



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

SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230200045502

Page: 1 of 41

## TEST REPORT

**Application No.:**

SZCR2302000455ET

**Applicant:**

Shantou Chenghai Systech Toys Co.,Ltd.

**Address of Applicant:**

LeCheng Building, Huafu, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China

**Manufacturer:**

Shantou Chenghai Systech Toys Co.,Ltd.

**Address of Manufacturer:**

LeCheng Building, Huafu, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China

**Factory:**

Shantou Chenghai Systech Toys Co.,Ltd.

**Address of Factory:**

LeCheng Building, Huafu, Guangyi Street, Chenghai District, Shantou City, Guangdong Province, China

**Equipment Under Test (EUT):**

**EUT Name:** RC DRONE

**Model No.:** S1, S2, S3, S5, S6, S7, S8, S9, S161, S162, S163, S165, S166, S167, S168, S169, M1, M2, M3, M5, M6, M7, M8, M9, F1, F2, F3, F5, F6, F7, F8, F9, NH525, NH760, H811, H812, H813, H815, H816, H817, H818, H819, H820, H821, H822, H823, H825, H826, H827, H828, H829, H830

♣

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

**FCC ID:**

2A65SREMO9

**Standard(s) :**

47 CFR Part 15, Subpart C 15.249

**Date of Receipt:**

2023-02-22

**Date of Test:**

2023-02-24 to 2023-03-09

**Date of Issue:**

2023-03-13

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

Keny Xu  
EMC Laboratory Manager



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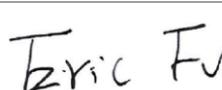
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<b>Revision Record</b>				
<b>Version</b>	<b>Chapter</b>	<b>Date</b>	<b>Modifier</b>	<b>Remark</b>
01		2023-03-13		Original

Authorized for issue by:			
		Gebin Sun	
		Gebin Sun/Project Engineer	
		Eric Fu	
		Eric Fu/Reviewer	

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## 2 Test Summary

<b>Radio Spectrum Technical Requirement</b>				
<b>Item</b>	<b>Standard</b>	<b>Method</b>	<b>Requirement</b>	<b>Result</b>
Antenna Requirement	47 CFR Part 15, Subpart C 15.249	N/A	47 CFR Part 15, Subpart C 15.203	Pass

<b>Radio Spectrum Matter Part</b>				
<b>Item</b>	<b>Standard</b>	<b>Method</b>	<b>Requirement</b>	<b>Result</b>
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass
Field Strength of the Fundamental Signal (15.249(a))		ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions Below 1GHz		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
Radiated Emissions Above 1GHz		ANSI C63.10 (2013) Section 6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass

**Declaration of EUT Family Grouping:**

Model No.: S1, S2, S3, S5, S6, S7, S8, S9, S161, S162, S163, S165, S166, S167, S168, S169, M1, M2, M3, M5, M6, M7, M8, M9, F1, F2, F3, F5, F6, F7, F8, F9, NH525, NH760, H811, H812, H813, H815, H816, H817, H818, H819, H820, H821, H822, H823, H825, H826, H827, H828, H829, H830

Only the model S9 was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used, internal wiring and functions were identical for all the above models, with only difference on product color, external appearance and packaging.

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## 4 General Information

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

Power supply:	4.5V DC(1.5V x 3 "AA" Size Batteries) for remote
Operation Frequency:	2410MHz to 2475MHz
Modulation Type:	GFSK
Number of Channels:	66
Channel spacing:	1MHz
Antenna Type:	Integral
Antenna Gain:	0.17dBi

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--

The EUT has been tested as an independent unit.

### 4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	± 3%
Field Strength of the Fundamental Signal (15.249(a))	± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz)
Restricted Band Around Fundamental Frequency	± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz)
Radiated Emissions Below 1GHz	± 4.5dB
Radiated Emissions Above 1GHz	± 4.8dB

Remark:

The  $U_{lab}$  (lab Uncertainty) is less than  $U_{cispr/ETSI}$  (CISPR/ETSI Uncertainty), so the test results

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

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#### 4.4 Test Location

All tests were performed at:

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518057.

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

No tests were sub-contracted.

#### 4.5 Test Facility

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

- **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 (Member No. 1937)**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1336**

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

Designation Number: CN1336. Test Firm Registration Number: 787754.

- **Innovation, Science and Economic Development Canada**

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

CAB identifier: CN0006.

IC#: 4620C.

#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None

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## 5 Equipment List

20dB Bandwidth					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2022-10-20	2023-10-19
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2022-03-23	2023-03-22
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2022-07-08	2023-07-07
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2022-04-07	2023-04-06

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2022-03-23	2023-03-22
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2022-08-10	2024-08-09
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2022-03-22	2023-03-21

Restricted Band Around Fundamental Frequency					
Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2022-03-23	2023-03-22
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2022-08-10	2024-08-09

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Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2022-03-22	2023-03-21
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## Radiated Emissions Below 1GHz

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2020-07-19	2023-07-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2022-10-20	2023-10-19
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2021-09-17	2023-09-16
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2021-11-30	2023-11-29
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2022-03-22	2023-03-21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2022-07-08	2023-07-07

## Radiated Emissions Above 1GHz

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2022-04-02	2025-04-01
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2022-03-23	2023-03-22
Horn Antenna	Rohde & Schwarz	HF907	SEM003-07	2022-07-24	2024-07-23
Microwave system amplifier	Agilent	83017A	SEM005-25	2022-09-21	2023-09-20
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2022-07-08	2023-07-07

## General used equipment

Equipment	Manufacturer	Model No.	Inventory No.	Cal Date	Cal Due Date
Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2022-09-04	2023-09-03
Humidity/ Temperature Indicator	Anymetre	TH101B	SEM002-09	2022-09-04	2023-09-03
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2022-03-28	2023-03-27

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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

#### 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 integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0.17dBi.

Antenna location: Refer to internal photo.



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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

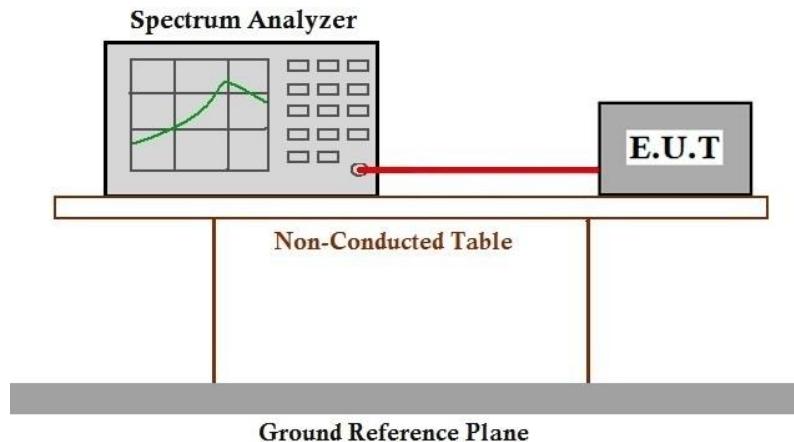
Operating Environment:

Temperature: 24.9 °C      Humidity: 45.3 % RH      Atmospheric Pressure: 1015 mbar

#### 7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

#### 7.1.3 Test Setup Diagram



#### 7.1.4 Measurement Procedure and Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	1.047	Pass
Middle	1.055	Pass
Highest	1.087	Pass

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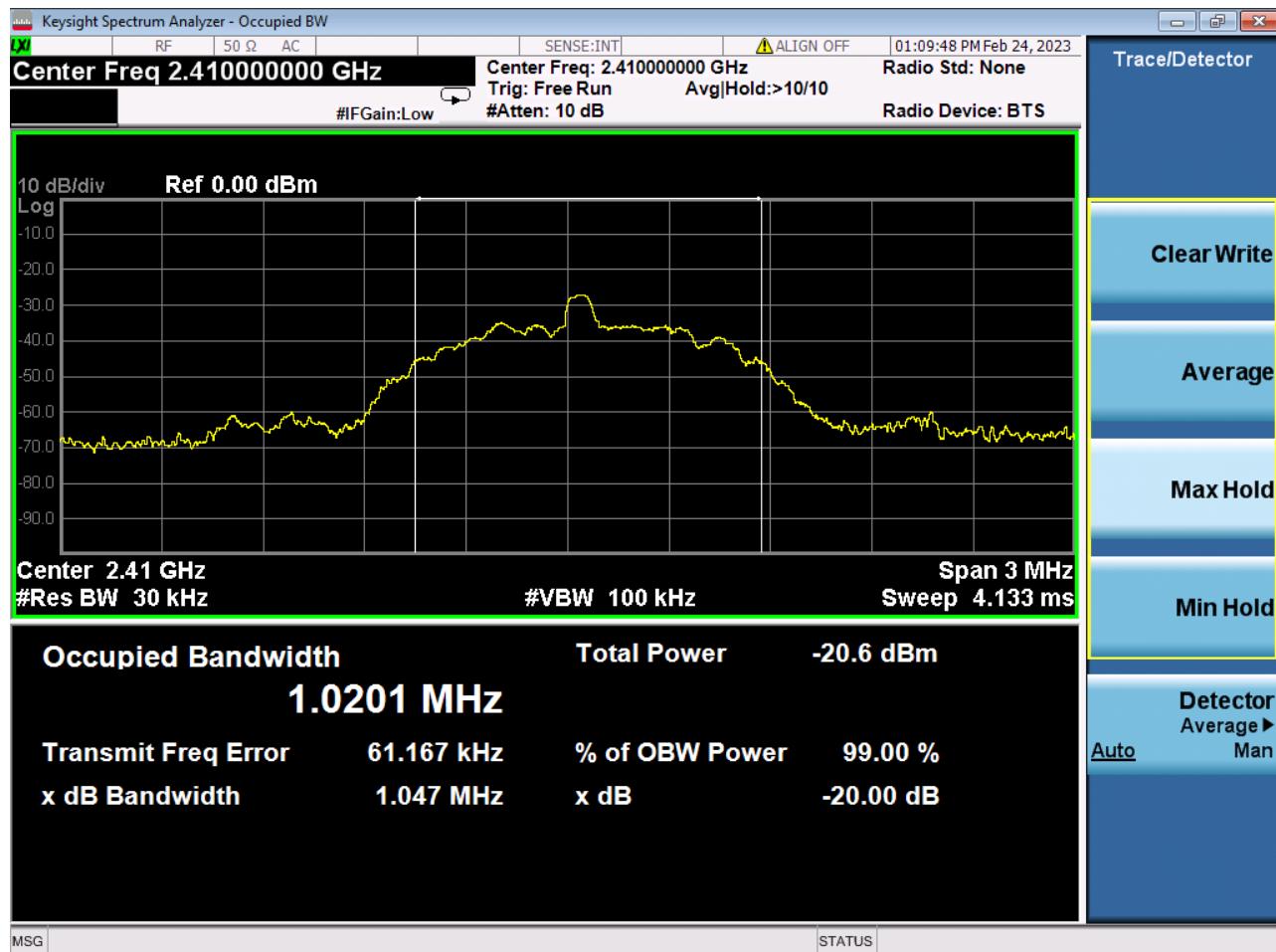
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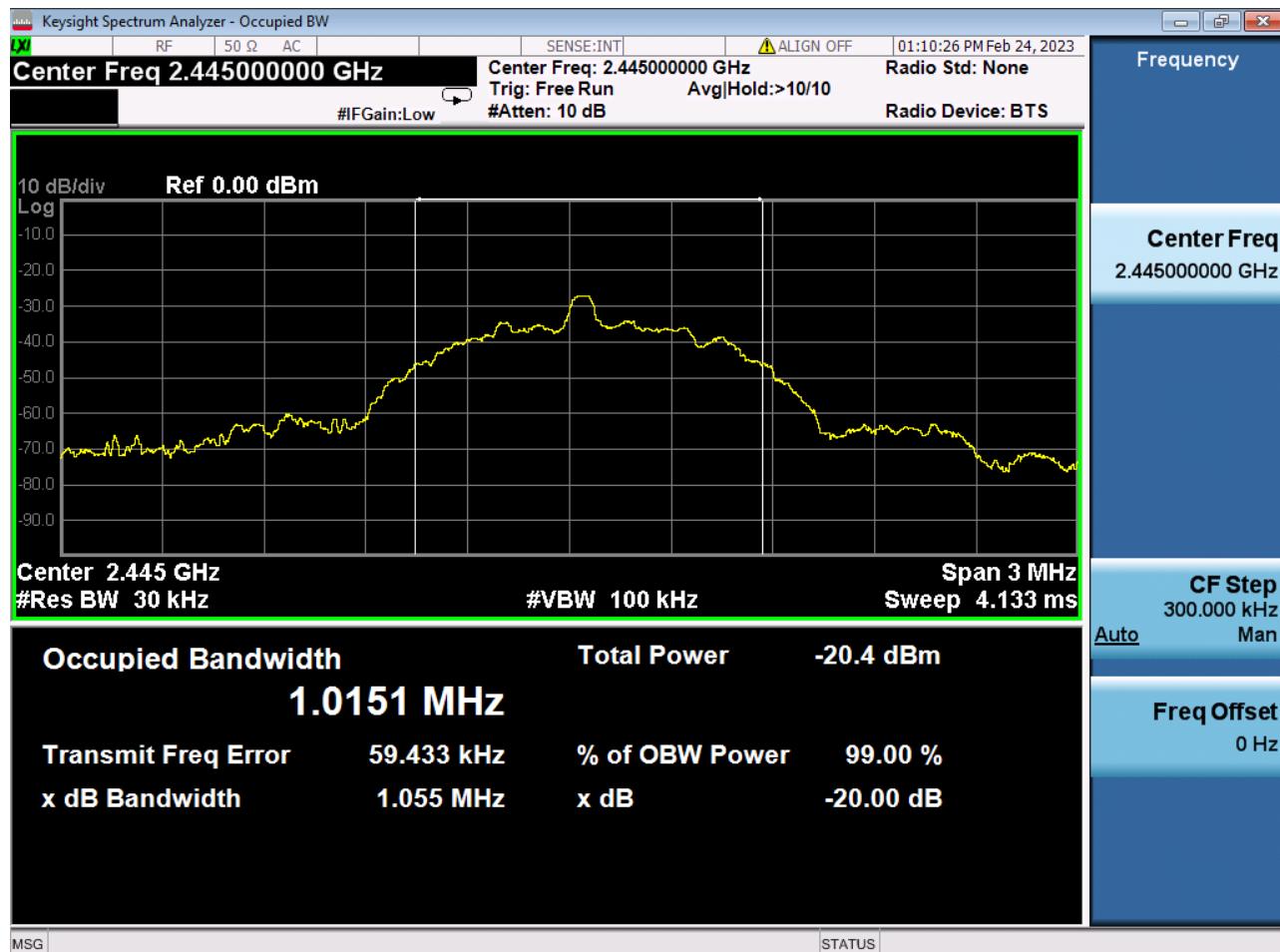
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**7.2 Field Strength of the Fundamental Signal (15.249(a))**

Test Requirement 47 CFR Part 15, Subpart C 15.249(a)

Test Method: ANSI C63.10 (2013) Section 6.5&amp;6.6

Measurement Distance: 3m

Limit:

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Remark: The frequencies above 1000MHz 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 fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.

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

Operating Environment:

Temperature: 21.7 °C      Humidity: 57.3 % RH      Atmospheric Pressure: 1015 mbar

**7.2.2 Test Mode Description**

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.



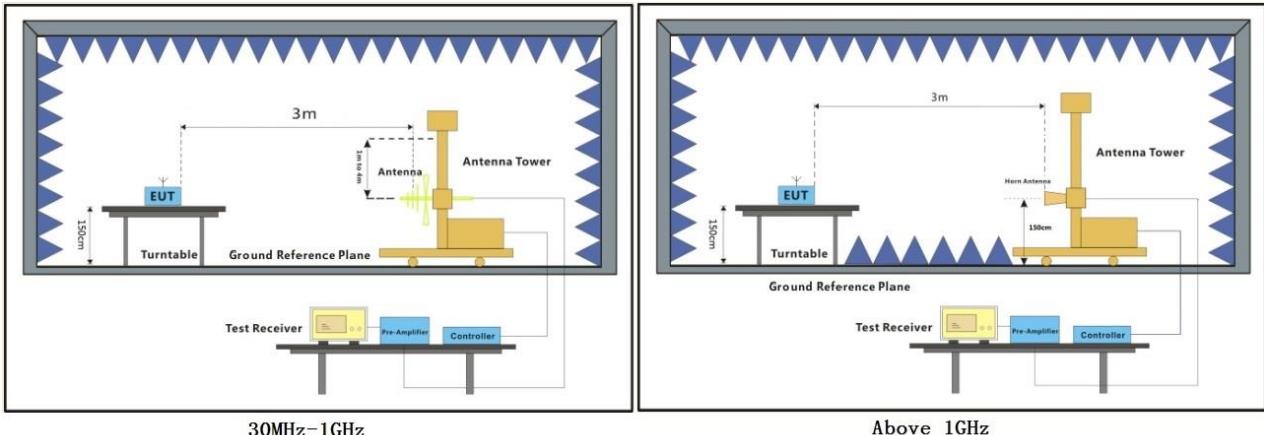
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### 7.2.3 Test Setup Diagram



### 7.2.4 Measurement Procedure and Data

- 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.
- 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.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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 the EUT in the lowest channel, the middle channel, the Highest channel.
- 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.
- Repeat above procedures until all frequencies measured was complete.

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



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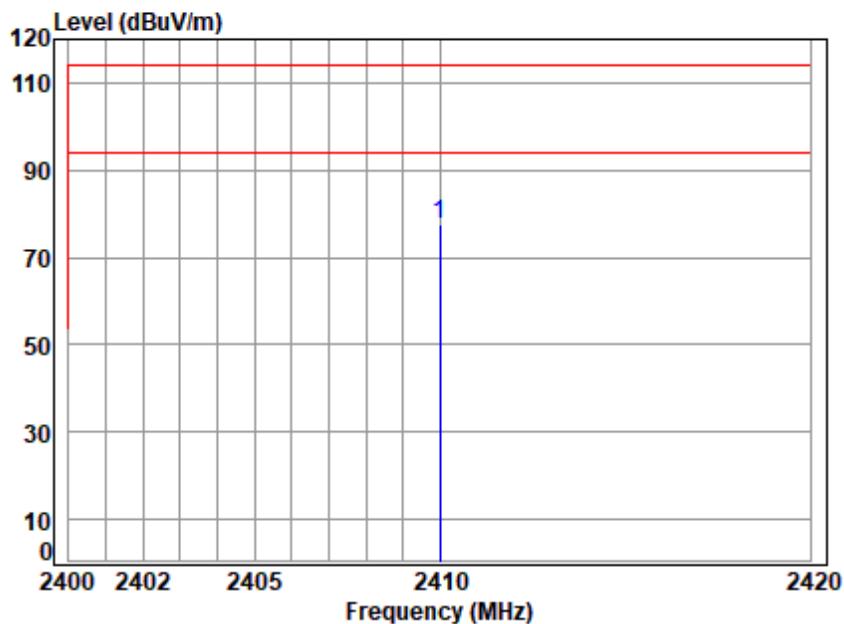
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2410 Field strength

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m		dB	dBuV	dBuV/m	dBuV/m	dB
1	2410.000	4.27	28.86	35.20	79.58	77.51	114.00	-36.49	peak

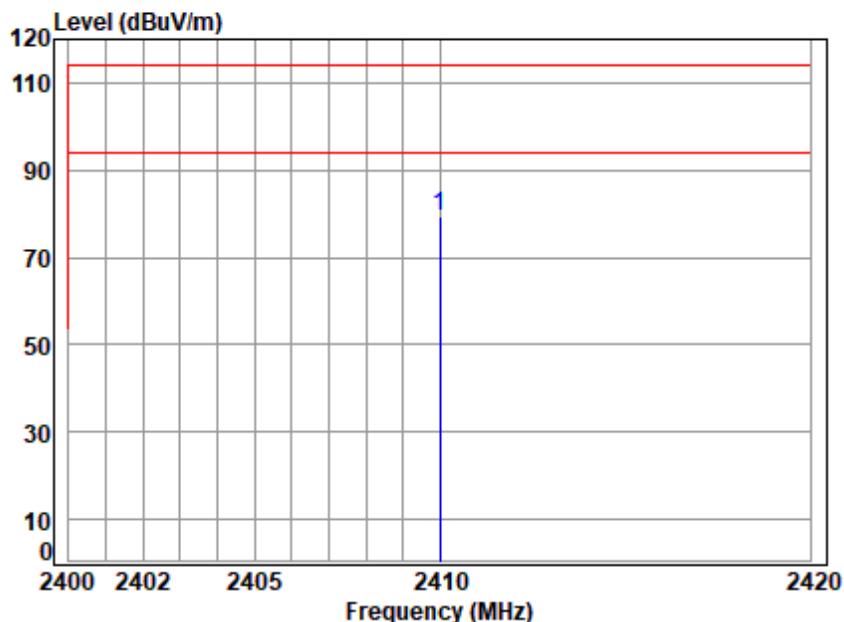
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

Job No : 00455ET

Mode : 2410 Field strength

	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
Freq	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2410.000	4.27	28.86	35.20	81.38	79.31	114.00	-34.69 peak

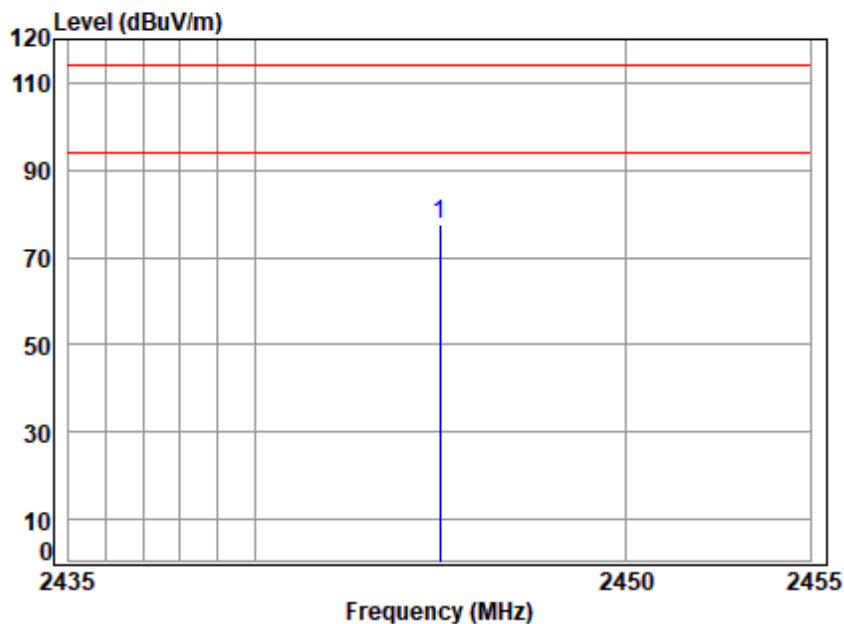
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2445 Field strength

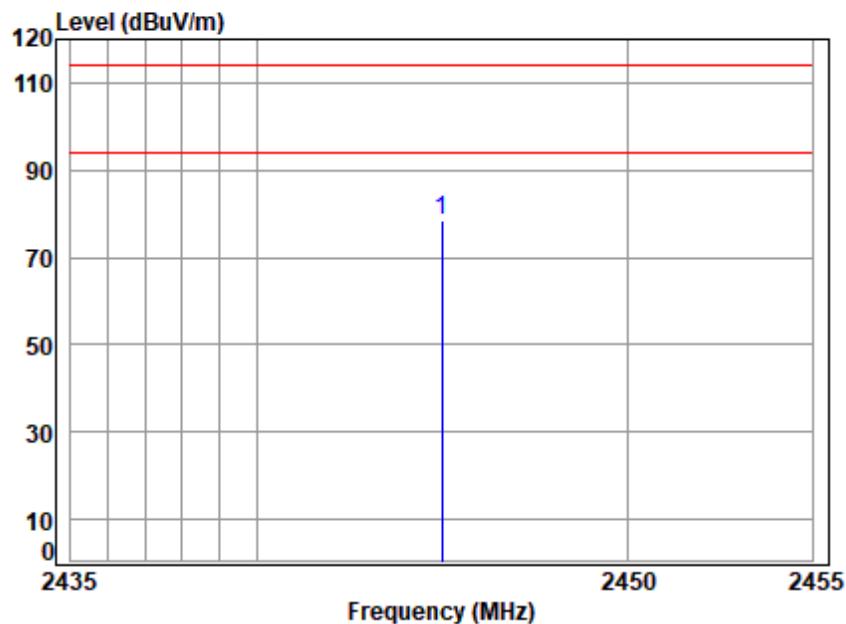
	Cable Freq	Ant Loss	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2445.000	4.31	29.07	35.18	79.16	77.36	114.00	-36.64 peak

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



Site : chamber

Condition: 3m VERTICAL

Job No : 00455ET

Mode : 2445 Field strength

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m		dB	dBuV	dBuV/m	dBuV/m	dB
1	2445.000	4.31	29.07	35.18	80.49	78.69	114.00	-35.31	peak

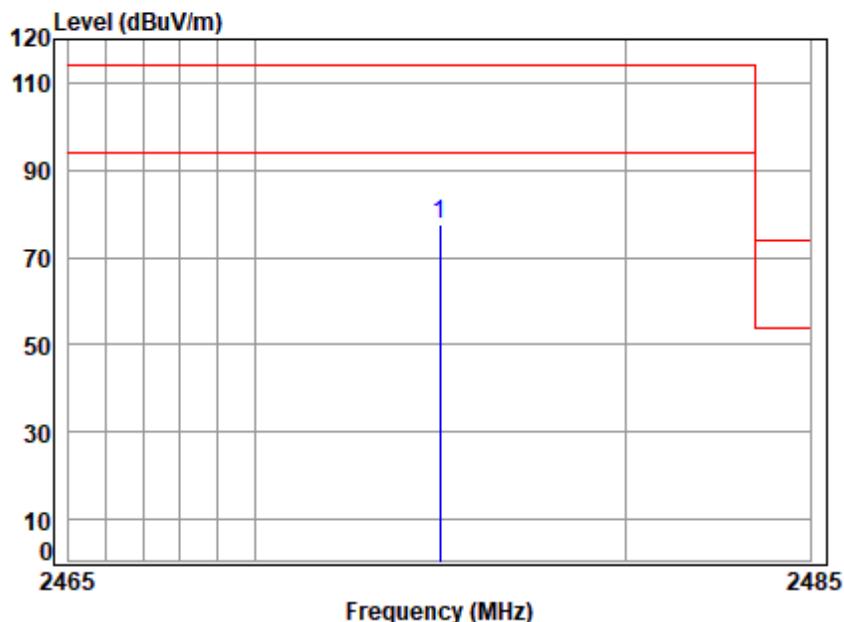
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2475 Field strength

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m		dB	dBuV	dBuV/m	dBuV/m	dB
1	2475.000	4.34	29.25	35.17	79.18	77.60	114.00	-36.40	peak

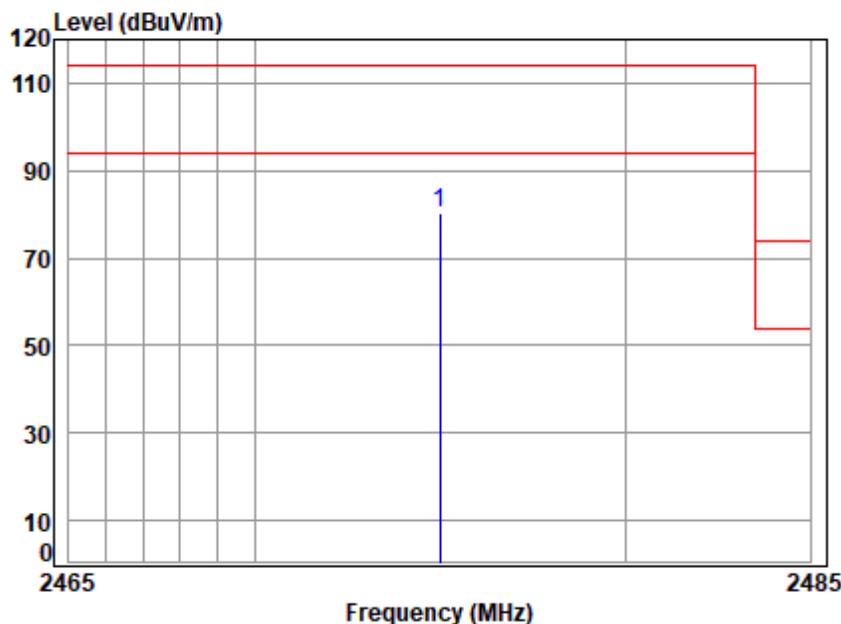


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m VERTICAL

Job No : 00455ET

Mode : 2475 Field strength

	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
Freq	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2475.000	4.34	29.25	35.17	81.93	80.35	114.00	-33.65 peak

## Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:  
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
- 2) The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the above measurement data were shown in the report

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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 6.10.5

Limit:

Frequency	Limit (dBuV/m @ 3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value
Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.		

**7.3.1 E.U.T. Operation**

Operating Environment:

Temperature: 21.7 °C      Humidity: 57.3 % RH      Atmospheric Pressure: 1015 mbar

**7.3.2 Test Mode Description**

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

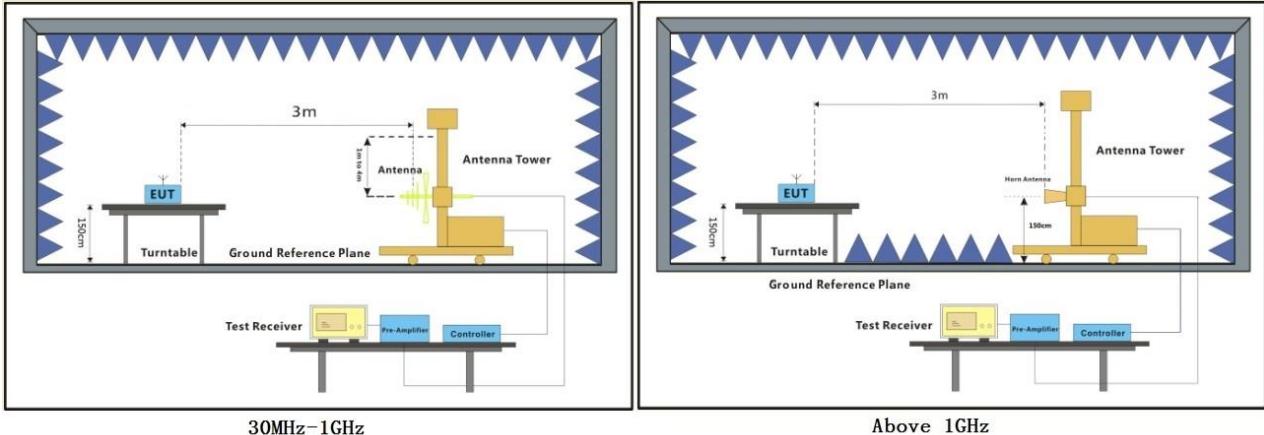
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**7.3.3 Test Setup Diagram****7.3.4 Measurement Procedure and Data**

- 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.
- 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.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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 the EUT in the lowest channel, the middle channel, the Highest channel.
- 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.
- Repeat above procedures until all frequencies measured was complete.

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



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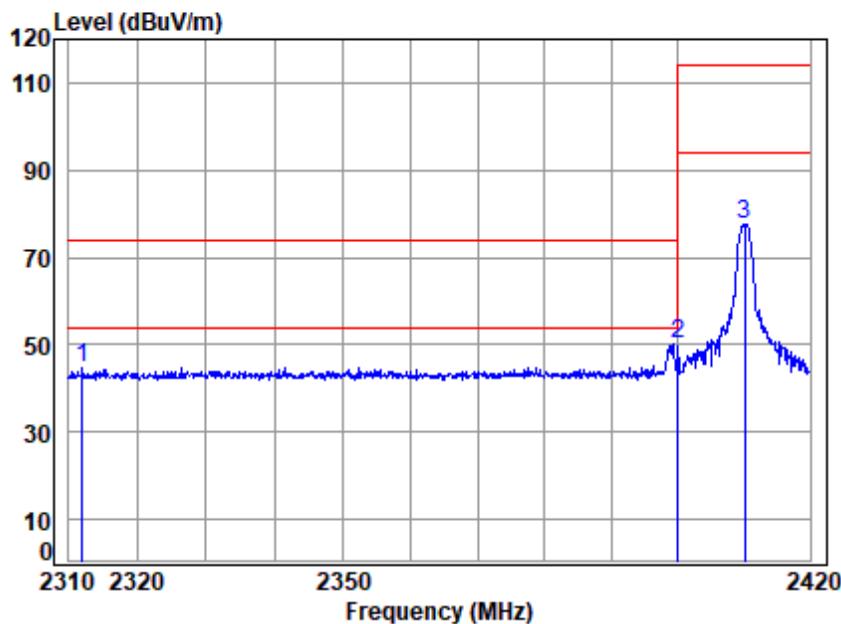
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2410 Band edge

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark	
								MHz	dB
1	2311.935	4.17	28.45	35.24	47.30	44.68	74.00	-29.32	Peak
2	2400.000	4.26	28.80	35.20	52.42	50.28	74.00	-23.72	peak
3	2410.113	4.27	28.86	35.20	79.64	77.57	114.00	-36.43	peak

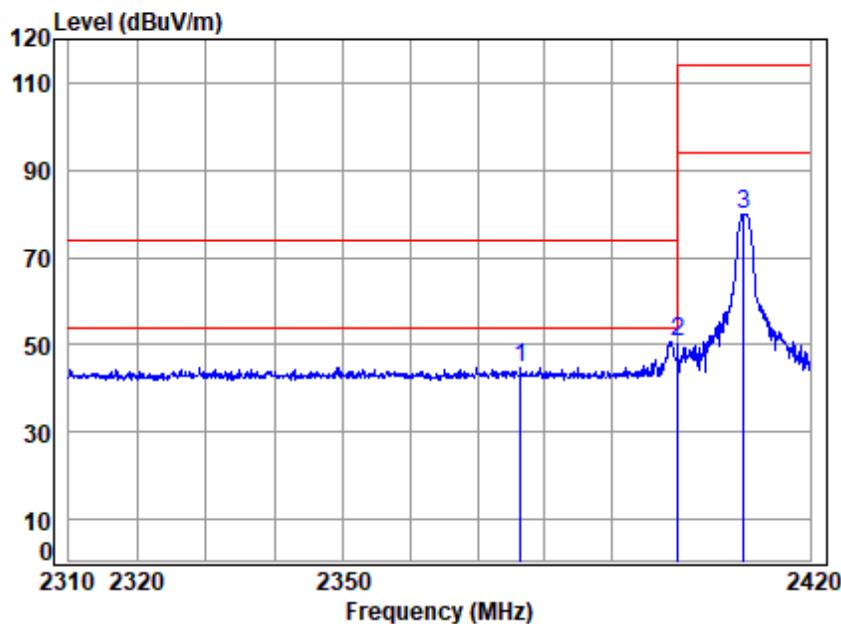
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m VERTICAL

Job No : 00455ET

Mode : 2410 Band edge

		Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark
	Freq	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2376.380	4.24	28.71	35.21	47.19	44.93	74.00	-29.07	Peak
2	2400.000	4.26	28.80	35.20	52.81	50.67	74.00	-23.33	peak
3	2410.001	4.27	28.86	35.20	82.12	80.05	114.00	-33.95	peak

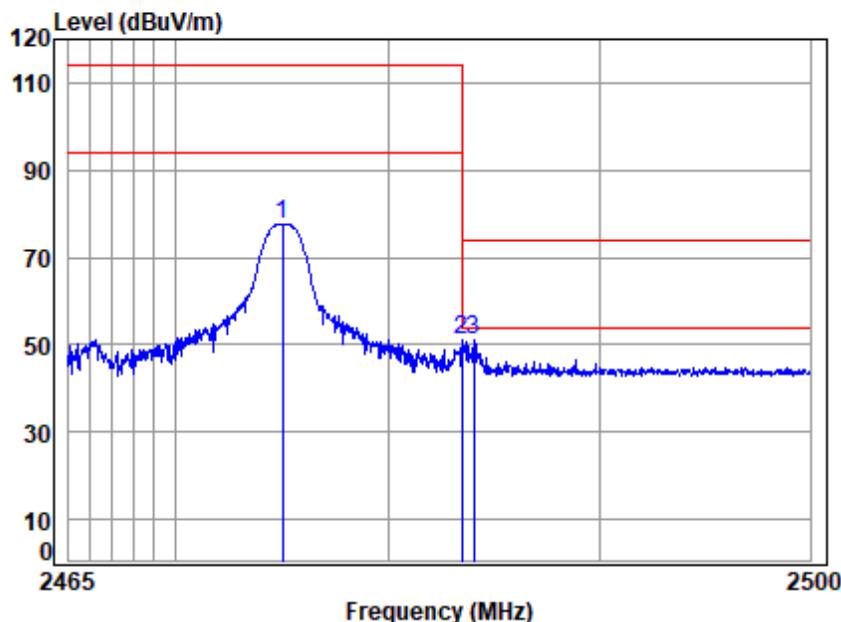
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2475 Band edge

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Limit Line	Over Limit	Remark	
								MHz	dB
								dB	dB
1	2475.030	4.34	29.25	35.17	79.12	77.54	114.00	-36.46	peak
2	2483.500	4.34	29.30	35.17	52.55	51.02	74.00	-22.98	peak
3	2484.084	4.34	29.31	35.16	52.41	50.90	74.00	-23.10	Peak

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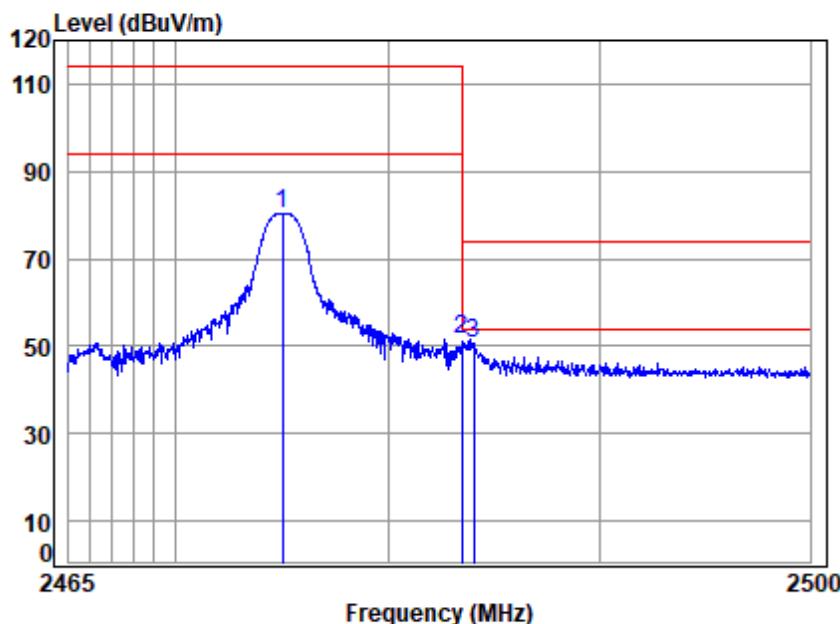
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber  
 Condition: 3m VERTICAL  
 Job No : 00455ET  
 Mode : 2475 Band edge

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Line Limit	Over Limit	Remark	
								MHz	dB
								dB	dB
1	2475.050	4.34	29.25	35.17	81.84	80.26	114.00	-33.74	peak
2	2483.500	4.34	29.30	35.16	53.30	51.78	74.00	-22.22	peak
3	2484.049	4.34	29.30	35.16	52.04	50.52	74.00	-23.48	Peak

## Remark:

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

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$
- 2) The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the above measurement data were shown in the report



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## 7.4 Radiated Emissions Below 1GHz

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

Measurement Distance: 3m

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
960-1000	500	3

### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

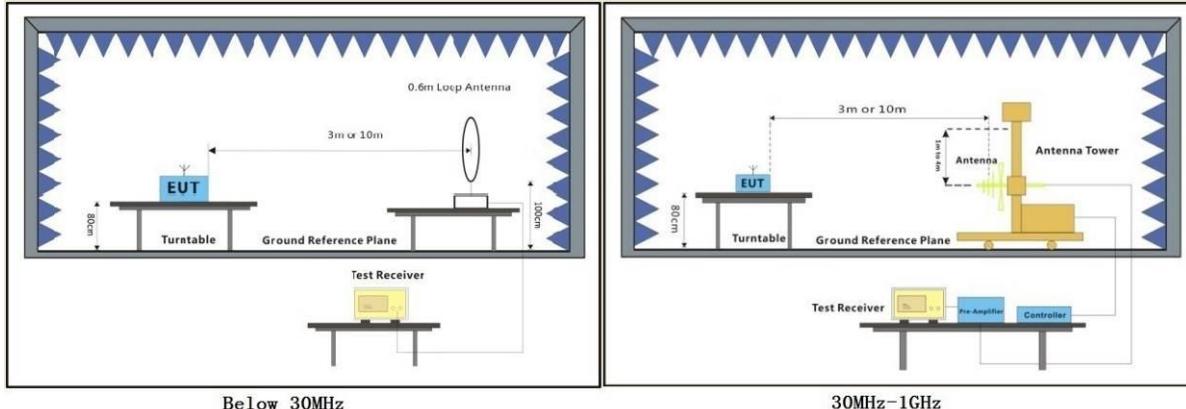
Humidity: 55.8 % RH

Atmospheric Pressure: 1015 mbar

### 7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

### 7.4.3 Test Setup Diagram



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

Remark:

- 1) 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 1 GHz, the disturbance 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.



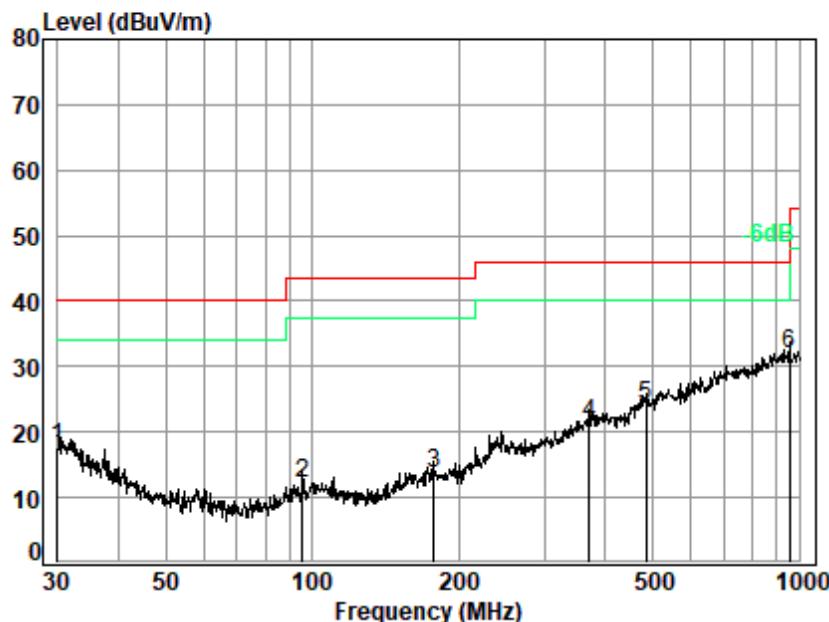
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Test Mode: 00; Polarity: Horizontal; Horizontal; Modulation:GFSK; ; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No. : 00455ET

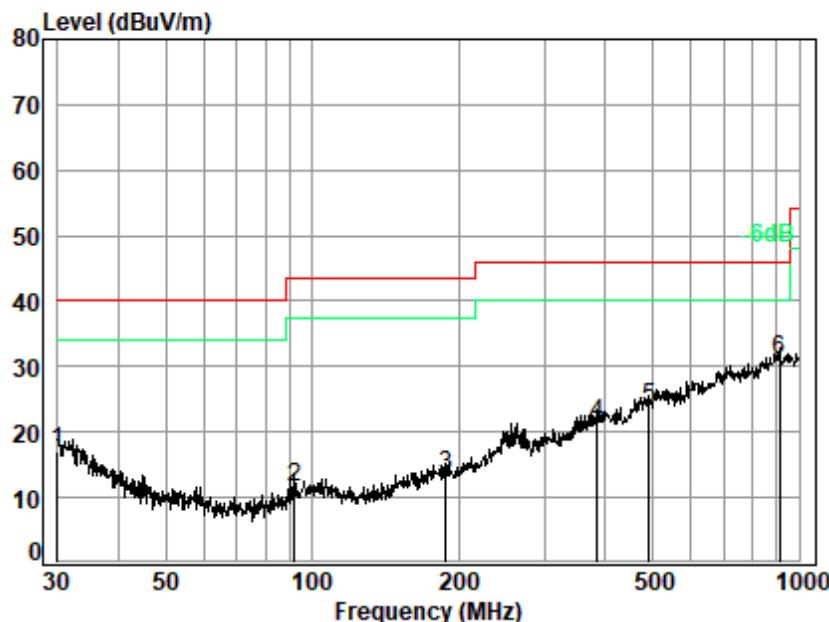
Test Mode: 00

Freq	Ant	Cable	Preamp	Read	Limit		Over	Remark
	Factor	Loss	Factor	Level	Level	Line	Limit	
MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
30.00	21.47	0.63	27.23	22.65	17.52	40.00	-22.48	QP
95.43	12.76	1.12	27.02	25.23	12.09	43.50	-31.41	QP
177.51	14.64	1.57	26.69	24.12	13.64	43.50	-29.86	QP
370.70	21.25	2.37	26.41	24.07	21.28	46.00	-24.72	QP
485.61	23.05	2.76	26.76	24.88	23.93	46.00	-22.07	QP
955.44	28.58	4.16	25.68	24.80	31.86	46.00	-14.14	QP

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



Site : chamber  
Condition: 3m VERTICAL  
Job No. : 00455ET  
Test Mode: 00

Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Limit		Over Limit	Remark
					dB	dBuV	dBuV/m	dBuV/m
MHz	dB/m	dB	dB	dB	dBuV	dBuV/m	dBuV/m	dB
1	30.00	21.47	0.63	27.23	22.14	17.01	40.00	-22.99 QP
2	91.82	12.28	1.10	27.03	25.21	11.56	43.50	-31.94 QP
3	188.41	14.70	1.63	26.65	23.63	13.31	43.50	-30.19 QP
4	385.28	21.29	2.43	26.46	24.02	21.28	46.00	-24.72 QP
5	492.47	22.94	2.79	26.78	24.73	23.68	46.00	-22.32 QP
6 q	909.67	28.42	4.05	25.86	24.33	30.94	46.00	-15.06 QP



## 7.5 Radiated Emissions Above 1GHz

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

Test Method: ANSI C63.10 (2013) Section 6.6

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
Above 1000	500	3

### 7.5.1 E.U.T. Operation

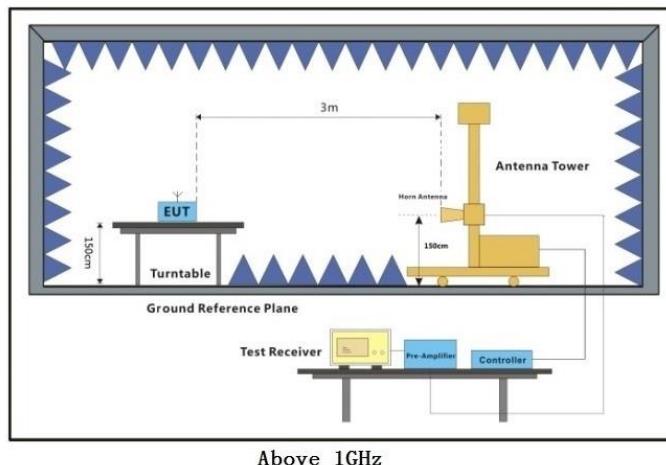
Operating Environment:

Temperature: 21.7 °C      Humidity: 57.3 % RH      Atmospheric Pressure: 1015 mbar

### 7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in transmitting with modulation mode.

### 7.5.3 Test Setup Diagram

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**7.5.4 Measurement Procedure and Data**

- a. 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.
- b. 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.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- h. 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.
- i. Repeat above procedures until all frequencies measured was complete.

Remark:

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

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

- 2) Scan from 1GHz to 25GHz, the disturbance above 18GHz 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.

- 3) 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.



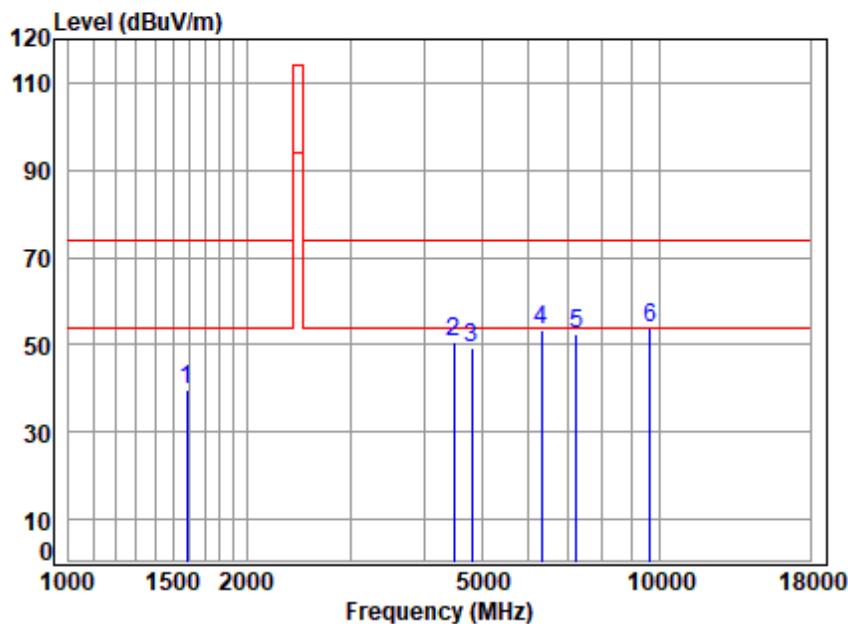
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2410 TX RSE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit		Over Limit	Remark
					Level	Line		
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1583.392	3.35	26.30	36.32	46.17	39.50	74.00	-34.50 peak
2	4495.125	6.77	33.50	34.51	44.77	50.53	74.00	-23.47 peak
3	4820.000	7.06	33.88	34.43	42.69	49.20	74.00	-24.80 peak
4	6322.136	8.21	35.20	34.88	44.78	53.31	74.00	-20.69 Peak
5	7230.000	8.54	35.80	35.44	43.62	52.52	74.00	-21.48 peak
6	9640.000	10.40	37.10	35.14	41.52	53.88	74.00	-20.12 peak

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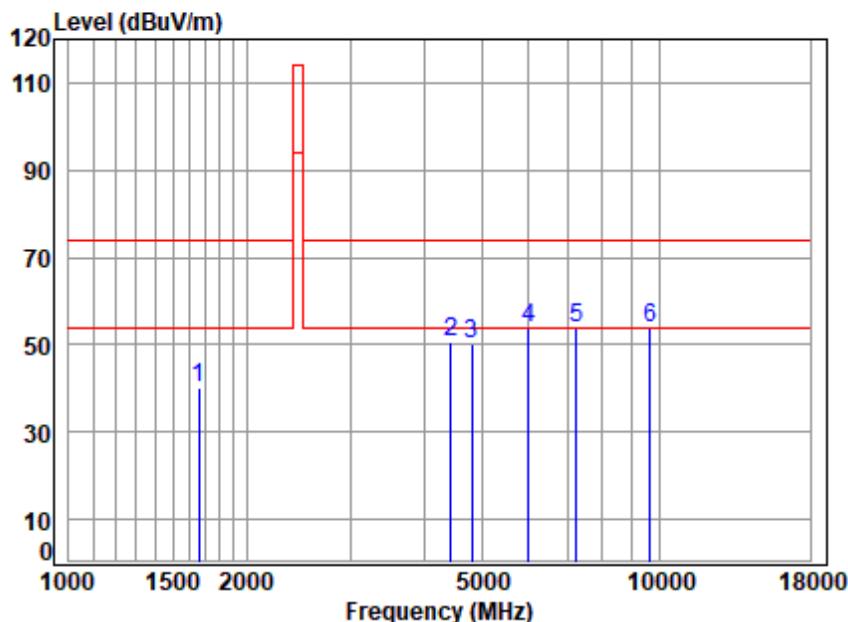


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Site : chamber  
 Condition: 3m VERTICAL  
 Job No : 00455ET  
 Mode : 2410 TX RSE

Freq	Cable	Ant	Preamp	Read	Limit	Over	Remark	
	Freq	Loss	Factor	Factor	Level	Level		
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1658.337	3.44	26.72	36.14	45.95	39.97	74.00	-34.03 peak
2	4443.453	6.72	33.50	34.53	44.90	50.59	74.00	-23.41 peak
3	4820.000	7.06	33.88	34.43	43.74	50.25	74.00	-23.75 peak
4	6001.626	8.16	35.00	34.62	45.23	53.77	74.00	-20.23 Peak
5	7230.000	8.54	35.80	35.44	44.80	53.70	74.00	-20.30 peak
6	9640.000	10.40	37.10	35.14	41.40	53.76	74.00	-20.24 peak

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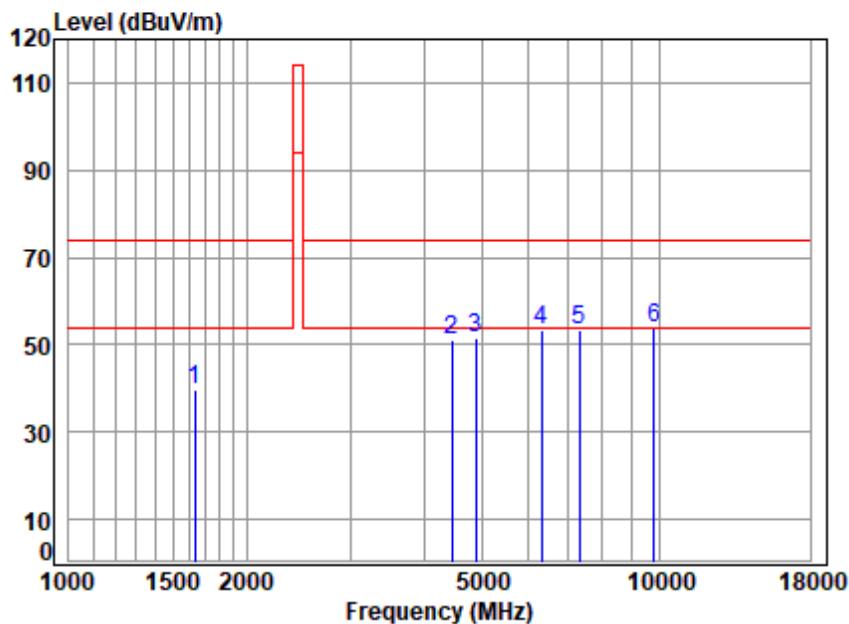


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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2445 TX RSE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit		Over Limit	Remark
					Level	Line		
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1634.543	3.41	26.64	36.19	45.61	39.47	74.00	-34.53 peak
2	4456.315	6.73	33.50	34.52	45.30	51.01	74.00	-22.99 peak
3	4890.000	7.12	34.08	34.41	44.78	51.57	74.00	-22.43 peak
4	6322.136	8.21	35.20	34.88	44.68	53.21	74.00	-20.79 peak
5	7335.000	8.64	35.90	35.47	44.11	53.18	74.00	-20.82 peak
6	9780.000	10.46	37.20	35.17	41.38	53.87	74.00	-20.13 peak

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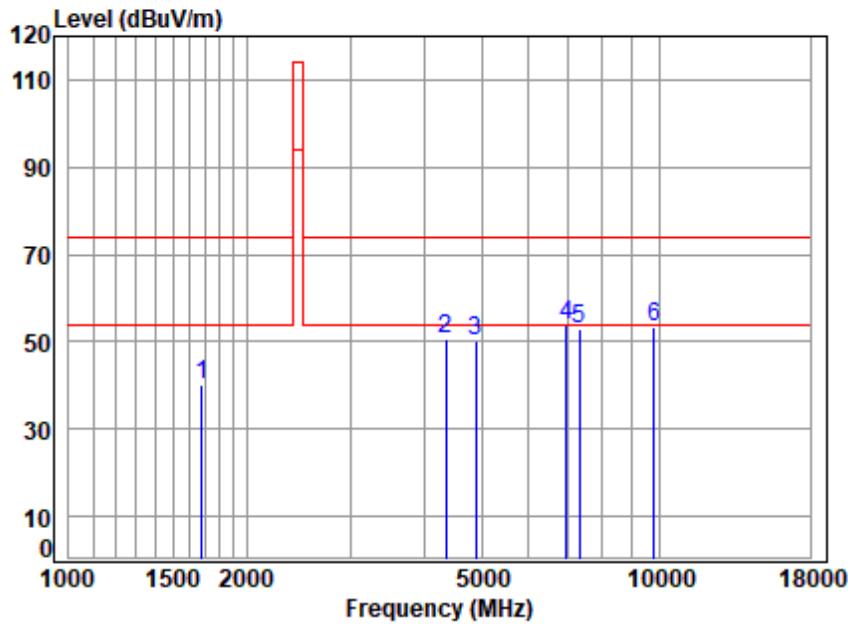


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00455ET  
Mode : 2445 TX RSE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit		Over Limit	Remark
					Level	Line		
1	1677.621	3.46	26.76	36.09	45.94	40.07	74.00	-33.93 peak
2	4354.454	6.63	33.59	34.55	45.06	50.73	74.00	-23.27 peak
3	4890.000	7.12	34.08	34.41	43.51	50.30	74.00	-23.70 peak
4	6954.852	8.31	35.71	35.36	44.99	53.65	74.00	-20.35 peak
5	7335.000	8.64	35.90	35.47	43.85	52.92	74.00	-21.08 peak
6	9780.000	10.46	37.20	35.17	40.78	53.27	74.00	-20.73 peak

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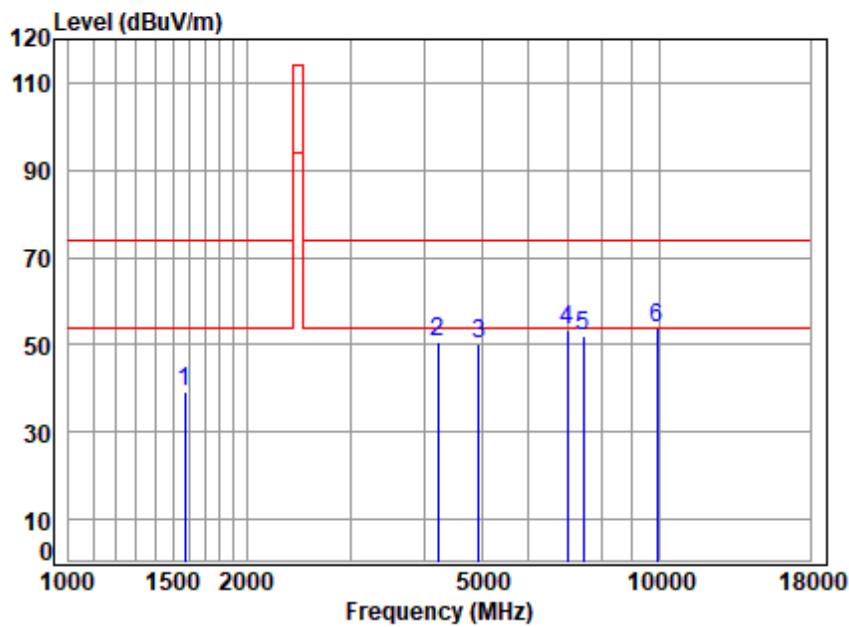


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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber

Condition: 3m HORIZONTAL

Job No : 00455ET

Mode : 2475 TX RSE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit		Over Limit	Remark
					Level	Line		
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	1574.265	3.34	26.19	36.34	46.05	39.24	74.00	-34.76 peak
2	4218.186	6.50	33.47	34.59	45.31	50.69	74.00	-23.31 peak
3	4950.000	7.17	34.20	34.39	43.33	50.31	74.00	-23.69 peak
4	6995.172	8.32	35.79	35.39	44.87	53.59	74.00	-20.41 peak
5	7425.000	8.72	35.90	35.49	43.07	52.20	74.00	-21.80 peak
6	9900.000	10.51	37.30	35.20	41.16	53.77	74.00	-20.23 peak

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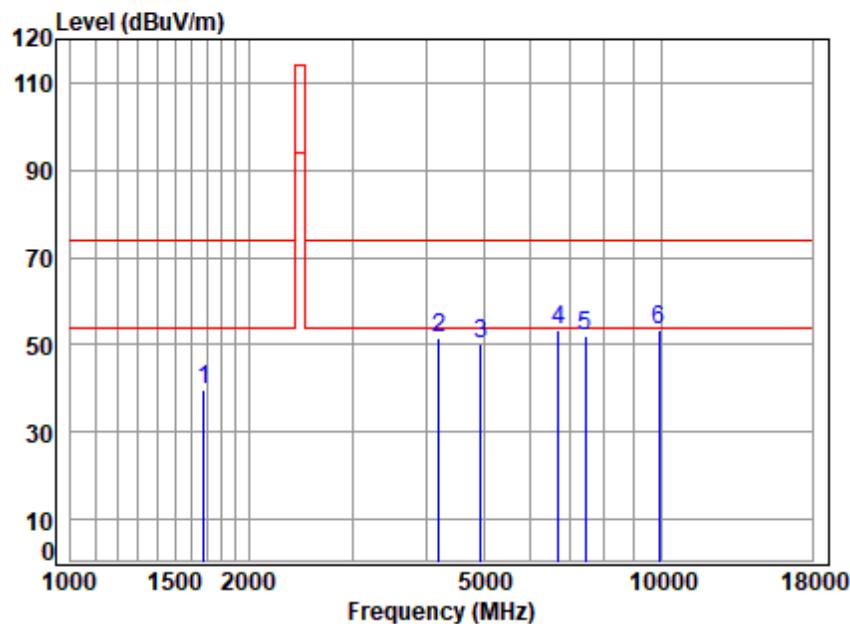


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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber  
Condition: 3m VERTICAL  
Job No : 00455ET  
Mode : 2475 TX RSE

Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit		Over Line	Over Limit	Remark
					dB	dBuV	dBuV/m	dBuV/m	
1 1677.621	3.46	26.76	36.09	45.55	39.68	74.00	-34.32	peak	
2 4206.011	6.49	33.42	34.60	46.46	51.77	74.00	-22.23	peak	
3 4950.000	7.17	34.20	34.39	43.07	50.05	74.00	-23.95	peak	
4 6698.373	8.27	35.60	35.17	44.52	53.22	74.00	-20.78	peak	
5 7425.000	8.72	35.90	35.49	43.10	52.23	74.00	-21.77	peak	
6 9900.000	10.51	37.30	35.20	40.69	53.30	74.00	-20.70	peak	

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## 8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2302000455ET

## 9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for SZCR2302000455ET.

- End of the Report -



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