



**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.: SZEM181101030102  
Page: 1 of 42

# TEST REPORT

**Application No.:** SZEM1811010301CR  
**Applicant:** Guangdong Yinrun Industry Co., LTD.  
**Address of Applicant:** Yinrun Ind. Garden, Laimei Zone, Chenghai, Shantou Guangdong, 515041 China  
**Manufacturer:** Guangdong Yinrun Industry Co., LTD.  
**Address of Manufacturer:** Yinrun Ind. Garden, Laimei Zone, Chenghai, Shantou Guangdong, 515041 China  
**Equipment Under Test (EUT):**  
**EUT Name:** Mini Runner Tumbler car  
**Model No.:** 10092, 10091, 212831 ♣  
♣ Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.  
**FCC ID** XHT100921812  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.249  
**Date of Receipt:** 2018-12-03  
**Date of Test:** 2018-12-03 to 2018-12-14  
**Date of Issue:** 2018-12-17

<b>Test Result:</b>	<b>Pass*</b>
---------------------	--------------

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



Keny Xu  
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-Documents.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.



<i>Revision Record</i>				
<i>Version</i>	<i>Chapter</i>	<i>Date</i>	<i>Modifier</i>	<i>Remark</i>
01		2018-12-17		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 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass

**Remark:**

Model No.: 10092, 10091, 212831

Only the model 10092 was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on color, appearance and packaging.



### 3 Contents

	Page
<b>1 COVER PAGE</b> .....	<b>1</b>
<b>2 TEST SUMMARY</b> .....	<b>3</b>
<b>3 CONTENTS</b> .....	<b>4</b>
<b>4 GENERAL INFORMATION</b> .....	<b>5</b>
4.1 DETAILS OF E.U.T. ....	5
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
<b>5 EQUIPMENT LIST</b> .....	<b>8</b>
<b>6 RADIO SPECTRUM TECHNICAL REQUIREMENT</b> .....	<b>11</b>
6.1 ANTENNA REQUIREMENT .....	11
6.1.1 <i>Test Requirement:</i> .....	11
6.1.2 <i>Conclusion</i> .....	11
<b>7 RADIO SPECTRUM MATTER TEST RESULTS</b> .....	<b>12</b>
7.1 20DB BANDWIDTH .....	12
7.1.1 <i>E.U.T. Operation</i> .....	12
7.1.2 <i>Test Setup Diagram</i> .....	12
7.1.3 <i>Measurement Procedure and Data</i> .....	12
7.2 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL (15.249(A)).....	15
7.2.1 <i>E.U.T. Operation</i> .....	15
7.2.2 <i>Test Setup Diagram</i> .....	15
7.2.3 <i>Measurement Procedure and Data</i> .....	16
7.3 RESTRICTED BAND AROUND FUNDAMENTAL FREQUENCY .....	24
7.3.1 <i>E.U.T. Operation</i> .....	25
7.3.2 <i>Test Setup Diagram</i> .....	25
7.3.3 <i>Measurement Procedure and Data</i> .....	25
7.4 RADIATED EMISSIONS .....	31
7.4.1 <i>E.U.T. Operation</i> .....	32
7.4.2 <i>Test Setup Diagram</i> .....	32
7.4.3 <i>Measurement Procedure and Data</i> .....	32
<b>8 PHOTOGRAPHS</b> .....	<b>42</b>
8.1 RESTRICTED BAND AROUND FUNDAMENTAL FREQUENCY TEST SETUP .....	42
8.2 EUT CONSTRUCTIONAL DETAILS (EUT PHOTOS).....	42

## 4 General Information

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

Power supply:	TX:DC 9V by 9.0Vx 1"6LP3146" battery
Operation Frequency:	2407MHz to 2475 MHz
Modulation Type:	GFSK
Number of Channels:	69
Channel Spacing:	1MHz
Antenna Type:	Integral antenna
Antenna Gain:	0dBi

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2407MHz	19	2425MHz	37	2443MHz	55	2461MHz
2	2408MHz	20	2426MHz	38	2444MHz	56	2462MHz
3	2409MHz	21	2427MHz	39	2445MHz	57	2463MHz
4	2410MHz	22	2428MHz	40	2446MHz	58	2464MHz
5	2411MHz	23	2429MHz	41	2447MHz	59	2465MHz
6	2412MHz	24	2430MHz	42	2448MHz	60	2466MHz
7	2413MHz	25	2431MHz	43	2449MHz	61	2467MHz
8	2414MHz	26	2432MHz	44	2450MHz	62	2468MHz
9	2415MHz	27	2433MHz	45	2451MHz	63	2469MHz
10	2416MHz	28	2434MHz	46	2452MHz	64	2470MHz
11	2417MHz	29	2435MHz	47	2453MHz	65	2471MHz
12	2418MHz	30	2436MHz	48	2454MHz	66	2472MHz
13	2419MHz	31	2437MHz	49	2455MHz	67	2473MHz
14	2420MHz	32	2438MHz	50	2456MHz	68	2474MHz
15	2421MHz	33	2439MHz	51	2457MHz	69	2475MHz
16	2422MHz	34	2440MHz	52	2458MHz	70	2479MHz
17	2423MHz	35	2441MHz	53	2459MHz	71	2480MHz
18	2424MHz	36	2442MHz	54	2460MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The Lowest channel(CH1)	2410MHz
The Middle channel(CH41)	2450MHz
The Highest channel(CH71)	2480MHz

## 4.2 Description of Support Units

The EUT has been tested as an independent unit.

## 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Conduction emission	± 3.45dB (9kHz to 150kHz)
		± 3.0dB (150kHz to 30MHz)
2	Radiated emission	± 4.5dB (30MHz-1GHz)
		± 4.8dB (1GHz-6GHz)
3	Radiated Immunity	± 1.64dB
4	Conducted Immunity	± 0.96dB
5	ESD	± 6 %
6	EFT (Electrical Fast Transients)	± 5 %
7	Surge Immunity	± 5 %
8	Voltage Dips and Interruptions	± 4 %
9	Temperature test	± 1 °C
10	Humidity test	± 3%
11	DC power test	± 0.5 %



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

- **FCC –Designation Number: CN1178**

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

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

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

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

CAB identifier: CN0006.

IC#: 4620C.

#### **4.6 Deviation from Standards**

None

#### **4.7 Abnormalities from Standard Conditions**

None



## 5 Equipment List

<b>20dB Bandwidth</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2018-07-12	2019-07-11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018-09-27	2019-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018-09-25	2019-09-24

<b>Field Strength of the Fundamental Signal (15.249(a))</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2018-07-12	2019-07-11
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-09-27	2019-09-26
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018-04-02	2019-04-01
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2018-04-02	2019-04-01
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21
Band filter	N/A	N/A	SEM023-01	N/A	N/A

<b>Restricted Band Around Fundamental Frequency</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2018-03-13	2021-03-12
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A





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

Report No.: SZEM181101030102

Page: 9 of 42

Coaxial Cable	SGS	N/A	SEM026-01	2018-07-12	2019-07-11
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2018-04-02	2019-04-01
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Horn Antenna (15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-15	2017-10-17	2020-10-16
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24
Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-09-27	2019-09-26
Pre-amplifier(18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018-04-02	2019-04-01
Pre-amplifier (26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2018-04-02	2019-04-01
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2018-09-25	2019-09-24
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2017-08-22	2020-08-21
Band filter	N/A	N/A	SEM023-01	N/A	N/A

<b>RE in Chamber</b>					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
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	2018-09-25	2019-09-24
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017-06-27	2020-06-26
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2018-04-02	2019-04-01
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018-07-12	2019-07-11

<b>RE in Chamber</b>					
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	2018-03-13	2021-03-12
EXA Signal Analyzer (10Hz-26.5GHz)	Agilent Technologies Inc	N9010A	SEM004-09	2018-04-13	2019-04-12
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-01	2017-06-27	2020-06-26
Horn Antenna (800MHz-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2018-04-13	2021-04-12
Amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2018-09-25	2019-09-24

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-Documents.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.



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

Report No.: SZEM181101030102

Page: 10 of 42

Pre-Amplifier (0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2018-09-27	2019-09-26
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	SEM026-01	2018-07-12	2019-07-11

**General used equipment**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2018-09-27	2019-09-26
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2018-09-27	2019-09-26
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2018-09-27	2019-09-26
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2018-04-08	2019-04-07

## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

Limit:

15.203 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.

#### 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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Internal photos.

## 7 Radio Spectrum Matter Test Results

### 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215  
Test Method: ANSI C63.10 (2013) Section 6.9  
Limit: N/A

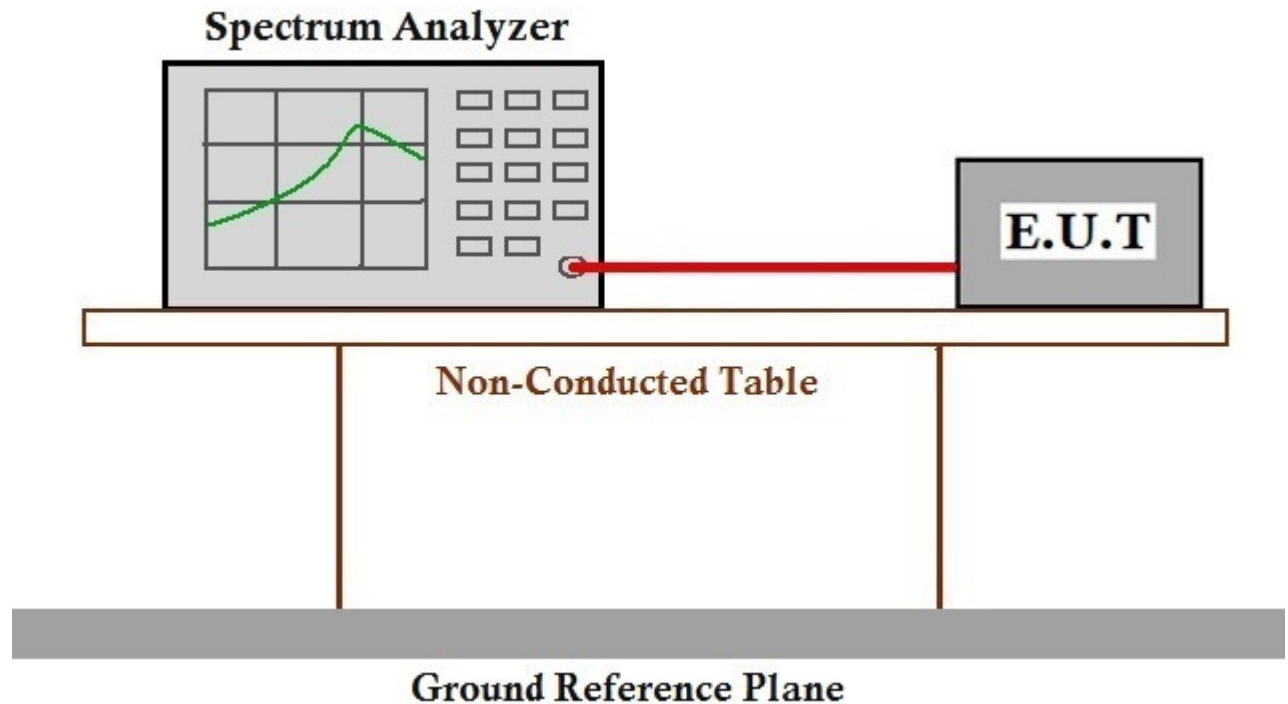
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20.7 °C Humidity: 45.7 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

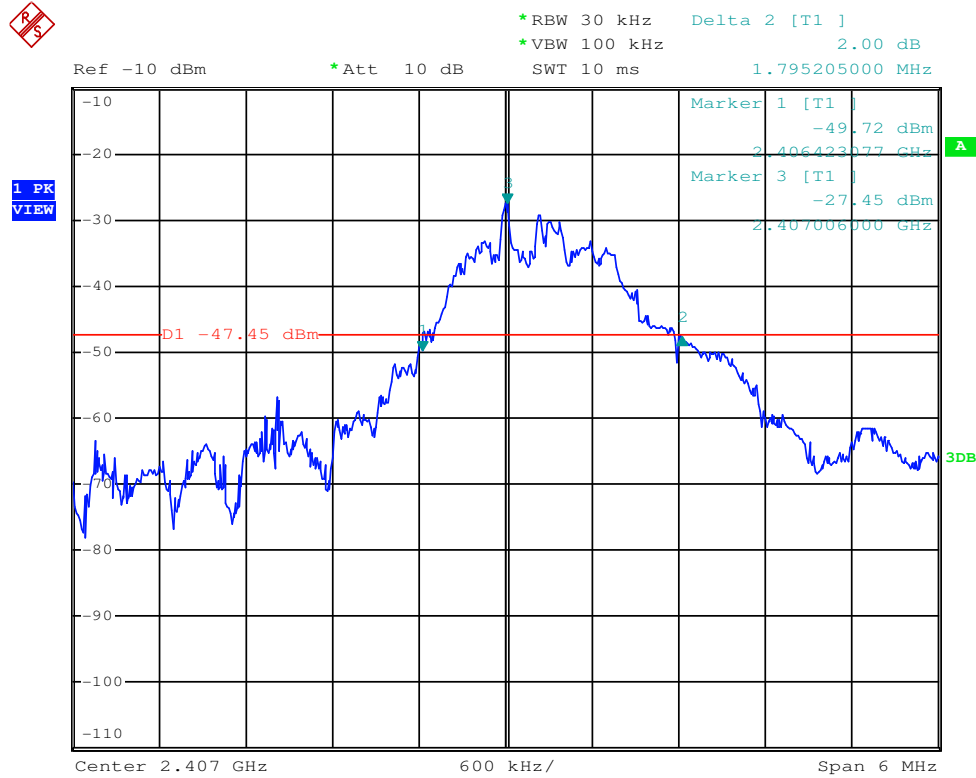
#### 7.1.2 Test Setup Diagram



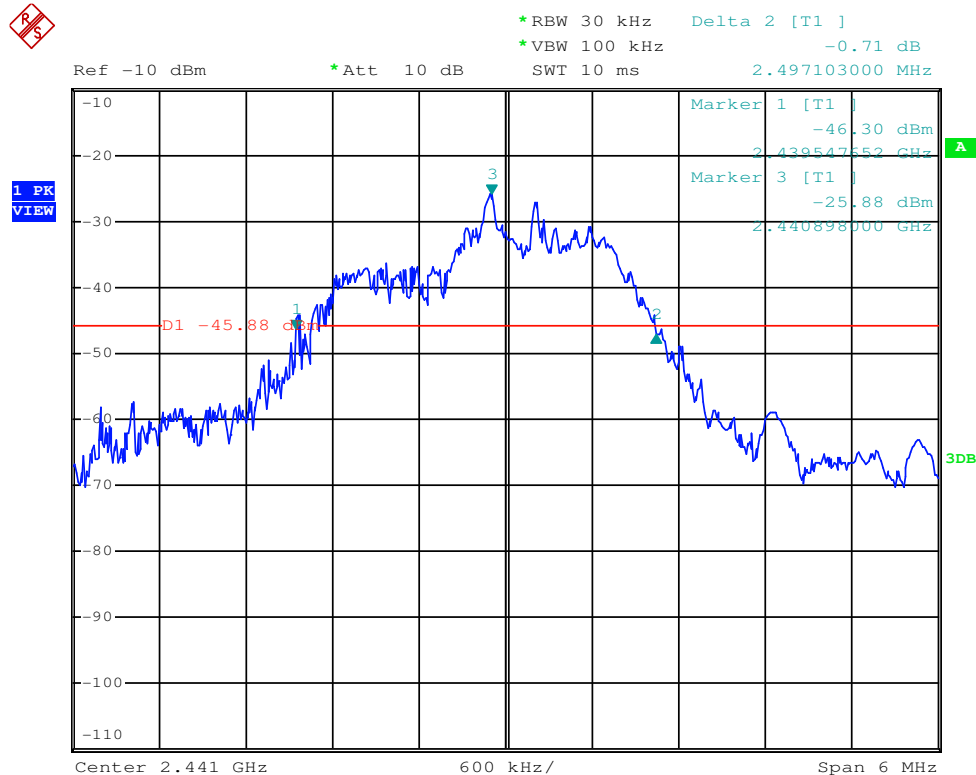
#### 7.1.3 Measurement Procedure and Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	1.795	Pass
Middle	2.497	Pass
Highest	2.497	Pass

Mode:a; Channel:Low



Mode:a; Channel:middle

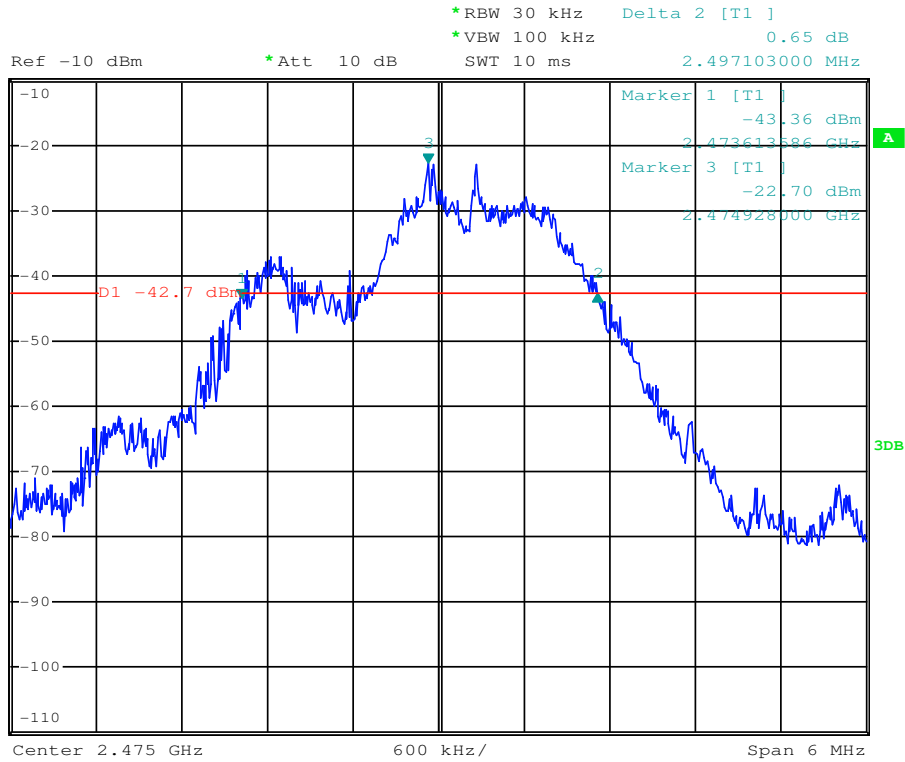




Mode:a; Channel:High



1 PR  
VIEW



## 7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)  
 Test Method: ANSI C63.10 (2013) Section 6.5&6.6  
 Measurement Distance: 3m  
 Limit:

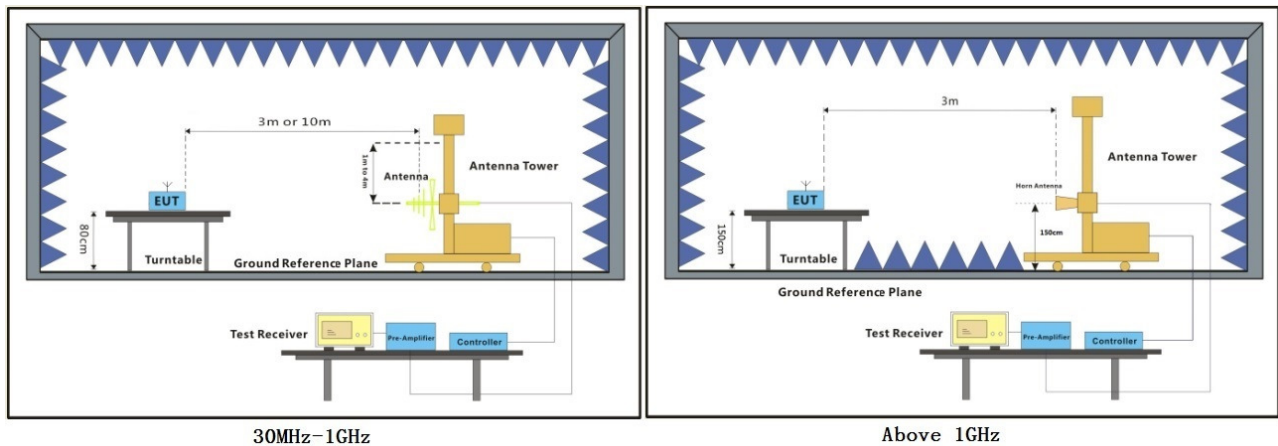
Frequency	Limit (dBuV/m @3m)	Remark
2400MHz-2483.5MHz	94.0	Average Value
	114.0	Peak Value

### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 59.5 % RH Atmospheric Pressure: 1020 mbar  
 Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

### 7.2.2 Test Setup Diagram



### **7.2.3 Measurement Procedure and Data**

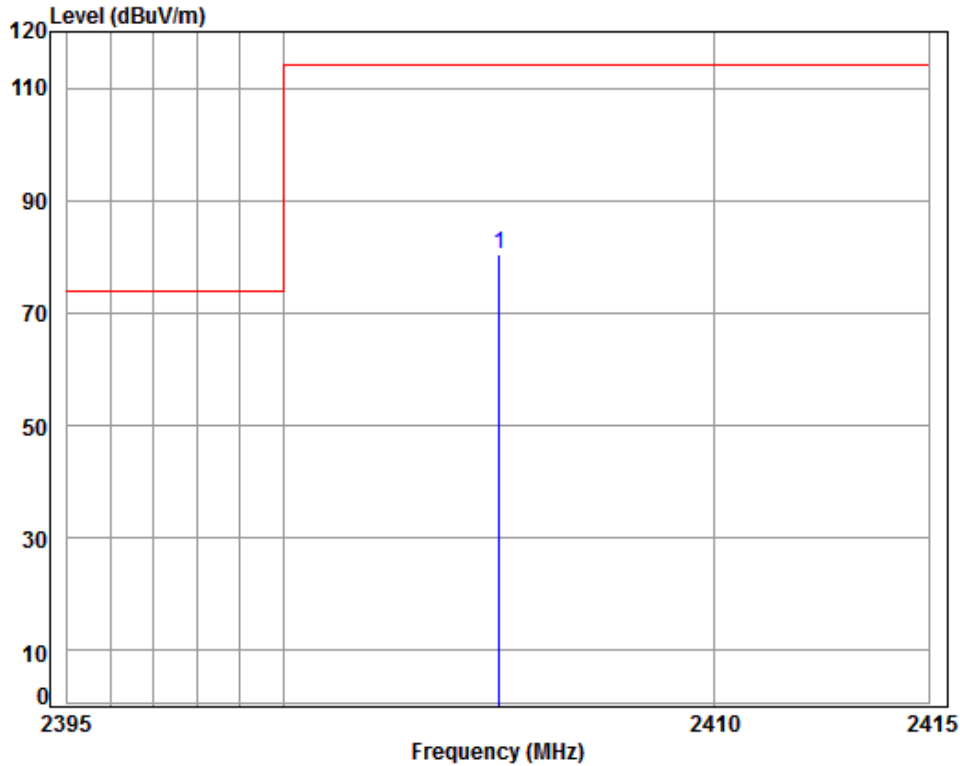
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 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; Modulation Type:GFSK; Channel:Low



Condition: 3m HORIZONTAL

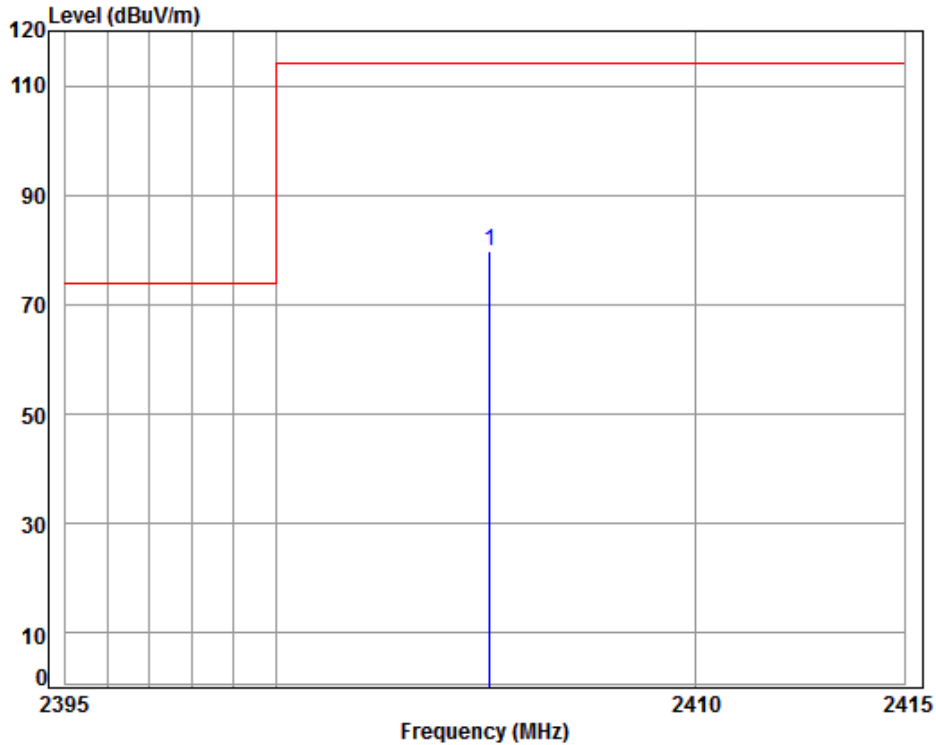
Job No : 10301CR

Mode : 2405 Filed Strength

	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 2405.001	5.49	29.12	37.95	83.91	80.57	114.00	-33.43 Peak



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



Condition: 3m VERTICAL

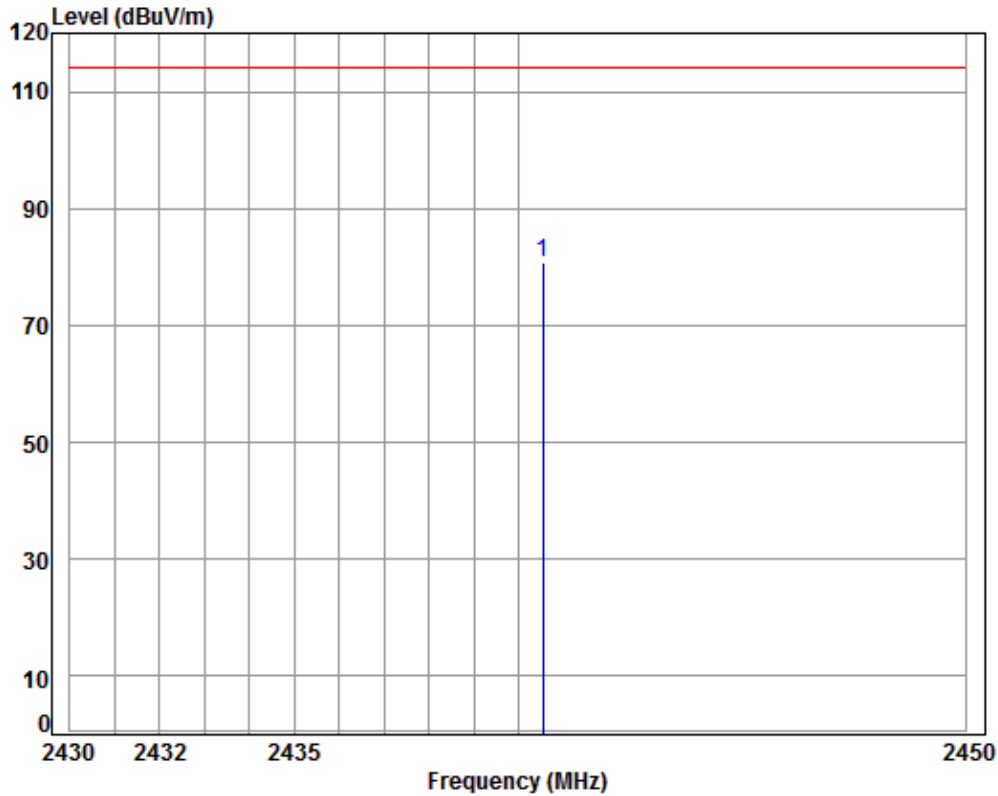
Job No : 10301CR

Mode : 2405 Filed Strength

	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 2405.103	5.50	29.12	37.95	83.17	79.84	114.00	-34.16 Peak



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



Condition: 3m HORIZONTAL

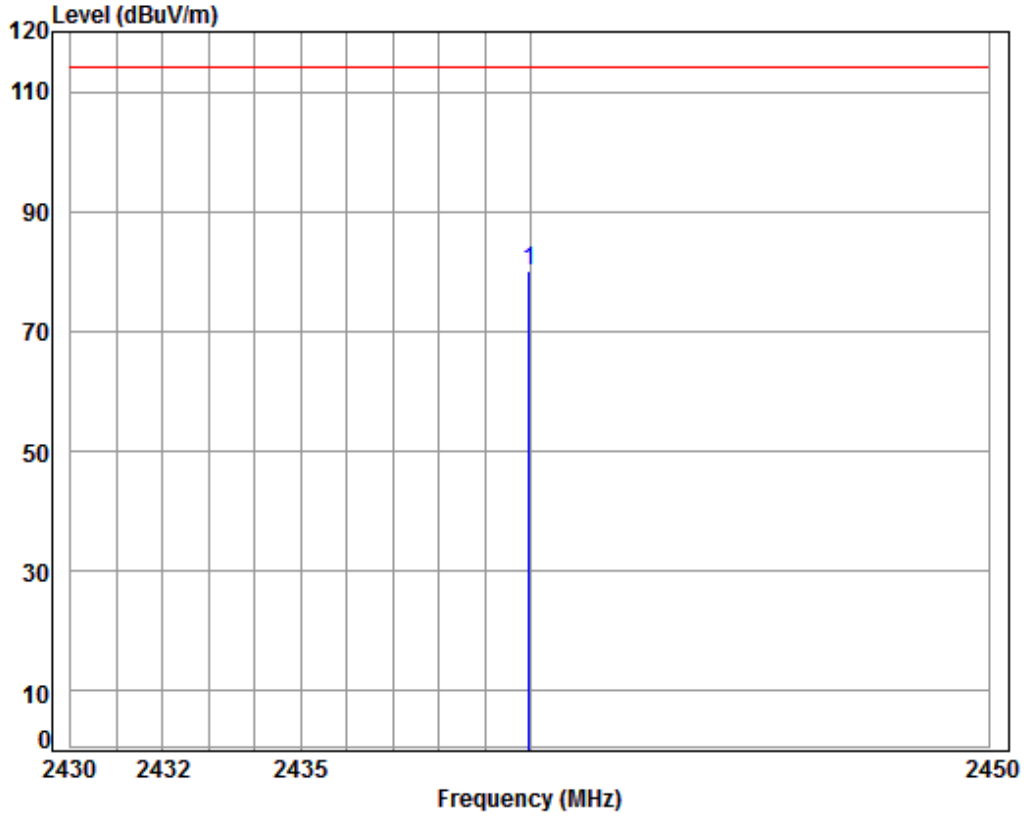
Job No : 10301CR

Mode : 2441 Filed Strength

	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 2440.540	5.54	29.23	37.95	83.95	80.77	114.00	-33.23	Peak



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



Condition: 3m VERTICAL

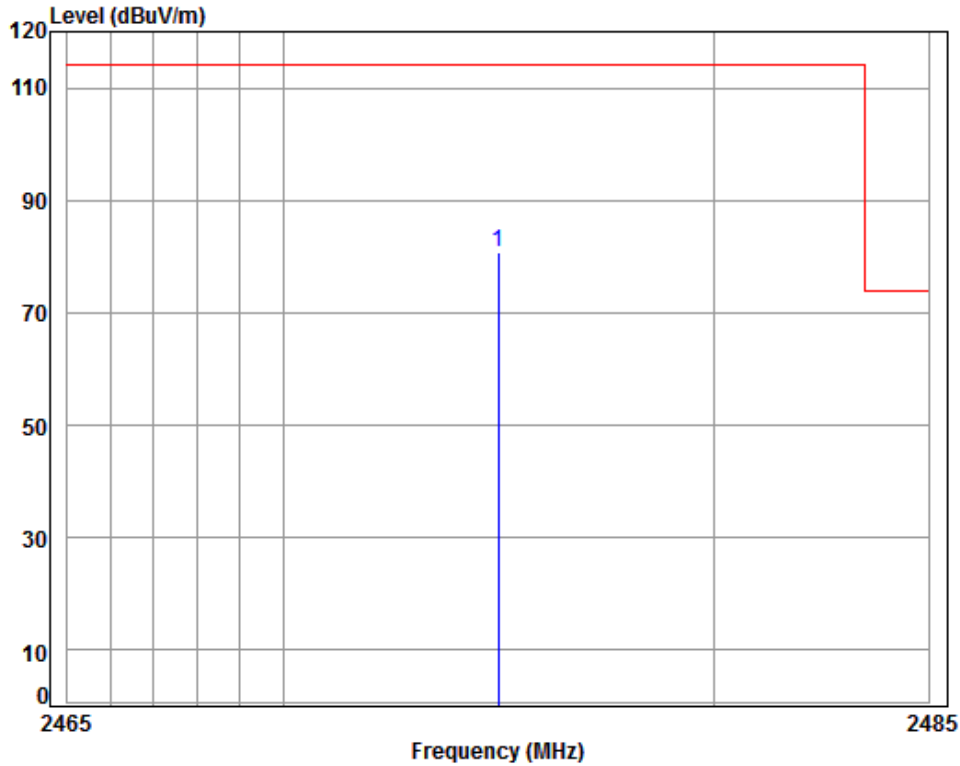
Job No : 10301CR

Mode : 2441 Filed Strength

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 2439.979	5.54	29.23	37.95	83.26	80.08	114.00	-33.92	Peak



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



Condition: 3m HORIZONTAL

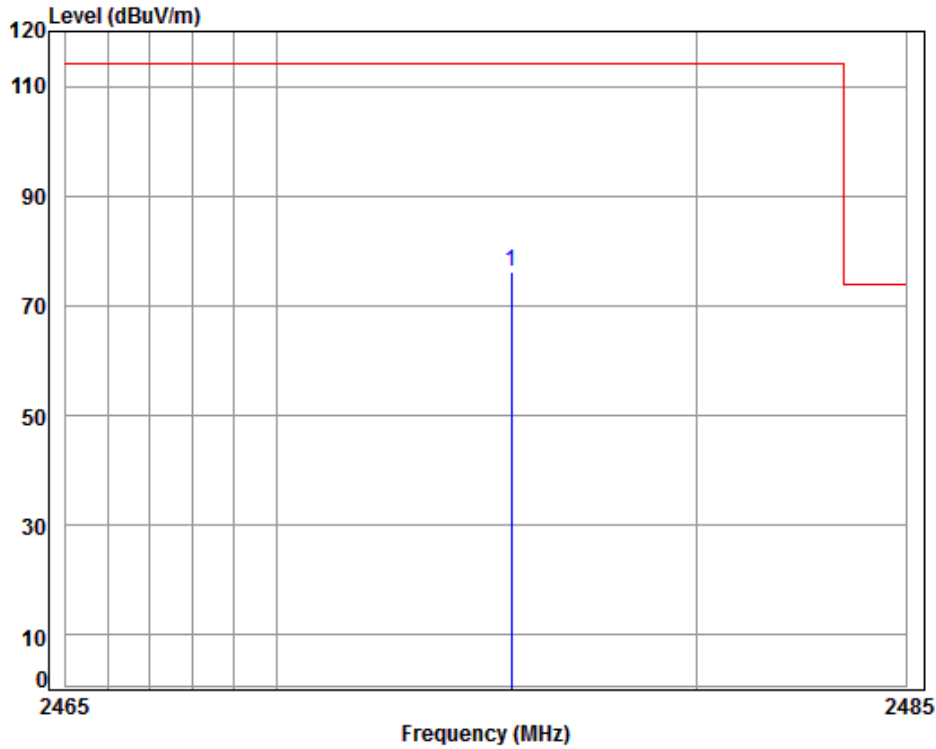
Job No : 10301CR

Mode : 2475 Filed Strength

	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 2474.985	5.59	29.33	37.95	83.81	80.78	114.00	-33.22 Peak



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



Condition: 3m VERTICAL

Job No : 10301CR

Mode : 2475 Filed Strength

	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 pp 2475.583	5.59	29.33	37.95	79.27	76.24	114.00	-37.76 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 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 above measurement data were shown in the report.



### 7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

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

Measurement Distance: 3m

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value

Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

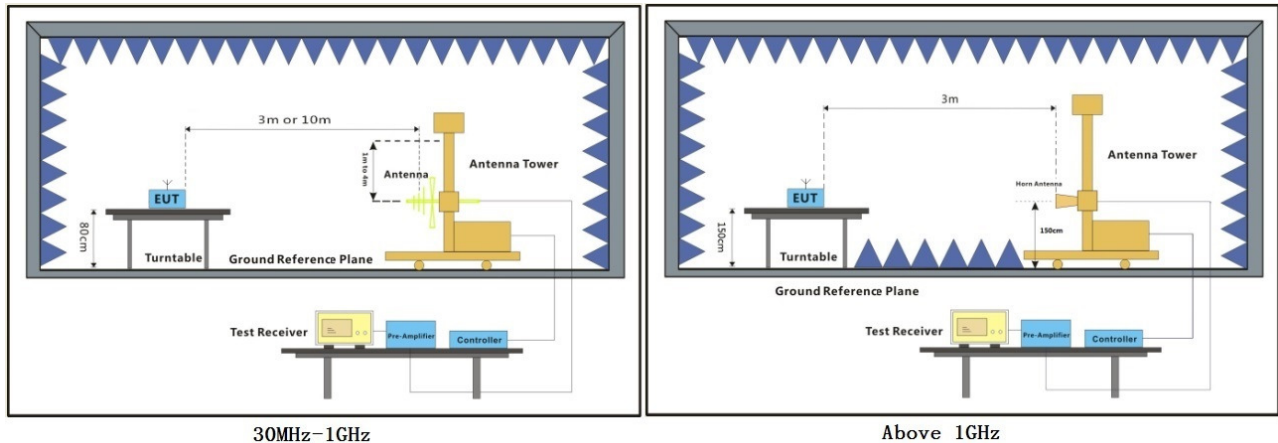


### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 21 °C Humidity: 59.5 % RH Atmospheric Pressure: 1020 mbar  
Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

### 7.3.2 Test Setup Diagram



### 7.3.3 Measurement Procedure and Data

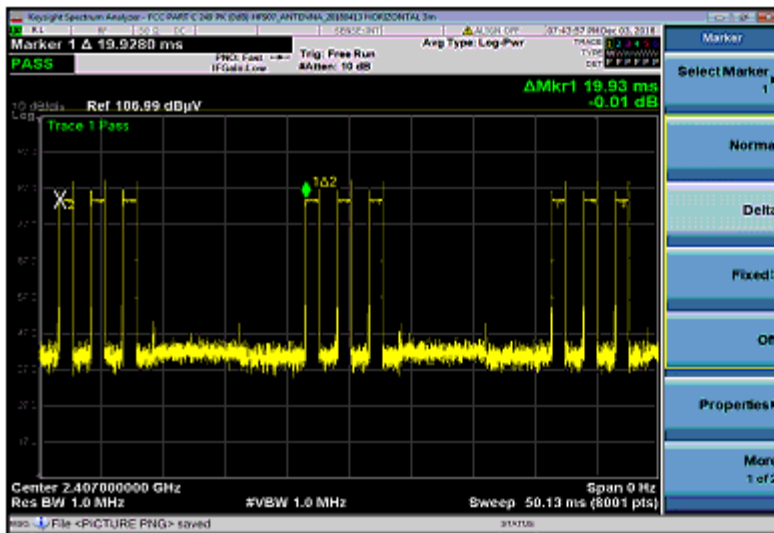
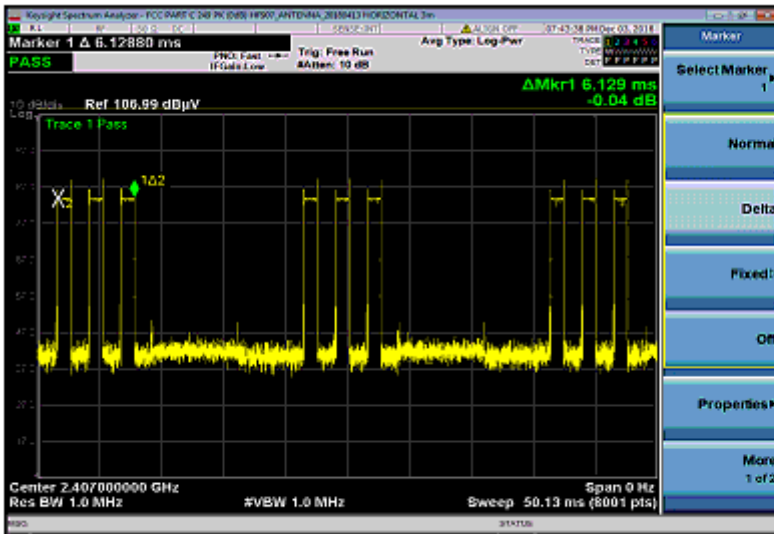
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 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

Average value:

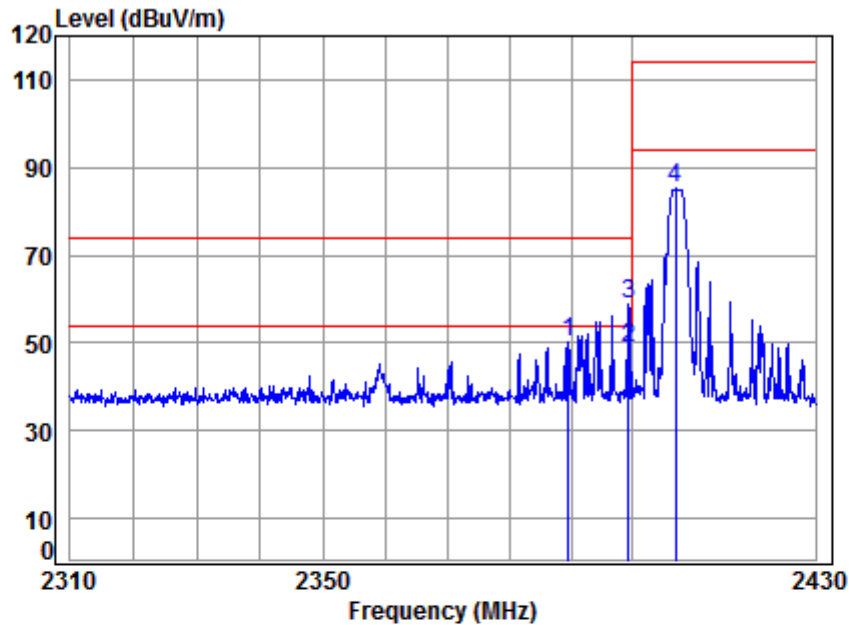
Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time =6.129ms
	T period =19.93ms
	PDCF value= -10.24dB

Duty cycle test plots:





Mode:a; Polarization:Horizontal; Modulation:GFSK; Channel:Low

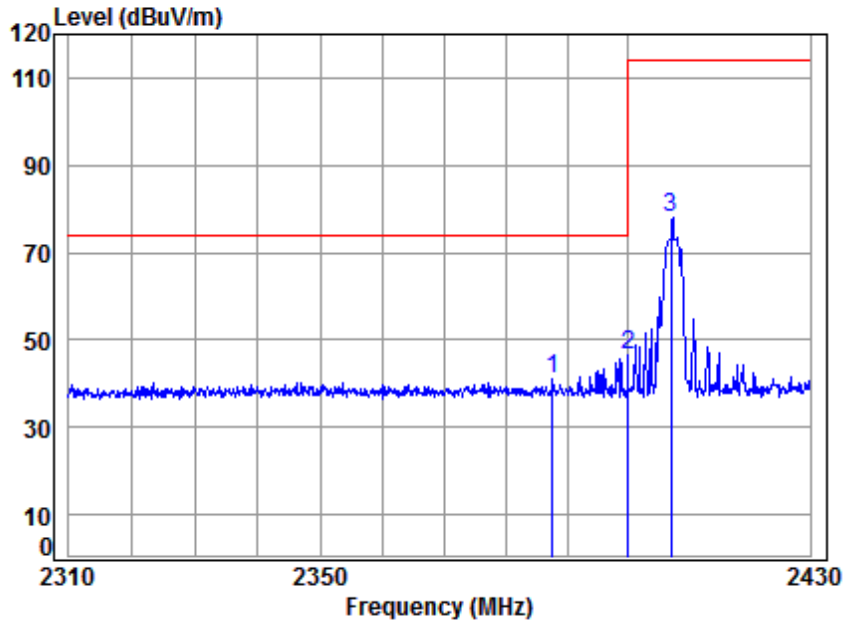


Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 10301CR  
Mode : 2407 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2389.605	5.47	28.52	41.17	57.32	50.14	74.00	-23.86 peak
2	2399.306	5.49	28.53	41.18	55.91	48.75	54.00	-5.25 Average
3	2399.306	5.49	28.53	41.18	66.15	58.99	74.00	-15.01 Peak
4	2407.000	5.50	28.55	41.18	92.24	85.11	114.00	-28.89 peak



Mode:a; Polarization:Vertical; Modulation:GFSK; Channel:Low

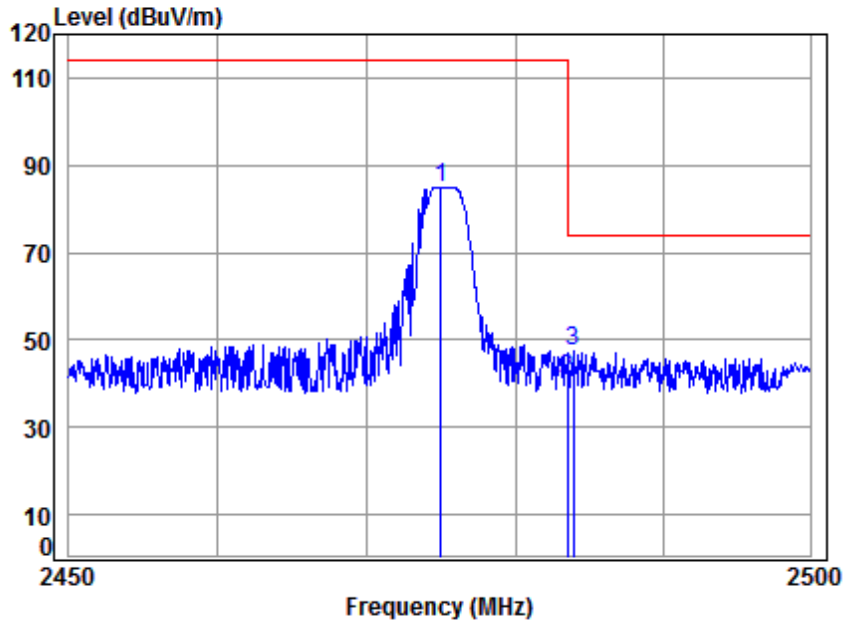


Site : chamber  
Condition: 3m VERTICAL  
Job No : 10301CR  
Mode : 2407 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit	Over	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2387.549	5.47	28.51	41.17	48.23	41.04	74.00	-32.96 peak
2	2399.914	5.49	28.54	41.18	53.82	46.67	74.00	-27.33 Peak
3	2407.000	5.50	28.55	41.18	85.00	77.87	114.00	-36.13 peak



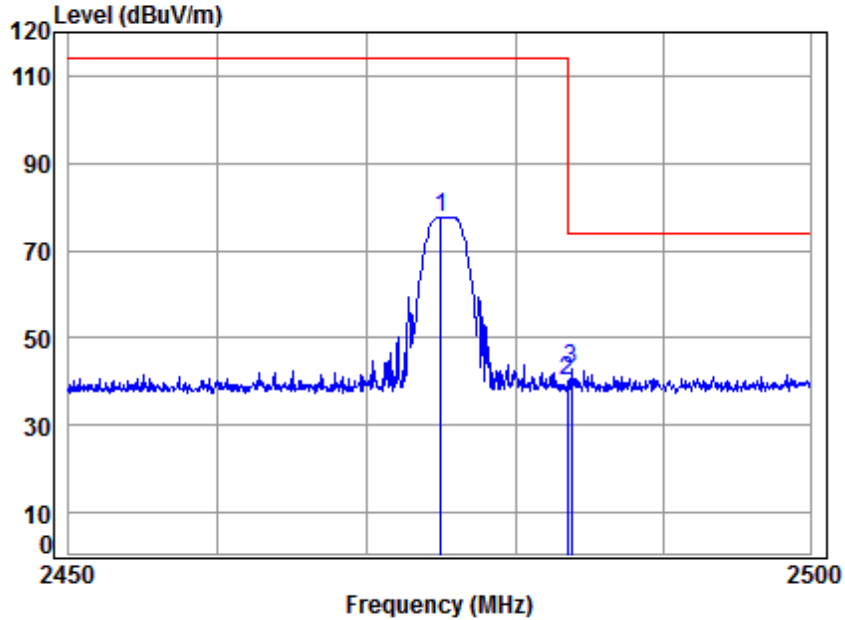
Mode:a; Polarization:Horizontal; Modulation:GFSK; Channel:High



Site : chamber  
Condition: 3m HORIZONTAL  
Job No : 10301CR  
Mode : 2475 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2475.000	5.59	28.66	41.21	91.82	84.86	114.00	-29.14	peak
2	2483.500	5.60	28.67	41.21	48.08	41.14	74.00	-32.86	peak
3	2483.940	5.60	28.67	41.21	54.20	47.26	74.00	-26.74	peak

Mode:a; Polarization:Vertical; Modulation:GFSK; Channel:High



Site : chamber  
 Condition: 3m VERTICAL  
 Job No : 10301CR  
 Mode : 2475 Band edge

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2475.000	5.59	28.66	41.21	84.45	77.49	114.00	-36.51	peak
2	2483.500	5.60	28.67	41.21	46.95	40.01	74.00	-33.99	peak
3	2483.790	5.60	28.67	41.21	49.75	42.81	74.00	-31.19	peak



#### 7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

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

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

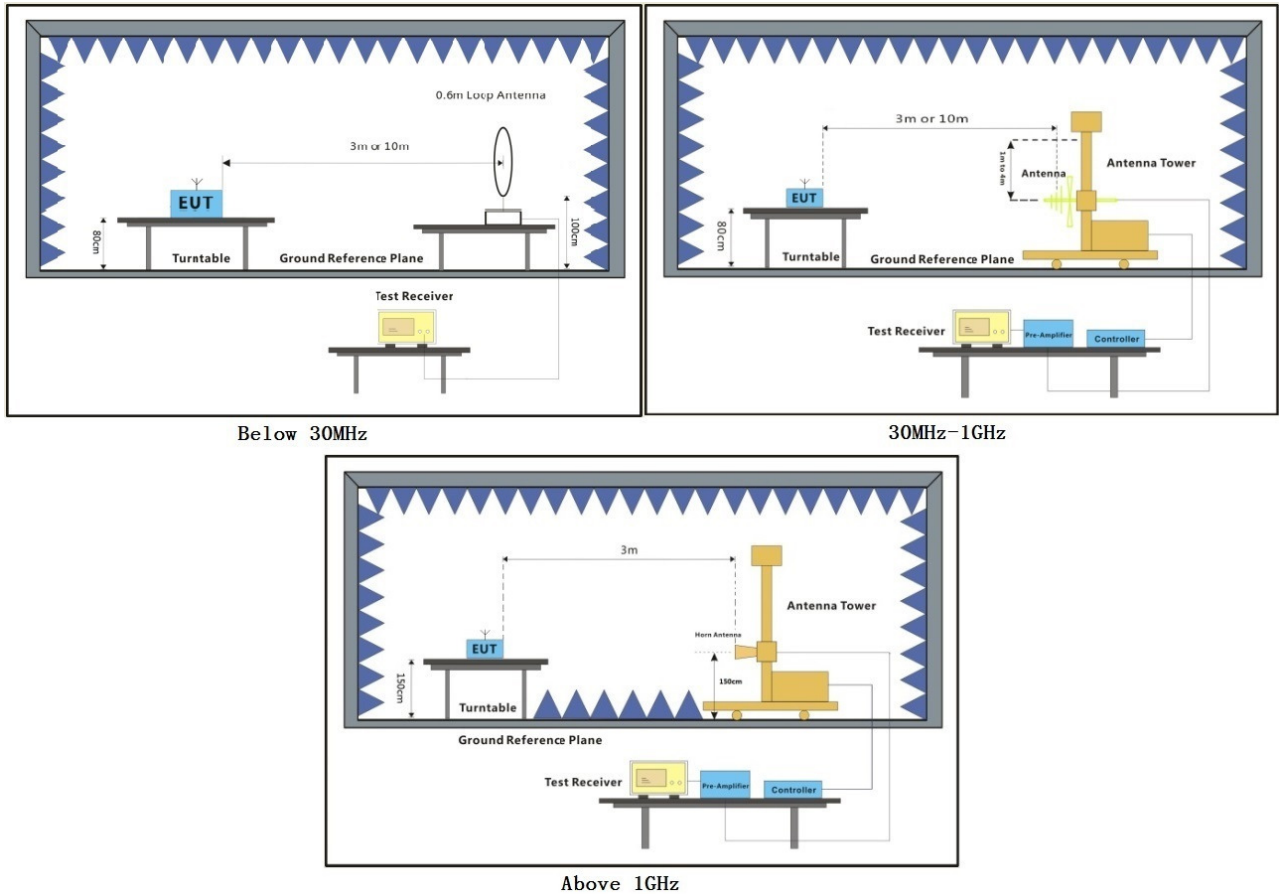
**7.4.1 E.U.T. Operation**

Operating Environment:

Temperature: 23.8 °C Humidity: 60.5 % RH Atmospheric Pressure: 1020 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

**7.4.2 Test Setup Diagram**



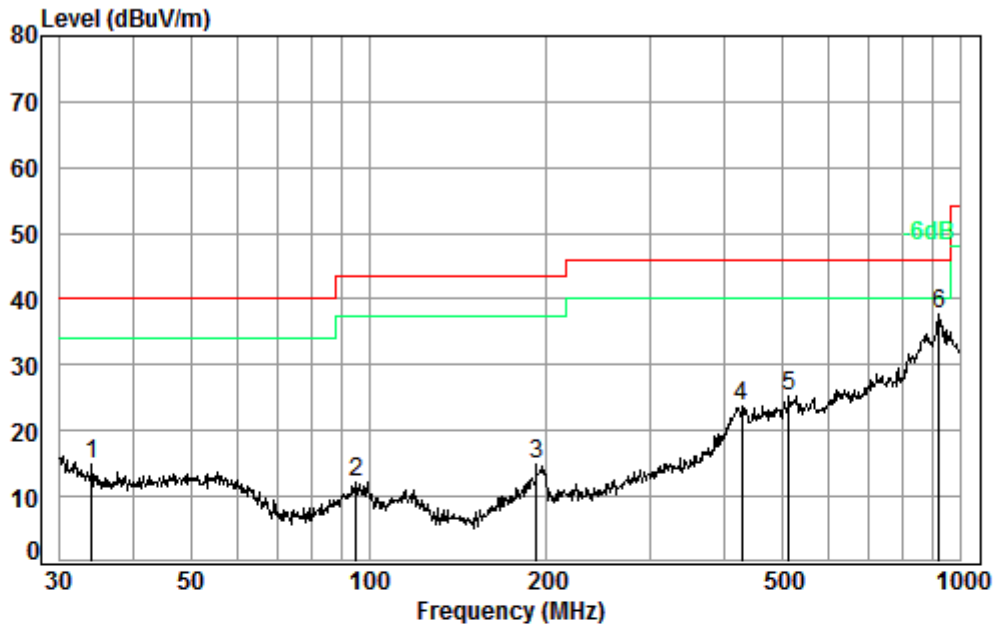
**7.4.3 Measurement Procedure and Data**

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.





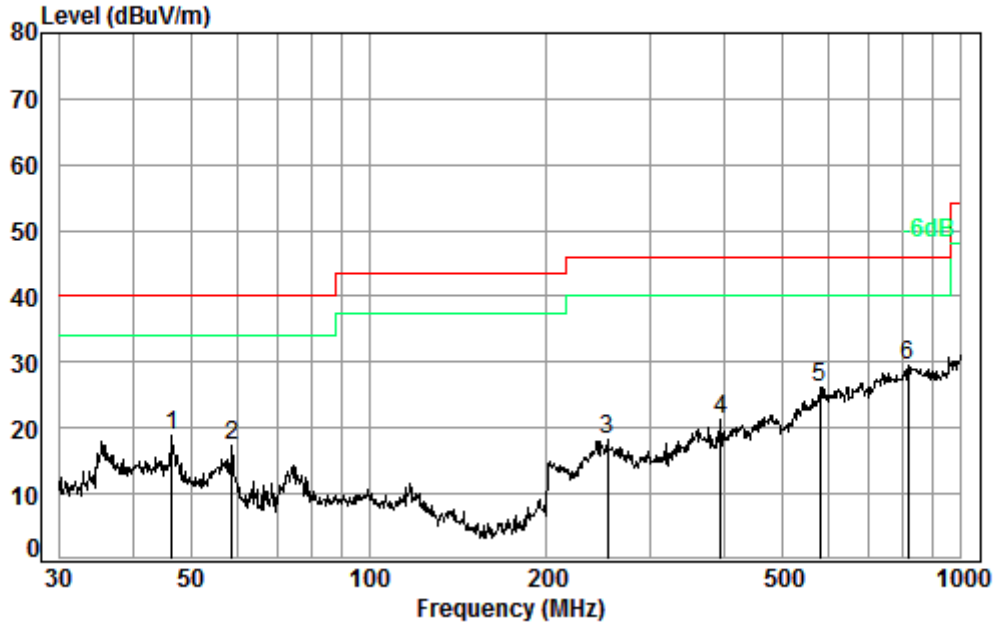
Below 1GHz:  
QP value:  
Mode:a; Polarization:Horizontal



Condition: 3m HORIZONTAL  
Job No. : 10301CR  
Test mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	34.04	0.60	20.31	27.65	21.64	14.90	40.00	-25.10
2	95.09	1.15	13.57	27.51	24.98	12.19	43.50	-31.31
3	191.75	1.39	16.26	27.53	24.80	14.92	43.50	-28.58
4	426.52	2.32	23.03	27.77	26.02	23.60	46.00	-22.40
5	513.63	2.61	24.90	27.85	25.67	25.33	46.00	-20.67
6 pp	919.29	3.62	29.90	27.02	31.09	37.59	46.00	-8.41

Mode:a; Polarization:Vertical



Condition: 3m VERTICAL

Job No. : 10301CR

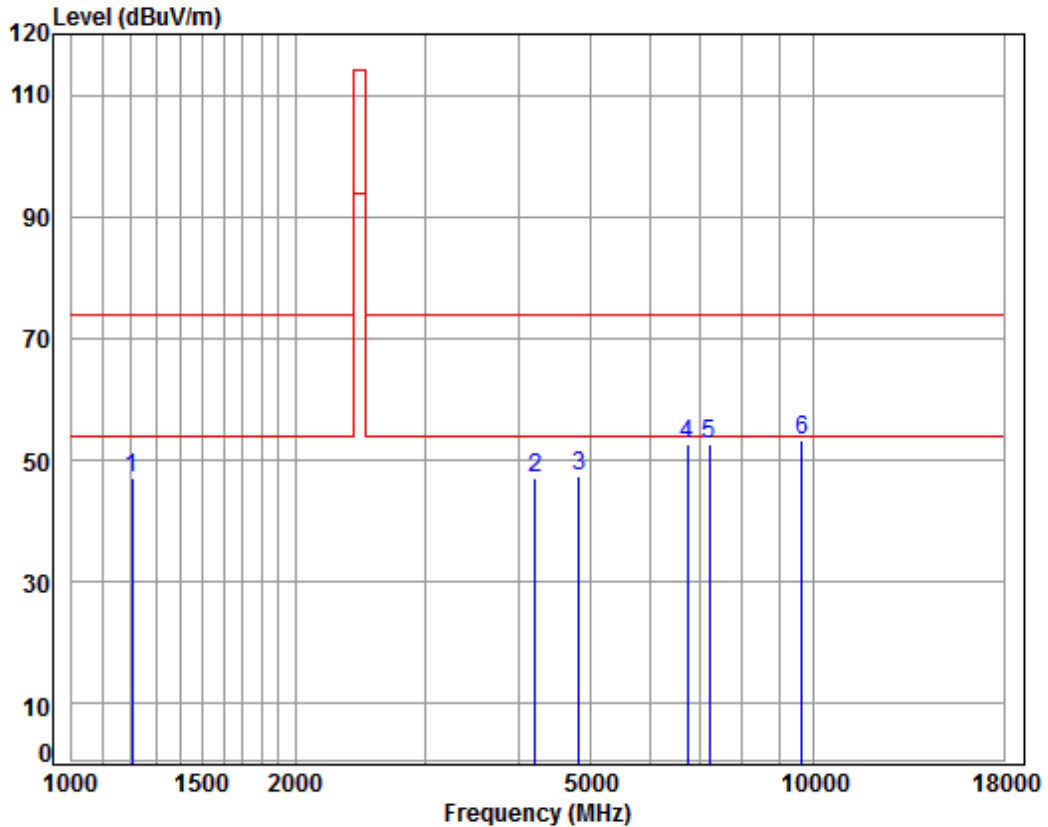
Test mode: a

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	46.50	0.74	15.27	27.61	30.58	18.98	40.00	-21.02
2	58.82	0.80	13.31	27.57	30.86	17.40	40.00	-22.60
3	252.95	1.69	19.00	27.54	25.10	18.25	46.00	-27.75
4	393.47	2.18	22.24	27.72	24.62	21.32	46.00	-24.68
5	578.67	2.68	26.20	27.74	25.11	26.25	46.00	-19.75
6 pp	815.97	3.27	28.72	27.36	24.80	29.43	46.00	-16.57



Above 1GHz

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

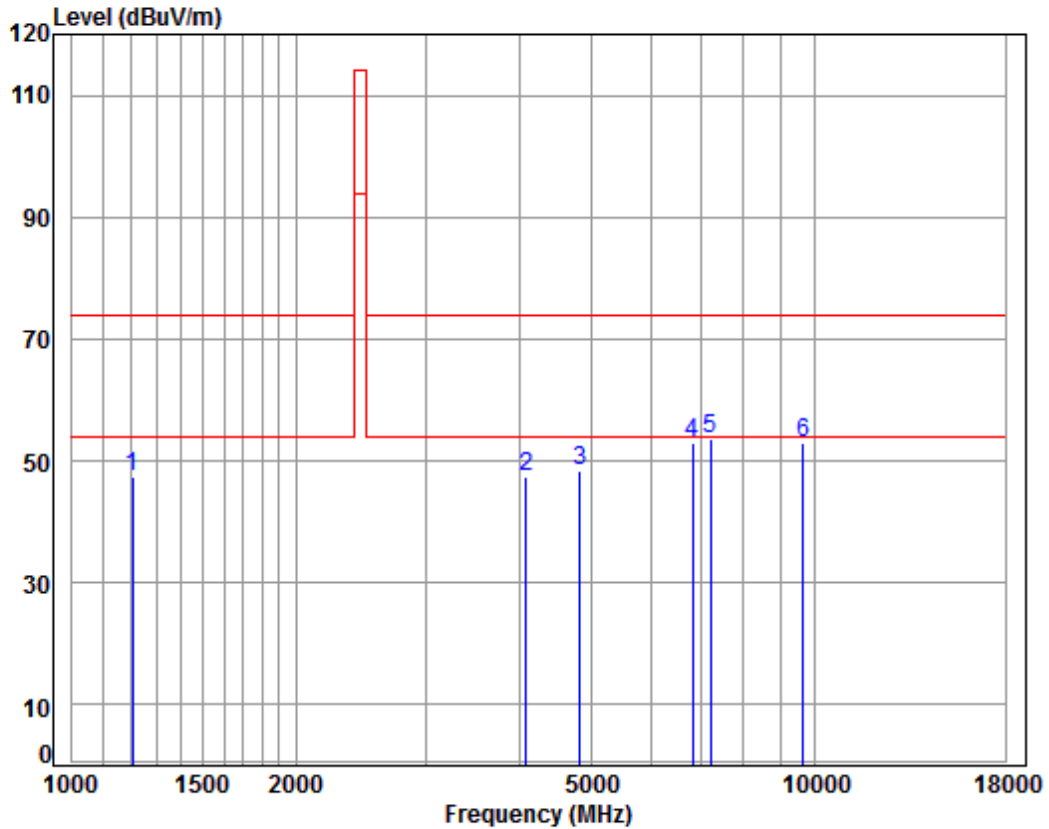


Condition: 3m HORIZONTAL  
Job No : 10301CR  
Mode : 2407 TX RSE

	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	1206.682	4.44	24.51	38.07	56.25	47.13	74.00	-26.87	peak
2	4206.011	7.23	33.60	38.11	44.38	47.10	74.00	-26.90	peak
3	4820.000	7.91	34.19	38.42	43.66	47.34	74.00	-26.66	peak
4	6756.708	10.80	35.83	37.53	43.68	52.78	74.00	-21.22	peak
5	7230.000	10.07	36.41	37.08	43.32	52.72	74.00	-21.28	peak
6 pp	9640.000	10.76	37.53	35.07	39.93	53.15	74.00	-20.85	peak



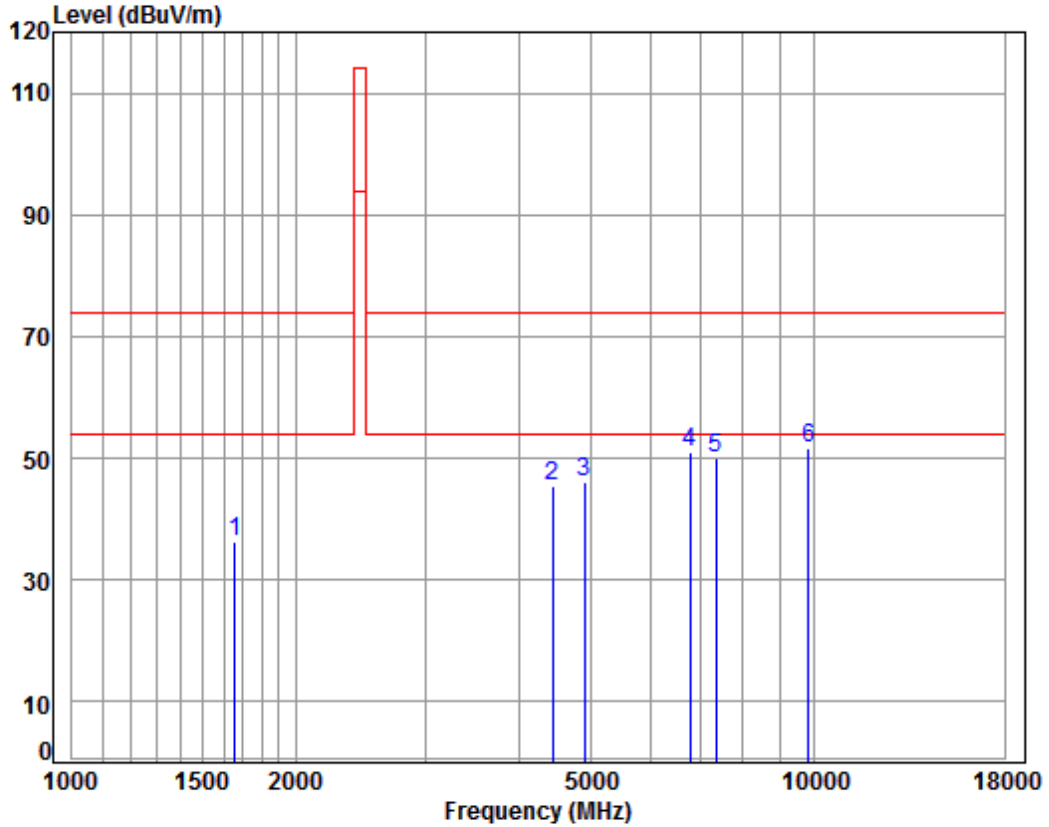
Mode:a; Polarization:Vertical; Modulation Type:GFSK; ; Channel:Low



Condition: 3m VERTICAL  
Job No : 10301CR  
Mode : 2407 TX RSE

	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	1206.682	4.44	24.51	38.07	56.53	47.41	74.00	-26.59	peak
2	4086.182	7.08	33.60	38.05	44.70	47.33	74.00	-26.67	peak
3	4820.000	7.91	34.19	38.42	44.64	48.32	74.00	-25.68	peak
4	6835.278	10.58	36.05	37.45	43.77	52.95	74.00	-21.05	peak
5 pp	7230.000	10.07	36.41	37.08	44.26	53.66	74.00	-20.34	peak
6	9640.000	10.76	37.53	35.07	39.87	53.09	74.00	-20.91	peak

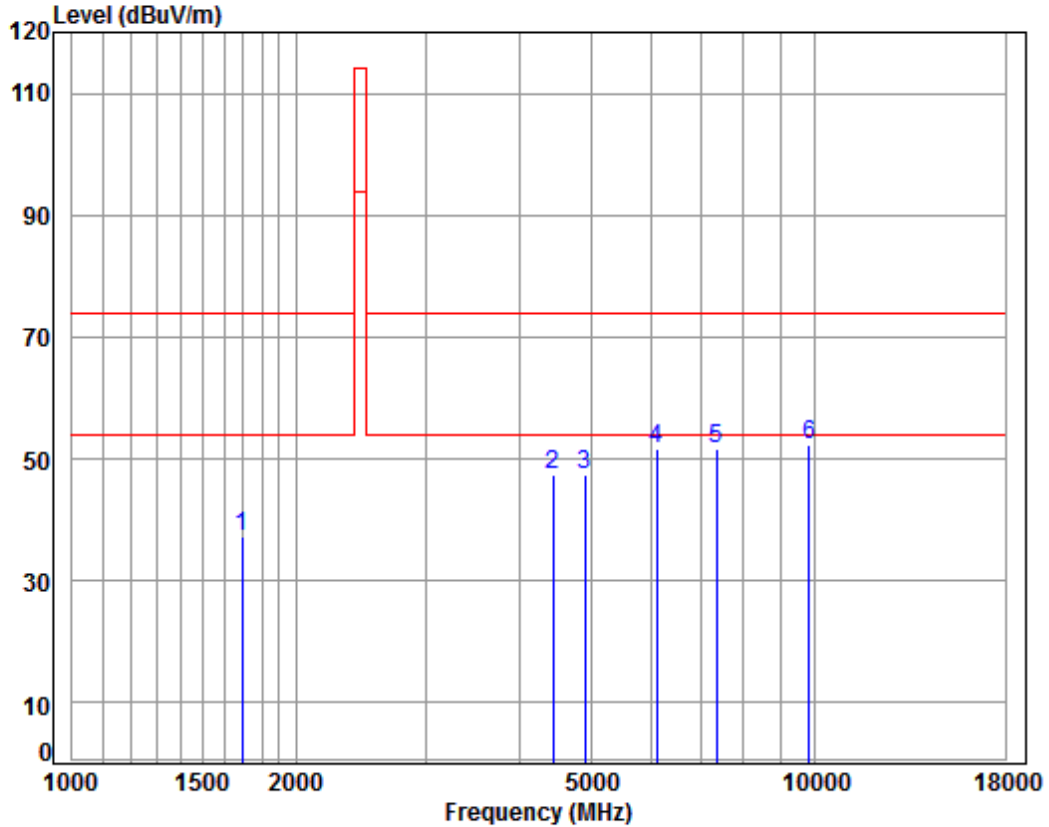
Mode:a; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:middle



Condition: 3m HORIZONTAL  
 Job No : 10301CR  
 Mode : 2441 TX RSE

	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	1658.337	5.28	26.50	38.03	42.54	36.29	74.00	-37.71	peak
2	4443.453	7.50	33.60	38.24	42.67	45.53	74.00	-28.47	peak
3	4900.000	7.99	34.33	38.45	42.25	46.12	74.00	-27.88	peak
4	6795.879	10.69	35.94	37.49	41.91	51.05	74.00	-22.95	peak
5	7350.000	10.04	36.36	36.97	40.59	50.02	74.00	-23.98	peak
6 pp	9800.000	10.84	37.56	35.00	38.22	51.62	74.00	-22.38	peak

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

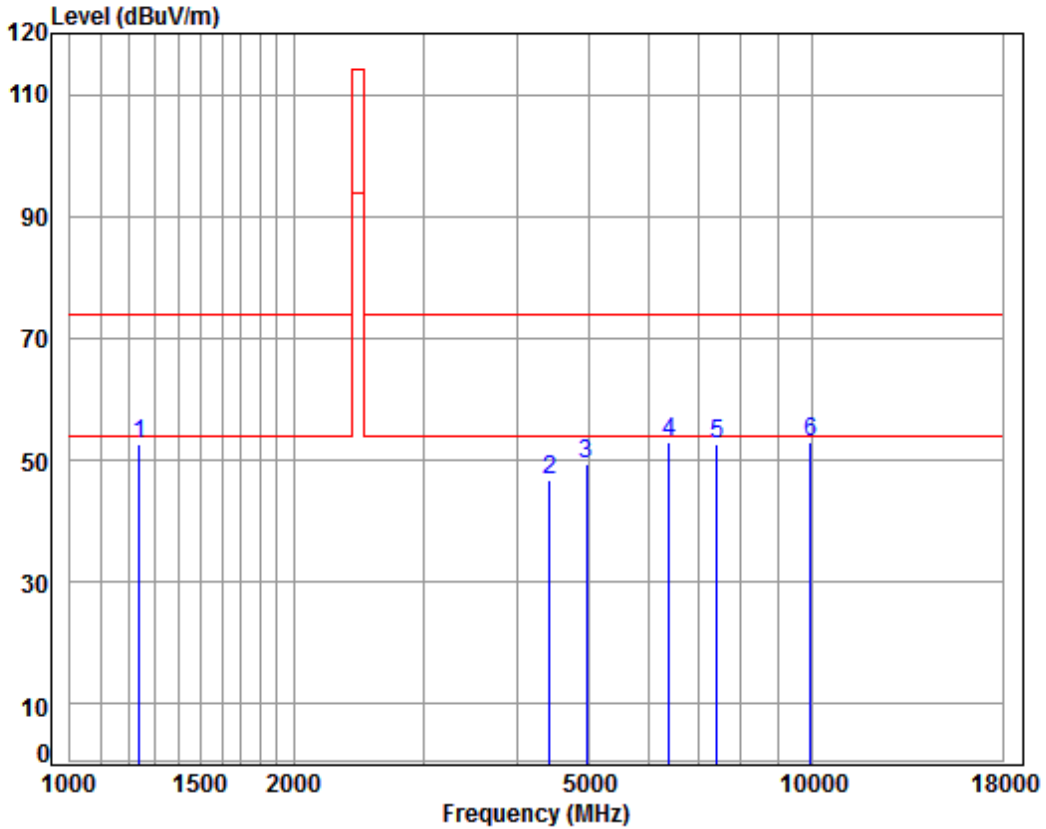


Condition: 3m VERTICAL  
 Job No : 10301CR  
 Mode : 2441 TX RSE

	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	1692.231	5.24	26.64	38.02	43.36	37.22	74.00	-36.78	peak
2	4430.628	7.48	33.60	38.23	44.59	47.44	74.00	-26.56	peak
3	4900.000	7.99	34.33	38.45	43.38	47.25	74.00	-26.75	peak
4	6106.616	10.78	34.79	38.19	44.34	51.72	74.00	-22.28	Peak
5	7350.000	10.04	36.36	36.97	42.18	51.61	74.00	-22.39	peak
6 pp	9800.000	10.84	37.56	35.00	39.07	52.47	74.00	-21.53	peak



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

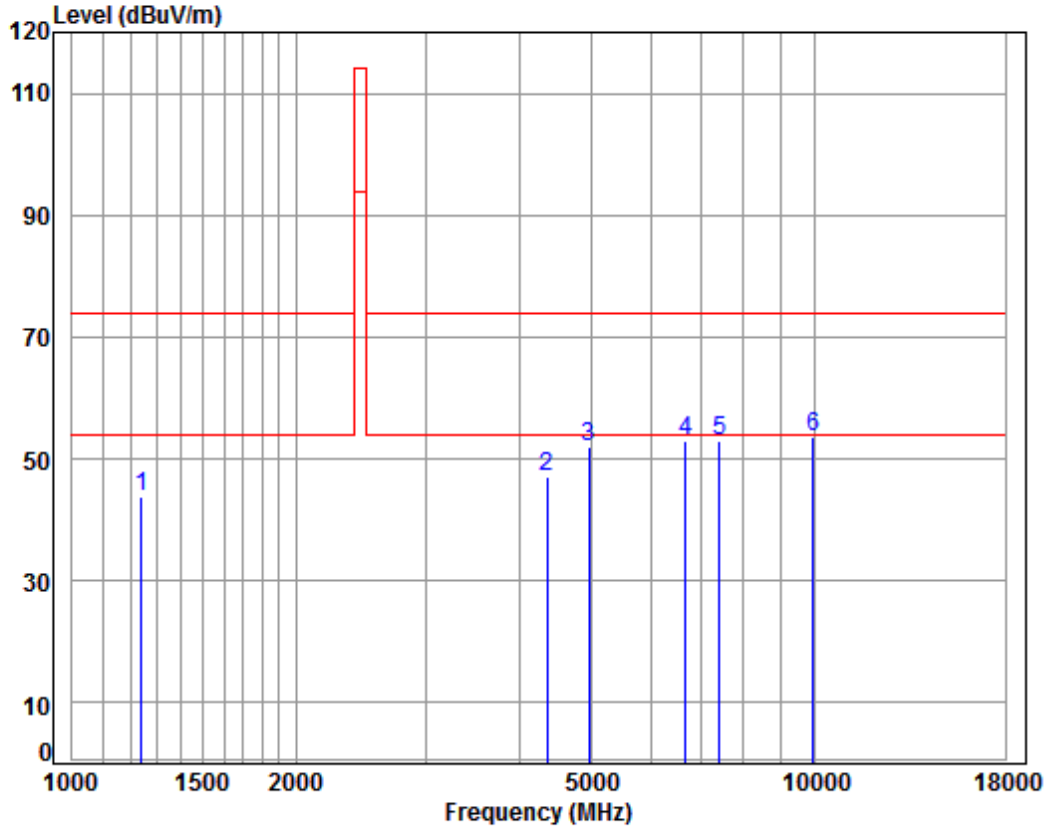


Condition: 3m HORIZONTAL  
Job No : 10301CR  
Mode : 2475 TX RSE

	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	1238.483	4.57	24.67	38.07	61.35	52.52	74.00	-21.48	peak
2	4417.841	7.47	33.60	38.22	43.86	46.71	74.00	-27.29	peak
3	4960.000	8.05	34.43	38.48	45.30	49.30	74.00	-24.70	peak
4	6414.167	11.38	35.03	37.87	44.41	52.95	74.00	-21.05	peak
5	7440.000	10.02	36.32	36.89	43.11	52.56	74.00	-21.44	peak
6	pp 9920.000	10.90	37.58	34.94	39.46	53.00	74.00	-21.00	peak



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



Condition: 3m VERTICAL  
Job No : 10301CR  
Mode : 2475 TX RSE

	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	1238.483	4.57	24.67	38.07	52.54	43.71	74.00	-30.29	peak
2	4354.454	7.40	33.60	38.19	44.40	47.21	74.00	-26.79	peak
3	4960.000	8.05	34.43	38.48	48.09	52.09	74.00	-21.91	peak
4	6698.373	10.97	35.67	37.59	43.80	52.85	74.00	-21.15	peak
5	7440.000	10.02	36.32	36.89	43.62	53.07	74.00	-20.93	peak
6 pp	9920.000	10.90	37.58	34.94	39.95	53.49	74.00	-20.51	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 the peak measurements were shown in the report.



## **8 Photographs**

### **8.1 Restricted Band Around Fundamental Frequency Test Setup**

Please refer to setup photos.

### **8.2 EUT Constructional Details (EUT Photos)**

Please Refer to external and internal photos for details.

- End of the Report -