FCC RADIO TEST REPORT

FCC ID	:	**TVE-111T15E**
Equipment	:	**Network Security Gateway**
Brand Name	:	**FORTINET**
Model Name	:	**FortiGate 4800Fxxxxxxxxxx, FG-4800Fxxxxxxxxxx, FORTIGATE-4800Fxxxxxxxxxx,** **FortiGate 4801Fxxxxxxxxxx, FG-4801Fxxxxxxxxxx, FORTIGATE-4801Fxxxxxxxxxx,** **FortiGate 4800F-DCxxxxxxxxxx, FG-4800F-DCxxxxxxxxxx, FORTIGATE-4800F-DCxxxxxxxxxx,** **FortiGate 4801F-DCxxxxxxxxxx, FG-4801F-DCxxxxxxxxxx, FORTIGATE-4801F-DCxxxxxxxxxx,** **(where "x" can be "A-Z", or "0-9", or "-", or blank for software changes or marketing purposes only.)**
Marketing Name	:	**FortiGate 4800F, FortiGate 4801F, FortiGate 4800F-DC, FortiGate 4801F-DC** **FortiGate 4800F-TAA, FortiGate 4801F-TAA, FortiGate 4800F-DC-TAA, FortiGate 4801F-DC-TAA** **FortiGate 4800F-TAA-FGDUS, FortiGate 4801F-TAA-FGDUS, FortiGate 4800F-DC-TAA-FGDUS, FortiGate 4801F-DC-TAA-FGDUS** **FortiGate 4800F-LENC, FortiGate 4801F-LENC, FortiGate 4800F-DC-LENC, FortiGate 4801F-DC-LENC**
Applicant	:	**Fortinet Inc.** **899 KIFER RD** **SUNNYVALE CA 94086** **UNITED STATES**
Manufacturer	:	**Fortinet Inc.** **899 KIFER RD** **SUNNYVALE CA 94086** **UNITED STATES**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Nov. 14, 2022 and testing was performed from Dec. 09, 2022 to Dec. 29, 2022. 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.

Louis Wu

Approved by: Louis Wu

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

Table of Contents

History of this test report **4**
Summary of Test Result **5**
1 General Description **6**
1.1 Product Feature of Equipment Under Test 6
1.2 Modification of EUT 6
1.3 Testing Location 6
1.4 Applicable Standards 6
2 Test Configuration of Equipment Under Test **7**
2.1 Carrier Frequency Channel 7
2.2 Test Mode 8
2.3 Connection Diagram of Test System 9
2.4 Support Unit used in test configuration and system 9
2.5 EUT Operation Test Setup 10
2.6 Measurement Results Explanation Example 10
3 Test Result **11**
3.1 6dB and 99% Bandwidth Measurement 11
3.2 Output Power Measurement 16
3.3 Power Spectral Density Measurement 17
3.4 Conducted Band Edges and Spurious Emission Measurement 22
3.5 Radiated Band Edges and Spurious Emission Measurement 28
3.6 AC Conducted Emission Measurement 32
3.7 Antenna Requirements 34
4 List of Measuring Equipment **35**
5 Uncertainty of Evaluation **37**
Appendix A. Conducted Test Results
Appendix B. AC Conducted Emission Test Result
Appendix C. Radiated Spurious Emission
Appendix D. Radiated Spurious Emission Plots
Appendix E. Duty Cycle Plots
Appendix F. Setup Photographs

History of this test report

Report No.	Version	Description	Issue Date
FR2N1407	01	Initial issue of report	Jan. 05, 2023
FR2N1407	02	Revise Appendix D and Appendix E	Feb. 06, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(2)	6dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.247(b)(3) 15.247(b)(4)	Output Power	Pass	-
3.3	15.247(e)	Power Spectral Density	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	Pass	3.53 dB under the limit at 216.240 MHz
3.6	15.207	AC Conducted Emission	Pass	1.94 dB under the limit at 16.050 MHz
3.7	15.203	Antenna Requirement	Pass	-

Declaration of Conformity:

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
   It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Uncertainty of Evaluation".

Comments and Explanations:

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Yun Huang

Report Producer: Doris Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth - LE

Product Feature	
Antenna Type	Bluetooth - LE: PIFA Antenna

Antenna information		
Bluetooth - LE	Peak Gain (dBi)	-0.27

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

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, 03CH22-HY

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

FCC designation No.: TW3786

1.4 Applicable Standards

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

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

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

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

2.2 Test Mode

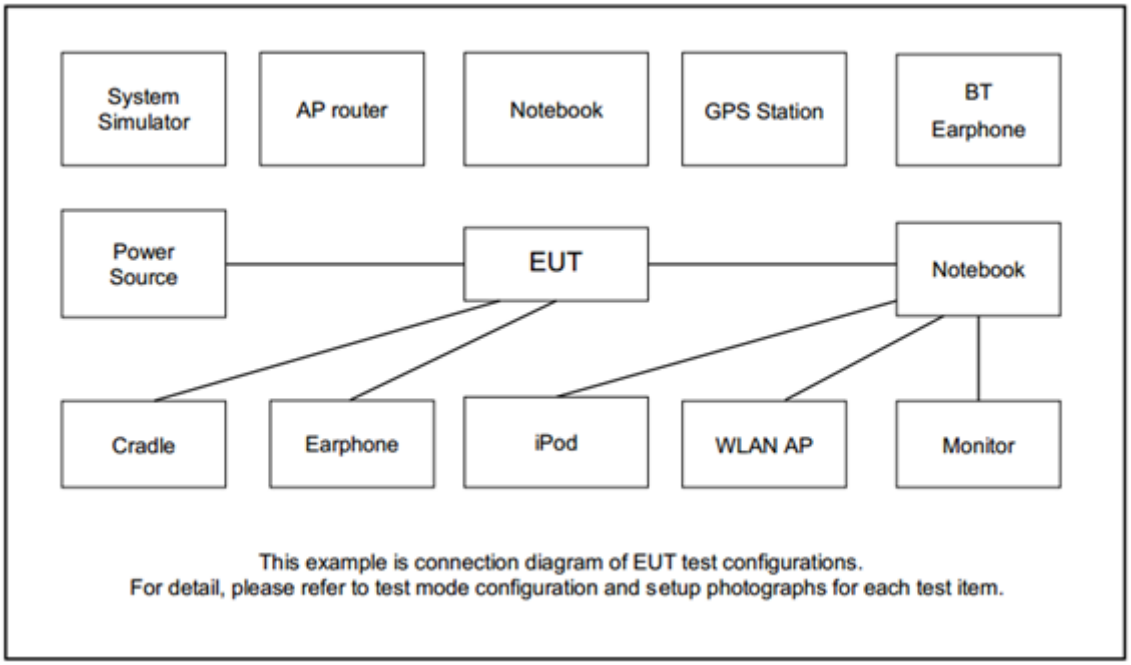
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

b. 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 – LE / GFSK**
	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
Radiated Test Cases	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_2Mbps
AC Conducted Emission	Mode 1: Bluetooth-LE
Remark: 1. For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power. 2. All the tests were performed with C15 power Cable 1	

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Dell	P79G	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 “Tera Term Version 4.95” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

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.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

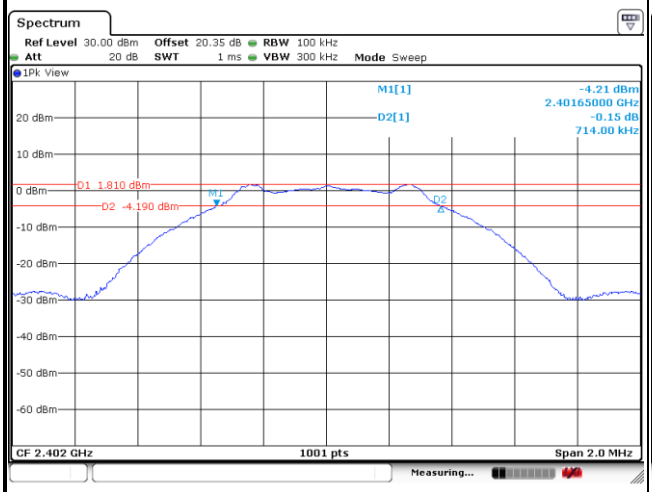
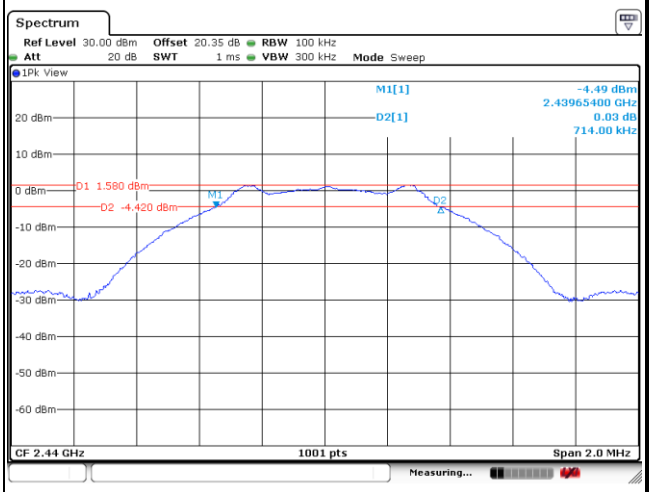
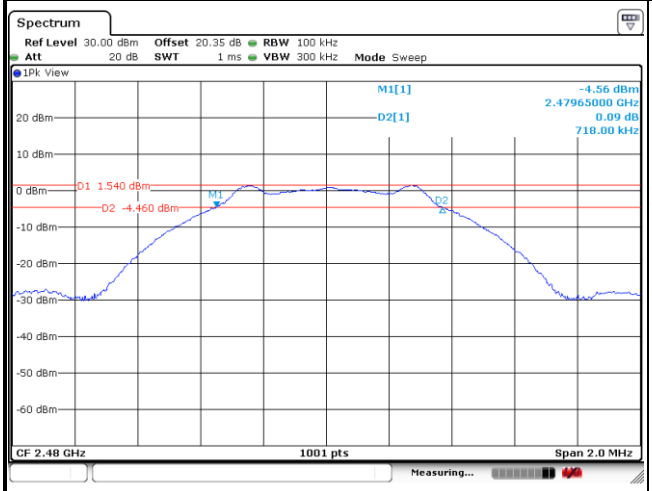
1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
6. Measure and record the results in the test report.

3.1.4 Test Setup

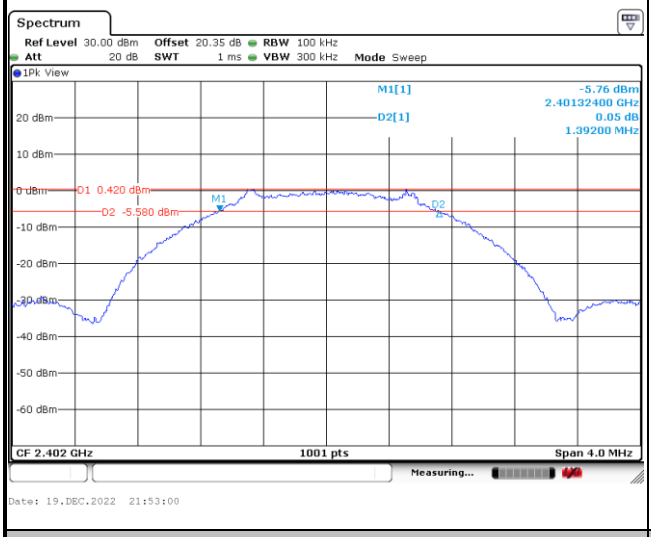
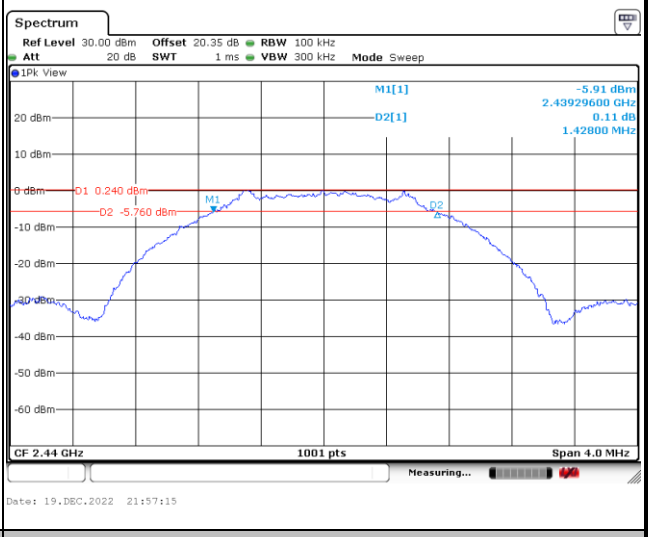
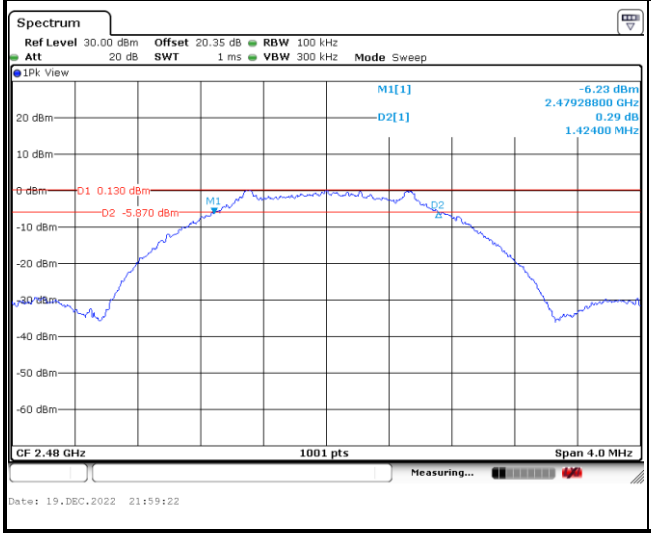
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

<1Mbps>

6 dB Bandwidth Plot on Channel 00	6 dB Bandwidth Plot on Channel 19
	
6 dB Bandwidth Plot on Channel 39	**N/A**
	

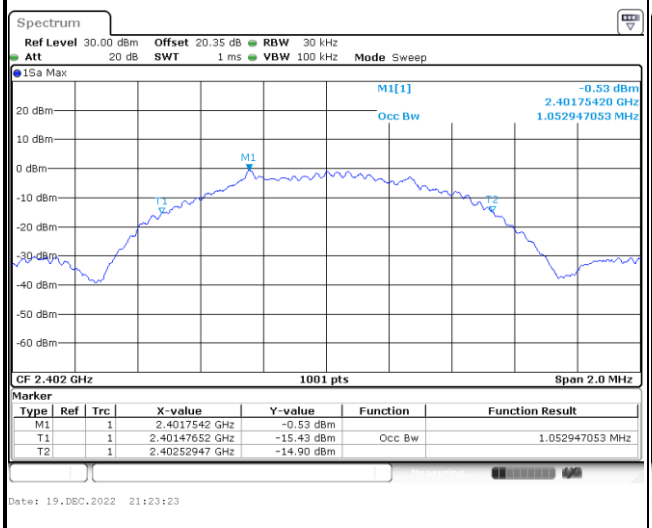
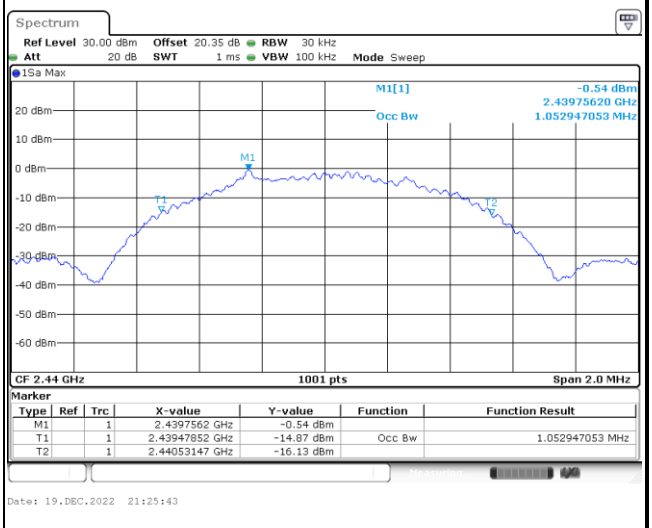
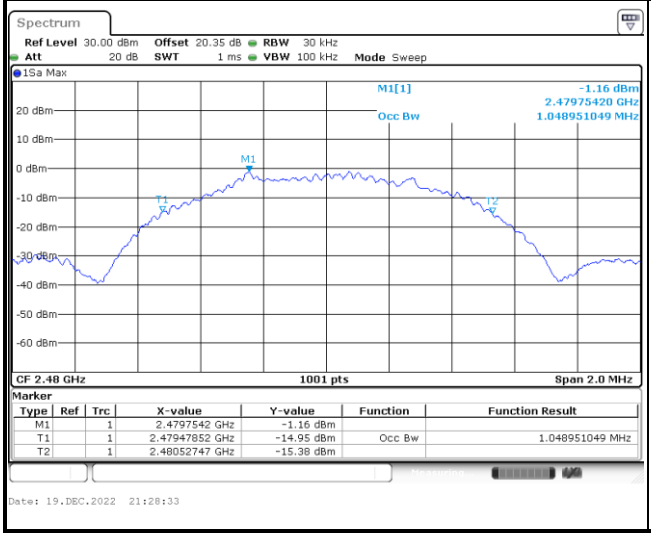
<2Mbps>

6 dB Bandwidth Plot on Channel 00	6 dB Bandwidth Plot on Channel 19
	
6 dB Bandwidth Plot on Channel 39	**N/A**
	

3.1.6 Test Result of 99% Occupied Bandwidth

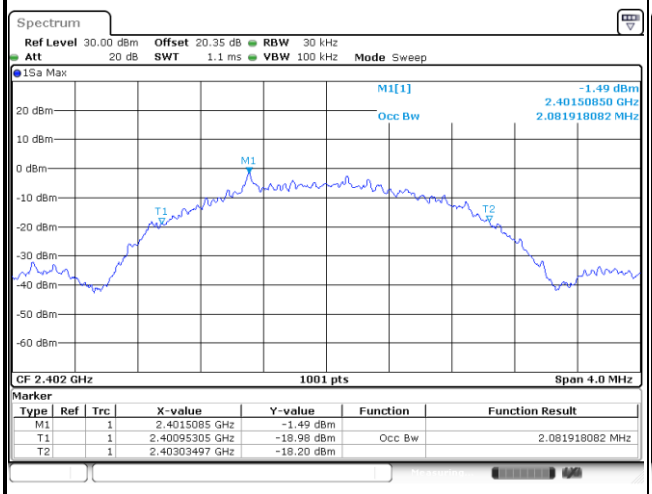
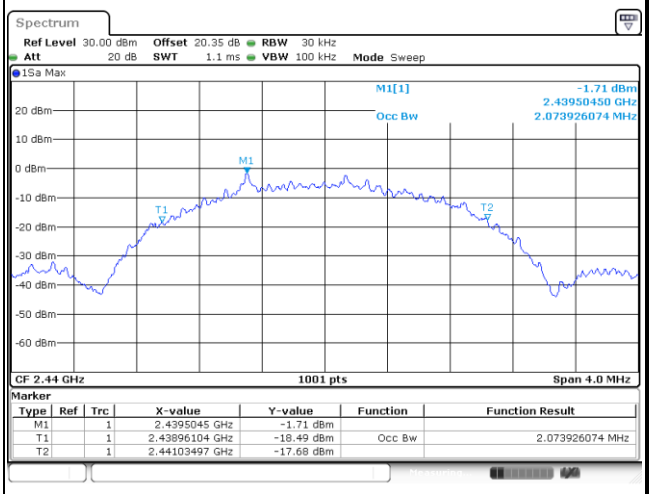
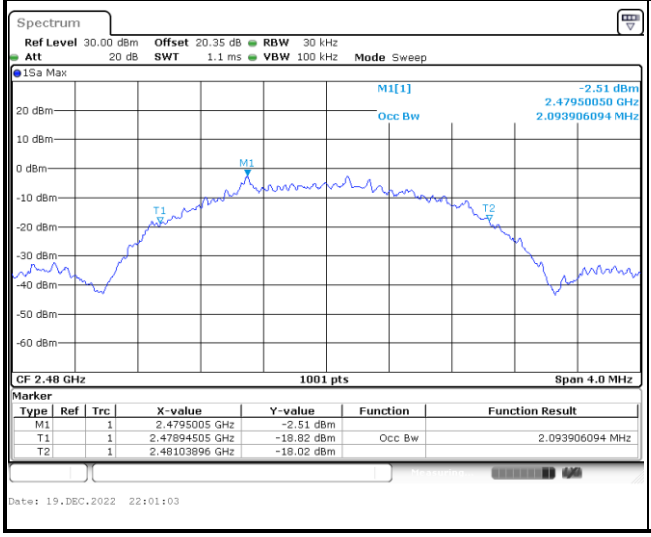
Please refer to Appendix A.

<1Mbps>

99% Bandwidth Plot on Channel 00	99% Occupied Bandwidth Plot on Channel 19
	
99% Occupied Bandwidth Plot on Channel 39	**N/A**
	

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<2Mbps>

99% Bandwidth Plot on Channel 00	99% Occupied Bandwidth Plot on Channel 19
	
99% Occupied Bandwidth Plot on Channel 39	**N/A**
	

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

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

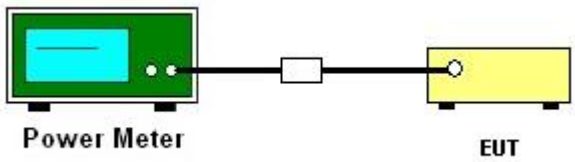
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

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

3.2.4 Test Setup



3.2.5 Test Result of Average Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

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 the ANSI C63.10 Section 11.10.2 Method PKPSD.
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. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth (VBW) = 10 kHz. In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6 dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. The Measured power density (dBm)/ 100 kHz is a reference level and is used as 20 dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

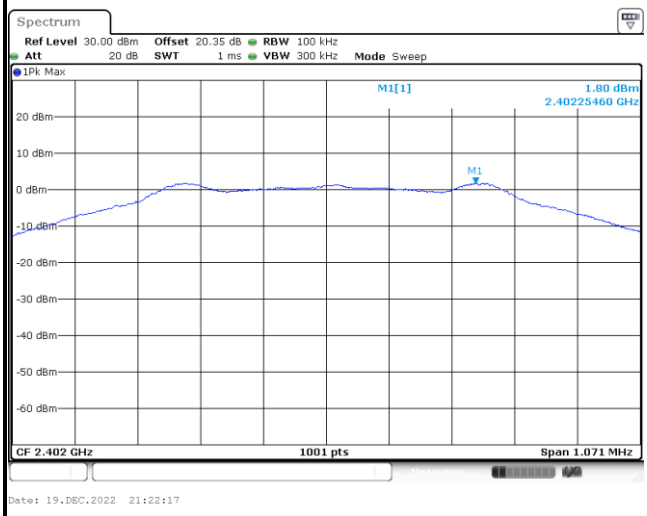
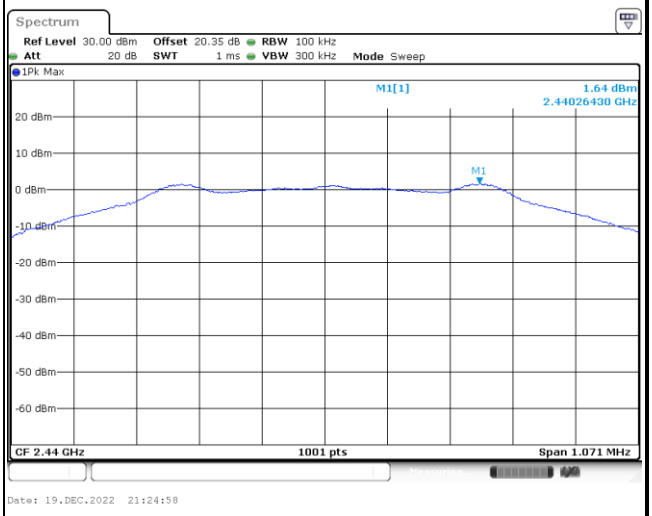
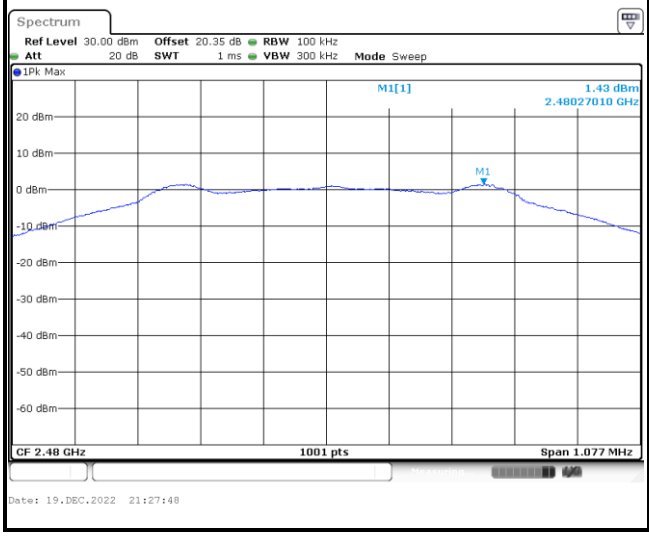
3.3.4 Test Setup

3.3.5 Test Result of Power Spectral Density

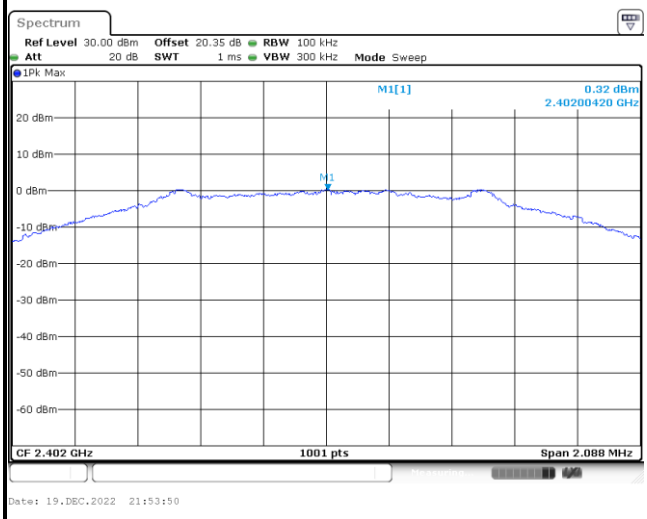
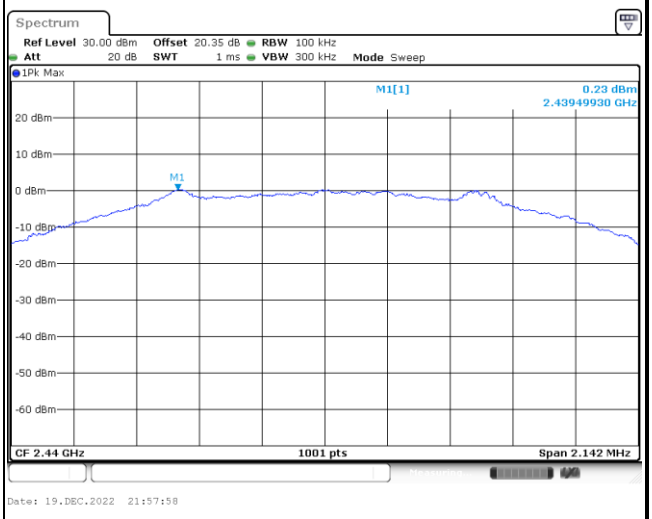
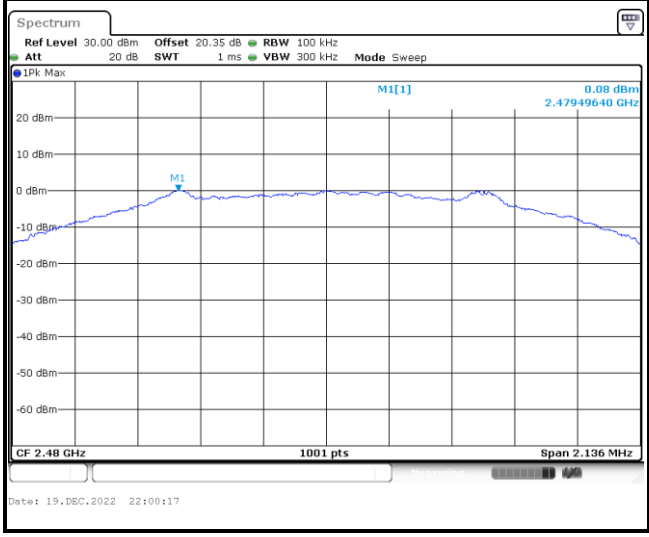
Please refer to Appendix A.

3.3.6 Test Result of Power Spectral Density Plots (100kHz)

<1Mbps>

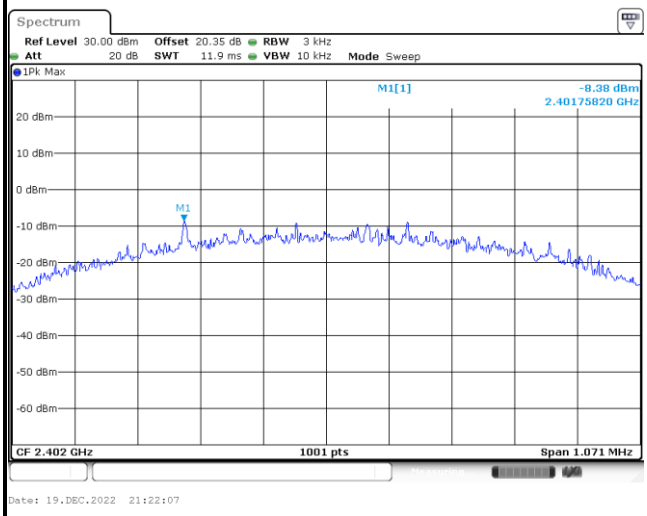
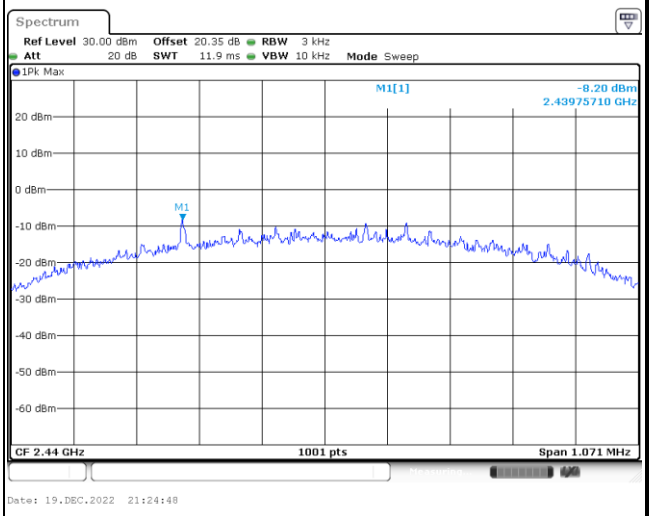
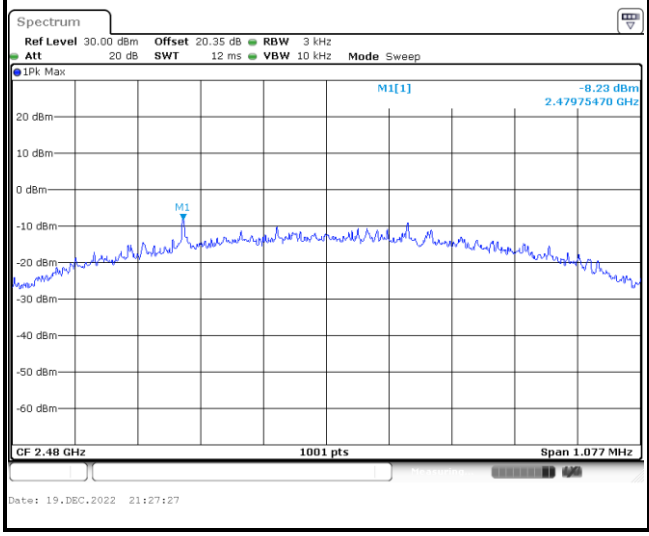
PSD 100kHz Plot on Channel 00	PSD 100kHz Plot on Channel 19
	
PSD 100kHz Plot on Channel 39	**N/A**
	

<2Mbps>

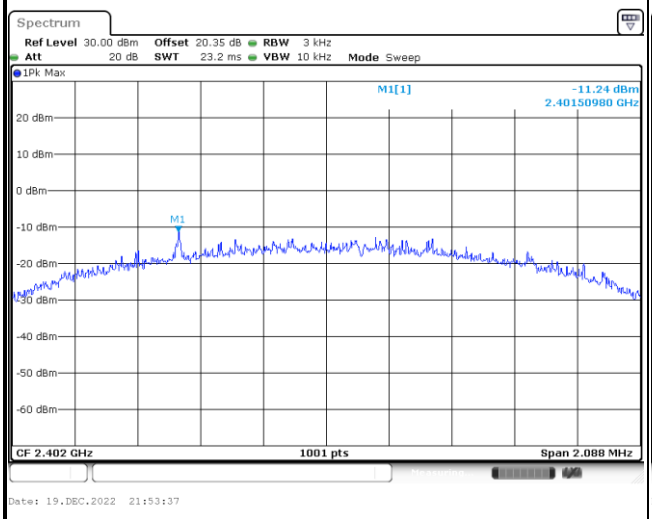
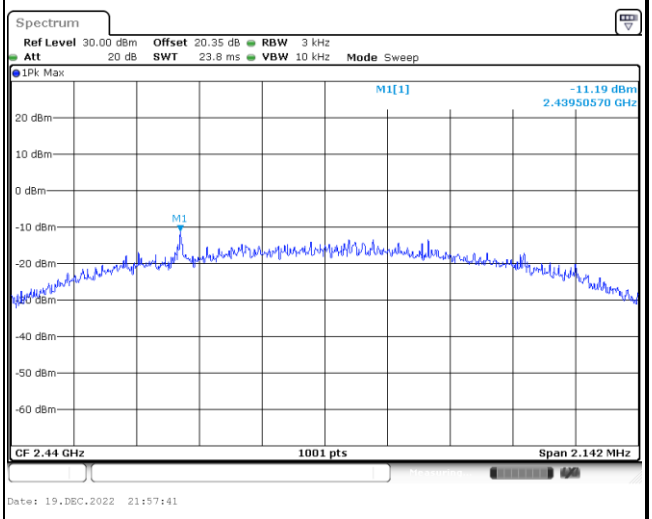
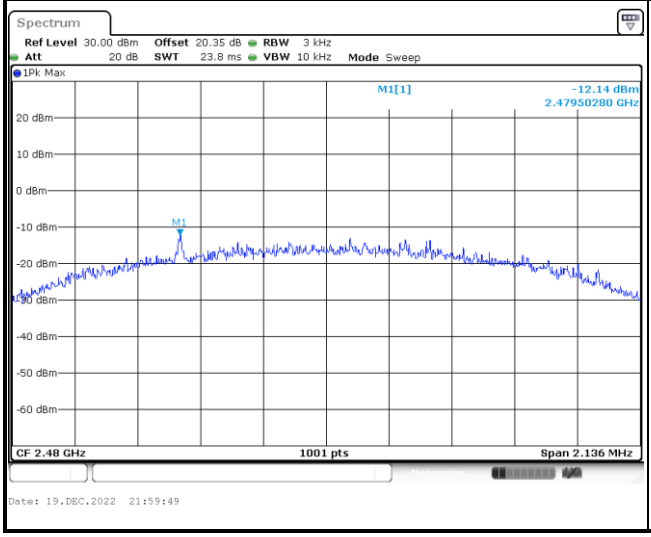
PSD 100kHz Plot on Channel 00	PSD 100kHz Plot on Channel 19
	
PSD 100kHz Plot on Channel 39	**N/A**
	

3.3.7 Test Result of Power Spectral Density Plots (3kHz)

<1Mbps>

PSD 3kHz Plot on Channel 00	PSD 3kHz Plot on Channel 19
	
PSD 3kHz Plot on Channel 39	**N/A**
	

<2Mbps>

PSD 3kHz Plot on Channel 00	PSD 3kHz Plot on Channel 19
	
PSD 3kHz Plot on Channel 39	**N/A**
	

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

3.4.2 Measuring Instruments

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

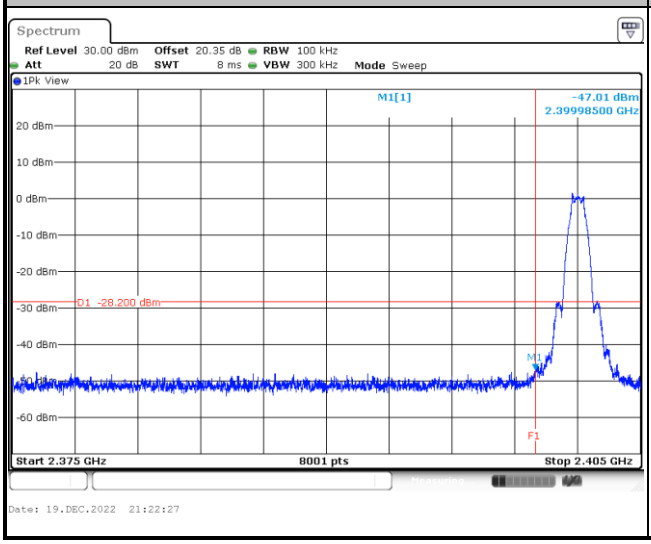
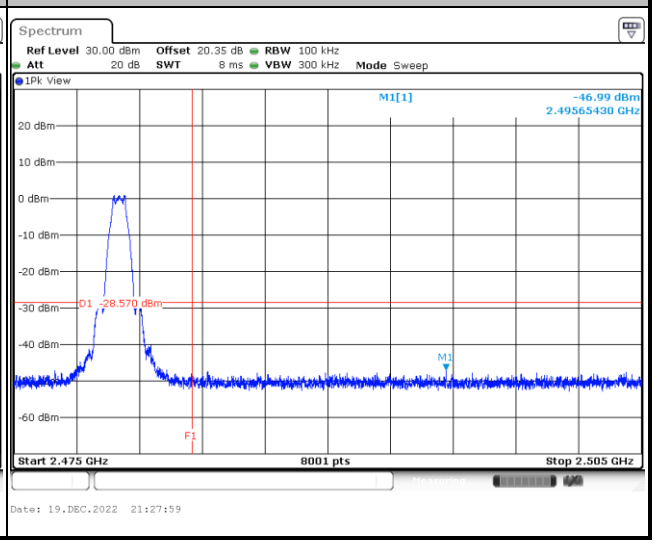
3.4.3 Test Procedure

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
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, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
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.

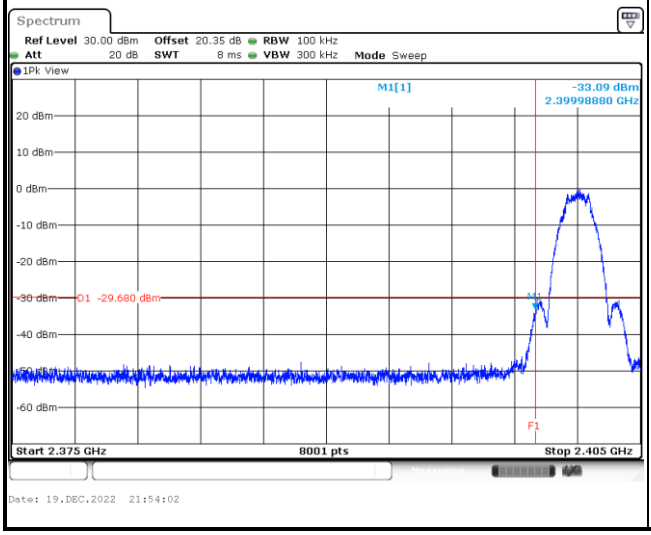
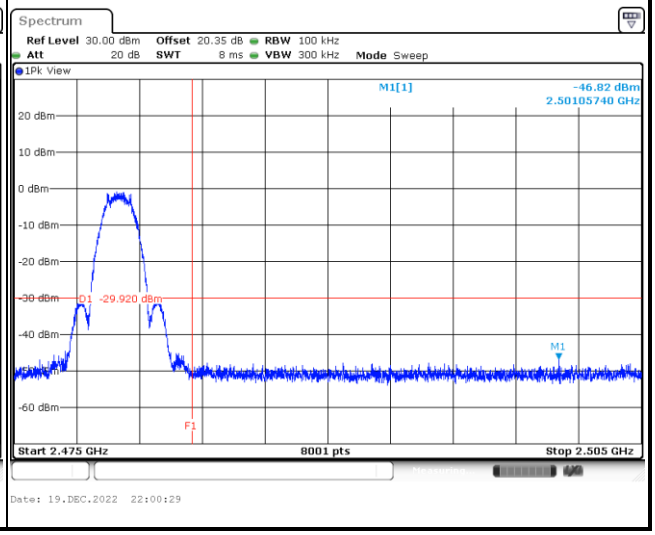
3.4.4 Test Setup

3.4.5 Test Result of Conducted Band Edges Plots

<1Mbps>

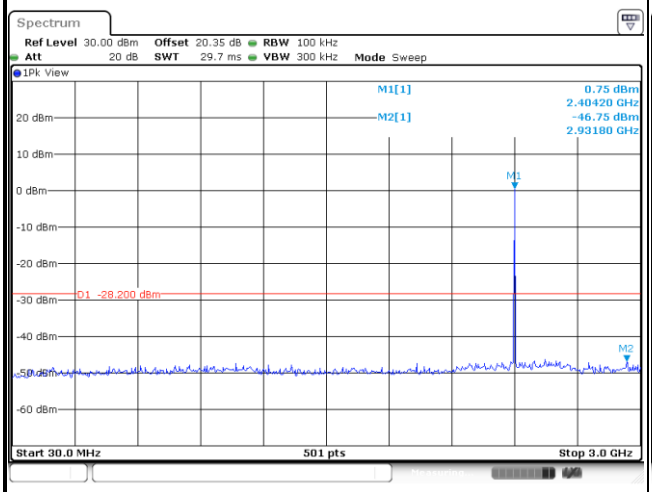
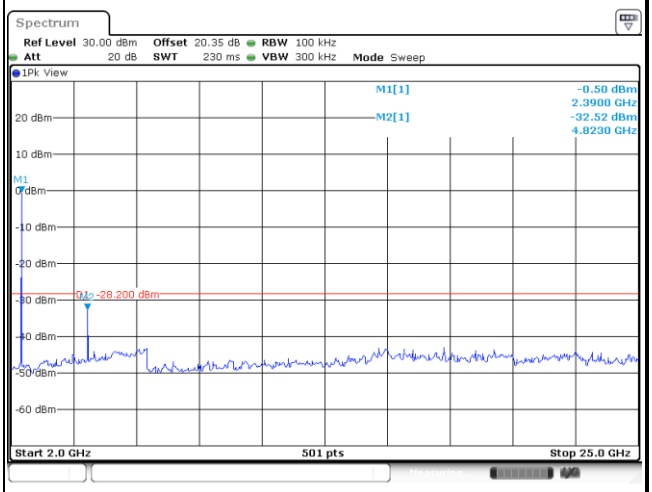
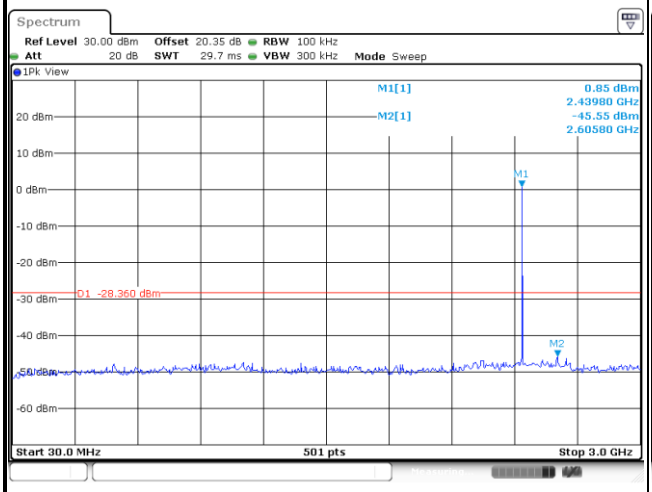
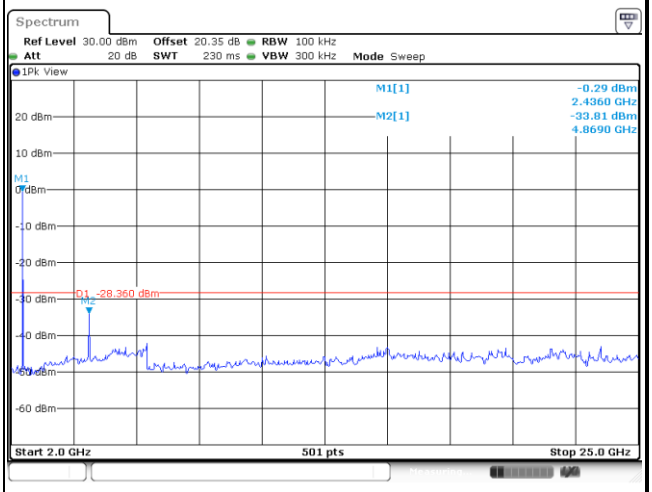
Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
	

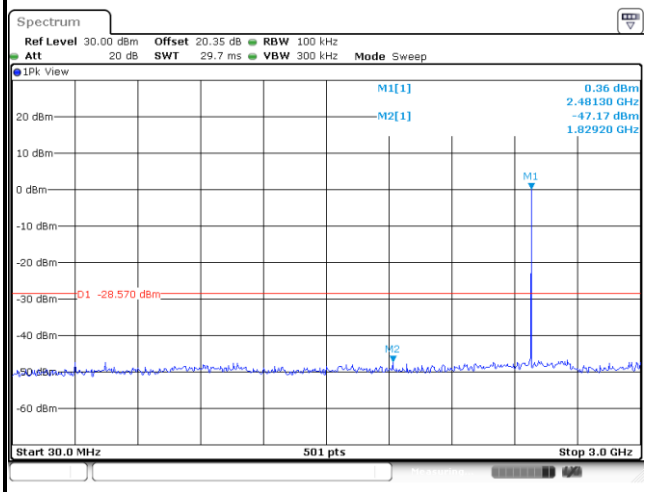
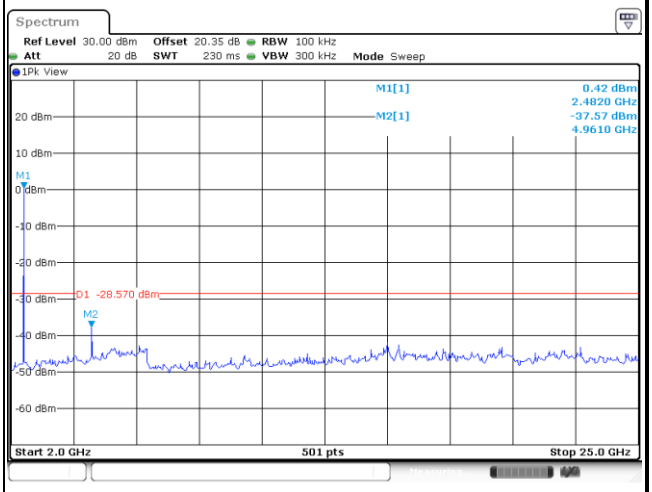
<2Mbps>

Low Band Edge Plot on Channel 00	High Band Edge Plot on Channel 39
	

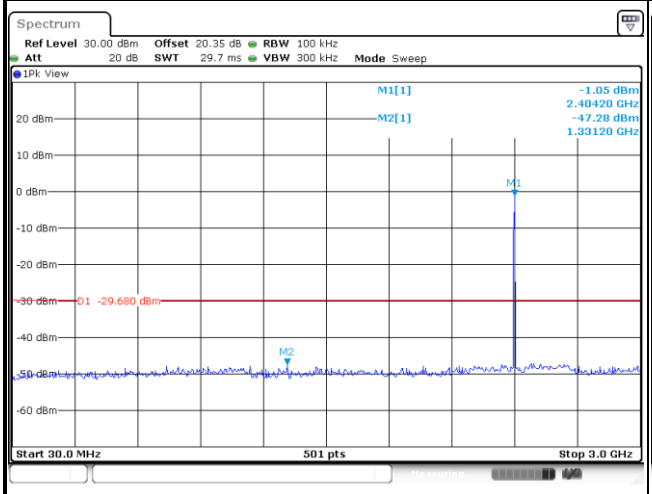
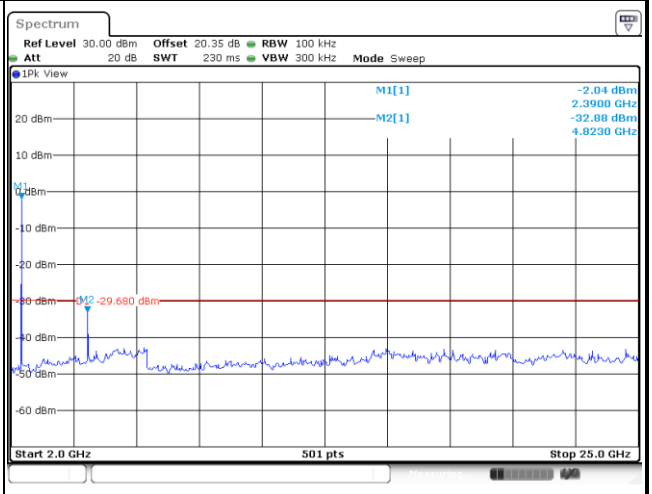
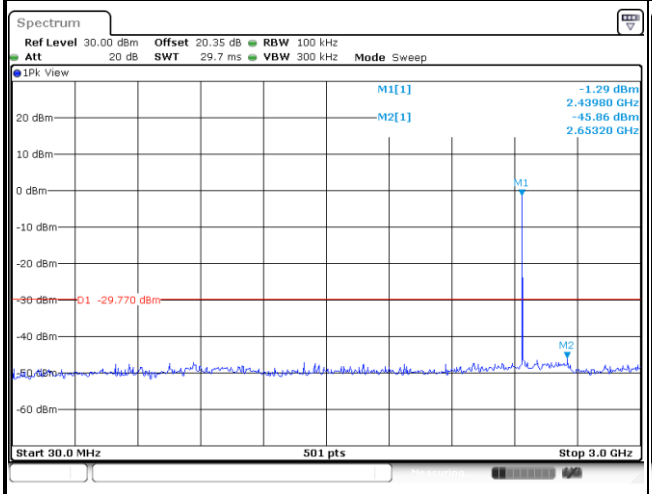
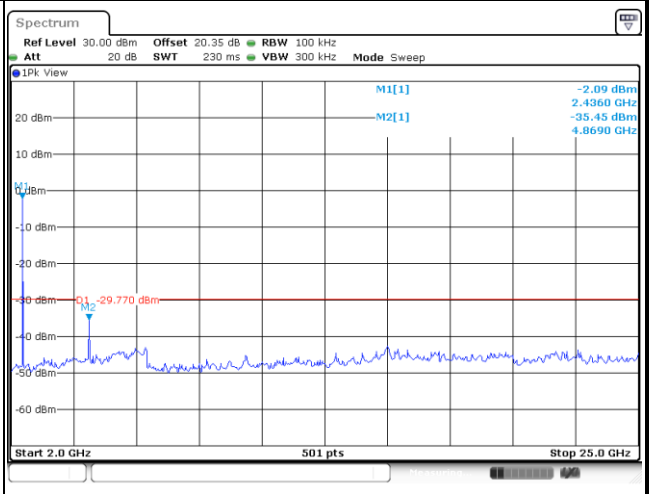
3.4.6 Test Result of Conducted Spurious Emission Plots

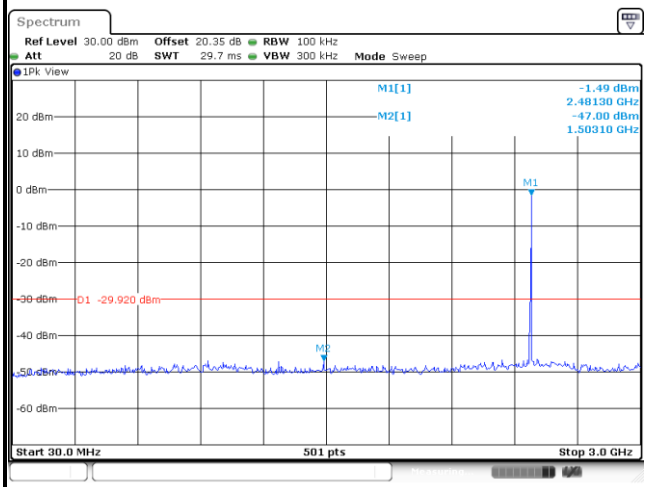
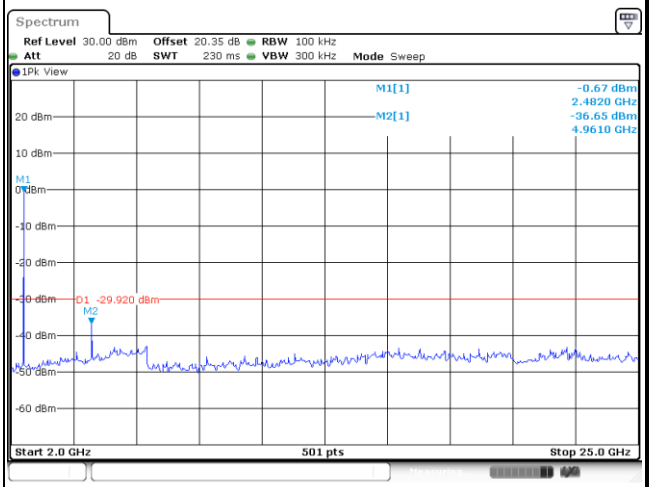
<1Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39
	

<2Mbps>

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00
	
Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19	**Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19**
	

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39	Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39
	

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device is measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

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

3.5.2 Measuring Instruments

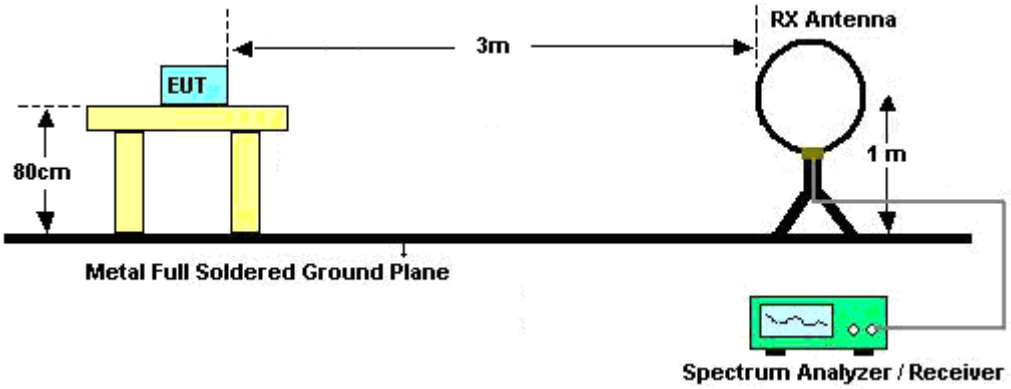
Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

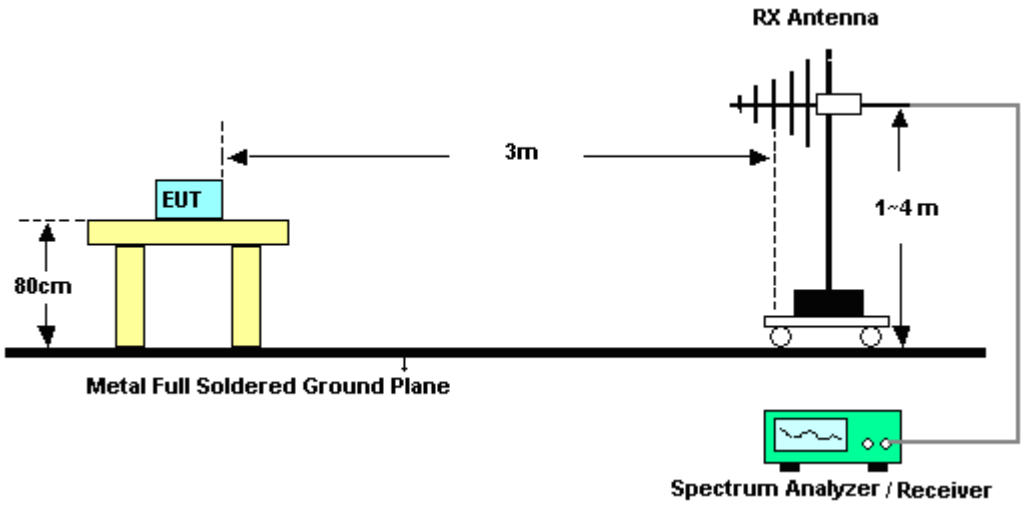
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the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

3.5.4 Test Setup

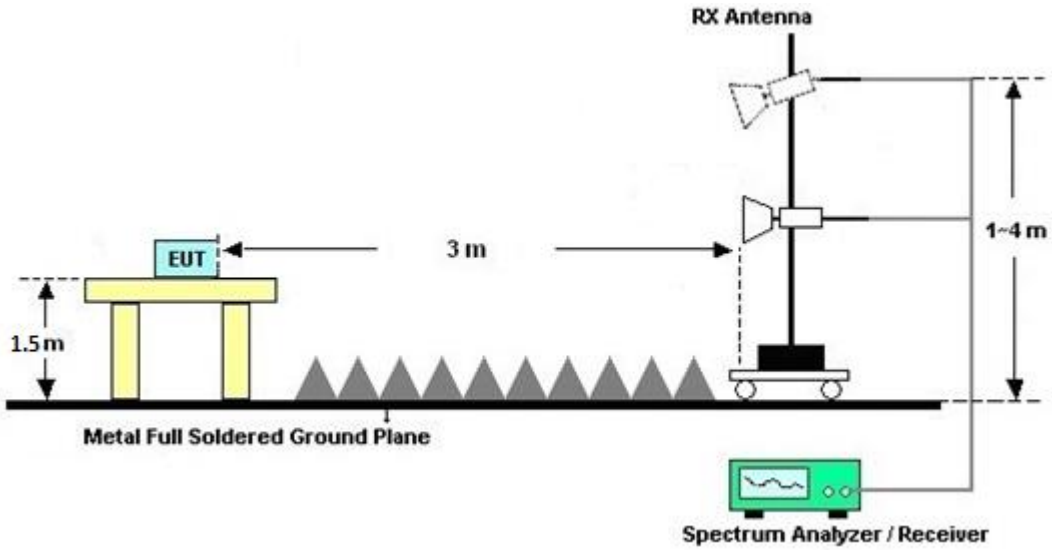
For radiated test below 30MHz



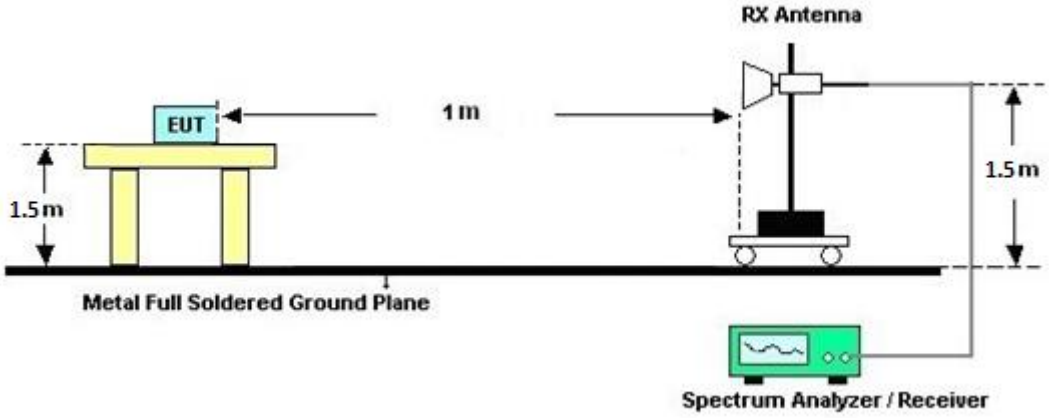
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.5.5 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.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

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

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 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 (dBμV)	
	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.

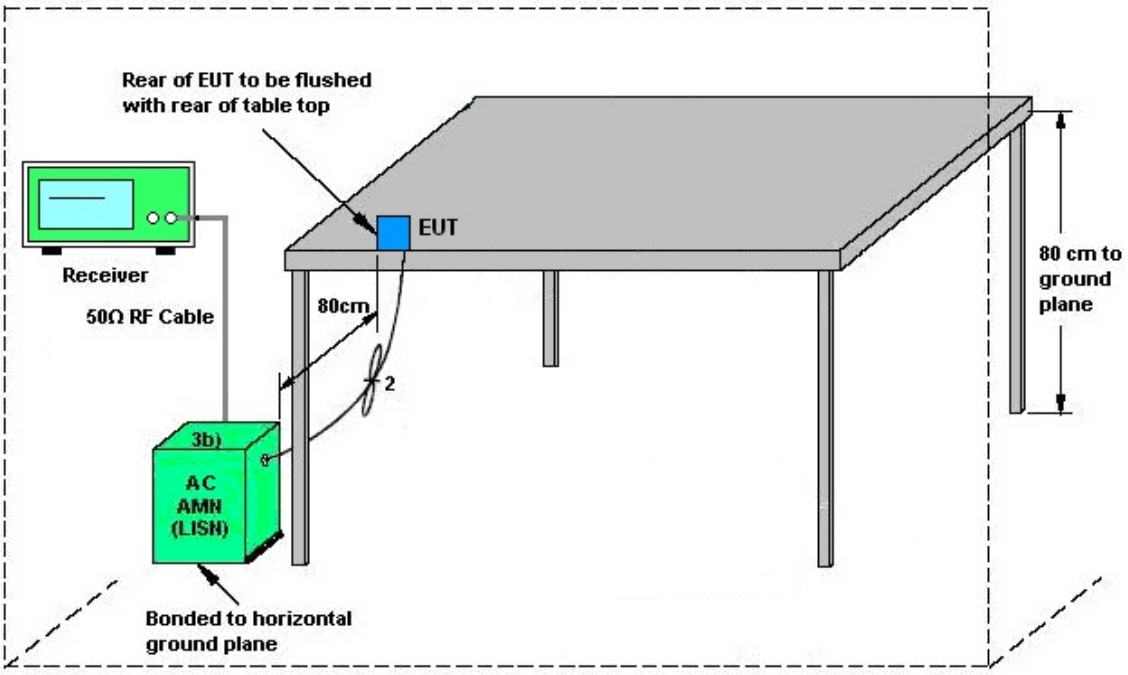
3.6.2 Measuring Instruments

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

3.6.3 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.

3.6.4 Test Setup



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 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.

3.7.2 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. 20, 2022	Dec.21, 2022~ Dec. 29, 2022	Sep. 19, 2023	Radiation (03CH22-HY)
Bilog Antenna with 6dB pad	TESEQ & WOKEN	CBL 6111D & 00802N1D-06	63304 & 002	N/A	Oct. 04, 2022	Dec.21, 2022~ Dec. 29, 2022	Oct. 03, 2023	Radiation (03CH22-HY)
Amplifier	SONOMA	310N	421581	N/A	Jul. 16, 2022	Dec.21, 2022~ Dec. 29, 2022	Jul. 15, 2023	Radiation (03CH22-HY)
Double Ridged Guide Horn Antenna	RFSPIN	DRH18-E	LE2C05A18EN	1GHz~18GHz	Jul. 06, 2022	Dec.21, 2022~ Dec. 29, 2022	Jul. 05, 2023	Radiation (03CH22-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	00991	18GHz-40GHz	May 14, 2022	Dec.21, 2022~ Dec. 29, 2022	May 13, 2023	Radiation (03CH22-HY)
Amplifier	EMEC	EM01G18GA	060877	N/A	Sep. 29, 2022	Dec.21, 2022~ Dec. 29, 2022	Sep. 28, 2023	Radiation (03CH22-HY)
Preamplifier	EMEC	EM18G40G	060801	18-40GHz	Jun. 28, 2022	Dec.21, 2022~ Dec. 29, 2022	Jun. 27, 2023	Radiation (03CH22-HY)
Signal Analyzer	Keysight	N9010B	MY60241058	N/A	Jul. 07, 2022	Dec.21, 2022~ Dec. 29, 2022	Jul. 06, 2023	Radiation (03CH22-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Dec.21, 2022~ Dec. 29, 2022	N/A	Radiation (03CH22-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Dec.21, 2022~ Dec. 29, 2022	N/A	Radiation (03CH22-HY)
Software	Audix	E3 6.09824_2019122	RK-002347	N/A	N/A	Dec.21, 2022~ Dec. 29, 2022	N/A	Radiation (03CH22-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 104	MY9837/4PE	9kHz~30MHz	Mar. 10, 2022	Dec.21, 2022~ Dec. 29, 2022	Mar. 09, 2023	Radiation (03CH22-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804390/2,804611/2,804615/2	N/A	Oct. 25, 2022	Dec.21, 2022~ Dec. 29, 2022	Oct. 24, 2023	Radiation (03CH22-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	Dec. 09, 2022	N/A	Conduction (CO07-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Dec. 09, 2022	N/A	Conduction (CO07-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	9561-F N00373	9kHz-200MHz	Nov. 01, 2022	Dec. 09, 2022	Oct. 31, 2023	Conduction (CO07-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	Mar. 16, 2022	Dec. 09, 2022	Mar. 15, 2023	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Feb. 16, 2022	Dec. 09, 2022	Feb. 15, 2023	Conduction (CO07-HY)
Four-Line V-Network	TESEQ	NNB 52	36122	N/A	Mar. 04, 2022	Dec. 09, 2022	Mar. 03, 2023	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Oct. 06, 2022	Dec. 09, 2022	Oct. 05, 2023	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESCI7	100724	9kHz~7GHz	Feb. 24, 2022	Dec. 09, 2022	Feb. 23, 2023	Conduction (CO07-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 17, 2022	Dec.14, 2022~ Dec. 19, 2022	Nov. 16, 2023	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	15I00041SNO 10 (NO:248)	10MHz~6GHz	Dec. 29, 2021	Dec.14, 2022~ Dec. 19, 2022	Dec. 28, 2022	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101905	10Hz - 40GHz(amp)	Aug. 03, 2022	Dec.14, 2022~ Dec. 19, 2022	Aug. 02, 2023	Conducted (TH05-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	3.46 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.92 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.42 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.40 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.38 dB

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Junyu Jhou	Temperature:	21~25	°C
Test Date:	2022/12/14~2022/12/19	Relative Humidity:	51~54	%

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.053	0.714	0.50	Pass
BLE	1Mbps	1	19	2440	1.053	0.714	0.50	Pass
BLE	1Mbps	1	39	2480	1.049	0.718	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	2.15	30.00	-0.27	1.88	36.00	Pass
BLE	1Mbps	1	19	2440	2.05	30.00	-0.27	1.78	36.00	Pass
BLE	1Mbps	1	39	2480	1.85	30.00	-0.27	1.58	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.80	-8.38	-0.27	8.00	Pass
BLE	1Mbps	1	19	2440	1.64	-8.20	-0.27	8.00	Pass
BLE	1Mbps	1	39	2480	1.43	-8.23	-0.27	8.00	Pass

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

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.082	1.392	0.50	Pass
BLE	2Mbps	1	19	2440	2.074	1.428	0.50	Pass
BLE	2Mbps	1	39	2480	2.094	1.424	0.50	Pass

TEST RESULTS DATA
Average Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	2.15	30.00	-0.27	1.88	36.00	Pass
BLE	2Mbps	1	19	2440	2.05	30.00	-0.27	1.78	36.00	Pass
BLE	2Mbps	1	39	2480	1.85	30.00	-0.27	1.58	36.00	Pass

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	0.35	-11.24	-0.27	8.00	Pass
BLE	2Mbps	1	19	2440	0.23	-11.19	-0.27	8.00	Pass
BLE	2Mbps	1	39	2480	0.08	-12.14	-0.27	8.00	Pass

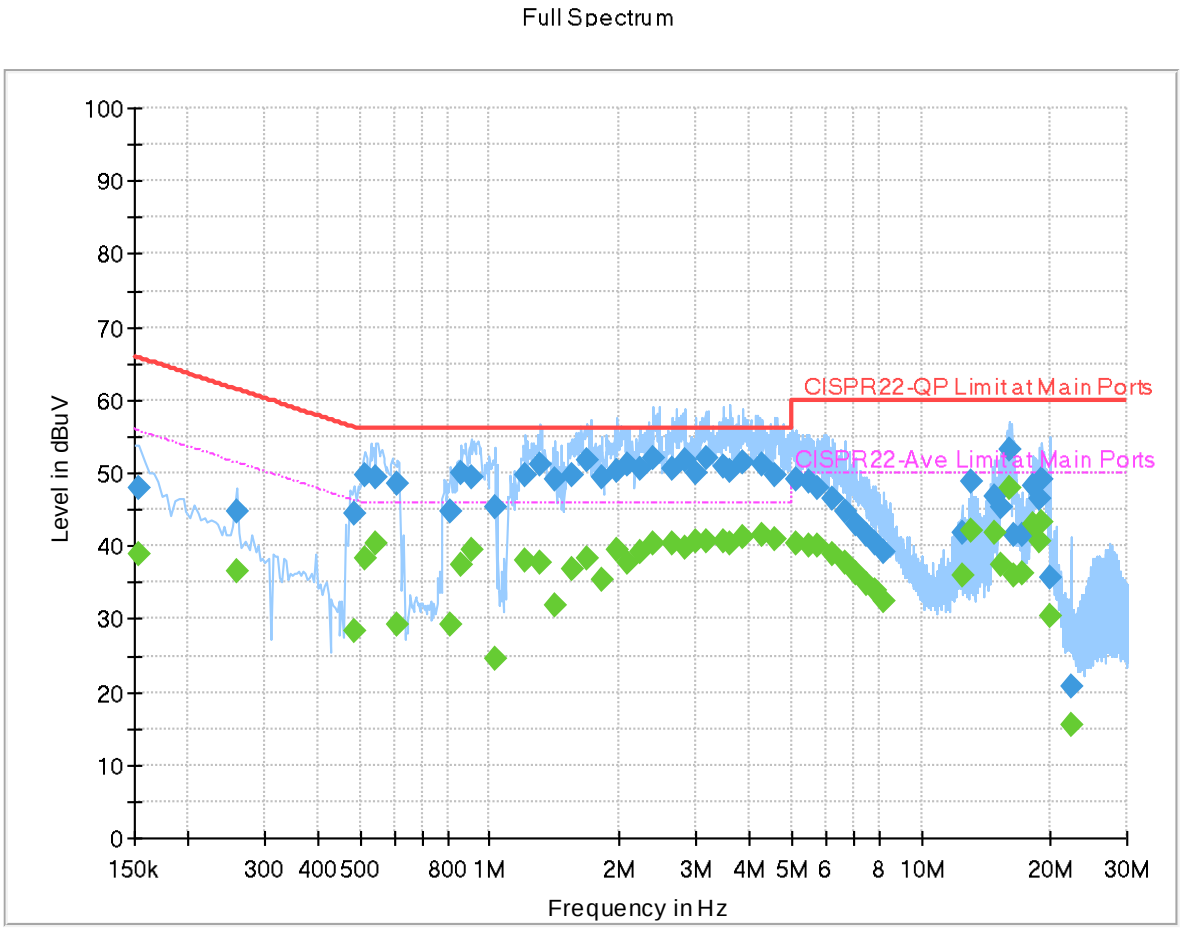
Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 30dBc limit.

Appendix B. AC Conducted Emission Test Results

Test Engineer :	Louis Chung	**Temperature :**	20.1~24.5℃
		Relative Humidity :	65.3~68.4%

EUT Information

Report NO :	2N1407
Test Mode :	Mode 1
Test Voltage :	220Vac/60Hz
Phase :	Line



Final_Result

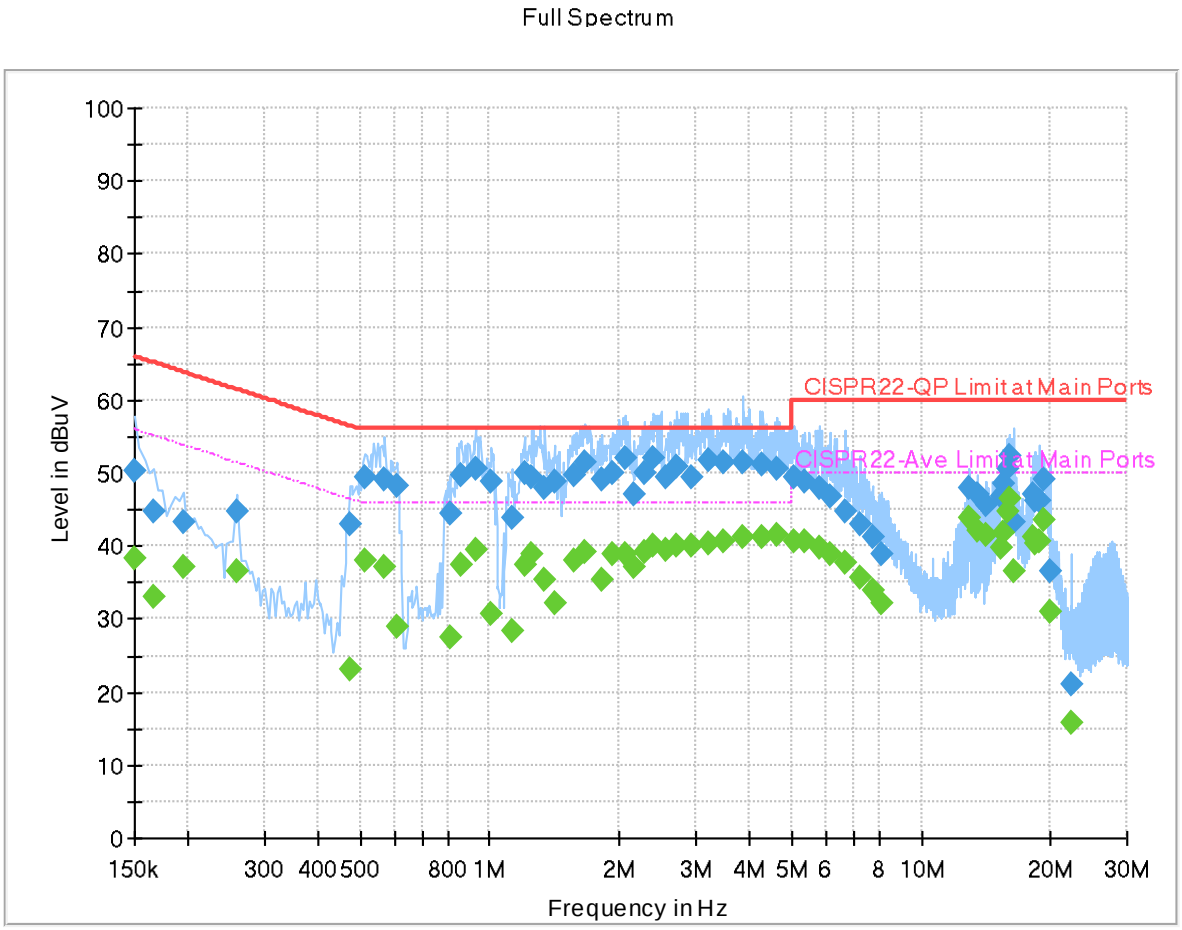
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.154000	---	38.87	55.78	16.91	L1	OFF	20.0
0.154000	48.08	---	65.78	17.70	L1	OFF	20.0
0.258000	---	36.65	51.50	14.85	L1	OFF	20.0
0.258000	44.83	---	61.50	16.67	L1	OFF	20.0
0.486000	---	28.33	46.24	17.91	L1	OFF	20.0
0.486000	44.54	---	56.24	11.70	L1	OFF	20.0
0.514000	---	38.20	46.00	7.80	L1	OFF	20.0
0.514000	49.64	---	56.00	6.36	L1	OFF	20.0
0.546000	---	40.24	46.00	5.76	L1	OFF	20.0
0.546000	49.46	---	56.00	6.54	L1	OFF	20.0
0.610000	---	29.27	46.00	16.73	L1	OFF	20.0
0.610000	48.43	---	56.00	7.57	L1	OFF	20.0
0.814000	---	29.28	46.00	16.72	L1	OFF	20.0
0.814000	44.65	---	56.00	11.35	L1	OFF	20.0
0.858000	---	37.56	46.00	8.44	L1	OFF	20.0
0.858000	50.03	---	56.00	5.97	L1	OFF	20.0
0.906000	---	39.42	46.00	6.58	L1	OFF	20.0
0.906000	49.49	---	56.00	6.51	L1	OFF	20.0
1.030000	---	24.50	46.00	21.50	L1	OFF	20.0

1.030000	45.40	---	56.00	10.60	L1	OFF	20.0
1.210000	---	37.92	46.00	8.08	L1	OFF	20.0
1.210000	49.73	---	56.00	6.27	L1	OFF	20.0
1.314000	---	37.82	46.00	8.18	L1	OFF	20.0
1.314000	51.16	---	56.00	4.84	L1	OFF	20.0
1.414000	---	32.01	46.00	13.99	L1	OFF	20.0
1.414000	49.00	---	56.00	7.00	L1	OFF	20.0
1.542000	---	36.92	46.00	9.08	L1	OFF	20.0
1.542000	49.80	---	56.00	6.20	L1	OFF	20.0
1.682000	---	38.45	46.00	7.55	L1	OFF	20.0
1.682000	51.86	---	56.00	4.14	L1	OFF	20.0
1.818000	---	35.41	46.00	10.59	L1	OFF	20.0
1.818000	49.30	---	56.00	6.70	L1	OFF	20.0
1.978000	---	39.47	46.00	6.53	L1	OFF	20.0
1.978000	50.38	---	56.00	5.62	L1	OFF	20.0
2.082000	---	37.83	46.00	8.17	L1	OFF	20.0
2.082000	51.13	---	56.00	4.87	L1	OFF	20.0
2.222000	---	39.10	46.00	6.90	L1	OFF	20.0
2.222000	50.49	---	56.00	5.51	L1	OFF	20.0
2.398000	---	40.28	46.00	5.72	L1	OFF	20.0
2.398000	51.94	---	56.00	4.06	L1	OFF	20.0
2.646000	---	40.37	46.00	5.63	L1	OFF	20.0
2.646000	50.67	---	56.00	5.33	L1	OFF	20.0
2.834000	---	39.63	46.00	6.37	L1	OFF	20.0
2.834000	51.61	---	56.00	4.39	L1	OFF	20.0
2.998000	---	40.53	46.00	5.47	L1	OFF	20.0
2.998000	50.14	---	56.00	5.86	L1	OFF	20.0
3.162000	---	40.55	46.00	5.45	L1	OFF	20.0
3.162000	52.10	---	56.00	3.90	L1	OFF	20.0
3.470000	---	40.78	46.00	5.22	L1	OFF	20.0
3.470000	50.99	---	56.00	5.01	L1	OFF	20.0
3.618000	---	40.39	46.00	5.61	L1	OFF	20.1
3.618000	50.33	---	56.00	5.67	L1	OFF	20.1
3.858000	---	41.20	46.00	4.80	L1	OFF	20.1
3.858000	51.47	---	56.00	4.53	L1	OFF	20.1
4.258000	---	41.49	46.00	4.51	L1	OFF	20.1
4.258000	51.09	---	56.00	4.91	L1	OFF	20.1
4.574000	---	41.06	46.00	4.94	L1	OFF	20.1
4.574000	49.71	---	56.00	6.29	L1	OFF	20.1
5.114000	---	40.36	50.00	9.64	L1	OFF	20.1
5.114000	49.08	---	60.00	10.92	L1	OFF	20.1
5.470000	---	40.17	50.00	9.83	L1	OFF	20.1
5.470000	48.71	---	60.00	11.29	L1	OFF	20.1
5.738000	---	40.07	50.00	9.93	L1	OFF	20.1
5.738000	47.88	---	60.00	12.12	L1	OFF	20.1
6.258000	---	38.88	50.00	11.12	L1	OFF	20.1
6.258000	46.35	---	60.00	13.65	L1	OFF	20.1
6.674000	---	37.68	50.00	12.32	L1	OFF	20.1
6.674000	44.61	---	60.00	15.39	L1	OFF	20.1
7.086000	---	36.35	50.00	13.65	L1	OFF	20.1
7.086000	43.12	---	60.00	16.88	L1	OFF	20.1
7.494000	---	34.88	50.00	15.12	L1	OFF	20.1
7.494000	41.54	---	60.00	18.46	L1	OFF	20.1
7.806000	---	33.87	50.00	16.13	L1	OFF	20.1
7.806000	40.49	---	60.00	19.51	L1	OFF	20.1
8.154000	---	32.50	50.00	17.50	L1	OFF	20.1
8.154000	39.14	---	60.00	20.86	L1	OFF	20.1
12.406000	---	36.05	50.00	13.95	L1	OFF	20.2
12.406000	41.71	---	60.00	18.29	L1	OFF	20.2
13.058000	---	42.01	50.00	7.99	L1	OFF	20.2
13.058000	48.78	---	60.00	11.22	L1	OFF	20.2
14.746000	---	41.71	50.00	8.29	L1	OFF	20.2
14.746000	46.92	---	60.00	13.08	L1	OFF	20.2
15.370000	---	37.49	50.00	12.51	L1	OFF	20.2
15.370000	45.39	---	60.00	14.61	L1	OFF	20.2
16.050000	---	48.06	50.00	1.94	L1	OFF	20.2
16.050000	53.20	---	60.00	6.80	L1	OFF	20.2
16.478000	---	36.06	50.00	13.94	L1	OFF	20.2
16.478000	41.58	---	60.00	18.42	L1	OFF	20.2
17.170000	---	36.12	50.00	13.88	L1	OFF	20.2
17.170000	41.42	---	60.00	18.58	L1	OFF	20.2

18.198000	**---**	**42.93**	**50.00**	**7.07**	**L1**	**OFF**	**20.2**
18.198000	**48.35**	**---**	**60.00**	**11.65**	**L1**	**OFF**	**20.2**
18.738000	**---**	**40.59**	**50.00**	**9.41**	**L1**	**OFF**	**20.2**
18.738000	**46.51**	**---**	**60.00**	**13.49**	**L1**	**OFF**	**20.2**
19.034000	**---**	**43.35**	**50.00**	**6.65**	**L1**	**OFF**	**20.2**
19.034000	**49.18**	**---**	**60.00**	**10.82**	**L1**	**OFF**	**20.2**
19.994000	**---**	**30.43**	**50.00**	**19.57**	**L1**	**OFF**	**20.2**
19.994000	**35.76**	**---**	**60.00**	**24.24**	**L1**	**OFF**	**20.2**
22.346000	**---**	**15.58**	**50.00**	**34.42**	**L1**	**OFF**	**20.2**
22.346000	**20.87**	**---**	**60.00**	**39.13**	**L1**	**OFF**	**20.2**

EUT Information

Report NO :	2N1407
Test Mode :	Mode 1
Test Voltage :	220Vac/60Hz
Phase :	Neutral



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.150000	---	38.31	56.00	17.69	N	OFF	20.0
0.150000	50.42	---	66.00	15.58	N	OFF	20.0
0.166000	---	33.17	55.16	21.99	N	OFF	20.0
0.166000	44.62	---	65.16	20.54	N	OFF	20.0
0.194000	---	37.21	53.86	16.65	N	OFF	20.0
0.194000	43.38	---	63.86	20.48	N	OFF	20.0
0.258000	---	36.60	51.50	14.90	N	OFF	20.0
0.258000	44.69	---	61.50	16.81	N	OFF	20.0
0.474000	---	23.21	46.44	23.23	N	OFF	20.0
0.474000	42.88	---	56.44	13.56	N	OFF	20.0
0.514000	---	38.10	46.00	7.90	N	OFF	20.0
0.514000	49.47	---	56.00	6.53	N	OFF	20.0
0.570000	---	37.22	46.00	8.78	N	OFF	20.0
0.570000	49.21	---	56.00	6.79	N	OFF	20.0
0.610000	---	29.07	46.00	16.93	N	OFF	20.0
0.610000	48.33	---	56.00	7.67	N	OFF	20.0
0.806000	---	27.59	46.00	18.41	N	OFF	20.0
0.806000	44.51	---	56.00	11.49	N	OFF	20.0
0.858000	---	37.36	46.00	8.64	N	OFF	20.0

0.858000	49.78	---	56.00	6.22	N	OFF	20.0
0.926000	---	39.58	46.00	6.42	N	OFF	20.0
0.926000	50.60	---	56.00	5.40	N	OFF	20.0
1.010000	---	30.80	46.00	15.20	N	OFF	20.0
1.010000	48.70	---	56.00	7.30	N	OFF	20.0
1.130000	---	28.25	46.00	17.75	N	OFF	20.0
1.130000	43.91	---	56.00	12.09	N	OFF	20.0
1.202000	---	37.43	46.00	8.57	N	OFF	20.0
1.202000	49.88	---	56.00	6.12	N	OFF	20.0
1.254000	---	38.82	46.00	7.18	N	OFF	20.0
1.254000	49.54	---	56.00	6.46	N	OFF	20.0
1.342000	---	35.43	46.00	10.57	N	OFF	20.0
1.342000	47.81	---	56.00	8.19	N	OFF	20.0
1.410000	---	32.20	46.00	13.80	N	OFF	20.0
1.410000	48.86	---	56.00	7.14	N	OFF	20.0
1.562000	---	37.92	46.00	8.08	N	OFF	20.0
1.562000	49.73	---	56.00	6.27	N	OFF	20.0
1.666000	---	39.19	46.00	6.81	N	OFF	20.0
1.666000	51.46	---	56.00	4.54	N	OFF	20.0
1.822000	---	35.25	46.00	10.75	N	OFF	20.0
1.822000	48.98	---	56.00	7.02	N	OFF	20.0
1.934000	---	38.83	46.00	7.17	N	OFF	20.0
1.934000	50.03	---	56.00	5.97	N	OFF	20.0
2.062000	---	38.75	46.00	7.25	N	OFF	20.0
2.062000	52.19	---	56.00	3.81	N	OFF	20.0
2.158000	---	37.17	46.00	8.83	N	OFF	20.0
2.158000	47.11	---	56.00	8.89	N	OFF	20.0
2.286000	---	39.17	46.00	6.83	N	OFF	20.0
2.286000	50.10	---	56.00	5.90	N	OFF	20.0
2.402000	---	40.16	46.00	5.84	N	OFF	20.0
2.402000	52.16	---	56.00	3.84	N	OFF	20.0
2.554000	---	39.56	46.00	6.44	N	OFF	20.0
2.554000	49.44	---	56.00	6.56	N	OFF	20.0
2.722000	---	40.09	46.00	5.91	N	OFF	20.0
2.722000	50.90	---	56.00	5.10	N	OFF	20.0
2.946000	---	40.05	46.00	5.95	N	OFF	20.0
2.946000	49.47	---	56.00	6.53	N	OFF	20.0
3.198000	---	40.28	46.00	5.72	N	OFF	20.0
3.198000	51.90	---	56.00	4.10	N	OFF	20.0
3.490000	---	40.77	46.00	5.23	N	OFF	20.1
3.490000	51.46	---	56.00	4.54	N	OFF	20.1
3.874000	---	41.18	46.00	4.82	N	OFF	20.1
3.874000	51.50	---	56.00	4.50	N	OFF	20.1
4.298000	---	41.23	46.00	4.77	N	OFF	20.1
4.298000	51.03	---	56.00	4.97	N	OFF	20.1
4.642000	---	41.46	46.00	4.54	N	OFF	20.1
4.642000	50.61	---	56.00	5.39	N	OFF	20.1
5.086000	---	40.55	50.00	9.45	N	OFF	20.1
5.086000	49.54	---	60.00	10.46	N	OFF	20.1
5.362000	---	40.56	50.00	9.44	N	OFF	20.1
5.362000	48.75	---	60.00	11.25	N	OFF	20.1
5.806000	---	39.82	50.00	10.18	N	OFF	20.1
5.806000	47.96	---	60.00	12.04	N	OFF	20.1
6.186000	---	38.92	50.00	11.08	N	OFF	20.1
6.186000	46.83	---	60.00	13.17	N	OFF	20.1
6.638000	---	37.62	50.00	12.38	N	OFF	20.1
6.638000	44.69	---	60.00	15.31	N	OFF	20.1
7.206000	---	35.63	50.00	14.37	N	OFF	20.1
7.206000	42.87	---	60.00	17.13	N	OFF	20.1
7.690000	---	34.02	50.00	15.98	N	OFF	20.1
7.690000	41.11	---	60.00	18.89	N	OFF	20.1
8.138000	---	32.18	50.00	17.82	N	OFF	20.1
8.138000	38.87	---	60.00	21.13	N	OFF	20.1
12.874000	---	43.96	50.00	6.04	N	OFF	20.2
12.874000	48.00	---	60.00	12.00	N	OFF	20.2
13.558000	---	42.02	50.00	7.98	N	OFF	20.2
13.558000	47.10	---	60.00	12.90	N	OFF	20.2
14.178000	---	41.49	50.00	8.51	N	OFF	20.2
14.178000	45.74	---	60.00	14.26	N	OFF	20.2
15.290000	---	39.68	50.00	10.32	N	OFF	20.2
15.290000	46.92	---	60.00	13.08	N	OFF	20.2

15.558000	---	41.79	50.00	8.21	N	OFF	20.2
15.558000	48.52	---	60.00	11.48	N	OFF	20.2
15.770000	---	44.76	50.00	5.24	N	OFF	20.2
15.770000	50.67	---	60.00	9.33	N	OFF	20.2
16.050000	---	46.57	50.00	3.43	N	OFF	20.3
16.050000	52.47	---	60.00	7.53	N	OFF	20.3
16.470000	---	36.53	50.00	13.47	N	OFF	20.3
16.470000	43.20	---	60.00	16.80	N	OFF	20.3
18.186000	---	41.27	50.00	8.73	N	OFF	20.3
18.186000	47.19	---	60.00	12.81	N	OFF	20.3
18.430000	---	40.29	50.00	9.71	N	OFF	20.3
18.430000	46.08	---	60.00	13.92	N	OFF	20.3
18.826000	---	40.62	50.00	9.38	N	OFF	20.3
18.826000	46.17	---	60.00	13.83	N	OFF	20.3
19.218000	---	43.54	50.00	6.46	N	OFF	20.3
19.218000	49.07	---	60.00	10.93	N	OFF	20.3
20.010000	---	31.11	50.00	18.89	N	OFF	20.3
20.010000	36.58	---	60.00	23.42	N	OFF	20.3
22.358000	---	15.65	50.00	34.35	N	OFF	20.3
22.358000	21.13	---	60.00	38.87	N	OFF	20.3

Appendix C. Radiated Spurious Emission

Test Engineer :	Leo Li	Temperature :	22.1~23.1°C
		Relative Humidity :	50~60%

<1Mpbs>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BLE CH 00 2402MHz		2312.31	50.91	-23.09	74	37.39	27.1	18.83	32.41	232	116	P	H
		2378.04	40.29	-13.71	54	26.69	27.1	18.96	32.46	232	116	A	H
	*	2402	93.18	-	-	79.55	27.1	19	32.47	232	116	P	H
	*	2402	92.62	-	-	78.99	27.1	19	32.47	232	116	A	H
													H
													H
		2313.885	51.93	-22.07	74	38.4	27.1	18.84	32.41	209	186	P	V
		2377.935	40.21	-13.79	54	26.61	27.1	18.96	32.46	209	186	A	V
	*	2402	91.99	-	-	78.36	27.1	19	32.47	209	186	P	V
	*	2402	91.41	-	-	77.78	27.1	19	32.47	209	186	A	V
													V
													V

BLE CH 19 2440MHz		2360.24	51.22	-22.78	74	37.64	27.1	18.92	32.44	199	117	P	H
		2387.92	39.89	-14.11	54	26.27	27.1	18.98	32.46	199	117	A	H
	*	2440	96.55	-	-	82.95	27.02	19.08	32.5	199	117	P	H
	*	2440	95.98	-	-	82.38	27.02	19.08	32.5	199	117	A	H
		2488.16	51.55	-22.45	74	38.06	26.85	19.17	32.53	199	117	P	H
		2488	42.69	-11.31	54	29.2	26.85	19.17	32.53	199	117	A	H
		2342.48	51.82	-22.18	74	38.26	27.1	18.89	32.43	301	166	P	V
		2343.76	40.04	-13.96	54	26.48	27.1	18.89	32.43	301	166	A	V
	*	2440	96.15	-	-	82.55	27.02	19.08	32.5	301	166	P	V
	*	2440	95.63	-	-	82.03	27.02	19.08	32.5	301	166	A	V
		2487.68	52.01	-21.99	74	38.52	26.85	19.17	32.53	301	166	P	V
		2488.08	42.67	-11.33	54	29.18	26.85	19.17	32.53	301	166	A	V

BLE	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)
BLE CH 39 2480MHz	*	2480	95.24	-	-	81.73	26.88	19.16	32.53	232	116	P	H
	*	2480	94.66	-	-	81.15	26.88	19.16	32.53	232	116	A	H
		2483.64	51.33	-22.67	74	37.83	26.87	19.16	32.53	232	116	P	H
		2483.52	40.51	-13.49	54	27.01	26.87	19.16	32.53	232	116	A	H
													H
													H
	*	2480	95.64	-	-	82.13	26.88	19.16	32.53	209	186	P	V
	*	2480	95.18	-	-	81.67	26.88	19.16	32.53	209	186	A	V
		2497.2	51.24	-22.76	74	37.78	26.81	19.19	32.54	209	186	P	V
		2483.52	40.75	-13.25	54	27.25	26.87	19.16	32.53	209	186	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

BLE (Harmonic @ 3m)

BLE	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)
BLE CH 00 2402MHz		4804	47.15	-26.85	74	33.62	32.61	14.51	33.59	-	-	P	H
		4804	36.69	-17.31	54	23.16	32.61	14.51	33.59	-	-	A	H
	@	16005	59.55	-14.45	74	39.8	40.9	24.17	45.32	197	249	P	H
	@	16005	57.92	3.92	54	38.17	40.9	24.17	45.32	197	249	A	H
													H
													H
													H
													H
													H
													H
													H
													H
		4802	46.66	-27.34	74	33.14	32.6	14.51	33.59	-	-	P	V
		4804	35.7	-18.3	54	22.17	32.61	14.51	33.59	-	-	A	V
	@	16005	57.97	-16.03	74	38.22	40.9	24.17	45.32	247	39	P	V
	@	16005	52.25	-1.75	54	32.5	40.9	24.17	45.32	247	39	A	V
													V
													V
													V
													V
													V
													V
													V
													V

BLE	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)
		4880	57.76	-16.24	74	44.11	32.76	14.46	33.57	200	111	P	H
		4880	49.38	-4.62	54	35.73	32.76	14.46	33.57	200	111	A	H
		7320	58.7	-15.3	74	40.63	37.44	16.58	35.95	100	116	P	H
		7320	47.36	-6.64	54	29.29	37.44	16.58	35.95	100	116	A	H
	@	16005	59.34	-14.66	74	39.59	40.9	24.17	45.32	201	249	P	H
	@	16005	58.68	4.68	54	38.93	40.9	24.17	45.32	201	249	A	H
													H
													H
													H
													H
													H
													H
BLE CH 19 2440MHz		4880	55.34	-18.66	74	41.69	32.76	14.46	33.57	267	92	P	V
		4880	45.42	-8.58	54	31.77	32.76	14.46	33.57	267	92	A	V
		7320	58.11	-15.89	74	40.04	37.44	16.58	35.95	100	168	P	V
		7320	47.1	-6.9	54	29.03	37.44	16.58	35.95	100	168	A	V
	@	16005	59.56	-14.44	74	39.81	40.9	24.17	45.32	248	37	P	V
	@	16005	56.89	2.89	54	37.14	40.9	24.17	45.32	248	37	A	V
													V
													V
													V
													V
													V
													V

BLE	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)
BLE CH 39 2480MHz		4960	55.28	-18.72	74	41.66	32.78	14.4	33.56	167	110	P	H
		4960	42.23	-11.77	54	28.61	32.78	14.4	33.56	167	110	A	H
		7440	58.29	-15.71	74	40.33	37.12	16.88	36.04	100	115	P	H
		7440	47.08	-6.92	54	29.12	37.12	16.88	36.04	100	115	A	H
	@	16005	59.21	-14.79	74	39.46	40.9	24.17	45.32	199	249	P	H
	@	16005	58.62	4.62	54	38.87	40.9	24.17	45.32	199	249	A	H
													H
													H
													H
													H
													H
													H
		4960	54.71	-19.29	74	41.09	32.78	14.4	33.56	273	85	P	V
		4960	41.24	-12.76	54	27.62	32.78	14.4	33.56	273	85	A	V
		7440	58.41	-15.59	74	40.45	37.12	16.88	36.04	100	171	P	V
		7440	47.2	-6.8	54	29.24	37.12	16.88	36.04	100	171	A	V
	@	16005	58.29	-15.71	74	38.54	40.9	24.17	45.32	239	37	P	V
	@	16005	56.8	2.8	54	37.05	40.9	24.17	45.32	239	37	A	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. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.
4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

<2Mpbs>

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

BLE	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)
BLE CH 00 2402MHz		2337.825	50.97	-23.03	74	37.42	27.1	18.88	32.43	174	116	P	H
		2377.935	40.05	-13.95	54	26.45	27.1	18.96	32.46	174	116	A	H
	*	2402	92.55	-	-	78.92	27.1	19	32.47	174	116	P	H
	*	2402	91.06	-	-	77.43	27.1	19	32.47	174	116	A	H
													H
													H
		2378.67	51.12	-22.88	74	37.52	27.1	18.96	32.46	198	185	P	V
		2378.145	40.09	-13.91	54	26.49	27.1	18.96	32.46	198	185	A	V
	*	2402	92.23	-	-	78.6	27.1	19	32.47	198	185	P	V
	*	2402	90.72	-	-	77.09	27.1	19	32.47	198	185	A	V
													V
													V
BLE CH 19 2440MHz		2371.28	50.86	-23.14	74	37.26	27.1	18.95	32.45	201	119	P	H
		2386.64	39.88	-14.12	54	26.27	27.1	18.97	32.46	201	119	A	H
	*	2440	96.48	-	-	82.88	27.02	19.08	32.5	201	119	P	H
	*	2440	94.98	-	-	81.38	27.02	19.08	32.5	201	119	A	H
		2488.64	52.17	-21.83	74	38.68	26.85	19.17	32.53	201	119	P	H
		2488	41.92	-12.08	54	28.43	26.85	19.17	32.53	201	119	A	H
		2332.4	50.95	-23.05	74	37.41	27.1	18.87	32.43	298	166	P	V
		2389.68	40.05	-13.95	54	26.43	27.1	18.98	32.46	298	166	A	V
	*	2440	96.1	-	-	82.5	27.02	19.08	32.5	298	166	P	V
	*	2440	94.58	-	-	80.98	27.02	19.08	32.5	298	166	A	V
		2487.52	51.53	-22.47	74	38.04	26.85	19.17	32.53	298	166	P	V
		2488	42.1	-11.9	54	28.61	26.85	19.17	32.53	298	166	A	V

BLE CH 39 2480MHz	*	2480	95.5	-	-	81.99	26.88	19.16	32.53	201	119	P	H
	*	2480	93.98	-	-	80.47	26.88	19.16	32.53	201	119	A	H
		2484.12	51.45	-22.55	74	37.96	26.86	19.16	32.53	201	119	P	H
		2483.52	42.72	-11.28	54	29.22	26.87	19.16	32.53	201	119	A	H
													H
													H
	*	2480	96.43	-	-	82.92	26.88	19.16	32.53	201	178	P	V
	*	2480	94.89	-	-	81.38	26.88	19.16	32.53	201	178	A	V
		2483.64	52.11	-21.89	74	38.61	26.87	19.16	32.53	201	178	P	V
		2483.52	43.24	-10.76	54	29.74	26.87	19.16	32.53	201	178	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

BLE (Harmonic @ 3m)

BLE	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)
BLE CH 00 2402MHz		4804	48.96	-25.04	74	35.43	32.61	14.51	33.59	175	115	P	H
		4804	36.39	-17.61	54	22.86	32.61	14.51	33.59	175	115	A	H
	@	16005	58.7	-15.3	74	38.95	40.9	24.17	45.32	197	249	P	H
	@	16005	59.11	5.11	54	39.36	40.9	24.17	45.32	197	249	A	H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	48.48	-25.52	74	34.95	32.61	14.51	33.59	100	117	P	V
		4804	36.07	-17.93	54	22.54	32.61	14.51	33.59	100	117	A	V
	@	16005	57.43	-16.57	74	37.68	40.9	24.17	45.32	241	37	P	V
	@	16005	57.23	3.23	54	37.48	40.9	24.17	45.32	241	37	A	V
													V
													V
													V
													V
													V
													V
													V
													V

BLE	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)
BLE CH 19 2440MHz		4880	57.9	-16.1	74	44.25	32.76	14.46	33.57	170	113	P	H
		4880	47.91	-6.09	54	34.26	32.76	14.46	33.57	170	113	A	H
		7320	57.79	-16.21	74	39.72	37.44	16.58	35.95	100	114	P	H
		7320	46.68	-7.32	54	28.61	37.44	16.58	35.95	100	114	A	H
	@	16005	58.09	-15.91	74	38.34	40.9	24.17	45.32	197	248	P	H
	@	16005	58.08	4.08	54	38.33	40.9	24.17	45.32	197	248	A	H
													H
													H
													H
													H
													H
													H
		4880	55.99	-18.01	74	42.34	32.76	14.46	33.57	266	87	P	V
		4880	44.89	-9.11	54	31.24	32.76	14.46	33.57	266	87	A	V
		7320	58.37	-15.63	74	40.3	37.44	16.58	35.95	100	169	P	V
		7320	47.26	-6.74	54	29.19	37.44	16.58	35.95	100	169	A	V
	@	16005	58.04	-15.96	74	38.29	40.9	24.17	45.32	242	37	P	V
	@	16005	57.38	3.38	54	37.63	40.9	24.17	45.32	242	37	A	V
													V
													V
													V
													V
													V
													V

BLE	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)
BLE CH 39 2480MHz		4960	59.21	-14.79	74	45.59	32.78	14.4	33.56	177	115	P	H
		4960	50.41	-3.59	54	36.79	32.78	14.4	33.56	177	115	A	H
		7440	57.7	-16.3	74	39.74	37.12	16.88	36.04	100	117	P	H
		7440	46.49	-7.51	54	28.53	37.12	16.88	36.04	100	117	A	H
	@	16005	58.94	-15.06	74	39.19	40.9	24.17	45.32	199	247	P	H
	@	16005	57.41	3.41	54	37.66	40.9	24.17	45.32	199	247	A	H
													H
													H
													H
													H
													H
													H
		4960	56.59	-17.41	74	42.97	32.78	14.4	33.56	267	88	P	V
		4960	45.95	-8.05	54	32.33	32.78	14.4	33.56	267	88	A	V
		7440	57.83	-16.17	74	39.87	37.12	16.88	36.04	100	167	P	V
		7440	46.62	-7.38	54	28.66	37.12	16.88	36.04	100	167	A	V
	@	16005	59.56	-14.44	74	39.81	40.9	24.17	45.32	249	41	P	V
	@	16005	51.31	-2.69	54	31.56	40.9	24.17	45.32	249	41	A	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. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

Emission after 18GHz

2.4GHz BLE (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 BLE SHF		18854	56.4	-17.6	74	56.46	37.82	17.51	55.39	-	-	P	H
		18854	41.28	-12.72	54	41.34	37.82	17.51	55.39	-	-	A	H
	@	23999	57.71	-16.29	74	52.07	38.3	21.14	53.8	206	201	P	H
	@	23999	57.07	-16.93	74	51.43	38.3	21.14	53.8	206	201	A	H
													H
													H
													H
													H
													H
													H
													H
													H
													V
		18448	56.89	-17.11	74	58.25	37.36	16.91	55.63	-	-	P	V
		18448	30.74	-23.26	54	32.1	37.36	16.91	55.63	-	-	A	V
	@	23999	55.31	-18.69	74	49.67	38.3	21.14	53.8	200	8	P	V
	@	23999	52.69	-1.31	54	47.05	38.3	21.14	53.8	200	8	A	V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.
4. 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 BLE (LF)

BLE	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 BLE LF		77.53	35.19	-4.81	40	52.93	13	1.98	32.72	-	-	P	H
		101.78	30.96	-12.54	43.5	45.2	16.2	2.25	32.69	-	-	P	H
		217.21	37.93	-8.07	46	52.65	14.92	3.08	32.72	-	-	P	H
		290.93	34.61	-11.39	46	44.73	19.12	3.52	32.76	-	-	P	H
		500.45	36.41	-9.59	46	41.05	23.81	4.44	32.89	-	-	P	H
	@	546.04	49.19	3.19	46	52.77	24.62	4.73	32.93	-	-	P	H
		704.15	38.11	-7.89	46	39.23	26.5	5.22	32.84	-	-	P	H
													H
													H
													H
													H
													H
		45.52	37.2	-2.8	40	51.52	16.84	1.59	32.75	-	-	P	V
		78.5	35.18	-4.82	40	52.81	13.1	1.99	32.72	-	-	P	V
		133.79	39.36	-4.14	43.5	51.99	17.58	2.49	32.7	-	-	P	V
		216.24	42.47	-3.53	46	57.29	14.82	3.08	32.72	119	319	Q	V
		450.01	41.76	-4.24	46	47.4	22.9	4.32	32.86	-	-	P	V
	@	544.1	45.79	-0.21	46	49.58	24.43	4.71	32.93	-	-	P	V
		704.15	38.48	-7.52	46	39.6	26.5	5.22	32.84	-	-	P	V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.
4. 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.

2.4GHz 2400~2483.5MHz

Disable RF Function (Harmonic @ 3m)

BLE	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)
	@	16005	59.87	-14.13	74	40.55	40.9	23.74	45.32	-	-	P	H
	@	16005	57.66	3.66	54	38.34	40.9	23.74	45.32	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
Disable RF													H
Function	@	16005	57.66	-16.34	74	38.34	40.9	23.74	45.32	-	-	P	V
	@	16005	56.47	2.47	54	37.15	40.9	23.74	45.32	-	-	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. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.
4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission after 18GHz

Disable RF Function (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)
Disable RF Function SHF	@	23999	57.53	-16.47	74	51.89	38.3	21.14	53.8	-	-	P	H
	@	23999	56.92	2.92	54	51.28	38.3	21.14	53.8	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													V
	@	23999	55.13	-18.87	74	49.49	38.3	21.14	53.8	-	-	P	V
	@	23999	52.54	-1.46	54	46.9	38.3	21.14	53.8	-	-	A	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.
4. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

Disable RF Function (LF)

BLE	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)
Disable RF Function LF	@	544.1	49.56	3.56	46	53.35	24.43	4.71	32.93	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
	@	546.04	46.49	0.49	46	50.07	24.62	4.73	32.93	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. Note “@” is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.
4. 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.

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	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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

BLE	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)
BLE CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Margin (dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. 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)

2. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Radiated Spurious Emission Plots

Test Engineer :	Leo Li	**Temperature :**	22.1~23.1°C
		Relative Humidity :	50~60%

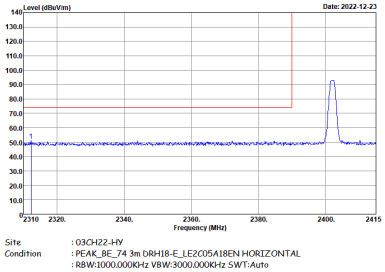
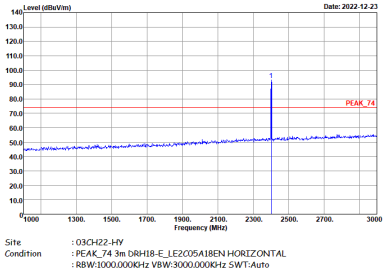
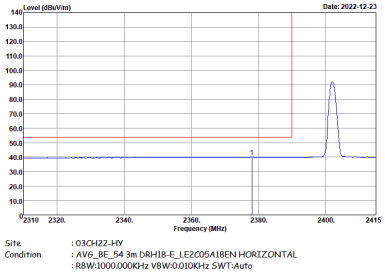
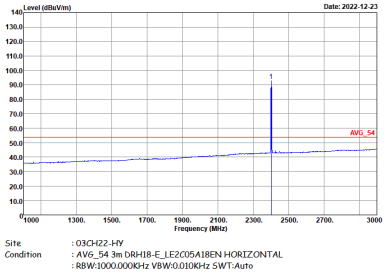
Note symbol

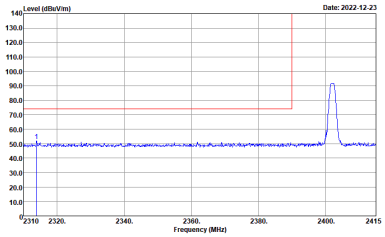
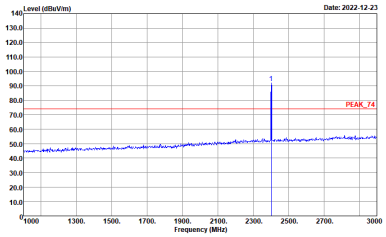
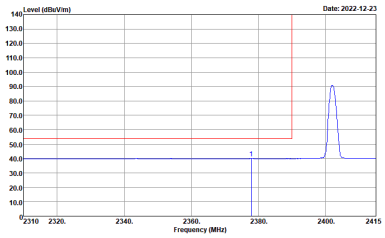
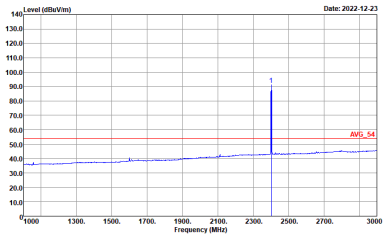
-L	**Low channel location**
-R	**High channel location**

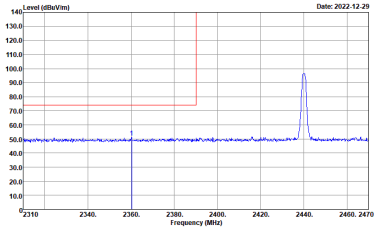
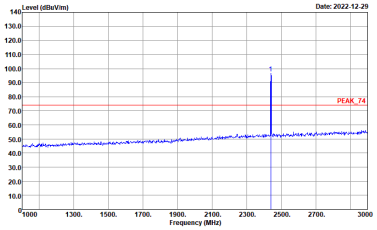
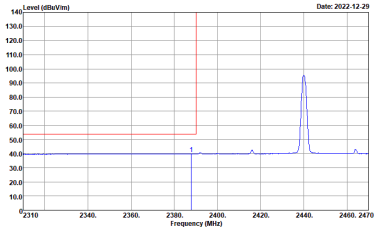
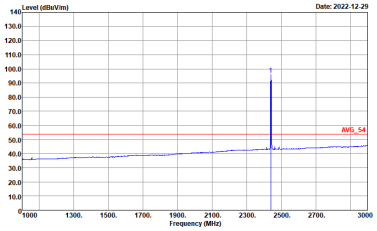
<1Mpbs>

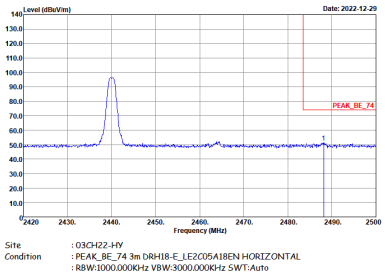
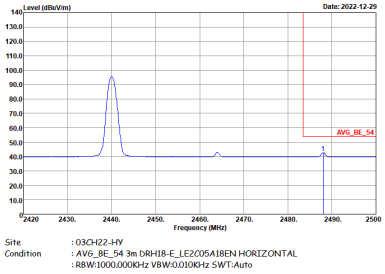
2.4GHz 2400~2483.5MHz

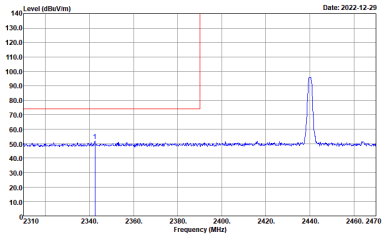
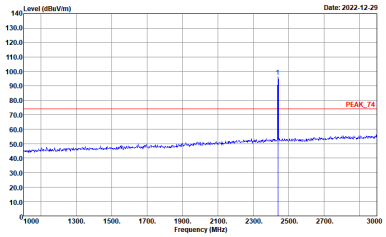
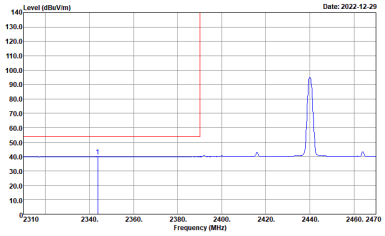
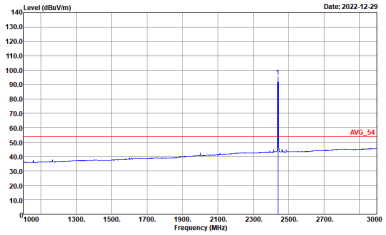
BLE (Band Edge @ 3m)

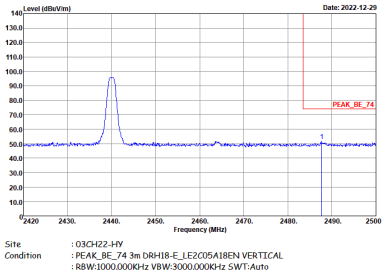
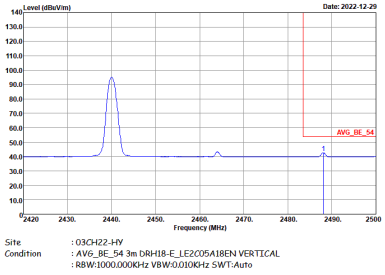
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak		
Avg.		

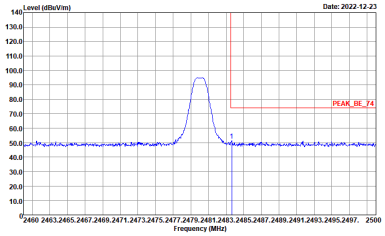
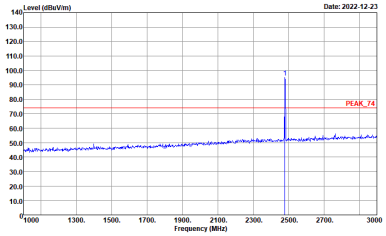
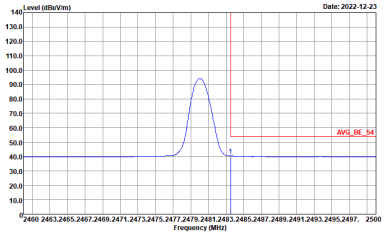
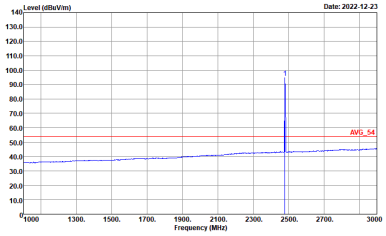
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

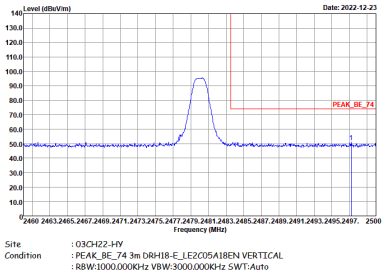
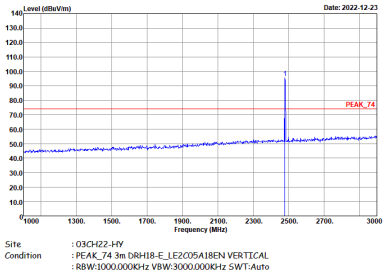
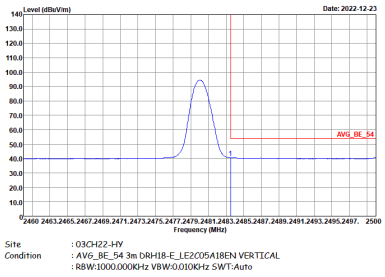
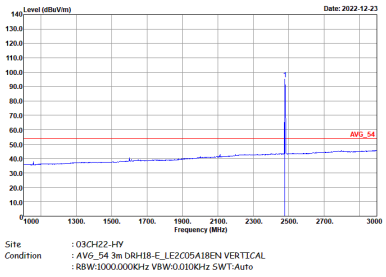
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH22-HV Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HV Condition : PEAK_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HV Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HV Condition : AVG_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

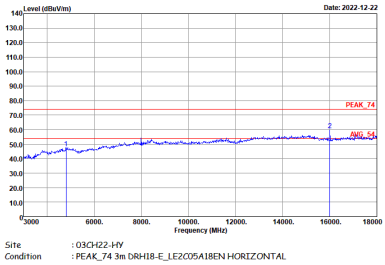
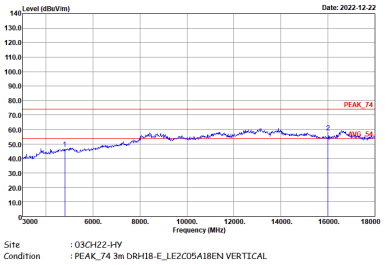
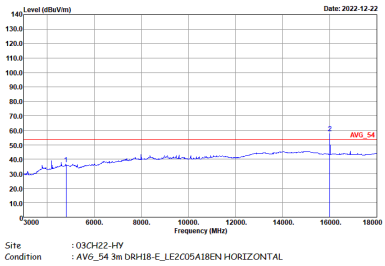
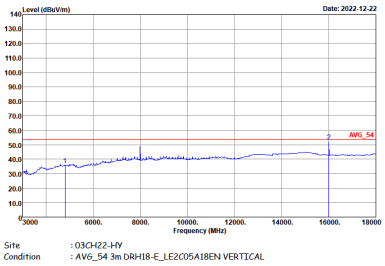
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

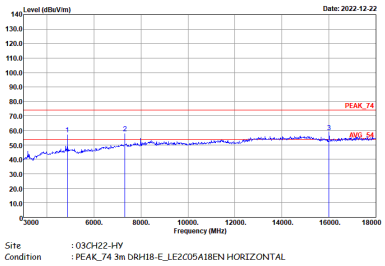
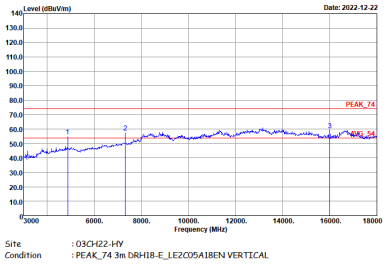
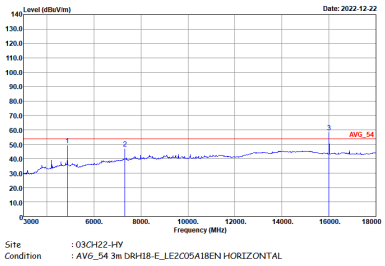
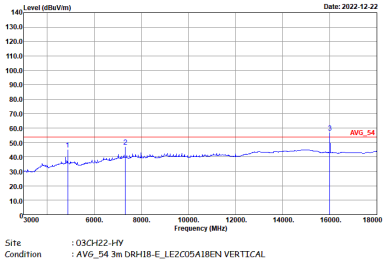
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

2.4GHz 2400~2483.5MHz

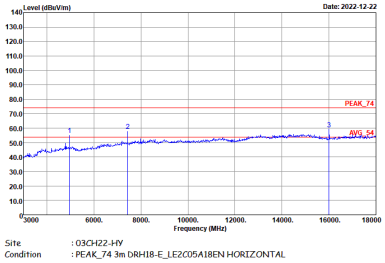
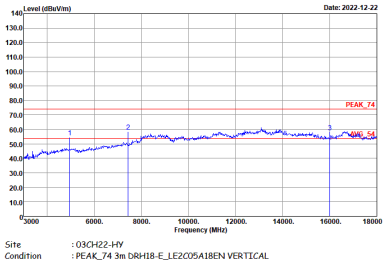
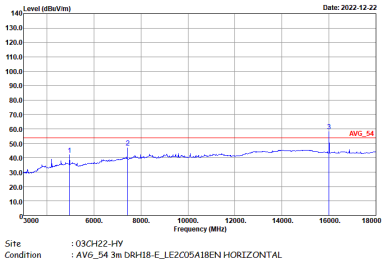
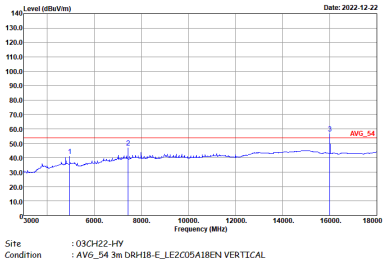
BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak		
Avg.		

Remark: #2 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak		
Avg.		

Remark: #3 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

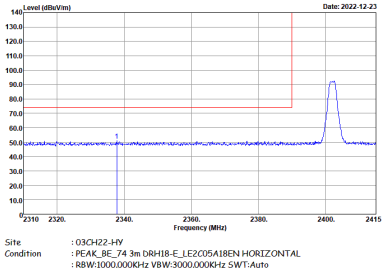
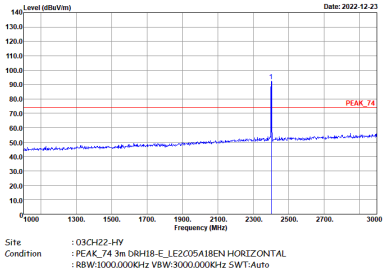
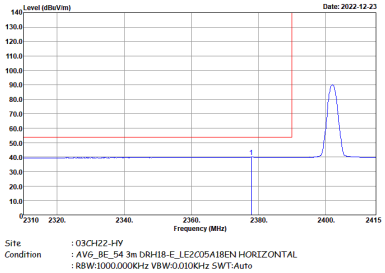
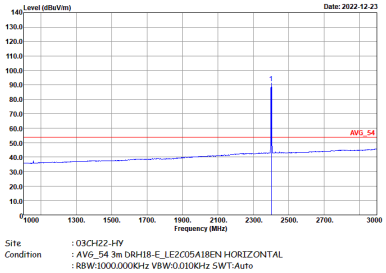
BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak		
Avg.		

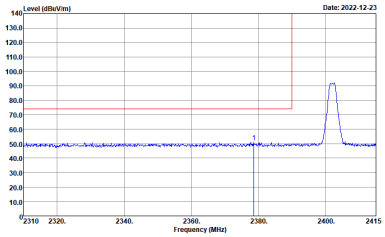
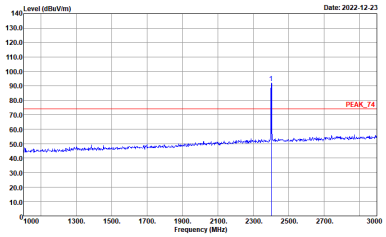
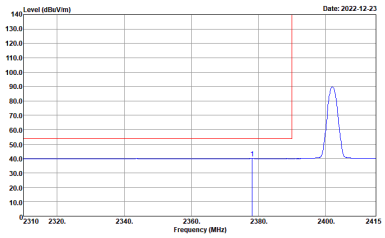
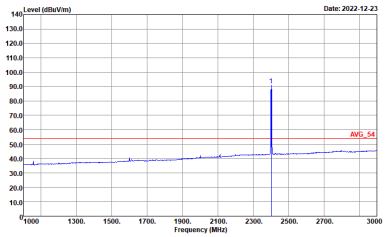
Remark: #3 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

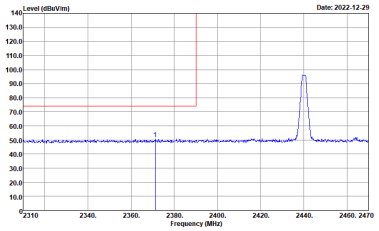
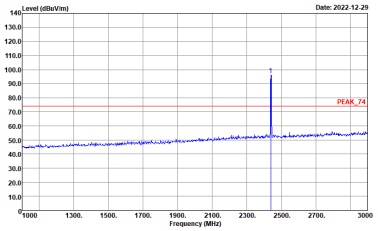
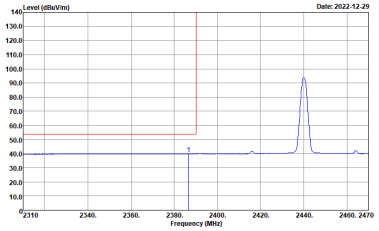
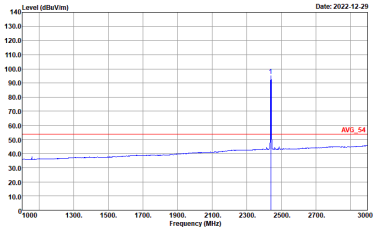
<2Mpbs>

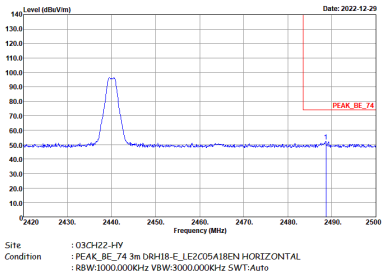
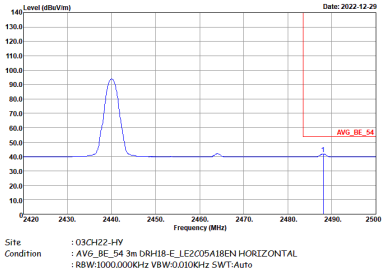
2.4GHz 2400~2483.5MHz

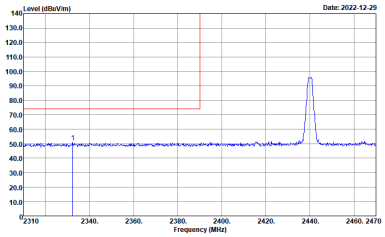
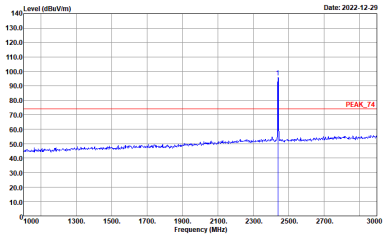
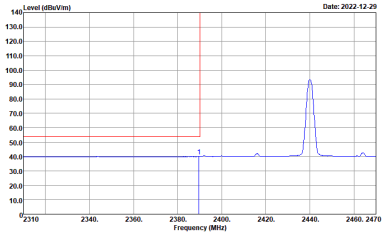
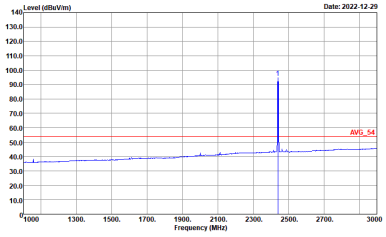
BLE (Band Edge @ 3m)

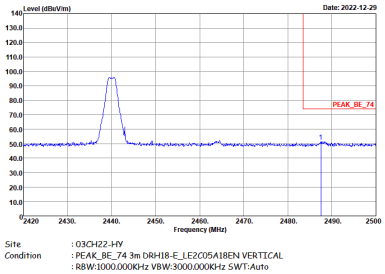
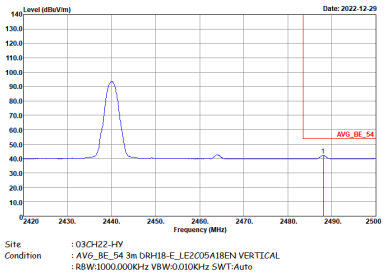
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Fundamental
Peak		
Avg.		

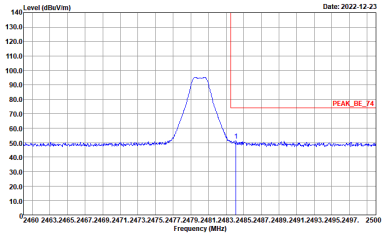
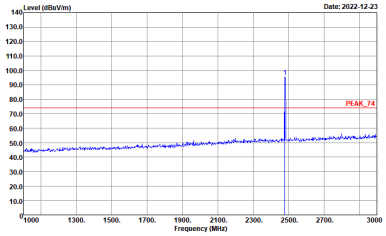
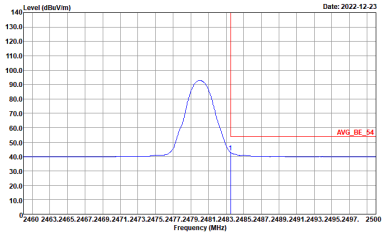
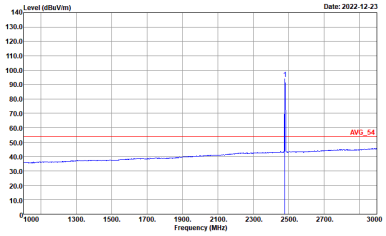
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH00 2402MHz	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

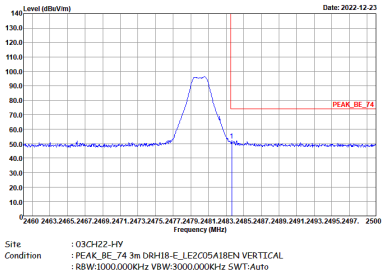
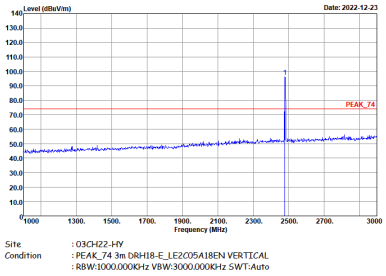
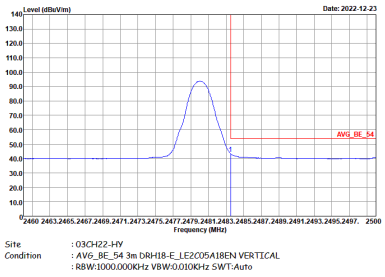
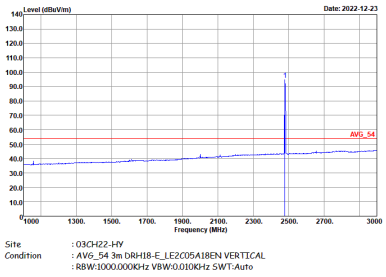
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH22-HV Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HV Condition : PEAK_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HV Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HV Condition : AVG_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

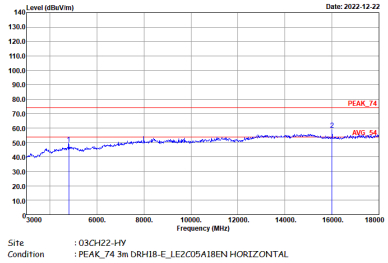
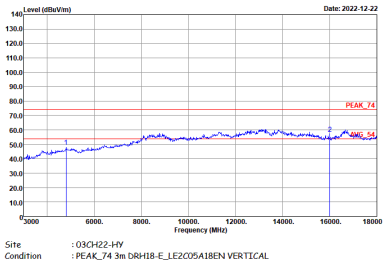
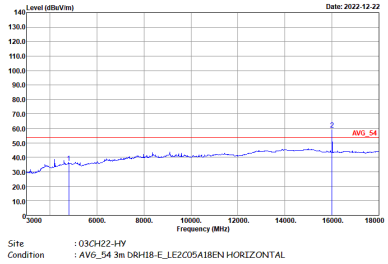
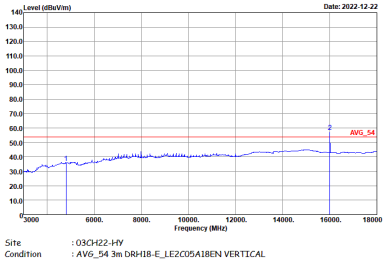
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH19 2440MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

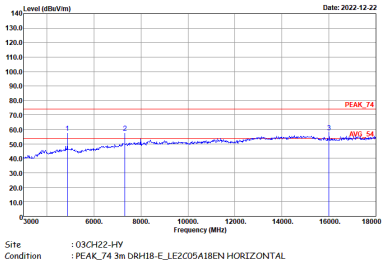
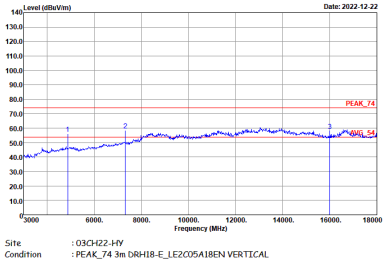
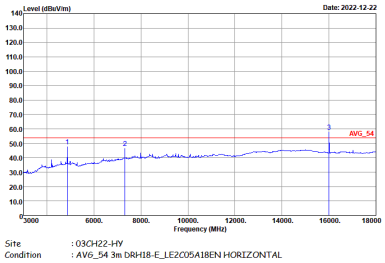
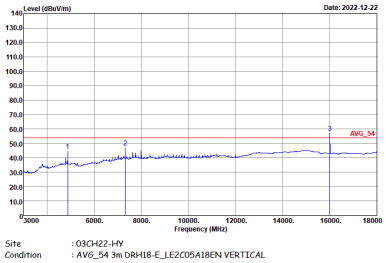
BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BLE CH39 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH22-HY Condition : PEAK_BE_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH22-HY Condition : PEAK_74 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH22-HY Condition : AVG_BE_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH22-HY Condition : AVG_54 3m DRH18-E_LE2C05A18EN VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

2.4GHz 2400~2483.5MHz

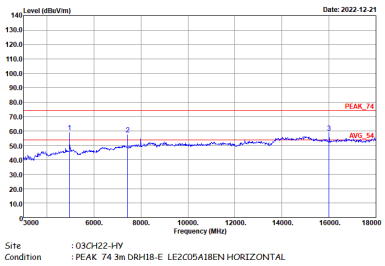
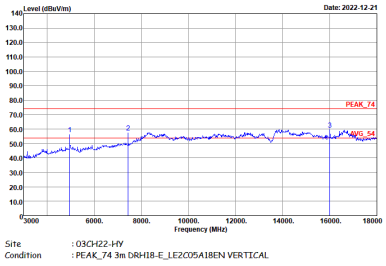
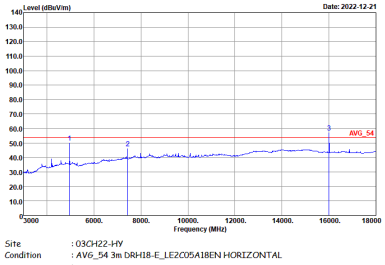
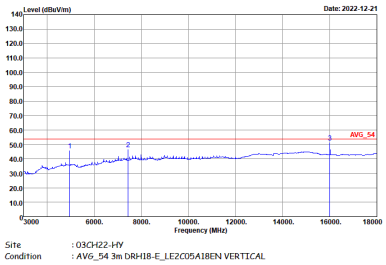
BLE (Harmonic @ 3m)

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH00 2402MHz	
	Horizontal	Vertical
Peak		
Avg.		

Remark: #2 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH19 2440MHz	
	Horizontal	Vertical
Peak		
Avg.		

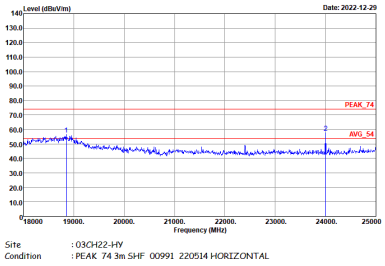
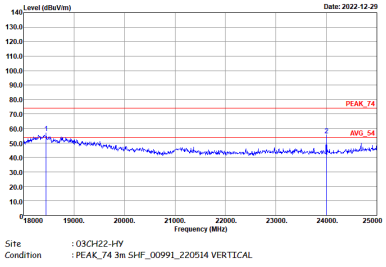
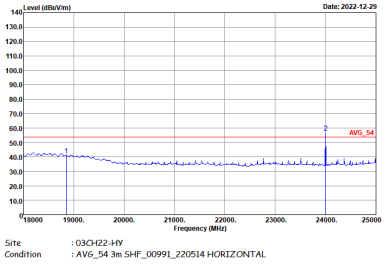
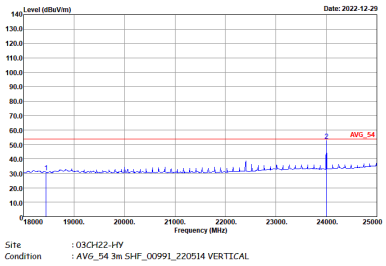
Remark: #3 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

BLE	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BLE CH39 2480MHz	
	Horizontal	Vertical
Peak		
Avg.		

Remark: #3 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

Emission after 18GHz

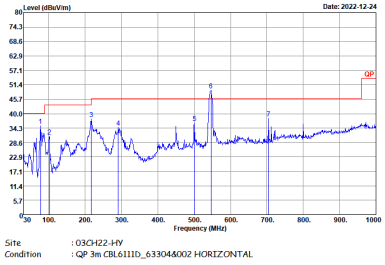
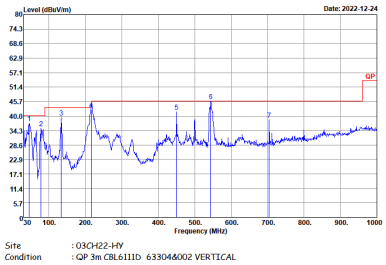
2.4GHz BLE (SHF @ 1m)

BLE	2.4GHz 2400~2483.5MHz	
ANT	BLE SHF	
1	Horizontal	Vertical
Peak		
Avg.		

Remark: #2 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

Emission below 1GHz

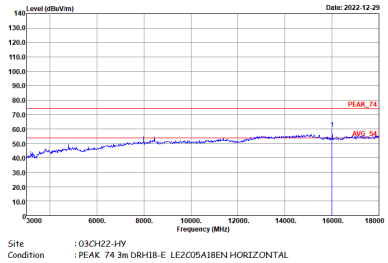
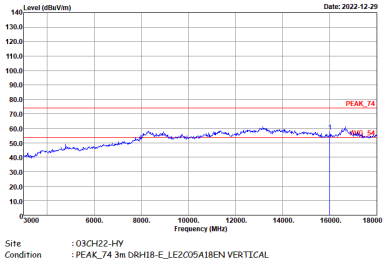
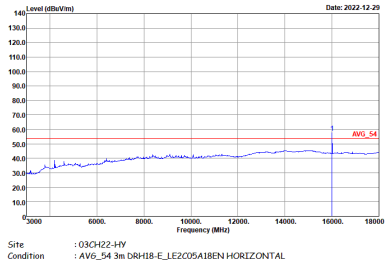
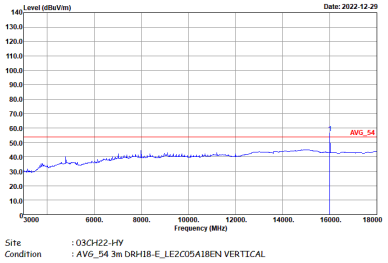
2.4GHz BLE (LF)

BLE	2.4GHz 2400~2483.5MHz	
	BLE LF	
	Horizontal	Vertical
QP / Peak		

Remark: #6 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

2.4GHz 2400~2483.5MHz

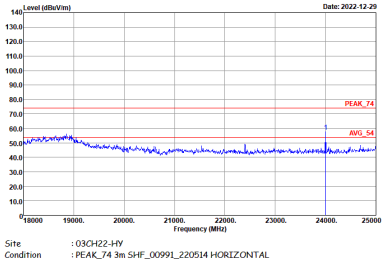
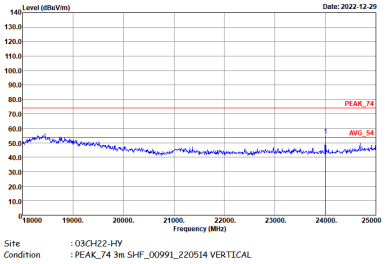
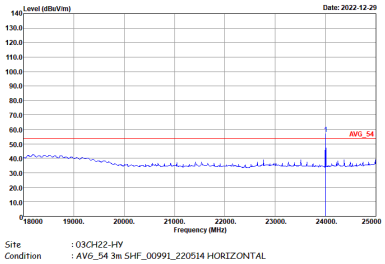
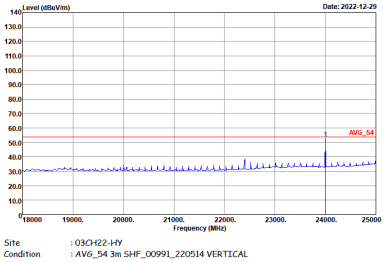
Disable RF Function (Harmonic @ 3m)

	Disable RF Function	
	Horizontal	Vertical
Peak		
Avg.		

Remark: #1 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

Emission after 18GHz

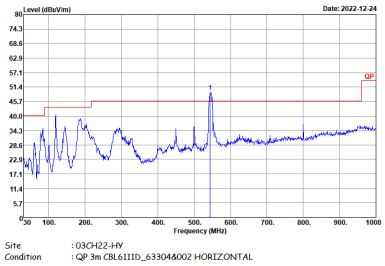
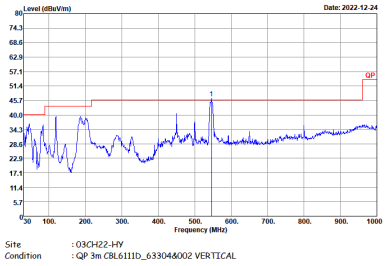
Disable RF Function (SHF @ 1m)

	Disable RF Function SHF	
	Horizontal	**Vertical**
Peak	 Site : 03CH22-HY Condition : PEAK_74 3m SHF_00991_220514 HORIZONTAL	 Site : 03CH22-HY Condition : PEAK_74 3m SHF_00991_220514 VERTICAL
Avg.	 Site : 03CH22-HY Condition : AVG_54 3m SHF_00991_220514 HORIZONTAL	 Site : 03CH22-HY Condition : AVG_54 3m SHF_00991_220514 VERTICAL

Remark: #1 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

Emission below 1GHz

Disable RF Function (LF)

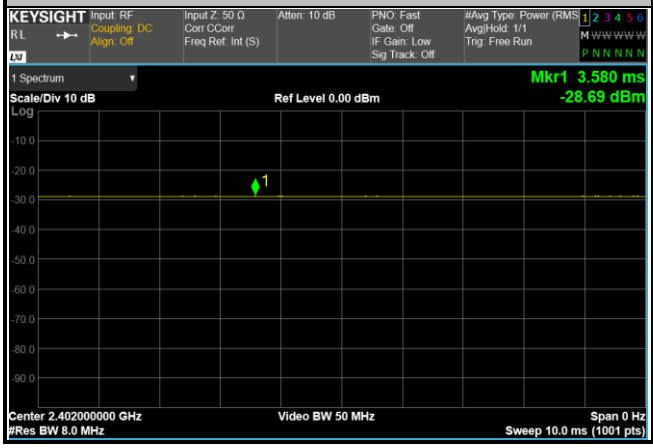
	Disable RF Function LF	
	Horizontal	Vertical
QP / Peak		

Remark: #1 is Electromagnetic Interference signal, not intentional radiator. The signal complies with ANSI C63.4 requirement can be ignored.

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
Bluetooth - LE for 1Mbps	100.00	3580	0.28	10Hz
Bluetooth - LE for 2Mbps	100.00	2650	0.38	10Hz

Bluetooth – LE for 1Mbps



Bluetooth – LE for 2Mbps