TEST REPORT

Application No.:	SZCR2408003058ET (SGS SZ NO.: T52410320026EM)
Applicant:	SHANTOU CITY HAPPY COW TOYS INDUSTRIAL CO., LTD.
Address of Applicant:	7th Bldg., Chousha Garth, Shanfen Road, Chenghai, Shantou, Guangdong, China
Manufacturer:	GOLD LIGHT TOYS FACTORY
Address of Manufacturer:	GANGXIA RD., PUMEI, CHENGHAI, SHANTOU CITY,G.D. CHINA
Equipment Under Test (EUT):	
EUT Name:	R/C TOYS
Item No.:	777-584, 0959, 878530, 777-584S, 777-585, DX390372 ♣
♣	Please refer to section 2 of this report which indicates which item was actually tested and which were electrically identical.
Country of Origin:	CHINA
FCC ID	R6Z20248777584
Standard(s) :	47 CFR Part 15, Subpart C 15.249
Date of Receipt:	2024-08-06
Date of Test:	2024-08-09 to 2024-08-24
Date of Issue:	2024-08-27
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

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Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2024-08-27		Original

Authorized for issue by:				
		Martin Tang **Martin Tang/Project Engineer**		
		Eric Fu **Eric Fu/Reviewer**		

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2 Test Summary

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

Radio Spectrum Matter Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
20dB Bandwidth	47 CFR Part 15, Subpart C 15.249	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:

Item No.: 777-584, 0959, 878530, 777-584S, 777-585, DX390372

Only the item 777-584 was tested, since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for the above items, with only difference on model No., appearance and decoration.

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4 General Information

4.1 Details of E.U.T.

Power supply:	Rechargeable battery DC3.7V,120mAh,0.44Wh for tank,Charged by DC 5V
Cable(s):	USB-C cable:about 35cm unshielded
Cable Loss (for RF conducted test):	0.5dB
Operation Frequency:	2405MHz-2475MHz
Modulation Type:	GFSK
Number of Channels:	3
Antenna Type:	PCB Antenna
Antenna Gain:	0.12dBi

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.

Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**2405**	2	**2440**	3	**2475**

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
Field Strength of the Fundamental Signal (15.249(a))	± 4.5dB (Below 1GHz);± 4.8dB (Above 1GHz)
Restricted Band Around Fundamental Frequency	± 6.0dB (Below 1GHz);± 4.6dB (Above 1GHz)
Radiated Emissions Below 1GHz	± 6.0dB for 3m; ± 5.0dB for 10m
Radiated Emissions Above 1GHz	± 4.6dB (1GHz-18GHz);± 4.8dB (18MHz-40GHz)
20dB Bandwidth	± 3%

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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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

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2024-05-11	2027-05-10
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2024-03-15	2025-03-14
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2023-07-23	2025-07-22
Microwave system amplifier	Agilent	83017A	SEM005-25	2023-09-19	2024-09-18
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2024-07-06	2025-07-05

Restricted Band Around Fundamental Frequency					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2024-05-11	2027-05-10
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2024-03-15	2025-03-14
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2023-07-23	2025-07-22
Microwave system amplifier	Agilent	83017A	SEM005-25	2023-09-19	2024-09-18
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2024-07-06	2025-07-05
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9170	SEM003-15	2024-08-10	2025-08-09
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-2640-50	SEM005-08	2024-03-15	2025-03-14

Radiated Emissions Below 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Loop Antenna	ETS-Lindgren	6502	SEM003-08	2023-11-20	2025-11-19
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2023-06-19	2026-06-18
MXE EMI Receiver	Agilent Technologies	N9038A	SEM004-15	2023-10-19	2024-10-18
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2023-09-16	2025-09-15
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2024-03-14	2025-03-13
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2024-07-06	2025-07-05

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Radiated Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
3m Fully-Anechoic Chamber	AUDIX	N/A	SEM001-02	2024-05-11	2027-05-10
Signal Analyzer	Rohde & Schwarz	FSV40	SEM008-04	2024-03-15	2025-03-14
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2023-07-23	2025-07-22
Microwave system amplifier	Agilent	83017A	SEM005-25	2023-09-19	2024-09-18
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2024-07-06	2025-07-05

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2023-10-19	2024-10-18
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2024-03-14	2025-03-13
Measurement Software	TST PASS	TST PASS V2.0	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM031-01	2024-07-06	2025-07-05
Attenuator	Huber+Suhner	6620_SMA-50-1	SEM021-09	2024-03-27	2025-03-26
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2024-03-19	2025-03-18

General used equipment					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Humidity/ Temperature Indicator	deli	8838	SEM002-32	2024-07-24	2025-07-23
Humidity/ Temperature Indicator	deli	8838	SEM002-33	2024-07-24	2025-07-23
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2024-03-18	2025-03-17

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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

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.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement.

Antenna location: Refer to Internal photos(tank)

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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

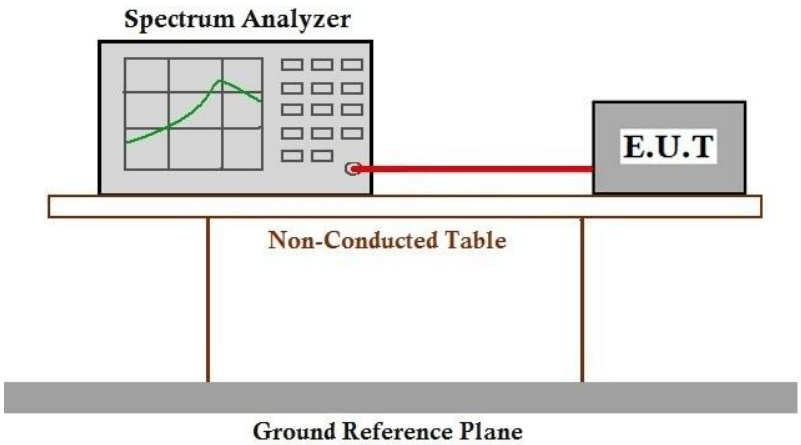
7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 22.6 °C Humidity: 52.9 % RH Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT(tank) 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	1.136	Pass
Middle	1.110	Pass
Highest	1.179	Pass

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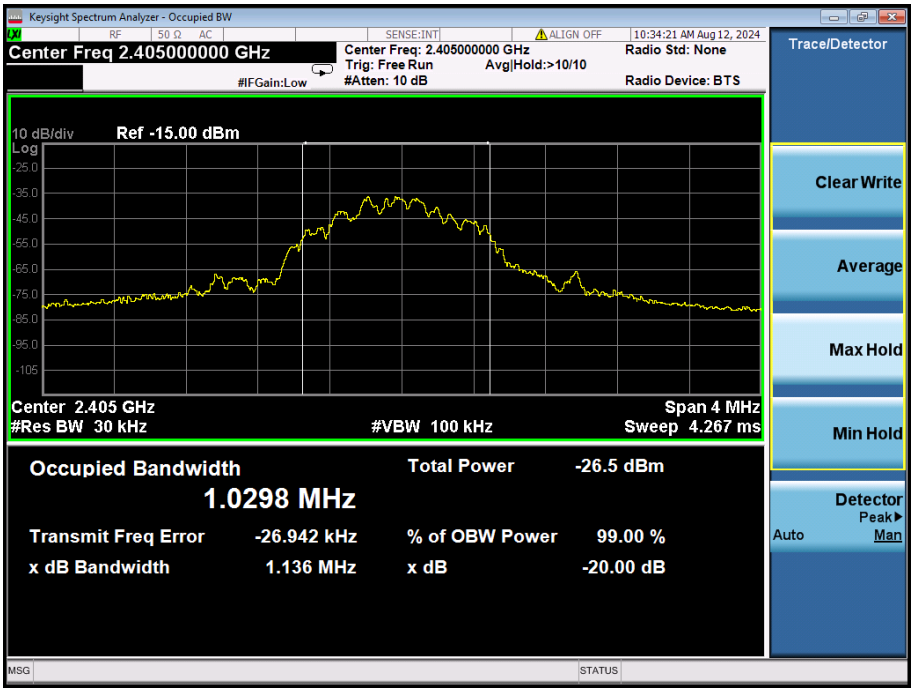

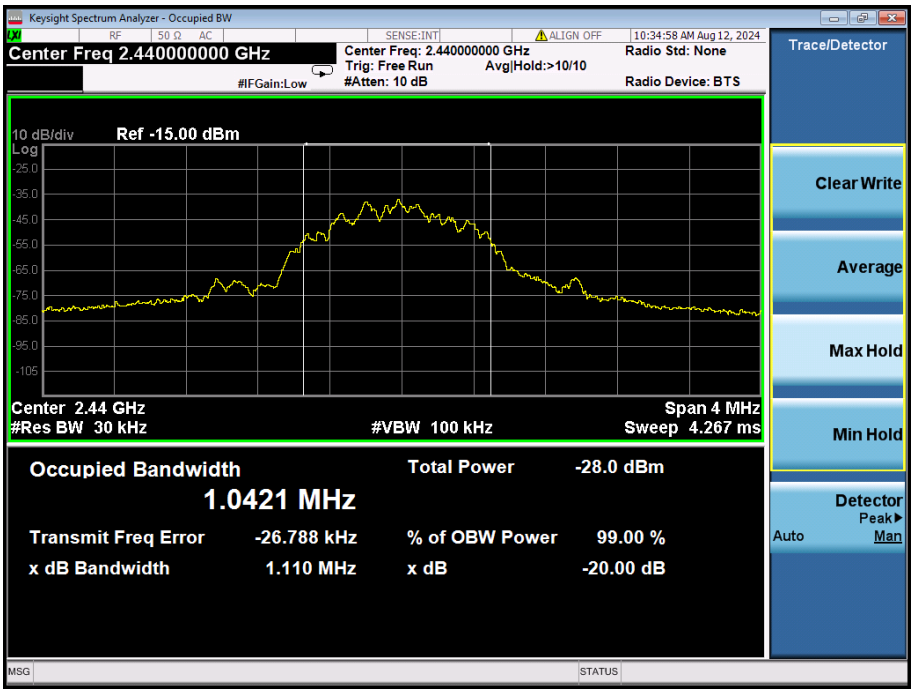

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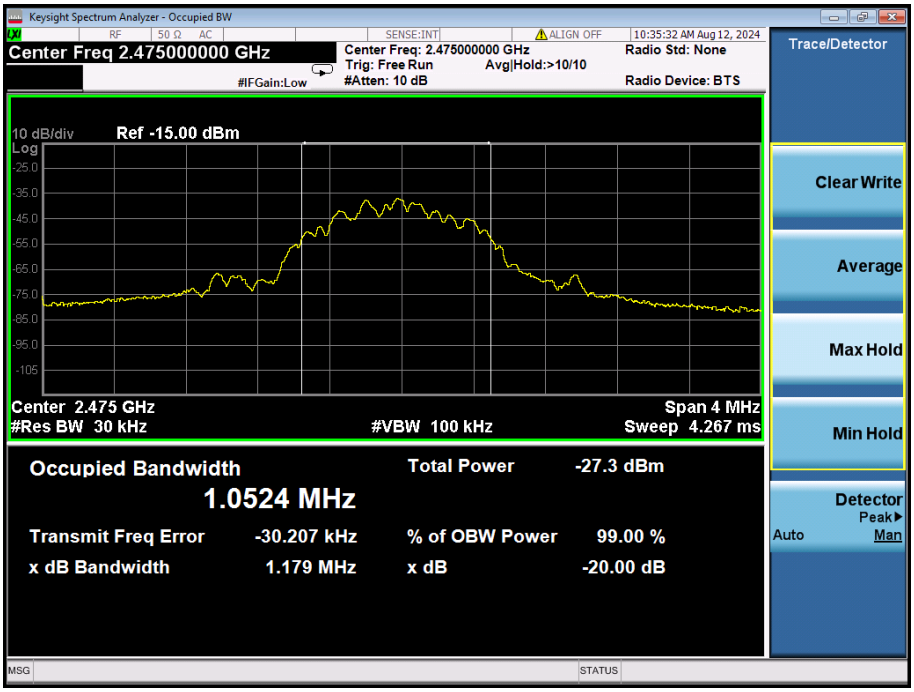

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7.2 Field Strength of the Fundamental Signal (15.249(a))

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

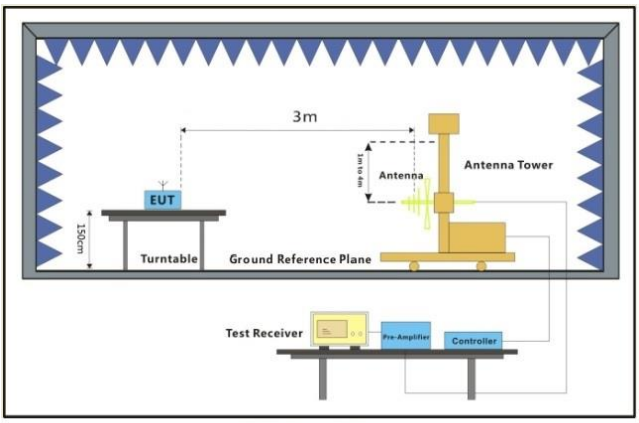
Operating Environment:

Temperature: 21.4 °C Humidity: 51.3 % RH Atmospheric Pressure: 1020 mbar

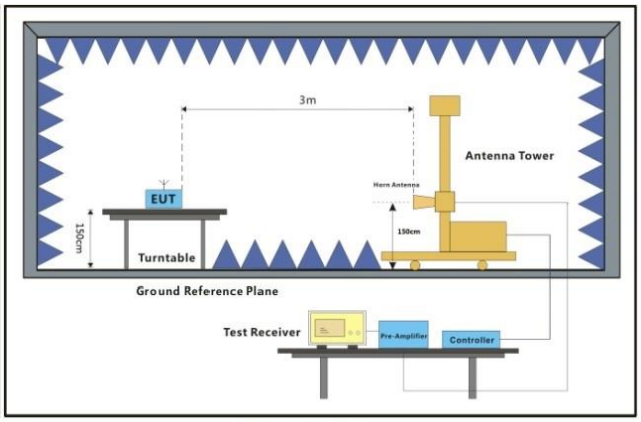
7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT(tank) in transmitting with modulation mode.

7.2.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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

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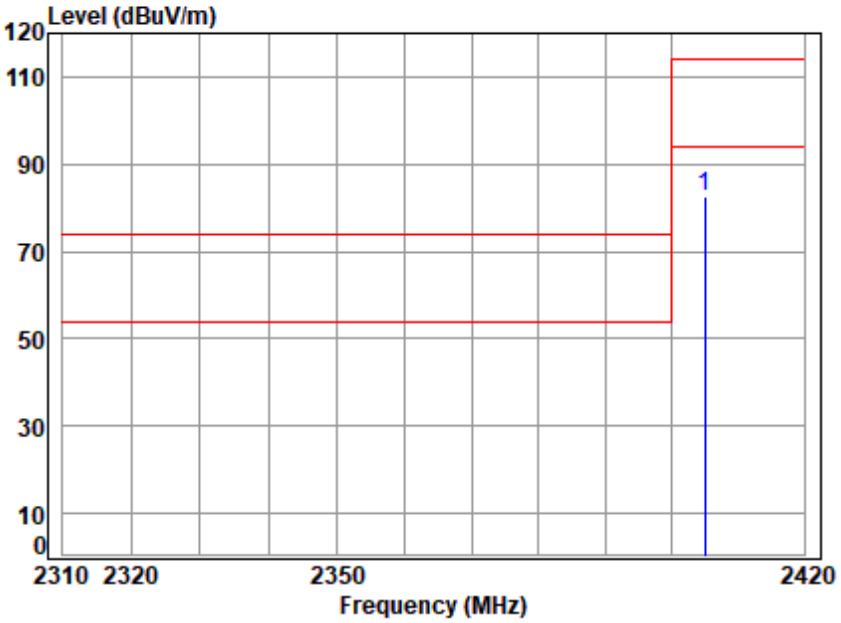
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low; Channel:185



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2405 Field Strength
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2405.00	5.09	29.08	37.40	85.70	82.47	114.00	-31.53	peak

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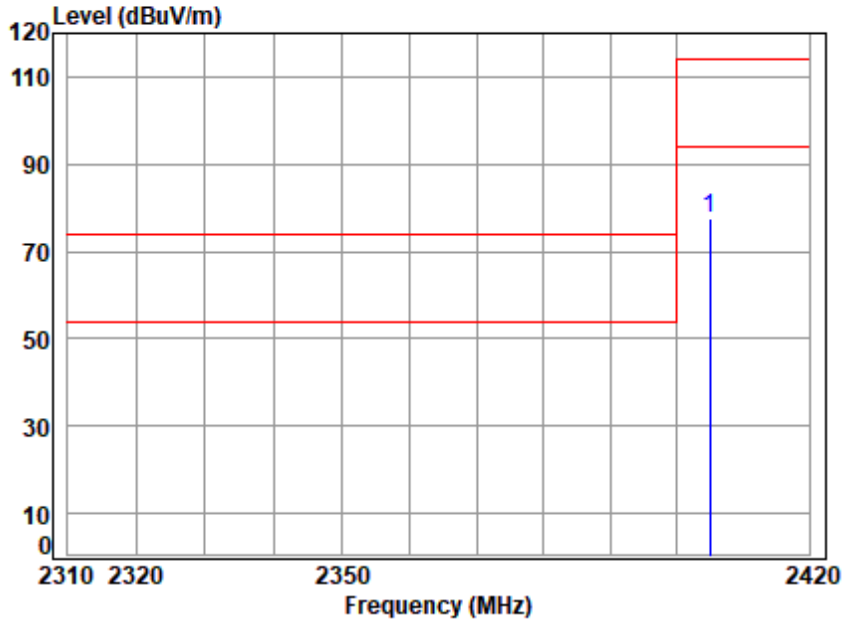
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low; Channel:185

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Site      : chamber
Condition: 3m VERTICAL
Job No    : 03058ET
Mode      : 2405 Field Strength
          : Tank
```

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2405.00	5.09	29.08	37.40	80.66	77.43	114.00	-36.57	peak

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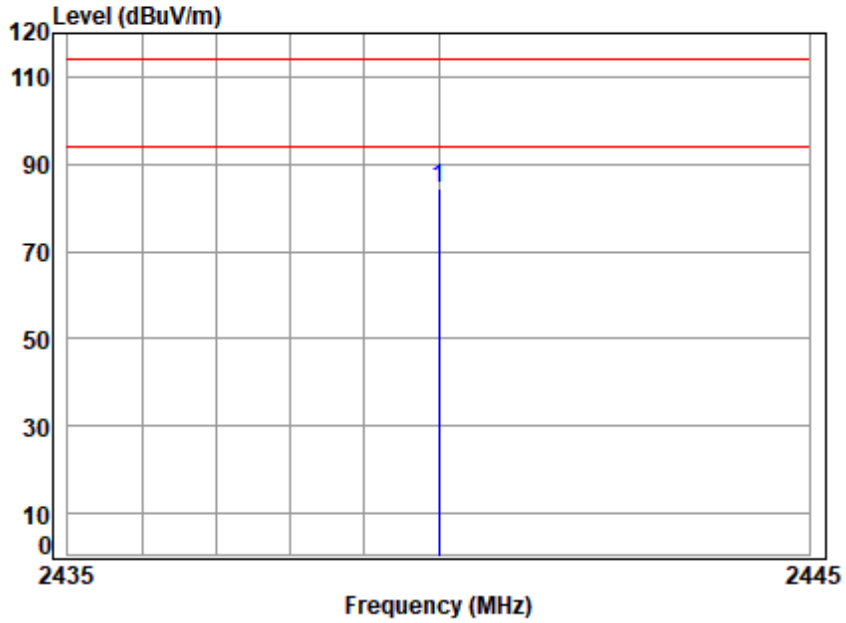
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle; Channel:115



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2440 Field Strength
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2440.00	5.12	28.94	37.32	87.85	84.59	114.00	-29.41	Peak

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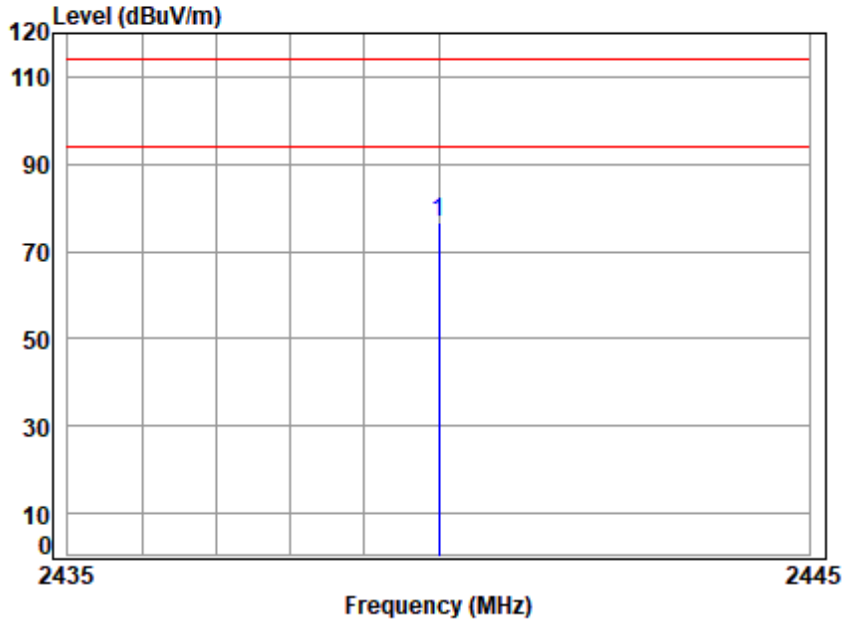
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle; Channel:115




```
Site      : chamber
Condition: 3m VERTICAL
Job No    : 03058ET
Mode      : 2440 Field Strength
          : Tank
```

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2440.00	5.12	28.94	37.32	80.04	76.78	114.00	-37.22	Peak

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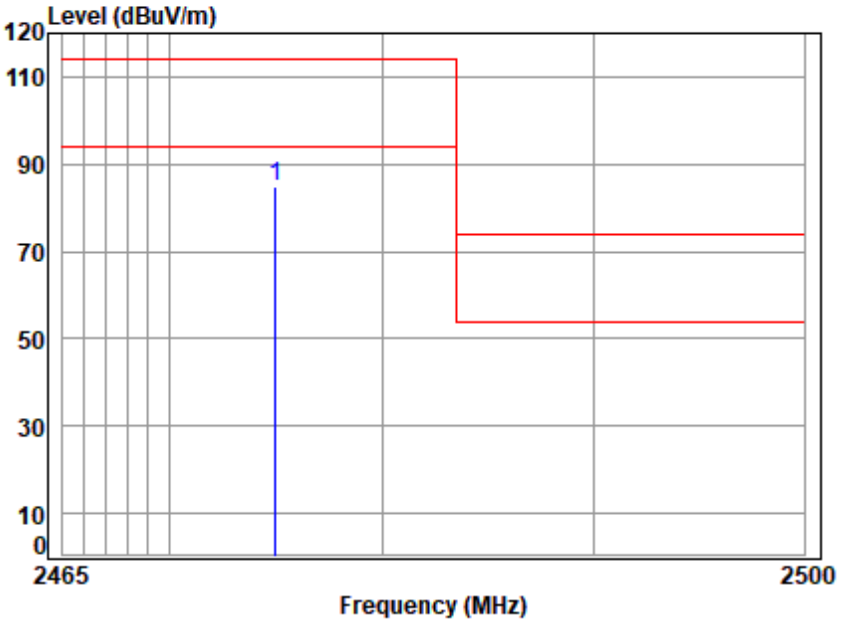
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2475 Field Strength
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2475.00	5.15	28.90	37.24	88.23	85.04	114.00	-28.96	peak

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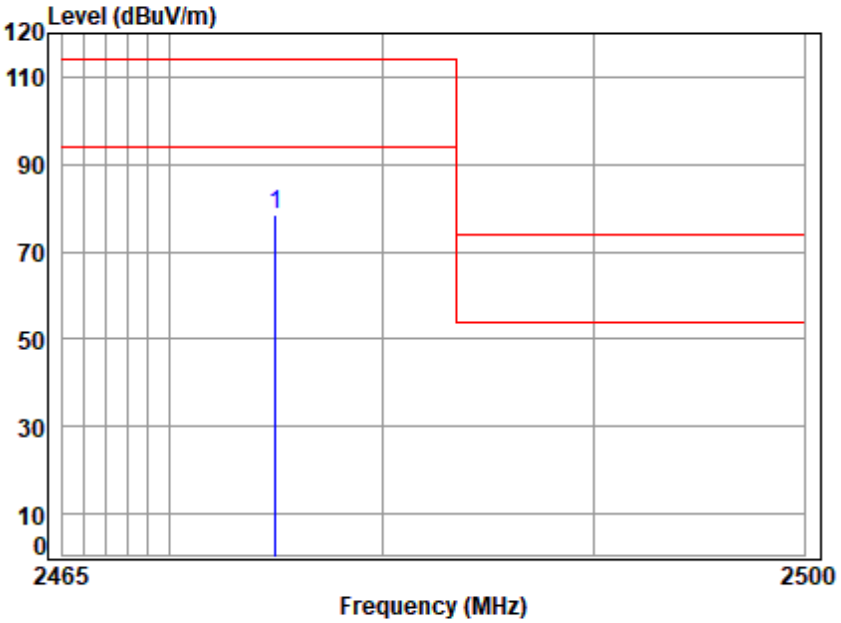
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 2475 Field Strength
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2475.00	5.15	28.90	37.24	81.87	78.68	114.00	-35.32	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 20dB 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 & 15.249(d) & 15.209
Test Method: ANSI C63.10 (2013) Section 6.10.5
Measurement Distance: 3m

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

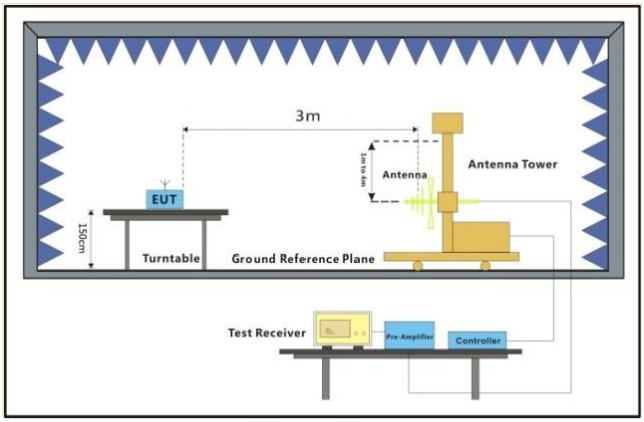
Operating Environment:

Temperature: 22.5 °C Humidity: 52.4 % RH Atmospheric Pressure: 1020 mbar

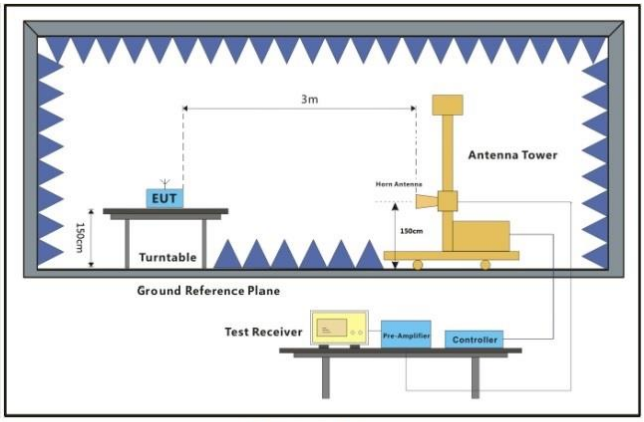
7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT(tank) in transmitting with modulation mode.

7.3.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

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

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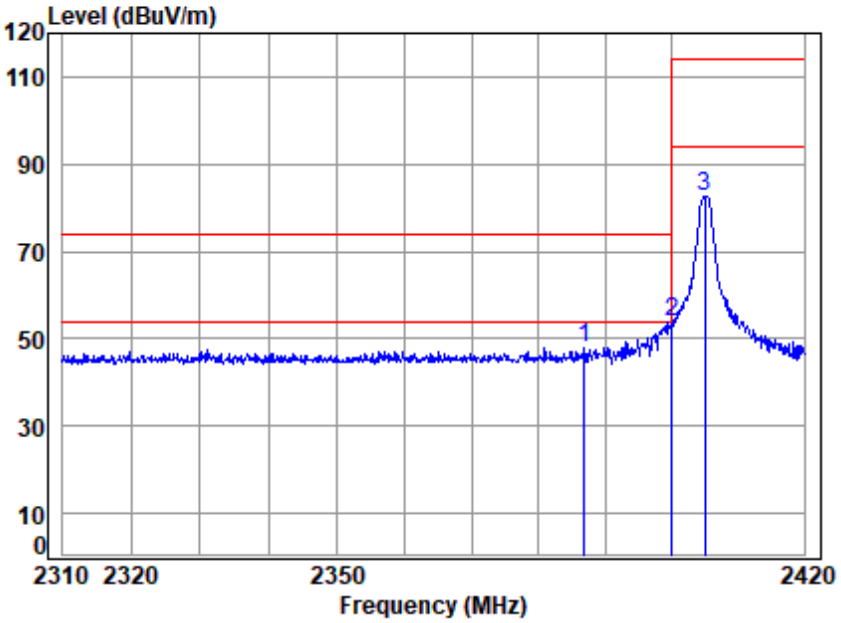
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low; Channel:185



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2405 Band edge
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2386.91	5.07	29.10	37.44	51.36	48.09	74.00	-25.91	Peak
2	2400.00	5.08	29.10	37.41	56.94	53.71	74.00	-20.29	peak
3	2405.00	5.09	29.08	37.40	85.70	82.47	114.00	-31.53	peak

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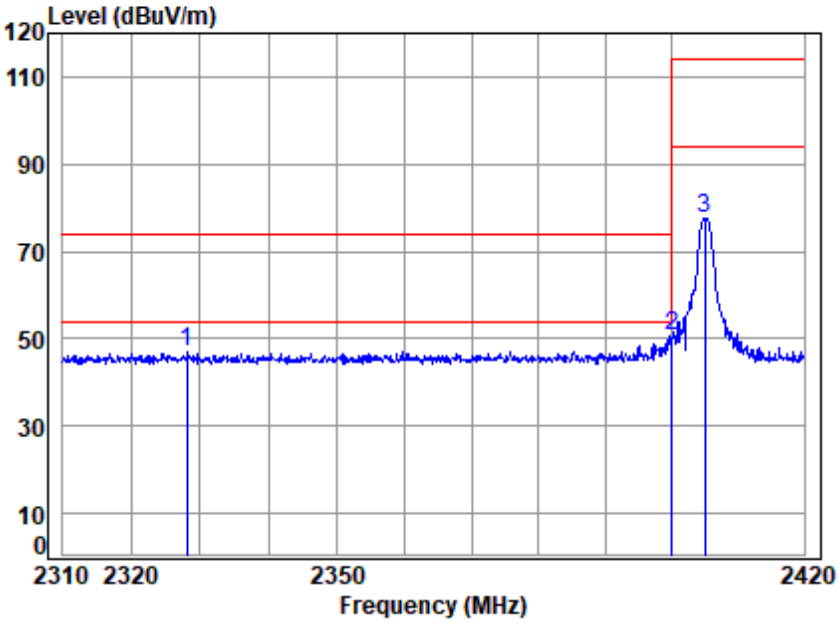
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low; Channel:185



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 2405 Band edge
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2328.12	5.02	28.80	37.58	50.95	47.19	74.00	-26.81	Peak
2	2400.00	5.08	29.10	37.41	53.94	50.71	74.00	-23.29	peak
3	2405.00	5.09	29.08	37.40	80.66	77.43	114.00	-36.57	peak

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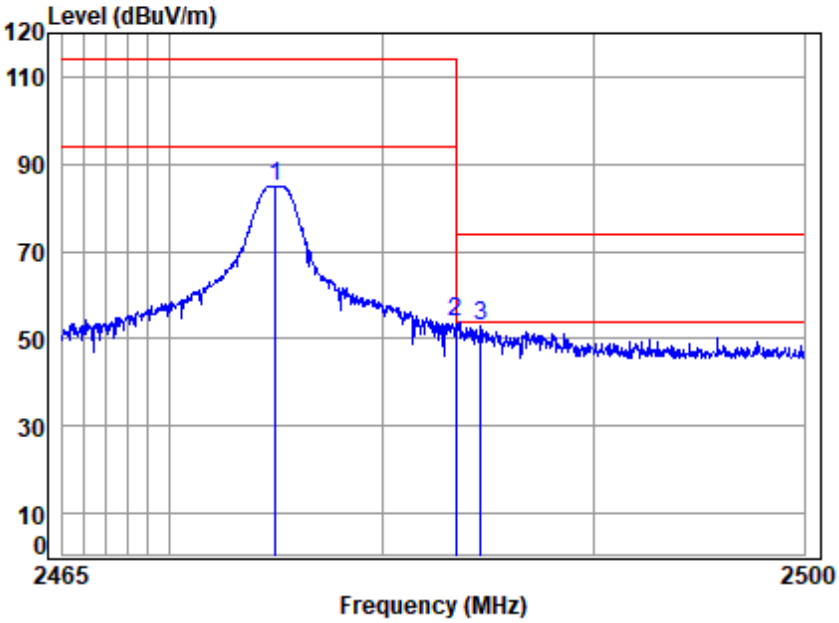
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2475 Band edge
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2475.00	5.15	28.90	37.24	88.23	85.04	114.00	-28.96	peak
2	2483.50	5.16	28.90	37.22	56.91	53.75	74.00	-20.25	peak
3	2484.68	5.16	28.90	37.21	55.90	52.75	74.00	-21.25	Peak

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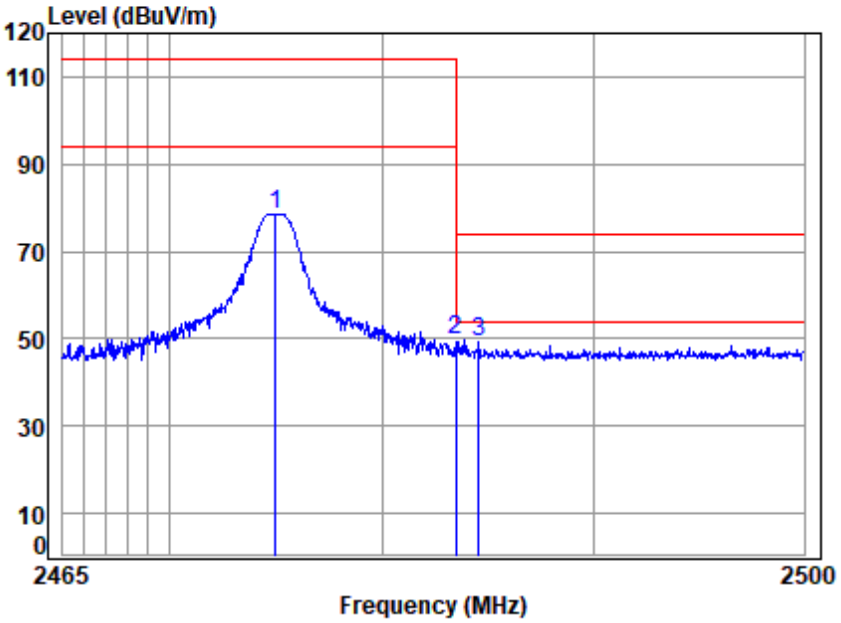
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 2475 Band edge
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2475.00	5.15	28.90	37.24	81.87	78.68	114.00	-35.32	peak
2	2483.50	5.16	28.90	37.22	52.98	49.82	74.00	-24.18	peak
3	2484.57	5.16	28.90	37.21	52.22	49.07	74.00	-24.93	Peak

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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

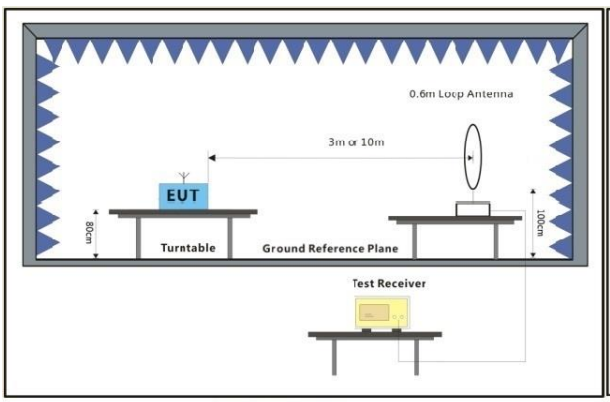
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 23.4 °C Humidity: 51.4 % RH Atmospheric Pressure: 1020 mbar

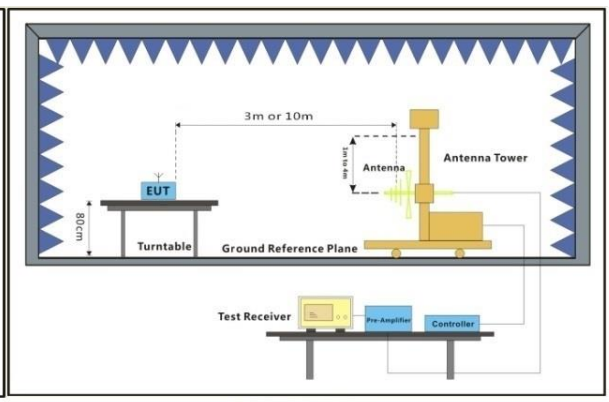
7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT(tank) in transmitting with modulation mode.

7.4.3 Test Setup Diagram



Below 30MHz



30MHz-1GHz

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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. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 9kHz to 30MHz, 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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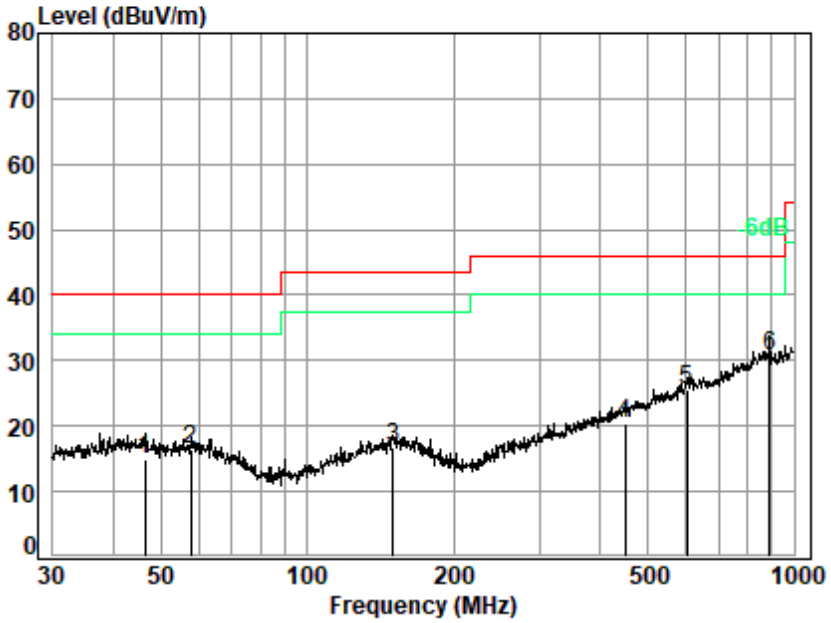
Test Mode: 01; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 01

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	46.34	0.80	13.84	27.69	27.89	14.84	40.00	-25.16	QP
2	57.59	0.90	11.71	27.67	31.39	16.33	40.00	-23.67	QP
3	150.01	1.51	13.04	27.34	29.42	16.63	43.50	-26.87	QP
4	449.56	2.73	21.17	27.67	24.09	20.32	46.00	-25.68	QP
5	601.43	3.21	24.43	28.22	26.08	25.50	46.00	-20.50	QP
6	890.73	4.07	28.06	27.15	25.69	30.67	46.00	-15.33	QP

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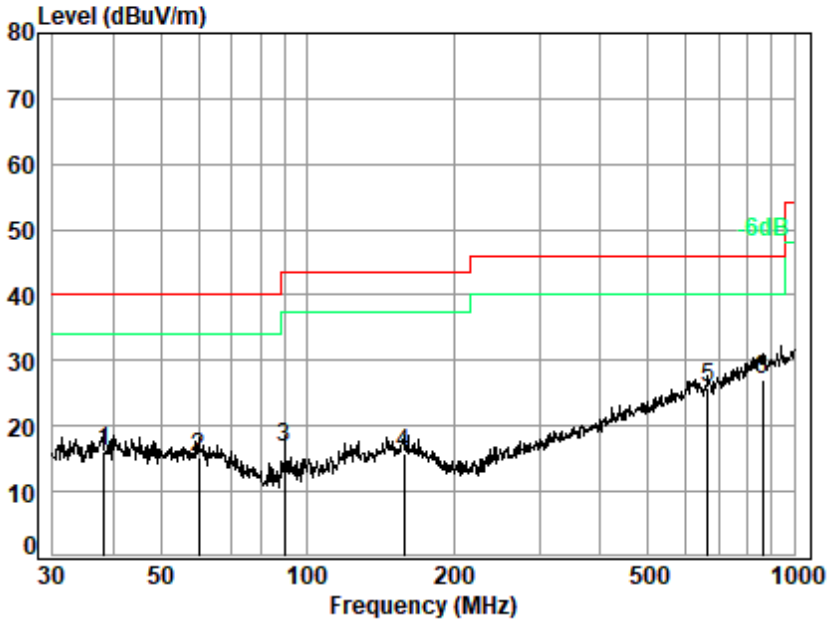
Test Mode: 01; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 01

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	38.21	0.73	17.19	27.71	26.02	16.23	40.00	-23.77	QP
2	59.86	0.92	11.50	27.67	30.55	15.30	40.00	-24.70	QP
3	89.90	1.13	11.72	27.62	31.47	16.70	43.50	-26.80	QP
4	158.11	1.55	13.64	27.31	27.82	15.70	43.50	-27.80	QP
5	663.47	3.41	25.32	28.01	25.11	25.83	46.00	-20.17	QP
6	860.04	3.99	27.29	27.30	23.00	26.98	46.00	-19.02	QP

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7.5 Radiated Emissions Above 1GHz

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)
Test Method: ANSI C63.10 (2013) Section 6.6
Measurement Distance: 3m

Limit:

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

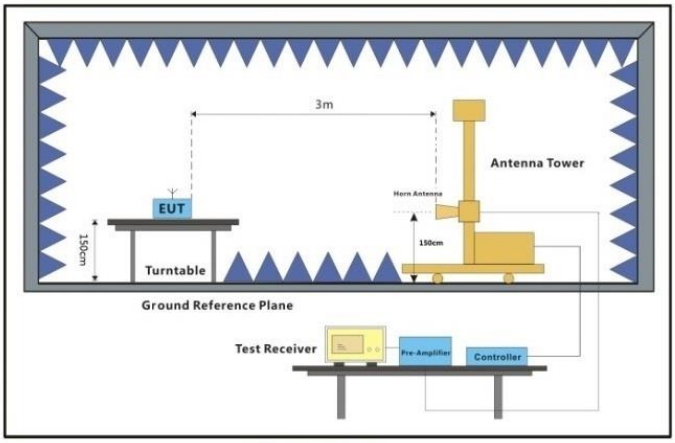
7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 23.1 °C Humidity: 51.3 % RH Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT(tank) in transmitting with modulation mode.

7.5.3 Test Setup Diagram



Above 1GHz

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7.5.4 Measurement Procedure and Data

a. 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.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak 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. Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

2. Scan from 18GHz to 40GHz, 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. 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.

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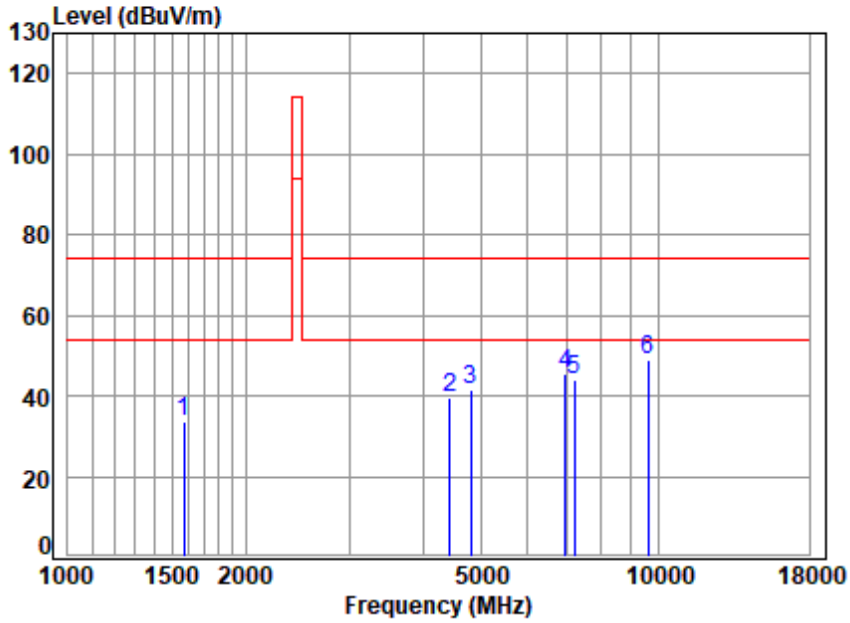
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low; Channel:185



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2405 TX RSE
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1574.27	4.17	26.90	38.40	40.76	33.43	74.00	-40.57	peak
2	4430.63	7.08	34.43	35.77	34.05	39.79	74.00	-34.21	peak
3	4810.00	7.32	34.34	35.51	35.38	41.53	74.00	-32.47	peak
4	6954.85	8.89	35.79	35.54	36.16	45.30	74.00	-28.70	peak
5	7215.00	9.19	35.70	35.79	35.09	44.19	74.00	-29.81	peak
6	9620.00	12.37	37.44	37.46	36.80	49.15	74.00	-24.85	peak

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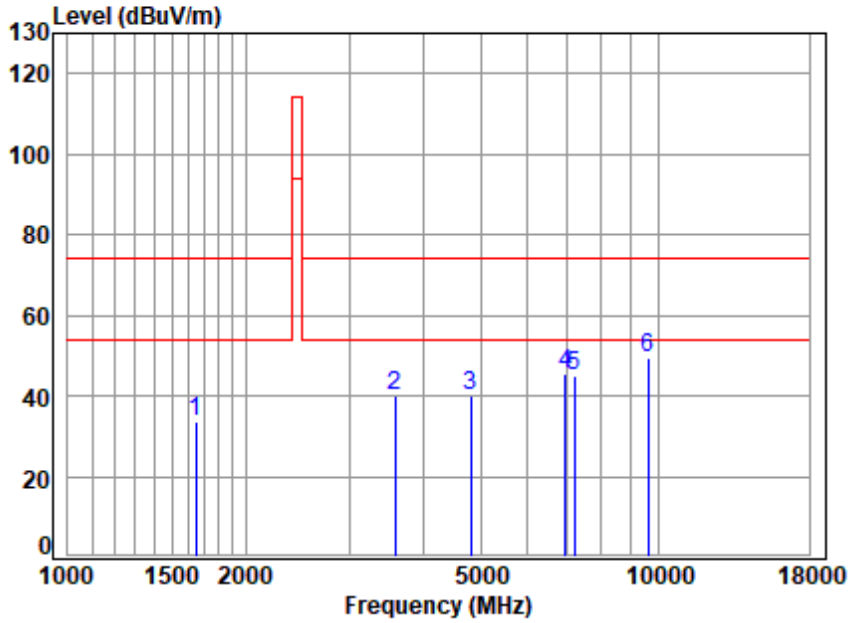
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:Low; Channel:185



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 2405 TX RSE
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1648.78	4.26	26.31	38.41	41.22	33.38	74.00	-40.62	peak
2	3587.82	6.33	31.98	36.12	37.61	39.80	74.00	-34.20	peak
3	4810.00	7.32	34.34	35.51	33.96	40.11	74.00	-33.89	peak
4	6954.85	8.89	35.79	35.54	36.22	45.36	74.00	-28.64	peak
5	7215.00	9.19	35.70	35.79	36.00	45.10	74.00	-28.90	peak
6	9620.00	12.37	37.44	37.46	36.89	49.24	74.00	-24.76	peak

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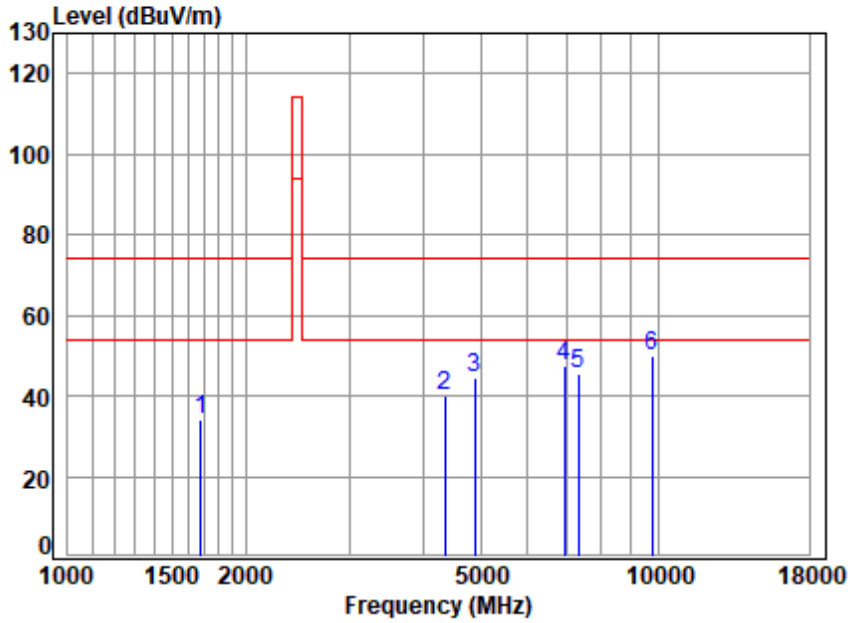
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:middle; Channel:115



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2440 TX RSE
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1677.62	4.30	26.24	38.41	41.87	34.00	74.00	-40.00	peak
2	4354.45	7.03	34.44	35.83	34.39	40.03	74.00	-33.97	peak
3	4880.00	7.36	34.62	35.47	38.09	44.60	74.00	-29.40	peak
4	6934.78	8.87	35.74	35.53	38.28	47.36	74.00	-26.64	peak
5	7320.00	9.32	35.70	35.90	36.21	45.33	74.00	-28.67	peak
6	9760.00	12.47	37.38	37.43	37.32	49.74	74.00	-24.26	peak

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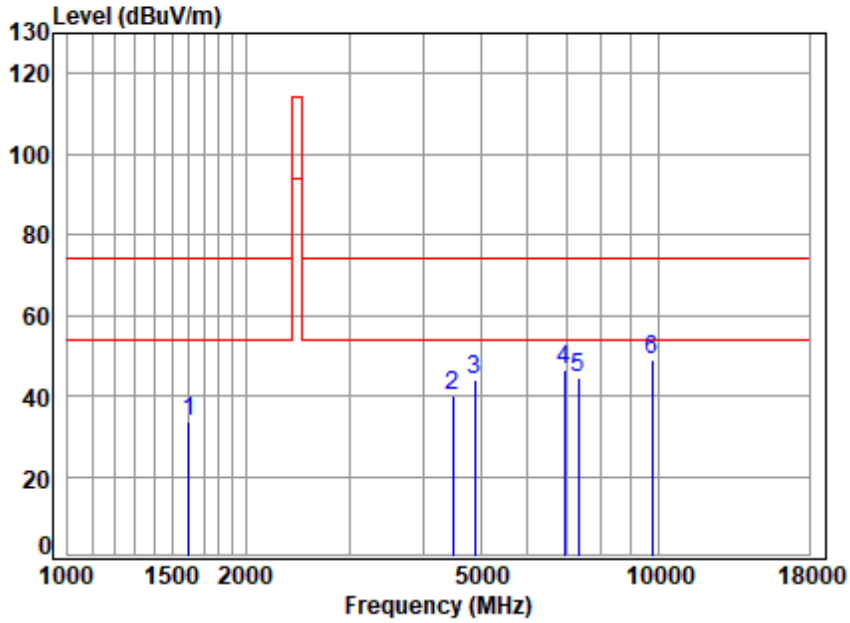
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:middle; Channel:115



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 2440 TX RSE
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1601.80	4.20	26.78	38.40	40.95	33.53	74.00	-40.47	peak
2	4482.15	7.11	33.81	35.74	34.99	40.17	74.00	-33.83	peak
3	4880.00	7.36	34.62	35.47	37.35	43.86	74.00	-30.14	peak
4	6934.78	8.87	35.74	35.53	37.14	46.22	74.00	-27.78	peak
5	7320.00	9.32	35.70	35.90	35.44	44.56	74.00	-29.44	peak
6	9760.00	12.47	37.38	37.43	36.53	48.95	74.00	-25.05	peak

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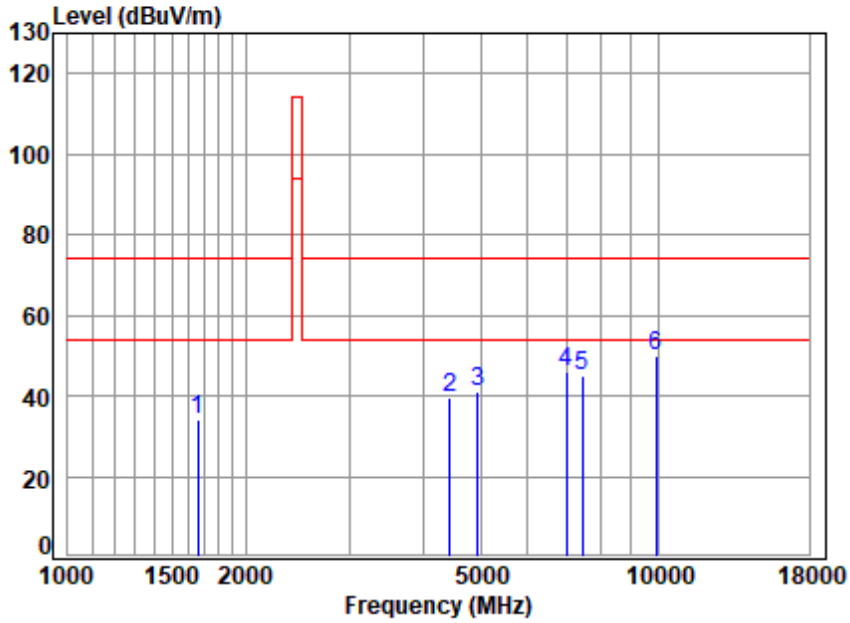
Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m HORIZONTAL
Job No : 03058ET
Mode : 2475 TX RSE
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1658.34	4.28	26.28	38.41	41.74	33.89	74.00	-40.11	peak
2	4430.63	7.08	34.43	35.77	33.58	39.32	74.00	-34.68	peak
3	4950.00	7.40	34.60	35.42	34.44	41.02	74.00	-32.98	peak
4	6995.17	8.92	35.71	35.57	36.90	45.96	74.00	-28.04	peak
5	7425.00	9.44	35.90	36.01	35.63	44.96	74.00	-29.04	peak
6	9900.00	12.56	37.30	37.39	37.34	49.81	74.00	-24.19	peak

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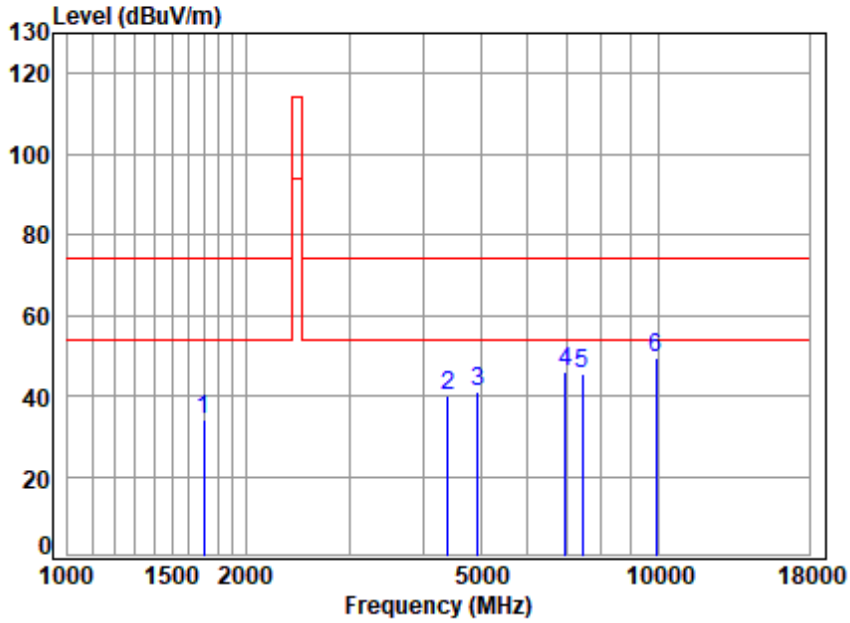
Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Site : chamber
Condition: 3m VERTICAL
Job No : 03058ET
Mode : 2475 TX RSE
: Tank

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1702.04	4.33	26.22	38.42	41.75	33.88	74.00	-40.12	peak
2	4405.09	7.06	34.74	35.79	33.91	39.92	74.00	-34.08	peak
3	4950.00	7.40	34.60	35.42	34.26	40.84	74.00	-33.16	peak
4	6954.85	8.89	35.79	35.54	36.73	45.87	74.00	-28.13	peak
5	7425.00	9.44	35.90	36.01	36.07	45.40	74.00	-28.60	peak
6	9900.00	12.56	37.30	37.39	36.88	49.35	74.00	-24.65	peak

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8 Test Setup Photo

Refer to Appendix - Test Setup Photo_tank for SZCR2408003058ET

9 EUT Constructional Details (EUT Photos)

Refer to Appendix - External and Internal photos_tank for SZCR2408003058ET

- End of the Report -

通标标准技术服务有限公司深圳分公司
检验检测专用章
Inspection & Testing Services
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