भादूविप्रा
TRAI

TELECOM REGULATORY AUTHORITY OF INDIA

Independent Drive Test Report

Kolkata LSA

November 2025

Contents

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

S. No	Drive test route	Type of route	Distance covered (KMs)	From date	To date
1	Kolkata	City	308.1	11-Nov-2025	15-Nov-2025
2	Kolkata	Inter Operator Calling	1 Location	15-Nov-2025	15-Nov-2025
3	Kolkata	Hotspot	10 Locations	10-Nov-2025	14-Nov-2025
4	Kolkata	Walk Test	2.6	13-Nov-2025	13-Nov-2025

Table-1: Drive test summary

2.2 Drive test routes

The map provides overview of drive test routes indicating city drive, inter-operator call test, hotspots and walk tests as per the legends shown on the map.
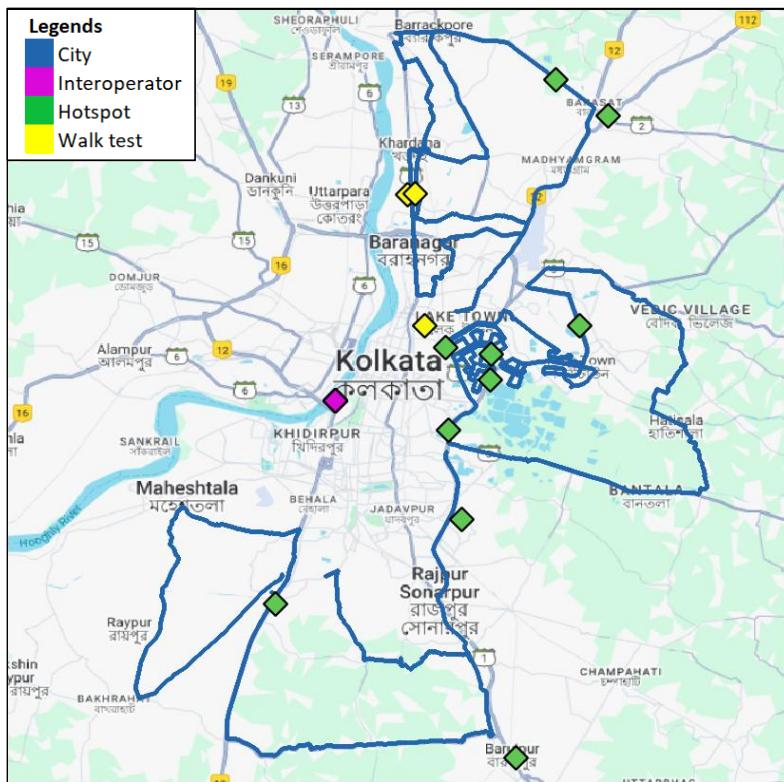
Figure-1: Drive test routes

2.3 Summary of areas covered

a) City- Amtala, Bibirhat, Maheshtala, Joka, Baruipur, Rajpur Sonarpur, Bantala, Hatisala, Vedic Village, New Town, Rajarhat,Salt Lake, Madhymgram, Barasat, Barrackpore & Khardaha etc.

b) Hotspot
1. Adamas University Barasat
2. Barasat Champadali Bus Stand
3. Baruipur Super Speciality Hospital Baruipur
4. Eco Park Major Arterial Road Newtown
5. Indian Institute of Management Calcutta
6. Karunamoyee Bus Terminus Bidhannagar
7. Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur
8. Nicco Park HM Block Sector IV Bidhannagar
9. Science City JBS Haldane AVE Mirania Gardens Topsia
10. Ultadanga Hudco More

c) Walk Test
1. College of Medicine & Sagore Dutta Hospital Kamarhati
2. JIS University Agarpara
3. Kolkata Railway Station

2.4 Telecom service providers detected frequency bands

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

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

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

2.5 Performance against key QoS parameters

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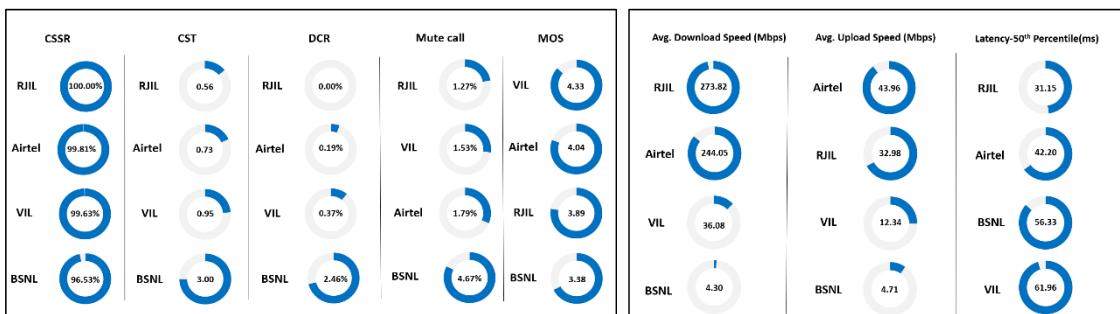
Summary-Voice services

Call Setup Success Rate: Airtel, BSNL, RJIL and VIL have call setup success rate of 99.81%, 96.53%, 100.00% and 99.63% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Setup Time: Airtel, BSNL, RJIL and VIL have call setup time of 0.73, 3.00, 0.56 and 0.95 seconds respectively in Auto-selection mode (5G/4G/3G/2G).

Drop Call Rate: Airtel, BSNL, RJIL and VIL have drop call rate of 0.19%, 2.46%, 0.00% and 0.37% respectively in Auto-selection mode (5G/4G/3G/2G).

Call Silence/Mute Rate: Airtel, BSNL, RJIL and VIL have silence call rate of 1.79%, 4.67%, 1.27% and 1.53% respectively in packet switched network (5G/4G).

Mean Opinion Score (MOS): Airtel, BSNL, RJIL and VIL have Average MOS of 4.04, 3.38, 3.89 and 4.33 respectively.

Summary-Data services

Data Download performance (Overall): Average download speed of Airtel (5G/4G) is 244.05 Mbps, BSNL (4G/3G/2G) is 4.30 Mbps, RJIL (5G/4G) is 273.82 Mbps and VIL (4G/2G) is 36.08 Mbps.

Data Upload performance (Overall): Average upload speed of Airtel (5G/4G) is 43.96 Mbps, BSNL (4G/3G/2G) is 4.71 Mbps, RJIL (5G/4G) is 32.98 Mbps and VIL (4G/2G) is 12.34 Mbps.

Latency (Overall): Airtel, BSNL, RJIL & VIL 50th percentile latency is 42.20 ms, 56.33 ms, 31.15 ms, 61.96 ms respectively.

Data performance - Hotspots (in Mbps):
Airtel- 4G D/L: 31.80   4G U/L: 14.90
           5G D/L: 197.95   5G U/L: 44.78
BSNL- 4G D/L: 4.19   4G U/L: 5.95
RJIL- 4G D/L: 46.77   4G U/L: 10.90
           5G D/L: 292.71   5G U/L: 33.52
VIL-   4G D/L: 29.19   4G U/L: 11.28

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

- The poor Signal Strength in auto-selection mode 5G/4G/3G/2G has been observed for 0.24%, 7.89%, 0.19% & 1.07% of the total IDT route in case of Airtel, BSNL, RJIL & VIL respectively.

QoS Performance Analysis- Kolkata 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 November-2025 covering city drive, hotspots and walk test. (Refer Table-1)

3.2 Voice performance

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

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	399	392	381
Call Setup Success Rate %	99.75	99.49	99.48
Drop Call Rate %	1.01	1.28	1.32
Call Setup Time-Average (Second)	3.40	2.36	4.63
Handover Success Rate %	96.38	98.82	97.99

Table-3: Summary of voice call performance in 3G/2G network mode only.
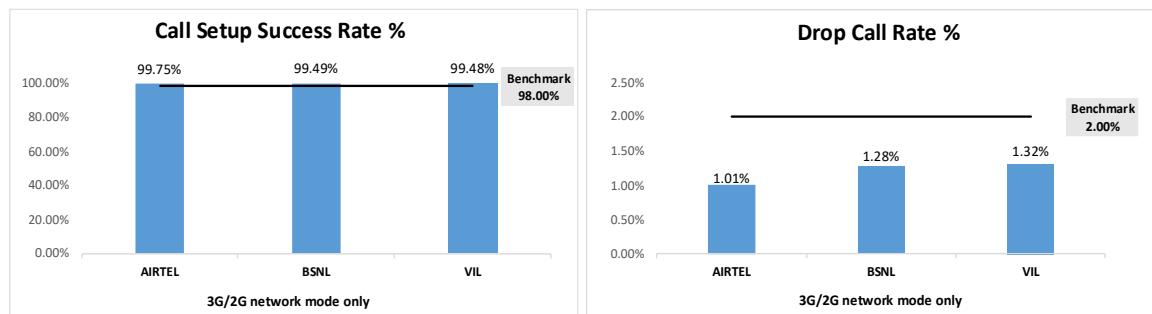
**Figure-2:** Call setup success rate and drop call rate performance.

Number of unique cell Id's covered in Voice test- Technology wise			
Technology	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
3G	NA	164	NA
2G	845	480	864

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

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

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

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	536	548	536	537
Call Setup Success Rate %	99.81	96.53	100.00	99.63
Drop Call Rate %	0.19	2.46	0.00	0.37
Call Setup Time-Average (Second)	0.73	3.00	0.56	0.95
Handover Success Rate %	100.00	99.77	99.97	100.00

**Table-5:** Summary of voice call performance in network auto-selection mode.
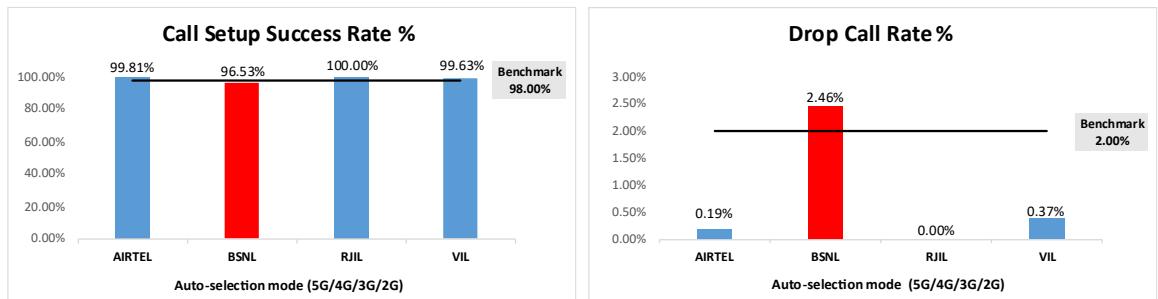
Figure-3: Performance for call setup success rate and drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	391	407	395	392
Number of silence call for >4 Sec	7	19	5	6
Silence Call Rate %	1.79	4.67	1.27	1.53
Number of silence instances for >4 Sec	7	26	6	8
Number of silence instances for >3 Sec	12	55	7	34
Number of silence instances for >2 sec	21	91	16	141
RTP Jitter (4G & 5G) in ms	3.95	8.44	15.42	15.86
Packet loss Rate Downlink %	0.28	4.49	0.65	1.76
Packet loss Rate Uplink %	0.25	3.71	0.36	0.66

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

Number of unique cell Id's covered in Voice test- Technology wise				
Technology	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
5G	0	NA	675	NA
4G	1400	660	942	1256
3G	NA	9	NA	NA
2G	17	123	NA	0

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

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

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

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

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls table-6	3513	3113	3475	3445
Speech Quality (Average MOS)	4.04	3.38	3.89	4.33
Number of samples with MOS >=4 to <5 (Excellent)	3050	1479	2407	2811
Number of samples with MOS >=3 to <4 (Good)	404	561	913	402
Number of samples with MOS >=2 to <3 (Fair)	41	653	91	98
Number of samples with MOS >=1 to <2 (Poor)	18	420	64	134
%age of samples with MOS >=4 to <5 (Excellent)	86.82%	47.51%	69.27%	81.60%
%age of samples with MOS >=3 to <4 (Good)	11.50%	18.02%	26.27%	11.67%
%age of samples with MOS >=2 to <3 (Fair)	1.17%	20.98%	2.62%	2.84%
%age of samples with MOS >=1 to <2 (Poor)	0.51%	13.49%	1.84%	3.89%

**Table-8:** Summary of speech quality (MOS) samples.
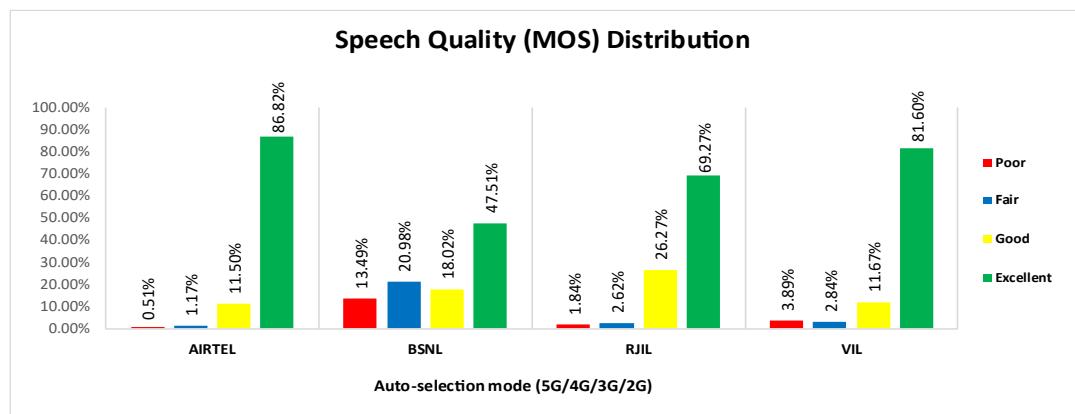
Figure- 4: Distribution of samples in MOS range.

(d) Inter-service provider voice call performance:
To check the performance of inter-service provider call setup success rate, total 35 to 39 inter operator calls were attempted at one location which is Princep ghat park, Kolkata. The Call setup success rate and call setup time observations are as below.

Call Setup Success Rate %				
From Service Provider	**To Service Provider**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
AIRTEL	NA	100.00	94.29	100.00
BSNL	100.00	NA	100.00	100.00
RJIL	97.14	100.00	NA	100.00
VIL	100.00	97.22	100.00	NA

Table-9: Call setup success rate across service providers.

> **Note-**
> - NA- Only inter-operator calls were measured during test.

Call setup time average (seconds)				
From Service Provider	**To Service Provider**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
AIRTEL	NA	2.25	1.02	1.95
BSNL	2.77	NA	1.85	1.80
RJIL	2.41	1.93	NA	1.86
VIL	1.59	1.97	1.44	NA

Table-10: Call setup time across service providers.

> **Note-**
> - NA- Only inter-operator calls were measured during test.

3.3 Data performance

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

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput (Mbits/s)	**Average**	244.05	4.30	273.82	36.08
	80th Percentile	359.44	6.19	395.83	50.31
	20th Percentile	115.48	1.71	147.21	16.67
Upload Throughput (Mbits/s)	**Average**	43.96	4.71	32.98	12.34
	80th Percentile	73.13	7.85	53.14	19.02
	20th Percentile	13.75	1.83	11.52	4.80
Latency (ms)	**50th Percentile**	42.20	56.33	31.15	61.96

Table-11: Summary of data performance in network auto-selection mode.
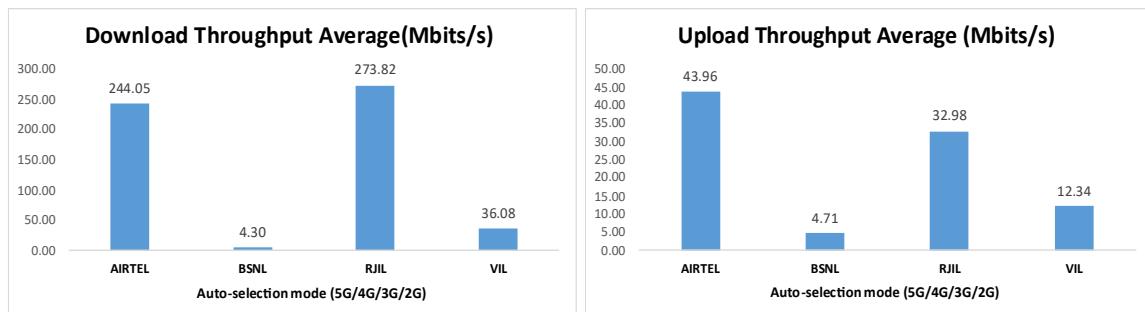
Figure- 5: Download and Upload throughput

Number of unique cell Id's covered in Data test- Technology wise				
Technology	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	0	NA	883	NA
4G	1380	487	64	1331
3G	NA	92	NA	NA
2G	0	13	NA	2

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

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

Detailed QoS Performance Analysis

4. Detailed QoS performance analysis

4.1 Overview

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

4.2 City

Drive test has been conducted from 11th November 2025 to 15th November 2025 in Kolkata city. (Refer Table-1)

4.2.1 Drive test route
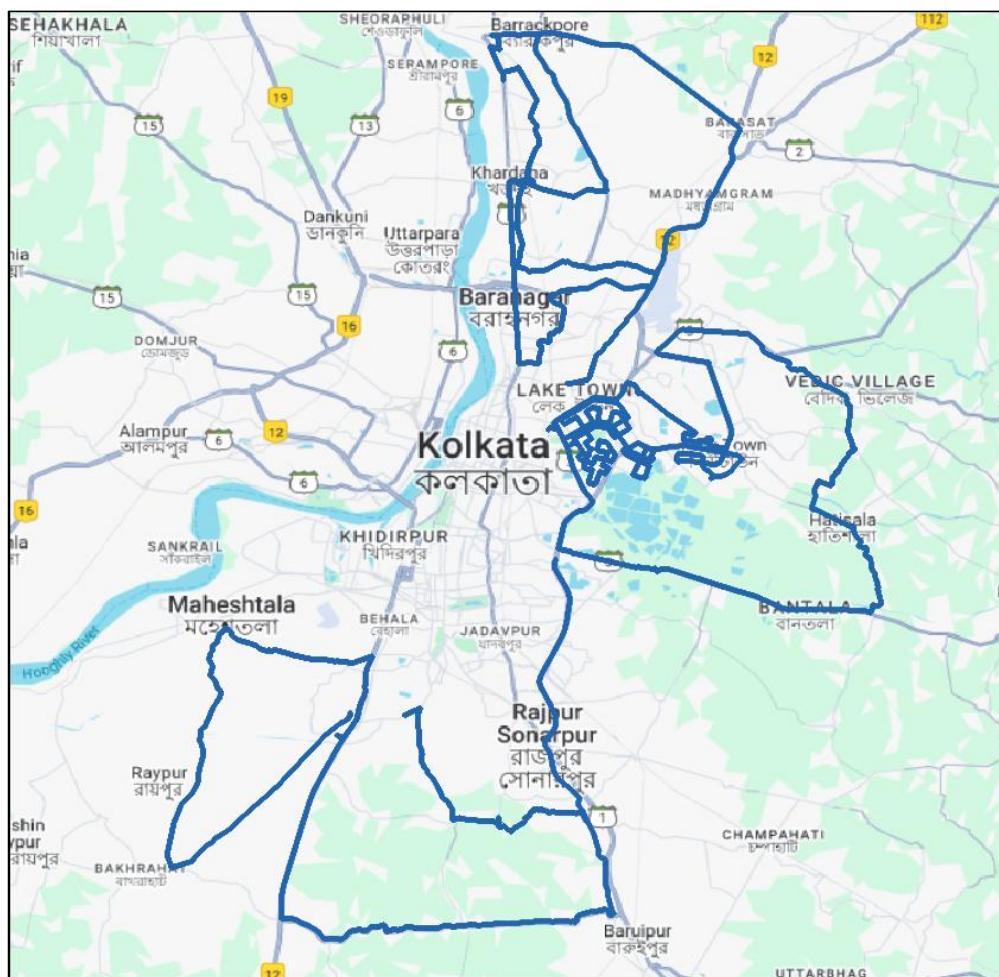
Figure- 6: Drive test routes

4.2.2 Area Covered

Amtala, Bibirhat, Maheshtala, Joka, Baruipur, Rajpur Sonarpur, Bantala, Hatisala, Vedic Village, New Town, Rajarhat,Salt Lake, Madhymgram, Barasat, Barrackpore & Khardaha etc.

4.2.3 Voice performance

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

Parameters	Service Provider		
	3G/2G network mode only		
	AIRTEL	BSNL	VIL
Call Attempts	399	392	381
Call Setup Success Rate %	99.75	99.49	99.48
Drop Call Rate %	1.01	1.28	1.32
Call Setup Time-Average (Second)	3.40	2.36	4.63
Handover Success Rate %	96.38	98.82	97.99

Table-13: Summary of voice call performance in 3G/2G network mode only**.**
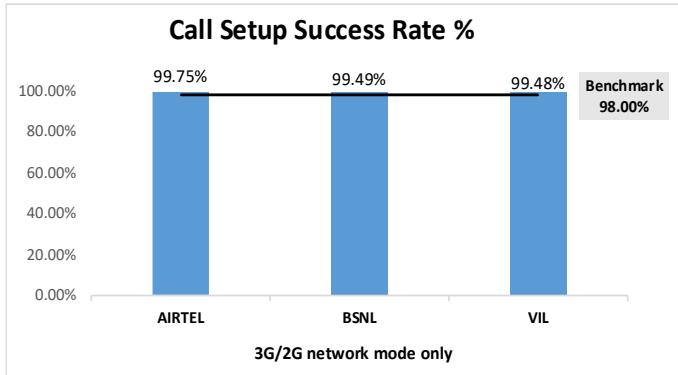
**Figure-7:** Performance for call setup success rate.
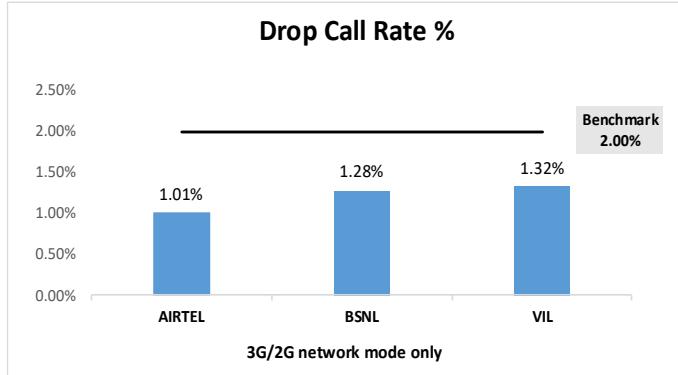
Figure-8: Performance for drop call rate.

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

Technology	Service Provider		
	AIRTEL	BSNL	VIL
3G	NA	21.61%	NA
2G	99.95%	78.39%	99.94%
Limited Service	0.05%	0.01%	0.06%

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

Note-
- NA**-** Service provider doesn't provide services in respective technology.
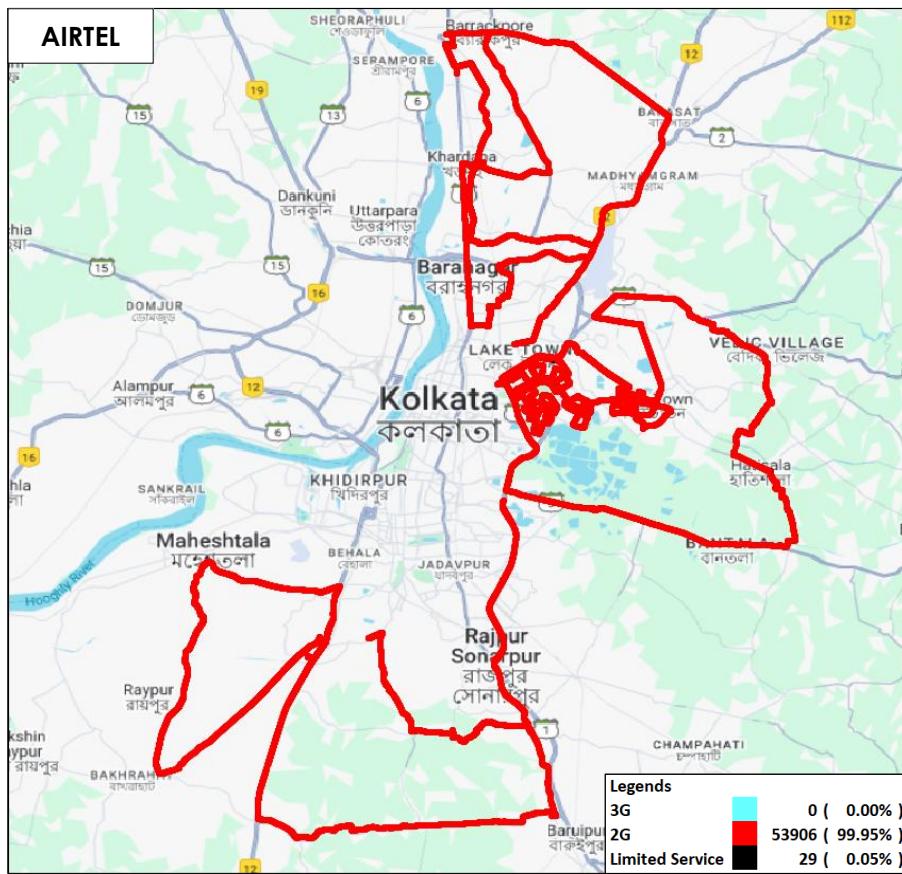
**Figure-9:** Serving technology plots 3G/2G network mode – AIRTEL

Legends	
3G	0 (0.00%)
2G	53906 (99.95%)
Limited Service	29 (0.05%)
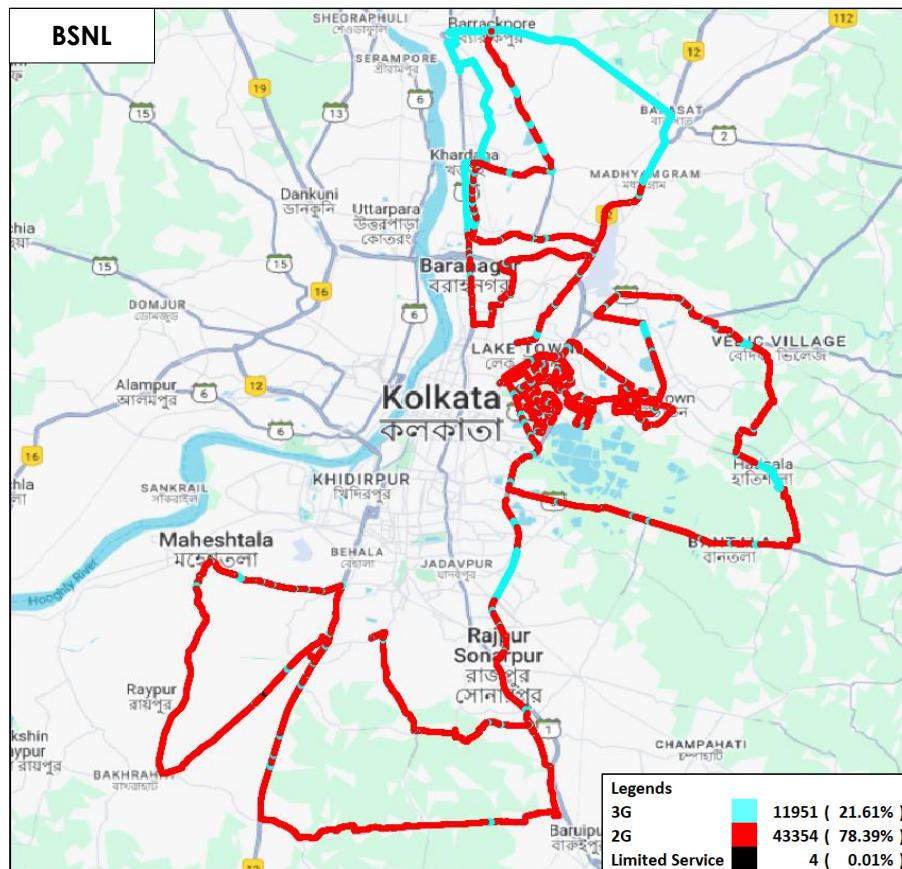
Figure-10: Serving technology plots 3G/2G network mode –BSNL.

Legends	
3G	11951 (21.61%)
2G	43354 (78.39%)
Limited Service	4 (0.01%)
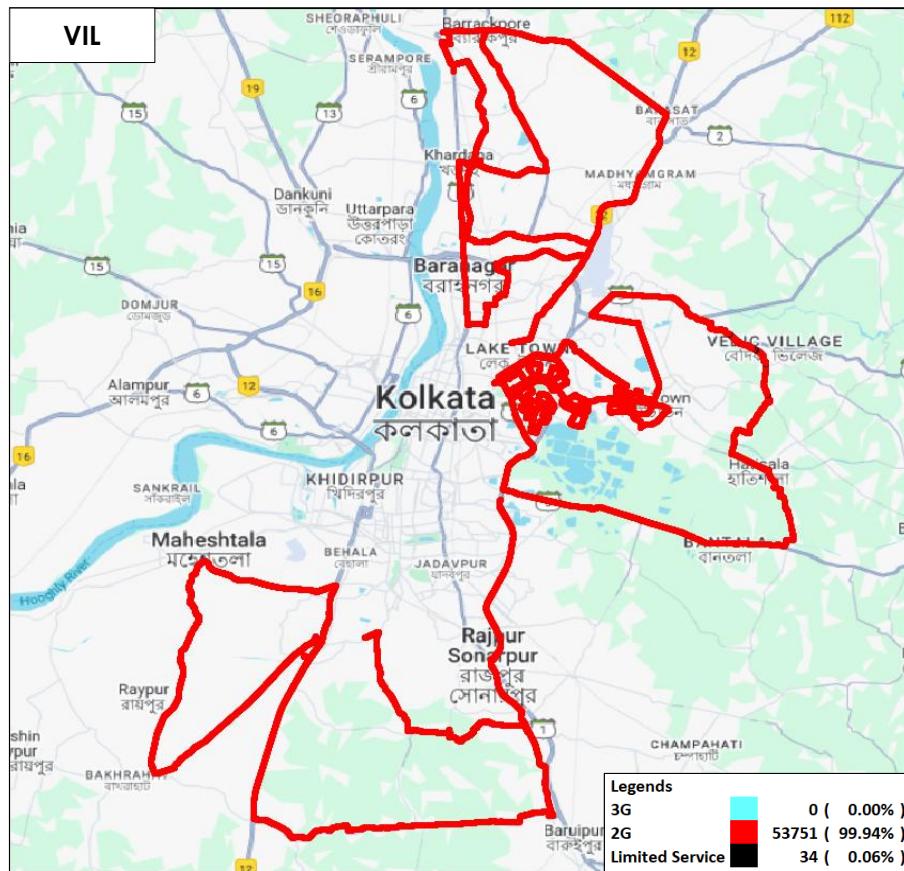
Figure-11: Serving technology plots 3G/2G network mode –VIL.

(c) Network Signal Strength Distribution: The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 34, 35 & 36 for map view)
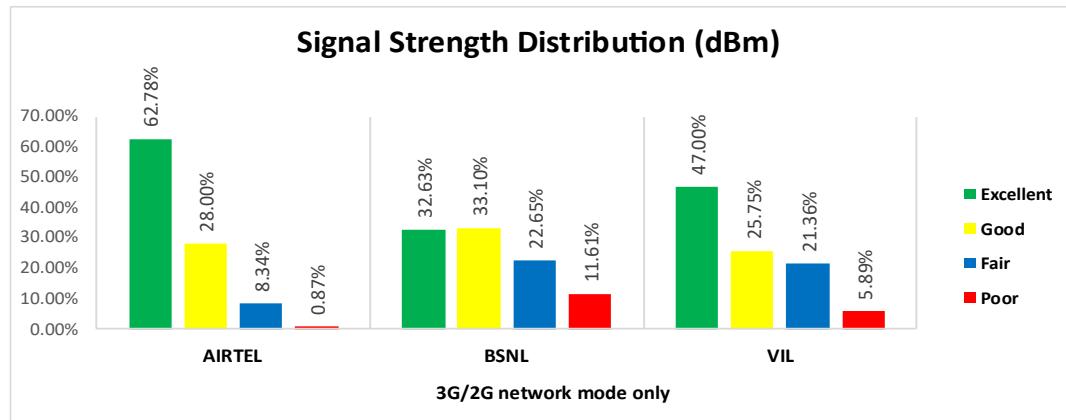

Figure-12: Signal strength distribution 3G/2G network mode only.

Observations:

- Airtel has 63% of samples falling in the excellent signal strength category.
- BSNL has 33% of samples falling in the excellent signal strength category.
- VIL has 47% of samples falling in the excellent signal strength category.

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

Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Call Attempts	400	415	400	404
Call Setup Success Rate %	99.75	95.90	100.00	99.75
Drop Call Rate %	0.25	3.02	0.00	0.25
Call Setup Time Average (Second)	0.74	3.15	0.57	0.91
Handover Success Rate %	100.00	99.76	99.97	100.00

**Table-15:** Summary of voice call performance in network auto-selection mode.
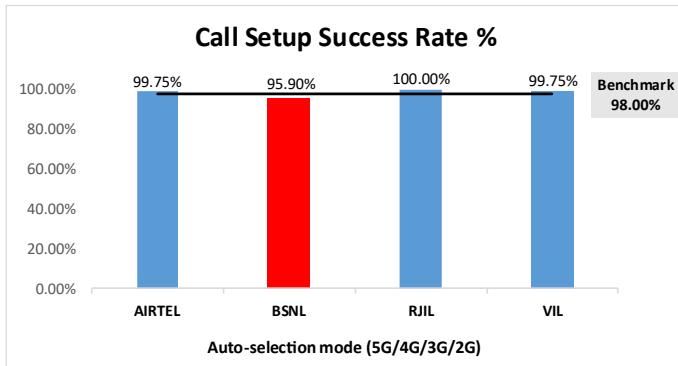
**Figure-13:** Performance for call setup success rate.
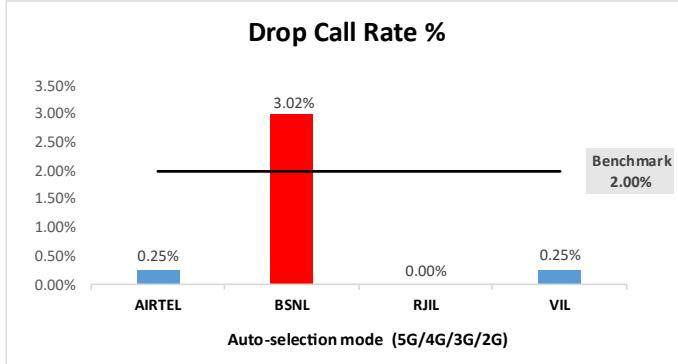
Figure-14: Performance for drop call rate.

Parameter	Service Provider			
	Mobile-to-Mobile (5G/4G - Open Mode)			
	AIRTEL	BSNL	RJIL	VIL
Call Established (within service provider Network)	391	407	395	392
Number of silence call for >4 Sec	7	19	5	6
Silence Call Rate %	1.79	4.67	1.27	1.53
Number of silence instances for >4 Sec	7	26	6	8
Number of silence instances for >3 Sec	12	55	7	34
Number of silence instances for >2 sec	21	91	16	141
RTP Jitter (4G & 5G) in ms	3.95	8.44	15.42	15.86
Packet loss Rate Downlink %	0.28	4.49	0.65	1.76
Packet loss Rate Uplink %	0.25	3.71	0.36	0.66

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

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

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

Speech Quality (MOS) distribution	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
Total Number of MOS Samples for calls in table-16	3513	3113	3475	3445
Speech Quality (Average MOS)	4.04	3.38	3.89	4.33
Number of samples with MOS >=4 to <5 (Excellent)	3050	1479	2407	2811
Number of samples with MOS >=3 to <4 (Good)	404	561	913	402
Number of samples with MOS >=2 to <3 (Fair)	41	653	91	98
Number of samples with MOS >=1 to <2 (Poor)	18	420	64	134
%age of samples with MOS >=4 to <5 (Excellent)	86.82%	47.51%	69.27%	81.60%
%age of samples with MOS >=3 to <4 (Good)	11.50%	18.02%	26.27%	11.67%
%age of samples with MOS >=2 to <3 (Fair)	1.17%	20.98%	2.62%	2.84%
%age of samples with MOS >=1 to <2 (Poor)	0.51%	13.49%	1.84%	3.89%

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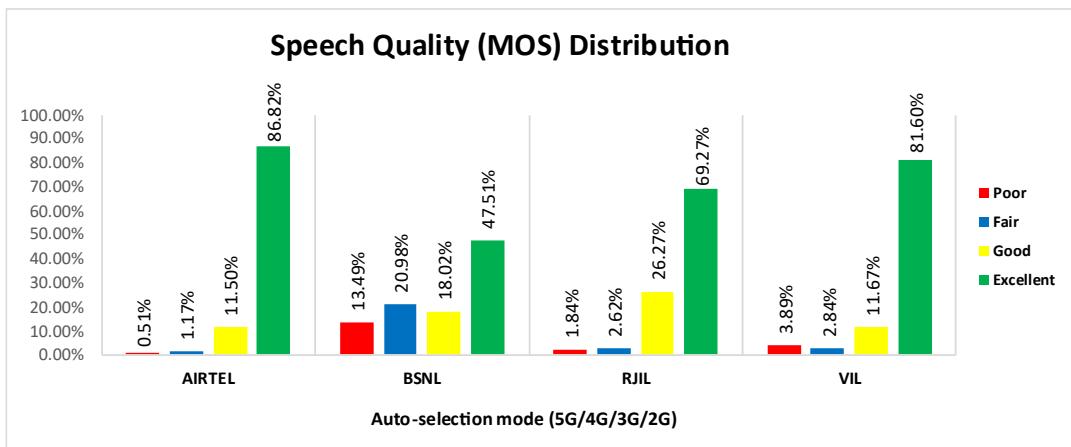
Figure-15: Distribution of samples in MOS range.

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

Technology	Service Provider			
	AIRTEL	BSNL	RJIL	VIL
5G	0.96%	NA	61.06%	NA
4G	97.06%	85.85%	38.92%	100.00%
3G	NA	1.56%	NA	NA
2G	1.97%	12.43%	NA	0.00%
Limited Service	0.00%	0.16%	0.01%	0.00%

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

> **Note**-
> • NA- Service provider doesn't provide services in respective technology.
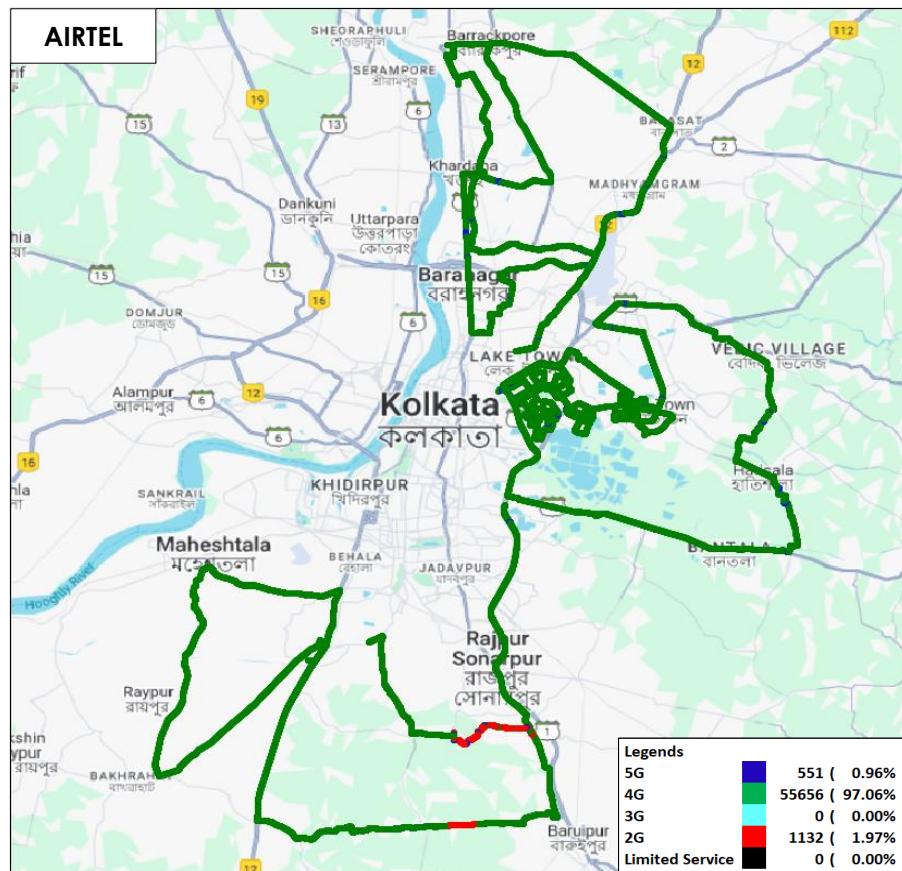
Figure-16: Serving technology plots in auto-selection mode (5G/4G/3G/2G) -AIRTEL.

Legends
5G		551 (	0.96%)
4G		55656 (	97.06%)
3G		0 (	0.00%)
2G		1132 (	1.97%)
Limited Service		0 (	0.00%)
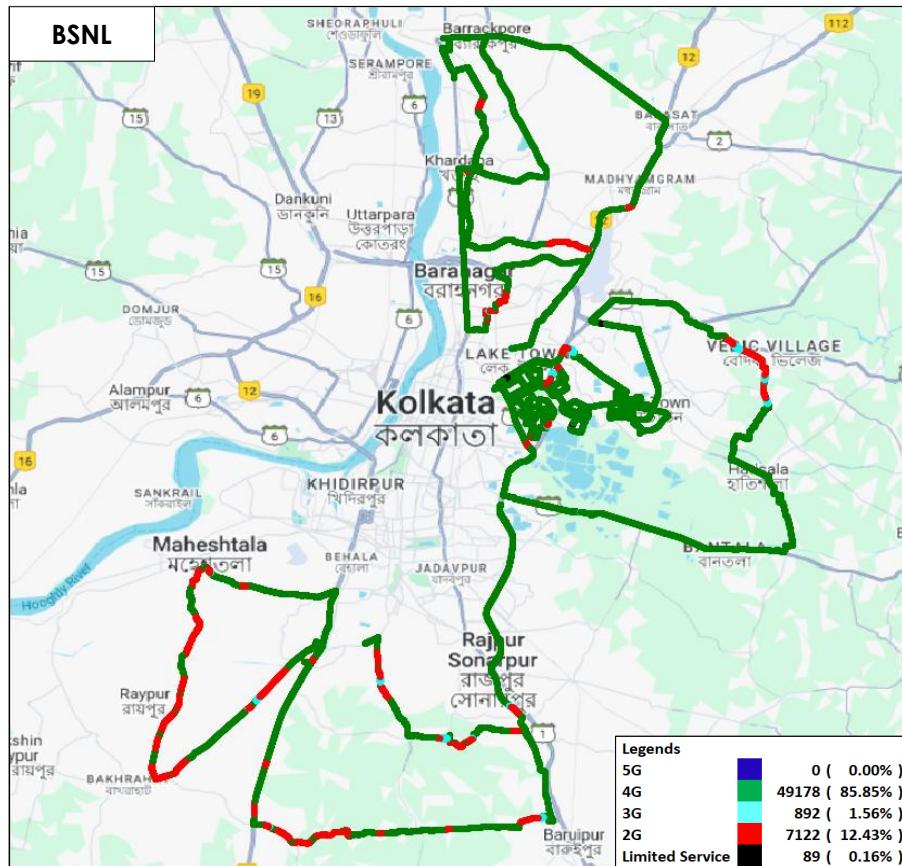
Figure-17: Serving technology plots in auto-selection mode (5G/4G/3G/2G) - BSNL (4G being rolled out)

Legends
|			
5G		0 (	0.00%)
4G		49178 (	85.85%)
3G		892 (	1.56%)
2G		7122 (	12.43%)
Limited Service		89 (	0.16%)
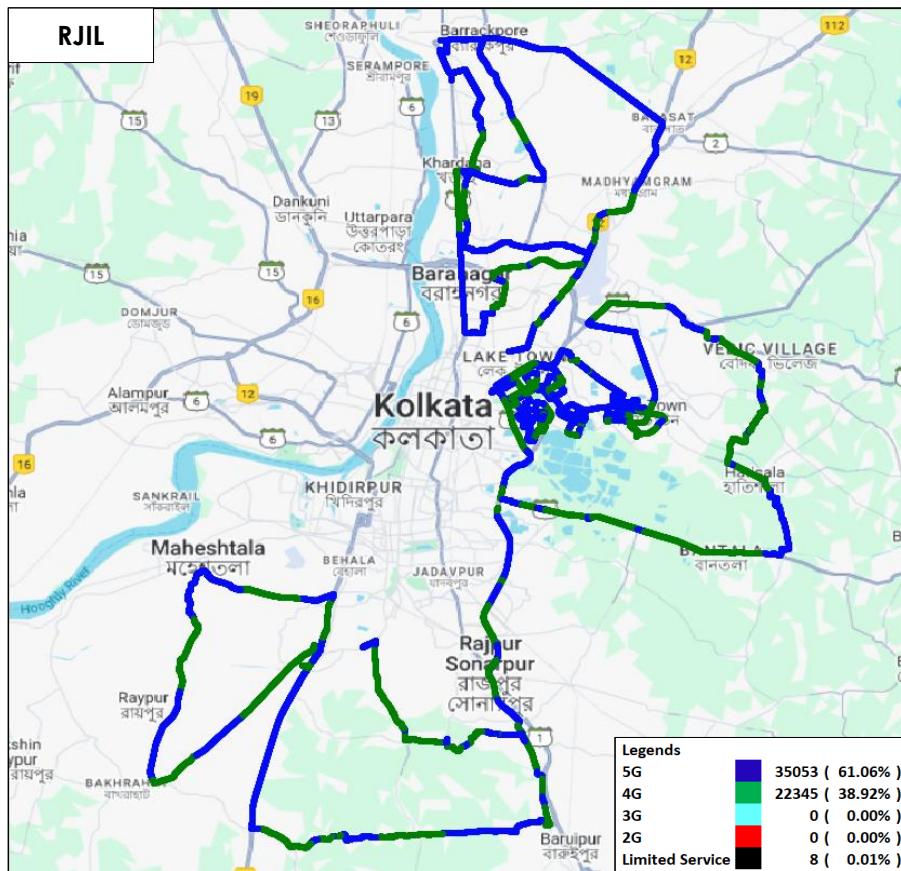
Figure-18: Serving technology plots in auto-selection mode (5G/4G/3G/2G)- RJIL.
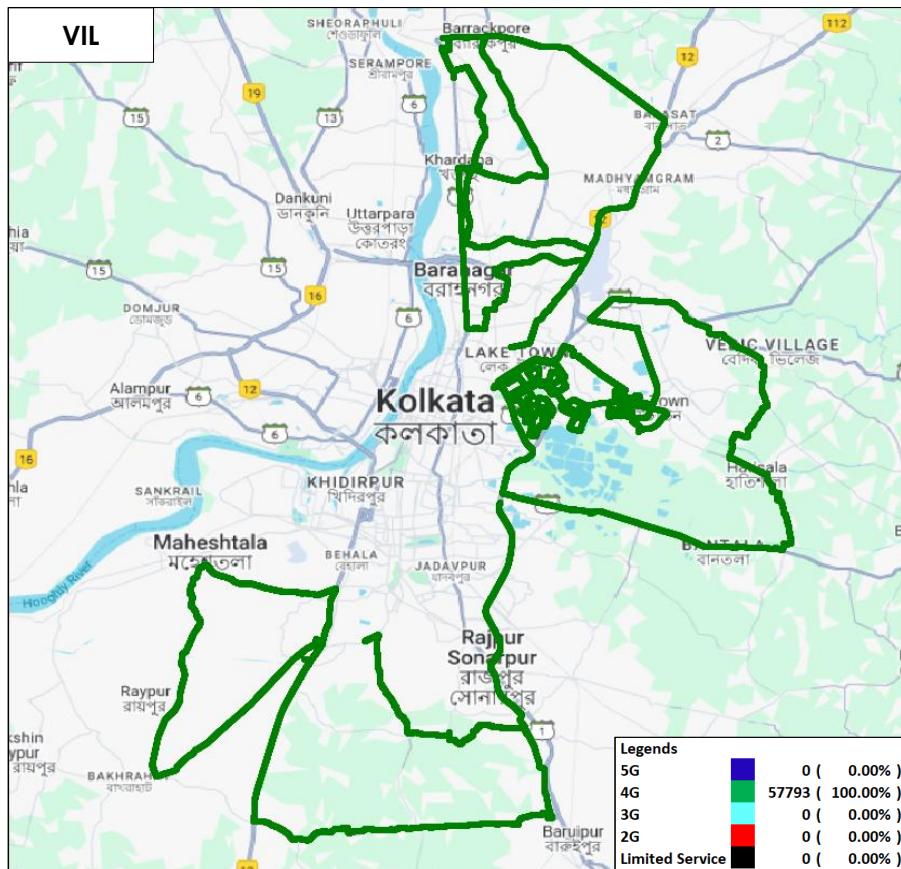

Figure-19: Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL.

(g) Network Signal Strength Distribution: The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-37, 38, 39 & 40 for map view)
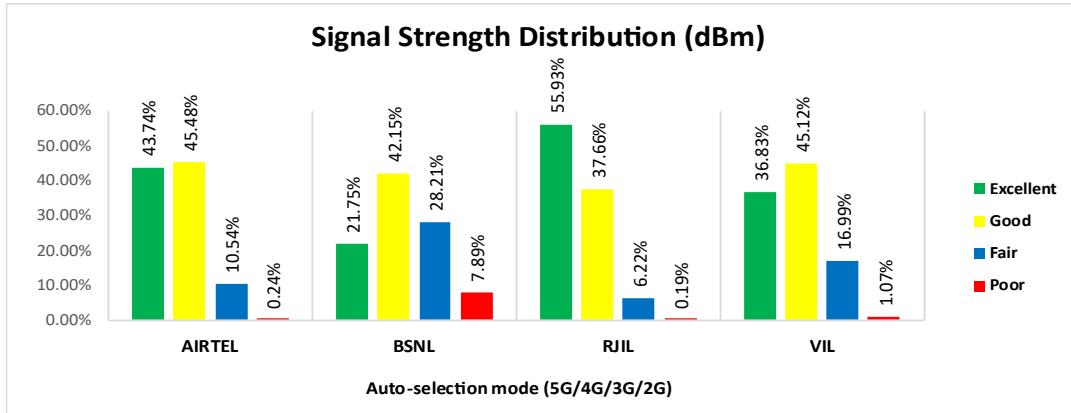

Figure-20: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

Observations:

- Airtel has 44% of samples falling in the excellent signal strength category.
- BSNL has 22% of samples falling in the excellent signal strength category.
- RJIL has 56% of samples falling in the excellent signal strength category.
- VIL has 37% of samples falling in the excellent signal strength category.

4.2.4 Data performance

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

Parameters		Service Provider			
		Auto-selection mode (5G/4G/3G/2G)			
		AIRTEL	BSNL	RJIL	VIL
Download Throughput (Mbits/s)	**Average**	251.84	4.23	282.40	37.00
	80th Percentile	376.99	6.14	402.02	52.64
	20th Percentile	118.05	1.46	148.88	15.57
Upload Throughput (Mbits/s)	**Average**	46.13	4.48	33.39	12.14
	80th Percentile	74.47	7.36	53.38	18.68
	20th Percentile	16.85	1.76	11.20	4.79
Latency (ms)	**50th Percentile**	41.72	58.05	30.72	62.59

Table-19: Summary of Data performance in network auto-selection mode.
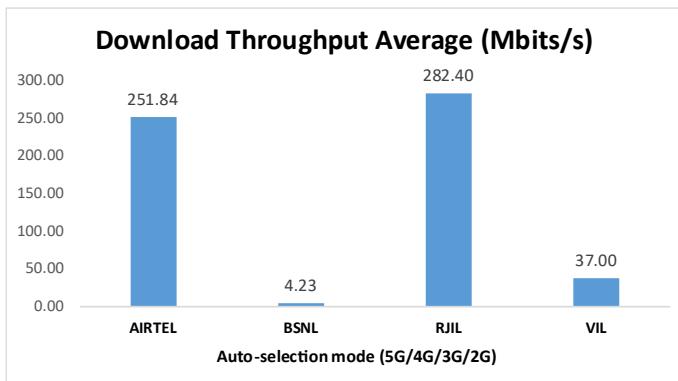
Figure- 21: Download throughput

Upload Throughput Average (Mbits/s)

	AIRTEL	BSNL	RJIL	VIL
	46.13	4.48	33.39	12.14

Auto-selection mode (5G/4G/3G/2G)
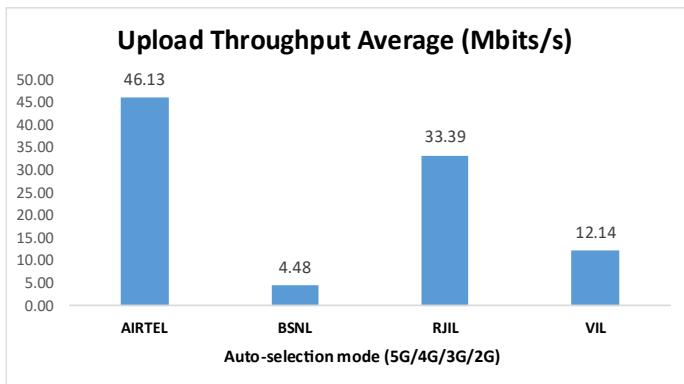
Figure- 22: Upload throughput

4.3 Hotspots

Hotspot testing has been done from 10th November 2025 to 14th November 2025. Ten locations have been tested in city.

4.3.1 Locations
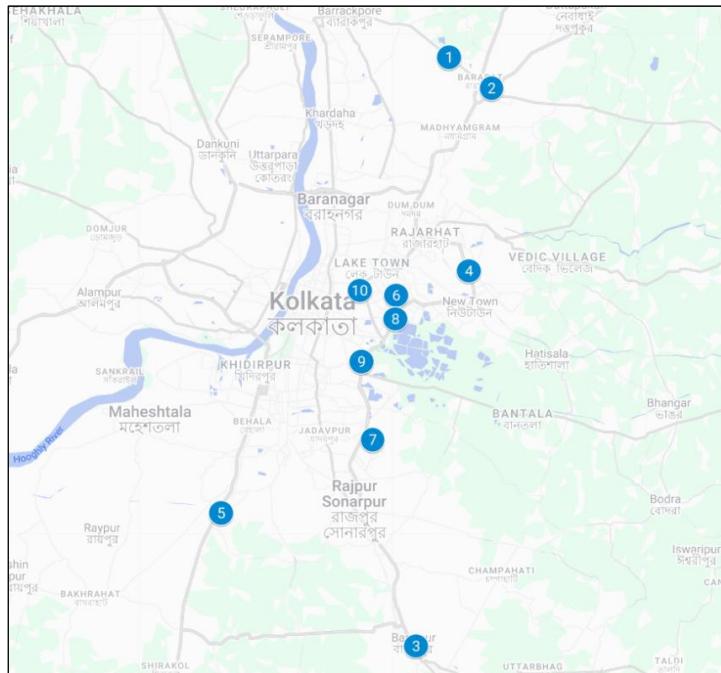
Figure- 23: Hotspot locations

4.3.2 Hotspot covered

1. Adamas University Barasat
2. Barasat Champadali Bus Stand
3. Baruipur Super Speciality Hospital Baruipur
4. Eco Park Major Arterial Road Newtown
5. Indian Institute of Management Calcutta
6. Karunamoyee Bus Terminus Bidhannagar
7. Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur
8. Nicco Park HM Block Sector IV Bidhannagar
9. Science City JBS Haldane AVE Mirania Gardens Topsia
10. Ultadanga Hudco More

4.3.3 Voice performance

Overall Voice Performance				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	100	100	100	100
Call Setup Success Rate %	100.00	98.00	100.00	99.00
Drop Call Rate %	0.00	0.00	0.00	1.01
Call Setup Time-Average (Second)	0.70	2.51	0.53	1.07

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

Adamas University Barasat				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.74	2.68	0.48	1.37

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

Barasat Champadali Bus Stand				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.59	2.85	0.45	1.42

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

Baruipur Super Speciality Hospital Baruipur				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.70	2.32	0.57	1.33

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

Eco Park Major Arterial Road Newtown				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.69	2.63	0.48	0.76

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

Indian Institute of Management Calcutta				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.71	2.32	0.52	1.40

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

Karunamoyee Bus Terminus Bidhannagar				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.73	2.70	0.47	1.07

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

Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	80.00	100.00	90.00
Drop Call Rate %	0.00	0.00	0.00	11.11
Call Setup Time-Average (Second)	0.74	2.39	0.57	1.07

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

Nicco Park HM Block Sector IV Bidhannagar				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.68	2.22	0.49	0.82

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

Science City JBS Haldane AVE Mirania Gardens Topsia				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.74	2.44	0.71	0.74

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

Ultadanga Hudco More				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	10	10	10	10
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	0.00	0.00	0.00
Call Setup Time-Average (Second)	0.63	2.48	0.53	0.72

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

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

Overall Data Performance				
Parameters	Service Provider			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	160.88	3.70	273.25	33.33
Download Throughput 80th Percentile (Mbit/s)	238.38	4.53	366.34	42.38
Download Throughput 20th Percentile (Mbit/s)	40.15	2.21	170.24	12.87
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	34.39	3.34	27.93	9.89
Upload Throughput 80th Percentile (Mbit/s)	71.37	4.50	44.92	16.51
Upload Throughput 20th Percentile (Mbit/s)	3.44	2.15	9.86	3.24
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.13	3.07	1.95	2.88
Youtube Initial Buffer Delay (Second)	1.01	2.87	0.75	1.35
Latency (ms) - 50th Percentile	44.21	55.33	32.62	57.83
Jitter (ms)	13.39	4.39	14.92	47.69
Packet Loss Rate%	8.02	6.51	6.19	4.10
Packet Loss Rate- 90th percentile	15.42	8.78	8.18	12.36

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

Adamas University Barasat				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	278.32	2.59	176.12	34.60
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	76.67	0.79	29.08	14.52
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	3.59	7.18	1.67	2.56
Youtube Initial Buffer Delay (Second)	1.59	12.13	0.55	0.78
Latency (ms) - 50th Percentile	48.68	65.13	34.49	65.50
Jitter (ms)	8.41	13.34	4.35	11.23
Packet Loss Rate%	0.30	10.30	0.00	0.70

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

Barasat Champadali Bus Stand				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average (Mbits/s)	204.08	3.31	272.47	26.47
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	63.13	3.26	27.15	4.42
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.63	2.05	1.98	2.92
Youtube Initial Buffer Delay (Second)	0.53	1.34	0.64	1.57
Latency (ms) - 50th Percentile	43.56	51.41	35.98	73.21
Jitter (ms)	5.80	3.25	4.79	11.44
Packet Loss Rate%	0.60	0.50	0.00	17.50

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

Baruipur Super Speciality Hospital Baruipur				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	230.56	1.72	573.23	34.05
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	9.87	3.81	65.88	6.98
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.38	2.15	1.60	1.99
Youtube Initial Buffer Delay (Second)	1.13	1.53	0.56	0.97
Latency (ms) - 50th Percentile	42.25	57.26	28.93	68.88
Jitter (ms)	4.11	2.29	2.60	8.59
Packet Loss Rate%	5.10	1.20	0.00	1.40

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

Eco Park Major Arterial Road Newtown				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	90.33	3.21	298.02	16.60
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	45.68	3.66	47.45	5.17
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.62	1.91	1.70	2.16
Youtube Initial Buffer Delay (Second)	0.77	1.93	0.67	1.12
Latency (ms) - 50th Percentile	38.81	55.34	29.71	60.56
Jitter (ms)	7.99	3.26	2.81	7.65
Packet Loss Rate%	12.50	0.30	0.00	1.10

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

Indian Institute of Management Calcutta				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	43.72	5.49	190.22	85.56
Download Session Setup Success Rate%	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	1.58	3.65	8.58	16.90
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.68	2.01	1.99	2.46
Youtube Initial Buffer Delay (Second)	1.06	1.04	0.67	0.75
Latency (ms)- 50th Percentile	66.05	53.46	31.15	58.32
Jitter (ms)	7.33	3.30	7.91	5.77
Packet Loss Rate%	2.10	0.60	0.40	0.50

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

Karunamoyee Bus Terminus Bidhannagar				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	42.70	1.81	475.89	2.14
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	2.60	2.29	11.83	0.88
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.54	4.63	1.67	9.03
Youtube Initial Buffer Delay (Second)	1.94	2.28	0.58	-
Latency (ms) - 50th Percentile	45.33	57.50	34.33	50.17
Jitter (ms)	73.81	2.44	4.24	405.22
Packet Loss Rate%	7.80	4.00	0.10	5.90

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

Note-"-" Youtube tests were failed.

Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	9.35	2.56	156.63	10.12
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	7.72	3.45	43.96	2.25
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	2.66	2.00	2.27	2.76
Youtube Initial Buffer Delay (Second)	1.07	1.73	0.77	4.41
Latency (ms) - 50th Percentile	70.17	55.24	41.64	81.00
Jitter (ms)	7.19	4.29	10.87	7.53
Packet Loss Rate%	9.50	3.30	3.10	13.00

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

Nicco Park HM Block Sector IV Bidhannagar				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	148.76	4.55	229.79	41.77
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	47.95	1.20	15.93	27.12
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.71	4.41	1.78	2.41
Youtube Initial Buffer Delay (Second)	0.55	5.97	0.61	0.65
Latency (ms) - 50th Percentile	40.41	60.26	33.28	41.19
Jitter (ms)	6.53	4.03	2.16	5.89
Packet Loss Rate%	0.30	1.10	0.10	0.30

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

Science City JBS Haldane AVE Mirania Gardens Topsia				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	174.22	8.65	97.14	27.10
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	13.17	6.09	3.88	5.25
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.79	2.32	3.11	2.17
Youtube Initial Buffer Delay (Second)	0.70	0.96	1.64	0.84
Latency (ms) - 50th Percentile	43.39	54.78	60.96	46.29
Jitter (ms)	7.99	3.90	104.64	6.37
Packet Loss Rate%	42.00	43.10	58.20	0.10

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

Ultadanga Hudco More				
Parameters	**Service Provider**			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Download Throughput Average (Mbits/s)	386.78	3.15	263.01	54.93
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	75.54	4.18	25.56	13.62
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Web Browsing Delay (Second)	1.74	2.35	1.72	2.22
Youtube Initial Buffer Delay (Second)	0.72	1.40	0.96	1.03
Latency (ms) - 50th Percentile	40.27	53.56	30.32	44.81
Jitter (ms)	4.64	4.17	5.01	6.90
Packet Loss Rate%	0.00	0.70	0.00	0.50

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

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

	Overall Data Performance				
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	197.95	-	292.71	-
	Upload Throughput Average (Mbits/s)	44.78	-	33.52	-
4G	Download Throughput Average (Mbits/s)	31.80	4.19	46.77	29.19
	Upload Throughput Average (Mbits/s)	14.90	5.95	10.90	11.28

Table-42: Overall Summary of 5G only & 4G only data download & upload speed.

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

	Adamas University Barasat				
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	281.26	-	157.12	-
	Upload Throughput Average (Mbits/s)	88.68	-	26.73	-
4G	Download Throughput Average (Mbits/s)	49.12	3.86	31.20	44.37
	Upload Throughput Average (Mbits/s)	10.83	4.36	15.84	13.58

Table-43: Overall Summary of 5G only & 4G only data download & upload speed.

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

	Barasat Champadali Bus Stand				
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	176.88	-	168.15	-
	Upload Throughput Average (Mbits/s)	84.00	-	17.80	-
4G	Download Throughput Average (Mbits/s)	80.00	3.90	88.08	12.18
	Upload Throughput Average (Mbits/s)	30.13	5.53	17.83	3.35

Table-44: Overall Summary of 5G only & 4G only data download & upload speed.

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

	Baruipur Super Speciality Hospital Baruipur				
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	Download Throughput Average (Mbits/s)	353.67	-	477.23	-
	Upload Throughput Average (Mbits/s)	31.58	-	26.68	-
4G	Download Throughput Average (Mbits/s)	49.26	1.55	78.70	42.86
	Upload Throughput Average (Mbits/s)	30.92	6.21	18.83	13.91

Table-45: Overall Summary of 5G only & 4G only data download & upload speed.

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

Eco Park Major Arterial Road Newtown					
	Parameters	Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	89.14	-	290.16	-
	Upload Throughput Average (Mbits/s)	45.38	-	59.49	-
4G	Download Throughput Average (Mbits/s)	12.74	3.01	14.64	21.77
	Upload Throughput Average (Mbits/s)	2.75	5.53	5.21	23.76

Table-46: Overall Summary of 5G only & 4G only data download & upload speed.

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

Indian Institute of Management Calcutta					
	Parameters	Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	171.29	-	186.83	-
	Upload Throughput Average (Mbits/s)	13.57	-	18.77	-
4G	Download Throughput Average (Mbits/s)	16.32	7.44	21.27	40.39
	Upload Throughput Average (Mbits/s)	11.44	5.90	5.82	13.55

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

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

Karunamoyee Bus Terminus Bidhannagar					
	Parameters	Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	47.03	-	675.62	-
	Upload Throughput Average (Mbits/s)	6.71	-	101.07	-
4G	Download Throughput Average (Mbits/s)	42.45	2.08	26.78	24.94
	Upload Throughput Average (Mbits/s)	8.23	2.44	10.98	0.44

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

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

Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur					
	Parameters	Service Provider			
		AIRTEL	BSNL	RJIL	VIL
5G	Download Throughput Average (Mbits/s)	-	-	251.49	-
	Upload Throughput Average (Mbits/s)	-	-	20.26	-
4G	Download Throughput Average (Mbits/s)	5.21	2.30	47.05	4.61
	Upload Throughput Average (Mbits/s)	6.96	4.51	4.99	4.16

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

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

Nicco Park HM Block Sector IV Bidhannagar					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	130.64	-	280.31	-
	Upload Throughput Average (Mbits/s)	56.93	-	23.99	-
4G	**Download Throughput Average (Mbits/s)**	15.72	3.59	39.60	58.44
	Upload Throughput Average (Mbits/s)	26.10	4.76	5.92	20.72

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

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

Science City JBS Haldane AVE Mirania Gardens Topsia					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	160.74	-	163.28	-
	Upload Throughput Average (Mbits/s)	24.23	-	10.59	-
4G	**Download Throughput Average (Mbits/s)**	29.53	10.68	57.77	15.95
	Upload Throughput Average (Mbits/s)	3.43	10.44	9.73	10.56

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

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

Ultadanga Hudco More					
Parameters		**Service Provider**			
		AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	**Download Throughput Average (Mbits/s)**	383.38	-	276.92	-
	Upload Throughput Average (Mbits/s)	68.55	-	29.78	-
4G	**Download Throughput Average (Mbits/s)**	17.68	3.51	62.63	26.40
	Upload Throughput Average (Mbits/s)	18.21	9.82	13.82	6.58

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

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

4.4 Walk Test

Walk test has been conducted on 13th November 2025. Three locations have been tested in city.

4.4.1 Walk test locations
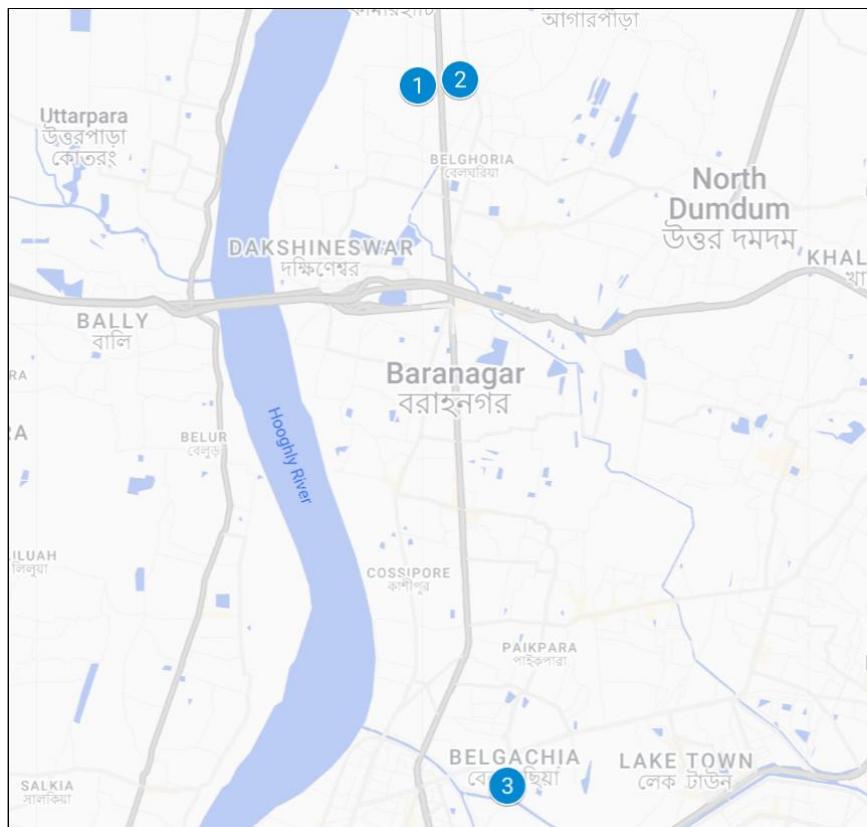
Figure-24: Walk test locations.

4.4.2 Walk test covered

1. College of Medicine & Sagore Dutta Hospital Kamarhati
2. JIS University Agarpara
3. Kolkata Railway Station

4.4.3 Voice performance

i) College of Medicine & Sagore Dutta Hospital Kamarhati
(a) Voice Call Performance in auto network selection mode (5G/4G/3G/2G)

College of Medicine & Sagore Dutta Hospital Kamarhati				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	11	11	11	11
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)	0.68	2.73	0.57	1.56
Handover Success Rate %	100.00	100.00	100.00	100.00

Table-53: Summary of Voice performance in network auto-selection mode (5G/4G/3G/2G).
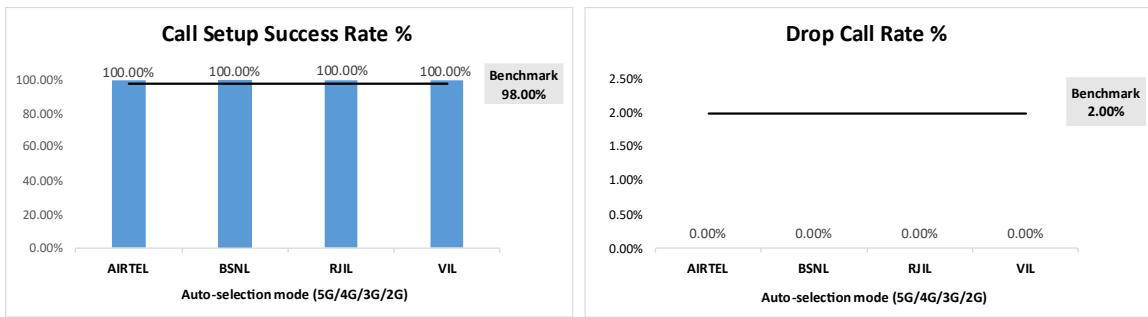
Figure- 25: Performance for call setup success rate and drop call rate

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

College of Medicine & Sagore Dutta Hospital Kamarhati				
Technology	**Service Provider**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	0.00%	NA	42.83%	NA
4G	100.00%	100.00%	57.17%	100.00%
3G	NA	0.00%	NA	NA
2G	0.00%	0.00%	NA	0.00%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-54: Time spent on technology during walk test.

(c) Network Signal Strength distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G).
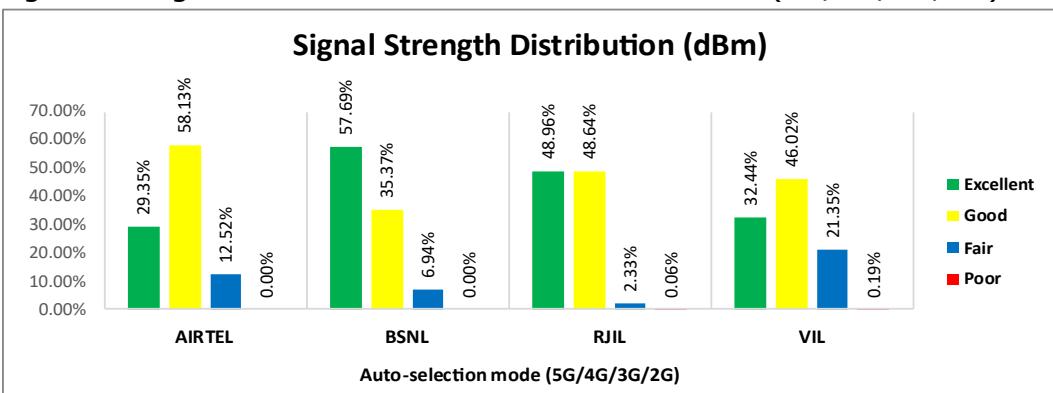
Figure-26: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

ii) JIS University Agarpara

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

JIS University Agarpara				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	13	11	13	11
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)	0.67	2.46	0.59	0.96
Handover Success Rate %	100.00	-	100.00	100.00

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

Note- "-"Handover did not attempt.
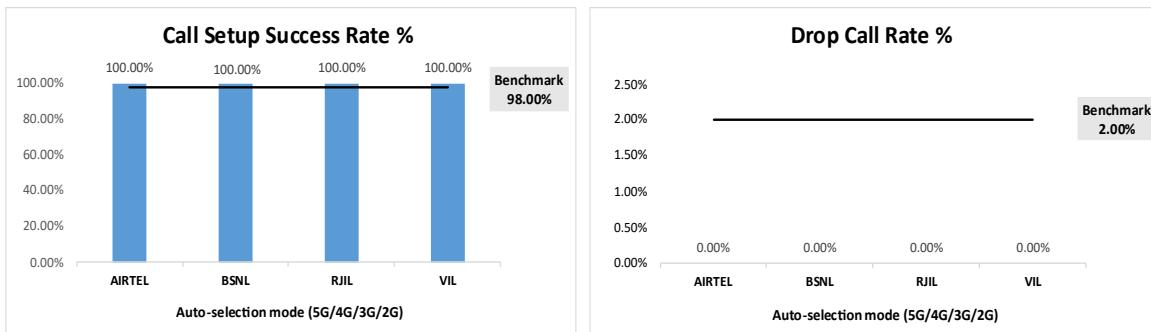
Figure- 27: Performance for call setup success rate and drop call rate

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

JIS University Agarpara				
Technology	**Service Provider**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	0.00%	NA	100.00%	NA
4G	100.00%	100.00%	0.00%	100.00%
3G	NA	0.00%	NA	NA
2G	0.00%	0.00%	NA	0.00%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-56: Time spent on technology during walk test.

(c) Network Signal Strength distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G).
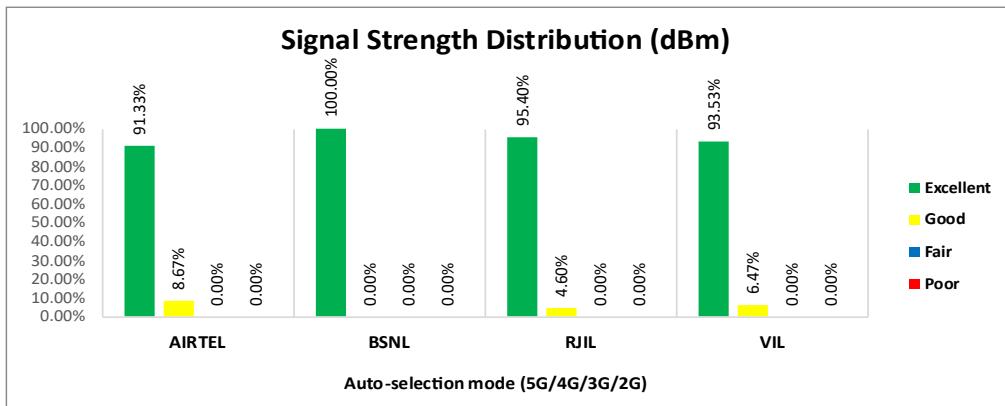
Figure-28: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

iii) Kolkata Railway Station

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

Kolkata Railway Station				
Parameters	**Service Provider**			
	Auto-selection mode (5G/4G/3G/2G)			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
Call Attempt	12	11	12	11
Call Setup Success Rate %	100.00	100.00	100.00	100.00
Drop Call Rate %	0.00	9.09	0.00	0.00
Call Setup Time-Average (Sec)	0.69	2.69	0.50	0.75
Handover Success Rate %	100.00	100.00	100.00	100.00

Table-57: Summary of Voice performance in network auto-selection mode (5G/4G/3G/2G).
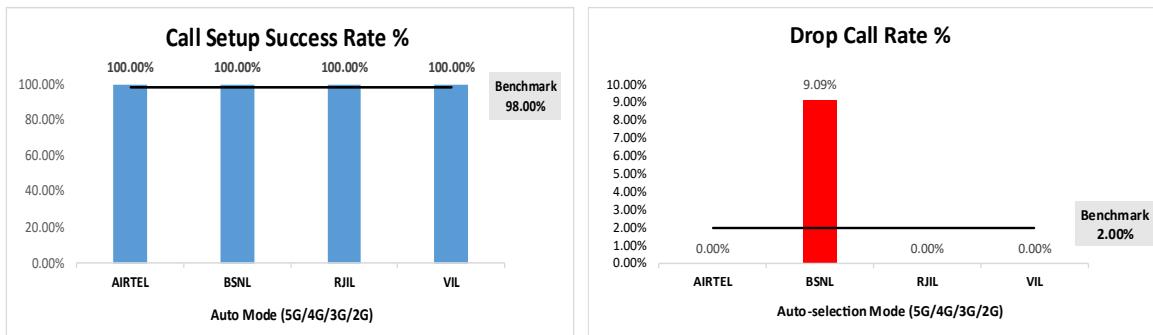
Figure- 29: Performance for call setup success rate and drop call rate

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

Kolkata Railway Station				
Technology	**Service Provider**			
	AIRTEL	**BSNL**	**RJIL**	**VIL**
5G	0.17%	NA	90.99%	NA
4G	99.83%	100.00%	9.01%	100.00%
3G	NA	0.00%	NA	NA
2G	0.00%	0.00%	NA	0.00%
Limited service	0.00%	0.00%	0.00%	0.00%

Table-58: Time spent on technology during walk test.

(c) Network Signal Strength distribution: The following chart provide signal strength distribution for auto-selection mode (5G/4G/3G/2G).
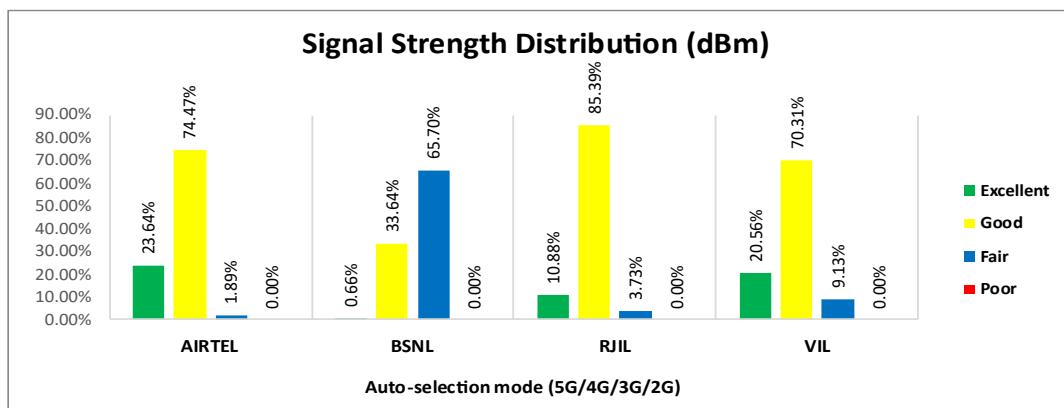
Figure-30: Signal strength distribution auto-selection mode 5G/4G/3G/2G.

4.4.4 Data performance

i) College of Medicine & Sagore Dutta Hospital Kamarhati
(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

College of Medicine & Sagore Dutta Hospital Kamarhati				
	Service Provider			
Parameters	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average(Mbits/s)	281.45	5.20	186.80	29.50
Download Throughput 80th Percentile	354.40	6.25	213.54	35.59
Download Throughput 20th Percentile	178.01	4.07	159.58	23.39
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	32.42	9.14	25.28	13.42
Upload Throughput 80th Percentile	57.16	10.96	33.97	23.20
Upload Throughput 20th Percentile	8.41	7.02	16.24	8.34
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms)-50th Percentile	40.89	52.14	35.60	64.08

Table-59: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).
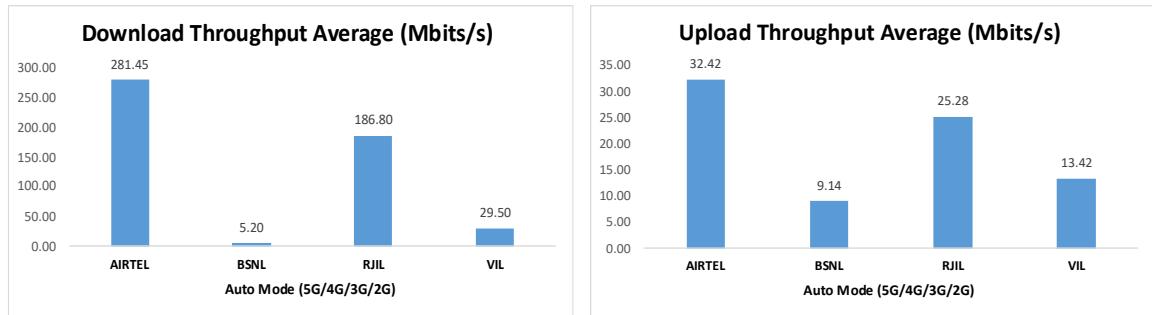
Figure- 31: Download and Upload throughput.

ii) JIS University Agarpara
(a) Data Parameters (Auto-selection mode- 5G/4G/3G/2G)

JIS University Agarpara				
	Service Provider			
Parameters	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average(Mbits/s)	241.26	9.13	151.30	25.97
Download Throughput 80th Percentile	280.39	10.31	199.59	32.66
Download Throughput 20th Percentile	195.05	7.46	100.13	17.87
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	19.61	12.22	55.24	24.38
Upload Throughput 80th Percentile	27.61	13.29	77.21	26.84
Upload Throughput 20th Percentile	10.29	10.93	37.20	21.29
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms)-50th Percentile	41.97	52.38	32.76	65.18

Table-60: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).
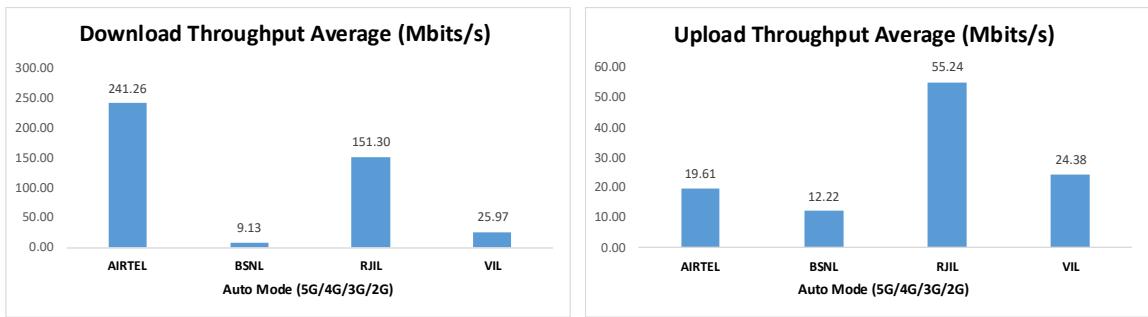
Figure- 32: Download and Upload throughput

iii) Kolkata Railway Station

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

Kolkata Railway Station				
Parameters	Service Provider			
	Auto-Selection Mode (5G/4G/3G/2G)			
	AIRTEL	BSNL	RJIL	VIL
Download Throughput Average(Mbits/s)	231.84	2.41	163.07	33.05
Download Throughput 80th Percentile	368.32	3.51	208.68	38.00
Download Throughput 20th Percentile	138.46	1.59	107.25	28.26
Download Session Setup Success Rate %	100.00	100.00	100.00	100.00
Upload Throughput Average (Mbits/s)	40.28	3.19	24.72	14.46
Upload Throughput 80th Percentile	72.32	4.61	32.53	22.98
Upload Throughput 20th Percentile	12.25	1.29	14.32	5.93
Upload Session Setup Success Rate %	100.00	100.00	100.00	100.00
Latency (ms)-50th Percentile	40.26	57.04	28.11	63.67

Table-61: Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).
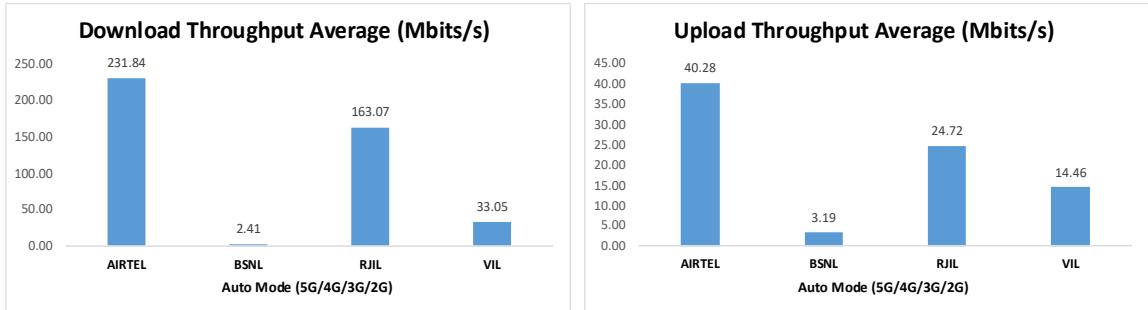
Figure- 33: Download and Upload throughput

5. Voice & Data Key findings

5.1 Overall Voice

1. **Call Setup Success Rate:**
   a) Airtel, BSNL and VIL have 99.75%, 99.49% and 99.48% call setup success rate respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL have 99.81%, 96.53%, 100.00% and 99.63% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

   c) Airtel had a 100.00% call setup success when calling BSNL and VIL whereas call blocking was observed when calling RJIL. (refer table-9)

   d) BSNL had a 100.00% call setup success rate while calling on peer service provider's network for inter-operator calls. (refer table-9)

   e) RJIL had a 100.00% call setup success when calling BSNL and VIL whereas call blocking was observed when calling Airtel. (refer table-9)

   f) VIL had a 100.00% call setup success when calling Airtel and RJIL whereas call blocking was observed when calling Airtel. (refer table-9)

2. **Call Setup Time**:
   a) Airtel, BSNL and VIL call setup time is 3.40, 2.36 and 4.63 seconds respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL & VIL call setup time is 0.73, 3.00, 0.56 & 0.95 seconds respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

3. **Call Silence/Mute Rate**: In packet switched network (4G/5G) Airtel, BSNL, RJIL and VIL have 1.79%, 4.67%, 1.27% and 1.53% silence call rate respectively. Further Airtel, BSNL, RJIL & VIL downlink RTP packet loss is 0.28%, 4.49%, 0.65% and 1.76% respectively. In uplink Airtel, BSNL, RJIL & VIL RTP packet loss is 0.25%, 3.71%, 0.36% & 0.66% respectively. (refer table-6)

4. **Drop Call Rate**:
   a) Airtel, BSNL and VIL drop call rate is 1.01%, 1.28% and 1.32% respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL drop call rate is 0.19%, 2.46%, 0.00% and 0.37% respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

5.2 Overall Data

1. **Data download and upload performance (Overall i.e. LSA):**
   a) Airtel, BSNL, RJIL and VIL average download speeds are 244.05 Mbps, 4.30 Mbps, 273.82 Mbps and 36.08 Mbps respectively. (refer table-11)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 43.96 Mbps, 4.71 Mbps, 32.98 Mbps and 12.34 Mbps respectively. (refer table-11)

2. **Data download and upload performance (static i.e. while stationary):**
   a) Airtel, BSNL, RJIL and VIL average download speeds are 160.88 Mbps, 3.70 Mbps, 273.25 Mbps and 33.33 Mbps respectively. (refer table-31)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 34.39 Mbps, 3.34 Mbps, 27.93 Mbps and 9.89 Mbps respectively. (refer table-31)

3. **Data session setup success rate (static i.e. while stationary):**
   a) All operators have 100.00% download session setup success rate. (refer table-31)

   b) All operators have 100.00% upload session setup success rate. (refer table-31)

5.3 Operator wise Key Findings

1. Airtel:
Voice

- 99.75% call setup success rate and 1.01% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 13)

- 99.81% call setup success rate and 0.19% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 99.75% call setup success rate and 0.25% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 53, 55 & 57)

Data

- Airtel has 244.05 Mbps average download speed & 43.96 Mbps average upload speed for LSA. (refer table-11)

- Airtel has 251.84 Mbps average download speed & 46.13 average upload speed across the measured routes for city drive. (refer table-19)

- Eco Park Major Arterial Road Newtown, Indian Institute of Management Calcutta, Karunamoyee Bus Terminus Bidhannagar and Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur have less download speed (less than 100 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-35, 36, 37 & 38)

- Baruipur Super Speciality Hospital Baruipur, Indian Institute of Management Calcutta, Karunamoyee Bus Terminus Bidhannagar, Narayana Hospital Mukundapur Market Nitai Nagar Santoshpur and Science City JBS Haldane AVE Mirania Gardens Topsia have less upload speed (less than 20 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 34, 36, 37, 38 & 40)

- JIS University Agarpara has less upload speed (less than 20 Mbps) out of total 3 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-60).

2. BSNL:
Voice

- 99.49% call setup success rate and 1.28% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 13)

- 96.53% call setup success rate and 2.46% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 95.90% call setup success rate and 3.02% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-15)

- 98.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at College of Medicine & Sagore Dutta Hospital Kamarhati and JIS University Agarpara walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 53 & 55)

- 100.00% call setup success rate and 9.09% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) at Kolkata Railway Station walk test location. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table- 57)

Data
- BSNL has 4.30 Mbps average download speed & 4.71 Mbps average upload speed for LSA. (refer table-11)

- BSNL has 4.23 Mbps average download speed & 4.48 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- All hotspot locations have less download speed (less than 10 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-32, 33, 34, 35, 36, 37, 38, 39, 40 & 41)

- Adamas University Barasat and Nicco Park HM Block Sector IV Bidhannagar have less upload speed (less than 2 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-32 & 39)

- All walk test locations have less download speed (less than 10 Mbps) in auto-selection mode (5G/4G/3G/2G). (refer table-59, 60 & 61)

3. RJIL:
Voice
- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 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-15)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 53, 55 & 57)

Data

- RJIL has 273.82 Mbps average download speed & 32.98 Mbps average upload speed for LSA. (refer table-11)

- RJIL has 282.40 Mbps average download speed & 33.39 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Science City JBS Haldane AVE Mirania Gardens Topsia has less download speed (less than 100 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 40)

- Indian Institute of Management Calcutta, Karunamoyee Bus Terminus Bidhannagar, Nicco Park HM Block Sector IV Bidhannagar and Science City JBS Haldane AVE Mirania Gardens Topsia have less upload speed (less than 20 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-36, 37, 39 & 40)

4. VIL:

Voice

- 99.48% call setup success rate and 1.32% drop call rate have been observed in 3G/2G network mode for LSA/city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-3 & 13)

- 99.63% call setup success rate and 0.37% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 99.75% call setup success rate and 0.25% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for city drive. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-15)

- 99.00% call setup success rate and 1.01% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all hotspot locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table- 53, 55 & 57)

Data

- VIL has 36.08 Mbps average download speed & 12.34 Mbps average upload speed for LSA. (refer table-11)

- VIL has 37.00 Mbps average download speed & 12.14 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Karunamoyee Bus Terminus Bidhannagar has less download speed (less than 10 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37)

- Karunamoyee Bus Terminus Bidhannagar has less upload speed (less than 2 Mbps) out of total 10 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37)

6. Annexure

6.1 Route wise coverage map

6.1.1 City
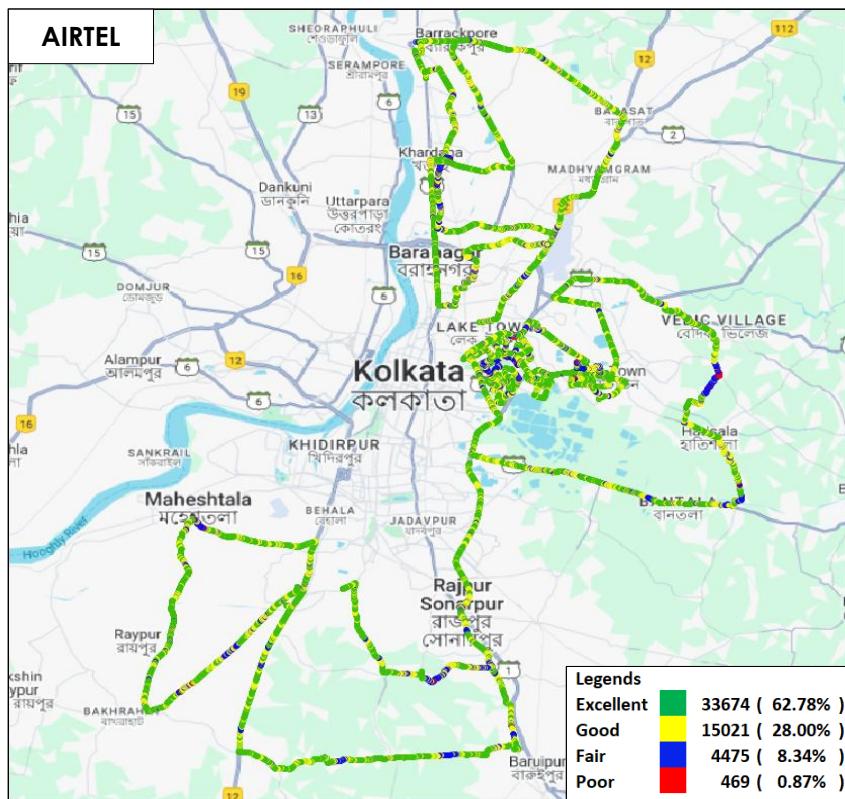
Figure-34: Signal strength 3G/2G network mode – AIRTEL.
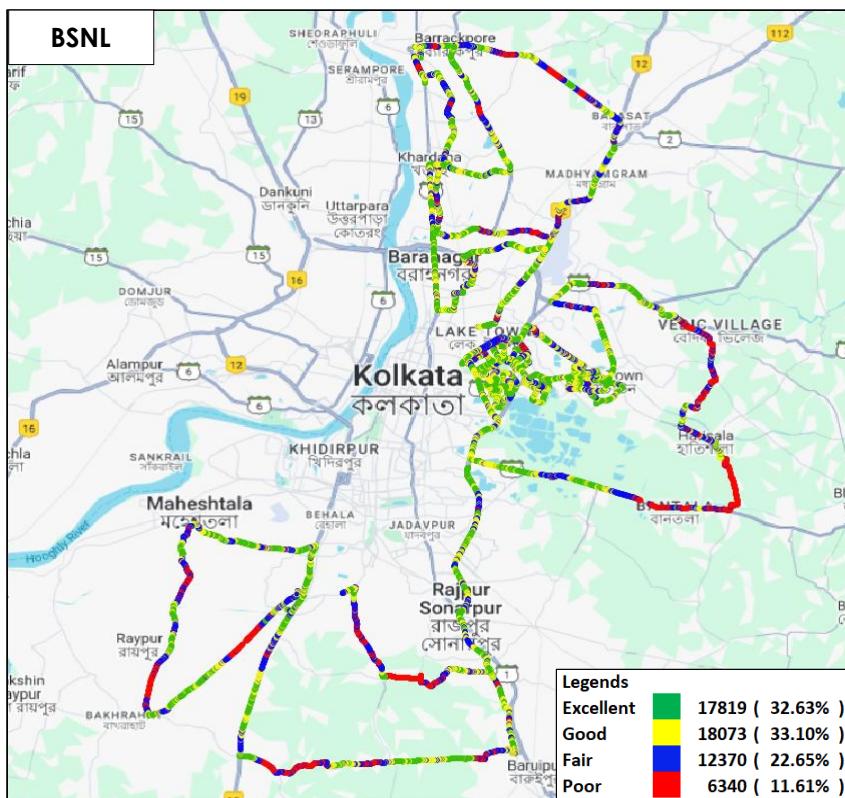
Figure-35: Signal strength 3G/2G network mode – BSNL.
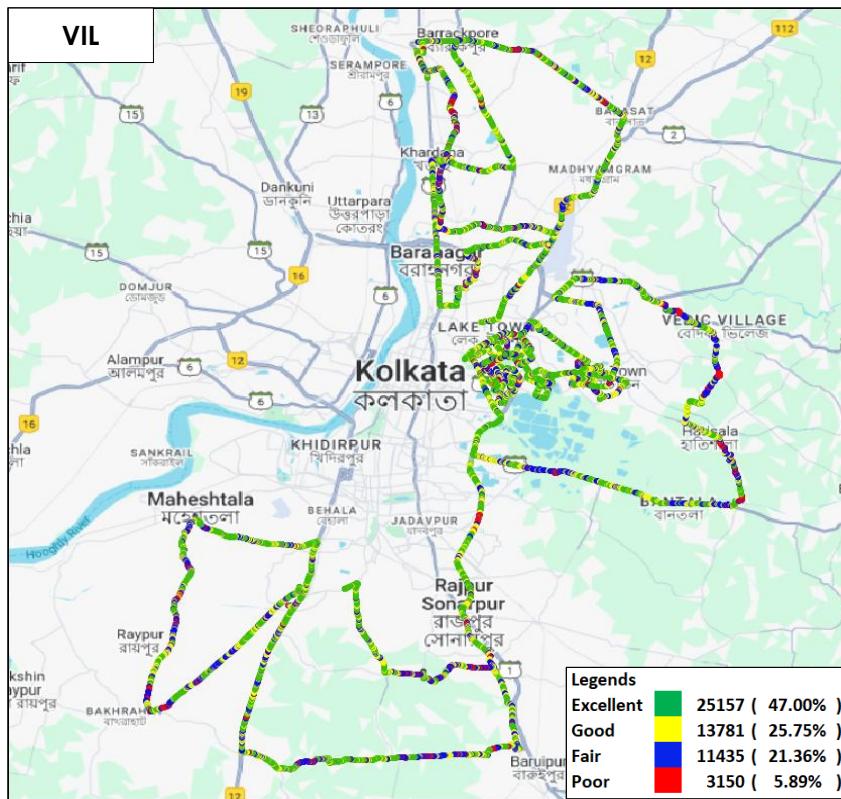
Figure-36: Signal strength 3G/2G network mode – VIL.
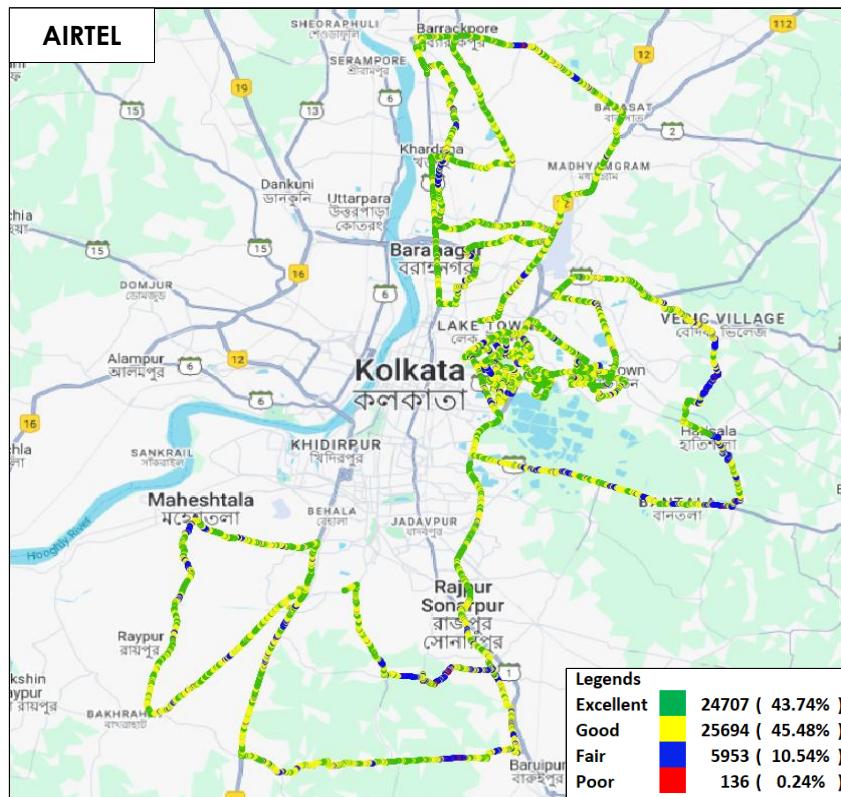
**Figure-37:** Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.
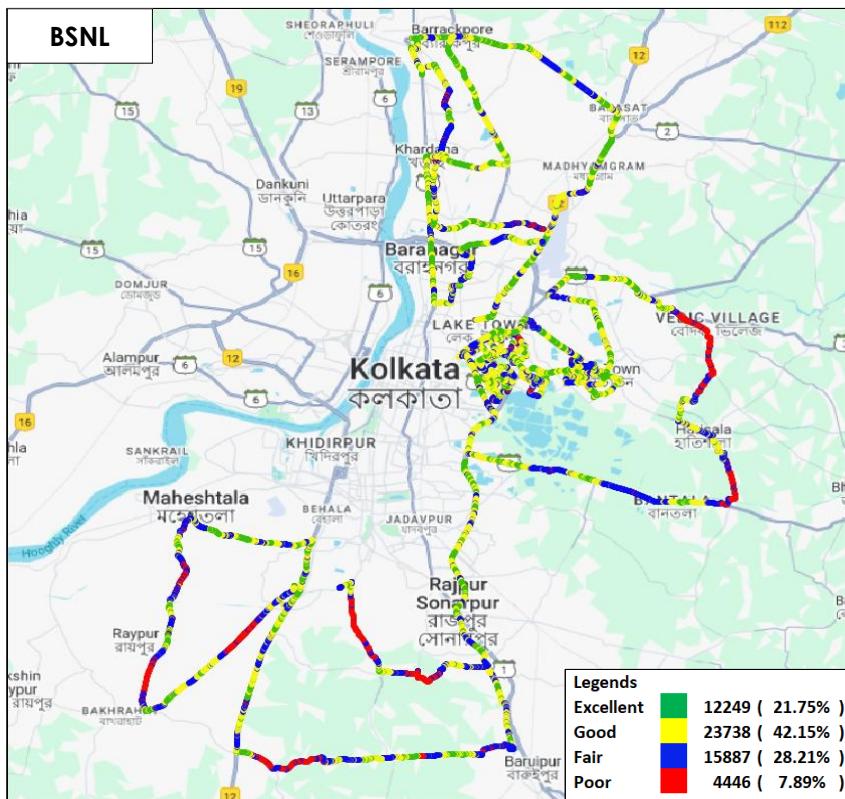
Figure-38: Signal strength auto-selection mode 5G/4G/3G/2G – BSNL (4G being rolled out).
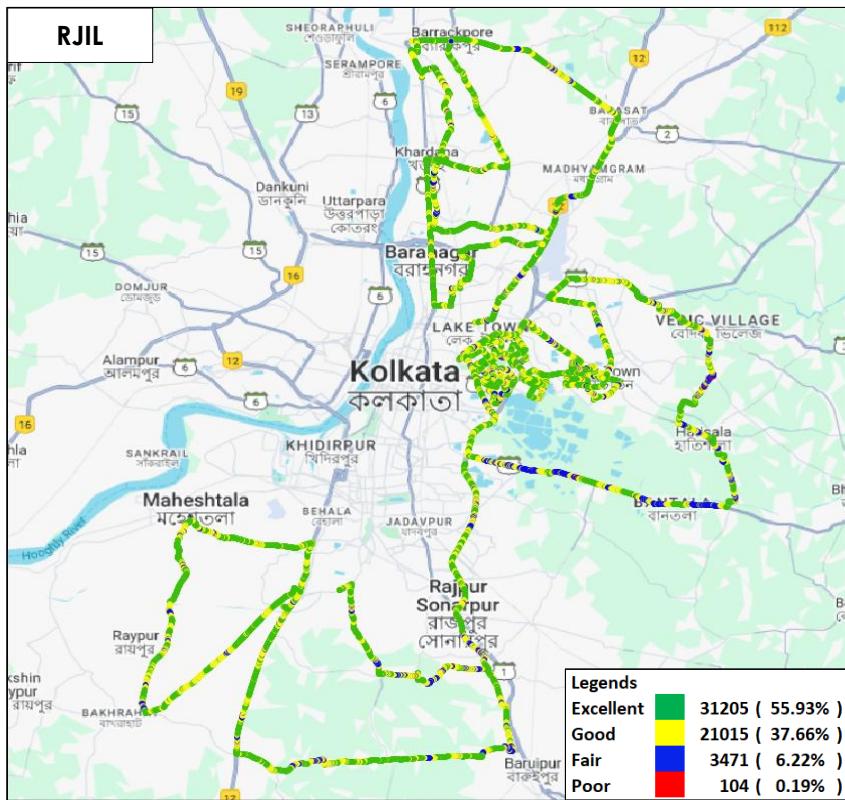

Figure-39: Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.
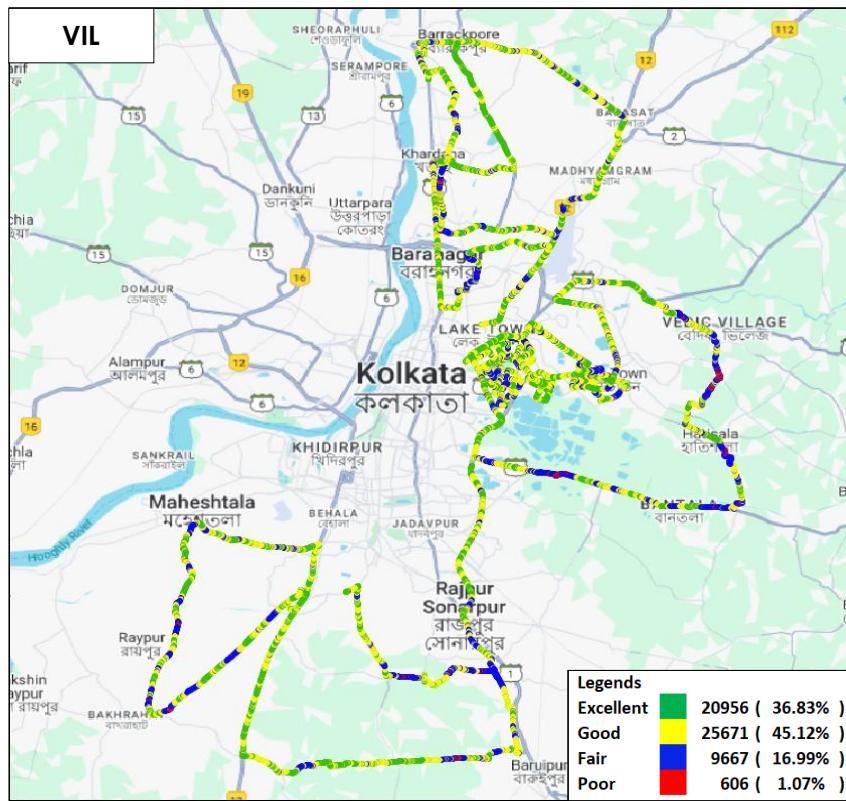
Figure-40: Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

7. Appendix

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

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

7.1 Appendix-I

7.1.1 Drive test setup

Voice Call		
Call details	**Technology**	**Detail**
Call Setup Timeout	• 3G/2G auto mode- switch Call	30 Sec
Call Duration	• 5G/4G/3G/2G auto mode- switch Call	120 Sec
Wait/ Guard Time	• 5G/4G MOS Call	15 Sec

Table-62: Voice test detail

Note-
- There is 15 sec wait time after locking and before starting first call in 3G/2G call.
- 10 calls to be made at each Hotspot location.
- Minimum 10 Calls to be made during the walk test. Call count will be increased based on walk test distance.
- Speech quality (MOS) has been measured only in city drive & highway by making Mobile to Mobile call.
- 180 Sec calls were made only in highway & railway route drive.

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

Latency & Jitter (TWAMP-UDP)		25 count- Dynamic 500 count- Hotspot Payload- 512 bytes in all drive
Packet Loss Rate (TWAMP-UDP & TCP)		500 counts (TWAMP-UDP) 500 counts (TCP) at each hotspot Payload- 512 bytes in all drive

Table-63: Data test detail

> **Note-**
> - 5 Data iteration to be done at each hotspot location.
> - Minimum 5 iteration to be made during the walk test. Iteration count will be increased based on walk test distance.
> - TWAMP-UDP & TCP test to be performed only once at hotspot location.
> - Youtube & Web browsing test to be performed at static location only.
> - All values are taken up to two decimal places with round off.
> - Delhi Based TRAI server being used for HTTP download, Upload, TCP & TWAMP for Airtel, BSNL & RJIL while VIL provides own server for download & upload.
> - Initially, VIL server was being used for TCP and TWAMP testing, but due to an issue with the VIL TCP & TWAMP server, the Delhi-based TRAI server was used for TCP and TWAMP testing for VIL.
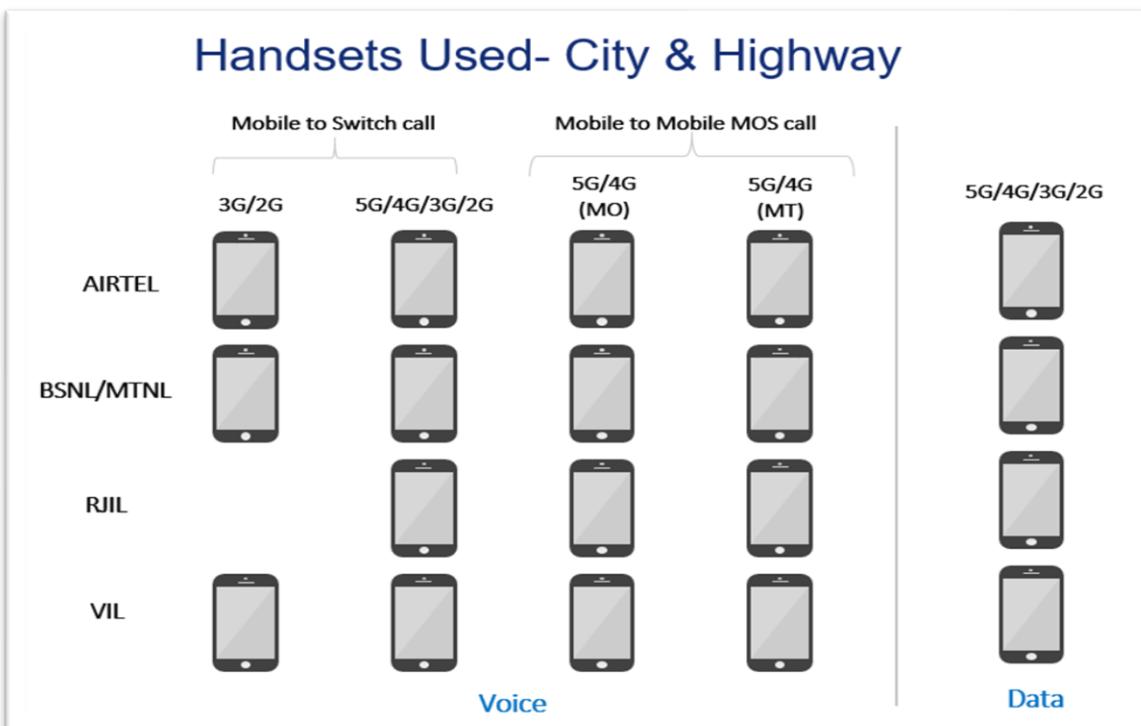
Figure-41: Number of handsets used in city & highway drive
MO: Mobile originating
MT: Mobile terminating

Handsets Used- Railway/Metro/Walk Test/ Hotspot & Coastal Area
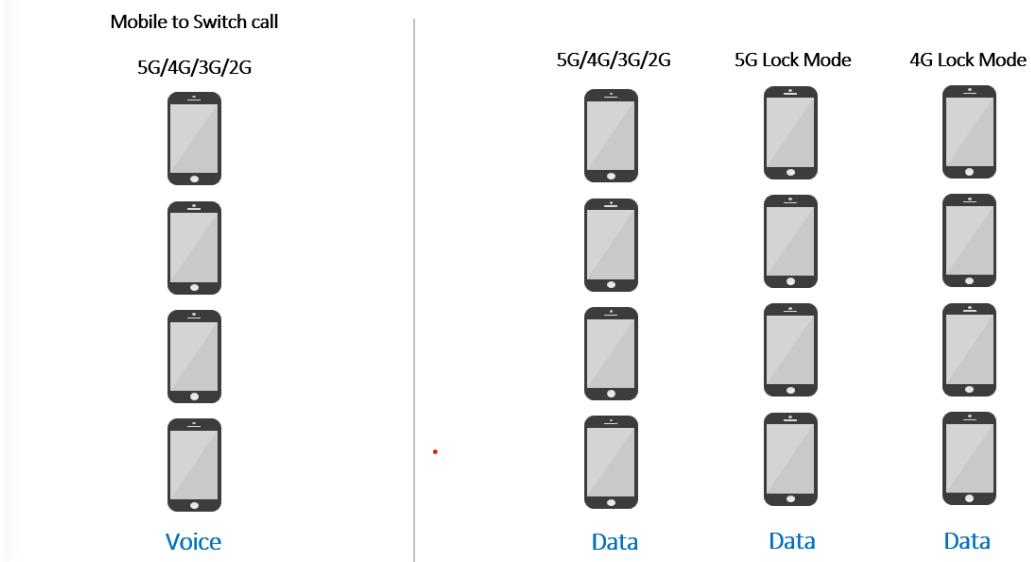
Figure-42: Number of handsets used in railway/metro/walktest/hotspot & coastal area

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)
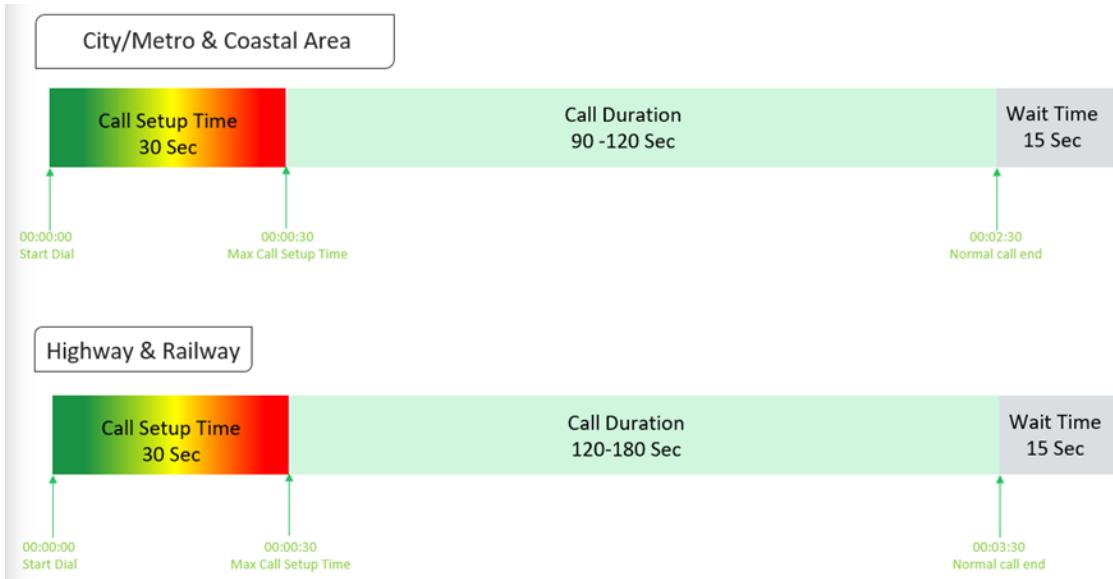
Figure-43: Voice test script for city/railway/metro/highway & coastal area

- 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-44: 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
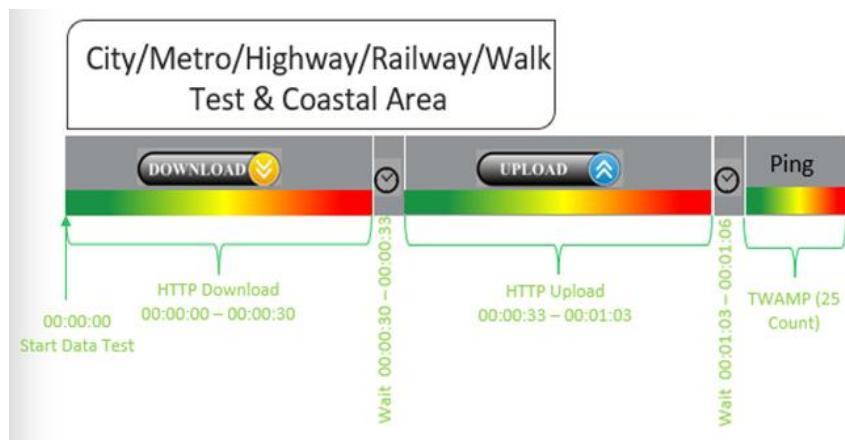
Figure-45: Data test script used in city/metro/railway/highway/walk test & coastal area

(d) Static Data(internet) testing
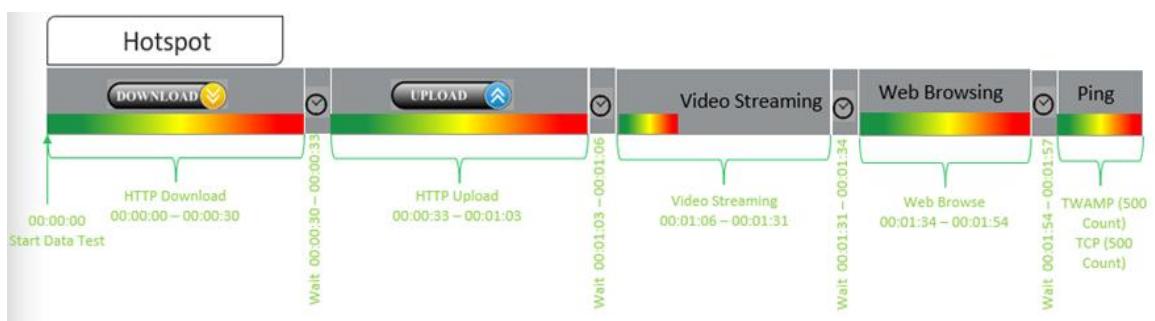
Figure-46: Data test script used at hotspot

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

7.2 Appendix-II

7.2.1 Network Performance Parameters for Voice calls

Parameter Name	Definition
Call Setup Success Rate	(i) Call Setup Success Rate is defined as the ratio of Established Calls to Call Attempts. 'Established Calls' mean the following events have happened in call setup: (a) Call attempt is made (b) The signaling channel is allocated (c) The call is routed to the outwards path of the terminating network (d) An alert signal is received by caller in the form of ring back tone, busy tone, or an announcement. CSSR = (Total Call Established/ Total Call Attempt) *100 As per QoS Regulation 2024 benchmark value is **>=98%**
Drop Call Rate	Drop call represents the service provider network's ability to maintain a call once it has been successfully established. This parameter shall include both incoming calls and outgoing calls which, once they have been established and have an assigned traffic channel/ bearer, are dropped, or interrupted before their normal completion by the user, the cause of the early termination being within the service provider's network Drop Call Rate = (Total Drop Call/Total Call Established) *100 As per QoS Regulation 2024 benchmark value is **<=2%**
Call Setup Time	Time taken from call initiate to call alerting/ringing. Call Setup Time = T2- T1 T2- Ringing (VoLTE/VoNR) & Alerting (for WCDMA & GSM), T1- Invite (VoLTE/VoNR) & CM Service Request (for WCDMA & GSM)
Voice Quality (MOS)	Voice quality in mobile networks is measured with algorithms based on ITU-T P.863 (POLQA). The grading for Voice quality has been given as: Excellent: MOS $\geq$ 4 and < 5 Good : MOS $\geq$ 3 and < 4 Fair : MOS $\geq$ 2 and < 3 Poor : MOS $\geq$ 1 and < 2
Handover Success Rate	Handover Success Rate = Count of successful handovers (All Technology Handover combined) / Total count of Handover Attempt (All Technology Handover combined) *100 Handover type which are considered- 2G Inter & Intra cell, 3G Soft & IRAT, 4G Inter & Intra frequency & SRVCC, 5G Inter & Intra frequency & 5G to 4G handovers.
Silence Call	A call which has $\geq$ 4 sec continuous RTP gap is considered as a Silence Call. Silence call rate = (count of silence call / Total calls established) *100 If a call observes multiple silence count >=4 sec in a particular established call it has been taken as one silent event.

Jitter	The inter arrival jitter is the difference in the relative transit time for two packets. The relative transit time is the difference between a packet's Real-time Transport Protocol (RTP) timestamp and the receiver's clock at the time of arrival, measured in the same units. If Si is the RTP timestamp from packet i, and Ri 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) = (Rj - Ri) - (Sj - Si)** The interarrival jitter is calculated continuously as each data packet i is received from source SSRC_n, using this difference D for that packet and the previous packet i-1 in order of arrival (not necessarily in sequence), according to the formula **J(i) = J(i-1) + (|D(i-1,i)| - J(i-1))/16 or 8**
Downlink Packet Drop Rate	Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call originating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE)
Uplink Packet Drop Rate	Number of RTP (Real-time Transport Protocol) Packets lost divided by total RTP packet received (against each source_SSRC and sequence number) at call terminating handset. This KPI is calculated from MOS call for packet call only (VoNR/VoLTE).
Signal Strength	Signal strength is the signal power level received by the wireless user.

Signal Strength 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

Table-64: Network performance parameter and definition voice

7.2.2 Network Performance Parameters Data tests

Parameter Name	Definition
Download Speed (Mbps)	The download speed is defined as the data transmission rate that is achieved for downloading a test file from a test server to a test device. Download Speed = Total bytes transferred during download / Total time for transfer • 80th percentile (upper range) & 20th percentile (lower range) value has been calculated for download throughput in dynamic drive and Hotspot combine data
Upload Speed (Mbps)	The upload speed is the data transmission rate that is achieved for uploading a test file from a test device to a test server. Upload Speed = Total bytes transferred during upload / Total time for transfer. • 80th percentile (upper range) & 20th percentile (lower range) value has been calculated for upload throughput in dynamic drive and Hotspot combine data.
Download Session Setup Success Rate	(total download session established (successfully connected to server)/ total download session attempt) *100. This KPI has been calculated for Hotspot only.

Upload Session Setup Success Rate	(total upload session established (successfully connected to server)/ total upload session attempt)*100. This KPI need to report for Hotspot only.
Web Page Download Time	Web browsing test is used to measure performance in terms of opening a web/HTTP page. Time taken to open the web page successfully is considered as web browsing delay/web page download time.
Video Streaming Delay	The Video streaming delay is time taken from start of video transfer to First video frame displayed in player.
Latency (TWAMP-UDP)	Latency is the time it takes for a small data set to be transmitted from a device to a server on the Internet and back to the same device again. The Latency is measured in milliseconds (ms). To calculate the one-way latency we just do half of the round-trip time. 50th percentile of one way latency has been reported.
Jitter (TWAMP-UDP)	Measure of variation in time in arrival of packets from a source to destination The consideration of packet delay jitter is considered by standard deviation of Inter Packet Delay Variation. If IPDV is used. By standard deviation is meant the average of standard deviation of IPDV on DL IPDV(i) = D(i) – D(i-1) then Stdvs of IPDV is considered as jitter.
Packet Loss Rate (TWAMP-UDP & TCP)	Number of packets lost out of total packet transferred during test. Packet loss rate = (Total packet lost / Total packet sent) *100 * Packet delay (using 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-65: 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.