



FCC RADIO TEST REPORT

BLUETOOTH BR

FCC ID : A4RGR83Y
Equipment : Phone
Model Name : GR83Y
Applicant : Google LLC
1600 Amphitheatre Parkway,
Mountain View, California, 94043 USA
Standard : FCC Part 15 Subpart C §15.247

The product was received on Dec. 20, 2023 and testing was performed from Jan. 11, 2024 to Apr. 08, 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 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.

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.)



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History of this test report

| Report No. | Version | Description | Issue Date |
|------------|---------|---|---------------|
| FR3N2325A | 01 | Initial issue of report | Apr. 26, 2024 |
| FR3N2325A | 02 | Revise Test Mode and Appendix A This report is an updated version, replacing the report issued on Apr. 26, 2024. | May 08, 2024 |
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Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---------------|------------------------------|--|--------------------|--------------------------------------|
| 3.1 | 15.247(a)(1) | Number of Channels | Pass | - |
| 3.2 | 15.247(a)(1) | Hopping Channel Separation | Pass | - |
| 3.3 | 15.247(a)(1) | Dwell Time of Each Channel | Pass | - |
| 3.4 | 15.247(a)(1) | 20dB Bandwidth | Pass | - |
| 3.4 | 2.1049 | 99% Occupied Bandwidth | Reporting only | - |
| 3.5 | 15.247(b)(1) 15.247(b)(4) | Peak Output Power | Pass | - |
| 3.6 | 15.247(d) | Conducted Band Edges | Pass | - |
| 3.7 | 15.247(d) | Conducted Spurious Emission | Pass | - |
| 3.8 | 15.247(d) | Radiated Band Edges and Radiated Spurious Emission | Pass | 6.46 dB under the limit at 64.74 MHz |
| 3.9 | 15.207 | AC Conducted Emission | Pass | 6.79 dB under the limit at 0.18 MHz |
| 3.10 | 15.203 | Antenna Requirement | Pass | - |

Conformity Assessment Condition:

- 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.
- The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty".

Disclaimer:

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.

Reviewed by: William Chen

Report Producer: Wilda Wei



1 General Description

1.1 Product Feature of Equipment Under Test

| Product Feature |
|---|
| General Specs GSM/WCDMA/LTE/5G NR, Bluetooth, BLE, BLE channel sounding, Thread, Wi-Fi 802.11be, UWB, NFC, WPT, NTN and GNSS. |
| Antenna Type WLAN: <Ant.3>: PIFA Antenna <Ant.4>: IFA Antenna |

| EUT Information List | |
|----------------------|----------------------------|
| S/N | Performed Test Item |
| 41101FDAP0002H | RF Conducted Measurement |
| 350964810105406 | Radiated Spurious Emission |
| 3B131FDAP0007E | Conducted Emission |

| Antenna information | | |
|-----------------------|-----------------|--------------|
| 2400 MHz ~ 2483.5 MHz | Peak Gain (dBi) | Ant.3: -0.10 |
| | | Ant.4: -0.30 |

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.1.1 Antenna Directional Gain

<For CDD Mode>

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)ii)

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows:

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

G_{ANT} is set equal to the gain of the antenna having the highest gain.

For PSD measurements, the directional gain calculation.

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k / 20}$ if the k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th antenna.

As minimum $N_{SS}=1$ is supported by EUT, the formula can be simplified as:

$$Directional\ gain = 10 \cdot \log \left[\left(10^{G_1 / 20} + 10^{G_2 / 20} + \dots + 10^{G_N / 20} \right)^2 / N_{ANT} \right] \text{ dBi}$$

Where G_1, G_2, \dots, G_N denote single antenna gain.

The directional gain “DG” is calculated as following table.

| | | | DG | DG | Power | PSD |
|------------------|--------------|--------------|--------------|--------------|------------------|------------------|
| | | | for | for | Limit | Limit |
| | Ant 3 | Ant 4 | Power | PSD | Reduction | Reduction |
| | (dBi) | (dBi) | (dBi) | (dBi) | (dB) | (dB) |
| Bluetooth | -0.10 | -0.30 | -0.10 | 2.81 | 0.00 | 0.00 |

Calculation example:

If a device has two antenna, $G_{ANT3} = -0.1\text{dBi}$; $G_{ANT4} = -0.3\text{dBi}$

Directional gain of power measurement = $\max(-0.1, -0.3) + 0 = -0.1 \text{ dBi}$

Directional gain of PSD derived from formula which is

$$10 \times \log \left\{ \left[10^{(-0.1 \text{ dBi} / 20)} + 10^{(-0.3 \text{ dBi} / 20)} \right]^2 / 2 \right\}$$

$$= 2.81 \text{ dBi}$$

Power and PSD limit reduction = Composite gain – 6dBi, (min = 0)



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., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855 |
| Test Site No. | Sporton Site No. |
| | TH05-HY, CO07-HY, 03CH15-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
- ♦ FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ♦ 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.



2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

| Frequency Band | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|-------------|---------|-------------|---------|-------------|
| 2400-2483.5 MHz | 0 | 2402 | 27 | 2429 | 54 | 2456 |
| | 1 | 2403 | 28 | 2430 | 55 | 2457 |
| | 2 | 2404 | 29 | 2431 | 56 | 2458 |
| | 3 | 2405 | 30 | 2432 | 57 | 2459 |
| | 4 | 2406 | 31 | 2433 | 58 | 2460 |
| | 5 | 2407 | 32 | 2434 | 59 | 2461 |
| | 6 | 2408 | 33 | 2435 | 60 | 2462 |
| | 7 | 2409 | 34 | 2436 | 61 | 2463 |
| | 8 | 2410 | 35 | 2437 | 62 | 2464 |
| | 9 | 2411 | 36 | 2438 | 63 | 2465 |
| | 10 | 2412 | 37 | 2439 | 64 | 2466 |
| | 11 | 2413 | 38 | 2440 | 65 | 2467 |
| | 12 | 2414 | 39 | 2441 | 66 | 2468 |
| | 13 | 2415 | 40 | 2442 | 67 | 2469 |
| | 14 | 2416 | 41 | 2443 | 68 | 2470 |
| | 15 | 2417 | 42 | 2444 | 69 | 2471 |
| | 16 | 2418 | 43 | 2445 | 70 | 2472 |
| | 17 | 2419 | 44 | 2446 | 71 | 2473 |
| | 18 | 2420 | 45 | 2447 | 72 | 2474 |
| | 19 | 2421 | 46 | 2448 | 73 | 2475 |
| | 20 | 2422 | 47 | 2449 | 74 | 2476 |
| | 21 | 2423 | 48 | 2450 | 75 | 2477 |
| | 22 | 2424 | 49 | 2451 | 76 | 2478 |
| | 23 | 2425 | 50 | 2452 | 77 | 2479 |
| | 24 | 2426 | 51 | 2453 | 78 | 2480 |
| | 25 | 2427 | 52 | 2454 | - | - |
| | 26 | 2428 | 53 | 2455 | - | - |



2.2 Test Mode

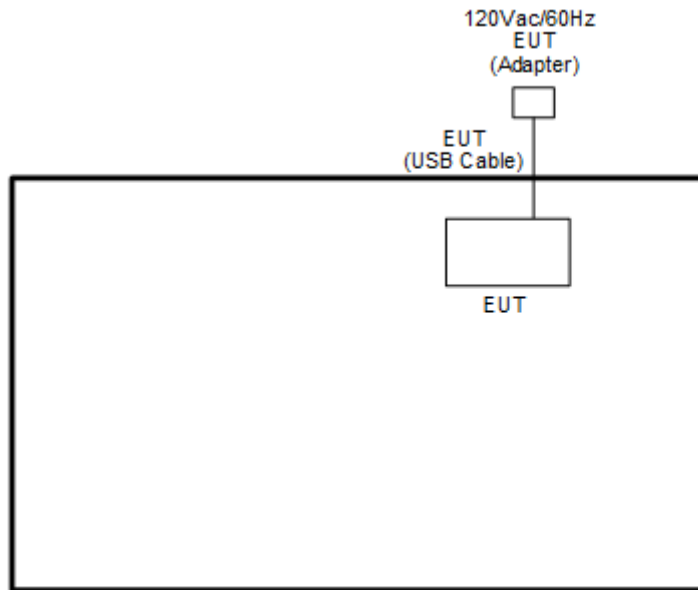
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). 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 accessory (Adapter or Earphone), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst plane, and the worst mode of radiated spurious emissions is X with Adapter for Ant 3 and Ant 4,Z plane with Adapter for Ant 3+4, and recorded in this report.
- b. The SISO mode conducted power is covered by MIMO mode per chain, so only the MIMO mode is tested.
- c. AC power line Conducted Emission was tested under maximum output power.

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

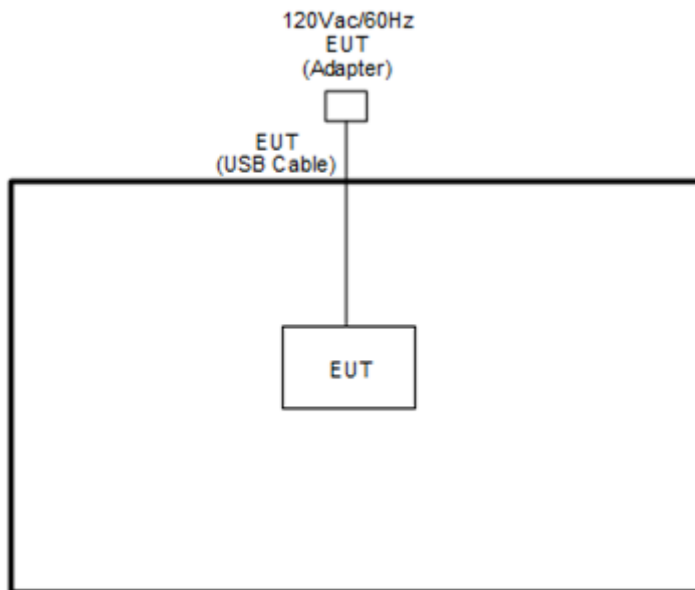
| Summary table of Test Cases | |
|--|--|
| Test Item | Data Rate / Modulation |
| Conducted Test Cases | Bluetooth BR 1Mbps GFSK |
| | Mode 1: CH00_2402 MHz |
| | Mode 2: CH39_2441 MHz |
| | Mode 3: CH78_2480 MHz |
| Radiated Test Cases | Bluetooth BR 1Mbps GFSK |
| | Mode 1: CH00_2402 MHz |
| | Mode 2: CH39_2441 MHz |
| | Mode 3: CH78_2480 MHz |
| AC Conducted Emission | Mode 1 :Bluetooth Link + USB cable 2 (Charging from Adapter 1) |
| Remark: 1. For Radiated Test Cases, the tests were performed with AC Adapter 1 and USB Cable 2. 2. During the preliminary test, both charging modes (Adapter mode and WPC Charging mode) were verified. It is determined that the adaptor mode is the worst case for official test. | |

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<Bluetooth Tx Mode>



2.4 Support Unit used in test configuration and system

| Item | Equipment | Brand Name | Model Name | FCC ID | Data Cable | Power Cord |
|------|-----------|------------|---------------|---------|------------|--|
| 1. | Notebook | DELL | Latitude 3400 | FCC DoC | 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 “BT_DUT_Control_GUI_2-26-24.exe” for FHSS 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.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

$$\begin{aligned} \text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)}. \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

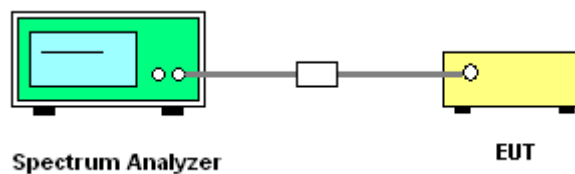
3.1.2 Measuring Instruments

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

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300 kHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

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 ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
Span = wide enough to capture the peaks of two adjacent channels;
RBW = 300 kHz; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW \geq RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

3.4.2 Measuring Instruments

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

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Use the following spectrum analyzer settings for 20 dB Bandwidth measurement.
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
RBW \geq 1% of the 20 dB bandwidth; VBW \geq RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
RBW \geq 1-5% of the 99% bandwidth; VBW \geq 3 * RBW; Sweep = auto; Detector function = peak;
Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup



3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.

3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

3.5 Output Power Measurement

3.5.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following:
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.
If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi.

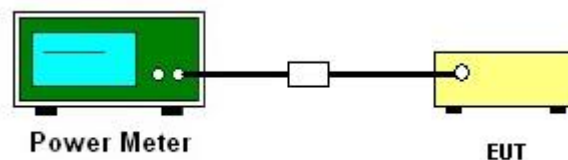
3.5.2 Measuring Instruments

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

3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Set RBW = 100 kHz, VBW = 300 kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2 and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

Please refer to Appendix A.

3.6.6 Test Result of Conducted Hopping Mode Band Edges

Please refer to Appendix A.

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

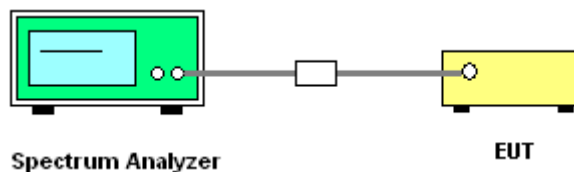
3.7.2 Measuring Instruments

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

3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurious must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

Please refer to Appendix A.



3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 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. 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 |

3.8.2 Measuring Instruments

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



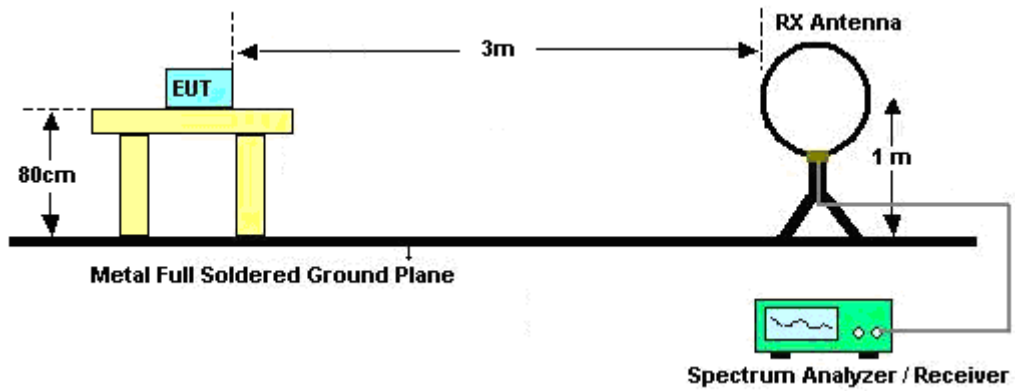
3.8.3 Test Procedures

1. 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.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
3. For each suspected emission, 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 to comply with the guidelines.
4. Set the maximum power setting and enable the EUT to transmit continuously.
5. 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, RBW = 1 MHz for $f > 1$ GHz ; VBW \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
 - (3) For average measurement: use duty cycle correction factor method per 15.35(c).
Duty cycle = On time/100 milliseconds
On time = $N_1 * L_1 + N_2 * L_2 + \dots + N_{n-1} * L_{n-1} + N_n * L_n$
Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
Average Emission Level = Peak Emission Level + $20 * \log$ (Duty cycle)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
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. 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 “-“.

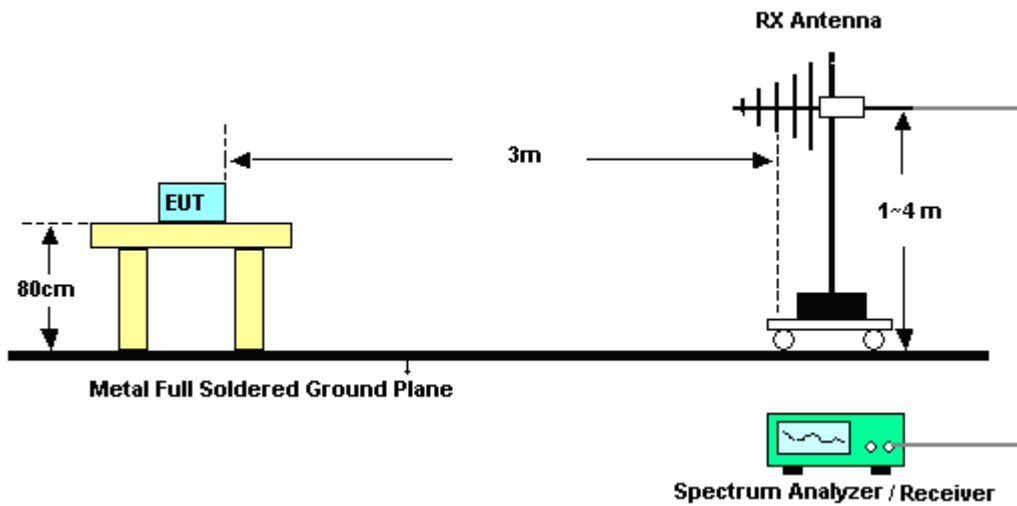
Note: The average levels are calculated from the peak level corrected with duty cycle correction factor (-24.76dB for BR Ant.3+4, -24.76 dB for BR Ant. 3 and -24.76dB for BR Ant. 4) derived from $20 \log$ (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.8.4 Test Setup

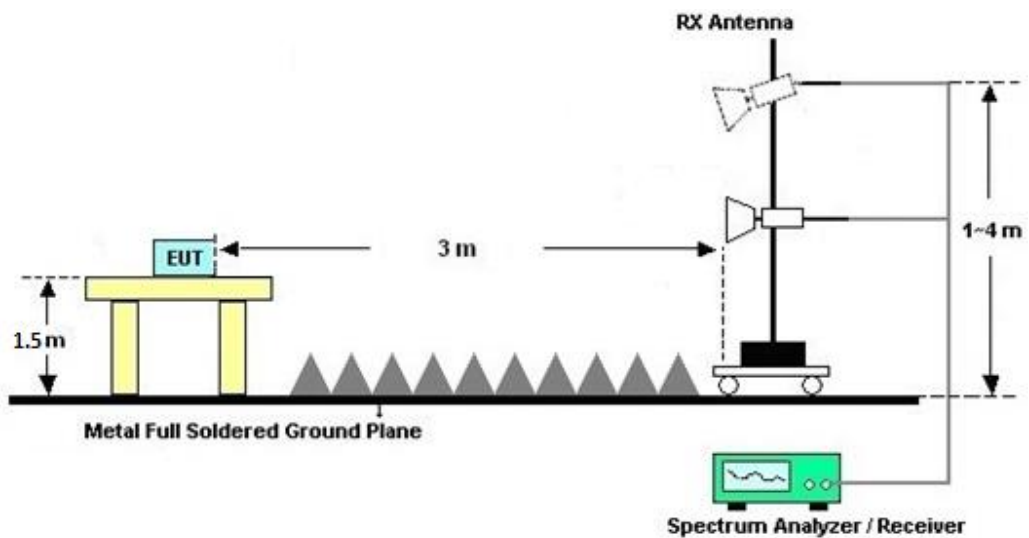
For radiated test below 30MHz



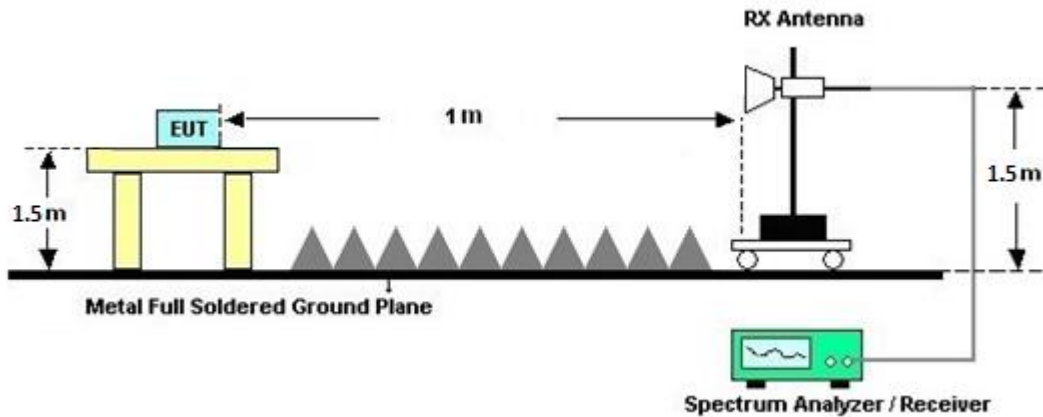
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.8.5 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.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.8.7 Duty Cycle

Please refer to Appendix E.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.



3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment 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.

| Frequency of emission (MHz) | Conducted limit (dB μ V) | |
|-----------------------------|------------------------------|-----------|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56* | 56 to 46* |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

*Decreases with the logarithm of the frequency.

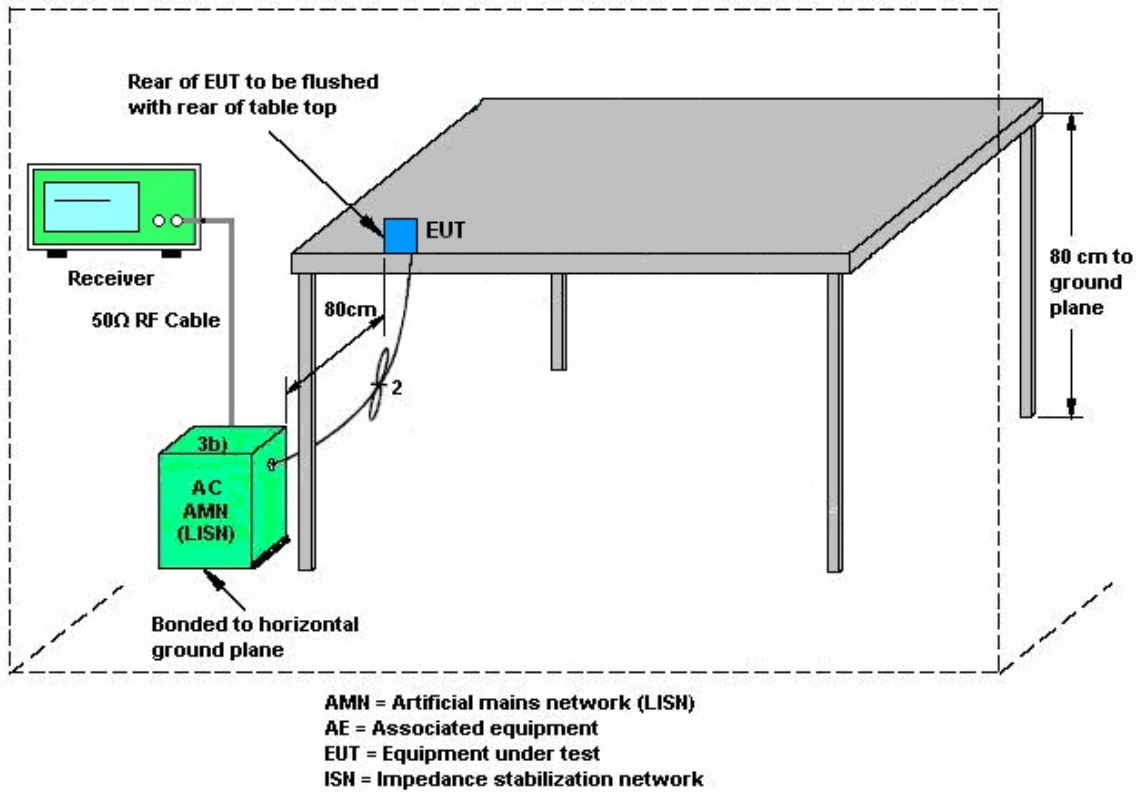
3.9.2 Measuring Instruments

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

3.9.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.



3.10 Antenna Requirements

3.10.1 Standard Applicable

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 rule.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.



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 | Jan. 11, 2024~ Mar. 27, 2024 | Sep. 11, 2024 | Radiation (03CH15-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00800N1D01N -06 | 47020 & 06 | 30MHz~1GHz | Oct. 07, 2023 | Jan. 11, 2024~ Feb. 06, 2024 | Oct. 06, 2024 | Radiation (03CH15-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & 00800N1D01N -06 | 41912 & 05 | 30MHz~1GHz | Feb. 04, 2024 | Feb. 07, 2024~ Mar. 27, 2024 | Feb. 03, 2025 | Radiation (03CH15-HY) |
| Horn Antenna | SCHWARZBE CK | BBHA 9120 D | 9120D-02294 | 1GHz~18GHz | Jun. 30, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jun. 29, 2024 | Radiation (03CH15-HY) |
| SHF-EHF Horn Antenna | SCHWARZBE CK | BBHA 9170 | 1225 | 18GHz~40GHz | Jul. 10, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jul. 09, 2024 | Radiation (03CH15-HY) |
| Amplifier | SONOMA | 310N | 363440 | 9kHz~1GHz | Dec. 26, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Dec. 25, 2024 | Radiation (03CH15-HY) |
| Preamplifier | EMEC | EM01G18G | 060812 | 1GHz~18GHz | Dec. 25, 2023 | Jan. 11, 2024~ Feb. 20, 2024 | Dec. 24, 2024 | Radiation (03CH15-HY) |
| Preamplifier | EMEC | EM01G18G | 060837 | 1GHz~18GHz | Feb. 15, 2024 | Feb. 21, 2024~ Mar. 27, 2024 | Feb. 14, 2025 | Radiation (03CH15-HY) |
| Preamplifier | Keysight | 83017A | MY53270264 | 1GHz~26.5GHz | Dec. 07, 2023 | Jan. 11, 2024~ Mar. 01, 2024 | Dec. 06, 2024 | Radiation (03CH15-HY) |
| Preamplifier | EM Electronics | EM01G18G | 060802 | 1GHz~18GHz | Feb. 29, 2024 | Mar. 01, 2024~ Mar. 27, 2024 | Feb. 28, 2025 | Radiation (03CH15-HY) |
| Preamplifier | EMEC | EM18G40G | 060801 | 18GHz~40GHz | Jun. 27, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jun. 26, 2024 | Radiation (03CH15-HY) |
| EMI Test Receiver | Keysight | N9038A(MXE) | MY53290045 | 20MHz~8.4GHz | Oct. 06, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Oct. 05, 2024 | Radiation (03CH15-HY) |
| Spectrum Analyzer | Keysight | N9010B | MY60241058 | 10Hz~44GHz | Jul. 06, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jul. 05, 2024 | Radiation (03CH15-HY) |
| Antenna Mast | ChainTek | MBS-520-1 | N/A | 1m~4m | N/A | Jan. 11, 2024~ Mar. 27, 2024 | N/A | Radiation (03CH15-HY) |
| Turn Table | ChainTek | T-200-S-1 | N/A | 0~360 Degree | N/A | Jan. 11, 2024~ Mar. 27, 2024 | N/A | Radiation (03CH15-HY) |
| Software | Audix | E3 6.2009-8-24 (k5) | RK-000451 | N/A | N/A | Jan. 11, 2024~ Mar. 27, 2024 | N/A | Radiation (03CH15-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104, 102E | MY582185/4, 519228/2,803 950/2 | N/A | Jun. 13, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jun. 12, 2024 | Radiation (03CH15-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 804011/2,804 012/2 | 18-40G | Jan. 02, 2024 | Jan. 11, 2024~ Mar. 27, 2024 | Jan. 01, 2025 | Radiation (03CH15-HY) |
| Filter | Wainwright | WLJ4-1000-15 30-6000-40ST | SN4 | 1.53GHz Low Pass Filter | Jun. 14, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jun. 13, 2024 | Radiation (03CH15-HY) |
| Filter | Wainwright | WHKX12-2700 -3000-18000-6 0ST | SN4 | 3GHz High Pass Filter | Jun. 14, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jun. 13, 2024 | Radiation (03CH15-HY) |
| Hygrometer | TECPEL | DTM-302 | SN4 | N/A | Jul. 26, 2023 | Jan. 11, 2024~ Mar. 27, 2024 | Jul. 25, 2024 | Radiation (03CH15-HY) |



| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---------------------|-----------------|---------------|---------------|-----------------|------------------|-----------------------------|---------------|----------------------|
| AC Power Source | ACPOWER | AFC-11003G | F317040033 | N/A | N/A | Mar. 23, 2024 | N/A | Conduction (CO07-HY) |
| Software | Rohde & Schwarz | EMC32 V10.30 | N/A | N/A | N/A | Mar. 23, 2024 | N/A | Conduction (CO07-HY) |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F N | 9561-F N00373 | 9kHz-200MHz | Oct. 20, 2023 | Mar. 23, 2024 | Oct. 19, 2024 | Conduction (CO07-HY) |
| RF Cable | HUBER + SUHNER | RG 214/U | 1358175 | 9kHz~30MHz | Mar. 14, 2024 | Mar. 23, 2024 | Mar. 13, 2025 | Conduction (CO07-HY) |
| Two-Line V-Network | TESEQ | NNB 51 | 45051 | N/A | Mar. 10, 2024 | Mar. 23, 2024 | Mar. 09, 2025 | Conduction (CO07-HY) |
| Four-Line V-Network | TESEQ | NNB 52 | 36122 | N/A | Mar. 07, 2024 | Mar. 23, 2024 | Mar. 06, 2025 | Conduction (CO07-HY) |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 102317 | 9kHz~3.6GHz | Sep. 20, 2023 | Mar. 23, 2024 | Sep. 19, 2024 | Conduction (CO07-HY) |
| Hygrometer | TECPEL | DTM-303A | TP201996 | N/A | Nov. 07, 2023 | Feb. 15, 2024~Apr. 08, 2024 | Nov. 06, 2024 | Conducted (TH05-HY) |
| Power Meter | Anritsu | ML2495A | 1036004 | N/A | Jul. 27, 2023 | Feb. 15, 2024~Apr. 08, 2024 | Jul. 26, 2024 | Conducted (TH05-HY) |
| Power Sensor | Anritsu | MA2411B | 1027253 | 300MHz~40GHz | Jul. 27, 2023 | Feb. 15, 2024~Apr. 08, 2024 | Jul. 26, 2024 | Conducted (TH05-HY) |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101566 | 10Hz~40GHz | Aug. 23, 2023 | Feb. 15, 2024~Apr. 08, 2024 | Aug. 22, 2024 | Conducted (TH05-HY) |



5 Measurement Uncertainty

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

| | |
|---|---------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 3.44 dB |
|---|---------|

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

| | |
|---|---------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 6.30 dB |
|---|---------|

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

| | |
|---|---------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.50 dB |
|---|---------|

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

| | |
|---|---------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.50 dB |
|---|---------|

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

| | |
|---|---------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.40 dB |
|---|---------|

Appendix A. Test Result of Conducted Test Items

| | | | | |
|----------------|-----------------------|--------------------|-------|----|
| Test Engineer: | Ju Chang | Temperature: | 21~25 | °C |
| Test Date: | 2024/02/15~2024/04/08 | Relative Humidity: | 51~54 | % |

TEST RESULTS DATA**20dB and 99% Occupied Bandwidth and Hopping Channel Separation**

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | 20db BW (MHz) | | 99% Bandwidth (MHz) | | Hopping Channel Separation Measurement (MHz) | | Hopping Channel Separation Measurement Limit (MHz) | | Pass /Fail |
|------|-----------|-----|-----|-------------|---------------|-------|---------------------|-------|--|-------|--|--------|------------|
| | | | | | Ant 3 | Ant 4 | Ant 3 | Ant 4 | Ant 3 | Ant 4 | Ant 3 | Ant 4 | |
| DH | 1Mbps | 2 | 0 | 2402 | 1.043 | 1.043 | 0.968 | 0.969 | 0.703 | 1.003 | 0.6957 | 0.6957 | Pass |
| DH | 1Mbps | 2 | 39 | 2441 | 1.043 | 1.043 | 0.967 | 0.968 | 0.994 | 0.994 | 0.6957 | 0.6957 | Pass |
| DH | 1Mbps | 2 | 78 | 2480 | 1.043 | 1.048 | 0.966 | 0.968 | 0.990 | 0.999 | 0.6957 | 0.6986 | Pass |

TEST RESULTS DATA**Dwell Time**

| Mod. | Hopping Channel Number Rate | Hops Over Occupancy Time(hops) | Package Transfer Time (msec) | Dwell Time (sec) | Limits (sec) | Pass /Fail |
|--------|-----------------------------|--------------------------------|------------------------------|------------------|--------------|------------|
| Normal | 79 | 106.67 | 2.90 | 0.31 | 0.4 | Pass |
| AFH | 20 | 53.33 | 2.90 | 0.15 | 0.4 | Pass |

TEST RESULTS DATA**Peak Power Table**

| DH | CH. | NTX | Peak Power Ant 3 (dBm) | Peak Power Ant 4 (dBm) | Peak Power Total (dBm) | Power Limit (dBm) | Test Result |
|-----|-----|-----|------------------------|------------------------|------------------------|-------------------|-------------|
| DH1 | 0 | 2 | 19.34 | 19.93 | 22.66 | 30.00 | Pass |
| | 39 | 2 | 18.86 | 19.73 | 22.33 | 30.00 | Pass |
| | 78 | 2 | 19.40 | 19.44 | 22.43 | 30.00 | Pass |

TEST RESULTS DATA**Average Power Table
(Reporting Only)**

| DH | CH. | NTX | Average Power Ant 3 (dBm) | Average Power Ant 4 (dBm) | Average Power Total (dBm) | Duty Factor (dB) |
|-----|-----|-----|---------------------------|---------------------------|---------------------------|------------------|
| DH1 | 0 | 2 | 19.09 | 19.79 | 22.47 | 5.15 |
| | 39 | 2 | 18.44 | 19.33 | 21.92 | 5.15 |
| | 78 | 2 | 19.11 | 19.33 | 22.23 | 5.15 |

TEST RESULTS DATA**Number of Hopping Frequency**

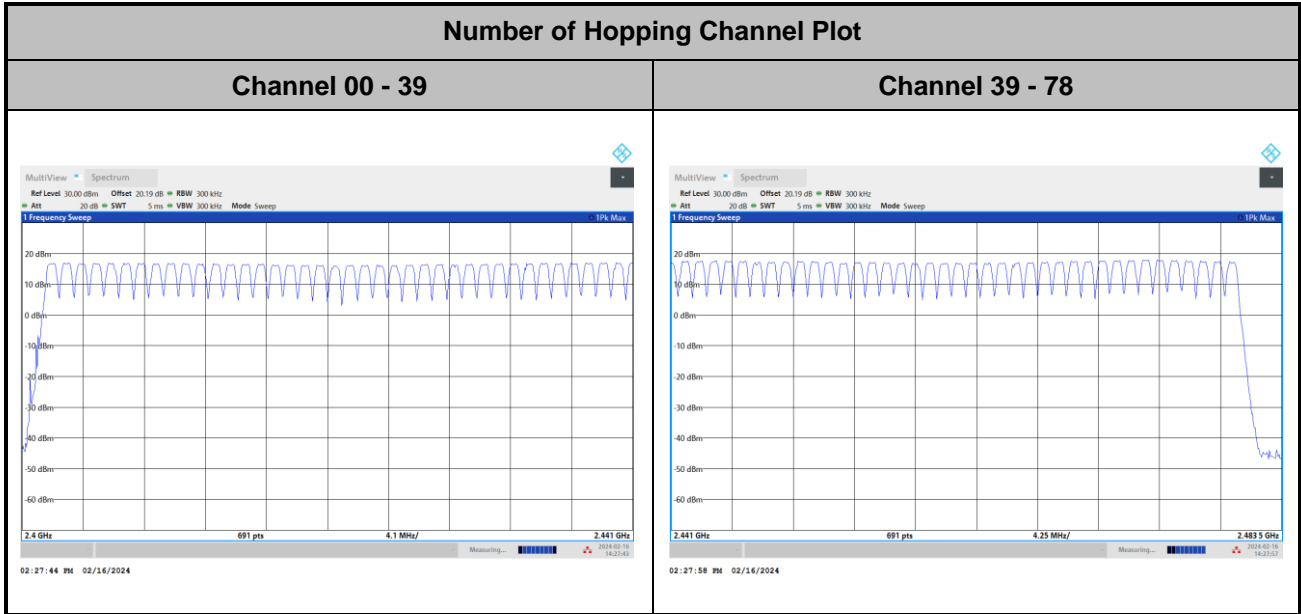
| Number of Hopping (Channel) | Adaptive Frequency Hopping (Channel) | Limits (Channel) | Pass/Fail |
|-----------------------------|--------------------------------------|------------------|-----------|
| 79 | 20 | > 15 | Pass |



<FHSS Ant. 3>

Number of Hopping Frequency

<1Mbps>

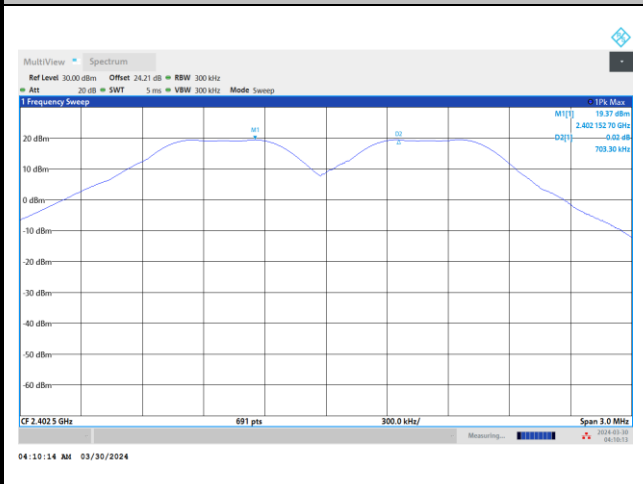




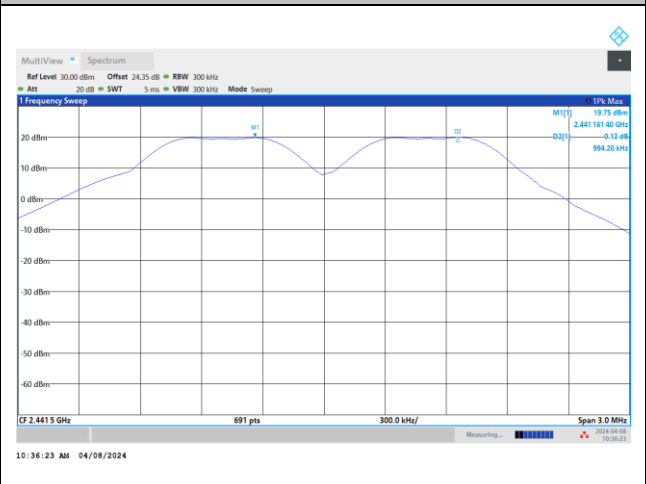
Hopping Channel Separation

<1Mbps>

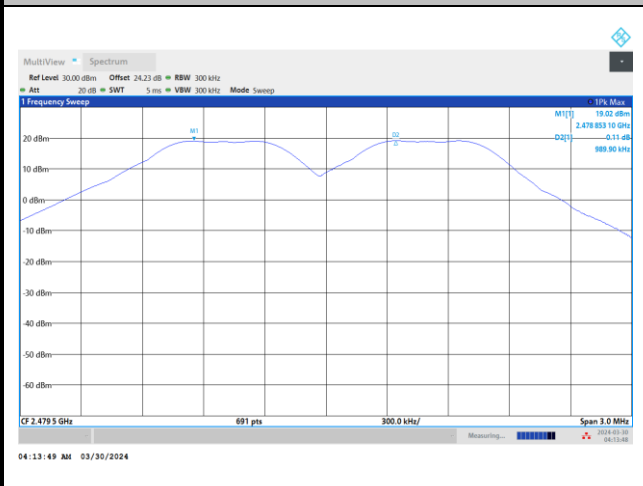
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40

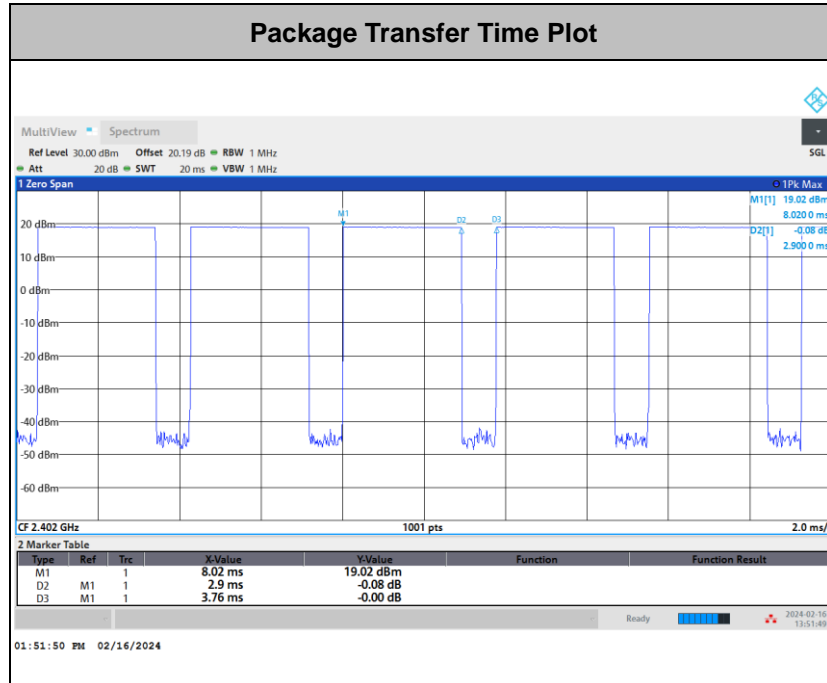


Channel Separation Plot on Channel 77 - 78





Dwell Time



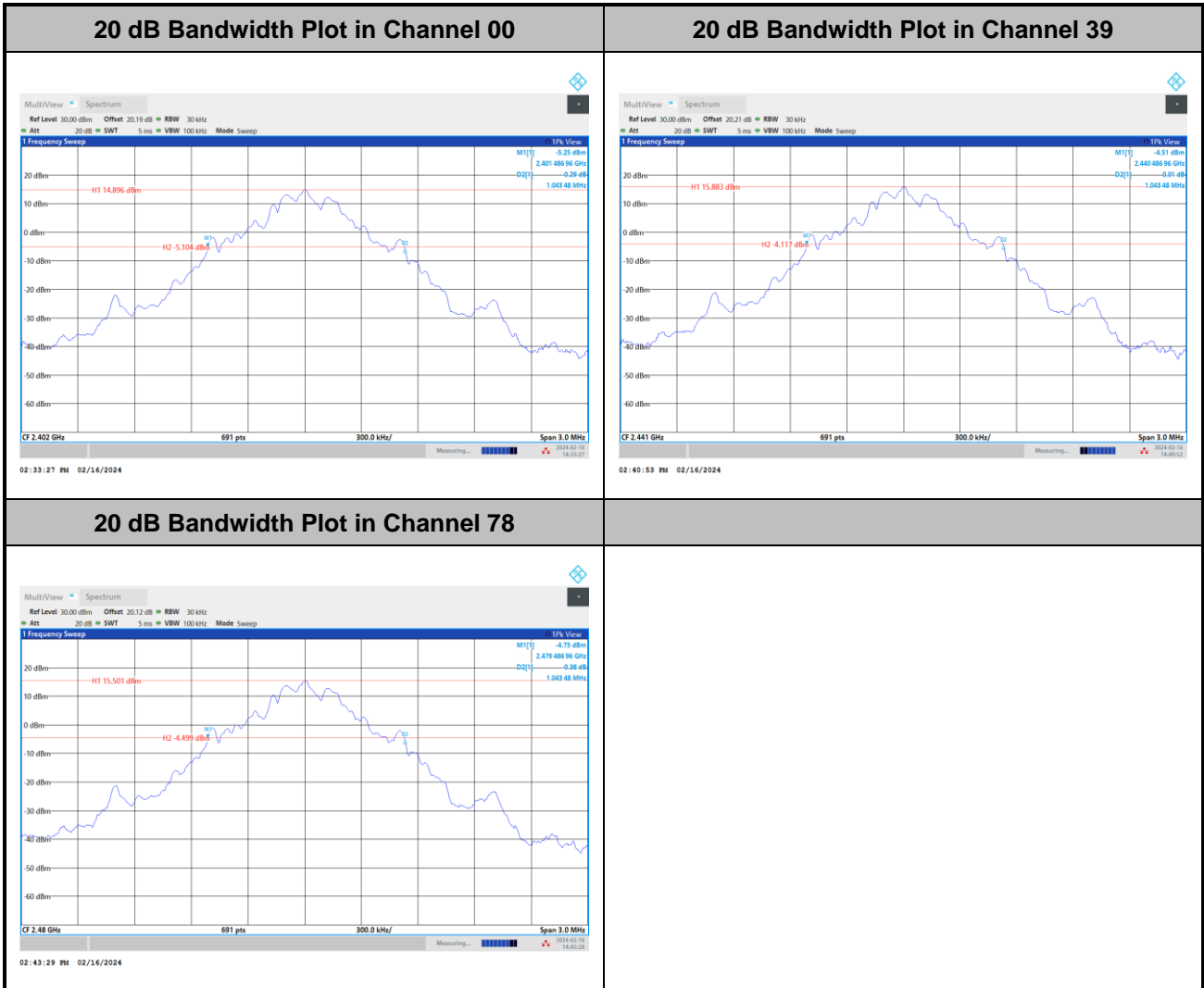
Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time



20dB Bandwidth

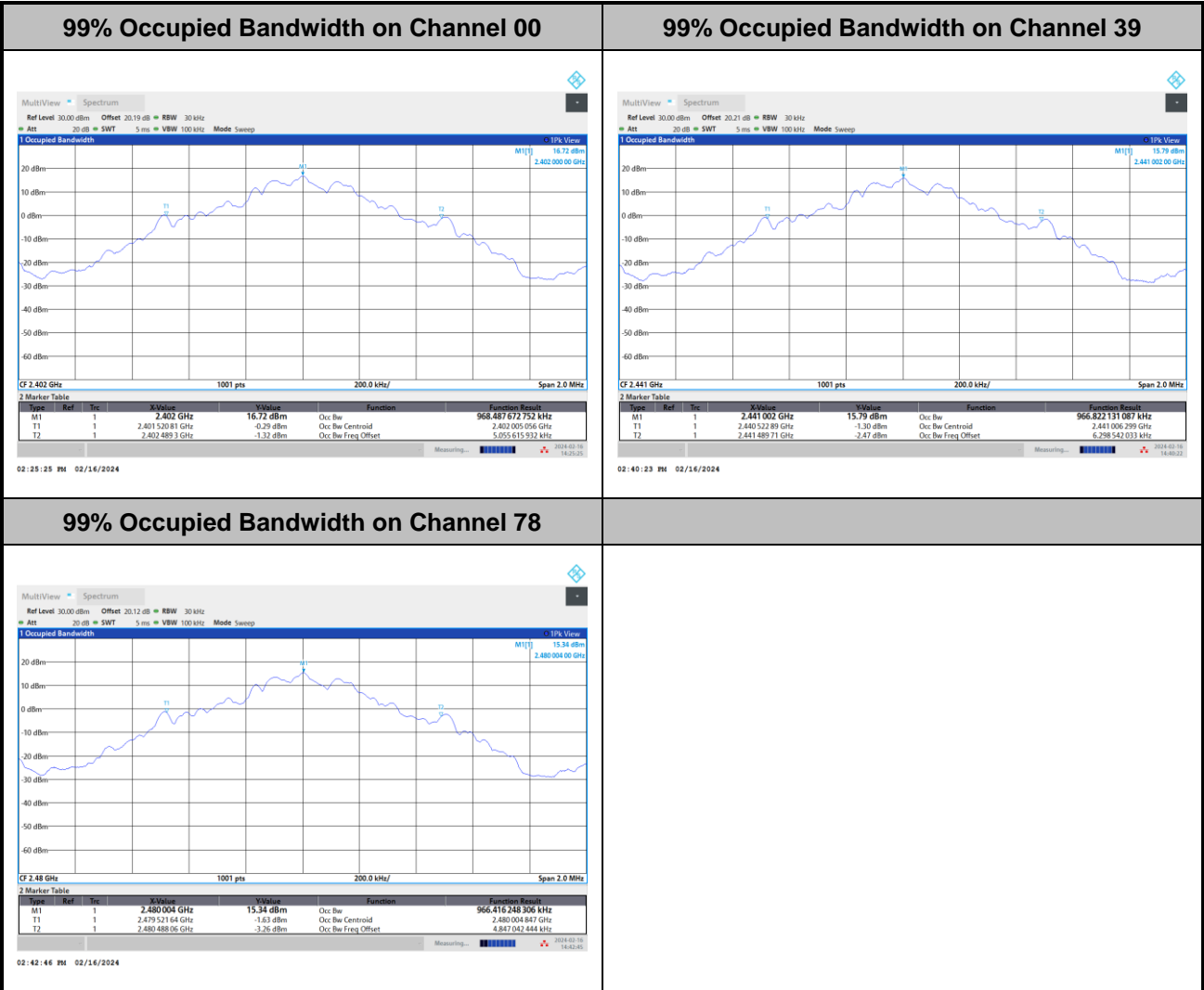
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99% Occupied Bandwidth

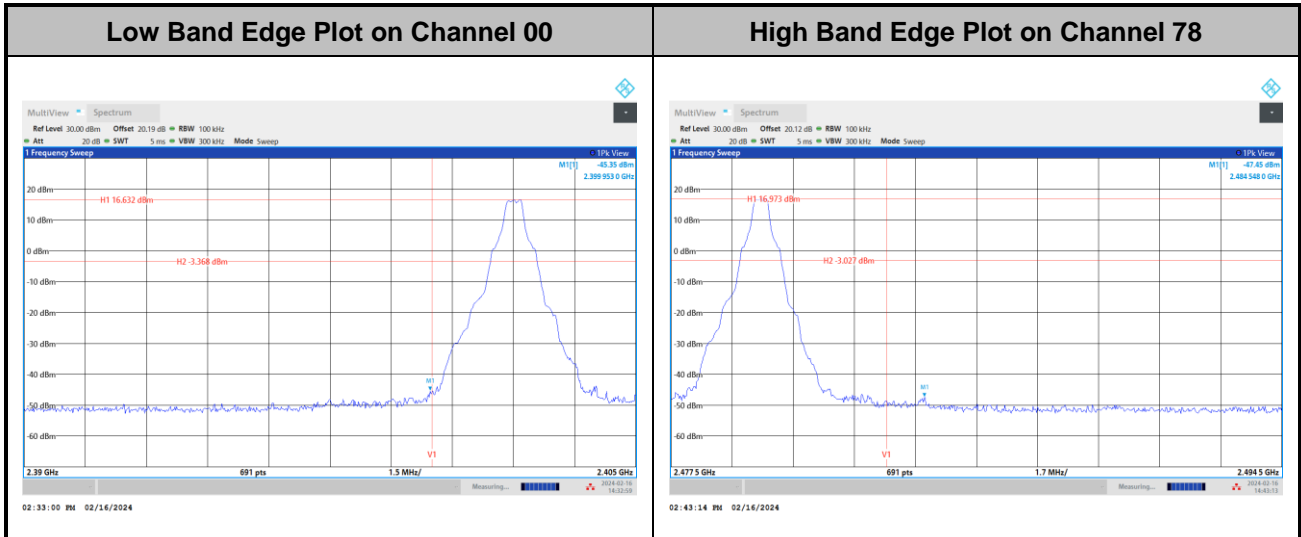
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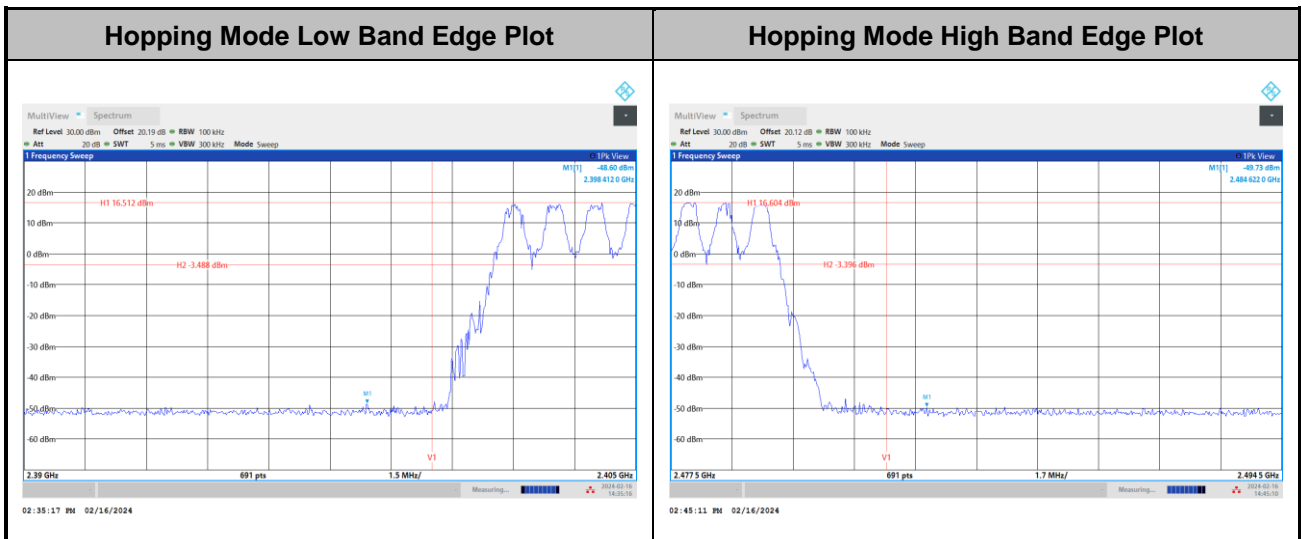
Band Edges

<1Mbps>



Hopping Mode Band Edges

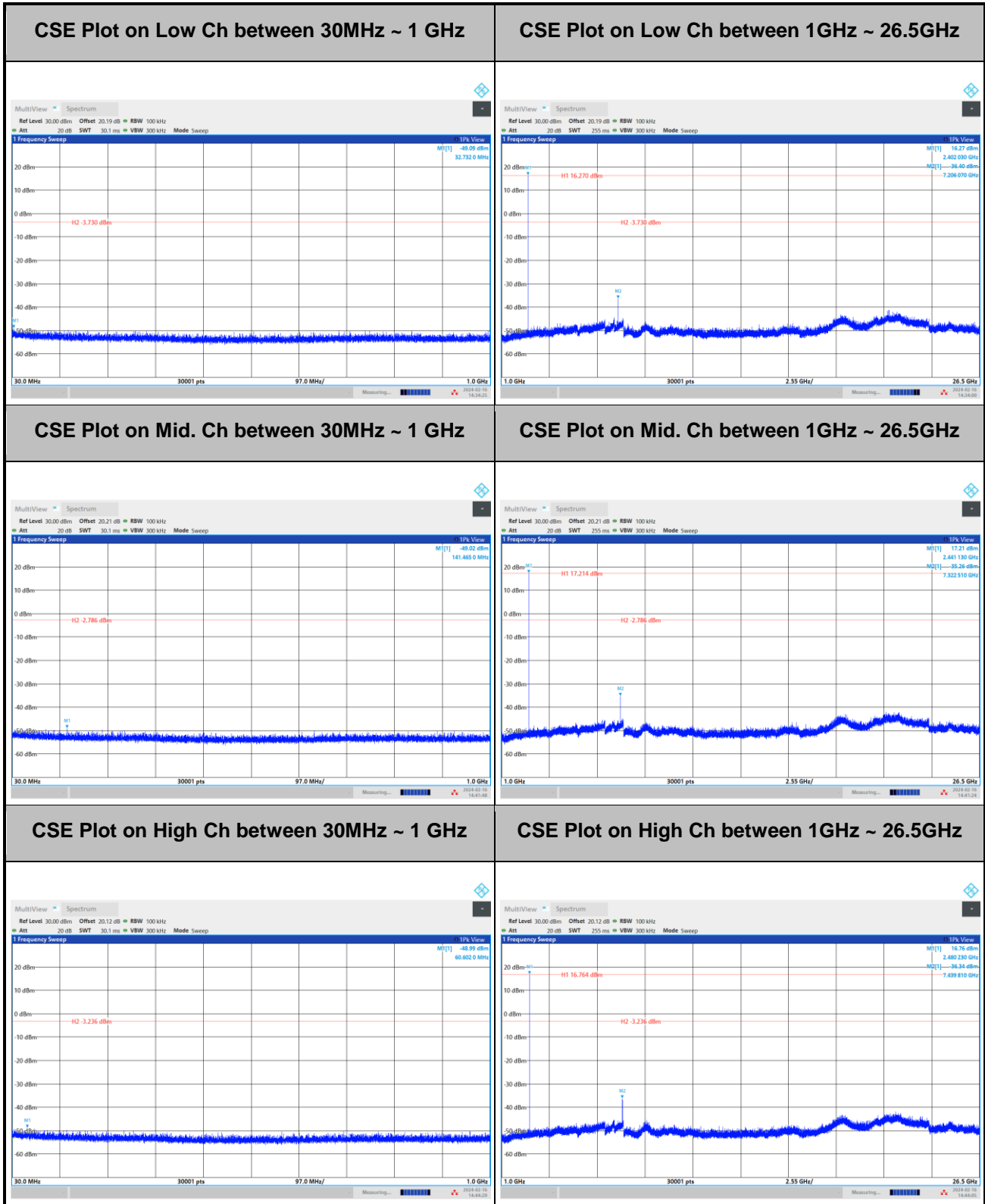
<1Mbps>





Conducted Spurious Emission

<1Mbps>

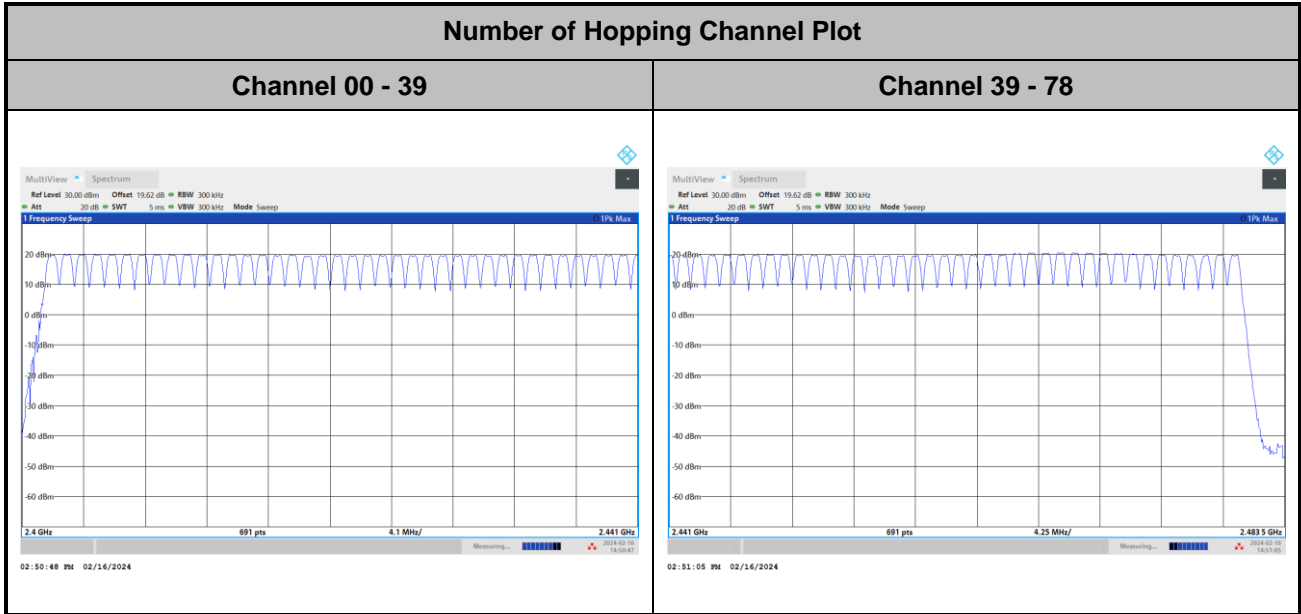




<FHSS Ant. 4>

Number of Hopping Frequency

<1Mbps>

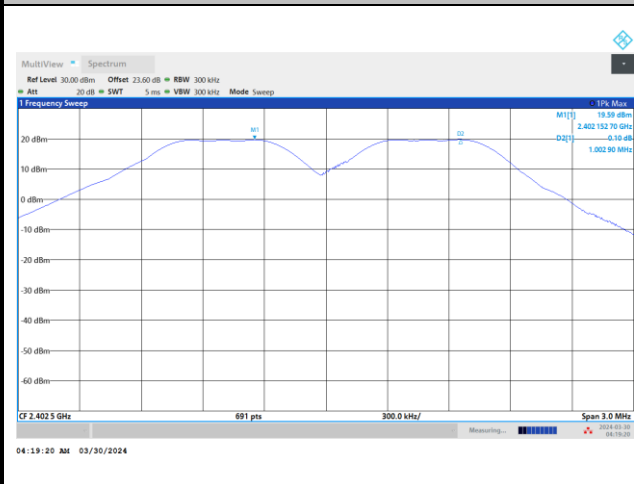




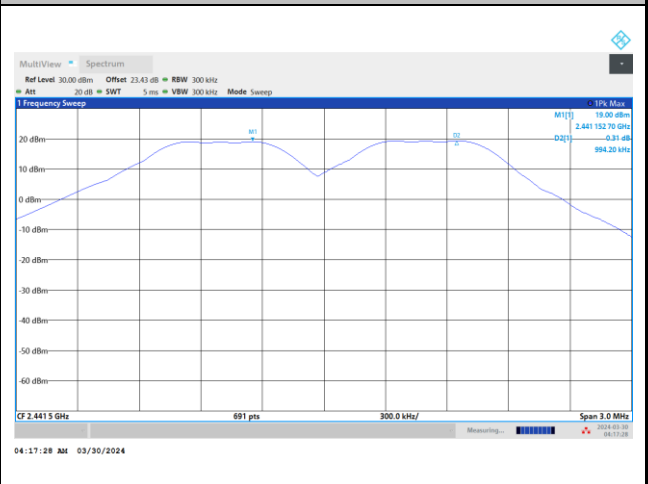
Hopping Channel Separation

<1Mbps>

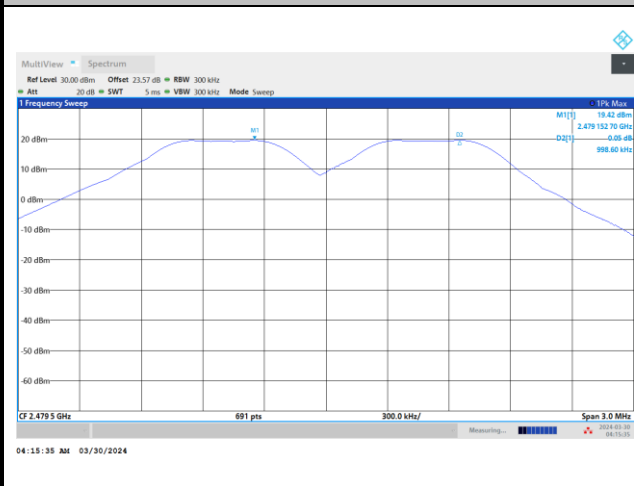
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40

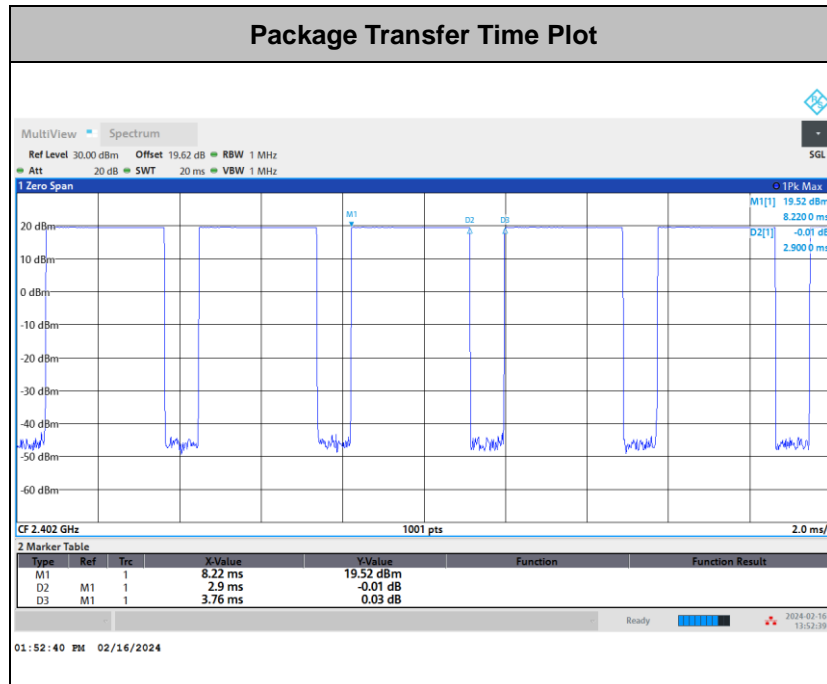


Channel Separation Plot on Channel 77 - 78





Dwell Time



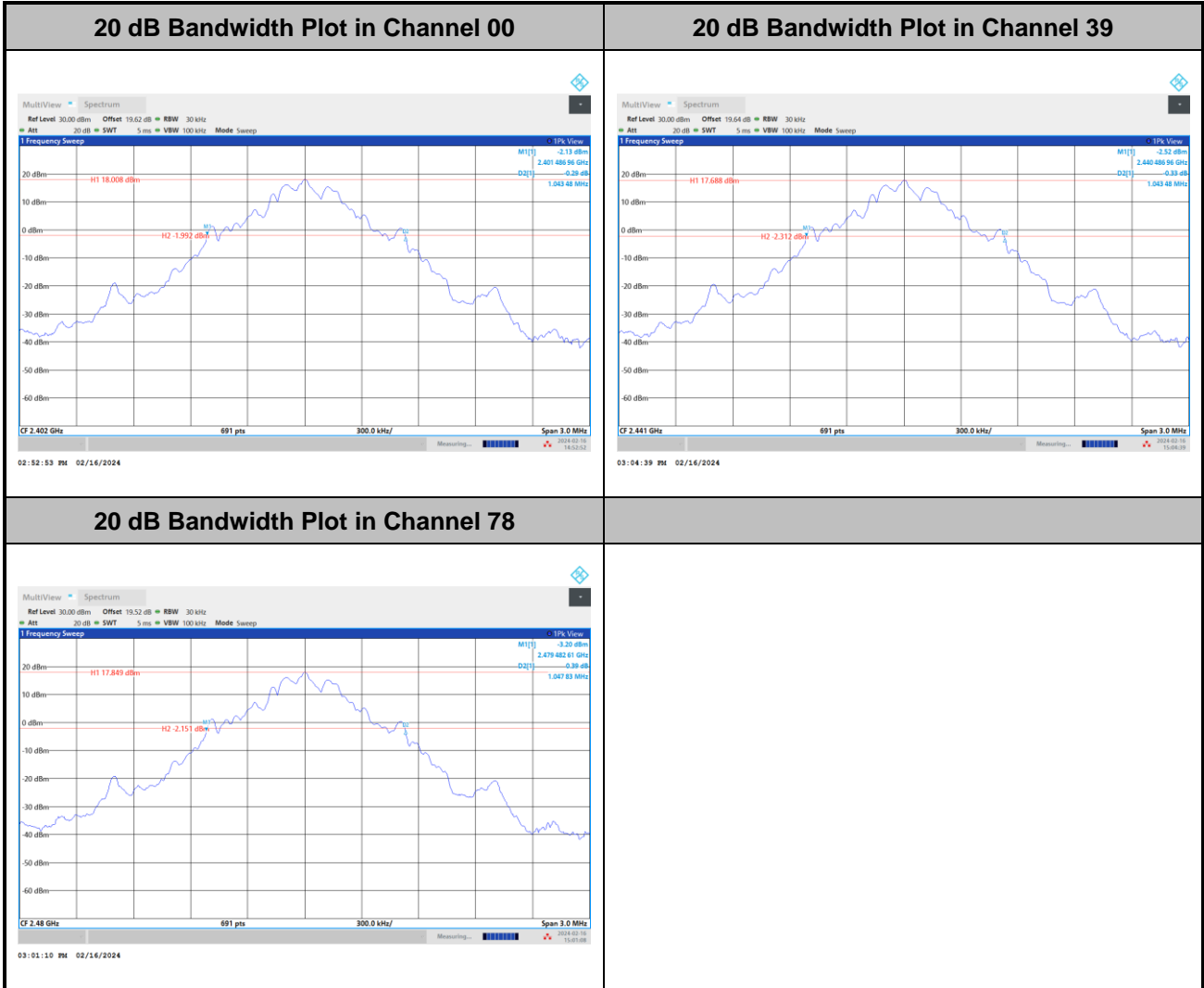
Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s), Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.
2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.
3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time



20dB Bandwidth

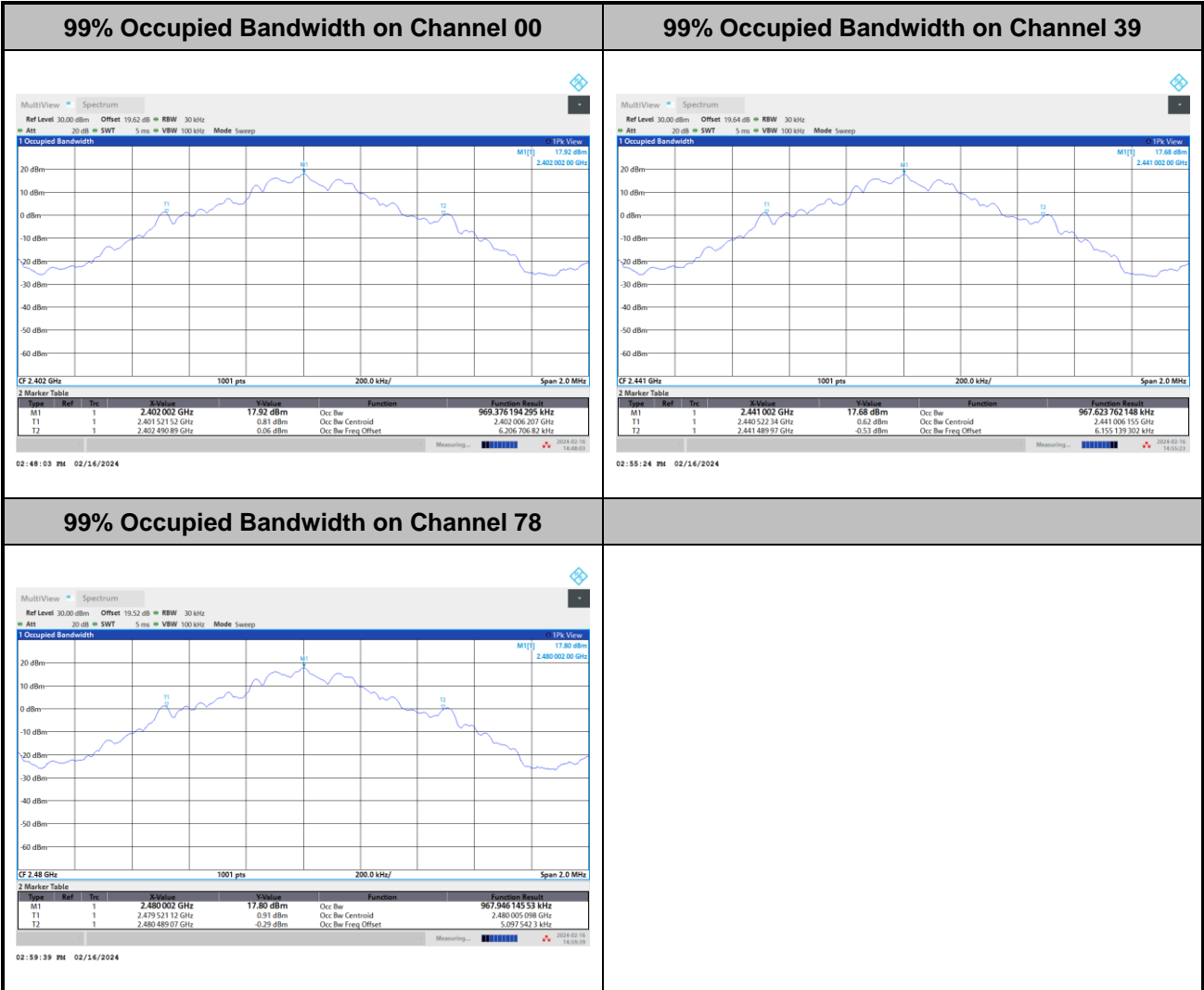
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99% Occupied Bandwidth

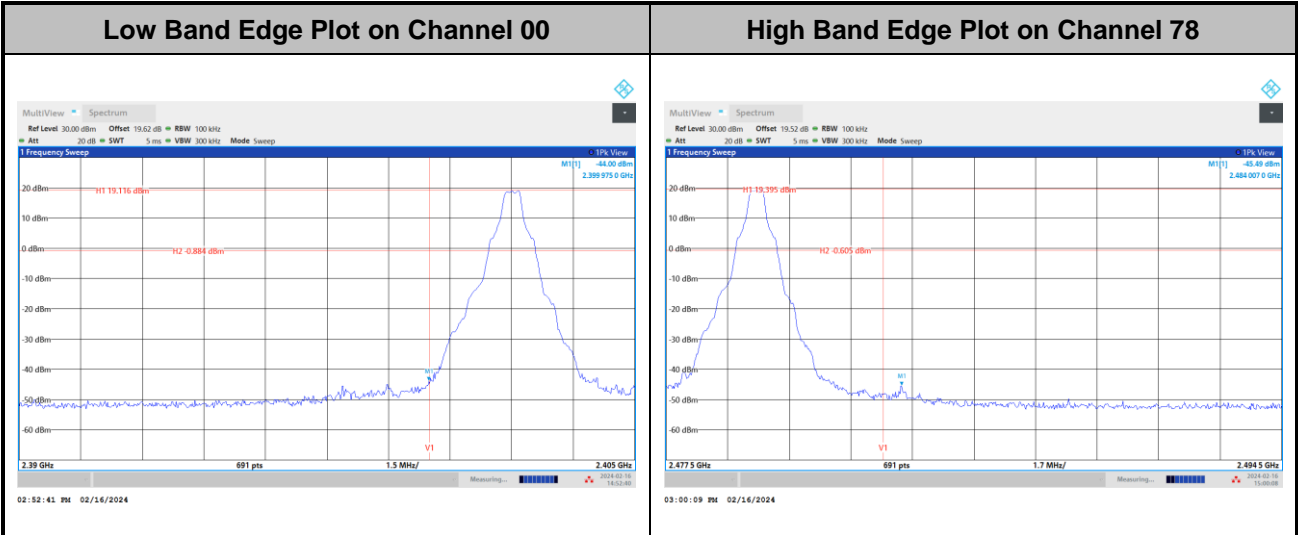
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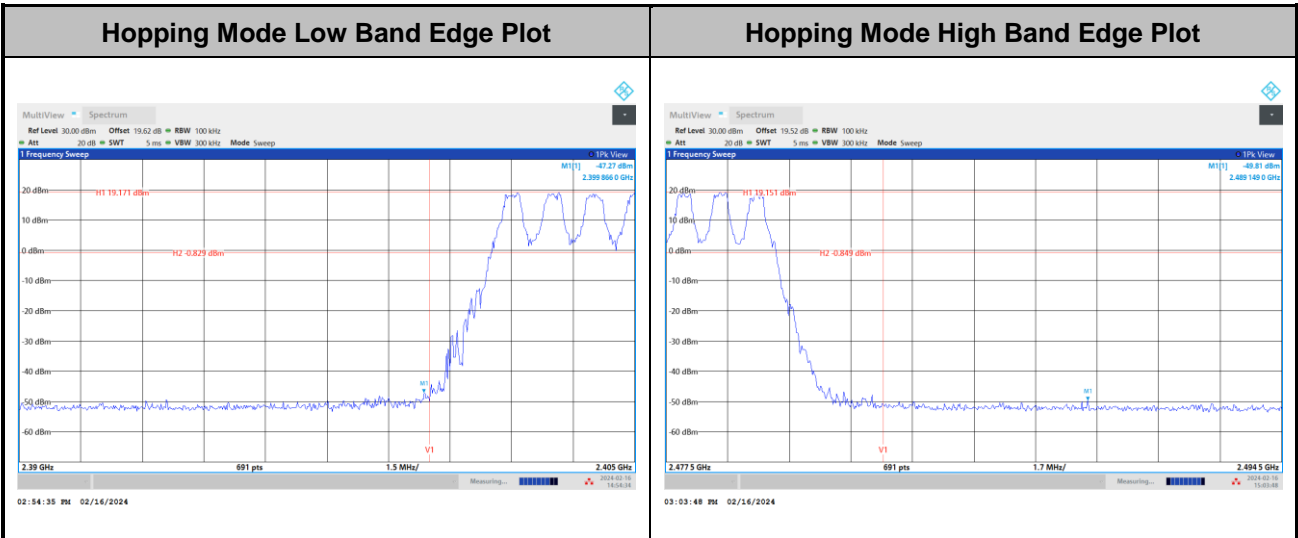
Band Edges

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Hopping Mode Band Edges

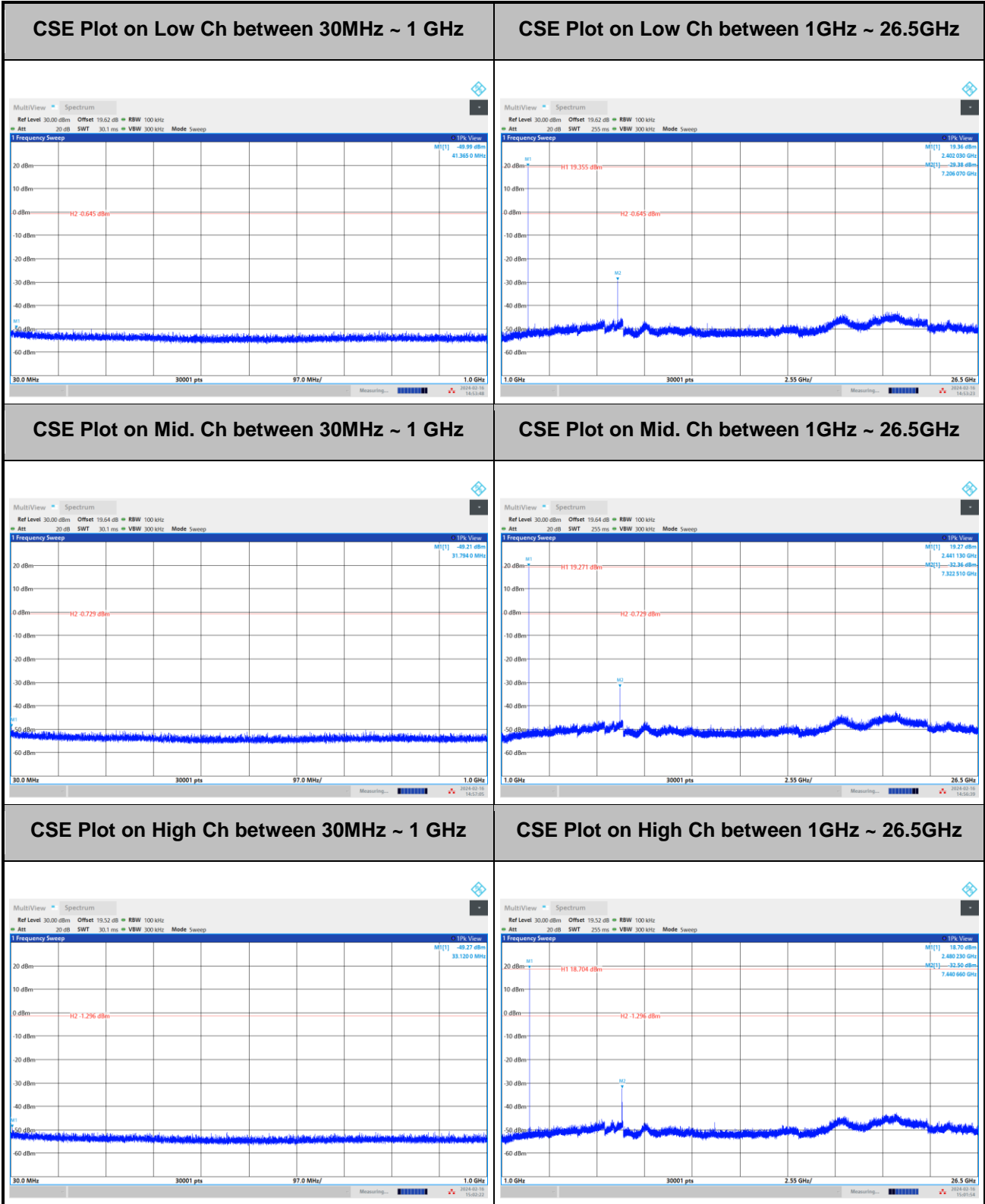
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Conducted Spurious Emission

<1Mbps>





Appendix B. AC Conducted Emission Test Results

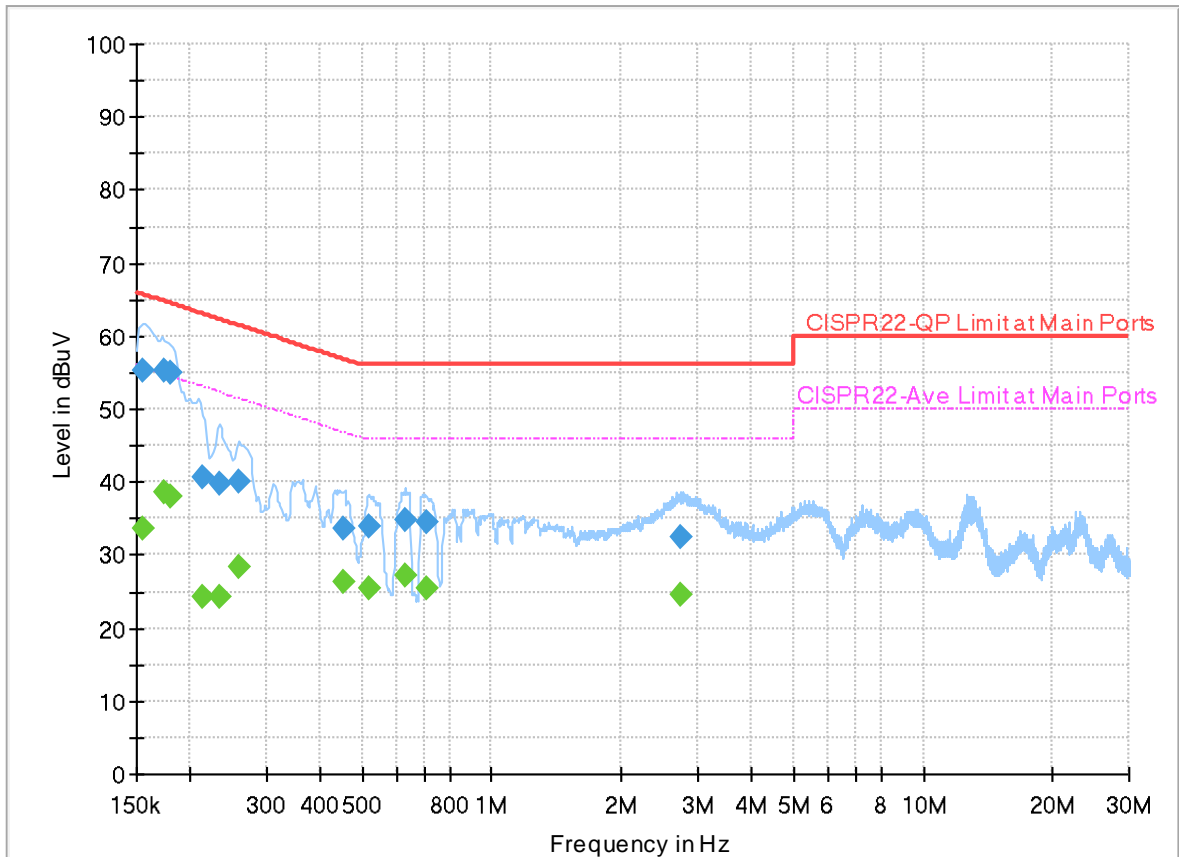
| | | | |
|-----------------|-------------|---------------------|-------------|
| Test Engineer : | Louis Chung | Temperature : | 19.2~23.3°C |
| | | Relative Humidity : | 49.5~53.6% |

EUT Information

Report NO : 3N2325

Test Voltage : 120Vac/60Hz
Phase : Line

Full Spectrum



Final_Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.155760 | --- | 33.53 | 55.69 | 22.16 | L1 | OFF | 19.9 |
| 0.155760 | 55.14 | --- | 65.69 | 10.55 | L1 | OFF | 19.9 |
| 0.174750 | --- | 38.69 | 54.73 | 16.04 | L1 | OFF | 19.9 |
| 0.174750 | 55.14 | --- | 64.73 | 9.59 | L1 | OFF | 19.9 |
| 0.179250 | --- | 38.06 | 54.52 | 16.46 | L1 | OFF | 19.9 |
| 0.179250 | 55.04 | --- | 64.52 | 9.48 | L1 | OFF | 19.9 |
| 0.213000 | --- | 24.12 | 53.09 | 28.97 | L1 | OFF | 19.9 |
| 0.213000 | 40.51 | --- | 63.09 | 22.58 | L1 | OFF | 19.9 |
| 0.233160 | --- | 24.15 | 52.34 | 28.19 | L1 | OFF | 19.9 |
| 0.233160 | 39.65 | --- | 62.34 | 22.69 | L1 | OFF | 19.9 |
| 0.260250 | --- | 28.39 | 51.42 | 23.03 | L1 | OFF | 19.9 |
| 0.260250 | 40.10 | --- | 61.42 | 21.32 | L1 | OFF | 19.9 |
| 0.455460 | --- | 26.35 | 46.78 | 20.43 | L1 | OFF | 19.9 |
| 0.455460 | 33.62 | --- | 56.78 | 23.16 | L1 | OFF | 19.9 |
| 0.520170 | --- | 25.33 | 46.00 | 20.67 | L1 | OFF | 19.9 |
| 0.520170 | 34.00 | --- | 56.00 | 22.00 | L1 | OFF | 19.9 |
| 0.629250 | --- | 27.12 | 46.00 | 18.88 | L1 | OFF | 19.9 |
| 0.629250 | 34.77 | --- | 56.00 | 21.23 | L1 | OFF | 19.9 |
| 0.705750 | --- | 25.44 | 46.00 | 20.56 | L1 | OFF | 19.9 |

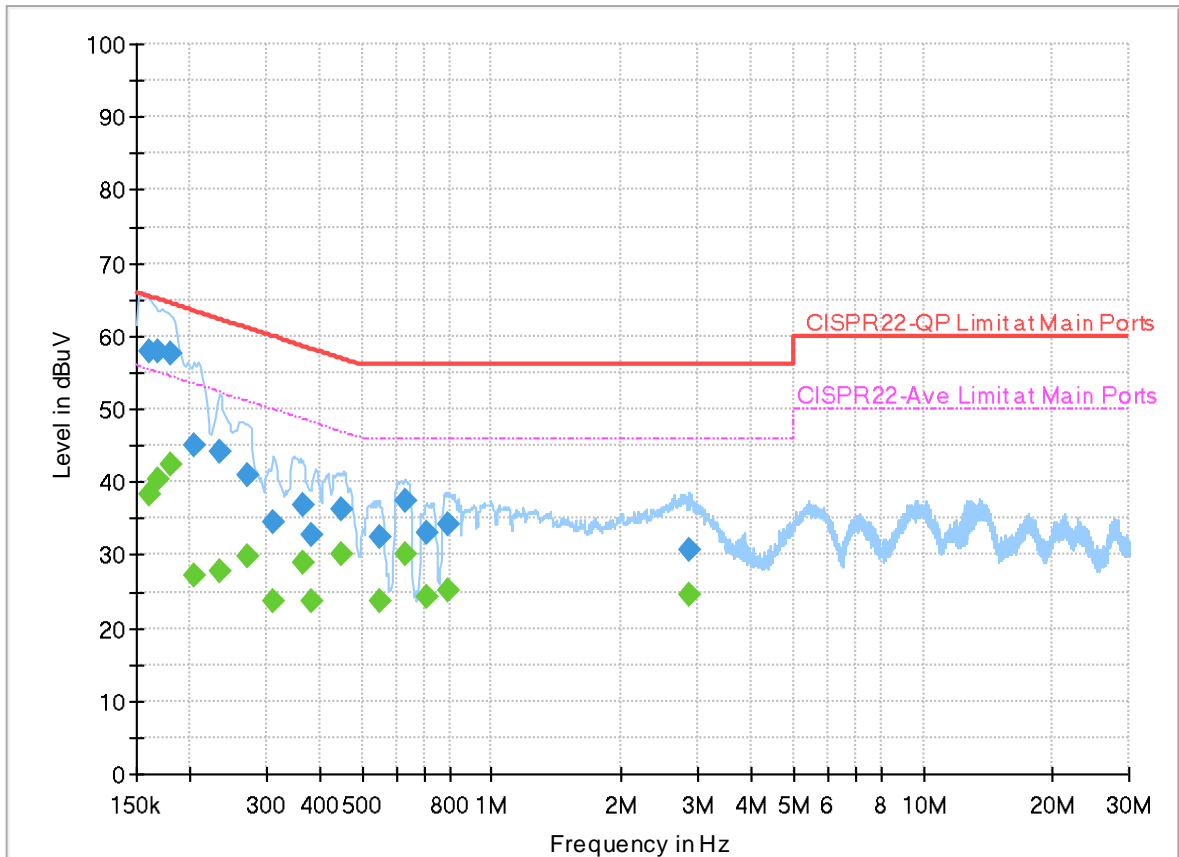
| | | | | | | | |
|-----------------|--------------|--------------|--------------|--------------|-----------|------------|-------------|
| 0.705750 | 34.58 | --- | 56.00 | 21.42 | L1 | OFF | 19.9 |
| 2.737500 | --- | 24.71 | 46.00 | 21.29 | L1 | OFF | 20.0 |
| 2.737500 | 32.35 | --- | 56.00 | 23.65 | L1 | OFF | 20.0 |

EUT Information

Report NO : 3N2325

Test Voltage : 120Vac/60Hz
Phase : Neutral

Full Spectrum



Final_Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|------|--------|------------|
| 0.161250 | --- | 38.41 | 55.40 | 16.99 | N | OFF | 19.9 |
| 0.161250 | 57.98 | --- | 65.40 | 7.42 | N | OFF | 19.9 |
| 0.168000 | --- | 40.46 | 55.06 | 14.60 | N | OFF | 19.9 |
| 0.168000 | 57.96 | --- | 65.06 | 7.10 | N | OFF | 19.9 |
| 0.179880 | --- | 42.44 | 54.49 | 12.05 | N | OFF | 19.9 |
| 0.179880 | 57.70 | --- | 64.49 | 6.79 | N | OFF | 19.9 |
| 0.204270 | --- | 27.24 | 53.44 | 26.20 | N | OFF | 19.9 |
| 0.204270 | 44.89 | --- | 63.44 | 18.55 | N | OFF | 19.9 |
| 0.235230 | --- | 27.69 | 52.26 | 24.57 | N | OFF | 19.9 |
| 0.235230 | 44.05 | --- | 62.26 | 18.21 | N | OFF | 19.9 |
| 0.271590 | --- | 29.76 | 51.07 | 21.31 | N | OFF | 19.9 |
| 0.271590 | 40.93 | --- | 61.07 | 20.14 | N | OFF | 19.9 |
| 0.309750 | --- | 23.71 | 49.98 | 26.27 | N | OFF | 19.9 |
| 0.309750 | 34.58 | --- | 59.98 | 25.40 | N | OFF | 19.9 |
| 0.363300 | --- | 29.07 | 48.65 | 19.58 | N | OFF | 19.9 |
| 0.363300 | 36.75 | --- | 58.65 | 21.90 | N | OFF | 19.9 |
| 0.382920 | --- | 23.74 | 48.22 | 24.48 | N | OFF | 19.9 |
| 0.382920 | 32.74 | --- | 58.22 | 25.48 | N | OFF | 19.9 |
| 0.449250 | --- | 30.22 | 46.89 | 16.67 | N | OFF | 19.9 |

| | | | | | | | |
|----------|-------|-------|-------|-------|---|-----|------|
| 0.449250 | 36.35 | --- | 56.89 | 20.54 | N | OFF | 19.9 |
| 0.550680 | --- | 23.79 | 46.00 | 22.21 | N | OFF | 19.9 |
| 0.550680 | 32.51 | --- | 56.00 | 23.49 | N | OFF | 19.9 |
| 0.629430 | --- | 30.13 | 46.00 | 15.87 | N | OFF | 19.9 |
| 0.629430 | 37.45 | --- | 56.00 | 18.55 | N | OFF | 19.9 |
| 0.708450 | --- | 24.30 | 46.00 | 21.70 | N | OFF | 19.9 |
| 0.708450 | 32.98 | --- | 56.00 | 23.02 | N | OFF | 19.9 |
| 0.787470 | --- | 25.07 | 46.00 | 20.93 | N | OFF | 19.9 |
| 0.787470 | 34.35 | --- | 56.00 | 21.65 | N | OFF | 19.9 |
| 2.869620 | --- | 24.52 | 46.00 | 21.48 | N | OFF | 20.0 |
| 2.869620 | 30.66 | --- | 56.00 | 25.34 | N | OFF | 20.0 |



Appendix C. Radiated Spurious Emission

| | | | |
|-----------------|--|---------------------|-------------|
| Test Engineer : | Daniel Lee, Quentin Liu and Bigshow Wang | Temperature : | 22.1~22.6°C |
| | | Relative Humidity : | 55~57% |

<BR_FHSS Ant. 3+4>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. | |
|------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|---|
| | | (MHz) | (dBµV/m) | (dB) | (dBµV/m) | (dBµV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) | |
| BT CH00 2402MHz | | 2310.525 | 50.15 | -23.85 | 74 | 44.29 | 27.22 | 15.42 | 36.78 | 100 | 214 | P | H | |
| | | 2310.525 | 25.39 | -28.61 | 54 | - | - | - | - | - | - | A | H | |
| | * | 2402 | 104.89 | - | - | 98.71 | 27.41 | 15.54 | 36.77 | 100 | 214 | P | H | |
| | * | 2402 | 80.13 | - | - | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | 2329.32 | 49.56 | -24.44 | 74 | 43.64 | 27.26 | 15.44 | 36.78 | 280 | 264 | P | V |
| | | | 2329.32 | 24.8 | -29.2 | 54 | - | - | - | - | - | - | A | V |
| | * | | 2402 | 103.8 | - | - | 97.62 | 27.41 | 15.54 | 36.77 | 280 | 264 | P | V |
| | * | | 2402 | 79.04 | - | - | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
| BT CH 39 2441MHz | | 2318.96 | 49.86 | -24.14 | 74 | 43.97 | 27.24 | 15.43 | 36.78 | 100 | 215 | P | H | |
| | | 2318.96 | 25.1 | -28.9 | 54 | - | - | - | - | - | - | A | H | |
| | * | 2441 | 105.25 | - | - | 98.87 | 27.56 | 15.59 | 36.77 | 100 | 215 | P | H | |
| | * | 2441 | 80.49 | - | - | - | - | - | - | - | - | A | H | |
| | | | 2495.38 | 50.37 | -23.63 | 74 | 43.71 | 27.78 | 15.65 | 36.77 | 100 | 215 | P | H |
| | | | 2495.38 | 25.61 | -28.39 | 54 | - | - | - | - | - | - | A | H |
| | | | 2358.02 | 49.99 | -24.01 | 74 | 43.97 | 27.32 | 15.48 | 36.78 | 382 | 79 | P | V |
| | | | 2358.02 | 25.23 | -28.77 | 54 | - | - | - | - | - | - | A | V |
| | * | | 2441 | 103.02 | - | - | 96.64 | 27.56 | 15.59 | 36.77 | 382 | 79 | P | V |
| | * | | 2441 | 78.26 | - | - | - | - | - | - | - | - | A | V |
| | | | 2499.72 | 50.16 | -23.84 | 74 | 43.48 | 27.8 | 15.65 | 36.77 | 382 | 79 | P | V |
| | | | 2499.72 | 25.4 | -28.6 | 54 | - | - | - | - | - | - | A | V |



| BT | Note | Frequency (MHz) | Level (dBμV/m) | Margin (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|---|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 78 2480MHz | * | 2480 | 104.79 | - | - | 98.21 | 27.72 | 15.63 | 36.77 | 249 | 213 | P | H | |
| | * | 2480 | 80.03 | - | - | - | - | - | - | - | - | A | H | |
| | | 2485.84 | 55.89 | -18.11 | 74 | 49.28 | 27.74 | 15.64 | 36.77 | 249 | 213 | P | H | |
| | | 2485.84 | 31.13 | -22.87 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | * | 2480 | 101.4 | - | - | 94.82 | 27.72 | 15.63 | 36.77 | 100 | 236 | P | V | |
| | * | 2480 | 76.64 | - | - | - | - | - | - | - | - | - | A | V |
| | | 2485.88 | 53.06 | -20.94 | 74 | 46.45 | 27.74 | 15.64 | 36.77 | 100 | 236 | P | V | |
| | | 2485.88 | 28.3 | -25.7 | 54 | - | - | - | - | - | - | A | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | | |



2.4GHz 2400~2483.5MHz
BT (Harmonic @ 3m)

| BT | Note | Frequency (MHz) | Level (dBμV/m) | Margin (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) |
|------------------------|------|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| BT CH 00 2402MHz | | 4804 | 40.1 | -33.9 | 74 | 57.25 | 32.12 | 8.49 | 57.76 | - | - | P | H |
| | | 4804 | 15.34 | -38.66 | 54 | - | - | - | - | - | - | A | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
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| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
| | | | 4804 | 41.07 | -32.93 | 74 | 58.22 | 32.12 | 8.49 | 57.76 | - | - | P |
| | | 4804 | 16.31 | -37.69 | 54 | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | V |
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| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |



| BT | Note | Frequency (MHz) | Level (dBµV/m) | Margin (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|------|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 39 2441MHz | | 4882 | 39.01 | -34.99 | 74 | 55.64 | 32.59 | 8.56 | 57.78 | - | - | P | H | |
| | | 4882 | 14.25 | -39.75 | 54 | - | - | - | - | - | - | A | H | |
| | | 7323 | 43.88 | -30.12 | 74 | 55.53 | 36.66 | 10.35 | 58.66 | - | - | P | H | |
| | | 7323 | 19.12 | -34.88 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
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| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | 4882 | 40.28 | -33.72 | 74 | 56.91 | 32.59 | 8.56 | 57.78 | - | - | P | V |
| | | | 4882 | 15.52 | -38.48 | 54 | - | - | - | - | - | - | A | V |
| | | | 7323 | 43.72 | -30.28 | 74 | 55.37 | 36.66 | 10.35 | 58.66 | - | - | P | V |
| | | | 7323 | 18.96 | -35.04 | 54 | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
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| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |



| BT | Note | Frequency (MHz) | Level (dBµV/m) | Margin (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|--|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 78 2480MHz | | 4960 | 39.33 | -34.67 | 74 | 55.49 | 33 | 8.63 | 57.79 | - | - | P | H | |
| | | 4960 | 14.57 | -39.43 | 54 | - | - | - | - | - | - | A | H | |
| | | 7440 | 45.13 | -28.87 | 74 | 57.29 | 36.12 | 10.47 | 58.75 | - | - | P | H | |
| | | 7440 | 20.37 | -33.63 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
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| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | 4960 | 39.68 | -34.32 | 74 | 55.84 | 33 | 8.63 | 57.79 | - | - | P | V |
| | | | 4960 | 14.92 | -39.08 | 54 | - | - | - | - | - | - | A | V |
| | | | 7440 | 44.31 | -29.69 | 74 | 56.47 | 36.12 | 10.47 | 58.75 | - | - | P | V |
| | | | 7440 | 19.55 | -34.45 | 54 | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
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| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only. | | | | | | | | | | | | | |



Emission above 18GHz

2.4GHz BT (SHF)

| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. |
|---------------------|---|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| | | | | | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | |
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| 2.4GHz BT SHF | | 24706.5 | 41.31 | -32.69 | 74 | 57.87 | 39.27 | -2.41 | 53.42 | - | - | P | H |
| | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | H |
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| | | | | | | | | | | | | | H |
| | | | 24400.5 | 40.5 | -33.5 | 74 | 57.53 | 39 | -2.45 | 53.58 | - | - | P |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
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| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | 1. No other spurious found. 2. All results are PASS against limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only. | | | | | | | | | | | | |



Emission below 1GHz

2.4GHz BT (LF)

| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. | |
|--------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|---|
| | | | | | Line | Level | Factor | Loss | Factor | Pos | Pos | Avg. | | |
| | | (MHz) | (dBµV/m) | (dB) | (dBµV/m) | (dBµV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) | |
| 2.4GHz BT LF | | 31.26 | 23.99 | -16.01 | 40 | 31.41 | 24.17 | 0.73 | 32.32 | - | - | P | H | |
| | | 62.76 | 21.56 | -18.44 | 40 | 40.88 | 12 | 1.06 | 32.38 | - | - | P | H | |
| | | 99.3 | 31.29 | -12.21 | 43.5 | 46.59 | 15.76 | 1.31 | 32.37 | - | - | P | H | |
| | | 177.06 | 23.4 | -20.1 | 43.5 | 38.8 | 15.17 | 1.8 | 32.37 | - | - | P | H | |
| | | 328.8 | 25.84 | -20.16 | 46 | 36.48 | 19.5 | 2.22 | 32.36 | - | - | P | H | |
| | | 871.2 | 30.7 | -15.3 | 46 | 30.51 | 28.32 | 3.53 | 31.66 | - | - | P | H | |
| | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | H |
| | | | 30.18 | 27.87 | -12.13 | 40 | 34.96 | 24.58 | 0.72 | 32.39 | - | - | P | V |
| | | | 64.74 | 33.54 | -6.46 | 40 | 52.79 | 12.1 | 1.07 | 32.42 | - | - | P | V |
| | | | 97.32 | 27.67 | -15.83 | 43.5 | 43.2 | 15.59 | 1.3 | 32.42 | - | - | P | V |
| | | | 179.76 | 26.37 | -17.13 | 43.5 | 41.97 | 14.98 | 1.82 | 32.4 | - | - | P | V |
| | | | 760.8 | 29.26 | -16.74 | 46 | 30.43 | 27.71 | 3.31 | 32.19 | - | - | P | V |
| | | | 956 | 32.24 | -13.76 | 46 | 29.68 | 29.76 | 3.76 | 30.96 | - | - | P | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |

Remark

- No other spurious found.
- All results are PASS against limit line.
- The emission position marked as "-" means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.



<BR_FHSS Ant. 3>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. | |
|------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|---|
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) | |
| BT CH00 2402MHz | | 2377.935 | 49.69 | -24.31 | 74 | 43.59 | 27.36 | 15.51 | 36.77 | 100 | 215 | P | H | |
| | | 2377.935 | 24.93 | -29.07 | 54 | - | - | - | - | - | - | A | H | |
| | * | 2402 | 111.62 | - | - | 105.44 | 27.41 | 15.54 | 36.77 | 100 | 215 | P | H | |
| | * | 2402 | 86.86 | - | - | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | | H |
| | | | 2353.47 | 49.37 | -24.63 | 74 | 43.36 | 27.31 | 15.48 | 36.78 | 296 | 298 | P | V |
| | | | 2353.47 | 24.61 | -29.39 | 54 | - | - | - | - | - | - | A | V |
| | * | | 2402 | 106.81 | - | - | 100.63 | 27.41 | 15.54 | 36.77 | 296 | 298 | P | V |
| | * | | 2402 | 82.05 | - | - | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| BT CH 39 2441MHz | | 2386.86 | 50.69 | -23.31 | 74 | 44.57 | 27.37 | 15.52 | 36.77 | 100 | 213 | P | H | |
| | | 2386.86 | 25.93 | -28.07 | 54 | - | - | - | - | - | - | A | H | |
| | * | 2441 | 113.77 | - | - | 107.39 | 27.56 | 15.59 | 36.77 | 100 | 213 | P | H | |
| | * | 2441 | 89.01 | - | - | - | - | - | - | - | - | A | H | |
| | | | 2485.65 | 50.87 | -23.13 | 74 | 44.26 | 27.74 | 15.64 | 36.77 | 100 | 213 | P | H |
| | | | 2485.65 | 26.11 | -27.89 | 54 | - | - | - | - | - | - | A | H |
| | | | 2321.48 | 50.14 | -23.86 | 74 | 44.25 | 27.24 | 15.43 | 36.78 | 400 | 281 | P | V |
| | | | 2321.48 | 25.38 | -28.62 | 54 | - | - | - | - | - | - | A | V |
| | * | | 2441 | 108.31 | - | - | 101.93 | 27.56 | 15.59 | 36.77 | 400 | 281 | P | V |
| | * | | 2441 | 83.55 | - | - | - | - | - | - | - | - | A | V |
| | | | 2485.58 | 50.49 | -23.51 | 74 | 43.88 | 27.74 | 15.64 | 36.77 | 400 | 281 | P | V |
| | | | 2485.58 | 25.73 | -28.27 | 54 | - | - | - | - | - | - | A | V |



| BT | Note | Frequency (MHz) | Level (dBμV/m) | Margin (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|---------------|---|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 78 2480MHz | * | 2480 | 108.74 | - | - | 102.16 | 27.72 | 15.63 | 36.77 | 400 | 261 | P | H | |
| | * | 2480 | 83.98 | - | - | - | - | - | - | - | - | A | H | |
| | | 2483.96 | 58.2 | -15.8 | 74 | 51.59 | 27.74 | 15.64 | 36.77 | 400 | 261 | P | H | |
| | | 2483.96 | 33.44 | -20.56 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | * | 2480 | 108.9 | - | - | 102.32 | 27.72 | 15.63 | 36.77 | 400 | 307 | P | V | |
| | * | 2480 | 84.14 | - | - | - | - | - | - | - | - | - | A | V |
| | | 2483.76 | 58.49 | -15.51 | 74 | 51.88 | 27.74 | 15.64 | 36.77 | 400 | 307 | P | V | |
| | | 2483.76 | 33.73 | -20.27 | 54 | - | - | - | - | - | - | A | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | |



2.4GHz 2400~2483.5MHz
BT (Harmonic @ 3m)

Table with 14 columns: BT, Note, Frequency (MHz), Level (dBµV/m), Margin (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Path Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include data for BT CH 00 2402MHz at 4804 MHz.



| BT | Note | Frequency (MHz) | Level (dBμV/m) | Margin (dB) | Limit Line (dBμV/m) | Read Level (dBμV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|---------------------------------|------|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 39 2441MHz | | 4882 | 39.17 | -34.83 | 74 | 55.8 | 32.59 | 8.56 | 57.78 | - | - | P | H | |
| | | 4882 | 14.41 | -39.59 | 54 | - | - | - | - | - | - | A | H | |
| | | 7323 | 45.68 | -28.32 | 74 | 57.33 | 36.66 | 10.35 | 58.66 | - | - | P | H | |
| | | 7323 | 20.92 | -33.08 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | 4882 | 39 | -35 | 74 | 55.63 | 32.59 | 8.56 | 57.78 | - | - | P | V |
| | | | 4882 | 14.24 | -39.76 | 54 | - | - | - | - | - | - | A | V |
| | | | 7323 | 44.21 | -29.79 | 74 | 55.86 | 36.66 | 10.35 | 58.66 | - | - | P | V |
| | | | 7323 | 19.45 | -34.55 | 54 | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |



| BT | Note | Frequency (MHz) | Level (dB μ V/m) | Margin (dB) | Limit Line (dB μ V/m) | Read Level (dB μ V) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|--|----------------------|---------------------------|------------------|-----------------------------------|---------------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 78 2480MHz | | 4960 | 40.76 | -33.24 | 74 | 56.92 | 33 | 8.63 | 57.79 | - | - | P | H | |
| | | 4960 | 16 | -38 | 54 | - | - | - | - | - | - | A | H | |
| | | 7440 | 44.03 | -29.97 | 74 | 56.19 | 36.12 | 10.47 | 58.75 | - | - | P | H | |
| | | 7440 | 19.27 | -34.73 | 54 | - | - | - | - | | | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | 4960 | 39.43 | -34.57 | 74 | 55.59 | 33 | 8.63 | 57.79 | - | - | P | V |
| | | | 4960 | 14.67 | -39.33 | 54 | - | - | - | - | - | - | A | V |
| | | | 7440 | 44.08 | -29.92 | 74 | 56.24 | 36.12 | 10.47 | 58.75 | - | - | P | V |
| | | | 7440 | 19.32 | -34.68 | 54 | - | - | - | - | | | A | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only. | | | | | | | | | | | | | |



<BR_FHSS Ant. 4>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. | |
|------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|---|
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) | |
| BT CH00 2402MHz | | 2351.475 | 49.19 | -24.81 | 74 | 43.2 | 27.3 | 15.47 | 36.78 | 100 | 310 | P | H | |
| | | 2351.475 | 24.43 | -29.57 | 54 | - | - | - | - | - | - | A | H | |
| | * | 2402 | 110.18 | - | - | 104 | 27.41 | 15.54 | 36.77 | 100 | 310 | P | H | |
| | * | 2402 | 85.42 | - | - | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | | H |
| | | | 2375.31 | 49.95 | -24.05 | 74 | 43.86 | 27.35 | 15.51 | 36.77 | 300 | 266 | P | V |
| | | | 2375.31 | 25.19 | -28.81 | 54 | - | - | - | - | - | - | A | V |
| | * | | 2402 | 109.57 | - | - | 103.39 | 27.41 | 15.54 | 36.77 | 300 | 266 | P | V |
| | * | | 2402 | 84.81 | - | - | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V | |
| BT CH 39 2441MHz | | 2335.76 | 50.59 | -23.41 | 74 | 44.65 | 27.27 | 15.45 | 36.78 | 100 | 330 | P | H | |
| | | 2335.76 | 25.83 | -28.17 | 54 | - | - | - | - | - | - | A | H | |
| | * | 2441 | 110.34 | - | - | 103.96 | 27.56 | 15.59 | 36.77 | 100 | 330 | P | H | |
| | * | 2441 | 85.58 | - | - | - | - | - | - | - | - | A | H | |
| | | | 2487.4 | 50.76 | -23.24 | 74 | 44.14 | 27.75 | 15.64 | 36.77 | 100 | 330 | P | H |
| | | | 2487.4 | 26 | -28 | 54 | - | - | - | - | - | - | A | H |
| | | | 2330.3 | 50.54 | -23.46 | 74 | 44.61 | 27.26 | 15.45 | 36.78 | 361 | 250 | P | V |
| | | | 2330.3 | 25.78 | -28.22 | 54 | - | - | - | - | - | - | A | V |
| | * | | 2441 | 108.77 | - | - | 102.39 | 27.56 | 15.59 | 36.77 | 361 | 250 | P | V |
| | * | | 2441 | 84.01 | - | - | - | - | - | - | - | - | A | V |
| | | | 2496.43 | 50.39 | -23.61 | 74 | 43.72 | 27.79 | 15.65 | 36.77 | 361 | 250 | P | V |
| | | 2496.43 | 25.63 | -28.37 | 54 | - | - | - | - | - | - | A | V | |



| BT | Note | Frequency (MHz) | Level (dBµV/m) | Margin (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|---|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|---|
| BT CH 78 2480MHz | * | 2480 | 104.94 | - | - | 98.36 | 27.72 | 15.63 | 36.77 | 100 | 224 | P | H | |
| | * | 2480 | 80.18 | - | - | - | - | - | - | - | - | A | H | |
| | | 2483.92 | 54.87 | -19.13 | 74 | 48.26 | 27.74 | 15.64 | 36.77 | 100 | 224 | P | H | |
| | | 2483.92 | 30.11 | -23.89 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | * | 2480 | 105 | - | - | 98.42 | 27.72 | 15.63 | 36.77 | 295 | 241 | P | V | |
| | * | 2480 | 80.24 | - | - | - | - | - | - | - | - | - | A | V |
| | | 2484.16 | 55.18 | -18.82 | 74 | 48.57 | 27.74 | 15.64 | 36.77 | 295 | 241 | P | V | |
| | | 2484.16 | 30.42 | -23.58 | 54 | - | - | - | - | - | - | A | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| Remark | 1. No other spurious found. 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | | |



2.4GHz 2400~2483.5MHz
BT (Harmonic @ 3m)

| BT | Note | Frequency (MHz) | Level (dBµV/m) | Margin (dB) | Limit Line (dBµV/m) | Read Level (dBµV) | Antenna Factor (dB/m) | Path Loss (dB) | Preamp Factor (dB) | Ant Pos (cm) | Table Pos (deg) | Peak Avg. (P/A) | Pol. (H/V) | |
|------------------------|------|----------------------|---------------------|------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-----------------------|---------------|---|
| BT CH 00 2402MHz | | 4804 | 38.62 | -35.38 | 74 | 55.77 | 32.12 | 8.49 | 57.76 | - | - | P | H | |
| | | 4804 | 13.86 | -40.14 | 54 | - | - | - | - | - | - | A | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | H | |
| | | | 4804 | 38.15 | -35.85 | 74 | 55.3 | 32.12 | 8.49 | 57.76 | - | - | P | V |
| | | | 4804 | 13.39 | -40.61 | 54 | - | - | - | - | - | - | A | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | |



| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. | | |
|---|--|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|-------|---|---|
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | Factor | Loss | Factor | Pos | Pos | Avg. | (H/V) | | |
| | | | | | | | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | | | |
| BT CH 78 2480MHz | | 4960 | 39.7 | -34.3 | 74 | 55.86 | 33 | 8.63 | 57.79 | - | - | P | H | | |
| | | 4960 | 14.94 | -39.06 | 54 | - | - | - | - | - | - | A | H | | |
| | | 7440 | 44.58 | -29.42 | 74 | 56.74 | 36.12 | 10.47 | 58.75 | - | - | P | H | | |
| | | 7440 | 19.82 | -34.18 | 54 | - | - | - | - | - | - | A | H | | |
| | | | | | | | | | | | | | H | | |
| | | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | | H | |
| | | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | | H |
| | | | | | | | | | | | | | | | H |
| | | | 4960 | 39.33 | -34.67 | 74 | 55.49 | 33 | 8.63 | 57.79 | - | - | P | V | |
| | | | 4960 | 14.57 | -39.43 | 54 | - | - | - | - | - | - | A | V | |
| | | | 7440 | 43.58 | -30.42 | 74 | 55.74 | 36.12 | 10.47 | 58.75 | - | - | P | V | |
| | | | 7440 | 18.82 | -35.18 | 54 | - | - | - | - | - | - | A | V | |
| | | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | | V | |
| | | | | | | | | | | | | | V | | |
| | | | | | | | | | | | | | V | | |
| | | | | | | | | | | | | | V | | |
| | | | | | | | | | | | | | V | | |
| Remark | 1. No other spurious found. | | | | | | | | | | | | | | |
| | 2. All results are PASS against Peak and Average limit line. | | | | | | | | | | | | | | |
| 3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only. | | | | | | | | | | | | | | | |



Note symbol

| | |
|-----|--|
| * | Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| ! | Test result is over limit line. |
| P/A | Peak or Average |
| H/V | Horizontal or Vertical |



A calculation example for radiated spurious emission is shown as below:

| BT | Note | Frequency | Level | Margin | Limit | Read | Antenna | Path | Preamp | Ant | Table | Peak | Pol. |
|------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| | | (MHz) | (dBμV/m) | (dB) | (dBμV/m) | (dBμV) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| BT CH 00 2402MHz | | 2390 | 55.45 | -18.55 | 74 | 54.51 | 32.22 | 4.58 | 35.86 | 103 | 308 | P | H |

- Path Loss(dB) = CaBT loss(dB) + Filter loss(dB) + Attenuator loss(dB)
- Level(dBμV/m) =
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Margin (dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

- Level(dBμV/m)
= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)
= 55.45 (dBμV/m)
- Margin (dB)
= Level(dBμV/m) – Limit Line(dBμV/m)
= 55.45(dBμV/m) – 74(dBμV/m)
= -18.55(dB)

Peak measured complies with the limit line, so test result is "PASS".



Appendix D. Radiated Spurious Emission Plots

| | | | |
|-----------------|--|---------------------|-------------|
| Test Engineer : | Daniel Lee, Quentin Liu and Bigshow Wang | Temperature : | 22.1~22.6°C |
| | | Relative Humidity : | 55~57% |

Note symbol

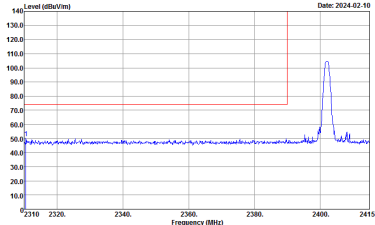
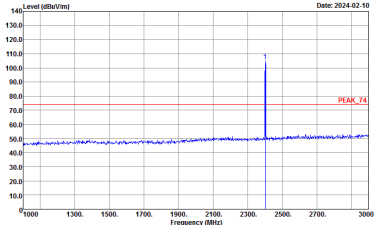
| | |
|----|-----------------------|
| -L | Low channel location |
| -R | High channel location |



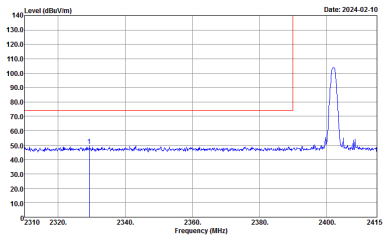
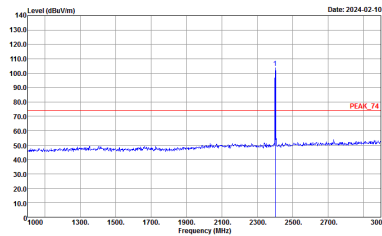
<BR_FHSS Ant. 3+4>

2.4GHz 2400~2483.5MHz

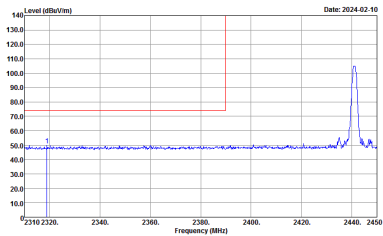
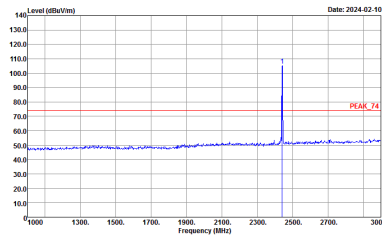
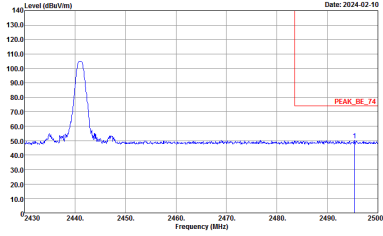
BT (Band Edge @ 3m)

| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|--|--|
| BT CH00 2402MHz | | |
| | Horizontal | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 9120D_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |



| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| | BT CH00 2402MHz | |
| | Vertical | Fundamental |
| Peak |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_SE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |

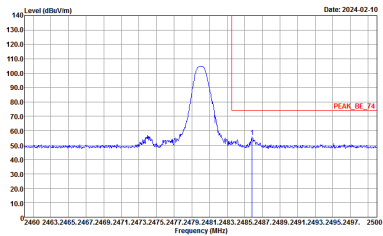
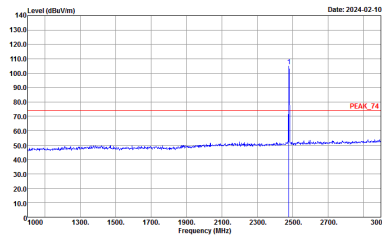


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|--|
| | BT CH39 2441MHz | |
| | Horizontal | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> | Left blank |

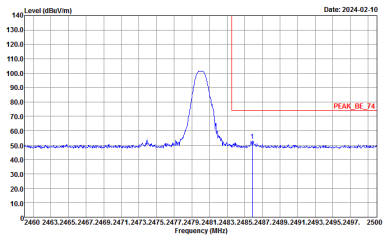
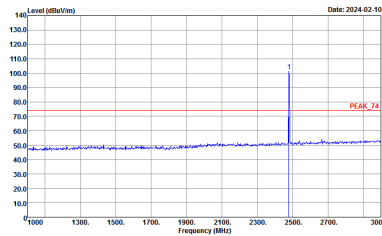


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|--|---|
| | BT CH39 2441MHz | |
| | Vertical | Fundamental |
| Peak | <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Peak | <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | Left blank |



| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| | BT CH78 2480MHz | |
| | Horizontal | Fundamental |
| Peak |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_BC_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

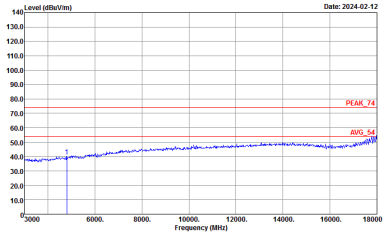
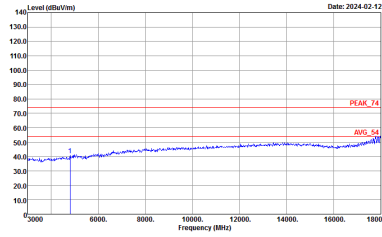


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|---|---|
| BT CH78 2480MHz | | |
| | Vertical | Fundamental |
| Peak |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_BC_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

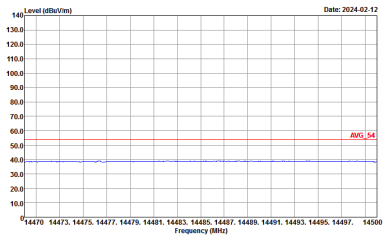
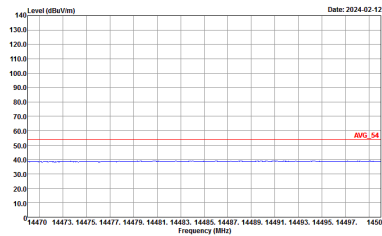
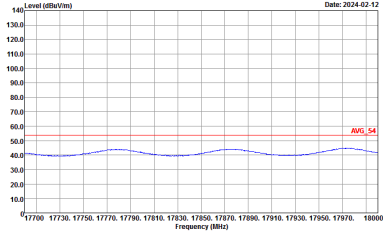
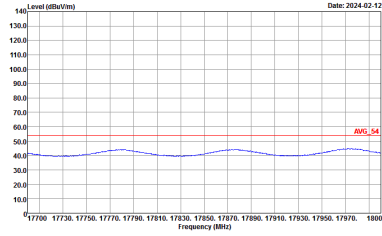


2.4GHz 2400~2483.5MHz

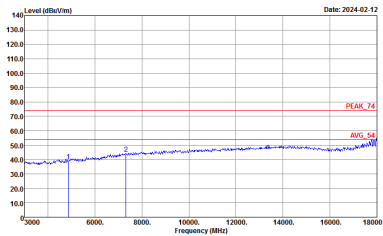
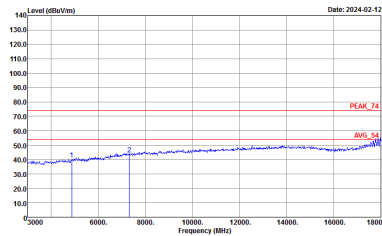
BT (Harmonic @ 3m)

| | | |
|--------------|--|---|
| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
| | BT CH00 2402MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |

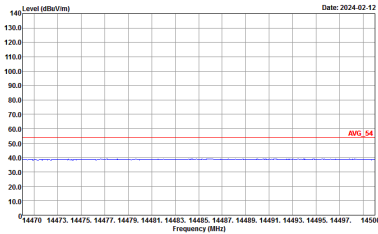
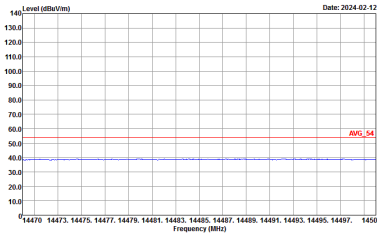
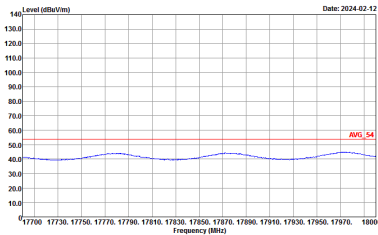
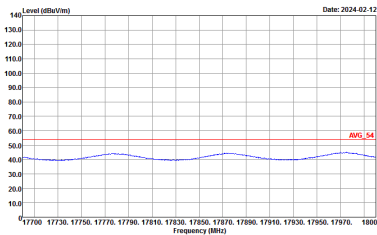


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH00 2402MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |

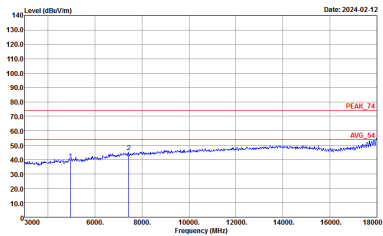
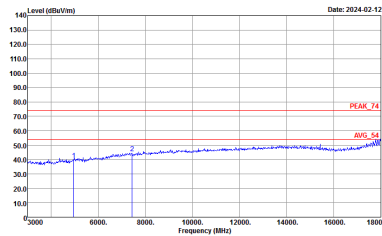


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|--|---|
| | BT CH39 2441MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |



| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH39 2441MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |



| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|--|---|
| | BT CH78 2480MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |

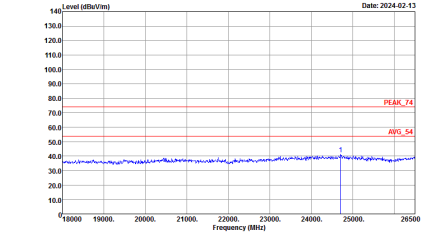
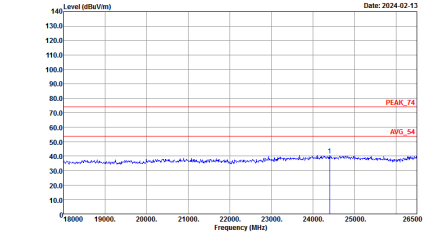


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|---|
| | BT CH78 2480MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |



Emission above 18GHz

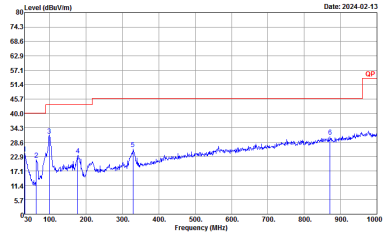
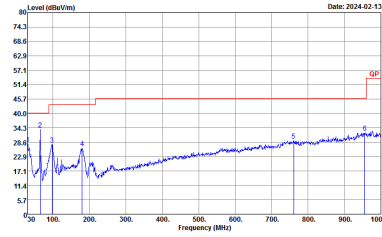
2.4GHz BT (SHF @ 1m)

| | | |
|-------------------------|--|---|
| BT | 2.4GHz 2400~2483.5MHz | |
| ANT | BT SHF | |
| | Horizontal | Vertical |
| <p>Peak</p> <p>Avg.</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 1m SHF_993_231124 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 1m SHF_993_231124 VERTICAL</p> |



Emission below 1GHz

2.4GHz BT (LF)

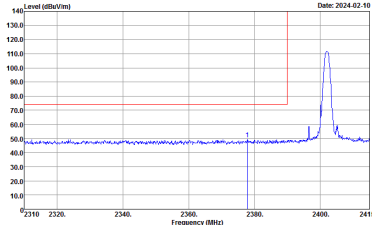
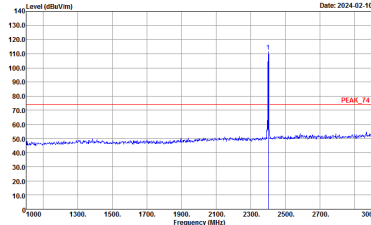
| BT | 2.4GHz 2400~2483.5MHz | |
|--------------|--|---|
| BT LF | | |
| Horizontal | | Vertical |
| QP / Peak |  <p>Site : 03CH15-HY Condition : QP 3m BIL06_20240203_210M HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : QP 3m BIL06_20240203_210M VERTICAL</p> |



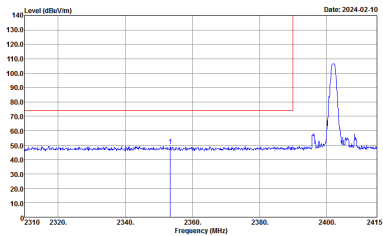
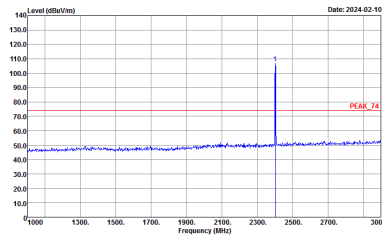
<BR_FHSS Ant. 3>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|--|--|
| BT CH00 2402MHz | | |
| | Horizontal | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 9120D_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |

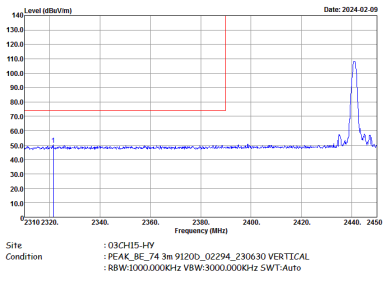
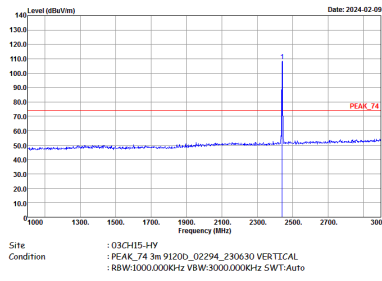
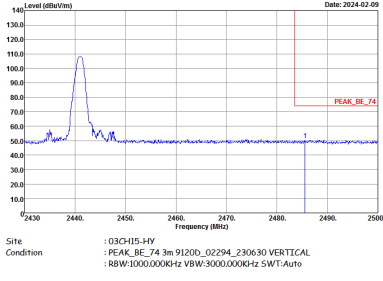


| | | |
|------|--|--|
| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
| | BT CH00 2402MHz | |
| | Vertical | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_SE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

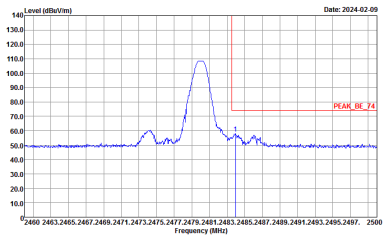
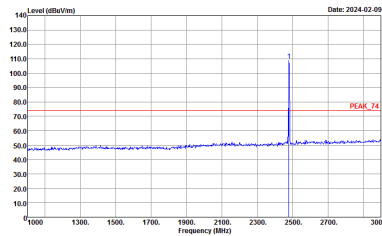


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|--|---|
| BT CH39 2441MHz | | |
| Horizontal | | Fundamental |
| Peak | <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Peak | <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | Left blank |

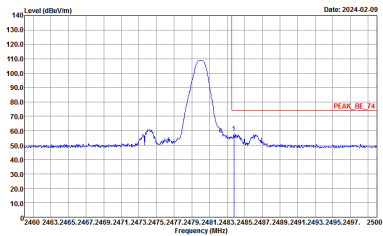
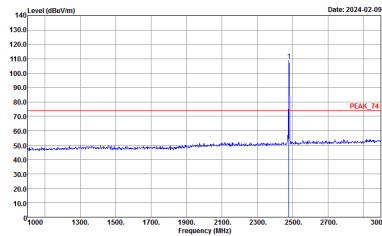


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|--|--|
| BT CH39 2441MHz | | |
| | Vertical | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | Left blank |



| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|---|---|
| BT CH78 2480MHz | | |
| Horizontal | | Fundamental |
| Peak |  <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : -PEAK_BC_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

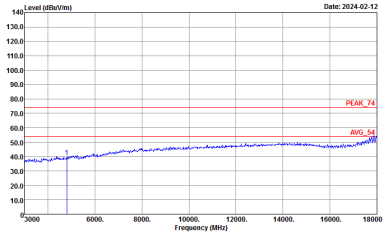
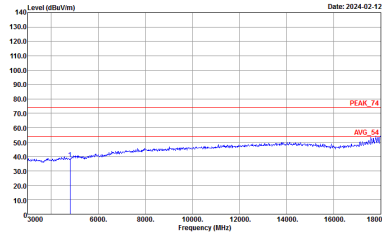


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|---|---|
| BT CH78 2480MHz | | |
| Vertical | | Fundamental |
| Peak |  <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : -PEAK_BC_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Date: 2024-02-09</p> <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

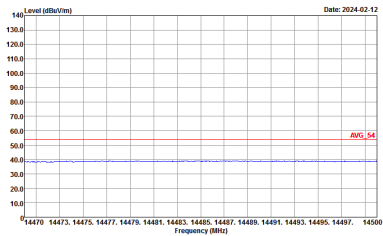
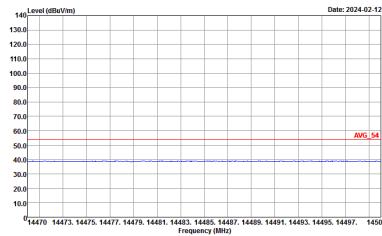
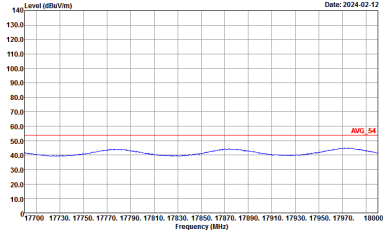
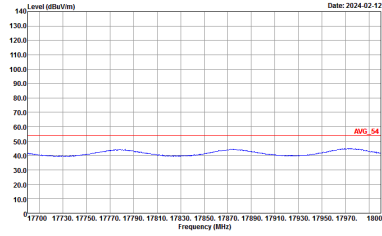


2.4GHz 2400~2483.5MHz

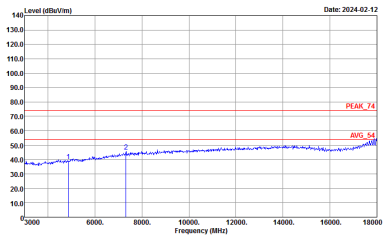
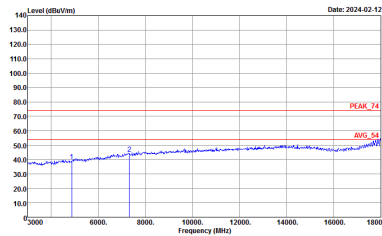
BT (Harmonic @ 3m)

| | | |
|--------------|--|---|
| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
| | BT CH00 2402MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |

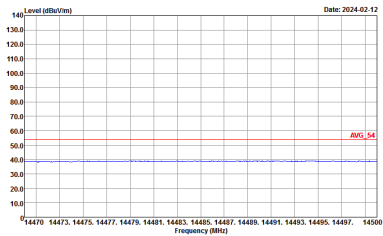
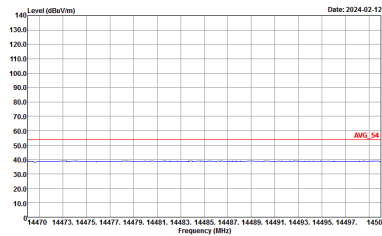
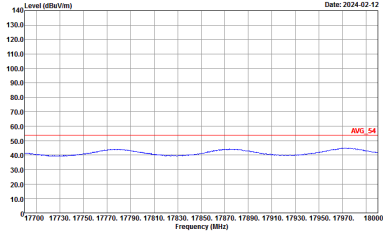
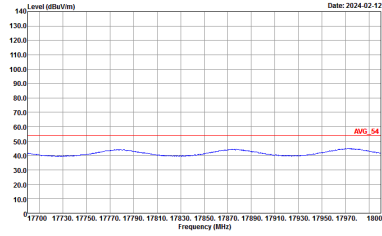


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH00 2402MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |

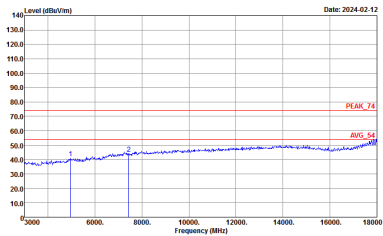
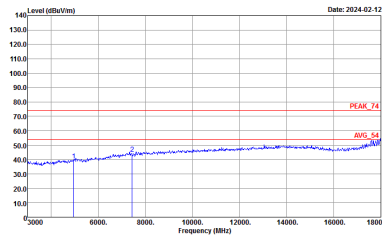


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|--|---|
| | BT CH39 2441MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |

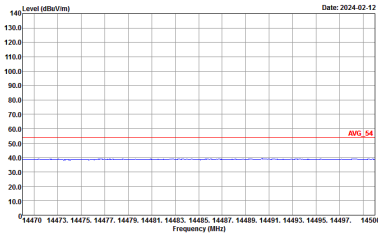
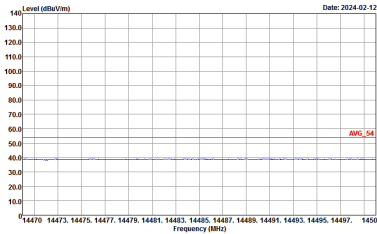
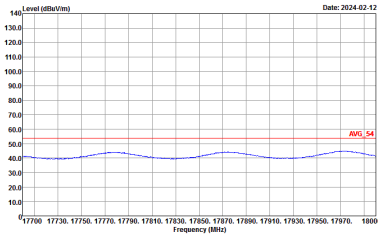
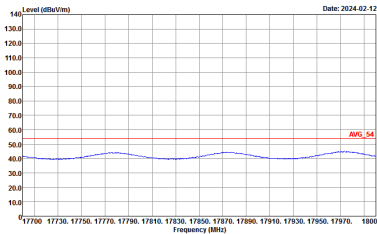


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH39 2441MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |



| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|--|---|
| | BT CH78 2480MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |



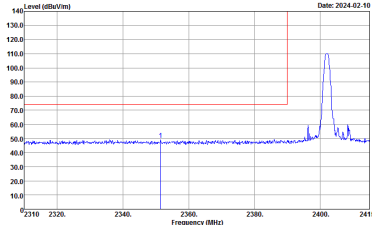
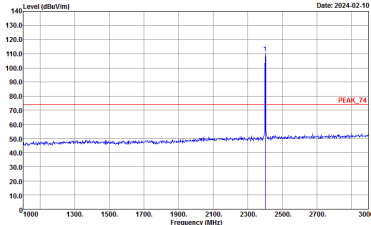
| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH78 2480MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |



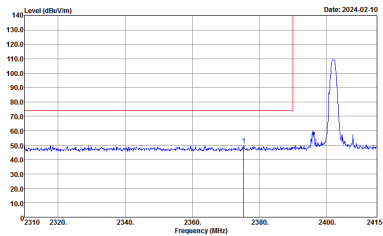
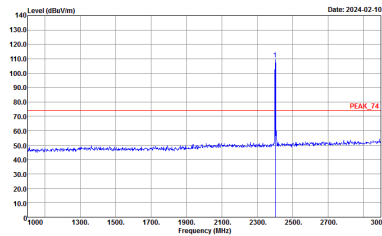
<BR_FHSS Ant. 4>

2.4GHz 2400~2483.5MHz

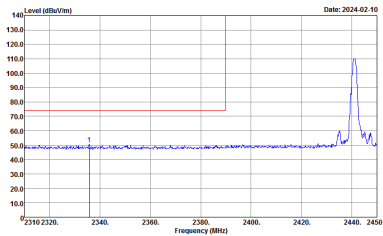
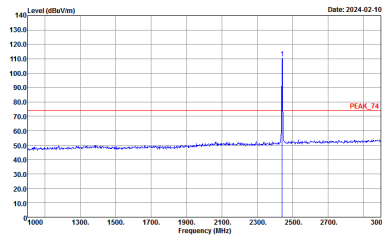
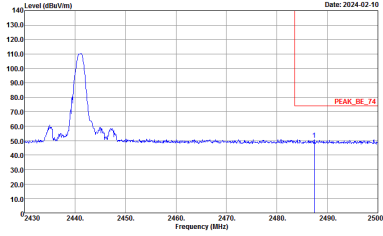
BT (Band Edge @ 3m)

| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|--|--|
| BT CH00 2402MHz | | |
| | Horizontal | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 9120D_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 9120D_02294_230630 HORIZONTAL : RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |

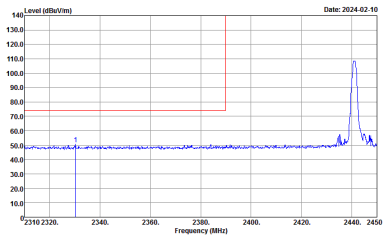
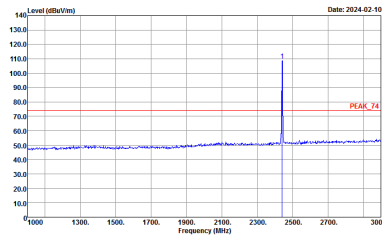
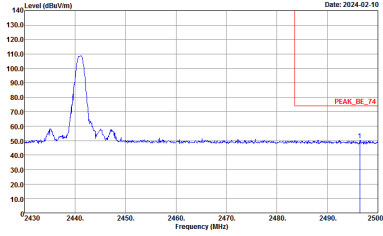


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| | BT CH00 2402MHz | |
| | Vertical | Fundamental |
| Peak |  <p data-bbox="430 683 742 728">Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 VERTICAL :RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |  <p data-bbox="901 683 1212 728">Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 VERTICAL :RBW:1000.000kHz VBW:3000.000kHz SWT:Auto</p> |

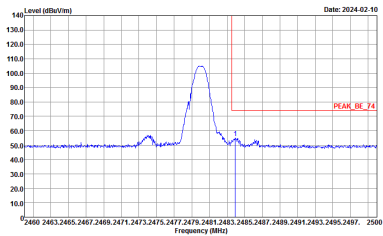
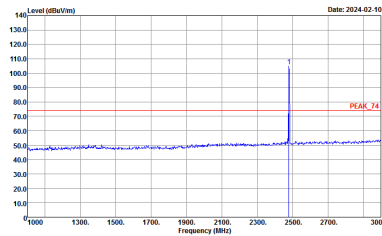


| | | |
|------|---|--|
| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
| | BT CH39 2441MHz | |
| | <p style="text-align: center;">Horizontal</p>  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | <p style="text-align: center;">Fundamental</p>  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Peak |  <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | Left blank |

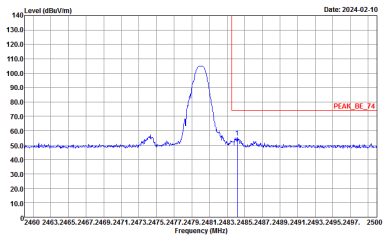
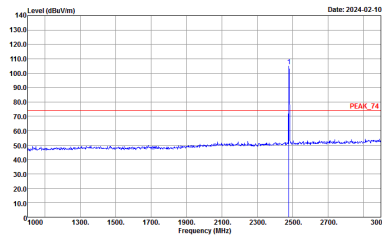


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|---|---|
| BT CH39 2441MHz | | |
| Vertical | | Fundamental |
| Peak |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2441 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2310 to 2450 MHz. A red line indicates the peak level at approximately 110 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2441 MHz. The y-axis ranges from 0 to 140 dBuV/m, and the x-axis ranges from 1000 to 3000 MHz. A red line indicates the peak level at approximately 75 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
| Peak |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at approximately 2441 MHz. The y-axis ranges from 10.0 to 140.0 dBuV/m, and the x-axis ranges from 2430 to 2500 MHz. A red line indicates the peak level at approximately 110 dBuV/m.</p> <p>Site : 03CH15-HY Condition : PEAK_BE_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> | Left blank |



| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|------|---|---|
| | BT CH78 2480MHz | |
| | Horizontal | Fundamental |
| Peak |  <p>Site : 03CH15-HY Condition : -PEAK_BC_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

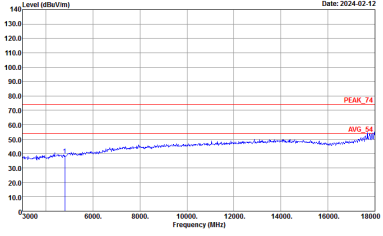
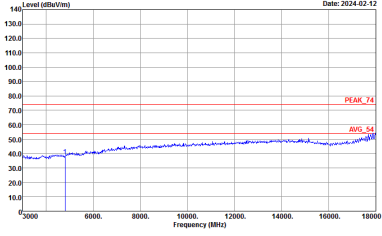


| BT | 2.4GHz 2400~2483.5MHz Band Edge @ 3m | |
|-----------------|---|---|
| BT CH78 2480MHz | | |
| | Vertical | Fundamental |
| Peak |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_BC_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Date: 2024-02-10</p> <p>Site : 03CH15-HY Condition : -PEAK_74 3m 91200_02294_230630 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |

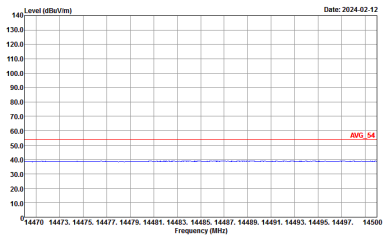
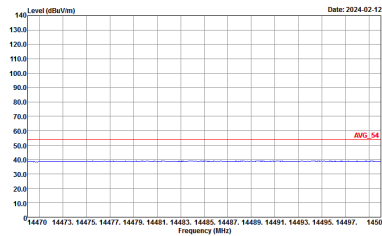
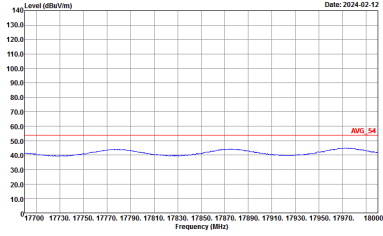
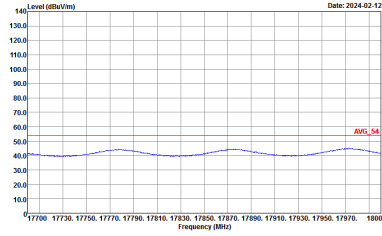


2.4GHz 2400~2483.5MHz

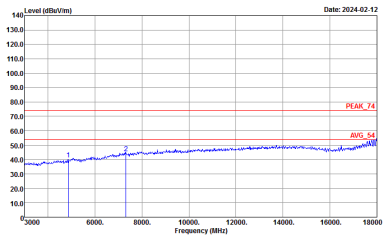
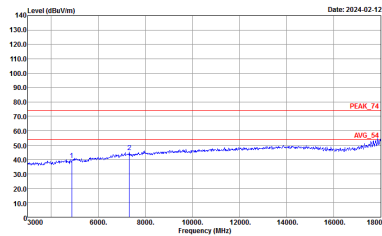
BT (Harmonic @ 3m)

| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|-----------------|--|---|
| BT CH00 2402MHz | | |
| Horizontal | | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |



| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH00 2402MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |

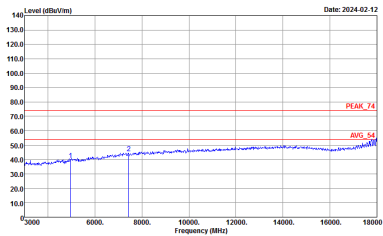
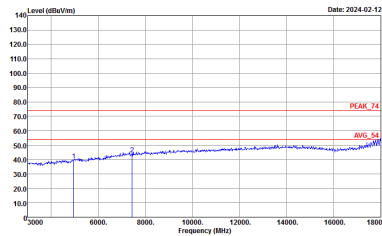


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|--|---|
| | BT CH39 2441MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |

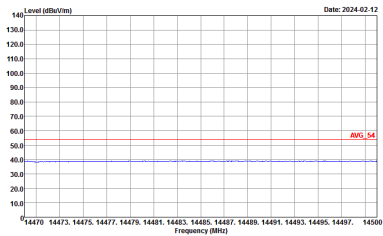
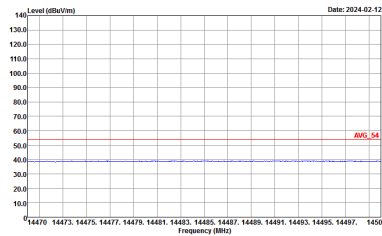
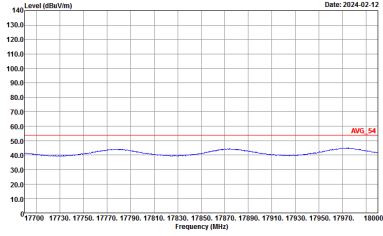
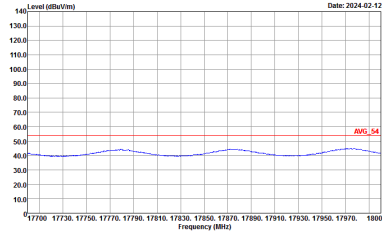


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|---|
| | BT CH39 2441MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> | <p>Date: 2024-02-12</p> <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |



| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--------------|--|---|
| | BT CH78 2480MHz | |
| | Horizontal | Vertical |
| Peak Avg. |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : PEAK_74 3m 91200_02294_230630 VERTICAL</p> |

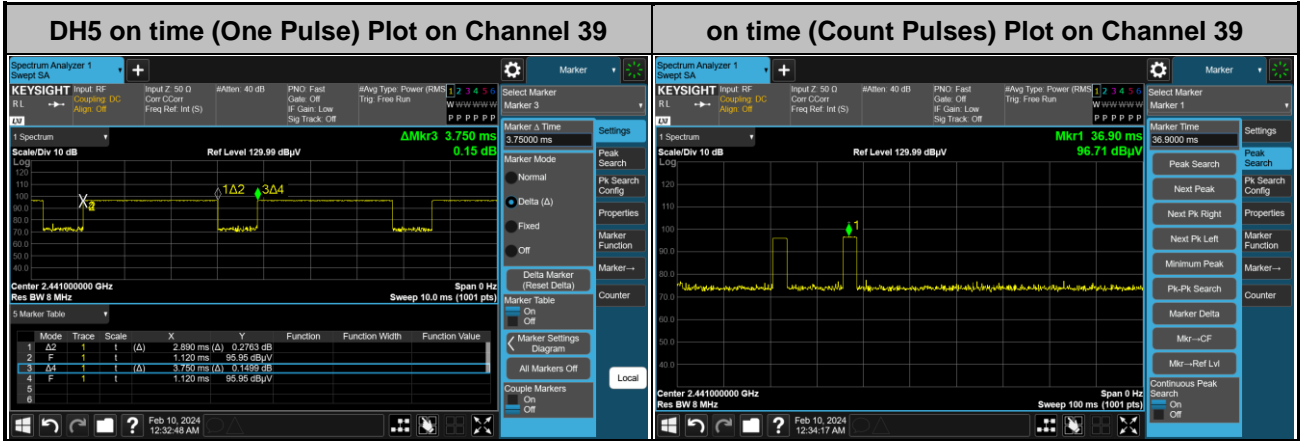


| BT | 2.4GHz 2400~2483.5MHz Harmonic @ 3m | |
|--|---|--|
| | BT CH78 2480MHz | |
| | Horizontal | Vertical |
| <p>14.47G ~14.5G Avg.</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |
| <p>17.7G ~18G Avg</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 HORIZONTAL</p> |  <p>Site : 03CH15-HY Condition : AV6_54 3m 91200_02294_230630 VERTICAL</p> |



Appendix E. Duty Cycle Plots

< BR_FHSS Ant. 3+4 >



Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.8 ms] = 2 hops

Thus, the maximum possible ON time:

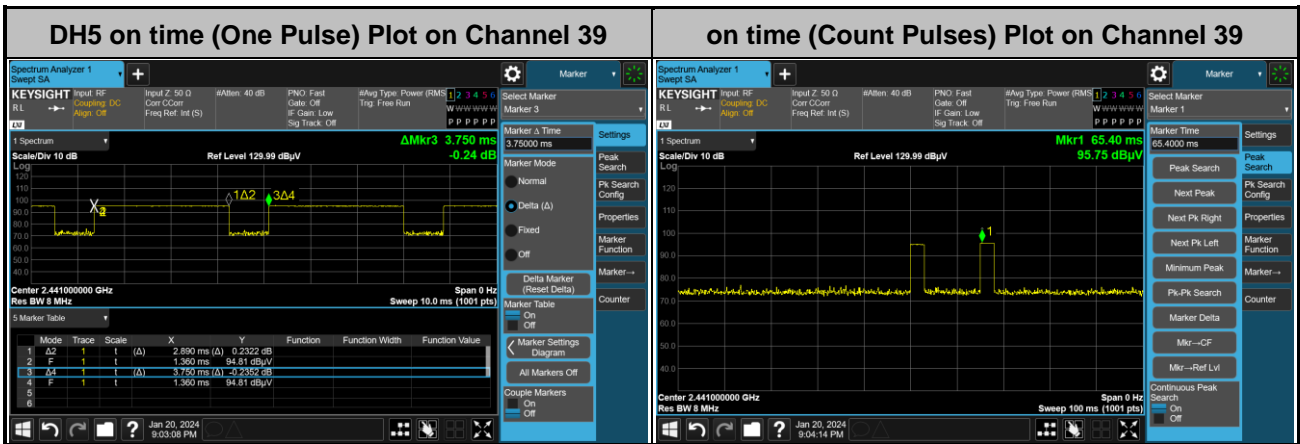
$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.78 \text{ ms}/100 \text{ ms}) = -24.76 \text{ dB}$$



< BR_FHSS Ant. 3 >



Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.78 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.76 dB
3. DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.8 ms] = 2 hops

Thus, the maximum possible ON time:

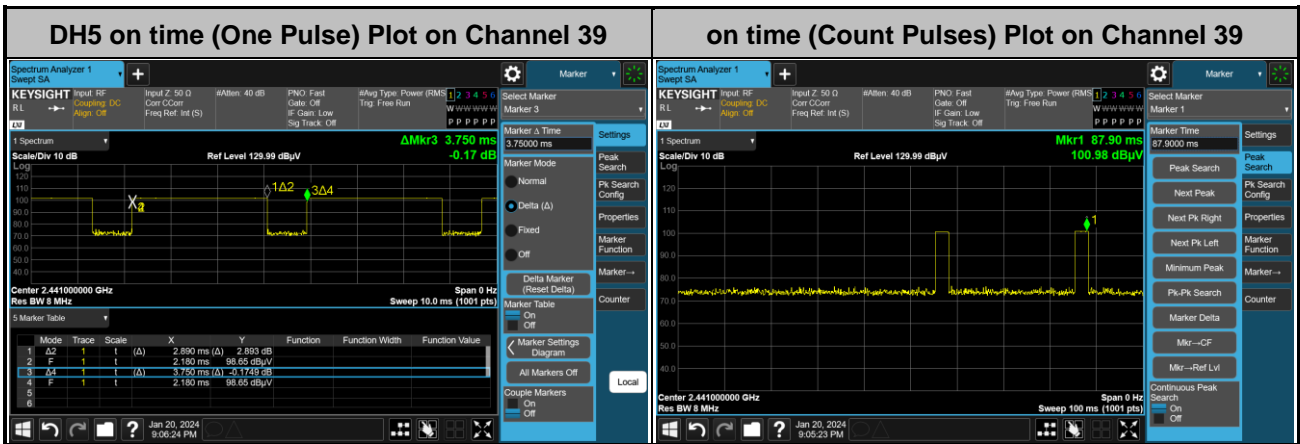
$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.78 \text{ ms}/100 \text{ ms}) = -24.76 \text{ dB}$$



< BR_FHSS Ant. 4 >



Note:

1. Worst case Duty cycle = on time/100 milliseconds = $2 * 2.89 / 100 = 5.78 \%$
2. Worst case Duty cycle correction factor = $20 * \log(\text{Duty cycle}) = -24.76 \text{ dB}$
3. DH5 has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

$$2.89 \text{ ms} \times 20 \text{ channels} = 57.8 \text{ ms}$$

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. $[100 \text{ ms} / 57.8 \text{ ms}] = 2 \text{ hops}$

Thus, the maximum possible ON time:

$$2.89 \text{ ms} \times 2 = 5.78 \text{ ms}$$

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

$$20 \times \log(5.78 \text{ ms}/100 \text{ ms}) = -24.76 \text{ dB}$$

—————THE END—————