



**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.: SZEM170600607703  
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# TEST REPORT

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

**Equipment Under Test (EUT):**

**EUT Name:** Construct'n Learn Smart Workbench  
**Item No.:** 643651, 643651C, 643651E4, 643651E4C ♣

♣ Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.

**P.O. No.:** HKPO17001675

**Labeled Age Grading:** 3+ Years

**Country of Origin:** China

**Country of Destination:** US

**FCC ID:** LU9643651C

**Standards:** 47 CFR Part 15, Subpart C 15.225

**Date of Receipt:** 2017-06-15

**Date of Test:** 2017-06-19 to 2017-06-20

**Date of Issue:** 2017-06-22

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



Jack Zhang  
EMC Laboratory Manager

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

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<b>Revision Record</b>				
<b>Version</b>	<b>Chapter</b>	<b>Date</b>	<b>Modifier</b>	<b>Remark</b>
01		2017-06-22		Original

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



## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.225	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 15.225	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Emission Mask	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)	Pass
Frequency tolerance	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart C 15.225(e)	Pass
Radiated Emissions(9kHz-30MHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass
Radiated Emissions(30MHz-1GHz)	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass

### Remark:

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

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



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## 4 General Information

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

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

Operation Frequency: 13.56MHz  
Antenna type: Loop antenna

### 4.2 Description of Support Units

The EUT has been tested independently.

### 4.3 Measurement Uncertainty

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



#### **4.4 Test Location**

All tests were performed at:

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

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

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

No tests were sub-contracted.

#### **4.5 Test Facility**

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

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

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

- **VCCI**

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

- **FCC – Registration No.: 556682**

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

- **Industry Canada (IC)**

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

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

None

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

None



## 5 Equipment List

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13

Frequency tolerance					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Signal Generator	Rohde & Schwarz	SML03	SEM006-02	2017-04-14	2018-04-13

Radiated Emissions(9kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2017-05-10	2018-05-10
EMI Test Receiver (9k-3GHz)	Rohde & Schwarz	ESCI	SEM004-01	2017-04-14	2018-04-13
Trilog-Broadband Antenna(30M-1GHz)	Schwarzbeck	VULB9168	SEM003-17	2016-01-26	2019-01-26
Pre-amplifier	Sonoma Instrument Co	310N	SEM005-03	2017-06-05	2018-06-04
Active Loop Antenna	ETS-Lindgren	6502	SEM003-08	2015-08-14	2018-08-14

Radiated Emissions(30MHz-1GHz)					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017-05-10	2018-05-10
EMI Test Receiver	Agilent Technologies	N9038A	SEM004-05	2016-10-09	2017-10-09
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2014-11-01	2017-11-01
Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEM003-11	2015-10-17	2018-10-17
Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEM003-12	2014-11-24	2017-11-24
Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEM005-01	2017-04-14	2018-04-13
Band filter	Amindeon	Asi 3314	SEM023-01	N/A	N/A
DC Power Supply	Zhao Xin	RXN-305D	SEM011-02	2016-10-09	2017-10-09
Loop Antenna	Beijing Daze	ZN30401	SEM003-09	2015-05-13	2018-05-13



<b>General used equipment</b>					
<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	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Shanghai Meteorological Industry Factory	ZJ1-2B	SEM002-04	2016-10-12	2017-10-12
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2016-10-12	2017-10-12
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2017-04-18	2018-04-18



## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

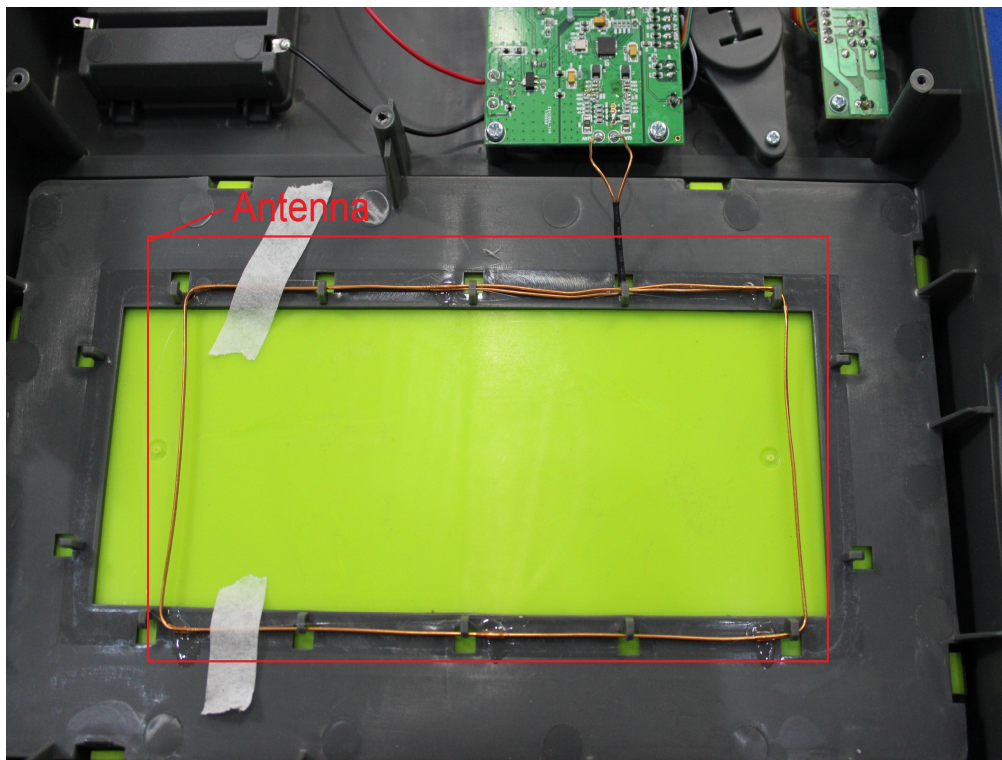
#### 6.1.2 Conclusion

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 an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an 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.



## 7 Radio Spectrum Matter Test Results

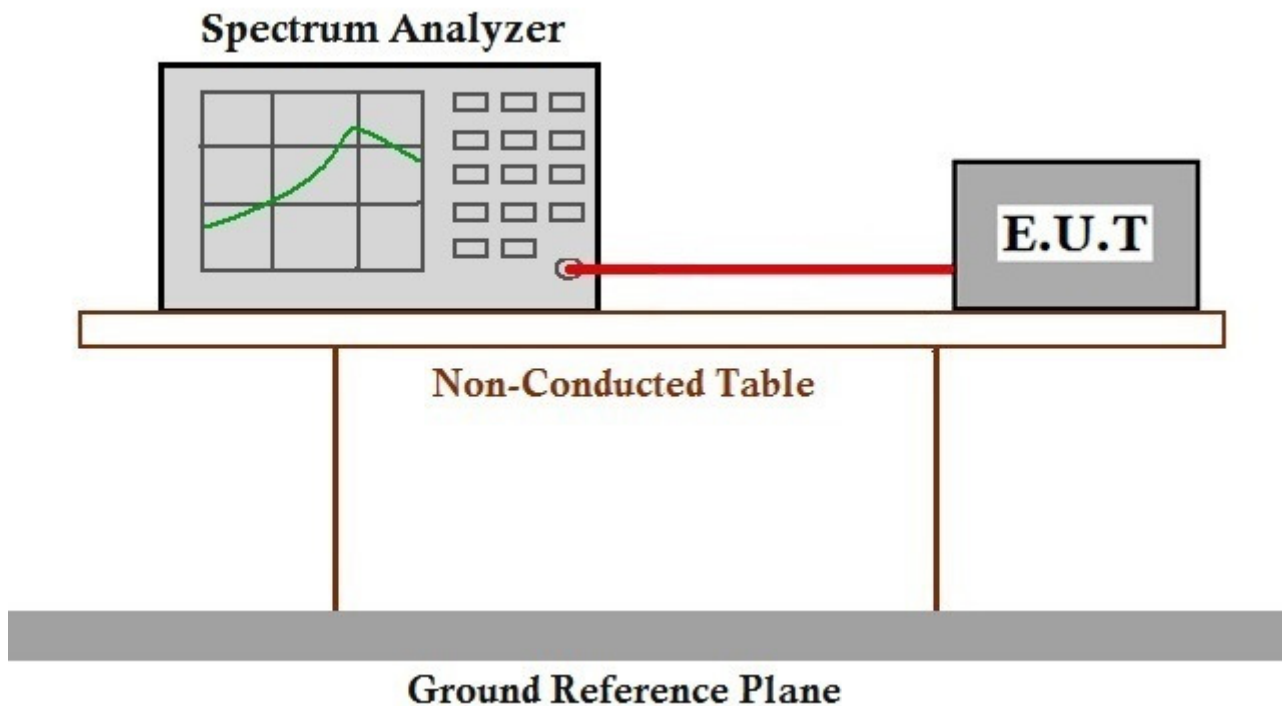
### 7.1 20dB Bandwidth

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

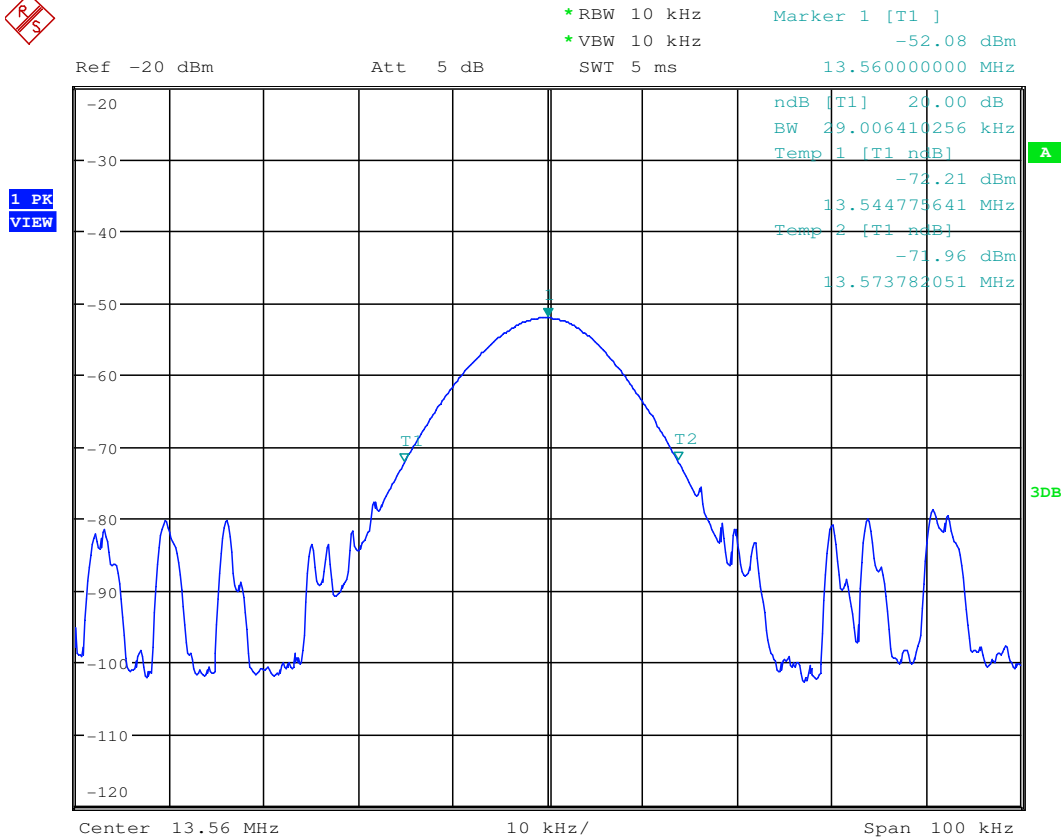
#### 7.1.1 E.U.T. Operation

Operating Environment:  
 Temperature: 24 °C Humidity: 54 % RH Atmospheric Pressure: 1005 mbar  
 Test mode c:TX mode\_Keep the EUT in transmitting mode.

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data





## **7.2 Emission Mask**

Test Requirement 47 CFR Part 15, Subpart C 15.225(a)&(b)&(C )  
Test Method: ANSI C63.10 (2013) Section 6.4  
Measurement Distance: 3m  
Limit:

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15.848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

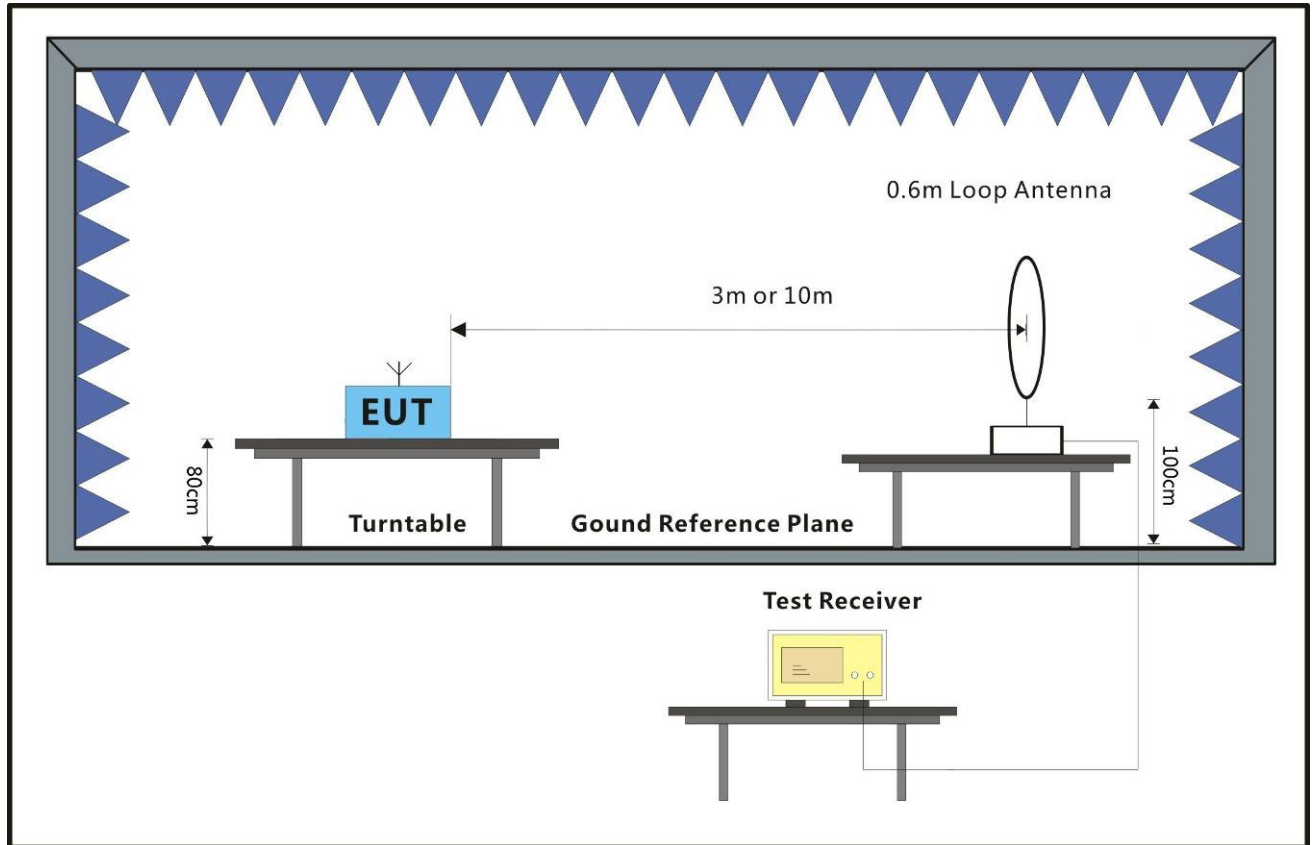
**7.2.1 E.U.T. Operation**

Operating Environment:

Temperature: 24 °C      Humidity: 54 % RH      Atmospheric Pressure: 1005 mbar

Test mode      c:TX mode\_Keep the EUT in transmitting mode.

**7.2.2 Test Setup Diagram**

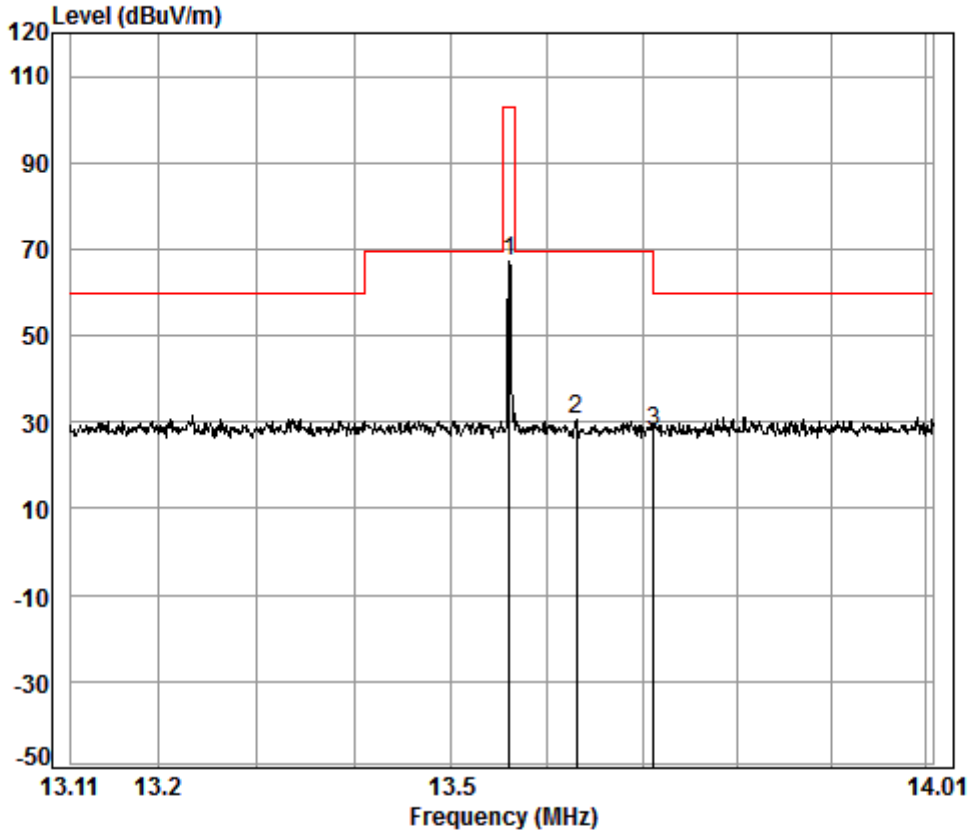


**7.2.3 Measurement Procedure and Data**

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.



Mode:c



Condition: 10m  
Job No. : 06077CR  
Test Mode: TX

	Freq	Cable Loss	Ant Factor	Preamplifier Factor	Read Level	Limit Level	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB
1	13.56	0.57	10.47	32.50	88.62	103.08	-35.92
2	13.63	0.57	10.47	32.50	52.02	69.56	-39.00
3 pp	13.71	0.57	10.47	32.50	49.39	59.59	-31.66



**Below 30MHz**

The test was performed at a 10m test site. According to below formulate and the test data at 10m test distance,

$$L_{30} / L_{10} = D_{10} / D_{30}$$

Note:

L<sub>30</sub>: Level @ 30m distance. Unit: uV/m;

L<sub>10</sub>: Level @ 10m distance. Unit: uV/m;

D<sub>30</sub>: 30m distance. Unit: m

D<sub>10</sub>: 10m distance. Unit: m

The level at 30m test distance is below:

Frequency (MHz)	Level @ 10m (dBuV/m)	Level @ 10m (uV/m)	Level @ 30m (uV/m)	Level @ 30m (dBuV/m)	Limit @ 30m (dBuV/m)	Margin (dB)
13.56	67.16	2280.34	760.11	57.62	84.000	-26.38
13.63	30.56	33.73	11.24	21.02	50.470	-29.45
13.71	27.93	24.92	8.31	18.39	40.510	-22.12

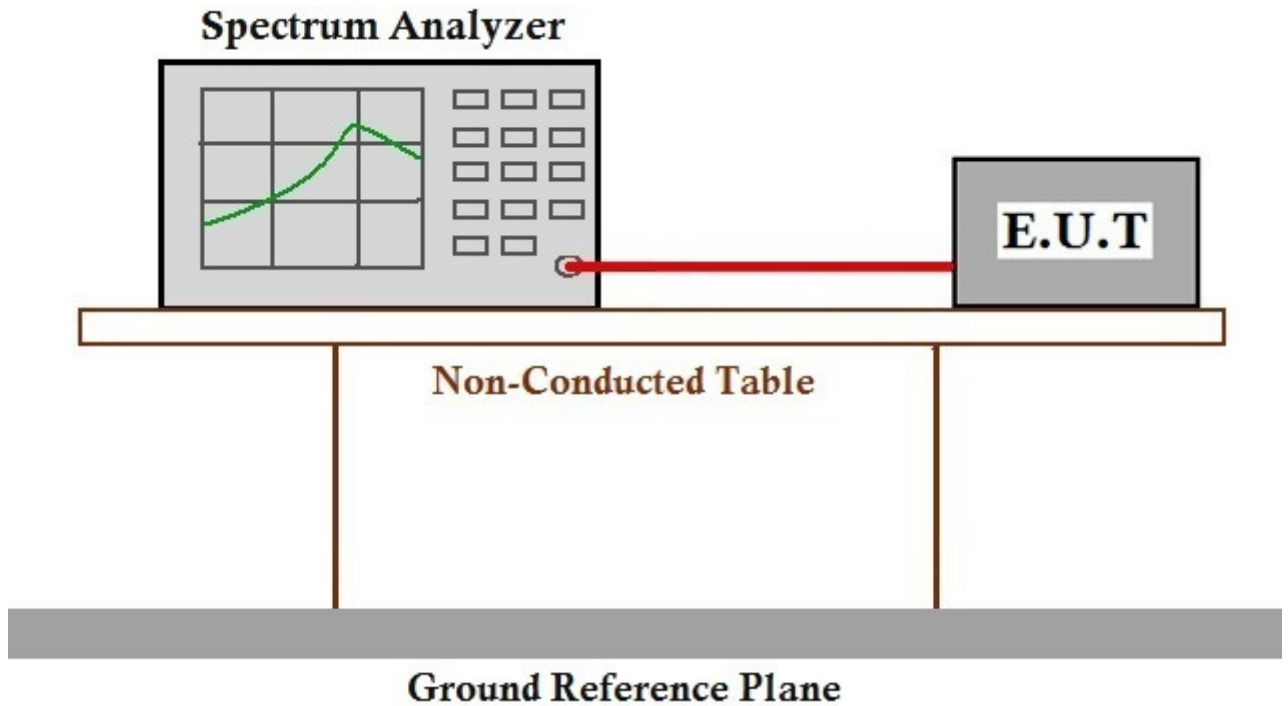
### 7.3 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)  
 Test Method: ANSI C63.10 (2013) Section 6.8  
 Measurement Distance: 10m  
 Limit: 1.356kHz

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

Operating Environment:  
 Temperature: 23 °C Humidity: 54 % RH Atmospheric Pressure: 1005 mbar  
 Test mode c:TX mode\_Keep the EUT in transmitting mode.

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Procedure and Data





Test Frequency: 13.56MHz			Temperature:20°C	
Supply Voltage (V) AC	Test Result (MHz)	Deviation (kHz)	Limit (kHz)	Result
120	13.5596780	0.322	1.3560	Pass

Test Frequency: 13.56MHz			Voltage:120V	
Temperature (°C)	Test Result (MHz)	Deviation (kHz)	Limit (kHz)	Result
-20	13.5596730	0.327	1.3560	Pass
-10	13.5596770	0.323	1.3560	
0	13.5596730	0.327	1.3560	
10	13.5596788	0.3212	1.3560	
20	13.5596745	0.3255	1.3560	
30	13.5596768	0.3232	1.3560	
40	13.5596758	0.3242	1.3560	
50	13.5596742	0.3258	1.3560	



#### 7.4 Radiated Emissions(9kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209  
Test Method: ANSI C63.10 (2013) Section 6.4&6.5  
Measurement Distance: 10m  
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

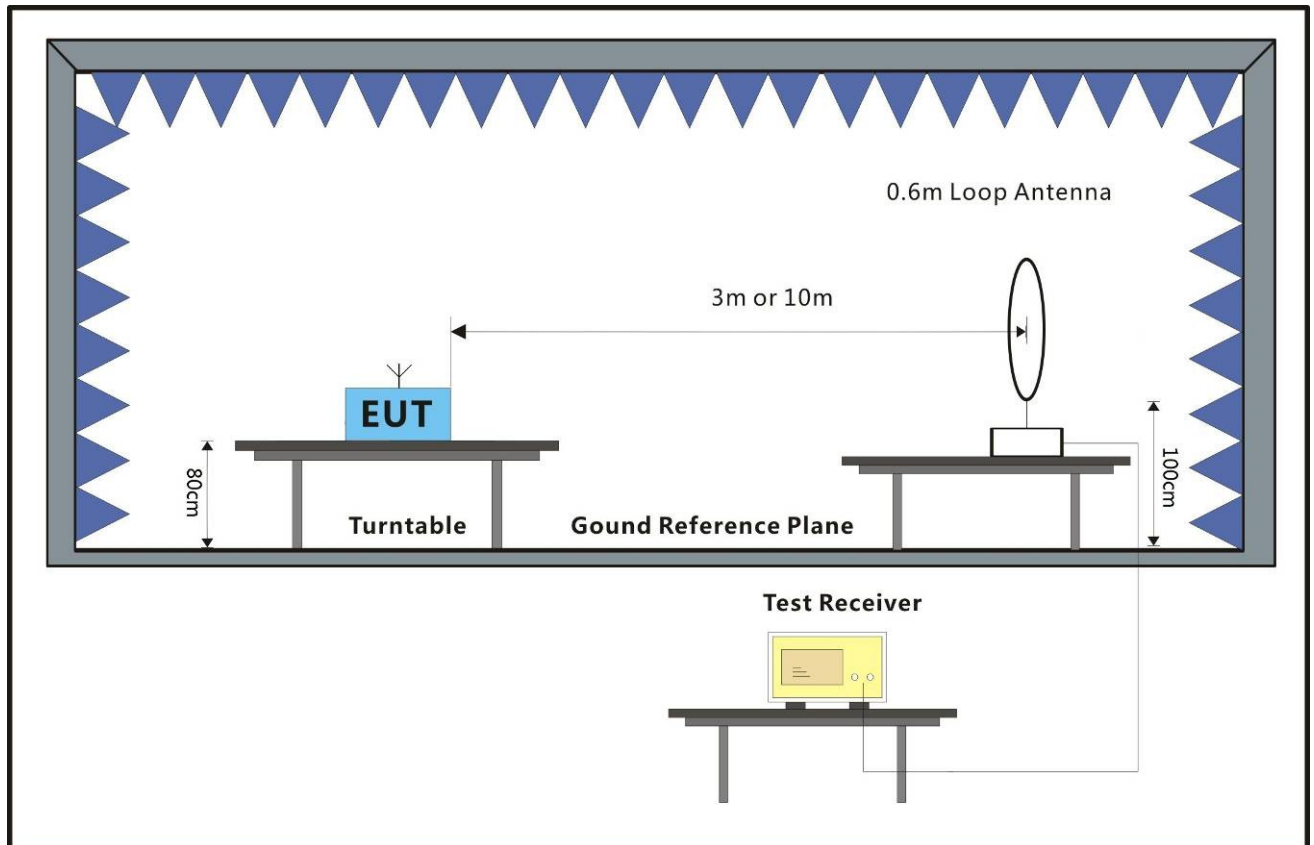
### 7.4.1 E.U.T. Operation

Operating Environment:

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

Test mode      c:TX mode\_Keep the EUT in transmitting mode.

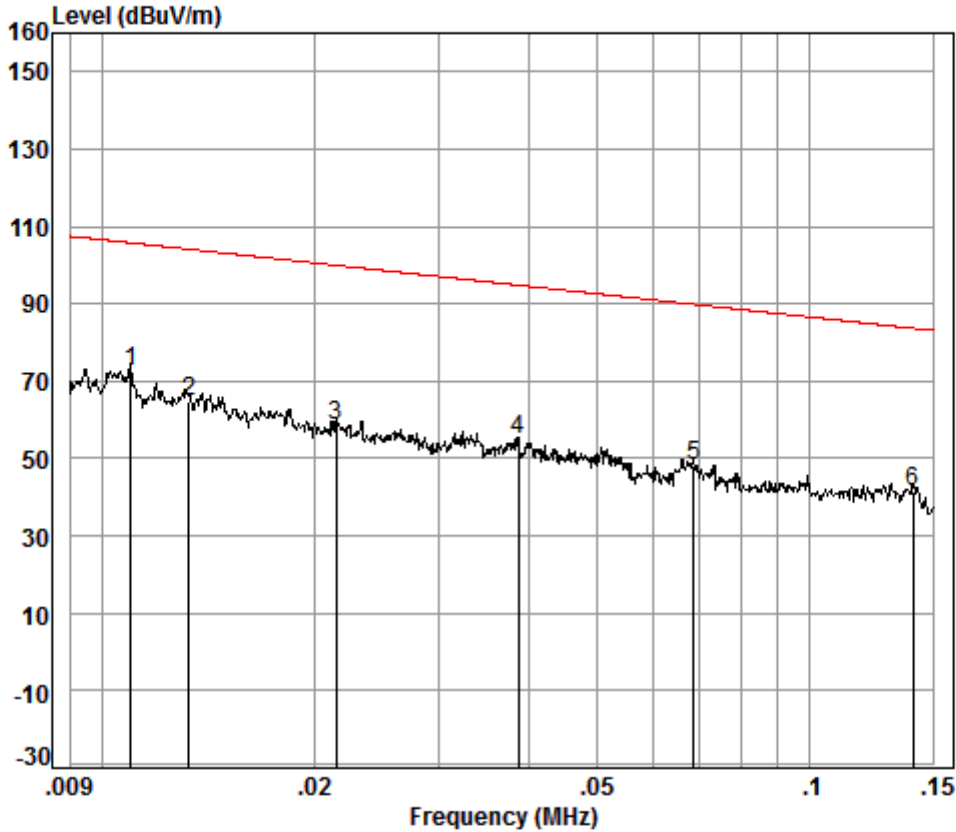
### 7.4.2 Test Setup Diagram



### 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.

Mode:c;

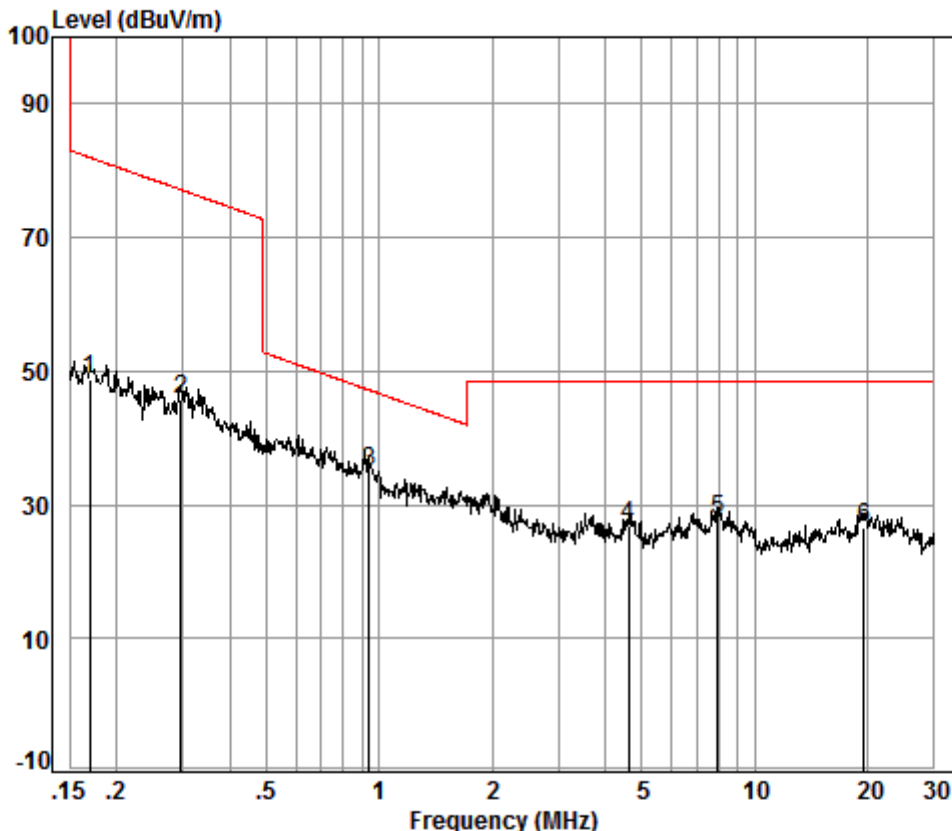


Condition: 10m  
Job No. : 06077CR  
Test Mode: TX

	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	0.01	0.28	18.71	32.48	85.85	72.36	105.77	-33.41
2	0.01	0.26	17.55	32.48	79.43	64.76	104.13	-39.37
3	0.02	0.21	14.81	32.49	75.83	58.36	99.98	-41.62
4	0.04	0.15	13.12	32.50	73.90	54.67	94.82	-40.15
5	0.07	0.09	12.17	32.51	68.43	48.18	89.87	-41.69
6	0.14	0.06	11.75	32.50	62.35	41.66	83.69	-42.03



Mode:c;



Condition: 10m

Job No. : 06077CR

Test Mode: TX

	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	0.17	0.07	12.80	32.50	68.47	48.84	81.97	-33.13
2	0.30	0.09	12.73	32.52	65.47	45.77	77.14	-31.37
3 pp	0.94	0.22	12.76	32.45	54.41	34.94	47.13	-12.19
4	4.60	0.42	11.38	32.48	47.43	26.75	48.50	-21.75
5	7.98	0.47	10.73	32.49	48.97	27.68	48.50	-20.82
6	19.53	0.67	10.76	32.52	47.67	26.58	48.50	-21.92



### 7.5 Radiated Emissions(30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

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

Measurement Distance: 3m

Limit:

Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3

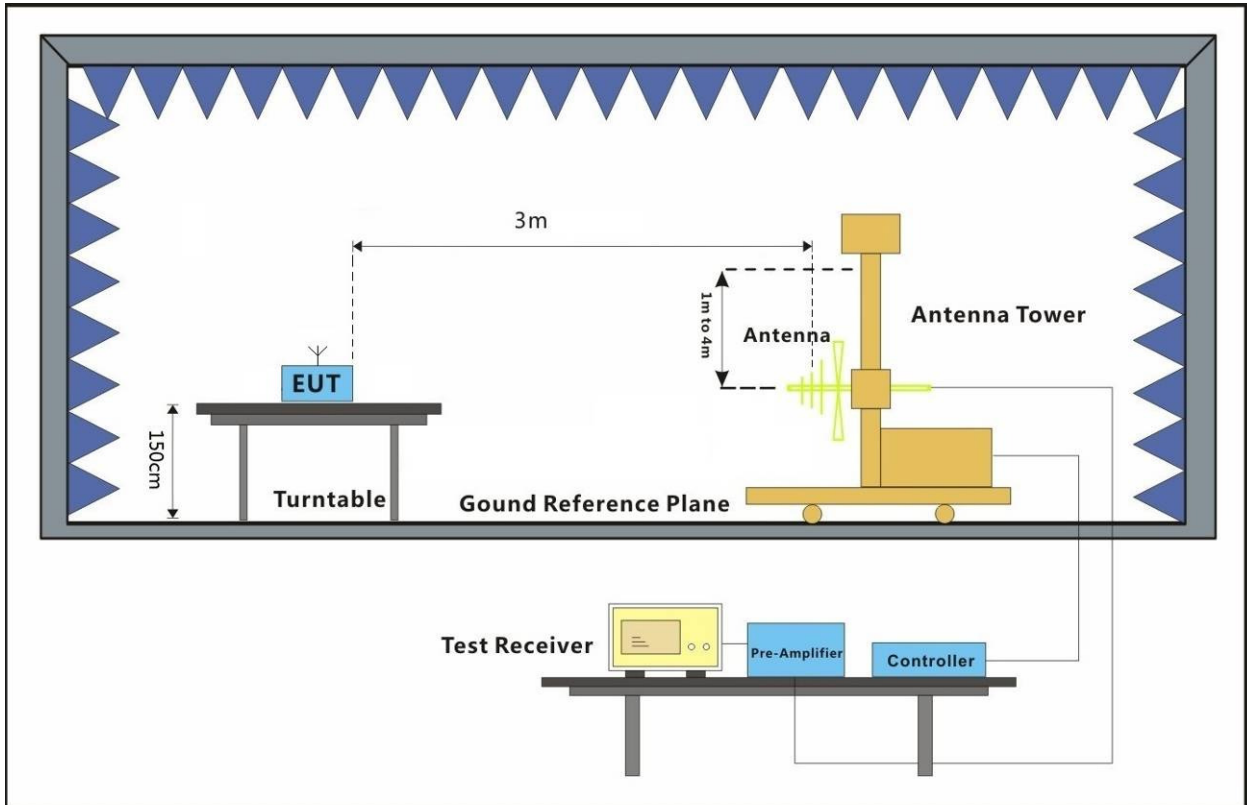
**7.5.1 E.U.T. Operation**

Operating Environment:

Temperature: 24 °C      Humidity: 54 % RH      Atmospheric Pressure: 1005 mbar

Test mode      c:TX mode\_Keep the EUT in transmitting mode.

**7.5.2 Test Setup Diagram**





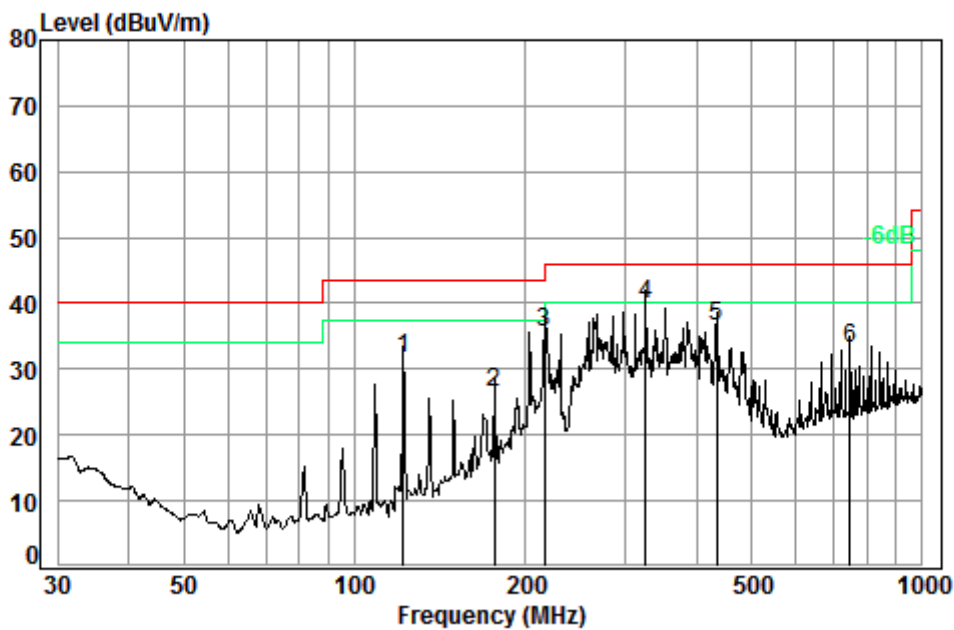
### **7.5.3 Measurement Procedure and Data**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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.
- g. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report.





Mode:c; Polarization:Horizontal

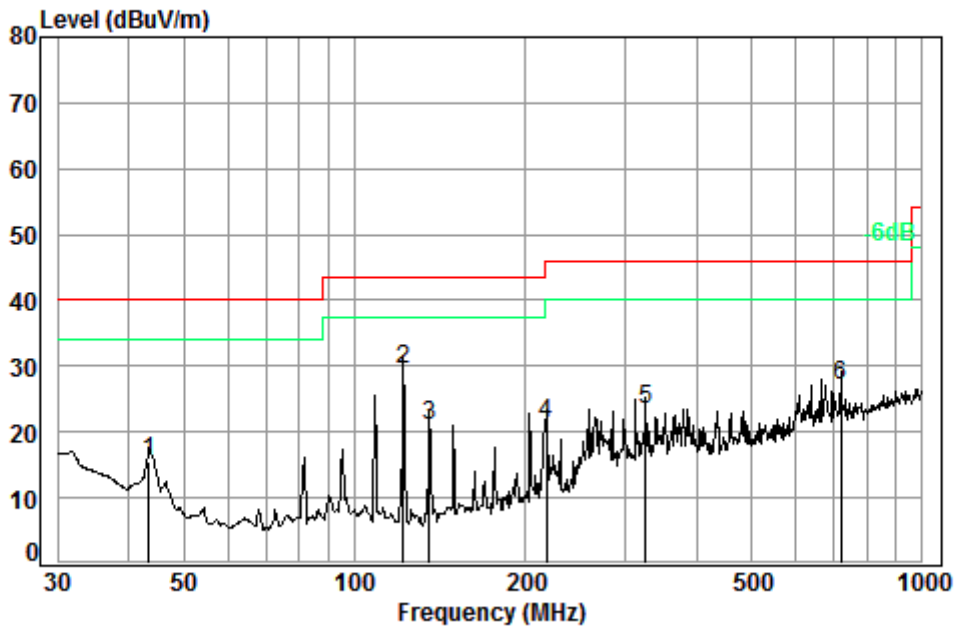


Condition: 3m HORIZONTAL  
Job No. : 06077CR  
Test mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	121.98	1.26	7.86	27.06	49.49	31.55	43.50	-11.95
2	176.27	1.36	9.75	26.79	42.17	26.49	43.50	-17.01
3	216.02	1.49	11.03	26.64	49.71	35.59	46.00	-10.41
4 pp	325.60	1.98	14.78	26.60	49.77	39.93	46.00	-6.07
5	434.07	2.35	16.58	27.35	45.06	36.64	46.00	-9.36
6	744.87	3.04	21.68	27.36	35.66	33.02	46.00	-12.98



Mode:c; Polarization:Vertical



Condition: 3m VERTICAL

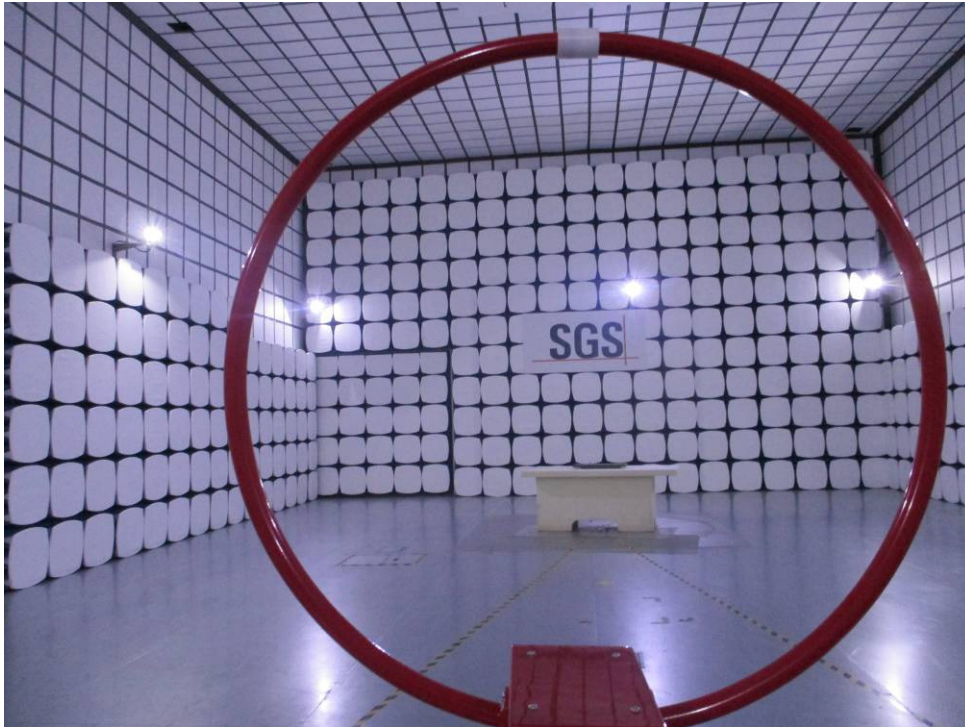
Job No. : 06077CR

Test mode: c

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit	Over
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	43.51	0.68	11.56	27.31	30.73	15.66	40.00	-24.34
2 pp	121.98	1.26	7.86	27.06	47.37	29.43	43.50	-14.07
3	135.51	1.29	7.92	26.98	38.83	21.06	43.50	-22.44
4	218.31	1.51	11.15	26.63	35.29	21.32	46.00	-24.68
5	325.60	1.98	14.78	26.60	33.13	23.29	46.00	-22.71
6	719.20	2.96	21.60	27.39	29.92	27.09	46.00	-18.91

## 8 Photographs

### 8.1 Radiated Emissions(9kHz-30MHz) Test Setup



### 8.2 Radiated Emissions(30MHz-1GHz) Test Setup



### 8.3 EUT Constructional Details

Refer to External photos & Internal photos