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Shenzhen Branch

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TEST REPORT

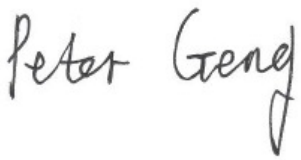
Application No.:	SZEM1709009743CR
Applicant:	Shenzhen Heiman Technology Co., Ltd.
Address of Applicant:	Heiman Industrial Park, No.84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
Manufacturer:	Shenzhen Heiman Technology Co., Ltd.
Address of Manufacturer:	Heiman Industrial Park, No.84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
Factory:	Shenzhen Heiman Technology Co., Ltd.
Address of Factory:	Heiman Industrial Park, No.84 Fuqian Road, Yuexingwei Community, Guanlan, Longhua New District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	Smart Humidity and Temperature Sensor
Model No.:	HS1HT(ZigBee)
FCC ID:	2AK7XHS1HT
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2017-09-13
Date of Test:	2017-09-15 to 2017-10-12
Date of Issue:	2017-10-16
Test Result:	Pass*

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

Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2017-10-16		Original

Authorized for issue by:				
				
		Peter Geng /Project Engineer		
				
		Eric Fu /Reviewer		

D

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(c)	Pass

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
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
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
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 15.209 & 15.247(d)	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.4	47 CFR Part 15, Subpart C 15.209 & 15.247(d)	Pass

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4 General Information

4.1 Details of E.U.T.

	Power supply:	DC 3V by CR2450 button cell
	Frequency Range	2.405-2.480GHz
	Modulation Technique	O-QPSK
	Channel Number	16
	Channel separation:	5MHz
	Antenna Type	Integral Antenna
	Antenna Gain	1.5dBi

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25×10^{-8}
2	Duty cycle	0.37%
3	Occupied Bandwidth	3%
4	RF conducted power	0.75dB
5	RF power density	2.84dB
6	Conducted Spurious emissions	0.75dB
7	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
8	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
9	Temperature test	1℃
10	Humidity test	3%
11	Supply voltages	1.5%
12	Time	3%

4.4 Test Location

All tests were performed at:

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

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.5 Test Facility

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

• CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• 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 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 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.

• Industry Canada (IC)

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

RE in Chamber(below 1GHz)

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2017-09-27	2018-09-27
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-02	2017-03-05	2020-03-05
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2017-04-14	2018-04-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2017-07-13	2018-07-12

RE in Chamber(above 1GHz)

Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-10	2018-05-10
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2017-06-05	2018-06-04
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-13
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2017-09-27	2018-09-27
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2017-09-27	2018-09-27
Band filter	N/A	N/A	N/A	N/A	N/A
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2017-07-13	2018-07-12

RF conducted test					
Test Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal. Date (yyyy-mm-dd)**	**Cal. Due date (yyyy-mm-dd)**
DC Power Supply	ZhaoXin	PS-3005D	SEM011-05	2017-09-27	2018-09-27
Spectrum Analyzer (20Hz-43GHz)	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13
Signal Generator (9kHz-40GHz)	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-27
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.6	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A

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	2017-09-29	2018-09-29
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-29
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-29
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-18

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

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

6.1.2 Conclusion

Standard Requirment:

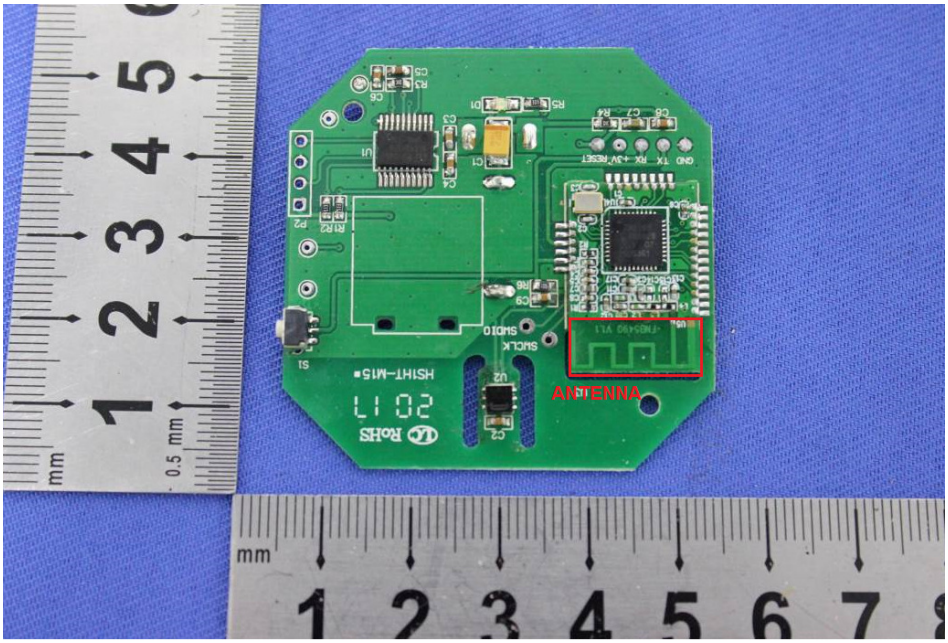
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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 1.5dBi.



7 Radio Spectrum Matter Test Results

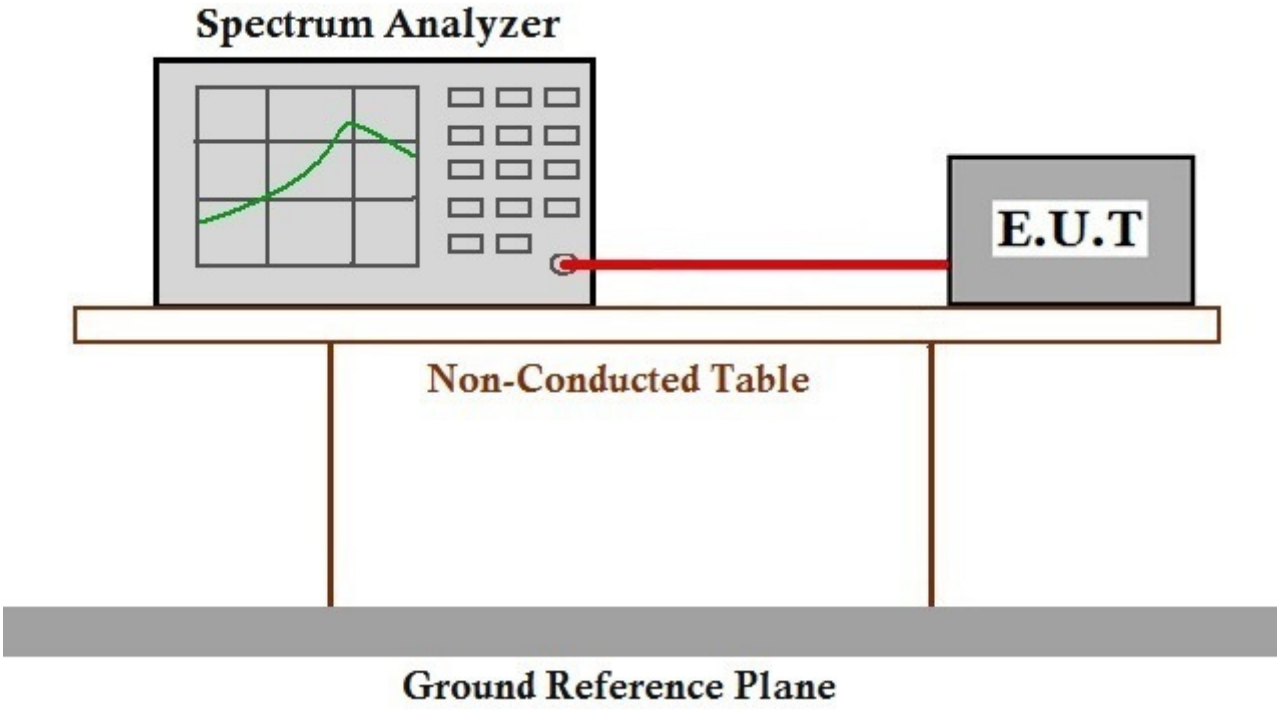
7.1 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)
Test Method: ANSI C63.10 (2013) Section 11.8.1
Limit: ⩾500 kHz

7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar
Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.1.2 Test Setup Diagram



7.1.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.2 Conducted Peak Output Power

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)
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≤ 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

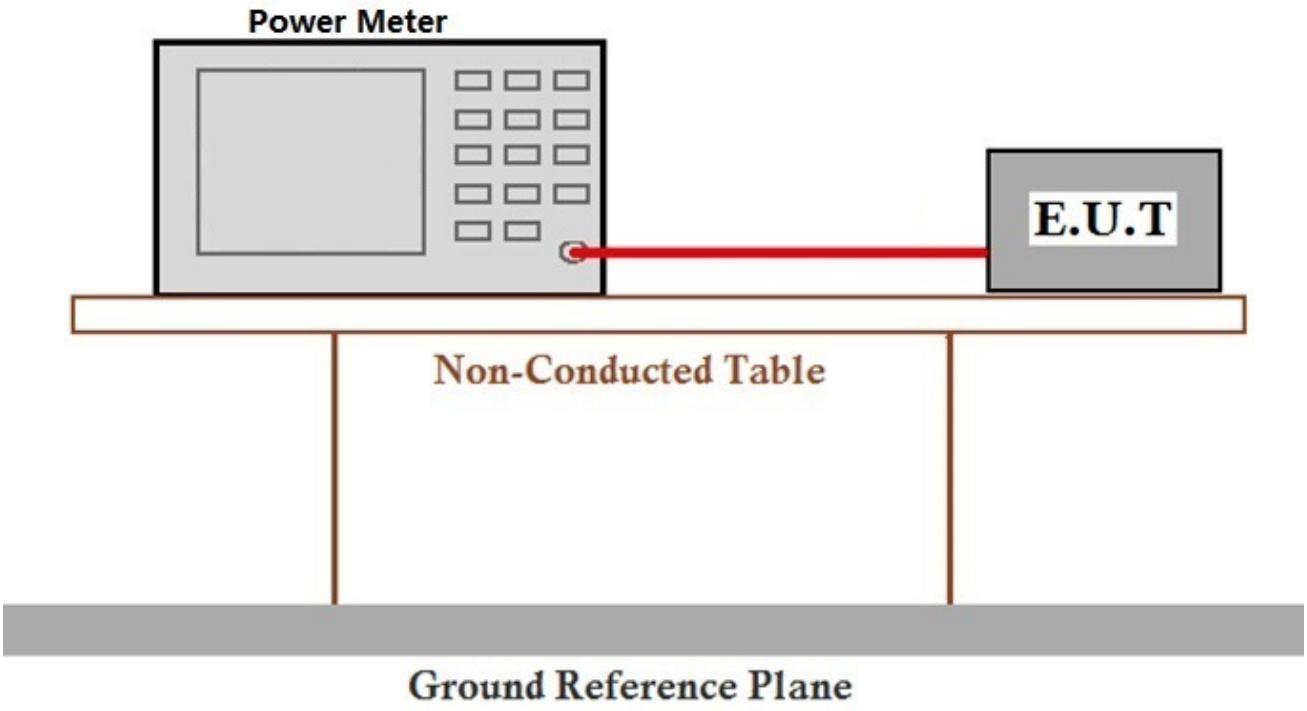
7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.2.2 Test Setup Diagram



7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.3 Power Spectrum Density

Test Requirement	47 CFR Part 15, Subpart C 15.247(e)
Test Method:	ANSI C63.10 (2013) Section 11.10.2
Limit:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

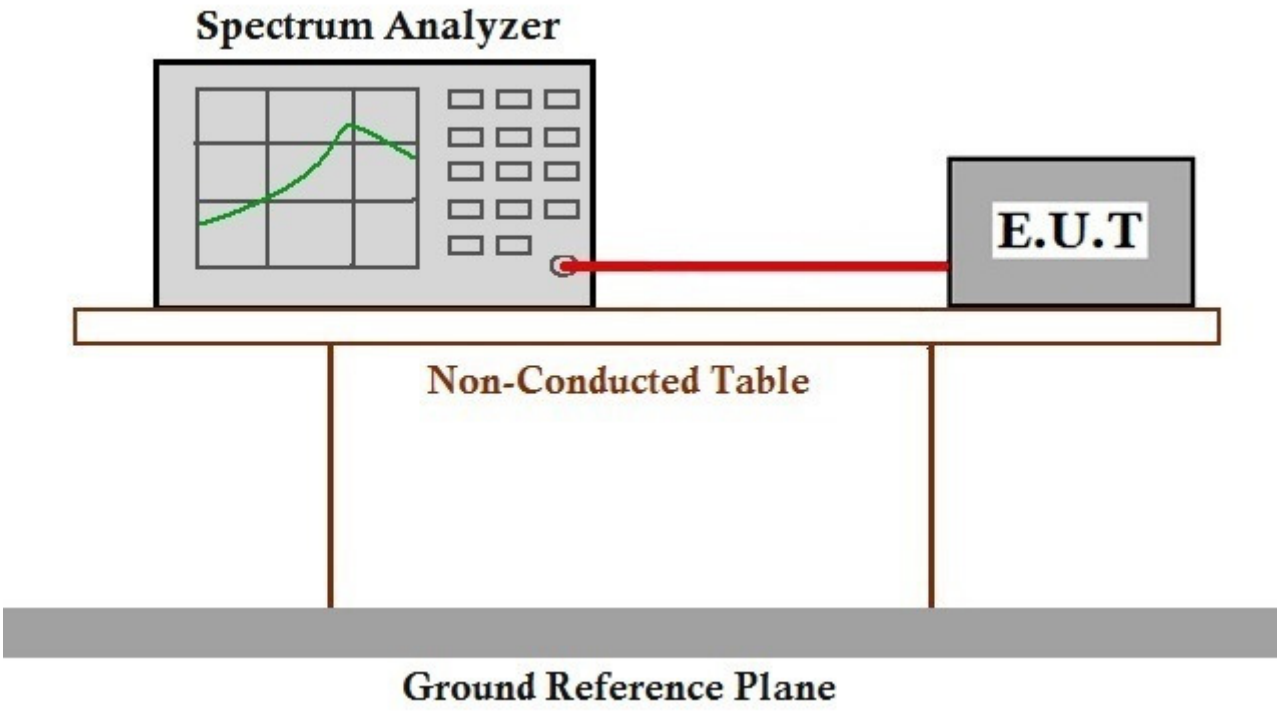
7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.3.2 Test Setup Diagram



7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.4 Conducted Band Edges Measurement

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
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)

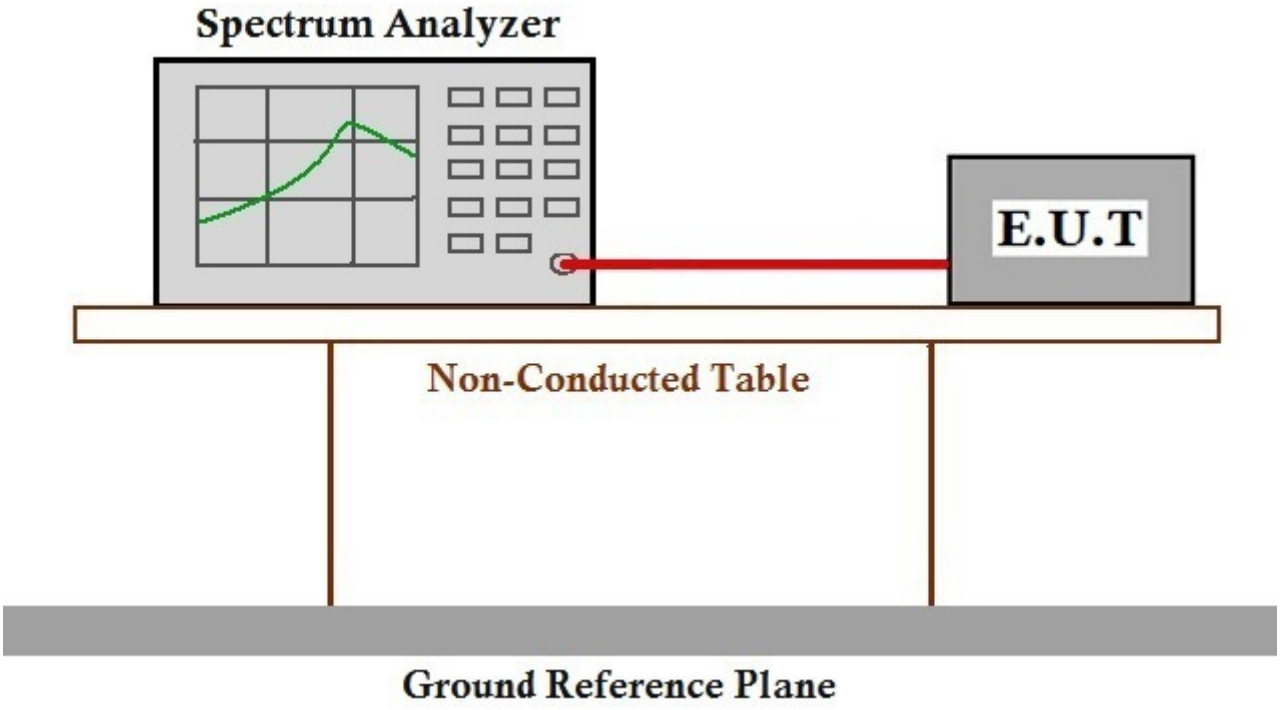
7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.4.2 Test Setup Diagram



7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.5 Conducted Spurious Emissions

Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
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)

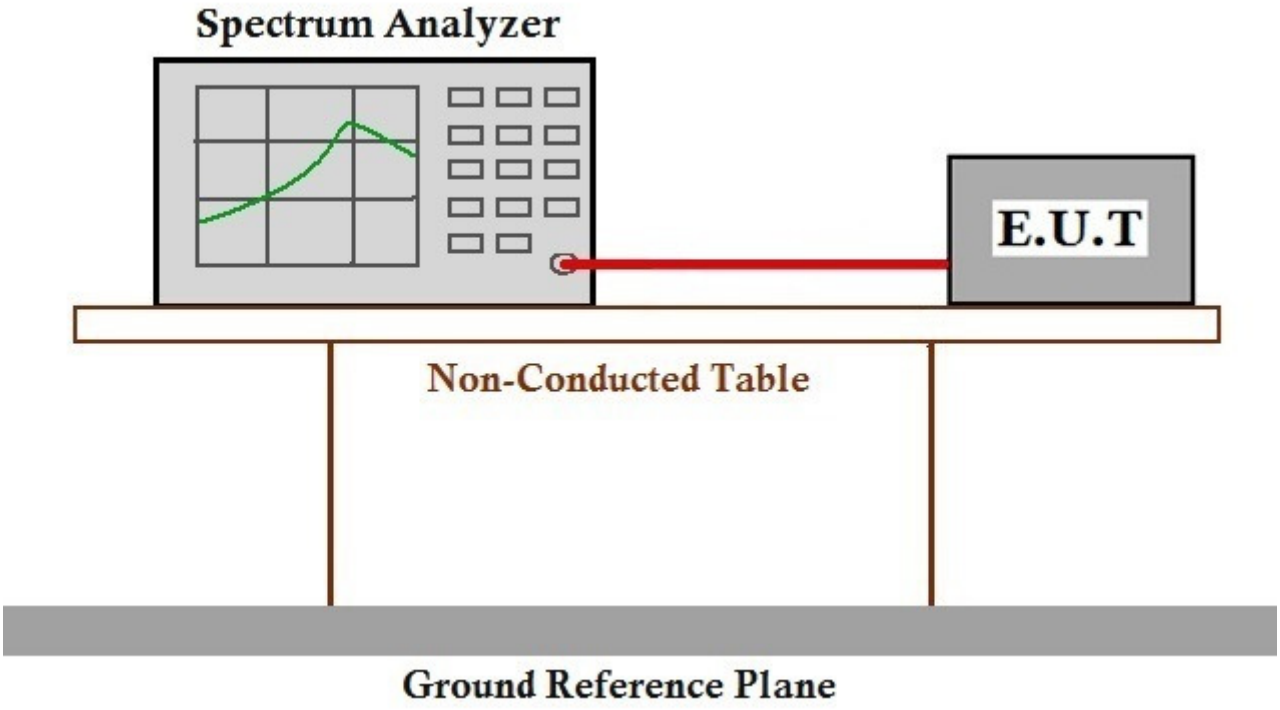
7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.5.2 Test Setup Diagram



7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix 15.247

7.6 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d)
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m
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.		

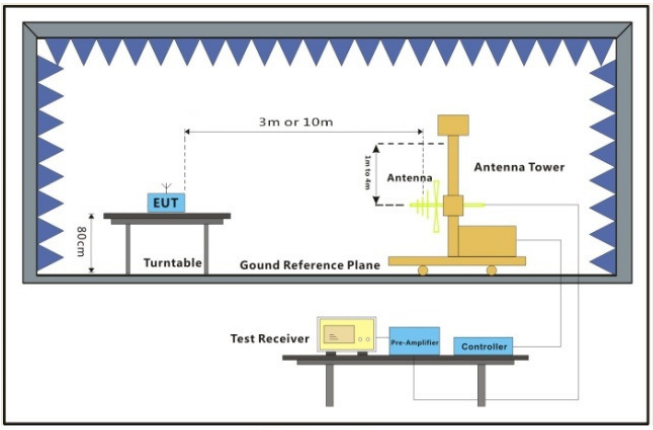
7.6.1 E.U.T. Operation

Operating Environment:

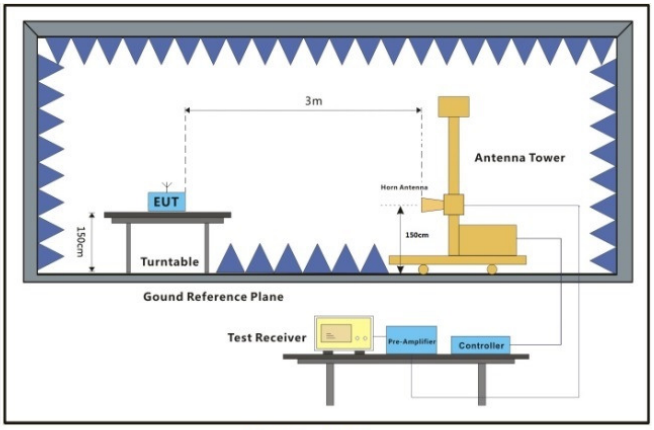
Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar

Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

7.6.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.6.3 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.

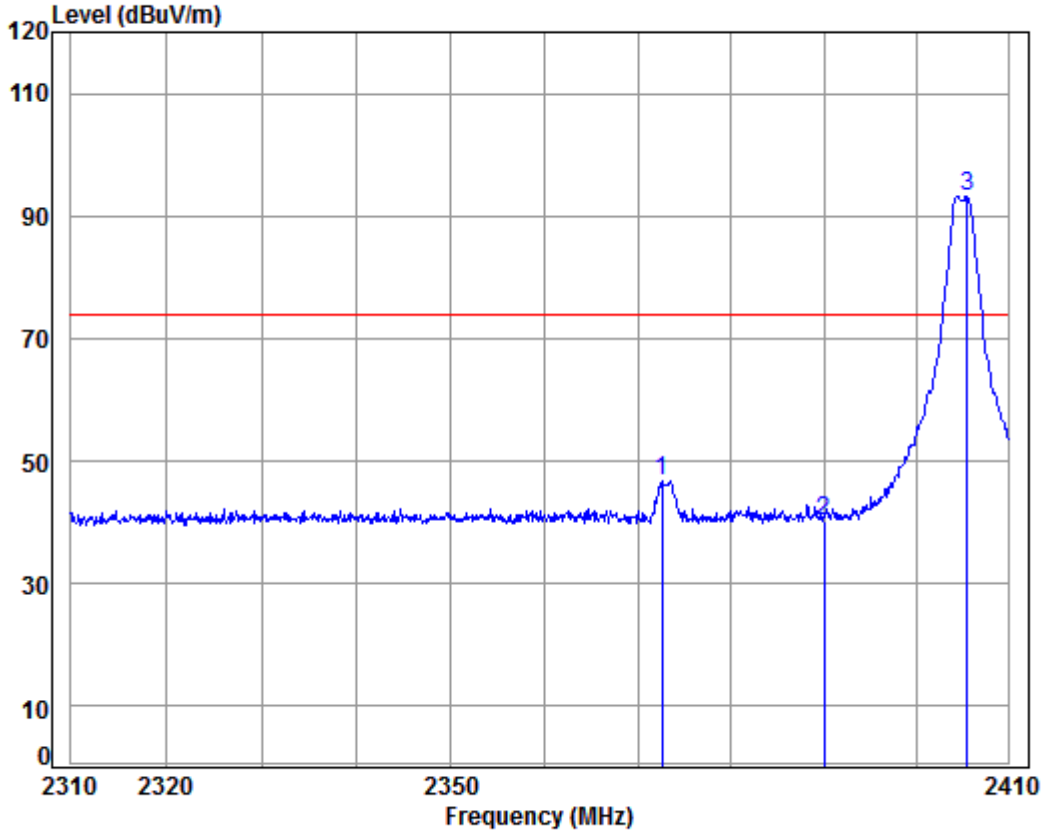
h. Test the EUT in the lowest channel,the middle channel,the Highest channel.

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

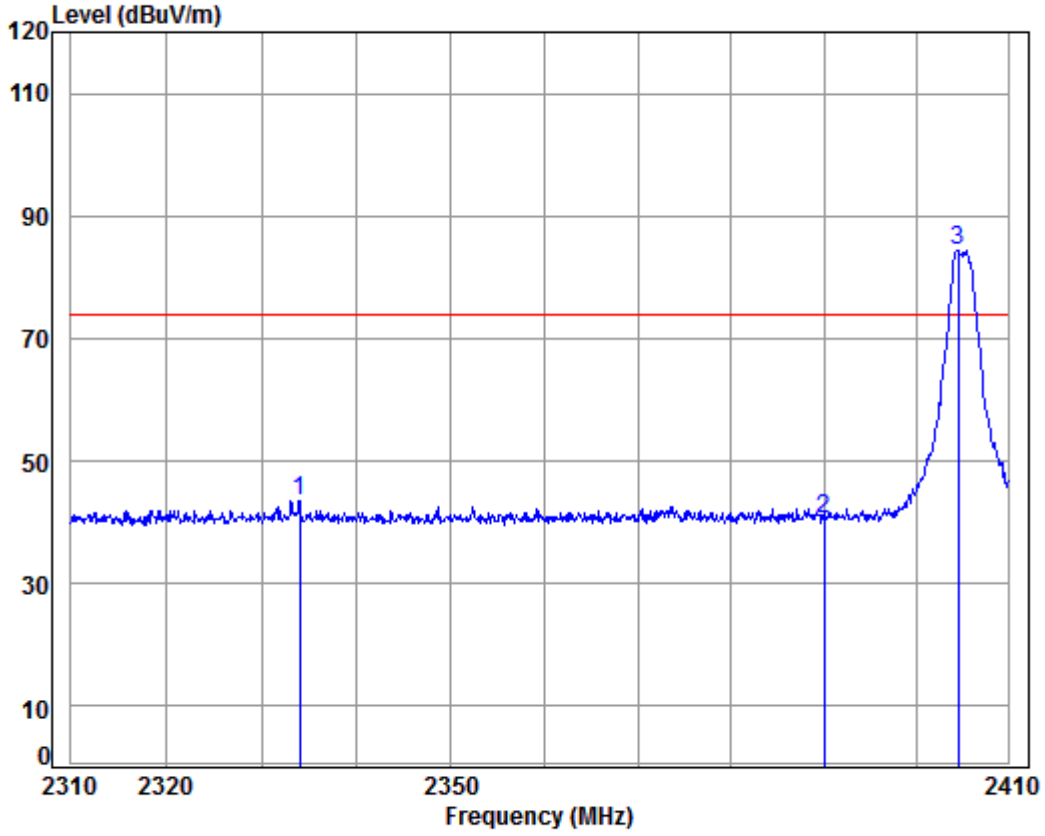
Mode:a; Polarization:Horizontal; Channel:Low



Condition: 3m HORIZONTAL
Job No : 09743CR
Mode : 2405 Band edge
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	2372.606	5.45	29.02	37.96	50.28	46.79	74.00	-27.21	peak
2	2390.000	5.47	29.08	37.96	43.77	40.36	74.00	-33.64	peak
3 pp	2405.510	5.50	29.12	37.95	96.59	93.26	74.00	19.26	peak

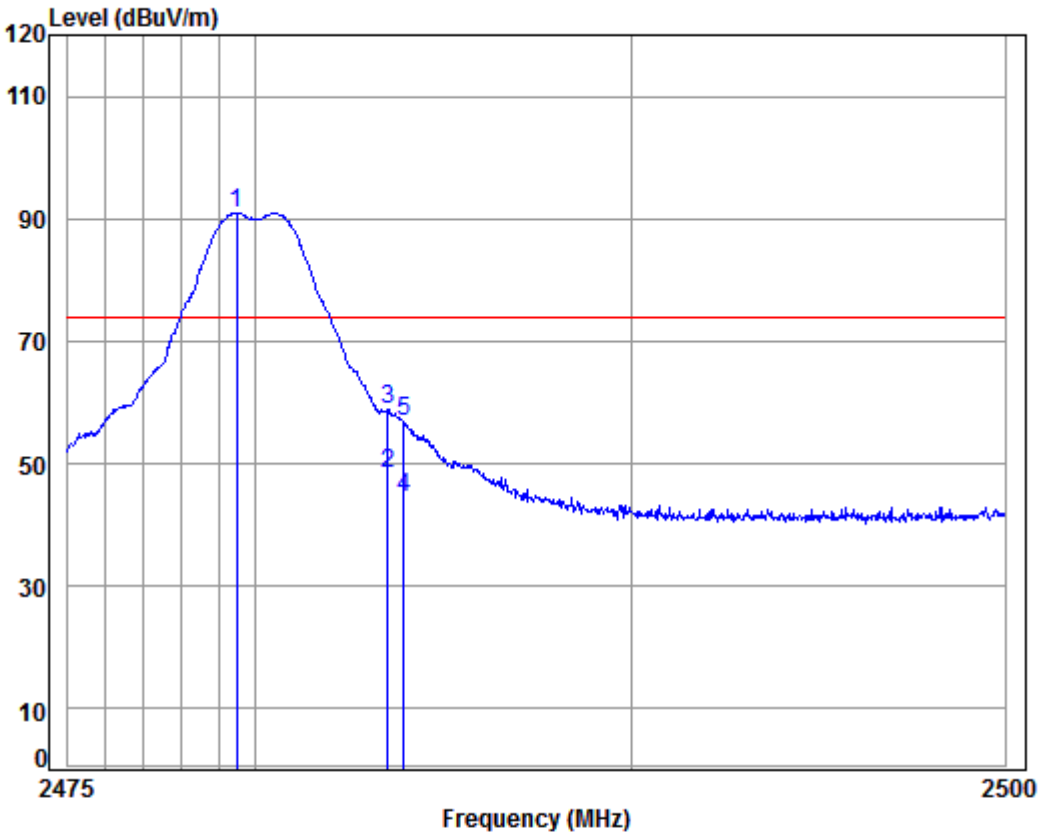
Mode:a; Polarization:Vertical; Channel:Low



Condition: 3m VERTICAL
Job No : 09743CR
Mode : 2405 Band edge
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	2334.010	5.40	28.91	37.96	47.18	43.53	74.00	-30.47	peak
2	2390.000	5.47	29.08	37.96	44.02	40.61	74.00	-33.39	peak
3 pp	2404.593	5.49	29.12	37.95	87.82	84.48	74.00	10.48	peak

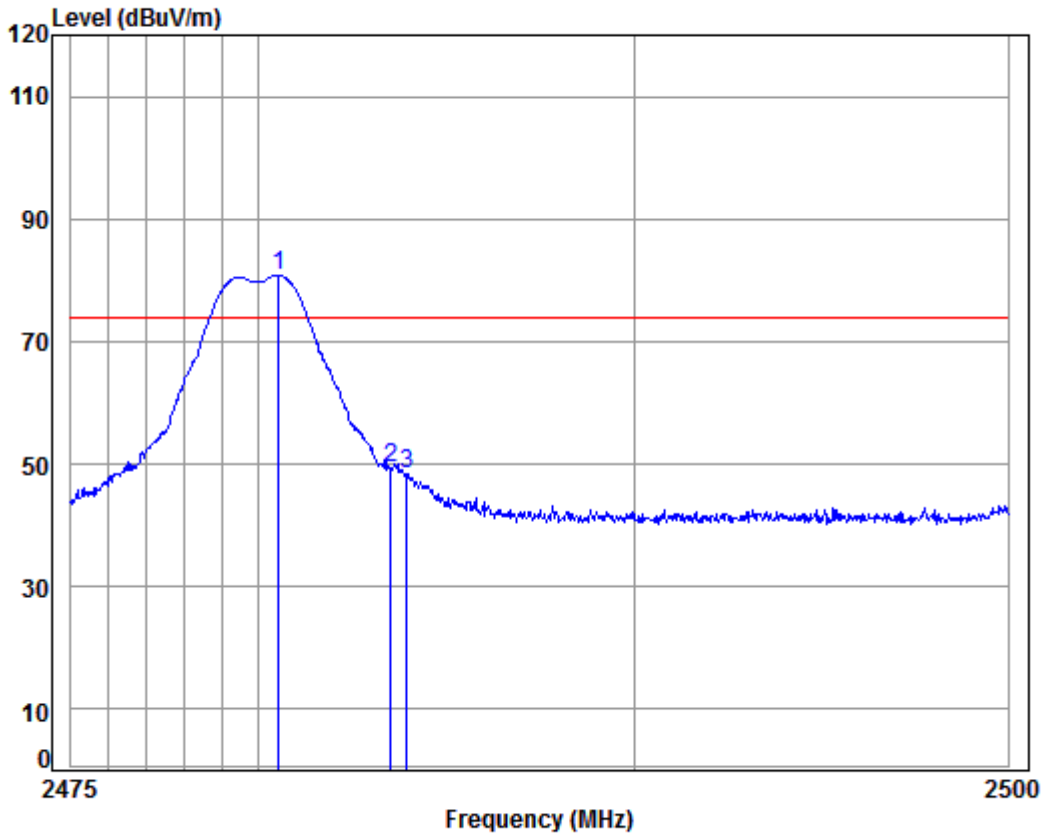
Mode:a; Polarization:Horizontal; Channel:High



Condition: 3m HORIZONTAL
Job No : 09743CR
Mode : 2480 Band edge
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	pp	2479.481	5.59	29.34	37.95	93.93	90.91	74.00	16.91	peak
2	av	2483.500	5.60	29.35	37.95	51.30	48.30	54.00	-5.70	Average
3		2483.500	5.60	29.35	37.95	61.73	58.73	74.00	-15.27	peak
4		2483.921	5.60	29.35	37.95	47.46	44.46	54.00	-9.54	Average
5		2483.921	5.60	29.35	37.95	59.75	56.75	74.00	-17.25	peak

Mode:a; Polarization:Vertical; Channel:High



Condition: 3m VERTICAL
Job No : 09743CR
Mode : 2480 Band edge
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 pp	2480.528	5.59	29.34	37.95	83.79	80.77	74.00	6.77	peak
2	2483.500	5.60	29.35	37.95	52.30	49.30	74.00	-24.70	peak
3	2483.921	5.60	29.35	37.95	51.55	48.55	74.00	-25.45	peak

7.7 Radiated Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.247(d)
Test Method: ANSI C63.10 (2013) Section 6.10.4
Measurement Distance: 3m
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

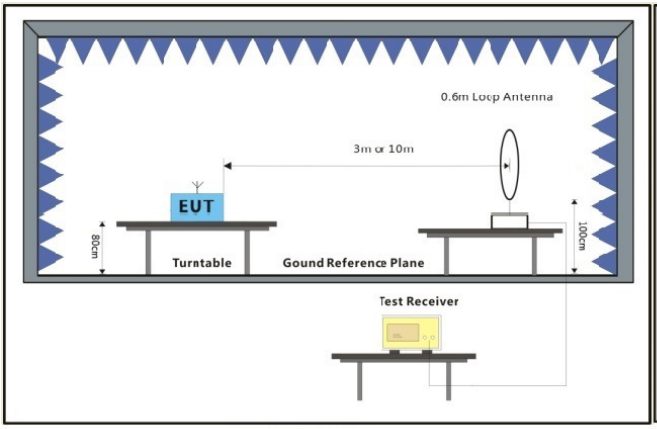
Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1005 mbar

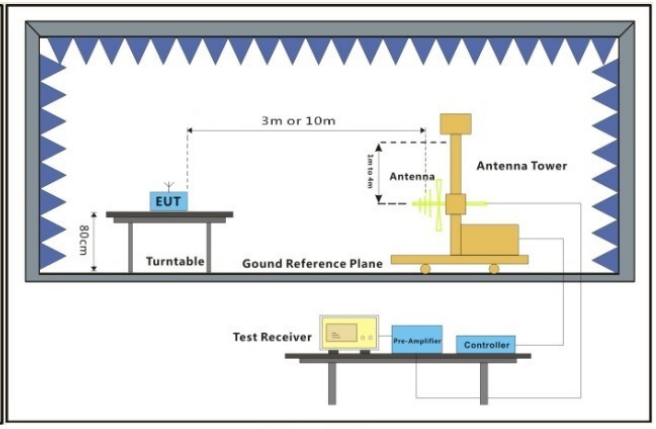
Test mode a:TX mode_Keep the EUT in continuously transmitting with O-QPSK modulation mode.

For below 1GHz, tests were conducted in H/M/L channels and the worst case is reported only.

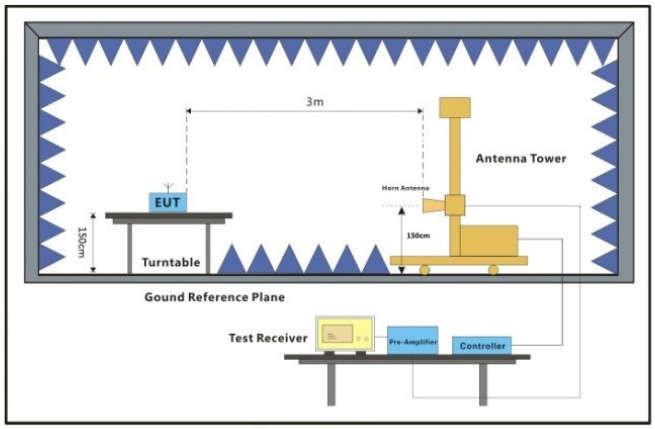
7.7.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



Above 1GHz

7.7.3 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.

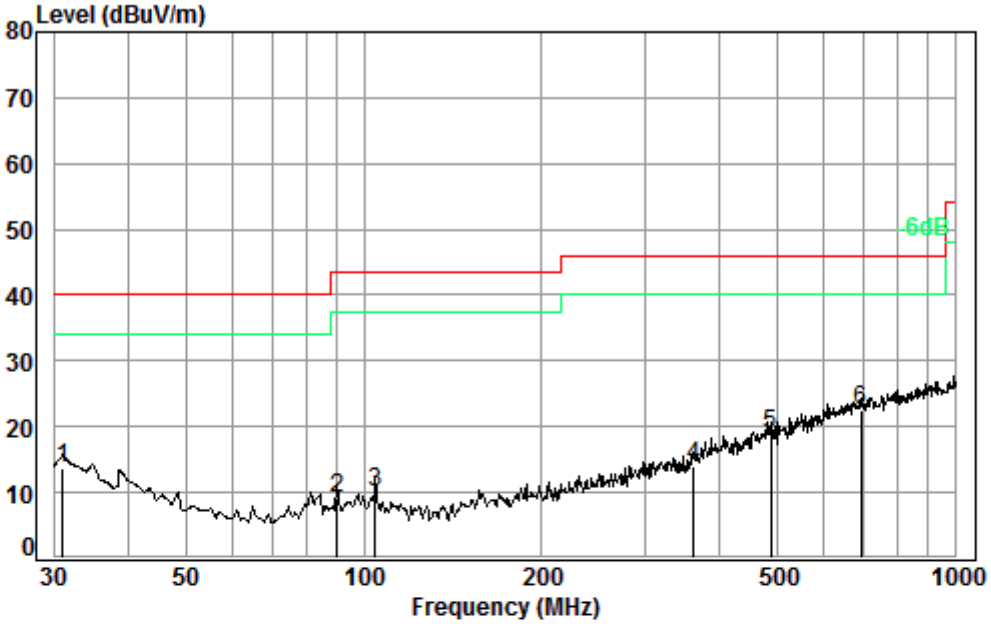
h. Test the EUT in the lowest channel,the middle channel,the Highest channel.

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

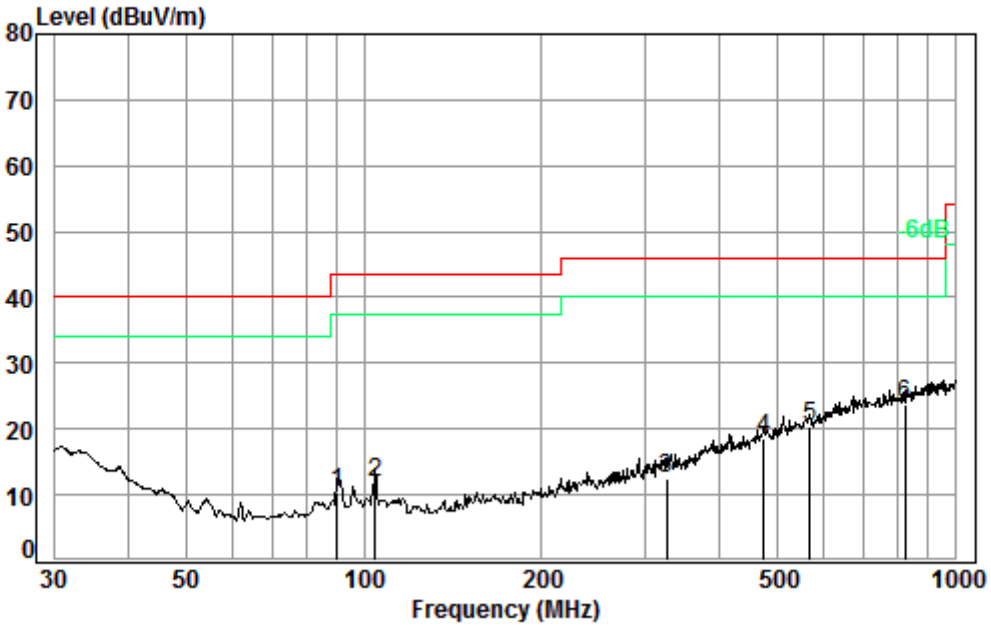
Radiated emission below 1GHz
Detector:QP
Mode:a; Polarization:Horizontal; Channel:Low



Condition: 3m HORIZONTAL
Job No. : 09743CR
Test mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.96	0.60	18.16	27.67	22.62	13.71	40.00	-26.29
2	90.22	1.10	8.71	27.51	26.73	9.03	43.50	-34.47
3	104.54	1.21	8.87	27.51	27.57	10.14	43.50	-33.36
4	360.45	2.09	14.78	27.66	24.91	14.12	46.00	-31.88
5	487.32	2.56	17.80	27.86	26.27	18.77	46.00	-27.23
6 pp	691.99	2.89	21.54	27.56	25.56	22.43	46.00	-23.57

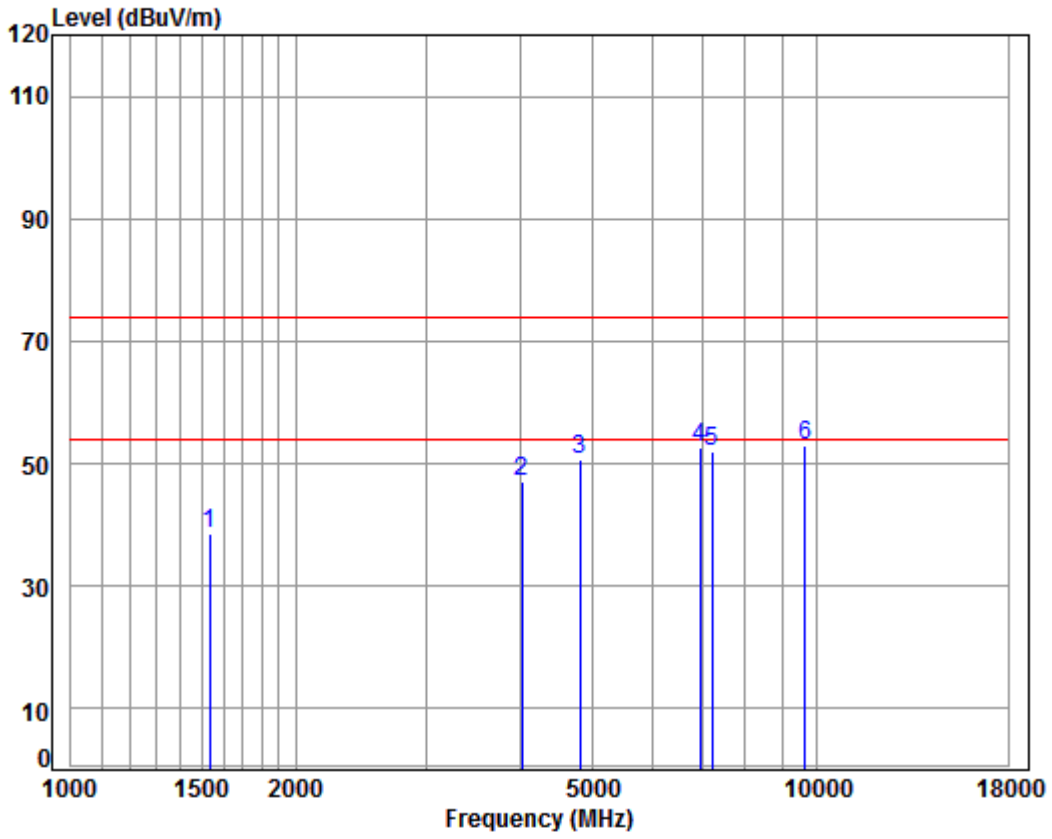
Mode:a; Polarization:Vertical; Channel:Low



Condition: 3m VERTICAL
Job No. : 09743CR
Test mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	90.22	1.10	8.71	27.51	28.12	10.42	43.50	-33.08
2	104.54	1.21	8.87	27.51	29.34	11.91	43.50	-31.59
3	324.46	1.98	14.78	27.59	23.42	12.59	46.00	-33.41
4	473.83	2.50	17.76	27.84	25.98	18.40	46.00	-27.60
5	566.62	2.67	19.03	27.76	26.36	20.30	46.00	-25.70
6 pp	821.71	3.29	22.36	27.34	25.43	23.74	46.00	-22.26

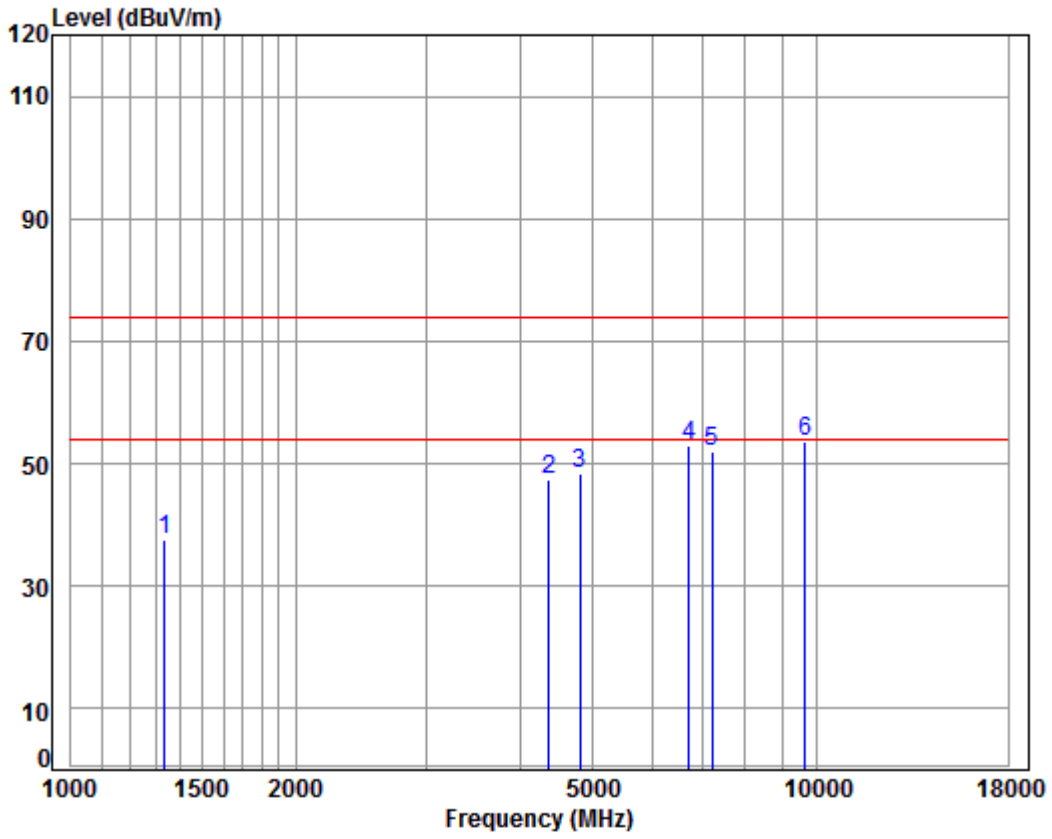
Mode:a; Polarization:Horizontal; Channel:Low



Condition: 3m HORIZONTAL
Job No : 09743CR
Mode : 2405 TX SE
Note : Zigbee
: 7#

	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	1533.841	5.44	25.96	38.04	45.14	38.50	74.00	-35.50	peak
2	4015.929	7.00	33.60	38.01	44.62	47.21	74.00	-26.79	peak
3	4810.000	7.90	34.17	38.41	47.18	50.84	74.00	-23.16	peak
4	6954.852	10.25	36.38	37.34	43.37	52.66	74.00	-21.34	peak
5	7215.000	10.07	36.41	37.10	42.71	52.09	74.00	-21.91	peak
6 pp	9620.000	10.75	37.52	35.08	39.81	53.00	74.00	-21.00	peak

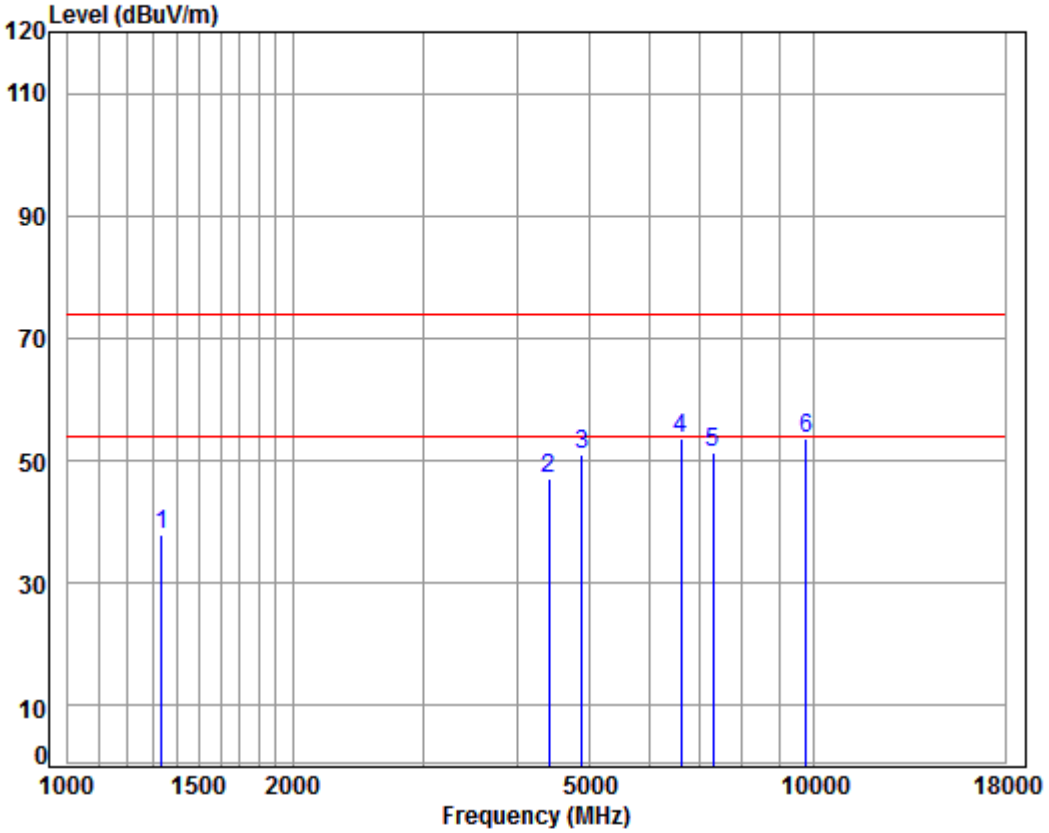
Mode:a; Polarization:Vertical; Channel:Low



Condition: 3m VERTICAL
Job No : 09743CR
Mode : 2405 TX SE
Note : Zigbee
: 7#

	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	1335.141	4.93	25.11	38.06	45.57	37.55	74.00	-36.45	peak
2	4367.058	7.41	33.60	38.20	44.52	47.33	74.00	-26.67	peak
3	4810.000	7.90	34.17	38.41	44.85	48.51	74.00	-25.49	peak
4	6737.207	10.86	35.78	37.55	43.89	52.98	74.00	-21.02	peak
5	7215.000	10.07	36.41	37.10	42.62	52.00	74.00	-22.00	peak
6 pp	9620.000	10.75	37.52	35.08	40.33	53.52	74.00	-20.48	peak

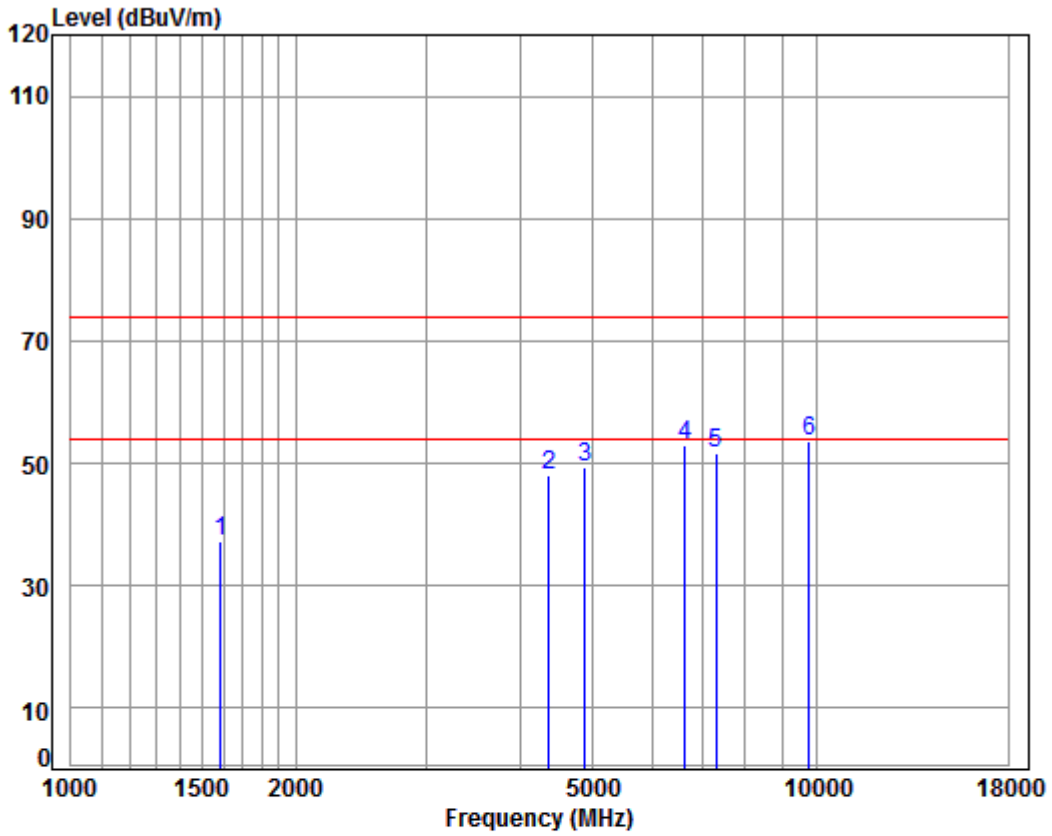
Mode:a; Polarization:Horizontal; Channel:middle



Condition: 3m HORIZONTAL
Job No : 09743CR
Mode : 2440 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	1335.141	4.93	25.11	38.06	45.94	37.92	74.00	-36.08	peak
2	4405.090	7.46	33.60	38.22	44.28	47.12	74.00	-26.88	peak
3	4880.000	7.97	34.29	38.45	47.34	51.15	74.00	-22.85	peak
4	6621.375	11.19	35.45	37.66	44.48	53.46	74.00	-20.54	peak
5	7320.000	10.05	36.37	37.00	41.93	51.35	74.00	-22.65	peak
6 pp	9760.000	10.82	37.55	35.02	40.41	53.76	74.00	-20.24	peak

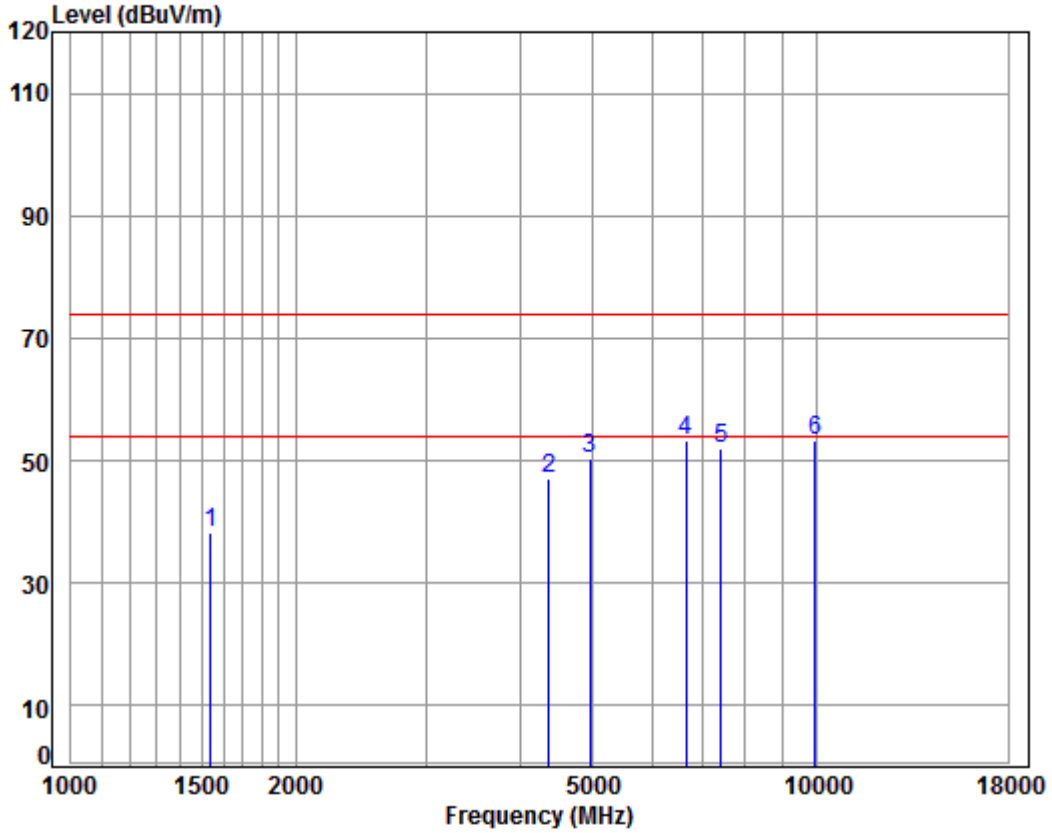
Mode:a; Polarization:Vertical; Channel:middle



Condition: 3m VERTICAL
Job No : 09743CR
Mode : 2440 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	1587.975	5.37	26.20	38.03	43.61	37.15	74.00	-36.85	peak
2	4367.058	7.41	33.60	38.20	45.23	48.04	74.00	-25.96	peak
3	4880.000	7.97	34.29	38.45	45.49	49.30	74.00	-24.70	peak
4	6640.542	11.13	35.50	37.64	43.83	52.82	74.00	-21.18	peak
5	7320.000	10.05	36.37	37.00	42.27	51.69	74.00	-22.31	peak
6 pp	9760.000	10.82	37.55	35.02	40.13	53.48	74.00	-20.52	peak

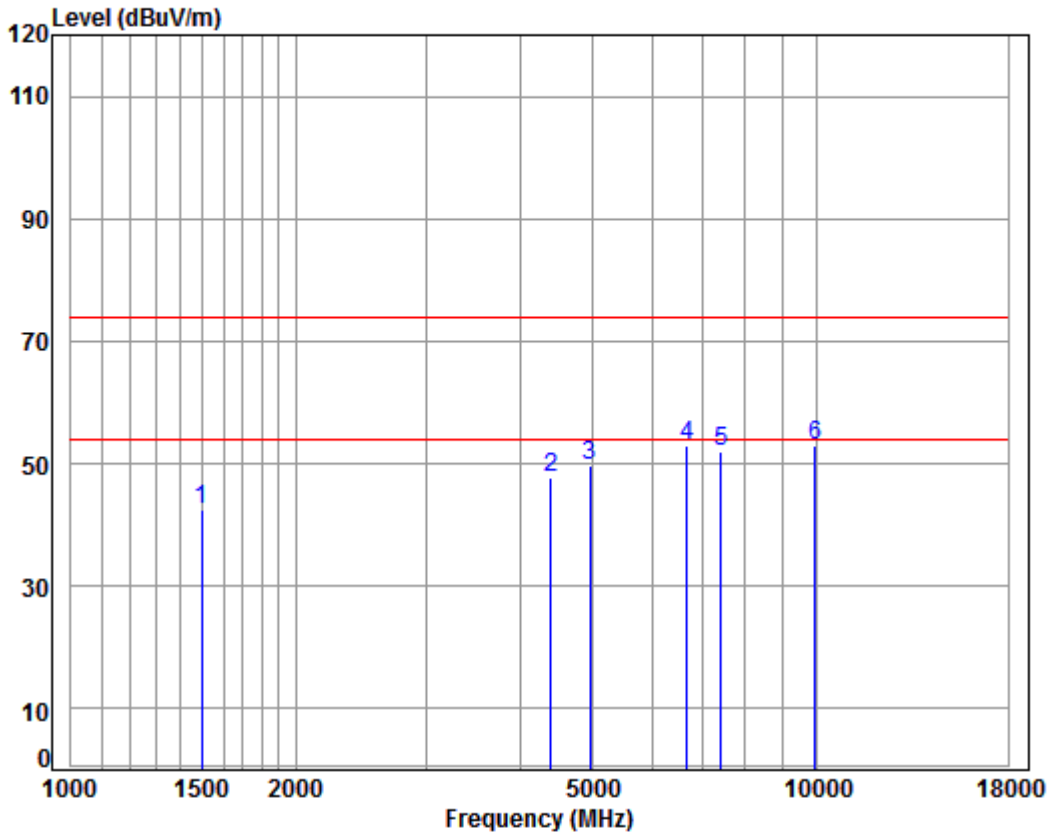
Mode:a; Polarization:Horizontal; Channel:High



Condition: 3m HORIZONTAL
Job No : 09743CR
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	1538.281	5.43	25.98	38.04	44.80	38.17	74.00	-35.83	peak
2	4367.058	7.41	33.60	38.20	44.44	47.25	74.00	-26.75	peak
3	4960.000	8.05	34.43	38.48	46.48	50.48	74.00	-23.52	peak
4	6659.763	11.08	35.56	37.62	44.19	53.21	74.00	-20.79	peak
5	7440.000	10.02	36.32	36.89	42.62	52.07	74.00	-21.93	peak
6 pp	9920.000	10.90	37.58	34.94	39.70	53.24	74.00	-20.76	peak

Mode:a; Polarization:Vertical; Channel:High



Condition: 3m VERTICAL
Job No : 09743CR
Mode : 2480 TX SE
Note : Zigbee

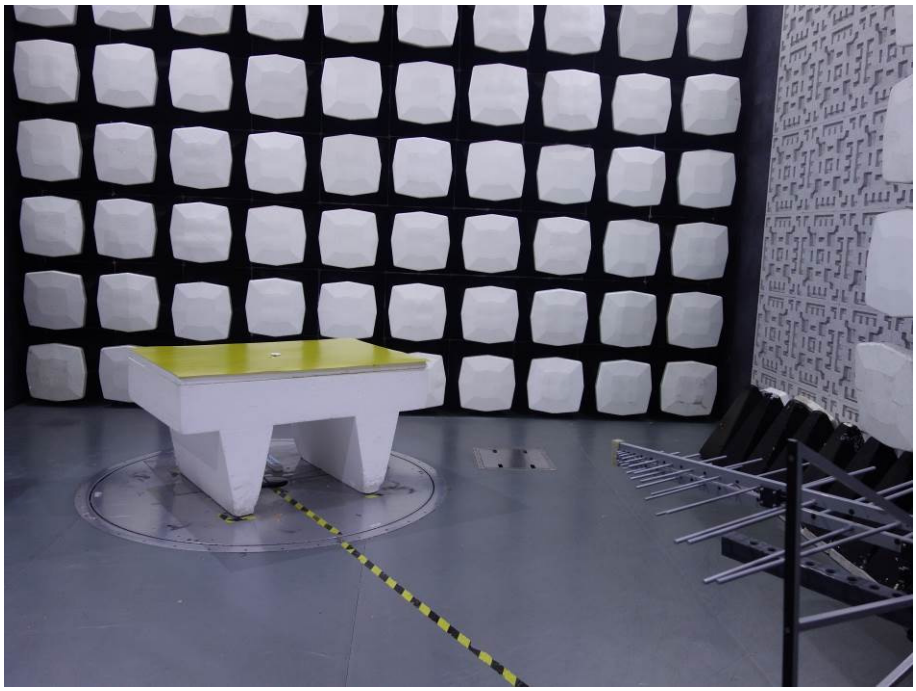
	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1498.781	5.48	25.80	38.04	49.27	42.51	74.00	-31.49	peak
2	4392.376	7.44	33.60	38.21	44.77	47.60	74.00	-26.40	peak
3	4960.000	8.05	34.43	38.48	45.68	49.68	74.00	-24.32	peak
4	6679.040	11.02	35.61	37.60	43.87	52.90	74.00	-21.10	peak
5	7440.000	10.02	36.32	36.89	42.59	52.04	74.00	-21.96	peak
6 pp	9920.000	10.90	37.58	34.94	39.38	52.92	74.00	-21.08	peak

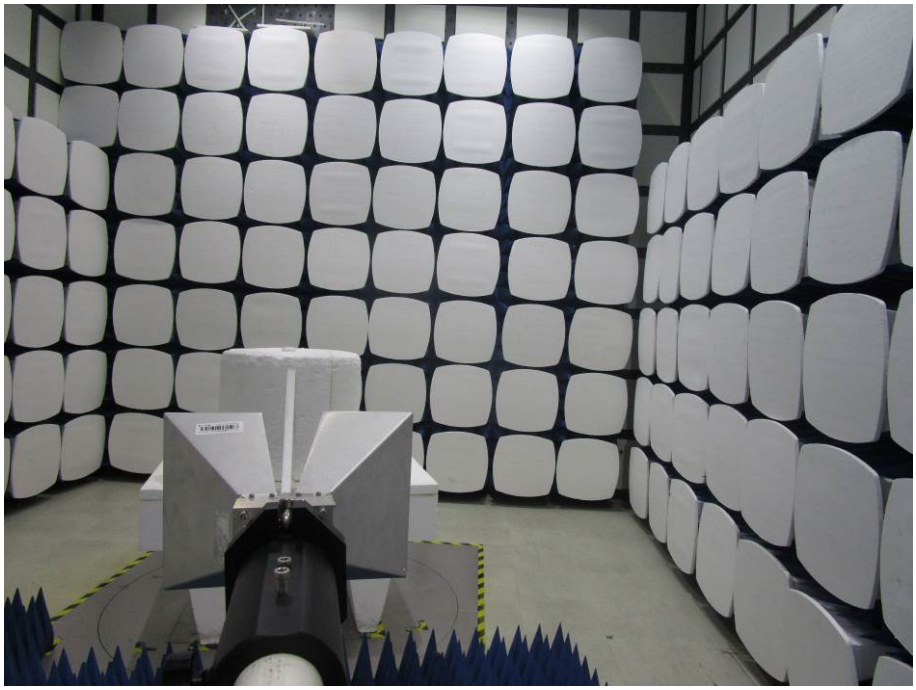
Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
2) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
3) As shown in this section, 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. So, only above measurement data were shown in the report.

8 Photographs

8.1 Radiated Spurious Emissions Test Setup





8.2 EUT Constructional Details

Refer to EUT external and internal photos.

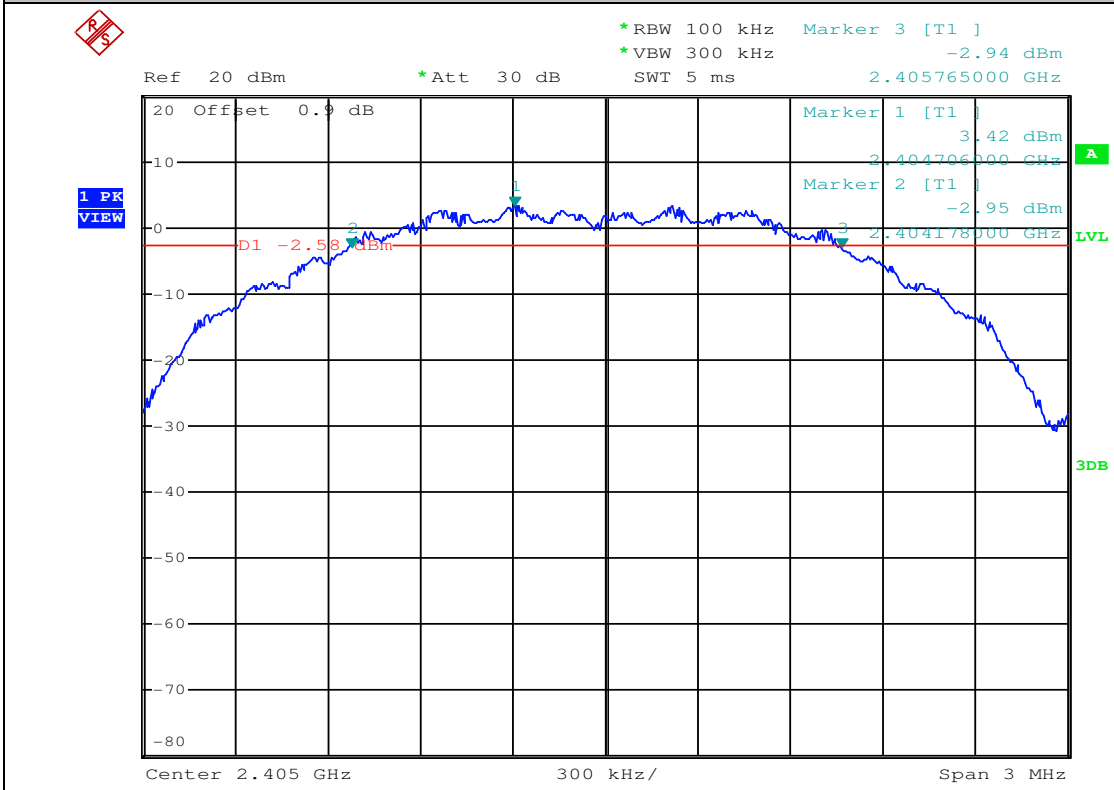
9 Appendix

9.1 Appendix 15.247

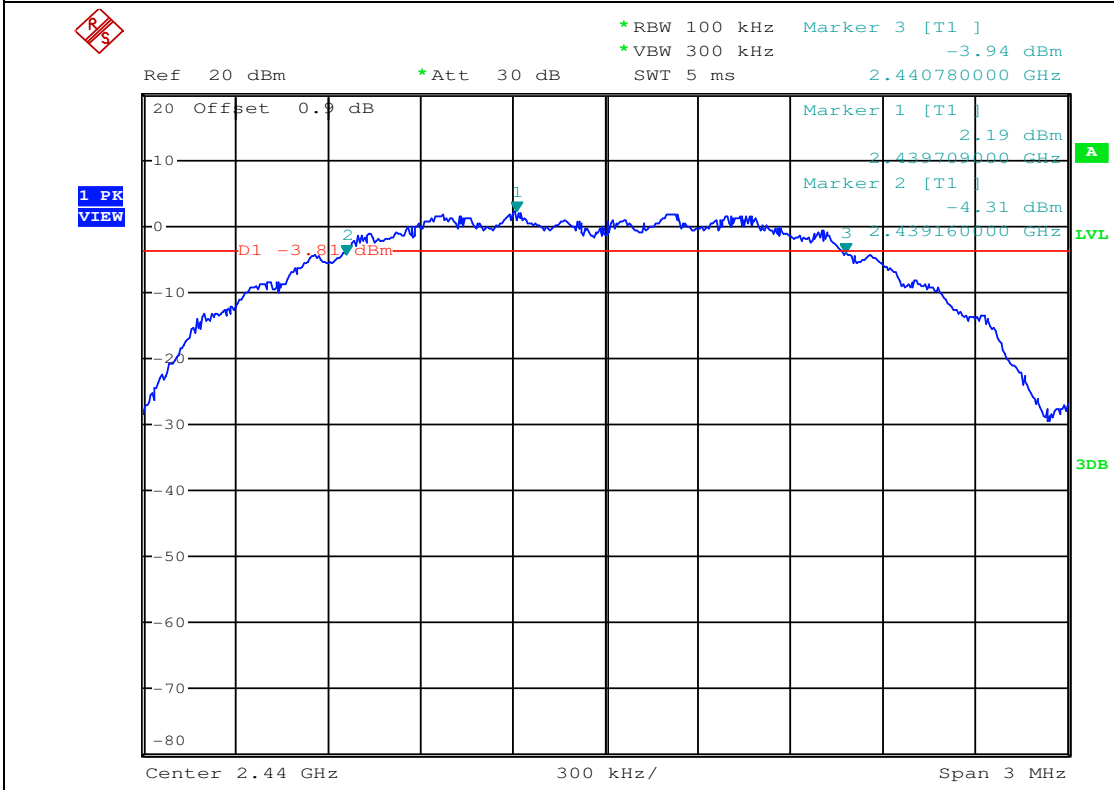
1.6dB Bandwidth

Test Mode	Test	Ant	EBW[MHz]	Limit[MHz]	Verdict
ZIGBEE	2405	Ant1	1.587	>=0.5	PASS
ZIGBEE	2440	Ant1	1.620	>=0.5	PASS
ZIGBEE	2480	Ant1	1.641	>=0.5	PASS

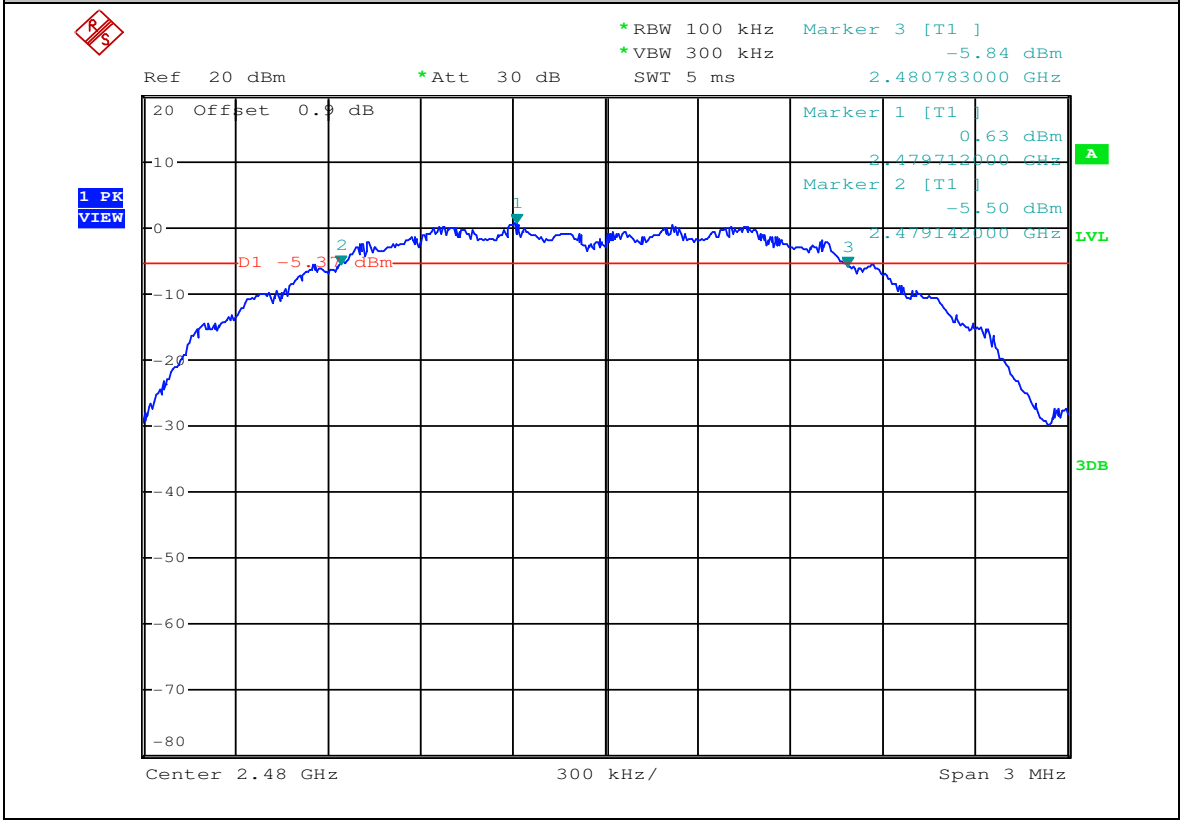
6dB Bandwidth_ ZIGBEE _2405_Ant1



6dB Bandwidth_ ZIGBEE _2440_Ant1



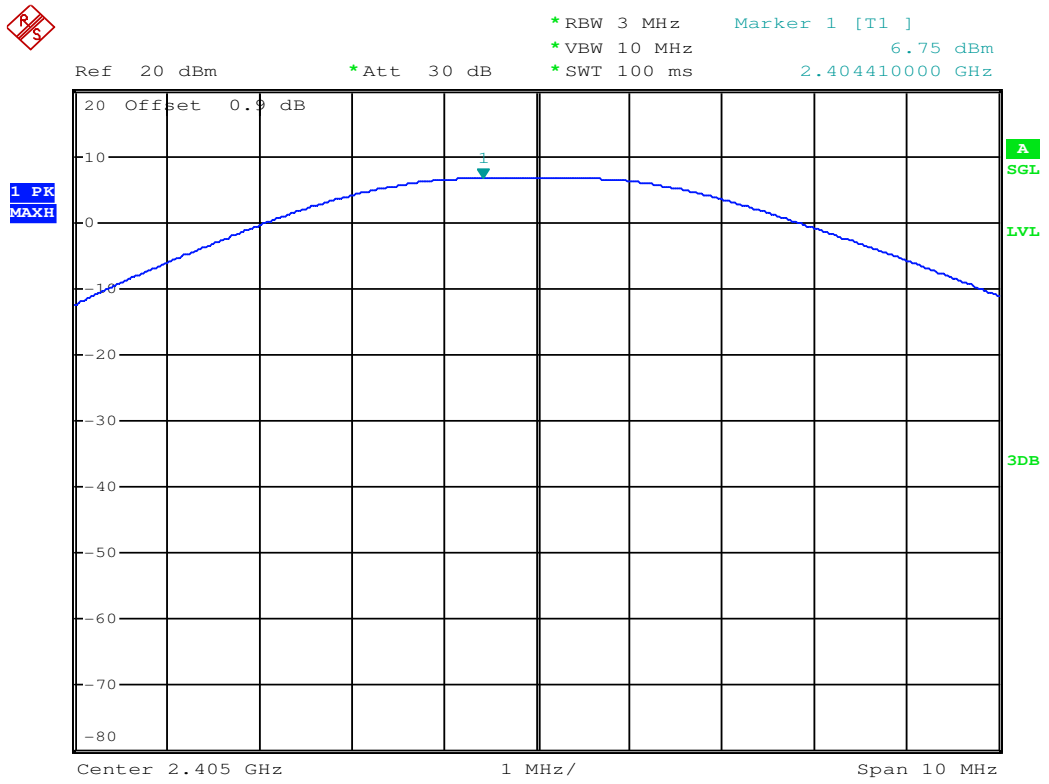
6dB Bandwidth_ ZIGBEE _2480_Ant1



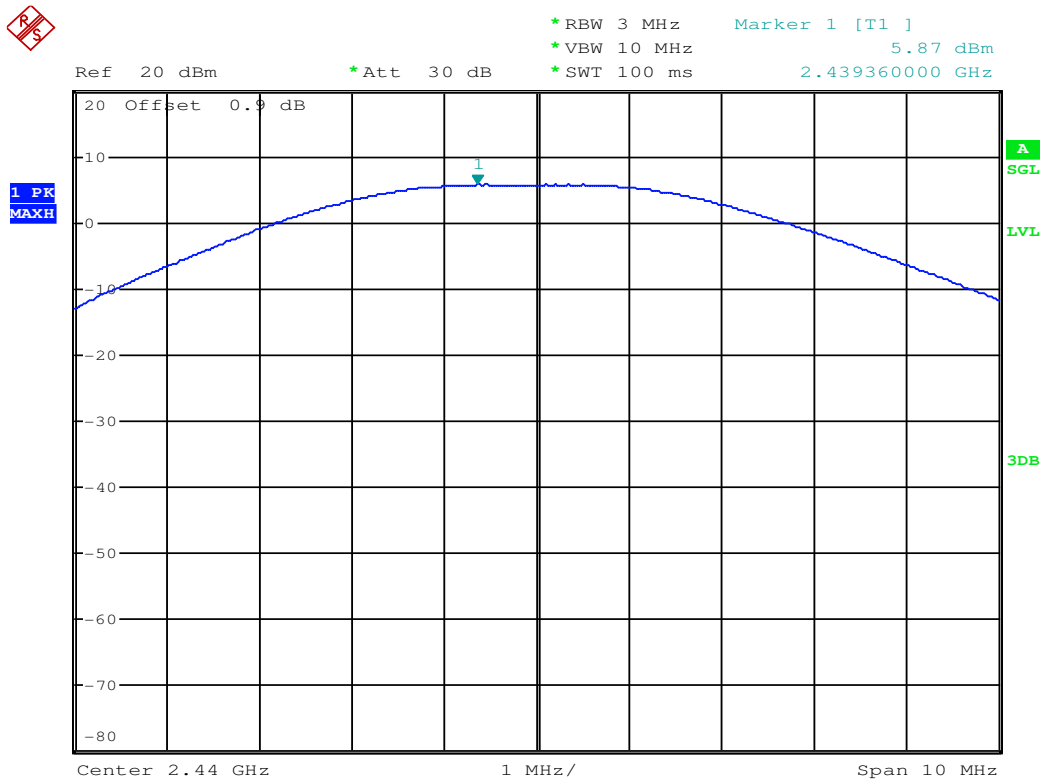
2.Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
ZIGBEE	2405	Ant1	6.75	<30	PASS
ZIGBEE	2440	Ant1	5.87	<30	PASS
ZIGBEE	2480	Ant1	4.34	<30	PASS

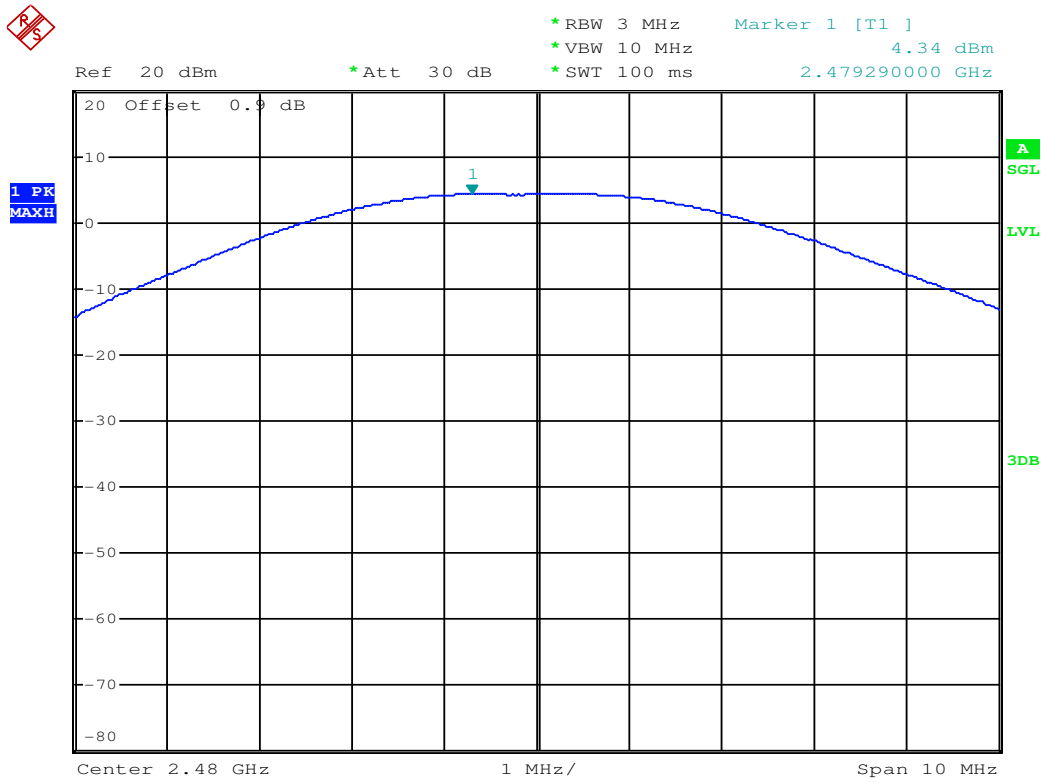
Maximum peak conducted output power_ ZIGBEE _2405_Ant1



Maximum peak conducted output power_ ZIGBEE _2440_Ant1



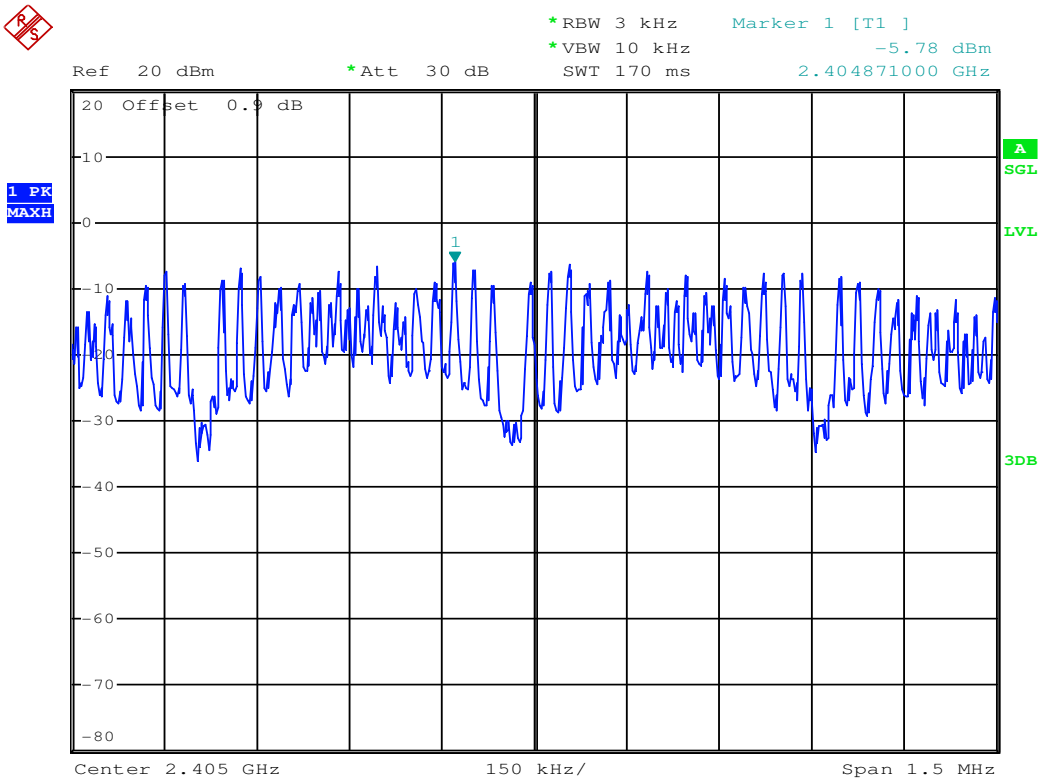
Maximum peak conducted output power_ ZIGBEE _2480_Ant1



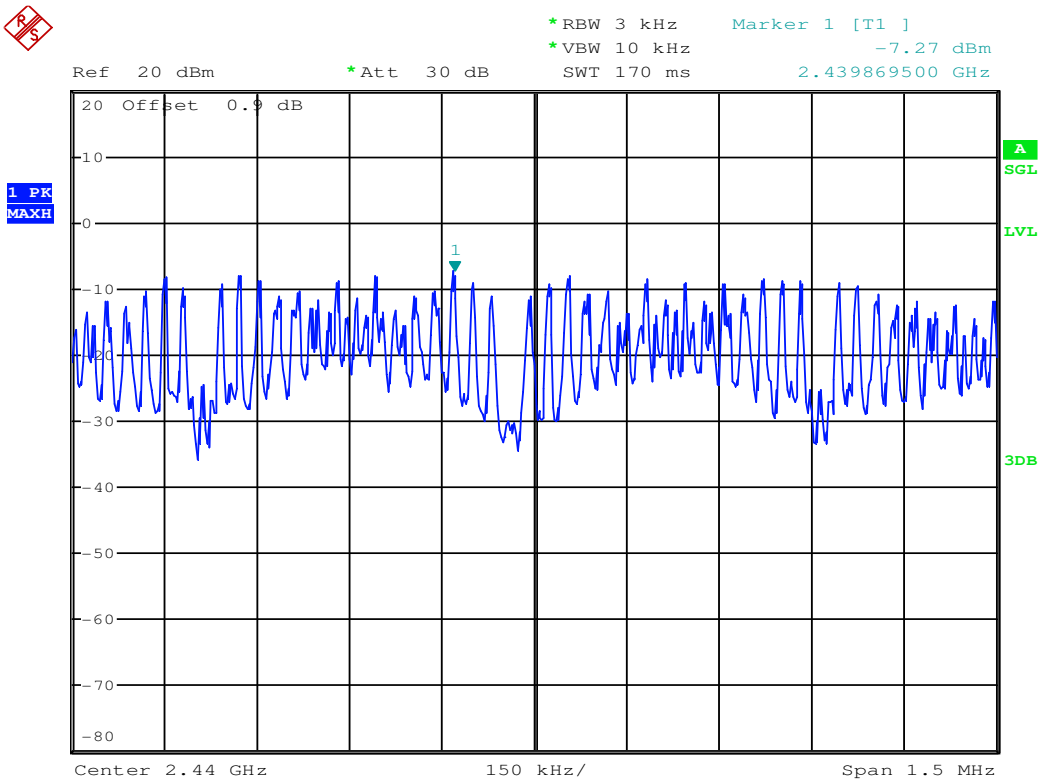
3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
ZIGBEE	2405	Ant1	-5.78	<8.00	PASS
ZIGBEE	2440	Ant1	-7.27	<8.00	PASS
ZIGBEE	2480	Ant1	-9.15	<8.00	PASS

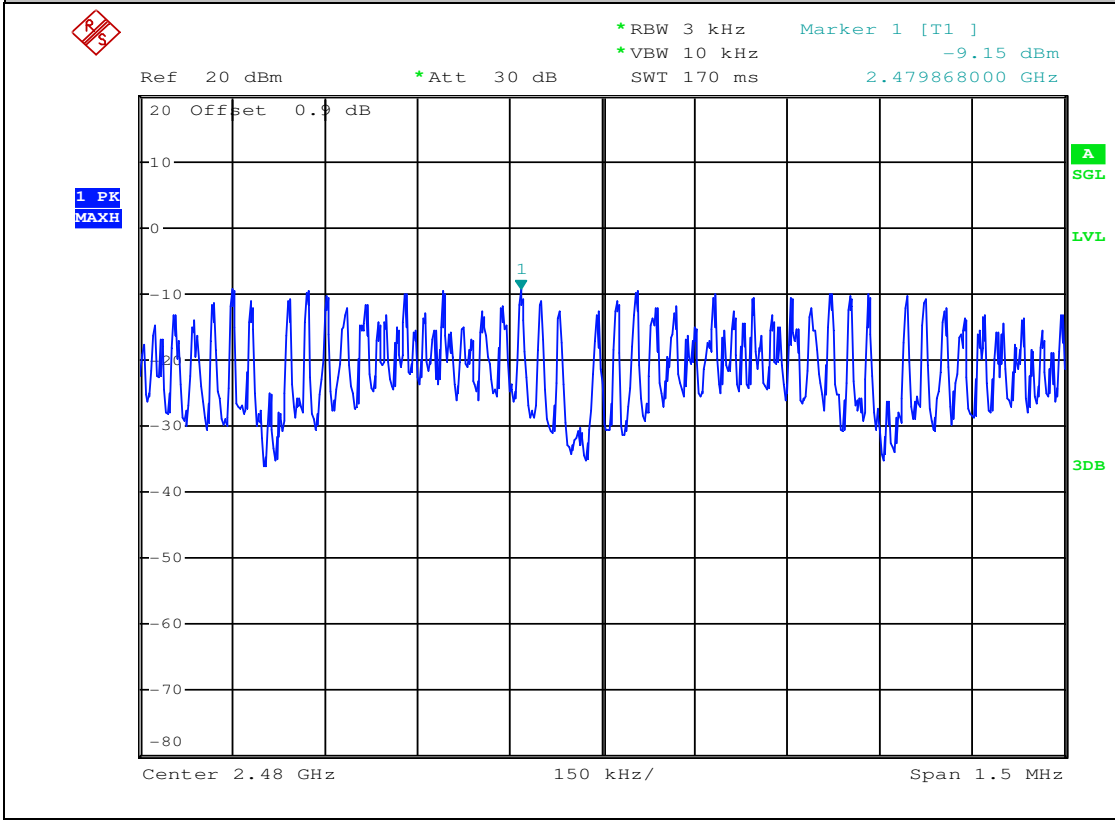
Maximum Peak power spectral density_ ZIGBEE _2405_Ant1



Maximum Peak power spectral density_ ZIGBEE _2440_Ant1



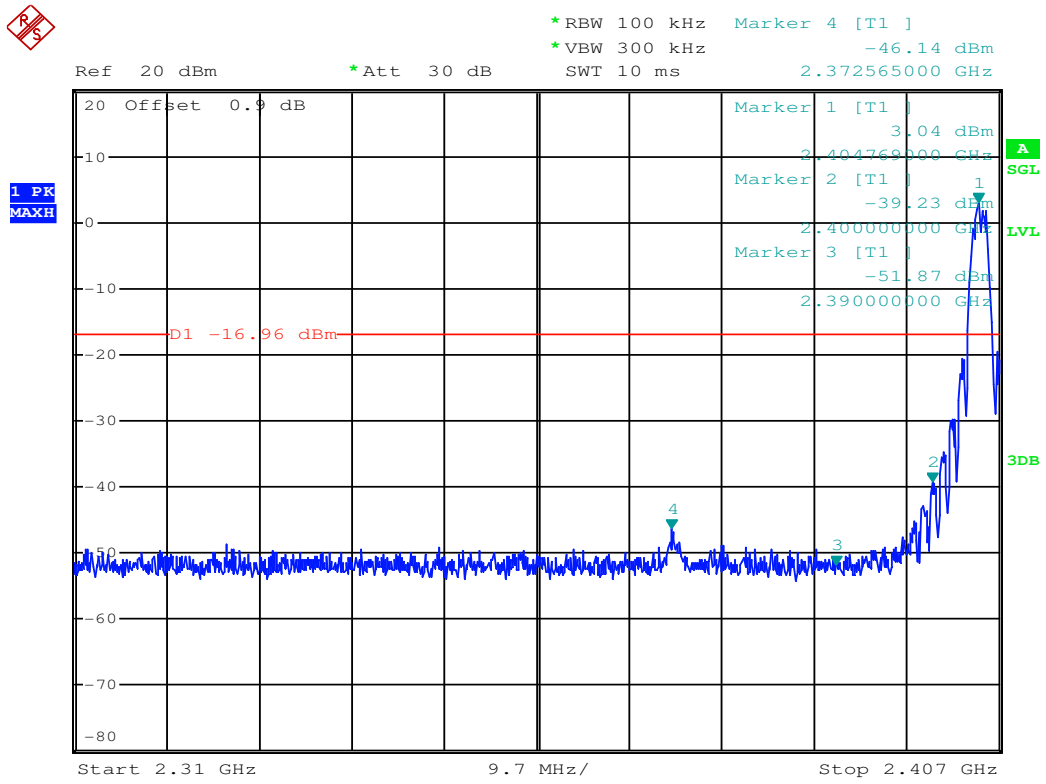
Maximum Peak power spectral density_ ZIGBEE _2480_Ant1



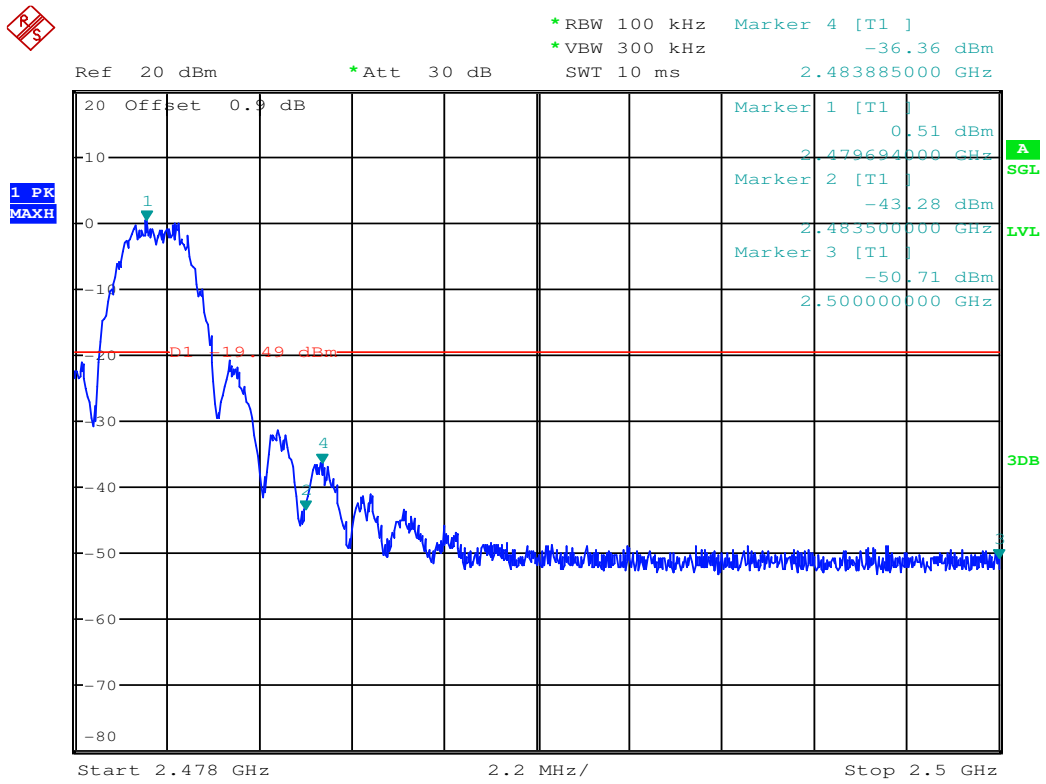
4.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
ZIGBEE	2405	Ant1	3.040	-46.142	<-16.96	PASS
ZIGBEE	2480	Ant1	0.510	-36.362	<-19.49	PASS

Band-edge for RF Conducted Emissions_ ZIGBEE _2405_Ant1

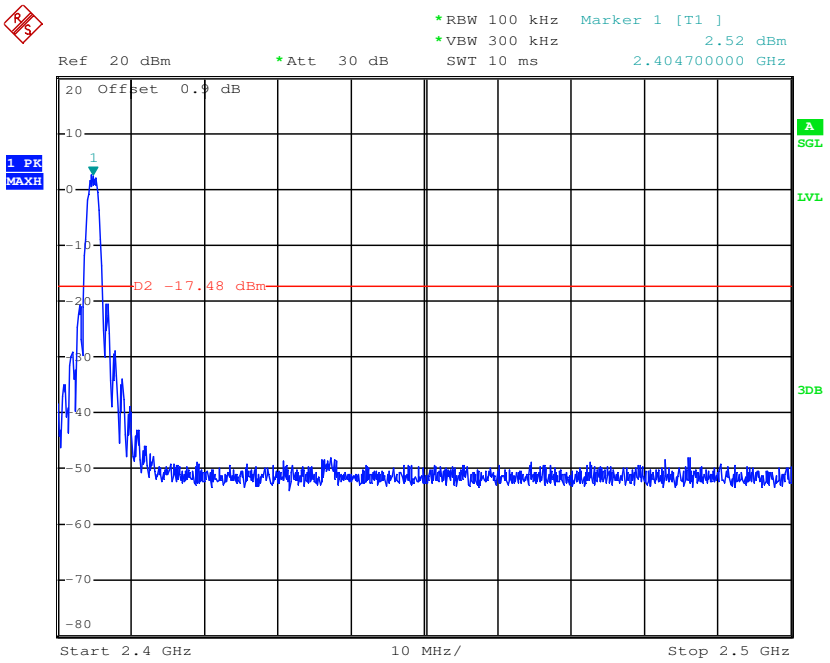
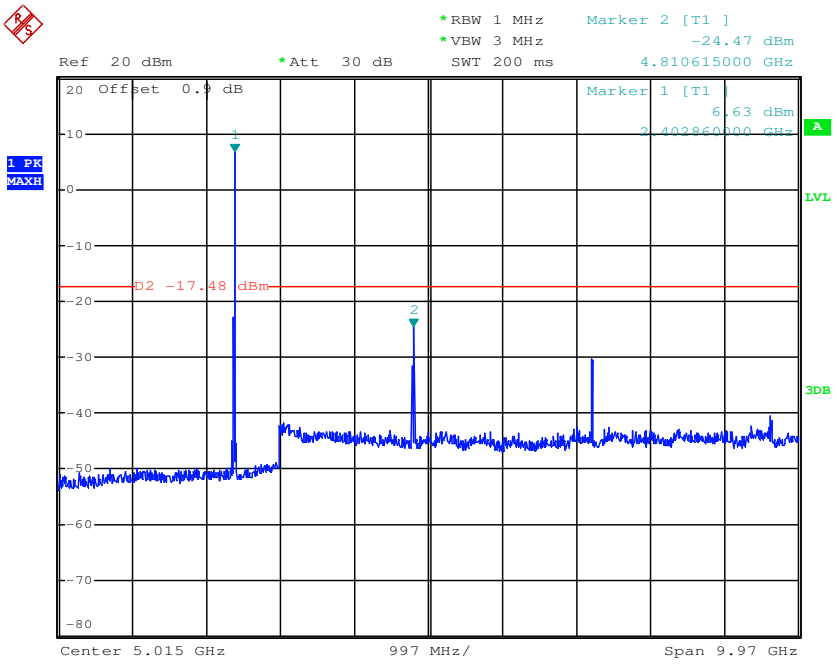


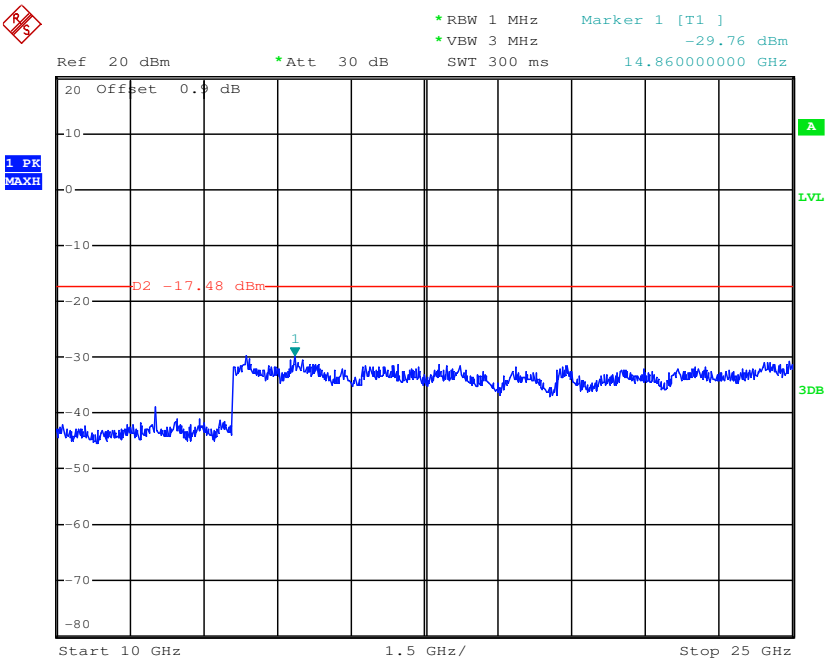
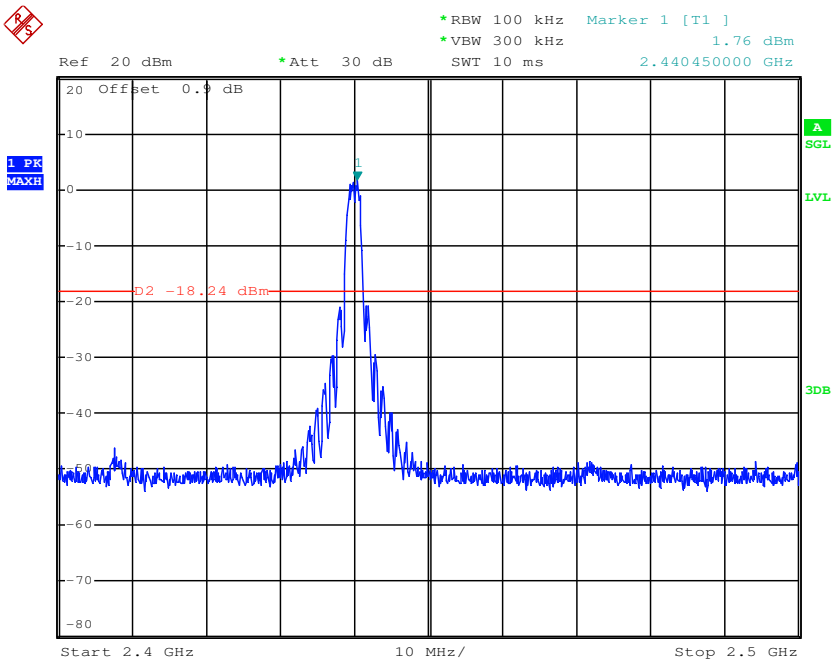
Band-edge for RF Conducted Emissions_ ZIGBEE _2480_Ant1

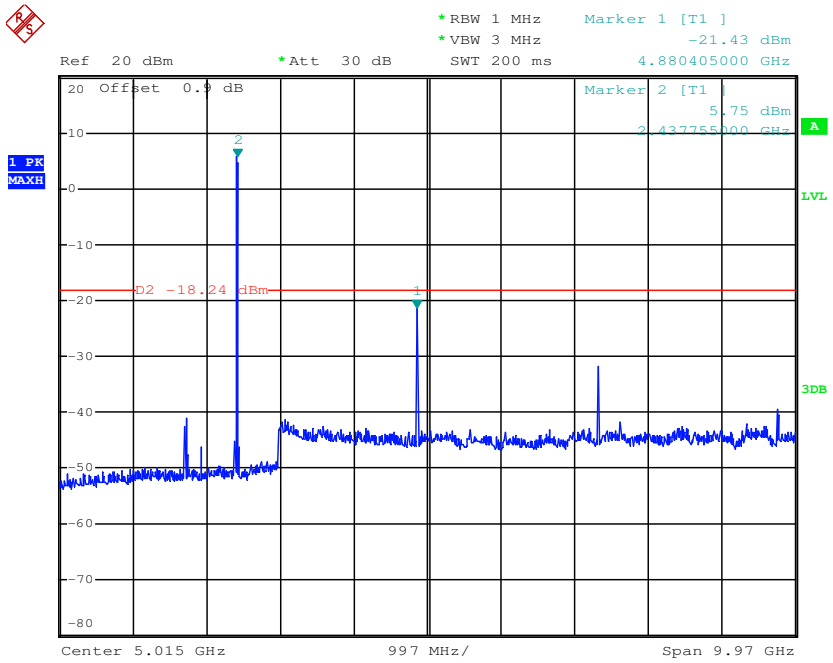
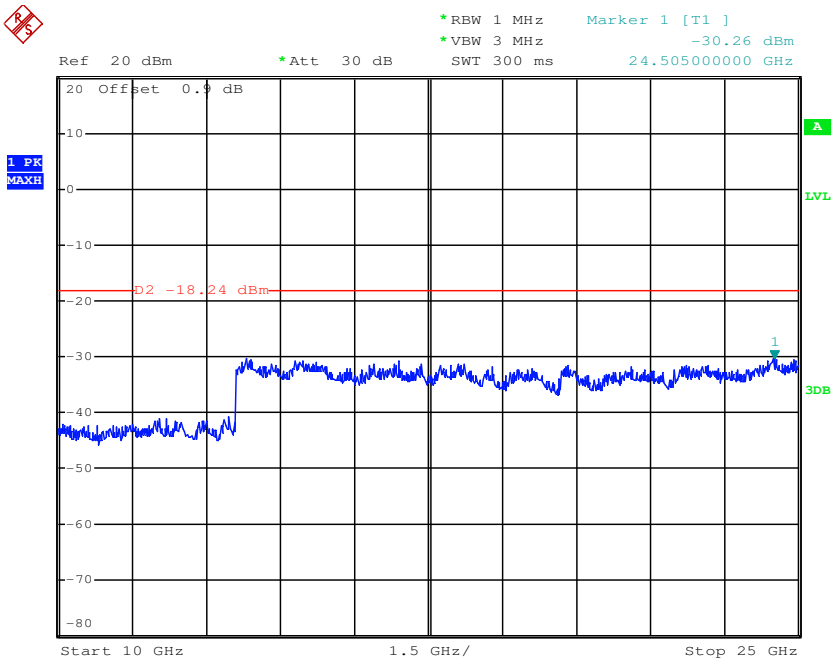


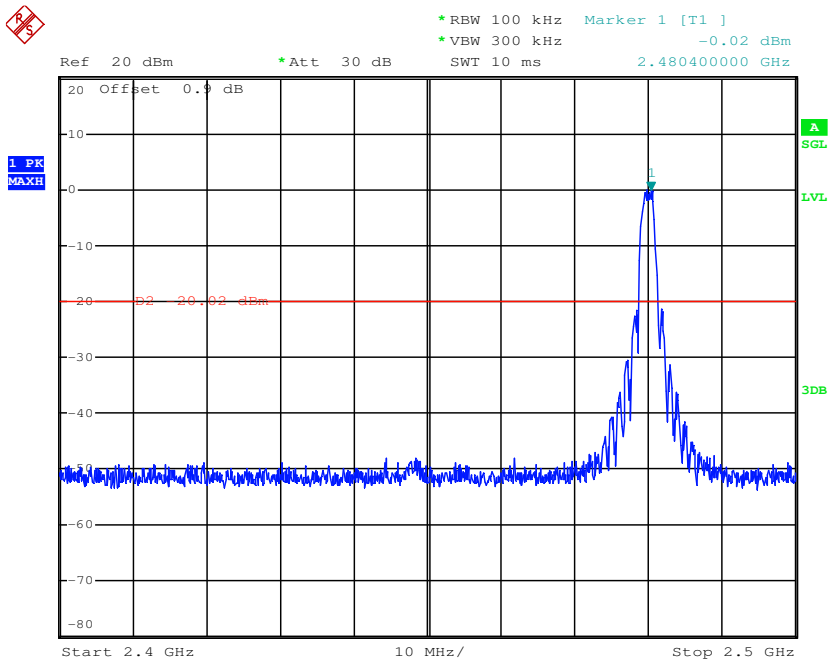
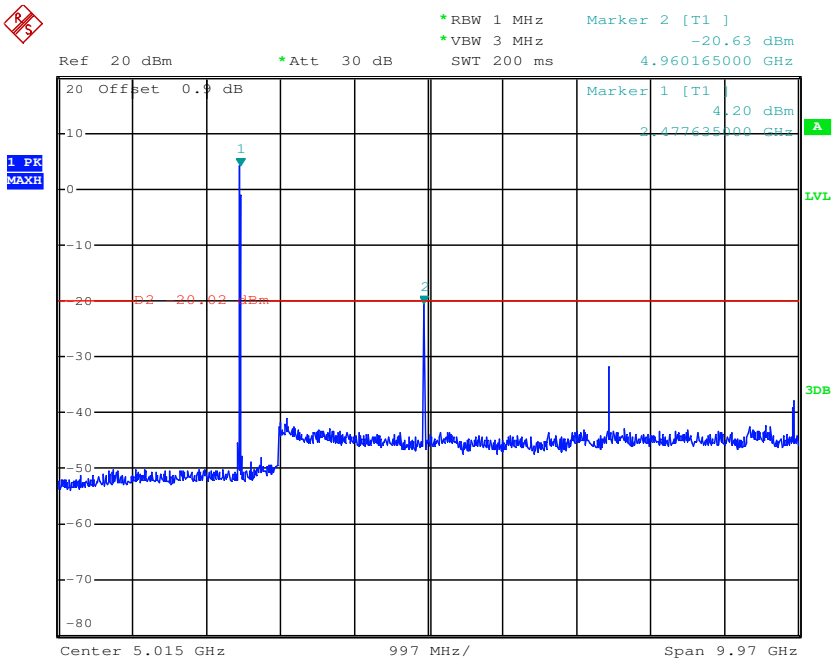
5.RF Conducted Spurious Emissions

Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
ZIGBEE	2405	30	10000	1000	3000	2.52	-24.47	<-17.48	PASS
ZIGBEE	2405	10000	25000	1000	3000	2.52	-29.76	<-17.48	PASS
ZIGBEE	2440	30	10000	1000	3000	1.76	-21.43	<-18.24	PASS
ZIGBEE	2440	10000	25000	1000	3000	1.76	-30.26	<-18.24	PASS
ZIGBEE	2480	30	10000	1000	3000	-0.02	-20.03	<-20.02	PASS
ZIGBEE	2480	10000	25000	1000	3000	-0.02	-30.03	<-20.02	PASS

RF Conducted Spurious Emissions_ ZIGBEE _2405_Ant1	
Pref	
CSE_1	

CSE_2	
RF Conducted Spurious Emissions_ ZIGBEE _2440_Ant1	
Pref	

CSE_1	
CSE_2	

RF Conducted Spurious Emissions_ ZIGBEE _2480_Ant1	
Pref	
CSE_1	

CSE_2