



TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Bihar LSA

August 2025

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1. Introduction

TRAI Act, 1997 mandates the Authority to ensure the services delivered through various telecommunications networks meet 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 interest of the consumers of telecommunications service.

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 Bihar License Service Area (LSA) during the month of August-2025 under the supervision of TRAI Regional Office (RO) Kolkata. Details of route / area covered during the IDT is as given below:

S. No	Drive test route	Type of route	Distance covered (KMs)	From date	To date
1	Jamshedpur-East Singhbhum district and adjoining area & Gaya district and adjoining area	City	577.1	04-Aug-2025	13-Aug-2025
2	Jamshedpur city & Gaya city	Inter Operator Calling	2 Locations	08-Aug-2025	13-Aug-2025
3	Jamshedpur-East Singhbhum district and adjoining area & Gaya district and adjoining area	Hotspot	19 Locations	07-Aug-2025	14-Aug-2025
4	Jamshedpur city & Gaya city	Walk Test	3.5	04-Aug-2025	11-Aug-2025

Table-1: Drive test summary

Note-

- Jamshedpur-East Singhbhum district and adjoining area drive have been done from 4th August 2025 to 6th August 2025, and Gaya district and adjoining area drive have been done from 11th August 2025 to 13th August 2025.
- Hotspots testing has been done on 7th August 2025 in Jamshedpur-East Singhbhum district and adjoining area and on 12th & 14th August 2025 in Gaya district and adjoining area.
- Walk tests have been done on 4th August 2025 in Jamshedpur city and on 11th August 2025 in Gaya city.
- Inter Operator call testing have been done on 8th August 2025 in Jamshedpur city and on 13th August 2025 in Gaya city.

2.2 Drive test routes

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

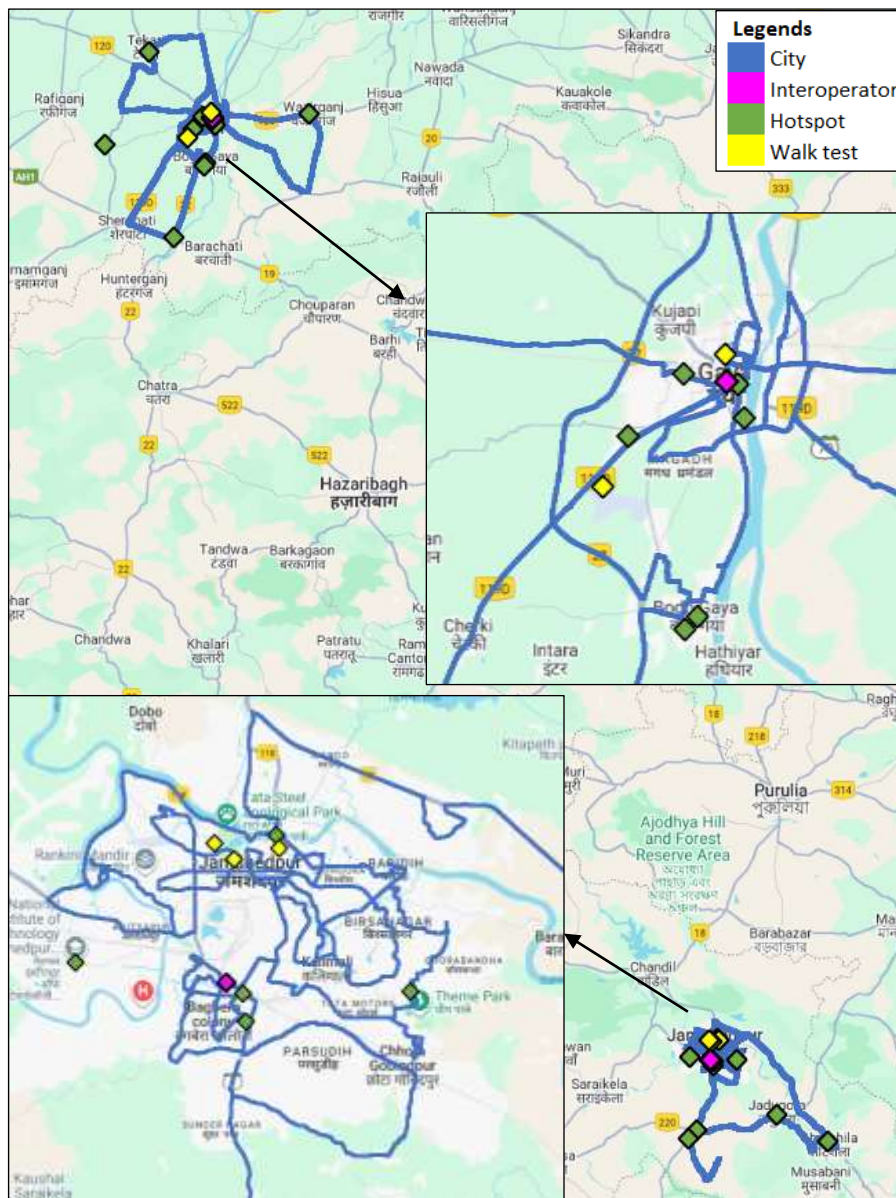


Figure-1: Drive test routes

2.3 Summary of areas covered

a) City- Jamshedpur-East Singhbhum district and adjoining area – Janamdi, Haldipokhar, Hata, Potka, Jadugora, Terenga, Benashol, Ghatshila, Tamakpal, Ulda, Belajuri, Mango, Baridih, Sidhgora, Birsanagar, Ghorabandha, Kalimali, Chhota Govindpur, Bagbera Colony, Adityapur, and Sunder Nagar etc.

Gaya District and adjoining area – Bajaura, Dobhi, Sherghati, Cherki, Magadh, Paraiya, Guraru, Panchananpur, Tekari, Belaganj, Silaunga, Chakand, Kujapi, Kaiya, Wazirganj, Tarawan, Bhare and Bodh Gaya etc.

b) Hotspot

1. Ghatara Post Office Mathurapur
2. Ghatsila College Phuldungri Ghatshila
3. Hata Mor
4. Jadugora
5. Kamta Prasad Sinha Inter College Gaya
6. Magadh Medical College Gaya
7. Mahabodhi Temple Bodh Gaya
8. Mango Bus Stand Mango Jamshedpur
9. National Institute of Technology Jamshedpur (NIT Jamshedpur)
10. Office of District Magistrate Gaya
11. PHC Dobhi
12. Police Station Wajirganj Gaya
13. S.N.S. College Tekari
14. Sadar Hospital Jamshedpur
15. Swami Vivekananda Chowk Haldipokhar
16. Tata Motors Hospital Kharangajhar Jamshedpur
17. Tatanagar Railway Station Jamshedpur
18. The Great Buddha Statue Bodh Gaya
19. Vishnupad Temple

c) Walk Test

1. Civil Court Jamshedpur
2. Jubilee Park
3. XLRI School of Management
4. Gaya International Airport
5. Gaya Railway Station

2.4 Telecom service providers detected frequency bands

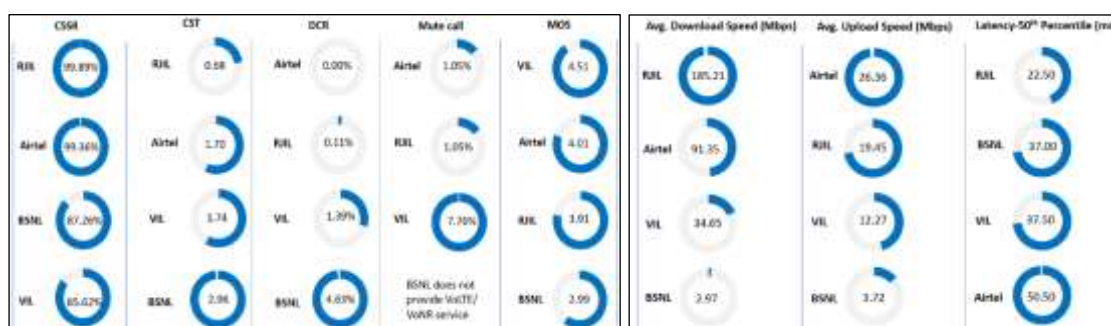
Technologies covered during the IDT and frequency bands in use are summarised in table below:

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

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

2.5 Performance against key QoS parameters

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



Summary-Voice services

Call Setup Success Rate: Airtel, BSNL, RJIL and VIL have call setup success rate of 99.36%, 87.26%, 99.89% and 85.62% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Setup Time: Airtel, BSNL, RJIL and VIL have call setup time of 1.70, 2.96, 0.68 & 1.74 seconds respectively in Auto-selection mode (5G/4G/3G/2G).

Drop Call Rate: Airtel, BSNL, RJIL and VIL have drop call rate of 0.00%, 4.63%, 0.11% & 1.39% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Silence/Mute Rate: Airtel, RJIL and VIL have silence call rate of 1.05%, 1.05% and 7.76% respectively in packet switched network (5G/4G).

Mean Opinion Score (MOS): Airtel, BSNL, RJIL and VIL have Average MOS of 4.01, 2.99, 3.91 & 4.51 respectively.

Summary-Data services

Data Download performance (Overall):

Average download speed of Airtel (5G/4G/2G) is 91.35 Mbps, BSNL (4G/3G/2G) is 2.97 Mbps, RJIL (5G/4G) is 185.21 Mbps and VIL (4G/2G) is 34.65 Mbps.

Data Upload performance (Overall):

Average upload speed of Airtel (5G/4G/2G) is 26.36 Mbps, BSNL (4G/3G/2G) is 3.72 Mbps, RJIL (5G/4G) is 19.45 Mbps and VIL (4G/2G) is 12.27 Mbps.

Latency (Overall): Airtel, BSNL, RJIL & VIL 50th percentile latency is 50.50 ms, 37.00 ms, 22.50 ms & 37.50 ms respectively.

Data performance - Hotspots (in Mbps):

Airtel- 4G D/L: 35.33	4G U/L: 13.14
5G D/L: 154.94	5G U/L: 36.47
BSNL- 4G D/L: 5.46	4G U/L: 7.82
RJIL- 4G D/L: 38.23	4G U/L: 9.23
5G D/L: 176.88	5G U/L: 21.14
VIL- 4G D/L: 25.36	4G U/L: 11.71

Note- "D/L" Download speed, "U/L" Upload speed

QoS Performance Analysis- Bihar 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 LSA during the month of August-2025 covering city drive, hotspots and walk test. (Refer Table-1)

3.2 Voice performance

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

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	650	722	723
Call Setup Success Rate %	99.85	84.35	89.90
Drop Call Rate %	0.00	4.43	3.08
Call Setup Time-Average (Second)	5.75	2.82	6.38
Handover Success Rate %	99.56	98.13	96.13

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

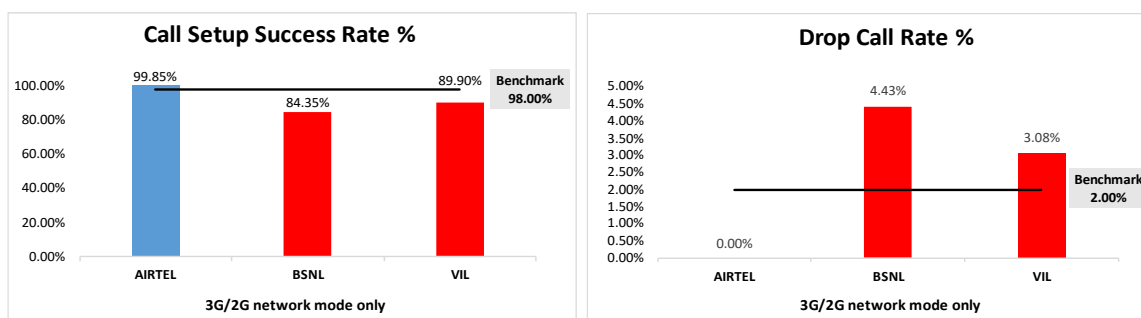


Figure-2: Call setup success rate and drop call rate performance.

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	156	NA
2G	910	382	578

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	937	989	942	1008
Call Setup Success Rate %	99.36	87.26	99.89	85.62
Drop Call Rate %	0.00	4.63	0.11	1.39
Call Setup Time-Average (Second)	1.70	2.96	0.68	1.74
Handover Success Rate %	100.00	95.13	99.90	99.70

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

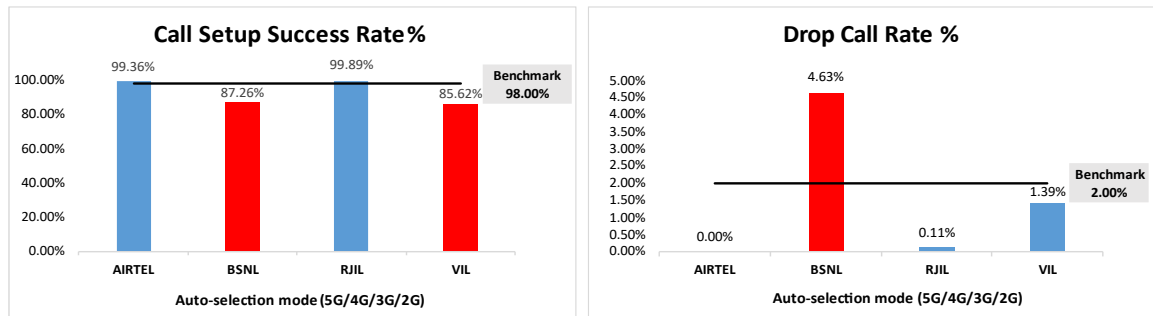


Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	667	567	669	567
Number of silence call for >4 Sec	7	NA	7	44
Silence Call Rate %	1.05	NA	1.05	7.76
Number of silence instances for >4 Sec	7	NA	10	60
Number of silence instances for >3 Sec	15	NA	16	95
Number of silence instances for >2 sec	33	NA	42	208
RTP Jitter (4G & 5G) in ms	4.43	NA	8.04	11.96
Packet loss Rate Downlink %	0.52	NA	0.36	1.35
Packet loss Rate Uplink %	0.52	NA	0.57	1.91

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

Note-

- NA- Due to unavailability of packet switched (VoLTE & VoNR) network in BSNL silence instances are not captured.

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	744	NA
4G	1774	398	2556	626
3G	NA	84	NA	NA
2G	2	407	NA	164

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	5932	4517	5901	4896
Speech Quality (Average MOS)	4.01	2.99	3.91	4.51
Number of samples with MOS ≥ 4 to < 5 (Excellent)	5012	0	4267	4403
Number of samples with MOS ≥ 3 to < 4 (Good)	787	2989	1324	289
Number of samples with MOS ≥ 2 to < 3 (Fair)	54	1080	223	77
Number of samples with MOS ≥ 1 to < 2 (Poor)	79	448	87	127
%age of samples with MOS ≥ 4 to < 5 (Excellent)	84.49%	0.00%	72.31%	89.93%
%age of samples with MOS ≥ 3 to < 4 (Good)	13.27%	66.17%	22.44%	5.90%
%age of samples with MOS ≥ 2 to < 3 (Fair)	0.91%	23.91%	3.78%	1.57%
%age of samples with MOS ≥ 1 to < 2 (Poor)	1.33%	9.92%	1.47%	2.59%

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

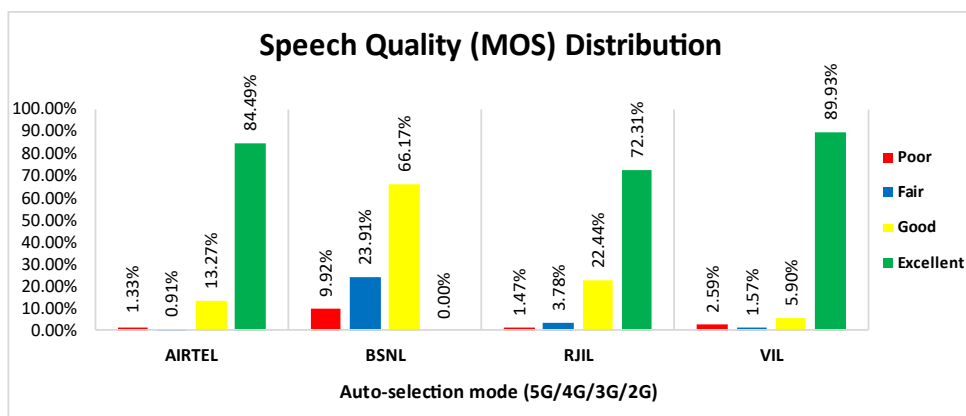


Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance: To check the performance of inter-service provider call setup success rate, total 61 to 71 inter operator calls was attempted at two locations which are Hotel Meridian in Jamshedpur city and Godrej Interio National Agency in Gaya city. 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	98.39
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	3.46	2.25	1.98
BSNL	4.00	NA	4.46	4.48
RJIL	2.33	3.00	NA	2.55
VIL	7.35	3.32	2.70	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	91.35	2.97	185.21	34.65
	80th Percentile	157.76	5.43	318.86	60.22
	20th Percentile	24.02	0.01	23.29	10.09
Upload Throughput (Mbits/s)	Average	26.36	3.72	19.45	12.27
	80th Percentile	45.91	6.53	37.82	21.03
	20th Percentile	5.98	1.21	2.42	2.77
Latency (ms)	50th Percentile	50.50	37.00	22.50	37.50

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

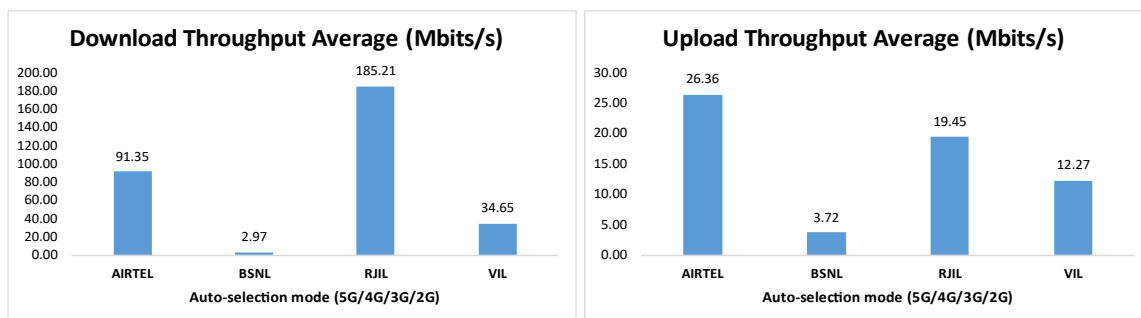


Figure- 5: Download and Upload throughput

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	1127	NA
4G	1898	552	705	656
3G	NA	74	NA	NA
2G	1	71	NA	254

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 drive, hotspots and walk test for all telecom service providers, the results of drive tests conducted is shown individually for respective areas/locations.

4.2 City

Drive test has been conducted from 4th August 2025 to 13th August 2025 in Jamshedpur-East Singhbhum district and adjoining area & Gaya district and adjoining area. (Refer Table-1)

4.2.1 Drive test route

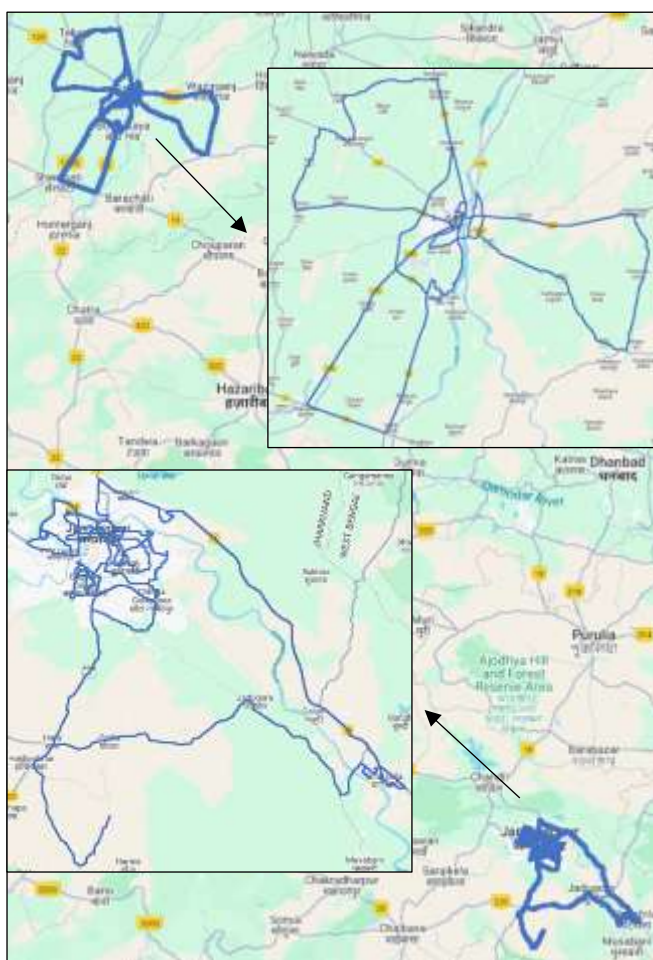


Figure- 6: Drive test routes

4.2.2 Area Covered

Jamshedpur-East Singhbhum district and adjoining area – Janamdi, Haldipokhar, Hata, Potka, Jadugora, Terenga, Benashol, Ghatshila, Tamakpal, Ulda, Belajuri, Mango, Baridih, Sidhgora, Birsanagar, Ghorabandha, Kalimali, Chhota Govindpur, Bagbera Colony, Adityapur, and Sunder Nagar etc.

Gaya District and adjoining area – Bajaura, Dobhi, Sherghati, Cherki, Magadh, Paraiya, Guraru, Panchananpur, Tekari, Belaganj, Silaunga, Chakand, Kujapi, Kaiya, Wazirganj, Tarawan, Bhare and Bodh Gaya etc.

4.2.3 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	650	722	723
Call Setup Success Rate %	99.85	84.35	89.90
Drop Call Rate %	0.00	4.43	3.08
Call Setup Time-Average (Second)	5.75	2.82	6.38
Handover Success Rate %	99.56	98.13	96.13

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

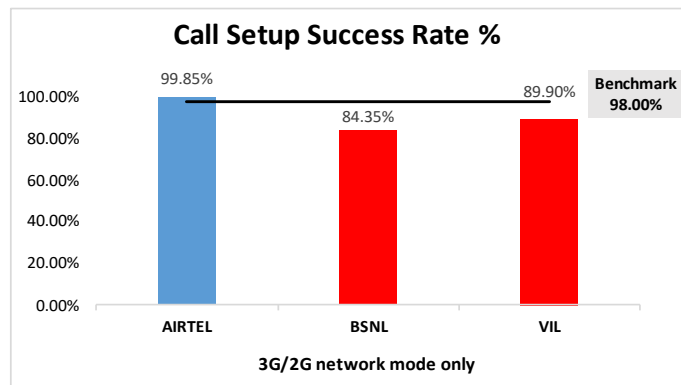


Figure-7: Performance for call setup success rate.

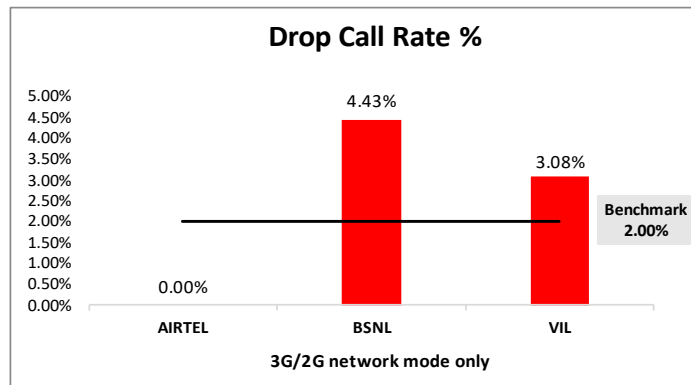


Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	7.00%	NA
2G	99.99%	89.83%	98.86%
Limited Service	0.01%	3.17%	1.14%

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

Note-

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

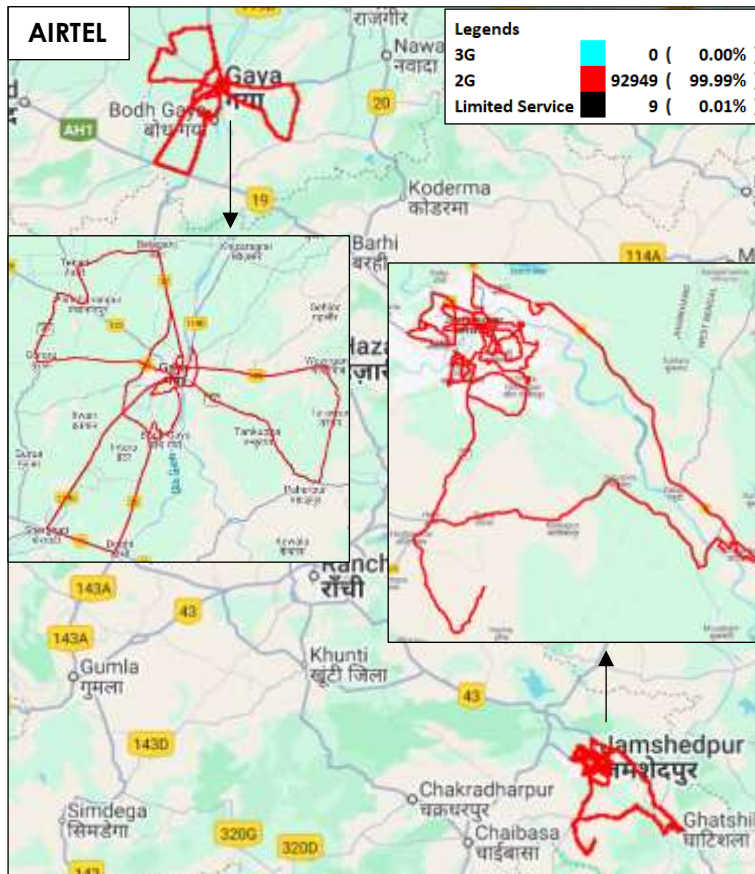


Figure-9: Serving technology plots 3G/2G network mode – AIRTEL

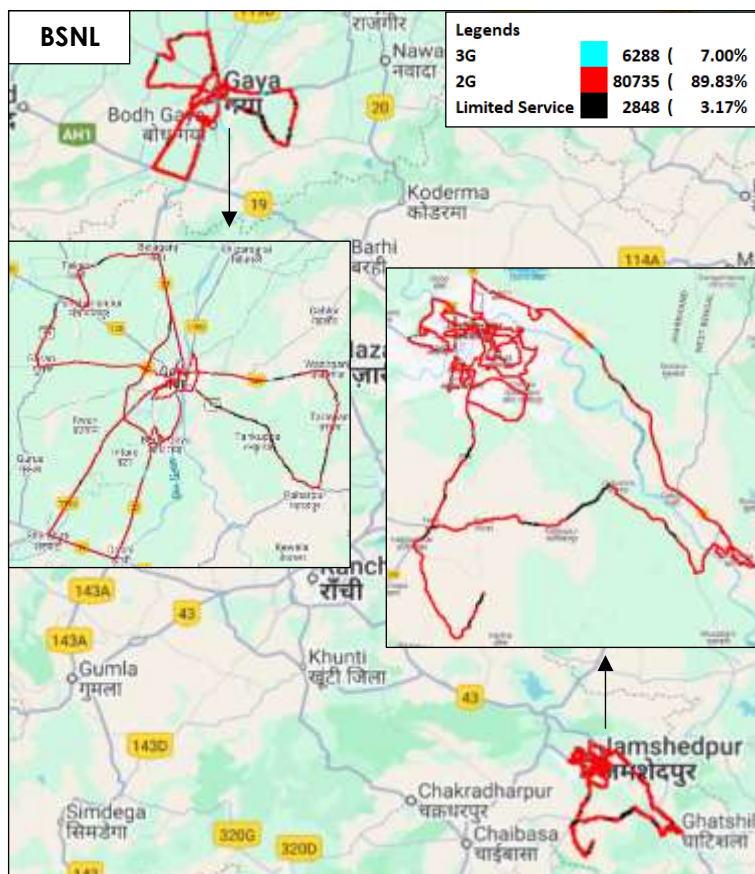


Figure-10: Serving technology plots 3G/2G network mode –BSNL.

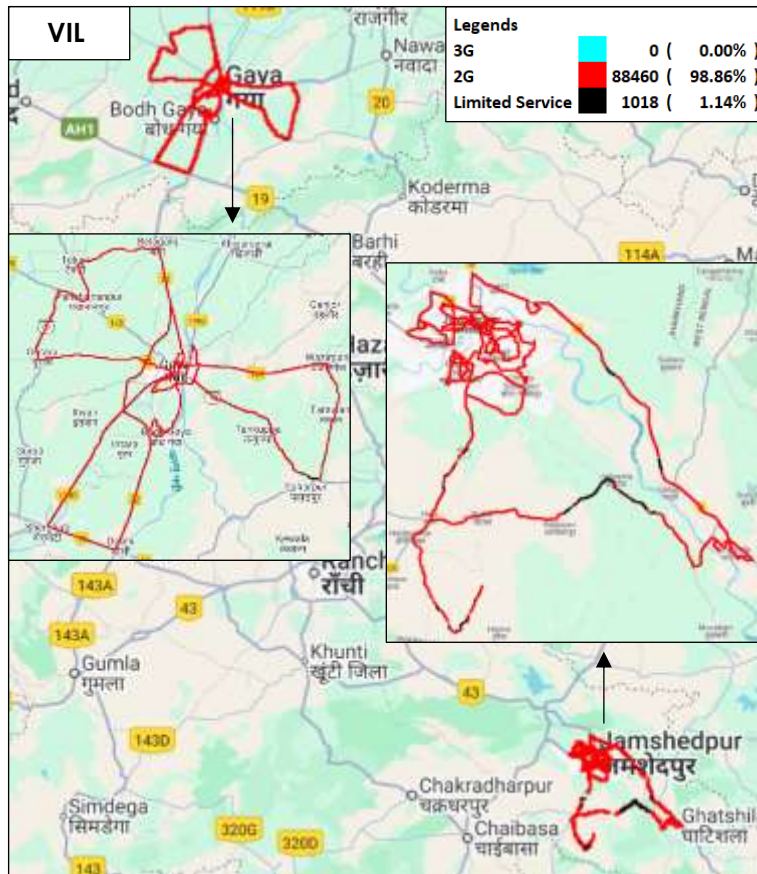


Figure-11: Serving technology plots 3G/2G network mode -VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 40, 41 & 42 for map view)

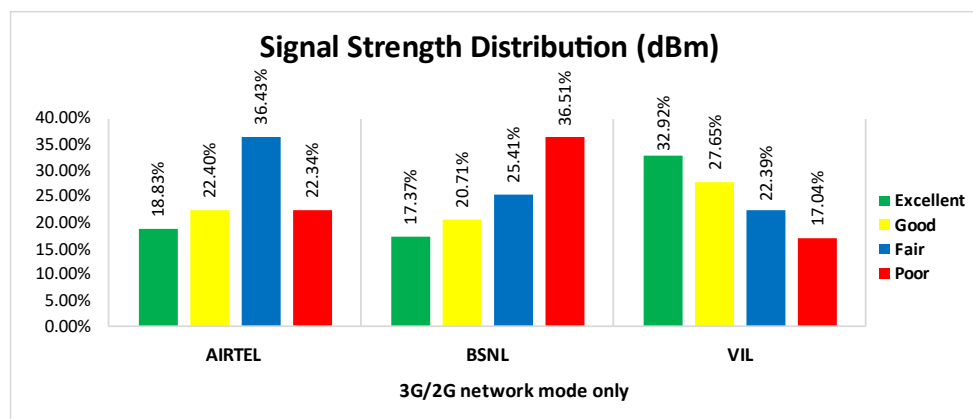


Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 19% of samples falling in the excellent signal strength category.
- BSNL has 17% of samples falling in the excellent signal strength category.
- VIL has 33% 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	689	733	693	760
Call Setup Success Rate %	99.13	83.36	99.86	82.37
Drop Call Rate %	0.00	2.78	0.14	1.92
Call Setup Time Average (Second)	1.71	2.99	0.70	1.89
Handover Success Rate %	100.00	94.64	99.90	99.68

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

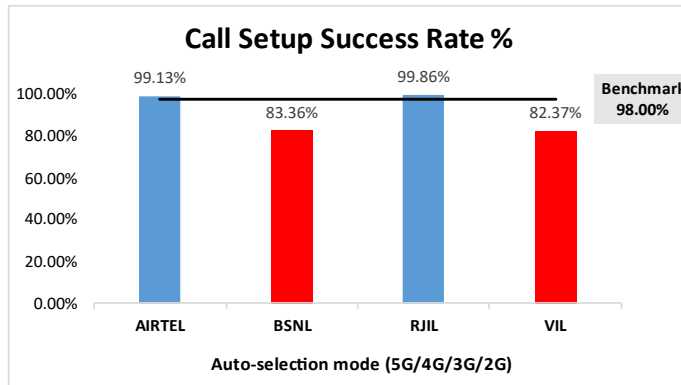


Figure-13: Performance for call setup success rate.

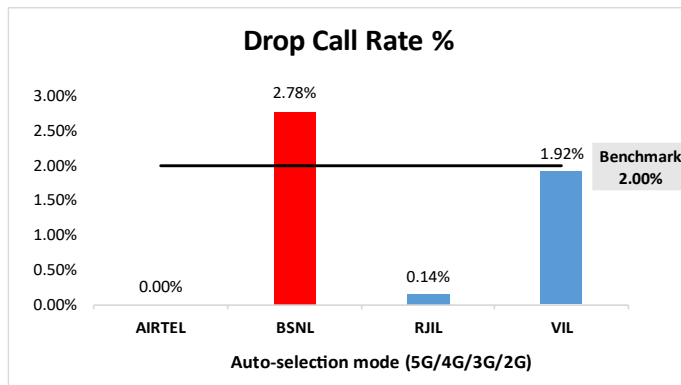


Figure-14: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	667	567	669	567
Number of silence call for >4 Sec	7	NA	7	44
Silence Call Rate %	1.05	NA	1.05	7.76
Number of silence instances for >4 Sec	7	NA	10	60
Number of silence instances for >3 Sec	15	NA	16	95
Number of silence instances for >2 sec	33	NA	42	208
RTP Jitter (4G & 5G) in ms	4.43	NA	8.04	11.96
Packet loss Rate Downlink %	0.52	NA	0.36	1.35
Packet loss Rate Uplink %	0.52	NA	0.57	1.91

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

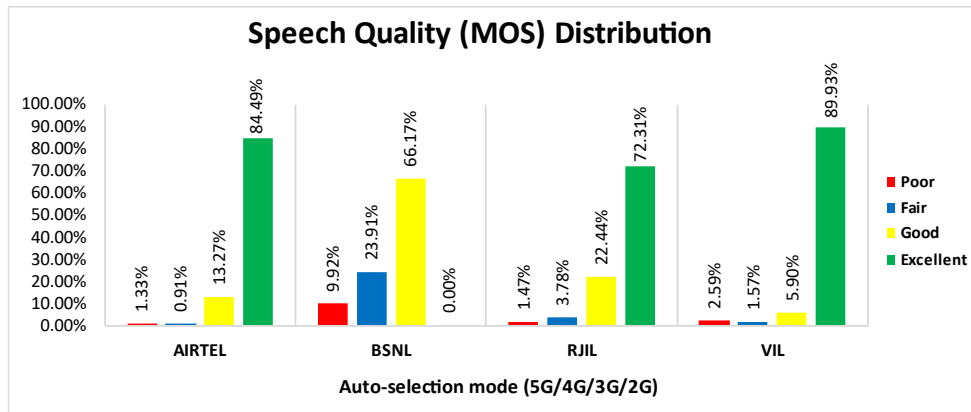
Note-

- NA- Due to unavailability of packet switched (VoLTE & VoNR) network in BSNL silence instances are not captured.

(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	5932	4517	5901	4896
Speech Quality (Average MOS)	4.01	2.99	3.91	4.51
Number of samples with MOS ≥ 4 to < 5 (Excellent)	5012	0	4267	4403
Number of samples with MOS ≥ 3 to < 4 (Good)	787	2989	1324	289
Number of samples with MOS ≥ 2 to < 3 (Fair)	54	1080	223	77
Number of samples with MOS ≥ 1 to < 2 (Poor)	79	448	87	127
%age of samples with MOS ≥ 4 to < 5 (Excellent)	84.49%	0.00%	72.31%	89.93%
%age of samples with MOS ≥ 3 to < 4 (Good)	13.27%	66.17%	22.44%	5.90%
%age of samples with MOS ≥ 2 to < 3 (Fair)	0.91%	23.91%	3.78%	1.57%
%age of samples with MOS ≥ 1 to < 2 (Poor)	1.33%	9.92%	1.47%	2.59%

Table-17: Summary of speech quality (MOS) samples**Figure-15:** Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	5.54%	NA	13.70%	NA
4G	94.04%	12.08%	86.22%	78.07%
3G	NA	6.25%	NA	NA
2G	0.14%	79.42%	NA	18.75%
Limited Service	0.28%	2.25%	0.08%	3.18%

Table-18: Time spent on technology during drive test.

Note-

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

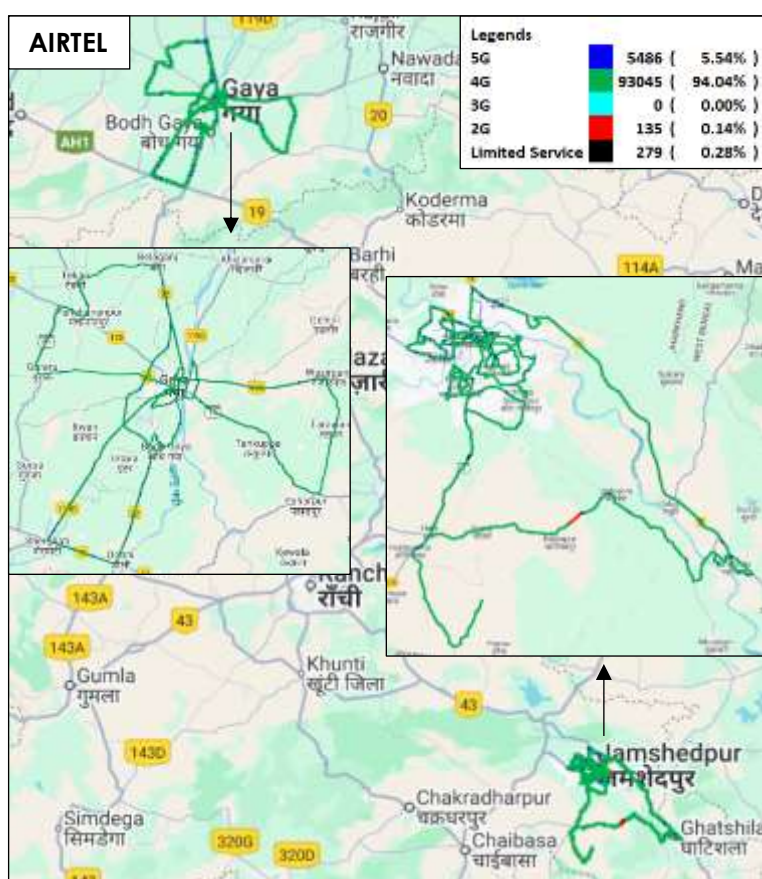


Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) -AIRTEL.

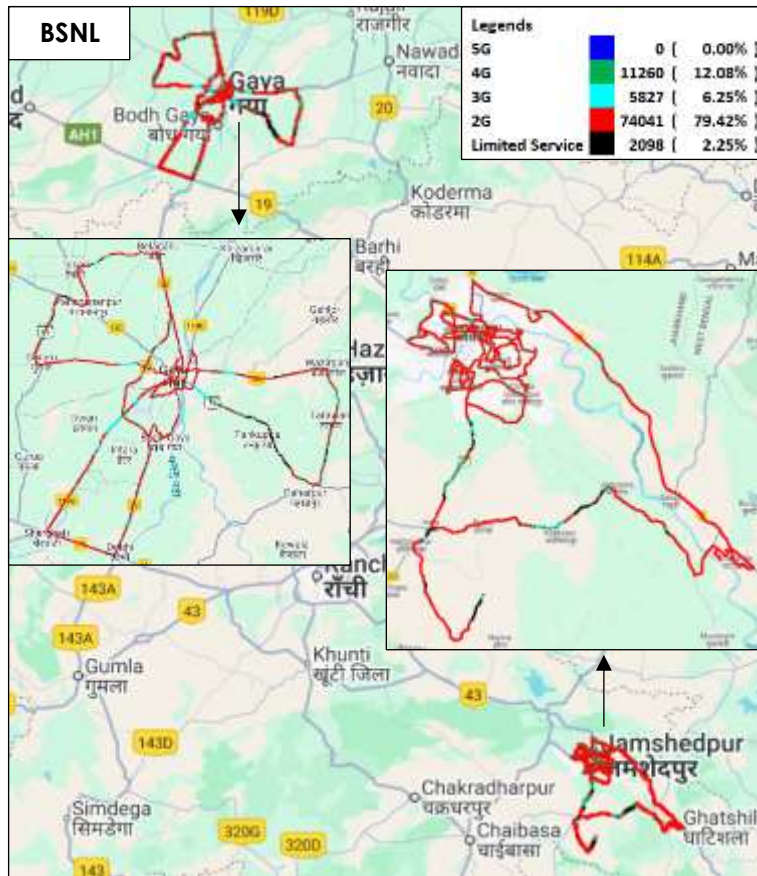


Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G-4G network being rolled out) -BSNL

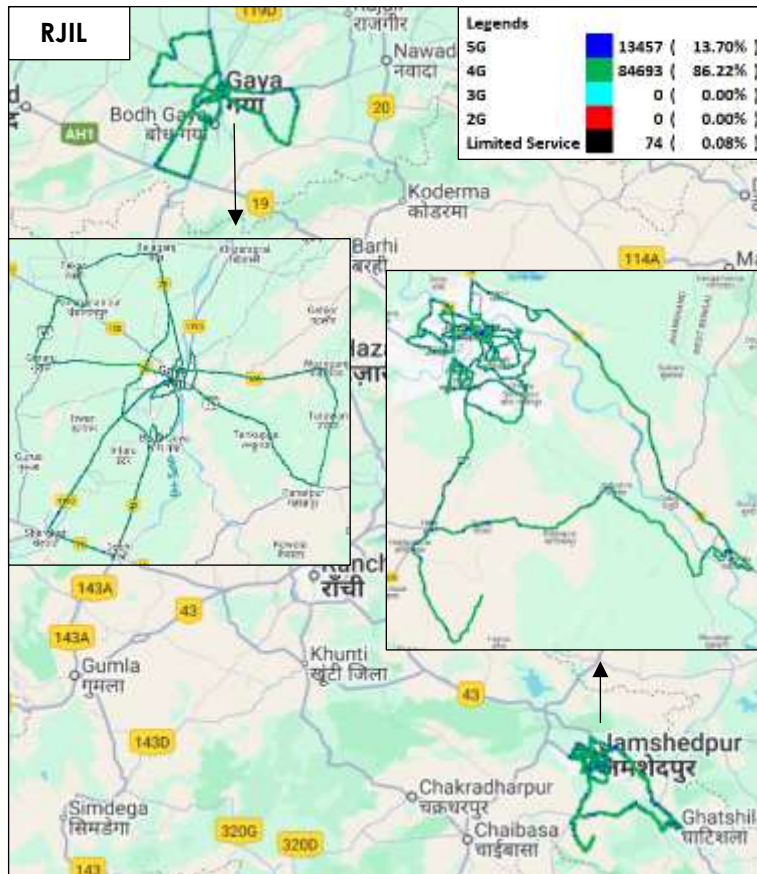


Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G)- RJIL.

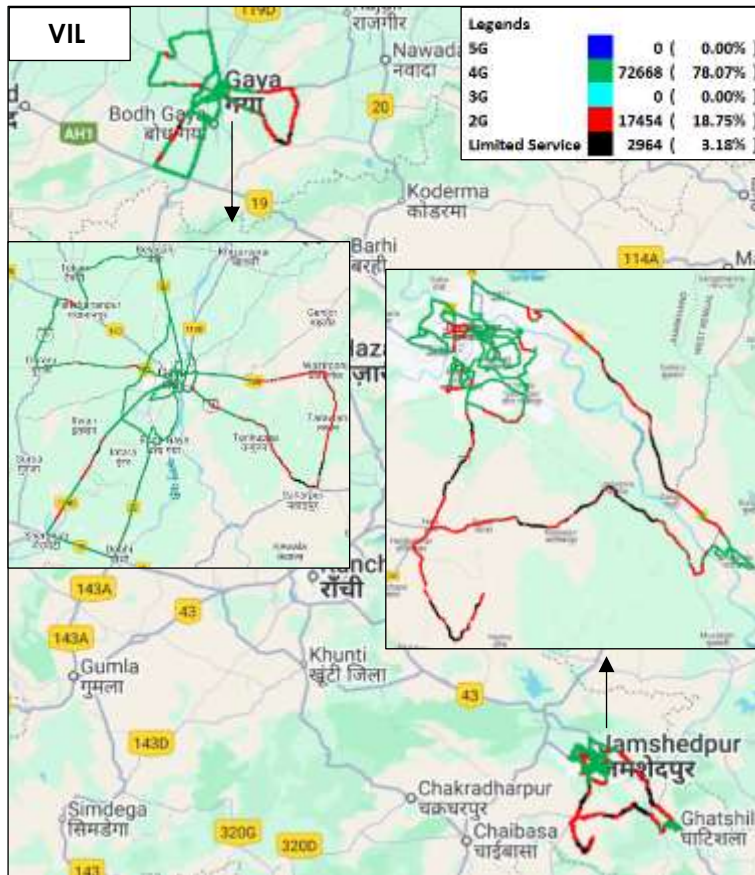


Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-43, 44, 45 & 46 for map view)

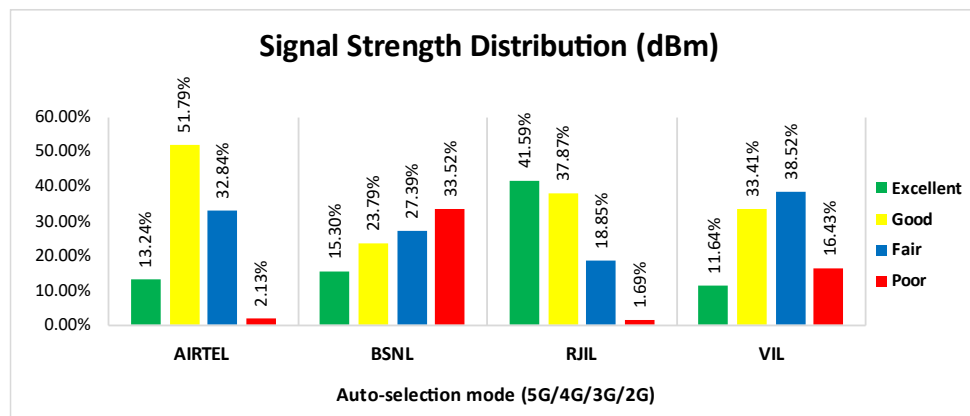


Figure-20: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

Observations:

- Airtel has 13% of samples falling in the excellent signal strength category.
- BSNL has 15% of samples falling in the excellent signal strength category.
- RJIL has 42% of samples falling in the excellent signal strength category.
- VIL has 12% of samples falling in the excellent signal strength category.

4.2.4 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	91.19	2.84	188.50	34.01
	80th Percentile	156.82	5.36	333.94	60.54
	20th Percentile	23.94	0.01	23.32	9.01
Upload Throughput (Mbits/s)	Average	26.08	3.77	19.69	11.62
	80th Percentile	45.14	6.72	38.80	19.71
	20th Percentile	5.98	1.21	2.42	2.75
Latency (ms)	50th Percentile	49.65	46.40	22.25	37.40

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

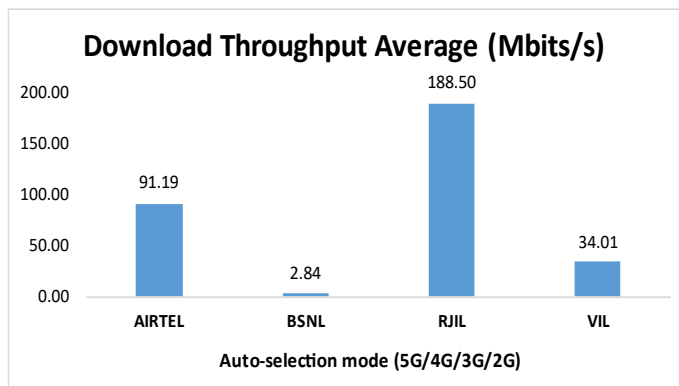


Figure- 21: Download throughput

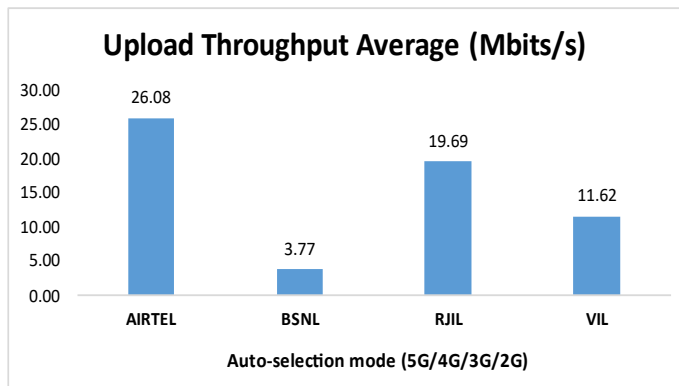


Figure- 22: Upload throughput

4.3 Hotspots

Hotspot testing has been done on 7th, 12th and 14th August 2025. Nineteen locations have been tested in Jamshedpur-East Singhbhum district and adjoining area & Gaya district and adjoining area.

4.3.1 Locations



Figure- 23: Hotspot locations

4.3.2 Hotspot covered

1. Ghatara Post Office Mathurapur
2. Ghatsila College Phuldungri Ghatshila
3. Hata Mor
4. Jadugora
5. Kamta Prasad Sinha Inter College Gaya
6. Magadh Medical College Gaya
7. Mahabodhi Temple Bodh Gaya
8. Mango Bus Stand Mango Jamshedpur
9. National Institute of Technology Jamshedpur (NIT Jamshedpur)
10. Office Of District Magistrate Gaya
11. PHC Dobhi
12. Police Station Wajirganj Gaya
13. S.N.S. College Tekari
14. Sadar Hospital Jamshedpur
15. Swami Vivekananda Chowk Haldipokhar
16. Tata Motors Hospital Kharangajhar Jamshedpur
17. Tatanagar Railway Station Jamshedpur
18. The Great Buddha Statue Bodh Gaya
19. Vishnupad Temple

4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	190	190	190	190
Call Setup Success Rate %	100.00	97.89	100.00	94.21
Drop Call Rate %	0.00	0.54	0.00	0.00
Call Setup Time-Average (Second)	1.67	2.82	0.62	1.45

Table-20: Overall summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Ghatera Post Office Mathurapur				
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	80.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.67	2.40	0.60	0.85

Table-21: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Ghatsila College Phuldungri Ghatshila				
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	90.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	1.70	5.08	0.63	0.95

Table-22: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Hata Mor				
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)	1.89	3.16	0.56	4.01

Table-23: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Jadugora				
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	0.00
Drop Call Rate %	0.00	0.00	0.00	-
Call Setup Time-Average (Second)	1.69	1.81	0.58	-

Table-24: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Note- "-" Call setup time & drop call rate have not been reported as all calls were failed at this location.

Kamta Prasad Sinha Inter College Gaya				
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	11.11	0.00	0.00
Call Setup Time-Average (Second)	1.71	2.01	0.71	0.96

Table-25: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Magadh Medical College Gaya				
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)	1.61	3.75	0.53	0.91

Table-26: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Mahabodhi Temple Bodh Gaya				
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)	1.69	1.37	0.93	0.97

Table-27: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Mango Bus Stand Mango Jamshedpur				
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)	1.63	2.35	0.69	0.89

Table-28: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

National Institute of Technology Jamshedpur (NIT Jamshedpur)				
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)	1.65	2.68	0.60	0.94

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

Office of District Magistrate Gaya				
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)	1.62	3.67	0.56	0.92

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

PHC Dobhi				
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)	1.62	1.84	0.75	0.83

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

Police Station Wajirganj Gaya				
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)	1.67	3.70	0.54	4.30

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

S.N.S. College Tekari				
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)	1.69	2.39	0.55	0.87

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

Sadar Hospital Jamshedpur				
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)	1.58	2.64	0.55	0.94

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

Swami Vivekananda Chowk Haldipokhar				
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)	1.62	3.88	0.53	3.70

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

Tata Motors Hospital Kharangajhar Jamshedpur				
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)	1.64	2.92	0.59	0.94

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

Tatanagar Railway Station Jamshedpur				
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)	1.65	2.81	0.64	1.03

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

The Great Buddha Statue Bodh Gaya				
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)	1.75	2.50	0.61	1.16

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

Vishnupad Temple				
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)	1.60	2.52	0.67	0.95

Table-39: 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)	112.01	2.76	181.57	38.19
Download Throughput 80th Percentile (Mbit/s)	189.94	5.26	300.31	63.99
Download Throughput 20th Percentile (Mbit/s)	31.82	0.01	35.77	9.70
Download Session Setup Success Rate %	88.42	85.26	98.95	92.22
Upload Throughput Average (Mbits/s)	26.46	3.58	18.10	11.65
Upload Throughput 80th Percentile (Mbit/s)	49.39	3.77	30.07	15.84
Upload Throughput 20th Percentile (Mbit/s)	3.49	1.21	2.04	1.21
Upload Session Setup Success Rate %	92.63	85.26	100.00	91.58
Web Browsing Delay (Second)	4.22	3.97	4.23	6.17
Youtube Initial Buffer Delay (Second)	0.95	2.60	1.28	1.34
Latency (ms) - 50th Percentile	51.00	34.95	22.60	38.10
Jitter (ms)	31.90	377.94	17.17	28.07
Packet Loss Rate%	6.24	36.01	1.70	24.53
Packet Loss Rate- 90th percentile	25.70	96.14	2.32	100.00

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

Ghatera Post Office Mathurapur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	91.93	0.02	39.66	15.73
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	22.58	1.09	2.24	1.51
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	4.64	-	5.71	4.97
Youtube Initial Buffer Delay (Second)	0.65	-	2.02	-
Latency (ms) - 50th Percentile	41.35	37.90	28.70	46.60
Jitter (ms)	2.95	810.45	10.43	9.28
Packet Loss Rate%	0.00	39.30	0.40	1.90

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

Note- "-" Browse and Youtube tests were failed.

Ghatsila College Phuldungri Ghatshila				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	175.68	2.59	353.44	74.56
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	24.14	2.01	63.81	34.86
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.77	3.10	2.36	6.24
Youtube Initial Buffer Delay (Second)	0.74	1.67	0.84	2.76
Latency (ms) - 50th Percentile	44.30	37.58	21.65	36.05
Jitter (ms)	3.97	16.17	2.33	1.83
Packet Loss Rate%	0.10	17.30	0.00	0.00

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

Hata Mor				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	10.55	6.46	326.48	0.01
Download Session Setup Success Rate %	100.00	40.00	100.00	100.00
Upload Throughput Average (Mbits/s)	9.13	3.61	45.92	0.05
Upload Session Setup Success Rate %	100.00	40.00	100.00	100.00
Web Browsing Delay (Second)	2.53	4.07	2.48	-
Youtube Initial Buffer Delay (Second)	1.05	1.07	0.78	-
Latency (ms) - 50th Percentile	63.00	52.50	21.70	3428.25
Jitter (ms)	13.08	189.76	2.65	207.56
Packet Loss Rate%	3.10	96.00	0.00	100.00

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

Note- "-" Browse and Youtube tests were failed.

Jadugora				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	36.42	7.76	25.49	-
Download Session Setup Success Rate %	100.00	100.00	100.00	0.00
Upload Throughput Average (Mbits/s)	2.84	10.27	2.02	-
Upload Session Setup Success Rate %	100.00	100.00	100.00	0.00
Web Browsing Delay (Second)	3.71	2.55	4.60	-
Youtube Initial Buffer Delay (Second)	1.51	2.07	4.91	-
Latency (ms) - 50th Percentile	57.00	34.15	35.20	-
Jitter (ms)	6.16	2.22	34.22	-
Packet Loss Rate%	0.60	0.00	2.40	100.00

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

Note- All data tests were failed.

Kamta Prasad Sinha Inter College Gaya				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	0.79	0.01	1.60	10.64
Download Session Setup Success Rate%	80.00	40.00	100.00	80.00
Upload Throughput Average (Mbits/s)	1.29	-	1.21	1.47
Upload Session Setup Success Rate %	100.00	0.00	100.00	80.00
Web Browsing Delay (Second)	-	-	9.61	3.26
Youtube Initial Buffer Delay (Second)	-	3.95	-	1.28
Latency (ms)- 50th Percentile	71.50	151358.25	35.65	49.90
Jitter (ms)	431.91	37048.96	110.10	262.25
Packet Loss Rate%	24.60	100.00	22.00	63.30

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

Note- Upload, Browse and Youtube tests were failed.

Magadh Medical College Gaya				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	134.01	0.03	320.29	84.18
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	54.07	1.22	19.02	41.28
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.76	-	4.05	5.37
Youtube Initial Buffer Delay (Second)	0.66	-	0.74	0.67
Latency (ms) - 50th Percentile	38.50	31.55	19.70	41.45
Jitter (ms)	3.76	8.95	2.53	1.79
Packet Loss Rate%	0.00	1.20	0.00	0.00

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

Note- Browse and Youtube tests were failed.

Mahabodhi Temple Bodh Gaya				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	58.49	2.42	250.94	77.40
Download Session Setup Success Rate %	80.00	60.00	100.00	100.00
Upload Throughput Average (Mbits/s)	11.72	1.18	4.59	12.61
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.60	4.47	4.89	9.14
Youtube Initial Buffer Delay (Second)	0.98	6.34	1.02	0.76
Latency (ms) - 50th Percentile	41.75	54.50	19.88	35.45
Jitter (ms)	22.44	36.20	10.11	2.43
Packet Loss Rate%	5.20	92.80	0.30	0.10

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

Mango Bus Stand Mango Jamshedpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	61.83	1.63	170.57	23.90
Download Session Setup Success Rate %	100.00	100.00	80.00	100.00
Upload Throughput Average (Mbits/s)	5.81	2.99	14.47	11.35
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.60	5.22	2.37	7.63
Youtube Initial Buffer Delay (Second)	1.93	3.19	0.94	1.88
Latency (ms) - 50th Percentile	53.50	39.53	22.60	33.35
Jitter (ms)	12.89	14.51	34.16	2.46
Packet Loss Rate%	5.30	6.30	1.80	0.00

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

National Institute of Technology Jamshedpur (NIT Jamshedpur)				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	258.96	0.01	256.11	83.87
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	80.18	1.24	6.12	41.27
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.68	-	2.36	2.66
Youtube Initial Buffer Delay (Second)	0.92	-	0.80	1.02
Latency (ms) - 50th Percentile	52.50	38.93	25.35	37.95
Jitter (ms)	3.04	21.04	4.66	2.25
Packet Loss Rate%	0.10	29.20	0.00	0.00

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

Note-"-" Browse and Youtube tests were failed.

Office of District Magistrate Gaya				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	181.70	0.00	196.92	46.10
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	52.90	1.22	10.89	14.66
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.37	-	4.82	7.11
Youtube Initial Buffer Delay (Second)	0.84	-	0.73	0.80
Latency (ms) - 50th Percentile	42.50	27.35	18.00	36.15
Jitter (ms)	2.91	23.32	3.01	2.68
Packet Loss Rate%	0.00	55.90	0.00	0.00

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

Note- "-" Browse and Youtube tests were failed.

PHC Dobhi				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	44.95	0.03	96.76	29.01
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	3.47	1.23	5.95	3.74
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.90	-	2.38	2.95
Youtube Initial Buffer Delay (Second)	1.10	-	0.81	0.76
Latency (ms) - 50th Percentile	52.50	37.85	17.68	40.55
Jitter (ms)	24.67	5.59	3.41	3.26
Packet Loss Rate%	6.70	24.40	0.00	0.10

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

Note- "-" Browse and Youtube tests were failed.

Police Station Wajirganj Gaya				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	67.09	0.00	531.18	0.00
Download Session Setup Success Rate %	40.00	100.00	100.00	40.00
Upload Throughput Average (Mbits/s)	35.05	1.22	93.73	0.05
Upload Session Setup Success Rate %	60.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.67	9.56	4.21	0.00
Youtube Initial Buffer Delay (Second)	0.79	-	1.30	-
Latency (ms) - 50th Percentile	40.50	431.00	20.05	897.00
Jitter (ms)	3.19	115.32	14.47	190.16
Packet Loss Rate%	0.00	89.30	0.30	100.00

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

Note- "-" Youtube tests were failed.

S.N.S. College Tekari				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	171.22	0.03	91.15	19.32
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	11.39	1.21	5.83	8.31
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	5.26	-	4.93	8.41
Youtube Initial Buffer Delay (Second)	0.77	-	0.72	0.76
Latency (ms)- 50th Percentile	77.00	34.75	24.78	32.65
Jitter (ms)	18.40	3.96	6.39	2.68
Packet Loss Rate%	34.20	0.80	0.00	0.00

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

Note- "-" Browse and Youtube tests were failed.

Sadar Hospital Jamshedpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	82.11	0.98	432.81	41.83
Download Session Setup Success Rate %	100.00	40.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.72	0.58	40.33	3.06
Upload Session Setup Success Rate %	80.00	20.00	100.00	100.00
Web Browsing Delay (Second)	8.22	9.54	2.27	2.73
Youtube Initial Buffer Delay (Second)	-	-	0.85	1.11
Latency (ms) - 50th Percentile	56.50	38.00	22.45	37.15
Jitter (ms)	21.21	10.57	4.26	4.90
Packet Loss Rate%	5.50	28.40	0.20	0.40

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

Note- "-" Youtube tests were failed.

Swami Vivekananda Chowk Haldipokhar				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	29.92	17.03	176.38	0.00
Download Session Setup Success Rate %	20.00	100.00	100.00	80.00
Upload Throughput Average (Mbits/s)	22.23	14.85	12.05	0.06
Upload Session Setup Success Rate %	40.00	100.00	100.00	80.00
Web Browsing Delay (Second)	3.40	2.89	2.62	-
Youtube Initial Buffer Delay (Second)	0.98	2.11	0.81	-
Latency (ms) - 50th Percentile	53.00	32.15	24.35	-
Jitter (ms)	4.91	2.13	2.60	-
Packet Loss Rate%	0.00	0.50	0.00	100.00

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

Note- "-" Browse, Youtube and Ping tests were failed.

Tata Motors Hospital Kharangajhar Jamshedpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	34.39	0.29	11.36	54.25
Download Session Setup Success Rate %	80.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	22.25	0.98	4.78	5.17
Upload Session Setup Success Rate %	80.00	80.00	100.00	100.00
Web Browsing Delay (Second)	2.53	-	2.57	5.55
Youtube Initial Buffer Delay (Second)	0.92	7.29	1.19	0.79
Latency (ms) - 50th Percentile	54.00	21553.75	23.58	37.98
Jitter (ms)	10.41	4693.12	6.83	2.41
Packet Loss Rate%	2.90	96.70	0.20	0.00

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

Note- "-" Browse tests were failed.

Tatanagar Railway Station Jamshedpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	128.25	10.83	44.94	3.12
Download Session Setup Success Rate %	80.00	100.00	100.00	60.00
Upload Throughput Average (Mbits/s)	20.78	13.69	7.16	1.52
Upload Session Setup Success Rate %	100.00	100.00	100.00	80.00
Web Browsing Delay (Second)	3.16	2.51	2.54	7.96
Youtube Initial Buffer Delay (Second)	0.86	0.93	1.07	4.31
Latency (ms) - 50th Percentile	72.00	33.50	31.00	42.35
Jitter (ms)	18.88	5.74	6.53	3.42
Packet Loss Rate%	30.10	4.10	2.30	0.00

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

The Great Buddha Statue Bodh Gaya				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	188.25	0.03	87.57	26.07
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	18.76	1.21	2.00	11.32
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.83	-	5.10	6.97
Youtube Initial Buffer Delay (Second)	0.72	-	3.86	1.78
Latency (ms)- 50th Percentile	54.00	25.80	22.08	33.35
Jitter (ms)	3.48	2.54	17.16	2.60
Packet Loss Rate%	0.20	0.50	0.10	0.20

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

Note- "-" Browse and Youtube tests were failed.

Vishnupad Temple				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	233.82	0.03	33.90	47.37
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	97.49	1.21	1.74	10.96
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	4.51	-	12.32	7.55
Youtube Initial Buffer Delay (Second)	0.66	-	5.38	1.84
Latency (ms) - 50th Percentile	38.95	28.50	19.05	34.55
Jitter (ms)	3.74	3.74	54.20	2.14
Packet Loss Rate%	0.00	1.50	2.30	0.00

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

Note- "-" Browse and Youtube tests were failed.

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)	154.94	-	176.88	-
	Upload Throughput Average (Mbits/s)	36.47	-	21.14	-
4G	Download Throughput Average (Mbits/s)	35.33	5.46	38.23	25.36
	Upload Throughput Average (Mbits/s)	13.14	7.82	9.23	11.71

Table-60: Overall Summary of 5G only & 4G only data download & upload speed.

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

Ghatera Post Office Mathurapur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	21.21	-
	Upload Throughput Average (Mbits/s)	-	-	9.36	-
4G	Download Throughput Average (Mbits/s)	72.30	4.14	37.43	18.07
	Upload Throughput Average (Mbits/s)	6.95	2.89	5.62	2.22

Table-61: Overall Summary of 5G only & 4G only data download & upload speed.

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

Ghatsila College Phuldungri Ghatshila					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	186.92	-	146.34	-
	Upload Throughput Average (Mbits/s)	17.07	-	42.19	-
4G	Download Throughput Average (Mbits/s)	58.50	4.46	46.21	63.52
	Upload Throughput Average (Mbits/s)	18.79	4.59	19.69	23.63

Table-62: Overall Summary of 5G only & 4G only data download & upload speed.

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

Hata Mor					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	54.38	-	96.43	-
	Upload Throughput Average (Mbits/s)	22.11	-	34.40	-
4G	Download Throughput Average (Mbits/s)	14.84	3.28	63.96	-
	Upload Throughput Average (Mbits/s)	20.85	4.47	15.66	-

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

Note- “-”Respective technology was not observed during the test.

Jadugora					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	93.36	-	2.95	-
	Upload Throughput Average (Mbits/s)	7.88	-	4.98	-
4G	Download Throughput Average (Mbits/s)	18.85	6.83	6.58	-
	Upload Throughput Average (Mbits/s)	1.77	12.86	2.04	-

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

Note- “-”Respective technology was not observed during the test.

Kamta Prasad Sinha Inter College Gaya					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	0.02	-
	Upload Throughput Average (Mbits/s)	-	-	1.51	-
4G	Download Throughput Average (Mbits/s)	8.74	0.43	2.92	7.87
	Upload Throughput Average (Mbits/s)	1.33	1.48	1.34	2.47

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

Note- “-”Respective technology was not observed during the test.

Magadh Medical College Gaya					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	159.37	-	390.92	-
	Upload Throughput Average (Mbits/s)	47.81	-	14.02	-
4G	Download Throughput Average (Mbits/s)	28.58	3.24	38.88	45.26
	Upload Throughput Average (Mbits/s)	11.95	17.12	9.48	22.21

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

Note- “-”Respective technology was not observed during the test.

Mahabodhi Temple Bodh Gaya					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	95.04	-	212.39	-
	Upload Throughput Average (Mbits/s)	28.08	-	16.20	-
4G	Download Throughput Average (Mbits/s)	35.49	3.45	14.81	33.61
	Upload Throughput Average (Mbits/s)	5.86	1.43	1.95	8.50

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

Note- “-”Respective technology was not observed during the test.

Mango Bus Stand Mango Jamshedpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	59.68	-	135.12	-
	Upload Throughput Average (Mbits/s)	10.69	-	11.89	-
4G	Download Throughput Average (Mbits/s)	27.16	1.73	12.35	18.13
	Upload Throughput Average (Mbits/s)	2.82	4.84	4.69	23.81

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

Note- “-”Respective technology was not observed during the test.

National Institute of Technology Jamshedpur (NIT Jamshedpur)					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	298.12	-	249.01	-
	Upload Throughput Average (Mbits/s)	90.76	-	23.61	-
4G	Download Throughput Average (Mbits/s)	24.48	4.60	60.65	52.88
	Upload Throughput Average (Mbits/s)	27.12	4.72	14.57	26.59

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

Note- “-”Respective technology was not observed during the test.

Office of District Magistrate Gaya					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	216.54	-	263.39	-
	Upload Throughput Average (Mbits/s)	31.44	-	25.26	-
4G	Download Throughput Average (Mbits/s)	26.58	6.51	46.92	20.22
	Upload Throughput Average (Mbits/s)	5.87	12.64	14.68	10.48

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

Note- “-”Respective technology was not observed during the test.

PHC Dobhi					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	154.55	-
	Upload Throughput Average (Mbits/s)	-	-	6.15	-
4G	Download Throughput Average (Mbits/s)	19.00	4.28	10.45	14.47
	Upload Throughput Average (Mbits/s)	1.54	3.45	1.04	5.19

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

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

Police Station Wajirganj Gaya					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	96.79	-	560.28	-
	Upload Throughput Average (Mbits/s)	51.22	-	93.26	-
4G	Download Throughput Average (Mbits/s)	48.40	15.87	76.52	-
	Upload Throughput Average (Mbits/s)	22.75	9.19	14.18	-

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

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

S.N.S. College Tekari					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	123.06	-	139.91	-
	Upload Throughput Average (Mbits/s)	18.50	-	11.14	-
4G	Download Throughput Average (Mbits/s)	51.36	5.55	2.22	5.43
	Upload Throughput Average (Mbits/s)	14.13	13.74	1.86	8.35

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

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

Sadar Hospital Jamshedpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	128.22	-	485.32	-
	Upload Throughput Average (Mbits/s)	15.36	-	56.89	-
4G	Download Throughput Average (Mbits/s)	20.30	2.96	30.72	9.94
	Upload Throughput Average (Mbits/s)	2.18	3.77	18.03	5.02

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

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

Swami Vivekananda Chowk Haldipokhar					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	266.70	-
	Upload Throughput Average (Mbits/s)	-	-	23.55	-
4G	Download Throughput Average (Mbits/s)	27.63	17.90	57.54	-
	Upload Throughput Average (Mbits/s)	26.21	14.81	8.66	-

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

Note- “-”Respective technology was not observed during the test.

Tata Motors Hospital Kharangajhar Jamshedpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	25.12	-	39.23	-
	Upload Throughput Average (Mbits/s)	-	-	4.20	-
4G	Download Throughput Average (Mbits/s)	35.81	4.46	12.82	16.85
	Upload Throughput Average (Mbits/s)	21.83	3.64	1.38	5.40

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

Note- “-”Respective technology was not observed during the test.

Tatanagar Railway Station Jamshedpur					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	107.63	-	85.11	-
	Upload Throughput Average (Mbits/s)	34.95	-	17.28	-
4G	Download Throughput Average (Mbits/s)	25.02	4.58	67.03	3.73
	Upload Throughput Average (Mbits/s)	3.80	4.40	14.12	3.14

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

Note- “-”Respective technology was not observed during the test.

The Great Buddha Statue Bodh Gaya					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	206.11	-	73.95	-
	Upload Throughput Average (Mbits/s)	36.94	-	3.14	-
4G	Download Throughput Average (Mbits/s)	67.45	4.86	81.48	28.04
	Upload Throughput Average (Mbits/s)	15.93	13.73	12.63	10.39

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

Note- “-”Respective technology was not observed during the test.

Vishnupad Temple					
Parameters		Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	300.91	-	37.83	-
	Upload Throughput Average (Mbits/s)	100.30	-	2.58	-
4G	Download Throughput Average (Mbits/s)	58.91	3.66	56.79	42.42
	Upload Throughput Average (Mbits/s)	38.38	14.81	13.77	18.22

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

Note- “-”Respective technology was not observed during the test.

4.4 Walk Test

Walk test has been conducted on 4th August 2025 and 11th August 2025. Five locations have been tested in the Jamshedpur city and Gaya city.

4.4.1 Walk test locations

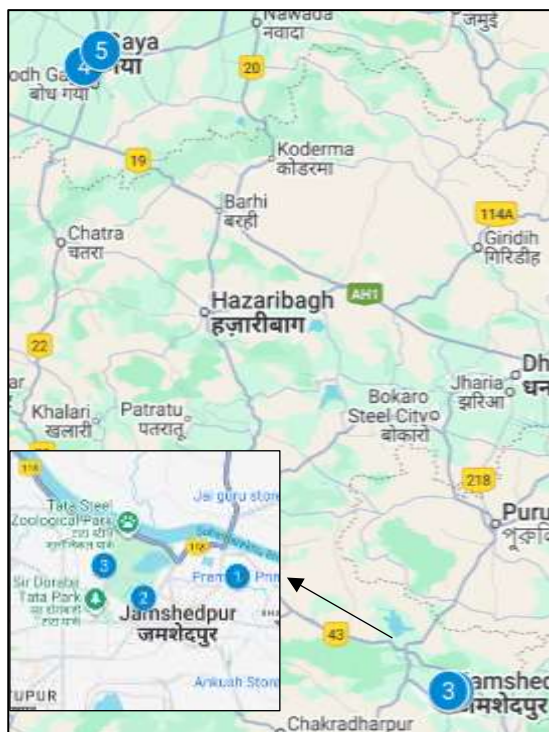


Figure-24: Walk test locations.

4.4.2 Walk test covered

1. Civil Court Jamshedpur
2. Jubilee Park
3. XLRI School of Management
4. Gaya International Airport
5. Gaya Railway Station

4.4.3 Voice performance

i) Civil Court Jamshedpur

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

Civil Court Jamshedpur				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	12	11	12	12
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 (Sec)	1.65	3.83	0.72	0.95
Handover Success Rate %	100.00	93.33	100.00	100.00

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

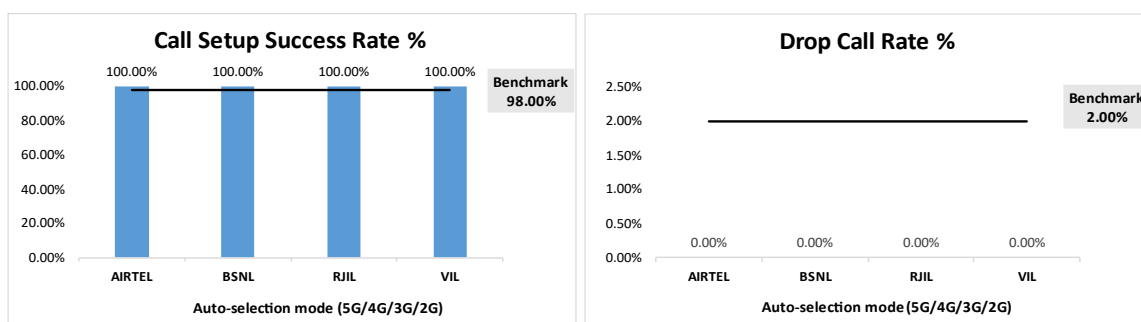


Figure-25: Performance for call setup success rate and drop call rate.

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

Civil Court Jamshedpur				
Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	6.90%	NA	12.81%	NA
4G	93.10%	12.43%	87.19%	92.15%
3G	NA	1.49%	NA	NA
2G	0.00%	86.07%	NA	7.85%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-81: Time spent on technology during walk test.

Note-

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

(c) Network Signal Strength distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G).

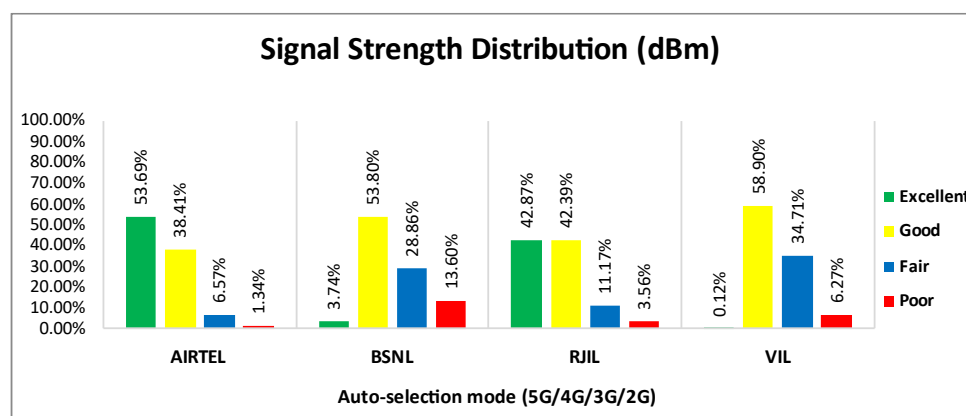


Figure-26: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

ii) Jubilee Park

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

Jubilee Park				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	12	11	12	12
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 (Sec)	1.67	1.84	0.59	1.00
Handover Success Rate %	100.00	100.00	100.00	100.00

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

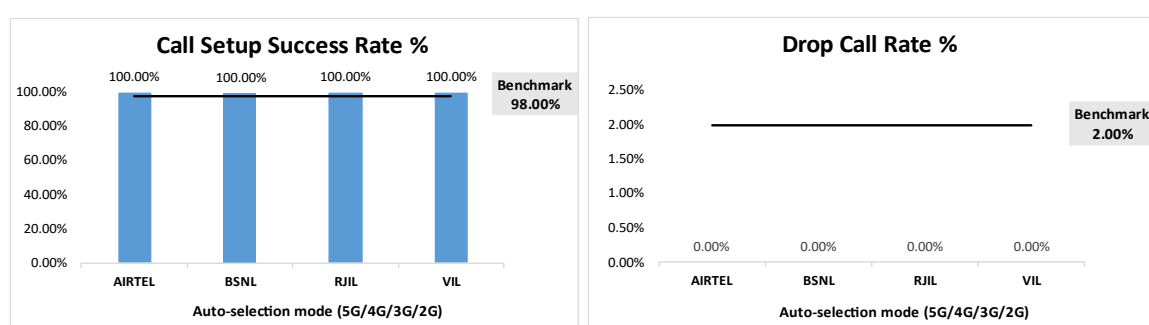


Figure- 27: Performance for call setup success rate and drop call rate.

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

Jubilee Park				
Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	9.43%	NA	14.57%	NA
4G	90.57%	13.55%	85.43%	100.00%
3G	NA	0.00%	NA	NA
2G	0.00%	86.45%	NA	0.00%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-83: Time spent on technology during walk test.

Note-

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

(c) Network Signal Strength distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G).

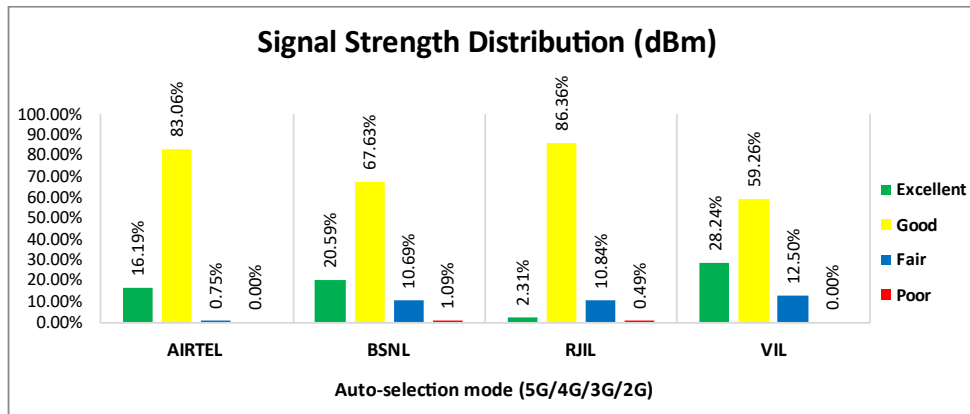


Figure-28: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

iii) XLRI School of Management

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

XLRI School of Management				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	10	10	11	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 (Sec)	1.67	2.99	0.68	0.94
Handover Success Rate %	100.00	-	100.00	-

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

Note "-" Handover did not attempt.

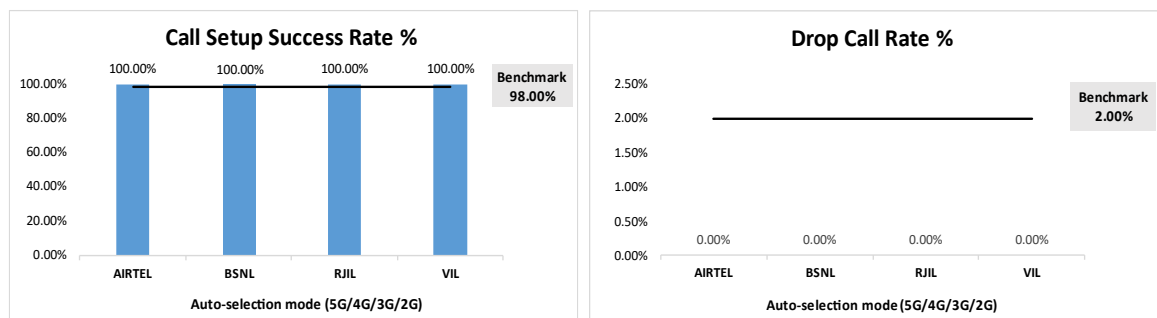


Figure- 29: Performance for call setup success rate and drop call rate.

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

XLRI School of Management				
Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	1.59%	NA	10.24%	NA
4G	98.41%	15.65%	89.76%	100.00%
3G	NA	0.00%	NA	NA
2G	0.00%	84.35%	NA	0.00%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-85: Time spent on technology during walk test.

Note-

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

(c) Network Signal Strength distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G).

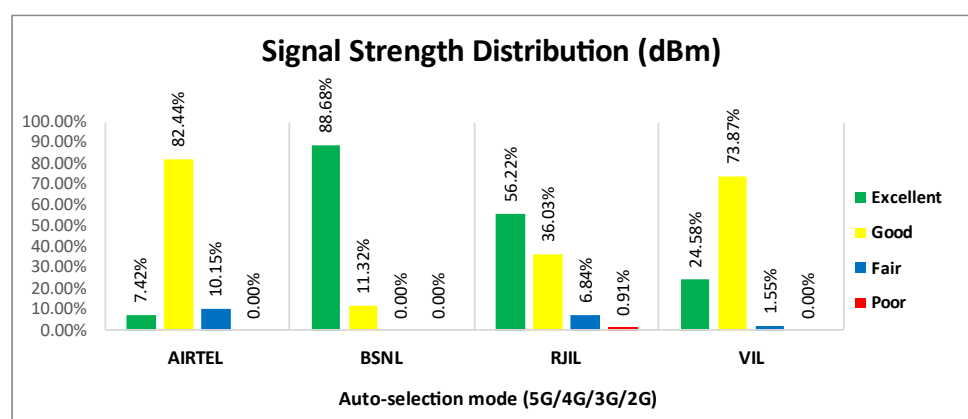


Figure-30: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

iv) Gaya International Airport

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

Gaya International Airport				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	12	22	12	12
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	100.00	0.00	0.00
Call Setup Time-Average (Sec)	1.68	2.96	0.73	0.95
Handover Success Rate %	100.00	96.88	100.00	100.00

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

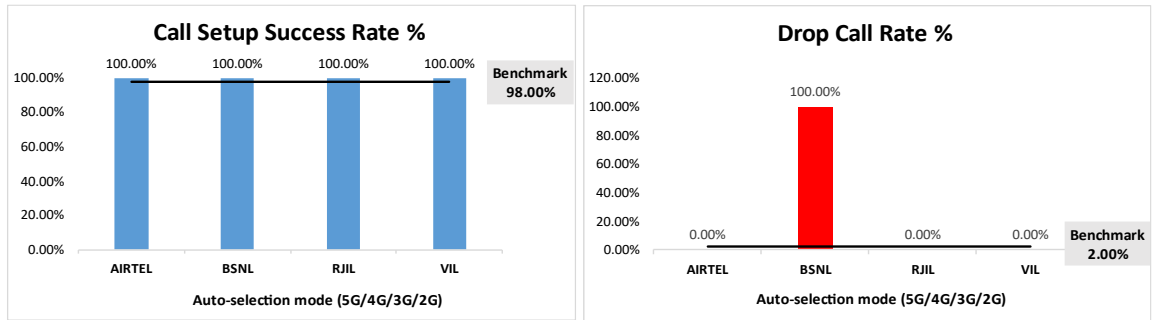


Figure-31: Performance for call setup success rate and drop call rate.

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

Gaya International Airport				
Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	0.00%	NA	14.75%	NA
4G	100.00%	39.07%	85.25%	97.44%
3G	NA	9.79%	NA	NA
2G	0.00%	50.85%	NA	2.56%
Limited service	0.00%	0.30%	0.00%	0.00%

Table-87: Time spent on technology during walk test.

Note-

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

(c) Network Signal Strength distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G).

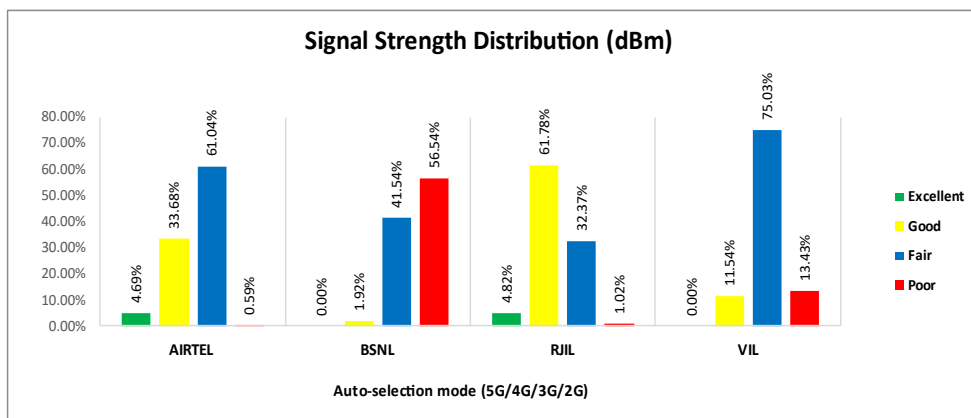


Figure-32: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

v) Gaya Railway Station

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

Gaya Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempt	12	12	12	12
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 (Sec)	1.68	3.58	0.60	0.93
Handover Success Rate %	100.00	100.00	100.00	100.00

Table-88: Summary of Voice performance in network auto-selection mode (5G/4G/3G/2G).

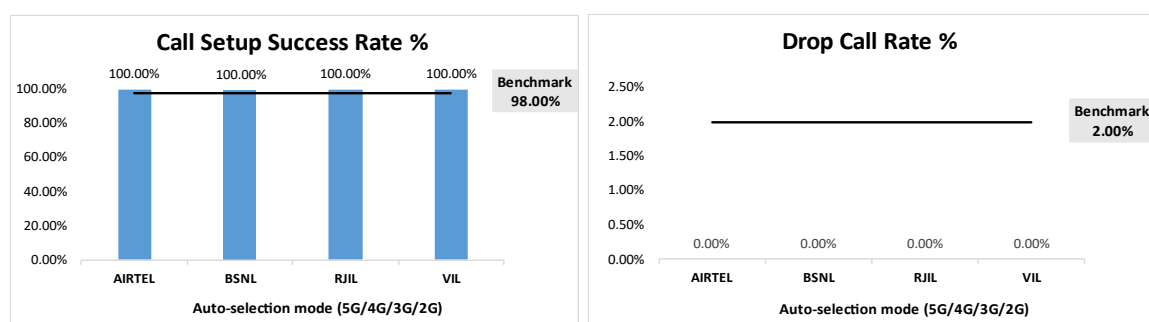


Figure- 33: Performance for call setup success rate and drop call rate.

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

Gaya Railway Station				
Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	3.01%	NA	13.09%	NA
4G	96.99%	14.16%	86.91%	100.00%
3G	NA	0.00%	NA	NA
2G	0.00%	85.84%	NA	0.00%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-89: Time spent on technology during walk test.

Note-

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

(c) Network Signal Strength distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G).

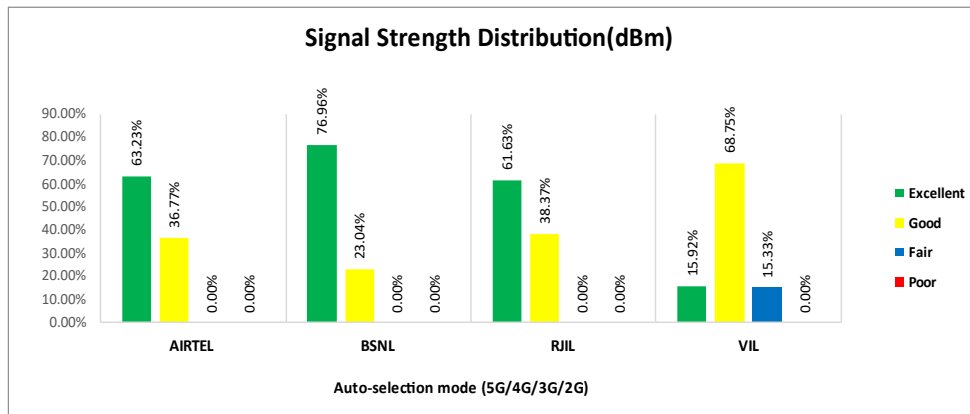


Figure-34: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

4.4.4 Data performance

i) Civil Court Jamshedpur

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

Civil Court Jamshedpur				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	117.51	3.32	454.23	35.75
Download Throughput 80th Percentile	190.86	4.28	673.63	44.50
Download Throughput 20th Percentile	53.20	2.63	223.79	27.74
Download Session Setup Success Rate %	100.00	93.33	86.67	100.00
Upload Throughput Average (Mbits/s)	46.38	3.95	42.78	18.37
Upload Throughput 80th Percentile	74.33	3.39	68.24	25.83
Upload Throughput 20th Percentile	24.53	2.75	15.62	12.62
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms)-50th Percentile	49.10	28.38	20.95	32.55

Table-90: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

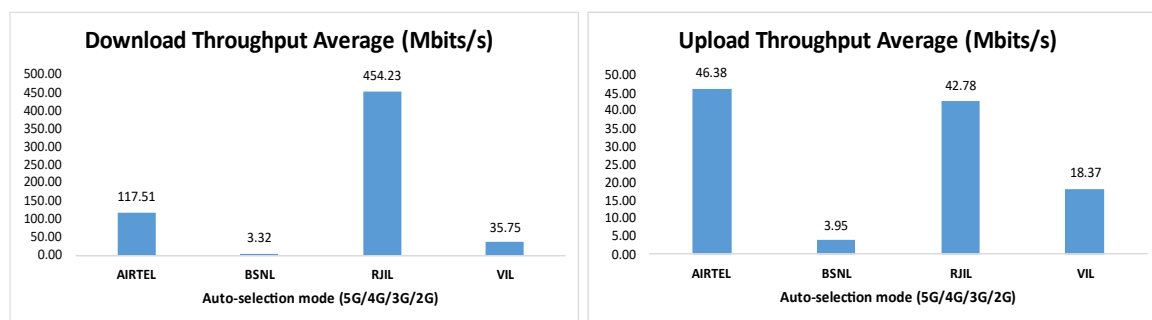


Figure- 35: Download and Upload throughput.

ii) Jubilee Park

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

Jubilee Park				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	62.57	2.43	143.85	45.13
Download Throughput 80th Percentile	65.35	5.02	190.92	57.97
Download Throughput 20th Percentile	49.74	0.01	91.20	33.30
Download Session Setup Success Rate %	100.00	66.67	93.33	100.00
Upload Throughput Average (Mbits/s)	28.57	2.07	7.97	30.63
Upload Throughput 80th Percentile	34.67	3.63	9.25	43.08
Upload Throughput 20th Percentile	23.19	0.77	5.38	15.80
Upload Session Setup Success Rate %	100.00	66.67	100.00	100.00
Latency (ms)-50th Percentile	61.50	39.15	22.15	32.70

Table-91: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

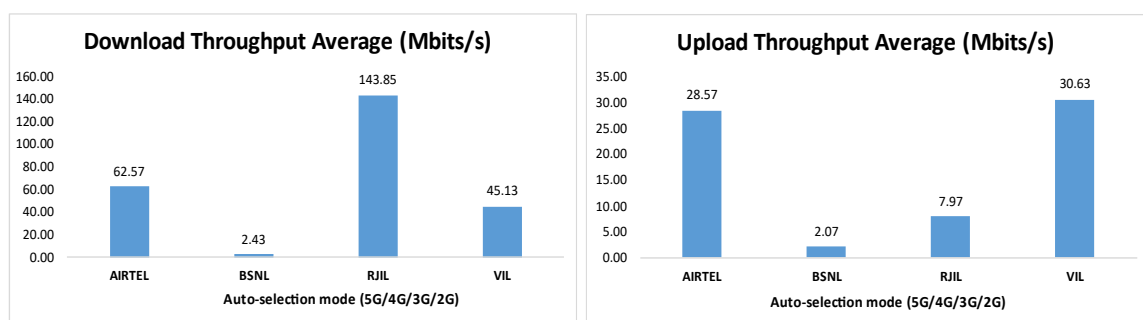


Figure- 36: Download and Upload throughput

iii) XLRI School of Management

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

XLRI School of Management				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	90.98	10.68	79.18	62.58
Download Throughput 80th Percentile	152.18	14.47	114.12	77.23
Download Throughput 20th Percentile	37.03	6.60	53.98	56.09
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	34.27	6.80	14.27	26.82
Upload Throughput 80th Percentile	47.98	8.95	29.94	30.12
Upload Throughput 20th Percentile	20.38	4.94	2.61	23.17
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms)-50th Percentile	54.50	33.50	24.00	33.65

Table-92: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

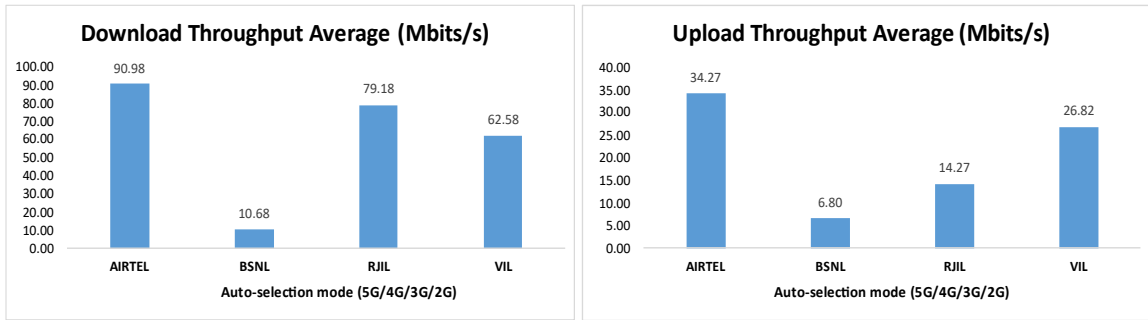


Figure- 37: Download and Upload throughput

iv) Gaya International Airport

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

Gaya International Airport				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	28.23	0.51	42.25	22.05
Download Throughput 80th Percentile	47.34	1.08	53.11	31.17
Download Throughput 20th Percentile	5.70	0.01	0.94	12.47
Download Session Setup Success Rate %	100.00	77.78	100.00	100.00
Upload Throughput Average (Mbits/s)	6.41	0.32	2.67	5.95
Upload Throughput 80th Percentile	9.01	0.64	3.50	8.82
Upload Throughput 20th Percentile	1.78	0.06	1.84	3.05
Upload Session Setup Success Rate %	93.75	72.22	100.00	100.00
Latency (ms)-50th Percentile	55.00	805.50	29.85	33.50

Table-93: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

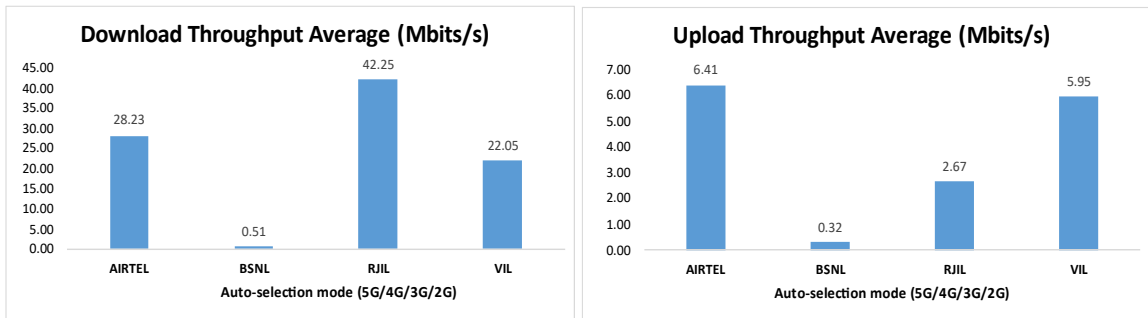


Figure- 38: Download and Upload throughput

v) Gaya Railway Station

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

Gaya Railway Station				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	55.99	2.98	99.47	23.54
Download Throughput 80th Percentile	116.61	3.52	197.42	39.24
Download Throughput 20th Percentile	17.96	2.43	15.72	10.51
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	32.83	2.37	26.48	16.58
Upload Throughput 80th Percentile	53.48	2.45	49.09	21.88
Upload Throughput 20th Percentile	18.45	2.26	15.06	10.05
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms)-50th Percentile	53.00	36.15	26.95	33.58

Table-94: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

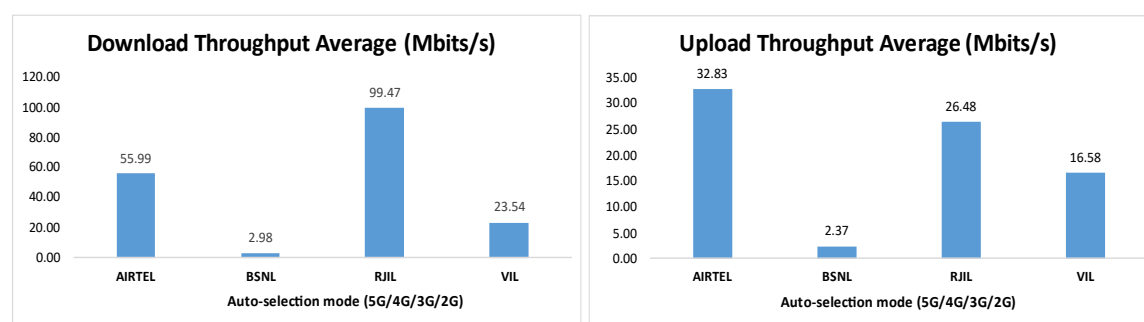


Figure- 39: Download and Upload throughput

5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:

- a) Airtel, BSNL and VIL have 99.85%, 84.35% and 89.90% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL have 99.36%, 87.26%, 99.89% and 85.62% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)
- c) Airtel, RJIL and VIL have 100% call setup success rate while calling on peer service provider's network for inter-operator calls. (refer to Table-9)
- d) BSNL had a 100.00% call setup success rate while calling Airtel and RJIL whereas call blocking was observed when calling VIL. (refer to Table-9)

2. Call Setup Time:

- a) Airtel, BSNL and VIL call setup time is 5.75, 2.82 and 6.38 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL & VIL call setup time is 1.70, 2.96, 0.68 and 1.74 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Call Silence/Mute Rate:

In packet switched network (4G/5G) Airtel, RJIL & VIL have 1.05%, 1.05% & 7.76% silence call rate respectively. Further Airtel, RJIL & VIL downlink RTP packet loss is 0.52%, 0.36% & 1.35% respectively. In uplink Airtel, BSNL, RJIL & VIL RTP packet loss is 0.52%, 0.57% & 1.91% respectively. (refer table-6)

4. Drop Call Rate:

- a) Airtel, BSNL and VIL drop call rate is 0.00%, 4.43% and 3.08% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, BSNL, RJIL and VIL drop call rate is 0.00%, 4.63%, 0.11% and 1.39% 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 91.35 Mbps, 2.97 Mbps, 185.21 Mbps and 34.65 Mbps respectively. (refer table-11)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 26.36 Mbps, 3.72 Mbps, 19.45 Mbps and 12.27 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 112.01 Mbps, 2.76 Mbps, 181.57 Mbps and 38.19 Mbps respectively. (refer table-40)
- b) Airtel, BSNL, RJIL and VIL average upload speeds are 26.46 Mbps, 3.58 Mbps, 18.10 Mbps and 11.65 Mbps respectively. (refer table-40)

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

- a) Airtel, BSNL, RJIL and VIL have 88.42%, 85.26%, 98.95% and 92.22% download session setup success rate respectively. (refer table-40)

- b) Airtel, BSNL, RJIL and VIL have 92.63%, 85.26%, 100.00% and 91.58% upload session setup success rate respectively. (refer table-40)

5.3 Operator wise Key Findings

1. Airtel:

Voice

- 99.85% call setup success rate and 0.00% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 13)
- 99.36% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 99.13% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 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-20)
- 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 walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 80, 82, 84, 86 & 88)

Data

- Airtel has 91.35 Mbps average download speed & 26.36 Mbps average upload speed for LSA. (refer table-11)
- Airtel has 91.19 Mbps average download speed & 26.08 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- Ghatara Post Office Mathurapur, Hata Mor, Jadugora, Kamta Prasad Sinha Inter College Gaya, Mahabodhi Temple Bodh Gaya, Mango Bus Stand Mango Jamshedpur, PHC Dobhi, Police Station Wajirganj Gaya, Sadar Hospital Jamshedpur, Swami Vivekananda Chowk Haldipokhar and Tata Motors Hospital Kharangajhar Jamshedpur have less download speed (less than 100 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-41, 43, 44, 45, 47, 48, 51, 52, 54, 55 & 56)
- Hata Mor, Jadugora, Kamta Prasad Sinha Inter College Gaya, Mahabodhi Temple Bodh Gaya, Mango Bus Stand Mango Jamshedpur, PHC Dobhi, S.N.S. College Tekari, Sadar Hospital Jamshedpur and The Great Buddha Statue Bodh Gaya have less upload speed (less than 20 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-43, 44, 45, 47, 48, 51, 53, 54 & 58)
- All walk test locations have less download speed (less than 100 Mbps) for auto-selection mode (5G/4G/3G/2G) except Civil Court Jamshedpur. (refer table-91, 92, 93 & 94)
- Gaya International Airport has less upload speed (less than 20 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 93)

2. BSNL:

Voice

- 84.35% call setup success rate and 4.43% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 13)
- 87.26% call setup success rate and 4.63% 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)
- 83.36% call setup success rate and 2.78% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 97.89% call setup success rate and 0.54% 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-20)
- 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 walk test locations except Gaya International Airport. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-80, 82, 84 & 88)
- 100.00% call setup success rate and 100.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Gaya International Airport walk test location. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table- 86)

Data

- BSNL has 2.97 Mbps average download speed & 3.72 Mbps average upload speed for LSA. (refer table-11)
- BSNL has 2.84 Mbps average download speed & 3.77 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- All hotspot locations have less download speed (less than 10 Mbps) except Swami Vivekananda Chowk Haldipokhar and Tatanagar Railway Station Jamshedpur for auto-selection mode (5G/4G/3G/2G). (refer table- 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 56, 58 & 59)
- Ghatera Post Office Mathurapur, Kamta Prasad Sinha Inter College Gaya, Magadh Medical College Gaya, Mahabodhi Temple Bodh Gaya, National Institute of Technology Jamshedpur (NIT Jamshedpur), Office of District Magistrate Gaya, PHC Dobhi, Police Station Wajirganj Gaya, S.N.S. College Tekari, Sadar Hospital Jamshedpur, Tata Motors Hospital Kharangajhar Jamshedpur, The Great Buddha Statue Bodh Gaya and Vishnupad Temple have less upload speed (less than 2 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-41, 45, 46, 47, 49, 50, 51, 52, 53, 54, 56, 58 & 59)
- All walk test locations have less download speed (less than 10 Mbps) for auto-selection mode (5G/4G/3G/2G) except XLRI School of Management (refer table- 90, 91, 93 & 94)
- Gaya International Airport has less upload speed (less than 2 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 93)

3. RJIL:

Voice

- 99.89% call setup success rate and 0.11% 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)
- 99.86% call setup success rate and 0.14% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)
- 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-20)
- 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 walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 80, 82, 84, 86 & 88)

Data

- RJIL has 185.21 Mbps average download speed & 19.45 Mbps average upload speed for LSA. (refer table-11)
- RJIL has 188.50 Mbps average download speed & 19.69 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- Ghatara Post Office Mathurapur, Jadugora, Kamta Prasad Sinha Inter College Gaya, PHC Dobhi, S.N.S. College Tekari, Tata Motors Hospital Kharangajhar Jamshedpur, Tatanagar Railway Station Jamshedpur, The Great Buddha Statue Bodh Gaya and Vishnupad Temple have less download speed (less than 100 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 41, 44, 45, 51, 53, 56, 57, 58 & 59)
- Ghatara Post Office Mathurapur, Jadugora, Kamta Prasad Sinha Inter College Gaya, Magadh Medical College Gaya, Mahabodhi Temple Bodh Gaya, Mango Bus Stand Mango Jamshedpur, National Institute of Technology Jamshedpur (NIT Jamshedpur), Office of District Magistrate Gaya, PHC Dobhi, S.N.S. College Tekari, Swami Vivekananda Chowk Haldipokhar, Tata Motors Hospital Kharangajhar Jamshedpur, Tatanagar Railway Station Jamshedpur, The Great Buddha Statue Bodh Gaya and Vishnupad Temple have less upload speed (less than 20 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 41, 44, 45, 46, 47, 48, 49, 50, 51, 53, 55, 56, 57, 58 & 59)
- XLRI School of Management, Gaya International Airport and Gaya Railway Station have less download speed (less than 100 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 92, 93 & 94)
- Jubilee Park, XLRI School of Management and Gaya International Airport have less upload speed (less than 20 Mbps) out of total 5 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table- 91, 92 & 93)

4. VIL:

Voice

- 89.90% call setup success rate and 3.08% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 13)

- 85.62% call setup success rate and 1.39% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-5)
- 82.37% call setup success rate and 1.92% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-15)
- 94.21% 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-20)
- 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 walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 80, 82, 84, 86 & 88)

Data

- VIL has 34.65 Mbps average download speed & 12.27 Mbps average upload speed for LSA. (refer table-11)
- VIL has 34.01 Mbps average download speed & 11.62 Mbps average upload speed across the measured routes for city drive. (refer table-19)
- Hata Mor, Jadugora, Police Station Wajirganj Gaya, Swami Vivekananda Chowk Haldipokhar and Tatanagar Railway Station Jamshedpur have less download speed (less than 10 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 43, 44, 52, 55 & 57)
- Ghatera Post Office Mathurapur, Hata Mor, Jadugora, Kamta Prasad Sinha Inter College Gaya, Police Station Wajirganj Gaya, Swami Vivekananda Chowk Haldipokhar and Tatanagar Railway Station Jamshedpur have less upload speed (less than 2 Mbps) out of total 19 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 41, 43, 44, 45, 52, 55 & 57)

6. Annexure

6.1 Route wise coverage map

6.1.1 City

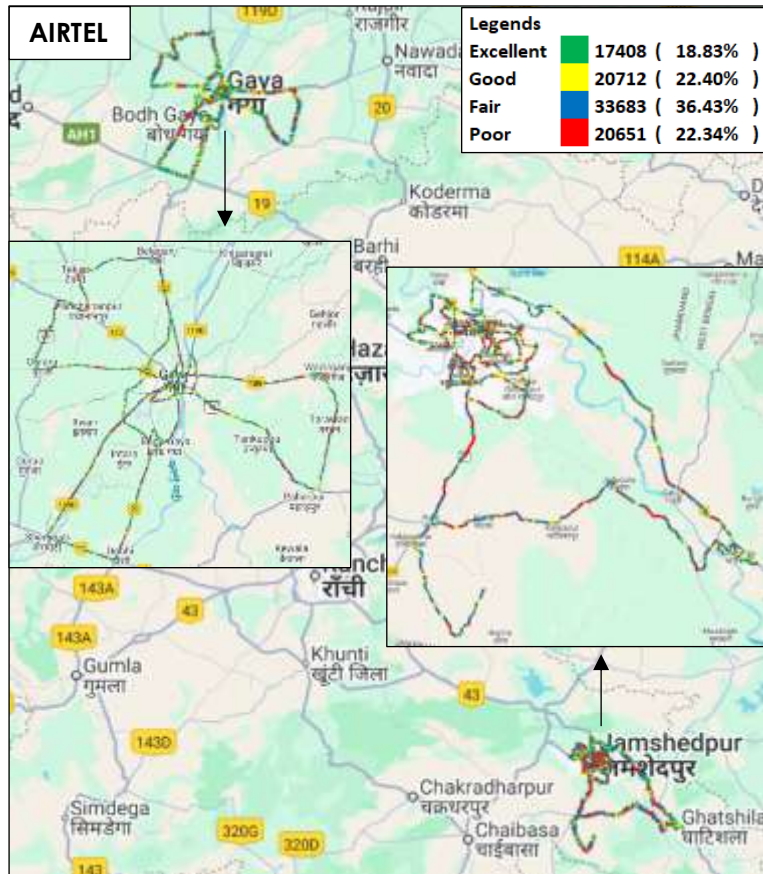


Figure-40: Signal strength 3G/2G network mode – AIRTEL.

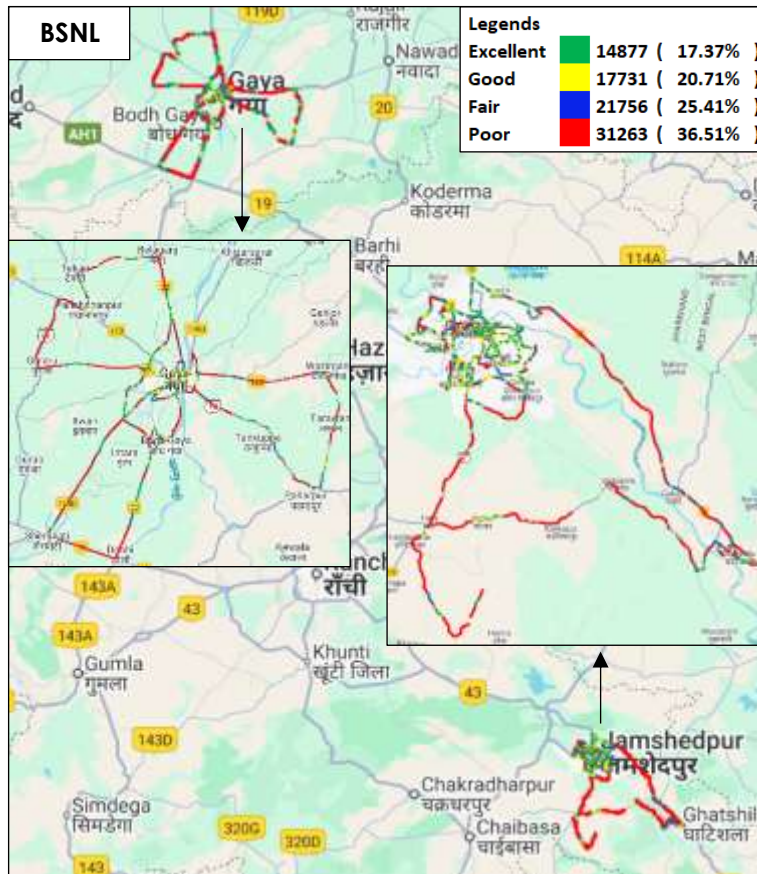


Figure-41: Signal strength 3G/2G network mode – BSNL.

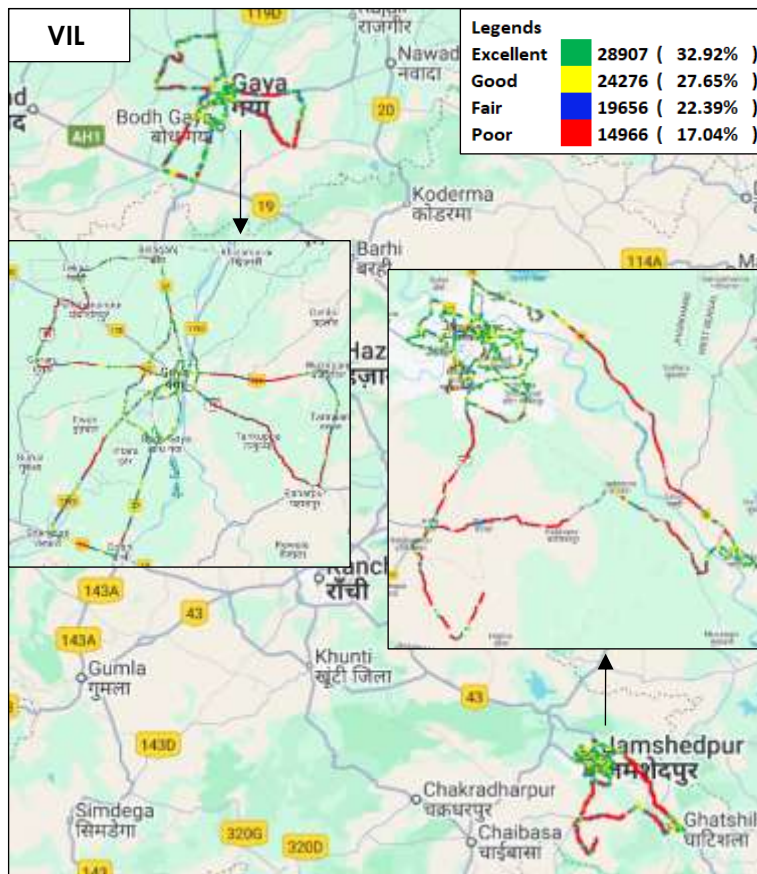


Figure-42: Signal strength 3G/2G network mode – VIL.

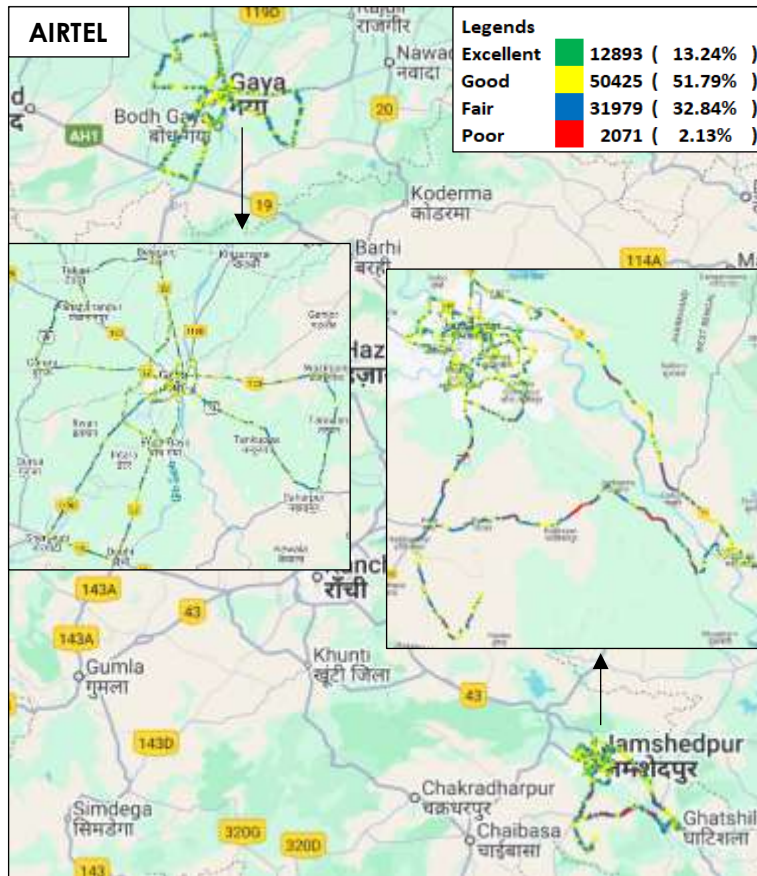


Figure-43: Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.

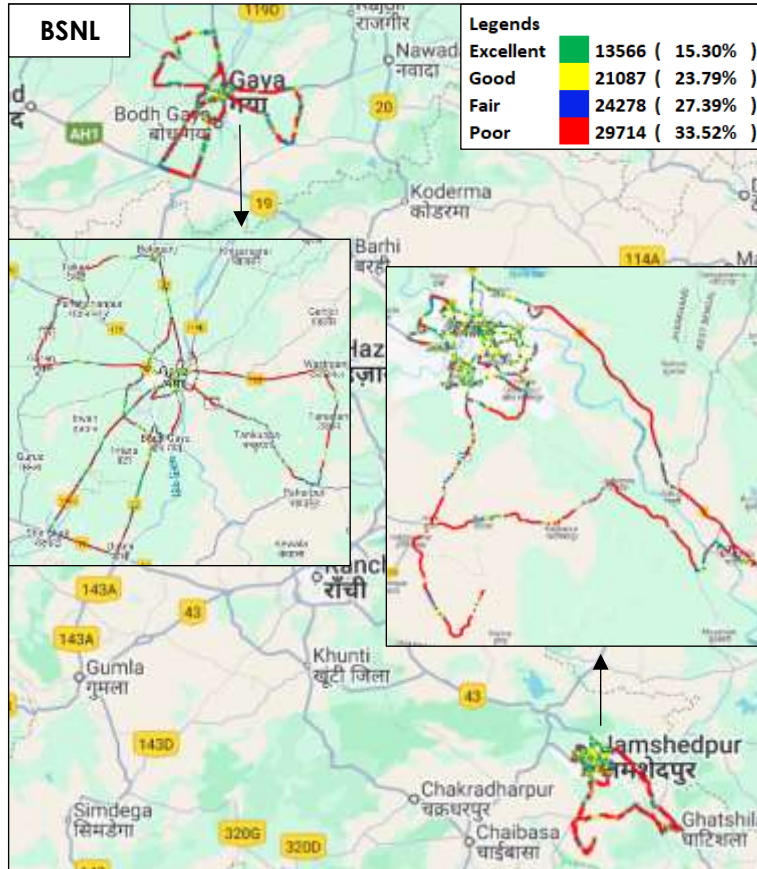


Figure-44: Signal strength auto-selection mode 5G/4G/3G/2G (4G network being rolled out) – BSNL.

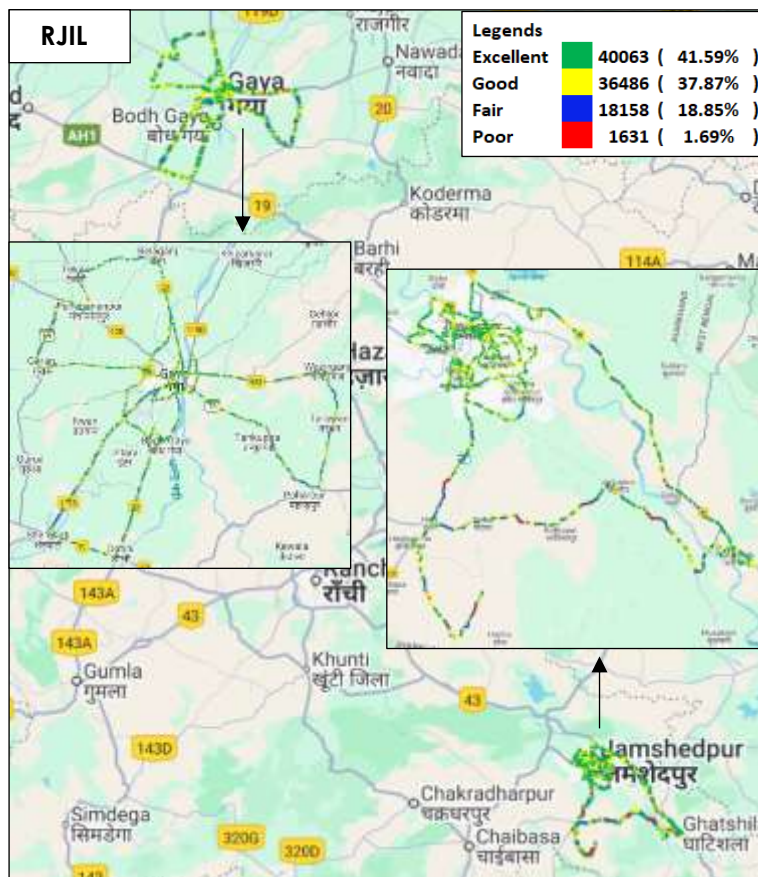


Figure-45: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

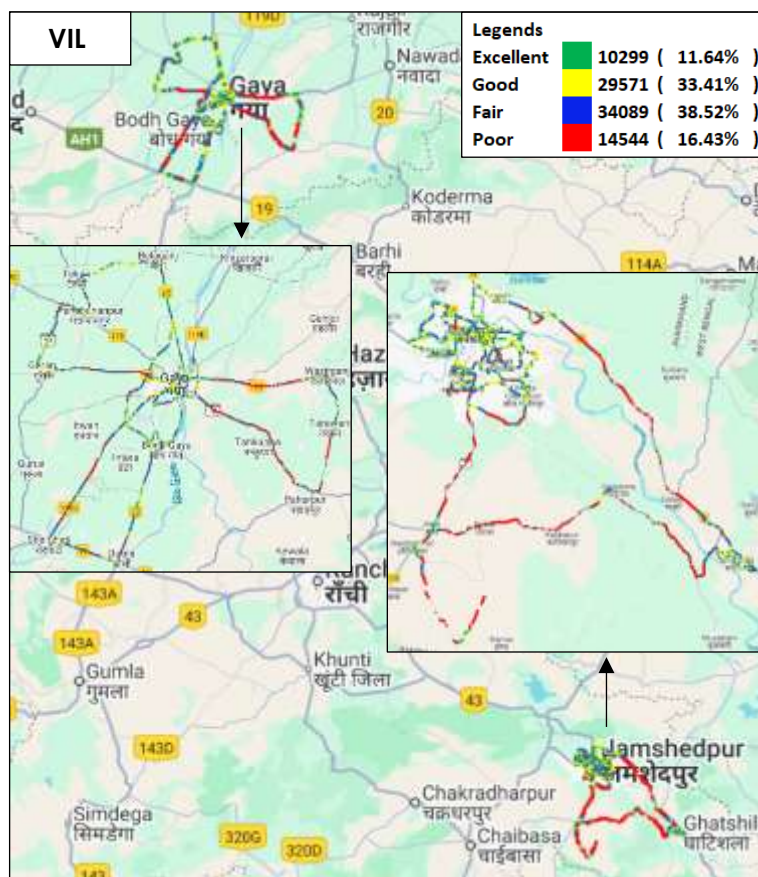


Figure-46: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

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		120 Sec
Wait/ Guard Time		15 Sec

Table-95: 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.
- 180 Sec calls were made only in highway & railway route drive.

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

Latency		25 count- Dynamic 1000 count- Hotspot Payload- 512 bytes in all drive
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Table-96: 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.
- Ping 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.
- Download and upload testing has been done on FTP server for Airtel, BSNL & RJIL. (Airtel, BSNL & RJIL not provided HTTP server)
- VIL download and upload testing is done on HTTP Server.

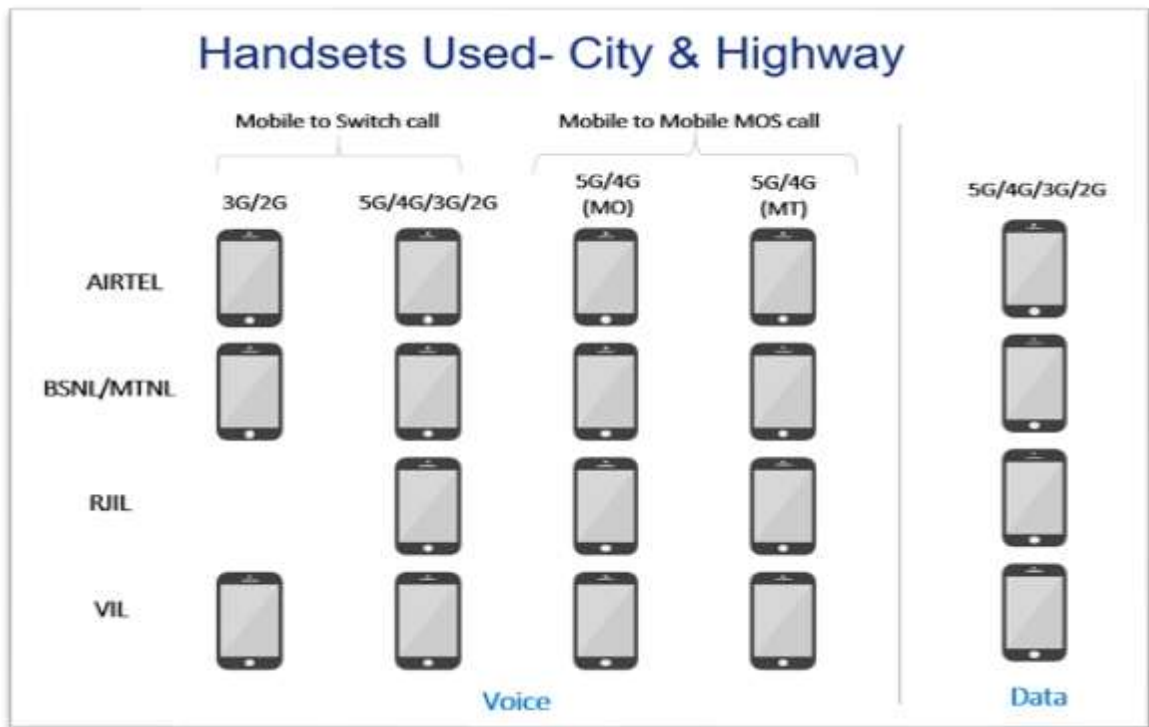


Figure-47: Number of handsets used in city & highway drive

MO: Mobile originating

MT: Mobile terminating

Handsets Used- Railway/Metro/Walk Test/ Hotspot & Coastal Area

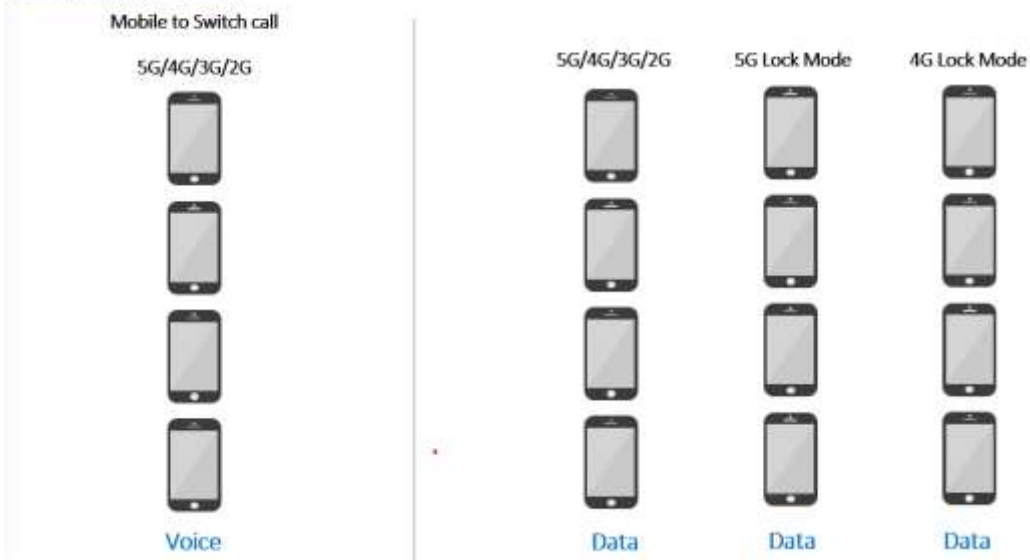


Figure-48: Number of handsets used in railway/metro/walktest/hotspot & coastal area

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)

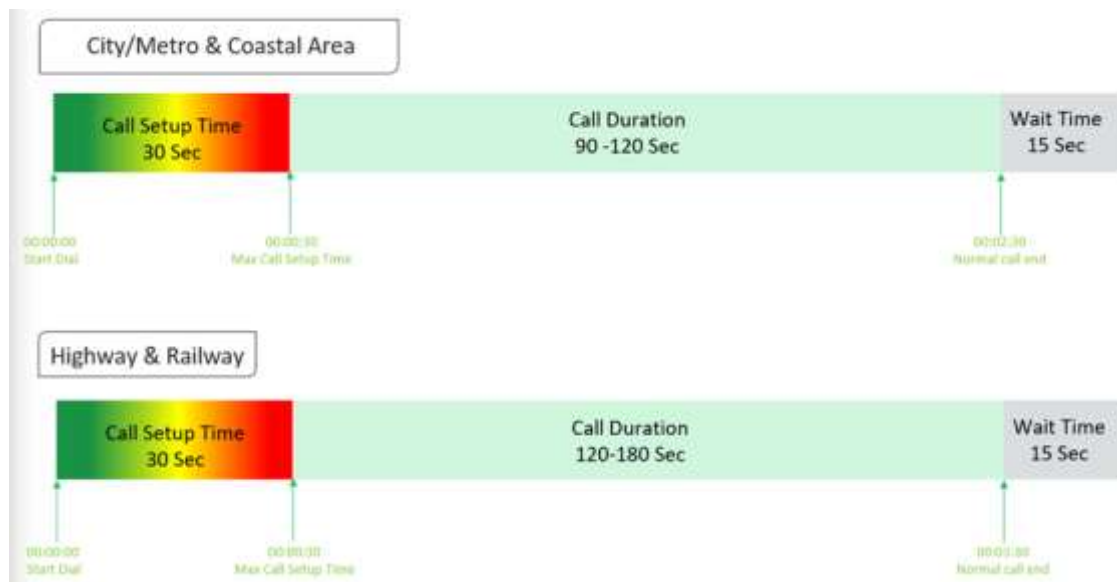


Figure-49: Voice test script for city/railway/metro/highway & coastal area

- 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-50: 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-51: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing

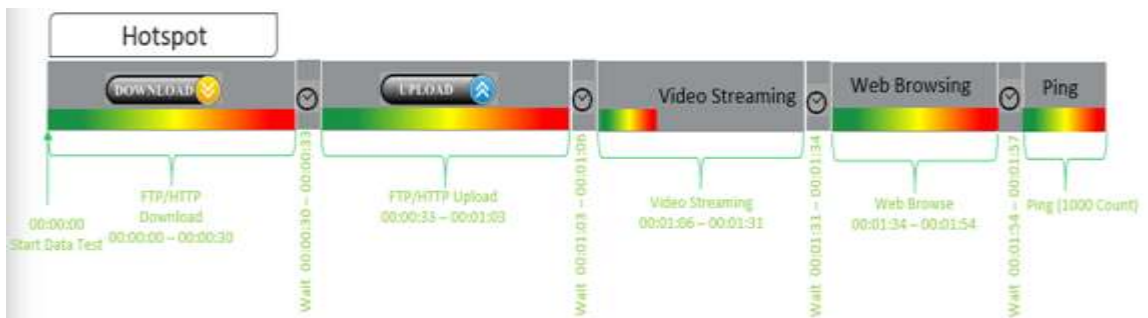


Figure-52: Data test script used at hotspot

- 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.
- Only 1 ping iteration (with 1000 Count) 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	Drop call 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 Drop Call/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 $J(i) = J(i-1) + (D(i-1,i) - J(i-1))/16 \text{ or } 8$																																		
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
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																														

Table-97: 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	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	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	Number of packets lost out of total packet transferred during test. Packet loss rate = (Total packet lost / Total packet sent) *100 * Packet delay (using ping) >90 ms considered as packet loss and included in packet loss rate. * Packet loss rate is calculated based on ICMP * 90th percentile for Packet loss rate has been reported in overall Hotspot performance summary.

Table-98: 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.