



TEST REPORT

Application No.: SZEM2009008718CR
Applicant: SAGEMCOM BROADBAND SAS
Address of Applicant: 250 Route de l'Empereur - 92848 RUEIL MALMAISON CEDEX- FRANCE
Manufacturer: SAGEMCOM BROADBAND SAS
Address of Manufacturer: 250 Route de l'Empereur - 92848 RUEIL MALMAISON CEDEX- FRANCE
Factory: AGEMCOM BROADBAND SAS
Address of Factory: 250 Route de l'Empereur - 92848 RUEIL MALMAISON CEDEX- FRANCE
Equipment Under Test (EUT):
EUT Name: Home Hub 4000(FAST 5689)
Model No.: FAST 5689
FCC ID: VW3FAST5689
Trade mark: SAGEMCOM
Standard(s) : 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2020-09-02
Date of Test: 2020-09-03 to 2020-09-30
Date of Issue: 2020-11-19

Test Result:

Pass*

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu

Keny Xu
EMC Laboratory Manager



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch EMC Laboratory

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2020-11-19		Original

Authorized for issue by:			
			
		Leo Lai/Project Engineer	
			
		Eric Fu/Reviewer	

2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass



3 Contents

	Page
1 COVER PAGE	1
2 TEST SUMMARY	3
3 CONTENTS	4
4 GENERAL INFORMATION	6
4.1 DETAILS OF E.U.T.	6
4.2 DESCRIPTION OF SUPPORT UNITS	6
4.3 MEASUREMENT UNCERTAINTY	6
4.4 TEST LOCATION.....	7
4.5 TEST FACILITY.....	7
4.6 DEVIATION FROM STANDARDS.....	7
4.7 ABNORMALITIES FROM STANDARD CONDITIONS	7
5 EQUIPMENT LIST.....	8
6 RADIO SPECTRUM TECHNICAL REQUIREMENT	12
6.1 ANTENNA REQUIREMENT	12
6.1.1 Test Requirement:	12
7 RADIO SPECTRUM MATTER TEST RESULTS.....	13
7.1 CONDUCTED PEAK OUTPUT POWER.....	13
7.1.1 E.U.T. Operation	13
7.1.2 Test Mode Description	13
7.1.3 Test Setup Diagram	14
7.1.4 Measurement Procedure and Data.....	14
7.2 MINIMUM 6DB BANDWIDTH.....	15
7.2.1 E.U.T. Operation	15
7.2.2 Test Mode Description	15
7.2.3 Test Setup Diagram	15
7.2.4 Measurement Procedure and Data.....	15
7.3 POWER SPECTRUM DENSITY.....	16
7.3.1 E.U.T. Operation	16
7.3.2 Test Mode Description	16
7.3.3 Test Setup Diagram	16
7.3.4 Measurement Procedure and Data.....	16
7.4 CONDUCTED BAND EDGES MEASUREMENT.....	17
7.4.1 E.U.T. Operation	17
7.4.2 Test Mode Description	17
7.4.3 Test Setup Diagram	18
7.4.4 Measurement Procedure and Data.....	18
7.5 CONDUCTED SPURIOUS EMISSIONS.....	19
7.5.1 E.U.T. Operation	19
7.5.2 Test Mode Description	19
7.5.3 Test Setup Diagram	20
7.5.4 Measurement Procedure and Data.....	20
7.6 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	21



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7.6.1	E.U.T. Operation	21
7.6.2	Test Mode Description	21
7.6.3	Test Setup Diagram	22
7.6.4	Measurement Procedure and Data.....	22
7.7	RADIATED SPURIOUS EMISSIONS	35
7.7.1	E.U.T. Operation	35
7.7.2	Test Mode Description	35
7.7.3	Test Setup Diagram	36
7.7.4	Measurement Procedure and Data.....	37
8	EMISSION TEST RESULTS	48
8.1	CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ).....	48
8.1.1	E.U.T. Operation	48
8.1.2	Test Mode Description	48
8.1.3	Test Setup Diagram	48
8.1.4	Measurement Procedure and Data.....	49
9	TEST SETUP PHOTO	52
10	EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS)	53
11	APPENDIX.....	54



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4 General Information

4.1 Details of E.U.T.

Test voltage:	120V~60Hz
Power adapter:	Model: MSA-Z5000IS12.0-60A-P Input: 100-120V~50/60Hz 1.5A Max, Output: DC 12V 5A
Antenna Gain:	3.85dBi
Channel Spacing:	5MHz
Number of Channels:	16
Modulation Type:	O-QPSK
Operation Frequency:	2405MHz to 2480MHz
Antenna Type:	Internal Antenna

	Power Setting
2405MHz	20
2440MHz	20
2475MHz	20
2480MHz	6

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	T430u	REF. No.SEA1800

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	$\pm 3.0\text{dB}$ (150kHz to 30MHz)
Conducted Peak Output Power	$\pm 0.75\text{dB}$
Minimum 6dB Bandwidth	$\pm 3\%$
Power Spectrum Density	$\pm 2.84\text{dB}$
Conducted Band Edges Measurement	$\pm 0.75\text{dB}$
Conducted Spurious Emissions	$\pm 0.75\text{dB}$
Radiated Emissions which fall in the restricted bands	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)
Radiated Spurious Emissions	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)

Remark:

The U_{lab} (lab Uncertainty) is less than U_{CISPR} (CISPR Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

4.4 Test Location

All tests were performed at:

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No tests were sub-contracted.

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISCED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2019-06-13	2022-06-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2020-07-10	2021-07-09
LISN	Rohde & Schwarz	ENV216	SEM007-01	2019-09-24	2021-09-22
LISN	ETS-LINDGREN	3816/2	SEM007-02	2020-04-01	2021-03-31
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2020-03-24	2021-03-23

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27



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Power Spectrum Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR733	SEM001-09	2019-06-13	2022-06-12
DC Power Supply	Rohde & Schwarz	NGSM 32/10	SEM011-04	2020-03-24	2021-03-23
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2019-09-24	2021-09-22
Measurement Software	TST	TST PASS V1.0.5	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2020-07-10	2021-07-09
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2019-09-24	2021-09-22
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2019-09-24	2021-09-22
Electric and Magnetic Field Analyzer	Narda	EHP-50F	SEM022-05	2019-11-28	2020-11-27

Radiated Emissions which fall in the restricted bands					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020-07-10	2021-07-09
EXA Spectrum Analyzer	Agilent Technologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2021-09-22
Pre-amplifier	Rohde & Schwarz	CH14-H052	SEM005-17	2020-04-01	2021-03-31
Pre-amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2021-09-22
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13

Radiated Spurious Emissions (30MHz-1GHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2019-12-16	2020-12-15
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-02	2019-05-24	2022-05-23
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2020-04-01	2021-03-31
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2020-07-10	2021-07-09

Radiated Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2020-07-10	2021-07-09
EXA Spectrum Analyzer	Agilent Technologies Inc	N9010A	SEM004-12	2020-04-09	2021-04-08
Horn Antenna	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2019-09-24	2021-09-22
Pre-amplifier	Rohde & Schwarz	CH14-H052	SEM005-17	2020-04-01	2021-03-31
Pre-amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2020-04-01	2021-03-31
DC Power Supply	Zhao Xin	KXN-6020D	SEM011-08	2019-09-24	2021-09-22
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2020-08-14	2023-08-13

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2019-09-26	2021-09-14
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2019-09-26	2021-09-14
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2019-09-26	2021-09-14
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2020-04-07	2021-04-06



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6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)

Limit:

Standard Requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 3.85dBi.

Antenna location: Refer to Internal photos.

7 Radio Spectrum Matter Test Results

7.1 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247

Test Method: ANSI C63.10 (2013) Section 11.9.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for ≥ 50 hopping channels
	0.25 for $25 \leq$ hopping channels < 50
	1 for digital modulation
2400-2483.5	1 for ≥ 75 non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

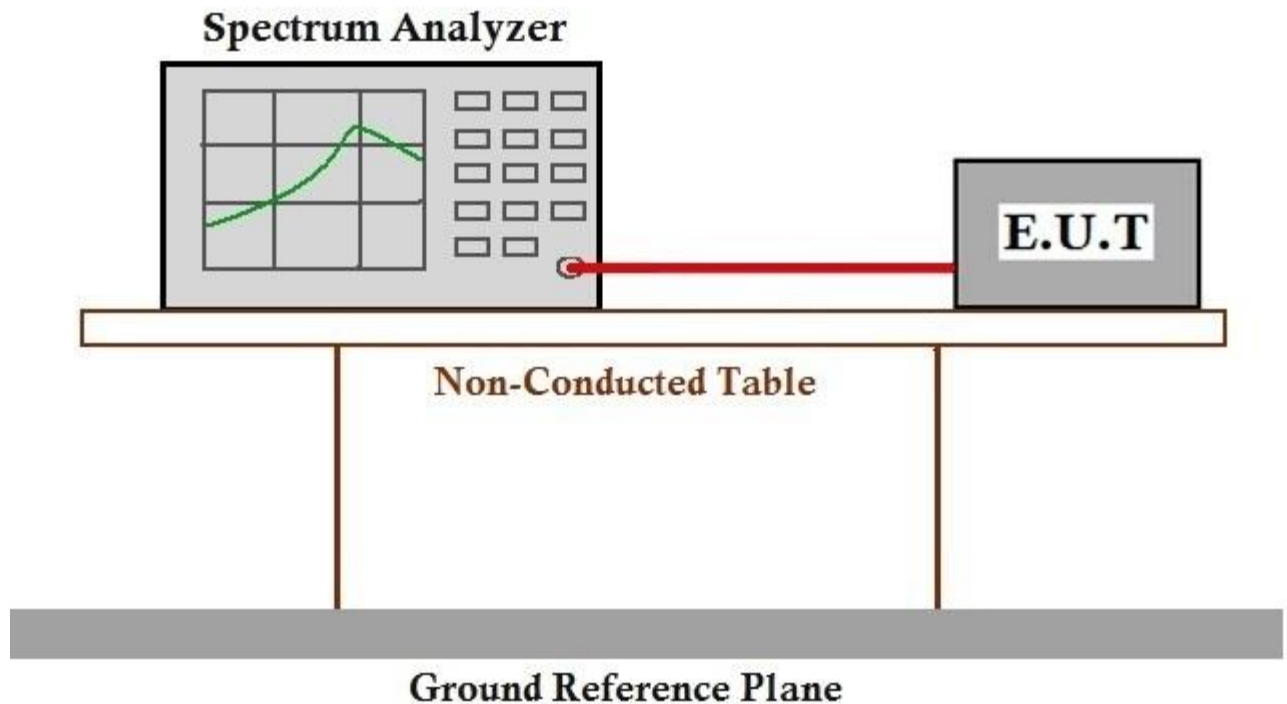
Humidity: 56.3 % RH

Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.2 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247
 Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit:
 ≥500 kHz

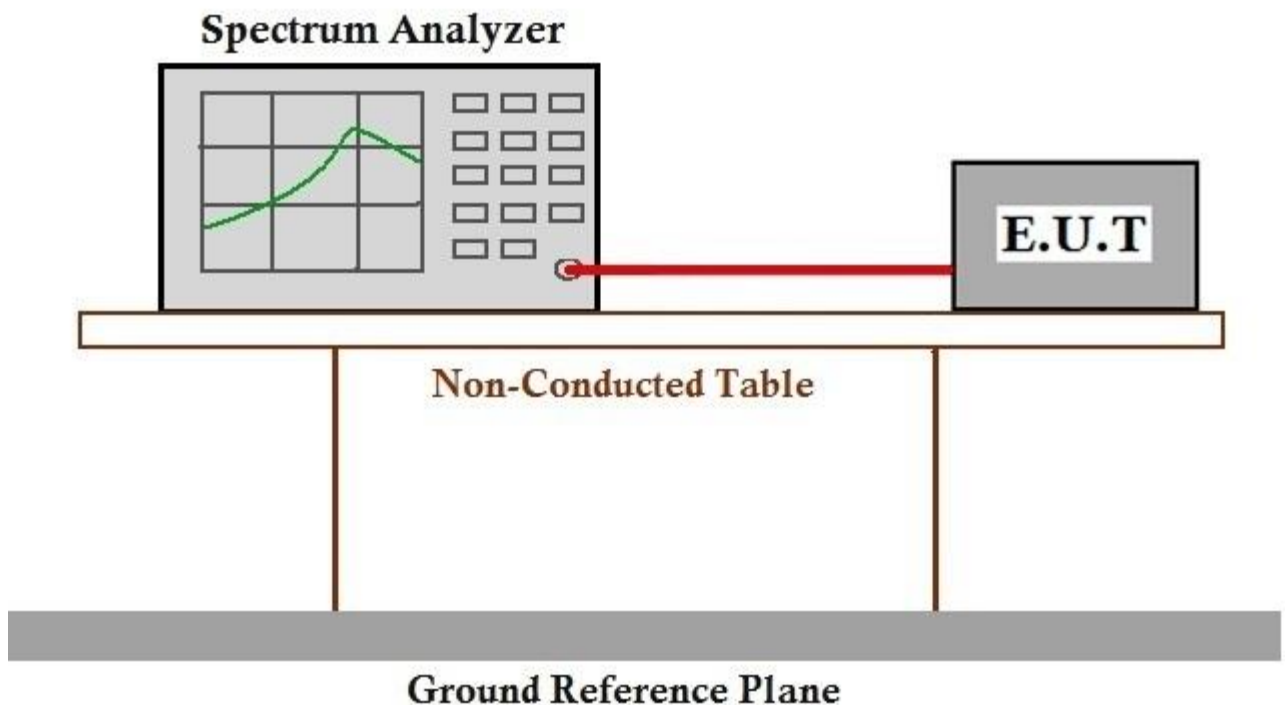
7.2.1 E.U.T. Operation

Operating Environment:
 Temperature: 23.4 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.3 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit:

≤8dBm in any 3 kHz band during any time interval of continuous transmission

7.3.1 E.U.T. Operation

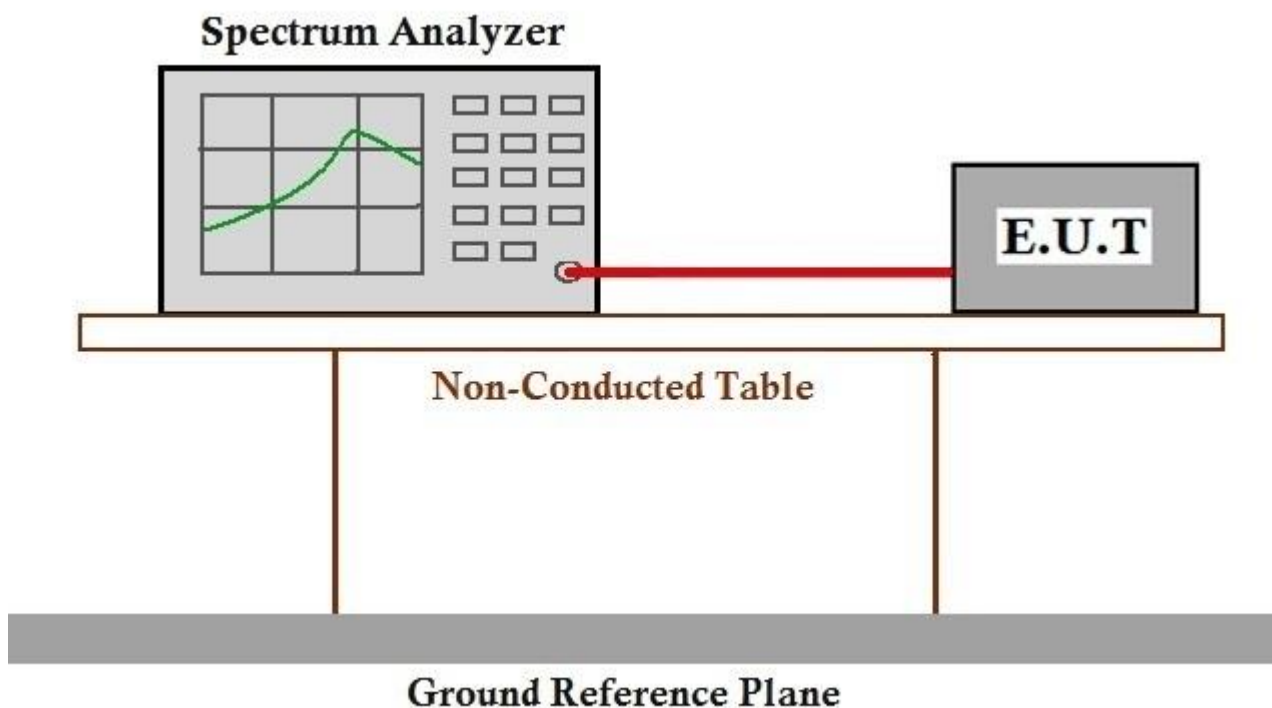
Operating Environment:

Temperature: 23.5 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.4 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247
Test Method: ANSI C63.10 (2013) Section 11.13.3.2

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.4.1 E.U.T. Operation

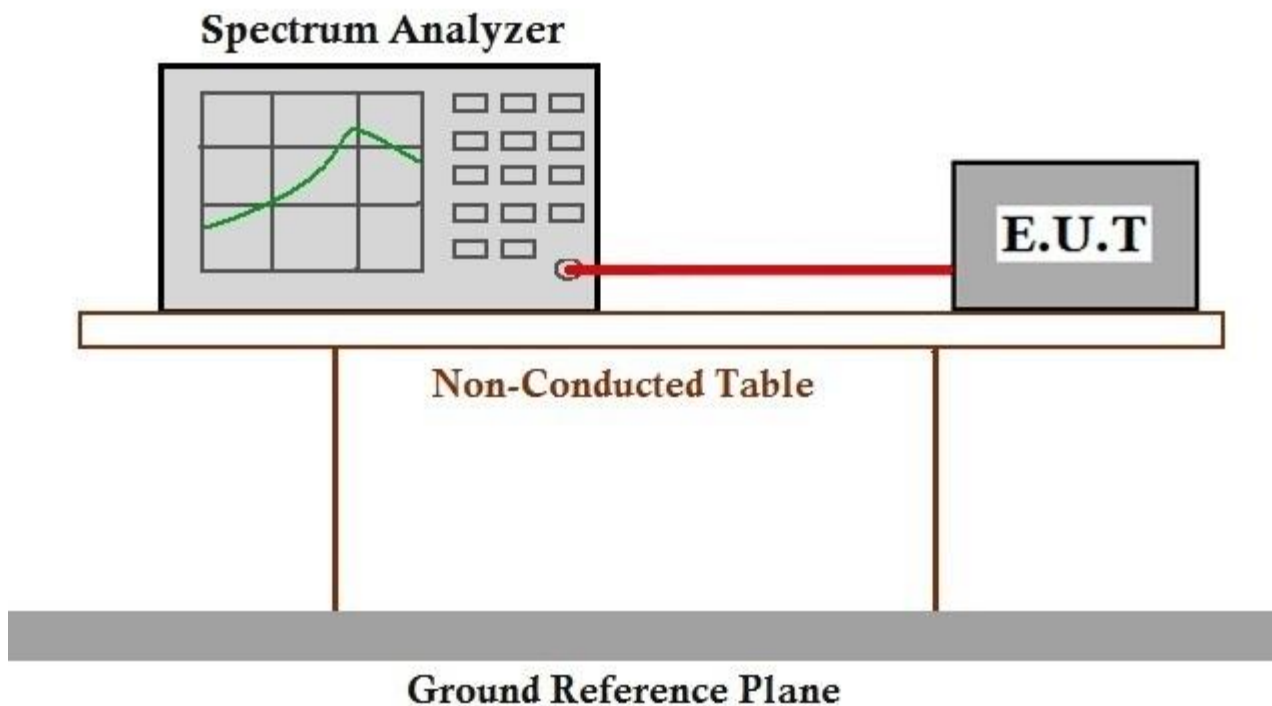
Operating Environment:

Temperature: 23.5 °C Humidity: 56.3 % RH Atmospheric Pressure: 1010 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.5 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247

Test Method: ANSI C63.10 (2013) Section 11.11

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

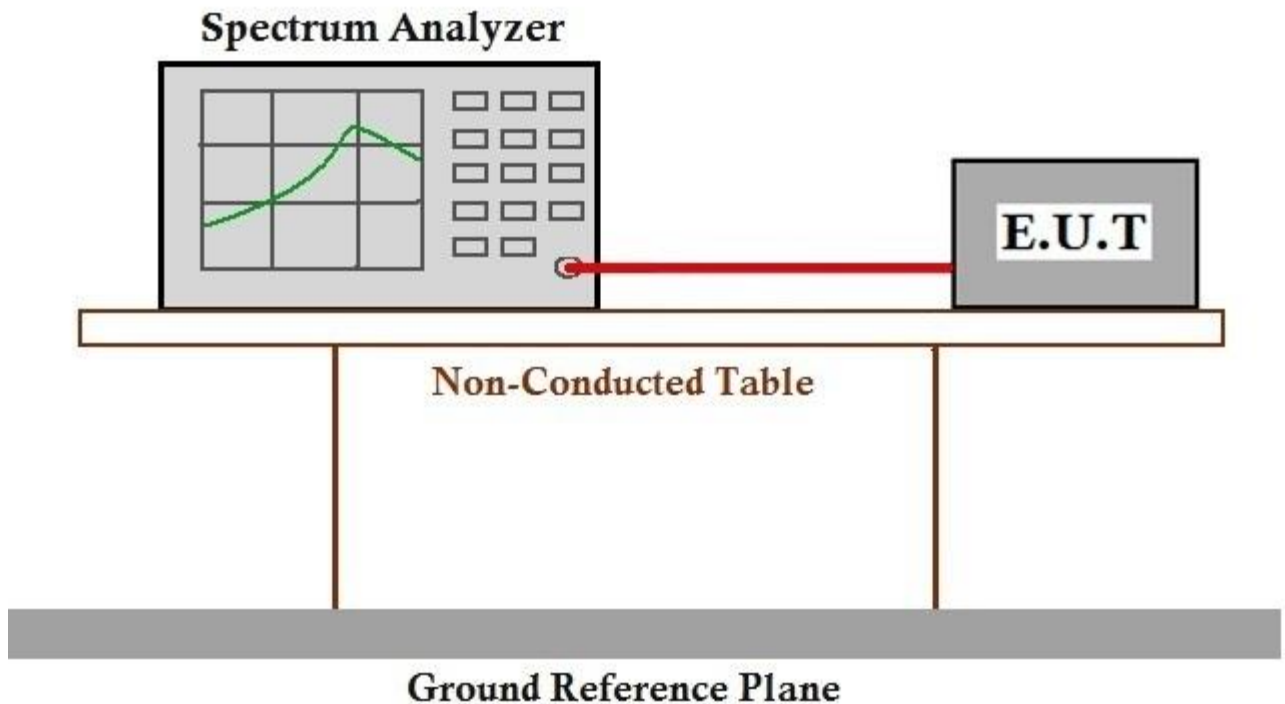
Humidity: 56.3 % RH

Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

Please Refer To Appendix For Details

7.6 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

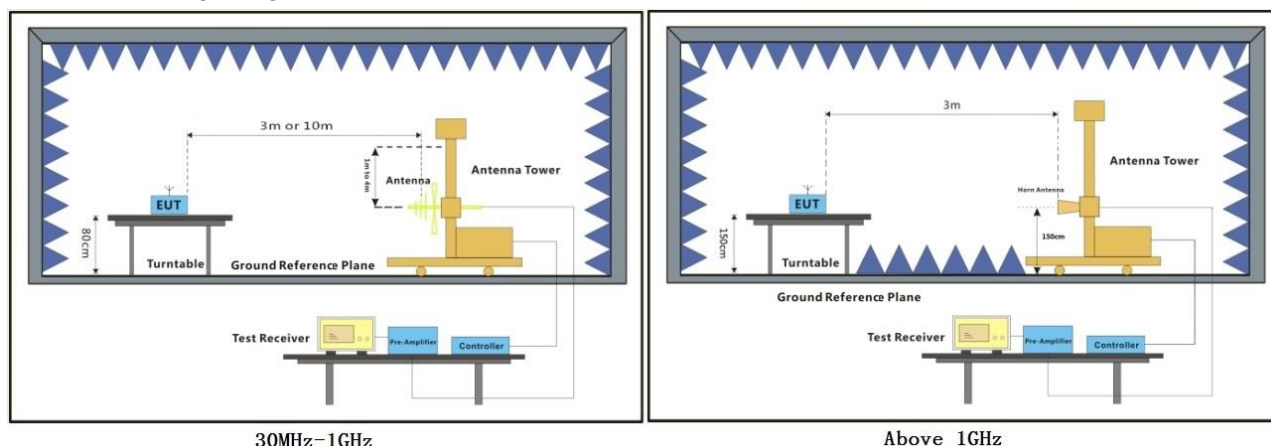
Humidity: 56.3 % RH

Atmospheric Pressure: 1010 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.6.3 Test Setup Diagram



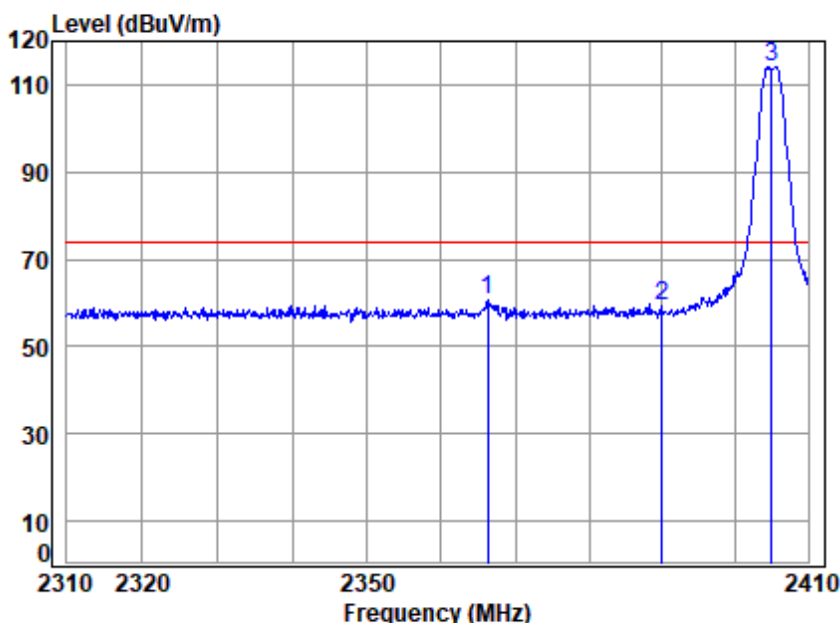
7.6.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2405 Band edge
Note : Zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq		Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz		dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2366.280	4.31	28.48	40.96	68.70	60.53	74.00	-13.47	peak
2	2390.000	4.34	28.52	40.97	67.63	59.52	74.00	-14.48	peak
3 *	2405.000	4.36	28.54	40.98	122.02	113.94	74.00	39.94	peak

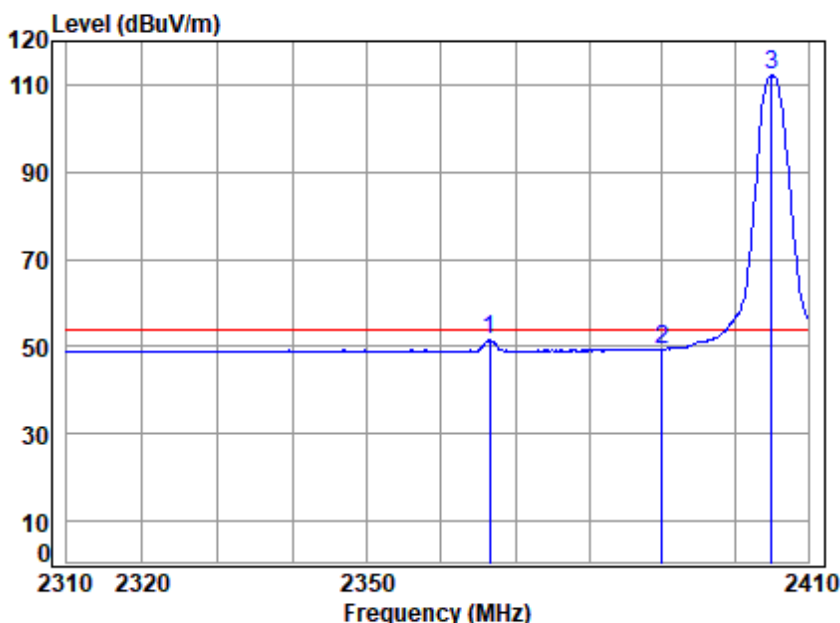


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Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2405 Band edge
Note : Zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq		Loss	Factor	Factor	Level	Level	Line	Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2366.480	4.31	28.48	40.96	59.64	51.47	54.00	-2.53	Average
2	2390.000	4.34	28.52	40.97	57.54	49.43	54.00	-4.57	Average
3 *	2405.000	4.36	28.54	40.98	120.21	112.13	54.00	58.13	Average

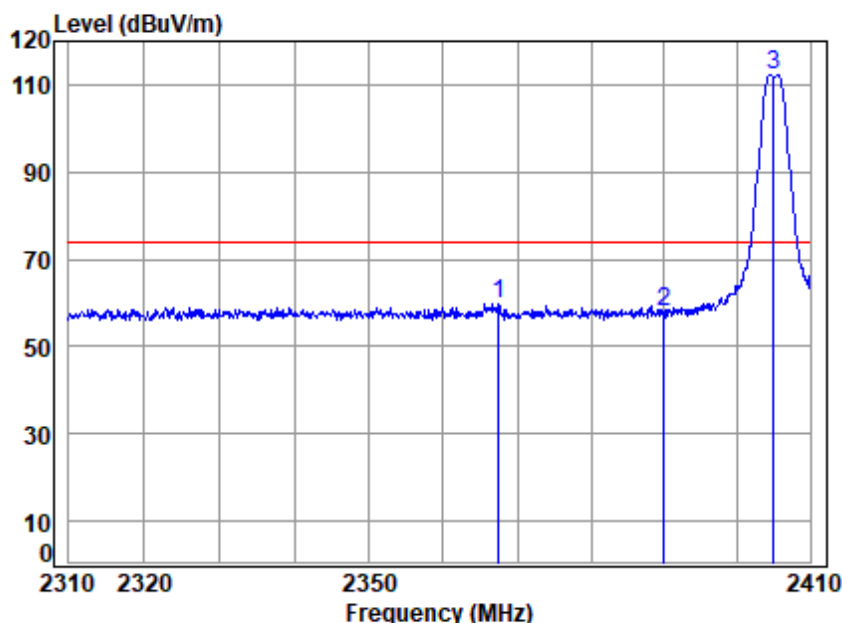


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Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: Low



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2405 Band edge
Note : Zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq		Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz		dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2367.483	4.31	28.48	40.96	67.89	59.72	74.00	-14.28	peak
2	2390.000	4.34	28.52	40.97	65.95	57.84	74.00	-16.16	peak
3 *	2405.000	4.36	28.54	40.98	120.34	112.26	74.00	38.26	peak

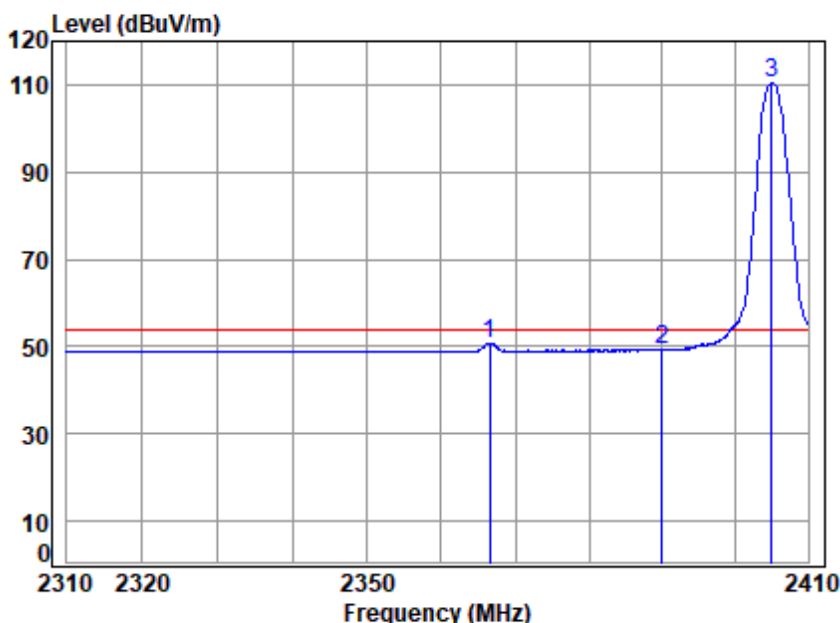


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Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: Low

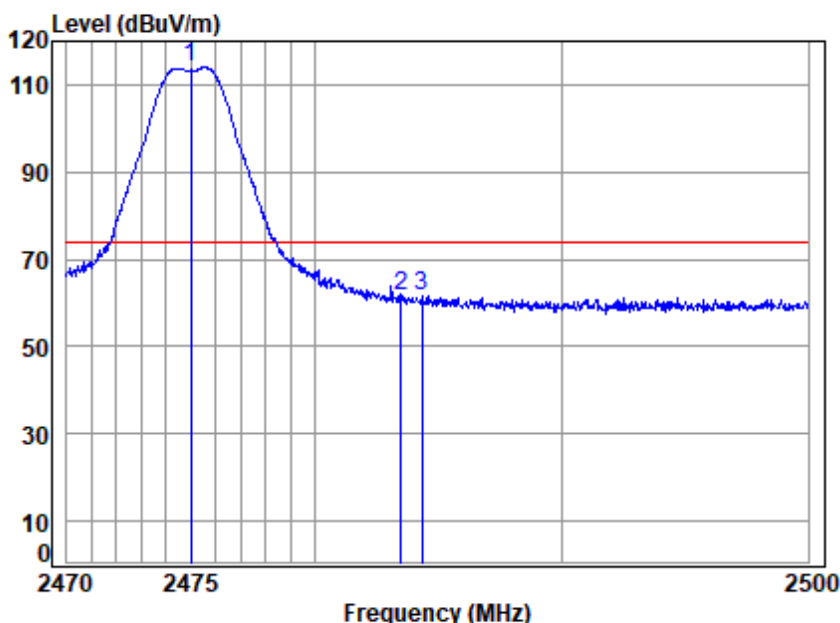


Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2405 Band edge
Note : Zigbee

		Cable	Ant	Preamp	Read	Limit	Over	
Freq		Loss	Factor	Factor	Level	Line	Limit	Remark
MHz		dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2366.480	4.31	28.48	40.96	59.03	50.86	54.00	-3.14 Average
2	2390.000	4.34	28.52	40.97	57.28	49.17	54.00	-4.83 Average
3 *	2405.000	4.36	28.54	40.98	118.52	110.44	54.00	56.44 Average



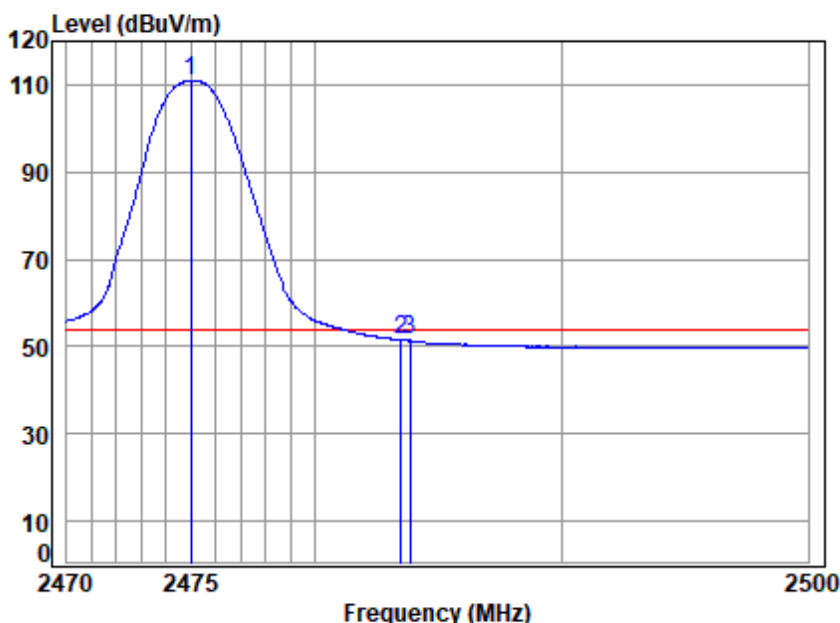
Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: High-1



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2475 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2475.000	4.49	28.67	41.01	121.77	113.92	74.00	39.92	peak
2 2483.500	4.49	28.67	41.01	69.28	61.43	74.00	-12.57	peak
3 2484.325	4.50	28.67	41.01	69.27	61.43	74.00	-12.57	peak

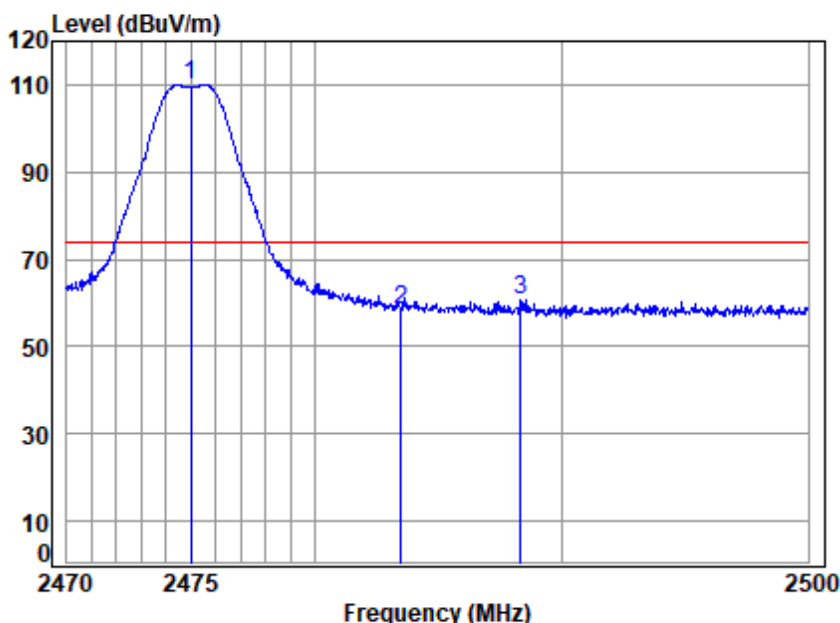
Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: High-1



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2475 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2475.000	4.49	28.67	41.01	118.91	111.06	54.00	57.06	Average
2 2483.500	4.49	28.67	41.01	59.40	51.55	54.00	-2.45	Average
3 2483.845	4.49	28.67	41.01	59.20	51.35	54.00	-2.65	Average

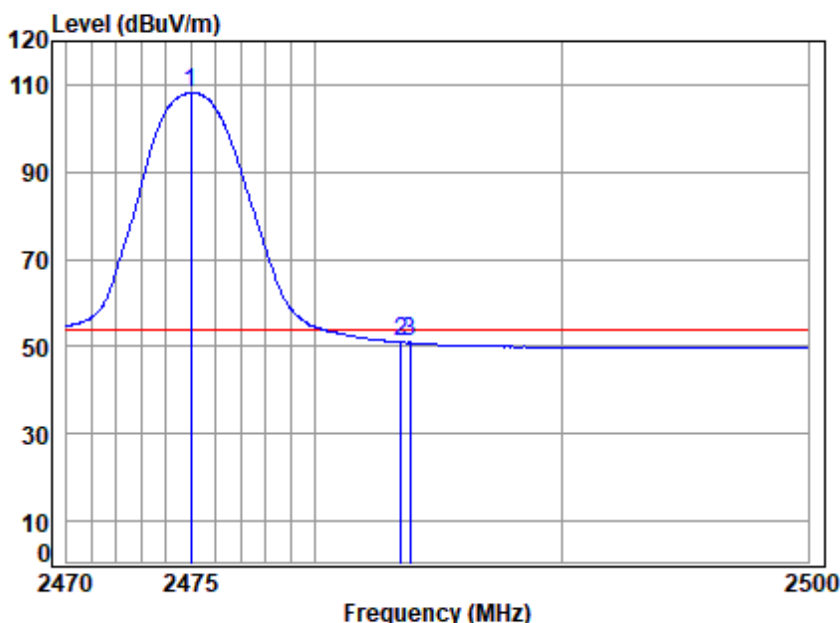
Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: High-1



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2475 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2475.000	4.49	28.67	41.01	117.79	109.94	74.00	35.94	peak
2 2483.500	4.49	28.67	41.01	66.16	58.31	74.00	-15.69	peak
3 2488.317	4.50	28.68	41.01	68.54	60.71	74.00	-13.29	peak

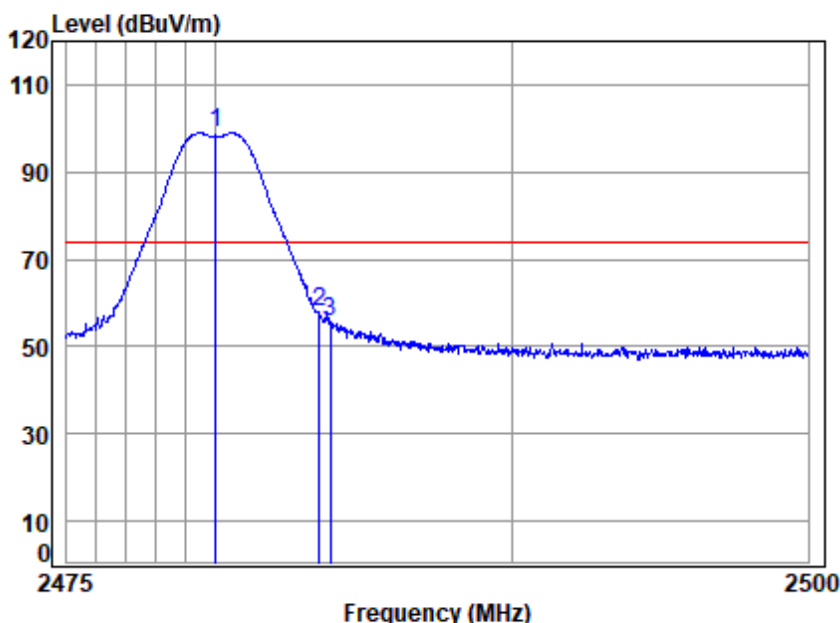
Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: High-1



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2475 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2475.000	4.49	28.67	41.01	115.99	108.14	54.00	54.14	Average
2 2483.500	4.49	28.67	41.01	58.89	51.04	54.00	-2.96	Average
3 2483.845	4.49	28.67	41.01	58.73	50.88	54.00	-3.12	Average

Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: High

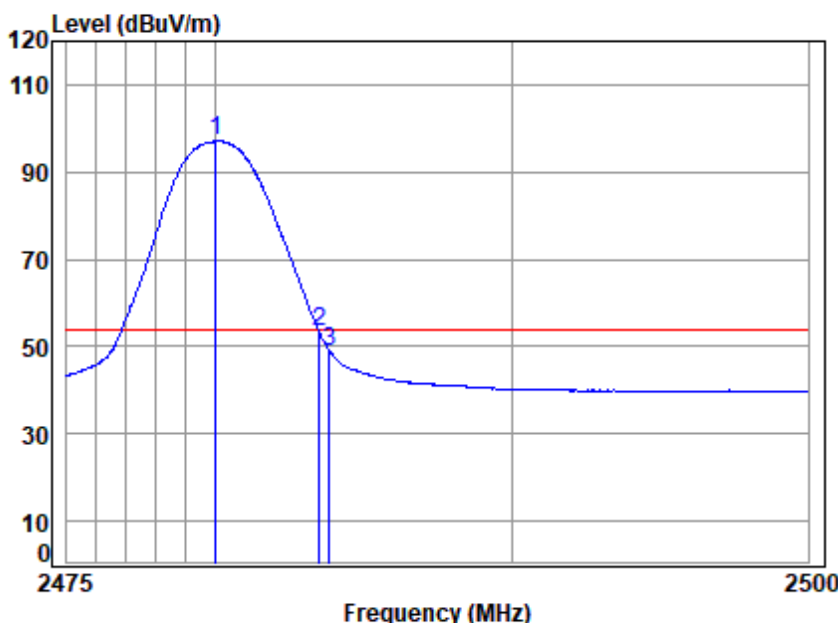


Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2480 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2480.000	4.49	28.67	41.01	106.72	98.87	74.00	24.87	peak
2 2483.500	4.49	28.67	41.01	65.87	58.02	74.00	-15.98	peak
3 2483.846	4.49	28.67	41.01	63.35	55.50	74.00	-18.50	peak



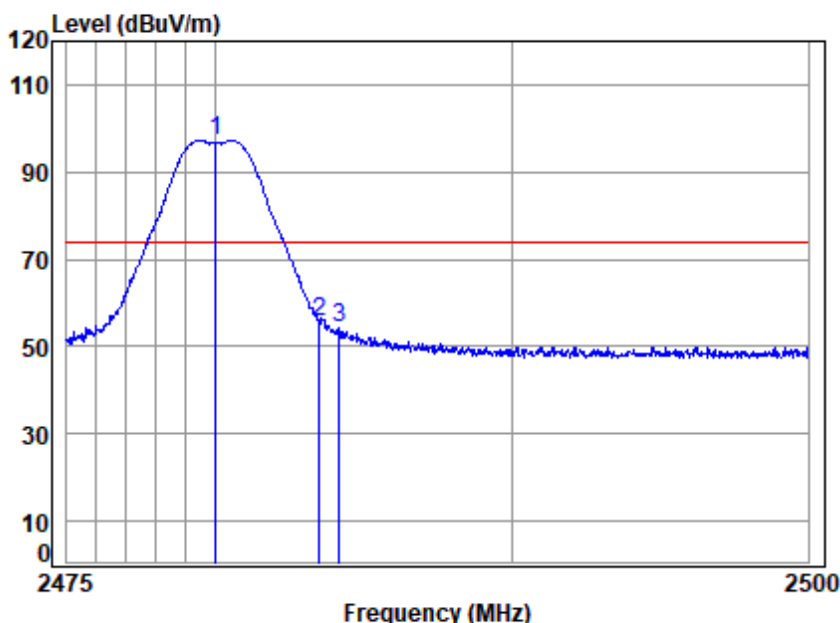
Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2480 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2480.000	4.49	28.67	41.01	104.90	97.05	54.00	43.05	Average
2 2483.500	4.49	28.67	41.01	61.13	53.28	54.00	-0.72	Average
3 2483.821	4.49	28.67	41.01	56.89	49.04	54.00	-4.96	Average

Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: High



Site : chamber

Condition: 3m VERTICAL

Job No : 08718CR/08719CR

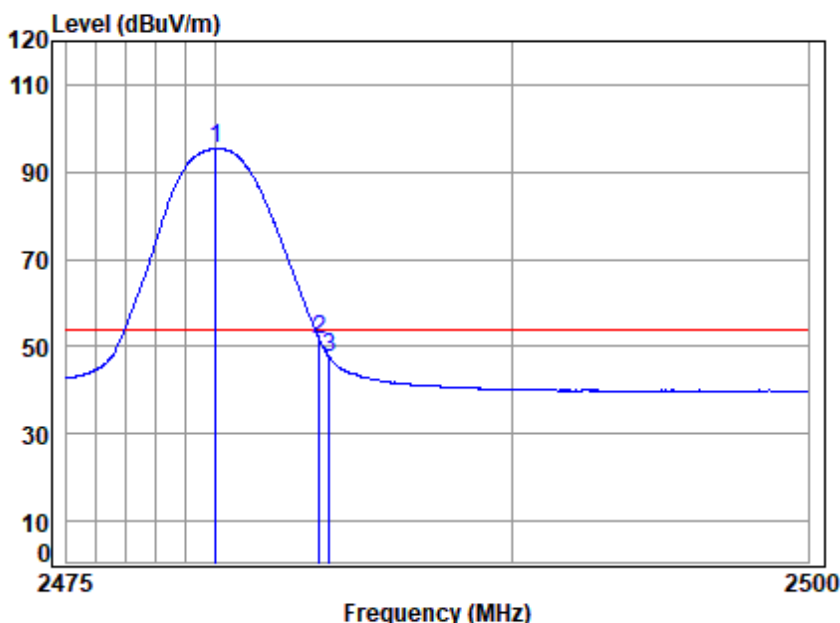
Mode : 2480 Band edge

Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2480.000	4.49	28.67	41.01	105.01	97.16	74.00	23.16	peak
2 2483.500	4.49	28.67	41.01	63.55	55.70	74.00	-18.30	peak
3 2484.171	4.50	28.67	41.01	62.17	54.33	74.00	-19.67	peak



Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: High



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2480 Band edge
Note : Zigbee

	Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 * 2480.000	4.49	28.67	41.01	103.24	95.39	54.00	41.39	Average
2 2483.500	4.49	28.67	41.01	59.42	51.57	54.00	-2.43	Average
3 2483.821	4.49	28.67	41.01	55.48	47.63	54.00	-6.37	Average

7.7 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

Limit:

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

7.7.1 E.U.T. Operation

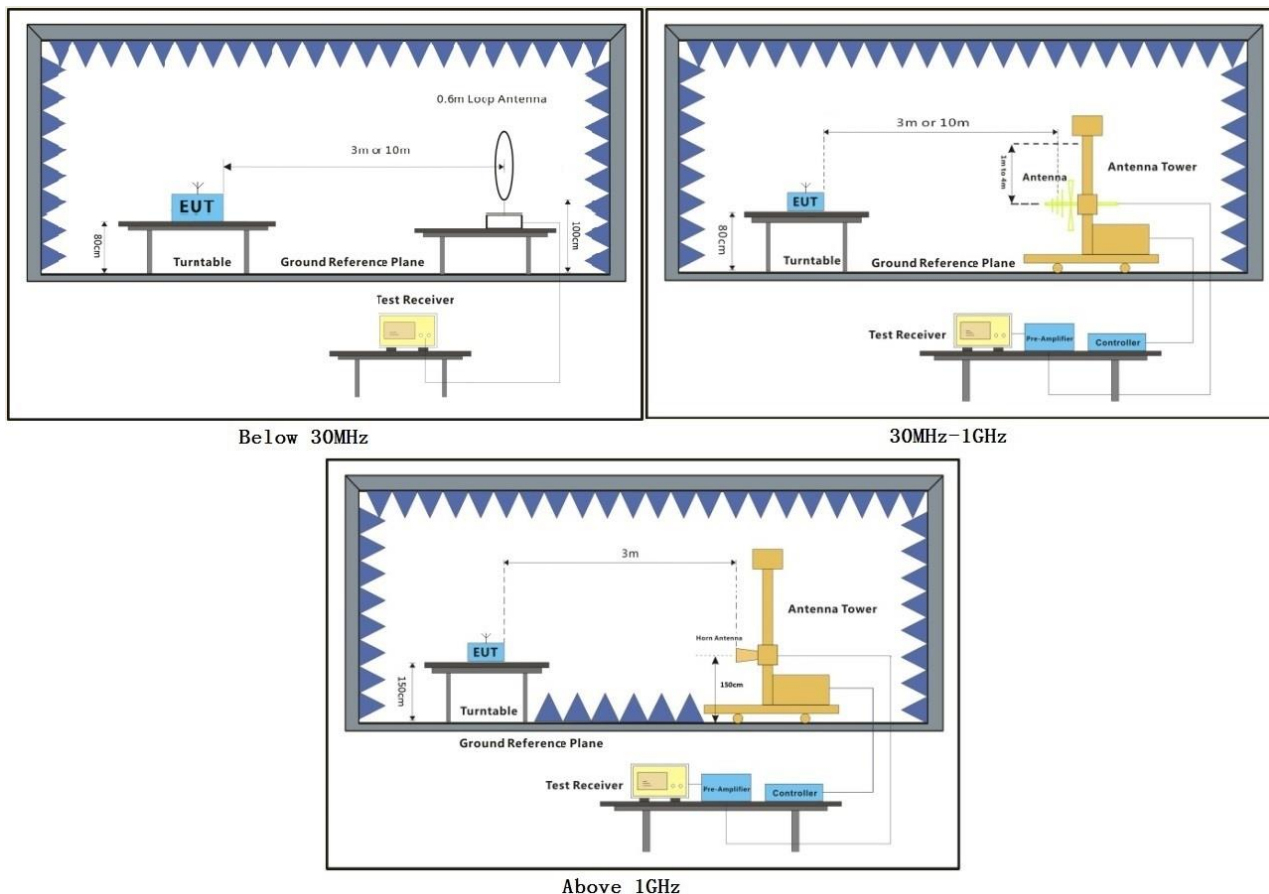
Operating Environment:

Temperature: °C Humidity: % RH Atmospheric Pressure: mbar

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.7.3 Test Setup Diagram





7.7.4 Measurement Procedure and Data

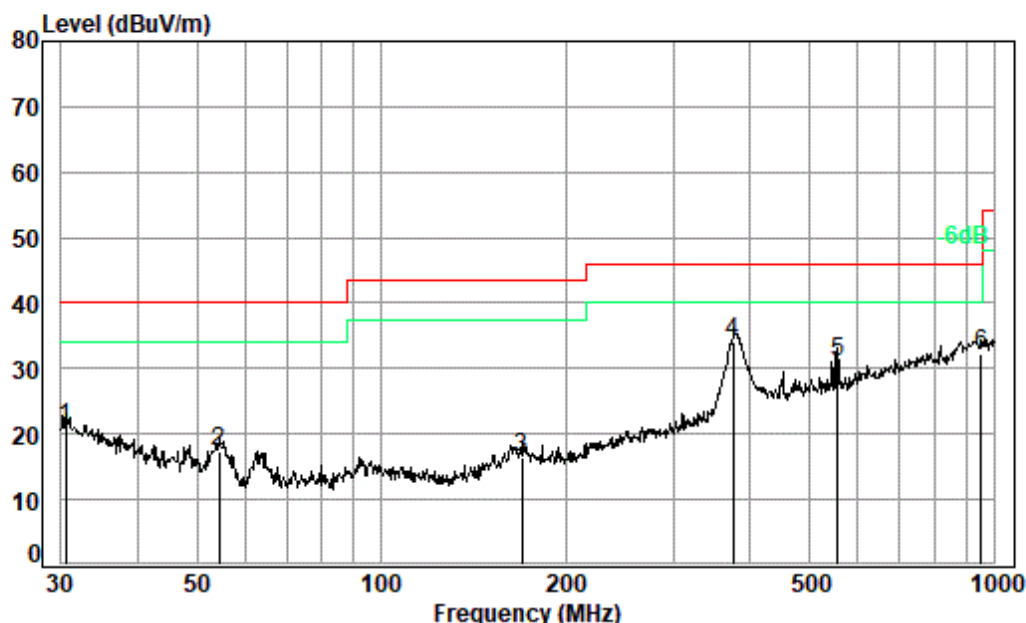
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

- 1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$
- 3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 4) For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



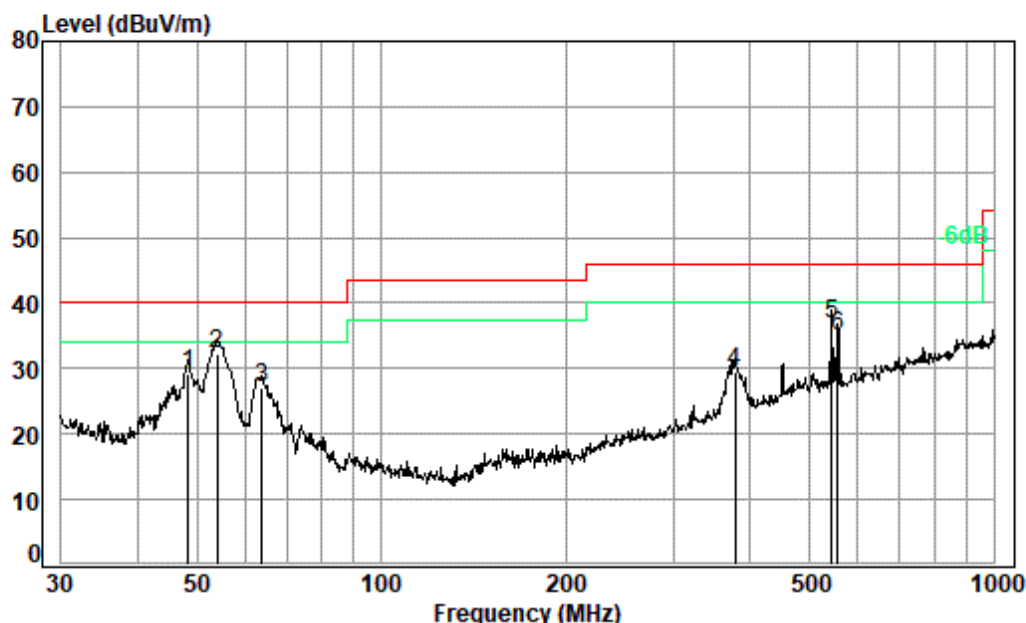
Test Mode: 05; Polarity: Horizontal



Condition: 3m HORIZONTAL
Job No. : 08718CR/08719CR
Test Mode: 05

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.53	0.61	22.59	27.73	25.59	21.06	40.00	-18.94	QP
2	54.45	0.75	13.36	27.67	30.94	17.38	40.00	-22.62	QP
3	169.60	1.18	15.59	27.25	26.91	16.43	43.50	-27.07	QP
4 pp	375.94	2.24	22.20	27.28	36.99	34.15	46.00	-11.85	QP
5	556.77	2.62	25.03	27.99	31.41	31.07	46.00	-14.93	QP
6	952.09	3.55	29.38	26.90	26.25	32.28	46.00	-13.72	QP

Test Mode: 05; Polarity: Vertical



Condition: 3m VERTICAL

Job No. : 08718CR/08719CR

Test Mode: 05

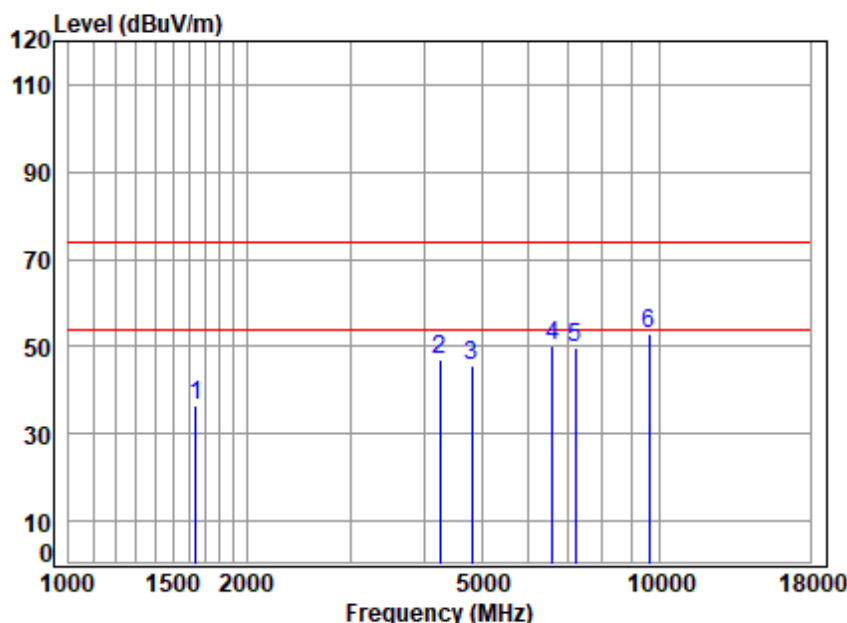
		Cable	Ant	Preamp	Read	Limit	Over	
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	48.33	0.70	14.52	27.69	41.77	29.30	40.00	-10.70 QP
2	53.88	0.74	13.50	27.67	45.68	32.25	40.00	-7.75 QP
3	63.76	0.80	12.74	27.66	41.12	27.00	40.00	-13.00 QP
4	378.58	2.24	22.20	27.29	32.47	29.62	46.00	-16.38 QP
5	543.27	2.59	25.03	27.95	37.15	36.82	46.00	-9.18 QP
6	556.77	2.62	25.03	27.99	35.27	34.93	46.00	-11.07 QP



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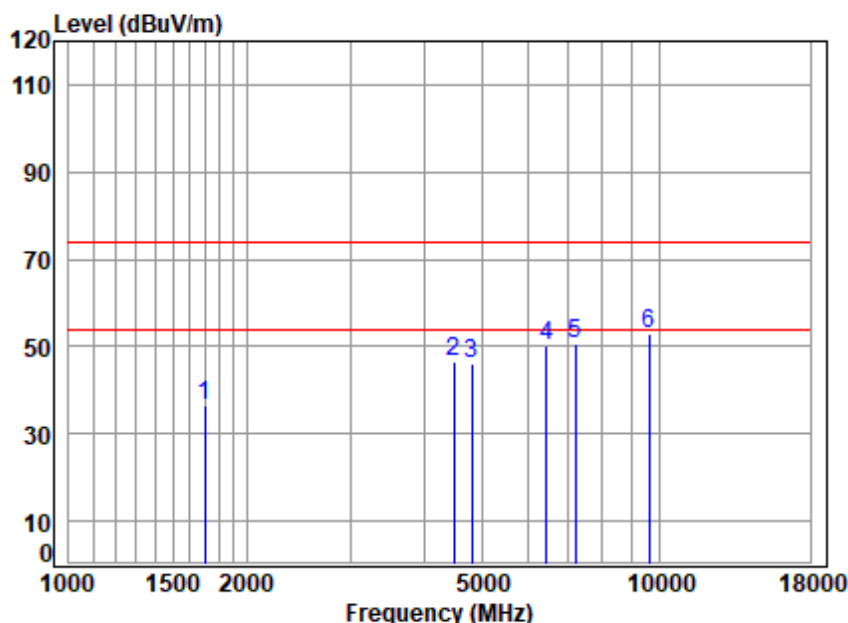
Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: Low



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2405 TX SE
Note : zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq		Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz		dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1644.019	3.38	26.44	40.60	47.30	36.52	74.00	-37.48	peak
2	4242.641	6.52	33.15	42.35	49.45	46.77	74.00	-27.23	peak
3	4810.000	7.10	33.98	42.77	47.25	45.56	74.00	-28.44	peak
4	6583.209	8.32	35.65	41.91	47.98	50.04	74.00	-23.96	peak
5	7215.000	8.75	36.08	41.57	46.31	49.57	74.00	-24.43	peak
6	9620.000	10.80	37.67	38.56	43.09	53.00	74.00	-21.00	peak

Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: Low



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2405 TX SE
Note : zigbee

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1702.042	3.43	26.68	40.63	46.85	36.33	74.00	-37.67	peak
2	4482.150	6.74	33.57	42.54	48.65	46.42	74.00	-27.58	peak
3	4810.000	7.10	33.98	42.77	47.84	46.15	74.00	-27.85	peak
4	6451.353	8.28	35.55	41.98	48.22	50.07	74.00	-23.93	peak
5	7215.000	8.75	36.08	41.57	47.43	50.69	74.00	-23.31	peak
6	9620.000	10.80	37.67	38.56	42.82	52.73	74.00	-21.27	peak

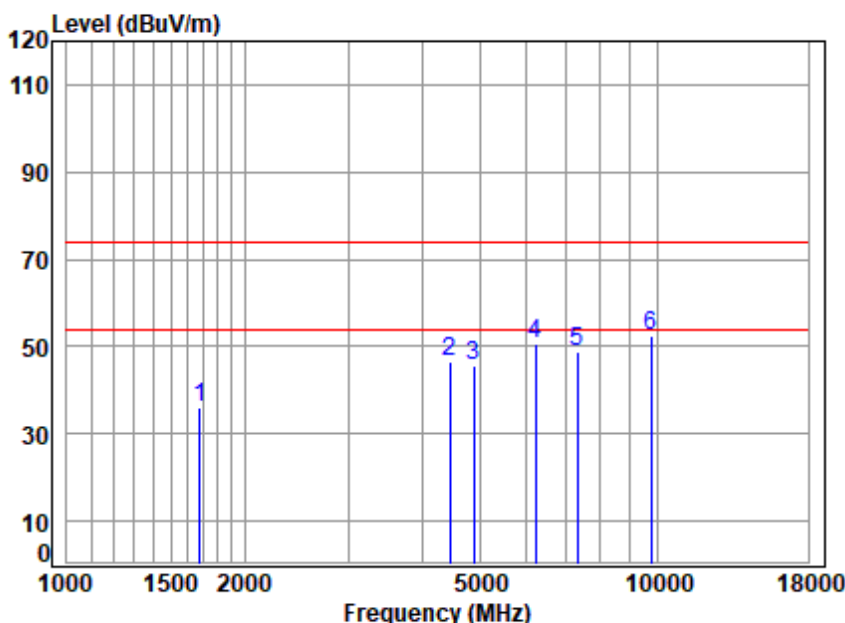


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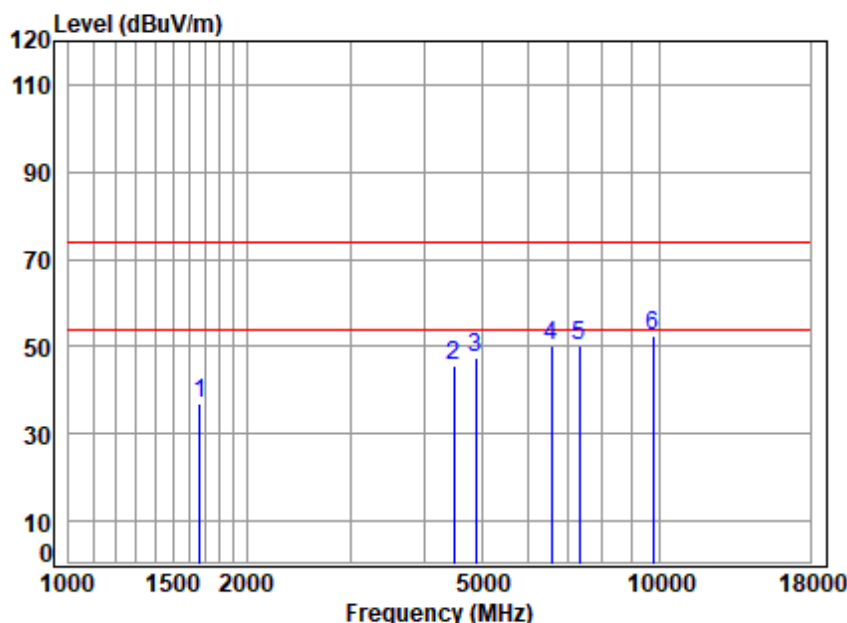
Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: middle



Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2440 TX SE
Note : zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq		Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz		dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1682.477	3.42	26.60	40.62	46.46	35.86	74.00	-38.14	peak
2	4456.315	6.72	33.53	42.52	48.99	46.72	74.00	-27.28	peak
3	4880.000	7.18	34.06	42.82	47.09	45.51	74.00	-28.49	peak
4	6213.441	8.27	35.32	42.11	49.33	50.81	74.00	-23.19	peak
5	7320.000	8.84	36.16	41.52	45.31	48.79	74.00	-25.21	peak
6	9760.000	10.76	37.76	38.35	42.36	52.53	74.00	-21.47	peak

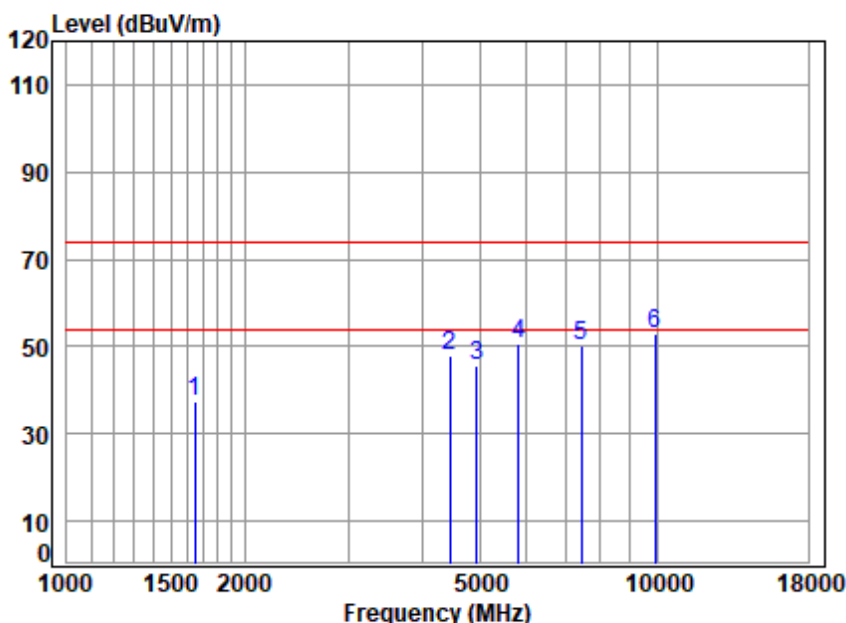
Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: middle



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2440 TX SE
Note : zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1667.951	3.40	26.54	40.61	47.62	36.95	74.00	-37.05	peak
2	4482.150	6.74	33.57	42.54	48.06	45.83	74.00	-28.17	peak
3	4880.000	7.18	34.06	42.82	48.81	47.23	74.00	-26.77	peak
4	6564.209	8.31	35.64	41.92	48.28	50.31	74.00	-23.69	peak
5	7320.000	8.84	36.16	41.52	46.78	50.26	74.00	-23.74	peak
6	9760.000	10.76	37.76	38.35	42.49	52.66	74.00	-21.34	peak

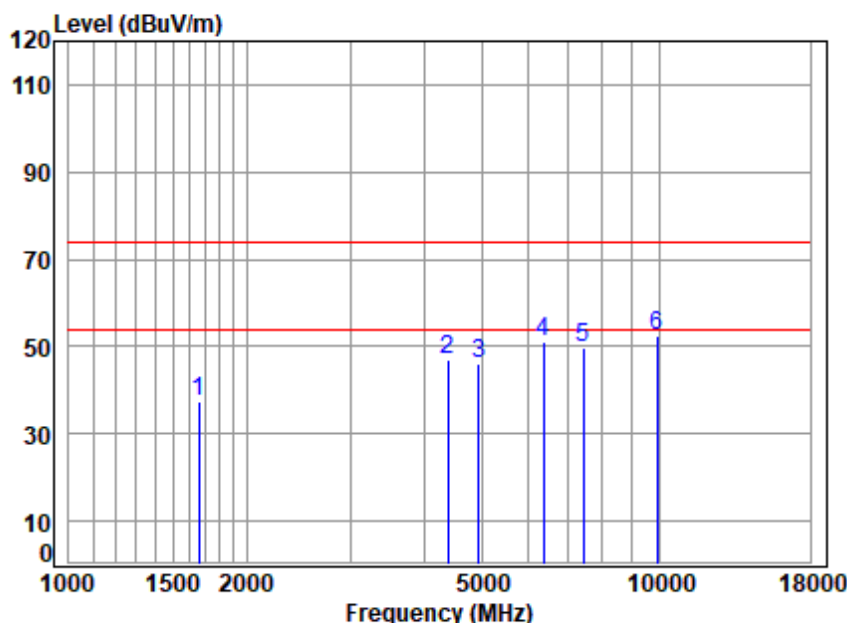
Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: High-1



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 08718CR/08719CR
 Mode : 2475 TX SE
 Note : zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1648.778	3.39	26.46	40.60	48.10	37.35	74.00	-36.65	peak
2	4456.315	6.72	33.53	42.52	50.07	47.80	74.00	-26.20	peak
3	4950.000	7.25	34.14	42.87	47.09	45.61	74.00	-28.39	peak
4	5813.812	8.23	34.92	42.35	50.05	50.85	74.00	-23.15	peak
5	7425.000	8.94	36.24	41.47	46.44	50.15	74.00	-23.85	peak
6	9900.000	10.72	37.84	38.14	42.31	52.73	74.00	-21.27	peak

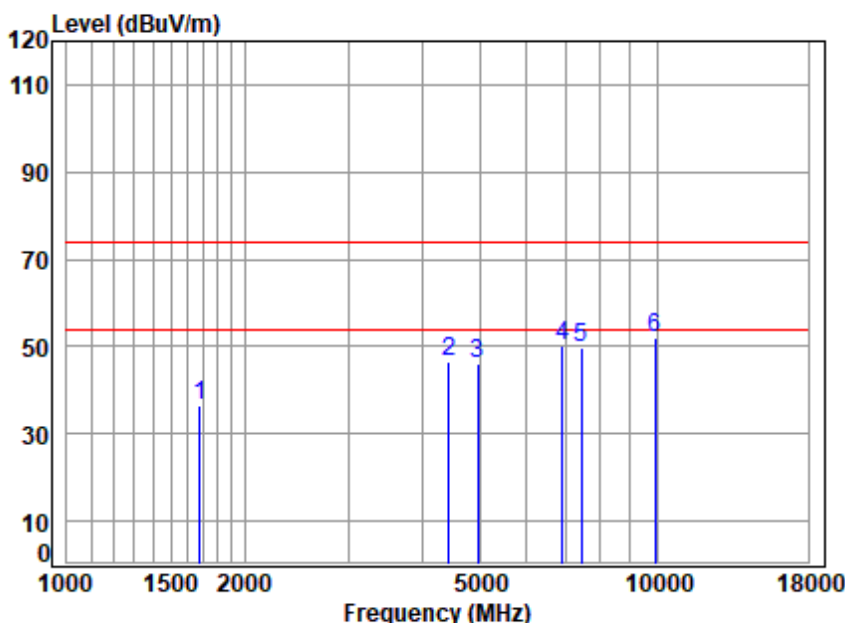
Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: High-1



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2475 TX SE
Note : zigbee

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1663.137	3.40	26.52	40.61	48.28	37.59	74.00	-36.41	peak
2	4379.699	6.65	33.39	42.46	49.34	46.92	74.00	-27.08	peak
3	4950.000	7.25	34.14	42.87	47.52	46.04	74.00	-27.96	peak
4	6358.789	8.27	35.46	42.03	49.21	50.91	74.00	-23.09	peak
5	7425.000	8.94	36.24	41.47	46.07	49.78	74.00	-24.22	peak
6	9900.000	10.72	37.84	38.14	41.96	52.38	74.00	-21.62	peak

Test Mode: 05; Polarity: Horizontal; Modulation: O-QPSK; Channel: High



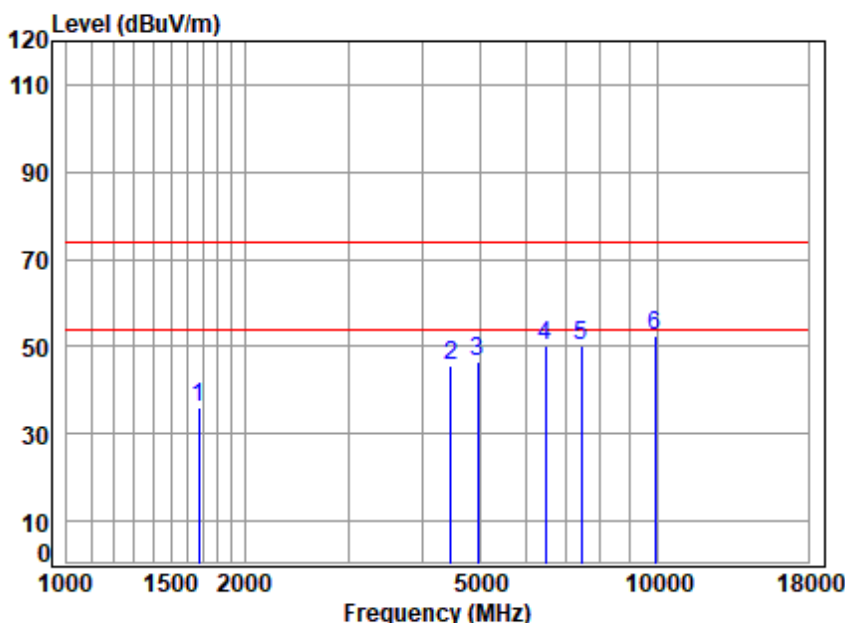
Site : chamber
Condition: 3m HORIZONTAL
Job No : 08718CR/08719CR
Mode : 2480 TX SE
Note : zigbee

		Cable	Ant	Preamp	Read		Limit	Over	
Freq	Loss	Factor	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1677.621	3.41	26.58	40.62	46.92	36.29	74.00	-37.71	peak
2	4430.628	6.70	33.48	42.50	48.99	46.67	74.00	-27.33	peak
3	4960.000	7.26	34.15	42.87	47.68	46.22	74.00	-27.78	peak
4	6914.763	8.50	35.85	41.73	47.65	50.27	74.00	-23.73	peak
5	7440.000	8.96	36.25	41.46	45.93	49.68	74.00	-24.32	peak
6	9920.000	10.71	37.85	38.12	41.68	52.12	74.00	-21.88	peak



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Test Mode: 05; Polarity: Vertical; Modulation: O-QPSK; Channel: High



Site : chamber
Condition: 3m VERTICAL
Job No : 08718CR/08719CR
Mode : 2480 TX SE
Note : zigbee

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1672.779	3.41	26.56	40.62	46.58	35.93	74.00	-38.07	peak
2	4469.214	6.73	33.55	42.53	47.83	45.58	74.00	-28.42	peak
3	4960.000	7.26	34.15	42.87	48.04	46.58	74.00	-27.42	peak
4	6470.026	8.28	35.57	41.97	48.28	50.16	74.00	-23.84	peak
5	7440.000	8.96	36.25	41.46	46.62	50.37	74.00	-23.63	peak
6	9920.000	10.71	37.85	38.12	42.10	52.54	74.00	-21.46	peak

8 Emission Test Results

8.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement: 47 CFR Part 15, Subpart C 15.207

Test Method: ANSI C63.10 (2013) Section 6.2

Limit:

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.

Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

8.1.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C

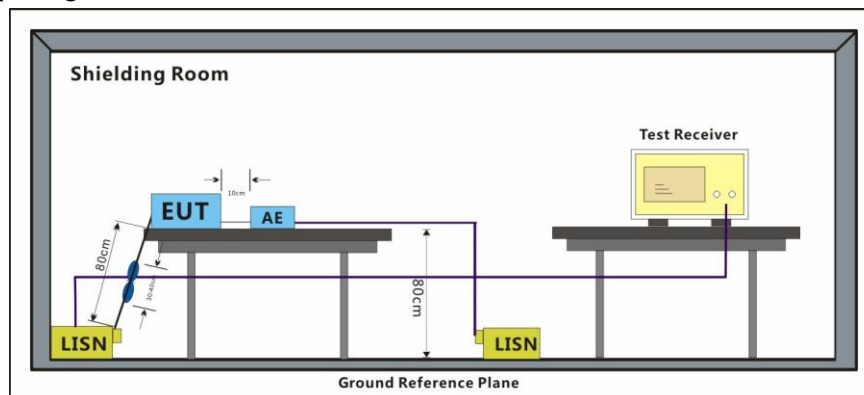
Humidity: 56 % RH

Atmospheric Pressure: 1000 mbar

8.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	05	TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

8.1.3 Test Setup Diagram

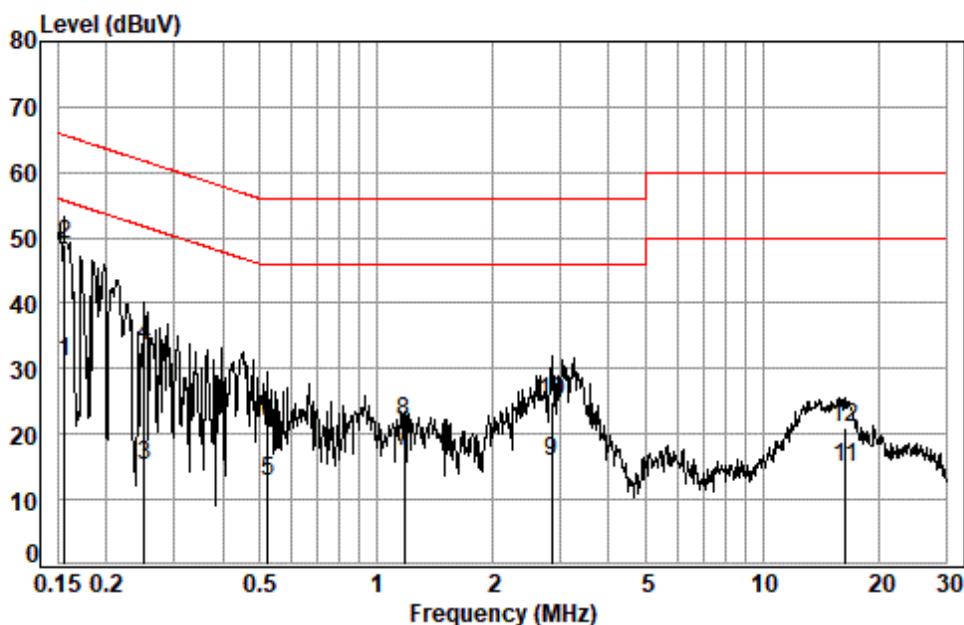


8.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

Test Mode: 05; Line: Live line



Site : Shielding Room
Condition: Line
Job No. : 08718CR
Test mode: 05

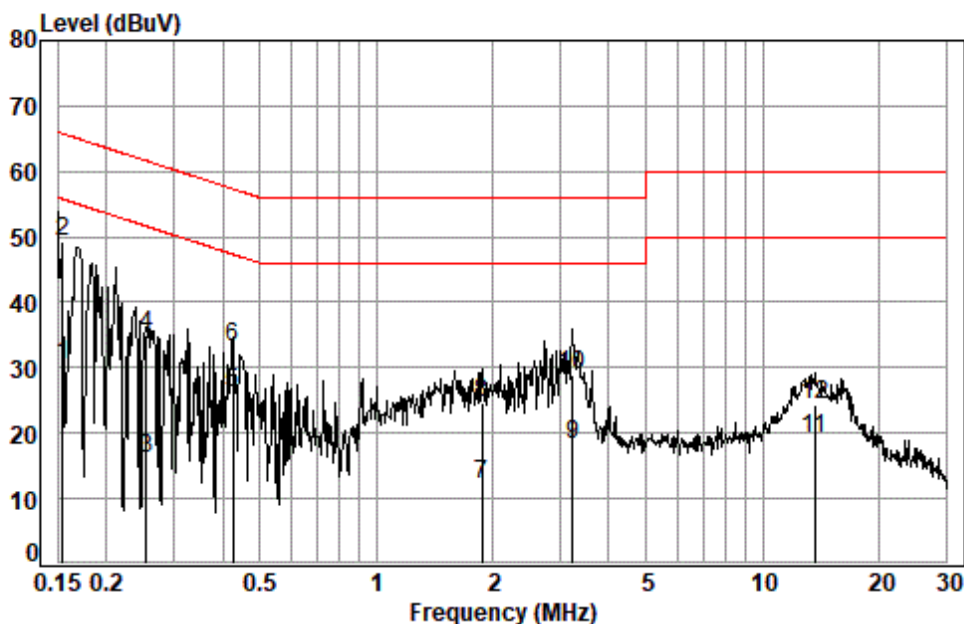
	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1557	0.01	9.68	21.38	31.07	55.69	-24.62	Average
2	0.1557	0.01	9.68	39.25	48.94	65.69	-16.75	QP
3	0.2508	0.03	9.68	5.46	15.17	51.73	-36.56	Average
4	0.2508	0.03	9.68	23.63	33.34	61.73	-28.39	QP
5	0.5238	0.06	9.69	3.02	12.77	46.00	-33.23	Average
6	0.5238	0.06	9.69	11.98	21.73	56.00	-34.27	QP
7	1.1844	0.11	9.71	7.46	17.28	46.00	-28.72	Average
8	1.1844	0.11	9.71	12.19	22.01	56.00	-33.99	QP
9	2.8390	0.16	9.76	5.90	15.82	46.00	-30.18	Average
10	2.8390	0.16	9.76	14.97	24.89	56.00	-31.11	QP
11	16.3985	0.22	10.67	4.13	15.02	50.00	-34.98	Average
12	16.3985	0.22	10.67	10.13	21.02	60.00	-38.98	QP



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Test Mode: 05; Line: Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 08718CR
Test mode: 05

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.1540	0.01	9.67	20.78	30.46	55.78	-25.32	Average
2	0.1540	0.01	9.67	39.61	49.29	65.78	-16.49	QP
3	0.2535	0.03	9.66	6.54	16.23	51.64	-35.41	Average
4	0.2535	0.03	9.66	25.38	35.07	61.64	-26.57	QP
5	0.4260	0.05	9.67	16.44	26.16	47.33	-21.17	Average
6	0.4260	0.05	9.67	23.35	33.07	57.33	-24.26	QP
7	1.8779	0.15	9.73	2.37	12.25	46.00	-33.75	Average
8	1.8779	0.15	9.73	14.77	24.65	56.00	-31.35	QP
9	3.2239	0.16	9.77	8.21	18.14	46.00	-27.86	Average
10	3.2239	0.16	9.77	19.12	29.05	56.00	-26.95	QP
11	13.6228	0.20	10.51	8.49	19.20	50.00	-30.80	Average
12	13.6228	0.20	10.51	13.67	24.38	60.00	-35.62	QP



9 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZEM2009008718CR



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10 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for SZEM2009008718CR





11 Appendix

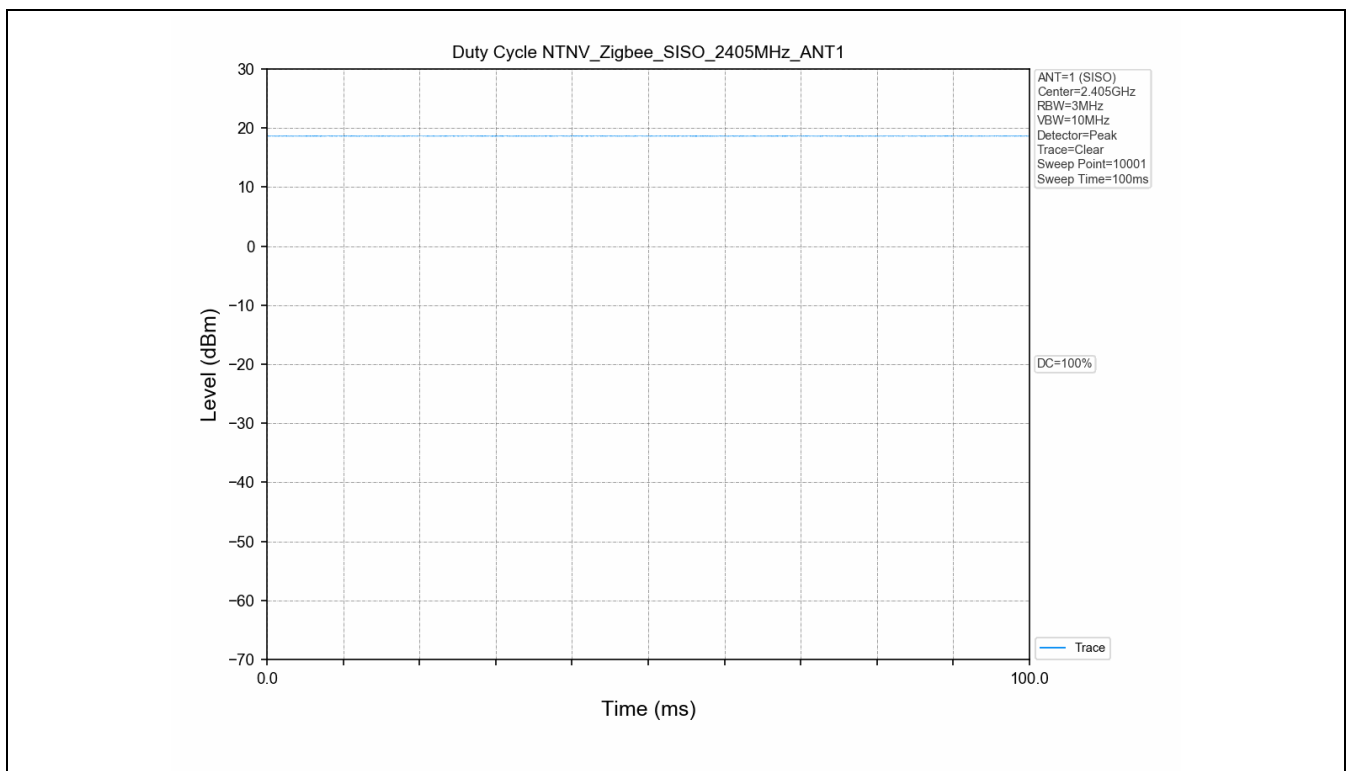
Appendix for 15.247

1. Duty Cycle

1.1 Test Result

Test Mode	Channel Frequency(MHz)	TX Type	ANT No.	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
Zigbee	2405	SISO	1	100.000	100.000	100.00	0.00
	2440	SISO	1	100.000	100.000	100.00	0.00
	2475	SISO	1	100.000	100.000	100.00	0.00
	2480	SISO	1	100.000	100.000	100.00	0.00

1.2 Test Graph

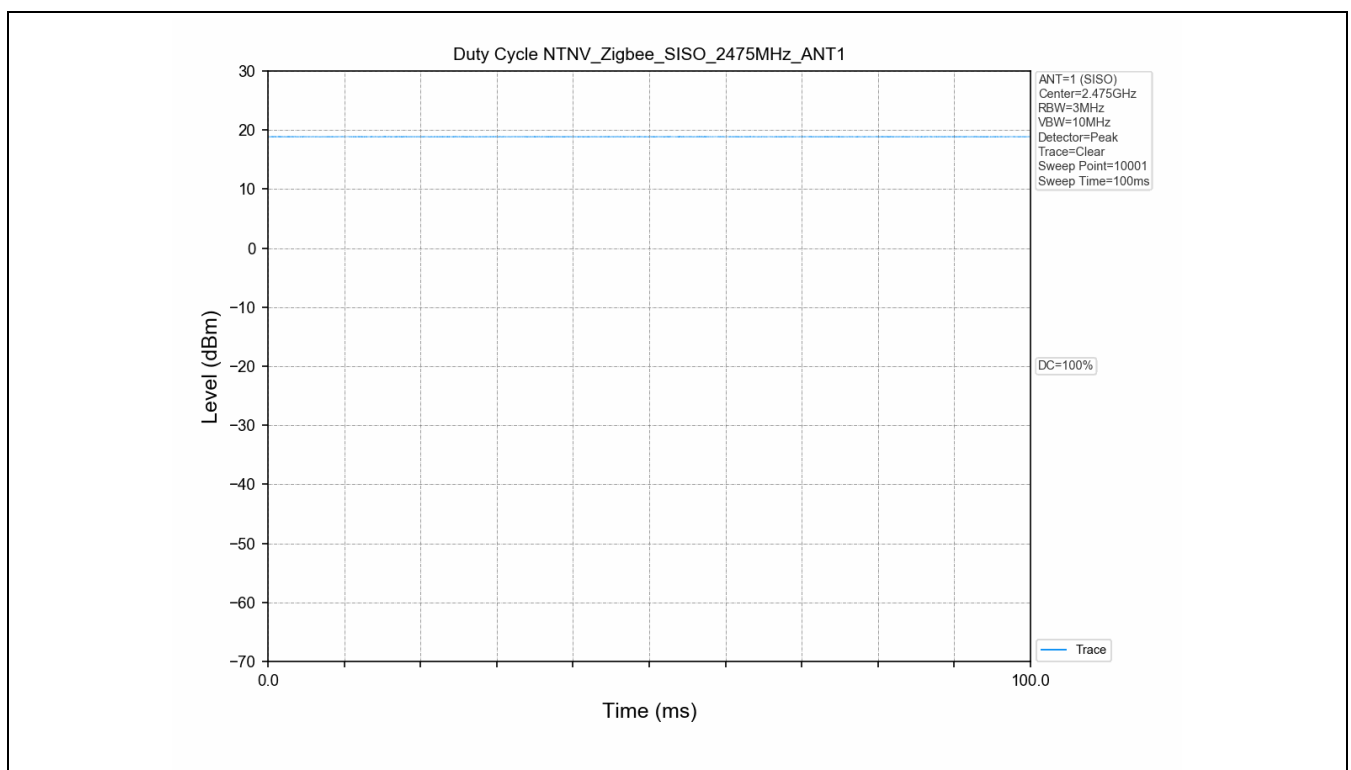
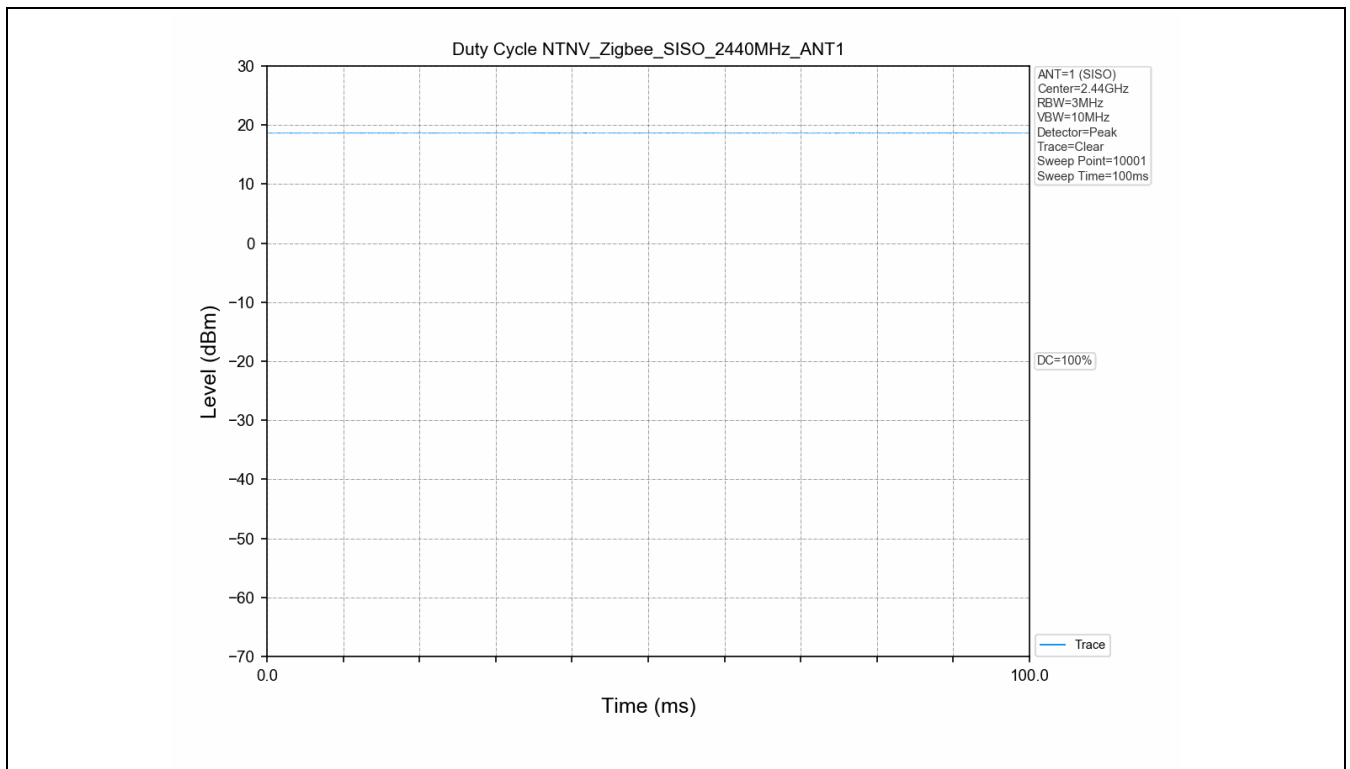


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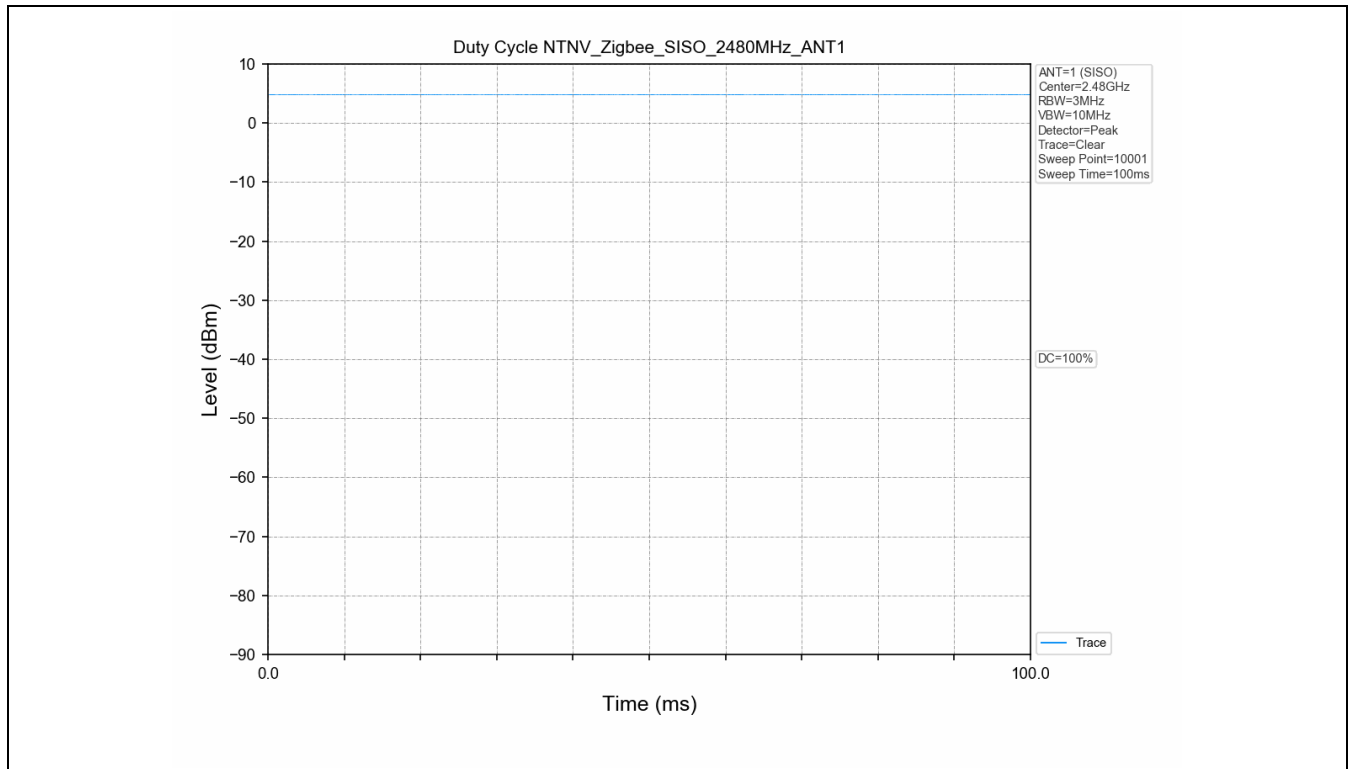
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Shenzhen Branch

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2. Bandwidth

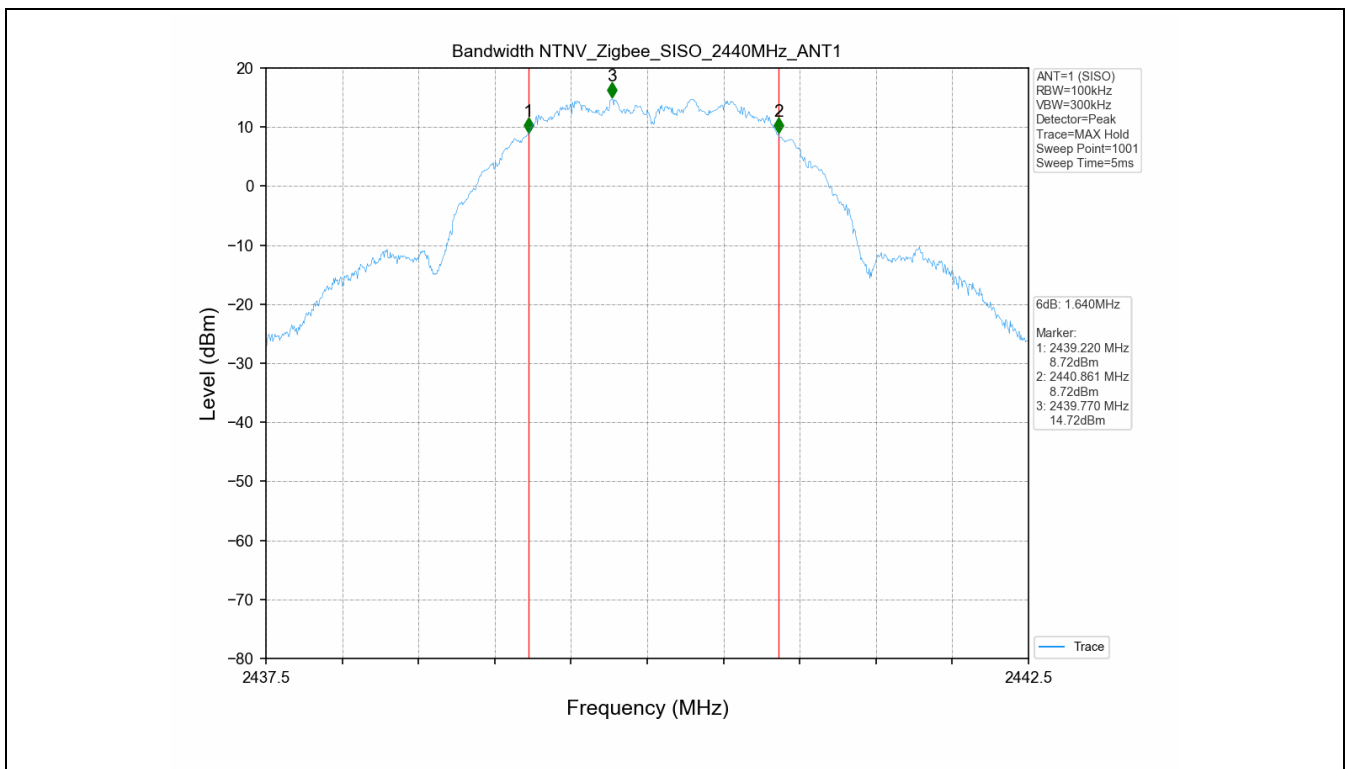
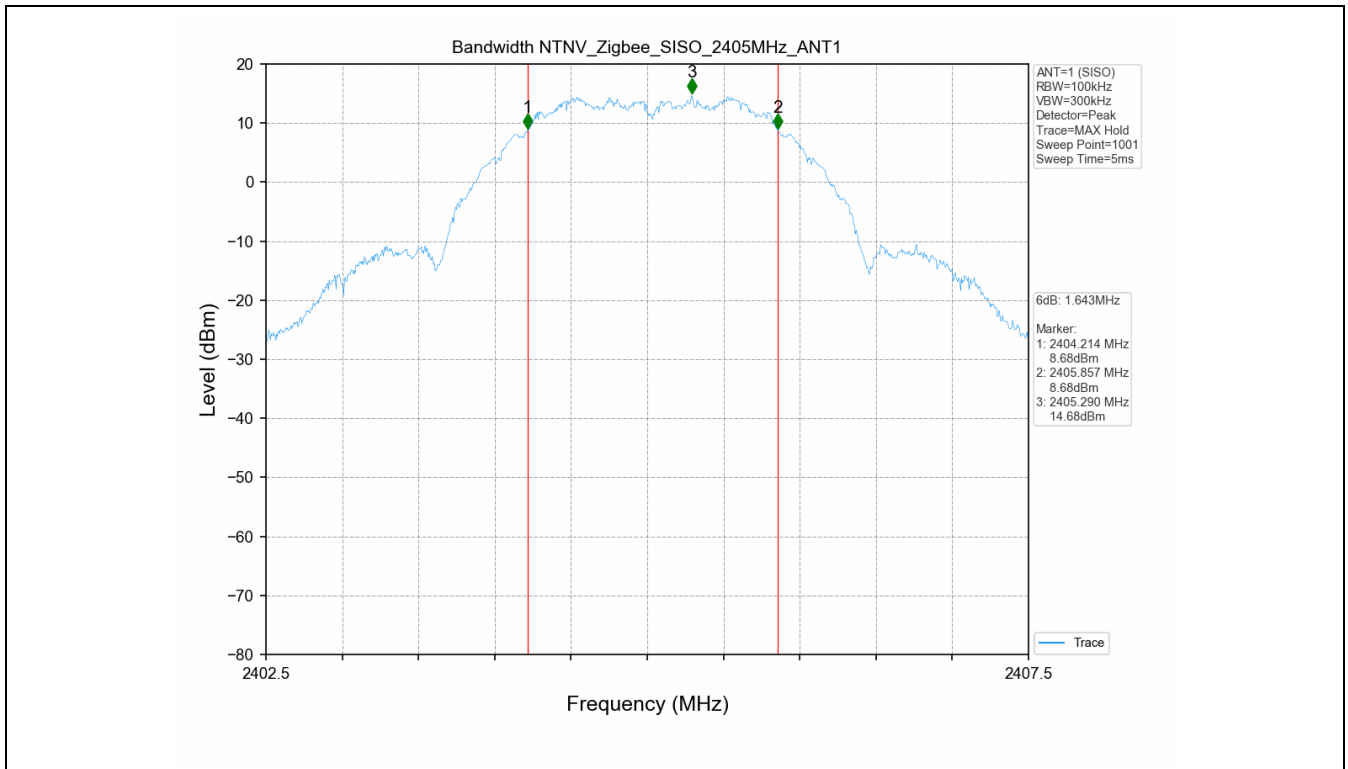
2.1 Test Result

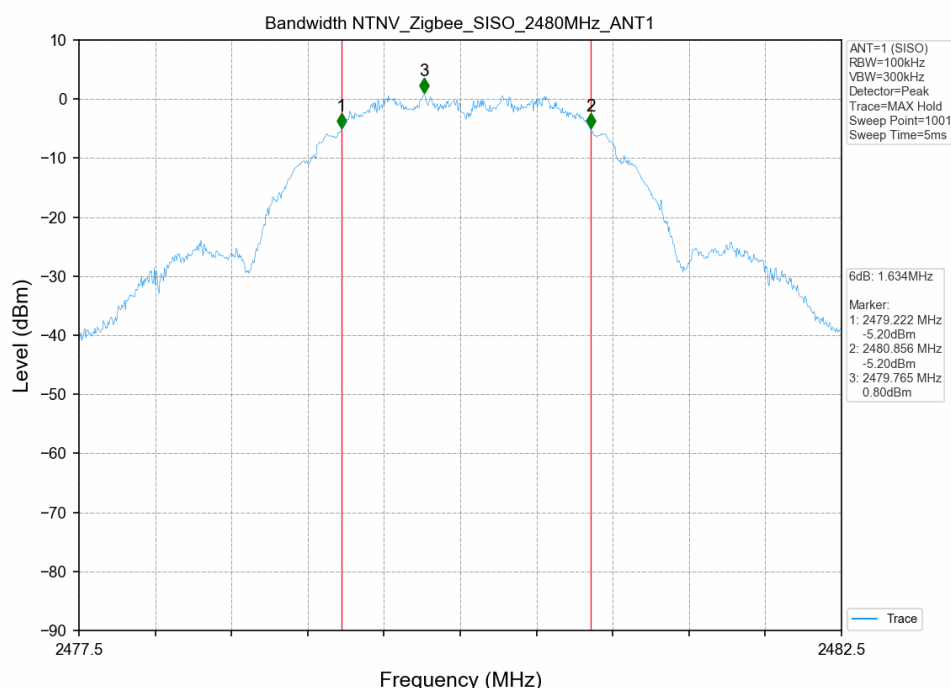
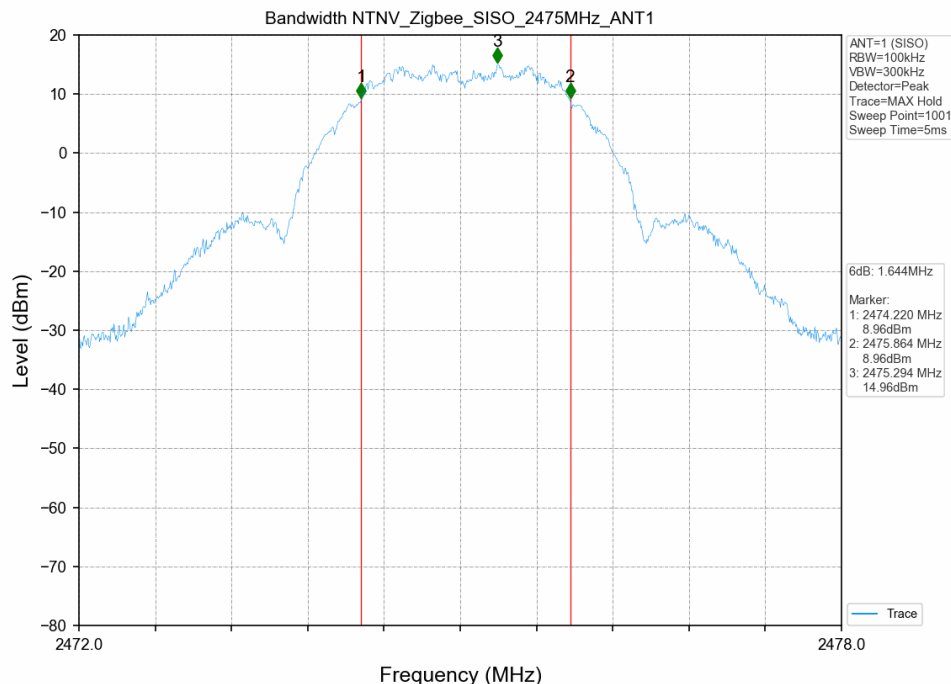
Test Mode	Frequency (MHz)	TX Type	ANT No.	6dB Bandwidth		Verdict
				Test Result (MHz)	Limits (MHz)	
Zigbee	2405	SISO	1	1.643	≥0.5	PASS
	2440	SISO	1	1.640	≥0.5	PASS
	2475	SISO	1	1.644	≥0.5	PASS
	2480	SISO	1	1.634	≥0.5	PASS

Test Mode	Frequency (MHz)	TX Type	ANT No.	99% Occupied Bandwidth	
				Test Result (MHz)	
Zigbee	2405	SISO	1	2.255	Only for Report Use
	2440	SISO	1	2.261	Only for Report Use
	2475	SISO	1	2.268	Only for Report Use
	2480	SISO	1	2.267	Only for Report Use

2.2 Test Graph - 6dB Bandwidth







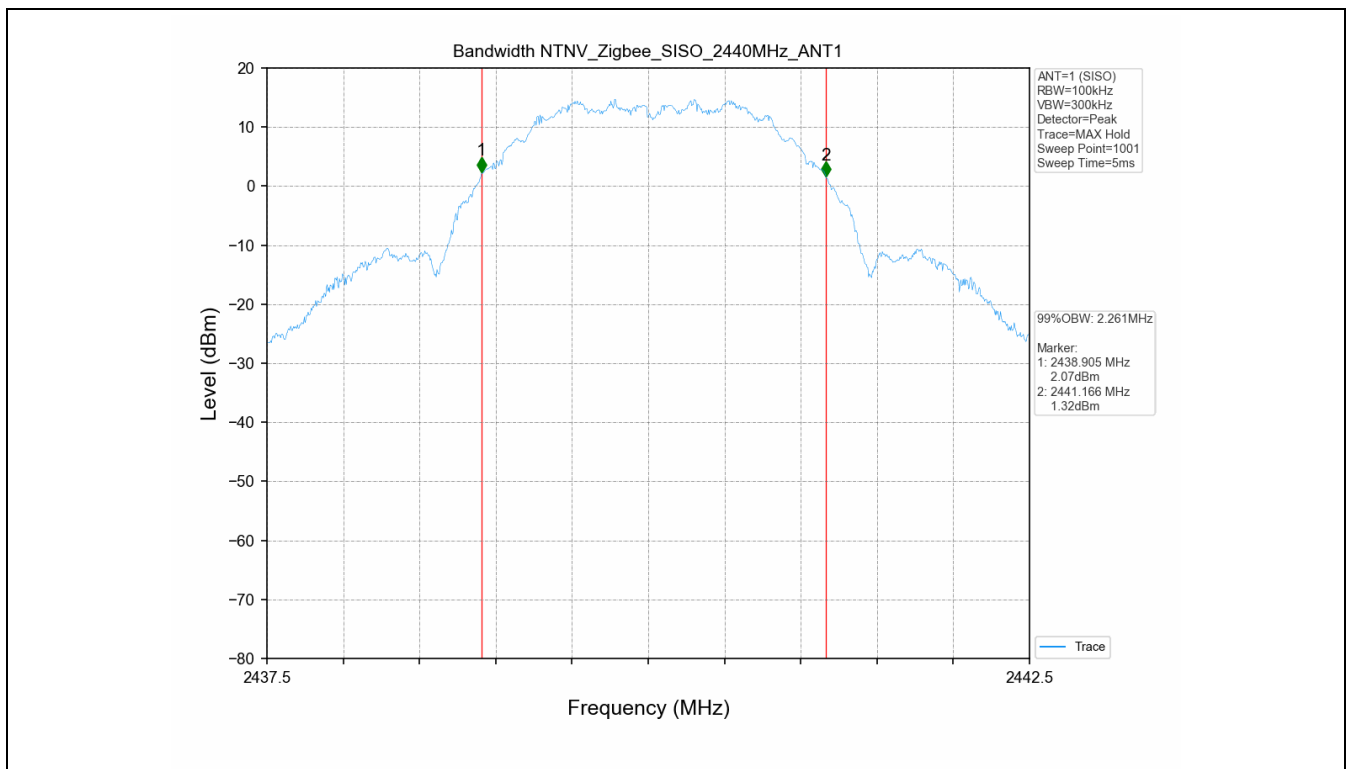
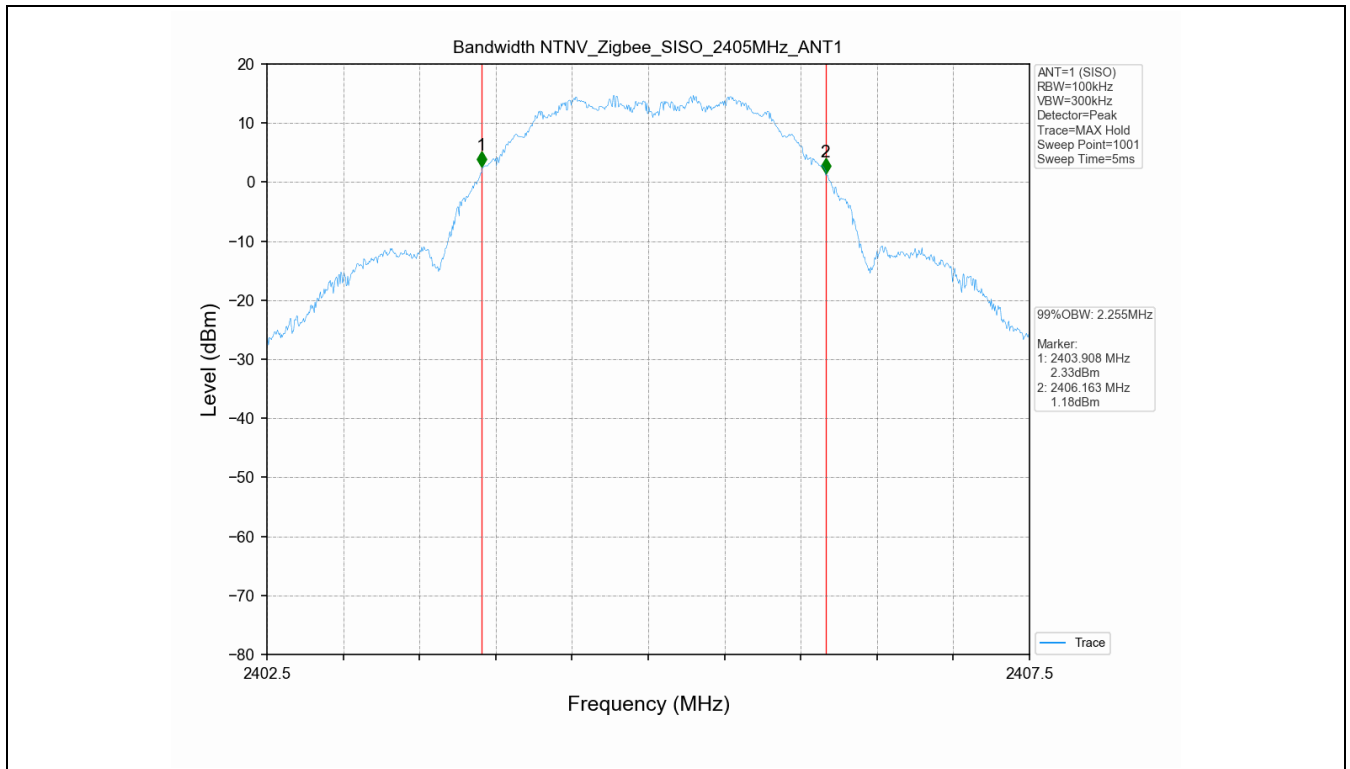
2.3 Test Graph - 99% Occupied Bandwidth

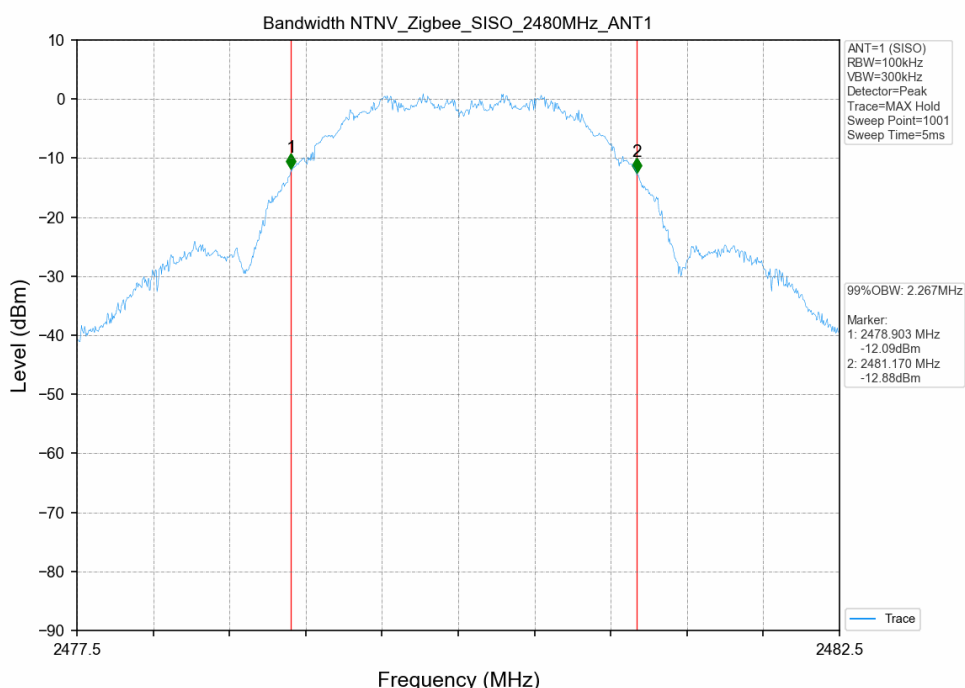
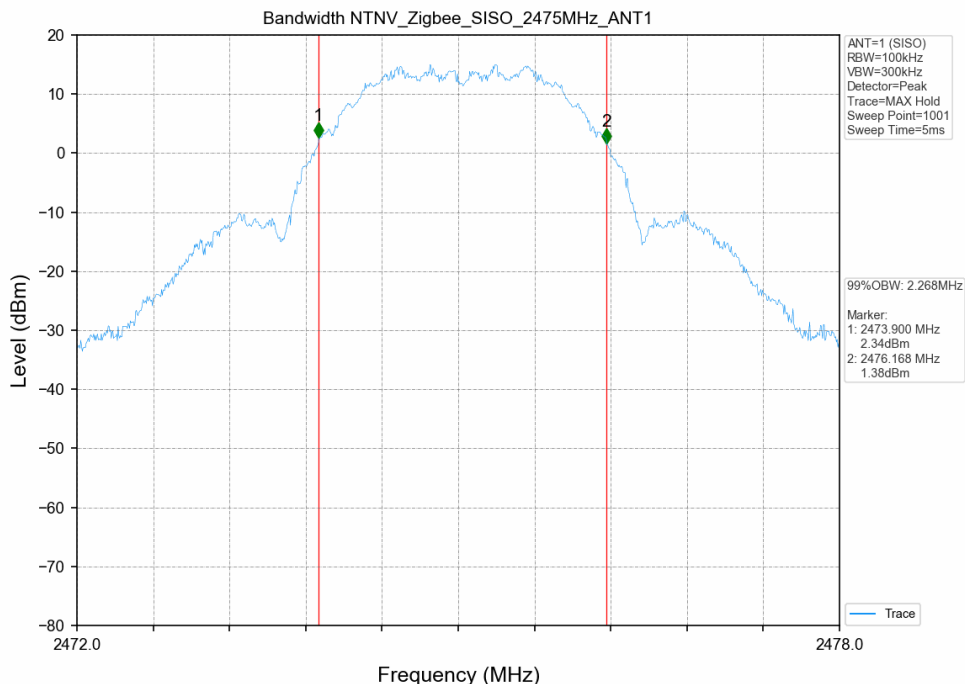


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3. Maximum Conducted Output Power

3.1 Test Result



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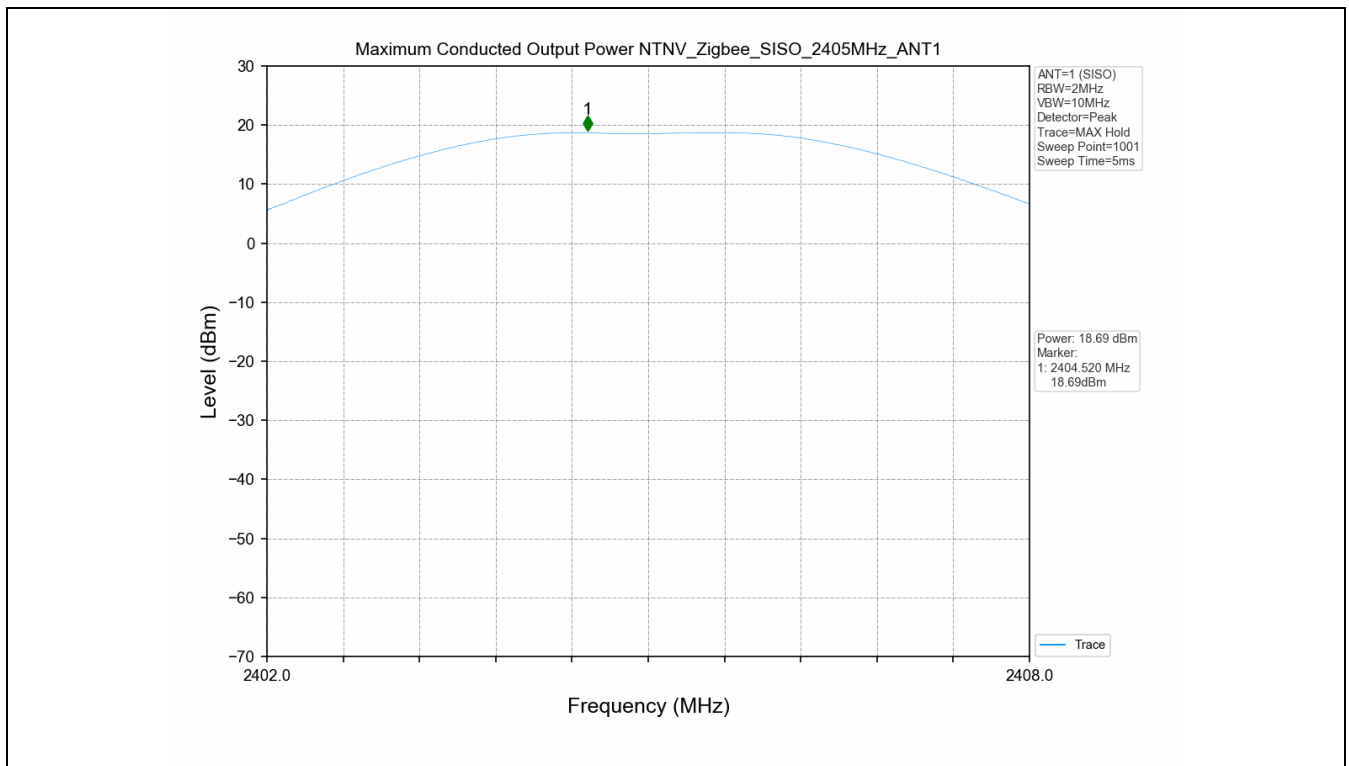
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Test Mode	Frequency (MHz)	Tx Type	Measured Peak Output Power (dBm)	Limits (dBm)	Verdict
			Ant 1		
Zigbee	2405	SISO	18.69	30	PASS
	2440	SISO	18.68	30	PASS
	2475	SISO	18.93	30	PASS
	2480	SISO	4.91	30	PASS

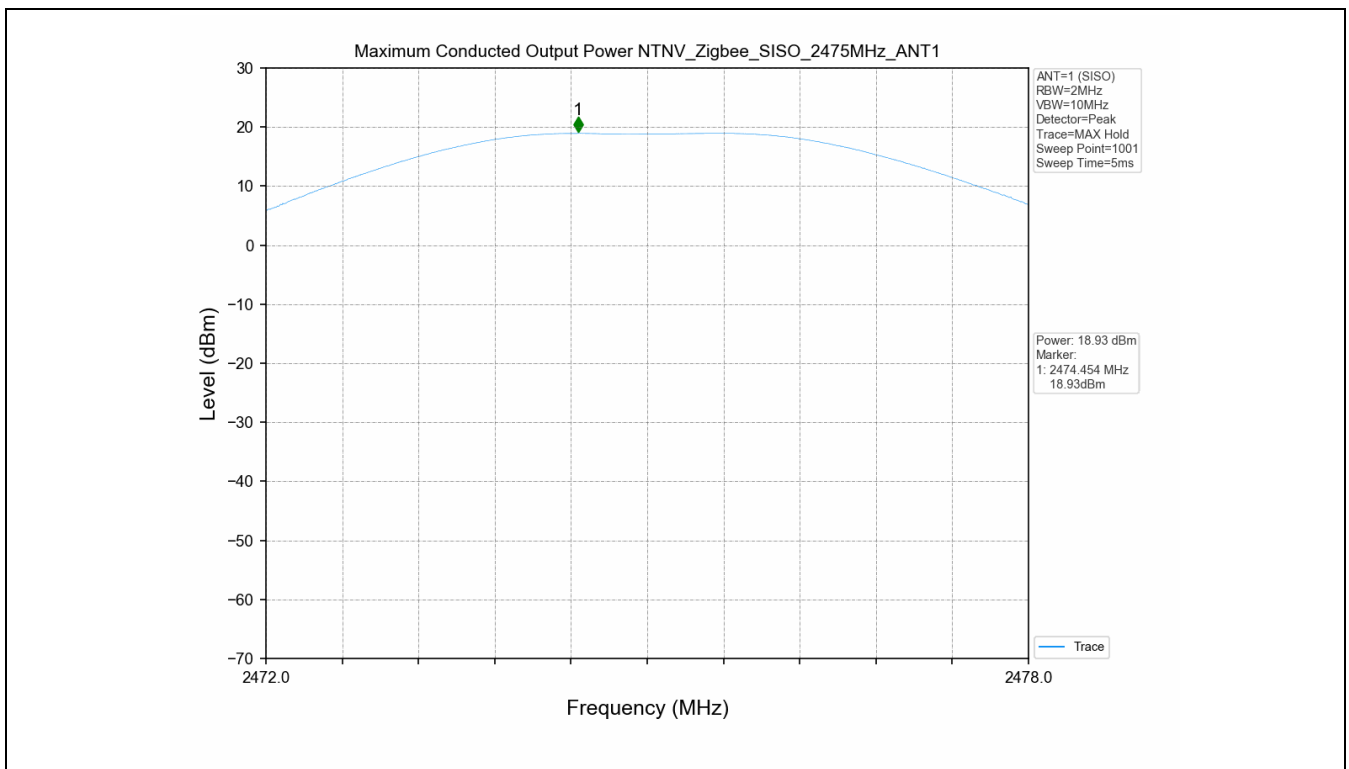
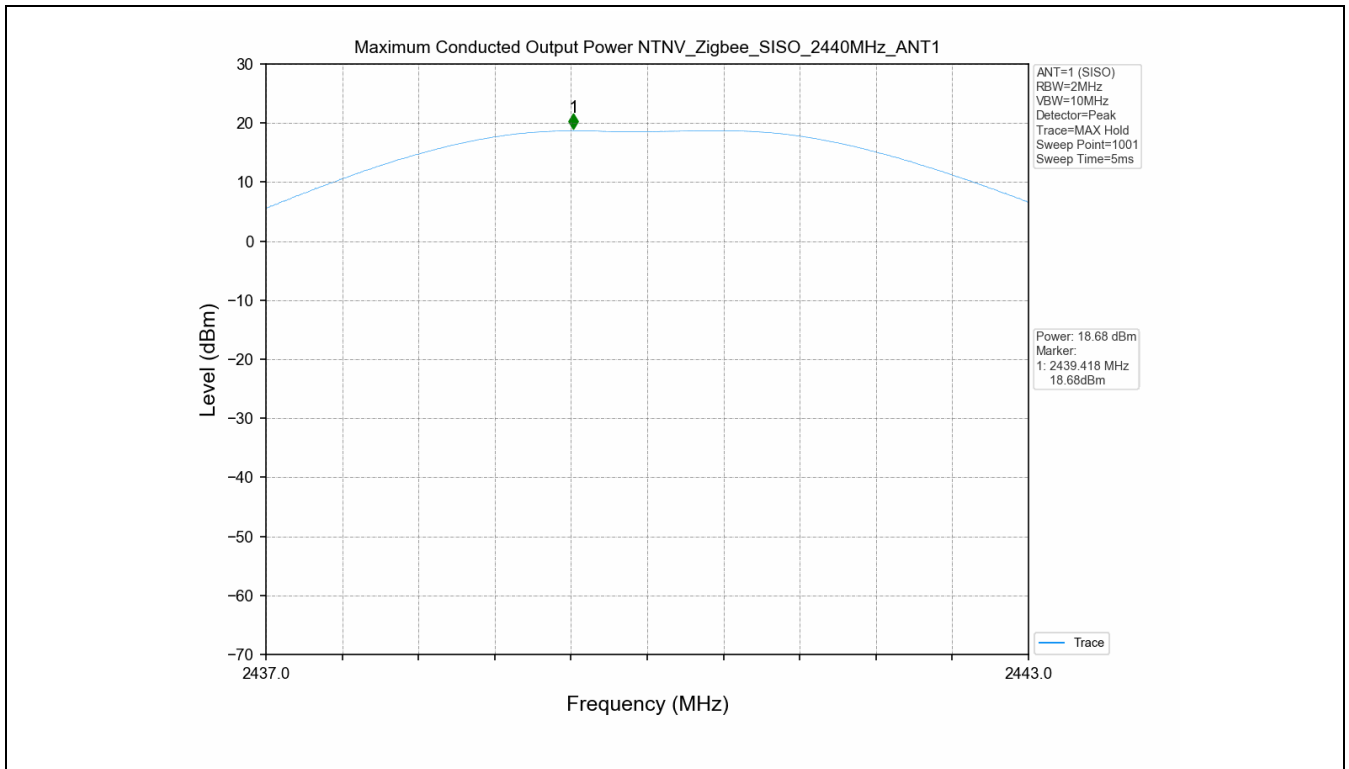
3.2 Test Graph

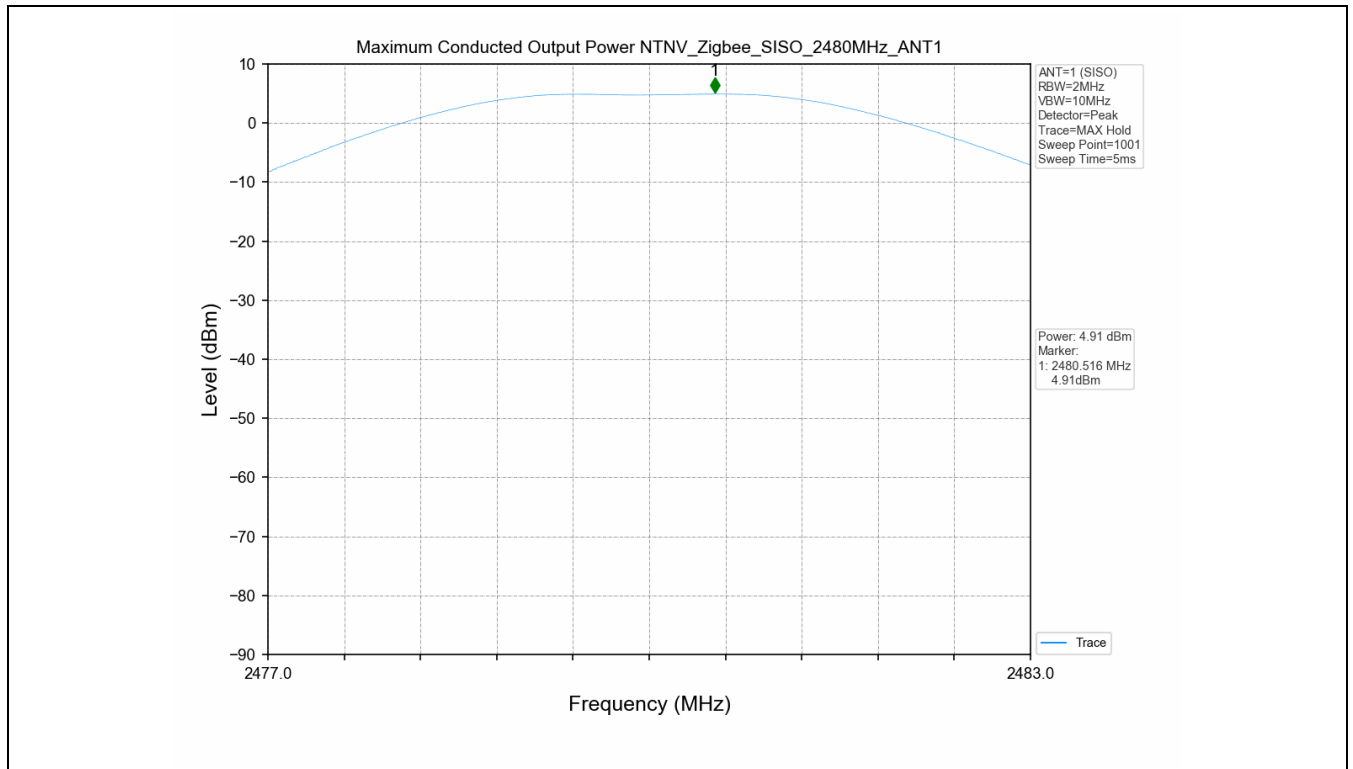


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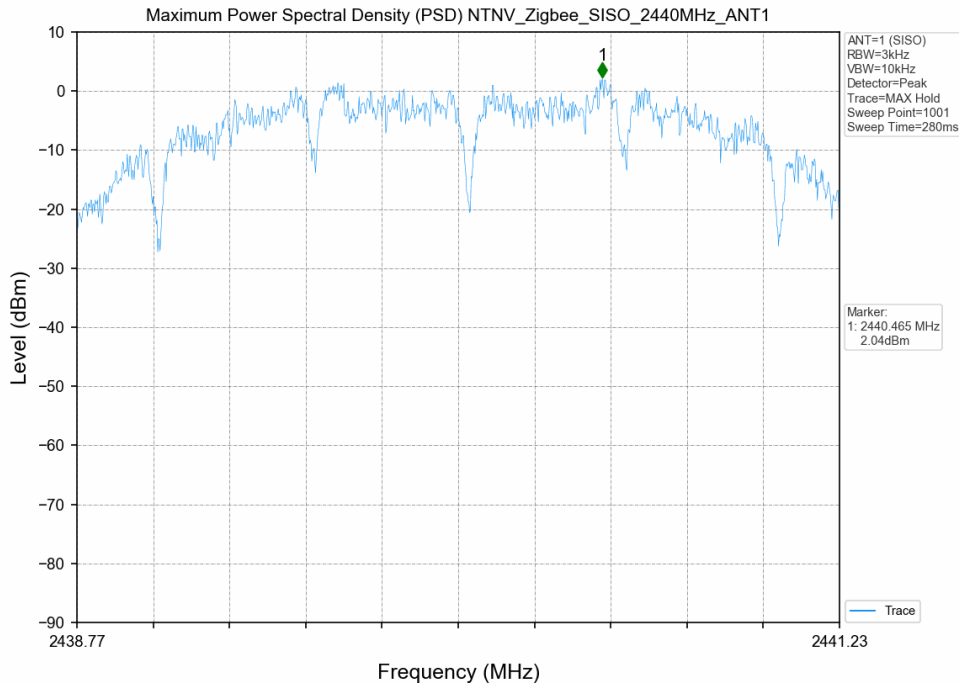
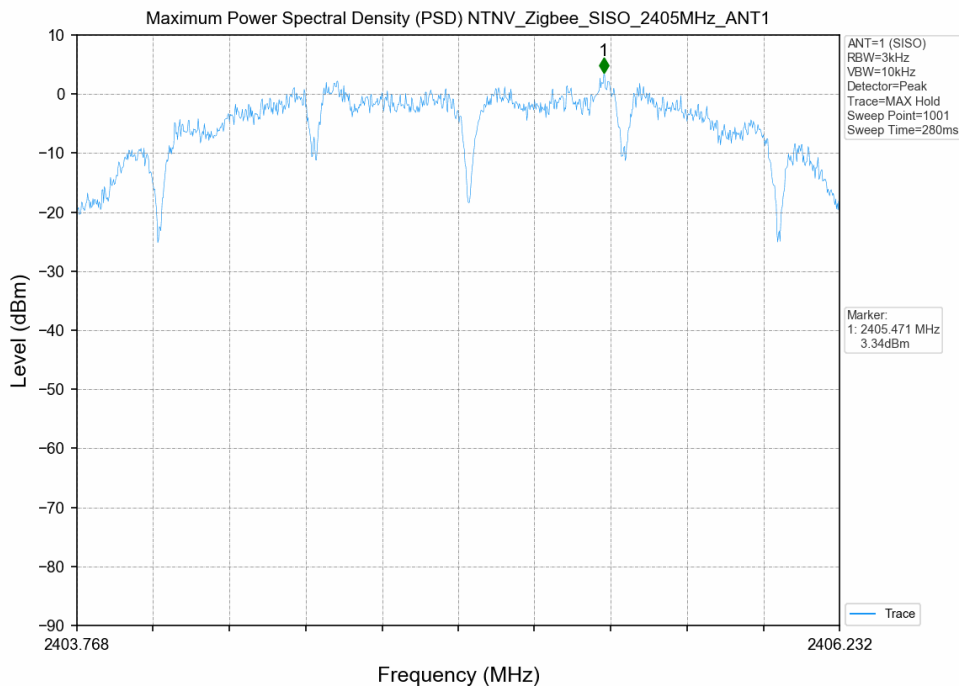
4. Maximum Power Spectral Density (PSD)

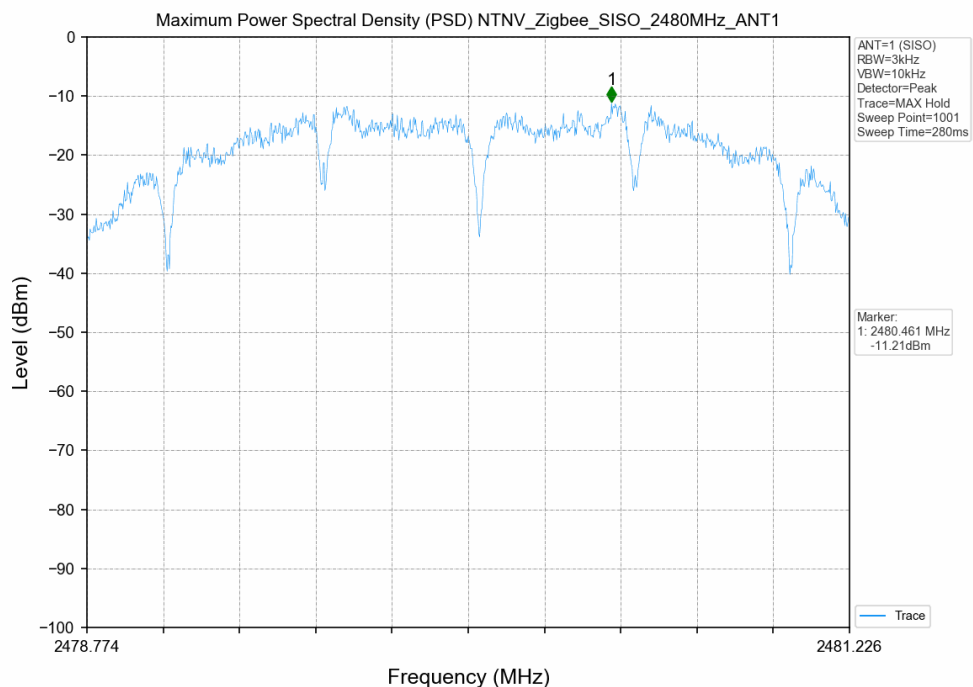
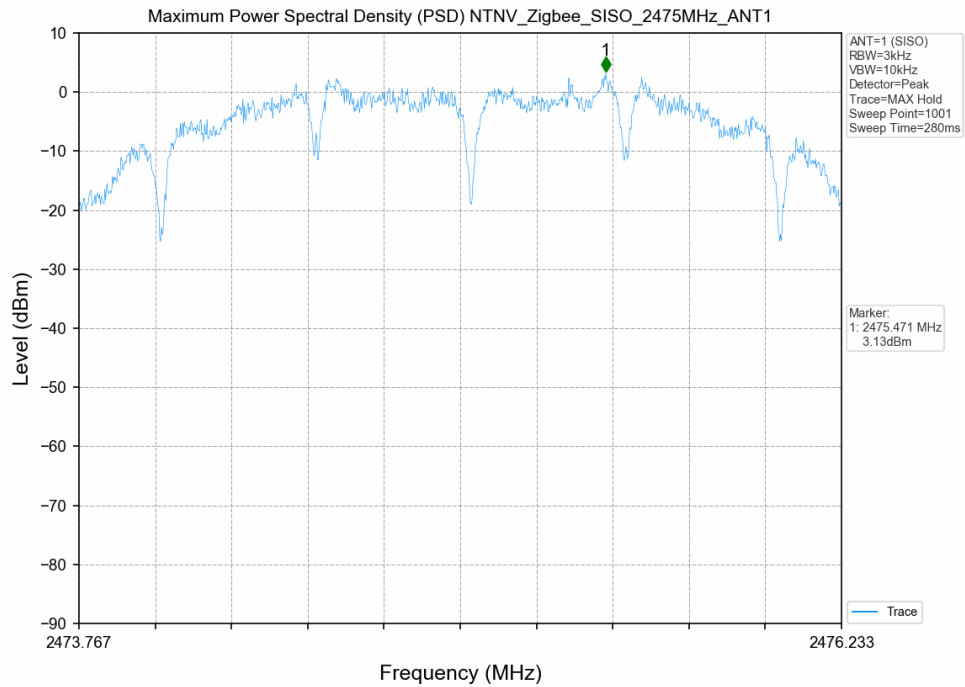
4.1 Test Result

Test Mode	Frequency (MHz)	Tx Type	Maximum Power Spectral Density (dBm/3KHz)	Limits (dBm/3KHz)	Verdict
			Ant 1		
Zigbee	2405	SISO	3.34	≤8	PASS
	2440	SISO	2.04	≤8	PASS
	2475	SISO	3.13	≤8	PASS
	2480	SISO	-11.21	≤8	PASS

4.2 Test Graph







5. Unwanted Emissions in Non-restricted Frequency Bands

5.1 Test Result



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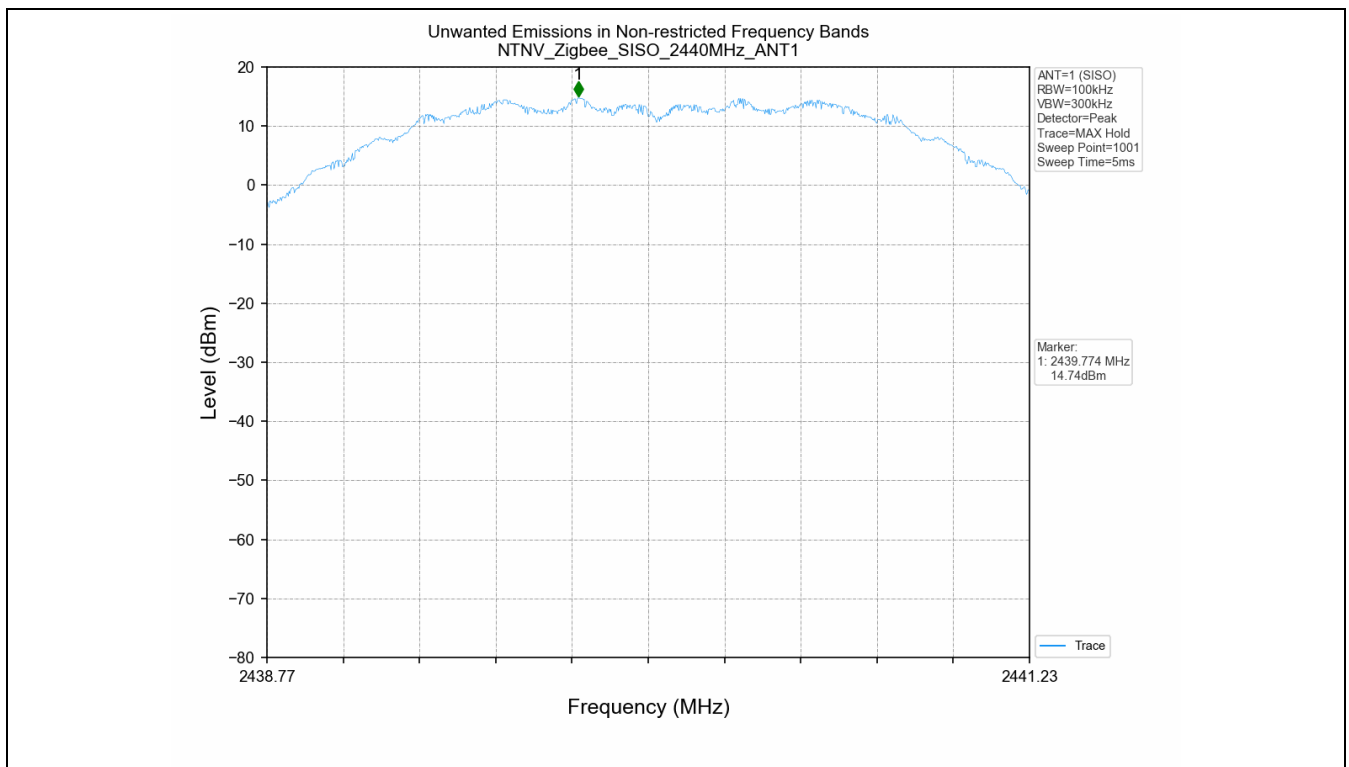
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Test Mode	Frequency (MHz)	TX Type	ANT No.	Spurious Conducted Emission (dBm)	Limits (dBm)	Verdict
Zigbee	2405	SISO	1	Refer to test graph	-5.26	PASS
	2440	SISO	1	Refer to test graph	-5.26	PASS
	2475	SISO	1	Refer to test graph	-4.98	PASS
	2480	SISO	1	Refer to test graph	-5.26	PASS

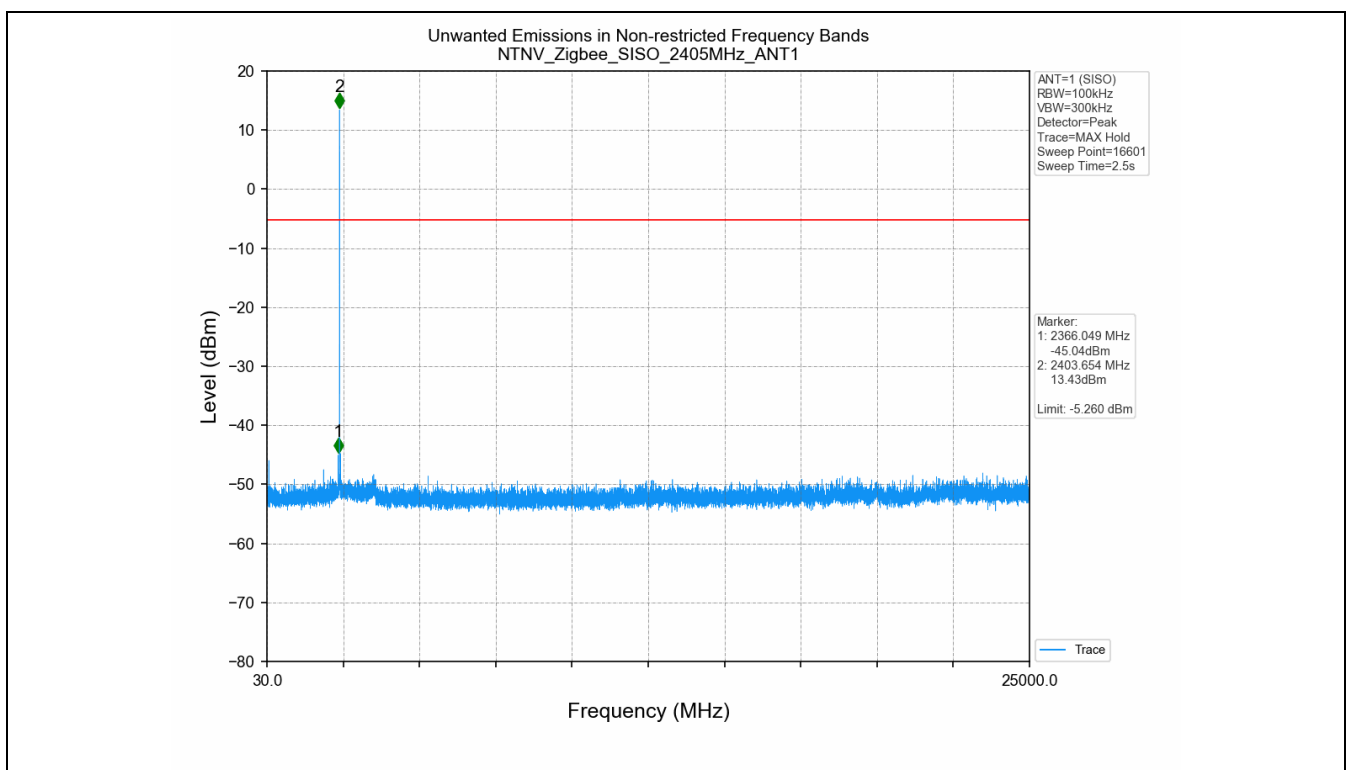
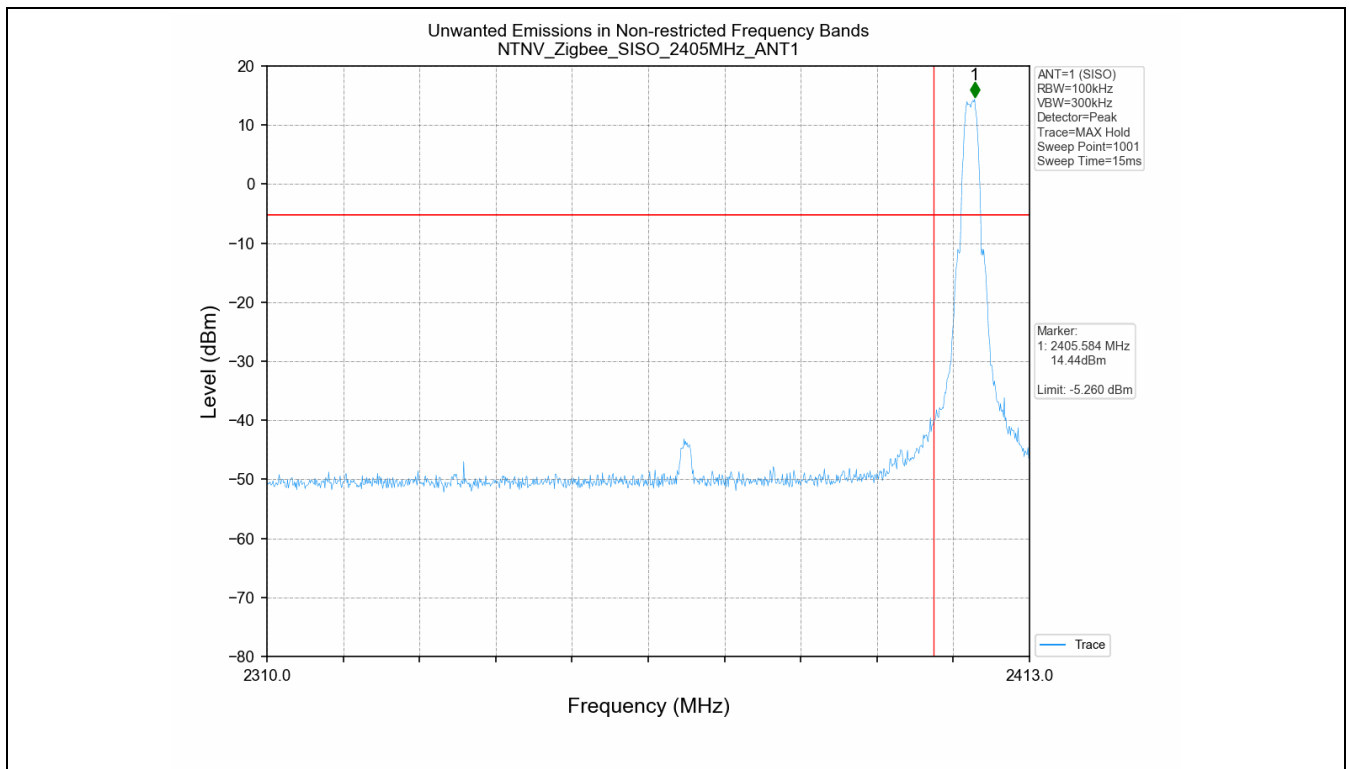
5.2 Test Graph



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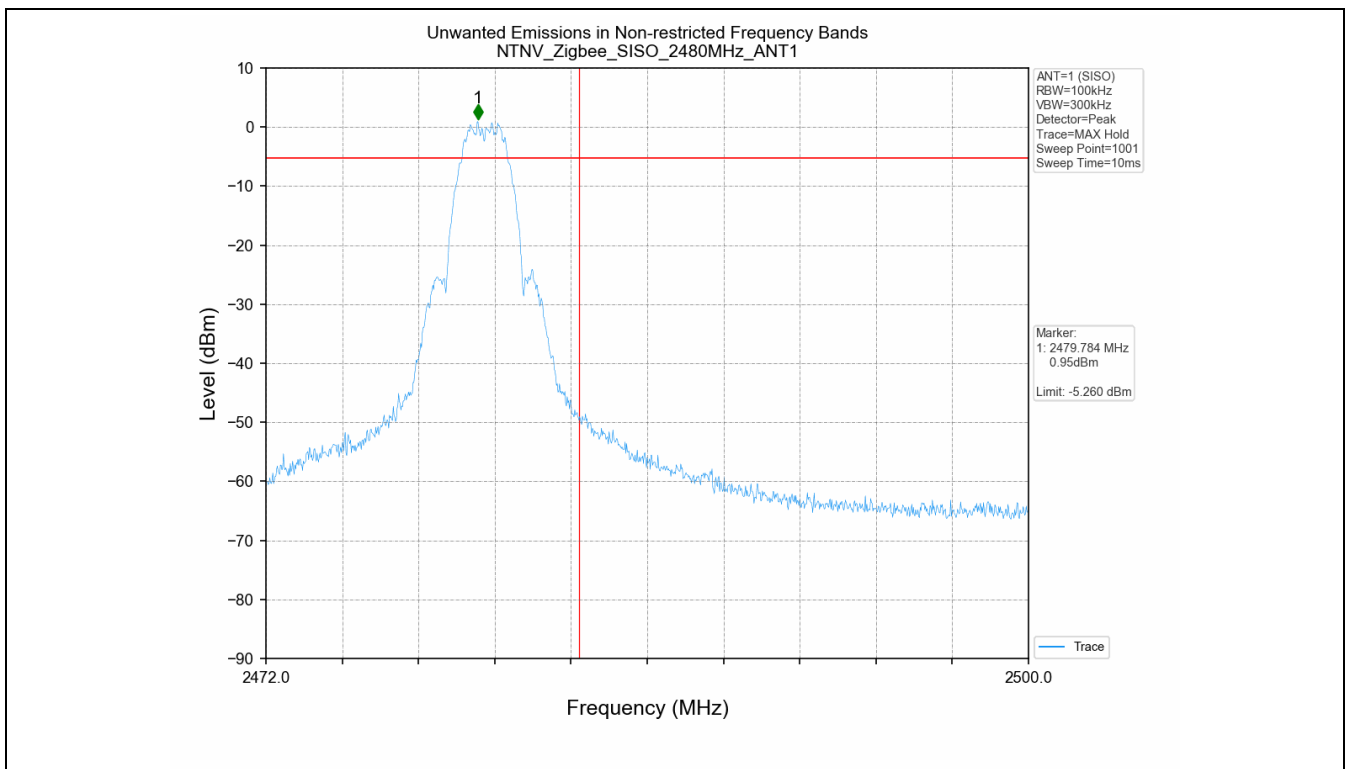
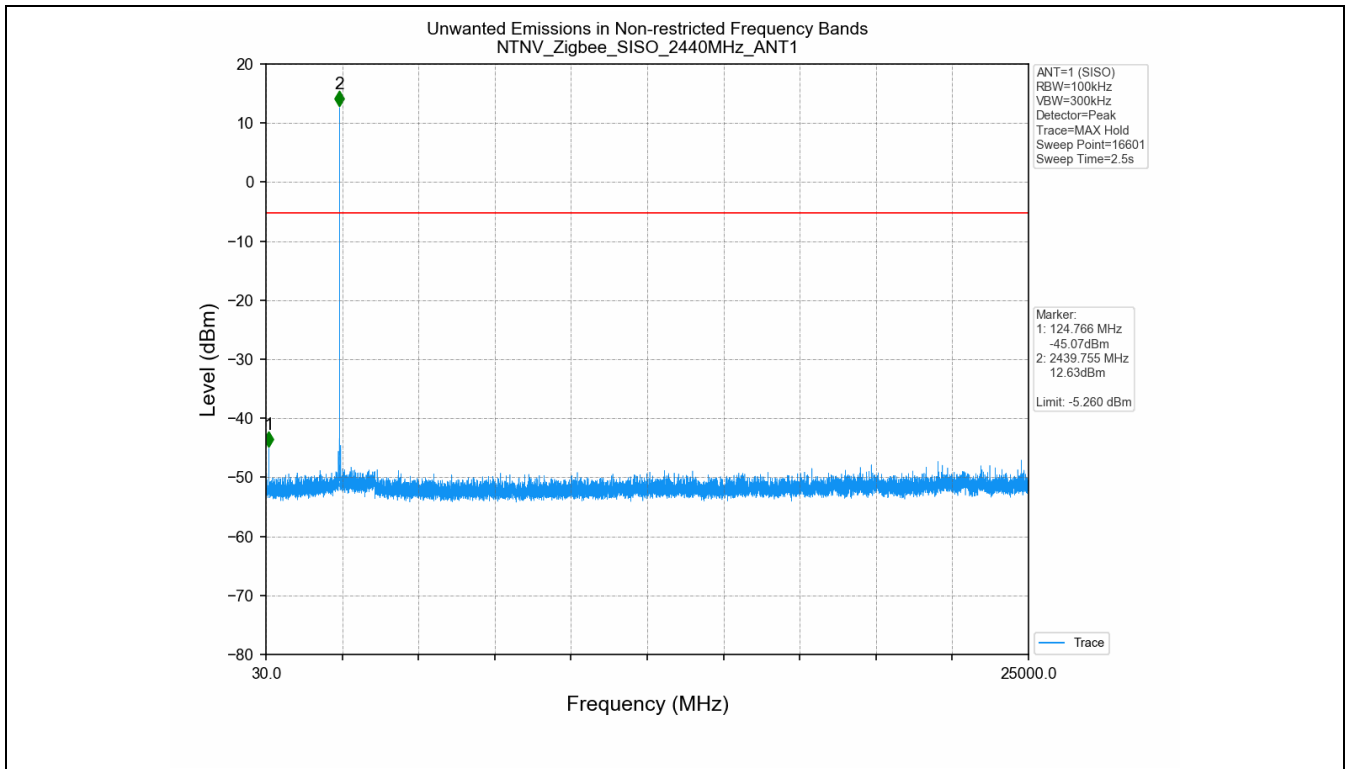
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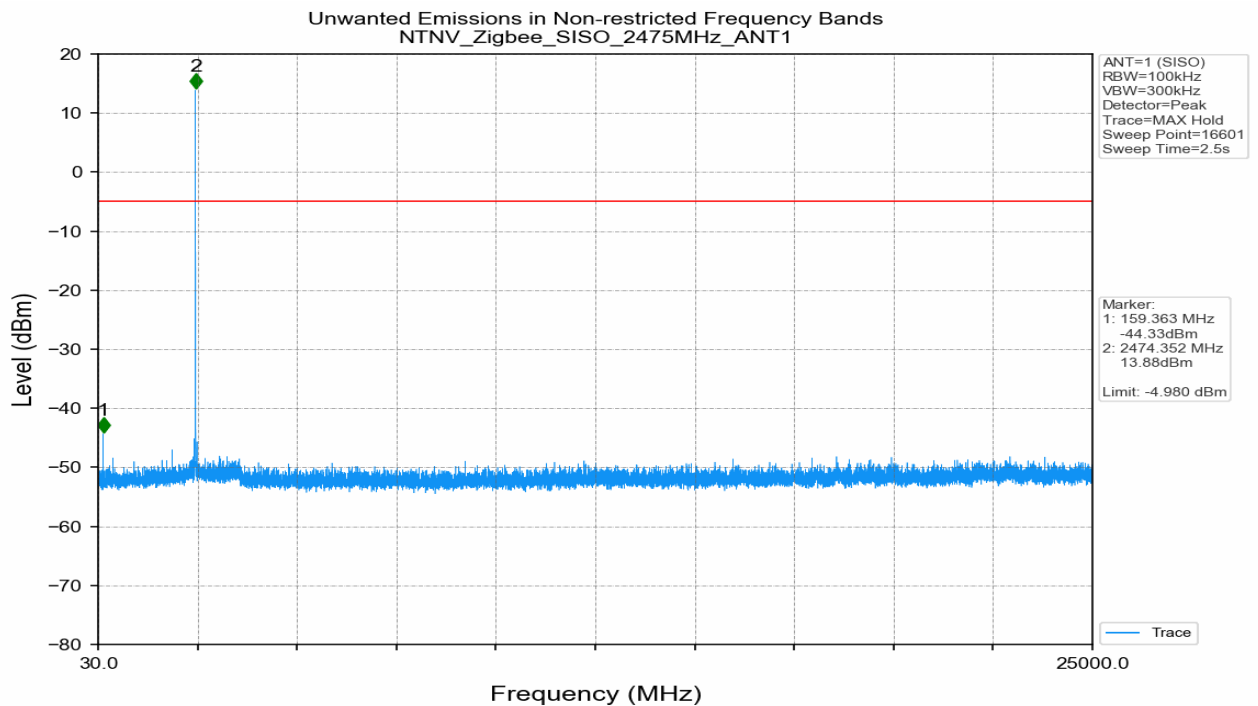
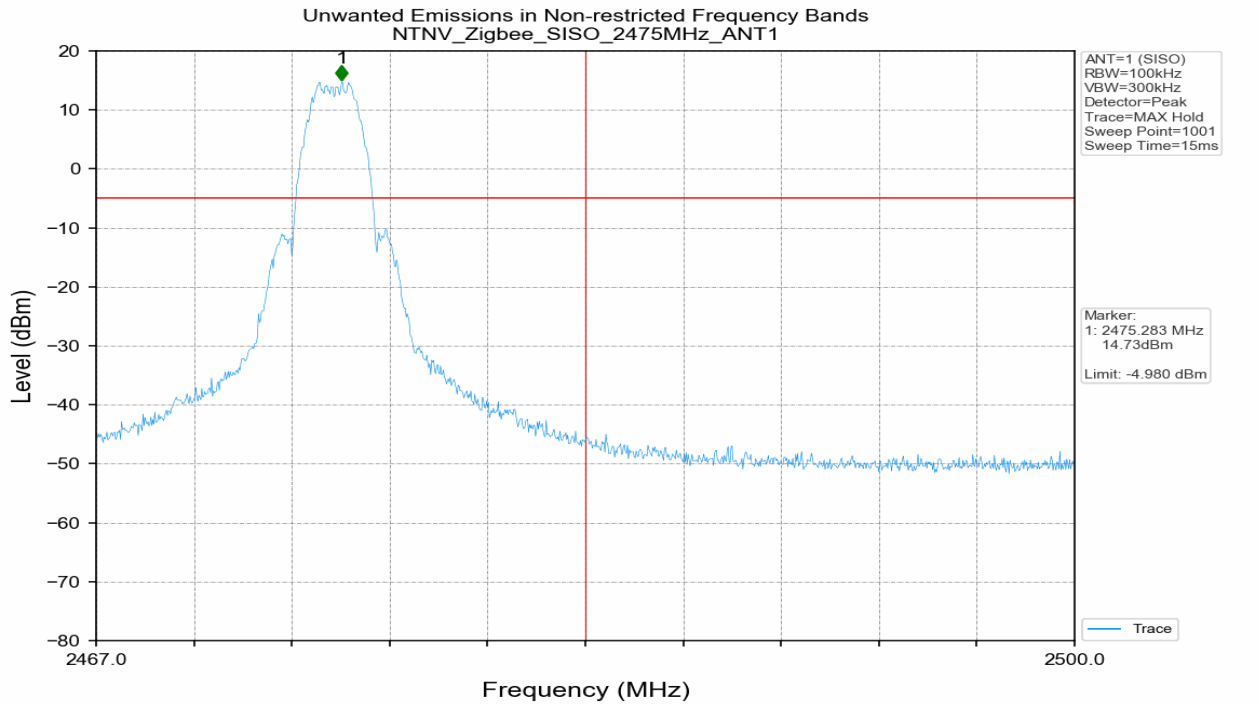


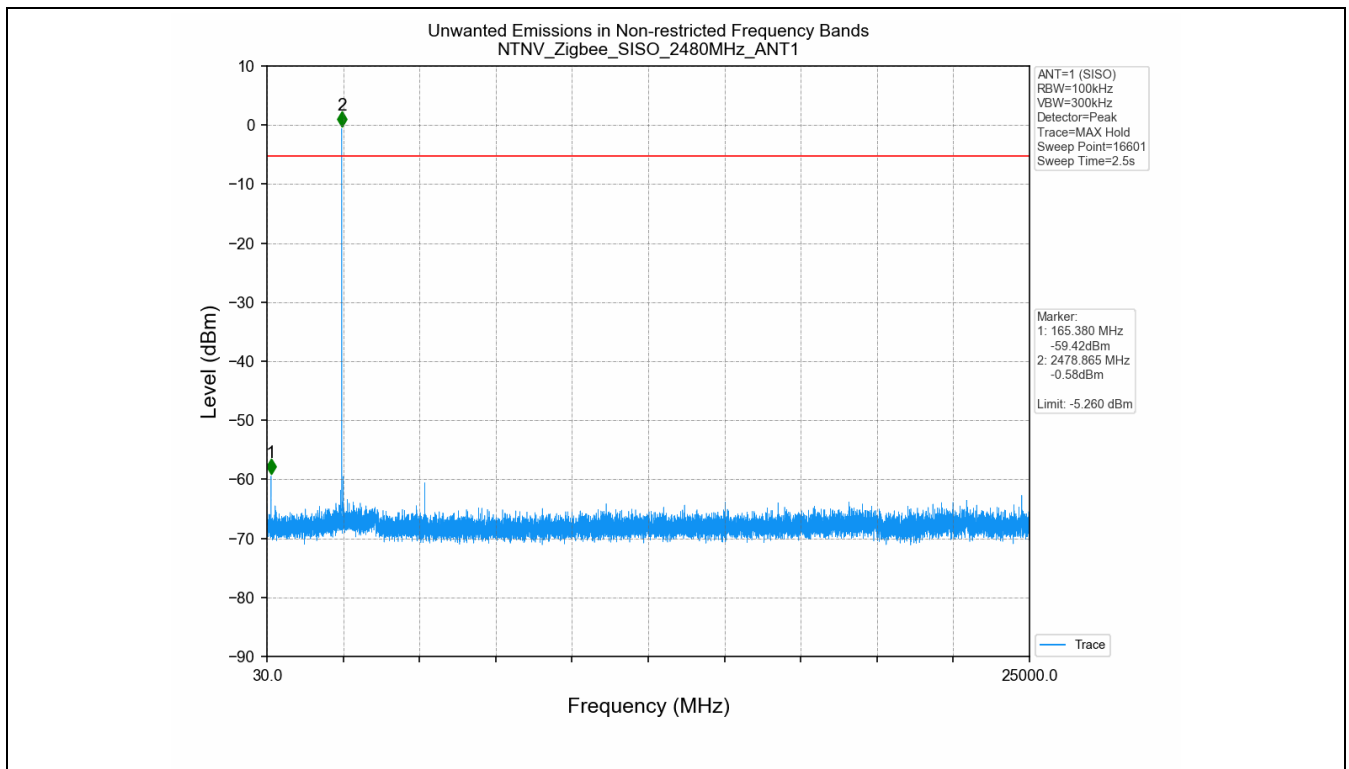
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