



TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Himachal Pradesh LSA

May 2026

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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 Himachal Pradesh License Service Area (LSA) during the month of May-2026 under the supervision of TRAI Regional Office (RO) Delhi. 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	Hamirpur & Bilaspur	City	290.6	13-May-2026	15-May-2026
2	Bilaspur	Inter Operator Calling	1 Location	16-May-2026	16-May-2026
3	Hamirpur & Bilaspur	Hotspot	8 Locations	13-May-2026	15-May-2026
4	Hamirpur	Walk test	2.5	14-May-2026	14-May-2026
5	Amb to Hamirpur & Hamirpur to Bilaspur	Highway	119.0	12-May-2026	14-May-2026
6	Chandigarh to Amb	Railway	168.0	12-May-2026	12-May-2026

Table-1: Drive test summary.

2.2 Drive test routes

The map provides overview of drive test routes indicating city drive, Inter-operator call test, hotspot, walk test, highway and railway as per the legends shown on the map.

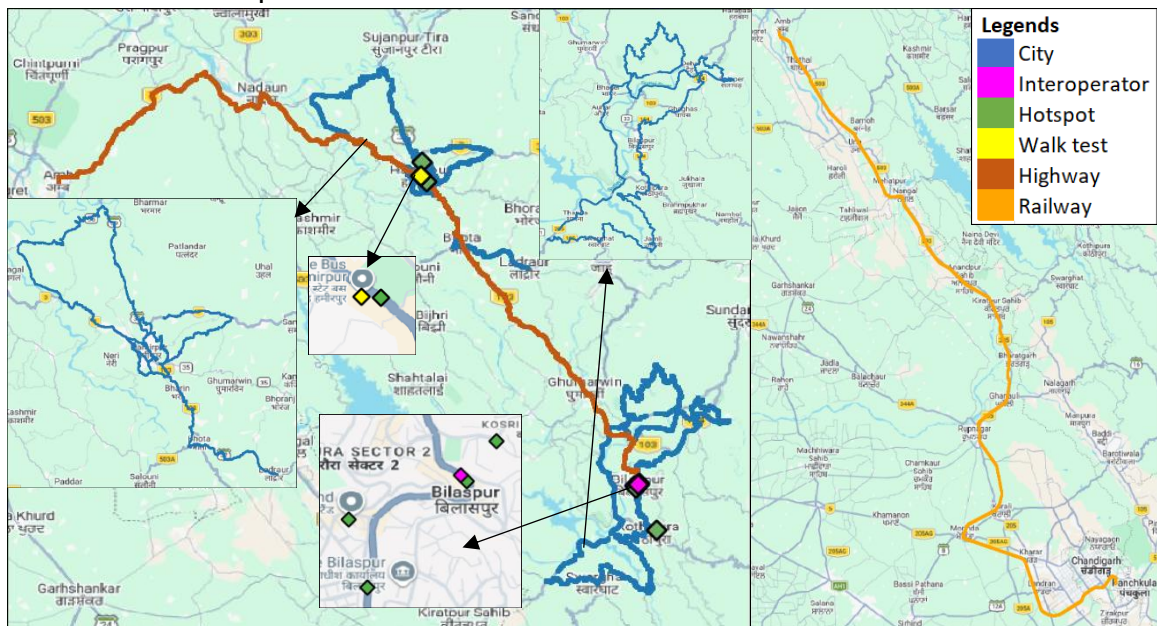


Figure-1: Drive test routes

2.3 Summary of areas covered

a) City

Hamirpur - Dhanpur, Jeehan, Karot Khas, Bharti, Paddar, Bharin, Bhota, Aghar and Ladraur etc.

Bilaspur - Harlog, Bhager, Auhar, Bharari, Zakatkhana, Jabal, Thapna, Swarghat, Jamli, Kothipura, Ghaghas, Dehar and Salaper etc.

b) Hotspot

1. AIIMS Bilaspur
2. Bilaspur Bus Stand
3. DC Office Bilaspur
4. Dr Radhakrishnan Govt Medical College Hospital, Hamirpur
5. Government Post Graduate College Bilaspur
6. ISBT Hamirpur
7. National Institute of Technology, Hamirpur
8. Purnam Mall Bilaspur

c) Walk test

1. Main Bazaar Hamirpur

d) Highway

Amb to Hamirpur – Lohara Khas, Jawar, Nadaun, Bharti, and Jol Sappar etc.

Hamirpur to Bilaspur – Bharin, Bhota, Dain, Ukhali, Dangar, Dadhol, Naswal, Ghumarwin, Bhager, Kandroul and Upper Nihal etc.

e) Railway - Chandigarh to Amb Via Sahibzada Asngr, Morinda, Rupnagar, Anandpur Sahib, Nangal Dam, Una Himachal.

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	900
2	Bharti Airtel Ltd.	4G	900,1800,2300
3	Bharti Airtel Ltd.	5G	3500
4	BSNL	2G	900
5	BSNL	3G	2100
6	BSNL	4G	700,2100,2500
7	Reliance JIO Infocomm Ltd.	4G	850,1800,2300
8	Reliance JIO Infocomm Ltd.	5G	700,3500
9	Vodafone Idea Ltd.	2G	1800
10	Vodafone Idea Ltd.	4G	900,1800,2100,2500
11	Vodafone Idea Ltd.	5G	3500

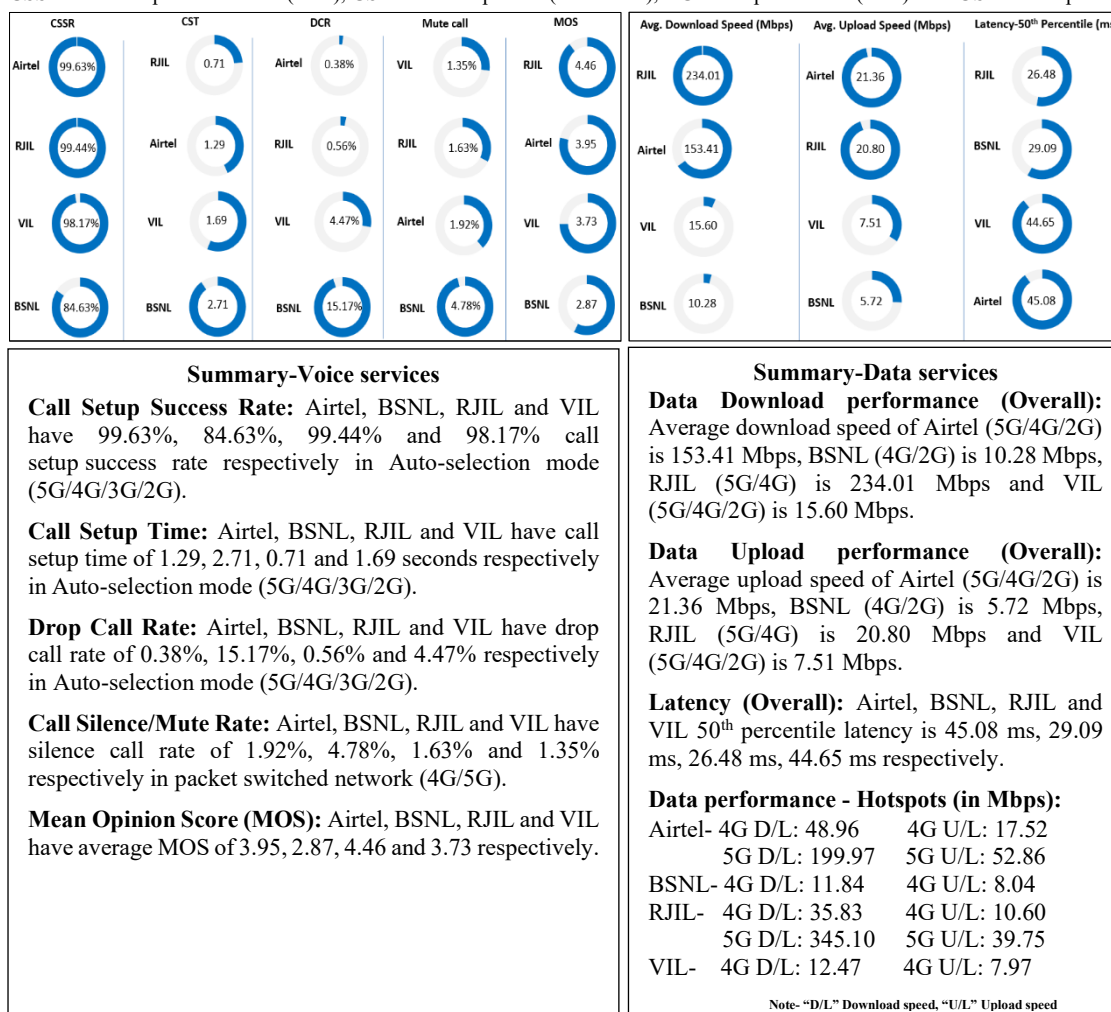
Table-2: Telecom service provider (TSP) covered in IDT

Note-

- Few 5G samples were observed in Vil during the railway drive in Chandigarh.

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 2.90%, 13.75%, 1.75% & 14.59% of the **Hamirpur City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 114 to 117** 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 13.96%, 15.11%, 14.75% & 13.55% of the **Hamirpur City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 118 to 121** 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 4.79%, 33.03%, 3.46% & 36.69% of the **Bilaspur City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 125 to 128** 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 20.71%, 37.75%, 21.06% & 32.73% of the **Bilaspur City IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 129 to 132** 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 7.15%, 48.61%, 1.97% & 37.17% of the **Amb to Hamirpur Highway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 136 to 139** 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 23.81%, 29.35%, 24.58% & 30.99% of the **Amb to Hamirpur Highway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 140 to 143** 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 0.61%, 19.82%, 0.58% & 18.17% of the **Hamirpur to Bilaspur Highway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 147 to 150** 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 9.85%, 20.28%, 12.30% & 15.54% of the **Hamirpur to Bilaspur Highway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 151 to 154** 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 2.81%, 14.16%, 3.07% & 11.96% of the **Railway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 155 to 158** 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 6.67%, 8.68%, 12.37% & 11.62% of the **Railway IDT route** in case of Airtel, BSNL, RJIL and VIL respectively. {refer **figure- 159 to 162** as per the **Section 6.1** under Para-6 (Annexure)}

QoS Performance Analysis- Himachal 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 Himachal Pradesh LSA during the month of May-2026 covering city drive, hotspots, walk test, highway and railway. (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	367	414	366
Call Setup Success Rate %	97.82	96.14	98.36
Drop Call Rate %	2.23	8.54	2.22
Call Setup Time-Average (Second)	3.33	3.70	4.20
Handover Success Rate %	98.87	99.11	94.79

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

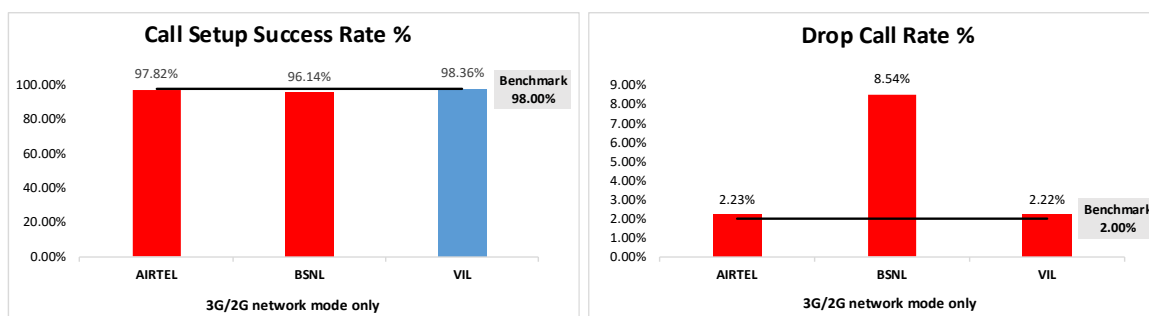


Figure-2: Call setup success rate and drop call rate performance.

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	80	NA
2G	376	183	191

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	534	631	539	547
Call Setup Success Rate %	99.63	84.63	99.44	98.17
Drop Call Rate %	0.38	15.17	0.56	4.47
Call Setup Time-Average (Second)	1.29	2.71	0.71	1.69
Handover Success Rate %	99.93	99.62	99.92	99.54

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

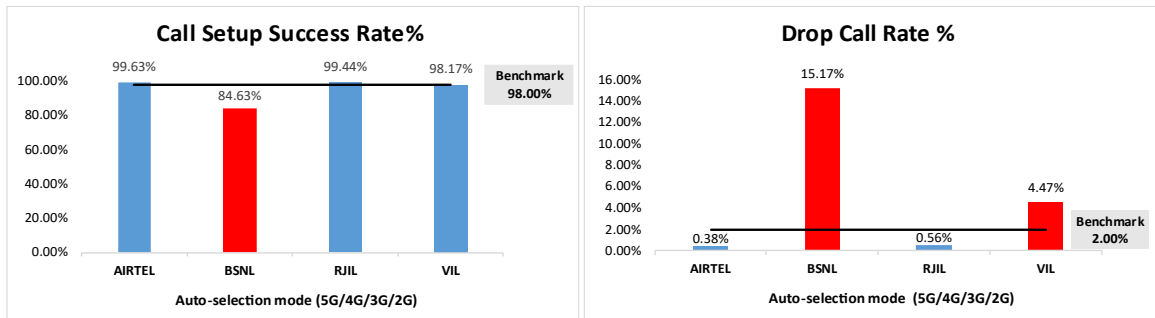


Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	365	293	369	370
Number of silences call for >4 Sec	7	14	6	5
Silence Call Rate %	1.92	4.78	1.63	1.35
Number of silence instances for >4 Sec	10	19	6	5
Number of silence instances for >3 Sec	18	31	10	10
Number of silence instances for >2 sec	29	49	24	33
RTP Jitter (4G & 5G) in ms	3.86	6.74	14.72	14.06
Packet loss Rate Downlink %	1.03	6.26	1.33	2.15
Packet loss Rate Uplink %	1.11	4.50	1.52	1.37

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	629	0
4G	1300	569	872	604
3G	NA	64	NA	NA
2G	3	149	NA	111

Table-7: 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.

(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	2557	1634	2517	2365
Speech Quality (Average MOS)	3.95	2.87	4.46	3.73
Number of samples with MOS ≥ 4 to < 5 (Excellent)	2070	453	2199	1429
Number of samples with MOS ≥ 3 to < 4 (Good)	367	225	179	591
Number of samples with MOS ≥ 2 to < 3 (Fair)	40	584	63	141
Number of samples with MOS ≥ 1 to < 2 (Poor)	80	372	76	204
%age of samples with MOS ≥ 4 to < 5 (Excellent)	80.95%	27.72%	87.37%	60.42%
%age of samples with MOS ≥ 3 to < 4 (Good)	14.35%	13.77%	7.11%	24.99%
%age of samples with MOS ≥ 2 to < 3 (Fair)	1.56%	35.74%	2.50%	5.96%
%age of samples with MOS ≥ 1 to < 2 (Poor)	3.13%	22.77%	3.02%	8.63%

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

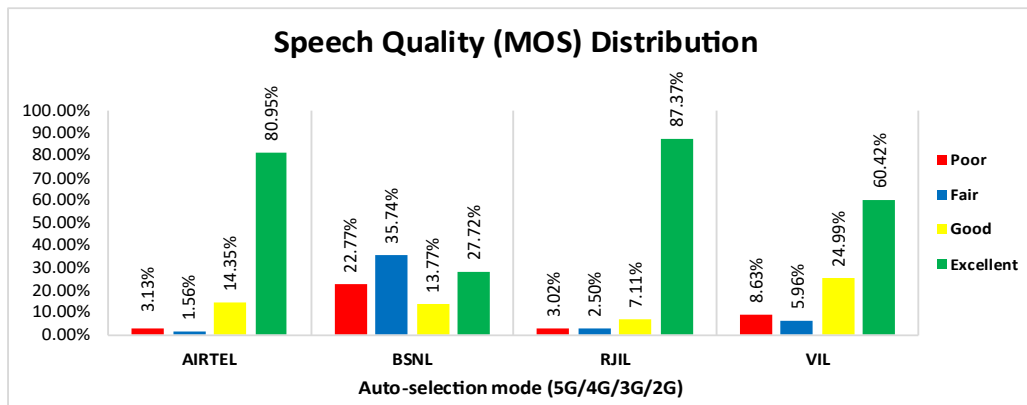


Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance: To check the performance of inter-service providers call setup success rate, total 13 to 15 inter operator calls were attempted at one location which is Near Neelam Hotel and Restaurant Bilaspur. 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	100.00	100.00	100.00
BSNL	100.00	NA	100.00	100.00
RJIL	100.00	100.00	NA	100.00
VIL	100.00	100.00	100.00	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	2.40	1.34	2.27
BSNL	2.59	NA	1.97	2.20
RJIL	1.96	1.67	NA	2.08
VIL	2.10	2.87	1.81	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	153.41	10.28	234.01	15.60
	80th Percentile	261.90	17.00	435.04	23.33
	20th Percentile	36.51	3.00	25.00	4.38
Upload Throughput (Mbits/s)	Average	21.36	5.72	20.80	7.51
	80th Percentile	35.90	9.85	39.93	10.92
	20th Percentile	3.90	1.59	2.60	2.33
Latency (ms)	50th Percentile	45.08	29.09	26.48	44.65

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

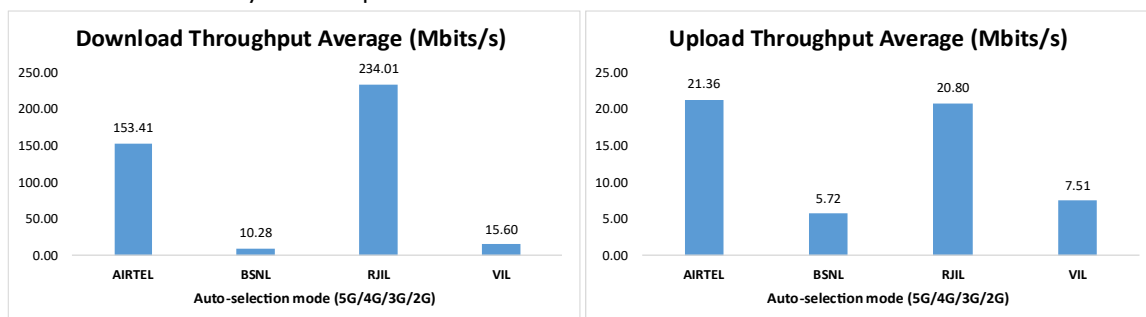


Figure- 5: Download and Upload throughput.

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	643	0
4G	1104	580	539	561
3G	NA	28	NA	NA
2G	0	14	NA	37

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, walktest, highway and railway 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 13th May 2026 to 15th May 2026 in Hamirpur and Bilaspur city. (Refer Table-1)

4.2.1 Hamirpur City

4.2.1.1 Drive test route

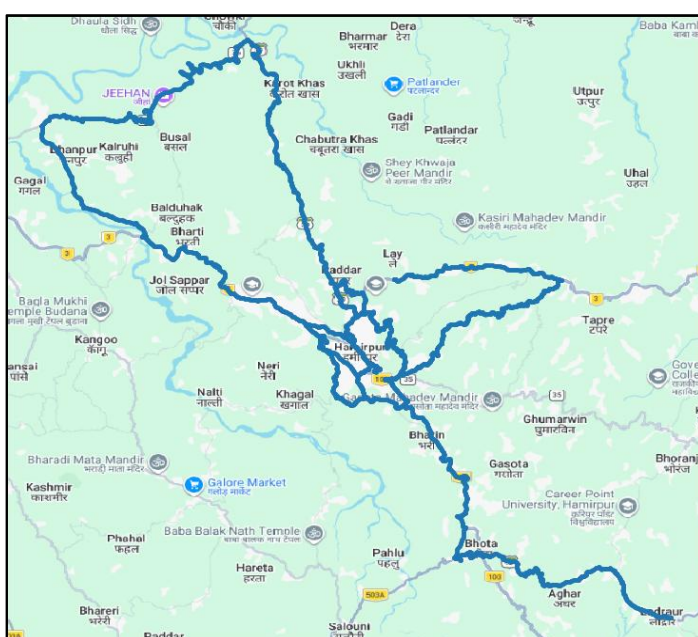


Figure- 6: Drive test routes

4.2.1.2 Areas covered

Dhanpur, Jeehan, Karot Khas, Bharti, Paddar, Bharin, Bhota, Aghar and Ladraur 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	141	147	141
Call Setup Success Rate %	100.00	98.64	100.00
Drop Call Rate %	0.00	4.14	0.71
Call Setup Time-Average (Second)	3.16	3.09	4.00
Handover Success Rate %	98.64	100.00	94.42

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

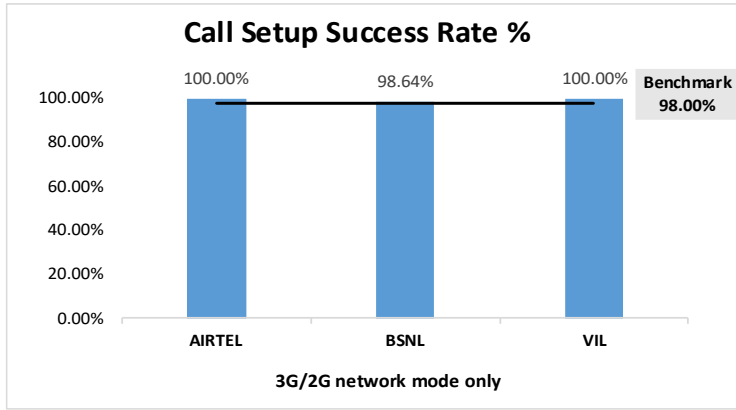


Figure-7: Performance for call setup success rate.

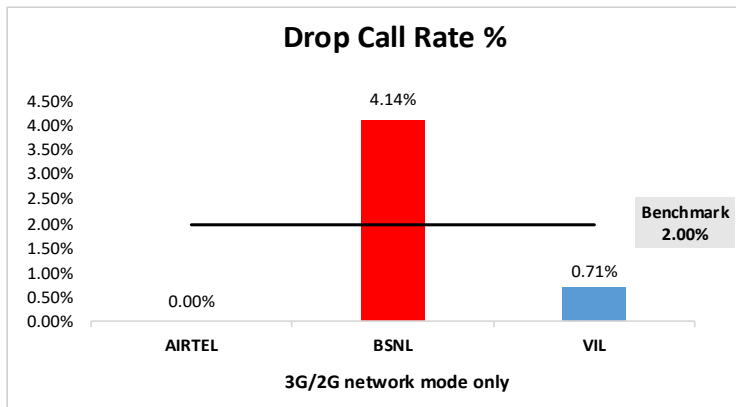


Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	60.74%	NA
2G	99.64%	39.08%	99.40%
Limited Service	0.36%	0.18%	0.60%

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

Note-

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

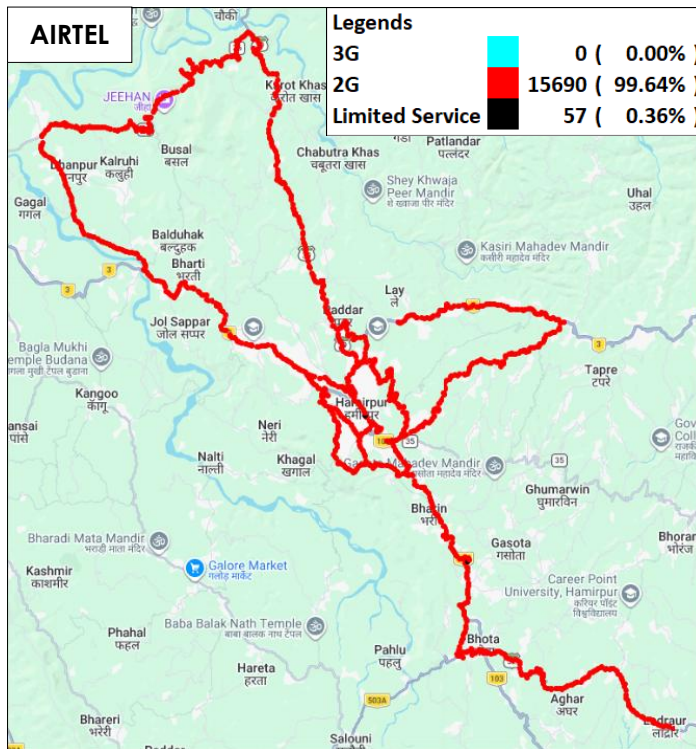


Figure-9: Serving technology plots 3G/2G network mode - AIRTEL

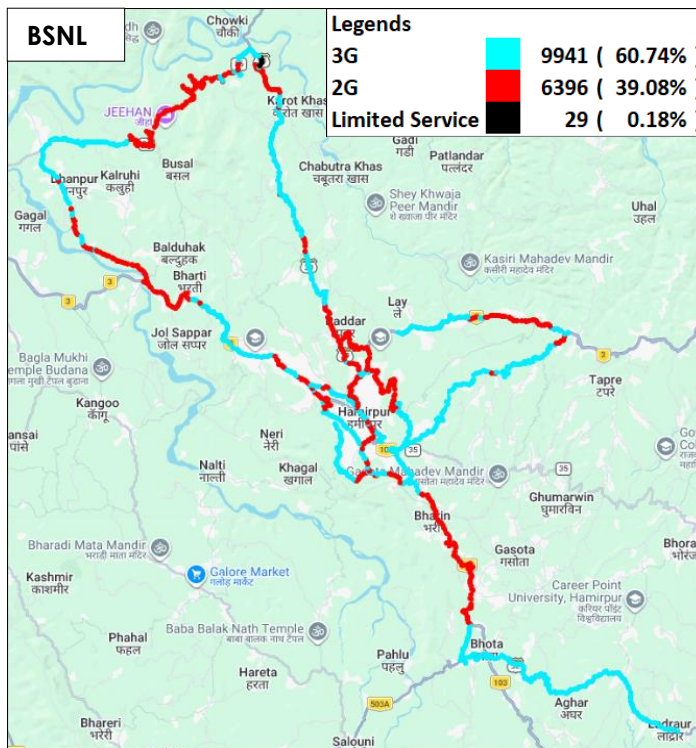


Figure-10: Serving technology plots 3G/2G network mode - BSNL.

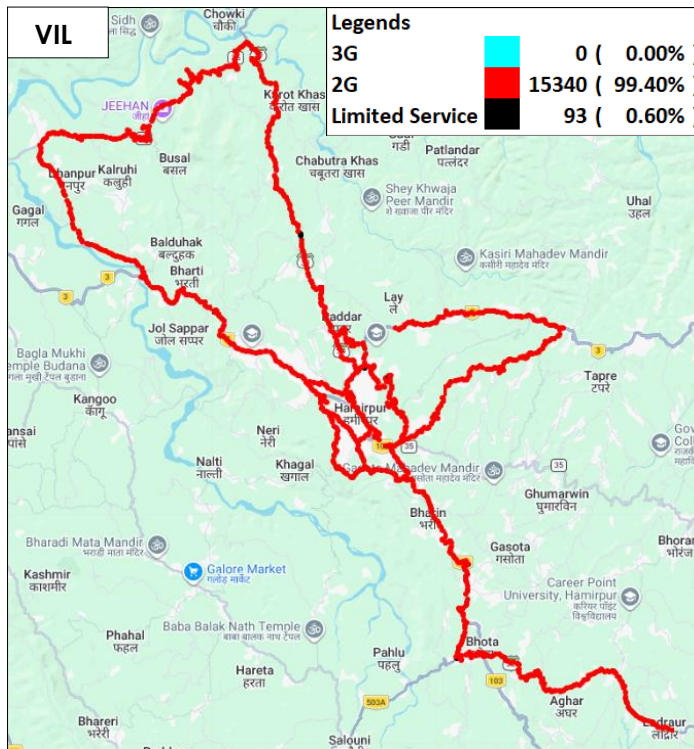


Figure-11: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 111, 112 & 113 for map view)

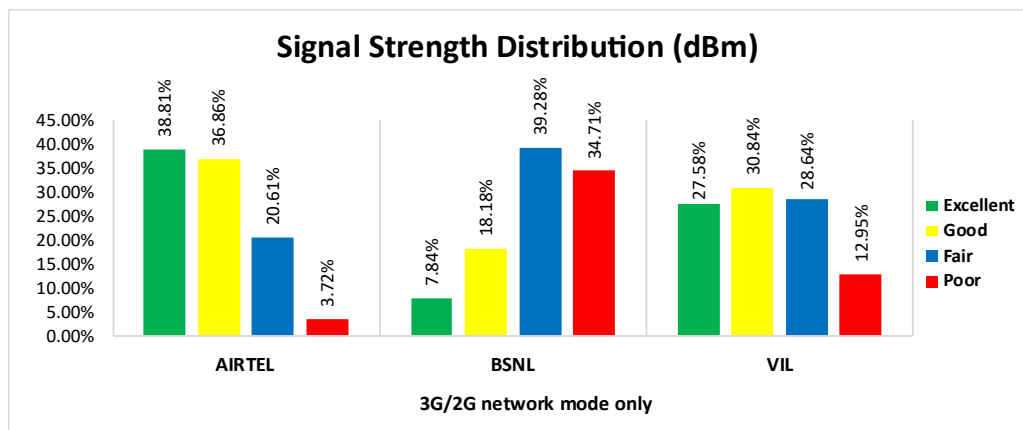


Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 39% of samples falling in the excellent signal strength category.
- BSNL has 8% of samples falling in the excellent signal strength category.
- VIL has 28% 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	148	162	149	149
Call Setup Success Rate %	100.00	93.21	99.33	99.33
Drop Call Rate %	0.00	11.92	0.00	0.68
Call Setup Time Average (Second)	1.22	2.26	0.76	1.38
Handover Success Rate %	99.90	99.47	99.92	100.00

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

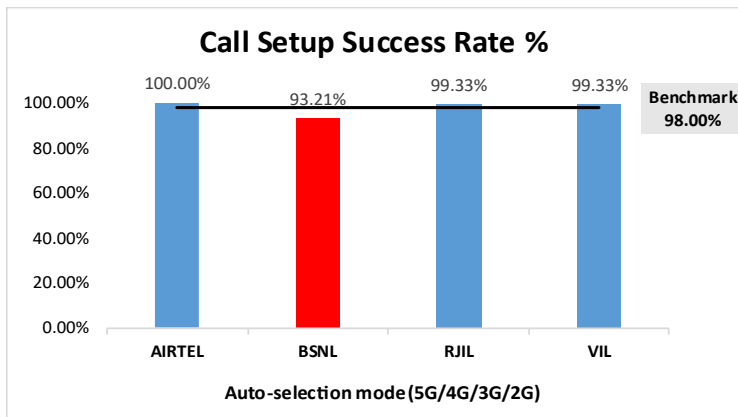


Figure-13: Performance for call setup success rate.

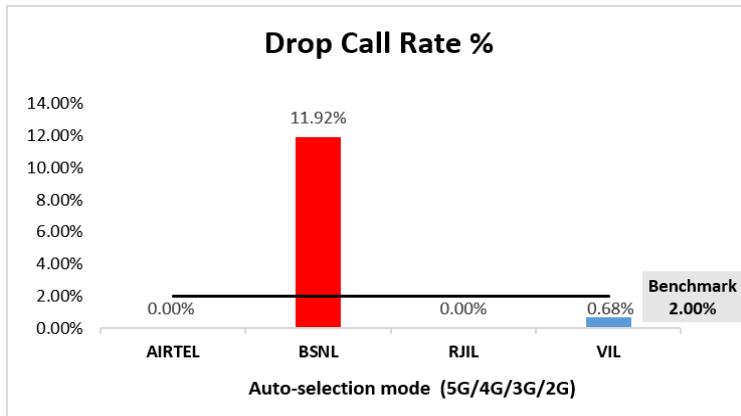


Figure-14: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	143	118	143	145
Number of silences call for >4 Sec	3	5	2	0
Silence Call Rate %	2.10	4.24	1.40	0.00
Number of silence instances for >4 Sec	3	5	2	0
Number of silence instances for >3 Sec	5	12	4	1
Number of silence instances for >2 sec	7	19	9	13
RTP Jitter (4G & 5G) in ms	3.78	6.64	14.93	13.75
Packet loss Rate Downlink %	0.68	4.50	0.89	0.97
Packet loss Rate Uplink %	0.60	3.57	0.95	0.73

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	847	592	826	833
Speech Quality (Average MOS)	3.96	3.18	4.46	3.94
Number of samples with MOS >=4 to <5 (Excellent)	699	237	719	572
Number of samples with MOS >=3 to <4 (Good)	112	102	60	211
Number of samples with MOS >=2 to <3 (Fair)	15	148	25	24
Number of samples with MOS >=1 to <2 (Poor)	21	105	22	26
%age of samples with MOS >=4 to <5 (Excellent)	82.53%	40.03%	87.05%	68.67%
%age of samples with MOS >=3 to <4 (Good)	13.22%	17.23%	7.26%	25.33%
%age of samples with MOS >=2 to <3 (Fair)	1.77%	25.00%	3.03%	2.88%
%age of samples with MOS >=1 to <2 (Poor)	2.48%	17.74%	2.66%	3.12%

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

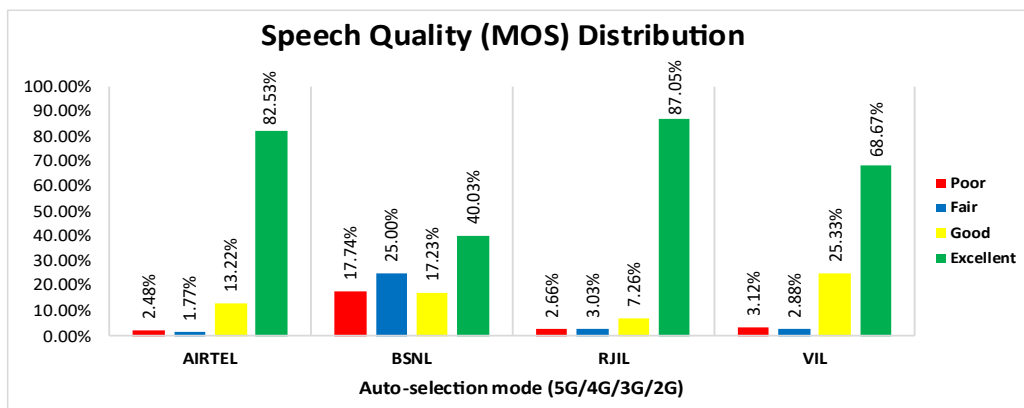


Figure-15: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	1.22%	NA	67.84%	NA
4G	98.78%	78.50%	32.16%	96.00%
3G	NA	13.18%	NA	NA
2G	0.00%	7.83%	NA	4.00%
Limited Service	0.00%	0.49%	0.00%	0.00%

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.

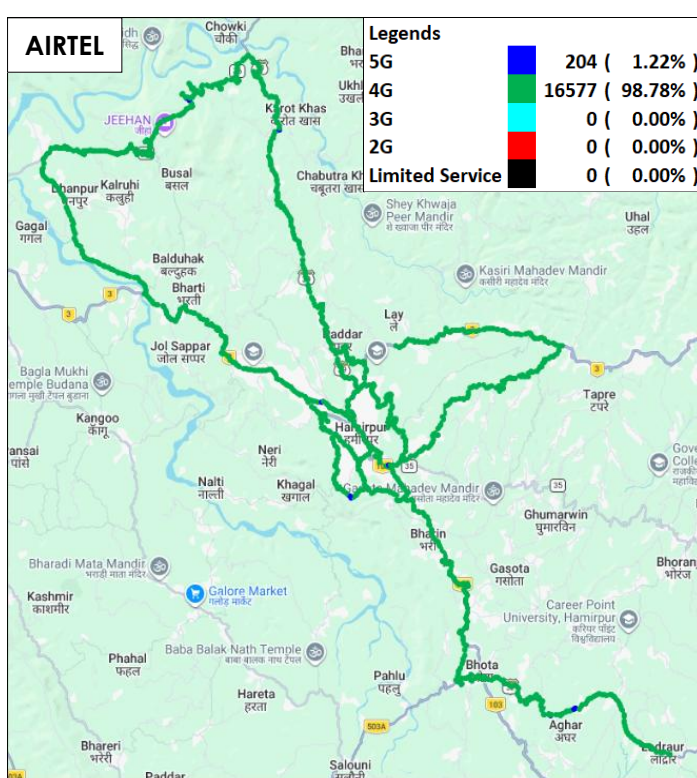


Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

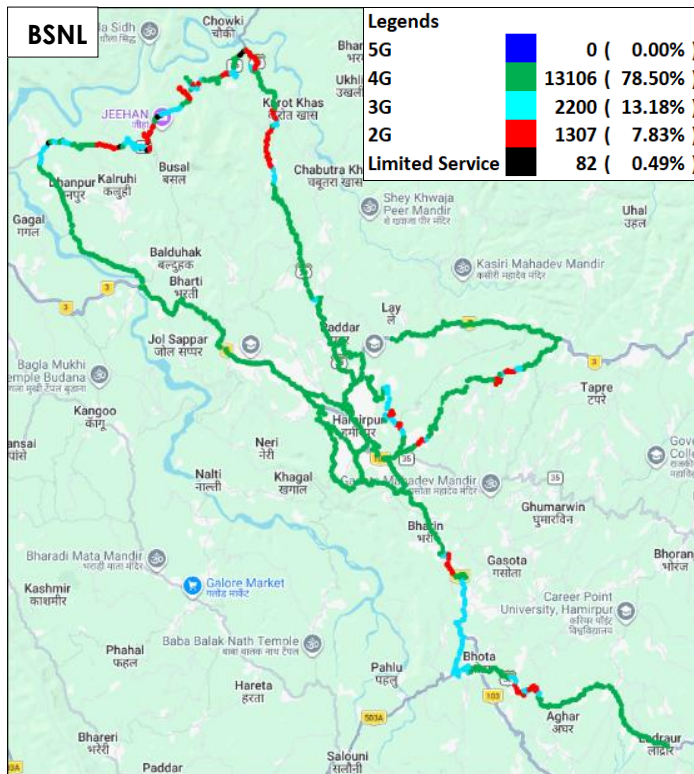


Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

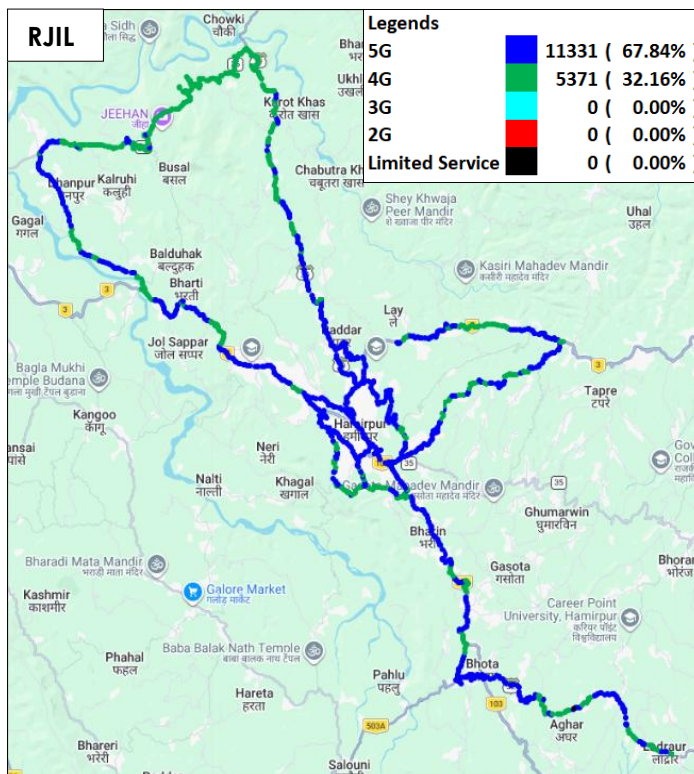


Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

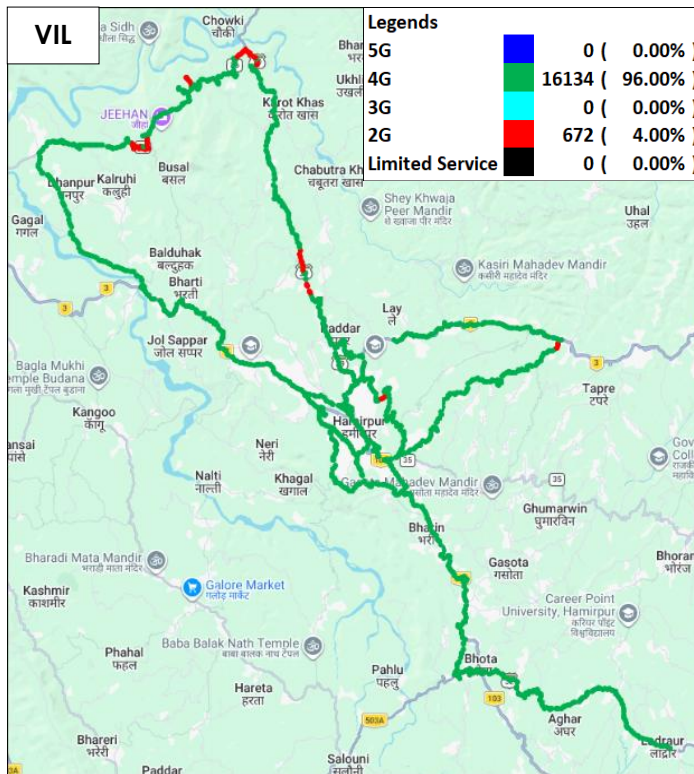


Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-114, 115, 116 & 117 for map view)

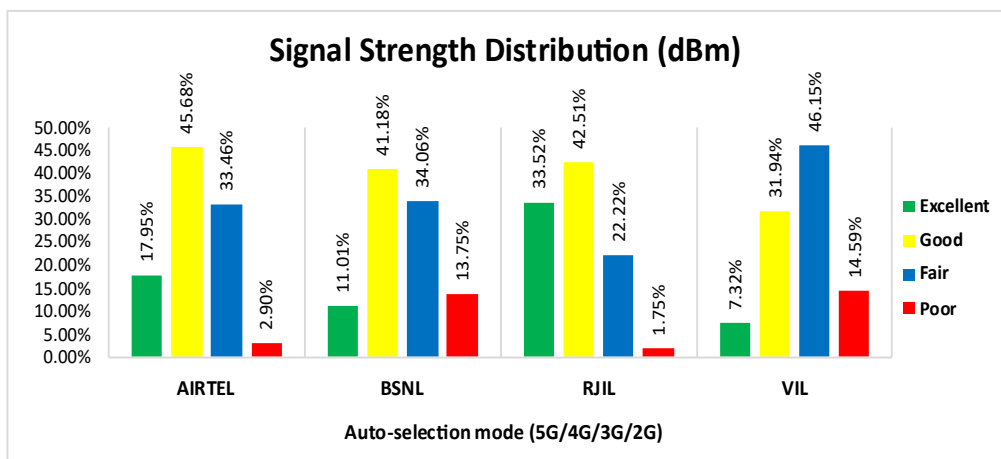


Figure-20: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 18% of samples falling in the excellent signal strength category.
- BSNL has 11% of samples falling in the excellent signal strength category.
- RJIL has 34% of samples falling in the excellent signal strength category.
- VIL has 7% 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	171.15	11.29	243.12	13.51
	80th Percentile	269.19	16.98	416.30	20.28
	20th Percentile	73.55	3.10	27.31	5.43
Upload Throughput (Mbits/s)	Average	18.38	4.81	19.81	6.35
	80th Percentile	32.54	7.58	39.37	8.95
	20th Percentile	3.43	1.67	3.20	3.07
Latency (ms)	50th Percentile	46.70	29.19	28.11	46.83

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

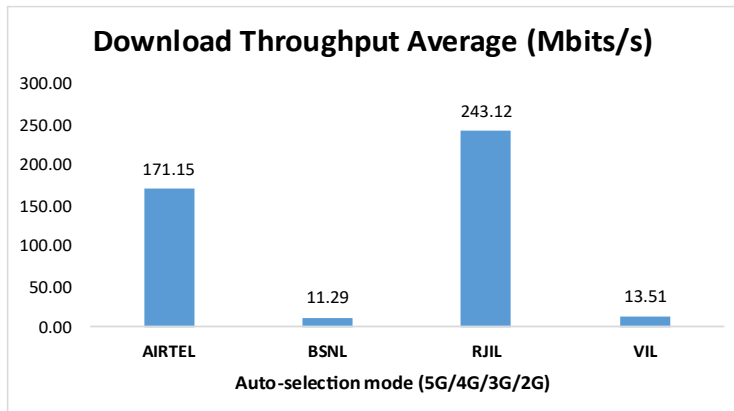


Figure- 21: Download throughput.

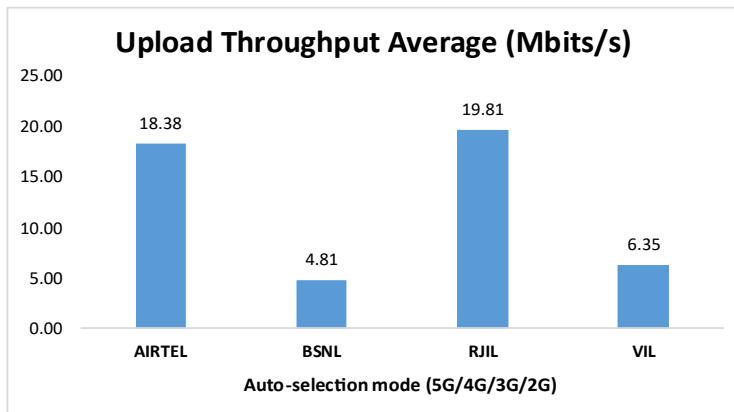


Figure- 22: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	75.45%	NA	73.12%	NA
4G	23.98%	92.27%	26.88%	99.23%
3G	NA	4.62%	NA	NA
2G	0.00%	0.20%	NA	0.61%
Limited Service	0.57%	2.90%	0.00%	0.16%

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.

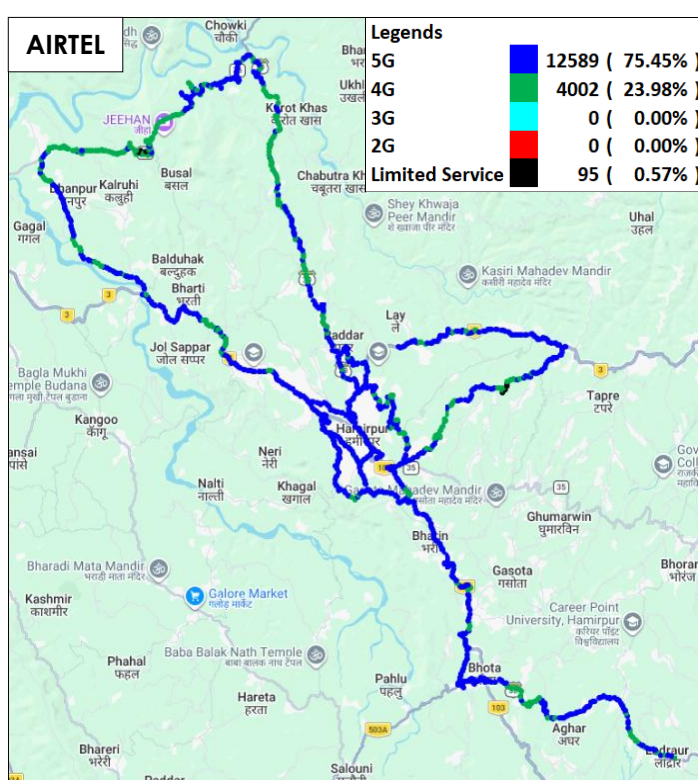


Figure-23: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

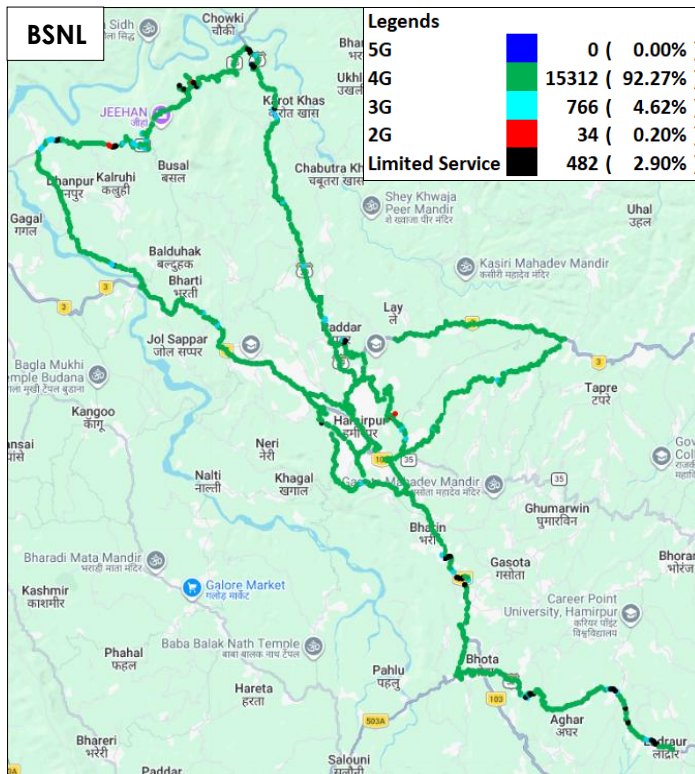


Figure-24: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

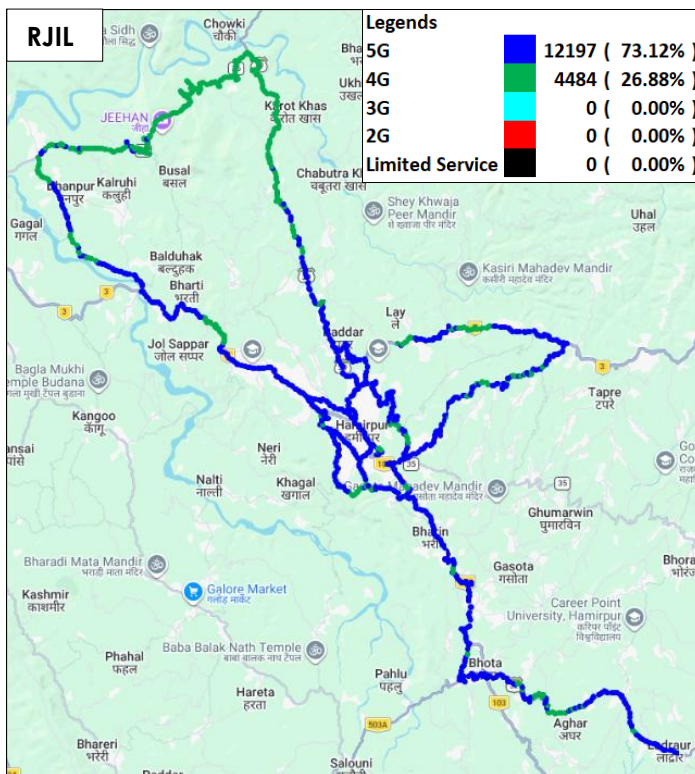


Figure-25: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

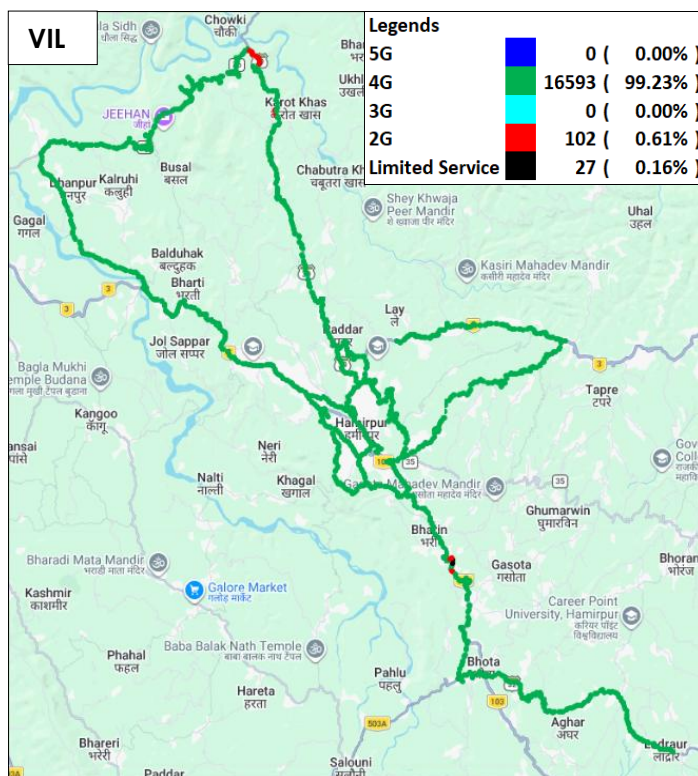


Figure-26: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-118, 119, 120 & 121 for map view)

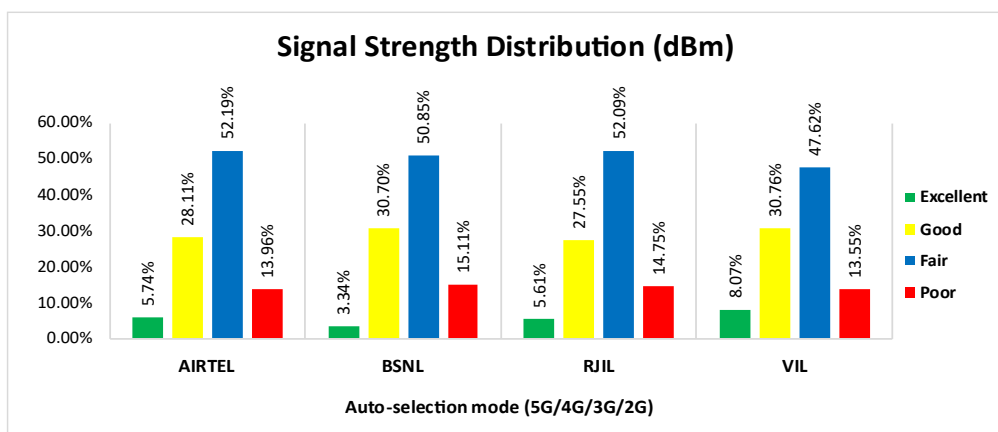


Figure-27: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 6% of samples falling in the excellent signal strength category.
- BSNL has 3% of samples falling in the excellent signal strength category.
- RJIL has 6% of samples falling in the excellent signal strength category.
- VIL has 8% of samples falling in the excellent signal strength category.

4.2.2 Bilaspur City

4.2.2.1 Drive test route

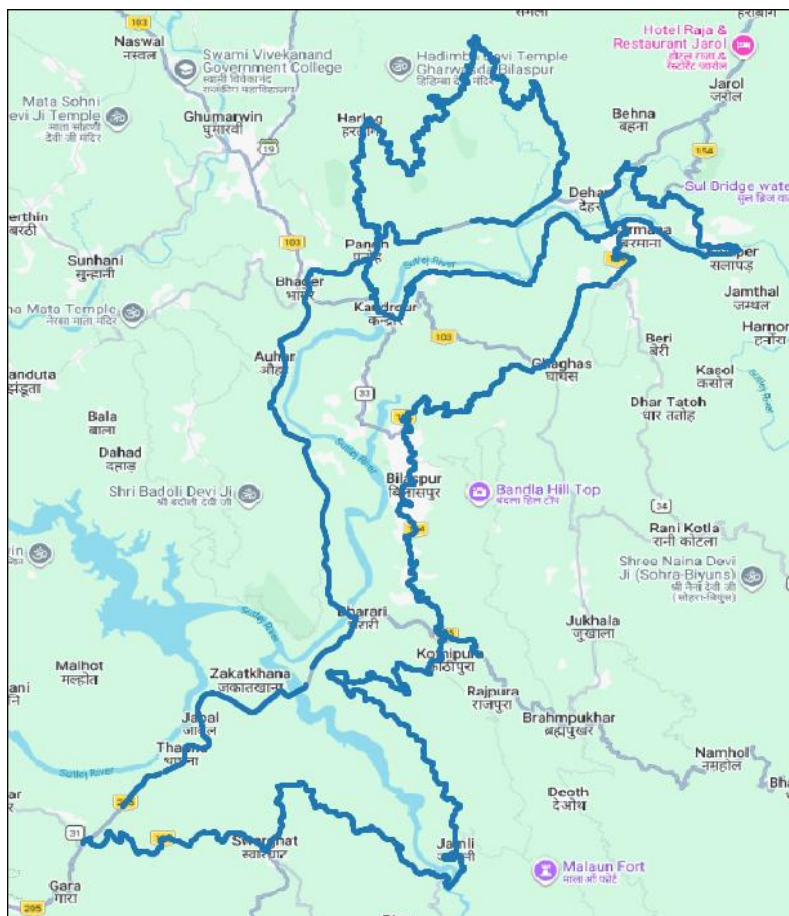


Figure- 28: Drive test routes

4.2.2.2 Areas covered

Harlog, Bhager, Auhar, Bharari, Zakatkhana, Jabal, Thapna, Swarghat, Jamli, Kothipura, Ghaghas, Dehar and Salaper 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	168	185	164
Call Setup Success Rate %	95.83	96.22	98.17
Drop Call Rate %	4.35	12.92	2.48
Call Setup Time-Average (Second)	3.27	4.00	4.28
Handover Success Rate %	98.20	96.97	91.43

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

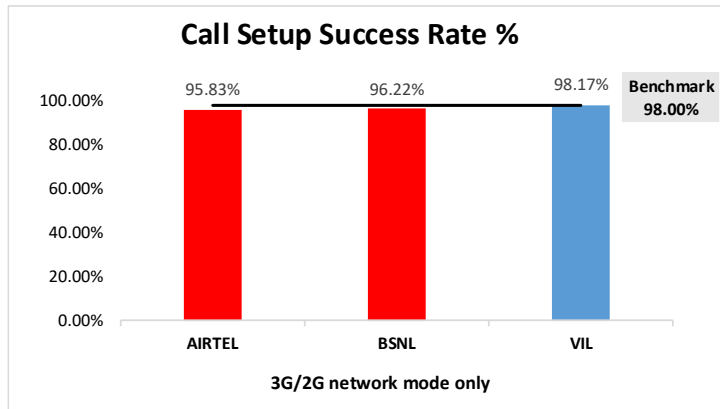


Figure-29: Performance for call setup success rate.

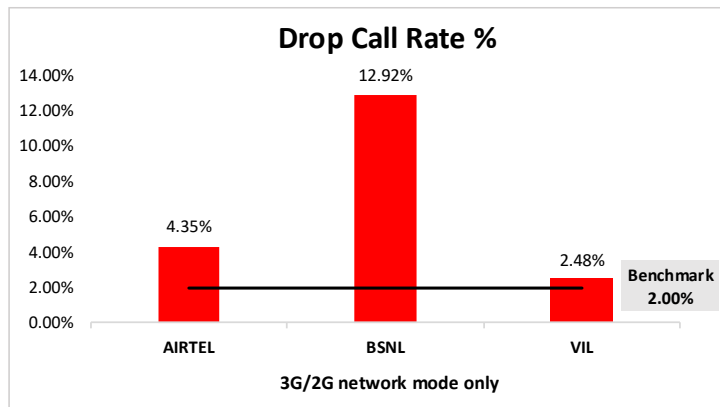


Figure-30: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	22.25%	NA
2G	99.11%	77.36%	99.06%
Limited Service	0.89%	0.39%	0.94%

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

Note-

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

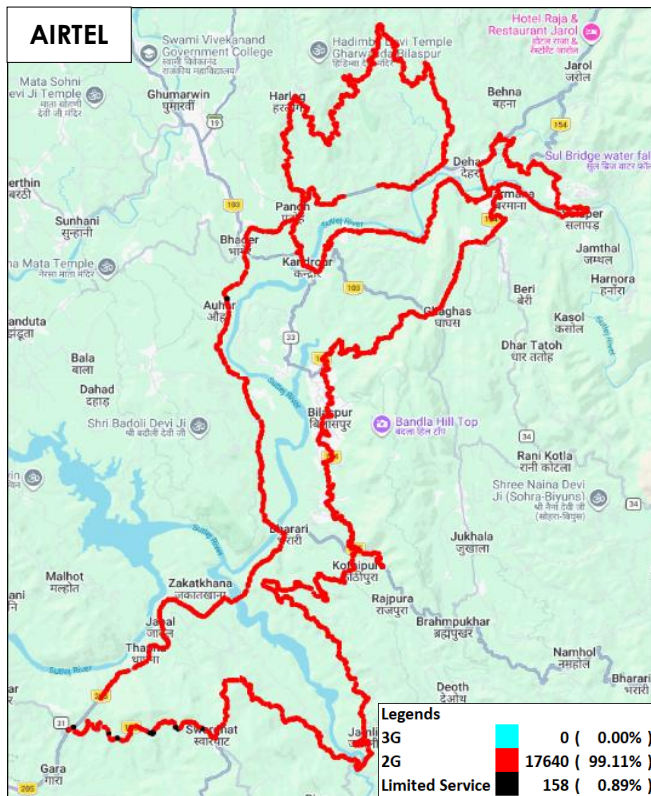


Figure-31: Serving technology plots 3G/2G network mode - AIRTEL.

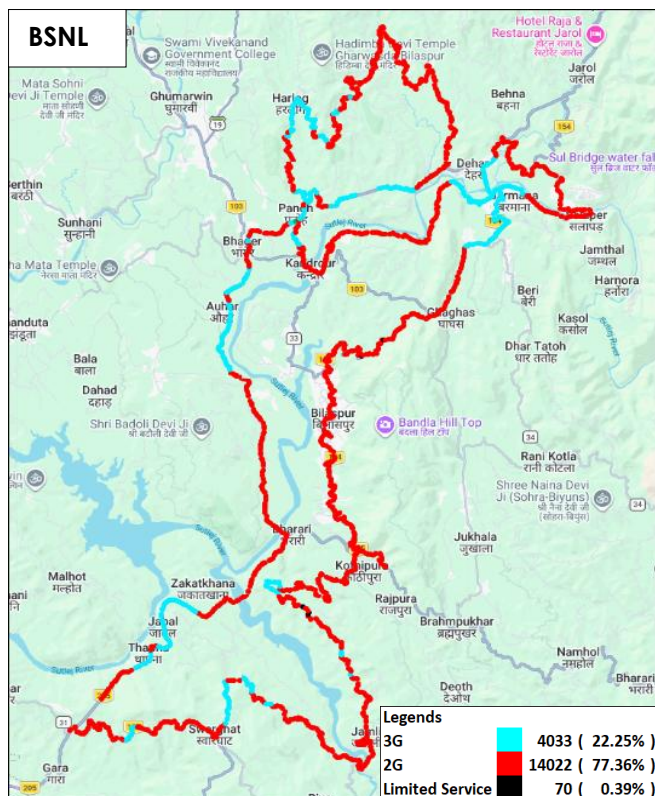


Figure-32: Serving technology plots 3G/2G network mode - BSNL.

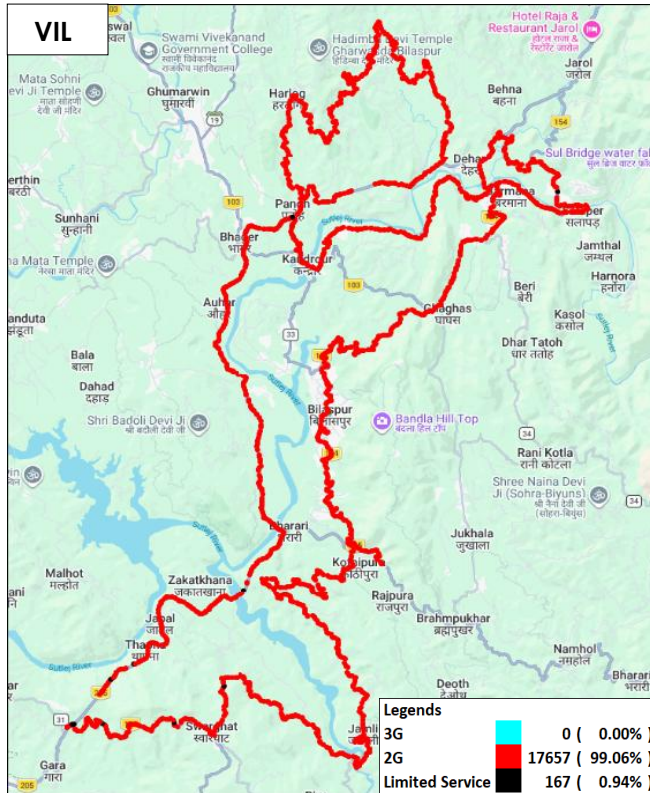


Figure-33: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 122, 123 & 124 for map view)

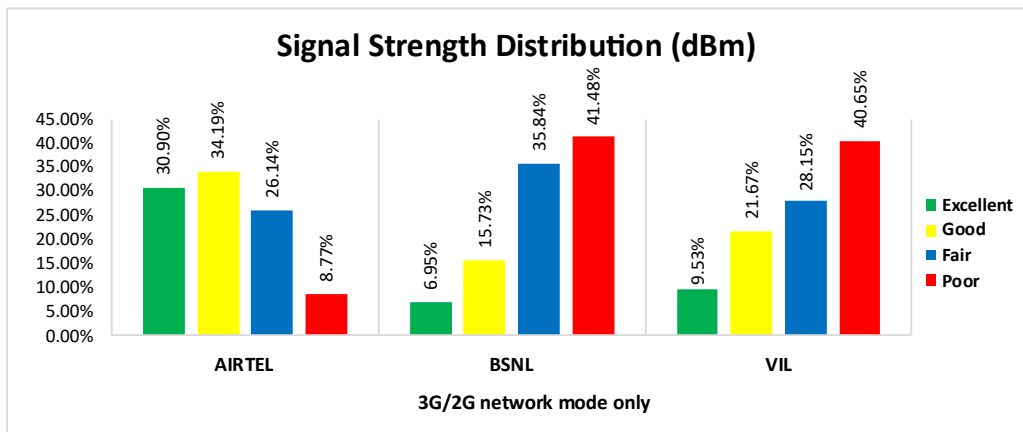


Figure-34: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 31% of samples falling in the excellent signal strength category.
- BSNL has 7% of samples falling in the excellent signal strength category.
- VIL has 10% 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	172	205	175	175
Call Setup Success Rate %	98.84	77.56	98.86	97.14
Drop Call Rate %	1.18	18.24	1.73	6.47
Call Setup Time Average (Second)	1.30	4.02	0.81	2.06
Handover Success Rate %	100.00	99.81	99.94	98.92

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

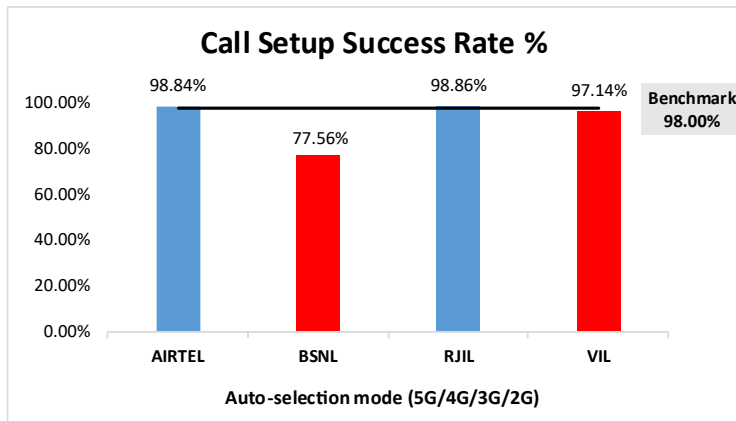


Figure-35: Performance for call setup success rate.

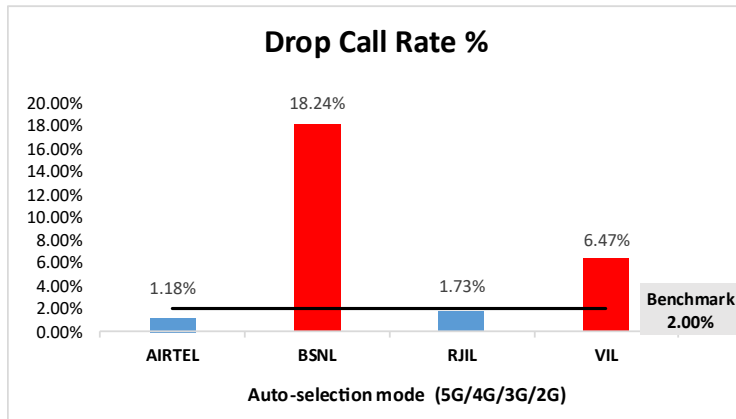


Figure-36: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	163	100	167	164
Number of silences call for >4 Sec	3	2	2	4
Silence Call Rate %	1.84	2.00	1.20	2.44
Number of silence instances for >4 Sec	5	5	2	4
Number of silence instances for >3 Sec	10	6	4	7
Number of silence instances for >2 sec	16	8	7	17
RTP Jitter (4G & 5G) in ms	3.84	6.12	14.11	13.97
Packet loss Rate Downlink %	1.36	7.48	1.49	3.70
Packet loss Rate Uplink %	1.59	4.68	2.05	2.36

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	956	424	962	862
Speech Quality (Average MOS)	3.93	2.68	4.45	3.75
Number of samples with MOS >=4 to <5 (Excellent)	774	77	837	528
Number of samples with MOS >=3 to <4 (Good)	131	40	73	212
Number of samples with MOS >=2 to <3 (Fair)	12	209	22	49
Number of samples with MOS >=1 to <2 (Poor)	39	98	30	73
%age of samples with MOS >=4 to <5 (Excellent)	80.96%	18.16%	87.01%	61.25%
%age of samples with MOS >=3 to <4 (Good)	13.70%	9.43%	7.59%	24.59%
%age of samples with MOS >=2 to <3 (Fair)	1.26%	49.29%	2.29%	5.68%
%age of samples with MOS >=1 to <2 (Poor)	4.08%	23.11%	3.12%	8.47%

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

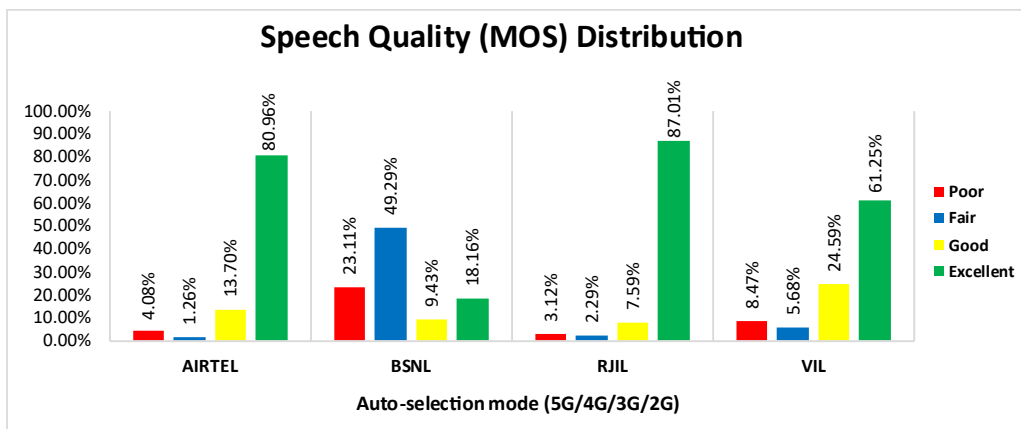


Figure-37: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	1.02%	NA	43.40%	NA
4G	97.83%	48.59%	56.25%	76.21%
3G	NA	8.91%	NA	NA
2G	0.49%	39.57%	NA	22.61%
Limited Service	0.66%	2.92%	0.35%	1.18%

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.

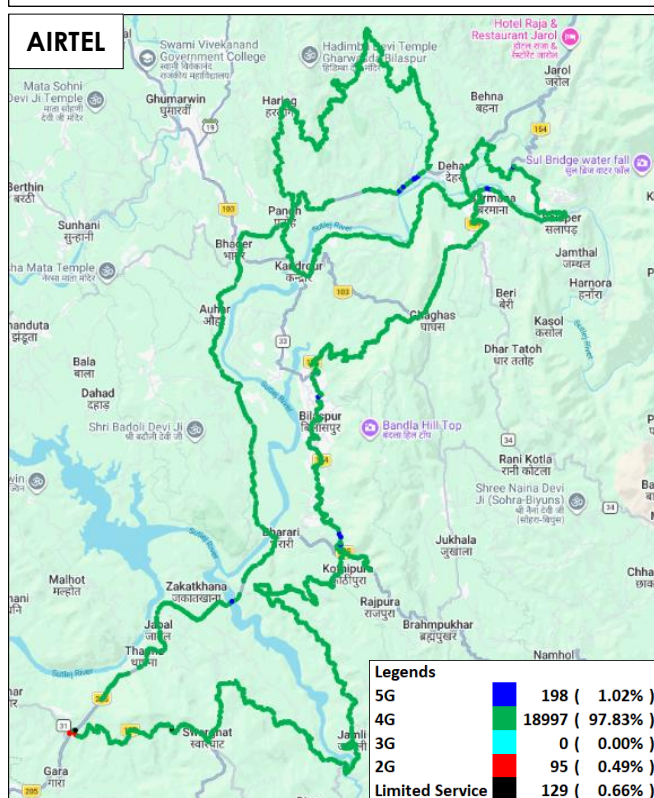


Figure-38: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

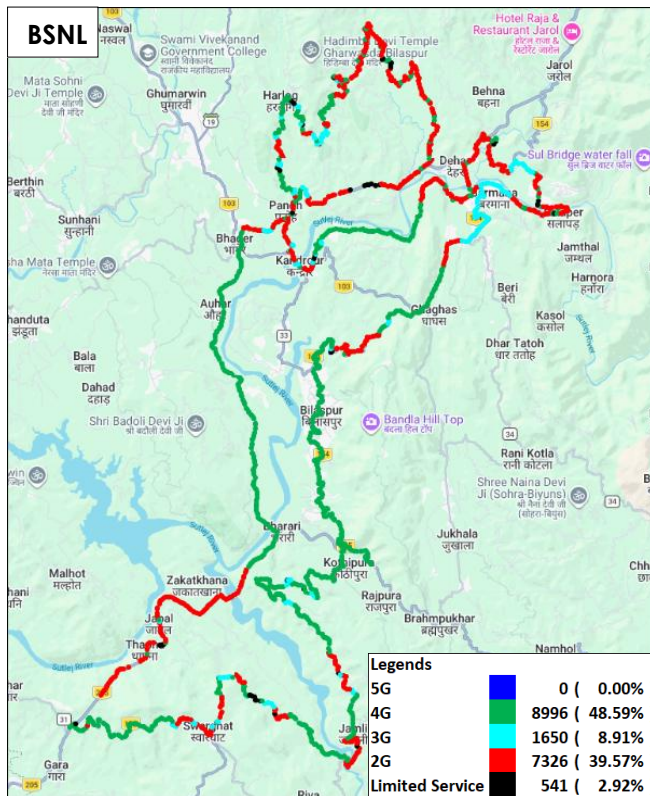


Figure-39: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

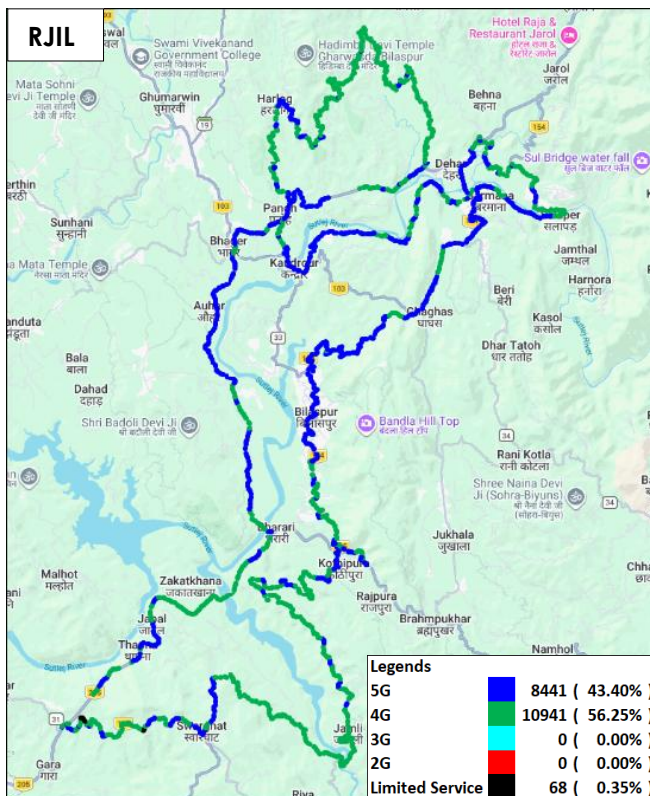


Figure-40: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

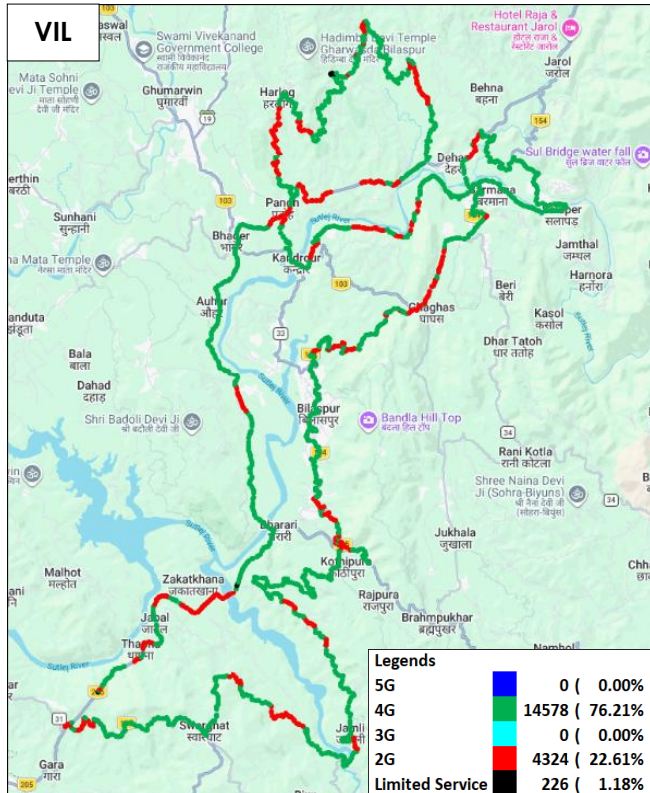


Figure-41: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-125, 126, 127 & 128 for map view)

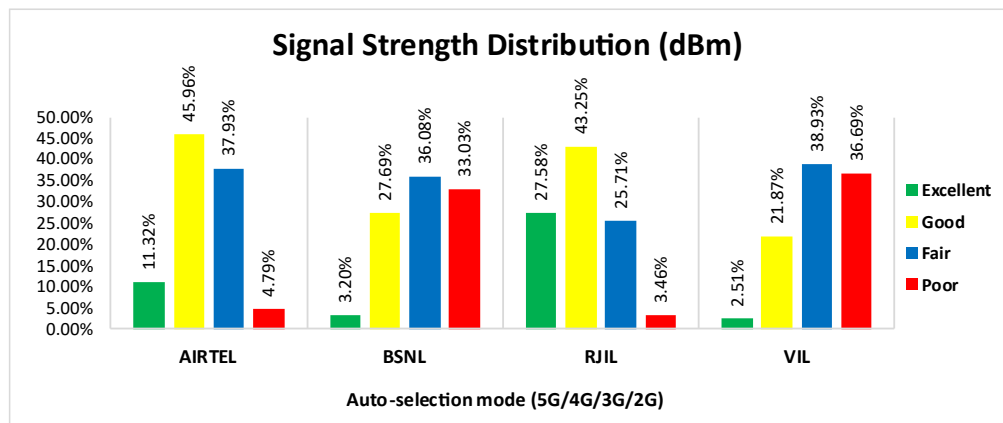


Figure-42: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 11% of samples falling in the excellent signal strength category.
- BSNL has 3% of samples falling in the excellent signal strength category.
- RJIL has 28% of samples falling in the excellent signal strength category.
- VIL has 3% of samples falling in the excellent signal strength category.

4.2.2.4 Data performance

(a) 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	87.49	6.92	172.19	13.62
	80th Percentile	135.75	10.28	321.69	24.98
	20th Percentile	14.71	1.30	11.75	1.40
Upload Throughput (Mbits/s)	Average	11.82	3.78	14.45	3.96
	80th Percentile	16.60	5.49	30.58	6.69
	20th Percentile	2.70	1.22	1.55	1.22
Latency (ms)	50th Percentile	47.22	30.60	28.66	44.09

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

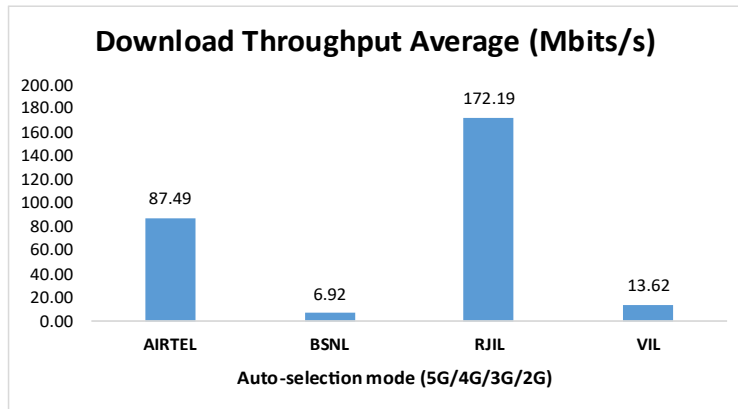


Figure- 43: Download throughput.

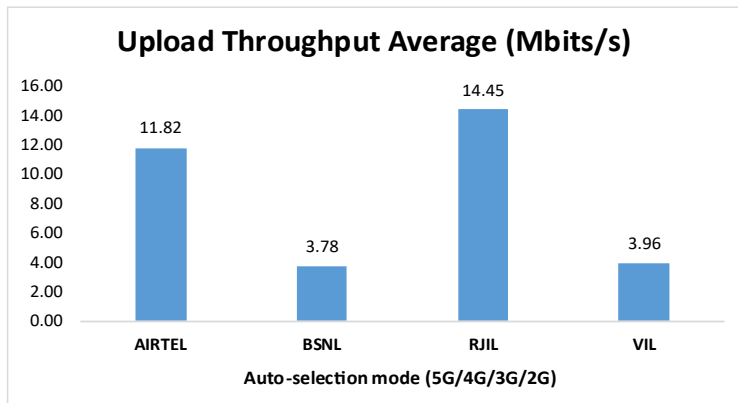


Figure- 44: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	26.18%	NA	53.78%	NA
4G	72.05%	69.67%	45.82%	89.04%
3G	NA	19.02%	NA	NA
2G	0.16%	4.77%	NA	9.64%
Limited Service	1.61%	6.54%	0.41%	1.32%

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.

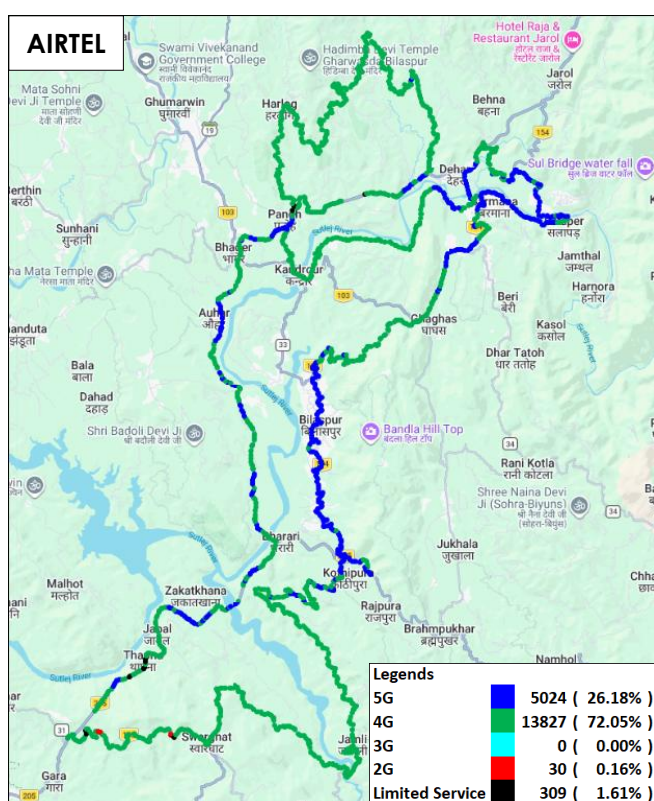


Figure-45: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

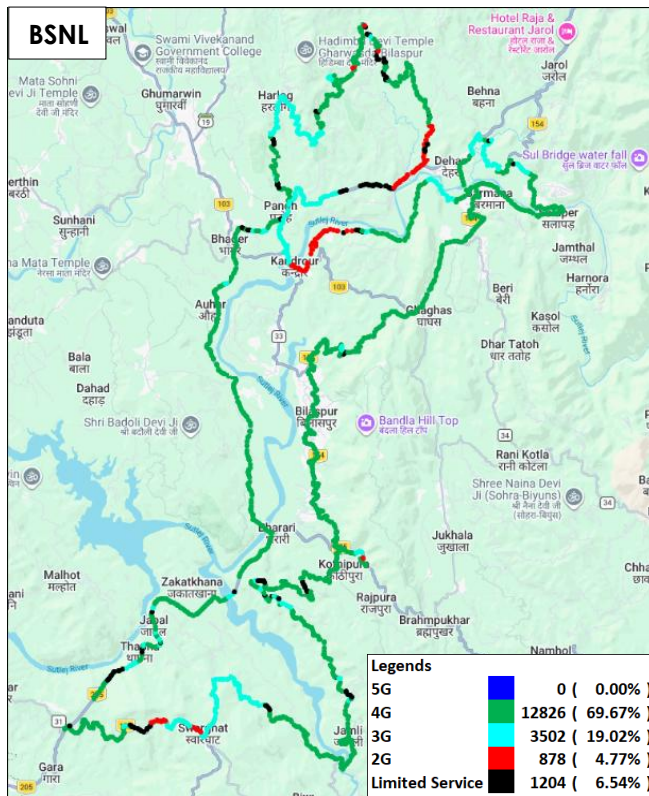


Figure-46: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

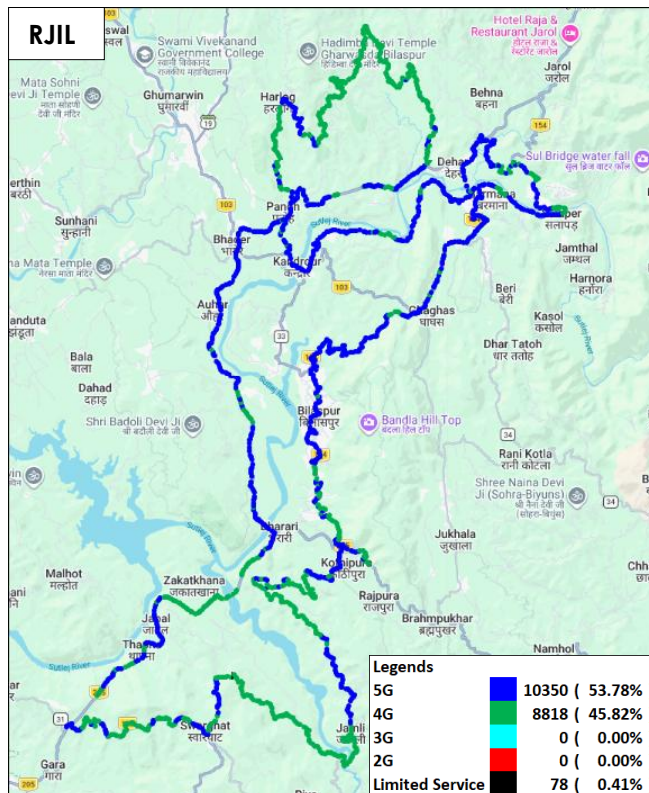


Figure-47: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

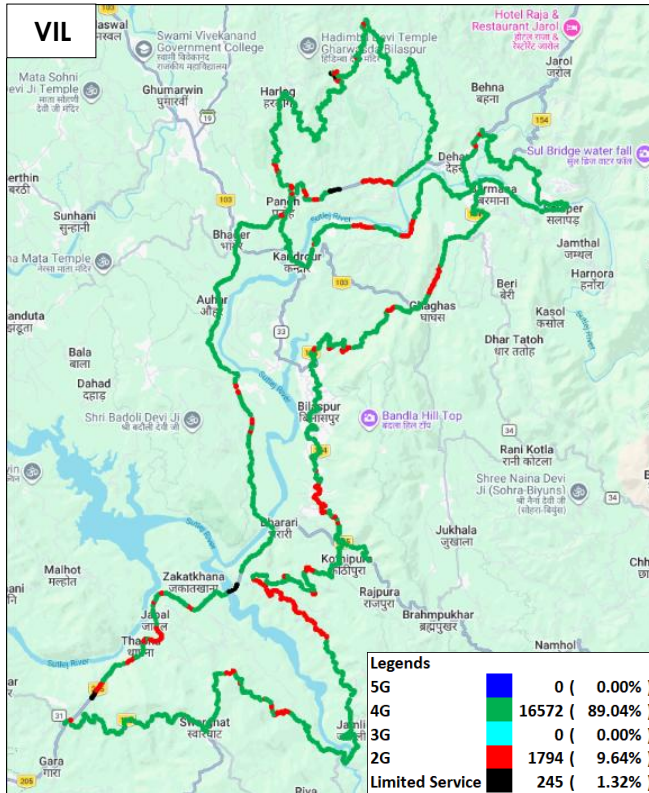


Figure-48: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-129, 130, 131 & 132 for map view)

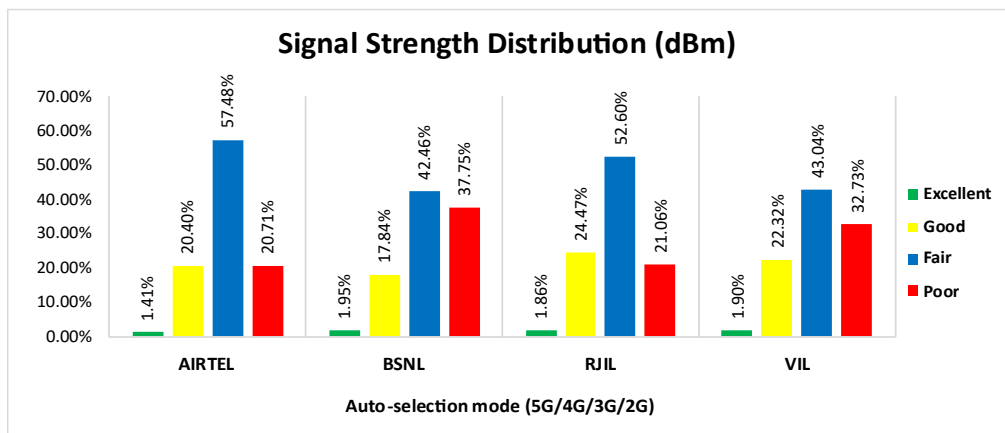


Figure-49: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 1% of samples falling in the excellent signal strength category.
- BSNL has 2% of samples falling in the excellent signal strength category.
- RJIL has 2% of samples falling in the excellent signal strength category.
- VIL has 2% of samples falling in the excellent signal strength category.

4.3 Hotspots

Hotspot testing has been conducted on 13th May 2026 & 15th May 2026. Eight locations have been tested in Hamirpur & Bilaspur cities. (Refer Table-1)

4.3.1 Locations

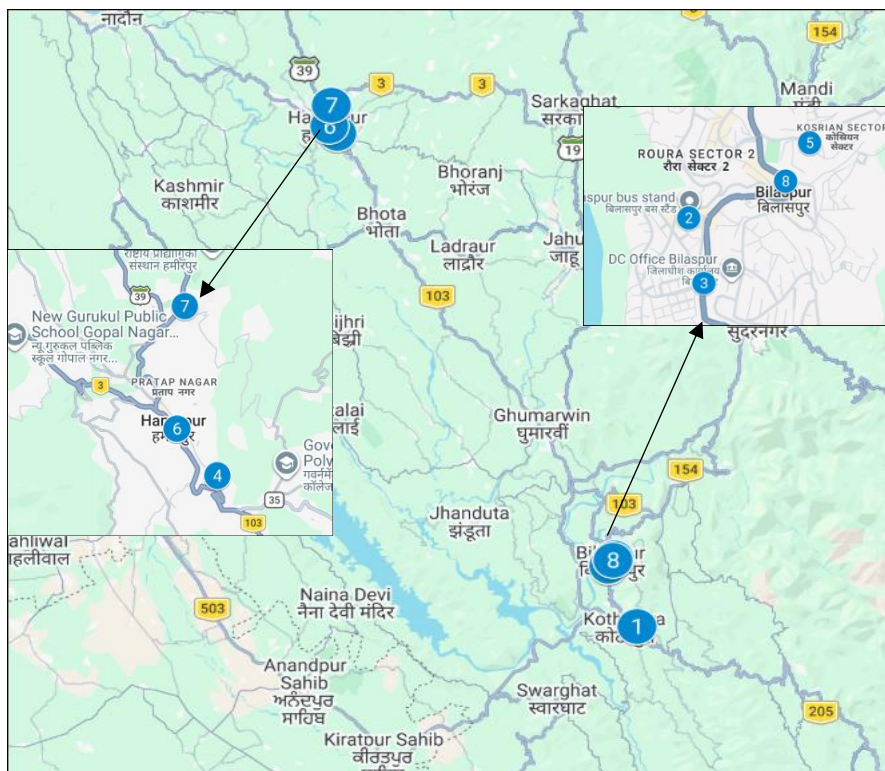


Figure- 50: Hotspot locations.

4.3.2 Hotspot covered

1. AIIMS Bilaspur
2. Bilaspur Bus Stand
3. DC Office Bilaspur
4. Dr Radhakrishnan Govt Medical College Hospital, Hamirpur
5. Government Post Graduate College Bilaspur
6. ISBT Hamirpur
7. National Institute of Technology, Hamirpur
8. Purnam Mall Bilaspur

4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	80	80	80	80
Call Setup Success Rate %	100.00	86.25	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.20	1.45	0.55	1.05

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

AIIMS Bilaspur				
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	90.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.15	2.00	0.72	0.95

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

Bilaspur 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)	1.23	1.34	0.52	0.95

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

DC Office Bilaspur				
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	1.25	0.48	1.33

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

Dr Radhakrishnan Govt Medical College Hospital, Hamirpur				
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	60.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.24	1.37	0.53	1.26

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

Government Post Graduate College Bilaspur				
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	40.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.14	1.09	0.58	1.11

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

ISBT Hamirpur				
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)	1.20	1.56	0.56	0.84

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

National Institute of Technology, Hamirpur				
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)	1.18	1.41	0.50	1.09

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

Purnam Mall Bilaspur				
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	1.36	0.53	0.86

Table-37: 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)	219.93	16.94	426.73	13.77
Download Throughput 80th Percentile (Mbit/s)	303.10	24.37	554.07	24.33
Download Throughput 20th Percentile (Mbit/s)	75.15	6.18	303.20	3.58
Download Session Setup Success Rate %	100.00	95.00	100.00	100.00
Upload Throughput Average (Mbits/s)	43.68	9.54	35.98	7.55
Upload Throughput 80th Percentile (Mbit/s)	55.31	13.92	53.82	11.85
Upload Throughput 20th Percentile (Mbit/s)	27.55	4.55	8.78	5.34
Upload Session Setup Success Rate %	100.00	97.50	100.00	97.50
Web Browsing Delay (Second)	6.05	4.42	3.31	1.92
Youtube Initial Buffer Delay (Second)	2.74	1.46	1.38	1.27
Latency (ms) - 50th Percentile	41.12	28.74	25.51	44.94
Jitter (ms)	6.00	7.61	11.81	16.72
Packet Loss Rate%	8.51	13.48	0.24	3.98
Packet Loss Rate- 90th percentile	15.60	51.60	0.80	12.20

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

AIIMS Bilaspur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	264.80	6.24	337.43	19.98
Download Session Setup Success Rate %	100.00	60.00	100.00	100.00
Upload Throughput Average (Mbits/s)	28.13	5.14	13.39	6.69
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	5.85	2.25	3.28	1.68
Youtube Initial Buffer Delay (Second)	1.63	1.56	1.08	1.06
Latency (ms) - 50th Percentile	55.98	-	23.37	47.27
Jitter (ms)	8.18	-	2.66	6.92
Packet Loss Rate%	13.20	100.00	0.00	0.00

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

Note- "- "Ping tests were failed.

Bilaspur Bus Stand				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	77.47	23.39	480.10	9.61
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	51.51	10.41	31.41	8.20
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.29	5.11	2.73	1.62
Youtube Initial Buffer Delay (Second)	4.80	0.87	0.58	1.14
Latency (ms) - 50th Percentile	37.03	31.51	23.12	41.72
Jitter (ms)	7.52	3.53	4.64	4.40
Packet Loss Rate%	47.20	0.20	0.00	0.10

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

DC Office Bilaspur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	63.29	18.46	593.18	20.29
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	79.20	7.51	83.76	11.71
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	7.23	5.73	2.54	1.51
Youtube Initial Buffer Delay (Second)	2.14	1.71	0.58	0.90
Latency (ms) - 50 th Percentile	44.83	26.97	24.26	39.51
Jitter (ms)	4.36	16.47	3.66	4.77
Packet Loss Rate%	0.10	1.10	0.00	0.00

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

Dr Radhakrishnan Govt Medical College Hospital, Hamirpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	88.30	29.75	150.82	1.24
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	46.50	17.76	2.74	2.64
Upload Session Setup Success Rate %	100.00	100.00	100.00	80.00
Web Browsing Delay (Second)	8.02	5.08	5.32	13.11
Youtube Initial Buffer Delay (Second)	2.71	0.74	6.24	-
Latency (ms) - 50th Percentile	36.37	29.00	31.49	62.78
Jitter (ms)	3.00	3.28	38.63	87.56
Packet Loss Rate%	3.10	0.20	1.20	31.00

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

Note- "-" Youtube tests were failed.

Government Post Graduate College Bilaspur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	556.43	11.69	516.20	16.05
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	48.03	8.49	46.03	9.41
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.39	1.46	3.46	2.08
Youtube Initial Buffer Delay (Second)	1.04	2.92	0.53	1.21
Latency (ms)- 50th Percentile	52.85	30.16	25.80	44.48
Jitter (ms)	8.00	2.10	3.17	5.51
Packet Loss Rate%	0.20	0.40	0.10	0.10

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

ISBT Hamirpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	340.93	17.31	426.99	12.91
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	48.84	10.55	8.92	9.14
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.68	6.02	3.62	1.71
Youtube Initial Buffer Delay (Second)	3.21	1.21	0.87	1.04
Latency (ms) - 50th Percentile	44.07	35.95	31.69	43.99
Jitter (ms)	3.68	18.85	36.16	9.34
Packet Loss Rate%	2.20	2.20	0.60	0.30

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

National Institute of Technology, Hamirpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	234.26	19.54	557.12	22.17
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	18.54	3.92	60.88	6.10
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.47	5.58	2.59	1.53
Youtube Initial Buffer Delay (Second)	0.70	1.81	0.68	1.70
Latency (ms)- 50th Percentile	35.32	25.75	25.95	45.36
Jitter (ms)	3.79	4.63	2.88	5.50
Packet Loss Rate%	1.50	1.70	0.00	0.10

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

Purnam Mall Bilaspur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	133.97	4.88	351.98	7.92
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	28.74	11.68	40.70	5.53
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.85	1.55	3.14	2.12
Youtube Initial Buffer Delay (Second)	6.13	0.89	0.47	1.85
Latency (ms) - 50th Percentile	37.33	26.79	24.80	50.80
Jitter (ms)	9.48	4.39	2.66	10.07
Packet Loss Rate%	0.60	2.00	0.00	0.20

Table-46: 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)	204.77	-	353.38	-
	Upload Throughput Average (Mbits/s)	54.12	-	40.71	-
4G	Download Throughput Average (Mbits/s)	50.13	12.12	36.69	12.77
	Upload Throughput Average (Mbits/s)	17.94	8.24	10.85	8.16

Table-47: Overall Summary of 5G only & 4G only data download & upload speed.

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

AIIMS Bilaspur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	229.99	-	355.76	-
	Upload Throughput Average (Mbits/s)	37.69	-	17.94	-
4G	Download Throughput Average (Mbits/s)	25.96	0.40	18.54	28.54
	Upload Throughput Average (Mbits/s)	11.93	1.25	1.67	12.04

Table-48: Overall Summary of 5G only & 4G only data download & upload speed.

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

Bilaspur Bus Stand					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	62.84	-	472.07	-
	Upload Throughput Average (Mbits/s)	62.38	-	59.22	-
4G	Download Throughput Average (Mbits/s)	35.86	6.46	14.09	13.17
	Upload Throughput Average (Mbits/s)	23.50	6.68	7.77	8.53

Table-49: Overall Summary of 5G only & 4G only data download & upload speed.

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

DC Office Bilaspur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	51.60	-	357.57	-
	Upload Throughput Average (Mbits/s)	93.93	-	73.34	-
4G	Download Throughput Average (Mbits/s)	32.73	23.80	44.68	11.65
	Upload Throughput Average (Mbits/s)	28.45	10.91	10.10	8.29

Table-50: Overall Summary of 5G only & 4G only data download & upload speed.

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

Dr Radhakrishnan Govt Medical College Hospital, Hamirpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	84.23	-	43.86	-
	Upload Throughput Average (Mbits/s)	33.90	-	2.70	-
4G	Download Throughput Average (Mbits/s)	43.66	7.36	42.47	3.89
	Upload Throughput Average (Mbits/s)	16.83	6.66	6.11	1.98

Table-51: Overall Summary of 5G only & 4G only data download & upload speed.

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

Government Post Graduate College Bilaspur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	485.04	-	444.60	-
	Upload Throughput Average (Mbits/s)	54.36	-	53.19	-
4G	Download Throughput Average (Mbits/s)	66.05	10.68	24.10	10.71
	Upload Throughput Average (Mbits/s)	11.78	5.12	13.68	9.46

Table-52: Overall Summary of 5G only & 4G only data download & upload speed.

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

ISBT Hamirpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	327.61	-	189.05	-
	Upload Throughput Average (Mbits/s)	80.66	-	8.19	-
4G	Download Throughput Average (Mbits/s)	65.66	19.80	23.55	11.50
	Upload Throughput Average (Mbits/s)	21.77	17.38	7.51	9.72

Table-53: Overall Summary of 5G only & 4G only data download & upload speed.

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

National Institute of Technology, Hamirpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	268.25	-	598.14	-
	Upload Throughput Average (Mbits/s)	41.86	-	72.81	-
4G	Download Throughput Average (Mbits/s)	54.35	21.33	95.91	14.71
	Upload Throughput Average (Mbits/s)	12.04	5.05	26.20	6.05

Table-54: Overall Summary of 5G only & 4G only data download & upload speed.

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

Purnam Mall Bilaspur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	128.62	-	365.99	-
	Upload Throughput Average (Mbits/s)	25.76	-	38.26	-
4G	Download Throughput Average (Mbits/s)	76.82	4.54	30.15	8.02
	Upload Throughput Average (Mbits/s)	17.24	12.86	13.79	9.23

Table-55: 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 on 14th May 2026. One location has been tested in the Hamirpur city. (Refer Table-1)

4.4.1 Walk test locations

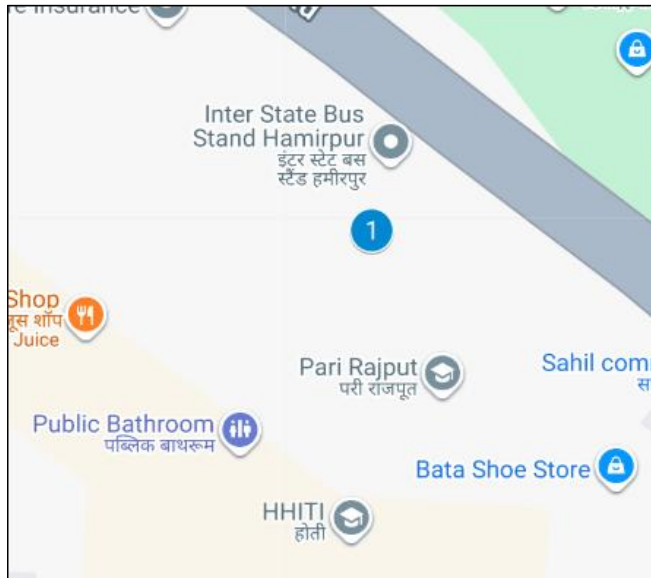


Figure-51: Walk Test locations.

4.4.2 Walk Test Covered

1. Main Bazaar Hamirpur

4.4.3 Voice Performance

Main Bazaar Hamirpur				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	19	21	19	20
Call Setup Success Rate %	100.00	90.48	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.16	1.08	0.51	1.03

Table-56: 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)

Main Bazaar Hamirpur				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	295.89	10.66	387.80	18.25
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	69.88	8.43	64.28	13.01
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms) - 50th Percentile	40.04	31.12	26.14	45.42

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

4.5 Highway

Drive test has been conducted from 12th May 2026 to 14th May 2026 covering two highway routes Amb to Hamirpur and Hamirpur to Bilaspur. (Refer Table-1)

4.5.1 Amb to Hamirpur

4.5.1.1 Drive test route



Figure-52: Drive test routes.

4.5.1.2 Routes covered

Lohara Khas, Jawar, Nadaun, Bharti, and Jol Sappar etc.

4.5.1.3 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	30	51	33
Call Setup Success Rate %	96.67	88.24	90.91
Drop Call Rate %	3.45	6.67	10.00
Call Setup Time-Average (Second)	4.49	4.75	5.23
Handover Success Rate %	100.00	99.55	100.00

Table-58: Summary of voice call performance in 3G/2G network mode only.

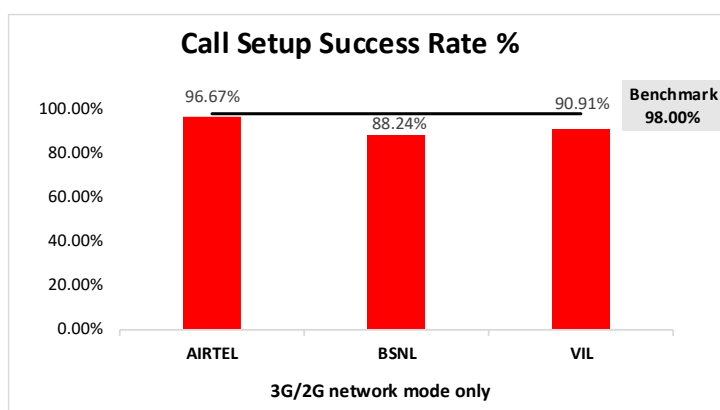


Figure-53: Performance for call setup success rate.

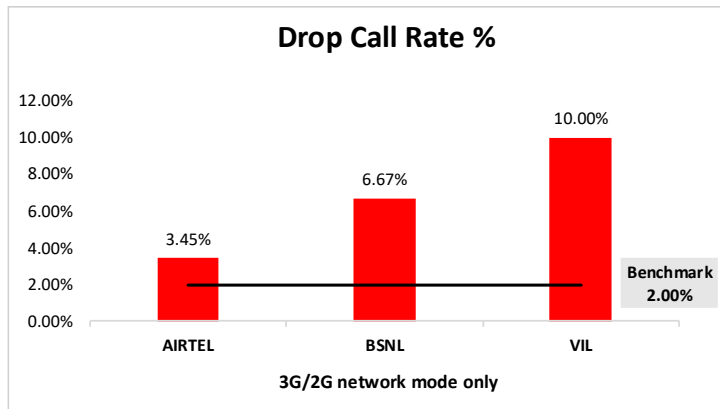


Figure-54: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	30.78%	NA
2G	99.52%	68.83%	98.48%
Limited Service	0.48%	0.39%	1.52%

Table-59: Time spent on technology during drive test 3G/2G network mode.

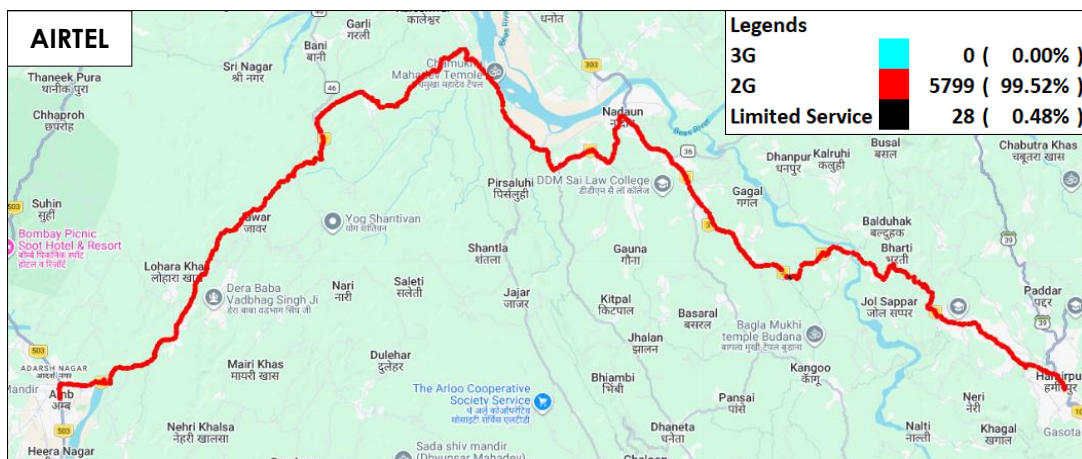


Figure-55: Serving technology plots 3G/2G network mode - AIRTEL.



Figure-56: Serving technology plots 3G/2G network mode - BSNL.



Figure-57: 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- 133, 134 & 135 for map view)

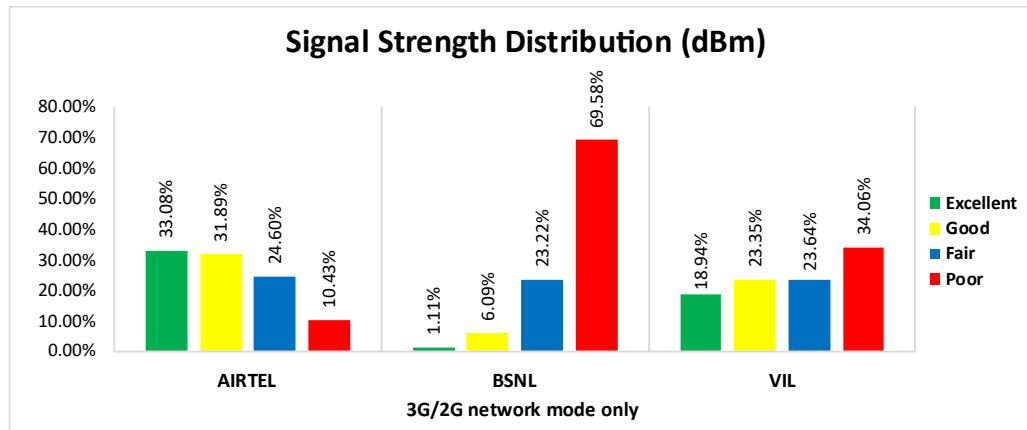


Figure-58: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 33% of samples falling in the excellent signal strength category.
- BSNL has 1% of samples falling in the excellent signal strength category.
- VIL has 19% 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	30	61	31	37
Call Setup Success Rate %	100.00	81.97	100.00	94.59
Drop Call Rate %	0.00	36.00	0.00	22.86
Call Setup Time Average (Second)	1.32	3.20	0.59	3.37
Handover Success Rate %	99.79	100.00	99.81	100.00

Table-60: Summary of voice call performance in network auto-selection mode.

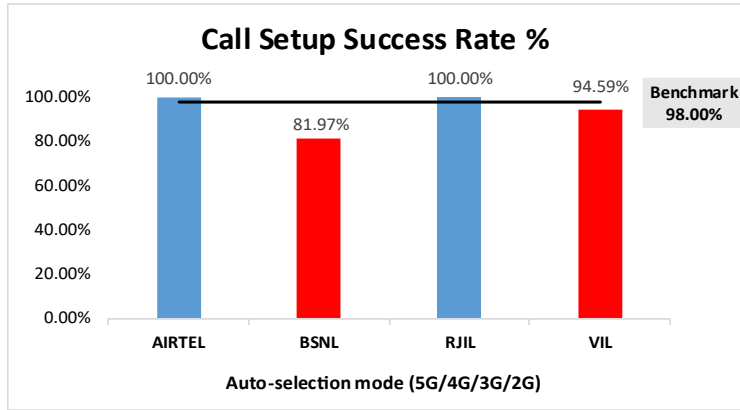


Figure-59: Performance for call setup success rate.

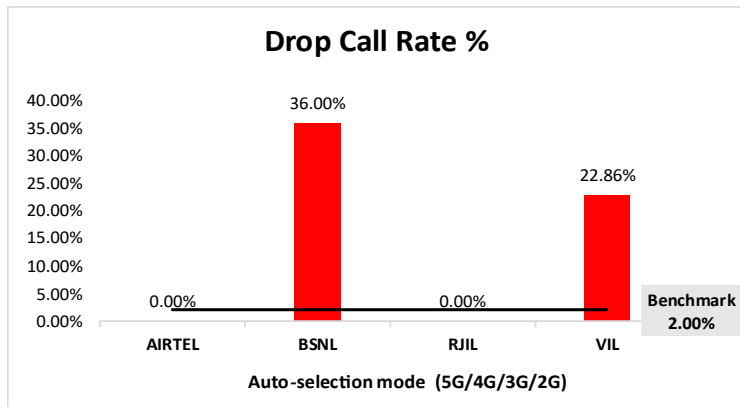


Figure-60: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	30	43	30	31
Number of silences call for >4 Sec	1	2	1	1
Silence Call Rate %	3.33	4.65	3.33	3.23
Number of silence instances for >4 Sec	2	2	1	1
Number of silence instances for >3 Sec	3	4	1	2
Number of silence instances for >2 sec	6	7	5	2
RTP Jitter (4G & 5G) in ms	4.71	5.54	14.86	13.31
Packet loss Rate Downlink %	1.62	9.46	2.69	1.09
Packet loss Rate Uplink %	1.67	6.28	1.60	0.28

Table-61: 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-61	377	371	367	304
Speech Quality (Average MOS)	3.86	2.50	4.50	3.24
Number of samples with MOS >=4 to <5 (Excellent)	282	46	329	128
Number of samples with MOS >=3 to <4 (Good)	67	44	20	72
Number of samples with MOS >=2 to <3 (Fair)	9	174	7	43
Number of samples with MOS >=1 to <2 (Poor)	19	107	11	61
%age of samples with MOS >=4 to <5 (Excellent)	74.80%	12.40%	89.65%	42.11%
%age of samples with MOS >=3 to <4 (Good)	17.77%	11.86%	5.45%	23.68%
%age of samples with MOS >=2 to <3 (Fair)	2.39%	46.90%	1.91%	14.14%
%age of samples with MOS >=1 to <2 (Poor)	5.04%	28.84%	3.00%	20.07%

Table-62: Summary of speech quality (MOS) samples.

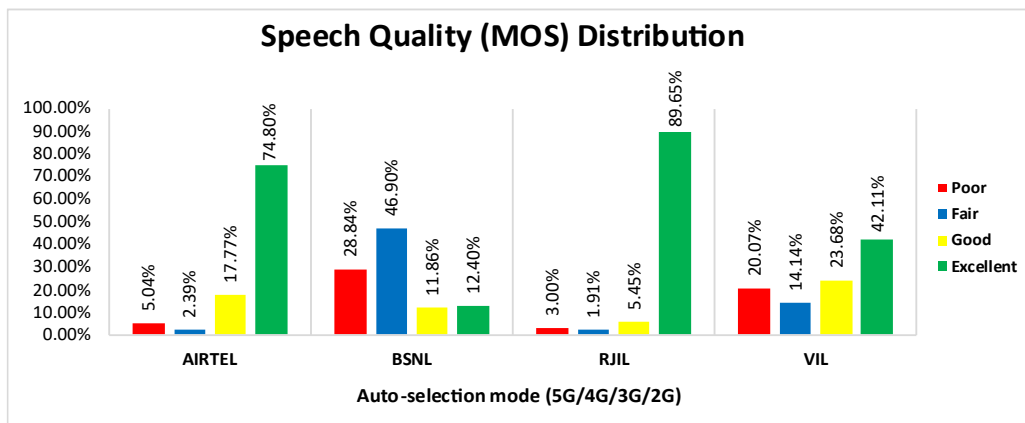


Figure-61: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	0.72%	NA	57.88%	NA
4G	99.28%	39.64%	42.12%	69.25%
3G	NA	22.48%	NA	NA
2G	0.00%	34.57%	NA	28.77%
Limited Service	0.00%	3.31%	0.00%	1.98%

Table-63: 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.

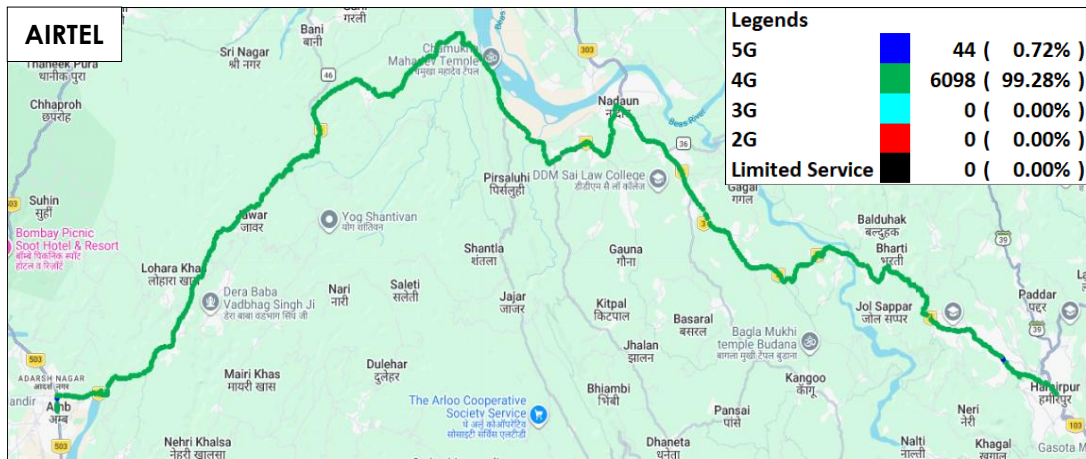


Figure-62: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

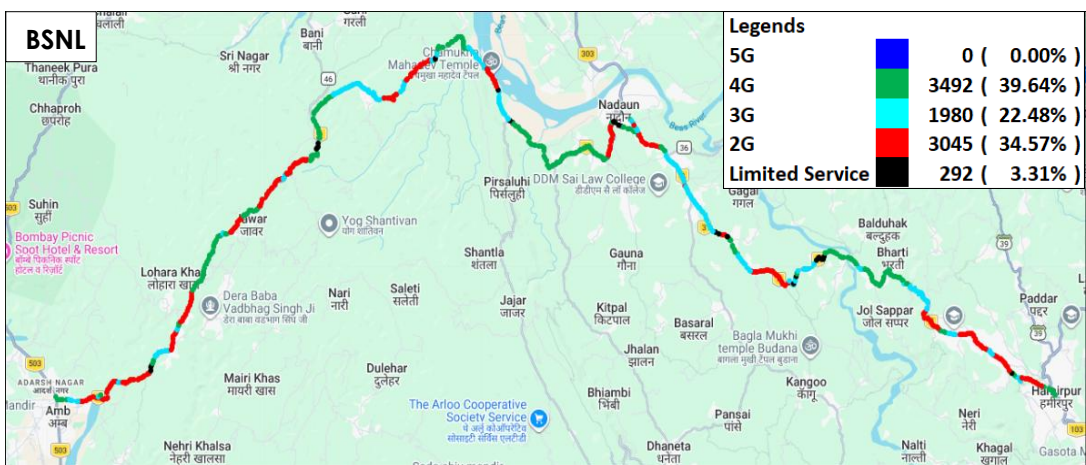


Figure-63: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

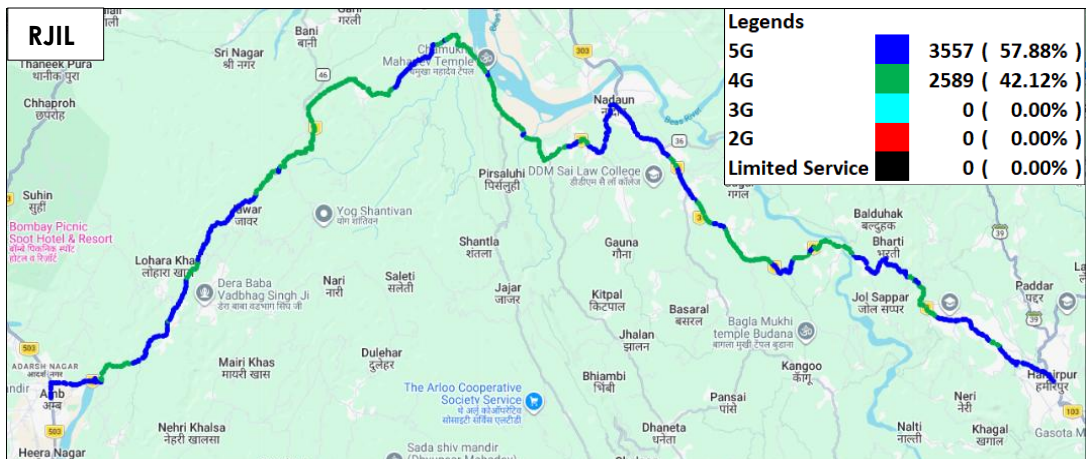


Figure-64: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

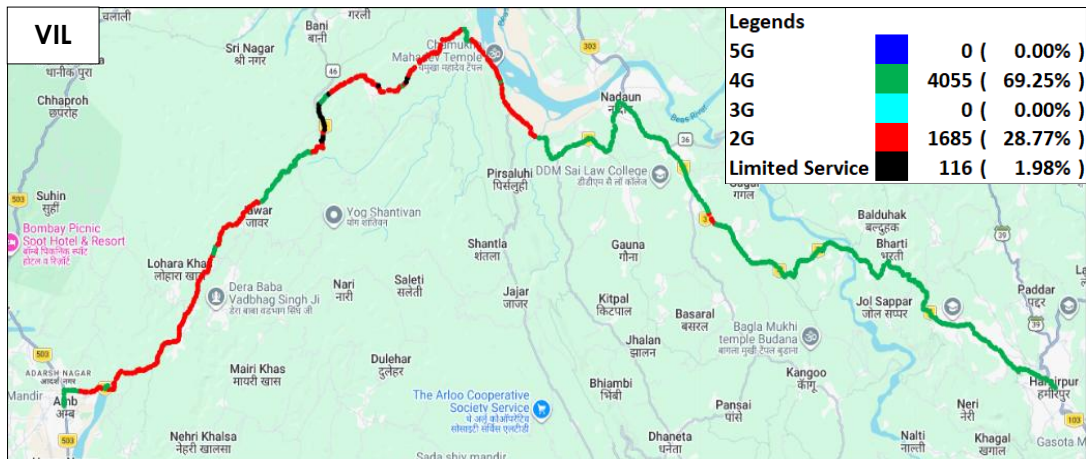


Figure-65: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-136, 137, 138 & 139 for map view)

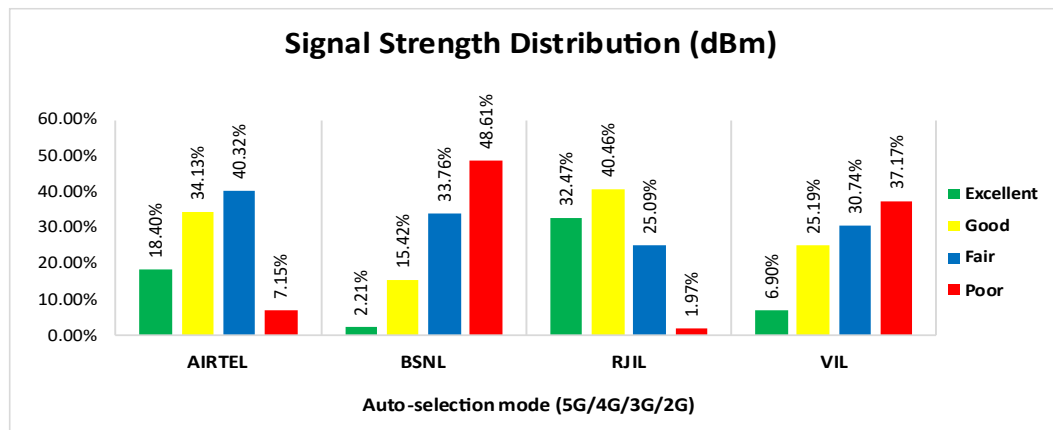


Figure-66: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 18% of samples falling in the excellent signal strength category.
- BSNL has 2% of samples falling in the excellent signal strength category.
- RJIL has 32% of samples falling in the excellent signal strength category.
- VIL has 7% of samples falling in the excellent signal strength category.

4.5.1.4 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	146.26	9.57	250.71	9.76
	80th Percentile	257.34	17.35	451.00	15.37
	20th Percentile	28.79	1.06	22.15	2.86
Upload Throughput (Mbits/s)	Average	15.77	5.03	22.81	5.00
	80th Percentile	29.54	8.86	43.46	7.93
	20th Percentile	3.40	1.61	2.02	2.02
Latency (ms)	50th Percentile	47.18	30.07	26.16	47.57

Table-64: Summary of Data performance in network auto-selection mode.

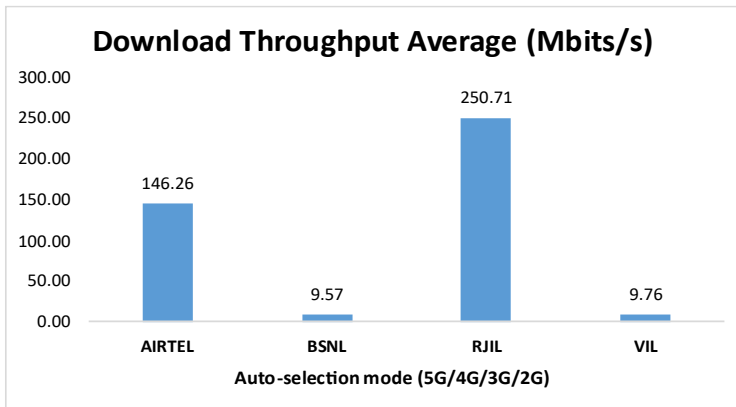


Figure-67: Download throughput.

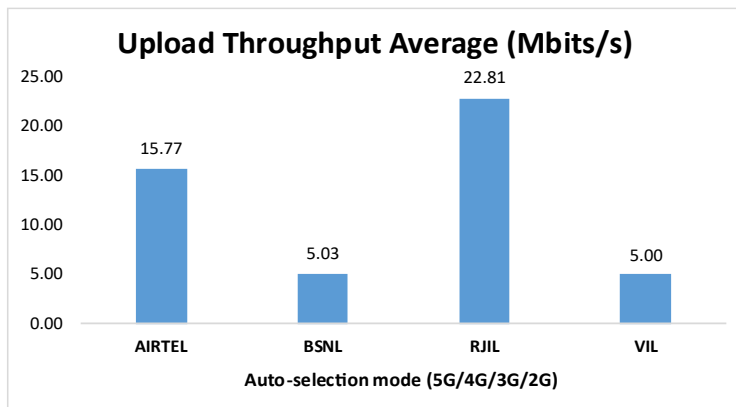


Figure- 68: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	52.81%	NA	66.42%	NA
4G	44.71%	75.46%	33.58%	89.84%
3G	NA	15.16%	NA	NA
2G	0.00%	3.15%	NA	8.34%
Limited Service	2.48%	6.24%	0.00%	1.82%

Table-65: 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.

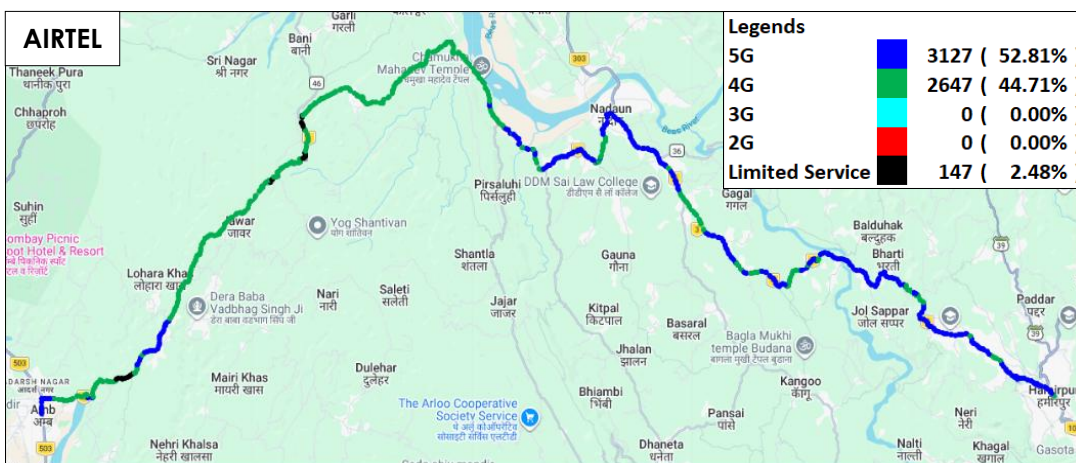


Figure-69: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

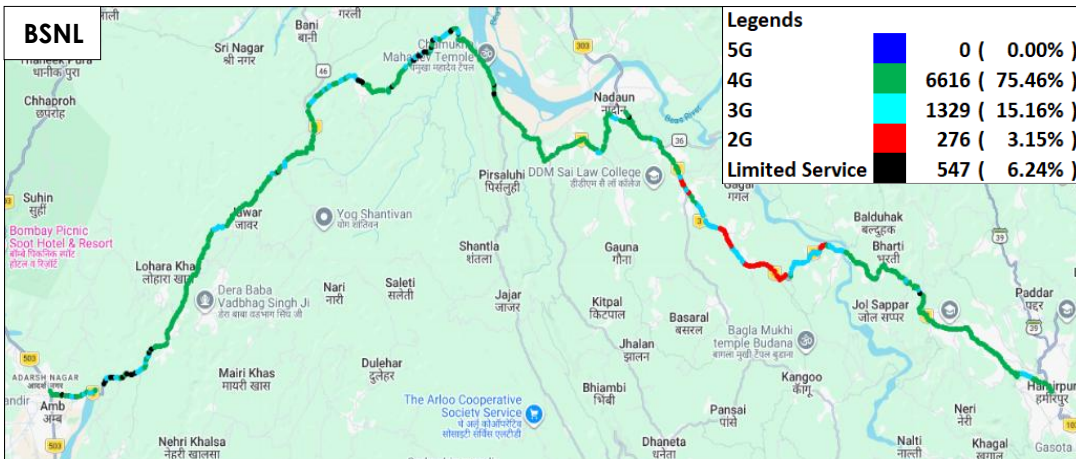


Figure-70: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

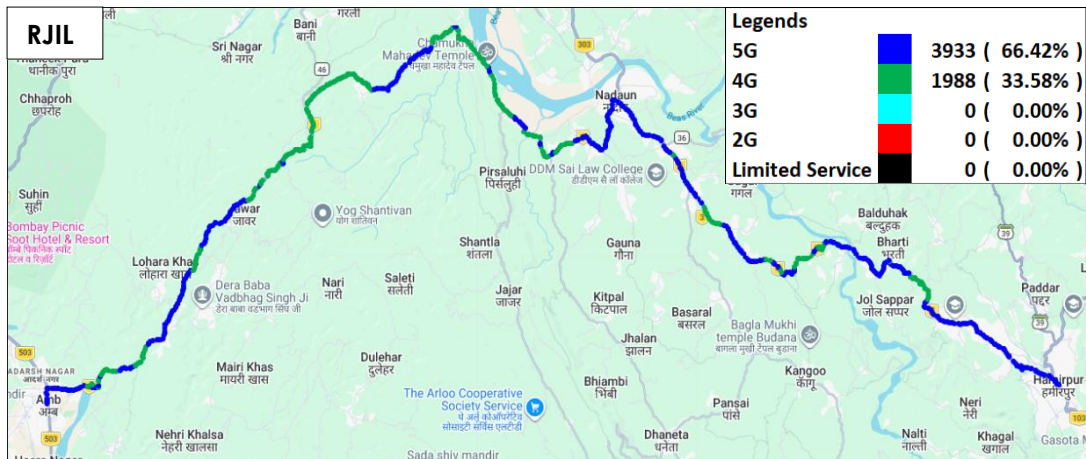


Figure-71: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

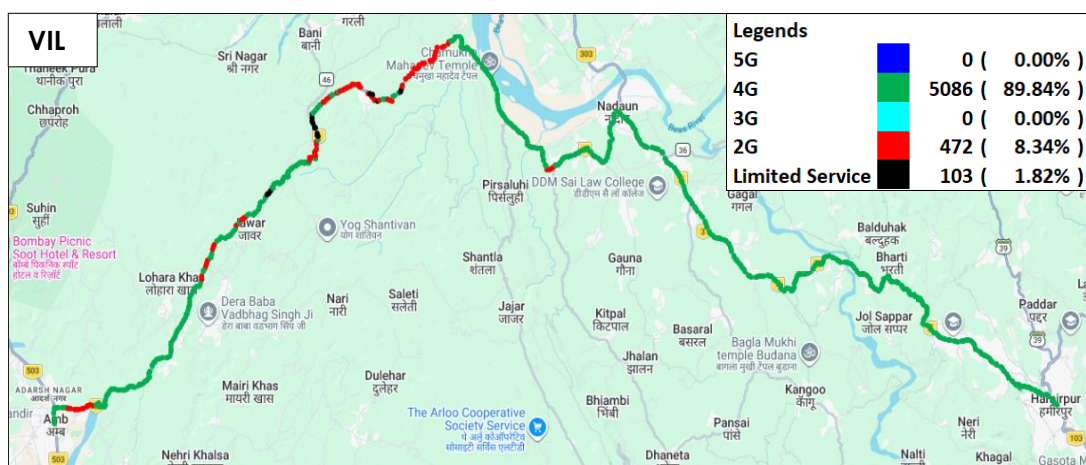


Figure-72: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-140, 141, 142 & 143 for map view)

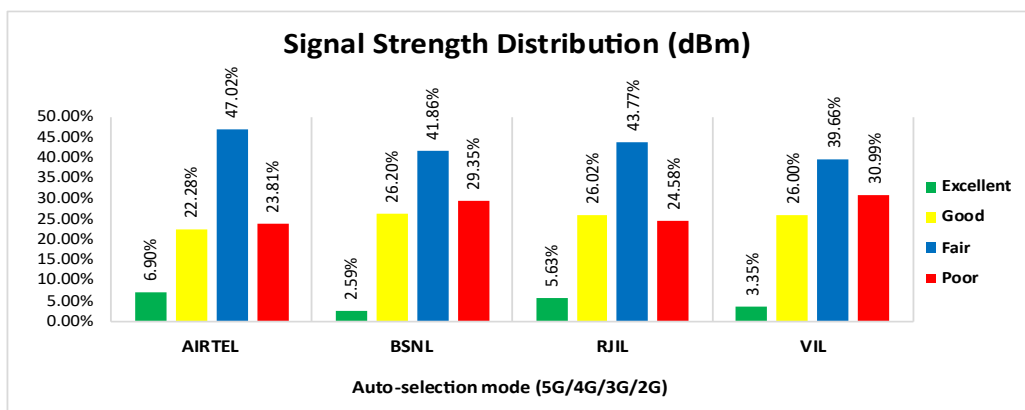


Figure-73: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 7% of samples falling in the excellent signal strength category.
- BSNL has 3% of samples falling in the excellent signal strength category.
- RJIL has 6% of samples falling in the excellent signal strength category.
- VIL has 3% of samples falling in the excellent signal strength category.

4.5.2 Hamirpur to Bilaspur

4.5.2.1 Drive test route

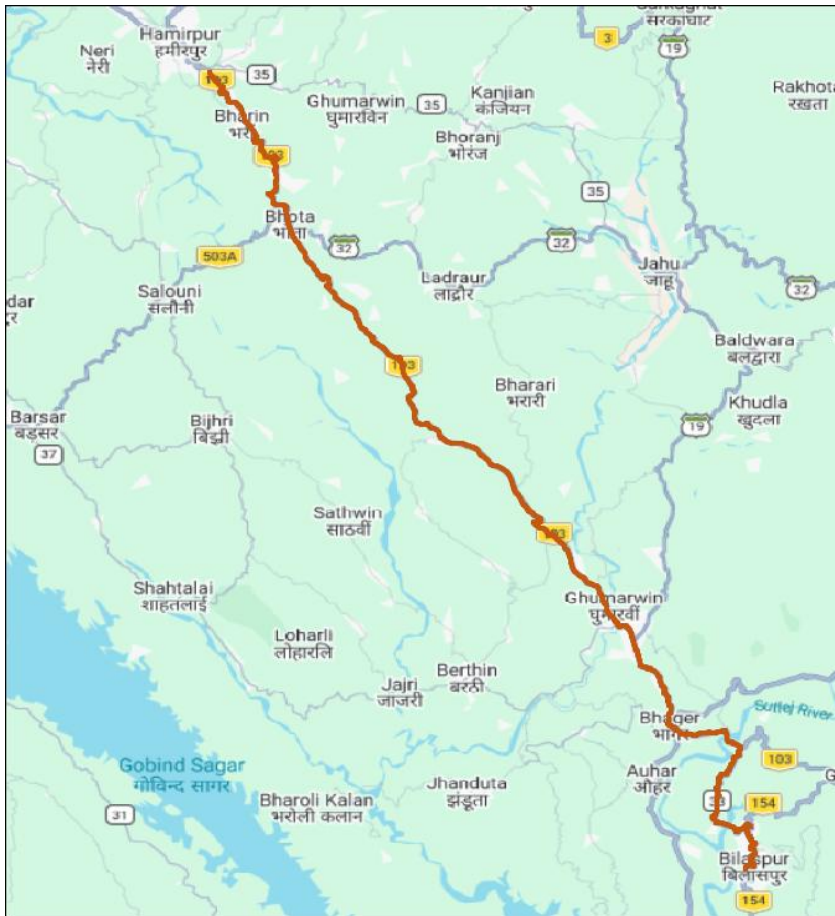


Figure-74: Drive test routes.

4.5.2.2 Areas covered

Bharin, Bhota, Dain, Ukhali, Dangar, Dadhol, Naswal, Ghumarwin, Bhager, Kandroun and Upper Nihal etc.

4.5.2.3 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	28	31	28
Call Setup Success Rate %	100.00	96.77	100.00
Drop Call Rate %	0.00	6.67	0.00
Call Setup Time-Average (Second)	3.33	3.35	3.71
Handover Success Rate %	100.00	99.11	98.91

Table-66: Summary of voice call performance in 3G/2G network mode only.

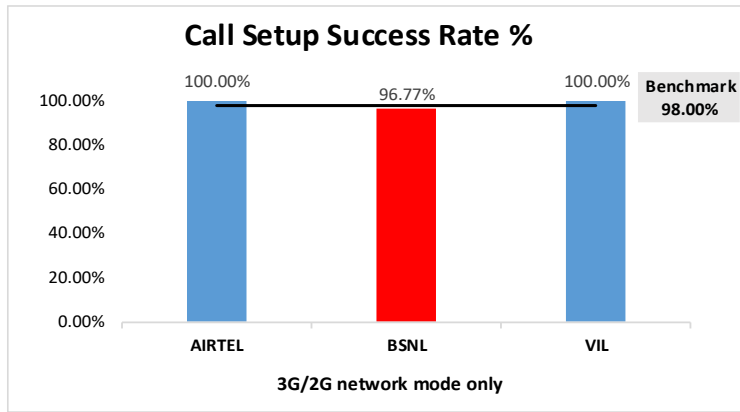


Figure-75: Performance for call setup success rate.

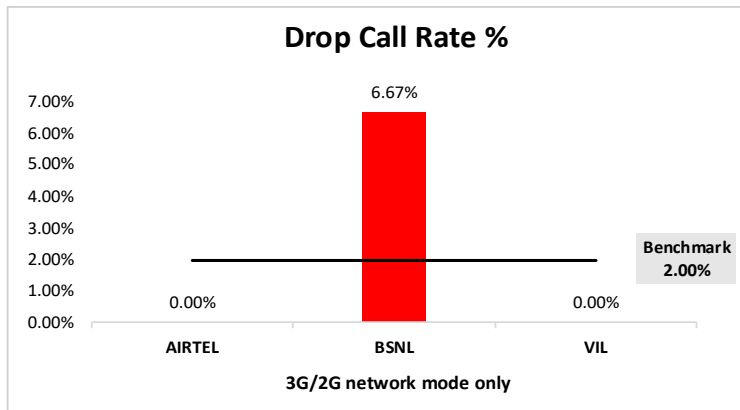


Figure-76: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	29.12%	NA
2G	99.79%	70.52%	99.73%
Limited Service	0.21%	0.36%	0.27%

Table-67: Time spent on technology during drive test 3G/2G network mode.

Note-

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

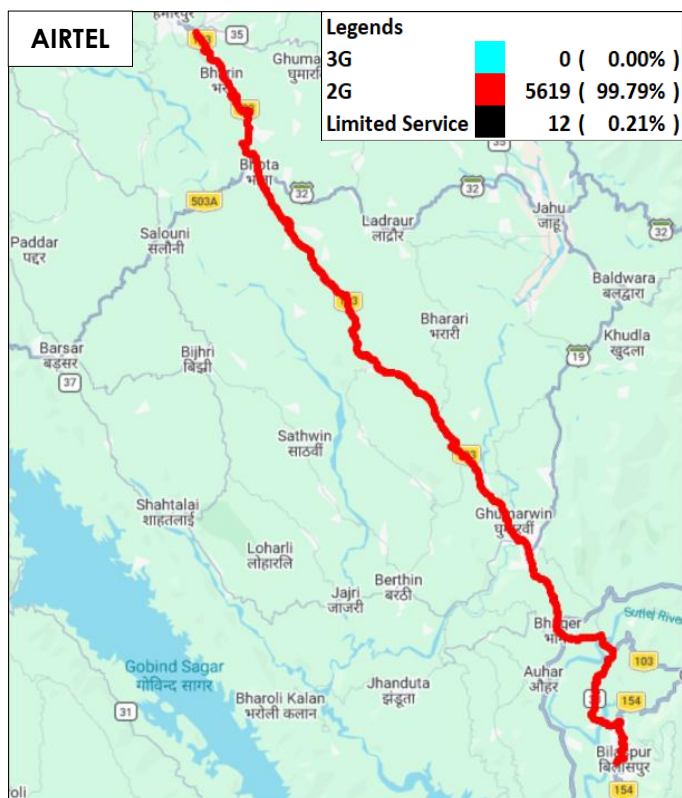


Figure-77: Serving technology plots 3G/2G network mode - AIRTEL

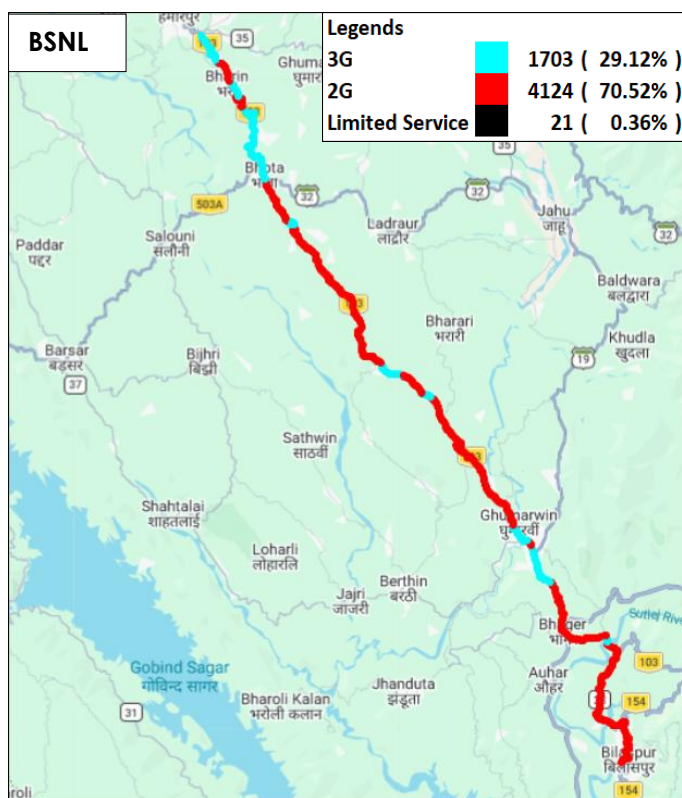


Figure-78: Serving technology plots 3G/2G network mode - BSNL.

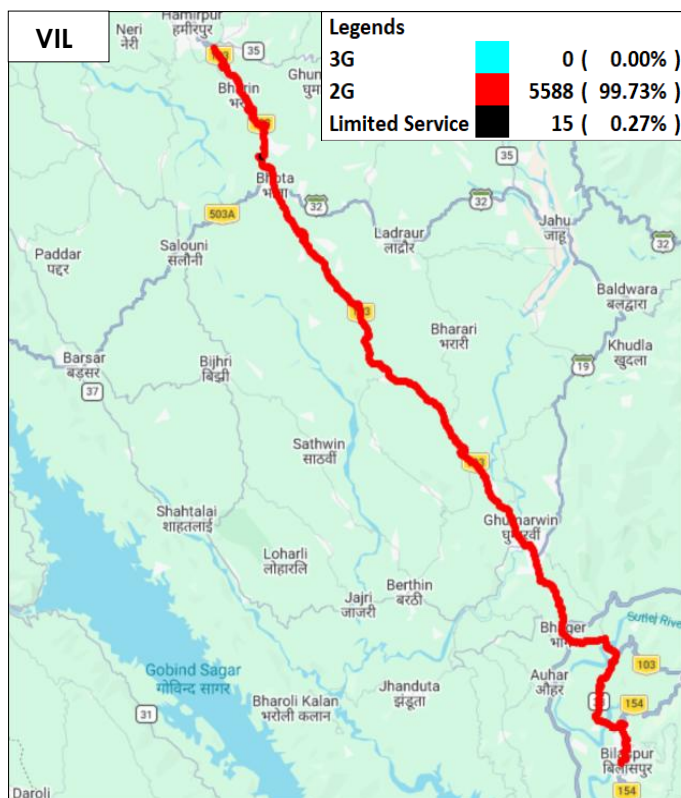


Figure-79: Serving technology plots 3G/2G network mode - VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 144, 145 & 146 for map view)

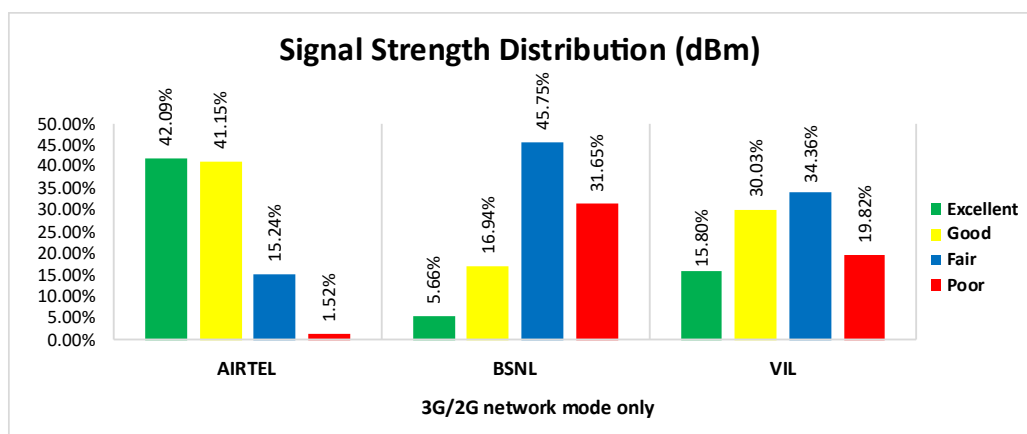


Figure-80: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 42% of samples falling in the excellent signal strength category.
- BSNL has 6% of samples falling in the excellent signal strength category.
- VIL has 16% 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	30	40	30	30
Call Setup Success Rate %	100.00	77.50	100.00	96.67
Drop Call Rate %	0.00	25.81	0.00	6.90
Call Setup Time Average (Second)	1.17	2.82	0.60	1.77
Handover Success Rate %	100.00	99.58	100.00	99.43

Table-68: Summary of voice call performance in network auto-selection mode.

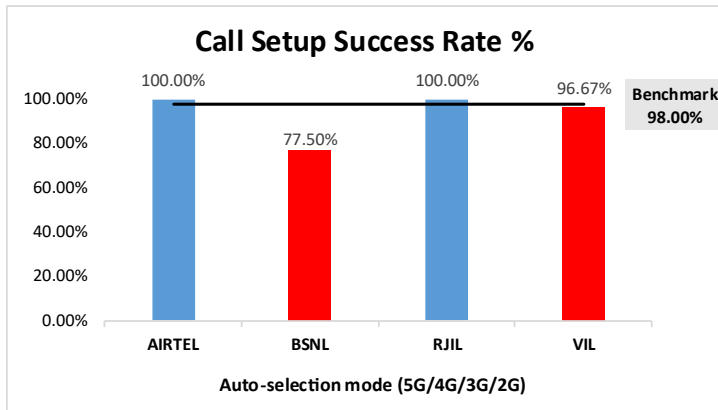


Figure-81: Performance for call setup success rate.

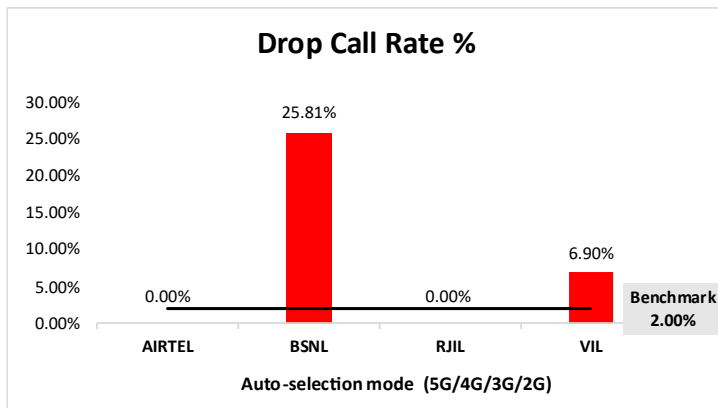


Figure-82: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	29	32	29	30
Number of silences call for >4 Sec	0	5	1	0
Silence Call Rate %	0.00	15.63	3.45	0.00
Number of silence instances for >4 Sec	0	7	1	0
Number of silence instances for >3 Sec	0	9	1	0
Number of silence instances for >2 sec	0	15	3	1
RTP Jitter (4G & 5G) in ms	3.28	8.3	15.80	15.72
Packet loss Rate Downlink %	0.27	7.92	1.18	0.38
Packet loss Rate Uplink %	0.29	5.48	1.22	0.37

Table-69: 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-69	377	247	362	366
Speech Quality (Average MOS)	4.04	3.03	4.45	3.62
Number of samples with MOS ≥ 4 to <5 (Excellent)	315	93	314	201
Number of samples with MOS ≥ 3 to <4 (Good)	57	39	26	96
Number of samples with MOS ≥ 2 to <3 (Fair)	4	53	9	25
Number of samples with MOS ≥ 1 to <2 (Poor)	1	62	13	44
%age of samples with MOS ≥ 4 to <5 (Excellent)	83.55%	37.65%	86.74%	54.92%
%age of samples with MOS ≥ 3 to <4 (Good)	15.12%	15.79%	7.18%	26.23%
%age of samples with MOS ≥ 2 to <3 (Fair)	1.06%	21.46%	2.49%	6.83%
%age of samples with MOS ≥ 1 to <2 (Poor)	0.27%	25.10%	3.59%	12.02%

Table-70: Summary of speech quality (MOS) samples.

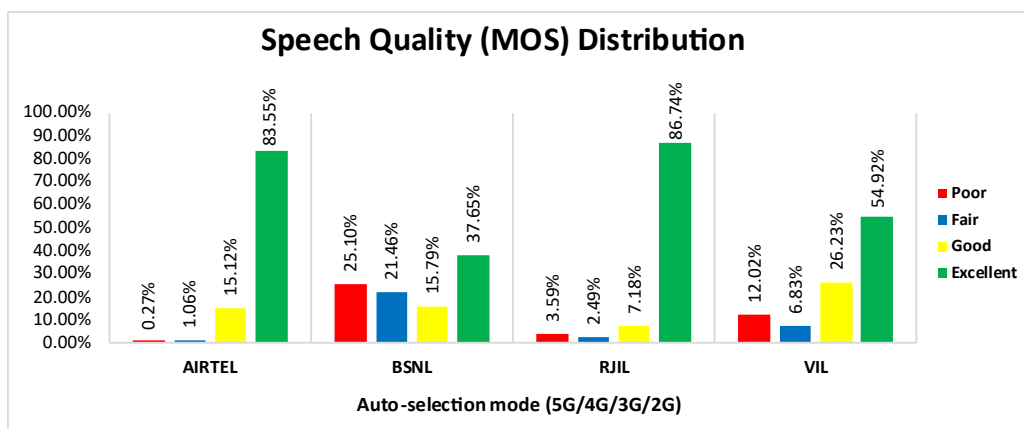


Figure-83: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	1.53%	NA	76.13%	NA
4G	98.47%	61.52%	23.87%	37.77%
3G	NA	12.95%	NA	NA
2G	0.00%	24.74%	NA	62.23%
Limited Service	0.00%	0.79%	0.00%	0.00%

Table-71: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.

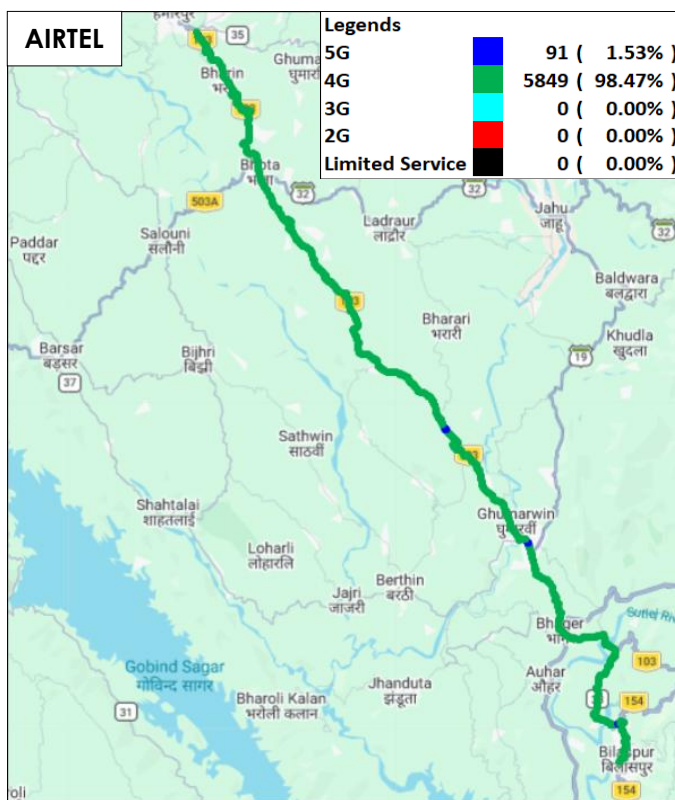


Figure-84: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

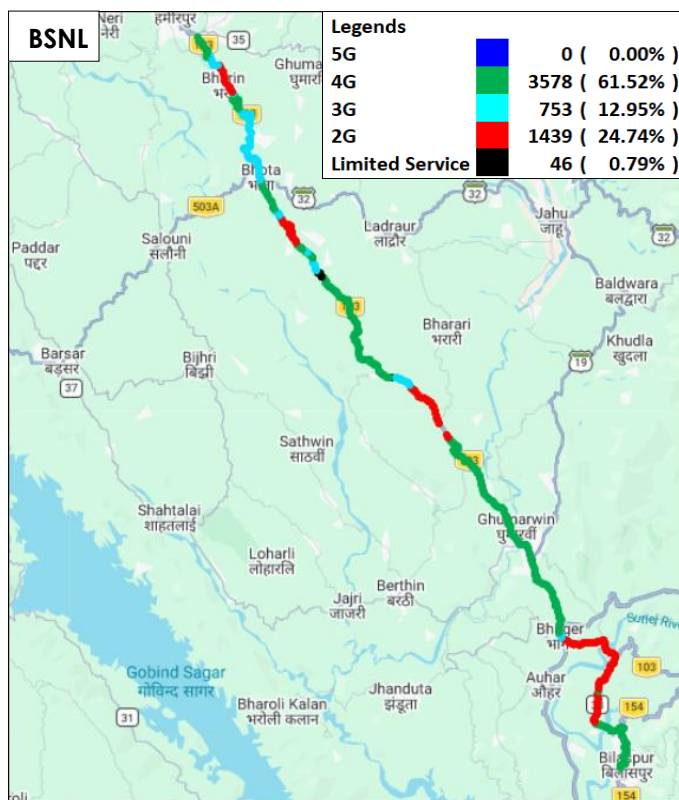


Figure-85: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

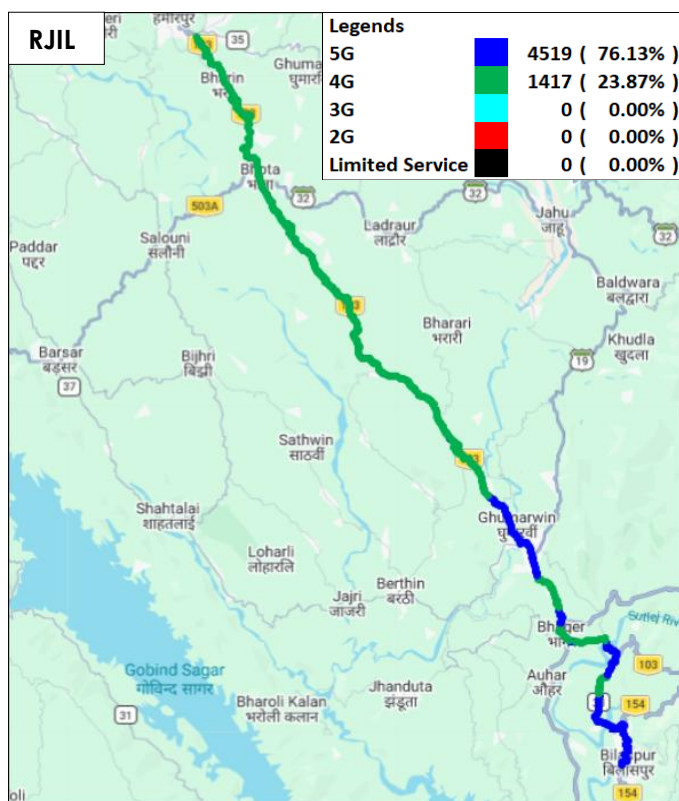


Figure-86: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

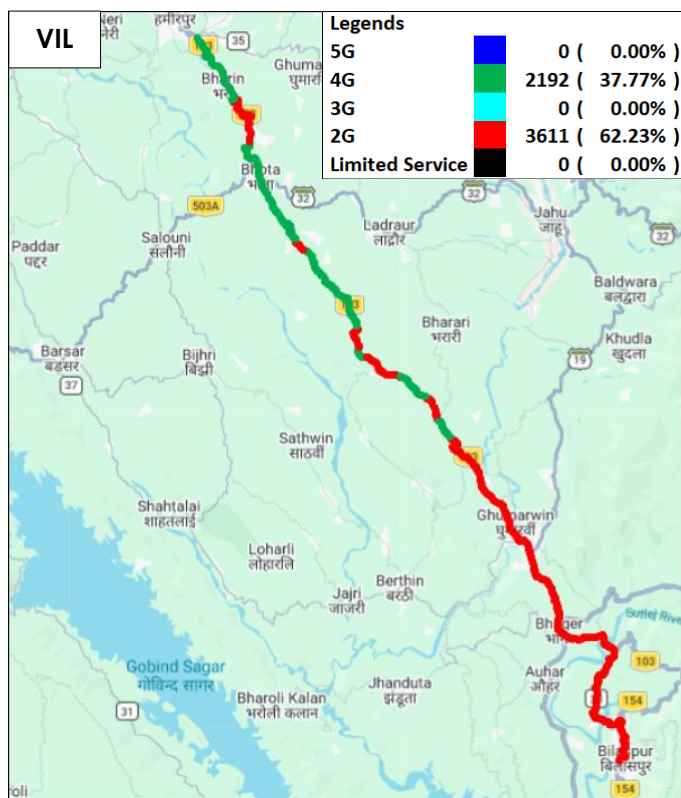


Figure-87: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-147, 148, 149 & 150 for map view)

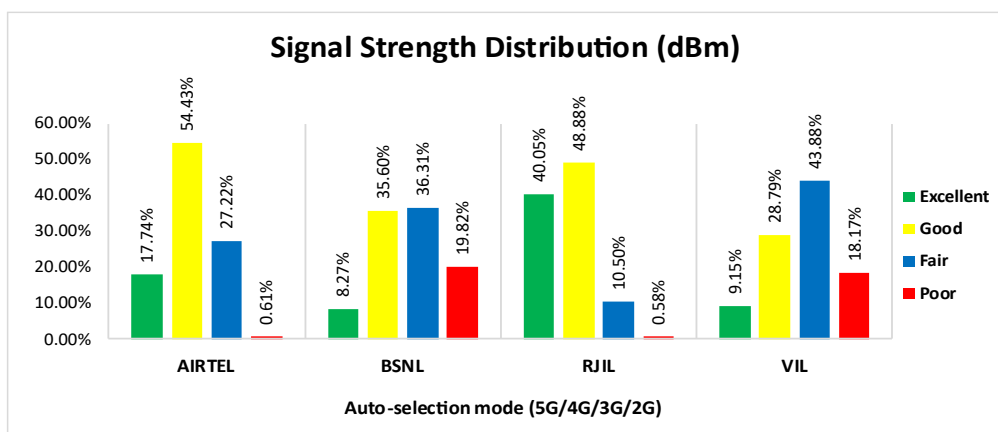


Figure-88: Signal strength distribution auto-selection mode (5G/4G/3G/2G) voice.

Observations:

- Airtel has 18% of samples falling in the excellent signal strength category.
- BSNL has 8% of samples falling in the excellent signal strength category.
- RJIL has 40% of samples falling in the excellent signal strength category.
- VIL has 9% of samples falling in the excellent signal strength category.

4.5.2.4 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	176.88	5.44	221.34	10.59
	80th Percentile	282.74	6.90	375.20	14.89
	20th Percentile	45.91	1.79	62.15	4.12
Upload Throughput (Mbits/s)	Average	17.67	3.89	15.83	5.89
	80th Percentile	30.39	4.03	27.43	8.52
	20th Percentile	3.25	1.38	4.02	2.19
Latency (ms)	50th Percentile	45.52	30.80	25.61	44.32

Table-72: Summary of Data performance in network auto-selection mode.

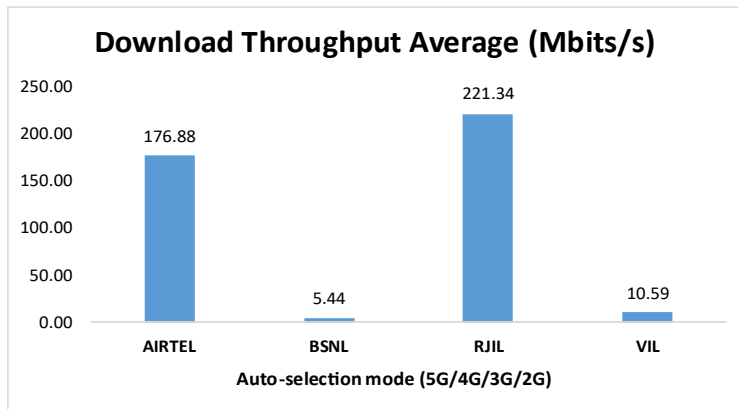


Figure-89: Download throughput.

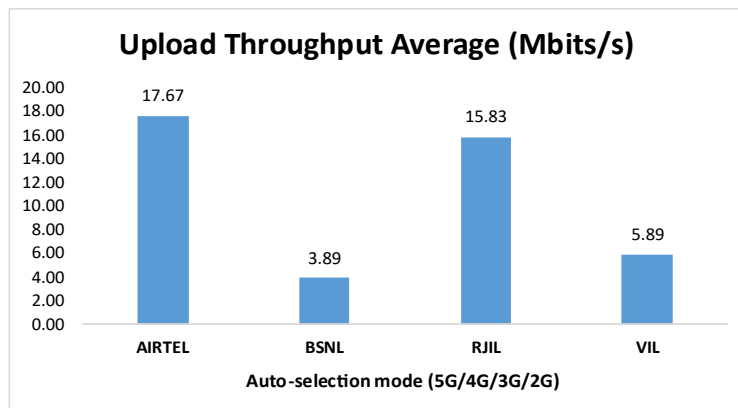


Figure- 90: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	61.96%	NA	87.77%	NA
4G	38.04%	90.06%	12.23%	100.00%
3G	NA	6.23%	NA	NA
2G	0.00%	0.05%	NA	0.00%
Limited Service	0.00%	3.66%	0.00%	0.00%

Table-73: 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.

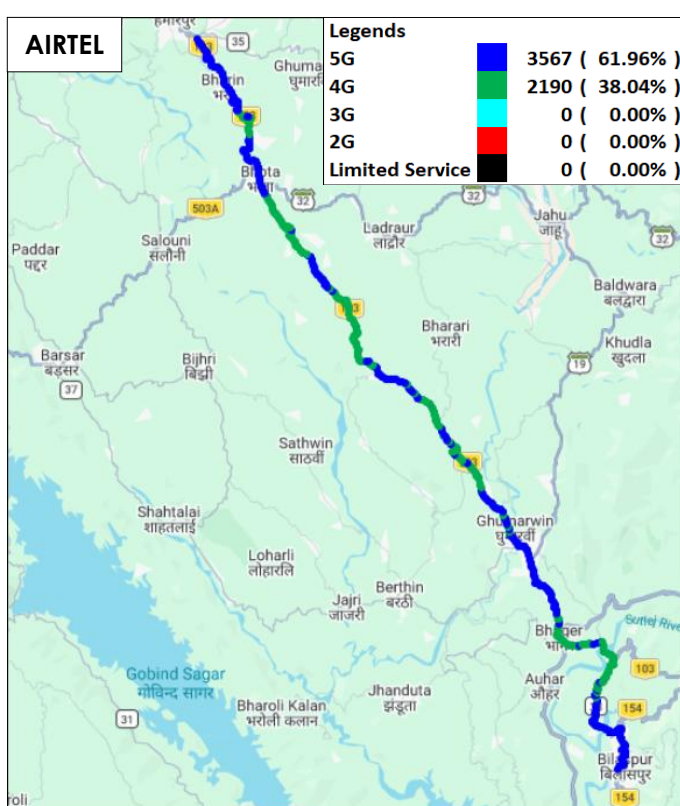


Figure-91: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

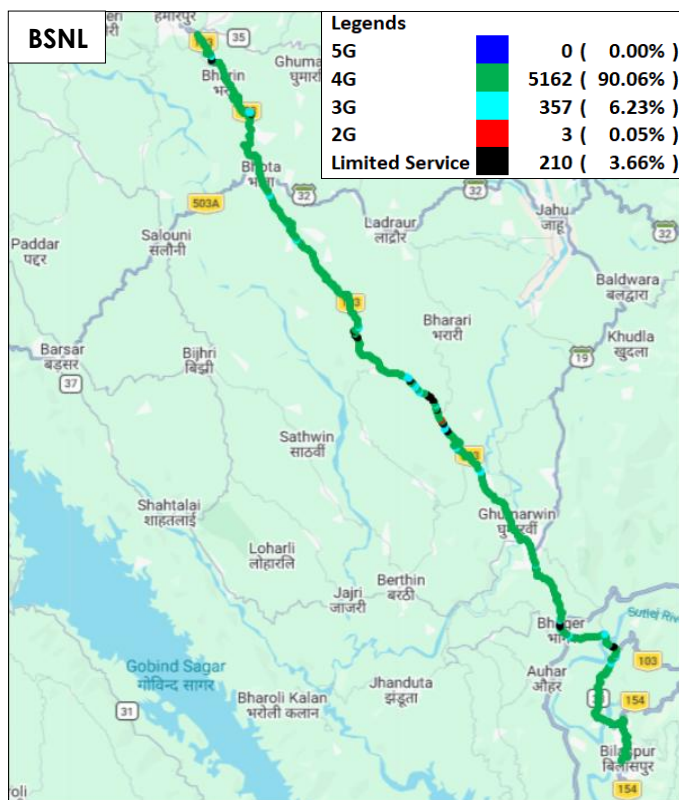


Figure-92: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - BSNL.

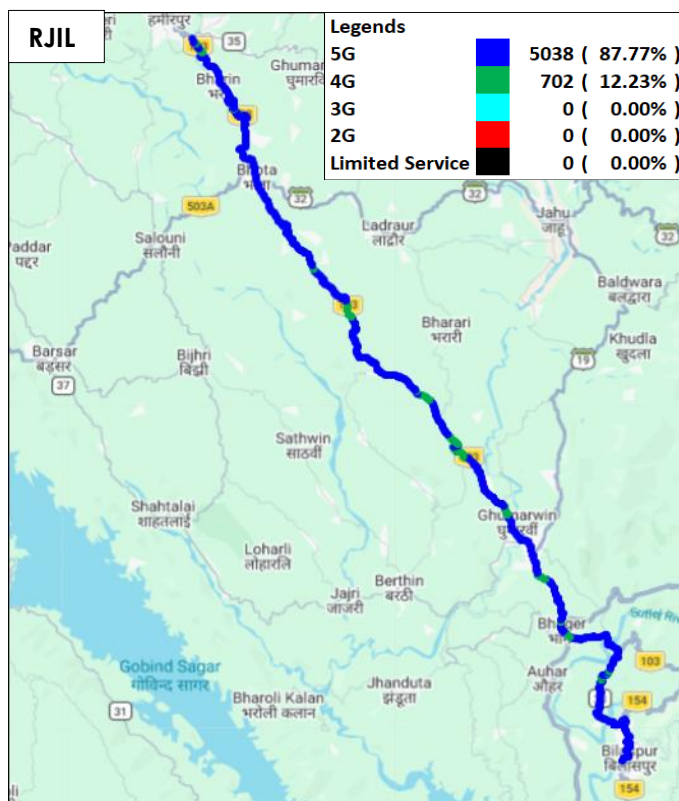


Figure-93: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - RJIL.

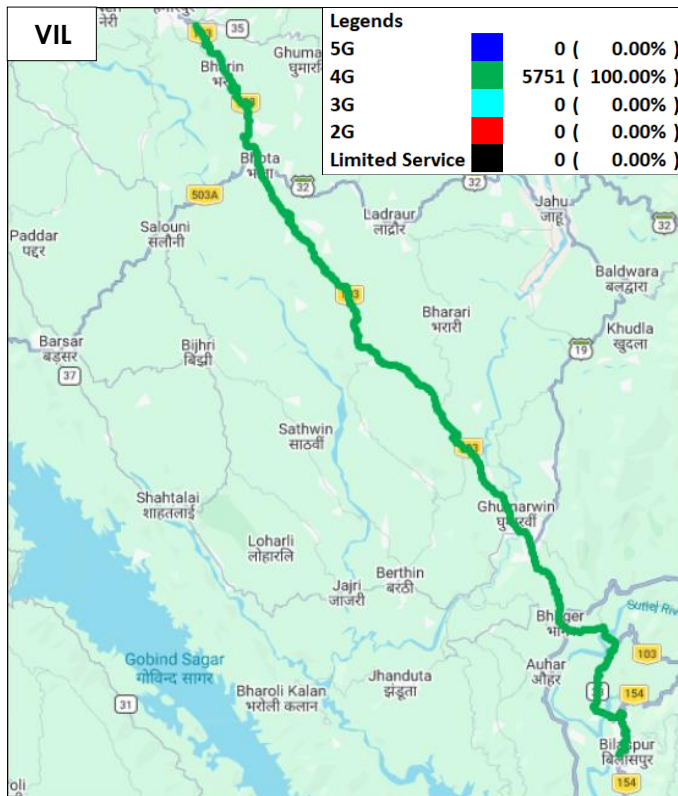


Figure-94: Serving technology plots in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-151, 152, 153 & 154 for map view)

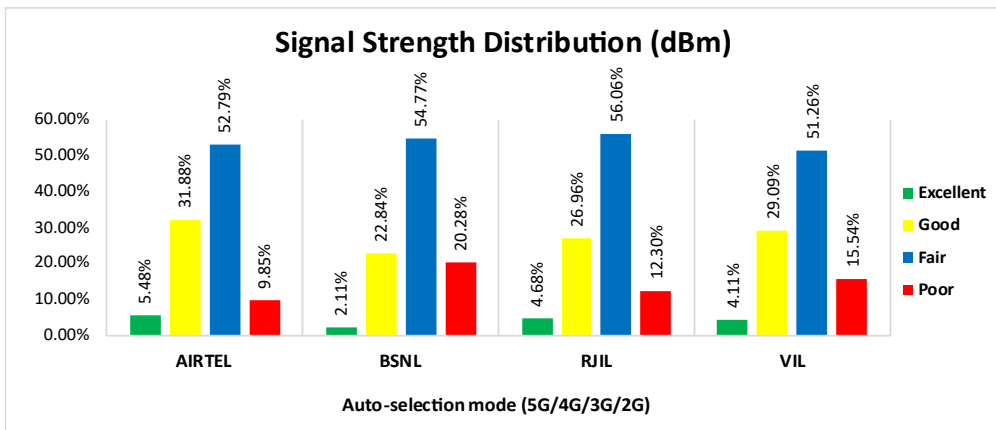


Figure-95: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 5% of samples falling in the excellent signal strength category.
- BSNL has 2% of samples falling in the excellent signal strength category.
- RJIL has 5% of samples falling in the excellent signal strength category.
- VIL has 4% of samples falling in the excellent signal strength category.

4.6 Railway

Drive test has been conducted on 12th May 2026 covering one railway route. (Refer Table-1)

4.6.1 Drive test route

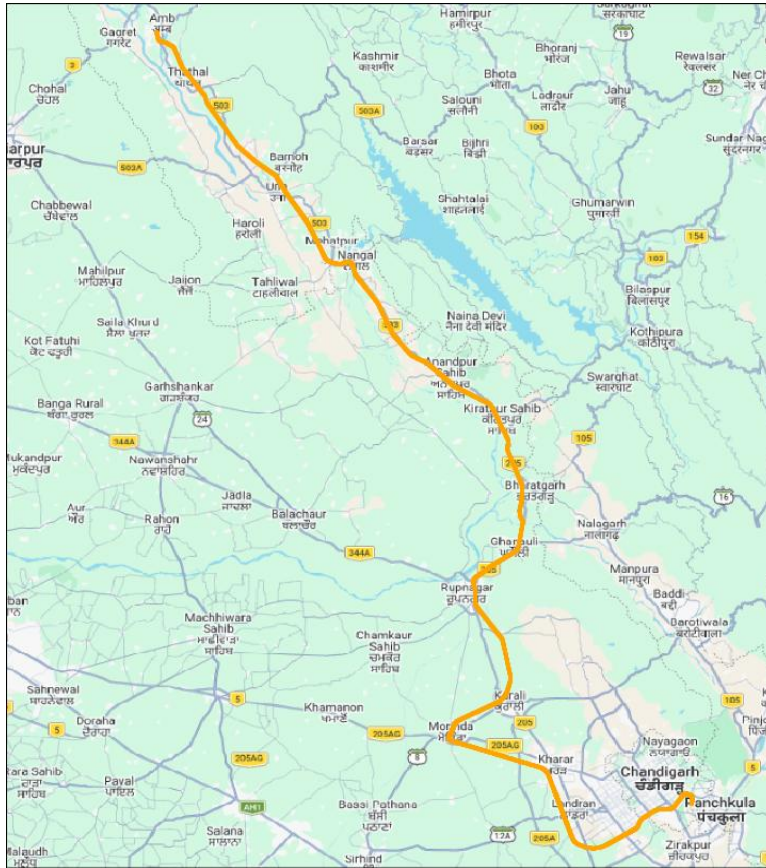


Figure-96: Drive test route railway.

4.6.2 Routes Covered

Chandigarh to Amb Via Sahibzada Asngr, Morinda, Rupnagar, Anandpur Sahib, Nangal Dam, Una Himachal.

4.6.3 Voice performance

(a) 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	55	62	55	56
Call Setup Success Rate %	100.00	88.71	100.00	98.21
Drop Call Rate %	0.00	14.55	0.00	3.64
Call Setup Time Average (Second)	1.67	1.78	0.71	1.47
Handover Success Rate %	99.91	99.28	99.91	99.63

Table-74: Summary of voice call performance in network auto-selection mode.

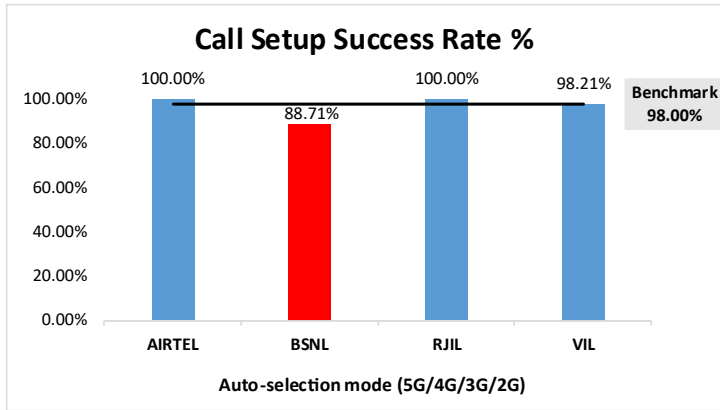


Figure-97: Performance for call setup success rate.

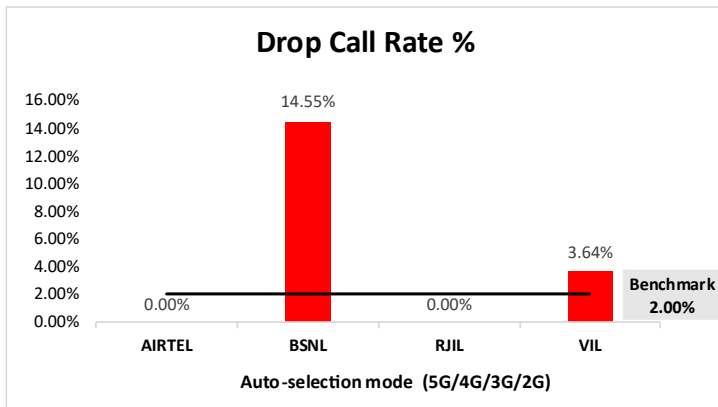


Figure-98: Performance for drop call rate.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	2.75%	NA	63.64%	0.00%
4G	97.25%	81.73%	36.36%	96.38%
3G	NA	3.84%	NA	NA
2G	0.00%	13.03%	NA	3.62%
Limited Service	0.00%	1.40%	0.00%	0.00%

Table-75: 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.

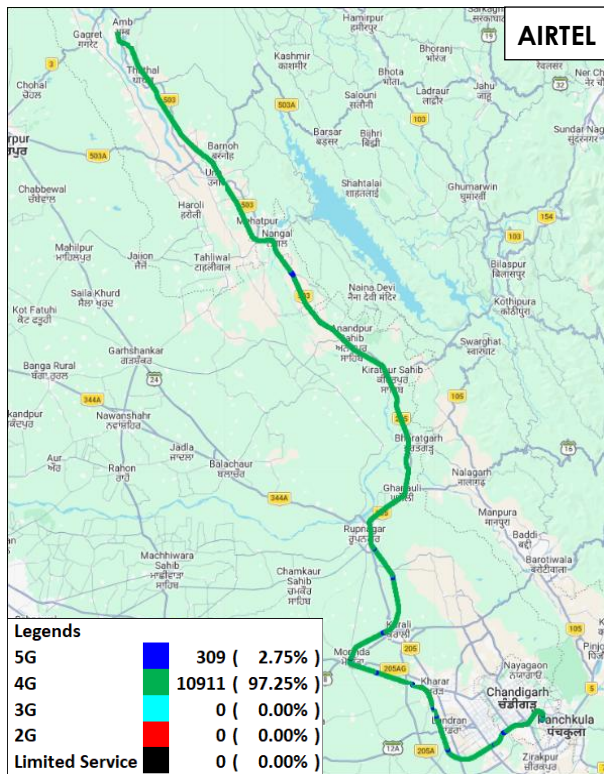


Figure-99: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

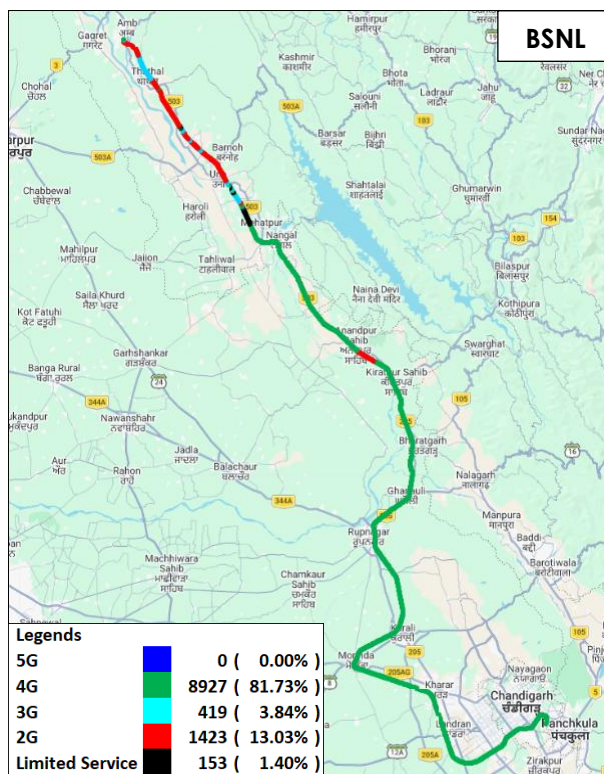


Figure-100: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - BSNL.

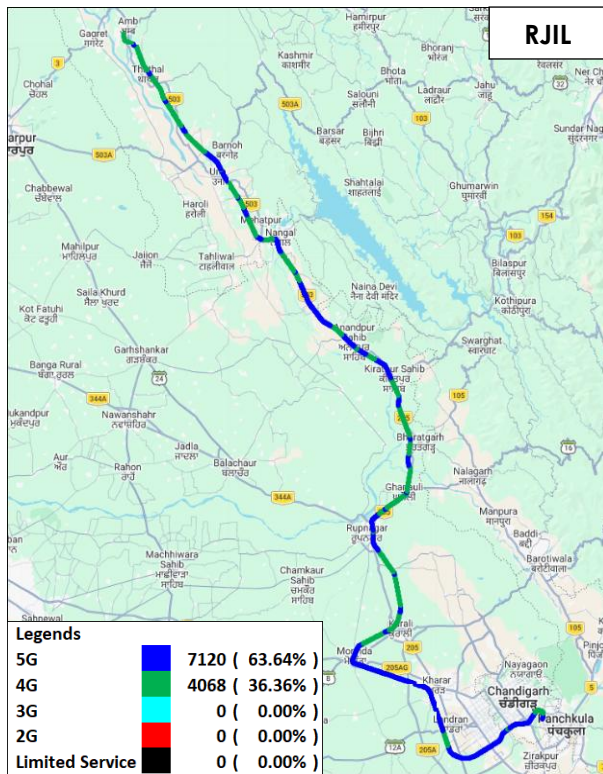


Figure-101: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - RJIL.

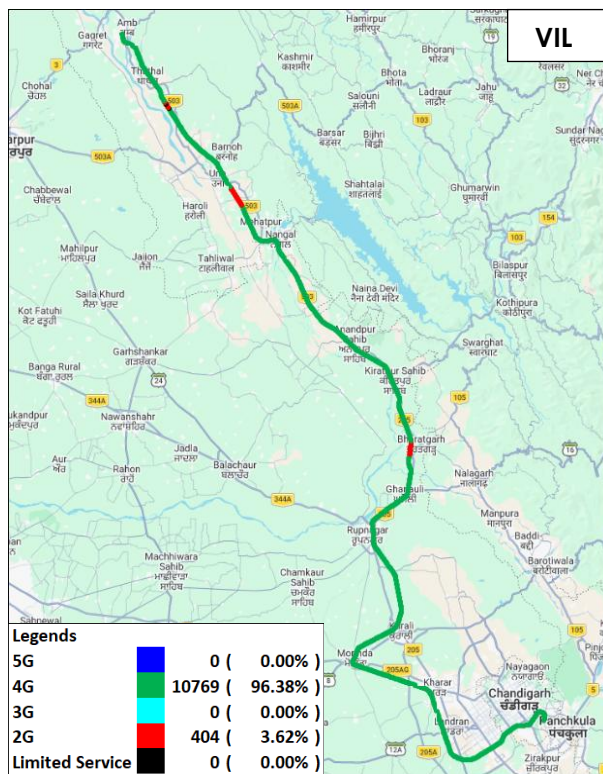


Figure-102: Serving technology plots in auto-selection mode (5G/4G/3G/2G) voice - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) voice. (Refer figure-155, 156, 157 & 158 for map view)

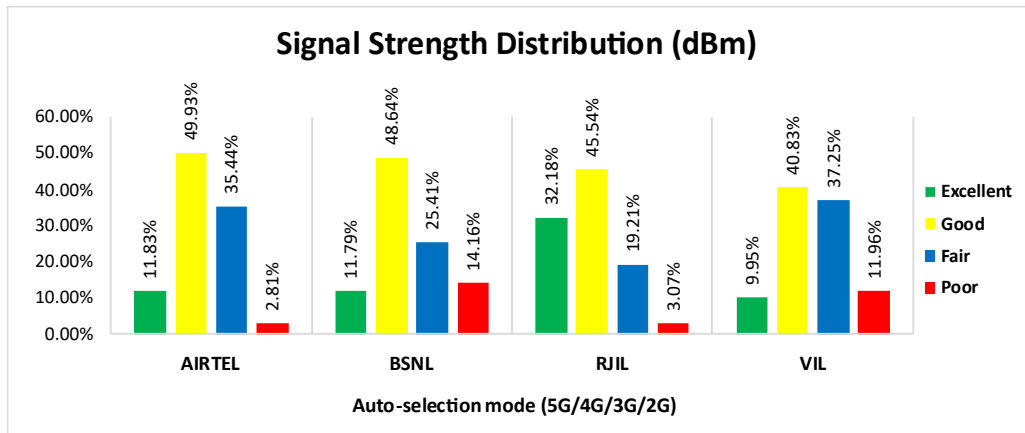


Figure-103: Signal strength distribution auto-selection mode 5G/4G/3G/2G voice.

Observations:

- Airtel has 12% of samples falling in the excellent signal strength category.
- BSNL has 12% of samples falling in the excellent signal strength category.
- RJIL has 32% of samples falling in the excellent signal strength category.
- VIL has 10% of samples falling in the excellent signal strength category.

4.6.4 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	165.09	12.77	195.53	27.16
	80th Percentile	248.85	18.25	277.65	42.95
	20th Percentile	56.89	7.54	51.63	7.64
Upload Throughput (Mbits/s)	Average	25.67	8.66	17.83	15.48
	80th Percentile	41.97	13.15	34.27	23.76
	20th Percentile	5.63	3.96	3.29	6.76
Latency (ms)	50th Percentile	48.71	27.20	26.18	40.40

Table-76: Summary of Data performance in network auto-selection mode.

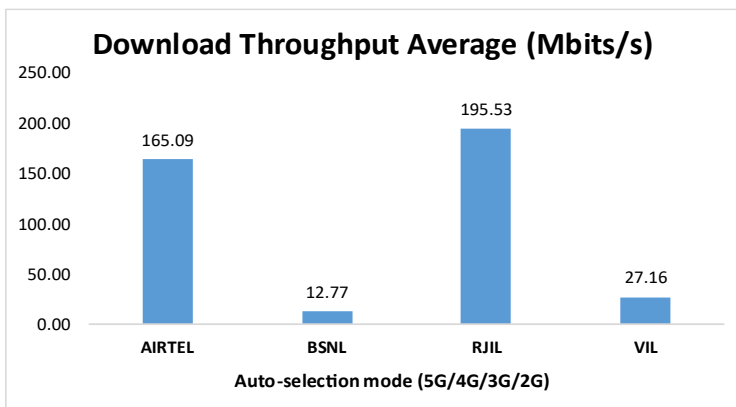


Figure 104: Download throughput.

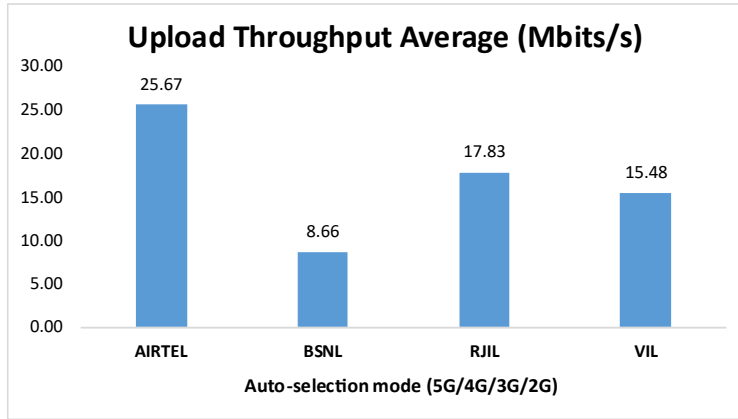


Figure-105: Upload throughput.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	71.35%	NA	89.24%	6.29%
4G	28.65%	97.03%	10.76%	89.55%
3G	NA	2.13%	NA	NA
2G	0.00%	0.19%	NA	4.16%
Limited Service	0.00%	0.66%	0.00%	0.00%

Table-77: 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.

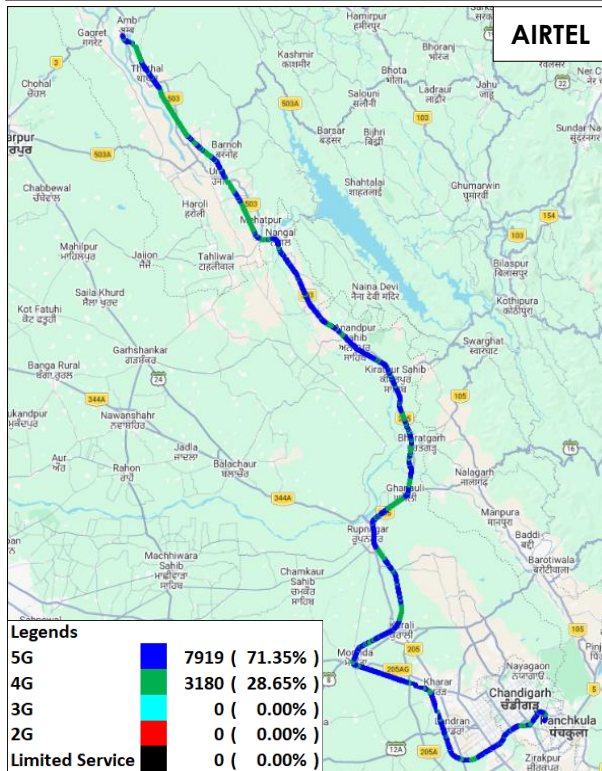


Figure-106: Serving technology plot in auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

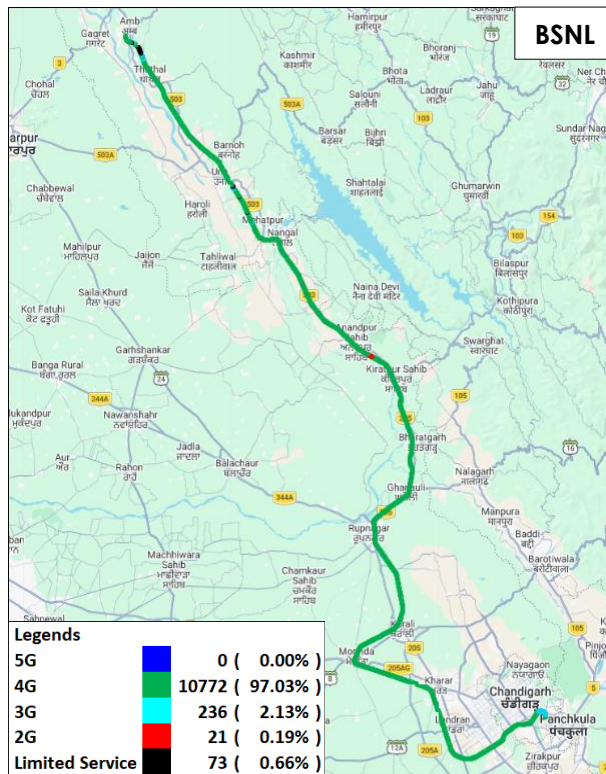


Figure-107: Serving technology plot in auto-selection mode (5G/4G/3G/2G) data - BSNL.

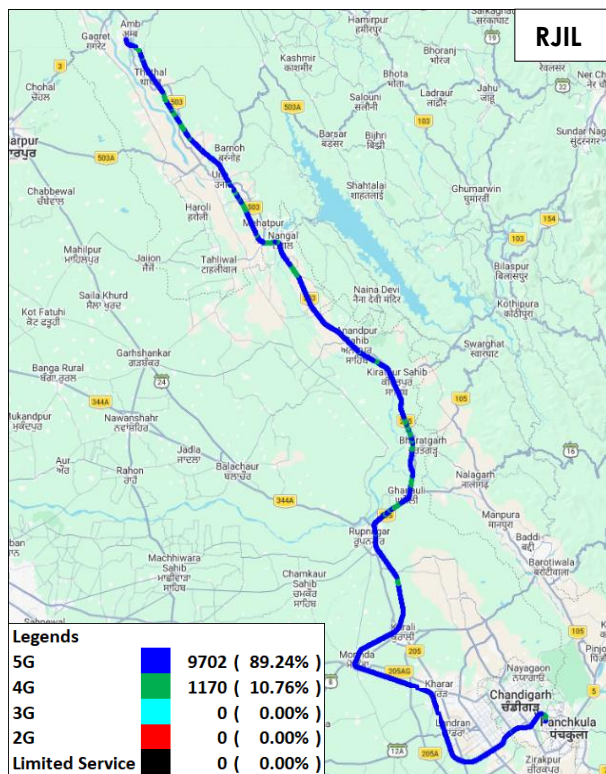


Figure-108: Serving technology plot in auto-selection mode (5G/4G/3G/2G) data - RJIL.

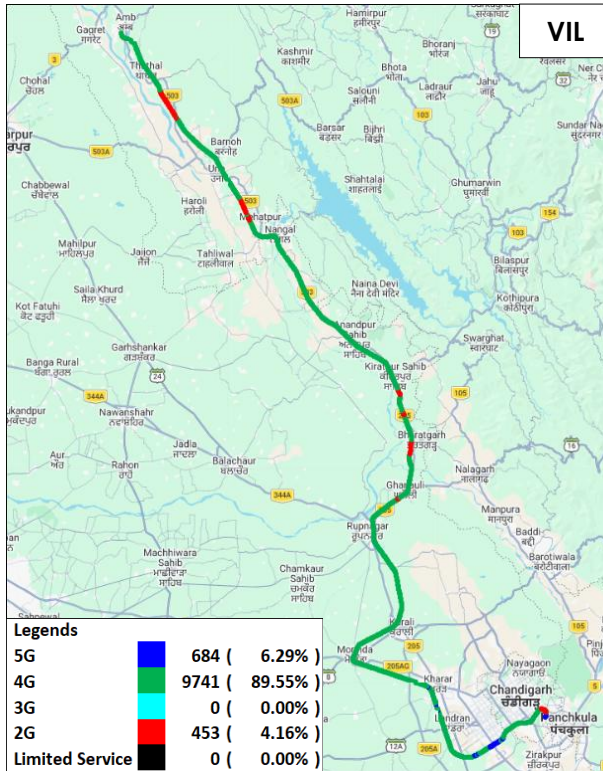


Figure-109: Serving technology plot in auto-selection mode (5G/4G/3G/2G) data - VIL.

(c) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G) data. (Refer figure-159, 160, 161 & 162 for map view)

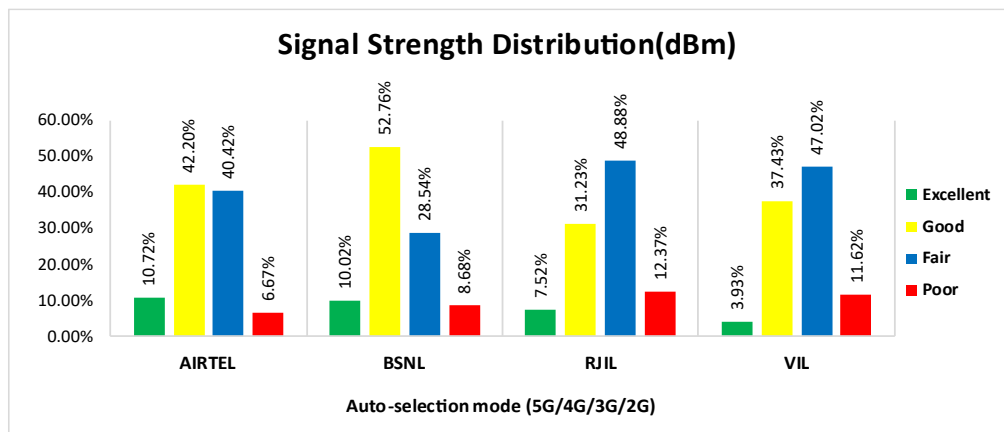


Figure-110: Signal strength distribution auto-selection mode (5G/4G/3G/2G) data.

Observations:

- Airtel has 11% of samples falling in the excellent signal strength category.
- BSNL has 10% of samples falling in the excellent signal strength category.
- RJIL has 8% of samples falling in the excellent signal strength category.
- VIL has 4% of samples falling in the excellent signal strength category.

5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:

- a) Airtel, BSNL and VIL have 97.82%, 96.14% and 98.36% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL have 99.63%, 84.63%, 99.44% and 98.17% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)
- c) All Operators have 100.00% call setup success rate while calling on peer service provider's network for inter-operator calls. (refer table-9)

2. Call Setup Time:

- a) Airtel, BSNL and VIL call setup time is 3.33, 3.70 and 4.20 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL & VIL call setup time is 1.29, 2.71, 0.71 & 1.69 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, Airtel, RJIL and VIL have 4.78%, 1.92%, 1.63% and 1.35% silence call rate respectively. Further BSNL has higher RTP packet loss rate in downlink (6.26%) compared to VIL (2.15%), RJIL (1.33%) & Airtel (1.03%). In uplink the RTP packet loss rate is higher for BSNL (4.50%) compared to RJIL (1.52%), VIL (1.37%) & Airtel (1.11%). (refer table-6)

4. Drop Call Rate:

- a) Airtel, BSNL and VIL drop call rate is 2.23%, 8.54% and 2.22% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL drop call rate is 0.38%, 15.17%, 0.56% and 4.47% 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 153.41 Mbps, 10.28 Mbps, 234.01 Mbps and 15.60 Mbps respectively. (refer table-11)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 21.36 Mbps, 5.72 Mbps, 20.80 Mbps and 7.51 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 219.93 Mbps, 16.94 Mbps, 426.73 Mbps and 13.77 Mbps respectively. (refer table-38)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 43.68 Mbps, 9.54 Mbps, 35.98 Mbps and 7.55 Mbps respectively. (refer table-38)

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

- a) Airtel, BSNL, RJIL and VIL have 100.00%, 95.00%, 100.00% and 100.00% download session setup success rate respectively. (refer table-38)
- b) Airtel, BSNL, RJIL and VIL have 100.00%, 97.50%, 100.00% and 97.50% upload session setup success rate respectively. (refer table-38)

5.3 Operator wise Key Findings

1.Airtel: Voice

- 97.82% call setup success rate and 2.23% 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)
- 99.63% 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 well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for Hamirpur 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 Hamirpur city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 95.83% call setup success rate and 4.35% drop call rate have been observed in 3G/2G network mode for Bilaspur city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 98.84% call setup success rate and 1.18% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Bilaspur 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 walktest location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-56)
- 96.67% call setup success rate and 3.45% drop call rate have been observed in 3G/2G network mode for Amb to Hamirpur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-58)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Amb to Hamirpur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-60)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for Hamirpur to Bilaspur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-66)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur to Bilaspur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-68)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-74)

Data

- Airtel has 153.41 Mbps average download speed & 21.36 Mbps average upload speed for LSA. (refer table-11)
- Airtel has 171.15 Mbps average download speed & 18.38 Mbps average upload speed across measured routes for Hamirpur city drive. (refer table-19)
- Airtel has 87.49 Mbps average download speed & 11.82 Mbps average upload speed across measured routes for Bilaspur city drive. (refer table-27)
- Bilaspur Bus Stand, DC Office Bilaspur and Dr Radhakrishnan Govt Medical College Hospital, Hamirpur have less download speed (less than 100 Mbps) out of total 8 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-40, 41 & 42)
- National Institute of Technology, Hamirpur has less upload speed (less than 20 Mbps) out of total 8 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-45)
- Airtel has 146.26 Mbps average download speed & 15.77 Mbps average upload speed across measured routes for Amb to Hamirpur highway route. (refer table-64)
- Airtel has 176.88 Mbps average download speed & 17.67 Mbps average upload speed across measured routes for Hamirpur to Bilaspur highway route. (refer table-72)
- Airtel has 165.09 Mbps average download speed & 25.67 Mbps average upload speed across measured routes for railway drive. (refer table-76)

2. BSNL:

Voice

- 96.14% call setup success rate and 8.54% 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)
- 84.63% call setup success rate and 15.17% 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% & 2.00% respectively. (refer table-5)
- 98.64% call setup success rate and 4.14% drop call rate have been observed in 3G/2G network mode for Hamirpur city drive. Performance is not meeting the benchmark of 2.00% for call drop rate. (refer table-13)
- 93.21% call setup success rate and 11.92% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 96.22% call setup success rate and 12.92% drop call rate have been observed in 3G/2G network mode for Bilaspur city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-21)
- 77.56% call setup success rate and 18.24% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Bilaspur city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-23)
- 86.25% 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 not meeting the benchmark of 98.00% for call setup success rate. (refer table-29)

- 90.48% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at walktest location. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-56)
- 88.24% call setup success rate and 6.67% drop call rate have been observed in 3G/2G network mode for Amb to Hamirpur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-58)
- 81.97% call setup success rate and 36.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Amb to Hamirpur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-60)
- 96.77% call setup success rate and 6.67% drop call rate have been observed in 3G/2G network mode for Hamirpur to Bilaspur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-66)
- 77.50% call setup success rate and 25.81% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur to Bilaspur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-68)
- 88.71% call setup success rate and 14.55% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-74)

Data

- BSNL has 10.28 Mbps average download speed & 5.72 Mbps average upload speed for LSA. (refer table-11)
- BSNL has 11.29 Mbps average download speed & 4.81 Mbps average upload speed across measured routes for Hamirpur city drive. (refer table-19)
- BSNL has 6.92 Mbps average download speed & 3.78 Mbps average upload speed across measured routes for Bilaspur city drive. (refer table-27)
- AIIMS Bilaspur and Purnam Mall Bilaspur have less download speed (less than 10 Mbps) out of total 8 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-39 & 46)
- BSNL has 9.57 Mbps average download speed & 5.03 Mbps average upload speed across measured routes for Amb to Hamirpur highway route. (refer table-64)
- BSNL has 5.44 Mbps average download speed & 3.89 Mbps average upload speed across measured routes for Hamirpur to Bilaspur highway route. (refer table-72)
- BSNL has 12.77 Mbps average download speed & 8.66 Mbps average upload speed across measured routes for railway drive. (refer table-76)

3. RJIL: Voice

- 99.44% call setup success rate and 0.56% 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)

- 99.33% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 98.86% call setup success rate and 1.73% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Bilaspur 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 walktest location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-56)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Amb to Hamirpur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-60)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur to Bilaspur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-68)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-74)

Data

- RJIL has 234.01 Mbps average download speed & 20.80 Mbps average upload speed for LSA. (refer table-11)
- RJIL has 243.12 Mbps average download speed & 19.81 Mbps average upload speed across measured routes for Hamirpur city drive. (refer table-19)
- RJIL has 172.19 Mbps average download speed & 14.45 Mbps average upload speed across measured routes for Bilaspur city drive. (refer table-27)
- AIIMS Bilaspur, Dr Radhakrishnan Govt Medical College Hospital, Hamirpur and ISBT Hamirpur have less upload speed (less than 20 Mbps) out of total 8 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-39, 42 & 44)
- RJIL has 250.71 Mbps average download speed & 22.81 Mbps average upload speed across measured routes for Amb to Hamirpur highway route. (refer table-64)
- RJIL has 221.34 Mbps average download speed & 15.83 Mbps average upload speed across measured routes for Hamirpur to Bilaspur highway route. (refer table-72)
- RJIL has 195.53 Mbps average download speed & 17.83 Mbps average upload speed across measured routes for railway drive. (refer table-76)

4. VIL: Voice

- 98.36% call setup success rate and 2.22% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 2.00% for call drop rate. (refer table-3)
- 98.17% call setup success rate and 4.47% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 2.00% for call drop rate. (refer table-5)
- 100.00% call setup success rate and 0.71% drop call rate have been observed in 3G/2G network mode for Hamirpur city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-13)
- 99.33% call setup success rate and 0.68% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 98.17% call setup success rate and 2.48% drop call rate have been observed in 3G/2G network mode for Bilaspur city drive. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table-21)
- 97.14% call setup success rate and 6.47% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Bilaspur city drive. Performance is not meeting 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 walktest location. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-56)
- 90.91% call setup success rate and 10.00% drop call rate have been observed in 3G/2G network mode for Amb to Hamirpur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-58)
- 94.59% call setup success rate and 22.86% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Amb to Hamirpur highway route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-60)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for Hamirpur to Bilaspur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-66)
- 96.67% call setup success rate and 6.90% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for Hamirpur to Bilaspur highway route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-68)
- 98.21% call setup success rate and 3.64% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for railway drive. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table-74)

Data

- VIL has 15.60 Mbps average download speed & 7.51 Mbps average upload speed for LSA. (refer table-11)

- VIL has 13.51 Mbps average download speed & 6.35 Mbps average upload speed across measured routes for Hamirpur city drive. (refer table-19)
- VIL has 13.62 Mbps average download speed & 3.96 Mbps average upload speed across measured routes for Bilaspur city drive. (refer table-27)
- Bilaspur Bus Stand, Dr Radhakrishnan Govt Medical College Hospital, Hamirpur and Purnam Mall Bilaspur have less download speed (less than 10 Mbps) out of total 8 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-40, 42 & 46)
- VIL has 9.76 Mbps average download speed & 5.00 Mbps average upload speed across measured routes for Amb to Hamirpur highway route. (refer table-64)
- VIL has 10.59 Mbps average download speed & 5.89 Mbps average upload speed across measured routes for Hamirpur to Bilaspur highway route. (refer table-72)
- VIL has 27.16 Mbps average download speed & 15.48 Mbps average upload speed across measured routes for railway drive. (refer table-76)

6. Annexure

6.1 Route wise coverage map

6.1.1 City

i) Hamirpur City

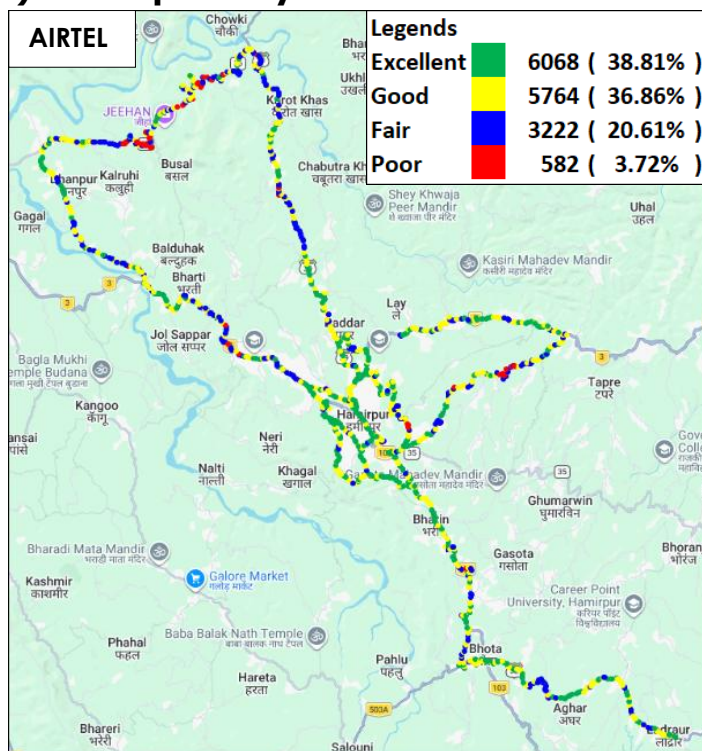


Figure-111: Signal strength 3G/2G network mode voice - AIRTEL.

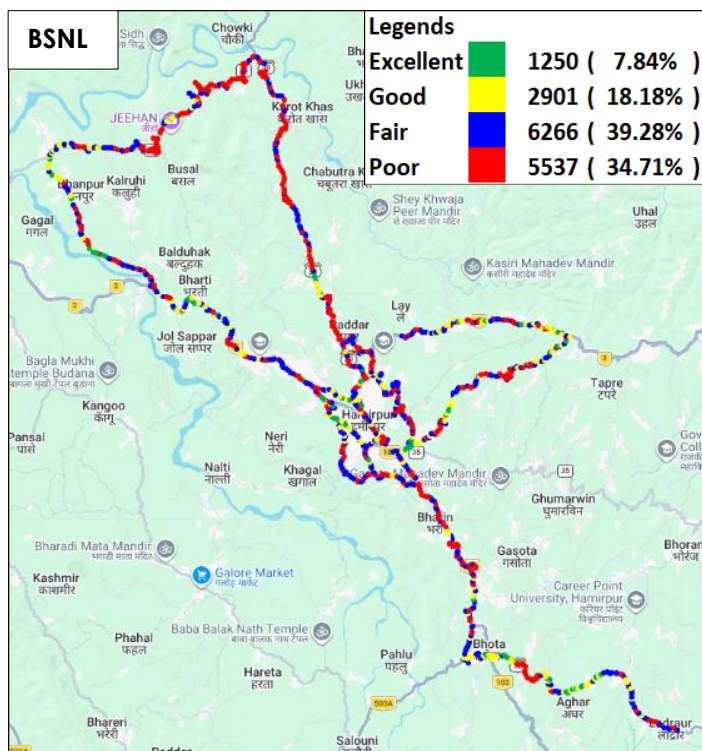


Figure-112: Signal strength 3G/2G network mode voice - BSNL.

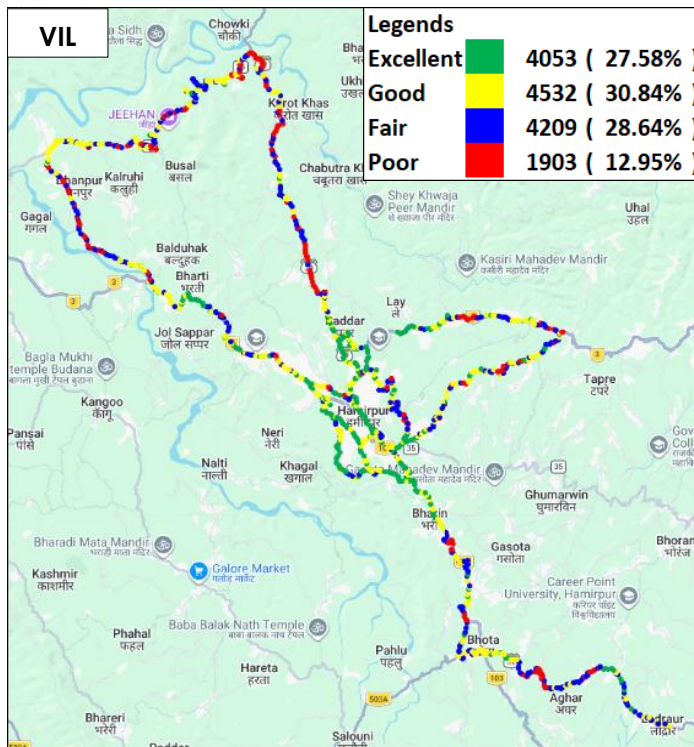


Figure-113: Signal strength 3G/2G network mode voice - VIL.

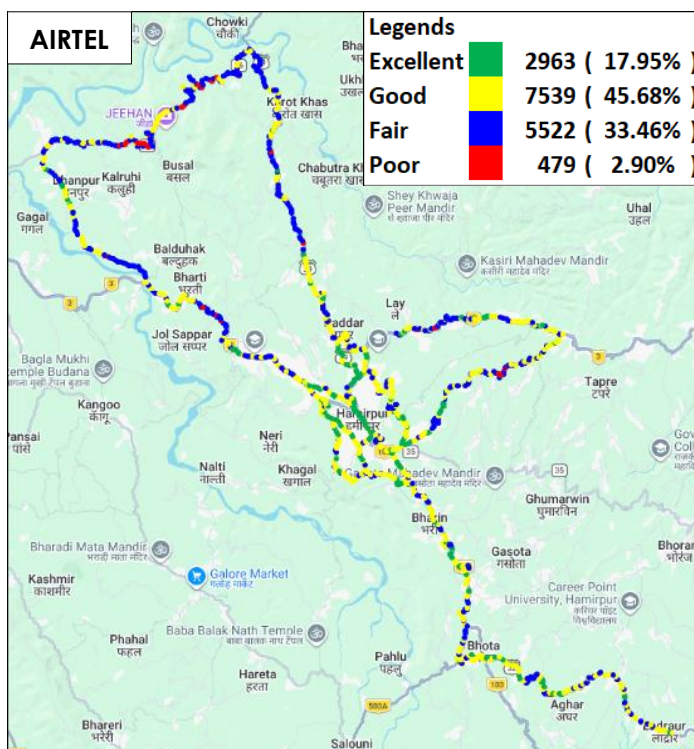


Figure-114: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

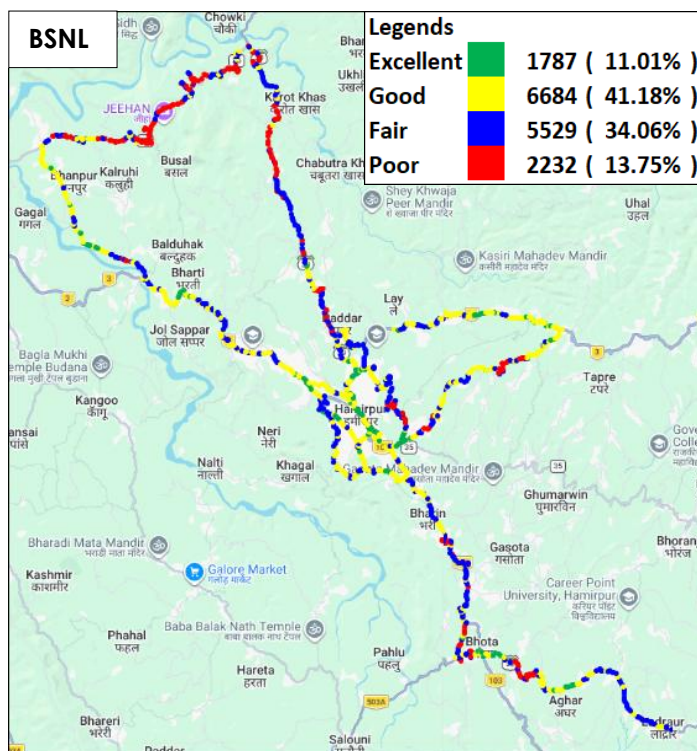


Figure-115: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

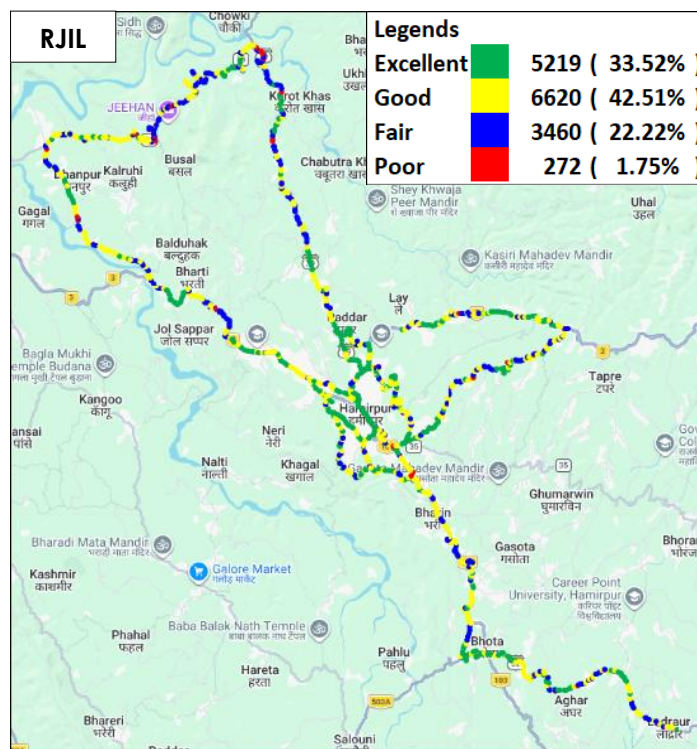


Figure-116: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

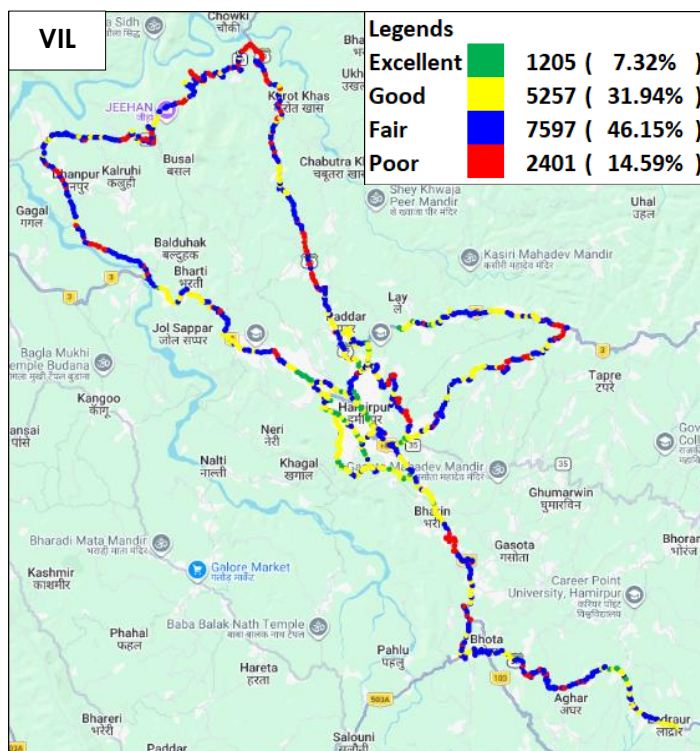


Figure-117: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

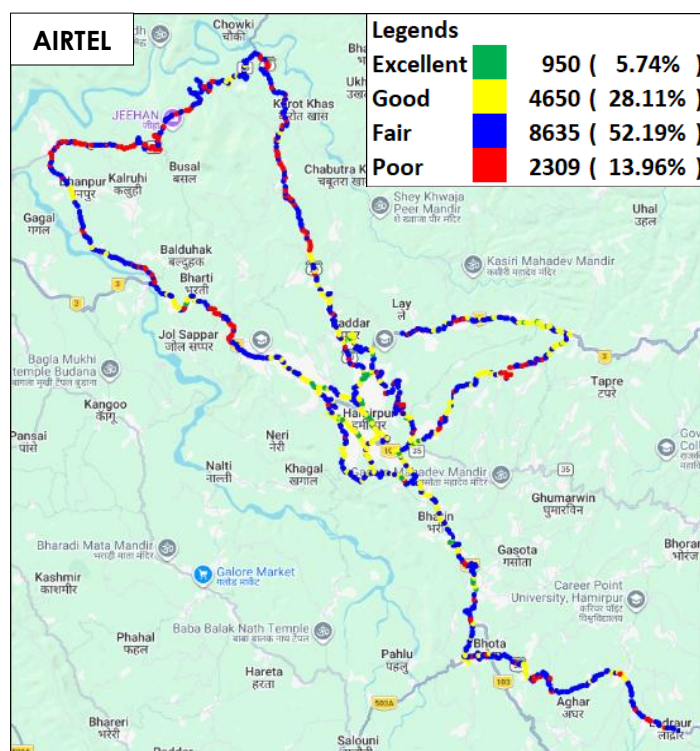


Figure-118: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

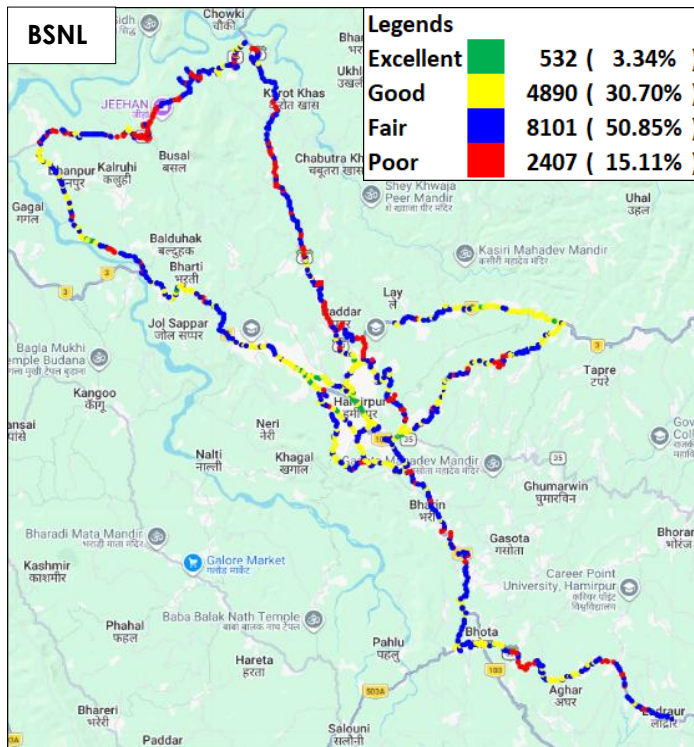


Figure-119: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

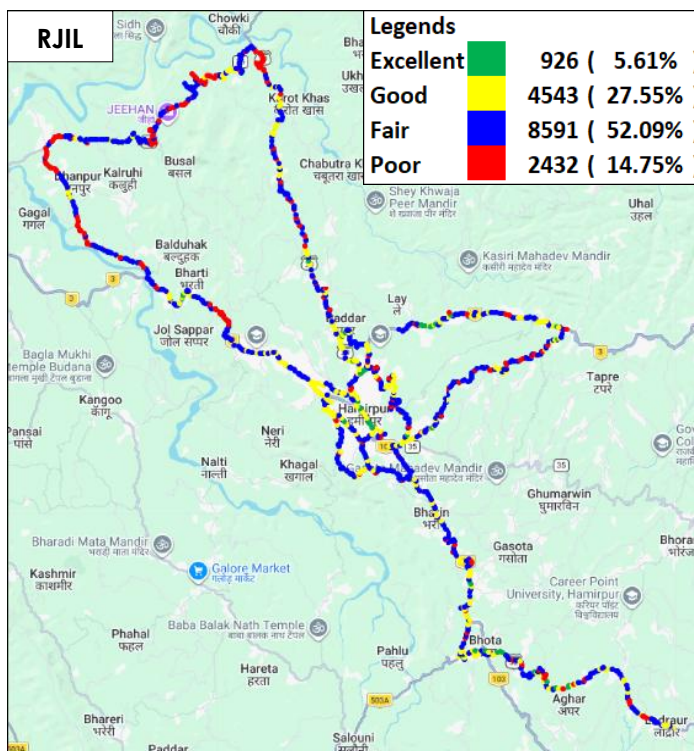


Figure-120: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

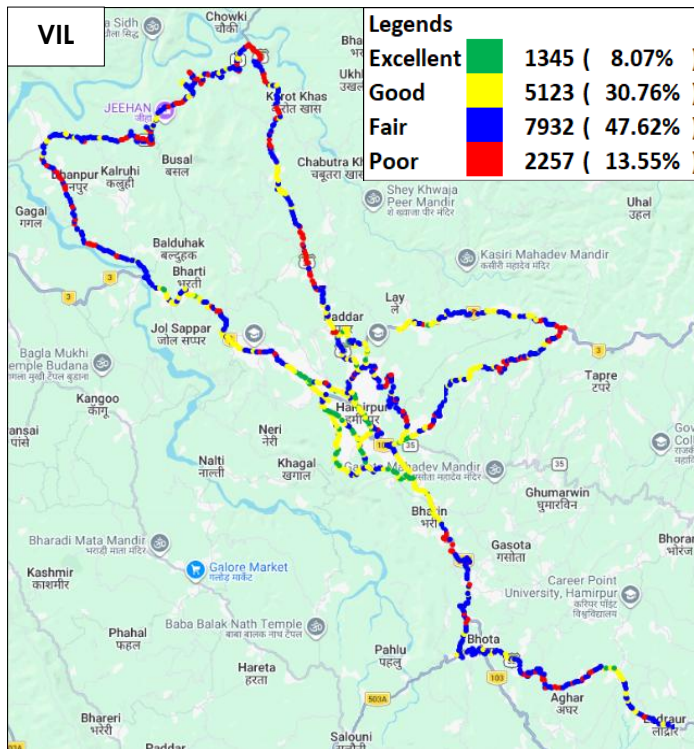


Figure-121: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

ii) Bilaspur City

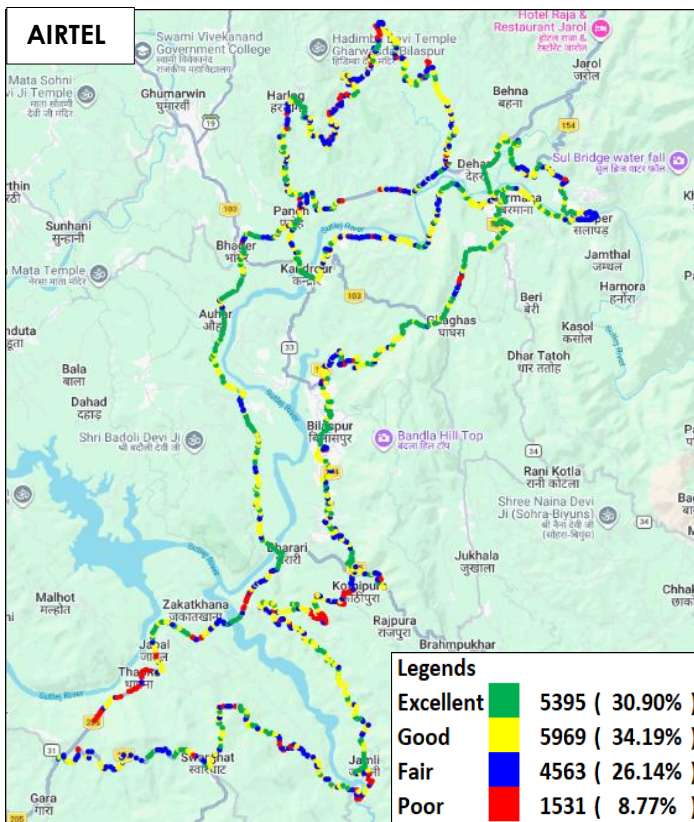


Figure-122: Signal strength 3G/2G network mode voice - AIRTEL.

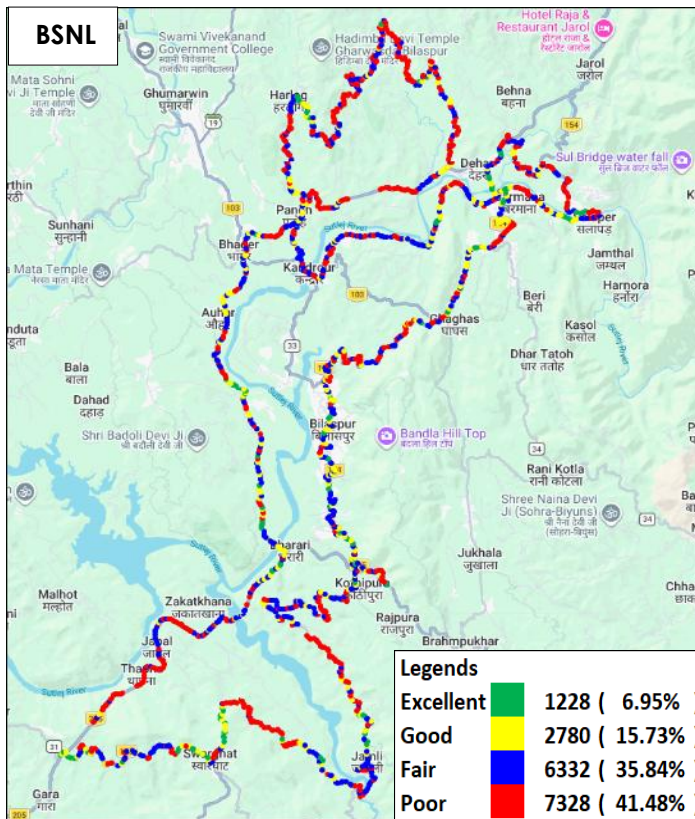


Figure-123: Signal strength 3G/2G network mode voice - BSNL.

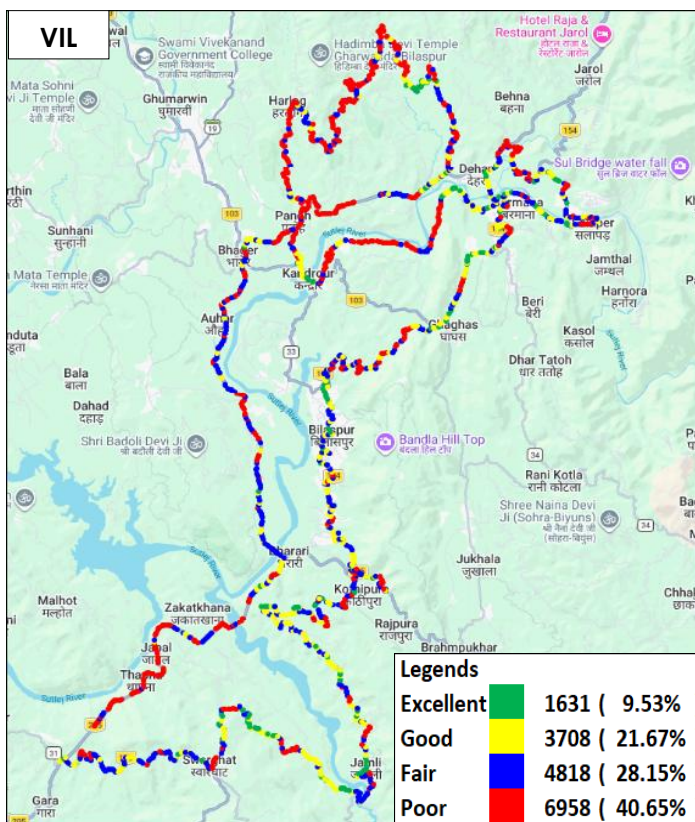


Figure-124: Signal strength 3G/2G network mode voice - VIL.

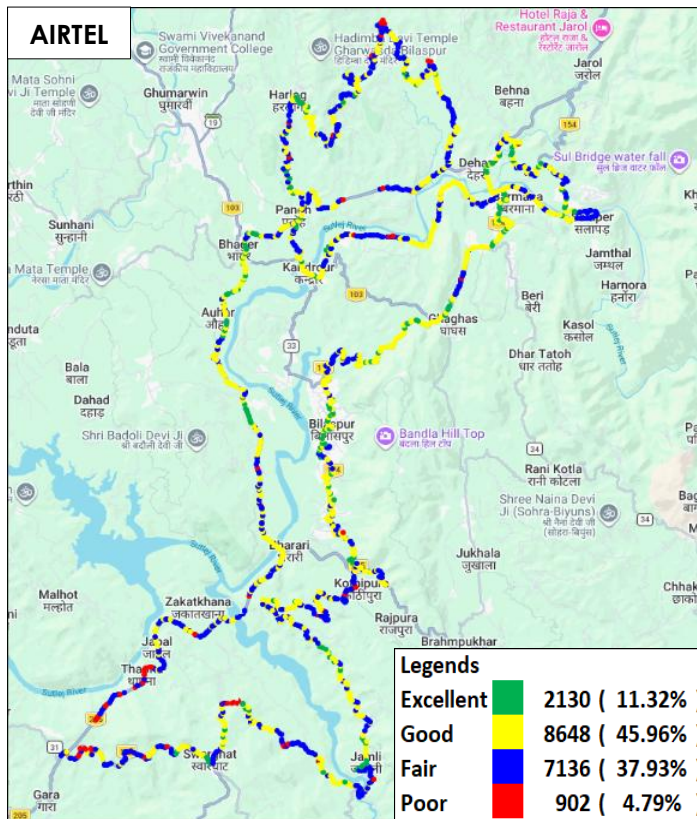


Figure-125: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

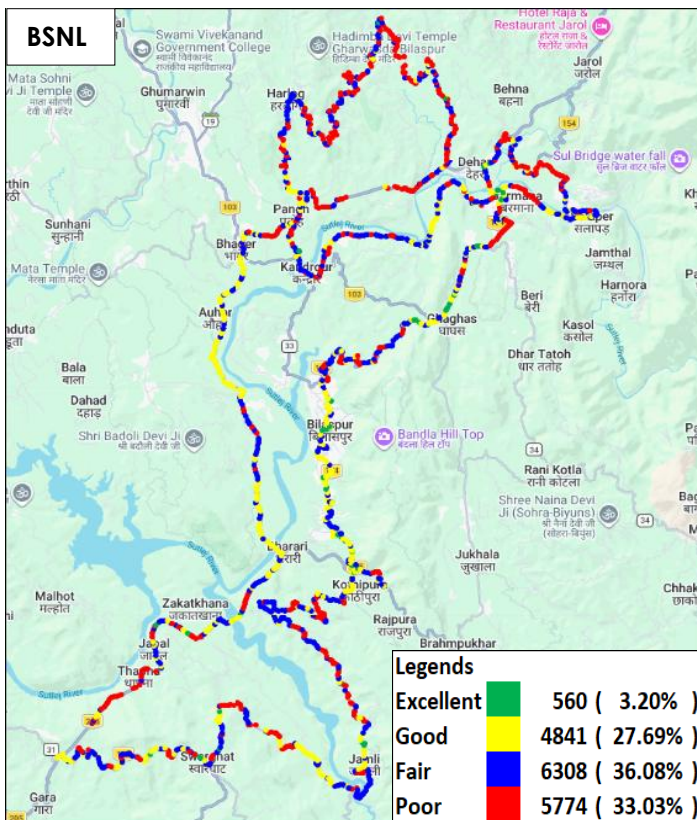


Figure-126: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

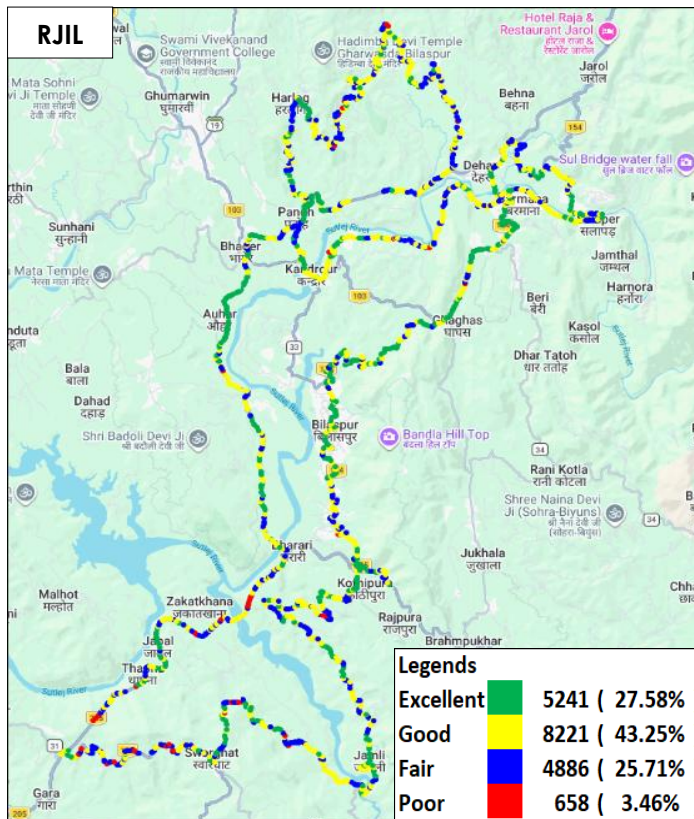


Figure-127: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

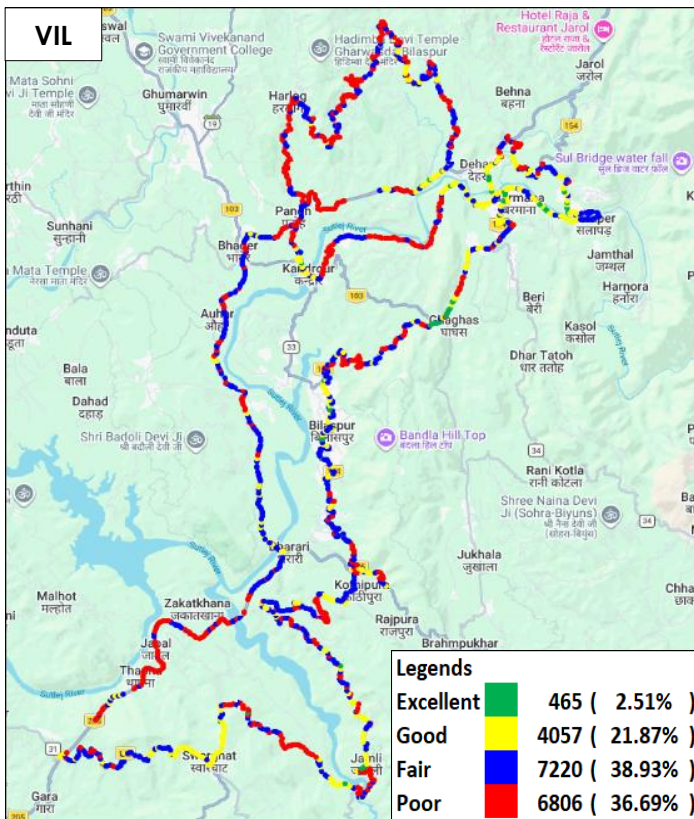


Figure-128: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

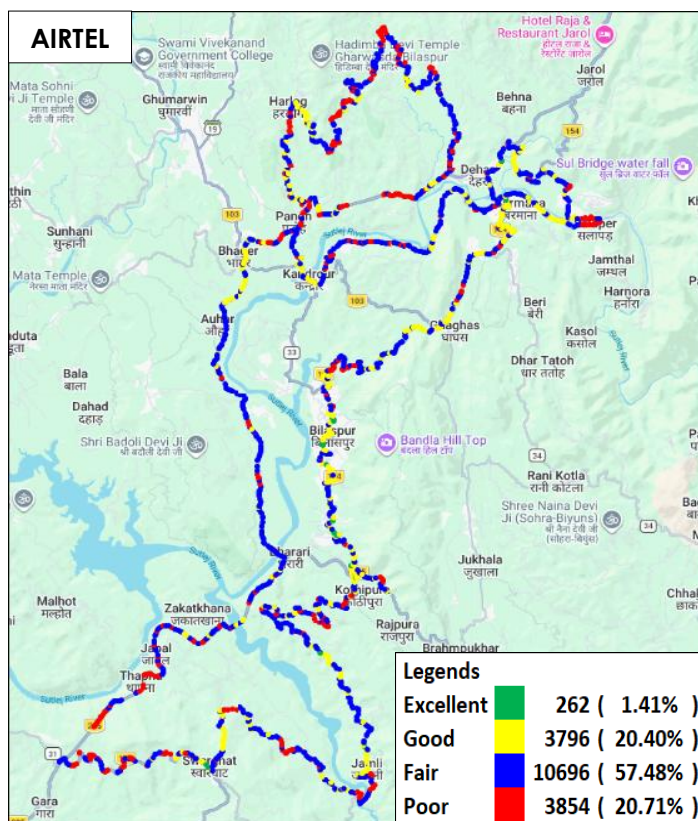


Figure-129: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

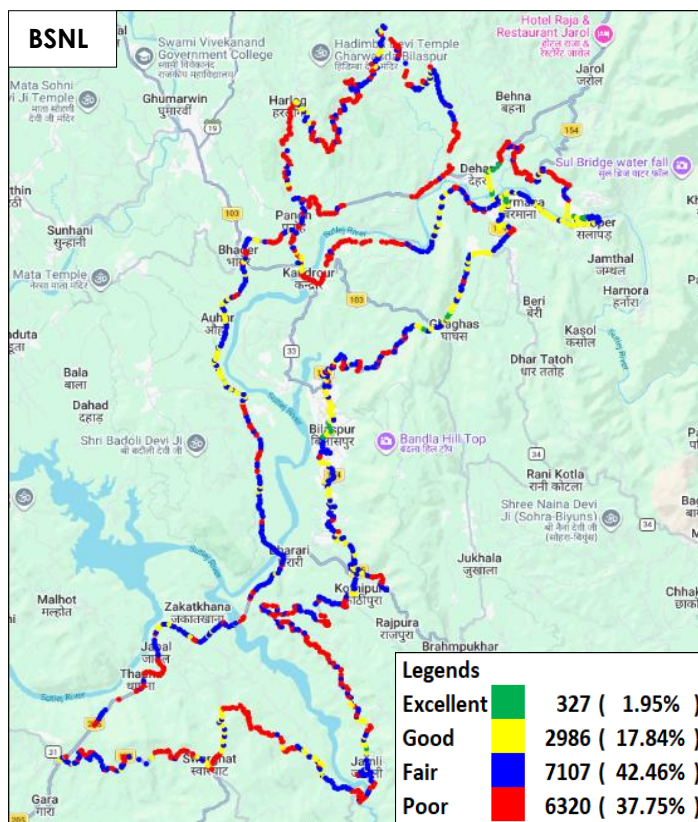


Figure-130: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

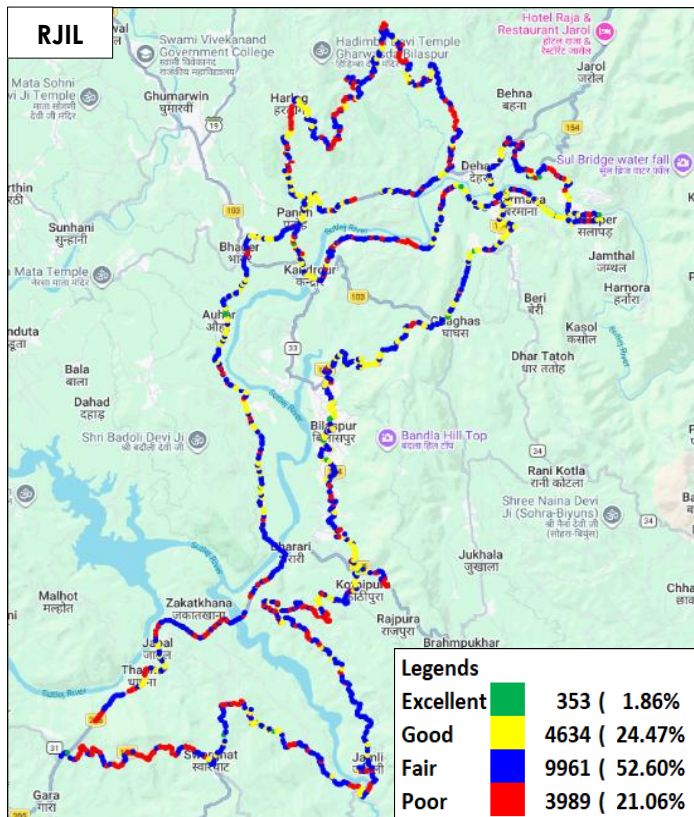


Figure-131: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

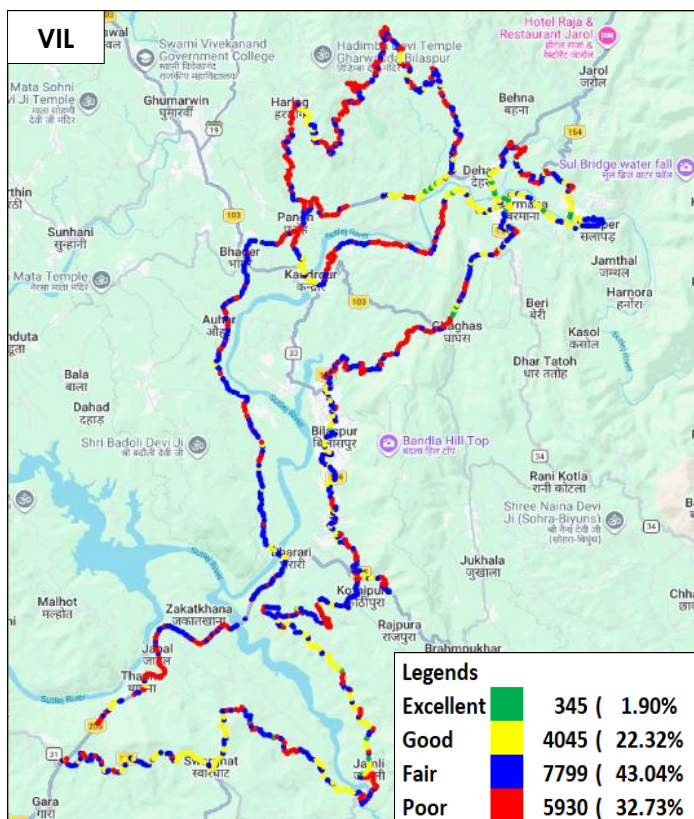


Figure-132: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

6.2.1 Highway

i) Amb to Hamirpur

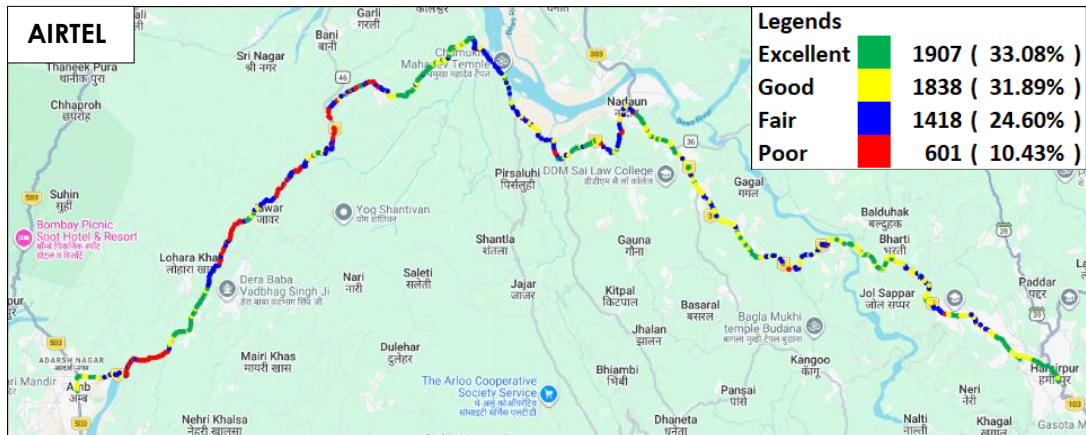


Figure-133: Signal strength 3G/2G network mode voice - AIRTEL.

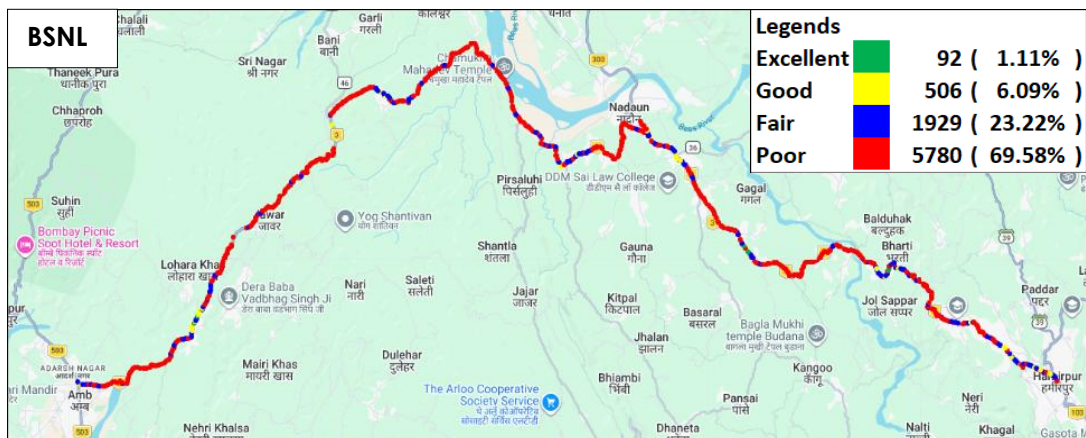


Figure-134: Signal strength 3G/2G network mode voice - BSNL.



Figure-135: Signal strength 3G/2G network mode voice - VIL.

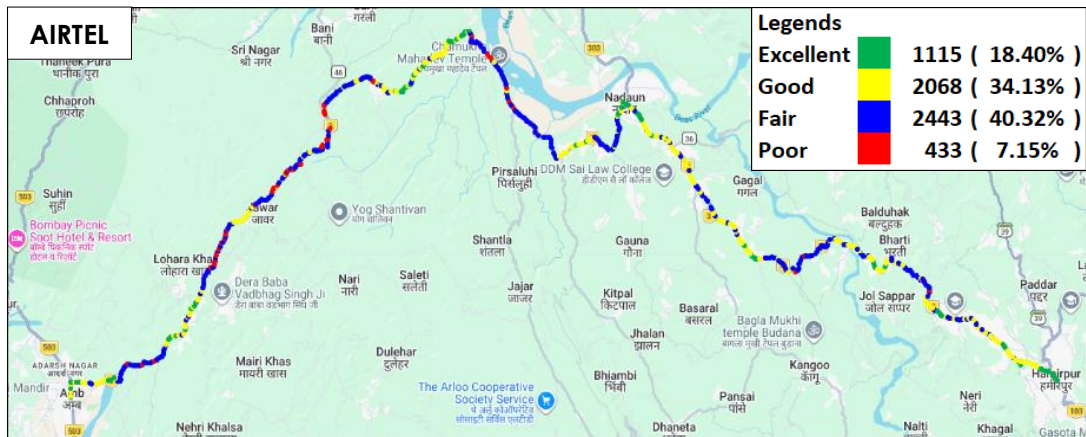


Figure-136: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

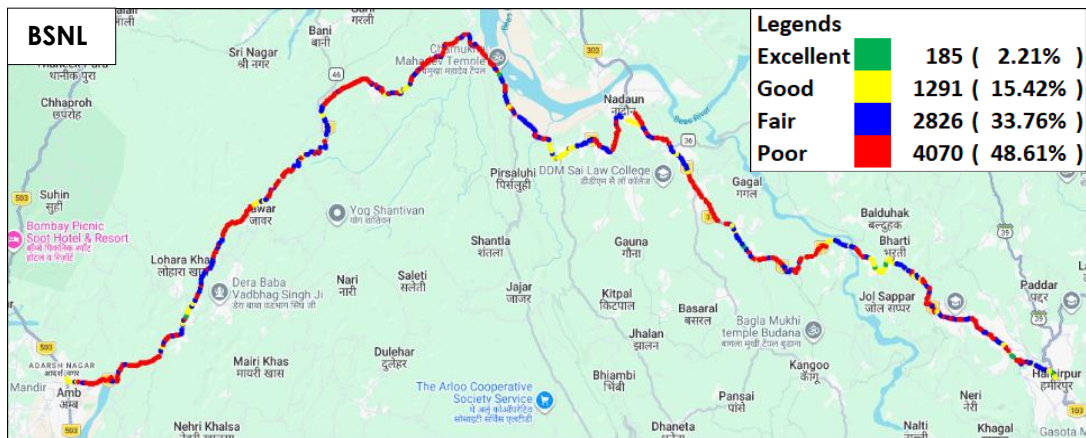


Figure-137: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

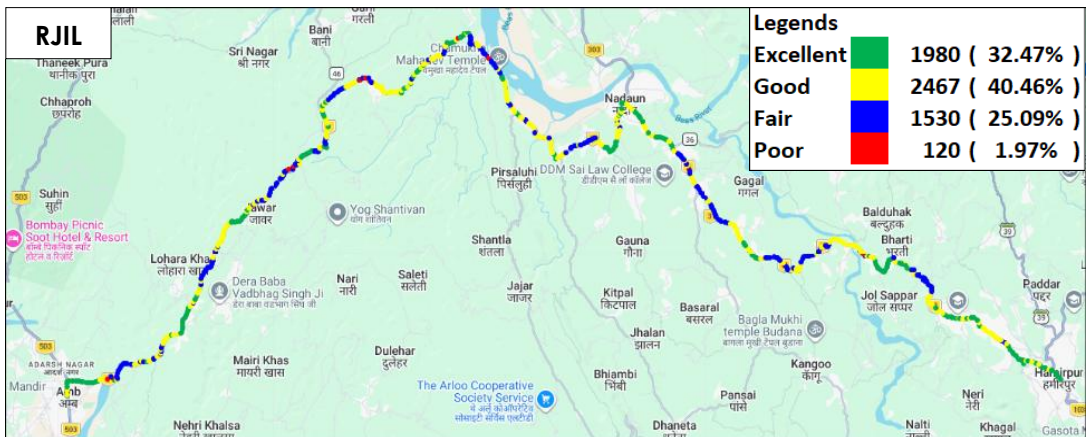


Figure-138: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

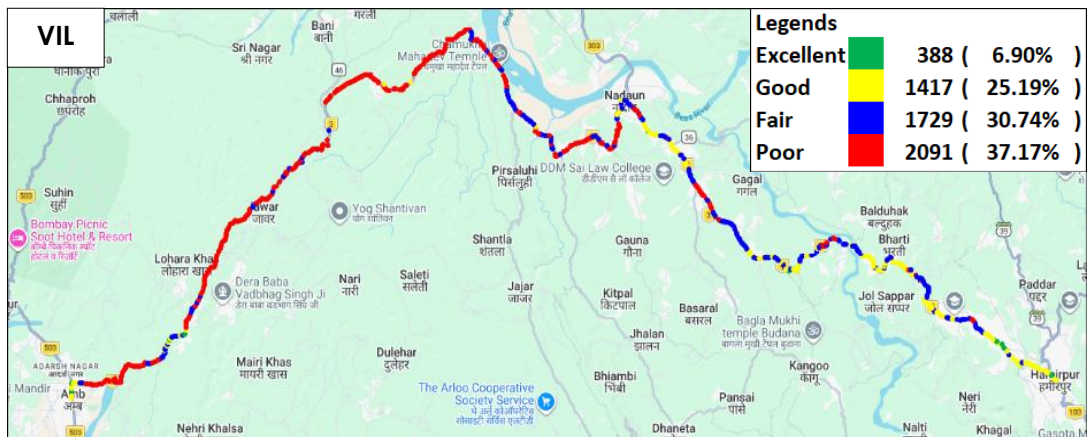


Figure-139: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

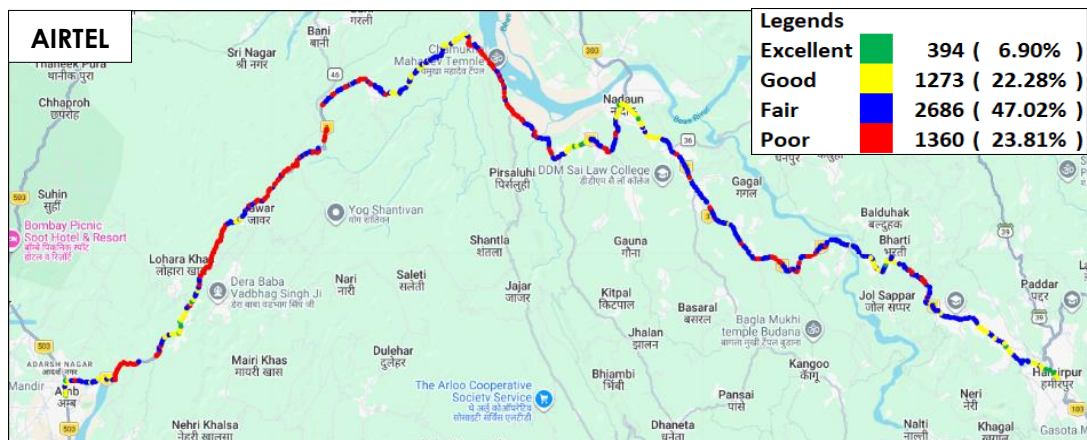


Figure-140: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

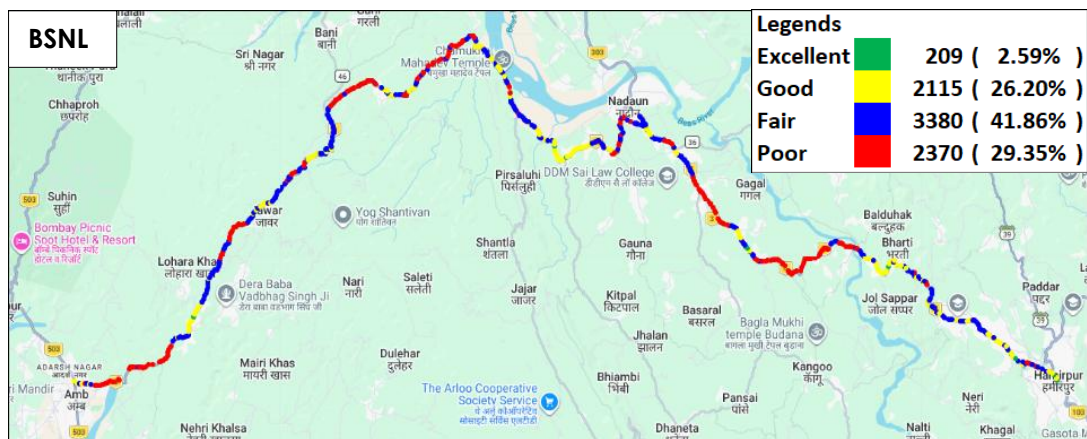


Figure-141: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

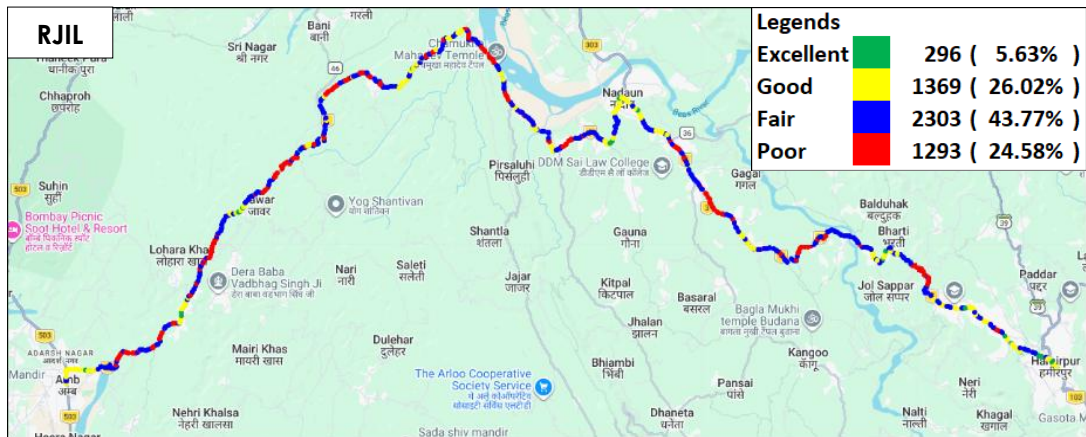


Figure-142: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

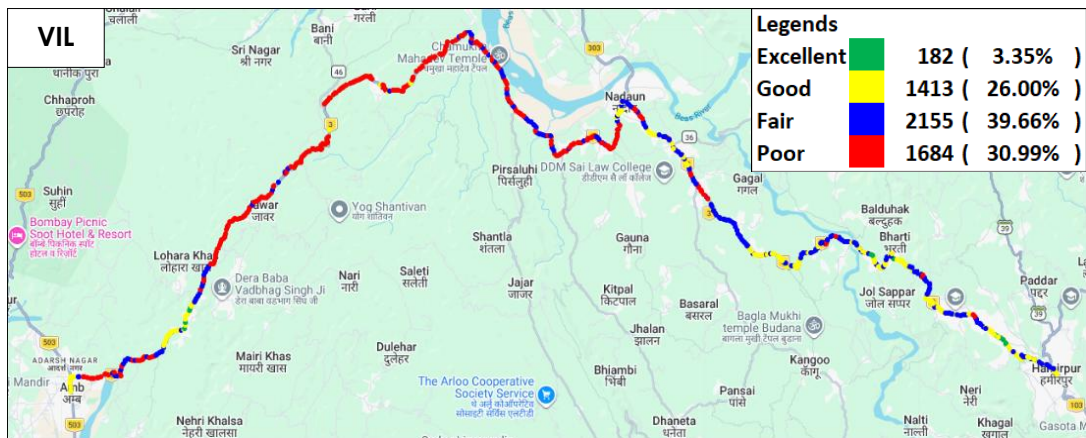


Figure-143: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

ii) Hamirpur to Bilaspur

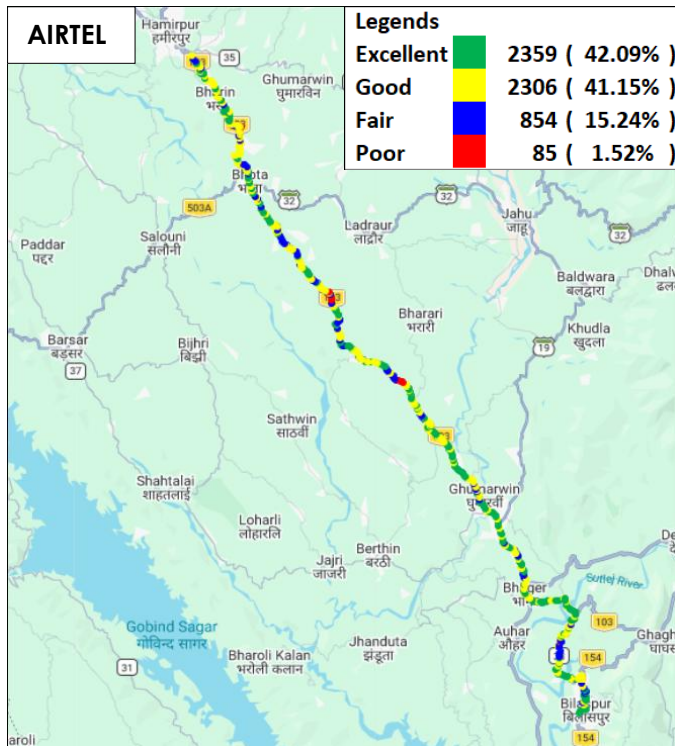


Figure-144: Signal strength 3G/2G network mode voice - AIRTEL.

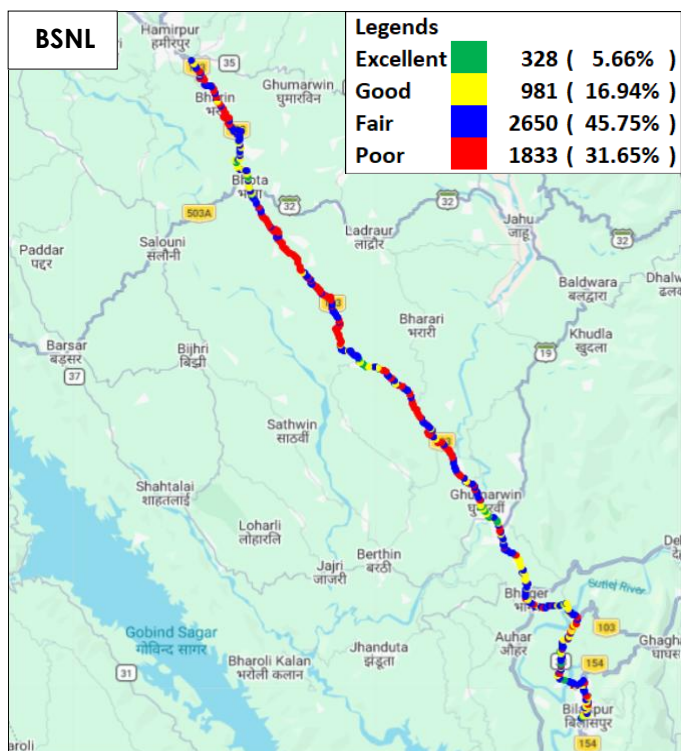


Figure-145: Signal strength 3G/2G network mode voice - BSNL.

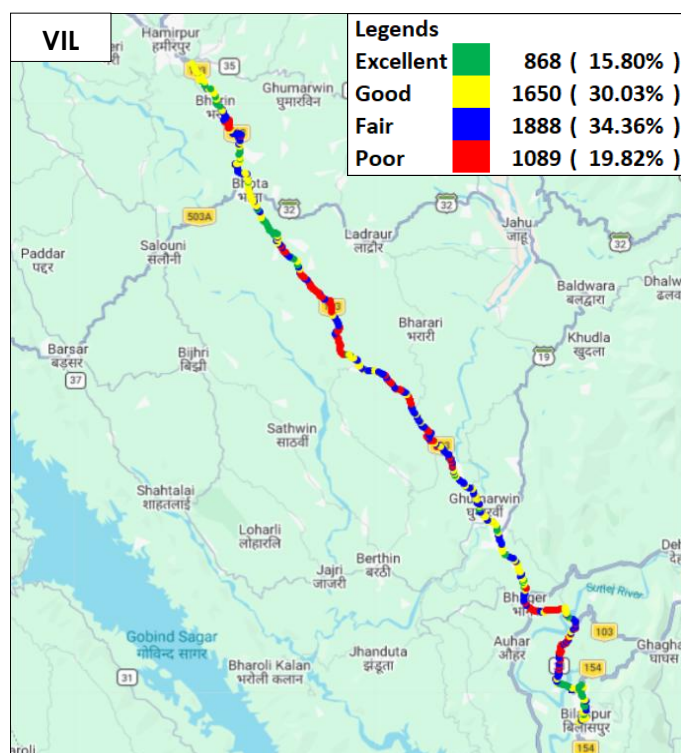


Figure-146: Signal strength 3G/2G network mode voice - VIL.

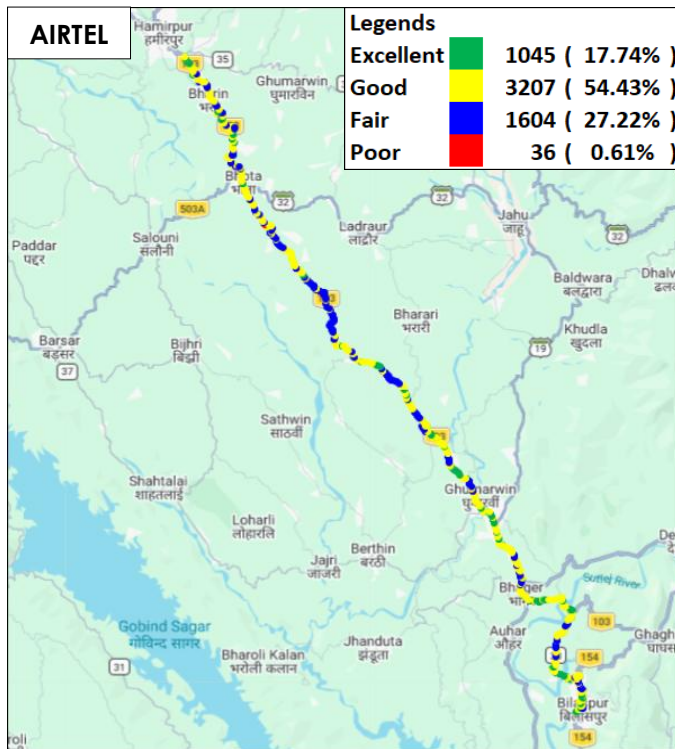


Figure-147: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

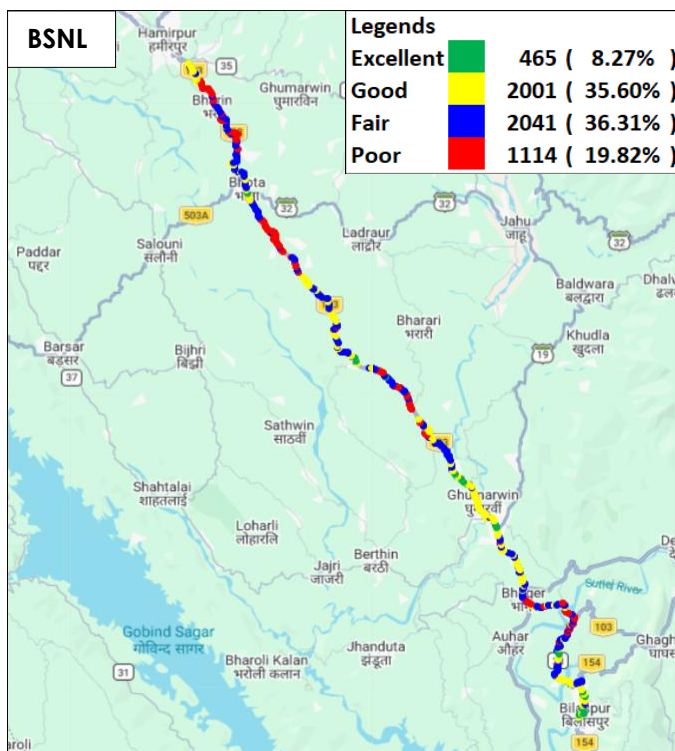


Figure-148: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

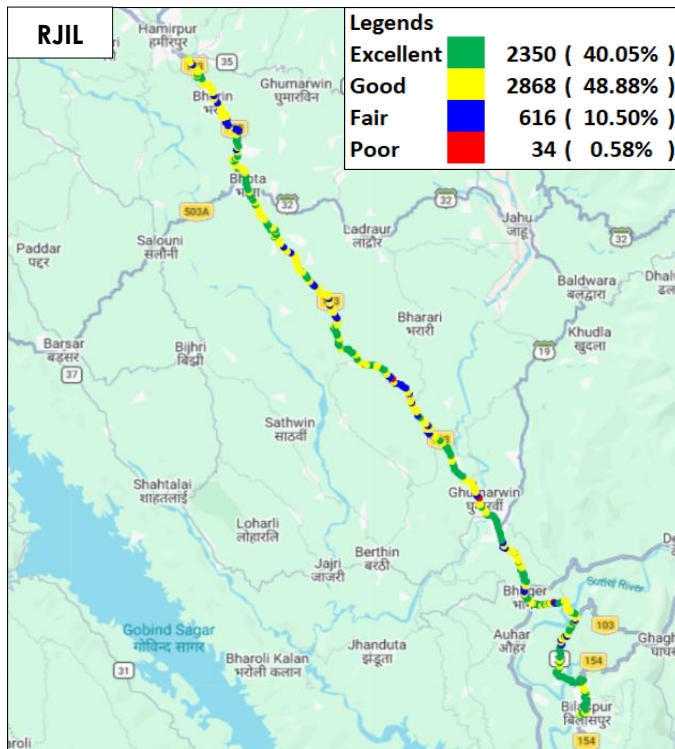


Figure-149: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

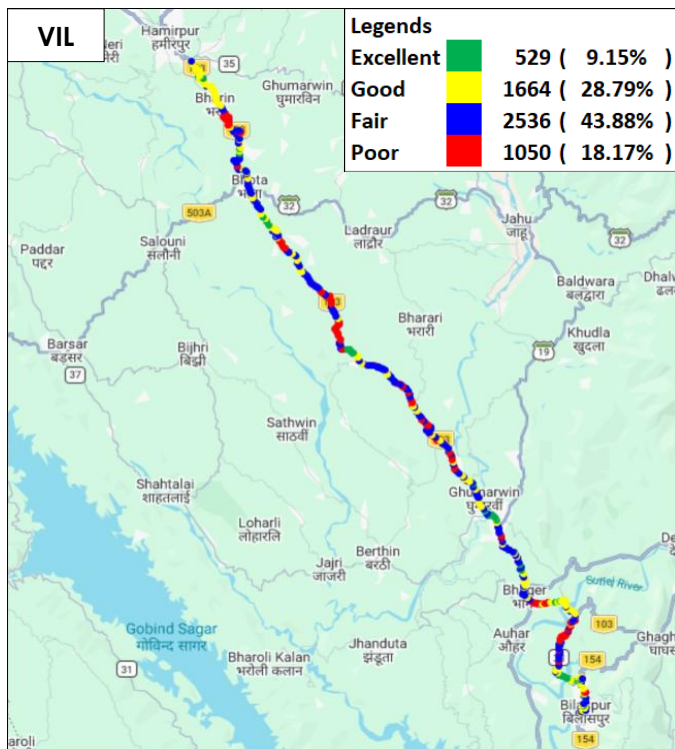


Figure-150: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

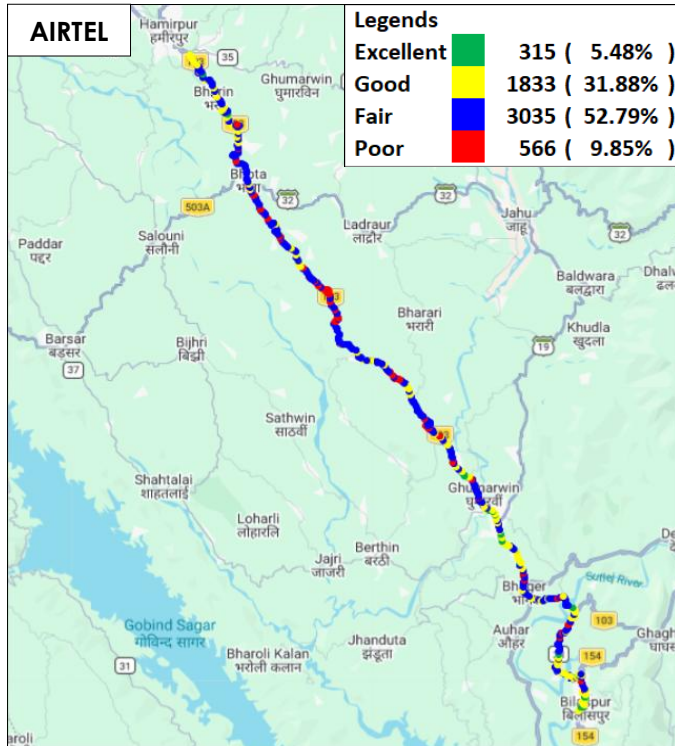


Figure-151: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

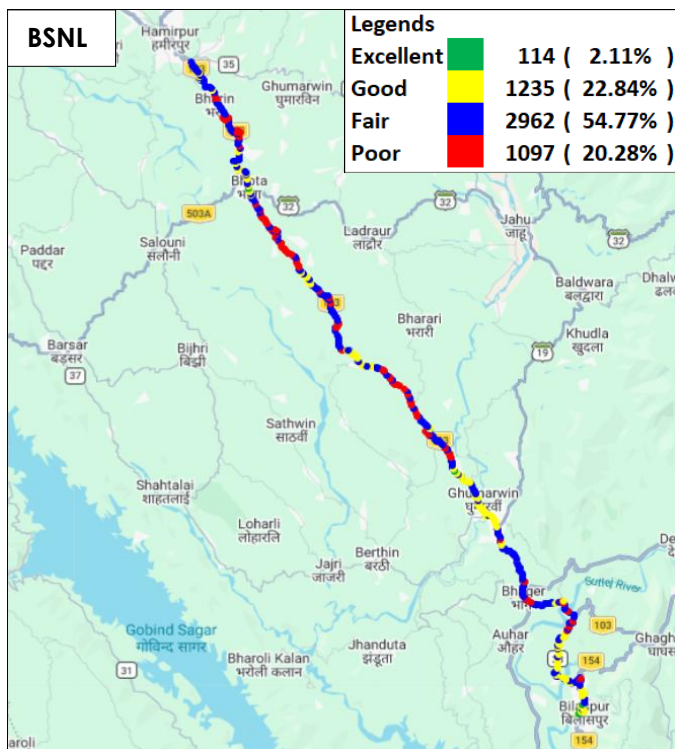


Figure-152: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

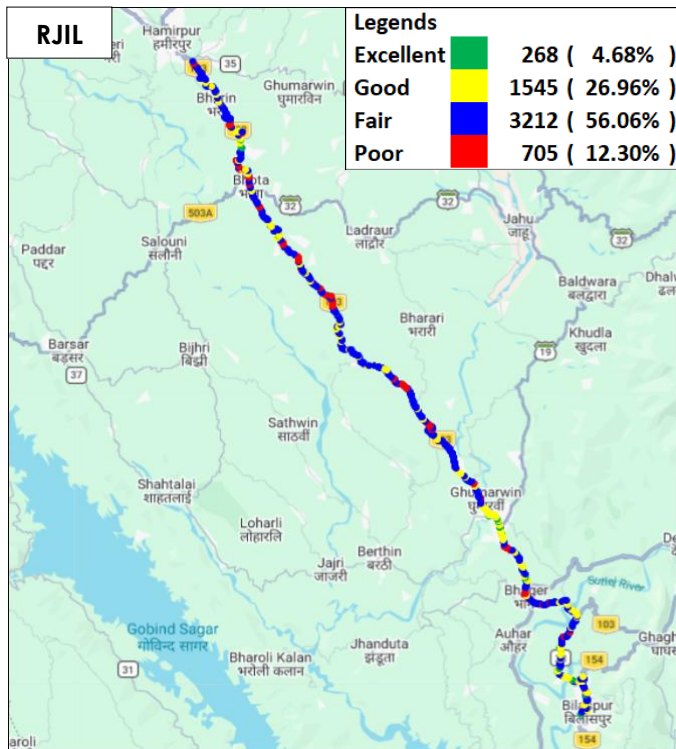


Figure-153: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

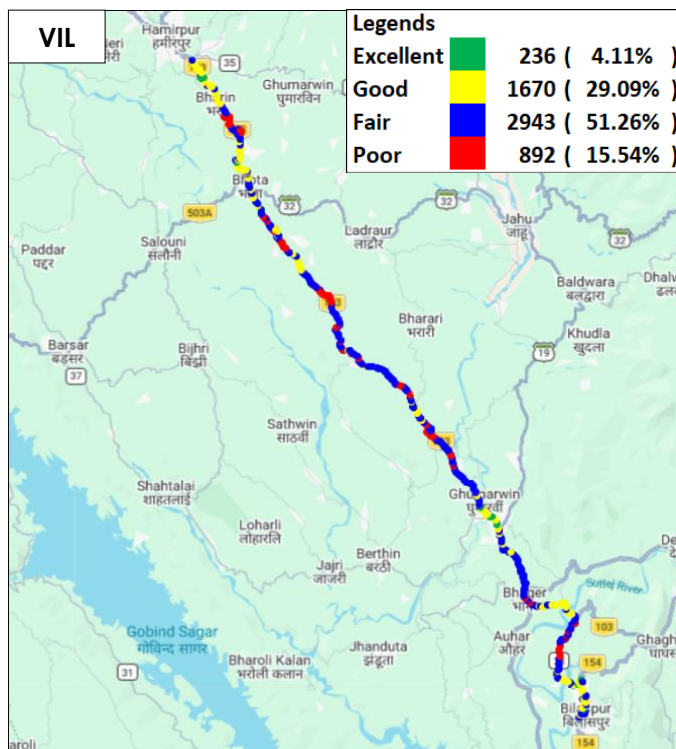


Figure-154: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

6.3.1 Railway

i) Chandigarh to Amb

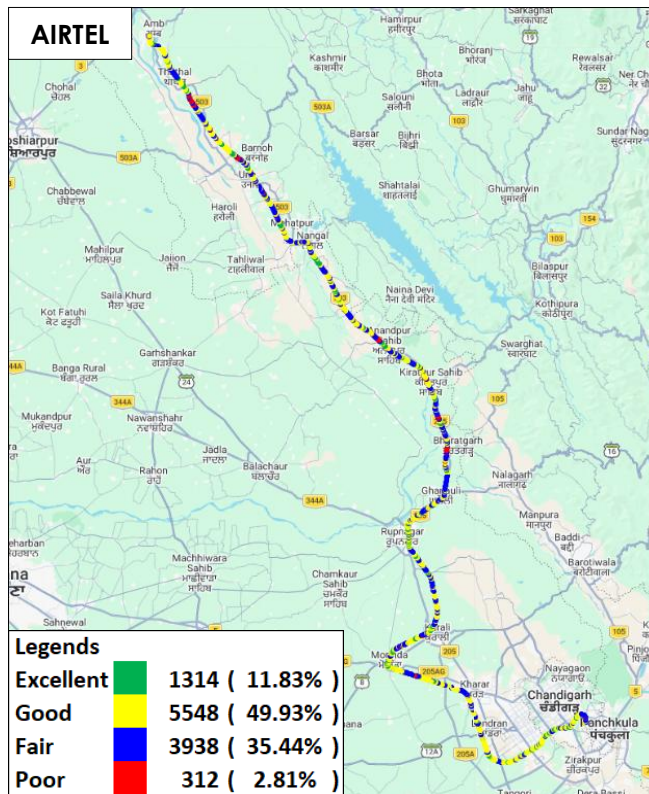


Figure-155: Signal strength auto-selection mode (5G/4G/3G/2G) voice - AIRTEL.

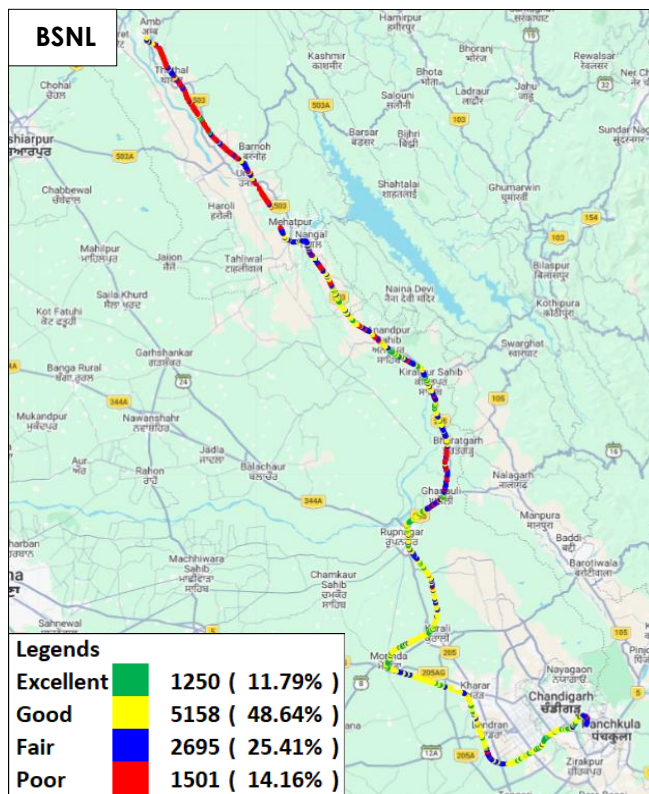


Figure-156: Signal strength auto-selection mode (5G/4G/3G/2G) voice - BSNL.

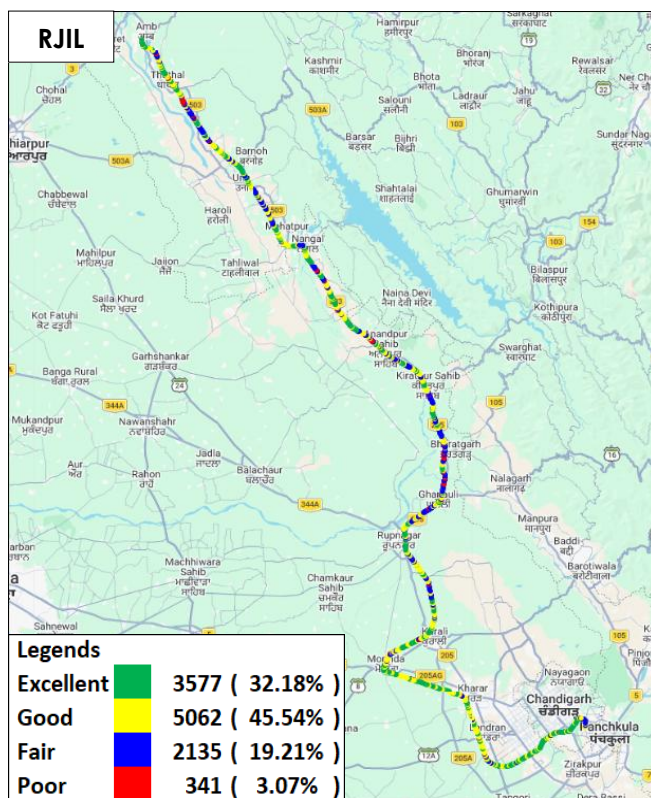


Figure-157: Signal strength auto-selection mode (5G/4G/3G/2G) voice - RJIL.

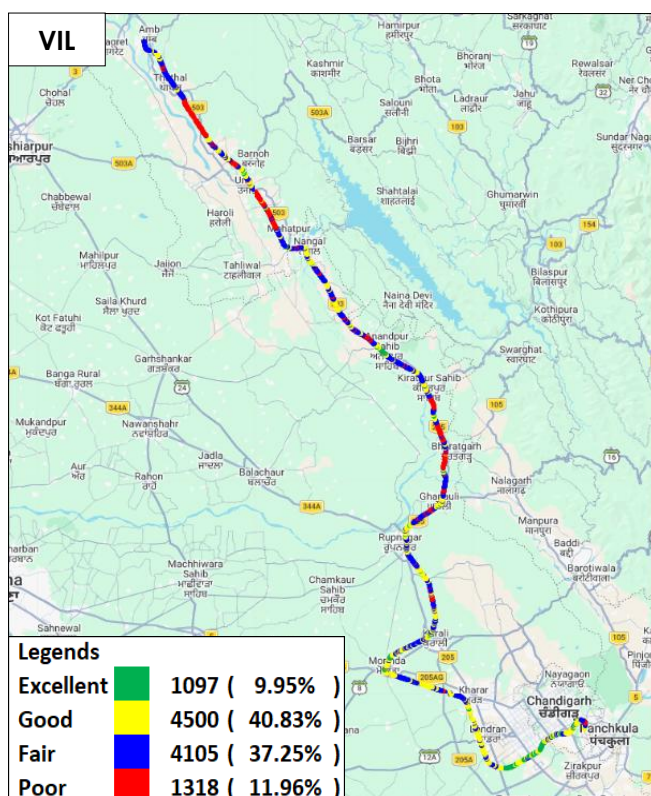


Figure-158: Signal strength auto-selection mode (5G/4G/3G/2G) voice - VIL.

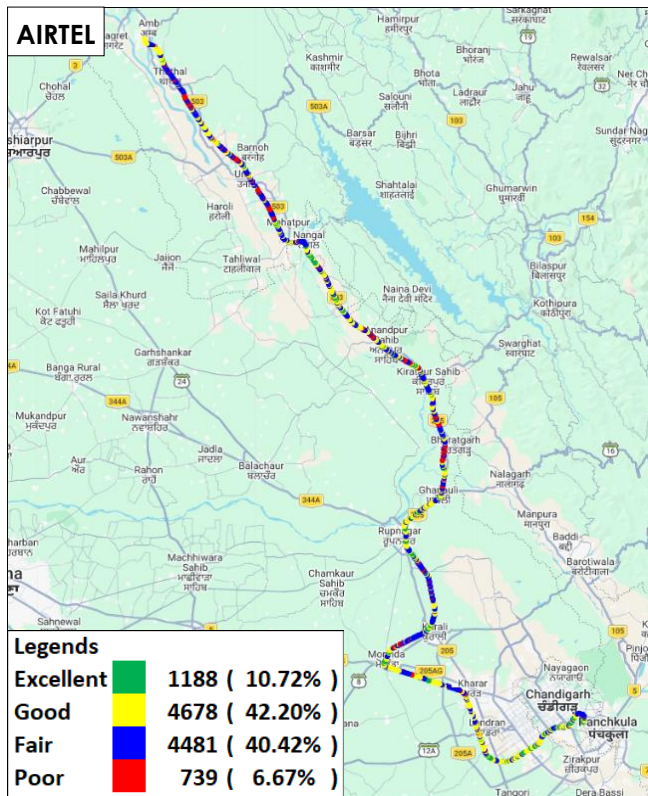


Figure-159: Signal strength auto-selection mode (5G/4G/3G/2G) data - AIRTEL.

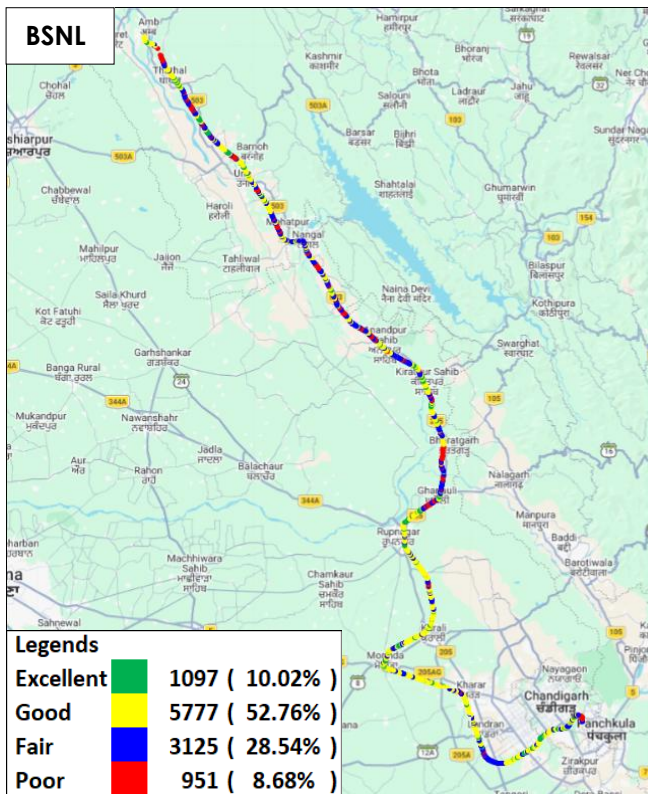


Figure-160: Signal strength auto-selection mode (5G/4G/3G/2G) data - BSNL.

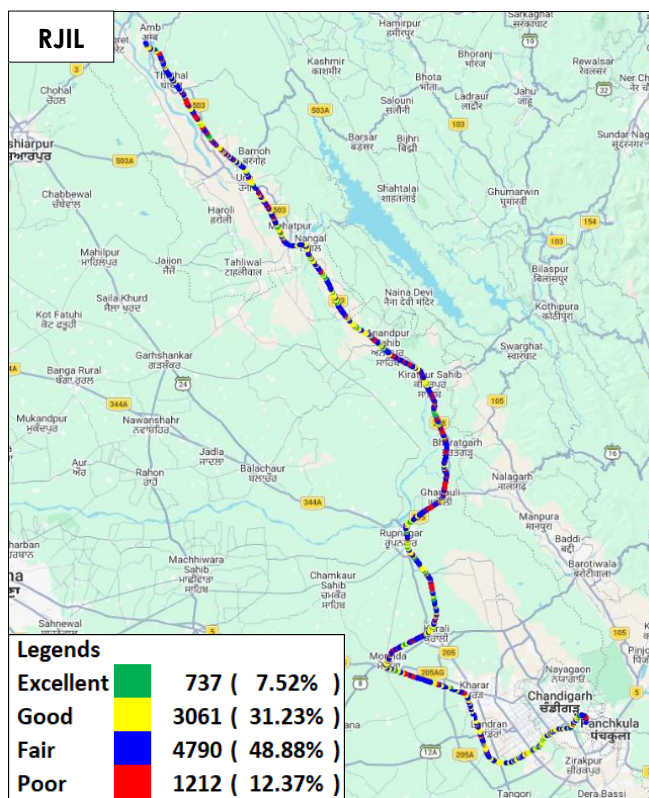


Figure-161: Signal strength auto-selection mode (5G/4G/3G/2G) data - RJIL.

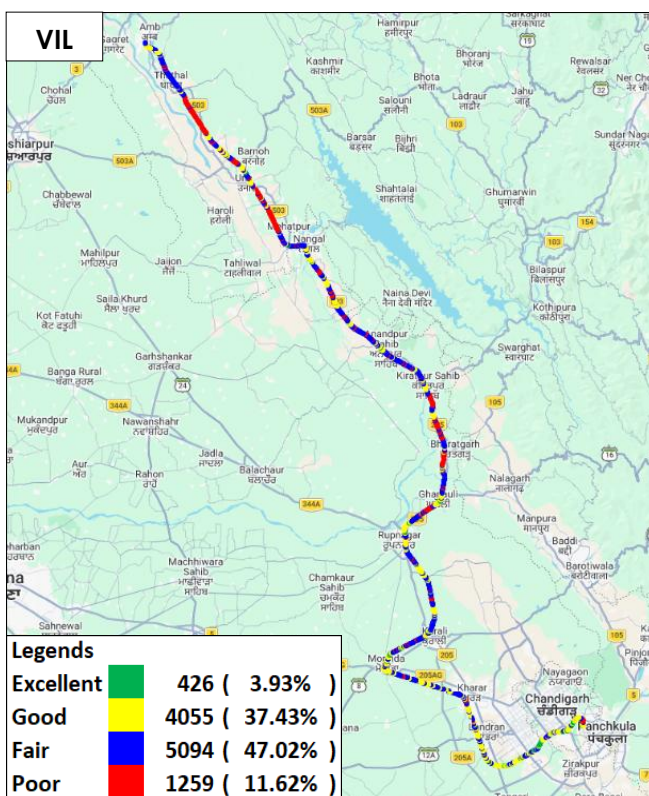


Figure-162: Signal strength auto-selection mode (5G/4G/3G/2G) data - VIL.

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	• 3G/2G auto mode- switch Call • 5G/4G/3G/2G auto mode- switch Call • 5G/4G MOS Call	30 Sec
Call Duration		90/180 seconds
Wait/ Guard Time		15 Sec

Table-78: Voice test detail

Note-

- 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.

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.ircctc.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-79: 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.

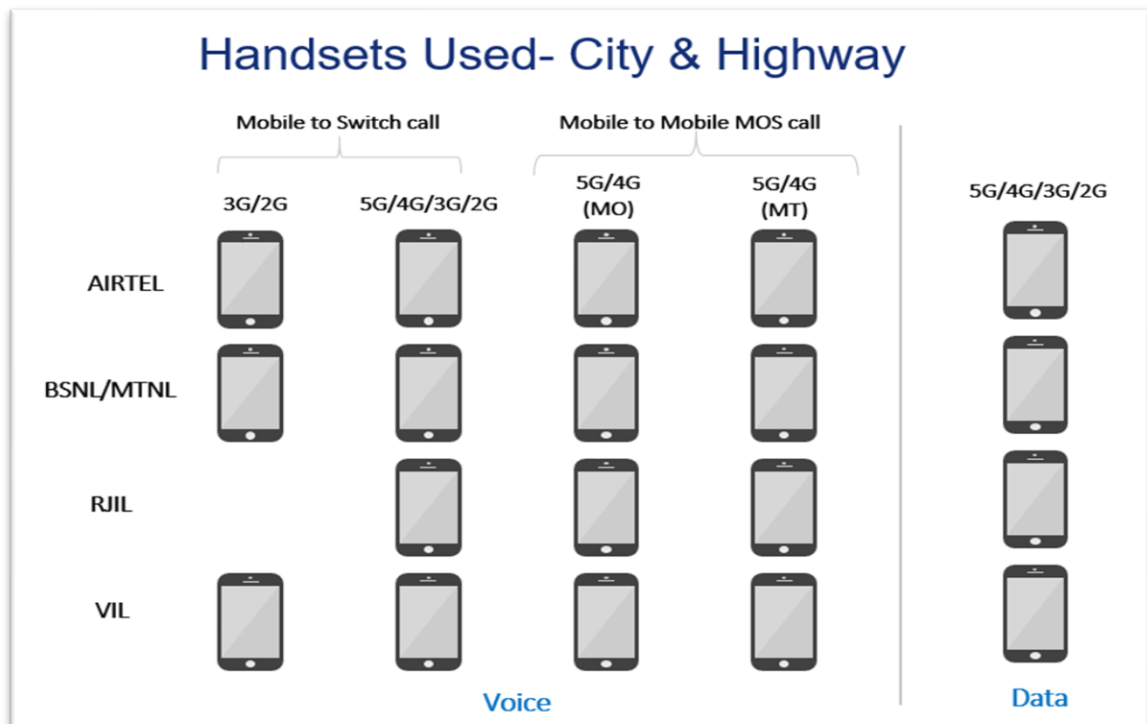


Figure-163: Number of handsets used in city & highway drive

MO: Mobile originating

MT: Mobile terminating

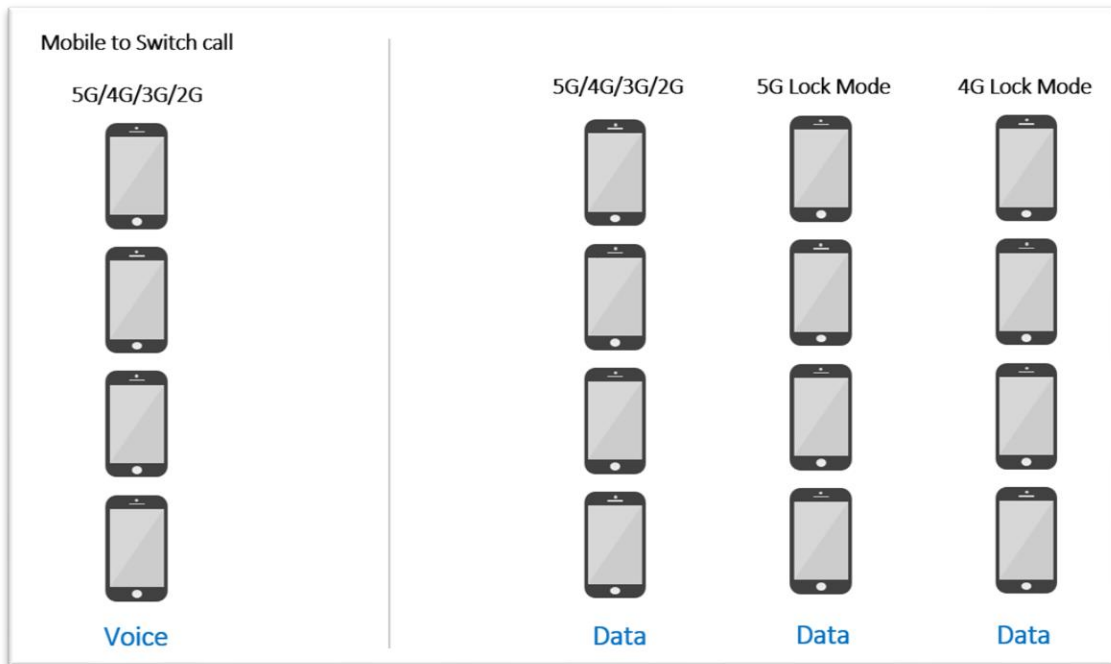


Figure-164: Number of handsets used in railway/metro/walktest/hotspot/coastal area.

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)

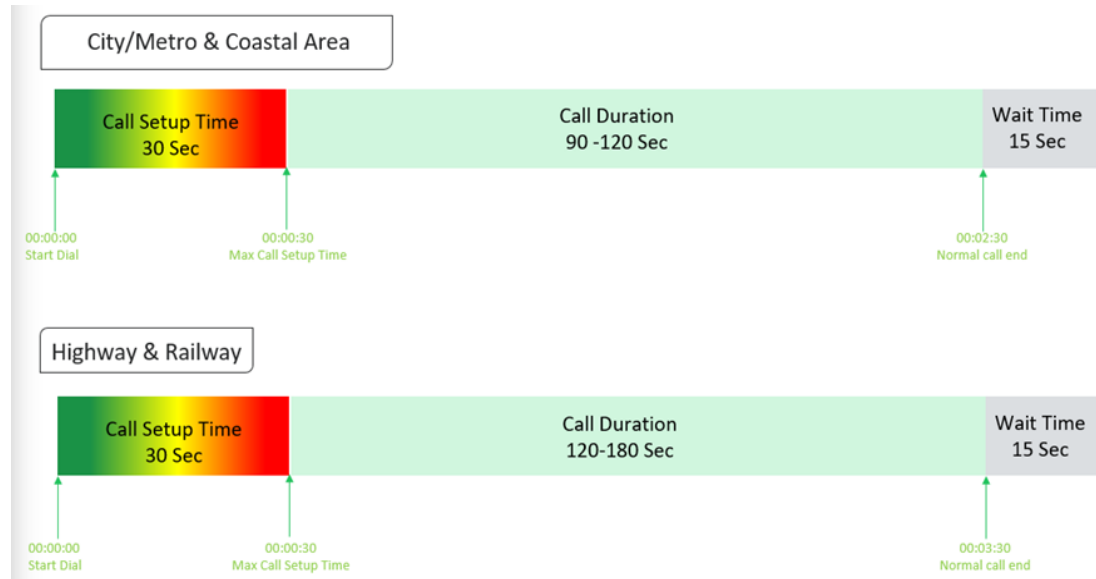


Figure-165: Voice test script for city/railway/metro/highway & coastal area

- 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-166: 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

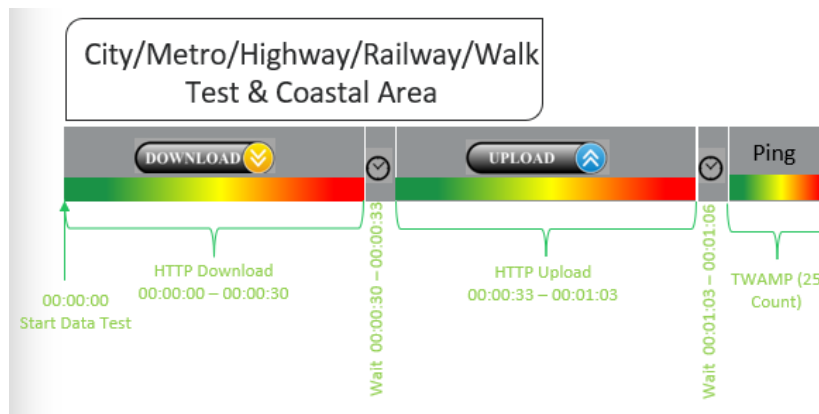


Figure-167: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing

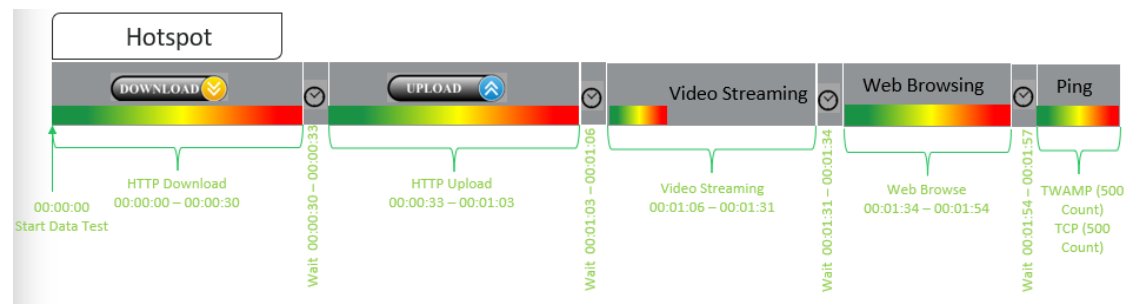


Figure-168: Data test script used at hotspot

- 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	(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: (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. CSSR = (Total Call Established/ Total Call Attempt) *100 As per QoS Regulation 2024 benchmark value is >=98%
Drop Call Rate	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 Drop Call Rate = (Total Call Drop/Total Call Established) *100 As per QoS Regulation 2024 benchmark value is <=2%
Call Setup Time	Time taken from call initiate to call alerting/ringing. Call Setup Time = T2- T1 T2- Ringing (VoLTE/VoNR) & Alerting (for WCDMA & GSM), T1- Invite (VoLTE/VoNR) & CM Service Request (for WCDMA & GSM)
Voice Quality (MOS)	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: Excellent: MOS ≥ 4 and < 5 Good : MOS ≥ 3 and < 4 Fair : MOS ≥ 2 and < 3 Poor : MOS ≥ 1 and < 2
Handover Success Rate	Handover Success Rate = Count of successful handovers (All Technology Handover combined) / Total count of Handover Attempt (All Technology Handover combined) *100 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.
Silence Call	A call which has ≥ 4 sec continuous RTP gap is considered as a Silence Call. Silence call rate = (count of silence call / Total calls established) *100 If a call observes multiple silence count ≥ 4 sec in a particular established call it has been taken as one silent event.

Jitter	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: $D(i,j) = (R_j - R_i) - (S_j - S_i)$ 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																																		
Downlink Packet Drop Rate	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)																																		
Uplink Packet Drop Rate	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).																																		
Signal Strength	Signal strength is the signal power level received by the wireless user. <table><tr><th rowspan="2">Parameter Name</th><th rowspan="2">Technology</th><th colspan="4">Signal Strength (dBm)</th></tr><tr><th>Excellent</th><th>Good</th><th>Fair</th><th>Poor</th></tr><tr><td>Rx Level</td><td>GSM</td><td>0 to ≥ -65</td><td><-65 to ≥ -75</td><td><-75 to ≥ -85</td><td><-85 to min</td></tr><tr><td>RSCP</td><td>WCDMA</td><td>0 to ≥ -70</td><td><-70 to ≥ -80</td><td><-80 to ≥ -90</td><td><-90 to min</td></tr><tr><td>RSRP</td><td>LTE</td><td>0 to ≥ -80</td><td><-80 to ≥ -95</td><td><-95 to ≥ -110</td><td><-110 to min</td></tr><tr><td>SS_RSRP</td><td>NR</td><td>0 to ≥ -80</td><td><-80 to ≥ -95</td><td><-95 to ≥ -110</td><td><-110 to min</td></tr></table>	Parameter Name	Technology	Signal Strength (dBm)				Excellent	Good	Fair	Poor	Rx Level	GSM	0 to ≥ -65	<-65 to ≥ -75	<-75 to ≥ -85	<-85 to min	RSCP	WCDMA	0 to ≥ -70	<-70 to ≥ -80	<-80 to ≥ -90	<-90 to min	RSRP	LTE	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min	SS_RSRP	NR	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min
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SS_RSRP	NR	0 to ≥ -80	<-80 to ≥ -95	<-95 to ≥ -110	<-110 to min																														

Table-80: Network performance parameter and definition voice

7.2.2 Network Performance Parameters Data tests

Parameter Name	Definition
Download Speed (Mbps)	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. Download Speed = Total bytes transferred during download / Total time for transfer 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)	The upload speed is the data transmission rate that is achieved for uploading a test file from a test device to a test server. Upload Speed = Total bytes transferred during upload / Total time for transfer. 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	(total download session established (successfully connected to server)/ total download session attempt) *100. This KPI has been calculated for Hotspot only.

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. *90th percentile for Packet loss rate has been reported in overall Hotspot performance summary.

Table-81: 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.

Hardik
Rajeshbhai
Patel

Digitally signed by
Hardik Rajeshbhai Patel
Date: 2026.06.08
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