



## TEST REPORT

Application No.:	GZCR2206000783AT
Applicant:	Bose Corporation
Address of Applicant:	100 The Mountain Rd, Framingham, Massachusetts, 01701 United States
Manufacturer:	Bose Corporation
Address of Manufacturer:	The Mountain Rd, Framingham, MA 01701, USA
Equipment Under Test (EUT):	
EUT Name:	2.4GHz Wireless Module
Model No.:	469T
Standard(s) :	47 CFR Part 15, Subpart C 15.247
Date of Receipt:	2022-04-15
Date of Test:	2022-04-25 to 2022-07-06
Date of Issue:	2022-07-06
Test Result:	Pass*

\* 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		2022-07-06		Original

Authorized for issue by			
			
	<b>Curry Wu/Project Engineer</b>		
			
	<b>Ricky Liu/Reviewer</b>		

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## 2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Antenna Requirement	47 CFR Part 15, Subpart C 15.247	N/A	47 CFR Part 15, Subpart C 15.203 & 15.247(b)(4)	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.247	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
Conducted Peak Output Power		ANSI C63.10 (2013) Section 11.9.1.3	47 CFR Part 15, Subpart C 15.247(b)(3)	Pass
Minimum 6dB Bandwidth		ANSI C63.10 (2013) Section 11.8.1	47 CFR Part 15, Subpart C 15.247a(2)	Pass
Power Spectrum Density		ANSI C63.10 (2013) Section 11.10.2	47 CFR Part 15, Subpart C 15.247(e)	Pass
Conducted Band Edges Measurement		ANSI C63.10 (2013) Section 11.13.3.2	47 CFR Part 15, Subpart C 15.247(d)	Pass
Conducted Spurious Emissions		ANSI C63.10 (2013) Section 11.11	47 CFR Part 15, Subpart C 15.247(d)	Pass
Radiated Emissions which fall in the restricted bands		ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Below 1GHz)		ANSI C63.10 (2013) Section 6.4,6,5,6,6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Radiated Spurious Emissions (Above 1GHz)		ANSI C63.10 (2013) Section 6.4,6,5,6,6	47 CFR Part 15, Subpart C 15.205 & 15.209	Pass
Duty Cycle		ANSI C63.10 (2013) Section 11.6	KDB 558074 D01 v05r02 section 6	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 3.3V from the mainboard which power by USB port
Operation Frequency:	2403MHz to 2481MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel bandwidth:	1MHz

Configuration for modules

Parts	Source 1	Source 2
PCB	NEW Era	EastSpaceLight
Discrepancy	Different manufacture. (Same PCB layout and PCB specification.)	

Parts	Source 1	Source 2	Source 3
Flash	MXIC-MX25V1006F (128K Byte)	GD-MD25D20 (256K Byte)	GD-GD25D10C (128K Byte)
Spec.	CMOS Serial 1M bit TSSOP 8 2.3V~3.6V	CMOS Serial 256K byte 2.7V TSSOP 8	CMOS Serial 1M bit 2.7V TSSOP 8
Discrepancy	Different manufacture and different flash memory specification.		

Parts	Source 1	Source 2
Crystal	Tai-saw TZ0233A	HOSONIC E3SB16E00000QE
Spec.	16MHz+/-10ppm MD 3.2x2.5	16MHz+/-10ppm SMD 3.2x2.5
Discrepancy	Different manufacture.	

PCB A	L2288SP 0314	EastSpaceLight + GD-MD25D20 (256K Byte) + Tai-Saw + IPEX4
PCB B	L2287SP 0311	New Era + MXIC-MX25V1006F + HOSONIC + IPEX4
PCB C	L19M4SP TX000179	EastSpaceLight + GD-MD25D10C (128K Byte) + Tai-Saw + Chip ANT
PCB D	L19M3SP TX000194	EastSpaceLight + GD-MD25D10C (128K Byte) + Tai-Saw + Chip ANT

Remark: All of above have been evaluated the before test and the worst case record in the report.

SN	ANT Type	Model Name	Max Gain(dBi)
1	IFA	WA-F-LA-03-287	3.1
2	Chip	CH2G4-6022-000D1-01	2.3

### 4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	L480	PF-1N6C3V
Mouse	Lenovo	M-U0025-O	REF. No.:SEA2400

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**4.3 Measurement Uncertainty**

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	±2.76dB
Conducted Peak Output Power	± 0.75dB
Minimum 6dB Bandwidth	± 3%
Power Spectrum Density	± 2.84dB
Conducted Band Edges Measurement	± 0.75dB
Conducted Spurious Emissions	± 0.75dB
Radiated Emissions which fall in the restricted bands	±5.00dB (30MHz-1GHz; 3m); ± 5.12dB (1GHz-6GHz); ± 5.38dB (6GHz-18GHz); ± 5.61dB (18GHz-40GHz)
Radiated Spurious Emissions (Below 1GHz)	±5.00dB (30MHz-1GHz; 3m); ±4.38dB (30MHz-1GHz; 10m);
Radiated Spurious Emissions (Above 1GHz)	± 5.12dB (1GHz-6GHz); ± 5.38dB (6GHz-18GHz); ± 5.61dB (18GHz-40GHz)
Duty Cycle	± 0.37%

Remark:  
The  $U_{lab}$  (lab Uncertainty) is less than  $U_{cispr}$  (CISPR 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:

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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:



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**● NVLAP (Lab Code: 200611-0)**

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**● 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)**

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**● 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, IEC6001 and Rules of procedure IEC6002, and the relevant IEC600 CB-Scheme Operational documents.

## 4.6 Deviation from Standards

None

## 4.7 Abnormalities from Standard Conditions

None

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## 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	2021-12-23	2022-12-22
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
Test Software E3c	Audix	Ver. 5.4.1221b	GZE100-62	N/A	N/A
EMI Test Receiver(9kHz-3.6GHz)	Rohde & Schwarz	ESR3	EMC2221	2022-05-20	2023-05-19

Conducted Peak Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Power Meter (U2021XA_Ch2)	Agilent Technologies	U2021XA_Ch2	SEM009-02	2022-05-16	2023-05-15
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Minimum 6dB 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	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

Power Spectrum Density					
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	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

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**Conducted Band Edges Measurement**

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	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

**Conducted Spurious Emissions**

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	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

**Radiated Emissions which fall in the restricted bands**

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	KMKG-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
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

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## Radiated Spurious Emissions (Below 1GHz)

Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
EMI Test Receiver(10Hz-26.5GHz)	Rohde & Schwarz	ESIB26	EMC0522	2021-12-17	2022-12-16
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	2022-02-22	2025-02-21
Amplifier(9kHz-1.3GHz)	HP	8447F	EMC2065	2022-06-21	2023-06-20
Active Loop Antenna-RED	ETS-Lindgren	6502	EMC2190	2022-04-06	2024-04-05
High Pass Filter (915MHz)	FSY MICROWAVE	HM1465-9SS	EMC2079	2021-12-17	2022-12-16
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	2022-05-20	2023-05-19

## Radiated Spurious Emissions (Above 1GHz)

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
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

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<b>Duty Cycle</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
EXA Signal Analyzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2021-09-16	2022-09-15
6dB Attenuator	HP	8491A	EMC2062	2022-03-29	2023-03-28
MI CABLE	SGS-EMC	0.8M	EMC2136	2021-11-01	2023-11-01
Test Software	TST	V2.0	GZE100-78	N/A	N/A

<b>General used equipment</b>					
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Inventory No</b>	<b>Cal Date</b>	<b>Cal Due Date</b>
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 & 15.247(b)(4)

#### 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 shall be considered sufficient to comply with the provisions of this section. 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of 15.211, 15.213, 15.217, 15.219, 15.221, or 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

##### EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antennas is 3.1dBi.

Antenna location: Refer to internal photo.

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## 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(dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

### 7.1.1 E.U.T. Operation

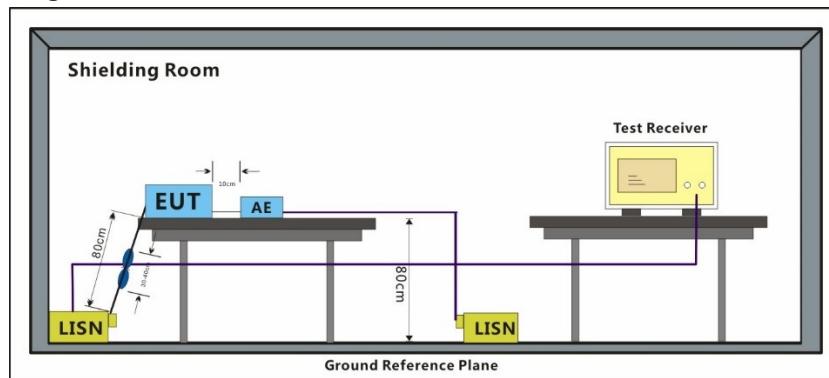
## Operating Environment:

Temperature: 23.8 °C      Humidity: 53.2 % RH      Atmospheric Pressure: 1003 mbars

### 7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Pre-scan	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B

### 7.1.3 Test Setup Diagram



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**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

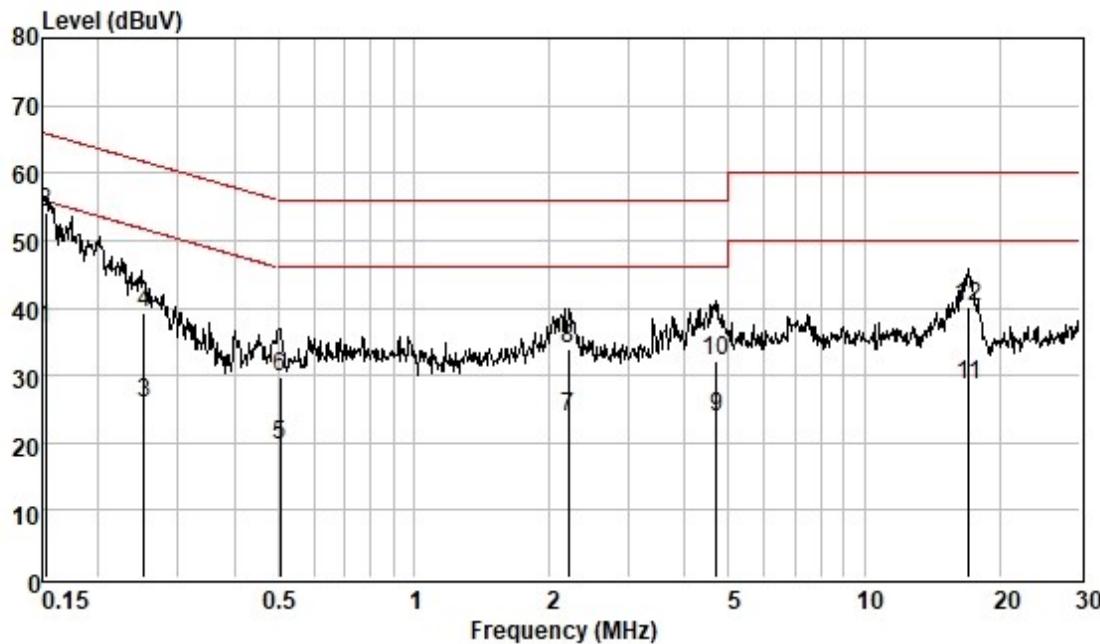
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Test Mode: 00; Line: Live line



Pol :LINE

Mode :

Model :

	Frequenc	Read Level	Cable Loss	LISN Factor	Measured Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.152	27.30	0.06	9.54	36.90	55.87	-18.97	Average
2	0.152	44.44	0.06	9.54	54.04	65.87	-11.83	QP
3	0.252	16.32	0.06	9.57	25.95	51.69	-25.74	Average
4	0.252	29.51	0.06	9.57	39.14	61.69	-22.55	QP
5	0.505	9.86	0.07	9.59	19.52	46.00	-26.48	Average
6	0.505	20.01	0.07	9.59	29.67	56.00	-26.33	QP
7	2.201	14.03	0.13	9.60	23.76	46.00	-22.24	Average
8	2.201	24.11	0.13	9.60	33.84	56.00	-22.16	QP
9	4.696	13.89	0.18	9.65	23.72	46.00	-22.28	Average
10	4.696	22.21	0.18	9.65	32.04	56.00	-23.96	QP
11	17.018	18.42	0.33	9.83	28.58	50.00	-21.42	Average
12	17.018	29.85	0.33	9.83	40.01	60.00	-19.99	QP

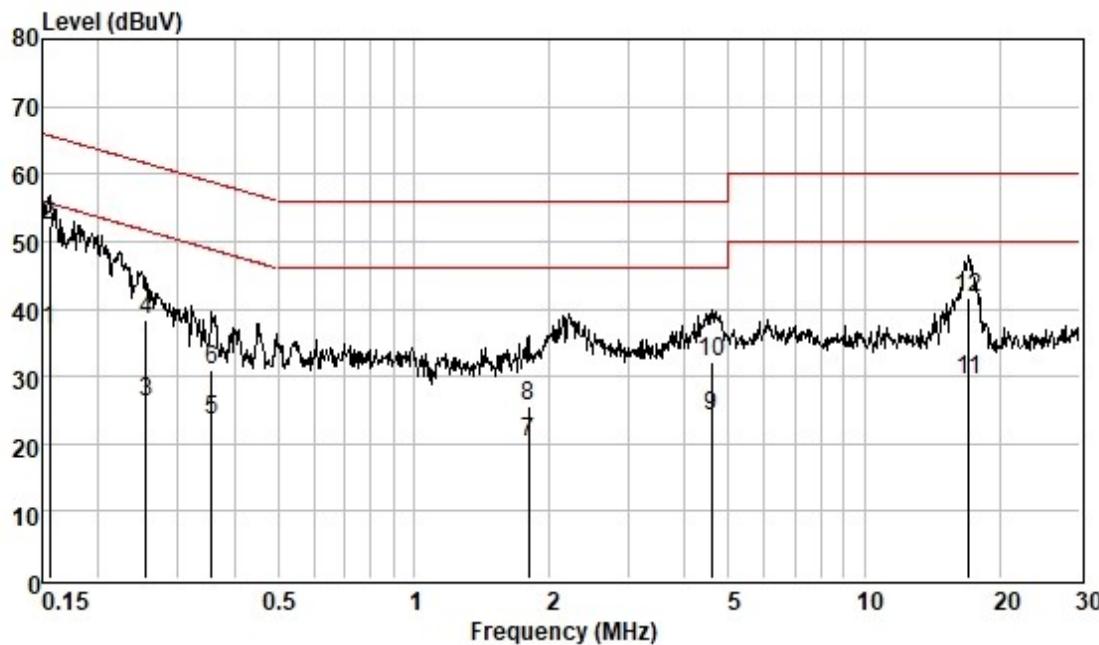
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Test Mode: 00; Line: Neutral Line



Pol : NEUTRAL

Mode :

Model :

	Frequenc	Read Level	Cable Loss	LISN Factor	Measured Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.156	27.14	0.06	9.53	36.73	55.69	-18.96	Average
2	0.156	42.82	0.06	9.53	52.41	65.69	-13.28	QP
3	0.255	16.66	0.06	9.56	26.28	51.60	-25.32	Average
4	0.255	28.67	0.06	9.56	38.29	61.60	-23.31	QP
5	0.356	13.78	0.06	9.57	23.41	48.83	-25.42	Average
6	0.356	21.24	0.06	9.57	30.87	58.83	-27.96	QP
7	1.800	10.55	0.11	9.59	20.25	46.00	-25.75	Average
8	1.800	15.89	0.11	9.59	25.59	56.00	-30.41	QP
9	4.574	14.19	0.18	9.65	24.02	46.00	-21.98	Average
10	4.574	22.42	0.18	9.65	32.25	56.00	-23.75	QP
11	17.018	19.21	0.33	9.88	29.42	50.00	-20.58	Average
12	17.018	31.38	0.33	9.88	41.59	60.00	-18.41	QP

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**7.2 Conducted Peak Output Power**

Test Requirement 47 CFR Part 15, Subpart C 15.247(b)(3)

Test Method: ANSI C63.10 (2013) Section 11.9.1.3

Limit:

Frequency range(MHz)	Output power of the intentional radiator(watt)
902-928	1 for $\geq 50$ hopping channels
	0.25 for $25 \leq$ hopping channels $< 50$
	1 for digital modulation
2400-2483.5	1 for $\geq 75$ non-overlapping hopping channels
	0.125 for all other frequency hopping systems
	1 for digital modulation
5725-5850	1 for frequency hopping systems and digital modulation

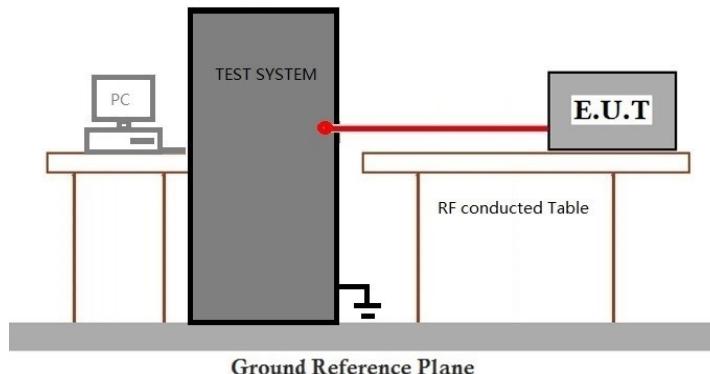
**7.2.1 E.U.T. Operation**

Operating Environment:

Temperature: 24.7 °C      Humidity: 51.2 % RH      Atmospheric Pressure: 1003 mbar

**7.2.2 Test Mode Description**

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B

**7.2.3 Test Setup Diagram**

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**7.2.4 Measurement Procedure and Data**

cable loss=0.9dB

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### 7.3 Minimum 6dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.247a(2)

Test Method: ANSI C63.10 (2013) Section 11.8.1

Limit:

≥500 kHz

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

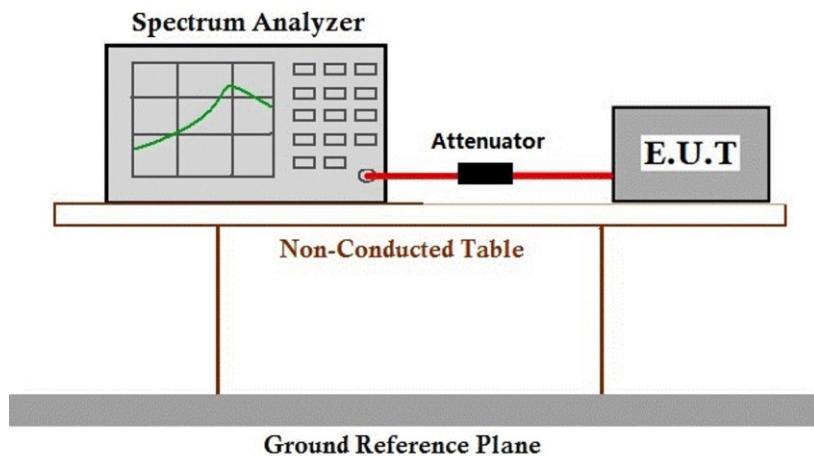
Operating Environment:

Temperature: 24.7 °C      Humidity: 51.2 % RH      Atmospheric Pressure: 1003 mbar

#### 7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B

#### 7.3.3 Test Setup Diagram



#### 7.3.4 Measurement Procedure and Data

cable loss=0.9dB

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## 7.4 Power Spectrum Density

Test Requirement 47 CFR Part 15, Subpart C 15.247(e)

Test Method: ANSI C63.10 (2013) Section 11.10.2

Limit:

≤8dBm in any 3 kHz band during any time interval of continuous transmission

### 7.4.1 E.U.T. Operation

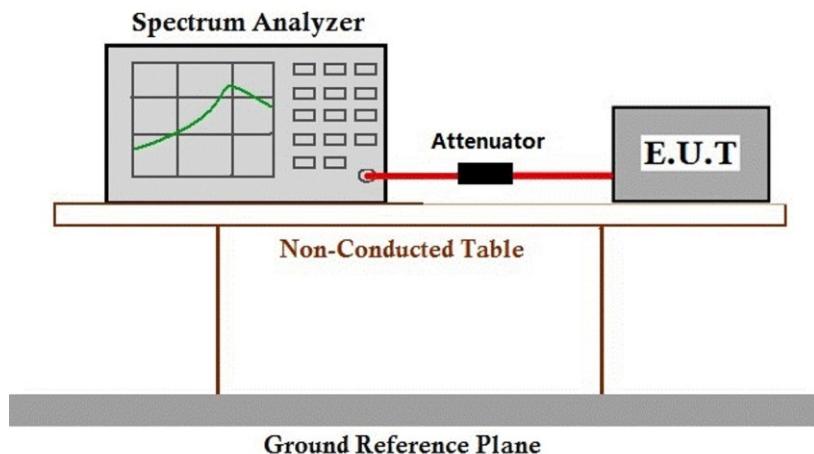
Operating Environment:

Temperature: 24.7 °C      Humidity: 51.2 % RH      Atmospheric Pressure: 1003 mbar

### 7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B

### 7.4.3 Test Setup Diagram



### 7.4.4 Measurement Procedure and Data

cable loss=0.9dB

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## 7.5 Conducted Band Edges Measurement

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.13.3.2

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 7.5.1 E.U.T. Operation

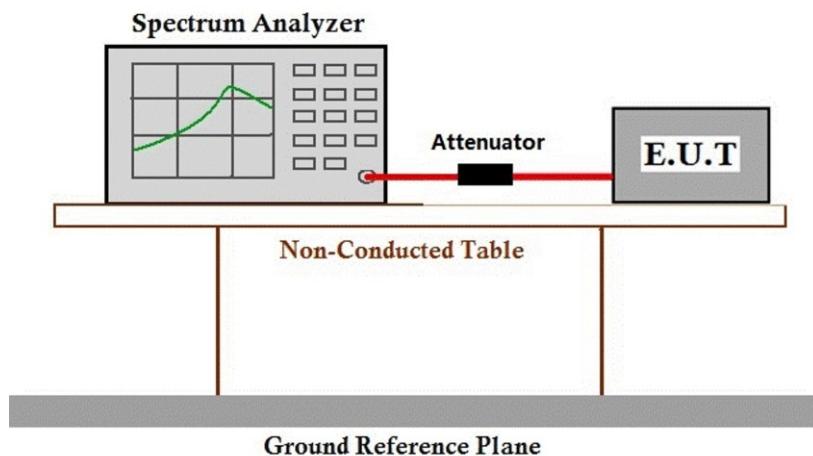
Operating Environment:

Temperature: 24.7 °C      Humidity: 51.2 % RH      Atmospheric Pressure: 1003 mbar

### 7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B

### 7.5.3 Test Setup Diagram



### 7.5.4 Measurement Procedure and Data

cable loss=0.9dB

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## 7.6 Conducted Spurious Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.247(d)

Test Method: ANSI C63.10 (2013) Section 11.11

Limit:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### 7.6.1 E.U.T. Operation

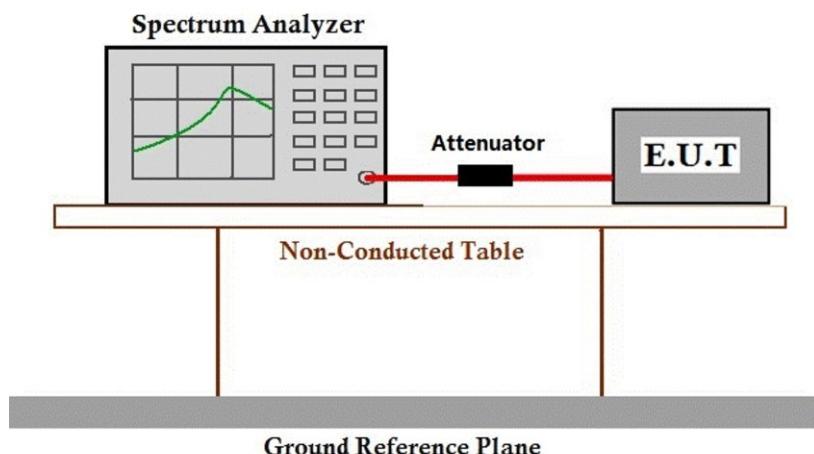
Operating Environment:

Temperature: 24.7 °C      Humidity: 51.2 % RH      Atmospheric Pressure: 1003 mbar

### 7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B

### 7.6.3 Test Setup Diagram



### 7.6.4 Measurement Procedure and Data

cable loss=0.9dB



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**7.7 Radiated Emissions which fall in the restricted bands**

Test Requirement 47 CFR Part 15, Subpart C 15.205 &amp; 15.209

Test Method: ANSI C63.10 (2013) Section 6.10.5

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
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

**7.7.1 E.U.T. Operation**

Operating Environment:

Temperature: 24.3 °C      Humidity: 53.6 % RH      Atmospheric Pressure: 1003 mbar

**7.7.2 Test Mode Description**

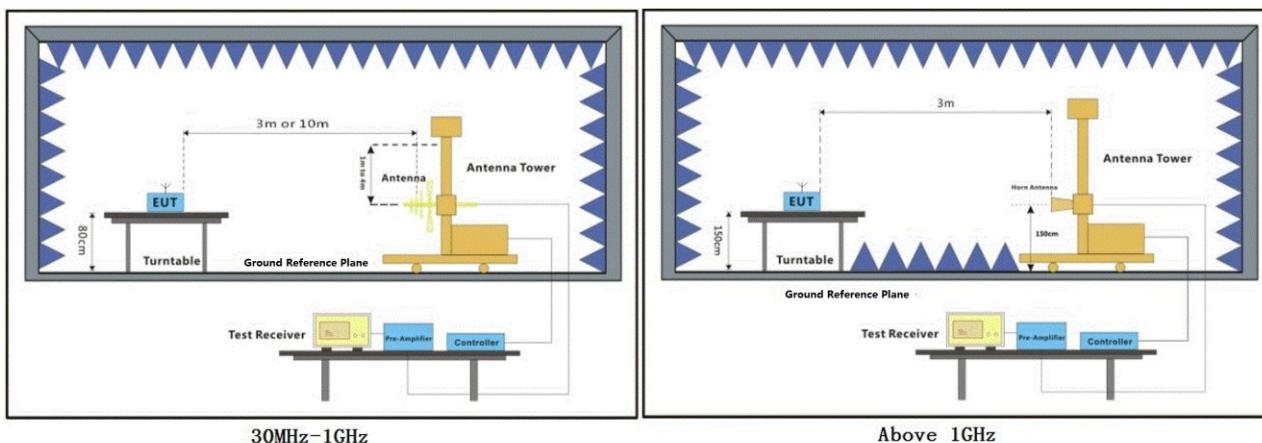
Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B
Final test	02	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB C
Final test	03	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB D

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**7.7.3 Test Setup Diagram****7.7.4 Measurement Procedure and Data**

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- Test the EUT in the lowest channel, the Highest channel.
- The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- Repeat above procedures until all frequencies measured was complete.

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

Remark 2: For frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For the emissions whose peak level is lower than the average limit, only the peak measurement is shown in the report.



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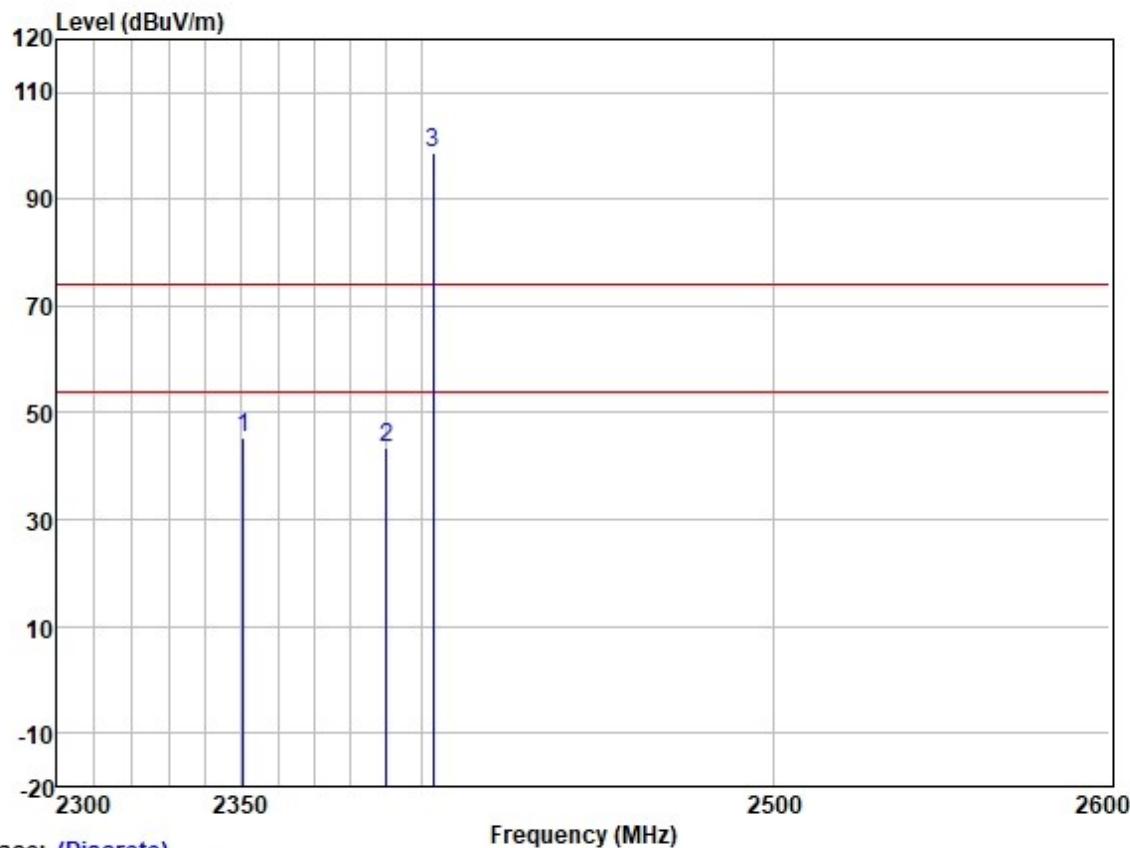
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No.198 Kezhi Road, Shenzhen Park, Guangzhou Economic & Technology Development District, Guangzhou, China 510663 t (86-20) 82155555 f (86-20) 82075058 [www.sgsgroup.com.cn](http://www.sgsgroup.com.cn)

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](mailto:sgs.china@sgs.com)

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



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit Line	Over Limit	Over Line Pol/Phase	Remark
	Freq	Level	Factor	Loss	Factor	Level				
MHz	dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB	dB	
1 2350.542	52.11	27.25	3.40	37.61	45.15	74.00	-28.85	HORIZONTAL	Peak	
2 2390.000	50.21	27.33	3.48	37.59	43.43	74.00	-30.57	HORIZONTAL	Peak	
3 * 2403.000	105.54	27.35	3.50	37.59	98.80	74.00	24.80	HORIZONTAL	Peak	

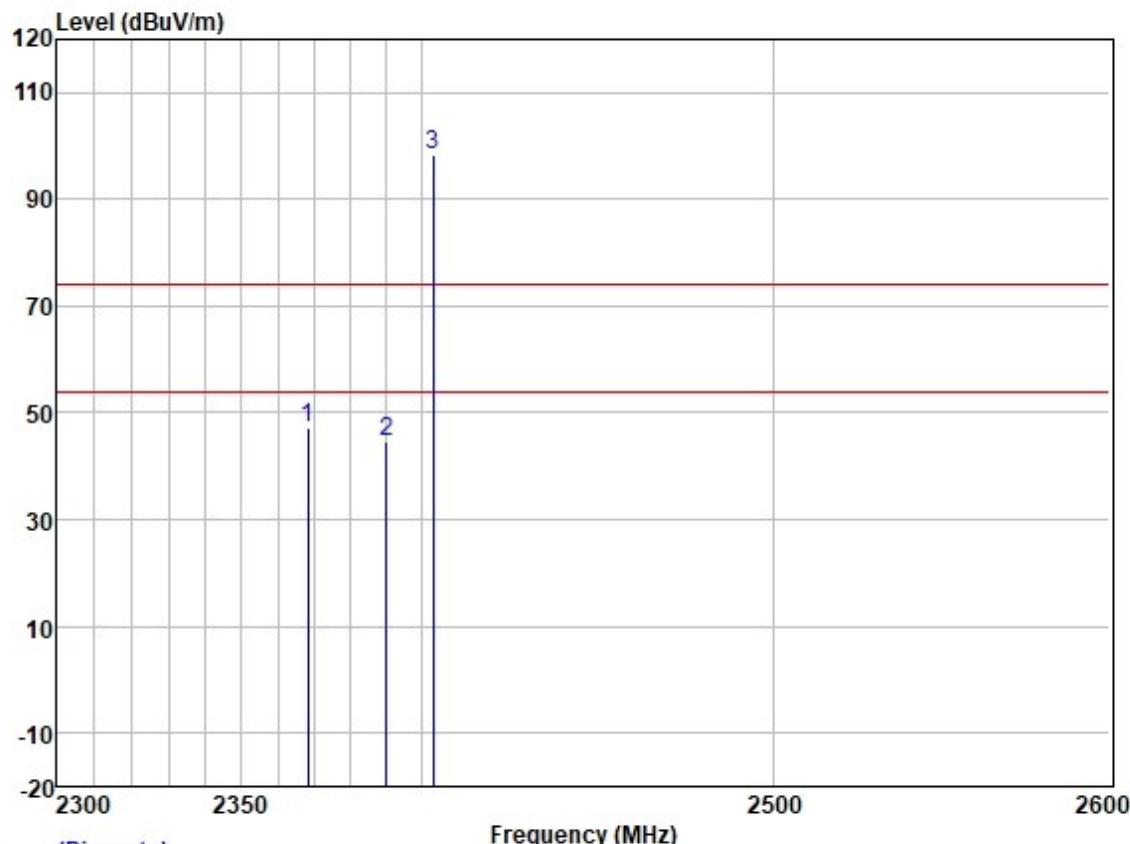
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp	Limit	Over	Limit Pol/Phase	Remark
	Level	Factor	Loss	Factor					
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1 2368.103	54.01	27.28	3.43	37.60	47.12	74.00	-26.88	VERTICAL	Peak
2 2390.000	51.22	27.33	3.48	37.59	44.44	74.00	-29.56	VERTICAL	Peak
3 * 2403.000	105.13	27.35	3.50	37.59	98.39	74.00	24.39	VERTICAL	Peak

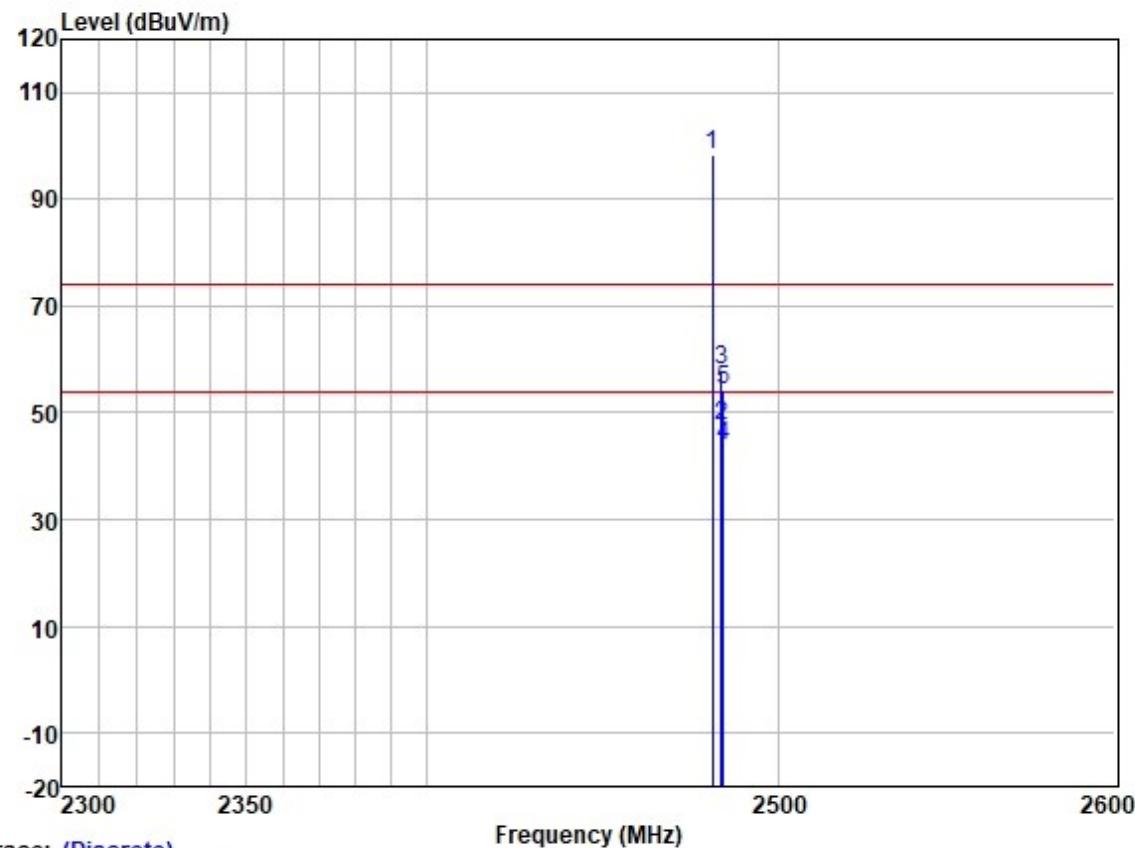
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Freq	ReadAntenna	Cable	Preamp	Limit	Over	Limit	Over	Remark
	Level	Factor	Loss					
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2481.000	104.96	27.47	3.60	37.57	98.46	74.00	24.46	HORIZONTAL Peak
2 2483.500	54.31	27.48	3.53	37.57	47.75	54.00	-6.25	HORIZONTAL Average
3 2483.500	64.73	27.48	3.53	37.57	58.17	74.00	-15.83	HORIZONTAL Peak
4 2483.979	50.41	27.48	3.53	37.57	43.85	54.00	-10.15	HORIZONTAL Average
5 2483.979	60.83	27.48	3.53	37.57	54.27	74.00	-19.73	HORIZONTAL Peak

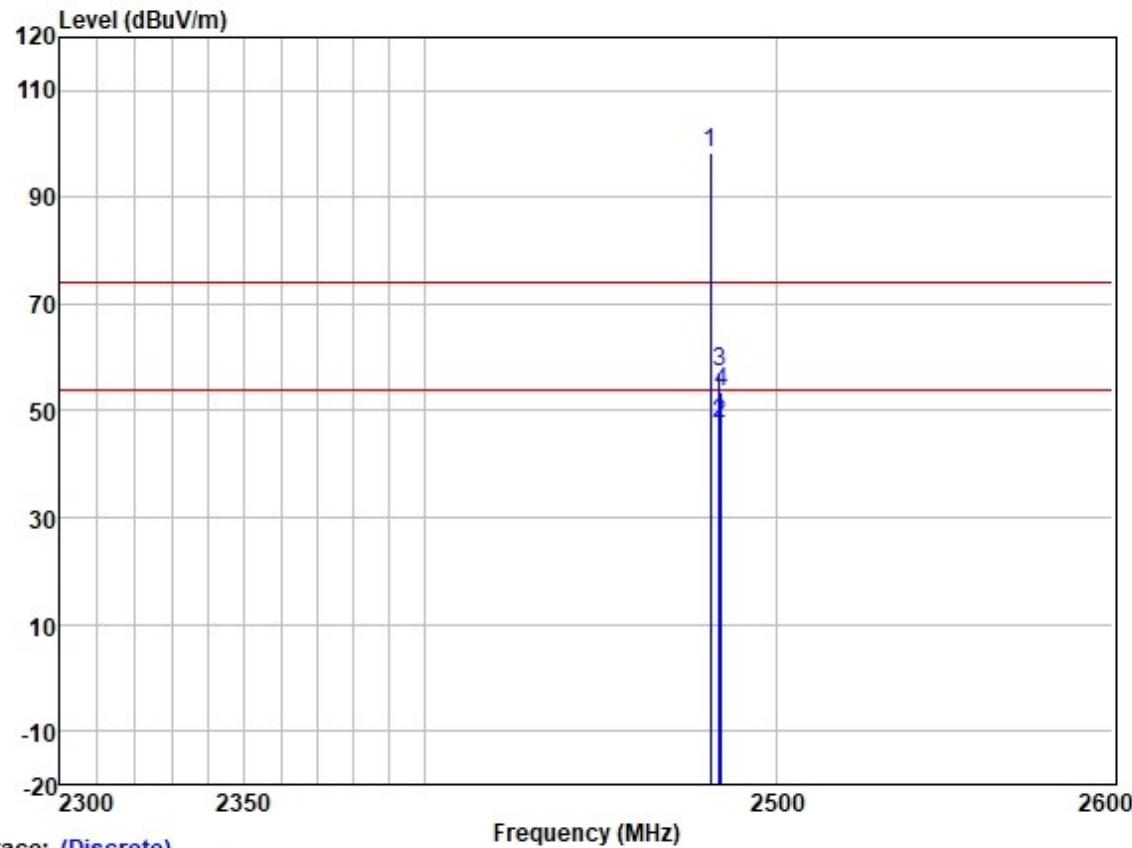
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Freq	ReadAntenna	Cable	Preamp	Limit	Over	Limit	Over	Remark
	Level	Factor	Loss					
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2481.000	104.81	27.47	3.60	37.57	98.31	74.00	24.31	VERTICAL Peak
2 2483.500	54.06	27.48	3.53	37.57	47.50	54.00	-6.50	VERTICAL Average
3 2483.500	63.98	27.48	3.53	37.57	57.42	74.00	-16.58	VERTICAL Peak
4 2484.014	60.04	27.48	3.53	37.57	53.48	74.00	-20.52	VERTICAL Peak

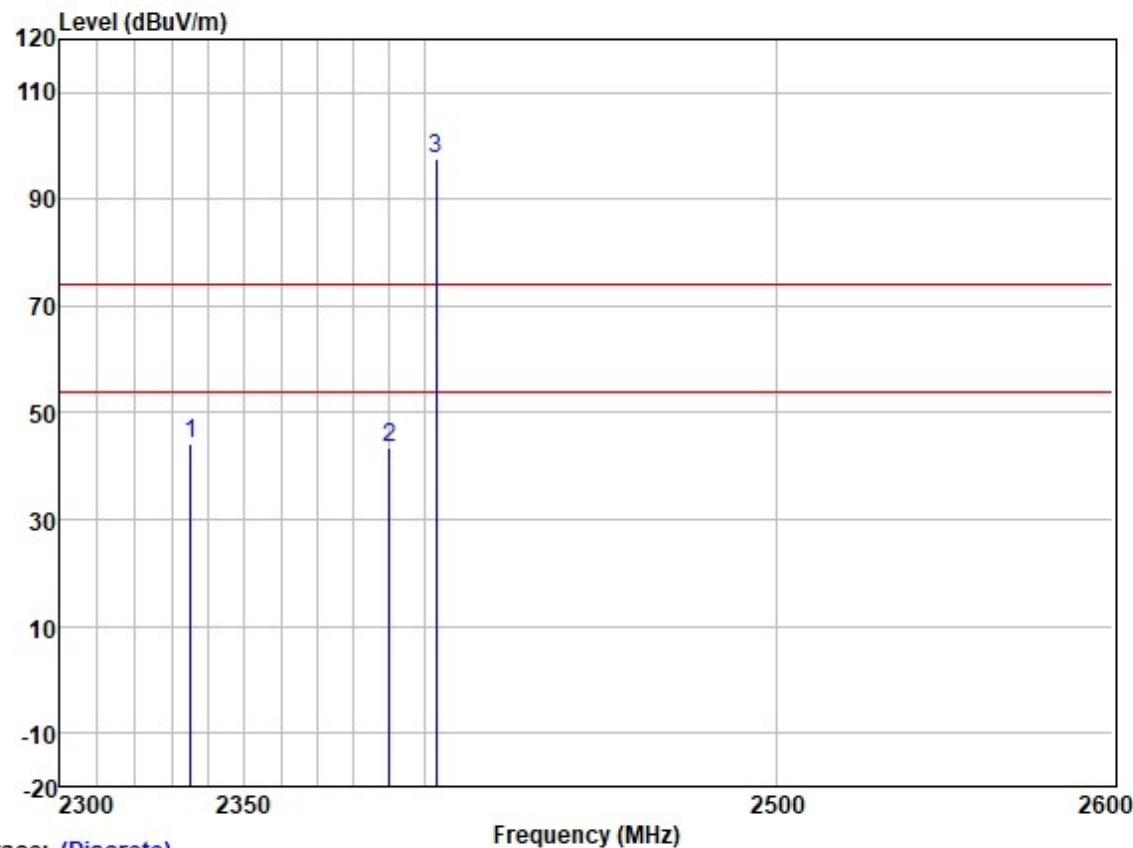
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Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low

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Guangzhou Branch Testing Center EEC Laboratory

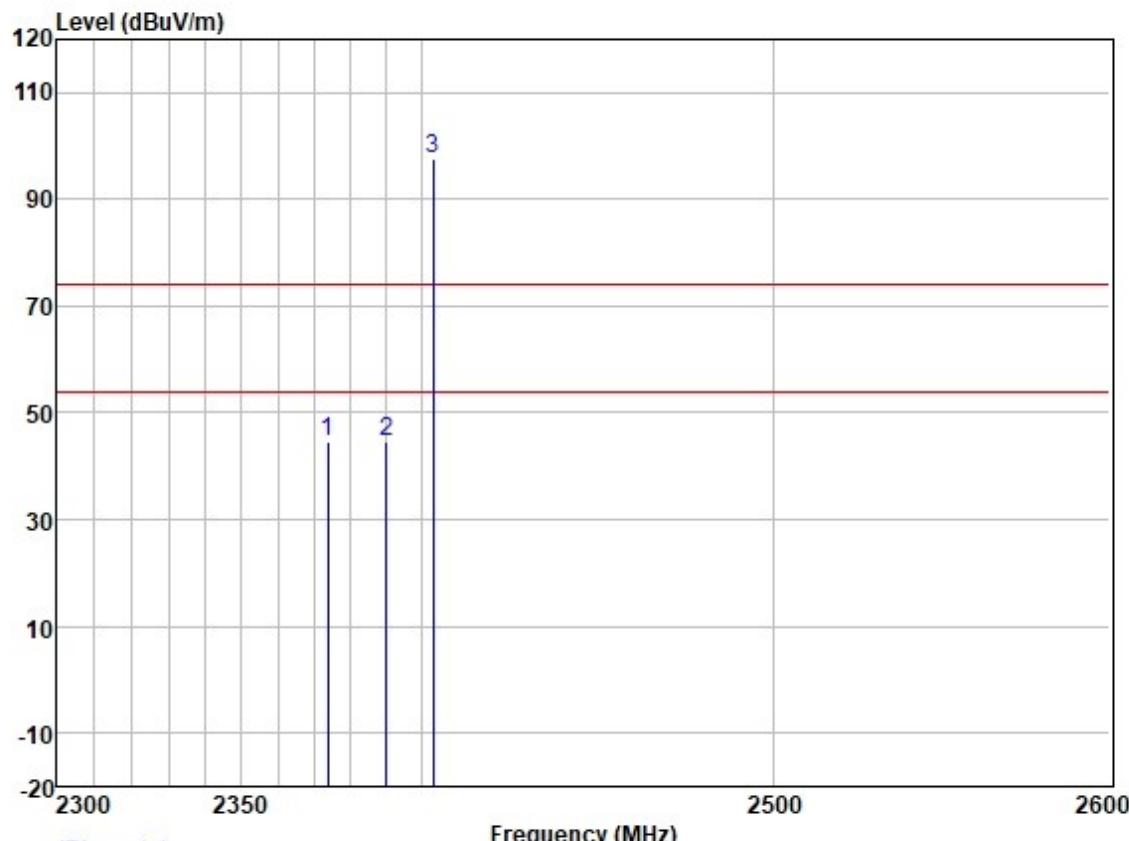
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Test Mode: 01; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



	Freq	ReadAntenna Level	Cable Factor	Preamp Loss	Limit Line	Over Limit	Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m		
1	2373.507	51.49	27.30	3.45	37.60	44.64	74.00	-29.36 VERTICAL Peak
2	2390.000	51.28	27.33	3.48	37.59	44.50	74.00	-29.50 VERTICAL Peak
3 *	2403.000	104.28	27.35	3.50	37.59	97.54	74.00	23.54 VERTICAL Peak

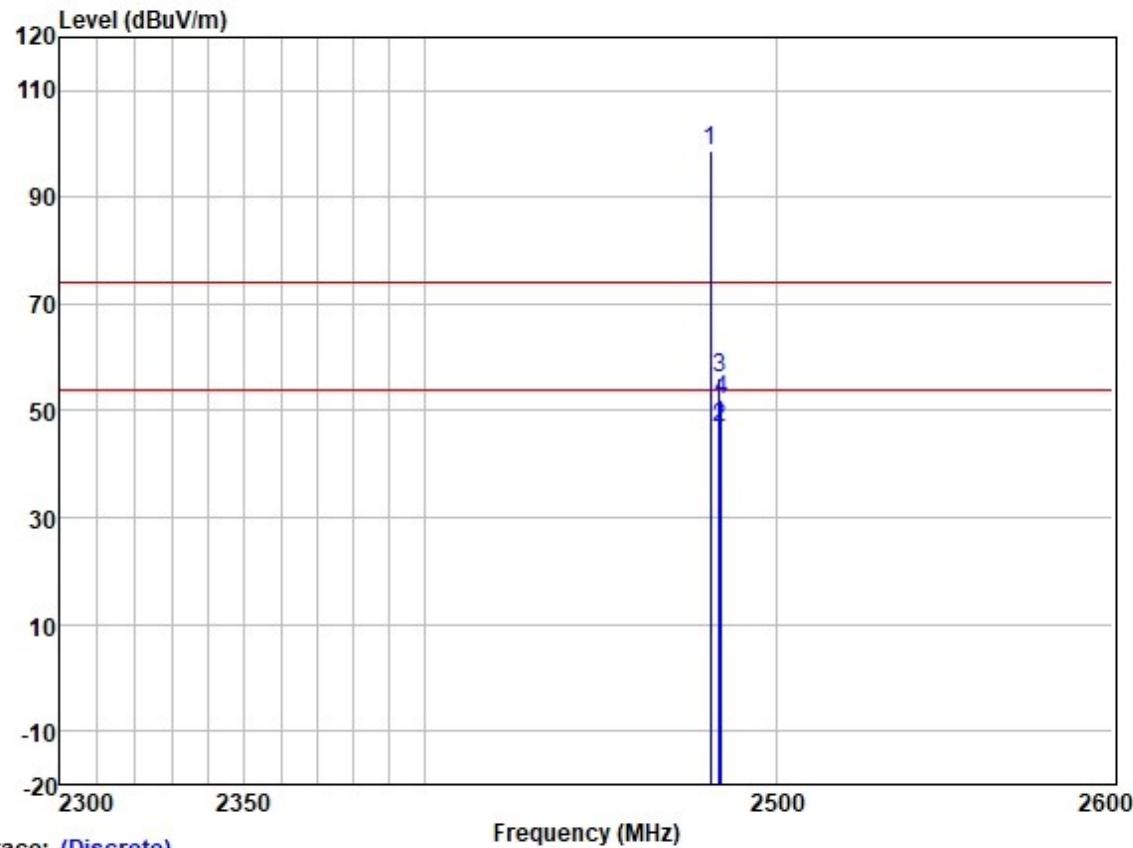
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Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; ; Channel:High

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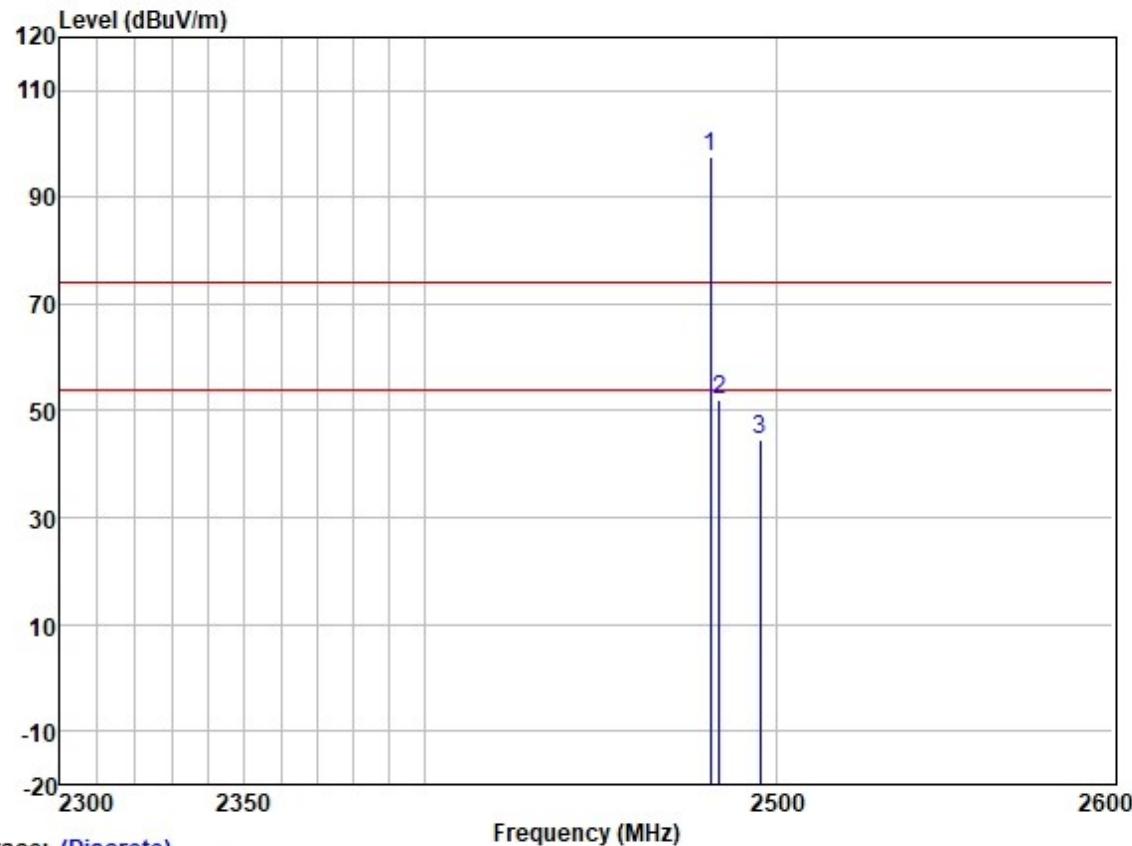
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Test Mode: 01; Polarity: Vertical; Modulation:GFSK; ; Channel:High

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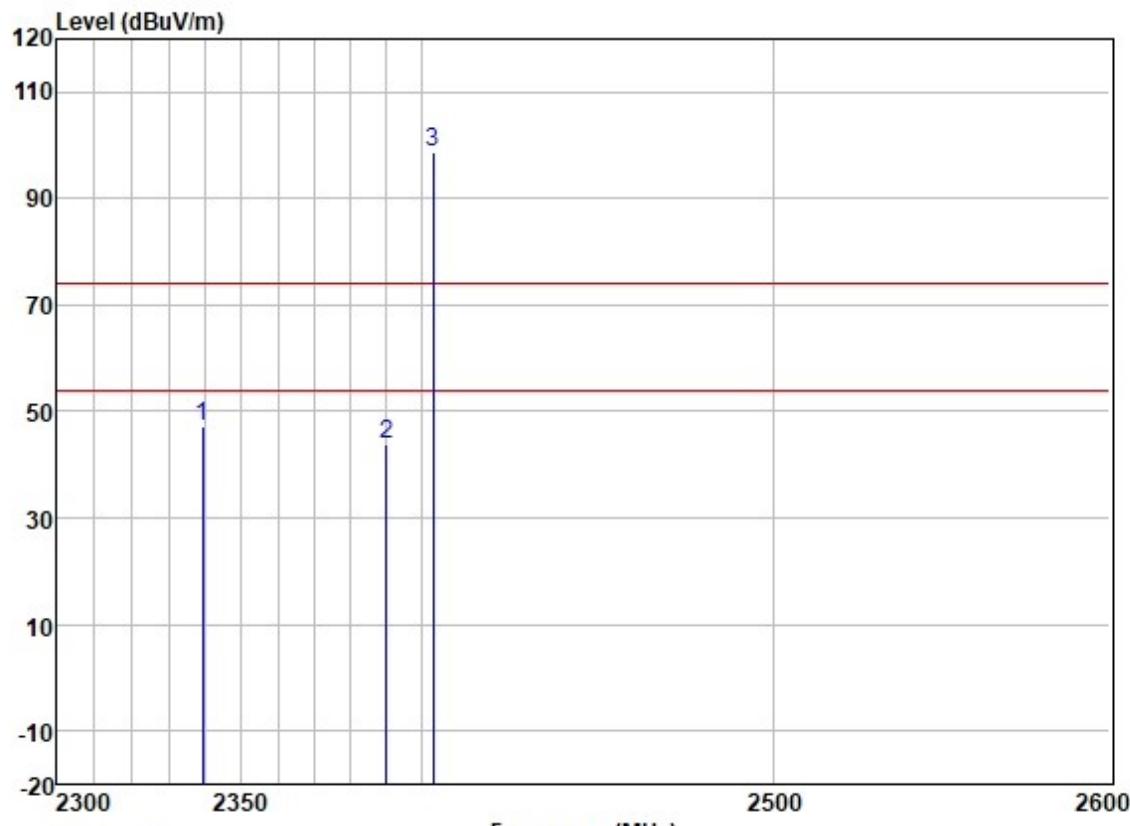
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low

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Guangzhou Branch Testing Center EEC Laboratory

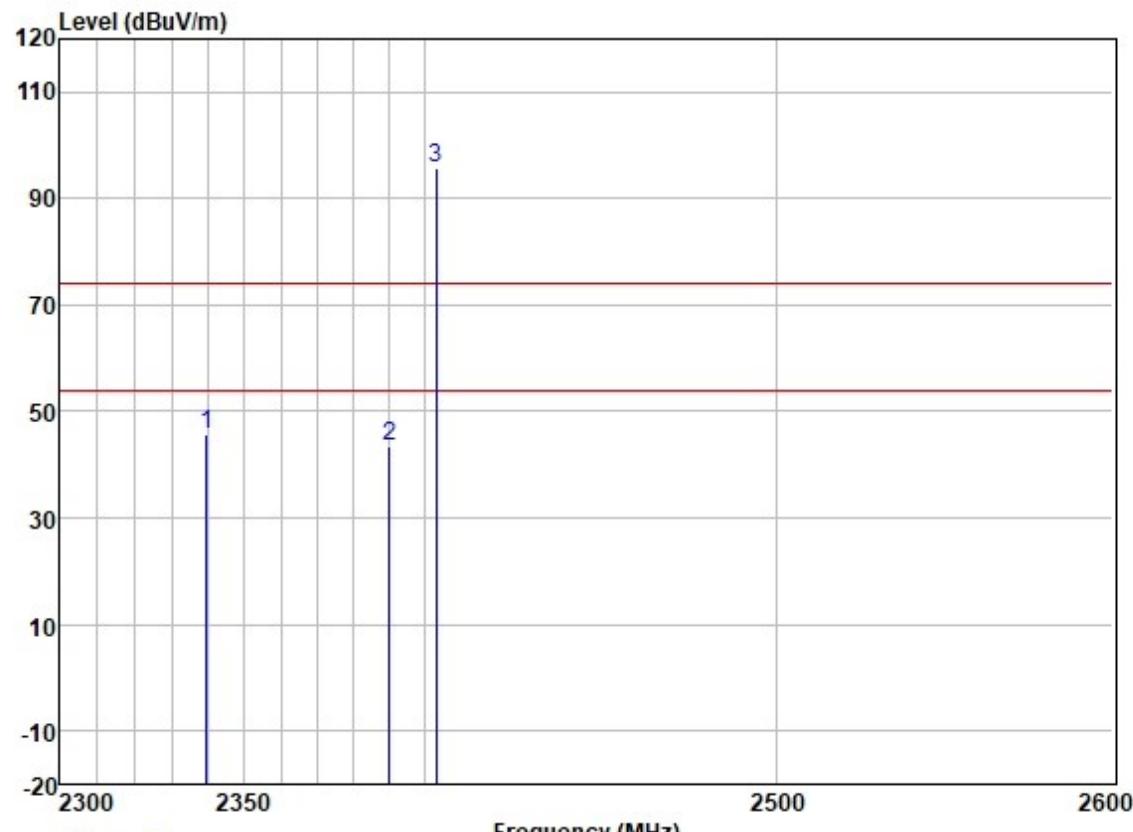
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low

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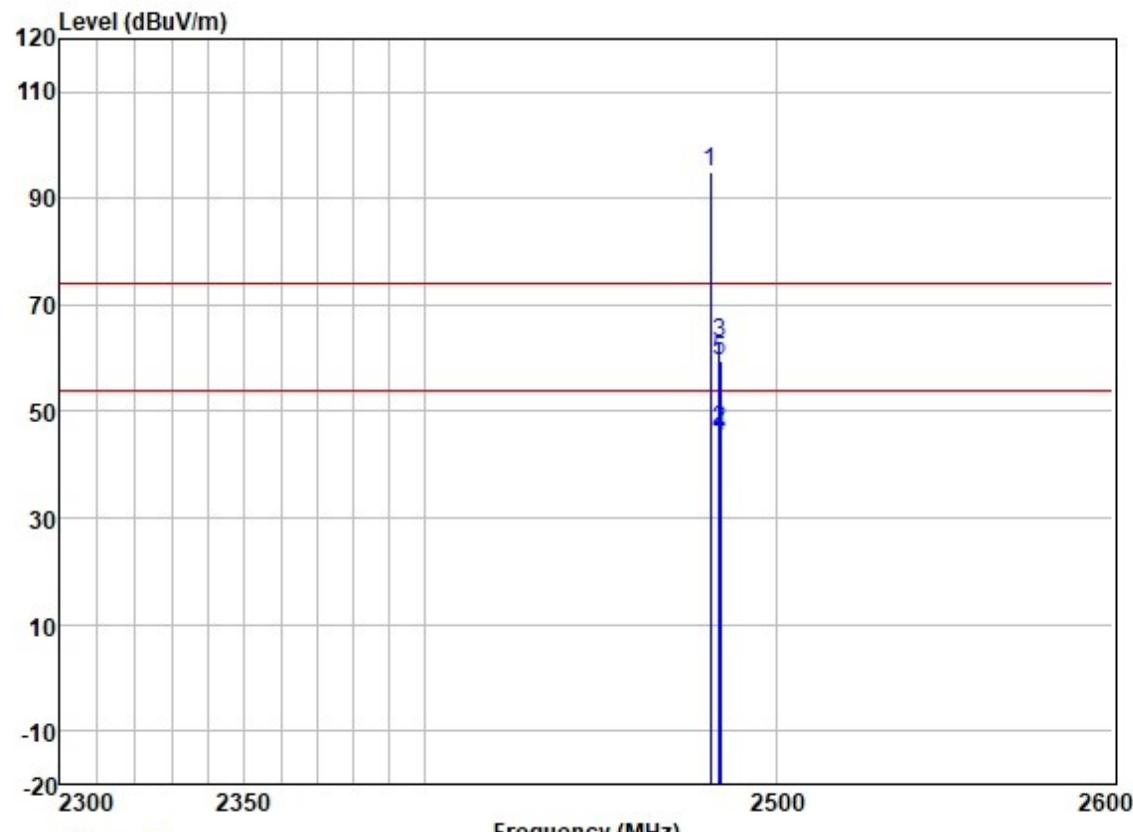
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Race: (Discrete)

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Limit	Over	Remark
	Level	Factor	Loss					
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2481.000	101.64	27.47	3.60	37.57	95.14	74.00	21.14	HORIZONTAL Peak
2 2483.500	52.92	27.48	3.53	37.57	46.36	54.00	-7.64	HORIZONTAL Average
3 2483.500	69.33	27.48	3.53	37.57	62.77	74.00	-11.23	HORIZONTAL Peak
4 2483.821	51.85	27.48	3.53	37.57	45.29	54.00	-8.71	HORIZONTAL Average
5 2483.821	66.26	27.48	3.53	37.57	59.70	74.00	-14.30	HORIZONTAL Peak

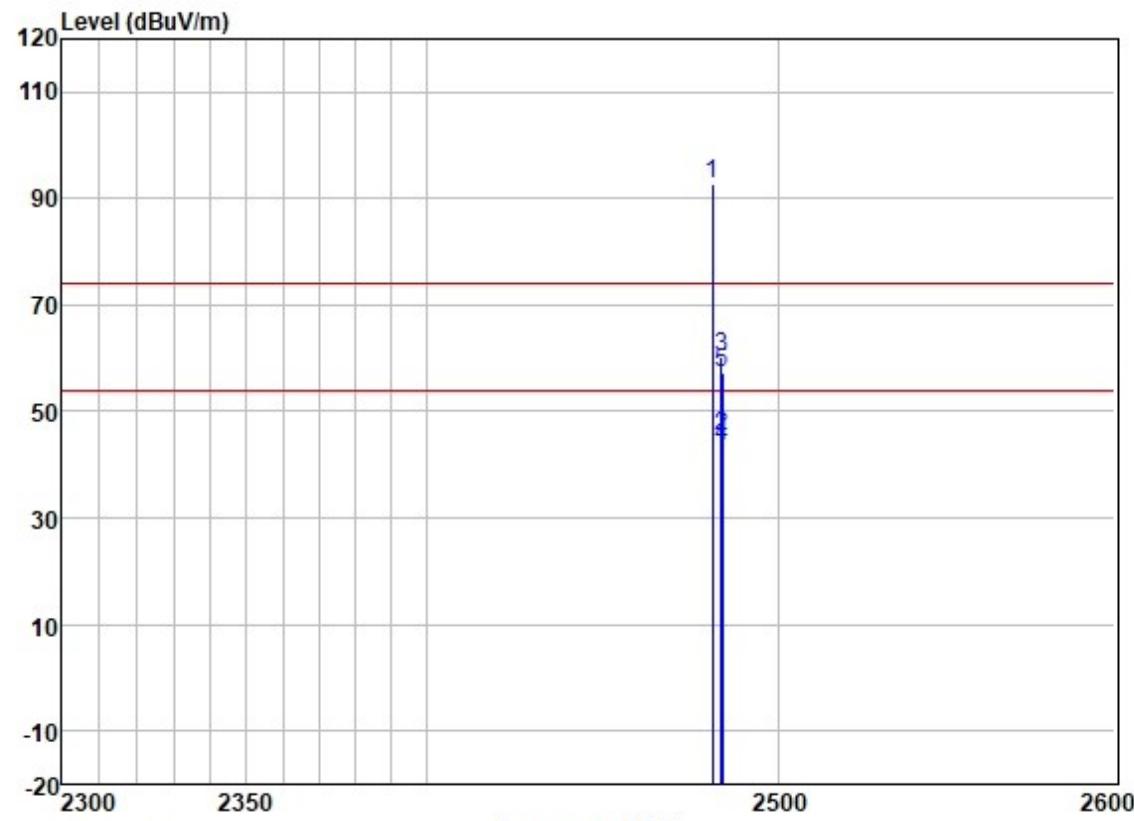
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:High



	Freq	ReadAntenna	Cable	Preamp	Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Line	Limit	
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	2481.000	99.24	27.47	3.60	37.57	92.74	74.00	18.74 VERTICAL Peak
2	2483.500	51.92	27.48	3.53	37.57	45.36	54.00	-8.64 VERTICAL Average
3	2483.500	66.88	27.48	3.53	37.57	60.32	74.00	-13.68 VERTICAL Peak
4	2483.846	49.98	27.48	3.53	37.57	43.42	54.00	-10.58 VERTICAL Average
5	2483.846	63.92	27.48	3.53	37.57	57.36	74.00	-16.64 VERTICAL Peak

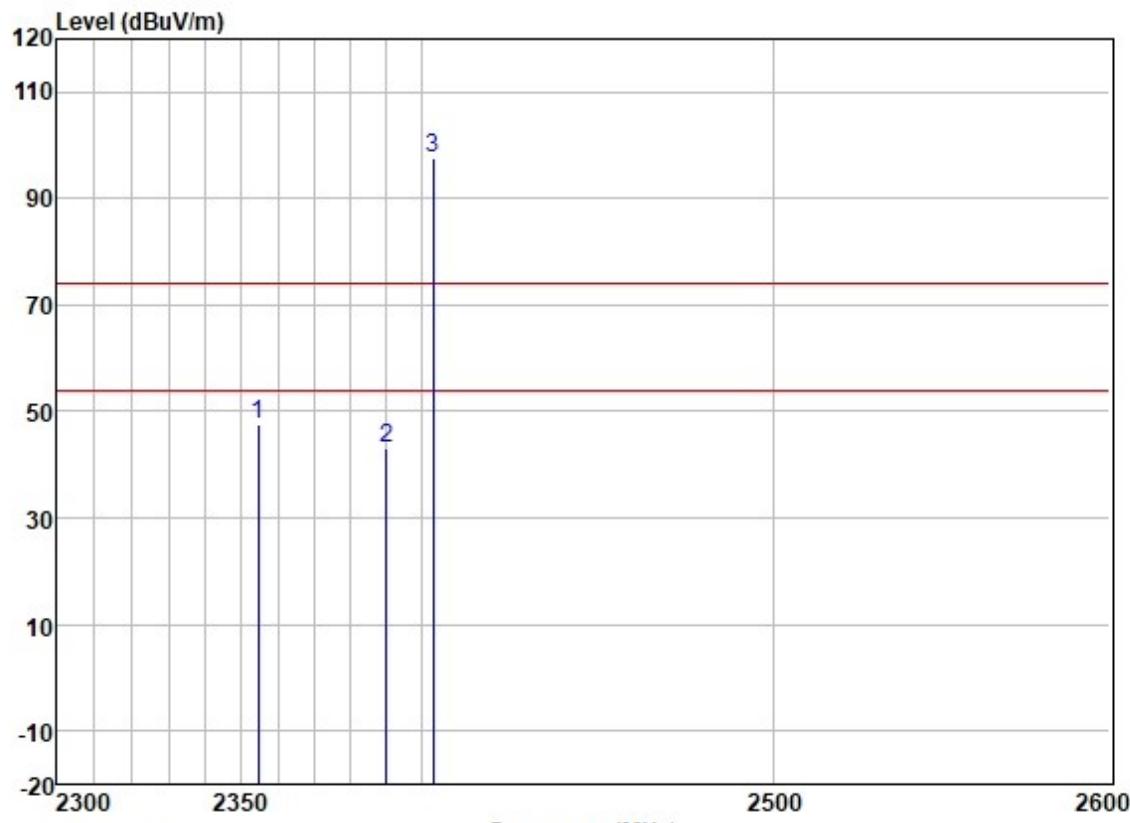
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Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low

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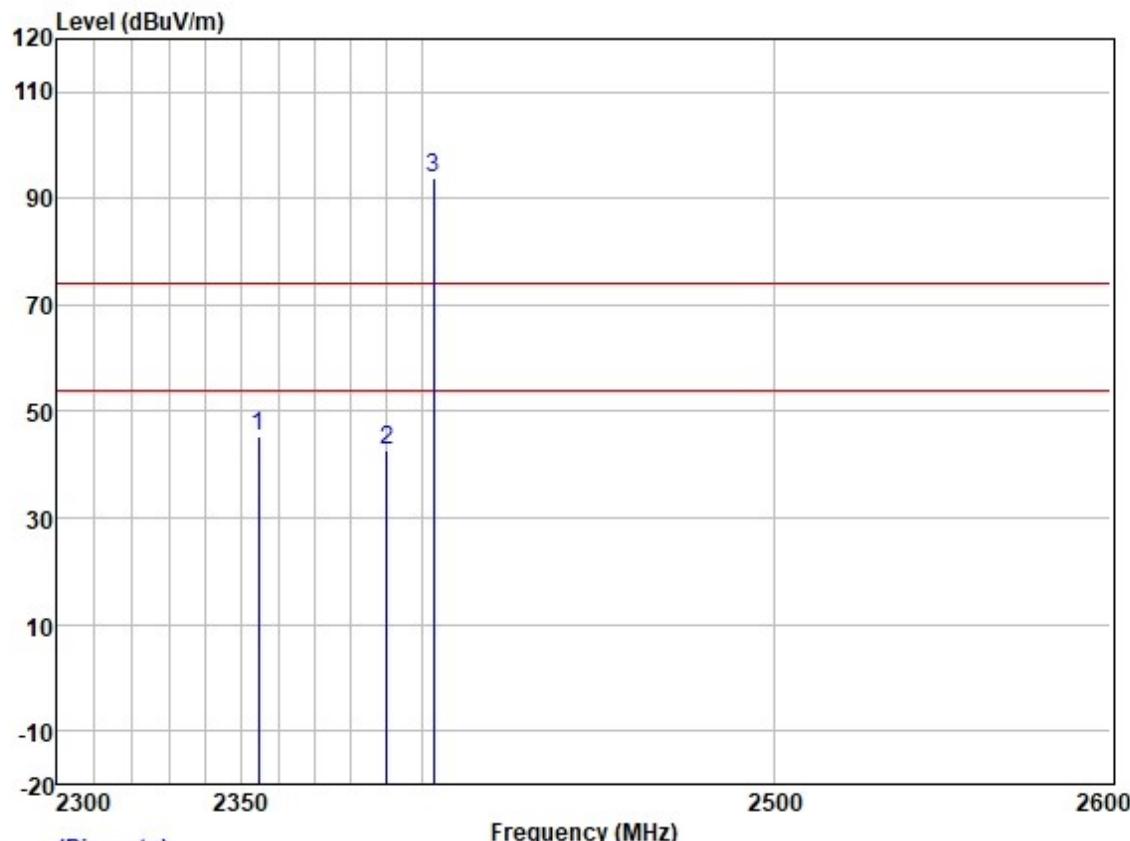
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Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:Low

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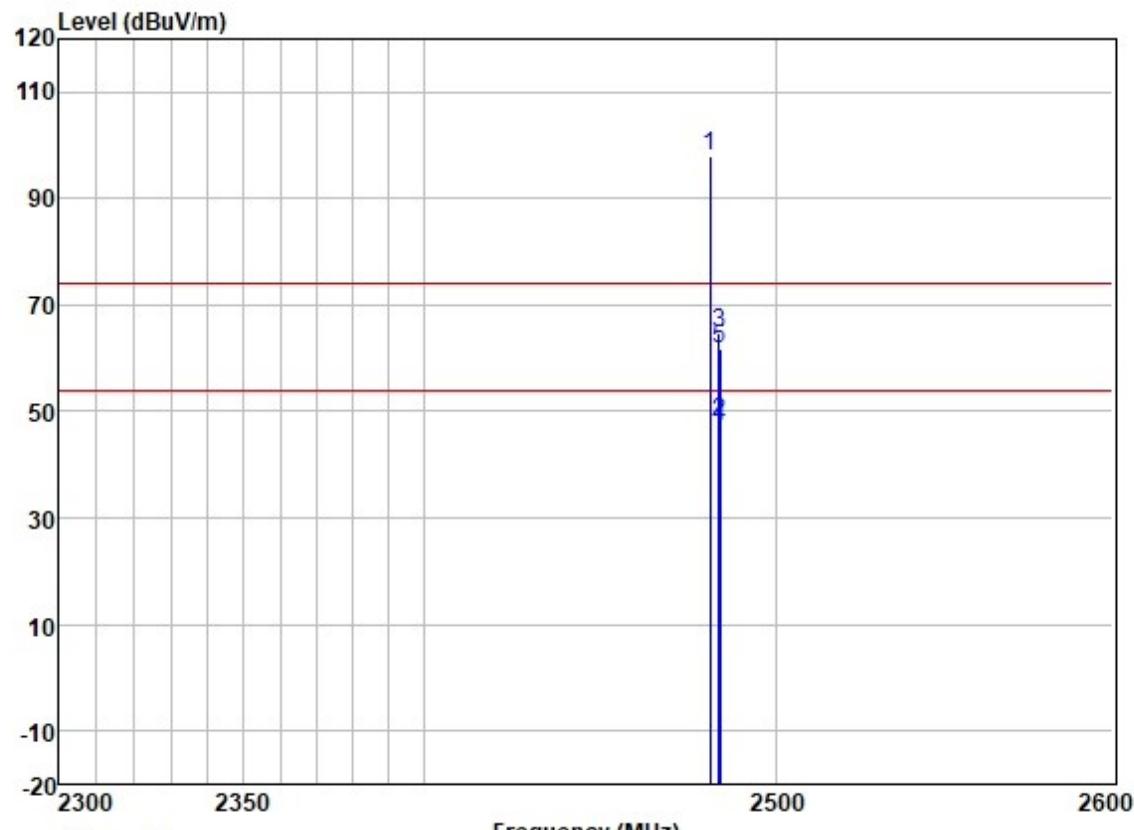
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Test Mode: 03; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Freq MHz	ReadAntenna Level	Factor	Cable Loss	Preamp Factor	Level	Limit Line	Over Limit	Over Line Pol/Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2481.000	104.30	27.47	3.60	37.57	97.80	74.00	23.80	HORIZONTAL	Peak
2 2483.500	54.67	27.48	3.53	37.57	48.11	54.00	-5.89	HORIZONTAL	Average
3 2483.500	71.24	27.48	3.53	37.57	64.68	74.00	-9.32	HORIZONTAL	Peak
4 2483.821	53.58	27.48	3.53	37.57	47.02	54.00	-6.98	HORIZONTAL	Average
5 2483.821	68.41	27.48	3.53	37.57	61.85	74.00	-12.15	HORIZONTAL	Peak

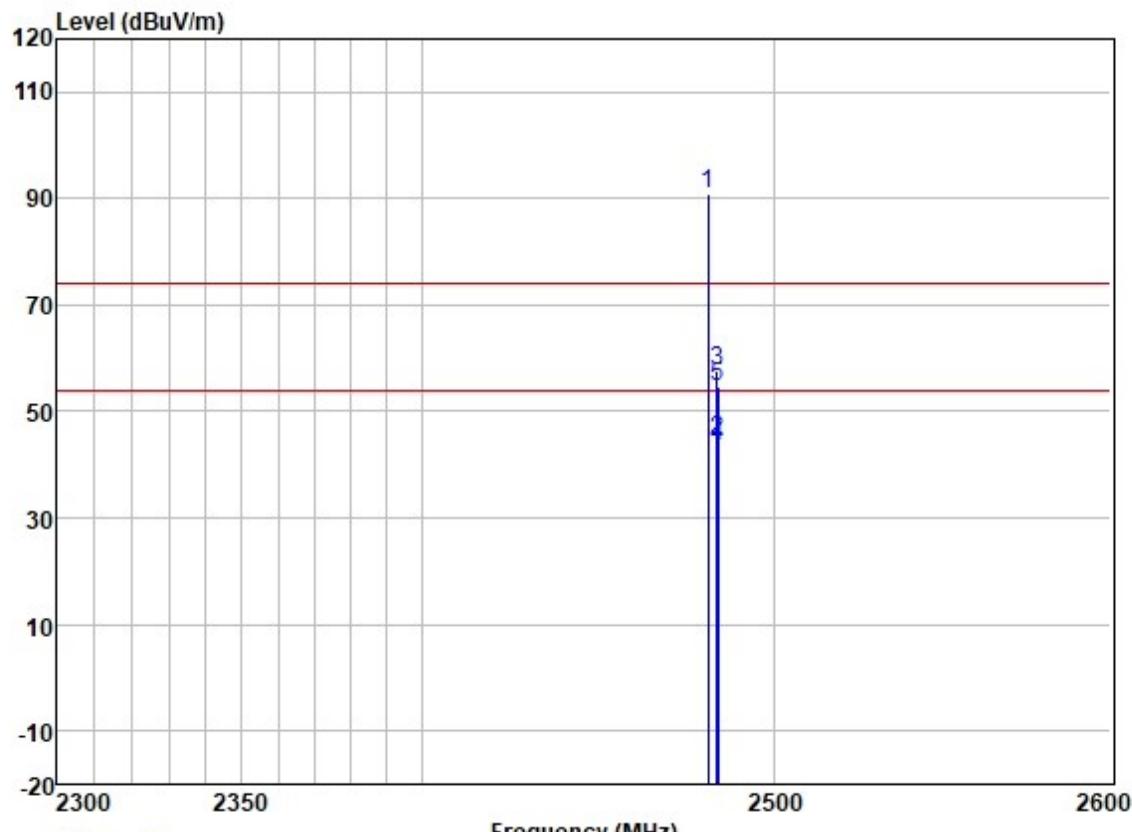
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Test Mode: 03; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Race: (Discrete)

Freq	ReadAntenna	Cable	Preamp	Limit	Over	Over	Over	Remark
	Level	Loss	Factor					
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1 * 2481.000	97.22	27.47	3.60	37.57	90.72	74.00	16.72	VERTICAL Peak
2 2483.500	51.09	27.48	3.53	37.57	44.53	54.00	-9.47	VERTICAL Average
3 2483.500	64.25	27.48	3.53	37.57	57.69	74.00	-16.31	VERTICAL Peak
4 2483.871	49.95	27.48	3.53	37.57	43.39	54.00	-10.61	VERTICAL Average
5 2483.871	61.21	27.48	3.53	37.57	54.65	74.00	-19.35	VERTICAL Peak

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**7.8 Radiated Spurious Emissions (Below 1GHz)**

Test Requirement 47 CFR Part 15, Subpart C 15.205 &amp; 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

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
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

**7.8.1 E.U.T. Operation**

Operating Environment:

Temperature: 24.3 °C      Humidity: 53.6 % RH      Atmospheric Pressure: 1003 mbar

**7.8.2 Test Mode Description**

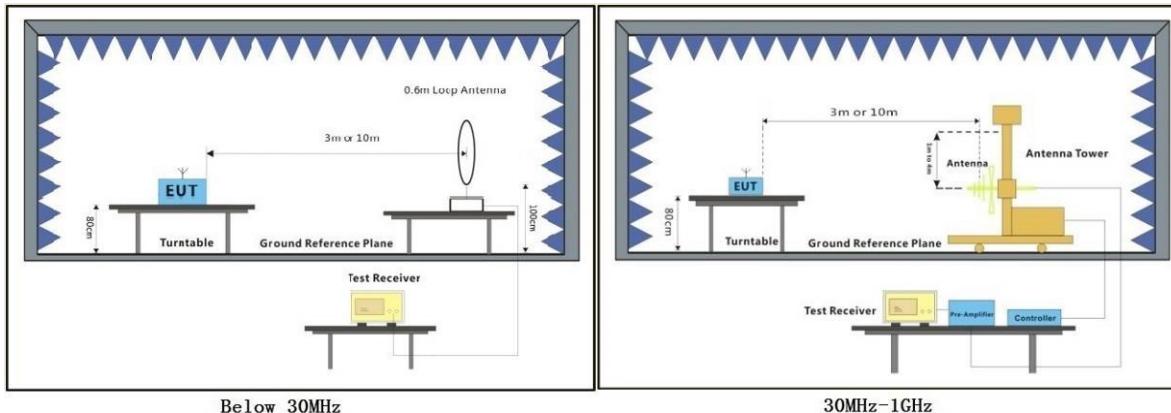
Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Pre-scan	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B
Pre-scan	02	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB C
Pre-scan	03	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB D

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**7.8.3 Test Setup Diagram****7.8.4 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. 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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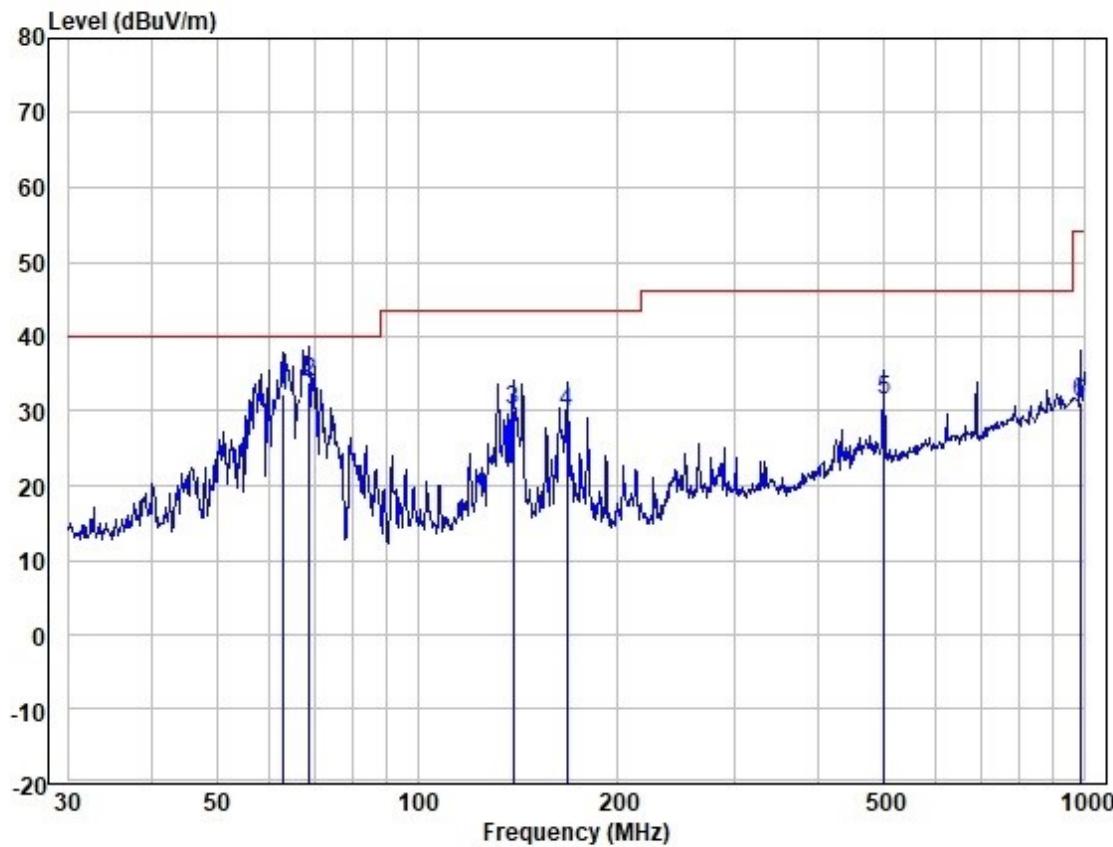
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Test Mode: 00; Polarity: Horizontal



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

Freq	Read	Antena	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 63.084	46.90	18.30	0.90	33.00	33.10	40.00	-6.90	HORIZONTAL	QP
2 68.872	48.39	17.37	0.98	33.00	33.74	40.00	-6.26	HORIZONTAL	QP
3 139.361	43.08	18.64	1.33	33.00	30.05	43.50	-13.45	HORIZONTAL	QP
4 167.824	42.52	18.88	1.58	33.00	29.98	43.50	-13.52	HORIZONTAL	QP
5 501.179	38.02	23.58	3.08	33.30	31.38	46.00	-14.62	HORIZONTAL	QP
6 986.072	28.43	29.85	4.23	31.35	31.16	54.00	-22.84	HORIZONTAL	QP

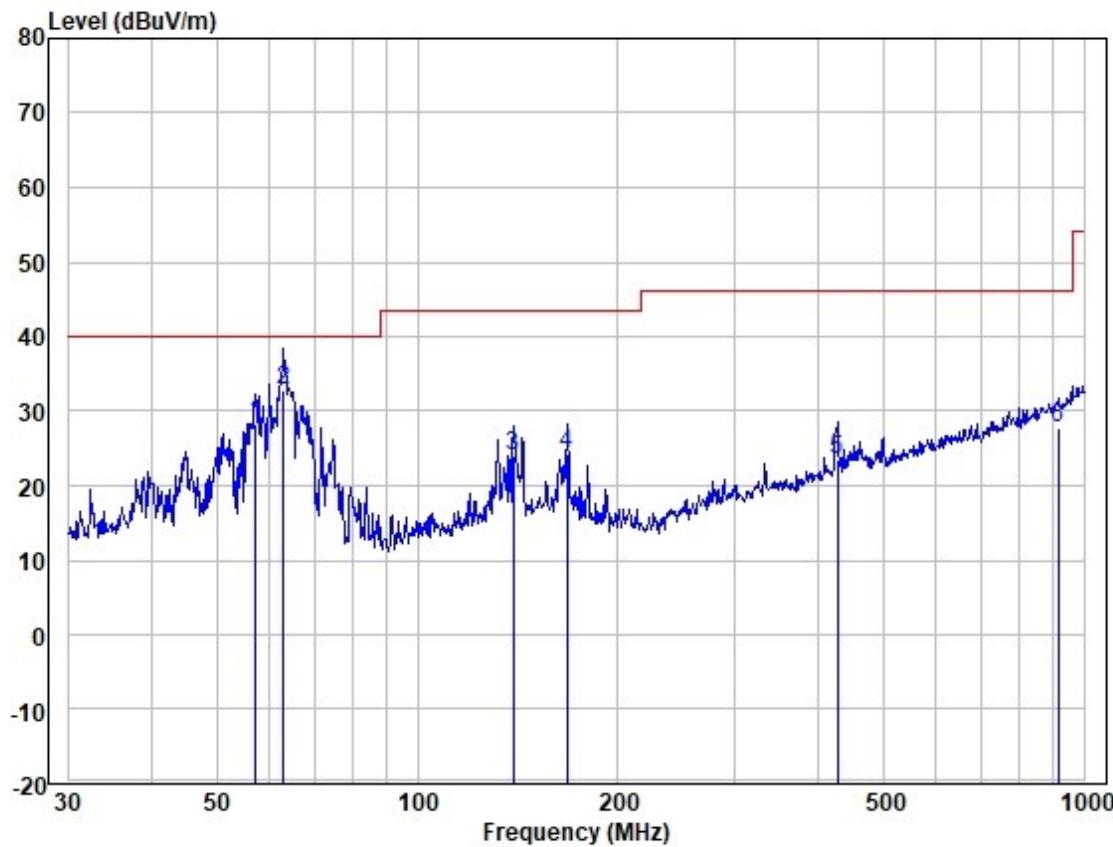
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Test Mode: 00; Polarity: Vertical



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

Freq	Read	Antena	Cable	Preamp	Measured	Limit	Over	Pol/	Remark
	Level	Factor	Loss	Factor	Level	Line	Limit	Phase	
1 57.191	41.31	19.08	0.84	33.00	28.23	40.00	-11.77	VERTICAL	QP
2 63.094	46.60	18.30	0.90	33.00	32.80	40.00	-7.20	VERTICAL	QP
3 139.361	37.07	18.64	1.33	33.00	24.04	43.50	-19.46	VERTICAL	QP
4 167.824	36.83	18.88	1.58	33.00	24.29	43.50	-19.21	VERTICAL	QP
5 426.521	32.06	22.03	2.55	33.23	23.41	46.00	-22.59	VERTICAL	QP
6 912.862	26.11	29.51	4.25	32.16	27.71	46.00	-18.29	VERTICAL	QP

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**7.9 Radiated Spurious Emissions (Above 1GHz)**

Test Requirement 47 CFR Part 15, Subpart C 15.205 &amp; 15.209

Test Method: ANSI C63.10 (2013) Section 6.4,6.5,6.6

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
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90kHz, 110-490kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, 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.

**7.9.1 E.U.T. Operation**

Operating Environment:

Temperature: 24.3 °C      Humidity: 53.6 % RH      Atmospheric Pressure: 1003 mbar

**7.9.2 Test Mode Description**

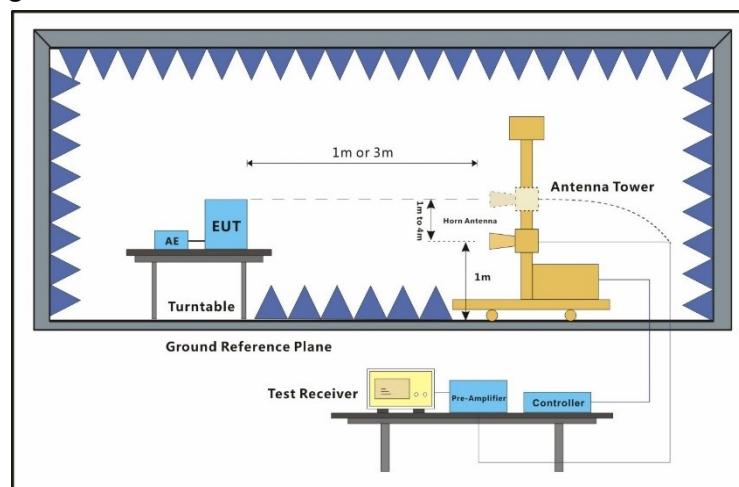
Pre-scan / Final test	Mode Code	Description
Final test	00	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB A
Final test	01	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB B
Final test	02	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB C
Final test	03	TX_non-Hop mode_Keep the EUT in continuously transmitting mode with modulation_PCB D

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**7.9.3 Test Setup Diagram**

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**7.9.4 Measurement Procedure and Data**

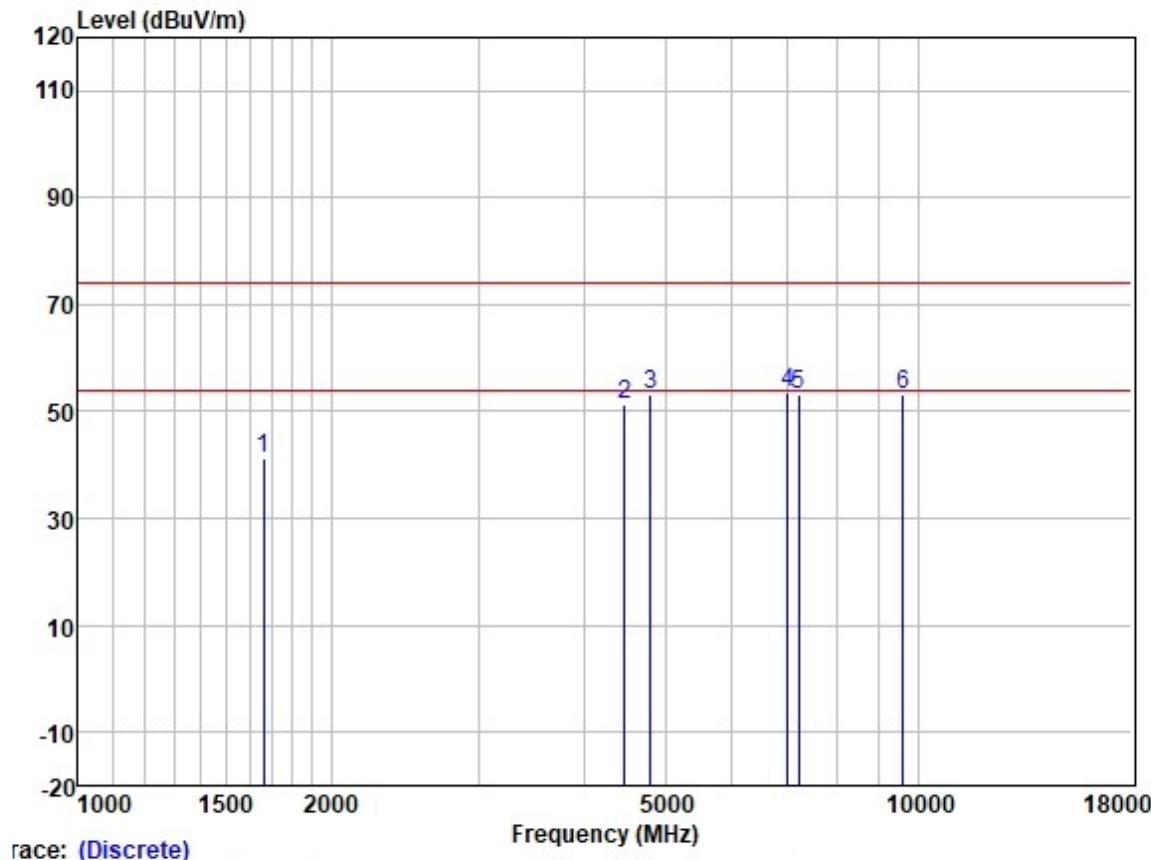
- a. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which 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 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



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	MHz	Level	Factor	Loss	Factor	Level				
1	1663.137	50.52	25.65	2.80	37.91	41.06	74.00	-32.94	HORIZONTAL	Peak
2	4469.214	52.24	30.77	4.93	36.81	51.13	74.00	-22.87	HORIZONTAL	Peak
3	4806.000	53.03	31.42	5.40	36.83	53.02	74.00	-20.98	HORIZONTAL	Peak
4	6995.172	49.98	35.00	5.81	37.25	53.54	74.00	-20.46	HORIZONTAL	Peak
5	7209.000	49.15	35.54	5.98	37.38	53.29	74.00	-20.71	HORIZONTAL	Peak
6	9612.000	45.32	38.37	7.07	37.42	53.34	74.00	-20.66	HORIZONTAL	Peak

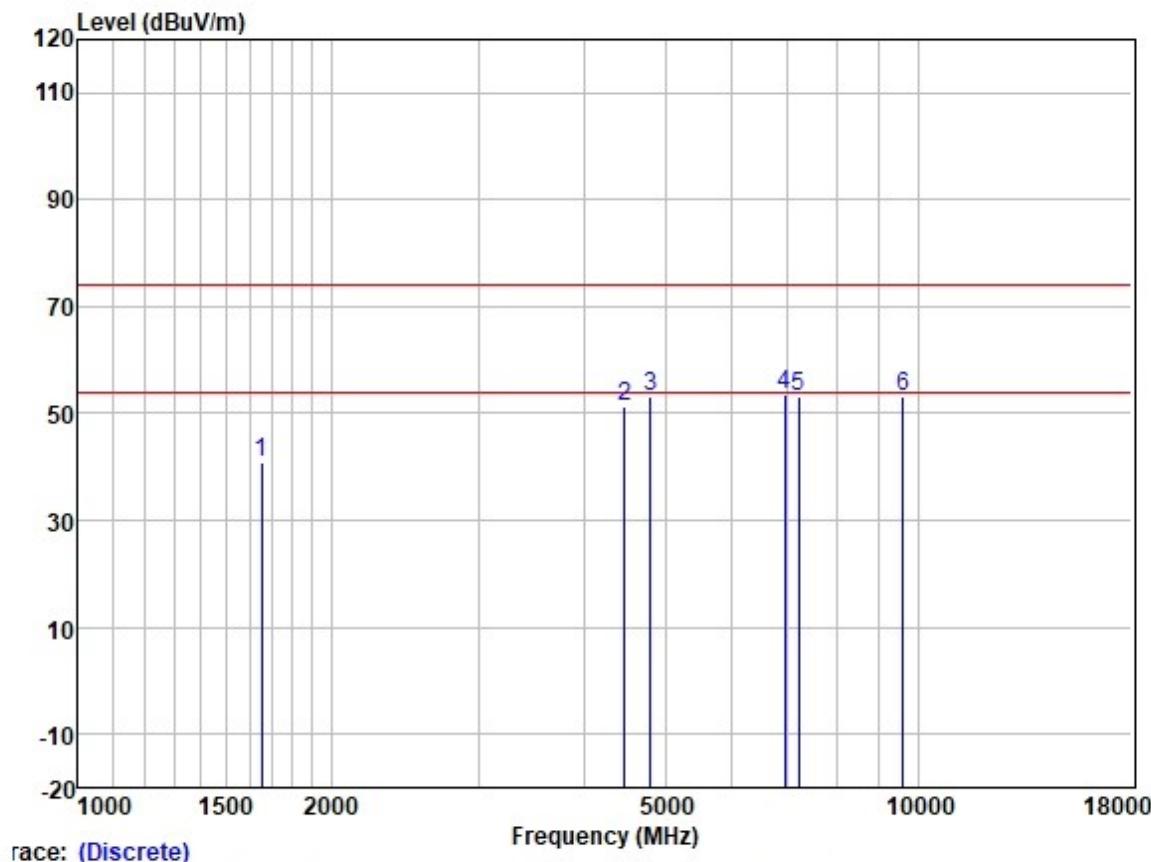
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1653.550	50.44	25.64	2.80	37.93	40.95	74.00	-33.05	VERTICAL	Peak
2	4469.214	52.24	30.77	4.93	36.81	51.13	74.00	-22.87	VERTICAL	Peak
3	4806.000	53.03	31.42	5.40	36.83	53.02	74.00	-20.98	VERTICAL	Peak
4	6934.778	49.94	34.92	5.81	37.19	53.48	74.00	-20.52	VERTICAL	Peak
5	7209.000	49.15	35.54	5.98	37.38	53.29	74.00	-20.71	VERTICAL	Peak
6	9612.000	45.32	38.37	7.07	37.42	53.34	74.00	-20.66	VERTICAL	Peak

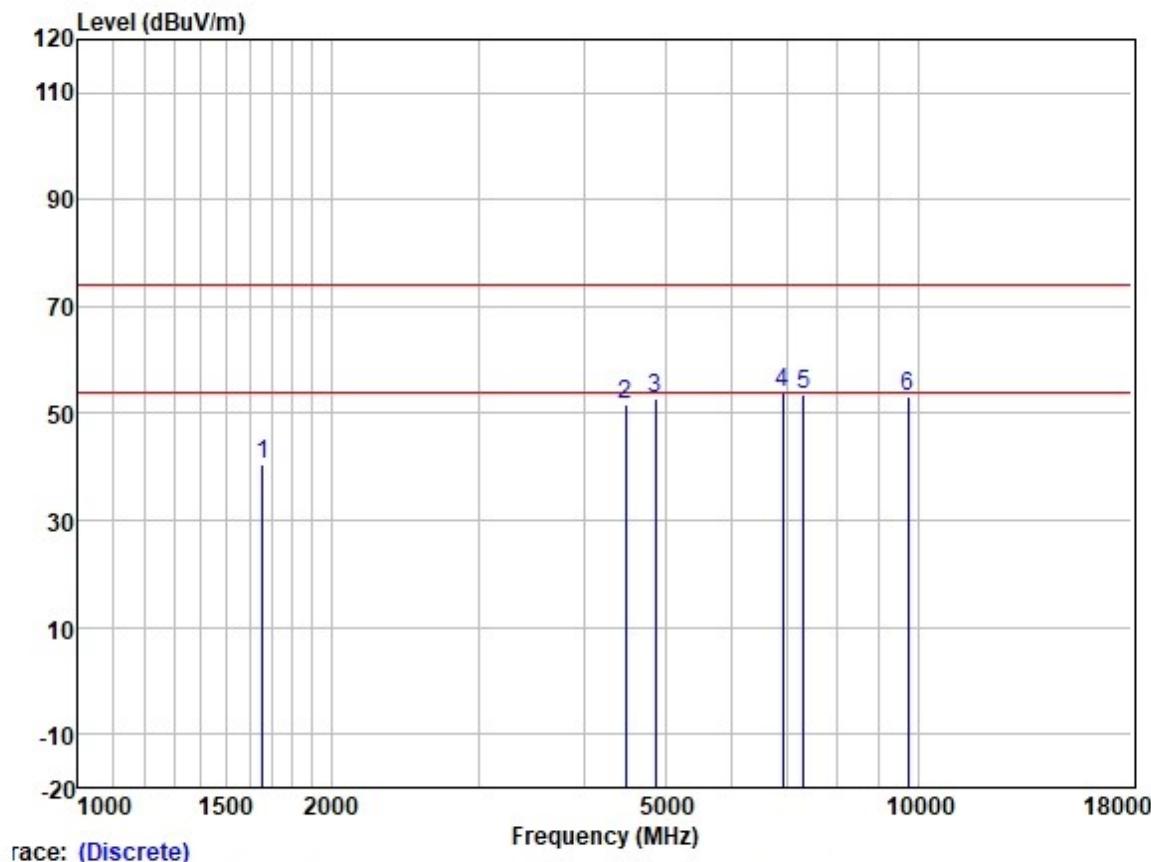
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	Freq	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1658.337	49.91	25.65	2.80	37.93	40.43	74.00	-33.57	HORIZONTAL	Peak
2	4482.150	52.82	30.78	4.99	36.81	51.78	74.00	-22.22	HORIZONTAL	Peak
3	4870.000	52.60	31.54	5.50	36.84	52.80	74.00	-21.20	HORIZONTAL	Peak
4	6894.806	50.51	34.85	5.81	37.18	53.99	74.00	-20.01	HORIZONTAL	Peak
5	7305.000	48.93	35.93	6.11	37.42	53.55	74.00	-20.45	HORIZONTAL	Peak
6	9740.000	45.21	38.50	7.02	37.41	53.32	74.00	-20.68	HORIZONTAL	Peak

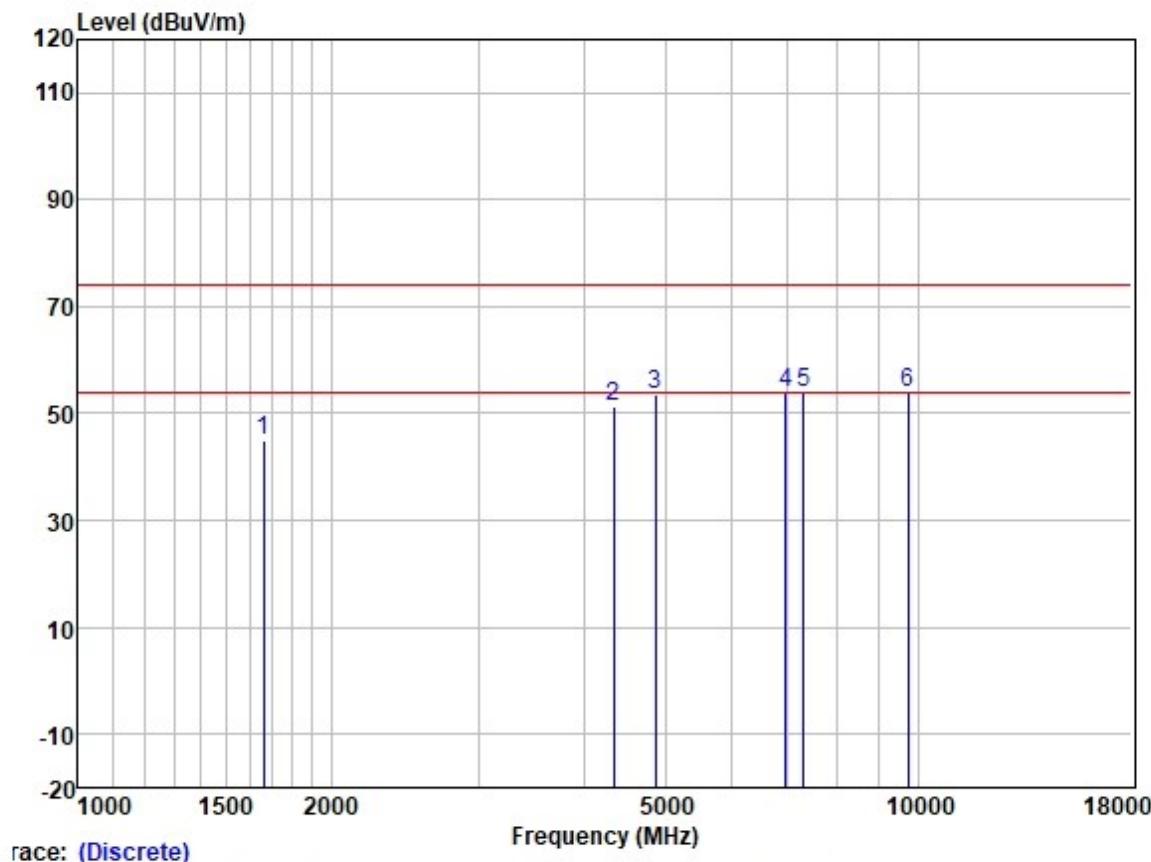
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:middle



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1663.137	54.27	25.65	2.80	37.91	44.81	74.00	-29.19	VERTICAL	Peak
2	4341.886	52.78	30.57	4.67	36.81	51.21	74.00	-22.79	VERTICAL	Peak
3	4870.000	53.35	31.54	5.50	36.84	53.55	74.00	-20.45	VERTICAL	Peak
4	6954.852	50.41	34.95	5.81	37.21	53.96	74.00	-20.04	VERTICAL	Peak
5	7305.000	49.36	35.93	6.11	37.42	53.98	74.00	-20.02	VERTICAL	Peak
6	9740.000	45.67	38.50	7.02	37.41	53.78	74.00	-20.22	VERTICAL	Peak

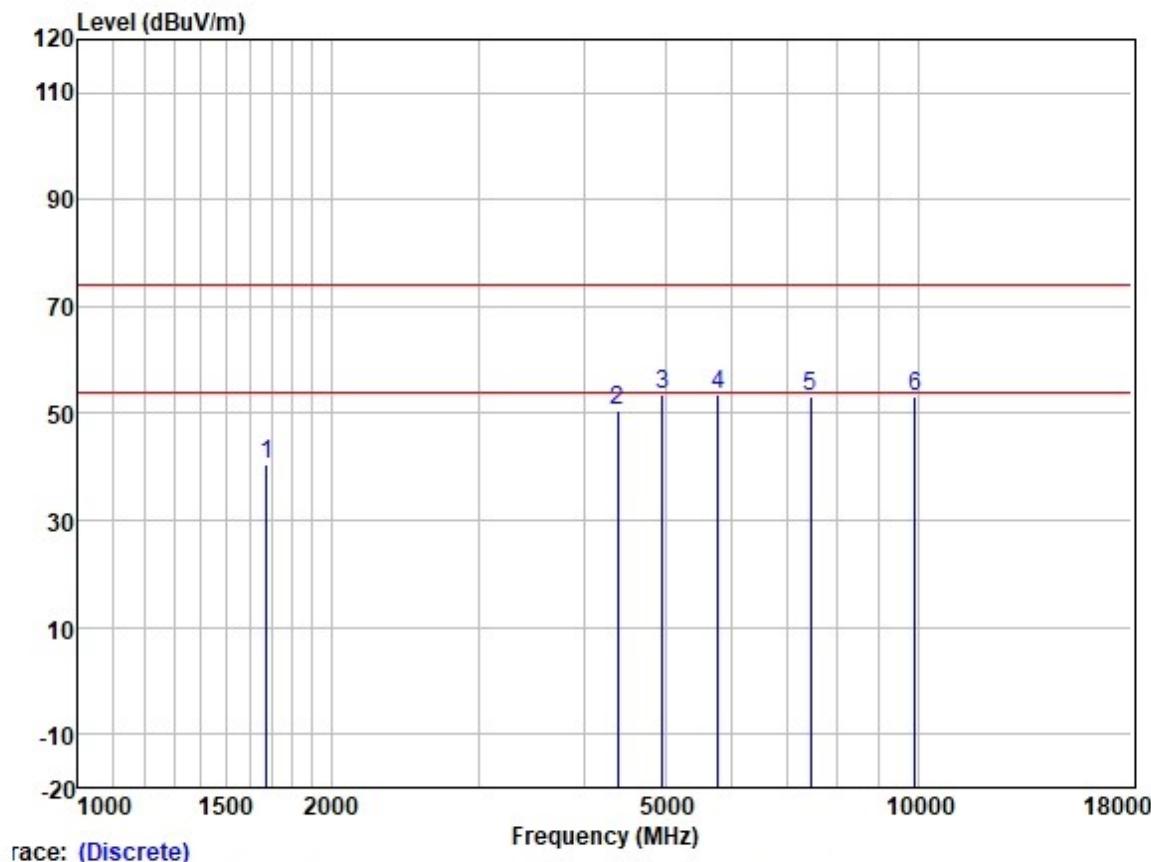
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Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1677.621	49.91	25.68	2.80	37.91	40.48	74.00	-33.52	HORIZONTAL	Peak
2	4392.376	51.85	30.66	4.70	36.81	50.40	74.00	-23.60	HORIZONTAL	Peak
3	4962.000	53.05	31.65	5.65	36.84	53.51	74.00	-20.49	HORIZONTAL	Peak
4	5780.300	52.02	32.16	6.10	36.89	53.39	74.00	-20.61	HORIZONTAL	Peak
5	7443.000	48.22	36.27	6.22	37.47	53.24	74.00	-20.76	HORIZONTAL	Peak
6	9924.000	45.00	38.65	6.96	37.40	53.21	74.00	-20.79	HORIZONTAL	Peak

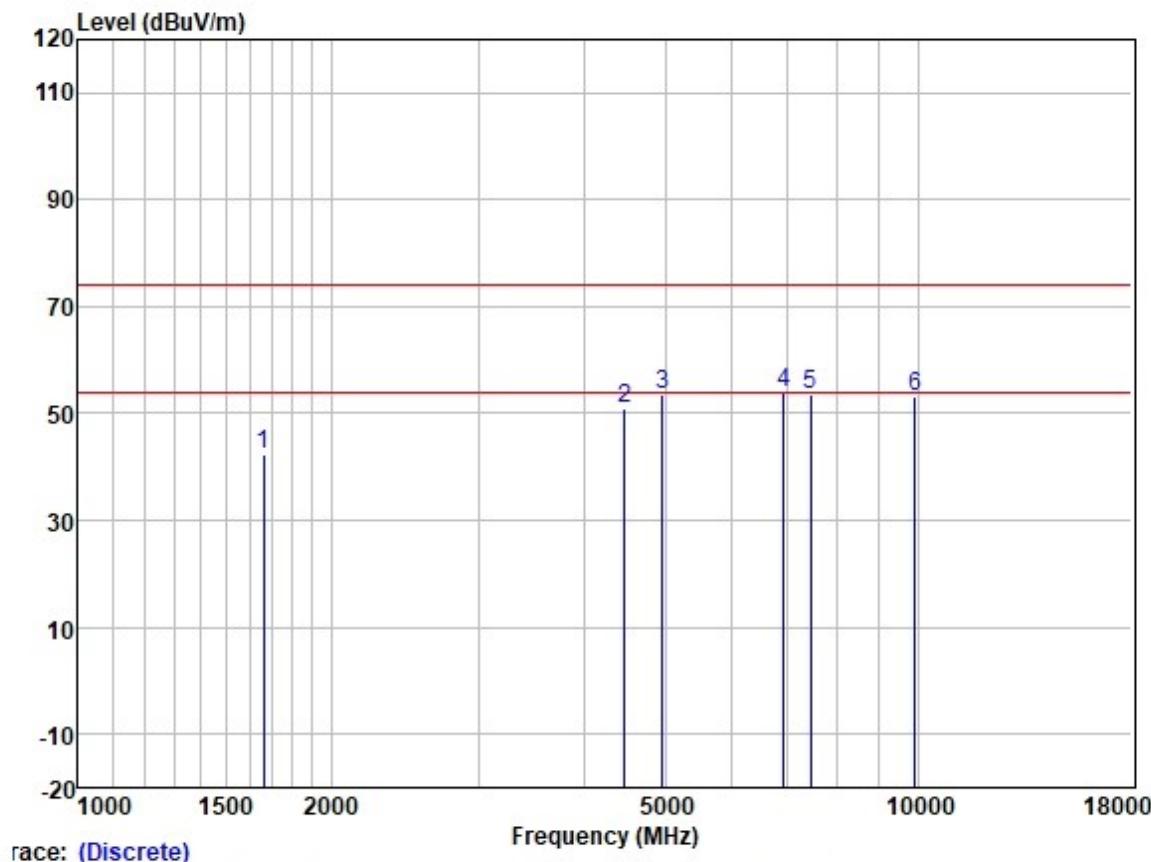
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Test Mode: 00; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level	dBuV/m	dBuV/m	dB	
1 1663.137	51.78	25.65	2.80	37.91	42.32	74.00	-31.68	VERTICAL	Peak	
2 4469.214	52.02	30.77	4.93	36.81	50.91	74.00	-23.09	VERTICAL	Peak	
3 4962.000	52.95	31.65	5.65	36.84	53.41	74.00	-20.59	VERTICAL	Peak	
4 6914.763	50.35	34.89	5.81	37.19	53.86	74.00	-20.14	VERTICAL	Peak	
5 7443.000	48.37	36.27	6.22	37.47	53.39	74.00	-20.61	VERTICAL	Peak	
6 9924.000	44.81	38.65	6.96	37.40	53.02	74.00	-20.98	VERTICAL	Peak	

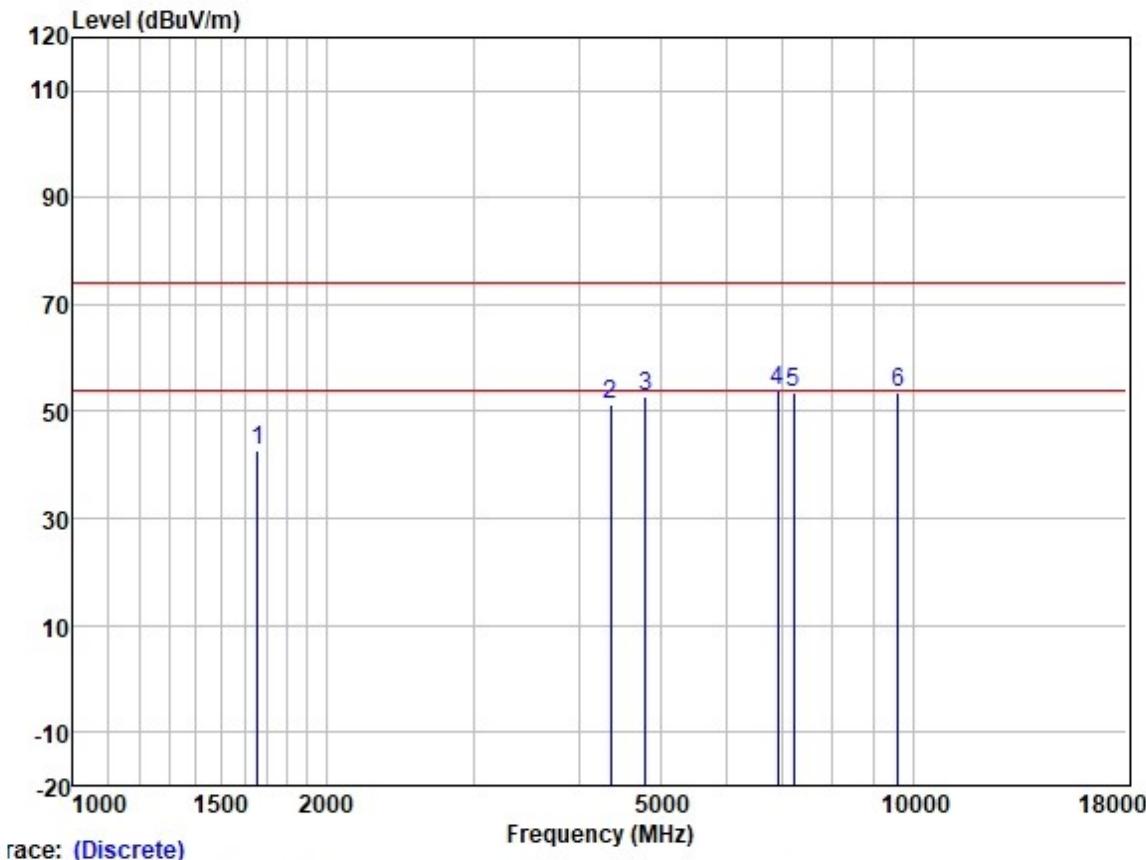
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Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1658.337	52.36	25.65	2.80	37.93	42.88	74.00	-31.12	HORIZONTAL	Peak
2	4367.058	52.66	30.62	4.68	36.81	51.15	74.00	-22.85	HORIZONTAL	Peak
3	4806.000	52.79	31.42	5.40	36.83	52.78	74.00	-21.22	HORIZONTAL	Peak
4	6894.806	50.39	34.85	5.81	37.18	53.87	74.00	-20.13	HORIZONTAL	Peak
5	7209.000	49.57	35.54	5.98	37.38	53.71	74.00	-20.29	HORIZONTAL	Peak
6	9612.000	45.38	38.37	7.07	37.42	53.40	74.00	-20.60	HORIZONTAL	Peak

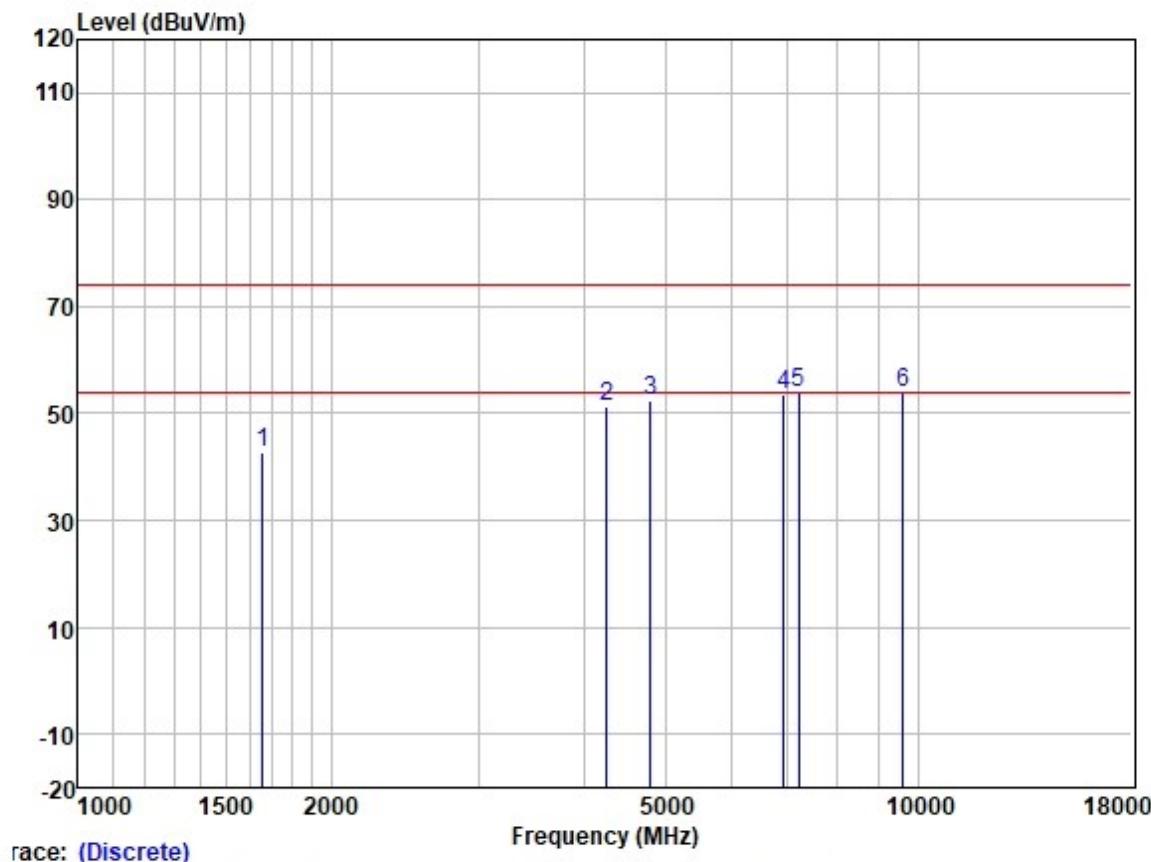
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Test Mode: 01; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1658.337	52.25	25.65	2.80	37.93	42.77	74.00	-31.23	VERTICAL	Peak
2	4254.921	52.99	30.34	4.62	36.81	51.14	74.00	-22.86	VERTICAL	Peak
3	4806.000	52.30	31.42	5.40	36.83	52.29	74.00	-21.71	VERTICAL	Peak
4	6914.763	50.20	34.89	5.81	37.19	53.71	74.00	-20.29	VERTICAL	Peak
5	7209.000	49.61	35.54	5.98	37.38	53.75	74.00	-20.25	VERTICAL	Peak
6	9612.000	45.84	38.37	7.07	37.42	53.86	74.00	-20.14	VERTICAL	Peak

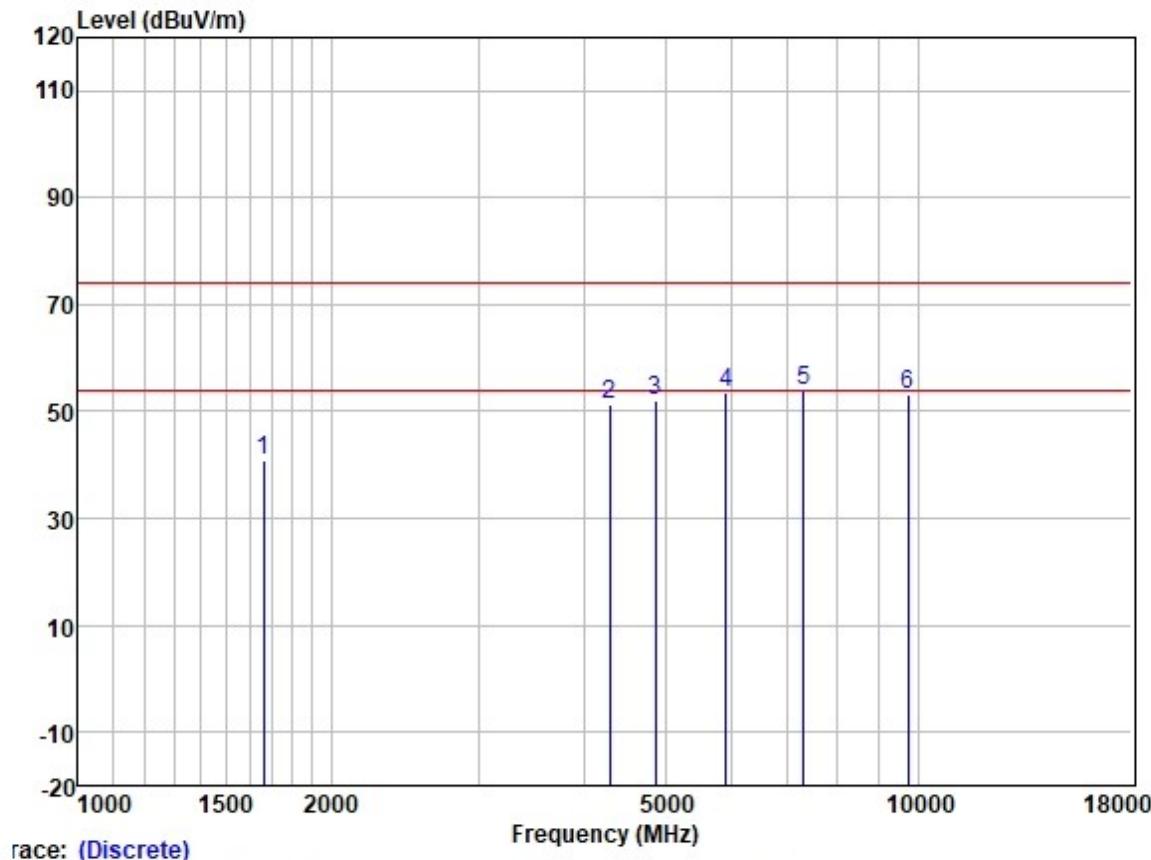
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Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Over	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1663.137	50.35	25.65	2.80	37.91	40.89	74.00	-33.11	HORIZONTAL	Peak
2	4291.977	53.15	30.45	4.64	36.81	51.43	74.00	-22.57	HORIZONTAL	Peak
3	4870.000	51.73	31.54	5.50	36.84	51.93	74.00	-22.07	HORIZONTAL	Peak
4	5915.516	52.21	32.33	5.95	36.90	53.59	74.00	-20.41	HORIZONTAL	Peak
5	7305.000	49.16	35.93	6.11	37.42	53.78	74.00	-20.22	HORIZONTAL	Peak
6	9740.000	44.96	38.50	7.02	37.41	53.07	74.00	-20.93	HORIZONTAL	Peak

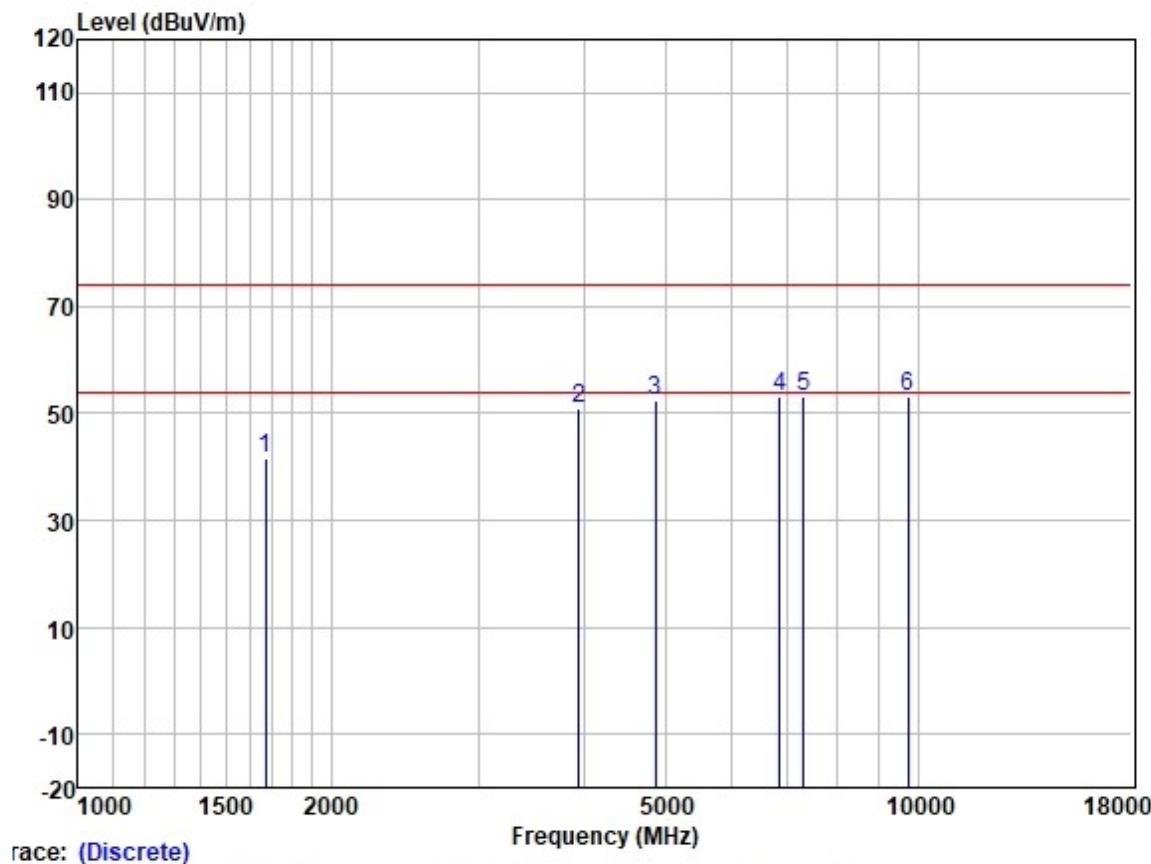
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Test Mode: 01; Polarity: Vertical; Modulation:GFSK; ; Channel:middle



Trace: (Discrete)	Freq	ReadAntenna		Cable		Preamp		Limit Line	Over Limit	Pol/Phase	Remark
		Level	Factor	Loss	Factor	Level	dBuV/m				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB			
1	1672.779	51.05	25.67	2.80	37.91	41.61	74.00	-32.39	VERTICAL	Peak	
2	3946.885	53.23	29.74	4.60	36.81	50.76	74.00	-23.24	VERTICAL	Peak	
3	4870.000	52.40	31.54	5.50	36.84	52.60	74.00	-21.40	VERTICAL	Peak	
4	6855.063	49.87	34.78	5.82	37.15	53.32	74.00	-20.68	VERTICAL	Peak	
5	7305.000	48.69	35.93	6.11	37.42	53.31	74.00	-20.69	VERTICAL	Peak	
6	9740.000	45.06	38.50	7.02	37.41	53.17	74.00	-20.83	VERTICAL	Peak	

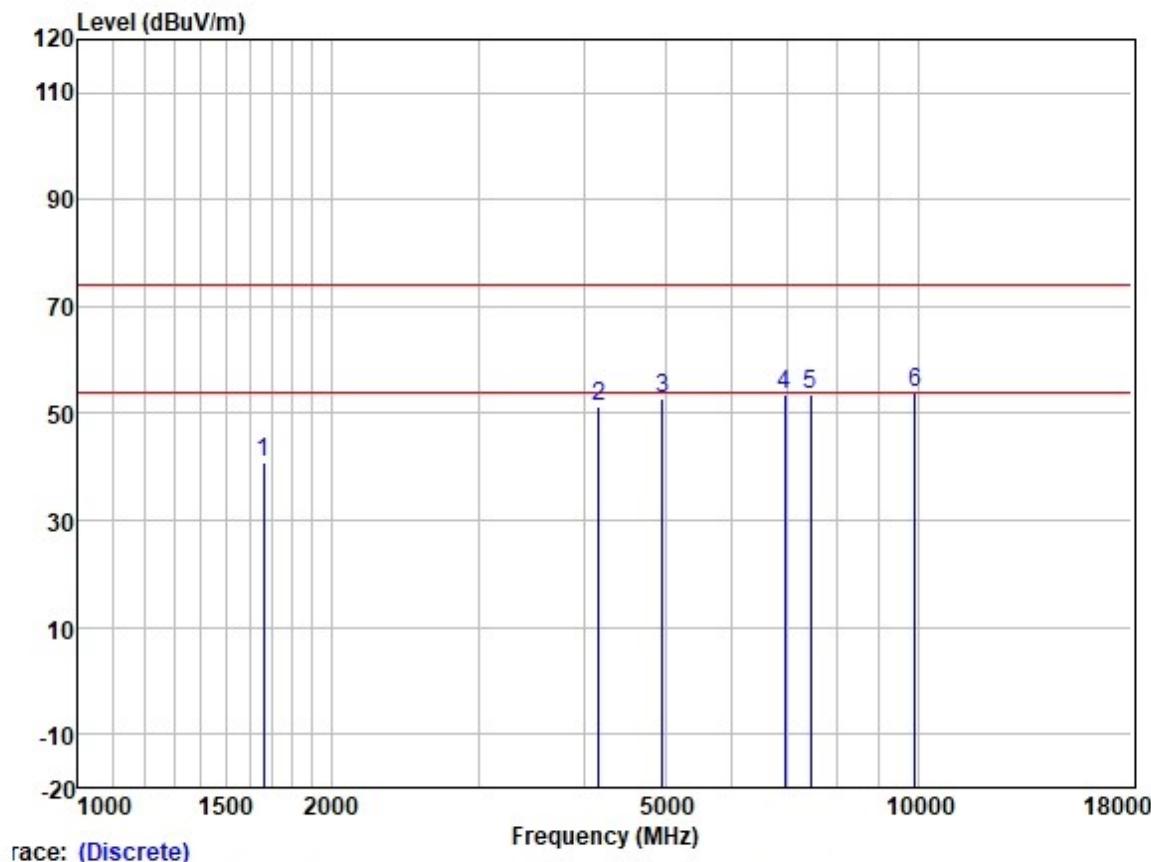
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Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level	dBuV/m	dBuV/m	dB	
1	1663.137	50.21	25.65	2.80	37.91	40.75	74.00	-33.25	HORIZONTAL	Peak
2	4169.698	53.29	30.09	4.60	36.80	51.18	74.00	-22.82	HORIZONTAL	Peak
3	4962.000	52.43	31.65	5.65	36.84	52.89	74.00	-21.11	HORIZONTAL	Peak
4	6934.778	49.92	34.92	5.81	37.19	53.46	74.00	-20.54	HORIZONTAL	Peak
5	7443.000	48.38	36.27	6.22	37.47	53.40	74.00	-20.60	HORIZONTAL	Peak
6	9924.000	45.69	38.65	6.96	37.40	53.90	74.00	-20.10	HORIZONTAL	Peak

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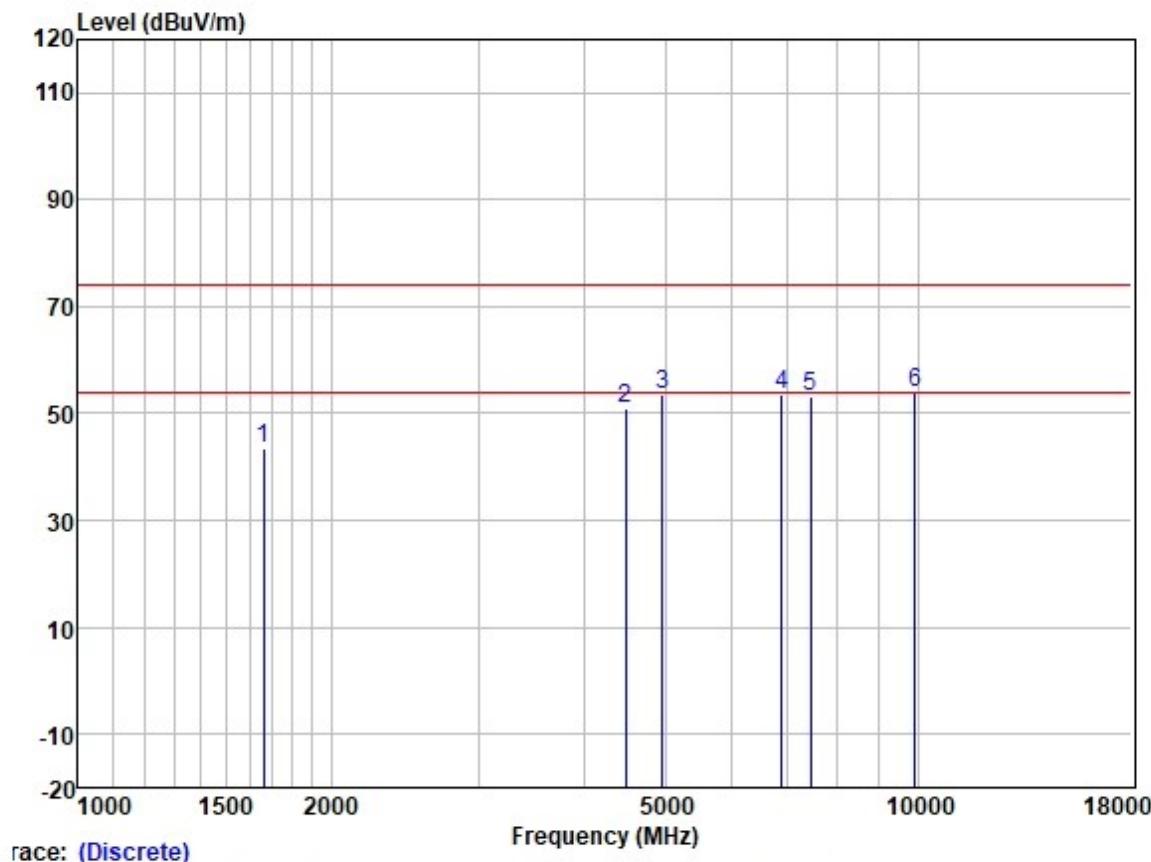


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Test Mode: 01; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Race: (Discrete)

Freq	ReadAntenna		Cable		Preamp		Limit	Over	Pol/Phase	Remark
	MHz	Level	Factor	Loss	Factor	Level				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1663.137	53.05	25.65	2.80	37.91	43.59	74.00	-30.41	VERTICAL	Peak
2	4482.150	51.83	30.78	4.99	36.81	50.79	74.00	-23.21	VERTICAL	Peak
3	4962.000	53.07	31.65	5.65	36.84	53.53	74.00	-20.47	VERTICAL	Peak
4	6874.906	50.01	34.82	5.82	37.16	53.49	74.00	-20.51	VERTICAL	Peak
5	7443.000	48.12	36.27	6.22	37.47	53.14	74.00	-20.86	VERTICAL	Peak
6	9924.000	45.70	38.65	6.96	37.40	53.91	74.00	-20.09	VERTICAL	Peak

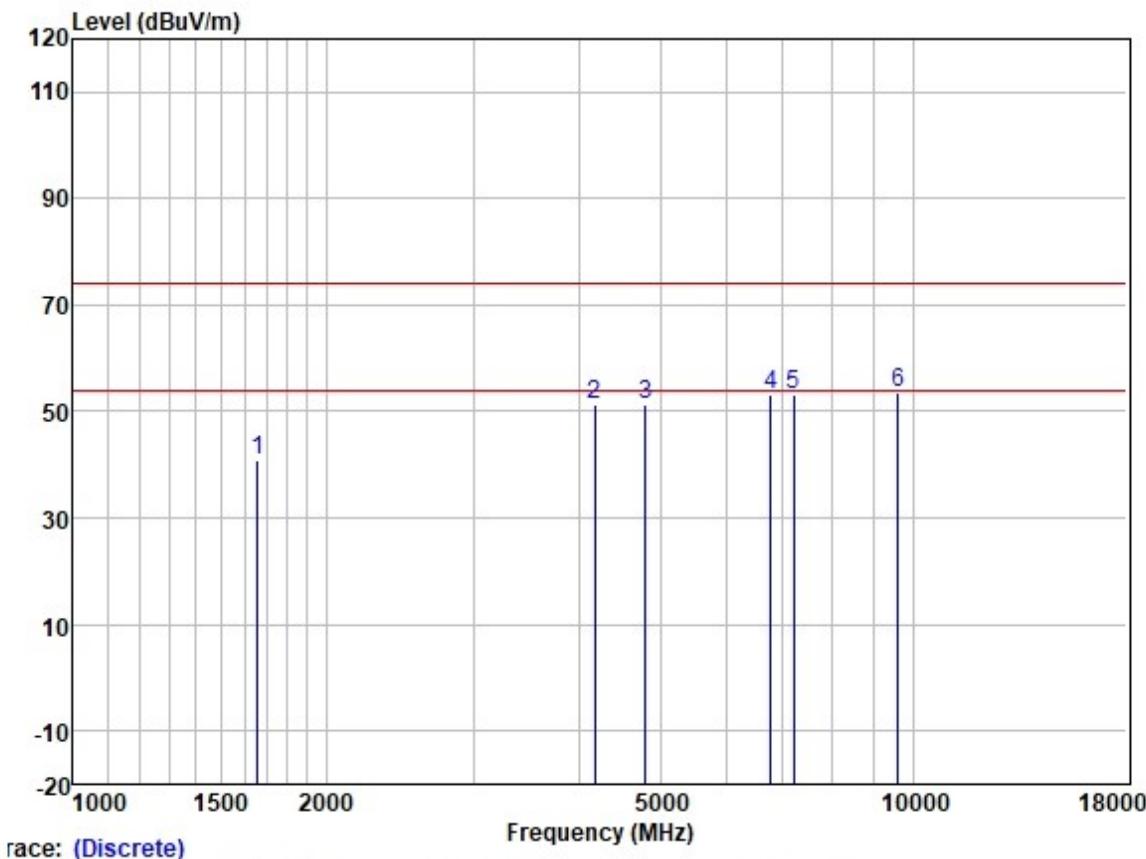
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low



Index: (Discrete)	Freq	ReadAntenna		Cable		Preamp	Limit	Over	Pol/Phase	Remark
		Level	Factor	Loss	Factor					
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB		
1	1658.337	50.31	25.65	2.80	37.93	40.83	74.00	-33.17	HORIZONTAL	Peak
2	4181.768	53.42	30.12	4.60	36.80	51.34	74.00	-22.66	HORIZONTAL	Peak
3	4806.000	51.38	31.42	5.40	36.83	51.37	74.00	-22.63	HORIZONTAL	Peak
4	6776.265	49.91	34.61	5.82	37.11	53.23	74.00	-20.77	HORIZONTAL	Peak
5	7209.000	49.14	35.54	5.98	37.38	53.28	74.00	-20.72	HORIZONTAL	Peak
6	9612.000	45.68	38.37	7.07	37.42	53.70	74.00	-20.30	HORIZONTAL	Peak

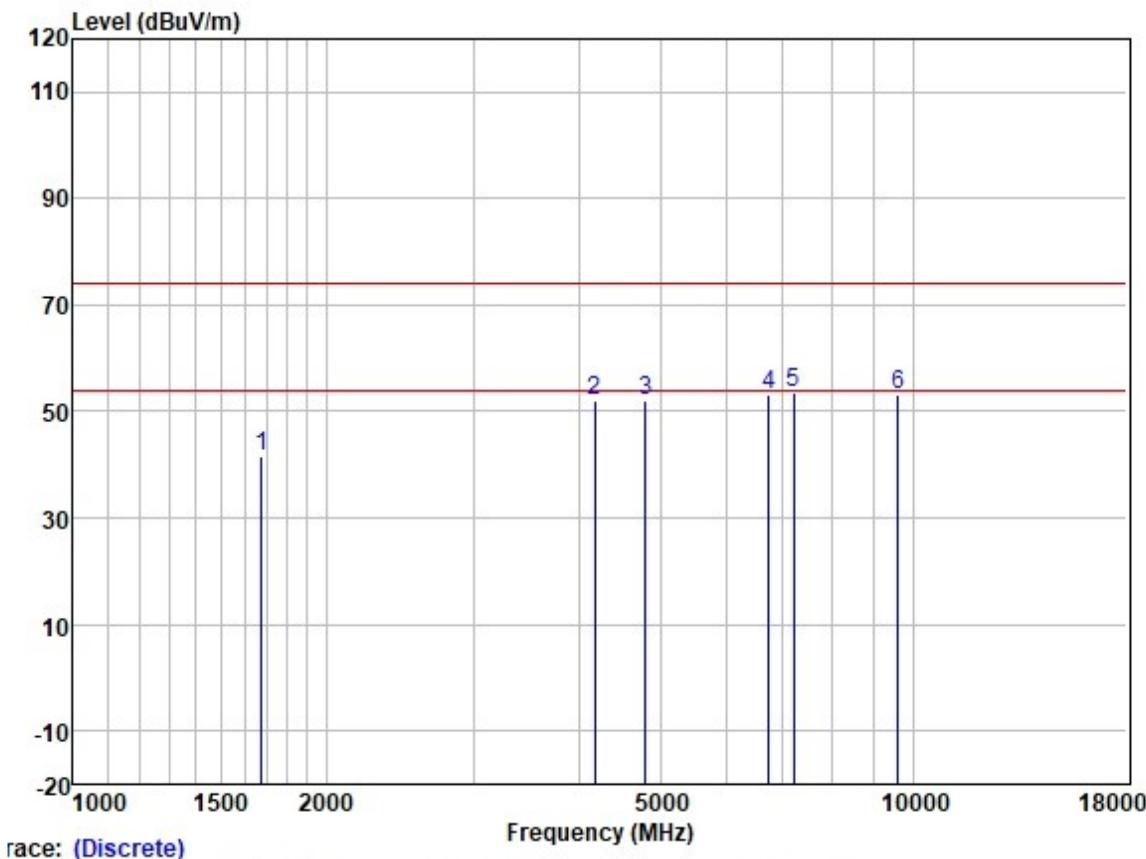
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:Low



Race: (Discrete)	Freq	ReadAntenna Level	Cable Loss	Preamp Factor	Limit Level	Limit Line	Over Limit	Pol/Phase	Remark	
									MHz	dB
	MHz	dBuV	dB/m		dB	dBuV/m	dBuV/m			
1	1677.621	50.98	25.68	2.80	37.91	41.55	74.00	-32.45	VERTICAL	Peak
2	4181.768	54.10	30.12	4.60	36.80	52.02	74.00	-21.98	VERTICAL	Peak
3	4806.000	51.93	31.42	5.40	36.83	51.92	74.00	-22.08	VERTICAL	Peak
4	6737.207	49.80	34.50	5.82	37.09	53.03	74.00	-20.97	VERTICAL	Peak
5	7209.000	49.52	35.54	5.98	37.38	53.66	74.00	-20.34	VERTICAL	Peak
6	9612.000	45.06	38.37	7.07	37.42	53.08	74.00	-20.92	VERTICAL	Peak

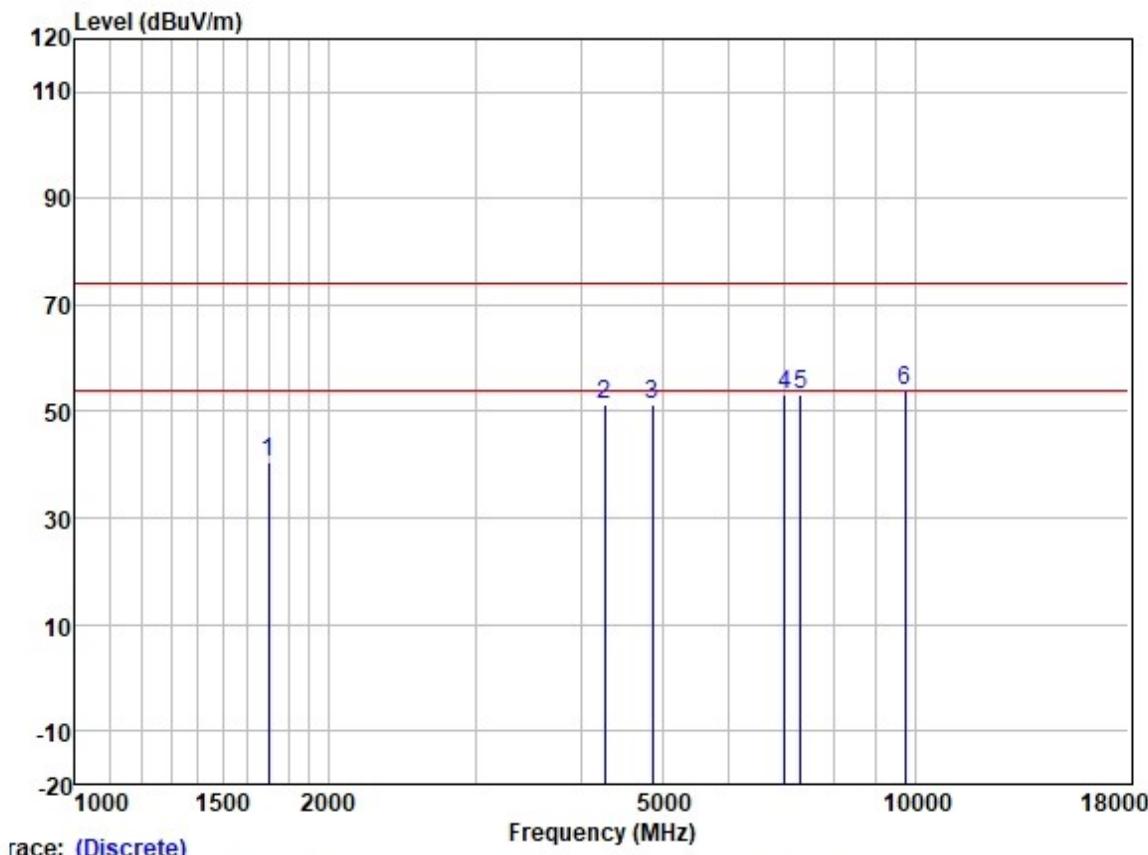
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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle



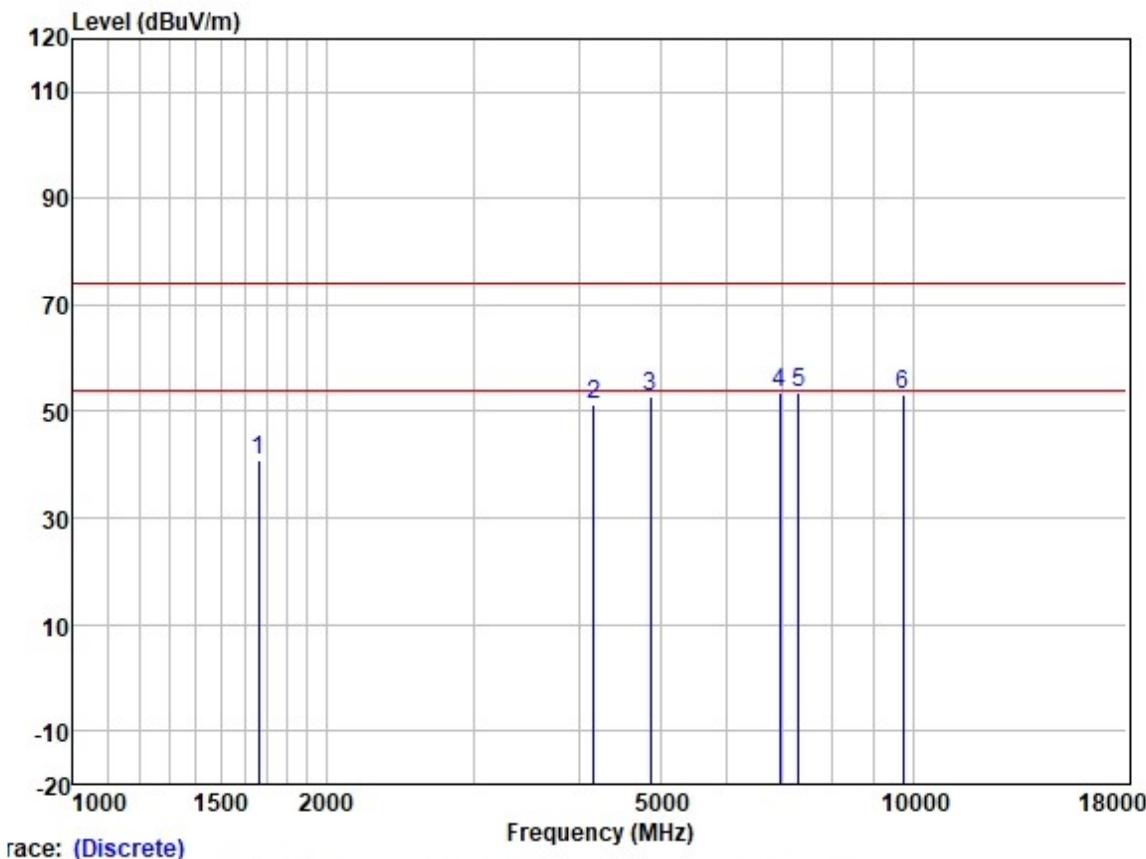
Freq	ReadAntenna	Cable	Preamp	Limit	Over	Limit	Over	Pol/Phase	Remark
	Level	Factor	Loss						
MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	dB	
1 1697.129	49.89	25.71	2.80	37.89	40.51	74.00	-33.49	HORIZONTAL	Peak
2 4267.237	52.94	30.38	4.63	36.81	51.14	74.00	-22.86	HORIZONTAL	Peak
3 4870.000	51.22	31.54	5.50	36.84	51.42	74.00	-22.58	HORIZONTAL	Peak
4 6995.172	49.45	35.00	5.81	37.25	53.01	74.00	-20.99	HORIZONTAL	Peak
5 7305.000	48.62	35.93	6.11	37.42	53.24	74.00	-20.76	HORIZONTAL	Peak
6 9740.000	45.63	38.50	7.02	37.41	53.74	74.00	-20.26	HORIZONTAL	Peak

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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:middle

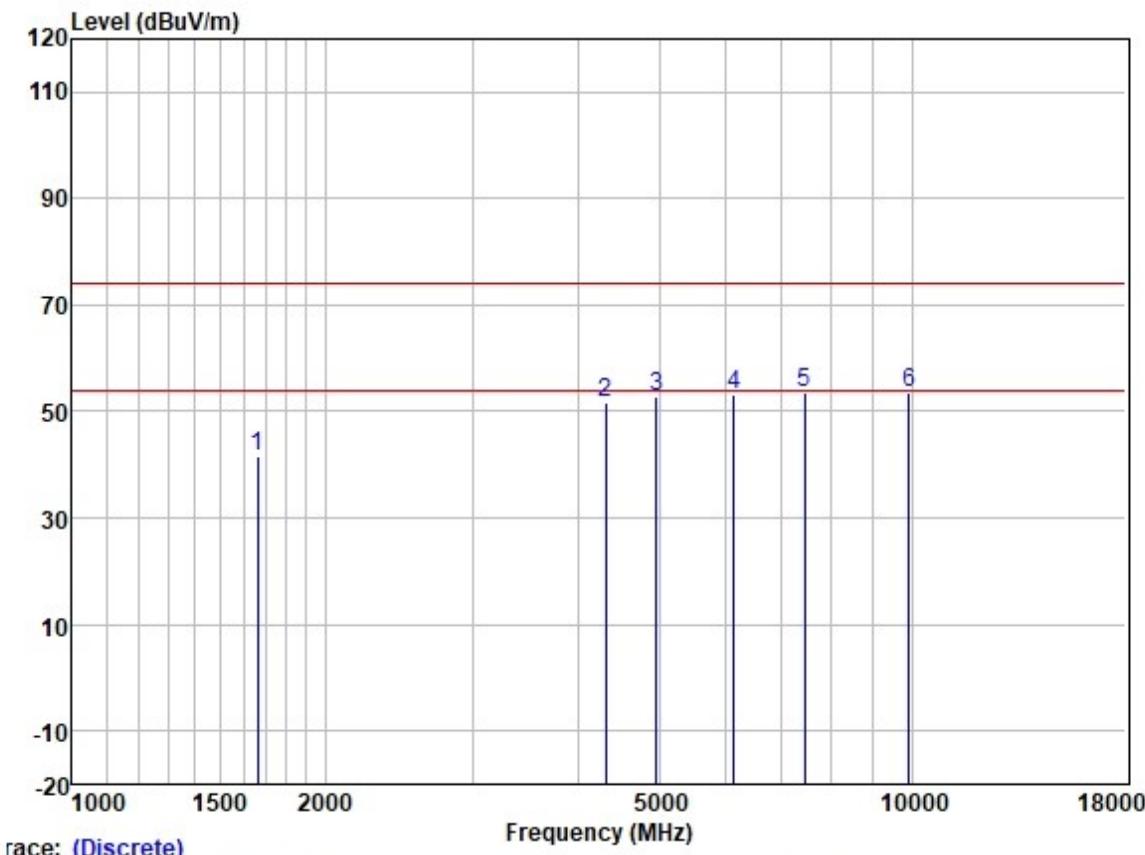


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Test Mode: 02; Polarity: Horizontal; Modulation:GFSK; ; Channel:High



Race: (Discrete)	Freq	ReadAntenna	Cable	Preamp	Limit	Over	Limit Pol/Phase	Remark
		Level	Loss	Factor				
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	1663.137	51.17	25.65	2.80	37.91	41.71	74.00	-32.29 HORIZONTAL Peak
2	4316.859	53.16	30.51	4.66	36.81	51.52	74.00	-22.48 HORIZONTAL Peak
3	4962.000	52.38	31.65	5.65	36.84	52.84	74.00	-21.16 HORIZONTAL Peak
4	6142.019	51.04	32.77	6.12	36.93	53.00	74.00	-21.00 HORIZONTAL Peak
5	7443.000	48.70	36.27	6.22	37.47	53.72	74.00	-20.28 HORIZONTAL Peak
6	9924.000	45.34	38.65	6.96	37.40	53.55	74.00	-20.45 HORIZONTAL Peak

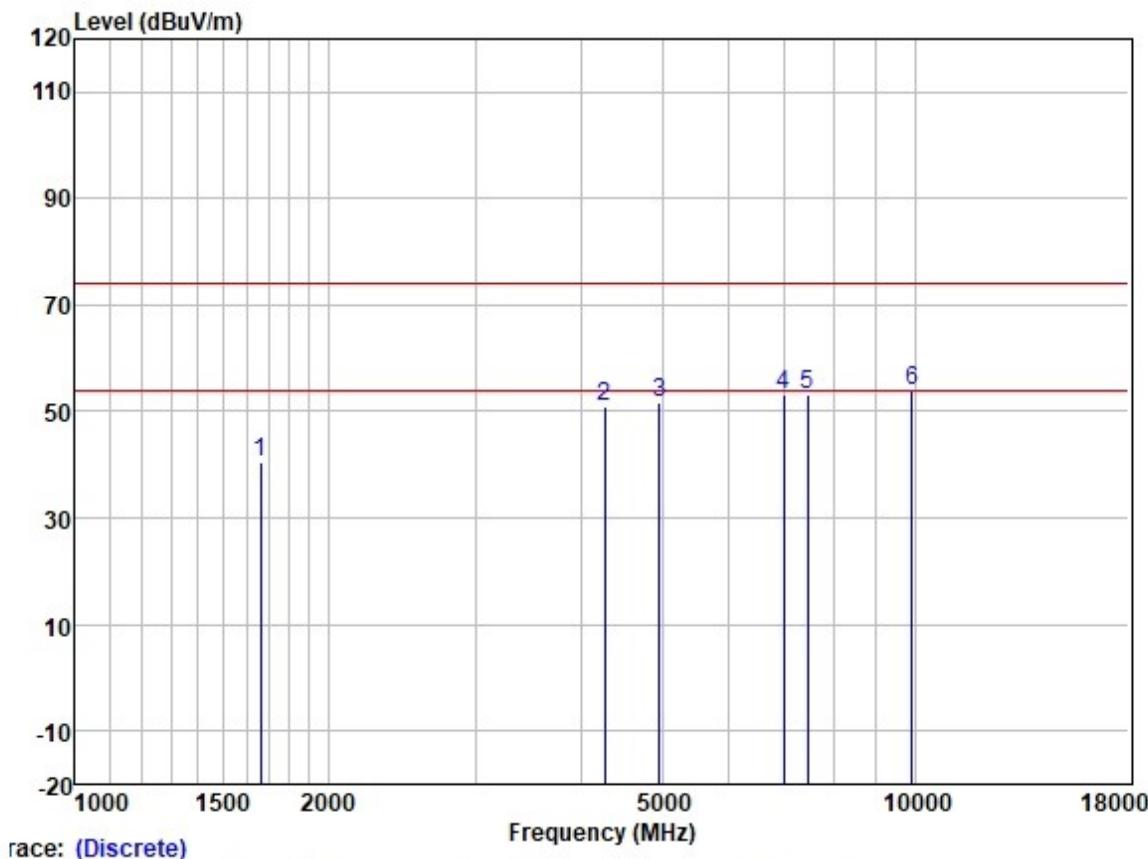
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Test Mode: 02; Polarity: Vertical; Modulation:GFSK; ; Channel:High



Index: (Discrete)	Freq	ReadAntenna		Cable		Preamp	Limit	Over	Over	Remark
		Freq	Level	Factor	Loss					
	MHz	dBuV	dB/m		dB	dB	dBuV/m	dBuV/m	dB	
1	1663.137	50.06	25.65	2.80	37.91	40.60	74.00	-33.40	VERTICAL	Peak
2	4267.237	52.65	30.38	4.63	36.81	50.85	74.00	-23.15	VERTICAL	Peak
3	4962.000	51.30	31.65	5.65	36.84	51.76	74.00	-22.24	VERTICAL	Peak
4	6974.982	49.73	34.97	5.81	37.23	53.28	74.00	-20.72	VERTICAL	Peak
5	7443.000	48.15	36.27	6.22	37.47	53.17	74.00	-20.83	VERTICAL	Peak
6	9924.000	45.77	38.65	6.96	37.40	53.98	74.00	-20.02	VERTICAL	Peak

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