**TRAI**

**TELECOM REGULATORY AUTHORITY OF INDIA**

*Independent Drive Test Report*

*Kolkata LSA*

*July 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 July-2025 under the supervision of TRAI Regional Office (RO) Kolkata. Details of route / area covered during the IDT is as given below:

| S. No | Drive test route | Type of route | Distance covered (KMs) | From date | To date |
|---|---|---|---|---|---|
| 1 | Kolkata TD, Parts of Howrah & Hooghly Districts and adjoining areas | City | 379.1 | 09-July-2025 | 14-July-2025 |
| 2 | Kolkata TD area | Inter Operator Calling | 1 Locations | 14-July-2025 | 14-July-2025 |
| 3 | Kolkata TD, Parts of Howrah & Hooghly Districts and adjoining areas and Metro Rail | Hotspot | 15 Locations | 08-July-2025 | 24-July-2025 |
| 4 | Kolkata TD area | Walk Test | 3.5 | 09-July-2025 | 09-July-2025 |
| 5 | Blue Line, Orange Line, Purple Line, Green Line 1 & Green Line 2 | Metro | 58.7 | 23-July-2025 | 24-July-2025 |

**Table-1:** Drive test summary

**Note**-
- Hotspots testing has been done on 8th, 12th, 14th & 24th July 2025 in Kolkata TD, Parts of Howrah & Hooghly Districts and adjoining areas and Metro Rail.

## 2.2 Drive test routes

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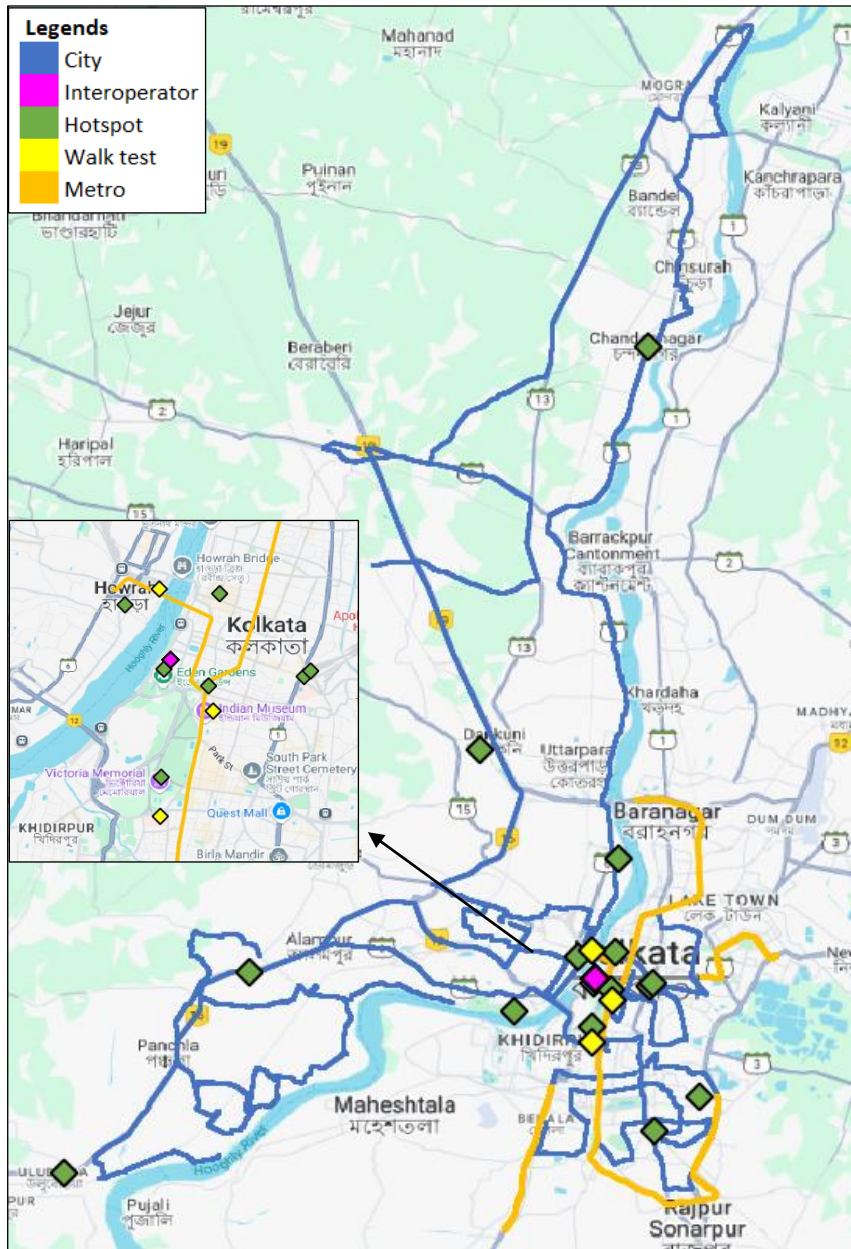


**Figure-1:** Drive test routes

## 2.3 Summary of areas covered

**a) City**- Kolkata city: Behala, Majherhat, Rasbihari Avenue, Hajra More, Tapsia, Ballygunge, E M Bypass, Garia, Jadavpur, Tollygunge, Alipore, College Street, Beleghata, Sealdah, Howrah Bridge, Shibpur, Alampur, Dhulagar, Panchla, Chengail, Bauria, Nalpur, Rishra, Uttarpara, Srirampur, Baidyabati, Chandannagar, Mankundu, Chinsurah, Bansberia, Tribeni, Bandel, Kuntighat, Singur, Chuttipur, Balarambati, Chhinamor, Dankuni, Bankra, , Bhadrakali, Belurmath, etc.

**b) Hotspot-**
1. Acropolis Mall Sector-1 Kolkata
2. Belur Math
3. Calcutta High Court
4. Chandannagar Sub Divisional Hospital
5. Dankuni Railway Junction
6. Esplanade Metro Station
7. Howrah District Hospital
8. Indian Institute of Engineering Science and Technology (IIEST)
9. Jadavpur University Kolkata
10. Jaladhulagori Toll Plaza NH-6 Howrah
11. Sarat Chandra Chattopadhyay Govt. Medical College & Hospital (Jadurberia Campus)
12. Satyanarayan Park AC Market
13. Sealdah Metro Station
14. Sealdah Railway Station
15. Victoria Memorial

**c) Walk Test**
1. Howrah Railway Station
2. New Market
3. SSKM Hospital

**d) Metro**
1. Dakshineswar to Kavi Subhash (Blue Line)
2. Kavi Subhash to Hemanta Mukherjee (Orange Line)
3. Majerhat to Joka (Purple Line)
4. Sector-5 to Sealdah (Green Line 2)
5. Esplanade to Howrah Maidan (Green Line 1)

## 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.
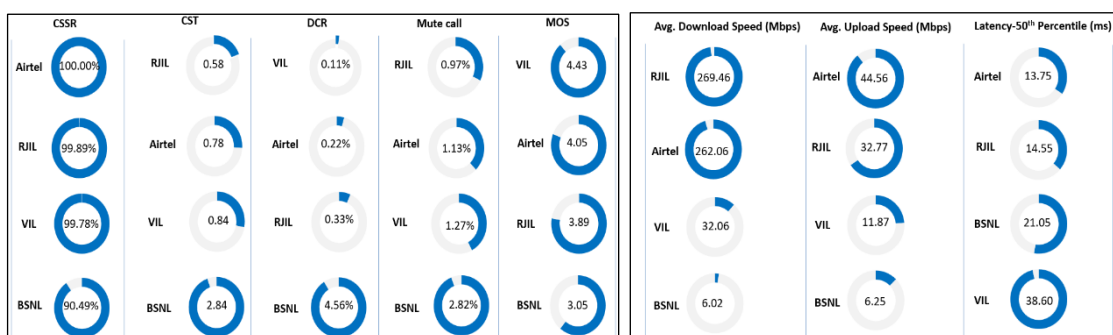


### Summary-Voice services

**Call Setup Success Rate:** Airtel, BSNL, RJIL and VIL have call setup success rate of 100.00%, 90.49%, 99.89% and 99.78% respectively in Auto-selection mode (5G/4G/3G/2G).

**Call Setup Time:** Airtel, BSNL, RJIL and VIL have call setup time of 0.78, 2.84, 0.58 & 0.84 seconds respectively in Auto-selection mode (5G/4G/3G/2G).

**Drop Call Rate:** Airtel, BSNL, RJIL and VIL have drop call rate of 0.22%, 4.56%, 0.33% & 0.11% respectively in Auto-selection mode (5G/4G/3G/2G).

**Call Silence/Mute Rate:** Airtel, BSNL, RJIL and VIL have silence call rate of 1.13%, 2.82%, 0.97% and 1.27% respectively in packet switched network (5G/4G).

**Mean Opinion Score (MOS):** Airtel, BSNL, RJIL and VIL have Average MOS of 4.05, 3.05, 3.89 & 4.43 respectively.

### Summary-Data services

**Data Download performance (Overall):** Average download speed of Airtel (5G/4G/2G) is 262.06 Mbps, BSNL (4G/3G/2G) is 6.02 Mbps, RJIL (5G/4G) is 269.46 Mbps and VIL (4G/2G) is 32.06 Mbps.

**Data Upload performance (Overall):** Average upload speed of Airtel (5G/4G/2G) is 44.56 Mbps, BSNL (4G/3G/2G) is 6.25 Mbps, RJIL (5G/4G) is 32.77 Mbps and VIL (4G/2G) is 11.87 Mbps.

**Latency (Overall):** Airtel, BSNL, RJIL & VIL 50th percentile latency is 13.75 ms, 21.05 ms, 14.55 ms & 38.60 ms respectively.

**Data performance - Hotspots (in Mbps):**
Airtel- 4G D/L: 43.44    4G U/L: 17.73
       5G D/L: 346.27   5G U/L: 66.83
BSNL- 4G D/L: 5.87    4G U/L: 9.04
RJIL-  4G D/L: 44.01    4G U/L: 10.07
       5G D/L: 194.94   5G U/L: 37.00
VIL-   4G D/L: 30.09    4G U/L: 10.73

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

# 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 July-2025 covering city drive, hotspots, walk test and metro drive. (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 | 613 | 625 | 599 |
| Call Setup Success Rate % | 99.02 | 97.76 | 99.67 |
| Drop Call Rate % | 0.33 | 1.47 | 0.17 |
| Call Setup Time-Average (Second) | 3.17 | 2.39 | 4.49 |
| Handover Success Rate % | 97.51 | 98.92 | 99.30 |

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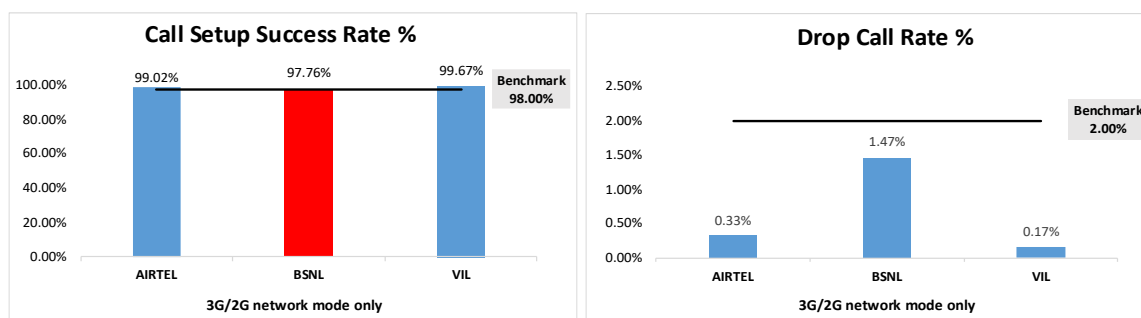


**Figure-2:** Call setup success rate and drop call rate performance.

| 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 | 284 | NA |
| 2G | 1191 | 749 | 1164 |

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

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

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## (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 | 904 | 946 | 910 | 896 |
| Call Setup Success Rate % | 100.00 | 90.49 | 99.89 | 99.78 |
| Drop Call Rate % | 0.22 | 4.56 | 0.33 | 0.11 |
| Call Setup Time-Average (Second) | 0.78 | 2.84 | 0.58 | 0.84 |
| Handover Success Rate % | 99.98 | 99.59 | 99.93 | 99.97 |

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



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

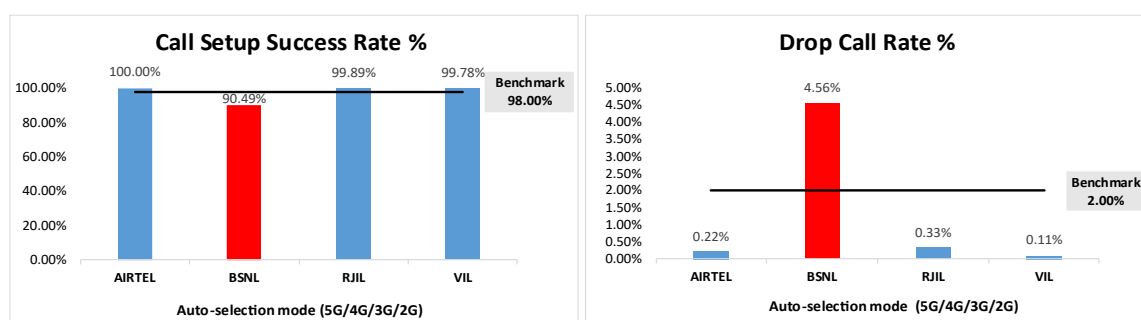| Parameter | Service Provider | | | |
|---|---|---|---|---|
| | Mobile-to-Mobile (5G/4G - Open Mode) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| Call Established (within service provider Network) | 619 | 639 | 617 | 629 |
| Number of silence call for >4 Sec | 7 | 18 | 6 | 8 |
| Silence Call Rate % | 1.13 | 2.82 | 0.97 | 1.27 |
| Number of silence instances for >4 Sec | 7 | 22 | 6 | 9 |
| Number of silence instances for >3 Sec | 13 | 39 | 19 | 32 |
| Number of silence instances for >2 sec | 22 | 76 | 37 | 100 |
| RTP Jitter (4G & 5G) in ms | 3.82 | 7.44 | 15.32 | 15.70 |
| Packet loss Rate Downlink % | 0.30 | 4.45 | 0.56 | 1.01 |
| Packet loss Rate Uplink % | 0.39 | 3.98 | 0.48 | 0.89 |

**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 | 1173 | NA |
| 4G | 2218 | 1070 | 1477 | 1946 |
| 3G | NA | 27 | NA | NA |
| 2G | 0 | 310 | NA | 5 |

**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.

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## (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 | 5522 | 4899 | 5478 | 5468 |
| Speech Quality (Average MOS) | 4.05 | 3.05 | 3.89 | 4.43 |
| Number of samples with MOS >=4 to <5 (Excellent) | 4859 | 1401 | 3596 | 4727 |
| Number of samples with MOS >=3 to <4 (Good) | 585 | 817 | 1679 | 517 |
| Number of samples with MOS >=2 to <3 (Fair) | 47 | 1984 | 117 | 120 |
| Number of samples with MOS >=1 to <2 (Poor) | 31 | 697 | 86 | 104 |
| %age of samples with MOS >=4 to <5 (Excellent) | 87.99% | 28.60% | 65.64% | 86.45% |
| %age of samples with MOS >=3 to <4 (Good) | 10.59% | 16.68% | 30.65% | 9.46% |
| %age of samples with MOS >=2 to <3 (Fair) | 0.85% | 40.50% | 2.14% | 2.19% |
| %age of samples with MOS >=1 to <2 (Poor) | 0.56% | 14.23% | 1.57% | 1.90% |

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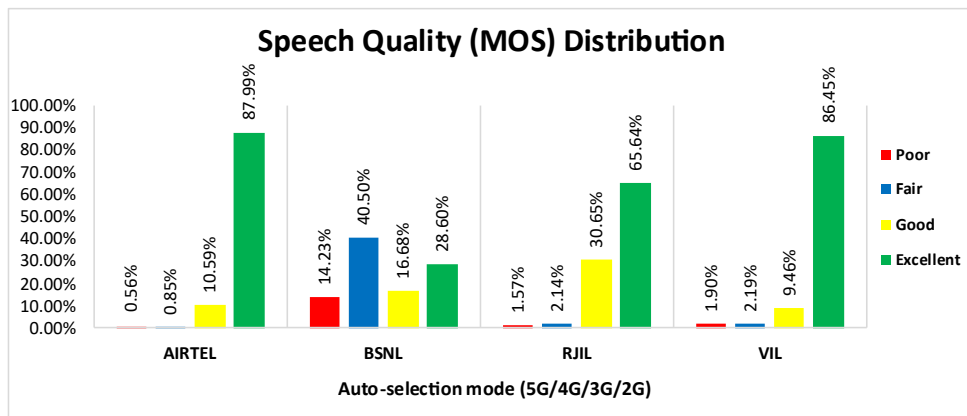


**Figure- 4:** Distribution of samples in MOS range.

## (d) Inter-service provider voice call performance:
To check the performance of inter-service provider call setup success rate, total 28 to 30 inter operator calls was attempted at one location which is Hindustan Colas. The Call setup success rate and call setup time observation is as below.

| From Service Provider | Call Setup Success Rate % | | | |
|---|---|---|---|---|
| | To Service Provider | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| AIRTEL | NA | 96.55 | 100.00 | 100.00 |
| BSNL | 93.33 | NA | 100.00 | 100.00 |
| RJIL | 96.43 | 100.00 | NA | 100.00 |
| VIL | 96.55 | 96.67 | 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 | 2.67 | 0.81 | 2.25 |
| **BSNL** | 2.22 | NA | 1.88 | 1.73 |
| **RJIL** | 1.43 | 1.78 | NA | 1.54 |
| **VIL** | 1.56 | 1.85 | 1.35 | 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** | 262.06 | 6.02 | 269.46 | 32.06 |
| | **80th Percentile** | 378.08 | 9.02 | 459.53 | 41.40 |
| | **20th Percentile** | 137.21 | 2.24 | 79.40 | 16.88 |
| **Upload Throughput (Mbits/s)** | **Average** | 44.56 | 6.25 | 32.77 | 11.87 |
| | **80th Percentile** | 75.35 | 11.58 | 55.08 | 19.03 |
| | **20th Percentile** | 13.73 | 2.17 | 9.41 | 4.52 |
| **Latency (ms)** | **50th Percentile** | 13.75 | 21.05 | 14.55 | 38.60 |

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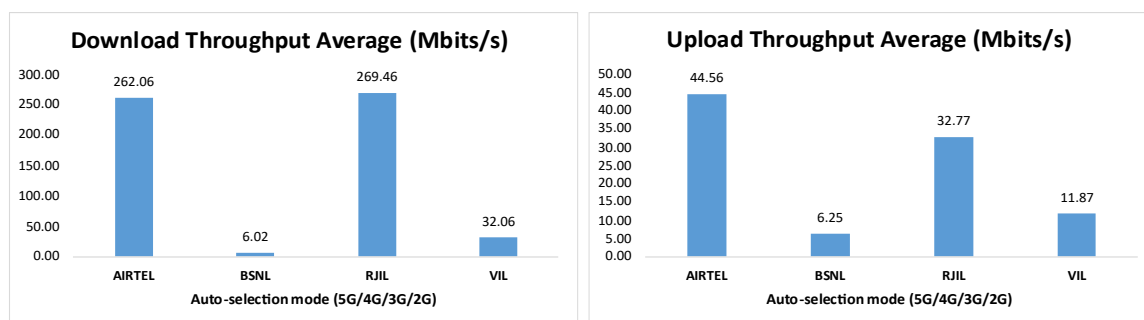


**Figure- 5:** Download and Upload throughput

| 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 | 1452 | NA |
| **4G** | 2276 | 1050 | 220 | 1990 |
| **3G** | NA | 70 | NA | NA |
| **2G** | 3 | 26 | NA | 9 |

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

## 4.2 City

Drive test has been conducted from 9th July 2025 to 14th July 2025 in Kolkata TD, Parts of Howrah & Hooghly Districts and adjoining areas. (Refer Table-1)
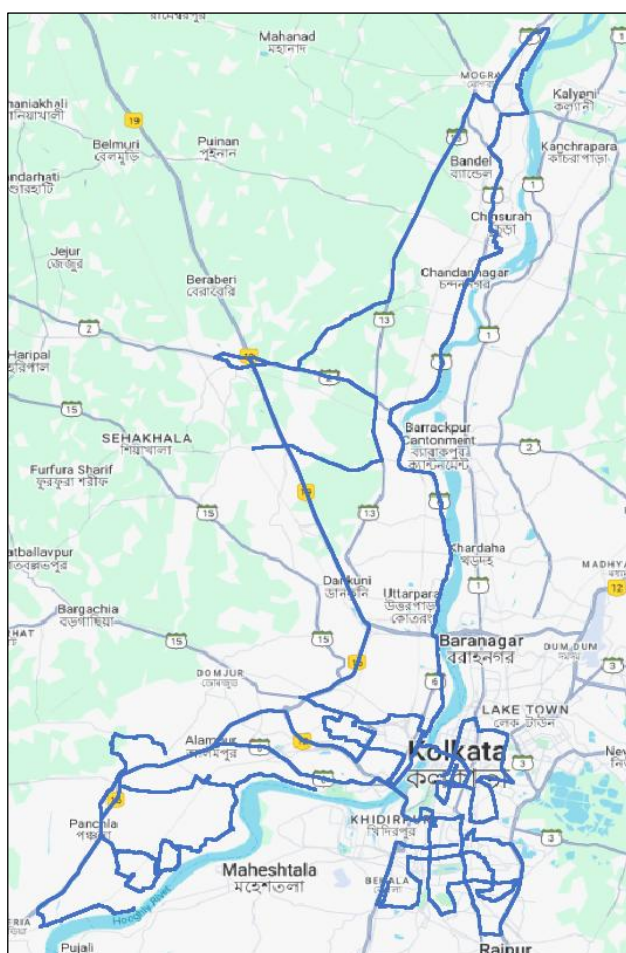
### 4.2.1 Drive test route



**Figure- 6:** Drive test routes

### 4.2.2 Area Covered

Kolkata city: Behala, Majherhat, Rasbihari Avenue, Hajra More, Tapsia, Ballygunge, E M Bypass, Garia, Jadavpur, Tollygunge, Alipore, College Street, Beleghata, Sealdah, Howrah Bridge, Shibpur, Alampur, Dhulagar, Panchla, Chengail, Bauria, Nalpur, Rishra, Uttarpara, Srirampur, Baidyabati, Chandannagar, Mankundu, Chinsurah, Bansberia, Tribeni, Bandel, Kuntighat, Chuttipur, Balarambati, Singur, Chhinamor, Dankuni, Bankra, , Bhadrakali, Belurmath, 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 | 613 | 625 | 599 |
| Call Setup Success Rate % | 99.02 | 97.76 | 99.67 |
| Drop Call Rate % | 0.33 | 1.47 | 0.17 |
| Call Setup Time-Average (Second) | 3.17 | 2.39 | 4.49 |
| Handover Success Rate % | 97.51 | 98.92 | 99.30 |

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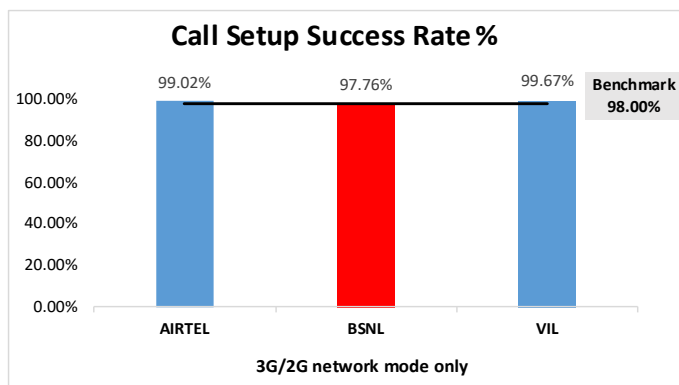


**Figure-7:** Performance for call setup success rate.
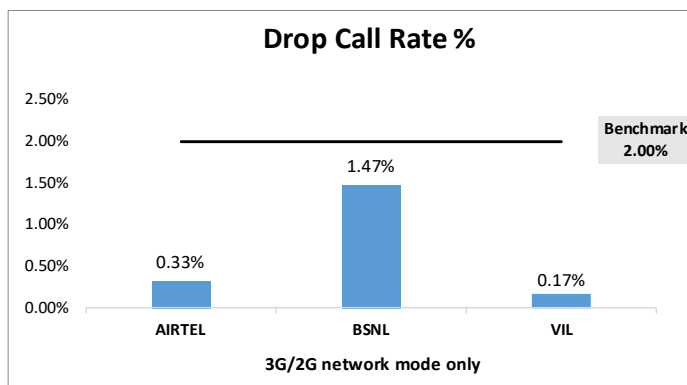


**Figure-8:** Performance for drop call rate.

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

| Technology | Service Provider | | |
|---|---|---|---|
| | AIRTEL | BSNL | VIL |
| 3G | NA | 18.65% | NA |
| 2G | 99.93% | 81.34% | 99.99% |
| Limited Service | 0.07% | 0.01% | 0.01% |

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

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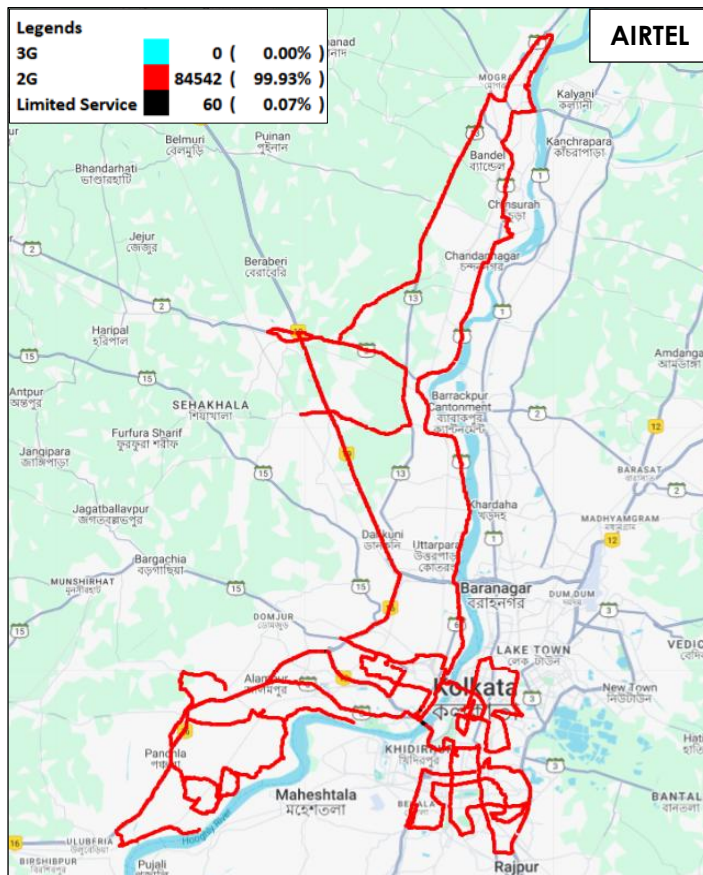
**Figure-9:** Serving technology plots 3G/2G network mode – AIRTEL
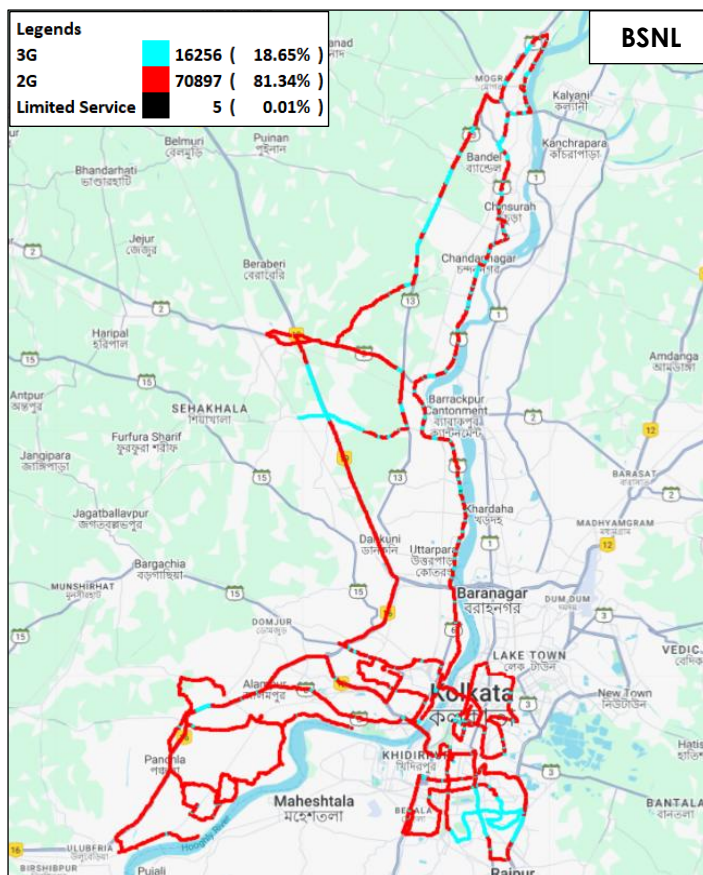


**Figure-10:** Serving technology plots 3G/2G network mode –BSNL.
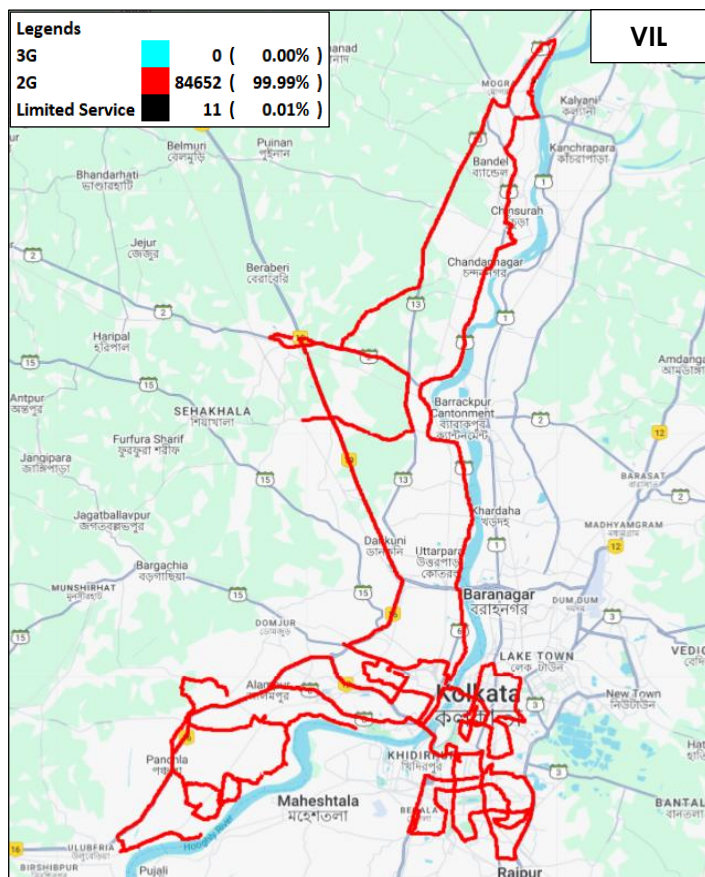
**Figure-11:** Serving technology plots 3G/2G network mode –VIL.

**(c) Network Signal Strength Distribution:** The following chart represents signal strength distribution for 3G/2G network mode only. (Refer figure- 76, 77 & 78 for map view)
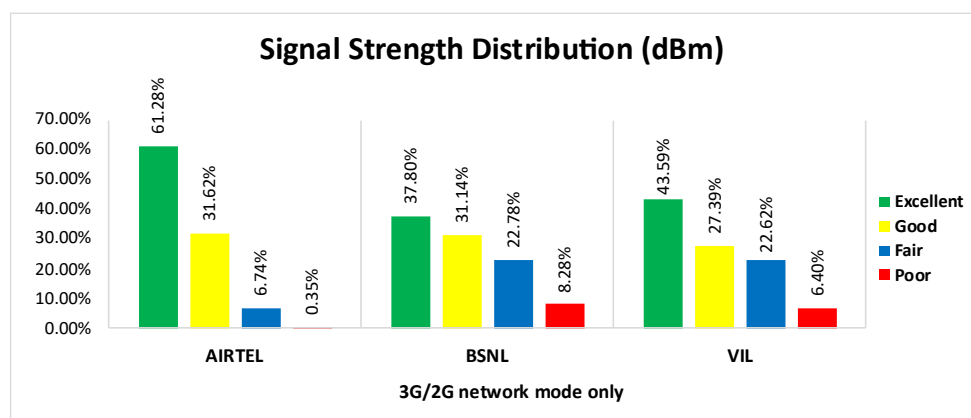


**Figure-12:** Signal strength distribution 3G/2G network mode only.

**Observations:**

- Airtel has 61% of samples falling in the excellent signal strength category.
- BSNL has 38% of samples falling in the excellent signal strength category.
- VIL has 44% 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** | 635 | 666 | 639 | 626 |
| **Call Setup Success Rate %** | 100.00 | 94.29 | 99.84 | 100.00 |
| **Drop Call Rate %** | 0.00 | 5.10 | 0.16 | 0.00 |
| **Call Setup Time Average (Second)** | 0.73 | 2.77 | 0.56 | 0.83 |
| **Handover Success Rate %** | 100.00 | 99.58 | 99.93 | 99.97 |

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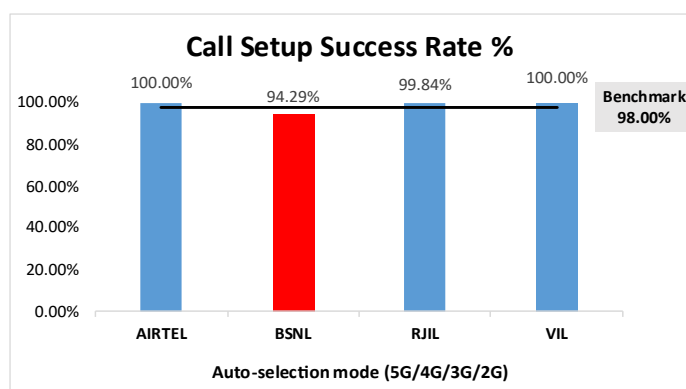


**Figure-13:** Performance for call setup success rate.
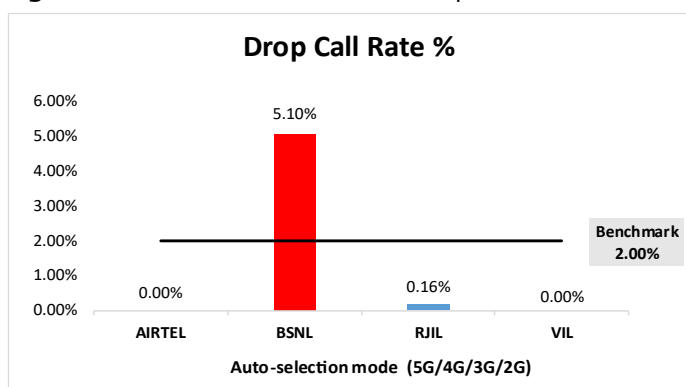


**Figure-14:** Performance for drop call rate.

| Parameter | Service Provider | | | |
|---|---|---|---|---|
| | Mobile-to-Mobile (5G/4G - Open Mode) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| **Call Established (within service provider Network)** | 619 | 639 | 617 | 629 |
| **Number of silence call for >4 Sec** | 7 | 18 | 6 | 8 |
| **Silence Call Rate %** | 1.13 | 2.82 | 0.97 | 1.27 |
| **Number of silence instances for >4 Sec** | 7 | 22 | 6 | 9 |
| **Number of silence instances for >3 Sec** | 13 | 39 | 19 | 32 |
| **Number of silence instances for >2 sec** | 22 | 76 | 37 | 100 |
| **RTP Jitter (4G & 5G) in ms** | 3.82 | 7.44 | 15.32 | 15.70 |
| **Packet loss Rate Downlink %** | 0.30 | 4.45 | 0.56 | 1.01 |
| **Packet loss Rate Uplink %** | 0.39 | 3.98 | 0.48 | 0.89 |

**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 | 5522 | 4899 | 5478 | 5468 |
| Speech Quality (Average MOS) | 4.05 | 3.05 | 3.89 | 4.43 |
| Number of samples with MOS >=4 to <5 (Excellent) | 4859 | 1401 | 3596 | 4727 |
| Number of samples with MOS >=3 to <4 (Good) | 585 | 817 | 1679 | 517 |
| Number of samples with MOS >=2 to <3 (Fair) | 47 | 1984 | 117 | 120 |
| Number of samples with MOS >=1 to <2 (Poor) | 31 | 697 | 86 | 104 |
| %age of samples with MOS >=4 to <5 (Excellent) | 87.99% | 28.60% | 65.64% | 86.45% |
| %age of samples with MOS >=3 to <4 (Good) | 10.59% | 16.68% | 30.65% | 9.46% |
| %age of samples with MOS >=2 to <3 (Fair) | 0.85% | 40.50% | 2.14% | 2.19% |
| %age of samples with MOS >=1 to <2 (Poor) | 0.56% | 14.23% | 1.57% | 1.90% |

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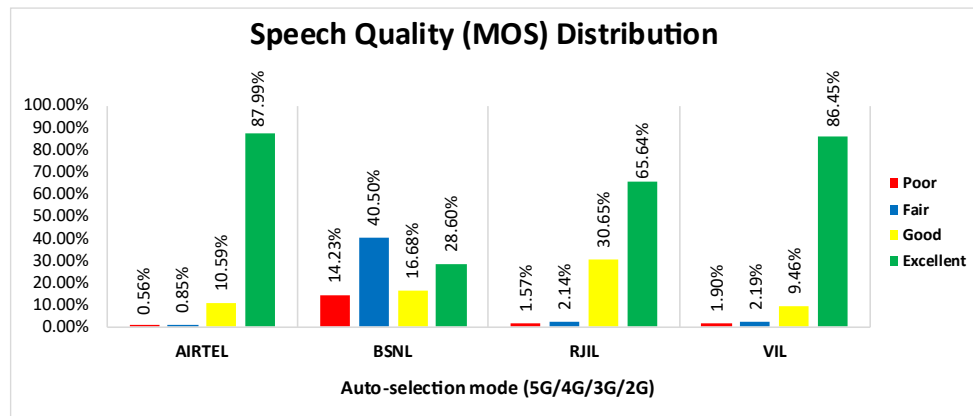


**Figure-15:** Distribution of samples in MOS range.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | AIRTEL | BSNL | RJIL | VIL |
| 5G | 11.81% | NA | 70.49% | NA |
| 4G | 88.19% | 77.75% | 29.50% | 100.00% |
| 3G | NA | 3.38% | NA | NA |
| 2G | 0.00% | 18.72% | NA | 0.00% |
| Limited Service | 0.00% | 0.15% | 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.



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

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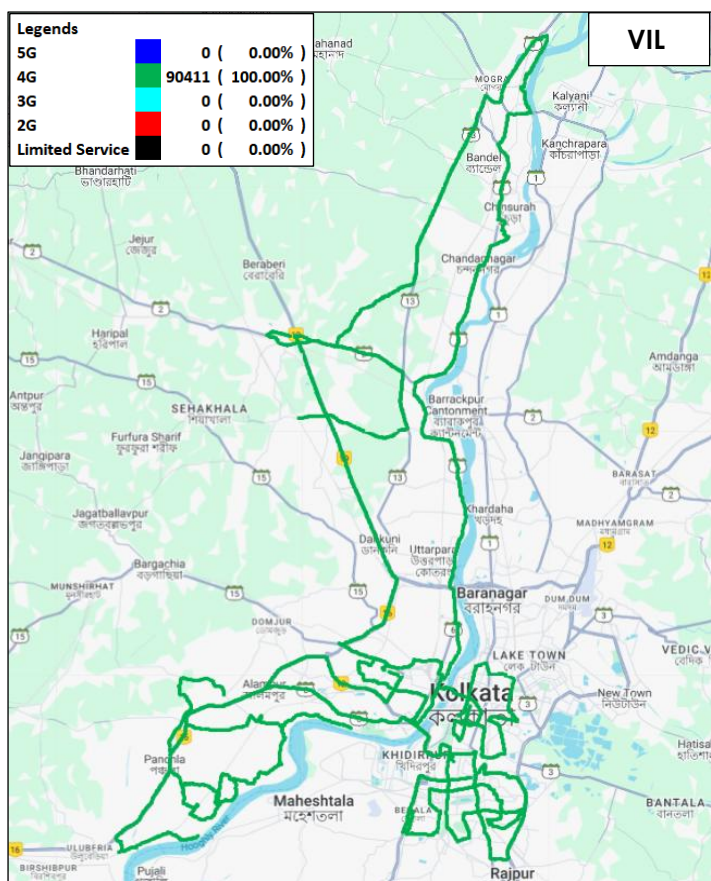


**Figure-19:** Serving technology plots in auto-selection mode (5G/4G/3G/2G) – VIL.

**(g) Network Signal Strength Distribution:** The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-79, 80, 81 & 82 for map view)
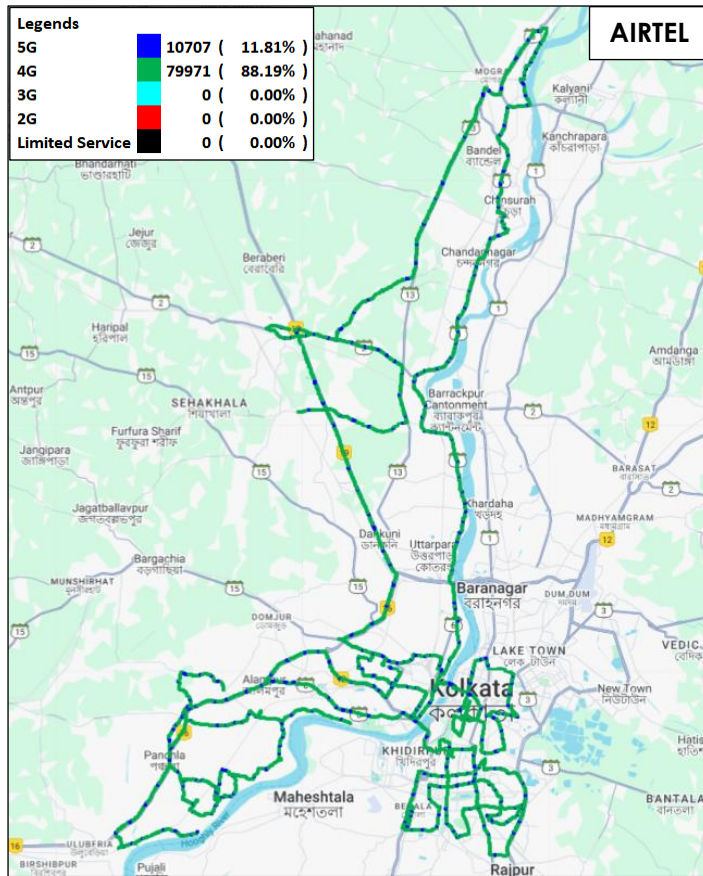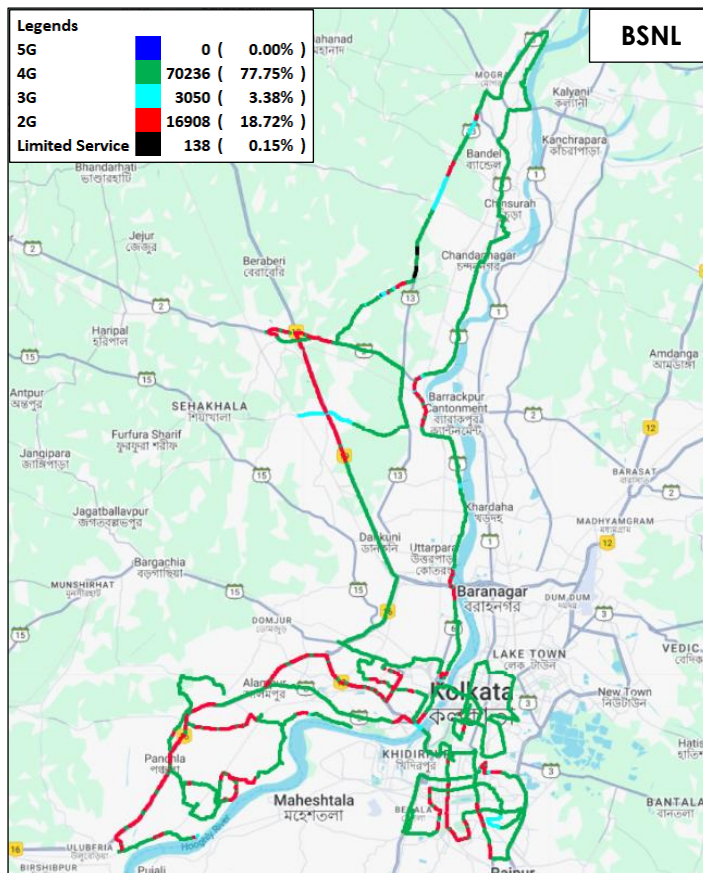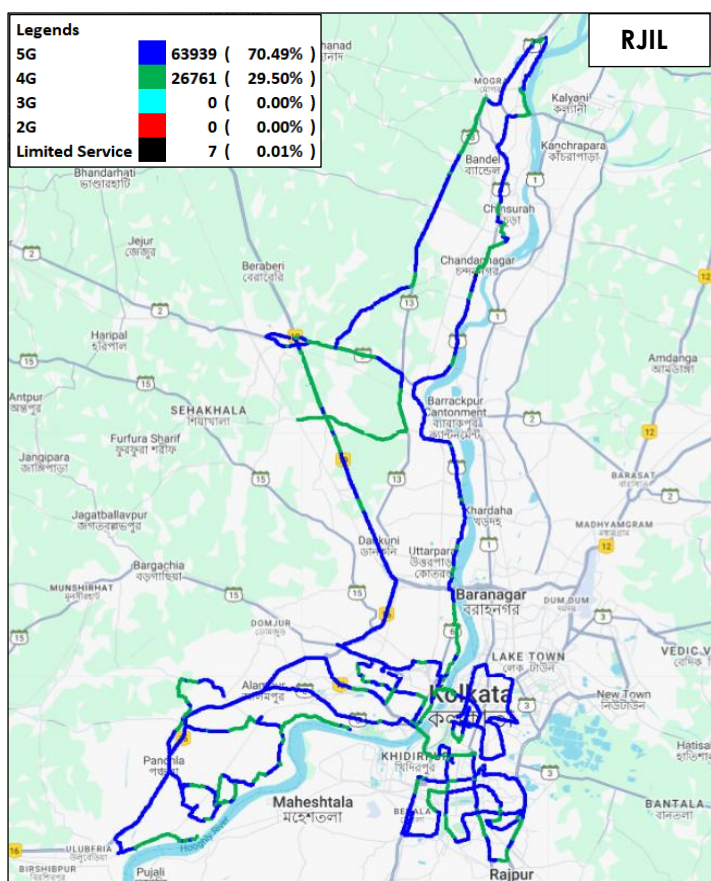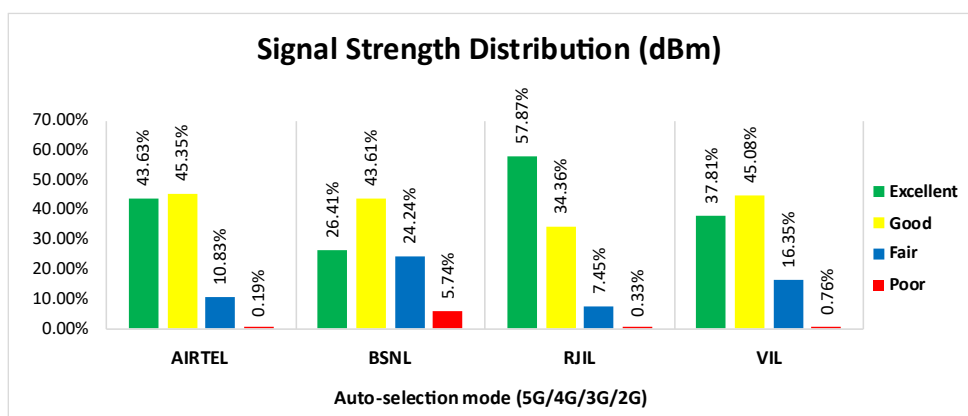


**Figure-20:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

**Observations:**

- Airtel has 44% of samples falling in the excellent signal strength category.
- BSNL has 26% of samples falling in the excellent signal strength category.
- RJIL has 58% of samples falling in the excellent signal strength category.
- VIL has 38% 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** | 276.70 | 6.20 | 310.06 | 32.43 |
| | **80th Percentile** | 381.16 | 9.42 | 497.38 | 41.24 |
| | **20th Percentile** | 167.13 | 2.26 | 143.56 | 19.26 |
| **Upload Throughput (Mbits/s)** | **Average** | 45.30 | 6.45 | 35.80 | 11.65 |
| | **80th Percentile** | 75.28 | 12.03 | 57.01 | 18.60 |
| | **20th Percentile** | 15.33 | 2.19 | 12.15 | 4.72 |
| **Latency (ms)** | **50th Percentile** | 12.50 | 21.00 | 13.40 | 38.60 |

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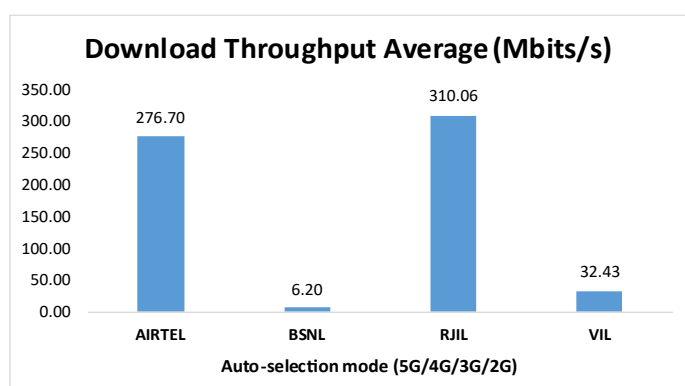


**Figure- 21:** Download throughput
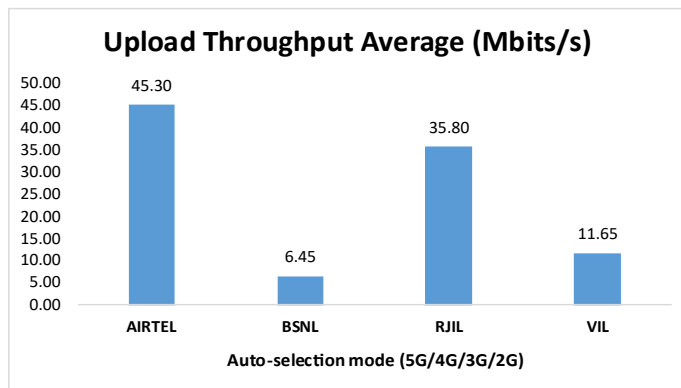
**Figure- 22:** Upload throughput

## 4.3 Hotspots

Hotspot testing has been done from 8th July 2025 to 24th July 2025. Fifteen locations have been tested in Kolkata, Howrah & Hooghly city and adjoining areas.

### 4.3.1 Locations
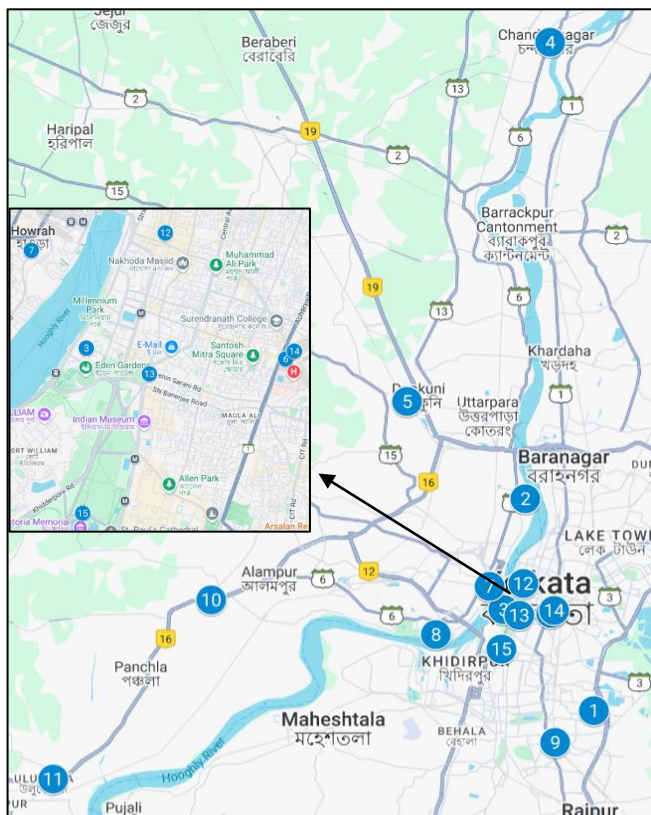


**Figure- 23:** Hotspot locations

## 4.3.2 Hotspot covered

1. Acropolis Mall Sector-1 Kolkata
2. Belur Math
3. Calcutta High Court
4. Chandannagar Sub Divisional Hospital
5. Dankuni Railway Junction
6. Esplanade Metro Station
7. Howrah District Hospital
8. Indian Institute of Engineering Science and Technology (IIEST)
9. Jadavpur University Kolkata
10. Jaladhulagori Toll Plaza NH-6 Howrah
11. Sarat Chandra Chattopadhyay Govt. Medical College & Hospital (Jadurberia Campus)
12. Satyanarayan Park AC Market
13. Sealdah Metro Station
14. Sealdah Railway Station
15. Victoria Memorial

## 4.3.3 Voice performance

| Overall Voice Performance | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 150 | 150 | 150 | 150 |
| **Call Setup Success Rate %** | 100.00 | 84.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 0.84 | 2.71 | 0.50 | 0.78 |

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

| Acropolis Mall Sector-1 Kolkata | | | | |
|---|---|---|---|---|
| **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 | 70.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 0.74 | 3.02 | 0.52 | 0.81 |

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

| Belur Math | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 10 | 10 | 10 | 10 |
| **Call Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 1.04 | 2.72 | 0.54 | 0.77 |

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

| Calcutta High Court | | | | |
|---|---|---|---|---|
| **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 | 2.76 | 0.51 | 0.69 |

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

| Chandannagar Sub Divisional Hospital | | | | |
|---|---|---|---|---|
| **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)** | 0.79 | 2.74 | 0.54 | 0.74 |

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

| Dankuni Railway Junction | | | | |
|---|---|---|---|---|
| **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)** | 0.62 | 2.30 | 0.57 | 0.78 |

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

| Esplanade Metro Station | | | | |
|---|---|---|---|---|
| **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 | 0.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | - | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 0.74 | - | 0.40 | 0.69 |

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

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

| Howrah District Hospital | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 10 | 10 | 10 | 10 |
| **Call Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 1.03 | 2.75 | 0.53 | 0.68 |

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

| Indian Institute of Engineering Science and Technology (IIEST) | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 10 | 10 | 10 | 10 |
| **Call Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 1.09 | 2.62 | 0.50 | 0.75 |

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

| Jadavpur University Kolkata | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 10 | 10 | 10 | 10 |
| **Call Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 1.15 | 2.80 | 0.52 | 0.80 |

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

| Jaladhulagori Toll Plaza NH-6 Howrah | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 10 | 10 | 10 | 10 |
| **Call Setup Success Rate %** | 100.00 | 90.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 0.69 | 3.72 | 0.47 | 0.87 |

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

| Sarat Chandra Chattopadhyay Govt. Medical College & Hospital (Jadurberia Campus) | | | | |
|---|---|---|---|---|
| **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)** | 0.77 | 2.61 | 0.47 | 0.75 |

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

| Satyanarayan Park AC Market | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 10 | 10 | 10 | 10 |
| **Call Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | 0.00 | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 1.15 | 2.45 | 0.47 | 0.73 |

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

| Sealdah Metro Station | | | | |
|---|---|---|---|---|
| **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 | 0.00 | 100.00 | 100.00 |
| **Drop Call Rate %** | 0.00 | - | 0.00 | 0.00 |
| **Call Setup Time-Average (Second)** | 0.66 | - | 0.53 | 0.68 |

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

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

| Sealdah Railway Station | | | | |
|---|---|---|---|---|
| **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 | 2.18 | 0.52 | 1.31 |

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

| Victoria Memorial | | | | |
|---|---|---|---|---|
| **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 | 2.84 | 0.44 | 0.71 |

**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** | **BSNL** | **RJIL** | **VIL** |
| Download Throughput Average (Mbits/s) | 287.19 | 5.95 | 178.88 | 36.85 |
| Download Throughput 80th Percentile (Mbit/s) | 486.21 | 7.23 | 378.64 | 46.40 |
| Download Throughput 20th Percentile (Mbit/s) | 104.21 | 3.22 | 45.11 | 11.77 |
| Download Session Setup Success Rate % | 100.00 | 84.00 | 100.00 | 100.00 |
| Upload Throughput Average (Mbits/s) | 54.28 | 3.70 | 21.01 | 15.05 |
| Upload Throughput 80th Percentile (Mbit/s) | 90.98 | 4.91 | 37.96 | 29.85 |
| Upload Throughput 20th Percentile (Mbit/s) | 12.16 | 2.23 | 4.81 | 3.81 |
| Upload Session Setup Success Rate % | 100.00 | 84.00 | 100.00 | 100.00 |
| Web Browsing Delay (Second) | 2.09 | 2.96 | 2.63 | 2.62 |
| Youtube Initial Buffer Delay (Second) | 0.74 | 2.03 | 0.98 | 1.10 |
| Latency (ms) - 50th Percentile | 14.60 | 21.15 | 16.10 | 38.85 |
| Jitter (ms) | 8.72 | 12.24 | 16.83 | 10.84 |
| Packet Loss Rate% | 0.54 | 21.24 | 1.68 | 2.81 |
| Packet Loss Rate- 90th percentile | 0.64 | 73.84 | 4.98 | 6.56 |

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

| Acropolis Mall Sector-1 Kolkata | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| Download Throughput Average (Mbits/s) | 26.01 | 5.15 | 98.53 | 12.89 |
| Download Session Setup Success Rate % | 100.00 | 100.00 | 100.00 | 100.00 |
| Upload Throughput Average (Mbits/s) | 3.60 | 4.32 | 11.48 | 1.59 |
| Upload Session Setup Success Rate % | 100.00 | 100.00 | 100.00 | 100.00 |
| Web Browsing Delay (Second) | 2.23 | 2.03 | 2.48 | 2.52 |
| Youtube Initial Buffer Delay (Second) | 1.07 | 1.03 | 0.67 | 1.42 |
| Latency (ms) - 50th Percentile | 16.70 | 22.98 | 20.85 | 39.70 |
| Jitter (ms) | 8.54 | 26.26 | 22.57 | 72.40 |
| Packet Loss Rate% | 0.20 | 9.90 | 1.50 | 5.90 |

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

| Belur Math | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| Download Throughput Average (Mbits/s) | 55.75 | 2.78 | 173.26 | 37.18 |
| Download Session Setup Success Rate % | 100.00 | 60.00 | 100.00 | 100.00 |
| Upload Throughput Average (Mbits/s) | 2.84 | 1.50 | 10.05 | 4.33 |
| Upload Session Setup Success Rate % | 100.00 | 60.00 | 100.00 | 100.00 |
| Web Browsing Delay (Second) | 2.28 | 3.04 | 2.20 | 2.47 |
| Youtube Initial Buffer Delay (Second) | 1.62 | 2.09 | 0.58 | 0.85 |
| Latency (ms) - 50th Percentile | 22.70 | 22.85 | 13.98 | 37.95 |
| Jitter (ms) | 7.38 | 11.99 | 16.93 | 3.55 |
| Packet Loss Rate% | 0.00 | 19.60 | 1.00 | 0.20 |

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

| Calcutta High Court | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 606.75 | 5.77 | 14.47 | 78.03 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 113.87 | 2.46 | 5.52 | 30.10 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 1.92 | 2.57 | 2.61 | 2.35 |
| **Youtube Initial Buffer Delay (Second)** | 0.55 | 1.26 | 1.01 | 0.97 |
| **Latency (ms) - 50th Percentile** | 13.45 | 22.40 | 24.00 | 41.25 |
| **Jitter (ms)** | 2.75 | 4.73 | 9.02 | 7.85 |
| **Packet Loss Rate%** | 0.00 | 2.70 | 0.10 | 7.00 |

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

| Chandannagar Sub Divisional Hospital | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 513.49 | 2.48 | 419.68 | 4.79 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 142.76 | 2.90 | 50.00 | 29.91 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 1.94 | 4.95 | 2.08 | 4.12 |
| **Youtube Initial Buffer Delay (Second)** | 0.55 | 6.99 | 0.50 | 0.95 |
| **Latency (ms) - 50th Percentile** | 11.65 | 20.85 | 12.30 | 42.80 |
| **Jitter (ms)** | 12.37 | 10.75 | 9.08 | 6.68 |
| **Packet Loss Rate%** | 0.80 | 1.70 | 0.10 | 20.50 |

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

| Dankuni Railway Junction | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 331.71 | 9.61 | 53.94 | 19.58 |
| **Download Session Setup Success Rate%** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 112.99 | 8.09 | 5.00 | 28.34 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.03 | 2.44 | 2.34 | 2.51 |
| **Youtube Initial Buffer Delay (Second)** | 0.56 | 1.09 | 1.18 | 0.87 |
| **Latency (ms)- 50th Percentile** | 13.50 | 8.55 | 15.25 | 38.30 |
| **Jitter (ms)** | 2.67 | 2.05 | 10.58 | 11.37 |
| **Packet Loss Rate%** | 0.00 | 0.00 | 0.40 | 1.40 |

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

| Esplanade Metro Station | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 36.15 | - | 41.74 | 21.32 |
| **Download Session Setup Success Rate %** | 100.00 | 0.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 2.99 | - | 8.29 | 19.62 |
| **Upload Session Setup Success Rate %** | 100.00 | 0.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.68 | - | 2.33 | 2.56 |
| **Youtube Initial Buffer Delay (Second)** | 1.26 | - | 0.70 | 0.89 |
| **Latency (ms) - 50th Percentile** | 31.48 | - | 19.65 | 35.05 |
| **Jitter (ms)** | 22.45 | - | 6.06 | 4.19 |
| **Packet Loss Rate%** | 6.20 | 100.00 | 0.20 | 0.50 |

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

**Note**-"-" All data tests were failed.

| Howrah District Hospital | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 145.91 | 5.40 | 383.20 | 7.21 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 18.84 | 2.94 | 69.17 | 1.98 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.11 | 2.80 | 2.12 | 2.58 |
| **Youtube Initial Buffer Delay (Second)** | 0.68 | 1.22 | 0.57 | 2.88 |
| **Latency (ms) - 50th Percentile** | 17.90 | 23.63 | 14.10 | 40.90 |
| **Jitter (ms)** | 7.50 | 16.36 | 3.69 | 12.50 |
| **Packet Loss Rate%** | 0.10 | 5.80 | 0.00 | 0.80 |

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

| Indian Institute of Engineering Science and Technology (IIEST) | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 543.42 | 10.76 | 217.64 | 35.08 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 75.81 | 2.08 | 18.26 | 30.71 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 1.77 | 3.39 | 2.33 | 2.34 |
| **Youtube Initial Buffer Delay (Second)** | 0.66 | 1.24 | 0.57 | 0.79 |
| **Latency (ms) - 50th Percentile** | 12.45 | 20.05 | 15.10 | 34.50 |
| **Jitter (ms)** | 22.00 | 7.59 | 10.46 | 3.21 |
| **Packet Loss Rate%** | 0.40 | 1.90 | 0.10 | 0.30 |

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

| Jadavpur University Kolkata | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 400.95 | 5.11 | 50.73 | 117.77 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 61.43 | 2.84 | 1.25 | 16.09 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 1.95 | 2.55 | 6.62 | 2.74 |
| **Youtube Initial Buffer Delay (Second)** | 0.55 | 2.85 | 5.97 | 1.17 |
| **Latency (ms) - 50th Percentile** | 16.73 | 19.98 | 17.75 | 38.45 |
| **Jitter (ms)** | 3.92 | 29.83 | 34.28 | 5.47 |
| **Packet Loss Rate%** | 0.00 | 31.90 | 3.00 | 0.90 |

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

| Jaladhulagori Toll Plaza NH-6 Howrah | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 235.52 | 1.99 | 66.49 | 46.08 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 29.43 | 1.38 | 16.30 | 5.75 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.00 | 4.19 | 2.24 | 2.51 |
| **Youtube Initial Buffer Delay (Second)** | 0.55 | 4.02 | 0.64 | 1.12 |
| **Latency (ms) - 50th Percentile** | 14.50 | 30.05 | 16.60 | 46.85 |
| **Jitter (ms)** | 8.80 | 17.66 | 4.06 | 7.26 |
| **Packet Loss Rate%** | 0.10 | 34.60 | 0.00 | 0.40 |

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

| Sarat Chandra Chattopadhyay Govt. Medical College & Hospital (Jadurberia Campus) | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 231.14 | 7.00 | 421.22 | 25.07 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 24.87 | 4.63 | 36.90 | 5.95 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.28 | 2.88 | 2.26 | 2.59 |
| **Youtube Initial Buffer Delay (Second)** | 0.77 | 1.10 | 0.66 | 1.26 |
| **Latency (ms) - 50th Percentile** | 13.55 | 21.35 | 14.80 | 38.75 |
| **Jitter (ms)** | 7.34 | 12.46 | 12.12 | 9.25 |
| **Packet Loss Rate%** | 0.00 | 2.70 | 0.20 | 0.90 |

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

| Satyanarayan Park AC Market | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 345.56 | 9.11 | 491.36 | 11.31 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 87.01 | 5.69 | 61.18 | 3.06 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.07 | 2.09 | 1.97 | 2.71 |
| **Youtube Initial Buffer Delay (Second)** | 0.56 | 2.32 | 0.53 | 1.17 |
| **Latency (ms) - 50th Percentile** | 11.25 | 19.90 | 10.70 | 45.10 |
| **Jitter (ms)** | 7.92 | 9.35 | 4.04 | 6.84 |
| **Packet Loss Rate%** | 0.00 | 1.40 | 0.10 | 0.20 |

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

| Sealdah Metro Station | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 282.32 | - | 95.11 | 40.43 |
| **Download Session Setup Success Rate%** | 100.00 | 0.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 51.12 | - | 3.84 | 29.69 |
| **Upload Session Setup Success Rate %** | 100.00 | 0.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 1.92 | - | 2.30 | 2.51 |
| **Youtube Initial Buffer Delay (Second)** | 0.60 | - | 0.85 | 0.85 |
| **Latency (ms)- 50th Percentile** | 10.55 | - | 17.18 | 32.00 |
| **Jitter (ms)** | 1.91 | - | 11.80 | 2.41 |
| **Packet Loss Rate%** | 0.00 | 100.00 | 1.10 | 0.20 |

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

**Note**-"-" All data tests were failed.

| Sealdah Railway Station | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 203.44 | 5.19 | 3.06 | 60.37 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 37.73 | 3.84 | 8.28 | 8.11 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Web Browsing Delay (Second)** | 2.14 | 2.54 | 3.37 | 2.53 |
| **Youtube Initial Buffer Delay (Second)** | 0.62 | 1.19 | 2.69 | 0.84 |
| **Latency (ms) - 50th Percentile** | 16.45 | 22.13 | 39.80 | 43.05 |
| **Jitter (ms)** | 10.19 | 10.75 | 56.47 | 5.71 |
| **Packet Loss Rate%** | 0.30 | 4.20 | 6.30 | 2.50 |

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

| Victoria Memorial | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| Download Throughput Average (Mbits/s) | 349.70 | 5.67 | 152.74 | 35.60 |
| Download Session Setup Success Rate % | 100.00 | 100.00 | 100.00 | 100.00 |
| Upload Throughput Average (Mbits/s) | 48.89 | 2.66 | 9.69 | 10.53 |
| Upload Session Setup Success Rate % | 100.00 | 100.00 | 100.00 | 100.00 |
| Web Browsing Delay (Second) | 2.03 | 3.43 | 2.22 | 2.34 |
| Youtube Initial Buffer Delay (Second) | 0.61 | 1.29 | 0.57 | 0.81 |
| Latency (ms) - 50th Percentile | 14.00 | 20.80 | 17.33 | 35.05 |
| Jitter (ms) | 5.07 | 7.64 | 42.82 | 4.00 |
| Packet Loss Rate% | 0.00 | 2.20 | 11.10 | 0.50 |

**Table-51:** 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) | 346.27 | - | 194.94 | - |
| | Upload Throughput Average (Mbits/s) | 66.83 | - | 37.00 | - |
| **4G** | Download Throughput Average (Mbits/s) | 43.44 | 5.87 | 44.01 | 30.09 |
| | Upload Throughput Average (Mbits/s) | 17.73 | 9.04 | 10.07 | 10.73 |

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

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

| Acropolis Mall Sector-1 Kolkata | | | | | |
|---|---|---|---|---|---|
| | **Parameters** | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 412.27 | - | 117.55 | - |
| | Upload Throughput Average (Mbits/s) | 47.61 | - | 15.75 | - |
| **4G** | Download Throughput Average (Mbits/s) | 13.81 | 4.69 | 2.41 | 4.77 |
| | Upload Throughput Average (Mbits/s) | 2.74 | 7.94 | 2.04 | 5.71 |

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

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

| Belur Math | | | | | |
|---|---|---|---|---|---|
| | **Parameters** | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 58.78 | - | 192.59 | - |
| | Upload Throughput Average (Mbits/s) | 10.41 | - | 19.40 | - |
| **4G** | Download Throughput Average (Mbits/s) | 51.29 | 3.14 | 50.12 | 29.07 |
| | Upload Throughput Average (Mbits/s) | 11.92 | 4.89 | 7.49 | 1.97 |

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

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

| Calcutta High Court | | | | | |
|---|---|---|---|---|---|
| Parameters | | Service Provider | | | |
| | | AIRTEL | BSNL | RJIL | VIL |
| 5G | Download Throughput Average (Mbits/s) | 550.01 | - | 8.36 | - |
| | Upload Throughput Average (Mbits/s) | 116.92 | - | 6.28 | - |
| 4G | Download Throughput Average (Mbits/s) | 36.46 | 7.19 | 6.82 | 58.70 |
| | Upload Throughput Average (Mbits/s) | 35.35 | 20.35 | 1.26 | 15.49 |

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

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

| Chandannagar Sub Divisional Hospital | | | | | |
|---|---|---|---|---|---|
| Parameters | | Service Provider | | | |
| | | AIRTEL | BSNL | RJIL | VIL |
| 5G | Download Throughput Average (Mbits/s) | 531.92 | - | 389.09 | - |
| | Upload Throughput Average (Mbits/s) | 120.51 | - | 64.77 | - |
| 4G | Download Throughput Average (Mbits/s) | 98.57 | 3.53 | 37.30 | 4.99 |
| | Upload Throughput Average (Mbits/s) | 38.04 | 3.73 | 22.38 | 22.70 |

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

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

| Dankuni Railway Junction | | | | | |
|---|---|---|---|---|---|
| Parameters | | Service Provider | | | |
| | | AIRTEL | BSNL | RJIL | VIL |
| 5G | Download Throughput Average (Mbits/s) | 443.98 | - | 84.19 | - |
| | Upload Throughput Average (Mbits/s) | 112.60 | - | 10.92 | - |
| 4G | Download Throughput Average (Mbits/s) | 50.54 | 6.62 | 50.04 | 18.06 |
| | Upload Throughput Average (Mbits/s) | 38.70 | 7.09 | 12.13 | 4.26 |

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

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

| Esplanade Metro Station | | | | | |
|---|---|---|---|---|---|
| Parameters | | Service Provider | | | |
| | | AIRTEL | BSNL | RJIL | VIL |
| 5G | Download Throughput Average (Mbits/s) | - | - | - | - |
| | Upload Throughput Average (Mbits/s) | - | - | - | - |
| 4G | Download Throughput Average (Mbits/s) | 17.98 | - | 45.29 | 16.46 |
| | Upload Throughput Average (Mbits/s) | 1.10 | - | 8.31 | 12.78 |

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

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

| Howrah District Hospital | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 157.65 | - | 347.37 | - |
| | Upload Throughput Average (Mbits/s) | 24.40 | - | 76.74 | - |
| **4G** | Download Throughput Average (Mbits/s) | 19.45 | 5.22 | 18.34 | 18.53 |
| | Upload Throughput Average (Mbits/s) | 6.53 | 5.23 | 10.32 | 6.51 |

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

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

| Indian Institute of Engineering Science and Technology (IIEST) | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 568.49 | - | 253.01 | - |
| | Upload Throughput Average (Mbits/s) | 107.53 | - | 19.54 | - |
| **4G** | Download Throughput Average (Mbits/s) | 76.38 | 9.28 | 65.78 | 35.65 |
| | Upload Throughput Average (Mbits/s) | 9.98 | 8.26 | 15.46 | 22.50 |

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

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

| Jadavpur University Kolkata | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 403.44 | - | 54.96 | - |
| | Upload Throughput Average (Mbits/s) | 83.23 | - | 1.16 | - |
| **4G** | Download Throughput Average (Mbits/s) | 58.74 | 4.69 | 99.59 | 84.96 |
| | Upload Throughput Average (Mbits/s) | 10.73 | 10.05 | 16.42 | 11.01 |

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

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

| Jaladhulagori Toll Plaza NH-6 Howrah | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 219.33 | - | 83.11 | - |
| | Upload Throughput Average (Mbits/s) | 39.44 | - | 21.19 | - |
| **4G** | Download Throughput Average (Mbits/s) | 9.79 | 4.29 | 5.43 | 24.74 |
| | Upload Throughput Average (Mbits/s) | 7.32 | 3.50 | 5.00 | 7.60 |

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

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

| Sarat Chandra Chattopadhyay Govt. Medical College & Hospital (Jadurberia Campus) | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 231.11 | - | 363.60 | - |
| | Upload Throughput Average (Mbits/s) | 29.89 | - | 84.52 | - |
| **4G** | Download Throughput Average (Mbits/s) | 12.15 | 6.73 | 54.04 | 16.16 |
| | Upload Throughput Average (Mbits/s) | 26.60 | 20.20 | 12.68 | 4.72 |

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

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

| Satyanarayan Park AC Market | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 441.89 | - | 464.50 | - |
| | Upload Throughput Average (Mbits/s) | 89.53 | - | 60.66 | - |
| **4G** | Download Throughput Average (Mbits/s) | 44.68 | 9.90 | 62.94 | 11.64 |
| | Upload Throughput Average (Mbits/s) | 34.89 | 15.61 | 16.61 | 5.48 |

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

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

| Sealdah Metro Station | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 307.20 | - | - | - |
| | Upload Throughput Average (Mbits/s) | 25.48 | - | - | - |
| **4G** | Download Throughput Average (Mbits/s) | 68.81 | - | 125.77 | 37.19 |
| | Upload Throughput Average (Mbits/s) | 14.12 | - | 5.97 | 28.02 |

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

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

| Sealdah Railway Station | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | Download Throughput Average (Mbits/s) | 145.25 | - | 3.26 | - |
| | Upload Throughput Average (Mbits/s) | 37.95 | - | 10.58 | - |
| **4G** | Download Throughput Average (Mbits/s) | 69.14 | 6.58 | 7.05 | 55.04 |
| | Upload Throughput Average (Mbits/s) | 5.64 | 3.96 | 5.13 | 6.26 |

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

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

| Victoria Memorial | | | | | |
|---|---|---|---|---|---|
| **Parameters** | | **Service Provider** | | | |
| | | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | **Download Throughput Average (Mbits/s)** | 369.93 | - | 172.61 | - |
| | **Upload Throughput Average (Mbits/s)** | 59.92 | - | 62.73 | - |
| **4G** | **Download Throughput Average (Mbits/s)** | 23.83 | 4.45 | 29.25 | 35.36 |
| | **Upload Throughput Average (Mbits/s)** | 12.28 | 6.68 | 4.59 | 5.95 |

**Table-67:** 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 9th July 2025. Three locations have been tested in the Kolkata TD area.

### 4.4.1 Walk test locations
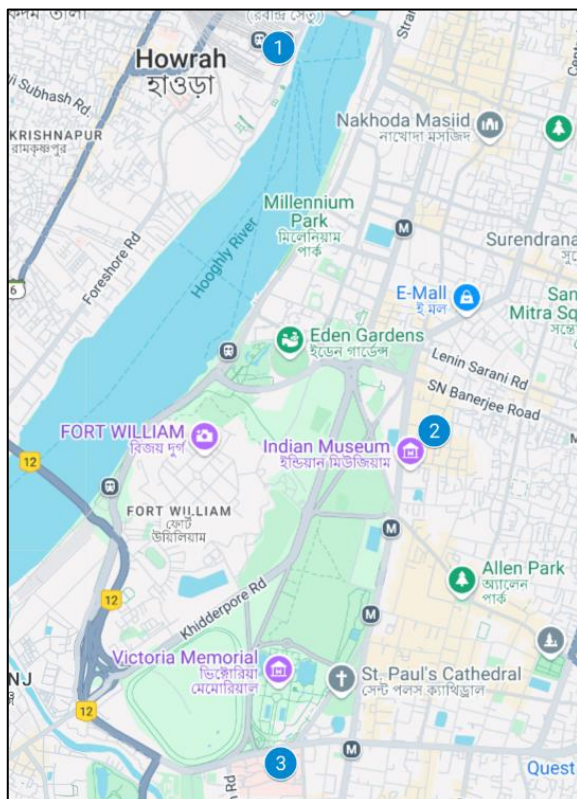


**Figure-24:** Walk test locations.

### 4.4.2 Walk test covered

1. Howrah Railway Station
2. New Market
3. SSKM Hospital

### 4.4.3 Voice performance

### i) Howrah Railway Station

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

| Howrah Railway Station | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 21 | 20 | 21 | 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 (Sec)** | 0.65 | 2.47 | 0.54 | 0.75 |
| **Handover Success Rate %** | 100.00 | - | 100.00 | 100.00 |

**Table-68:** Summary of Voice performance in network auto-selection mode (5G/4G/3G/2G).

**Note** "**-** "Handover did not attempt.
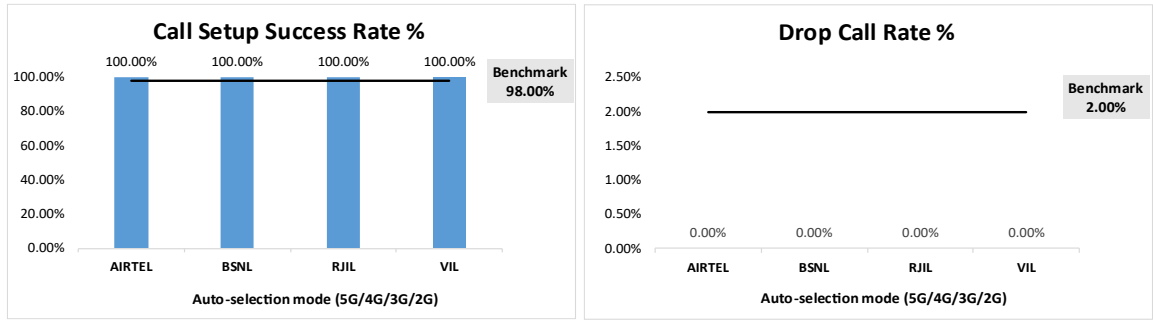
**Figure-25:** Performance for call setup success rate and drop call rate.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 9.31% | NA | 94.83% | NA |
| **4G** | 90.69% | 100.00% | 5.17% | 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-69:** Time spent on technology during walk test.

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

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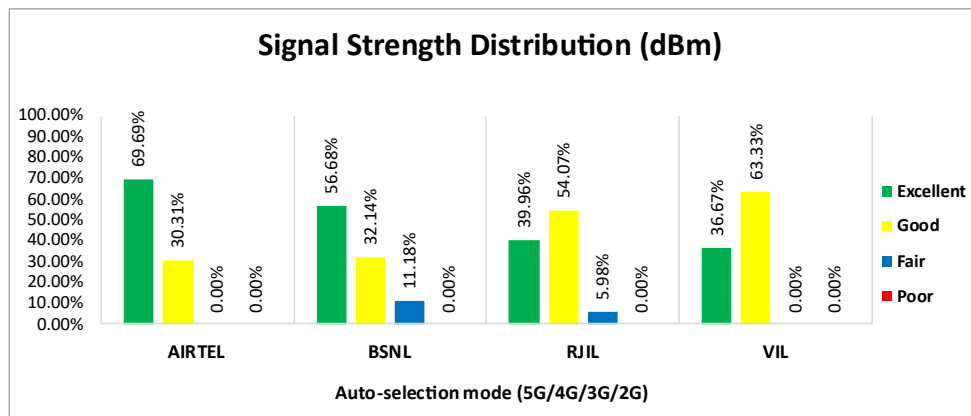


**Figure-26:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

## ii) New Market

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

| New Market | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-selection mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Call Attempt** | 11 | 11 | 12 | 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 | 2.87 | 0.49 | 0.84 |
| **Handover Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |

**Table-70:** Summary of Voice performance in network auto-selection mode (5G/4G/3G/2G).
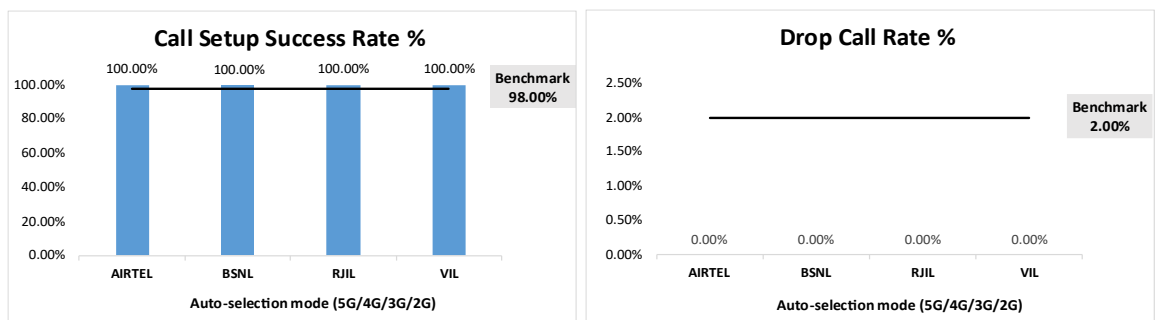


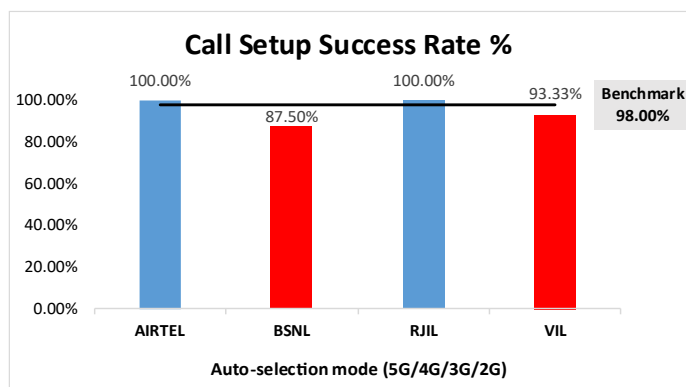**Figure- 27:** Performance for call setup success rate and drop call rate.

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

| New Market | | | | |
|---|---|---|---|---|
| **Technology** | **Service Provider** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 0.76% | NA | 100.00% | NA |
| **4G** | 99.24% | 30.34% | 0.00% | 100.00% |
| **3G** | NA | 0.00% | NA | NA |
| **2G** | 0.00% | 69.66% | NA | 0.00% |
| **Limited service** | 0.00% | 0.00% | 0.00% | 0.00% |

**Table-71:** Time spent on technology during walk test.

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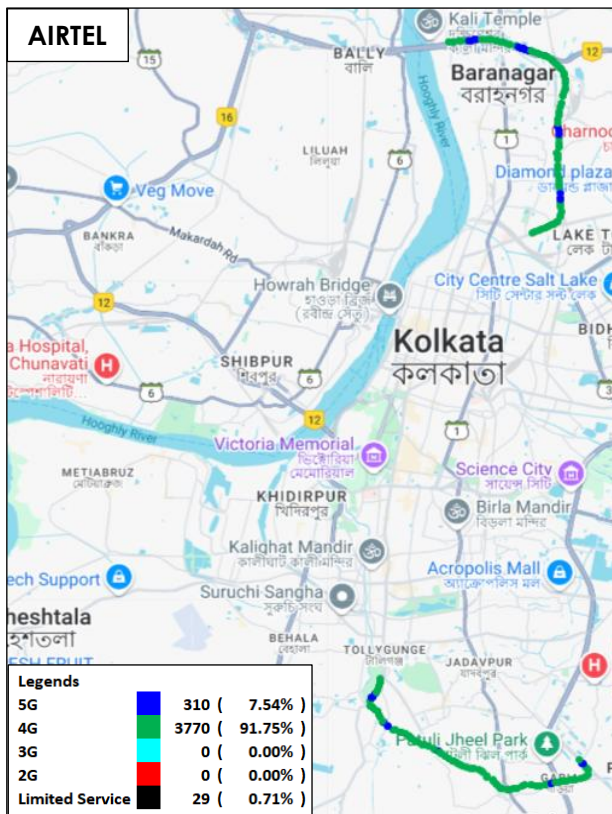- NA- Service provider doesn't provide services in respective technology.

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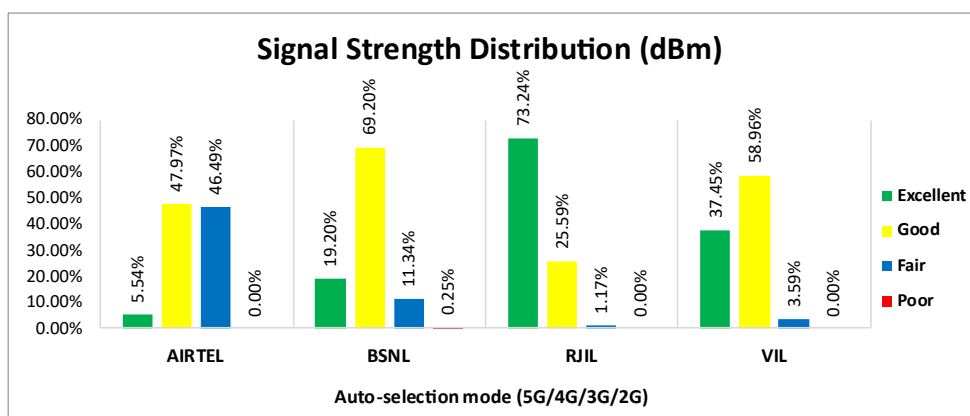


**Figure-28:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

## iii) SSKM Hospital

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

| SSKM Hospital | | | | |
|---|---|---|---|---|
| **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)** | 0.78 | 2.45 | 0.50 | 0.75 |
| **Handover Success Rate %** | 100.00 | 100.00 | 99.55 | 100.00 |

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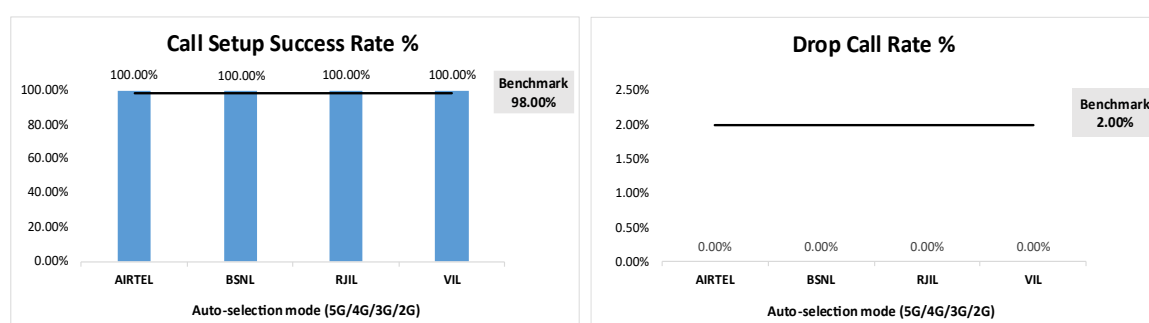


**Figure- 29:** Performance for call setup success rate and drop call rate.

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

| SSKM Hospital | | | | |
|---|---|---|---|---|
| **Technology** | **Service Provider** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 1.34% | NA | 55.37% | NA |
| **4G** | 98.66% | 100.00% | 44.63% | 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-73:** Time spent on technology during walk test.

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

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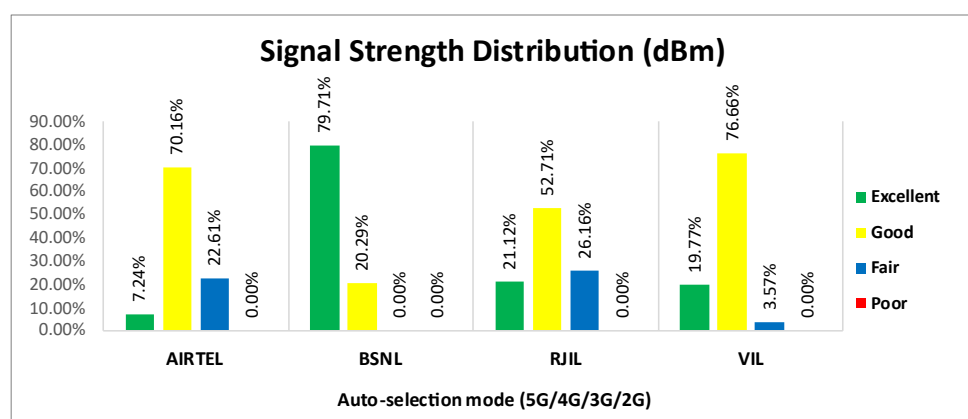


**Figure-30:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

# 4.4.4 Data performance

## i) Howrah Railway Station

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

| Howrah Railway Station | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 260.46 | 6.28 | 10.48 | 35.43 |
| **Download Throughput 80th Percentile** | 363.77 | 10.33 | 11.87 | 58.79 |
| **Download Throughput 20th Percentile** | 164.47 | 0.00 | 4.14 | 11.08 |
| **Download Session Setup Success Rate %** | 100.00 | 88.46 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 57.80 | 7.30 | 10.16 | 9.67 |
| **Upload Throughput 80th Percentile** | 80.91 | 14.08 | 14.48 | 13.23 |
| **Upload Throughput 20th Percentile** | 32.51 | 0.00 | 4.81 | 4.02 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Latency (ms)-50th Percentile** | 13.98 | 18.58 | 28.00 | 37.90 |

**Table-74:** Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).
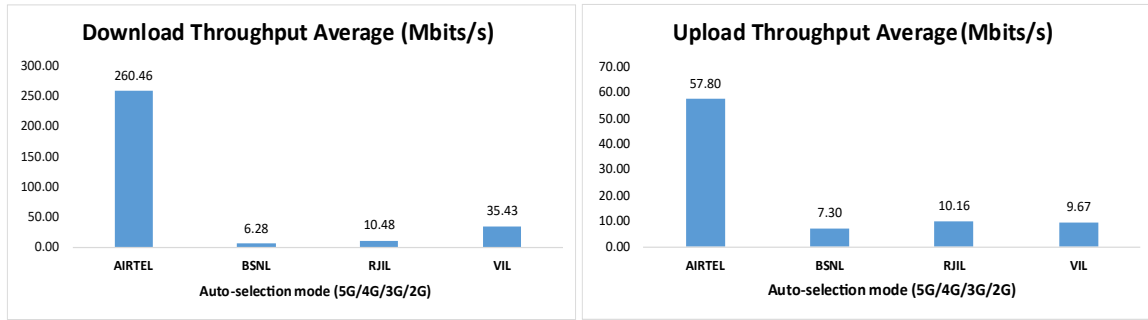
**Figure- 31:** Download and Upload throughput.

## ii) New Market

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

| New Market | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 69.16 | 3.86 | 55.99 | 22.24 |
| **Download Throughput 80th Percentile** | 168.43 | 6.52 | 105.92 | 34.61 |
| **Download Throughput 20th Percentile** | 6.03 | 0.84 | 15.99 | 12.75 |
| **Download Session Setup Success Rate %** | 100.00 | 68.42 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 10.31 | 3.56 | 30.24 | 19.45 |
| **Upload Throughput 80th Percentile** | 22.08 | 5.35 | 56.29 | 22.99 |
| **Upload Throughput 20th Percentile** | 1.65 | 0.00 | 9.28 | 16.01 |
| **Upload Session Setup Success Rate %** | 100.00 | 78.95 | 100.00 | 100.00 |
| **Latency (ms)-50th Percentile** | 28.50 | 20.60 | 20.35 | 35.85 |

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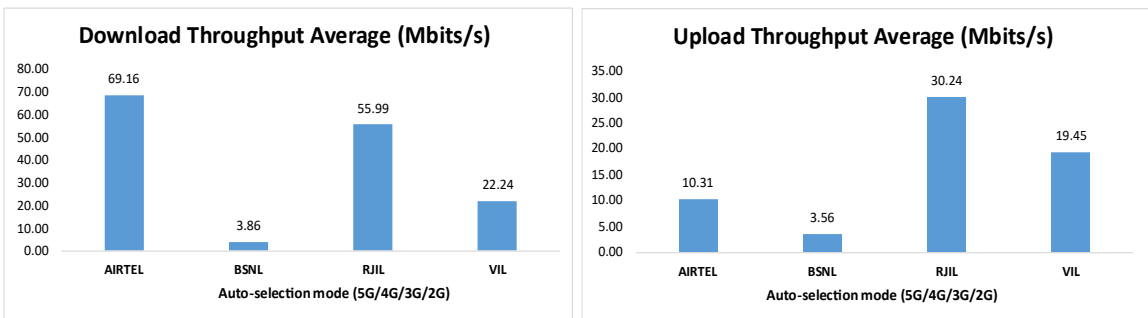


**Figure- 32:** Download and Upload throughput

# iii) SSKM Hospital

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

| SSKM Hospital | | | | |
|---|---|---|---|---|
| **Parameters** | **Service Provider** | | | |
| | **Auto-Selection Mode (5G/4G/3G/2G)** | | | |
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **Download Throughput Average (Mbits/s)** | 61.74 | 4.21 | 85.35 | 38.87 |
| **Download Throughput 80th Percentile** | 131.43 | 5.68 | 162.97 | 51.28 |
| **Download Throughput 20th Percentile** | 8.88 | 2.70 | 7.58 | 20.71 |
| **Download Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Upload Throughput Average (Mbits/s)** | 6.56 | 6.55 | 10.63 | 10.13 |
| **Upload Throughput 80th Percentile** | 9.63 | 7.18 | 15.29 | 15.29 |
| **Upload Throughput 20th Percentile** | 2.31 | 5.27 | 2.62 | 3.66 |
| **Upload Session Setup Success Rate %** | 100.00 | 100.00 | 100.00 | 100.00 |
| **Latency (ms)-50th Percentile** | 23.35 | 21.70 | 14.83 | 40.00 |

**Table-76:** Summary of Data performance in network auto-selection mode (5G/4G/3G/2G).
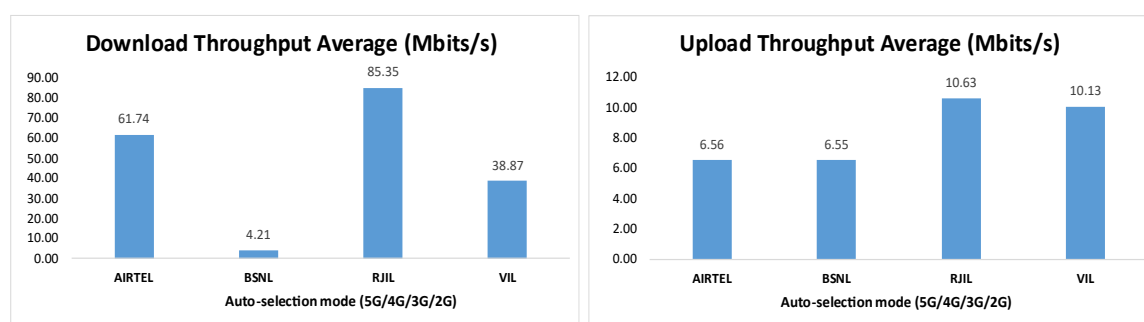


**Figure- 33:** Download and Upload throughput

## 4.5 Metro

Drive test has been conducted on 23rd July 2025 and 24th July 2025 covering five metro routes. (Refer Table-1)

### 4.5.1 Drive test route
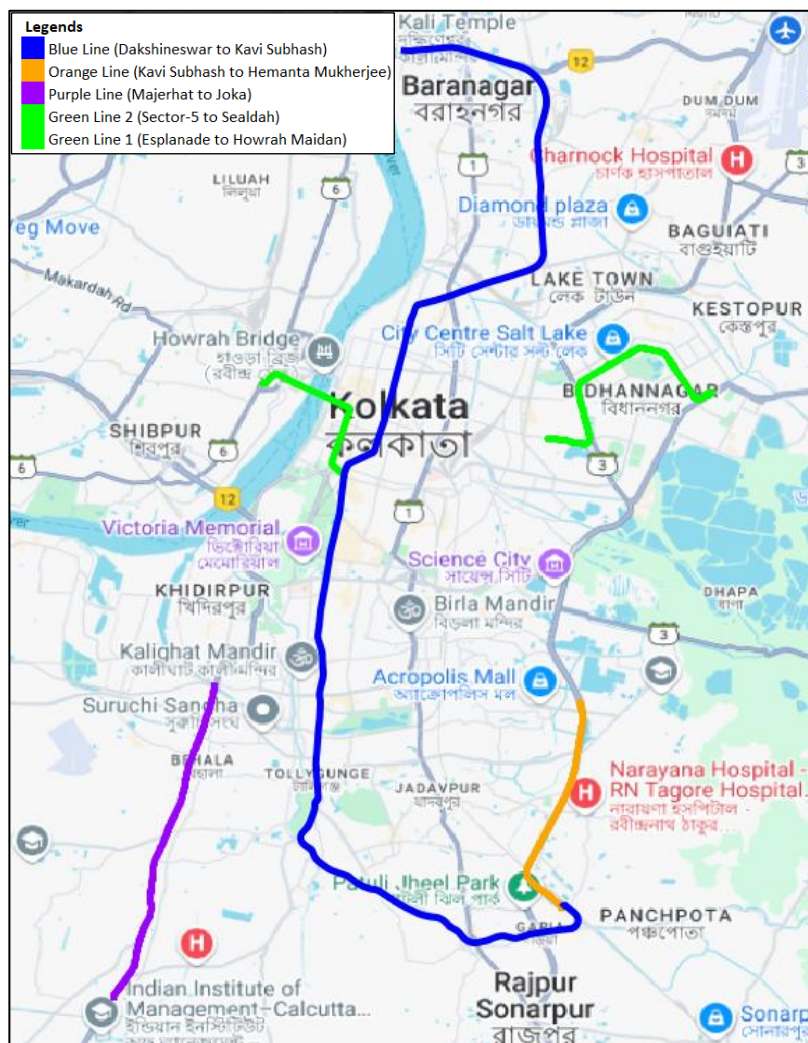


**Figure-34:** Drive test route metro

### 4.5.2 Routes Covered

1. Dakshineswar to Kavi Subhash (Blue line)
2. Kavi Subhash to Hemanta Mukherjee (Orange line)
3. Majerhat to Joka (Purple line)
4. Sector-5 to Sealdah (Green line 2)
5. Esplanade to Howrah Maidan (Green line 1)

## 4.5.2.1 Dakshineswar to Kavi Subhash

## i) Voice performance

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

| Parameters | Service Provider | | | |
|---|---|---|---|---|
| | Auto-selection mode (5G/4G/3G/2G) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| Call Attempts | 29 | 32 | 30 | 30 |
| Call Setup Success Rate % | 100.00 | 87.50 | 100.00 | 93.33 |
| Drop Call Rate % | 6.90 | 17.86 | 6.67 | 3.57 |
| Call Setup Time Average (Second) | 0.88 | 3.87 | 1.41 | 1.33 |
| Handover Success Rate % | 100.00 | 98.98 | 100.00 | 100.00 |

**Table-77:** Summary of voice call performance in network auto-selection mode.
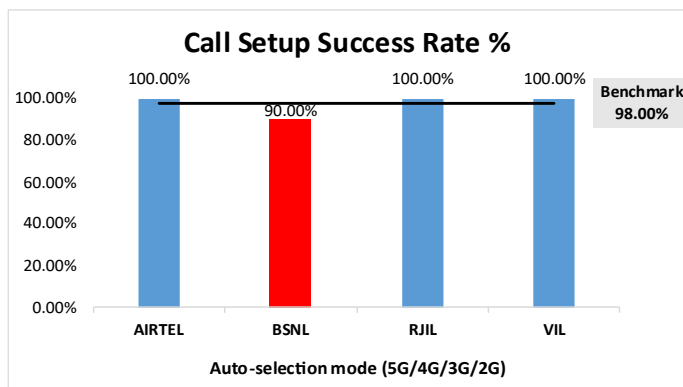


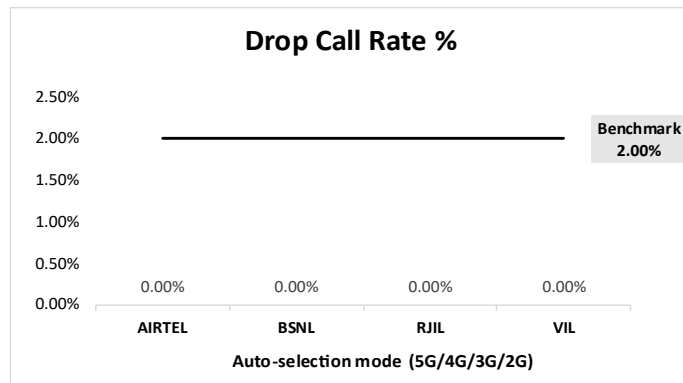**Figure-35:** Performance for call setup success rate.
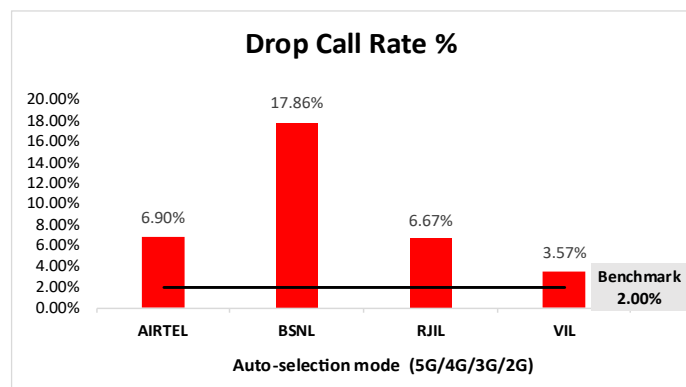


**Figure-36:** Performance for drop call rate.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 7.54% | NA | 23.86% | NA |
| **4G** | 91.75% | 27.52% | 75.49% | 95.48% |
| **3G** | NA | 2.82% | NA | NA |
| **2G** | 0.00% | 66.58% | NA | 4.37% |
| **Limited Service** | 0.71% | 3.08% | 0.66% | 0.15% |

**Table-78:** Time spent on technology during drive test.

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



**Figure-37:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-AIRTEL.
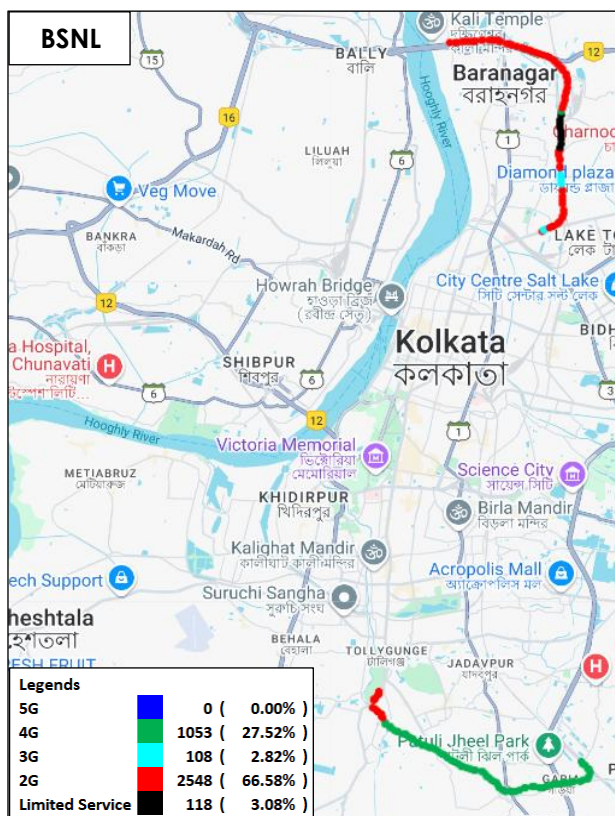
**Figure-38:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-BSNL.
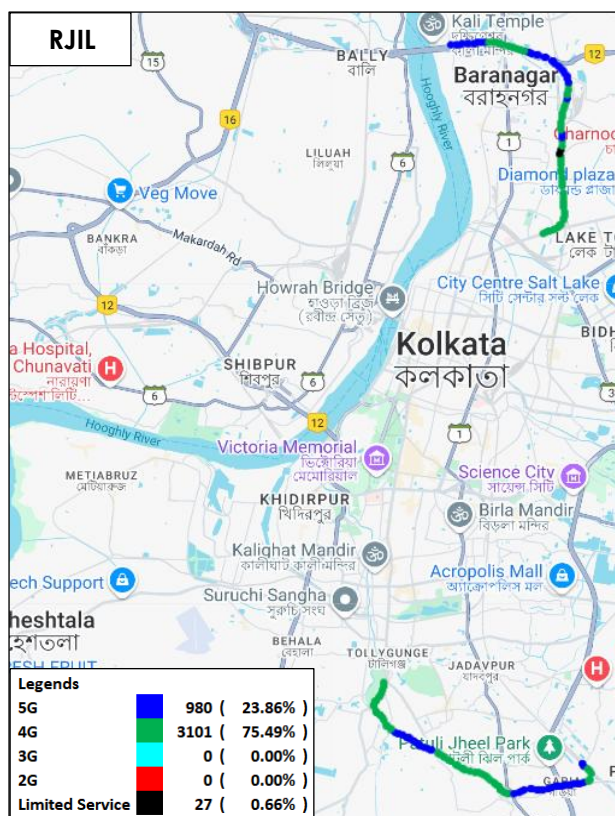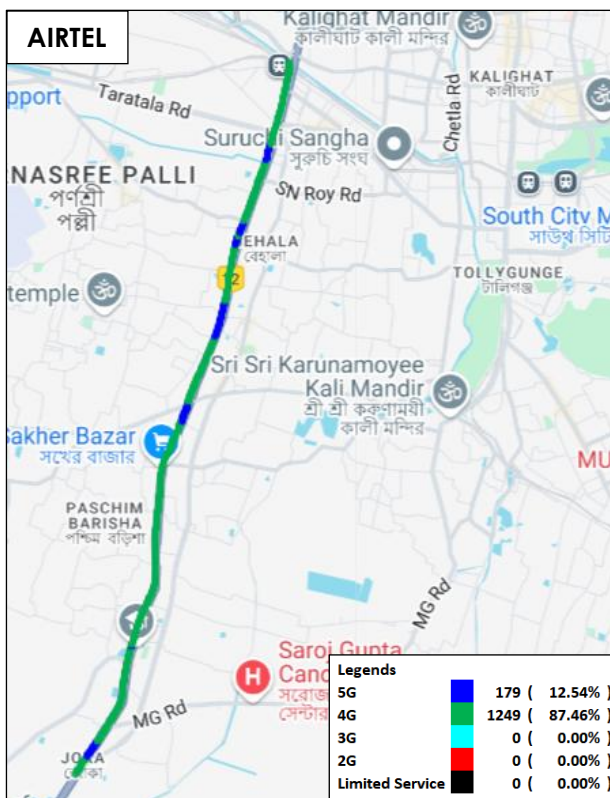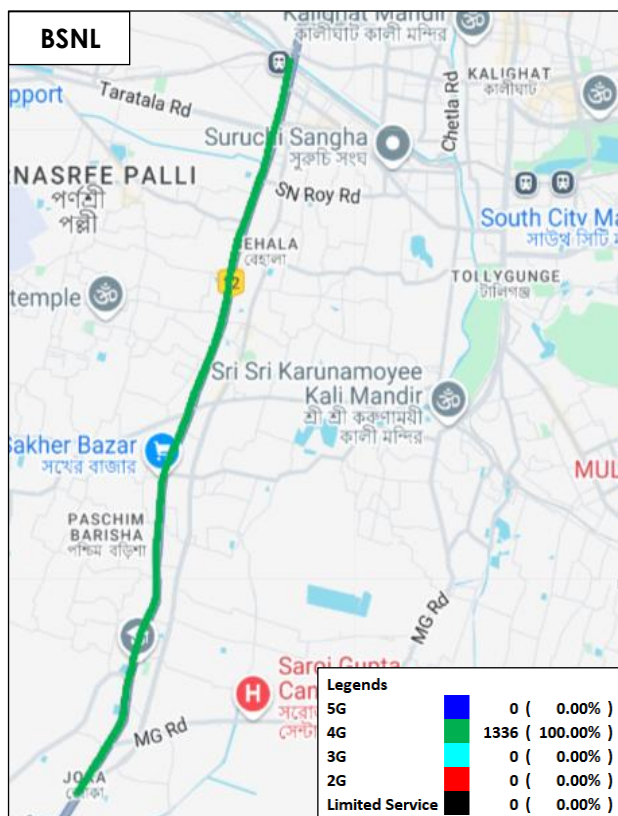


**Figure-39:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-RJIL.
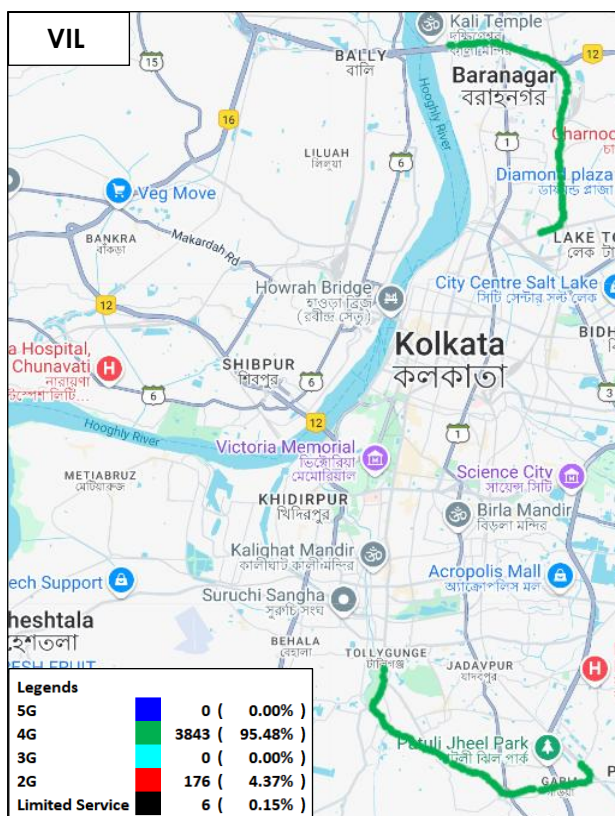
**Figure-40:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-VIL.

**(c) Network Signal Strength Distribution:** The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-83, 84, 85 & 86 for map view)
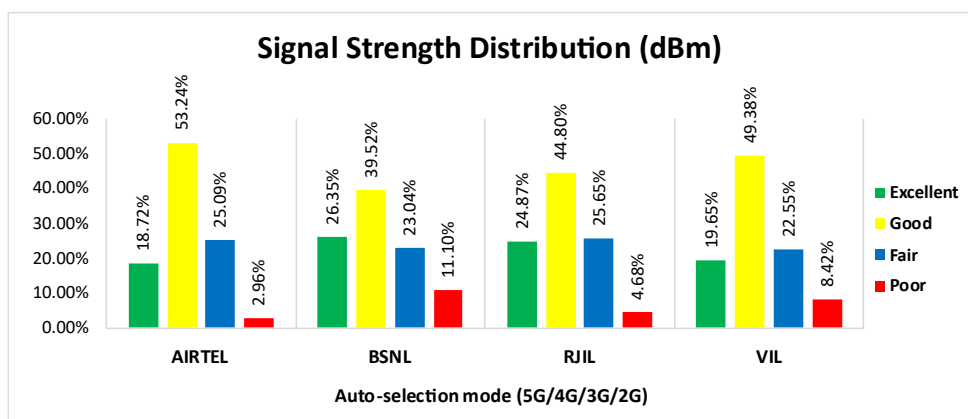


**Figure-41:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

**Observations:**

- Airtel has 19% of samples falling in the excellent signal strength category.
- BSNL has 26% of samples falling in the excellent signal strength category.
- RJIL has 25% of samples falling in the excellent signal strength category.
- VIL has 20% of samples falling in the excellent signal strength category.

## ii) 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 | 154.12 | 5.55 | 135.57 | 23.16 |
| | 80th Percentile | 335.95 | 7.74 | 285.82 | 31.85 |
| | 20th Percentile | 8.09 | 2.23 | 1.03 | 12.14 |
| Upload Throughput (Mbits/s) | Average | 28.29 | 5.28 | 22.00 | 10.88 |
| | 80th Percentile | 63.36 | 7.94 | 44.05 | 16.21 |
| | 20th Percentile | 1.29 | 1.48 | 2.45 | 4.53 |
| Latency (ms) | 50th Percentile | 18.90 | 21.20 | 17.25 | 38.35 |

**Table-79:** Summary of Data performance in network auto-selection mode.
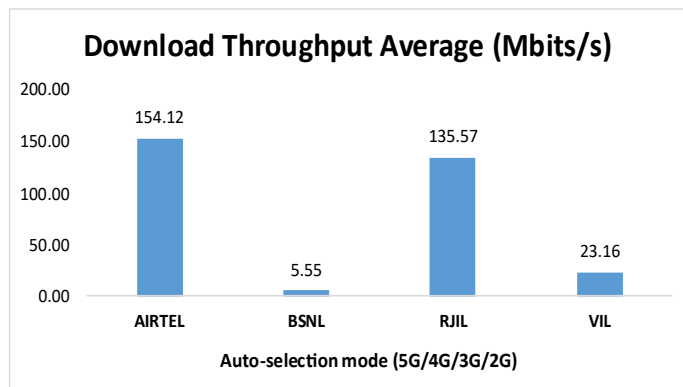


**Figure-42:** Download throughput
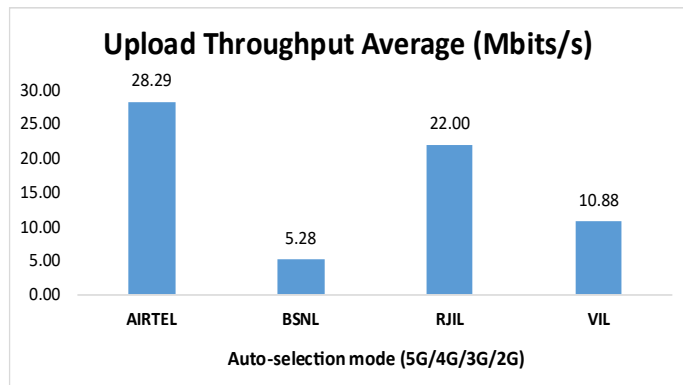


**Figure-43:** Upload throughput

## 4.5.2.2 Kavi Subhash to Hemanta Mukherjee

### i) Voice performance

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

| Parameters | Service Provider | | | |
| --- | --- | --- | --- | --- |
| | Auto-selection mode (5G/4G/3G/2G) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| Call Attempts | 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 (Second) | 0.70 | 4.37 | 0.60 | 0.79 |
| Handover Success Rate % | 100.00 | 100.00 | 100.00 | 100.00 |

**Table-80:** Summary of voice call performance in network auto-selection mode.
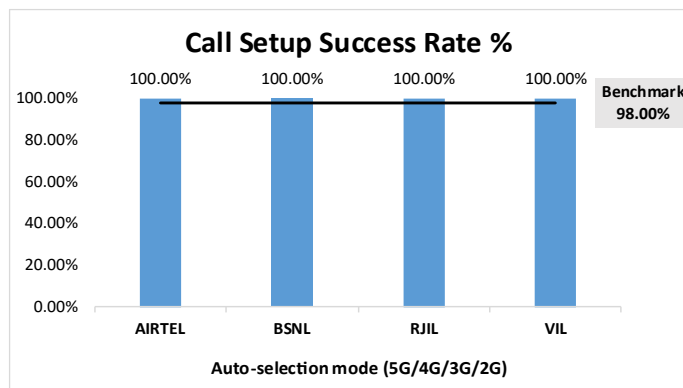


**Figure-44:** Performance for call setup success rate.
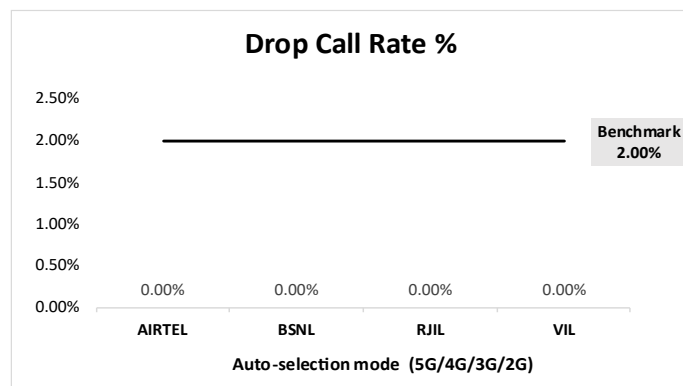


**Figure-45:** Performance for drop call rate.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 12.39% | NA | 52.60% | NA |
| **4G** | 87.61% | 100.00% | 47.40% | 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-81:** Time spent on technology during drive test.

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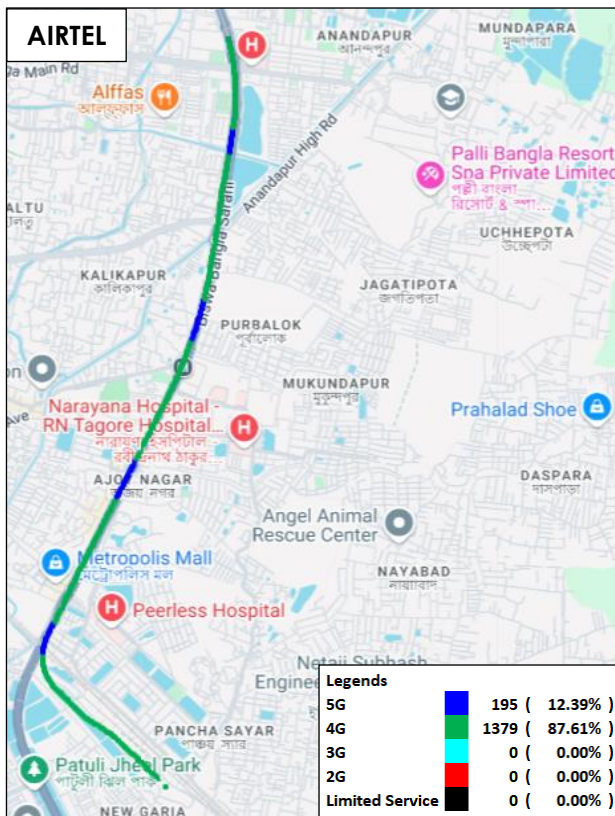


**Figure-46:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-AIRTEL.
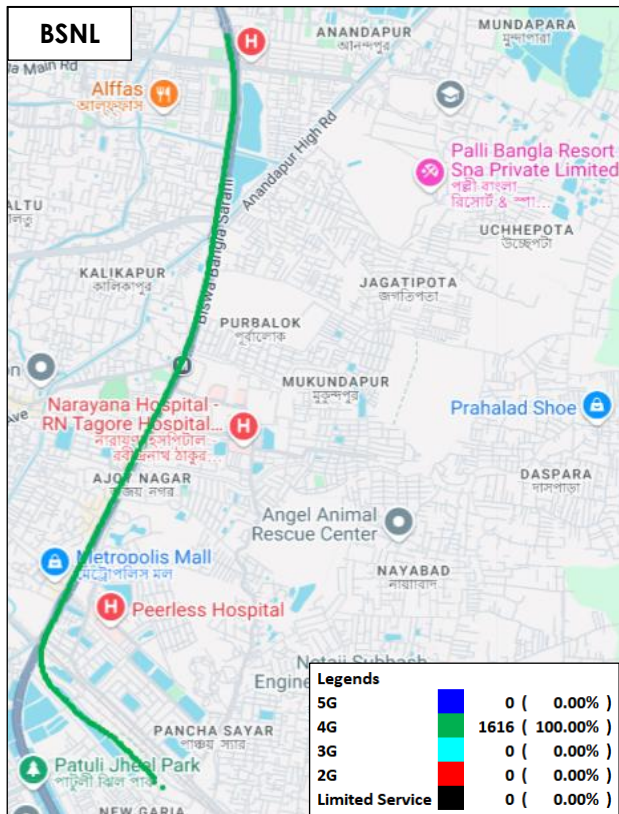
**Figure-47:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-BSNL.
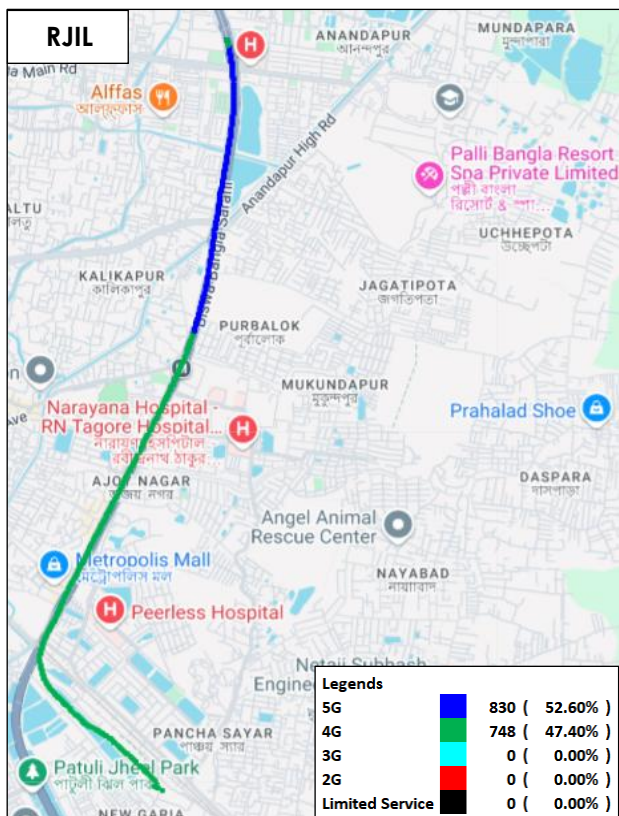


**Figure-48:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-RJIL.
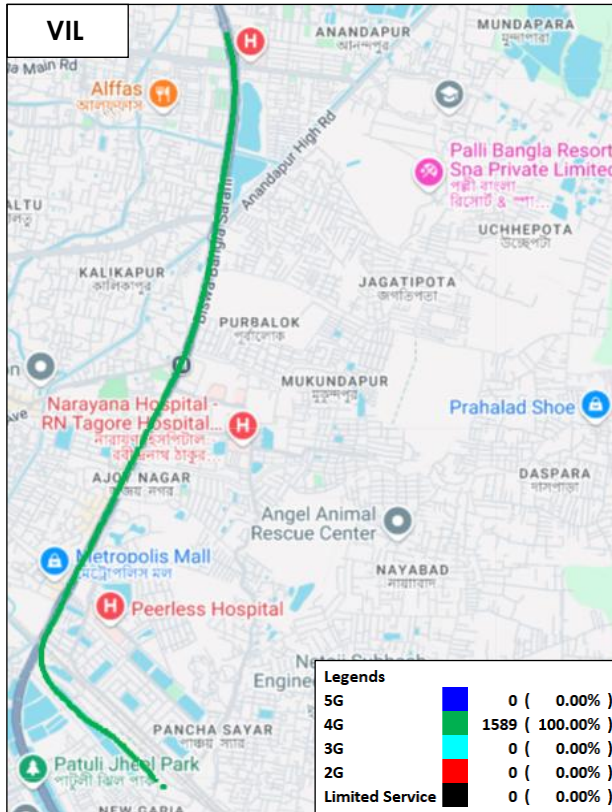
**Figure-49:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-VIL.

**(c) Network Signal Strength Distribution:** The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-87, 88, 89 & 90 for map view)
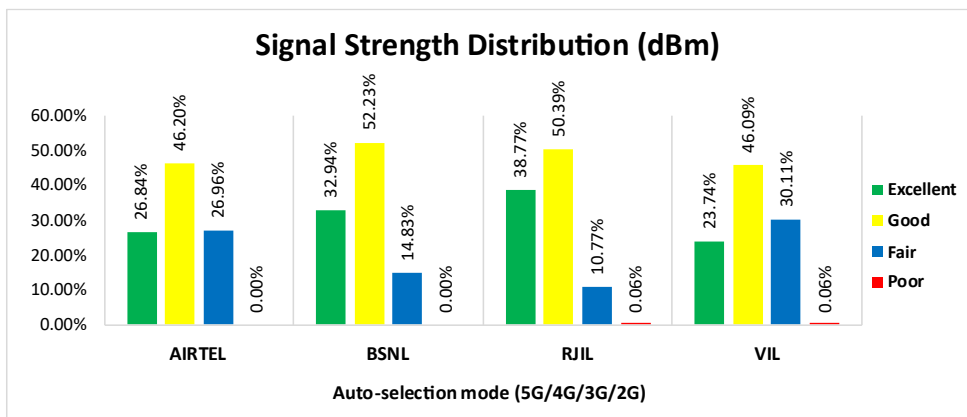


**Figure-50:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

## Observations:

- Airtel has 27% of samples falling in the excellent signal strength category.
- BSNL has 33% of samples falling in the excellent signal strength category.
- RJIL has 39% of samples falling in the excellent signal strength category.
- VIL has 24% of samples falling in the excellent signal strength category.

## ii) 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 | 217.64 | 4.02 | 88.64 | 18.78 |
| | 80th Percentile | 250.05 | 6.48 | 139.96 | 30.11 |
| | 20th Percentile | 162.35 | 1.88 | 41.21 | 7.27 |
| Upload Throughput (Mbits/s) | Average | 34.22 | 4.92 | 26.45 | 8.77 |
| | 80th Percentile | 44.84 | 6.57 | 36.06 | 11.56 |
| | 20th Percentile | 15.33 | 1.95 | 14.03 | 3.73 |
| Latency (ms) | 50th Percentile | 13.30 | 20.10 | 14.90 | 42.80 |

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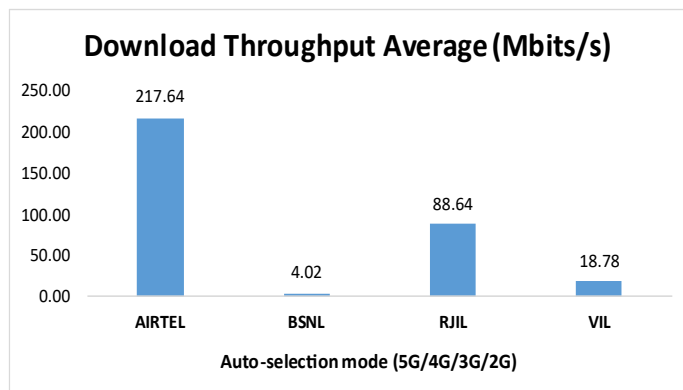


**Figure-51:** Download throughput
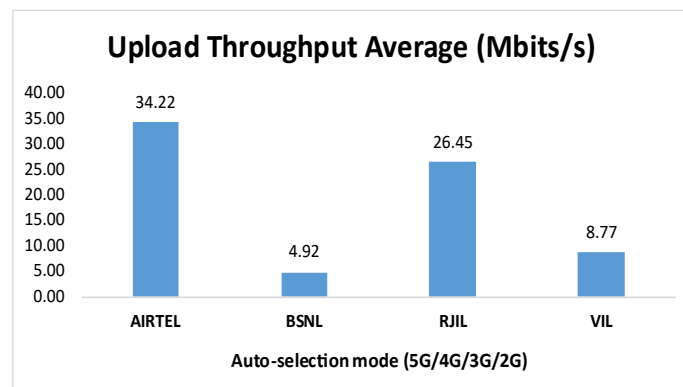


**Figure-52:** Upload throughput

## 4.5.2.3 Majerhat to Joka

### i) Voice performance

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

| Parameters | Service Provider | | | |
|---|---|---|---|---|
| | Auto-selection mode (5G/4G/3G/2G) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| Call Attempts | 10 | 10 | 10 | 10 |
| Call Setup Success Rate % | 100.00 | 90.00 | 100.00 | 100.00 |
| Drop Call Rate % | 0.00 | 0.00 | 0.00 | 0.00 |
| Call Setup Time Average (Second) | 0.75 | 3.45 | 0.54 | 0.97 |
| Handover Success Rate % | 100.00 | 100.00 | 100.00 | 100.00 |

**Table-83:** Summary of voice call performance in network auto-selection mode.



**Figure-53:** Performance for call setup success rate.



**Figure-54:** Performance for drop call rate.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 12.54% | NA | 62.69% | NA |
| **4G** | 87.46% | 100.00% | 37.31% | 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-84:**Time spent on technology during drive test.

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



**Figure-55:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-AIRTEL.

**Figure-56:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-BSNL.
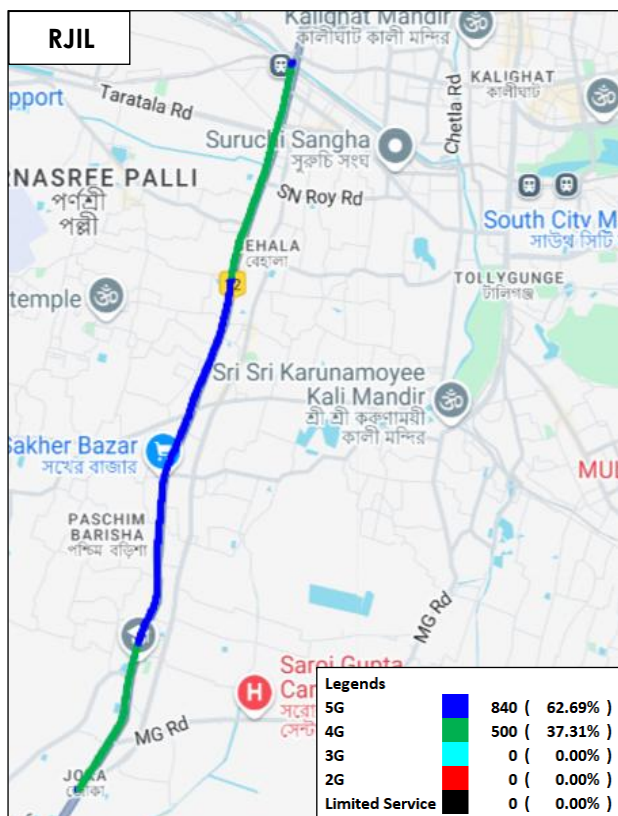


**Figure-57:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-RJIL.
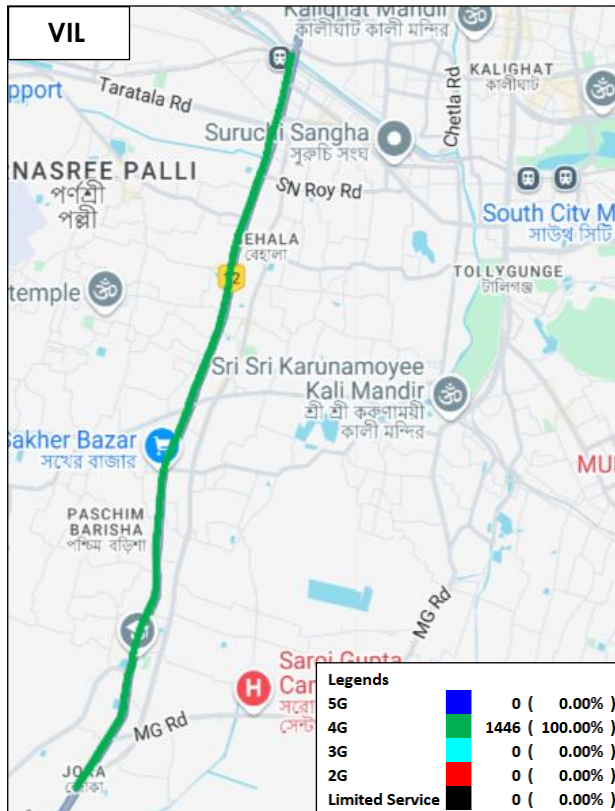
**Figure-58:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-VIL.

**(c) Network Signal Strength Distribution:** The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-91, 92, 93 & 94 for map view)
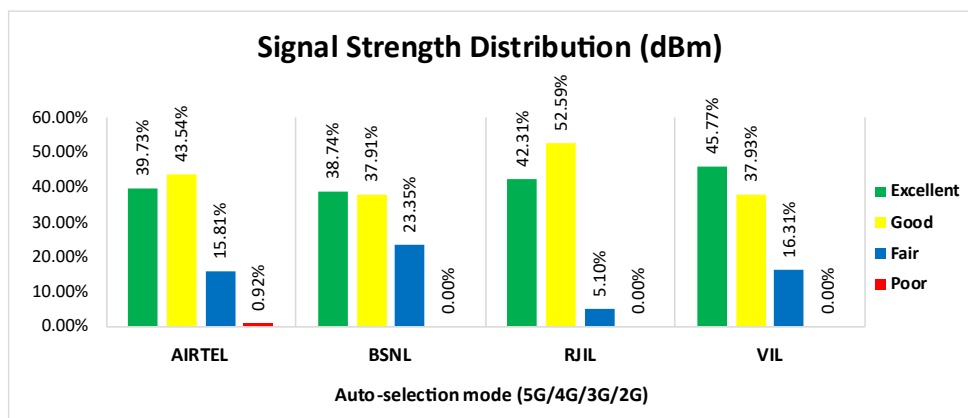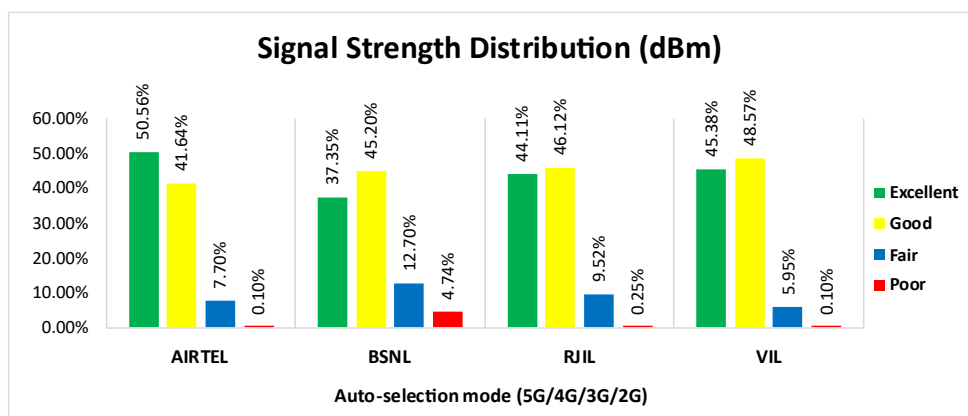


**Figure-59:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

**Observations:**

- Airtel has 40% of samples falling in the excellent signal strength category.
- BSNL has 39% of samples falling in the excellent signal strength category.
- RJIL has 42% of samples falling in the excellent signal strength category.
- VIL has 46% of samples falling in the excellent signal strength category.

## ii) 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 | 242.64 | 4.36 | 145.85 | 24.91 |
| | 80th Percentile | 324.26 | 6.98 | 213.68 | 37.54 |
| | 20th Percentile | 118.66 | 0.86 | 77.89 | 11.67 |
| Upload Throughput (Mbits/s) | Average | 67.04 | 6.86 | 28.19 | 7.47 |
| | 80th Percentile | 82.08 | 9.13 | 43.13 | 9.03 |
| | 20th Percentile | 54.93 | 3.97 | 11.29 | 4.35 |
| Latency (ms) | 50th Percentile | 11.85 | 20.50 | 14.15 | 39.50 |

**Table-85:** Summary of Data performance in network auto-selection mode.
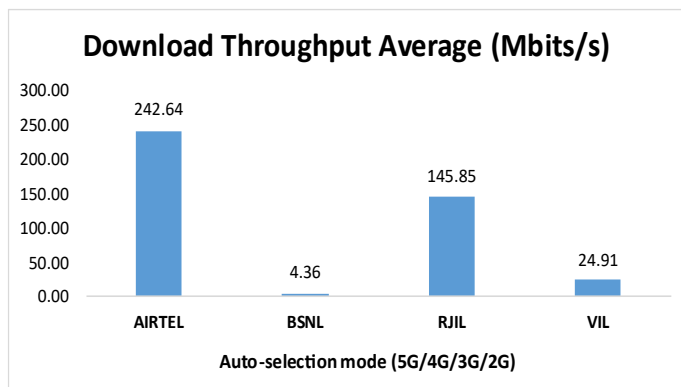


**Figure-60:** Download throughput
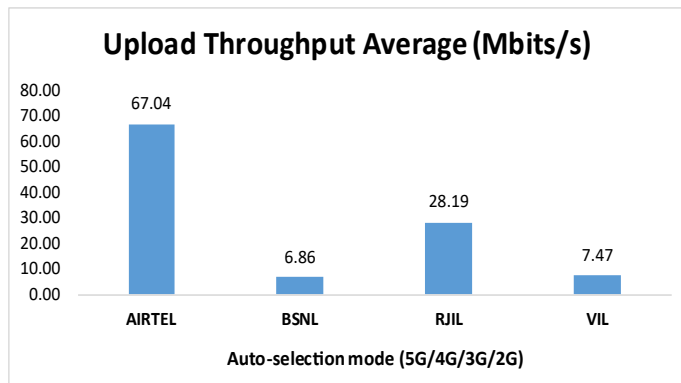


**Figure-61:** Upload throughput

## 4.5.2.4 Sector-5 to Sealdah

### i) Voice performance

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

| Parameters | Service Provider | | | |
|---|---|---|---|---|
| | Auto-selection mode (5G/4G/3G/2G) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| Call Attempts | 16 | 19 | 16 | 16 |
| Call Setup Success Rate % | 100.00 | 63.16 | 100.00 | 100.00 |
| Drop Call Rate % | 0.00 | 16.67 | 0.00 | 0.00 |
| Call Setup Time Average (Second) | 2.26 | 4.21 | 0.67 | 0.90 |
| Handover Success Rate % | 99.16 | 100.00 | 100.00 | 100.00 |

**Table-86:** Summary of voice call performance in network auto-selection mode.
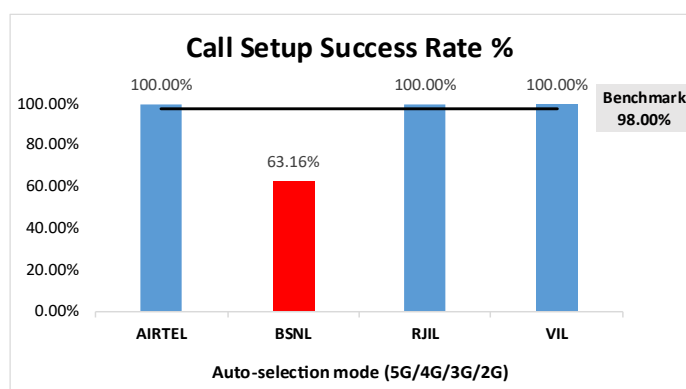


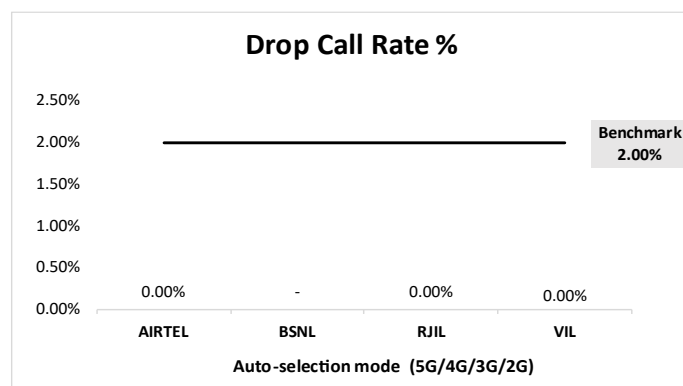**Figure-62:** Performance for call setup success rate.
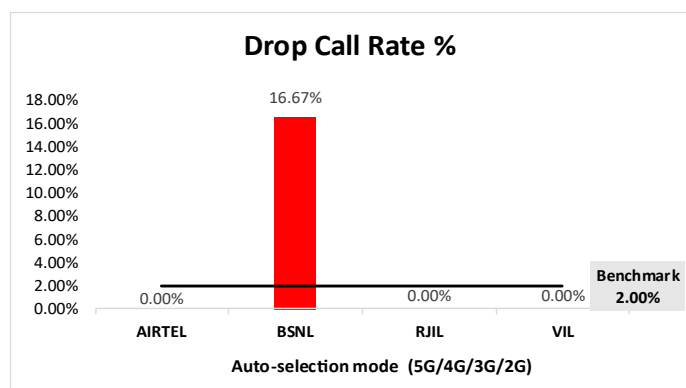


**Figure-63:** Performance for drop call rate.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 6.40% | NA | 52.07% | NA |
| **4G** | 93.60% | 63.62% | 47.93% | 100.00% |
| **3G** | NA | 0.38% | NA | NA |
| **2G** | 0.00% | 30.27% | NA | 0.00% |
| **Limited Service** | 0.00% | 5.74% | 0.00% | 0.00% |

**Table-87:** Time spent on technology during drive test.

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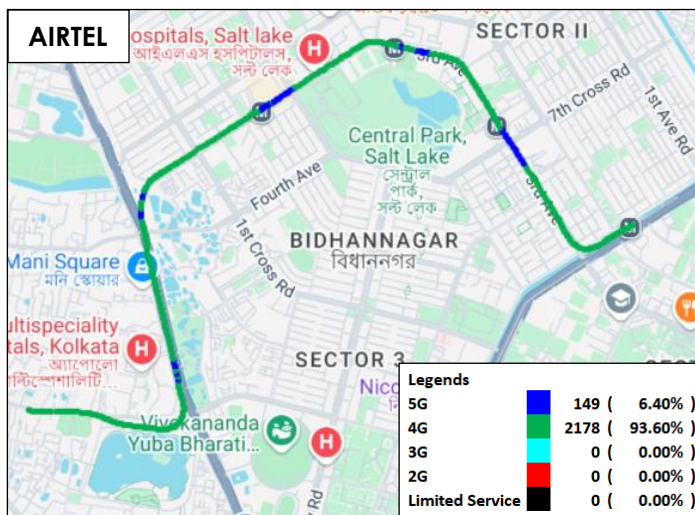


**Figure-64:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-AIRTEL.
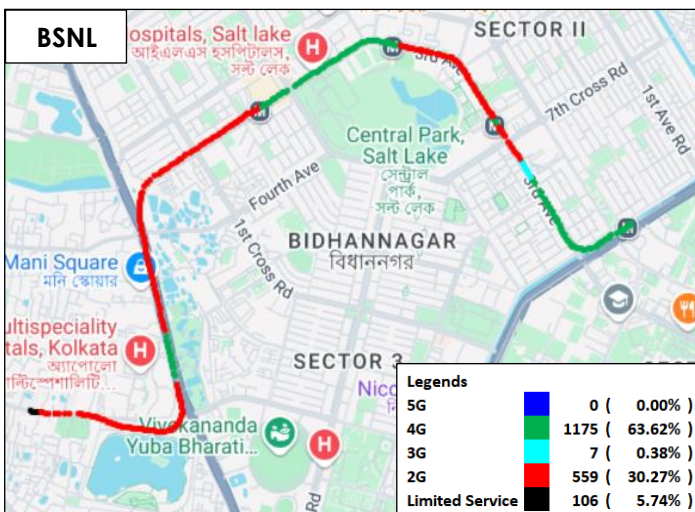


**Figure-65:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-BSNL.
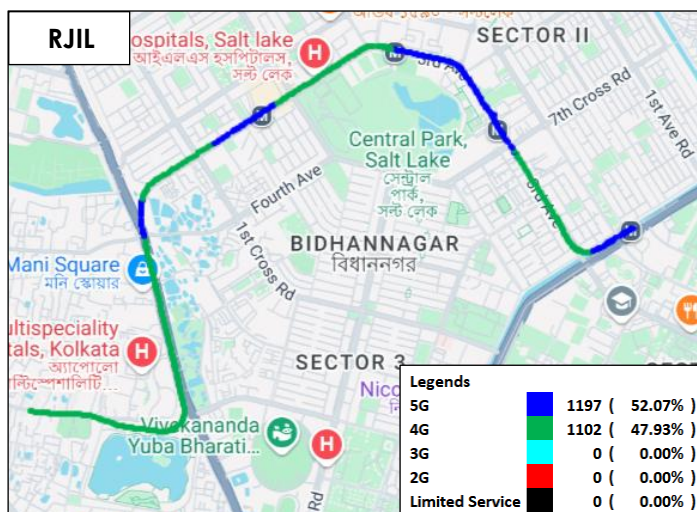
**Figure-66:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-RJIL.
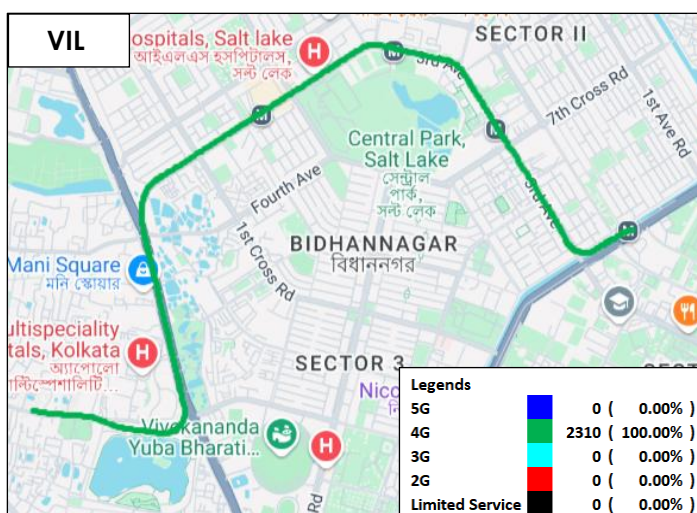


**Figure-67:** Serving technology plots in auto-selection mode (5G/4G/3G/2G)-VIL.

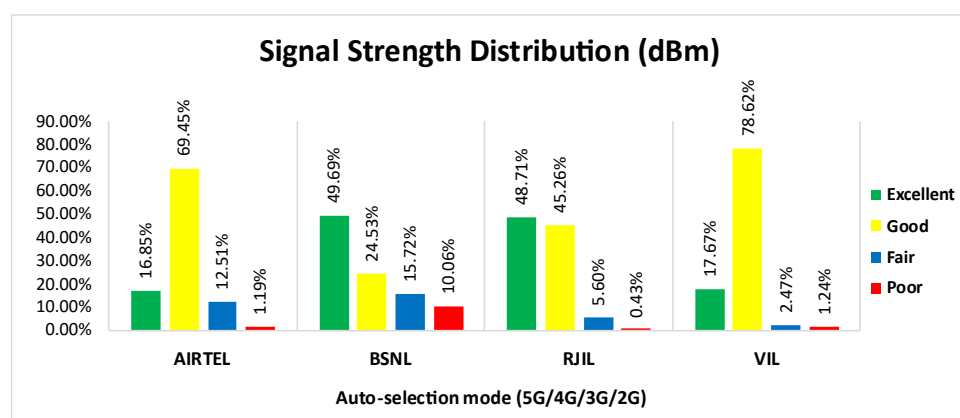**(c) Network Signal Strength Distribution:** The following chart provides signal strength distribution for auto-selection mode (5G/4G/3G/2G). (Refer figure-95, 96, 97 & 98 for map view)



**Figure-68:** Signal strength distribution auto-selection mode 5G/4G/3G/2G.

**Observations:**

- Airtel has 51% of samples falling in the excellent signal strength category.
- BSNL has 37% of samples falling in the excellent signal strength category.
- RJIL has 44% of samples falling in the excellent signal strength category.
- VIL has 45% of samples falling in the excellent signal strength category.

## ii) 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** | 198.53 | 3.76 | 50.83 | 33.36 |
| | **80th Percentile** | 353.18 | 5.62 | 75.75 | 42.68 |
| | **20th Percentile** | 15.60 | 2.11 | 22.68 | 20.52 |
| **Upload Throughput (Mbits/s)** | **Average** | 43.28 | 8.26 | 16.98 | 12.65 |
| | **80th Percentile** | 82.58 | 13.33 | 28.97 | 23.35 |
| | **20th Percentile** | 9.21 | 2.11 | 2.38 | 4.89 |
| **Latency (ms)** | **50th Percentile** | 12.05 | 19.80 | 17.30 | 37.20 |

**Table-88:** Summary of Data performance in network auto-selection mode.
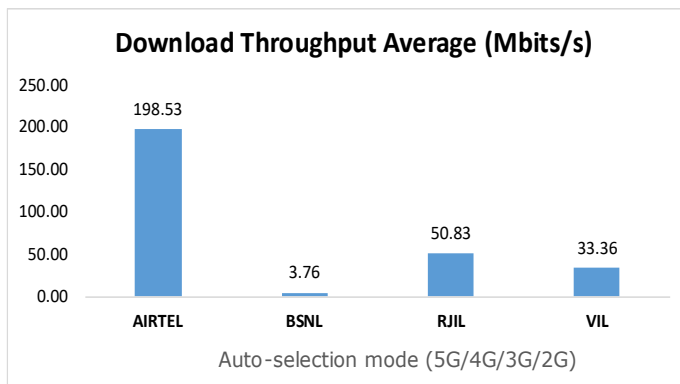


**Figure-69:** Download throughput
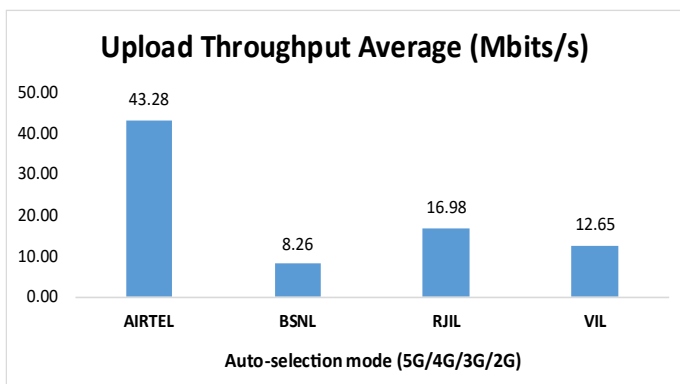


**Figure-70:** Upload throughput

## 4.5.2.5 Esplanade to Howrah

### i) Voice performance

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

| Parameters | Service Provider | | | |
|---|---|---|---|---|
| | Auto-selection mode (5G/4G/3G/2G) | | | |
| | AIRTEL | BSNL | RJIL | VIL |
| Call Attempts | 10 | 16 | 10 | 11 |
| Call Setup Success Rate % | 100.00 | 0.00 | 100.00 | 100.00 |
| Drop Call Rate % | 0.00 | - | 0.00 | 0.00 |
| Call Setup Time Average (Second) | 0.84 | - | 0.61 | 0.80 |
| Handover Success Rate % | 100.00 | - | 100.00 | 100.00 |

**Table-89:** Summary of voice call performance in network auto-selection mode.

> **Note**- "-" Call setup time & drop call rate have not been reported as all calls were failed across this metro route.
> Handover did not attempt in BSNL.
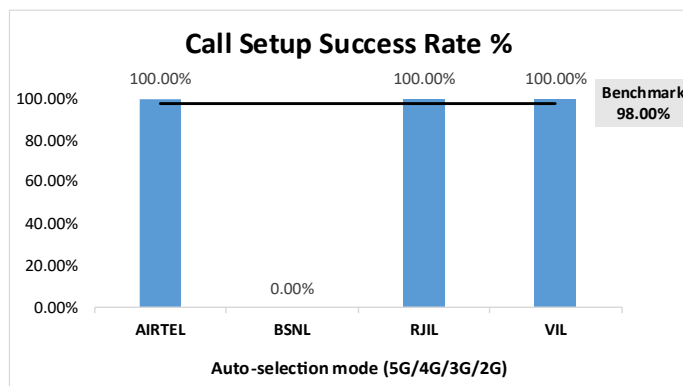
**Figure-71:** Performance for call setup success rate.

**Figure-72:** Performance for drop call rate.

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

| Technology | Service Provider | | | |
|---|---|---|---|---|
| | **AIRTEL** | **BSNL** | **RJIL** | **VIL** |
| **5G** | 7.86% | NA | 0.00% | NA |
| **4G** | 92.14% | 0.00% | 100.00% | 100.00% |
| **3G** | NA | 0.00% | NA | NA |
| **2G** | 0.00% | 46.72% | NA | 0.00% |
| **Limited Service** | 0.00% | 53.28% | 0.00% | 0.00% |

**Table-90:** Time spent on technology during drive test.

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

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



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

**Observations:**

- Airtel has 17% of samples falling in the excellent signal strength category.
- BSNL has 50% of samples falling in the excellent signal strength category.
- RJIL has 49% of samples falling in the excellent signal strength category.
- VIL has 18% of samples falling in the excellent signal strength category.

## ii) 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** | 110.51 | - | 20.26 | 26.32 |
| | **80th Percentile** | 269.99 | - | 24.94 | 34.82 |
| | **20th Percentile** | 2.57 | - | 17.81 | 19.24 |
| **Upload Throughput (Mbits/s)** | **Average** | 20.69 | - | 10.29 | 12.86 |
| | **80th Percentile** | 39.36 | - | 18.93 | 36.24 |
| | **20th Percentile** | 1.27 | - | 1.69 | 2.18 |
| **Latency (ms)** | **50th Percentile** | 19.85 | - | 41.50 | 36.35 |

**Table-91:** Summary of Data performance in network auto-selection mode.

> **Note**-"-" All data tests were failed.
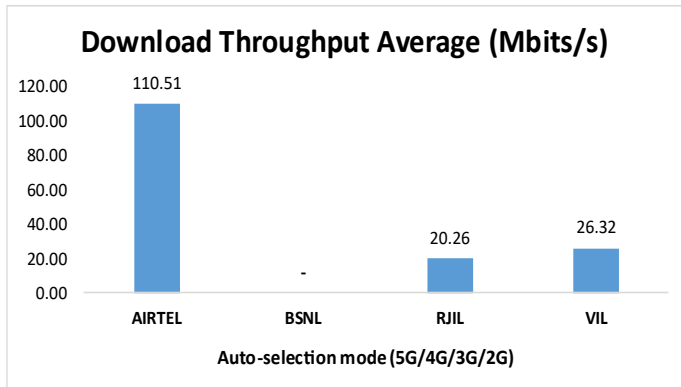
**Figure-74:** Download throughput
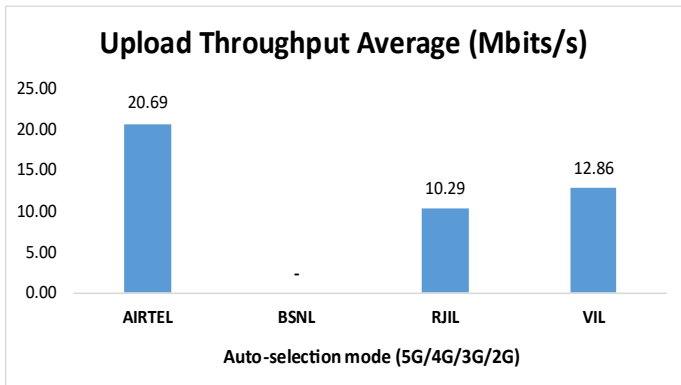


**Figure-75:** Upload throughput

# 5. Voice & Data Key findings

## 5.1 Overall Voice

1. **Call Setup Success Rate:**
   a) Airtel, BSNL and VIL have 99.02%, 97.76% and 99.67% call setup success rate respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL have 100.00%, 90.49%, 99.89% and 99.78% call setup success rate respectively in auto-selection mode (5G/4G/3G/2G). (refer table-5)

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

   d) BSNL had a 100.00% call setup success rate while calling RJIL and VIL whereas call blocking was observed when calling Airtel. (refer to Table-9)

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

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

2. **Call Setup Time**:
   a) Airtel, BSNL and VIL call setup time is 3.17, 2.39 and 4.49 seconds respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL & VIL call setup time is 0.78, 2.84, 0.58 and 0.84 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 & VIL have 1.13%, 2.82%, 0.97% & 1.27% silence call rate respectively. Further Airtel, BSNL, RJIL & VIL downlink RTP packet loss is 0.30%, 4.45%, 0.56% & 1.01% respectively. In uplink Airtel, BSNL, RJIL & VIL RTP packet loss is 0.39%, 3.98%, 0.48% & 0.89% respectively. (refer table-6)

4. **Drop Call Rate**:
   a) Airtel, BSNL and VIL drop call rate is 0.33%, 1.47% and 0.17% respectively in 3G/2G network mode. (refer table-3)

   b) Airtel, BSNL, RJIL and VIL drop call rate is 0.22%, 4.56%, 0.33% and 0.11% 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 262.06 Mbps, 6.02 Mbps, 269.46 Mbps and 32.06 Mbps respectively. (refer table-11)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 44.56 Mbps, 6.25 Mbps, 32.77 Mbps and 11.87 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 287.19 Mbps, 5.95 Mbps, 178.88 Mbps and 36.85 Mbps respectively. (refer table-36)

   b) Airtel, BSNL, RJIL and VIL average upload speeds are 54.28 Mbps, 3.70 Mbps, 21.01 Mbps and 15.05 Mbps respectively. (refer table-36)

3. **Data session setup success rate (static i.e. while stationary):**
    a) Airtel, BSNL, RJIL and VIL have 100.00%, 84.00%, 100.00% and 100.00% download session setup success rate respectively. (refer table-36)

    b) Airtel, BSNL, RJIL and VIL have 100.00%, 84.00%, 100.00% and 100.00% upload session setup success rate respectively. (refer table-36)

# 5.3 Operator wise Key Findings

## 1. Airtel:

**Voice**
- 99.02% call setup success rate and 0.33% 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)

- 100.00% call setup success rate and 0.22% 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-68, 70 & 72)

- 100.00% call setup success rate and 6.90% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Dakshineswar to Kavi Subhash metro route. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table-77)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across all metro routes except Dakshineswar to Kavi Subhash. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-80, 83, 86 & 89)

**Data**
- Airtel has 262.06 Mbps average download speed & 44.56 Mbps average upload speed for LSA. (refer table-11)

- Airtel has 276.70 Mbps average download speed & 45.30 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Acropolis Mall Sector-1 Kolkata, Belur Math and Esplanade Metro Station have less download speed (less than 100 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 38 & 42)

- Acropolis Mall Sector-1 Kolkata, Belur Math, Esplanade Metro Station and Howrah District Hospital have less upload speed (less than 20 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 38, 42 & 43)

- New Market and SSKM Hospital have less download speed (less than 100 Mbps) out of total 3 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-75 & 76)

- New Market and SSKM Hospital have less upload speed (less than 20 Mbps) out of total 3 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-75 & 76)

## 2. BSNL:

### Voice

- 97.76% call setup success rate and 1.47% drop call rate have been observed for 3G/2G network mode for LSA/city drive. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-3 & 13)

- 90.49% call setup success rate and 4.56% 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)

- 94.29% call setup success rate and 5.10% 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)

- 84.00% 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 not meeting the benchmark of 98.00% for call setup success rate. (refer table-20)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for all walk test locations. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-68, 70 & 72)

- 87.50% call setup success rate and 17.86% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Dakshineswar to Kavi Subhash metro route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-77)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Kavi Subhash to Hemanta Mukherjee metro route. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-80)

- 90.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Majerhat to Joka metro route. Performance is not meeting the benchmark of 98.00% for call setup success rate. (refer table-83)

- 63.16% call setup success rate and 16.67% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Sector-5 to Sealdah metro route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-86)

- 0.00% call setup success rate has been observed as all calls were failed in auto-selection mode (5G/4G/3G/2G) across Esplanade to Howrah Maidan metro route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-89)

### Data

- BSNL has 6.02 Mbps average download speed & 6.25 Mbps average upload speed for LSA. (refer table-11)

- BSNL has 6.20 Mbps average download speed & 6.45 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- All hotspot locations have less download speed (less than 10 Mbps) except Indian Institute of Engineering Science and Technology (IIEST) for auto-selection mode (5G/4G/3G/2G). (refer table-37, 38, 39, 40, 41, 42, 43, 45, 46, 47, 48, 49, 50 & 51)

- Belur Math, Esplanade Metro Station, Jaladhulagori Toll Plaza NH-6 Howrah and Sealdah Metro Station have less upload speed (less than 2 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-38, 42, 46 & 49)

- All walk test locations have less download speed (less than 10 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-74, 75 & 76)

- All metro routes have less download speed (less than 10 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-79, 82, 85, 88 & 91)

- Esplanade to Howrah Maidan has less upload speed (less than 2 Mbps) out of total 5 metro routes for auto-selection mode (5G/4G/3G/2G). (refer table-91)

### 3. RJIL:
**Voice**
- 99.89% call setup success rate and 0.33% 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)

- 99.84% 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-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-68, 70 & 72)

- 100.00% call setup success rate and 6.67% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Dakshineswar to Kavi Subhash metro route. Performance is not meeting the benchmark of 2.00% for drop call rate. (refer table-77)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across all metro routes except Dakshineswar to Kavi Subhash. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-80, 83, 86 & 89)

**Data**
- RJIL has 269.46 Mbps average download speed & 32.77 Mbps average upload speed for LSA. (refer table-11)

- RJIL has 310.06 Mbps average download speed & 35.80 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Acropolis Mall Sector-1 Kolkata, Calcutta High Court, Dankuni Railway Junction, Esplanade Metro Station, Jadavpur University Kolkata, Jaladhulagori Toll Plaza NH-6 Howrah, Sealdah Metro Station and Sealdah Railway Station have less download speed (less than 100 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-37, 39, 41, 42, 45, 46, 49 & 50)

- Acropolis Mall Sector-1 Kolkata, Belur Math, Calcutta High Court, Dankuni Railway Junction, Esplanade Metro Station, Indian Institute Of Engineering Science and Technology (IIEST), Jadavpur University Kolkata, Jaladhulagori Toll Plaza NH-6 Howrah, Sealdah Metro Station, Sealdah Railway Station and Victoria Memorial have less upload speed (less than 20 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 37, 38, 39, 41, 42, 44, 45, 46, 49, 50 & 51)

- All walk test locations have less download speed (less than 100 Mbps) for auto-selection mode (5G/4G/3G/2G). (refer table-74, 75 & 76)

- Howrah Railway Station and SSKM Hospital have less upload speed (less than 20 Mbps) out of total 3 walk test locations for auto-selection mode (5G/4G/3G/2G). (refer table-74 & 76)

- Kavi Subhash to Hemanta Mukherjee, Sector-5 to Sealdah and Esplanade to Howrah Maidan have less download speed (less than 100 Mbps) out of total 5 metro routes for auto-selection mode (5G/4G/3G/2G). (refer table-82, 88 & 91)

- Sector-5 to Sealdah and Esplanade to Howrah Maidan have less upload speed (less than 20 Mbps) out of total 5 metro routes for auto-selection mode (5G/4G/3G/2G). (refer table-88 & 91)

## 4. VIL:
### Voice
- 99.67% call setup success rate and 0.17% 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)

- 99.78% call setup success rate and 0.11% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) for LSA. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-5)

- 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-68, 70 & 72)

- 93.33% call setup success rate and 3.57% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across Dakshineswar to Kavi Subhash metro route. Performance is not meeting the benchmark of 98.00% & 2.00% respectively. (refer table-77)

- 100.00% call setup success rate and 0.00% drop call rate have been observed in auto-selection mode (5G/4G/3G/2G) across all metro routes except Dakshineswar to Kavi Subhash. Performance is well within the benchmark of 98.00% & 2.00% respectively. (refer table-80, 83, 86 & 89)

**Data**
- VIL has 32.06 Mbps average download speed & 11.87 Mbps average upload speed for LSA. (refer table-11)

- VIL has 32.43 Mbps average download speed & 11.65 Mbps average upload speed across the measured routes for city drive. (refer table-19)

- Chandannagar Sub Divisional Hospital and Howrah District Hospital have less download speed (less than 10 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table-40 & 43)

- Acropolis Mall Sector-1 Kolkata and Howrah District Hospital have less upload speed (less than 2 Mbps) out of total 15 hotspot locations for auto-selection mode (5G/4G/3G/2G). (refer table- 37 & 43)

# 6. Annexure

## 6.1 Route wise coverage map

### 6.1.1 City
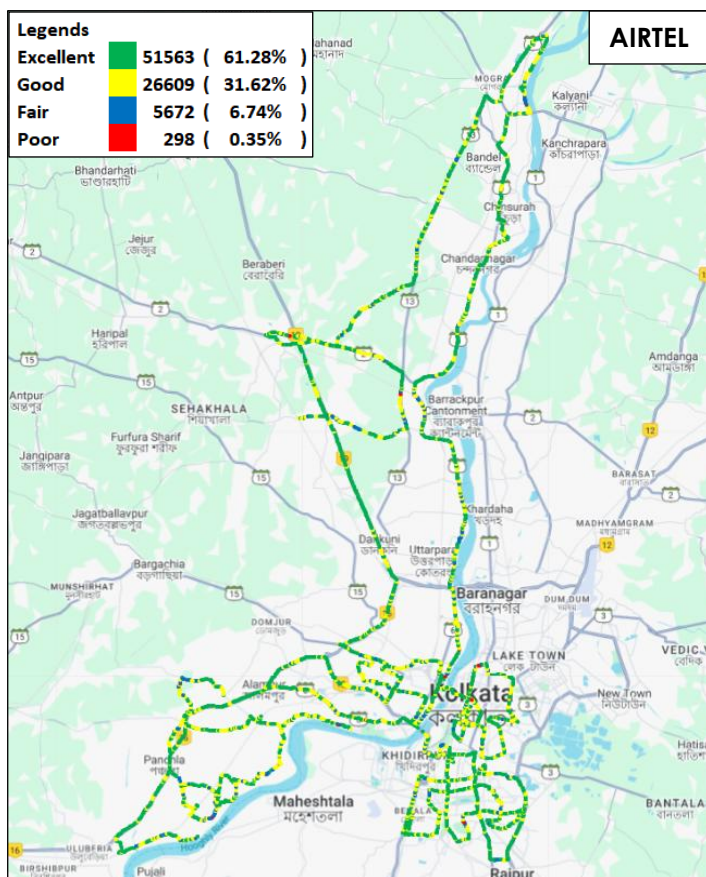


**Figure-76:** Signal strength 3G/2G network mode – AIRTEL.
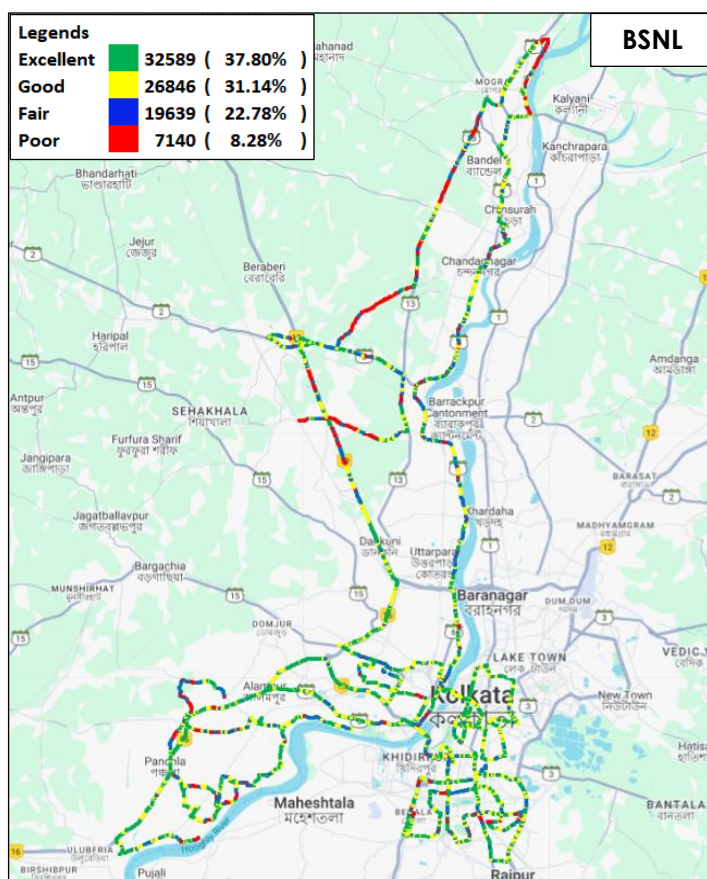
**BSNL**

**Figure-77:** Signal strength 3G/2G network mode – BSNL.

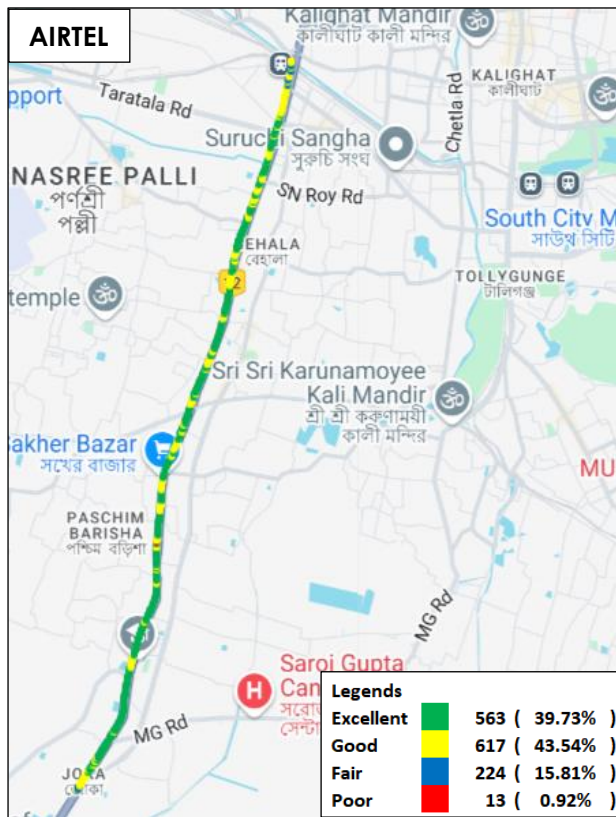**VIL**
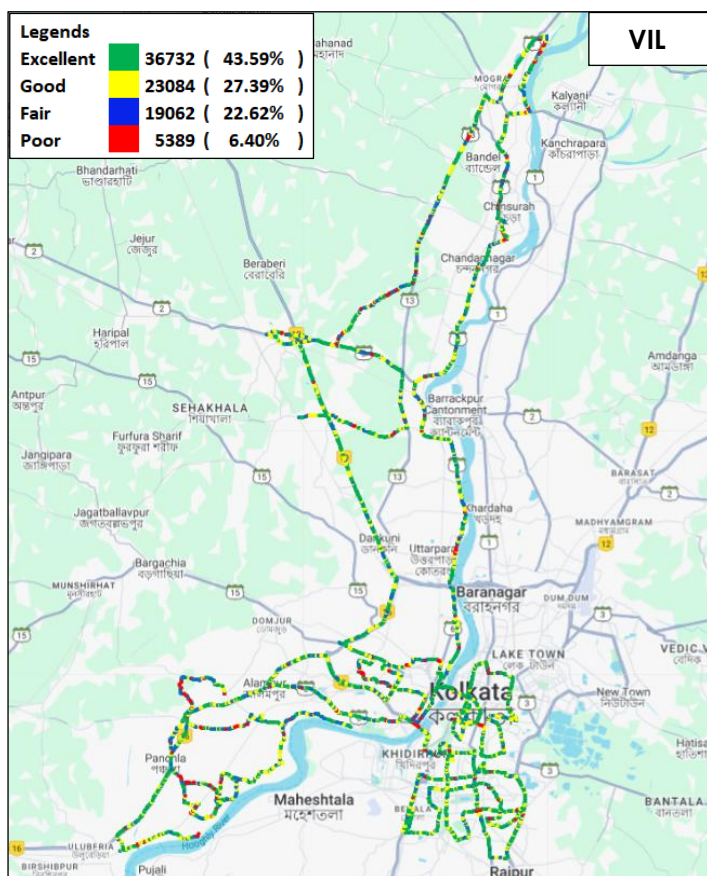
**Figure-78:** Signal strength 3G/2G network mode – VIL.
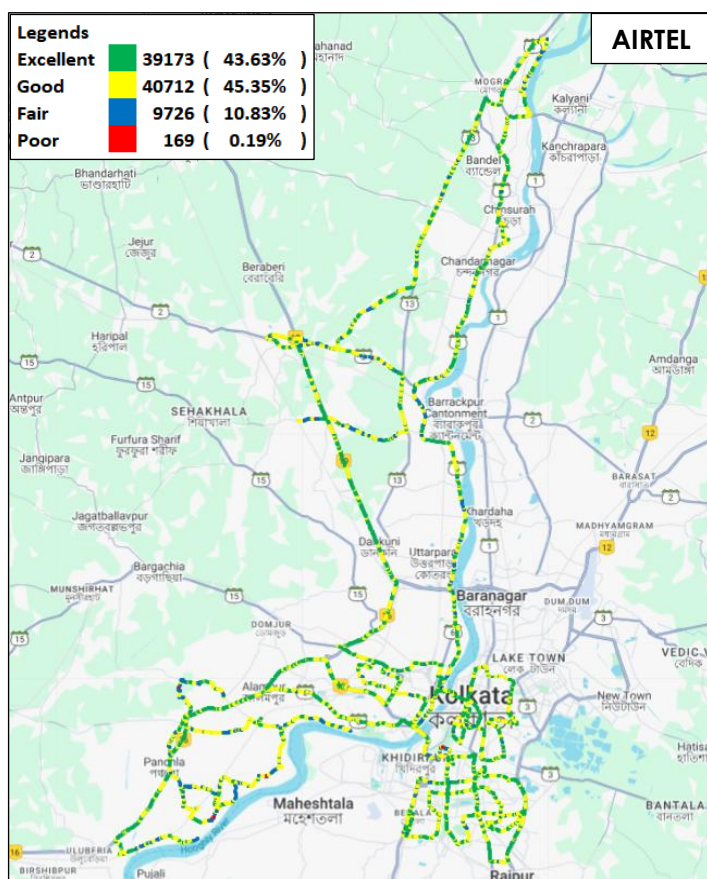
**Figure-79:** Signal strength auto-selection mode 5G/4G/3G/2G – AIRTEL.
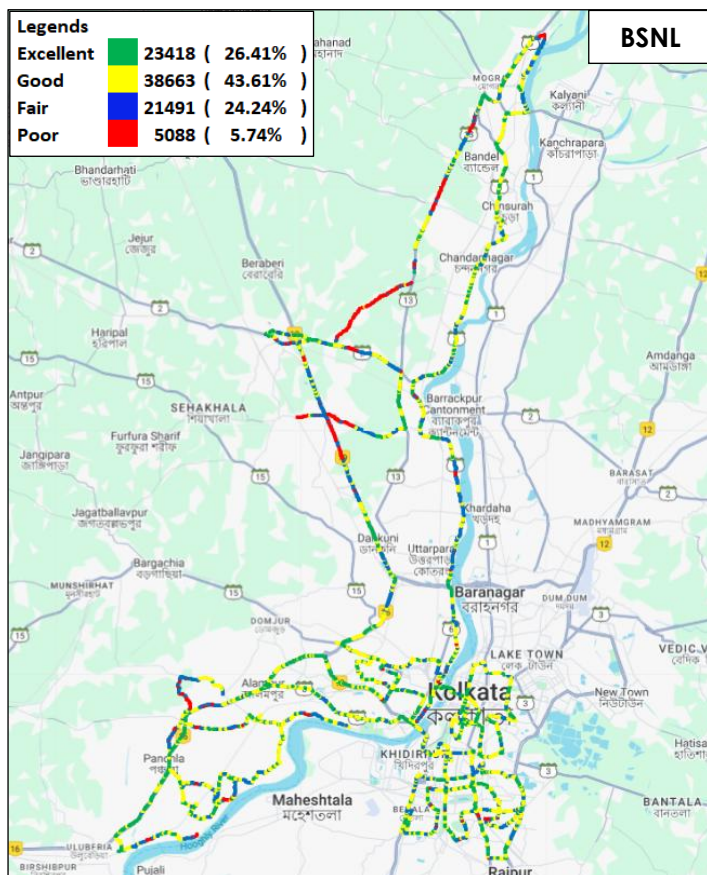


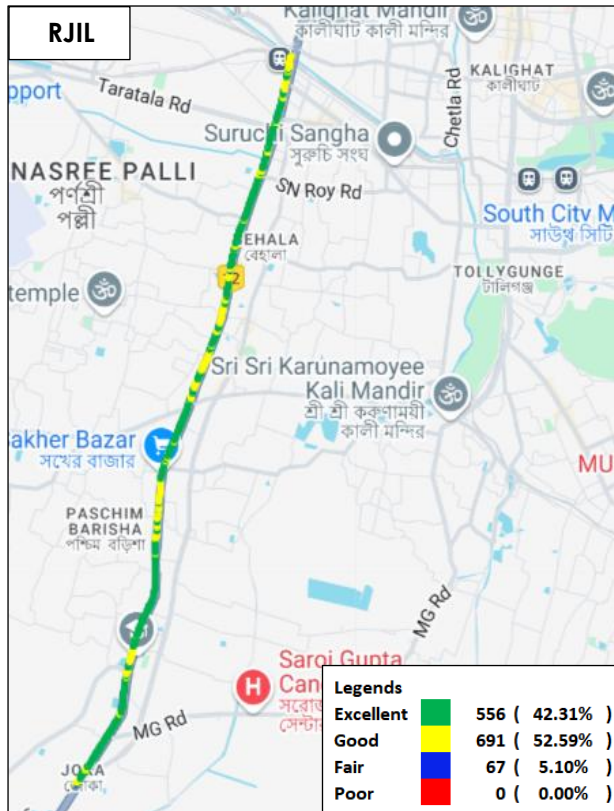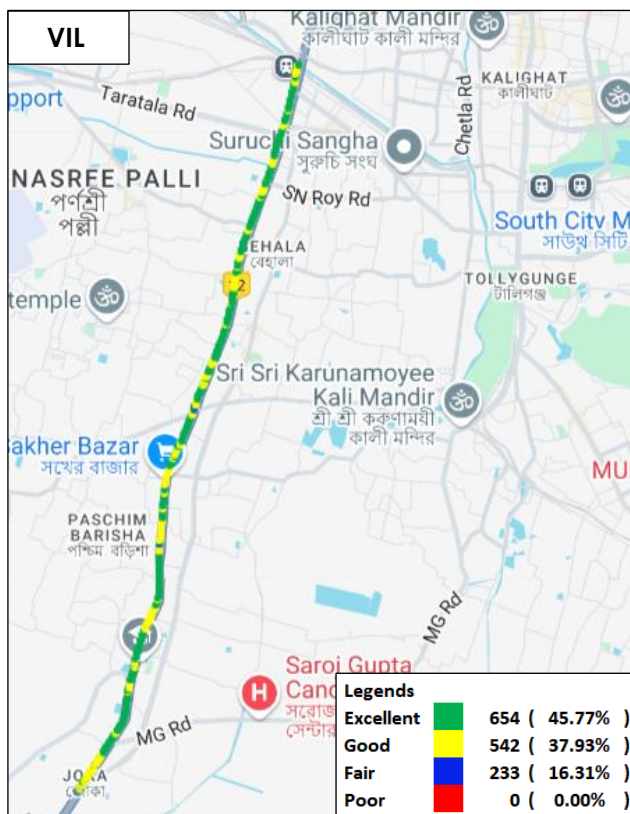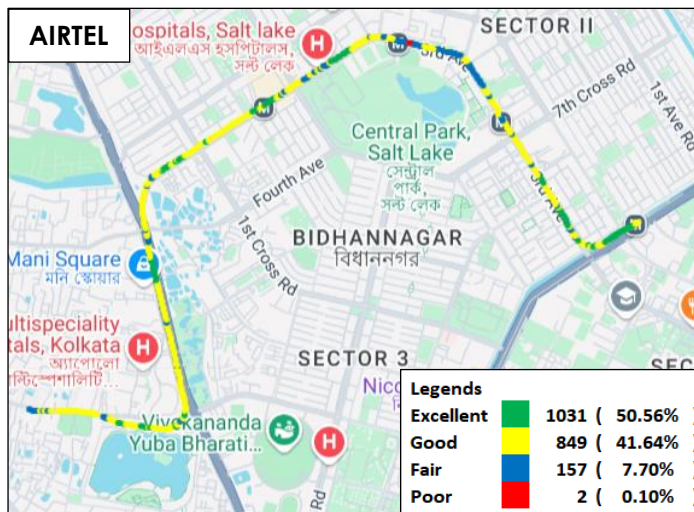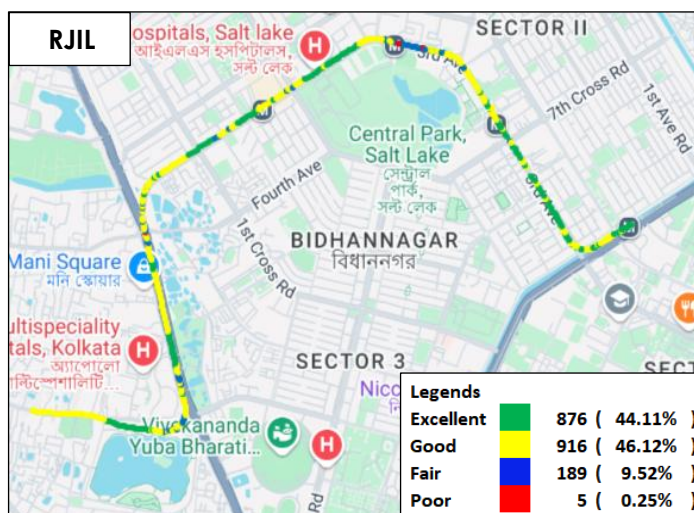**Figure-80:** Signal strength auto-selection mode 5G/4G/3G/2G (4G network being rolled out) – BSNL.
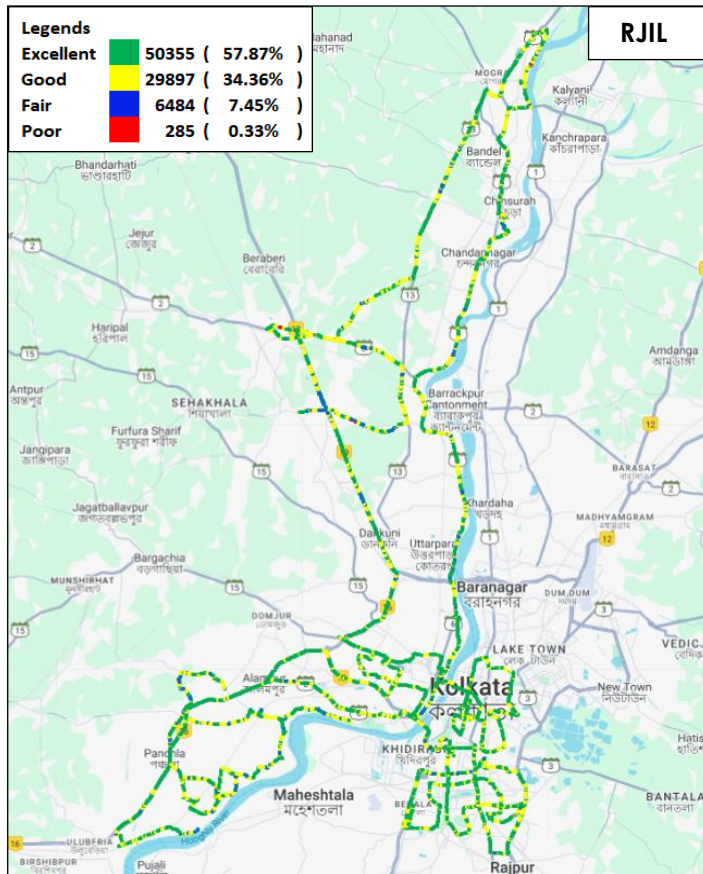
**Figure-81:** Signal strength auto-selection mode 5G/4G/3G/2G – RJIL.
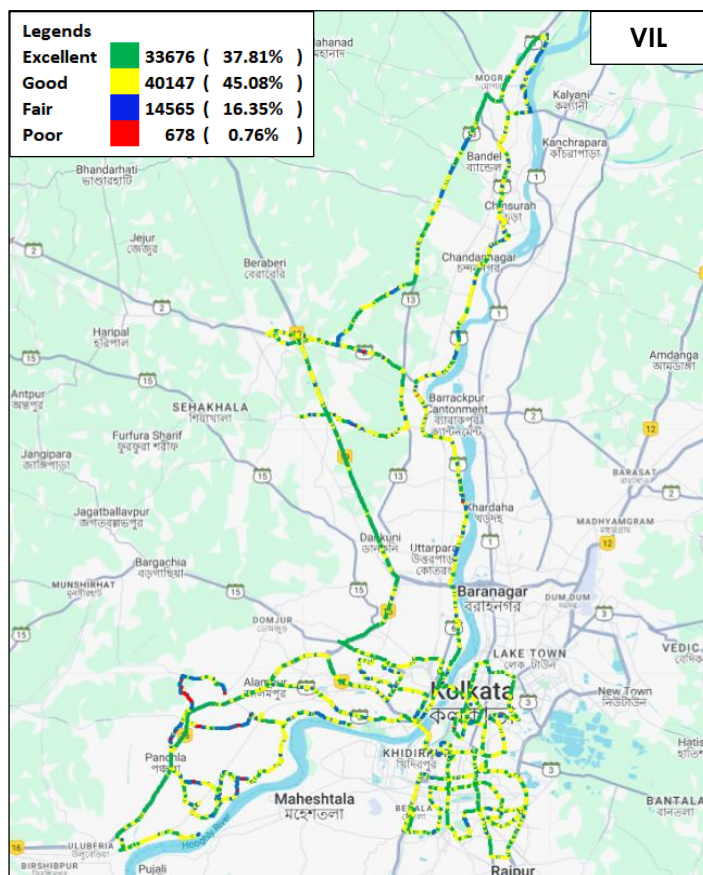


**Figure-82:** Signal strength auto-selection mode 5G/4G/3G/2G – VIL.

## 6.1.2 Metro

## i) Dakshineswar to Kavi Subhash



| Legends | | |
|---|---|---|
| Excellent | | 740 ( 18.72% ) |
| Good | | 2105 ( 53.24% ) |
| Fair | | 992 ( 25.09% ) |
| Poor | | 117 ( 2.96% ) |
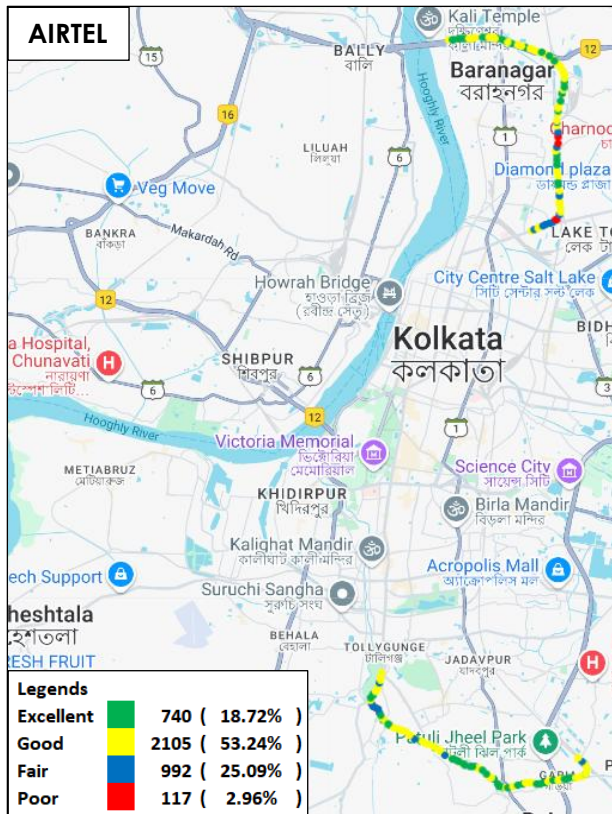
**Figure-83:** Signal strength auto-selection mode 5G/4G/3G/2G –AIRTEL



| Legends | | |
|---|---|---|
| Excellent | | 969 ( 26.35% ) |
| Good | | 1453 ( 39.52% ) |
| Fair | | 847 ( 23.04% ) |
| Poor | | 408 ( 11.10% ) |
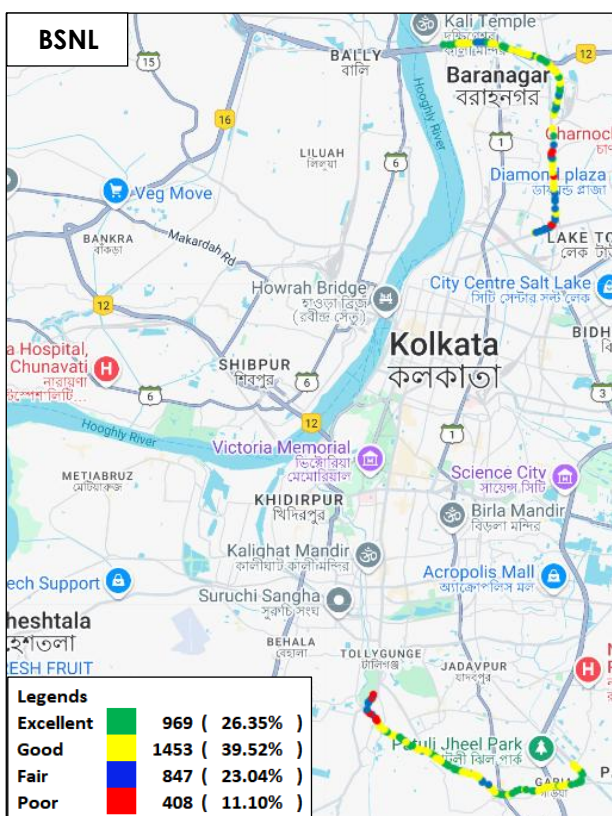
**Figure-84:** Signal strength auto-selection mode 5G/4G/3G/2G -BSNL
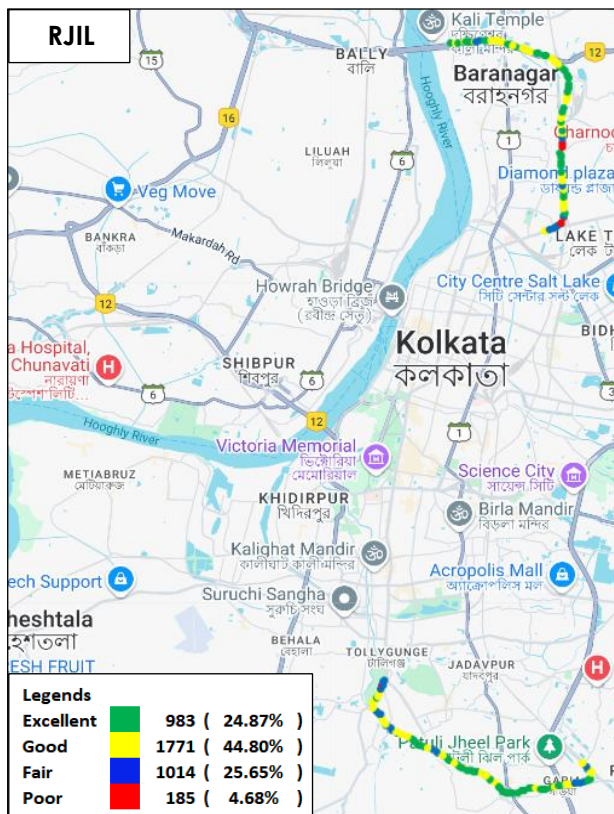
**Figure-85:** Signal strength auto-selection mode 5G/4G/3G/2G - RJIL
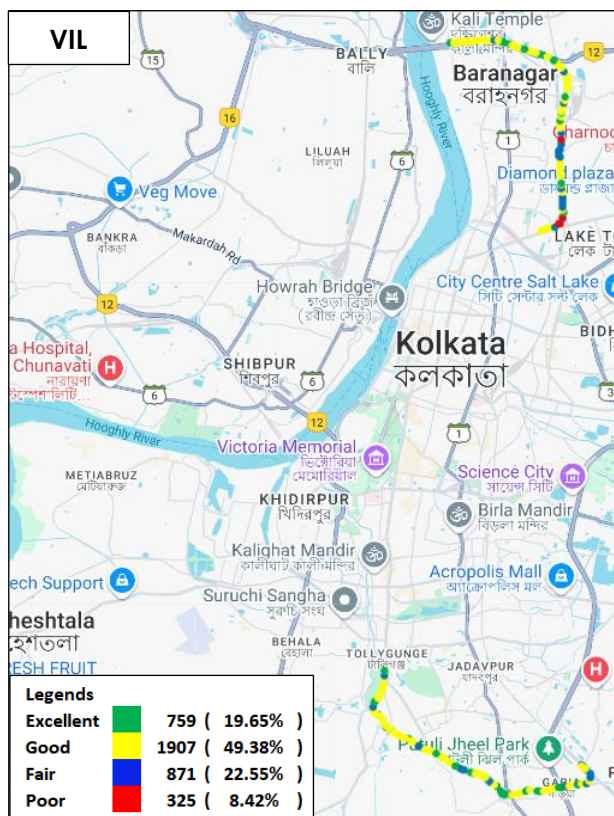


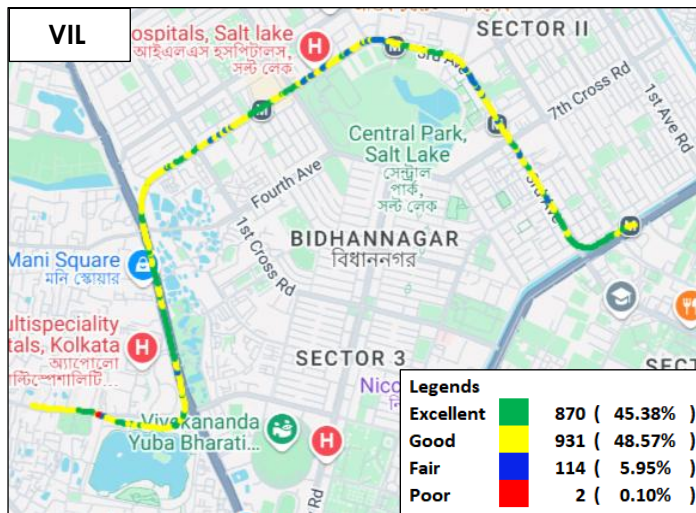**Figure-86:** Signal strength auto-selection mode 5G/4G/3G/2G – VIL

## ii) Kavi Subhash to Hemanta Mukherjee
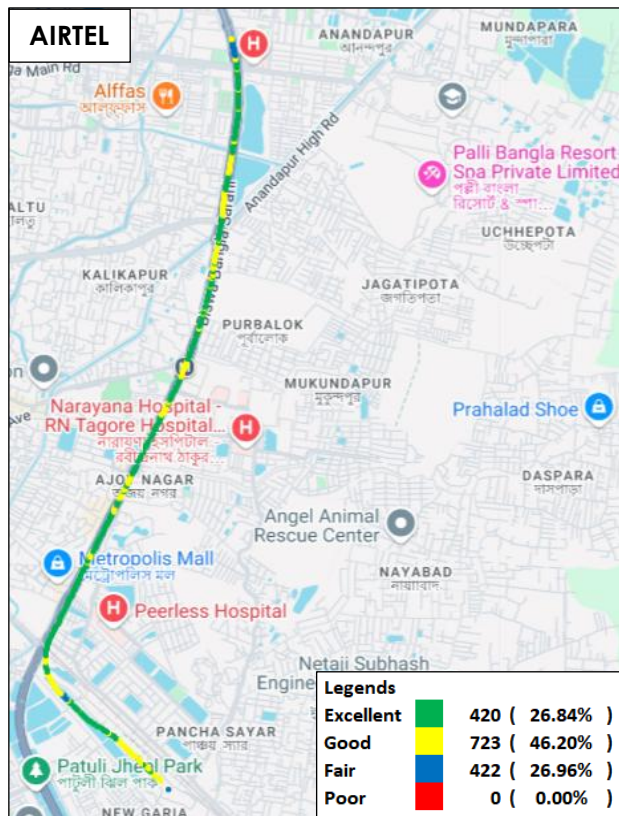


**Figure-87:** Signal strength auto-selection mode 5G/4G/3G/2G –AIRTEL
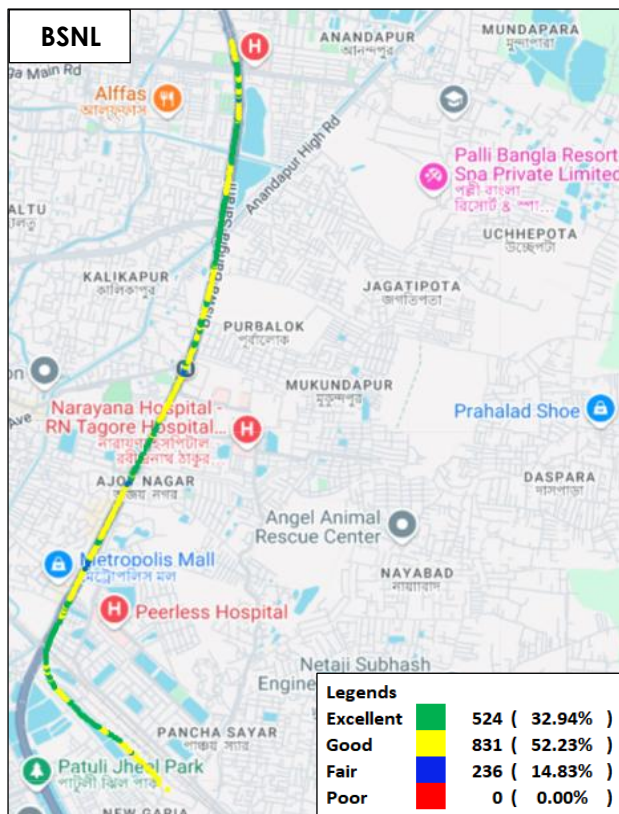


**Figure-88:** Signal strength auto-selection mode 5G/4G/3G/2G -BSNL

**Legends**

| Excellent | 601 ( 38.77% ) |
| Good | 781 ( 50.39% ) |
| Fair | 167 ( 10.77% ) |
| Poor | 1 ( 0.06% ) |
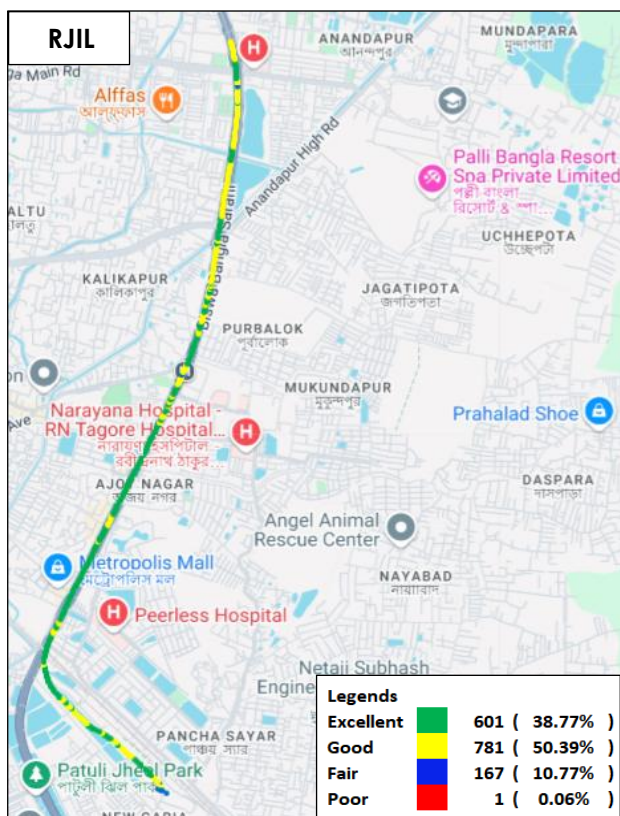
**Figure-89:** Signal strength auto-selection mode 5G/4G/3G/2G - RJIL



**Legends**

| Excellent | 373 ( 23.74% ) |
| Good | 724 ( 46.09% ) |
| Fair | 473 ( 30.11% ) |
| Poor | 1 ( 0.06% ) |
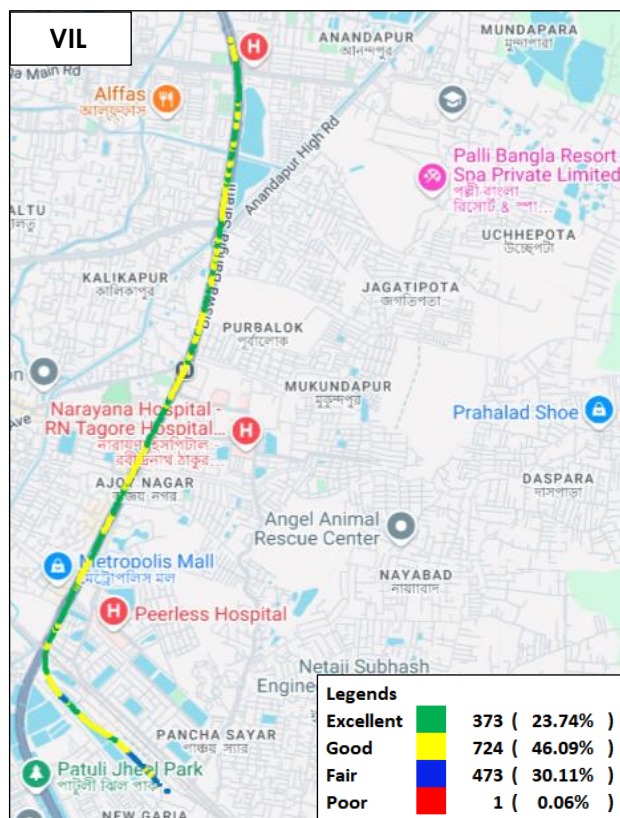
**Figure-90:** Signal strength auto-selection mode 5G/4G/3G/2G – VIL

## iii) Majerhat to Joka



**Figure-91:** Signal strength auto-selection mode 5G/4G/3G/2G –AIRTEL
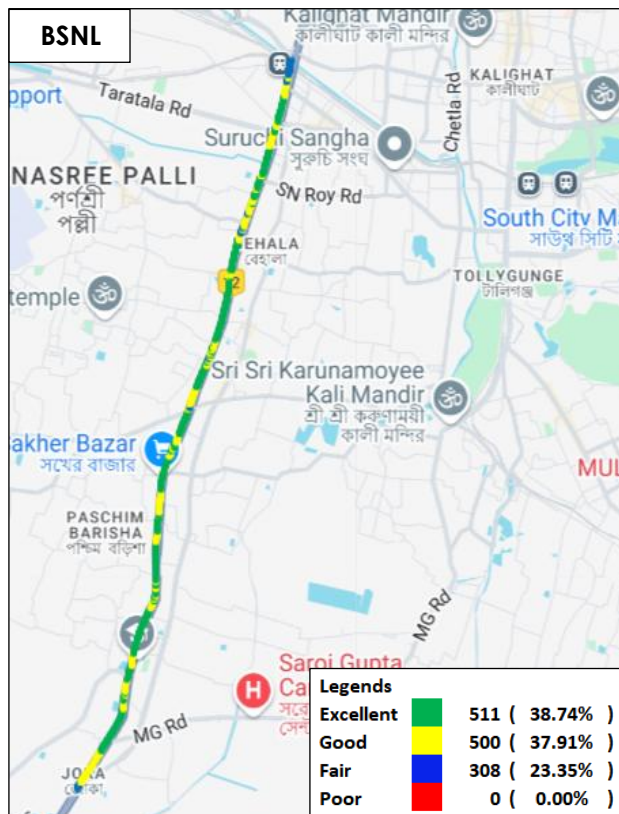


**Figure-92:** Signal strength auto-selection mode 5G/4G/3G/2G -BSNL

**Figure-93:** Signal strength auto-selection mode 5G/4G/3G/2G - RJIL



**Figure-94:** Signal strength auto-selection mode 5G/4G/3G/2G – VIL

## iv) Sector-5 to Sealdah



**Figure-95:** Signal strength auto-selection mode 5G/4G/3G/2G –AIRTEL
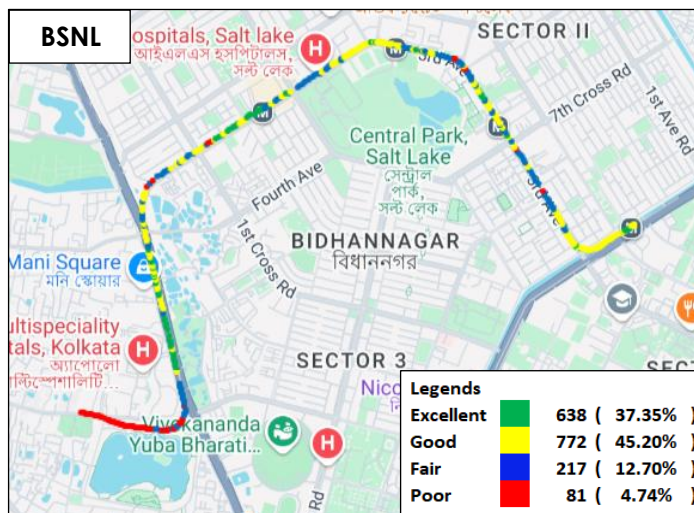


**Figure-96:** Signal strength auto-selection mode 5G/4G/3G/2G -BSNL



**Figure-97:** Signal strength auto-selection mode 5G/4G/3G/2G – RJIL

**Figure-98:** 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<br>• 5G/4G/3G/2G auto mode- switch Call<br>• 5G/4G MOS Call | 30 Sec |
| Call Duration | | 120 Sec |
| Wait/ Guard Time | | 15 Sec |

**Table-92:** Voice test detail

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

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

| | | 25 count- Dynamic<br>1000 count- Hotspot<br>Payload- 512 bytes in all drive |
|---|---|---|
| Latency | | |

**Table-93:** Data test detail

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**Note-**
- 5 Data iteration to be done at each hotspot location.
- Minimum 5 iteration to be made during the walk test. Iteration count will be increased based on walk test distance.
- Ping test to be performed only once at hotspot location.
- Youtube & Web browsing test to be performed at static location only.
- All values are taken up to two decimal places with round off.
- Download and upload testing has been done on FTP server for Airtel, BSNL & RJIL. (Airtel, BSNL & RJIL not provided HTTP server)
- VIL download and upload testing is done on HTTP Server.

---
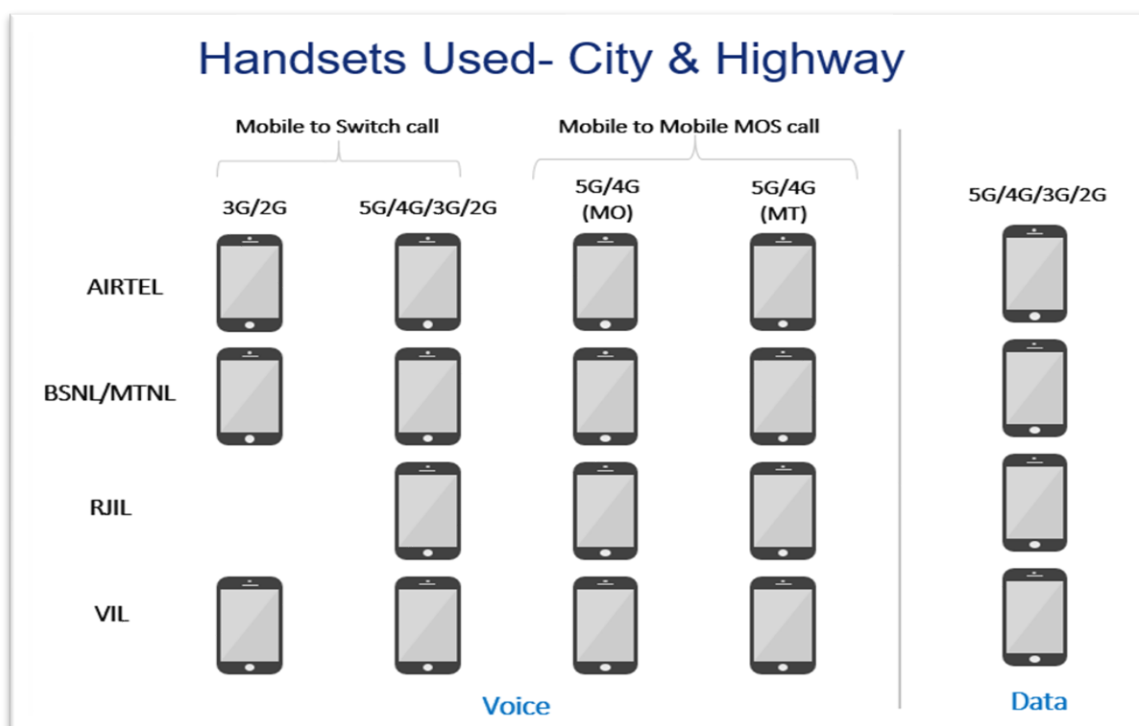


**Figure-99:** Number of handsets used in city & highway drive

MO: Mobile originating
MT: Mobile terminating

**Figure-100:** 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)
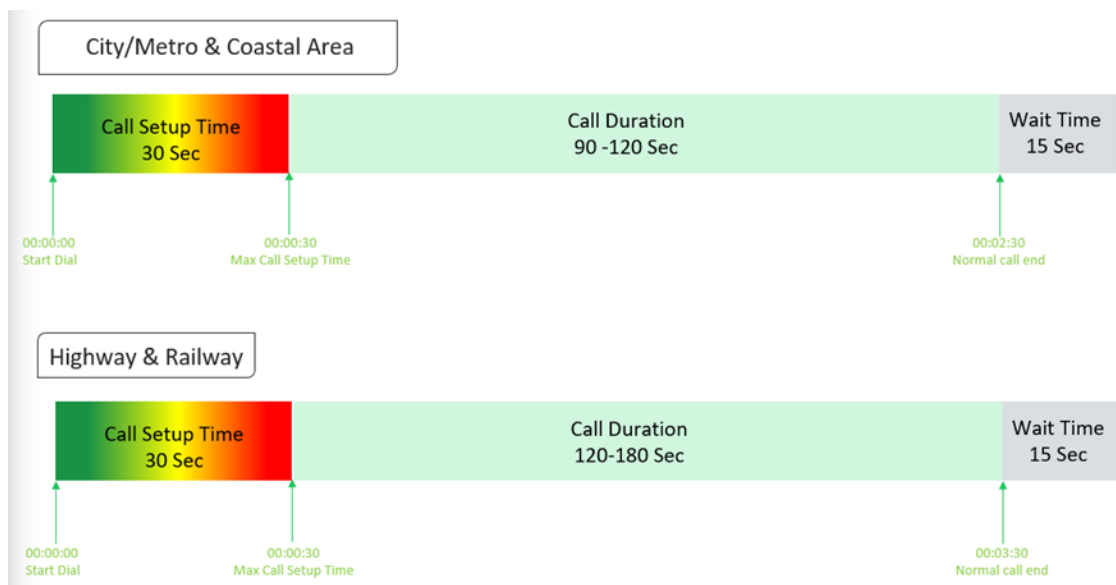


**Figure-101:** Voice test script  for city/railway/metro/highway & coastal area

- 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-102:** 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
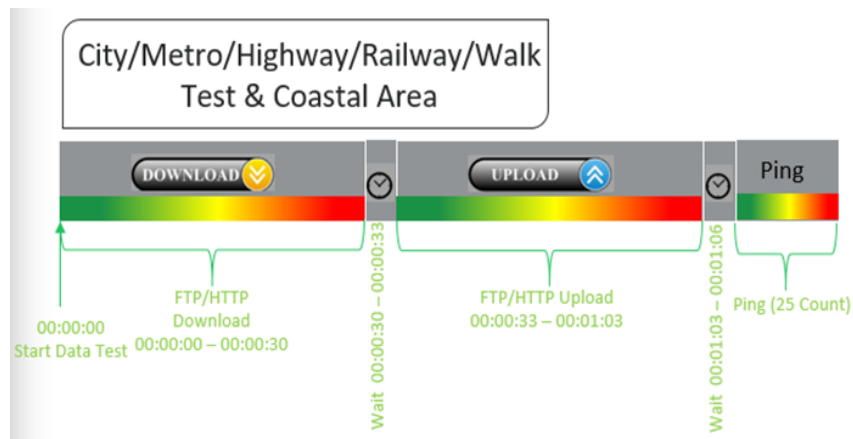


**Figure-103:** Data test script used in city/metro/railway/highway/walk test & coastal area
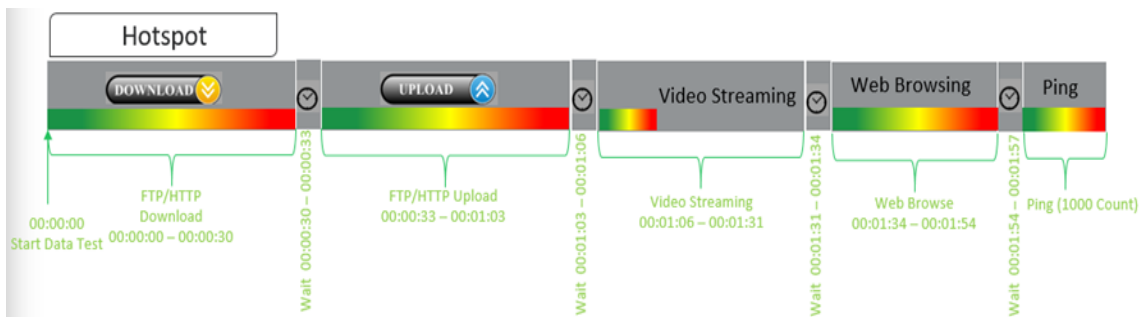
## (d) Static Data(internet) testing



**Figure-104:** Data test script used at hotspot

- 5 Data iteration done at each hotspot location.
- Min. 5 iteration made during the walk test.
- Web browsing duration mentioned above is for one web site only.
- Only 1 ping iteration (with 1000 Count) done at hotspot location.

## 7.2 Appendix-II

## 7.2.1 Network Performance Parameters for Voice calls

| Parameter Name | Definition |
|---|---|
| **Call Setup Success Rate** | (i) Call Setup Success Rate is defined as the ratio of Established Calls to Call Attempts. 'Established Calls' mean the following events have happened in call setup:<br>(a) Call attempt is made<br>(b) The signaling channel is allocated<br>(c) The call is routed to the outwards path of the terminating network<br>(d) An alert signal is received by caller in the form of ring back tone, busy tone, or an announcement.<br><br>CSSR = (Total Call Established/ Total Call Attempt) *100<br><br>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<br><br>Drop Call Rate = (Total Drop Call/Total Call Established) *100<br><br>As per QoS Regulation 2024 benchmark value is **<=2%** |
| **Call Setup Time** | Time taken from call initiate to call alerting/ringing.<br><br>Call Setup Time = T2- T1<br><br>T2- Ringing (VoLTE/VoNR) & Alerting (for WCDMA & GSM),<br>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:<br>Excellent: MOS $\geq$ 4 and < 5<br>Good : MOS $\geq$ 3 and < 4<br>Fair : MOS $\geq$ 2 and < 3<br>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<br><br>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.<br><br>Silence call rate = (count of silence call / Total calls established) *100<br><br>If a call observes multiple silence count >=4 sec in a particular established call it has been taken as one silent event. |

| | 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: |
|---|---|
| **Jitter** | $D(i,j) = (Rj - Ri) - (Sj - Si)$ <br><br> 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 <br> $J(i) = J(i-1) + (|D(i-1,i)| - J(i-1))/16$ 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. <br> 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. |

| 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-94:** 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. <br><br> Download Speed = Total bytes transferred during download / Total time for transfer <br><br> • 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. <br><br> Upload Speed = Total bytes transferred during upload / Total time for transfer. <br><br> • 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. <br> 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.<br><br>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.<br>The Latency is measured in milliseconds (ms).<br>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<br><br>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<br><br>IPDV(i) = D(i) – D(i-1)<br>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<br><br>* Packet delay (using ping) >90 ms considered as packet loss and included in packet loss rate.<br><br>* Packet loss rate is calculated based on ICMP<br><br>* 90th percentile for Packet loss rate has been reported in overall Hotspot performance summary. |

**Table-95:** 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.