

TEST REPORT

Application No.: GZCR2202000193AT
Applicant: GUANGDONG SYMA MODEL AIRCRAFT INDUSTRIAL CO., LTD.
Address of Applicant: No. 2 West Xingye Road Laimei Industrial Area, Chenghai Shantou City, Guangdong, China
Manufacturer: GUANGDONG SYMA MODEL AIRCRAFT INDUSTRIAL CO., LTD.
Address of Manufacturer: No. 2 West Xingye Road Laimei Industrial Area, Chenghai Shantou City, Guangdong, China
Factory: GUANGDONG SYMA MODEL AIRCRAFT INDUSTRIAL CO., LTD.
Address of Factory: No. 2 West Xingye Road Laimei Industrial Area, Chenghai Shantou City, Guangdong, China

Equipment Under Test (EUT):

EUT Name: R/C CAR
Model No.: TG1012
Standard(s) : 47 CFR Part 15, Subpart C 15.249
Date of Receipt: 2022-02-14
Date of Test: 2022-02-16 to 2022-03-08
Date of Issue: 2022-03-09

Test Result:	Pass*
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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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Guangzhou Branch EMC Laboratory. 中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2022-03-09		Original

Authorized for issue by:			
Tested By		 <hr/> Curry Wu/Project Engineer	
Reviewed By		 <hr/> Ricky Liu/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&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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3 Contents

	Page
1 Cover Page	1
2 Test Summary	3
3 Contents	4
4 General Information	6
4.1 Details of E.U.T.	6
4.2 Description of Support Units	6
4.3 Measurement Uncertainty	7
4.4 Test Location	8
4.5 Test Facility	8
4.6 Deviation from Standards	9
4.7 Abnormalities from Standard Conditions	9
5 Equipment List	10
6 Radio Spectrum Technical Requirement	13
6.1 Antenna Requirement	13
6.1.1 Test Requirement:	13
6.1.2 Conclusion	13
7 Radio Spectrum Matter Test Results	14
7.1 20dB Bandwidth	14
7.1.1 E.U.T. Operation	14
7.1.2 Test Mode Description	14
7.1.3 Test Setup Diagram	14
7.1.4 Measurement Procedure and Data	14
7.2 Field Strength of the Fundamental Signal (15.249(a))	18
7.2.1 E.U.T. Operation	18
7.2.2 Test Mode Description	18
7.2.3 Test Setup Diagram	18
7.2.4 Measurement Procedure and Data	19
7.3 Restricted Band Around Fundamental Frequency	27
7.3.1 E.U.T. Operation	27
7.3.2 Test Mode Description	27
7.3.3 Test Setup Diagram	27
7.3.4 Measurement Procedure and Data	28
7.4 Radiated Emissions (below 1GHz)	33
7.4.1 E.U.T. Operation	33
7.4.2 Test Mode Description	33
7.4.3 Test Setup Diagram	33
7.4.4 Measurement Procedure and Data	34
7.5 Radiated Emissions (above 1GHz)	37
7.5.1 E.U.T. Operation	37
7.5.2 Test Mode Description	37
7.5.3 Test Setup Diagram	37
7.5.4 Measurement Procedure and Data	38



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8 Test Setup Photo45

9 EUT Constructional Details (EUT Photos)45



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4 General Information

4.1 Details of E.U.T.

Power supply:	Transmitter: DC 3.0V (2*1.5V "AA" Size Batteries)
Operation Frequency:	2414.4 MHz to 2474.4MHz
Modulation Type:	GFSK
Antenna Type:	wire
Antenna Gain:	2dBi
Number of Channels:	60

Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2414.4	16	2430	31	2445	46	2460
2	2416	17	2431	32	2446	47	2461
3	2417	18	2432	33	2447	48	2462
4	2418	19	2433	34	2448	49	2463
5	2419	20	2434	35	2449	50	2464
6	2420	21	2435	36	2450	51	2465
7	2421	22	2436	37	2451	52	2466
8	2422	23	2437	38	2452	53	2467
9	2423	24	2438	39	2453	54	2468
10	2424	25	2439	40	2454	55	2469
11	2425	26	2440	41	2455	56	2470
12	2426	27	2441	42	2456	57	2471
13	2427	28	2442	43	2457	58	2472
14	2428	29	2443	44	2458	59	2473
15	2429	30	2444.4	45	2459	60	2474.4

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--
The EUT has been tested as an independent unit.			



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4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
20dB Bandwidth	± 3%
Field Strength of the Fundamental Signal (15.249(a))	±5.00dB (30MHz-1GHz; 3m);±4.38dB (30MHz-1GHz; 10m);± 4.52Db (1GHz-6GHz);
Restricted Band Around Fundamental Frequency	±5.00dB (30MHz-1GHz; 3m);±4.38dB (30MHz-1GHz; 10m);± 4.52dB (1GHz-6GHz);
Radiated Emissions (below 1GHz)	±5.00dB (30MHz-1GHz; 3m);±4.38dB (30MHz-1GHz; 10m)
Radiated Emissions (above 1GHz)	± 4.52dB (1GHz-6GHz);± 4.54dB (above 6GHz)
<p>Remark:</p> <p>The U_{lab} (lab Uncertainty) is less than U_{cispr} (CISPR Uncertainty), so the test results</p> <ul style="list-style-type: none"> – 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:

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



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5 Equipment List

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	2021-12-17	2022-12-16
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	2021-12-17	2022-12-16
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	2021-11-01	2022-10-31
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
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	2021-12-17	2022-12-16
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	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
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	2021-11-01	2022-10-31



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MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2021-11-01	2022-10-31
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
Notch Filter (5150-5880)	Mico-Tronics	BRM50716	EMC2168	2021-07-29	2022-07-28
Horn Antenna(14-40GHz)	SCHWARZBECK	BBHA 9170	EMC2041	2020-06-28	2023-06-27
Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	EMC2172	2021-08-30	2022-08-29

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
				2021-12-26	2023-12-25
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	2021-12-17	2022-12-16
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-12-17	2022-12-16
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	2021-11-01	2022-10-31
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



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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 2dBi.

Antenna location: Refer to Internal photos



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7 Radio Spectrum Matter Test Results

7.1 20dB Bandwidth

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

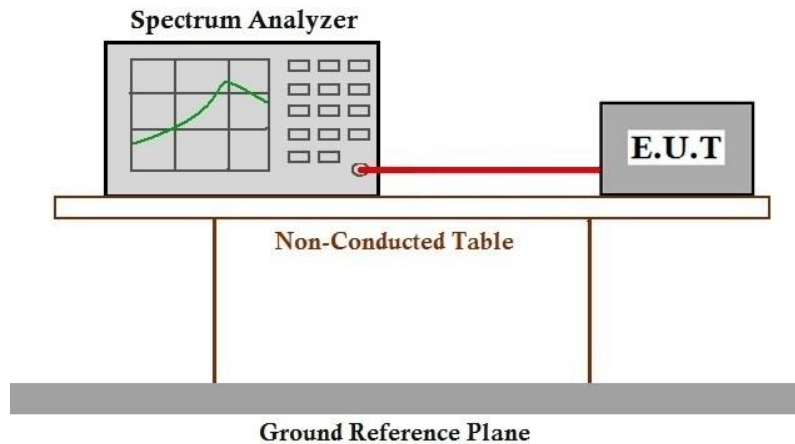
7.1.1 E.U.T. Operation

Operating Environment:
Temperature: 23.1 °C Humidity: 54.9 % 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

Test channel	20dB bandwidth (MHz)	Results
Lowest	9.169	Pass
Middle	8.310	Pass
Highest	4.871	Pass



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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

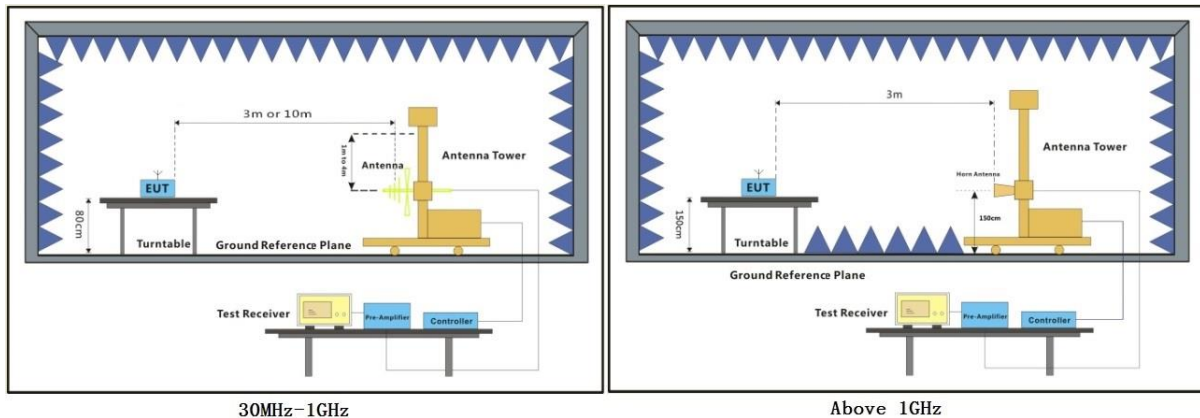
Operating Environment:

Temperature: 22.5 °C Humidity: 55.2 % RH Atmospheric Pressure: 1003 mbar

7.2.2 Test Mode Description

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

7.2.3 Test Setup Diagram



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

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

Average value calculation method:

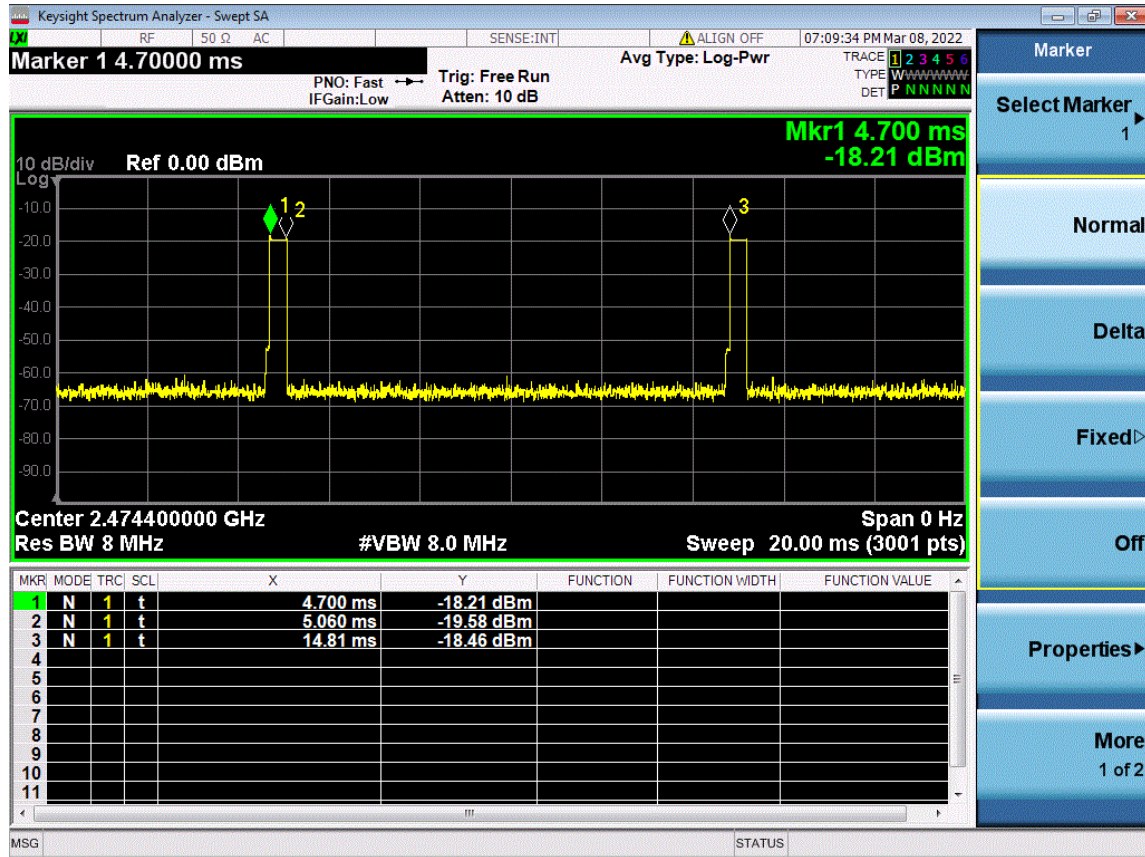
Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20 log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	Ton time =0.36ms
	T period =10.11ms
	Duty cycle=3.56%
	PDCF value= -28.97dB



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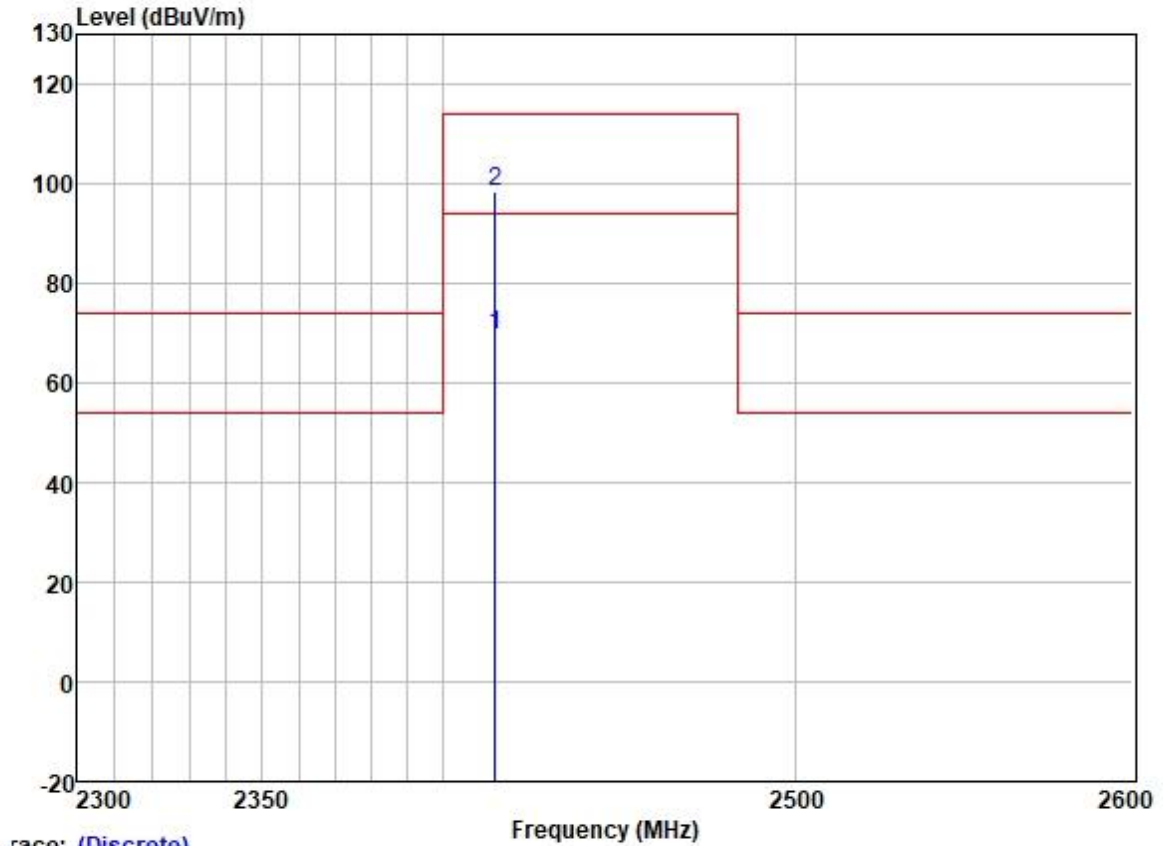
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



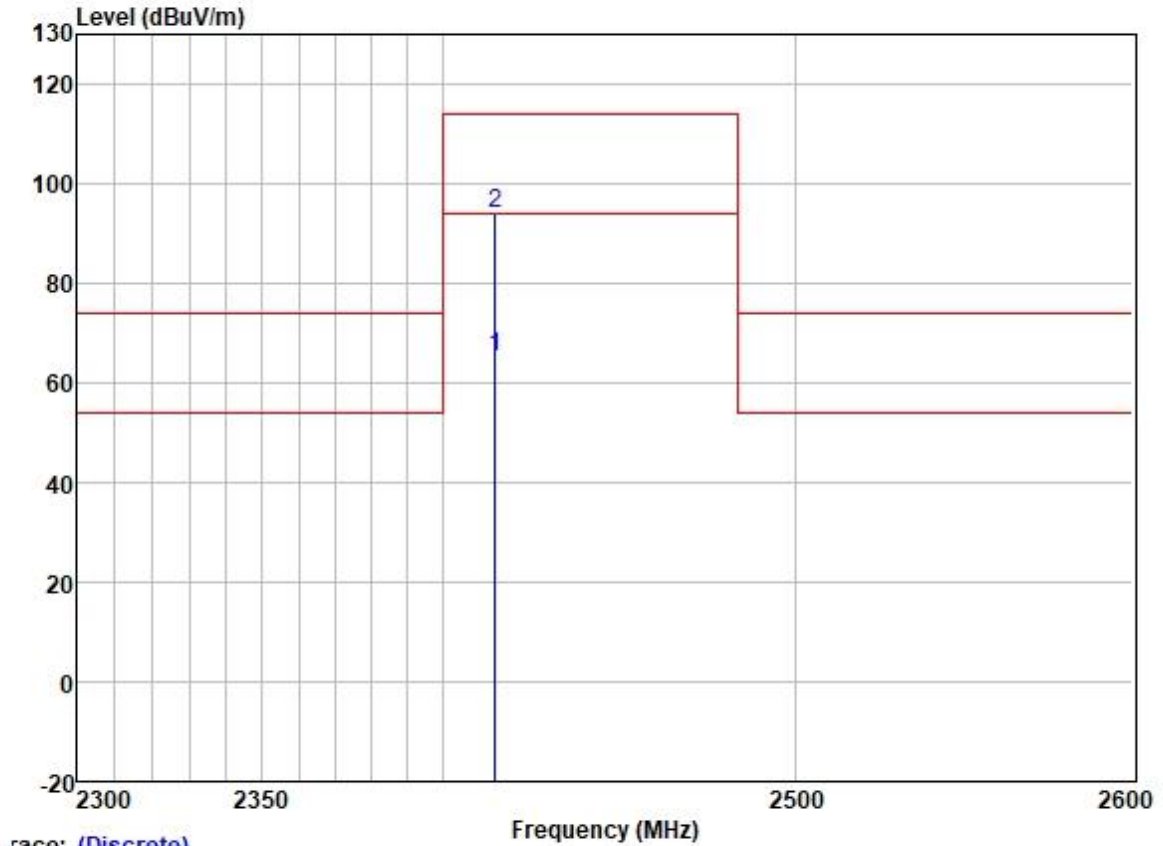
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Limit Level	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	2414.400	76.26	27.38	3.47	37.58	69.53	94.00	-24.47 HORIZONTAL Average
2	2414.400	105.23	27.38	3.47	37.58	98.50	114.00	-15.50 HORIZONTAL Peak



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



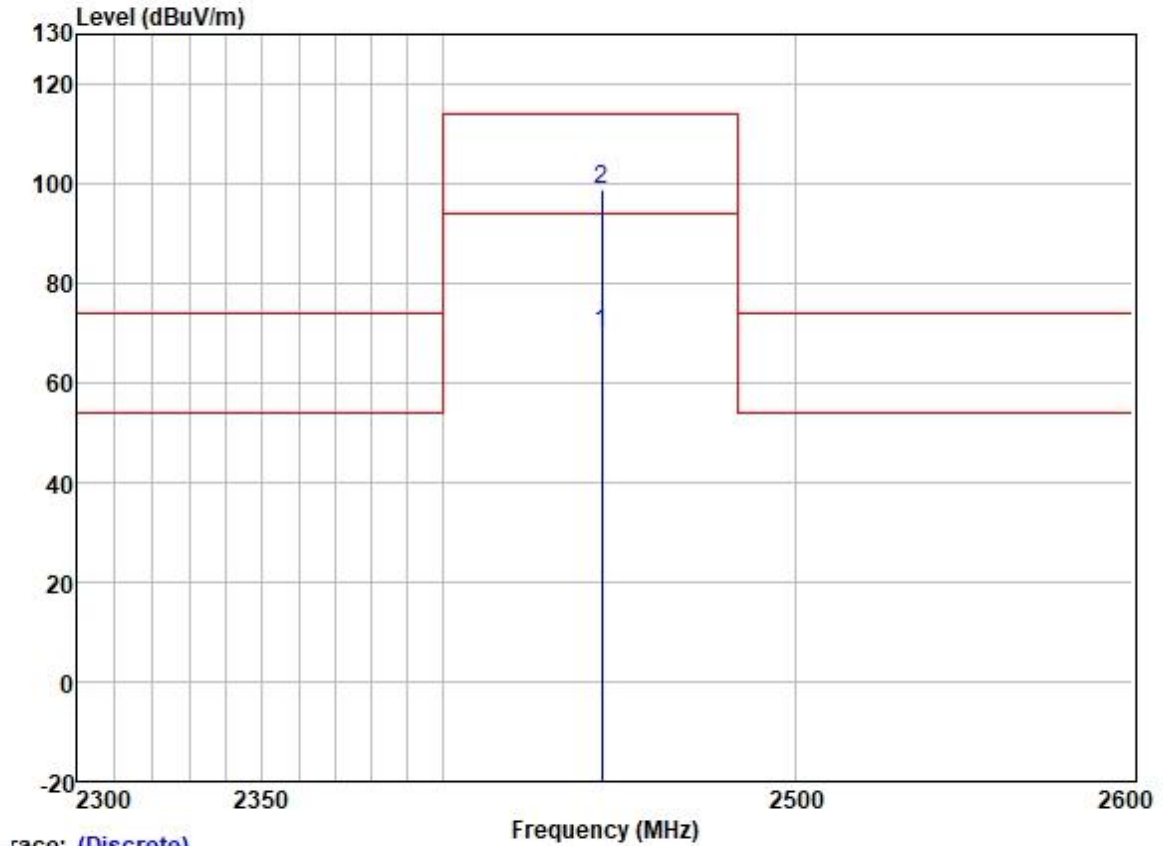
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Limit Level	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	2414.400	71.91	27.38	3.47	37.58	65.18	94.00	-28.82 VERTICAL Average
2	2414.400	100.88	27.38	3.47	37.58	94.15	114.00	-19.85 VERTICAL Peak



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



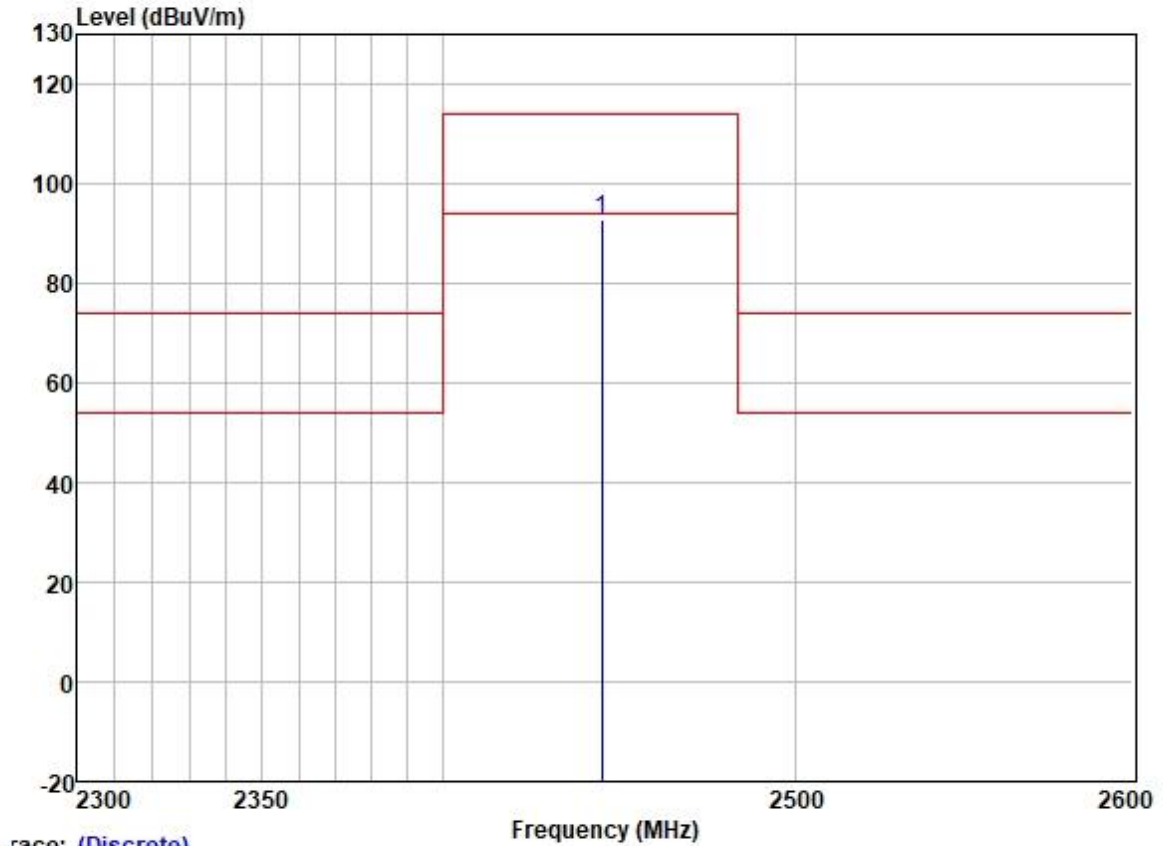
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Limit Level	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	2444.400	76.59	27.42	3.40	37.58	69.83	94.00	-24.17 HORIZONTAL Average
2	2444.400	105.59	27.42	3.40	37.58	98.83	114.00	-15.17 HORIZONTAL Peak



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



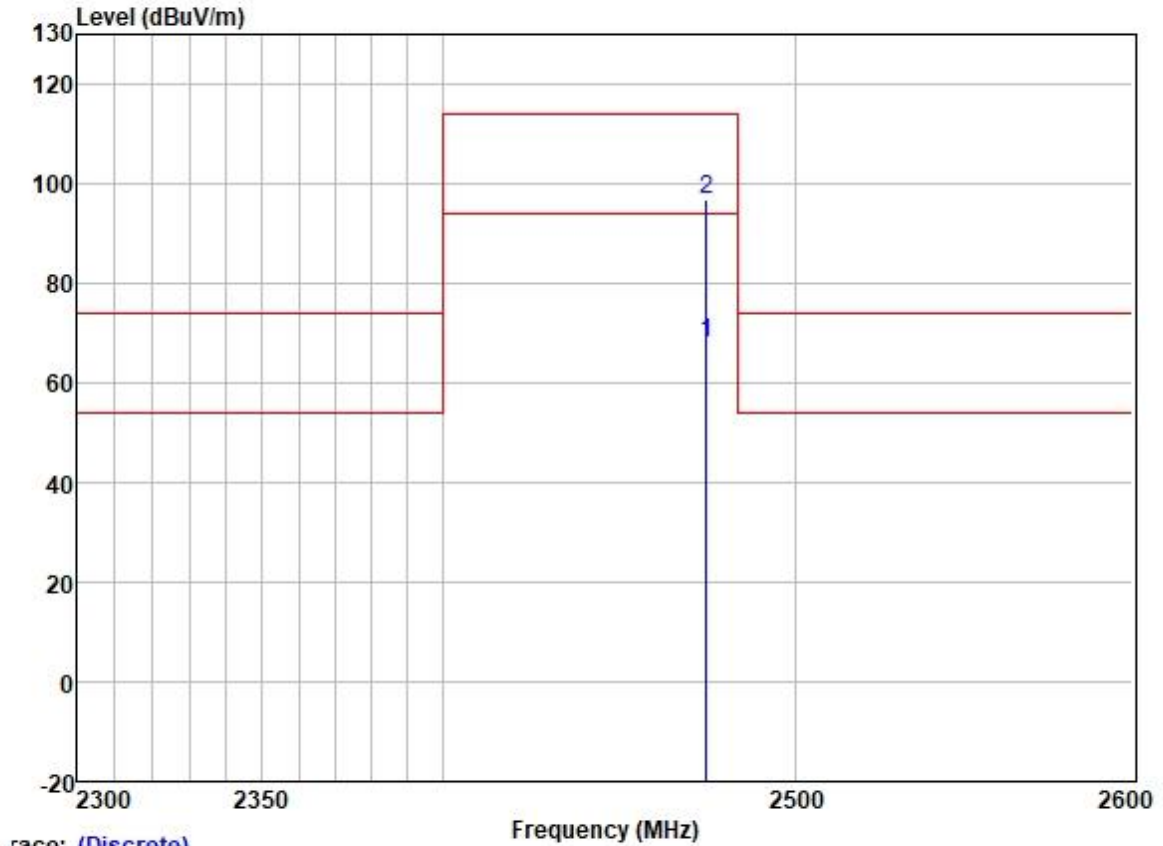
Trace: (Discrete)

	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	2444.400	99.40	27.42	3.40	37.58	92.64	114.00	-21.36	VERTICAL	Peak



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



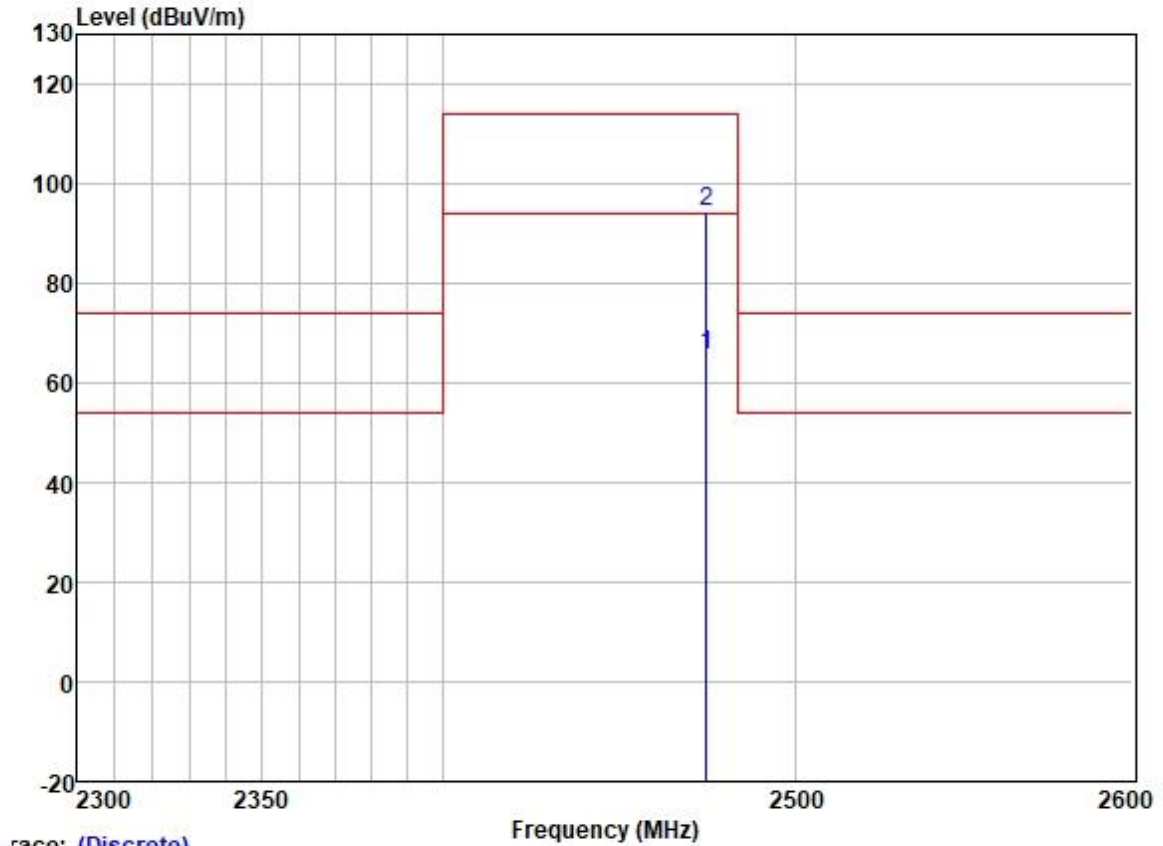
Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Preamp Factor	Limit Level	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	2474.400	74.49	27.46	3.55	37.57	67.93	94.00	-26.07	HORIZONTAL Average
2	2474.400	103.47	27.46	3.55	37.57	67.93	114.00	-17.09	HORIZONTAL Peak



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



Trace: (Discrete)

	Read Freq	Antenna Level	Cable Factor	Preamp Loss	Level	Limit	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB		
1	2474.400	72.02	27.46	3.55	37.57	94.00	-28.54	VERTICAL	Average
2	2474.400	100.99	27.46	3.55	37.57	94.43	-19.57	VERTICAL	Peak



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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.

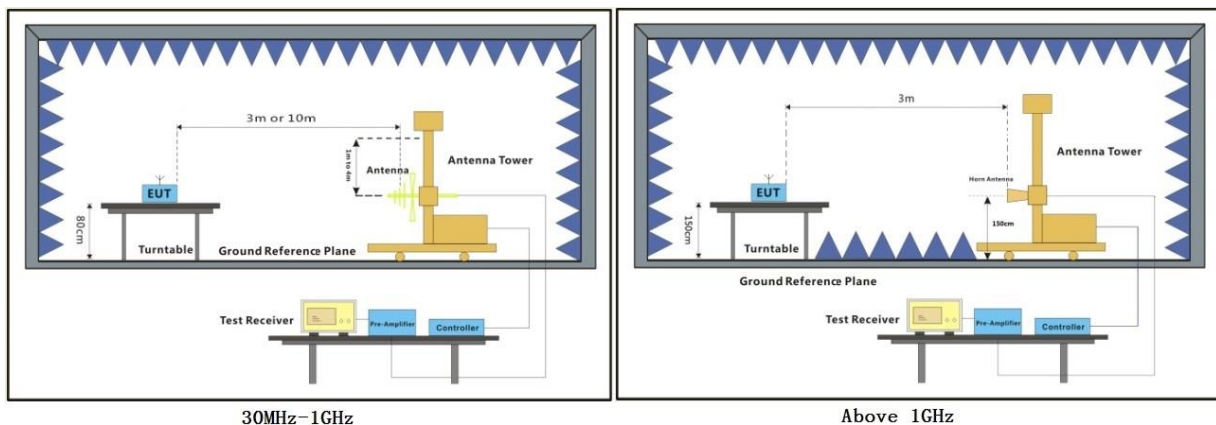
7.3.1 E.U.T. Operation

Operating Environment:
 Temperature: 23.1 °C Humidity: 54.9 % 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



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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 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.

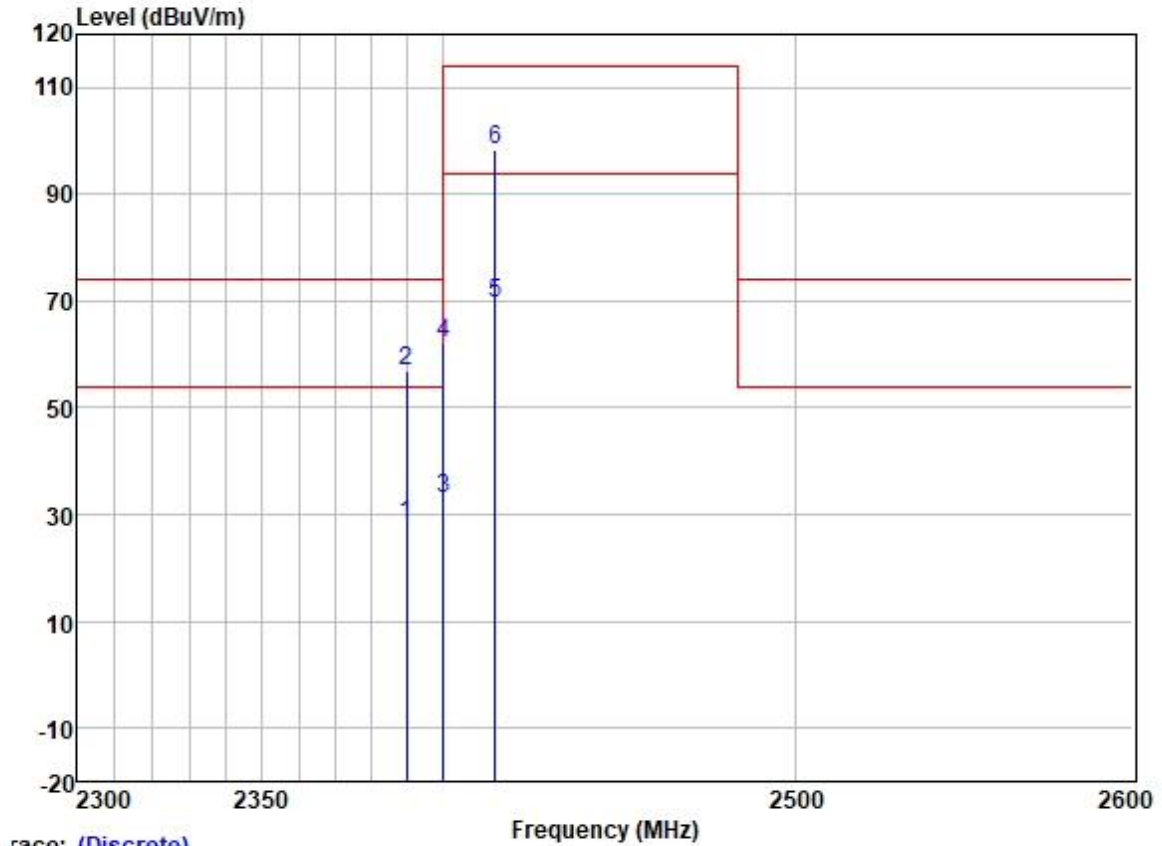
Average value calculation method please refer to clause 7.2.4



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



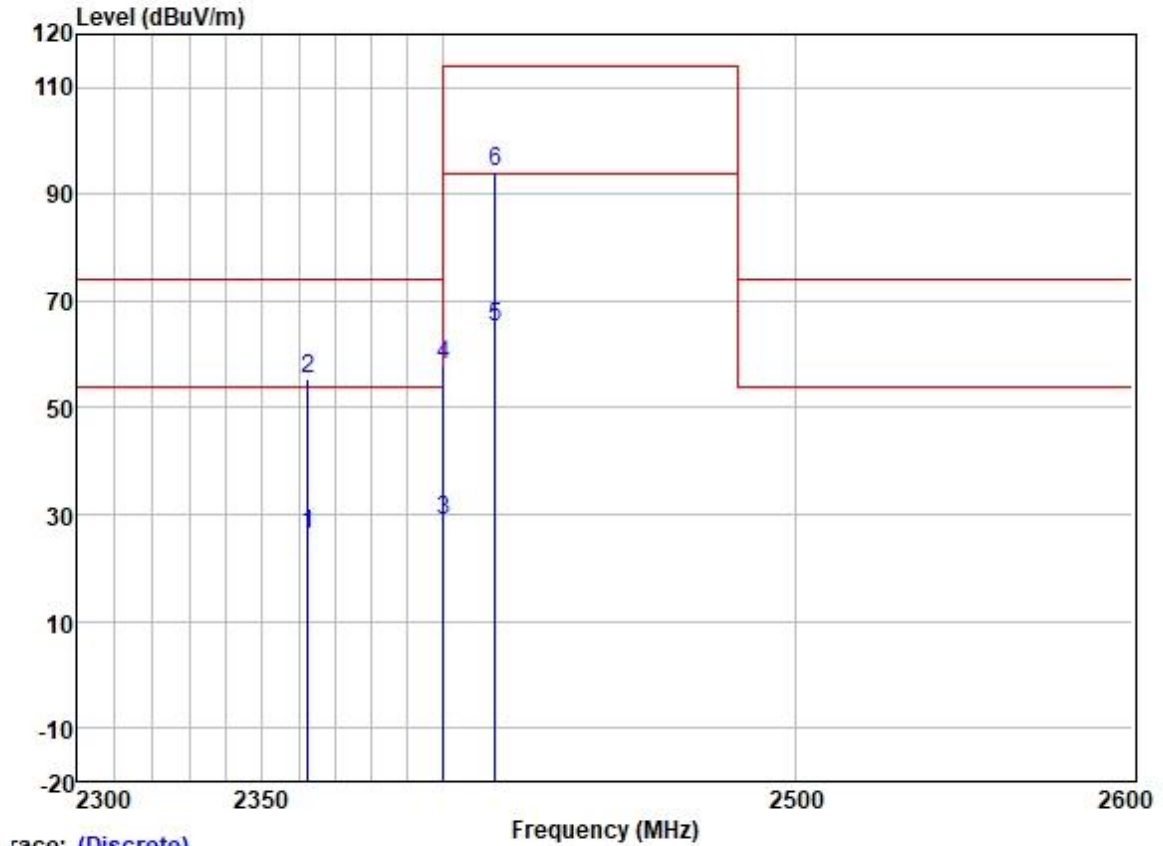
Trace: (Discrete)

	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	2389.665	34.82	27.33	3.48	37.59	28.04	54.00	-25.96	HORIZONTAL	Average
2	2389.665	63.78	27.33	3.48	37.59	57.00	74.00	-17.00	HORIZONTAL	Peak
3	2400.000	39.91	27.35	3.50	37.59	33.17	54.00	-20.83	HORIZONTAL	Average
4	2400.000	68.89	27.35	3.50	37.59	62.15	74.00	-11.85	HORIZONTAL	Peak
5	2414.400	76.26	27.38	3.47	37.58	69.53	94.00	-24.47	HORIZONTAL	Average
6	2414.400	105.23	27.38	3.47	37.58	98.50	114.00	-15.50	HORIZONTAL	Peak



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



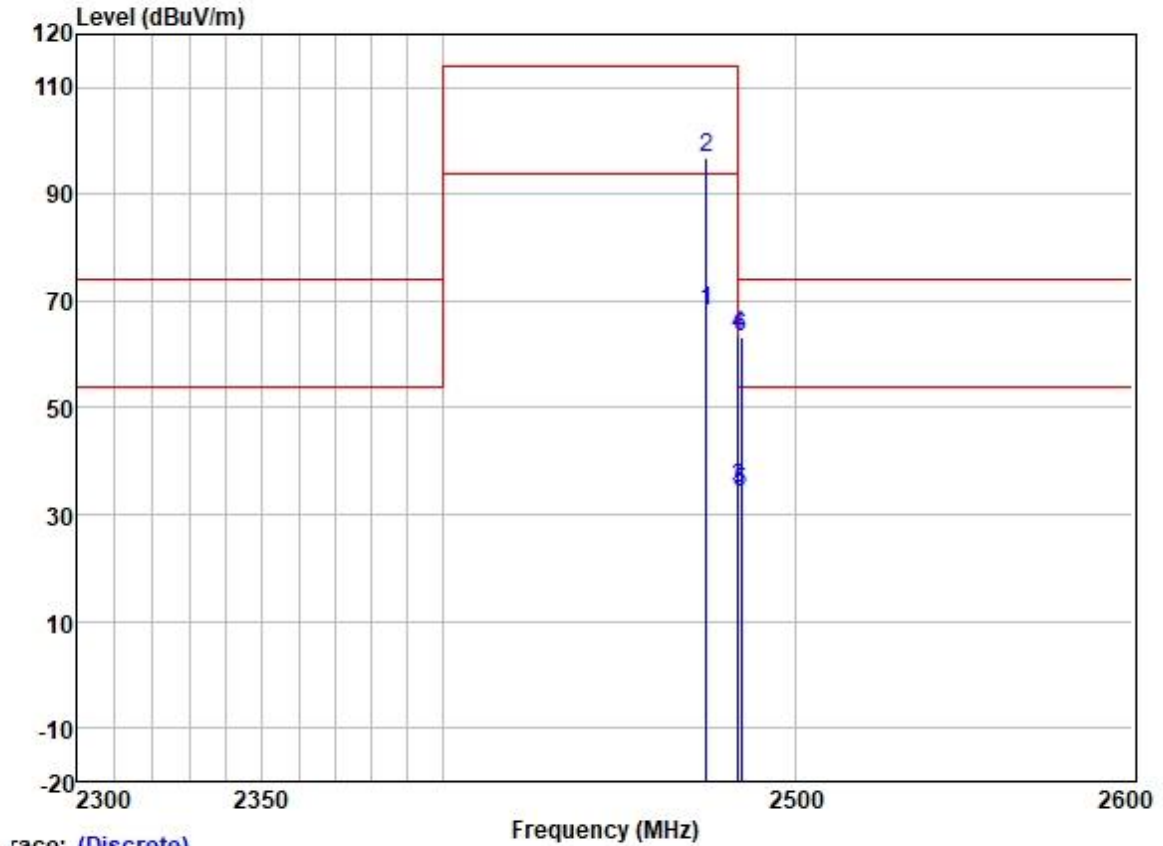
Trace: (Discrete)

	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	2362.539	33.34	27.27	3.42	37.60	26.43	54.00	-27.57	VERTICAL	Average
2	2362.539	62.31	27.27	3.42	37.60	55.40	74.00	-18.60	VERTICAL	Peak
3	2400.000	35.63	27.35	3.50	37.59	28.89	54.00	-25.11	VERTICAL	Average
4	2400.000	64.61	27.35	3.50	37.59	57.87	74.00	-16.13	VERTICAL	Peak
5	2414.400	71.91	27.38	3.47	37.58	65.18	94.00	-28.82	VERTICAL	Average
6	2414.400	100.88	27.38	3.47	37.58	94.15	114.00	-19.85	VERTICAL	Peak



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



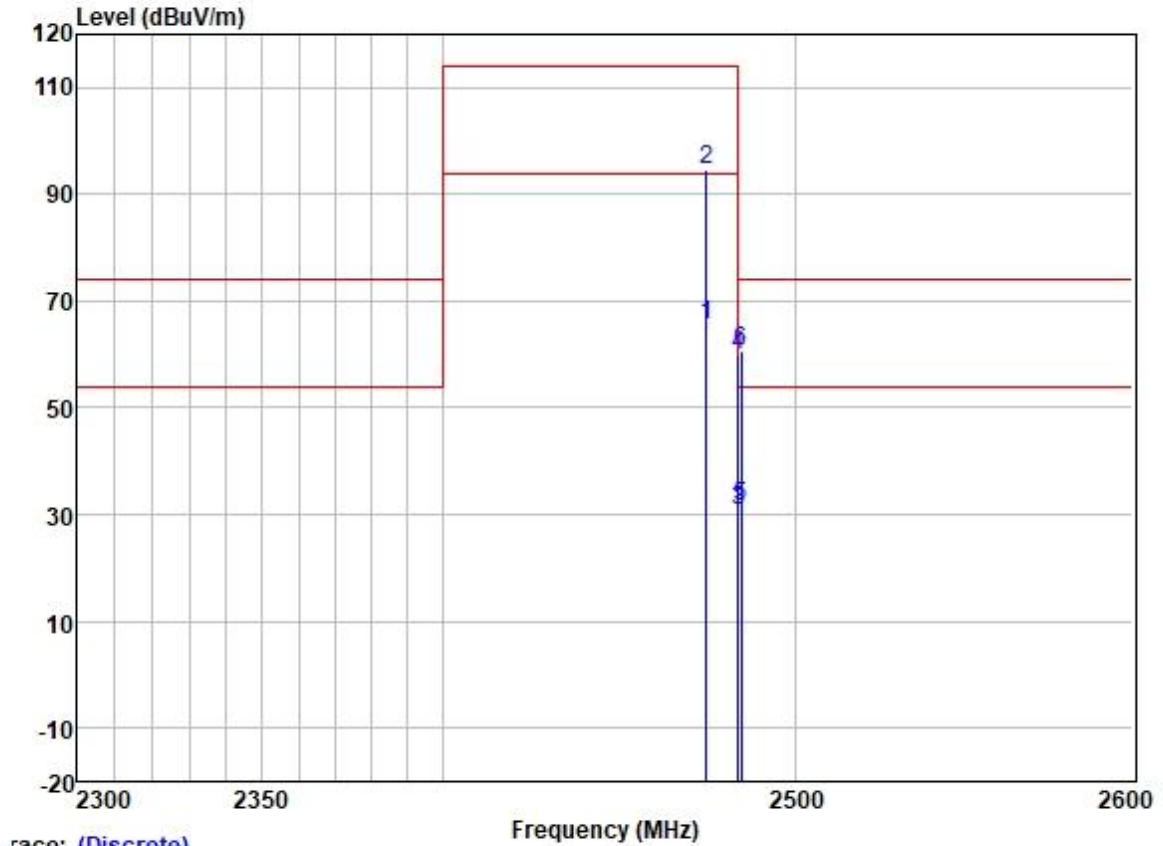
Trace: (Discrete)

	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	2474.400	74.49	27.46	3.55	37.57	67.93	94.00	-26.07	HORIZONTAL	Average
2	2474.400	103.47	27.46	3.55	37.57	96.91	114.00	-17.09	HORIZONTAL	Peak
3	2483.500	41.31	27.48	3.53	37.57	34.75	54.00	-19.25	HORIZONTAL	Average
4	2483.500	70.29	27.48	3.53	37.57	63.73	74.00	-10.27	HORIZONTAL	Peak
5	2484.259	40.66	27.48	3.53	37.57	34.10	54.00	-19.90	HORIZONTAL	Average
6	2484.259	69.64	27.48	3.53	37.57	63.08	74.00	-10.92	HORIZONTAL	Peak



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



Trace: (Discrete)

	Read Freq	Antenna Level	Antenna Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	2474.400	72.02	27.46	3.55	37.57	65.46	94.00	-28.54	VERTICAL	Average
2	2474.400	100.99	27.46	3.55	37.57	94.43	114.00	-19.57	VERTICAL	Peak
3	2483.500	37.41	27.48	3.53	37.57	30.85	54.00	-23.15	VERTICAL	Average
4	2483.500	66.39	27.48	3.53	37.57	59.83	74.00	-14.17	VERTICAL	Peak
5	2484.434	38.14	27.48	3.53	37.57	31.58	54.00	-22.42	VERTICAL	Average
6	2484.434	67.12	27.48	3.53	37.57	60.56	74.00	-13.44	VERTICAL	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
 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

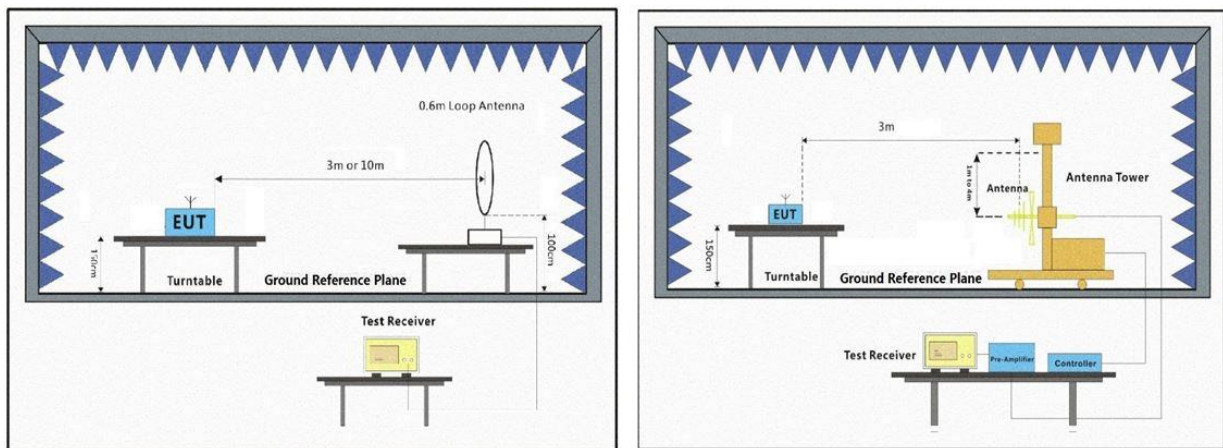
7.4.1 E.U.T. Operation

Operating Environment:
 Temperature: 23.5 °C Humidity: 54.4 % RH Atmospheric Pressure: 1003 mbar

7.4.2 Test Mode Description

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

7.4.3 Test Setup Diagram



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7.4.4 Measurement Procedure and Data

- a. 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:

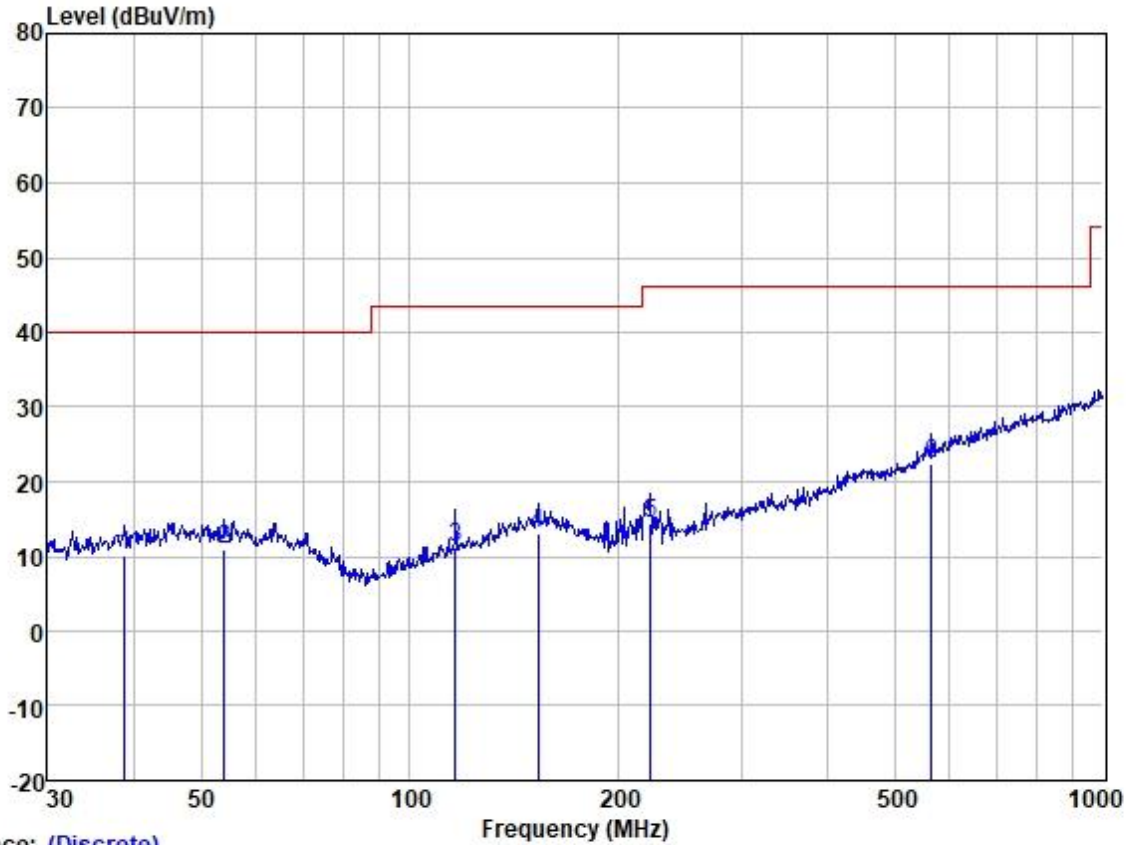
- 1) Through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.
- 2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Final Test Level = Receiver Reading + 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.



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



Trace: (Discrete)

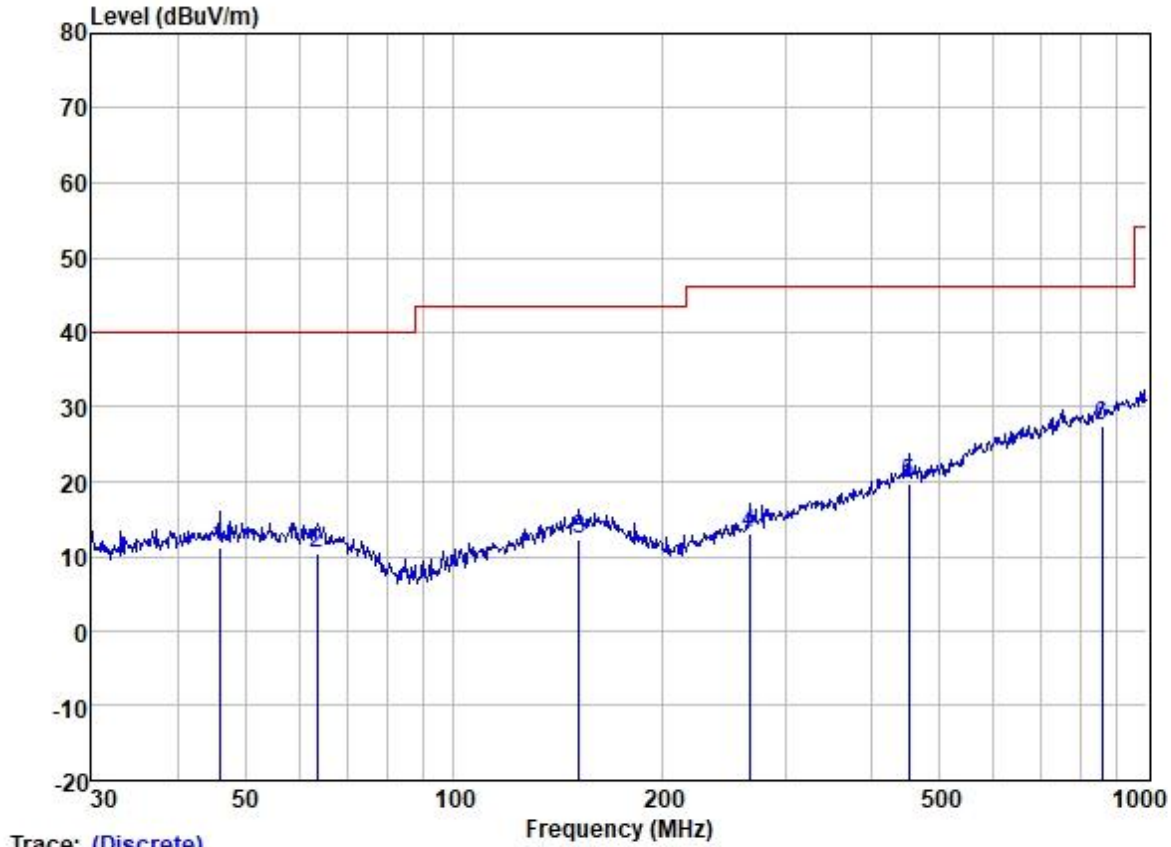
Site : SGS
Job :
Model :
Power :
Test Mode :

	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	dB		
1	38.752	23.27	12.96	1.09	27.18	10.14	40.00	-29.86	HORIZONTAL	QP
2	53.882	23.27	13.70	1.18	27.17	10.98	40.00	-29.02	HORIZONTAL	QP
3	116.132	25.66	10.73	1.84	27.04	11.19	43.50	-32.31	HORIZONTAL	QP
4	153.200	24.24	13.47	2.28	26.82	13.17	43.50	-30.33	HORIZONTAL	QP
5	222.170	28.52	9.78	2.67	26.70	14.27	46.00	-31.73	HORIZONTAL	QP
6	564.639	27.04	18.56	4.93	28.15	22.38	46.00	-23.62	HORIZONTAL	QP



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



Trace: (Discrete)

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	dB		
1	45.855	23.46	13.69	1.13	27.17	11.11	40.00	-28.89	VERTICAL	QP
2	63.536	22.79	13.49	1.32	27.15	10.45	40.00	-29.55	VERTICAL	QP
3	151.597	23.29	13.49	2.26	26.83	12.21	43.50	-31.29	VERTICAL	QP
4	266.609	24.47	12.19	3.02	26.58	13.10	46.00	-32.90	VERTICAL	QP
5	452.720	26.10	17.10	4.22	27.72	19.70	46.00	-26.30	VERTICAL	QP
6	860.035	26.05	22.60	6.63	27.91	27.37	46.00	-18.63	VERTICAL	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)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
Above 1000	500	54.0	AV	3

7.5.1 E.U.T. Operation

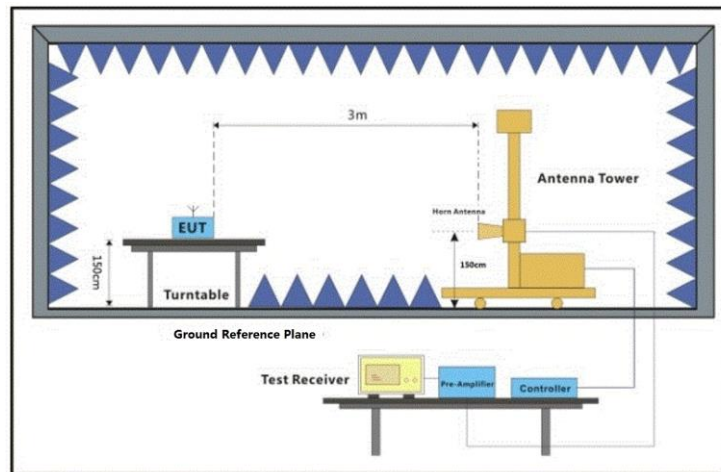
Operating Environment:

Temperature: 23.1 °C Humidity: 54.9 % RH Atmospheric Pressure: 1003 mbar

7.5.2 Test Mode Description

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

7.5.3 Test Setup Diagram



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7.5.4 Measurement Procedure and Data

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

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
 Final Test Level = Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor
- 2) Scan from 1GHz to 25GHz, the disturbance above 18GHz was very low. The points marked on above plots are the highest emissions could be found when testing, so only above points had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.
- 3) The field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.

Average value calculation method please refer to clause 7.2.4

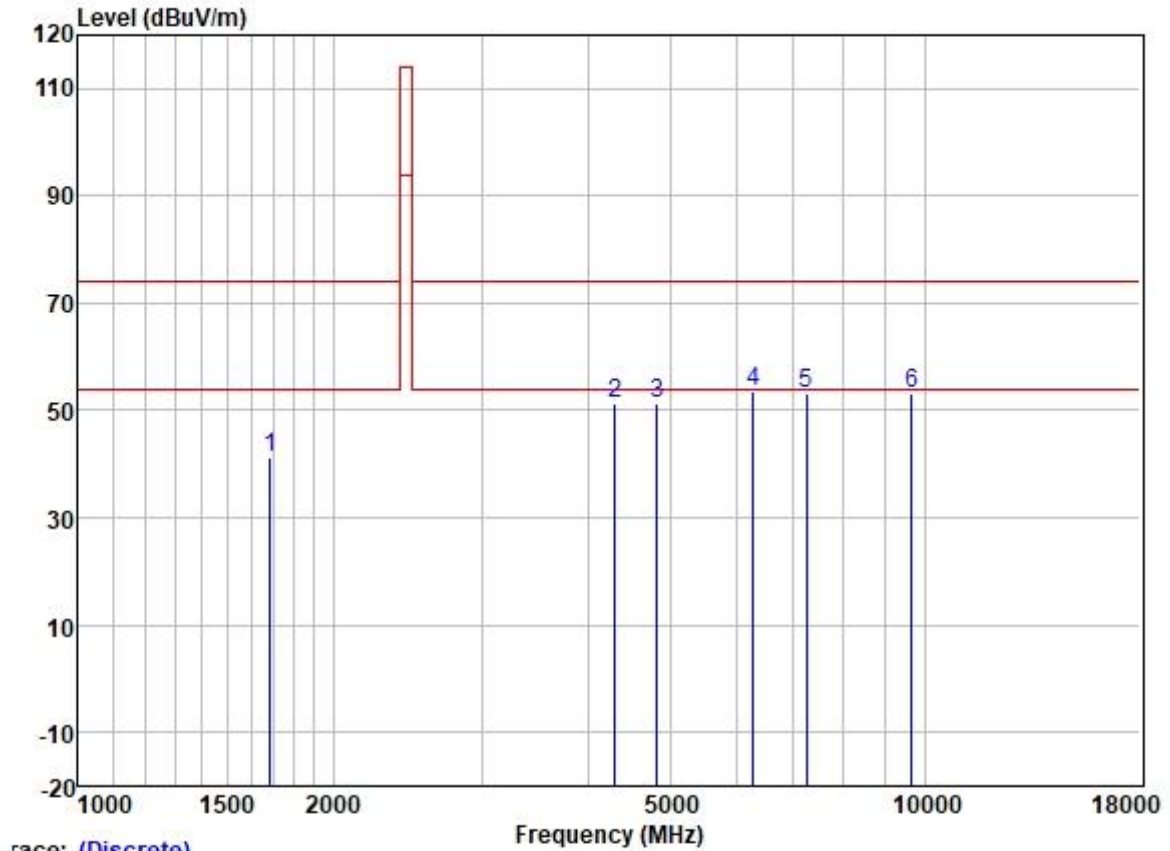


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 Guangzhou Branch Testing Services EEC Laboratory. 中国·广州·经济技术开发区科学城科珠路198号 邮编: 510663 t (86-20) 82155555 f (86-20) 82075058 sgs.china@sgs.com

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



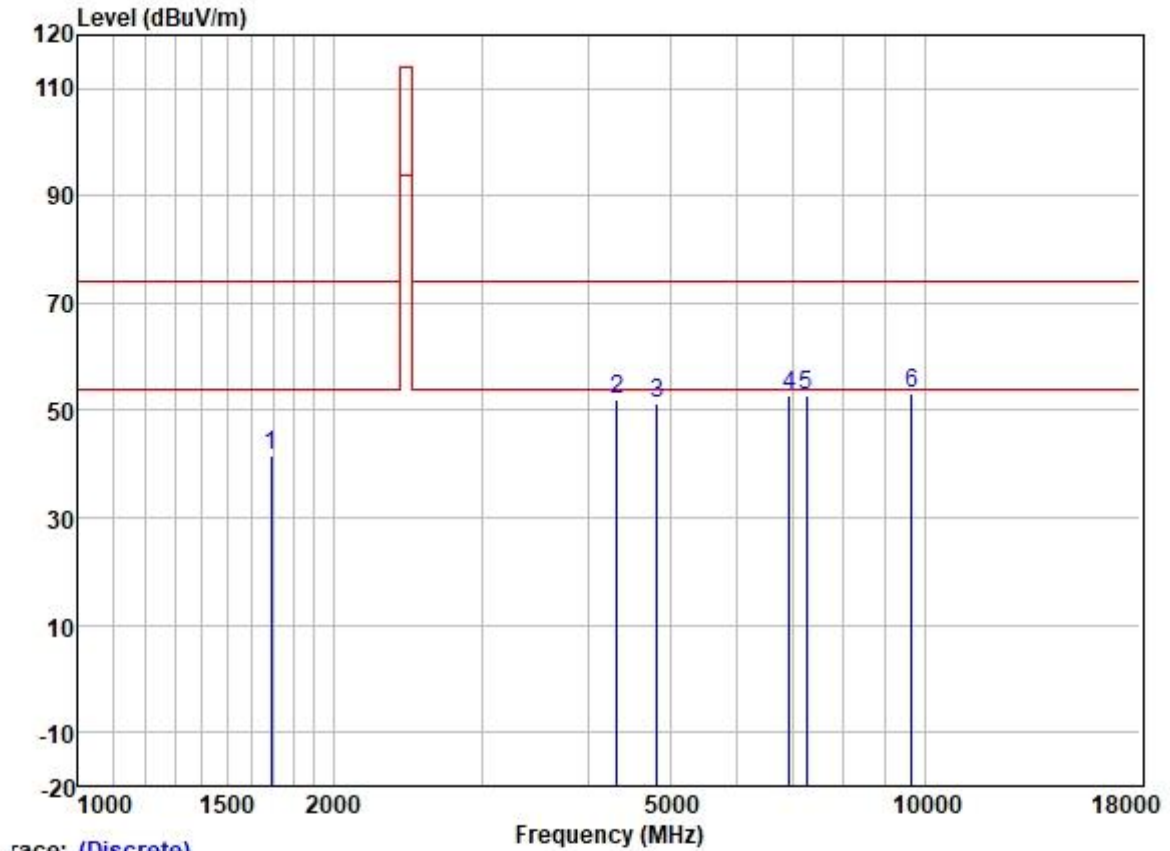
Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over				
Freq	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark		
MHz	dBuV	dB/m	dB	dB	dBuV/m	dB			
1	1687.347	50.58	25.69	2.80	37.91	41.16	74.00	-32.84	HORIZONTAL Peak
2	4304.400	52.87	30.48	4.65	36.81	51.19	74.00	-22.81	HORIZONTAL Peak
3	4828.800	51.11	31.47	5.44	36.83	51.19	74.00	-22.81	HORIZONTAL Peak
4	6267.553	51.16	33.29	6.00	36.95	53.50	74.00	-20.50	HORIZONTAL Peak
5	7243.200	48.83	35.70	6.03	37.40	53.16	74.00	-20.84	HORIZONTAL Peak
6	9657.600	44.99	38.42	7.05	37.42	53.04	74.00	-20.96	HORIZONTAL Peak



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



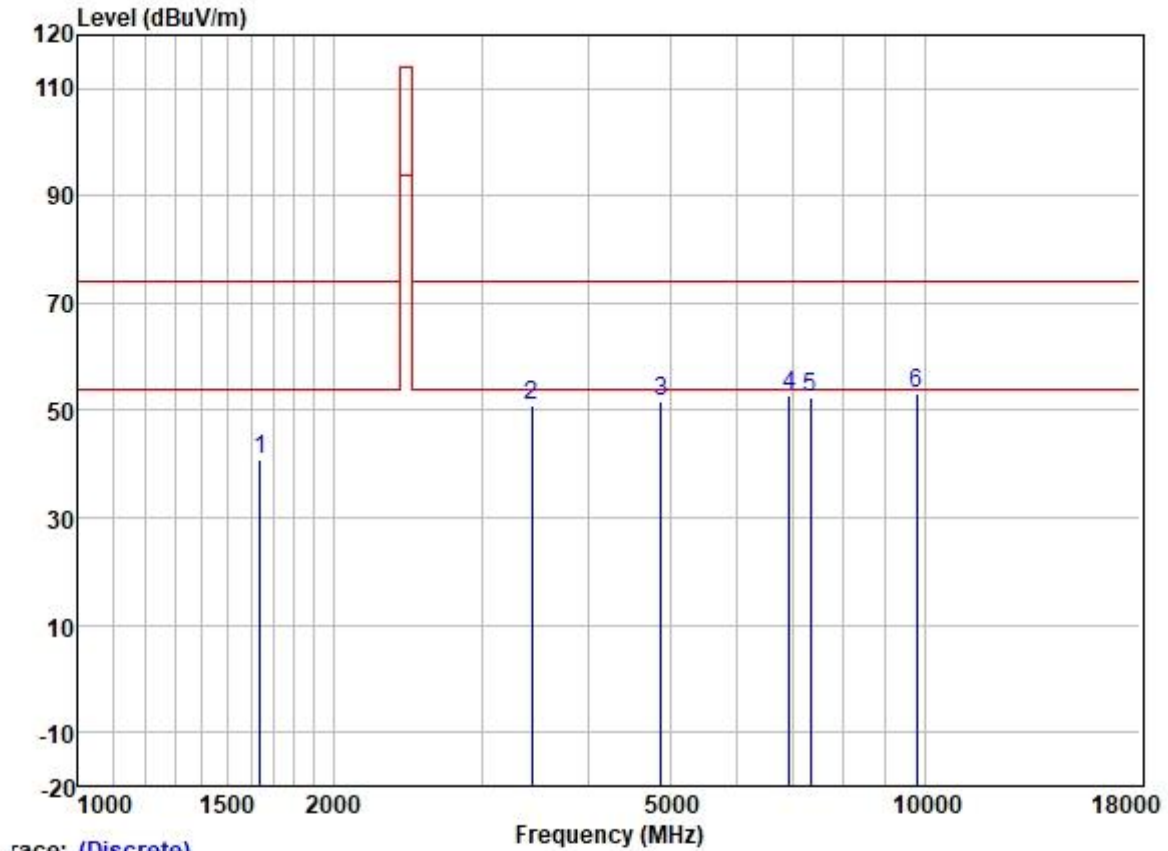
Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over					
Freq	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark			
MHz	dBuV	dB/m	dB	dB	dBuV/m	dB				
1	1692.231	51.14	25.70	2.80	37.89	41.75	74.00	-32.25	VERTICAL	Peak
2	4329.354	53.47	30.54	4.67	36.81	51.87	74.00	-22.13	VERTICAL	Peak
3	4828.800	51.25	31.47	5.44	36.83	51.33	74.00	-22.67	VERTICAL	Peak
4	6914.763	49.13	34.89	5.81	37.19	52.64	74.00	-21.36	VERTICAL	Peak
5	7243.200	48.65	35.70	6.03	37.40	52.98	74.00	-21.02	VERTICAL	Peak
6	9657.600	45.11	38.42	7.05	37.42	53.16	74.00	-20.84	VERTICAL	Peak



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



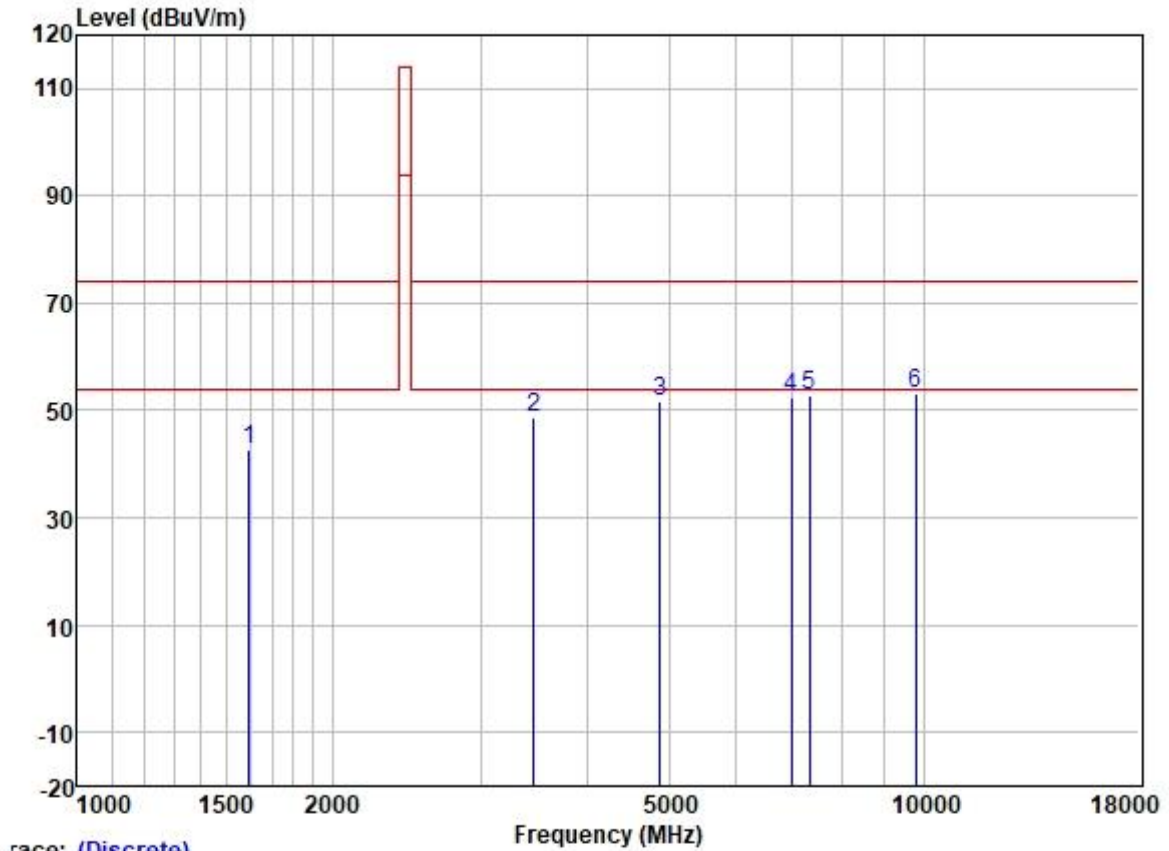
Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over				
Freq	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark		
MHz	dBuV	dB/m	dB	dB	dBuV/m	dB			
1	1639.274	50.38	25.62	2.80	37.93	40.87	74.00	-33.13	HORIZONTAL Peak
2	3435.590	54.77	28.87	4.16	36.97	50.83	74.00	-23.17	HORIZONTAL Peak
3	4888.800	51.60	31.56	5.52	36.84	51.84	74.00	-22.16	HORIZONTAL Peak
4	6914.763	49.42	34.89	5.81	37.19	52.93	74.00	-21.07	HORIZONTAL Peak
5	7333.200	47.78	36.00	6.13	37.43	52.48	74.00	-21.52	HORIZONTAL Peak
6	9777.600	45.17	38.53	7.01	37.41	53.30	74.00	-20.70	HORIZONTAL Peak



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



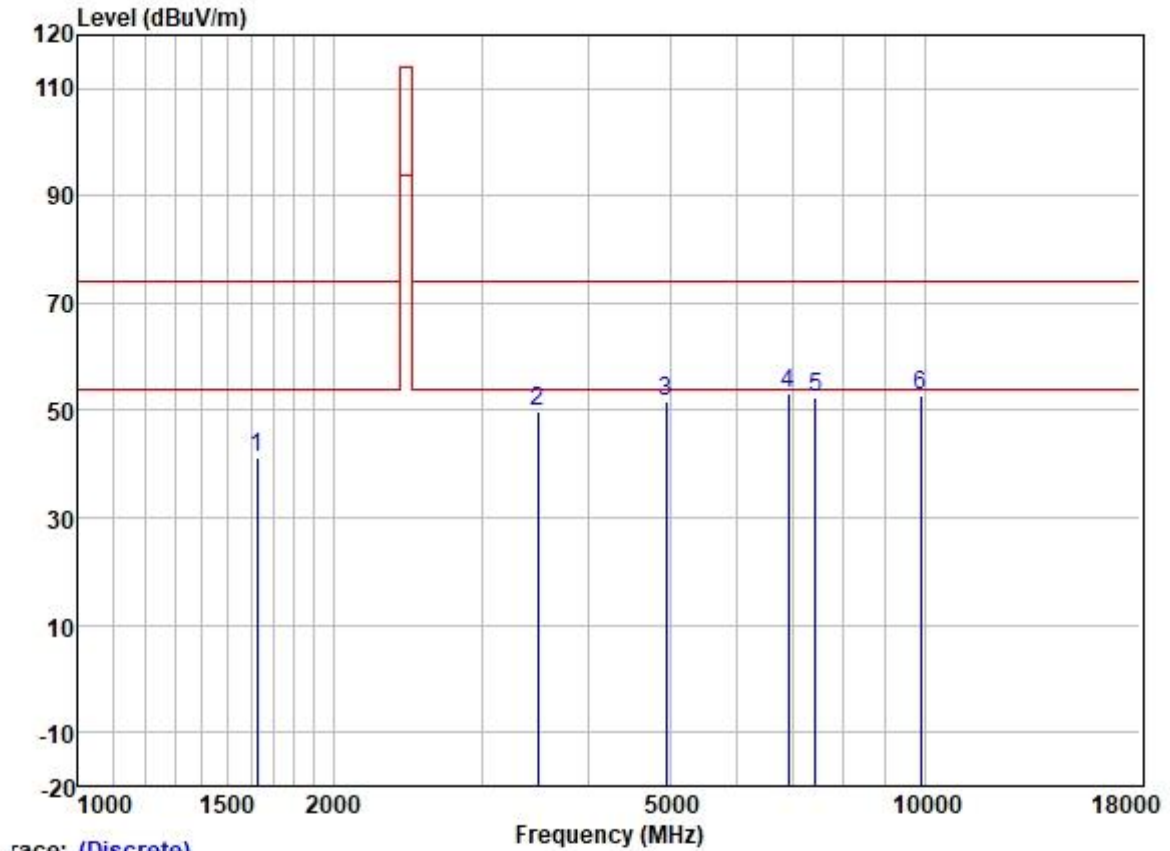
Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over					
Freq	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark			
MHz	dBuV	dB/m	dB	dB	dBuV/m	dB				
1	1597.181	52.47	25.58	2.80	37.98	42.87	74.00	-31.13	VERTICAL	Peak
2	3465.510	52.69	28.88	4.22	36.95	48.84	74.00	-25.16	VERTICAL	Peak
3	4888.800	51.49	31.56	5.52	36.84	51.73	74.00	-22.27	VERTICAL	Peak
4	6974.982	48.79	34.97	5.81	37.23	52.34	74.00	-21.66	VERTICAL	Peak
5	7333.200	48.16	36.00	6.13	37.43	52.86	74.00	-21.14	VERTICAL	Peak
6	9777.600	45.03	38.53	7.01	37.41	53.16	74.00	-20.84	VERTICAL	Peak



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



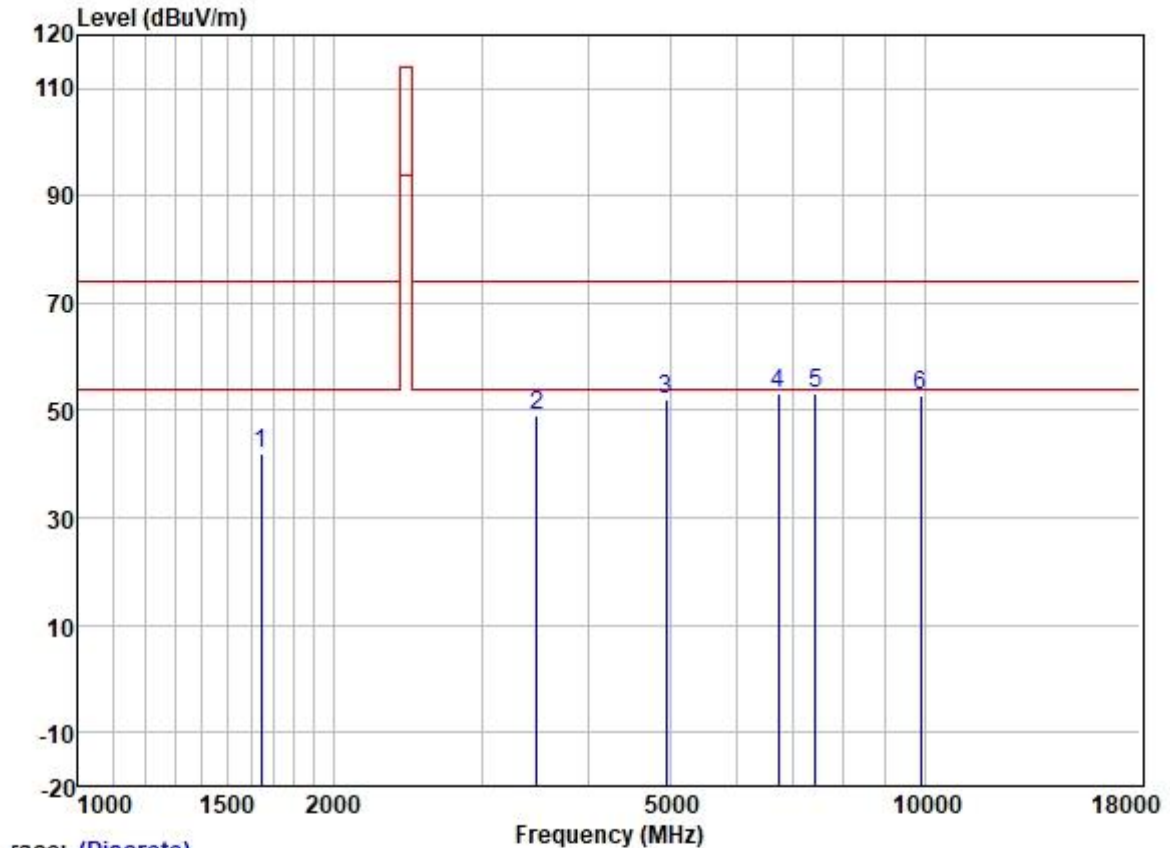
Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over				
Freq	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark		
MHz	dBuV	dB/m	dB	dB	dBuV/m	dB			
1	1625.121	50.81	25.61	2.80	37.95	41.27	74.00	-32.73	HORIZONTAL Peak
2	3495.691	53.68	28.90	4.30	36.94	49.94	74.00	-24.06	HORIZONTAL Peak
3	4948.800	51.10	31.64	5.62	36.84	51.52	74.00	-22.48	HORIZONTAL Peak
4	6894.806	49.63	34.85	5.81	37.18	53.11	74.00	-20.89	HORIZONTAL Peak
5	7423.200	47.54	36.27	6.22	37.47	52.56	74.00	-21.44	HORIZONTAL Peak
6	9897.600	44.63	38.63	6.97	37.41	52.82	74.00	-21.18	HORIZONTAL Peak



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



Trace: (Discrete)

	ReadAntenna	Cable	Preamp	Limit	Over					
Freq	Level	Loss	Factor	Line	Limit	Pol/Phase	Remark			
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	1644.019	51.59	25.63	2.80	37.93	42.09	74.00	-31.91	VERTICAL	Peak
2	3485.601	52.98	28.89	4.27	36.95	49.19	74.00	-24.81	VERTICAL	Peak
3	4948.800	51.56	31.64	5.62	36.84	51.98	74.00	-22.02	VERTICAL	Peak
4	6717.762	50.07	34.44	5.83	37.09	53.25	74.00	-20.75	VERTICAL	Peak
5	7423.200	48.28	36.27	6.22	37.47	53.30	74.00	-20.70	VERTICAL	Peak
6	9897.600	44.66	38.63	6.97	37.41	52.85	74.00	-21.15	VERTICAL	Peak



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8 Test Setup Photo

Refer to Appendix – Test Setup Photos for GZCR2202000193AT.

9 EUT Constructional Details (EUT Photos)

Refer to Appendix – External and Internal Photos for GZCR2202000193AT

- End of the Report -



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