



## TEST REPORT

**Application No.:** GZCR2111021393AT  
**Applicant:** ZALMAN Tech Co., Ltd  
**Address of Applicant:** #2612, Obiztower, 126, Beolmal-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, the Republic of Korea, Seoul, South Korea  
**Manufacturer:** Guangdong Shuoqiang Electronics Co., Ltd.  
**Address of Manufacturer:** #9 Lianxin Road, Shangjiao Community, Chang'an Town, Dongguan City, Guangdong Province, China.  
**Factory:** Guangdong Shuoqiang Electronics Co., Ltd.  
**Address of Factory:** #9 Lianxin Road, Shangjiao Community, Chang'an Town, Dongguan City, Guangdong Province, China.  
**Equipment Under Test (EUT):**  
**EUT Name:** 2.4G WIRELESS GAMING HEADSET dongle  
**Model No.:** ZM-HPS700W dongle  
**Standard(s):** 47 CFR Part 15, Subpart C 15.249  
**Date of Receipt:** 2021-11-02  
**Date of Test:** 2021-11-13 to 2021-12-01  
**Date of Issue:** 2021-12-02

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

Kobe Jian  
EMC Laboratory Manager



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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-12-02		Original

Authorized for issue by				
				
		Curry Wu/Project Engineer		
				
		Ricky Liu/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
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
20dB Bandwidth		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&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass
Radiated Emissions (above 1GHz)		ANSI C63.10 (2013) Section 6.4&6.5&6.6	47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)	Pass

### Note:

E.U.T./EUT means Equipment Under Test.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.



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## 4 General Information

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

Power supply: DC 5V from PC input AC 120V/60Hz for dongle.  
Operation Frequency: 2406-2478Mhz  
Modulation Type: GFSK  
Number of Channels: 25  
Channel Spacing: 3MHz  
Antenna Type: PCB Antenna  
Antenna Gain: 0dBi

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Note Book Computer	LENOVO	ThinkPad T490	PF1D1MVJ



### 4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	$\pm 3.12\text{dB}$
20dB Bandwidth	$\pm 3\%$
Field Strength of the Fundamental Signal (15.249(a))	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)
Restricted Band Around Fundamental Frequency	$\pm 4.5\text{dB}$ (Below 1GHz); $\pm 4.8\text{dB}$ (Above 1GHz)
Radiated Emissions (below 1GHz)	$\pm 5.06\text{dB}$ (30MHz-1GHz ; 3m) $\pm 4.46\text{dB}$ (30MHz-1GHz ; 10m)
Radiated Emissions (above 1GHz)	$\pm 5.08\text{dB}$ (1GHz-6GHz); $\pm 5.14\text{dB}$ (above 6GHz)
<p>Remark:</p> <p>The <math>U_{\text{lab}}</math> (lab Uncertainty) is less than <math>U_{\text{CISPR}}</math> (CISPR Uncertainty), so the test results</p> <ul style="list-style-type: none"> <li>– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;</li> <li>– non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.</li> </ul>	

#### 4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,  
 198 Kezhu Road, Sciencetech Park, Guangzhou Economic & Technology Development District,  
 Guangzhou, China 510663

Tel: +86 20 82155555 Fax: +86 20 82075059

No tests were sub-contracted.

#### 4.5 Test Facility

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

- **NVLAP (Lab Code: 200611-0)**

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 200611-0.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

- **ACMA**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory can also perform testing for the Australian/New Zealand Regulatory Compliance Mark (RCM).

- **SGS UK(Certificate No.: 32), SGS-TUV SAARLAND and SGS-FIMKO**

Have approved SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory as a supplier of EMC TESTING SERVICES and SAFETY TESTING SERVICES.

- **CNAS (Lab Code: L0167)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been assessed and in compliance with CNAS-CL01:2018 accreditation criteria for testing laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of Testing Laboratories.

- **FCC Recognized Accredited Test Firm(Registration No.: 486818)**

SGS-CSTC Standards Technical Services Co., Ltd., EMC Laboratory has been accredited and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation Number: CN5016, Test Firm Registration Number: 486818.

- **ISED (Registration No.: 4620B, CAB identifier: CN0052)**

SGS-CSTC Standards Technical Services Co., Ltd., has been registered by Innovation Science and Economic Development Canada for Wireless Device Testing laboratories to test to Canadian radio equipment requirements. Registration No. 4620B, CAB identifier: CN0052.

- **VCCI (Registration No.: R-12460, C-12584, G-20107 and T-11179)**

The 10m Semi-anechoic chamber, 966 Anechoic Chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-12460, C-12584, G-20107 and T-11179 respectively.

- **CBTL (Lab Code: TL129)**

SGS-CSTC Standards Technical Services Co., Ltd., E&E Laboratory has been assessed and fully comply with the requirements of ISO/IEC 17025:2017, the Basic Rules, IECEE 01 and Rules of procedure IECEE 02, and the relevant IECEE CB-Scheme Operational documents.



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**4.6 Deviation from Standards**

None

**4.7 Abnormalities from Standard Conditions**

None



## 5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2021-01-08	2022-01-06
Two-Line V-Network-GZ	Rohde & Schwarz	ENV216	EMC2135	2021-09-24	2022-09-23
Coaxial Cable	HangTianXing	2m	EMC0107	2020-09-09	2022-09-08
EMI Test Receiver(9kHz-3.6GHz)	Rohde & Schwarz	ESR4	EMC2221	2021-06-01	2022-05-31

20dB Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
MI CABLE	SGS-EMC	0.8M	EMC2137	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-12	2022-11-11
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

Restricted Band Around Fundamental Frequency					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(20Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-01-08	2022-01-07
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08



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Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-12	2022-11-11
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A

## Radiated Emissions (below 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Chamber cable	HangTianXing	N/A	EMC0542	2020-09-09	2022-09-08
Trilog Broadband Antenna(25MHz-1GHz)- Lab	SCHWARZBECK MESS-ELEKTRONIK	VULB 9168	SEM003-18	2019-02-22	2022-02-22
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2021-05-19	2022-05-18
Active Loop Antenna- RED	ETS-Lindgren	6502	EMC2190	2019-12-27	2021-12-26
10m Semi-Anechoic Chamber	ETS	N/A	EMC0530	2019-10-20	2022-10-19
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
EMI Test Receiver(1Hz- 8GHz)	Rohde & Schwarz	ESW8	EMC2220	2021-05-26	2022-05-25

## Radiated Emissions (above 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Chamber cable(Above 1GHz)	Scoflex	KMKM-8.0m	EMC0545	2020-09-09	2022-09-08
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-12	2022-11-11
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2021-09-16	2022-09-15
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A



General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
DMM	Fluke	73	EMC0006	2021-07-05	2022-07-05
DMM	Fluke	73	EMC0007	2021-07-05	2022-07-05



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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. The best case gain of the antenna is 0dBi.

Antenna location: Refer to Internal photos



## 7 Radio Spectrum Matter Test Results

### 7.1 Conducted Emissions at AC Power Line (150kHz-30MHz)

Test Requirement 47 CFR Part 15, Subpart C 15.207

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

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz

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

Operating Environment:

Temperature: 23.3 °C

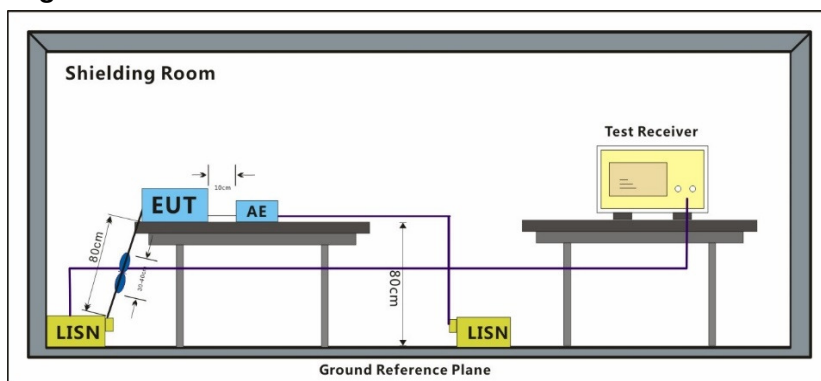
Humidity: 56.3 % RH

Atmospheric Pressure: 1003 mbar

#### 7.1.2 Test Mode Description

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

#### 7.1.3 Test Setup Diagram

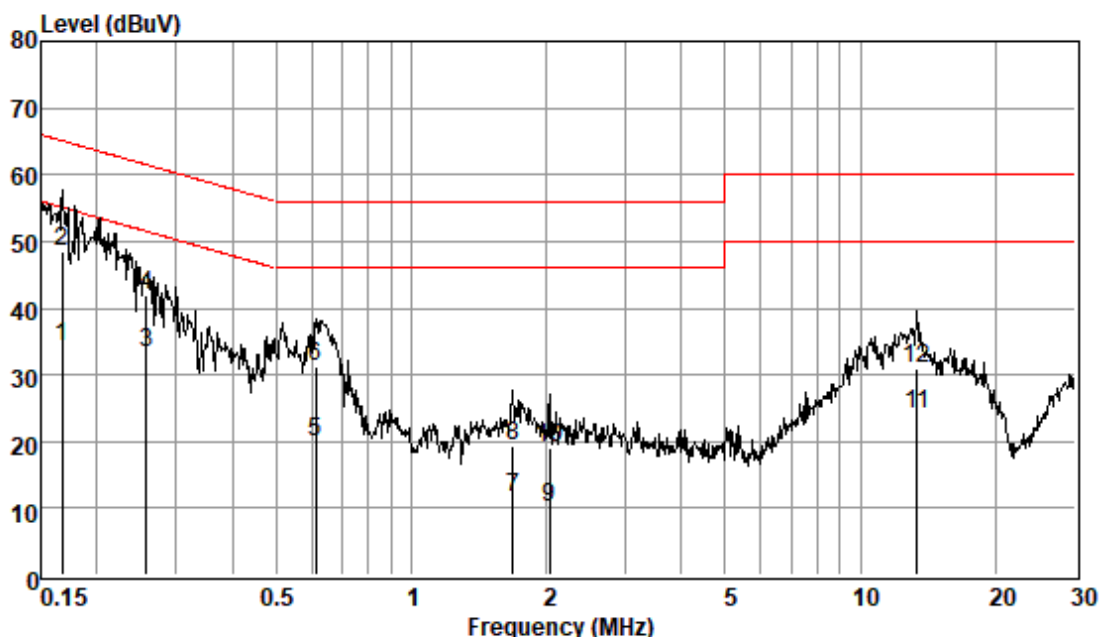


#### 7.1.4 Measurement Procedure and Data

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

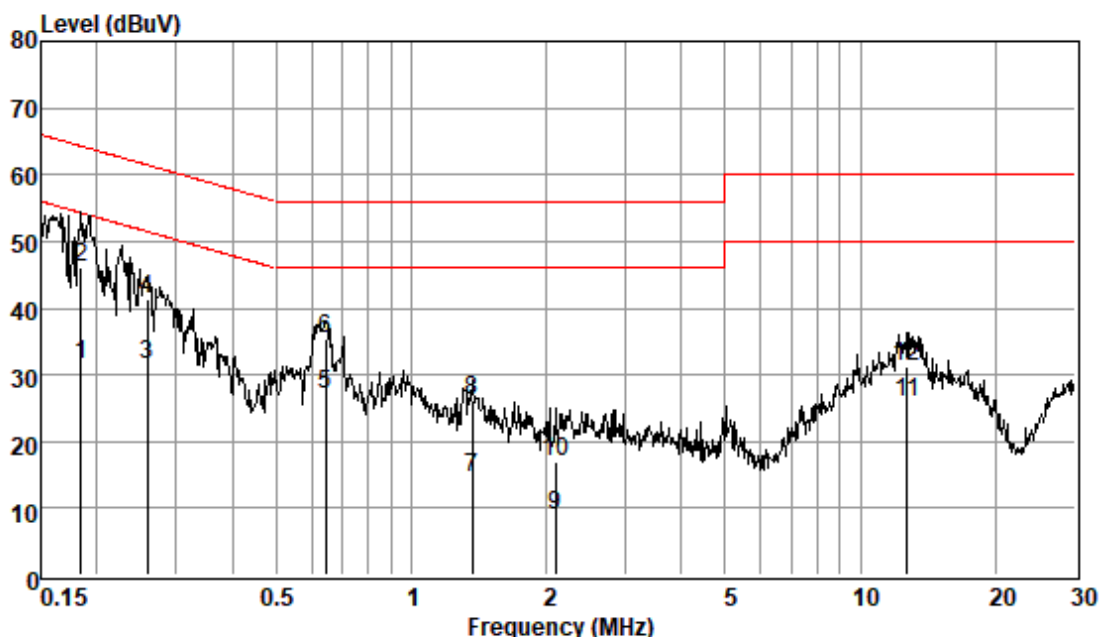
Test Mode: 00; Line: Live line



Pol : LINE  
Mode :  
Model :

Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.17	24.65	0.06	9.62	34.33	55.08	-20.75	Average
0.17	38.69	0.06	9.62	48.37	65.08	-16.71	QP
0.26	23.56	0.06	9.62	33.24	51.51	-18.27	Average
0.26	32.36	0.06	9.62	42.04	61.51	-19.47	QP
0.61	10.33	0.07	9.63	20.03	46.00	-25.97	Average
0.61	21.54	0.07	9.63	31.24	56.00	-24.76	QP
1.68	1.88	0.11	9.61	11.60	46.00	-34.40	Average
1.68	9.67	0.11	9.61	19.39	56.00	-36.61	QP
2.03	0.32	0.12	9.62	10.06	46.00	-35.94	Average
2.03	9.36	0.12	9.62	19.10	56.00	-36.90	QP
13.34	14.22	0.29	9.72	24.23	50.00	-25.77	Average
13.34	20.89	0.29	9.72	30.90	60.00	-29.10	QP

Test Mode: 00; Line: Neutral Line



Pol : NEUTRAL

Mode :

Model :

Frequency MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.18	21.78	0.06	9.55	31.39	54.28	-22.89	Average
0.18	36.44	0.06	9.55	46.05	64.28	-18.23	QP
0.26	22.03	0.06	9.55	31.64	51.47	-19.83	Average
0.26	31.82	0.06	9.55	41.43	61.47	-20.04	QP
0.64	17.33	0.07	9.54	26.94	46.00	-19.06	Average
0.64	25.64	0.07	9.54	35.25	56.00	-20.75	QP
1.37	4.82	0.09	9.55	14.46	46.00	-31.54	Average
1.37	16.63	0.09	9.55	26.27	56.00	-29.73	QP
2.10	-0.70	0.12	9.54	8.96	46.00	-37.04	Average
2.10	7.22	0.12	9.54	16.88	56.00	-39.12	QP
12.72	16.01	0.28	9.62	25.91	50.00	-24.09	Average
12.72	21.27	0.28	9.62	31.17	60.00	-28.83	QP



### 7.2 20dB Bandwidth

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

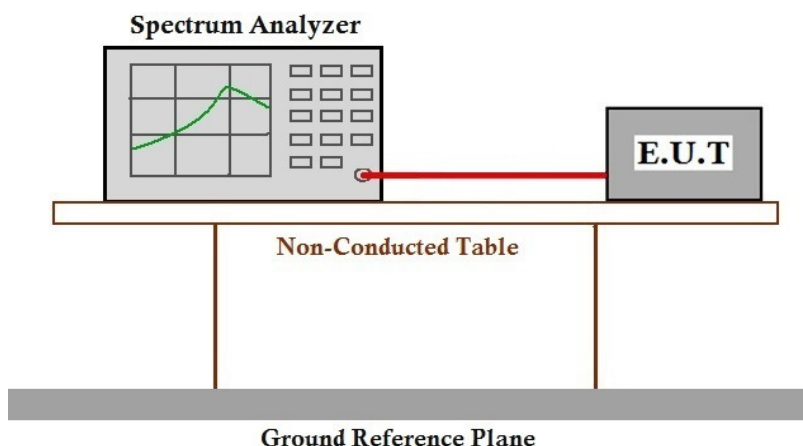
#### 7.2.1 E.U.T. Operation

Operating Environment:  
Temperature: 23.7 °C Humidity: 56.3 % RH Atmospheric Pressure: 1003 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.

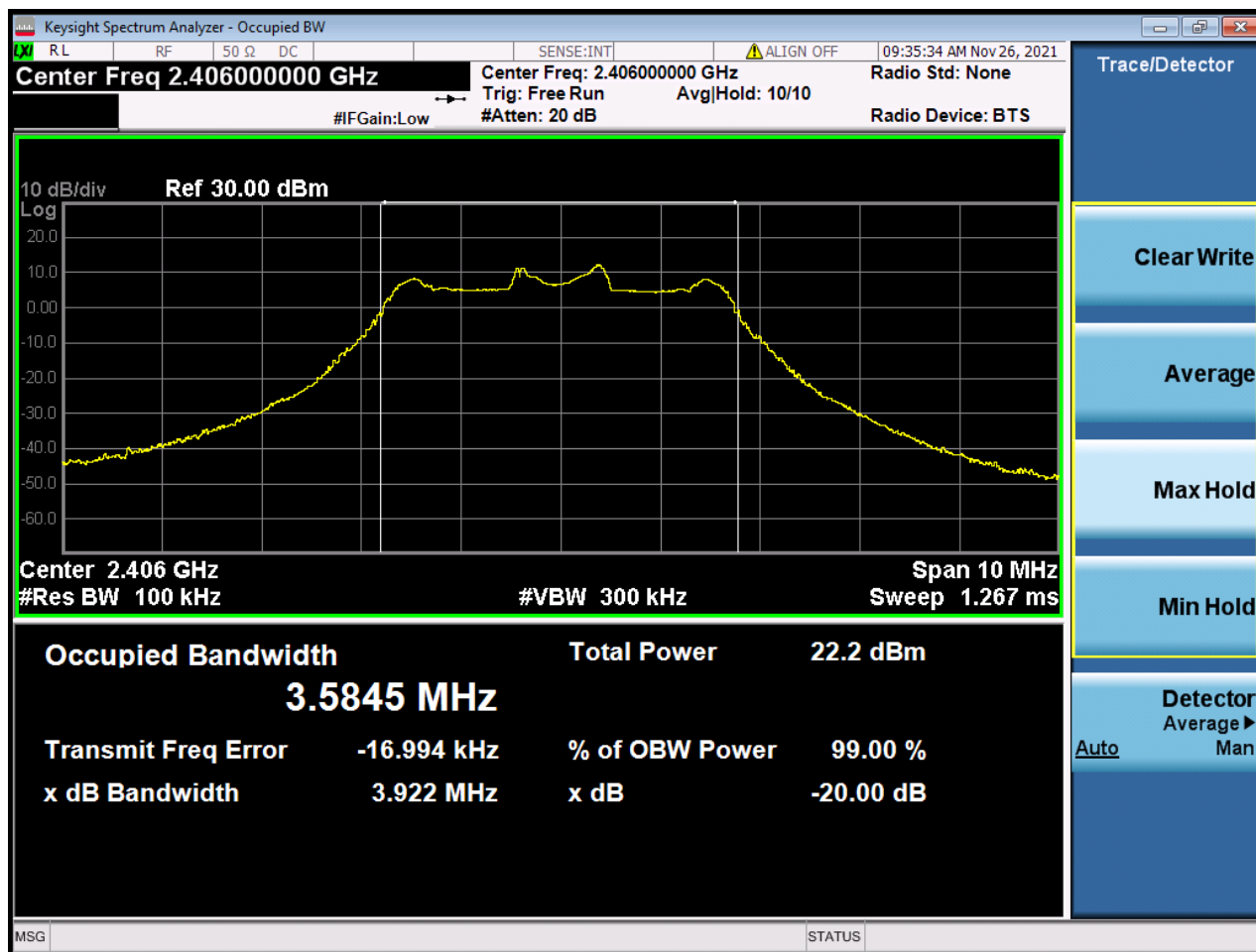
#### 7.2.3 Test Setup Diagram

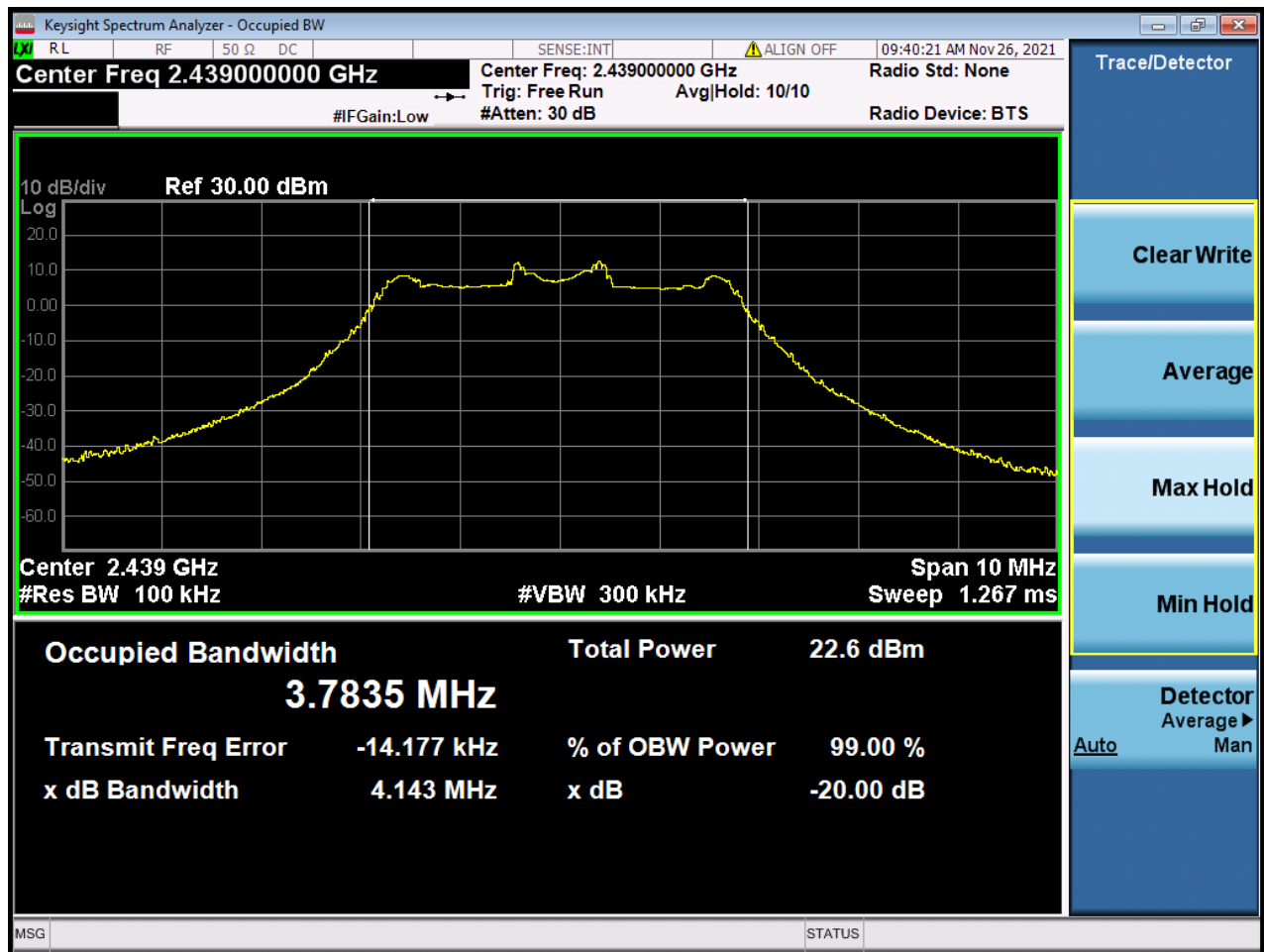


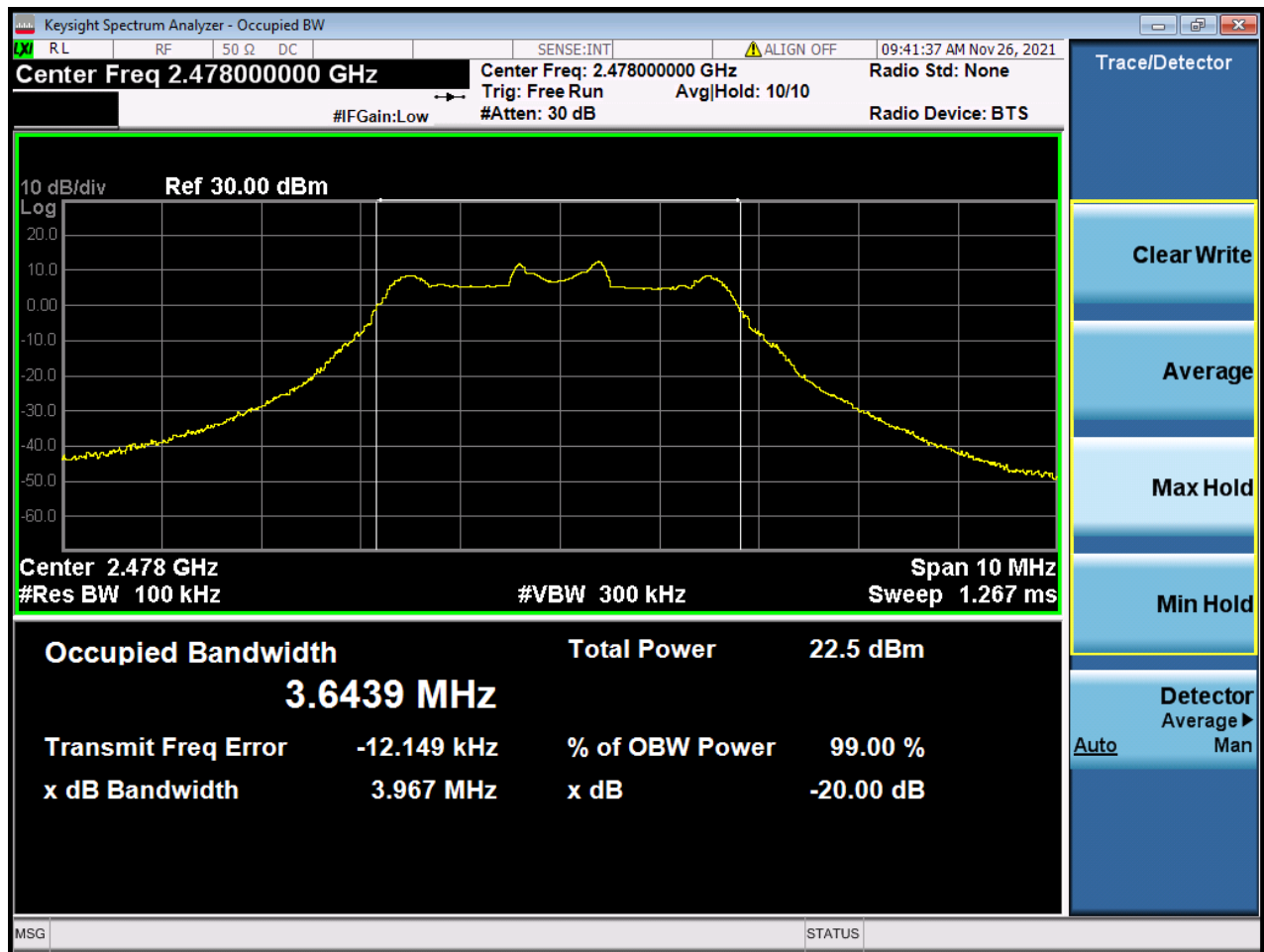
#### 7.2.4 Measurement Procedure and Data

Test channel	20dB bandwidth (MHz)	Results
Lowest	3.922	Pass
Middle	4.143	Pass
Highest	3.967	Pass









### 7.3 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.

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

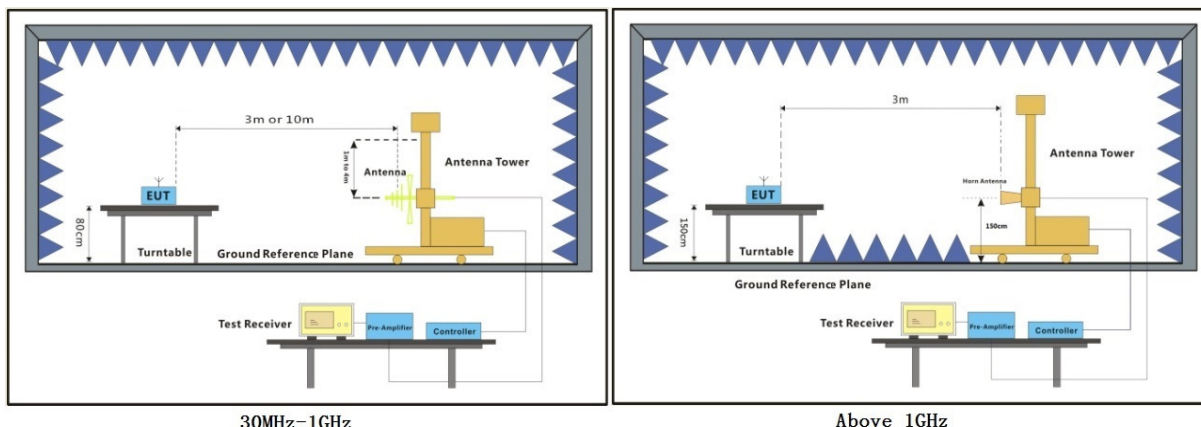
Operating Environment:

Temperature: 23.6 °C Humidity: 56.2 % RH Atmospheric Pressure: 1003 mbar

#### 7.3.2 Test Mode Description

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

#### 7.3.3 Test Setup Diagram





### 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.

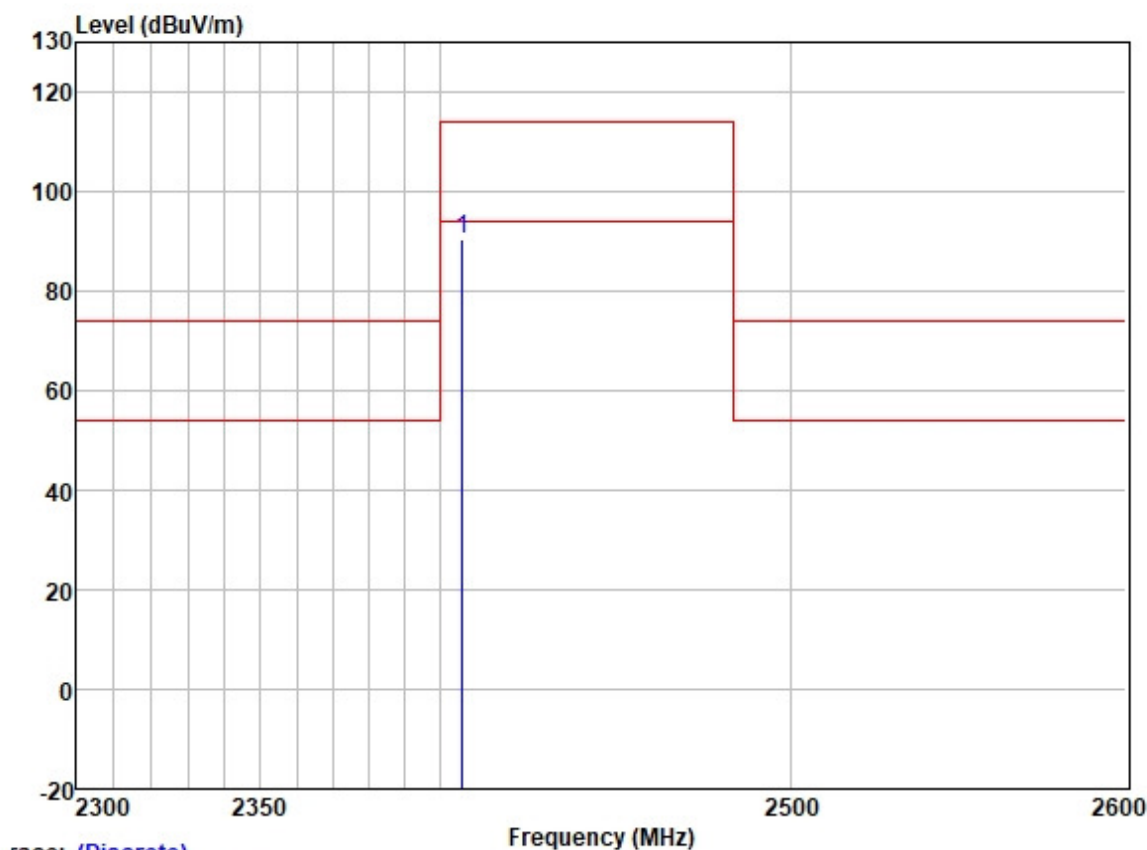
Remark 1: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Remark 2: Antenna: 3 denotes the type of antenna for above 1000MHz.





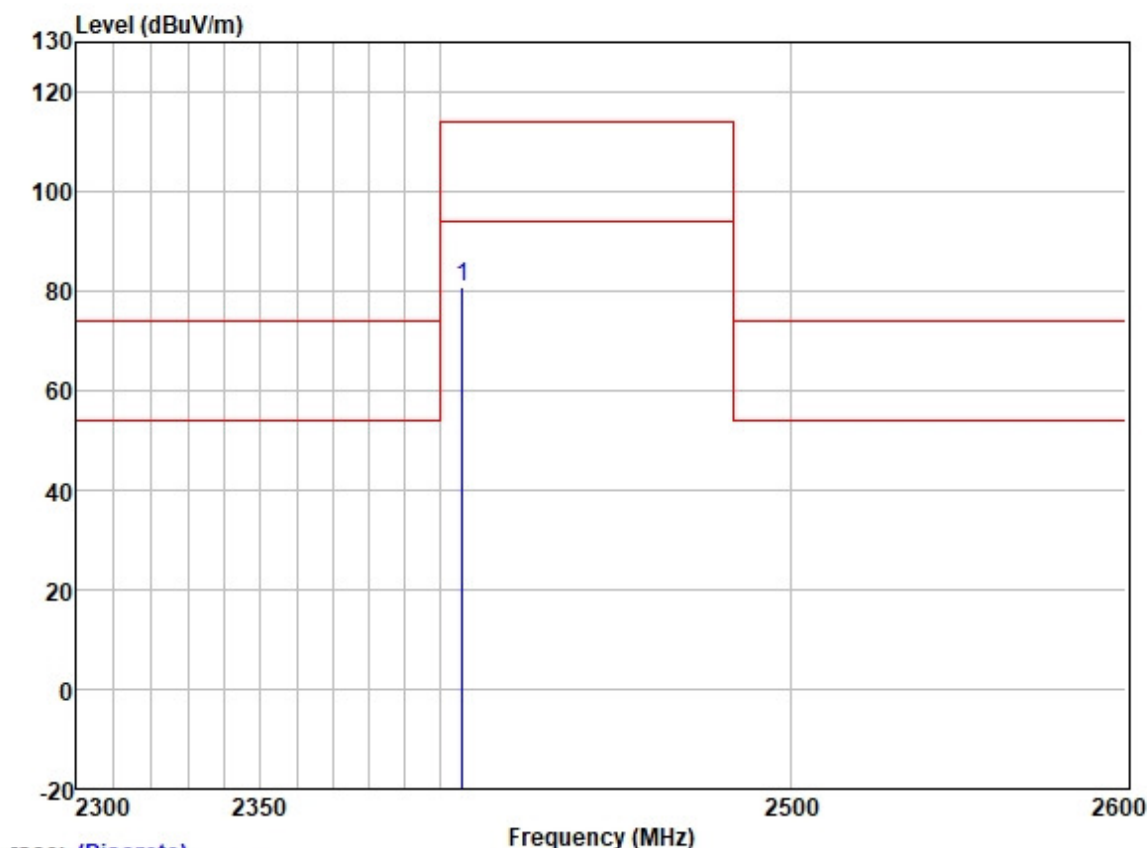
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2406.000	97.30	27.36	3.48	37.59	90.55	114.00	-23.45	HORIZONTAL Peak

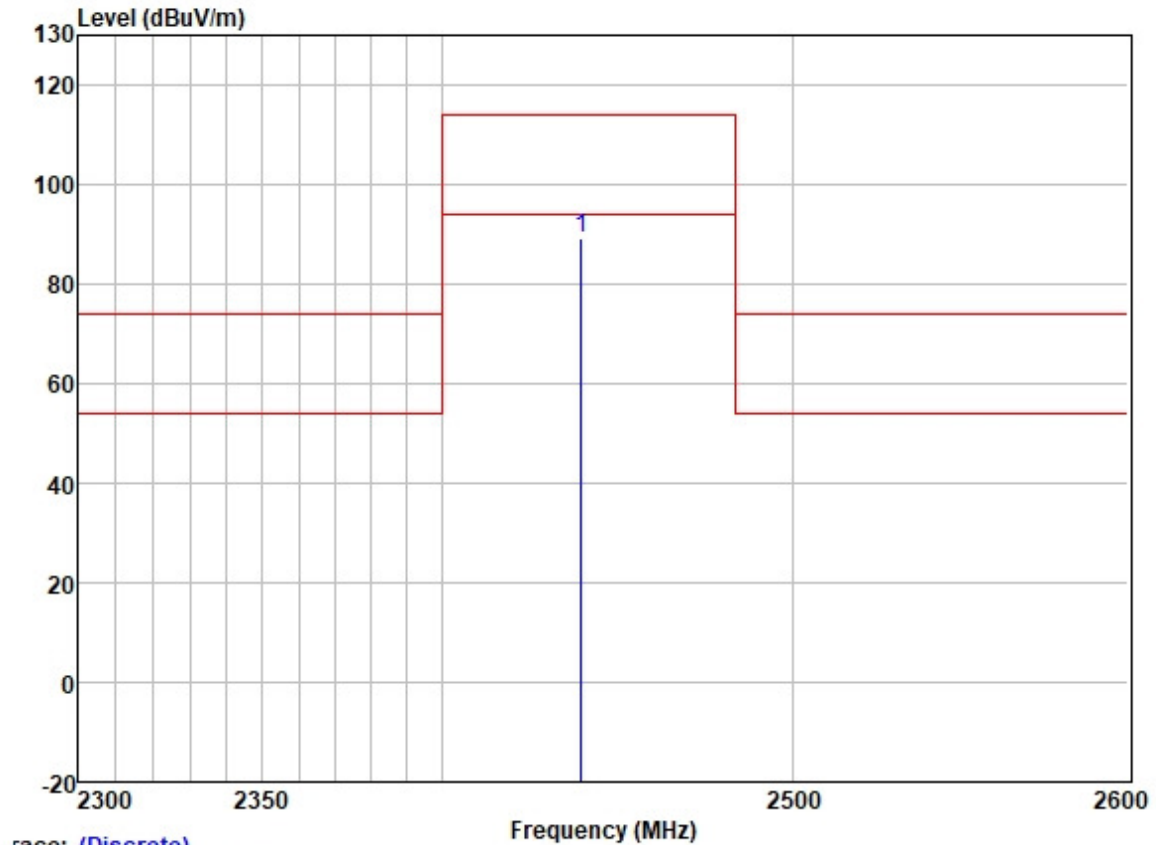
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Trace: (Discrete)

	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2406.000	87.49	27.36	3.48	37.59	80.74	114.00	-33.26	VERTICAL Peak

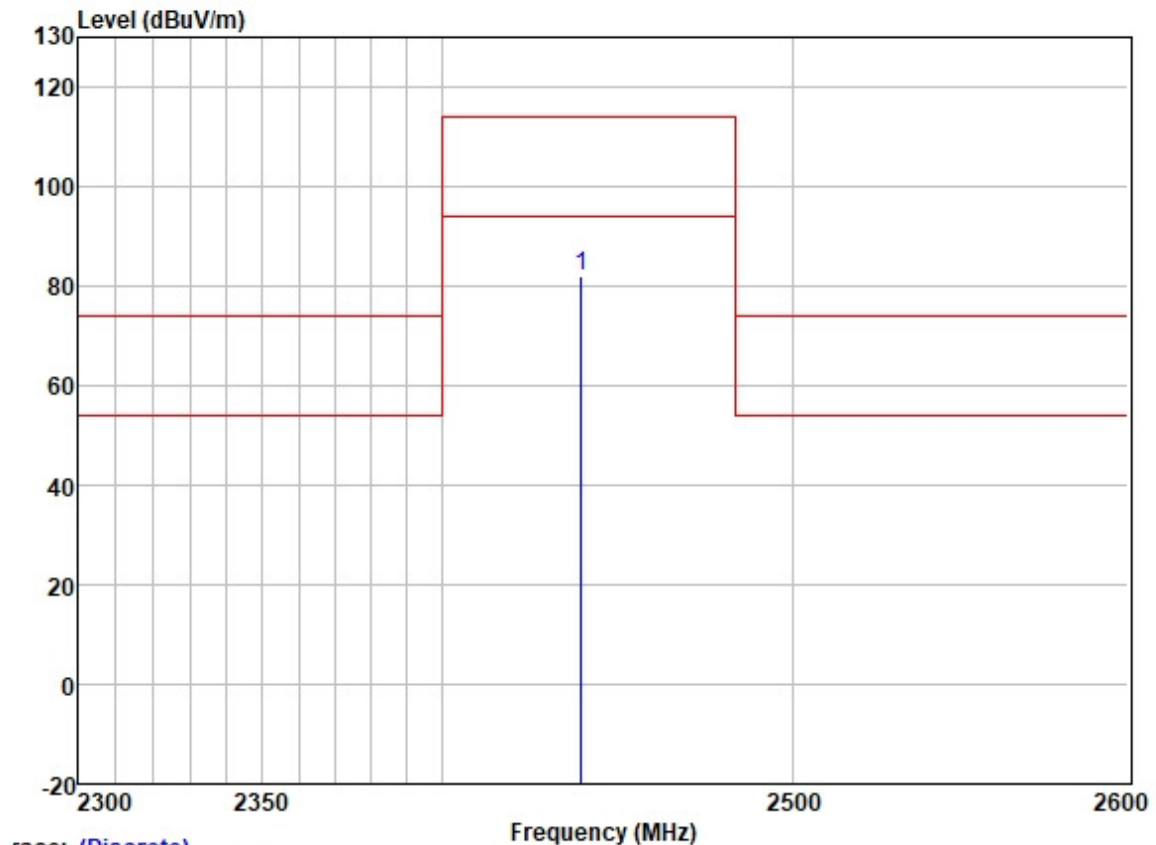
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)

	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2439.000	96.07	27.41	3.42	37.58	89.32	114.00	-24.68	HORIZONTAL Peak

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

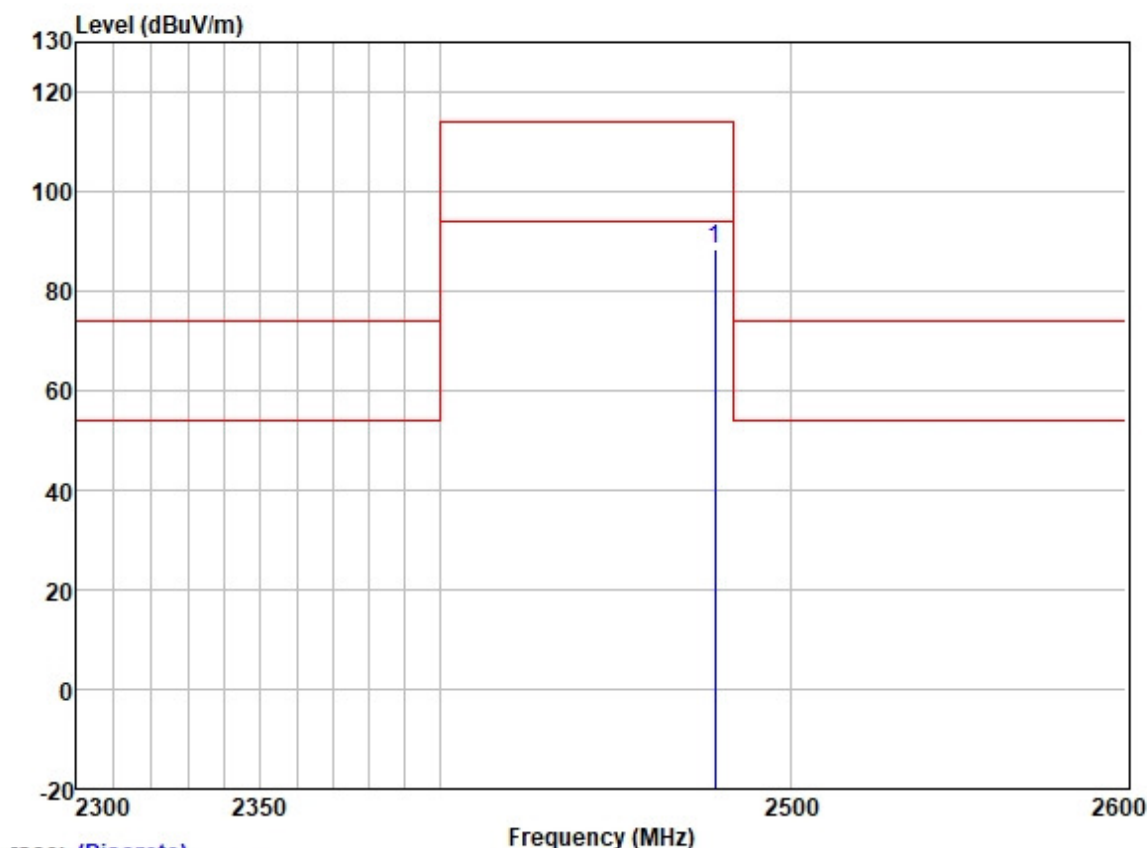


Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp	Level	Limit	Over		
	MHz	Level	Factor	Loss	Factor	Line	Limit	Pol/Phase	Remark
		dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2439.000	88.86	27.41	3.42	37.58	82.11	114.00	-31.89	VERTICAL Peak



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



Trace: (Discrete)

	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2478.000	94.71	27.47	3.60	37.57	88.21	114.00	-25.79	HORIZONTAL Peak



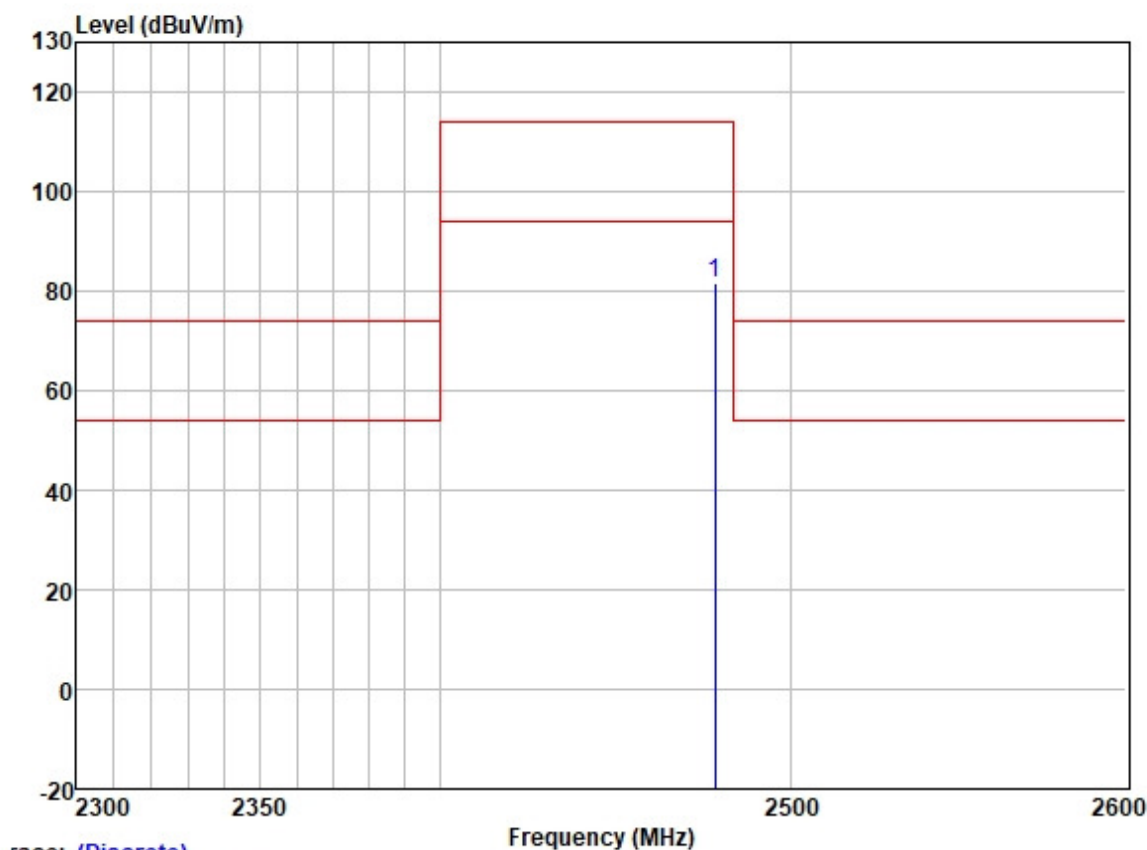
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Read	Antenna	Cable	Preamp		Limit	Over		
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2478.000	87.96	27.47	3.60	37.57	81.46	114.00	-32.54	VERTICAL Peak

### 7.4 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.

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

Operating Environment:

Temperature: 23.7 °C

Humidity: 56.6 % RH

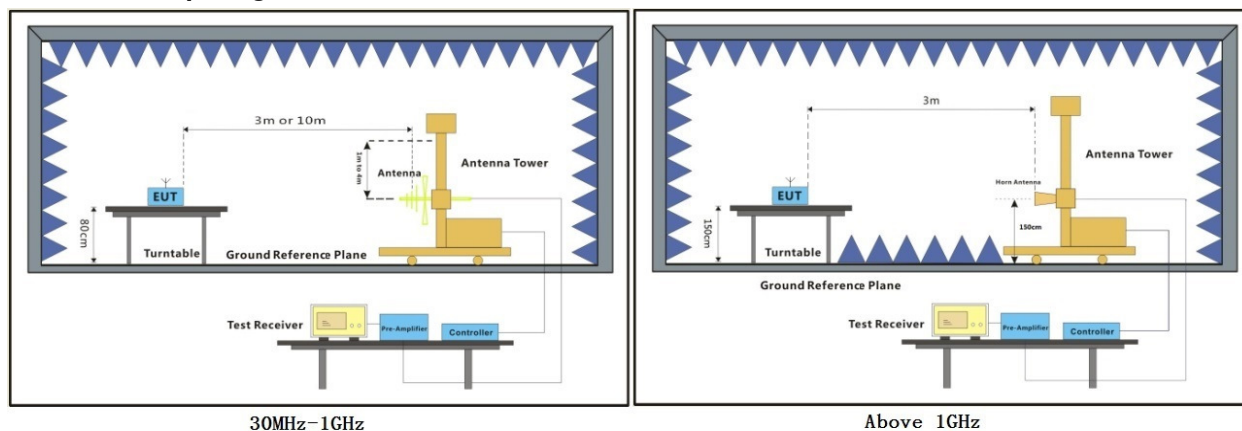
Atmospheric Pressure: 1003 mbar

#### 7.4.2 Test Mode Description

Pre-scan / Mode  
Final test Code Description

Final test 00 TX mode\_Keep the EUT in transmitting with modulation mode.

#### 7.4.3 Test Setup Diagram



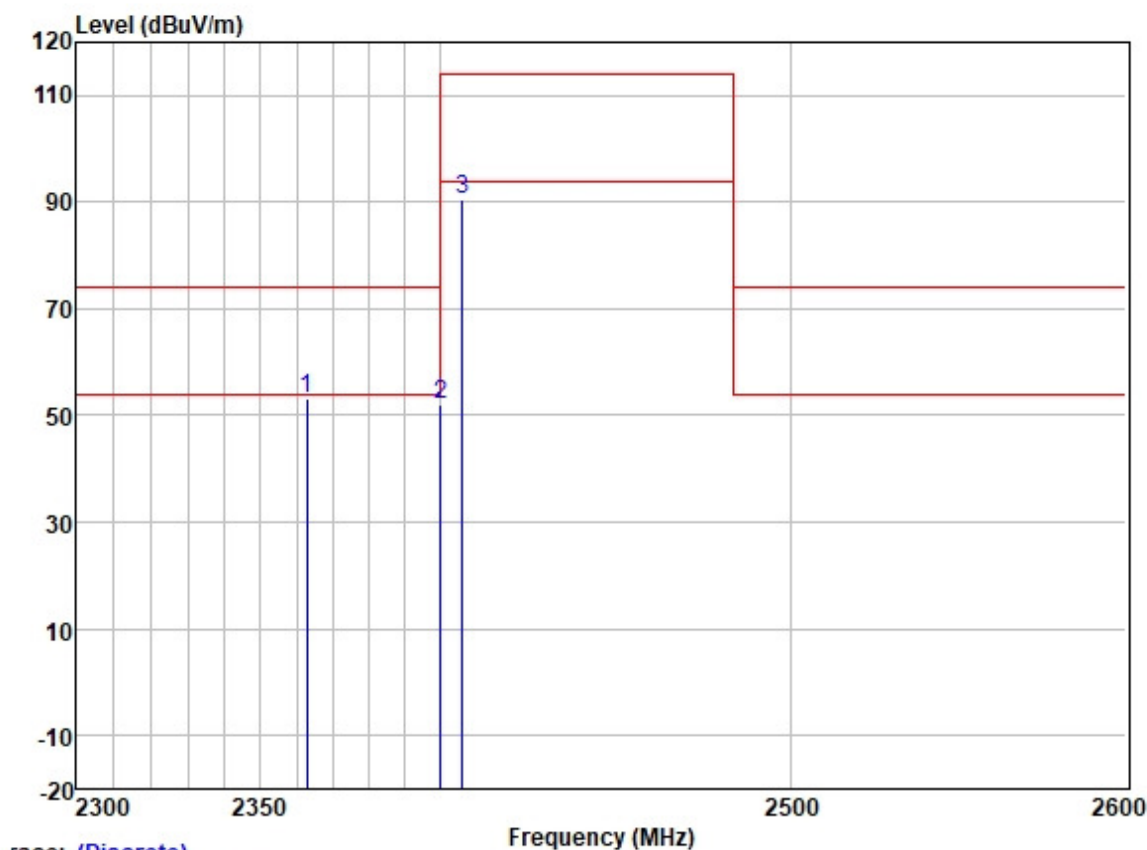
#### 7.4.4 Measurement Procedure and Data

- a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 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 Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

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

Remark 2: Antenna: 3 denotes the type of antenna for above 1000MHz.

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

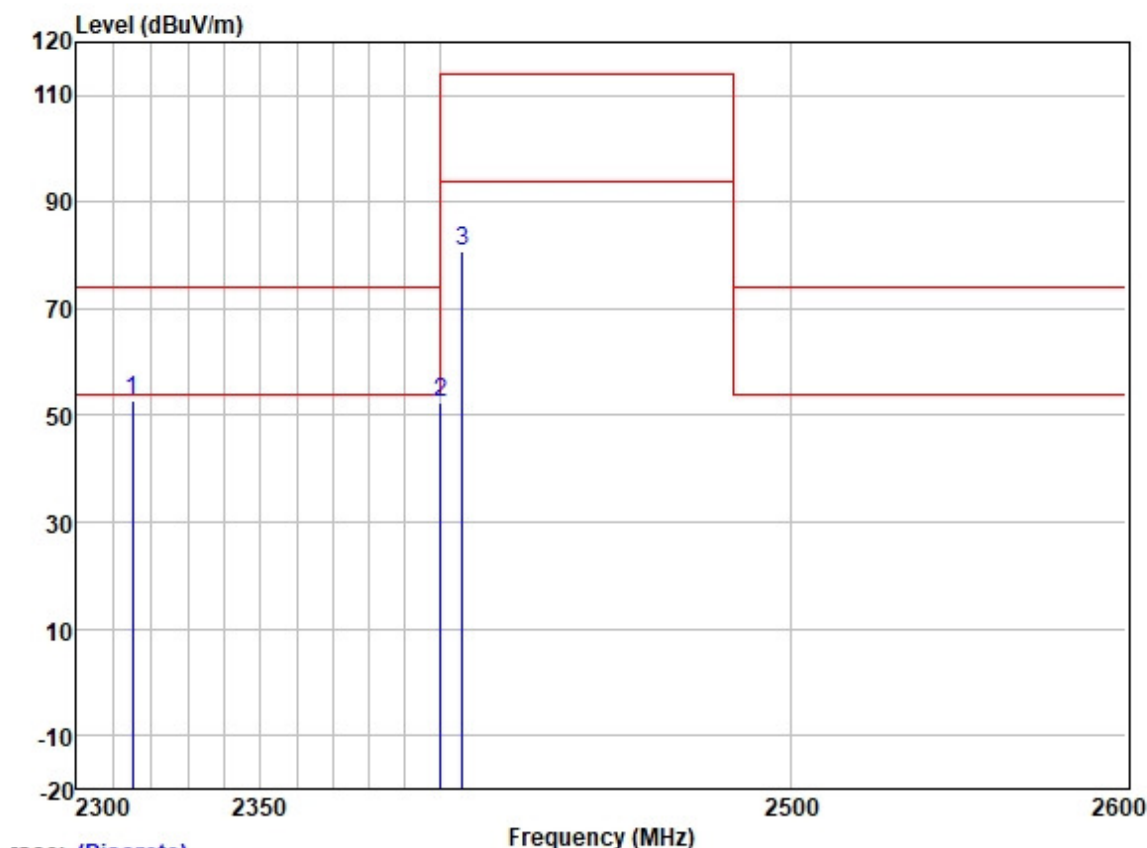


Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2362.711	59.90	27.27	3.42	37.60	52.99	74.00	-21.01	HORIZONTAL	Peak
2	2400.000	58.75	27.35	3.50	37.59	52.01	74.00	-21.99	HORIZONTAL	Peak
3	2406.000	97.30	27.36	3.48	37.59	90.55	114.00	-23.45	HORIZONTAL	Peak



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

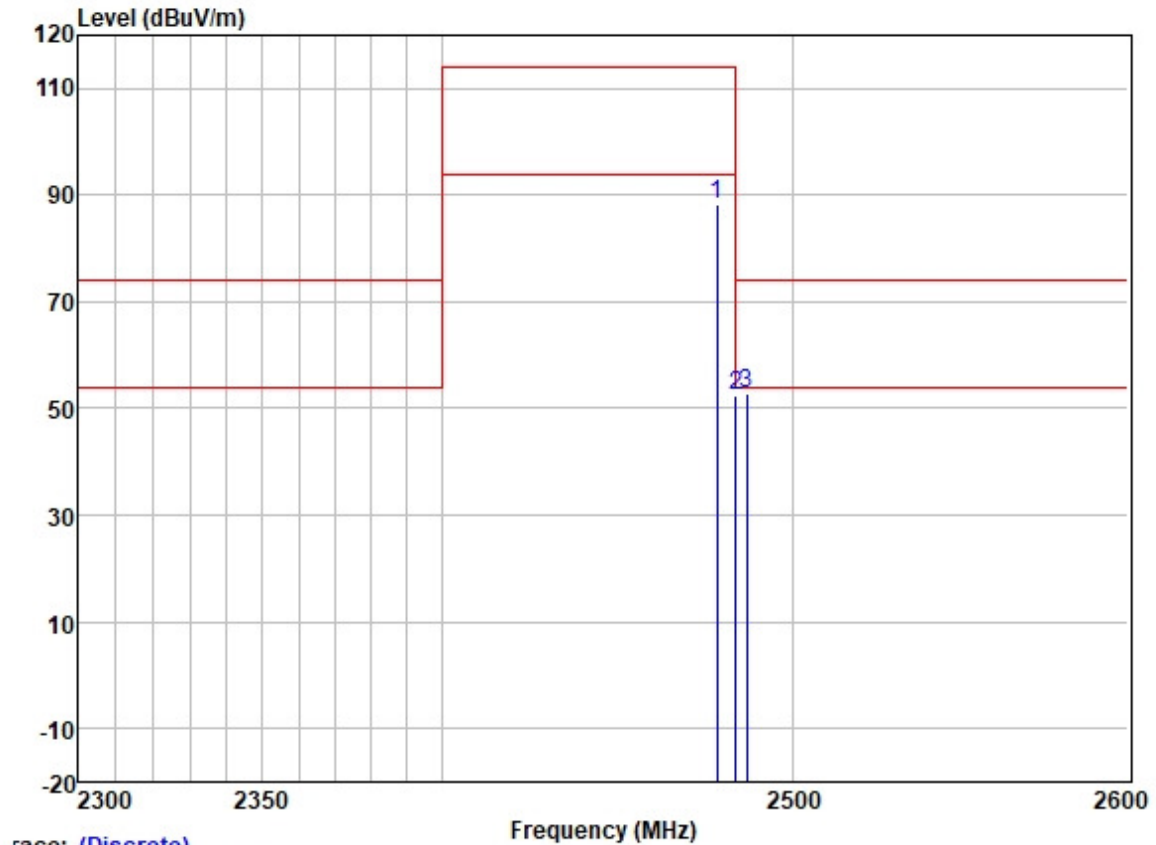


	ReadAntenna	Cable	Preamp		Limit	Over			
Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 2314.948	60.00	27.15	3.32	37.62	52.85	74.00	-21.15	VERTICAL	Peak
2 2400.000	59.04	27.35	3.50	37.59	52.30	74.00	-21.70	VERTICAL	Peak
3 2406.000	87.49	27.36	3.48	37.59	80.74	114.00	-33.26	VERTICAL	Peak





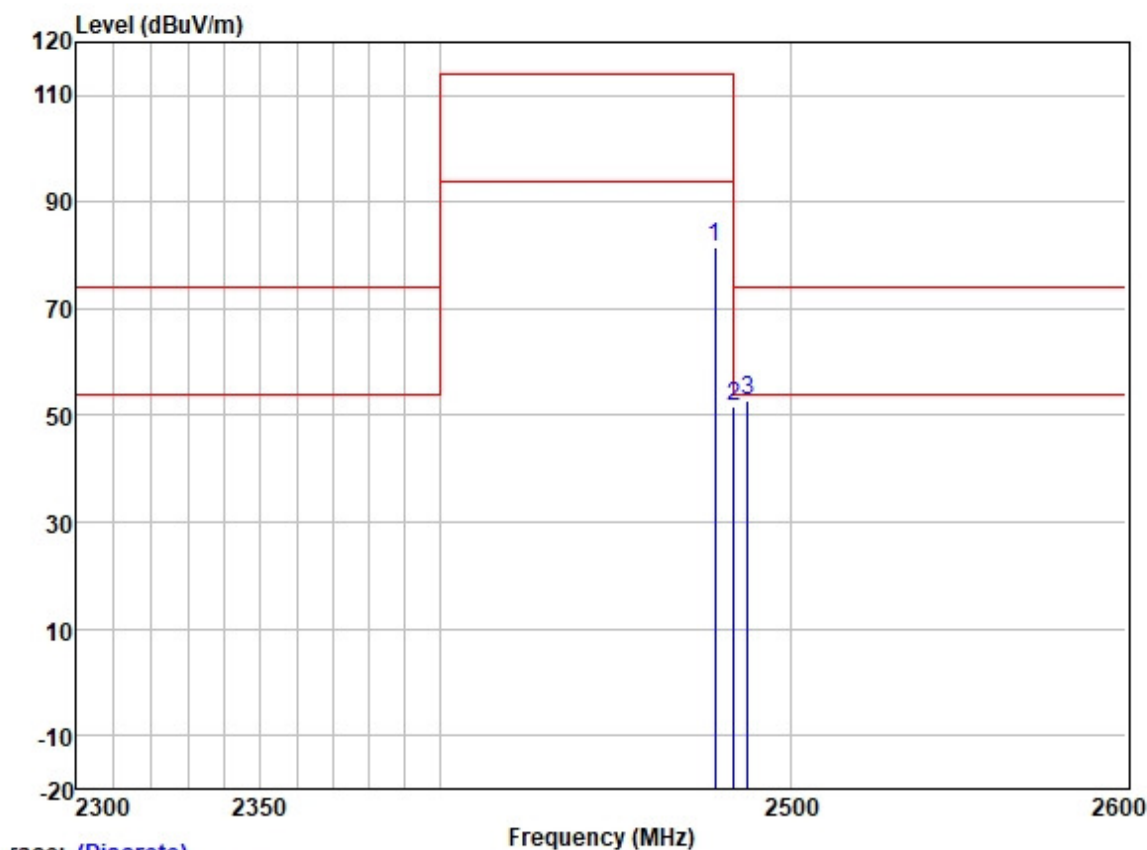
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2478.000	94.71	27.47	3.60	37.57	88.21	114.00	-25.79	HORIZONTAL Peak
2	2483.500	59.01	27.48	3.53	37.57	52.45	74.00	-21.55	HORIZONTAL Peak
3	2486.747	59.38	27.48	3.53	37.57	52.82	74.00	-21.18	HORIZONTAL Peak

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



Trace: (Discrete)

	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2478.000	87.96	27.47	3.60	37.57	81.46	114.00	-32.54	VERTICAL	Peak
2	2483.500	58.22	27.48	3.53	37.57	51.66	74.00	-22.34	VERTICAL	Peak
3	2487.378	59.50	27.48	3.53	37.57	52.94	74.00	-21.06	VERTICAL	Peak

### 7.5 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&6.6  
 Measurement Distance: 3m  
 Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

#### 7.5.1 E.U.T. Operation

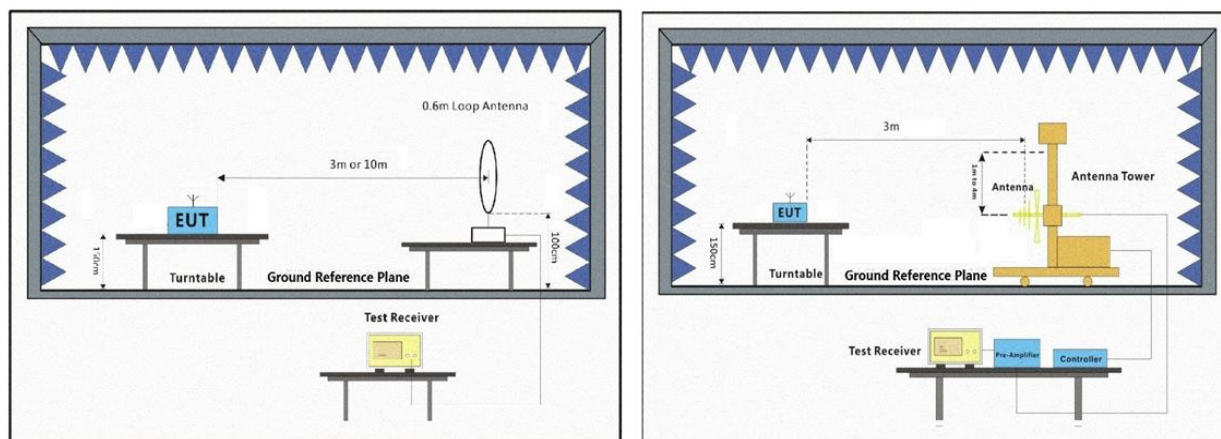
Operating Environment:

Temperature: 23.3 °C Humidity: 56.9 % RH Atmospheric Pressure: 1003 mbar

#### 7.5.2 Test Mode Description

Pre-scan / Mode	Description
Final test Code	
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

- a. 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. 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 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) 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:

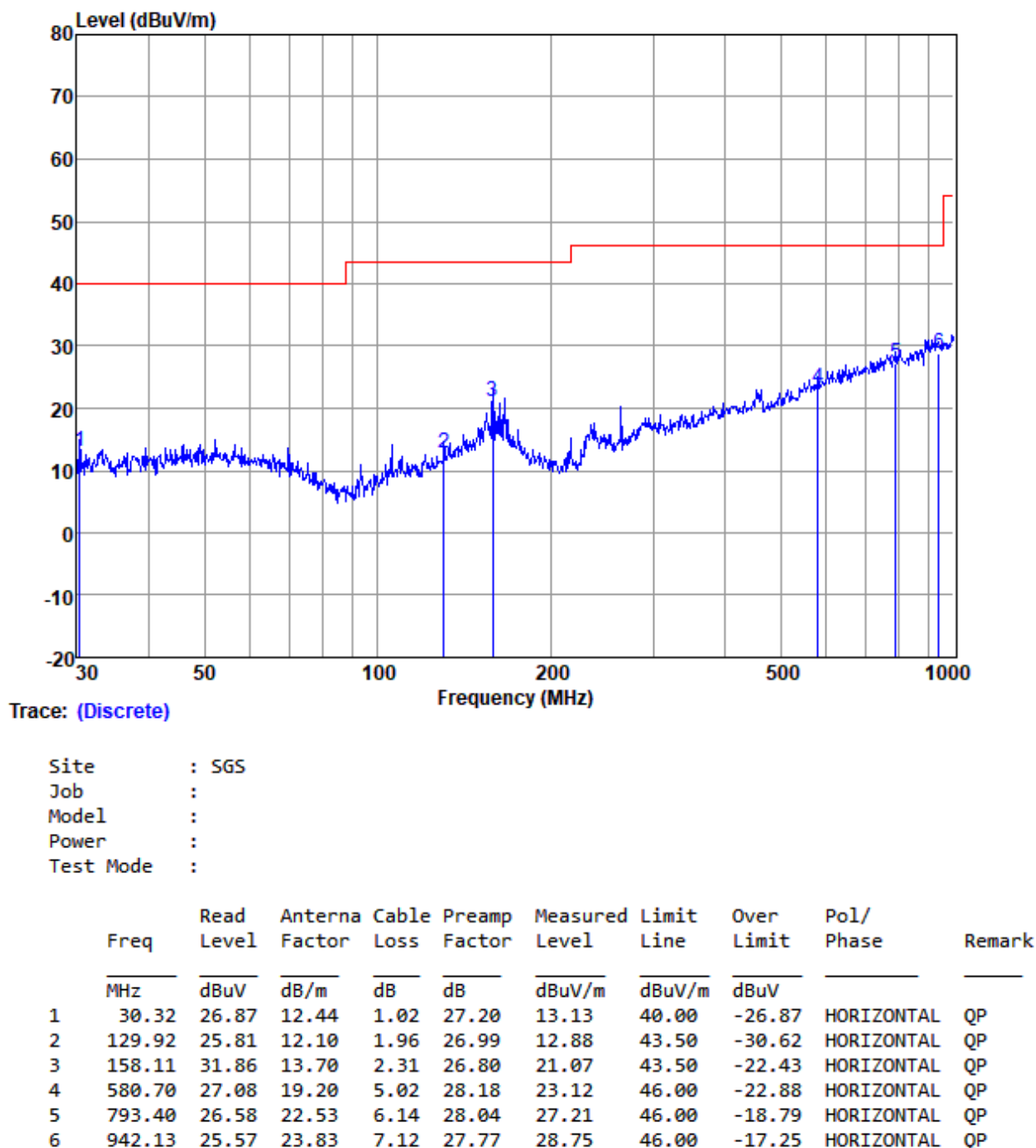
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

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.



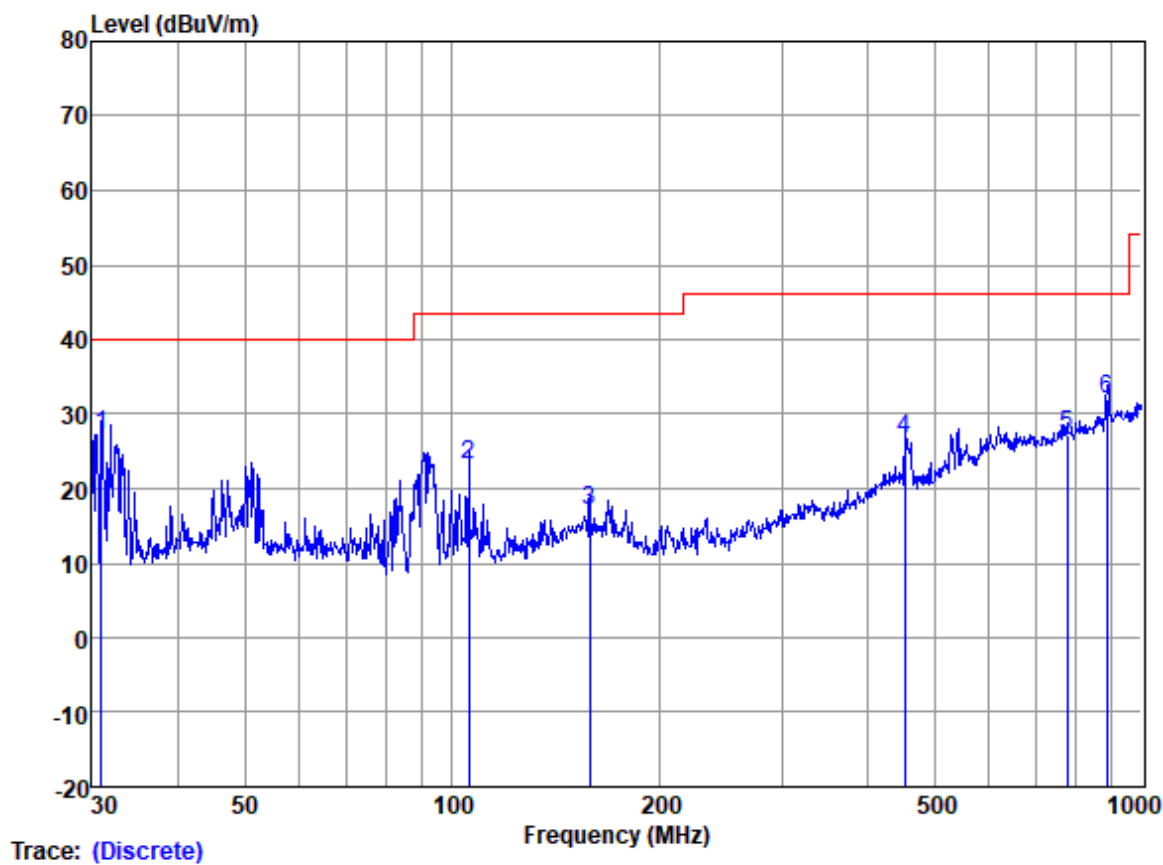


Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low





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



Site : SGS  
Job :  
Model :  
Power :  
Test Mode :

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	30.96	40.82	12.55	1.03	27.20	27.20	40.00	-12.80	VERTICAL	QP
2	105.64	38.65	9.95	1.77	27.07	23.30	43.50	-20.20	VERTICAL	QP
3	158.11	27.79	13.70	2.31	26.80	17.00	43.50	-26.50	VERTICAL	QP
4	452.72	32.68	17.37	4.22	27.72	26.55	46.00	-19.45	VERTICAL	QP
5	779.61	26.71	22.30	6.11	28.05	27.07	46.00	-18.93	VERTICAL	QP
6	890.73	29.81	23.10	6.86	27.86	31.91	46.00	-14.09	VERTICAL	QP

### 7.6 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 6.4&6.5&6.6

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30
30-88	100	40.0	QP	3
88-216	150	43.5	QP	3
216-960	200	46.0	QP	3
960-1000	500	54.0	QP	3
Above 1000	500	54.0	AV	3

#### 7.6.1 E.U.T. Operation

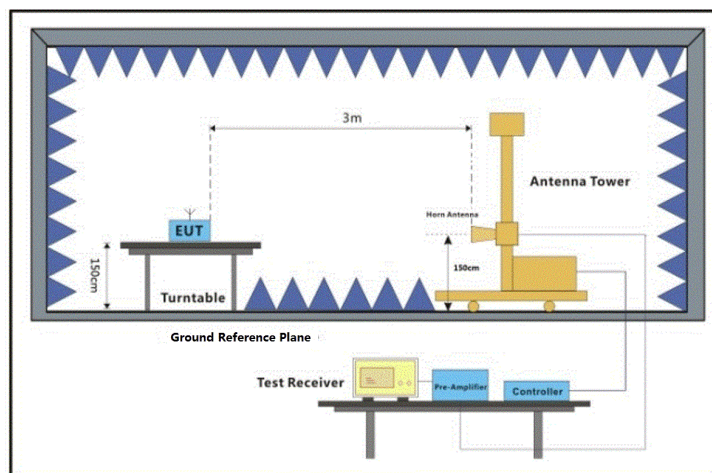
Operating Environment:

Temperature: 23.5 °C Humidity: 56.5 % RH Atmospheric Pressure: 1003 mbar

#### 7.6.2 Test Mode Description

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

#### 7.6.3 Test Setup Diagram



#### 7.6.4 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:

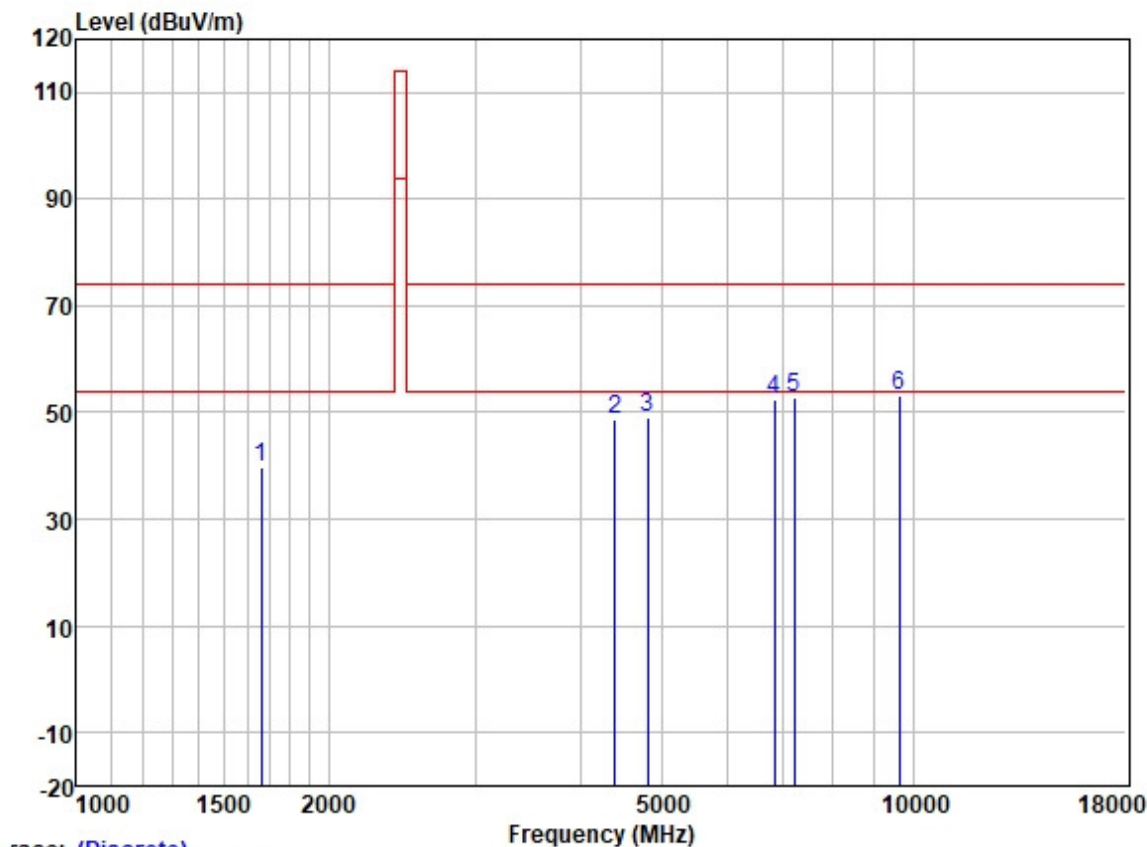
Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor

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.



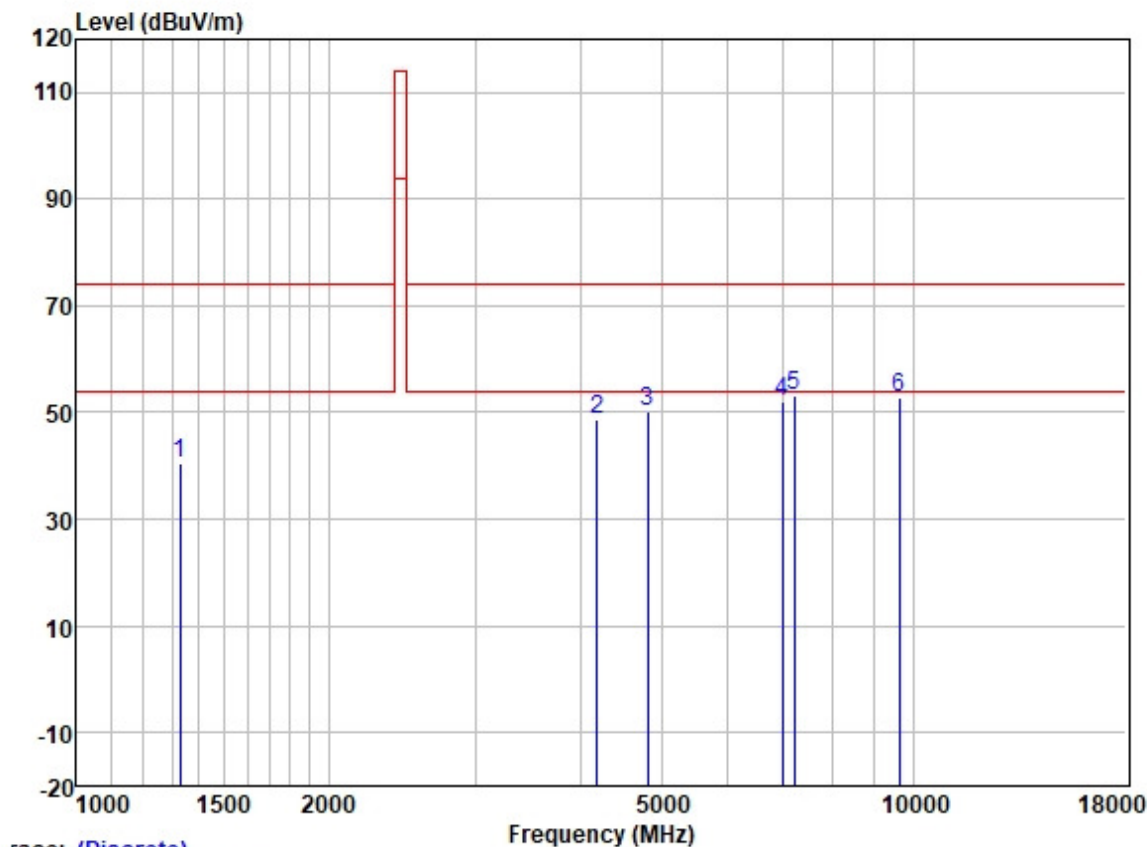
Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1663.137	49.26	25.65	2.80	37.91	39.80	74.00	-34.20	HORIZONTAL	Peak
2	4405.090	50.07	30.68	4.70	36.81	48.64	74.00	-25.36	HORIZONTAL	Peak
3	4812.000	48.95	31.45	5.42	36.83	48.99	74.00	-25.01	HORIZONTAL	Peak
4	6835.278	48.83	34.74	5.82	37.13	52.26	74.00	-21.74	HORIZONTAL	Peak
5	7218.000	48.63	35.62	6.01	37.39	52.87	74.00	-21.13	HORIZONTAL	Peak
6	9624.000	45.08	38.37	7.07	37.42	53.10	74.00	-20.90	HORIZONTAL	Peak



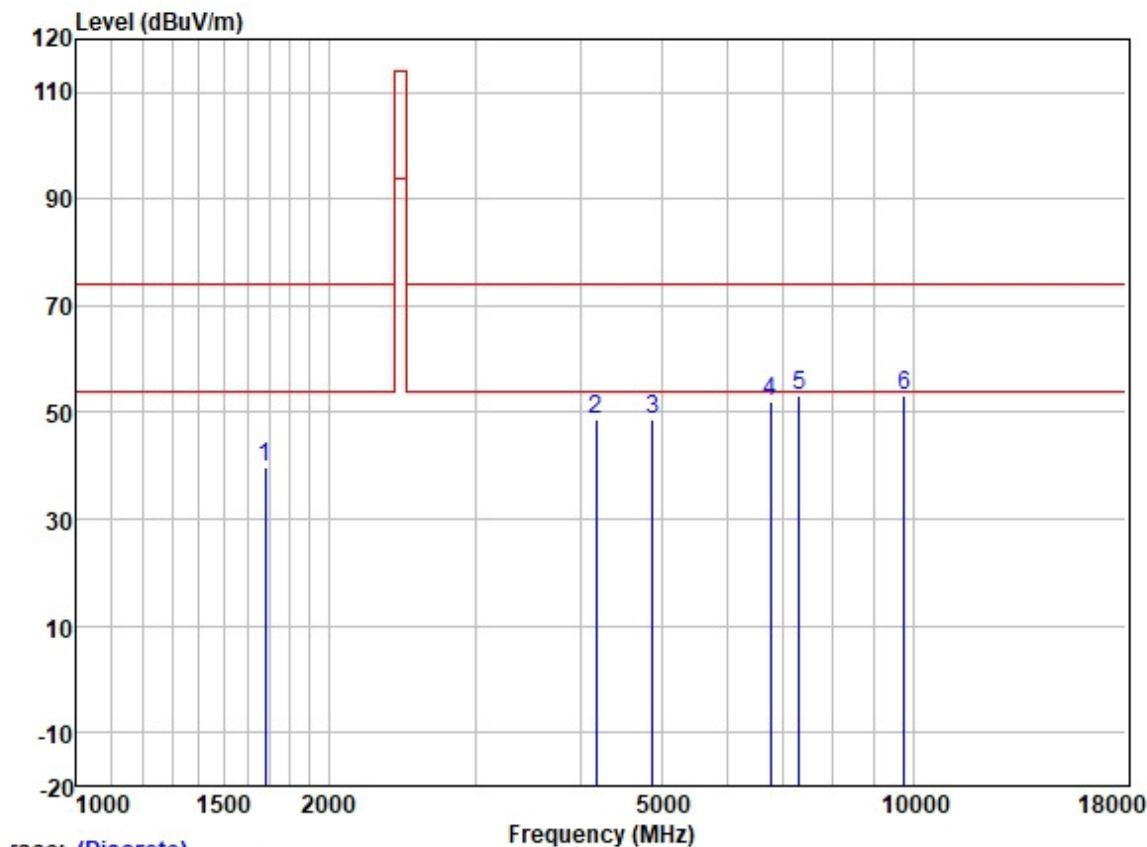
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



	Freq	Read	Antenna	Cable	Preamp	Level	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	dBuV/m	Line	Limit		
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1331.288	50.82	25.28	2.60	38.29	40.41	74.00	-33.59	VERTICAL	Peak
2	4193.872	50.90	30.15	4.60	36.81	48.84	74.00	-25.16	VERTICAL	Peak
3	4812.000	50.30	31.45	5.42	36.83	50.34	74.00	-23.66	VERTICAL	Peak
4	6974.982	48.33	34.97	5.81	37.23	51.88	74.00	-22.12	VERTICAL	Peak
5	7218.000	48.95	35.62	6.01	37.39	53.19	74.00	-20.81	VERTICAL	Peak
6	9624.000	44.85	38.37	7.07	37.42	52.87	74.00	-21.13	VERTICAL	Peak

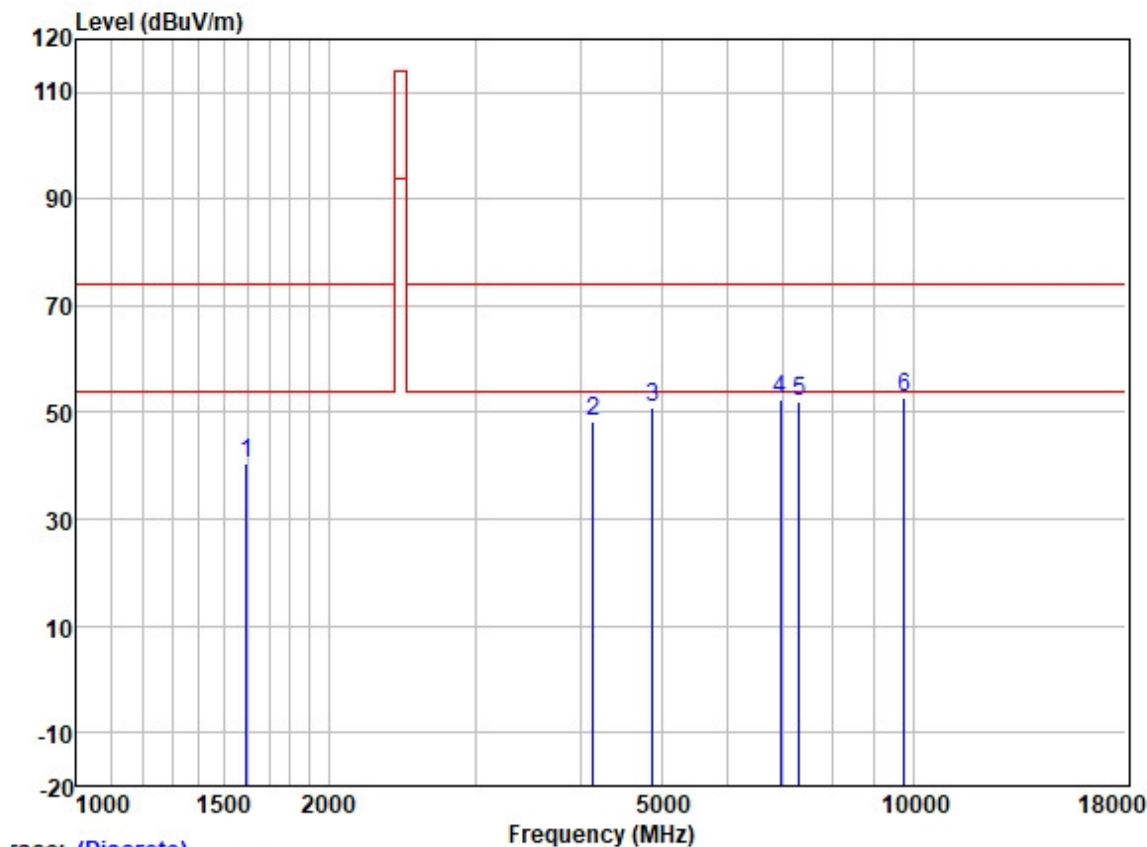


Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



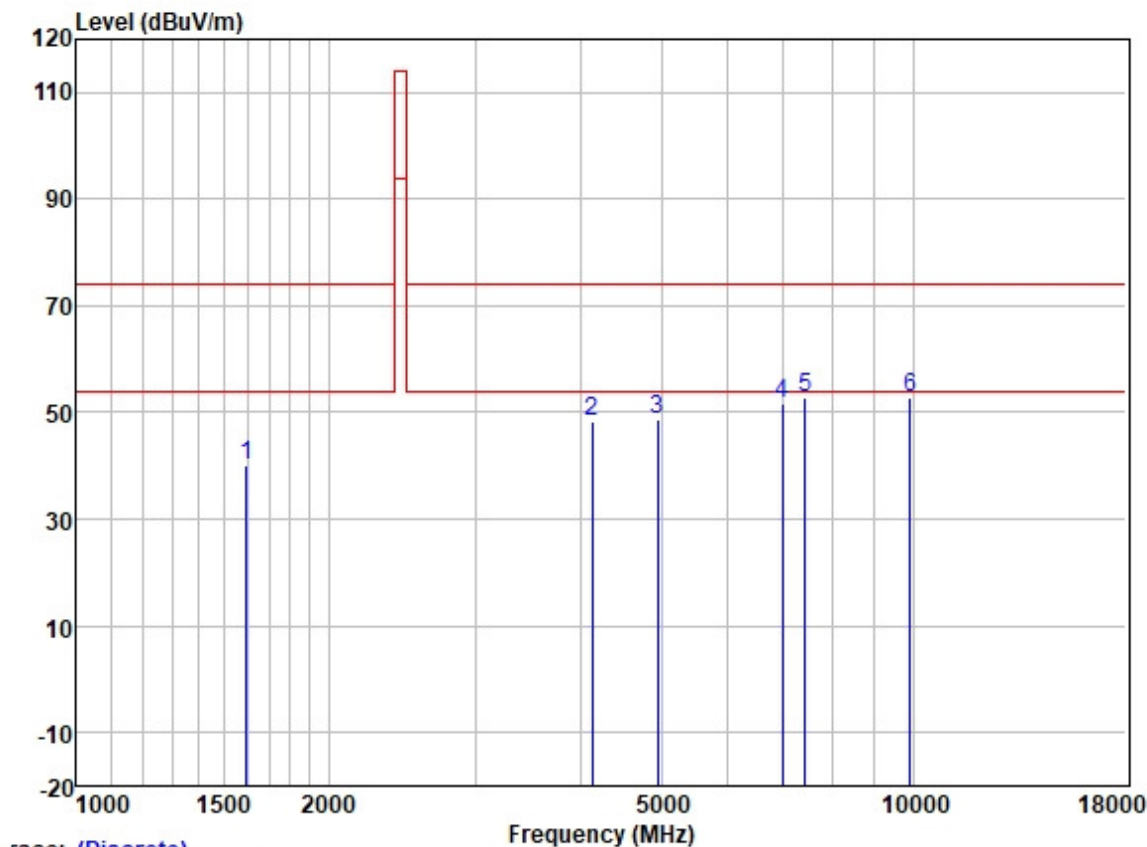
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
	MHz	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1682.477	48.99	25.68	2.80	37.91	39.56	74.00	-34.44	HORIZONTAL	Peak
2	4181.768	50.70	30.12	4.60	36.80	48.62	74.00	-25.38	HORIZONTAL	Peak
3	4878.000	48.34	31.54	5.50	36.84	48.54	74.00	-25.46	HORIZONTAL	Peak
4	6756.708	48.73	34.56	5.82	37.10	52.01	74.00	-21.99	HORIZONTAL	Peak
5	7317.000	48.29	36.00	6.13	37.43	52.99	74.00	-21.01	HORIZONTAL	Peak
6	9756.000	45.22	38.50	7.02	37.41	53.33	74.00	-20.67	HORIZONTAL	Peak

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



	Freq	ReadAntenna	Cable	Preamp		Limit	Over		
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1597.181	49.98	25.58	2.80	37.98	40.38	74.00	-33.62	VERTICAL
2	4145.664	50.59	30.03	4.60	36.80	48.42	74.00	-25.58	VERTICAL
3	4878.000	50.83	31.54	5.50	36.84	51.03	74.00	-22.97	VERTICAL
4	6934.778	48.78	34.92	5.81	37.19	52.32	74.00	-21.68	VERTICAL
5	7317.000	47.21	36.00	6.13	37.43	51.91	74.00	-22.09	VERTICAL
6	9756.000	44.84	38.50	7.02	37.41	52.95	74.00	-21.05	VERTICAL

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

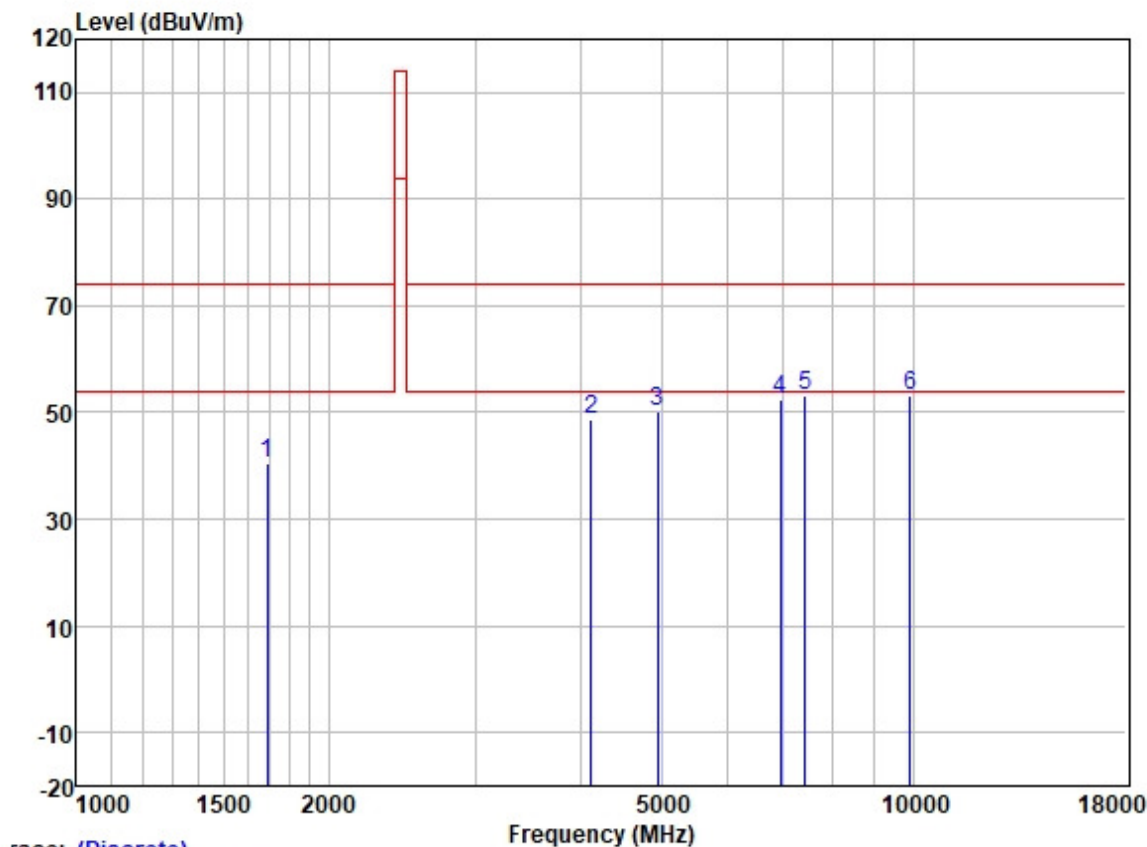


Trace: (Discrete)

		ReadAntenna		Cable	Preamp		Limit	Over		
	Freq	Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1597.181	49.74	25.58	2.80	37.98	40.14	74.00	-33.86	HORIZONTAL	Peak
2	4133.699	50.67	30.01	4.60	36.80	48.48	74.00	-25.52	HORIZONTAL	Peak
3	4956.000	48.17	31.65	5.65	36.84	48.63	74.00	-25.37	HORIZONTAL	Peak
4	6974.982	48.25	34.97	5.81	37.23	51.80	74.00	-22.20	HORIZONTAL	Peak
5	7434.000	47.87	36.27	6.22	37.47	52.89	74.00	-21.11	HORIZONTAL	Peak
6	9912.000	44.70	38.65	6.96	37.41	52.90	74.00	-21.10	HORIZONTAL	Peak



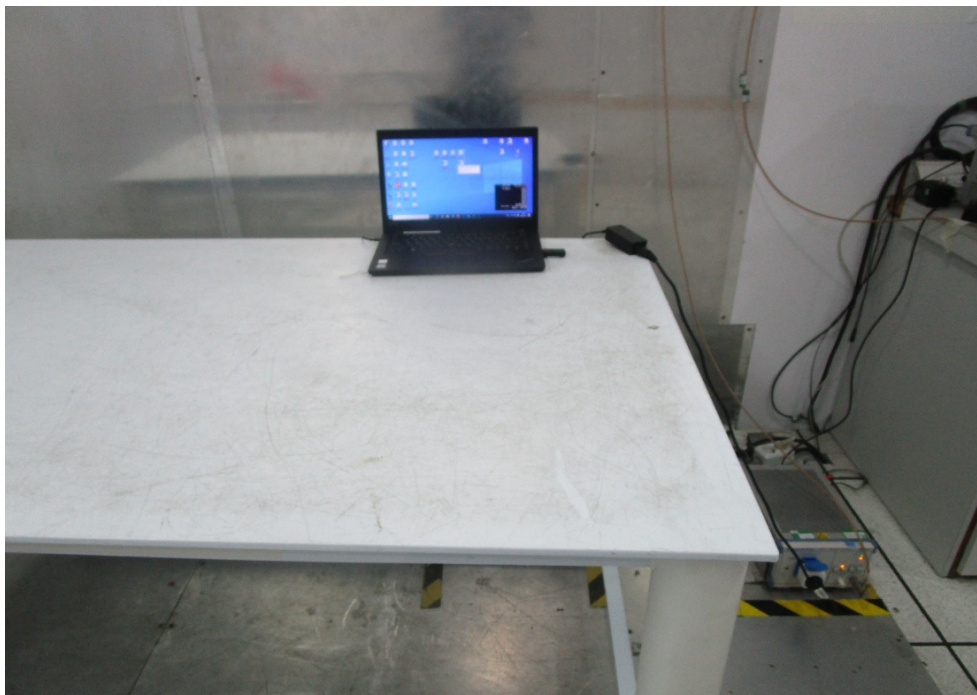
Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



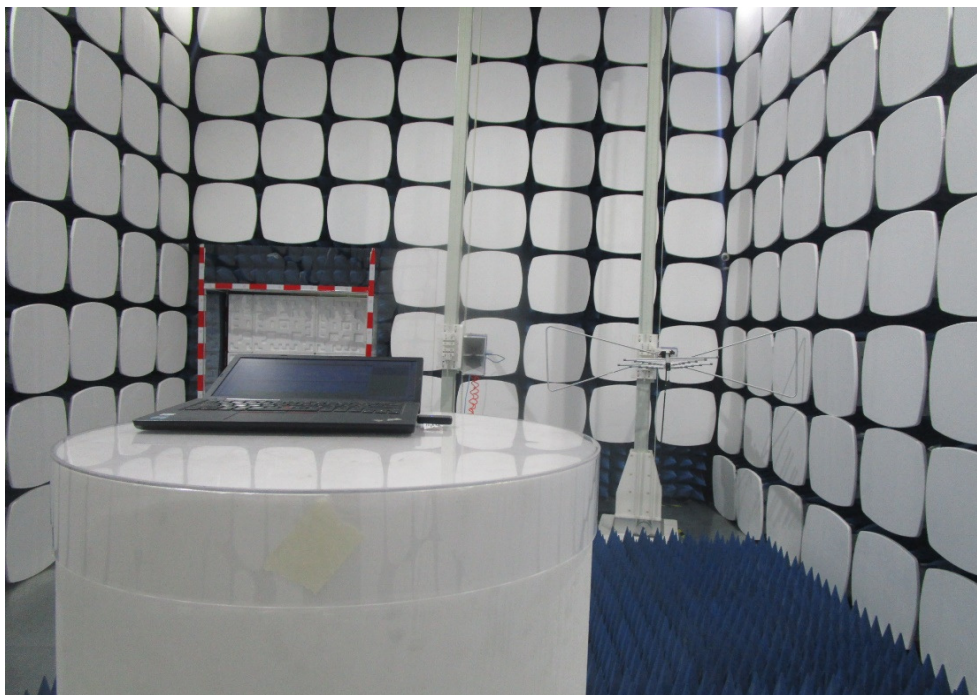
	Freq	ReadAntenna	Cable	Preamp		Limit	Over			
		Level	Factor	Loss	Factor	Level	Line	Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1692.231	49.87	25.70	2.80	37.89	40.48	74.00	-33.52	VERTICAL	Peak
2	4121.768	50.92	29.98	4.60	36.80	48.70	74.00	-25.30	VERTICAL	Peak
3	4956.000	49.70	31.65	5.65	36.84	50.16	74.00	-23.84	VERTICAL	Peak
4	6934.778	48.91	34.92	5.81	37.19	52.45	74.00	-21.55	VERTICAL	Peak
5	7434.000	48.00	36.27	6.22	37.47	53.02	74.00	-20.98	VERTICAL	Peak
6	9912.000	44.86	38.65	6.96	37.41	53.06	74.00	-20.94	VERTICAL	Peak

## 8 Test Setup Photo

### Conducted Emissions at AC Power Line (150kHz-30MHz)

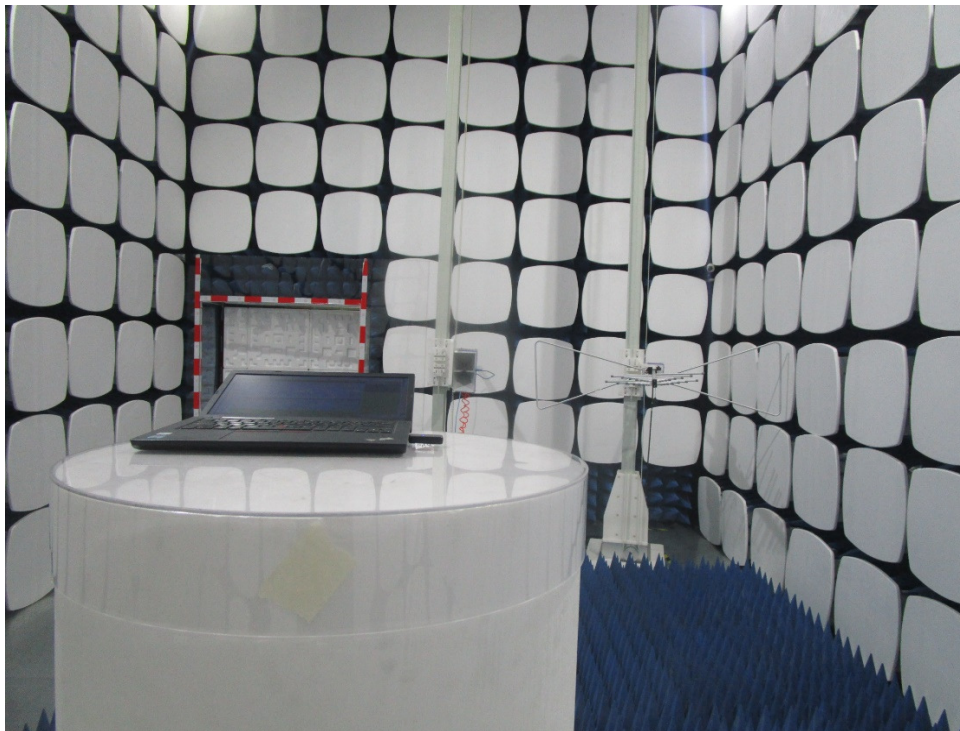


### Field Strength of the Fundamental Signal (15.249(a))





### Restricted Band Around Fundamental Frequency



### Radiated Emissions (below 1GHz)

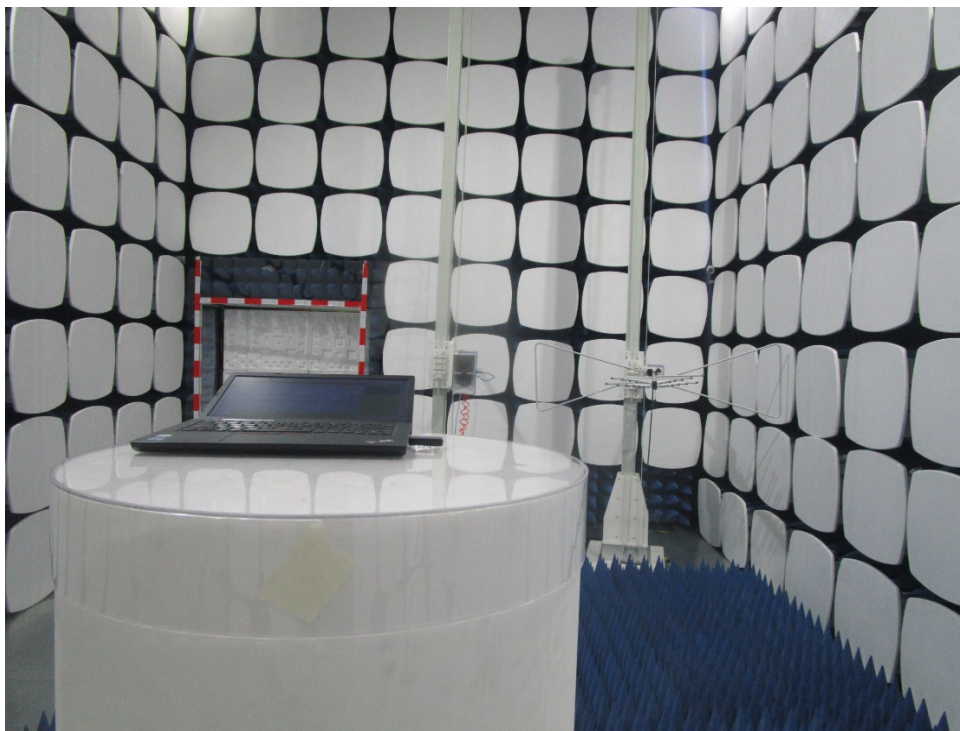


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### Radiated Emissions (above 1GHz)





## 9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for GZCR2111021393AT

- End of the Report -