1. Test Information

1.1. Location and Date

Testing was performed in the RF laboratory at Insulet's headquarters (100 Nagog Park, Acton MA 01720) on September 17, 2025.

1.2. Configuration Tested

Antenna patterns were measured using the Satellite v2p227 PCBA (Insulet Part # PT-001831), which is functionally equivalent to the latest version (v.5). The antenna tested (Insulet Part # PT-001695) is v.4, which is functionally equivalent to the newest v.5 release.

1.3. Antenna Manufacturer

Huayi Precision

Address: *Huayi Build, Qiushuiling Industrial Area, Egongling, Pinghu, Longgang District, Shenzhen*

1.4. Test Equipment

Manufacturer and Model #	Description	Calibration Due Date
Rohde & Schwartz ZNB8 VNA	Vector Network Analyzer	February 28 2026
ETS Lindgren-3115	Double Ridge Horn Antenna	NA
DV Test 346004	Anechoic Chamber	NA

1.5. Definition of Abbreviations Used

Abbreviation	Definition
VNA	Vector Network Analyzer
RF	Radio Frequency
BLE	Bluetooth Low Energy
DUT	Device Under Test

1.6. Results Summary

Parameter	Value
Operating Frequency (GHz)	2.402 – 2.480
Maximum Antenna Gain	3.6
Maximum Realized Gain (including losses) (dB)	0.9
EIRP (dBm)	1.26

2. Test Data

2.1. Radiation Patterns and Gain

2.1.1. Method

The test set-up is depicted in Figure 1. The device-under-test (DUT) is placed inside the anechoic chamber, fed via the network analyzer, and rotated around the principal *xy*, *xz*, and *yz* planes; the power received by the horn antenna is recorded as an S_{21} measurement over the Bluetooth frequency range (2.4 GHz - 2.480 GHz).

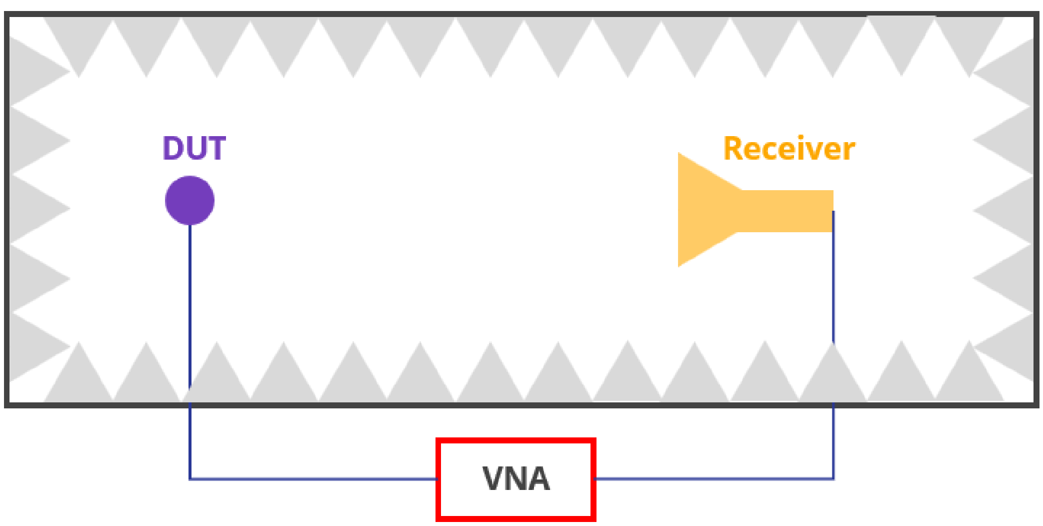


Figure 1. Test set-up for radiation pattern measurement.

The DUT reference plane begins as close as possible to the antenna pad on the PCB, and measurements include mismatch loss between the antenna and PCB trace. The measurements do not include effects from filter circuitry applied farther down the RF chain. These components are evaluated in Section 2.2.

Antenna gain is calculated by first determining the free-space path loss between the DUT and the horn antenna receiver, where λ is the wavelength at a particular frequency.

$$Distance_{TX-RX} = d = 774.7\ mm$$
$$Path\ loss = \left(\frac{4\pi d}{\lambda}\right)^2$$

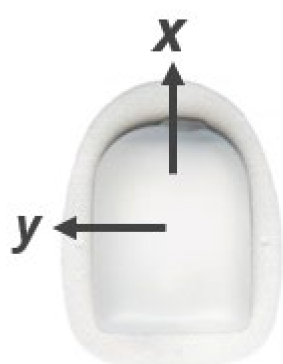
The Friis equation is then used to find the gain of the transmitter (DUT):

$$Power_{Received} = Power_{Transmitted} + Gain_{Transmitter} + Gain_{Receiver} - Path\ Loss$$

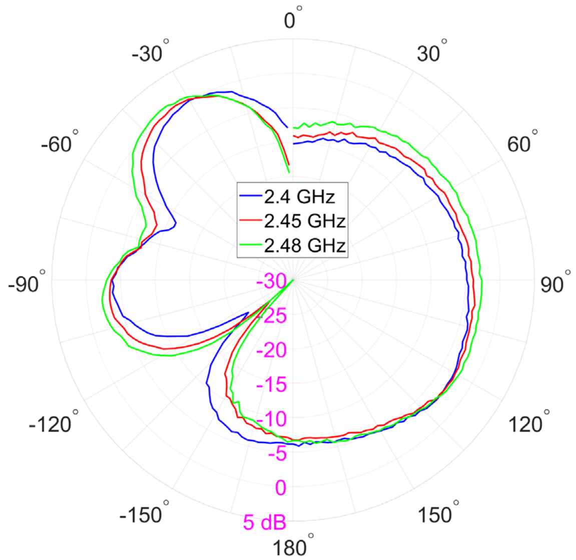
The difference between received and transmitted power is given by the measured S_{21} parameter and the gain of the receiver is obtained from the manufacturer's datasheet. Note that cable losses are accounted for in the calibration of the network analyzer. Therefore, with these values known, the gain of the transmitter (the DUT) can be found.

2.1.2. Pattern Measurements

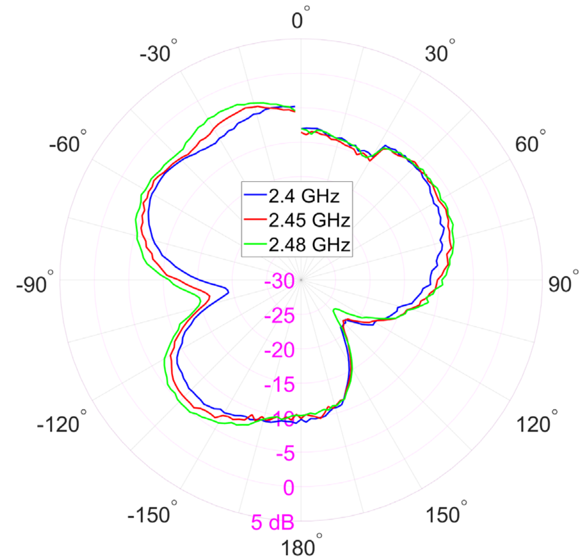
Figure 1shows the theta and phi components of the measured radiation patterns at low, middle, and high frequencies across the operating band.



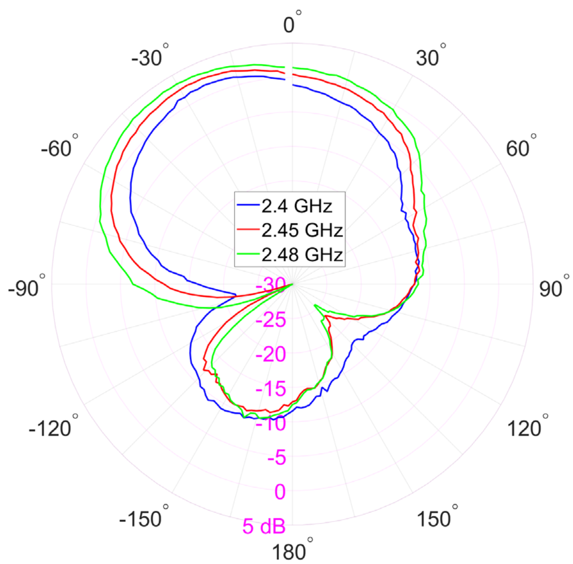
Gain$_\theta$ *xy-plane*



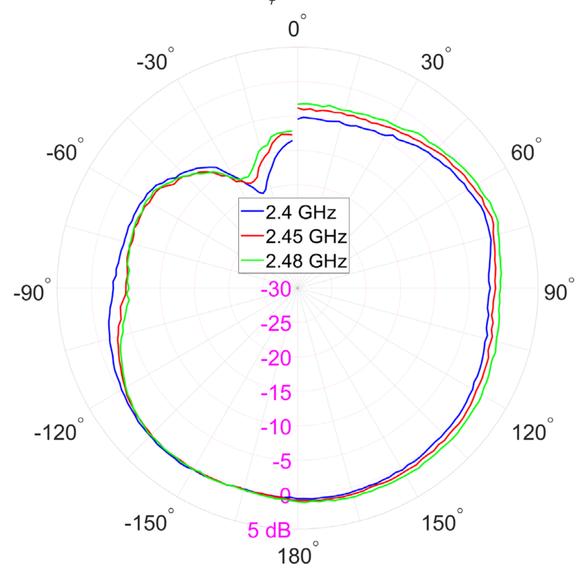
Gain$_\phi$ *xy-plane*



Gain$_\theta$ *xz-plane*



Gain$_\phi$ *xz-plane*



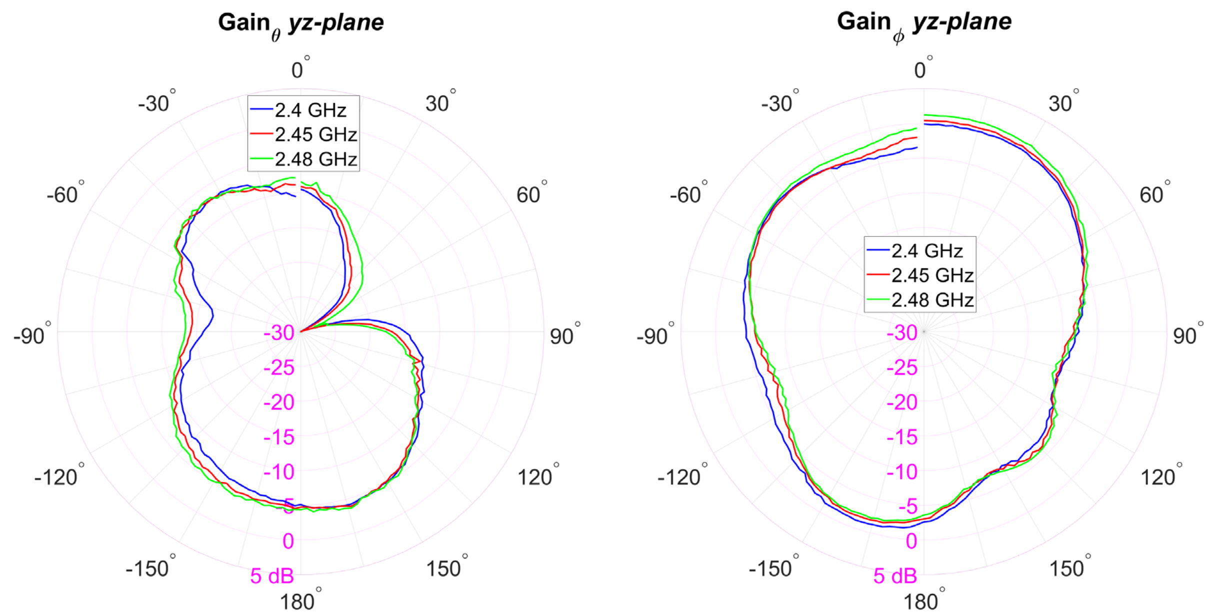


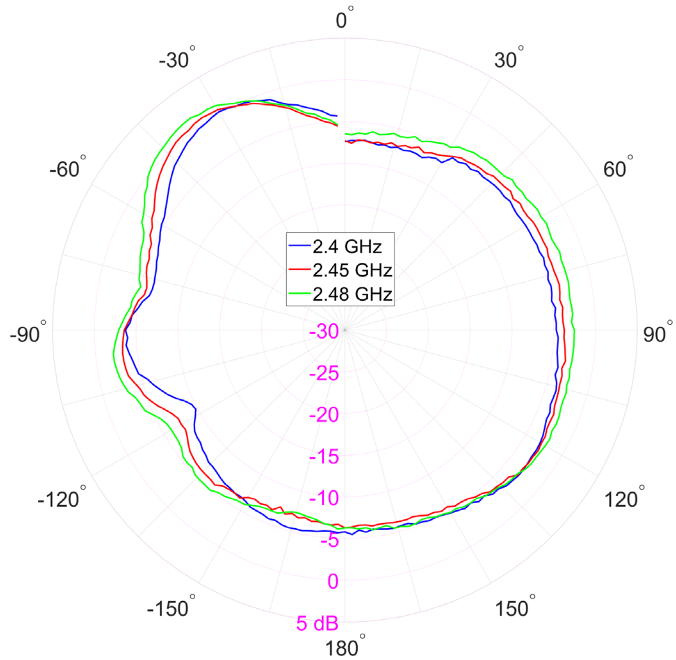
Figure 2. Measured radiation patterns.

Because Insulet's Pods can be oriented in any direction with respect to their paired devices (such as a glucose sensor or smartphone), the total gain of the antenna provides a better summary of the user's actual experience. Total gain (in linear units) is calculated as

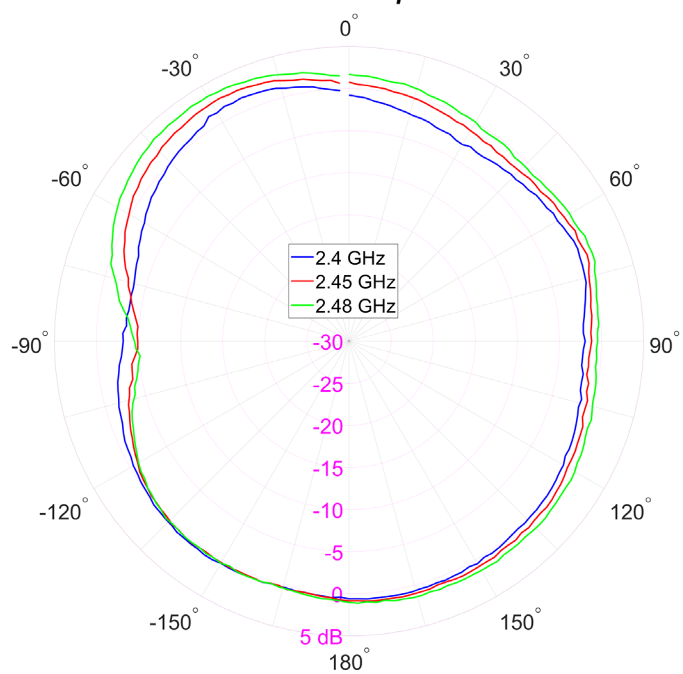
$$Total\ Gain = \sqrt{(Gain_\theta)^2 + \left(Gain_\phi\right)^2},$$

and corresponding plots are shown in Figure 2.

Total Gain *xy-plane*



Total Gain *xz-plane*



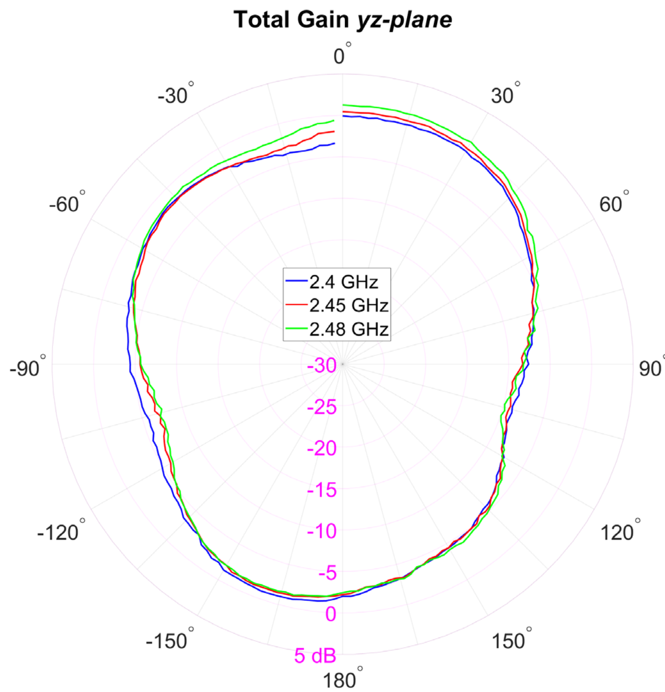


Figure 3. Computed total gain

2.1.3. Data Summary

Table 1 shows the maximum gain in decibels, measured in the three planes for each component, as well as the calculated total gain value.

Table 1. Antenna maximum gain for different field components.

Plane\Component	θ-component (dB)	ϕ-component (dB)	Total Gain (dB)
xy	1.2	-2.9	1.4
xz	3.6	0.7	3.6
yz	-3.6	1.2	1.2

2.2. Filter Network

A filter network is applied to the RF chain between the antenna pad and the BLE chip's RF input/output pin and Figure 3 shows the measured loss through this filter.

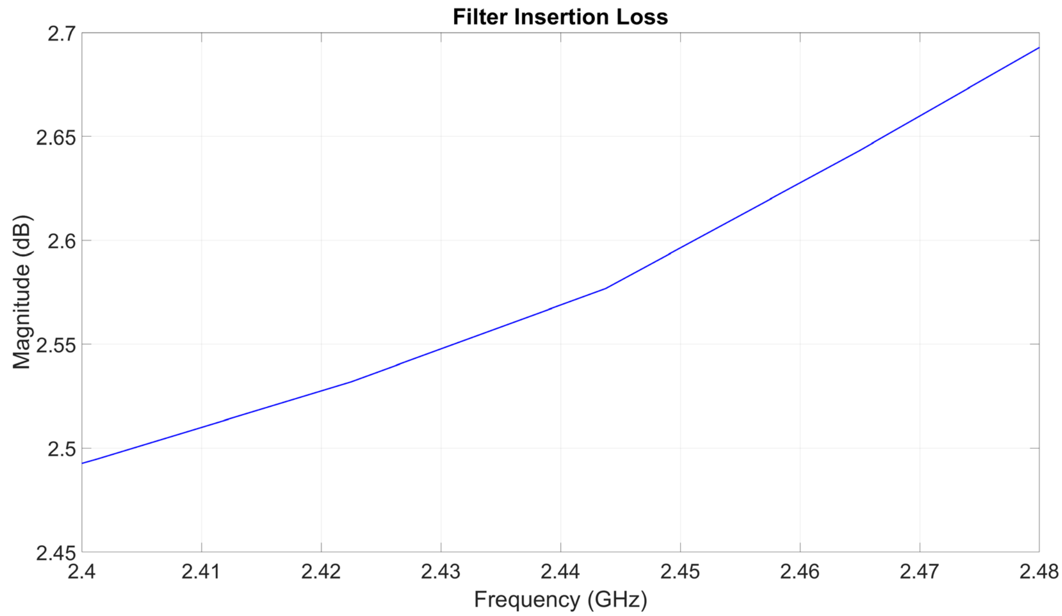


Figure 4. Filter insertion loss.

The maximum loss is 2.69 dB across the Bluetooth band. Loss from the trace itself is negligible, so the realized gain (accounting for antenna gain, mismatch, and loss) is given in Table 1.

Table 2. Realized gain seen at BLE IC port.

Plane\Component	θ-component (dB)	ϕ-component (dB)	Total Gain (dB)
xy	-1.5	-5.6	-1.3
xz	0.91	-2.0	0.9
yz	-6.3	-1.5	-1.5