FCC RADIO TEST REPORT

FCC ID	:	**S9GR560**
Equipment	:	**R560 Access Point**
Brand Name	:	**RUCKUS**
Model Name	:	**R560**
Applicant	:	**Ruckus Wireless, Inc.** **350 W. JAVA DR., SUNNYVALE CA 94089 USA**
Manufacturer	:	**Ruckus Wireless, Inc.** **350 W. JAVA DR., SUNNYVALE CA 94089 USA**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Jun. 26, 2022 and testing was performed from Jul. 08, 2022 to Sep. 12, 2022. We, Sporton International (USA) Inc., 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 (USA) Inc., the test report shall not be reproduced except in full.

Approved by: Neil Kao

Sporton International (USA) Inc.

1175 Montague Expressway, Milpitas, CA 95035

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History of this test report

Report No.	Version	Description	Issue Date
FR220302001C	01	Initial issue of report	Sep. 21, 2022

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)	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	0.57 dB under the limit at 2366.385 MHz
3.6	15.207	AC Conducted Emission	Pass	2.36 dB under the limit at 0.605 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Conformity Assessment Condition:
1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account. 2. Please refer to the section ”Uncertainty of Evaluation” for measurement uncertainty.
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.

1 General Description

1.1 Product Feature of Equipment Under Test

Bluetooth-LE, Wi-Fi 2.4GHz 802.11b/g/n/ac/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, Wi-Fi 6GHz 802.11a/n/ac/ax and ZigBee.

Product Feature	
Antenna Type	**WLAN:** <Ant. 1>: Omni-Directional Antenna <Ant. 2>: Omni-Directional Antenna <Ant. 3>: Omni-Directional Antenna <Ant. 4>: Omni-Directional Antenna **Bluetooth:** Omni-Directional Antenna **ZigBee:** Omni-Directional Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	1.8

Remark: The above EUT's information 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 (USA) Inc.
Test Site Location	1175 Montague Expressway, Milpitas, CA 95035 TEL : 408 9043300
Test Site No.	**Sporton Site No.**
	CO01-CA, 03CH02-CA, TH01-CA

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

FCC Designation No.: US1250

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: All the test items were validated and recorded in accordance with the standards without any modification during the testing.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	11	2405	19	2445
	12	2410	20	2450
	13	2415	21	2455
	14	2420	22	2460
	15	2425	23	2465
	16	2430	24	2470
	17	2435	25	2475
	18	2440	26	2480

2.2 Test Mode

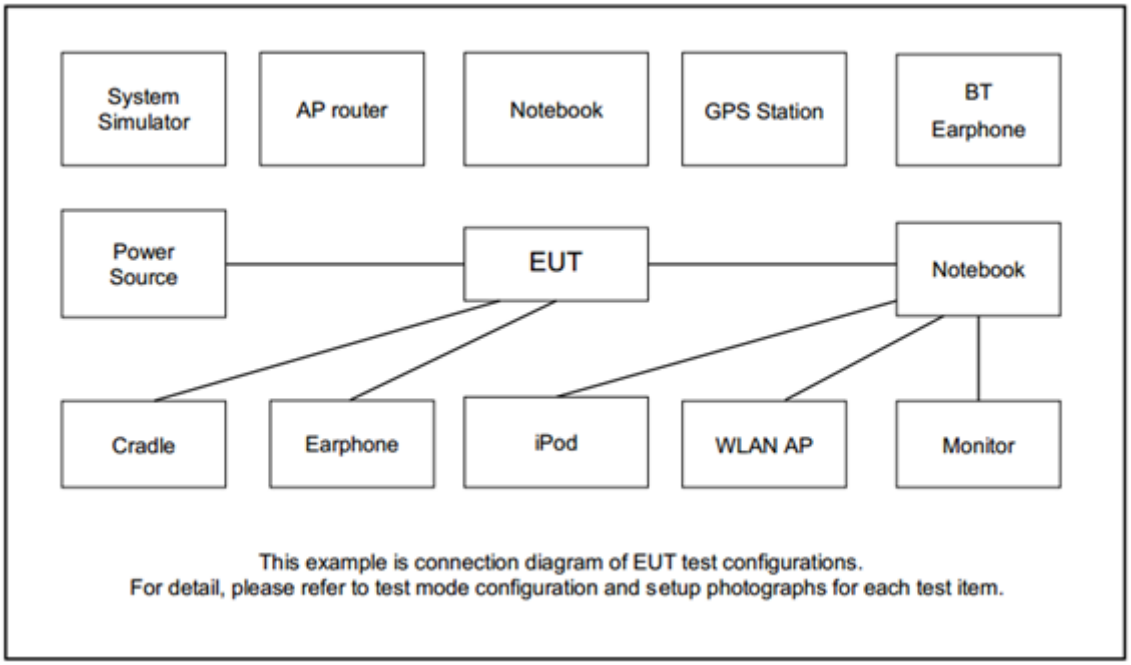
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report..

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	**250Kbps / GFSK**
	Mode 1: ZigBee Tx CH11_2405 MHz Mode 2: ZigBee Tx CH17_2435 MHz Mode 3: ZigBee Tx CH25_2475 MHz Mode 4: ZigBee Tx CH26_2480 MHz
Radiated Test Cases	Mode 1: ZigBee Tx CH11_2405 MHz Mode 2: ZigBee Tx CH17_2435 MHz Mode 3: ZigBee Tx CH25_2475 MHz Mode 4: ZigBee Tx CH26_2480 MHz
AC Conducted Emission	Mode 1. WLAN (2.4GHz) Link + ZigBee Tx + WLAN (5GHz) Link + Lan 1 Link + Lan 2 Link + USB Dongle (Load) + PoE Adapter Mode 2. Bluetooth-LE TX + Lan 1 Link + Lan 2 Link + USB Dongle (Load) + AC Adapter
Remark: The worst case of conducted emission is mode 1; only the test data of it was reported.	

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.	PoE Adapter	Ruckus	740-64214-001	NA	NA	Unshielded, 1.8m
2.	USB Dongle	SanDisk	SDCZ60-016G	NA	NA	NA
3.	Notebook	Lenovo	20BX001CUS	NA	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	Notebook	Lenovo	21EB0020US	NA	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	Acer	Altos PS548-G1	DOC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	Adapter	Ruckus	740-64277-001	NA	NA	Unshielded, 1.0m

2.5 EUT Operation Test Setup

The RF test items, utility “PuTTY Verson 0.75” 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.

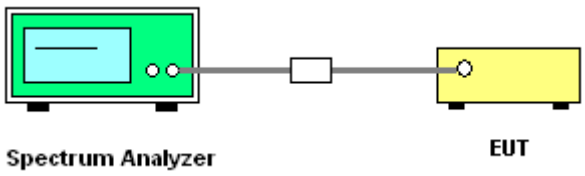
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

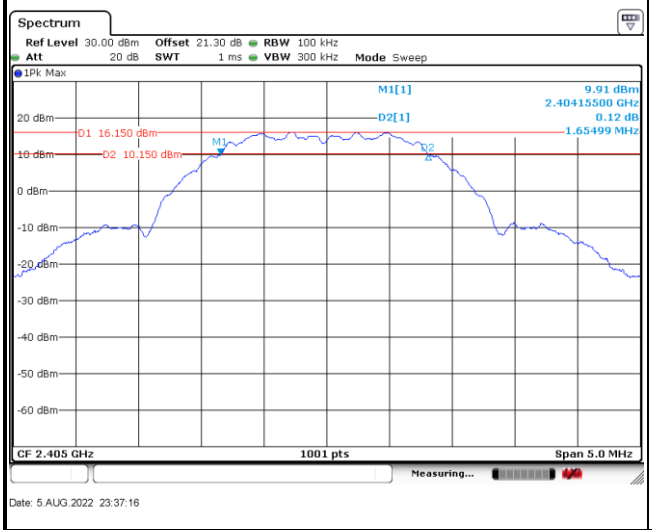
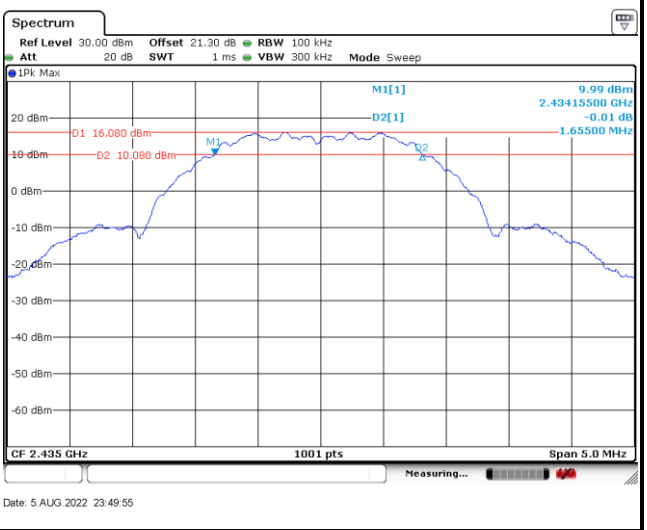
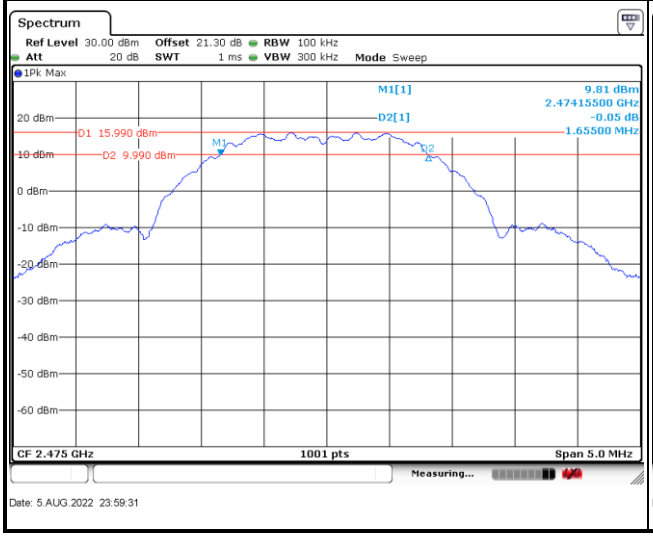
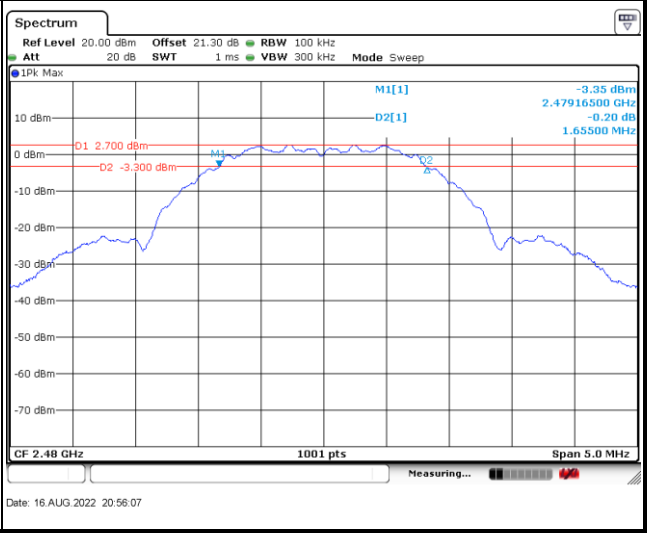
1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
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



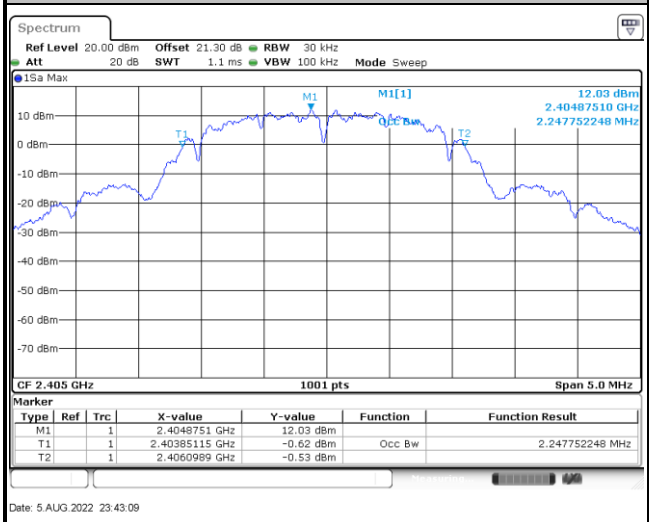
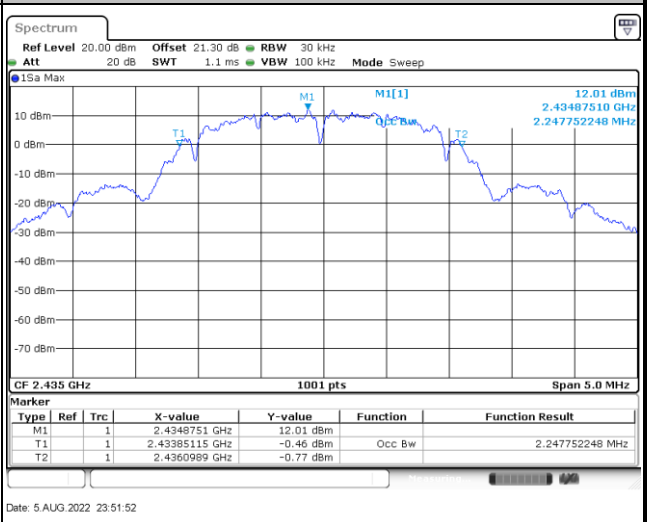
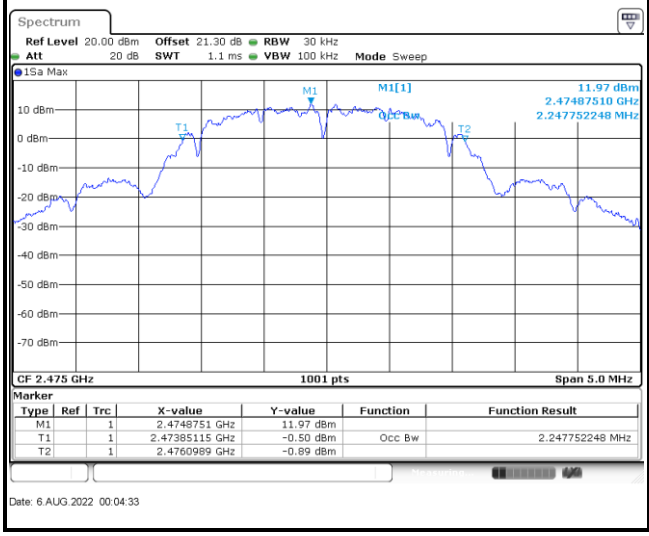
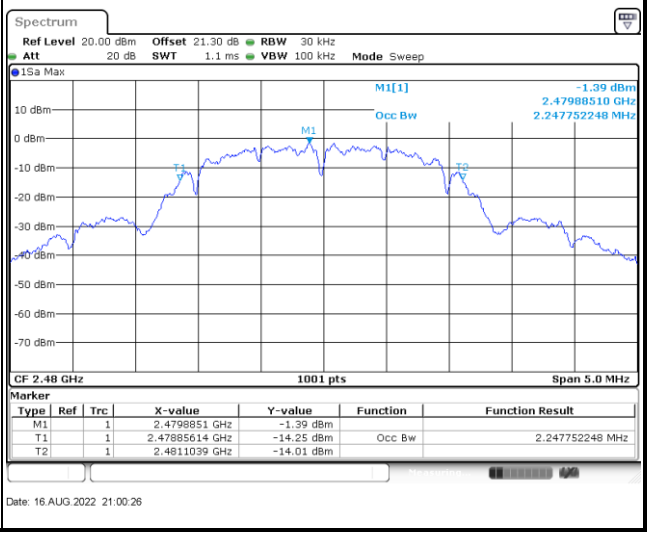
3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

6 dB Bandwidth Plot on Channel 11	6 dB Bandwidth Plot on Channel 17
	
6 dB Bandwidth Plot on Channel 25	**6 dB Bandwidth Plot on Channel 26**
	

3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

99% Bandwidth Plot on Channel 11	99% Occupied Bandwidth Plot on Channel 17
	
99% Occupied Bandwidth Plot on Channel 25	**99% Occupied Bandwidth Plot on Channel 26**
	

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

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.

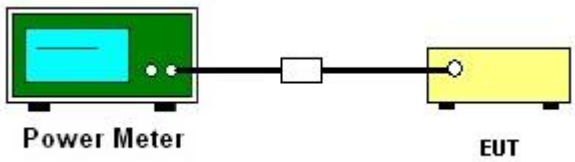
3.2.2 Measuring Instruments

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

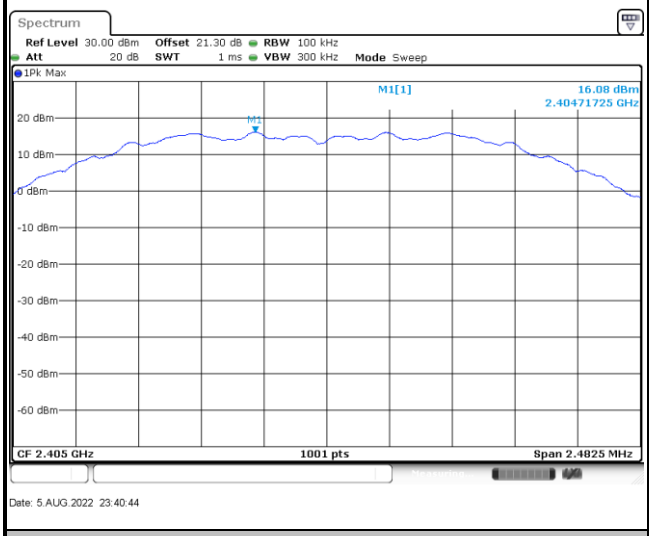
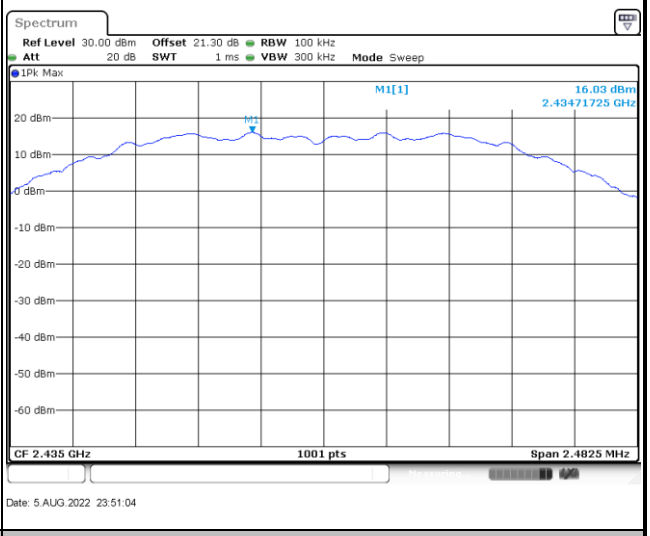
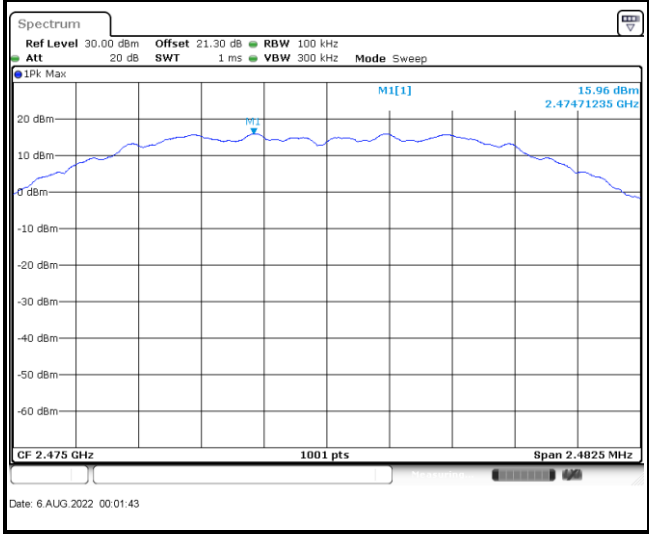
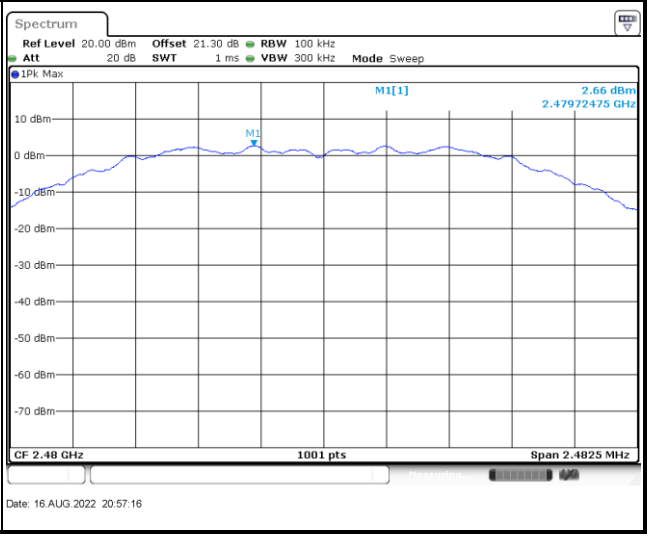
1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
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. (6dB 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

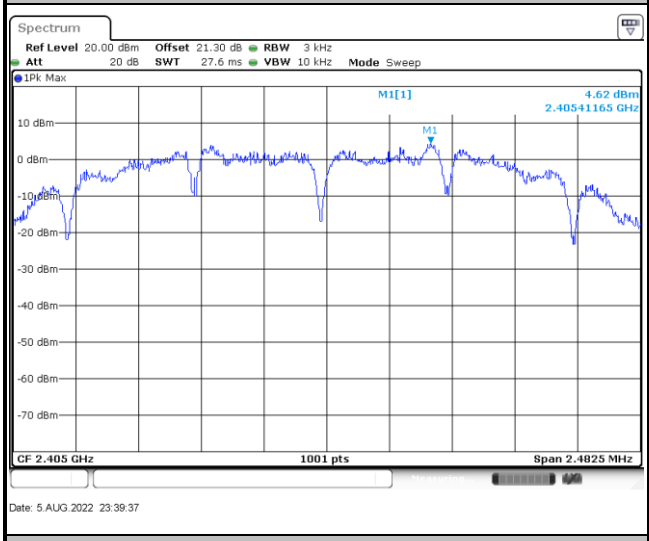
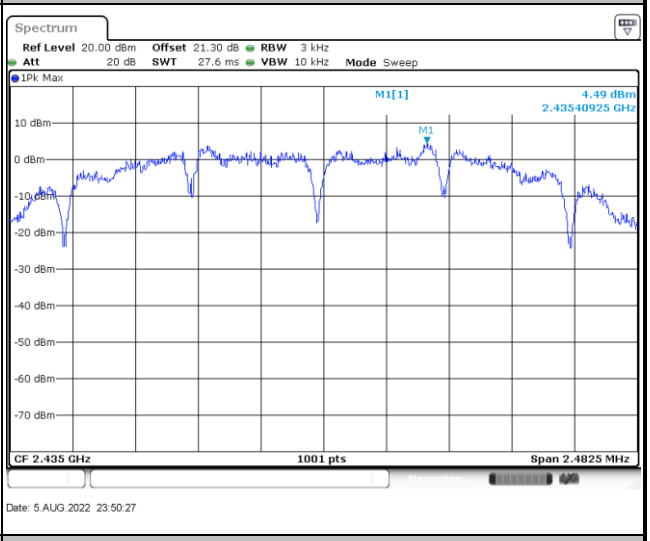
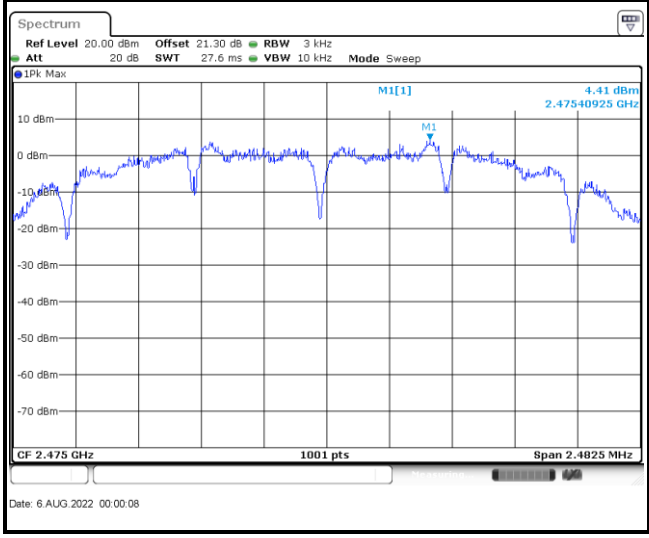
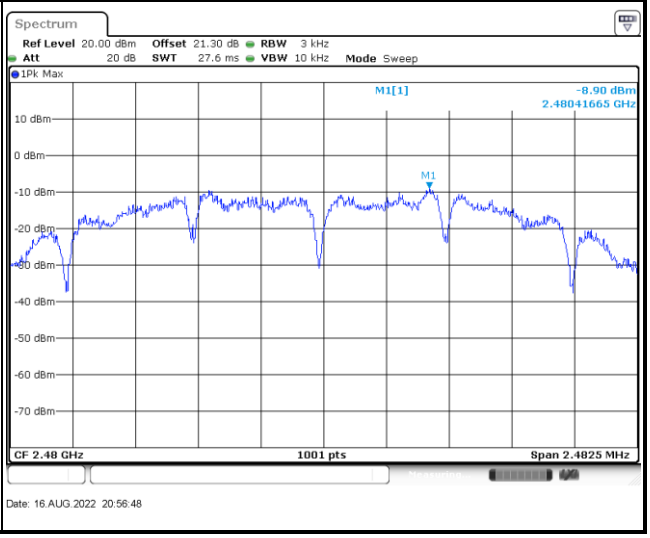
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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

PSD 100kHz Plot on Channel 11	PSD 100kHz Plot on Channel 17
	
PSD 100kHz Plot on Channel 25	**PSD 100kHz Plot on Channel 26**
	

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

PSD 3kHz Plot on Channel 11	PSD 3kHz Plot on Channel 17
	
PSD 3kHz Plot on Channel 25	**PSD 3kHz Plot on Channel 26**
	

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 30 dB down from the highest emission level within the authorized band.

3.4.2 Measuring Instruments

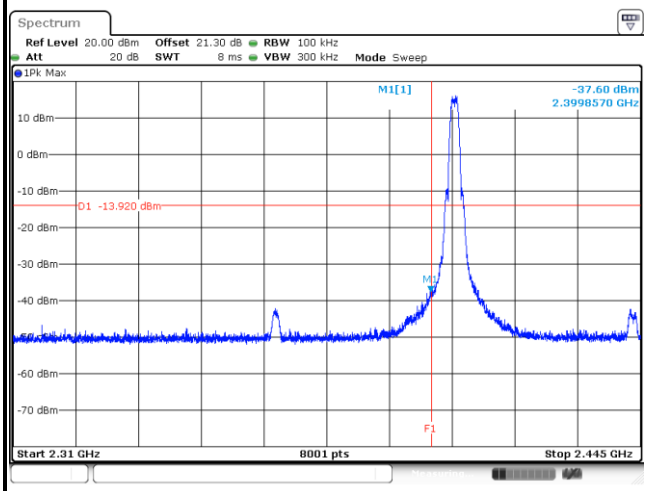
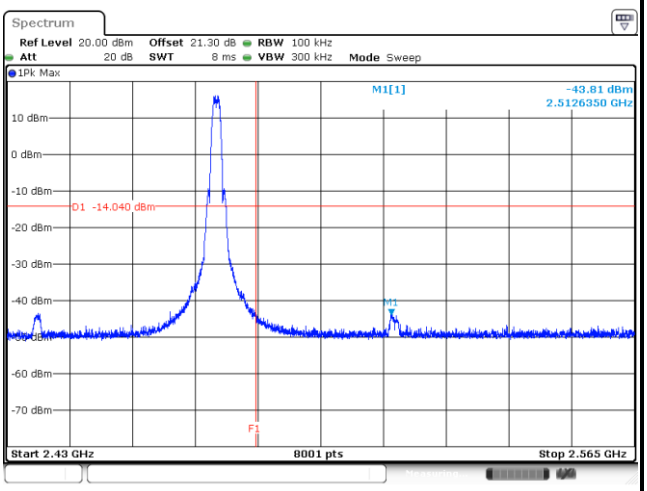
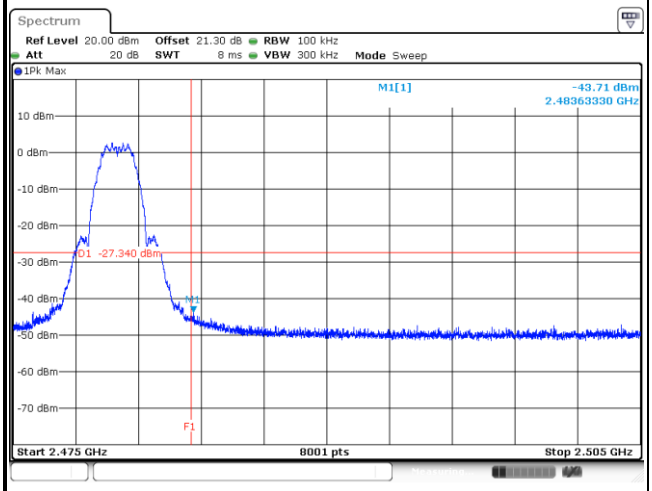
Please refer to the measuring equipment list in this test report.

3.4.3 Test Procedure

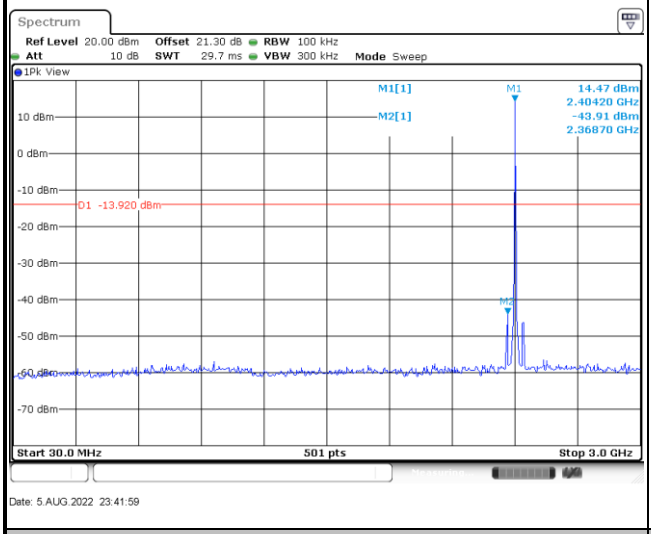
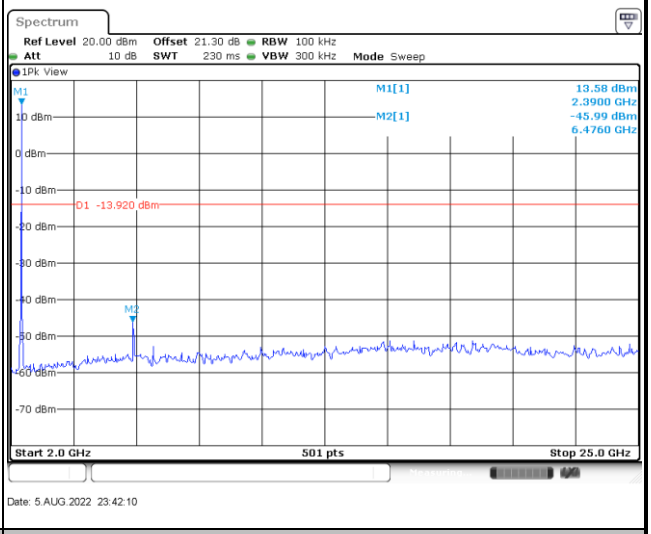
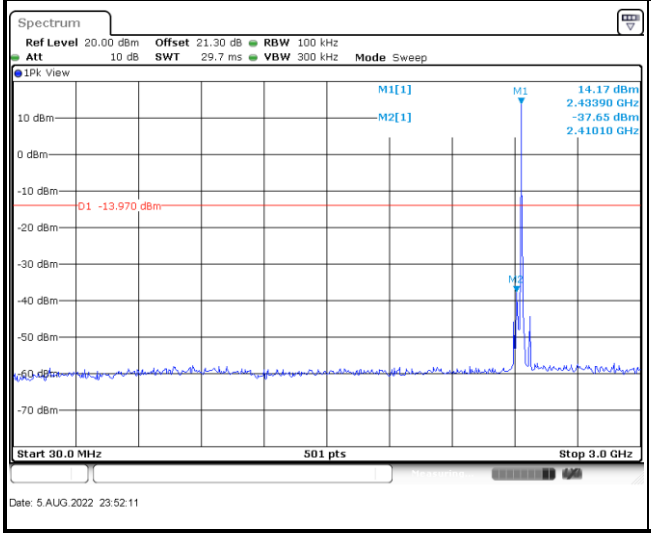
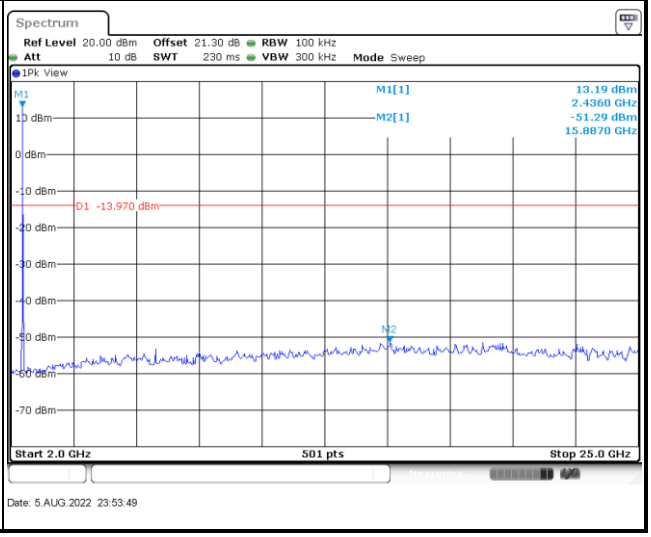
1. The testing follows the ANSI C63.10 Section 11.11.1 General and 11.11.3 Emission level measurement.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable 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.

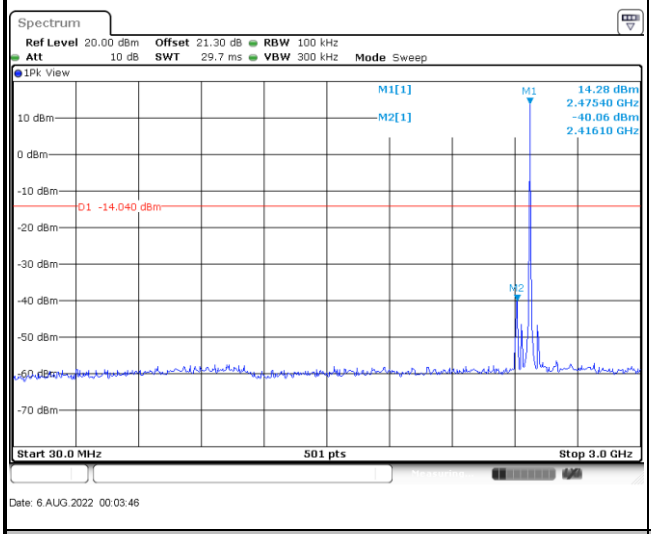
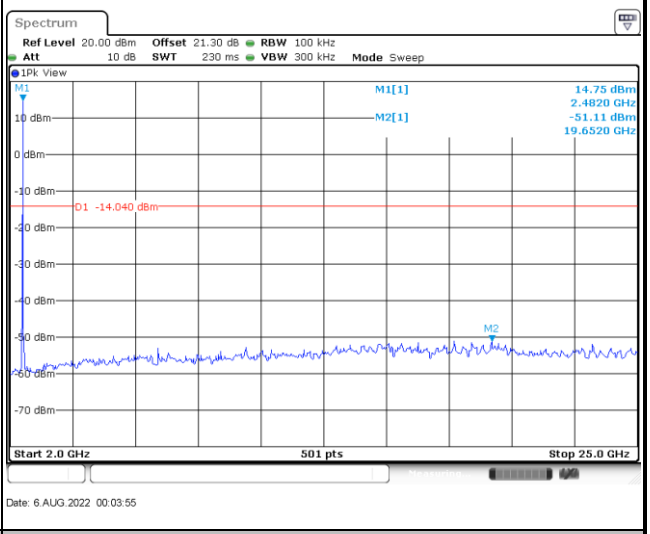
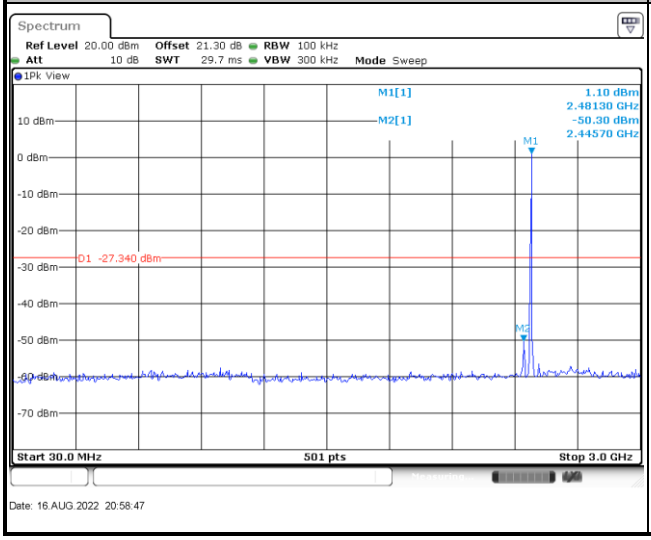
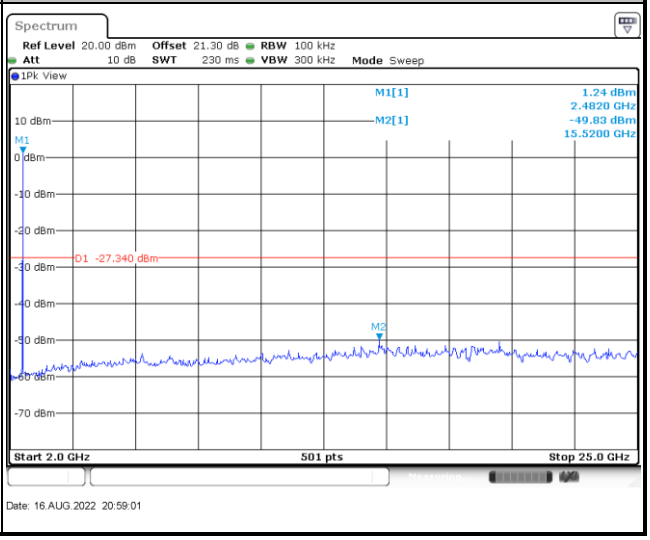
3.4.4 Test Setup

3.4.5 Test Result of Conducted Band Edges Plots

Low Band Edge Plot on Channel 11	High Band Edge Plot on Channel 25
	
High Band Edge Plot on Channel 26	**N/A**
	

3.4.6 Test Result of Conducted Spurious Emission Plots

Conducted Spurious Emission Plot on ZigBee Channel 11	Conducted Spurious Emission Plot on ZigBee Channel 11
	
Conducted Spurious Emission Plot on ZigBee Channel 17	Conducted Spurious Emission Plot on ZigBee Channel 17
	

Conducted Spurious Emission Plot on ZigBee Channel 25	Conducted Spurious Emission Plot on ZigBee Channel 25
	
Conducted Spurious Emission Plot on ZigBee Channel 26	Conducted Spurious Emission Plot on ZigBee Channel 26
	

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 was 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 shall comply with the general field strength limits as following table:

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

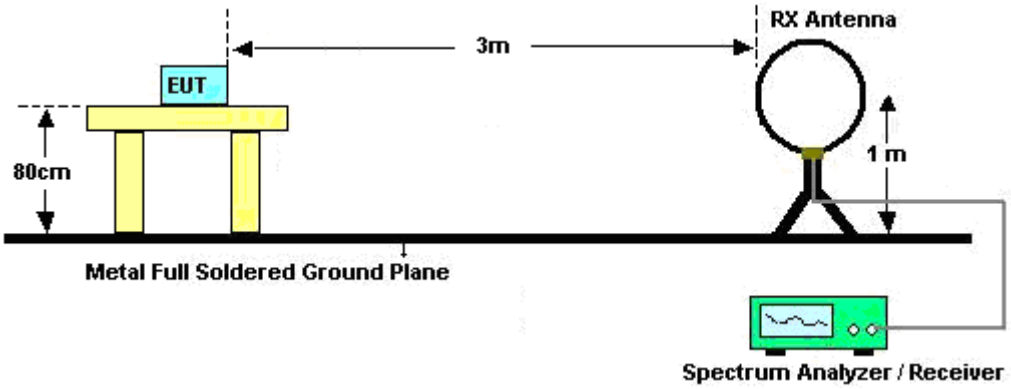
Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

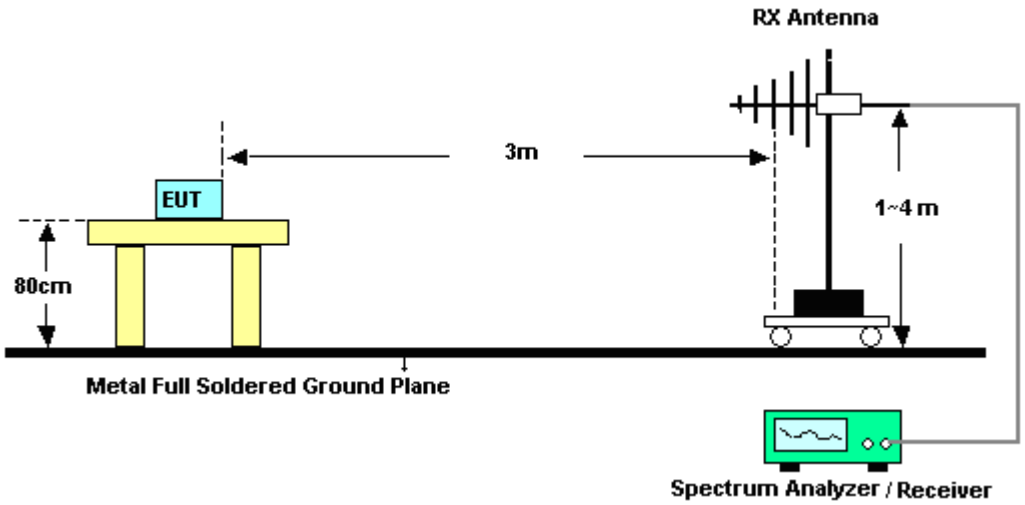
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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

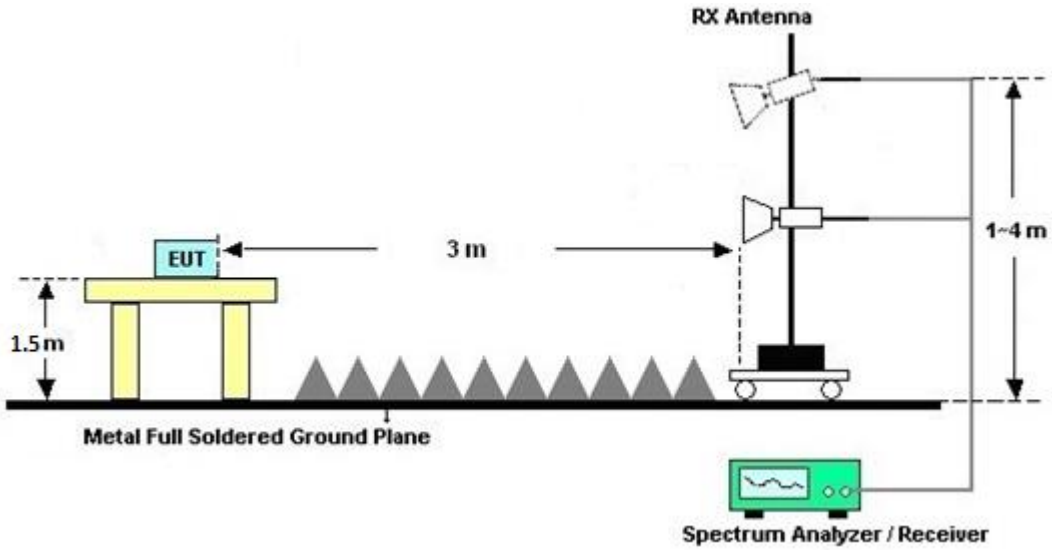
For radiated test below 30MHz



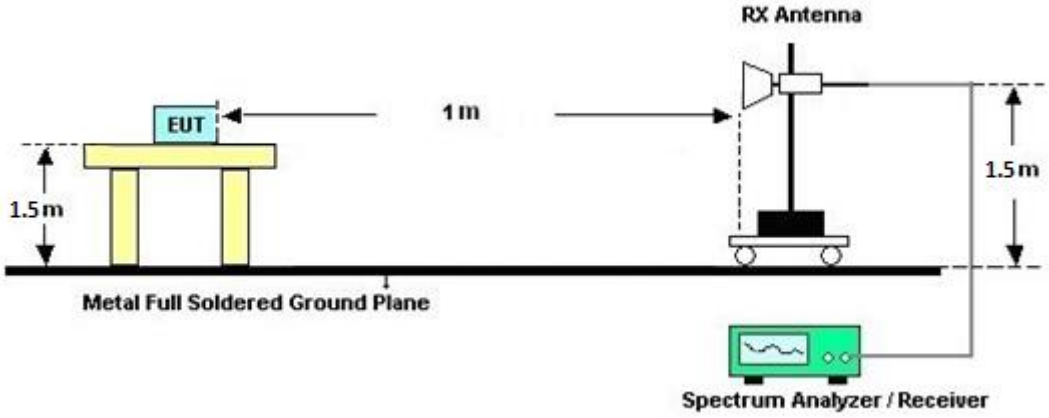
For radiated test from 30MHz to 1GHz



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.

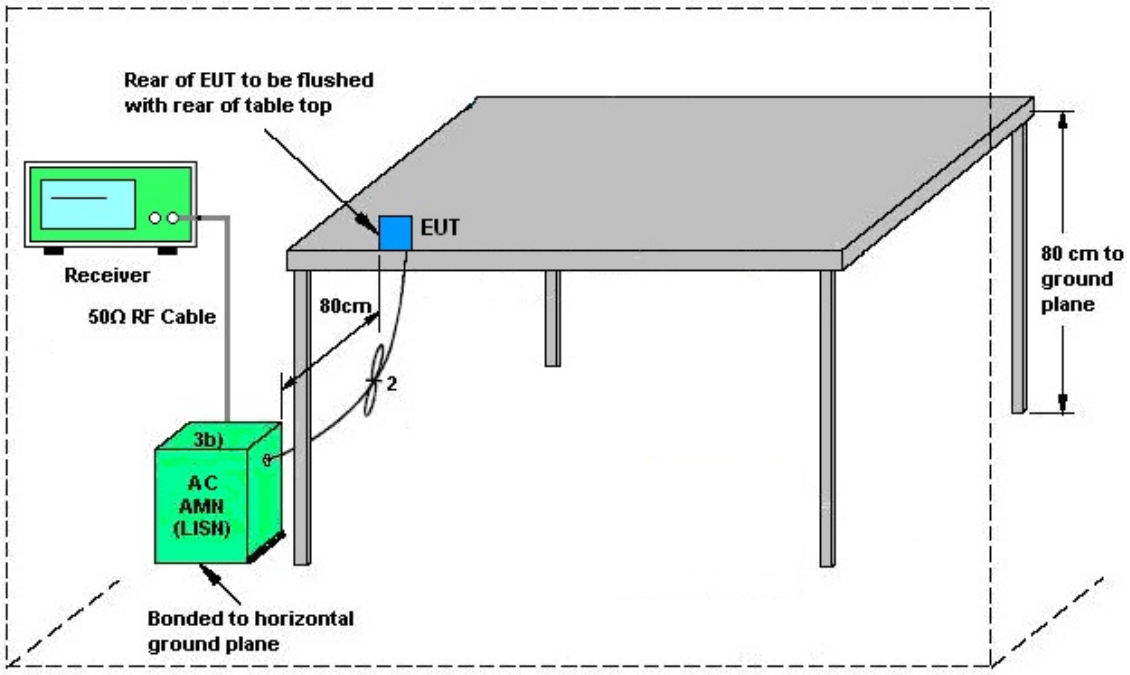
3.6.2 Measuring Instruments

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

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. 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.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

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	100840	9kHz~30MHz	Jul. 05, 2022	Jul. 08, 2022~ Sep. 12, 2022	Jul. 04, 2023	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	54683	30MHz~1GHz	Oct. 15, 2021	Jul. 08, 2022~ Aug. 04, 2022	Oct. 14, 2022	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Jul. 11, 2022	Aug. 04, 2022~ Sep. 12, 2022	Jul. 10, 2023	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	01895	1GHz~18GHz	Aug. 25, 2021	Jul. 08, 2022~ Aug. 23, 2022	Aug. 24, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02113	1GHz~18GHz	Jun. 22, 2022	Aug. 24, 2022~ Sep. 12, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00841	18GHz~40GHz	Aug. 26, 2021	Jul. 08, 2022~ Aug. 23, 2022	Aug. 25, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00842	18GHz~40GHz	Aug. 16, 2022	Aug. 24, 2022~ Sep. 12, 2022	Aug. 15, 2023	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	May 10, 2022	Jul. 08, 2022~ Sep. 09, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	May 11, 2022	Jul. 08, 2022~ Sep. 09, 2022	May 10, 2023	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270321	1GHz~26.5GHz	May 09, 2022	Jul. 08, 2022~ Sep. 12, 2022	May 08, 2023	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	May 10, 2022	Jul. 08, 2022~ Sep. 12, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060725	18GHz-40GHz	May 10, 2022	Jul. 08, 2022~ Sep. 12, 2022	May 09, 2023	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	060726	18GHz-40GHz	Feb. 10, 2022	Jul. 08, 2022~ Sep. 12, 2022	Feb. 09, 2023	Radiation (03CH02-CA)
RF Cable	HUBER+SUHNER	SUCOFLEX 102	8024032/2, 802406/2, 802875/2	N/A	Jun. 22, 2022	Jul. 08, 2022~ Sep. 12, 2022	Jun. 21, 2023	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY57420221	10Hz~44GHz	Sep. 22, 2021	Jul. 08, 2022~ Sep. 12, 2022	Sep. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 22, 2021	Jul. 08, 2022~ Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3GHz High Pass Filter	Jul. 21, 2022	Jul. 21, 2022~ Sep. 12, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 22, 2021	Jul. 08, 2022~ Jul. 20, 2022	Jul. 21, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN1	1.2GHz Low Pass Filter	Jul. 21, 2022	Jul. 21, 2022~ Sep. 12, 2022	Jul. 20, 2023	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 30, 2021	Jul. 08, 2022~ Aug. 15, 2022	Aug. 29, 2022	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142601	N/A	Jul. 27, 2022	Aug. 16, 2022~ Sep. 12, 2022	Jul. 26, 2023	Radiation (03CH02-CA)
Controller	ChainTek	EM-1000	060876	NA	N/A	Jul. 08, 2022~ Sep. 12, 2022	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jul. 08, 2022~ Sep. 12, 2022	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jul. 08, 2022~ Sep. 12, 2022	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Jul. 08, 2022~ Sep. 12, 2022	N/A	Radiation (03CH02-CA)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	Testo	608-H1	45142595	N/A	Aug. 30, 2021	Aug. 05, 2022~ Aug. 16, 2022	Aug. 29, 2022	Conducted (TH01-CA)
Power Sensor	EM Electronics Corporation	RPR3006W	RPR6W-1901 026	10MHz-6GHz	May 10, 2022	Aug. 05, 2022~ Aug. 16, 2022	May 09, 2023	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101089	10Hz-40GHz	Jun. 01, 2022	Aug. 05, 2022~ Aug. 16, 2022	May 31, 2023	Conducted (TH01-CA)
Switch Box & RF Cable	EM Electronics	EMSW26	1090304	N/A	Mar. 30, 2022	Aug. 05, 2022~ Aug. 16, 2022	Mar. 29, 2023	Conducted (TH01-CA)
LISN	TESEQ	NNB51	47407	N/A	May 10, 2022	Aug. 18, 2022~ Sep. 08, 2022	May 09, 2023	Conduction (CO01-CA)
LISN	TESEQ	NNB51	47415	N/A	May 10, 2022	Aug. 18, 2022~ Sep. 08, 2022	May 09, 2023	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9kHz~7GHz	May 31, 2022	Aug. 18, 2022~ Sep. 08, 2022	May 30, 2023	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jul. 05, 2022	Aug. 18, 2022~ Sep. 08, 2022	Jul. 04, 2023	Conduction (CO01-CA)
Test Software	R&S	EMC32 V10.30.0	N/A	N/A	N/A	Aug. 18, 2022~ Sep. 08, 2022	N/A	Conduction (CO01-CA)

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))	**2.0 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.7 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.2 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.4 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Liliana Gonzalez	Temperature:	22~24	°C
Test Date:	2022/08/05~2022/08/16	Relative Humidity:	48~54.2	%

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
ZigBee	250K	1	11	2405	2.248	1.655	0.50	Pass
ZigBee	250K	1	17	2435	2.248	1.655	0.50	Pass
ZigBee	250K	1	25	2475	2.248	1.655	0.50	Pass
ZigBee	250K	1	26	2480	2.248	1.655	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
ZigBee	250K	1	11	2405	19.97	30.00	1.80	21.77	36.00	Pass
ZigBee	250K	1	17	2435	19.90	30.00	1.80	21.70	36.00	Pass
ZigBee	250K	1	25	2475	19.79	30.00	1.80	21.59	36.00	Pass
ZigBee	250K	1	26	2480	6.65	30.00	1.80	8.45	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
ZigBee	250K	1	11	2405	16.08	4.62	1.80	8.00	Pass
ZigBee	250K	1	17	2435	16.03	4.49	1.80	8.00	Pass
ZigBee	250K	1	25	2475	15.96	4.41	1.80	8.00	Pass
ZigBee	250K	1	26	2480	2.66	-8.90	1.80	8.00	Pass

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

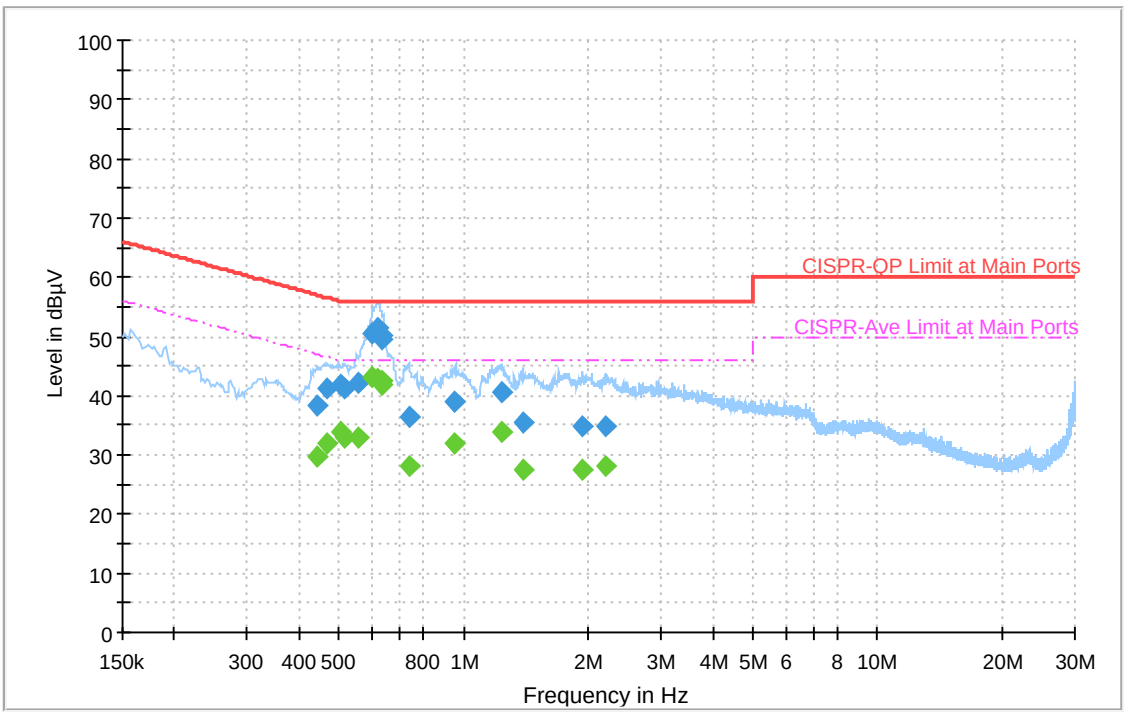
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Venkata Kondepud and Leo Liu	**Temperature :**	23~25℃
		Relative Humidity :	43~47%

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Mode:	1
Project	220302001

Full Spectrum



Final_Result

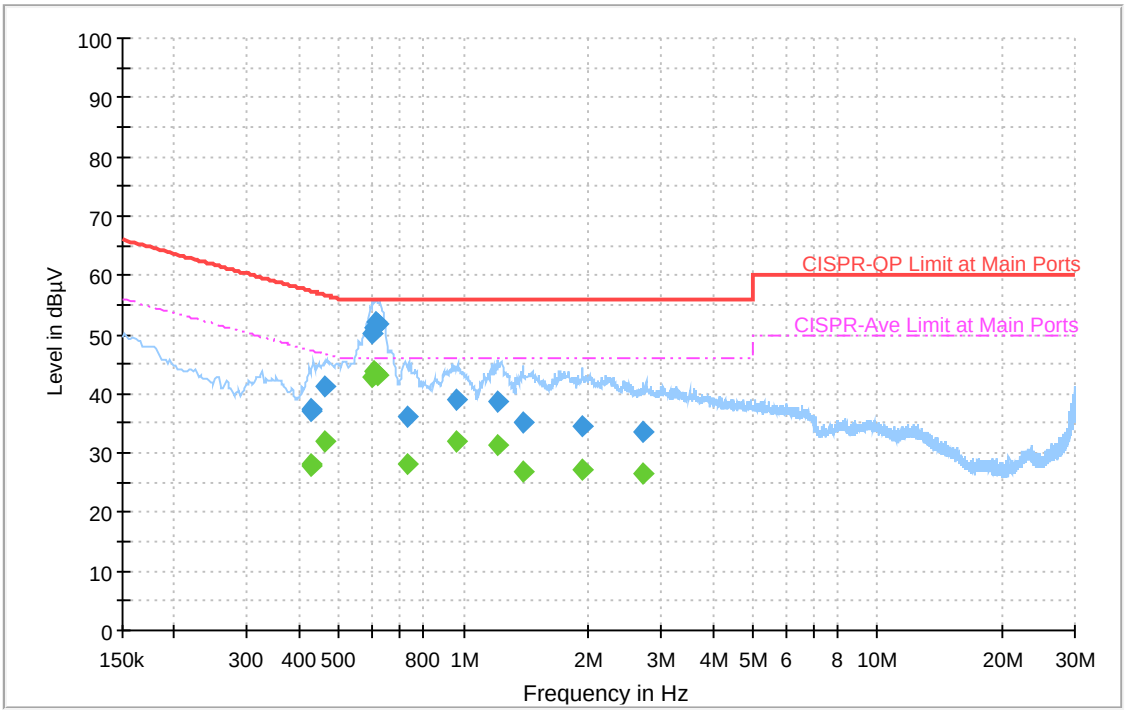
Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.440475	38.49	---	57.05	18.56	L1	OFF	20.3
0.440475	---	29.79	47.05	17.26	L1	OFF	20.3
0.468105	41.06	---	56.55	15.49	L1	OFF	20.3
0.468105	---	31.82	46.55	14.73	L1	OFF	20.3
0.504096	41.79	---	56.00	14.21	L1	OFF	20.3
0.504096	---	33.94	46.00	12.06	L1	OFF	20.3
0.517623	41.28	---	56.00	14.72	L1	OFF	20.3
0.517623	---	32.81	46.00	13.19	L1	OFF	20.3
0.555900	42.06	---	56.00	13.94	L1	OFF	20.3
0.555900	---	32.93	46.00	13.07	L1	OFF	20.3
0.602340	50.43	---	56.00	5.57	L1	OFF	20.3
0.602340	---	43.04	46.00	2.96	L1	OFF	20.3
0.618198	51.56	---	56.00	4.44	L1	OFF	20.3
0.618198	---	42.92	46.00	3.08	L1	OFF	20.3
0.631887	50.13	---	56.00	5.87	L1	OFF	20.3
0.631887	---	42.43	46.00	3.57	L1	OFF	20.3
0.634146	49.63	---	56.00	6.37	L1	OFF	20.3
0.634146	---	41.97	46.00	4.03	L1	OFF	20.3
0.738537	36.35	---	56.00	19.65	L1	OFF	20.3
0.738537	---	28.06	46.00	17.94	L1	OFF	20.3
0.955284	38.89	---	56.00	17.11	L1	OFF	20.3

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.955284	---	31.84	46.00	14.16	L1	OFF	20.3
1.233069	40.44	---	56.00	15.56	L1	OFF	20.3
1.233069	---	33.76	46.00	12.24	L1	OFF	20.3
1.385637	35.35	---	56.00	20.65	L1	OFF	20.3
1.385637	---	27.37	46.00	18.63	L1	OFF	20.3
1.924134	34.89	---	56.00	21.11	L1	OFF	20.3
1.924134	---	27.57	46.00	18.43	L1	OFF	20.3
2.193000	34.97	---	56.00	21.03	L1	OFF	20.3
2.193000	---	28.00	46.00	18.00	L1	OFF	20.3

EUT Information

Site:	CO01-CA
Power:	120Vac/60Hz
Mode:	1
Project	220302001

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.428523	---	28.06	47.28	19.22	N	OFF	20.3
0.428523	37.00	---	57.28	20.28	N	OFF	20.3
0.429396	---	27.87	47.26	19.39	N	OFF	20.3
0.429396	37.35	---	57.26	19.91	N	OFF	20.3
0.464388	---	32.07	46.61	14.54	N	OFF	20.3
0.464388	41.23	---	56.61	15.38	N	OFF	20.3
0.597489	---	42.95	46.00	3.05	N	OFF	20.3
0.597489	50.22	---	56.00	5.78	N	OFF	20.3
0.604590	---	43.64	46.00	2.36	N	OFF	20.3
0.604590	51.23	---	56.00	4.77	N	OFF	20.3
0.613986	---	43.42	46.00	2.58	N	OFF	20.3
0.613986	52.10	---	56.00	3.90	N	OFF	20.3
0.622581	---	43.06	46.00	2.94	N	OFF	20.3
0.622581	51.74	---	56.00	4.26	N	OFF	20.3
0.734325	---	28.21	46.00	17.79	N	OFF	20.3
0.734325	36.25	---	56.00	19.75	N	OFF	20.3
0.963699	---	32.09	46.00	13.91	N	OFF	20.3
0.963699	38.93	---	56.00	17.07	N	OFF	20.3
1.204926	---	31.21	46.00	14.79	N	OFF	20.3
1.204926	38.76	---	56.00	17.24	N	OFF	20.3
1.388652	---	26.99	46.00	19.01	N	OFF	20.3

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
1.388652	35.09	---	56.00	20.91	N	OFF	20.3
1.931433	---	27.07	46.00	18.93	N	OFF	20.3
1.931433	34.40	---	56.00	21.60	N	OFF	20.3
2.714397	---	26.58	46.00	19.42	N	OFF	20.3
2.714397	33.53	---	56.00	22.47	N	OFF	20.3

Appendix C. Radiated Spurious Emission

Test Engineer :	Fu Chen	**Temperature :**	20~24°C
		Relative Humidity :	42~47%

2.4GHz 2400~2483.5MHz

ZigBee (Band Edge @ 3m)

ZigBee	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)
ZigBee CH 11 2405MHz		2366.49	59.89	-14.11	74	46.29	27.74	17.38	31.52	190	314	P	H
		2366.385	53.43	-0.57	54	39.83	27.74	17.38	31.52	190	314	A	H
	*	2405	117.99	-	-	104.37	27.66	17.45	31.49	190	314	P	H
	*	2405	116.16	-	-	102.54	27.66	17.45	31.49	190	314	A	H
		2442	61.98	-36.01	97.99	48.28	27.66	17.51	31.47	190	314	P	H
													H
		2388.435	56.57	-17.43	74	42.86	27.79	17.42	31.5	303	37	P	V
		2366.385	47.4	-6.6	54	33.68	27.86	17.38	31.52	303	37	A	V
	*	2405	111.1	-	-	97.41	27.73	17.45	31.49	303	37	P	V
	*	2405	109.25	-	-	95.56	27.73	17.45	31.49	303	37	A	V
		2442	58.53	-32.57	91.1	44.91	27.58	17.51	31.47	303	37	P	V
													V
ZigBee CH 17 2435MHz		2358	55.64	-18.36	74	42.04	27.76	17.37	31.53	160	315	P	H
		2388.24	44.06	-9.94	54	30.45	27.69	17.42	31.5	160	315	A	H
		2396	60.15	-38.22	98.37	46.54	27.67	17.43	31.49	160	315	P	H
	*	2435	118.37	-	-	104.69	27.66	17.5	31.48	160	315	P	H
	*	2435	116.61	-	-	102.93	27.66	17.5	31.48	160	315	A	H
		2472	61.04	-37.33	98.37	47.3	27.64	17.57	31.47	160	315	P	H
		2486.08	55.08	-18.92	74	41.33	27.62	17.59	31.46	160	315	P	H
		2496.08	44.2	-9.8	54	30.44	27.61	17.6	31.45	160	315	A	V
		2387.12	55.93	-18.07	74	42.23	27.79	17.42	31.51	299	38	P	V
		2350.16	43.98	-10.02	54	30.24	27.91	17.35	31.52	299	38	A	V
		2396	56.48	-35.13	91.61	42.78	27.76	17.43	31.49	299	38	P	V
	*	2435	111.61	-	-	97.98	27.61	17.5	31.48	299	38	P	V
	*	2435	109.76	-	-	96.13	27.61	17.5	31.48	299	38	A	V
		2474	57.19	-34.42	91.61	43.57	27.52	17.57	31.47	299	38	P	V
		2490.08	54.76	-19.24	74	41.13	27.5	17.59	31.46	299	38	P	V
		2495.52	43.89	-10.11	54	30.25	27.49	17.6	31.45	299	38	A	V

ZigBee CH 25 2475MHz		2436	61.12	-37.4	98.52	47.44	27.66	17.5	31.48	176	318	P	H
	*	2475	118.52	-	-	104.79	27.63	17.57	31.47	176	318	P	H
	*	2475	116.84	-	-	103.11	27.63	17.57	31.47	176	318	A	H
		2483.88	62.17	-11.83	74	48.43	27.62	17.58	31.46	176	318	P	H
		2483.52	52.25	-1.75	54	38.51	27.62	17.58	31.46	176	318	A	H
		2512	60.4	-38.12	98.52	46.63	27.59	17.63	31.45	176	318	P	H
		2432	56.77	-36.05	92.82	43.15	27.62	17.49	31.49	400	10	P	V
	*	2475	112.82	-	-	99.2	27.52	17.57	31.47	400	10	P	V
	*	2475	110.98	-	-	97.36	27.52	17.57	31.47	400	10	A	V
		2483.56	57.77	-16.23	74	44.14	27.51	17.58	31.46	400	10	P	V
		2483.52	48.18	-5.82	54	34.55	27.51	17.58	31.46	400	10	A	V
		2512	58.46	-34.36	92.82	44.75	27.53	17.63	31.45	400	10	P	V
ZigBee CH 26 2480MHz	*	2480	105.59	-	-	91.84	27.63	17.58	31.46	175	317	P	H
	*	2480	103.73	-	-	89.98	27.63	17.58	31.46	175	317	A	H
		2483.56	62.02	-11.98	74	48.28	27.62	17.58	31.46	175	317	P	H
		2483.52	52.7	-1.3	54	38.96	27.62	17.58	31.46	175	317	A	H
													H
													H
	*	2480	100.31	-	-	86.68	27.51	17.58	31.46	400	12	P	V
	*	2480	98.46	-	-	84.83	27.51	17.58	31.46	400	12	A	V
		2483.68	58.26	-15.74	74	44.63	27.51	17.58	31.46	400	12	P	V
		2483.52	48.66	-5.34	54	35.03	27.51	17.58	31.46	400	12	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

ZigBee (Harmonic @ 3m)

ZigBee	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)
ZigBee CH 11 2405MHz		4810	51.76	-22.24	74	76.57	31.5	11.57	67.88	162	6	P	H
		4810	45.8	-8.2	54	70.61	31.5	11.57	67.88	162	6	A	H
		7215	50.41	-23.59	74	66.28	36.18	13.98	66.03	168	307	P	H
		11715	49.51	-24.49	74	59.73	39.42	18.07	67.71	-	-	P	H
		11715	37.23	-16.77	54	47.45	39.42	18.07	67.71	-	-	A	H
		14490	51.36	-22.64	74	57.21	41.94	20.19	67.98	-	-	P	H
		14490	41.76	-12.24	54	47.61	41.94	20.19	67.98	-	-	A	H
		18000	59.37	-14.63	74	58.35	48.82	21.92	69.72	-	-	P	H
		18000	49	-5	54	47.98	48.82	21.92	69.72	-	-	A	H
													H
													H
													H
		4810	51.3	-22.7	74	76.07	31.54	11.57	67.88	300	349	P	V
		4810	45.71	-8.29	54	70.48	31.54	11.57	67.88	300	349	A	V
		7215	51.2	-22.8	74	67.08	36.17	13.98	66.03	340	348	P	V
		11505	49.35	-24.65	74	59.11	40.08	17.86	67.7	-	-	P	V
		11505	37.79	-16.21	54	47.55	40.08	17.86	67.7	-	-	A	V
		14490	51.43	-22.57	74	57.28	41.94	20.19	67.98	-	-	P	V
		14490	41.81	-12.19	54	47.66	41.94	20.19	67.98	-	-	A	V
		18000	58.93	-15.07	74	57.69	49.04	21.92	69.72	-	-	P	V
		18000	49.29	-4.71	54	48.05	49.04	21.92	69.72	-	-	A	V
													V
													V
													V

ZigBee	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)
ZigBee CH 17 2435MHz		4870	48.71	-25.29	74	73.59	31.46	11.57	67.91	302	0	P	H
		4870	41.63	-12.37	54	66.51	31.46	11.57	67.91	302	0	A	H
		7305	48.55	-25.45	74	65.08	36.33	14.08	66.94	189	48	P	H
		7305	39.42	-14.58	54	55.95	36.33	14.08	66.94	189	48	A	H
		11520	49.72	-24.28	74	59.4	40.13	17.88	67.69	-	-	P	H
		11520	38	-16	54	47.68	40.13	17.88	67.69	-	-	A	H
		14490	51.49	-22.51	74	57.34	41.94	20.19	67.98	-	-	P	H
		14490	41.64	-12.36	54	47.49	41.94	20.19	67.98	-	-	A	H
		18000	58.18	-15.82	74	57.16	48.82	21.92	69.72	-	-	P	H
		18000	48.93	-5.07	54	47.91	48.82	21.92	69.72	-	-	A	H
													H
													H
		4870	48.8	-25.2	74	73.71	31.43	11.57	67.91	307	35	P	V
		4870	42.13	-11.87	54	67.04	31.43	11.57	67.91	307	35	A	V
		7305	51.42	-22.58	74	67.93	36.35	14.08	66.94	325	345	P	V
		7305	43.45	-10.55	54	59.96	36.35	14.08	66.94	325	345	A	V
		11610	49.55	-24.45	74	59.24	39.92	17.96	67.57	-	-	P	V
		11610	37.92	-16.08	54	47.61	39.92	17.96	67.57	-	-	A	V
		14490	51.22	-22.78	74	57.07	41.94	20.19	67.98	-	-	P	V
		14490	41.68	-12.32	54	47.53	41.94	20.19	67.98	-	-	A	V
		18000	58.37	-15.63	74	57.13	49.04	21.92	69.72	-	-	P	V
		18000	49.3	-4.7	54	48.06	49.04	21.92	69.72	-	-	A	V
													V
													V

ZigBee	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)
		4950	47.7	-26.3	74	72.69	31.47	11.58	68.04	250	356	P	H
		4950	41.29	-12.71	54	66.28	31.47	11.58	68.04	250	356	A	H
		7425	48.96	-25.04	74	65.58	36.47	14.2	67.29	218	309	P	H
		7425	40	-14	54	56.62	36.47	14.2	67.29	218	309	A	H
		11520	49.93	-24.07	74	59.61	40.13	17.88	67.69	-	-	P	H
		11520	38.13	-15.87	54	47.81	40.13	17.88	67.69	-	-	A	H
		14490	52.48	-21.52	74	58.33	41.94	20.19	67.98	-	-	P	H
		14490	41.64	-12.36	54	47.49	41.94	20.19	67.98	-	-	A	H
		18000	58.02	-15.98	74	57	48.82	21.92	69.72	-	-	P	H
		18000	49.21	-4.79	54	48.19	48.82	21.92	69.72	-	-	A	H
													H
ZigBee CH 25 2475MHz													H
		4950	47.26	-26.74	74	72.34	31.38	11.58	68.04	295	356	P	V
		4950	40.52	-13.48	54	65.6	31.38	11.58	68.04	295	356	A	V
		7425	49.76	-24.24	74	66.38	36.47	14.2	67.29	295	341	P	V
		7425	41.63	-12.37	54	58.25	36.47	14.2	67.29	295	341	A	V
		12180	50.22	-23.78	74	59.49	39.28	18.49	67.04	-	-	P	V
		12180	38.53	-15.47	54	47.8	39.28	18.49	67.04	-	-	A	V
		14490	51.36	-22.64	74	57.21	41.94	20.19	67.98	-	-	P	V
		14490	41.76	-12.24	54	47.61	41.94	20.19	67.98	-	-	A	V
		17985	59.63	-14.37	74	58.92	48.7	21.91	69.9	-	-	P	V
		17985	48.64	-5.36	54	47.93	48.7	21.91	69.9	-	-	A	V
													V
													V

ZigBee	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)
		4960	40.75	-33.25	74	65.72	31.51	11.58	68.06	-	-	P	H
		7440	44.98	-29.02	74	61.52	36.49	14.2	67.23	-	-	A	H
		11580	49.8	-24.2	74	59.45	40.02	17.93	67.6	-	-	P	H
		11580	38.17	-15.83	54	47.82	40.02	17.93	67.6	-	-	A	H
		14490	51.42	-22.58	74	57.27	41.94	20.19	67.98	-	-	P	H
		14490	41.76	-12.24	54	47.61	41.94	20.19	67.98	-	-	A	H
		18000	58.89	-15.11	74	57.87	48.82	21.92	69.72	-	-	P	H
		18000	48.93	-5.07	54	47.91	48.82	21.92	69.72	-	-	A	H
													H
													H
													H
													H
ZigBee CH 26 2480MHz		4960	40.81	-33.19	74	65.83	31.46	11.58	68.06	-	-	P	V
		7440	44.95	-29.05	74	61.51	36.47	14.2	67.23	-	-	A	V
		11430	50.42	-23.58	74	60.58	40.01	17.78	67.95	-	-	P	V
		11430	37.5	-16.5	54	47.66	40.01	17.78	67.95	-	-	A	V
		14490	52.07	-21.93	74	57.92	41.94	20.19	67.98	-	-	P	V
		14490	41.68	-12.32	54	47.53	41.94	20.19	67.98	-	-	A	V
		18000	59.09	-14.91	74	57.85	49.04	21.92	69.72	-	-	P	V
		18000	49.26	-4.74	54	48.02	49.04	21.92	69.72	-	-	A	V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Emission above 18GHz

2.4GHz ZigBee (SHF)

ZigBee	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 ZigBee SHF		23047	38.92	-35.08	74	37.9	38.63	14.62	52.23	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		23810	37.74	-36.26	74	36.38	38.5	15.18	52.32	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

2.4GHz ZigBee (LF)

ZigBee	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 ZigBee LF		185.2	32.34	-11.16	43.5	47.7	14.8	2.24	32.4	125	0	Q	H
		196.84	35.97	-7.53	43.5	51.17	14.9	2.3	32.4	-	-	P	H
		250.19	35.43	-10.57	46	46.74	18.52	2.59	32.42	-	-	P	H
		500.45	36.89	-9.11	46	42.02	23.8	3.66	32.59	-	-	P	H
		749.74	39.63	-6.37	46	39.31	28.09	4.63	32.4	-	-	P	H
		957.32	33.04	-12.96	46	28.22	30.85	5.12	31.15	-	-	P	H
													H
													H
													H
													H
													H
													H
		57.16	37.21	-2.79	40	56.6	11.78	1.26	32.43	100	41	Q	V
		123.12	35.84	-7.66	43.5	48.86	17.6	1.79	32.41	-	-	P	V
		198.78	34.24	-9.26	43.5	49.43	14.9	2.31	32.4	-	-	P	V
		500.45	37.1	-8.9	46	42.23	23.8	3.66	32.59	-	-	P	V
		749.74	40.2	-5.8	46	39.88	28.09	4.63	32.4	-	-	P	V
		949.56	33.29	-12.71	46	28.64	30.79	5.08	31.22	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or noise floor only.

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

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

ZigBee	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)
ZigBee CH 11 2405MHz		2405	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2405	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 @ 2405MHz:

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 @ 2405MHz:

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

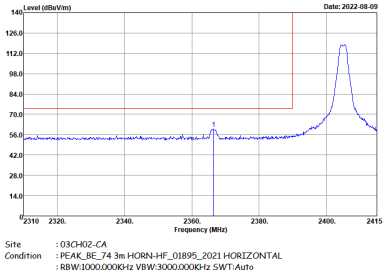
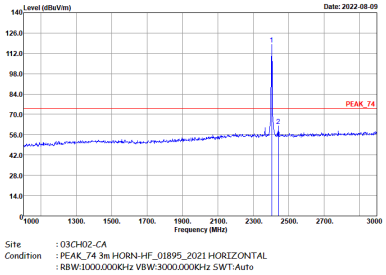
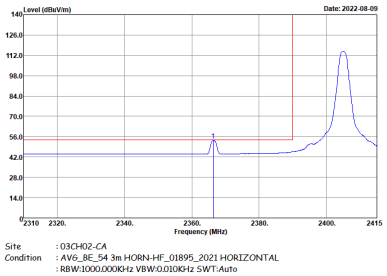
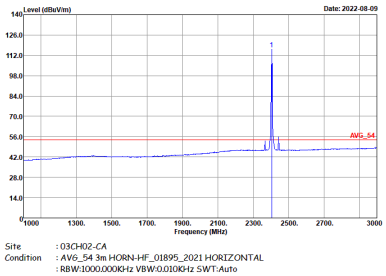
Test Engineer :	Fu Chen	**Temperature :**	20~24°C
		Relative Humidity :	42~47%

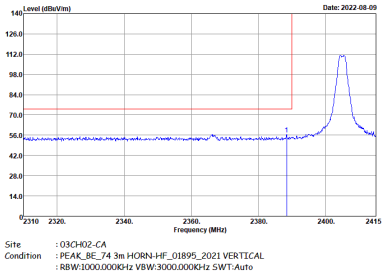
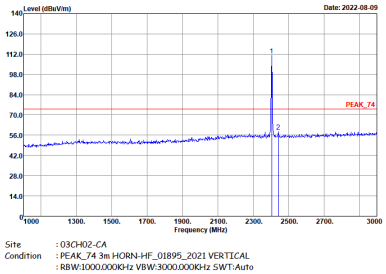
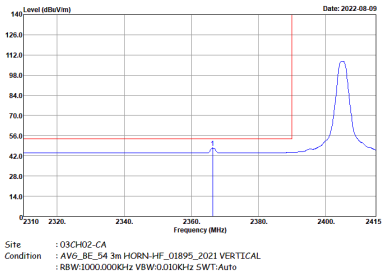
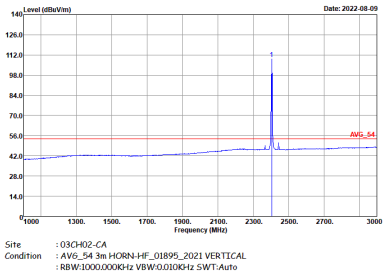
Note symbol

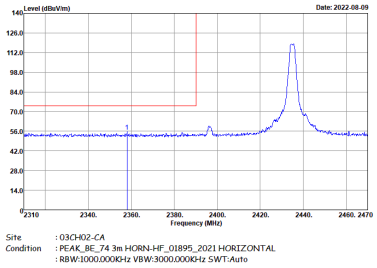
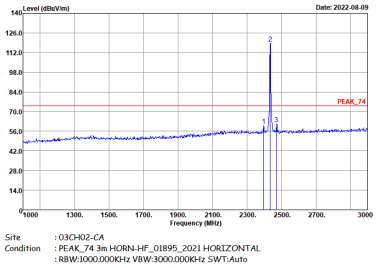
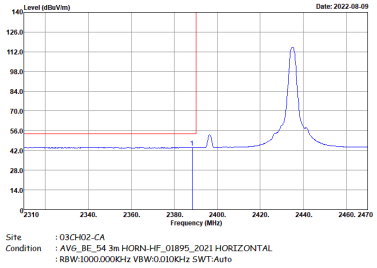
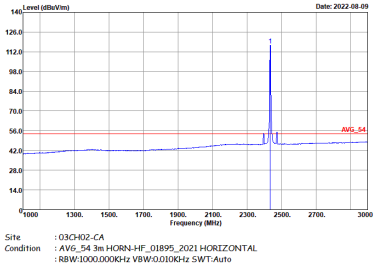
-L	**Low channel location**
-R	**High channel location**

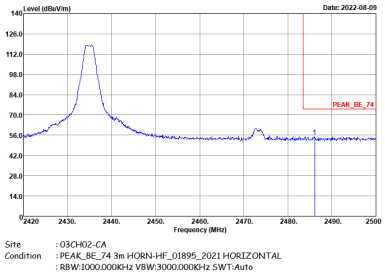
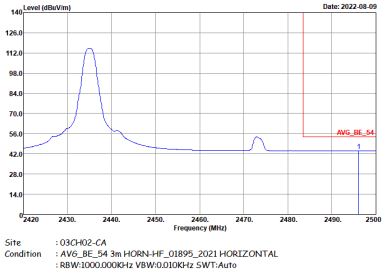
2.4GHz 2400~2483.5MHz

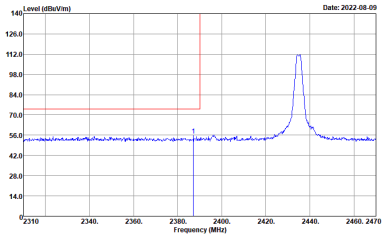
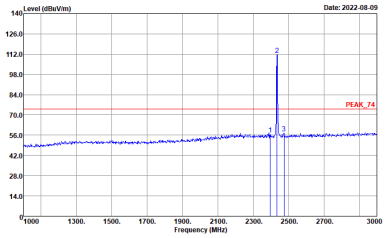
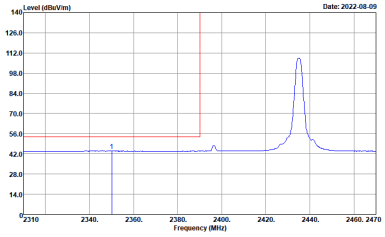
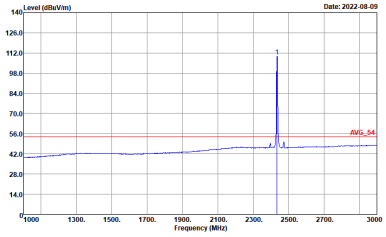
ZigBee (Band Edge @ 3m)

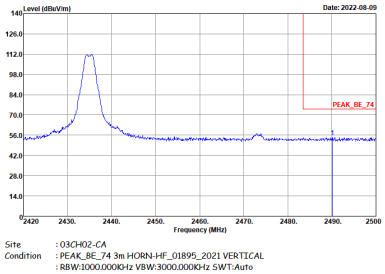
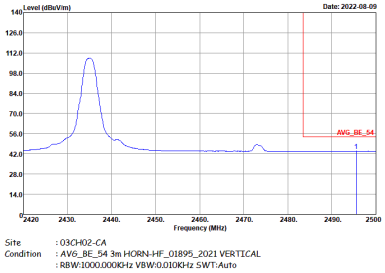
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH11 2405MHz	
	Horizontal	Fundamental
Peak		
Avg.		

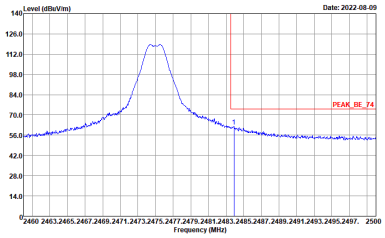
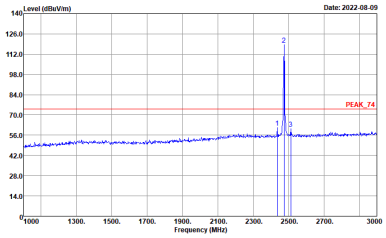
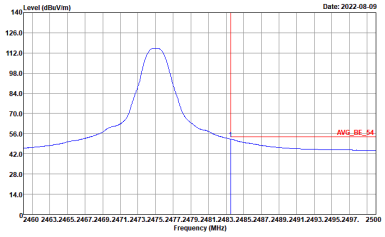
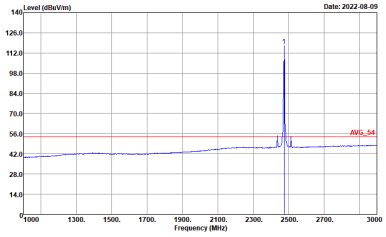
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH11 2405MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

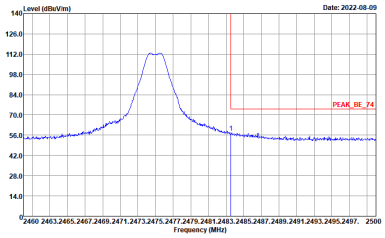
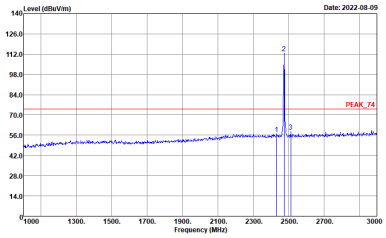
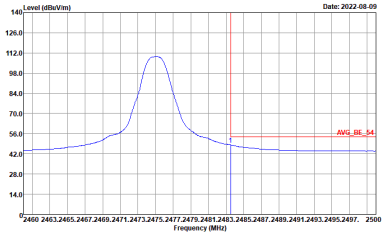
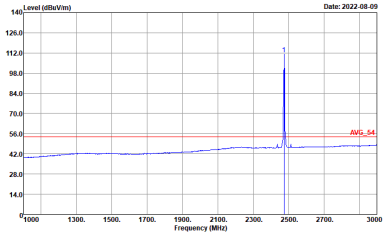
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH17 2435MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

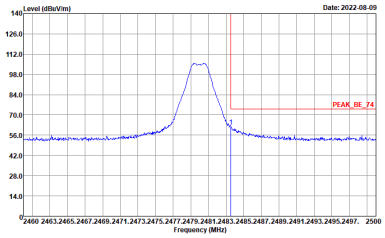
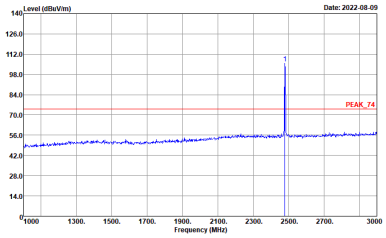
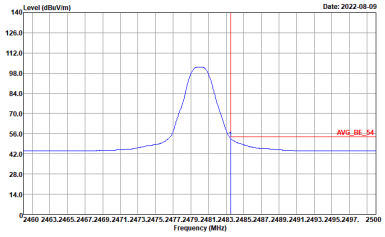
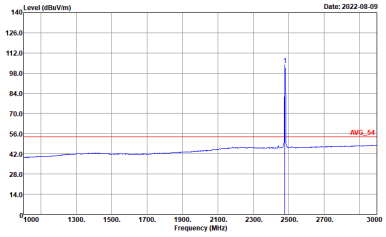
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH17 2435MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

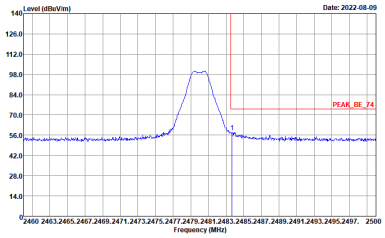
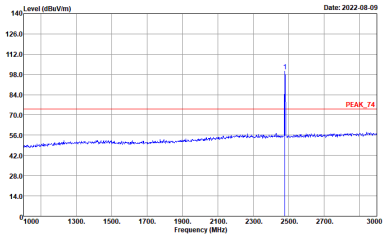
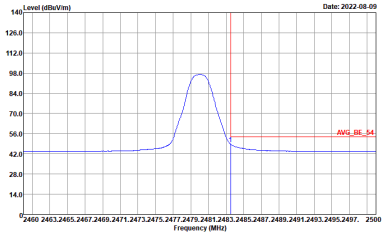
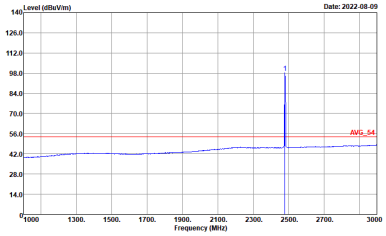
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH17 2435MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH17 2435MHz - R	
	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH25 2475MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

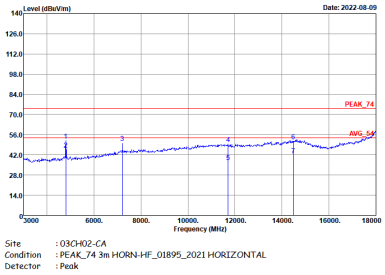
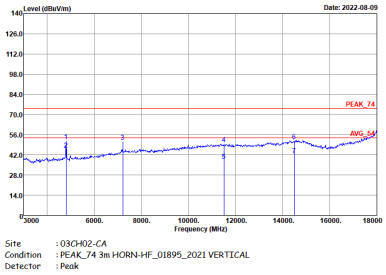
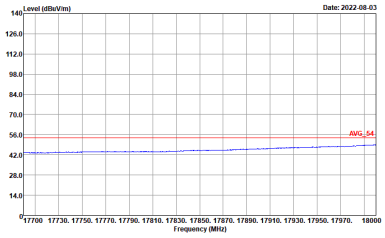
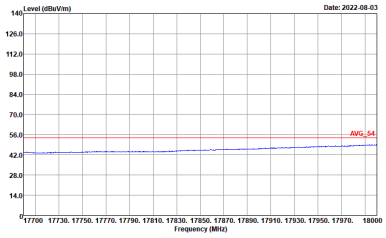
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH25 2475MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

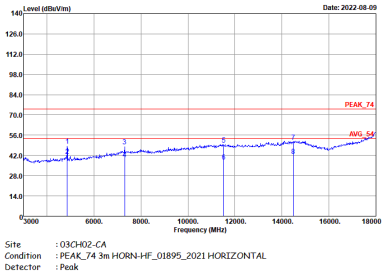
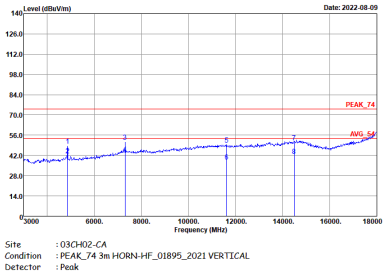
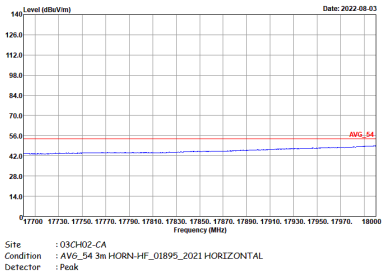
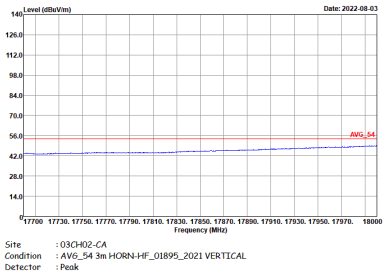
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH26 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

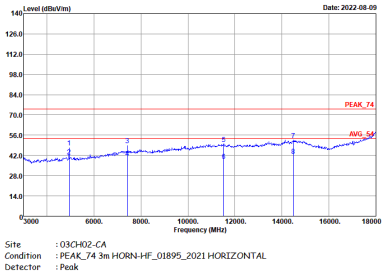
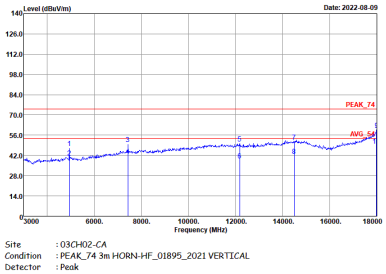
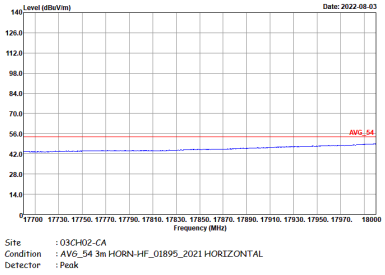
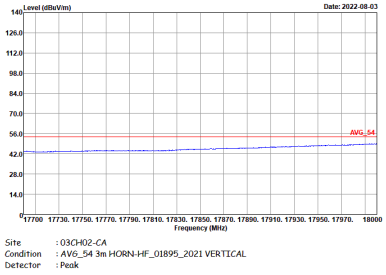
ZigBee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	ZigBee CH26 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

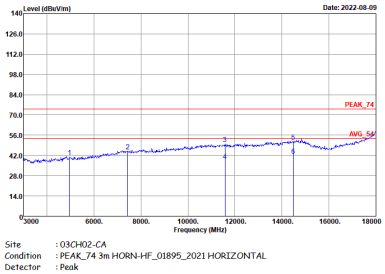
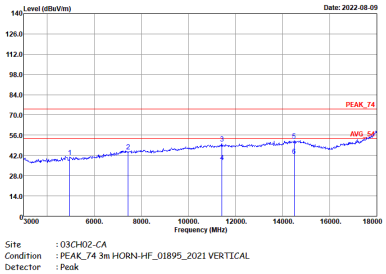
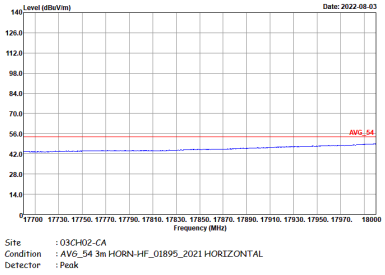
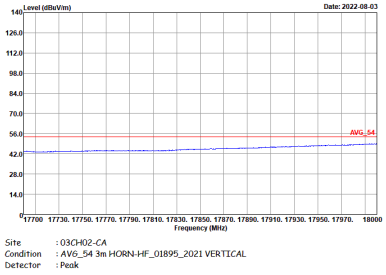
2.4GHz 2400~2483.5MHz

ZigBee (Harmonic @ 3m)

ZigBee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZigBee CH11 2405MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL Detector : Peak
Avg.	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL Detector : Peak

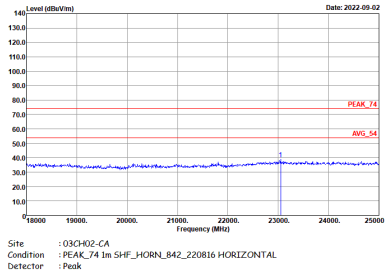
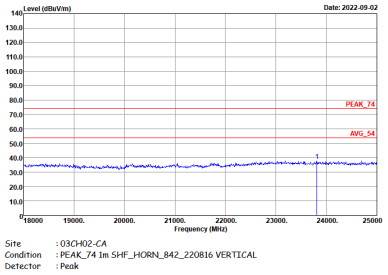
ZigBee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZigBee CH17 2435MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL Detector : Peak
Avg.	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL Detector : Peak

ZigBee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZigBee CH25 2475MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL Detector : Peak
Avg.	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL Detector : Peak

ZigBee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	ZigBee CH26 2480MHz	
	Horizontal	Vertical
Peak Avg.	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : PEAK_74 3m HORN-HF_01895_2021 VERTICAL Detector : Peak
Avg.	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 HORIZONTAL Detector : Peak	 Site : 03CH02-CA Condition : AVG_54 3m HORN-HF_01895_2021 VERTICAL Detector : Peak

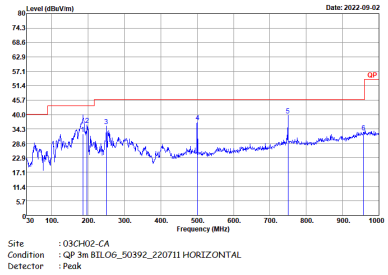
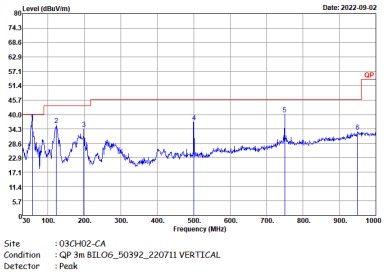
Emission above 18GHz

2.4GHz ZigBee (SHF @ 1m)

ZigBee	2.4GHz 2400~2483.5MHz	
	ZigBee SHF	
	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

2.4GHz ZigBee (LF)

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

Appendix E. Duty Cycle Plots

Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
ZigBee	100	-	-	10Hz

ZigBee