of voice call performance in network auto-selection mode(5G/4G/3G/2G)

4.3.4 Data performance (Auto-selection mode 5G/4G/3G/2G)

Overall Data Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	126.69	11.07	155.86	24.77
Download Throughput 80th Percentile (Mbit/s)	203.06	15.48	242.23	41.36
Download Throughput 20th Percentile (Mbit/s)	56.69	5.61	66.22	9.32
Download Session Setup Success Rate %	100.00	98.75	100.00	100.00
Upload Throughput Average (Mbits/s)	26.07	5.37	14.41	12.13
Upload Throughput 80th Percentile (Mbit/s)	41.63	7.47	20.68	24.71
Upload Throughput 20th Percentile (Mbit/s)	7.26	1.86	6.22	1.84
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.14	4.68	4.70	4.69
Youtube Initial Buffer Delay (Second)	2.12	1.48	0.91	2.57
Latency (ms) - 50th Percentile	35.31	45.08	38.30	35.35
Jitter (ms)	10.62	13.43	16.96	12.35
Packet Loss Rate%	11.65	5.11	1.94	8.58
Packet Loss Rate- 90th percentile	38.78	8.76	7.14	18.80

Table-46: Overall Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Carmel Convent Hr. Sec School Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	89.41	15.24	78.05	25.24
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	21.14	5.65	7.77	21.12
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.68	7.03	4.74	3.05
Youtube Initial Buffer Delay (Second)	0.96	0.92	1.12	1.27
Latency (ms) – 50 th Percentile	31.89	49.34	41.21	30.12
Jitter (ms)	17.07	2.89	20.25	4.08
Packet Loss Rate%	7.30	5.20	2.10	0.00

Table-47: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Collectorate Sagar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	162.53	15.25	149.83	60.78
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	17.45	10.35	9.35	6.00
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.21	5.43	4.02	5.09
Youtube Initial Buffer Delay (Second)	3.04	1.08	1.28	0.99
Latency (ms) - 50th Percentile	30.43	41.53	28.72	-
Jitter (ms)	5.15	7.24	3.53	-
Packet Loss Rate%	3.10	1.20	0.00	60.10

Table-48: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- “-”Ping tests were failed.

Dr. Hari Singh Gaur University Sagar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	29.93	17.57	5.66	29.84
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.56	5.85	1.51	12.02
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.77	4.31	10.59	6.00
Youtube Initial Buffer Delay (Second)	7.53	1.20	-	0.64
Latency (ms) – 50th Percentile	54.50	43.32	48.88	35.14
Jitter (ms)	13.43	3.31	145.02	4.81
Packet Loss Rate%	1.10	0.20	12.50	0.00

Table-49: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "--"Youtube tests were failed.

Government Engineering College Sagar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	160.42	5.61	144.85	41.36
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	28.34	2.99	14.31	33.50
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.56	2.33	4.60	4.44
Youtube Initial Buffer Delay (Second)	0.84	3.38	0.82	0.70
Latency (ms) - 50th Percentile	29.06	43.58	33.26	-
Jitter (ms)	2.47	3.60	18.90	-
Packet Loss Rate%	0.10	1.90	1.40	50.00

Table-50: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G)

Note- "--"Ping tests were failed.

Government Polytechnic College Sagar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	283.95	8.89	276.99	8.63
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	28.89	4.12	55.20	2.13
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.87	4.39	5.06	3.86
Youtube Initial Buffer Delay (Second)	0.92	1.15	0.72	6.22
Latency (ms)- 50th Percentile	105.37	47.46	29.77	31.14
Jitter (ms)	17.72	4.34	3.96	22.92
Packet Loss Rate%	48.90	5.90	0.10	1.20

Table-51: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Kirodimal Arts & Science College Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	71.89	7.03	105.62	8.51
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	35.38	2.92	1.63	10.92
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.04	2.07	8.39	2.53
Youtube Initial Buffer Delay (Second)	2.20	2.42	-	1.34
Latency (ms) - 50th Percentile	33.34	45.84	50.43	30.97
Jitter (ms)	9.23	5.13	14.66	7.35
Packet Loss Rate%	1.20	2.10	5.50	2.50

Table-52: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "-" Youtube tests were failed.

Kirodimal Govt District Hospital Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	80.91	10.39	270.51	40.63
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	41.87	4.52	10.52	34.41
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.93	4.94	5.18	6.34
Youtube Initial Buffer Delay (Second)	3.29	1.91	1.02	0.73
Latency (ms)- 50th Percentile	33.34	40.28	37.81	25.68
Jitter (ms)	8.56	3.66	3.79	4.14
Packet Loss Rate%	0.10	0.30	0.60	0.00

Table-53: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G)

Kirodimal Polytechnic College Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	79.55	12.04	215.43	8.21
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	40.00	8.47	8.99	20.14
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.57	4.33	3.80	2.20
Youtube Initial Buffer Delay (Second)	3.05	1.16	1.03	1.05
Latency (ms) - 50th Percentile	30.39	45.05	40.15	27.73
Jitter (ms)	3.24	4.01	3.70	4.21
Packet Loss Rate%	0.50	0.30	0.00	2.30

Table-54: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Makroniya Chauraha Sagar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	166.65	2.82	93.58	38.19
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	16.54	3.53	18.57	2.54
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.43	7.49	4.33	6.72
Youtube Initial Buffer Delay (Second)	1.13	1.60	0.79	4.96
Latency (ms) - 50th Percentile	35.04	41.56	30.29	36.63
Jitter (ms)	3.47	2.88	4.97	6.90
Packet Loss Rate%	0.40	0.00	0.10	2.40

Table-55: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Medical College Sagar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	135.51	5.86	70.85	12.87
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	2.88	1.43	9.12	1.76
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.51	6.24	4.40	5.02
Youtube Initial Buffer Delay (Second)	2.20	2.15	1.10	6.88
Latency (ms) - 50th Percentile	66.68	46.07	37.96	39.69
Jitter (ms)	20.46	5.57	6.31	13.98
Packet Loss Rate%	33.00	5.90	0.20	12.50

Table-56: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

O.P. Jindal University (OPJU) Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	186.67	34.83	138.74	36.00
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	6.32	18.41	4.87	11.37
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.49	4.60	4.65	5.40
Youtube Initial Buffer Delay (Second)	1.05	0.83	0.82	0.91
Latency (ms) – 50th Percentile	70.86	46.11	49.89	39.09
Jitter (ms)	20.46	4.64	6.27	5.98
Packet Loss Rate%	34.90	0.20	0.20	0.20

Table-57: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Raigarh Bus Stand				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	188.89	8.56	347.07	14.92
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	33.59	5.24	32.83	4.08
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.99	2.25	4.39	2.44
Youtube Initial Buffer Delay (Second)	4.52	1.22	0.72	1.87
Latency (ms) - 50th Percentile	33.37	42.02	39.76	35.34
Jitter (ms)	9.08	3.62	8.47	4.26
Packet Loss Rate%	1.40	48.00	0.30	0.60

Table-58: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G)

Raigarh Collectorate				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	43.42	6.87	114.75	13.23
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	13.54	1.99	6.46	2.54
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	8.31	3.21	3.50	2.30
Youtube Initial Buffer Delay (Second)	1.15	1.47	1.04	7.01
Latency (ms)- 50th Percentile	53.33	49.16	39.79	42.76
Jitter (ms)	13.54	9.62	15.94	5.25
Packet Loss Rate%	4.80	1.10	1.10	0.10

Table-59: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Sagar Bus Stand				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	101.88	0.21	124.81	42.20
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	49.40	1.27	21.13	28.64
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	6.08	2.96	3.14	6.04
Youtube Initial Buffer Delay (Second)	0.64	-	0.72	0.76
Latency (ms) - 50th Percentile	37.07	54.38	26.67	36.80
Jitter (ms)	3.32	132.22	3.84	71.15
Packet Loss Rate%	0.00	8.20	0.00	3.70

Table-60: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "-" Youtube tests were failed.

Shanichari Bazaar Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	59.24	13.84	181.50	10.17
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	7.53	4.52	8.03	1.81
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.11	5.26	4.96	3.51
Youtube Initial Buffer Delay (Second)	1.18	0.95	0.95	4.24
Latency (ms)- 50th Percentile	53.88	44.06	56.44	43.62
Jitter (ms)	16.96	13.04	11.11	12.61
Packet Loss Rate%	5.00	1.00	6.90	1.00

Table-61: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Uttam International School Raigarh				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	186.16	10.03	175.51	5.48
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	72.71	4.72	20.32	1.11
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.07	4.69	4.63	12.87
Youtube Initial Buffer Delay (Second)	0.69	1.13	0.64	-
Latency (ms) - 50th Percentile	28.43	44.94	44.32	45.49
Jitter (ms)	5.65	10.67	2.42	4.81
Packet Loss Rate%	44.60	0.30	0.10	0.70

Table-62: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

4.3.5 Data performance (5G Only & 4G Only Download & Upload Speed)

Overall Data Performance					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	113.66	-	143.52	-
	Upload Throughput Average (Mbits/s)	29.50	-	13.79	-
4G	Download Throughput Average (Mbits/s)	33.62	10.93	40.95	19.59
	Upload Throughput Average (Mbits/s)	6.86	5.18	11.43	10.11

Table-63: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.					
Carmel Convent Hr. Sec School Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	72.77	-	75.03	-
	Upload Throughput Average (Mbits/s)	13.43	-	4.98	-
4G	Download Throughput Average (Mbits/s)	26.87	12.12	62.69	20.58
	Upload Throughput Average (Mbits/s)	9.13	4.44	7.50	22.00

Table-64: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.					
---	--	--	--	--	--

Collectorate Sagar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	158.64	-	154.33	-
	Upload Throughput Average (Mbits/s)	17.59	-	7.44	-
4G	Download Throughput Average (Mbits/s)	16.21	12.49	21.97	41.69
	Upload Throughput Average (Mbits/s)	2.27	3.00	10.37	3.71

Table-65: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Dr. Hari Singh Gaur University Sagar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	0.52	-
	Upload Throughput Average (Mbits/s)	-	-	2.14	-
4G	Download Throughput Average (Mbits/s)	30.17	16.93	3.2	17.04
	Upload Throughput Average (Mbits/s)	1.37	8.96	1.52	13.27

Table-66: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Government Engineering College Sagar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	80.20	-	110.33	-
	Upload Throughput Average (Mbits/s)	30.22	-	12.64	-
4G	Download Throughput Average (Mbits/s)	34.80	4.80	24.28	31.21
	Upload Throughput Average (Mbits/s)	4.84	3.44	12.07	22.18

Table-67: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Government Polytechnic College Sagar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	213.69	-	53.11	-
	Upload Throughput Average (Mbits/s)	19.26	-	27.60	-
4G	Download Throughput Average (Mbits/s)	15.88	3.51	86.5	6.25
	Upload Throughput Average (Mbits/s)	2.83	3.05	23.35	3.55

Table-68: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Kirodimal Arts & Science College Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	77.91	-	88.13	-
	Upload Throughput Average (Mbits/s)	31.59	-	3.70	-
4G	Download Throughput Average (Mbits/s)	26.93	8.37	9.62	9.28
	Upload Throughput Average (Mbits/s)	6.63	3.28	6.3	12.63

Table-69: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Kirodimal Govt District Hospital Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	65.37	-	256.70	-
	Upload Throughput Average (Mbits/s)	47.73	-	11.96	-
4G	Download Throughput Average (Mbits/s)	82.74	10.65	97.41	38.40
	Upload Throughput Average (Mbits/s)	6.54	5.97	14.99	23.90

Table-70: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Kirodimal Polytechnic College Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	54.73	-	163.05	-
	Upload Throughput Average (Mbits/s)	38.30	-	9.14	-
4G	Download Throughput Average (Mbits/s)	15.78	9.29	20.85	8.94
	Upload Throughput Average (Mbits/s)	7.70	6.35	7.46	14.63

Table-71: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Makroniya Chauraha Sagar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	223.35	-	96.78	-
	Upload Throughput Average (Mbits/s)	24.09	-	15.17	-
4G	Download Throughput Average (Mbits/s)	12.65	9.56	81.06	30.50
	Upload Throughput Average (Mbits/s)	2.92	2.58	29.22	5.03

Table-72: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Medical College Sagar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	117.03	-	81.20	-
	Upload Throughput Average (Mbits/s)	24.65	-	9.37	-
4G	Download Throughput Average (Mbits/s)	12.93	0.60	6.48	8.96
	Upload Throughput Average (Mbits/s)	1.96	1.98	3.47	6.02

Table-73: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

O.P. Jindal University (OPJU) Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	187.55	-	48.38	-
	Upload Throughput Average (Mbits/s)	5.66	-	3.40	-
4G	Download Throughput Average (Mbits/s)	118.26	31.75	9.63	22.21
	Upload Throughput Average (Mbits/s)	21.77	18.28	1.91	1.70

Table-74: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Raigarh Bus Stand					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	241.22	-	340.66	-
	Upload Throughput Average (Mbits/s)	28.58	-	31.84	-
4G	Download Throughput Average (Mbits/s)	19.61	5.54	8.79	15.33
	Upload Throughput Average (Mbits/s)	4.07	4.41	8.79	5.70

Table-75: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Raigarh Collectorate					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	37.35	-	311.13	-
	Upload Throughput Average (Mbits/s)	18.79	-	30.97	-
4G	Download Throughput Average (Mbits/s)	18.34	7.20	114.02	9.54
	Upload Throughput Average (Mbits/s)	3.48	3.3	25.31	1.79

Table-76: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Sagar Bus Stand					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	116.99	-	109.30	-
	Upload Throughput Average (Mbits/s)	49.10	-	18.13	-
4G	Download Throughput Average (Mbits/s)	29.19	0.44	17.54	36.13
	Upload Throughput Average (Mbits/s)	17.18	1.22	7.73	22.86

Table-77: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Shanichari Bazaar Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	59.11	-	194.20	-
	Upload Throughput Average (Mbits/s)	16.70	-	7.06	-
4G	Download Throughput Average (Mbits/s)	19.10	26.60	27.15	6.84
	Upload Throughput Average (Mbits/s)	2.95	7.1	6.24	1.36

Table-78: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

Uttam International School Raigarh					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	92.18	-	184.84	-
	Upload Throughput Average (Mbits/s)	75.97	-	20.41	-
4G	Download Throughput Average (Mbits/s)	58.38	10.80	54.02	7.91
	Upload Throughput Average (Mbits/s)	14.04	4.72	17.1	1.44

Table-79: Overall Summary of 5G only & 4G only data download & upload speed.

Note- "-"Respective technology was not observed during the test.

4.4 Walk Test

Walk test has been conducted from 16th March 2026 to 21st March 2026. Four locations have been tested in the cities. (Refer Table-1)

4.4.1 Walk test locations

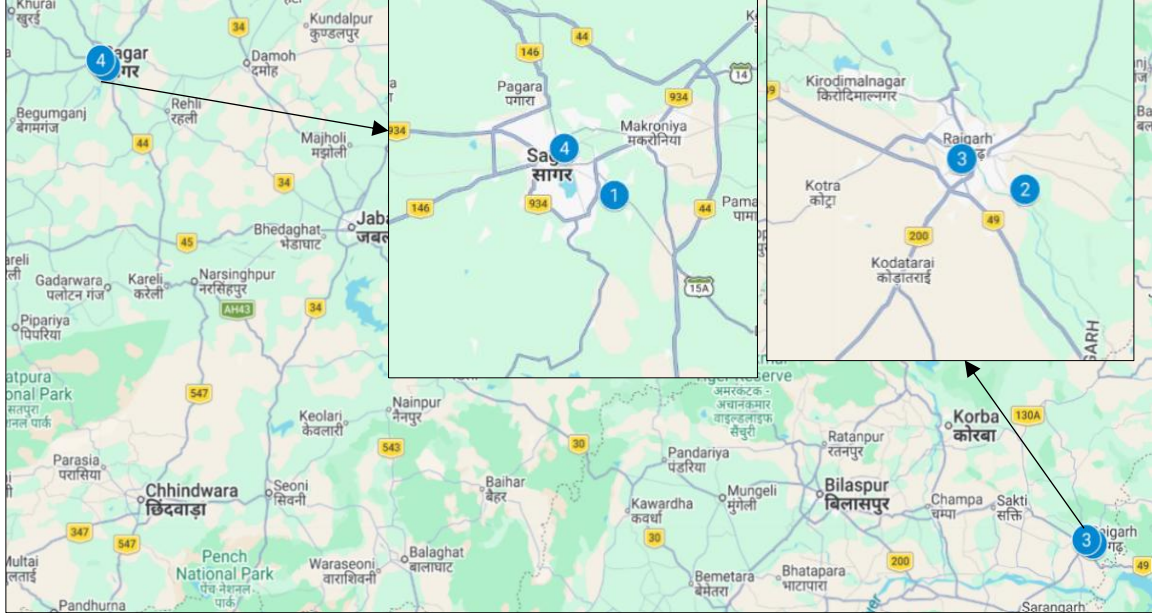


Figure-51: Walk Test locations.

4.4.2 Walk Test Covered

1. Dr. Hari Singh Gaur University Sagar
2. Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh
3. Raigarh Railway Station
4. Sagar Railway Station

4.4.3 Voice Performance

Dr. Hari Singh Gaur University Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	26	25	27	26
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	7.41	0.00
Call Setup Time-Average (Second)	1.21	1.15	1.20	0.68

Table-80: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	15	15	16	15
Call Setup Success Rate %	100.00	100.00	75.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.23	1.85	0.47	0.66

Table-81: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Raigarh Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	15	15	15	15
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.29	1.72	0.56	0.66

Table-82: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Sagar Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	17	17	18	18
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.23	1.08	0.49	0.79

Table-83: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

4.4.4 Data Performance

(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

Dr. Hari Singh Gaur University Sagar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	73.74	30.67	82.55	42.03
Download Session Setup Success Rate %	100.00	100.00	94.12	100.00
Upload Throughput Average (Mbits/s)	11.10	11.67	8.24	23.88
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	52.16	45.58	28.23	32.96

Table-84: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Late Shri Laxhi Ram Agrawal Memorial Government Medical College Raigarh				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	74.65	22.65	361.95	9.64
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	15.34	6.42	43.25	7.97
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	55.85	43.04	32.86	38.35

Table-85: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Raigarh Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	69.03	13.70	237.04	29.19
Download Session Setup Success Rate %	100.00	100.00	100.00	93.33
Upload Throughput Average (Mbits/s)	42.59	6.19	30.83	29.14
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	39.66	45.04	36.42	29.80

Table-86: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Sagar Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	113.82	18.97	101.40	25.58
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	47.81	8.84	31.73	3.04
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	30.42	45.80	34.60	43.20

Table-87: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

5. Voice & Data Key finding

5.1 Overall Voice

1. Call Setup Success Rate:

- a) Airtel, BSNL and VIL have 98.72%, 89.39% and 97.86% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL have 99.38%, 91.37%, 94.09% and 98.29% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)
- c) Airtel had a 100.00% call setup success rate when calling to VIL, while call blocking was observed when calling to BSNL and RJIL. (refer table-9)
- d) Call blocking was observed in all scenarios for BSNL & RJIL when calling on peer service provider's network for inter-operator calls. (refer table -9)
- e) VIL had a 100.00% call setup success rate when calling to Airtel, while call blocking was observed when calling to BSNL and RJIL. (refer table-9)

2. Call Setup Time:

- a) Airtel, BSNL and VIL call setup time is 4.73, 3.46 & 3.26 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL & VIL call setup time is 1.26, 2.26, 0.60 & 0.83 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Call Silence/Mute Rate: In packet switched network (4G/5G) BSNL, VIL, Airtel & RJIL have 5.10%, 1.30%, 1.11% & 0.57% silence call rate respectively. Further BSNL has higher RTP packet loss rate in downlink (3.84%) compared to RJIL (1.27%), Airtel (0.92%) & VIL (0.92%). In uplink the RTP packet loss rate is higher for BSNL (3.41%) compared to RJIL (1.10%), Airtel (1.00%) & VIL (0.83%). (refer table-6)

4. Drop Call Rate:

- a) Airtel, BSNL and VIL drop call rate is 0.19%, 8.35% and 0.00% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL drop call rate is 0.00%, 1.31%, 0.38% and 0.62% respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

5.2 Overall Data

1. Data download and upload performance (Overall i.e. LSA):

- a) Airtel, BSNL, RJIL and VIL average download speeds are 100.06 Mbps, 16.03 Mbps, 213.67 Mbps and 28.20 Mbps respectively. (refer table-11)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 23.10 Mbps, 5.48 Mbps, 23.38 Mbps and 12.36 Mbps respectively. (refer table-11)

2. Data download and upload performance (static i.e. while stationary):

- a) Airtel, BSNL, RJIL and VIL average download speeds are 126.69 Mbps, 11.07 Mbps, 155.86 Mbps and 24.77 Mbps respectively. (refer table-46)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 26.07 Mbps, 5.37 Mbps, 14.41 Mbps and 12.13 Mbps respectively. (refer table-46)

3. Data session setup success rate (static i.e. while stationary):

- a) Airtel, BSNL, RJIL and VIL have 100.00%, 98.75%, 100.00% and 100.00% download session setup success rate respectively. (refer table-46)
- b) All operators have 100.00% upload session setup success rate. (refer table-46)

5.3 Operator wise Key Findings

1.Airtel:

Voice

- 98.72% call setup success rate and 0.19% drop call rate have been observed in 3G/2G network mode for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3)
- 99.38% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 99.30% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for Sagar city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-13)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Sagar city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 98.08% call setup success rate and 0.39% drop call rate have been observed in 3G/2G network mode for Raigarh city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 98.19% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Raigarh city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-23)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-29)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 80 to 83)

Data

- Airtel has 100.06 Mbps average download speed & 23.10 Mbps average upload speed for LSA. (refer table-11)
- Airtel has 98.22 Mbps average download speed & 22.20 Mbps average upload speed for Sagar City Drive. (refer table-19)
- Airtel has 98.78 Mbps average download speed & 22.21 Mbps average upload speed for Raigarh City Drive. (refer table-27)
- Carmel Convent Hr. Sec School Raigarh, Dr. Hari Singh Gaur University Sagar, Kirodimal Arts & Science College Raigarh, Kirodimal Govt District Hospital Raigarh, Kirodimal Polytechnic College Raigarh, Raigarh Collectorate and Shanichari Bazaar Raigarh have less download speed (less than 100 Mbps) out of total 16 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 47, 49, 52, 53, 54, 59 & 61)

- Collectorate Sagar, Dr. Hari Singh Gaur University Sagar, Makroniya Chauraha Sagar, Medical College Sagar, O.P. Jindal University (OPJU) Raigarh, Raigarh Collectorate and Shanichari Bazaar Raigarh have less upload speed (less than 20 Mbps) out of total 16 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 48, 49, 55, 56, 57, 59 & 61)
- Dr. Hari Singh Gaur University Sagar, Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh and Raigarh Railway Station have less download speed (less than 100 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 84, 85 & 86)
- Dr. Hari Singh Gaur University Sagar and Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh have less upload speed (less than 20 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 84 & 85)

2. BSNL:

Voice

- 89.39% call setup success rate and 8.35% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-3)
- 91.37% call setup success rate and 1.31% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-5)
- 92.43% call setup success rate and 2.14% drop call rate have been observed in 3G/2G network mode for Sagar city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-13)
- 85.17% call setup success rate and 1.85% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Sagar city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-15)
- 86.29% call setup success rate and 15.12% drop call rate have been observed in 3G/2G network mode for Raigarh city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 91.23% call setup success rate and 1.54% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Raigarh city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-23)
- 100.00% call setup success rate and 0.63% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-29)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 80 to 83)

Data

- BSNL has 16.03 Mbps average download speed & 5.48 Mbps average upload speed for LSA. (refer table-11)
- BSNL has 15.73 Mbps average download speed & 4.73 Mbps average upload speed for Sagar city drive. (refer table-19)

- BSNL has 16.08 Mbps average download speed & 5.40 Mbps average upload speed for Raigarh city drive. (refer table-27)
- Government Engineering College Sagar, Government Polytechnic College Sagar, Kirodimal Arts & Science College Raigarh, Makroniya Chauraha Sagar, Medical College Sagar, Raigarh Bus Stand, Raigarh Collectorate and Sagar Bus Stand have less download speed (less than 10 Mbps) out of total 16 hotspots locations for auto-selection mode (5G/4G/3G/2G). (refer table-50, 51, 52, 55, 56, 58, 59 & 60)
- Medical College Sagar, Raigarh Collectorate and Sagar Bus Stand hotspot locations have less upload speed (less than 2 Mbps) out of total 16 hotspots locations for auto-selection mode (5G/4G/3G/2G). (refer table- 56, 59 & 60)

3. RJIL:

Voice

- 94.09% call setup success rate and 0.38% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-5)
- 99.66% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Sagar city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 85.23% call setup success rate and 0.39% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Raigarh city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-23)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-29)
- 100.00% call setup success rate and 7.41% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Dr. Hari Singh Gaur University Sagar walk test location. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table-80)
- 75.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh walk test location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-81)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Raigarh Railway Station & Sagar Railway Station walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 82 & 83)

Data

- RJIL has 213.67 Mbps average download speed & 23.38 Mbps average upload speed for LSA. (refer table-11)
- RJIL has 277.28 Mbps average download speed & 28.71 Mbps average upload speed for Sagar city drive. (refer table-19)
- RJIL has 172.64 Mbps average download speed & 19.84 Mbps average upload speed for Raigarh city drive. (refer table-27)

- Carmel Convent Hr. Sec School Raigarh, Dr. Hari Singh Gaur University Sagar, Makroniya Chauraha Sagar and Medical College Sagar have less download speed (less than 100 Mbps) out of total 16 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 47, 49, 55 & 56)
- Carmel Convent Hr. Sec School Raigarh, Collectorate Sagar, Dr. Hari Singh Gaur University Sagar, Government Engineering College Sagar, Kirodimal Arts & Science College Raigarh, Kirodimal Govt District Hospital Raigarh, Kirodimal Polytechnic College Raigarh, Makroniya Chauraha Sagar, Medical College Sagar, O.P. Jindal University (OPJU) Raigarh, Raigarh Collectorate and Shanichari Bazaar Raigarh have less upload speed (less than 20 Mbps) out of total 16 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 59 & 61)
- Dr. Hari Singh Gaur University Sagar has less download speed (less than 100 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 84)
- Dr. Hari Singh Gaur University Sagar has less upload speed (less than 20 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 84)

4. VIL: Voice

- 97.86% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-3)
- 98.29% call setup success rate and 0.62% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 97.61% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for Sagar city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-13)
- 97.03% call setup success rate and 1.70% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Sagar city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-15)
- 98.14% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for Raigarh city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 98.93% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Raigarh city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-23)
- 98.75% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-29)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 80 to 83)

Data

- VIL has 28.20 Mbps average download speed & 12.36 Mbps average upload speed for LSA. (refer table-11)
- VIL has 35.85 Mbps average download speed & 10.55 Mbps average upload speed for Sagar city drive. (refer table-19)
- VIL has 21.72 Mbps average download speed & 13.06 Mbps average upload speed for Raigarh city drive. (refer table-27)
- Government Polytechnic College Sagar, Kirodimal Arts & Science College Raigarh, Kirodimal Polytechnic College Raigarh and Uttam International School Raigarh have less download speed (less than 10 Mbps) out of total 16 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 51, 52, 54 & 62)
- Medical College Sagar, Shanichari Bazaar Raigarh and Uttam International School Raigarh have less upload speed (less than 2 Mbps) out of total 16 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 56, 61 & 62)
- Late Shri Lakhi Ram Agrawal Memorial Government Medical College Raigarh has less download speed (less than 10 Mbps) out of total 4 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-85)

6. Annexure

6.1.1 City

(i) Sagar

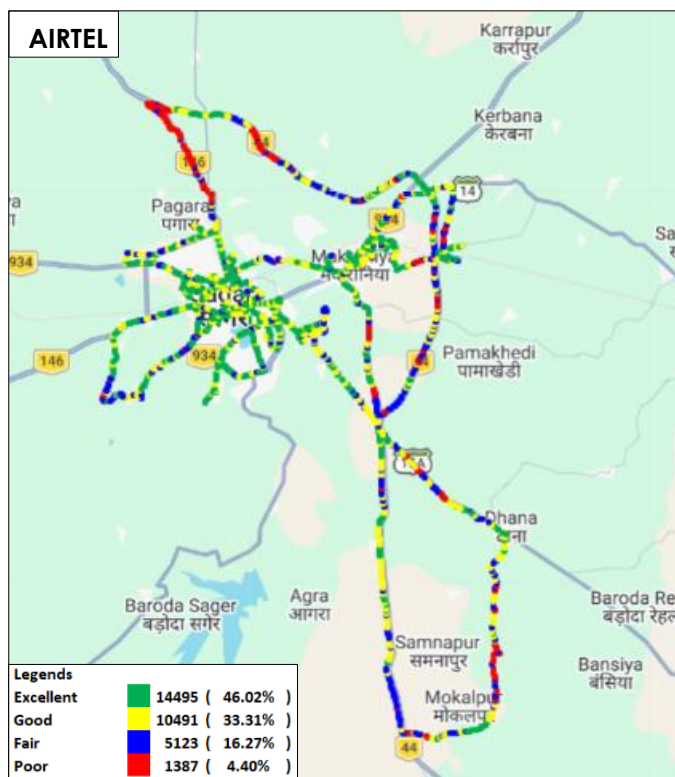


Figure-52: Signal strength 3G/2G network mode voice - AIRTEL.

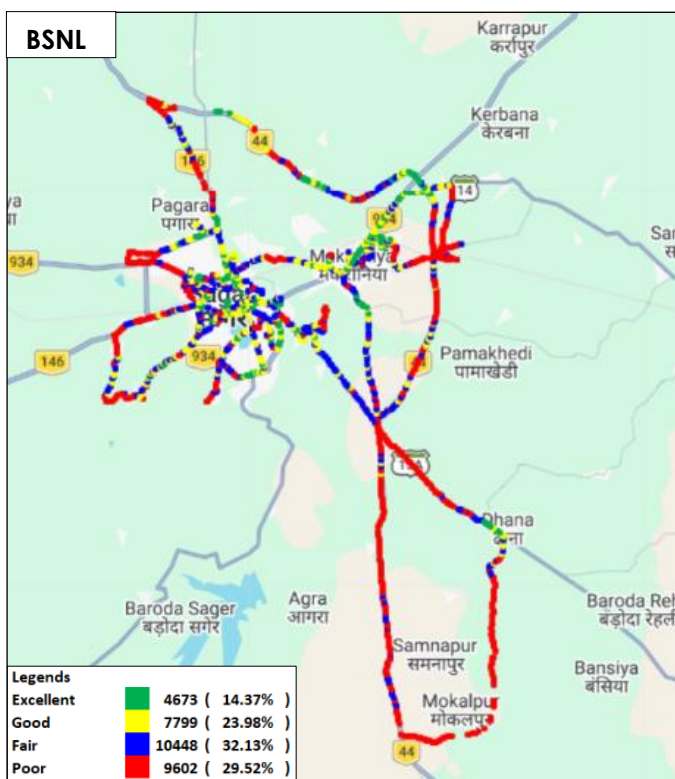


Figure-53: Signal strength 3G/2G network mode voice - BSNL.

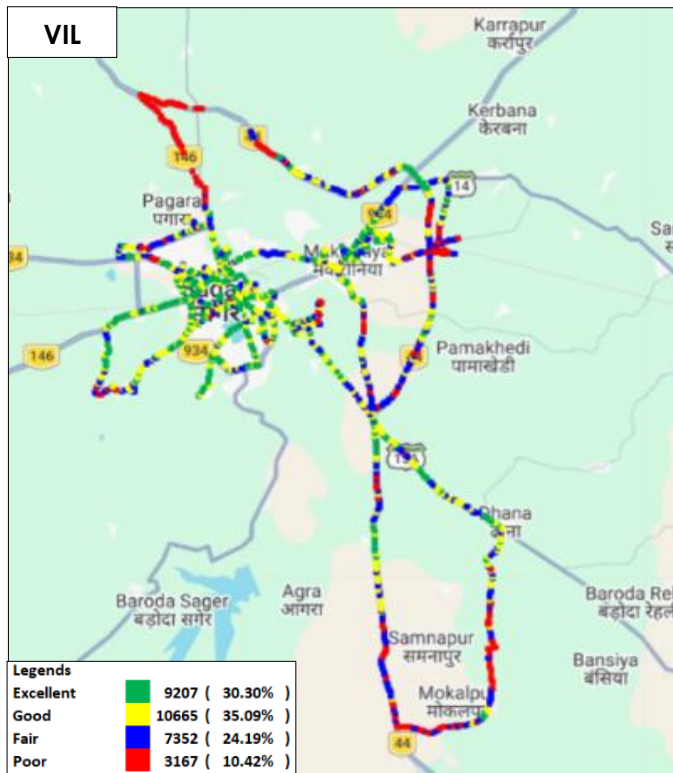


Figure-54: Signal strength 3G/2G network mode voice - VIL.

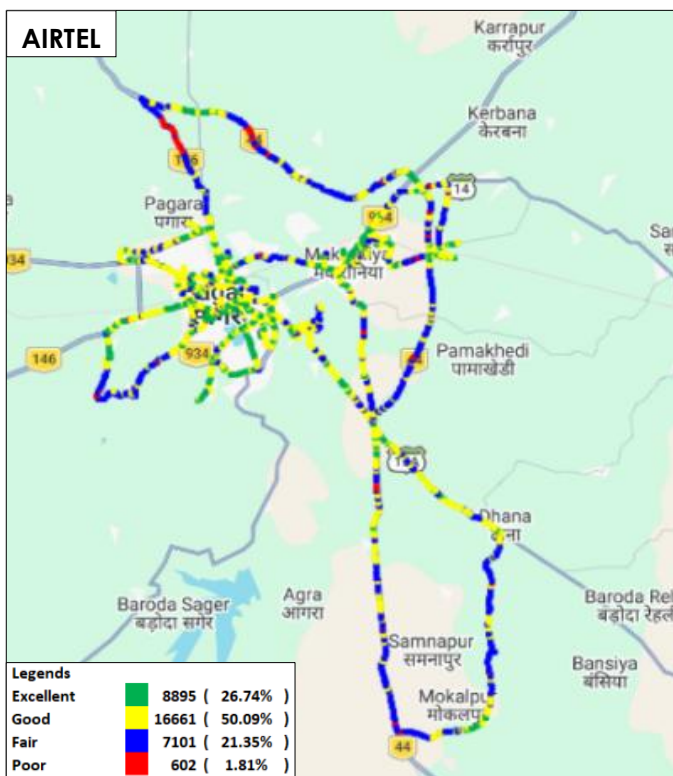


Figure-55: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

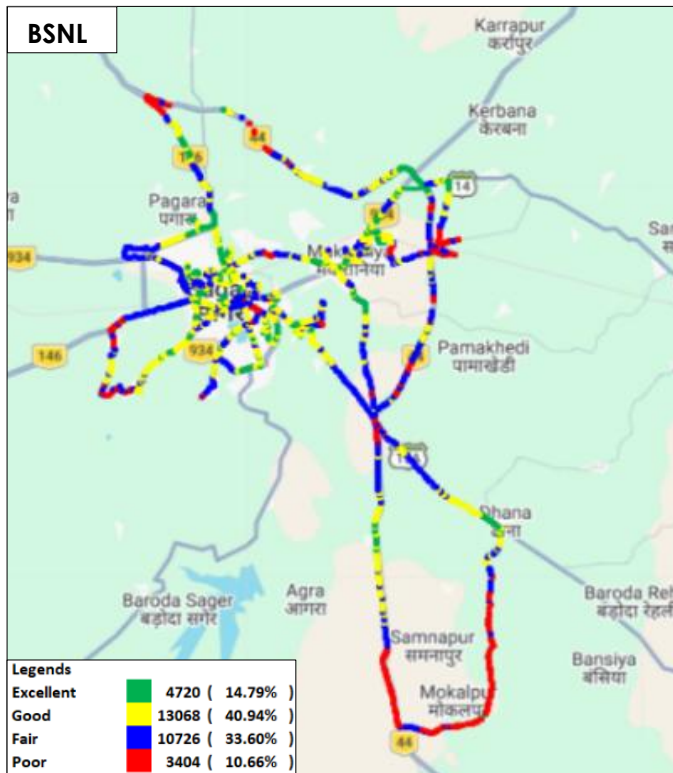


Figure-56: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

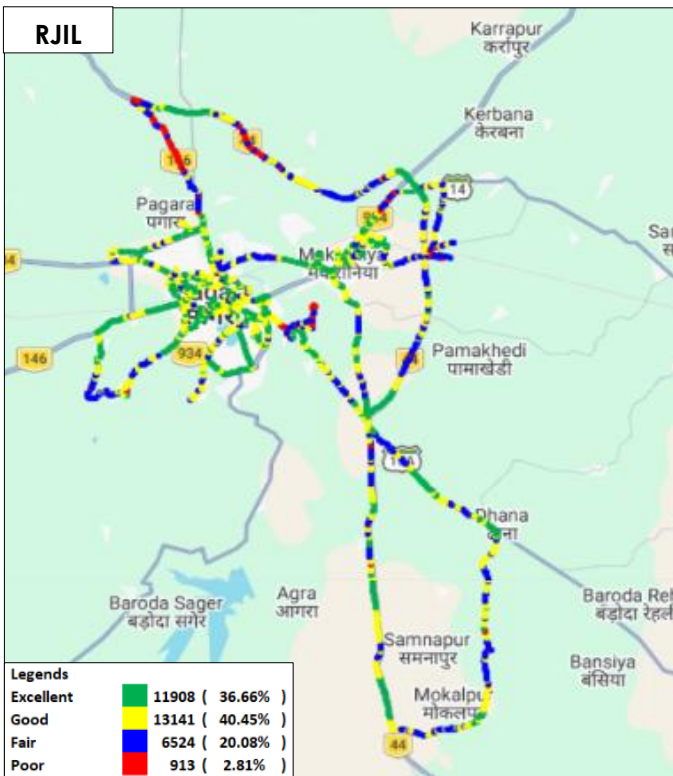


Figure-57: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

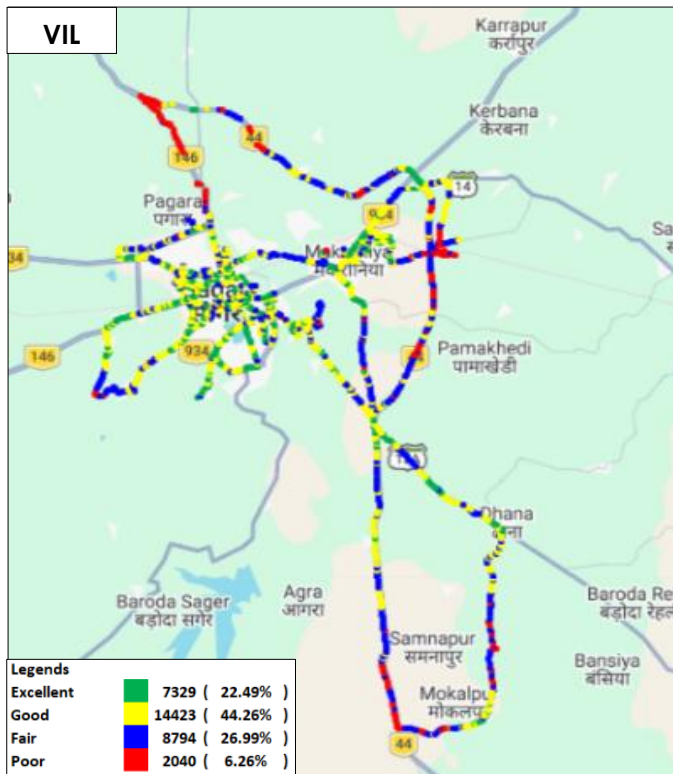


Figure-58: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

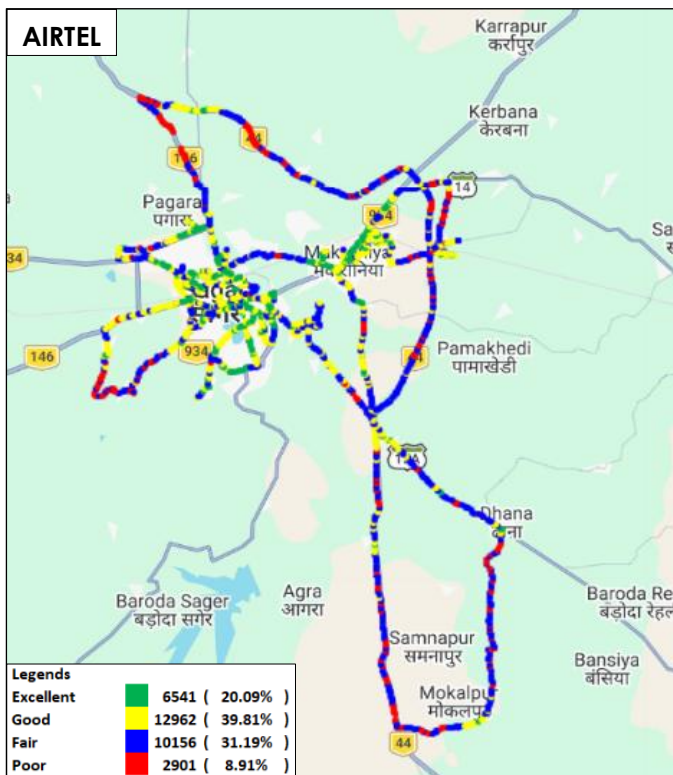


Figure-59: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

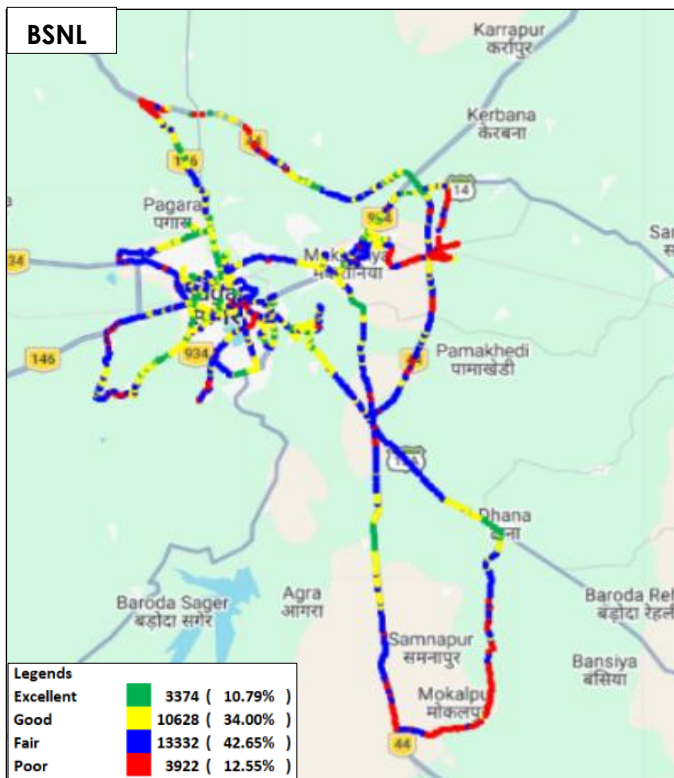


Figure-60: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

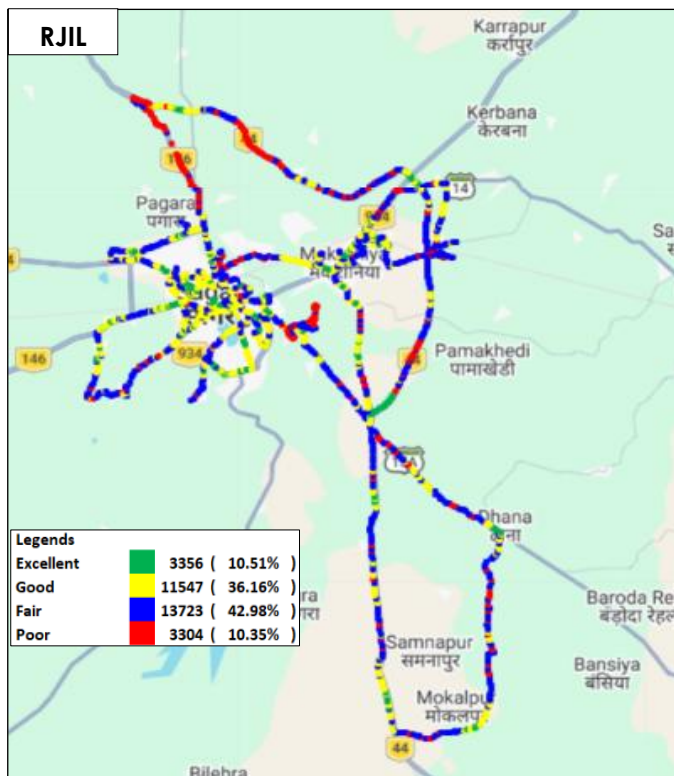


Figure-61: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

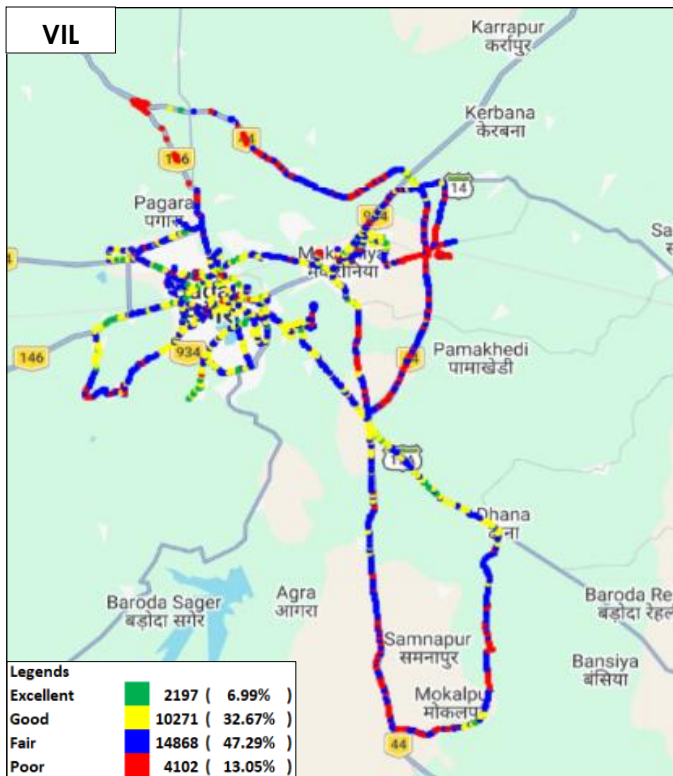


Figure-62: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

(ii) Raigarh

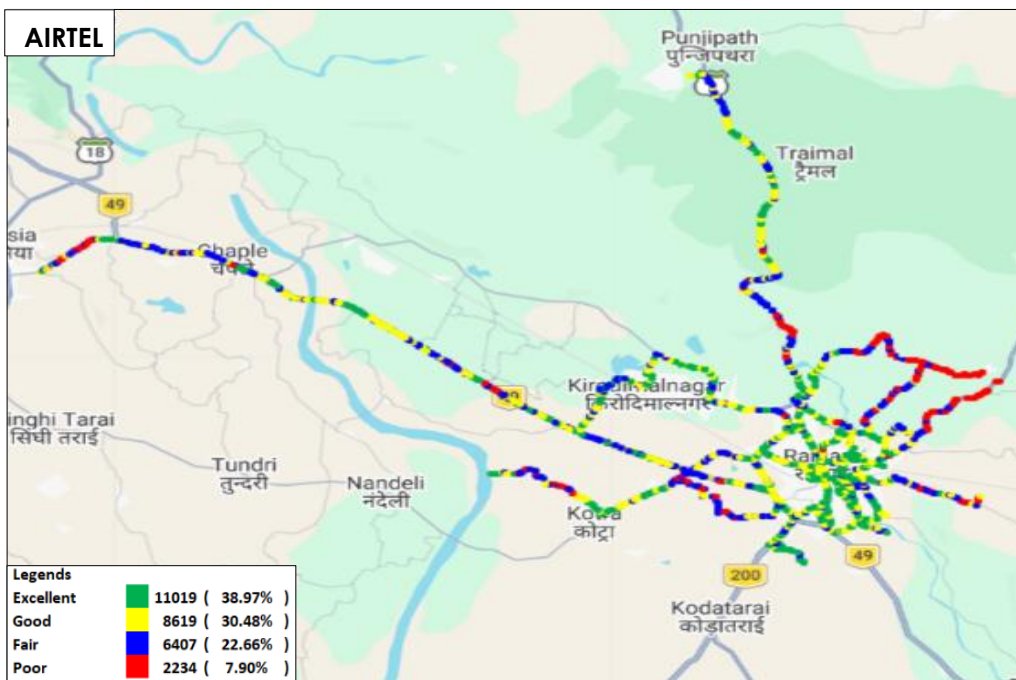


Figure-63: Signal strength 3G/2G network mode voice - AIRTEL.

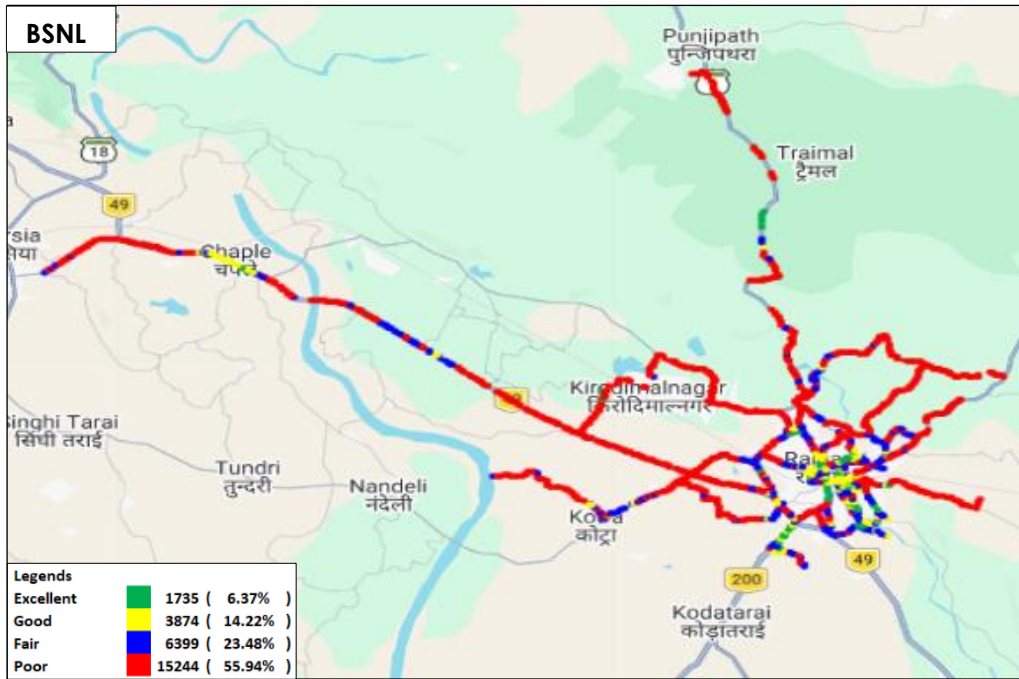


Figure-64: Signal strength 3G/2G network mode voice - BSNL.

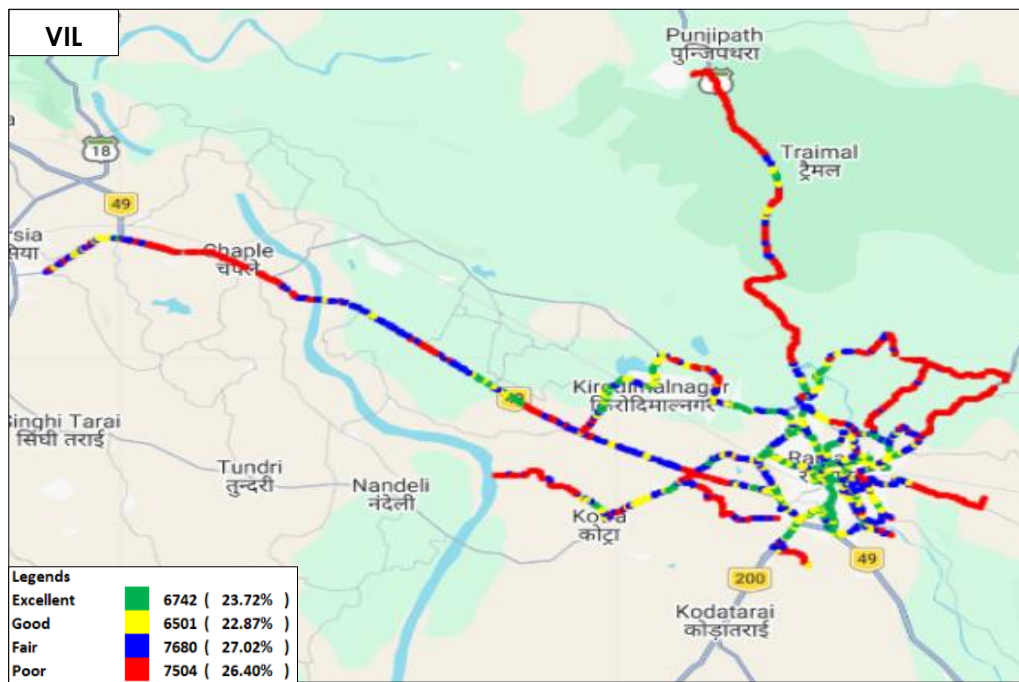


Figure-65: Signal strength 3G/2G network mode voice - VIL.

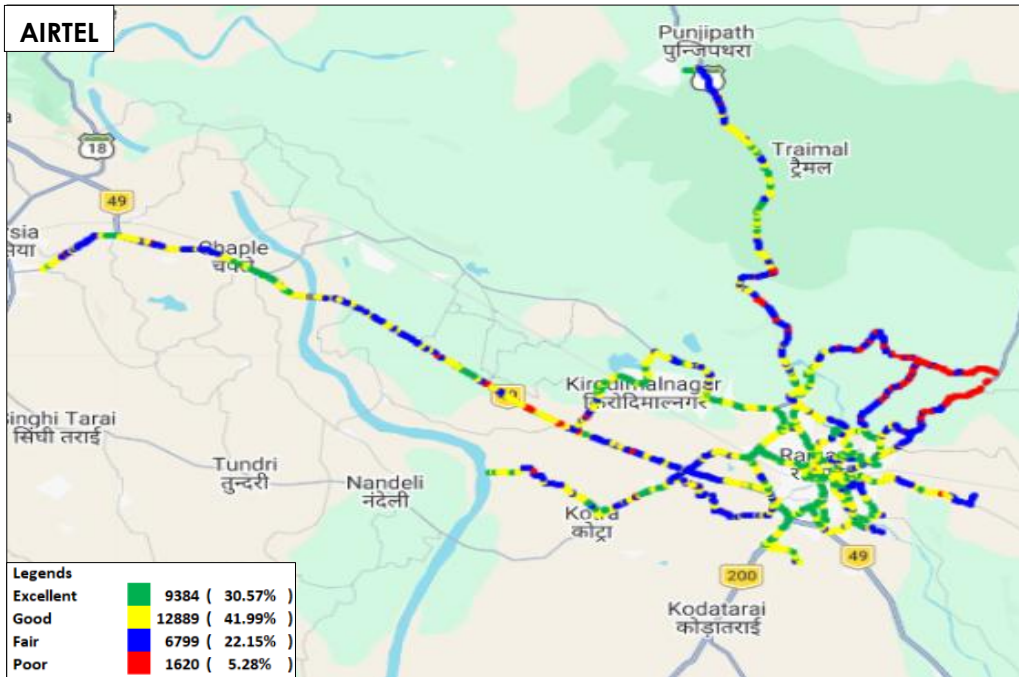


Figure-66: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

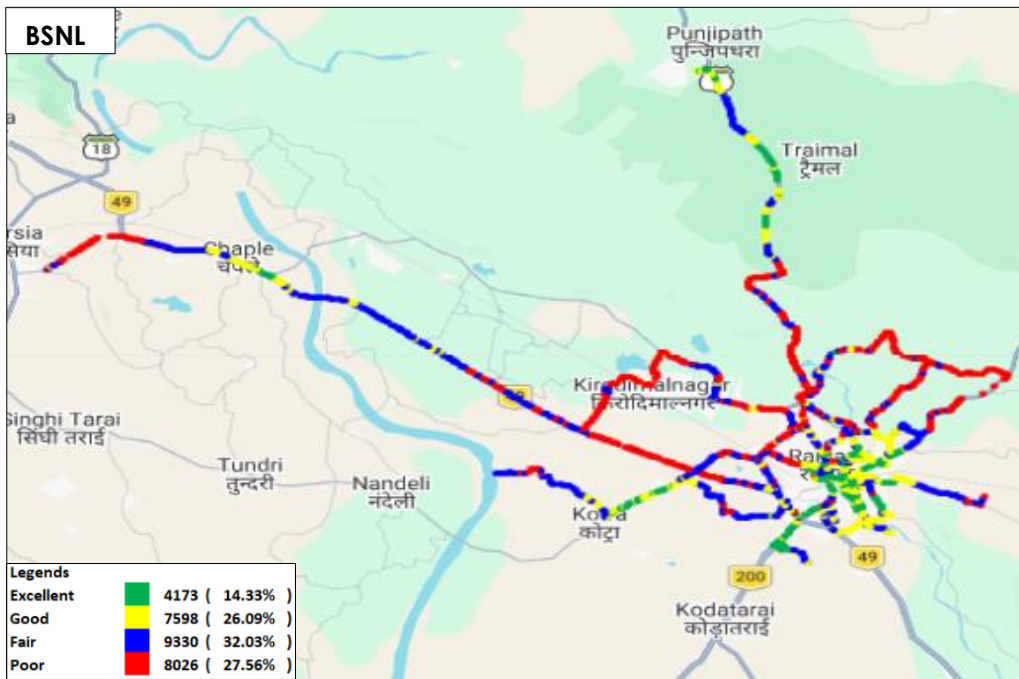


Figure-67: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

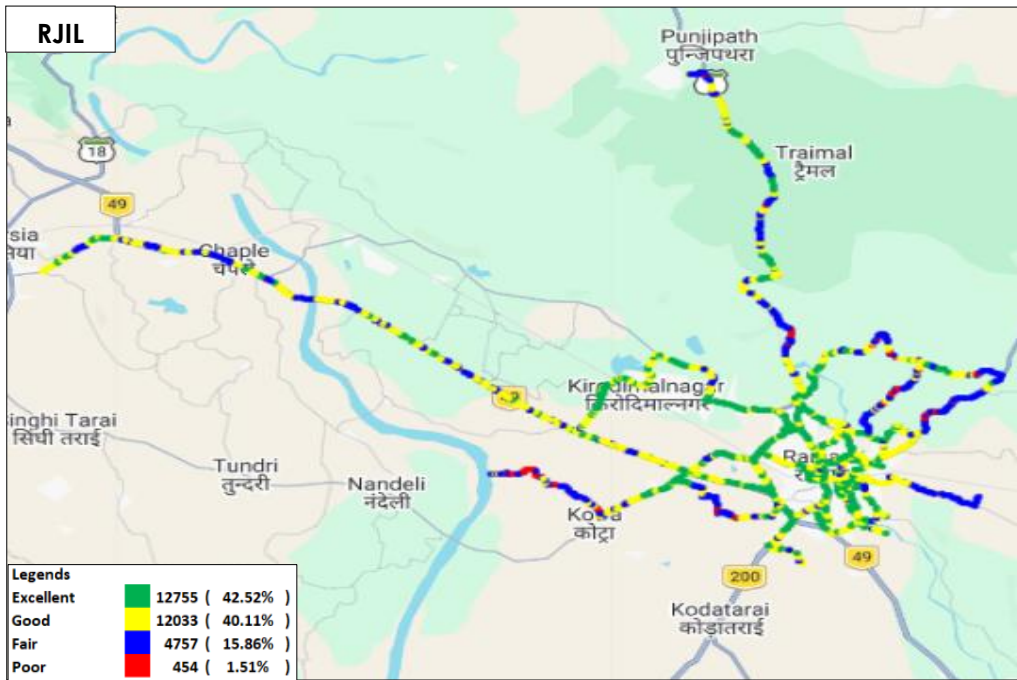


Figure-68: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

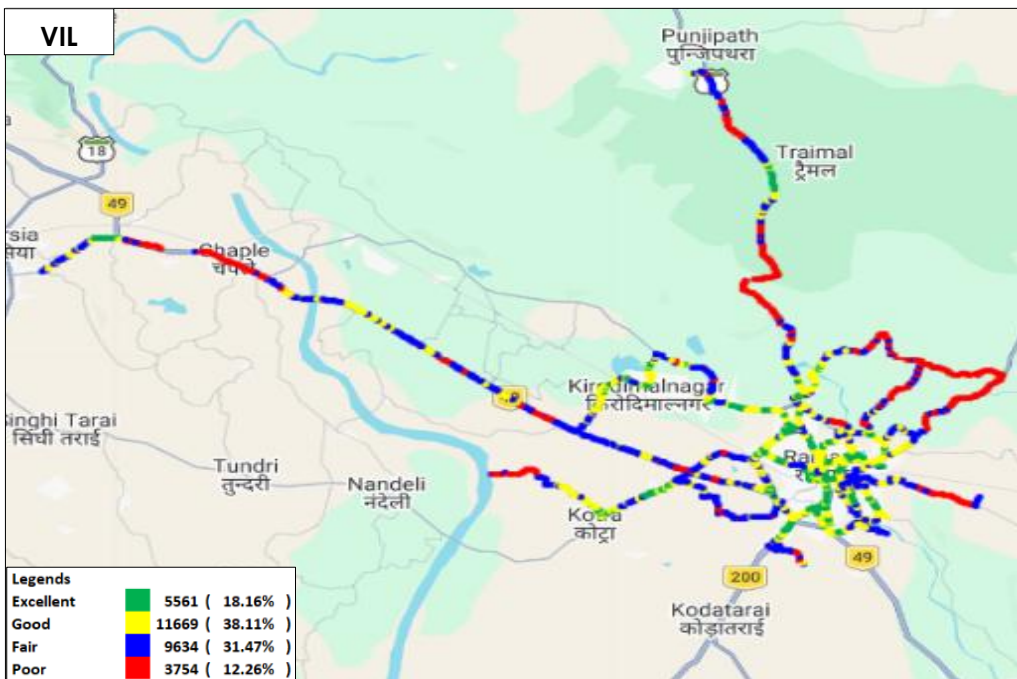


Figure-69: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

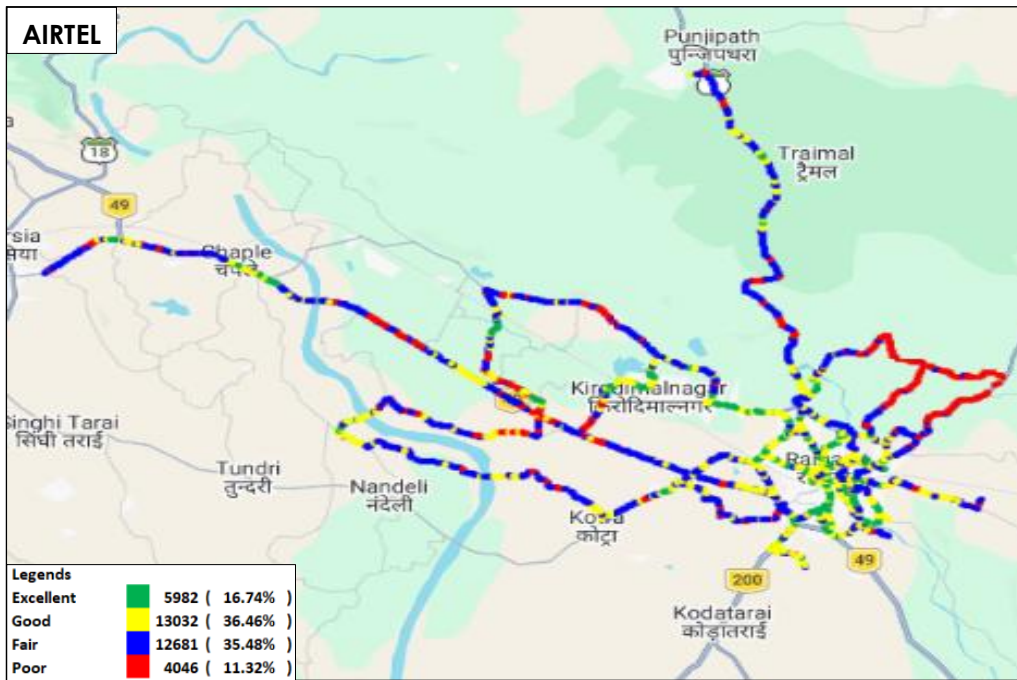


Figure-70: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

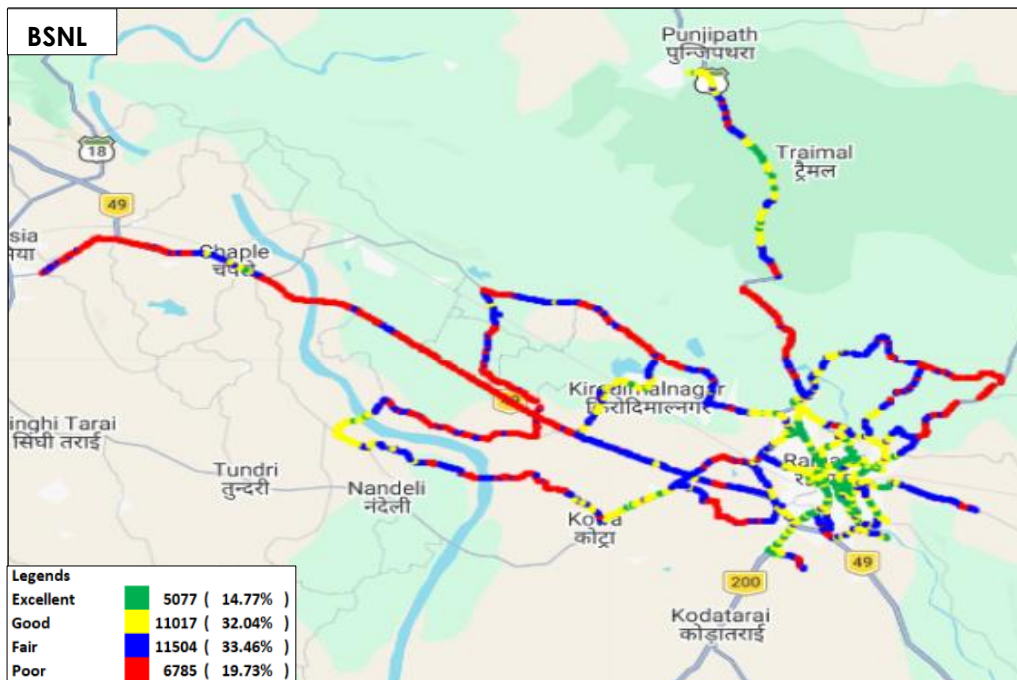


Figure-71: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

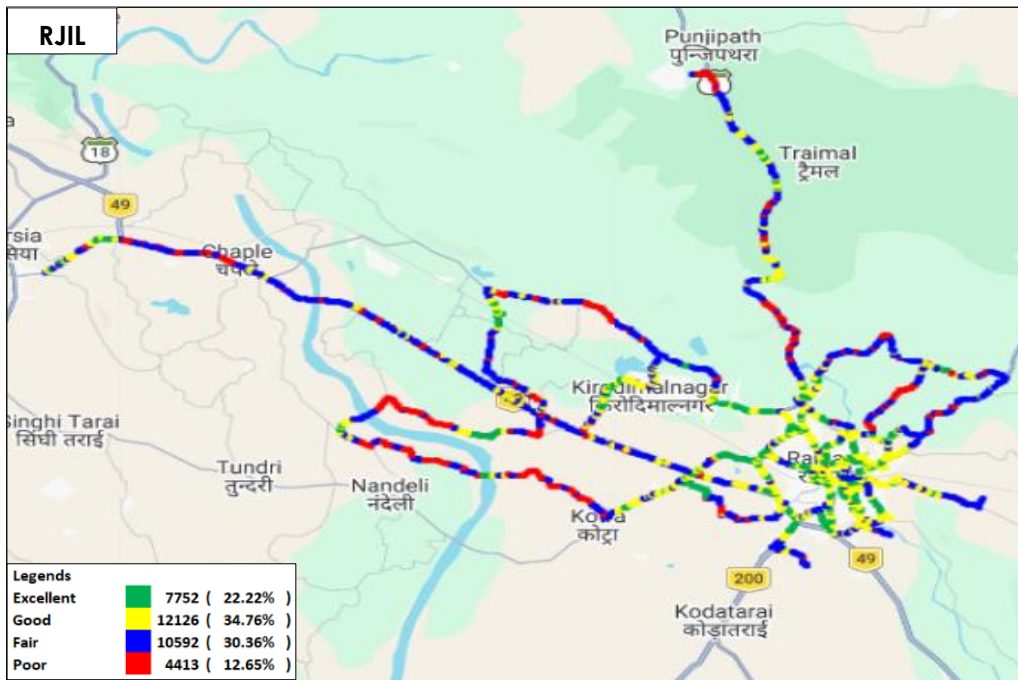


Figure-72: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

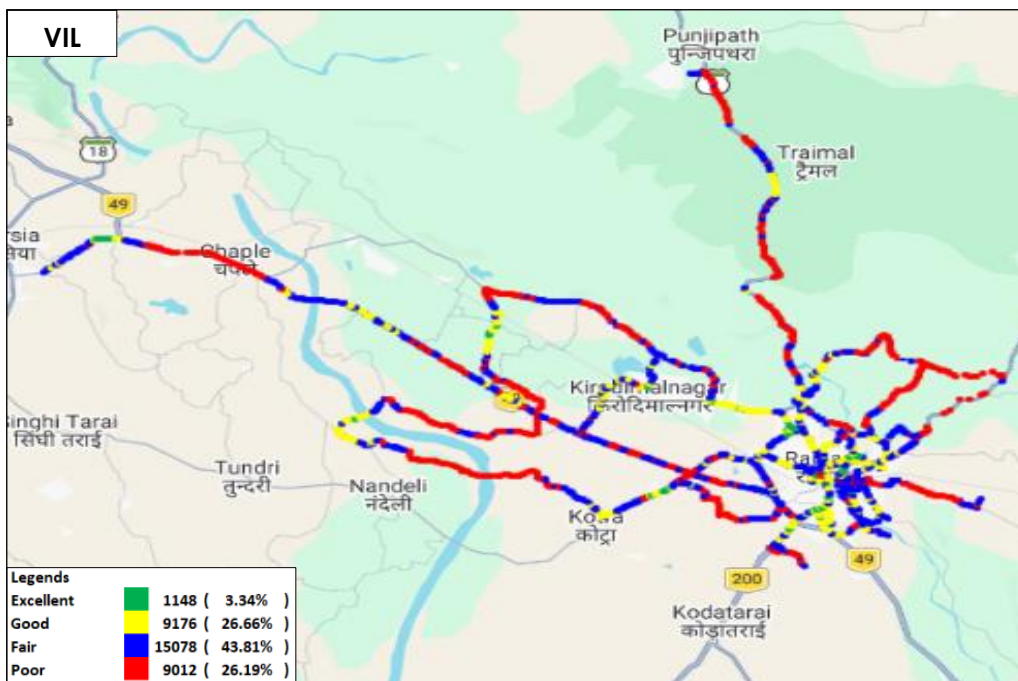


Figure-73: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

7. Appendix

The details of the setup used for conducting the drive test and the network or performance parameters captured under different conditions may be seen at Appendix-I. The calculation method of each QoS parameter is given in Appendix-II of the report. The summary of key equipment used in technical setup is as under

- **Device-1:** OnePlus Nord CE3 for 3G/2G CAT-15 Smartphone.
- **Device-2:** Samsung Galaxy S23 for 5G/4G/3G/2G CAT-20 Smartphone
- **Drive test Software:** Azenqos Engineering capable Applications to capture actual user experience.

7.1 Appendix-I

7.1.1 Drive test setup

Voice Call		
Call details	Technology	Detail
Call Setup Timeout	<ul style="list-style-type: none"> • 3G/2G auto mode- switch Call • 5G/4G/3G/2G auto mode- switch Call • 5G/4G MOS Call 	30 Sec
Call Duration		90 seconds
Wait/ Guard Time		15 Sec

Table-88: Voice test detail

<p>Note-</p> <ul style="list-style-type: none"> • There is 15 sec wait time after locking and before starting first call in 3G/2G call. • 10 calls to be made at each Hotspot location. • Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance. • Speech quality (MOS) has been measured only in city drive & highway by making Mobile to Mobile call. • 180 Sec calls were made only in highway & railway route drive.

Data Test		
Test Type	Technology	Detail
FTP/HTTP Download	5G/4G/3G/2G Auto Mode	500 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
FTP/HTTP Upload		250 MB File- 30 Sec Timeout, (Multithread 3- TCP Connection at a time)
YouTube Streaming		20 Sec Video & 25 sec Timeout (Only at Hotspot)
Web Browsing		3 popular websites (www.google.co.in , www.irctc.co.in , sbi.bank.in) 20 sec timeout (only at Hotspot)

Latency & Jitter (TWAMP-UDP)		25 count- Dynamic 500 count- Hotspot Payload- 42 bytes in all drive
Packet Loss Rate (TWAMP-UDP & TCP)		500 counts (TWAMP-UDP) 500 counts (TCP) at each hotspot Payload- 42 bytes in all drive

Table-89: Data test detail

- Note-**
- 5 Data iteration to be done at each hotspot location.
 - Minimum 5 iteration to be made during the walk test. Iteration count will be increased based on walk test distance.
 - TWAMP-UDP & TCP test to be performed only once at hotspot location.
 - Youtube & Web browsing test to be performed at static location only.
 - All values are taken up to two decimal places with round off.
 - Airtel server was used for FTP Download, FTP Upload, TCP and TWAMP testing, for Airtel.
 - Delhi-based TRAI server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing, for BSNL.
 - RJIL server was used for FTP Download, FTP Upload, TCP and TWAMP testing, for RJIL.
 - VIL server was used for HTTP Download, HTTP Upload, TCP and TWAMP testing, for VIL.

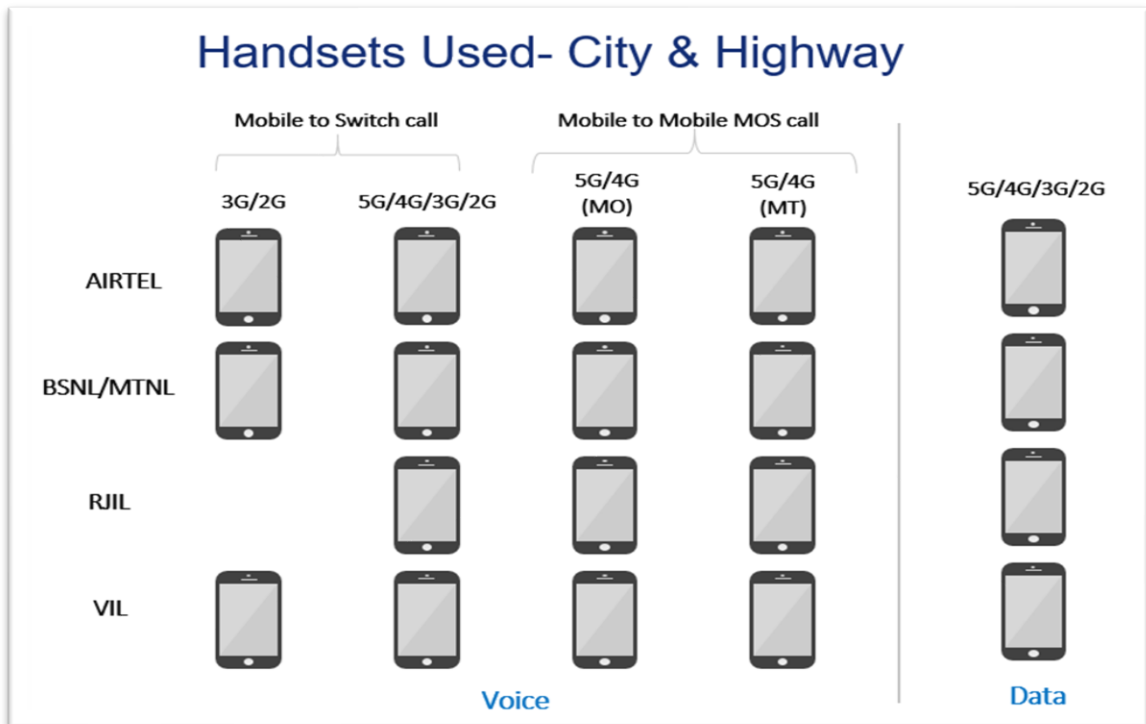


Figure-74: Number of handsets used in city & highway drive

MO: Mobile originating
MT: Mobile terminating

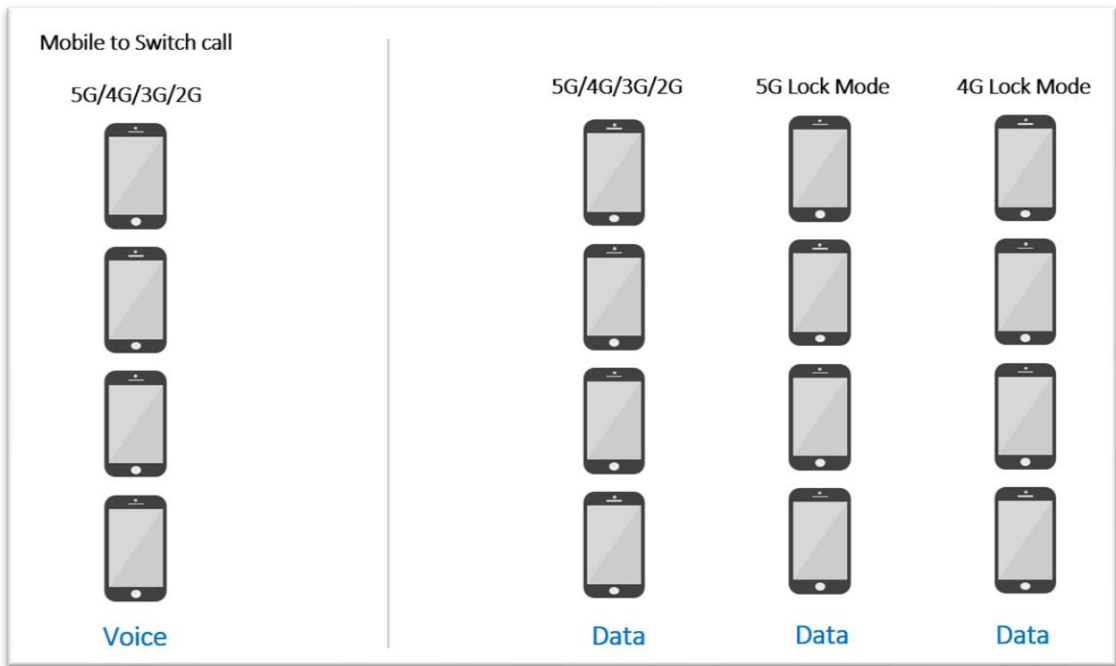


Figure-75: Number of handsets used in railway/metro/walktest/hotspot/coastal area.

Note- 5G & 4G Lock mode testing has been performed at hotspot locations only.

7.1.2 Drive test Methodology

(a) Dynamic voice testing (on the move)

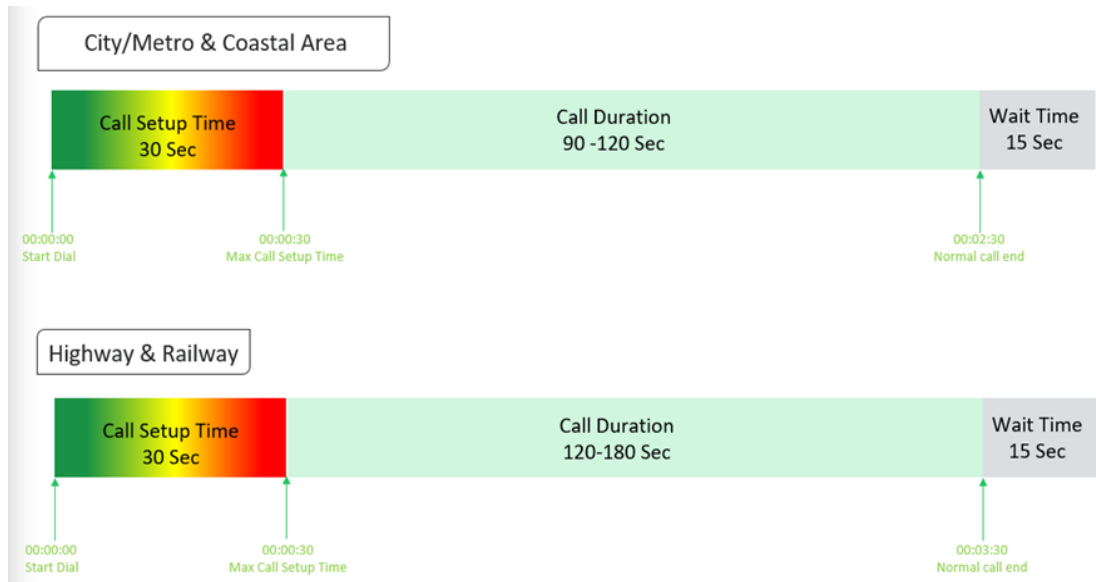


Figure-76: Voice test script for city/railway/metro/highway & coastal area

- 15 sec wait time is applied after locking Radio Access Technology (RAT) to 3G/2G and before starting first call in 3G/2G call.
- Speech quality (MOS) will be measured only City & Highway drive by making Mobile to Mobile calls.

(b) Hotspot voice testing



Figure-77: Voice test script for walktest/hotspot

- 10 calls to be made at each Hotspot location.
- Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance.

(c) Dynamic Data (internet) test

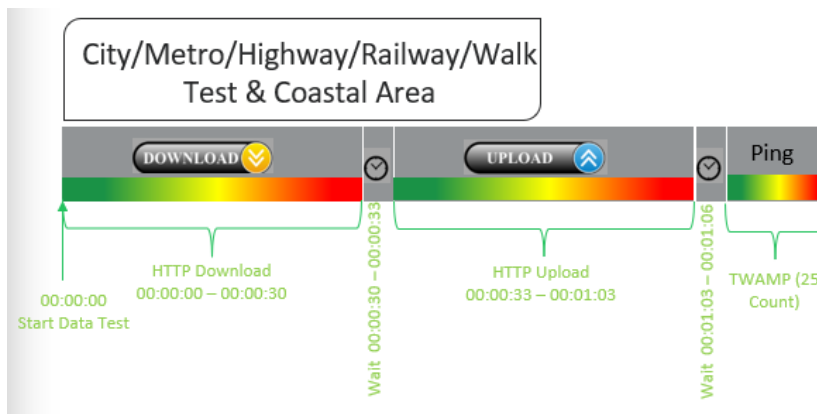


Figure-78: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing

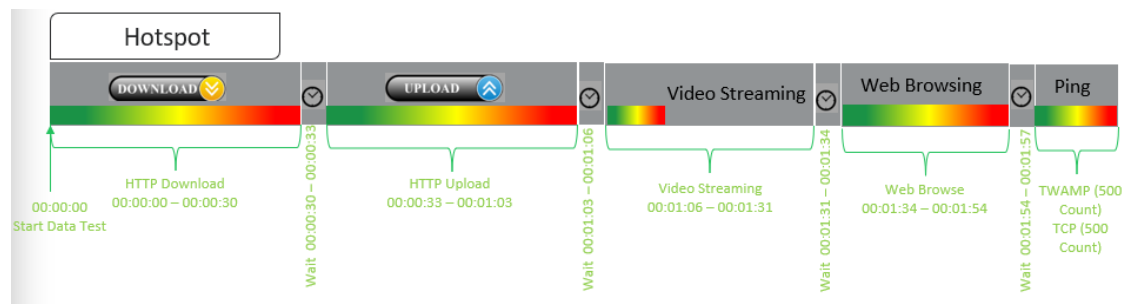


Figure-79: Data test script used at hotspot

- 5 Data iteration done at each hotspot location
- Min. 5 iteration made during the walk test.
- Web browsing duration mentioned above is for one web site only.
- One ping iteration (with 500 Count of each- TWAMP & TCP) done at hotspot location.

7.2 Appendix-II

7.2.1 Network Performance Parameters for Voice calls

Parameter Name	Definition
Call Setup Success Rate	<p>(i) Call Setup Success Rate is defined as the ratio of Established Calls to Call Attempts. 'Established Calls' mean the following events have happened in call setup:</p> <ul style="list-style-type: none"> (a) Call attempt is made (b) The signaling channel is allocated (c) The call is routed to the outwards path of the terminating network (d) An alert signal is received by caller in the form of ring back tone, busy tone, or an announcement. <p>CSSR = (Total Call Established/ Total Call Attempt) *100</p> <p>As per QoS Regulation 2024 benchmark value is >=98%</p>
Drop Call Rate	<p>Call drop represents the service provider network's ability to maintain a call once it has been successfully established. This parameter shall include both incoming calls and outgoing calls which, once they have been established and have an assigned traffic channel/ bearer, are dropped, or interrupted before their normal completion by the user, the cause of the early termination being within the service provider's network</p> <p>Drop Call Rate = (Total Call Drop/Total Call Established) *100</p> <p>As per QoS Regulation 2024 benchmark value is <=2%</p>
Call Setup Time	<p>Time taken from call initiate to call alerting/ringing.</p> <p>Call Setup Time = T2- T1</p> <p>T2- Ringing (VoLTE/VoNR) & Alerting (for WCDMA & GSM), T1- Invite (VoLTE/VoNR) & CM Service Request (for WCDMA & GSM)</p>
Voice Quality (MOS)	<p>Voice quality in mobile networks is measured with algorithms based on ITU-T P.863 (POLQA). The grading for Voice quality has been given as:</p> <p>Excellent: MOS ≥ 4 and < 5 Good : MOS ≥ 3 and < 4 Fair : MOS ≥ 2 and < 3 Poor : MOS ≥ 1 and < 2</p>
Handover Success Rate	<p>Handover Success Rate = Count of successful handovers (All Technology Handover combined) / Total count of Handover Attempt (All Technology Handover combined) *100</p> <p>Handover type which are considered- 2G Inter & Intra cell, 3G Soft & IRAT, 4G Inter & Intra frequency & SRVCC, 5G Inter & Intra frequency & 5G to 4G handovers.</p>
Silence Call	<p>A call which has ≥ 4 sec continuous RTP gap is considered as a Silence Call.</p> <p>Silence call rate = (count of silence call / Total calls established) *100</p> <p>If a call observes multiple silence count ≥ 4 sec in a particular established call it has been taken as one silent event.</p>

Jitter	<p>The inter arrival jitter is the difference in the relative transit time for two packets. The relative transit time is the difference between a packet's Real-time Transport Protocol (RTP) timestamp and the receiver's clock at the time of arrival, measured in the same units. If S_i is the RTP timestamp from packet i, and R_i is the time of arrival in RTP timestamps units for packet i, then for two packets i and j the inter-arrival jitter D can be expressed as: $D(i,j) = (R_j - R_i) - (S_j - S_i)$</p> <p>The interarrival jitter is calculated continuously as each data packet i is received from source $SSRC_n$, using this difference D for that packet and the previous packet $i-1$ in order of arrival (not necessarily in sequence), according to the formula $J(i) = J(i-1) + (D(i-1,i) - J(i-1))/16$ or 8</p>																																		
Downlink Packet Drop Rate	<p>Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call originating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE).</p>																																		
Uplink Packet Drop Rate	<p>Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call terminating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE).</p>																																		
Signal Strength	<p>Signal strength is the signal power level received by the wireless user.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Parameter Name</th> <th rowspan="2">Technology</th> <th colspan="4">Signal Strength (dBm)</th> </tr> <tr> <th style="background-color: #92D050;">Excellent</th> <th style="background-color: #FFD700;">Good</th> <th style="background-color: #4682B4;">Fair</th> <th style="background-color: #FF0000;">Poor</th> </tr> </thead> <tbody> <tr> <td>Rx Level</td> <td>GSM</td> <td>0 to \geq -65</td> <td><-65 to \geq-75</td> <td><-75 to \geq-85</td> <td><-85 to min</td> </tr> <tr> <td>RSCP</td> <td>WCDMA</td> <td>0 to \geq -70</td> <td><-70 to \geq-80</td> <td><-80 to \geq-90</td> <td><-90 to min</td> </tr> <tr> <td>RSRP</td> <td>LTE</td> <td>0 to \geq -80</td> <td><-80 to \geq-95</td> <td><-95 to \geq-110</td> <td><-110 to min</td> </tr> <tr> <td>SS_RSRP</td> <td>NR</td> <td>0 to \geq -80</td> <td><-80 to $>$-95</td> <td><-95 to \geq-110</td> <td><-110 to min</td> </tr> </tbody> </table>	Parameter Name	Technology	Signal Strength (dBm)				Excellent	Good	Fair	Poor	Rx Level	GSM	0 to \geq -65	<-65 to \geq -75	<-75 to \geq -85	<-85 to min	RSCP	WCDMA	0 to \geq -70	<-70 to \geq -80	<-80 to \geq -90	<-90 to min	RSRP	LTE	0 to \geq -80	<-80 to \geq -95	<-95 to \geq -110	<-110 to min	SS_RSRP	NR	0 to \geq -80	<-80 to $>$ -95	<-95 to \geq -110	<-110 to min
Parameter Name	Technology			Signal Strength (dBm)																															
		Excellent	Good	Fair	Poor																														
Rx Level	GSM	0 to \geq -65	<-65 to \geq -75	<-75 to \geq -85	<-85 to min																														
RSCP	WCDMA	0 to \geq -70	<-70 to \geq -80	<-80 to \geq -90	<-90 to min																														
RSRP	LTE	0 to \geq -80	<-80 to \geq -95	<-95 to \geq -110	<-110 to min																														
SS_RSRP	NR	0 to \geq -80	<-80 to $>$ -95	<-95 to \geq -110	<-110 to min																														

Table-90: Network performance parameter and definition voice

7.2.2 Network Performance Parameters Data tests

Parameter Name	Definition
Download Speed (Mbps)	<p>The download speed is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device.</p> <p>Download Speed = Total bytes transferred during download / Total time for transfer</p> <ul style="list-style-type: none"> 80th percentile (upper range) & 20th percentile (lower range) value has been calculated for download throughput in dynamic drive and Hotspot combine data
Upload Speed (Mbps)	<p>The upload speed is the data transmission rate that is achieved for uploading a test file from a test device to a test server.</p> <p>Upload Speed = Total bytes transferred during upload / Total time for transfer.</p> <ul style="list-style-type: none"> 80th percentile (upper range) & 20th percentile (lower range) value has been calculated for upload throughput in dynamic drive and Hotspot combine data.
Download Session Setup Success Rate	<p>(total download session established (successfully connected to server)/ total download session attempt) *100. This KPI has been calculated for Hotspot only.</p>

Upload Session Setup Success Rate	(total upload session established (successfully connected to server)/ total upload session attempt)*100. This KPI need to report for Hotspot only.
Web Page Download Time	Web browsing test is used to measure performance in terms of opening a web/HTTP page. Time taken to open the web page successfully is considered as web browsing delay/web page download time.
Video Streaming Delay	The Video streaming delay is time taken from start of video transfer to First video frame displayed in player.
Latency (TWAMP-UDP)	Latency is the time it takes for a small data set to be transmitted from a device to a server on the Internet and back to the same device again. The Latency is measured in milliseconds (ms). To calculate the one-way latency, we just do half of the round-trip time. 50th percentile of one-way latency has been reported.
Jitter (TWAMP-UDP)	Measure of variation in time in arrival of packets from a source to destination The consideration of packet delay jitter is considered by standard deviation of Inter Packet Delay Variation. If IPDV is used. By standard deviation is meant the average of standard deviation of IPDV on DL $IPDV(i) = D(i) - D(i-1)$ then Stdvs of IPDV is considered as jitter.
Packet Loss Rate (TWAMP-UDP & TCP)	Number of packets lost out of total packet transferred during test. Packet loss rate = (Total packet lost / Total packet sent) *100 * Packet delay (using TWAMP-UDP & TCP) >90 ms considered as packet loss and included in packet loss rate. * Packet loss rate is calculated based on TWAMP-UDP & TCP. *90 th percentile for Packet loss rate has been reported in overall Hotspot performance summary.

Table-91: Network performance parameter and definition Data

Disclaimer: The observations presented above and, in the reports, represent the performance of the service providers on the area/route under test on the day/time of conducting the drive test and no inference whatsoever may be drawn regarding the quality of the telecom service by the service providers in the whole city/state/licensed service area.