



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

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Report No.: SZEM180700666202  
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# TEST REPORT

**Application No.:** SZEM1807006662CR  
**Applicant:** SHENZHEN FIRSTAR BATTERY CO., Limited  
**Address of Applicant:** 3rd floor, No.2 Fuzhong Industrial Park Fuzhong Rd, Fuyong Baoan District Shenzhen China  
**Manufacturer:** SHENZHEN FIRSTAR BATTERY CO., Limited  
**Address of Manufacturer:** 3rd floor, No.2 Fuzhong Industrial Park Fuzhong Rd, Fuyong Baoan District Shenzhen China  
**Factory:** RT Tech Limited  
**Address of Factory:** 5F Building, Fulin Industrial Part, WeiXi Road, DalingShan Town, DongGuan Ciry, GuangDong, China  
**Equipment Under Test (EUT):**  
**EUT Name:** Mouse  
**Model No.:** 5765  
**Trade mark:** tzumi  
**FCC ID:** 2AJ4A-5765R  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.249  
**Date of Receipt:** 2018-07-25  
**Date of Test:** 2018-07-30  
**Date of Issue:** 2018-08-07

<b>Test Result:</b>	<b>Pass*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.



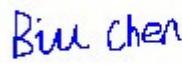
Keny Xu

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.

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<i>Revision Record</i>				
<i>Version</i>	<i>Chapter</i>	<i>Date</i>	<i>Modifier</i>	<i>Remark</i>
01		2018-08-07		Original

<b>Authorized for issue by:</b>			
		 Bill Chen	
		<hr/> Bill Chen /Project Engineer	
		 Eric Fu	
		<hr/> Eric Fu /Reviewer	

## 2 Test Summary

<b>Radio Spectrum Technical Requirement</b>				
<b>Item</b>	<b>Standard</b>	<b>Method</b>	<b>Requirement</b>	<b>Result</b>
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

<b>Radio Spectrum Matter Part</b>				
<b>Item</b>	<b>Standard</b>	<b>Method</b>	<b>Requirement</b>	<b>Result</b>
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
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

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## 4 General Information

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

Power supply:	Dongle:DC input 5V
Frequency Range:	2402MHz to 2480MHz
Channel Spacing:	2MHz
Modulation Type:	GFSK
Number of Channels:	40
Antenna Type:	PIFA
Antenna Gain:	0dBi

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	11	2422MHz	21	2442MHz	31	2462MHz
2	2404MHz	12	2424MHz	22	2444MHz	32	2464MHz
3	2406MHz	13	2426MHz	23	2446MHz	33	2466MHz
4	2408MHz	14	2428MHz	24	2448MHz	34	2468MHz
5	2410MHz	15	2430Hz	25	2450MHz	35	2470MHz
6	2412MHz	16	2432MHz	26	2452MHz	36	2472MHz
7	2414MHz	17	2434MHz	27	2454MHz	37	2474MHz
8	2416MHz	18	2436MHz	28	2456MHz	38	2476MHz
9	2418MHz	19	2438MHz	29	2458MHz	39	2478MHz
10	2420MHz	20	2440MHz	30	2460MHz	40	2480MHz

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)	2402MHz
The Middle channel(CH20)	2440MHz
The Highest channel(CH40)	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	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Duty cycle	$\pm 0.37\%$
3	Occupied Bandwidth	$\pm 3\%$
4	RF conducted power	$\pm 0.75\text{dB}$



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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 (Below 1GHz)
		± 4.8dB (Above 1GHz)
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 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.

- 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

<b>Conducted Emissions at AC Power Line (150kHz-30MHz)</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017-05-10	2020-05-09
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018-07-12	2019-07-11
LISN	Rohde & Schwarz	ENV216	SEM007-01	2017-09-27	2018-09-26
LISN	ETS-LINDGREN	3816/2	SEM007-02	2018-04-02	2019-04-01
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2018-04-02	2019-04-01

<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	2017-09-27	2018-09-26
Spectrum Analyzer	Rohde & Schwarz	FSP	SEM004-06	2017-09-27	2018-09-26
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-02	2018-07-12	2019-07-11
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-26
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-26

<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	2017-09-27	2018-09-26
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2017-09-27	2018-09-27
Pre-amplifier (18-26GHz)	Rohde & Schwarz	CH14-H052	SEM005-17	2018-04-02	2019-04-01



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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	2017-09-27	2018-09-26
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
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	2017-09-27	2018-09-26
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118- 352810	SEM005-05	2017-09-27	2018-09-27
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	2017-09-27	2018-09-26
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>Radiated Emissions</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



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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	2017-09-27	2018-09-26
Low Noise Amplifier (100MHz-18GHz)	Black Diamond Series	BDLNA-0118- 352810	SEM005-05	2017-09-27	2018-09-27
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	2017-09-27	2018-09-26
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

## General used equipment

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-03	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-28
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-28
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:

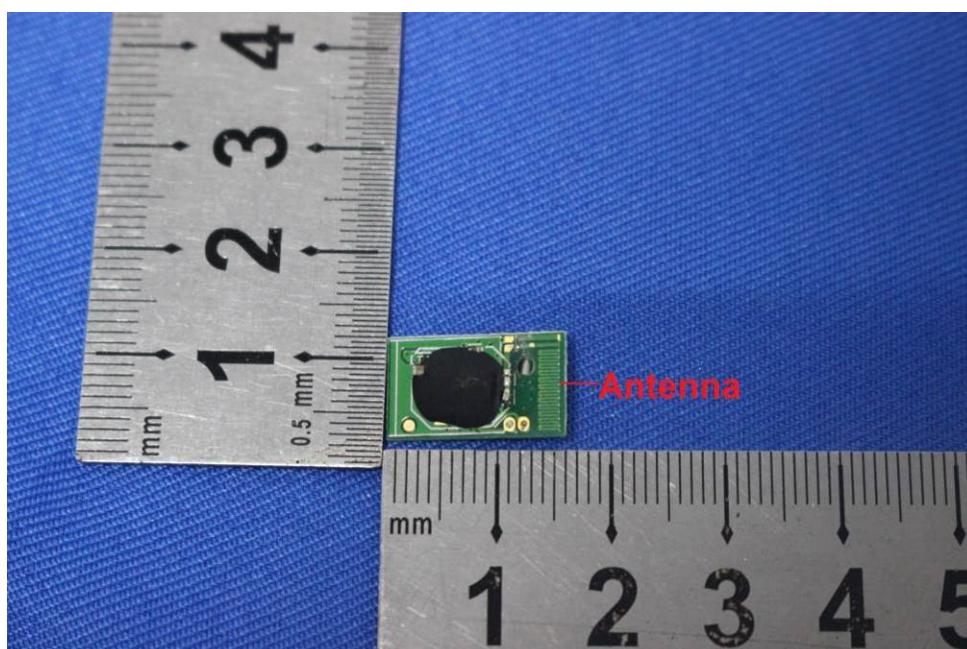
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit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

## 7 Radio Spectrum Matter Test Results

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

Test Requirement 47 CFR Part 15, Subpart C 15.207

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

Limit:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

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

Operating Environment:

Temperature: 19.9 °C Humidity: 47.1 % RH Atmospheric Pressure: 1005 mbar

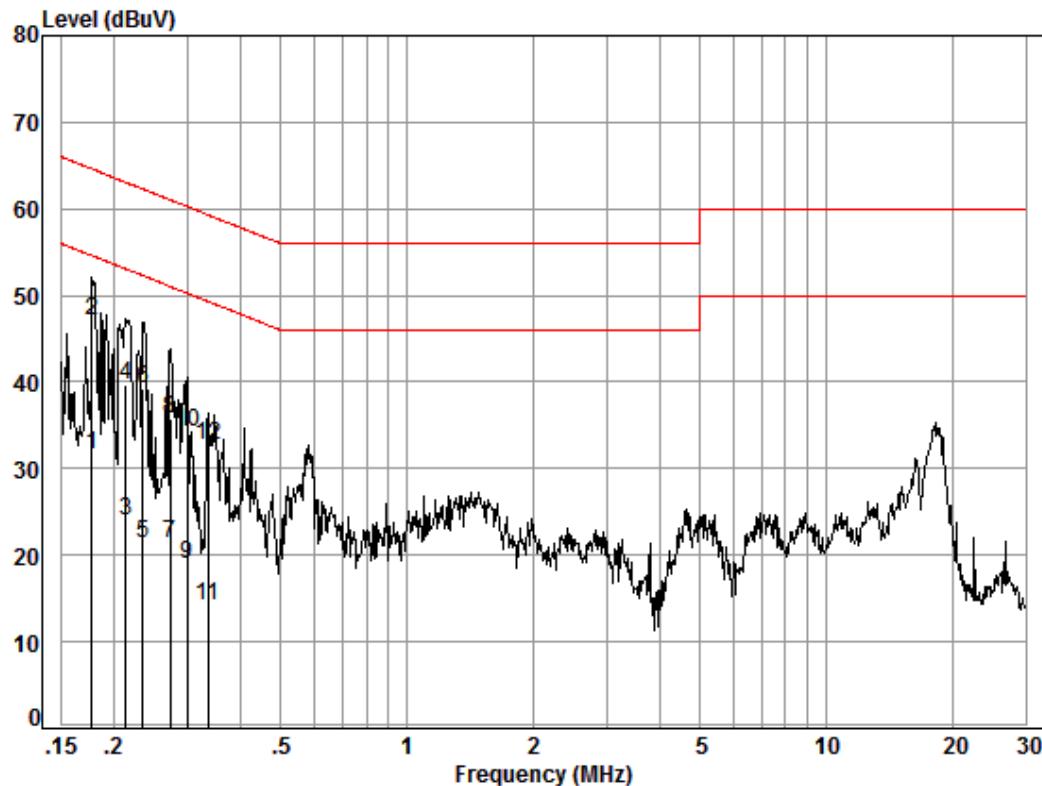
Test mode: c:TX mode(Dongle)\_Keep the EUT in transmitting with modulation mode.

#### 7.1.2 Measurement Procedure and Data

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

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

Mode:c; Line:Live Line



Site : Shielding Room

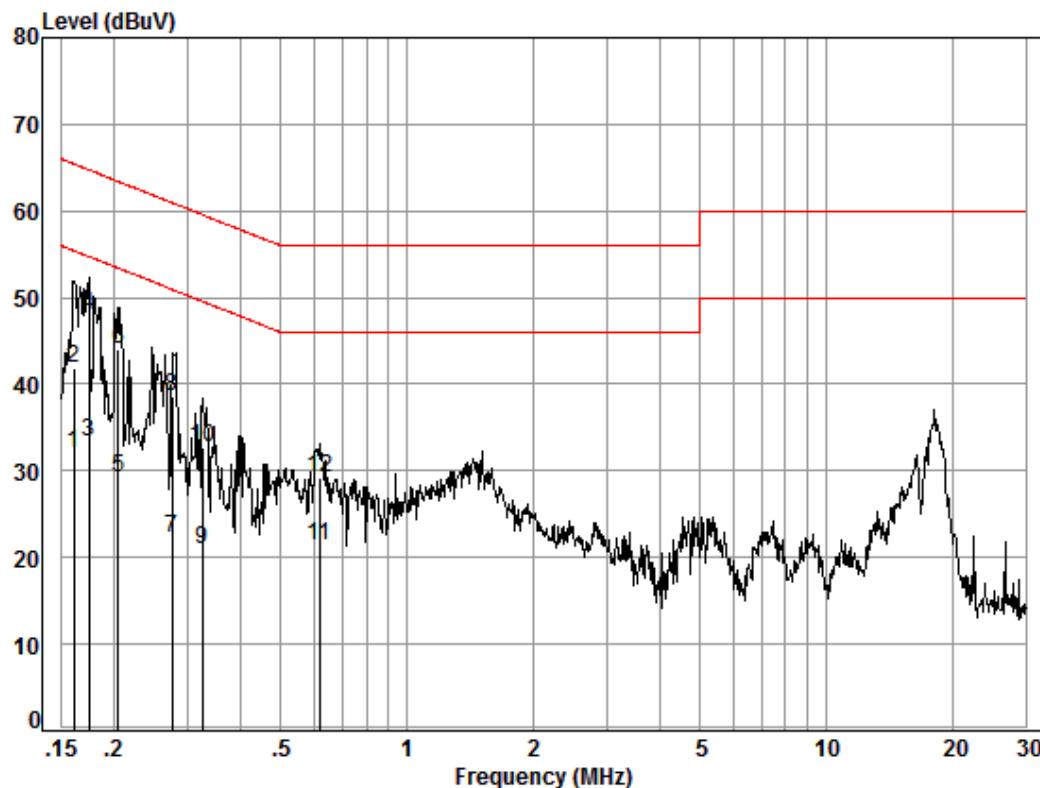
Condition: Line

Job No. : 06662CR

Test mode: c

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.18	0.03	9.52	22.10	31.65	54.64	-22.99	Average
2	0.18	0.03	9.52	37.52	47.07	64.64	-17.57	QP
3	0.21	0.03	9.50	14.53	24.06	53.05	-28.99	Average
4	0.21	0.03	9.50	30.21	39.74	63.05	-23.31	QP
5	0.23	0.03	9.51	11.86	21.40	52.30	-30.90	Average
6	0.23	0.03	9.51	29.77	39.31	62.30	-22.99	QP
7	0.27	0.03	9.51	11.76	21.30	51.03	-29.73	Average
8	0.27	0.03	9.51	26.18	35.72	61.03	-25.31	QP
9	0.30	0.03	9.51	9.41	18.95	50.28	-31.33	Average
10	0.30	0.03	9.51	24.68	34.22	60.28	-26.06	QP
11	0.34	0.03	9.50	4.55	14.08	49.31	-35.23	Average
12	0.34	0.03	9.50	23.17	32.70	59.31	-26.61	QP

Mode:c; Line:Neutral Line



Site : Shielding Room

Condition: Neutral

Job No. : 06662CR

Test mode: c

Freq	Cable	LISN	Read	Limit	Over	Remark	
	Loss	Factor	Level		Level		
	MHz	dB	dB	dBuV	dBuV	dB	
1	0.16	0.02	9.59	22.42	32.03	55.43	-23.40 Average
2	0.16	0.02	9.59	32.31	41.92	65.43	-23.51 QP
3	0.17	0.03	9.59	23.63	33.25	54.77	-21.52 Average
4	0.17	0.03	9.59	38.37	47.99	64.77	-16.78 QP
5	0.21	0.03	9.57	19.70	29.30	53.40	-24.10 Average
6	0.21	0.03	9.57	34.53	44.13	63.40	-19.27 QP
7	0.28	0.03	9.58	12.53	22.14	50.94	-28.80 Average
8	0.28	0.03	9.58	29.06	38.67	60.94	-22.27 QP
9	0.33	0.03	9.58	11.41	21.02	49.57	-28.55 Average
10	0.33	0.03	9.58	23.14	32.75	59.57	-26.82 QP
11	0.62	0.06	9.62	11.75	21.43	46.00	-24.57 Average
12	0.62	0.06	9.62	19.45	29.13	56.00	-26.87 QP

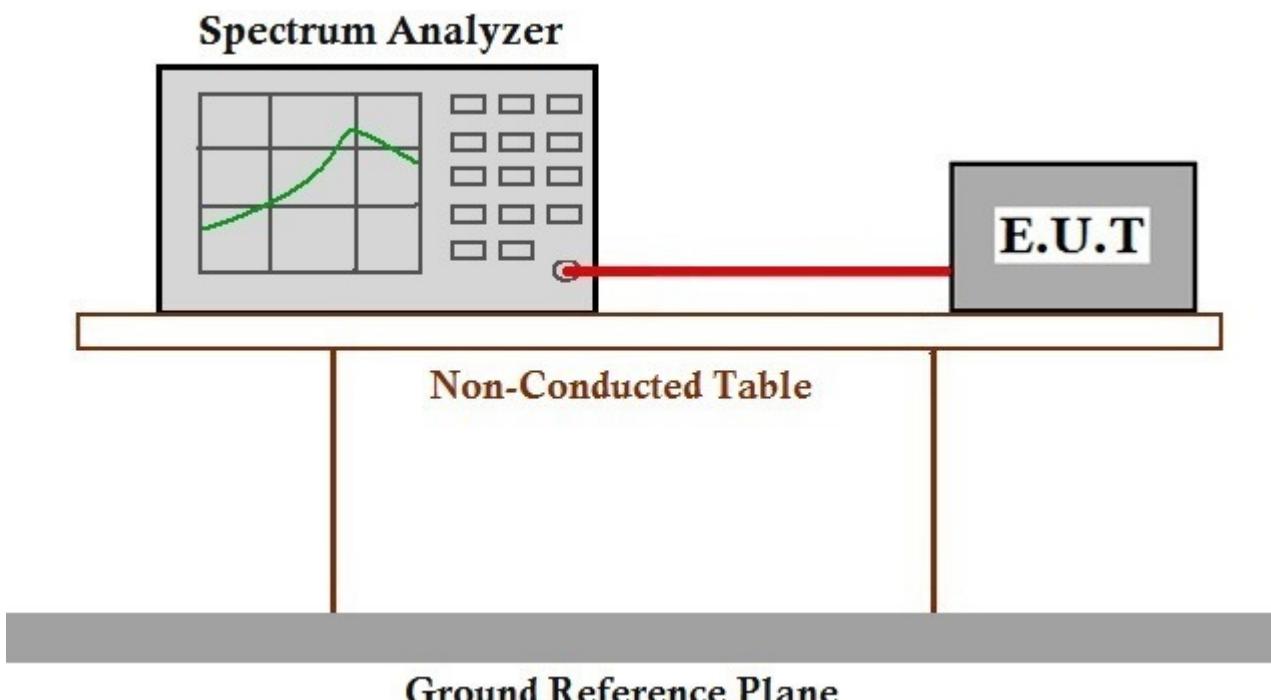
## 7.2 20dB Bandwidth

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

### 7.2.1 E.U.T. Operation

Operating Environment:  
Temperature: 24.3 °C      Humidity: 50.7 % RH      Atmospheric Pressure: 1005 mbar  
Test mode c:TX mode(Dongle)\_Keep the EUT in transmitting with modulation mode.

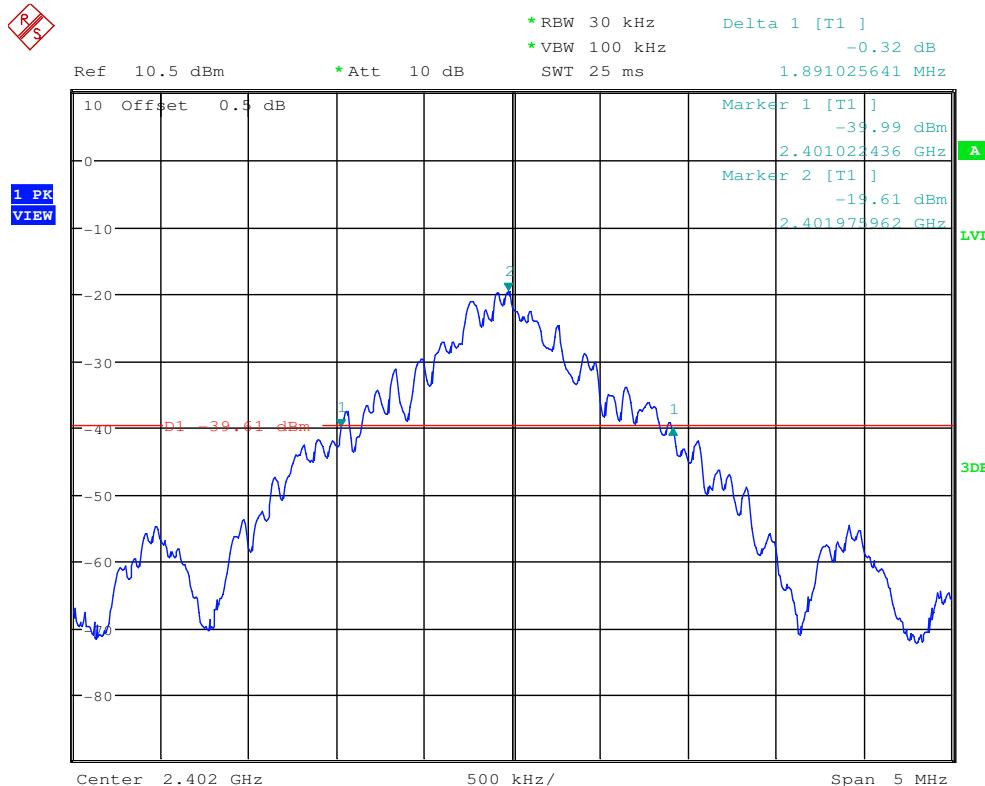
### 7.2.2 Test Setup Diagram



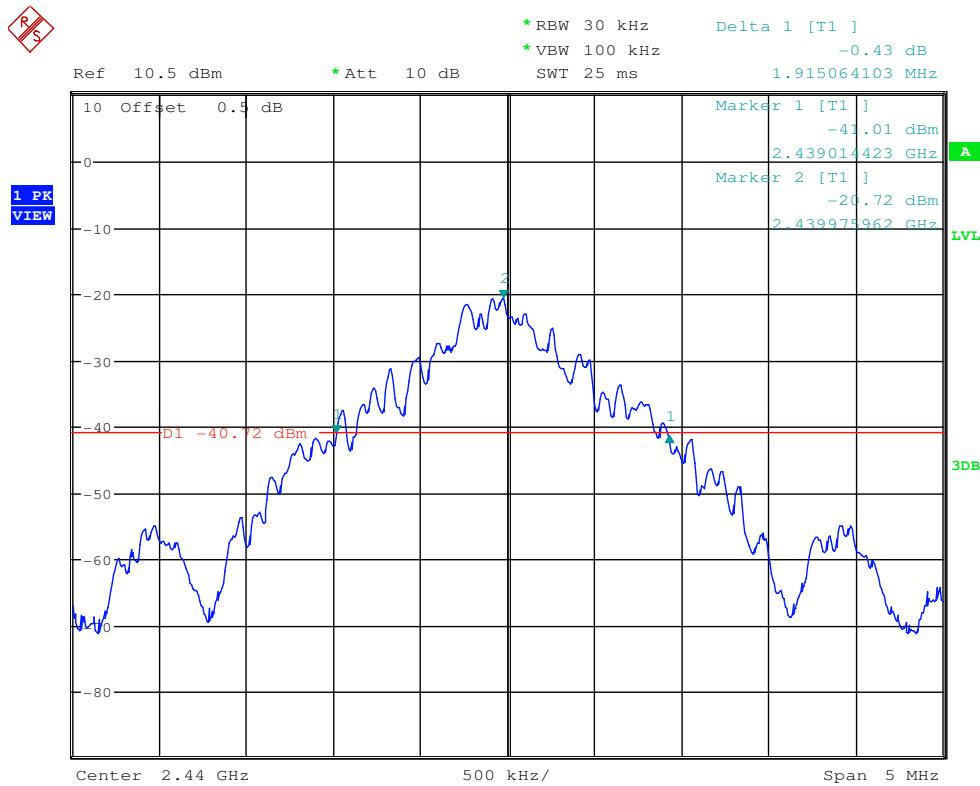
### 7.2.3 Measurement Procedure and Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	1.891	Pass
Middle	1.915	Pass
Highest	2.147	Pass

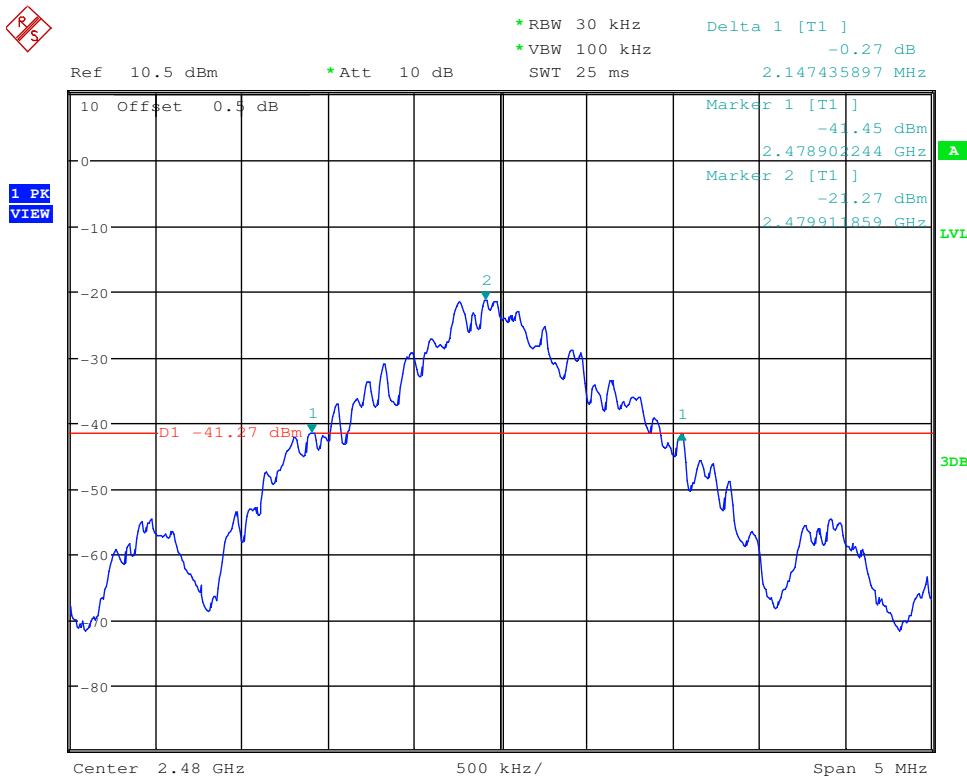
2402



2440



2480



### **7.3 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:

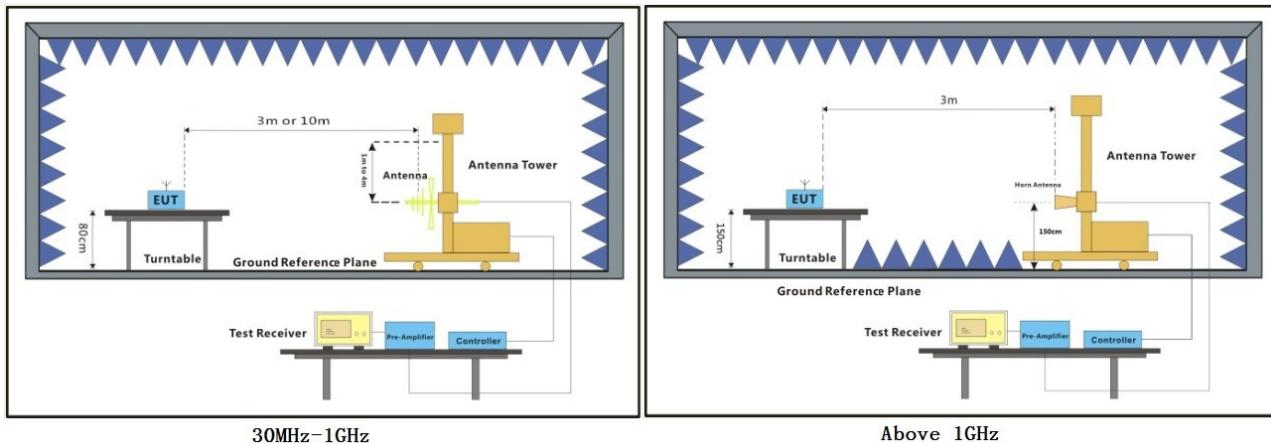
Frequency	Limit (dBuV/m @3m)	Remark
2400MHz-2483.5MHz	94.0	Average Value
	114.0	Peak Value

### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.1 °C      Humidity: 53.7 % RH      Atmospheric Pressure: 1005 mbar  
Test mode: c:TX mode(Dongle)\_Keep the EUT in transmitting with modulation mode.

### 7.3.2 Test Setup Diagram



### 7.3.3 Measurement Procedure and Data

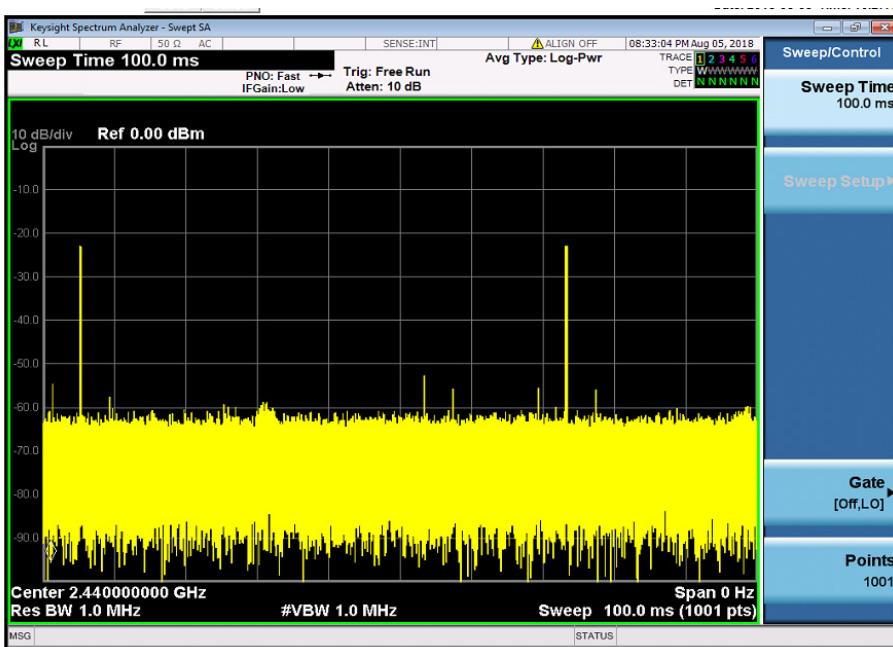
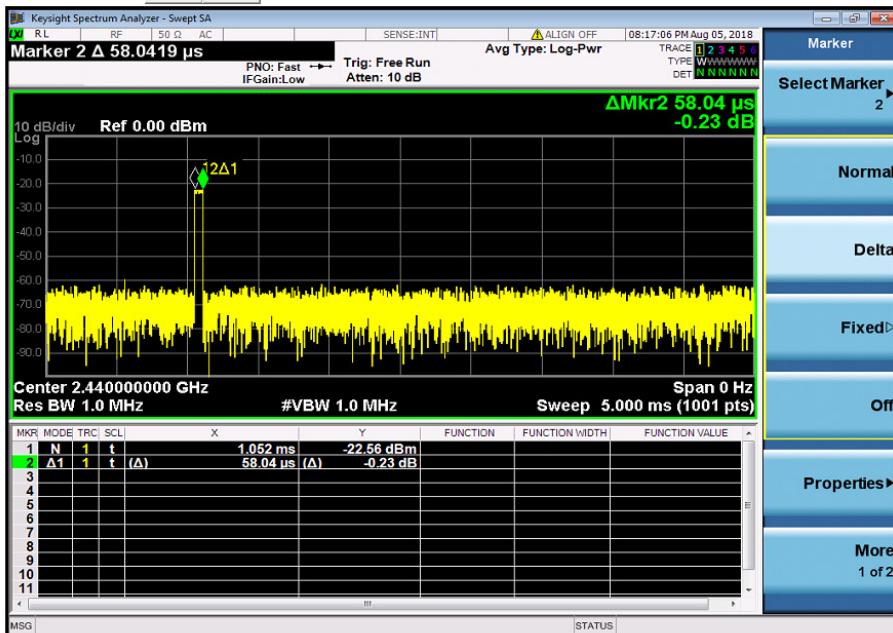
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5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

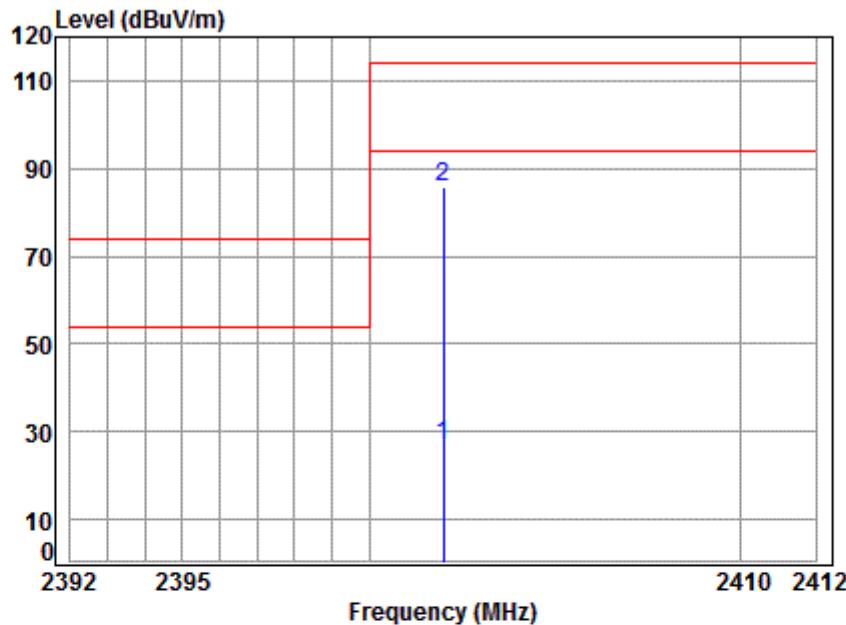
Average value:

Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time =0.11608ms
	T period =100ms
	PDCF value= -58.7dB

Duty cycle test plots:



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



Condition: 3m HORIZONTAL

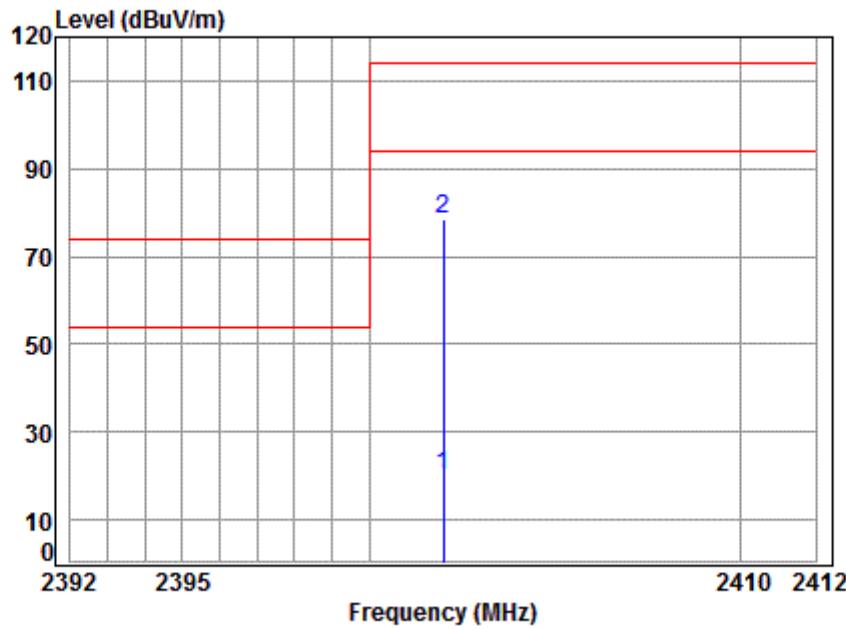
Job No : 06662CR

Mode : 2402 Field Strength

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 av	2402.000	5.49	28.54	41.88	34.82	26.99	94.00	-67.01	Average
2 pp	2402.000	5.49	28.54	41.88	93.54	85.69	114.00	-28.31	peak

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



Condition: 3m VERTICAL

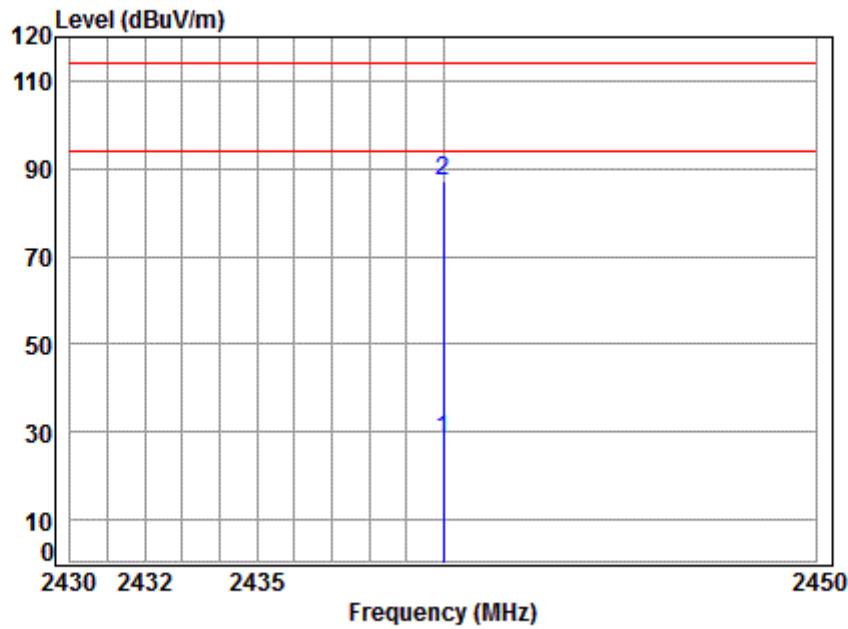
Job No : 06662CR

Mode : 2402 Field Strength

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2402.000	5.49	28.54	41.88	27.72	19.88	94.00	-74.12 Average
2 pp	2402.000	5.49	28.54	41.88	86.43	78.58	114.00	-35.42 peak

Mode:c; Polarization:Horizontal; Modulation:GFSK; ; Channel:middle



Condition: 3m HORIZONTAL

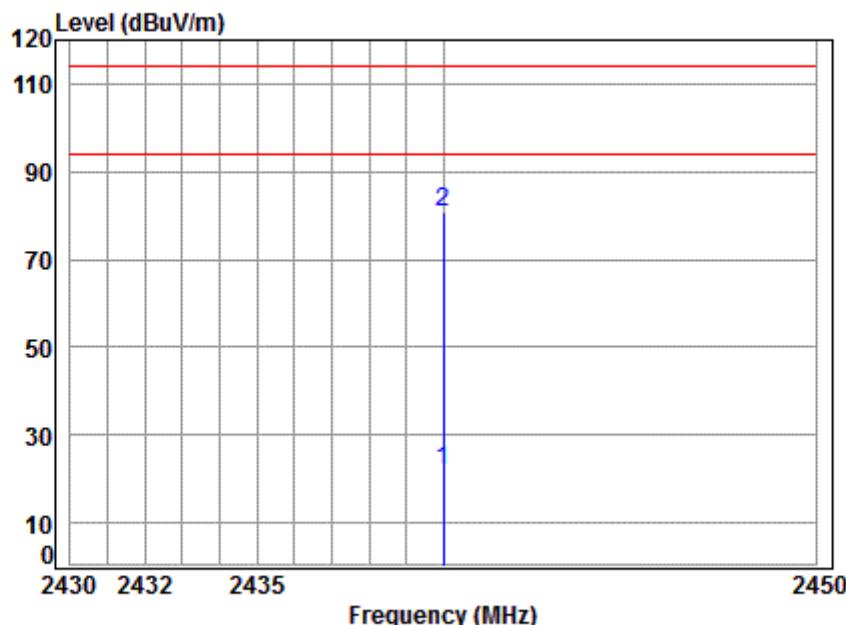
Job No : 06662CR

Mode : 2440 Field Strength

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2440.000	5.54	28.60	41.89	36.11	28.37	94.00	-65.63 Average
2 pp	2440.000	5.54	28.60	41.89	94.82	87.07	114.00	-26.93 Peak

Mode:c; Polarization:Vertical; Modulation:GFSK; ; Channel:middle



Condition: 3m VERTICAL

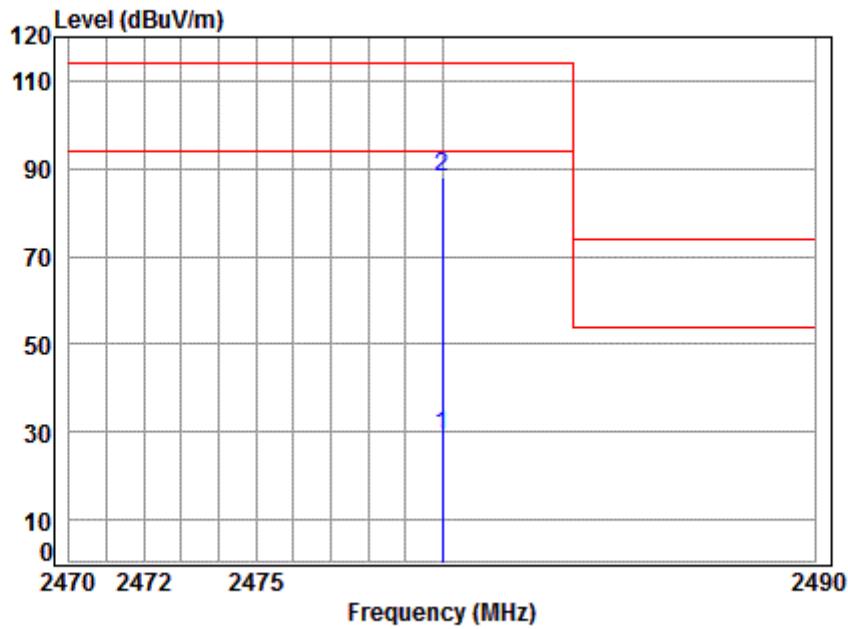
Job No : 06662CR

Mode : 2440 Field Strength

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2440.000	5.54	28.60	41.89	29.86	22.13	94.00	-71.87 Average
2 pp	2440.000	5.54	28.60	41.89	88.58	80.83	114.00	-33.17 Peak

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



Condition: 3m HORIZONTAL

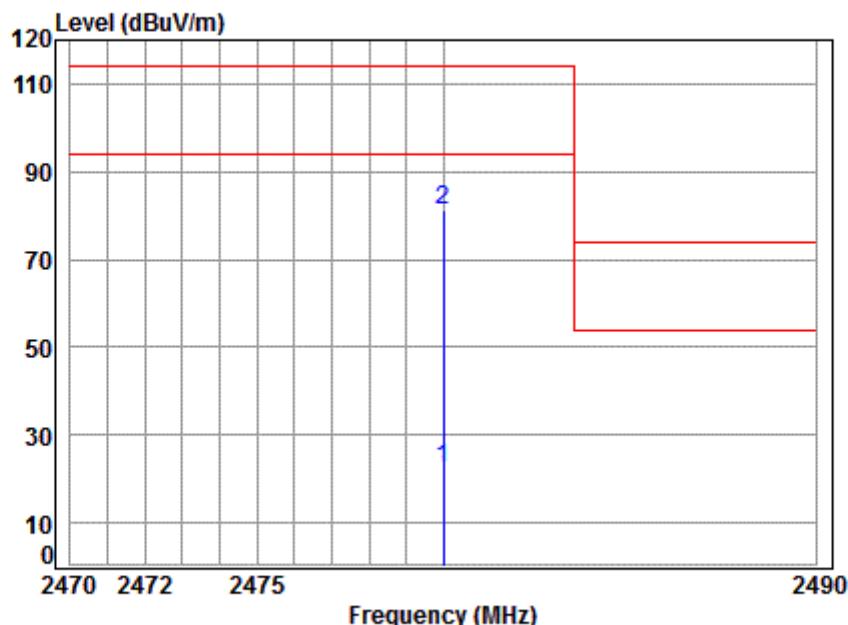
Job No : 06662CR

Mode : 2480 Filed Strength

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2480.000	5.59	28.67	41.91	37.07	29.43	94.00	-64.57 Average
2 pp	2480.000	5.59	28.67	41.91	95.78	88.13	114.00	-25.87 peak

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



Condition: 3m VERTICAL

Job No : 06662CR

Mode : 2480 Field Strength

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 av	2480.000	5.59	28.67	41.91	30.04	22.41	94.00	-71.59 Average
2 pp	2480.000	5.59	28.67	41.91	88.76	81.11	114.00	-32.89 peak

#### **7.4 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

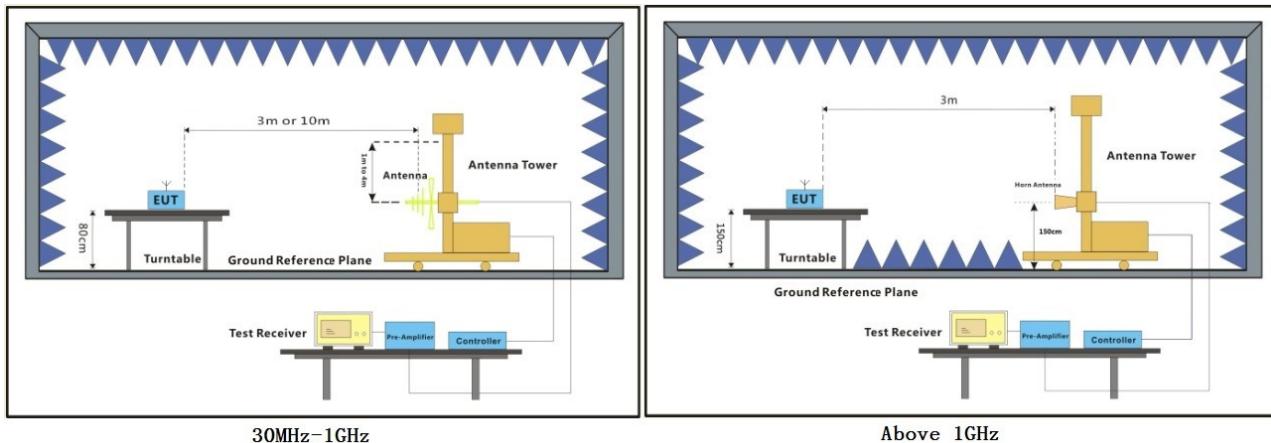
Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

#### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22.3 °C      Humidity: 55.8 % RH      Atmospheric Pressure: 1005 mbar  
Test mode: c:TX mode(Dongle)\_Keep the EUT in transmitting with modulation mode.

#### 7.4.2 Test Setup Diagram



#### 7.4.3 Measurement Procedure and Data

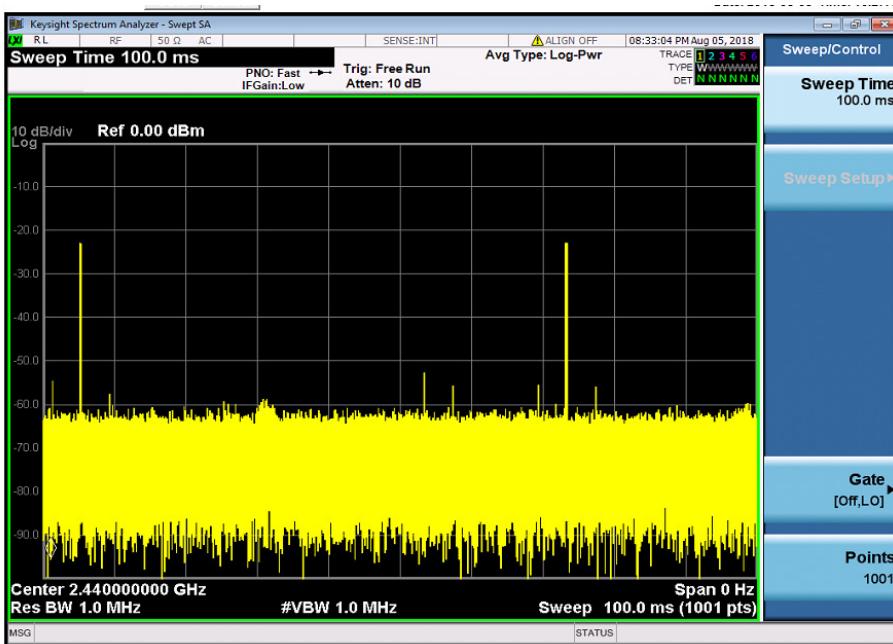
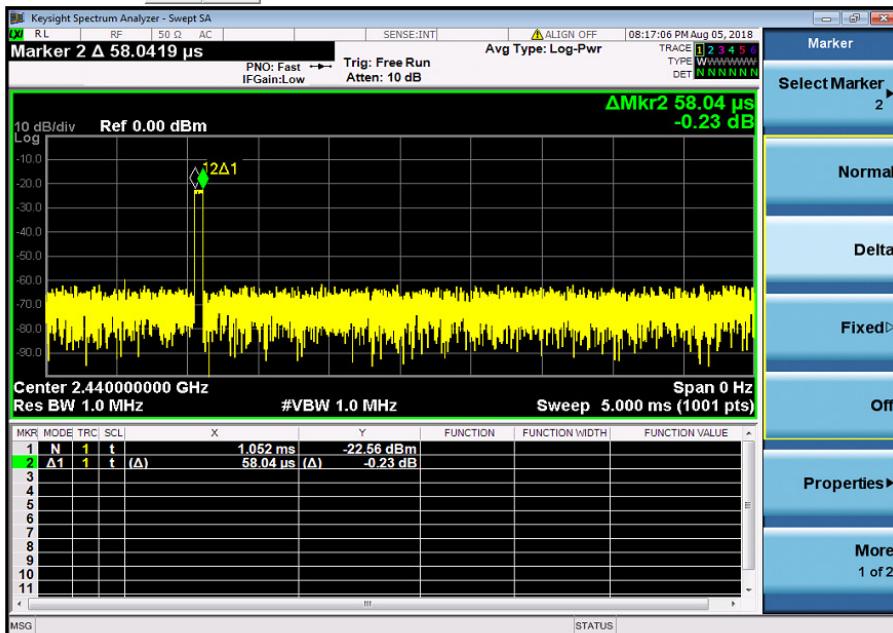
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5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

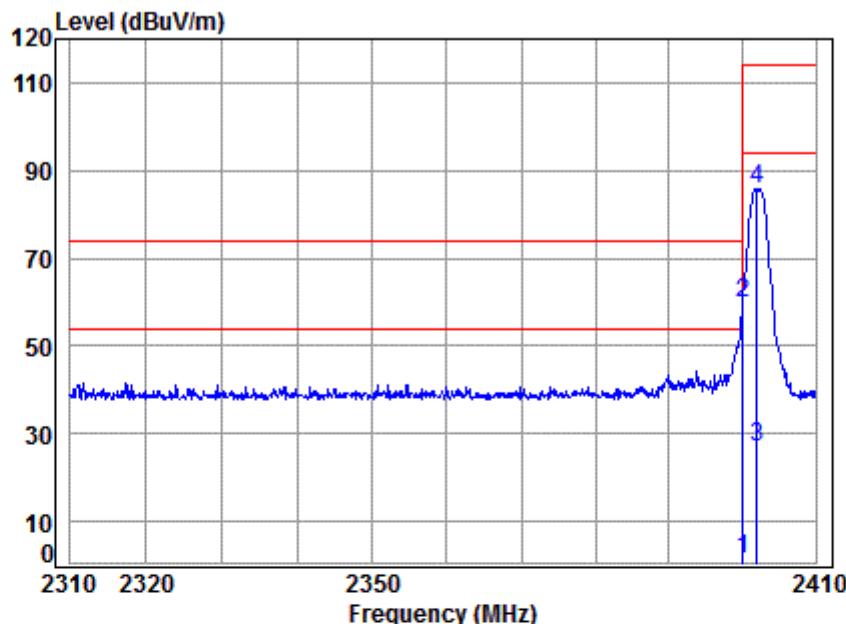
Average value:

Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time =0.11608ms
	T period =100ms
	PDCF value= -58.7dB

Duty cycle test plots:



Mode:c; Polarization:Horizontal; Modulation:GFSK; hannel:Low



Condition: 3m HORIZONTAL

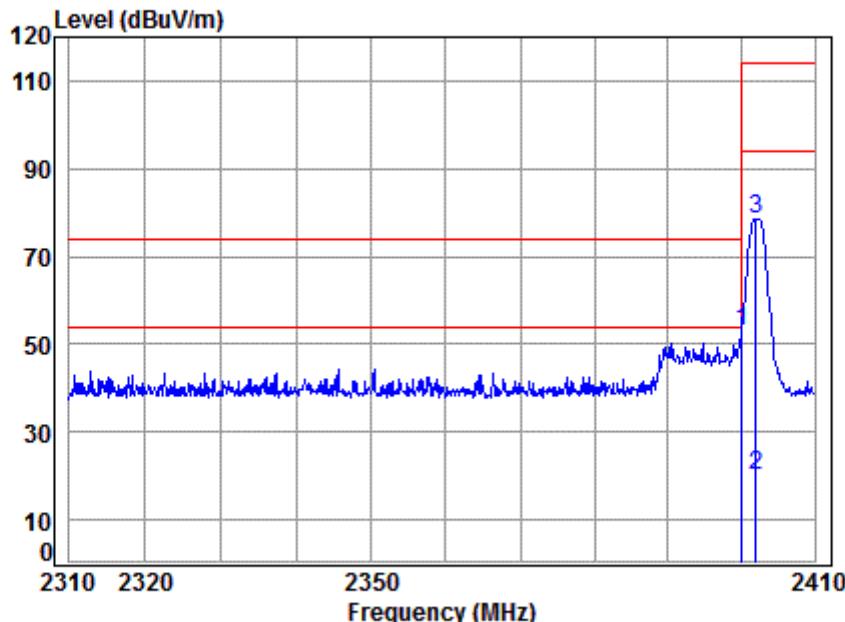
Job No : 06662CR

Mode : 2402 Band edge

Note : Dongle

		Cable Freq	Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Level	Over Limit	Over Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	av	2400.000	5.49	28.54	41.88	9.10	1.22	54.00	-52.78	Average
2	pp	2400.000	5.49	28.54	41.88	67.77	59.92	74.00	-14.08	peak
3		2402.000	5.49	28.54	41.88	34.82	26.99	94.00	-67.01	Average
4		2402.000	5.49	28.54	41.88	93.54	85.69	114.00	-28.31	peak

Mode:c; Polarization:Vertical; Modulation:GFSK; hannel:Low



Condition: 3m VERTICAL

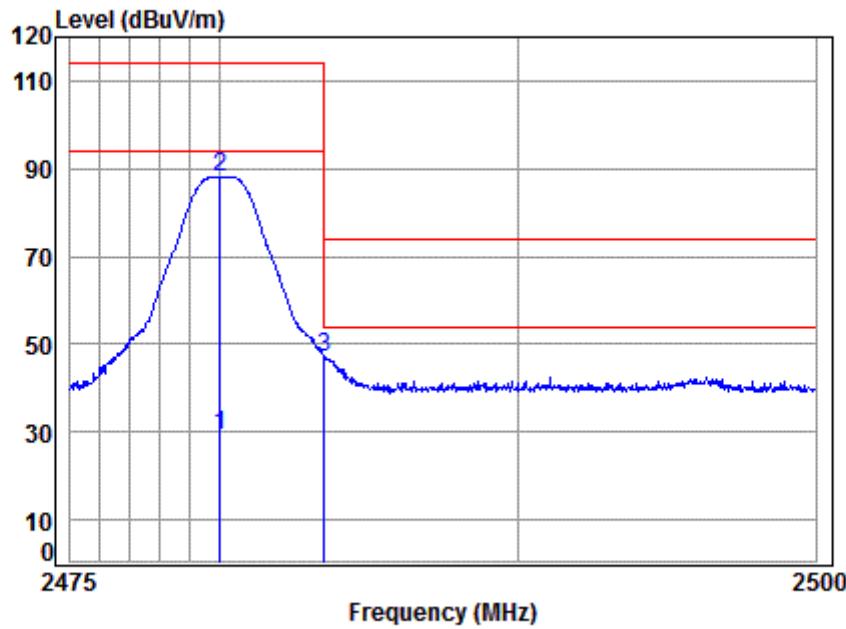
Job No : 06662CR

Mode : 2402 Band edge

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1 pp	2400.000	5.49	28.54	41.88	60.79	52.94	74.00	-21.06 peak
2 av	2402.000	5.49	28.54	41.88	27.72	19.88	94.00	-74.12 Average
3	2402.000	5.49	28.54	41.88	86.43	78.58	114.00	-35.42 peak

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



Condition: 3m HORIZONTAL

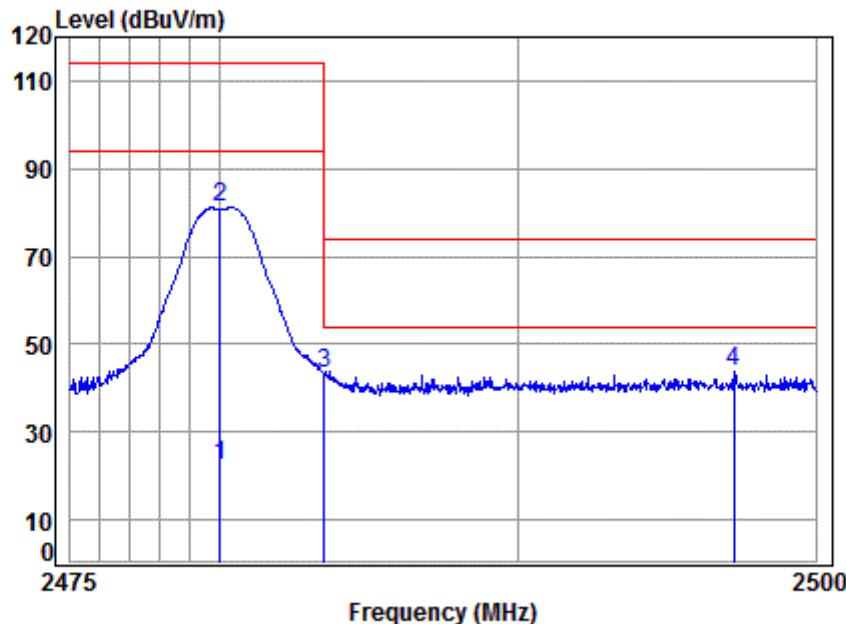
Job No : 06662CR

Mode : 2480 Band edge

Note : Dongle

	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	av 2480.000	5.59	28.67	41.91	37.07	29.43	94.00	-64.57 Average
2	pp 2480.000	5.59	28.67	41.91	95.78	88.13	114.00	-25.87 peak
3	2483.500	5.60	28.67	41.91	54.75	47.11	74.00	-26.89 peak

Mode:c; Polarization:Vertical; Modulation:GFSK; hannel:High



Condition: 3m VERTICAL

Job No : 06662CR

Mode : 2480 Band edge

Note : Dongle

	Cable	Ant	Preamp	Read	Limit	Over				
	Freq	Loss	Factor	Level	Level	Line	Limit			
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB			
1	av	2480.000	5.59	28.67	41.91	30.04	22.41	94.00	-71.59	Average
2		2480.000	5.59	28.67	41.91	88.76	81.11	114.00	-32.89	peak
3		2483.500	5.60	28.67	41.91	50.81	43.17	74.00	-30.83	peak
4	pp	2497.238	5.62	28.70	41.92	51.41	43.81	74.00	-30.19	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.

## 7.5 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:

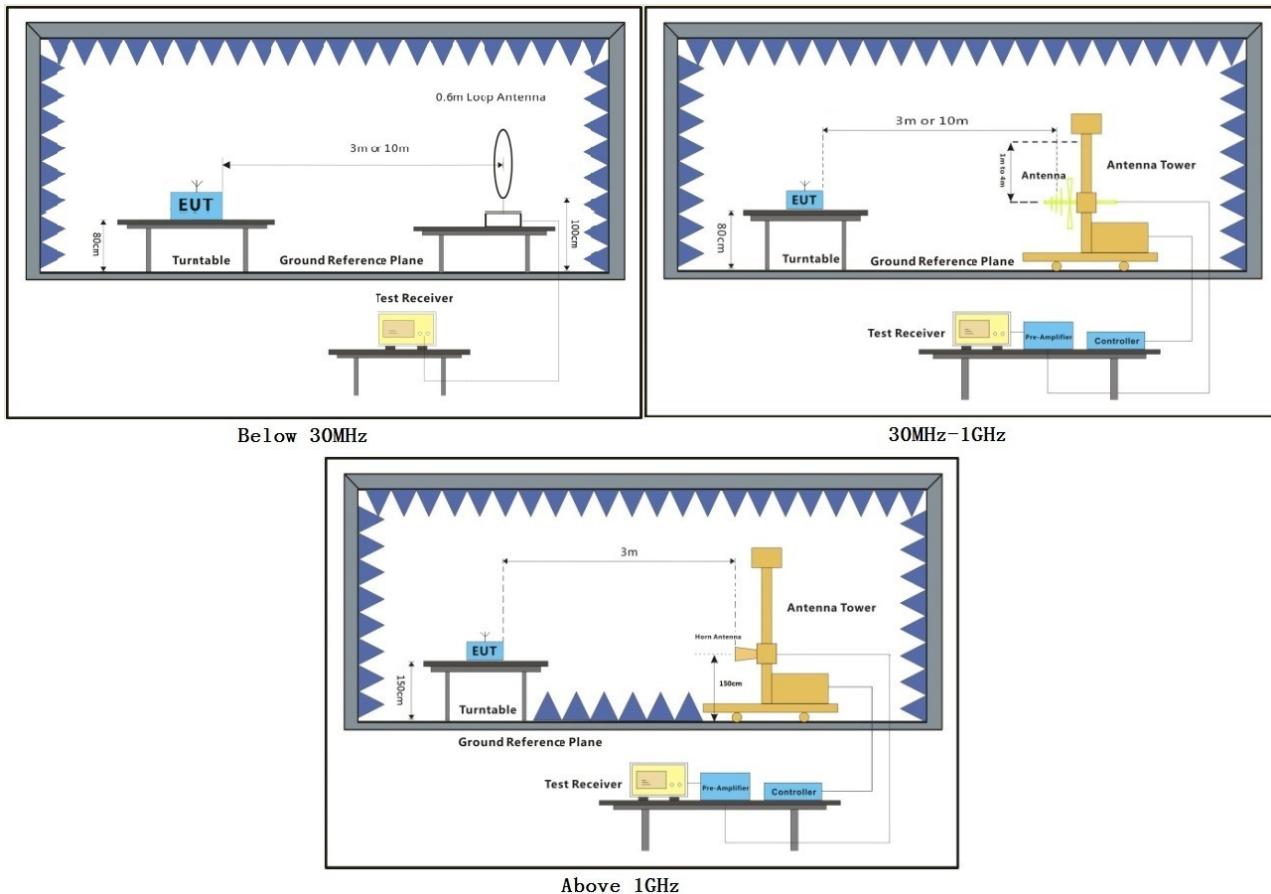
Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 25.1 °C      Humidity: 53.7 % RH      Atmospheric Pressure: 1005 mbar  
Test mode: c:TX mode(Dongle)\_Keep the EUT in transmitting with modulation mode.

### 7.5.2 Test Setup Diagram

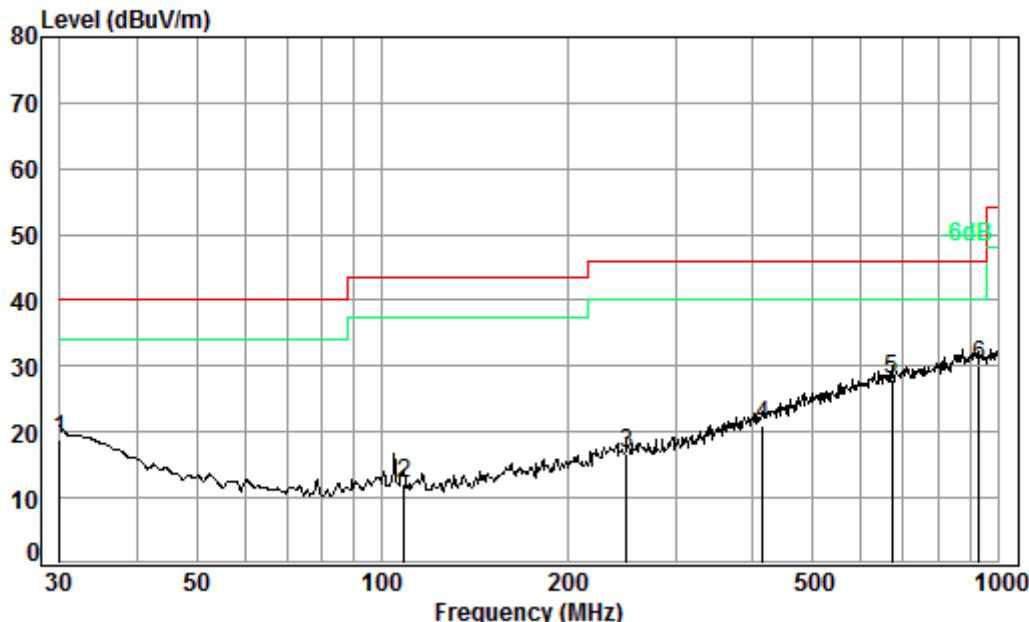


### 7.5.3 Measurement Procedure and Data

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:

Mode:c; Polarization:Horizontal;



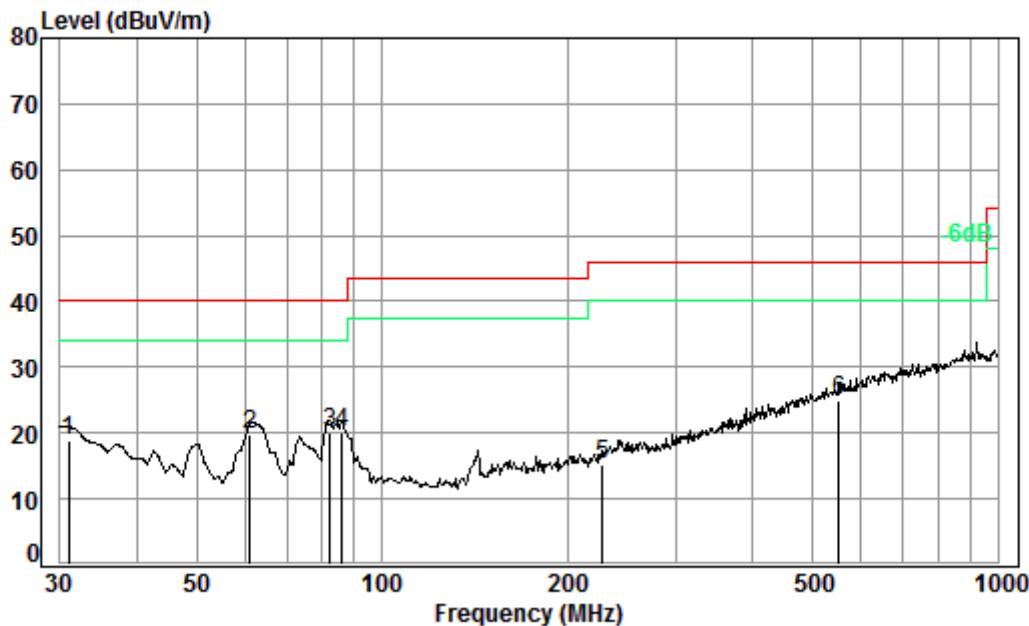
Condition: 3m HORIZONTAL

Job No. : 06662CR

Test mode: c

Freq	Cable	Ant	Preamp	Read	Limit	Over	Over	
	Loss	Factor	Factor	Level				
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.00	0.60	22.50	27.67	23.51	18.94	40.00	-21.06
2	108.65	1.22	13.59	27.51	24.90	12.20	43.50	-31.30
3	249.43	1.67	18.94	27.53	23.66	16.74	46.00	-29.26
4	414.72	2.26	22.76	27.76	23.76	21.02	46.00	-24.98
5	672.84	2.85	27.57	27.59	25.28	28.11	46.00	-17.89
6 pp	932.27	3.63	29.97	26.97	23.51	30.14	46.00	-15.86

Mode:c; Polarization:Vertical;



Condition: 3m VERTICAL

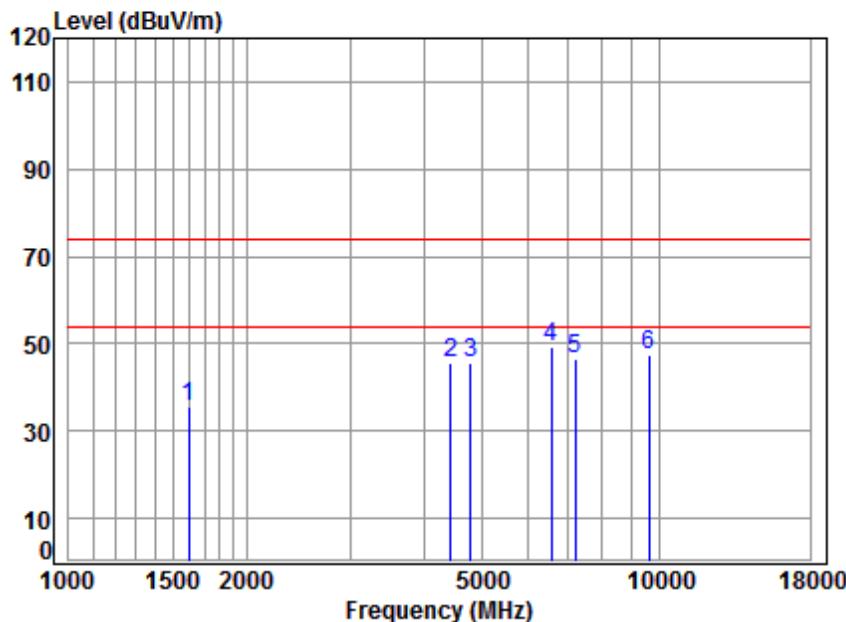
Job No. : 06662CR

Test mode: c

Freq	Cable	Ant	Preamp	Read	Limit		Over	
	MHz	Loss	Factor	Factor	Level	Level	Line	Limit
1	30.96	0.60	21.95	27.67	24.13	19.01	40.00	-20.99
2	61.13	0.80	13.15	27.56	33.25	19.64	40.00	-20.36
3 pp	82.36	1.10	12.27	27.50	34.13	20.00	40.00	-20.00
4	86.20	1.10	12.70	27.50	33.63	19.93	40.00	-20.07
5	228.49	1.56	17.90	27.53	23.30	15.23	46.00	-30.77
6	552.88	2.66	25.70	27.78	24.34	24.92	46.00	-21.08

Above 1GHz

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



Condition: 3m HORIZONTAL

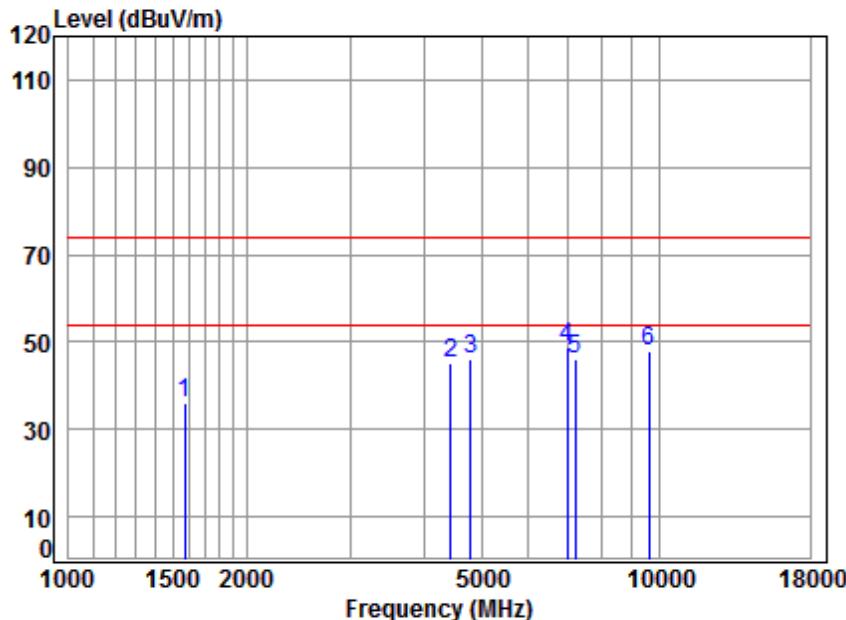
Job No : 06662CR

Mode : 2402 TX RSE

Note : Dongle

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level		Limit Line	Over Limit	Remark
				Level	Level			
1 1597.181	5.35	26.24	41.47	45.69	35.81	74.00	-38.19	peak
2 4430.628	7.48	33.48	42.41	47.22	45.77	74.00	-28.23	peak
3 4804.000	7.89	33.97	42.47	46.42	45.81	74.00	-28.19	peak
4 pp 6564.209	11.35	35.64	41.17	43.51	49.33	74.00	-24.67	peak
5 7206.000	10.08	36.07	40.71	41.08	46.52	74.00	-27.48	peak
6 9608.000	10.75	37.67	37.74	36.74	47.42	74.00	-26.58	peak

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



Condition: 3m VERTICAL

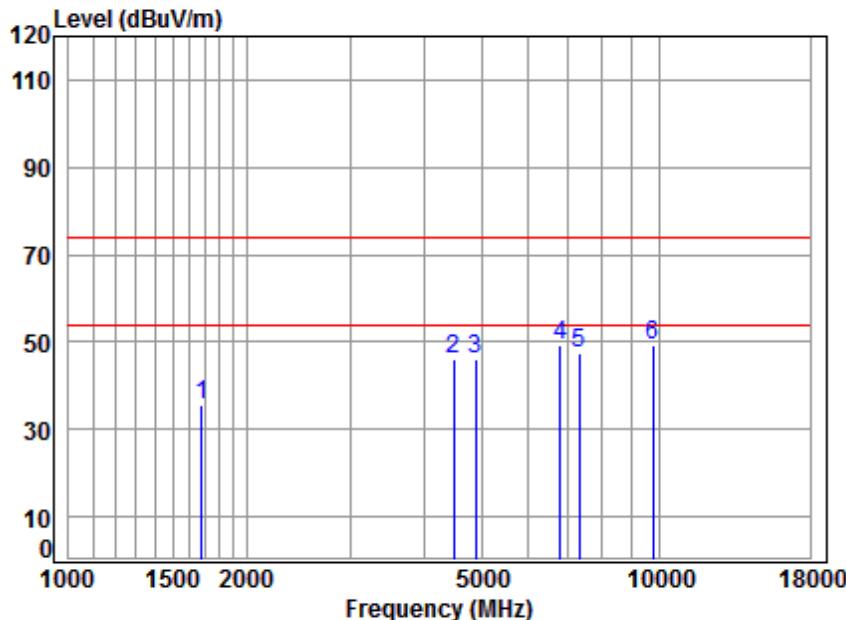
Job No : 06662CR

Mode : 2402 TX RSE

Note : Dongle

		Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1574.265	5.38	26.14	41.45	46.11	36.18	74.00	-37.82	peak
2	4430.628	7.48	33.48	42.41	46.73	45.28	74.00	-28.72	peak
3	4804.000	7.89	33.97	42.47	46.81	46.20	74.00	-27.80	peak
4 pp	6995.172	10.14	35.90	40.86	43.49	48.67	74.00	-25.33	peak
5	7206.000	10.08	36.07	40.71	40.82	46.26	74.00	-27.74	peak
6	9608.000	10.75	37.67	37.74	37.19	47.87	74.00	-26.13	peak

Mode:c; Polarization:Horizontal; Modulation:GFSK; Channel:middle



Condition: 3m HORIZONTAL

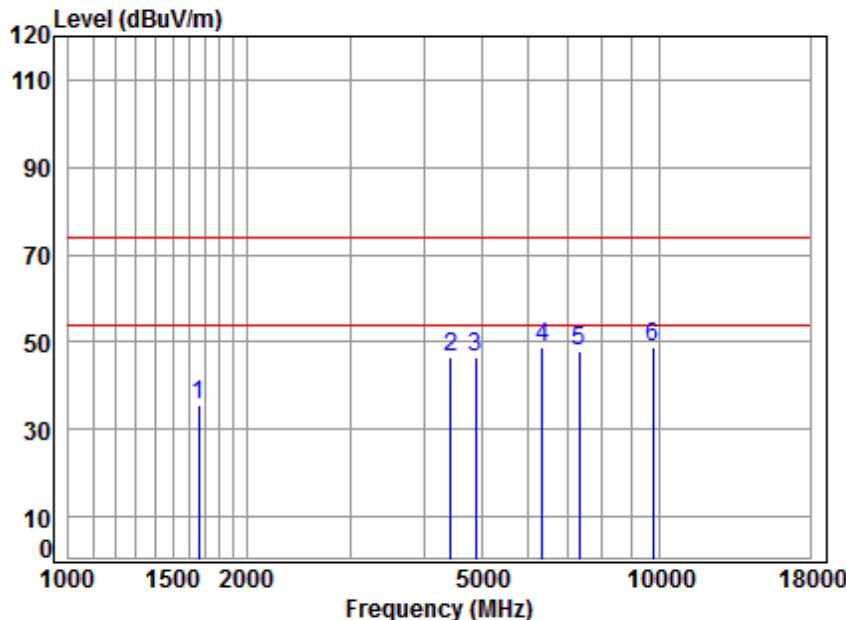
Job No : 06662CR

Mode : 2440 TX RSE

Note : Dongle

		Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1677.621	5.25	26.58	41.52	45.27	35.58	74.00	-38.42	peak
2	4495.125	7.55	33.59	42.42	47.36	46.08	74.00	-27.92	peak
3	4880.000	7.97	34.06	42.48	46.67	46.22	74.00	-27.78	peak
4 pp	6795.879	10.69	35.78	41.00	43.72	49.19	74.00	-24.81	peak
5	7320.000	10.05	36.16	40.63	42.03	47.61	74.00	-26.39	peak
6	9760.000	10.82	37.76	37.53	38.07	49.12	74.00	-24.88	peak

Mode:c; Polarization:Vertical; Modulation:GFSK; Channel:middle



Condition: 3m VERTICAL

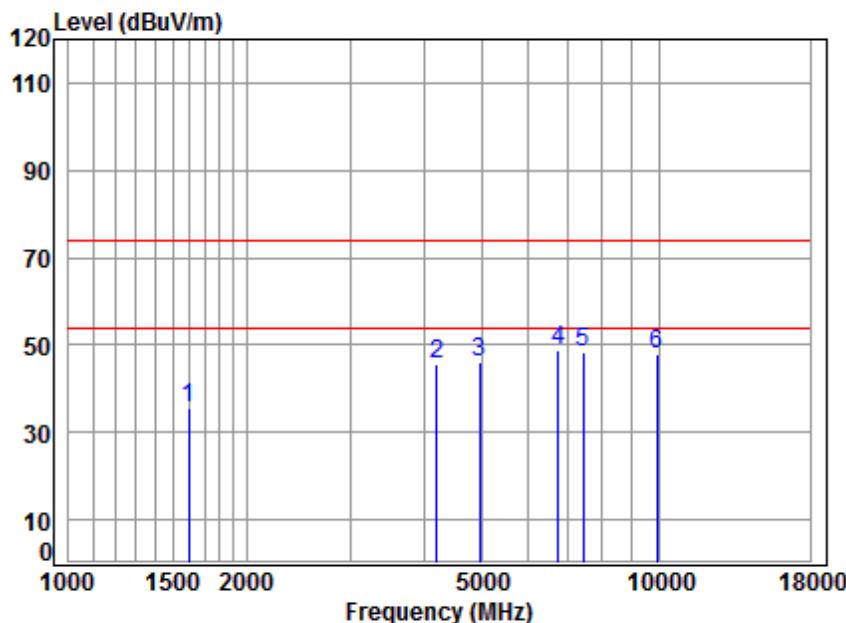
Job No : 06662CR

Mode : 2440 TX RSE

Note : Dongle

		Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1663.137	5.27	26.52	41.51	45.18	35.46	74.00	-38.54	peak
2	4443.453	7.50	33.50	42.41	47.91	46.50	74.00	-27.50	peak
3	4880.000	7.97	34.06	42.48	46.96	46.51	74.00	-27.49	peak
4	6340.436	11.24	35.44	41.34	43.46	48.80	74.00	-25.20	peak
5	7320.000	10.05	36.16	40.63	42.23	47.81	74.00	-26.19	peak
6 pp	9760.000	10.82	37.76	37.53	37.76	48.81	74.00	-25.19	peak

Mode:c; Polarization:Horizontal; Modulation:GFSK; channel:High



Condition: 3m HORIZONTAL

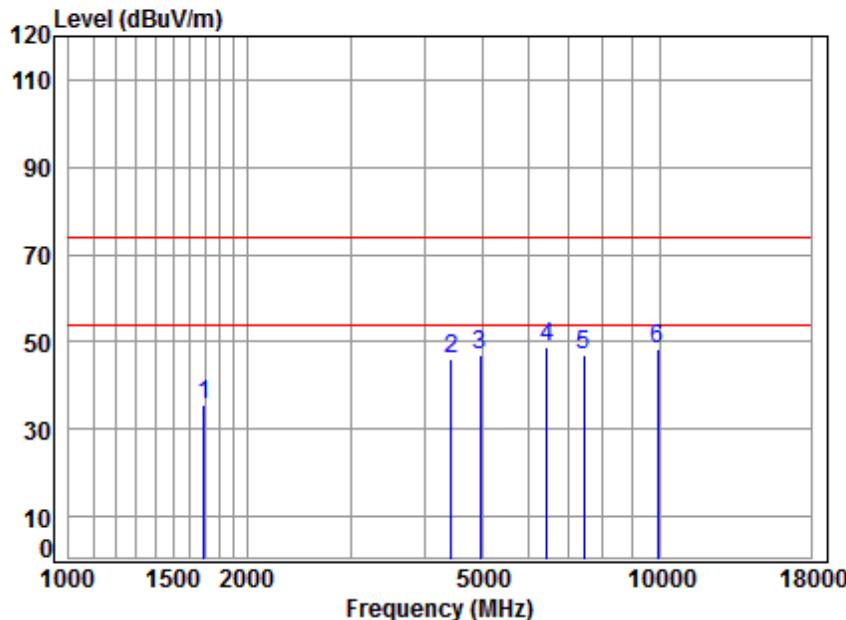
Job No : 06662CR

Mode : 2480 TX RSE

Note : Dongle

		Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Over Line	Over Limit	Remark
		MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1597.181	5.35	26.24	41.47	45.68	35.80	74.00	-38.20	peak
2	4193.872	7.21	33.06	42.36	47.49	45.40	74.00	-28.60	peak
3	4960.000	8.05	34.15	42.49	46.31	46.02	74.00	-27.98	peak
4 pp	6737.207	10.86	35.75	41.04	43.28	48.85	74.00	-25.15	peak
5	7440.000	10.02	36.25	40.56	42.49	48.20	74.00	-25.80	peak
6	9920.000	10.90	37.85	37.31	36.69	48.13	74.00	-25.87	peak

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



Condition: 3m VERTICAL

Job No : 06662CR

Mode : 2480 TX RSE

Note : Dongle

		Cable Freq	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	1692.231	5.24	26.64	41.53	45.41	35.76	74.00	-38.24	peak	
2	4430.628	7.48	33.48	42.41	47.49	46.04	74.00	-27.96	peak	
3	4960.000	8.05	34.15	42.49	47.26	46.97	74.00	-27.03	peak	
4 pp	6432.732	11.41	35.54	41.27	43.13	48.81	74.00	-25.19	peak	
5	7440.000	10.02	36.25	40.56	41.44	47.15	74.00	-26.85	peak	
6	9920.000	10.90	37.85	37.31	36.97	48.41	74.00	-25.59	peak	

## Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor &amp; 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.

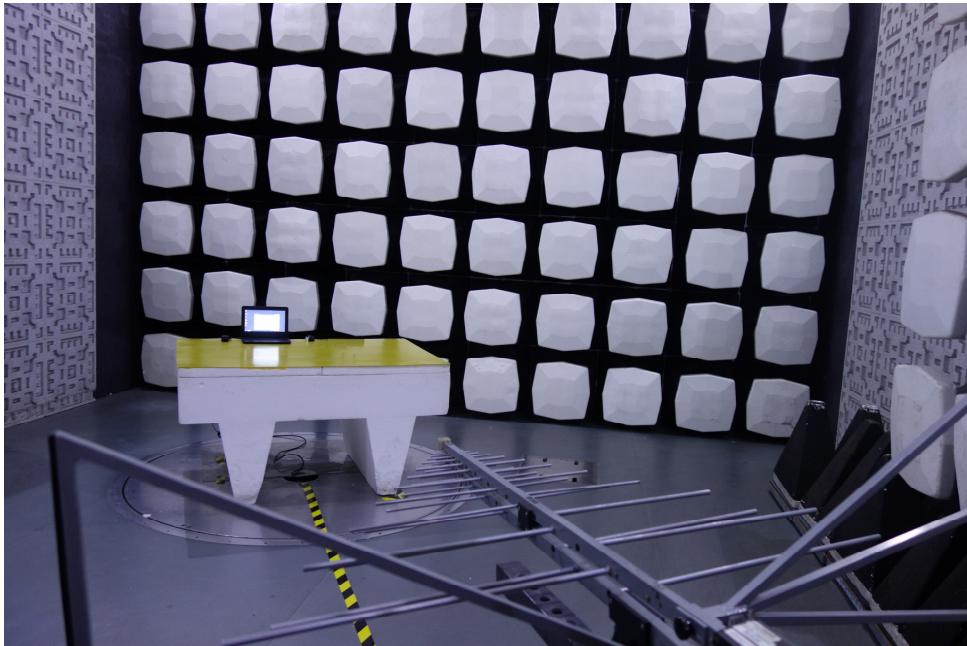
## **8 Photographs**

### **8.1 Conducted Emissions at AC Power Line (150kHz-30MHz) Test Setup**

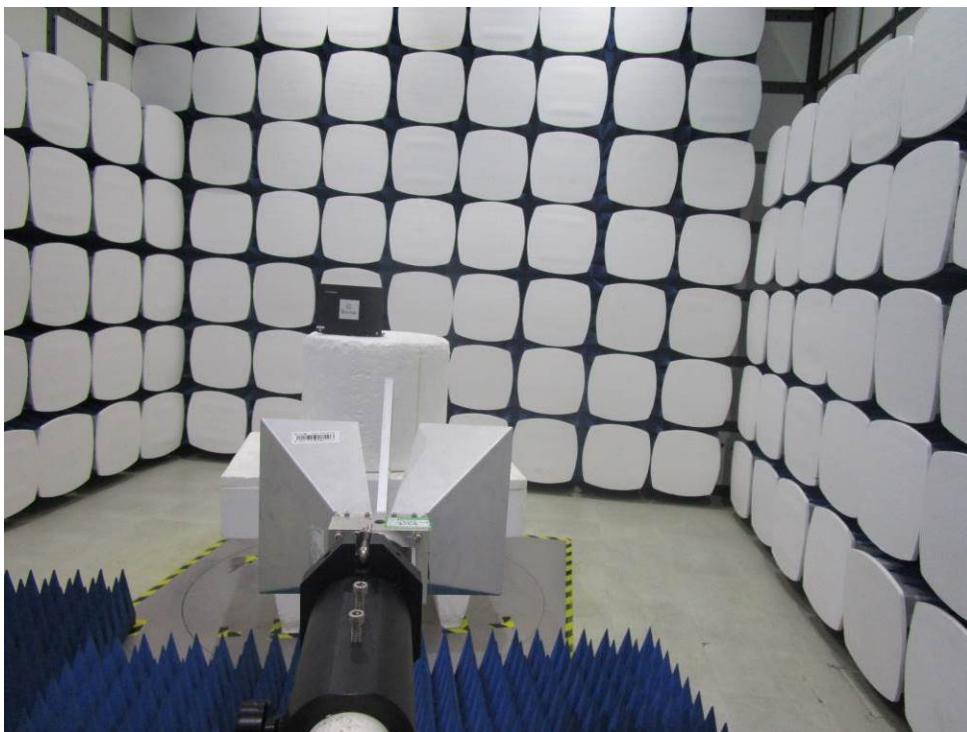


## 8.2 Radiated Emissions Test Setup

Below 1GHz



Above 1GHz



## 8.3 EUT Constructional Details (EUT Photos)

Refer to External and Internal photos.

- End of the Report -