



## TEST REPORT

**Application No.:** SHEM2105004480CR  
**FCC ID:** 2A2I2-YMX600AS  
**IC:** 27470-YMX600AS  
**Applicant:** Yimeixu WitChip Energy Hitech Co., Ltd  
**Address of Applicant:** Building 2-4, No 355 Ruifeng Road, Gaozhao Street, Jiaxing, Zhejiang 324000 China  
**Manufacturer:** Yimeixu WitChip Energy Hitech Co., Ltd  
**Address of Manufacturer:** Building 2-4, No 355 Ruifeng Road, Gaozhao Street, Jiaxing, Zhejiang 324000 China  
**Factory:** Yimeixu WitChip Energy Hitech Co., Ltd  
**Address of Factory:** Building 2-4, No 355 Ruifeng Road, Gaozhao Street, Jiaxing, Zhejiang 324000 China  
**Equipment Under Test (EUT):**  
**EUT Name:** Smart photovoltaic optimizer  
**Model No.:** YMX600A  
**Standard(s) :** 47 CFR Part 15, Subpart C 15.249  
RSS-210 issue 10 Amendment 1  
RSS-Gen Issue 5, April 2018, Amendment 2  
**Date of Receipt:** 2022-08-04  
**Date of Test:** 2022-08-10 to 2022-10-10  
**Date of Issue:** 2023-01-05

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

Parlam Zhan

Parlam Zhan  
Laboratory Manager



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# SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd.

Report No.: SHEM210500448001  
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Revision Record			
Version	Description	Date	Remark
00	Original	2023-01-05	/

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

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## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	FCC Requirement	IC Requirement	Method	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	RSS-Gen Clause 6.8	N/A	Pass

Radio Spectrum Matter Part				
Item	FCC Requirement	IC Requirement	Method	Result
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	RSS-Gen Section 6.7	ANSI C63.10 (2013) Section 6.9	Pass
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	RSS-210 Issue10 Annex B B.10	ANSI C63.10 (2013) Section 6.5&6.6	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	RSS-210 Issue10 Annex B B.10& RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4&6.5&6.6	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	RSS-210 Issue10 Annex B B.10& RSS-Gen Section 8.9	ANSI C63.10 (2013) Section 6.4&6.5&6.6	Pass
99% Bandwidth	-	RSS-Gen Section 6.7	ANSI C63.10 Section 6.9.3	Pass

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## 4 General Information

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

Power supply:	DC 12~80V
Test voltage:	DC 36V
Operation Frequency:	2420MHz-2465MHz
Modulation Type:	GFSK
Number of Channels:	10
Channel Spacing:	5MHz
Antenna Type:	PCB Antenna
S/N:	2579
Firmware version:	2.29.11

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
DC Power Supply	HP	-	-

### 4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	$8.4 \times 10^{-8}$
2	Timeout	2s
3	Duty Cycle	0.37%
4	Occupied Bandwidth	3%
5	RF Radiated Power	5.1dB (Below 1GHz)
		4.9dB (Above 1GHz)
6	Radiated Spurious Emission Test	4.2dB (Below 30MHz)
		4.5dB (30MHz-1GHz)
		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
7	Temperature Test	1°C
8	Humidity Test	3%
9	Supply Voltages	1.5%
10	Time	3%

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

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#### **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.

Note:

1. SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc ) is provided by the applicant. (if applicable).
2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).

#### **4.5 Test Facility**

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

- **A2LA (Certificate No. 6332.01)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

- **FCC (Designation Number: CN1301)**

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

- **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory. Company Number: 8617A

- **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

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## 5 Equipment List

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
<b>RF Radiated Test</b>					
EMI test Receiver	R&S	ESU40	SHEM051-1	2021-12-20	2022-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2021-12-20	2022-12-19
Communication Tester	R&S	CMW500	SHEM268-1	2022-07-25	2023-07-24
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2021-12-20	2022-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2021-05-07	2023-05-06
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2022/8/11	2024-08-10
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2021-09-18	2023-09-17
Pre-Amplifier	HP	8447D	SHEM236-1	2022-08-02	2023-08-01
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2021-12-20	2022-12-19
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	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2022-01-07	2023-01-06
Test software	ESE	E3	Version: 6.111221a	/	/

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Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
<b>RF Radiated Test</b>					
EMI test Receiver	R&S	ESU40	SHEM051-1	2022-12-20	2023-12-19
Spectrum Analyzer	R&S	FSP-30	SHEM002-1	2022-12-20	2023-12-19
Communication Tester	R&S	CMW500	SHEM268-1	2022-07-25	2023-07-24
Loop Antenna (9kHz-30MHz)	Schwarzbeck	FMZB1519	SHEM135-1	2022-12-20	2023-12-19
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM048-1	2021-09-11	2023-09-10
Antenna (25MHz-2GHz)	Schwarzbeck	VULB9168	SHEM202-1	2021-05-07	2023-05-06
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2022/8/11	2024-08-10
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021-09-18	2023-09-17
Horn Antenna (14-40GHz)	Schwarzbeck	BBHA 9170	SHEM049-1	2021-09-18	2023-09-17
Pre-Amplifier	HP	8447D	SHEM236-1	2022-08-02	2023-08-01
High-amplifier (14-40GHz)	Schwarzbeck	10001	SHEM049-2	2022-12-20	2023-12-19
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	2020-05-25	2023-05-24
RE test Cable	/	RE01, RE02, RE06	/	2022-01-07	2023-01-06
Test software	ESE	E3	Version: 6.111221a	/	/

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## 6 Radio Spectrum Technical Requirement

### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

Limit:

15.203 requirement:

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

#### 6.1.2 Conclusion

Standard Requirement:

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

EUT Antenna:

The antenna is PCB antenna and no consideration of replacement.

Antenna location: Refer to Appendix (Internal Photos)

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## 7 Radio Spectrum Matter Test Results

### 7.1 20dB Bandwidth

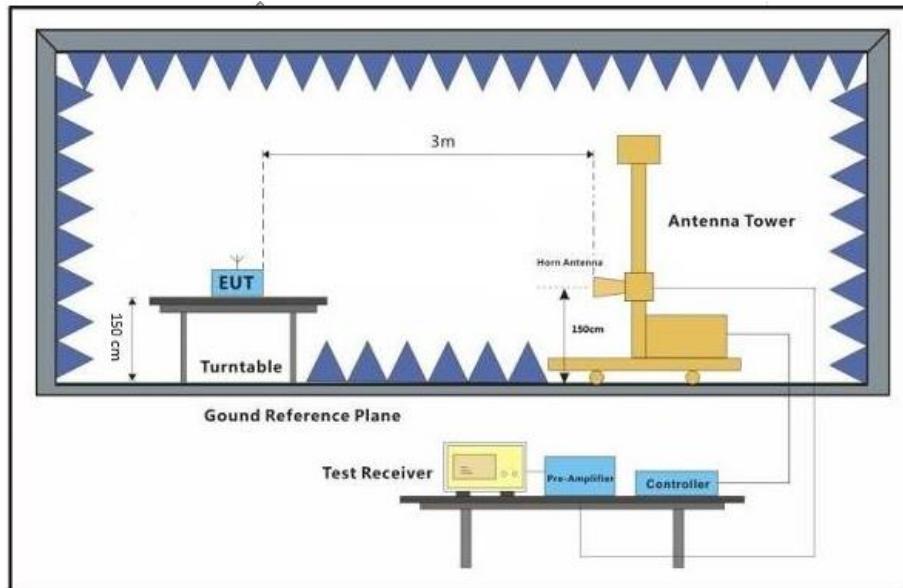
Test Requirement 47 CFR Part 15, Subpart C 15.215  
Test Method: ANSI C63.10 (2013) Section 6.9

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

Operating Environment:

Temperature: 20 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar  
Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.1.2 Test Setup Diagram



#### 7.1.3 Measurement Procedure and Data

1. Place the EUT on the table and set it in Engineering mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = approximately 1 % to 5 % of the OBW (set 100 kHz), VBW =3\* RBW, Span=10MHz, Sweep=auto
4. Mark the peak frequency and –20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured was complete.

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Frequency (MHz)	Bandwidth (MHz)	Result
2420	2.75	PASS
2440	2.71	PASS
2465	2.74	PASS

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**Test plot as follows:**
**Channel: 2420MHz**

**Channel: 2440MHz**


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Channel: 2465MHz



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## 7.2 Field Strength of the Fundamental Signal (15.249(a))

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)  
Test Method: ANSI C63.10 (2013) Section 6.5&6.6

**Test Site:** **Measurement Distance: 3m**

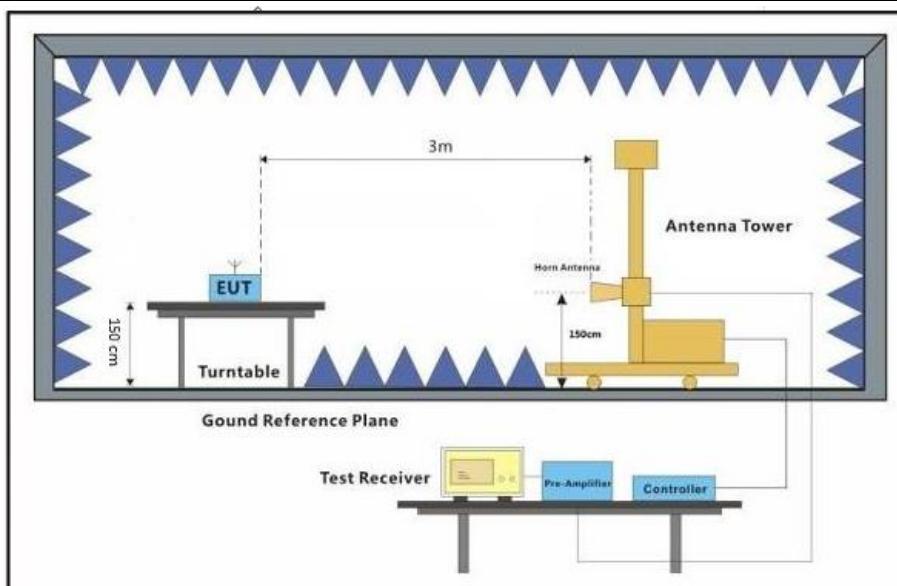
**Receiver Setup:**

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

**Limit:**

Frequency	Limit (dBuV/m)	Remark
2400~2483.5 MHz	114	Peak
	94	Average

**Test Setup:**



**Test Procedure:**

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.

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- 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.

Test Results: Pass

**Measurement Data**

Peak value:

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2420	101.42	-4.47	96.95	114	-17.05	Peak	Horizontal
	92.84	-4.47	88.37	94	-5.63	Average	Horizontal
	91.46	-4.47	86.99	94	-7.01	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2440	100.23	-4.40	95.83	114	-18.17	Peak	Horizontal
	91.49	-4.40	87.09	94	-6.91	Average	Horizontal
	89.45	-4.40	85.05	94	-8.95	Peak	Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
2465	101.01	-4.35	96.66	114	-17.34	Peak	Horizontal
	96.33	-4.35	91.98	94	-2.02	Average	Horizontal
	93.14	-4.35	88.79	94	-5.21	Peak	Vertical

Remark:

- 1) The basic equation with a sample calculation is as follows: Level = Read Level + Factor.  
**(The Factor is calculated by adding the Antenna Factor, Cable Loss and Preamp Factor)**
- 2) If the Peak value below the Average Limit, the Quasi-Peak test doesn't perform for this submission.

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### 7.3 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 &amp; 15.249(d) &amp; 15.209

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

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

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar

Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

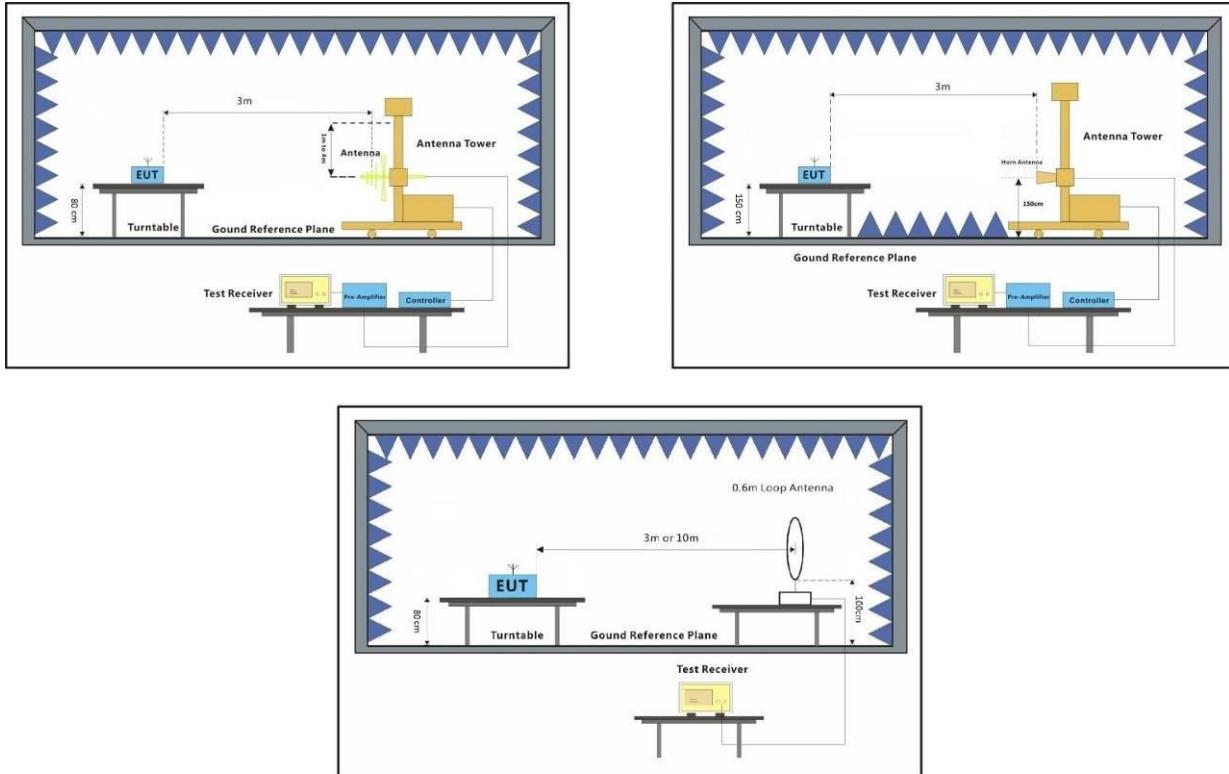
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**7.3.2 Test Setup Diagram**

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### 7.3.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: 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.

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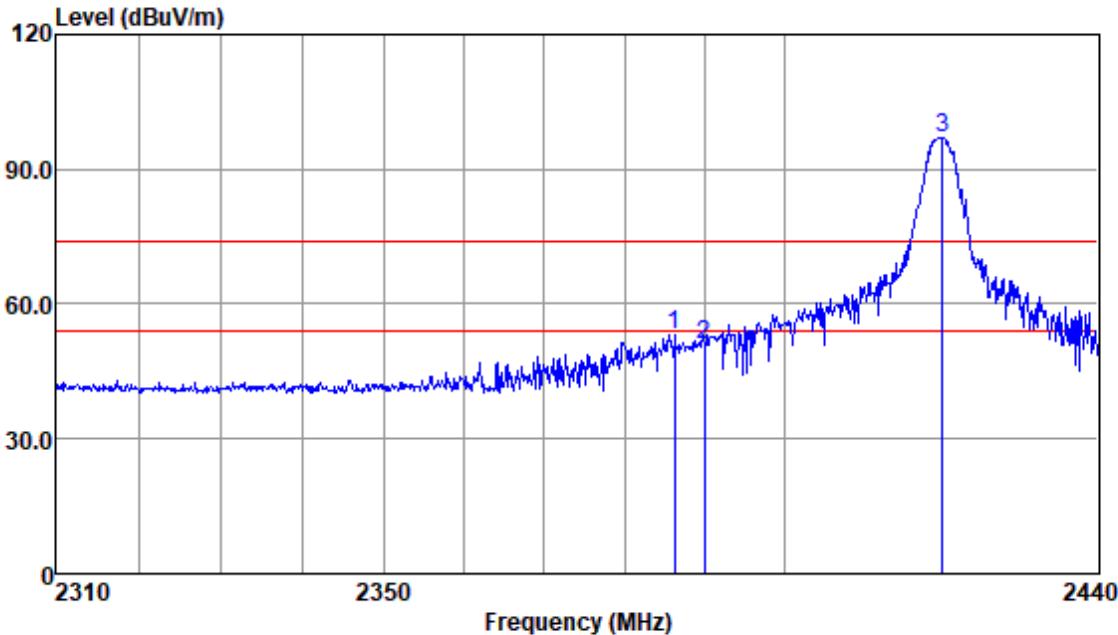
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low

**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	
2386.23	57.87	26.03	4.60	35.18	53.32	74.00	-20.68	Peak
2390.00	55.46	26.03	4.60	35.18	50.91	74.00	-23.09	Peak
2420.04	101.42	26.08	4.66	35.21	96.95	74.00	22.95	Peak

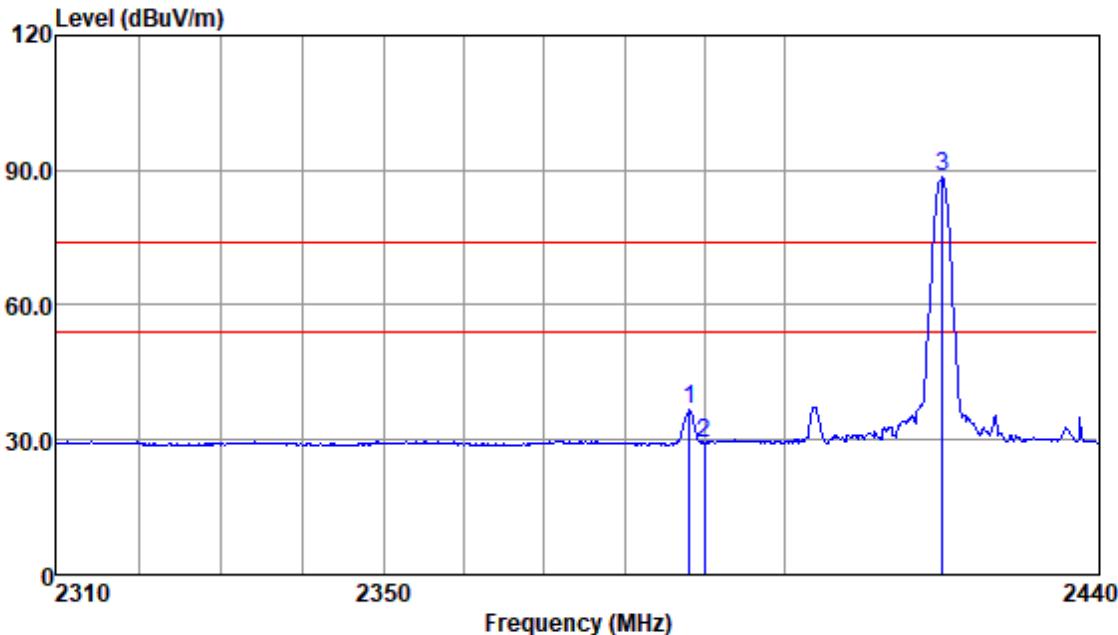
Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor



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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	
2388.19	41.11	26.03	4.60	35.18	36.56	54.00	-17.44	Average
2390.00	33.87	26.03	4.60	35.18	29.32	54.00	-24.68	Average
2420.04	92.84	26.08	4.66	35.21	88.37	54.00	34.37	Average

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

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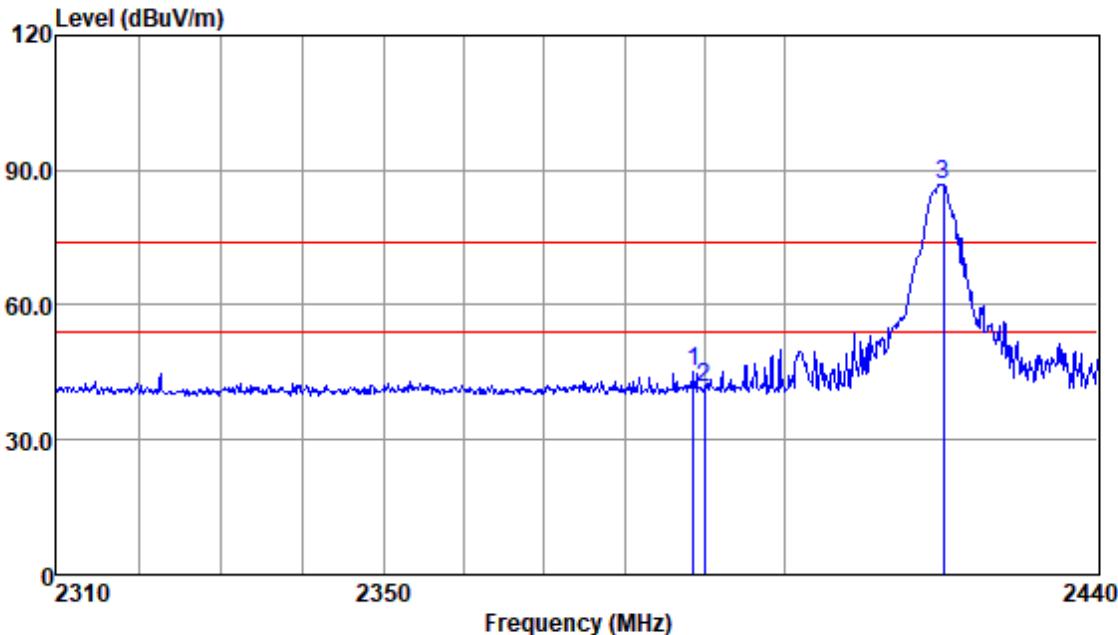


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low

**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	
2388.58	49.63	26.03	4.60	35.18	45.08	74.00	-28.92	Peak
2390.00	46.23	26.03	4.60	35.18	41.68	74.00	-32.32	Peak
2420.18	91.46	26.08	4.66	35.21	86.99	74.00	12.99	Peak

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



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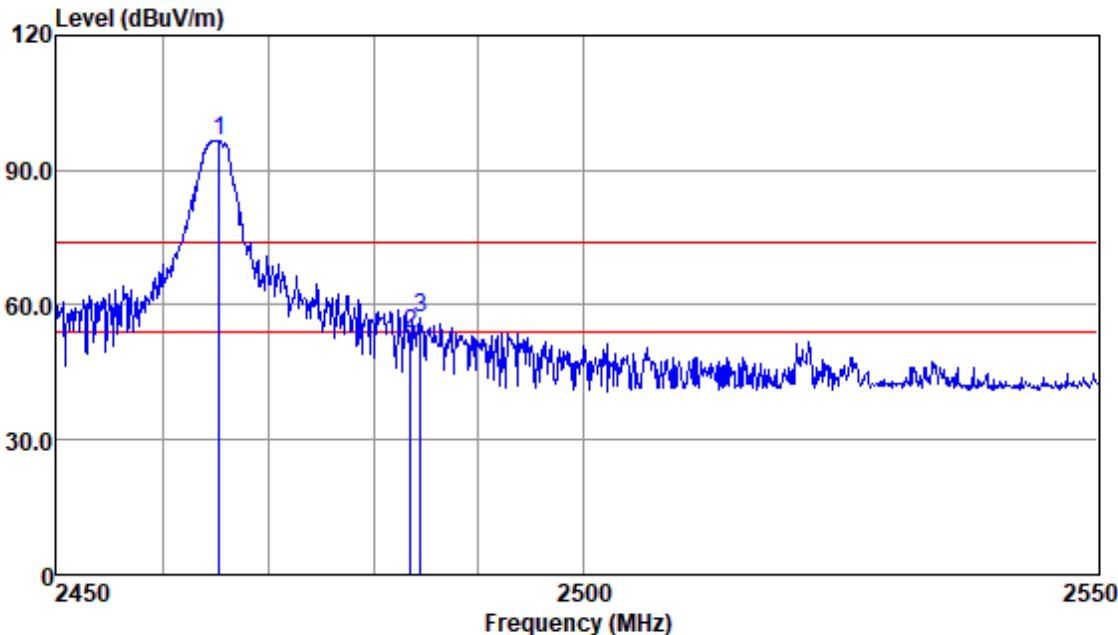
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High

**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	
2465.34	101.01	26.15	4.74	35.24	96.66	74.00	22.66	Peak
2483.50	57.92	26.18	4.78	35.26	53.62	74.00	-20.38	Peak
2484.45	61.60	26.18	4.78	35.26	57.30	74.00	-16.70	Peak

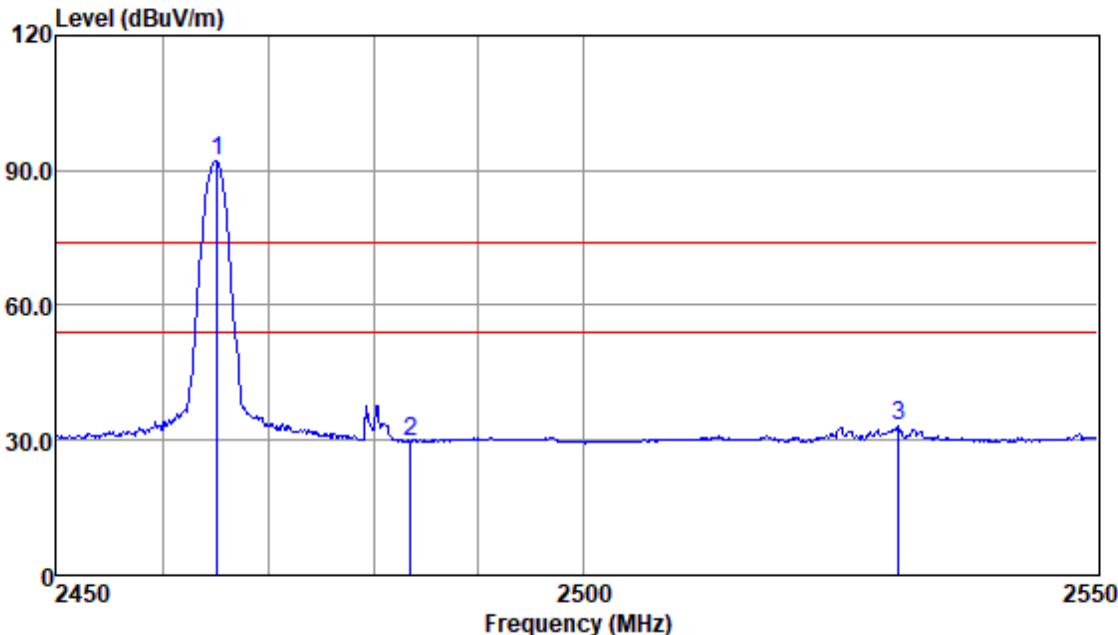
Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor



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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High

**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	
2465.14	96.33	26.15	4.74	35.24	91.98	54.00	37.98	Average
2483.50	34.04	26.18	4.78	35.26	29.74	54.00	-24.26	Average
2530.49	37.59	26.29	4.85	35.31	33.42	54.00	-20.58	Average

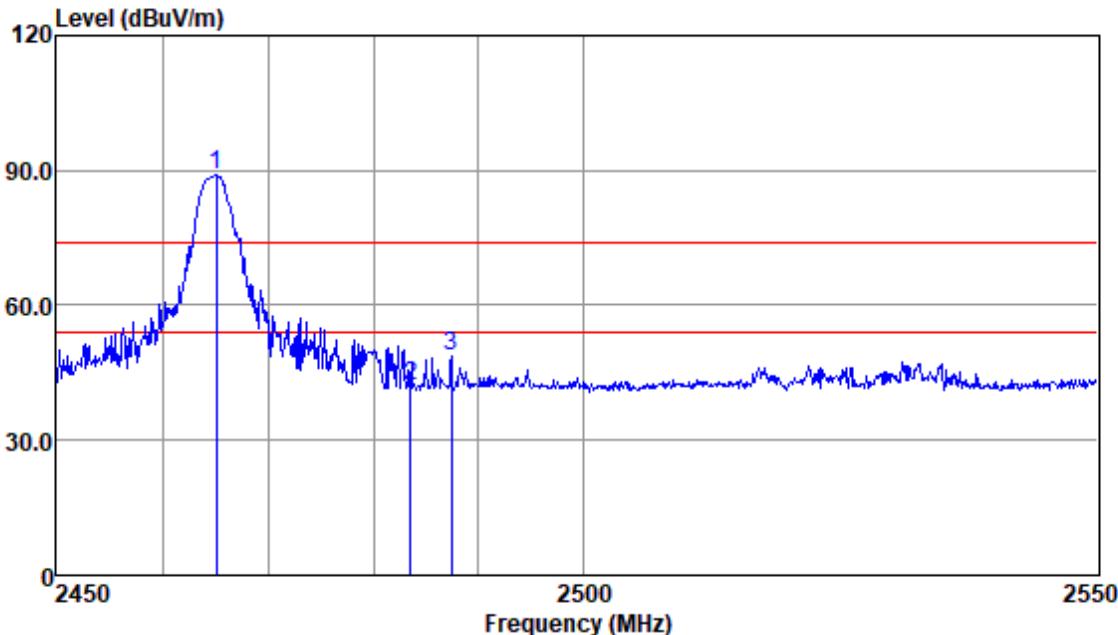
Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor



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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High

**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	
2465.04	93.14	26.15	4.74	35.24	88.79	74.00	14.79	Peak
2483.50	46.16	26.18	4.78	35.26	41.86	74.00	-32.14	Peak
2487.43	53.12	26.19	4.78	35.26	48.83	74.00	-25.17	Peak

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



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## 7.4 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)  
Test Method: ANSI C63.10 (2013) Section 6.4&6.5&6.6  
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.

### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1002 mbar  
Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

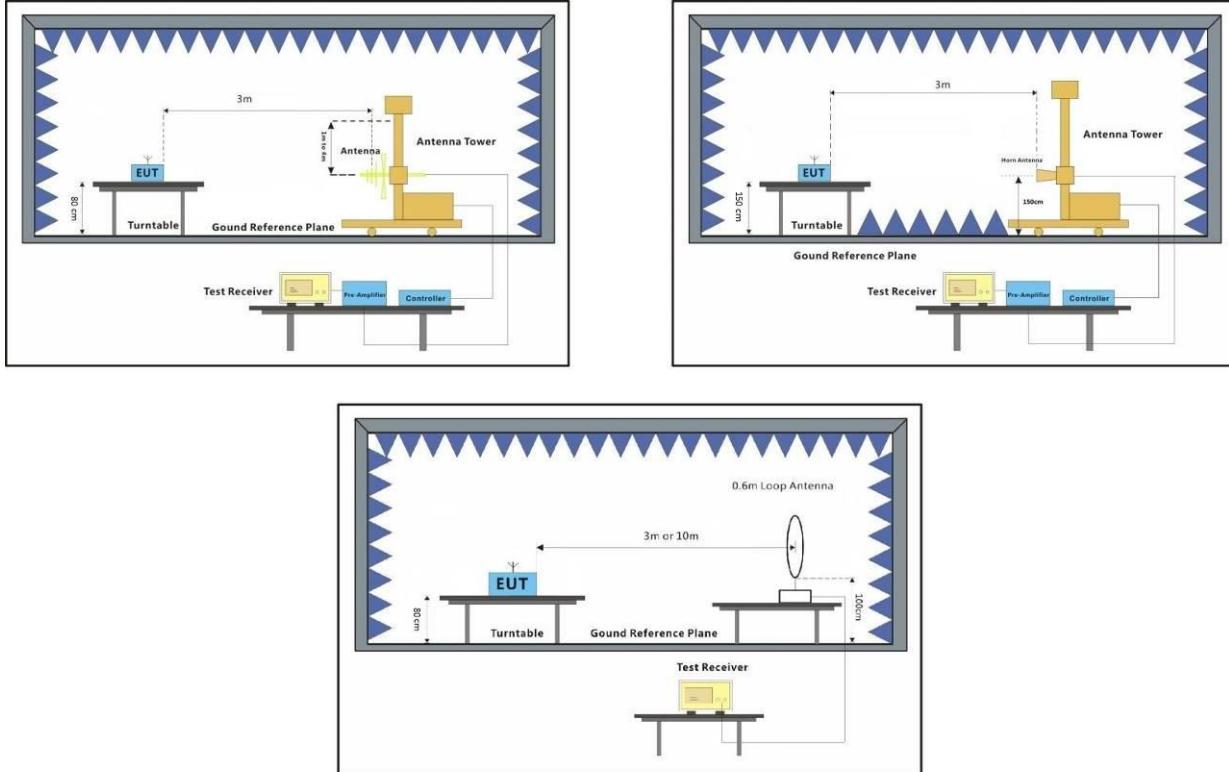
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**7.4.2 Test Setup Diagram**

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#### 7.4.3 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark:

1) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

3) Scan from 9kHz to 25GHz, 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) 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



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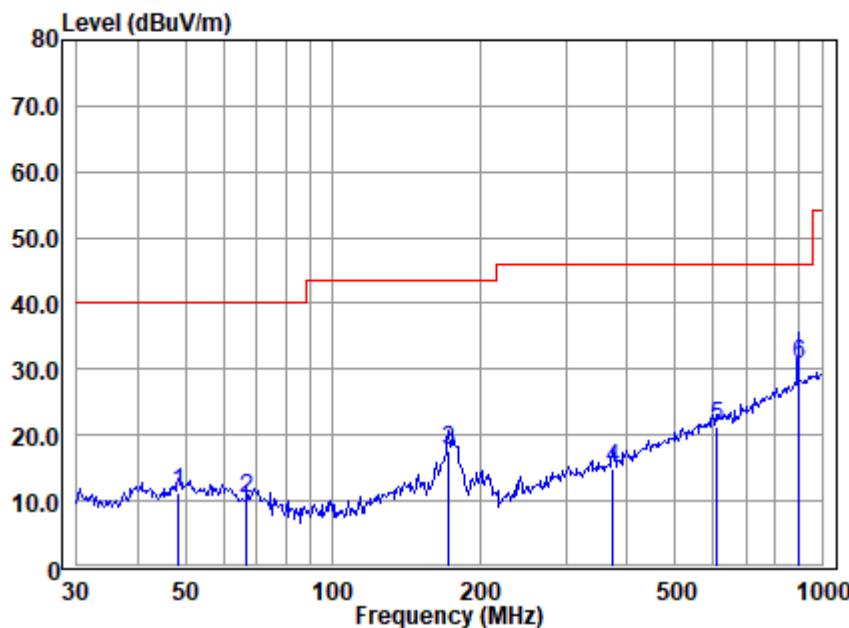
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30MHz-1GHz:

Mode:a; Polarization:Horizontal



Antenna Polarity :Horizontal  
EUT/Project :4480CR  
Test mode :00

Freq MHz	Read Level dBuV	Antenna Factor dB/m	Cable Loss dB	Preamp Factor dB	Emission Level dBuV/m	Limit Line dBuV/m	Over Limit dB	Remark
	-	-	-	-	-	-	-	-
1 48.38	27.66	13.99	1.64	31.98	11.31	40.00	-28.69	QP
2 66.84	27.96	12.07	2.06	31.86	10.23	40.00	-29.77	QP
3 172.60	34.14	12.43	3.22	32.21	17.58	43.50	-25.92	QP
4 373.89	28.30	15.10	4.90	33.45	14.85	46.00	-31.15	QP
5 607.18	27.57	20.02	6.28	32.70	21.17	46.00	-24.83	QP
6 893.66	29.68	23.48	7.48	29.98	30.66	46.00	-15.34	QP

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

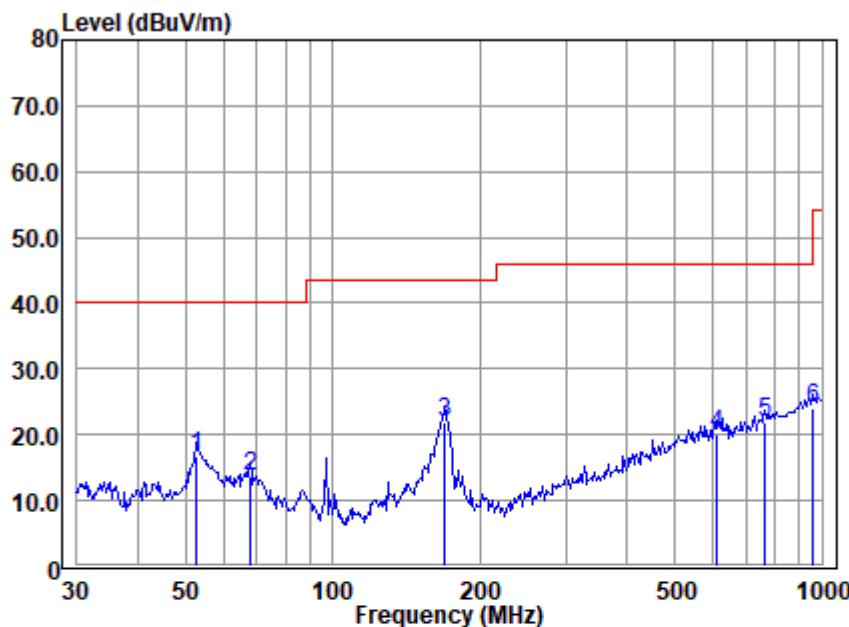


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Mode:a; Polarization:Vertical



Antenna Polarity :Vertical  
EUT/Project :4480CR  
Test mode :00

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 52.63	33.43	13.69	1.74	32.00	16.86	40.00	-23.14	QP
2 67.79	31.62	11.89	2.08	31.83	13.76	40.00	-26.24	QP
3 169.00	38.20	12.78	3.22	32.26	21.94	43.50	-21.56	QP
4 611.46	26.33	20.11	6.32	32.54	20.22	46.00	-25.78	QP
5 765.65	23.07	22.40	6.83	30.49	21.81	46.00	-24.19	QP
6 958.71	22.27	23.75	7.75	29.70	24.07	46.00	-21.93	QP

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



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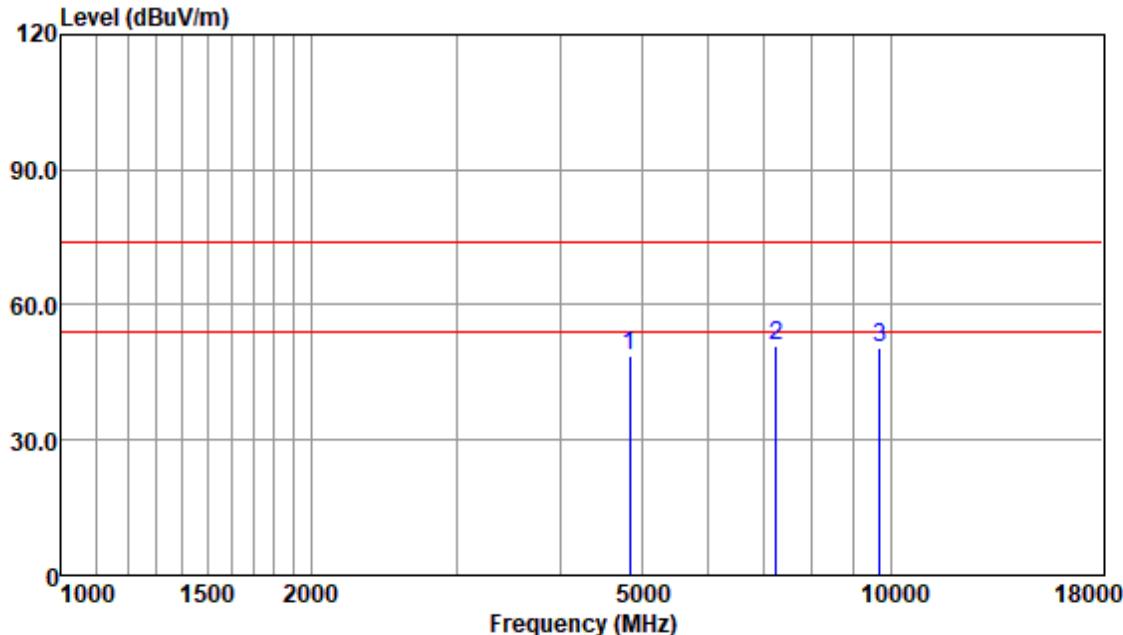
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Above 1GHz:

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



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	
4840.00	47.25	30.97	7.46	36.80	48.88	74.00	-25.12	Peak
7260.00	45.16	33.42	7.80	35.48	50.90	74.00	-23.10	Peak
9680.00	40.60	35.08	8.57	33.55	50.70	74.00	-23.30	Peak

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

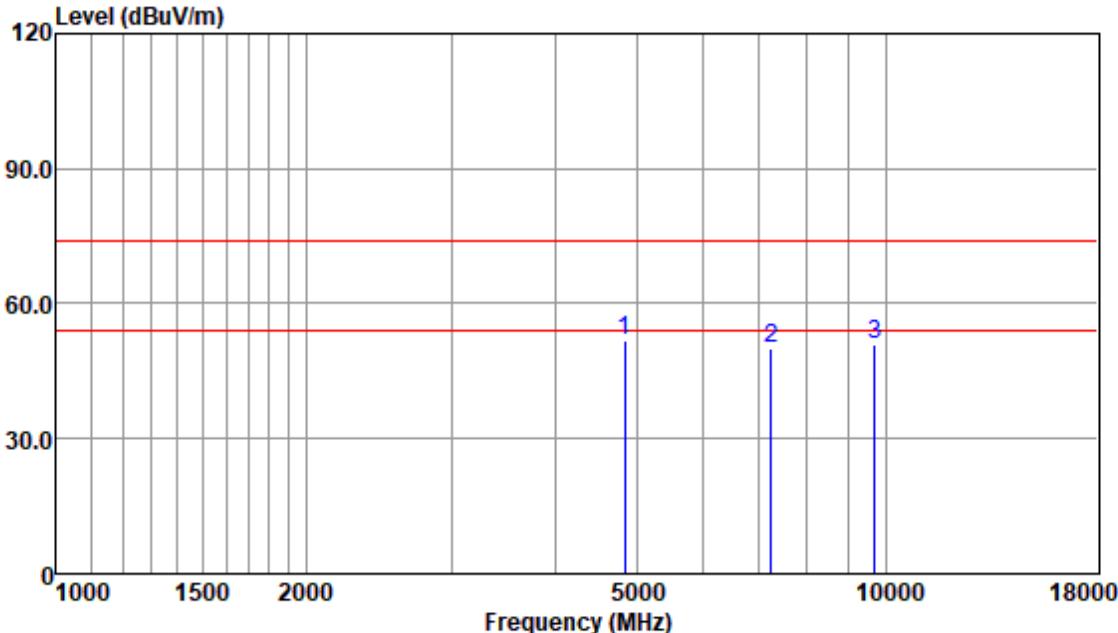


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low

**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	
4840.00	50.32	30.97	7.46	36.80	51.95	74.00	-22.05	Peak
7260.00	44.08	33.42	7.80	35.48	49.82	74.00	-24.18	Peak
9680.00	40.76	35.08	8.57	33.55	50.86	74.00	-23.14	Peak

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

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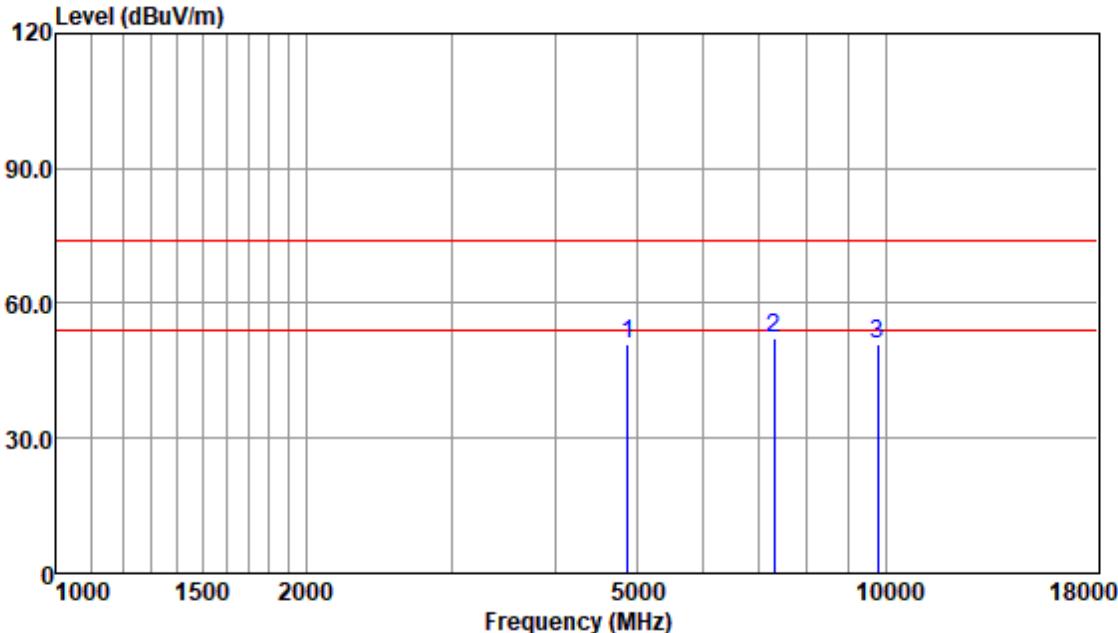
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle

**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	
4880.00	49.19	31.09	7.46	36.81	50.93	74.00	-23.07	Peak
7320.00	46.39	33.47	7.83	35.42	52.27	74.00	-21.73	Peak
9760.00	40.73	35.06	8.57	33.50	50.86	74.00	-23.14	Peak

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

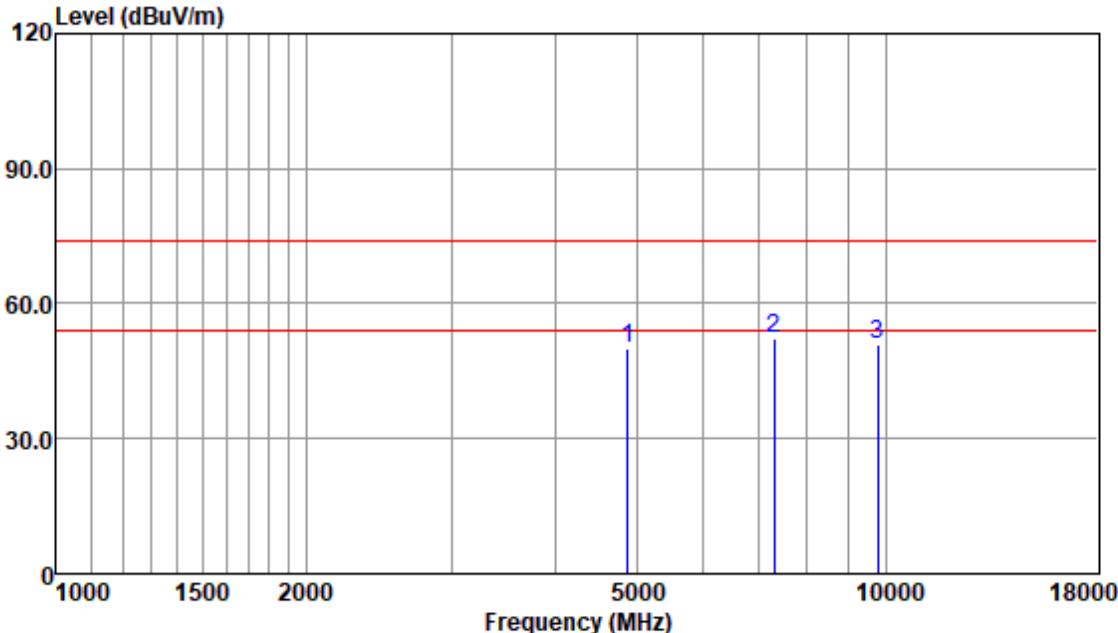


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中国·上海·松江区金都西路588号 邮编: 201612 t (86-21) 61915666 f (86-21) 61915678 [www.sgsgroup.com.cn](http://www.sgsgroup.com.cn)  
sgs.china@sgs.com

Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle

**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	
4880.00	48.17	31.09	7.46	36.81	49.91	74.00	-24.09	Peak
7320.00	46.35	33.47	7.83	35.42	52.23	74.00	-21.77	Peak
9760.00	40.99	35.06	8.57	33.50	51.12	74.00	-22.88	Peak

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

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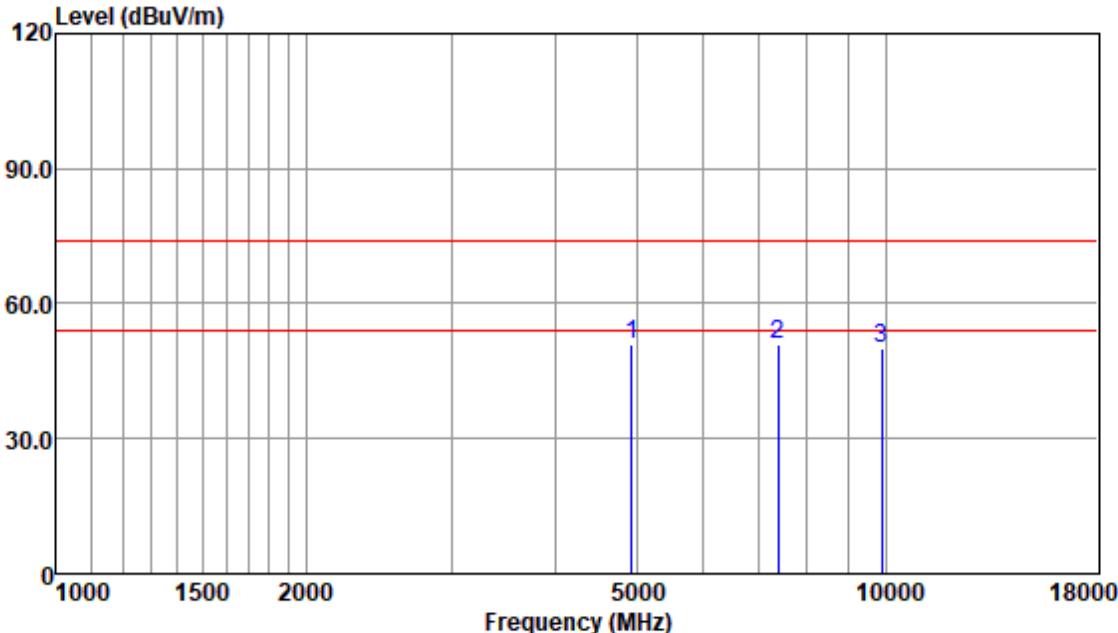
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Antenna Polarity :HORIZONTAL

Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
4930.00	49.19	31.21	7.46	36.82	51.04	74.00	-22.96	Peak
7395.00	45.07	33.57	7.86	35.37	51.13	74.00	-22.87	Peak
9860.00	39.72	35.05	8.58	33.44	49.91	74.00	-24.09	Peak

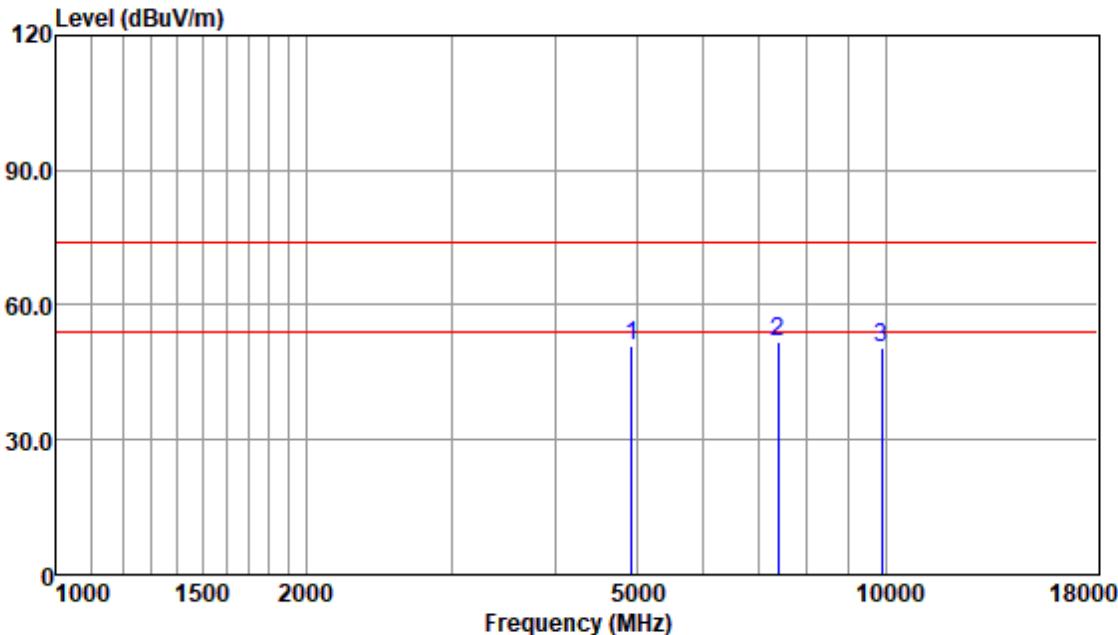
Note: Emission Level=Read Level+Antenna Factor+Cable loss+Preamp Factor



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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High

**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	
4930.00	49.26	31.21	7.46	36.82	51.11	74.00	-22.89	Peak
7395.00	45.61	33.57	7.86	35.37	51.67	74.00	-22.33	Peak
9860.00	40.45	35.05	8.58	33.44	50.64	74.00	-23.36	Peak

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



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## 7.5 99% Bandwidth

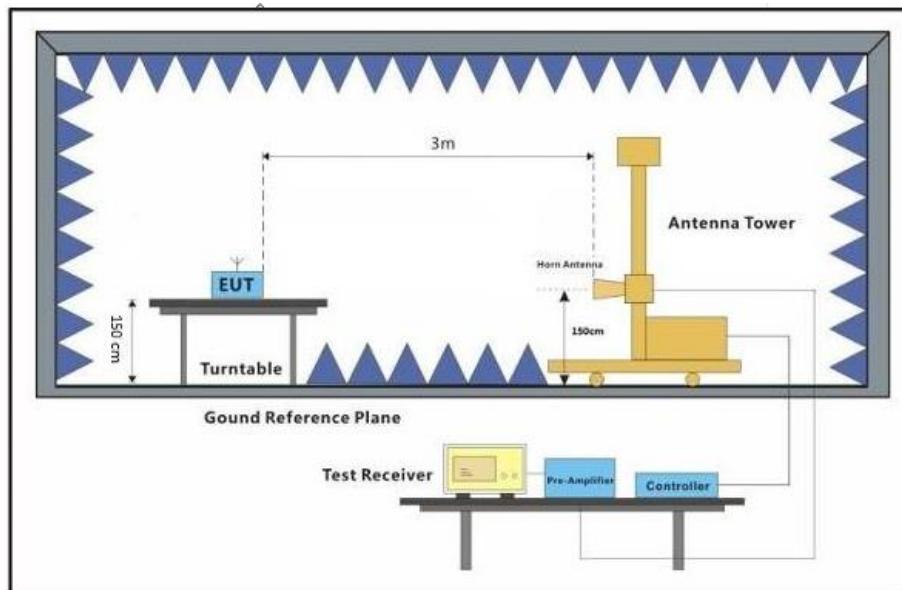
Test Requirement RSS-Gen Section 6.7  
Test Method: RSS-Gen Section 6.7

### 7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 20 °C      Humidity: 50 % RH      Atmospheric Pressure: 1010 mbar  
Test mode a:TX mode\_Keep the EUT in transmitting with modulation mode.

### 7.5.2 Test Setup Diagram



### 7.5.3 Measurement Procedure and Data

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = approximately 2 to 3 times the 20dB bandwidth, centred on the hopping channel;
3. Set the spectrum analyzer: RBW = 1% of the span (set 100kHz). VBW >= RBW. Sweep = auto; Detector Function = Peak. Trace = Max Hold.
4. Mark the peak frequency and using the 99% OBW function measure the bandwidth.



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Frequency (MHz)	Bandwidth (MHz)	Result
2420	3.845	PASS
2440	2.798	PASS
2465	2.926	PASS

**Channel: 2420MHz**

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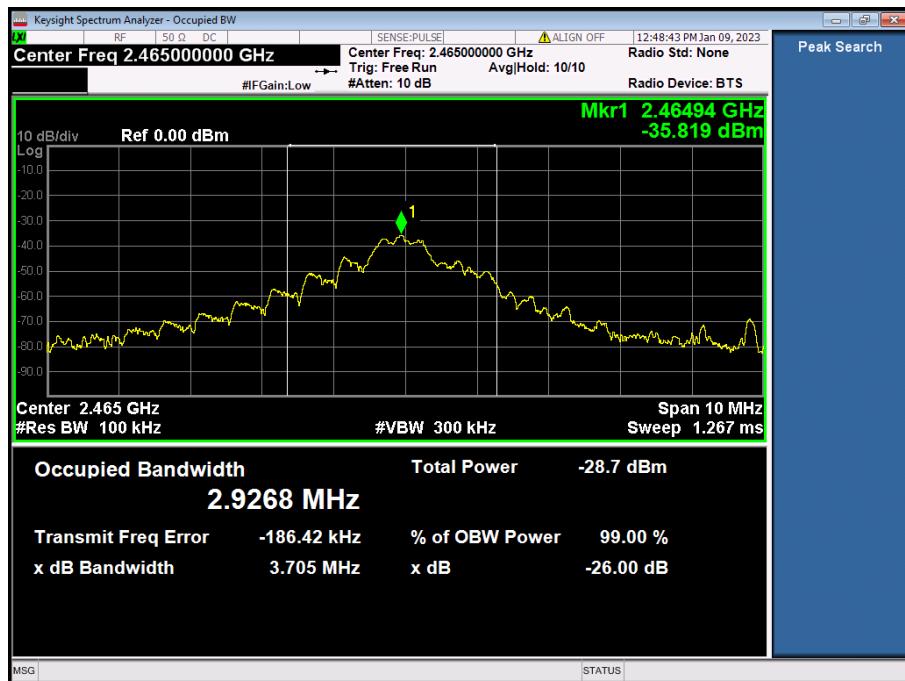


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**Channel: 2440MHz**

**Channel: 2465MHz**


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## 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 -**



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