

Quarterly Report on Mobile Quality of Service (QoS)



Bhutan InfoComm and Media Authority
Royal Government of Bhutan

(January-March) 2025

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Report on Mobile Quality of Service (QoS)

1. Background

The Bhutan InfoComm and Media Authority (Authority) carries out the Mobile QoS drive test to monitor and report the QoS regularly. The report contains the mobile QoS for both voice and data through the various parameters of Key Performance Indicators (KPI). The test was carried out at Tsirang.

2. Locations and date of monitoring

Sl. No	Indoor/Outdoor	Name of the place	Dzongkhag
1.	Outdoor	Damphu Hospital Area	Tsirang
2.		Damphu Town Area	

• Legend for RSRP Plot



A. Monitoring Result

The findings of the drive test of operators are as shown below:

I. Outdoor

1. *Damphu Hospital Area*

• *Mobile Voice Service*

Operator	Call Drop rate (<2%)	Mean Opinion Score (≥ 3.5)	Call Fallback Setup Time (≤ 9 Seconds)	Remark
BTL	0	3.87	8.19	No issue
TICL	0	3.54	7.93	No issue

- *Data Throughputs (Mbps) (4G)*

Operators	File Transfer Protocol		Remarks
	Download (≥ 6 Mbps)	Upload (≥ 2 Mbps)	
BTL	30.35	14.89	No issue
TICL	9.64	4.38	No issue

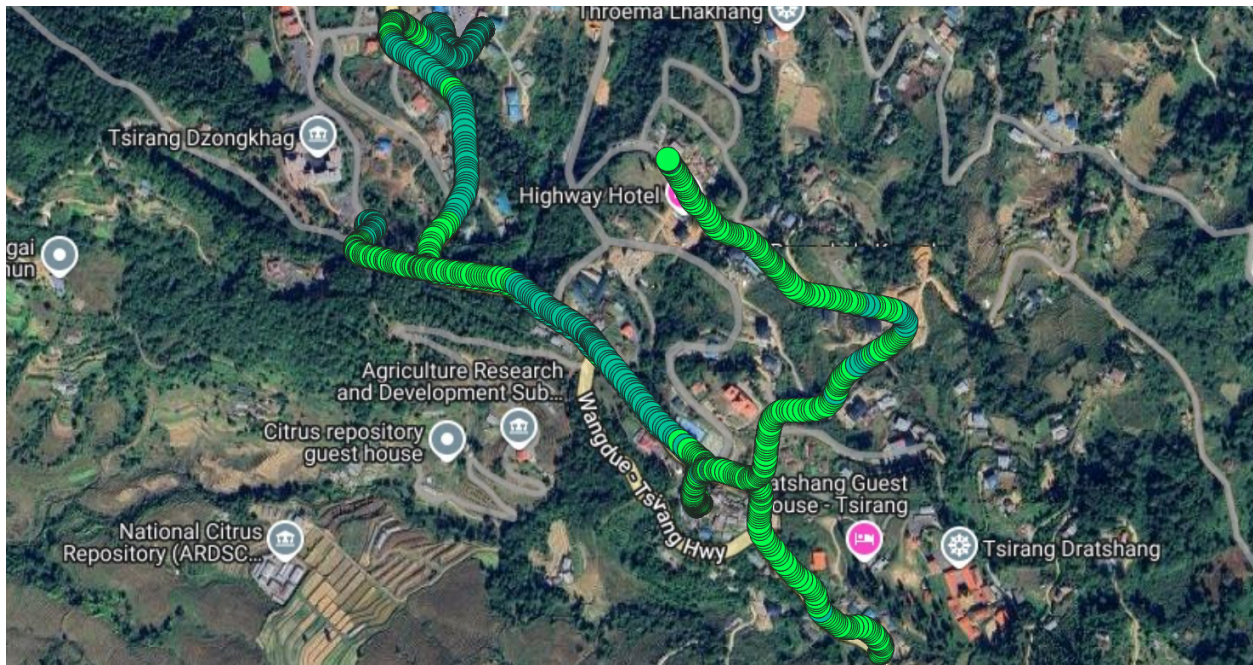


Figure number 1.1 : RSRP plot 4G B-mobile (Damphu Hospital Area)

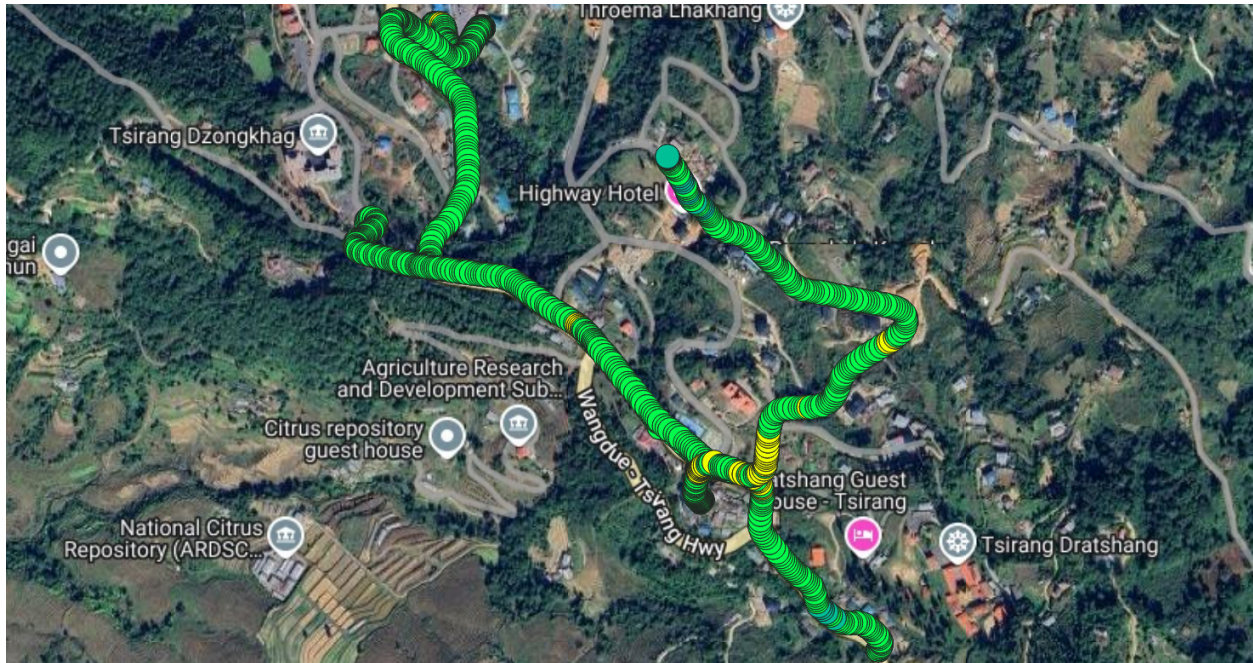


Figure number 1.2 : RSRP plot 4G Tashi Cell (Damphu Hospital Area)

2. Damphu Town

- *Mobile Voice Service*

Operator	Call Drop rate (<2%)	Mean Opinion Score (≥ 3.5)	Call Fallback Setup Time (≤ 9 Seconds)	Remark
BTL	0	3.8	8.05	No issue
TICL	0	3.64	7.71	No issue

- *Data Throughputs (Mbps) (4G)*

Operators	File Transfer Protocol		Remarks
	Download (≥ 6 Mbps)	Upload (≥ 2 Mbps)	

BTL	30.93	28.73	No issue
TICL	18.14	15.3	No issue

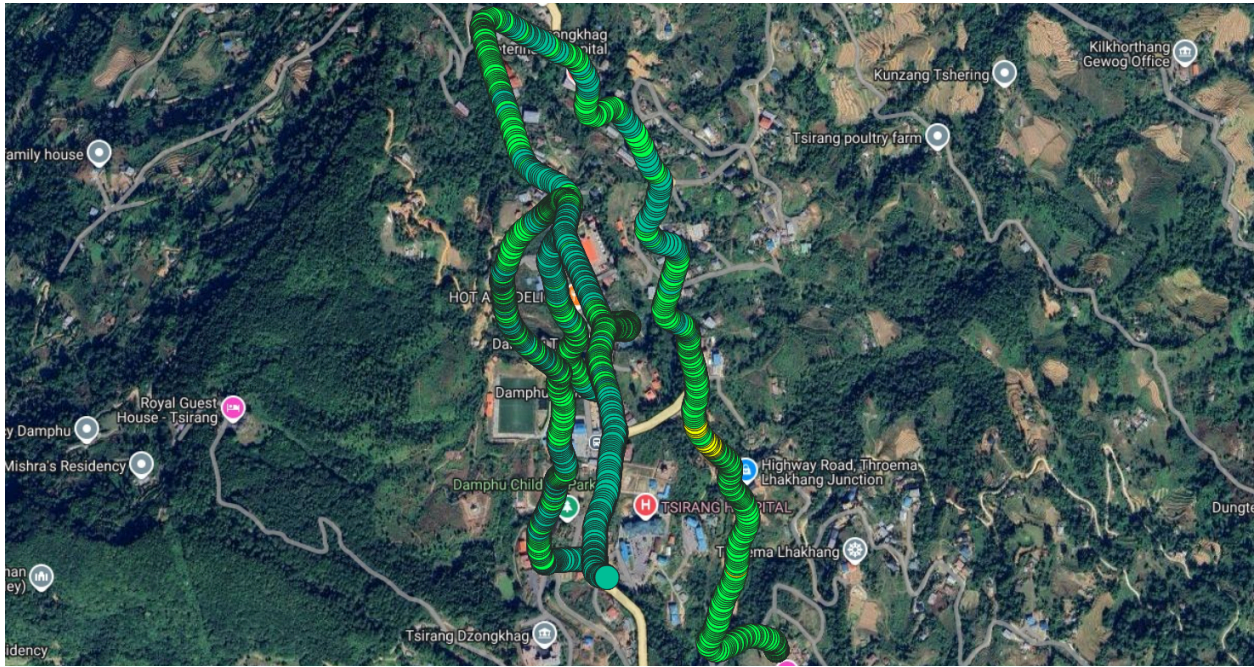


Figure number 2.1 : RSRP plot 4G B-mobile (Damphu Town Area)

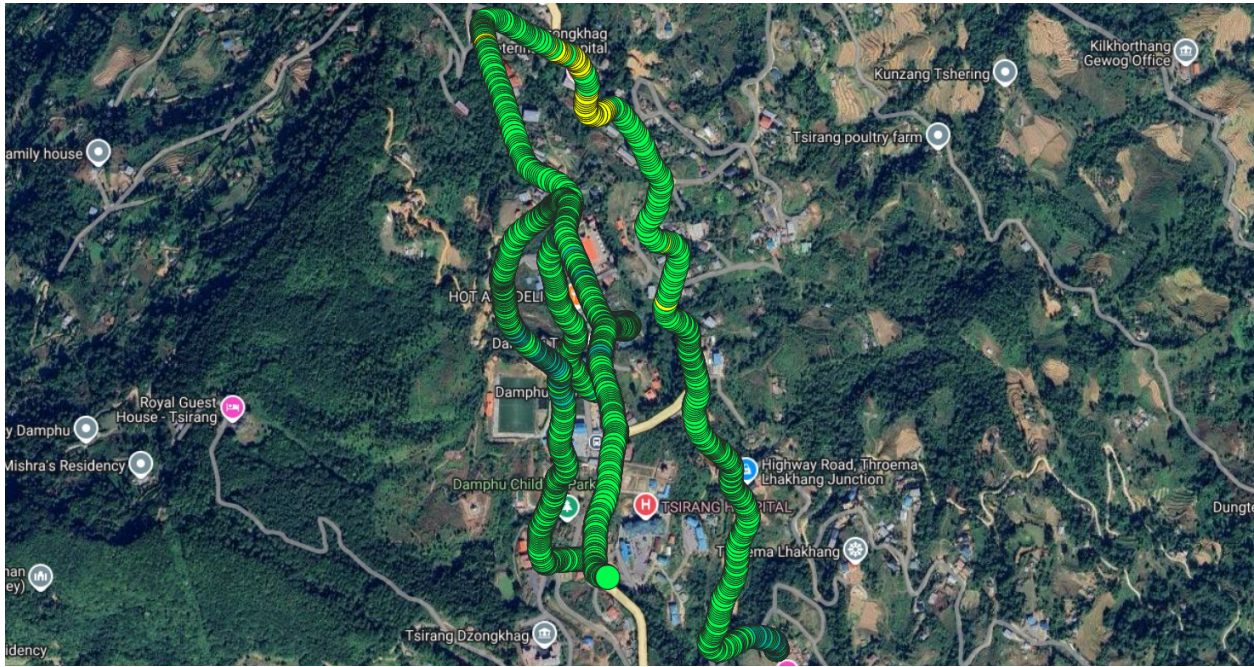


Figure number 2.2 : RSRP plot 4G Tashi Cell (Damphu Town Area)

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B. Summarized Findings

1. Mobile Voice service

There were no issues with the Mobile Voice Services in the monitored area

2. Mobile Data Service

There were no issues with the Mobile Data Services in the monitored area

5. Follow up Actions Taken by the Authority

The general follow up actions and some of the rectifications actions taken by the Authority against the issues addressed above are mentioned below:

- The Authority has initiated the discussion with two telcos on the effective usage of microwave frequencies.
- The Authority has also issued the extra spectrum for TIPL in 2100MHz for trial deployment to resolve the current issues of congestion.
- Based on the issue from the monthly OSS report submitted by the Telcos, we have also planned to carry out the physical verification in the affected areas.

6. Terminologies

- I. **Operator:** Refers to the respective mobile service providers
- II. **Call Drop Rate:** Refers to the fraction of the telephone calls which, due to technical reasons, were cut off before the speaking parties had finished their conversation and before one of them had hung up (dropped calls).
- III. **CDR** = (Number of Call drops/ Total number of attempted calls) x 100
- IV. **Call Completion Rate:** Refers to the ratio of successfully completed calls to the total number of attempted calls.
- V. **CCR** = Number of successful calls / total number of attempted calls
- VI. **Data Throughput Rate:** Refers to the actual amount of data transmitted or transferred in a period of time. It is used for measuring the speeds of data uploads or downloads.

- A. For 3G, the benchmark is: Uplink \geq 1Mbps, Downlink \geq 1.5 Mbps
 - B. For 4G, the benchmark is: Uplink \geq 2Mbps, Downlink \geq 6Mbps

- VII. **File Transfer Protocol (FTP):** Is a standard network protocol used for the transfer of computer files between a client and server on a computer network.

- VIII. **Hypertext Transfer Protocol (HTTP):** Is an application protocol for distributed, collaborative, and hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web.

- IX. **Mean Opinion Score (MOS):** Is a numerical measure of quality of human speech at the destination end of the circuit and will determine the voice quality of user experience (QoE) while talking over the phone. To measure the quality of experience (QoE). It is expressed as a single number in the range from 1 to 5, where the value of 1 corresponds to the lowest quality experienced by the end-users and 5 as the excellent quality experienced as shown below:
 - A. 5: Excellent
 - B. 4: Good
 - C. 3: Fair
 - D. 2: Poor
 - E. 1: Bad

- X. **Peak Hours:** Is a time period determined by Service provider where traffic or number of call attempts is the maximum. The peak hours for Bhutan Telecom limited (BTL) is 3 PM to 10 PM while a peak hour for Tashi InfoComm Limited (TICL) is from 6PM to 12 AM.

- XI. **Off – Peak Hours:** Is a time period determined by Service provided where the traffic or call attempts is moderate. The Off- peak hours of BTL is from 6 AM to 3 PM and Off-peak hours for TICL is from 6 AM to 6 PM.

- XII. **Latency:** Is a measure of delay. In a network, **latency** measures the time it takes for some data to get to its destination across the network. It is usually measured as a round trip delay - the time taken for information to get to its destination and back again.

- XIII. **Mbps:** stands for “megabits per second.” It is a measure of internet bandwidth. In simple terms, bandwidth is the download rate of your internet connection. It is the maximum speed at which you can download data from the internet onto to your computer or mobile device

XIV. **RxLeV:** RxLev represents the received signal strength level measured in dBm units. -105dBm represents the weakest/unusable signal and -80 dBm the strongest.

XV. **RSCP:** received signal code power denotes the power measured by a receiver on a particular physical communication channel.

XVI. **RSRP:** Reference Signal Received Power is a measurement of the received power level in an LTE cell network. The average power is a measurement of the power received from a single reference signal.

XVII. **Mobile Network Coverage (Signal Strength)**

Sl.No	QoS Parameters	Best dBm	Average dBm	Worst dBm
1	Rxlev (GSM)	≥ -80	$-80 \leq -95$	≤ -105
2	RSCP (UMTS)	≥ -80	$-80 \leq -100$	≤ -110
3	RSRP (LTE)	≥ -80	$-80 \leq -105$	≤ -115