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Report No.: SZEM171001057803  
Page: 1 of 30

## TEST REPORT

**Application No.:** SZEM1710010578CR (SHEM1709005981CR)  
**Applicant:** QINGDAO TRI-LINK LOCK GROUP CO., LTD.  
**Address of Applicant:** 11F, BUILDING 2, TIANBAO MANSION 61 HAIER ROAD QINGDAO CHINA  
**Manufacturer:** SUZHOU FANGHUI ELECTRONIC TECHNOLOGY CO., LTD.  
**Address of Manufacturer:** NO.166 JUFENG ROAD, JINFENG INDUSTRY PARK, BEIQIAO TOWN, XIANGCHENG, SUZHOU CITY, CHINA  
**Factory:** SUZHOU FANGHUI ELECTRONIC TECHNOLOGY CO., LTD.  
**Address of Factory:** NO.166 JUFENG ROAD, JINFENG INDUSTRY PARK, BEIQIAO TOWN, XIANGCHENG, SUZHOU CITY, CHINA  
**FCC ID:** 2ACYBLHI-1742XXX  
**IC:** 21082-LHI1742XXX  
**Equipment Under Test (EUT):**  
**EUT Name:** BLE DIGITAL LOCK  
**Model No.:** LHI-1742XXX, LHLP-88XXXXX  
**α** Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.  
**Trade mark:** TRU-BOLT  
**Standards:** 47 CFR Part 15, Subpart C 15.247  
RSS-247 Issue 2 February 2017, RSS-Gen Issue-4 November 2014  
**Date of Receipt:** 2017-09-07  
**Date of Test:** 2017-09-21 to 2017-09-29  
**Date of Issue:** 2017-10-12

<b>Test Result :</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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Revision Record				
Version	Chapter	Date	Modifier	Remark
00	/	2017-10-12	/	Original

Authorized for issue by:			
Tested By			2017-10-12
	Foray Chen /Project Engineer		Date
Checked By			2017-10-12
	Eric Fu /Reviewer		Date



## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(c)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
99% Bandwidth	RSS-247 Issue 2, February 2017	ANSI C63.10 Section 6.9.3	RSS-Gen Section 6.6	Pass
Minimum 6dB Bandwidth	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Conducted Peak Output Power	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.9.1	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Power Spectrum Density	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.4,6.5,6.6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass

### Declaration of EUT Family Grouping:

Note: There are series models mentioned in this report, and they are the identical in electrical and electronic characters. Only the model LHI-1742XXX was tested since their differences were the model number and appearance.



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## 4 General Information

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

Power supply:	DC 6V, 4* AA size battery
Operating frequency:	2402-2480MHz
Bluetooth version:	BT4.0 LE
Modulation type	GFSK
Number of channels:	40
Antenna type	PCB
Antenna gain	0dbi

### 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	7.25 x 10 <sup>-8</sup>
2	Timeout	2s
3	Duty cycle	0.37%
4	Occupied Bandwidth	3%
5	RF conducted power	0.75dB
6	RF power density	2.84dB
7	Conducted Spurious emissions	0.75dB
8	RF Radiated power	4.5dB (below 1GHz)
		4.8dB (above 1GHz)
9	Radiated Spurious emission test	4.5dB (30MHz-1GHz)
		4.8dB (1GHz-18GHz)
10	Temperature test	1°C
11	Humidity test	3%
12	Supply voltages	1.5%
13	Time	3%



#### 4.4 Standards Applicable for Testing

**Table 1 : Tests Carried Out Under 47 CFR Part 15, Subpart C 15.247**

Item	Status
Antenna Requirement	√
Conducted Emissions at AC Power Line (150kHz-30MHz)	×
Duty Cycle	×
99% Bandwidth	√
Minimum 6dB Bandwidth	√
Conducted Peak Output Power	√
20dB Bandwidth	×
Carrier Frequencies Separation	×
Hopping Channel Number	×
Dwell Time	×
Power Spectrum Density	√
Conducted Band Edges Measurement	√
Conducted Spurious Emissions	√
Radiated Emissions which fall in the restricted bands	√
Radiated Spurious Emissions	√
Other requirements Frequency Hopping Spread Spectrum System Hopping Sequence	×

× Indicates that the test is not applicable  
√ Indicates that the test is applicable



#### **4.5 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.

#### **4.6 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.

#### **4.7 Deviation from Standards**

None

#### **4.8 Abnormalities from Standard Conditions**

None





## 5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
<b>Conducted Emission at AC Power Line</b>					
EMI test receiver	R&S	ESR7	SHEM162-1	2016-12-29	2017-12-28
LISN	Schwarzbeck	NSLK8127	SHEM061-1	2016-12-29	2017-12-28
LISN	EMCO	3816/2	SHEM019-1	2016-12-29	2017-12-28
Pulse limiter	R&S	ESH3-Z2	SHEM029-1	2017-08-12	2018-08-11
CE test Cable	/	CE01	/	2016-12-29	2017-12-28
<b>Conducted Test</b>					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-04-24	2018-04-23
Spectrum Analyzer	Agilent	N9202A	SHEM181-1	2017-07-03	2018-07-02
Power meter	R&S	NRP	SHEM057-1	2016-12-29	2017-12-28
Power Sensor	R&S	NRP-Z22	SHEM136-1	2017-07-22	2018-07-21
Power Sensor	R&S	NRP-Z91	SHEM057-2	2016-12-29	2017-12-28
Signal Generator	R&S	SMR40	SHEM058-1	2017-07-03	2018-07-02
Signal Generator	Agilent	N5182A	SHEM182-1	2017-07-03	2018-07-02
Communication Tester	R&S	CMW500	SHEM183-1	2017-07-03	2018-07-02
Switcher	Tonscend	JS0806	SHEM184-1	/	/
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2017-09-13	2018-09-12
AC Power Stabilizer	WOCEN	6100	SHEM045-1	2017-01-14	2018-01-13
DC Power Supply	QJE	QJ30003SII	SHEM046-1	2017-01-14	2018-01-13
<b>Radiated Test</b>					
EMI test receiver	R&S	ESU40	SHEM051-1	2017-09-26	2018-09-25
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-04-24	2018-04-23
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2017-04-10	2018-04-09
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2017-02-28	2018-02-27
Antenna (25MHz-3GHz)	Schwarzbeck	HL562	SHEM010-1	2017-02-28	2018-02-27
Horn Antenna (1-8GHz)	Schwarzbeck	HF906	SHEM009-1	2016-09-24	2018-09-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2017-01-14	2018-01-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2017-02-13	2018-01-15
Pre-amplifier (9KHz-2GHz)	CLAVIIO	BDLNA-0001-412010	SHEM164-1	2017-08-22	2018-08-21
Pre-amplifier (1-26.5GHz)	CLAVIIO	BDLNA-0118-352810	SHEM050-2	2017-08-22	2018-08-21
Band filter	LORCH	9BRX-875/X150-SR	SHEM156-1	/	/
Band filter	LORCH	13BRX-1950/X500-SR	SHEM083-2	/	/
Band filter	LORCH	5BRX-2400/X200-SR	SHEM155-1	/	/
Band filter	LORCH	5BRX-5500/X1000-SR	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G-100SS	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700-3SS	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2017-07-22	2018-07-21
RE test Cable	/	RE01, RE02, RE06	/	2016-12-29	2017-12-28

## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.247

#### 6.1.2 Conclusion

Standard Requirement:

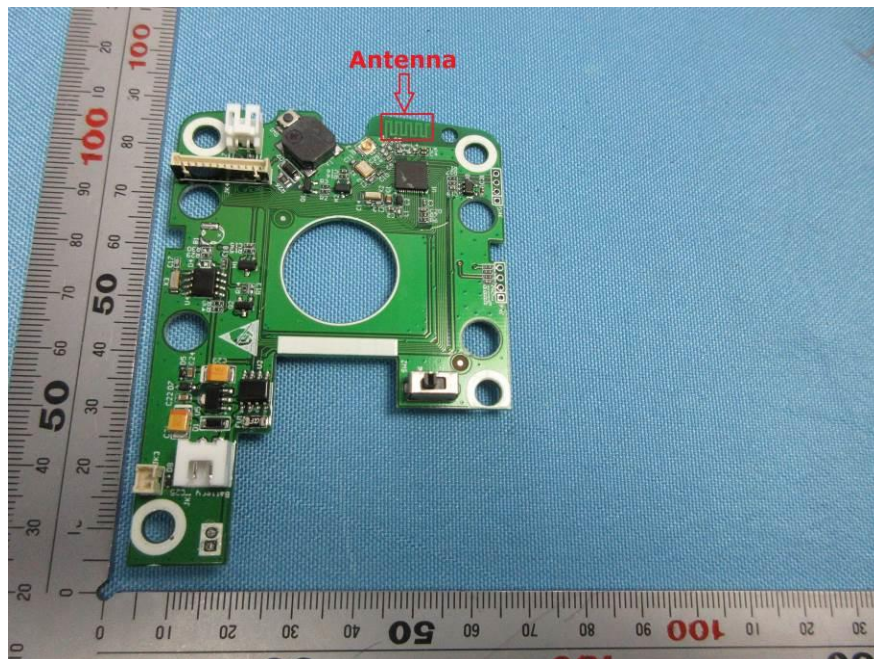
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

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



## 7 Radio Spectrum Matter Test Results

### 7.1 99% Bandwidth

Test Requirement: RSS-247 Issue 2, February 2017  
 Test Method: ANSI C63.10 Section 6.9.3

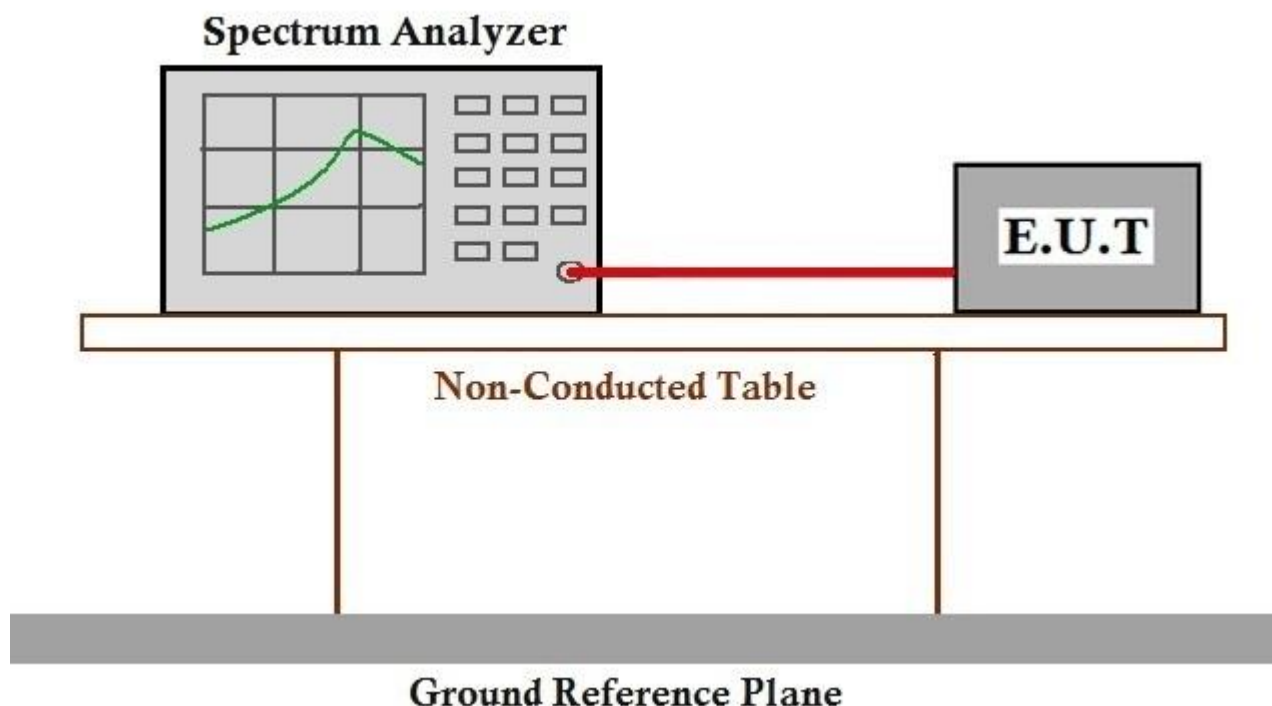
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Data

The detailed test data see: Appendix 15.247

## 7.2 Minimum 6dB Bandwidth

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

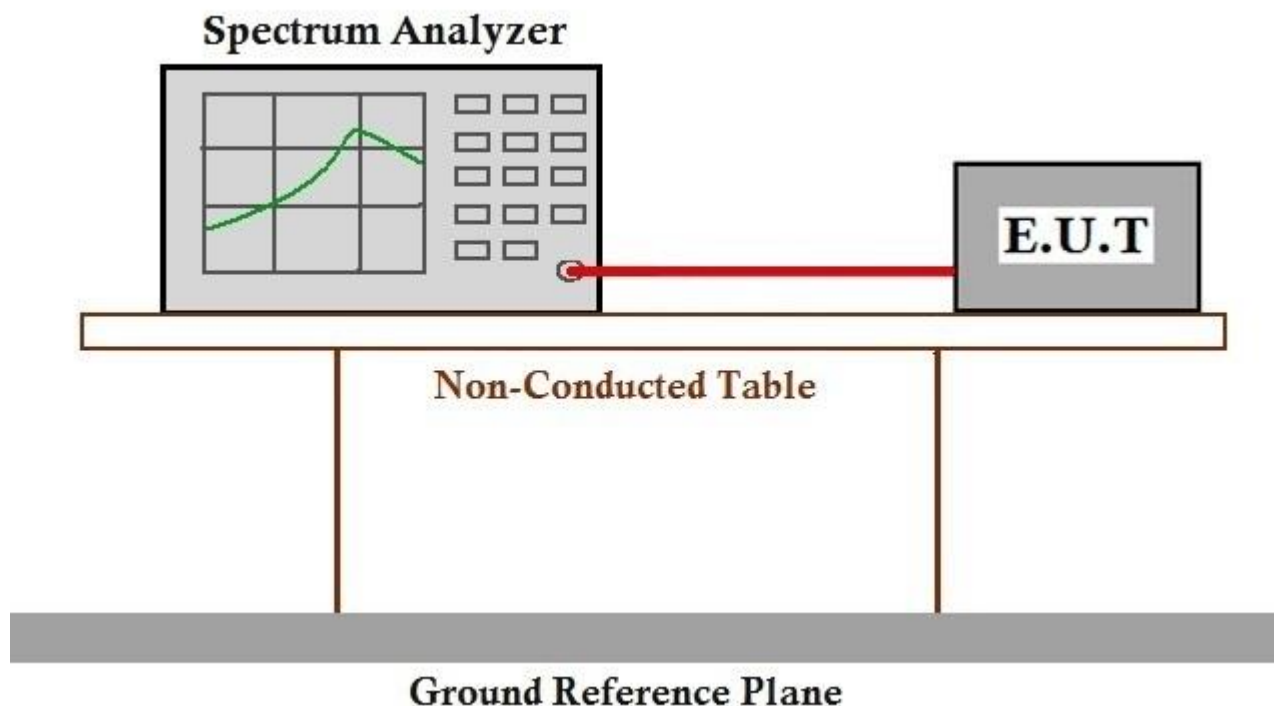
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

Test mode a: Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

### 7.2.2 Test Setup Diagram



### 7.2.3 Measurement Data

The detailed test data see: Appendix 15.247

### 7.3 Conducted Peak Output Power

Test Requirement: 47 CFR Part 15, Subpart C 15.247  
Test Method: ANSI C63.10 (2013) Section 11.9.1  
Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for $\geq 50$ hopping channels
	0.25 for $< 50$ hopping channels
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

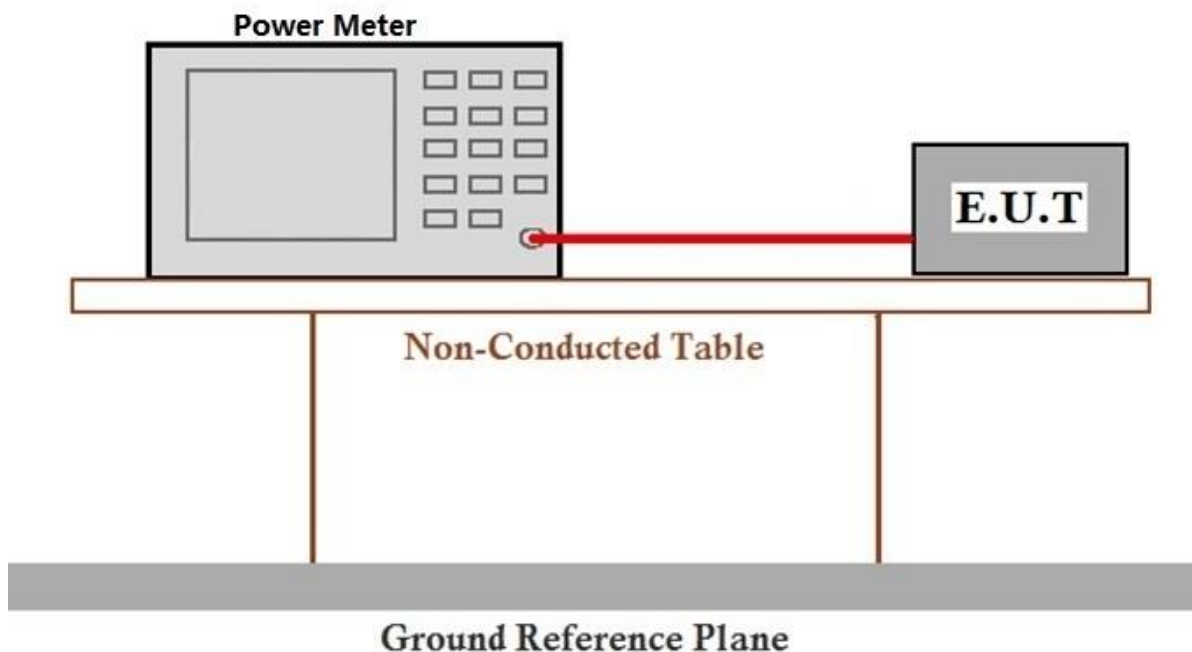
#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Data

The detailed test data see: Appendix 15.247

## 7.4 Power Spectrum Density

Test Requirement: 47 CFR Part 15, Subpart C 15.247  
 Test Method: ANSI C63.10 (2013) Section 11.10.2  
 Limit:  $\leq 8\text{dBm}$  in any 3 kHz band during any time interval of continuous transmission

### 7.4.1 E.U.T. Operation

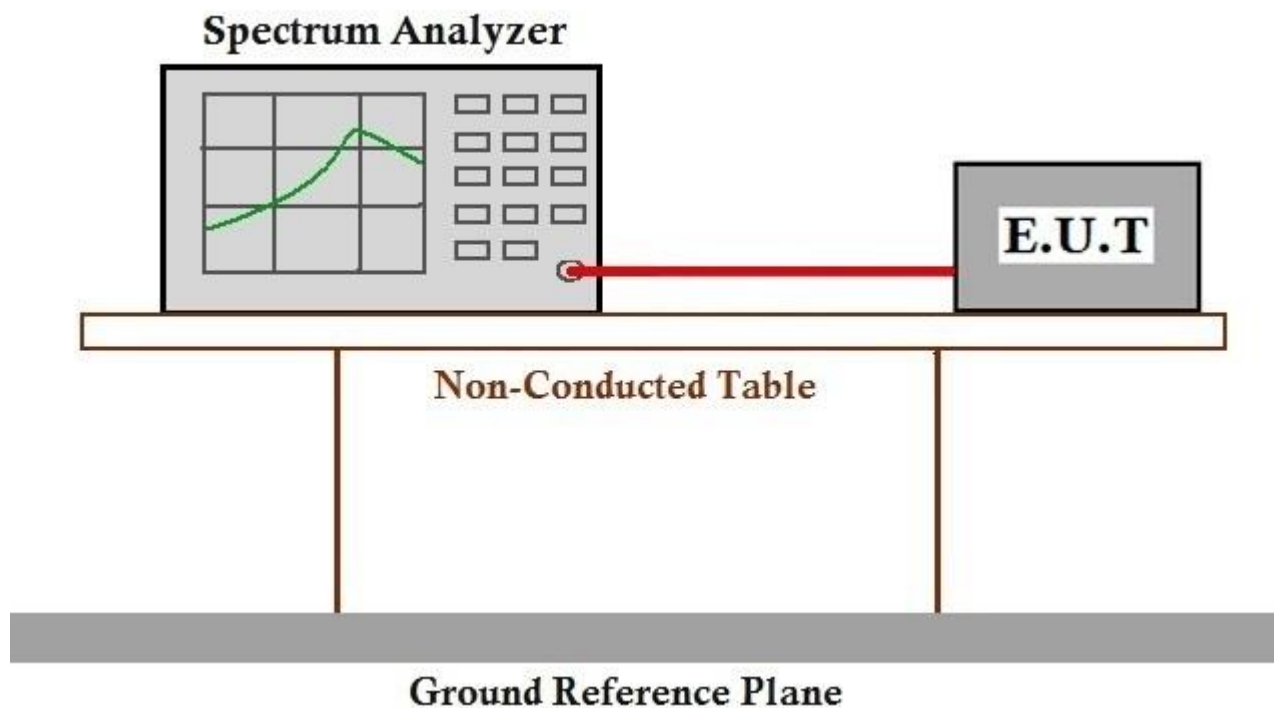
Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

Test mode

a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

### 7.4.2 Test Setup Diagram



### 7.4.3 Measurement Data

The detailed test data see: Appendix 15.247



## 7.5 Conducted Band Edges Measurement

Test Requirement:	47 CFR Part 15, Subpart C 15.247
Test Method:	ANSI C63.10 (2013) Section 11.13.3.2
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmi

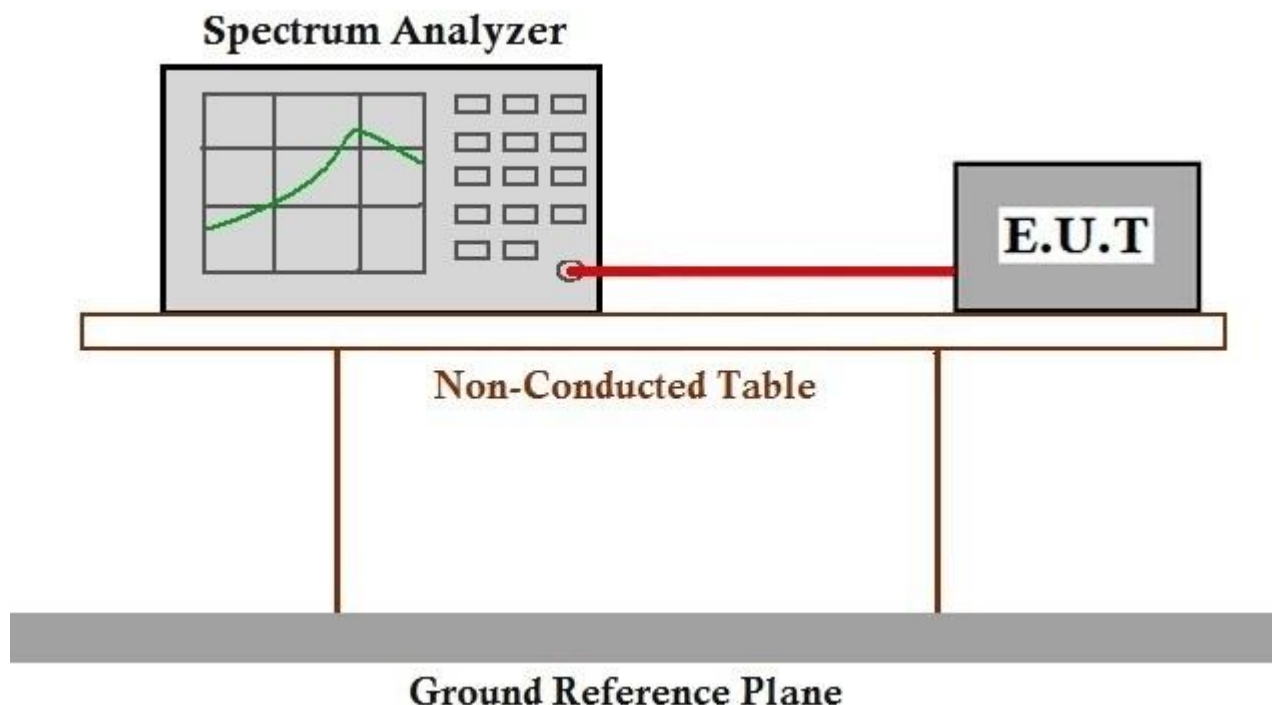
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Data

The detailed test data see: Appendix 15.247

## 7.6 Conducted Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.247  
 Test Method: ANSI C63.10 (2013) Section 11.11  
 Limit: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmi

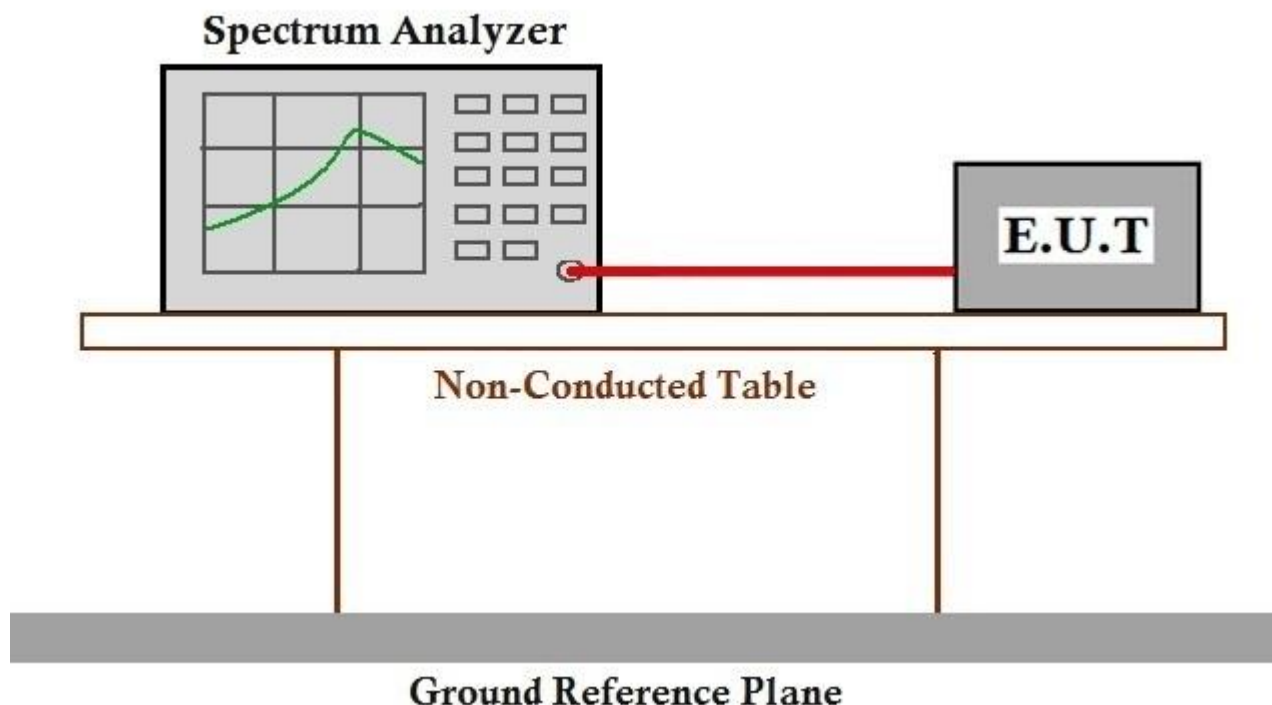
### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

Test mode a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

### 7.6.2 Test Setup Diagram



### 7.6.3 Measurement Data

The detailed test data see: Appendix 15.247





## 7.7 Radiated Emissions which fall in the restricted bands

Test Requirement: 47 CFR Part 15, Subpart C 15.247

Test Method: ANSI C63.10 (2013) Section 6.10.5

Limit:

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 7.7.1 E.U.T. Operation

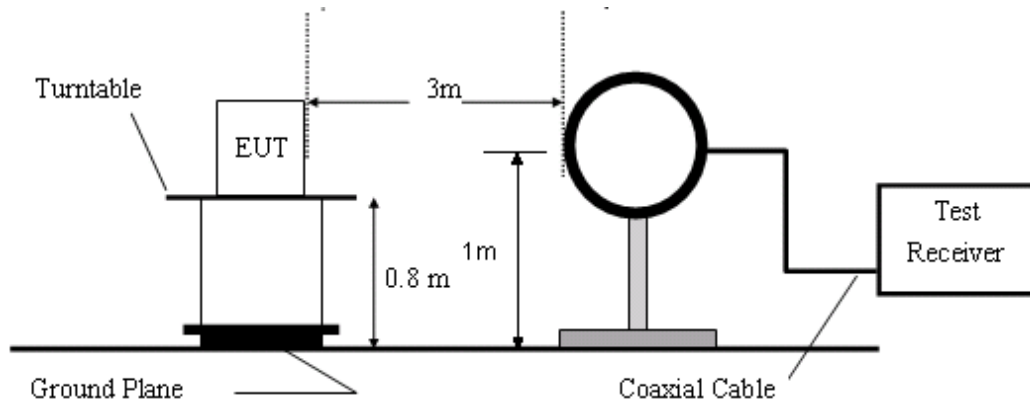
Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

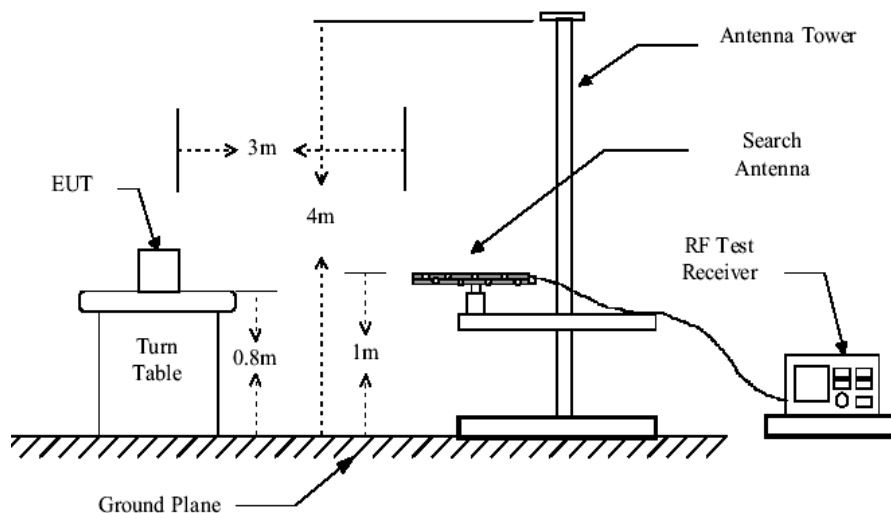
Test mode

a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

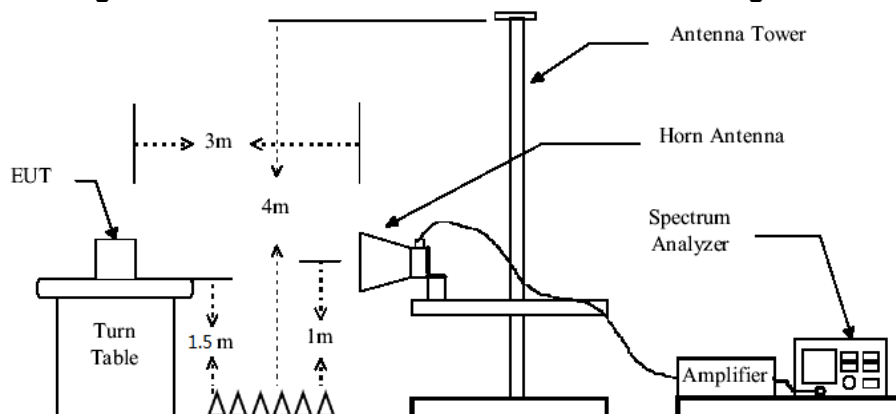
### 7.7.2 Test Setup Diagram



**Figure1. 30MHz to 1GHz radiated emissions test configuration**



**Figure2. 30MHz to 1GHz radiated emissions test configuration**



**Figure3. Above 1GHz radiated emissions test configuration**



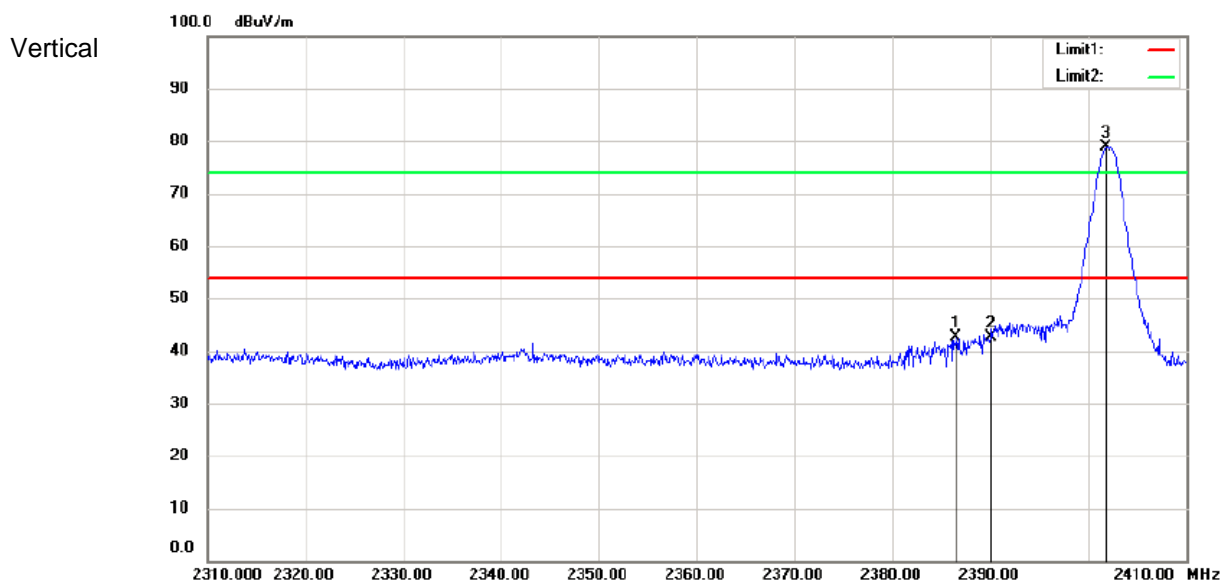
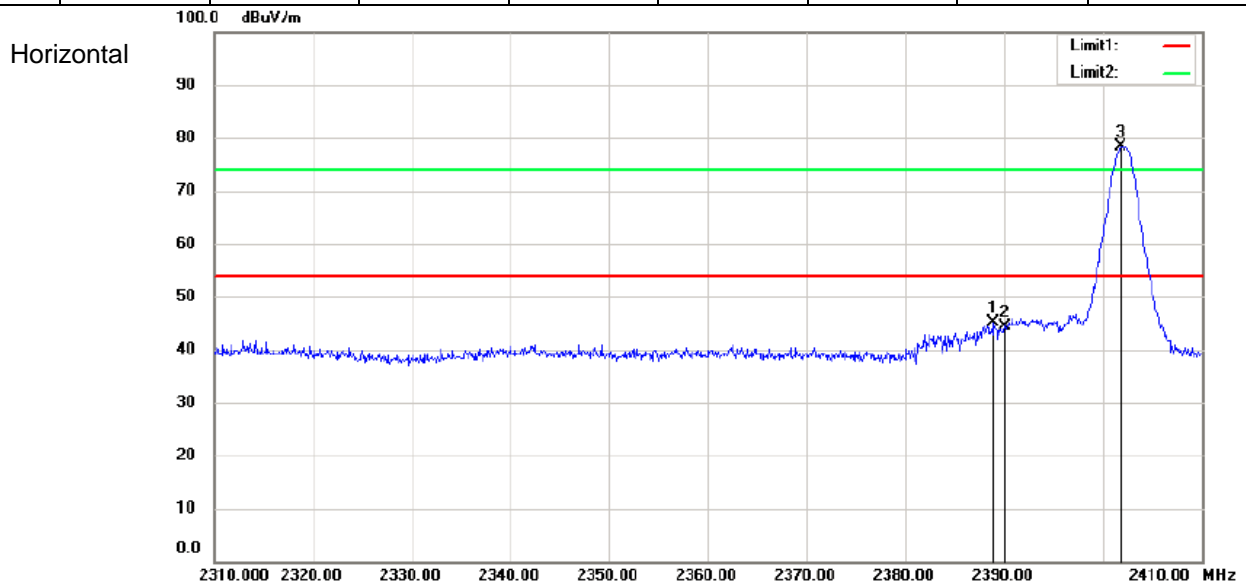
### **7.7.3 Measurement Data**

- 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.



Lowest Channel

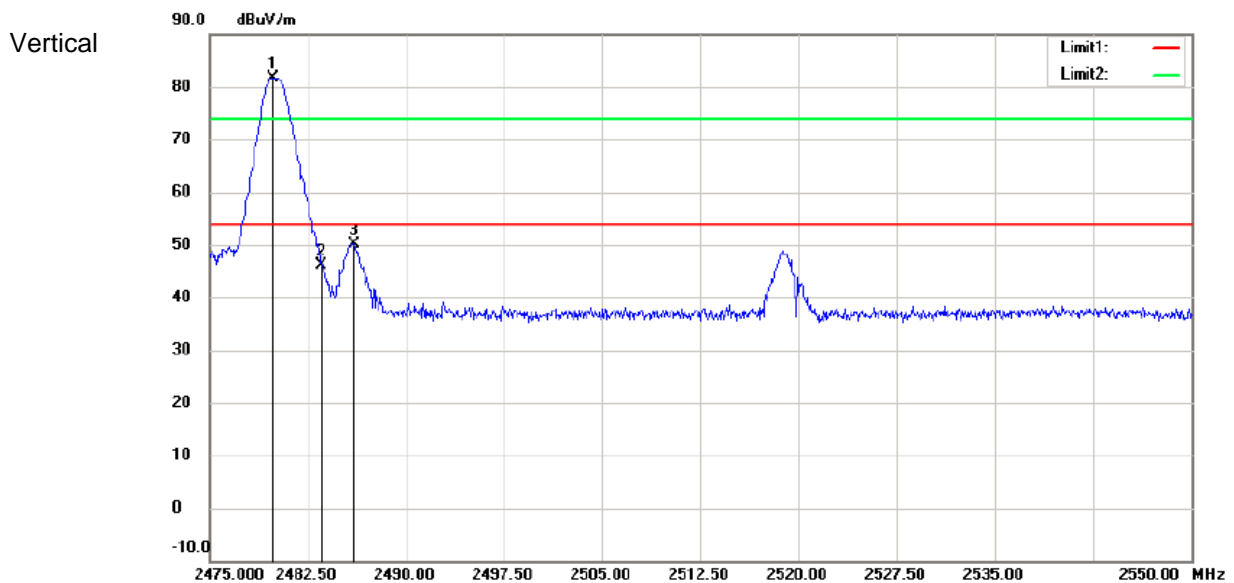
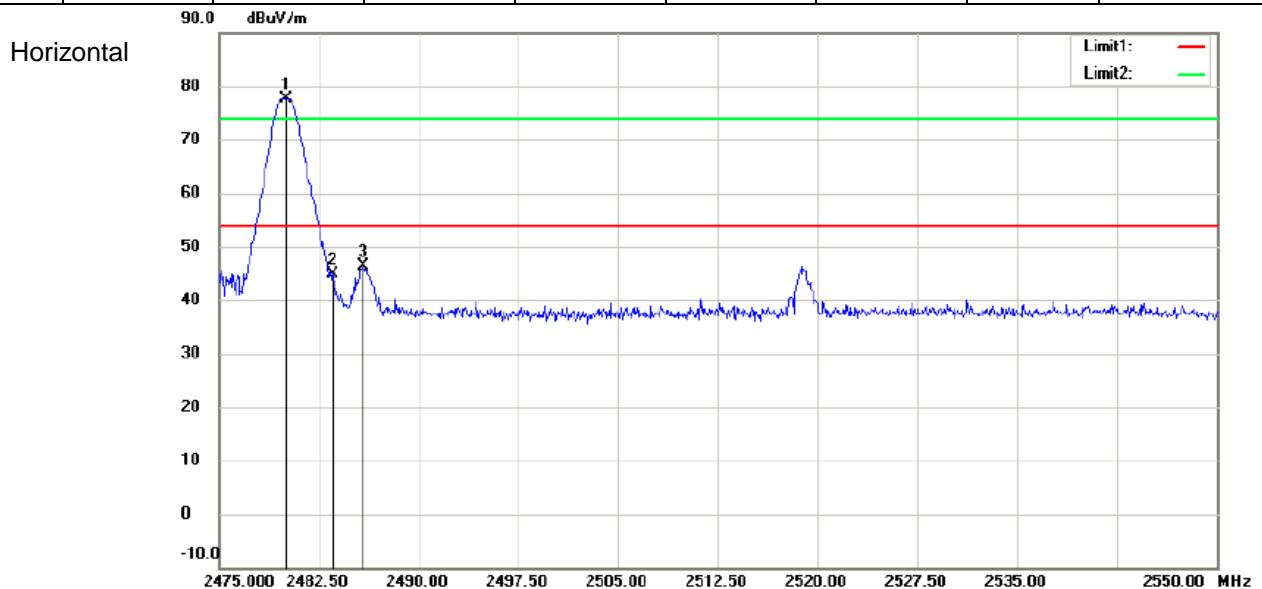
MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2388.9	49.13	-3.89	45.24	54	-8.76	Peak	Horizontal
2	2390	48.28	-3.89	44.39	54	-9.61	Peak	Horizontal
3	2401.8	82.2	-3.91	78.29	54	24.29	Peak	Horizontal
1	2386.5	46.4	-3.88	42.52	54	-11.48	Peak	Vertical
2	2390	46.56	-3.89	42.67	54	-11.33	Peak	Vertical
3	2401.8	82.69	-3.91	78.78	54	24.78	Peak	Vertical





### Highest Channel

MK.	Frequency (MHz)	Reading (dBuV/m)	Corrected factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	2480.025	81.69	-4	77.69	54	23.69	Peak	Horizontal
2	2483.5	48.91	-4.01	44.9	54	-9.1	Peak	Horizontal
3	2485.875	50.5	-4.01	46.49	54	-7.51	Peak	Horizontal
1	2479.8	85.65	-4	81.65	54	27.65	Peak	Vertical
2	2483.5	50.07	-4.01	46.06	54	-7.94	Peak	Vertical
3	2486.025	54.25	-4.02	50.23	54	-3.77	Peak	Vertical



Remark: 1). Test Level = Receiver Reading + Antenna Factor + Cable Loss- Preamplifier Factor  
2). If the Peak value below the AV Limit, the AV test doesn't perform for this submission.



All frequencies within the “Restricted bands” have been evaluated to compliance. Except as shown in paragraph of this section, only spurious emissions are permitted in any of the frequency bands listed below:

a. FCC Part 15, Subpart C Section 15.205 Restricted bands of operation.

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
10.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.5 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	
13.36 - 13.41			



b. RSS-Gen section 7.2.2 Restricted bands of operation

MHz	MHz	GHz
0.090-0.110	240-285	9.0-9.2
2.1735-2.1905	322-335.4	9.3-9.5
3.020-3.026	399.9-410	10.6-12.7
4.125-4.128	608-614	13.25-13.4
4.17725-4.17775	960-1427	14.47-14.5
4.20725-4.20775	1435-1626.5	15.35-16.2
5.677-5.683	1645.5-1646.5	17.7-21.4
6.215-6.218	1660-1710	22.01-23.12
6.26775-6.26825	1718.8-1722.2	23.6-24.0
6.31175-6.31225	2200-2300	31.2-31.8
8.291-8.294	2310-2390	36.43-36.5
8.362-8.366	2655-2900	Above 38.6
8.37625-8.38675	3260-3267	
8.41425-8.41475	3332-3339	
12.29-12.293	3345.8-3358	
12.51975-12.52025	3500-4400	
12.57675-12.57725	4500-5150	
13.36-13.41	5350-5460	
16.42-16.423	7250-7750	
16.69475-16.69525	8025-8500	
16.80425-16.80475		
25.5-25.67		
37.5-38.25		
73-74.6		
74.8-75.2		
108-138		
156.52475-156.52525		
156.7-156.9		



## 7.8 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15, Subpart C 15.247  
Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6  
Limit:

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

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.



### 7.8.1 E.U.T. Operation

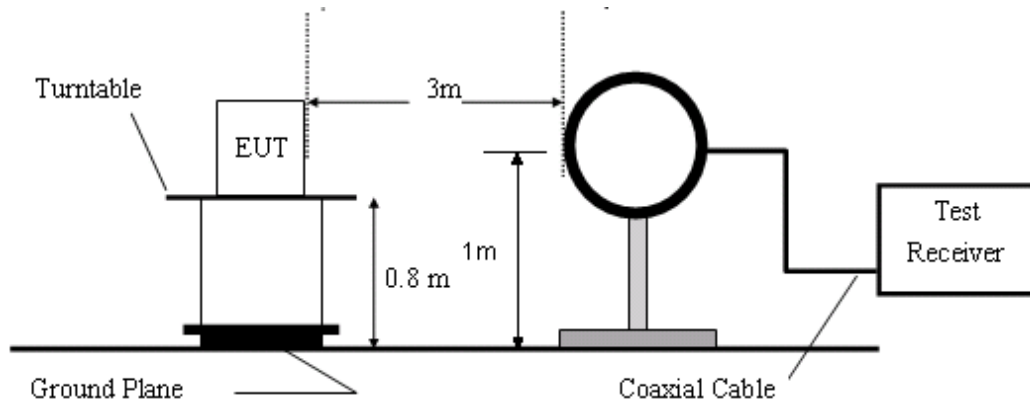
Operating Environment:

Temperature: 22 °C Humidity: 51 % RH Atmospheric Pressure: 1002 mbar

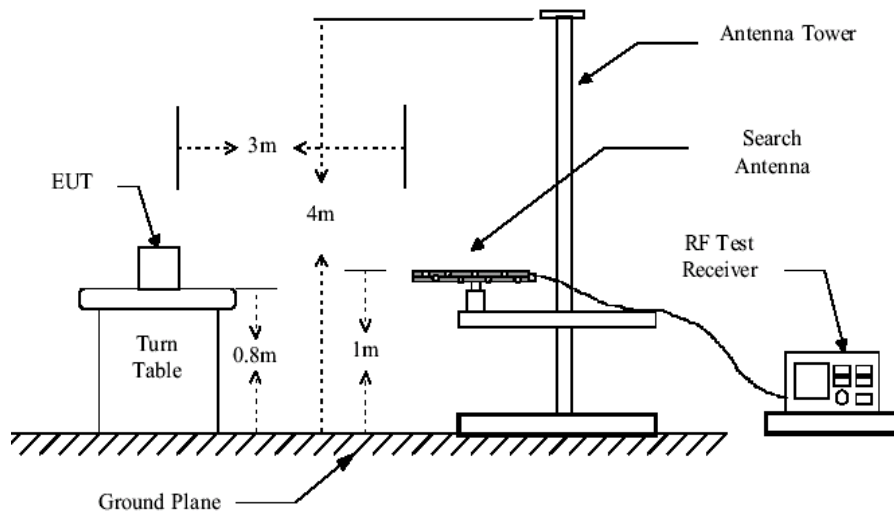
Test mode

a:Engineering Mode: Using test software to control EUT working in continuous transmitting and receiving, and select channel and modulation type.

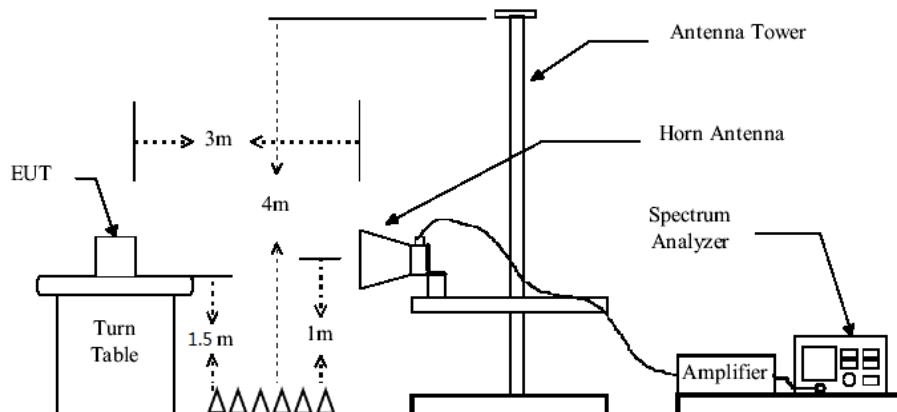
### 7.8.2 Test Setup Diagram



**Figure1. 30MHz to 1GHz radiated emissions test configuration**



**Figure2. 30MHz to 1GHz radiated emissions test configuration**



**Figure3. Above 1GHz radiated emissions test configuration**

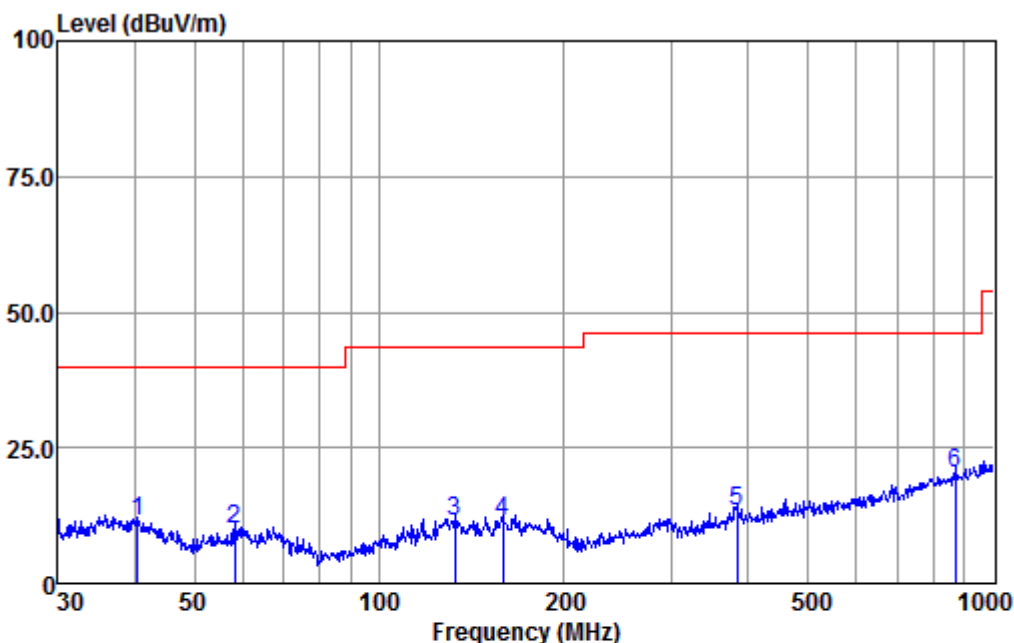


### **7.8.3 Measurement Data**

- 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.



30MHz-1GHz:  
Vertical:

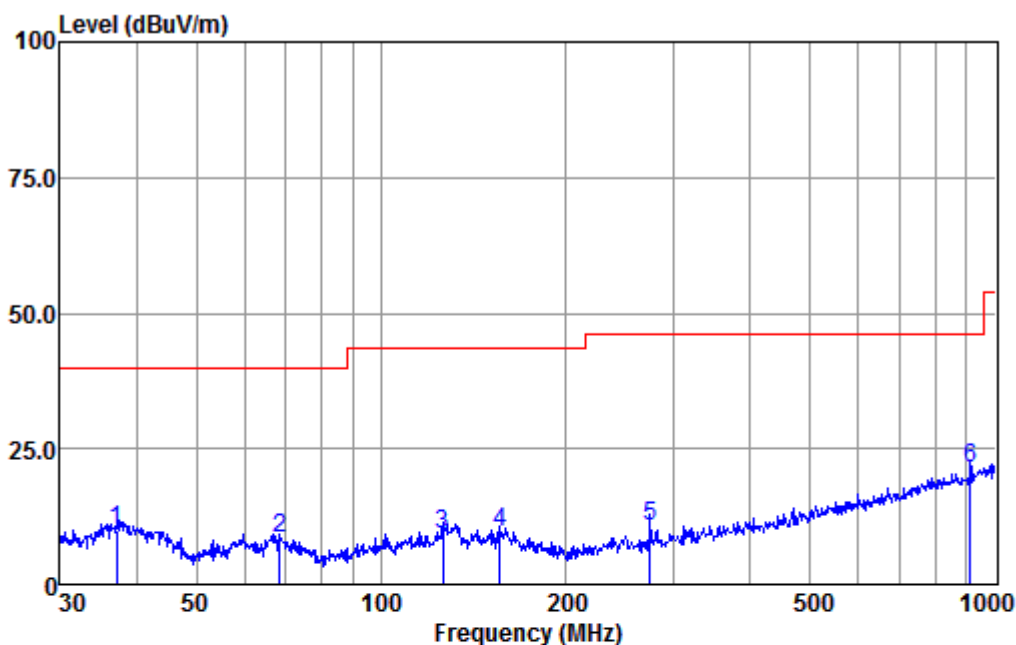


Condition : VERTICAL

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dB	
1	40.42	37.66	16.03	0.22	42.62	11.29	40.00	QP
2	58.20	40.16	12.25	0.29	42.65	10.05	40.00	QP
3	132.69	41.20	12.37	0.59	42.65	11.51	43.50	QP
4	159.23	40.36	13.03	0.63	42.59	11.43	43.50	QP
5	382.59	39.59	14.80	0.97	42.14	13.22	46.00	QP
6 q	869.13	37.72	22.46	2.31	42.10	20.39	46.00	QP



Horizontal:



Condition : HORIZONTAL

	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	37.15	36.18	16.04	0.21	42.62	9.81	40.00	-30.19 QP
2	68.39	39.12	11.59	0.33	42.66	8.38	40.00	-31.62 QP
3	126.33	39.60	11.83	0.56	42.66	9.33	43.50	-34.17 QP
4	156.46	38.90	12.70	0.63	42.60	9.63	43.50	-33.87 QP
5	274.19	40.04	12.35	0.81	42.43	10.77	46.00	-35.23 QP
6 q	912.86	37.85	22.85	2.45	41.80	21.35	46.00	-24.65 QP



**Above 1GHz:**

**Lowest Channel**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	4804	37.59	6.18	43.77	54	-10.23	peak	Horizontal
2	7206	36.47	10.63	47.1	54	-6.9	peak	Horizontal
3	9608	33.32	14.38	47.7	54	-6.3	peak	Horizontal
4	4804	36.66	6.18	42.84	54	-11.16	peak	Vertical
5	7206	34.8	10.63	45.43	54	-8.57	peak	Vertical
6	9608	33.96	14.38	48.34	54	-5.66	peak	Vertical

**Middle Channel**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	4880	38.95	6.97	45.92	54	-8.08	peak	Horizontal
2	7320	38.54	11.12	49.66	54	-4.34	peak	Horizontal
3	9760	34.4	14.35	48.75	54	-5.25	peak	Horizontal
4	4880	38.51	6.97	45.48	54	-8.52	peak	Vertical
5	7320	36.63	11.12	47.75	54	-6.25	peak	Vertical
6	9760	33.08	14.35	47.43	54	-6.57	peak	Vertical

**Highest Channel**

Mark	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Emission (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	4960	41.25	7.49	48.74	54	-5.26	peak	Horizontal
2	7440	37.39	11.65	49.04	54	-4.96	peak	Horizontal
3	9920	33.83	14.4	48.23	54	-5.77	peak	Horizontal
4	4960	38.64	7.49	46.13	54	-7.87	peak	Vertical
5	7440	35.88	11.65	47.53	54	-6.47	peak	Vertical
6	9920	36.62	14.4	51.02	54	-2.98	peak	Vertical

Remark: 1) Emission = Receiver Reading + Factor

2) Factor = Antenna Factor + Cable Loss + Pre-amplifier Factor.

3) If the Peak value below the AV Limit, the AV test doesn't perform for this submission.

4) No spurious emissions were detected within 20dB of limit below 30MHz



## **8 Test Setup Photographs**

Refer to the < Test Setup photos-FCC>.

## **9 EUT Constructional Details**

Refer to the < External Photos > & < Internal Photos >.