FCC RF Test Report

APPLICANT	:	Ningbo Lingzhu Technology CO., Ltd.
EQUIPMENT	:	Control Panel MAX
MODEL NAME	:	TPA10-M2U,TPA10-M2X
FCC ID	:	2A789-TPA10
STANDARD	:	47 CFR Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	May. 19, 2023 ~ Jun. 01, 2023

We, Sporton International Inc. (Kunshan), 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 Inc. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED
Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR350402D	Rev. 01	Initial issue of report	Aug. 18, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report only	-
3.2	15.247(b)(3)	Output Power	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 2.16 dB at 2483.50 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 6.82 dB at 0.297 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	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. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”

Disclaimer:

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

1 General Description

1.1 Applicant

Ningbo Lingzhu Technology CO., Ltd.
No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC

1.2 Manufacturer

Ningbo Lingzhu Technology CO., Ltd.
No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Control Panel MAX
Model Name	TPA10-M2U,TPA10-M2X
FCC ID	2A789-TPA10
SN	RSE: FWAED13ZJ0007D Conducted: ZNVEC28KL00004 Conduction: ZNVEC28KL00017
HW Version	V1.0
SW Version	V2.X.X

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. The two model name are only for different markets purpose, no other difference.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification	
Tx/Rx Frequency Range	2405 MHz ~ 2480 MHz
Number of Channels	16
Carrier Frequency of Each Channel	2405 MHz, 2410MHz, … 2475MHz , 2480MHz
Maximum Output Power to Antenna	18.32 dBm (0.0679 W)
99% Occupied Bandwidth	2.248 MHz
Antenna Type / Gain	IPEX Antenna type with gain 2.65 dBi
Type of Modulation	O-QPSK

1.5 Modification of EUT

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

1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	CO01-KS 03CH08-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH08-KS	AUDIX	E3	6.2009-8-24al
2.	CO01-KS	AUDIX	E3	6.2009-8-24

1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Descriptions of Test Mode

The RF output power was recorded in the following table:

Frequency Band	Channel	Freq.(MHz)
2405-2480 MHz	11	2405
	18	2440
	25	2475
	26	2480

2.2 Test Mode

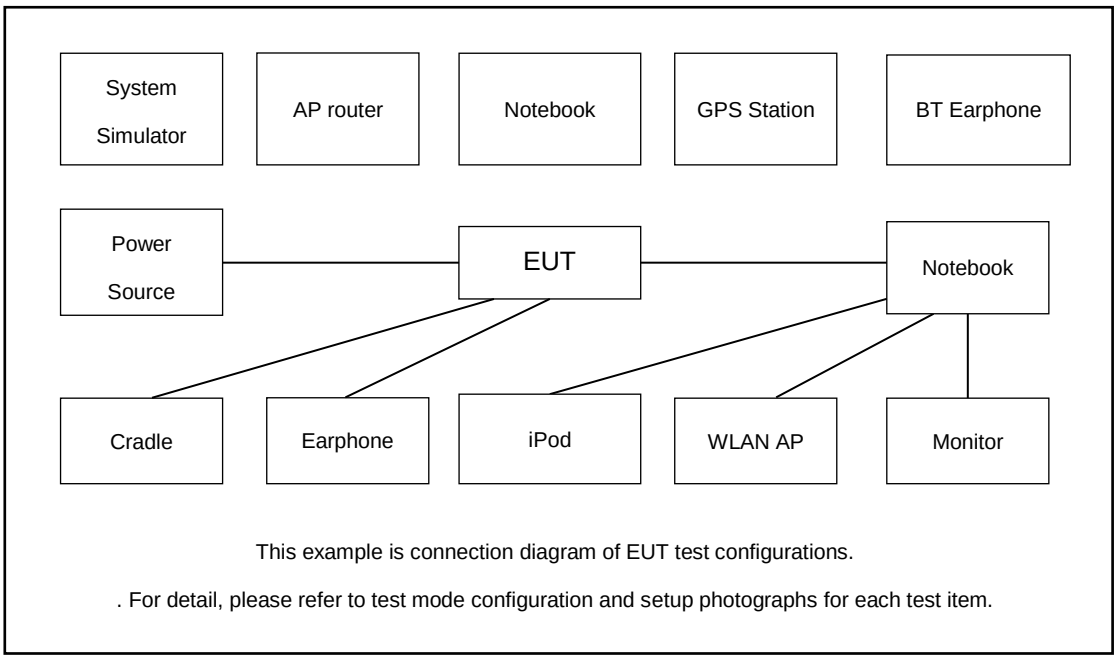
a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Y plane as worst plane) from all possible combinations.

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**
	250kbps / Zigbee
Conducted TCs	Mode 1: Zigbee Tx CH11_2405 MHz Mode 2: Zigbee Tx CH18_2440 MHz Mode 3: Zigbee Tx CH25_2475 MHz Mode 4: Zigbee Tx CH26_2480 MHz
Radiated TCs	Mode 1: Zigbee Tx CH11_2405 MHz Mode 2: Zigbee Tx CH18_2440 MHz Mode 3: Zigbee Tx CH25_2475 MHz Mode 4: Zigbee Tx CH26_2480 MHz Mode 5: Bluetooth-LE 1M_CH00 + Zigbee_CH26 + WLAN 11n HT40_CH09 (Co-location)
AC Conducted Emission	Mode 1: Bluetooth Link + WLAN Link(2.4G) + AC 120V/60Hz + Notebook(RJ45 Link) + Lamp bulb(L1) + Lamp bulb(L2)

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
2.	Notebook	Lenovo	V130-15IKB005	N/A	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
3.	Bluetooth Earphone	Lenovo	LBH308	N/A	N/A	N/A
4.	Lamp bulb	NA	N/A	N/A	N/A	N/A
5.	Lamp bulb	NA	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For Zigbee function, the engineering test program was provided and enabled to make EUT continuous transmit.

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 5.60 dB

Offset(dB) = RF cable loss(dB)

= 5.60(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.

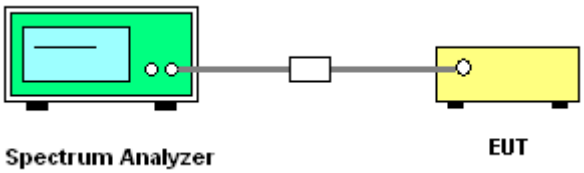
3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 11.8
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 to the maximum power setting and enable the EUT 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 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 30kHz and set the Video bandwidth (VBW) = 100kHz.
6. Measure and record the results in the test report.

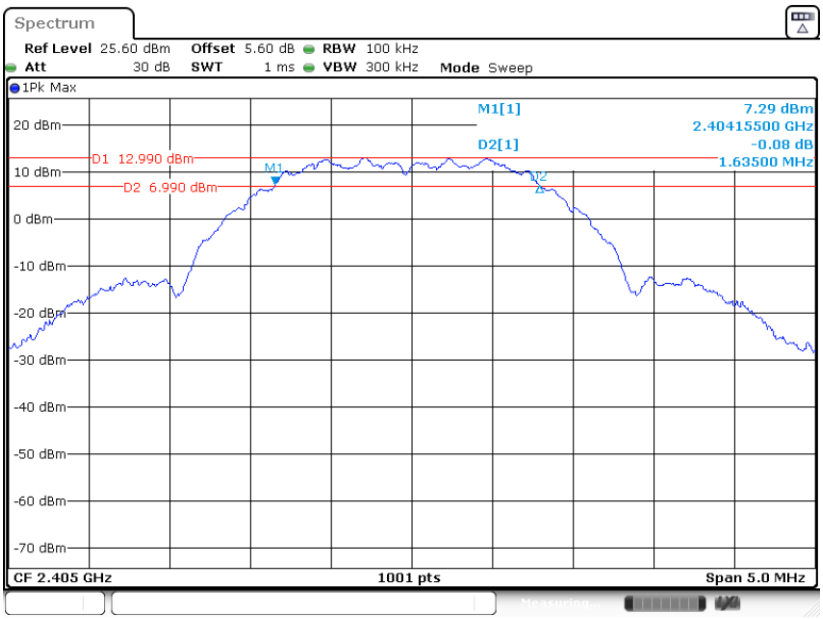
3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

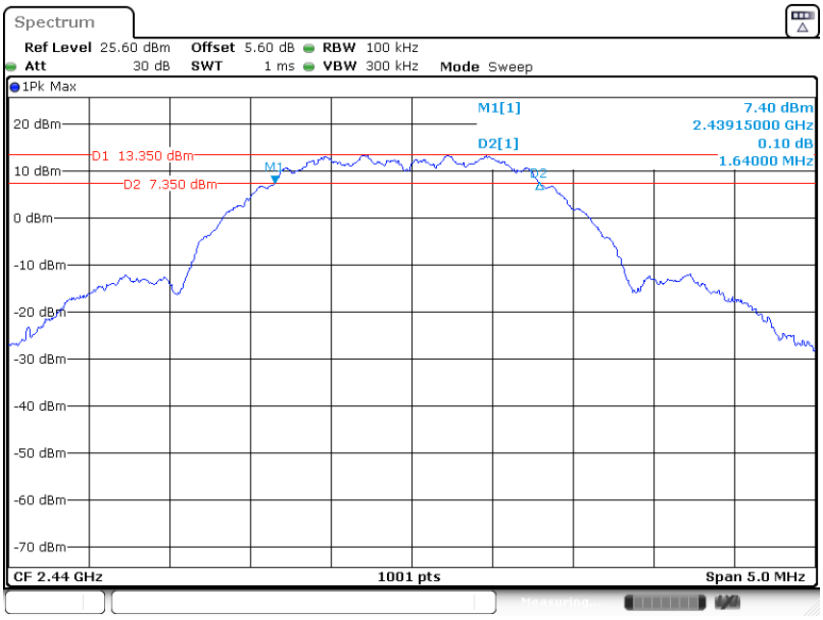
Please refer to Appendix A.

6 dB Bandwidth Plot on Channel 11



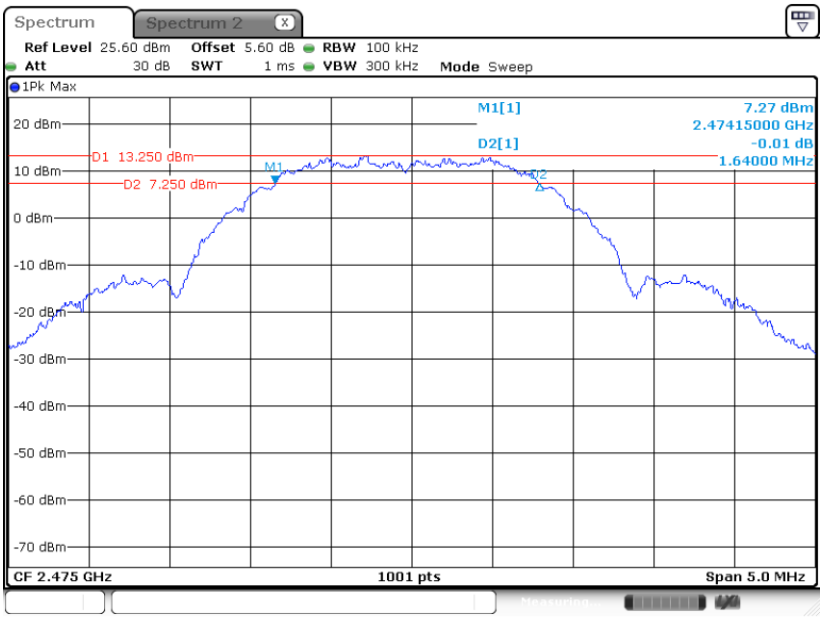
Date: 30.MAY.2023 22:46:33

6 dB Bandwidth Plot on Channel 18



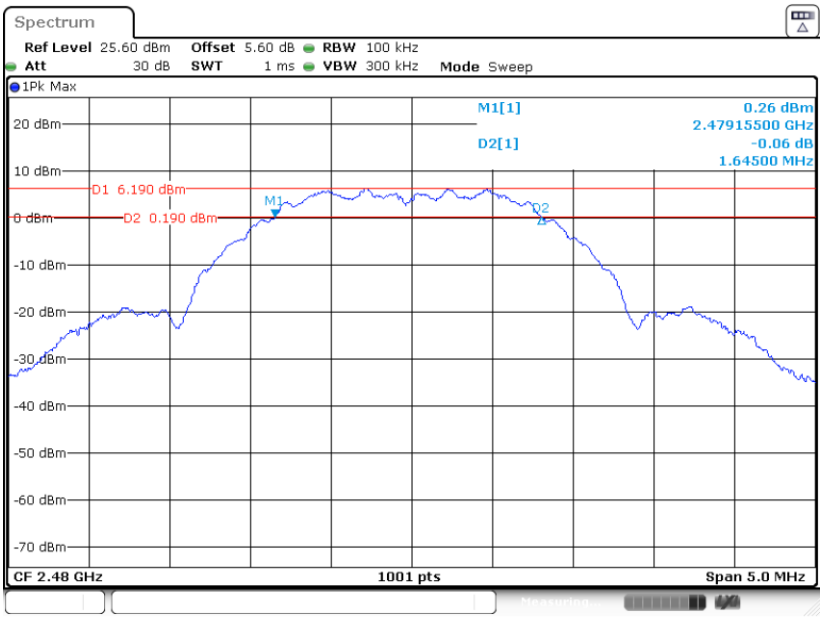
Date: 30.MAY.2023 22:53:09

6 dB Bandwidth Plot on Channel 25



Date: 2.JUN.2023 20:05:00

6 dB Bandwidth Plot on Channel 26

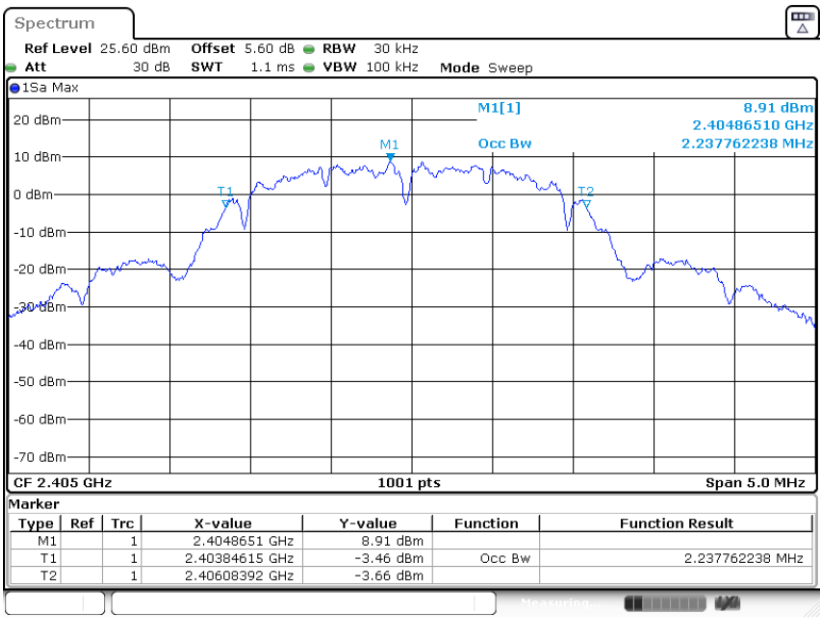


Date: 30.MAY.2023 23:11:41

3.1.6 Test Result of 99% Occupied Bandwidth

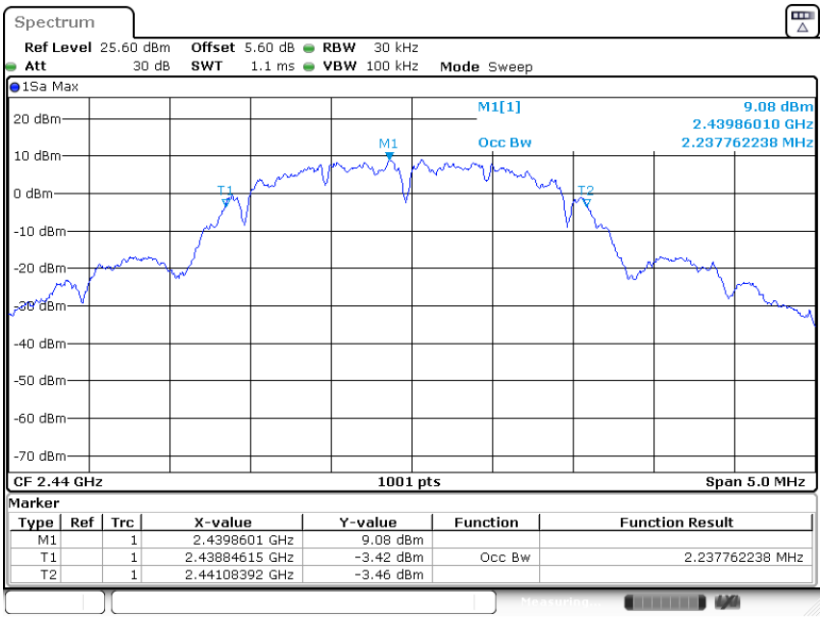
Please refer to Appendix A.

99% Bandwidth Plot on Channel 11



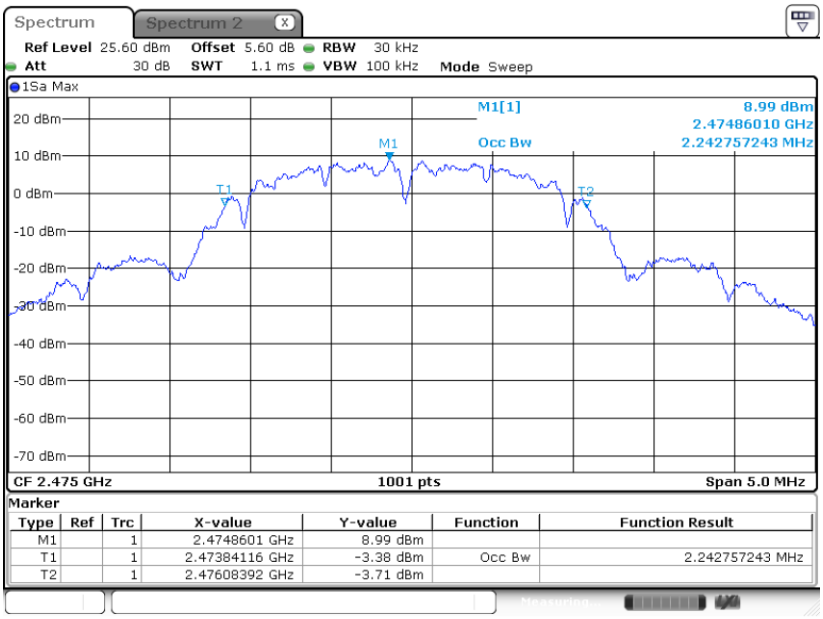
Date: 30.MAY.2023 22:48:20

99% Occupied Bandwidth Plot on Channel 18



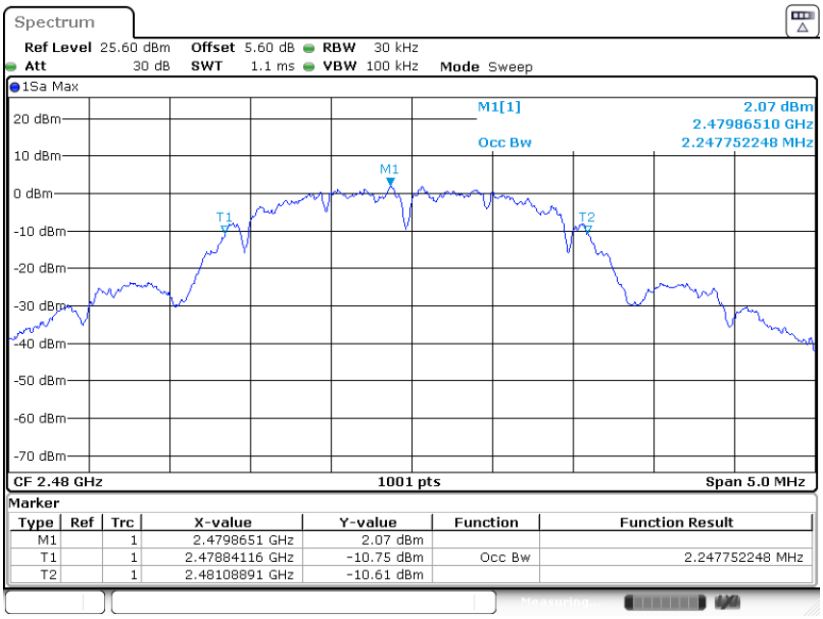
Date: 30.MAY.2023 22:54:37

99% Occupied Bandwidth Plot on Channel 25



Date: 2.JUN.2023 20:07:50

99% Occupied Bandwidth Plot on Channel 26



Date: 30.MAY.2023 23:13:27

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

3.2 Output Power Measurement

3.2.1 Limit of Peak Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi 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 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

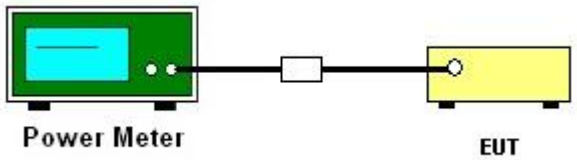
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

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 8dBm in any 3kHz band at any time interval of continuous transmission.

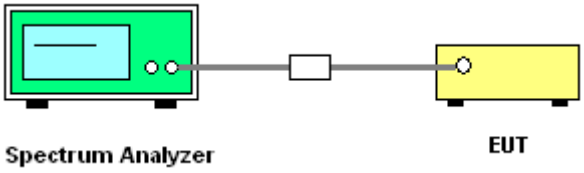
3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2013 clause 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 to the maximum power setting and enable the EUT 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)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup

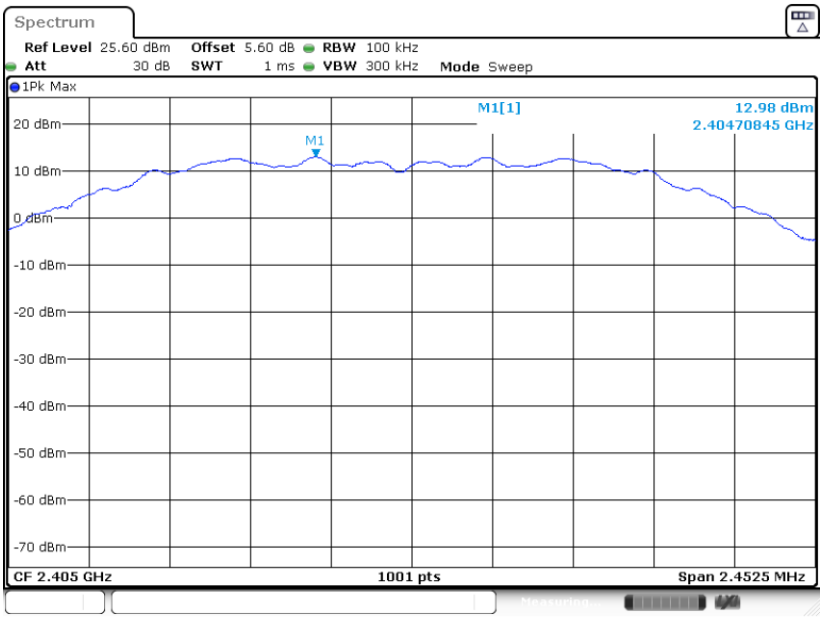


3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

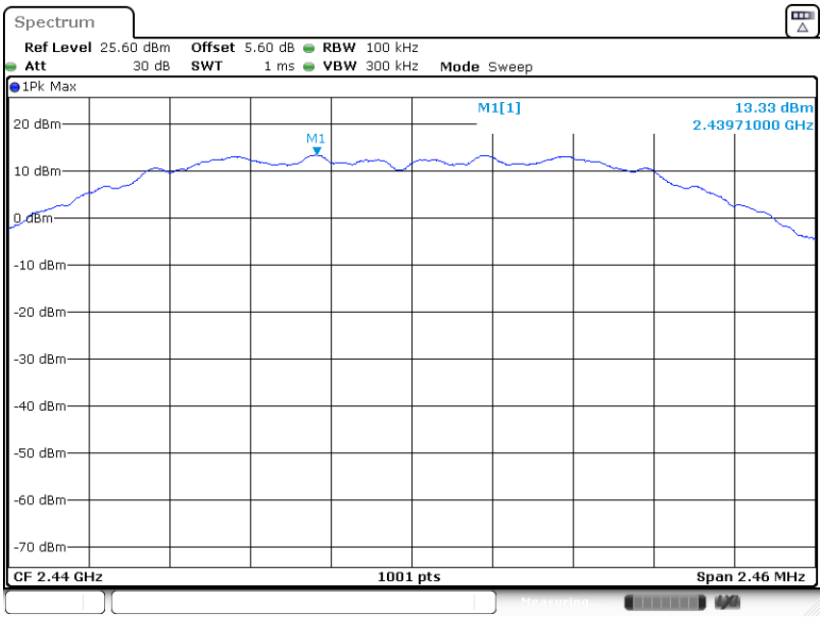
3.3.6 Test Result of Power Spectral Density Plots (100kHz)

PSD 100kHz Plot on Channel 11



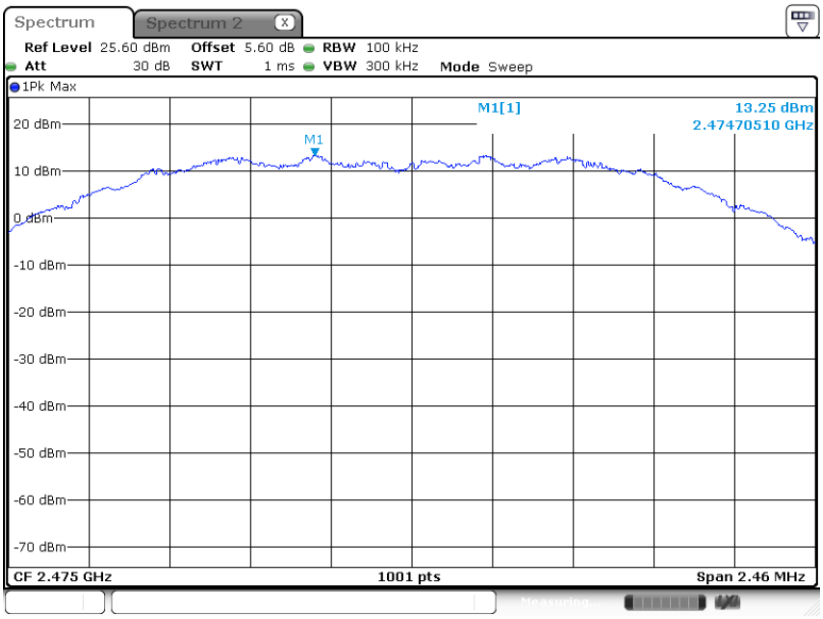
Date: 30.MAY.2023 22:47:11

PSD 100kHz Plot on Channel 18



Date: 30.MAY.2023 22:53:47

PSD 100kHz Plot on Channel 25



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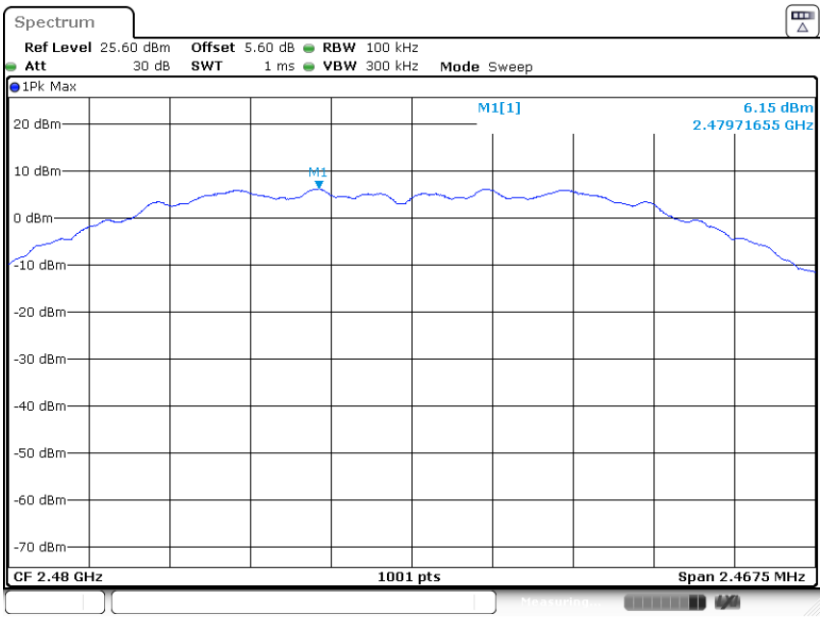
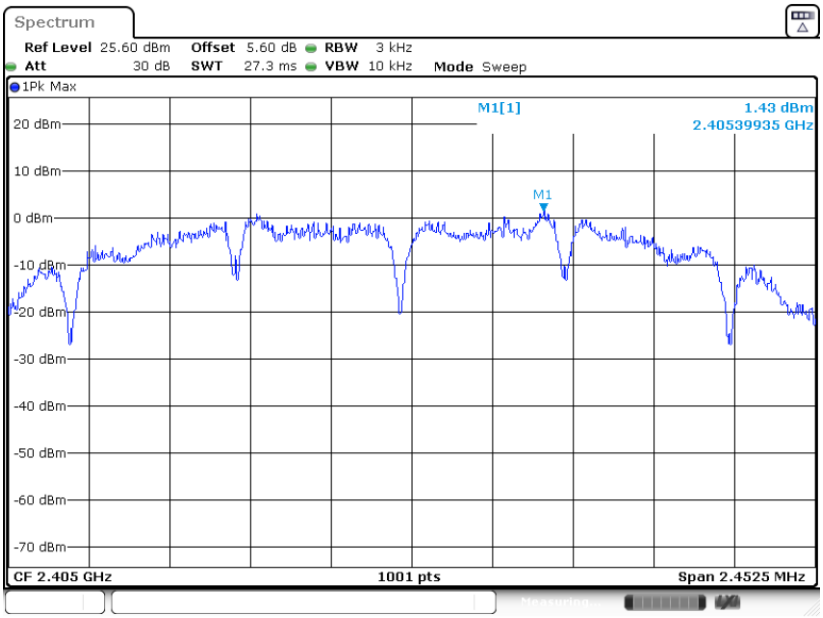
PSD 100kHz Plot on Channel 26



Date: 30.MAY.2023 23:12:18

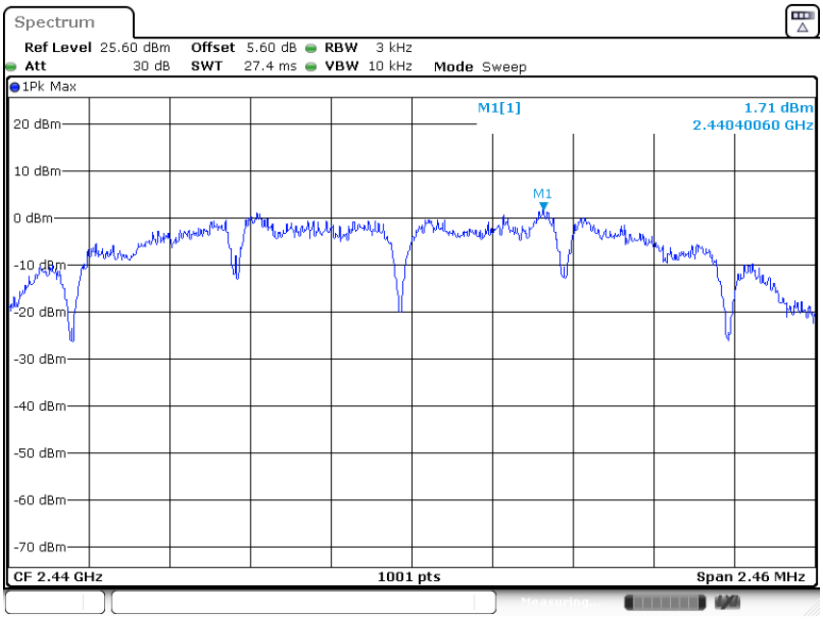
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

PSD 3kHz Plot on Channel 11



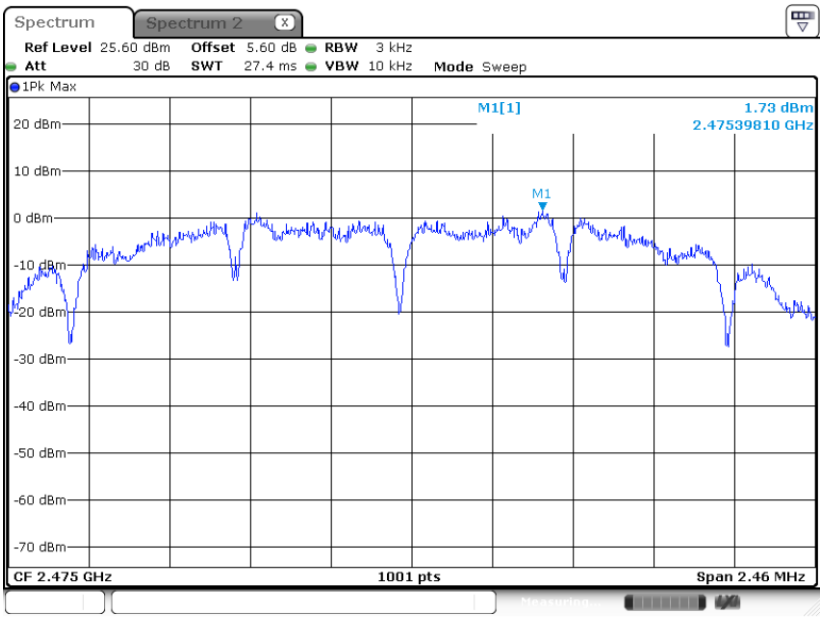
Date: 30.MAY.2023 22:46:52

PSD 3kHz Plot on Channel 18



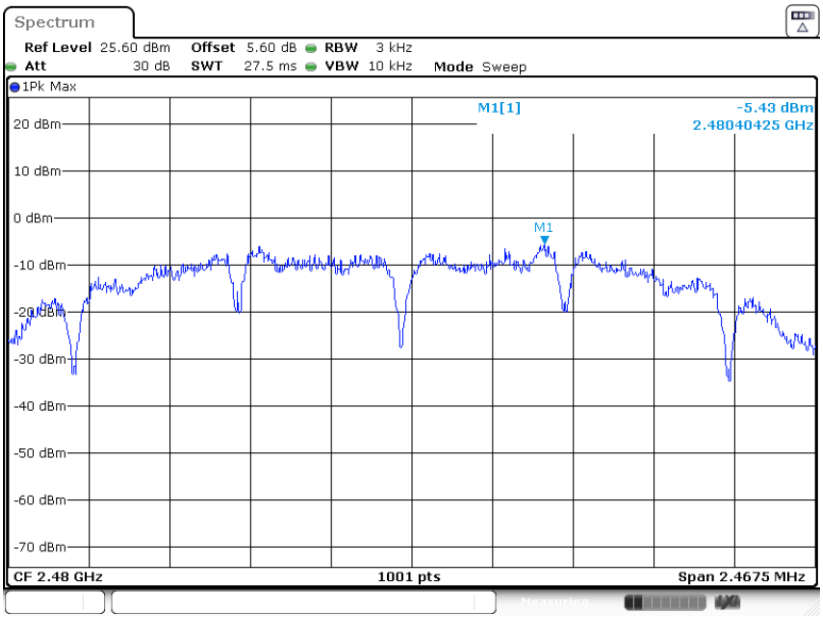
Date: 30.MAY.2023 22:53:28

PSD 3kHz Plot on Channel 25



Date: 2.JUN.2023 20:06:23

PSD 3kHz Plot on Channel 26



Date: 30.MAY.2023 23:12:00

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.

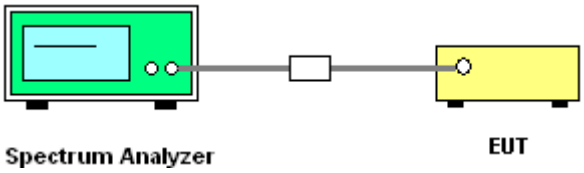
3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedure

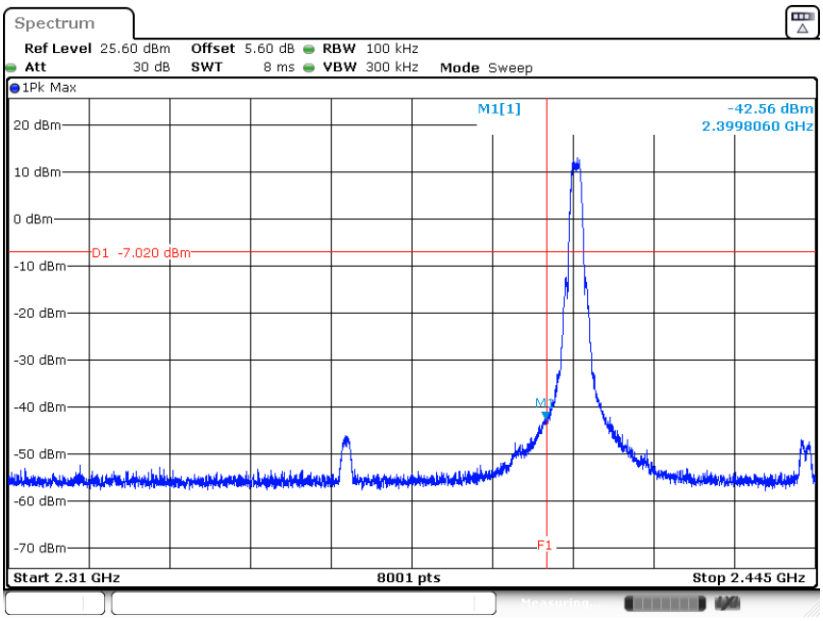
1. The testing follows ANSI C63.10-2013 clause 11.13
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 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



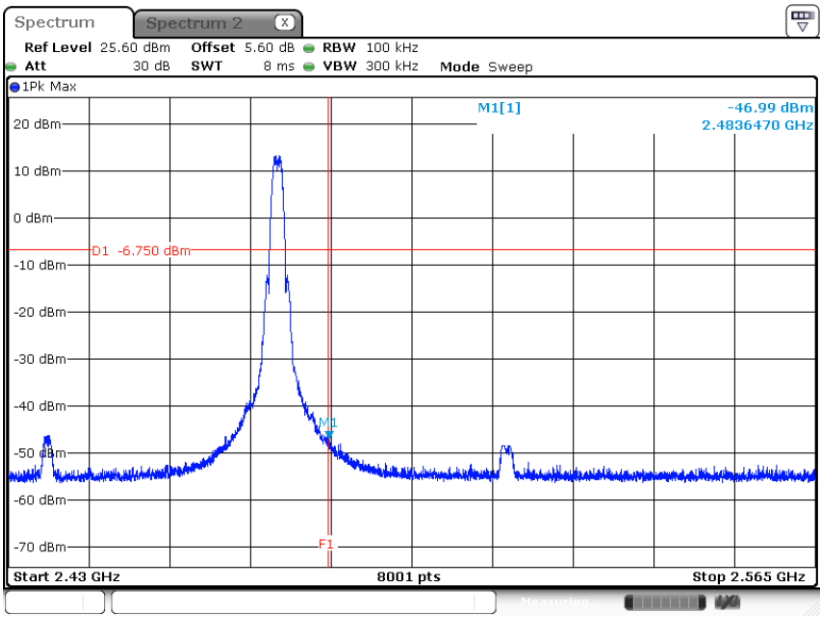
3.4.5 Test Result of Conducted Band Edges Plots

Low Band Edge Plot on Channel 11



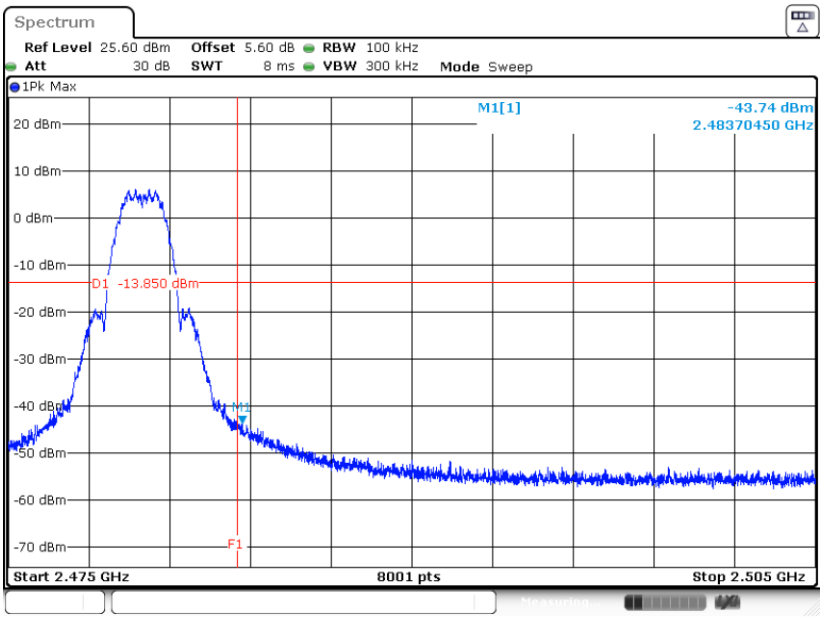
Date: 30.MAY.2023 22:47:30

High Band Edge Plot on Channel 25



Date: 2.JUN.2023 20:19:14

High Band Edge Plot on Channel 26

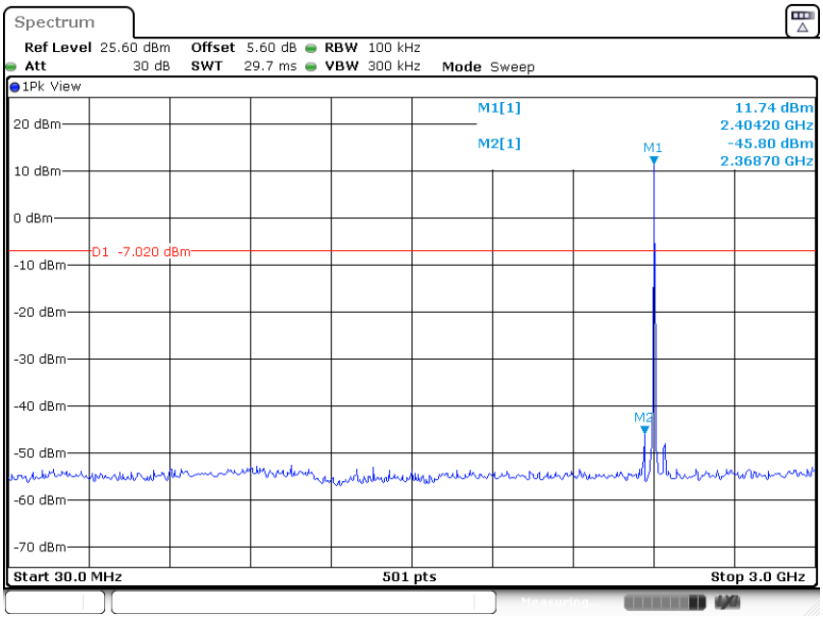


Date: 30.MAY.2023 23:12:37

3.4.6 Test Result of Conducted Spurious Emission Plots

Conducted Spurious Emission Plot on

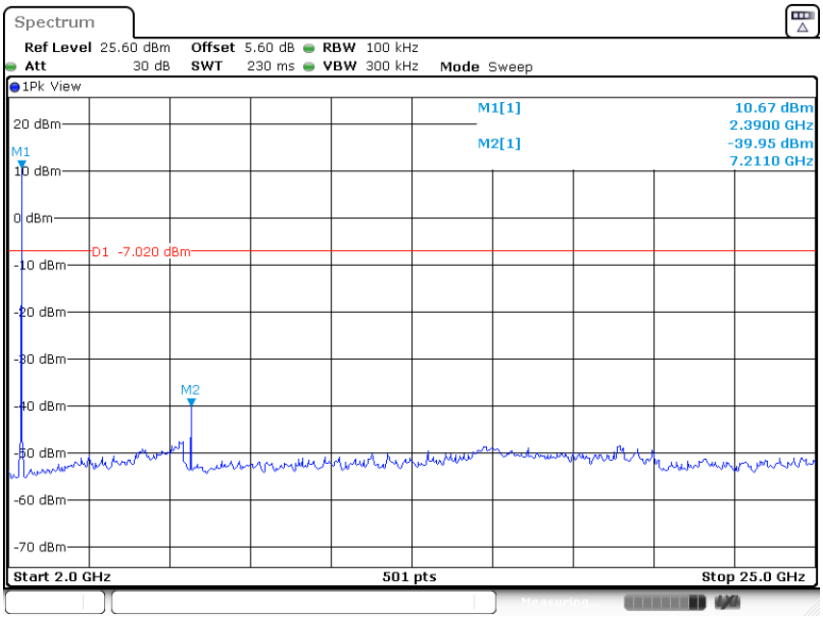
Zigbee Channel 11



Date: 30.MAY.2023 22:47:51

Conducted Spurious Emission Plot on

Zigbee Channel 11



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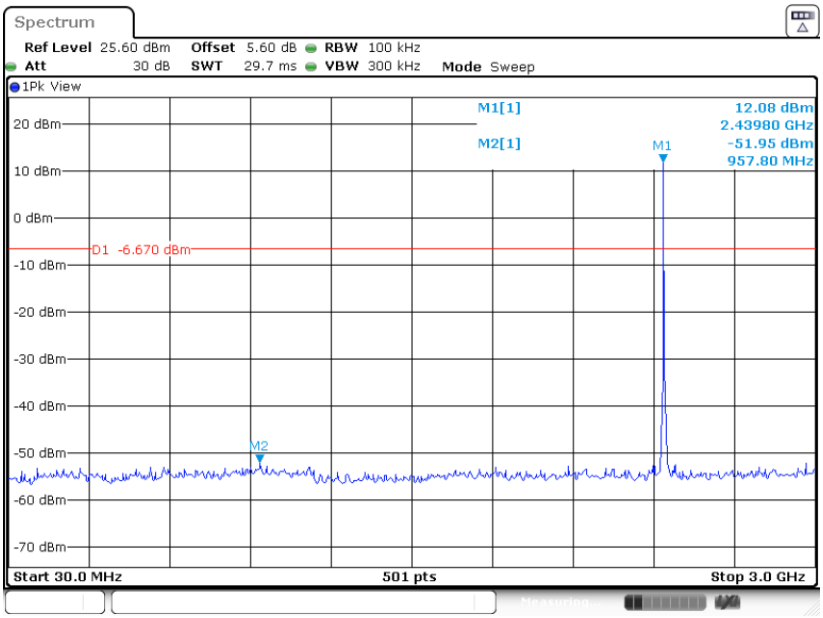
Conducted Spurious Emission Plot on

Zigbee Channel 18



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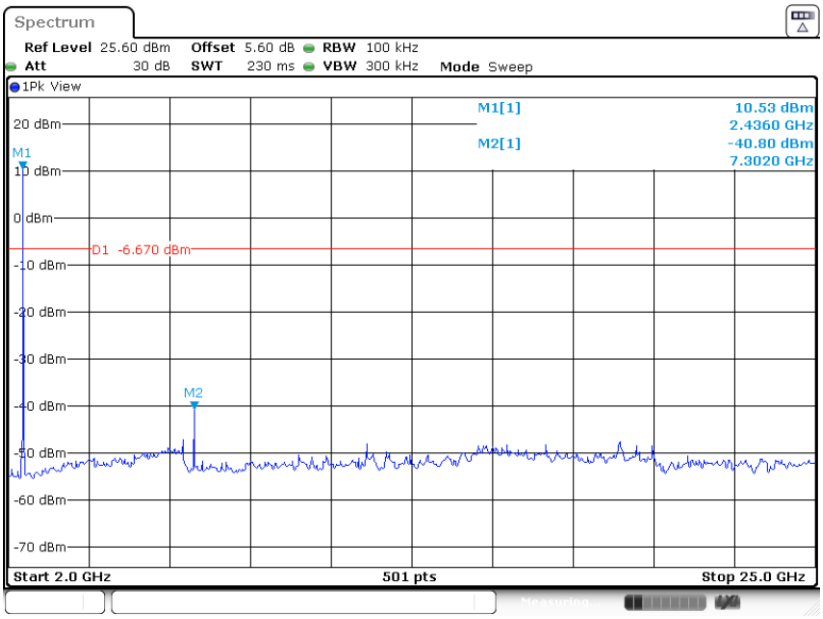
Conducted Spurious Emission Plot on

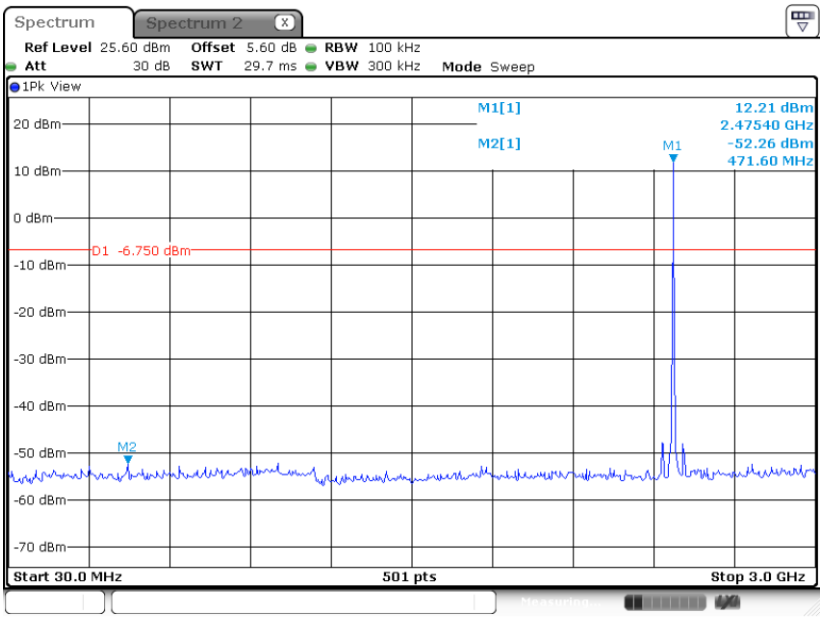
Zigbee Channel 18



Date: 30.MAY.2023 23:09:42

Conducted Spurious Emission Plot on

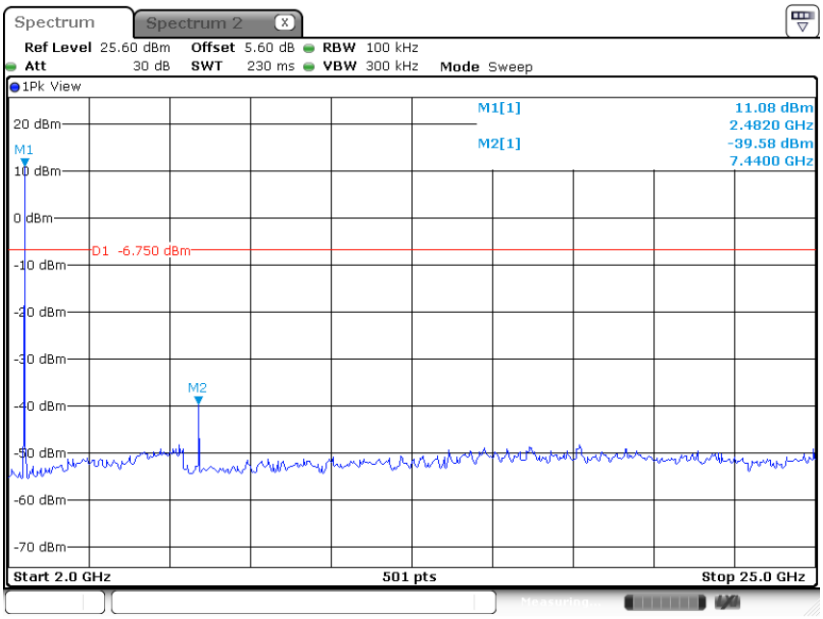
Zigbee Channel 25



Date: 2.JUN.2023 20:07:25

Conducted Spurious Emission Plot on

Zigbee Channel 25



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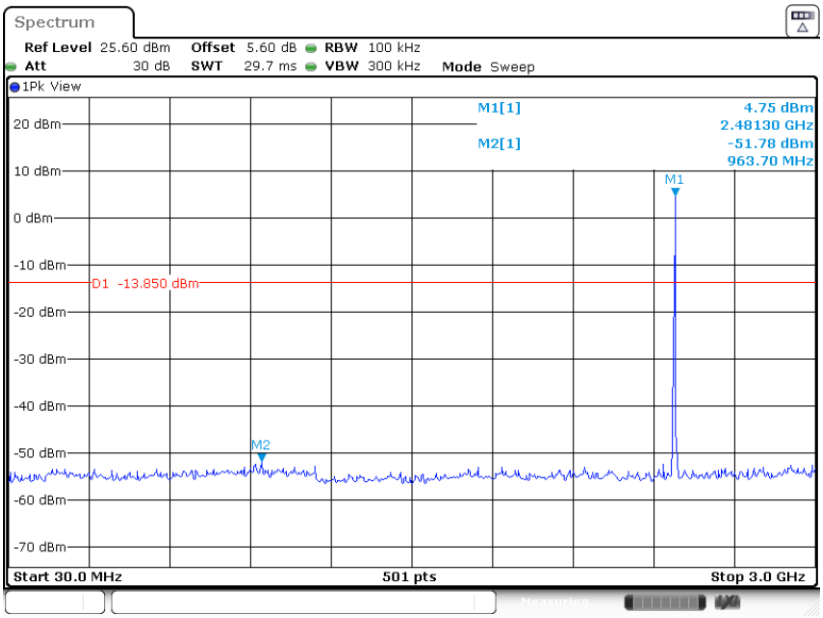
Conducted Spurious Emission Plot on

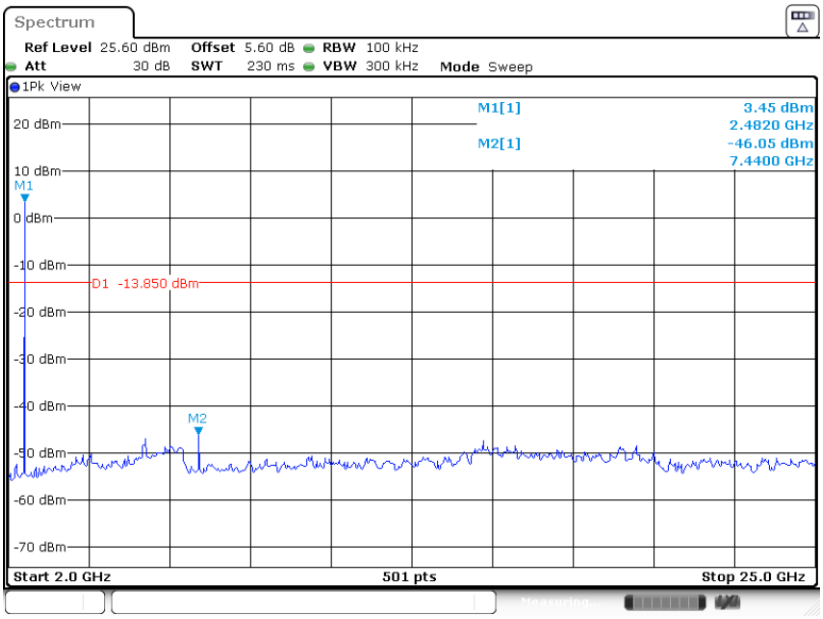
Zigbee Channel 26



Date: 30.MAY.2023 23:12:58

Conducted Spurious Emission Plot on

Zigbee Channel 26



Date: 30.MAY.2023 23:13:18

3.5 Spurious Emission Measurement in the Restricted Band

3.5.1 Limit of Spurious Emission Measurement in the Restricted Band

Emissions which fall in the restricted bands must also comply with the limits as below.

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

3.5.2 Measuring Instruments

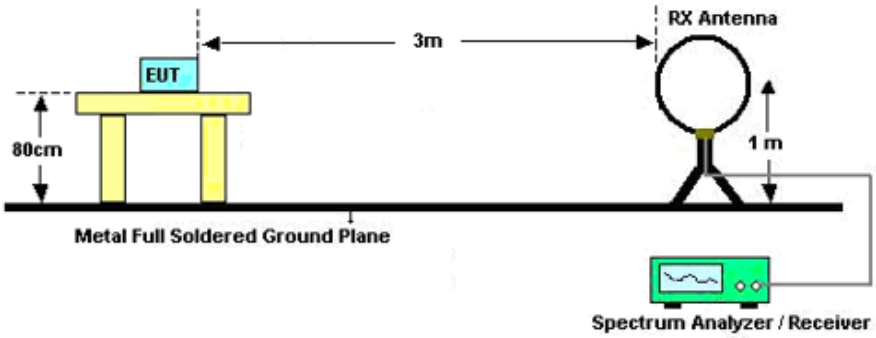
The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.5.3 Test Procedures

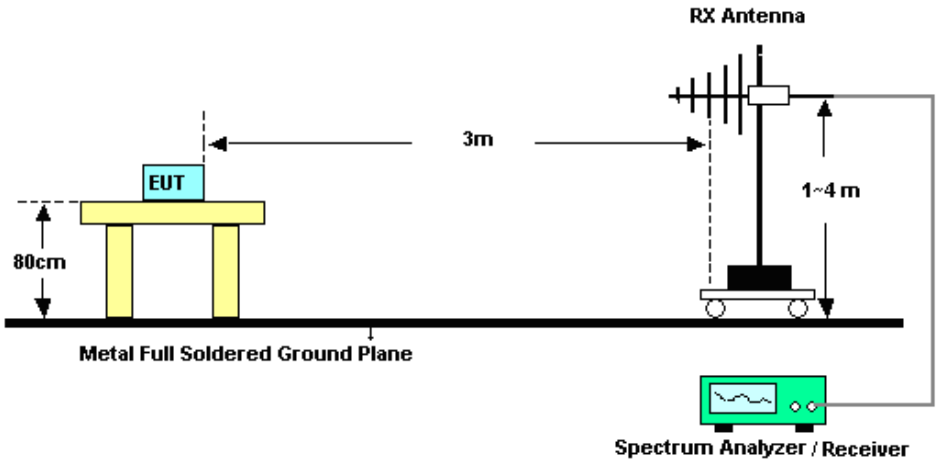
1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving 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. For conducted spurious emission measurement in the restricted band, 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.
7. For measurement below 1GHz, if the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
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= 3MHz 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 maximumpower control level for the tested mode of operation.

3.5.4 Test Setup

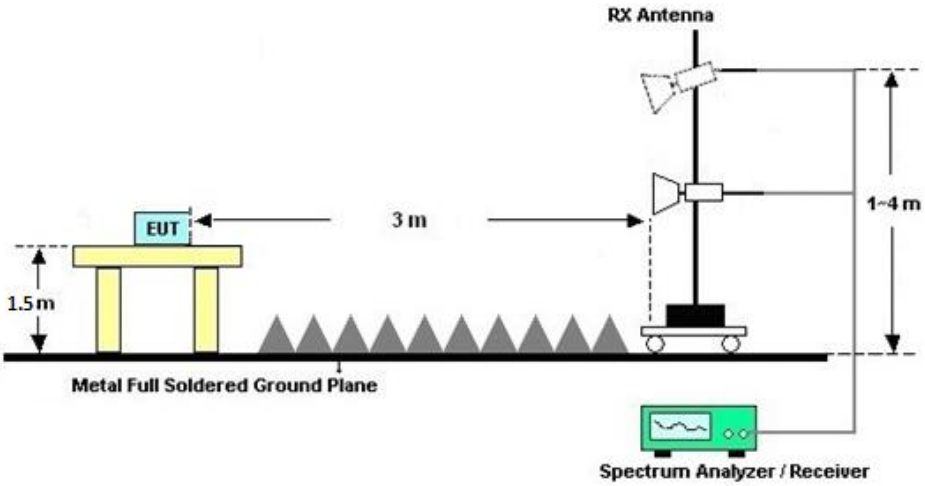
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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.

3.5.6 Test Results of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.5.7 Test Result of Cabinet Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C

3.5.8 Duty Cycle

Please refer to Appendix 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.

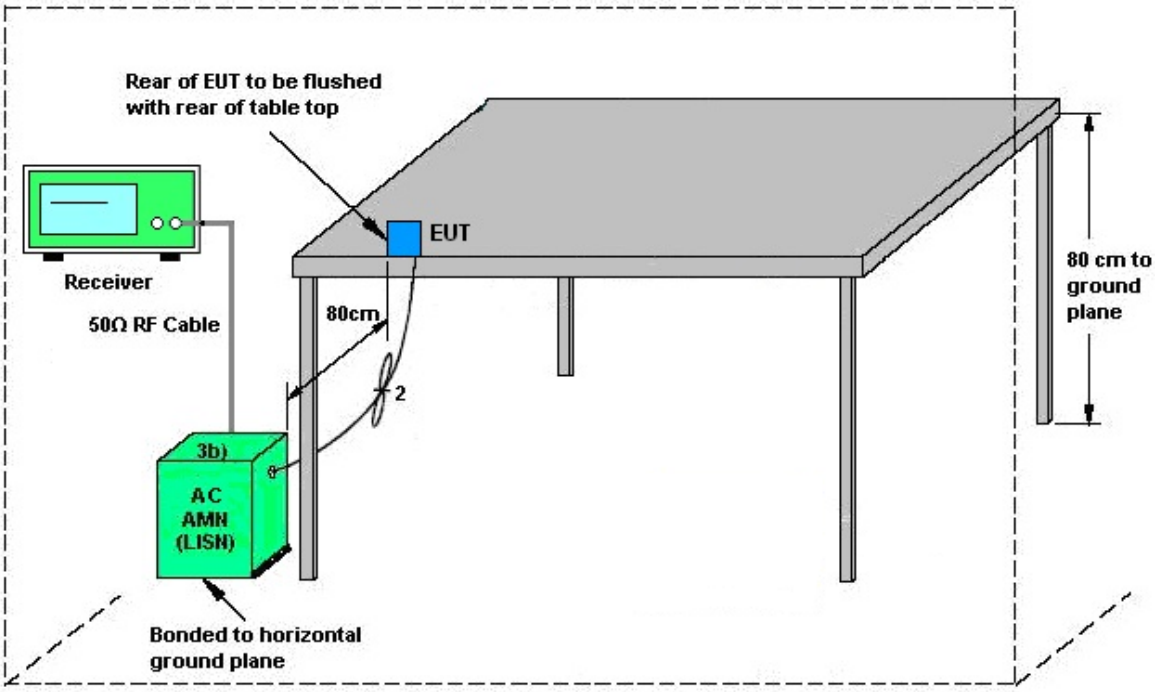
3.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

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 should 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 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. 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	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	May 30, 2023 ~May 31, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 05, 2023	May 30, 2023 ~May 31, 2023	Jan. 04, 2024	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2023	May 30, 2023 ~May 31, 2023	Jan. 04, 2024	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jul. 11, 2022	May 19, 2023 ~Jun. 01, 2023	Jul. 10, 2023	Radiation (03CH08-KS)
Spectrum Analyzer	R&S	FSV40	101932	10kHz~40GHz; Max 30dBm	Oct. 12, 2022	May 19, 2023 ~Jun. 01, 2023	Oct. 11, 2023	Radiation (03CH08-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	May 19, 2023 ~Jun. 01, 2023	Oct. 15, 2023	Radiation (03CH08-KS)
Bilog Antenna	TESEQ& VGT	CBL 61110	59915	30MHz-1GHz	Aug. 26, 2022	May 19, 2023 ~Jun. 01, 2023	Aug. 25, 2023	Radiation (03CH08-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00240138	1GHz~18GHz	Jul. 08, 2022	May 19, 2023 ~Jun. 01, 2023	Jul. 07, 2023	Radiation (03CH08-KS)
SHF-EHF Horn	Com-power	AH-840	101070	18GHz~40GHz	Jan. 08, 2023	May 19, 2023 ~Jun. 01, 2023	Jan. 07, 2024	Radiation (03CH08-KS)
Amplifier	SONOMA	310N	413741	9KHz-1GHz	Jan. 05, 2023	May 19, 2023 ~Jun. 01, 2023	Jan. 04, 2024	Radiation (03CH08-KS)
Amplifier	EM	EM01G18GA	060834	1Ghz-18Ghz	Oct. 12, 2022	May 19, 2023 ~Jun. 01, 2023	Oct. 11, 2023	Radiation (03CH08-KS)
high gain Amplifier	EM	EM01G18GA	060845	1Ghz-18Ghz	Jan. 05, 2023	May 19, 2023 ~Jun. 01, 2023	Jan. 04, 2024	Radiation (03CH08-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2023	May 19, 2023 ~Jun. 01, 2023	Jan. 04, 2024	Radiation (03CH08-KS)
AC Power Source	Chroma	61601	616010002473	N/A	NCR	May 19, 2023 ~Jun. 01, 2023	NCR	Radiation (03CH08-KS)
Turn Table	EM	EM 1000-T	N/A	0~360 degree	NCR	May 19, 2023 ~Jun. 01, 2023	NCR	Radiation (03CH08-KS)
Antenna Mast	EM	EM 1000-A	N/A	1 m~4 m	NCR	May 19, 2023 ~Jun. 01, 2023	NCR	Radiation (03CH08-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 16, 2023	May 30, 2023 ~May 31, 2023	May 15, 2024	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	May 30, 2023 ~May 31, 2023	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 16, 2023	May 30, 2023 ~May 31, 2023	May 15, 2024	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	May 30, 2023 ~May 31, 2023	Oct. 11, 2023	Conduction (CO01-KS)

NCR: No Calibration Required.

5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±0.56 dB
Conducted Emissions	±0.92 dB
Occupied Channel Bandwidth	±0.03 %
Conducted Power Spectral Density	±0.54 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.94dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	6.28dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.90dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.26dB

---------- THE END ----------

Appendix A. Conducted Test Results

Report Number : FR350402D

Bluetooth Low Energy

Test Engineer:	Gene Wang	Temperature:	20~26	°C
Test Date:	2023.5.30~2023.6.1	Relative Humidity:	40~51	%

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	250Kbps	1	11	2405	2.238	1.64	0.50	Pass
Zigbee	250Kbps	1	18	2440	2.238	1.64	0.50	Pass
Zigbee	250Kbps	1	25	2475	2.243	1.64	0.50	Pass
Zigbee	250Kbps	1	26	2480	2.248	1.65	0.50	Pass

TEST RESULTS DATA
Peak Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
Zigbee	250Kbps	1	11	2405	17.77	30.00	2.65	20.42	36.00	Pass
Zigbee	250Kbps	1	18	2440	18.32	30.00	2.65	20.97	36.00	Pass
Zigbee	250Kbps	1	25	2475	18.05	30.00	2.65	20.70	36.00	Pass
Zigbee	250Kbps	1	26	2480	10.51	30.00	2.65	13.16	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
Zigbee	250Kbps	1	11	2405	0.00	17.75
Zigbee	250Kbps	1	18	2440	0.00	18.28
Zigbee	250Kbps	1	25	2475	0.00	17.92
Zigbee	250Kbps	1	26	2480	0.00	10.46

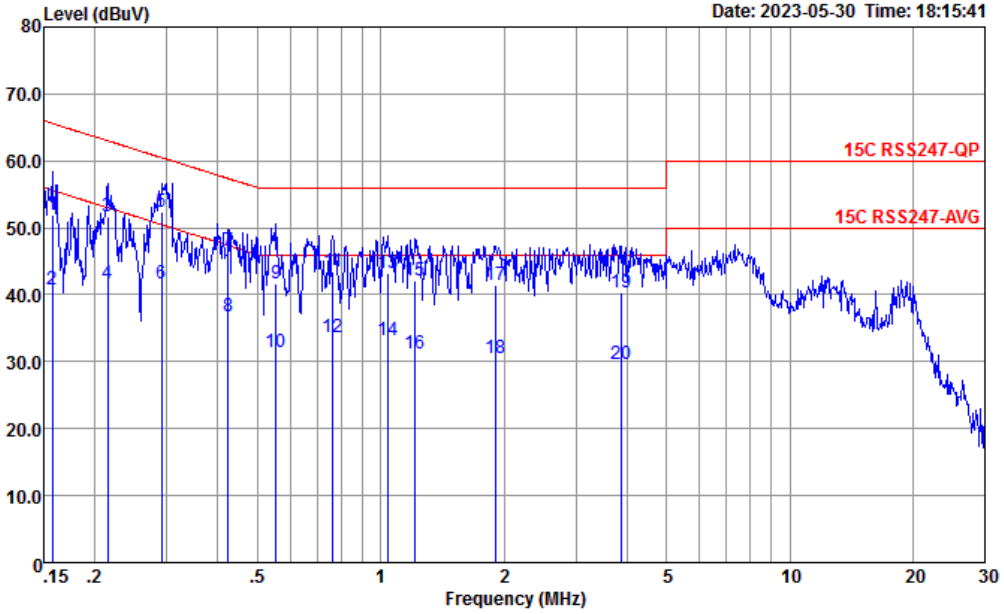
TEST RESULTS DATA
Peak Power Density

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	250Kbps	1	11	2405	12.98	1.43	2.65	8.00	Pass
Zigbee	250Kbps	1	18	2440	13.33	1.71	2.65	8.00	Pass
Zigbee	250Kbps	1	25	2475	13.25	1.73	2.65	8.00	Pass
Zigbee	250Kbps	1	26	2480	6.15	-5.43	2.65	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.

Appendix B. AC Conducted Emission Test Results

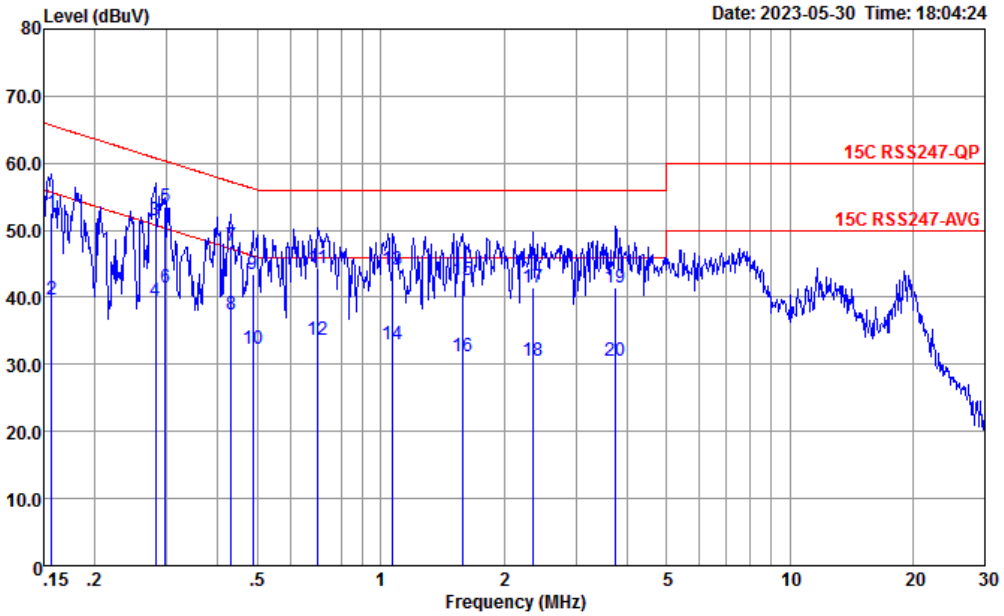
Test Engineer :	Amos Zhang	**Temperature :**	24.2~25.6℃
		Relative Humidity :	37~39%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-LINE LINE

		Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1		0.157	51.99	-13.61	65.60	41.50	0.06	10.43	QP
2		0.157	40.69	-14.91	55.60	30.20	0.06	10.43	Average
3		0.215	51.63	-11.38	63.01	41.19	0.03	10.41	QP
4		0.215	41.63	-11.38	53.01	31.19	0.03	10.41	Average
5	*	0.291	52.31	-8.19	60.50	41.90	0.06	10.35	QP
6		0.291	41.61	-8.89	50.50	31.20	0.06	10.35	Average
7		0.424	46.48	-10.89	57.37	36.20	0.00	10.28	QP
8		0.424	36.88	-10.49	47.37	26.60	0.00	10.28	Average
9		0.555	41.65	-14.35	56.00	31.51	-0.05	10.19	QP
10		0.555	31.35	-14.65	46.00	21.21	-0.05	10.19	Average
11		0.763	43.55	-12.45	56.00	33.49	-0.09	10.15	QP
12		0.763	33.65	-12.35	46.00	23.59	-0.09	10.15	Average
13		1.043	43.30	-12.70	56.00	33.29	-0.10	10.11	QP
14		1.043	33.30	-12.70	46.00	23.29	-0.10	10.11	Average
15		1.216	42.19	-13.81	56.00	32.21	-0.11	10.09	QP
16		1.216	31.29	-14.71	46.00	21.31	-0.11	10.09	Average
17		1.908	41.44	-14.56	56.00	31.50	-0.12	10.06	QP
18		1.908	30.54	-15.46	46.00	20.60	-0.12	10.06	Average
19		3.881	40.44	-15.56	56.00	30.50	-0.12	10.06	QP
20		3.881	29.54	-16.46	46.00	19.60	-0.12	10.06	Average

Test Engineer :	Amos Zhang	**Temperature :**	24.2~25.6℃
		Relative Humidity :	37~39%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-NEUTRAL NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.156	52.66	-12.99	65.65	42.20	0.03	10.43	QP
2	0.156	39.76	-15.89	55.65	29.30	0.03	10.43	Average
3	0.282	51.52	-9.24	60.76	41.20	-0.04	10.36	QP
4	0.282	39.52	-11.24	50.76	29.20	-0.04	10.36	Average
5 *	0.297	53.50	-6.82	60.32	43.20	-0.05	10.35	QP
6	0.297	41.50	-8.82	50.32	31.20	-0.05	10.35	Average
7	0.431	47.80	-9.44	57.24	37.60	-0.07	10.27	QP
8	0.431	37.40	-9.84	47.24	27.20	-0.07	10.27	Average
9	0.486	43.44	-12.79	56.23	33.30	-0.08	10.22	QP
10	0.486	32.24	-13.99	46.23	22.10	-0.08	10.22	Average
11	0.701	44.27	-11.73	56.00	34.20	-0.09	10.16	QP
12	0.701	33.67	-12.33	46.00	23.60	-0.09	10.16	Average
13	1.071	44.19	-11.81	56.00	34.20	-0.11	10.10	QP
14	1.071	32.89	-13.11	46.00	22.90	-0.11	10.10	Average
15	1.585	42.56	-13.44	56.00	32.60	-0.12	10.08	QP
16	1.585	31.16	-14.84	46.00	21.20	-0.12	10.08	Average
17	2.358	41.44	-14.56	56.00	31.50	-0.12	10.06	QP
18	2.358	30.54	-15.46	46.00	20.60	-0.12	10.06	Average
19	3.759	41.44	-14.56	56.00	31.50	-0.12	10.06	QP
20	3.759	30.54	-15.46	46.00	20.60	-0.12	10.06	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

Appendix C. Radiated Spurious Emission Test Data

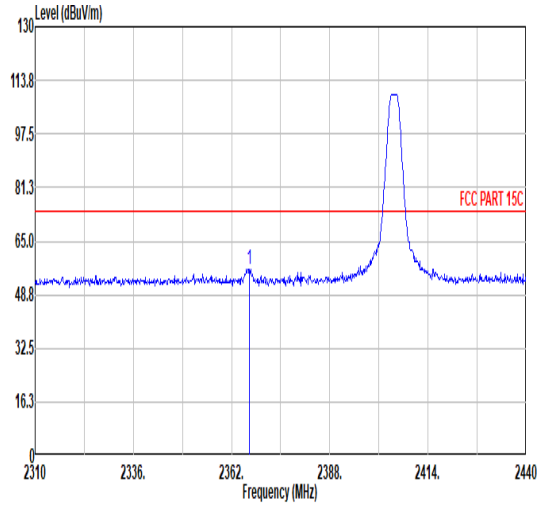
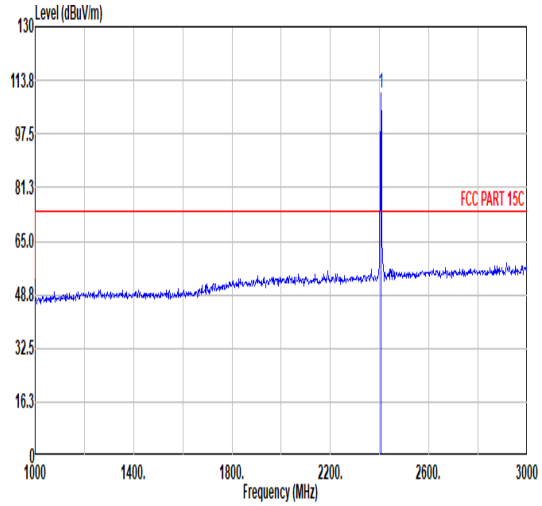
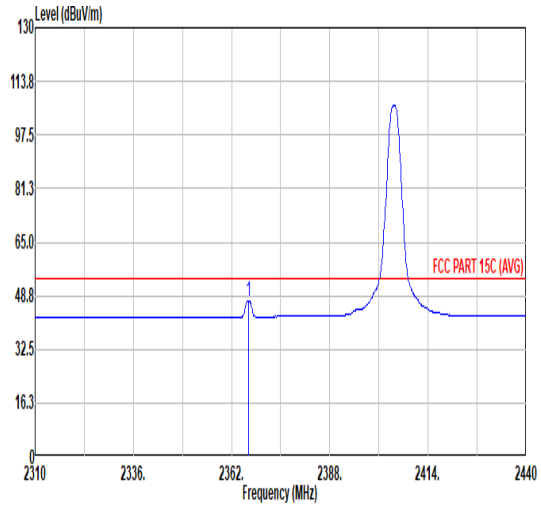
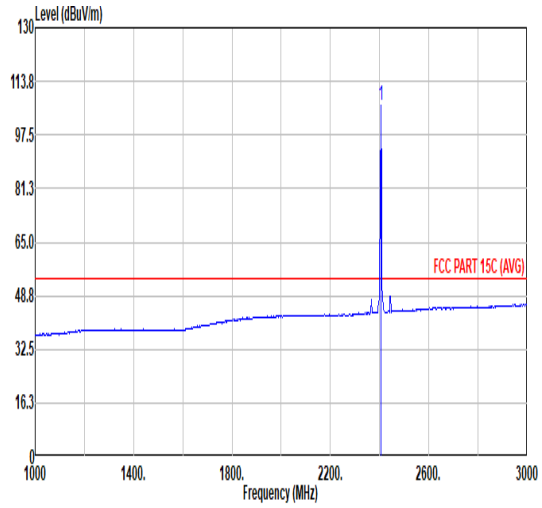
Test Engineer :	Koi Ji	Relative Humidity :	41 ~ 42 ％
		Temperature :	22 ~ 23 ℃

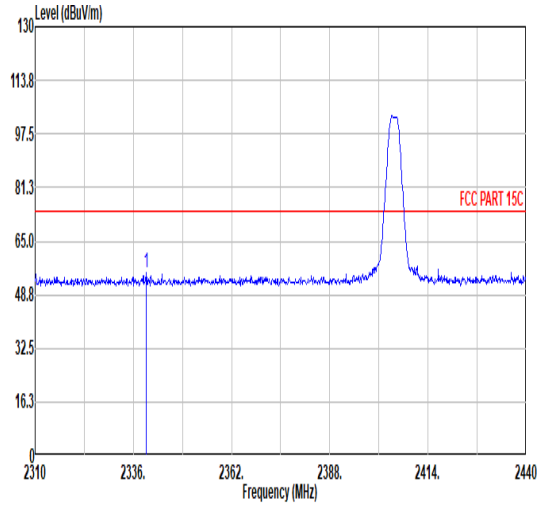
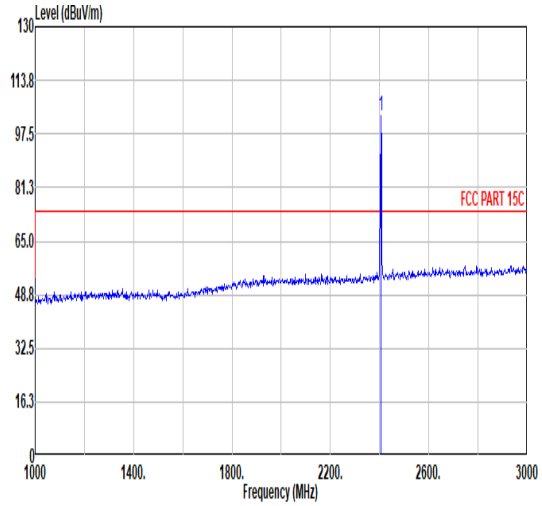
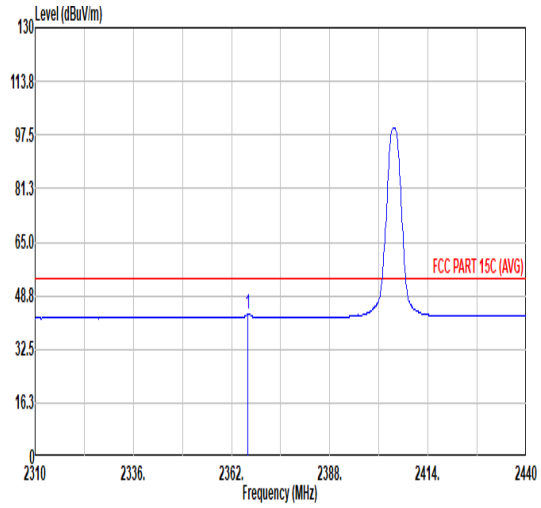
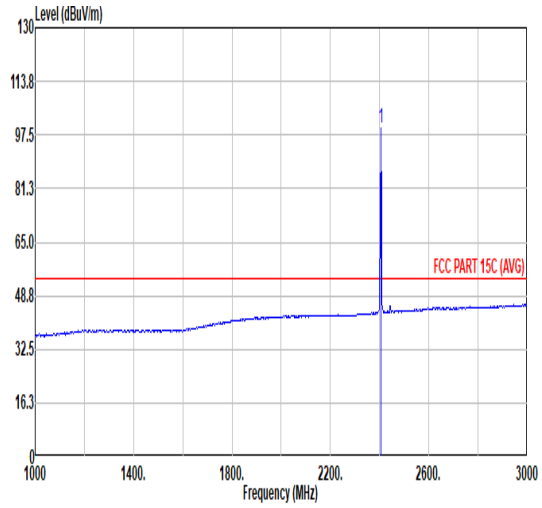
Radiated Spurious Emission Test Modes

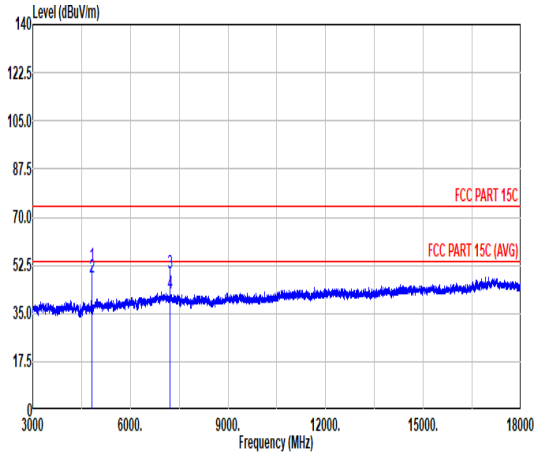
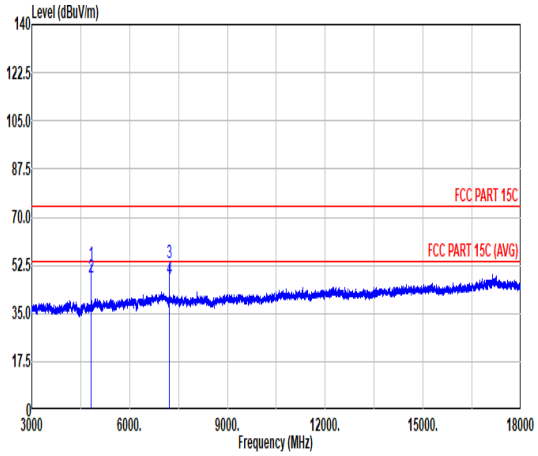
Mode	Band (MHz)	Modulation	Channel	Frequency	Data Rate	Remark
Mode 1	2400-2483.5	Zigbee	11	2405	250Kbps	-
Mode 2	2400-2483.5	Zigbee	18	2440	250Kbps	-
Mode 3	2400-2483.5	Zigbee	25	2475	250Kbps	-
Mode 4	2400-2483.5	Zigbee	26	2480	250Kbps	-
Mode 5	2400-2483.5	Zigbee	26	2480	250Kbps	LF
Mode 6	2400-2483.5	Bluetooth-LE 1M_CH00 + Zigbee_CH26 + WLAN 11n HT40_CH09				co-lacation

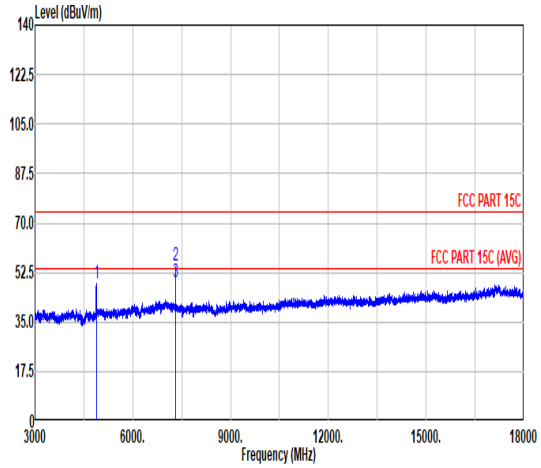
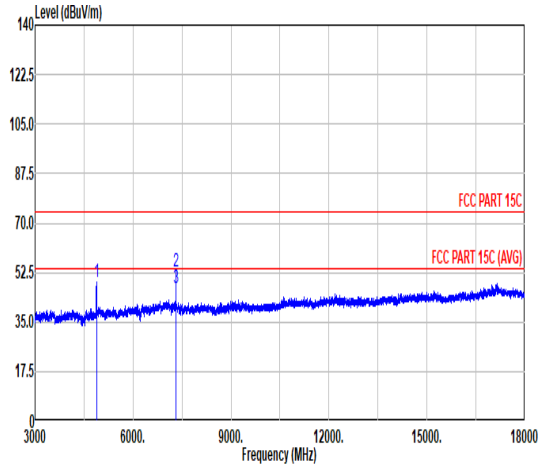
Summary of each worse mode

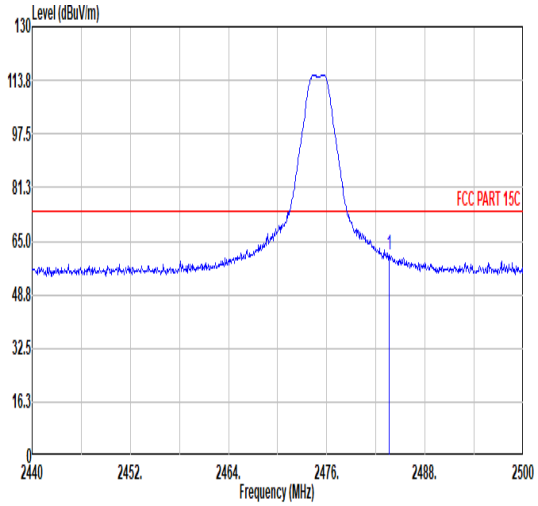
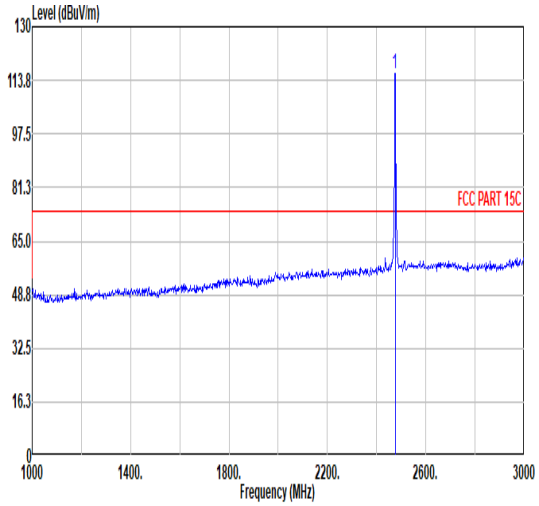
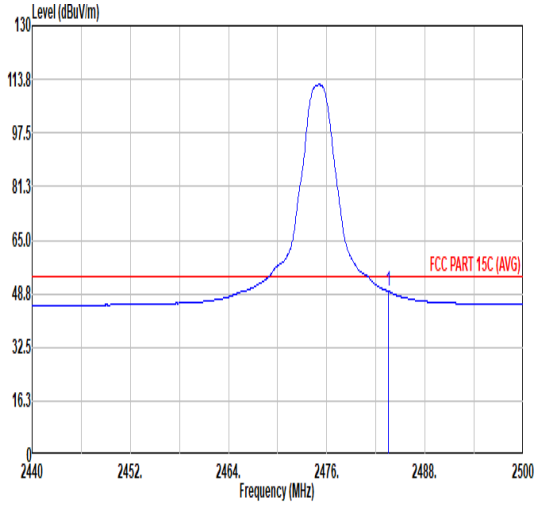
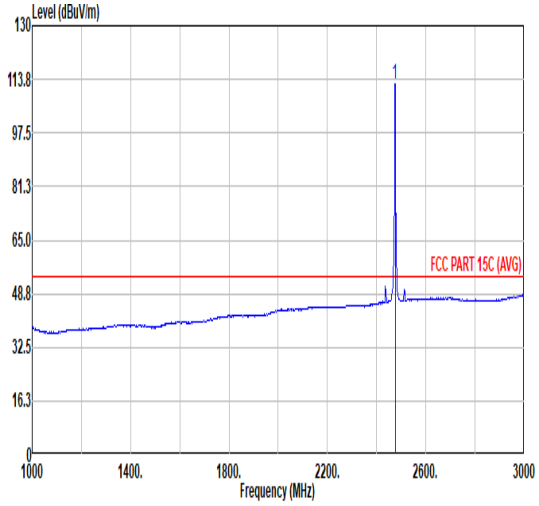
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Zigbee	11	2366.42	47.30	54.00	-6.70	H	AVERAGE	Pass	Band Edge
	Zigbee	11	4810.00	48.15	54.00	-5.85	H	AVERAGE	Pass	Harmonic
2	Zigbee	18	-	-	-	-	-	-	-	Band Edge
	Zigbee	18	7320.00	49.19	54.00	-4.81	H	AVERAGE	Pass	Harmonic
3	Zigbee	25	2483.50	49.52	54.00	-4.48	H	AVERAGE	Pass	Band Edge
	Zigbee	25	7425.00	44.73	74.00	-29.27	H	PEAK	Pass	Harmonic
4	Zigbee	26	2483.50	51.84	54.00	-2.16	H	AVERAGE	Pass	Band Edge
	Zigbee	26	7440.00	45.86	74.00	-28.14	V	PEAK	Pass	Harmonic
5	Zigbee	26	736.16	37.86	46.00	-8.14	H	PEAK	Pass	LF
6	Zigbee	26	2483.5	51.82	54	-2.18	H	Average	Pass	Band Edge
	Zigbee	26	4960.00	47.03	74.00	-26.97	H	Peak	Pass	Harmonic

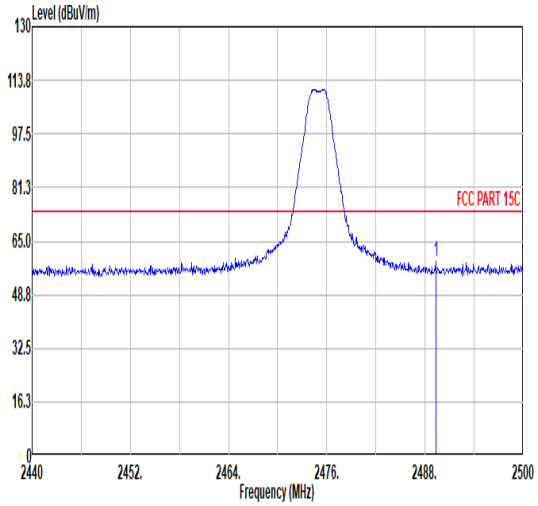
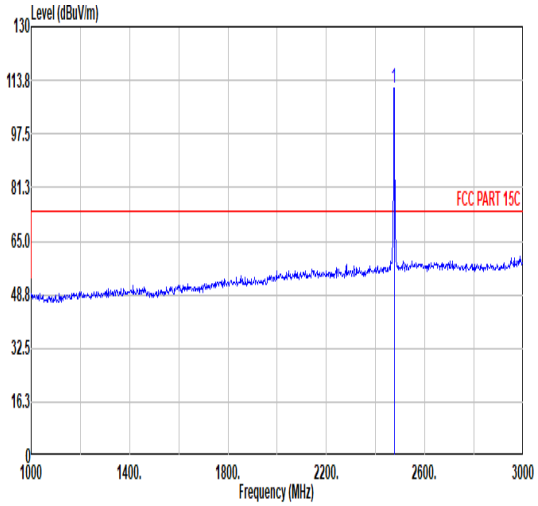
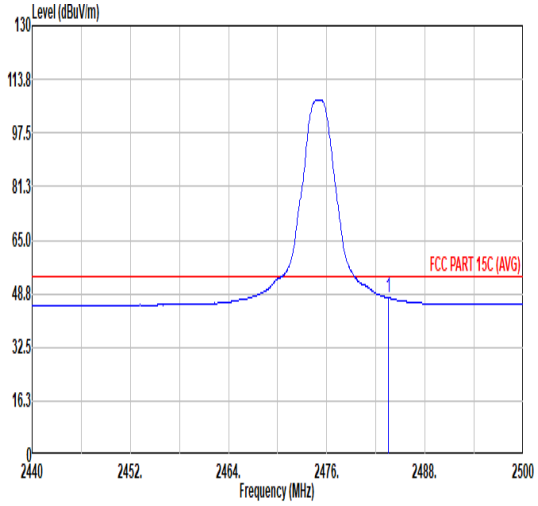
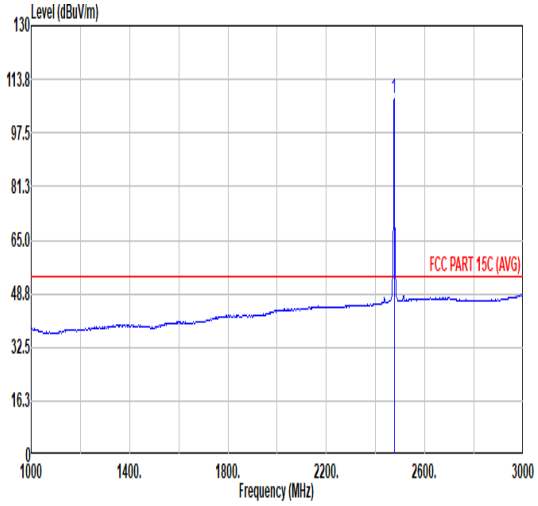
Mode	1	
	Band Edge	
	2400-2483.5_Zigbee _CH11_2405MHz	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2366.68 56.54 74.00 -17.46 42.44 31.93 7.08 30.91 6.00 197 360 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2405.00 109.80 ------ ------ 95.52 32.01 7.14 30.87 6.00 197 360 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2366.42 47.30 54.00 -6.70 33.20 31.93 7.08 30.91 6.00 197 360 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2405.00 106.48 ------ ------ 92.19 32.01 7.14 30.86 6.00 197 360 AVERAGE

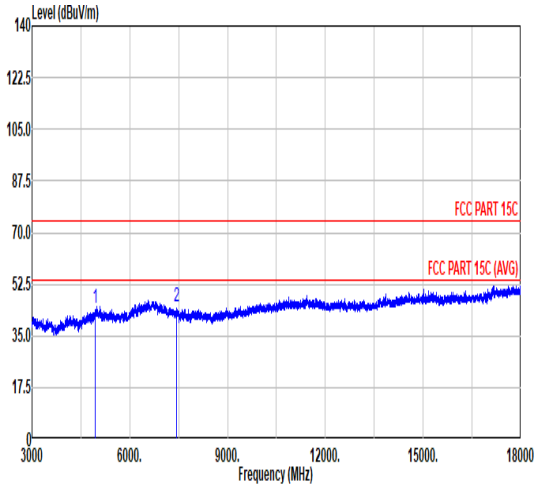
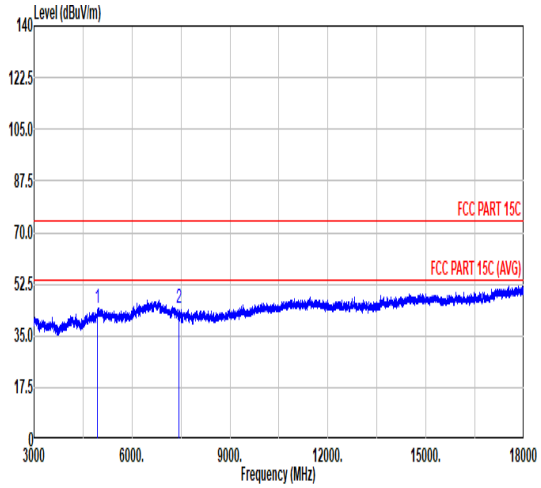
Mode	1	
	Band Edge	
	2400-2483.5_Zigbee _CH11_2405MHz	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2339.38 55.21 74.00 -18.79 41.23 31.87 7.04 30.93 6.00 340 249 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2405.00 103.02 ------ ------ 88.74 32.01 7.14 30.87 6.00 340 249 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2366.29 43.09 54.00 -10.91 28.99 31.93 7.08 30.91 6.00 340 249 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2405.00 99.55 ------ ------ 85.26 32.01 7.14 30.86 6.00 340 249 AVERAGE

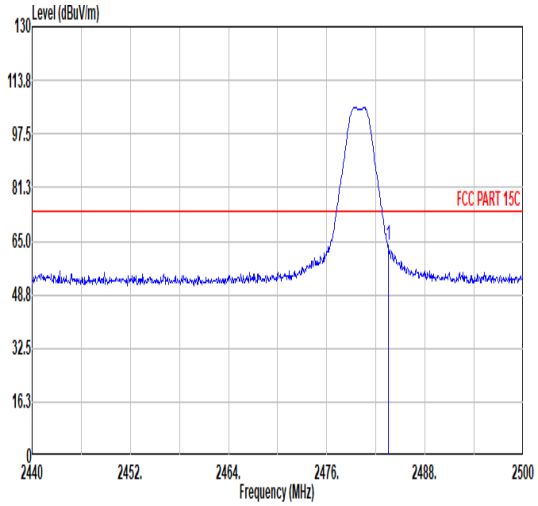
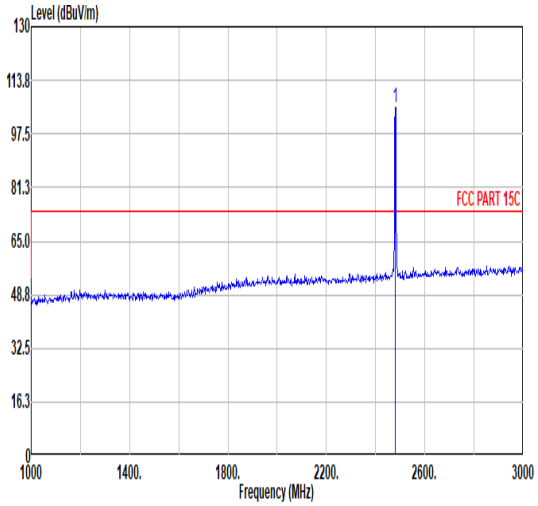
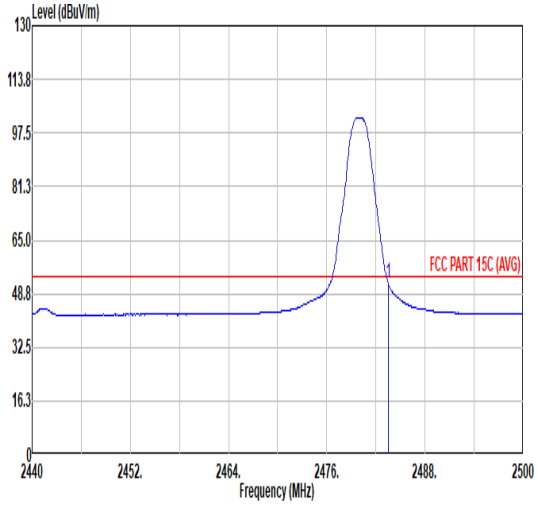
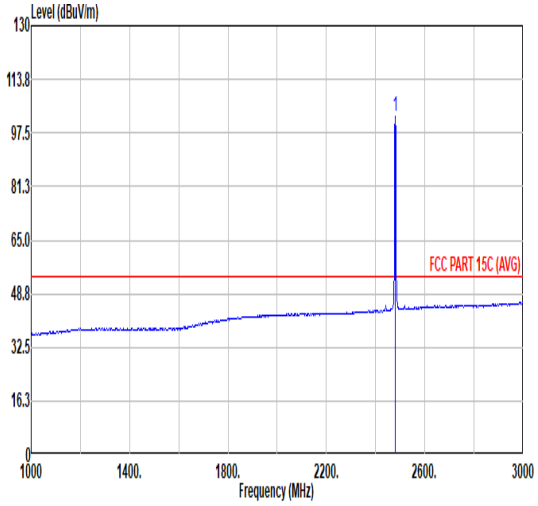
Mode	1	
	Harmonic	
	2400-2483.5_Zigbee _CH11_2405MHz	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4810.00 52.49 74.00 -21.51 73.52 34.10 10.30 65.43 0.00 107 169 PEAK 2 4810.00 48.15 54.00 -5.85 69.18 34.10 10.30 65.43 0.00 107 169 AVERAGE 3 7215.00 49.59 74.00 -24.41 66.18 35.80 12.79 65.18 0.00 107 169 PEAK 4 7215.00 42.39 54.00 -11.61 58.98 35.80 12.79 65.18 0.00 107 169 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4810.00 52.93 74.00 -21.07 73.96 34.10 10.30 65.43 0.00 105 187 PEAK 2 4810.00 48.03 54.00 -5.97 69.06 34.10 10.30 65.43 0.00 105 187 AVERAGE 3 7215.00 53.34 74.00 -20.66 69.93 35.80 12.79 65.18 0.00 101 86 PEAK 4 7215.00 47.81 54.00 -6.19 64.40 35.80 12.79 65.18 0.00 101 86 AVERAGE

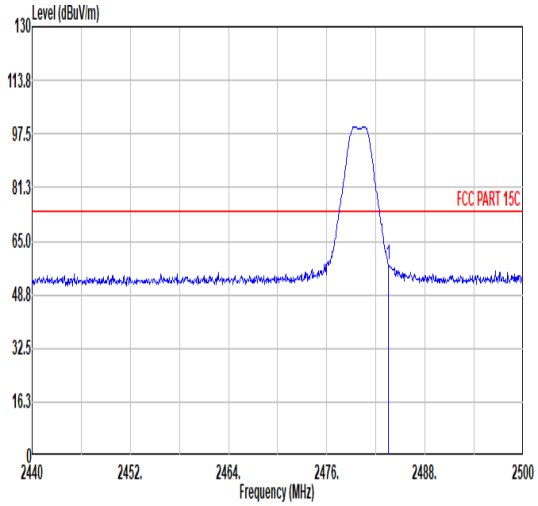
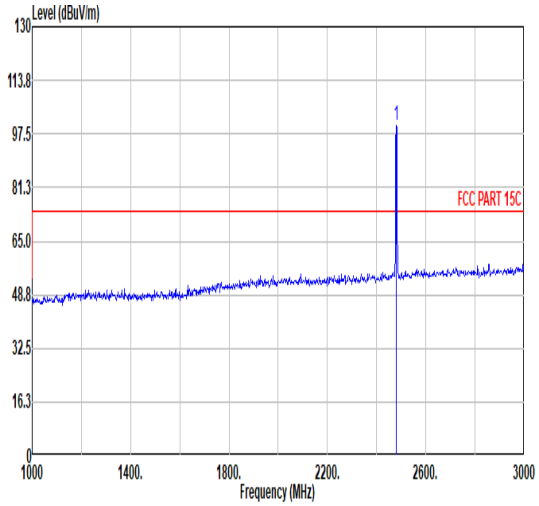
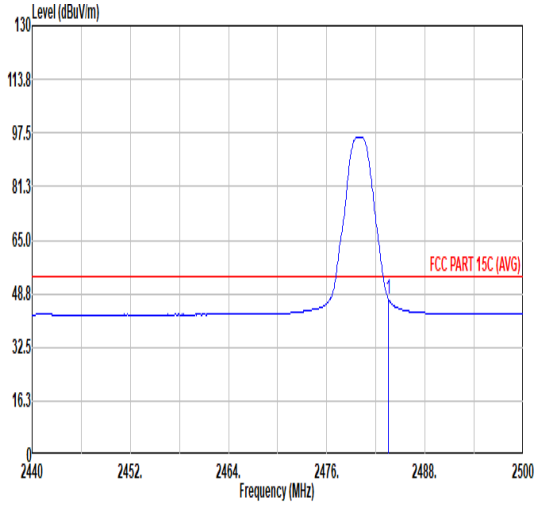
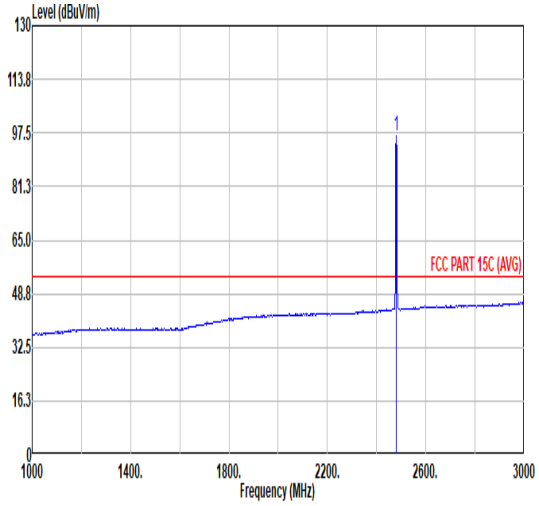
Mode	2	
	Harmonic	
	2400-2483.5_Zigbee _CH18_2440MHz	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4880.00 48.63 74.00 -25.37 69.58 34.10 10.39 65.44 0.00 --- --- Peak 2 7320.00 54.84 74.00 -19.16 71.47 35.80 12.82 65.25 0.00 274 119 Peak 3 7320.00 49.19 54.00 -4.81 65.82 35.80 12.82 65.25 0.00 274 119 Average	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4880.00 48.91 74.00 -25.09 69.86 34.10 10.39 65.44 0.00 --- --- Peak 2 7320.00 52.86 74.00 -21.14 69.49 35.80 12.82 65.25 0.00 103 57 Peak 3 7320.00 47.27 54.00 -6.73 63.90 35.80 12.82 65.25 0.00 103 57 Average

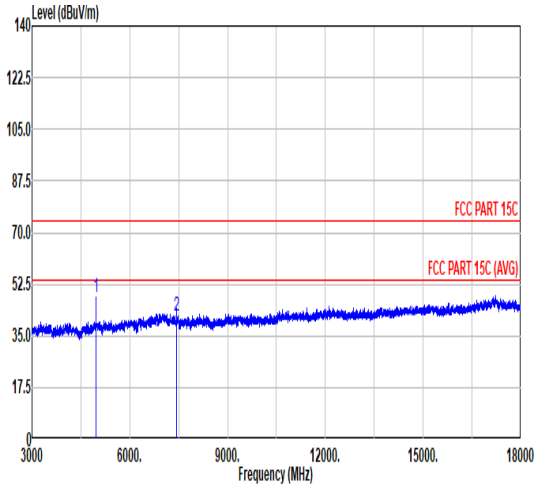
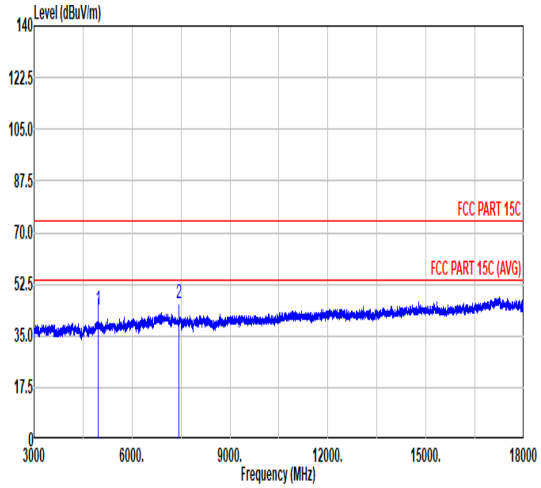
Mode	3	
	Band Edge	
	2400-2483.5_ Zigbee _CH25_2475MHz	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.62 60.93 74.00 -13.07 44.20 32.30 9.31 30.88 6.00 194 0 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2475.00 115.69 ------ ------ 99.01 32.30 9.27 30.89 6.00 194 0 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 49.52 54.00 -4.48 32.79 32.30 9.31 30.88 6.00 194 0 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2475.00 112.29 ------ ------ 95.59 32.30 9.28 30.88 6.00 194 0 AVERAGE

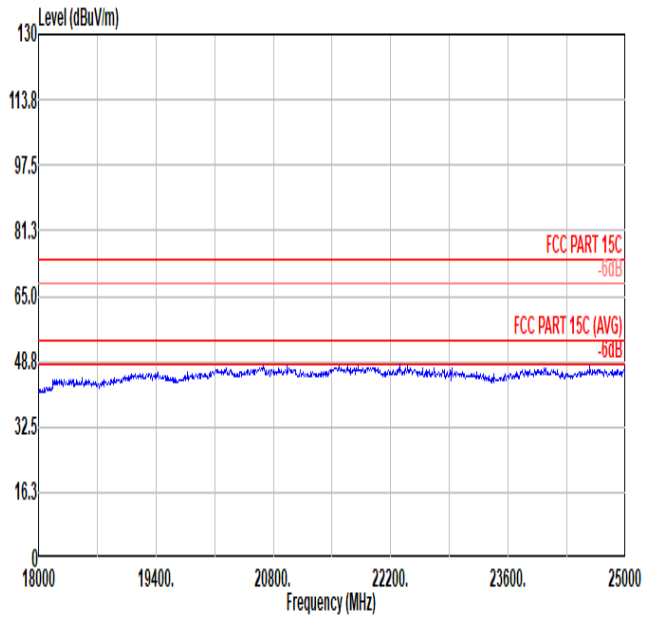
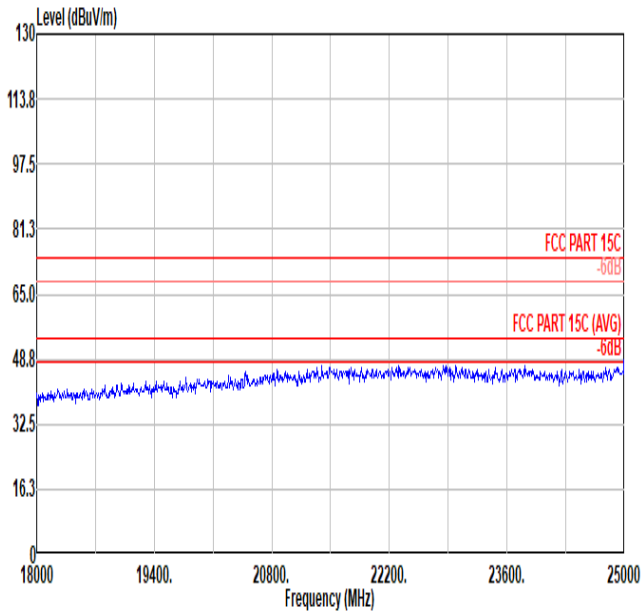
Mode	3	
	Band Edge	
	2400-2483.5_ Zigbee _CH25_2475MHz	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2489.32 58.63 74.00 -15.37 41.86 32.30 9.34 30.87 6.00 295 209 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2475.00 111.16 ------ ------ 94.48 32.30 9.27 30.89 6.00 295 209 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 47.55 54.00 -6.45 30.82 32.30 9.31 30.88 6.00 295 209 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2475.00 107.71 ------ ------ 91.01 32.30 9.28 30.88 6.00 295 209 AVERAGE

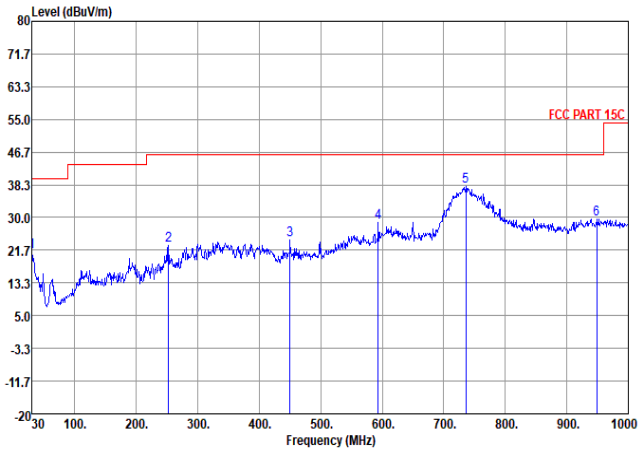
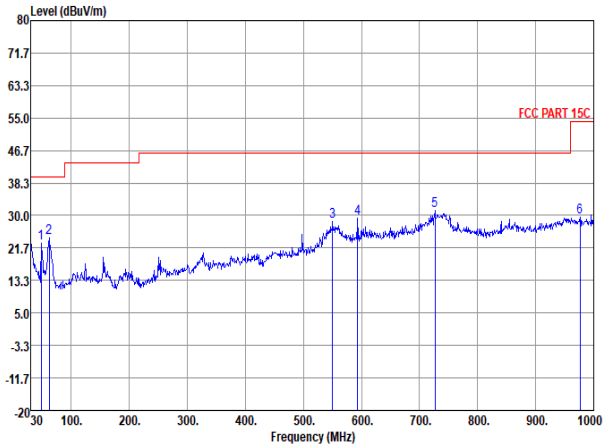
Mode	3	
	Harmonic	
	2400-2483.5_ Zigbee _CH25_2475MHz	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4950.00 44.16 74.00 -29.84 61.82 34.10 13.66 65.42 0.00 --- --- PEAK 2 7425.00 44.73 74.00 -29.27 58.52 35.60 15.76 65.15 0.00 --- --- PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4950.00 44.55 74.00 -29.45 62.21 34.10 13.66 65.42 0.00 --- --- PEAK 2 7425.00 44.44 74.00 -29.56 58.23 35.60 15.76 65.15 0.00 --- --- PEAK

Mode	4	
	Band Edge	
	2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 63.98 74.00 -10.02 49.21 32.13 7.29 30.65 6.00 241 25 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 105.71 ------ ------ 90.97 32.12 7.28 30.66 6.00 241 25 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 51.84 54.00 -2.16 37.07 32.13 7.29 30.65 6.00 241 25 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 102.40 ------ ------ 87.66 32.12 7.28 30.66 6.00 241 25 AVERAGE

Mode	4	
	Band Edge	
	2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 57.84 74.00 -16.16 43.07 32.13 7.29 30.65 6.00 367 236 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 99.97 ------ ------ 85.23 32.12 7.28 30.66 6.00 367 236 PEAK
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 47.29 54.00 -6.71 32.52 32.13 7.29 30.65 6.00 367 236 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 96.50 ------ ------ 81.76 32.12 7.28 30.66 6.00 367 236 AVERAGE

Mode	4	
	Harmonic	
	2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4959.00 48.12 74.00 -25.88 68.97 34.10 10.50 65.45 0.00 --- --- PEAK 2 7440.00 41.49 74.00 -32.51 58.15 35.80 12.87 65.33 0.00 --- --- PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4960.00 43.67 74.00 -30.33 64.52 34.10 10.50 65.45 0.00 --- --- PEAK 2 7440.00 45.86 74.00 -28.14 62.52 35.80 12.87 65.33 0.00 --- --- PEAK

Mode	Emission above 18GHz	
	2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Horizontal	Vertical
Peak Avg		

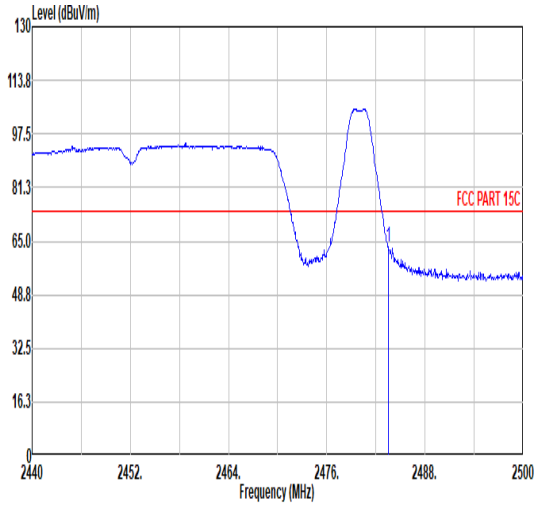
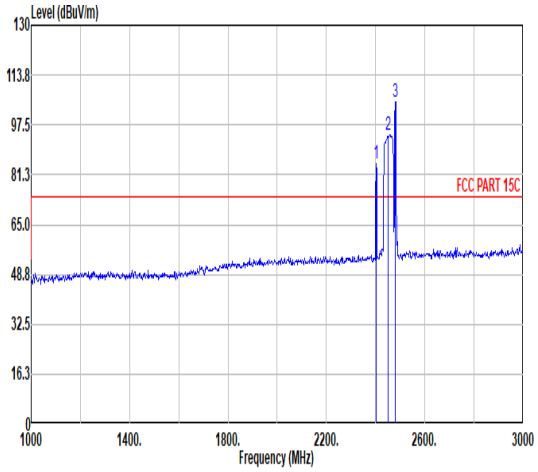
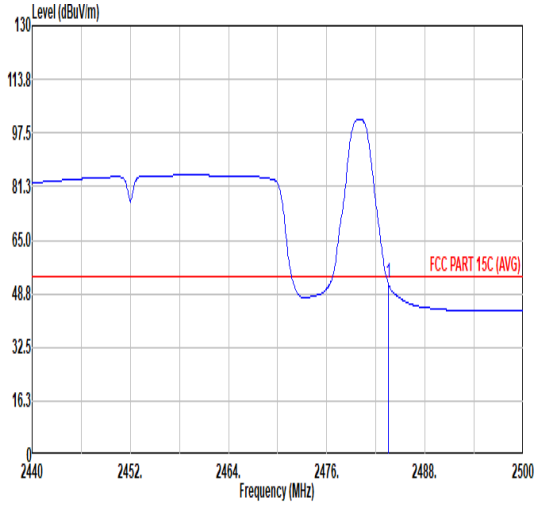
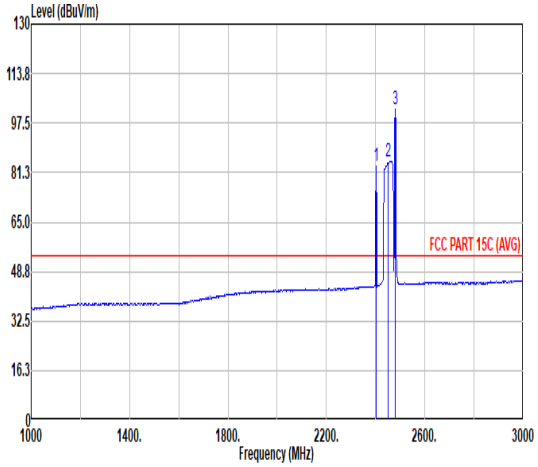
Mode	5 Emission below 1GHz 2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Horizontal	Vertical
Peak Avg		

Horizontal:

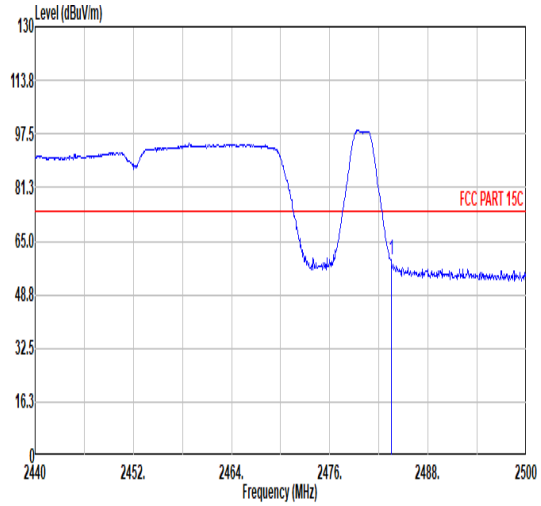
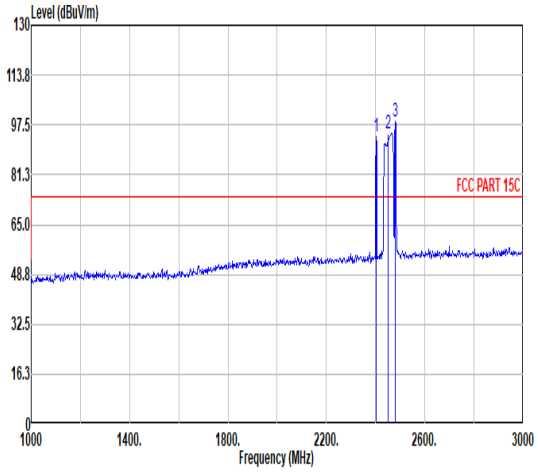
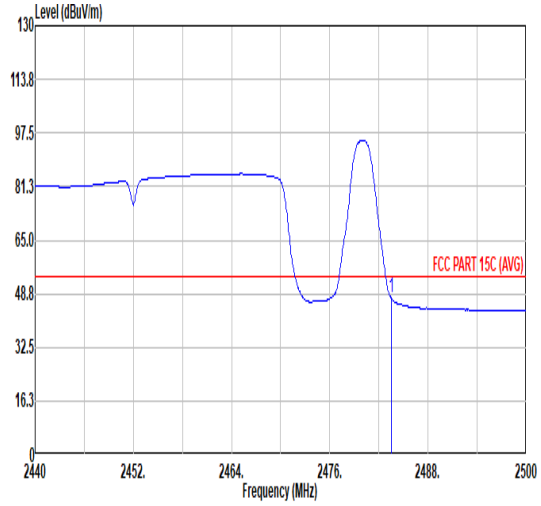
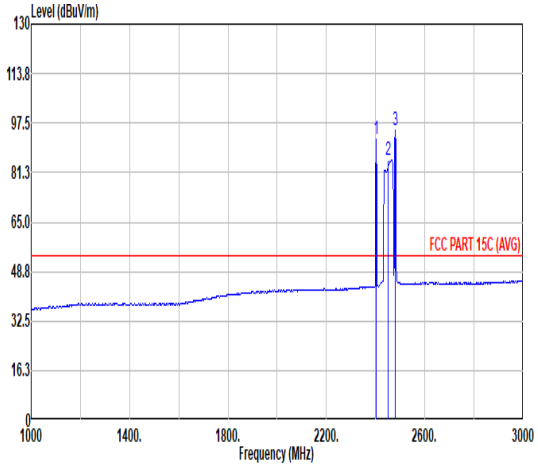
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	30.00	21.18	-18.82	40.00	27.74	25.74	0.50	32.80	---	---	Peak
2	252.13	22.78	-23.22	46.00	34.70	18.78	2.31	33.01	---	---	Peak
3	450.01	24.24	-21.76	46.00	31.38	22.96	3.09	33.19	---	---	Peak
4	593.57	28.88	-17.12	46.00	32.58	26.04	3.55	33.29	---	---	Peak
5	736.16	37.86	-8.14	46.00	39.87	27.25	3.96	33.22	---	---	Peak
6	948.59	29.72	-16.28	46.00	27.29	29.82	4.48	31.87	---	---	Peak

Vertical:

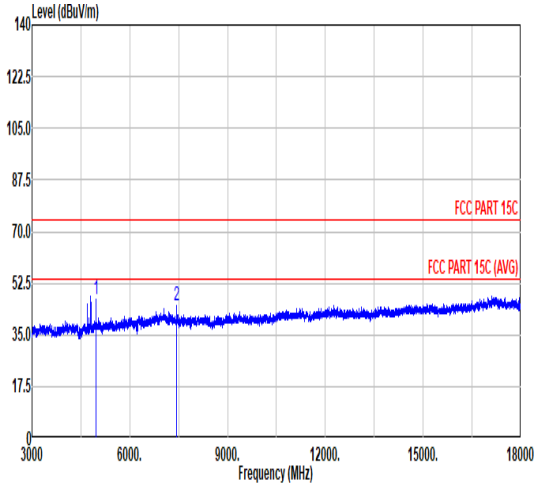
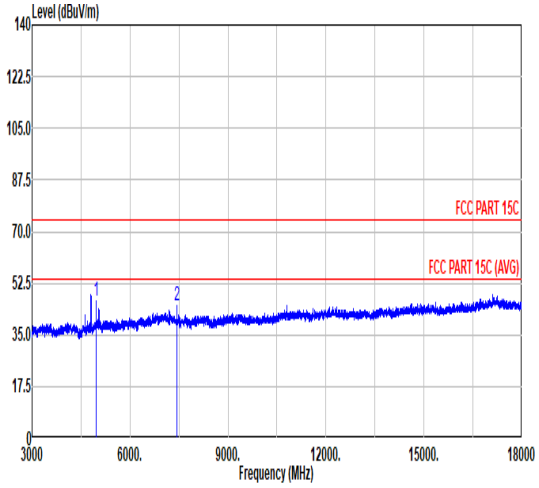
	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	48.43	23.00	-17.00	40.00	39.71	15.45	0.75	32.91	---	---	Peak
2	62.01	24.16	-15.84	40.00	43.31	12.83	0.94	32.92	---	---	Peak
3	549.92	28.50	-17.50	46.00	33.33	25.10	3.41	33.34	---	---	Peak
4	593.57	29.43	-16.57	46.00	33.13	26.04	3.55	33.29	---	---	Peak
5	726.46	31.32	-14.68	46.00	33.54	27.11	3.93	33.26	---	---	Peak
6	976.72	29.50	-24.50	54.00	26.31	30.24	4.54	31.59	---	---	Peak

Mode	6 (co-lacation)	
	Band Edge - L	
	2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.56 63.05 74.00 -10.95 48.28 32.13 7.29 30.65 6.00 239 360 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2402.00 84.77 74.00 10.77 70.51 32.00 7.13 30.87 6.00 239 360 Peak 2 2452.00 94.29 74.00 20.29 79.71 32.08 7.23 30.73 6.00 239 360 Peak 3 2480.00 105.17 74.00 31.17 90.43 32.12 7.28 30.66 6.00 239 360 Peak
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 51.82 54.00 -2.18 37.05 32.13 7.29 30.65 6.00 239 360 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2402.00 83.36 54.00 29.36 69.10 32.00 7.13 30.87 6.00 239 360 Average 2 2452.00 84.94 54.00 30.94 70.36 32.08 7.23 30.73 6.00 239 360 Average 3 2480.00 101.83 54.00 47.83 87.09 32.12 7.28 30.66 6.00 239 360 Average

Note: the highest signal over limit are BLE + Zigbee + WLAN co-location fundamental signals.

Mode	6	
	Band Edge - L	
	2400-2483.5_Zigbee _CH26_2480MHz	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 59.53 74.00 -14.47 44.76 32.13 7.29 30.65 6.00 100 221 PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2402.00 93.76 74.00 19.76 79.50 32.00 7.13 30.87 6.00 100 221 Peak 2 2452.00 94.85 74.00 20.85 80.27 32.08 7.23 30.73 6.00 100 221 Peak 3 2480.00 98.68 74.00 24.68 83.94 32.12 7.28 30.66 6.00 100 221 Peak
Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.50 47.38 54.00 -6.62 32.61 32.13 7.29 30.65 6.00 100 221 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2402.00 92.13 54.00 38.13 77.87 32.00 7.13 30.87 6.00 100 221 Average 2 2452.00 85.29 54.00 31.29 70.71 32.08 7.23 30.73 6.00 100 221 Average 3 2480.00 95.25 54.00 41.25 80.51 32.12 7.28 30.66 6.00 100 221 Average

Note: the highest signal over limit are BLE + Zigbee + WLAN co-location fundamental signals.

Mode	6	
	Harmonic	
	2400-2483.5_Zigbee _CH26_2480MHz	
ANT	1	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4960.00 47.03 74.00 -26.97 67.88 34.10 10.50 65.45 0.00 --- --- Peak 2 7440.00 44.70 74.00 -29.30 61.36 35.80 12.87 65.33 0.00 --- --- Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4960.00 46.51 74.00 -27.49 67.36 34.10 10.50 65.45 0.00 --- --- Peak 2 7440.00 44.69 74.00 -29.31 61.35 35.80 12.87 65.33 0.00 --- --- Peak

Appendix D. Duty Cycle Plots

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

zigbee