# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| **FCC ID** | : | **P4Q-TG2A001** |
| **Equipment** | : | **Internet Gateway** |
| **Brand Name** | : | **Amazon, AWS, SKF,** |
| **Model Name** | : | **TG2A001,**<br>**TG2A001YYYY (Y= 10 characters, Y can be 0-9, a-z, A-Z, "-", "_" or blank for marketing purpose and no impact safety related critical components and constructions.)** |
| **Applicant** | : | **Mitac Digital Technology Corp.**<br>**4F., NO. 1, R&D ROAD 2, HSINCHU SCIENCE PARK, HSINCHU 30076, TAIWAN, R.O.C.** |
| **Standard** | : | **FCC Part 15 Subpart C §15.247** |

**The product was received on Jun. 19, 2024 and testing was performed from Jul. 02, 2024 to Dec. 11, 2024. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.**

**The test results in this partial report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.**

Louis Wu

**Approved by: Louis Wu**

***Sporton International Inc. Wensan Laboratory***
*No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)*

# Table of Contents

# History of this test report

| Report No. | Version | Description | Issue Date |
|---|---|---|---|
| FR430401B | 01 | Initial issue of report | Nov. 29, 2024 |
| FR430401B | 02 | 1. Revise Summary of Test Result, List of Measuring Equipment and Measurement Uncertainty<br>2. Revise appendix B and D<br>This report is an updated version, replacing the report issued on Nov. 29, 2024. | Dec. 13, 2024 |
| FR430401B | 03 | Revise Product Feature of Equipment Under Test<br>This report is an updated version, replacing the report issued on Dec. 13, 2024. | Dec. 25, 2024 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| - | 15.247(a)(2) | 6dB Bandwidth | Pass | See Note |
| - | 2.1049 | 99% Occupied Bandwidth | Pass | See Note |
| 3.1 | 15.247(b)(3)<br>15.247(b)(4) | Output Power | Pass | - |
| - | 15.247(e) | Power Spectral Density | Pass | See Note |
| - | 15.247(d) | Conducted Band Edges and Spurious Emission | Pass | See Note |
| 3.2 | 15.247(d) | Radiated Band Edges and Spurious Emission | Pass | 3.04 dB under the limit at 839.95 MHz |
| - | 15.207 | AC Conducted Emission | Pass | See Note |
| 3.3 | 15.203 | Antenna Requirement | Pass | - |

**Note:**

1. For host device, Radiated Spurious Emission is verified and complies with the limit in this test report.
2. For host device, the Conducted Output Power is no difference after compared to module (Model: AW-XM553)
3. Spot-check testing on unwanted (spurious) radiated emissions is carried out on the worst-case modulation and channel per frequency range as shown in original module's filing. Radiated Spurious Emission is verified and complies with the limit in this test report.

| **Conformity Assessment Condition:** |
|---|
| 1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. |
| 2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty". |
| **Disclaimer:** |
| 1. The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity. |
| 2. The purpose of different brand name is for marketing segmentation. |

**Reviewed by: Sheng Kuo**

**Report Producer: Wilda Wei**

# 1 General Description

## 1.1 Product Feature of Equipment Under Test

| Product Feature |
|---|
| **General Specs**<br>Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, and Sub 1GHz.<br><br>**Antenna Type**<br>WLAN: PIFA Antenna<br>Bluetooth: PIFA Antenna<br>Sub 1G: PIFA Antenna |

| Antenna information | | |
|---|---|---|
| **2400 MHz ~ 2483.5 MHz** | Peak Gain (dBi) | 2.89 |

| SKU List | | | | | |
|---|---|---|---|---|---|
| **SKU** | **Variant num** | **Wifi/BT** | **BLE** | **Sub GHz** | **Sound** |
| 1 | 1 | x | x | x | x |
| 2 | 2 | x | x | x | - |
| 3 | 3 | x | x | - | x |
| 4 | 4 | x | x | - | - |
| 5 | 5 | x | - | x | x |
| 6 | 6 | x | - | x | - |
| 7 | 7 | - | - | x | x |
| 8 | 8 | - | - | x | - |

**Remark:**

1. The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.
2. The RF related hardware (including WLAN, Bluetooth, Sub 1Ghz module, and Sound) of all models are identical. The RF feature differences are controlled by the embedded software.

## 1.2 Modification of EUT

No modifications made to the EUT during the testing.

## 1.3 Testing Location

| | |
|---|---|
| **Test Site** | Sporton International Inc. Wensan Laboratory |
| **Test Site Location** | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City 333010, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| **Test Site No.** | **Sporton Site No.** |
| | TH05-HY, 03CH16-HY |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786

## 1.4 Applicable Standards

According to the specifications declared by the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 2 Test Configuration of Equipment Under Test

## 2.1 Carrier Frequency Channel

| Frequency Band | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|
| 2400-2483.5 MHz | 0 | 2402 | 21 | 2444 |
| | 1 | 2404 | 22 | 2446 |
| | 2 | 2406 | 23 | 2448 |
| | 3 | 2408 | 24 | 2450 |
| | 4 | 2410 | 25 | 2452 |
| | 5 | 2412 | 26 | 2454 |
| | 6 | 2414 | 27 | 2456 |
| | 7 | 2416 | 28 | 2458 |
| | 8 | 2418 | 29 | 2460 |
| | 9 | 2420 | 30 | 2462 |
| | 10 | 2422 | 31 | 2464 |
| | 11 | 2424 | 32 | 2466 |
| | 12 | 2426 | 33 | 2468 |
| | 13 | 2428 | 34 | 2470 |
| | 14 | 2430 | 35 | 2472 |
| | 15 | 2432 | 36 | 2474 |
| | 16 | 2434 | 37 | 2476 |
| | 17 | 2436 | 38 | 2478 |
| | 18 | 2438 | 39 | 2480 |
| | 19 | 2440 | - | - |
| | 20 | 2442 | - | - |

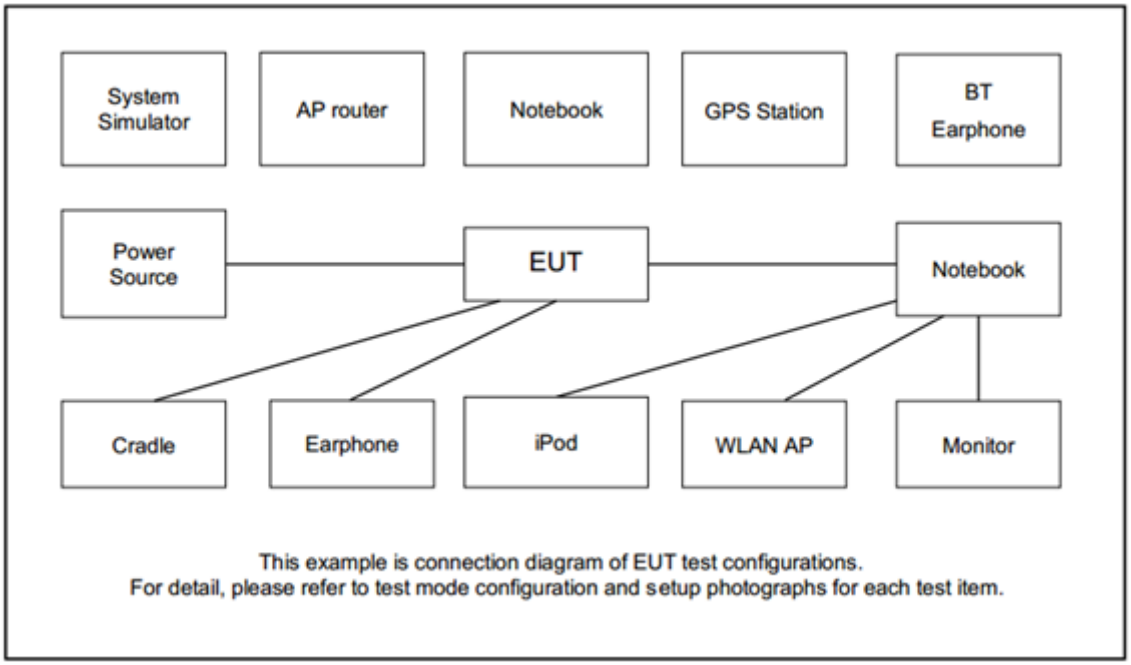
## 2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 KHz to 18 GHz) .For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases | |
|---|---|
| **Test Item** | **Data Rate / Modulation** |
| **Conducted Test Cases** | **Bluetooth – LE / GFSK** |
| | Mode 1: Bluetooth Tx CH19_2440 MHz_2Mbps |
| **Radiated Test Cases** | Mode 1: Bluetooth Tx CH19_2440 MHz_2Mbps |
| **Remark:**<br>1. For Radiated Test Cases, the tests were performed with SKU 1 (E).<br>2. For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power. | |

## 2.3 Connection Diagram of Test System




## 2.4 Support Unit used in test configuration and system

| Item | Equipment | Brand Name | Model Name | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | Notebook | Lenovo | L570 | N/A | N/A | AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m |

## 2.5 EUT Operation Test Setup

The RF test items, utility “Tera Term 4.95” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

# 3 Test Result

## 3.1 Output Power Measurement

### 3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

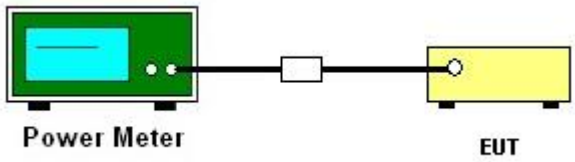
### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.1.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT is connected to the power meter by RF cable and attenuator.
3. The path loss is compensated to the results for each measurement.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. Measure the conducted output power and record the results in the test report.

### 3.1.4 Test Setup




### 3.1.5 Test Result of Average Output Power

Please refer to Appendix A.

## 3.2 Radiated Band Edges and Spurious Emission Measurement

### 3.2.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 0.009 – 0.490 | 2400/F(kHz) | 300 |
| 0.490 – 1.705 | 24000/F(kHz) | 30 |
| 1.705 – 30.0 | 30 | 30 |
| 30 – 88 | 100 | 3 |
| 88 – 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

### 3.2.2 Measuring Instruments

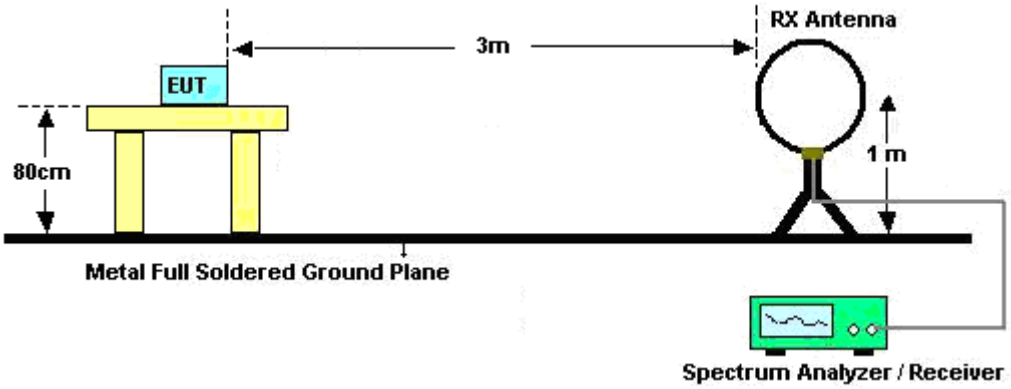
Please refer to the measuring equipment list in this test report.

### 3.2.3 Test Procedures

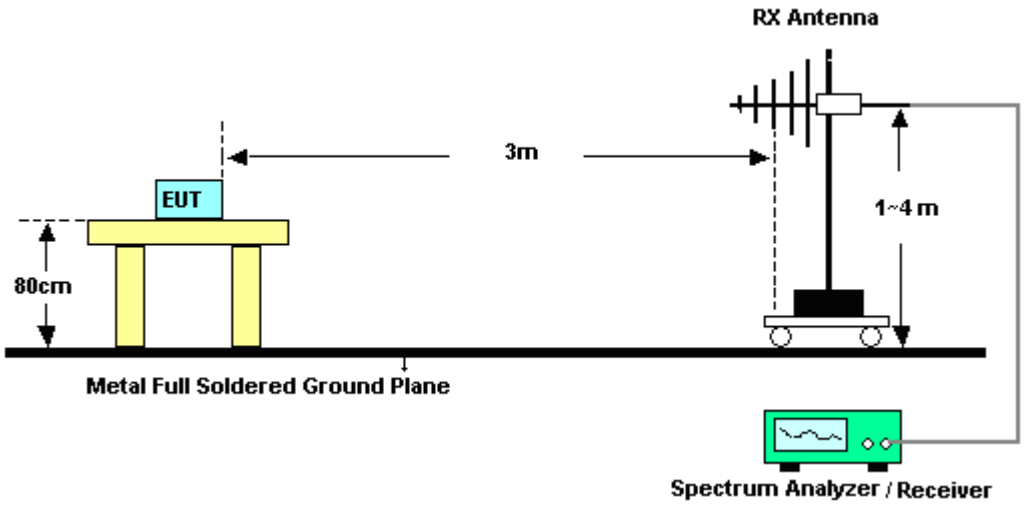
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
7. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW = 3 MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

## 3.2.4 Test Setup

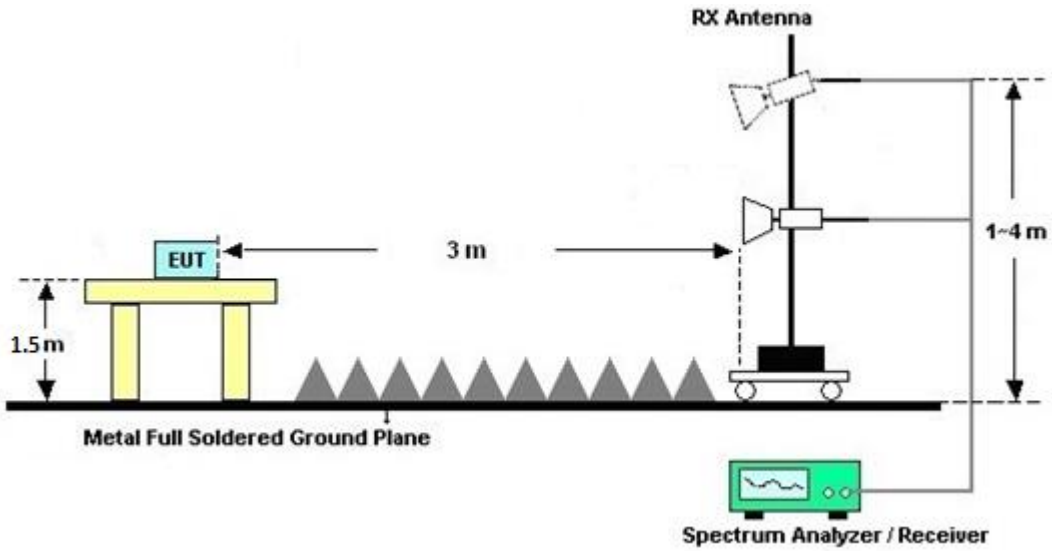
**For radiated test below 30MHz**




**For radiated test from 30MHz to 1GHz**




**For radiated test from 1GHz to 18GHz**



### 3.2.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

### 3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

### 3.2.7 Duty Cycle

Please refer to Appendix C.

### ~~3.2.8~~ Test Result of Radiated Spurious Emission

Please refer to Appendix B.

## 3.3 Antenna Requirements

### 3.3.1 Standard Applicable

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

### 3.3.2 Antenna Anti-Replacement Construction

Antenna permanently attached.

# 4 List of Measuring Equipment

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Sep. 12, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Sep. 11, 2024 | Radiation (03CH16-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Aug. 29, 2024 | Dec. 11, 2024 | Aug. 28, 2025 | Radiation (03CH16-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA9170 | 00993 | 18GHz-40GHz | Nov. 24, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Nov. 23, 2024 | Radiation (03CH16-HY) |
| SHF-EHF Horn Antenna | SCHWARZBECK | BBHA9170 | 00993 | 18GHz-40GHz | Nov. 18, 2024 | Dec. 11, 2024 | Nov. 17, 2025 | Radiation (03CH16-HY) |
| EMI Test Receiver | Keysight | N9038A(MXE) | MY57290111 | 3Hz~26.5GHz | Dec. 04, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Dec. 03, 2024 | Radiation (03CH16-HY) |
| EMI Test Receiver | Keysight | N9038A(MXE) | MY57290111 | 3Hz~26.5GHz | Nov. 22, 2024 | Dec. 11, 2024 | Nov. 21, 2025 | Radiation (03CH16-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00802N1D01N -06 | 47020 & 06 | 30MHz to 1GHz | Oct. 07, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Oct. 06, 2024 | Radiation (03CH16-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00802N1D01N -06 | 47020 & 06 | 30MHz to 1GHz | Oct. 05, 2024 | Dec. 11, 2024 | Oct. 04, 2025 | Radiation (03CH16-HY) |
| Horn Antenna | SCHWARZBECK | BBHA 9120 D | 9120D-1522 | 1G~18GHz | Mar. 28, 2024 | Jul. 17, 2024~ Dec. 11, 2024 | Mar. 27, 2025 | Radiation (03CH16-HY) |
| Amplifier | SONOMA | 310N | 371607 | 9kHz~1GHz | Jul. 02, 2024 | Jul. 17, 2024~ Dec. 11, 2024 | Jul. 01, 2025 | Radiation (03CH16-HY) |
| Preamplifier | Keysight | 83017A | MY53270264 | 1GHz~26.5GHz | Dec. 07, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Dec. 06, 2024 | Radiation (03CH16-HY) |
| Preamplifier | Keysight | 83017A | MY53270264 | 1GHz~26.5GHz | Dec. 05, 2024 | Dec. 11, 2024 | Dec. 04, 2025 | Radiation (03CH16-HY) |
| Preamplifier | EMEC | EM1G18G | 060812 | 1GHz~18GHz | Dec. 25, 2023 | Jul. 17, 2024~ Dec. 11, 2024 | Dec. 24, 2024 | Radiation (03CH16-HY) |
| Preamplifier | EMEC | EM18G40G | 060872 | 18GHz~40GHz | Sep. 06, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Sep. 05, 2024 | Radiation (03CH16-HY) |
| Preamplifier | EMEC | EM18G40G | 060872 | 18GHz~40GHz | Nov. 29, 2024 | Dec. 11, 2024 | Nov. 28, 2025 | Radiation (03CH16-HY) |
| Filter | Wainwright | WLK4-1000-1530-8000-40SS | SN17 | 1.53GHz Low Pass Filter | Jan. 15, 2024 | Jul. 17, 2024~ Dec. 11, 2024 | Jan. 14, 2025 | Radiation (03CH16-HY) |
| Filter | Wainwright | WHKX12-2700-3000-18000-60ST | SN3 | 3GHz High Pass Filter | Jun. 28, 2024 | Jul. 17, 2024~ Dec. 11, 2024 | Jun. 27, 2025 | Radiation (03CH16-HY) |

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| Filter | Wainwright | WHKX8-5872.5-6750-18000-40ST | SN27 | 6.75GHz High Pass Filter | Nov. 13, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Nov. 12, 2024 | Radiation (03CH16-HY) |
| Filter | Wainwright | WHKX8-5872.5-6750-18000-40ST | SN27 | 6.75GHz High Pass Filter | Nov. 12, 2024 | Dec. 11, 2024 | Nov. 11, 2025 | Radiation (03CH16-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 803951/2 | 9K~30M | Mar. 06, 2024 | Jul. 17, 2024~ Dec. 11, 2024 | Mar. 05, 2025 | Radiation (03CH16-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102/SUCOFLEX 104 | EC-A5-300-5757,805935/4,802434/4 | 30MHz~18GHz | Aug. 08, 2023 | Jul. 17, 2024~ Jul. 20, 2024 | Aug. 07, 2024 | Radiation (03CH16-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102/SUCOFLEX 104 | EC-A5-300-5757,805935/4,802434/4 | 30MHz~18GHz | Aug. 07, 2024 | Dec. 11, 2024 | Aug. 06, 2025 | Radiation (03CH16-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 804011/2,804012/2 | 18-40GHz | Jan. 02, 2024 | Jul. 17, 2024~ Dec. 11, 2024 | Jan. 01, 2025 | Radiation (03CH16-HY) |
| Software | Audix | E3 230621 V9 | RK-002393 | N/A | N/A | Jul. 17, 2024~ Dec. 11, 2024 | N/A | Radiation (03CH16-HY) |
| Controller | ChainTek | 3000-1 | N/A | Control Turn table & Ant Mast | N/A | Jul. 17, 2024~ Dec. 11, 2024 | N/A | Radiation (03CH16-HY) |
| Antenna Mast | ChainTek | MBS-520-1 | N/A | 1m~4m | N/A | Jul. 17, 2024~ Dec. 11, 2024 | N/A | Radiation (03CH16-HY) |
| Turn Table | ChainTek | T-200-S-1 | N/A | 0~360 Degree | N/A | Jul. 17, 2024~ Dec. 11, 2024 | N/A | Radiation (03CH16-HY) |
| Hygrometer | TECPEL | DTM-303A | TP201996 | N/A | Nov. 07, 2023 | Jul. 02, 2024~ Jul. 23, 2024 | Nov. 06. 2024 | Conducted (TH05-HY) |
| Power Sensor | DARE | RPR3006W | 17I00015SNO035 (NO:109) | 10MHz~6GHz | Jan. 15, 2024 | Jul. 02, 2024~ Jul. 23, 2024 | Jan. 14, 2025 | Conducted (TH05-HY) |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101566 | 10Hz~40GHz | Aug. 23, 2023 | Jul. 02, 2024~ Jul. 23, 2024 | Aug. 22, 2024 | Conducted (TH05-HY) |
| Switch Control Mainframe | EM Electronics | EMSW18SE | SW191204 (BOX8) | N/A | Jan. 02, 2024 | Jul. 02, 2024~ Jul. 23, 2024 | Jan. 01, 2025 | Conducted (TH05-HY) |
| Software | Sporton | BTWIFI_Final_version:1.0(2024-04-11) | N/A | Conducted Items | N/A | Jul. 02, 2024~ Jul. 23, 2024 | N/A | Conducted (TH05-HY) |

# 5 Measurement Uncertainty

**Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **6.5 dB** |

**Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **4.9 dB** |

**Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **5.1 dB** |

# Appendix A. Test Result of Conducted Test Items

| Test Engineer: | Ju Chabg | Temperature: | 21~25 | °C |
|---|---|---|---|---|
| Test Date: | 2024/07/02~2024/07/23 | Relative Humidity: | 51~54 | % |

***TEST RESULTS DATA***
***Average Power Table***

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Average Conducted Power (dBm) | Conducted Power Limit (dBm) | DG (dBi) | EIRP Power (dBm) | EIRP Power Limit (dBm) | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|---|
| BLE GFSK | 2Mbps | 1 | 19 | 2440 | 0.60 | 30.00 | 2.89 | 3.49 | 36.00 | Pass |

***TEST RESULTS DATA***
***Peak Power Density***

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Peak PSD (dBm /100kHz) | Peak PSD (dBm /3kHz) | DG (dBi) | Peak PSD Limit (dBm /3kHz) | Pass/Fail |
|---|---|---|---|---|---|---|---|---|---|
| BLE GFSK | 2Mbps | 1 | 19 | 2440 | -0.12 | -15.40 | 2.89 | 8.00 | Pass |

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

# Appendix B. Radiated Spurious Emission Test Data

| | | | |
|---|---|---|---|
| **Test Engineer :** | Bill Chang, Gary Guo, and Steven Wu | **Temperature :** | 18.2 ~ 20.2 ℃ |
| | | **Relative Humidity :** | 54.2 ~ 56.1 % |

## Note symbol

| | |
|---|---|
| -L | **Low channel location** |
| -R | **High channel location** |

## B1. Radiated Spurious Emission Test Modes

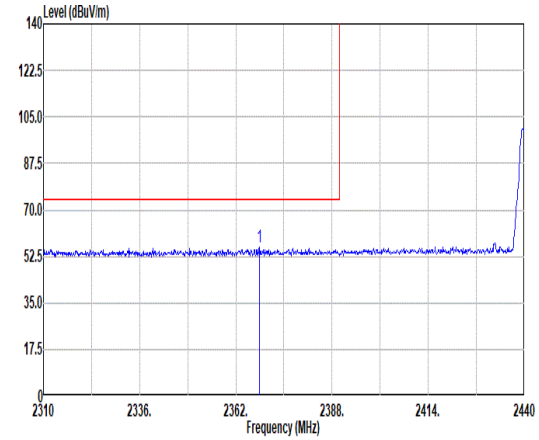
| Mode | Band (MHz) | Antenna | Modulation | Channel | Frequency | Data Rate | RU | Remark |
|---|---|---|---|---|---|---|---|---|
| Mode 2 | 2400-2483.5 | 1 | Bluetooth-LE_GSFK | 19 | 2440 | 2Mbps | - | - |
| Mode 6 | 2400-2483.5 | 1 | Bluetooth-LE_GSFK | 19 | 2440 | 2Mbps | - | LF |

## B2. Summary of each worse mode

| Mode | Modulation | Ch. | Freq. (MHz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Pol. | Peak Avg. | Result | RU | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Bluetooth-LE_GSFK | 19 | 2498.32 | 45.00 | 54.00 | -9.00 | V | Avg. | Pass | - | Band Edge |
| | Bluetooth-LE_GSFK | 19 | 7320.00 | 46.26 | 74.00 | -27.74 | H | Peak | Pass | - | Harmonic |
| 6 | Bluetooth-LE_GSFK | 19 | 839.95 | 42.96 | 46.00 | -3.04 | H | QP | Pass | - | LF |

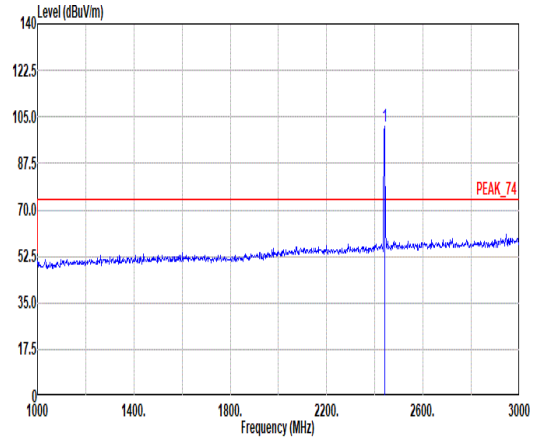
| Mode | 2 | |
|---|---|---|
| | Band Edge - L | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Horizontal | Fundamental |

**Peak**




Site : 03CH16-HY
Condition: PEAK_BE_74 3m 9120D-1522_240328 HORIZONTAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

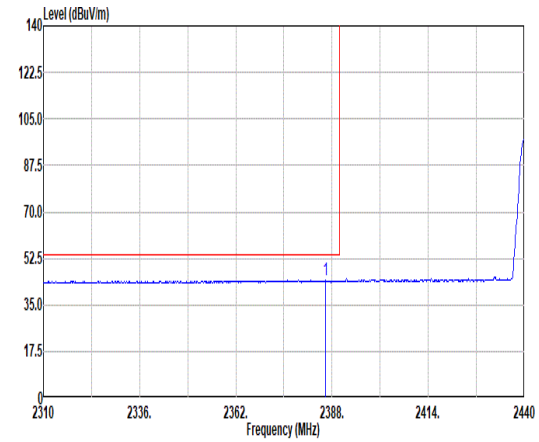
| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2368.37 | 55.89 | 74.00 | -18.11 | 41.04 | 27.20 | 7.65 | 29.92 | 9.92 | 192 | 14 | PEAK |




Site : 03CH16-HY
Condition: PEAK_74 3m 9120D-1522_240328 HORIZONTAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

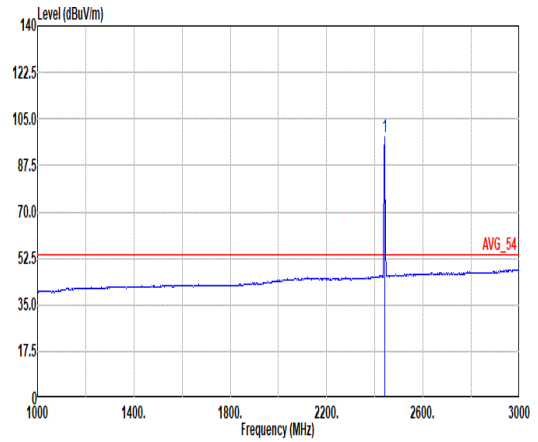
| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2440.00 | 101.26 | ------ | ------ | 85.96 | 27.60 | 7.68 | 29.90 | 9.92 | 192 | 14 | PEAK |

**Avg**



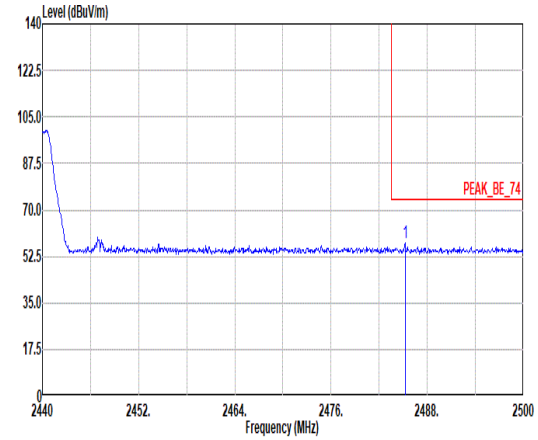
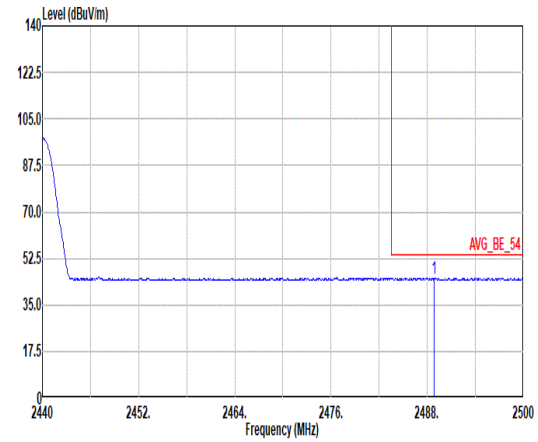

Site : 03CH16-HY
Condition: AVG_BE_54 3m 9120D-1522_240328 HORIZONTAL
: RBW:1000.000kHz VBW:1.000kHz SWT:Auto

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2386.18 | 44.26 | 54.00 | -9.74 | 29.30 | 27.26 | 7.69 | 29.91 | 9.92 | 192 | 14 | AVERAGE |



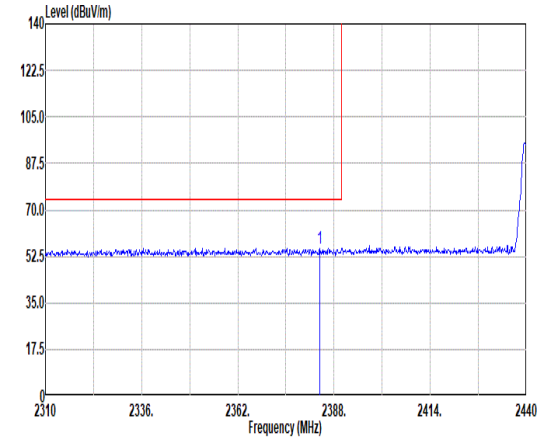

Site : 03CH16-HY
Condition: AVG_54 3m 9120D-1522_240328 HORIZONTAL
: RBW:1000.000kHz VBW:1.000kHz SWT:Auto

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2440.00 | 98.42 | ------ | ------ | 83.12 | 27.60 | 7.68 | 29.90 | 9.92 | 192 | 14 | AVERAGE |

| Mode | 2 | |
|---|---|---|
| | Band Edge - R | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Horizontal | Fundamental |
| Peak |  <br>Site : 03CH16-HY<br>Condition: PEAK_BE_74 3m 9120D-1522_240328 HORIZONTAL<br>: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br><br>Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark<br>MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg<br>1 2485.24 57.55 74.00 -16.45 42.17 27.70 7.64 29.88 9.92 192 14 PEAK | Blank |
| Avg |  <br>Site : 03CH16-HY<br>Condition: AVG_BE_54 3m 9120D-1522_240328 HORIZONTAL<br>: RBW:1000.000kHz VBW:1.000kHz SWT:Auto<br><br>Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark<br>MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg<br>1 2488.90 44.99 54.00 -9.01 29.61 27.70 7.64 29.88 9.92 192 14 AVERAGE | Blank |

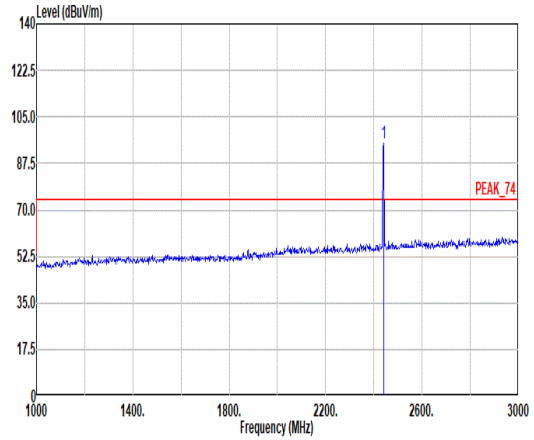
| Mode | 2 | |
|---|---|---|
| | Band Edge - L | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Vertical | Fundamental |

**Peak**




Site : 03CH16-HY
Condition: PEAK_BE_74 3m 9120D-1522_240328 VERTICAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

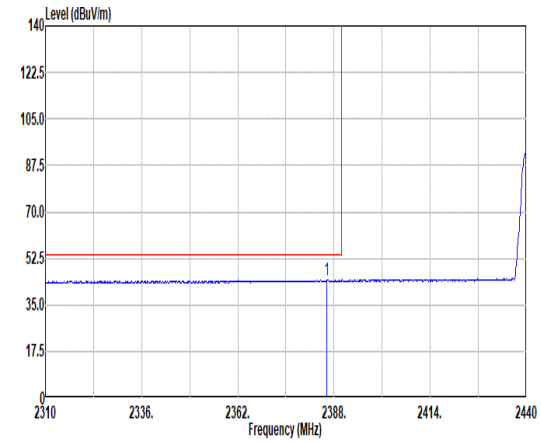
| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2384.10 | 55.55 | 74.00 | -18.45 | 40.62 | 27.24 | 7.68 | 29.91 | 9.92 | 105 | 197 | PEAK |




Site : 03CH16-HY
Condition: PEAK_74 3m 9120D-1522_240328 VERTICAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

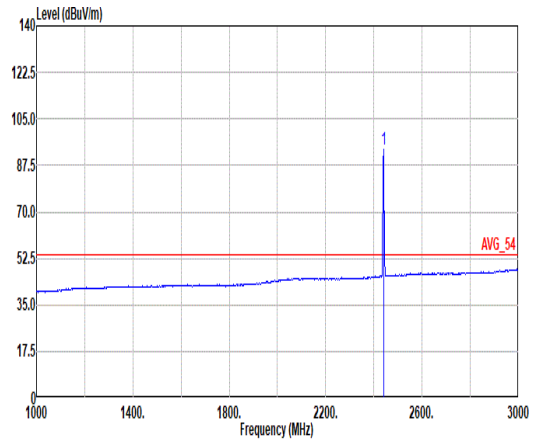
| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2440.00 | 95.27 | ------ | ------ | 79.97 | 27.60 | 7.68 | 29.90 | 9.92 | 105 | 197 | PEAK |

**Avg**



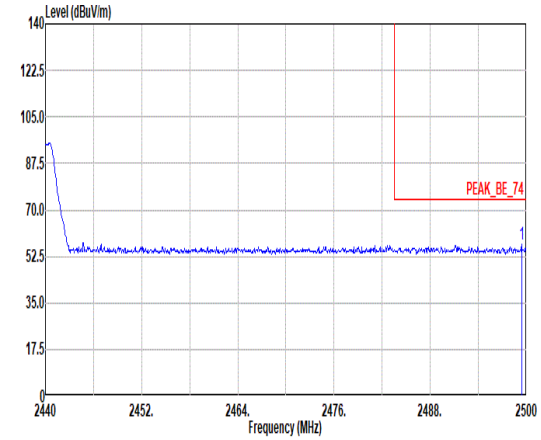
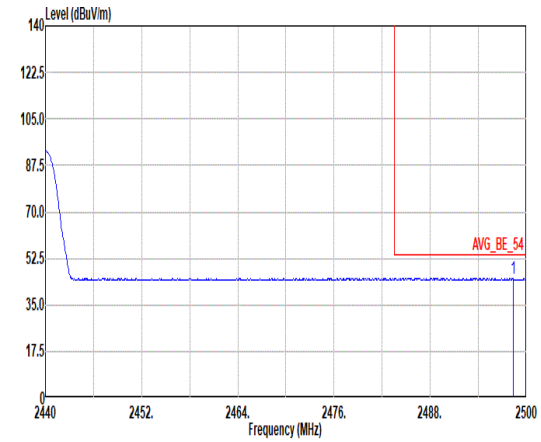

Site : 03CH16-HY
Condition: AVG_BE_54 3m 9120D-1522_240328 VERTICAL
: RBW:1000.000kHz VBW:1.000kHz SWT:Auto

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2386.05 | 44.28 | 54.00 | -9.72 | 29.32 | 27.26 | 7.69 | 29.91 | 9.92 | 105 | 197 | AVERAGE |




Site : 03CH16-HY
Condition: AVG_54 3m 9120D-1522_240328 VERTICAL
: RBW:1000.000kHz VBW:1.000kHz SWT:Auto

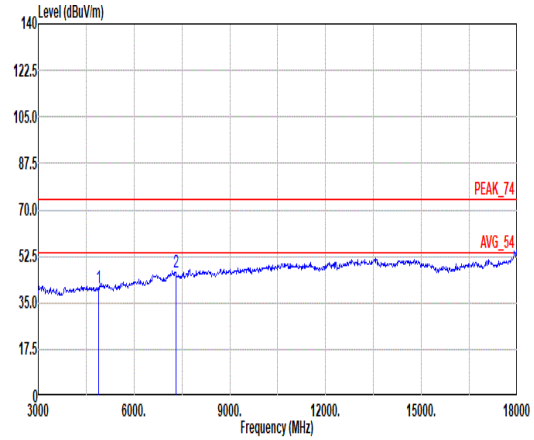
| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 2440.00 | 93.68 | ------ | ------ | 78.38 | 27.60 | 7.68 | 29.90 | 9.92 | 105 | 197 | AVERAGE |

| Mode | 2 | |
|---|---|---|
| | Band Edge - R | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Vertical | Fundamental |
| Peak |  <br>Site : 03CH16-HY<br>Condition: PEAK_BE_74 3m 9120D-1522_240328 VERTICAL<br>: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto<br><br>Freq / Level / Limit Line / Margin / Read Level / Ant Factor / Cable Loss / Preamp Factor / Aux Factor / APos / TPos / Remark<br>MHz / dBuV/m / dBuV/m / dB / dBuV / dB/m / dB / dB / dB / cm / deg<br>1 2499.40 56.83 74.00 -17.17 41.46 27.70 7.63 29.88 9.92 105 197 PEAK | Blank |
| Avg |  <br>Site : 03CH16-HY<br>Condition: AVG_BE_54 3m 9120D-1522_240328 VERTICAL<br>: RBW:1000.000kHz VBW:1.000kHz SWT:Auto<br><br>Freq / Level / Limit Line / Margin / Read Level / Ant Factor / Cable Loss / Preamp Factor / Aux Factor / APos / TPos / Remark<br>MHz / dBuV/m / dBuV/m / dB / dBuV / dB/m / dB / dB / dB / cm / deg<br>1 2498.32 45.00 54.00 -9.00 29.63 27.70 7.63 29.88 9.92 105 197 AVERAGE | Blank |

| Mode | 2 | |
|---|---|---|
| | Harmonic | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Horizontal | Vertical |

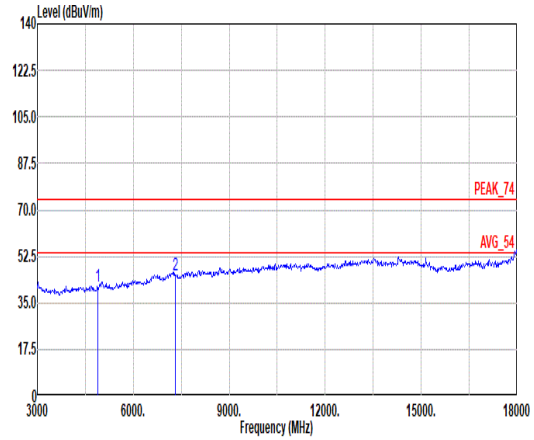
**Peak**

**Avg**



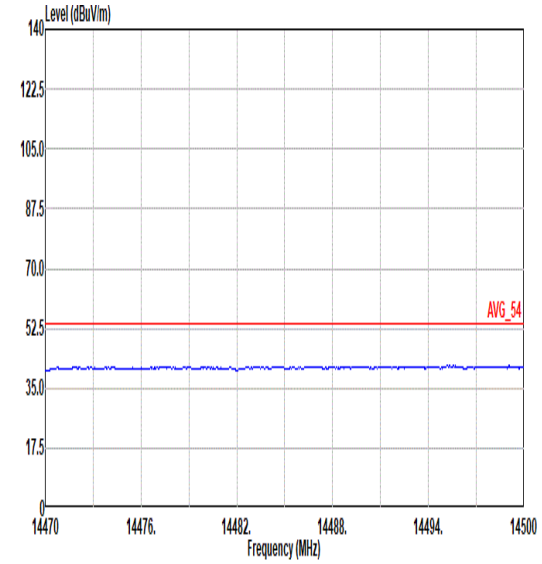
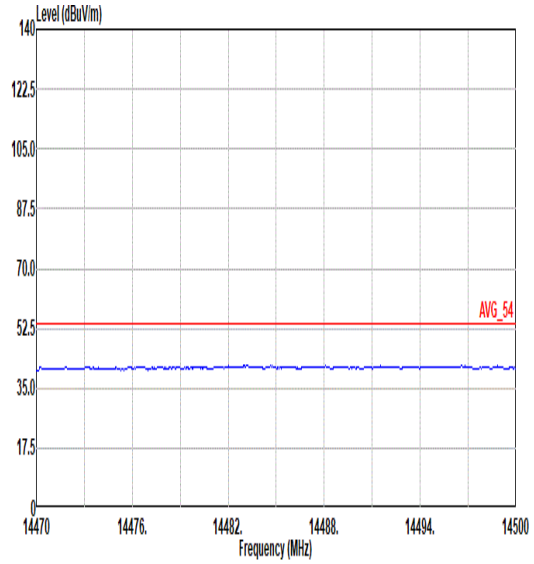
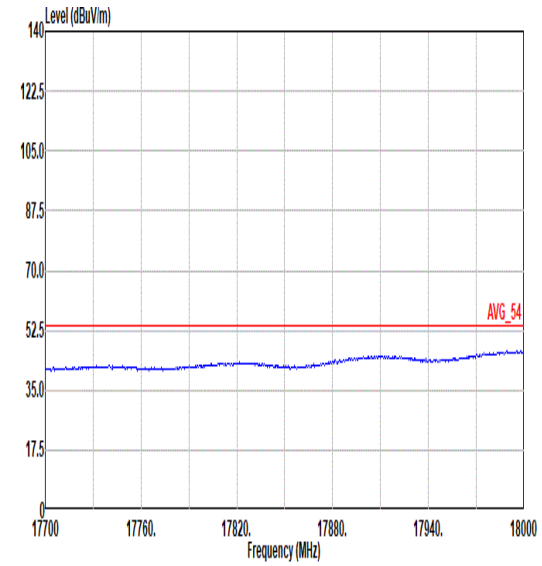
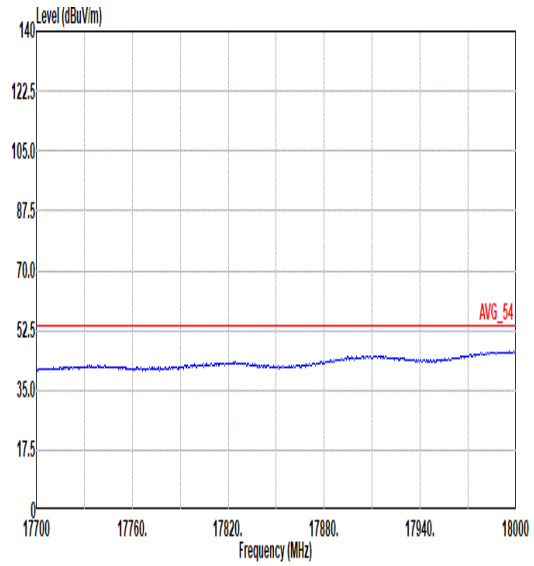

Site : 03CH16-HY
Condition: PEAK_74 3m 9120D-1522_240328 HORIZONTAL

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 4880.00 | 40.93 | 74.00 | -33.07 | 63.01 | 32.62 | 10.88 | 66.02 | 0.44 | -- | -- | PEAK |
| 2 | 7320.00 | 46.26 | 74.00 | -27.74 | 61.14 | 36.78 | 13.36 | 65.46 | 0.44 | -- | -- | PEAK |



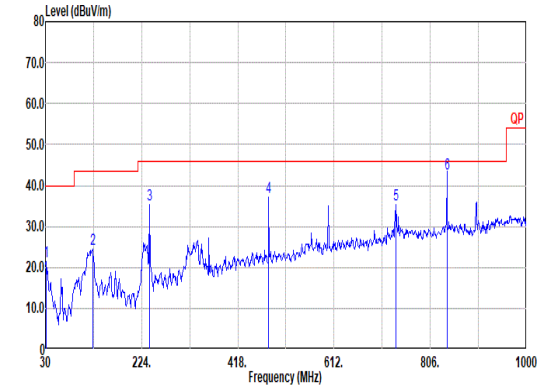

Site : 03CH16-HY
Condition: PEAK_74 3m 9120D-1522_240328 VERTICAL

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 4880.00 | 41.31 | 74.00 | -32.69 | 63.39 | 32.62 | 10.88 | 66.02 | 0.44 | -- | -- | PEAK |
| 2 | 7320.00 | 45.39 | 74.00 | -28.61 | 60.27 | 36.78 | 13.36 | 65.46 | 0.44 | -- | -- | PEAK |

| Mode | 2 | |
|---|---|---|
| | Harmonic | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Horizontal | Vertical |
| 14.47G ~14.5G Avg |  <br>Site : 03CH16-HY<br>Condition: AVG_54 3m 9120D-1522_240328 HORIZONTAL |  <br>Site : 03CH16-HY<br>Condition: AVG_54 3m 9120D-1522_240328 VERTICAL |
| 17.7G ~18G Avg |  <br>Site : 03CH16-HY<br>Condition: AVG_54 3m 9120D-1522_240328 HORIZONTAL |  <br>Site : 03CH16-HY<br>Condition: AVG_54 3m 9120D-1522_240328 VERTICAL |

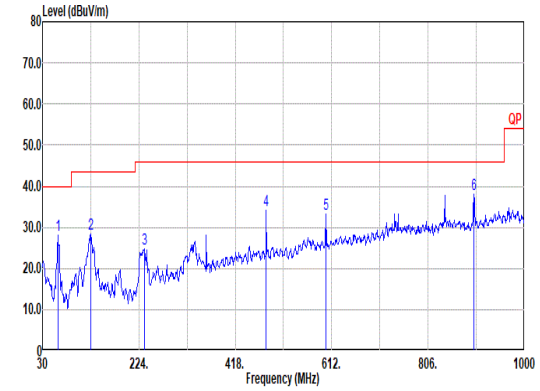
| Mode | 6 | |
|---|---|---|
| | LF | |
| | 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz | |
| ANT | 1 | |
| Pol. | Horizontal | Vertical |

QP/ Peak




Site : 03CH16-HY
Condition: QP 3m CBL6111D&00802N1D01N-06 _47020 & 06_241005 HORIZONTAL

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 30.97 | 21.32 | 40.00 | -18.68 | 28.73 | 24.25 | 0.90 | 32.61 | 0.05 | -- | -- | Peak |
| 2 | 125.06 | 24.39 | 43.50 | -19.11 | 37.25 | 17.61 | 1.74 | 32.30 | 0.09 | -- | -- | Peak |
| 3 | 240.49 | 35.22 | 46.00 | -10.78 | 47.70 | 17.53 | 2.40 | 32.45 | 0.04 | -- | -- | Peak |
| 4 | 480.08 | 37.18 | 46.00 | -8.82 | 42.99 | 23.41 | 3.40 | 32.74 | 0.12 | -- | -- | Peak |
| 5 | 737.13 | 35.26 | 46.00 | -10.74 | 34.76 | 28.19 | 4.22 | 32.10 | 0.19 | -- | -- | Peak |
| 6 | 839.95 | 42.96 | 46.00 | -3.04 | 41.15 | 29.26 | 4.52 | 32.19 | 0.22 | 100 | 140 | QP |




Site : 03CH16-HY
Condition: QP 3m CBL6111D&00802N1D01N-06 _47020 & 06_241005 VERTICAL

| | Freq | Level | Limit Line | Margin | Read Level | Ant Factor | Cable Loss | Preamp Factor | Aux Factor | APos | TPos | Remark |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB/m | dB | dB | dB | cm | deg | |
| 1 | 61.04 | 28.22 | 40.00 | -11.78 | 47.21 | 12.01 | 1.22 | 32.28 | 0.06 | -- | -- | Peak |
| 2 | 127.00 | 28.28 | 43.50 | -15.22 | 41.30 | 17.48 | 1.75 | 32.33 | 0.08 | -- | -- | Peak |
| 3 | 234.67 | 24.87 | 46.00 | -21.13 | 38.10 | 16.84 | 2.37 | 32.48 | 0.04 | -- | -- | Peak |
| 4 | 480.08 | 34.24 | 46.00 | -11.76 | 40.05 | 23.41 | 3.40 | 32.74 | 0.12 | -- | -- | Peak |
| 5 | 600.36 | 33.36 | 46.00 | -12.64 | 36.55 | 25.72 | 3.82 | 32.89 | 0.16 | -- | -- | Peak |
| 6 | 898.15 | 38.04 | 46.00 | -7.96 | 36.26 | 29.19 | 4.67 | 32.27 | 0.19 | -- | -- | Peak |

# Appendix C. Duty Cycle Plots

| Band | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting |
|---|---|---|---|---|
| Bluetooth - LE for 2Mbps | 43.00 | 1075 | 0.93 | 1kHz |

**Bluetooth - LE for 2Mbps**