# 1. OTA PASSIVE ANTENNA TEST REPORT

| | | | |
|---|---|---|---|
| **Date of Report** | 13/08/2024 | **Client's Contact person:** | Phuc Nguyen |
| **Number of pages:** | 12 | | |
| **Responsible Test engineer:** | | | Veli-Matti Niemitalo |
| **Testing laboratory:** | **Verkotan Oy**<br>Elektroniikkatie 17<br>90590 Oulu<br>Finland | **Client:** | SCRAM Systems 1241 W Mineral Ave Littleton, CO 80015 United States |
| **Tested devices** | Bracelet P8M-GPS900W3 | | |
| **Testing has been carried out in accordance with:** | Passive measurements per customer request | | |
| **Documentation:** | The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. | | |
| **Test Results:** | The test results relate only to devices specified in this document | | |

**Date and signatures:** 13.08.2024

**Sami Laukkanen CTO**

## 2. SUMMARY

### 2.1 Test Details

**Devices under Test (DUT):**

| | |
|---|---|
| **Product:** | Bracelet P8M-GPS900W3 |
| **Note** | |
| **Manufacturer info:** | GM10000GC |
| **SW Info:** | - |
| **DUT number:** | 22074 |
| **Tested Frequencies [MHz]** | 2400-2490 in 10 MHz steps |



**Figure 1 DUT top/front** **Figure 2 DUT back**

**Testing information:**



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| | |
|---|---|
| **Testing performed:** | 22.5.2024 |
| **Notes:** | - |
| **Document name:** | Passive_OTA_test_report_ID6669_13082024 |
| **Temperature °C / Humidity RH%** | 22±2 / 25%±10% |
| **Measurement performed by:** | Veli-Matti Niemitalo |
| **Document history:** | 24.5.2024 Draft version<br>13.08.2024 Signed version |

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## 3. TEST EQUIPMENT

Main used test equipment is listed below. For full equipment list and calibration intervals, please contact the testing laboratory.

| Type of Equipment | Type | Manufacturer | Calibration date | Calibration period | Calibration due | Purpose |
|---|---|---|---|---|---|---|
| Diagonal Dual Polarized Horn Measurement Antenna | 114960 | ETS | Included in range calibration | Included in range calibration | Included in range calibration | Probe antenna |
| Positioning Controller | 2090 | EMCO | n/a | n/a | n/a | DUT alignment |
| 3D Positioner | Custom made | ETS-Lindgren | n/a | n/a | n/a | DUT alignment |
| Anechoic Chamber | 4 | ETS-Lindgren | 23.09.2023 | 1 year | 23.09.2024 | Test range |
| Switching System | MSN6TD-06DEC-SP | American Microwave | Included in range calibration | Included in range calibration | Included in range calibration | Probe selection |
| Switching System | SW6AD-A61 | Pulsar | Included in range calibration | Included in range calibration | Included in range calibration | Probe selection |
| Network Analyzer | E5071C | Agilent | 20.05.2024 | 1 year | 20.05.2025 | Measurement transmitter / receiver |
| Dual-Ridge Horn Antenna | SH600 | MVG | 20.08.2020 | n/a | n/a | Calibration antenna 1-9 GHz |

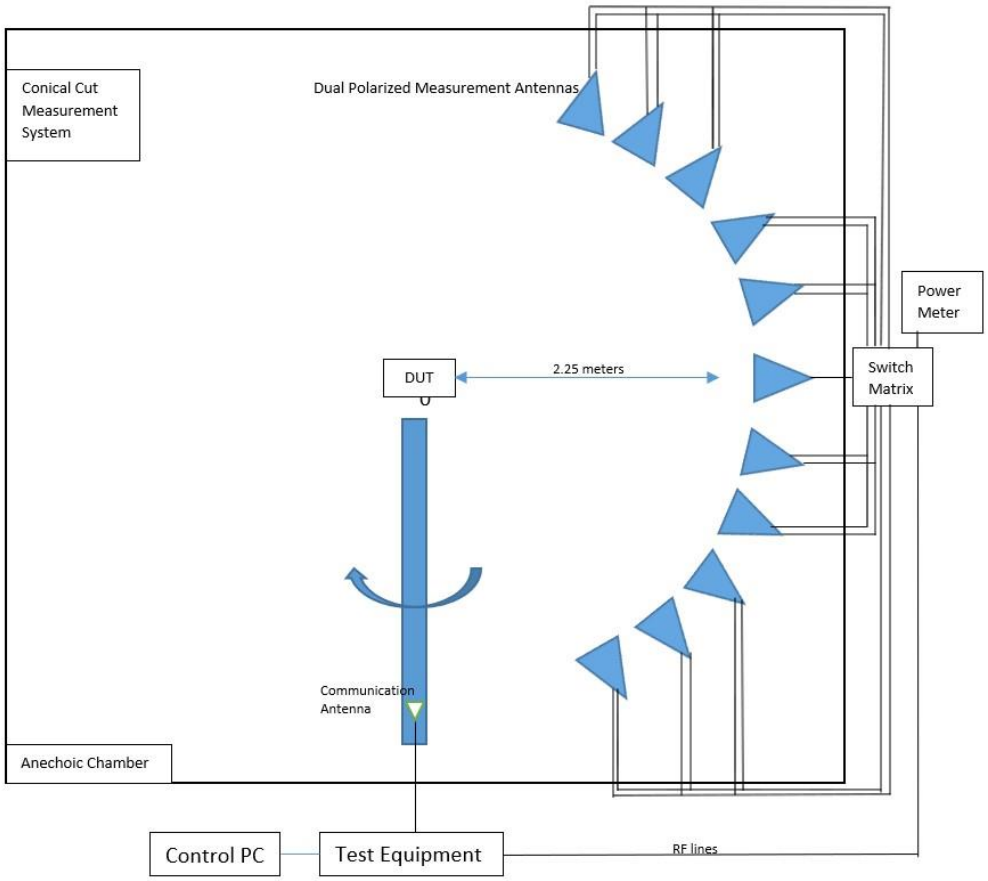


**Figure 3. Laboratory 4 chamber schematic.**



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## 4. TEST SETUP

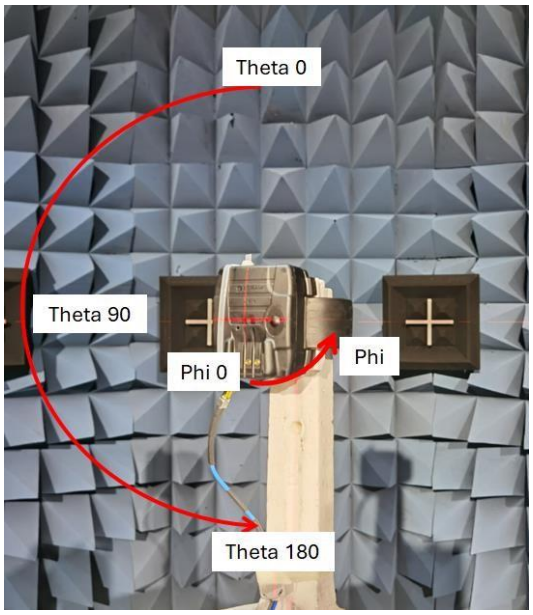



**Figure 4 DUT in Free Space passive measurement and coordinate system**

Vertical laser in DUT setup position denotes phi=0, horizontal laser denotes theta=90. Theta 0 is directly up from DUT, and theta 180 is down from DUT.

# 5. RESULTS

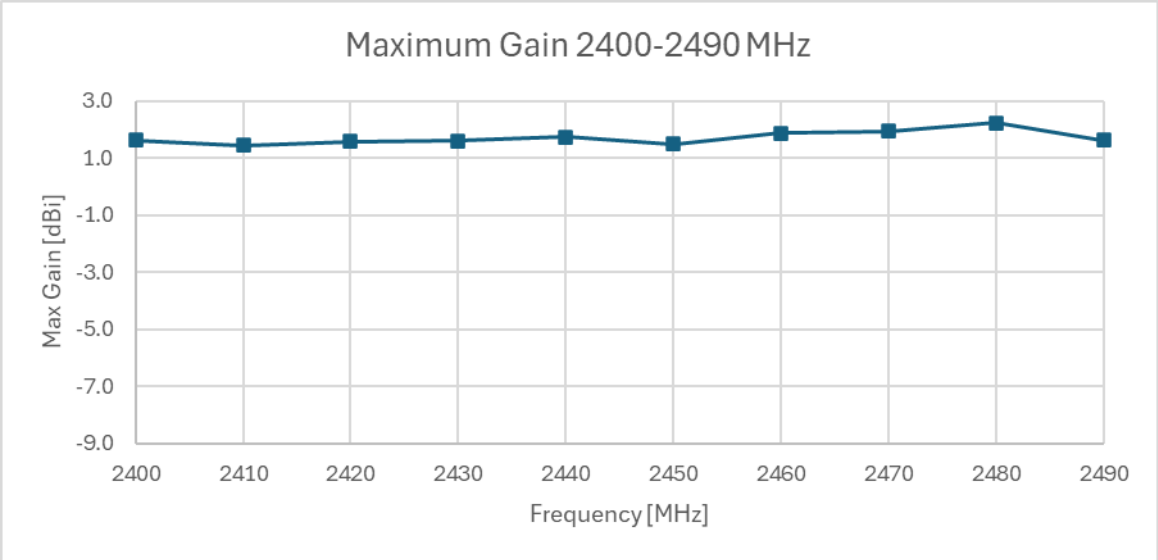
## 5.1 Passive OTA measurements

### 5.1.1 Maximum gain and efficiency

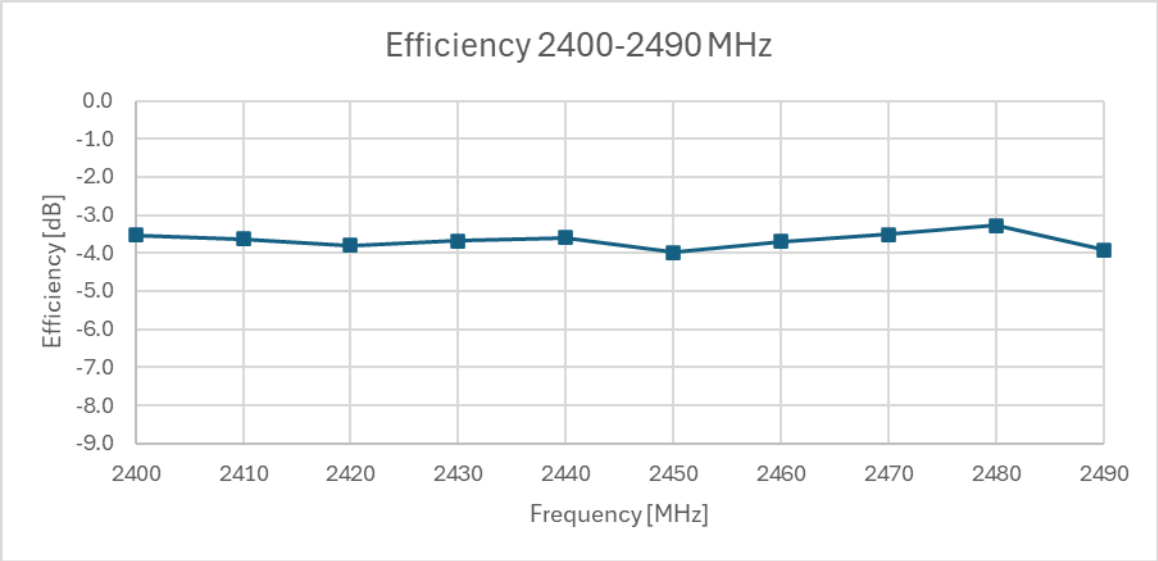
| Frequency [MHz] | Max gain [dBi] | Efficiency [dB] |
|---|---|---|
| 2400 | 1.6 | -3.5 |
| 2410 | 1.4 | -3.6 |
| 2420 | 1.6 | -3.8 |
| 2430 | 1.6 | -3.7 |
| 2440 | 1.7 | -3.6 |
| 2450 | 1.5 | -4.0 |
| 2460 | 1.9 | -3.7 |
| 2470 | 1.9 | -3.5 |
| 2480 | 2.2 | -3.3 |
| 2490 | 1.6 | -3.9 |

**Table 1 2400-2490 MHz max gain and efficiency**

### 5.1.2 Maximum gain (graphs)

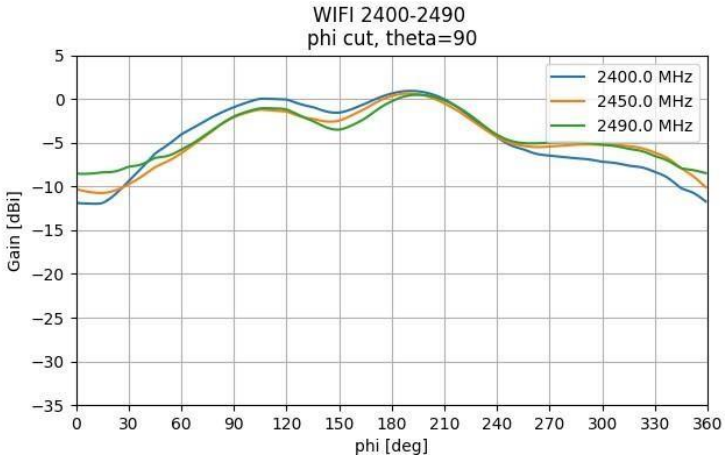


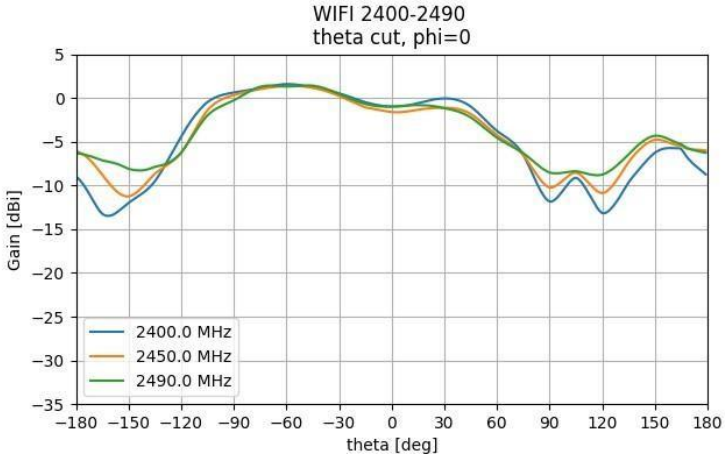

### 5.1.3 Efficiency (graphs)

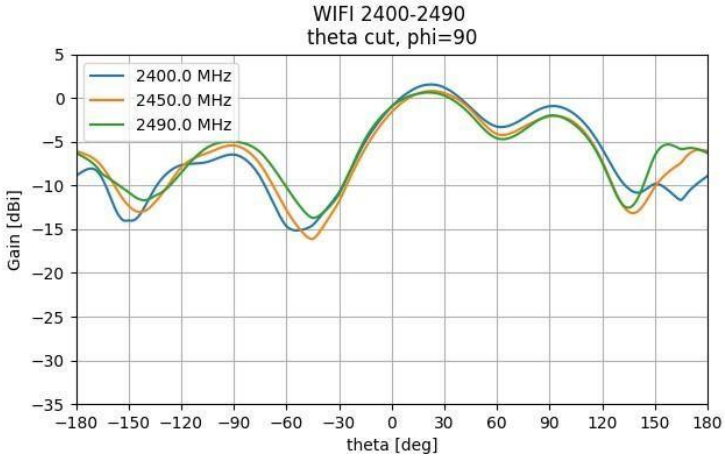


# 6. ANTENNA PATTERN CUTS

## 6.1 2400-2490 MHz



## 7. ANTENNA PATTERNS