



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

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

Telephone: +86 (0) 755 2601 2053  
Fax: +86 (0) 755 2671 0594  
Email: ee.shenzhen@sgs.com

Report No.: SZEM170900964602  
Page: 1 of 52

## **TEST REPORT**

**Application No.:** SZEM1709009646CR  
**Applicant:** Shenzhen Counterbalance Technology Co., Ltd  
**Address of Applicant:** Building9, shanghenglang fourth industrial zone, DaLang street, LongHua new District, Shenzhen, China  
**Manufacturer:** Shenzhen Counterbalance Technology Co., Ltd  
**Address of Manufacturer:** Building9, shanghenglang fourth industrial zone, DaLang street, LongHua new District, Shenzhen, China  
**Factory:** Komda Industrial (Dongguan) Co., Ltd.  
**Address of Factory:** Pinshan Village, Tangxia Town, Dongguan, Guangdong Province, China  
**Equipment Under Test (EUT):**  
**EUT Name:** Smart E Bike  
**Model No.:** D1  
**FCC ID:** 2AIOAD1  
**Standards:** 47 CFR Part 15, Subpart C 15.247  
**Date of Receipt:** 2017-09-15  
**Date of Test:** 2017-09-19 to 2017-10-24  
**Date of Issue:** 2017-10-25

<b>Test Result :</b>	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.

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.



Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2017-10-25		Original

Authorized for issue by:				
				
		<hr/>		
		Bill Chen /Project Engineer		
				
		<hr/>		
		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(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 11.9.1.1	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 15.205 & 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



### 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 .....	12
7.2.2 Test Setup Diagram .....	12
7.2.3 Measurement Procedure and Data .....	12
7.3 POWER SPECTRUM DENSITY .....	13
7.3.1 E.U.T. Operation .....	13
7.3.2 Test Setup Diagram .....	13
7.3.3 Measurement Procedure and Data .....	13
7.4 CONDUCTED BAND EDGES MEASUREMENT .....	14
7.4.1 E.U.T. Operation .....	14
7.4.2 Test Setup Diagram .....	14
7.4.3 Measurement Procedure and Data .....	14
7.5 CONDUCTED SPURIOUS EMISSIONS .....	15
7.5.1 E.U.T. Operation .....	15
7.5.2 Test Setup Diagram .....	15
7.5.3 Measurement Procedure and Data .....	15
7.6 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS .....	16
7.6.1 E.U.T. Operation .....	16
7.6.2 Test Setup Diagram .....	16
7.6.3 Measurement Procedure and Data .....	17
7.7 RADIATED SPURIOUS EMISSIONS .....	22
7.7.1 E.U.T. Operation .....	23
7.7.2 Test Setup Diagram .....	23



7.7.3	Measurement Procedure and Data.....	24
<b>8</b>	<b>PHOTOGRAPHS.....</b>	<b>34</b>
8.1	RADIATED SPURIOUS EMISSIONS TEST SETUP .....	34
8.2	EUT CONSTRUCTIONAL DETAILS .....	35
<b>9</b>	<b>APPENDIX.....</b>	<b>36</b>
9.1	APPENDIX 15.247.....	36

## 4 General Information

### 4.1 Details of E.U.T.

Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	V4.0 Single mode
Modulation Type:	GFSK
Number of Channels:	40
Sample Type:	Portable production
Antenna Type:	Integral
Antenna Gain:	0dBi
Power supply:	Li-ion power battery pack:
	Model: HA103
	Voltage: 36V
	Capacity: 10.4Ah
	Power: 374.4Wh
	Limited charging voltage: 42V

### 4.2 Description of Support Units

The EUT has been tested with associated equipment below.

Description	Manufacturer	Model No.
Laptop	Lenovo	T430u
Test board	Supply to SGS	FT232

### 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 –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

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

RE in Chamber						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-08-05	2020-08-04
2	MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2017-09-27	2018-09-27
3	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-02	2017-03-05	2020-03-05
4	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2017-04-14	2018-04-13
5	Measurement Software	AUDIX	e3 V8.2014- 6-27	N/A	N/A	N/A
6	Coaxial Cable	SGS	N/A	SEM025-01	2017-07-13	2018-07-12





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

Report No.: SZEM170900964602

Page: 9 of 52

RE in Chamber						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
1	3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-10	2018-05-10
2	EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2017-06-05	2018-06-04
3	BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
4	Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-13
5	Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2017-09-27	2018-09-27
6	Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2017-09-27	2018-09-27
7	Band filter	N/A	N/A	N/A	N/A	N/A
8	Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
9	Coaxial Cable	SGS	N/A	SEM026-01	2017-07-13	2018-07-12

General used equipment						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
1	Humidity/Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2017-09-29	2018-09-29
2	Humidity/Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-29
3	Humidity/Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-29
4	Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-17

## 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)

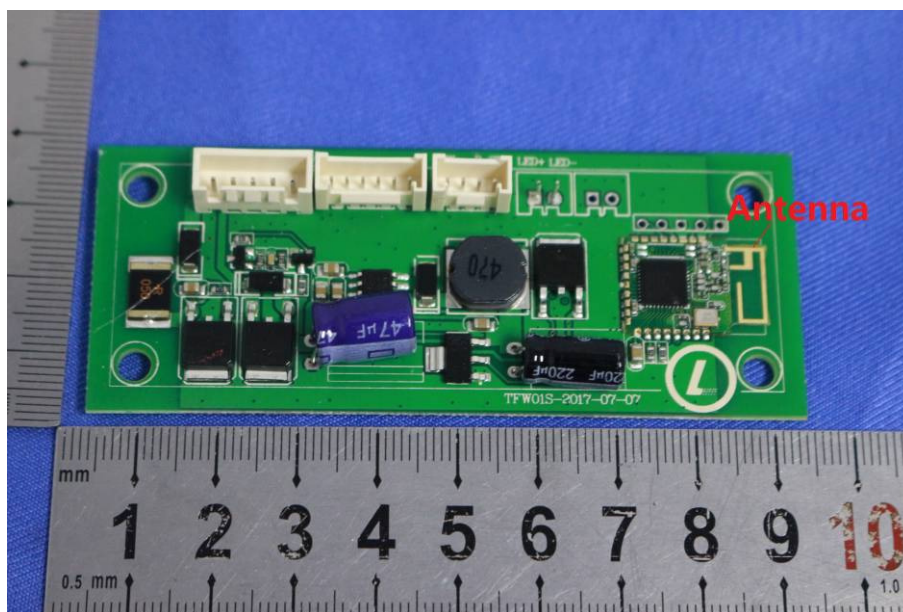
#### 6.1.2 Conclusion

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

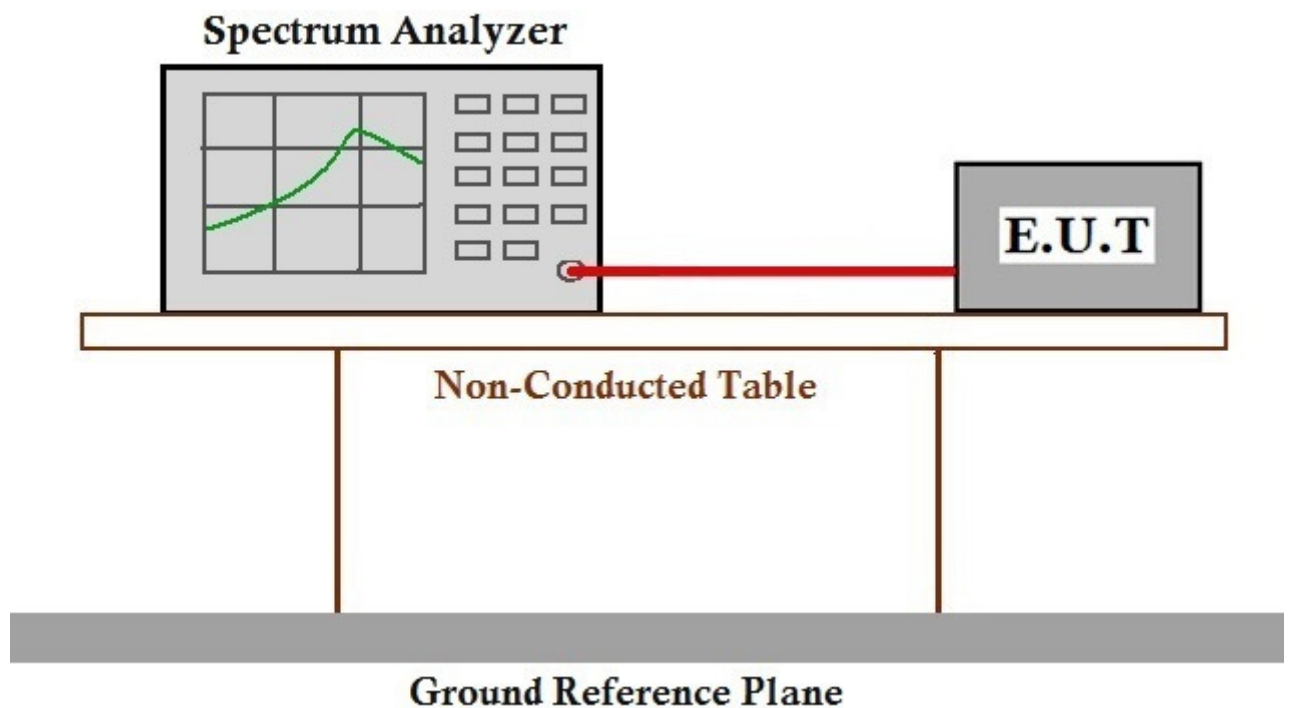
Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)  
Test Method: ANSI C63.10 (2013) Section 11.8.1  
Limit:  $\geq 500$  kHz

#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 25 °C Humidity: 55 % RH Atmospheric Pressure: 1005 mbar  
Test mode c: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 11.9.1.1

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for $\geq 50$ hopping channels
	0.25 for $25 \leq$ hopping channels $< 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ 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

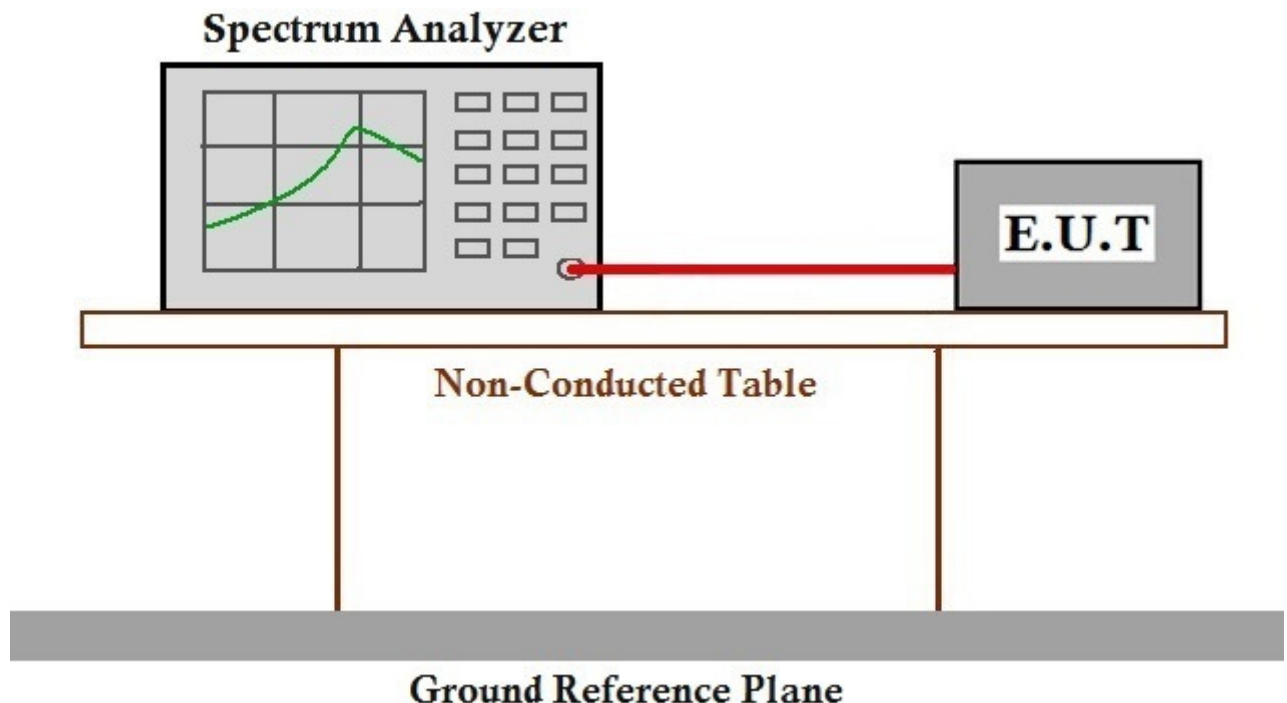
### 7.2.1 E.U.T. Operation

Operating Environment:

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

Test mode c: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:	≤8dBm in any 3 kHz band during any time interval of continuous transmission

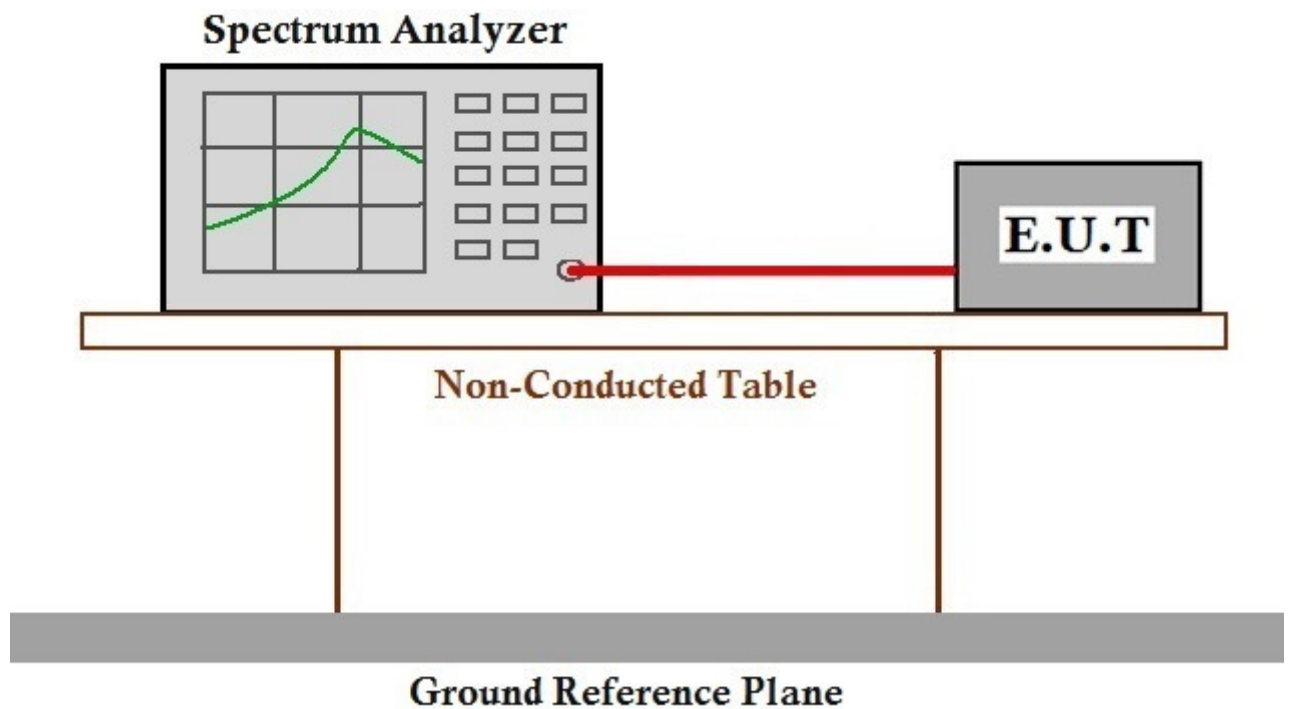
#### 7.3.1 E.U.T. Operation

Operating Environment:

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

Test mode      c: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

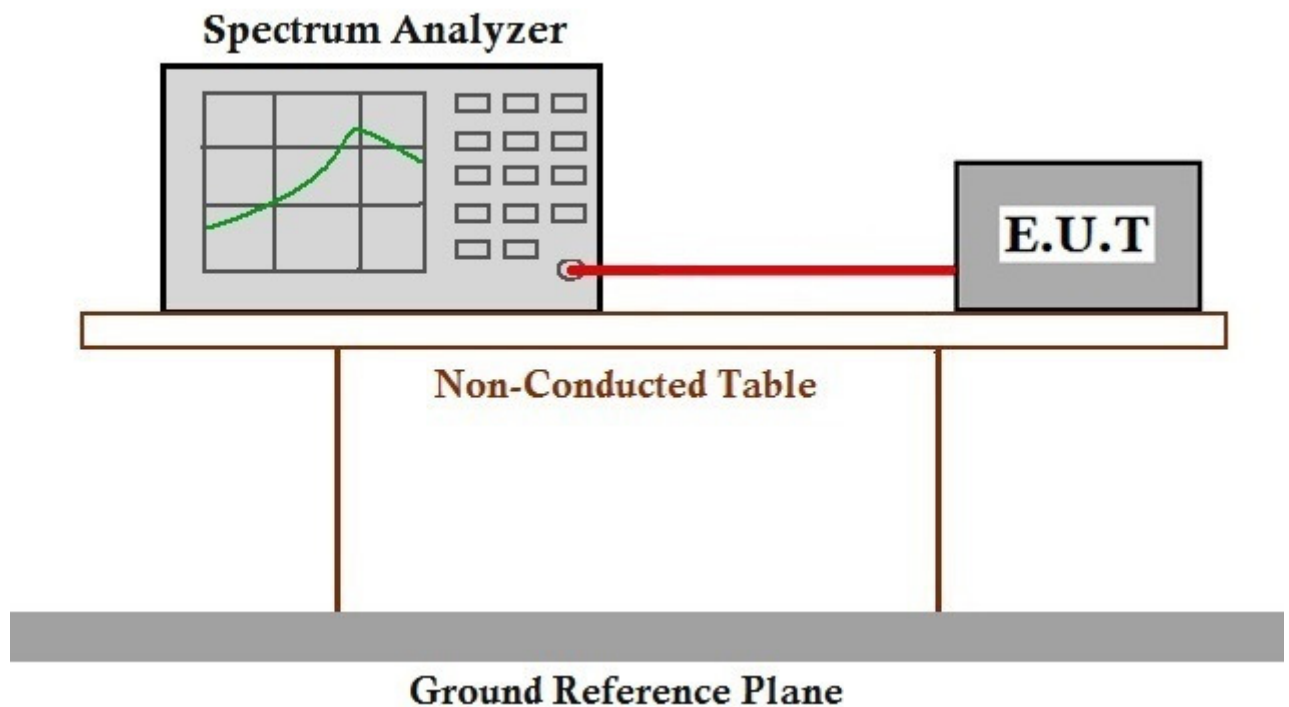
### 7.4.1 E.U.T. Operation

Operating Environment:

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

Test mode c: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.

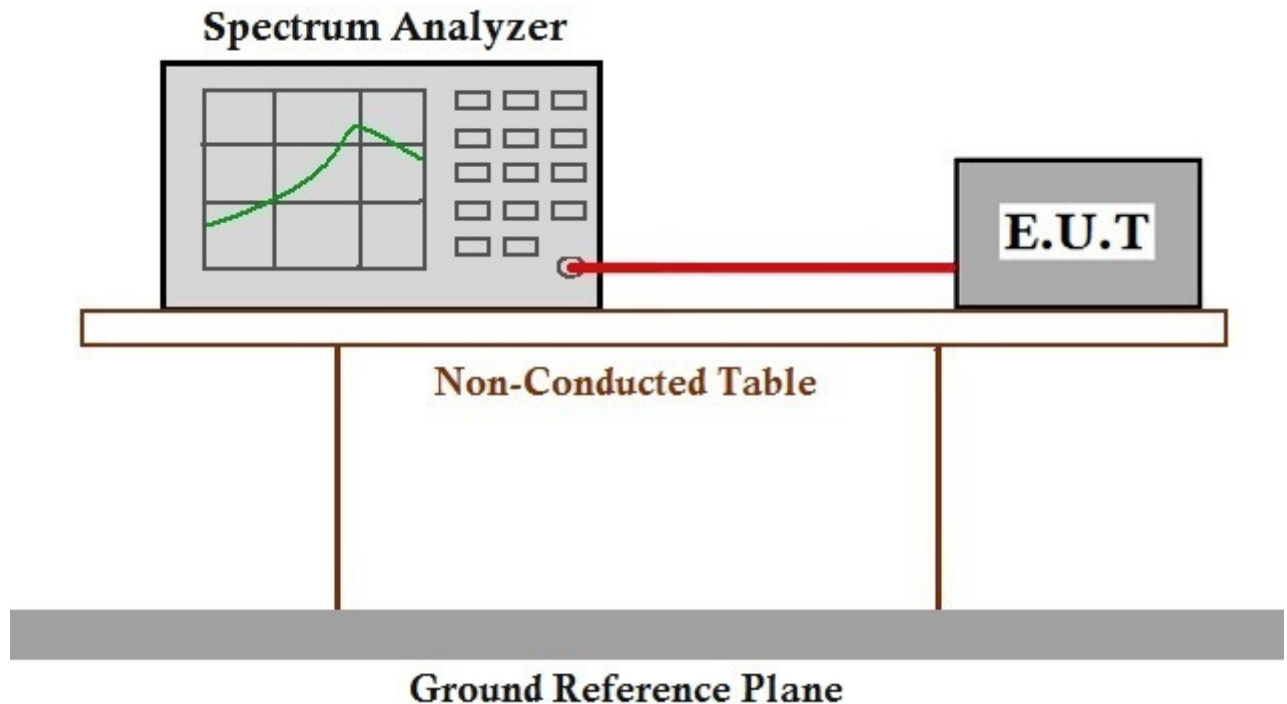
### 7.5.1 E.U.T. Operation

Operating Environment:

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

Test mode      c: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  
Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
0.009-0.490	$2400/F(\text{kHz})$	300
0.490-1.705	$24000/F(\text{kHz})$	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

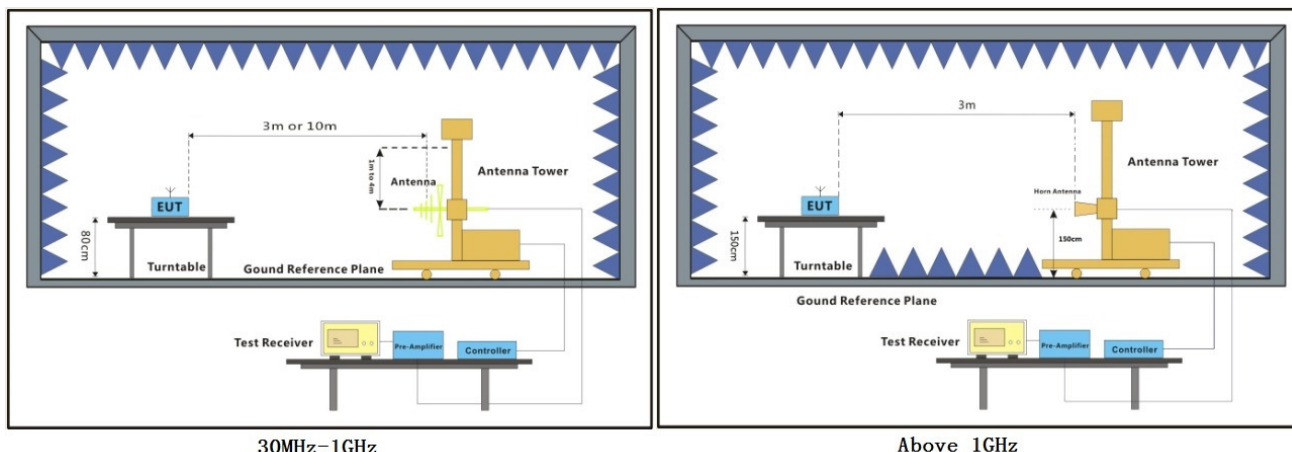
Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field 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: 1015 mbar  
Test mode c:TX mode\_Keep the EUT in continuously transmitting mode with GFSK modulation

### 7.6.2 Test Setup Diagram





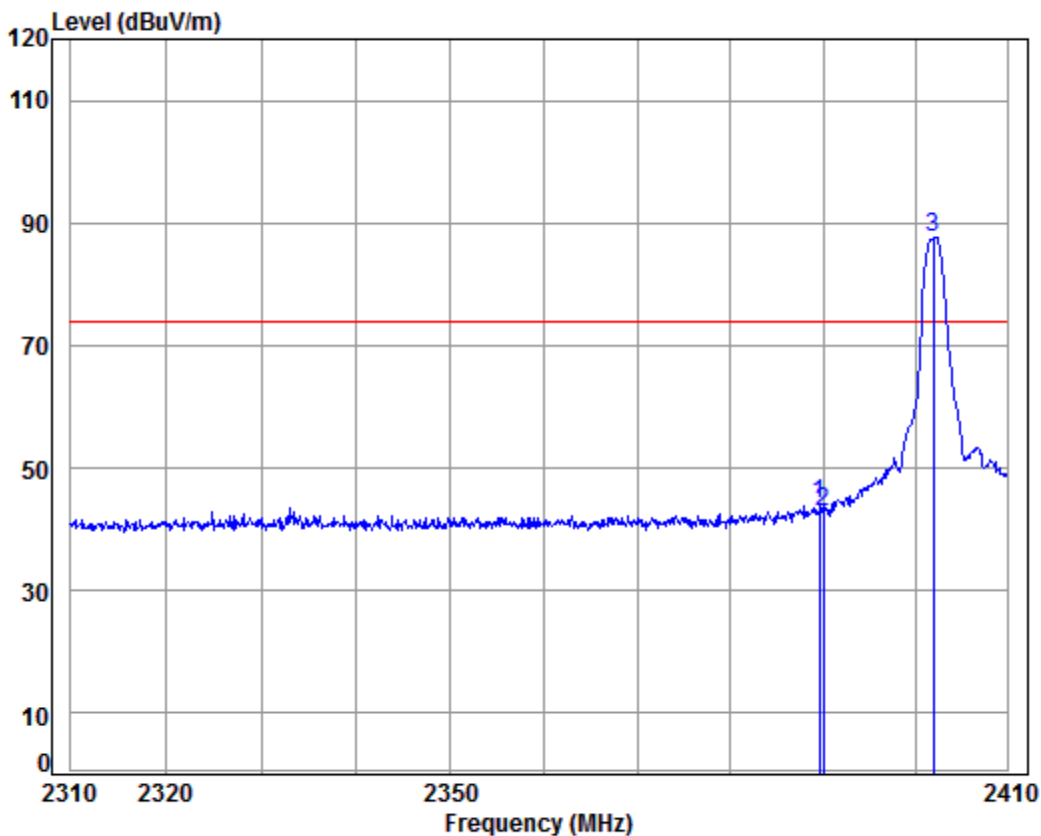


### **7.6.3 Measurement Procedure and Data**

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 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.



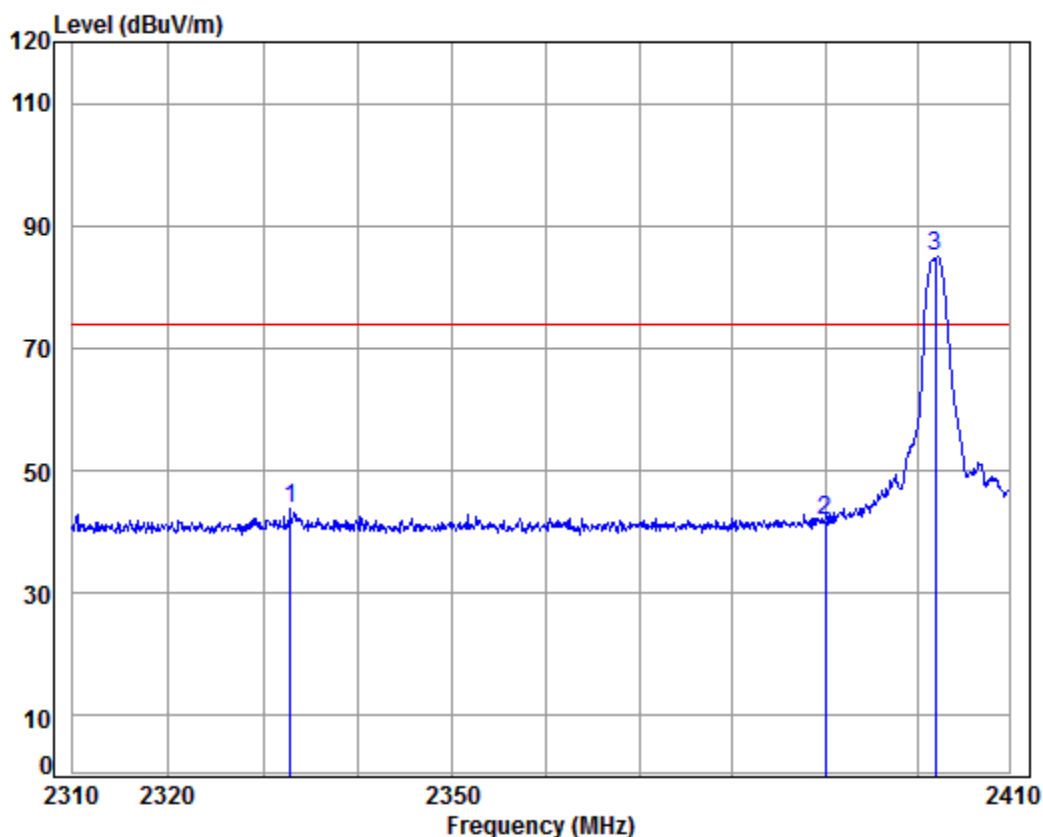
Mode:c; Polarization:Horizontal; Modulation Type:GFSK; Channel:Low



Condition: 3m HORIZONTAL  
Job No: : 09646MD  
Mode: : 2402 Band edge  
Note : 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	5.47	29.08	37.66	47.18	44.07	74.00	-29.93	peak
2	2390.000	5.47	29.08	37.66	45.81	42.70	74.00	-31.30	peak
3 pp	2402.000	5.49	29.11	37.65	90.83	87.78	74.00	13.78	peak

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



Condition: 3m VERTICAL

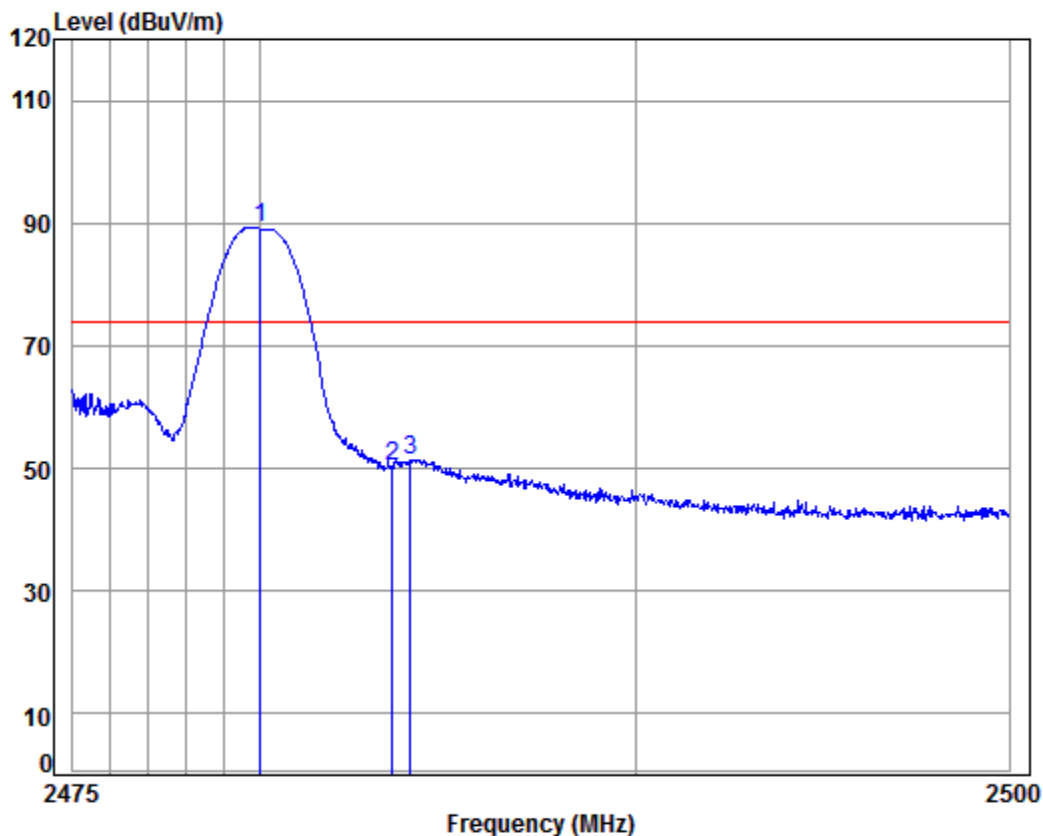
Job No: : 09646MD

Mode: : 2402 Band edge

Note : BLE

	Freq	Cable Loss	Ant Factor	Preamplifier	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2332.824	5.40	28.90	37.66	47.11	43.75	74.00	-30.25	peak
2	2390.000	5.47	29.08	37.66	44.87	41.76	74.00	-32.24	peak
3 pp	2402.000	5.49	29.11	37.65	87.97	84.92	74.00	10.92	peak

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



Condition: 3m HORIZONTAL

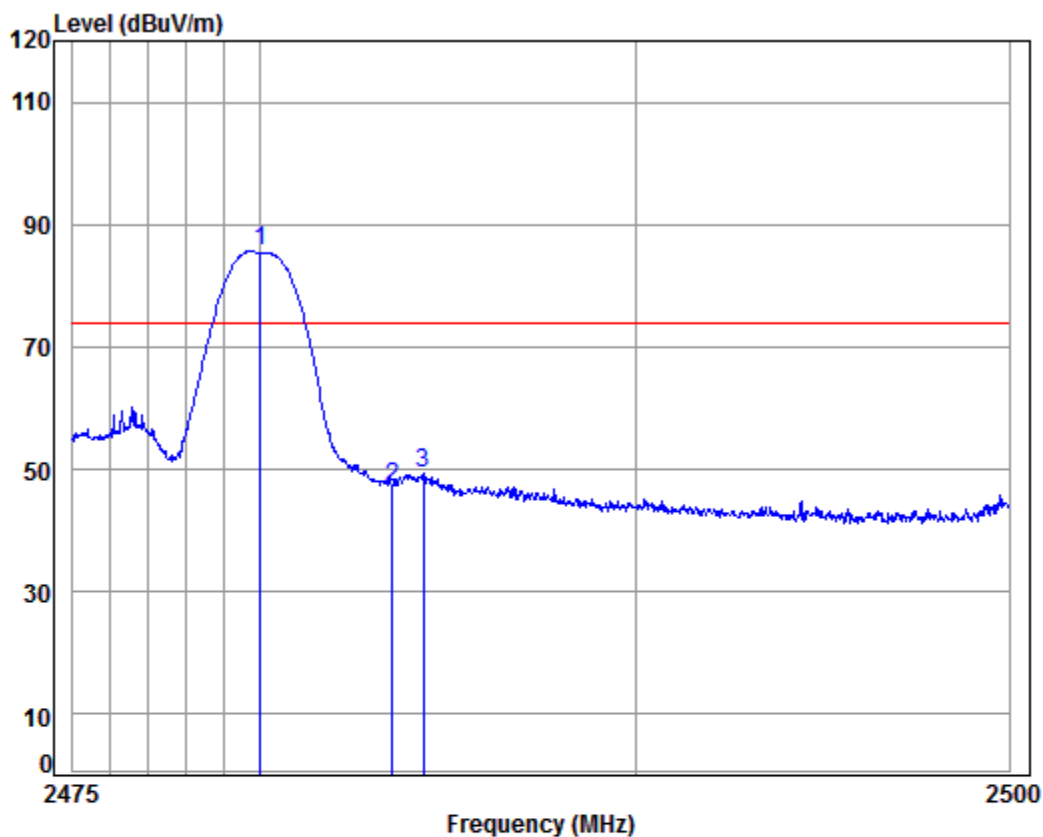
Job No: : 09646MD

Mode: : 2480 Band edge

Note : 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 pp	2480.000	5.59	29.34	37.65	92.13	89.41	74.00	15.41	peak
2	2483.500	5.60	29.35	37.65	52.93	50.23	74.00	-23.77	peak
3	2483.996	5.60	29.35	37.65	54.16	51.46	74.00	-22.54	peak

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



Condition: 3m VERTICAL

Job No: : 09646MD

Mode: : 2480 Band edge

Note : 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	2480.000	5.59	29.34	37.65	88.37	85.65	74.00	11.65	peak
2	2483.500	5.60	29.35	37.65	49.94	47.24	74.00	-26.76	peak
3	2484.345	5.60	29.35	37.65	51.99	49.29	74.00	-24.71	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) 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.



## 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.

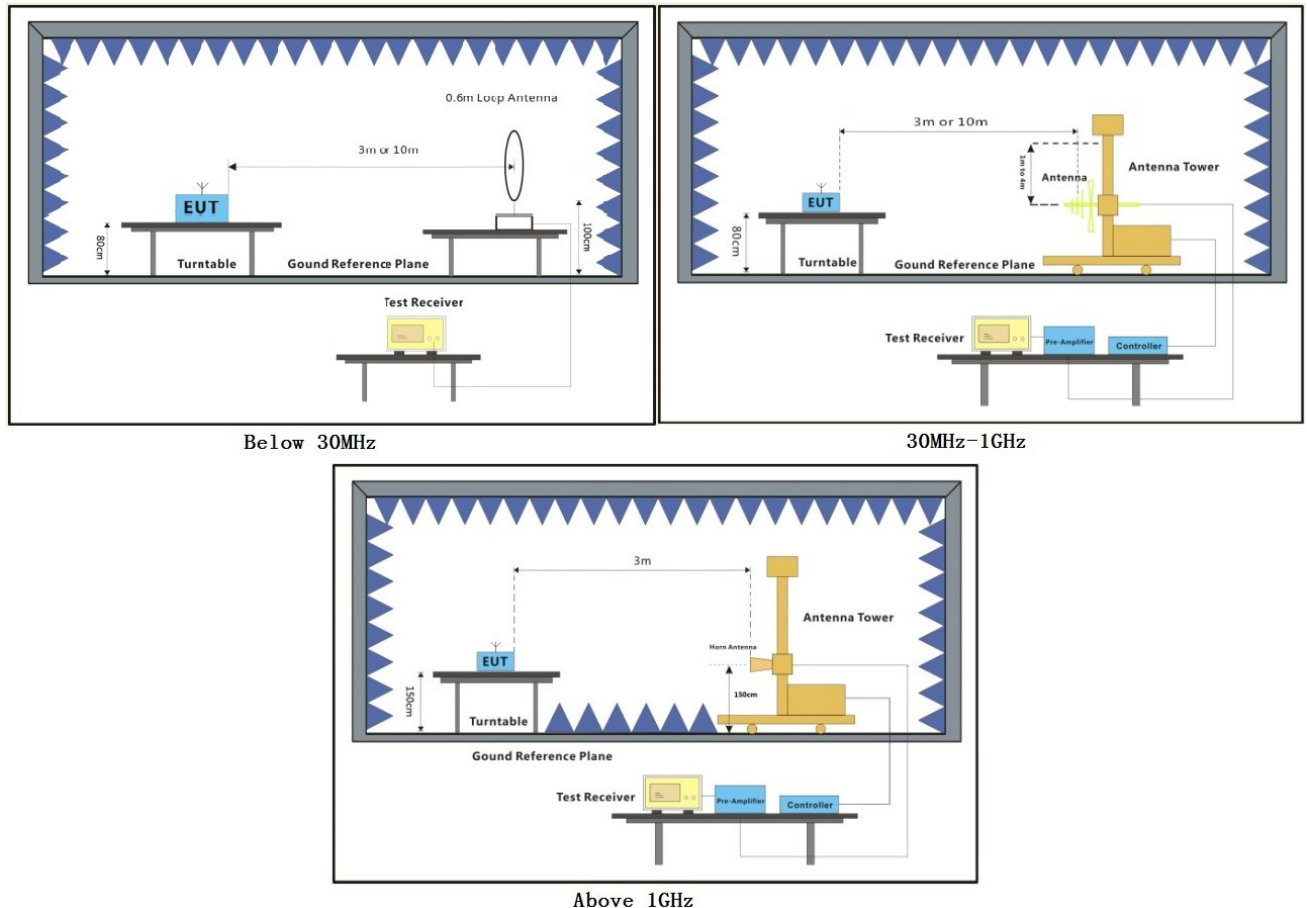
### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1015 mbar

Test mode c: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 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.

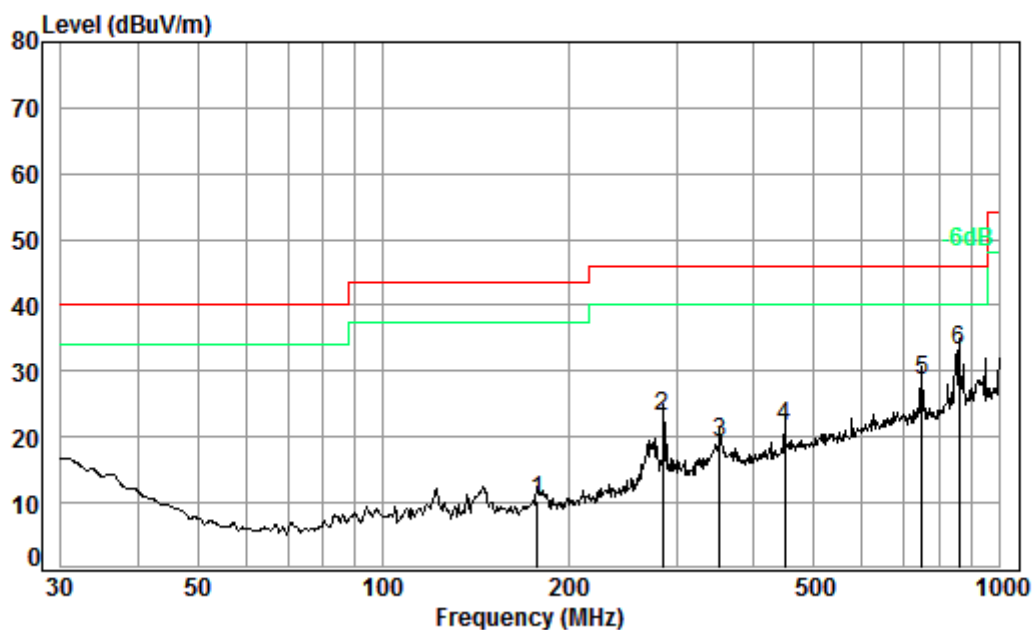




Radiated Emission below 1GHz

Detector:QP

Mode:c; Polarization:Horizontal



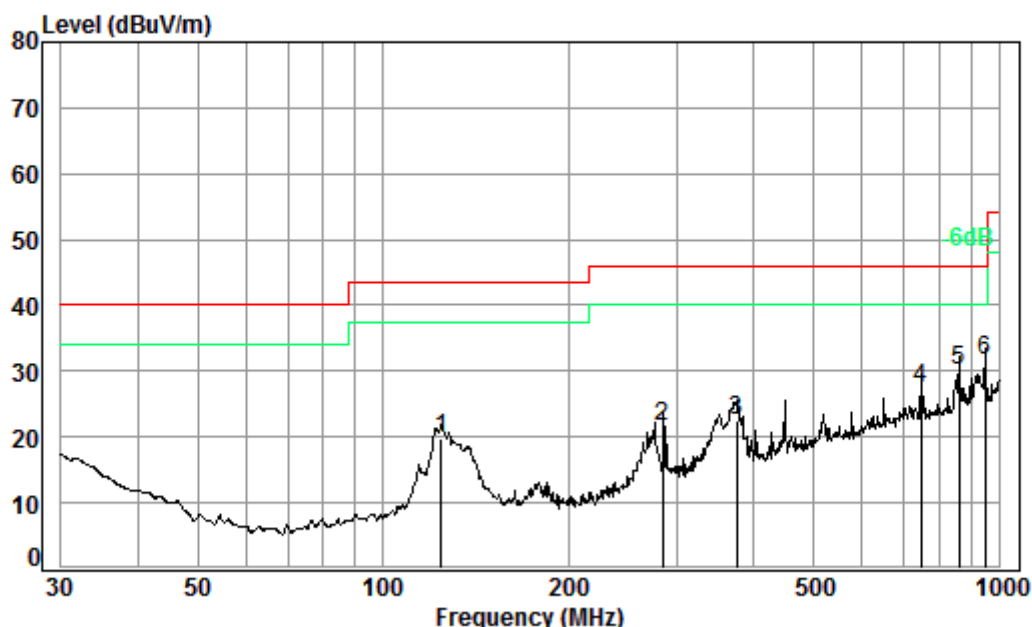
Condition: 3m HORIZONTAL

Job No. : 09646MD

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	dBuV/m
1	178.13	1.37	9.83	26.78	26.05	10.47	43.50
2	284.98	1.84	13.24	26.44	34.41	23.05	46.00
3	351.71	2.06	14.04	26.81	29.90	19.19	46.00
4	449.56	2.41	16.89	27.44	29.67	21.53	46.00
5	750.11	3.06	21.70	27.35	31.24	28.65	46.00
6 pp	863.06	3.46	22.71	26.96	33.84	33.05	46.00

Mode:c; Polarization:Vertical



Condition: 3m VERTICAL

Job No. : 09646MD

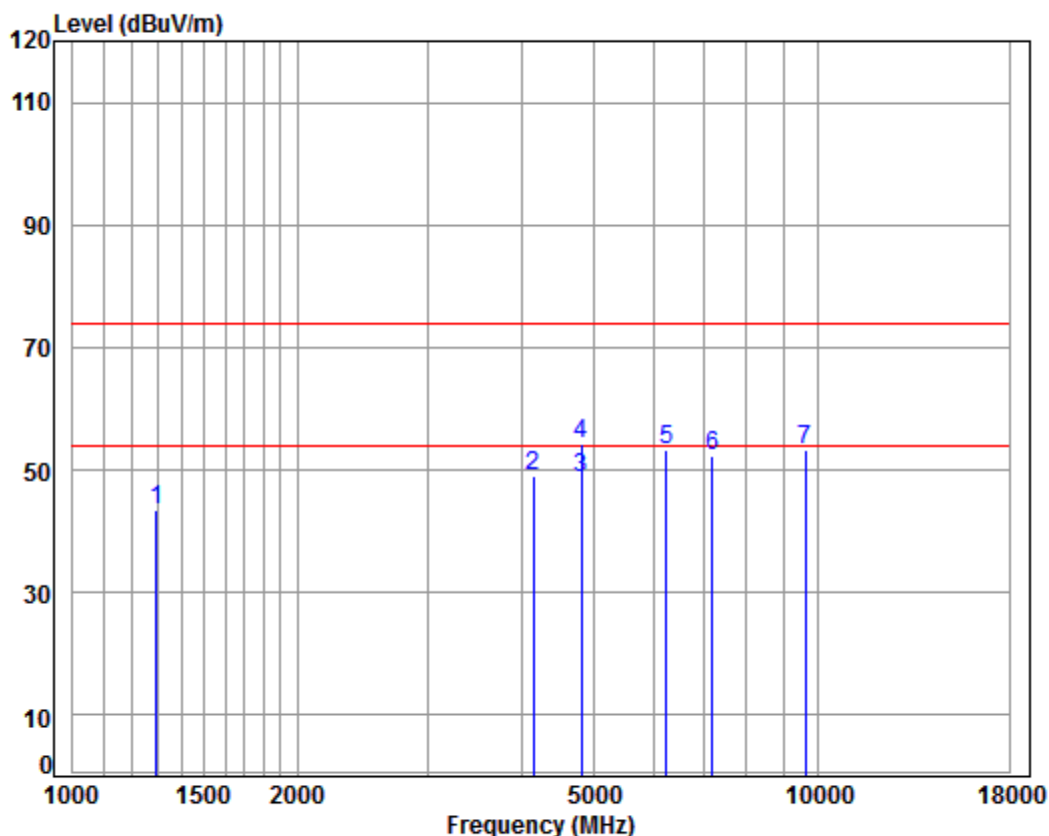
Test mode: c

	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	124.13	1.26	7.82	27.05	37.84	19.87	43.50	-23.63
2	284.98	1.84	13.24	26.44	33.09	21.73	46.00	-24.27
3	375.94	2.13	16.01	26.97	31.40	22.57	46.00	-23.43
4	747.48	3.05	21.69	27.35	30.13	27.52	46.00	-18.48
5	863.06	3.46	22.71	26.96	30.96	30.17	46.00	-15.83
6 pp	948.76	3.65	23.30	26.54	31.08	31.49	46.00	-14.51



Above 1GHz

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



Condition: 3m HORIZONTAL

Job No : 09646MD

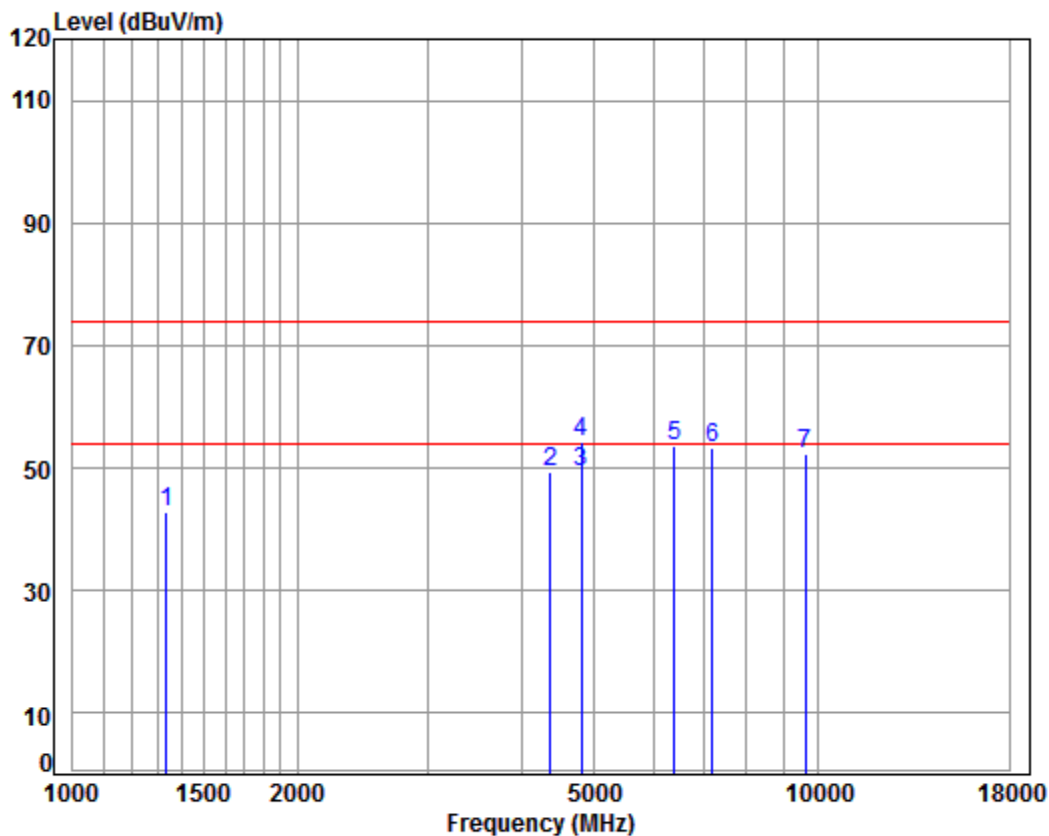
Mode : 2402 TX SE

Note : 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	1293.359	4.77	24.92	37.76	51.62	43.55	74.00	-30.45	peak
2	4145.664	7.16	33.60	37.13	45.28	48.91	74.00	-25.09	peak
3	pp 4804.000	7.89	34.16	37.26	44.08	48.87	54.00	-5.13	Average
4	pk 4804.000	7.89	34.16	37.26	49.55	54.34	74.00	-19.66	peak
5	6249.464	11.06	34.90	37.82	45.16	53.30	74.00	-20.70	peak
6	7206.000	10.08	36.42	37.56	43.35	52.29	74.00	-21.71	peak
7	9608.000	10.75	37.52	35.80	40.87	53.34	74.00	-20.66	peak



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

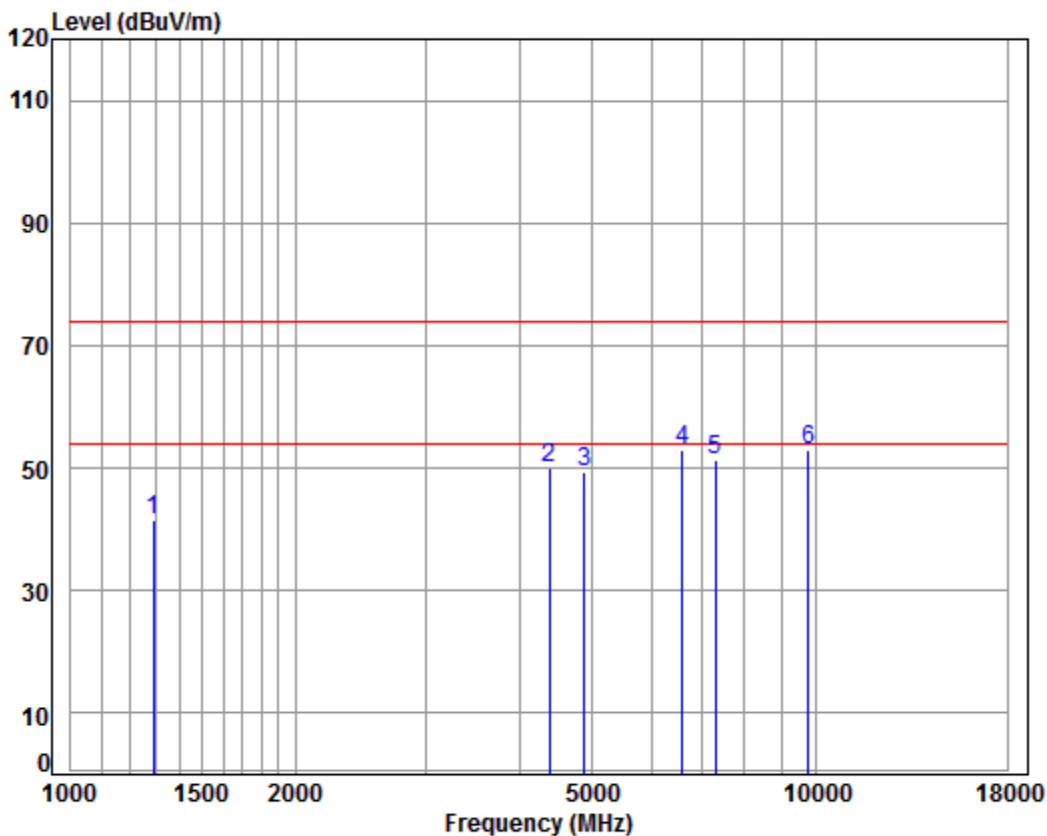


Condition: 3m VERTICAL  
Job No : 09646MD  
Mode : 2402 TX SE  
Note : BLE

	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	1335.141	4.93	25.11	37.76	50.53	42.81	74.00	-31.19	peak
2	4367.058	7.41	33.60	37.18	45.52	49.35	74.00	-24.65	peak
3	4804.000	7.89	34.16	37.26	44.61	49.40	54.00	-4.60	Average
4	4804.000	7.89	34.16	37.26	49.34	54.13	74.00	-19.87	Peak
5	6414.167	11.38	35.03	37.77	45.07	53.71	74.00	-20.29	peak
6	7206.000	10.08	36.42	37.56	44.49	53.43	74.00	-20.57	peak
7	9608.000	10.75	37.52	35.80	39.78	52.25	74.00	-21.75	peak



Mode:c; Polarization:Horizontal; Modulation Type:GFSK; Channel:Middle



Condition: 3m HORIZONTAL

Job No : 09646MD

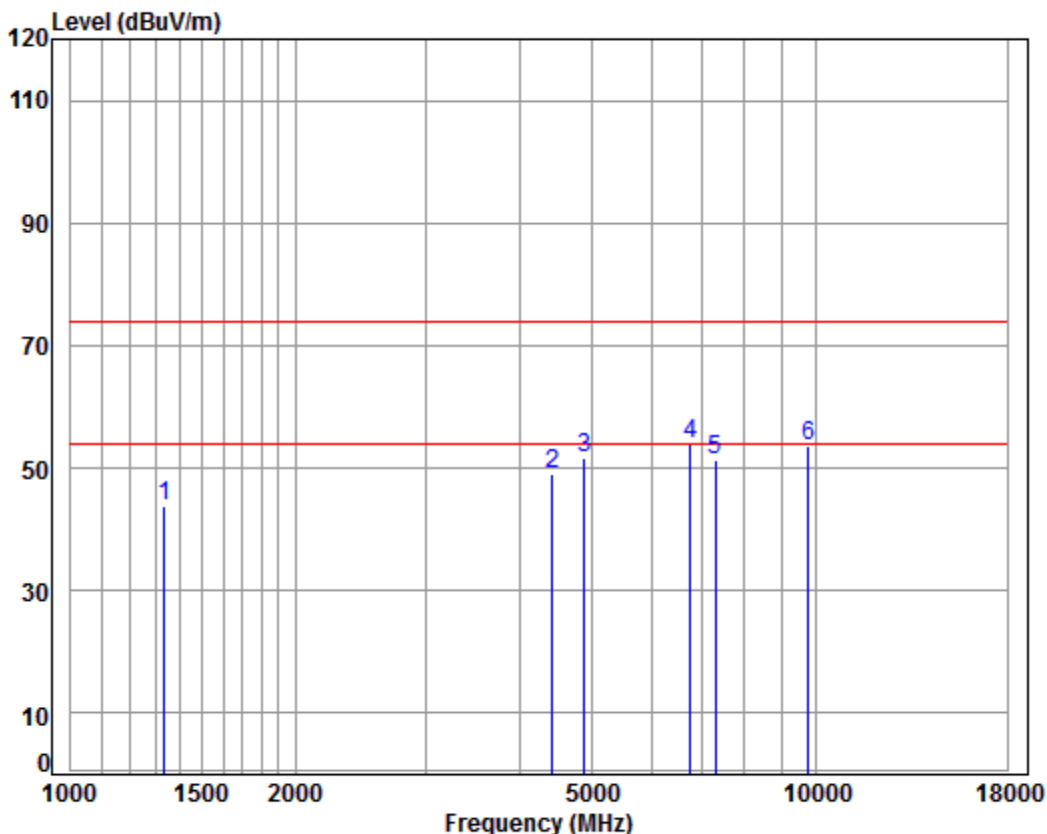
Mode : 2440 TX SE

Note : 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	1289.627	4.76	24.91	37.76	49.77	41.68	74.00	-32.32	peak
2	4379.699	7.43	33.60	37.18	46.32	50.17	74.00	-23.83	peak
3	4880.000	7.97	34.29	37.28	44.27	49.25	74.00	-24.75	peak
4	6602.265	11.24	35.39	37.71	44.18	53.10	74.00	-20.90	peak
5	7320.000	10.05	36.37	37.53	42.60	51.49	74.00	-22.51	peak
6 pp	9760.000	10.82	37.55	35.68	40.44	53.13	74.00	-20.87	peak



Mode:c; Polarization:Vertical; Modulation Type:GFSK; Channel:Middle

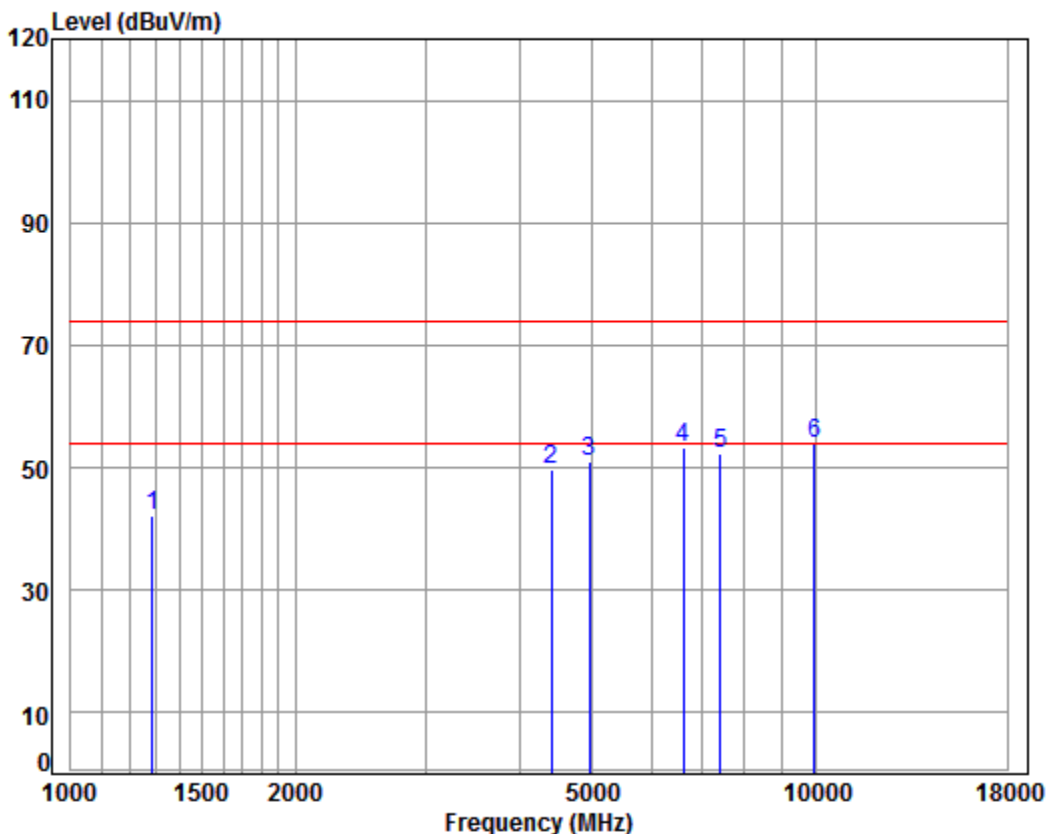


Condition: 3m VERTICAL  
Job No : 09646MD  
Mode : 2440 TX SE  
Note : BLE

	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	4.93	25.11	37.76	51.65	43.93	74.00	-30.07	peak
2	4417.841	7.47	33.60	37.19	45.13	49.01	74.00	-24.99	peak
3	4880.000	7.97	34.29	37.28	46.69	51.67	74.00	-22.33	peak
4 pp	6776.265	10.75	35.89	37.66	44.88	53.86	74.00	-20.14	peak
5	7320.000	10.05	36.37	37.53	42.45	51.34	74.00	-22.66	peak
6	9760.000	10.82	37.55	35.68	40.84	53.53	74.00	-20.47	peak



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

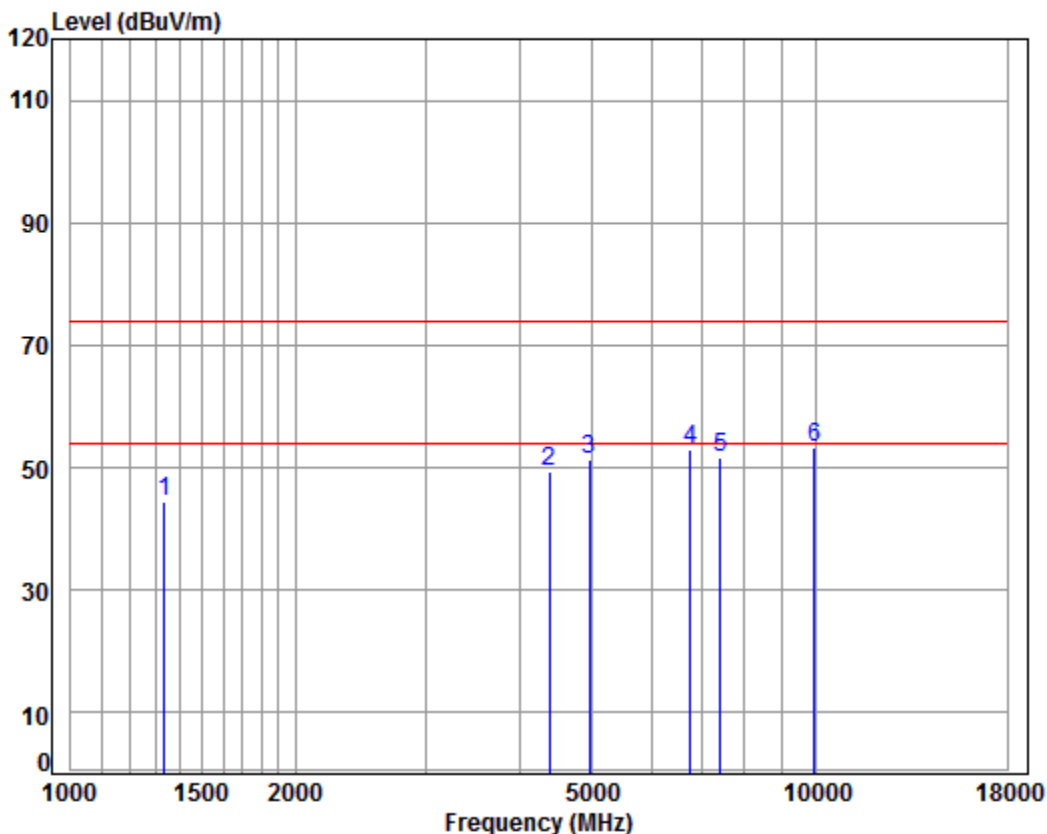


Condition: 3m HORIZONTAL  
Job No : 09646MD  
Mode : 2480 TX SE  
Note : BLE

	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	1285.904	4.75	24.89	37.76	50.31	42.19	74.00	-31.81	peak
2	4405.090	7.46	33.60	37.19	45.84	49.71	74.00	-24.29	peak
3	4960.000	8.05	34.43	37.29	45.95	51.14	74.00	-22.86	peak
4	6621.375	11.19	35.45	37.71	44.40	53.33	74.00	-20.67	peak
5	7440.000	10.02	36.32	37.51	43.60	52.43	74.00	-21.57	peak
6 pp	9920.000	10.90	37.58	35.56	40.91	53.83	74.00	-20.17	peak



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



Condition: 3m VERTICAL  
Job No : 09646MD  
Mode : 2480 TX SE  
Note : 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	4.93	25.11	37.76	52.25	44.53	74.00	-29.47	peak
2	4379.699	7.43	33.60	37.18	45.64	49.49	74.00	-24.51	peak
3	4960.000	8.05	34.43	37.29	45.99	51.18	74.00	-22.82	peak
4	6776.265	10.75	35.89	37.66	44.09	53.07	74.00	-20.93	peak
5	7440.000	10.02	36.32	37.51	42.85	51.68	74.00	-22.32	peak
6 pp	9920.000	10.90	37.58	35.56	40.43	53.35	74.00	-20.65	peak



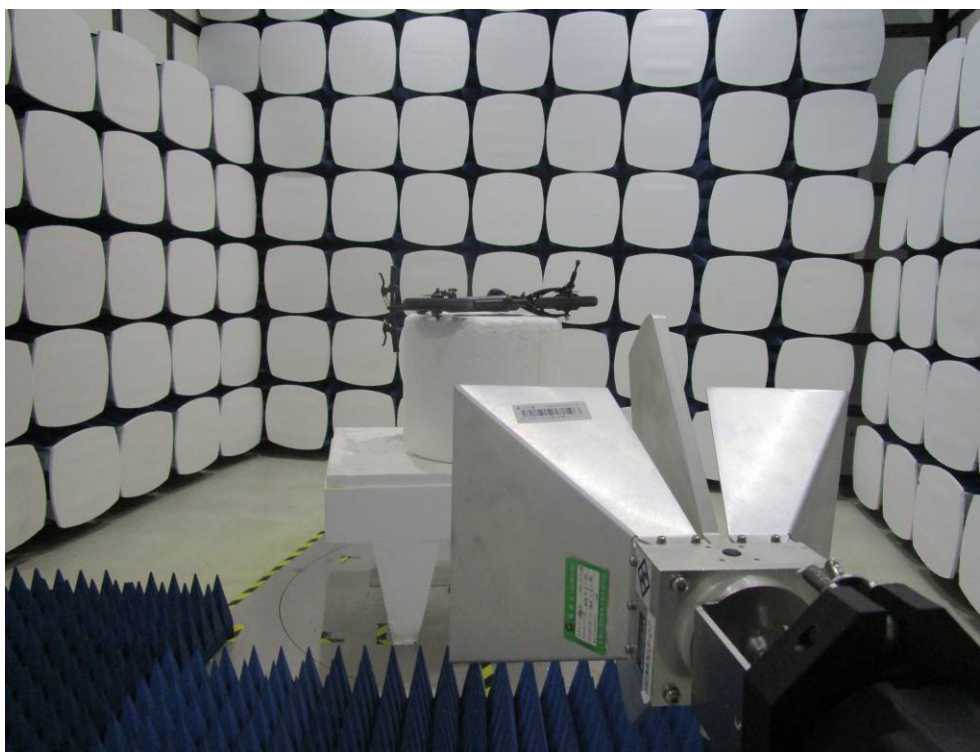
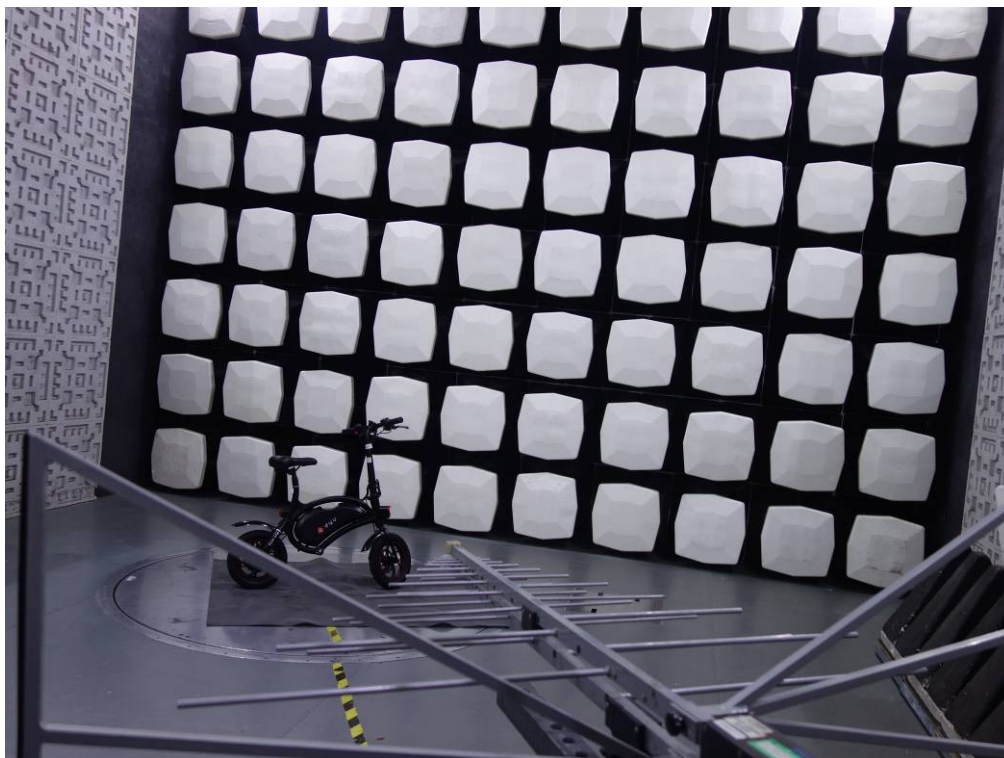


Remark:

- 3) 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
- 4) 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.
- 5) 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 Appendix A - Photographs of EUT Constructional Details for SZEM1709009646CR.

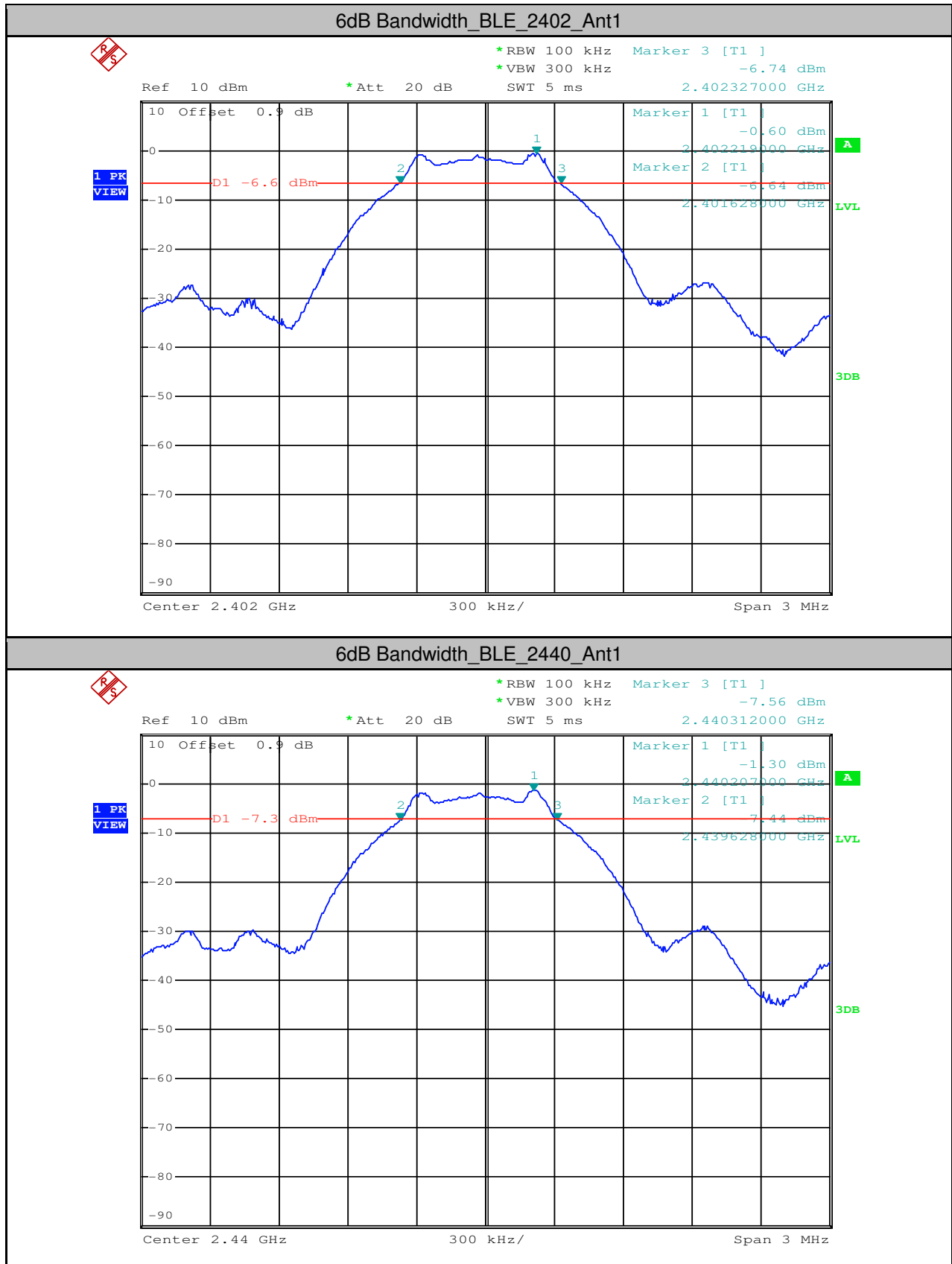


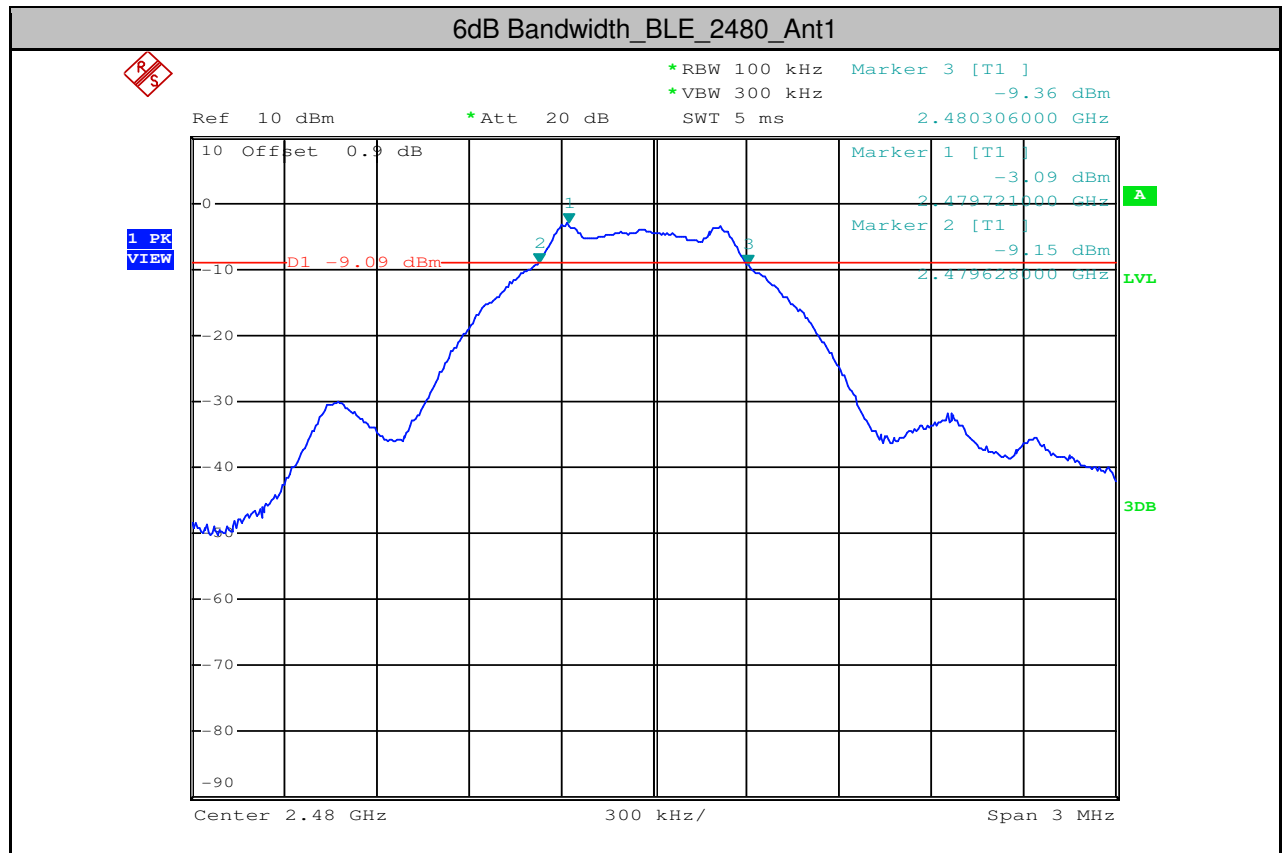
## 9 Appendix

### 9.1 Appendix 15.247

#### 1.6dB Bandwidth

Test Mode	Test Channel	Ant	EBW[MHz]	Limit[MHz]	Verdict
BLE	2402	Ant1	0.699	$\geq 0.5$	PASS
BLE	2440	Ant1	0.684	$\geq 0.5$	PASS
BLE	2480	Ant1	0.678	$\geq 0.5$	PASS



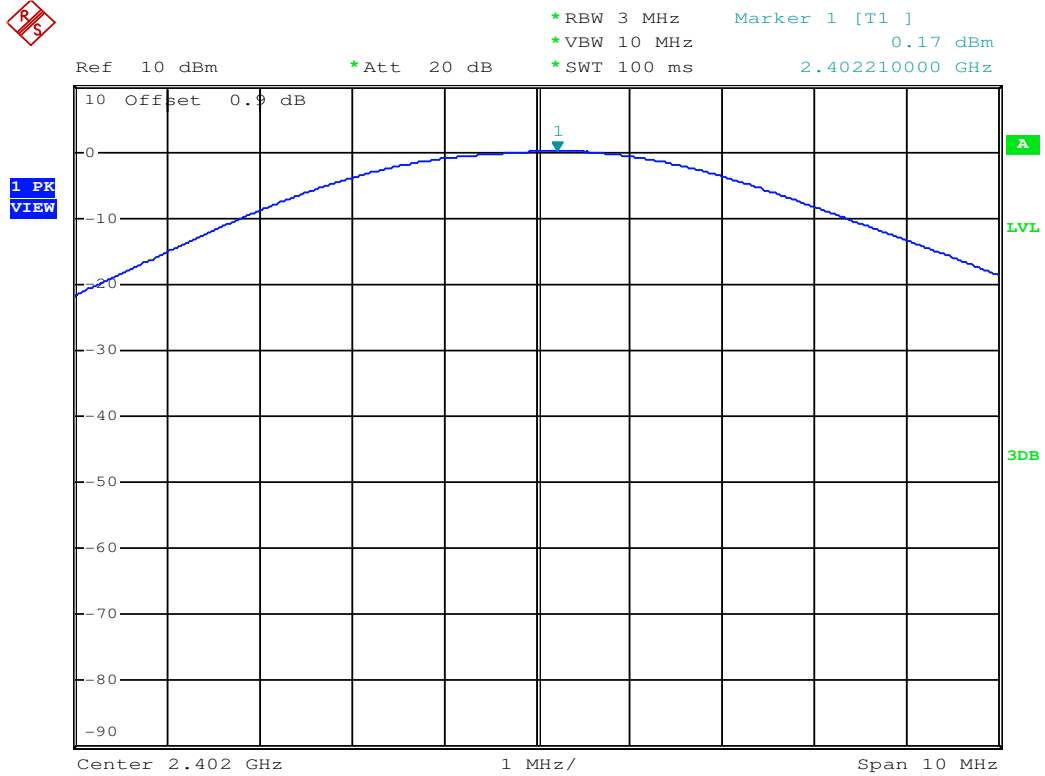




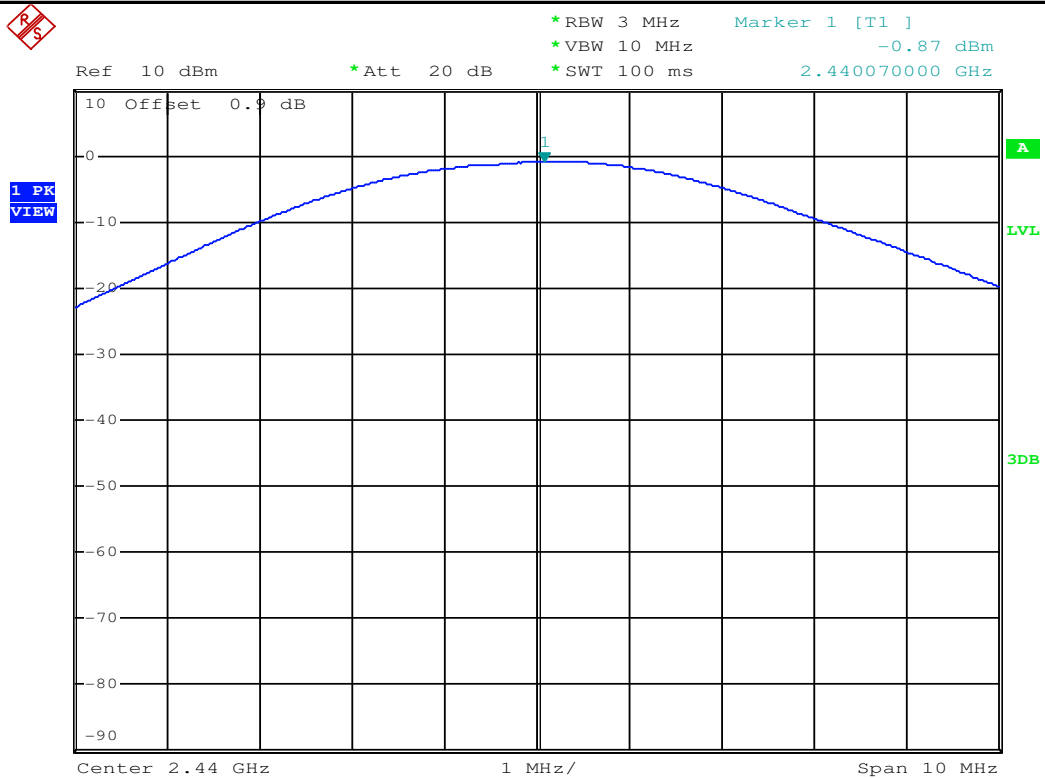
## 2. Maximum peak conducted output power

Test Mode	Test Channel	Ant	Power[dBm]	Limit[dBm]	Verdict
BLE	2402	Ant1	0.17	<30	PASS
BLE	2440	Ant1	-0.87	<30	PASS
BLE	2480	Ant1	-2.64	<30	PASS

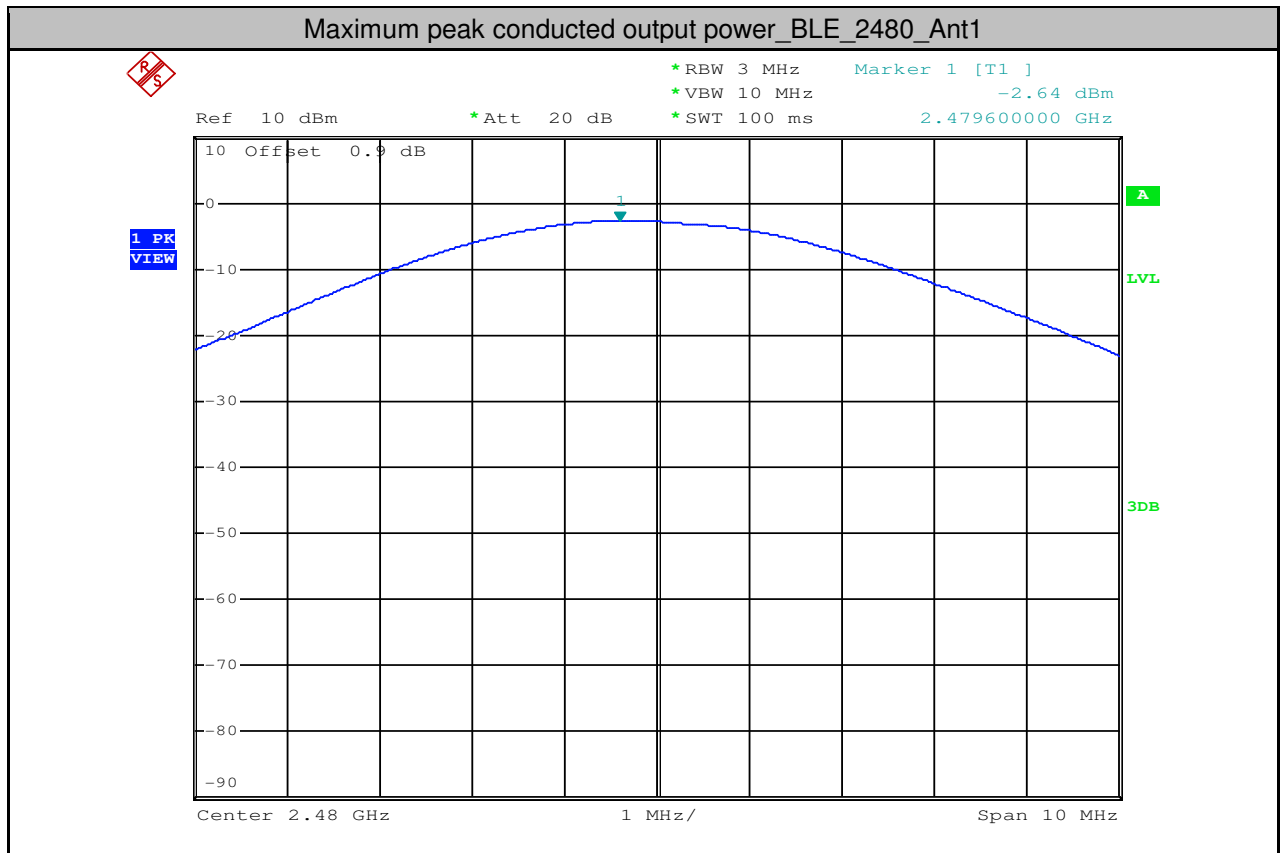
Maximum peak conducted output power\_BLE\_2402\_Ant1



Maximum peak conducted output power\_BLE\_2440\_Ant1



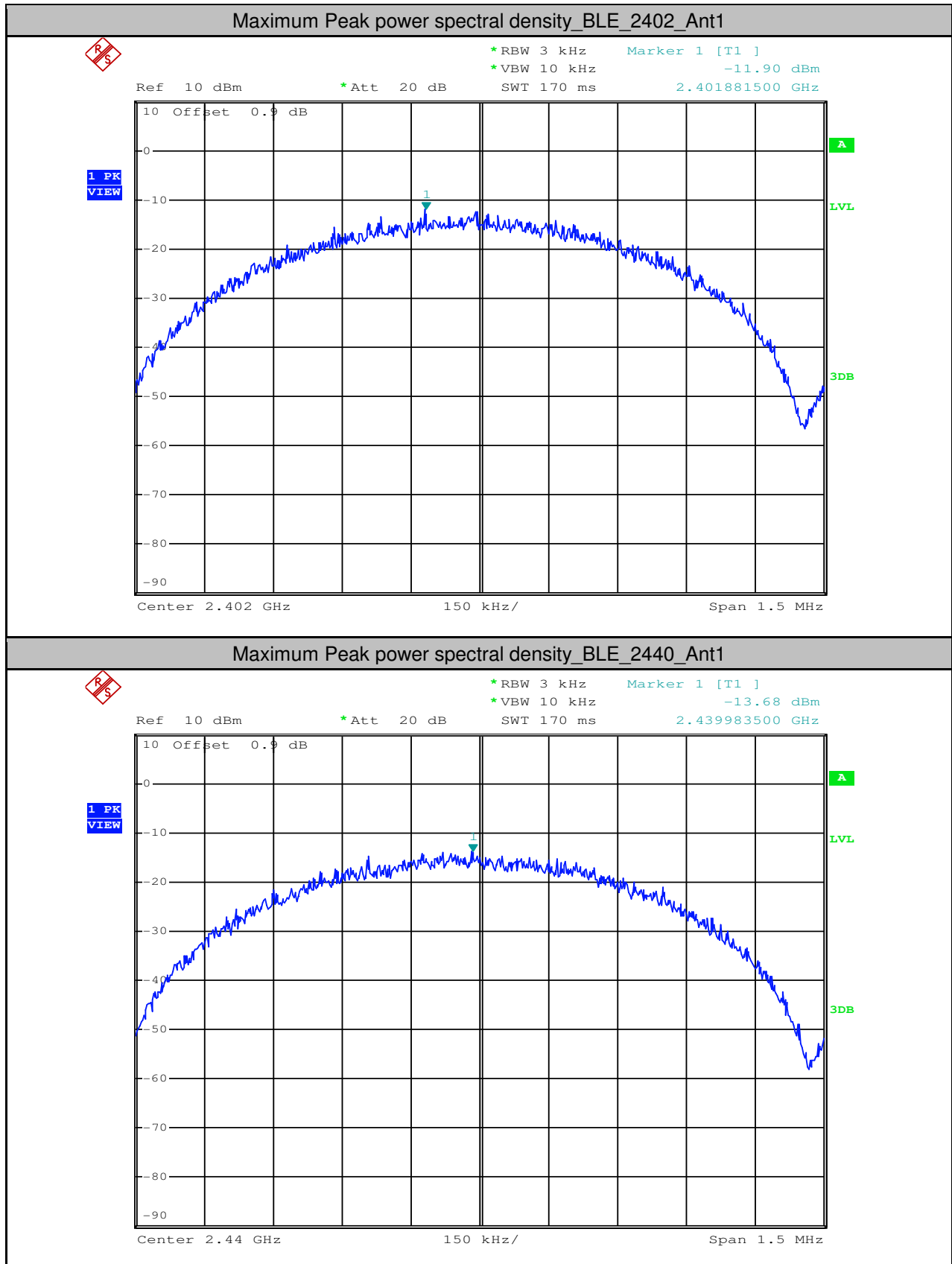


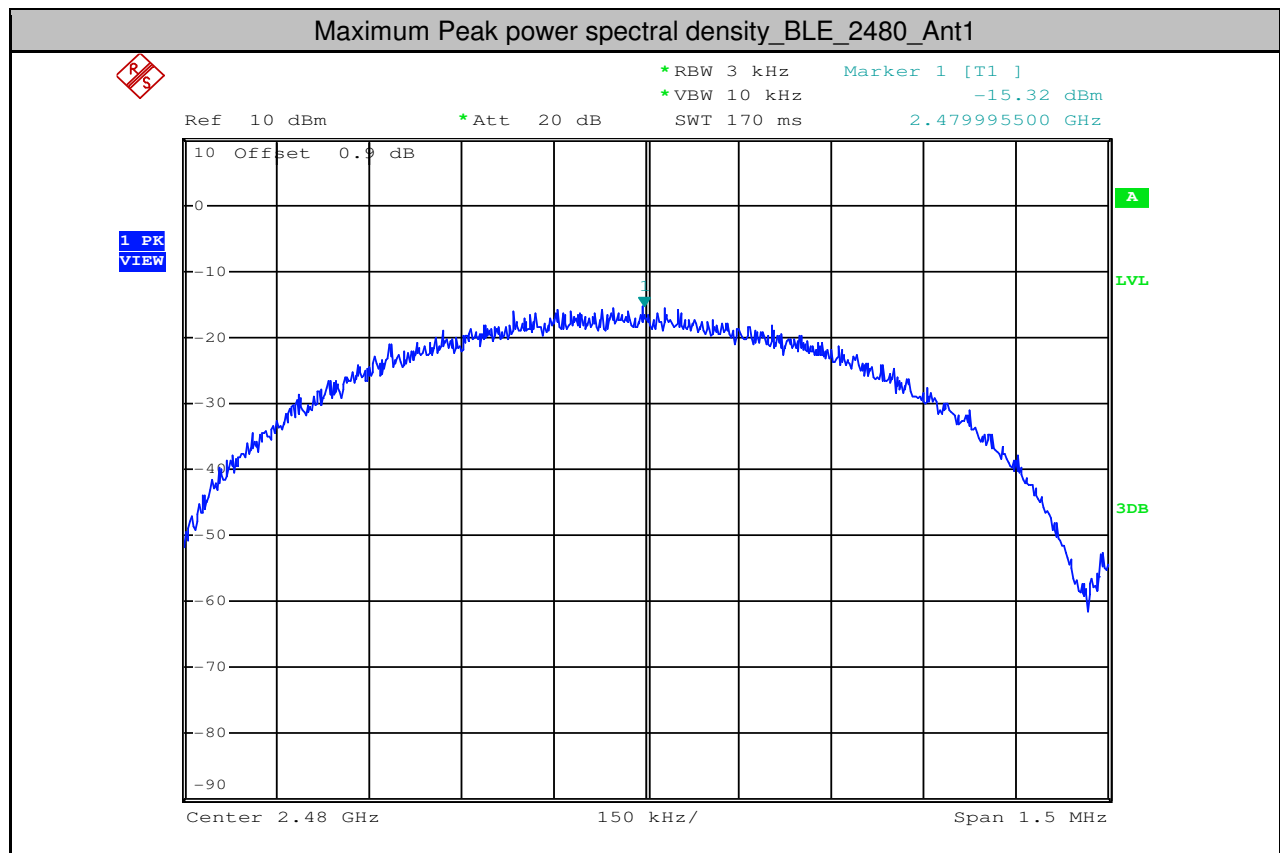




### 3.Maximum Peak power spectral density

Test Mode	Test Channel	Ant	PSD[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE	2402	Ant1	-11.9	<8.00	PASS
BLE	2440	Ant1	-13.68	<8.00	PASS
BLE	2480	Ant1	-15.32	<8.00	PASS

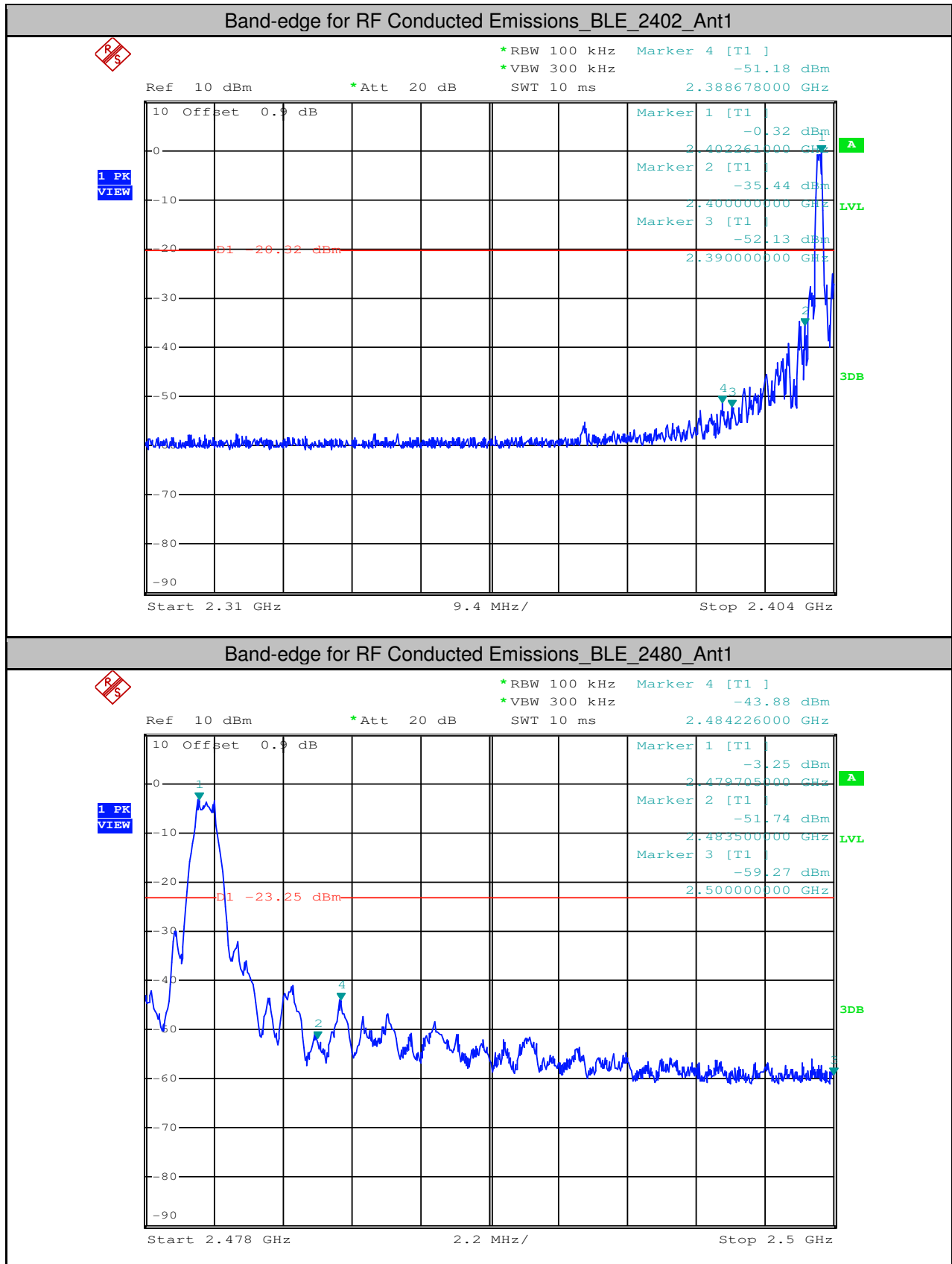






#### 4. Band-edge for RF Conducted Emissions

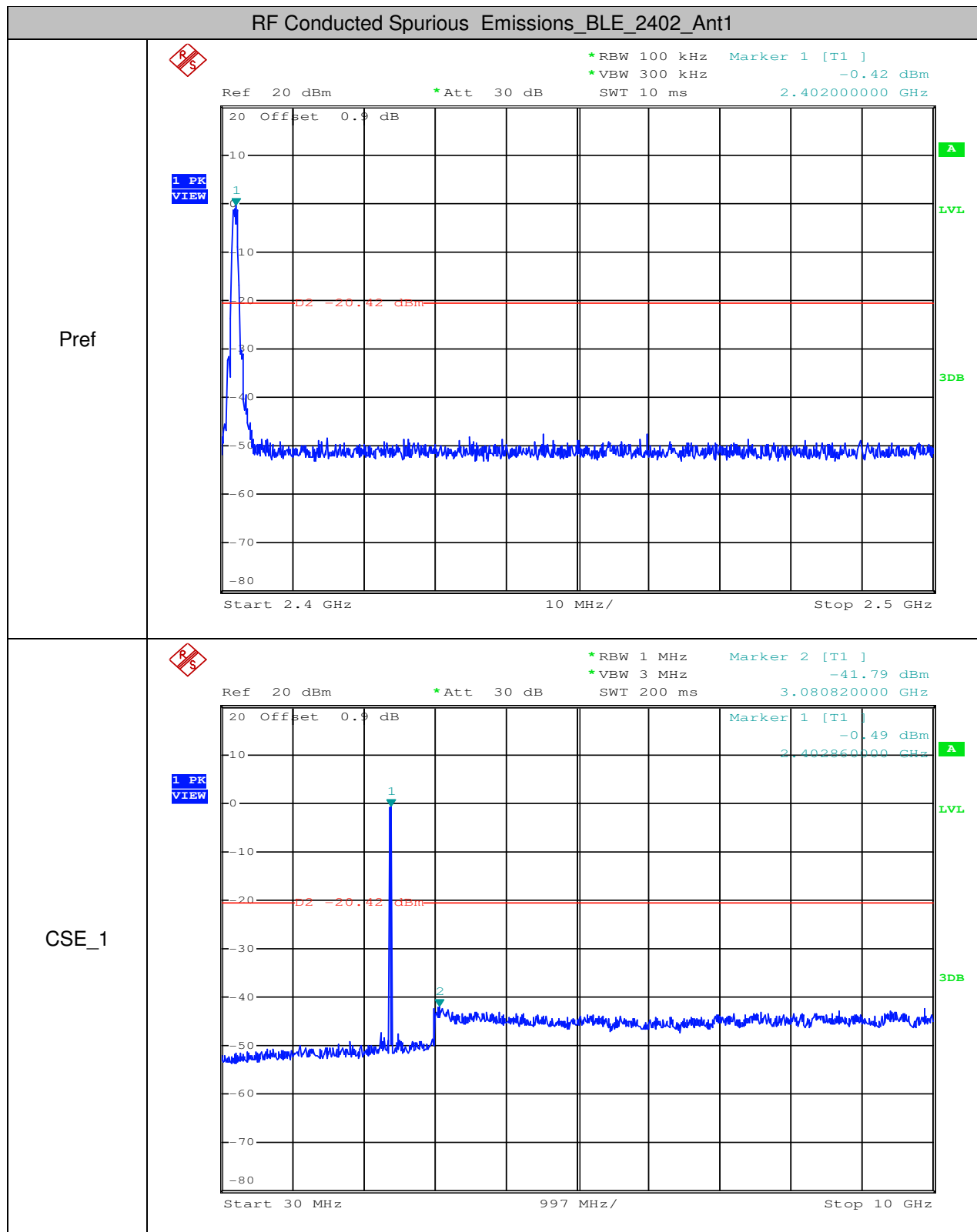
Test Mode	Test Channel	Ant	Carrier Power[dBm]	Max. Spurious Level [dBm]	Limit [dBm]	Verdict
BLE	2402	Ant1	-0.320	-51.185	<-20.32	PASS
BLE	2480	Ant1	-3.250	-43.879	<-23.25	PASS



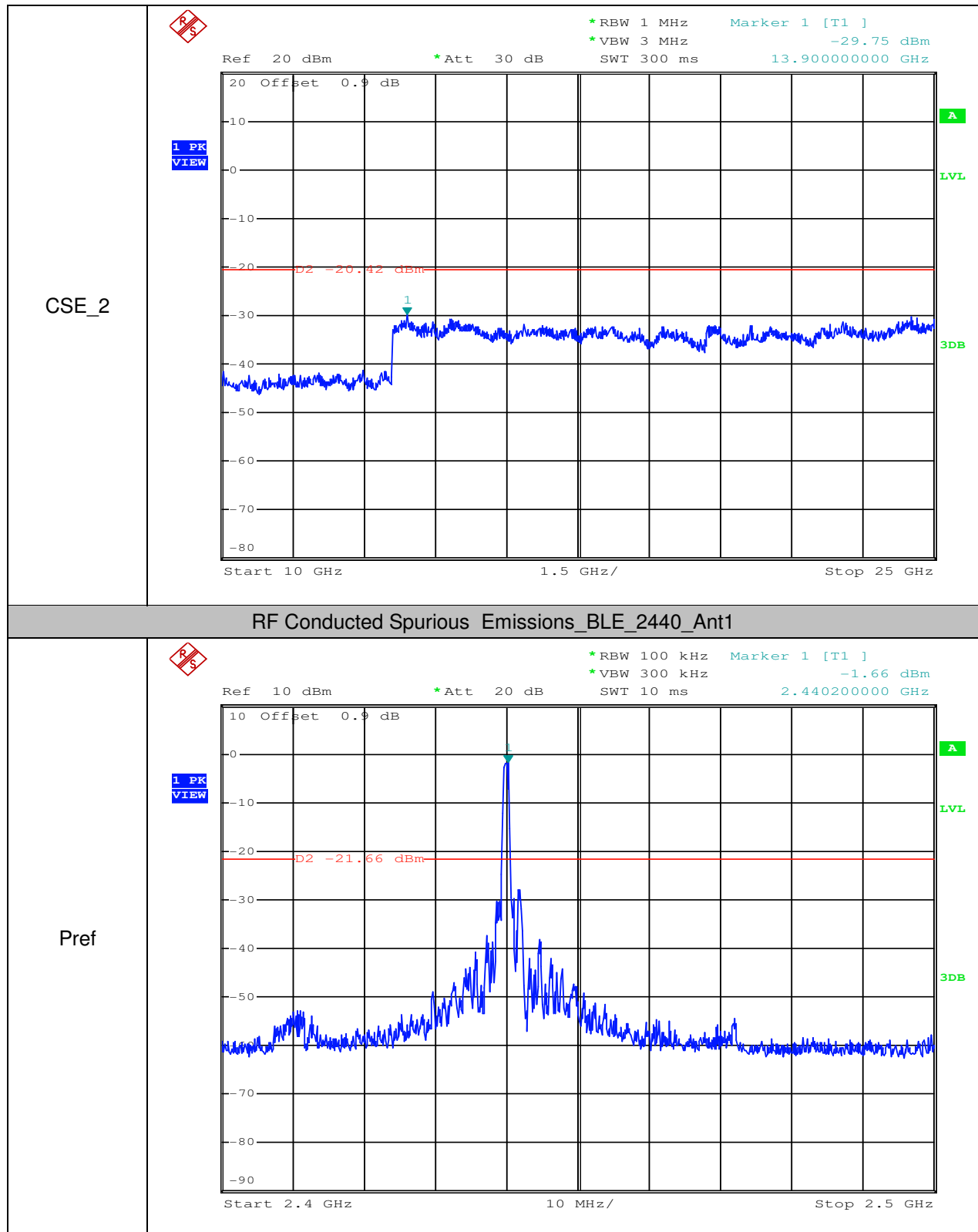


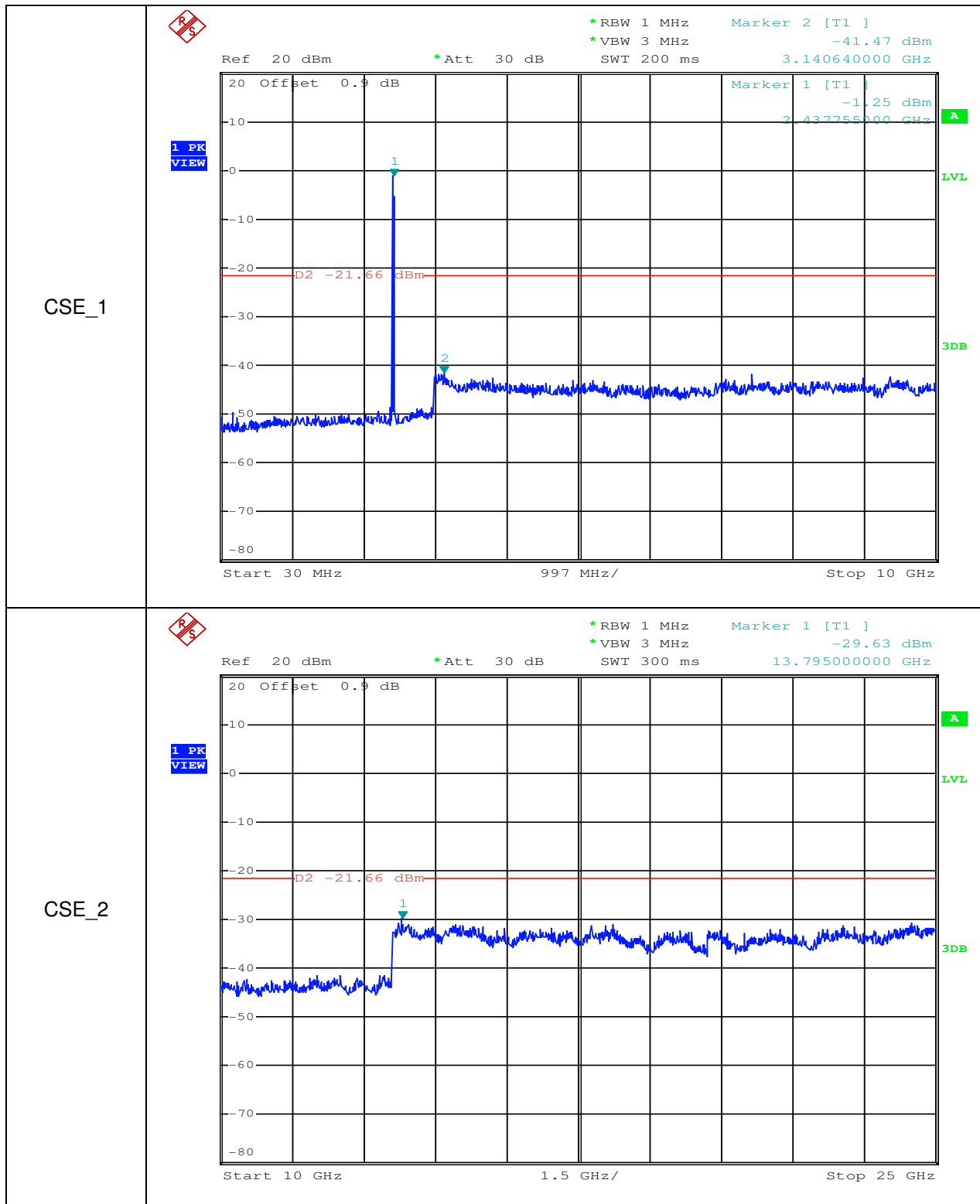
**5.RF Conducted Spurious Emissions**

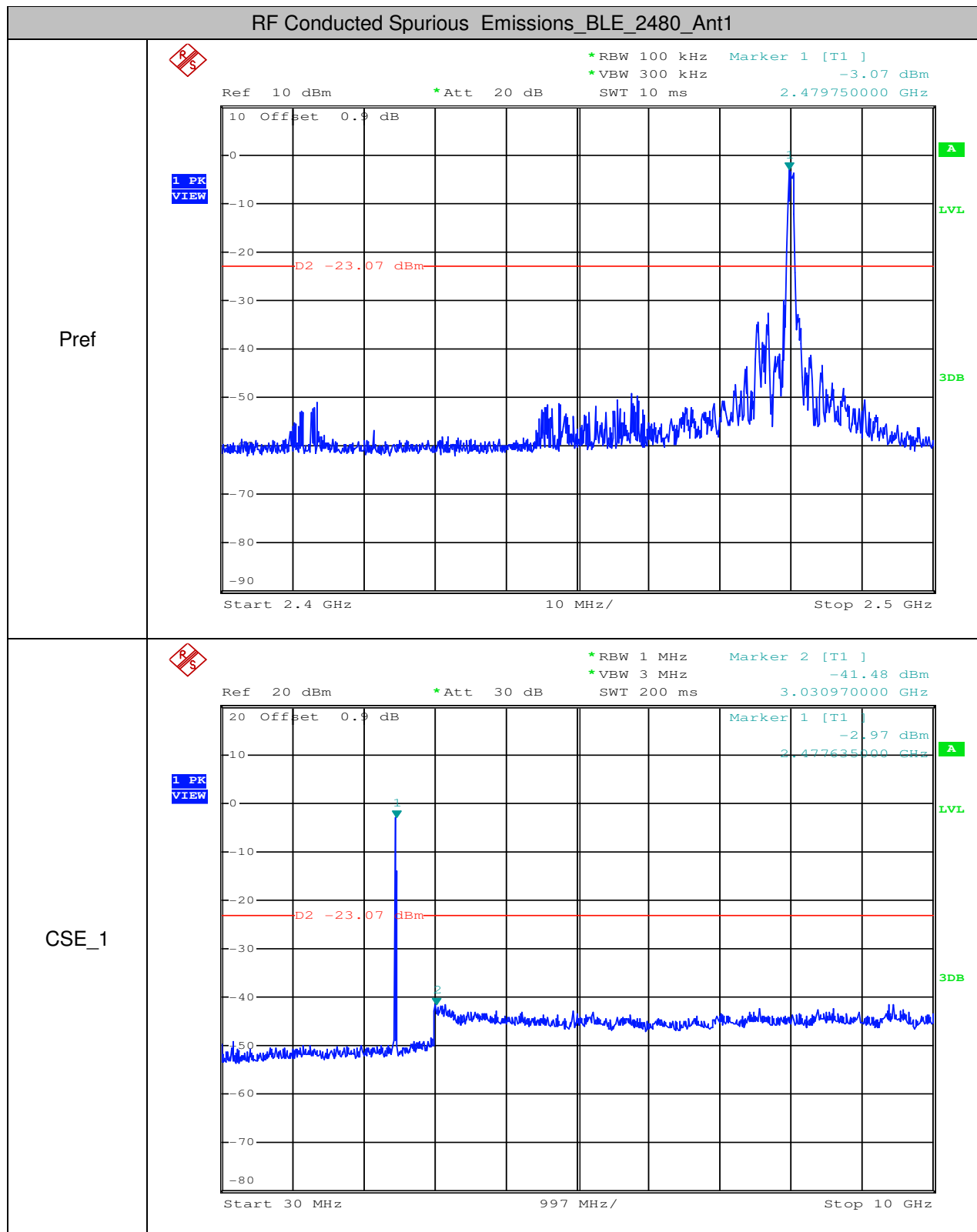
Test Mode	Test Channel	StartFre [MHz]	StopFre [MHz]	RBW [kHz]	VBW [kHz]	Pref[dBm]	Max. Level [dBm]	Limit [dBm]	Verdict
BLE	2402	30	10000	1000	3000	-0.42	-41.790	<-20.42	PASS
BLE	2402	10000	25000	1000	3000	-0.42	-29.750	<-20.42	PASS
BLE	2440	30	10000	1000	3000	-1.66	-41.470	<-21.66	PASS
BLE	2440	10000	25000	1000	3000	-1.66	-29.630	<-21.66	PASS
BLE	2480	30	10000	1000	3000	-3.07	-41.480	<-23.07	PASS
BLE	2480	10000	25000	1000	3000	-3.07	-29.930	<-23.07	PASS

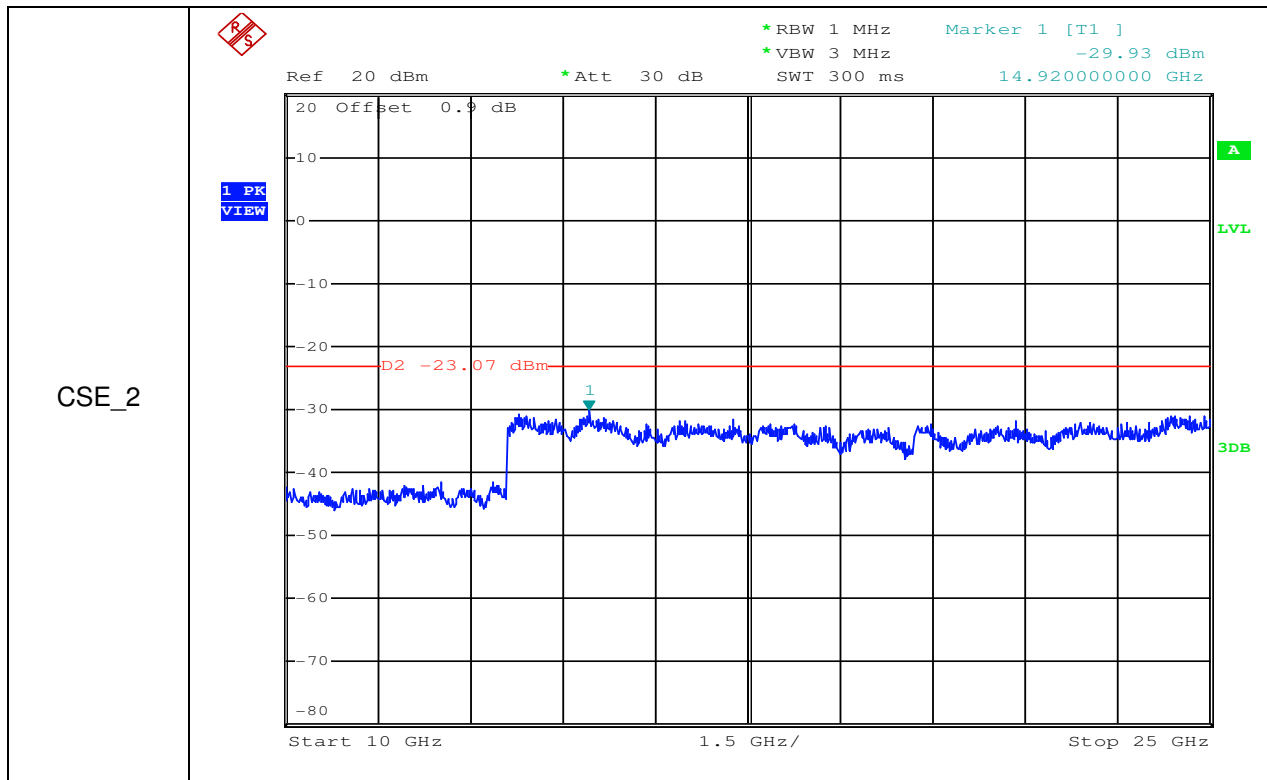












- End of the Report -