



TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Delhi LSA

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

Sl. No	Drive test route	Type of route	Distance covered (KMs)/ Locations	From date	To date
1	Delhi	City	370.6	15-Apr-2025	25-Apr-2025
2	Delhi	Hotspot	17 Locations	17-Apr-2025	25-Apr-2025
3	Delhi	Walk Test	4.4	25-Apr-2025	25-Apr-2025
4	Noida to Aligarh	Highway	124.9	25-Apr-2025	25-Apr-2025

Table-1: Drive test summary

Note-

- City drive has been done on 15th, 16th, 22nd & 25th April 2025.
- Hotspot testing has been done on 17th, 22nd 24th & 25th April 2025.

2.2 Drive test routes

The map provides overview of drive test routes indicating city drive, hotspots, walk test and highway as per the legends shown on the map.

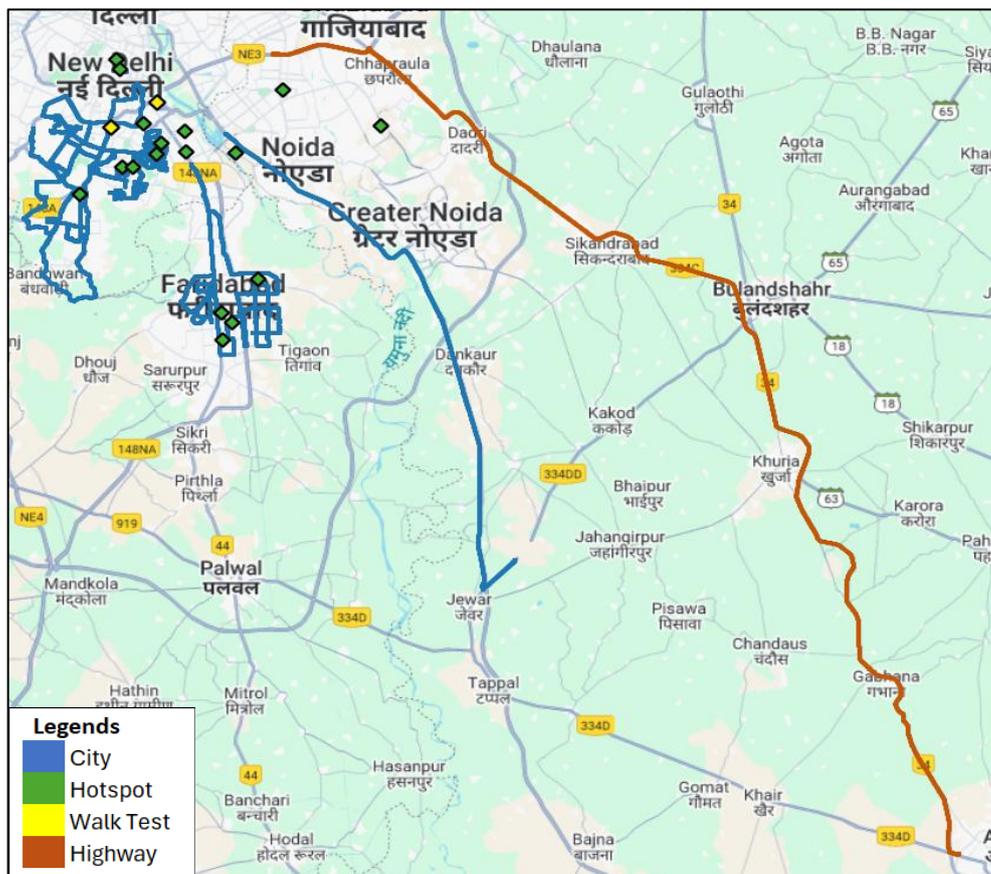


Figure-1: Drive test routes

2.3 Summary of areas covered

a) **City**- Vasant Vihar, Lajapt Nagar, Hauz Khas, Chhatarpur, Okhla Phase-1, Old Fridabad, Noida Sec-126, Greater Noida Sec-151, Greater Noida Sec-149, Salarpur, Karoli and Noida international Airport etc.

b) Hotspot

1. Amity University, Sector 125, Noida
2. Amrita Hospital, Sector 88, Faridabad
3. Apollo Hospital, Sarita Vihar
4. Birla Vidya Niketan School, Pushp Vihar
5. Chhatarpur Mandir
6. Deshbandhu College, Kalkaji
7. District and Sessions Court, Sector 12, Faridabad
8. Gd Goenka International School, Greater Noida
9. J C Bose University of Science and Technology, Sector 6 Faridabad
10. Jamia Milia College
11. Kailash Hospital and Neuro Institute, Sector 71 Noida
12. Kalkaji Mandir
13. Lajpat Nagar Central Market
14. Palika Kendra
15. Saket Court

16. Vidya Mandir Public School, Sector 15A, Faridabad

17. Windsor Place, Delhi

c) Walk Test

1. AIIMS Hospital
2. Nizamuddin Railway Station

d) Highway- Noida to Aligarh via NH-334C and NH-34 through Dadri, Bulandshahr, Khurja, Dashahara and Gabhana.

2.4 Telecom service providers detected frequency bands

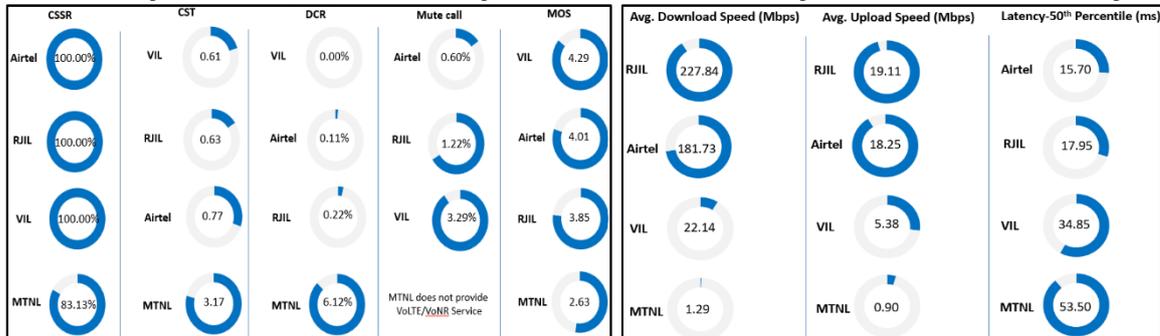
Technologies covered during the IDT and frequency bands in use are summarised in below table.

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

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 milli seconds), DCR: Drop Call Rate (in %) & MOS: Mean Opinion Score.



Summary-Voice Service

Call Setup Success Rate: Airtel, MTNL, RJIL and VIL have call setup success rate of 100.00%, 83.13%, 100.00% and 100.00% and respectively in Auto-selection mode (5G/4G/3G/2G).

Call Setup Time: Airtel, MTNL, RJIL and VIL have call setup time of 0.77, 3.17, 0.63 & 0.61 seconds respectively in Auto-selection mode (5G/4G/3G/2G).

Drop Call Rate: Airtel, MTNL, RJIL and VIL have drop call rate of 0.11%, 6.12%, 0.22% & 0.00% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Silence/Mute Rate: Airtel, RJIL and VIL have silence call rate of 0.60%, 1.22% and 3.29% respectively in packet switched network (5G/4G).

Mean Opinion Score (MOS): Airtel, MTNL, RJIL and VIL have average MOS Score of 4.01, 2.63, 3.85 & 4.29 respectively.

Summary-Data Service

Data Download performance (Overall): Average download speed of Airtel (5G/4G) is 181.73 Mbps, MTNL (3G/2G) is 1.29 Mbps, RJIL (5G/4G) is 227.84 Mbps and VIL (4G/2G) is 22.14 Mbps.

Data Upload performance (Overall): Average upload speed of Airtel (5G/4G) is 18.25 Mbps, MTNL (3G/2G) is 0.90 Mbps, RJIL (5G/4G) is 19.11 Mbps and VIL (4G/2G) is 5.38 Mbps.

Data performance - Hotspots (in Mbps):

Airtel- 4G D/L: 31.23	4G U/L: 9.63
5G D/L: 242.24	5G U/L: 30.90
RJIL- 4G D/L: 32.53	4G U/L: 8.81
5G D/L: 285.62	5G U/L: 23.89
VIL- 4G D/L: 24.90	4G U/L: 7.08

Note- "D/L" Download speed, "U/L" Upload speed
4G & 5G technology have not been observed in MTNL at hotspot locations

QoS Performance Analysis- Delhi 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 April-2025 covering city drive, hotspots, walk test and highway. (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	MTNL	VIL
Call Attempts	716	755	836
Call Setup Success Rate %	87.01	88.48	98.56
Drop Call Rate %	1.44	12.13	1.94
Call Setup Time-Average (Second)	3.48	3.07	4.63
Handover Success Rate %	97.01	99.97	95.04

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

Note- 68 & 165 calls in VIL were disconnected after “Alerting” and before “Connect” during the city & highway drive respectively.

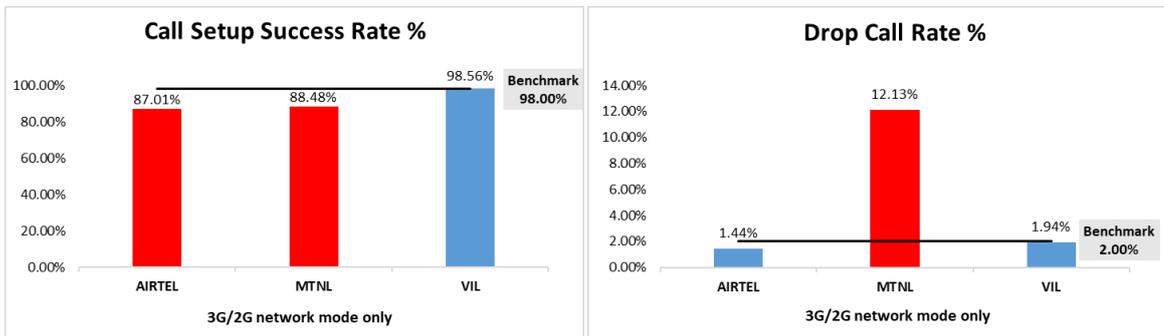


Figure-2: Call setup success rate and drop call rate performance.

Number of unique cell id’s covered in Voice test- Technology wise			
Technology	Service Provider		
	3G/2G network mode only		
	AIRTEL	MTNL	VIL
3G	NA	233	NA
2G	1296	77	1213

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	MTNL	RJIL	VIL
Call Attempts	901	1002	913	897
Call Setup Success Rate %	100.00	83.13	100.00	100.00
Drop Call Rate %	0.11	6.12	0.22	0.00
Call Setup Time-Average (Second)	0.77	3.17	0.63	0.61
Handover Success Rate %	99.88	99.73	99.78	99.94

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

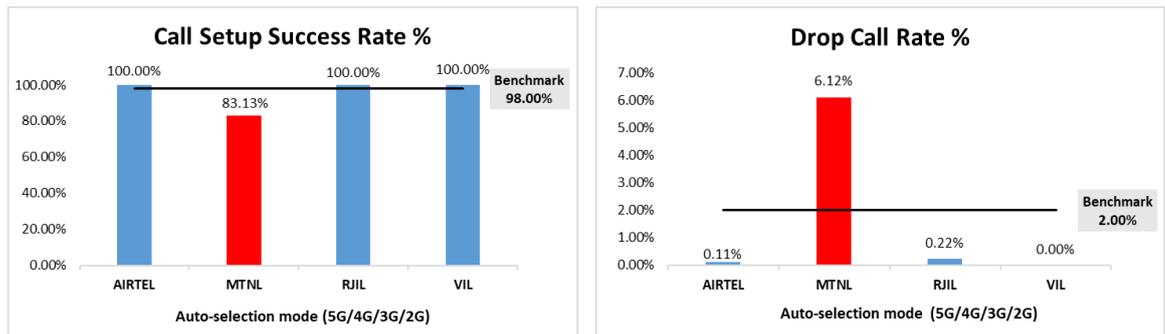


Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider Network)	667	629	658	669
Number of silence call for >4 Sec	4	NA	8	22
Silence Call Rate %	0.60	NA	1.22	3.29
Number of silence instances for >4 Sec	4	NA	9	22
Number of silence instances for >3 Sec	7	NA	16	44
Number of silence instances for >2 sec	20	NA	57	153
RTP Jitter (4G & 5G) in ms	4.17	NA	8.60	14.86
Packet loss Rate Downlink %	0.58	NA	0.45	1.82
Packet loss Rate Uplink %	0.30	NA	1.00	1.98

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

Note-

- NA- Due to unavailability of packet switched (VoLTE & VoNR) network in MTNL 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	MTNL	RJIL	VIL
5G	0	NA	837	NA
4G	2806	NA	2951	2407
3G	NA	277	NA	NA
2G	0	83	NA	6

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

Note-

- NA- Service provider doesn't provide services on 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 score values means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
Total Number of MOS Samples for calls in table-6	4320	3367	4173	4265
Speech Quality (Average MOS Score)	4.01	2.63	3.85	4.29
Number of samples with MOS >=4 to <5 (Excellent)	3581	0	2842	3320
Number of samples with MOS >=3 to <4 (Good)	630	1287	998	632
Number of samples with MOS >=2 to <3 (Fair)	68	1419	216	193
Number of samples with MOS >=1 to <2 (Poor)	41	661	117	120
%age of samples with MOS >=4 to <5 (Excellent)	82.89%	0.00%	68.10%	77.84%
%age of samples with MOS >=3 to <4 (Good)	14.58%	38.22%	23.92%	14.82%
%age of samples with MOS >=2 to <3 (Fair)	1.57%	42.14%	5.18%	4.53%
%age of samples with MOS >=1 to <2 (Poor)	0.95%	19.63%	2.80%	2.81%

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

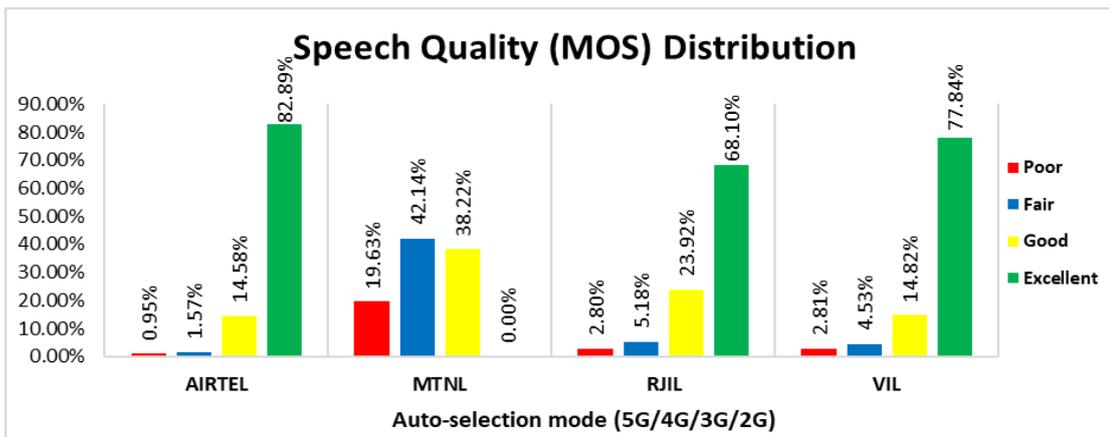


Figure- 4: Distribution of samples in MOS score range.

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	MTNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	181.73	1.29	227.84	22.14
	80th Percentile	300.61	1.75	376.65	33.45
	20th Percentile	35.96	0.61	36.51	7.37
Upload Throughput (Mbits/s)	Average	18.25	0.90	19.11	5.38
	80th Percentile	33.39	1.49	35.11	7.59
	20th Percentile	0.00	0.25	3.18	1.95
Latency (ms)	50th Percentile	15.70	53.50	17.95	34.85

Table-9: Summary of data performance in network auto-selection mode.

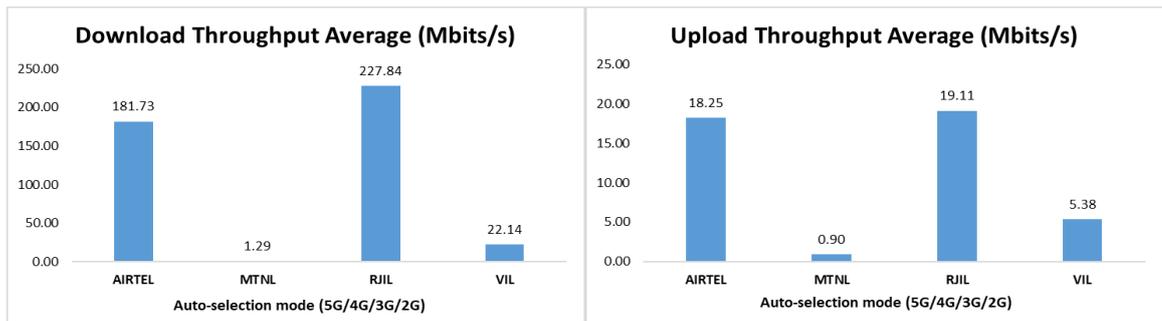


Figure- 5: Download and upload throughput.

Number of unique cell id's covered in Data test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
5G	0	NA	1386	NA
4G	2869	NA	399	2076
3G	NA	318	NA	NA
2G	0	68	NA	18

Table-10: Technology wise number of network cell id's latched during drive test.

Note-

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

Detailed QoS Performance Analysis

4. Detailed QoS performance analysis

4.1 Overview

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

4.2 City

Drive test has been conducted from 15th April 2025 to 25th April 2025 in Delhi. (refer table-1)

4.2.1 Drive test route

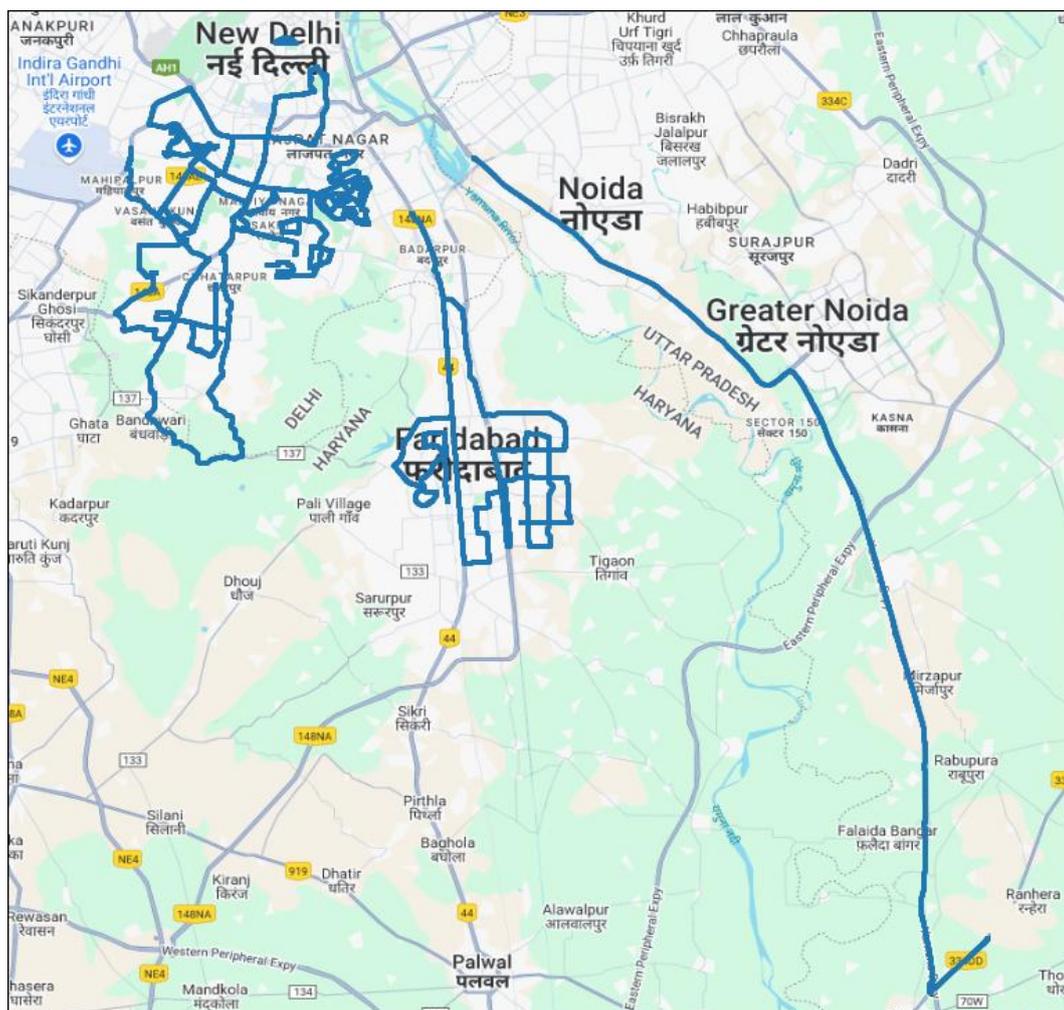


Figure- 6: Drive test routes.

4.2.2 Areas covered

Vasant Vihar, Lajapt Nagar, Hauz Khas, Chhatarpur, Okhla Phase-1, Old Fridabad, Noida Sec-126, Greater Noida Sec-151, Greater Noida Sec-149, Salarpur, Karoli and Noida international Airport 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	MTNL	VIL
Call Attempts	638	688	652
Call Setup Success Rate %	91.38	89.97	98.62
Drop Call Rate %	0.51	12.44	1.87
Call Setup Time-Average (Second)	3.40	3.05	4.49
Handover Success Rate %	97.13	100.00	95.69

Table-11: Summary of voice call performance in 3G/2G network mode only.

Note- 68 calls in VIL were disconnected after "Alerting" and before "Connect".

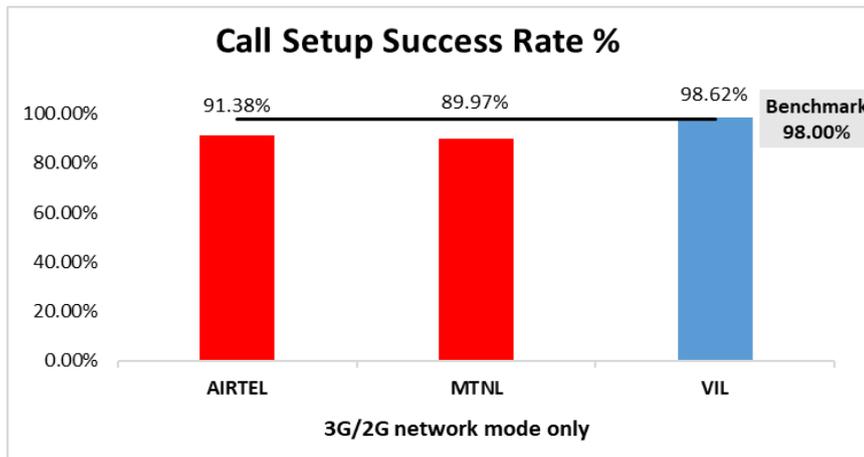


Figure-7: Performance for call setup success rate.

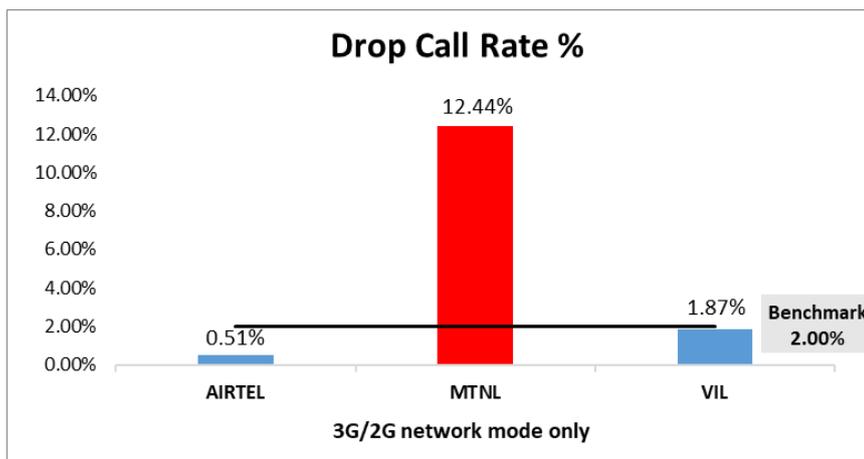


Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	MTNL	VIL
3G	NA	95.61%	NA
2G	99.95%	4.09%	99.95%
Limited Service	0.05%	0.31%	0.05%

Table-12: Time spent on technology during drive test 3G/2G network mode only.

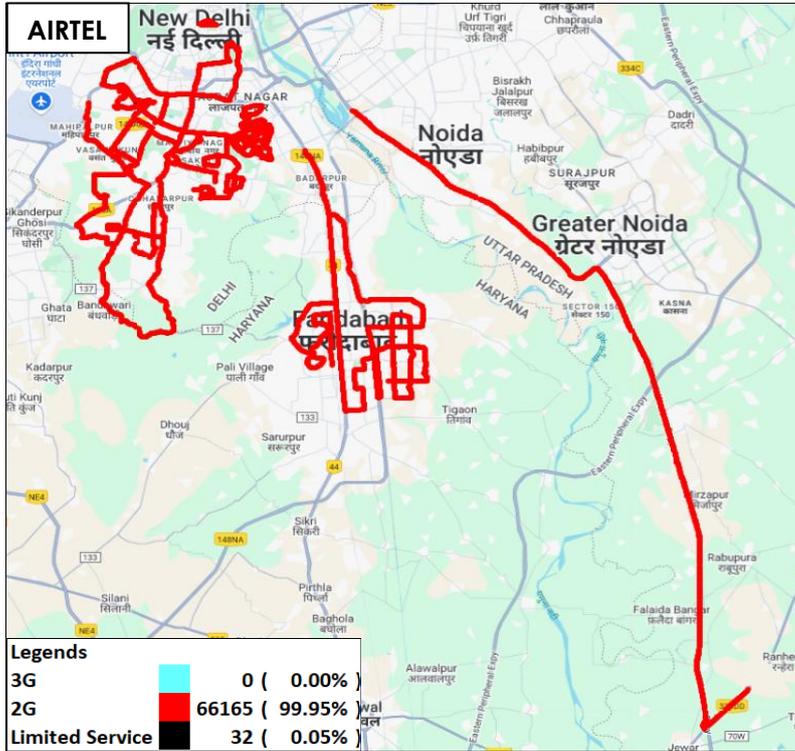


Figure-9: Serving technology plots 3G/2G network mode-AIRTEL

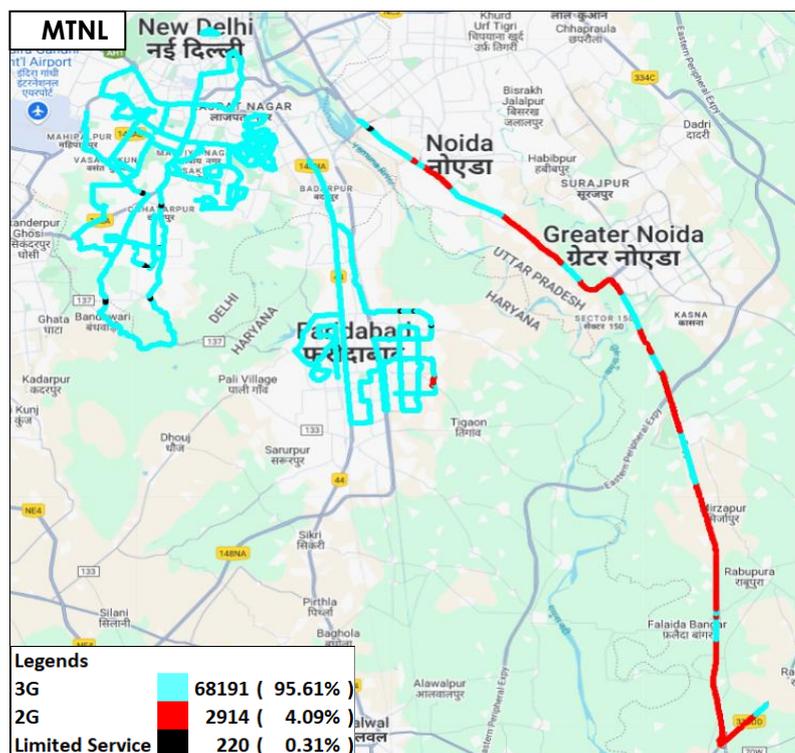


Figure-10: Serving technology plots 3G/2G network mode – MTNL.

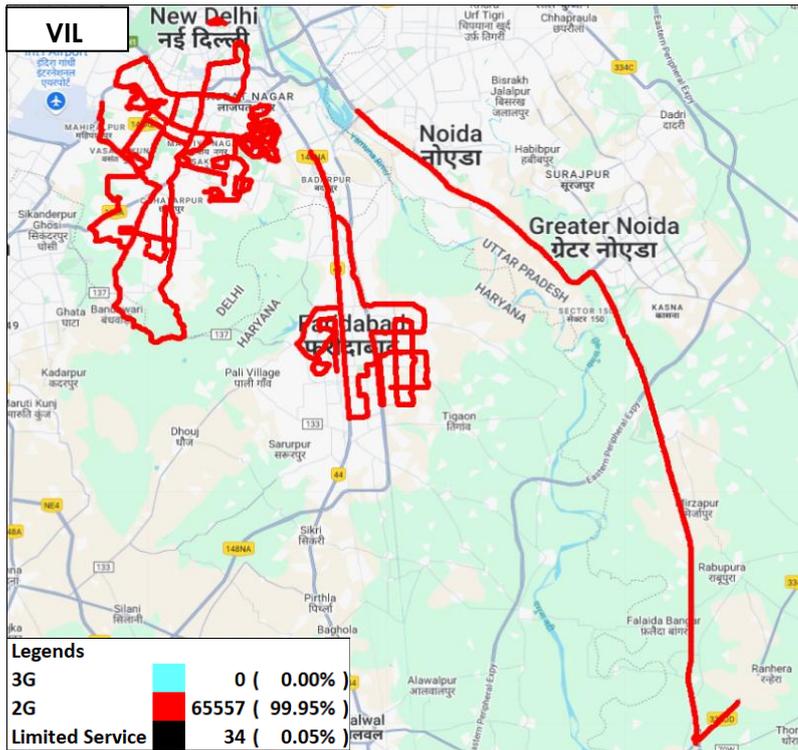


Figure-11: Serving technology plots 3G/2G network mode –VIL.

(c) Network Signal Strength distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (refer figure-42, 43 & 44 for map view)

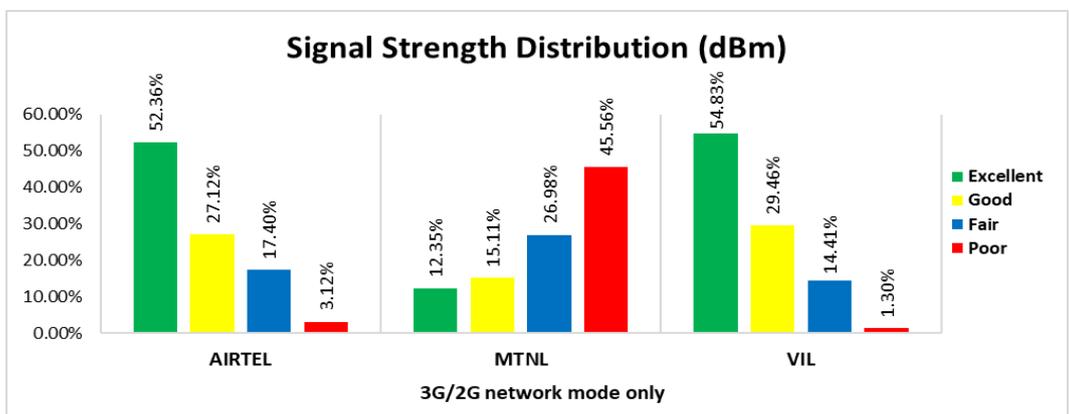


Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 52% of samples falling in the excellent signal strength category.
- MTNL has 12% of samples falling in the excellent signal strength category.
- VIL has 55% 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	MTNL	RJIL	VIL
Call Attempts	639	737	647	638
Call Setup Success Rate %	100.00	78.56	100.00	100.00
Drop Call Rate %	0.16	6.74	0.31	0.00
Call Setup Time Average (Second)	0.75	3.18	0.65	0.62
Handover Success Rate %	99.87	99.97	99.75	99.92

Table-13: Summary of voice call performance in network auto-selection mode.

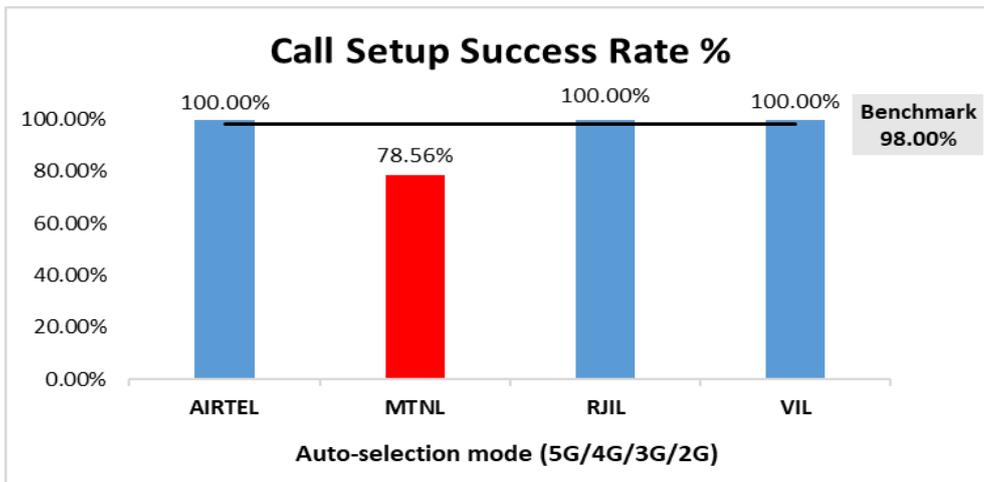


Figure-13: Performance for call setup success rate.

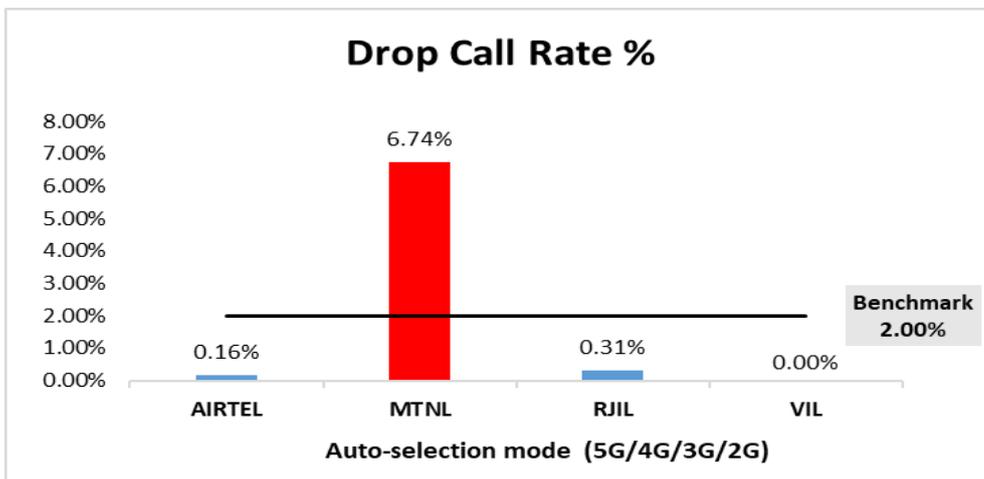


Figure-14: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider Network)	617	572	606	618
Number of silence call for >4 Sec	4	NA	8	16
Silence Call Rate %	0.65	NA	1.32	2.59
Number of silence instances for >4 Sec	4	NA	9	16
Number of silence instances for >3 Sec	6	NA	14	32
Number of silence instances for >2 sec	16	NA	43	126
RTP Jitter (4G & 5G) in ms	4.17	NA	8.66	15.08
Packet loss Rate Downlink %	0.58	NA	0.45	1.81
Packet loss Rate Uplink %	0.29	NA	1.00	1.93

Table-14: Summary of silence instances & packet loss rate for mobile-to-mobile call.

Note-

- NA- Due to unavailability of packet switched (VoLTE & 5G) network in MTNL silence instances are not captured.

(e) 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 score values means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
Total Number of MOS Samples for calls in table-14	3675	2806	3539	3647
Speech Quality (Average MOS Score)	4.02	2.68	3.85	4.30
Number of samples with MOS >=4 to <5 (Excellent)	3084	0	2393	2846
Number of samples with MOS >=3 to <4 (Good)	511	1206	857	543
Number of samples with MOS >=2 to <3 (Fair)	54	1091	191	175
Number of samples with MOS >=1 to <2 (Poor)	26	509	98	83
%age of samples with MOS >=4 to <5 (Excellent)	83.92%	0.00%	67.62%	78.04%
%age of samples with MOS >=3 to <4 (Good)	13.90%	42.98%	24.22%	14.89%
%age of samples with MOS >=2 to <3 (Fair)	1.47%	38.88%	5.40%	4.80%
%age of samples with MOS >=1 to <2 (Poor)	0.71%	18.14%	2.77%	2.28%

Table-15: Summary of speech quality (MOS) samples.

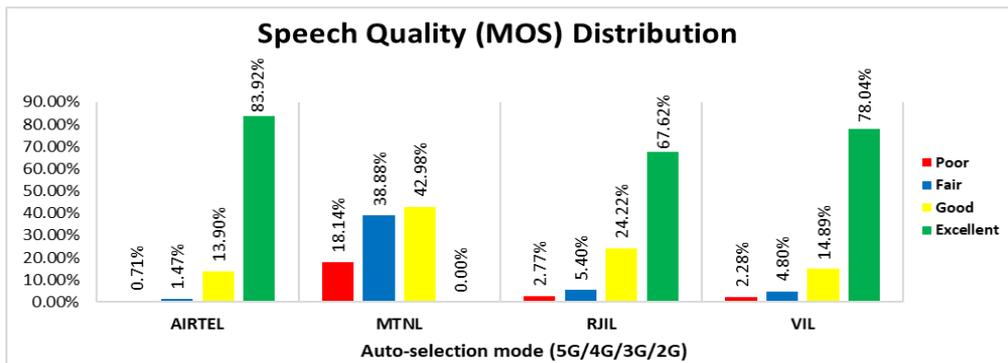


Figure-15: Distribution of samples in MOS score range.

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

Technology	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
5G	3.65%	NA	18.11%	NA
4G	96.35%	NA	81.88%	99.69%
3G	NA	94.17%	NA	NA
2G	0.00%	3.98%	NA	0.31%
Limited Service	0.00%	1.84%	0.01%	0.00%

Table-16: Time spent on technology during drive test.

Note-

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

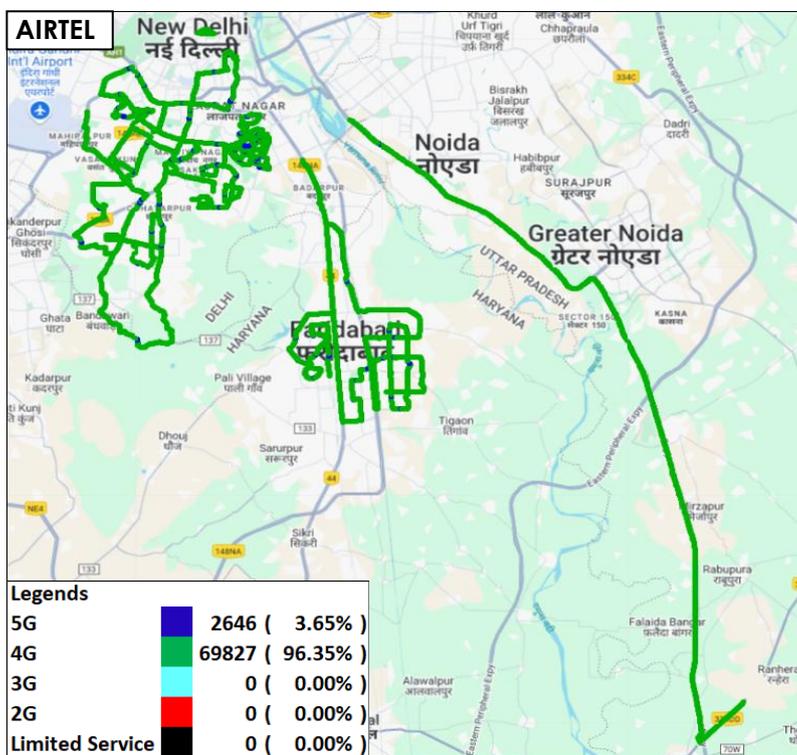


Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) -AIRTEL.

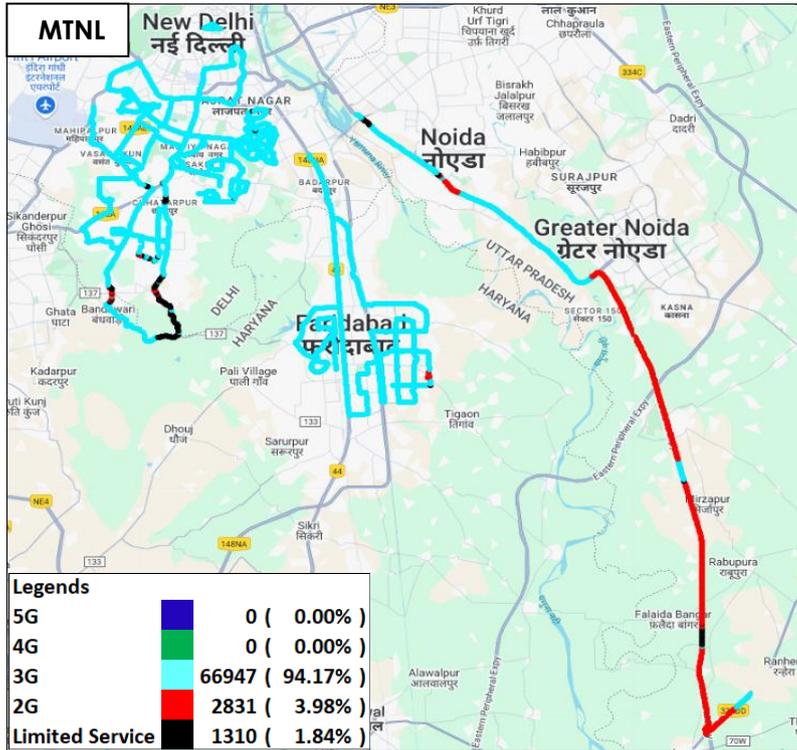


Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) –MTNL.

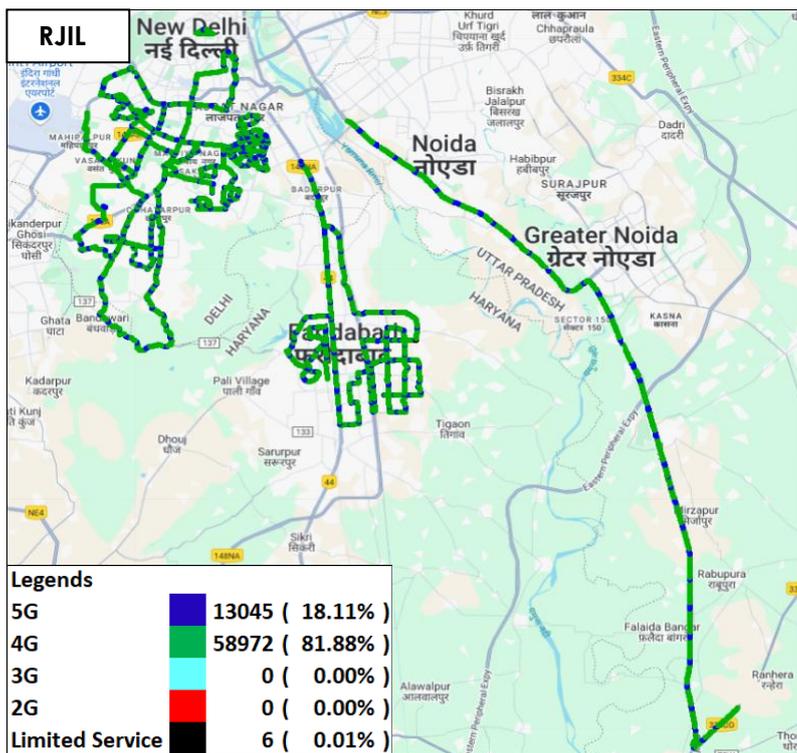


Figure-18: Serving technology plots in auto-selection (5G/4G/3G/2G)- RJIL.

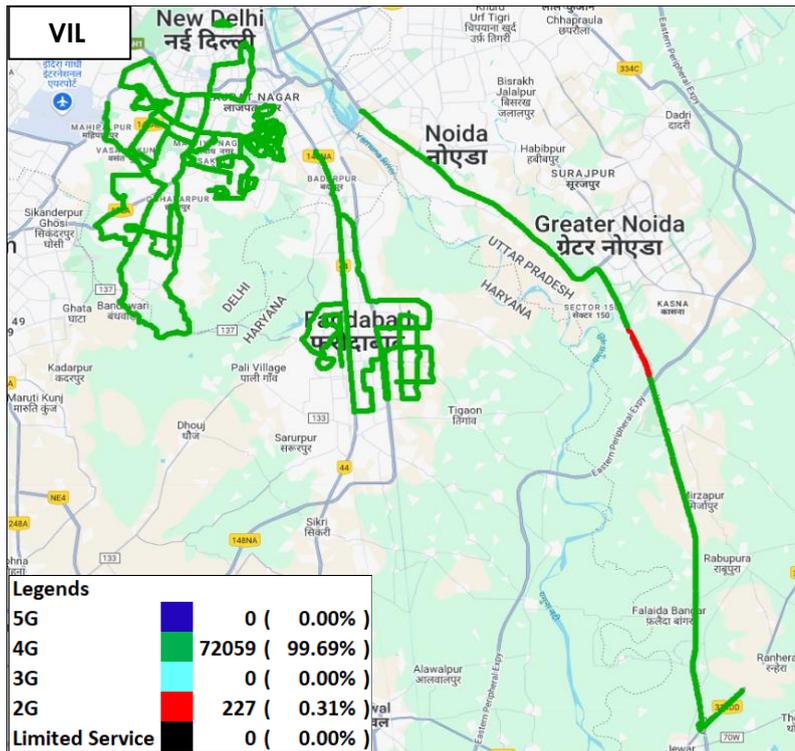


Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL.

(g) Network Signal Strength distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G). (refer figure-45, 46, 47 & 48 for map view)

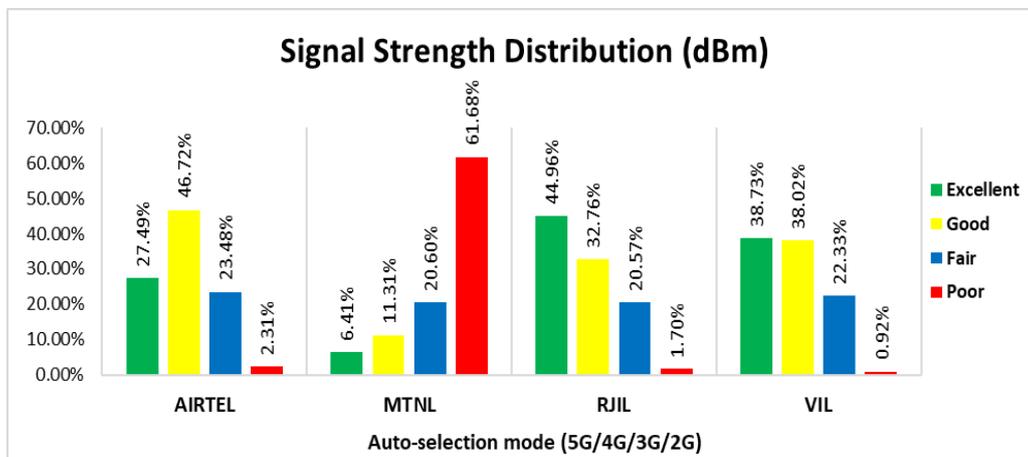


Figure-20: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

Observations:

- Airtel has 27% of samples falling in the excellent signal strength category.
- MTNL has 6% of samples falling in the excellent signal strength category.
- RJIL has 45% of samples falling in the excellent signal strength category.
- VIL has 39% 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	MTNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	193.59	1.26	245.79	21.53
	80th Percentile	316.34	1.73	406.67	33.05
	20th Percentile	46.45	0.61	66.53	8.14
Upload Throughput (Mbits/s)	Average	18.75	0.83	18.88	4.96
	80th Percentile	34.68	1.41	34.32	7.12
	20th Percentile	0.00	0.24	2.91	2.02
Latency (ms)	50th Percentile	15.25	64.00	17.80	36.18

Table-17: Summary of Data performance in network auto-selection mode.

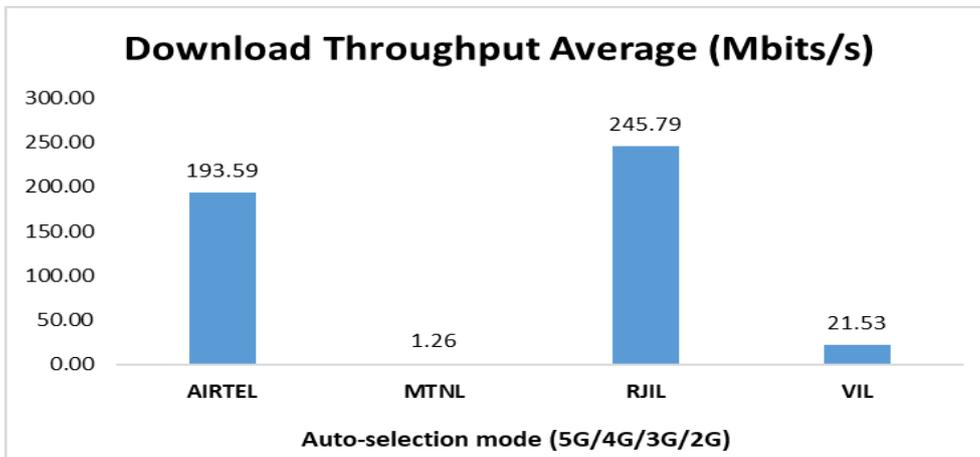


Figure- 21: Download throughput.

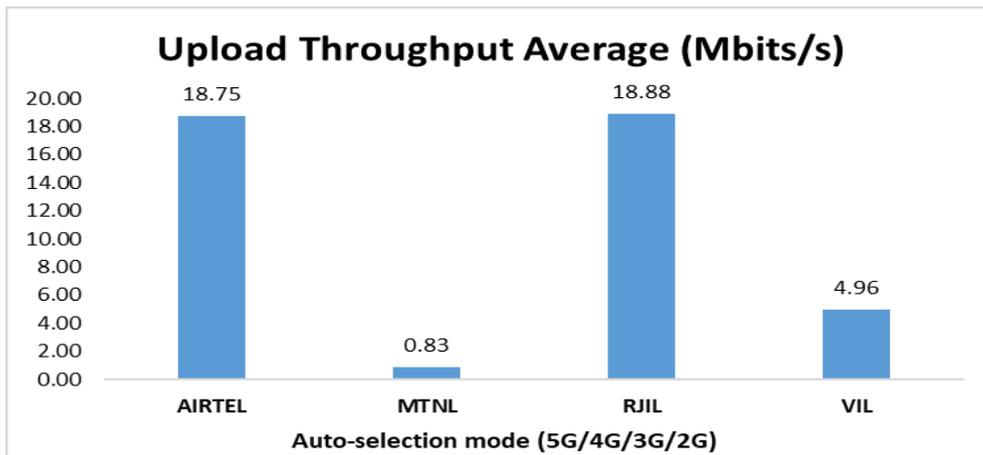


Figure- 22: Upload throughput.

4.3 Hotspots

Hotspot testing has been done from 17th April to 25th April 2025. Seventeen locations have been tested in the city.

4.3.1 Locations

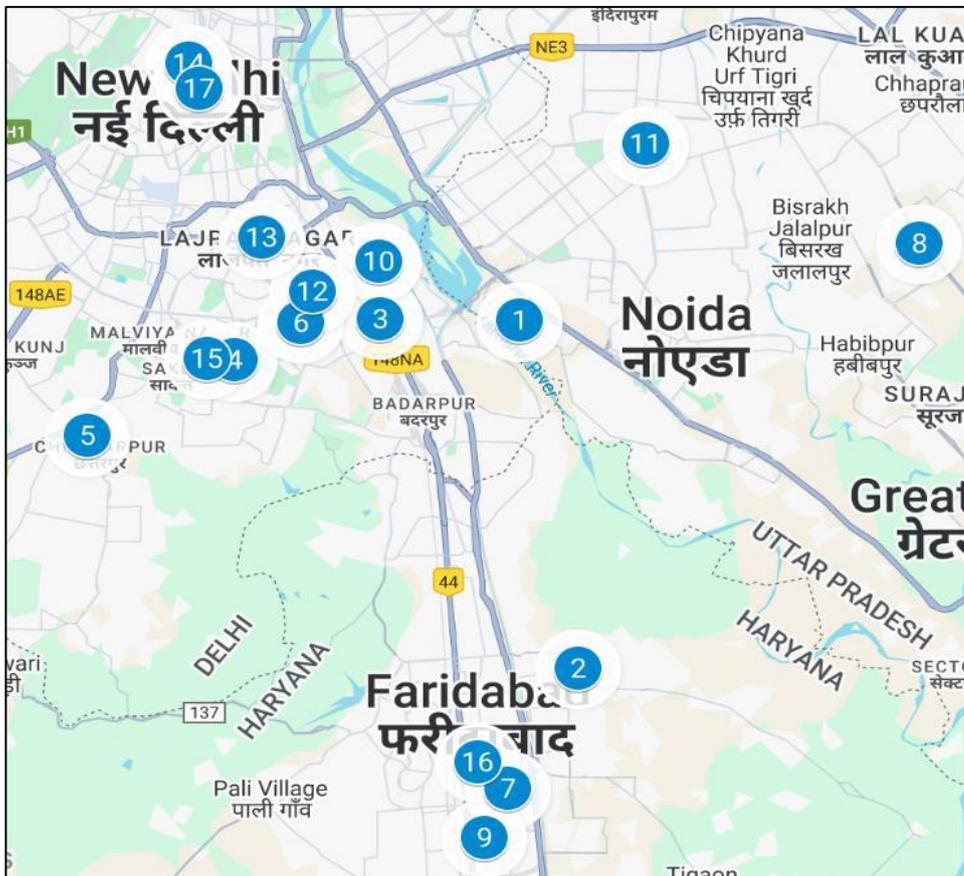


Figure- 23: Hotspot locations

4.3.2 Hotspot covered

1. Amity University, Sector 125, Noida
2. Amrita Hospital, Sector 88, Faridabad
3. Apollo Hospital, Sarita Vihar
4. Birla Vidya Niketan School, Pushp Vihar
5. Chhatarpur Mandir
6. Deshbandhu College, Kalkaji
7. District and Sessions Court, Sector 12, Faridabad
8. Gd Goenka International School, Greater Noida
9. J C Bose University of Science and Technology, Sector 6 Faridabad
10. Jamia Milia College
11. Kailash Hospital and Neuro Institute, Sector 71 Noida
12. Kalkaji Mandir
13. Lajpat Nagar Central Market
14. Palika Kendra
15. Saket Court
16. Vidya Mandir Public School, Sector 15A, Faridabad
17. Windsor Place, Delhi

4.3.3 Voice performance

Overall Voice Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	170	167	170	170
Call Setup Success Rate %	100.00	94.61	100.00	100.00
Drop Call Rate %	0.00	3.16	0.00	0.00
Call Setup Time-Average (Sec)	0.84	2.92	0.60	0.58

Table-18: Overall summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Amity University, Sector 125, Noida				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	20.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Sec)	0.67	2.86	0.78	0.47

Table-19: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Amrita Hospital, Sector 88, Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.76	2.83	0.55	0.55

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

Apollo Hospital, Sarita Vihar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	1.66	2.86	0.51	0.49

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

Birla Vidya Niketan School, Pushp Vihar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	10.00	0.00	0.00
Call Setup Time-Average (Sec)	0.64	3.41	0.56	0.49

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

Chhatarpur Mandir				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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	33.33	0.00	0.00
Call Setup Time-Average (Sec)	0.64	3.15	0.59	0.51

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

Deshbandhu College, Kalkaji				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.70	3.06	0.58	0.47

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

District and Sessions Court, Sector 12, Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.74	2.71	0.59	0.68

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

Gd Goenka International School, Greater Noida				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.93	2.83	0.64	1.00

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

J C Bose University of Science and Technology, Sector 6 Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.66	2.61	0.53	0.48

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

Jamia Milia College				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.89	2.76	0.55	0.57

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

Kailash Hospital and Neuro Institute, Sector 71 Noida				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.73	2.68	0.52	0.87

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

Kalkaji Mandir				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	1.42	2.78	0.59	0.60

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

Lajpat Nagar Central Market				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	10.00	0.00	0.00
Call Setup Time-Average (Sec)	0.67	3.72	0.61	0.46

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

Palika Kendra				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.71	2.80	0.60	0.53

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

Saket Court				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	10	7	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 (Sec)	0.69	2.67	0.70	0.54

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

Vidya Mandir Public School, Sector 15A, Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	0.79	2.71	0.63	0.62

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

Windsor Place, Delhi				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	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 (Sec)	1.01	3.05	0.60	0.57

Table-35: 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	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	114.08	1.76	255.92	20.50
Download Throughput 80th Percentile (Mbit/s)	209.75	2.09	388.86	32.24
Download Throughput 20th Percentile (Mbit/s)	16.90	0.95	113.78	7.11
Download Session Setup Success Rate %	100.00	61.18	100.00	97.59
Upload Throughput Average (Mbits/s)	15.89	1.15	21.87	4.81
Upload Throughput 80th Percentile (Mbit/s)	24.25	1.86	38.21	8.40
Upload Throughput 20th Percentile (Mbit/s)	2.23	0.31	2.98	1.81
Upload Session Setup Success Rate %	98.82	62.35	100.00	96.47
Web Browsing Delay (Second)	1.79	2.44	1.69	2.08
Youtube Initial Buffer Delay (Second)	1.20	1.76	0.94	1.23
Latency (ms)-50th Percentile	15.75	36.70	18.00	34.10
Jitter (ms)	12.56	196.21	25.65	224.79
Packet Loss Rate%	1.13	53.57	1.95	4.49
Packet Loss Rate- 90th percentile	4.02	100.00	6.40	8.82

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

Amity University, Sector 125, Noida				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	86.95	-	11.71	24.73
Download Session Setup Success Rate %	100.00	0.00	100.00	100.00
Upload Throughput Average (Mbits/s)	16.09	-	2.42	6.39
Upload Session Setup Success Rate %	100.00	0.00	100.00	100.00
Web Browsing Delay (Second)	1.67	3.21	2.07	1.71
Youtube Initial Buffer Delay (Second)	0.69	-	0.96	0.82
Latency (ms)-50th Percentile	12.55	-	16.10	41.98
Jitter (ms)	3.31	-	39.33	3.82
Packet Loss Rate%	0.30	100.00	0.60	0.10

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

Note- "-" Download, Upload and Youtube tests were failed.

Amrita Hospital, Sector 88, Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	81.74	1.90	219.62	65.84
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	14.56	1.11	10.45	13.86
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.88	2.59	1.50	1.70
Youtube Initial Buffer Delay (Second)	1.75	3.51	0.60	0.72
Latency (ms)-50th Percentile	14.40	1281.00	16.68	28.90
Jitter (ms)	7.72	146.38	13.28	4.48
Packet Loss Rate%	0.20	99.90	0.20	0.60

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

Apollo Hospital, Sarita Vihar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	122.49	-	4.35	20.54
Download Session Setup Success Rate %	100.00	0.00	100.00	100.00
Upload Throughput Average (Mbits/s)	20.84	-	1.20	2.97
Upload Session Setup Success Rate %	100.00	0.00	100.00	100.00
Web Browsing Delay (Second)	1.44	-	2.87	1.87
Youtube Initial Buffer Delay (Second)	0.61	-	5.50	1.17
Latency (ms)-50th Percentile	15.73	4321.50	24.15	34.60
Jitter (ms)	48.18	1444.72	190.70	4.67
Packet Loss Rate%	7.60	98.90	15.10	0.40

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

Note- "-" Download, Upload Web browsing and Youtube tests were failed.

Birla Vidya Niketan School, Pushp Vihar				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	23.28	-	584.24	35.61
Download Session Setup Success Rate %	100.00	0.00	100.00	100.00
Upload Throughput Average (Mbits/s)	4.45	-	57.22	9.12
Upload Session Setup Success Rate %	100.00	0.00	100.00	100.00
Web Browsing Delay (Second)	1.40	-	2.00	1.73
Youtube Initial Buffer Delay (Second)	0.83	-	0.63	0.83
Latency (ms)-50th Percentile	14.95	-	15.40	23.50
Jitter (ms)	6.60	-	6.93	3.09
Packet Loss Rate%	0.40	100.00	0.00	0.10

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

Chhatarpur Mandir				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	65.07	-	188.59	9.73
Download Session Setup Success Rate %	100.00	0.00	100.00	100.00
Upload Throughput Average (Mbits/s)	10.11	-	4.68	1.89
Upload Session Setup Success Rate %	100.00	0.00	100.00	100.00
Web Browsing Delay (Second)	2.60	-	1.34	1.73
Youtube Initial Buffer Delay (Second)	0.94	-	0.77	1.45
Latency (ms)-50th Percentile	15.85	-	22.83	31.95
Jitter (ms)	4.61	-	9.77	7.71
Packet Loss Rate%	0.10	100.00	1.30	0.80

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

Deshbandhu College, Kalkaji				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	87.96	1.41	151.87	3.83
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	13.90	1.94	2.69	1.54
Upload Session Setup Success Rate %	100.00	80.00	100.00	33.33
Web Browsing Delay (Second)	1.52	1.87	1.60	4.33
Youtube Initial Buffer Delay (Second)	0.83	1.05	0.82	4.72
Latency (ms)-50th Percentile	15.25	26.30	24.90	75.25
Jitter (ms)	10.53	8.82	14.37	3563.03
Packet Loss Rate%	0.20	0.60	0.50	49.40

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

District and Sessions Court, Sector 12, Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	104.98	1.56	450.99	12.55
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	22.91	0.79	31.46	3.27
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	1.41	2.17	1.39	2.35
Youtube Initial Buffer Delay (Second)	0.95	1.36	0.73	0.88
Latency (ms)-50th Percentile	14.65	2251.50	19.33	28.60
Jitter (ms)	4.61	46.14	31.58	5.44
Packet Loss Rate%	0.00	100.00	1.10	0.30

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

Gd Goenka International School, Greater Noida				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	1.79	0.87	10.53	0.55
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.65	0.16	1.33	0.81
Upload Session Setup Success Rate %	80.00	80.00	100.00	100.00
Web Browsing Delay (Second)	5.49	3.12	2.34	5.98
Youtube Initial Buffer Delay (Second)	-	2.31	3.68	3.30
Latency (ms)-50th Percentile	26.15	63.00	32.35	37.20
Jitter (ms)	59.40	8.47	38.39	86.70
Packet Loss Rate%	3.90	9.10	5.40	4.10

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

Note- "-" Youtube tests was failed.

J C Bose University of Science and Technology, Sector 6 Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	34.21	1.42	399.36	5.41
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	3.42	1.81	54.18	3.62
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	1.44	2.04	1.33	1.79
Youtube Initial Buffer Delay (Second)	0.96	0.88	0.58	1.56
Latency (ms)-50th Percentile	18.15	32.95	12.98	26.35
Jitter (ms)	6.89	35.20	4.12	21.26
Packet Loss Rate%	0.00	63.40	0.00	1.00

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

Jamia Milia College				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	202.72	1.68	128.76	23.62
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	50.41	2.30	34.30	6.32
Upload Session Setup Success Rate %	100.00	60.00	100.00	100.00
Web Browsing Delay (Second)	1.35	1.74	1.39	1.61
Youtube Initial Buffer Delay (Second)	0.56	0.83	0.64	0.73
Latency (ms)-50th Percentile	14.65	25.15	21.88	24.00
Jitter (ms)	4.94	8.89	11.82	2.07
Packet Loss Rate%	0.00	0.90	0.50	0.20

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

Kailash Hospital and Neuro Institute, Sector 71 Noida				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	218.52	1.66	362.35	12.59
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	11.35	1.46	19.12	1.77
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.37	2.21	1.31	1.77
Youtube Initial Buffer Delay (Second)	0.67	1.47	0.65	1.86
Latency (ms)-50th Percentile	17.20	26.55	15.50	34.95
Jitter (ms)	5.96	11.32	4.35	4.63
Packet Loss Rate%	0.20	0.40	0.10	0.30

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

Kalkaji Mandir				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	23.15	0.38	292.82	14.52
Download Session Setup Success Rate %	100.00	40.00	100.00	100.00
Upload Throughput Average (Mbits/s)	2.27	0.24	11.69	2.11
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	2.14	2.85	1.80	1.85
Youtube Initial Buffer Delay (Second)	3.64	4.83	0.65	0.92
Latency (ms)-50th Percentile	16.53	36.65	22.25	39.95
Jitter (ms)	8.67	114.06	14.72	14.73
Packet Loss Rate%	0.10	13.70	0.30	0.60

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

Lajpat Nagar Central Market				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	72.17	1.05	227.11	27.47
Download Session Setup Success Rate %	100.00	80.00	100.00	100.00
Upload Throughput Average (Mbits/s)	18.14	0.24	37.09	11.29
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.99	5.71	1.50	1.58
Youtube Initial Buffer Delay (Second)	2.89	3.51	0.63	0.66
Latency (ms)-50th Percentile	17.05	33.15	21.93	44.08
Jitter (ms)	9.07	673.07	8.41	5.14
Packet Loss Rate%	4.20	15.30	0.00	0.60

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

Palika Kendra				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	3.17	4.78	306.23	37.47
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	3.14	1.22	16.64	2.81
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.91	2.65	1.41	1.56
Youtube Initial Buffer Delay (Second)	3.87	1.88	0.59	0.76
Latency (ms)-50th Percentile	15.30	25.20	14.25	33.65
Jitter (ms)	10.91	40.70	5.43	3.33
Packet Loss Rate%	0.70	5.20	0.00	0.40

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

Saket Court				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	68.12	0.00	182.94	12.65
Download Session Setup Success Rate %	100.00	20.00	100.00	60.00
Upload Throughput Average (Mbits/s)	23.27	0.32	6.53	1.15
Upload Session Setup Success Rate %	100.00	20.00	100.00	80.00
Web Browsing Delay (Second)	1.45	-	1.93	2.25
Youtube Initial Buffer Delay (Second)	0.77	-	0.73	5.68
Latency (ms)-50th Percentile	13.80	952.00	26.65	53.50
Jitter (ms)	4.95	549.60	32.04	77.08
Packet Loss Rate%	0.10	93.50	7.90	15.90

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

Note- "--Web browsing and Youtube tests were failed.

Vidya Mandir Public School, Sector 15A, Faridabad				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	449.89	1.81	580.80	20.22
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	9.79	1.78	65.01	5.05
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.40	1.89	1.40	1.73
Youtube Initial Buffer Delay (Second)	0.67	1.26	0.52	0.78
Latency (ms)-50th Percentile	13.75	2228.50	11.65	33.95
Jitter (ms)	4.90	3.42	5.59	6.80
Packet Loss Rate%	0.10	100.00	0.00	0.60

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

Windsor Place, Delhi				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	293.10	2.19	248.32	11.47
Download Session Setup Success Rate %	100.00	40.00	100.00	100.00
Upload Throughput Average (Mbits/s)	41.01	1.22	15.76	5.75
Upload Session Setup Success Rate %	100.00	80.00	100.00	100.00
Web Browsing Delay (Second)	1.36	2.54	1.56	2.01
Youtube Initial Buffer Delay (Second)	0.59	1.14	0.67	1.02
Latency (ms)-50th Percentile	16.05	27.98	14.80	32.45
Jitter (ms)	13.11	78.36	9.22	11.51
Packet Loss Rate%	1.10	9.80	0.10	0.90

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

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

Overall Data Performance					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	242.24	-	285.62	-
	Upload Throughput Average (Mbits/s)	30.90	-	23.89	-
4G	Download Throughput Average (Mbits/s)	31.23	-	32.53	24.90
	Upload Throughput Average (Mbits/s)	9.63	-	8.81	7.08

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

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

Amity University, Sector 125, Noida					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	3.26	-
	Upload Throughput Average (Mbits/s)	-	-	2.87	-
4G	Download Throughput Average (Mbits/s)	63.11	-	7.00	15.02
	Upload Throughput Average (Mbits/s)	4.14	-	1.31	8.69

Table-55: Summary of data download & upload speed 5G only & 4G only.

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

Amrita Hospital, Sector 88, Faridabad					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	182.83	-	263.73	-
	Upload Throughput Average (Mbits/s)	27.84	-	11.71	-
4G	Download Throughput Average (Mbits/s)	14.38	-	42.56	80.29
	Upload Throughput Average (Mbits/s)	11.35	-	9.12	17.16

Table-56: Summary of 5G only & 4G only data download & upload speed.

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

Apollo Hospital, Sarita Vihar					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	122.49	-	1.20	-
	Upload Throughput Average (Mbits/s)	20.84	-	2.83	-
4G	Download Throughput Average (Mbits/s)	0.28	-	14.41	27.72
	Upload Throughput Average (Mbits/s)	1.08	-	3.42	4.57

Table-57: Summary of 5G only & 4G only data download & upload speed.

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

Birla Vidya Niketan School, Pushp Vihar					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	698.86	-
	Upload Throughput Average (Mbits/s)	-	-	61.32	-
4G	Download Throughput Average (Mbits/s)	55.91	-	57.65	45.28
	Upload Throughput Average (Mbits/s)	11.95	-	7.93	9.63

Table-58: Summary of 5G only & 4G only data download & upload speed.

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

Chhatarpur Mandir					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	249.26	-	31.32	-
	Upload Throughput Average (Mbits/s)	-	-	5.73	-
4G	Download Throughput Average (Mbits/s)	12.63	-	8.91	7.11
	Upload Throughput Average (Mbits/s)	8.61	-	4.62	1.75

Table-59: Summary of 5G only & 4G only data download & upload speed.

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

Deshbandhu College, Kalkaji					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	326.64	-	58.90	-
	Upload Throughput Average (Mbits/s)	-	-	2.97	-
4G	Download Throughput Average (Mbits/s)	20.33	-	2.76	10.53
	Upload Throughput Average (Mbits/s)	13.37	-	0.83	2.55

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

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

District and Sessions Court, Sector 12, Faridabad					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	348.41	-	403.28	-
	Upload Throughput Average (Mbits/s)	-	-	21.46	-
4G	Download Throughput Average (Mbits/s)	40.86	-	21.60	34.36
	Upload Throughput Average (Mbits/s)	21.21	-	15.55	3.43

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

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

GD Goenka International School, Greater Noida					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	0.56	-	1.91	-
	Upload Throughput Average (Mbits/s)	-	-	2.59	-
4G	Download Throughput Average (Mbits/s)	5.33	-	20.34	1.33
	Upload Throughput Average (Mbits/s)	2.63	-	4.60	1.16

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

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

J C Bose University of Science and Technology, Sector 6 Faridabad					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	393.70	-
	Upload Throughput Average (Mbits/s)	-	-	51.50	-
4G	Download Throughput Average (Mbits/s)	22.27	-	98.14	5.29
	Upload Throughput Average (Mbits/s)	9.65	-	22.87	3.19

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

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

Jamia Milia College					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	202.72	-	226.22	-
	Upload Throughput Average (Mbits/s)	50.41	-	39.36	-
4G	Download Throughput Average (Mbits/s)	32.98	-	17.08	38.82
	Upload Throughput Average (Mbits/s)	12.79	-	6.12	12.80

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

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

Kailash Hospital and Neuro Institute, Sector 71 Noida					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	218.52	-	430.90	-
	Upload Throughput Average (Mbits/s)	11.35	-	22.79	-
4G	Download Throughput Average (Mbits/s)	54.45	-	18.82	12.25
	Upload Throughput Average (Mbits/s)	9.09	-	10.41	14.09

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

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

Kalkaji Mandir					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	255.16	-
	Upload Throughput Average (Mbits/s)	-	-	13.08	-
4G	Download Throughput Average (Mbits/s)	17.61	-	15.81	15.91
	Upload Throughput Average (Mbits/s)	3.79	-	5.85	3.11

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

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

Lajpat Nagar Central Market					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	130.12	-	215.05	-
	Upload Throughput Average (Mbits/s)	31.23	-	34.09	-
4G	Download Throughput Average (Mbits/s)	16.63	-	29.32	20.30
	Upload Throughput Average (Mbits/s)	13.62	-	6.28	16.17

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

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

Palika Kendra					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	498.79	-
	Upload Throughput Average (Mbits/s)	-	-	24.11	-
4G	Download Throughput Average (Mbits/s)	8.77	-	22.93	38.72
	Upload Throughput Average (Mbits/s)	2.19	-	12.04	5.29

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

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

Saket Court					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	128.73	-	104.91	-
	Upload Throughput Average (Mbits/s)	76.88	-	5.13	-
4G	Download Throughput Average (Mbits/s)	87.74	-	19.11	10.43
	Upload Throughput Average (Mbits/s)	14.79	-	13.08	1.54

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

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

Vidya Mandir Public School, Sector 15A, Faridabad					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	709.91	-	643.16	-
	Upload Throughput Average (Mbits/s)	16.31	-	58.86	-
4G	Download Throughput Average (Mbits/s)	55.81	-	88.97	30.88
	Upload Throughput Average (Mbits/s)	14.31	-	14.08	5.99

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

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

Windsor Place, Delhi					
Parameters		Service Provider			
		AIRTEL	MTNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	293.10	-	391.97	-
	Upload Throughput Average (Mbits/s)	41.01	-	24.60	-
4G	Download Throughput Average (Mbits/s)	21.79	-	67.66	23.22
	Upload Throughput Average (Mbits/s)	9.05	-	11.64	8.08

Table-71: 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 25th April. Two locations have been tested in the city.

4.4.1 Locations

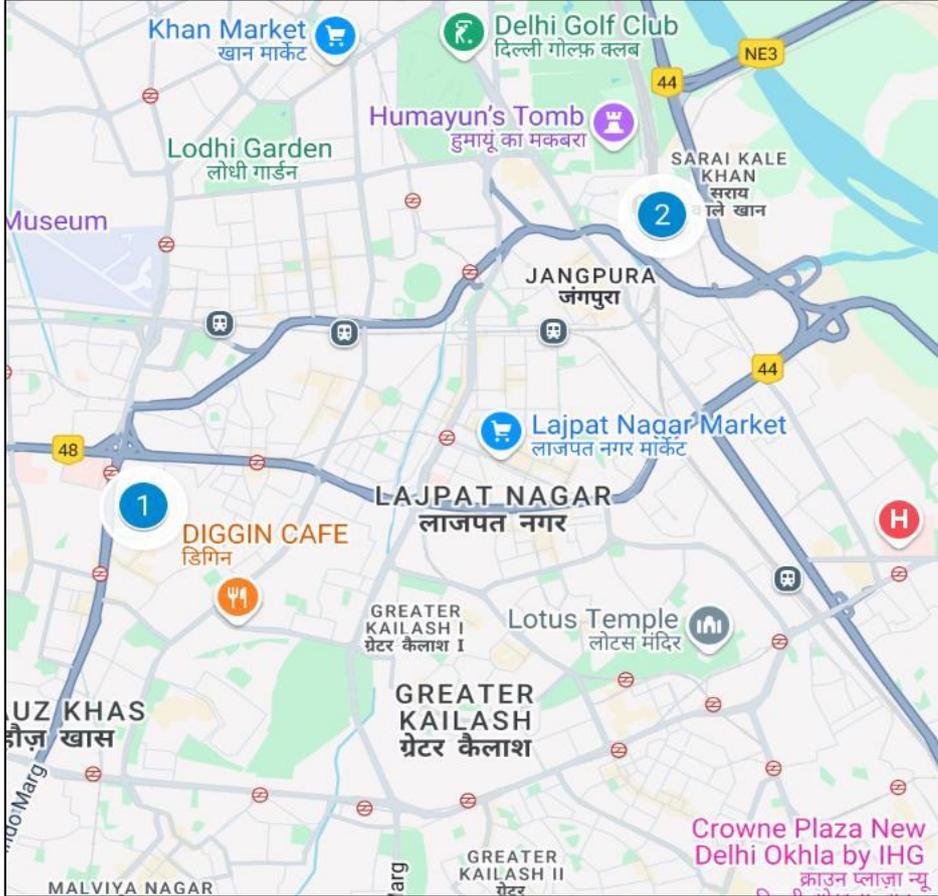


Figure-24: Walk Test location.

4.4.2 Walk Test Covered

1. AIIMS Hospital
2. Nizamuddin Railway Station

4.4.3 Voice Performance

AIIMS Hospital				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	22	22	23	20
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)	0.89	3.26	0.59	0.66

Table-72: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

Nizamuddin Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Call Attempt	20	19	21	19
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)	0.73	2.87	0.55	0.49

Table-73: Summary of voice call performance in network auto-selection mode (5G/4G/3G/2G).

4.4.4 Data Performance

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

AIIMS Hospital				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	-	1.41	11.89	6.17
Download Session Setup Success Rate %	0.00	81.82	100.00	90.91
Upload Throughput Average (Mbits/s)	-	1.40	7.05	5.94
Upload Session Setup Success Rate %	0.00	85.71	100.00	100.00
Latency (ms) - 50th Percentile	-	70.50	17.60	45.10

Table-74: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

Note- "-" Download, Upload and Latency tests were failed.

Nizamuddin Railway Station				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	MTNL	RJIL	VIL
Download Throughput Average (Mbits/s)	87.39	1.05	53.97	13.80
Download Session Setup Success Rate %	100.00	95.83	100.00	100.00
Upload Throughput Average (Mbits/s)	9.94	0.41	15.07	1.71
Upload Session Setup Success Rate %	100.00	87.50	100.00	100.00
Latency (ms) - 50th Percentile	17.30	83.50	20.25	226.00

Table-75: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).

4.5 Highway

Drive test has been conducted on 25th April 2025 covering one highway route. (Refer Table-1)

4.5.1 Drive test route



Figure-25: Drive test route highway

4.5.2 Routes Covered

Noida to Aligarh via NH-334C and NH-34 through Dadri, Sikandrabad, Bulandshahr, Khurja, Dashahara and Gabhana.

4.5.3 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	MTNL	VIL
Call Attempts	78	67	184
Call Setup Success Rate %	51.28	73.13	98.37
Drop Call Rate %	15.00	8.16	2.21
Call Setup Time-Average (Second)	4.78	3.27	5.12
Handover Success Rate %	96.21	99.69	89.24

Table-76: Summary of voice call performance in 3G/2G network mode only.

Note- 165 calls in VIL were disconnected after "Alerting" and before "Connect".

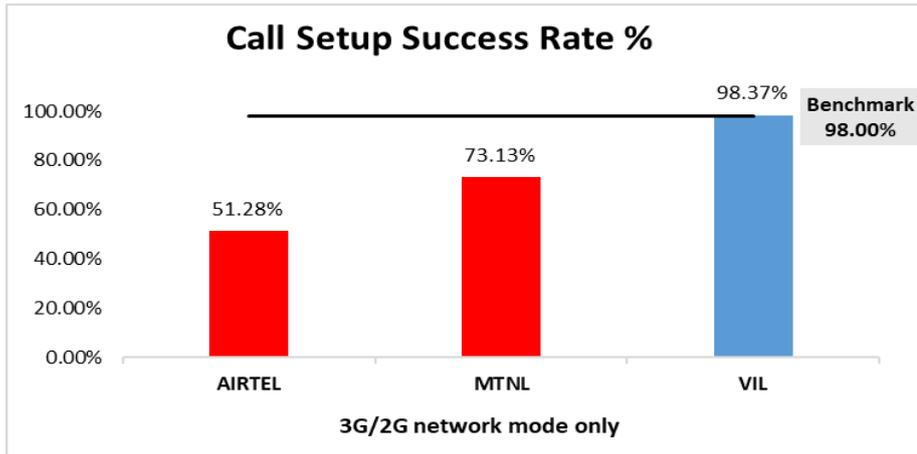


Figure-26: Performance for call setup success rate.

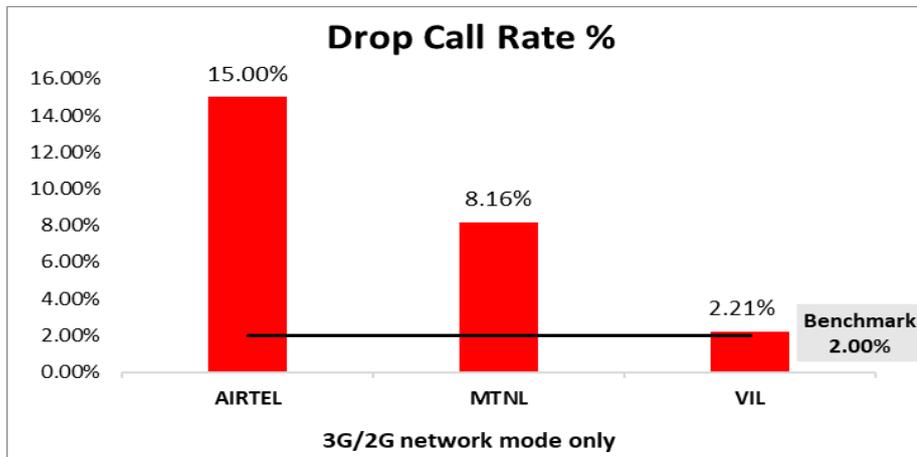


Figure-27: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	MTNL	VIL
3G	NA	51.32%	NA
2G	99.79%	48.43%	99.54%
Limited Service	0.21%	0.25%	0.46%

Table-77: Time spent on technology during drive test 3G/2G network mode only.

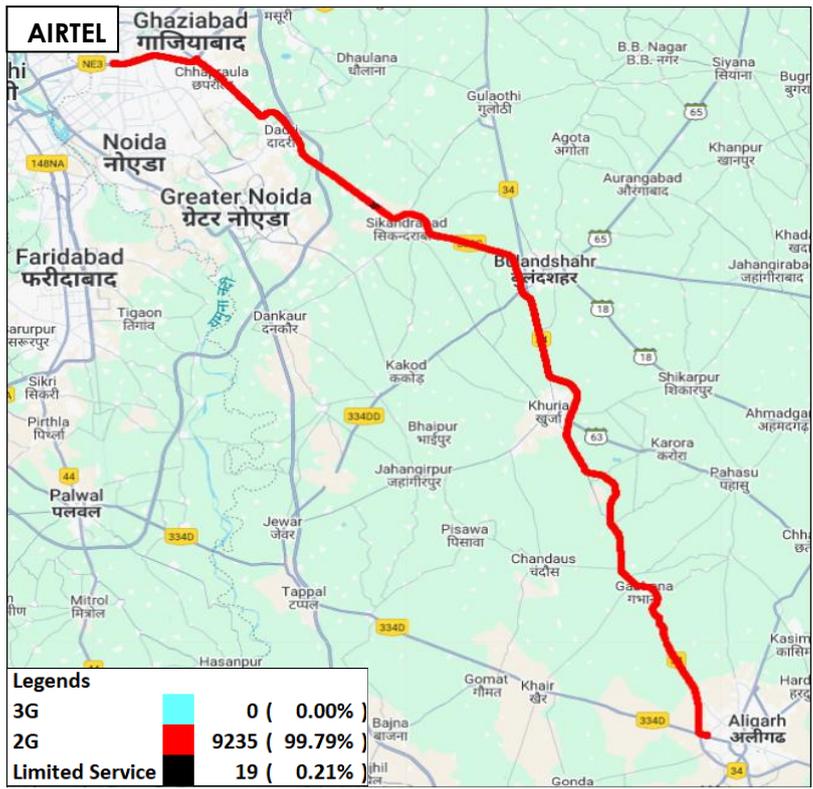


Figure-28: Serving technology plots 3G/2G network mode-AIRTEL

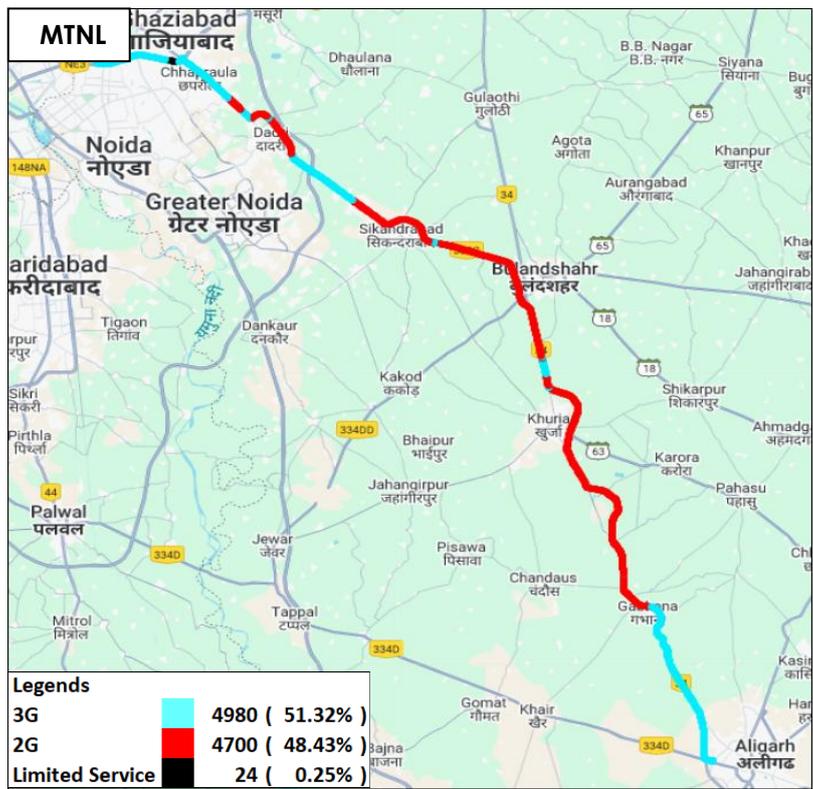


Figure-29: Serving technology plots 3G/2G network mode – MTNL

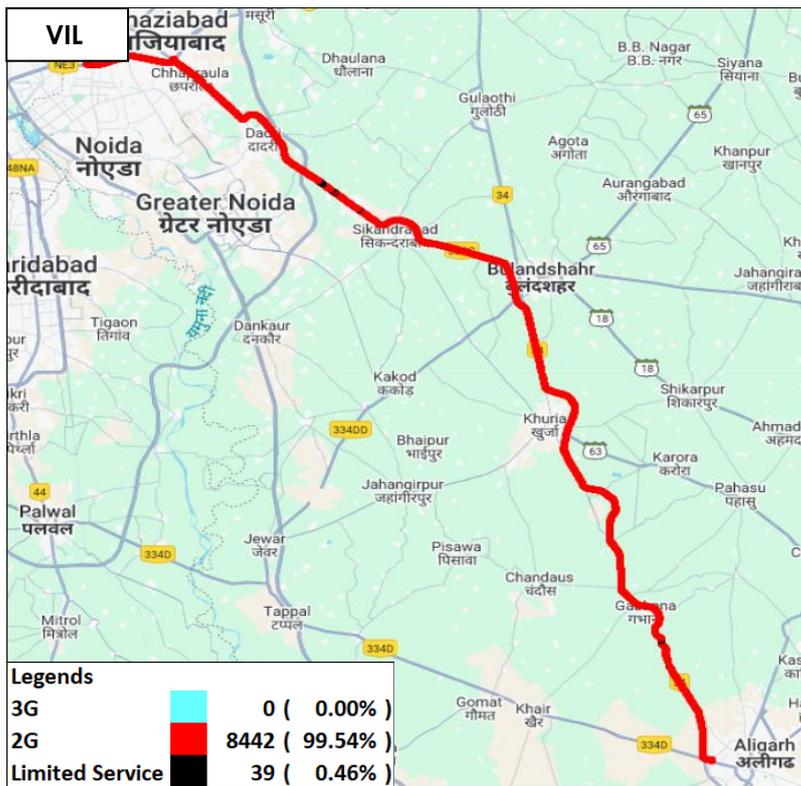


Figure-30: Serving technology plots 3G/2G network mode –VIL.

(c) Network Signal Strength distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (refer figure-49, 50 & 51 for map view)

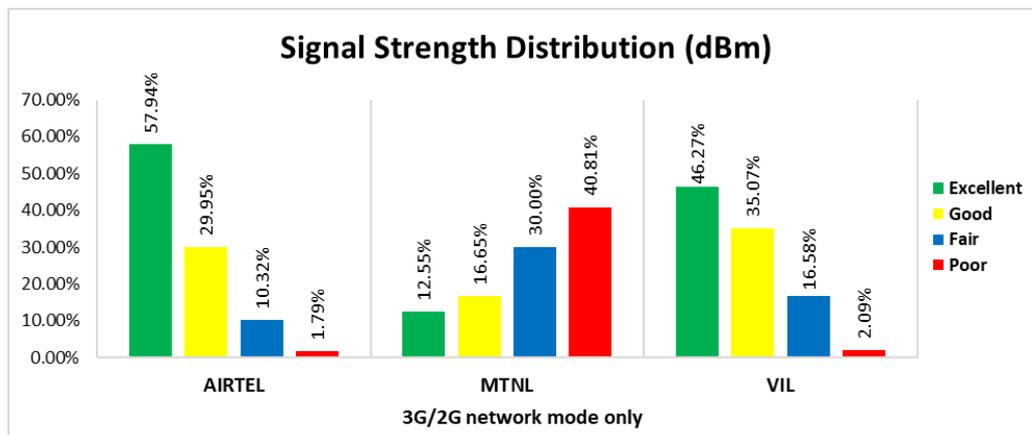


Figure-31: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 58% of samples falling in the excellent signal strength category.
- MTNL has 13% of samples falling in the excellent signal strength category.
- VIL has 46% 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	MTNL	RJIL	VIL
Call Attempts	50	57	52	50
Call Setup Success Rate %	100.00	96.49	100.00	100.00
Drop Call Rate %	0.00	12.73	0.00	0.00
Call Setup Time Average (Second)	0.77	3.79	0.62	0.55
Handover Success Rate %	99.83	96.78	99.84	100.00

Table-78: Summary of voice call performance in network auto-selection mode.

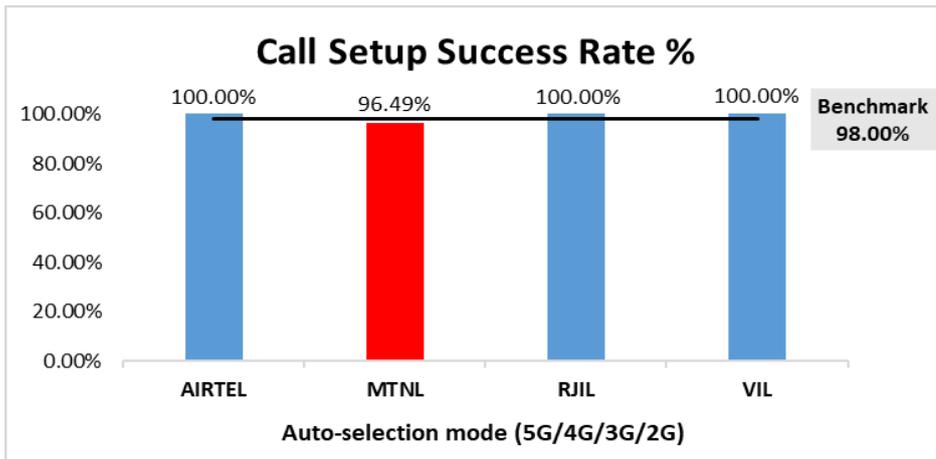


Figure-32: Performance for call setup success rate.

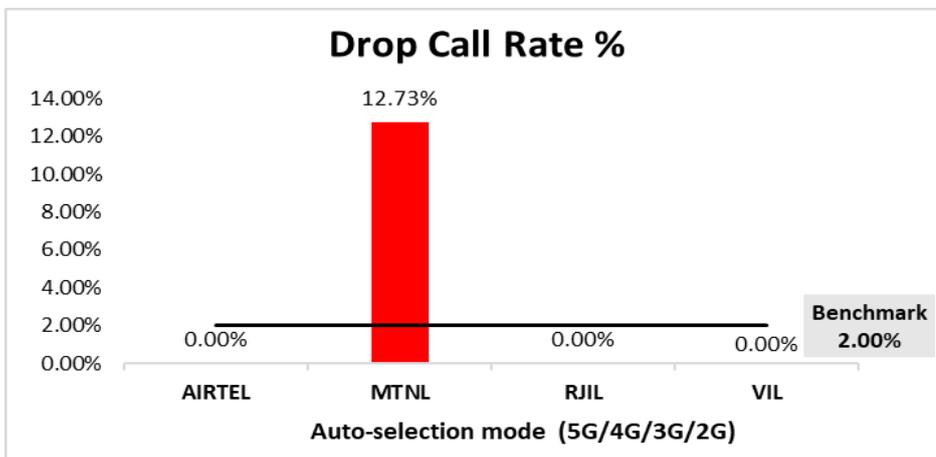


Figure-33: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	MTNL	RJIL	VIL
Call Established (within service provider Network)	50	57	52	51
Number of silence call for >4 Sec	0	NA	0	6
Silence Call Rate %	0.00	NA	0.00	11.76
Number of silence instances for >4 Sec	0	NA	0	6
Number of silence instances for >3 Sec	1	NA	2	12
Number of silence instances for >2 sec	4	NA	14	27
RTP Jitter (4G & 5G) in ms	4.16	NA	8.20	13.44
Packet loss Rate Downlink %	0.62	NA	0.40	1.96
Packet loss Rate Uplink %	0.51	NA	0.97	2.56

Table-79: Summary of silence instances & packet loss rate for mobile-to-mobile call.

Note-

- NA- Due to unavailability of packet switched (VoLTE & VoNR) network in MTNL 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 score values means: 5-Excellent, 4-Good, 3-Fair, 2-Poor, 1-Bad.

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
Total Number of MOS Samples for calls in table-79	645	561	634	618
Speech Quality (Average MOS Score)	3.94	2.40	3.86	4.20
Number of samples with MOS >=4 to <5 (Excellent)	497	0	449	474
Number of samples with MOS >=3 to <4 (Good)	119	81	141	89
Number of samples with MOS >=2 to <3 (Fair)	14	328	25	18
Number of samples with MOS >=1 to <2 (Poor)	15	152	19	37
%age of samples with MOS >=4 to <5 (Excellent)	77.05%	0.00%	70.82%	76.70%
%age of samples with MOS >=3 to <4 (Good)	18.45%	14.44%	22.24%	14.40%
%age of samples with MOS >=2 to <3 (Fair)	2.17%	58.47%	3.94%	2.91%
%age of samples with MOS >=1 to <2 (Poor)	2.33%	27.09%	3.00%	5.99%

Table-80: Summary of speech quality (MOS) samples.

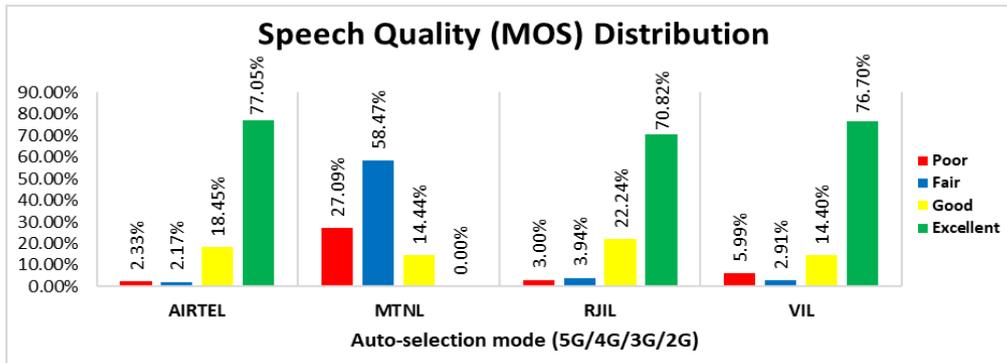


Figure-34: Distribution of samples in MOS score range.

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

Technology	Service Provider			
	AIRTEL	MTNL	RJIL	VIL
5G	0.62%	NA	11.12%	NA
4G	99.38%	NA	88.79%	100.00%
3G	NA	36.32%	NA	NA
2G	0.00%	63.35%	NA	0.00%
Limited Service	0.00%	0.33%	0.09%	0.00%

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

Note-

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

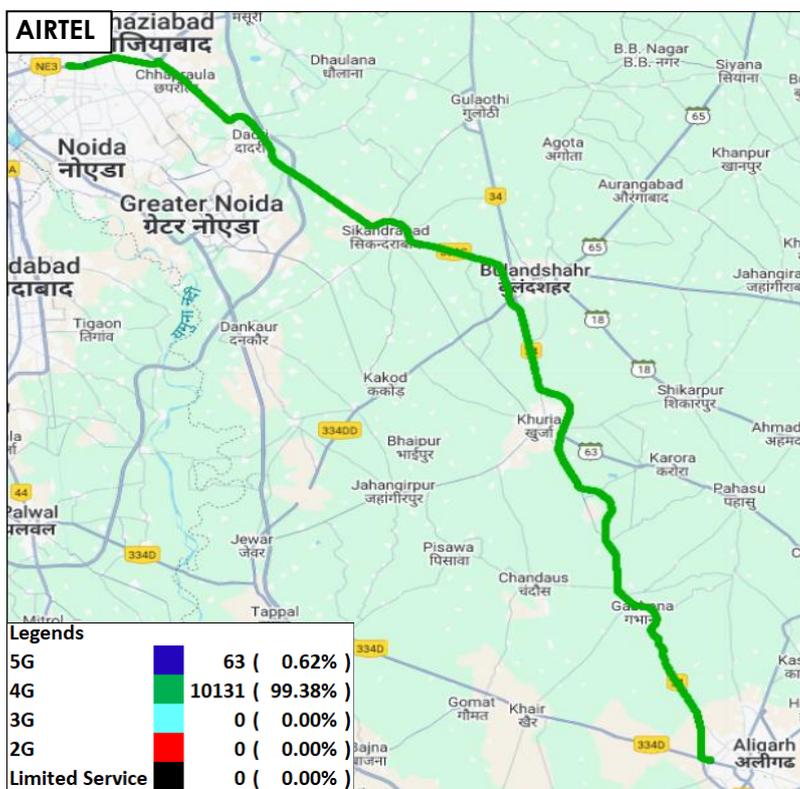


Figure-35: Serving technology plots in auto-selection mode (5G/4G/3G/2G) -AIRTEL.

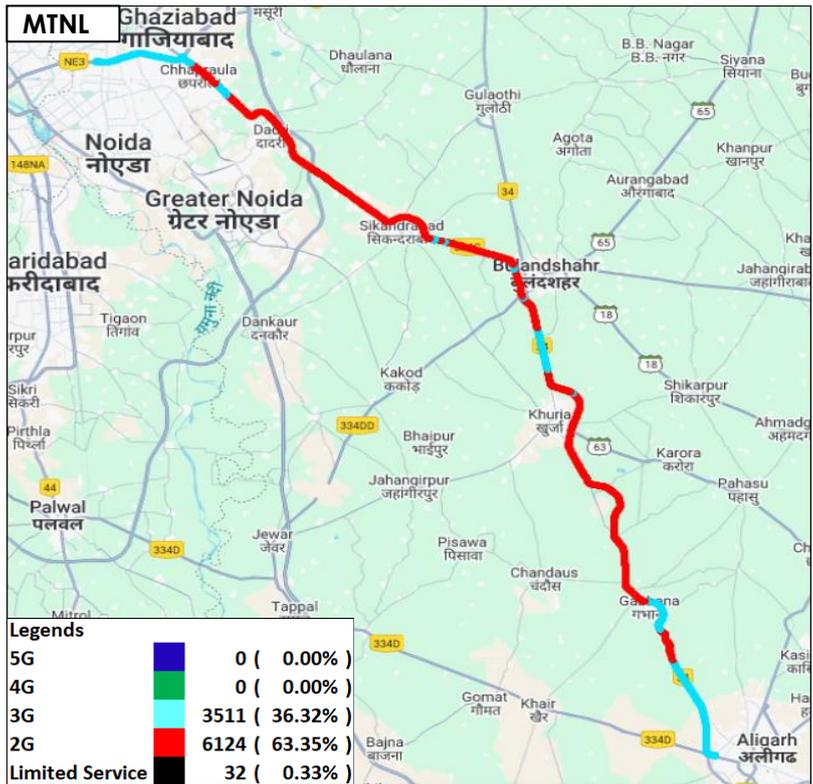


Figure-36: Serving technology plots in auto-selection mode (5G/4G/3G/2G) -MTNL.

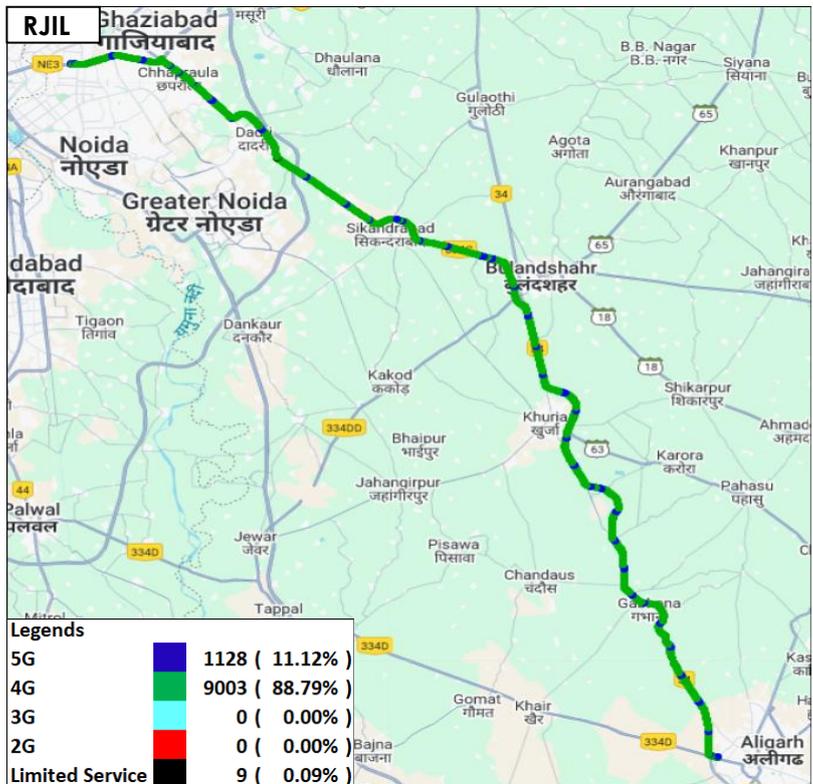


Figure-37: Serving technology plots in auto-selection (5G/4G/3G/2G)- RJIL.

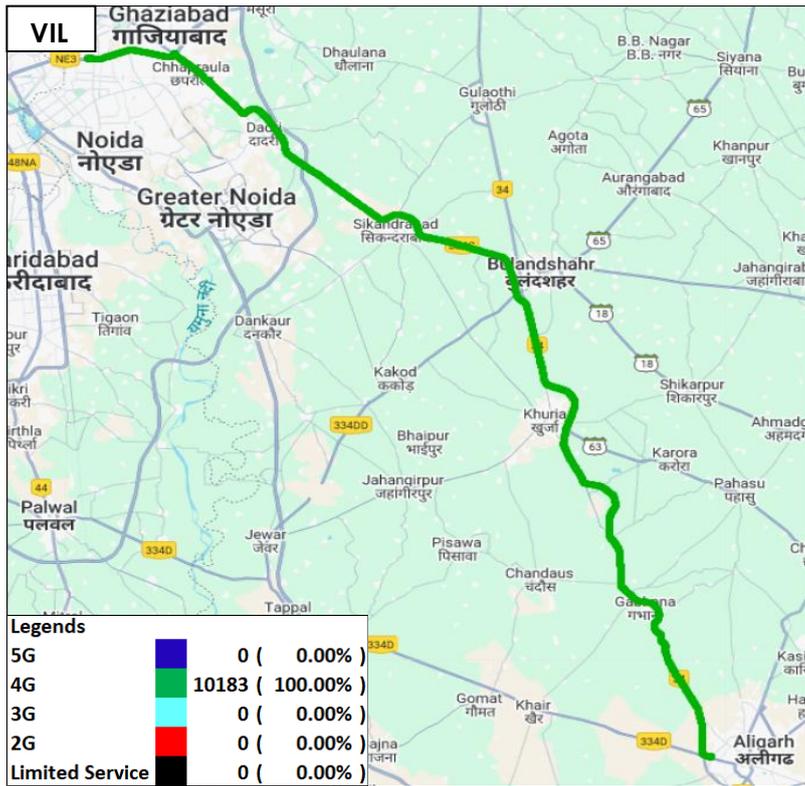


Figure-38: Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL.

(g) Network Signal Strength distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G). (refer figure-52, 53, 54 & 55 for map view)

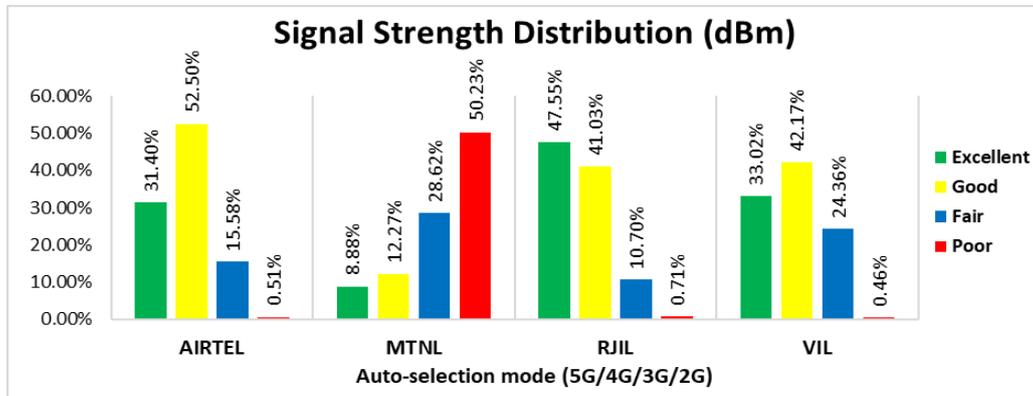


Figure-39: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

Observations:

- Airtel has 31% of samples falling in the excellent signal strength category.
- MTNL has 9% of samples falling in the excellent signal strength category.
- RJIL has 48% of samples falling in the excellent signal strength category.
- VIL has 33% of samples falling in the excellent signal strength category.

4.5.4 Data performance

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

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	MTNL	RJIL	VIL
Download Throughput (Mbits/s)	Average	163.11	1.11	172.84	33.11
	80th Percentile	268.10	1.72	294.74	58.70
	20th Percentile	52.76	0.14	26.40	10.42
Upload Throughput (Mbits/s)	Average	18.16	1.19	22.16	9.35
	80th Percentile	31.20	2.00	39.35	16.30
	20th Percentile	1.80	0.36	4.58	2.49
Latency (ms)	50th Percentile	19.30	65.75	18.10	31.10

Table-82: Summary of Data performance in network auto-selection mode.

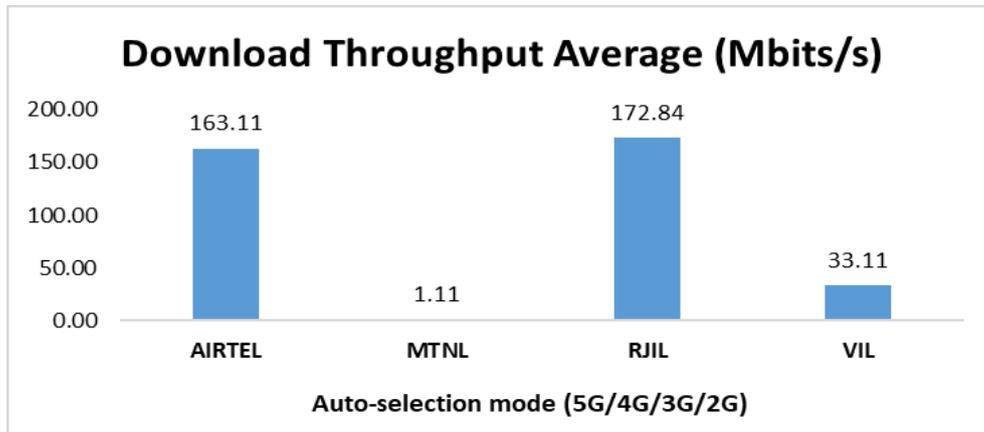


Figure-40: Download throughput.

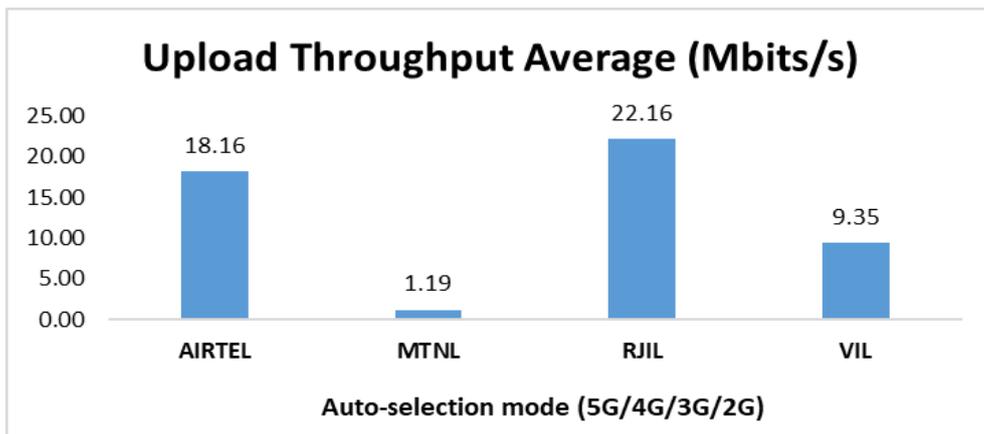


Figure-41: Upload throughput.

5. Voice & Data Key findings

5.1 Overall Voice

1. Call Setup Success Rate:

- a) Airtel, MTNL and VIL have 87.01%, 88.48% and 98.56% call setup success rate respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, MTNL, RJIL and VIL have 100.00%, 83.13%, 100.00% and 100.00% call setup success rate respectively in Auto-selection mode (5G/4G/3G/2G). (refer table-5)

2. Call Setup Time:

- a) Airtel, MTNL and VIL call setup time is 3.48, 3.07 & 4.63 seconds respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, MTNL, RJIL & VIL call setup time is 0.77, 3.17, 0.63 & 0.61 seconds respectively in Auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. Drop Call Rate:

- a) Airtel, MTNL and VIL drop call rate 1.44%, 12.13% & 1.94% respectively in 3G/2G network mode. (refer table-3)
- b) Airtel, MTNL, RJIL and VIL drop call rate 0.11%, 6.12% 0.22% & 0.00% respectively in Auto-selection mode (5G/4G/3G/2G). (refer table-5)

4. Call Silence/Mute Rate: In packet switched network (4G/5G) VIL, RJIL and Airtel have 3.29%, 1.22% & 0.60% silence call rate respectively. Further VIL has higher RTP packet loss rate in downlink (1.82%) compared to Airtel (0.58%) and RJIL (0.45%). In uplink the RTP packet loss rate is higher for VIL (1.98%) compared to RJIL (1.00%) and Airtel (0.30%). (refer table-6)

5.2 Overall Data

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

- a) Airtel, MTNL, RJIL and VIL average download speed are 181.73 Mbps, 1.29 Mbps, 227.84 Mbps and 22.14 Mbps respectively. (refer table-9)
- b) Airtel, MTNL, RJIL and VIL average upload speed are 18.25 Mbps, 0.90 Mbps, 19.11 Mbps and 5.38 Mbps respectively. (refer table-9)

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

- a) Airtel, MTNL, RJIL and VIL average download speed are 114.08 Mbps, 1.76 Mbps, 255.92 Mbps and 20.50 Mbps respectively. (refer table-36)
- b) Airtel, MTNL, RJIL and VIL average upload speed are 15.89 Mbps, 1.15 Mbps, 21.87 Mbps and 4.81 Mbps respectively. (refer table-36)

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

- a) Airtel, MTNL, RJIL and VIL have 100.00%, 61.18%, 100.00% and 97.59% download session setup success rate respectively. (refer table-36)
- b) Airtel, MTNL, RJIL and VIL have 98.82%, 62.35%, 100.00% and 96.47% upload session setup success rate respectively. (refer table-36)

5.3 Operator wise Key Findings

1. Airtel:

Voice

- 87.01% call setup success rate and 1.44% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-3)
- 100.00% call setup success rate and 0.11% drop call rate have been observed in (5G/4G/3G/2G) network mode for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 91.38% call setup success rate and 0.51% drop call rate have been observed in 3G/2G network mode for city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-11)
- 100.00% call setup success rate and 0.16% 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-13)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-18)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for both walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-72 & 73)
- 51.28% call setup success rate and 15.00% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-76)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-78)

Data

- Airtel has average download speed of 181.73 Mbps and average upload speed of 18.25 Mbps for LSA. (refer table-9)
- Airtel has average download speed of 193.59 Mbps and average upload speed of 18.75 Mbps across the measured routes for city drive. (refer table -17)
- Amity University Sector-125 Noida, Amrita Hospital Sector 88 Faridabad, Birla Vidya Niketan School Pushp Vihar, Chhatarpur Mandir, Deshbandhu College Kalkaji, GD Goenka International School Greater Noida, JC Bose University of Science and Technology Sector-6 Faridabad, Kalkaji Mandir, Lajpat Nagar Central Market, Palika Kendra and Saket Court have less download speed (less than 100 Mbps) out of total 17 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-37, 38, 40, 41, 42, 44, 45, 48, 49, 50 & 51)
- Amity University Sector-125 Noida, Amrita Hospital Sector 88 Faridabad, Birla Vidya Niketan School Pushp Vihar, Chhatarpur Mandir, Deshbandhu College Kalkaji, GD Goenka International School Greater Noida, JC Bose University of Science and Technology Sector-6 Faridabad, Kalish Hospital and Neuro Institute Sector 71 Noida, Kalkaji Mandir, Lajpat Nagar Central Market, Palika Kendra and Vidya Mandir Public School Sector 15A Faridabad have less Upload

speed (less than 20 Mbps) out of total 17 Hotspots in auto-selection mode (5G/4G/3G/2G). (refer table-37, 38, 40, 41, 42, 44, 45, 47, 48, 49, 50 & 52)

- AIIMS Hospital and Nizamuddin Railway Station walk test locations have less download speed (less than 100 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-74 & 75)
- AIIMS Hospital and Nizamuddin Railway Station walk test locations have less upload speed (less than 20 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-74 & 75)
- Airtel has average download speed of 163.11 Mbps and average upload speed of 18.16 Mbps across the measured routes for highway drive. (refer table -82)

2. MTNL:

Voice

- 88.48% call setup success rate and 12.13% drop call rate have been observed in 3G/2G network mode for LSA. Performance is not meeting the benchmark of 98.00% 2.00% respectively. (refer table-3)
- 83.13% call setup success rate and 6.12% drop call rate have been observed in (5G/4G/3G/2G) network mode for LSA. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 89.97% call setup success rate and 12.44% drop call rate have been observed in 3G/2G network mode for city drive. Performance is not meeting the benchmark of 98.00% 2.00% respectively. (refer table-11)
- 78.56% call setup success rate and 6.74% 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-13)
- 94.61% call setup success rate and 3.16% 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% & 2.00% respectively. (refer table-18)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for both walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-72 & 73)
- 73.13% call setup success rate and 8.16% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-76)
- 96.49% call setup success rate and 12.73% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-78)

Data

- MTNL has average download speed of 1.29 Mbps and average upload speed of 0.90 Mbps for LSA. (refer table-9)
- MTNL has average download speed of 1.26 Mbps and average upload speed of 0.83 Mbps across the measured routes for city drive. (refer table -17)
- MTNL has average download speed of 1.11 Mbps and average upload speed of 1.19 Mbps across the measured routes for highway drive. (refer table -82)

3. RJIL:

Voice

- 100.00% call setup success rate and 0.22% drop call rate have been observed in the auto-selection mode for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 100.00% call setup success rate and 0.31% 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-13)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-18)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for both walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-72 & 73)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-78)

Data

- RJIL has average download speed of 227.84 Mbps and average upload speed of 19.11 Mbps for LSA. (refer table-9)
- RJIL has average download speed of 245.79 Mbps and average upload speed of 18.88 Mbps across the measured routes for city drive. (refer table -17)
- Amity University Sector-125 Noida, Apollo Hospital Sarita Vihar and GD Goenka International School Greater Noida have less download speed (less than 100 Mbps) out of total 17 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-37, 39 & 44)
- Amity University Sector-125 Noida, Amrita Hospital Sector 88 Faridabad, Apollo Hospital Sarita Vihar, Chhatarpur Mandir, Deshbandhu College Kalkaji, GD Goenka International School Greater Noida, Kalish Hospital and Neuro Institute Sector 71 Noida, Kalkaji Mandir, Palika Kendra, Saket Court and Windsor Place Delhi have less Upload speed(less than 20 Mbps) out of total 17 Hotspots in auto-selection mode (5G/4G/3G/2G). (refer table-37, 38, 39, 41, 42, 44, 47, 48, 50, 51 & 53)
- AIIMS Hospital and Nizamuddin Railway Station walk test locations have less download speed (less than 100 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-74 and 75)
- AIIMS Hospital and Nizamuddin Railway Station walk test locations have less upload speed (less than 20 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-74 and 75)
- RJIL has average download speed of 172.84 Mbps and average upload speed of 22.16 Mbps across the measured routes for highway drive. (refer table -82)

4. VIL:

Voice

- 98.56% call setup success rate and 1.94% drop call rate have been observed in 3G/2G network mode for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in (5G/4G/3G/2G) network mode for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)
- 98.62% call setup success rate and 1.87% drop call rate have been observed in 3G/2G network mode for city drive. Performance is well within the benchmark of 98.00% 2.00% respectively. (refer table-11)
- 100.00% 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-13)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-18)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for both walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-72 & 73)
- 98.37% call setup success rate and 2.21% drop call rate have been observed in 3G/2G network mode for highway drive. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table-76)
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for highway drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-78)

Data

- VIL has average download speed of 22.14 Mbps and average upload speed of 5.38 Mbps for LSA. (refer table-9)
- VIL has average download speed of 21.53 Mbps and average upload speed of 4.96 Mbps across the measured routes for city drive. (refer table -17)
- Chhatarpur Mandir, Deshbandhu College Kalkaji, GD Goenka International School Greater Noida and JC Bose University of Science and Technology Sector-6 Faridabad have less download speed (less than 10 Mbps) out of total 17 Hotspots for auto-selection mode (5G/4G/3G/2G). (refer table-41, 42, 44 & 45)
- Chhatarpur Mandir, Deshbandhu College Kalkaji, GD Goenka International School Greater Noida, Kalish Hospital and Neuro Institute Sector 71 Noida and Saket Court have less upload speed (less than 2 Mbps) out of total 17 Hotspots in auto-selection mode (5G/4G/3G/2G). (refer table-41, 42, 44, 47 & 51)
- AIIMS hospital walk test location has less download speed (less than 10 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-74)
- Nizamuddin Railway Station Walk test location has less upload speed (less than 2 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-75)
- VIL has average download speed of 33.11 Mbps and average upload speed of 9.35 Mbps across the measured routes for highway drive. (refer table -82)

6. Annexure

6.1 Route wise coverage map

6.1.1 City

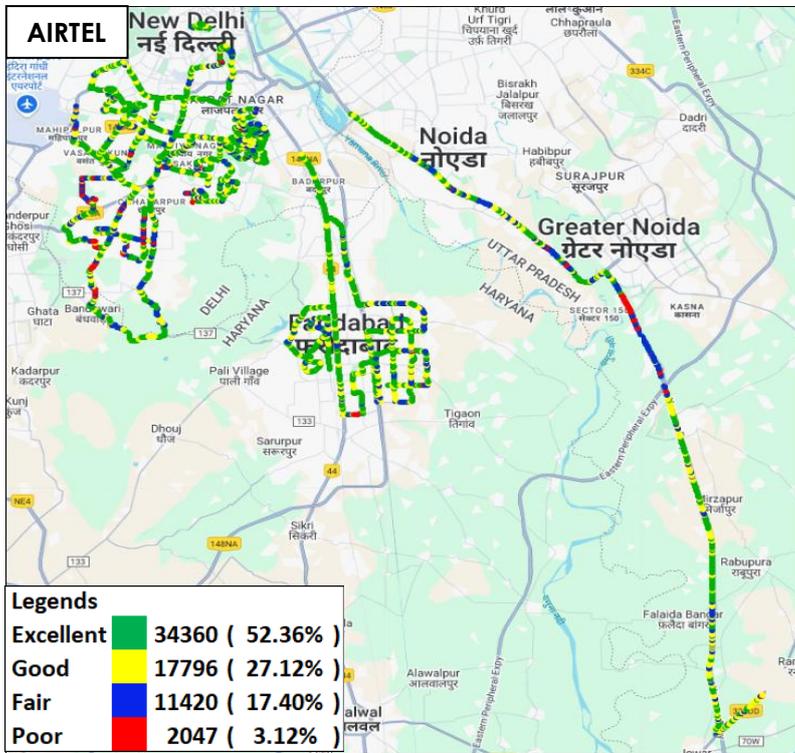


Figure-42: Signal strength 3G/2G network mode – AIRTEL.

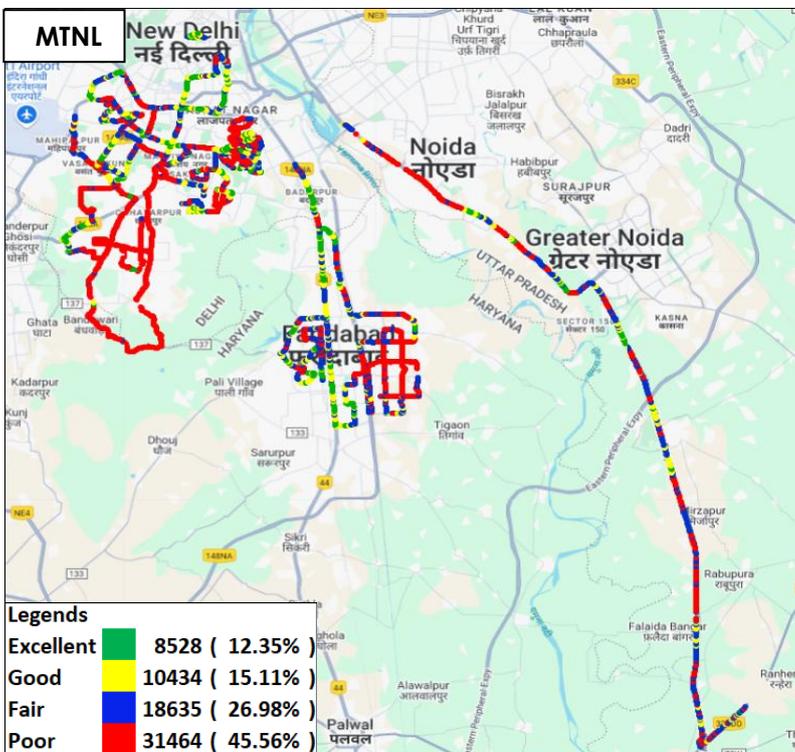


Figure-43: Signal strength 3G/2G network mode – MTNL.

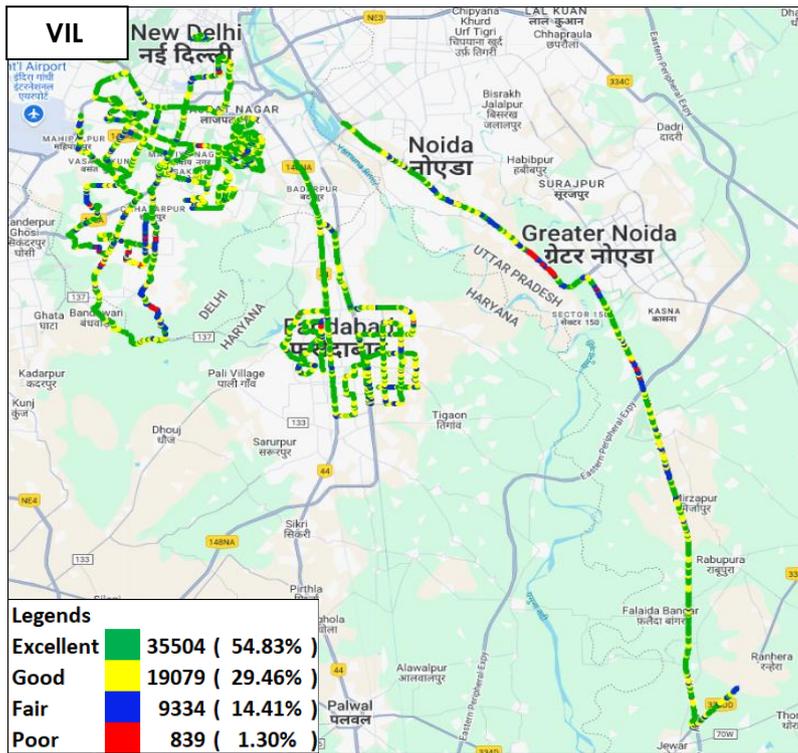


Figure-44: Signal strength 3G/2G network mode – VIL.

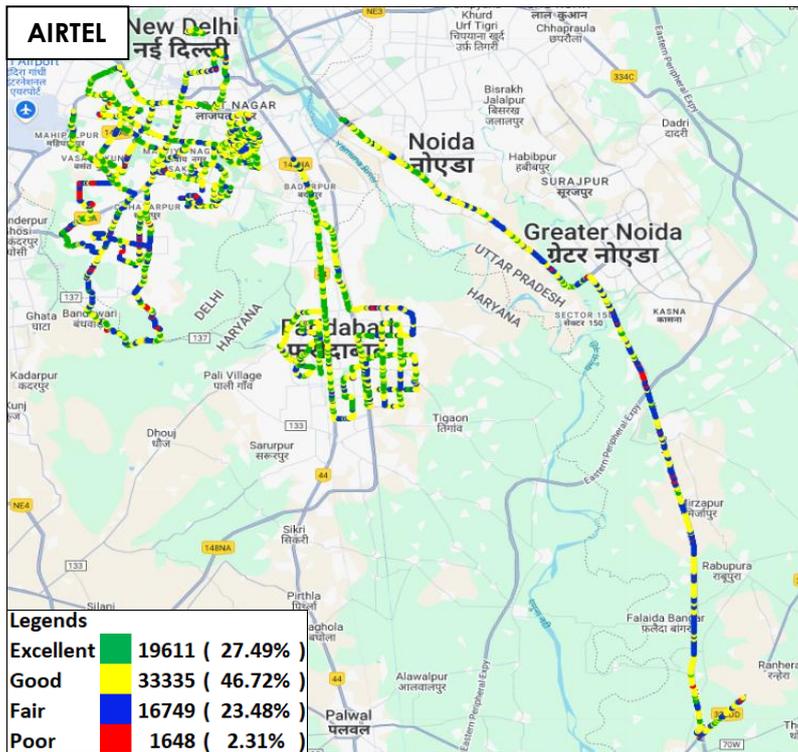


Figure-45: Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.

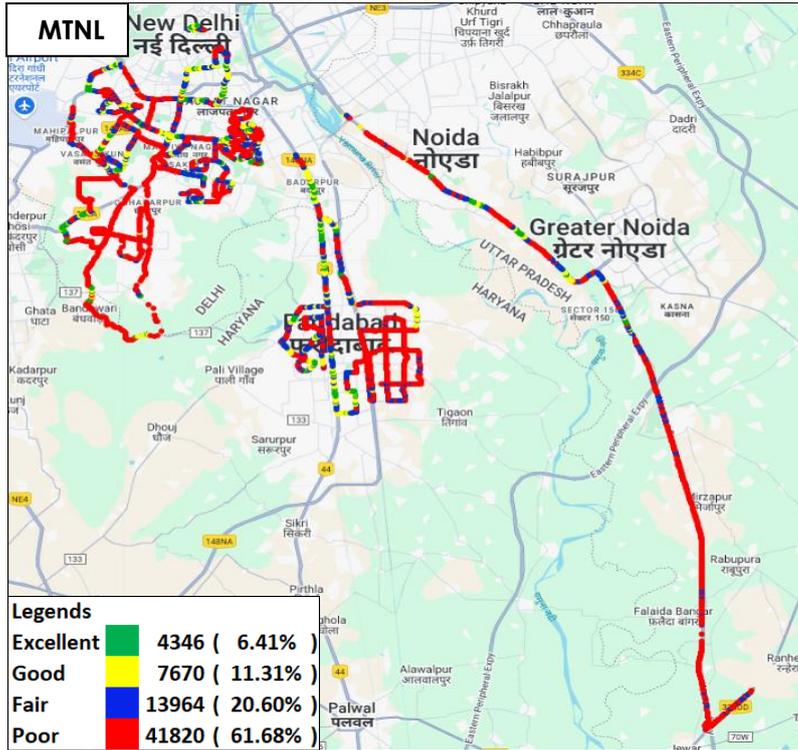


Figure-46: Signal strength auto-selection mode 5G/4G/3G/2G – MTNL.

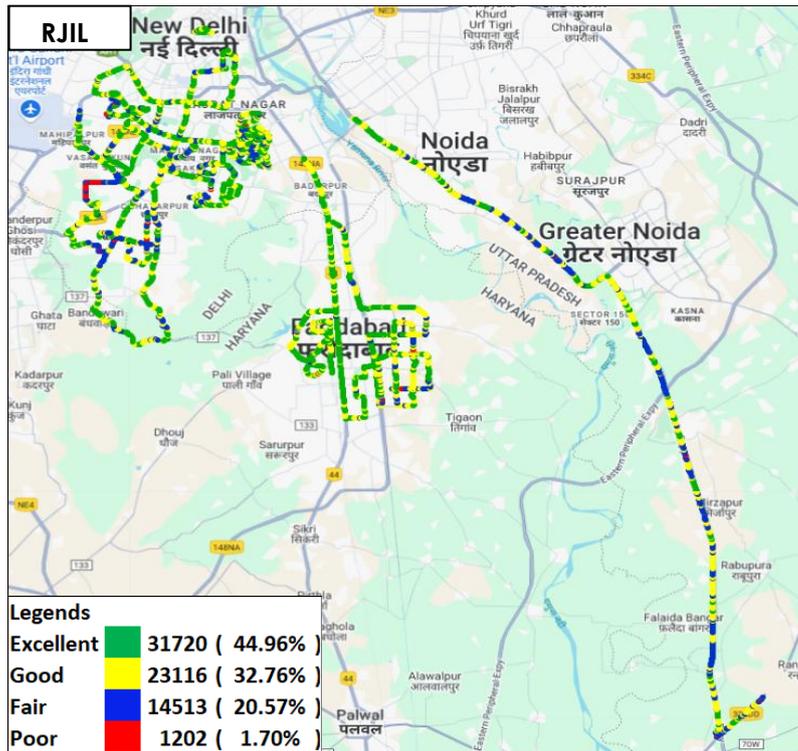


Figure-47: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

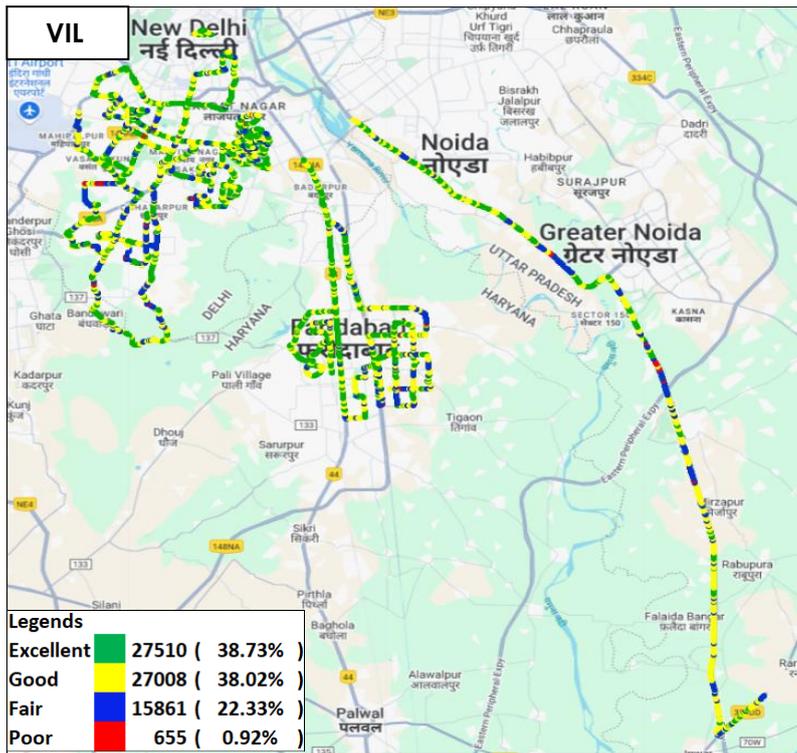


Figure-48: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

6.1.2 Highway

i) Noida to Aligarh

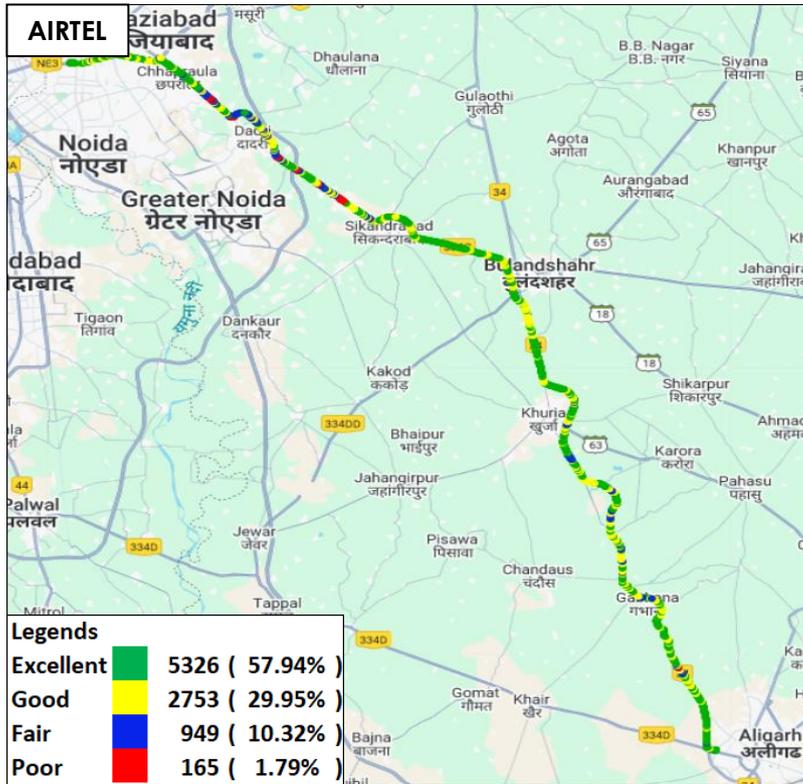


Figure-49: Signal strength 3G/2G network mode – AIRTEL.

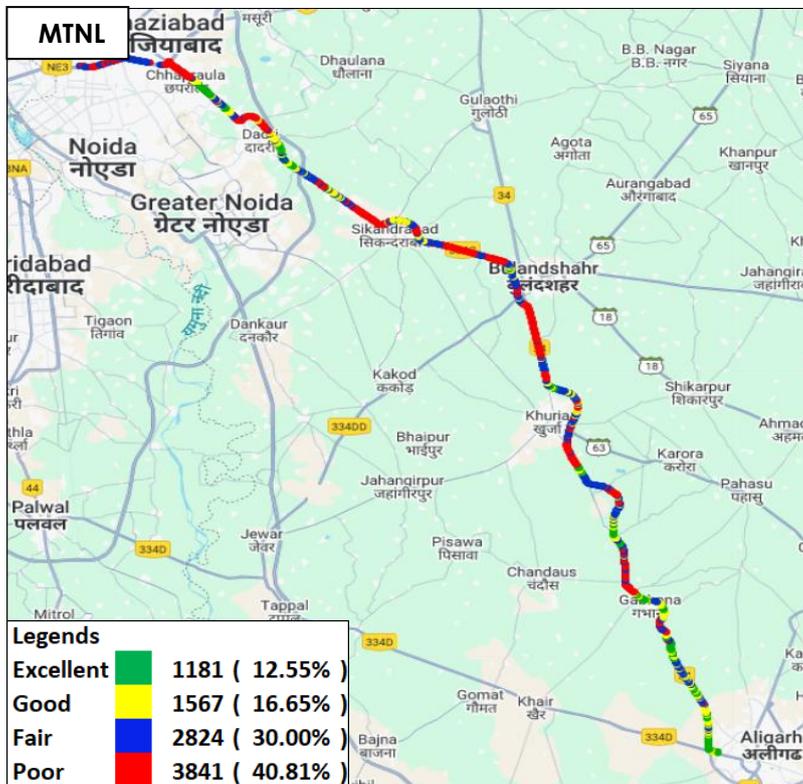


Figure-50: Signal strength 3G/2G network mode – MTNL.

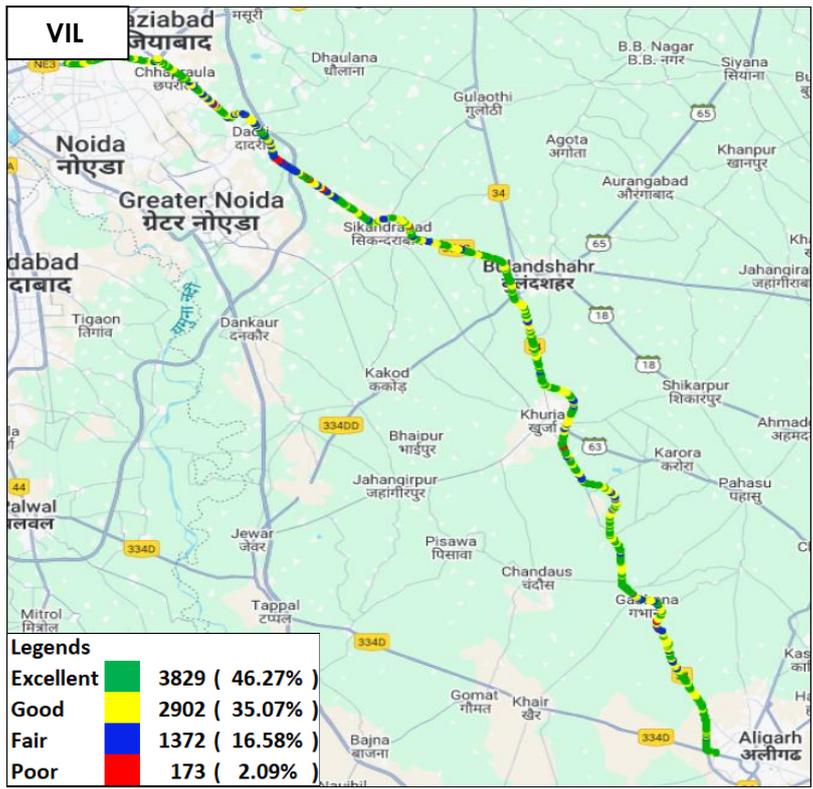


Figure-51: Signal strength 3G/2G network mode – VIL

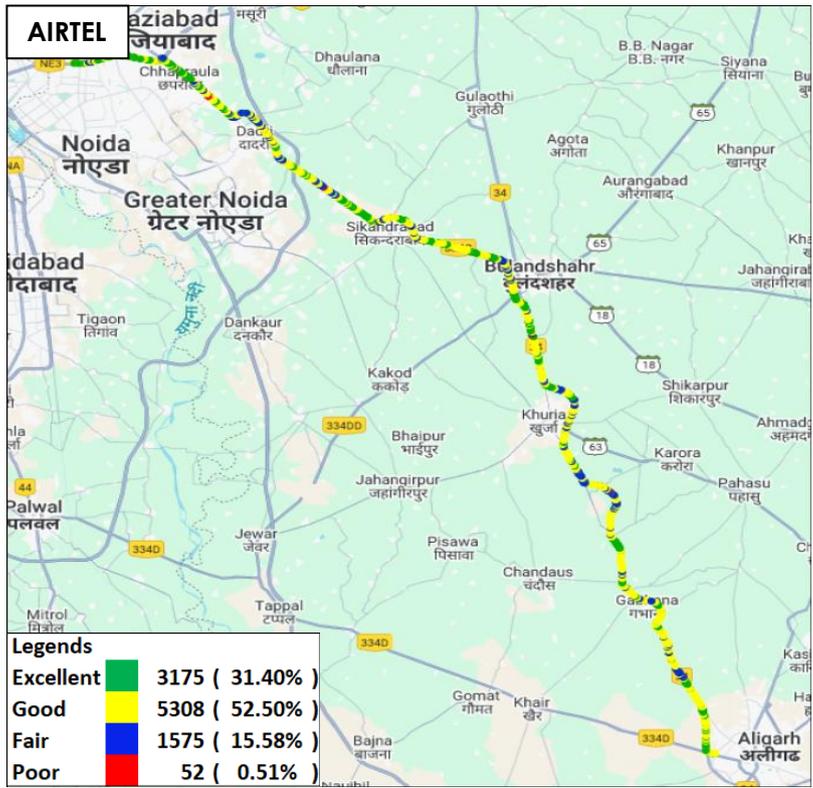


Figure-52: Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.

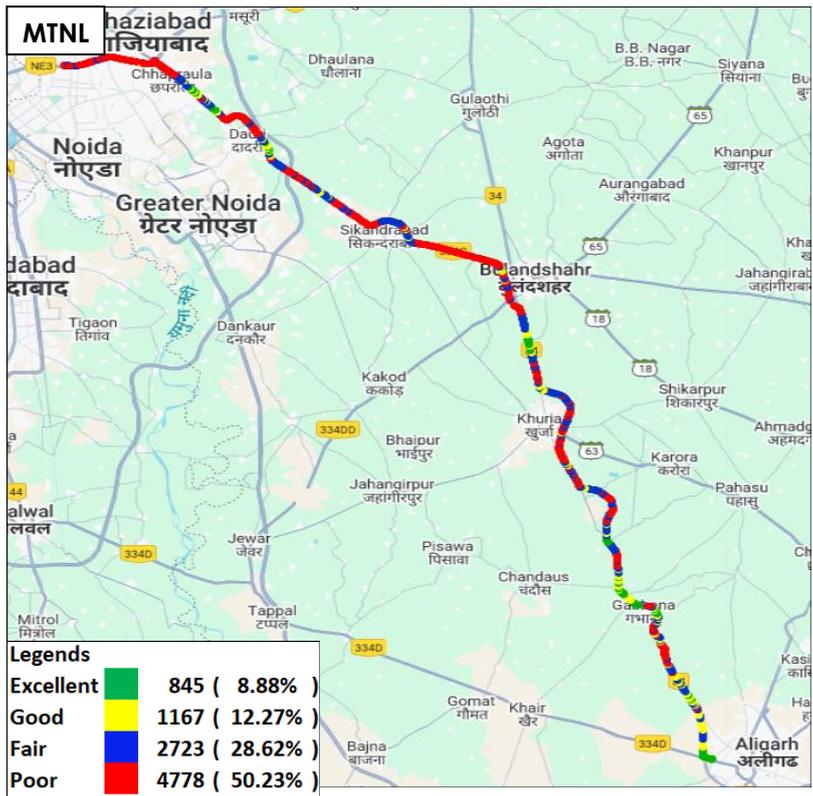


Figure-53: Signal strength auto-selection mode 5G/4G/3G/2G – MTNL.

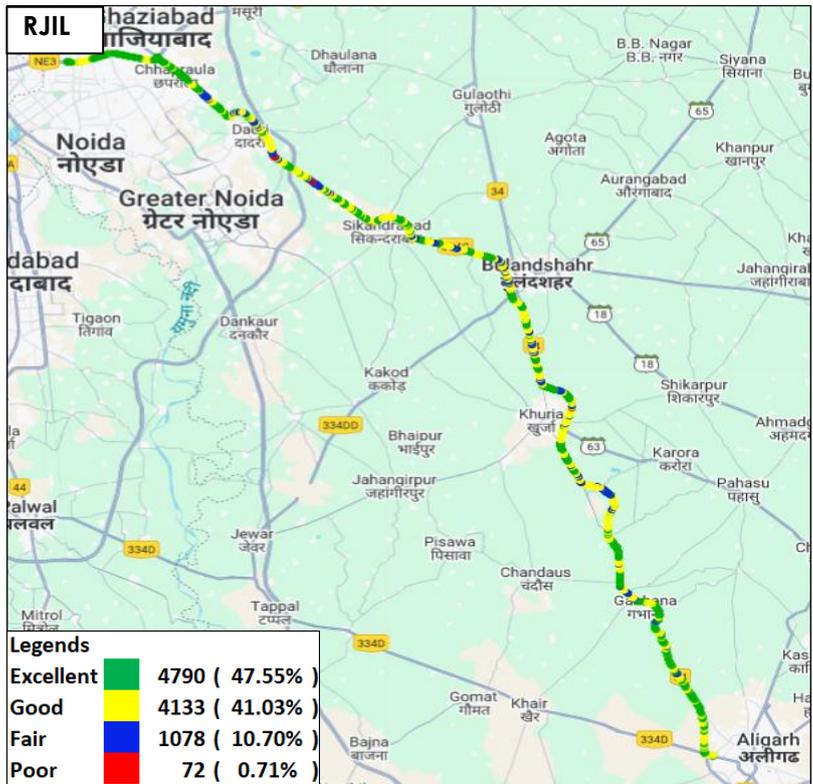


Figure-54: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.

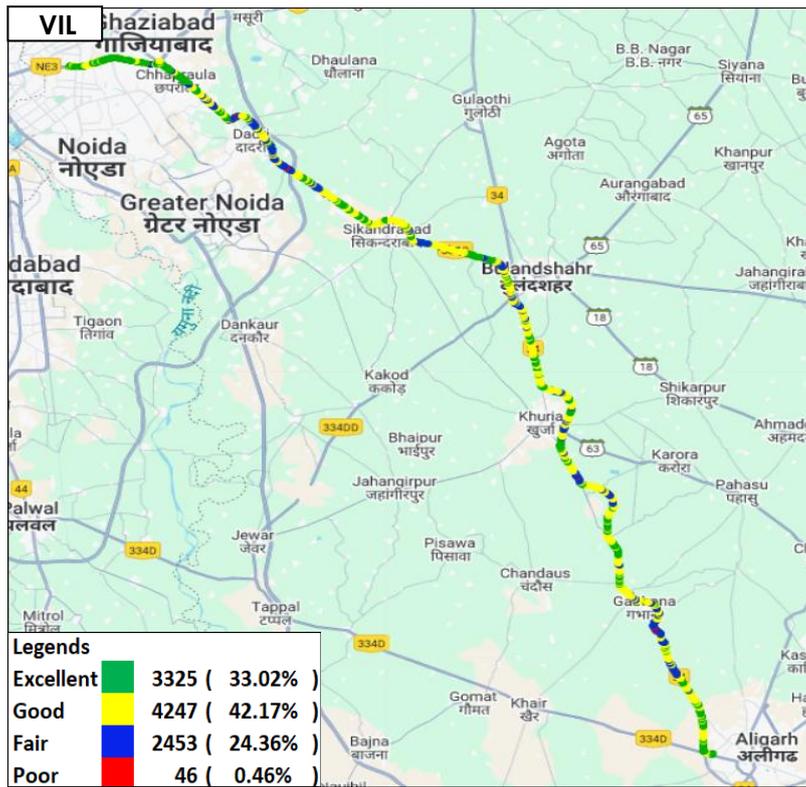


Figure-55: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

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	<ul style="list-style-type: none"> • 3G/2G auto mode- switch Call • 5G/4G/3G/2G auto mode- switch Call • 5G/4G MOS Call 	30 Sec
Call Duration		90 Sec/ 180 Sec
Wait/ Guard Time		15 Sec

Table-83: Voice test detail

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

Data Test		
Test Type	Technology	Detail
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.ircct.co.on , www.sbi.co.in) 20 Sec timeout (only at Hotspot)

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

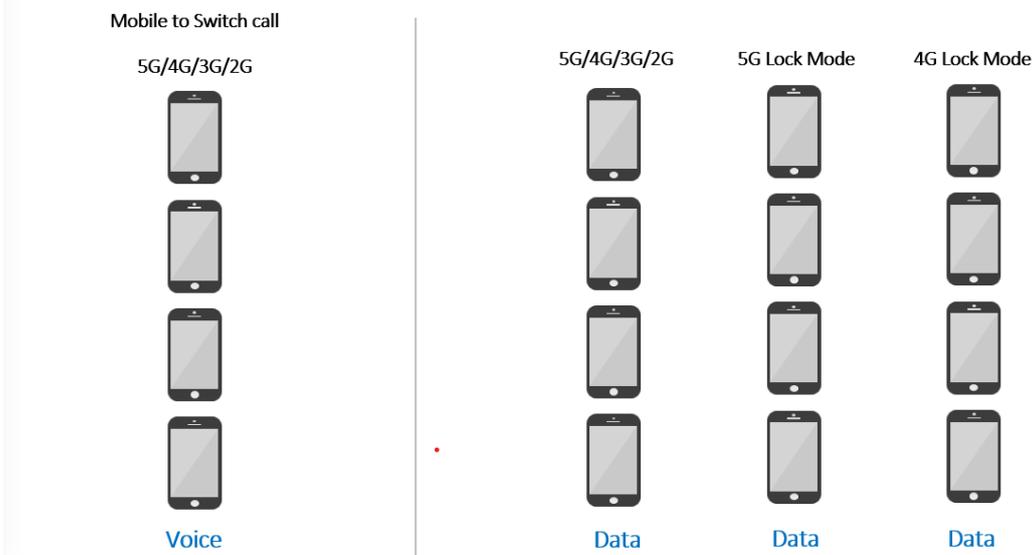


Figure-57: Number of handsets used in railway/metro/walktest/hotspot & coastal area

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)

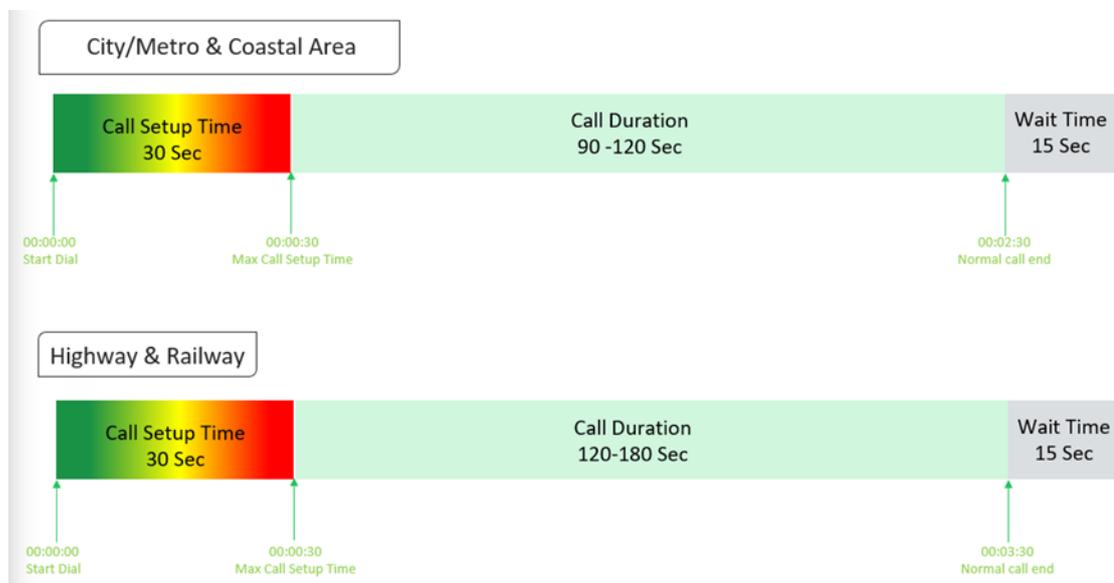


Figure-58: Voice test script for city/railway/metro/highway & coastal area

- 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-59: 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

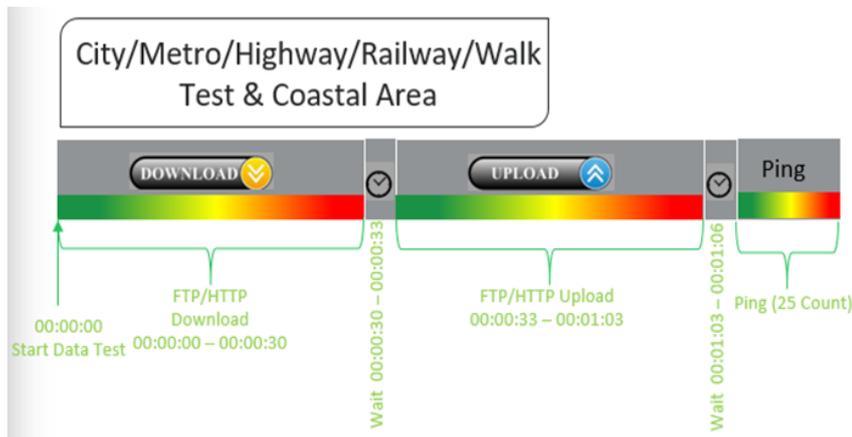


Figure-60: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing

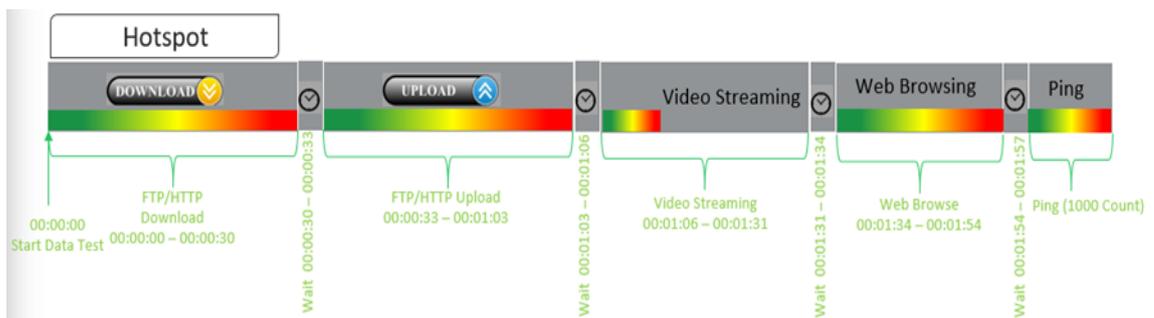


Figure-61: Data test script used at hotspot

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

Jitter	<p>The inter arrival jitter is the difference in the relative transit time for two packets. The relative transit time is the difference between a packet's Real-time Transport Protocol (RTP) timestamp and the receiver's clock at the time of arrival, measured in the same units. If S_i is the RTP timestamp from packet i, and R_i is the time of arrival in RTP timestamps units for packet i, then for two packets i and j the inter-arrival jitter D can be expressed as: $D(i,j) = (R_j - R_i) - (S_j - S_i)$</p> <p>The interarrival jitter is calculated continuously as each data packet i is received from source $SSRC_n$, using this difference D for that packet and the previous packet $i-1$ in order of arrival (not necessarily in sequence), according to the formula $J(i) = J(i-1) + (D(i-1,i) - J(i-1))/16$ or 8</p>																																		
Downlink Packet Drop Rate	<p>Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call originating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE)</p>																																		
Uplink Packet Drop Rate	<p>Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call terminating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE).</p>																																		
Signal Strength	<p>Signal strength is the signal power level received by the wireless user.</p> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Parameter Name</th> <th rowspan="2">Technology</th> <th colspan="4">Signal Strength (dBm)</th> </tr> <tr> <th style="background-color: #92D050;">Excellent</th> <th style="background-color: #FFD700;">Good</th> <th style="background-color: #000080; color: white;">Fair</th> <th style="background-color: #FF0000; color: white;">Poor</th> </tr> </thead> <tbody> <tr> <td>Rx Level</td> <td>GSM</td> <td>0 to \geq -65</td> <td><-65 to \geq -75</td> <td><-75 to \geq -85</td> <td><-85 to min</td> </tr> <tr> <td>RSCP</td> <td>WCDMA</td> <td>0 to \geq -70</td> <td><-70 to \geq -80</td> <td><-80 to \geq -90</td> <td><-90 to min</td> </tr> <tr> <td>RSRP</td> <td>LTE</td> <td>0 to \geq -80</td> <td><-80 to \geq -95</td> <td><-95 to \geq -110</td> <td><-110 to min</td> </tr> <tr> <td>SS_RSRP</td> <td>NR</td> <td>0 to \geq -80</td> <td><-80 to \geq -95</td> <td><-95 to \geq -110</td> <td><-110 to min</td> </tr> </tbody> </table>	Parameter Name	Technology	Signal Strength (dBm)				Excellent	Good	Fair	Poor	Rx Level	GSM	0 to \geq -65	<-65 to \geq -75	<-75 to \geq -85	<-85 to min	RSCP	WCDMA	0 to \geq -70	<-70 to \geq -80	<-80 to \geq -90	<-90 to min	RSRP	LTE	0 to \geq -80	<-80 to \geq -95	<-95 to \geq -110	<-110 to min	SS_RSRP	NR	0 to \geq -80	<-80 to \geq -95	<-95 to \geq -110	<-110 to min
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SS_RSRP	NR	0 to \geq -80	<-80 to \geq -95	<-95 to \geq -110	<-110 to min																														

Table-85: Network performance parameter and definition voice

7.2.2 Network Performance Parameters Data tests

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

Upload Session Setup Success Rate	(total upload session established (successfully connected to server)/ total upload session attempt)*100. This KPI need to report for Hotspot only.
Web Page Download Time	Web browsing test is used to measure performance in terms of opening a web/HTTP page. Time taken to open the web page successfully is considered as web browsing delay/web page download time.
Video Streaming Delay	The Video streaming delay is time taken from start of video transfer to First video frame displayed in player.
Latency	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-86: 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.