

**ISP1807LR Antenna Measurement**

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## 1. Object

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This document describes the antenna measurements that have been carried out to validate the performance of the ISP1807LR module. The measurements were carried out at a sub-contractor using a StarLab antenna measurement system.

## 2. Measurement system

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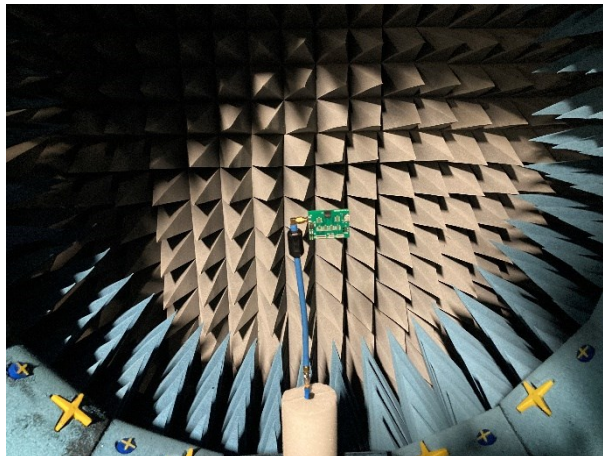
The measurement system is a Satimo/MVG StarLab.

Two different measurements have been carried out:

- Test of the antenna portion of the module to determine its gain and radiation pattern using a test board with an SMA connector that is connected to the antenna by a short microstrip transmission line. These tests were carried out over the 2.3 to 2.6 GHz frequency range at 10 MHz intervals
- Test of the module and integrated antenna using a CW signal generated by the RF portion of the module. This test was carried out at 3 frequencies – 2405, 2440 and 2480 MHz.

### 2.1. Antenna measurement setup

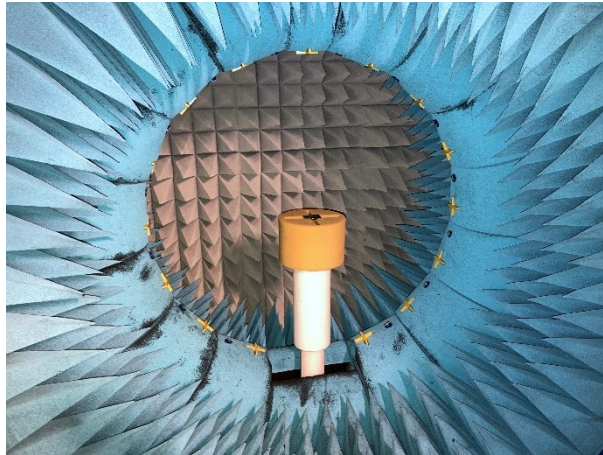
This setup was used to test the antenna portion of the module.



The system measures the gain of the antenna including the microstrip track on the test board.

### 2.2. Module measurement setup

This setup was used to measure the module with its integrated antenna connected to the RF output.



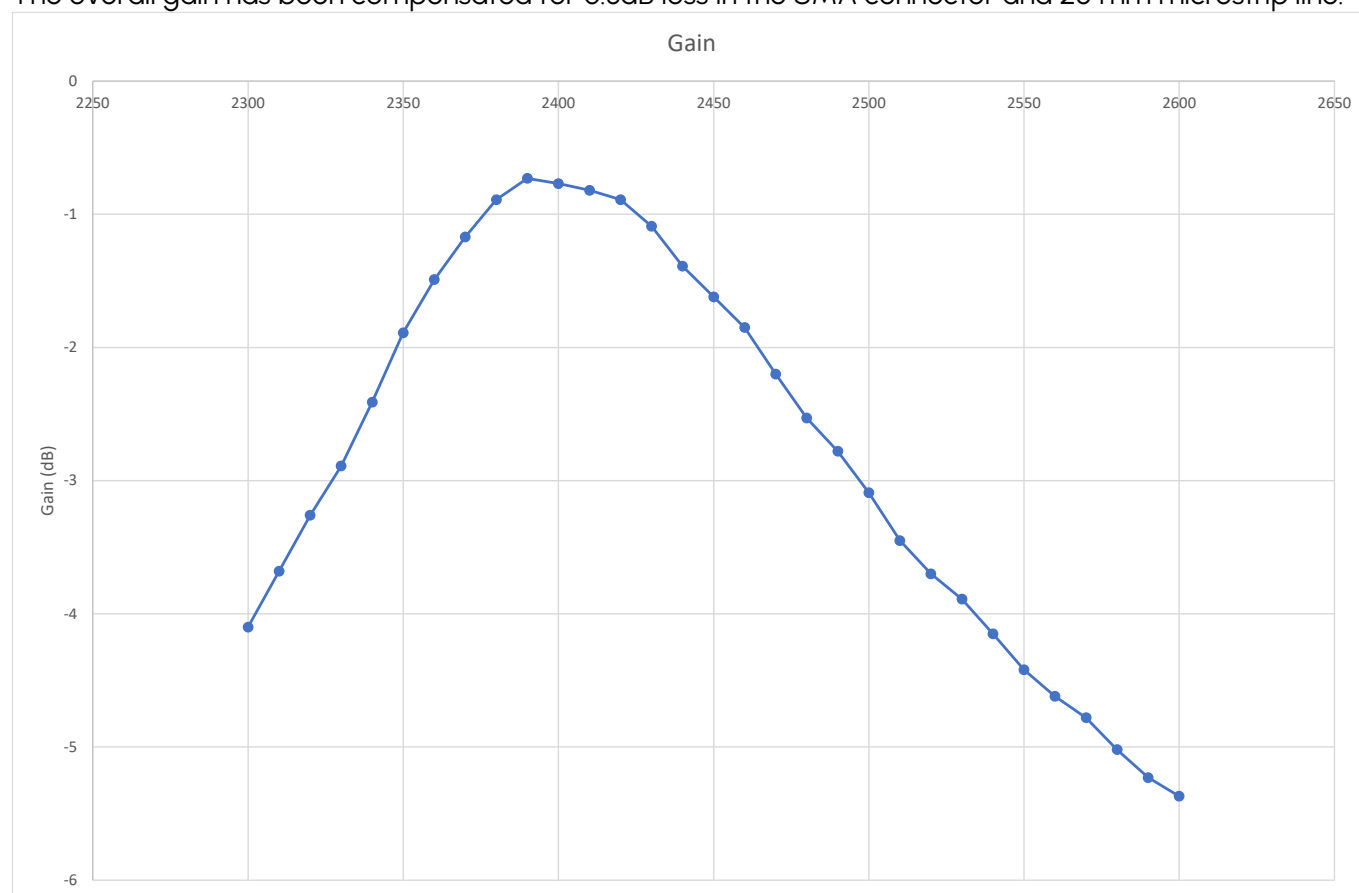
The module is attached to a small PCB that supplies the module with 3V from a CR2032 coin cell. The module is programmed to transmit a CW signal.

### 3. Measurement Results

#### 3.1. Antenna measurements

These measurements use the setup in section 2.1.

The overall gain has been compensated for 0.3dB loss in the SMA connector and 25 mm microstrip line.



Maximum gain is -0.7 dB

### 3.2. Module Measurements

The module measurements were carried out with 6.4 dBm CW signal connected directly to the internal antenna. The system was calibrated with a horn antenna with known gain and taking into account the output power of the module the antenna gain was estimated

The maximum total gain is tabulated below:

Frequency (MHz)	2405	2440	2480
Gain dBi	-1.16	0.28	-0.15

## 4. Conclusions

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The different measurement techniques give slightly different results, due to ground plane size and the coaxial cable in the case of the antenna measurements.

Given the typical use case in which the antenna is connected directly to the RF output of the module the results from section 3.2 are closer to those that will be achieved in normal usage.

This confirms that the maximum gain is less than 0.6 dBi as indicated in the datasheet.