

# RF TEST REPORT

## LP0002:2020

APPLICANT

台灣愛力根藥品股份有限公司

BRAND NAME

ZELTIQ Aesthetics Inc

MODEL NAME

CS-CB-BLU-01-00

REPORT NUMBER

HA210315-MCG-002-R01

# TEST REPORT

**Date of Issue**  
September 13, 2021

**Test Site**  
Hyundai C-Tech, Inc. dba HCT America, Inc.  
1726 Ringwood Ave, San Jose, CA 95131, USA

|                                 |                                         |
|---------------------------------|-----------------------------------------|
| <b>Applicant</b>                | 台灣愛力根藥品股份有限公司                           |
| <b>Applicant Address</b>        | 臺北市中正區羅斯福路2段102號9樓                      |
| <b>Manufacturer</b>             | ZELTIQ Aesthetics Inc                   |
| <b>Product Name</b>             | Patient Call Button                     |
| <b>Brand Name</b>               | ZELTIQ Aesthetics Inc                   |
| <b>Model Name</b>               | CS-CB-BLU-01-00                         |
| <b>RF Specification</b>         | Bluetooth V5.0 LE                       |
| <b>Modulation Type</b>          | GFSK                                    |
| <b>Equipment Classification</b> | Digital Transmission System (DTS)       |
| <b>NCC Rule Part(s)</b>         | LP0002:2020                             |
| <b>Test Procedure</b>           | ANSI C63.10-2013, KDB 558074 D01 v05r02 |

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures required. The results of testing in this report apply only to the product which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

**Tested By**



Yongsoo Park

Test Engineer

**Reviewed By**



Sunwoo Kim

Technical Manager

## REVISION HISTORY

*The revision history for this document is shown in table.*

| TEST REPORT NO.      | DATE       | DESCRIPTION                                                                                             |
|----------------------|------------|---------------------------------------------------------------------------------------------------------|
| HA210315-MCG-002-R01 | 07/20/2021 | Initial Issue                                                                                           |
| HA210315-MCG-002-R01 | 09/13/2021 | 1. Corrected the antenna model name and manufacturer<br>2. Added the receiver spurious emission results |
|                      |            |                                                                                                         |

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## 1. GENERAL INFORMATION

### EUT DESCRIPTION

|                              |                            |
|------------------------------|----------------------------|
| <b>Model</b>                 | CS-CB-BLU-01-00            |
| <b>EUT Type</b>              | Patient Call Button        |
| <b>Power Supply</b>          | 3 VDC                      |
| <b>RF Specification</b>      | Bluetooth V5.0 LE (1 Mbps) |
| <b>Transmitter Chain</b>     | 1                          |
| <b>Operating Environment</b> | Indoor and outdoor         |
| <b>Operating Temperature</b> | -20 °C ~ 50 °C             |

### RF SPECIFICATION SUBJECT TO THE REPORT

|                                            |                                                                                                                      |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>RF Specification</b>                    | Bluetooth V5.0 LE (1 Mbps)                                                                                           |
| <b>Frequency Range</b>                     | 2402 MHz - 2480 MHz                                                                                                  |
| <b>Max. RF Output Power</b>                | Peak : 6.853 dBm (4.845 mW)                                                                                          |
| <b>Modulation Type</b>                     | GFSK                                                                                                                 |
| <b>Number of Channels</b>                  | 40 channels                                                                                                          |
| <b>Antenna Specification <sup>1)</sup></b> | Antenna Type : PCB Trace<br>Antenna Model : ZTQ1<br>Manufactured by ZELTIQ Aesthetics Inc<br>Peak Gain Max. -0.1 dBi |
| <b>Firmware Version <sup>2)</sup></b>      | 3.0                                                                                                                  |
| <b>Hardware Version <sup>2)</sup></b>      | 2                                                                                                                    |
| <b>Date(s) of Tests</b>                    | March 15, 2021 ~ March 18, 2021 and September 10, 2021                                                               |

#### Note :

1. Antenna information is based on the document provided.
2. Firmware and Hardware Versions are provided by the client.

## OPERATING FREQUENCY CHANNELS

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

## 2. METHODOLOGY

FCC KDB 558074 D01 DTS Measurement Guidance v05r02 dated April 2nd, 2019 entitled “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) and the measurement procedure described in ANSI C63.10( Version : 2013) ‘the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices’.

### EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 3.3, 3.6 and 4.10.1 under LP0002:2020.

## GENERAL TEST PROCEDURES

### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.2 of ANSI C63.10. (Version :2013) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz. Above 1GHz with 1.5m using absorbers between the EUT and receive antenna. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. Also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 8 of ANSI C63.10. (Version: 2013)

### Conducted Antenna Terminal

KDB 558074 D01 v05r02

## DESCRIPTION OF TEST MODES

The EUT is equipped with Bluetooth V5.0 LE. The frequency channel on the device was set to continuous TX / RX modes using the test firmware provided by the manufacturer during test on the terminal application, Teraterm application.

## 3. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment's, which is traceable to recognized national standards. Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2017).

## 4. FACILITIES AND ACCREDITATIONS

### FACILITIES

The SAC (Semi-Anechoic Chamber) and conducted measurement facility used to collect the radiated data are located at 1726 Ringwood Avenue, San Jose, California 95131, USA. (LAB CODE : US0198)

The site is constructed in conformance with the requirements of ANSI C63.4. (Version :2014) and CISPR Publication 22.



### EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 5. ANTENNA REQUIREMENTS

### According to Section 3.2, LP0002:2020:

Low-power radio frequency transmitter or transceiver (receiver) shall utilize a permanently, half- permanently attached antenna or uses a unique coupling at the antenna and at any cable connector between the transmitter and the antenna. The antenna shall be omni-directional type. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector or other than authorized is prohibited. Such standard connectors are for example: BNC, F type, N type, M type, UG type, RCA, SMA, SMB, and other standard type antenna connectors.

## 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

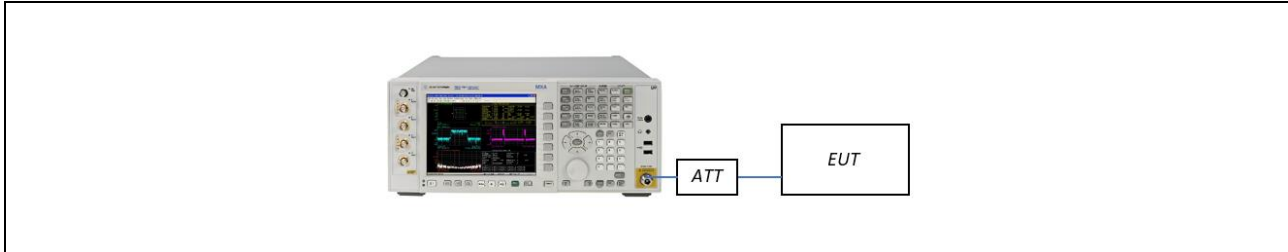
All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the  $U_{CISPR}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Parameter                                | Expanded Uncertainty ( $\pm$ dB) |
|------------------------------------------|----------------------------------|
| Conducted Disturbance (150 kHz ~ 30 MHz) | 2.55                             |
| Radiated Disturbance (9 kHz ~ 30 MHz)    | 3.20                             |
| Radiated Disturbance (30 MHz ~ 1 GHz)    | 4.73                             |
| Radiated Disturbance (1 GHz ~ 18 GHz)    | 5.21                             |
| Radiated Disturbance (18 GHz ~ 40 GHz)   | 5.18                             |

## 7. DESCRIPTION OF TESTS

### 7.1. DUTY CYCLE

#### TEST SETUP



#### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

We tested according to the zero-span measurement method, 6 (b) in KDB 558074 D01 v05r02.

The largest available value of RBW is 8 MHz and VBW is 50 MHz.

The zero-span method of measuring duty cycle shall not be used if  $T \leq 6.25$  microseconds. ( $50/6.25 = 8$ )

The zero-span method was used because all measured T data are  $> 6.25$  microseconds and both RBW and VBW are  $> 50/T$ .

- RBW = 8 MHz (the largest available value)
- VBW = 8 MHz ( $\geq$  RBW)
- SPAN = 0 Hz
- Detector = Peak
- Number of points in sweep  $> 100$
- Trace mode = Clear write
- Measure  $T_{total}$  and  $T_{on}$
- Calculate Duty Cycle =  $T_{on} / T_{total}$  and Duty Cycle Factor =  $10 * \log(1/\text{Duty Cycle})$

#### Note :

The duty cycle was not measured since the EUT transmits with 100% DC.

## 7.2. 6 dB BANDWIDTH

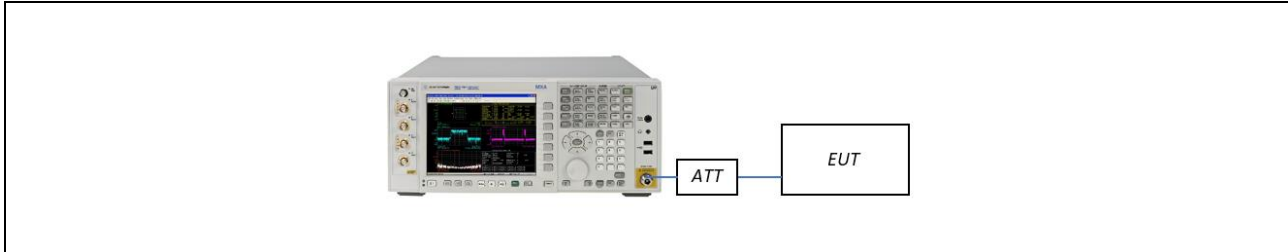
### LIMIT

Test Requirements and limit : Section 4.10.1.6 (2) (A), LP0002:2020

The bandwidth at 6 dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

The minimum permissible 6 dB bandwidth is 500 kHz.

### TEST SETUP



### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

The Spectrum Analyzer is set to (Section 8.2 in KDB 558074 D01 v05r02, Subclause 11.8 in ANSI 63.10-2013)

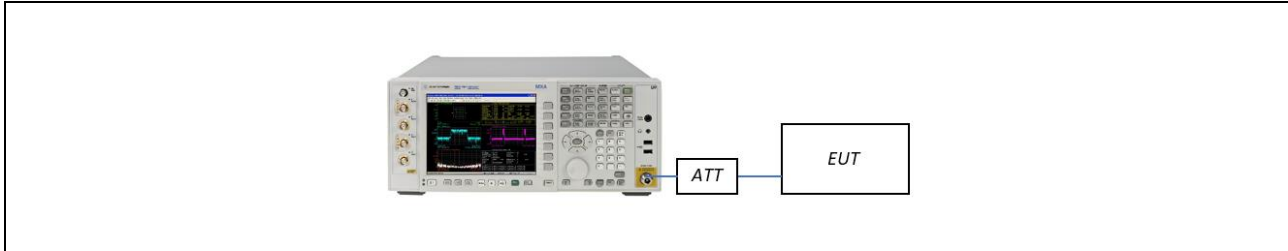
- RBW = 100 kHz
- VBW  $\geq 3 \times$  RBW
- Detector = Peak
- Trace mode = max hold
- Sweep = auto couple
- Allow the trace to stabilize
- X dB bandwidth measurement function built-in the spectrum analyzer was used to measure 6 dB bandwidth.

### 7.3. OUTPUT POWER

#### LIMIT

Test Requirements and limit : Section 4.10.1.2 (1) (C), LP0002:2020  
The maximum permissible conducted output power is 1 W.

#### TEST SETUP



#### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.  
TX condition of the EUT is the actual operating mode by BT LE test program.  
The Spectrum Analyzer is set to

Peak Power (Section 8.3.1.1 in KDB 558074 D01 v05r02, Subclause 11.9.1.1 in ANSI 63.10-2013)

- $RBW \geq DTS \text{ Bandwidth}$
- $VBW \geq 3 \times RBW$
- $SPAN \geq 3 \times RBW$
- Detector Mode = Peak
- Sweep = auto couple
- Trace Mode = max hold
- Allow trace to fully stabilize.
- Use peak marker function to determine the peak amplitude level

Average Power (Section 8.3.2.2 in KDB 558074 D01 v05r02, Subclause 11.9.2.2 in ANSI 63.10-2013)

- We use the spectrum analyzer's integrated band power measurement function.
- Measure the duty cycle.
- Set span to at least 1.5 times the OBW.
- $RBW = 1\text{-}5\%$  of the OBW, not to exceed 1 MHz
- $VBW \geq 3 \times RBW$
- Number of points in sweep  $\geq 2 \times \text{span} / RBW$ . (This gives bin-to-bin spacing  $\leq RBW/2$ , so that narrowband signals are not lost between frequency bins.)
- Sweep time = auto.
- Detector = RMS (i.e., power averaging)
- Do not use sweep triggering. Allow the sweep to "free run".
- Trace average at least 100 traces in power averaging (RMS) mode.
- Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

#### Sample Calculation

- Conducted Output Power (Peak) = Reading Value + ATT loss + Cable loss
- Conducted Output Power (Average) = Reading Value + ATT loss + Cable loss + Duty Cycle Factor

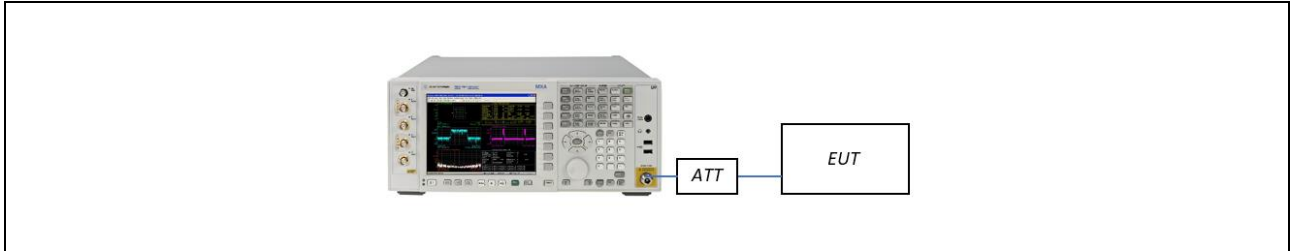
## 7.4. POWER SPECTRAL DENSITY

### LIMIT

Test Requirements and limit : Section 4.10.1.6 (2) (B), LP0002:2020

The transmitter power density average over 1-second interval shall not be greater than 8dBm in any 3kHz BW.

### TEST SETUP



### TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer.

We tested according to Procedure 8.4 in KDB 558074 D01 v05r02, Procedure 11.10 in ANSI 63.10-2013.

The spectrum analyzer is set to :

- Set analyzer center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- $RBW = 3 \text{ kHz} \leq RBW \leq 100 \text{ kHz}$ .
- $VBW \geq 3 \times RBW$ .
- Sweep = auto couple
- Detector = power averaging (rms) or sample detector (when rms not available).
- Ensure that the number of measurement points in the sweep  $\geq [2 \times \text{span} / RBW]$ .
- Employ trace averaging (rms) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- Use the peak marker function to determine the maximum amplitude level within the RBW. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
- if then duty factor shall be added to adjust the result if the duty cycle is less than 98%

## 7.5. CONDUCTED BAND EDGE (OUT OF BAND EMISSIONS) / CONDUCTED SPURIOUS EMISSIONS

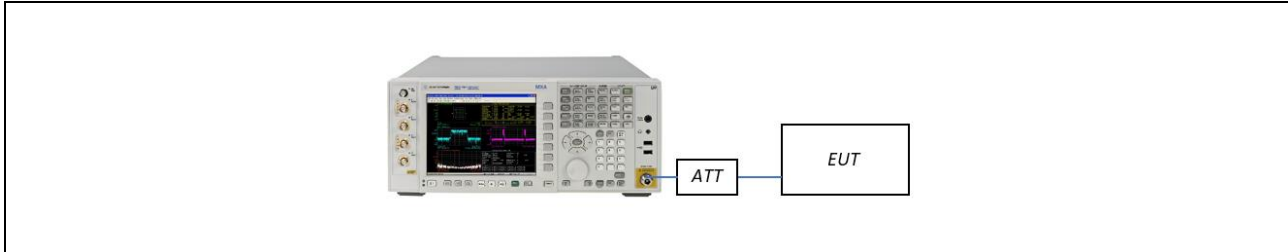
### LIMIT

Test Requirements and limit : Section 4.10.1.5 (1), LP0002:2020

The maximum conducted (peak) output power was used to demonstrate compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

[ Conducted > 20 dBc ]

### TEST SETUP



### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer.

(Procedure 8.5 in KDB 558074 D01 v05r02, Procedure 11.11 in ANSI 63.10-2013)

- RBW = 100 kHz
- VBW  $\geq 3 \times$  RBW
- Set span to encompass the spectrum to be examined
- Detector = Peak
- Trace Mode = max hold
- Sweep time = auto couple
- Ensure that the number of measurement points  $\geq 2 \times \text{Span} / \text{RBW}$
- Allow trace to fully stabilize.
- Use peak marker function to determine the maximum amplitude level.

Measurements are made over the 30 MHz to 25 GHz range with the transmitter set to the lowest, middle, and highest channels.

## 7.6. RADIATED EMISSIONS

### RADIATED EMISSION LIMIT

Section 4.10.1.5, LP0002:2020

### RESTRICTED BANDS OF OPERATION

The frequency band listed below and shall meet the field strength requirement in section 3.6, LP0002:2020

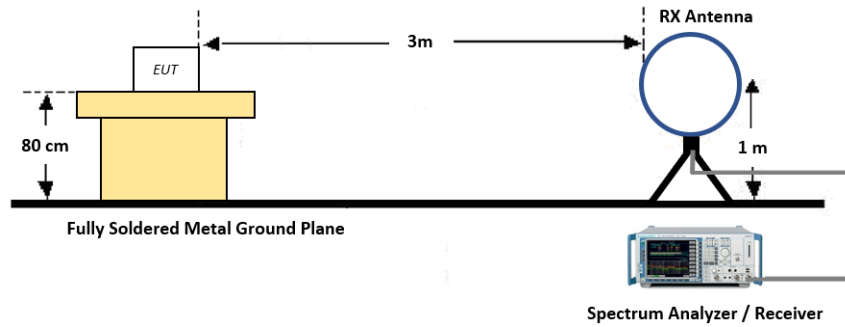
| Section 3.5, LP0002:2020 |                 |                 |
|--------------------------|-----------------|-----------------|
| Frequency (MHz)          | Frequency (MHz) | Frequency (MHz) |
| 0.090 – 0.110            | 322.00 – 335.40 | 3500.0 – 4400.0 |
| 0.490 – 0.510            | 399.90 – 410.00 | 4500.0 – 5250.0 |
| 2.172 – 2.198            | 485.00 – 510.00 | 5350.0 – 5460.0 |
| 3.013 – 3.033            | 608.00 – 614.00 | 7250.0 – 7750.0 |
| 4.115 – 4.198            | 703.00 – 748.00 | 8025.0 – 8500.0 |
| 5.670 – 5.690            | 758.00 – 803.00 | 9000.0 – 9200.0 |
| 6.200 – 6.300            | 825.00 – 915.00 | 9300.0 – 9500.0 |
| 8.230 – 8.400            | 930.00 – 1240.0 | 10600 – 12700   |
| 12.265 – 12.600          | 1300.0 – 1427.0 | 13250 – 13400   |
| 13.340 – 13.430          | 1435.0 – 1626.5 | 14470 – 14500   |
| 14.965 – 15.020          | 1660.0 – 1785.0 | 15350 – 16200   |
| 16.700 – 16.755          | 1805.0 – 1880.0 | 17700 – 21400   |
| 19.965 – 20.020          | 1885.0 – 1900.0 | 22010 – 23120   |
| 25.500 – 25.700          | 1905.0 – 1985.0 | 23600 – 24000   |
| 37.475 – 38.275          | 2010.0 – 2025.0 | 31200 – 31800   |
| 73.500 – 75.400          | 2110.0 – 2170.0 | 36430 – 36500   |
| 108.00 – 138.00          | 2200.0 – 2300.0 | Above 38600     |
| 149.90 – 150.05          | 2310.0 – 2390.0 |                 |
| 156.70 – 156.90          | 2483.5 – 2900.0 |                 |
| 162.01 – 167.17          | 3260.0 – 3267.0 |                 |
| 167.72 – 173.20          | 3332.0 – 3339.0 |                 |
| 240.00 – 285.00          | 3345.8 – 3358.0 |                 |

### FIELD STRENGTH LIMIT

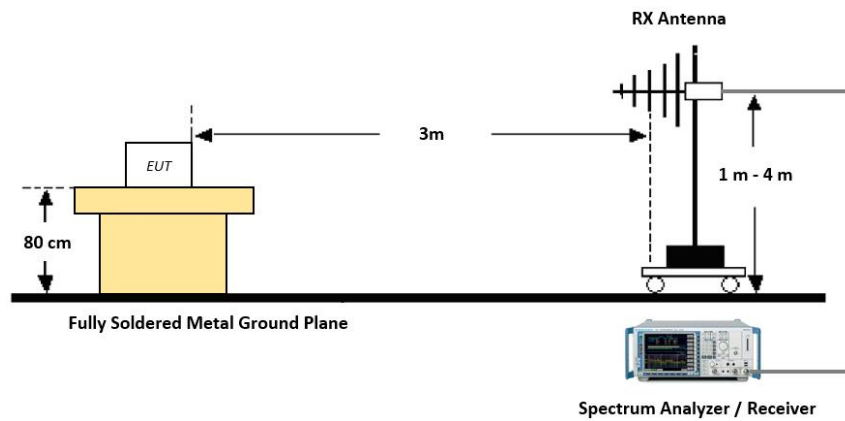
| Section 3.6, LP0002:2020  |                       |                          |
|---------------------------|-----------------------|--------------------------|
| Frequency (MHz)           | Field Strength (uV/m) | Measurement Distance (m) |
| $0.009 \leq f \leq 0.490$ | $2400/F(\text{kHz})$  | 300                      |
| $0.490 < f \leq 1.705$    | $24000/F(\text{kHz})$ | 30                       |
| $1.705 < f < 30$          | 30                    | 30                       |
| $30 \leq f \leq 88$       | 100                   | 3                        |
| $88 < f \leq 216$         | 150                   | 3                        |
| $216 < f \leq 960$        | 200                   | 3                        |
| $960 < f$                 | 500                   | 3                        |

## TEST SETUP

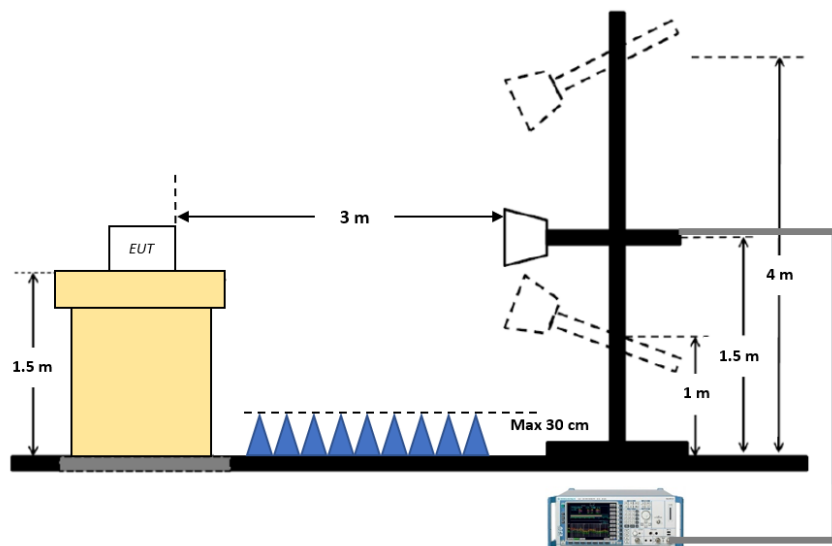
### Below 30 MHz



### 30 MHz - 1 GHz



### Above 1 GHz



#### TEST PROCEDURE OF RADIATED SPURIOUS EMISSION (BELOW 30 MHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The loop antenna was placed at a location 3m from the EUT
3. The EUT is placed on a turntable, which is 0.8m above ground plane.
4. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
5. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
6. Distance Correction Factor (0.009 MHz – 0.490 MHz) =  $40 \cdot \log(3 \text{ m}/300 \text{ m}) = -80 \text{ dB}$   
Measurement Distance: 3 m
7. Distance Correction Factor (0.490 MHz – 30 MHz) =  $40 \cdot \log(3 \text{ m}/30 \text{ m}) = -40 \text{ dB}$   
Measurement Distance: 3 m
8. Spectrum Setting
  - Frequency Range = 9 kHz ~ 30 MHz
  - Detector = Peak
  - Trace = Max hold
  - RBW = 9 kHz
  - VBW  $\geq 3 \cdot \text{RBW}$
9. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)
10. There is a comparison data both open-field test site and alternative test site – semi-Anechoic chamber according to 414788 D01. And the results are properly calibrated.

#### TEST PROCEDURE OF RADIATED SPURIOUS EMISSION (30 MHz – 1 GHz)

1. The EUT was placed on a non-conductive table located on semi-anechoic chamber.
2. The EUT is placed on a turntable, which is 0.8 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. Spectrum Setting
  - (1) Measurement Type (Peak):
    - Measured Frequency Range: 30 MHz – 1 GHz
    - Detector = Peak
    - Trace = Max hold
    - RBW = 100 kHz
    - VBW  $\geq 3 \cdot \text{RBW}$
  - (2) Measurement Type(Quasi-peak):
    - Measured Frequency Range: 30 MHz – 1 GHz
    - Detector = Quasi-Peak
    - RBW = 120 kHz
6. Total = Reading Value + Antenna Factor (A.F) + Cable Loss (C.L)

## TEST PROCEDURE OF RADIATED SPURIOUS EMISSION (ABOVE 1 GHz)

1. The EUT is placed on a turntable, which is 1.5 m above ground plane.
2. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

### (1) Measurement Type(Peak):

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW

### (2) Measurement Type(Average): Duty cycle $\geq 98\%$

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

### (3) Measurement Type(Average): Duty cycle $< 98\%$ , duty cycle variations are less than $\pm 2\%$

- Measured Frequency Range : 1 GHz – 25 GHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

10. Measurement value only up to 6 maximum emissions noted or would be lesser if no specific emissions from the EUT are recorded (*i.e.*: margin  $> 20$  dB from the applicable limit) and considered that is already beyond the background noise floor.

## 11. Sample Calculation

- (1) Total (Peak) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)
- (2) Total (Average, Duty  $\geq 98\%$ ) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)
- (3) Total (Average, Duty  $< 98\%$ ) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Duty Cycle Factor

## TEST PROCEDURE OF RADIATED RESTRICTED BAND EDGE

1. Radiated test is performed with hopping off (if there is any)
2. The EUT is placed on a turntable, which is 1.5 m above ground plane.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.
4. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
5. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. The unit was tested with its standard battery.
8. Spectrum Setting

### (1) Measurement Type(Peak):

- Detector = Peak
- Trace = Max hold
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW

### (2) Measurement Type(Average): Duty cycle $\geq 98\%$ ,

- Measured Frequency Range : 2310 MHz – 2390 MHz / 2483.5 MHz – 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).

### (3) Measurement Type(Average): Duty cycle $< 98\%$ , duty cycle variations are less than $\pm 2\%$

- Measured Frequency Range : 2310 MHz – 2390 MHz / 2483.5 MHz – 2500 MHz
- Detector = RMS
- Averaging type = power (*i.e.*, RMS)
- RBW = 1 MHz
- VBW  $\geq 3 \times$  RBW
- Sweep time = auto.
- Trace mode = average (at least 100 traces).
- Correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 % duty cycle.
- Duty Cycle Factor (dB) : Please refer to the please refer to section 9.1.

9. Measurement value only up to 6 maximum emissions noted or would be lesser if no specific emissions from the EUT are recorded (*i.e.*: margin  $> 20$  dB from the applicable limit) and considered that's already beyond the background noise floor.

## 10. Sample Calculation

- (1) Total (Peak) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L)
- (2) Total (Average, Duty  $\geq 98\%$ ) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G)
- (3) Total (Average, Duty  $< 98\%$ ) = Reading Value + Antenna Factor(A.F) + Cable Loss(C.L) - Amp Gain(G) + Duty Cycle Factor

## 7.7. AC POWER LINE CONDUCTED EMISSIONS

### LIMIT

Section 3.3, LP0002:2020

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN).

| Frequency Range (MHz) | Limits (dB $\mu$ V) |          |
|-----------------------|---------------------|----------|
|                       | Quasi-peak          | Average  |
| 0.15 - 0.50           | 66 - 56*            | 56 - 46* |
| 0.50 - 5              | 56                  | 46       |
| 5 - 30                | 60                  | 50       |

\*Decreases with the logarithm of the frequency.

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### TEST SETUP

See test photographs attached in Annex A for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors : Quasi Peak and Average Detector.

Sample Calculation :

Quasi-peak(Final Result) = Reading Value + Correction Factor

## 8. SUMMARY OF TEST RESULTS

| Test Description                    | NCC Rule Part Section(s)                | Test Limit           | Test Condition | Test Result       |
|-------------------------------------|-----------------------------------------|----------------------|----------------|-------------------|
| 6 dB Bandwidth                      | Section 4.10.1.6 (2) (A)<br>LP0002:2020 | $\geq 500$ kHz       | Conducted      | PASS              |
| Conducted Maximum Peak Output Power | Section 4.10.1.2 (1) (C)<br>LP0002:2020 | $\leq 1$ W           |                | PASS              |
| Power Spectral Density              | Section 4.10.1.6 (2) (B)<br>LP0002:2020 | $\leq 8$ dBm / 3 kHz |                | PASS              |
| Band Edge (Out of Band Emissions)   | Section 4.10.1.5 (1)<br>LP0002:2020     | $\geq 20$ dBc        |                | PASS              |
| AC Power line Conducted Emissions   | Section 3.3<br>LP0002:2020              | cf. Section 7.7      |                | N/A <sup>1)</sup> |
| Radiated Spurious Emissions         | Section 4.10.1.5<br>LP0002:2020         | cf. Section 7.6      | Radiated       | PASS              |
| Radiated Restricted Band Edge       | Section 4.10.1.5<br>LP0002:2020         | cf. Section 7.6      |                | PASS              |
| Receiver Spurious Emissions         | Section 3.9<br>LP0002:2020              | cf. Section 7.6      |                | PASS              |

**Note :**

1. AC line conducted emission is not applicable since the EUT is powered by internal battery.

## **WORST CASE CONFIGURATION**

### **RADIATED TEST**

1. EUT Axis

All X, Y, and Z positions for horizontal / vertical antenna polarization were investigated to find the worst-case position. The position Y was selected for the full evaluation.

### **CONDUCTED TEST**

1. All the RF tests in mode were performed at low, mid, and high channels.

### **OUTPUT POWER SETTING**

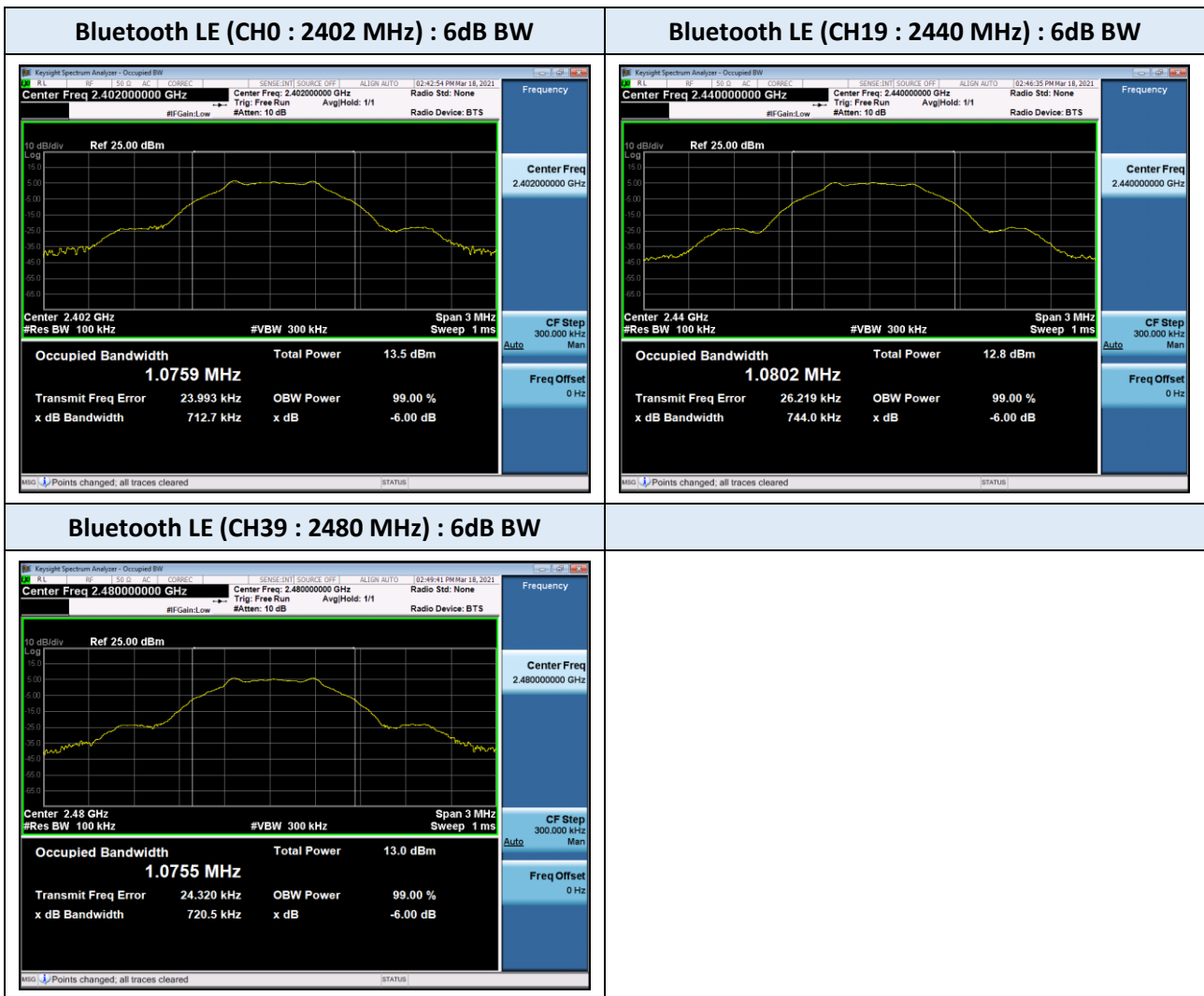
1. The output power was set to 8 dBm on all channels.
2. No duty factor was applied to the result since EUT transmits with 100 % duty (DC) during testing.

## 9. TEST RESULT

### 9.1. 6 dB BANDWIDTH

| Bluetooth LE    |         | 6 dB Bandwidth (kHz) |       |
|-----------------|---------|----------------------|-------|
| Frequency (MHz) | Channel | Result               | Limit |
| 2402            | 0       | 712.7                | ≥ 500 |
| 2440            | 19      | 744.0                |       |
| 2480            | 39      | 720.5                |       |

### TEST PLOTS



## 9.2. OUTPUT POWER

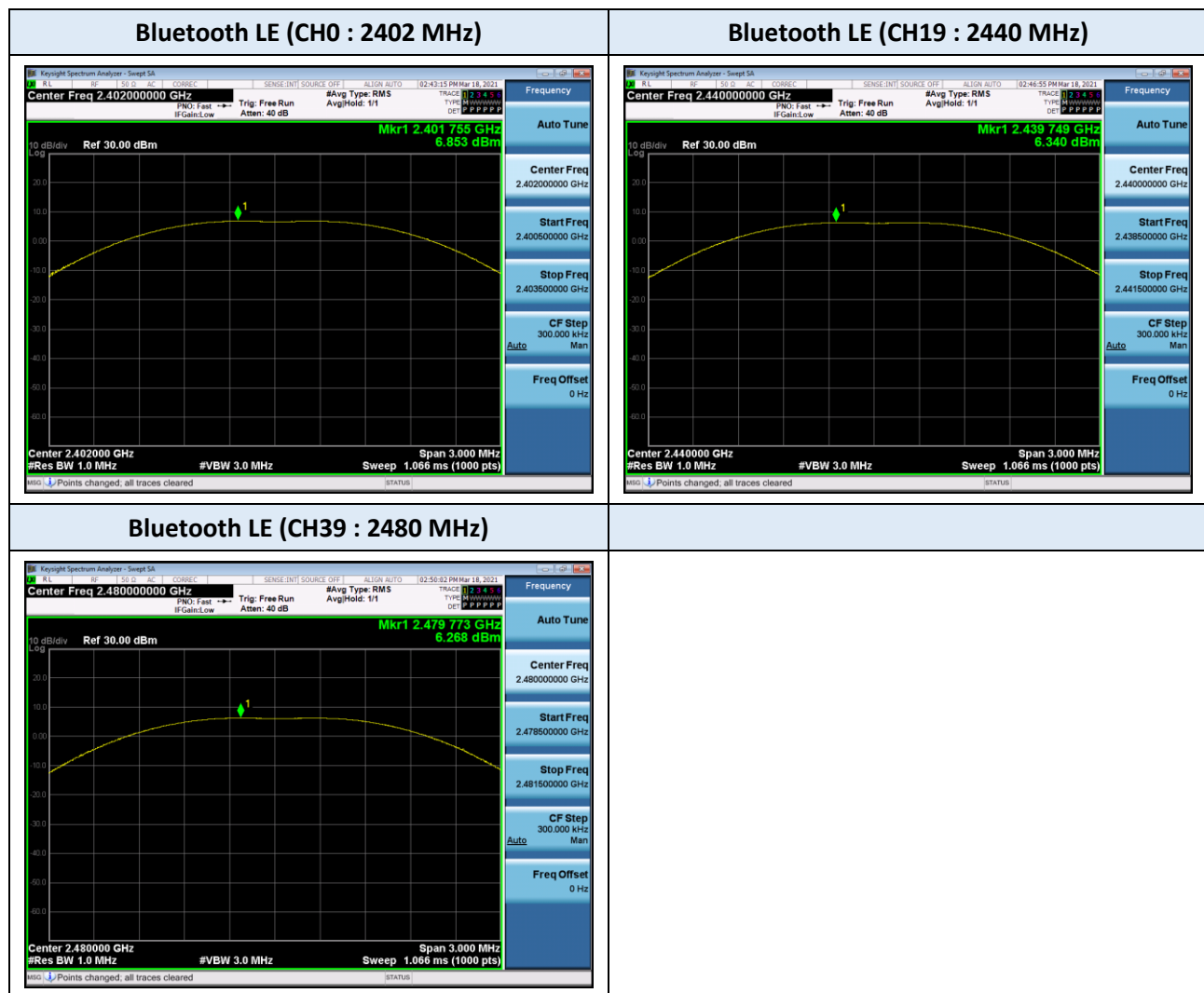
### Peak Power

| Bluetooth LE    |             | Test Result          |             |           |
|-----------------|-------------|----------------------|-------------|-----------|
| Frequency (MHz) | Channel No. | Measured Power (dBm) | Limit (dBm) | Result    |
| 2402            | 0           | 6.853                | 30          | Compliant |
| 2440            | 19          | 6.340                | 30          | Compliant |
| 2480            | 39          | 6.268                | 30          | Compliant |

#### Note :

- The output power results in plot include the spectrum offset, which is a combination loss of the attenuator and the cable used for testing

### TEST PLOTS



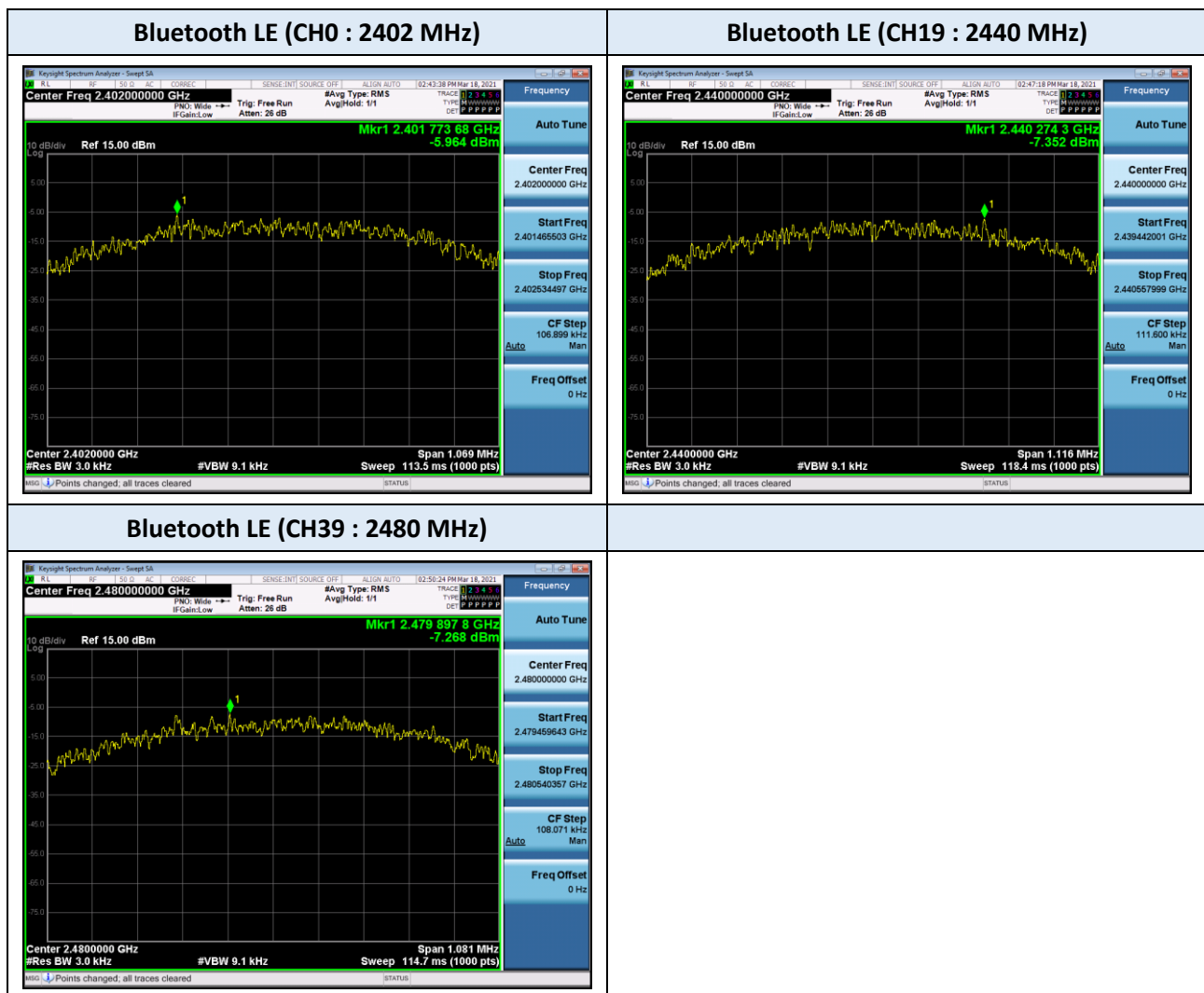
### 9.3. POWER SPECTRAL DENSITY

| Bluetooth LE    |             | Test Result                  |                     |           |
|-----------------|-------------|------------------------------|---------------------|-----------|
| Frequency (MHz) | Channel No. | Measured Level (dBm / 3 kHz) | Limit (dBm / 3 kHz) | Result    |
| 2402            | 0           | -5.964                       | 8.000               | Compliant |
| 2440            | 19          | -7.352                       | 8.000               | Compliant |
| 2480            | 39          | -7.268                       | 8.000               | Compliant |

#### Note :

- The output power results in plot include the spectrum offset, which is a combination loss of the attenuator and the cable used for testing

#### TEST PLOTS

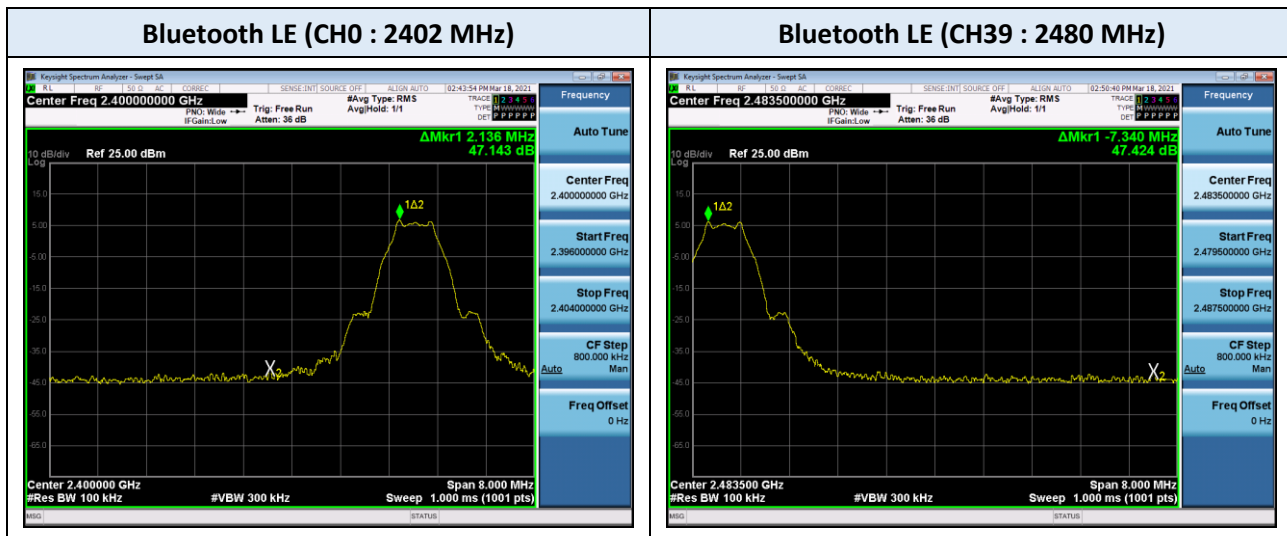


## 9.4. CONDUCTED BAND EDGE & SPURIOUS EMISSIONS

### Out of Band Emissions at the Band Edge

| Bluetooth LE    |             |          | Test Result          |             |           |
|-----------------|-------------|----------|----------------------|-------------|-----------|
| Frequency [MHz] | Channel No. | Position | Measured Level [dBc] | Limit [dBc] | Result    |
| 2402            | 0           | Low      | 47.143               | 20          | Compliant |
| 2480            | 39          | High     | 47.424               | 20          | Compliant |

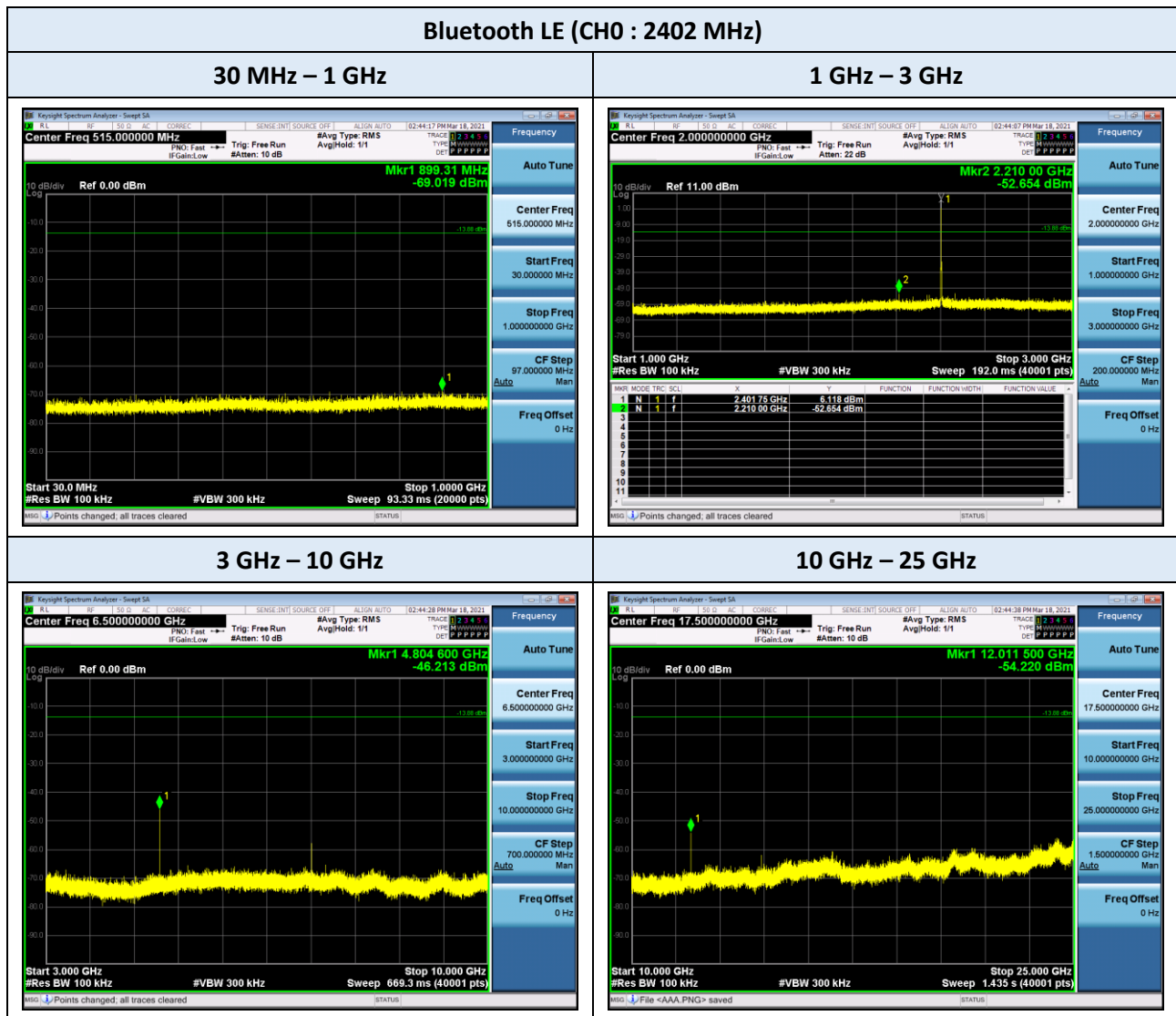
### TEST PLOTS



## Conducted Spurious Emissions

| Bluetooth LE    |             |          | Test Result          |             |           |
|-----------------|-------------|----------|----------------------|-------------|-----------|
| Frequency [MHz] | Channel No. | Position | Measured Level [dBc] | Limit [dBc] | Result    |
| 2402            | 0           | Low      | 52.331               | 20          | Compliant |
| 2440            | 19          | Middle   | 54.767               | 20          | Compliant |
| 2480            | 39          | High     | 57.485               | 20          | Compliant |

## TEST PLOTS



## Note:

The plots included in this report are only at the worst-case channel

## 9.5. RADIATED SPURIOUS EMISSIONS

Frequency Range : 9 kHz – 30 MHz

Test Mode                      Bluetooth LE (GFSK) : TX mode  
Operating Frequency        CH 39 (2480 MHz)

| Frequency (MHz) | Polarization | Reading (dBuV) | Corr. <sup>1)</sup> (dB) | Total (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Measurement Type |
|-----------------|--------------|----------------|--------------------------|----------------|----------------|-------------|------------------|
| 0.504           | 180°         | 5.3            | 14.7                     | 20.0           | 73.6           | 53.6        | QP               |
| 0.521           | 90°          | 5.0            | 14.7                     | 19.7           | 73.3           | 53.6        | QP               |

### Notes:

1. Correction Factor: Antenna Factor + Cable loss
2. Limit line = Specific Limits (dBuV) + Distance extrapolation factor
3. Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB)
4. The measurement distance is 3 meters.
5. The other Frequencies are attenuated more than 20 dB below the permissible limits.  
The worst-case result is included in this report.

# Frequency Range : Below 1 GHz

Test Mode Bluetooth LE (GFSK) : TX mode  
Operating Frequency CH 39 (2480 MHz)

| Frequency (MHz) | Polarization | Reading (dBuV) | Corr. <sup>1)</sup> (dB) | Total (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Measurement Type |
|-----------------|--------------|----------------|--------------------------|----------------|----------------|-------------|------------------|
| 897.750         | V            | 23.8           | 3.5                      | 27.3           | 46             | 18.7        | QP               |
| 950.769         | H            | 23.7           | 3.9                      | 27.6           | 46             | 18.4        | QP               |

## Notes:

1. Correction Factor: Antenna Factor + Cable loss  
The worst-case result is included in this report.

# Frequency Range : Above 1 GHz

Test Mode Bluetooth LE (GFSK) : TX mode  
Operating Frequency CH 0 (2402 MHz)

| Frequency (MHz) | Polarization | Reading (dBuV) |      | Factor (dB)         | Level (dBuV/m) |      | Limit (dBuV/m) |    | Margin (dB) |      |
|-----------------|--------------|----------------|------|---------------------|----------------|------|----------------|----|-------------|------|
|                 |              | AV             | PK   | Corr. <sup>1)</sup> | AV             | PK   | AV             | PK | AV          | PK   |
| 2337.870        | V            | 50.6           | 54.3 | -11.7               | 38.9           | 42.6 | 54             | 74 | 15.1        | 31.4 |
| 2338.199        | H            | 53.1           | 56.9 | -11.7               | 41.4           | 45.2 | 54             | 74 | 12.6        | 28.8 |
| 2529.964        | V            | 44.2           | 49.3 | -10.7               | 33.5           | 38.6 | 54             | 74 | 20.5        | 35.4 |
| 2529.989        | H            | 46.9           | 51.0 | -10.7               | 36.2           | 40.3 | 54             | 74 | 17.8        | 33.7 |
| 4803.458        | H            | 55.4           | 60.3 | -6.4                | 49.0           | 53.9 | 54             | 74 | 5.0         | 20.1 |
| 4804.524        | V            | 51.9           | 56.3 | -6.4                | 45.5           | 49.9 | 54             | 74 | 8.5         | 24.1 |
| 7205.296        | H            | 50.4           | 55.7 | -0.6                | 49.8           | 55.1 | 54             | 74 | 4.2         | 18.9 |
| 7206.768        | V            | 48.4           | 53.4 | -0.6                | 47.8           | 52.8 | 54             | 74 | 6.2         | 21.2 |
| 9609.095        | H            | 46.8           | 52.4 | 1.8                 | 48.6           | 54.2 | 54             | 74 | 5.4         | 19.8 |
| 9609.132        | V            | 48.7           | 53.9 | 1.8                 | 50.5           | 55.7 | 54             | 74 | 3.5         | 18.3 |
| 12011.262       | H            | 39.1           | 45.6 | 3.8                 | 42.9           | 49.4 | 54             | 74 | 11.1        | 24.6 |
| 12011.323       | V            | 41.4           | 47.4 | 3.8                 | 45.2           | 51.2 | 54             | 74 | 8.8         | 22.8 |

## Notes:

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain

Test Mode Bluetooth LE (GFSK) : TX mode  
 Operating Frequency CH 19 (2440 MHz)

| Frequency (MHz) | Polarization | Reading (dBuV) |      | Factor (dB)         | Level (dBuV/m) |      | Limit (dBuV/m) |    | Margin (dB) |      |
|-----------------|--------------|----------------|------|---------------------|----------------|------|----------------|----|-------------|------|
|                 |              | AV             | PK   | Corr. <sup>1)</sup> | AV             | PK   | AV             | PK | AV          | PK   |
| 2375.867        | H            | 51.9           | 55.5 | -11.4               | 40.5           | 44.1 | 54             | 74 | 13.5        | 29.9 |
| 2376.112        | V            | 48.1           | 51.9 | -11.4               | 36.7           | 40.5 | 54             | 74 | 17.3        | 33.5 |
| 2503.680        | V            | 46.3           | 51.7 | -10.8               | 35.5           | 40.9 | 54             | 74 | 18.5        | 33.1 |
| 2504.012        | H            | 51.0           | 54.7 | -10.8               | 40.2           | 43.9 | 54             | 74 | 13.8        | 30.1 |
| 4837.512        | V            | 56.1           | 60.8 | -6.3                | 49.8           | 54.5 | 54             | 74 | 4.2         | 19.5 |
| 4838.385        | H            | 54.7           | 59.5 | -6.3                | 48.4           | 53.2 | 54             | 74 | 5.6         | 20.8 |
| 7256.321        | V            | 47.4           | 52.6 | 0.1                 | 47.5           | 52.7 | 54             | 74 | 6.5         | 21.3 |
| 7257.752        | H            | 50.2           | 54.9 | 0.1                 | 50.3           | 55.0 | 54             | 74 | 3.7         | 19.0 |
| 9677.045        | V            | 49.7           | 54.7 | 1.8                 | 51.5           | 56.5 | 54             | 74 | 2.5         | 17.5 |
| 9677.066        | H            | 46.8           | 51.9 | 1.8                 | 48.6           | 53.7 | 54             | 74 | 5.4         | 20.3 |
| 12096.334       | H            | 39.0           | 45.8 | 4.0                 | 43.0           | 49.8 | 54             | 74 | 11.0        | 24.2 |
| 12096.450       | V            | 40.7           | 47.4 | 4.0                 | 44.7           | 51.4 | 54             | 74 | 9.3         | 22.6 |

**Notes:**

1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain

Test Mode Bluetooth LE (GFSK) : TX mode  
 Operating Frequency CH 39 (2480 MHz)

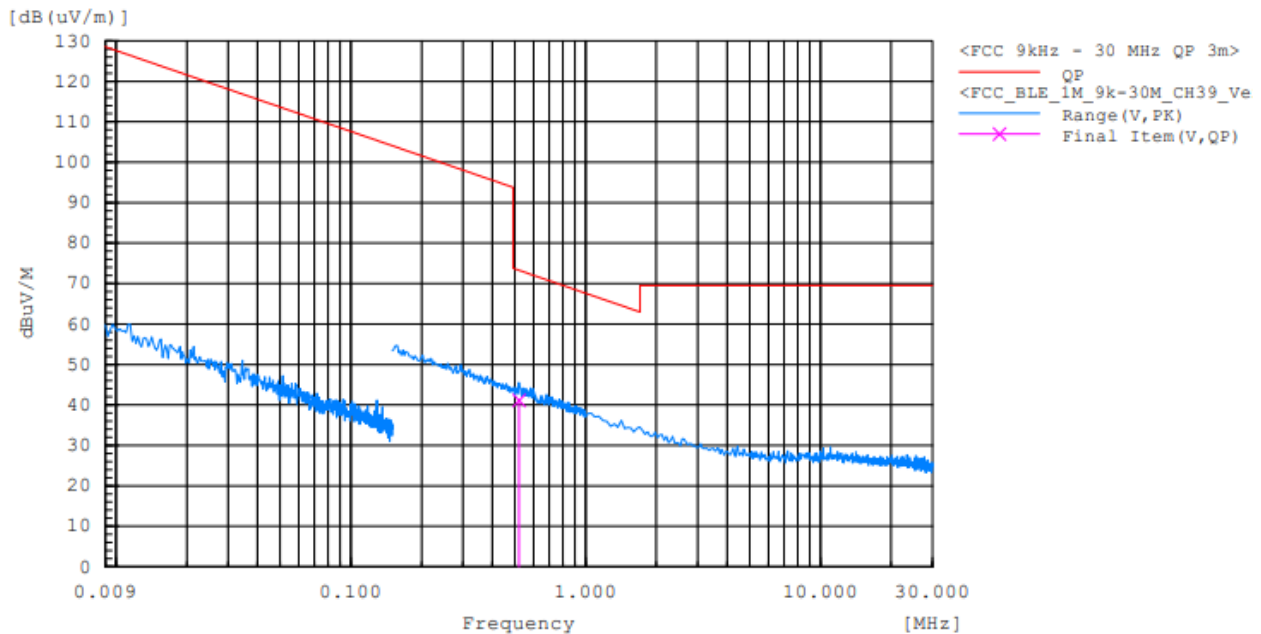
| Frequency (MHz) | Polarization | Reading (dBuV) |      | Factor (dB)         | Level (dBuV/m) |      | Limit (dBuV/m) |    | Margin (dB) |      |
|-----------------|--------------|----------------|------|---------------------|----------------|------|----------------|----|-------------|------|
|                 |              | AV             | PK   | Corr. <sup>1)</sup> | AV             | PK   | AV             | PK | AV          | PK   |
| 2352.117        | V            | 47.0           | 51.1 | -11.6               | 35.4           | 39.5 | 54             | 74 | 18.6        | 34.5 |
| 2352.146        | H            | 52.4           | 56.0 | -11.6               | 40.8           | 44.4 | 54             | 74 | 13.2        | 29.6 |
| 2544.179        | H            | 48.5           | 52.7 | -10.7               | 37.8           | 42.0 | 54             | 74 | 16.2        | 32.0 |
| 2543.842        | V            | 45.9           | 50.4 | -10.7               | 35.2           | 39.7 | 54             | 74 | 18.8        | 34.3 |
| 4878.498        | H            | 55.0           | 58.9 | -6.1                | 48.9           | 52.8 | 54             | 74 | 5.1         | 21.2 |
| 4878.575        | V            | 59.0           | 63.3 | -6.1                | 52.9           | 57.2 | 54             | 74 | 1.1         | 16.8 |
| 7316.205        | H            | 49.6           | 55.1 | 0.2                 | 49.8           | 55.3 | 54             | 74 | 4.2         | 18.7 |
| 7316.176        | V            | 46.2           | 52.0 | 0.2                 | 46.4           | 52.2 | 54             | 74 | 7.6         | 21.8 |
| 9755.156        | H            | 48.5           | 54.2 | 1.8                 | 50.3           | 56.0 | 54             | 74 | 3.7         | 18.0 |
| 9754.981        | V            | 49.5           | 55.1 | 1.8                 | 51.3           | 56.9 | 54             | 74 | 2.7         | 17.1 |
| 12196.298       | H            | 37.9           | 44.3 | 4.1                 | 42.0           | 48.4 | 54             | 74 | 12.0        | 25.6 |
| 12193.788       | V            | 40.2           | 47.3 | 4.1                 | 44.3           | 51.4 | 54             | 74 | 9.7         | 22.6 |

**Notes:**

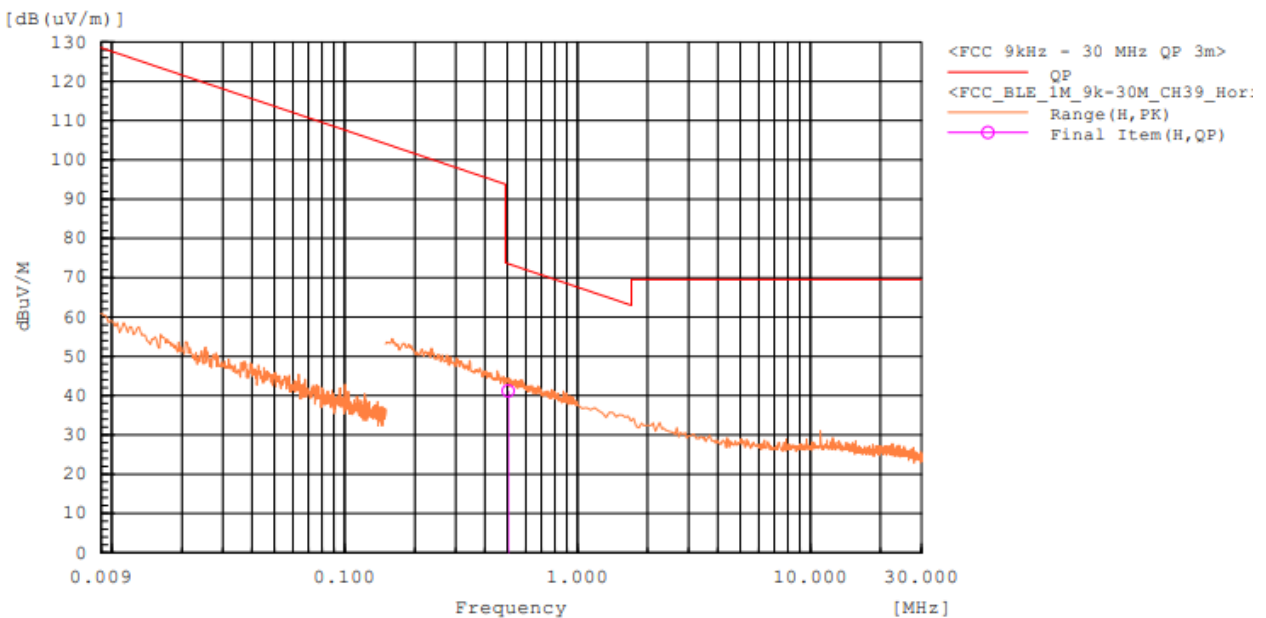
1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain

■ TEST PLOTS

**Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 90°) : CH39**



**Radiated Spurious Emission 9 kHz – 30 MHz (Antenna Position 180°) : CH39**

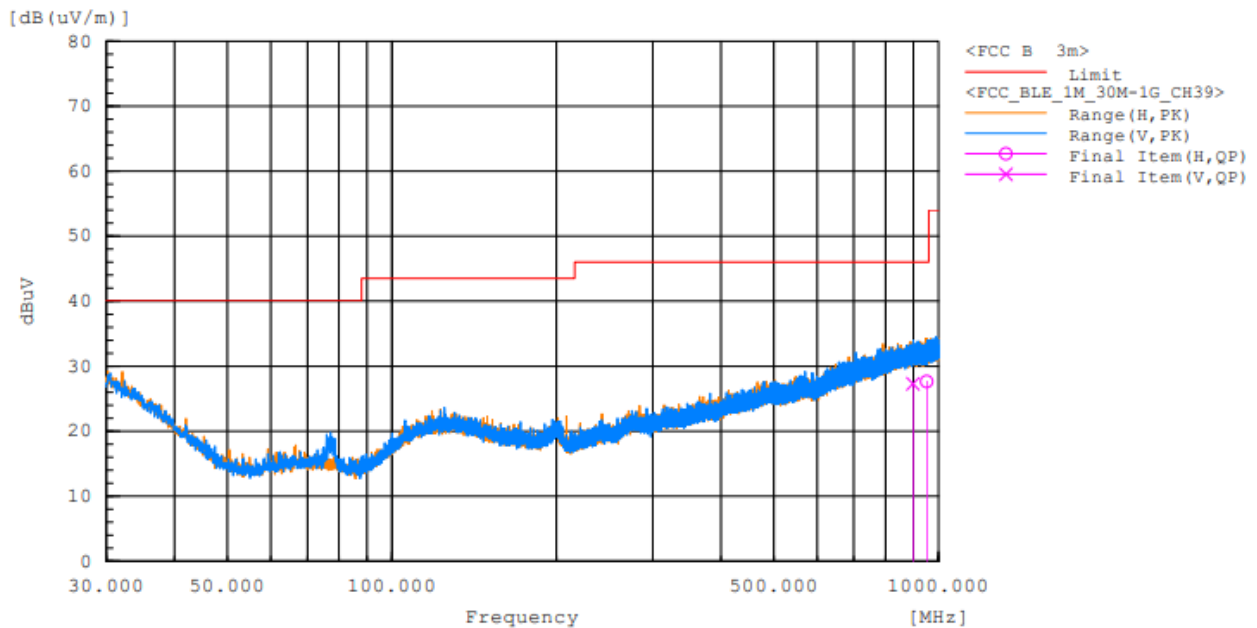


**Note:**

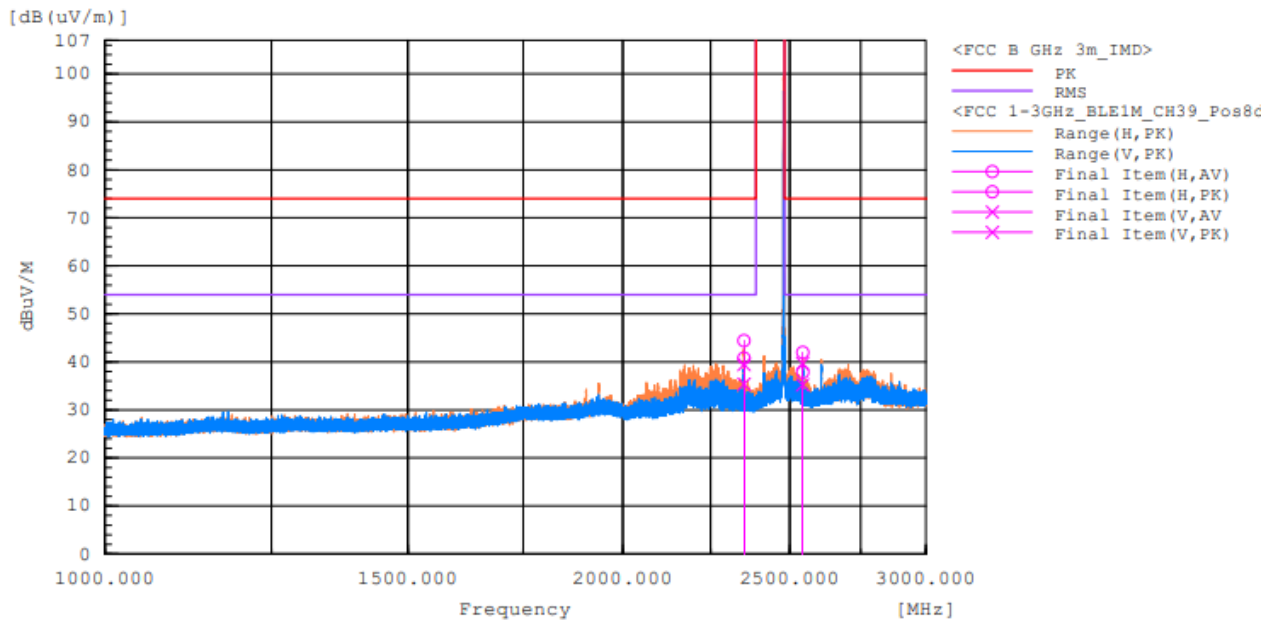
The worst-case plots are included in this report.

■ TEST PLOTS

**Radiated Spurious Emission 30 MHz – 1 GHz : CH39**



**Radiated Spurious Emission 1 GHz – 3 GHz : CH39**

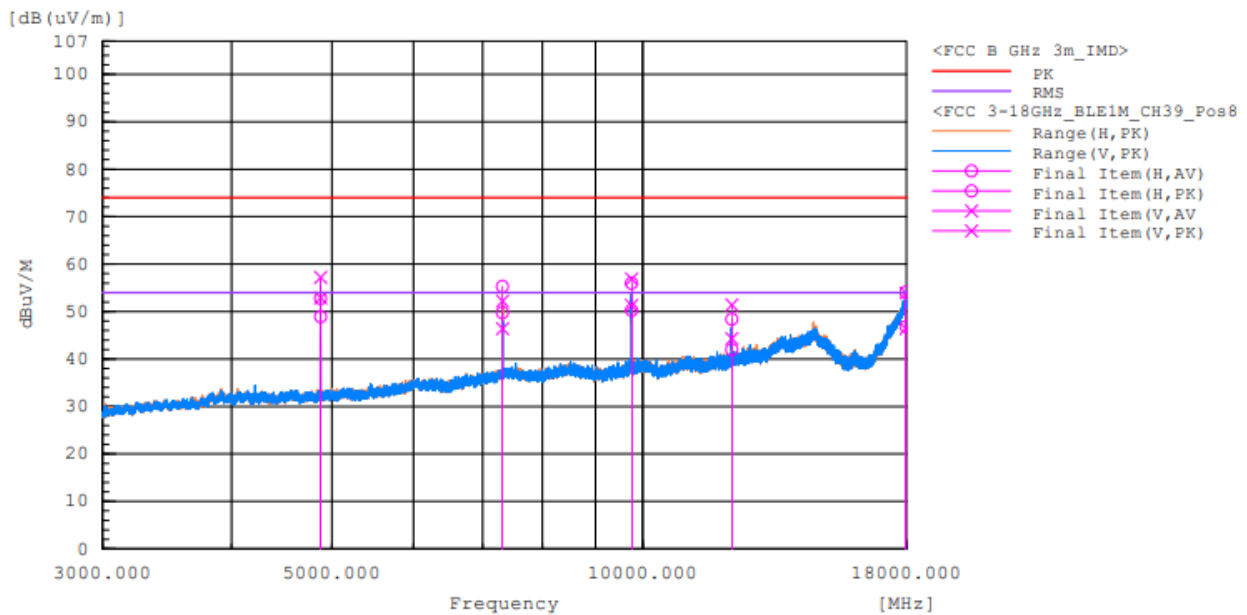


**Note:**

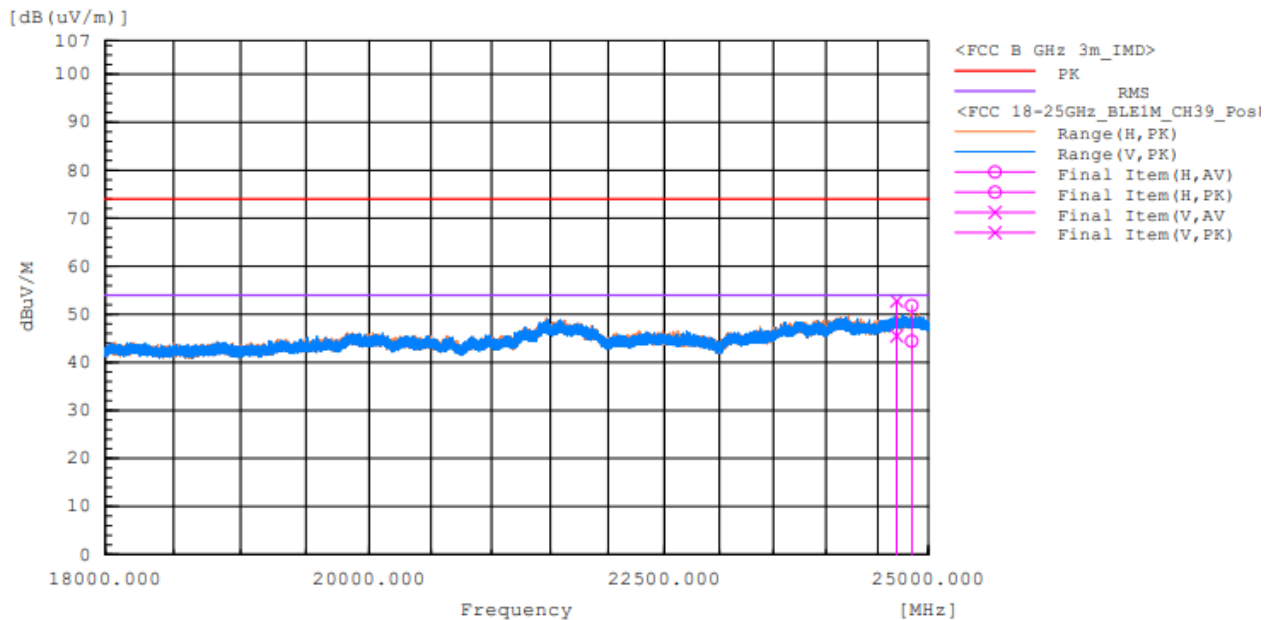
The worst-case plots are included in this report.

■ TEST PLOTS

**Radiated Spurious Emission 3 GHz – 18 GHz : CH39**



**Radiated Spurious Emission 18 GHz – 25 GHz : CH39**



**Note:**

The worst-case plots are included in this report.

## 9.6. RADIATED RESTRICTED BAND EDGES

Test Mode Bluetooth LE (GFSK) : TX mode  
Operating Frequency CH 0 (2402 MHz)

| Frequency (MHz) | Polarization | Reading (dBuV) |      | Factor (dB) | Level (dBuV/m) |      | Limit (dBuV/m) |    | Margin (dB) |      |
|-----------------|--------------|----------------|------|-------------|----------------|------|----------------|----|-------------|------|
|                 |              | AV             | PK   |             | AV             | PK   | AV             | PK | AV          | PK   |
| 2337.828        | H            | 52.8           | 56.5 | -11.7       | 41.1           | 44.8 | 54             | 74 | 12.9        | 29.2 |
| 2338.158        | V            | 50.0           | 53.6 | -11.7       | 38.3           | 41.9 | 54             | 74 | 15.7        | 32.1 |
| 2369.925        | H            | 46.7           | 53.1 | -11.4       | 35.3           | 41.7 | 54             | 74 | 18.7        | 32.3 |
| 2370.077        | V            | 43.6           | 48.8 | -11.4       | 32.2           | 37.4 | 54             | 74 | 21.8        | 36.6 |
| 2377.585        | H            | 47.4           | 52.9 | -11.3       | 36.1           | 41.6 | 54             | 74 | 17.9        | 32.4 |
| 2378.028        | V            | 43.8           | 50.2 | -11.3       | 32.5           | 38.9 | 54             | 74 | 21.5        | 35.1 |

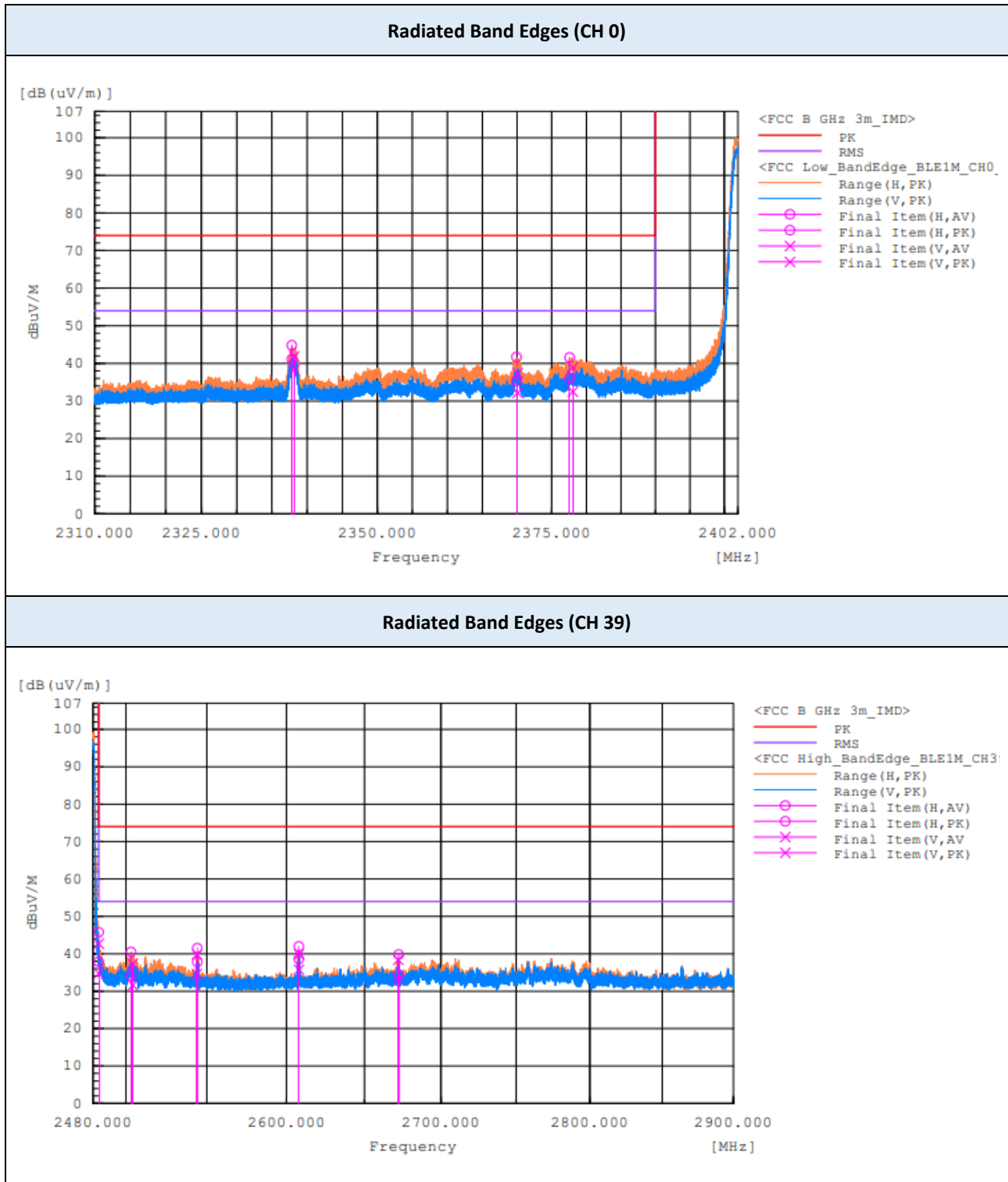
Test Mode Bluetooth LE (GFSK) : TX mode  
Operating Frequency CH 39 (2480 MHz)

| Frequency (MHz) | Polarization | Reading (dBuV) |      | Factor (dB) | Level (dBuV/m) |      | Limit (dBuV/m) |    | Margin (dB) |      |
|-----------------|--------------|----------------|------|-------------|----------------|------|----------------|----|-------------|------|
|                 |              | AV             | PK   |             | AV             | PK   | AV             | PK | AV          | PK   |
| 2483.500        | V            | 45.7           | 53.6 | -10.9       | 34.8           | 42.7 | 54             | 74 | 19.2        | 31.3 |
| 2483.500        | H            | 48.8           | 56.7 | -10.9       | 37.9           | 45.8 | 54             | 74 | 16.1        | 28.2 |
| 2503.184        | H            | 45.0           | 51.3 | -10.8       | 34.2           | 40.5 | 54             | 74 | 19.8        | 33.5 |
| 2504.155        | V            | 42.4           | 48.2 | -10.8       | 31.6           | 37.4 | 54             | 74 | 22.4        | 36.6 |
| 2543.761        | V            | 45.3           | 50.5 | -10.7       | 34.6           | 39.8 | 54             | 74 | 19.4        | 34.2 |
| 2543.951        | H            | 48.5           | 52.2 | -10.7       | 37.8           | 41.5 | 54             | 74 | 16.2        | 32.5 |
| 2607.828        | V            | 46.4           | 50.5 | -10.6       | 35.8           | 39.9 | 54             | 74 | 18.2        | 34.1 |
| 2607.864        | H            | 49.2           | 52.6 | -10.6       | 38.6           | 42.0 | 54             | 74 | 15.4        | 32.0 |
| 2672.046        | V            | 43.7           | 48.9 | -10.5       | 33.2           | 38.4 | 54             | 74 | 20.8        | 35.6 |
| 2672.210        | H            | 45.1           | 50.4 | -10.6       | 34.5           | 39.8 | 54             | 74 | 19.5        | 34.2 |

### Notes:

1. Correction Factor: Antenna Factor + Cable loss

■ TEST PLOTS



## 9.7. RECEIVER SPURIOUS EMISSION

Test Mode Bluetooth LE (GFSK) : RX mode  
 Operating Frequency CH 39 (2480 MHz)

| Frequency (MHz)     | Polarization | Reading (dBuV) | Corr. <sup>1)</sup> (dB) | Total (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Measurement Type |
|---------------------|--------------|----------------|--------------------------|----------------|----------------|-------------|------------------|
| No major peak found |              |                |                          |                |                |             |                  |

Test Mode Bluetooth LE (GFSK) : RX mode  
 Operating Frequency CH 39 (2480 MHz)

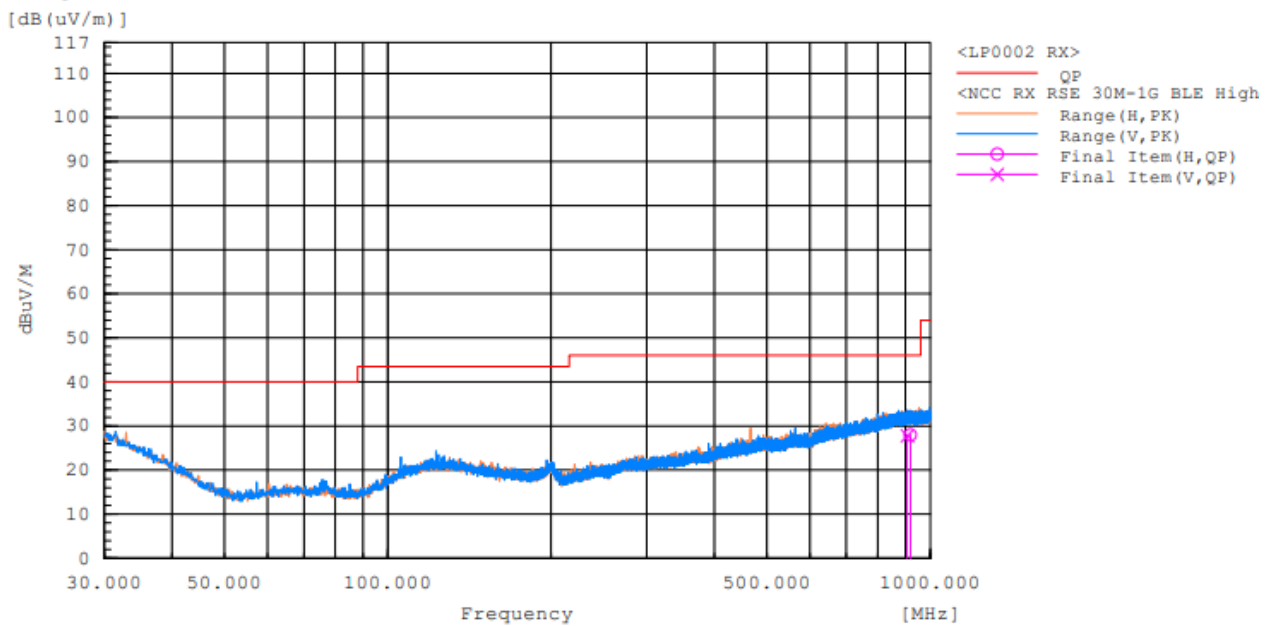
| Frequency (MHz)     | Polarization | Reading (dBuV) | Corr. <sup>1)</sup> (dB) | Total (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Measurement Type |
|---------------------|--------------|----------------|--------------------------|----------------|----------------|-------------|------------------|
| No major peak found |              |                |                          |                |                |             |                  |

### Note(s) :

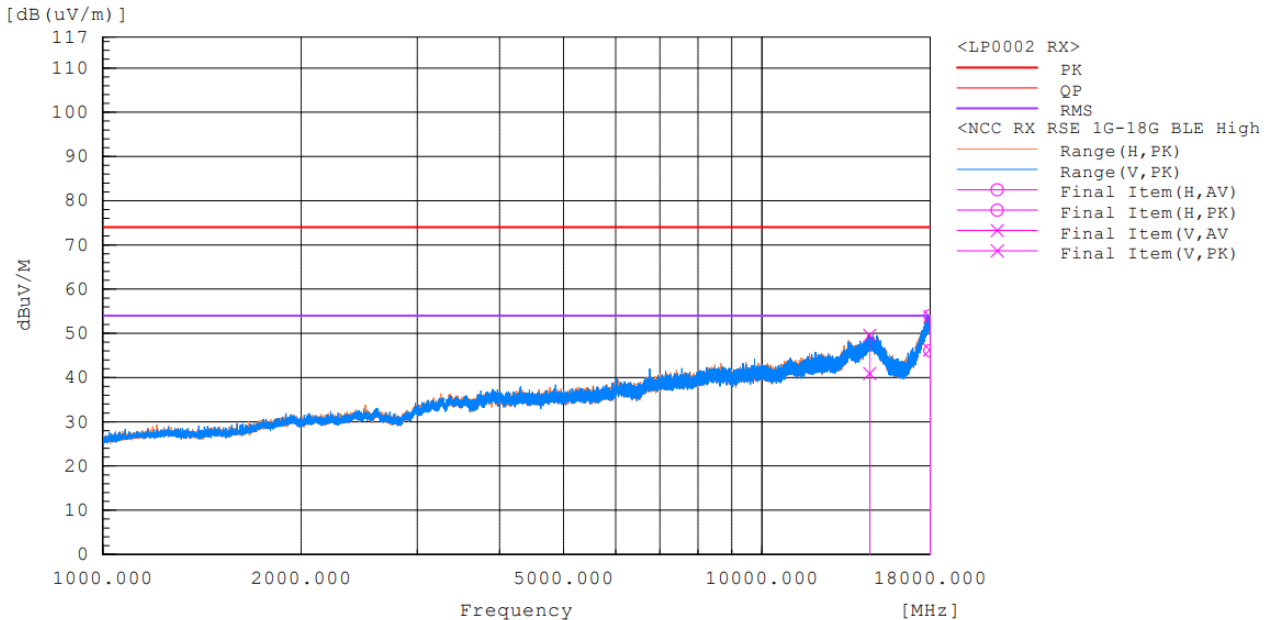
1. Correction Factor: Antenna Factor + Cable loss + Preamplifier Gain
2. No major peak found within the frequency range.

■ TEST PLOTS

Receiver Spurious Emission below 1 GHz (CH 39)



Receiver Spurious Emission above 1 GHz (CH 39)



## 10. LIST OF TEST EQUIPMENT

| No.                                 | Instrument                            | Model No.                  | Calibration Due (mm/dd/yy) | Manufacture     | Serial No. |
|-------------------------------------|---------------------------------------|----------------------------|----------------------------|-----------------|------------|
| <input checked="" type="checkbox"/> | Signal Analyzer<br>(20 Hz ~ 40.0 GHz) | ESU40                      | 12/09/2021                 | Rohde & Schwarz | 100529     |
| <input checked="" type="checkbox"/> | Signal Analyzer<br>(10 Hz ~ 40.0 GHz) | FSV40                      | 02/03/2022                 | Rohde & Schwarz | 101424     |
| <input checked="" type="checkbox"/> | Signal Analyzer<br>(10 Hz ~ 26.5 GHz) | N9020A                     | 11/07/2021                 | Keysight        | MY52091291 |
| <input type="checkbox"/>            | Attenuator<br>(20 dB, DC ~ 26.5 GHz)  | 8493C                      | 12/07/2021                 | HP              | 09072      |
| <input checked="" type="checkbox"/> | Attenuator<br>(10 dB, DC ~ 26.5 GHz)  | CFAD261002                 | 01/07/2022                 | CERNEX          | H0044      |
| <input checked="" type="checkbox"/> | Loop Antenna<br>(0.009 ~ 30 MHz)      | AL-130R                    | 04/16/2023                 | Com-Power       | 121082     |
| <input checked="" type="checkbox"/> | BI-LOG Antenna<br>(30 MHz ~ 6 GHz)    | JB6                        | 10/26/2022                 | Sunol           | A071116    |
| <input checked="" type="checkbox"/> | LNA<br>(30 MHz ~ 1GHz)                | 8447D                      | 07/26/2022                 | HP              | 2443A03587 |
| <input checked="" type="checkbox"/> | Horn Antenna<br>(1 GHz ~ 18 GHz)      | DRH-118                    | 10/21/2022                 | Sunol           | A070516    |
| <input checked="" type="checkbox"/> | LNA<br>(1 GHz ~ 18 GHz)               | PAM-118A                   | 07/06/2022                 | Com-Power       | 18040074   |
| <input checked="" type="checkbox"/> | Horn Antenna<br>(18 GHz ~ 40 GHz)     | DRH-1840                   | 02/16/2022                 | Sunol           | 17121      |
| <input checked="" type="checkbox"/> | LNA<br>(18 GHz ~ 40 GHz)              | CBL184050-45-01            | 02/04/2022                 | CERNEX, Inc.    | 27973      |
| <input type="checkbox"/>            | Power Divider-2way<br>(DC ~ 26.5 GHz) | 11636B                     | 12/11/2021                 | HP              | 50820      |
| <input type="checkbox"/>            | Directional Coupler<br>(1-4GHz)       | 3022                       | 12/15/2021                 | Narda           | 72118      |
| <input checked="" type="checkbox"/> | High Pass Filter                      | WHK10-2520-3000-18000-40EF | 01/06/2022                 | Wainwright      | 9          |
| <input type="checkbox"/>            | EMI Test Receiver                     | ESR3                       | 12/17/2021                 | Rohde & Schwarz | 102363     |
| <input type="checkbox"/>            | LISN                                  | ENV216                     | 01/16/2022                 | Rohde & Schwarz | 101349     |
| <input type="checkbox"/>            | DC Power Supply                       | PAB 18-1A                  | 01/07/2022                 | Kikusui         | 1350582    |

### Note:

- Equipment listed above that calibrated during the testing period was set for test after the calibration.
- Equipment listed above that has a calibration due date during the testing period, the testing is completed before equipment expiration date

## ANNEX A. TEST SETUP PHOTOS

*The setup photos are provided as a separate document.*

## **ANNEX B. PHOTOGRAPHS OF EUT**

### **B.1. EXTERNAL PHOTOS**

*The external photos are provided as a separate document.*

### **B.2. INTERNAL PHOTOS**

*The internal photos are provided as a separate document.*

***END OF TEST REPORT***