



## TEST REPORT

**Application No.:** SHEM1809008316CR  
**FCC ID:** SVC-PULSEBAR2I  
**IC:** 152C-PULSEBAR2I  
**Applicant:** Lenbrook Industries Limited  
**Address of Applicant:** 633 Granite Court, Pickering, Ontario, Canada L1W 3K1  
**Manufacturer:** Lenbrook Industries Limited  
**Address of Manufacturer:** 633 Granite Court, Pickering, Ontario, Canada L1W 3K1  
**Factory:** Hansong (Nanjing) Technology Ltd.  
**Address of Factory:** 8th Kangping Road, Jiangning Economy and Technology Development Zone, Nanjing, 211106, China.

**Equipment Under Test (EUT):**

**EUT Name:** Wireless Streaming Sound System  
**Model No.:** Pulse Soundbar 2i  
**Trade mark:** Bluesound  
**Standard(s) :** 47 CFR Part 15, Subpart E 15.407  
RSS-247 Issue 2, February 2017  
RSS-Gen Issue 5, April 2018  
**Date of Receipt:** 2018-09-20  
**Date of Test:** 2018-11-21 to 2018-12-17  
**Date of Issue:** 2019-01-10

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

Parlam Zhan

Parlam Zhan  
E&E Section 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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SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.  
Testing Center EMC Laboratory

NO.588 West Jindu Road, Songjiang District, Shanghai, China 201612  
中国·上海·松江区金都西路588号 邮编: 201612

t(86-21) 61915666 f(86-21) 61915678 www.sgsgroup.com.cn  
t(86-21) 61915666 f(86-21) 61915678 e [sgs.china@sgs.com](mailto:sgs.china@sgs.com)



Revision Record			
Version	Description	Date	Remark
00	Original	2019-01-10	/

Authorized for issue by:			
			
		<hr/> Bill Wu / Project Engineer	
			
		<hr/> Parlam Zhan / Reviewer	



## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart E 15.407	N/A	47 CFR Part 15, Subpart C 15.203	Pass
Transmission in the Absence of Data	47 CFR Part 15, Subpart E 15.407	N/A	47 CFR Part 15, Subpart C 15.407 (c)	Pass

N/A: Not applicable

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart E 15.407	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207 & 15.407 b(6)	Pass
99% Bandwidth	47 CFR Part 15, Subpart E 15.407	KDB 789033 II D	N/A	Pass
26dB Emission bandwidth	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II C 1	47 CFR Part 15, Subpart C 15.407 (a)	Pass
Minimum 6 dB bandwidth (5.725-5.85 GHz band )	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II C 2	47 CFR Part 15, Subpart C 15.407 (e)	Pass
Maximum Conducted output power	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II E	47 CFR Part 15, Subpart C 15.407 (a)	Pass
Peak Power spectrum density	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II F	47 CFR Part 15, Subpart C 15.407 (a)	Pass
Radiated Emissions	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II G	47 CFR Part 15, Subpart C 15.209 & 15.407(b)	Pass
Radiated Emissions which fall in the restricted bands	47 CFR Part 15, Subpart E 15.407	KDB 789033 D02 II G	47 CFR Part 15, Subpart C 15.209 & 15.407(b)	Pass
Frequency Stability	47 CFR Part 15, Subpart E 15.407	ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart C 15.407 (g)	Pass

N/A: Not applicable



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## 4 General Information

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

Power supply:	AC 100-240V~50/60Hz 80W
Test voltage:	AC 120V/60Hz
Cable:	AC Cable 200cm
Antenna Gain	Antenna 1: 2dBi Antenna 2: 2dBi
Antenna Type	PIFA Antenna
DFS Function	Slave without Radar detection
TPC Function	Not Support
Number of Channels	6
Channel List	5180MHz,5210MHz,5240MHz,5736MHz,5762MHz,5814MHz

#### Power level setting using in test:

Channel	Level
5180	Default
5210	Default
5240	Default
5736	Default
5762	Default
5814	Default

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Router	FIR302M	FIR302M	/
Laptop	LENOVO	R400	/



### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 7.25 \times 10^{-8}$
2	Timeout	$\pm 2s$
3	Duty cycle	$\pm 0.37\%$
4	Occupied Bandwidth	$\pm 3\%$
5	RF conducted power	$\pm 0.75dB$
6	RF power density	$\pm 2.84dB$
7	Conducted Spurious emissions	$\pm 0.75dB$
8	RF Radiated power	$\pm 4.5dB$ (Below 1GHz) $\pm 4.8dB$ (Above 1GHz)
9	Radiated Spurious emission test	$\pm 4.2dB$ (Below 30MHz) $\pm 4.4dB$ (30MHz-1GHz) $\pm 4.6dB$ (1GHz-18GHz) $\pm 5.2dB$ (Above 18GHz)
10	Temperature test	$\pm 1^{\circ}C$
11	Humidity test	$\pm 3\%$
12	Supply voltages	$\pm 1.5\%$
13	Time	$\pm 3\%$

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .



#### **4.4 Test Location**

All tests were performed at:

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

588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China

Tel: +86 21 6191 5666 Fax: +86 21 6191 5678

No tests were sub-contracted.

#### **4.5 Test Facility**

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

- **CNAS (No. CNAS L0599)**

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. 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.

- **NVLAP (Certificate No. 201034-0)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP). Certificate No. 201034-0.

- **FCC –Designation Number: CN5033**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

Designation Number: CN5033. Test Firm Registration Number: 479755.

- **Industry Canada (IC) – IC Assigned Code: 8617A**

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 8617A-1.

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

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

None

#### **4.7 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	2017-12-20	2018-12-19
LISN	Schwarzbeck	NSLK8127	SHEM061-1	2017-12-20	2018-12-19
LISN	EMCO	3816/2	SHEM019-1	2017-12-20	2018-12-19
Pulse limiter	R&S	ESH3-Z2	SHEM029-1	2017-12-20	2018-12-19
CE test Cable	/	CE01	/	2017-12-26	2018-12-25
<b>Conducted Test</b>					
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-12-20	2018-12-19
Spectrum Analyzer	Agilent	N9020A	SHEM181-1	2018-08-13	2019-08-12
Signal Generator	R&S	SMR20	SHEM006-1	2018-08-13	2019-08-12
Signal Generator	Agilent	N5182A	SHEM182-1	2018-08-13	2019-08-12
Communication Tester	R&S	CMW270	SHEM183-1	2018-08-13	2019-08-12
Switcher	Tonscend	JS0806	SHEM184-1	2018-08-13	2019-08-12
Power Sensor	Keysight	U2021XA * 4	SHEM184-1	2018-08-13	2019-08-12
Splitter	Anritsu	MA1612A	SHEM185-1	/	/
Coupler	e-meca	803-S-1	SHEM186-1	/	/
High-low Temp Cabinet	Suzhou Zhihe	TL-40	SHEM087-1	2017-09-25	2020-09-24
AC Power Stabilizer	WOCEN	6100	SHEM045-1	2017-12-26	2018-12-25
DC Power Supply	QJE	QJ30003SII	SHEM046-1	2017-12-26	2018-12-25
Conducted test Cable	/	RF01~RF04	/	2017-12-26	2018-12-25
<b>Radiated Test</b>					
EMI test Receiver	R&S	ESU40	SHEM051-1	2017-12-20	2018-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2017-12-20	2018-12-19
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2017-04-10	2020-04-09
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2017-02-28	2020-02-27
Antenna (25MHz-3GHz)	Schwarzbeck	HL562	SHEM010-1	2017-02-28	2020-02-27
Horn Antenna (1-8GHz)	Schwarzbeck	HF906	SHEM009-1	2017-10-24	2020-10-23
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2017-01-14	2020-01-13
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2017-12-03	2020-12-02
Pre-amplifier (9kHz-2GHz)	CLAVIIO	BDLNA-0001	SHEM164-1	2018-08-13	2019-08-12
Pre-amplifier (1-18GHz)	CLAVIIO	BDLNA-0118	SHEM050-2	2018-08-13	2019-08-12
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2017-12-20	2018-12-19
Signal Generator	R&S	SMR40	SHEM058-1	2018-08-13	2019-08-12
Band Filter	LORCH	9BRX-875/X150	SHEM156-1	/	/
Band Filter	LORCH	13BRX-1950/X500	SHEM083-2	/	/
Band Filter	LORCH	5BRX-2400/X200	SHEM155-1	/	/
Band Filter	LORCH	5BRX-5500/X1000	SHEM157-2	/	/
High pass Filter	Wainwright	WHK3.0/18G	SHEM157-1	/	/
High pass Filter	Wainwright	WHKS1700	SHEM157-3	/	/
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2017-07-22	2020-07-21
RE test Cable	/	RE01, RE02, RE06	/	2017-12-26	2018-12-25



## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

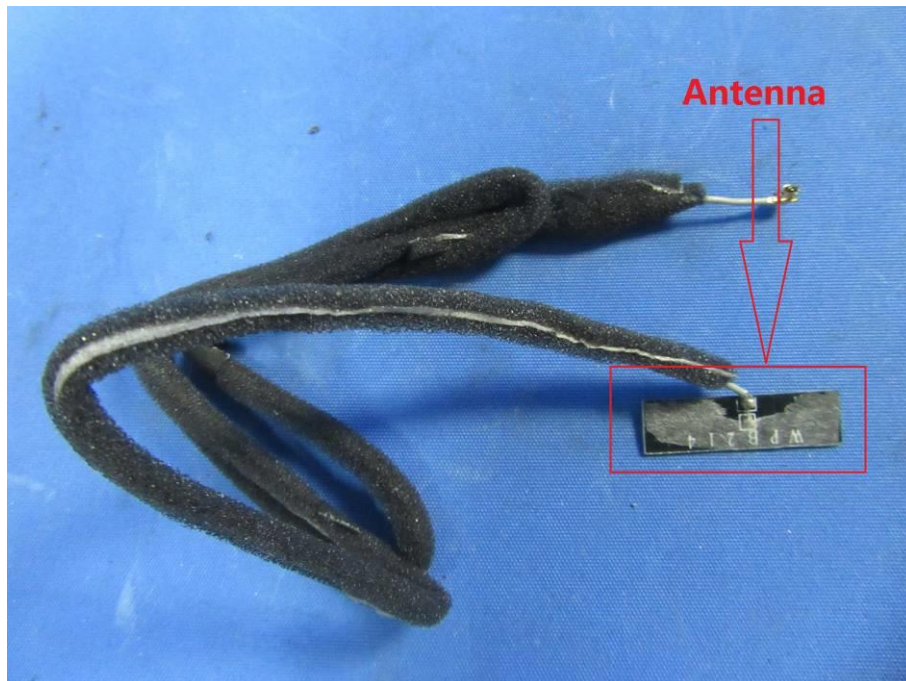
#### 6.1.2 Conclusion

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 a 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 PIFA Antenna and no consideration of replacement. The best case gain of the antenna is 2dBi.





## **6.2 Transmission in the Absence of Data**

### **6.2.1 Test Requirement:**

47 CFR Part 15, Subpart C 15.407 (c)

### **6.2.2 Conclusion**

Standard Requirement:

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Applicants shall include in their application for equipment authorization a description of how this requirement is met.

EUT Details:

WIFI chip (AL7230S) support automatically discontinue transmission in case of either absence of information to transmit or operational failure, if the chip detect absence of information to transmit or operational failure, it will be automatically shut off.

## 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 & 15.407 b(6)

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

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	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.

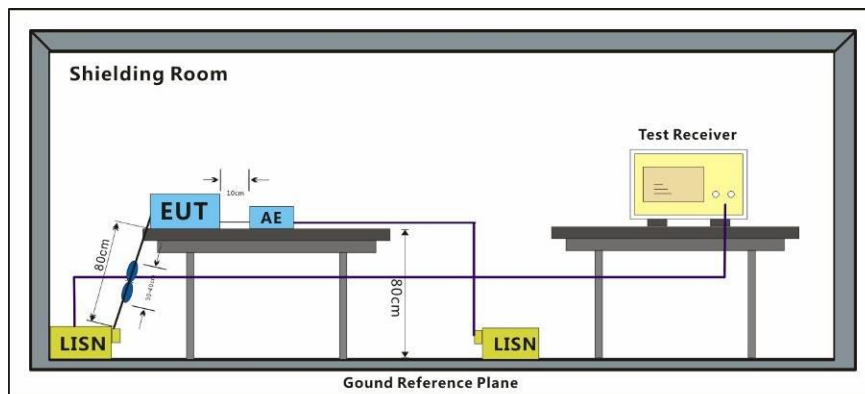
#### 7.1.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

#### 7.1.2 Test Setup Diagram





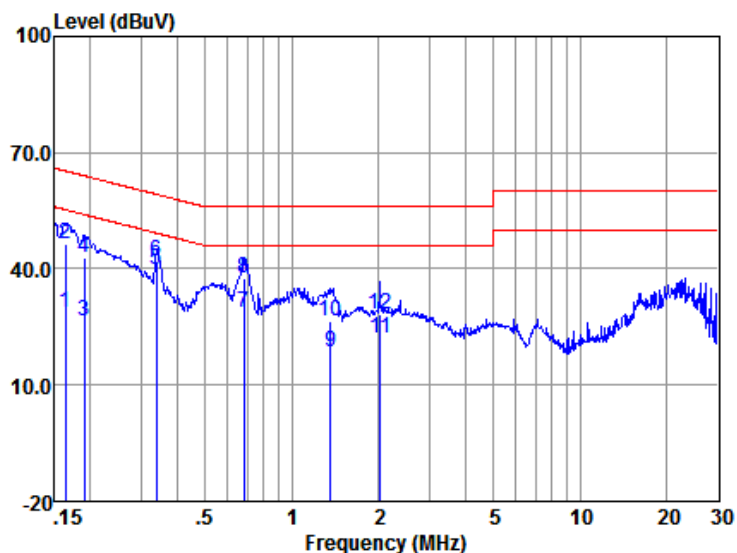
### **7.1.3 Measurement Procedure and Data**

- 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:b; Line:Live Line



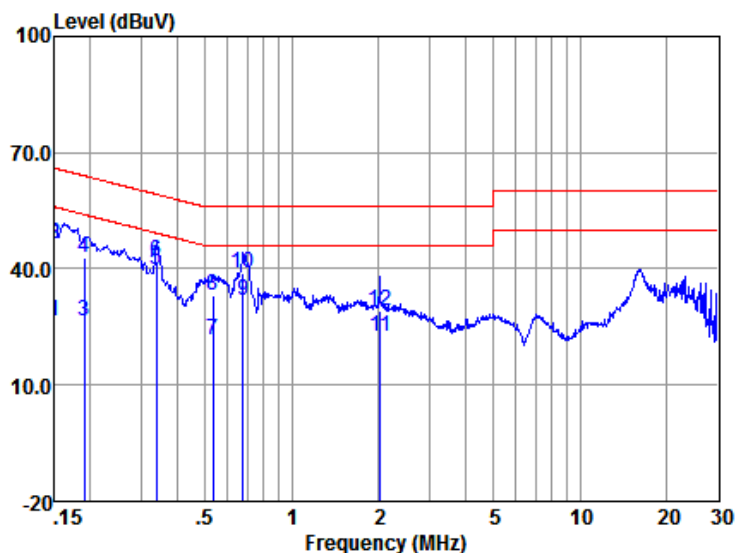
LISN : LINE  
EUT/Project No : 6104CR  
Test mode : e

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.16	18.83	0.05	9.82	28.70	55.30	-26.60	Average
2	0.16	36.62	0.05	9.82	46.49	65.30	-18.81	QP
3	0.19	16.41	0.05	9.83	26.29	54.02	-27.73	Average
4	0.19	32.79	0.05	9.83	42.67	64.02	-21.35	QP
5	0.34	30.07	0.05	9.84	39.96	49.22	-9.26	Average
6	0.34	31.90	0.05	9.84	41.79	59.22	-17.43	QP
7	0.68	18.67	0.04	9.85	28.56	46.00	-17.44	Average
8	0.68	27.56	0.04	9.85	37.45	56.00	-18.55	QP
9	1.36	8.49	0.05	9.84	18.38	46.00	-27.62	Average
10	1.36	16.82	0.05	9.84	26.71	56.00	-29.29	QP
11	2.02	12.12	0.05	9.87	22.04	46.00	-23.96	Average
12	2.02	18.52	0.05	9.87	28.44	56.00	-27.56	QP

Notes: Emission Level = Read Level +LISN Factor + Cable loss



Mode:b; Line:Neutral Line



LISN : NEUTRAL  
EUT/Project No : 6104CR  
Test mode : e

	Freq (MHz)	Read level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Emission Level (dBuV)	Limit (dBuV)	Over Limit (dB)	Remark
1	0.15	16.47	0.06	9.82	26.35	56.00	-29.65	Average
2	0.15	36.36	0.06	9.82	46.24	66.00	-19.76	QP
3	0.19	16.81	0.06	9.83	26.70	54.02	-27.32	Average
4	0.19	33.14	0.06	9.83	43.03	64.02	-20.99	QP
5	0.34	29.82	0.05	9.84	39.71	49.22	-9.51	Average
6	0.34	32.14	0.05	9.84	42.03	59.22	-17.19	QP
7	0.53	11.80	0.05	9.76	21.61	46.00	-24.39	Average
8	0.53	23.38	0.05	9.76	33.19	56.00	-22.81	QP
9	0.68	21.91	0.05	9.85	31.81	46.00	-14.19	Average
10	0.68	29.06	0.05	9.85	38.96	56.00	-17.04	QP
11	2.02	12.45	0.06	9.87	22.38	46.00	-23.62	Average
12	2.02	19.19	0.06	9.87	29.12	56.00	-26.88	QP

Notes: Emission Level = Read Level +LISN Factor + Cable loss

## 7.2 99% Bandwidth

Test Requirement N/A

Test Method: KDB 789033 II D

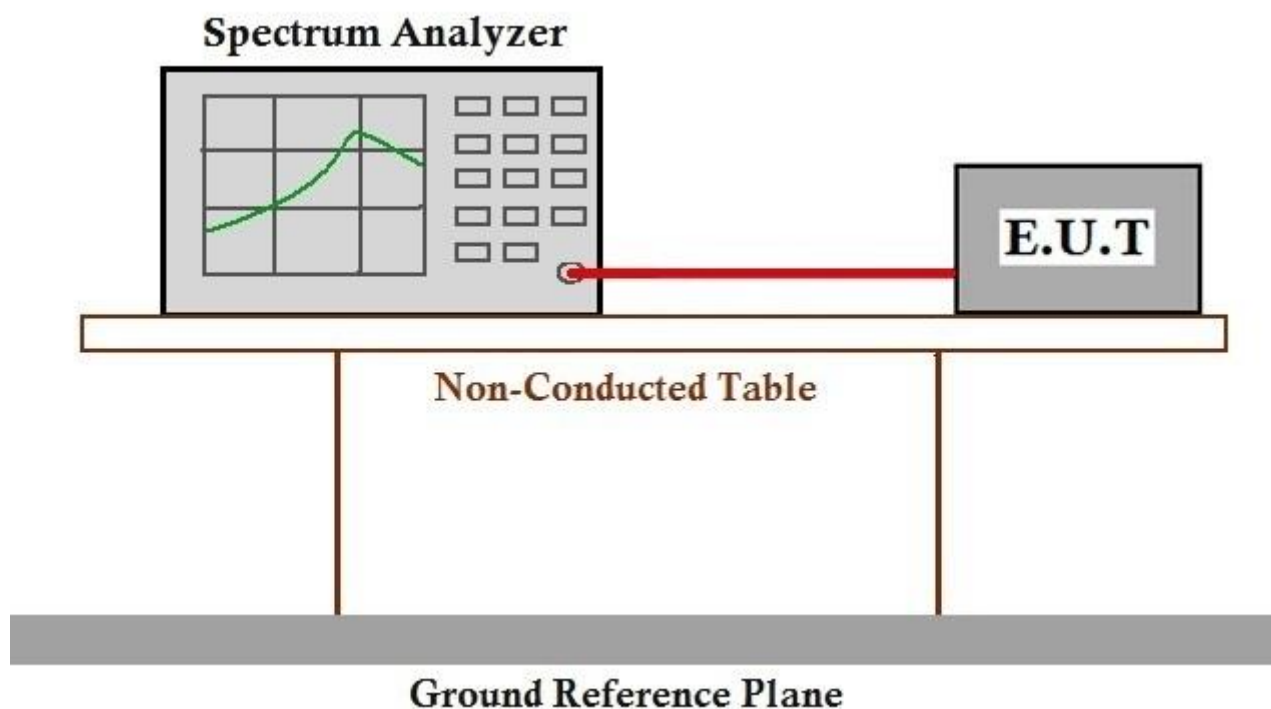
### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

### 7.2.2 Test Setup Diagram



### 7.2.3 Measurement Procedure and Data

The detailed test data see: Appendix F for SHEM180900831606

### 7.3 26dB Emission bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.407 (a)

Test Method: KDB 789033 D02 II C 1

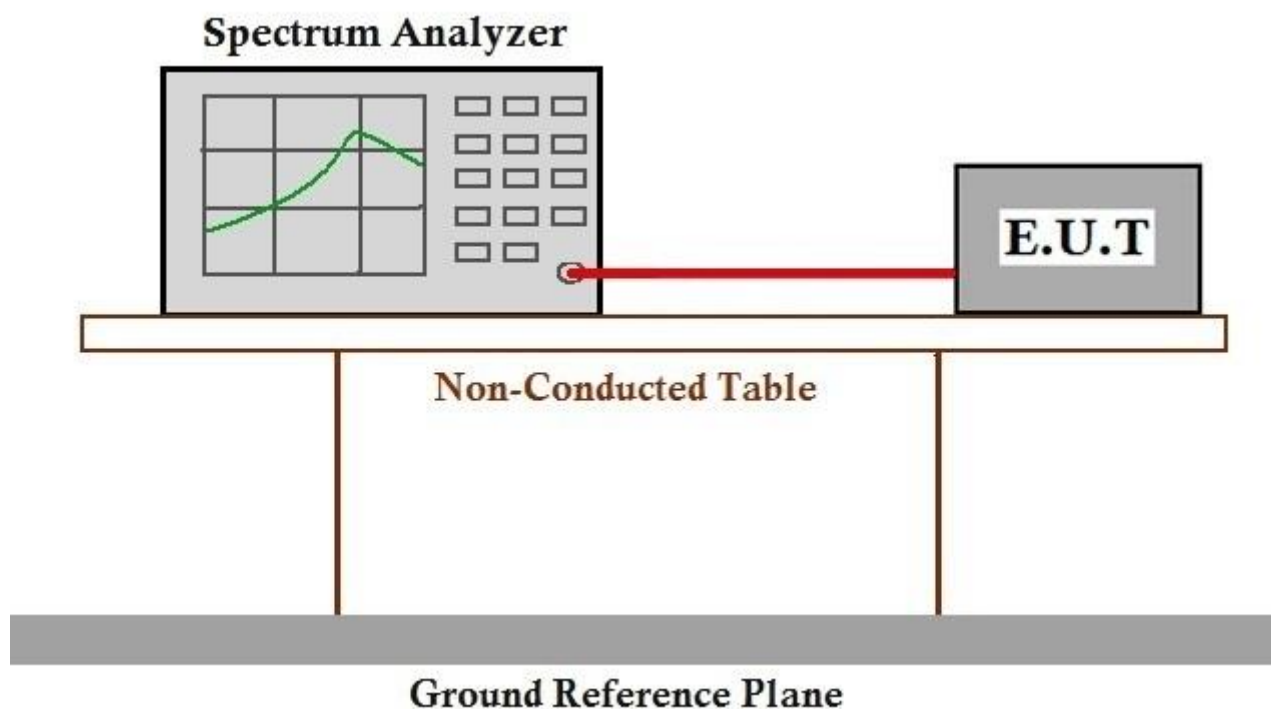
#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

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

#### 7.3.2 Test Setup Diagram



#### 7.3.3 Measurement Procedure and Data

The detailed test data see: Appendix F for SHEM180900831606



#### 7.4 Minimum 6 dB bandwidth (5.725-5.85 GHz band )

Test Requirement 47 CFR Part 15, Subpart C 15.407 (e)  
 Test Method: KDB 789033 D02 II C 2  
 Limit:  $\geq 500$  kHz

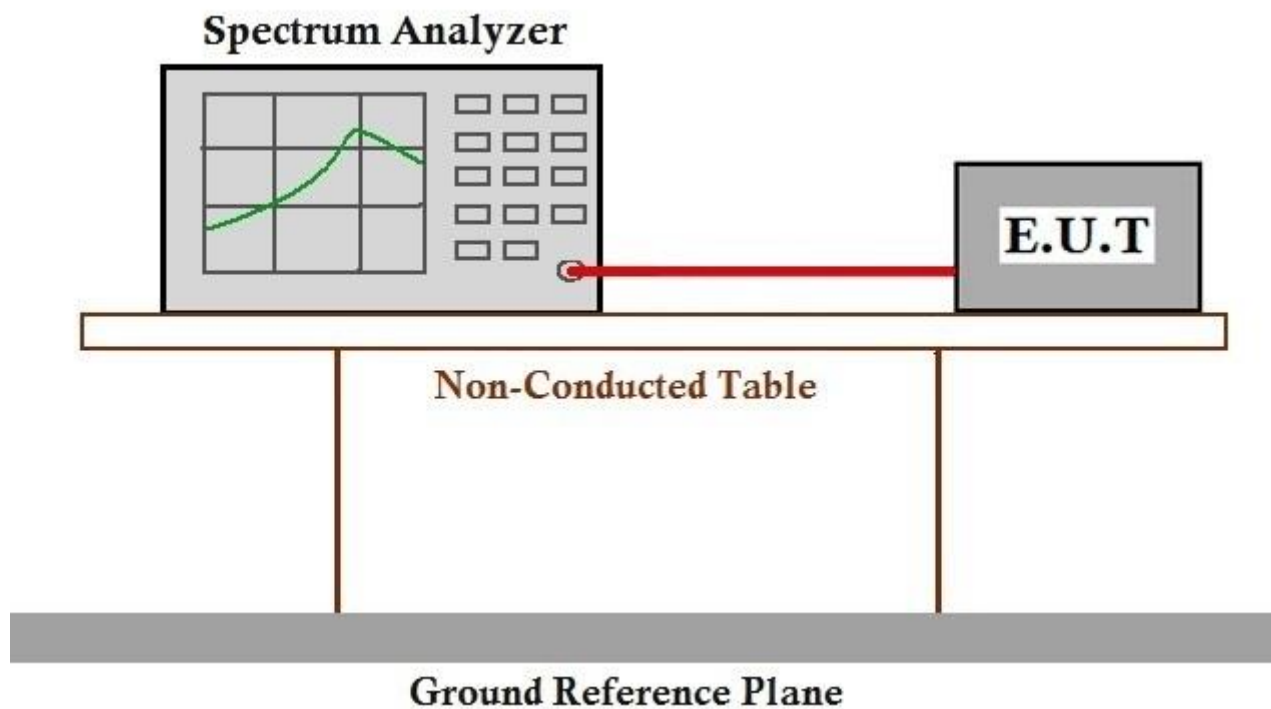
##### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

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

##### 7.4.2 Test Setup Diagram



##### 7.4.3 Measurement Procedure and Data

The detailed test data see: Appendix F for SHEM180900831606

## 7.5 Maximum Conducted output power

Test Requirement 47 CFR Part 15, Subpart C 15.407 (a)

Test Method: KDB 789033 D02 II E

Limit:

Frequency band(MHz)	Limit
5150-5250	$\leq 1\text{W}(30\text{dBm})$ for master device
	$\leq 250\text{mW}(24\text{dBm})$ for client device
5250-5350	$\leq 250\text{mW}(24\text{dBm})$ for client device or $11\text{dBm}+10\log B^*$
5470-5725	$\leq 250\text{mW}(24\text{dBm})$ for client device or $11\text{dBm}+10\log B^*$
5725-5850	$\leq 1\text{W}(30\text{dBm})$
Remark:	<p>* Where B is the 26dB emission bandwidth in MHz.</p> <p>The maximum conducted output power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.</p> <p>For IC 5150MHz to 5250MHz limit is <math>\text{EIRP} \leq 200\text{mW}(23\text{dBm})</math></p>

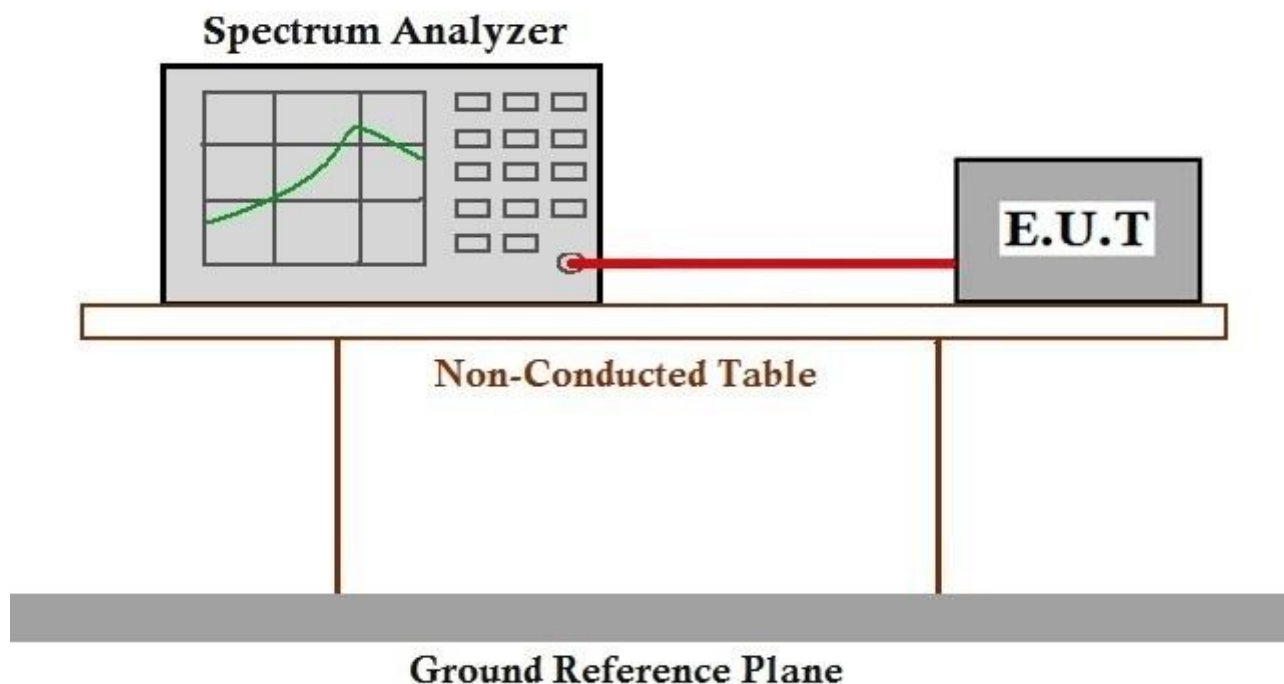
### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Procedure and Data

The detailed test data see: Appendix E for SHEM180900831606

## 7.6 Peak Power spectrum density

Test Requirement 47 CFR Part 15, Subpart C 15.407 (a)

Test Method: KDB 789033 D02 II F

Limit:

Frequency band(MHz)	Limit
5150-5250	≤17dBm in 1MHz for master device
	≤11dBm in 1MHz for client device
5250-5350	≤11dBm in 1MHz for client device
5470-5725	≤11dBm in 1MHz for client device
5725-5850	≤30dBm in 500 kHz
Remark:	The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. For IC 5150MHz to 5250MHz limit is EIRP PSD ≤ 10dBm

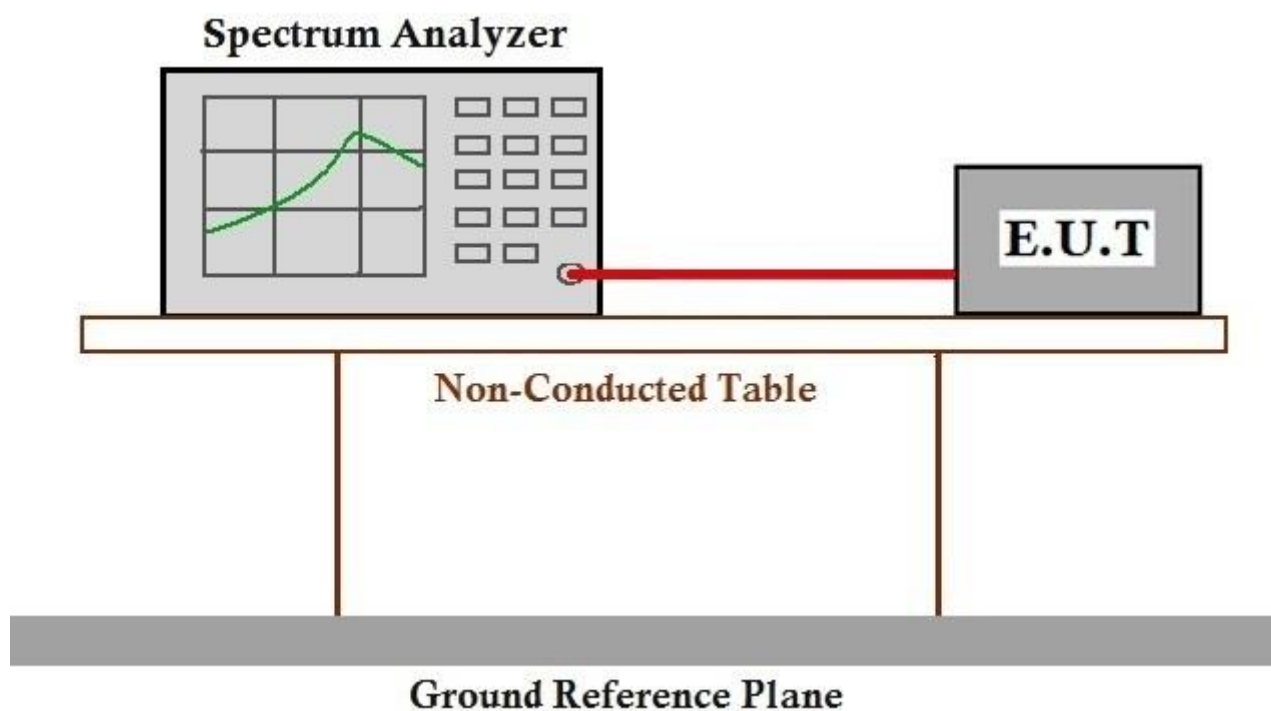
### 7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

### 7.6.2 Test Setup Diagram



### 7.6.3 Measurement Procedure and Data

The detailed test data see: Appendix E for SHEM180900831606

## 7.7 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.407(b)

Test Method: KDB 789033 D02 II G

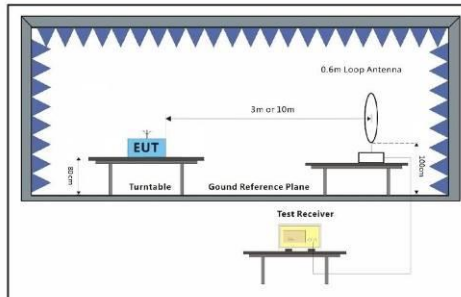
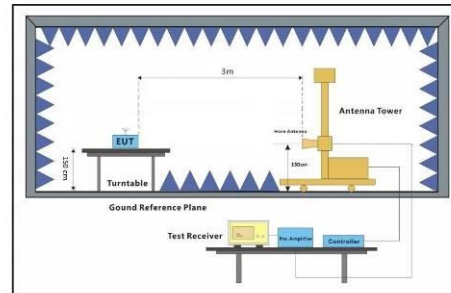
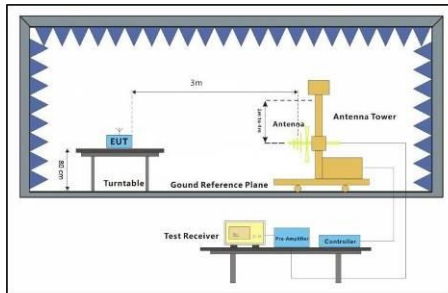
### 7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

### 7.7.2 Test Setup Diagram





### 7.7.3 Measurement Procedure and Data

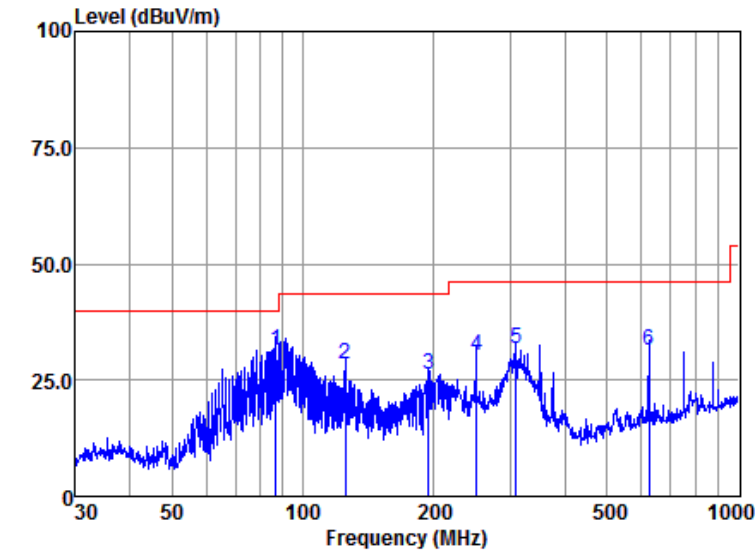
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5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

1. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor
2. For emission below 1GHz, through the pre-scan found the worst case is the lowest channel of 802.11a. Only the worst case is recorded in the report.
3. Scan from 9kHz to 40GHz, the disturbance above 18GHz and below 30MHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
4. 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. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.
- 5: Peak limit for Band 1 is -27dBm/MHz, according  $EIRP[dBm] = E[dB\mu V/m] - 95.2$ , So the converted "E" value is 68.2dBuV/m
6. This test item was investigated while operating in each antenna mode, however, it was determined that antenna 1 produced the worst emissions. So the emissions produced from other operation are not report.



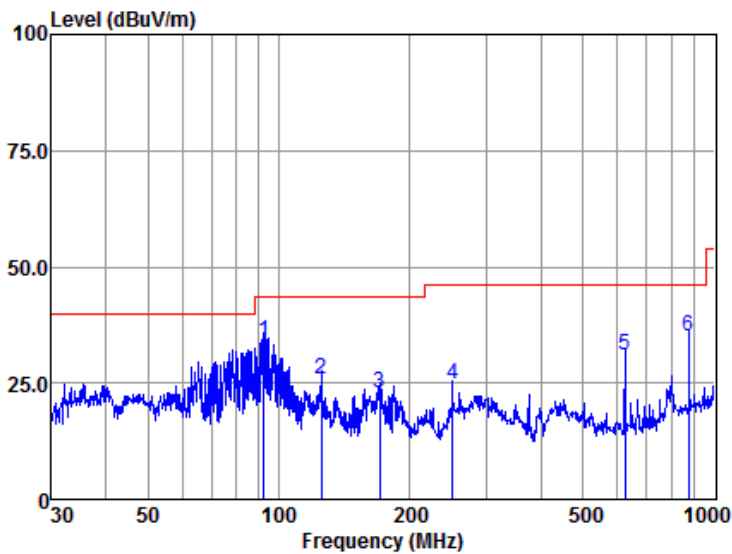
Below 1GHz



Antenna Polarity :HORIZONTAL  
EUT/Project :6104CR  
Test mode :e

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	86.50	65.43	8.07	0.40	42.68	31.22	40.00	-8.78	QP
2	125.01	59.22	11.46	0.55	42.67	28.56	43.50	-14.94	QP
3	194.45	58.17	9.88	0.69	42.53	26.21	43.50	-17.29	QP
4	250.30	60.52	11.50	0.77	42.46	30.33	46.00	-15.67	QP
5	308.91	59.97	13.39	0.86	42.38	31.84	46.00	-14.16	QP
6	625.08	52.68	19.62	1.41	42.19	31.52	46.00	-14.48	QP

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Antenna Polarity :VERTICAL  
EUT/Project :6104CR  
Test mode :e

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	92.46	67.75	8.47	0.43	42.69	33.96	43.50	-9.54	QP
2	125.01	56.31	11.46	0.55	42.67	25.65	43.50	-17.85	QP
3	170.79	53.33	11.62	0.65	42.57	23.03	43.50	-20.47	QP
4	250.30	54.74	11.50	0.77	42.46	24.55	46.00	-21.45	QP
5	625.08	52.23	19.62	1.41	42.19	31.07	46.00	-14.93	QP
6	875.25	52.36	22.51	2.35	42.10	35.12	46.00	-10.88	QP

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Above 1GHz:

Test Channel	Frequency MHz	Polarization	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Over Limit dB	Detector
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5180	10360	Vertical	31.83	14.28	46.11	68.2	-22.09	peak
	15540	Vertical	26.67	21.58	48.25	54	-5.75	peak
	20720	Vertical	27.18	23.16	50.34	54	-3.66	peak
	10360	Horizontal	31.62	14.28	45.90	68.2	-22.30	peak
	15540	Horizontal	25.93	21.58	47.51	54	-6.49	peak
	20720	Horizontal	25.96	23.16	49.12	54	-4.88	peak
5210	10420	Vertical	33.30	14.14	47.44	68.2	-20.76	peak
	15630	Vertical	27.47	21.22	48.69	54	-5.31	peak
	20840	Vertical	26.68	23.24	49.92	54	-4.08	peak
	10420	Horizontal	31.09	14.14	45.23	68.2	-22.97	peak
	15630	Horizontal	25.99	21.22	47.21	54	-6.79	peak
	20840	Horizontal	28.40	23.24	51.64	54	-2.36	peak
5240	10480	Vertical	36.34	14.08	50.42	68.2	-17.78	peak
	15720	Vertical	29.18	21.10	50.28	54	-3.72	peak
	20960	Vertical	25.99	23.64	49.63	54	-4.37	peak
	10480	Horizontal	29.67	14.08	43.75	68.2	-24.45	peak
	15720	Horizontal	30.01	21.10	51.11	54	-2.89	peak
	20960	Horizontal	26.97	23.64	50.61	54	-3.39	peak





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Test Channel	Frequency MHz	Polarization	RX_R dBuV	Factor dB	Emission dBuV/m	Limit dBuV/m	Over Limit dB	Detector
5736	11472	Vertical	30.35	14.41	44.76	54	-9.24	peak
	17208	Vertical	27.61	22.57	50.18	68.2	-18.02	peak
	22944	Vertical	26.47	24.45	50.92	54	-3.08	peak
	11472	Horizontal	32.38	14.41	46.79	54	-7.21	peak
	17208	Horizontal	26.24	22.57	48.81	68.2	-19.39	peak
	22944	Horizontal	24.89	24.45	49.34	54	-4.66	peak
5762	11524	Vertical	33.83	14.25	48.08	54	-5.92	peak
	17286	Vertical	26.72	21.86	48.58	68.2	-19.62	peak
	23048	Vertical	27.93	24.68	52.61	68.2	-15.59	peak
	11524	Horizontal	33.94	14.25	48.19	54	-5.81	peak
	17286	Horizontal	29.07	21.86	50.93	68.2	-17.27	peak
	23048	Horizontal	30.00	24.68	54.68	68.2	-13.52	peak
5814	11628	Vertical	33.91	14.06	47.97	54	-6.03	peak
	17442	Vertical	28.80	21.15	49.95	68.2	-18.25	peak
	23256	Vertical	25.70	25.11	50.81	68.2	-17.39	peak
	11628	Horizontal	33.91	14.06	47.97	54	-6.03	peak
	17442	Horizontal	28.80	21.15	49.95	68.2	-18.25	peak
	23256	Horizontal	25.70	25.11	50.81	68.2	-17.39	peak

## 7.8 Radiated Emissions which fall in the restricted bands

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.407(b)

Test Method: KDB 789033 D02 II G

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.

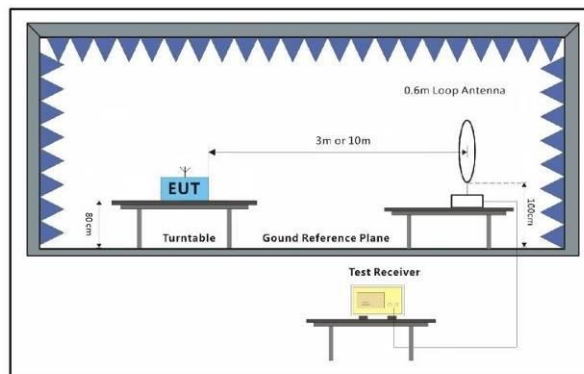
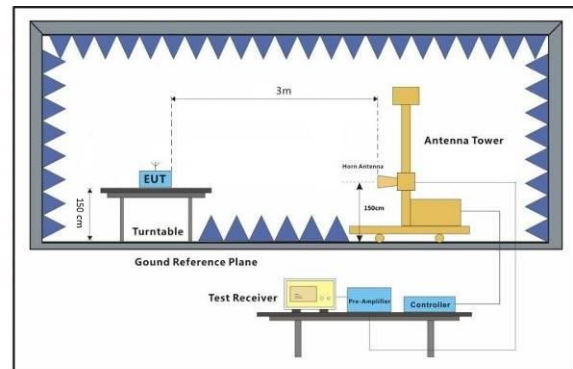
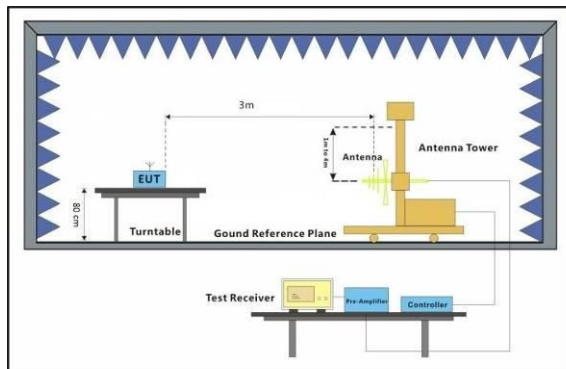
### 7.8.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

### 7.8.2 Test Setup Diagram





### **7.8.3 Measurement Procedure and Data**

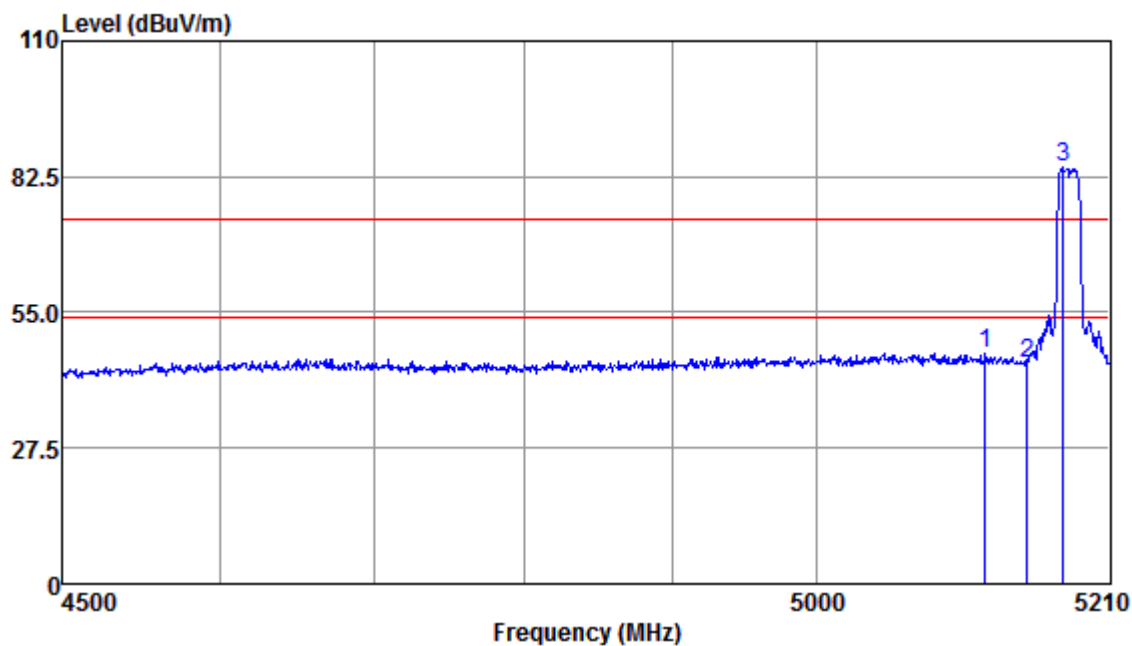
- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 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 1 :  $\text{Level} = \text{Read Level} + \text{Cable Loss} + \text{Antenna Factor} - \text{Preamp Factor}$

Remark 2: This test item was investigated while operating in each antenna mode, however, it was determined that antenna 1 produced the worst emissions. So the emissions produced from other operation are not report.



Polarization:Horizontal; Channel:5180MHz



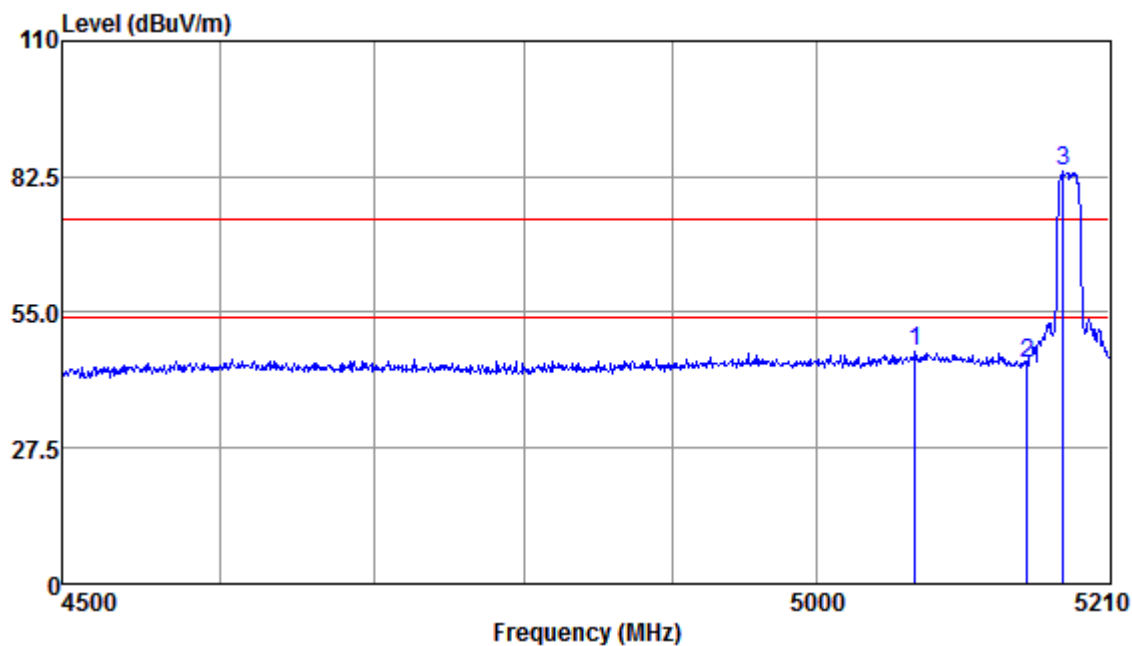
Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
5119.96	44.85	31.57	9.26	38.83	46.85	74.00	-27.15	Peak
5150.00	42.65	31.61	9.06	38.81	44.51	74.00	-29.49	Peak
5176.52	82.87	31.65	8.86	38.80	84.58	74.00	10.58	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Polarization:Vertical; Channel:5180MHz



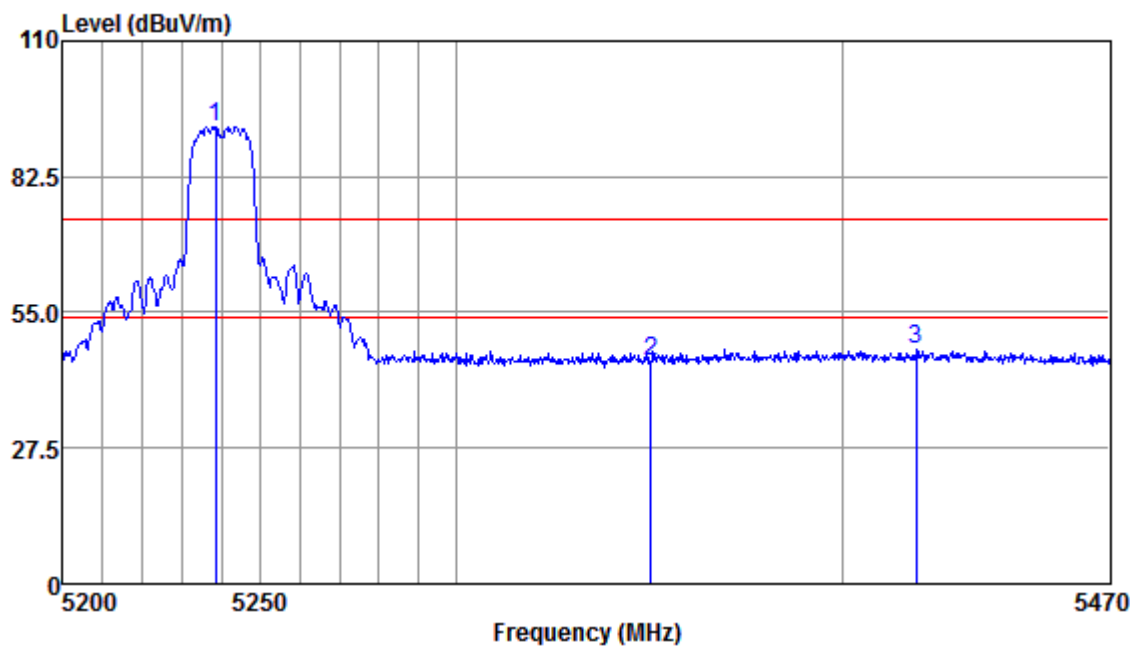
Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
5069.95	44.90	31.51	9.44	38.85	47.00	74.00	-27.00	Peak
5150.00	42.73	31.61	9.06	38.81	44.59	74.00	-29.41	Peak
5176.52	81.97	31.65	8.86	38.80	83.68	74.00	9.68	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Polarization:Horizontal; Channel:5240MHz



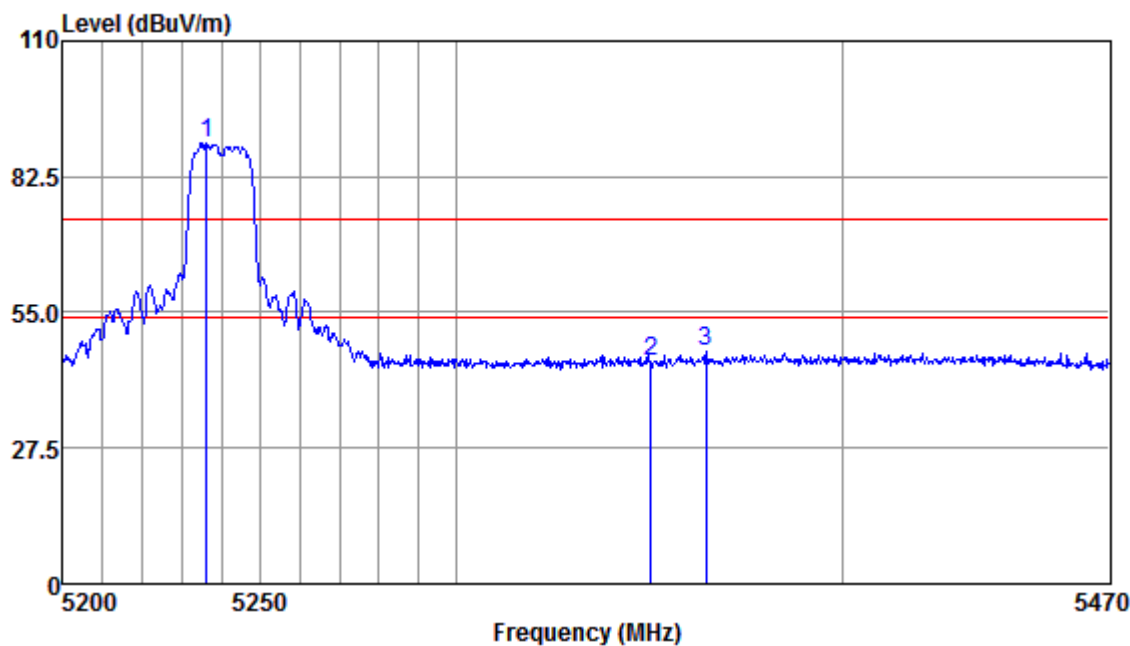
Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
5238.57	90.94	31.74	8.68	38.77	92.59	74.00	18.59	Peak
5350.00	42.53	31.89	9.20	38.70	44.92	74.00	-29.08	Peak
5419.01	44.77	31.99	9.34	38.66	47.44	74.00	-26.56	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Polarization:Vertical; Channel:5240MHz



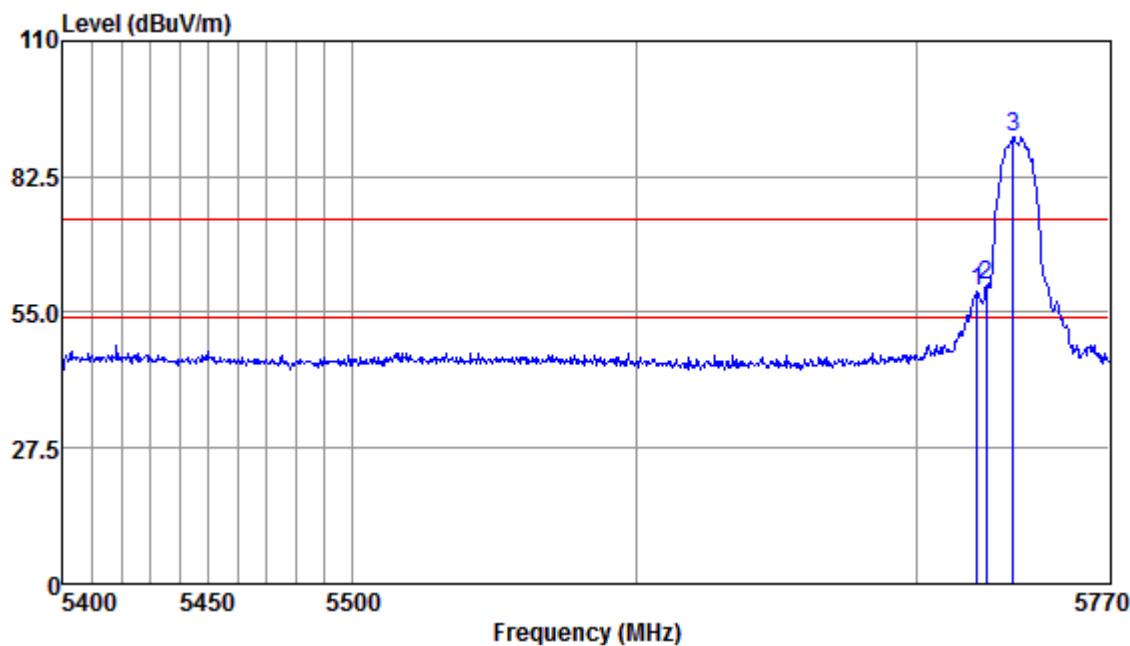
Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
5236.19	87.68	31.74	8.68	38.77	89.33	74.00	15.33	Peak
5350.00	42.55	31.89	9.20	38.70	44.94	74.00	-29.06	Peak
5364.16	44.49	31.91	9.20	38.69	46.91	74.00	-27.09	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Polarization:Horizontal; Channel:5736MHz



Antenna Polarity :HORIZONTAL

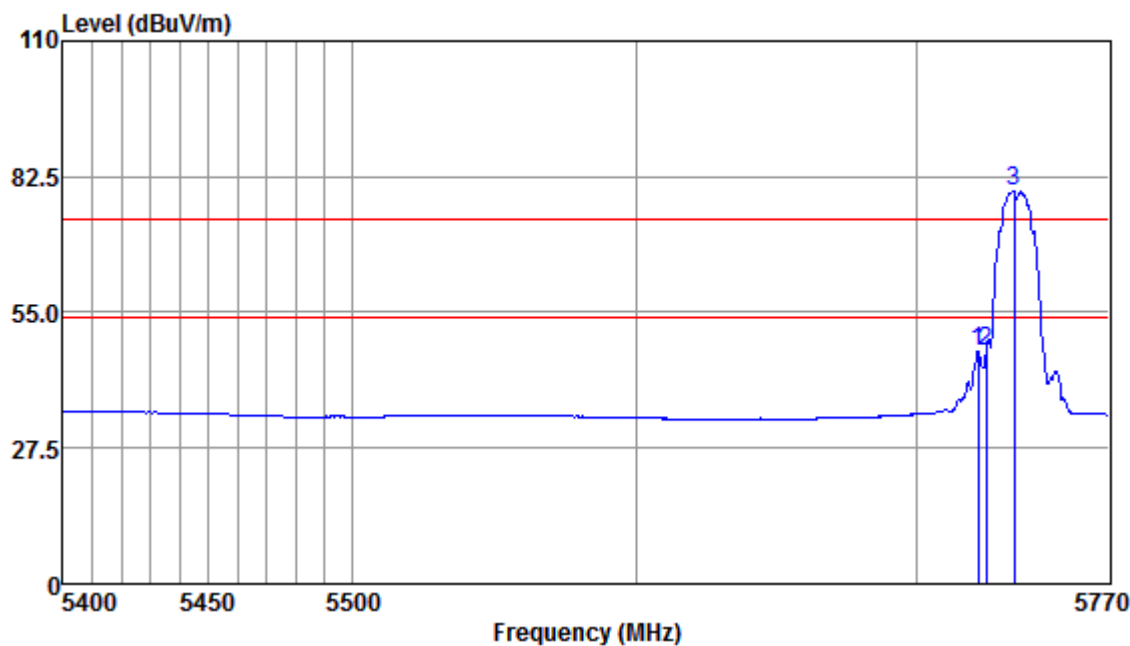
Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
5721.64	56.84	32.14	9.00	38.74	59.24	74.00	-14.76	Peak
5725.00	58.06	32.15	9.00	38.75	60.46	74.00	-13.54	Peak
5734.93	88.08	32.15	9.00	38.75	90.48	74.00	16.48	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor





Polarization:Horizontal; Channel:5736MHz



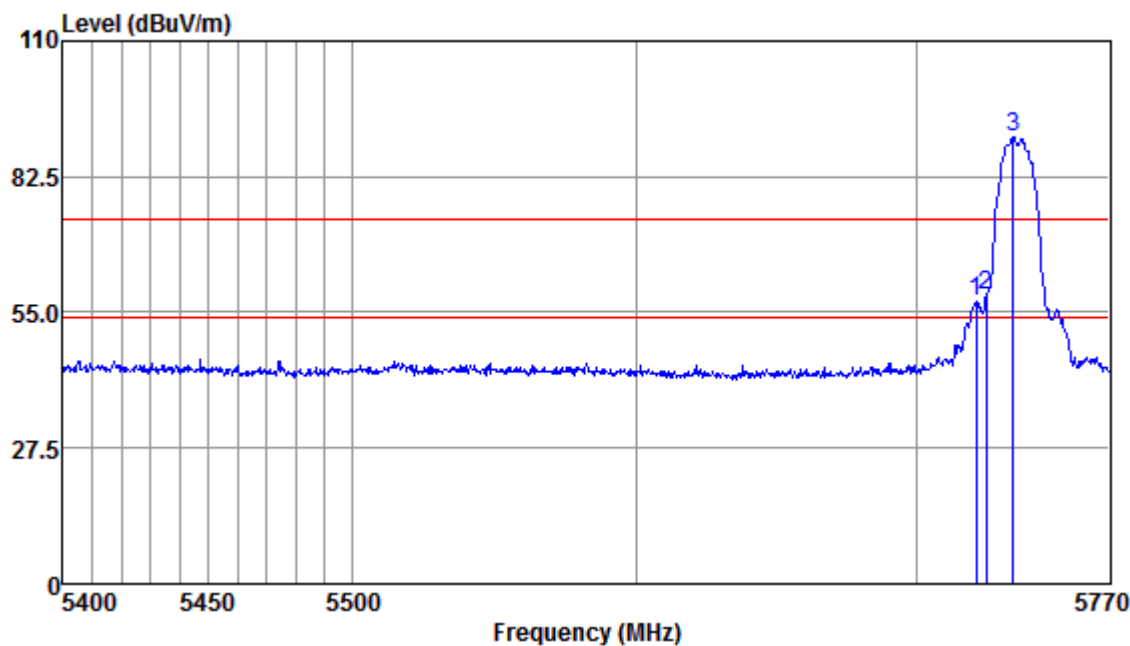
Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
5722.02	44.76	32.14	9.00	38.74	47.16	54.00	-6.84	Average
5725.00	44.80	32.15	9.00	38.75	47.20	54.00	-6.80	Average
5735.31	77.10	32.15	9.00	38.75	79.50	54.00	25.50	Average

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Polarization:Vertical; Channel:5736MHz



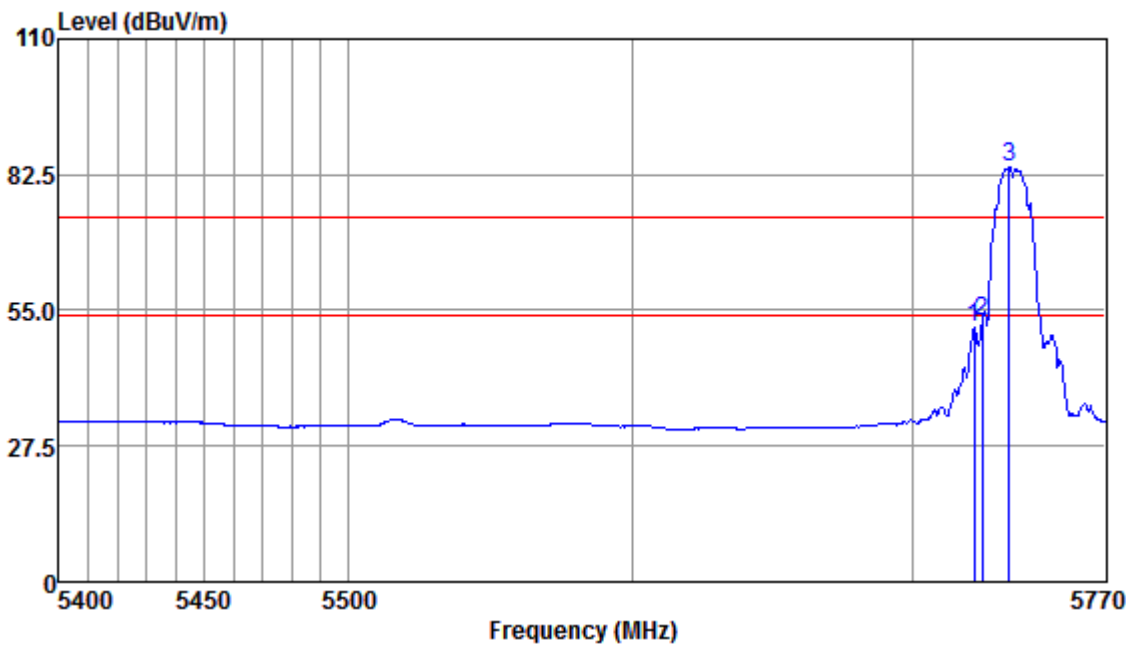
Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
5721.26	54.97	32.14	9.00	38.74	57.37	74.00	-16.63	Peak
5725.00	56.07	32.15	9.00	38.75	58.47	74.00	-15.53	Peak
5734.93	88.04	32.15	9.00	38.75	90.44	74.00	16.44	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Polarization:Vertical; Channel:5736MHz



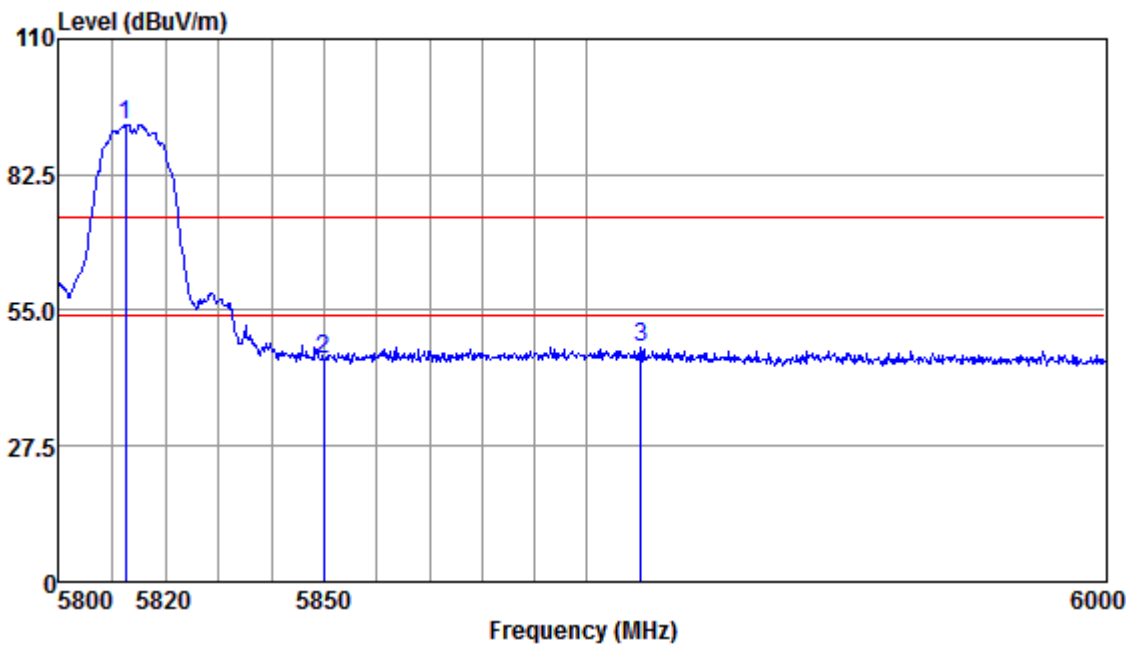
Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
-----	-----	-----	-----	-----	-----	-----	-----	-----
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
5722.02	49.12	32.14	9.00	38.74	51.52	54.00	-2.48	Average
5725.00	50.36	32.15	9.00	38.75	52.76	54.00	-1.24	Average
5734.93	81.66	32.15	9.00	38.75	84.06	54.00	30.06	Average

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



Polarization:Horizontal; Channel:5814MHz



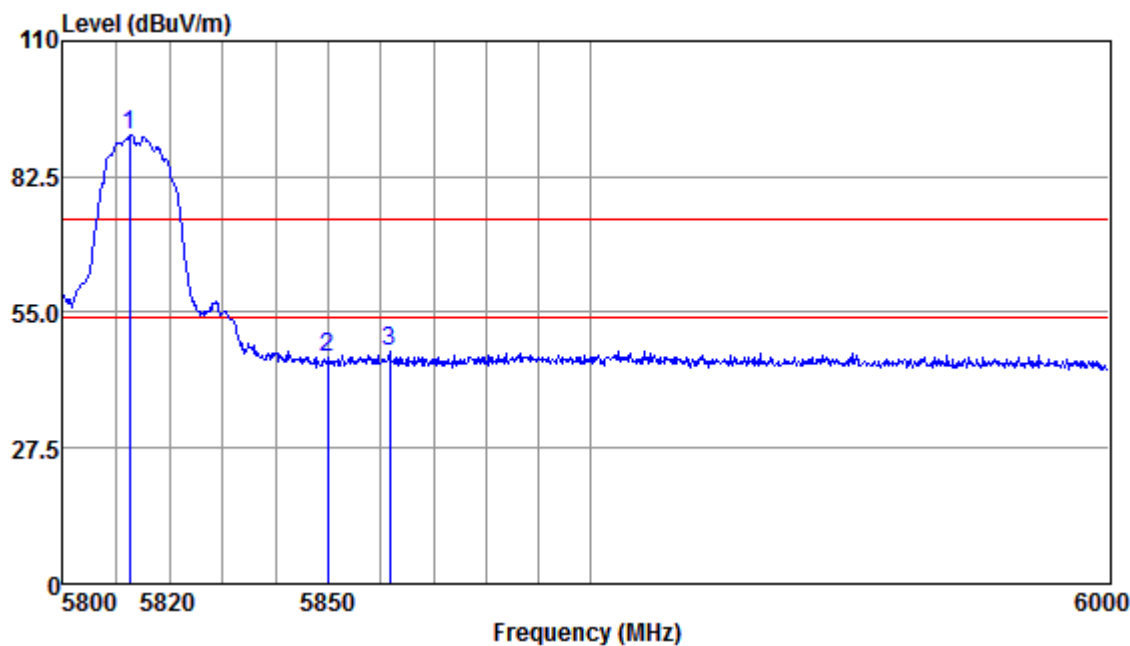
Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamplifier Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
5812.60	90.47	32.16	8.87	38.78	92.72	74.00	18.72	Peak
5850.00	42.92	32.17	8.90	38.75	45.24	74.00	-28.76	Peak
5910.36	45.17	32.18	8.96	38.69	47.62	74.00	-26.38	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamplifier Factor



Polarization:Vertical; Channel:5814MHz



Antenna Polarity :VERTICAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
5812.60	88.51	32.16	8.87	38.78	90.76	74.00	16.76	Peak
5850.00	43.43	32.17	8.90	38.75	45.75	74.00	-28.25	Peak
5861.67	44.56	32.17	8.90	38.74	46.89	74.00	-27.11	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

## 7.9 Frequency Stability

Test Requirement	47 CFR Part 15, Subpart C 15.407 (g)
Test Method:	ANSI C63.10 (2013) Section 6.8
Limit:	The frequency tolerance shall be maintained within the band of operation frequency over a temperature variation of -20 degrees to 55 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

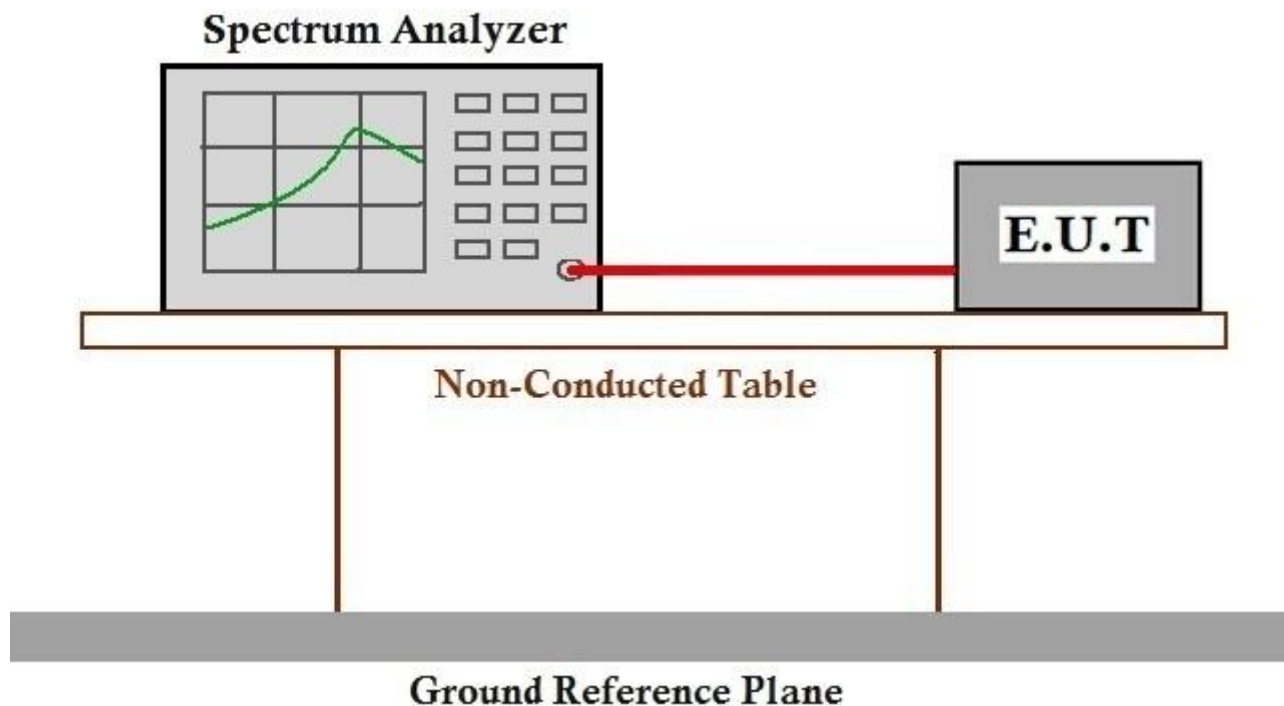
### 7.9.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

Test mode: b:TX mode\_Keep the EUT in continuously transmitting mode.

### 7.9.2 Test Setup Diagram



### 7.9.3 Measurement Procedure and Data

The detailed test data see: Appendix F for SHEM180900831606



## **8 Test Setup Photographs**

Refer to the <Test Setup photos-FCC >.

## **9 EUT Constructional Details**

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

**- End of the Report -**