

# Observations

## Signal Strength (RSRP)

- **Band 1:**  $-98$  dBm  $\rightarrow$  *Fair to weak*
- **Band 7:**  $-106$  dBm  $\rightarrow$  *Weak*

Band 7 (higher frequency) shows weaker signal strength, which is expected because higher frequencies attenuate more indoors.

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## Signal Quality (RSRQ & SINR)

- **RSRQ:**  $-12$  to  $-14$  dB  $\rightarrow$  *Poor*
- **SINR:**  $-20$  dB  $\rightarrow$  *Very poor*

Even though signal exists, it is heavily affected by interference and/or noise, likely due to:

- Indoor environment
  - Network load
  - Multiple reflections and obstructions
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## Carrier Frequency & Bandwidth

- Both bands use 20 MHz bandwidth, which is good for capacity.
  - However, usable throughput is limited by poor SINR, not bandwidth.
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# Analysis

## Effect of Signal Strength and Quality on Performance

Signal strength (RSRP) and signal quality (RSRQ, SINR) have a direct impact on data speed, network stability, and connection reliability.

In the observed measurements, RSRP values range from  $-98$  dBm to  $-106$  dBm, indicating fair to weak signal strength. While the device maintains a connection, such levels are insufficient for consistently high data rates. The situation is further degraded by very low SINR values ( $-20$  dB), which indicate that the received signal is significantly weaker than the surrounding interference and noise.

Low SINR forces the network to:

- Use lower modulation and coding schemes
- Increase retransmissions
- Reduce throughput

As a result, even with a relatively wide 20 MHz channel, achievable data speeds are likely to be low and unstable.

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### **Environmental Factors**

The measurements suggest an indoor environment, where signal propagation is affected by:

- Walls and building materials
- Distance from the base station
- Reflections and multipath interference

The poorer RSRP on LTE Band 7 (2600 MHz) compared to Band 1 (2100 MHz) aligns with radio propagation theory: higher-frequency bands experience greater penetration loss indoors.

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### **Network Stability and Reliability**

Poor RSRQ and SINR values can cause:

- Increased latency
- Temporary throughput drops
- Possible handovers between cells or bands

This explains why users may experience fluctuating speeds or brief connectivity issues despite being connected to 4G.