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

No. 1 Workshop, M-10, Middle section, Science & Technology Park,
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TEST REPORT

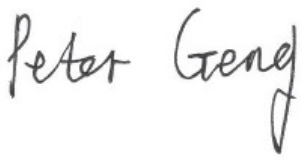
Application No.:	SZEM1710010496CR
Applicant:	Guangdong Shiji Technology Co., Ltd
Address of Applicant:	NO.8, Road 5, Dachewei Area, Yongxin Industrial Zone Lianshang Town, Chenghai District, Shantou, China
Equipment Under Test (EUT):	
EUT Name:	Remote control aircraft series
Model No.:	Please refer to section 2 ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Standard(s) :	47 CFR Part 15, Subpart C 15.249
FCC ID :	2ALUJS20W720PB
Date of Receipt:	2017-10-09
Date of Test:	2017-10-16 to 2017-10-25
Date of Issue:	2017-10-26
Test Result:	**Pass***

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

Jack Zhang
EMC Laboratory Manager

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

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2017-10-26		Original

Authorized for issue by:				
				
		Peter Geng /Project Engineer		
				
		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**
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

Remark:

Model No.: S20W720P-D(GPS), S20W, S20W720P, S20W720P-D, S20W1080P, S20W1080P(GPS), S30W, S30W720P, S30W720P-D, S30W1080P, S30W720P-D(GPS), S30W1080P(GPS), S70W, S70W720P-D, S70W1080P, S70W720P-D(GPS), S70W1080P(GPS), Z1, Z1W, Z1W720P-D, Z1W1080P, Z1W720P-D(GPS), Z1W1080P(GPS), Z7W, Z7W720P-D, Z7W1080P, Z7W720P-D(GPS), Z7W1080P(GPS), VR001, C1001, W1003, X300-1, X300-1C, X300-1CW, X300-2, X300-2C, X300-2CW, T20C, T20CW, T20CW-F, T20VR, T30C, T30CW, T30CW-F, T30VR, T70C, T70CW, T70CW-F, T70VR, X200-1, X200-2, X200-2C, X200-2CW, SJ200, SJ230, SJ250, SJ2001, SJ2012, SJ280, SJ991, SJ997, SJ998, S20VR, S30VR, S70VR, Z1VR, Z7VR, X300S1, X300S1W, X300S1W720P, X300S1W720P-D, X300S2, X300S2W, X300S2W720P, X300S2W720P-D, X300VR, XT280708, XT280710, W311RA, W311RAW407VR

Only the model S20W720P-D(GPS) was tested, since the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, only different on colour, appearance and packing.

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	Remote: Built-in rechargeable battery which charged by USB port
Cable:	USB charging line: 80cm, unshielded
Frequency Range:	2402 MHz ~ 2478MHz
Modulation Type:	GFSK
Number of Channels:	16
Antenna Type:	Integral antenna
Antenna Gain:	-3dBi

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	7	2434	13	2464
2	2409	8	2440	14	2469
3	2414	9	2444	15	2474
4	2419	10	2449	16	2478
5	2424	11	2454		
6	2429	12	2459		

Remark: ch1, ch8 and ch 16 were selected to conduct all tests.

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Adapter	Apple	A1357 W010A051	REF. No.SEA0500

4.3 Measurement Uncertainty

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

4.4 Test Location

All tests were performed at:

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

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

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

No tests were sub-contracted.

4.5 Test Facility

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

• **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC

Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• **VCCI**

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

• **FCC –Designation Number: CN1178**

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

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

• **Industry Canada (IC)**

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

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017-05-10	2018-05-10
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2017-07-13	2018-07-12
LISN	Rohde & Schwarz	ENV216	SEM007-01	2017-09-27	2018-09-27
LISN	ETS-LINDGREN	3816/2	SEM007-02	2017-04-14	2018-04-13
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2017-04-14	2018-04-13

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DC Power Supply	ZhaoXin	RXN-305D	SEM011-02	2017-09-27	2018-09-27
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2017-07-13	2018-07-12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2017-09-27	2018-09-27
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2017-09-27	2018-09-27

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-02	2020-05-01
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2017-07-13	2018-07-12
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-02	2017-03-05	2020-03-05
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-14
Horn Antenna(15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-14	2017-06-16	2020-06-15
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2017-09-27	2018-09-27
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2017-09-27	2018-09-27
Pre-amplifier(0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2016-12-02	2017-12-01
Pre-amplifier(26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2017-04-14	2018-04-13
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2017-09-27	2018-09-27
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

Restricted Band Around Fundamental Frequency					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2017-05-02	2020-05-01
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2017-07-13	2018-07-12
Spectrum Analyzer	Rohde & Schwarz	FSU43	SEM004-08	2017-04-14	2018-04-13
BiConiLog Antenna (26-3000MHz)	ETS-Lindgren	3142C	SEM003-02	2017-03-05	2020-03-05
Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEM003-07	2015-06-14	2018-06-14
Horn Antenna(15GHz-40GHz)	Schwarzbeck	BBHA 9170	SEM003-14	2017-06-16	2020-06-15
Pre-amplifier (0.1-1300MHz)	HP	8447D	SEM005-02	2017-09-27	2018-09-27
Low Noise Amplifier(100MHz-18GHz)	Black Diamond Series	BDLNA-0118-352810	SEM005-05	2017-09-27	2018-09-27
Pre-amplifier(0.1-26.5GHz)	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2016-12-02	2017-12-01
Pre-amplifier(26GHz-40GHz)	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2017-04-14	2018-04-13
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2017-09-27	2018-09-27
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	2018-09-29
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2017-09-29	2018-09-29
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2017-09-29	2018-09-29
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-18

6 Radio Spectrum Technical Requirement

6.1 Antenna Requirement

6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

6.1.2 Conclusion

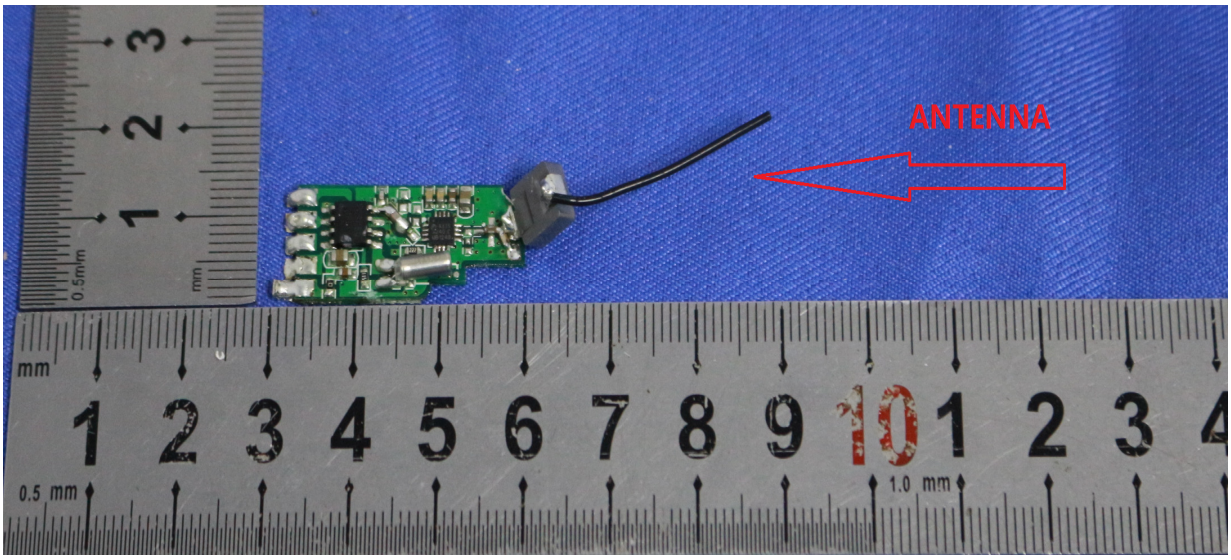
Standard Requirment:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently

attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -3dBi.



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: 25 °C Humidity: 45 % RH Atmospheric Pressure: 1010 mbar

Test mode: d:Charge + TX mode_Keep the EUT in charging and 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.

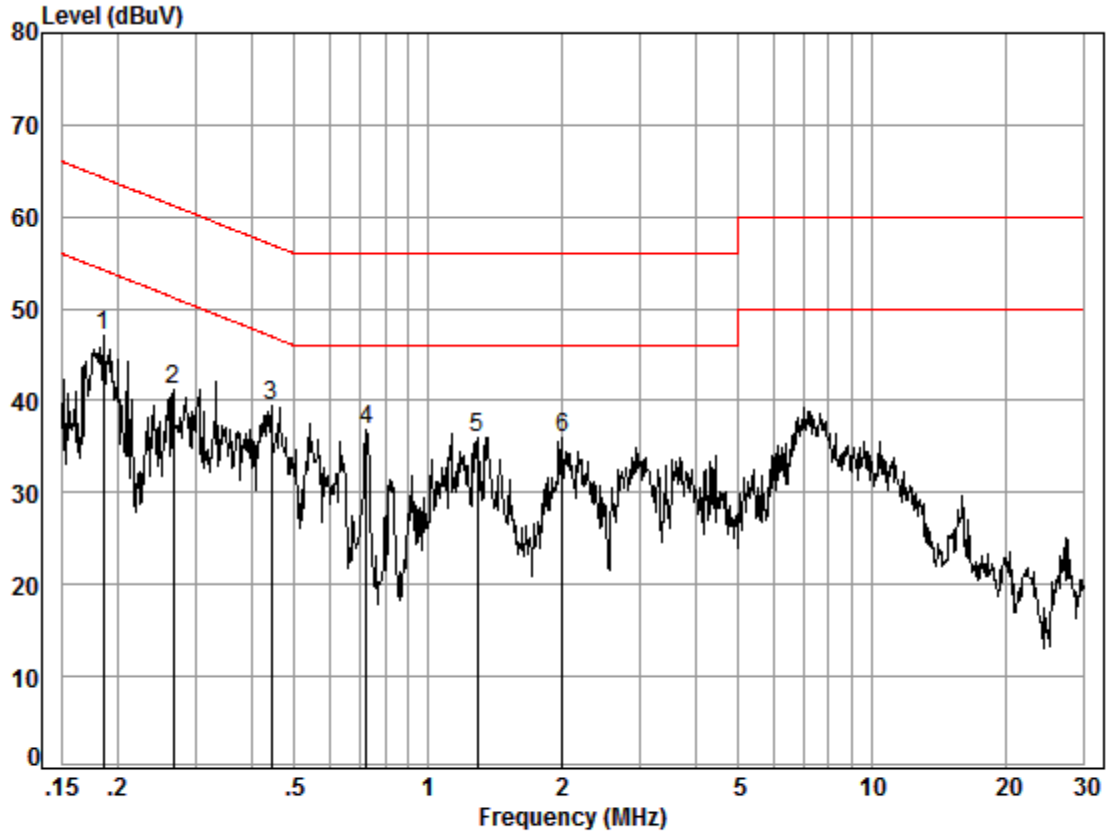
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,

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

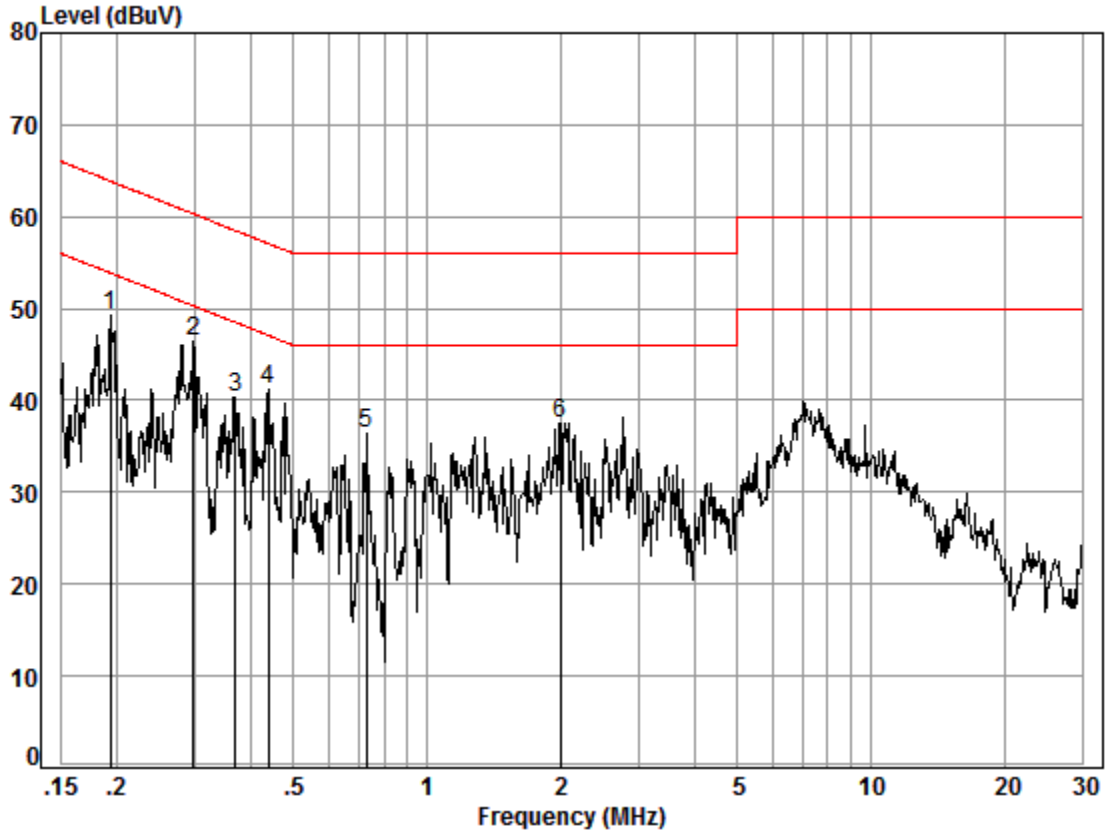
Mode:d; Line:Live Line



Site : Shielding Room
Condition: Line
Job No. : 10496CR
Test mode: d

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.19	0.02	9.51	37.57	47.10	54.24	-7.14	Peak
2	0.27	0.01	9.51	31.73	41.25	51.20	-9.95	Peak
3	0.44	0.01	9.49	29.86	39.36	46.98	-7.62	Peak
4	0.73	0.02	9.49	27.34	36.85	46.00	-9.15	Peak
5	1.29	0.02	9.51	26.43	35.96	46.00	-10.04	Peak
6	2.01	0.02	9.51	26.51	36.04	46.00	-9.96	Peak

Mode:d; Line:Neutral Line



Site : Shielding Room
Condition: Neutral
Job No. : 10496CR
Test mode: d

	Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1	0.19	0.02	9.57	39.66	49.25	53.89	-4.64	Peak
2	0.30	0.01	9.58	36.92	46.51	50.32	-3.81	Peak
3	0.37	0.01	9.58	30.73	40.32	48.52	-8.20	Peak
4	0.44	0.01	9.59	31.55	41.15	47.07	-5.92	Peak
5	0.73	0.02	9.62	26.83	36.47	46.00	-9.53	Peak
6	2.00	0.02	9.65	27.93	37.60	46.00	-8.40	Peak

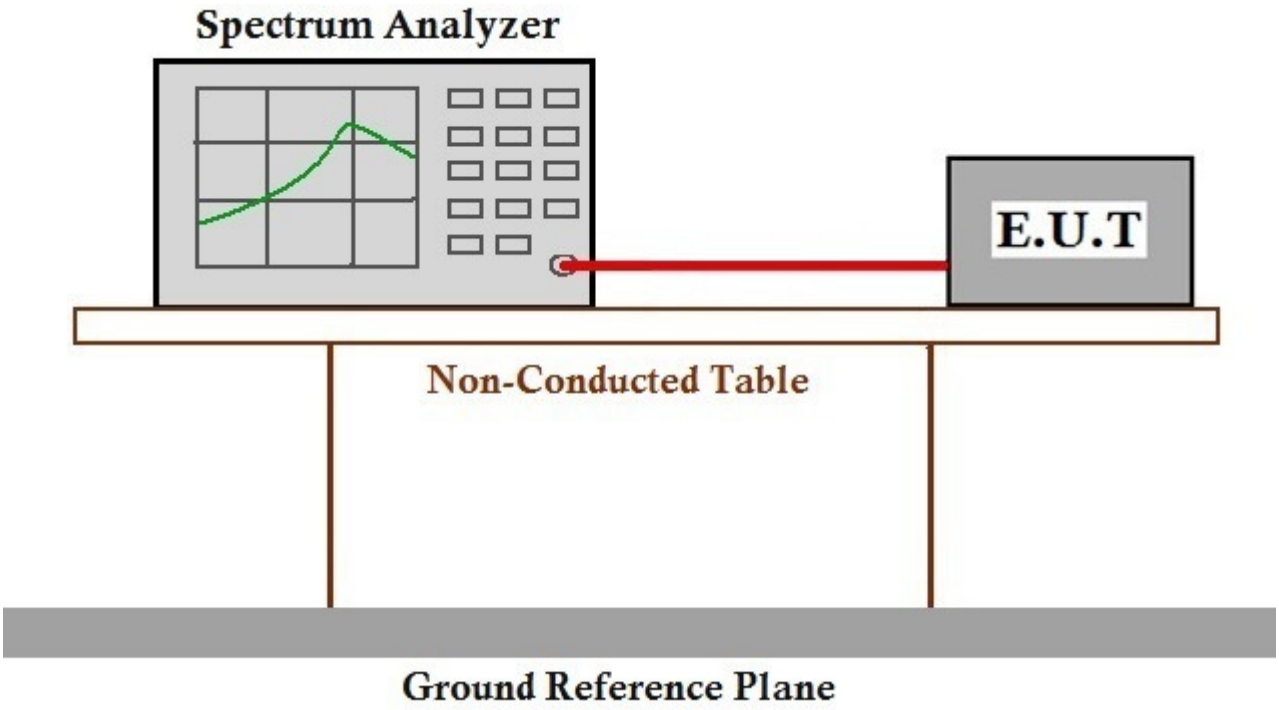
7.2 20dB Bandwidth

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: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1010 mbar
Test mode c:TX mode_Keep the EUT in transmitting with modulation mode.

7.2.2 Test Setup Diagram



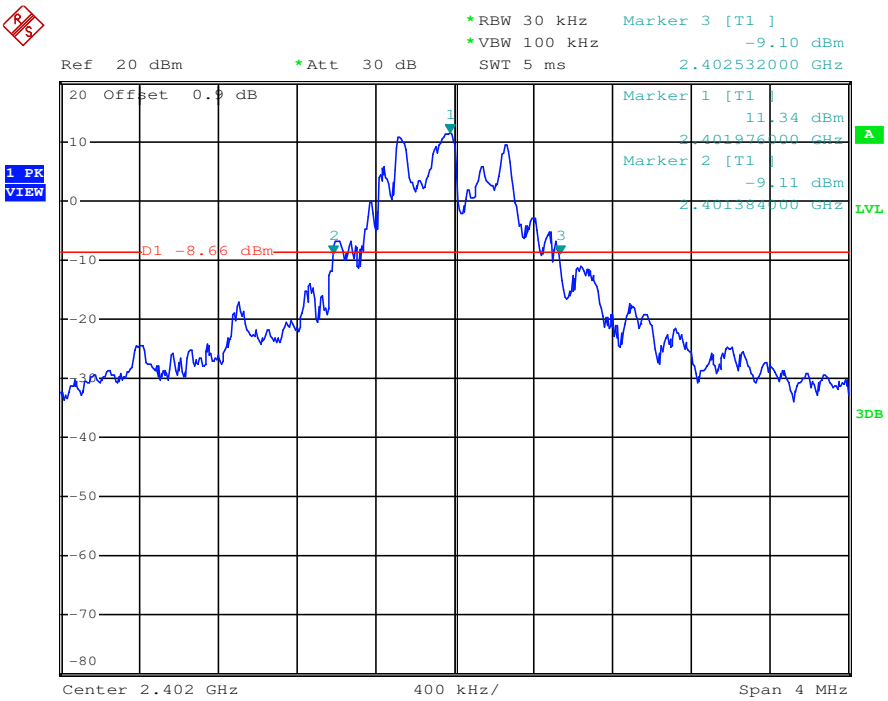
7.2.3 Measurement Procedure and Data

Measurement Data

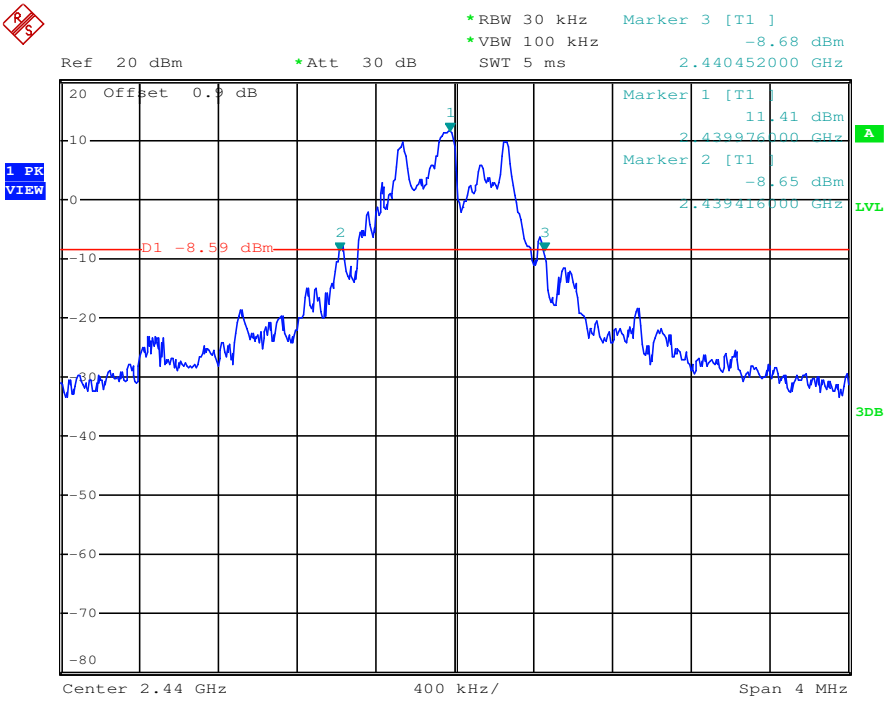
Test Channel	20dB bandwidth (MHz)	Results
Lowest	1.148	Pass
Middle	1.036	Pass
Highest	0.892	Pass

Test plot as follows:

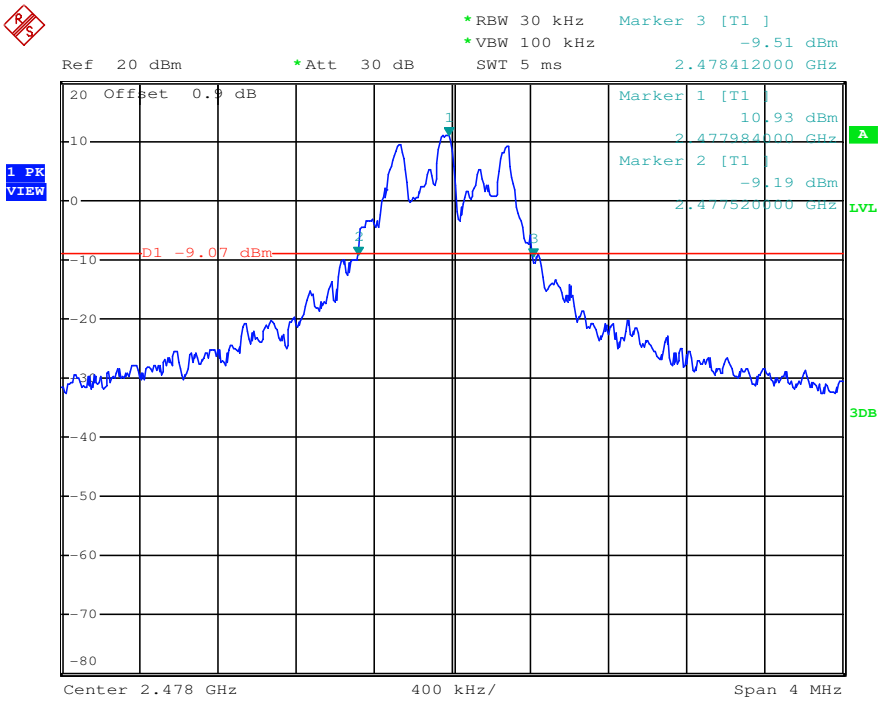
Test channel:	Lowest



Test channel:	Middle



Test channel:	Highest



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

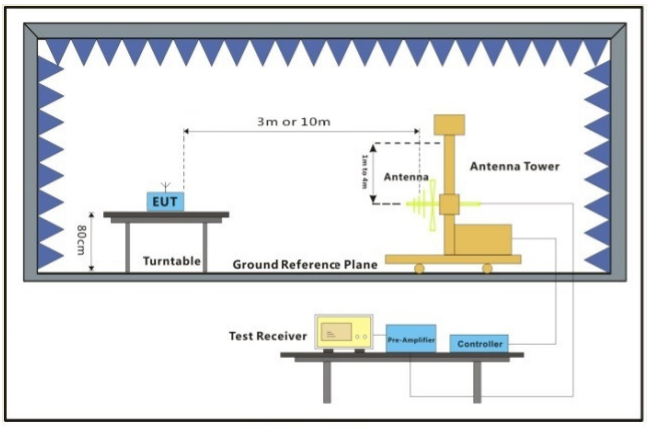
7.3.1 E.U.T. Operation

Operating Environment:

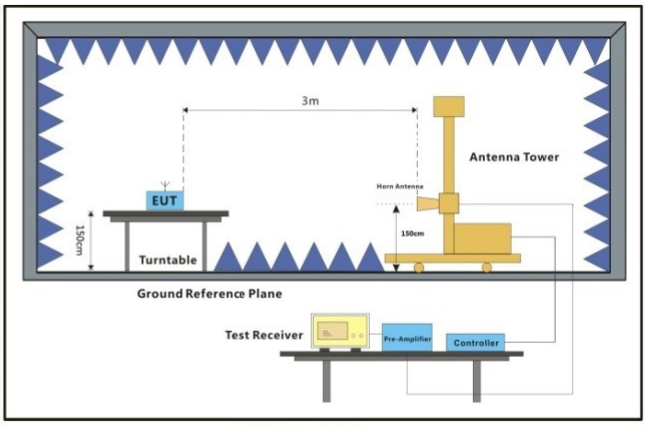
Temperature: 24 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar

Test mode c:TX mode_Keep the EUT in transmitting with modulation mode.

7.3.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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.

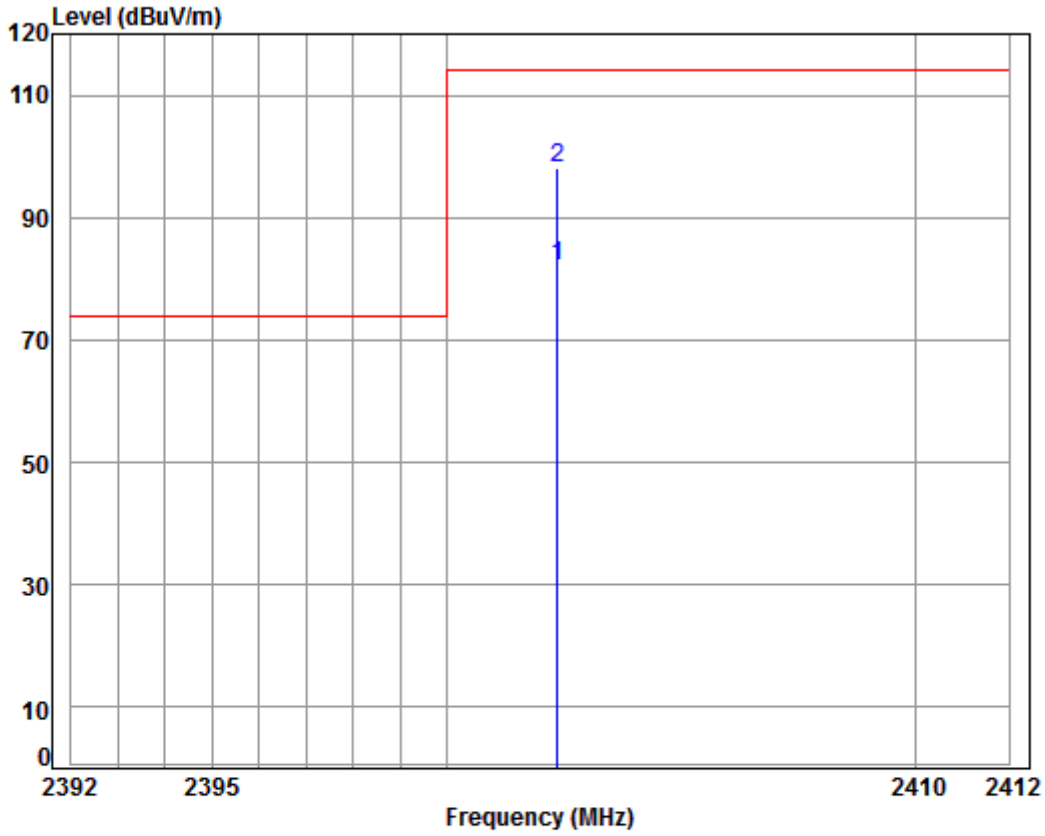
g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified 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.

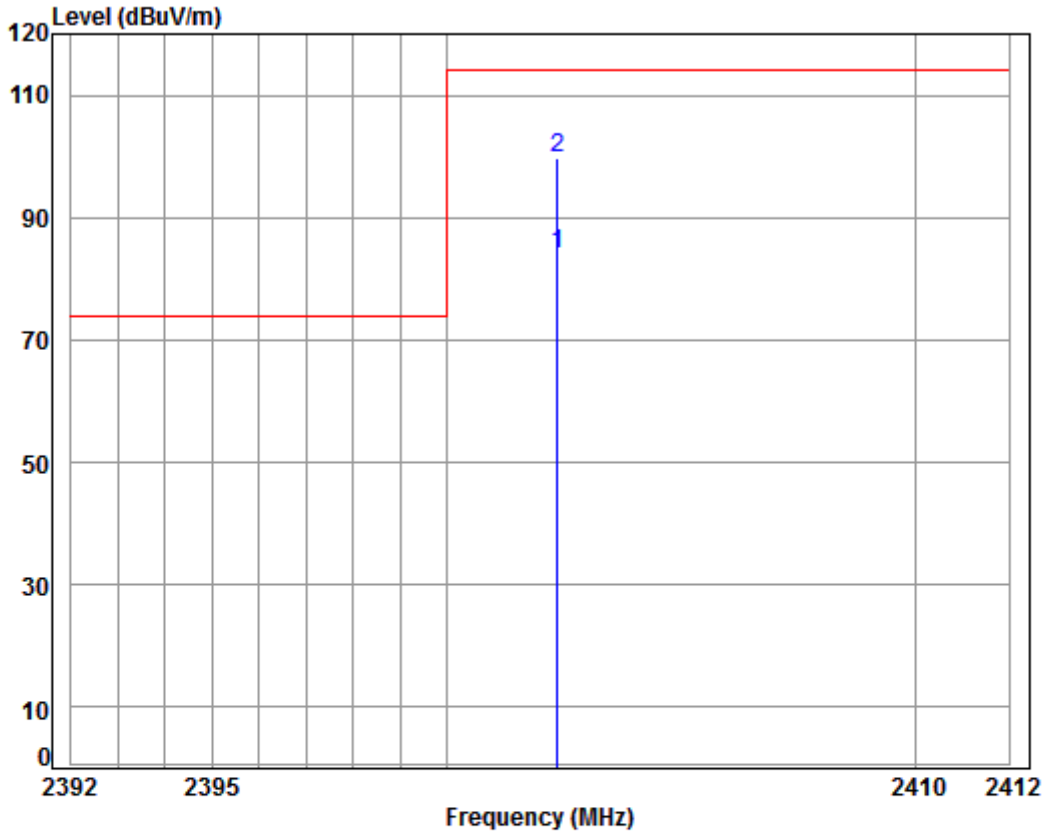
j. Repeat above procedures until all frequencies measured was complete.

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



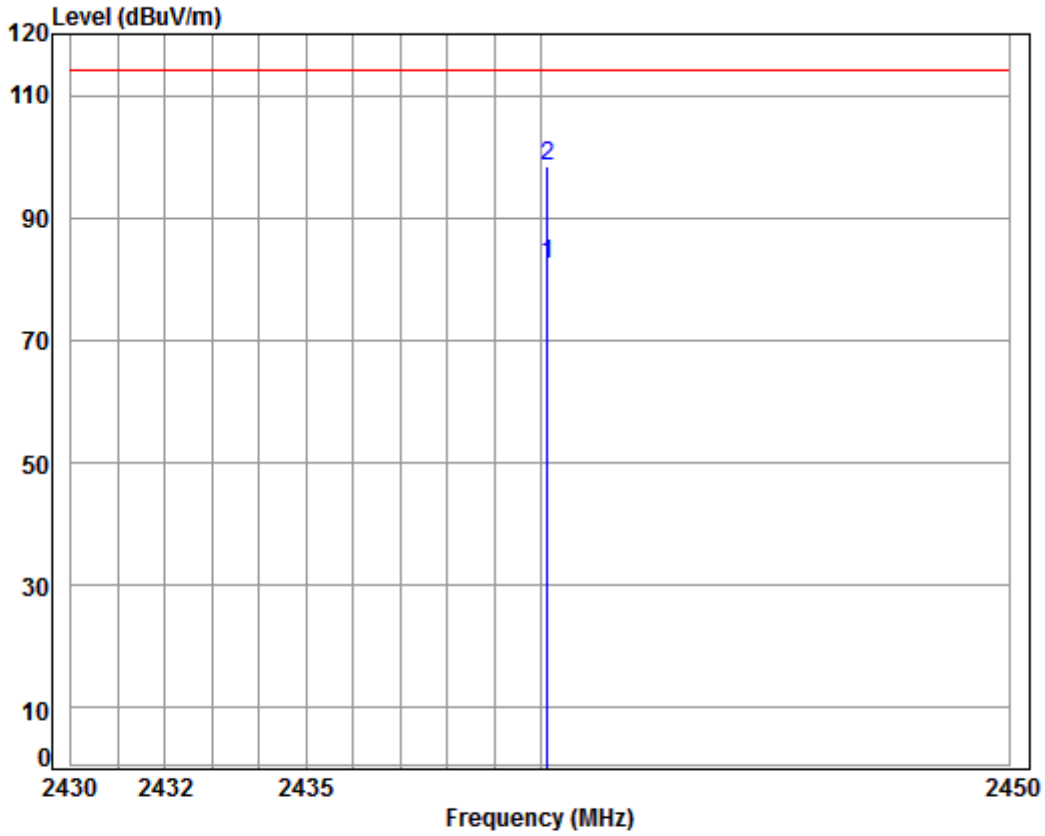
Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2402 Field strength

	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 2402.352	5.49	29.11	37.65	85.03	81.98	94.00	-12.02	Average
2	pk 2402.352	5.49	29.11	37.65	101.03	97.98	114.00	-16.02	Peak



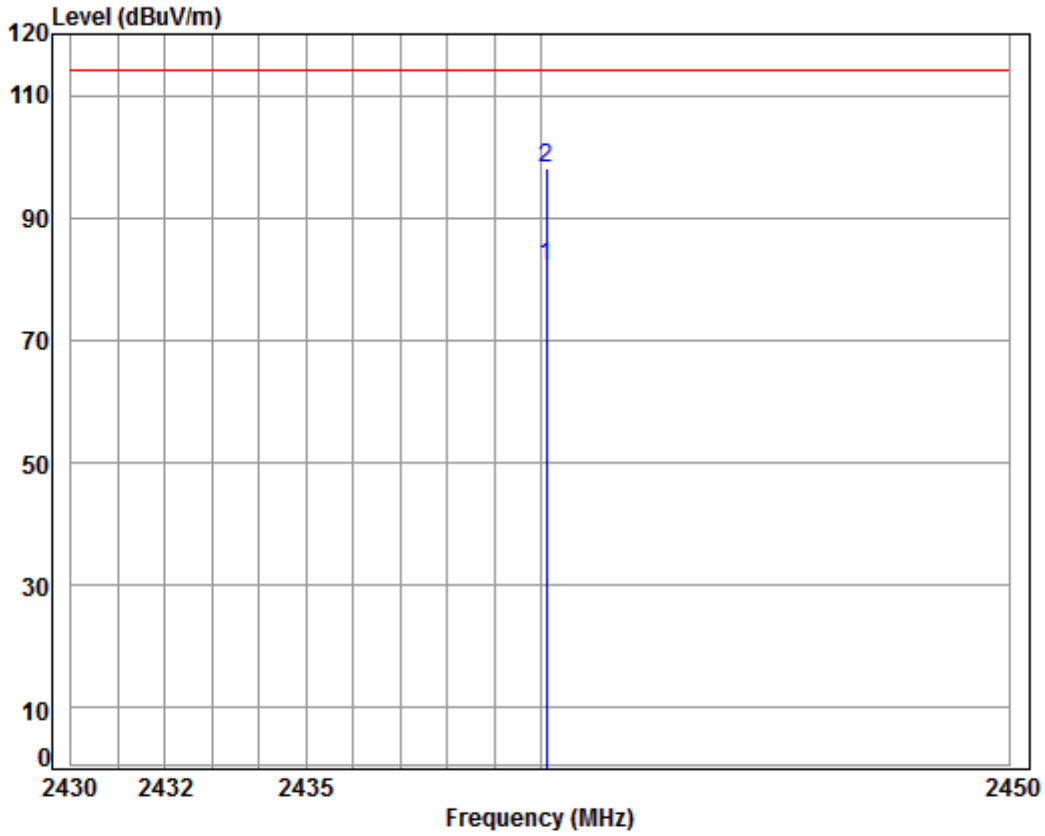
Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2402 Field strength

	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 2402.352	5.49	29.11	37.65	86.92	83.87	94.00	-10.13	Average
2	pk 2402.352	5.49	29.11	37.65	102.92	99.87	114.00	-14.13	Peak



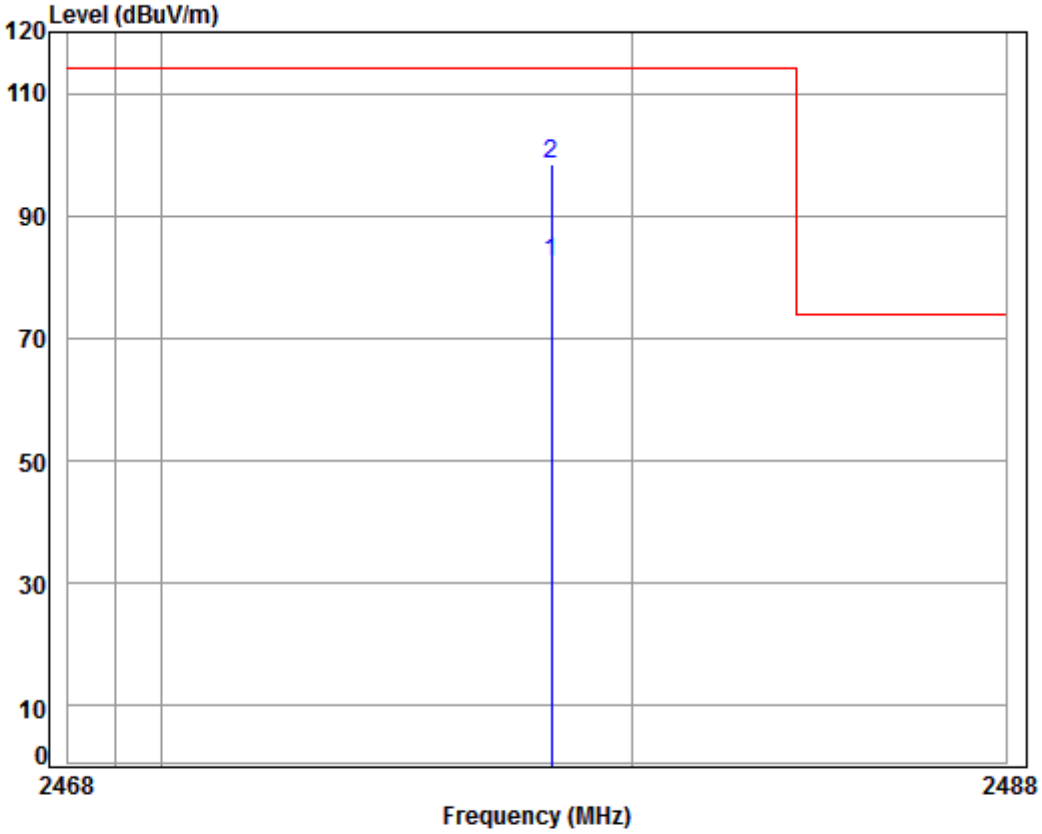
Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2440 Field strength

	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 2440.139	5.54	29.23	37.65	85.17	82.29	94.00	-11.71	Average
2	pk 2440.139	5.54	29.23	37.65	101.17	98.29	114.00	-15.71	Peak



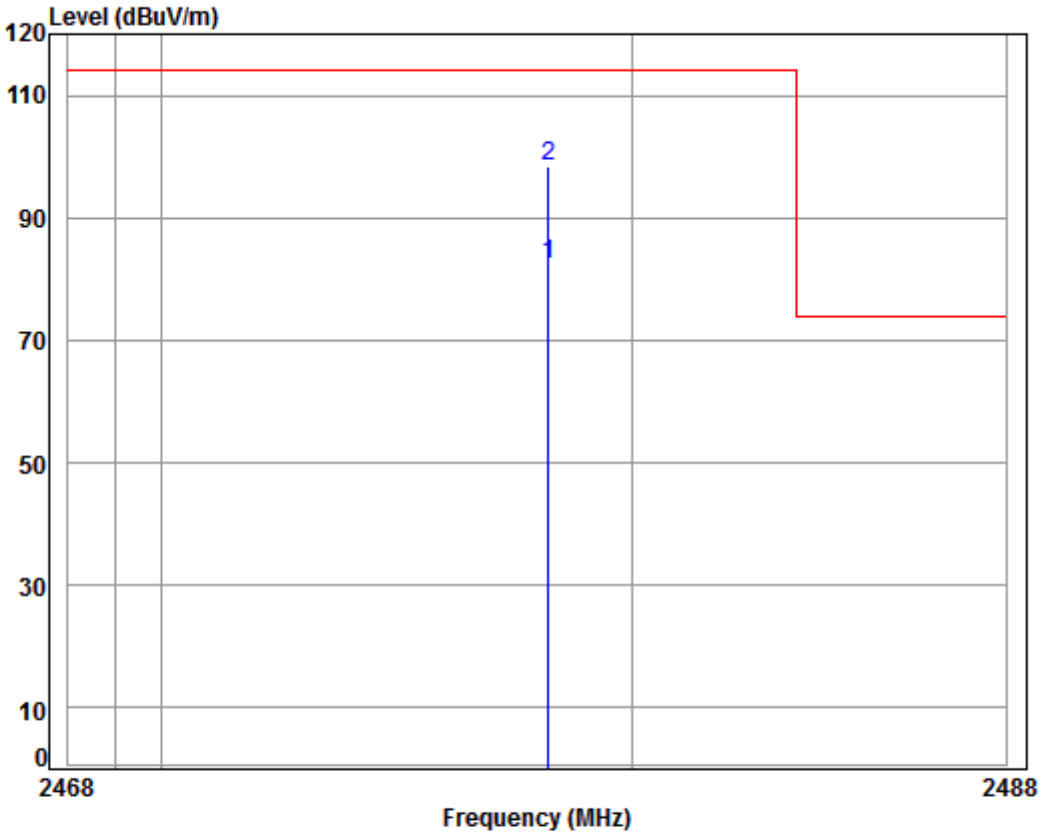
Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2440 Field strength

	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 2440.114	5.54	29.23	37.65	85.03	82.15	94.00	-11.85	Average
2	pk 2440.114	5.54	29.23	37.65	101.03	98.15	114.00	-15.85	Peak



Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2478 Field 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 2478.286	5.59	29.34	37.65	85.14	82.42	94.00	-11.58	Average
2	pk 2478.286	5.59	29.34	37.65	101.14	98.42	114.00	-15.58	peak



Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2478 Field 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 2478.236	5.59	29.34	37.65	85.22	82.50	94.00	-11.50	Average
2	pk 2478.236	5.59	29.34	37.65	101.22	98.50	114.00	-15.50	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

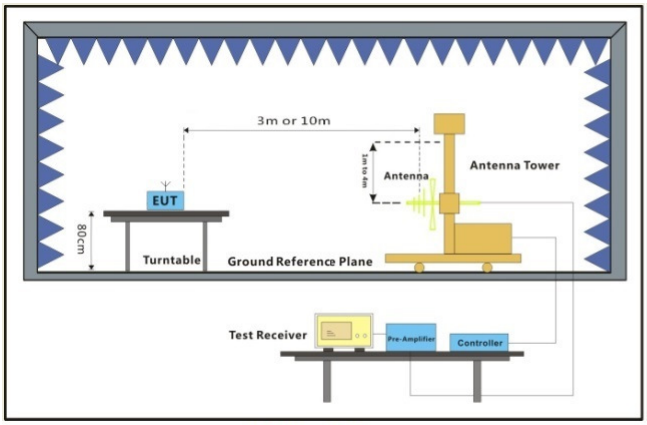
Operating Environment:

Temperature: 24 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar

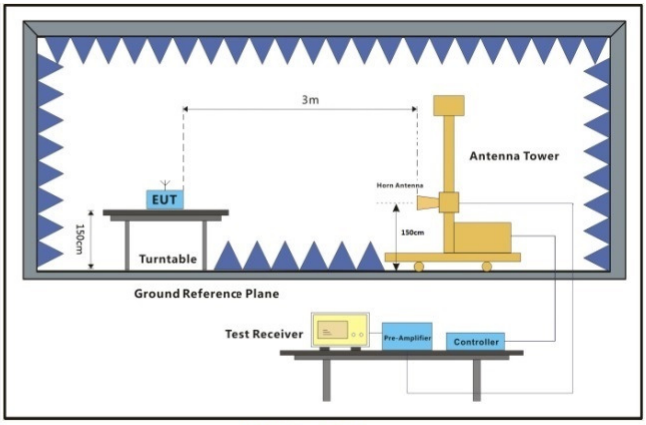
Pretest these mode to find the worst case: c:TX mode_Keep the EUT in transmitting with modulation mode.
d:Charge + TX mode_Keep the EUT in charging and transmitting with modulation mode.

The worst case for final test: d:Charge + TX mode_Keep the EUT in charging and transmitting with modulation mode.

7.4.2 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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.

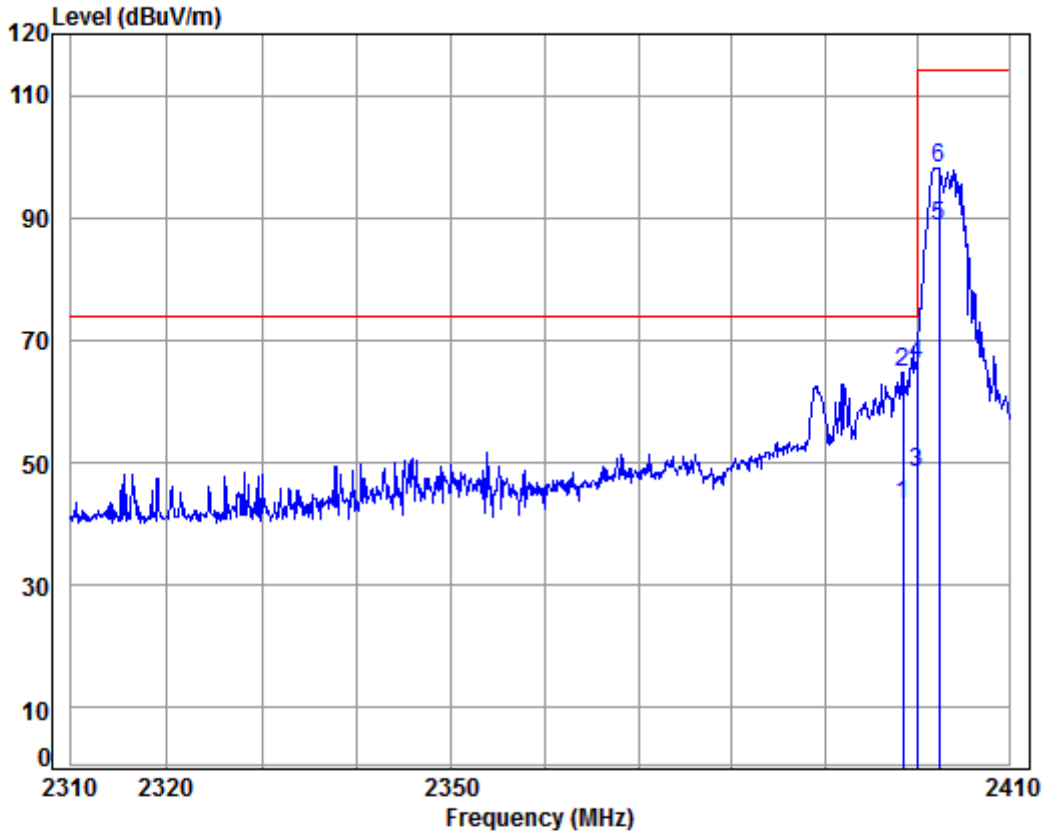
g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified 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.

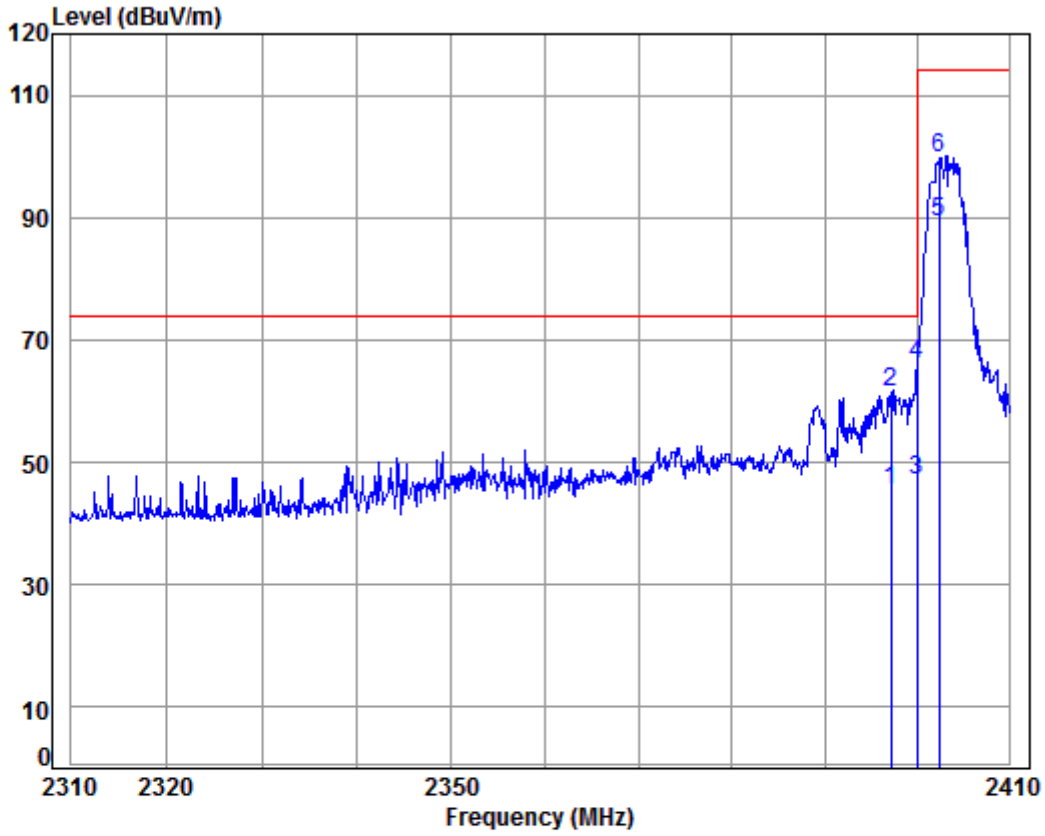
j. Repeat above procedures until all frequencies measured was complete.

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



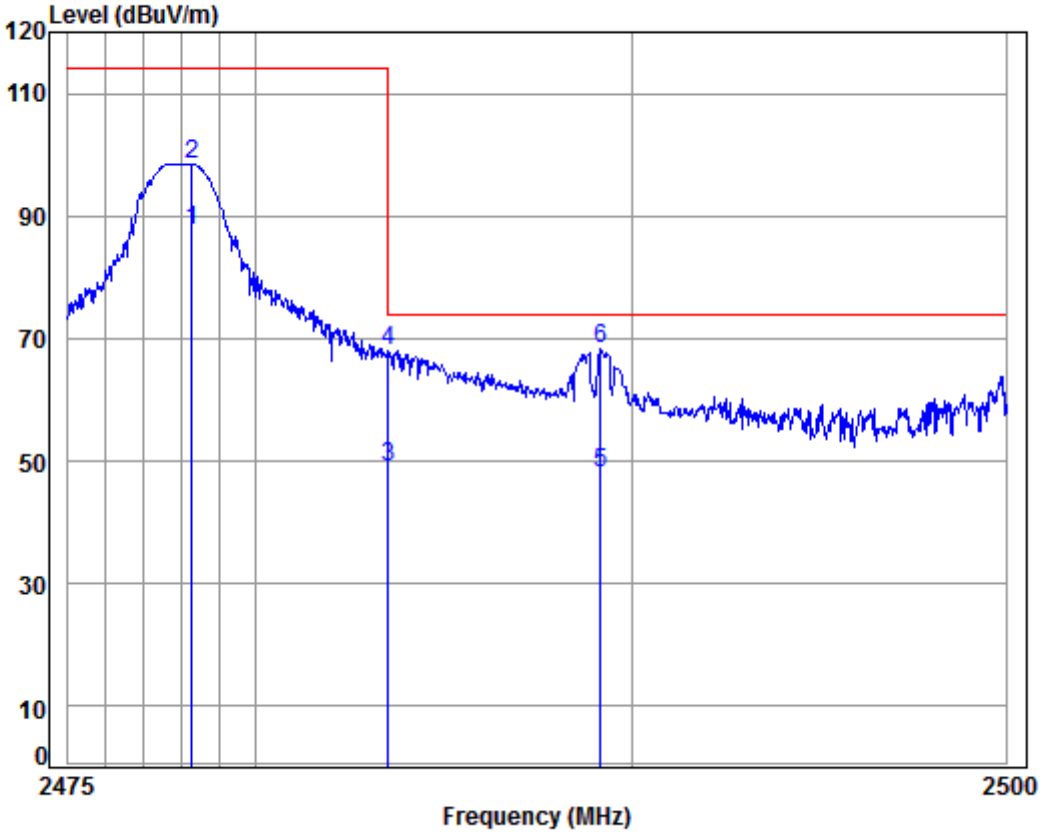
Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2402 Band edge

	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	2398.487	5.49	29.10	37.66	46.13	43.06	54.00	-10.94	Average
2	2398.487	5.49	29.10	37.66	67.92	64.85	74.00	-9.15	Peak
3	2400.000	5.49	29.11	37.66	51.47	48.41	54.00	-5.59	Average
4 pk	2400.000	5.49	29.11	37.66	69.15	66.09	74.00	-7.91	Peak
5 pp	2402.352	5.49	29.11	37.65	91.67	88.62	94.00	-5.38	Average
6	2402.352	5.49	29.11	37.65	101.03	97.98	114.00	-16.02	Peak



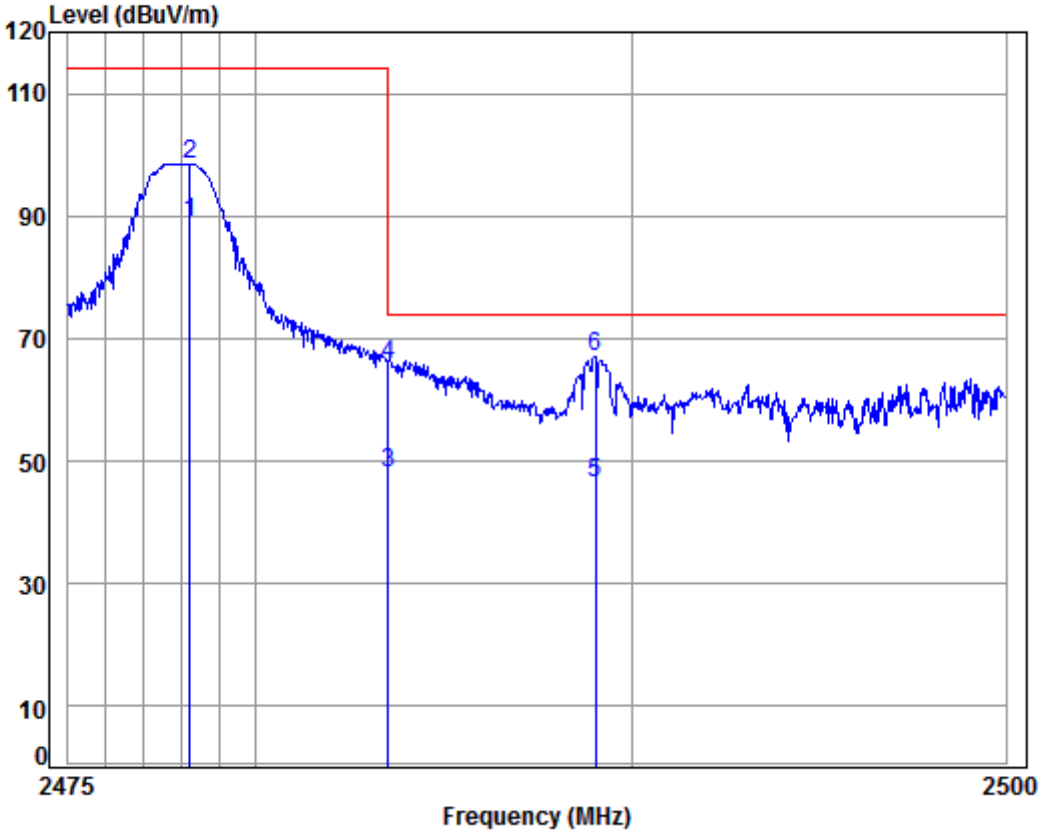
Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2402 Band edge

	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	2397.166	5.48	29.10	37.66	48.61	45.53	54.00	-8.47	Average
2	2397.166	5.48	29.10	37.66	64.47	61.39	74.00	-12.61	Peak
3	2400.000	5.49	29.11	37.66	50.00	46.94	54.00	-7.06	Average
4 pk	2400.000	5.49	29.11	37.66	69.10	66.04	74.00	-7.96	Peak
5 pp	2402.352	5.49	29.11	37.65	92.21	89.16	94.00	-4.84	Average
6	2402.352	5.49	29.11	37.65	102.92	99.87	114.00	-14.13	Peak



Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2478 Band edge

		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		2478.286	5.59	29.34	37.65	90.35	87.63	94.00	-6.37	Average
2		2478.286	5.59	29.34	37.65	101.14	98.42	114.00	-15.58	peak
3	pp	2483.500	5.60	29.35	37.65	51.71	49.01	54.00	-4.99	Average
4		2483.500	5.60	29.35	37.65	70.57	67.87	74.00	-6.13	peak
5		2489.169	5.61	29.37	37.65	50.70	48.03	54.00	-5.97	Average
6	pk	2489.169	5.61	29.37	37.65	70.87	68.20	74.00	-5.80	peak



Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2478 Band edge

	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 2478.236	5.59	29.34	37.65	91.67	88.95	94.00	-5.05	Average
2	2478.236	5.59	29.34	37.65	101.22	98.50	114.00	-15.50	peak
3	2483.500	5.60	29.35	37.65	50.71	48.01	54.00	-5.99	Average
4	2483.500	5.60	29.35	37.65	68.48	65.78	74.00	-8.22	Peak
5	2489.019	5.61	29.37	37.65	49.11	46.44	54.00	-7.56	Average
6	pk 2489.019	5.61	29.37	37.65	69.71	67.04	74.00	-6.96	peak

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

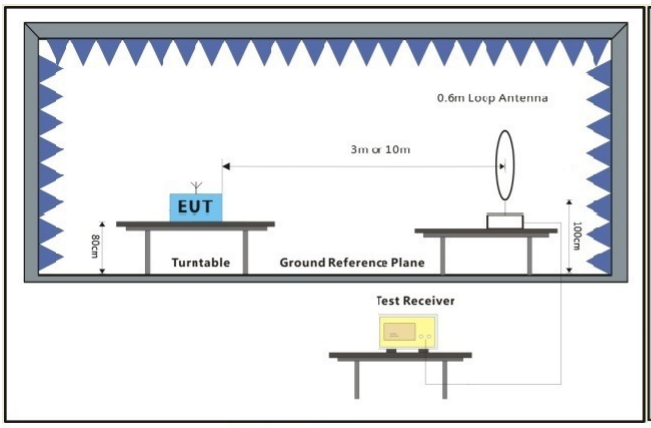
Operating Environment:

Temperature: 24 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar

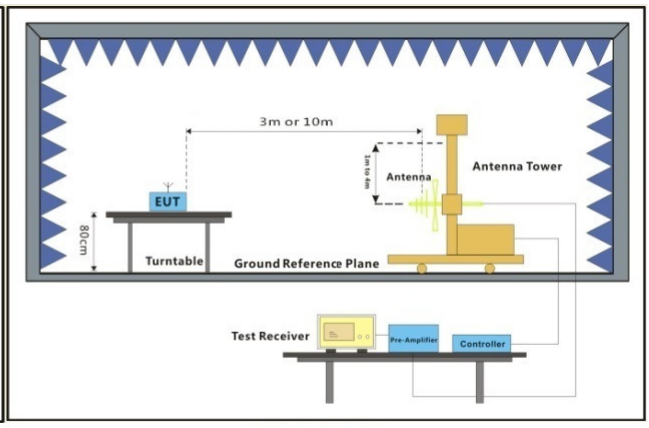
Pretest these mode to find the worst case: c:TX mode_Keep the EUT in transmitting with modulation mode.
d:Charge + TX mode_Keep the EUT in charging and transmitting with modulation mode.

The worst case for final test: d:Charge + TX mode_Keep the EUT in charging and transmitting with modulation mode.
For below 1GHz, tests were conducted in H/M/L channels and the worst case is reported only.

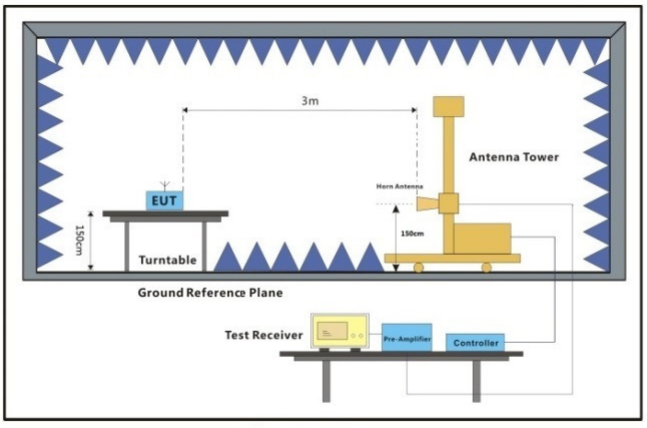
7.5.2 Test Setup Diagram



Below 30MHz



30MHz-1GHz



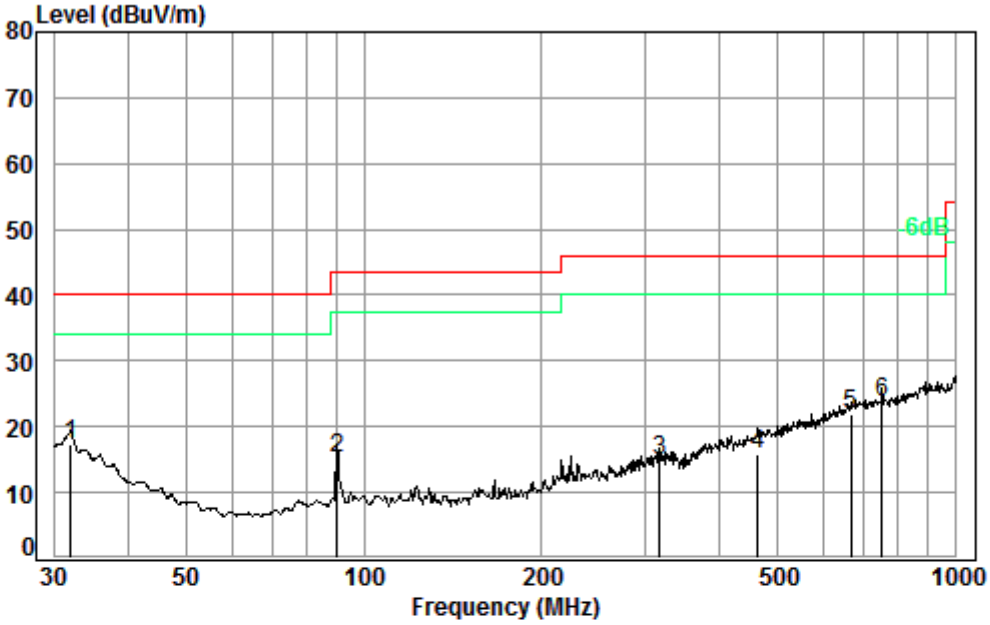
Above 1GHz

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.

Radiated emission below 1GHz

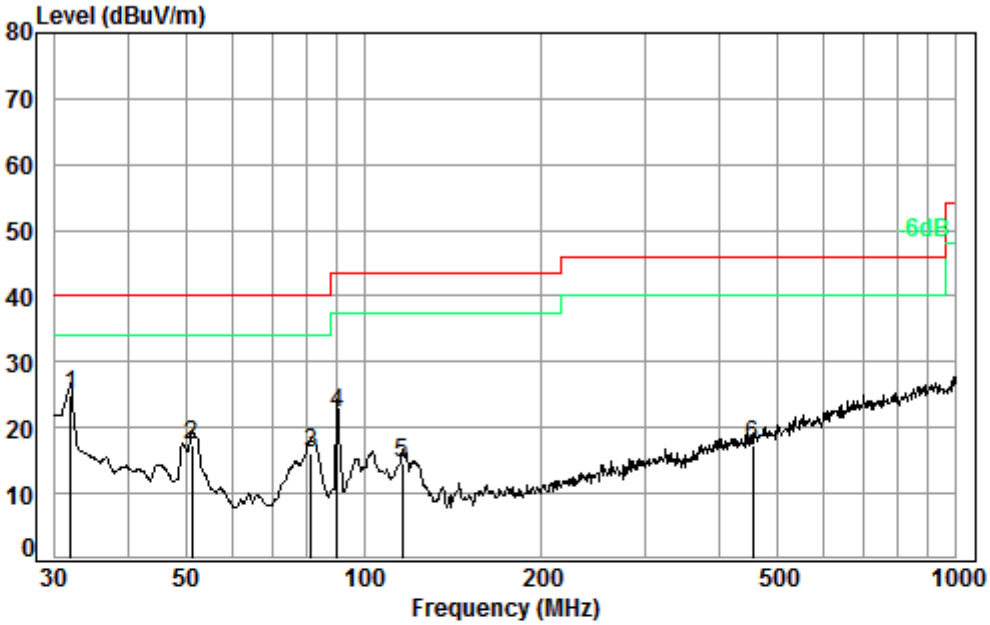
Mode:d; Polarization:Horizontal; Channel:Low



Condition: 3m HORIZONTAL
Job No. : 10496CR
Test mode: d

	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	31.95	0.60	17.61	27.35	26.56	17.42	40.00	-22.58
2	90.22	1.10	8.71	27.21	32.75	15.35	43.50	-28.15
3	316.59	1.95	14.50	26.52	24.89	14.82	46.00	-31.18
4	462.35	2.46	17.34	27.52	23.39	15.67	46.00	-30.33
5	665.80	2.84	21.11	27.45	25.25	21.75	46.00	-24.25
6 pp	750.11	3.06	21.70	27.35	26.38	23.79	46.00	-22.21

Mode:d; Polarization:Vertical; Channel:Low

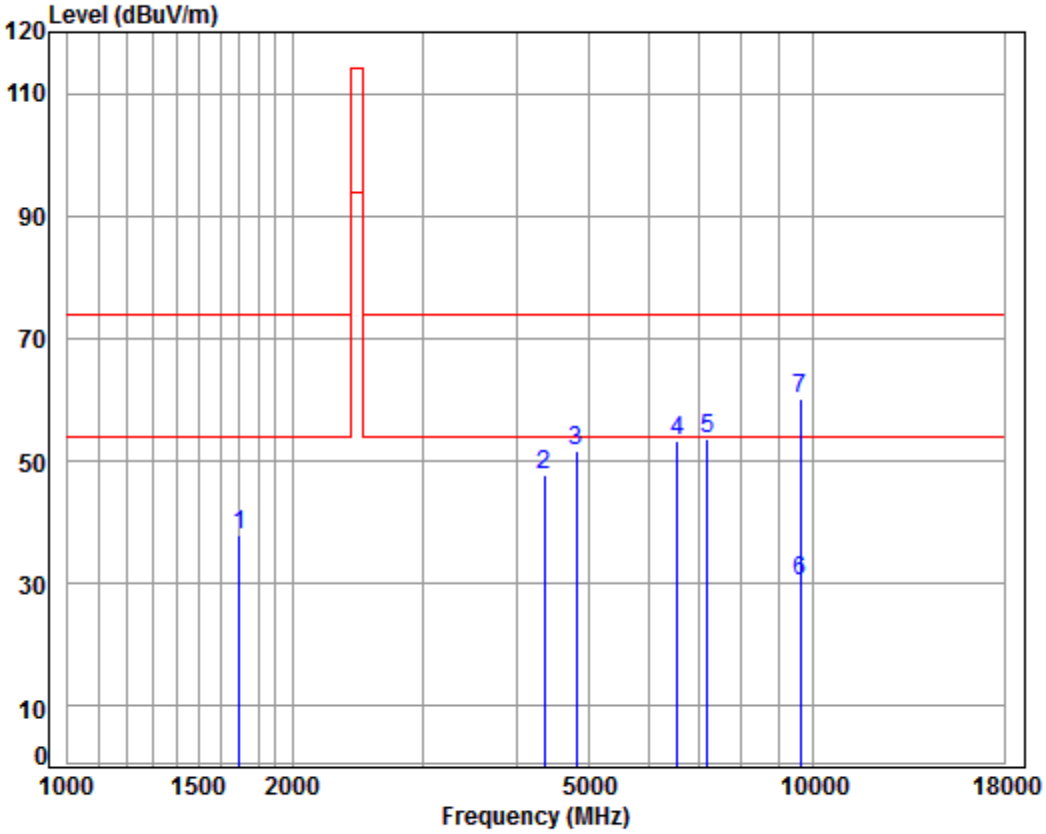


Condition: 3m VERTICAL
Job No. : 10496CR
Test mode: d

	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 pp	31.95	0.60	17.61	27.35	33.96	24.82	40.00	-15.18
2	51.30	0.80	8.50	27.29	35.45	17.46	40.00	-22.54
3	81.50	1.10	7.85	27.23	34.41	16.13	40.00	-23.87
4	90.22	1.10	8.71	27.21	39.75	22.35	43.50	-21.15
5	116.13	1.24	8.17	27.09	32.26	14.58	43.50	-28.92
6	454.31	2.43	17.06	27.46	25.18	17.21	46.00	-28.79

Transmitter emission above 1GHz

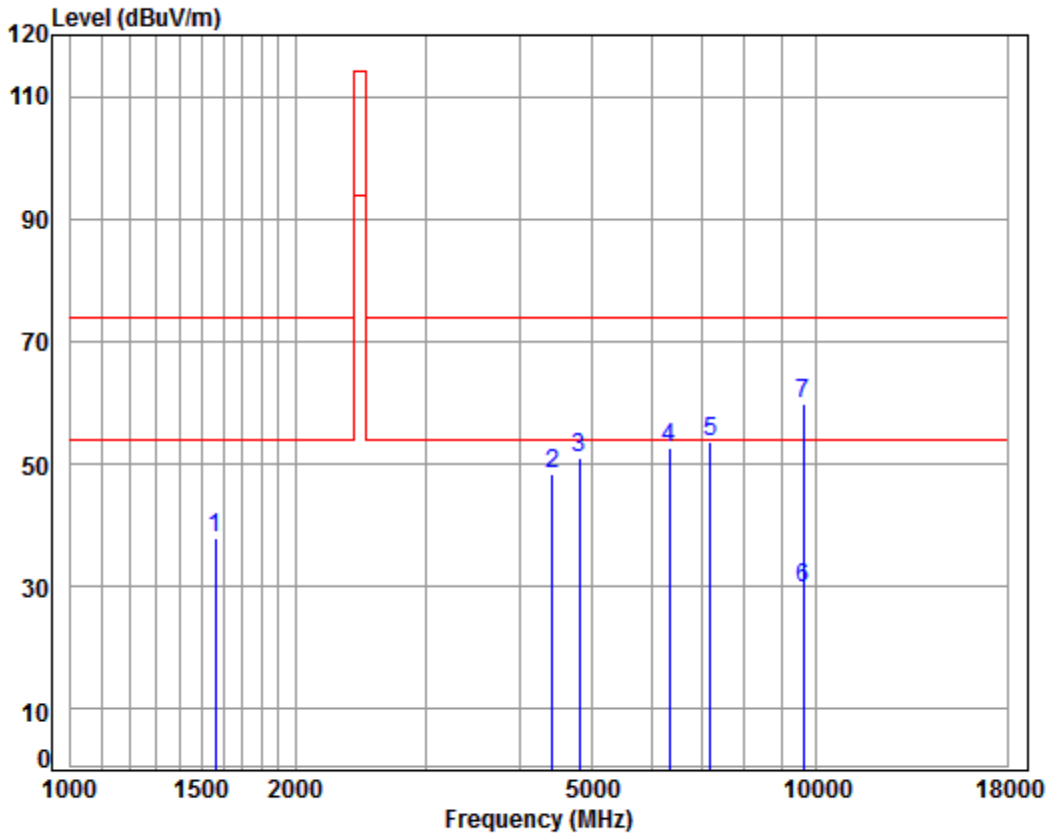
Mode:d; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:Low



Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2402 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	1697.129	5.23	26.66	37.72	43.76	37.93	74.00	-36.07	peak
2	4354.454	7.40	33.60	37.18	43.99	47.81	74.00	-26.19	peak
3	4804.000	7.89	34.16	37.26	46.82	51.61	74.00	-22.39	peak
4	6564.209	11.35	35.29	37.73	44.45	53.36	74.00	-20.64	peak
5	7206.000	10.08	36.42	37.56	44.79	53.73	74.00	-20.27	peak
6 av	9608.000	10.75	37.52	35.80	17.80	30.27	54.00	-23.73	Average
7 pp	9608.000	10.75	37.52	35.80	47.80	60.27	74.00	-13.73	peak

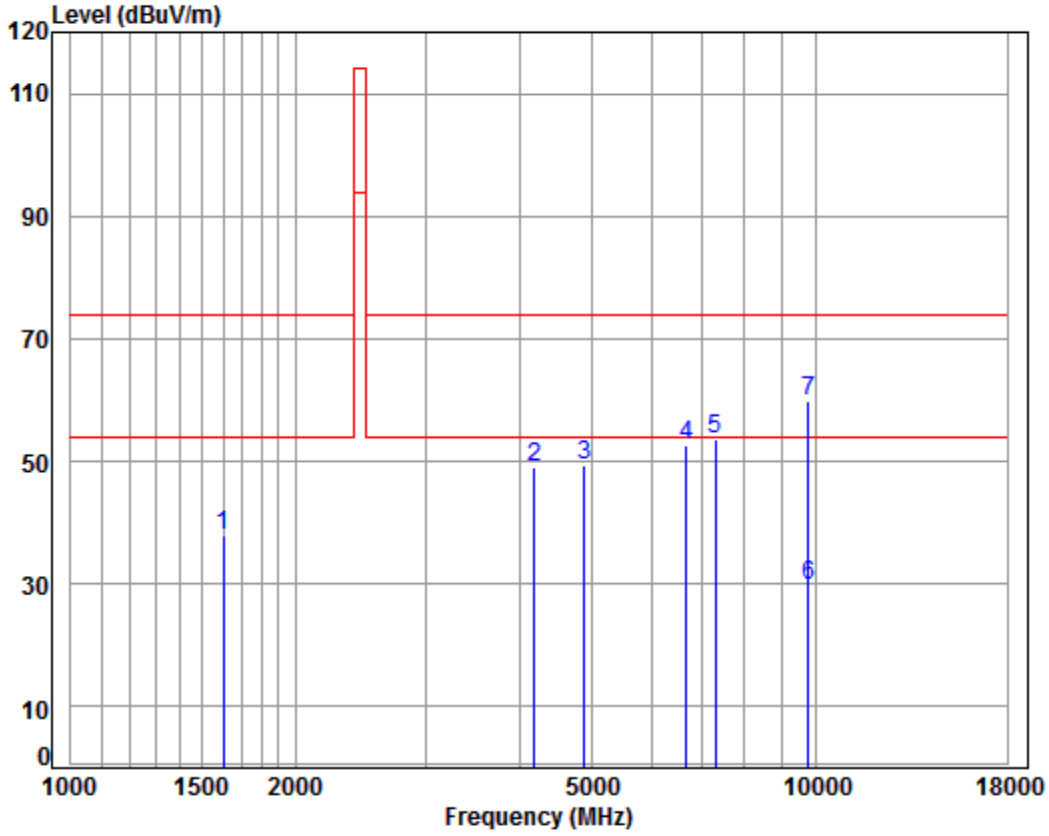
Mode:d; Polarization:Vertical; Modulation Type:GFSK; ; Channel:Low



Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2402 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	1565.191	5.39	26.10	37.74	44.24	37.99	74.00	-36.01	peak
2	4417.841	7.47	33.60	37.19	44.48	48.36	74.00	-25.64	peak
3	4804.000	7.89	34.16	37.26	46.14	50.93	74.00	-23.07	peak
4	6340.436	11.24	34.98	37.79	44.32	52.75	74.00	-21.25	peak
5	7206.000	10.08	36.42	37.56	44.77	53.71	74.00	-20.29	peak
6 av	9608.000	10.75	37.52	35.80	17.40	29.87	54.00	-24.13	Average
7 pp	9608.000	10.75	37.52	35.80	47.40	59.87	74.00	-14.13	peak

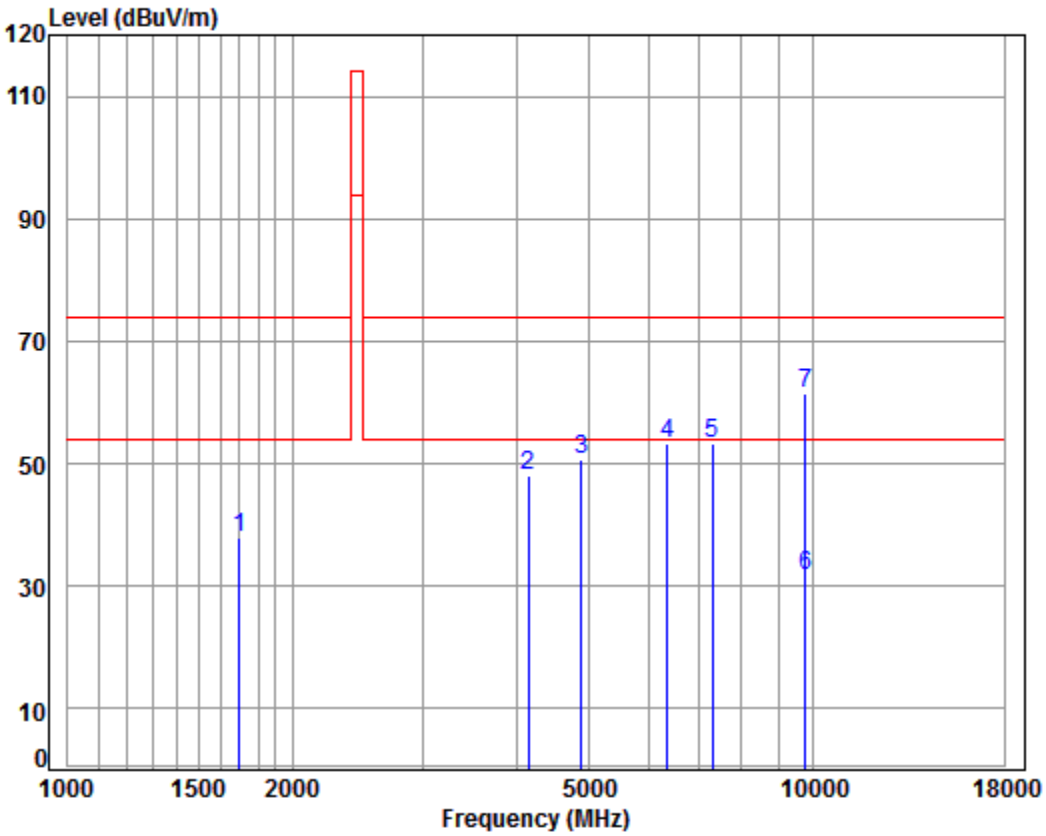
Mode:d; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:middle



Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2440 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	1601.804	5.35	26.26	37.73	44.03	37.91	74.00	-36.09	peak
2	4181.768	7.20	33.60	37.14	45.24	48.90	74.00	-25.10	peak
3	4880.000	7.97	34.29	37.28	44.31	49.29	74.00	-24.71	peak
4	6698.373	10.97	35.67	37.69	43.77	52.72	74.00	-21.28	peak
5	7320.000	10.05	36.37	37.53	44.71	53.60	74.00	-20.40	peak
6 av	9760.000	10.82	37.55	35.68	17.18	29.87	54.00	-24.13	Average
7 pp	9760.000	10.82	37.55	35.68	47.18	59.87	74.00	-14.13	peak

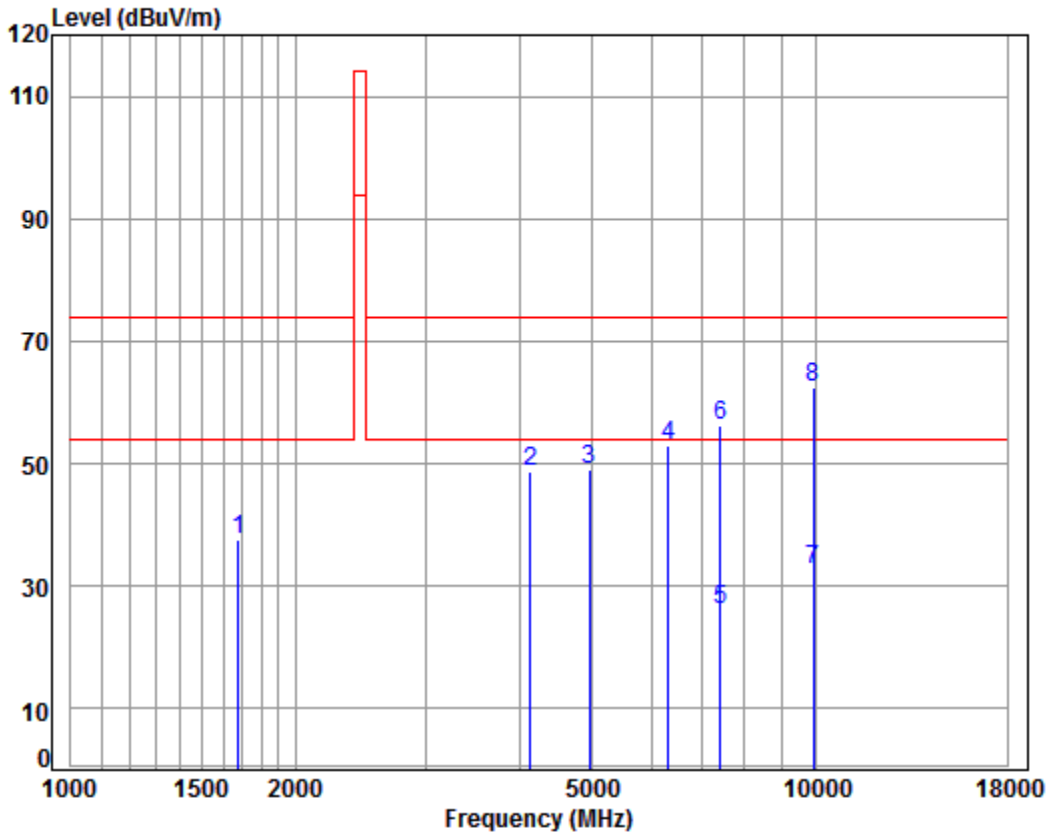
Mode:d; Polarization:Vertical; Modulation Type:GFSK; ; Channel:middle



Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2440 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	1697.129	5.23	26.66	37.72	43.61	37.78	74.00	-36.22	peak
2	4145.664	7.16	33.60	37.13	44.38	48.01	74.00	-25.99	peak
3	4880.000	7.97	34.29	37.28	45.58	50.56	74.00	-23.44	peak
4	6358.789	11.27	34.99	37.79	44.76	53.23	74.00	-20.77	peak
5	7320.000	10.05	36.37	37.53	44.55	53.44	74.00	-20.56	peak
6 av	9760.000	10.82	37.55	35.68	18.89	31.58	54.00	-22.42	Average
7 pp	9760.000	10.82	37.55	35.68	48.89	61.58	74.00	-12.42	peak

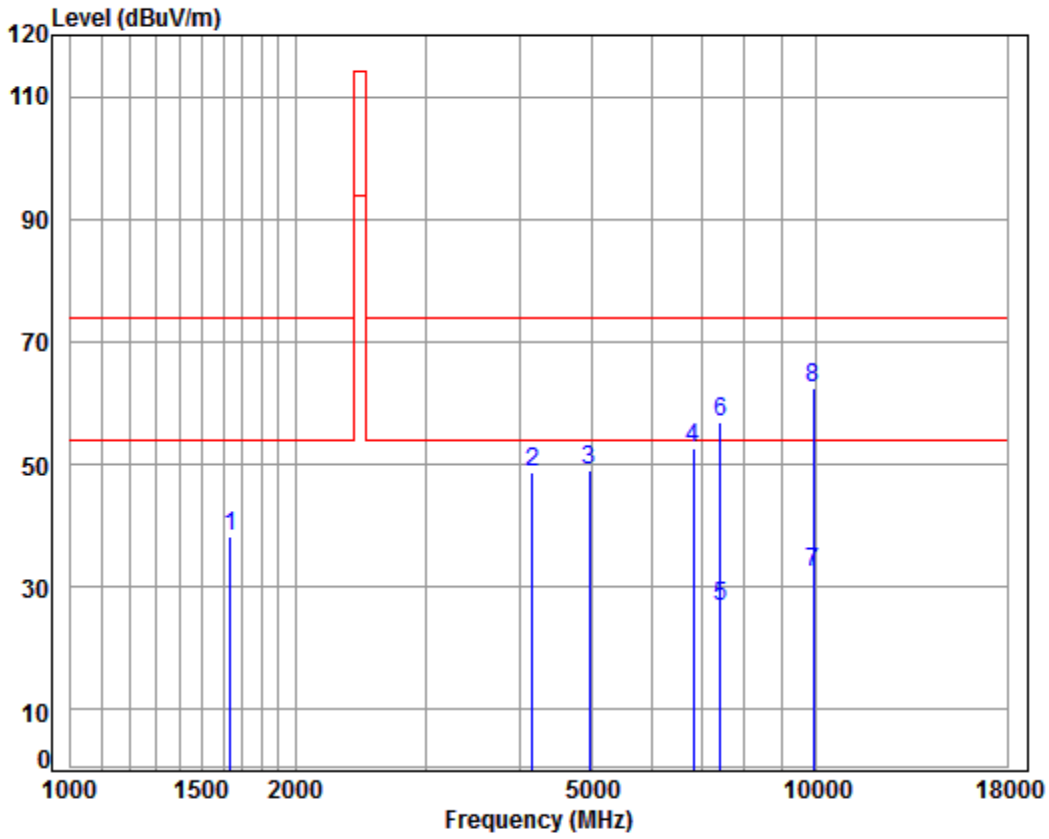
Mode:d; Polarization:Horizontal; Modulation Type:GFSK; ; Channel:High



Condition: 3m HORIZONTAL
Job No : 10496CR
Mode : 2478 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		1677.621	5.25	26.58	37.73	43.35	37.45	74.00	-36.55	peak
2		4133.699	7.14	33.60	37.13	45.03	48.64	74.00	-25.36	peak
3		4956.000	8.05	34.42	37.29	43.96	49.14	74.00	-24.86	peak
4		6322.136	11.20	34.96	37.80	44.52	52.88	74.00	-21.12	peak
5		7434.000	10.02	36.33	37.51	17.45	26.29	54.00	-27.71	Average
6		7434.000	10.02	36.33	37.51	47.45	56.29	74.00	-17.71	peak
7	av	9912.000	10.90	37.58	35.57	19.68	32.59	54.00	-21.41	Average
8	pp	9912.000	10.90	37.58	35.57	49.68	62.59	74.00	-11.41	peak

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



Condition: 3m VERTICAL
Job No : 10496CR
Mode : 2478 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	1639.274	5.30	26.42	37.73	44.22	38.21	74.00	-35.79	peak
2	4157.664	7.17	33.60	37.13	45.23	48.87	74.00	-25.13	peak
3	4956.000	8.05	34.42	37.29	43.77	48.95	74.00	-25.05	peak
4	6835.278	10.58	36.05	37.65	43.79	52.77	74.00	-21.23	peak
5	7434.000	10.02	36.33	37.51	18.07	26.91	54.00	-27.09	Average
6	7434.000	10.02	36.33	37.51	48.07	56.91	74.00	-17.09	peak
7 av	9912.000	10.90	37.58	35.57	19.58	32.49	54.00	-21.51	Average
8 pp	9912.000	10.90	37.58	35.57	49.58	62.49	74.00	-11.51	peak

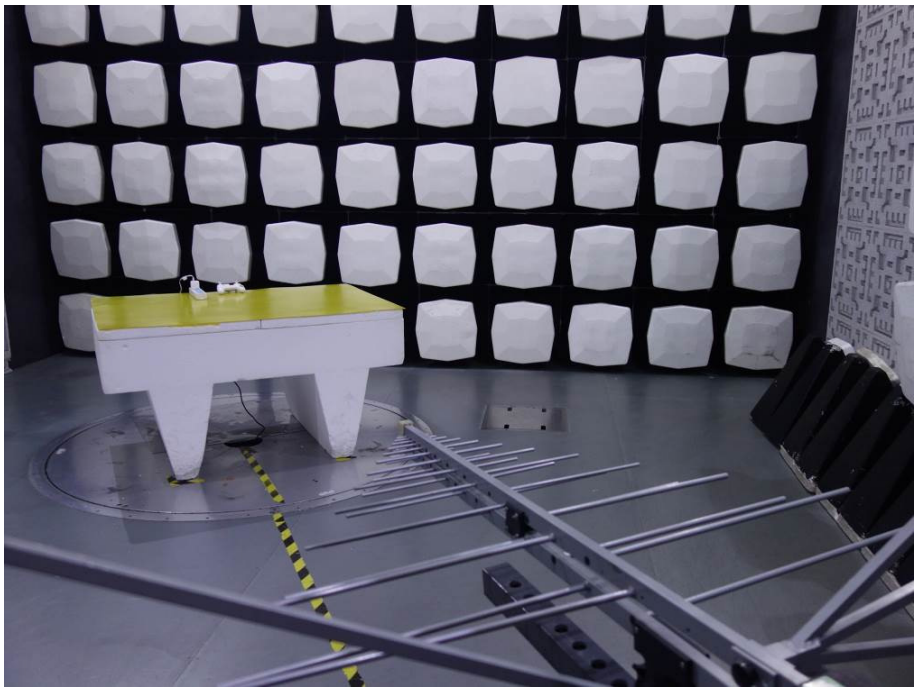
Remark:

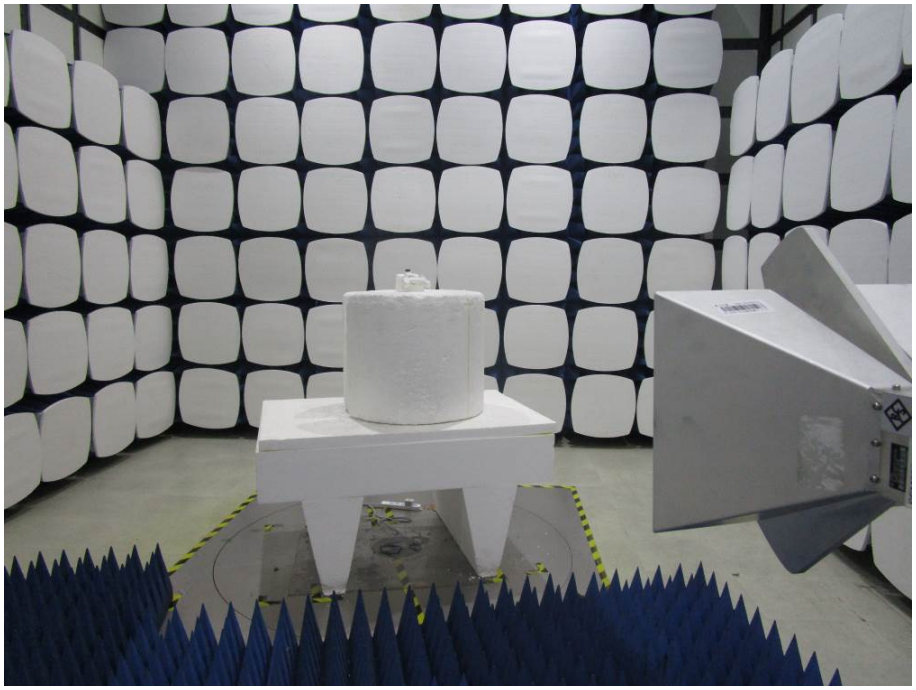
1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor
2) Scan from 9kHz to 25GHz, the disturbance above 18GHz 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 above measurement data 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





8.3 EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for SZEM1710010496CR.