



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

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Report No.: SZEM170600607702
Page: 1 of 57

TEST REPORT

Application No.: SZEM1706006077CR(SGS SZ No.:T51710230086EM)
Applicant: MGA ENTERTAINMENT (H.K.) LTD.
Address of Applicant: 6/F, YHC TOWER, 1 SHEUNG YUET ROAD, KOWLOON BAY, KOWLOON,
Hong Kong

Equipment Under Test (EUT):
EUT Name: Construct'n Learn Smart Workbench
Item No.: 643651, 643651C, 643651E4, 643651E4C ♣
♣ Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.

P.O. No.: HKPO17001675
Labeled Age Grading: 3+ Years
Country of Origin: China
Country of Destination: US
FCC ID: LU9643651C
Standards: 47 CFR Part 15, Subpart C 15.247
Date of Receipt: 2017-06-15
Date of Test: 2017-06-19 to 2017-06-20
Date of Issue: 2017-06-22

Test Result :	Pass*
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* 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.

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2017-06-22		Original

Authorized for issue by:				
		Gebin Sun		2017-06-20
		Gebin Sun /Project Engineer		Date
		Eric Fu		2017-06-22
		Eric Fu /Reviewer		Date



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 11.9.1.2	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 15.205 & 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

Remark:

Item No.: 643651, 643651C, 643651E4, 643651E4C

Only the item 643651 was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above items, only different on item No..



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	10
6.1 ANTENNA REQUIREMENT	10
6.1.1 Test Requirement:	10
6.1.2 Conclusion	10
7 RADIO SPECTRUM MATTER TEST RESULTS	11
7.1 MINIMUM 6DB BANDWIDTH	11
7.1.1 E.U.T. Operation	11
7.1.2 Test Setup Diagram	11
7.1.3 Measurement Procedure and Data	11
7.2 CONDUCTED PEAK OUTPUT POWER	12
7.2.1 E.U.T. Operation	13
7.2.2 Test Setup Diagram	13
7.2.3 Measurement Procedure and Data	13
7.3 POWER SPECTRUM DENSITY	14
7.3.1 E.U.T. Operation	14
7.3.2 Test Setup Diagram	14
7.3.3 Measurement Procedure and Data	14
7.4 CONDUCTED BAND EDGES MEASUREMENT	15
7.4.1 E.U.T. Operation	15
7.4.2 Test Setup Diagram	15
7.4.3 Measurement Procedure and Data	15
7.5 CONDUCTED SPURIOUS EMISSIONS	16
7.5.1 E.U.T. Operation	16
7.5.2 Test Setup Diagram	16
7.5.3 Measurement Procedure and Data	16
7.6 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS	17
7.6.1 E.U.T. Operation	17
7.6.2 Test Setup Diagram	17
7.6.3 Measurement Procedure and Data	18
7.7 RADIATED SPURIOUS EMISSIONS	23
7.7.1 E.U.T. Operation	24
7.7.2 Test Setup Diagram	24
7.7.3 Measurement Procedure and Data	25



8	PHOTOGRAPHS.....	35
8.1	RADIATED SPURIOUS EMISSIONS TEST SETUP	35
8.2	EUT CONSTRUCTIONAL DETAILS	35
9	APPENDIX.....	36
9.1	APPENDIX 15.247.....	36-57



4 General Information

4.1 Details of E.U.T.

Power supply: 6V DC(1.5V x 4 "AA" Size Batteries)
4.5V DC(1.5V x 3 "AAA" Size Batteries)

Operation Frequency: 2402MHz~2480MHz
Bluetooth Version: V4.0 BLE
Modulation Type: GFSK
Number of Channel: 40
Sample Type: portable production
Antenna Type: Integral
Antenna Gain: 0dBi

4.2 Description of Support Units

The EUT has been tested independently.

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.25 x 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 °C
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 – Registration No.: 556682**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.: 556682.

- **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

Minimum 6dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Power Spectrum Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Conducted Band Edges Measurement					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09

Conducted Spurious Emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2016-10-09	2017-10-09
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2016-10-09	2017-10-09



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

Report No.: SZEM170600607702

Page: 9 of 57

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	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12
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 Requirement:

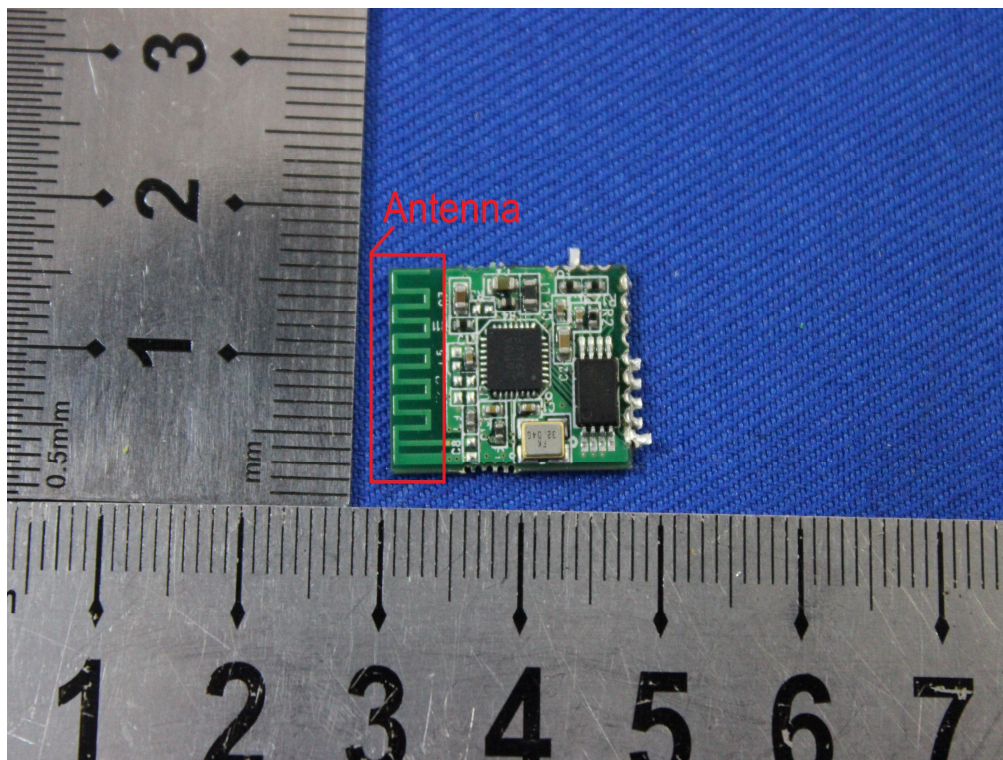
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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 0dBi.



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

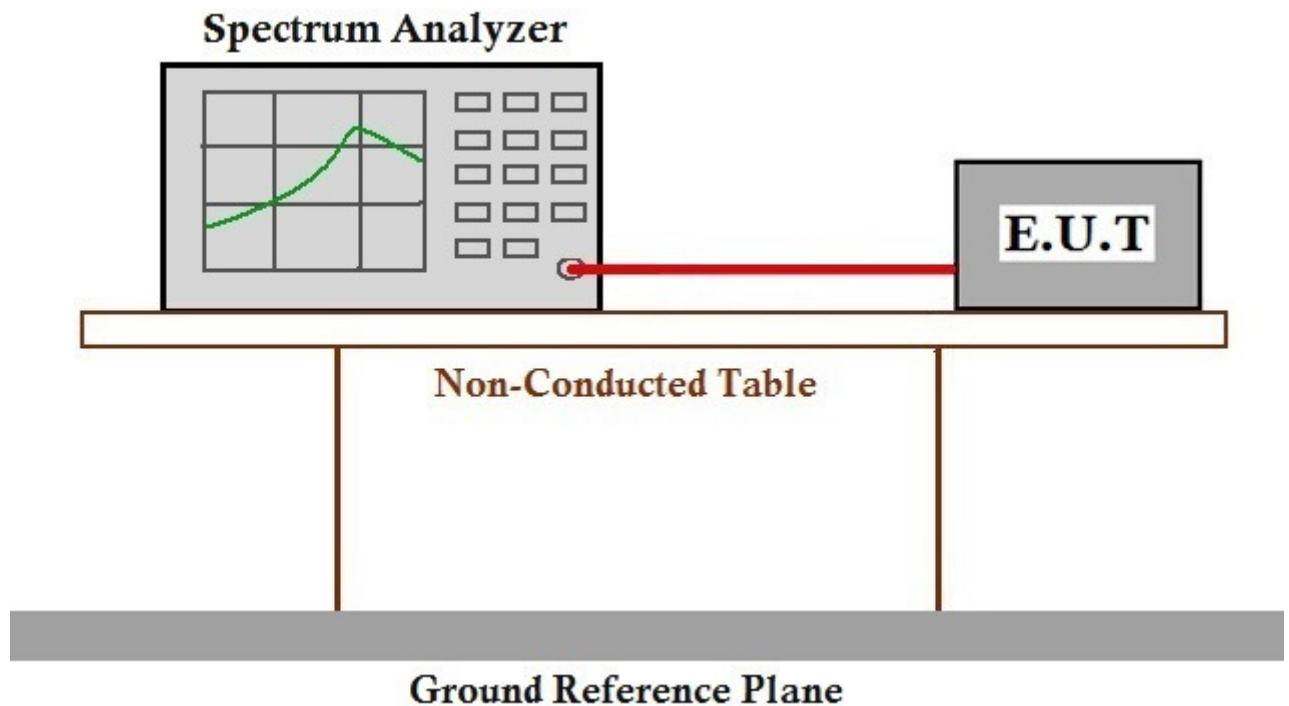
7.1.1 E.U.T. Operation

Operating Environment:

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

Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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 11.9.1.2

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

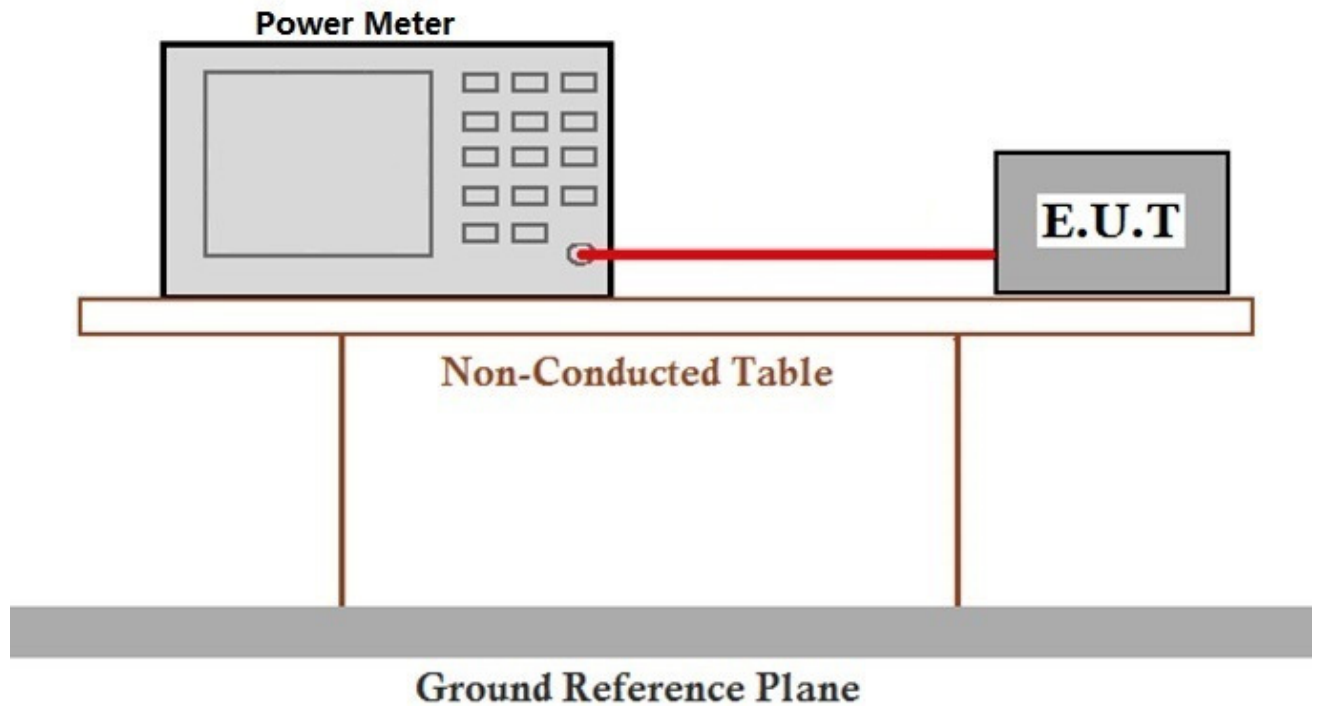
7.2.1 E.U.T. Operation

Operating Environment:

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

Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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: $\leq 8\text{dBm}$ in any 3 kHz band during any time interval of continuous transmission

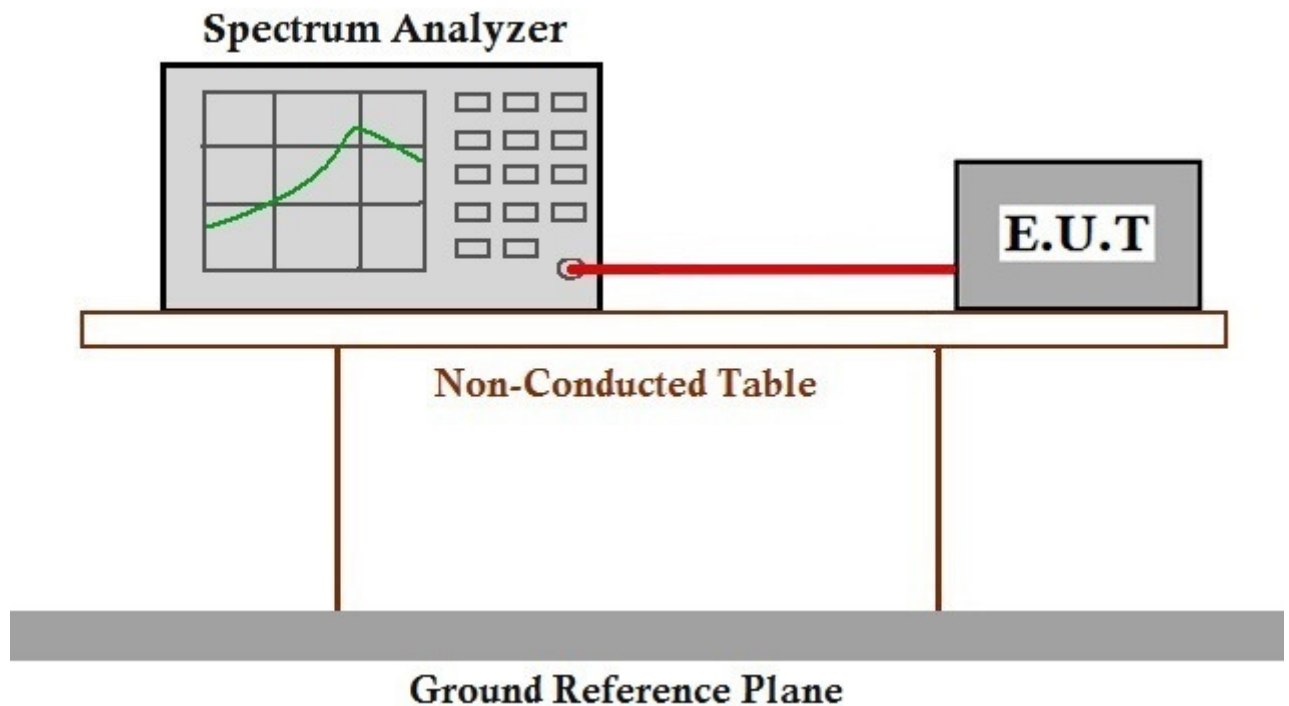
7.3.1 E.U.T. Operation

Operating Environment:

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

Test mode: b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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

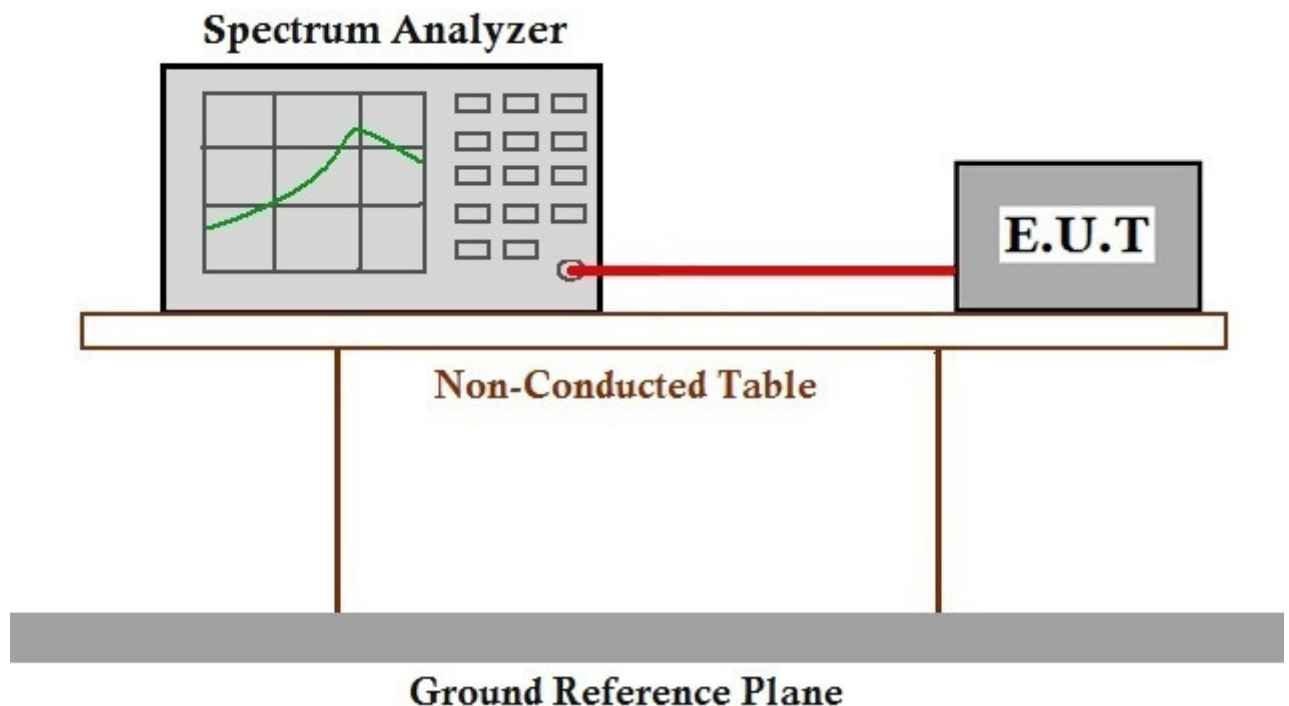
7.4.1 E.U.T. Operation

Operating Environment:

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

Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

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

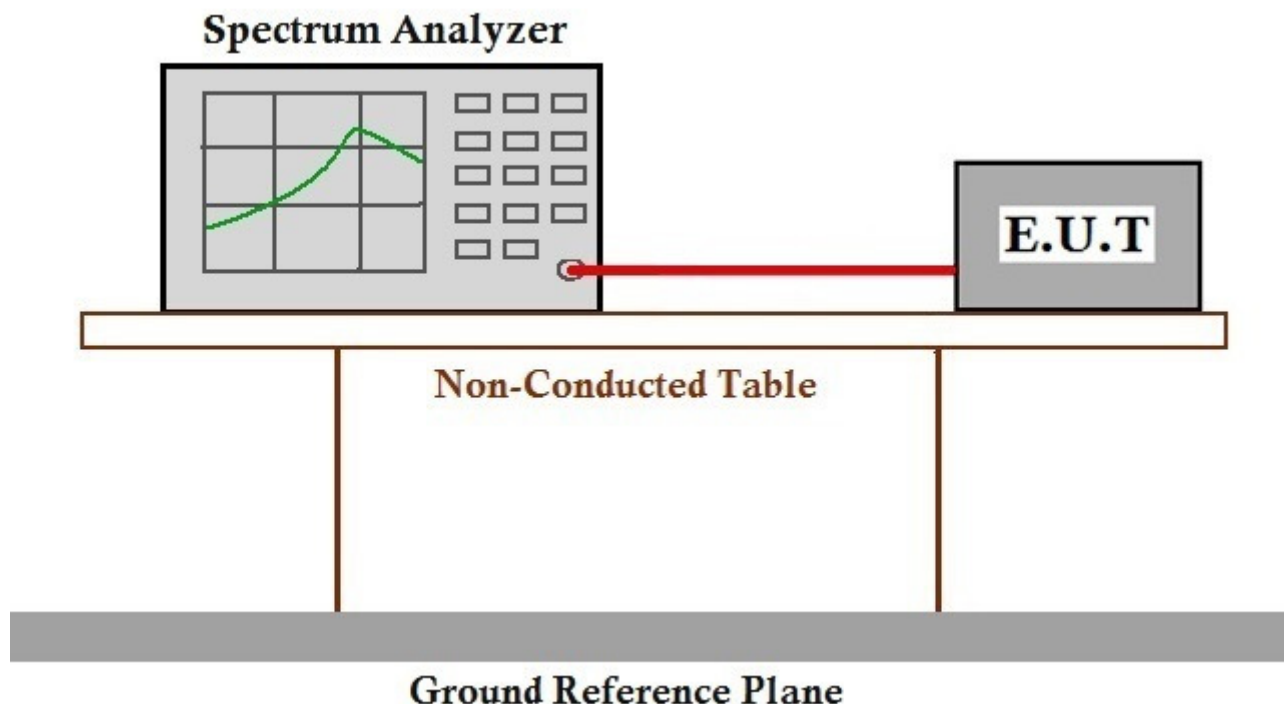
Test Requirement	47 CFR Part 15, Subpart C 15.247(d)
Test Method:	ANSI C63.10 (2013) Section 11.11
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be 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.

7.5.1 E.U.T. Operation

Operating Environment:

Temperature:	25 °C	Humidity:	55 % RH	Atmospheric Pressure:	1005 mbar
Test mode	b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.				

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 15.205 & 15.209

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

Measurement Distance: 3m

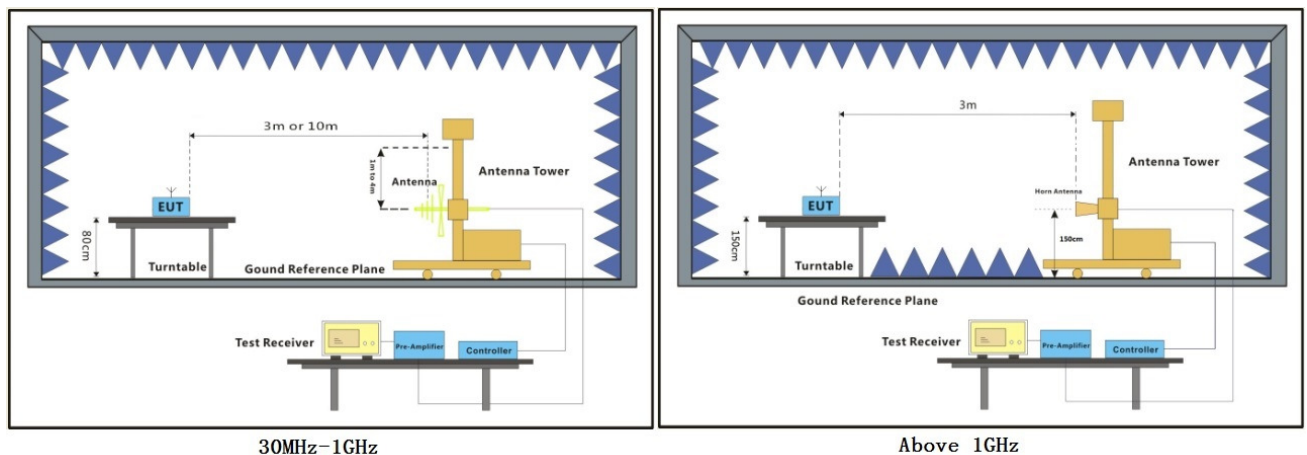
7.6.1 E.U.T. Operation

Operating Environment:

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

Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.6.2 Test Setup Diagram



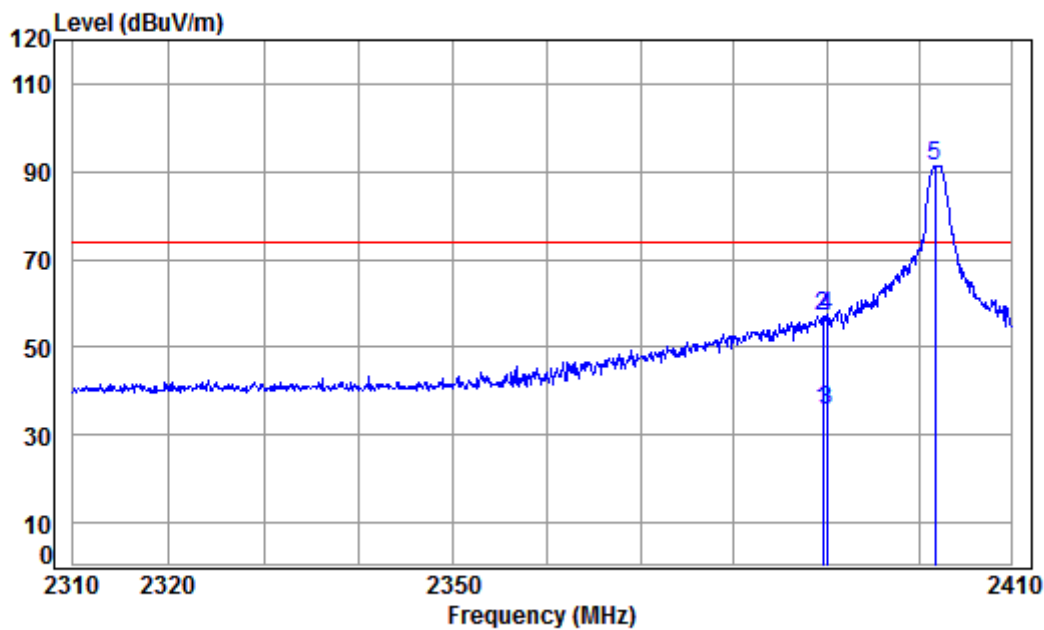


7.6.3 Measurement Procedure and Data

- 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.



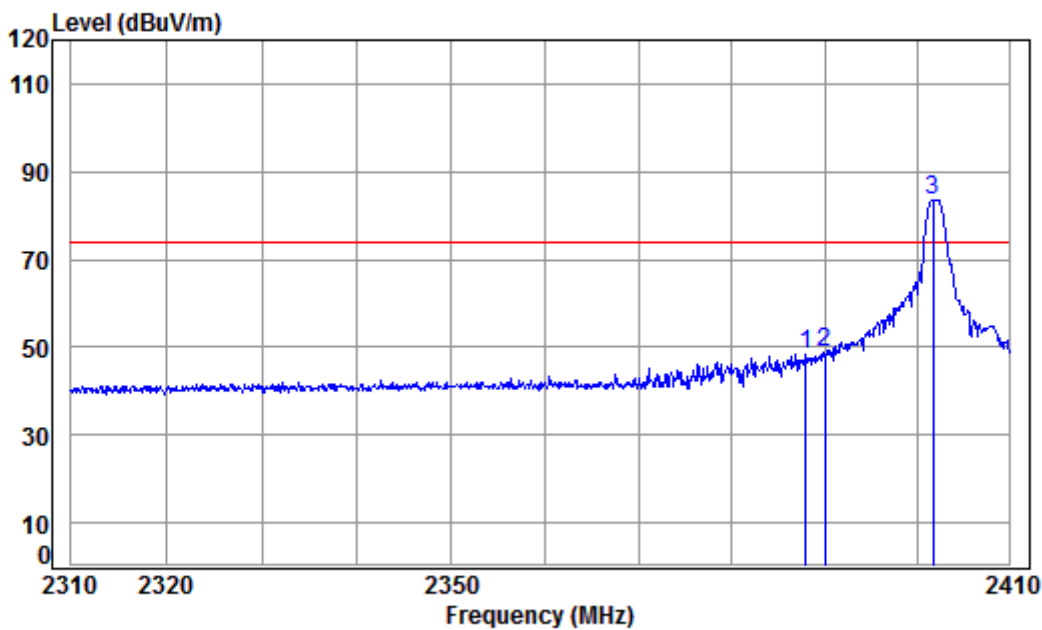
Mode:b; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:Low



Condition: 3m HORIZONTAL
Job No: : 06077CR
Mode: : 2402 Band edge
: BLE

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2389.659	5.34	29.08	37.96	39.14	35.60	54.00	-18.40	Average
2	2389.659	5.34	29.08	37.96	60.68	57.14	74.00	-16.86	peak
3 av	2390.000	5.34	29.08	37.96	39.23	35.69	54.00	-18.31	Average
4	2390.000	5.34	29.08	37.96	60.56	57.02	74.00	-16.98	peak
5 pp	2401.741	5.35	29.11	37.96	94.64	91.14	74.00	17.14	peak

Mode:b; Polarization:Vertical; Modulation Type:GFSK; ; Channel:Low



Condition: 3m VERTICAL

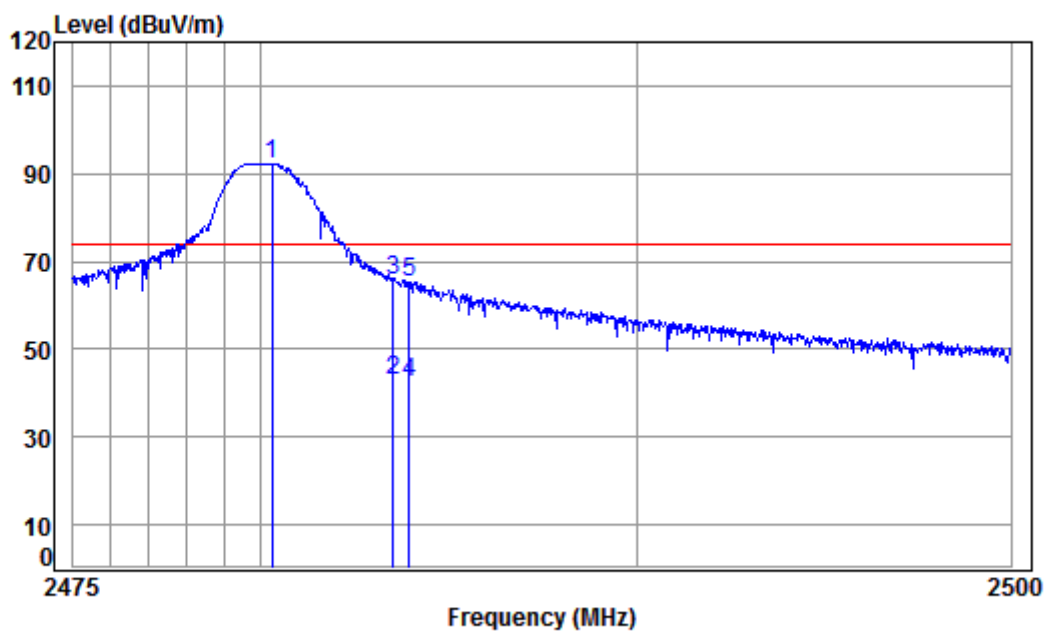
Job No: : 06077CR

Mode: : 2402 Band edge

: BLE

		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	2388.040	5.34	29.07	37.96	51.88	48.33	74.00	-25.67 peak
2	2390.000	5.34	29.08	37.96	52.19	48.65	74.00	-25.35 peak
3 pp	2401.741	5.35	29.11	37.96	87.21	83.71	74.00	9.71 peak

Mode:b; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:High



Condition: 3m HORIZONTAL

Job No: : 06077CR

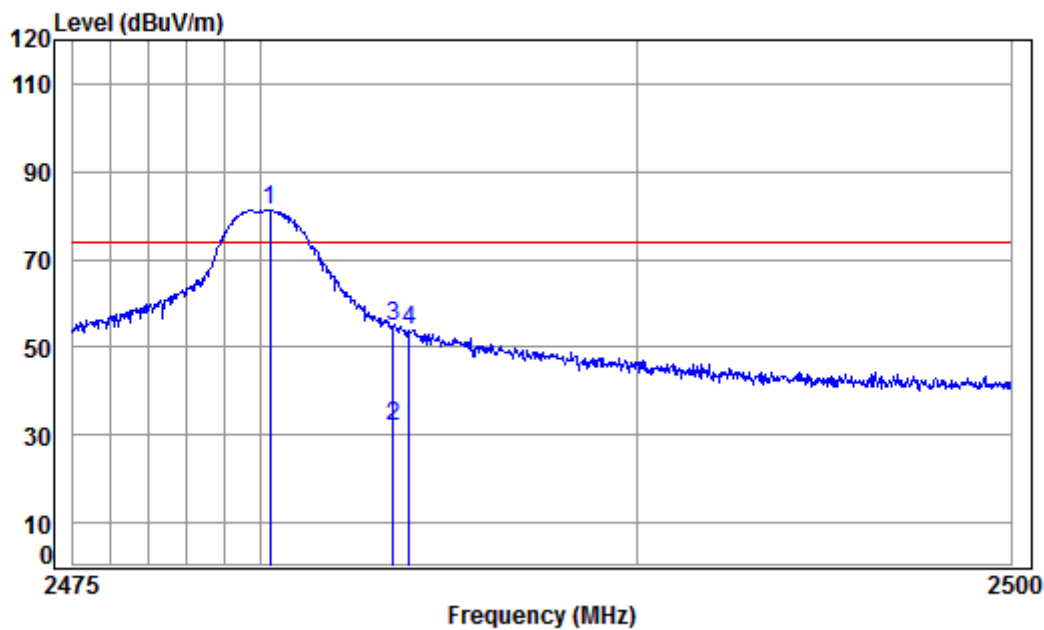
Mode: : 2480 Band edge

: BLE

		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	pp 2480.279	5.41	29.34	37.95	95.51	92.31	74.00	18.31 peak
2	av 2483.500	5.41	29.35	37.95	45.94	42.75	54.00	-11.25 Average
3	2483.500	5.41	29.35	37.95	69.09	65.90	74.00	-8.10 peak
4	2483.946	5.41	29.35	37.95	45.77	42.58	54.00	-11.42 Average
5	2483.946	5.41	29.35	37.95	68.33	65.14	74.00	-8.86 peak



Mode:b; Polarization:Vertical; Modulation Type:GFSK; ; Channel:High



Condition: 3m VERTICAL

Job No: : 06077CR

Mode: : 2480 Band edge

: BLE

		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	pp 2480.229	5.41	29.34	37.95	84.28	81.08	74.00	7.08 peak
2	av 2483.500	5.41	29.35	37.95	35.35	32.16	54.00	-21.84 Average
3	2483.500	5.41	29.35	37.95	57.93	54.74	74.00	-19.26 peak
4	2483.946	5.41	29.35	37.95	57.12	53.93	74.00	-20.07 peak



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

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.

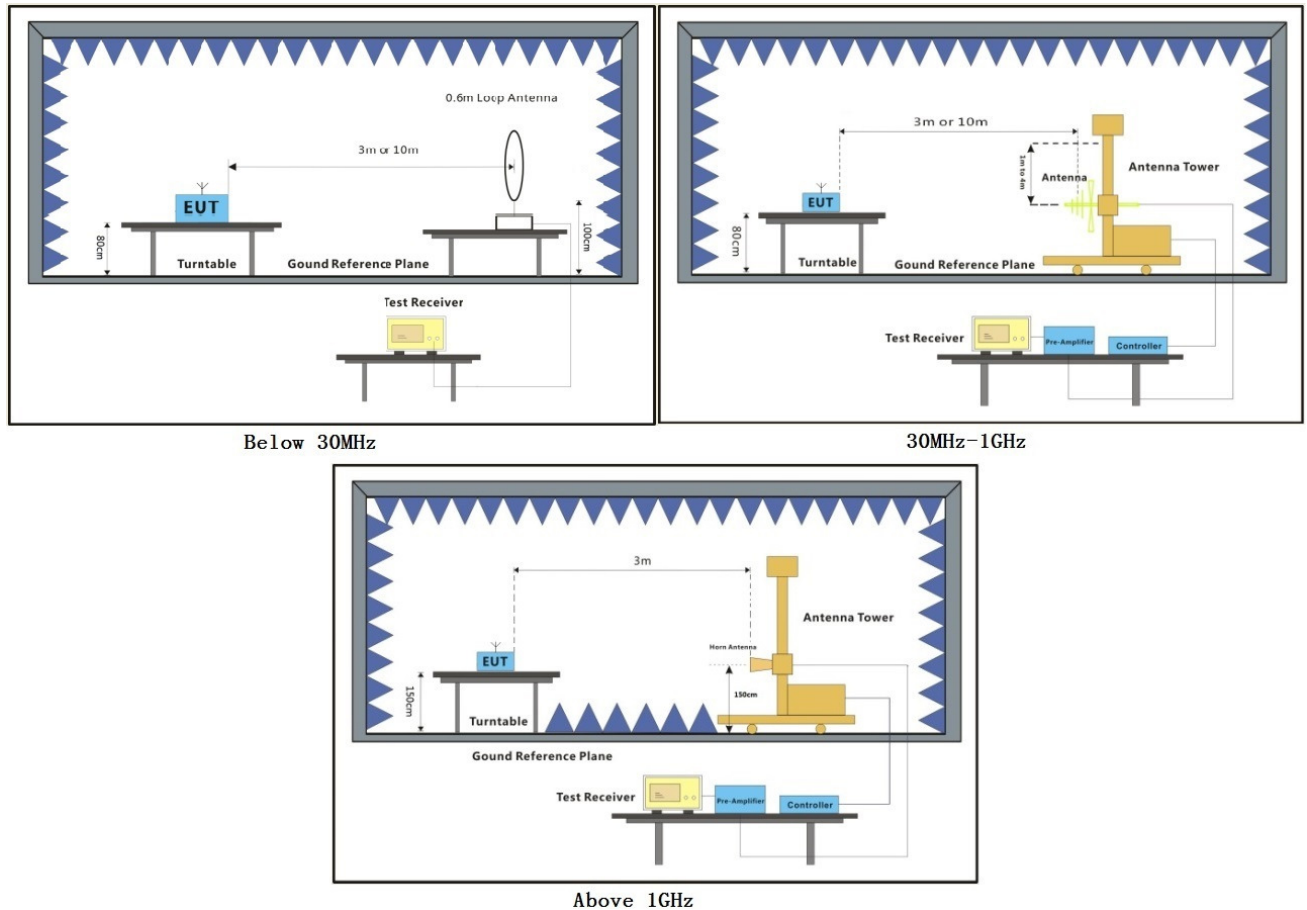
7.7.1 E.U.T. Operation

Operating Environment:

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

Test mode b:TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation.

7.7.2 Test Setup Diagram





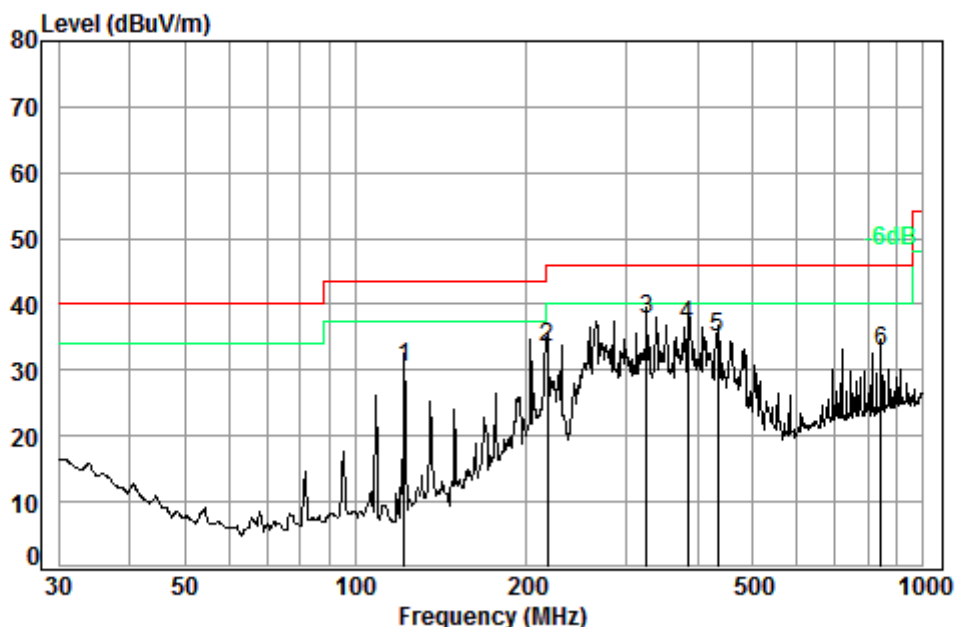
7.7.3 Measurement Procedure and Data

- 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.



Radiated Emission below 1GHz

Mode:b; Polarization:Horizontal



Condition: 3m HORIZONTAL

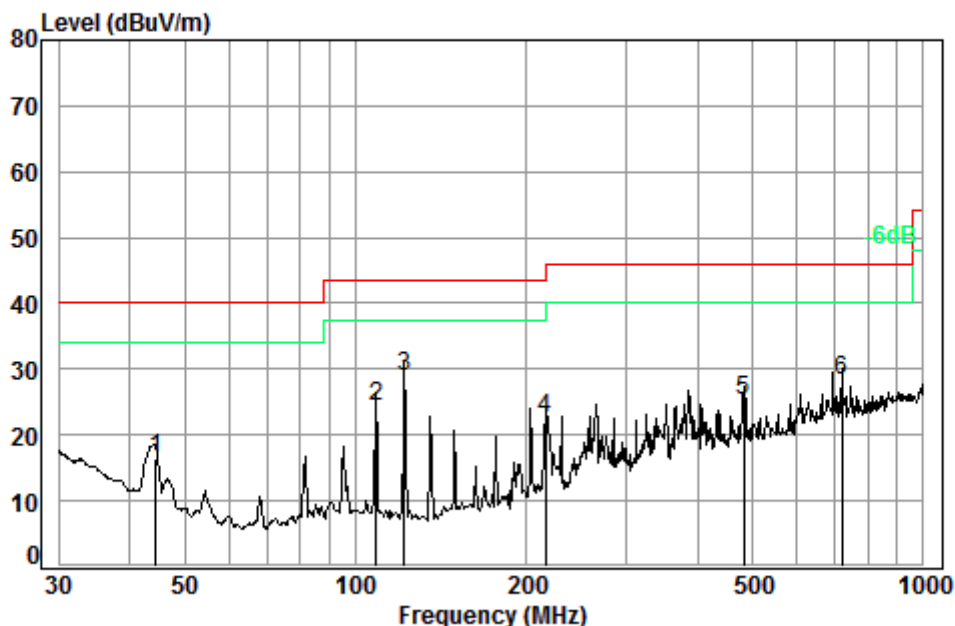
Job No. : 06077CR

Test mode: c

		Cable	Ant	Preamp	Read		Limit	Over
	Freq	Loss	Factor	Factor	Level	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	121.98	1.26	7.86	27.06	48.36	30.42	43.50	-13.08
2	217.54	1.50	11.11	26.63	47.52	33.50	46.00	-12.50
3 pp	325.60	1.98	14.78	26.60	47.44	37.60	46.00	-8.40
4	385.28	2.16	16.12	27.03	45.41	36.66	46.00	-9.34
5	434.07	2.35	16.58	27.35	43.36	34.94	46.00	-11.06
6	842.13	3.38	22.40	27.06	34.10	32.82	46.00	-13.18



Mode:b; Polarization:Vertical



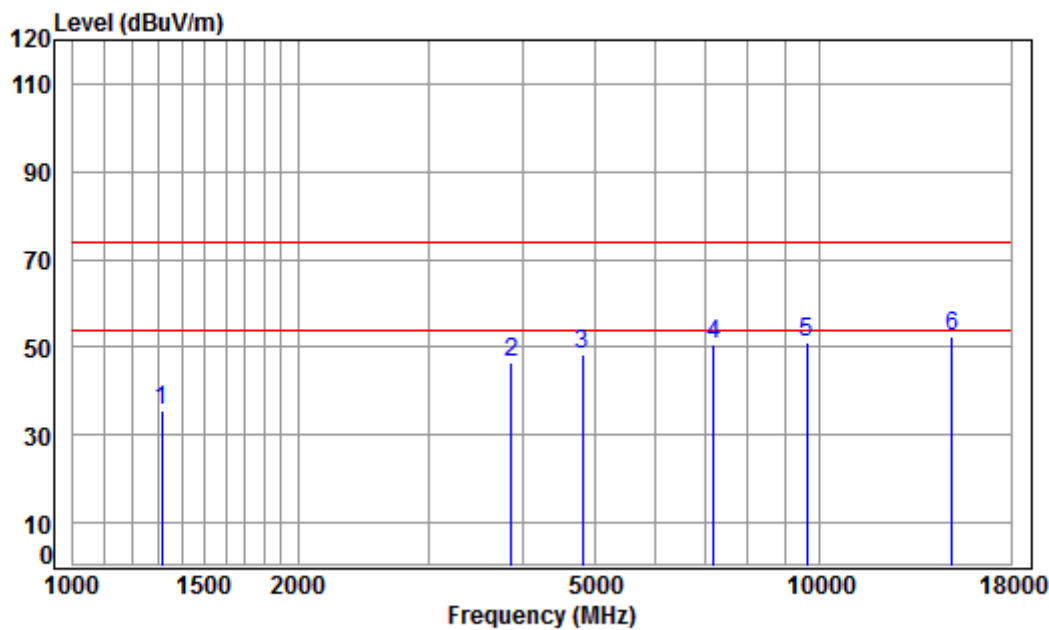
Condition: 3m VERTICAL
Job No. : 06077CR
Test mode: c

	Freq	Cable	Ant	Preamp	Read	Limit	Over
	MHz	Loss	Factor	Factor	Level	Line	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB
1	44.59	0.70	11.08	27.31	32.06	16.53	40.00 -23.47
2	108.65	1.22	8.67	27.14	41.62	24.37	43.50 -19.13
3 pp	121.98	1.26	7.86	27.06	46.88	28.94	43.50 -14.56
4	216.02	1.49	11.03	26.64	36.52	22.40	46.00 -23.60
5	482.22	2.54	17.80	27.62	32.64	25.36	46.00 -20.64
6	719.20	2.96	21.60	27.39	31.05	28.22	46.00 -17.78



Transmitter Emission above 1GHz

Mode:b; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:Low



Condition: 3m HORIZONTAL

Job No: : 06077CR

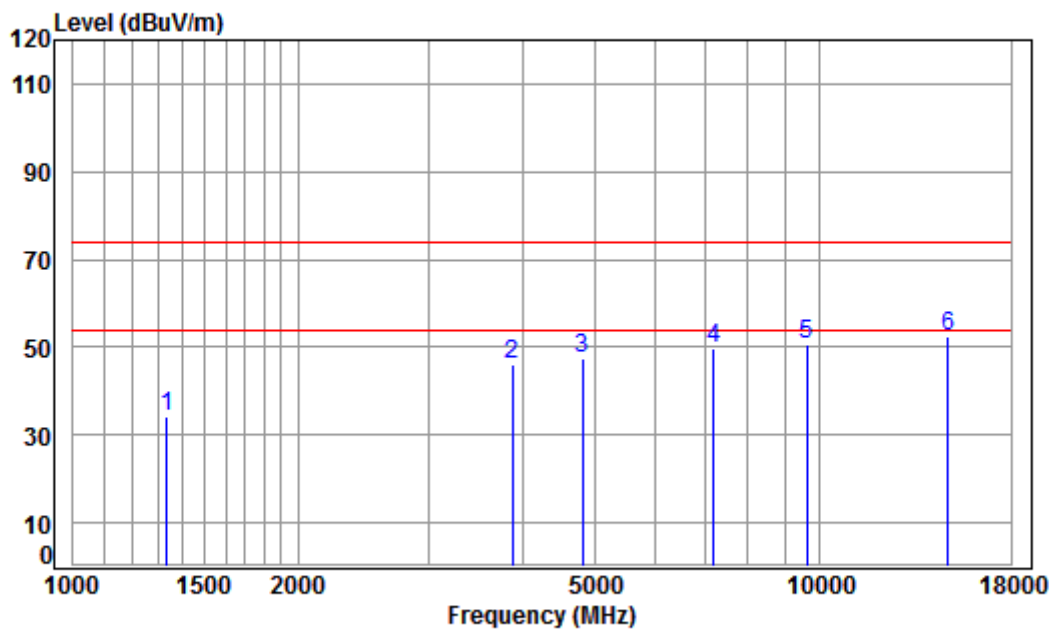
Mode: : 2402 TX SE

: BLE

	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	1315.985	4.24	25.03	38.07	44.17	35.37	74.00	-38.63	peak
2	3856.668	6.59	33.22	37.99	44.85	46.67	74.00	-27.33	peak
3	4804.000	7.73	34.16	38.40	44.97	48.46	74.00	-25.54	peak
4	7206.000	9.65	36.42	37.11	41.80	50.76	74.00	-23.24	peak
5	9608.000	11.06	37.52	35.10	37.72	51.20	74.00	-22.80	peak
6	pp15003.420	14.85	41.30	38.90	35.36	52.61	74.00	-21.39	peak



Mode:b; Polarization:Vertical; Modulation Type:GFSK; ; Channel:Low

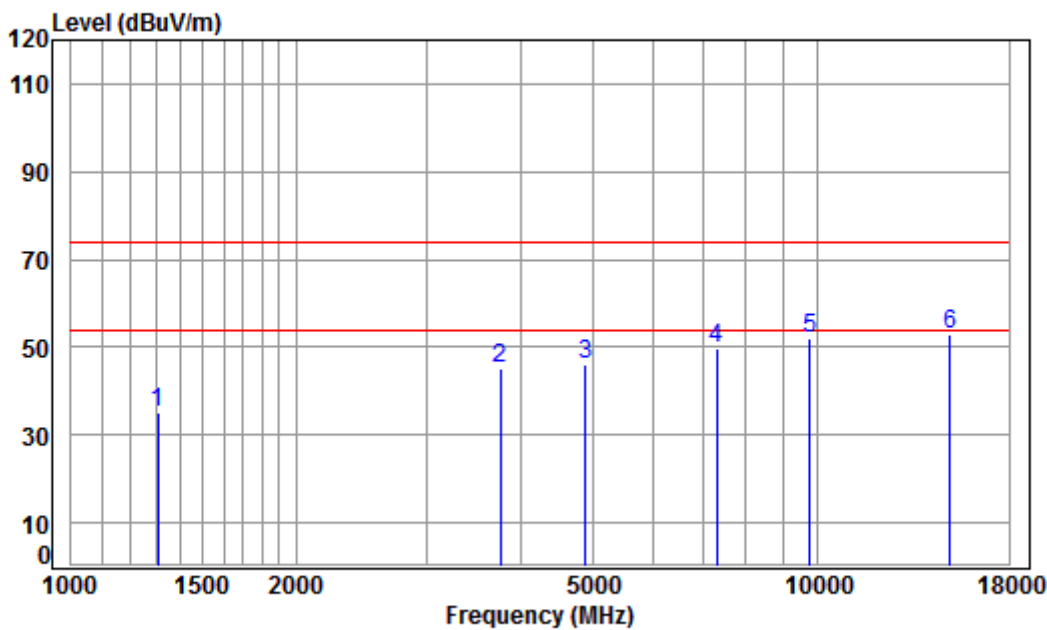


Condition: 3m Vertical
Job No: : 06077CR
Mode: : 2402 TX SE
: BLE

	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	4.27	25.11	38.07	43.13	34.44	74.00	-39.56	peak
2	3867.831	6.60	33.25	37.99	44.27	46.13	74.00	-27.87	peak
3	4804.000	7.73	34.16	38.40	44.12	47.61	74.00	-26.39	peak
4	7206.000	9.65	36.42	37.11	40.68	49.64	74.00	-24.36	peak
5	9608.000	11.06	37.52	35.10	37.11	50.59	74.00	-23.41	peak
6	pp14830.960	14.81	41.00	38.92	35.49	52.38	74.00	-21.62	peak



Mode:b; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:middle



Condition: 3m HORIZONTAL

Job No: : 06077CR

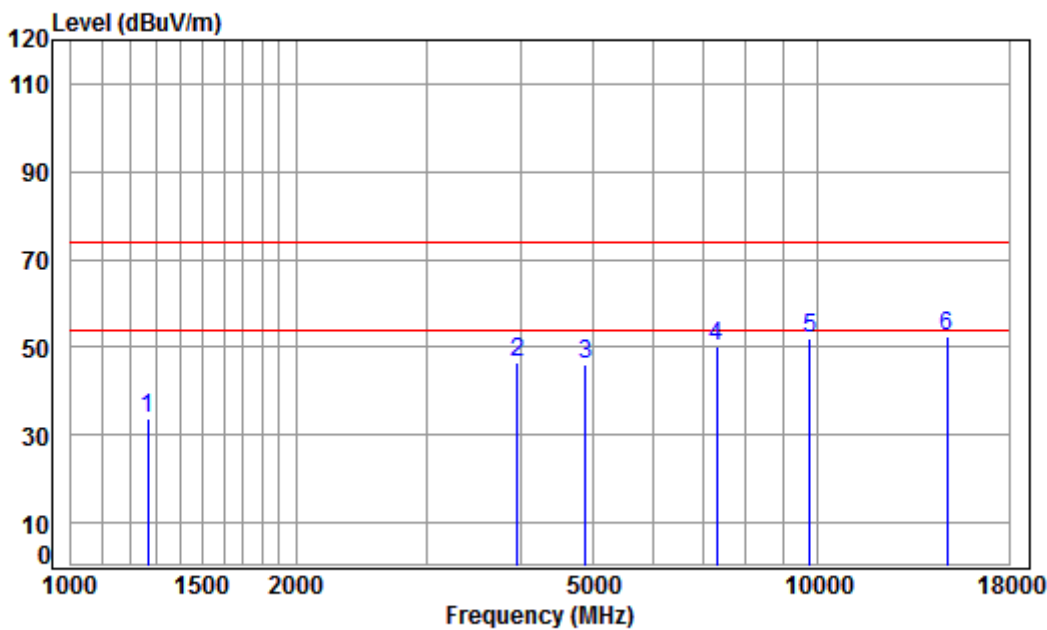
Mode: : 2440 TX SE

: BLE

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1308.399	4.23	24.99	38.07	44.04	35.19	74.00	-38.81	peak
2	3757.637	6.51	32.94	37.98	43.69	45.16	74.00	-28.84	peak
3	4880.000	7.83	34.29	38.44	42.27	45.95	74.00	-28.05	peak
4	7320.000	9.73	36.37	37.01	40.65	49.74	74.00	-24.26	peak
5	9760.000	11.21	37.55	35.02	38.16	51.90	74.00	-22.10	peak
6	pp15003.420	14.85	41.30	38.90	35.56	52.81	74.00	-21.19	peak



Mode:b; Polarization:Vertical; Modulation Type:GFSK; ; Channel:middle



Condition: 3m VERTICAL

Job No: : 06077CR

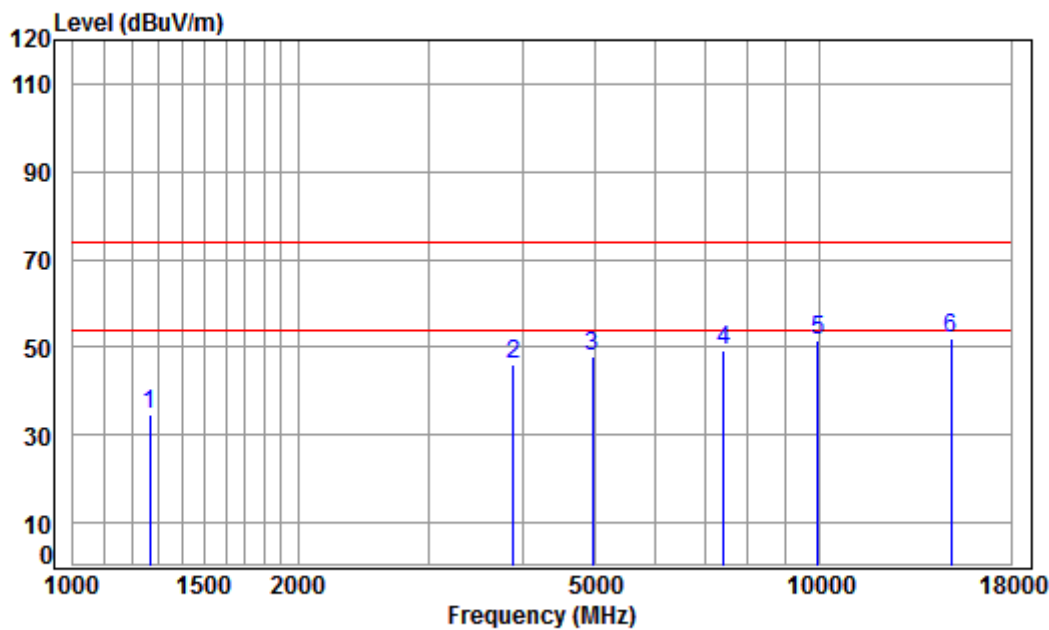
Mode: : 2440 TX SE

: BLE

	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	1267.454	4.18	24.80	38.07	42.99	33.90	74.00	-40.10	peak
2	3958.309	6.67	33.49	38.00	44.23	46.39	74.00	-27.61	peak
3	4880.000	7.83	34.29	38.44	42.36	46.04	74.00	-27.96	peak
4	7320.000	9.73	36.37	37.01	41.21	50.30	74.00	-23.70	peak
5	9760.000	11.21	37.55	35.02	38.21	51.95	74.00	-22.05	peak
6	pp14873.890	14.82	41.08	38.91	35.38	52.37	74.00	-21.63	peak



Mode:b; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:High



Condition: 3m HORIZONTAL

Job No: : 06077CR

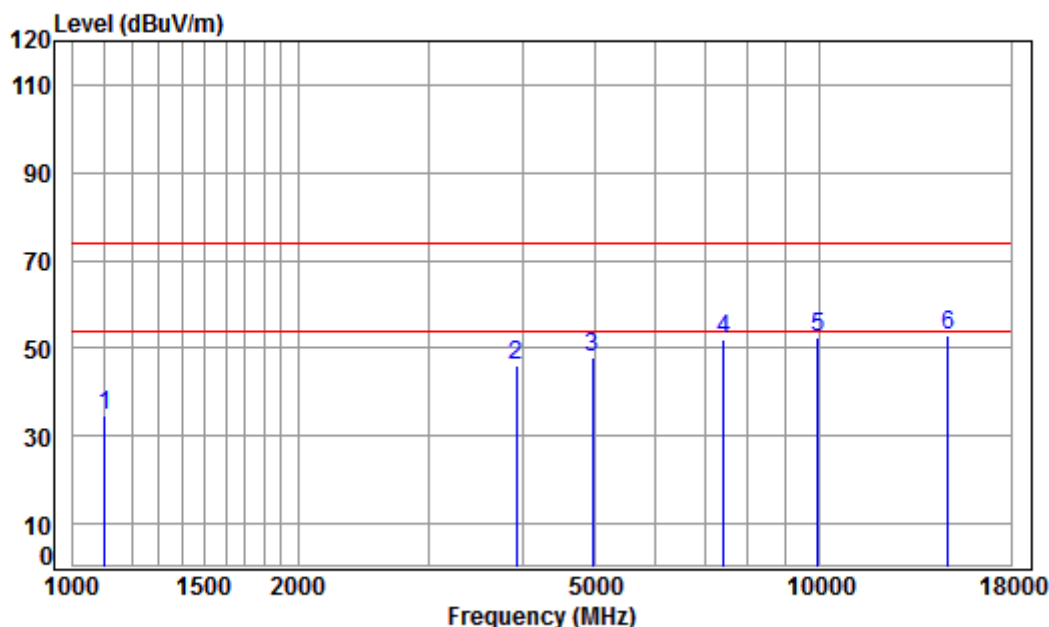
Mode: : 2480 TX SE

: BLE

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1267.454	4.18	24.80	38.07	43.61	34.52	74.00	-39.48	peak
2	3890.255	6.62	33.31	37.99	44.29	46.23	74.00	-27.77	peak
3	4960.000	7.95	34.43	38.48	43.90	47.80	74.00	-26.20	peak
4	7440.000	9.81	36.32	36.90	40.14	49.37	74.00	-24.63	peak
5	9920.000	11.36	37.58	34.94	37.66	51.66	74.00	-22.34	peak
6	pp14960.120	14.84	41.23	38.90	35.02	52.19	74.00	-21.81	peak



Mode:b; Polarization:Vertical; Modulation Type:GFSK; ; Channel:High



Condition: 3m VERTICAL

Job No: : 06077CR

Mode: : 2480 TX SE

: BLE

	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	1103.264	3.93	23.98	38.09	44.85	34.67	74.00	-39.33	peak
2	3924.135	6.64	33.40	37.99	43.96	46.01	74.00	-27.99	peak
3	4960.000	7.95	34.43	38.48	44.17	48.07	74.00	-25.93	peak
4	7440.000	9.81	36.32	36.90	42.59	51.82	74.00	-22.18	peak
5	9920.000	11.36	37.58	34.94	38.34	52.34	74.00	-21.66	peak
6	pp14830.960	14.81	41.00	38.92	36.18	53.07	74.00	-20.93	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:

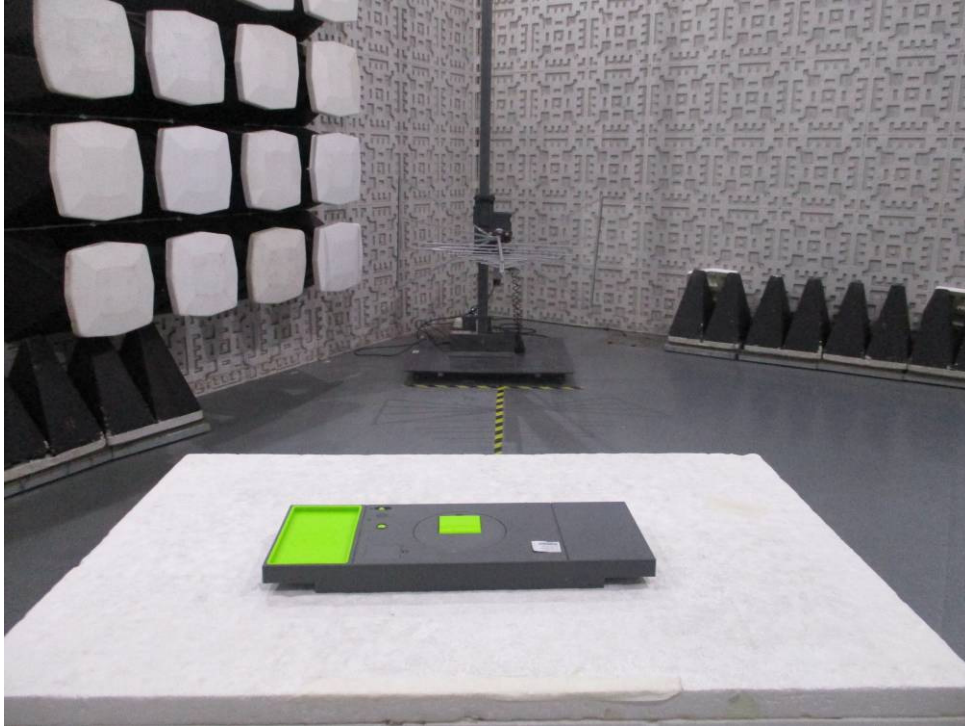
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance above 13GHz 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.

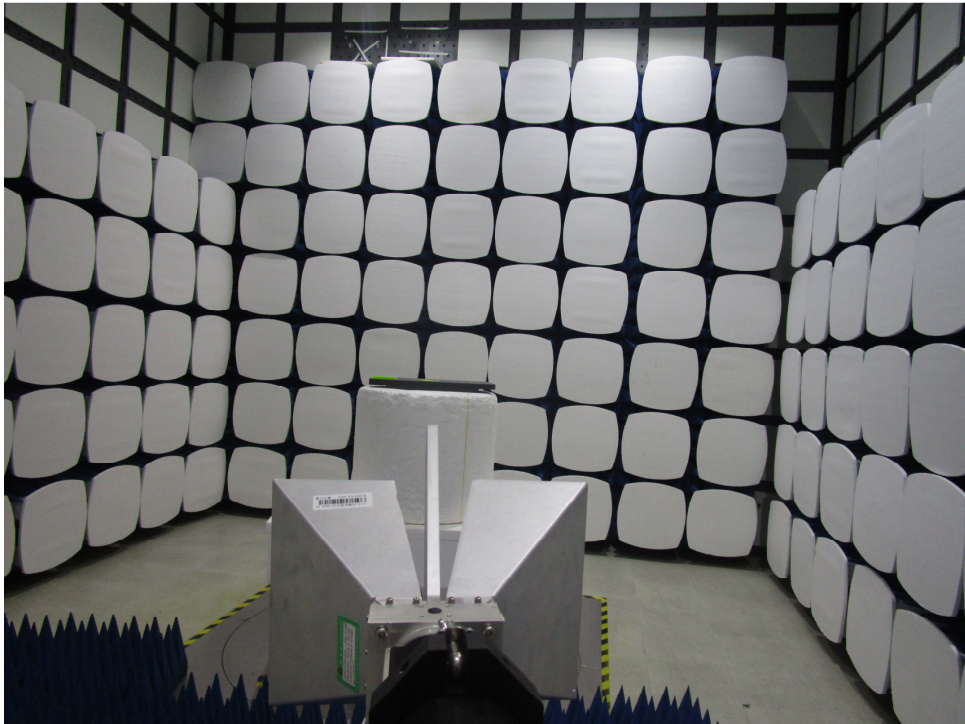
3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

8 Photographs

8.1 Radiated Spurious Emissions(30MHz-1GHz) Test Setup



8.2 Radiated Spurious Emissions Test Setup



8.3 EUT Constructional Details

Refer to External photos & Internal photos

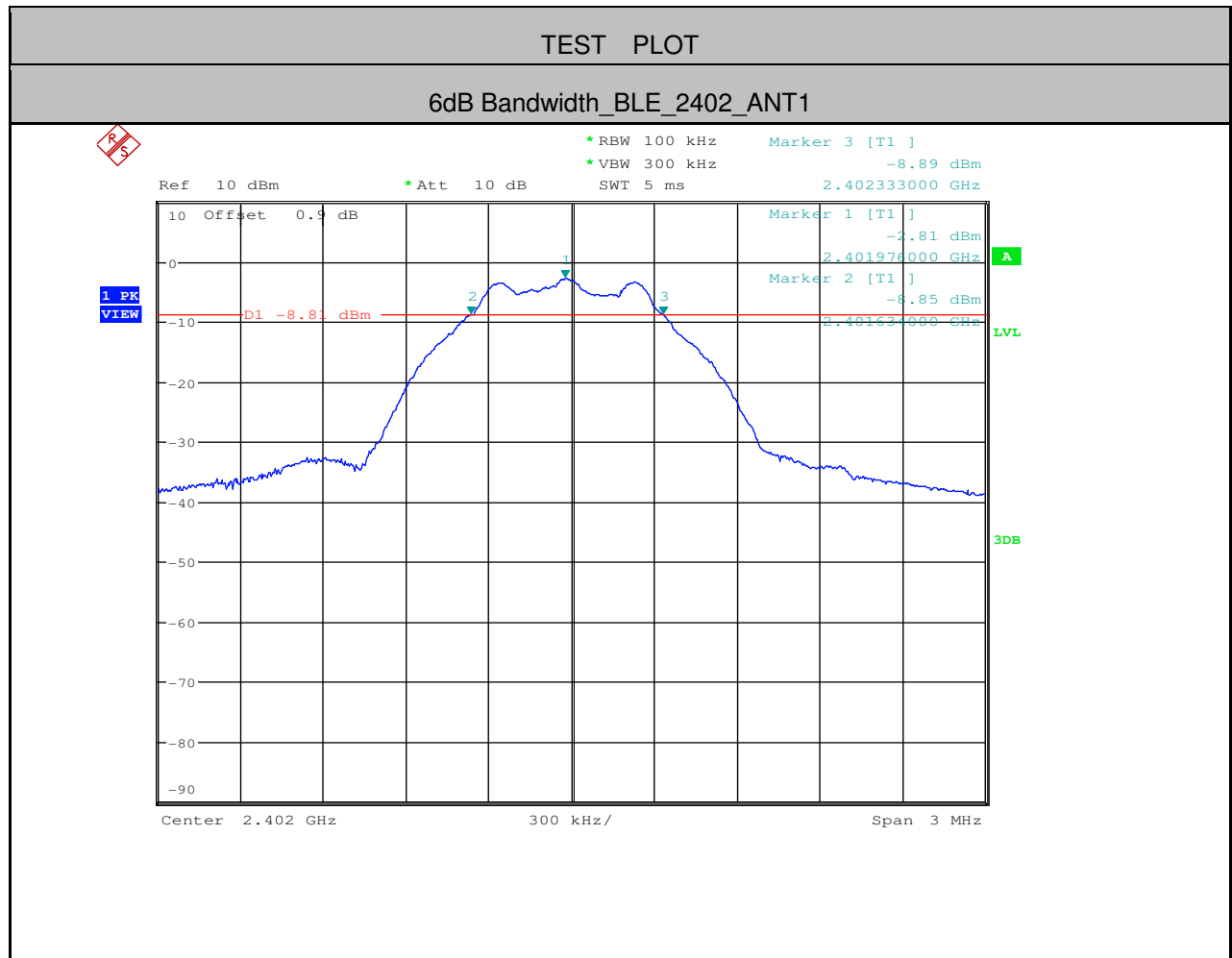


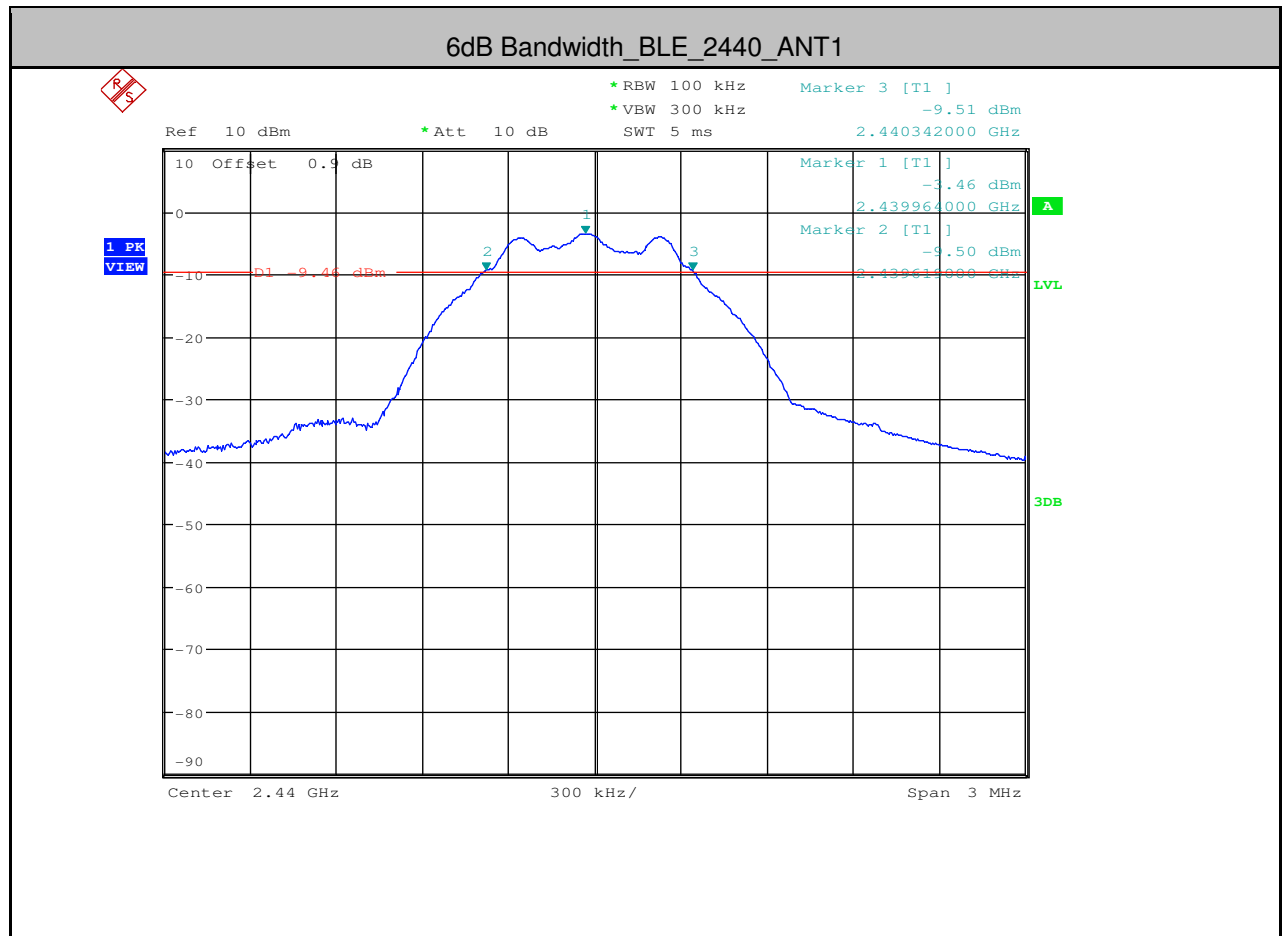
Appendix

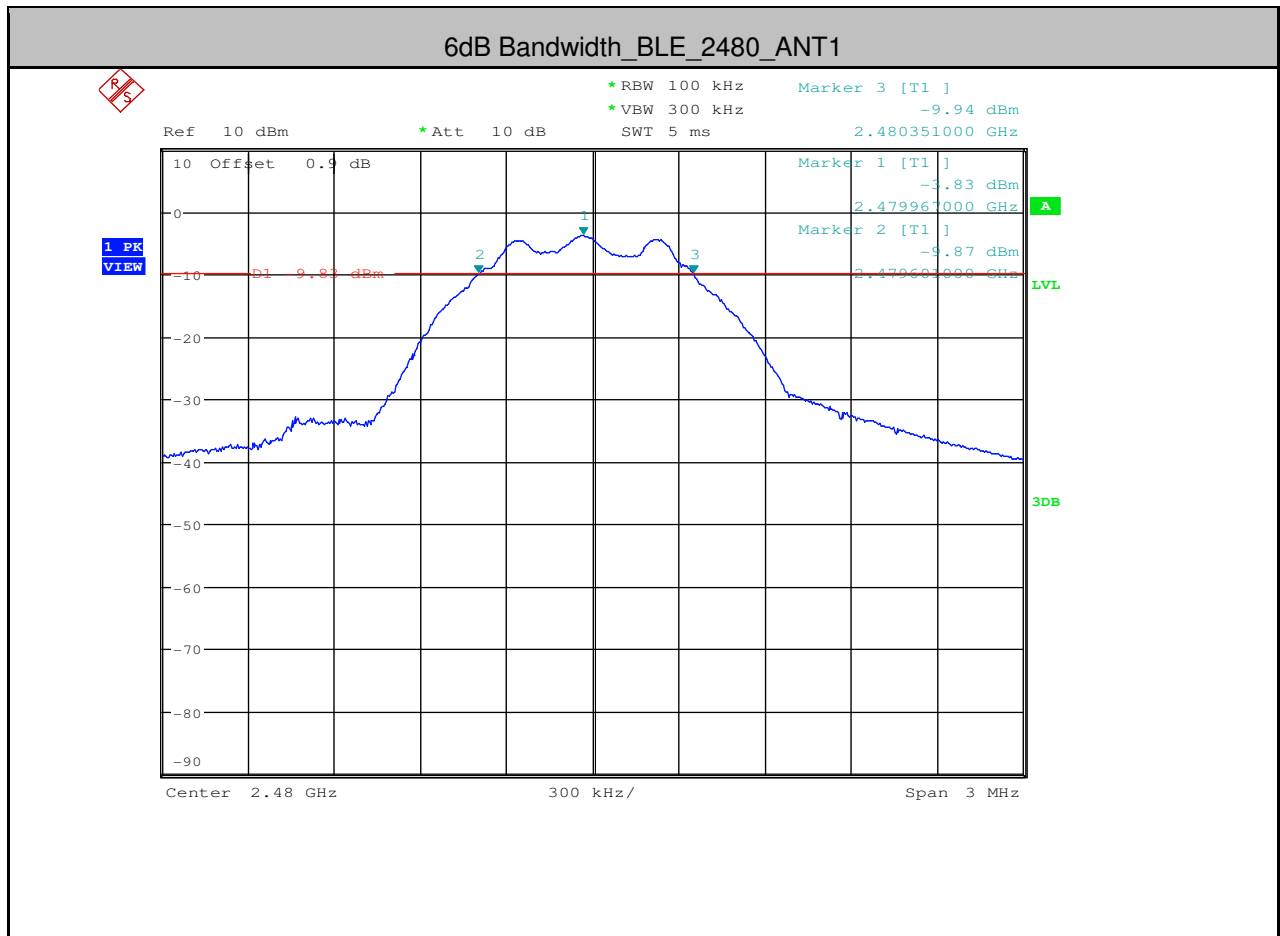
8.4 Appendix 15.247

1.6dB Bandwidth

Test Mode	Test Channel	Ant	EBW[MHz]	Limit	Verdict
BLE	2402	Ant1	0.699	≥ 0.5	PASS
BLE	2440	Ant1	0.723	≥ 0.5	PASS
BLE	2480	Ant1	0.750	≥ 0.5	PASS



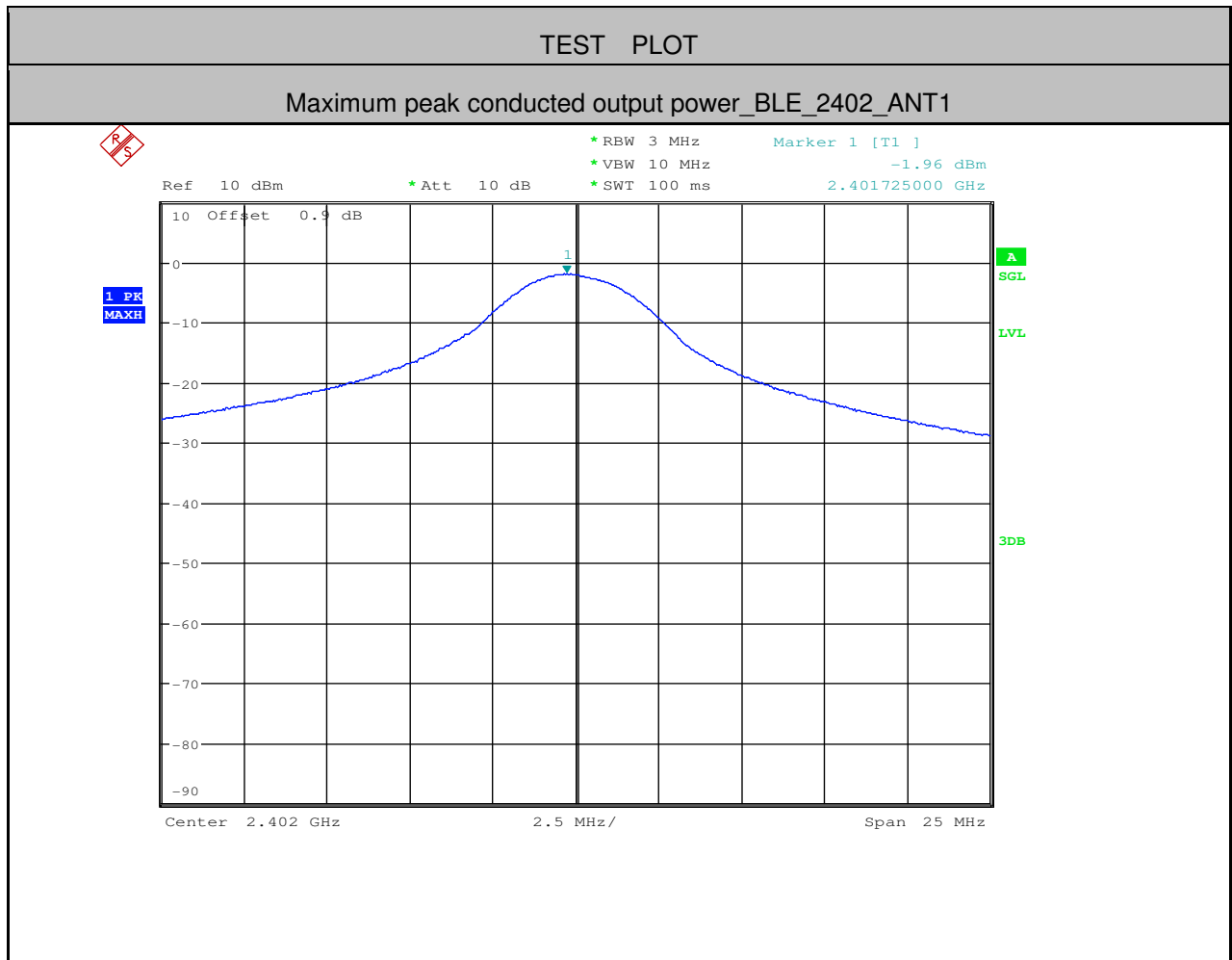


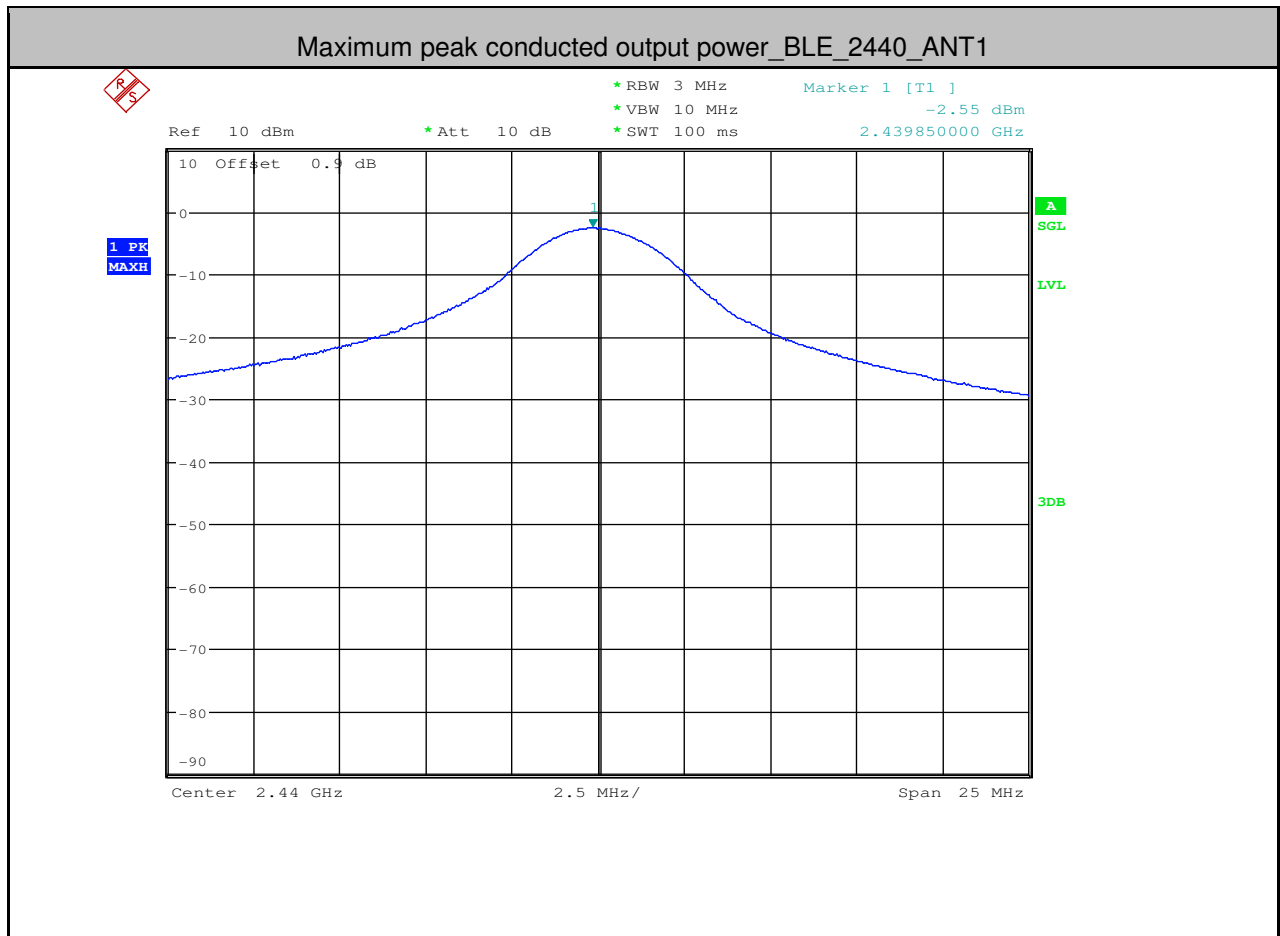




2. Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	-1.96	<30	PASS
BLE	2440	Ant1	-2.55	<30	PASS
BLE	2480	Ant1	-2.89	<30	PASS



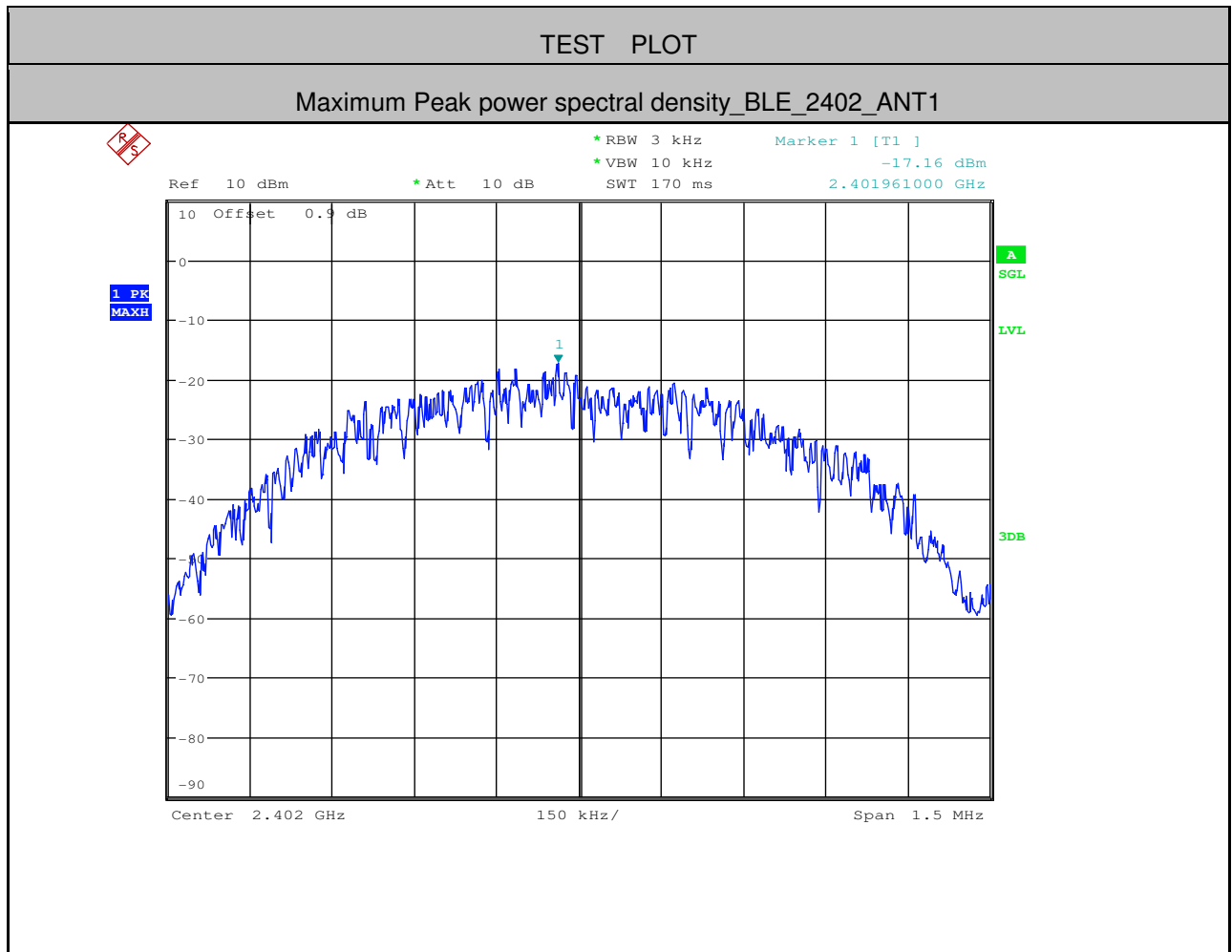


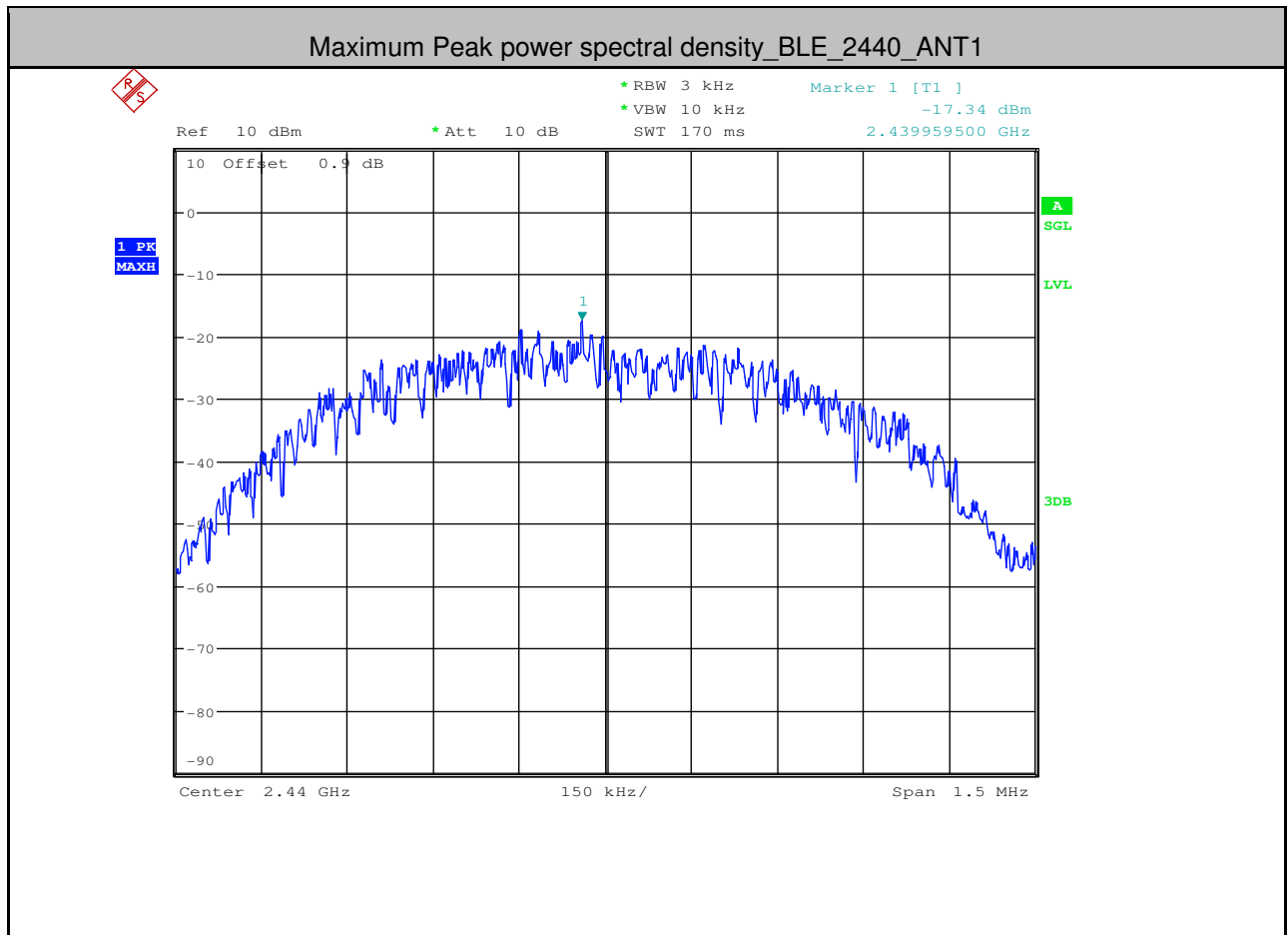


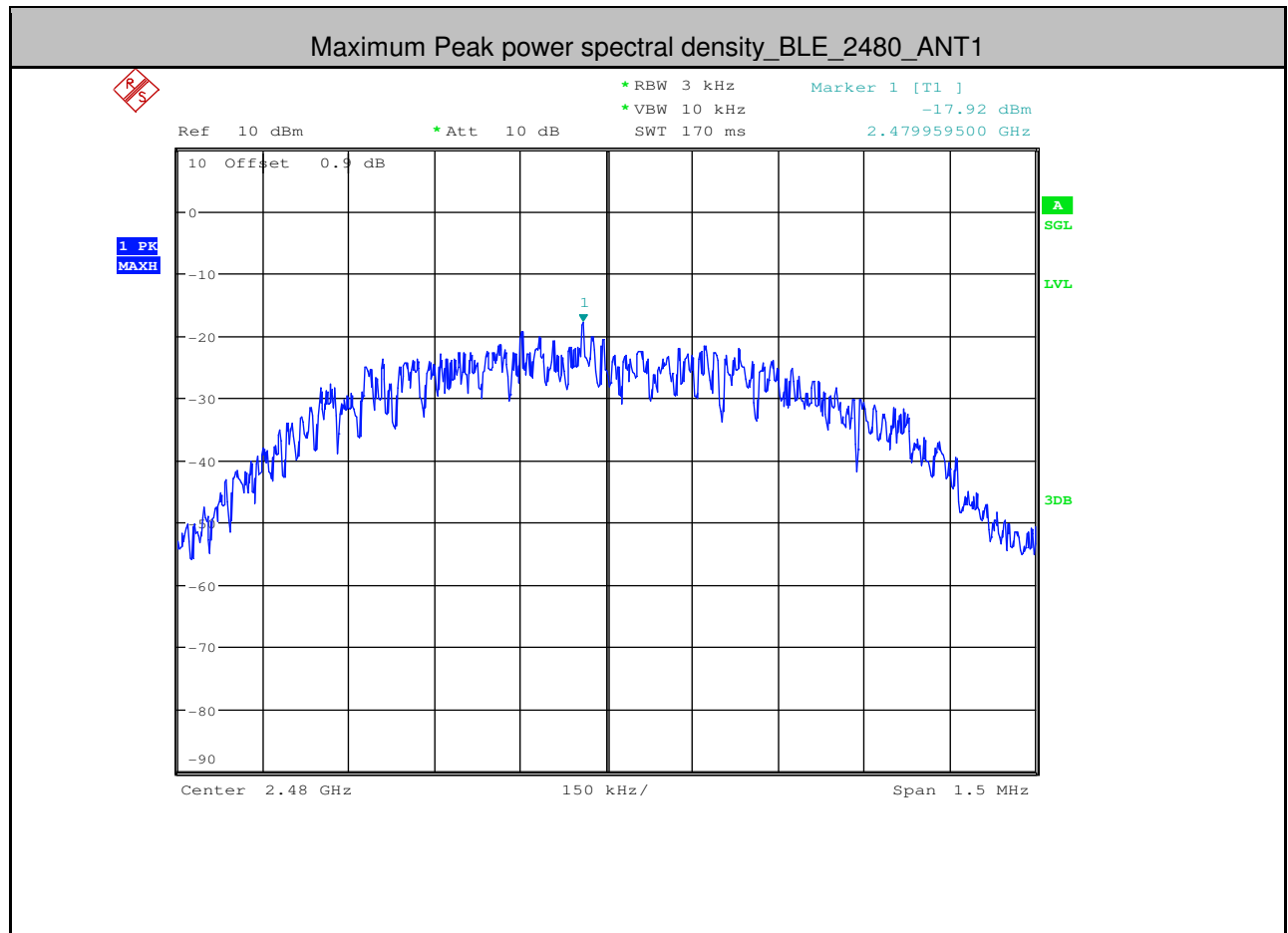


3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-17.16	<8.00	PASS
BLE	2440	Ant1	-17.34	<8.00	PASS
BLE	2480	Ant1	-17.92	<8.00	PASS



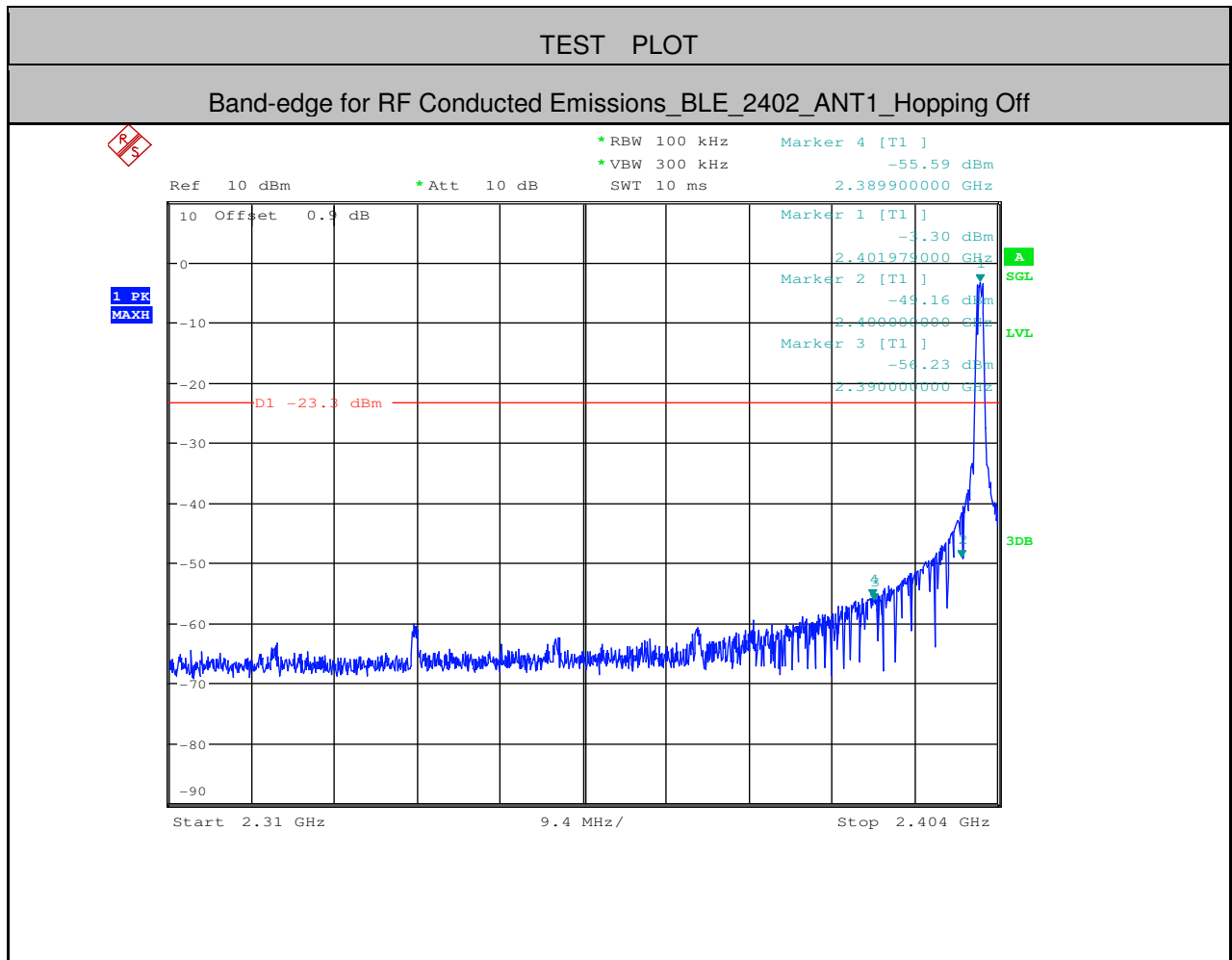


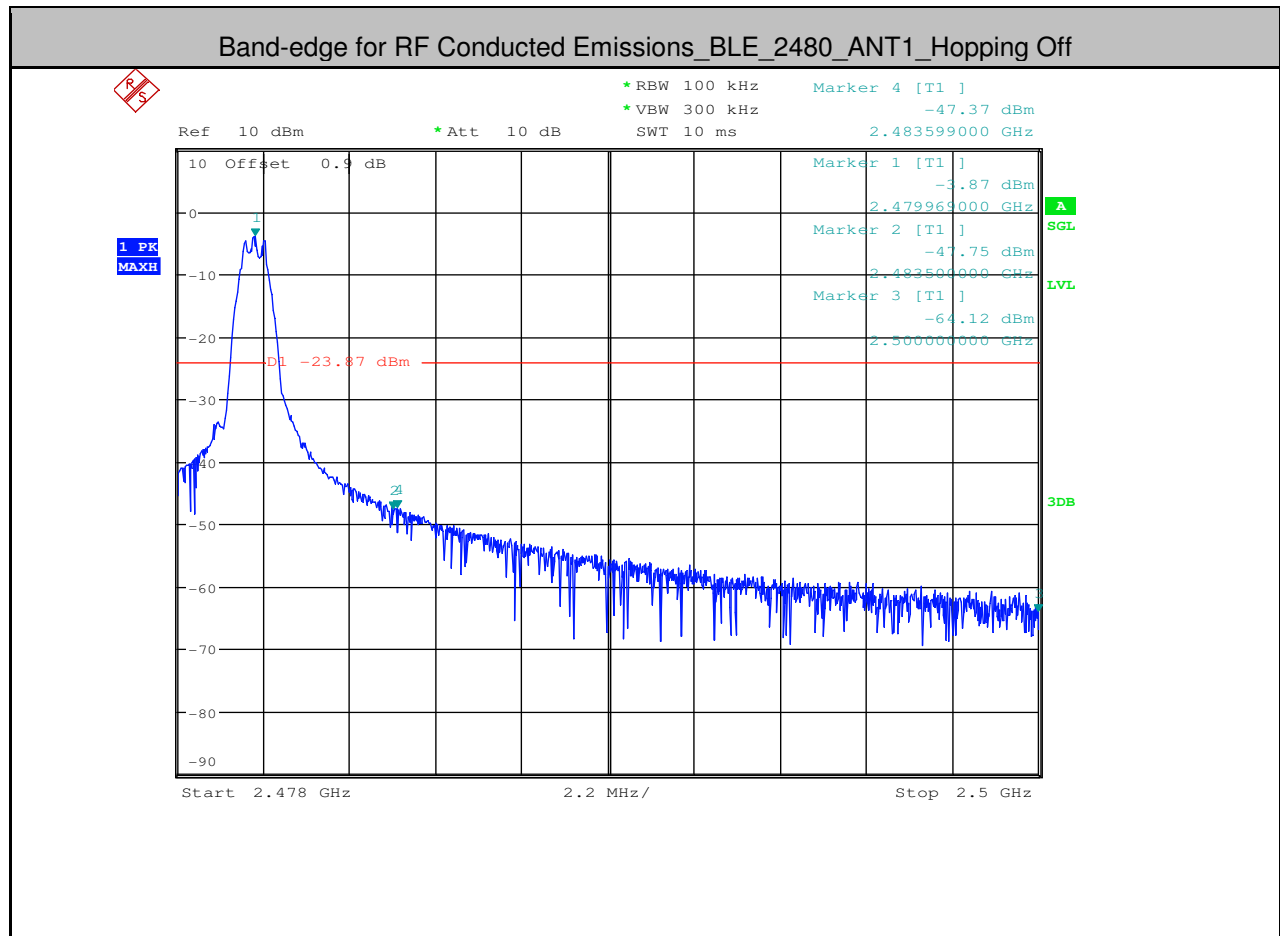




5.Band-edge for RF Conducted Emissions

Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	-3.300	-55.588	<-23.3	PASS
BLE	2480	Ant1	-3.870	-47.373	<-23.87	PASS

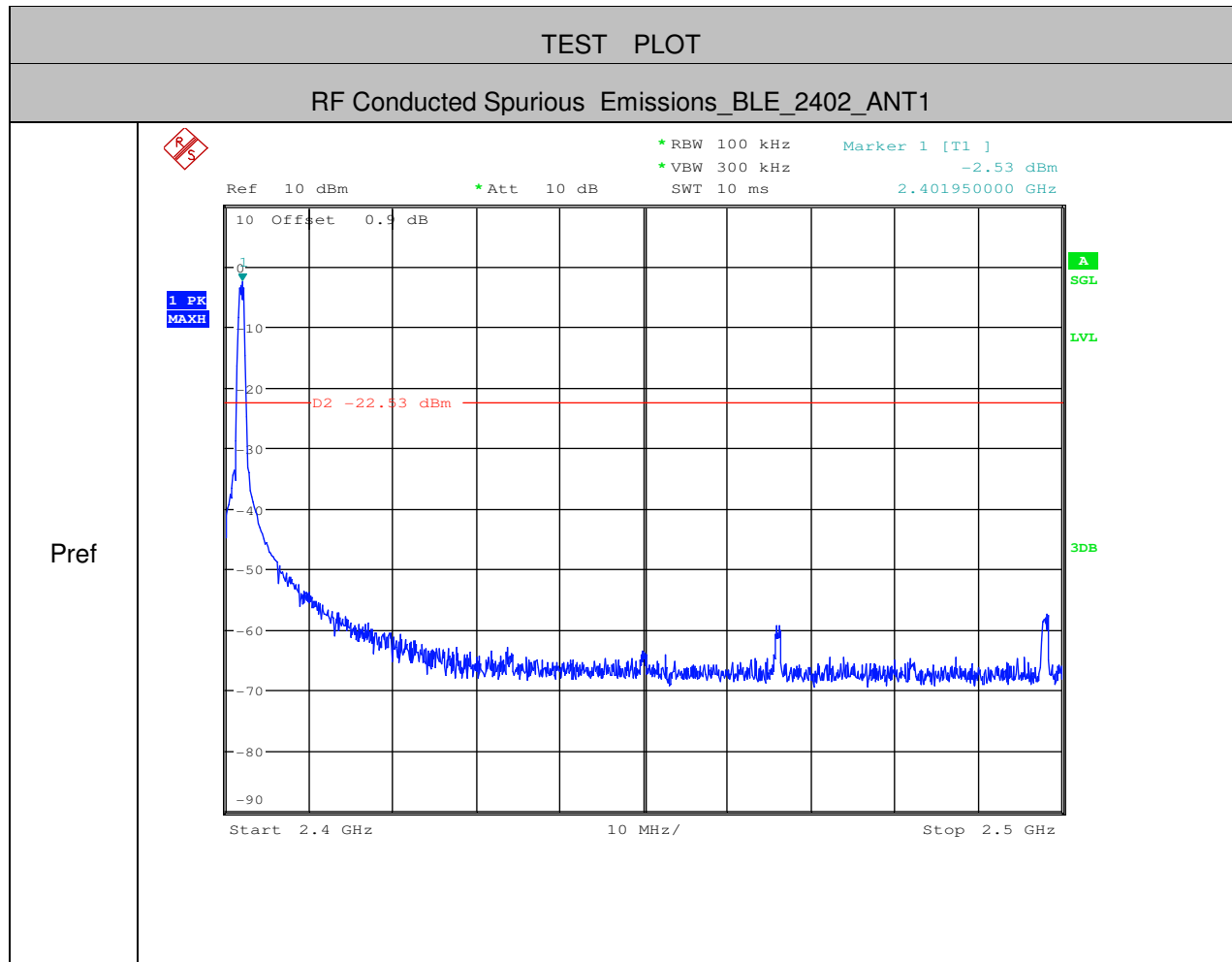


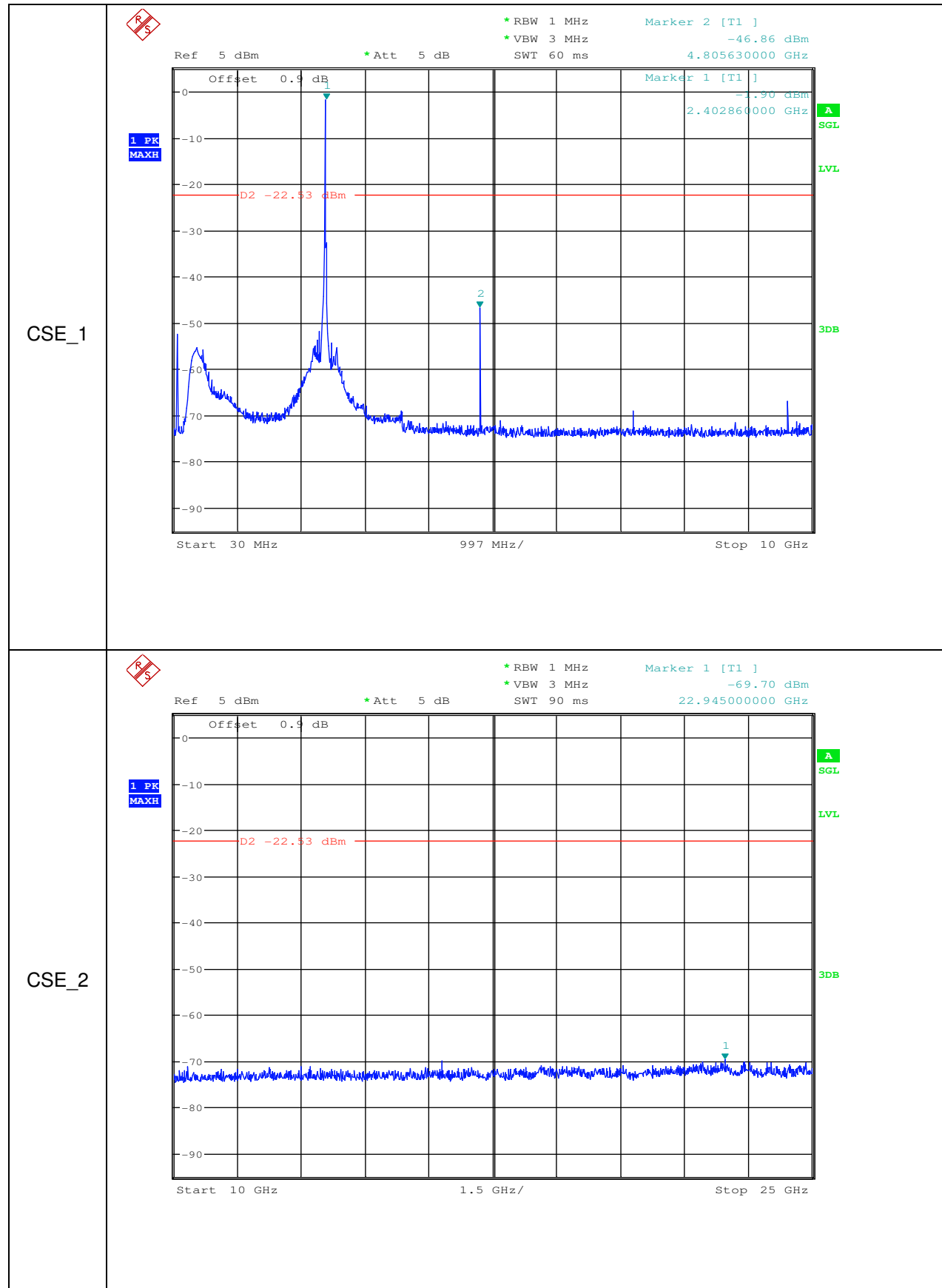


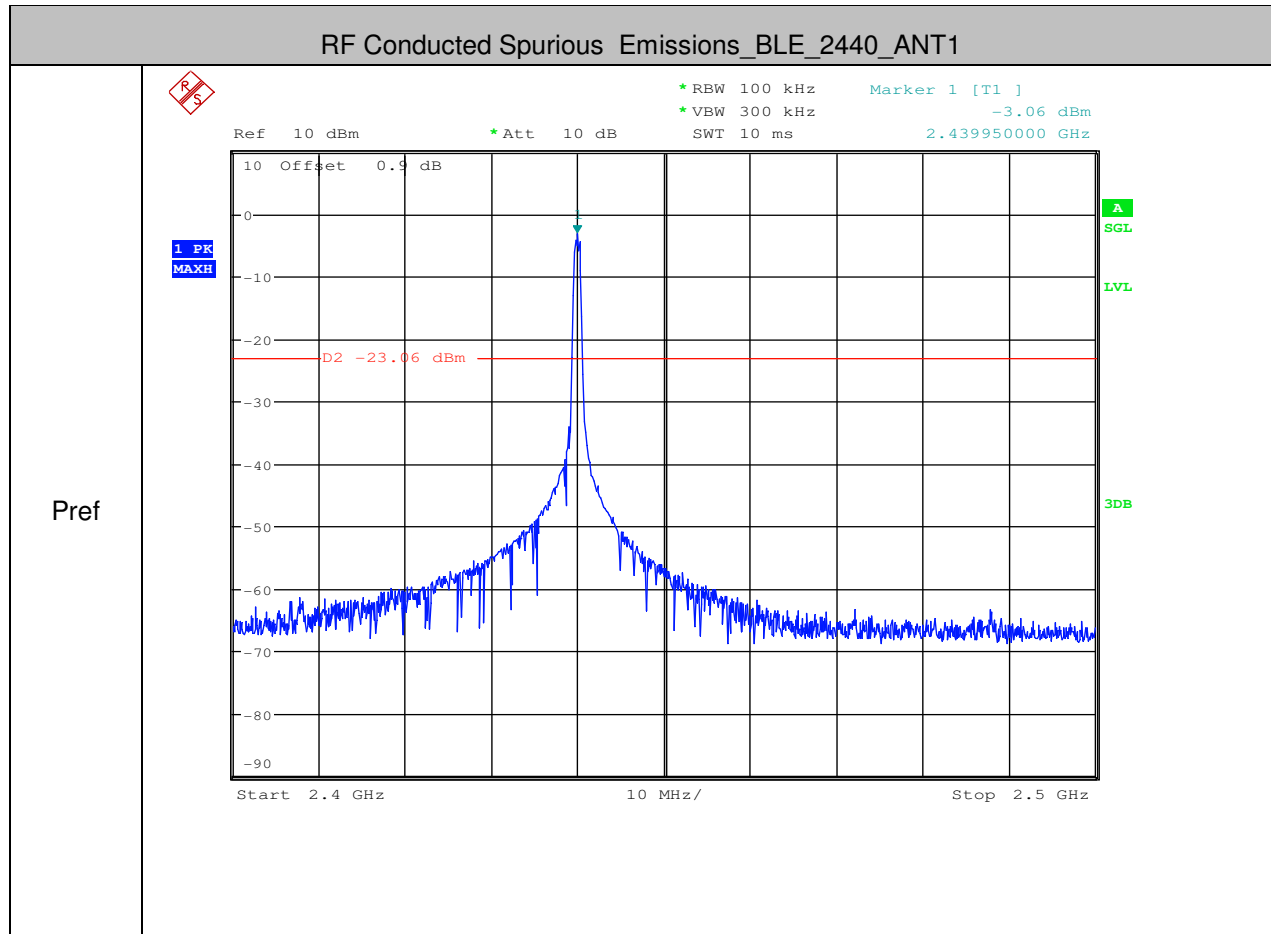


6.RF Conducted Spurious Emissions

Test Mode	Test Channel	Ant	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	30	10000	1000	3000	-2.53	-46.860	<-22.53	PASS
BLE	2402	Ant1	10000	25000	1000	3000	-2.53	-69.700	<-22.53	PASS
BLE	2440	Ant1	30	10000	1000	3000	-3.06	-48.420	<-23.06	PASS
BLE	2440	Ant1	10000	25000	1000	3000	-3.06	-69.570	<-23.06	PASS
BLE	2480	Ant1	30	10000	1000	3000	-3.31	-46.920	<-23.31	PASS
BLE	2480	Ant1	10000	25000	1000	3000	-3.31	-69.310	<-23.31	PASS







Pref

