TEST REPORT

Application No.:	SZCR2505002007AT
Applicant:	Mattel Asia Pacific Sourcing Ltd.
Address of Applicant:	11/F., South Tower, World Finance Centre, Harbour City, Tsimshatsui, Kowloon, 852, Hong Kong
Manufacturer:	Mattel Asia Pacific Sourcing Ltd.
Address of Manufacturer:	11/F., South Tower, World Finance Centre, Harbour City, Tsimshatsui, Kowloon, 852, Hong Kong
Equipment Under Test (EUT):	
EUT Name:	Hot Wheels R/C Vehicles 1:24 Series
Model No.:	124HW
SKU:	JHW58
Trade Mark:	Mattel
FCC ID:	PIY124HW-25A5R
Standard(s) :	47 CFR Part 15, Subpart C 15.249
Date of Receipt:	2025-05-19
Date of Test:	2025-05-25 to 2025-06-03
Date of Issue:	2025-06-06
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		2025-06-06		Original

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

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**
Field Strength of the Fundamental Signal (15.249(a))	47 CFR Part 15, Subpart C 15.249	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
20dB Bandwidth		ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass

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4 General Information

4.1 Details of E.U.T.

Power supply:	4.5V DC (1.5V x 3 "AAA" Size Batteries) for Car
Operation Frequency:	2420MHz to 2462MHz
Modulation Type:	GFSK
Number of Channels:	43
Channel Spacing:	1MHz
Antenna Type:	Wire Antenna
Antenna Gain:	0.52dBi

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.
RF cable	supplied by SGS	N/A(cable loss:0.6dB)	REF. No.SEL000089

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.

4.4 Test Location

All tests were performed at:

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

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 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

5 Equipment List

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 30M-8GHz	Tonscend	TAP30M8G30	SZ-WRG-M-050	2025-01-07	2026-01-06
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2024-07-24	2025-07-23

Restricted Band Around Fundamental Frequency					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 30M-8GHz	Tonscend	TAP30M8G30	SZ-WRG-M-050	2025-01-07	2026-01-06
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2024-07-24	2025-07-23

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	2024-08-14	2025-08-13
BiConiLog Antenna	ETS-LINDGREN	3142C	SEM003-01	2023-09-16	2025-09-15
Pre-Amplifier	Agilent Technologies	8447D	SEM005-01	2025-03-04	2026-03-03
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

Radiated Emissions Above 1GHz					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
Signal & Spectrum Analyzer	Rohde & Schwarz	FSV	SZ-WRG-M-048	2025-01-07	2026-01-06
Low Noise Amplifier 1G-18GHz	Tonscend	TAP01018050	SZ-WRG-M-051	2025-01-07	2026-01-06
Low Noise Amplifier 18G-40GHz	Tonscend	TAP18040048	SZ-WRG-M-052	2025-01-08	2026-01-07
Double Ridge Horn Antenna 1GHz-18GHz	SCHWARZBECK	BBHA 9120 D	SZ-WRG-M-055	2023-12-21	2025-12-20
SHF-EHF Horn 15GHz-40GHz	SCHWARZBECK	BBHA 9170	SZ-WRG-M-056	2023-12-25	2025-12-24
RSE Test Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Chamber	CRTSGSSAC966	N/A	SZ-WRG-C-063	2025-01-06	2028-01-05
Humidity and Temperature Indicator	deli	8838	SEM002-46	2024-07-24	2025-07-23

RF Conducted Test					
Equipment	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal Date**	**Cal Due Date**
DC Power Supply	Chroma	62012P-80-60	SEM011-11	2024-08-14	2025-08-13
MXA Signal Analyzer	KEYSIGHT	N9020A	SEM004-19	2025-03-04	2026-03-03
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	2025-03-03	2026-03-02
Programmable Temperature & Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2025-02-26	2026-02-25

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	2025-03-03	2026-03-02

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. The best case gain of the antenna is 0.52dBi.

Antenna location: Refer to internal photos

7 Radio Spectrum Matter Test Results

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

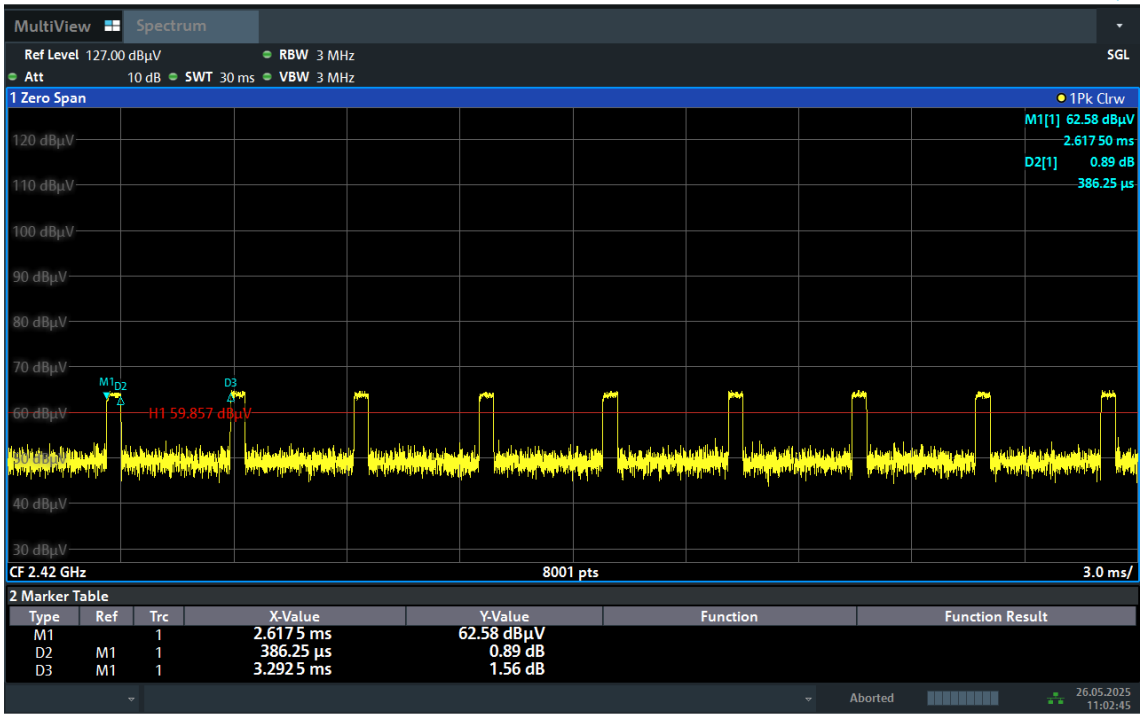
Test Requirement 47 CFR Part 15, Subpart C 15.249(a)
Test Method: ANSI C63.10 (2013) Section 6.5&6.6
Measurement Distance: 3m

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.		

Average value:

Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time =0.386ms
	T period =3.293ms
	Duty cycle=11.72%
	PDCF value= -18.62dB



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7.1.1 E.U.T. Operation

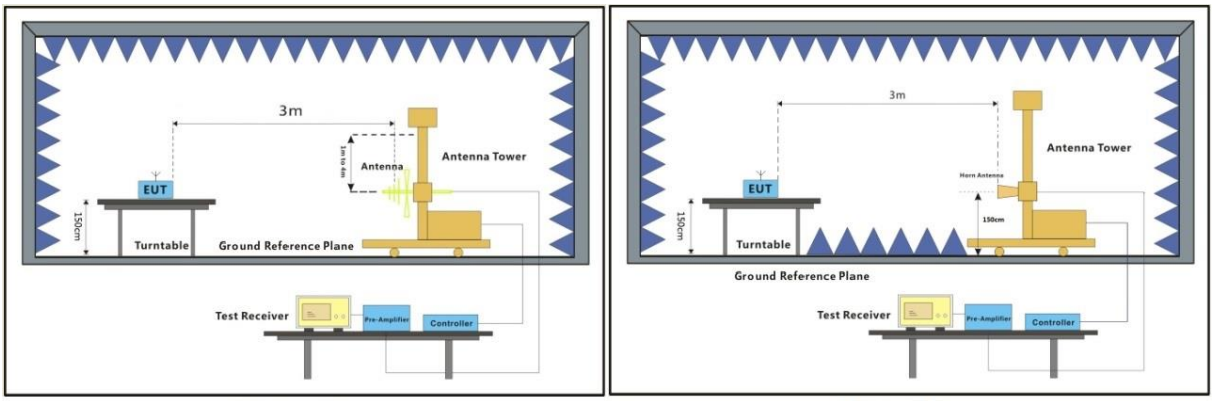
Operating Environment:

Temperature: 24.6 °C Humidity: 50.8 % RH Atmospheric Pressure: 1020 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



30MHz-1GHz Above 1GHz

7.1.4 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.

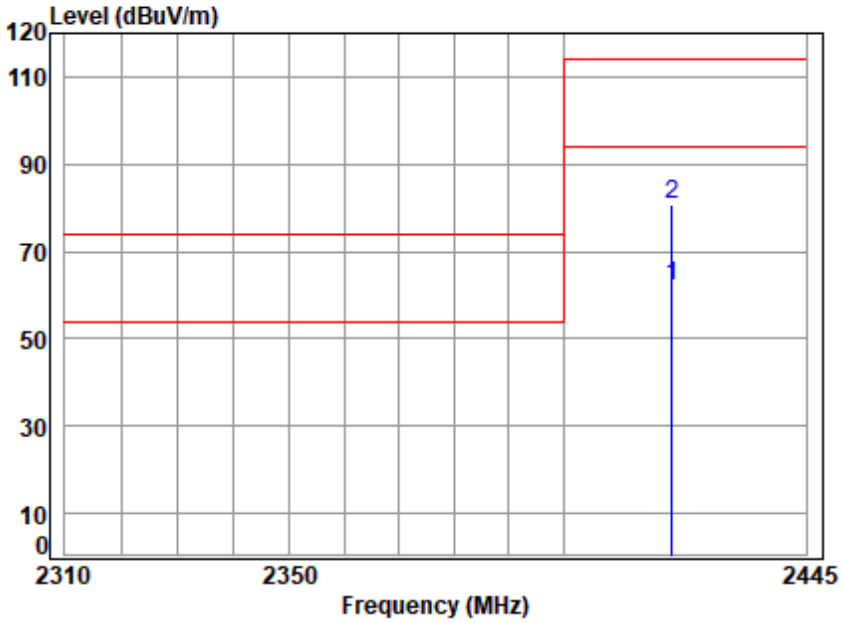
Remark:

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

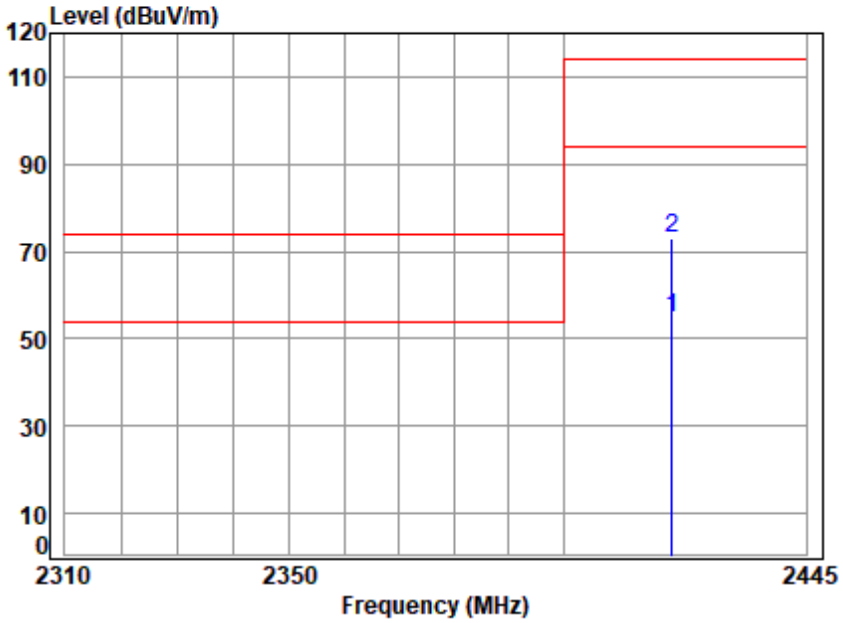
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2420MHz

	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	pp 2420.000	6.97	27.54	31.54	59.23	62.20	94.00	-31.80	Average
2	pk 2420.000	6.97	27.54	31.54	77.85	80.82	114.00	-33.18	peak

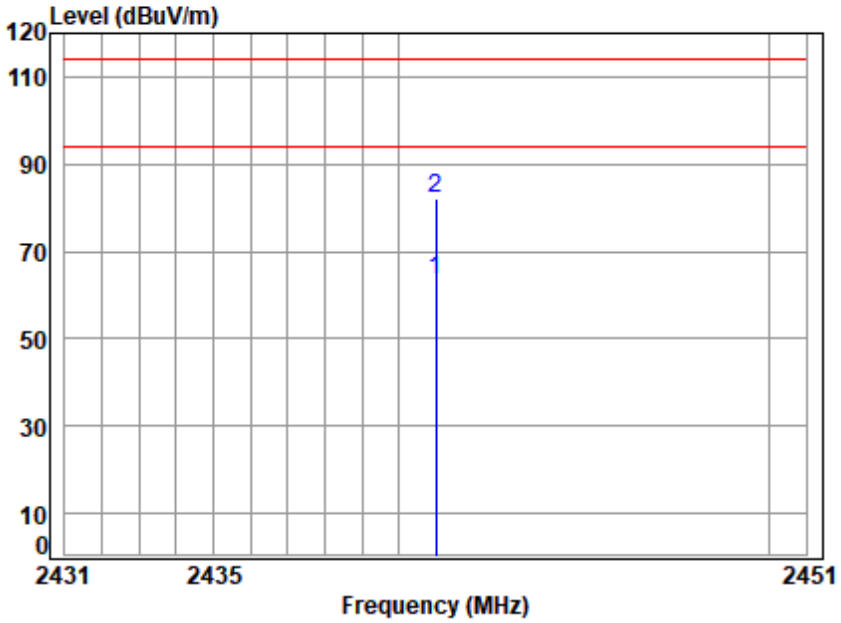
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2420MHz

	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	pp 2420.000	6.97	27.54	31.54	51.57	54.54	94.00	-39.46	Average
2	pk 2420.000	6.97	27.54	31.54	70.19	73.16	114.00	-40.84	peak

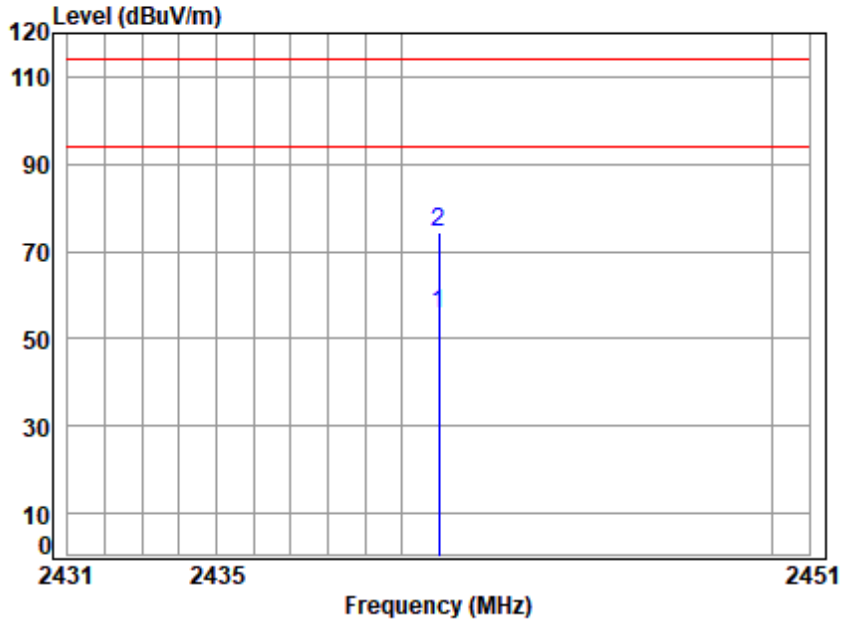
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2441MHz

	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	pp 2441.000	7.11	27.58	31.54	60.35	63.50	94.00	-30.50	Average
2	pk 2441.000	7.11	27.58	31.54	78.97	82.12	114.00	-31.88	peak

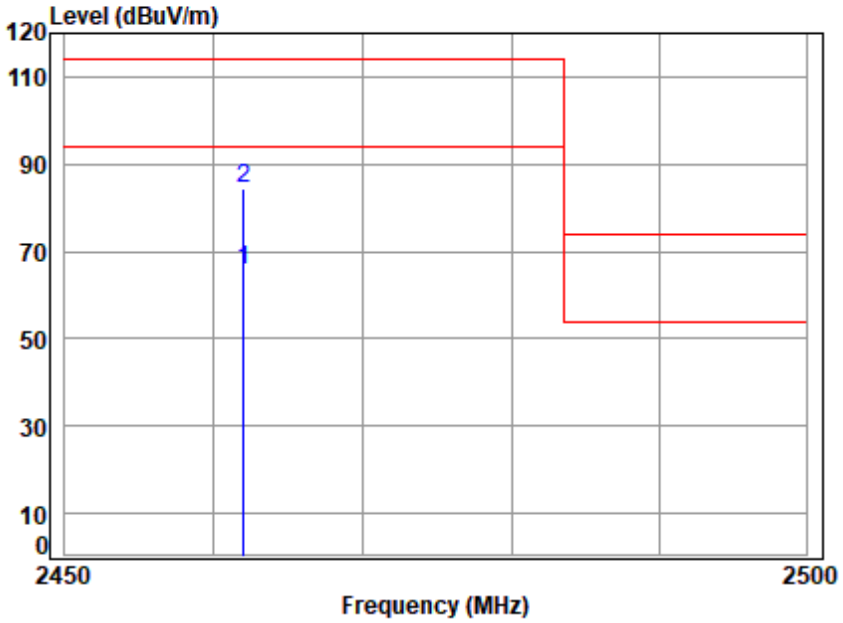
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2441MHz

	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	pp 2441.000	7.11	27.58	31.54	52.56	55.71	94.00	-38.29	Average
2	pk 2441.000	7.11	27.58	31.54	71.18	74.33	114.00	-39.67	peak

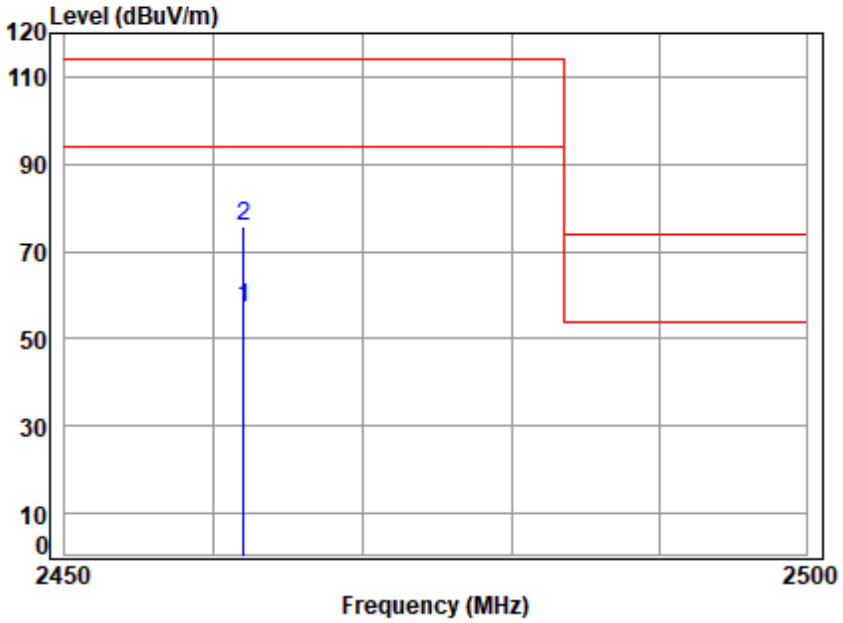
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2462MHz

	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	pp 2462.000	7.25	27.67	31.55	62.29	65.66	94.00	-28.34	Average
2	pk 2462.000	7.25	27.67	31.55	80.91	84.28	114.00	-29.72	peak

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



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2462MHz

	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	pp 2462.000	7.25	27.67	31.55	53.69	57.06	94.00	-36.94	Average
2	pk 2462.000	7.25	27.67	31.55	72.31	75.68	114.00	-38.32	peak

7.2 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.		

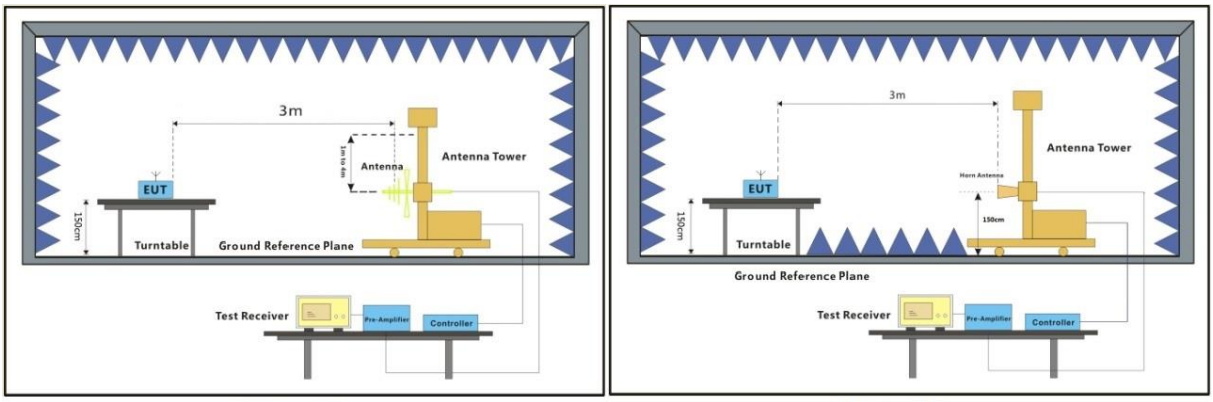
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 24.5 °C Humidity: 50.3 % RH Atmospheric Pressure: 1020 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.

7.2.3 Test Setup Diagram



30MHz-1GHz　　Above 1GHz

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.

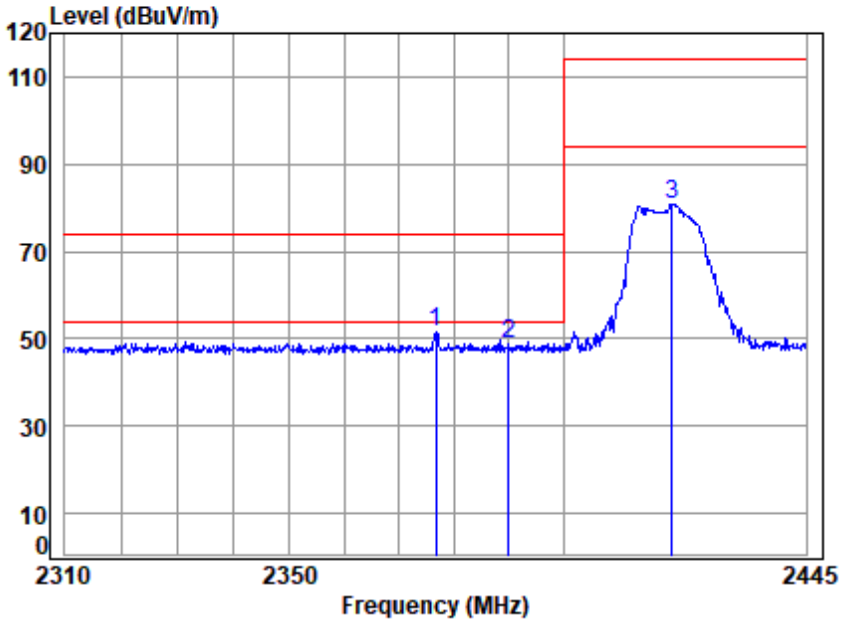
Remark:

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

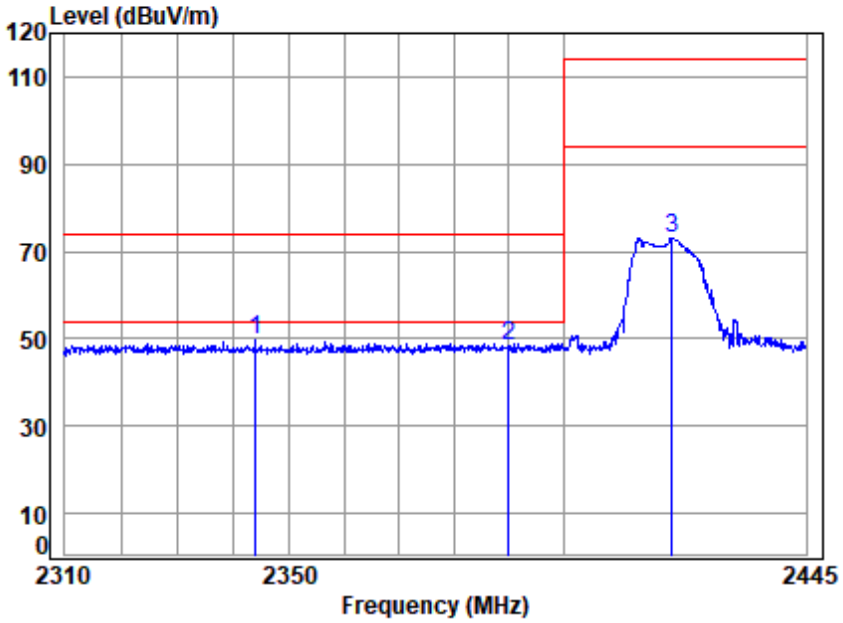
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2420 Band edge
: 2.4G

	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 pp	2376.677	6.82	27.41	31.54	48.71	51.40	74.00	-22.60	peak
2	2390.000	6.82	27.46	31.54	46.04	48.78	74.00	-25.22	peak
3	2420.000	6.97	27.54	31.54	77.85	80.82	114.00	-33.18	peak

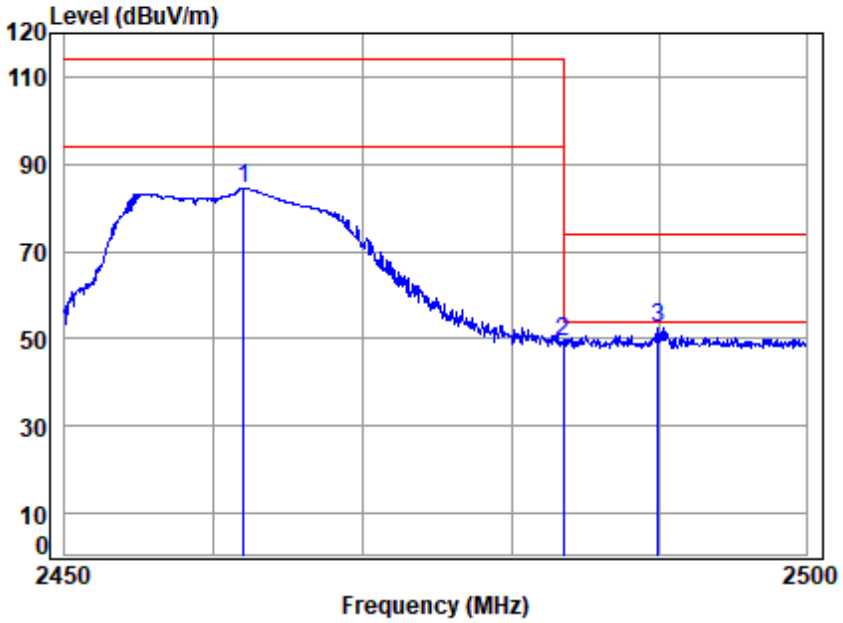
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2420 Band edge
: 2.4G

	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 pp	2343.966	6.80	27.29	31.53	47.06	49.62	74.00	-24.38	peak
2	2390.000	6.82	27.46	31.54	45.65	48.39	74.00	-25.61	peak
3	2420.000	6.97	27.54	31.54	70.19	73.16	114.00	-40.84	peak

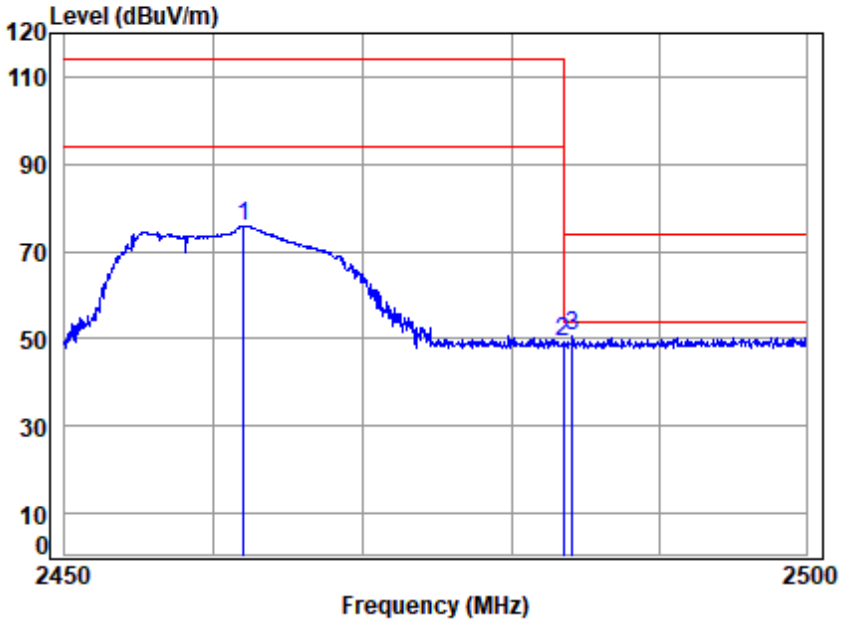
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2462 Band edge
: 2.4G

	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	2462.000	7.25	27.67	31.55	80.91	84.28	114.00	-29.72	peak
2	2483.500	7.40	27.80	31.55	45.67	49.32	74.00	-24.68	peak
3 pp	2489.919	7.44	27.84	31.55	48.88	52.61	74.00	-21.39	peak

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



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2462 Band edge
: 2.4G

	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	2462.000	7.25	27.67	31.55	72.31	75.68	114.00	-38.32	peak
2	2483.500	7.40	27.80	31.55	45.56	49.21	74.00	-24.79	peak
3 pp	2484.141	7.40	27.80	31.55	46.81	50.46	74.00	-23.54	peak

7.3 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

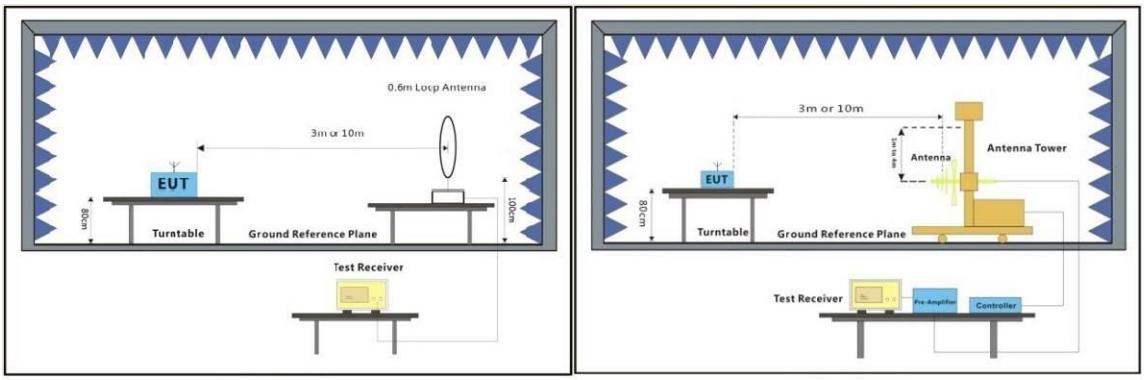
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 23.5 °C Humidity: 46.8 % RH Atmospheric Pressure: 1020 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.

7.3.3 Test Setup Diagram



Below 30MHz 30MHz-1GHz

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 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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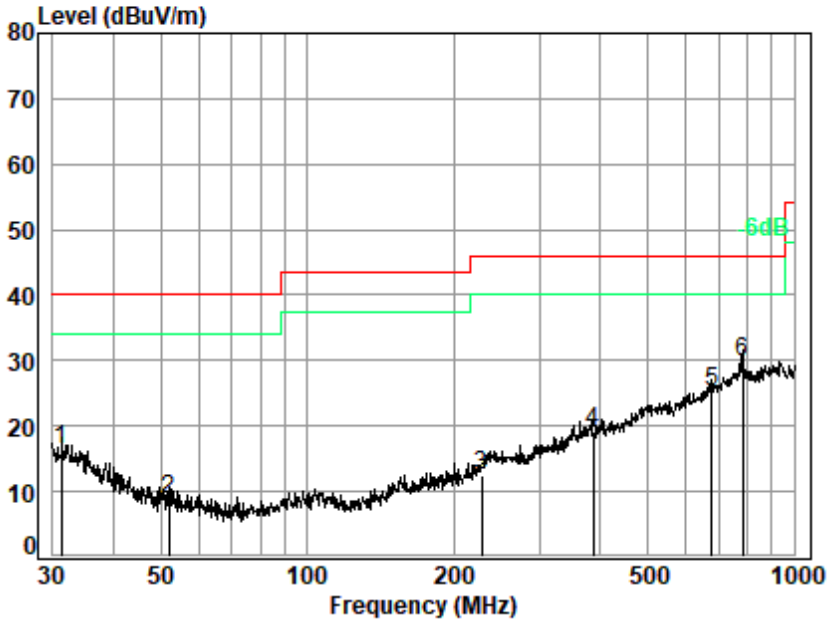
中国・广东・深圳市南山区科技园中区M-10栋1号厂房 邮编:518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

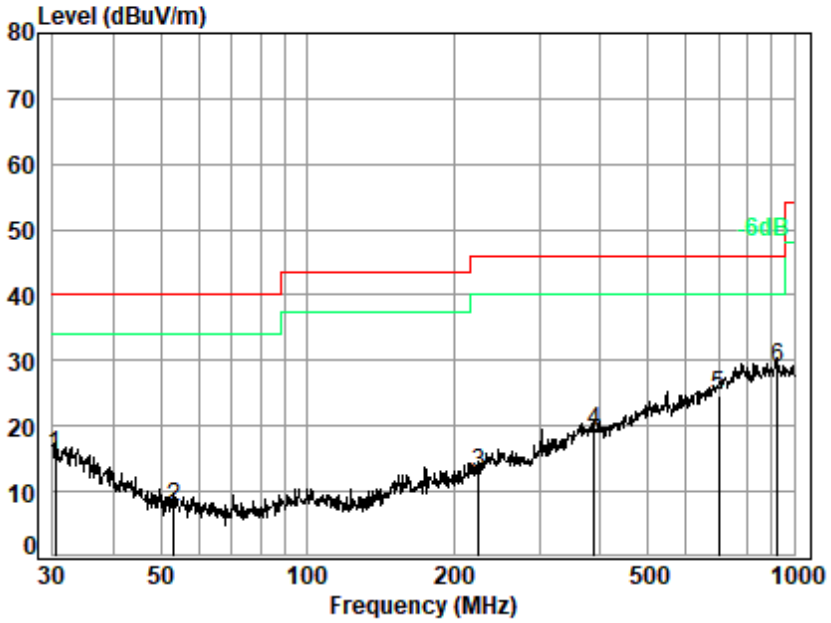
Test Mode: 00; Polarity: Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : 02005AT/02007AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	31.289	20.60	0.65	27.79	22.95	16.41	40.00	-23.59	QP
2	52.025	12.46	0.85	27.73	23.20	8.78	40.00	-31.22	QP
3	227.691	16.12	1.85	27.05	21.60	12.52	46.00	-33.48	QP
4	386.634	20.85	2.50	27.10	22.94	19.19	46.00	-26.81	QP
5	677.580	25.78	3.44	27.78	23.87	25.31	46.00	-20.69	QP
6 q	782.345	27.08	3.77	27.52	26.35	29.68	46.00	-16.32	QP

Test Mode: 00; Polarity: Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : 02005AT/02007AT
Test Mode: 00

	Freq	Ant Factor	Cable Loss	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dB	dB	dBuV	dBuV/m	dBuV/m	dB	
1	30.317	21.05	0.64	27.79	21.70	15.60	40.00	-24.40	QP
2	53.318	12.24	0.86	27.72	22.31	7.69	40.00	-32.31	QP
3	225.308	15.77	1.84	27.06	22.09	12.64	46.00	-33.36	QP
4	387.992	20.82	2.50	27.11	22.99	19.20	46.00	-26.80	QP
5	699.305	25.93	3.51	27.73	22.88	24.59	46.00	-21.41	QP
6 q	925.756	28.18	4.16	26.58	23.07	28.83	46.00	-17.17	QP

7.4 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

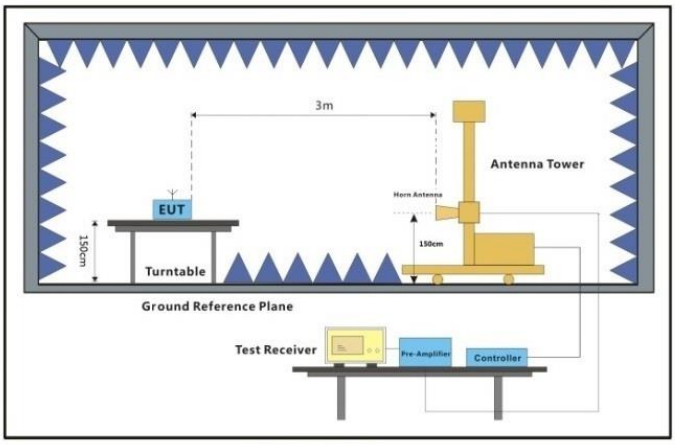
7.4.1 E.U.T. Operation

Operating Environment:
Temperature: 25.6 °C Humidity: 50.8 % RH Atmospheric Pressure: 1020 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



Above 1GHz

7.4.4 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.

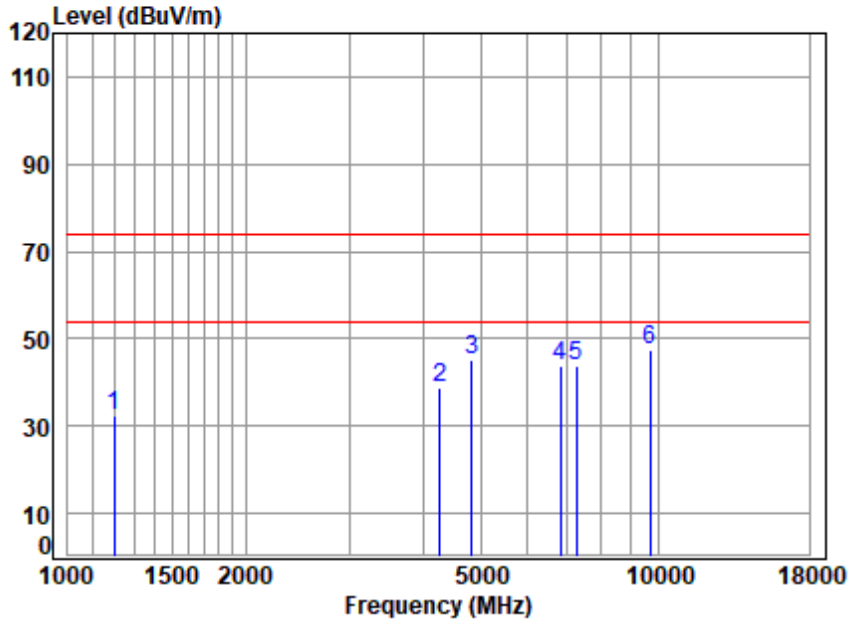
Remark:

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.

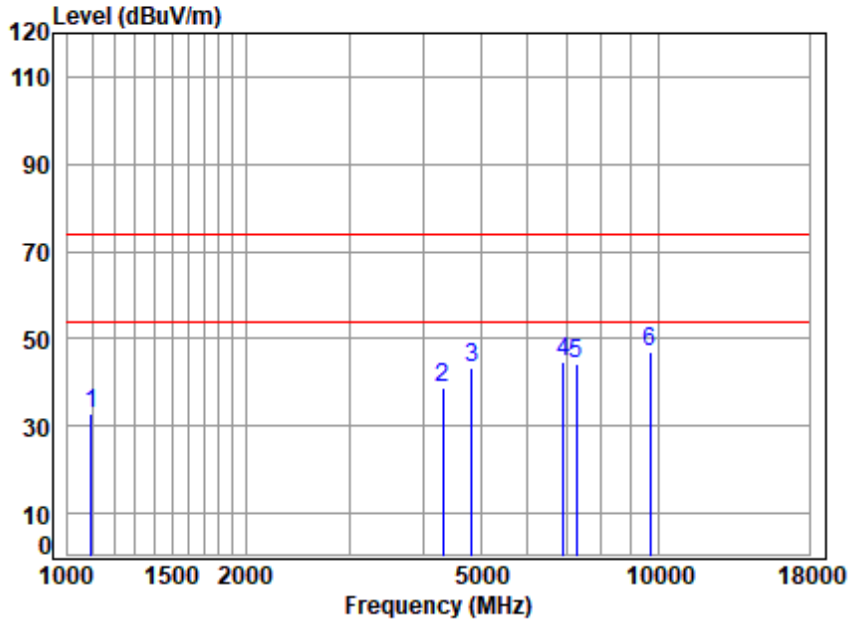
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2420 TX RSE
: 2.4G

	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	1196.264	7.19	25.31	54.70	54.45	32.25	74.00	-41.75	peak
2	4267.237	8.47	31.17	55.79	55.10	38.95	74.00	-35.05	peak
3	4840.000	8.94	32.06	56.19	60.19	45.00	74.00	-29.00	peak
4	6815.551	10.97	35.93	56.74	53.77	43.93	74.00	-30.07	peak
5	7260.000	11.10	36.62	56.49	52.41	43.64	74.00	-30.36	peak
6 pp	9680.000	12.58	38.70	54.39	50.39	47.28	74.00	-26.72	peak

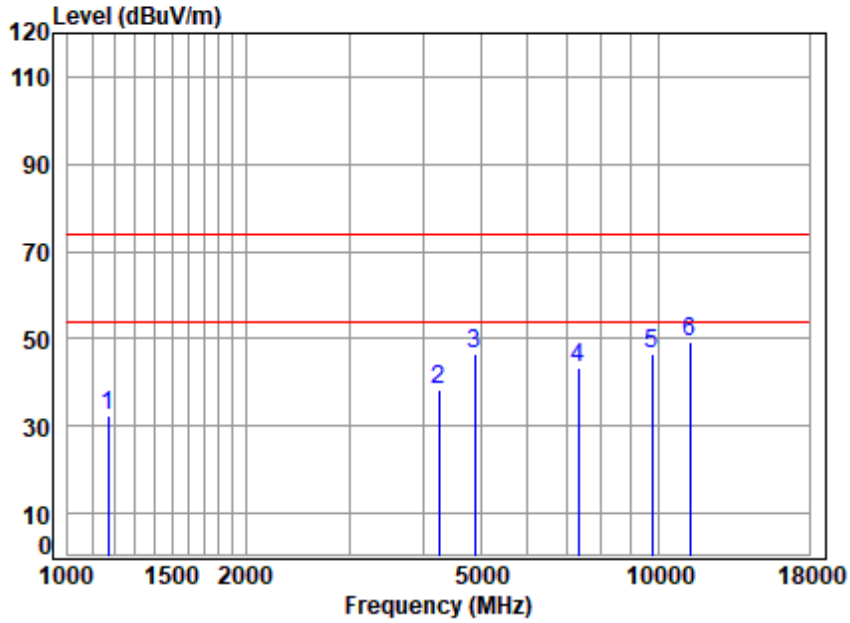
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:Low



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2420 TX RSE
: 2.4G

	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	1096.904	7.10	25.59	54.70	54.73	32.72	74.00	-41.28	peak
2	4316.859	8.47	31.30	55.82	54.99	38.94	74.00	-35.06	peak
3	4840.000	8.94	32.06	56.19	58.72	43.53	74.00	-30.47	peak
4	6894.806	10.94	36.18	56.72	54.48	44.88	74.00	-29.12	peak
5	7260.000	11.10	36.62	56.49	53.00	44.23	74.00	-29.77	peak
6 pp	9680.000	12.58	38.70	54.39	49.95	46.84	74.00	-27.16	peak

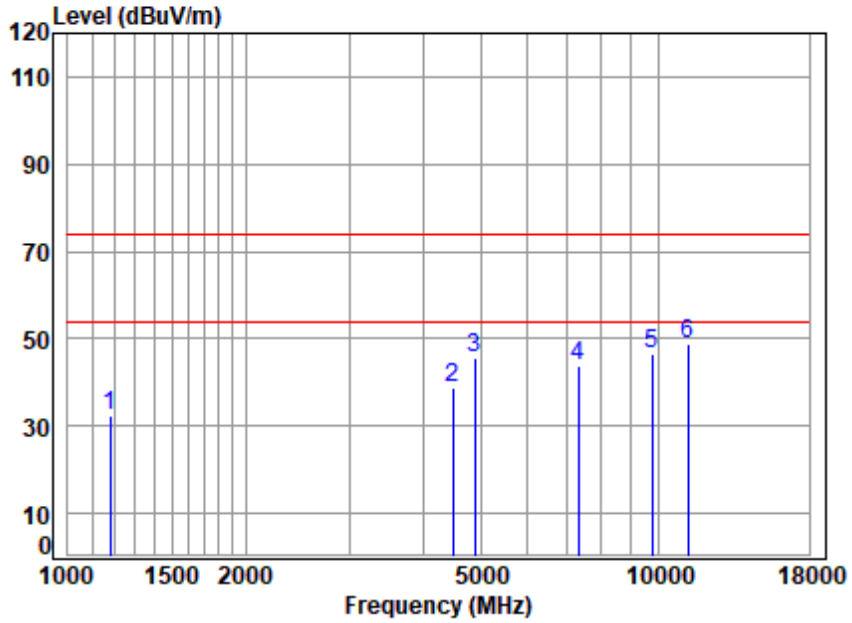
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:middle



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2441 TX RSE
: 2.4G

	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	1168.920	7.16	25.36	54.70	54.80	32.62	74.00	-41.38	peak
2	4242.641	8.48	31.06	55.77	54.76	38.53	74.00	-35.47	peak
3	4882.000	8.98	32.16	56.22	61.74	46.66	74.00	-27.34	peak
4	7323.000	11.12	36.75	56.44	52.05	43.48	74.00	-30.52	peak
5	9764.000	12.86	38.60	54.31	49.24	46.39	74.00	-27.61	peak
6	pp11302.480	14.39	39.70	53.59	48.62	49.12	74.00	-24.88	peak

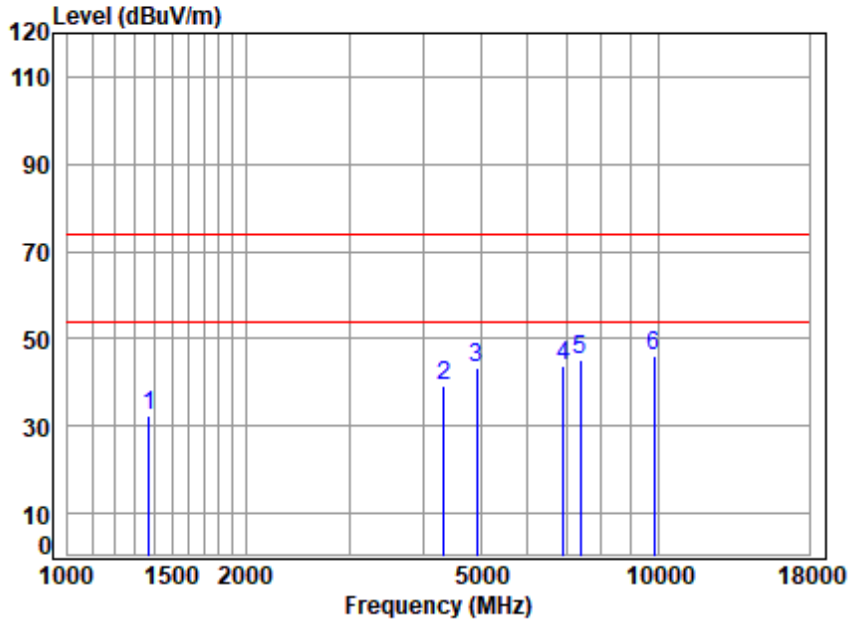
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:middle



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2441 TX RSE
: 2.4G

	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	1179.100	7.17	25.34	54.70	54.68	32.49	74.00	-41.51	peak
2	4495.125	8.56	31.58	55.95	54.69	38.88	74.00	-35.12	peak
3	4882.000	8.98	32.16	56.22	60.50	45.42	74.00	-28.58	peak
4	7323.000	11.12	36.75	56.44	52.42	43.85	74.00	-30.15	peak
5	9764.000	12.86	38.60	54.31	49.56	46.71	74.00	-27.29	peak
6	pp11204.900	14.25	39.60	53.56	48.75	49.04	74.00	-24.96	peak

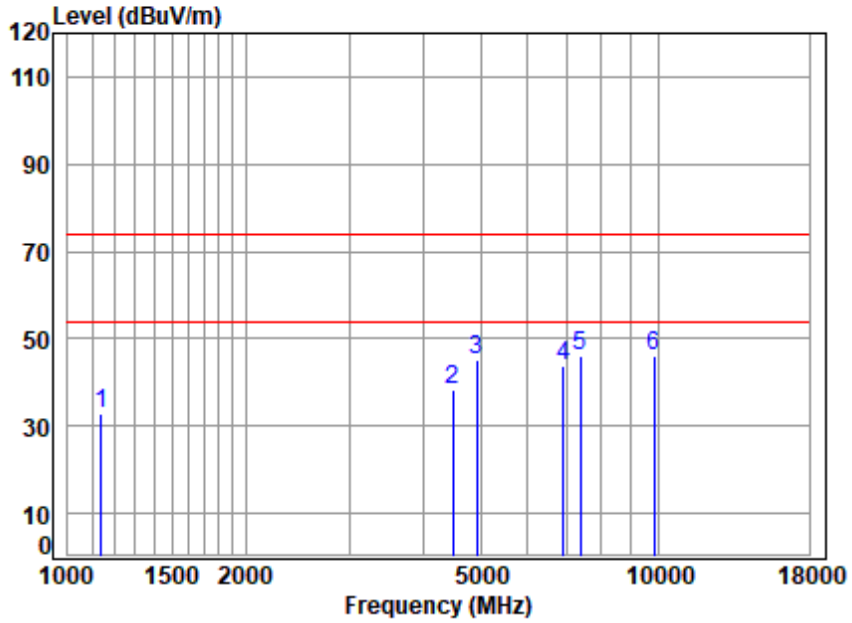
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL
Job No : 02005AT/02007AT
Mode : 2462 TX RSE
: 2.4G

	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	1370.328	7.19	25.06	54.70	55.03	32.58	74.00	-41.42	peak
2	4329.354	8.48	31.30	55.83	55.31	39.26	74.00	-34.74	peak
3	4924.000	9.03	32.20	56.25	58.40	43.38	74.00	-30.62	peak
4	6914.763	10.94	36.17	56.72	53.29	43.68	74.00	-30.32	peak
5	7386.000	11.19	36.73	56.39	53.56	45.09	74.00	-28.91	peak
6 pp	9848.000	12.84	37.83	54.24	49.54	45.97	74.00	-28.03	peak

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



Condition: 3m VERTICAL
Job No : 02005AT/02007AT
Mode : 2462 TX RSE
: 2.4G

	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	1138.904	7.14	25.44	54.70	54.75	32.63	74.00	-41.37	peak
2	4495.125	8.56	31.58	55.95	54.32	38.51	74.00	-35.49	peak
3	4924.000	9.03	32.20	56.25	60.10	45.08	74.00	-28.92	peak
4	6914.763	10.94	36.17	56.72	53.30	43.69	74.00	-30.31	peak
5 pp	7386.000	11.19	36.73	56.39	54.76	46.29	74.00	-27.71	peak
6	9848.000	12.84	37.83	54.24	49.85	46.28	74.00	-27.72	peak

7.5 20dB Bandwidth

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

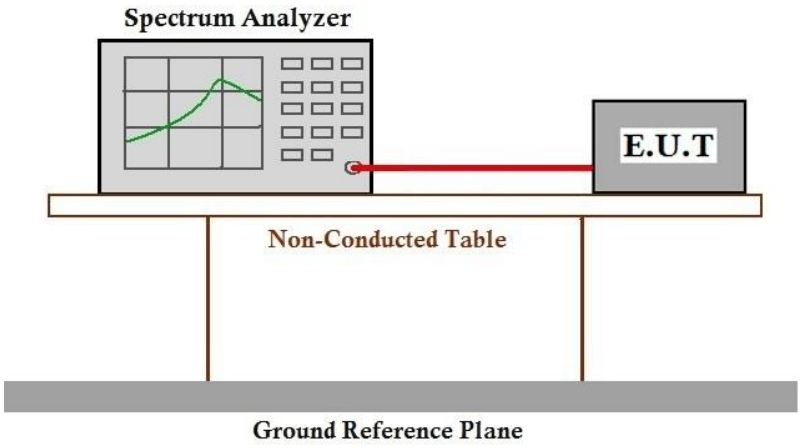
7.5.1 E.U.T. Operation

Operating Environment:
Temperature: 25.4 °C Humidity: 36.3 % RH Atmospheric Pressure: 1020 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



7.5.4 Measurement Procedure and Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	9.290	Pass
Middle	8.372	Pass
Highest	8.162	Pass

2420MHz

2441MHz

2462MHz

8 Test Setup Photo

Refer to Appendix - Test Setup Photo for SZCR2505002007AT

9 EUT Constructional Details (EUT Photos)

Refer to External and Internal Photos for SZCR2505002007AT

- End of the Report -