FCC RADIO TEST REPORT

FCC ID	:	**2AEM4-71213573**
Equipment	:	**Wireless router/access point**
Brand Name	:	**eero**
Model Name	:	**S010001**
Applicant	:	**eero LLC** **660 3rd Street, 4th Floor, San Francisco, CA 94107**
Manufacturer	:	**eero LLC** **660 3rd Street, 4th Floor, San Francisco, CA 94107**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Aug. 10, 2021 and testing was started from Aug. 11, 2021 and completed on Oct. 19, 2021. 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 of Sporton International (USA) Inc., the test report shall not be reproduced except in full.

Neil Kao

Approved by: Neil Kao

Sporton International (USA) Inc.

1175 Montague Expressway, Milpitas, CA 95035

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR210727001C	01	Initial issue of report	Nov. 17, 2021
FR210727001C	02	Revise some content of descriptions	Dec. 16, 2021

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	Under limit 0.78 dB at 12375.000 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 10.48 dB at 0.492 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Product Feature of Equipment Under Test

The EUT is an indoor AP with radios including Bluetooth - LE, Wi-Fi 2.4GHz 802.11b/g/n, Wi-Fi 5GHz 802.11a/n/ac/ax and 802.15.4 (Zigbee), equipped with integrated antennas configured below:

Antenna configuration	
Antenna Type	**WLAN 2.4GHz** <Ant. 6>: Flexible PCB Antenna <Ant. 3>: Flexible PCB Antenna **WLAN 5GHz** <Ant. 4>: Flexible PCB Antenna <Ant. 5>: Flexible PCB Antenna **Bluetooth - LE:** Flexible PCB Antenna **Zigbee:** Flexible PCB Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	3.24

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

Specification of Accessories				
Adapter 1	**Brand Name**	eero	**Model Name**	C210001
Adapter 2	**Brand Name**	eero	**Model Name**	C210003
Adapter 3	**Brand Name**	eero	**Model Name**	C210004
Adapter 4	**Brand Name**	eero	**Model Name**	C210005

Remark: The manufacturer declares that all the power supplies listed are electrically identical from one another, the only difference between all the models are the plugs designed for use in different countries. All the test is performed with only one power supply, model C210001 as shown in this report.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

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.**
	TH01-CA, CO01-CA, 03CH02-CA

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

1.4 Applicable Standards

According to the specifications of 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 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards without any deviation during the test.
2. This EUT has also been tested and shown compliance with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	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).
Radiated measurements are performed in one orientation which is plane X according to the prescribed placement of the device in normal operation declared by the manufacturer.

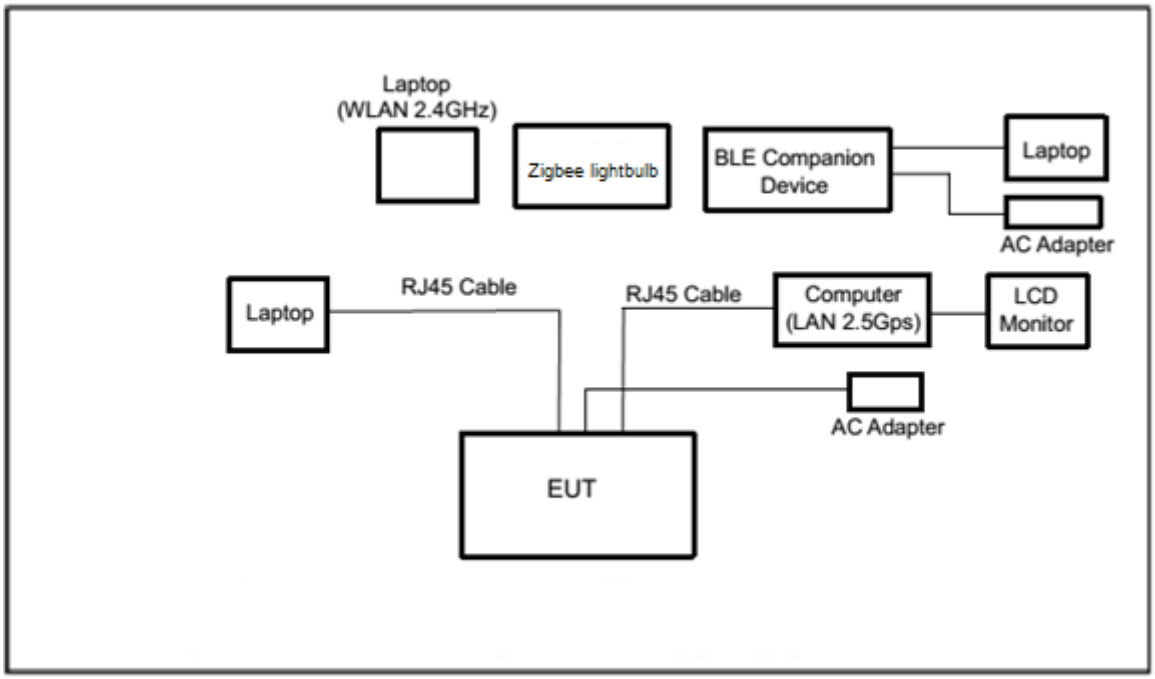
b. AC power line Conducted Emission was tested under maximum output power.

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

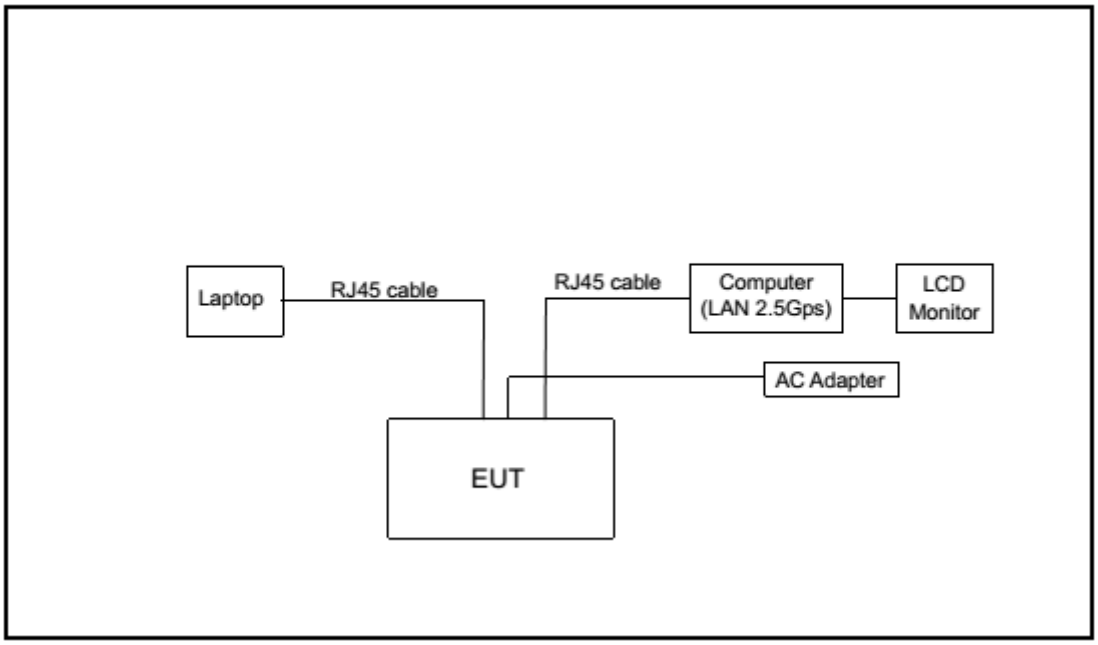
Summary table of Test Cases	
Test Item	**Data Rate / Modulation**
Conducted Test Cases	**250Kbps / GFSK**
	Mode 1: Zigbee Tx CH11_2405 MHz Mode 2: Zigbee Tx CH17_2435 MHz Mode 3: Zigbee Tx CH25_2475 MHz Mode 4: Zigbee Tx CH26_2480 MHz
Radiated Test Cases	Mode 1: Zigbee Tx CH11_2405 MHz Mode 2: Zigbee 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 Link + LAN 1 Link + LAN 2 Link + Adapter Mode 2: WLAN (2.4GHz) Link + Bluetooth - LE Link + LAN 1 Link + LAN 2 Link + 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

<AC Conducted Emission Mode>



<Radiated Emission Mode>



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	Acer	PS548 G1	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
2.	Notebook	HP	14-dq1043cl	TX2-RTL8822CE	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	Computer	Fractal	FD-C-DEF7A-01 (NETINTX550TR Intel X550T2BLK)	FCC DoC	N/A	Unshielded, 1.2 m
4.	LCD Monitor	Samsung	LS27E310HZG/ZA	FCC DoC	N/A	Unshielded, 1.2m
5.	BLE Companion Device	eero	S010001	N/A	N/A	N/A
6.	Light Bulb for Zigbee	Philips	Hue	N/A	N/A	N/A

2.5 EUT Operation Test Setup

The RF test items, utility “Radio Control Console V4.0.0.0” 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.

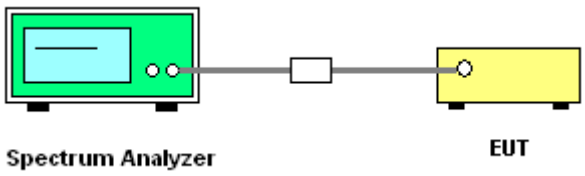
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

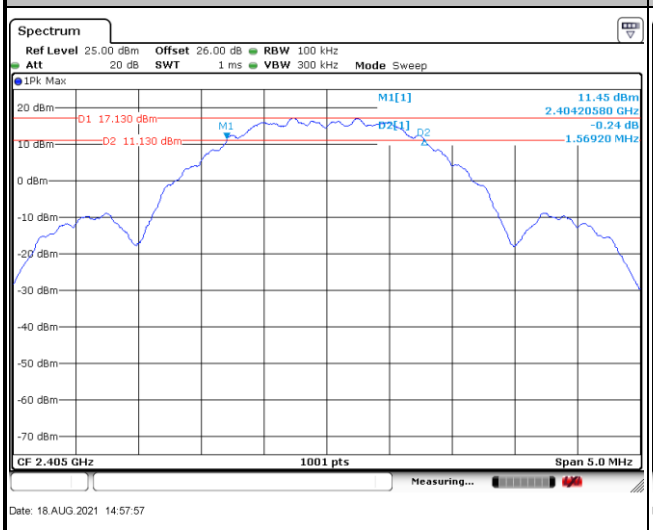
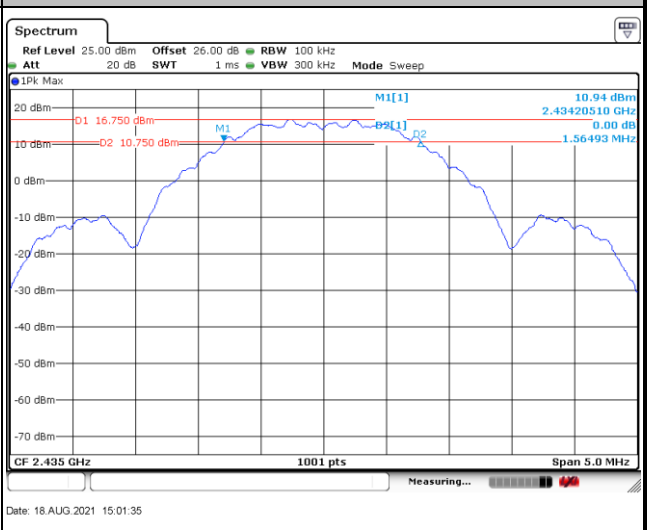
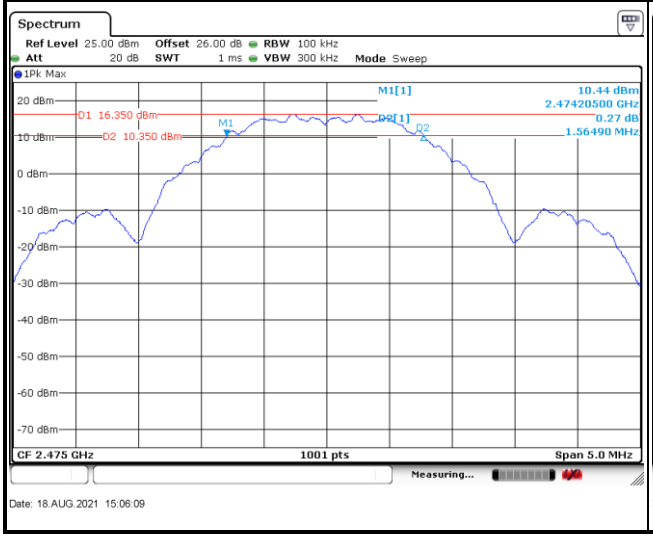
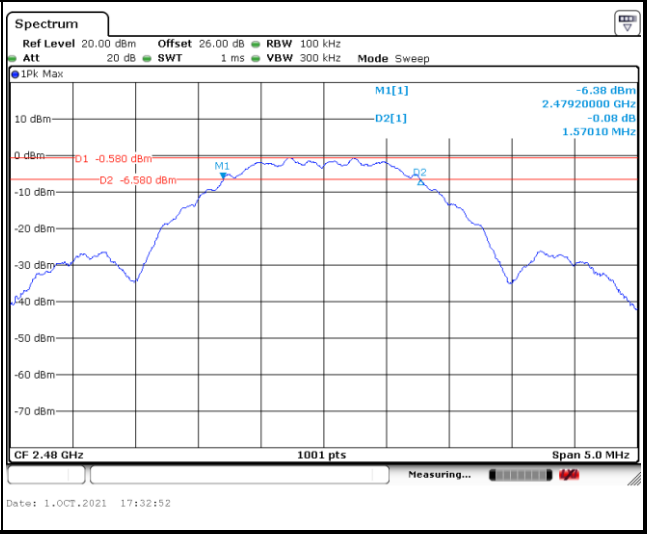
1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit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



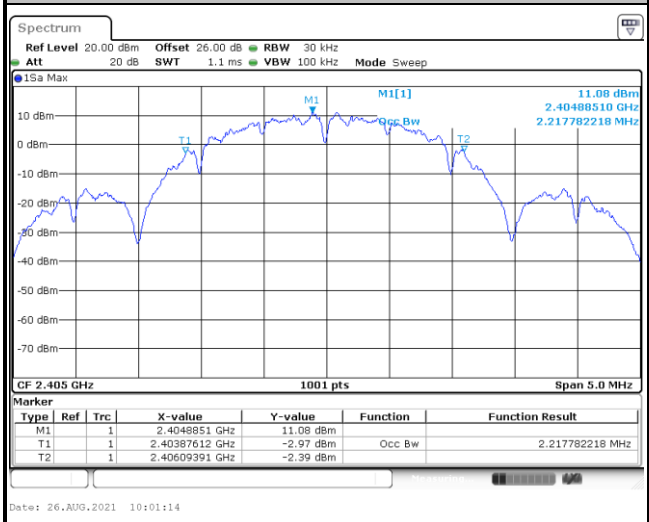
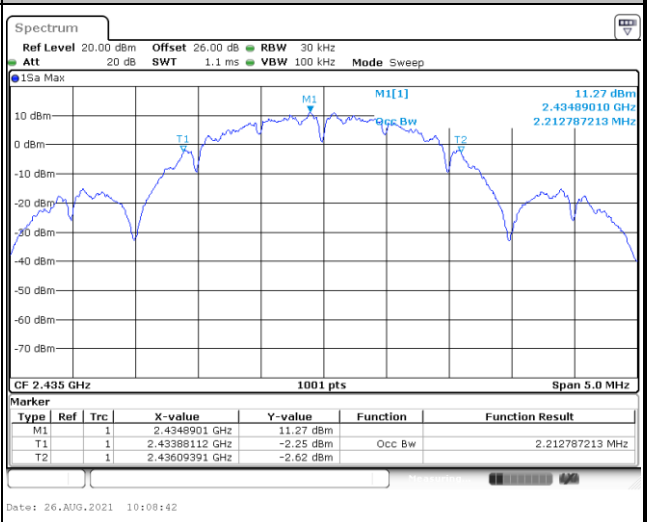
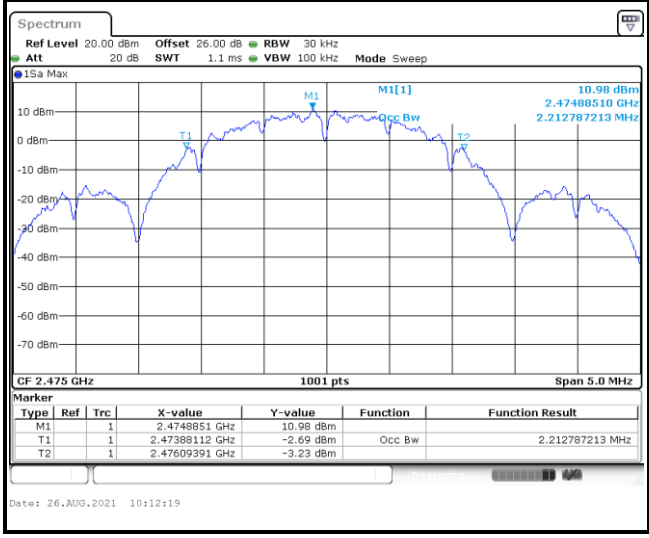
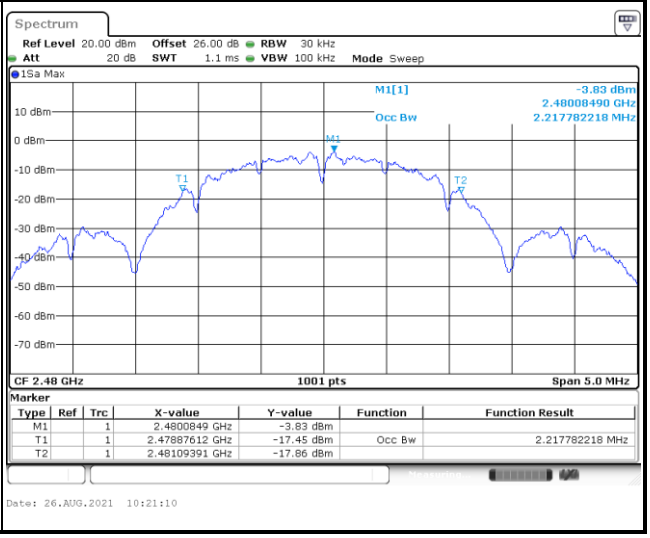
3.1.5 Test Result of 6dB Bandwidth

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.

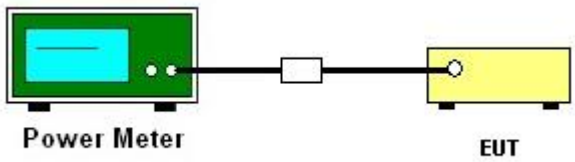
3.2.2 Measuring Instruments

See list of measuring equipment of 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 was connected to the power meter by RF cable and attenuator.
3. The path loss was 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

See list of measuring equipment of this test report.

3.3.3 Test Procedures

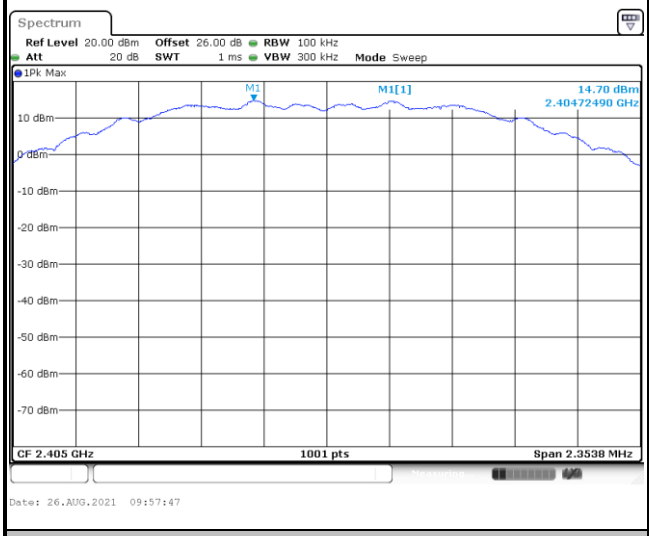
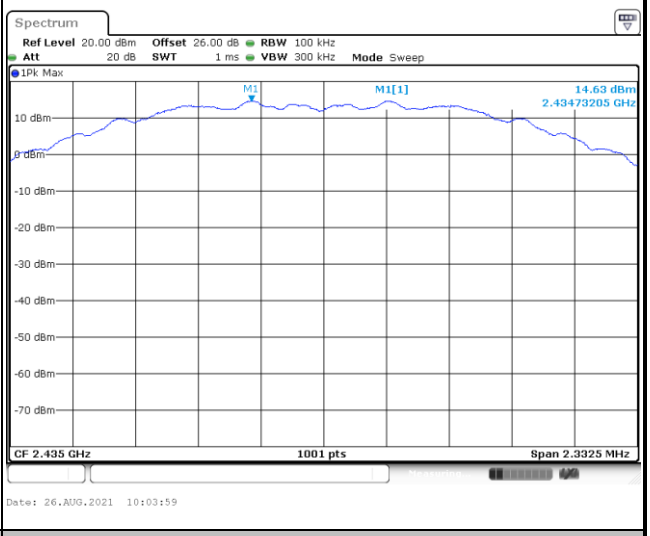
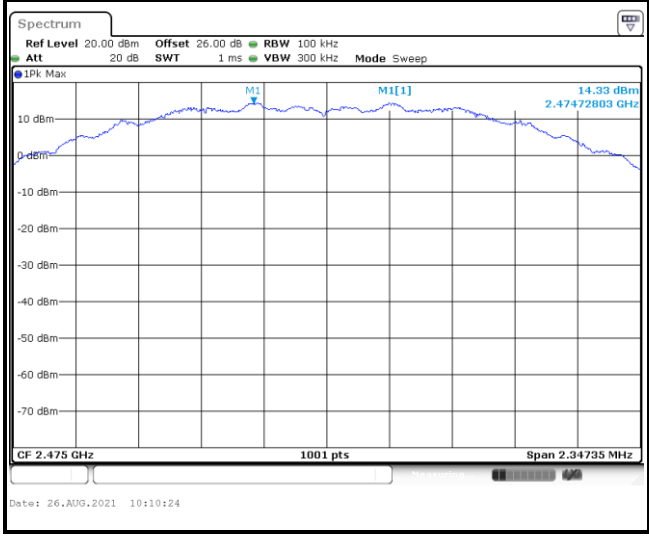
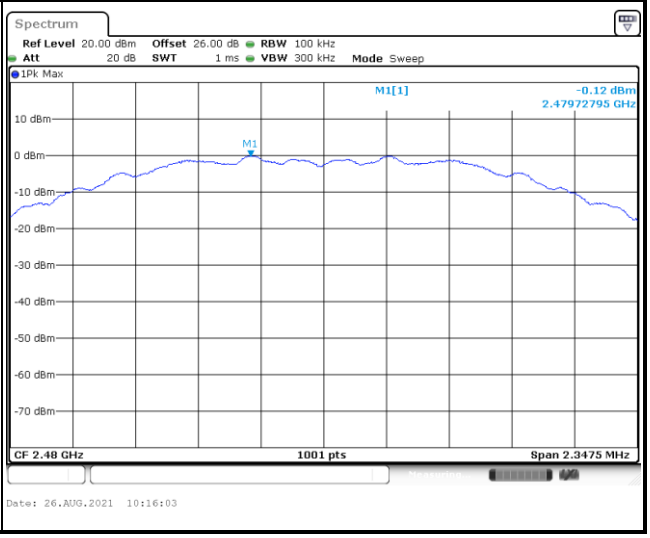
1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.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

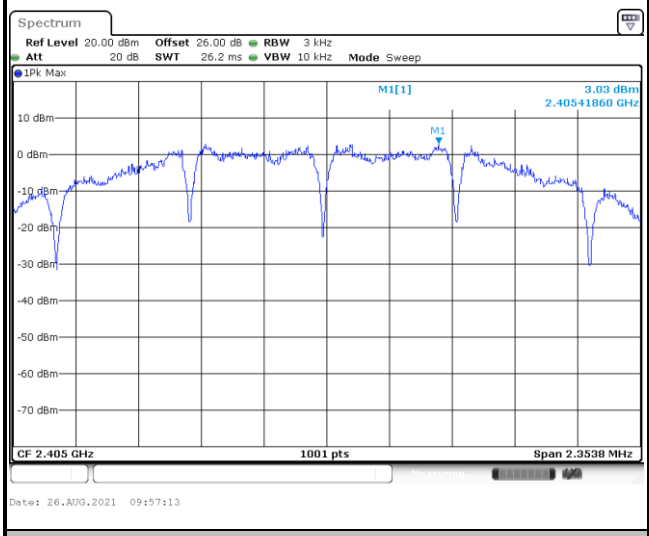
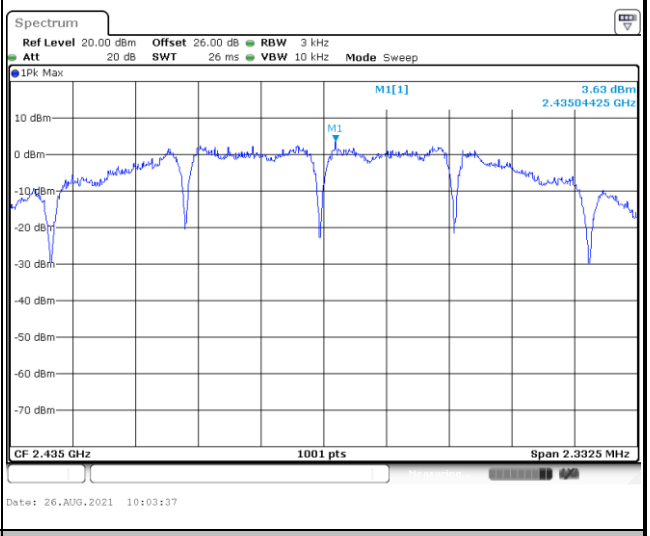
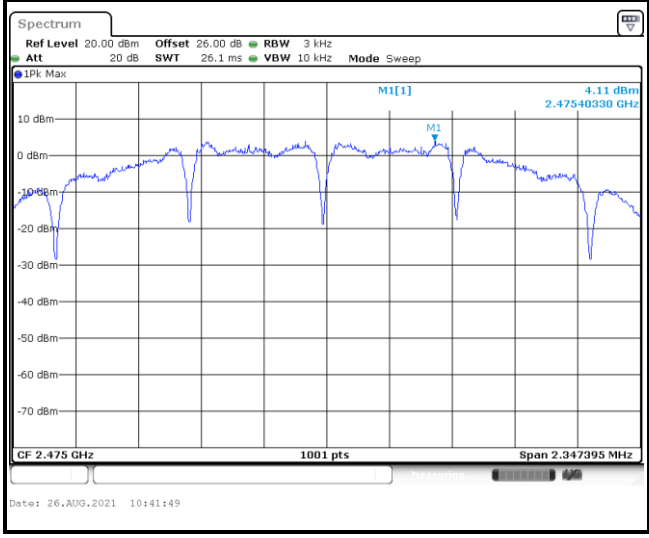
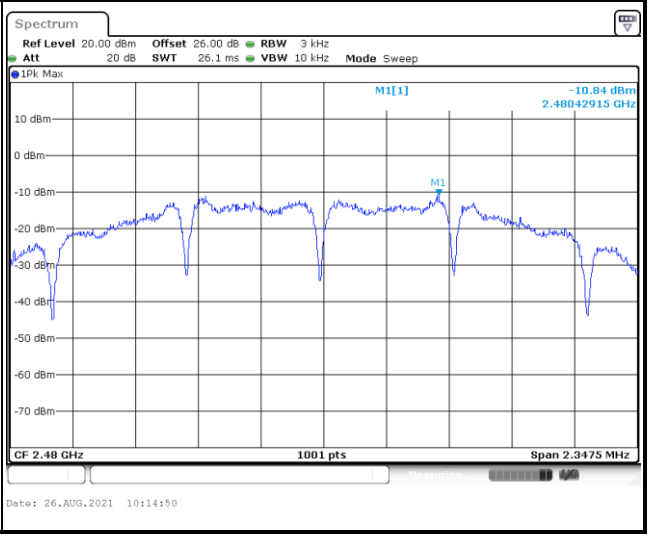
3.3.5 Test Result of Power Spectral Density

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

3.4.2 Measuring Instruments

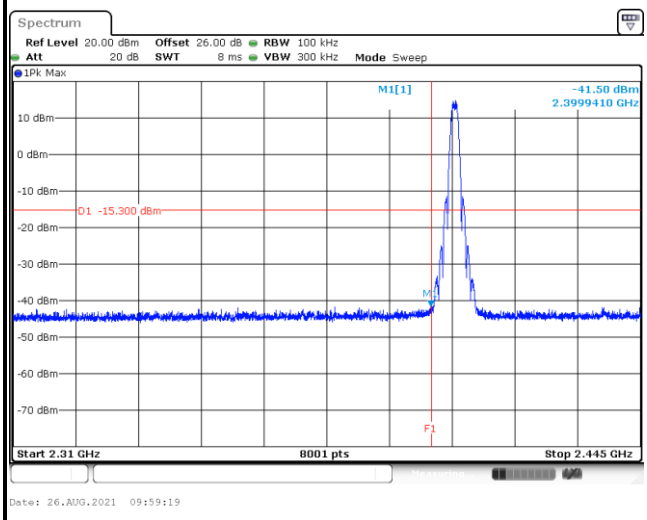
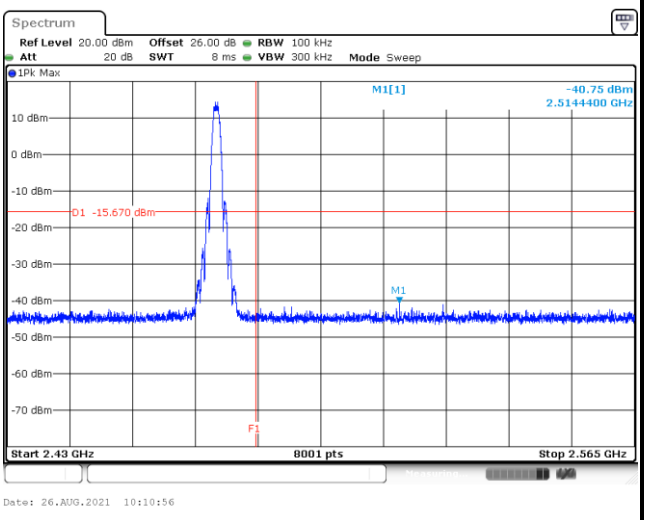
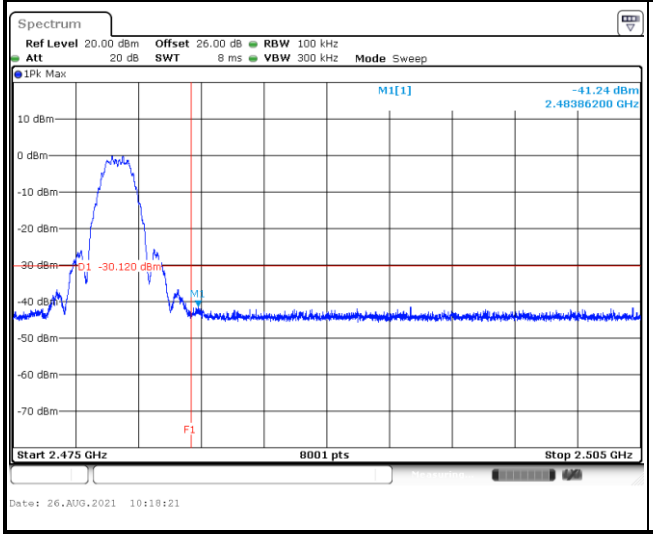
See list of measuring equipment of this test report.

3.4.3 Test Procedure

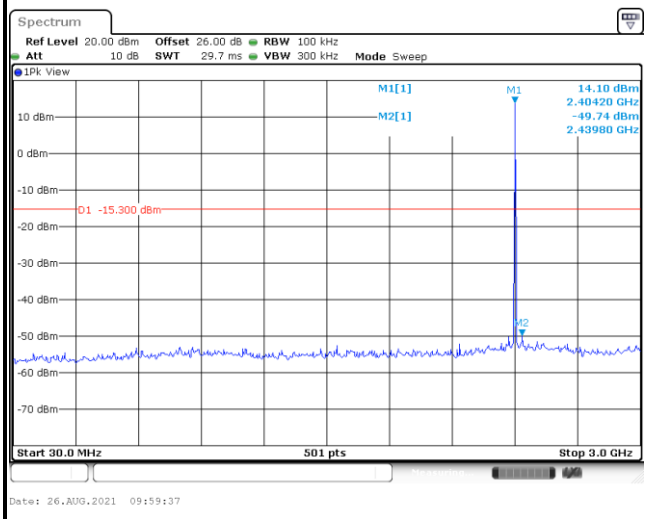
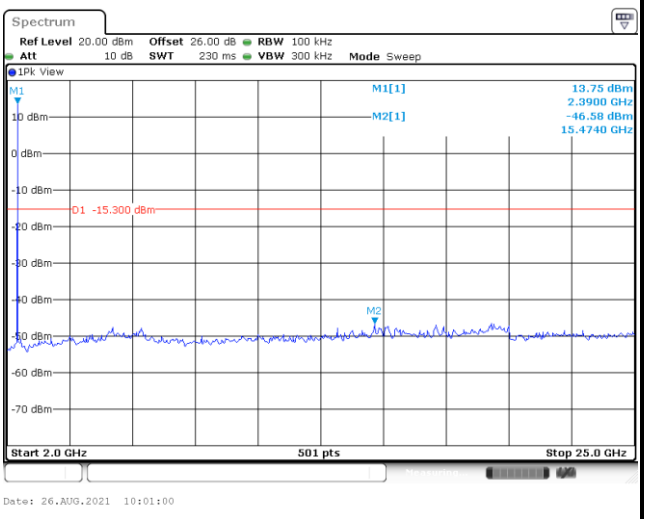
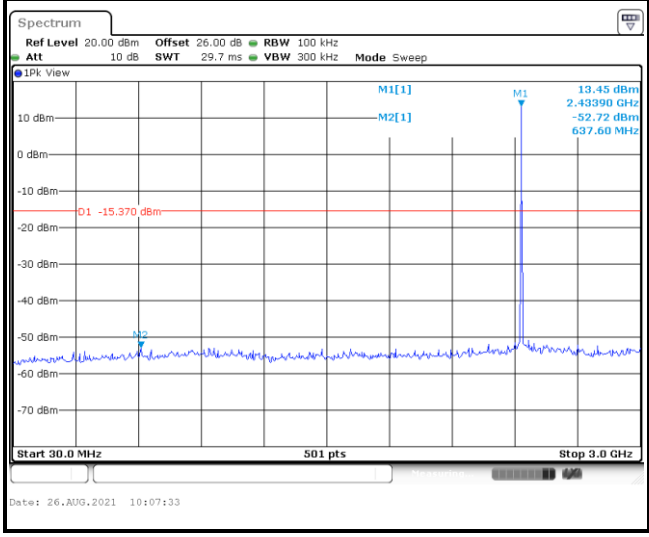
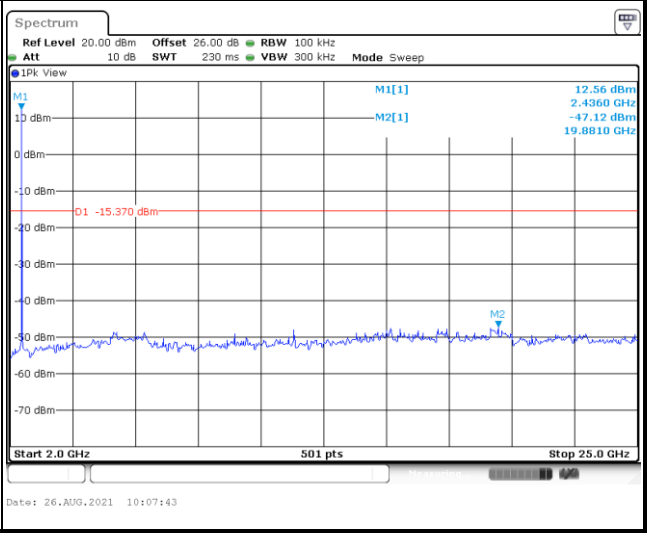
1. The testing follows the ANSI C63.10 Section 11.11.1 General and 11.11.3 Emission level measurement.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable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

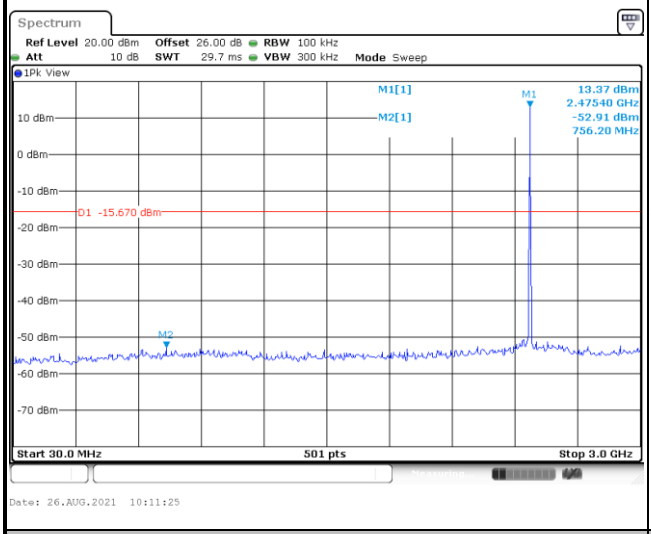
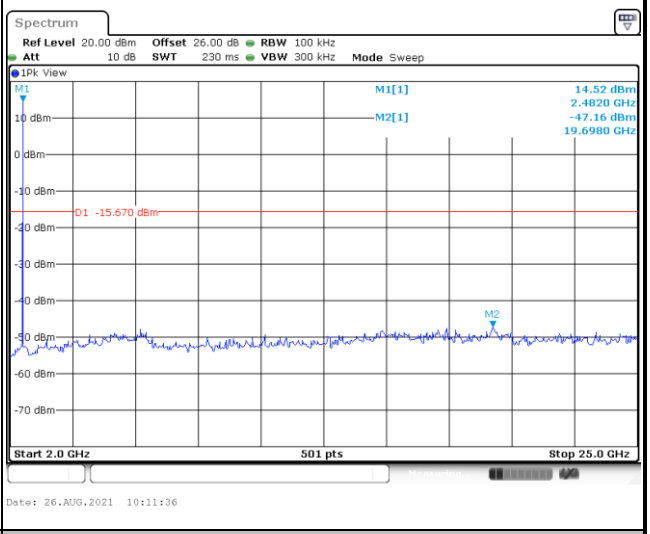
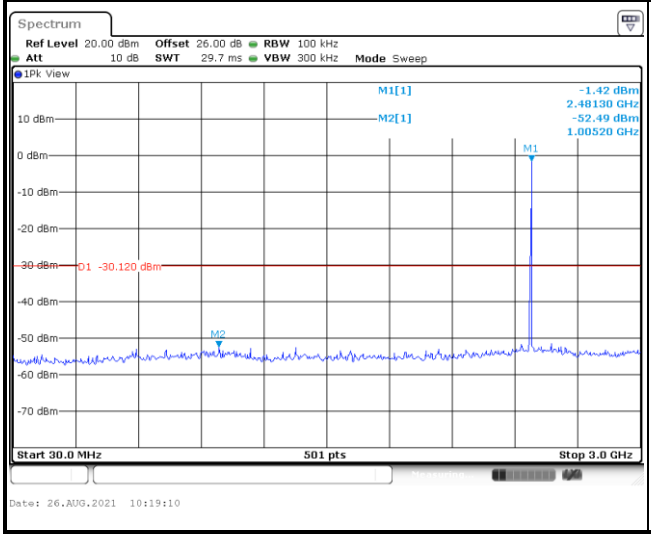
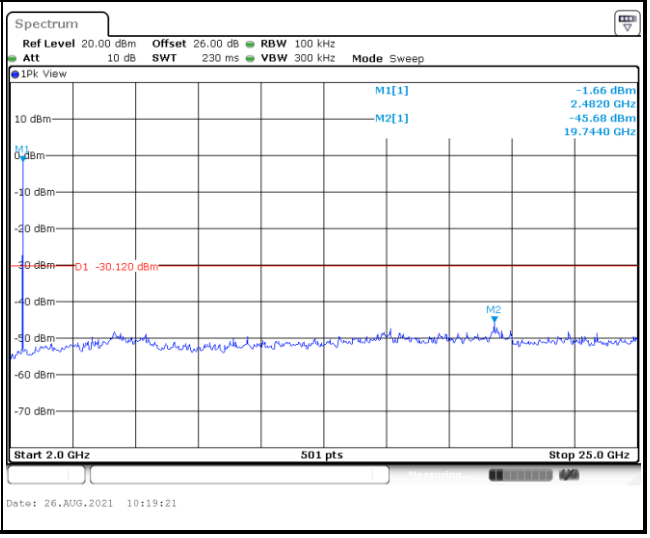
3.4.4 Test Setup

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

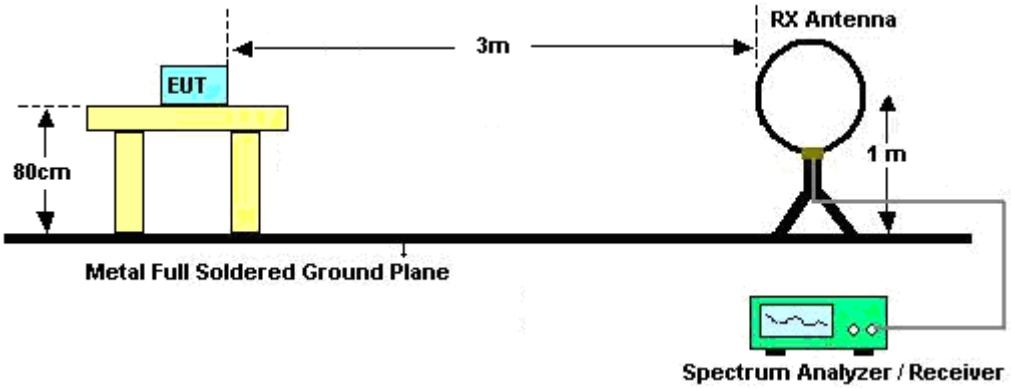
See list of measuring equipment of this test report.

3.5.3 Test Procedures

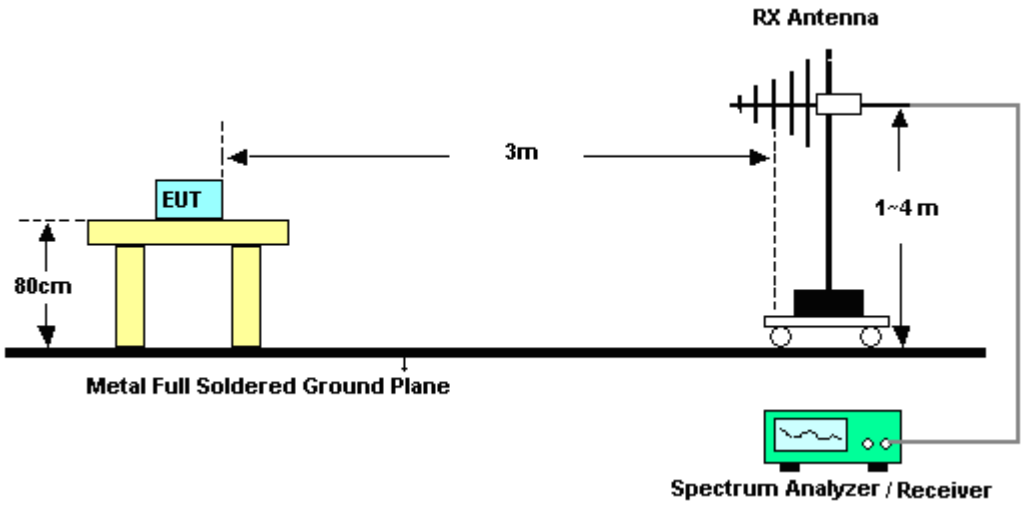
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was 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 was placed at distance 3 meter from measurement antenna which was 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 1GHz was performed by adjusting the antenna tower from 1m to 4m and by rotating the turn table from 0degree to 360 degree to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6dB margin against QP limit line, the position is marked as "-".
7. Radiated testing above 1GHz was performed by adjusting the antenna tower from 1m to 4m and by rotating the turn table from 0 degree to 360 degree 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 6dB 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

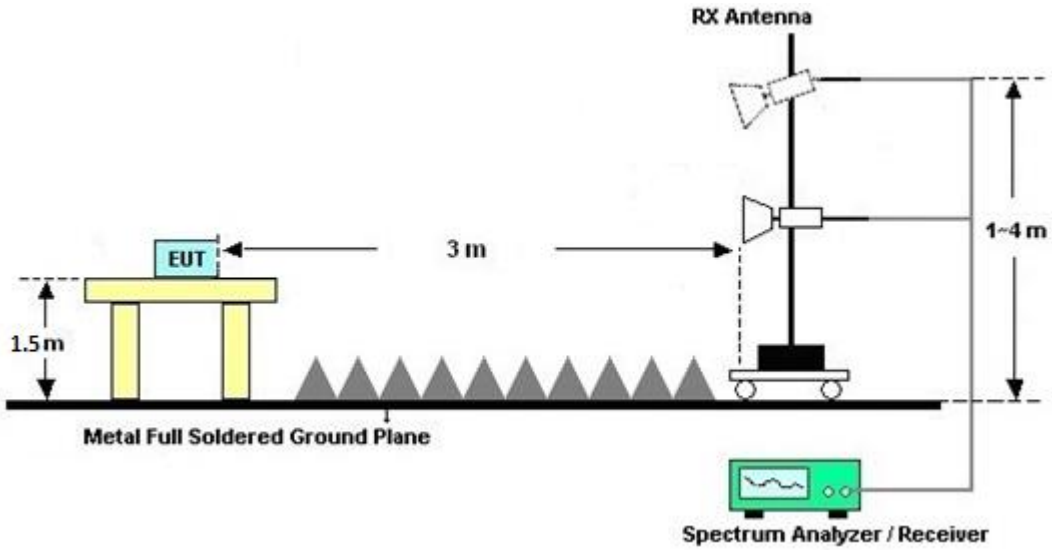
For radiated test below 30MHz



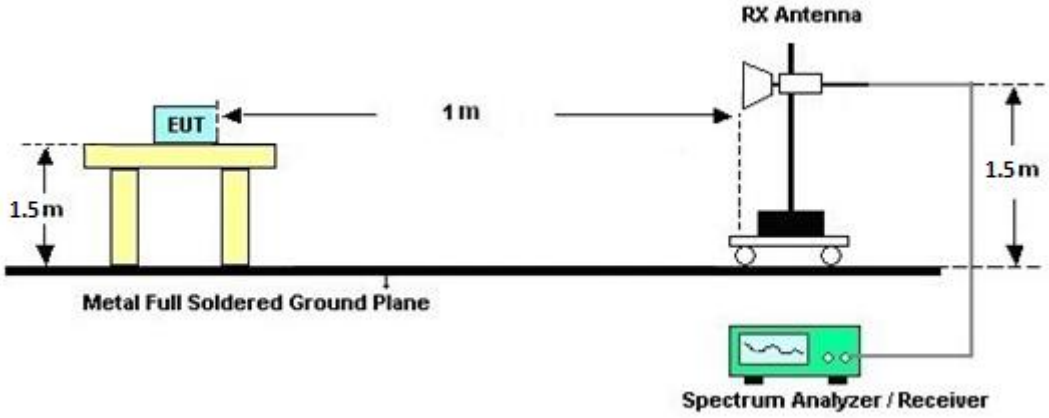
For radiated test from 30MHz to 1GHz



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 started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was 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 came 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.

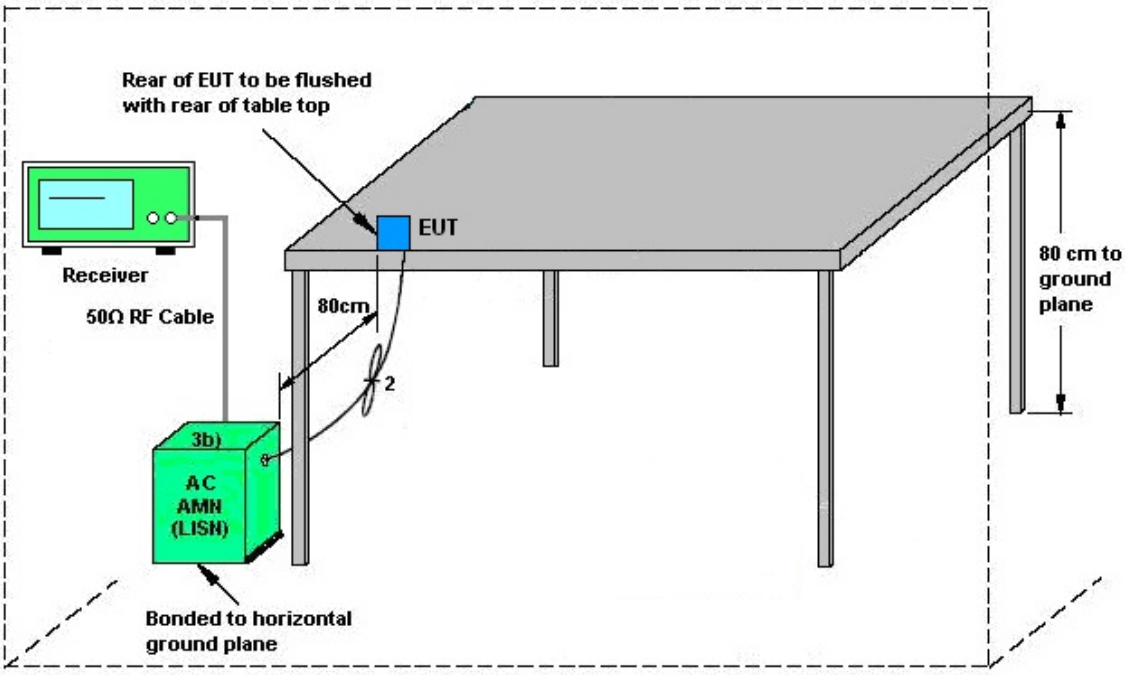
3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was 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 sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) 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 and power spectral density limit 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	R&S	HFH2-Z2E	100840	9kHz~30MHz	Jun. 21, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jun. 20, 2022	Radiation (03CH02-CA)
Bilog Antenna	TESEQ	6111D	50392	30MHz~1GHz	Aug. 10, 2021	Aug. 11, 2021~ Oct. 18, 2021	Aug. 09, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9120D	02113	1GHz~18GHz	Jul. 08, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 07, 2022	Radiation (03CH02-CA)
Horn Antenna	SCHWARZBECK	BBHA 9170D	00842	18GHz~40GHz	Jul. 20, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 19, 2022	Radiation (03CH02-CA)
Amplifier	SONOMA	310N	372240	N/A	Aug. 09, 2021	Aug. 11, 2021~ Oct. 18, 2021	Aug. 08, 2022	Radiation (03CH02-CA)
Preamplifier	Keysight	83017A	MY53270323	1GHz~26.5GHz	Jul. 27, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 26, 2022	Radiation (03CH02-CA)
Preamplifier	E-instrument	ERA-100M-18G-56-01-A70	EC1900251	1GHz~18GHz	Mar. 30, 2021	Aug. 11, 2021~ Oct. 18, 2021	Mar. 29, 2022	Radiation (03CH02-CA)
Preamplifier	Jet-Power	JPA0118-55-303	1710001800055004	1GHz~18GHz	Jul. 21, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 20, 2022	Radiation (03CH02-CA)
Preamplifier	EMEC	EMC18G40G	60725	18GHz-40GHz	Jul. 21, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 20, 2022	Radiation (03CH02-CA)
Spectrum Analyzer	Keysight	N9010A	MY542004485	10Hz~44GHz	Mar. 05, 2021	Aug. 11, 2021~ Oct. 18, 2021	Mar. 04, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN10	3G Highpass	Jul. 23, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 22, 2022	Radiation (03CH02-CA)
Filter	Wainwright	WLK12-1200-1272-11000-40SS	SN1	1.2G Low Pass	Jul. 23, 2021	Aug. 11, 2021~ Oct. 18, 2021	Jul. 22, 2022	Radiation (03CH02-CA)
Hygrometer	TESEO	608-H1	45142602	N/A	Aug. 04, 2021	Aug. 11, 2021~ Oct. 18, 2021	Aug. 03, 2022	Radiation (03CH02-CA)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Aug. 11, 2021~ Oct. 18, 2021	N/A	Radiation (03CH02-CA)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Aug. 11, 2021~ Oct. 18, 2021	N/A	Radiation (03CH02-CA)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Aug. 11, 2021~ Oct. 18, 2021	N/A	Radiation (03CH02-CA)
Software	Audix	E3	N/A	N/A	N/A	Aug. 11, 2021~ Oct. 18, 2021	N/A	Radiation (03CH02-CA)
Hygrometer	Testo	608-H1	45141354	N/A	Jul. 30, 2021	Aug. 18, 2021~ Oct. 04, 2021	Jul. 29, 2022	Conducted (TH01-CA)
Power Sensor	DARE!!	RPR3006W	RPR6W-191024	10MHz-6GHz	Jul. 13, 2021	Aug. 18, 2021~ Oct. 04, 2021	Jul. 12, 2022	Conducted (TH01-CA)
Switch	EM Electronics	EMSW18	SW1070902	N/A	Aug. 03, 2021	Aug. 18, 2021~ Oct. 04, 2021	Aug. 02, 2022	Conducted (TH01-CA)
Spectrum Analyzer	Rohde & Schwarz	FSV40	101545	10Hz-40GHz	Jun. 01, 2021	Aug. 18, 2021~ Oct. 04, 2021	May 31, 2022	Conducted (TH01-CA)
LISN	TESEQ	NNB51	47407	N/A	Jul. 21, 2021	Aug. 16, 2021~ Oct. 19, 2021	Jul. 20, 2022	Conduction (CO01-CA)
LISN	TESEQ	NNB51	47415	N/A	Jun. 30, 2021	Aug. 16, 2021~ Oct. 19, 2021	Jun. 29, 2022	Conduction (CO01-CA)
EMI Test Receiver	R&S	ESR7	102177	9KHz~7GHz	Jun. 02, 2021	Aug. 16, 2021~ Oct. 19, 2021	Jun. 01, 2022	Conduction (CO01-CA)
Pulse limiter with 10dB attenuation	R&S	VTSD 9561-F N	9561-F-N00412	N/A	Jul. 07, 2021	Aug. 16, 2021~ Oct. 19, 2021	Jul. 06, 2022	Conduction (CO01-CA)
Test Software	R&S	EMC32 V10.30.0	N/A	N/A	N/A	Aug. 16, 2021~ Oct. 19, 2021	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:	Steve Chen	Temperature:	20.3~24	°C
Test Date:	2021/8/18~2021/10/4	Relative Humidity:	34.1~45.6	%

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	2.218	1.569	0.50	Pass
Zigbee	250K	1	17	2435	2.213	1.565	0.50	Pass
Zigbee	250K	1	25	2475	2.213	1.565	0.50	Pass
Zigbee	250K	1	26	2480	2.218	1.570	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	17.50	30.00	3.24	20.74	36.00	Pass
Zigbee	250K	1	17	2435	17.40	30.00	3.24	20.64	36.00	Pass
Zigbee	250K	1	25	2475	17.20	30.00	3.24	20.44	36.00	Pass
Zigbee	250K	1	26	2480	2.60	30.00	3.24	5.84	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	14.70	3.03	3.24	8.00	Pass
Zigbee	250K	1	17	2435	14.63	3.63	3.24	8.00	Pass
Zigbee	250K	1	25	2475	14.33	4.11	3.24	8.00	Pass
Zigbee	250K	1	26	2480	-0.12	-10.84	3.24	8.00	Pass

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

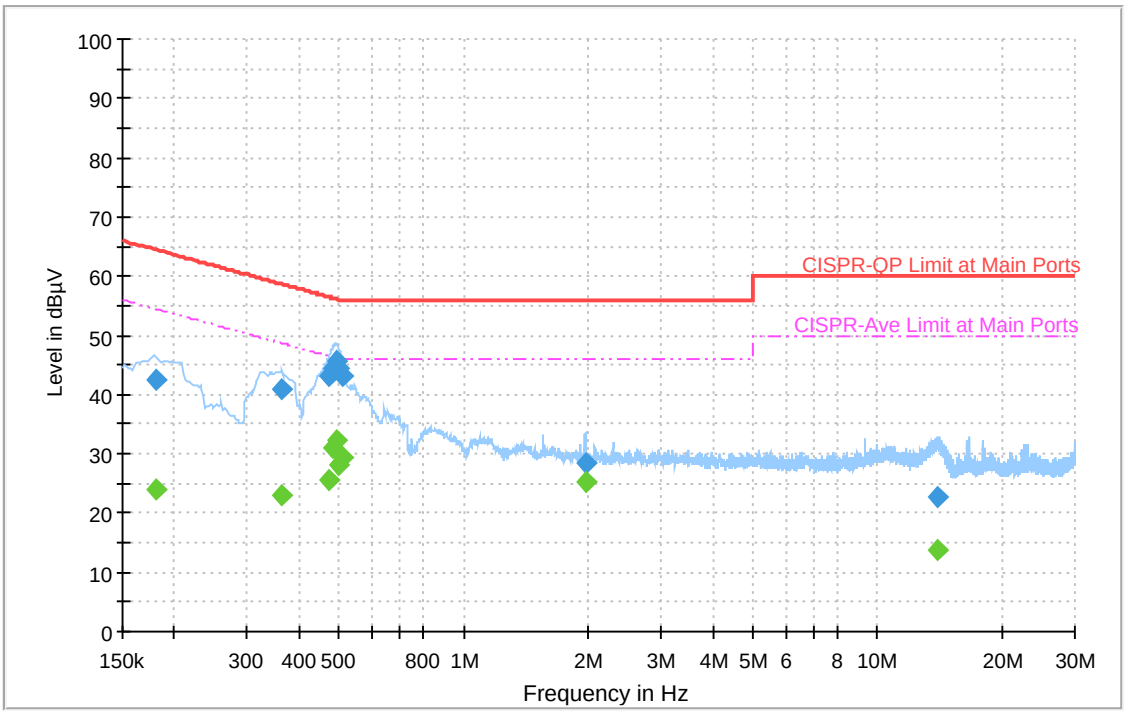
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Jordan Huang	**Temperature :**	24~26℃
		Relative Humidity :	43~47%

EUT Information

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

Full Spectrum



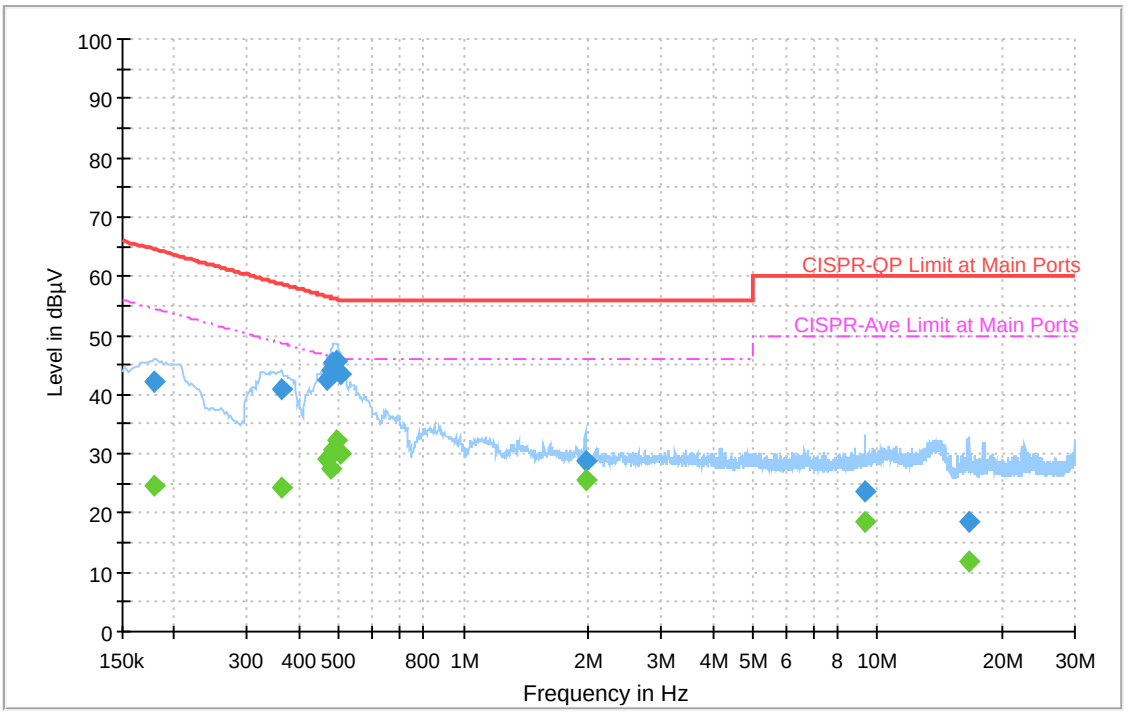
Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.181500	---	23.90	54.42	30.52	L1	OFF	20.3
0.181500	42.44	---	64.42	21.98	L1	OFF	20.3
0.363750	---	22.91	48.64	25.73	L1	OFF	20.3
0.363750	40.88	---	58.64	17.76	L1	OFF	20.3
0.474000	---	25.51	46.44	20.93	L1	OFF	20.3
0.474000	42.99	---	56.44	13.45	L1	OFF	20.3
0.480750	---	31.12	46.33	15.21	L1	OFF	20.3
0.480750	44.35	---	56.33	11.98	L1	OFF	20.3
0.492000	---	32.29	46.13	13.84	L1	OFF	20.3
0.492000	45.65	---	56.13	10.48	L1	OFF	20.3
0.501000	---	28.02	46.00	17.98	L1	OFF	20.3
0.501000	44.53	---	56.00	11.47	L1	OFF	20.3
0.507750	---	29.42	46.00	16.58	L1	OFF	20.3
0.507750	43.27	---	56.00	12.73	L1	OFF	20.3
1.965750	---	25.20	46.00	20.80	L1	OFF	20.3
1.965750	28.42	---	56.00	27.58	L1	OFF	20.3
13.933500	---	13.65	50.00	36.35	L1	OFF	20.5
13.933500	22.72	---	60.00	37.28	L1	OFF	20.5

EUT Information

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

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Line	Filter	Corr. (dB)
0.179250	---	24.53	54.52	29.99	N	OFF	20.2
0.179250	42.25	---	64.52	22.27	N	OFF	20.2
0.361500	---	24.29	48.69	24.40	N	OFF	20.3
0.361500	40.79	---	58.69	17.90	N	OFF	20.3
0.469500	---	29.05	46.52	17.47	N	OFF	20.3
0.469500	42.63	---	56.52	13.89	N	OFF	20.3
0.476250	---	27.58	46.40	18.82	N	OFF	20.3
0.476250	43.99	---	56.40	12.41	N	OFF	20.3
0.485250	---	30.64	46.25	15.61	N	OFF	20.3
0.485250	45.51	---	56.25	10.74	N	OFF	20.3
0.492000	---	32.38	46.13	13.75	N	OFF	20.3
0.492000	45.64	---	56.13	10.49	N	OFF	20.3
0.505500	---	30.04	46.00	15.96	N	OFF	20.3
0.505500	43.46	---	56.00	12.54	N	OFF	20.3
1.965750	---	25.40	46.00	20.60	N	OFF	20.3
1.965750	28.62	---	56.00	27.38	N	OFF	20.3
9.350250	---	18.54	50.00	31.46	N	OFF	20.4
9.350250	23.80	---	60.00	36.20	N	OFF	20.4
16.651500	---	11.90	50.00	38.10	N	OFF	20.5
16.651500	18.62	---	60.00	41.38	N	OFF	20.5

Appendix C. Radiated Spurious Emission

Test Engineer :	Michael Bui and Daniel Lee	Temperature :	20~24°C
		Relative Humidity :	42~48%

2.4GHz 2400~2483.5MHz

Zigbee (Band Edge @ 3m)

Zigbee	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	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		2329.005	56.21	-17.79	74	42.03	28.06	17.44	31.32	367	106	P	H
		2372.475	45.13	-8.87	54	31.1	27.8	17.52	31.29	367	106	A	H
	*	2405	110.33	-	-	96.41	27.61	17.58	31.27	367	106	P	H
	*	2405	108.91	-	-	94.99	27.61	17.58	31.27	367	106	A	H
													H
													H
		2372.475	57.89	-16.11	74	43.61	28.05	17.52	31.29	105	211	P	V
		2372.475	48.53	-5.47	54	34.25	28.05	17.52	31.29	105	211	A	V
	*	2405	116.95	-	-	102.69	27.95	17.58	31.27	105	211	P	V
	*	2405	115.38	-	-	101.12	27.95	17.58	31.27	105	211	A	V
													V
													V
Zigbee CH 17 2435MHz		2340.88	55.88	-18.12	74	41.73	28	17.46	31.31	360	114	P	H
		2310.16	44.48	-9.52	54	30.24	28.15	17.41	31.32	360	114	A	H
	*	2435	109.57	-	-	95.68	27.51	17.64	31.26	360	114	P	H
	*	2435	108.09	-	-	94.2	27.51	17.64	31.26	360	114	A	H
		2484.96	54.88	-19.12	74	40.89	27.48	17.75	31.24	360	114	P	H
		2499.36	44.28	-9.72	54	30.25	27.48	17.78	31.23	360	114	A	H
		2371.44	56.07	-17.93	74	41.79	28.05	17.52	31.29	100	195	P	V
		2370.96	47.45	-6.55	54	33.18	28.04	17.52	31.29	100	195	A	V
	*	2435	116.5	-	-	102.4	27.72	17.64	31.26	100	195	P	V
	*	2435	115.02	-	-	100.92	27.72	17.64	31.26	100	195	A	V
		2486.16	55.83	-18.17	74	41.8	27.52	17.75	31.24	100	195	P	V
		2499.04	46.25	-7.75	54	32.19	27.51	17.78	31.23	100	195	A	V

Zigbee	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (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 25 2475MHz	*	2475	109.4	-	-	95.44	27.47	17.73	31.24	392	111	P	H
	*	2475	107.89	-	-	93.93	27.47	17.73	31.24	392	111	A	H
		2494.72	55.25	-18.75	74	41.23	27.48	17.77	31.23	392	111	P	H
		2483.56	44.6	-9.4	54	30.61	27.48	17.75	31.24	392	111	A	H
													H
													H
	*	2475	117.97	-	-	103.95	27.53	17.73	31.24	100	198	P	V
	*	2475	116.48	-	-	102.46	27.53	17.73	31.24	100	198	A	V
		2484.24	57.99	-16.01	74	43.96	27.52	17.75	31.24	100	198	P	V
		2483.56	46.72	-7.28	54	32.69	27.52	17.75	31.24	100	198	A	V
													V
													V
Zigbee CH 26 2480MHz	*	2480	94.24	-	-	80.26	27.48	17.74	31.24	394	106	P	H
	*	2480	92.68	-	-	78.7	27.48	17.74	31.24	394	106	A	H
		2483.56	56.35	-17.65	74	42.36	27.48	17.75	31.24	394	106	P	H
		2483.52	47.38	-6.62	54	33.39	27.48	17.75	31.24	394	106	A	H
													H
													H
	*	2480	102.4	-	-	88.37	27.53	17.74	31.24	116	214	P	V
	*	2480	100.92	-	-	86.89	27.53	17.74	31.24	116	214	A	V
		2483.52	60.31	-13.69	74	46.28	27.52	17.75	31.24	116	214	P	V
		2483.52	53.21	-0.79	54	39.18	27.52	17.75	31.24	116	214	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)	Over Limit (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	52.92	-21.08	74	78.19	31.44	11.49	68.2	297	216	P	H
		4810	47.58	-6.42	54	72.85	31.44	11.49	68.2	297	216	A	H
		10815	50.87	-23.13	74	62.2	40.04	16.89	68.26	-	-	P	H
		10815	38.6	-15.4	54	49.93	40.04	16.89	68.26	-	-	A	H
		12025	49.71	-24.29	74	60.3	39.29	17.88	67.76	156	227	P	H
		12025	40.7	-13.3	54	51.29	39.29	17.88	67.76	156	227	A	H
		14490	51.09	-22.91	74	57.17	41.76	19.9	67.74	-	-	P	H
		14490	41.27	-12.73	54	47.35	41.76	19.9	67.74	-	-	A	H
		17955	60.08	-13.92	74	59.3	47.28	22.92	69.42	-	-	P	H
		17955	49.68	-4.32	54	48.9	47.28	22.92	69.42	-	-	A	H
													H
													H
		4810	51.04	-22.96	74	76.32	31.43	11.49	68.2	288	206	P	V
		4810	44.89	-9.11	54	70.17	31.43	11.49	68.2	288	206	A	V
		10875	49.7	-24.3	74	60.69	40.25	16.94	68.18	-	-	P	V
		10875	39.21	-14.79	54	50.2	40.25	16.94	68.18	-	-	A	V
		12025	57.06	-16.94	74	67.58	39.36	17.88	67.76	228	154	P	V
		12025	50.25	-3.75	54	60.77	39.36	17.88	67.76	228	154	A	V
		14490	51.52	-22.48	74	57.73	41.63	19.9	67.74	-	-	P	V
		14490	41.18	-12.82	54	47.39	41.63	19.9	67.74	-	-	A	V
		17940	61.24	-12.76	74	61.11	46.65	22.9	69.42	-	-	P	V
		17940	49.34	-4.66	54	49.21	46.65	22.9	69.42	-	-	A	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 emission is noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Zigbee	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (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)
		4870	47.23	-26.77	74	72.34	31.45	11.6	68.16	-	-	P	H
		7305	47.93	-26.07	74	64.54	36.4	13.81	66.82	-	-	P	H
		11340	50.09	-23.91	74	60.6	39.9	17.32	67.73	-	-	P	H
		11340	39.53	-14.47	54	50.04	39.9	17.32	67.73	-	-	A	H
		12175	52.12	-21.88	74	62.3	39.33	18.01	67.52	248	220	P	H
		12175	45.92	-8.08	54	56.1	39.33	18.01	67.52	248	220	A	H
		14490	50.96	-23.04	74	57.04	41.76	19.9	67.74	-	-	P	H
		14490	41.78	-12.22	54	47.86	41.76	19.9	67.74	-	-	A	H
		17985	61.08	-12.92	74	59.5	48.05	22.95	69.42	-	-	P	H
		17985	50.48	-3.52	54	48.9	48.05	22.95	69.42	-	-	A	H
													H
Zigbee CH 17 2435MHz													H
		4870	47.54	-26.46	74	72.57	31.53	11.6	68.16	-	-	P	V
		7305	45.97	-28.03	74	62.62	36.36	13.81	66.82	-	-	P	V
		11355	50.07	-23.93	74	60.49	39.96	17.33	67.71	-	-	P	V
		11355	39.52	-14.48	54	49.94	39.96	17.33	67.71	-	-	A	V
		12175	56.78	-17.22	74	66.8	39.49	18.01	67.52	226	154	P	V
		12175	50.58	-3.42	54	60.6	39.49	18.01	67.52	226	154	A	V
		14490	50.62	-23.38	74	56.83	41.63	19.9	67.74	-	-	P	V
		14490	41.58	-12.42	54	47.79	41.63	19.9	67.74	-	-	A	V
		17955	59.97	-14.03	74	59.5	46.97	22.92	69.42	-	-	P	V
		17955	49.17	-4.83	54	48.7	46.97	22.92	69.42	-	-	A	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 emission is noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Zigbee	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (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	47.03	-26.97	74	72.15	31.49	11.49	68.1	-	-	P	H
		7425	47.74	-26.26	74	64.13	36.57	13.88	66.84	-	-	P	H
		11370	49.93	-24.07	74	60.3	39.99	17.34	67.7	-	-	P	H
		11370	39.32	-14.68	54	49.69	39.99	17.34	67.7	-	-	A	H
		12375	53.61	-20.39	74	63.8	38.82	18.2	67.21	134	297	P	H
		12375	47.21	-6.79	54	57.4	38.82	18.2	67.21	134	297	A	H
		14490	50.74	-23.26	74	56.82	41.76	19.9	67.74	-	-	P	H
		14490	41.31	-12.69	54	47.39	41.76	19.9	67.74	-	-	A	H
		17985	60.08	-13.92	74	58.5	48.05	22.95	69.42	-	-	P	H
		17985	50.18	-3.82	54	48.6	48.05	22.95	69.42	-	-	A	H
													H
Zigbee CH 25 2475MHz													H
		4950	44.21	-29.79	74	69.39	31.43	11.49	68.1	-	-	P	V
		7425	47.38	-26.62	74	63.94	36.4	13.88	66.84	-	-	P	V
		11280	50.38	-23.62	74	60.99	39.9	17.27	67.78	-	-	P	V
		11280	39.24	-14.76	54	49.85	39.9	17.27	67.78	-	-	A	V
		12375	59.4	-14.6	74	69.44	38.97	18.2	67.21	225	154	P	V
		12375	53.22	-0.78	54	63.26	38.97	18.2	67.21	225	154	A	V
		14490	50.14	-23.86	74	56.35	41.63	19.9	67.74	-	-	P	V
		14490	41.77	-12.23	54	47.98	41.63	19.9	67.74	-	-	A	V
		18000	59.86	-14.14	74	58.3	48.01	22.97	69.42	-	-	P	V
		18000	49.66	-4.34	54	48.1	48.01	22.97	69.42	-	-	A	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 emission is noise floor only.
4. The emission level close to 18GHz is checked that the average emission level is noise floor only.

Zigbee	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (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	40.04	-33.96	74	65.14	31.54	11.46	68.1	-	-	P	H
		7440	44.53	-29.47	74	60.88	36.59	13.9	66.84	-	-	P	H
		11460	49.64	-24.36	74	59.7	40.15	17.41	67.62	-	-	P	H
		11460	39.8	-14.2	54	49.86	40.15	17.41	67.62	-	-	A	H
		14490	50.76	-23.24	74	56.84	41.76	19.9	67.74	-	-	P	H
		14490	41.38	-12.62	54	47.46	41.76	19.9	67.74	-	-	A	H
		17970	60.38	-13.62	74	59.2	47.66	22.94	69.42	-	-	P	H
		17970	49.98	-4.02	54	48.8	47.66	22.94	69.42	-	-	A	H
													H
													H
													H
													H
Zigbee CH 26 2480MHz		4960	39.33	-34.67	74	64.5	31.47	11.46	68.1	-	-	P	V
		7440	44.69	-29.31	74	61.21	36.42	13.9	66.84	-	-	P	V
		10845	50.48	-23.52	74	61.6	40.19	16.91	68.22	-	-	P	V
		10845	38.75	-15.25	54	49.87	40.19	16.91	68.22	-	-	A	V
		14490	50.84	-23.16	74	57.05	41.63	19.9	67.74	-	-	P	V
		14490	41.75	-12.25	54	47.96	41.63	19.9	67.74	-	-	A	V
		17940	59.44	-14.56	74	59.31	46.65	22.9	69.42	-	-	P	V
		17940	49.24	-4.76	54	49.11	46.65	22.9	69.42	-	-	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 and emission level has at least 6dB margin against limit 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	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	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		24519.5	45.4	-28.6	74	41.68	38.99	25.73	51.46	-	-	P	H
		26168.5	45.93	-28.07	74	40.72	39.44	27.06	51.75	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		24519.5	45.15	-28.85	74	41.34	39.08	25.73	51.46	-	-	P	V
		26024	46.43	-27.57	74	41.46	39.17	27.11	51.77	-	-	P	V
													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. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or noise floor only.

Emission below 1GHz

2.4GHz Zigbee (LF)

Zigbee	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	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		71.71	26.51	-13.49	40	44.86	12.57	1.51	32.43	-	-	P	H
		125.06	30.78	-12.72	43.5	43.64	17.7	1.84	32.4	-	-	P	H
		141.55	28.92	-14.58	43.5	41.93	17.4	1.99	32.4	-	-	P	H
		745.86	39.41	-6.59	46	39.32	27.92	4.57	32.4	-	-	P	H
		874.87	38.17	-7.83	46	35.82	29.1	5.03	31.78	-	-	P	H
		949.56	34.62	-11.38	46	29.87	30.69	5.26	31.2	-	-	P	H
													H
													H
													H
													H
													H
													H
		50.37	33.17	-6.83	40	50.27	14.11	1.23	32.44	-	-	P	V
		119.24	28.37	-15.13	43.5	41.41	17.6	1.77	32.41	-	-	P	V
		125.06	32.89	-10.61	43.5	45.75	17.7	1.84	32.4	-	-	P	V
		746.83	36.93	-9.07	46	36.81	27.94	4.57	32.39	-	-	P	V
		874.87	37.29	-8.71	46	34.94	29.1	5.03	31.78	-	-	P	V
		952.47	34.72	-11.28	46	29.88	30.75	5.27	31.18	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as “-” means no suspected emission found 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:

BLE	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
				Limit	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. Over Limit(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. Over Limit(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. Over Limit(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

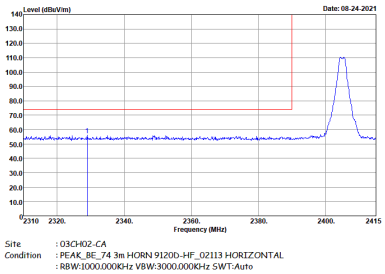
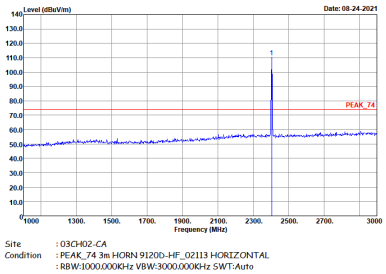
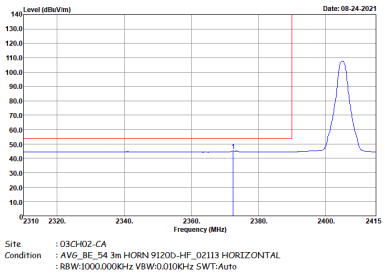
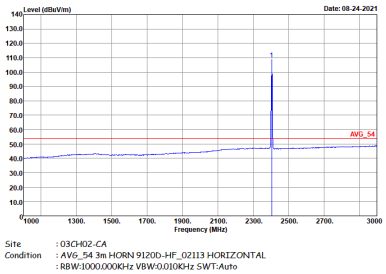
Test Engineer :	Michael Bui and Daniel Lee	**Temperature :**	20~24°C
		Relative Humidity :	42~48%

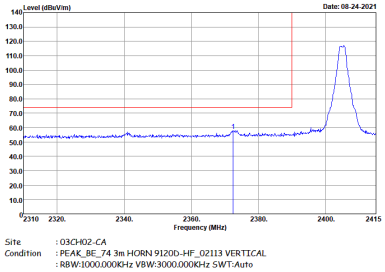
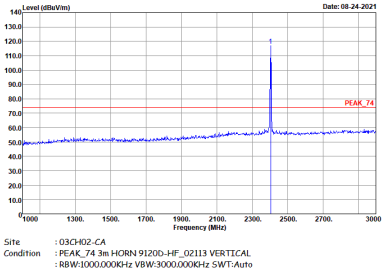
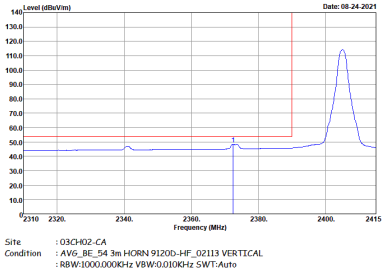
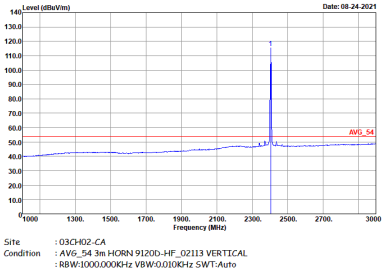
Note symbol

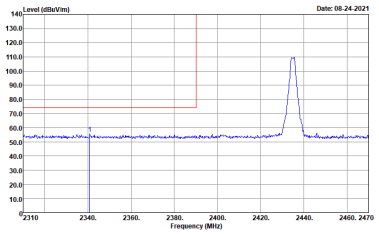
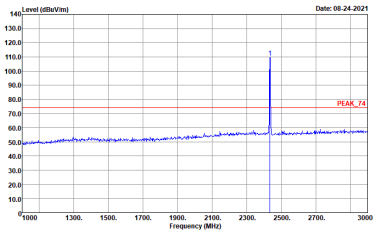
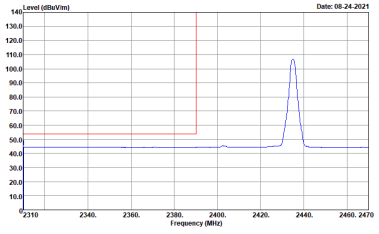
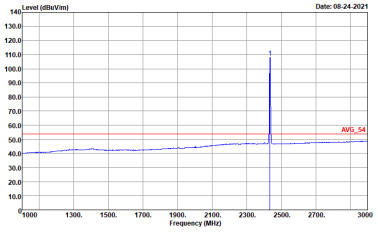
-L	**Low channel location**
-R	**High channel location**

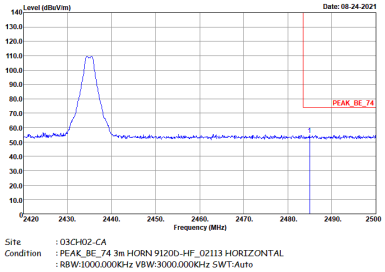
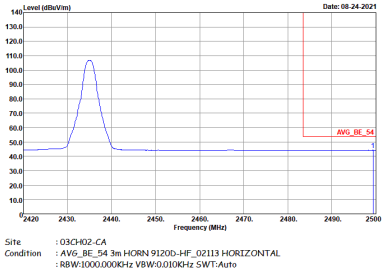
2.4GHz 2400~2483.5MHz

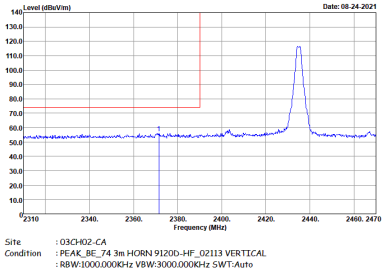
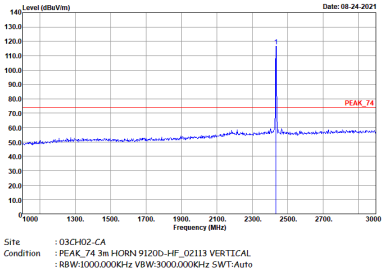
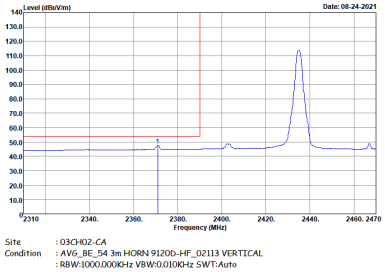
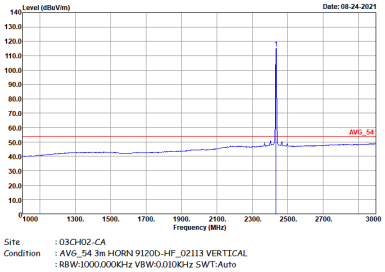
Zigbee (Band Edge @ 3m)

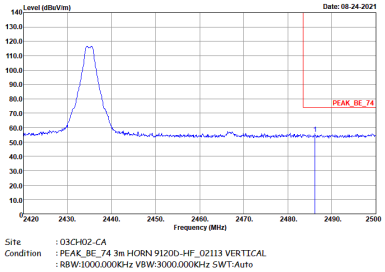
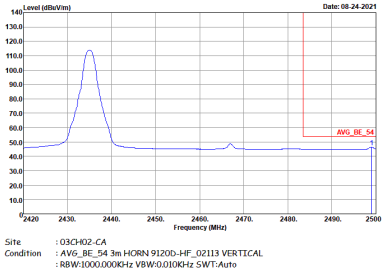
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH11 2405MHz	
	Horizontal	Fundamental
Peak		
Avg.		

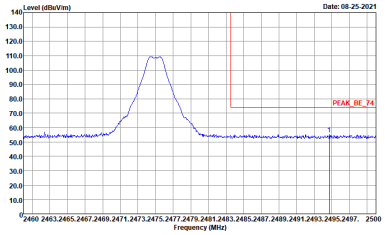
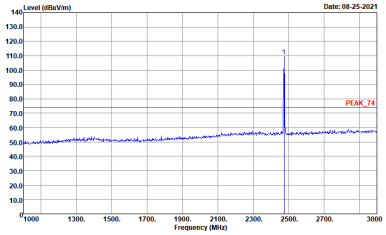
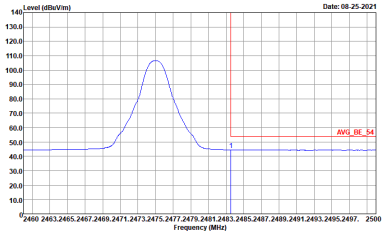
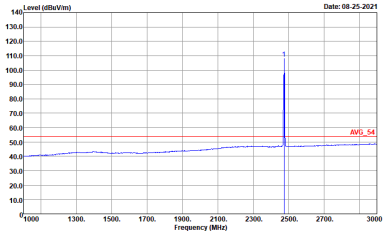
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH11 2405MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

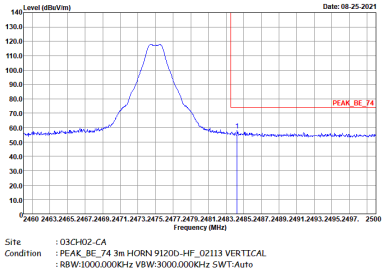
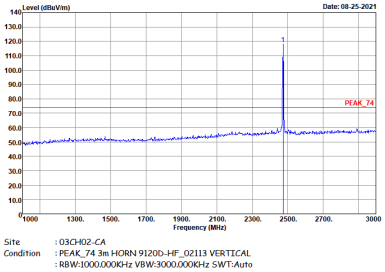
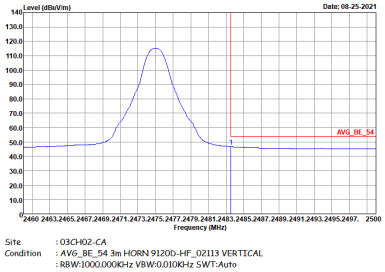
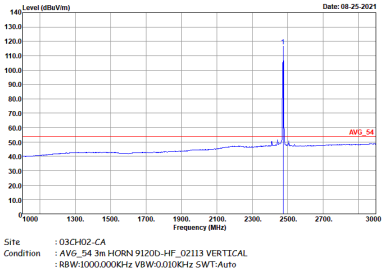
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH17 2435MHz - L	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

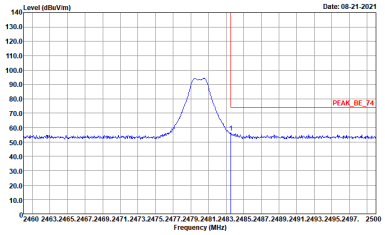
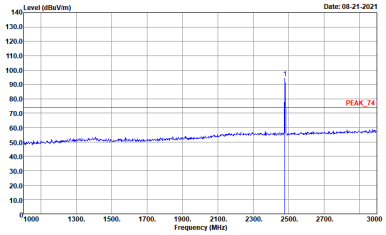
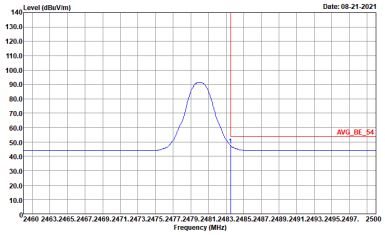
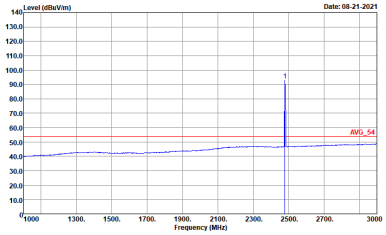
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH17 2435MHz - R	
	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

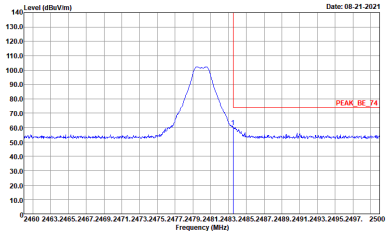
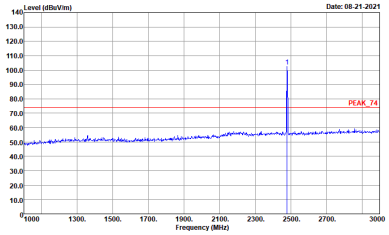
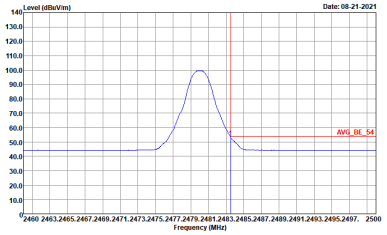
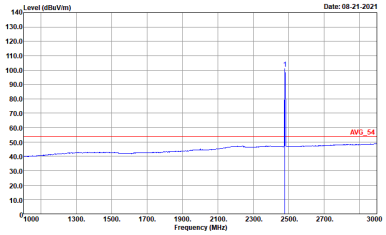
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH17 2435MHz - L	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 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 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

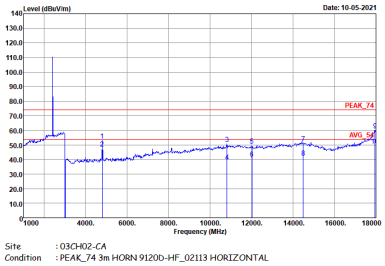
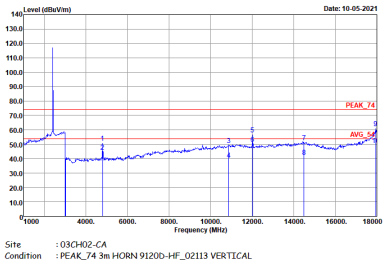
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH25 2475MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

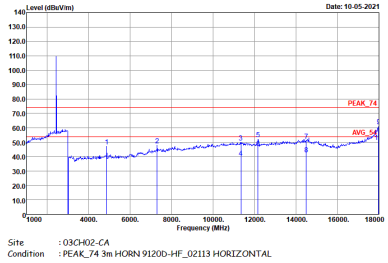
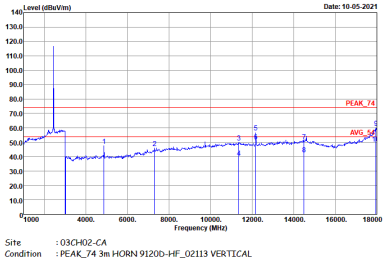
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH26 2480MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 HORIZONTAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

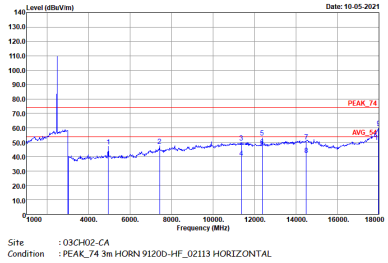
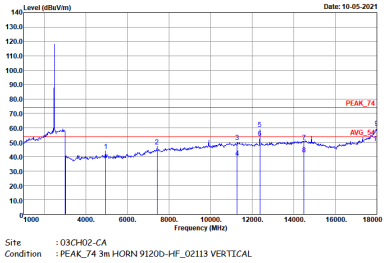
Zigbee	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	Zigbee CH26 2480MHz	
	Vertical	Fundamental
Peak	 Site : 03CH02-CA Condition : PEAK_BE_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH02-CA Condition : PEAK_74 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH02-CA Condition : AVG_BE_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto	 Site : 03CH02-CA Condition : AVG_54 3m HORN 9120D-HF_02113 VERTICAL : RBW:1000.000KHz VBW:0.010KHz SWT:Auto

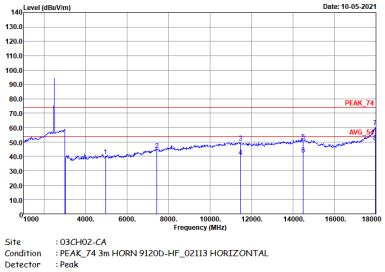
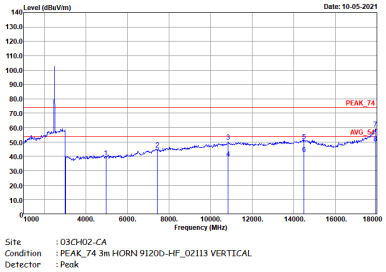
2.4GHz 2400~2483.5MHz

Zigbee (Harmonic @ 3m)

Zigbee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	Zigbee CH11 2405MHz	
	Horizontal	Vertical
Peak Avg.		

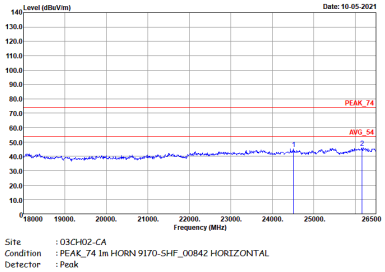
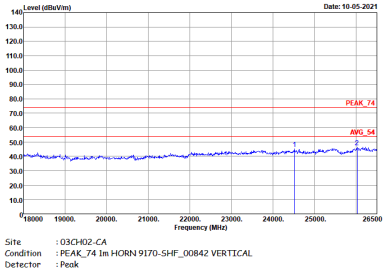
Zigbee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	Zigbee CH17 2435MHz	
	Horizontal	Vertical
Peak Avg.		

Zigbee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	Zigbee CH25 2475MHz	
	Horizontal	Vertical
Peak		

Zigbee	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	Zigbee CH26 2480MHz	
	Horizontal	Vertical
Peak		

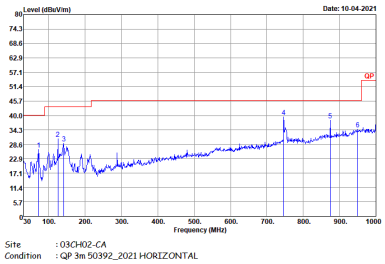
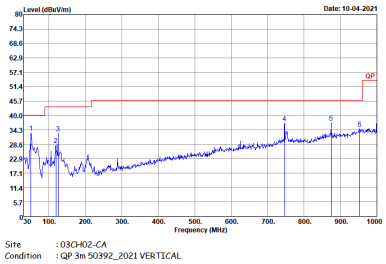
Emission above 18GHz

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