Exercise 3.1: Investigating Cellular Network Parameters Using Service Mode

The recorded values:

Bedroom (8:05)

- Cell ID: CI 10449982 (CID 62), eNb 40820
- Carrier frequency: EARFCN 1549
- Bandwidth: 20 MHz
- Signal strength: RSSI -57 dBm, RSRP -95 dBm
- Signal quality: RSRQ -16 dB, SNR 13 dB

Kitchen (8:10)

- Cell ID: CI 10449982 (CID 62), eNb 40820
- Carrier frequency: EARFCN 1549
- Bandwidth: 20 MHz
- Signal strength: RSSI -61 dBm, RSRP -97 dBm
- Signal quality: RSRQ -14 dB, SNR 14 dB

Outside apartment (8:15)

Primary cell (top block):

- Cell ID: CI 10449982 (CID 62), eNb 40820
- Carrier frequency: EARFCN 1549
- Bandwidth: 20 MHz
- Signal strength: RSSI -77 dBm, RSRP -114 dBm
- Signal quality: RSRQ -15 dB, SNR 4 dB

Extra/secondary LTE carrier shown (lower block):

- Cell ID: CI 10449992 (CID 72), eNb 40820
- Carrier frequency: EARFCN 497
- Bandwidth: 20 MHz

- Signal strength: RSSI -81 dBm, RSRP -118 dBm
- Signal quality: RSRQ -15 dB, SNR 3 dB

Strength got much worse outside

Compared to bedroom:

- RSRP: -95 → -114 dBm (≈ 19 dB weaker)
- SNR: 13 → 4 dB (≈ 9 dB worse)
  That's a big drop, and it will usually hurt speed + stability.

Kitchen vs bedroom is minor:

- RSRP is ~2 dB weaker in kitchen, but SNR is slightly better (14 vs 13) and RSRQ is better (-14 vs -16). That suggests the kitchen spot may have less interference, even if raw power is slightly lower.

Analysis: how strength/quality affect speed, stability, reliability

Data speed

- Higher RSRP + higher SNR usually allows higher modulation/coding (more bits per symbol), so higher throughput.
- Your outside reading (RSRP -114, SNR 4) is in the "weak + noisy" zone → the network likely forces more robust (slower) modulation, more error correction, and you'll see lower speed, especially uplink.

Network stability (drops, buffering, handovers)

- Low SNR increases decoding errors → more retransmissions → higher latency/jitter.
- With SNR 3–4 dB outside, you're closer to conditions where calls/data can become inconsistent (especially if you move).

Connectivity reliability

- RSRQ around -14 to -16 dB is already not great; it often points to interference or cell load.
- Even when RSRP is decent (bedroom/kitchen), a worse RSRQ can still reduce real-world performance because the signal is "busy/noisy."

Key Findings

Measurements collected with NetMonster on a Samsung Galaxy S21 (DNA Finland) showed that the device remained primarily on 4G LTE with carrier aggregation (1800 + 1800 + 2100 + 2100) during all tests, while 5G NSA remained disconnected. Across the three locations, the phone stayed mostly on the same serving cell/site (eNb 40820, CI 10449982), indicating that performance changes were mainly due to radio propagation and environment, not a major tower handover.

Indoors, the bedroom and kitchen results were similar, with only small differences in signal level (RSRP around -95 to -97 dBm) and slightly better quality in the kitchen (RSRQ improved from -16 to -14 dB, SNR from 13 to 14 dB). Outdoors, the connection degraded significantly: RSRP dropped to about -114 dBm and SNR fell to ~4 dB, with an additional LTE carrier (EARFCN 497) appearing. This combination of weaker signal strength and poorer signal quality would be expected to reduce throughput, increase retransmissions, and make the connection less stable (higher latency/jitter and less reliable data performance). Overall, the results support the core relationship that stronger RSRP and higher SNR lead to better speed and stability, while low RSRP and low SNR correspond to worse connectivity, especially under interference and/or changing environmental conditions.