1. Measurement Information

- Measurement Facility: Microsoft Antenna Lab
- Equipment: MVG Starlab (formerly known as Satimo)
- Calibration Verification: A reference calibration dipole was measured before the device was tested and compared to the reported values of the manufacturer to verify that the chamber calibration is within measurement uncertainty and in good standing

2. Impedance/Return Loss Measurement

The impedance/return loss measurement was measured by installing 50-Ohm coaxial cables in the device under test and measured using a Copper Mountain C2409 VNA. The 50-Ohm coax cables are connected at the RF connectors at the main board and routed to come out from the back side of the device away from the integrated antennas. The VNA was calibrated and the 50-Ohm cables were de-embedded to enable accurate impedance measurement. Their loss was measured and used to adjust the gain data measured in the chamber.

3. Radiation Pattern and Gain Measurement

The radiation pattern and gain measurements were done in the MVG Starlab fully anechoic chamber. The antenna gain reported is the maximum measured in both horizontal and vertical polarizations.

4. Passive Gain Calibration and Test Method

The calibration of the chamber is performed using gain by substitution method. A reference calibration dipole with known antenna gain and efficiency connected in the middle of the chamber in the quiet zone is measured and a calibration file that includes offset values for each frequency to adjust the losses of the system is generated. The device under test was tested the same way as the calibration dipoles and the calibration file described above is used to calculate the gain of each embedded antenna.

5. Peak Antenna Gain (dBi)

Frequency (MHz)	Antenna 6 Wi-Fi/BT	Antenna 7 Wi-Fi
2400 to 2485	1.4	1.6
5150 to 5250	0.6	2.3
5250 to 5350	0.5	2.9
5470 to 5725	3.3	2.9
5725 to 5850	3.6	2.4
5925 to 6425	3.5	3.2
6425 to 6525	3.4	2.4
6525 to 6875	3.4	3.3
6875 to 7125	3.5	3.3