TEST REPORT

Application No.:	GZCR2104020065AT
Applicant:	Harman International Industries, Incorporated
Address of Applicant:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES
Manufacturer:	Harman International Industries, Incorporated
Address of Manufacturer:	8500 Balboa Blvd, Northridge, CA 91329, UNITED STATES
Factory:	Zhong Shan City Richsound Electronic Industrial Ltd.
Address of Factory:	No.16, East Shagang Road, Gangkou, Zhongshan, Guangdong, China.
Equipment Under Test (EUT):	
EUT Name:	Soundbar with Wireless Subwoofer and Virtual Atmos
Model No.:	CINEMA SB190
Trade Mark:	JBL
Standard(s) :	47 CFR Part 15, Subpart C 15.249
Date of Receipt:	2021-04-02
Date of Test:	2021-04-19 to 2021-04-27
Date of Issue:	2021-05-14
Test Result:	**Pass***

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

Kobe Jian
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		*2021-05-14*		*Original*

Authorized for issue by				
Tested By		**Curry Wu/Project Engineer**		
Reviewed By		**Ricky Liu/Reviewer**		

SGS-CSTC Standards Technical Services Co., Ltd. Guangzhou Branch Testing Center, EEC Laboratory.
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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**
Conducted Emissions at AC Power Line (150kHz-30MHz)	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.2	47 CFR Part 15, Subpart C 15.207	Pass
20dB Bandwidth	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))	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.5&6.6	47 CFR Part 15, Subpart C 15.249(a)	Pass
Restricted Band Around Fundamental Frequency	47 CFR Part 15, Subpart C 15.249	ANSI C63.10 (2013) Section 6.10.5	47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209	Pass
Radiated Emissions	47 CFR Part 15, Subpart C 15.249	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.

3 Contents

Page

4 General Information

4.1 Details of E.U.T.

Power supply:	AC 100-240V 50/60Hz for soundbar (Tx)
	AC 100-240V 50/60Hz for subwoofer (Rx)
	DC 3V = size 'AAA' battery for IR remote controller
Cable(s):	about 1.5m x 2 wires AC mains cable for soundbar &subwoofer
	about 1.5m length HDMI cable
Test Voltage:	AC 230 V, 50 Hz
Operating Frequency:	2404.5 MHz-2479.5 MHz
Channel number:	16
Channel Spacing	5 MHz
Modulation Type:	FSK
Sample Type:	Portable production
Antenna Type:	Integral
Antenna Gain:	2.28 dBi declared by manufacture
Software Version:	SV01
Hardware Version:	CSM1_V2.1
Sample NO.:	RS0174DL0000162
Power Setting:	Default

4.2 Description of Support Units

The EUT has been tested as an independent unit.

4.3 Measurement Uncertainty

Test Item	Measurement Uncertainty
Conducted Emissions at AC Power Line (150kHz-30MHz)	3.12dB
20dB Bandwidth	± 3%
Field Strength of the Fundamental Signal (15.249(a))	± 4.5dB (Below 1GHz); ± 4.8dB (Above 1GHz)
Restricted Band Around Fundamental Frequency	± 4.5dB (Below 1GHz); ± 4.8dB (Above 1GHz)
Radiated Emissions	5.06dB （30MHz-1GHz；3m） 4.46dB （30MHz-1GHz；10m） 5.08dB (1GHz-6GHz) 5.14dB (6GHz-18GHz)

4.4 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Guangzhou Branch EMC Laboratory,

198 Kezhu Road, Scientech 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.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Conducted Emissions at AC Power Line (150kHz-30MHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver(9kHz-2.75GHz)	Rohde & Schwarz	ESCS30	EMC0506	2020-11-13	2021-11-12
Shielding Room	ChangZhou ZhongYu	8m x 3m x 3.8m	EMC0306	N/A	N/A
Two-Line V-Network	Rohde & Schwarz	ENV216	EMC0118	2021-01-08	2022-01-06
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

20dB Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EXA Signal Analzer(10Hz-44GHz)	Agilent Technologies	N9010A	EMC2138	2020-09-17	2021-09-16
6dB Attenuator	HP	8491A	EMC2062	2020-04-15	2022-04-14
Test Software JS1120-3	HangTianXing	V2.6	GZE100-69	N/A	N/A
MI CABLE	SGS-EMC	0.8M	EMC2136	2019-11-02	2021-11-01

Field Strength of the Fundamental Signal (15.249(a))					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Signal Analyzer (20Hz-26.5GHz)	Rohde & Schwarz	FISQ 26	EMC0069	2020/11/13	2021/11/12

Restricted Band Around Fundamental Frequency					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Signal Analyzer (20Hz-26.5GHz)	Rohde & Schwarz	FISQ 26	EMC0069	2020/11/13	2021/11/12

Radiated Emissions					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Chamber cable	HangTianXing	N/A	EMC0542	2019-06-28	2021-06-27
Horn Antenna(1GHz-18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120D	EMC2026	2019-09-25	2022-09-24
1GHz-26.5 GHz Pre-Amplifier	Agilent	8449B	EMC0521	2021-01-08	2022-01-07
2.4GHz Filter	Micro-Tronics	BRM 50702	EMC2069	2021-01-08	2022-01-07
966 Anechoic Chamber	C.R.T	9m x 6m x 6m	EMC2142	2020-12-20	2023-12-19
MXE EMI Receiver(10Hz-8.4GHz)	Keysight	N9038A	EMC2139	2020-11-13	2021-11-12
EXA Signal Analyzer(10Hz-44GHz)	Keysight	N9010A	EMC2138	2020-09-17	2021-09-16
Test Software E3	Audix	Ver.6.120110a	GZE100-61	N/A	N/A
Signal Analyzer (20Hz-26.5GHz)	Rohde & Schwarz	FISQ 26	EMC0069	2020/11/13	2021/11/12

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
DMM	Fluke	73	EMC0006	2020-07-09	2021-07-08
DMM	Fluke	73	EMC0007	2020-07-09	2021-07-08

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 2.28dBi.

Antenna location: Refer to Internal photos

7 Radio Spectrum Matter Test Results

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

Test Requirement: 47 CFR Part 15, Subpart C 15.249

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

Limit:

Frequency of emission(MHz)	Conducted limit(dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency.		
Detector: Peak for pre-scan (9kHz resolution bandwidth) 0.15M to 30MHz		

7.1.1 E.U.T. Operation

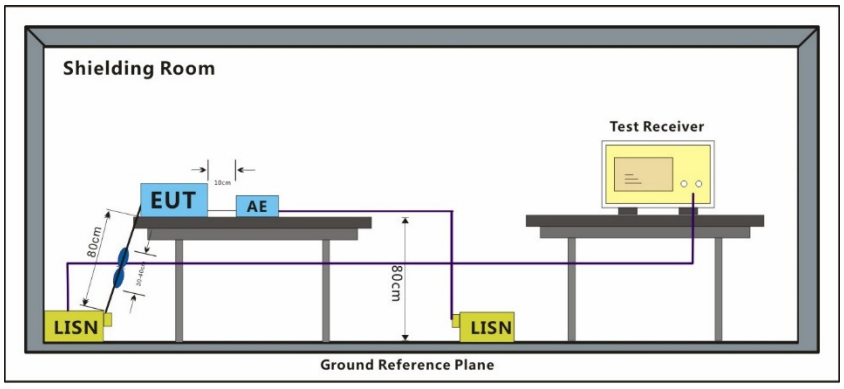
Operating Environment:

Temperature: 25.3 °C Humidity: 52.5 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in transmitting with modulation mode.

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50ohm/50μH + 5ohm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

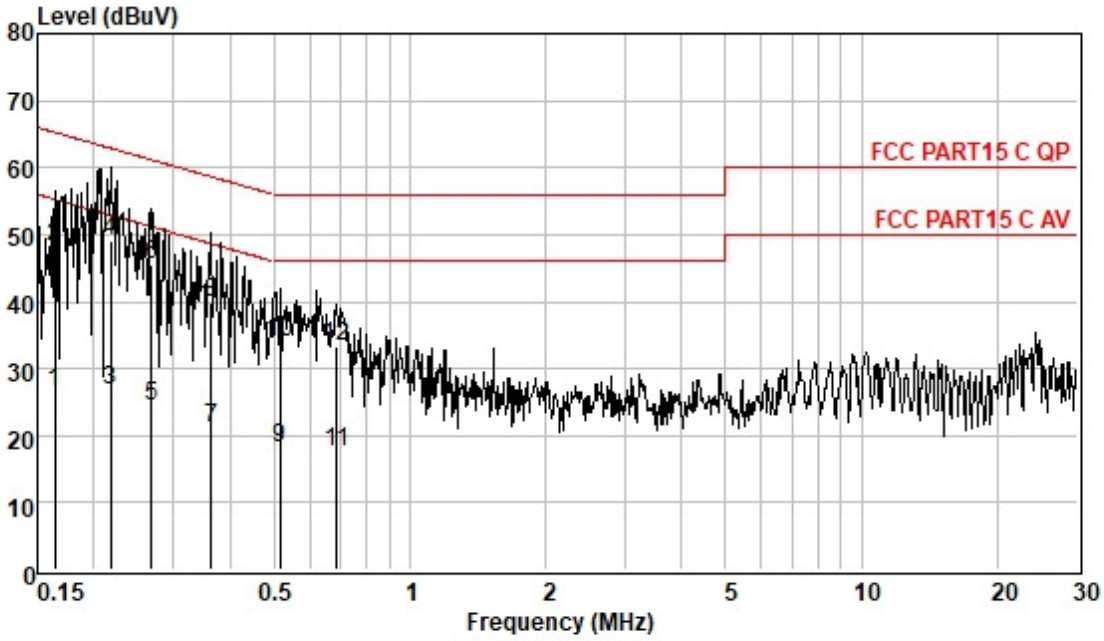
3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

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

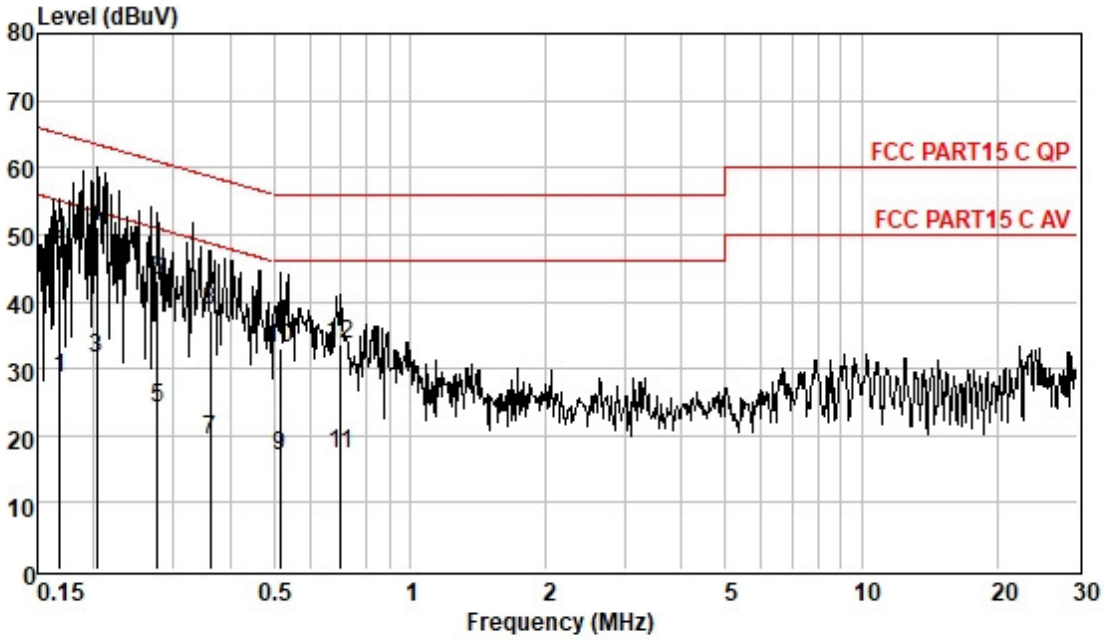
Test Mode: 04; Line: Live line



Pol :LINE
Mode :Wireless
Model :

Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.16	16.69	0.06	9.62	26.37	55.25	-28.88	Average
0.16	38.51	0.06	9.62	48.19	65.25	-17.06	QP
0.22	16.97	0.06	9.63	26.66	52.92	-26.26	Average
0.22	39.32	0.06	9.63	49.01	62.92	-13.91	QP
0.27	14.59	0.06	9.62	24.27	51.16	-26.89	Average
0.27	35.90	0.06	9.62	45.58	61.16	-15.58	QP
0.36	11.48	0.06	9.63	21.17	48.65	-27.48	Average
0.36	30.16	0.06	9.63	39.85	58.65	-18.80	QP
0.52	8.51	0.07	9.63	18.21	46.00	-27.79	Average
0.52	24.27	0.07	9.63	33.97	56.00	-22.03	QP
0.69	7.79	0.07	9.63	17.49	46.00	-28.51	Average
0.69	23.72	0.07	9.63	33.42	56.00	-22.58	QP

Test Mode: 04; Line: Neutral Line



Pol :NEUTRAL
Mode :Wireless
Model :

Frequenc MHz	Read Level dBuV	Cable Loss dB	LISN Factor dB	Measured Level dBuV	Limit Line dBuV	Over Limit dB	Remark
0.17	19.03	0.06	9.55	28.64	55.03	-26.39	Average
0.17	38.93	0.06	9.55	48.54	65.03	-16.49	QP
0.20	21.85	0.06	9.54	31.45	53.49	-22.04	Average
0.20	41.59	0.06	9.54	51.19	63.49	-12.30	QP
0.28	14.35	0.06	9.54	23.95	50.94	-26.99	Average
0.28	33.49	0.06	9.54	43.09	60.94	-17.85	QP
0.36	9.87	0.06	9.54	19.47	48.69	-29.22	Average
0.36	29.16	0.06	9.54	38.76	58.69	-19.93	QP
0.52	7.28	0.07	9.55	16.90	46.00	-29.10	Average
0.52	23.47	0.07	9.55	33.09	56.00	-22.91	QP
0.70	7.59	0.07	9.55	17.21	46.00	-28.79	Average
0.70	23.87	0.07	9.55	33.49	56.00	-22.51	QP

7.2 20dB Bandwidth

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

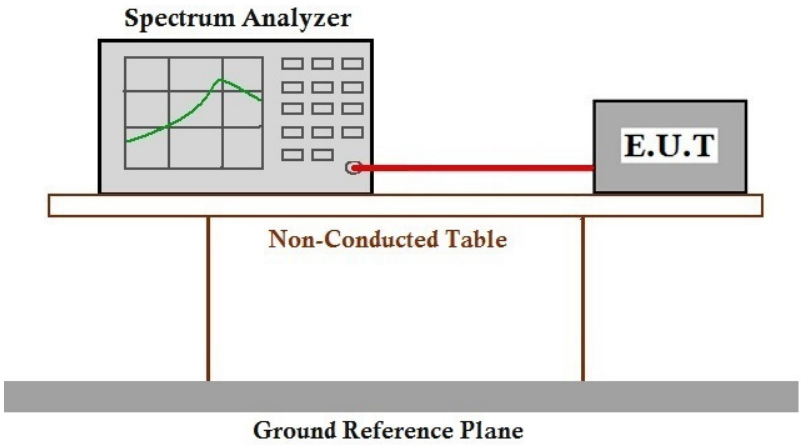
7.2.1 E.U.T. Operation

Operating Environment:
Temperature: 23 °C Humidity: 55 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in transmitting with modulation mode.

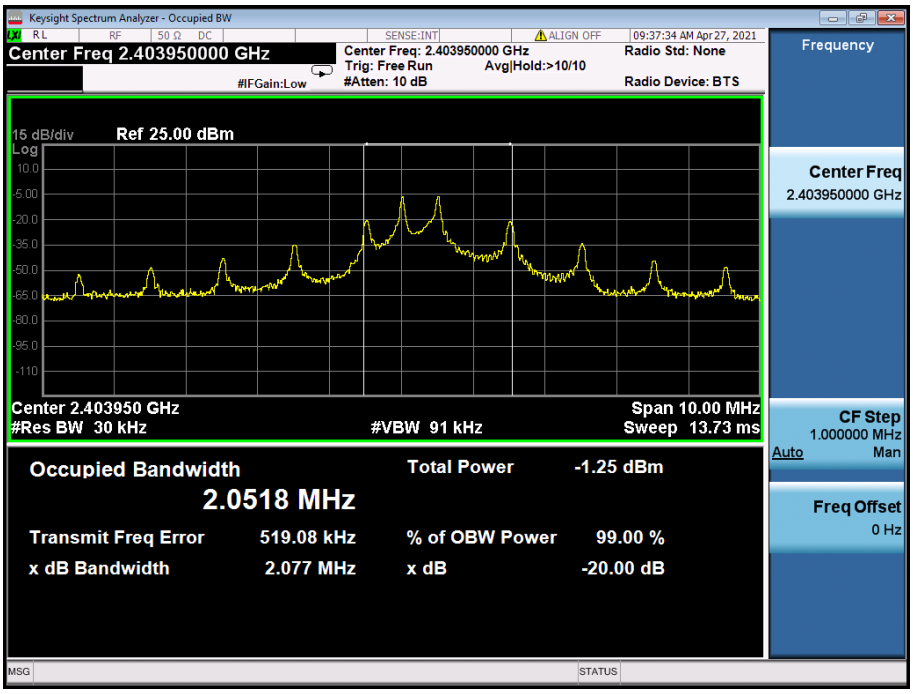
7.2.3 Test Setup Diagram



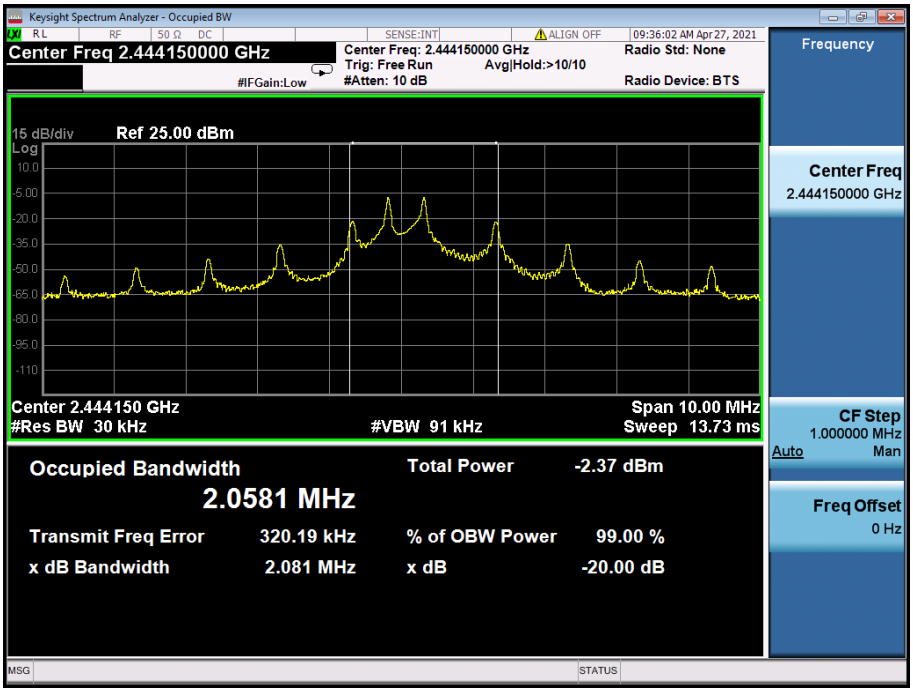
7.2.4 Measurement Procedure and Data

Cable Loss=0.9

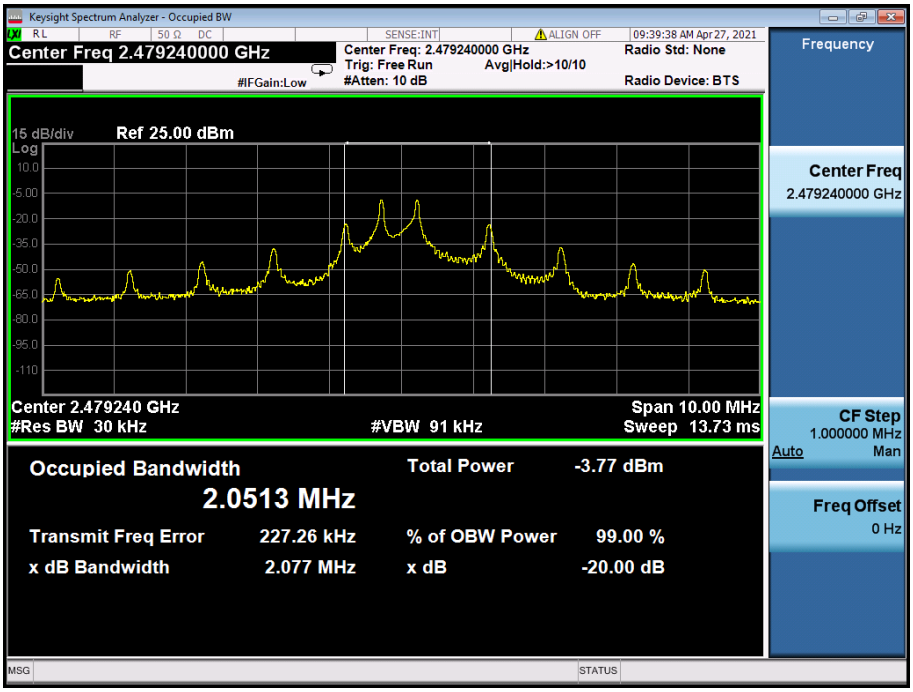
Test Mode: 04; Channel: Low



Test Mode: 04; Channel: middle



Test Mode: 04; Channel: high



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

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

Fundamental frequency(MHz)	Field strength of fundamental(millivolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500
Remark: The frequencies above 1000MHz are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For fundamental frequency in "902-928MHz", the field strength of fundamental is based on Quasi-Peak.		

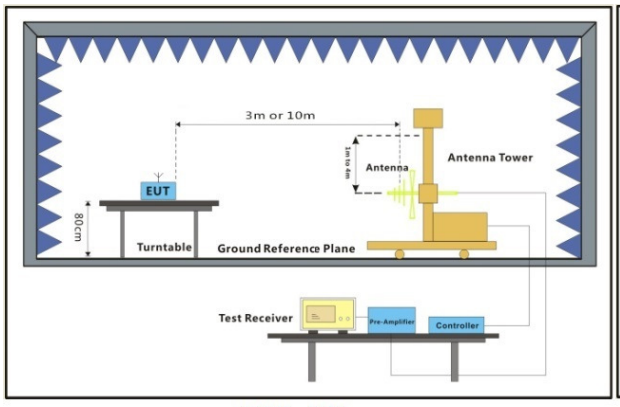
7.3.1 E.U.T. Operation

Operating Environment:
Temperature: 25.5 °C Humidity: 59.7 % RH Atmospheric Pressure: 1010 mbar

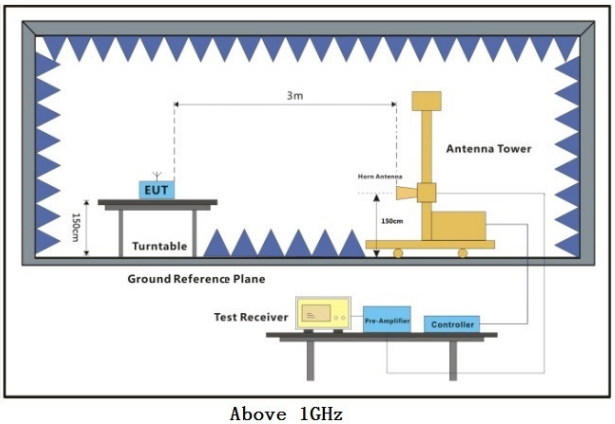
7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in transmitting with modulation mode.

7.3.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.3.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c.The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

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

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

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

g.If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

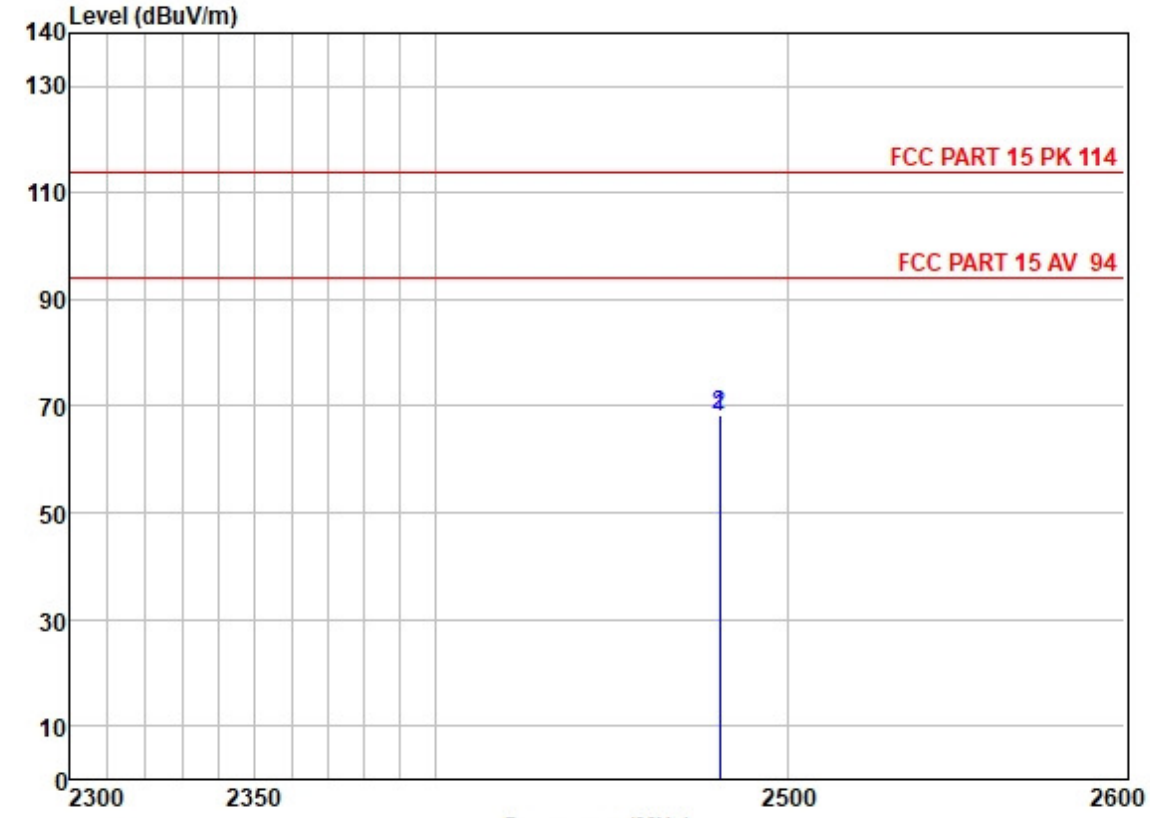
h.Test the EUT in the lowest channel, the middle channel, the Highest channel.

i.The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j.Repeat above procedures until all frequencies measured was complete.

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

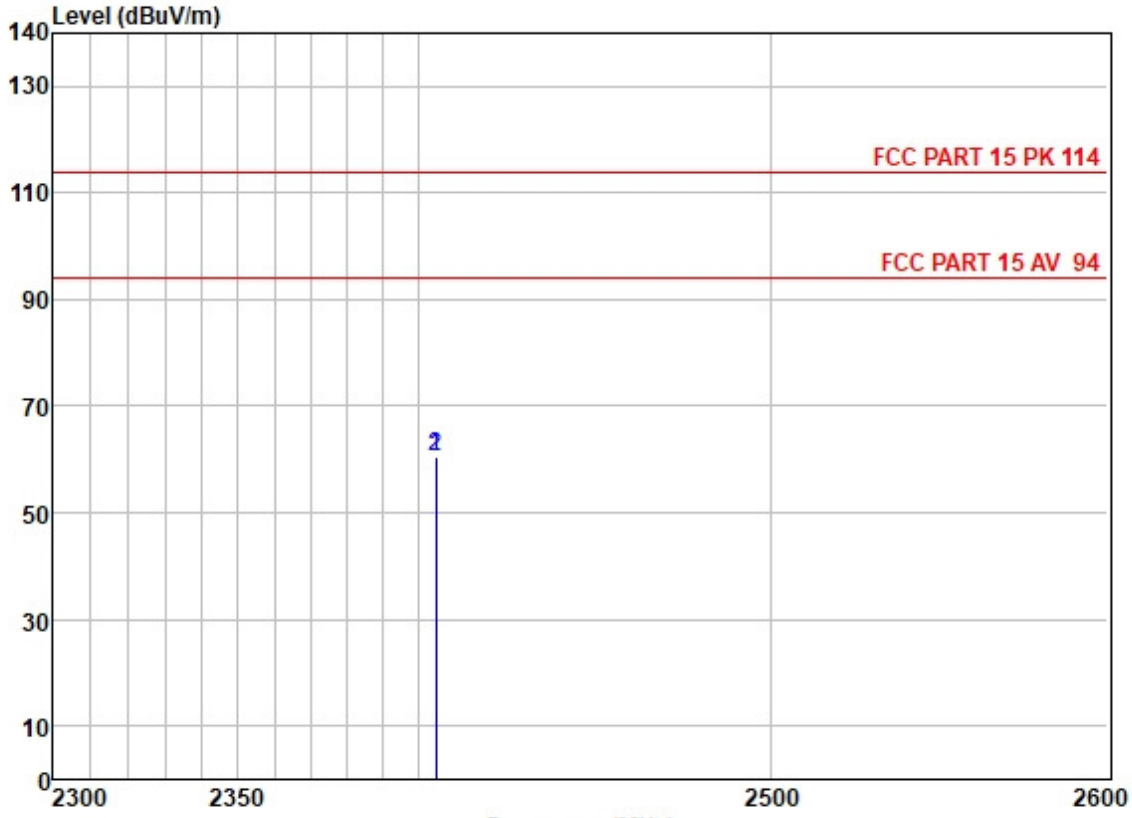
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:High;



race: (Discrete)

	Freq	ReadLevel	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	2480.214	74.37	27.47	3.60	37.57	67.87	94.00	-26.13	HORIZONTAL	Average
2	2480.214	74.97	27.47	3.60	37.57	68.47	114.00	-45.53	HORIZONTAL	Peak

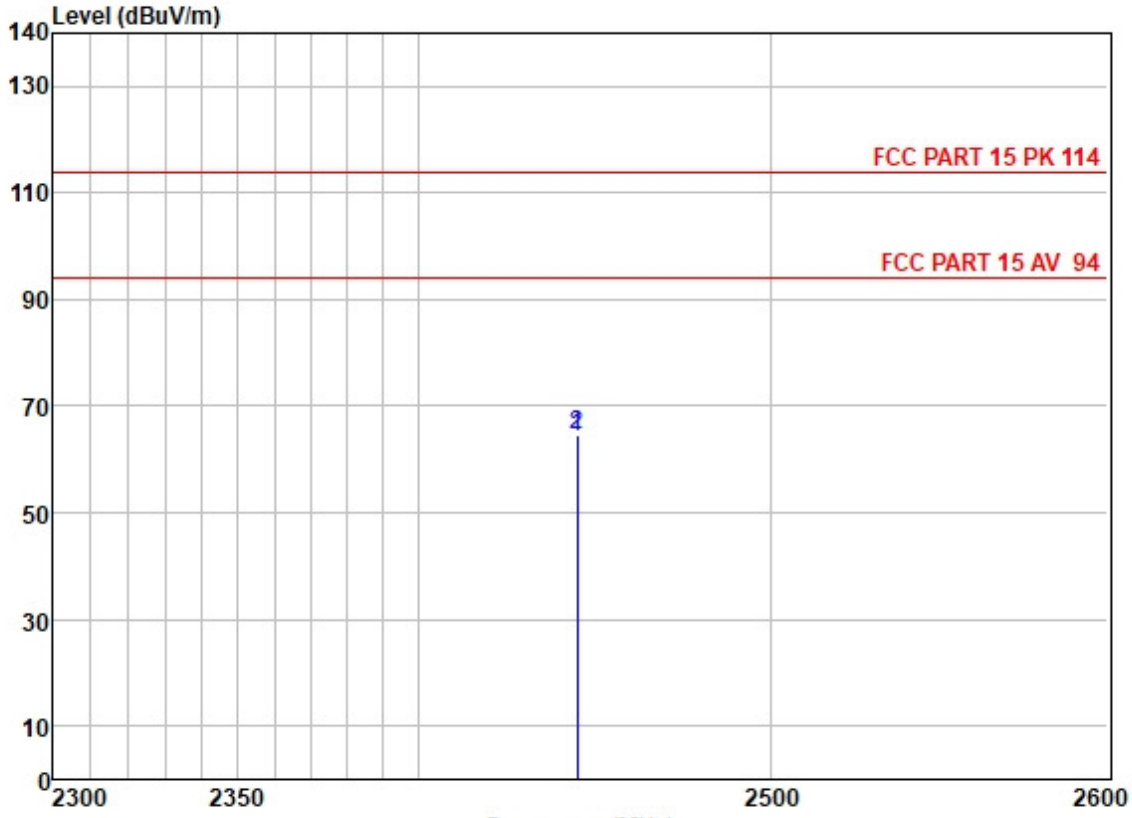
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:Low;



race: (Discrete)

	Freq	ReadAntenna Level	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	2404.673	67.09	27.36	3.48	37.59	60.34	94.00	-33.66	HORIZONTAL	Average
2	2404.673	67.33	27.36	3.48	37.59	60.58	114.00	-53.42	HORIZONTAL	Peak

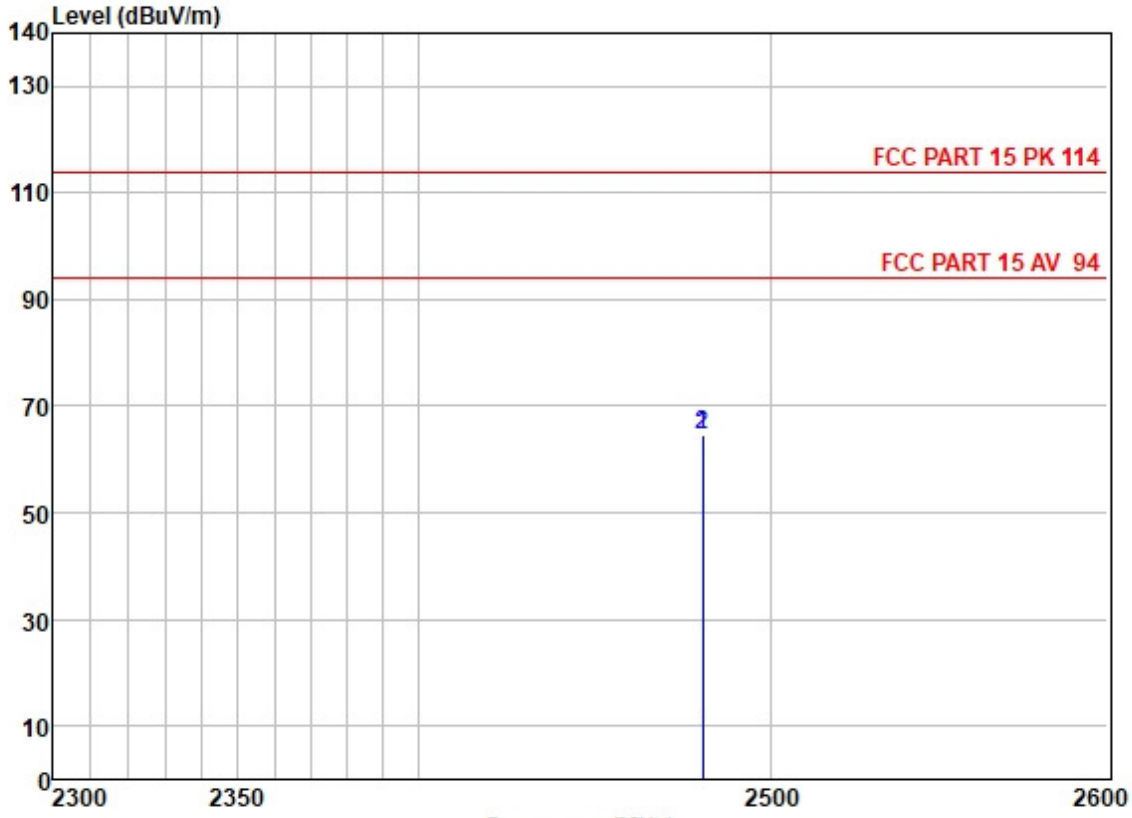
Test Mode: 04; Polarity: Horizontal; Modulation:GFSK; ; Channel:middle;



race: (Discrete)

	Freq	ReadLevel	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	2444.540	71.05	27.42	3.40	37.58	64.29	94.00	-29.71	HORIZONTAL	Average
2	2444.540	71.34	27.42	3.40	37.58	64.58	114.00	-49.42	HORIZONTAL	Peak

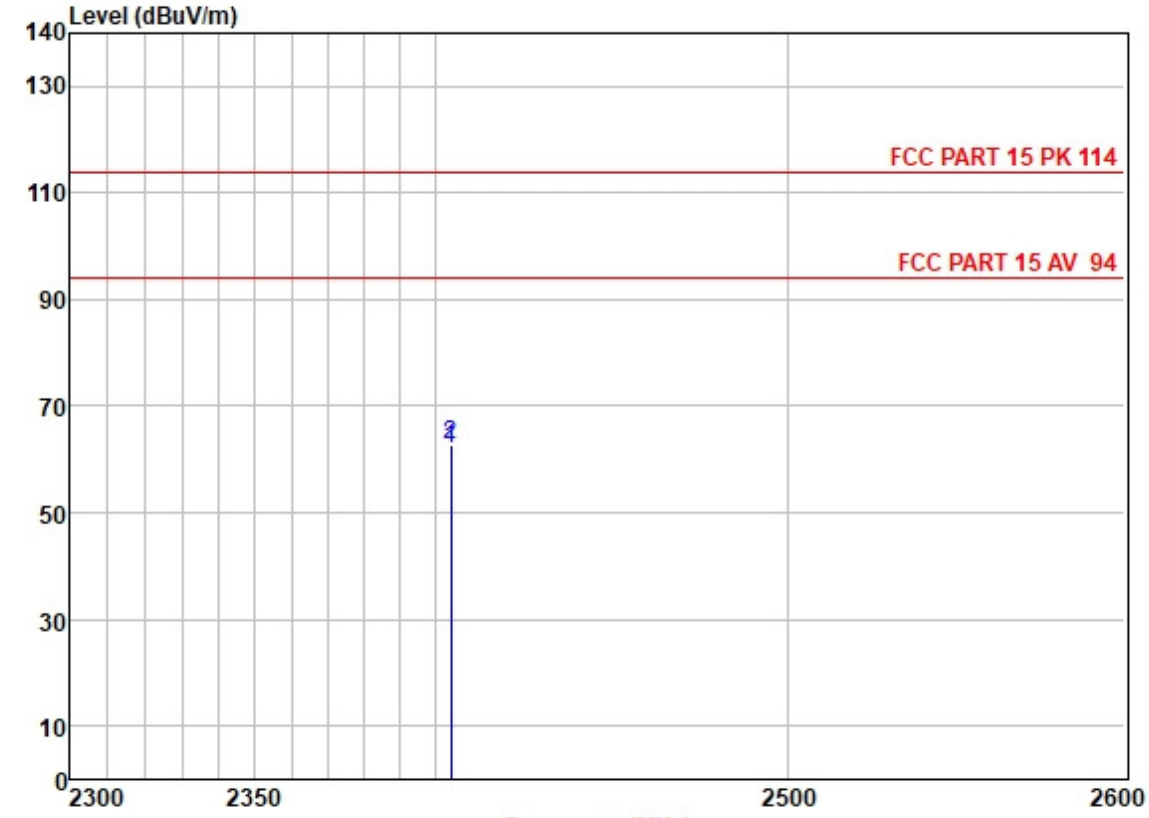
Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:High;



race: (Discrete)

	Freq	ReadLevel	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	2480.214	71.02	27.47	3.60	37.57	64.52	94.00	-29.48	VERTICAL	Average
2	2480.214	71.24	27.47	3.60	37.57	64.74	114.00	-49.26	VERTICAL	Peak

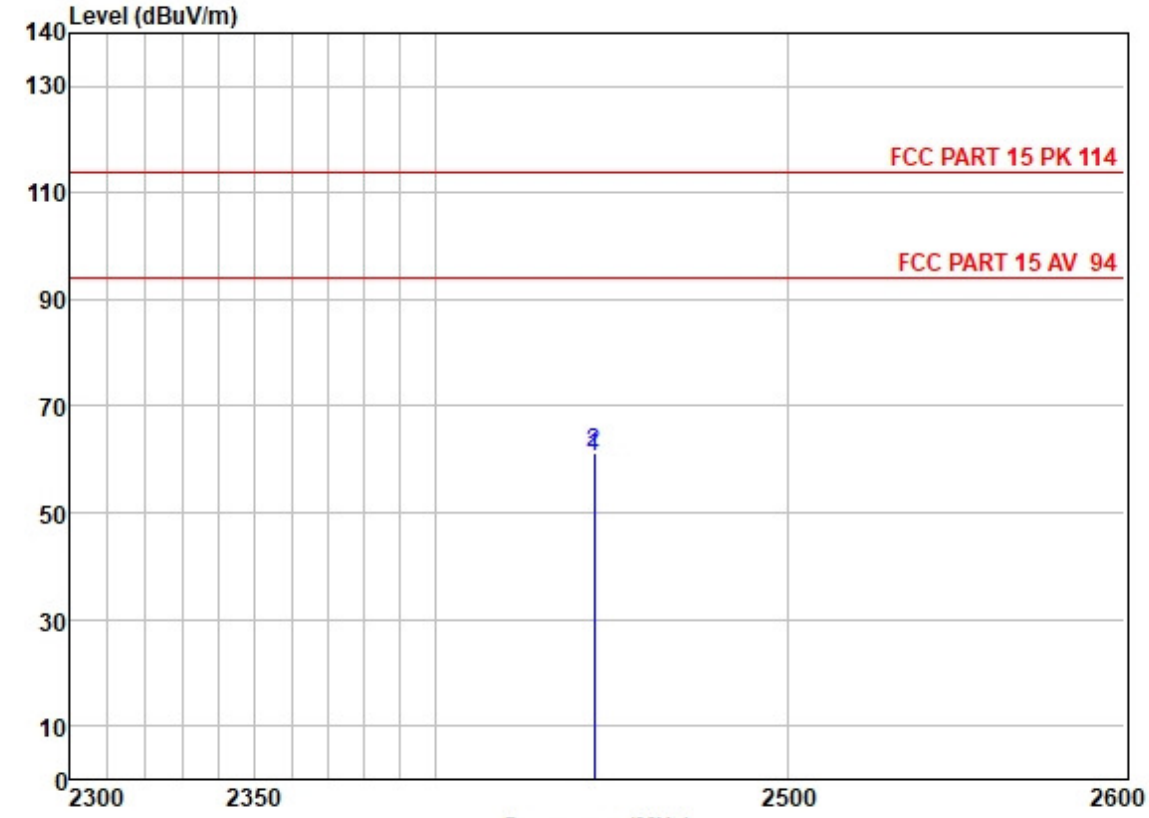
Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:Low;



race: (Discrete)

	Freq	ReadLevel	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	2404.083	68.64	27.35	3.50	37.59	61.90	94.00	-32.10	VERTICAL	Average
2	2404.083	69.51	27.35	3.50	37.59	62.77	114.00	-51.23	VERTICAL	Peak

Test Mode: 04; Polarity: Vertical; Modulation:GFSK; ; Channel:middle;



race: (Discrete)

	Freq	ReadLevel	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	2444.500	67.26	27.42	3.40	37.58	60.50	94.00	-33.50	VERTICAL	Average
2	2444.500	68.00	27.42	3.40	37.58	61.24	114.00	-52.76	VERTICAL	Peak

7.4 Restricted Band Around Fundamental Frequency

Test Requirement 47 CFR Part 15, Subpart C 15.205 & 15.249(d) & 15.209

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

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
Above 1GHz	74.0	Peak Value
Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209,whichever is the lesser attenuation.		

7.4.1 E.U.T. Operation

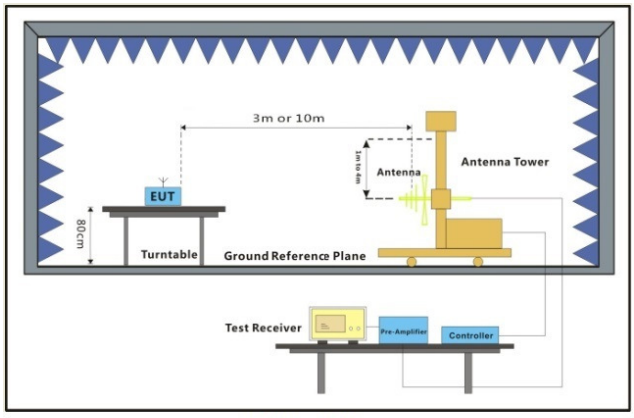
Operating Environment:

Temperature: 25.4 °C Humidity: 59.3 % RH Atmospheric Pressure: 1010 mbar

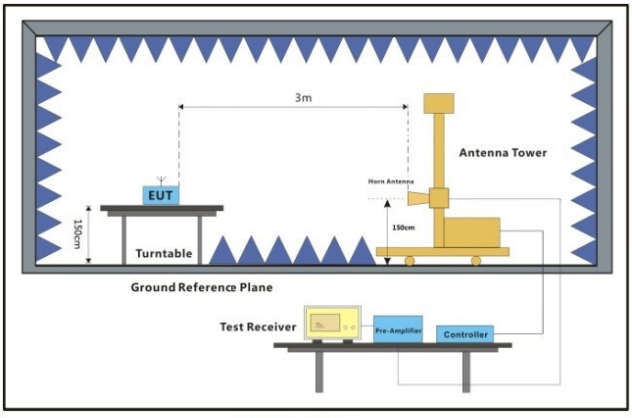
7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in transmitting with modulation mode.

7.4.3 Test Setup Diagram



30MHz-1GHz



Above 1GHz

7.4.4 Measurement Procedure and Data

a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

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

c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

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

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

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

g. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

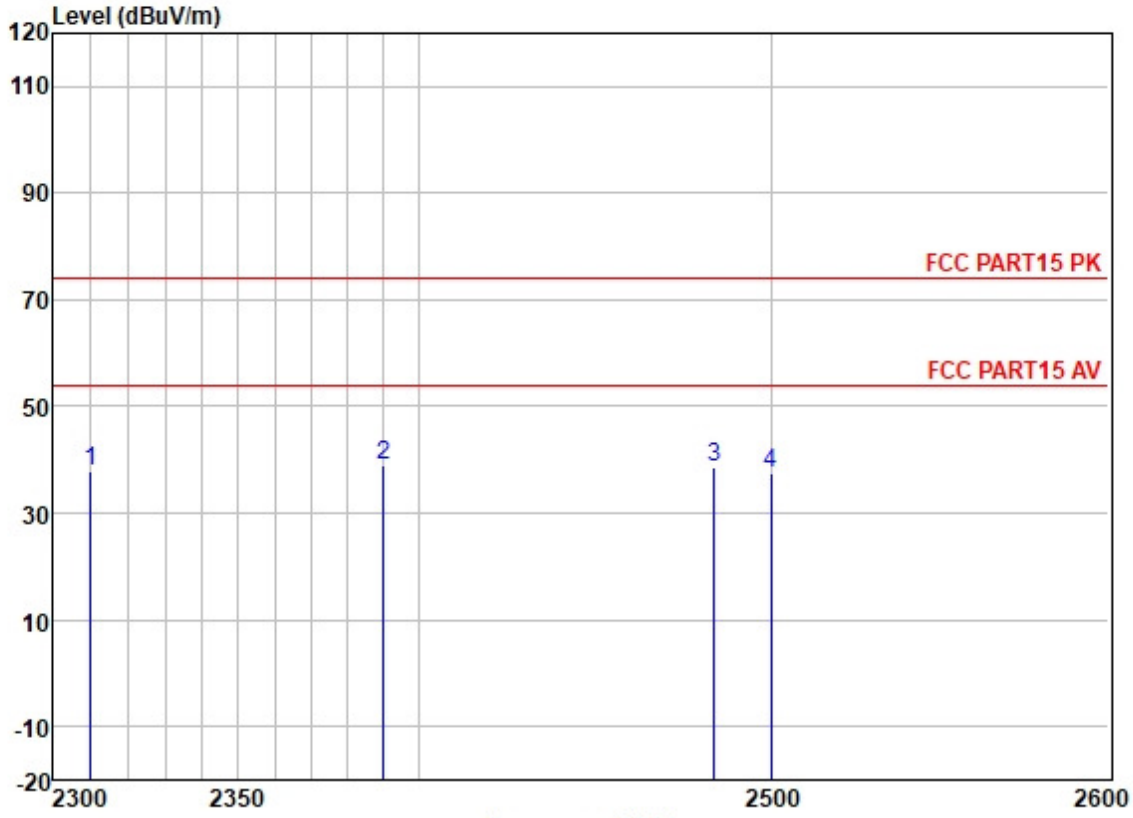
h. Test the EUT in the lowest channel, the middle channel, the Highest channel.

i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.

j. Repeat above procedures until all frequencies measured was complete.

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

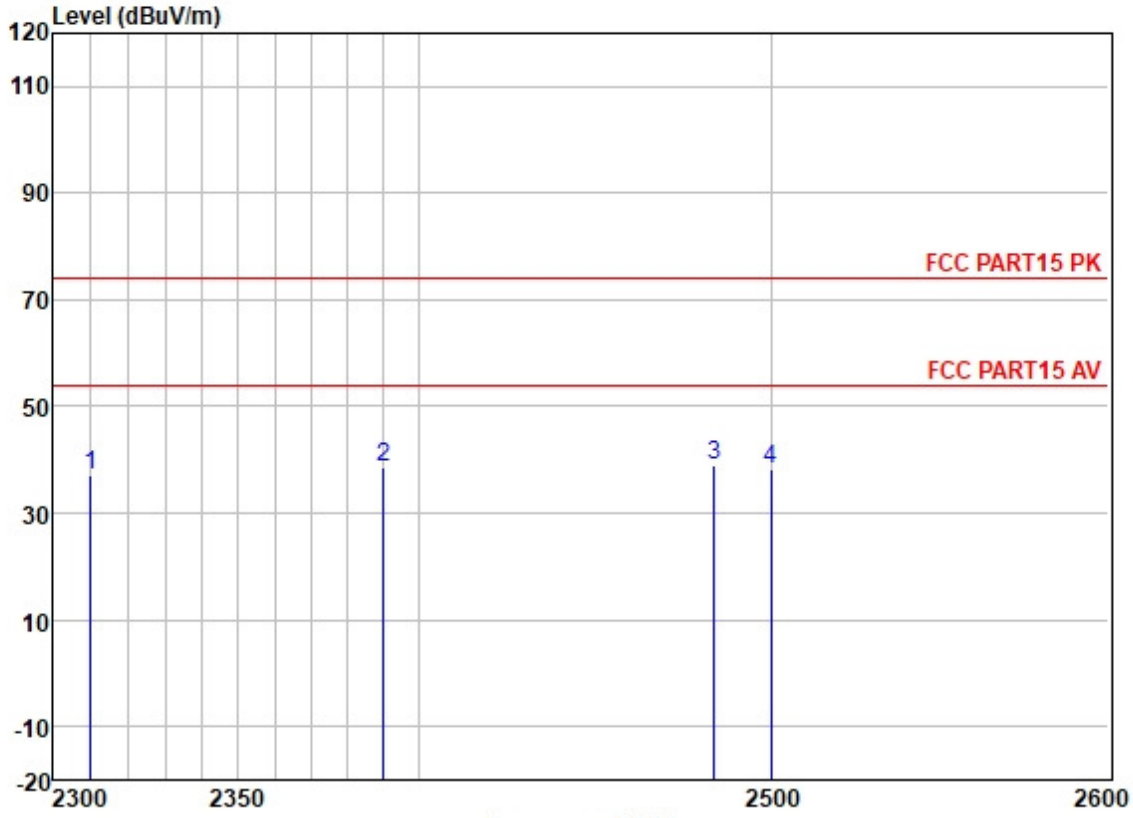
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:High;



race: (Discrete)

	Freq	ReadLevel	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	2310.000	45.09	27.15	3.32	37.62	37.94	74.00	-36.06	HORIZONTAL	Peak
2	2390.000	45.66	27.33	3.48	37.59	38.88	74.00	-35.12	HORIZONTAL	Peak
3	2483.500	45.07	27.48	3.53	37.57	38.51	74.00	-35.49	HORIZONTAL	Peak
4	2500.000	44.26	27.50	3.40	37.56	37.60	74.00	-36.40	HORIZONTAL	Peak

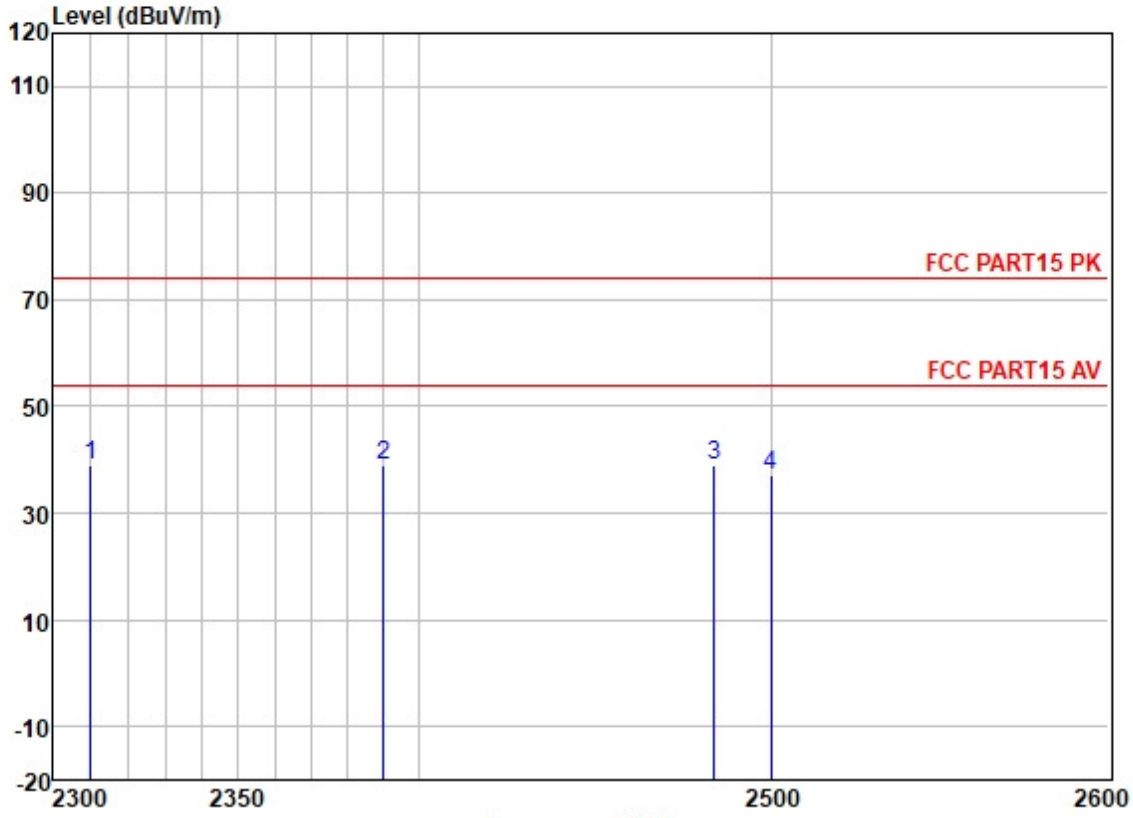
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:Low;



race: (Discrete)

	Freq	ReadLevel	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	2310.000	44.10	27.15	3.32	37.62	36.95	74.00	-37.05	HORIZONTAL	Peak
2	2390.000	45.41	27.33	3.48	37.59	38.63	74.00	-35.37	HORIZONTAL	Peak
3	2483.500	45.55	27.48	3.53	37.57	38.99	74.00	-35.01	HORIZONTAL	Peak
4	2500.000	45.00	27.50	3.40	37.56	38.34	74.00	-35.66	HORIZONTAL	Peak

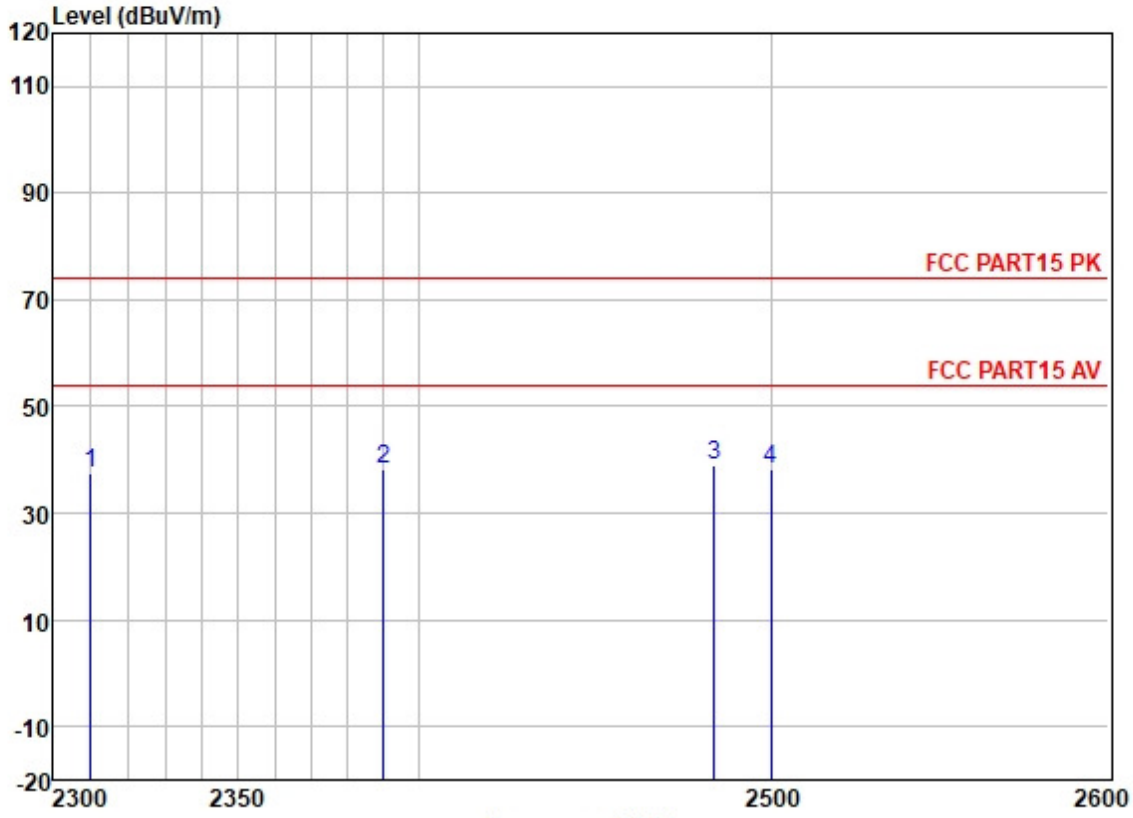
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:middle;



race: (Discrete)

	Freq	ReadLevel	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	2310.000	46.18	27.15	3.32	37.62	39.03	74.00	-34.97	HORIZONTAL	Peak
2	2390.000	45.84	27.33	3.48	37.59	39.06	74.00	-34.94	HORIZONTAL	Peak
3	2483.500	45.51	27.48	3.53	37.57	38.95	74.00	-35.05	HORIZONTAL	Peak
4	2500.000	43.90	27.50	3.40	37.56	37.24	74.00	-36.76	HORIZONTAL	Peak

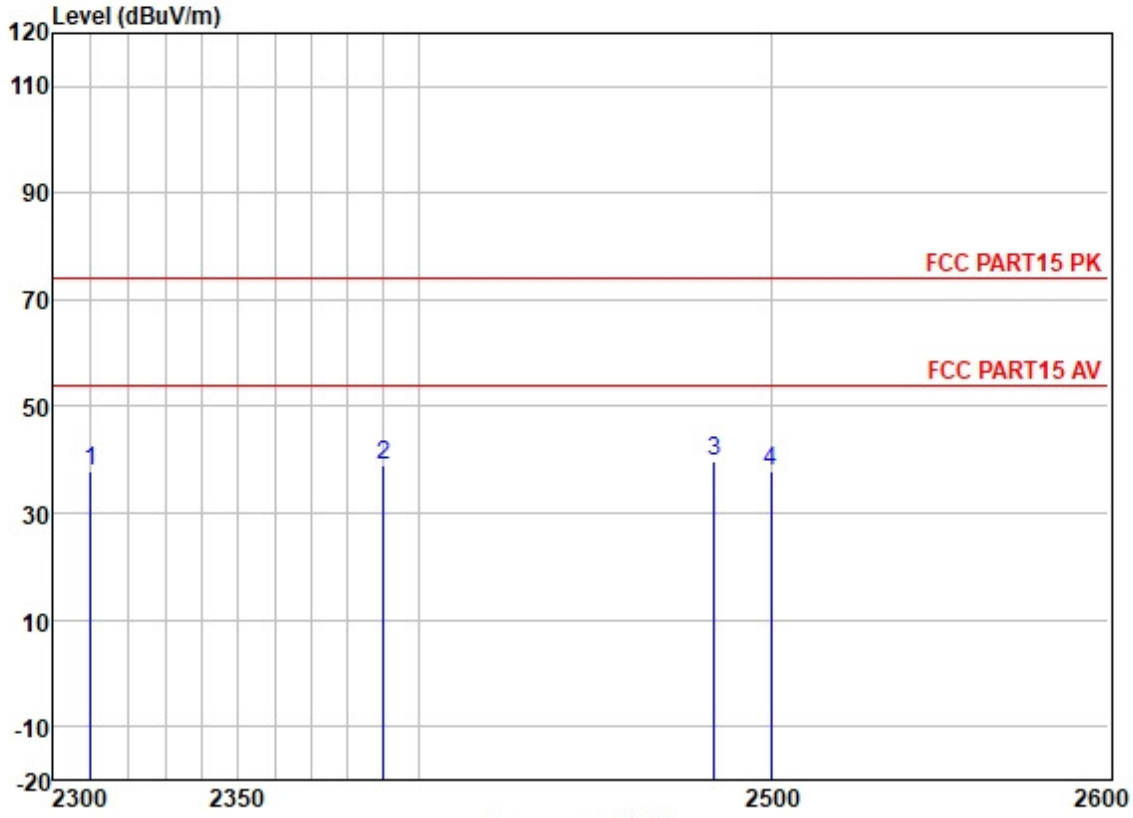
Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:High;



race: (Discrete)

	Freq	ReadLevel	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	2310.000	44.80	27.15	3.32	37.62	37.65	74.00	-36.35	VERTICAL	Peak
2	2390.000	44.95	27.33	3.48	37.59	38.17	74.00	-35.83	VERTICAL	Peak
3	2483.500	45.50	27.48	3.53	37.57	38.94	74.00	-35.06	VERTICAL	Peak
4	2500.000	45.03	27.50	3.40	37.56	38.37	74.00	-35.63	VERTICAL	Peak

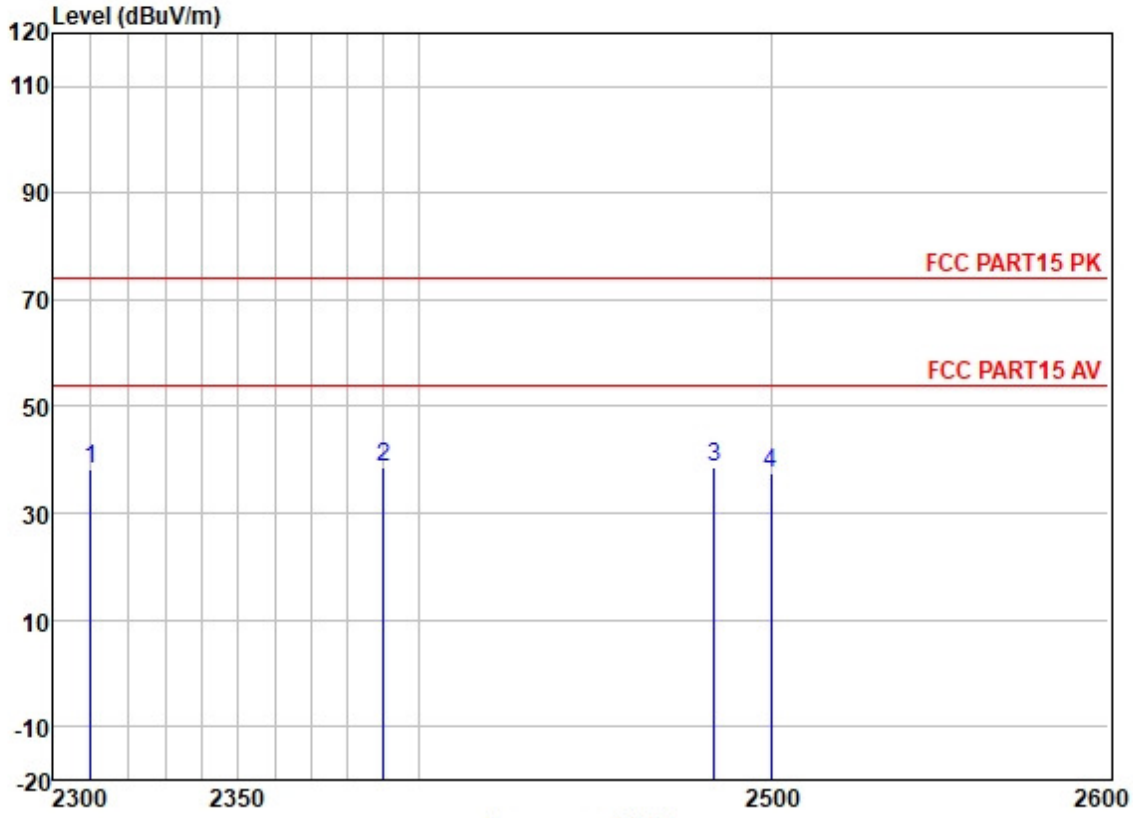
Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:Low;



race: (Discrete)

	Freq	ReadLevel	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	2310.000	45.17	27.15	3.32	37.62	38.02	74.00	-35.98	VERTICAL	Peak
2	2390.000	45.60	27.33	3.48	37.59	38.82	74.00	-35.18	VERTICAL	Peak
3	2483.500	46.38	27.48	3.53	37.57	39.82	74.00	-34.18	VERTICAL	Peak
4	2500.000	44.66	27.50	3.40	37.56	38.00	74.00	-36.00	VERTICAL	Peak

Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:middle;



race: (Discrete)

	Freq	ReadLevel	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	2310.000	45.49	27.15	3.32	37.62	38.34	74.00	-35.66	VERTICAL	Peak
2	2390.000	45.42	27.33	3.48	37.59	38.64	74.00	-35.36	VERTICAL	Peak
3	2483.500	45.10	27.48	3.53	37.57	38.54	74.00	-35.46	VERTICAL	Peak
4	2500.000	44.16	27.50	3.40	37.56	37.50	74.00	-36.50	VERTICAL	Peak

7.5 Radiated Emissions

Test Requirement 47 CFR Part 15, Subpart C 15.209 & 15.249 (a),(d)

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

Limit:

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

7.5.1 E.U.T. Operation

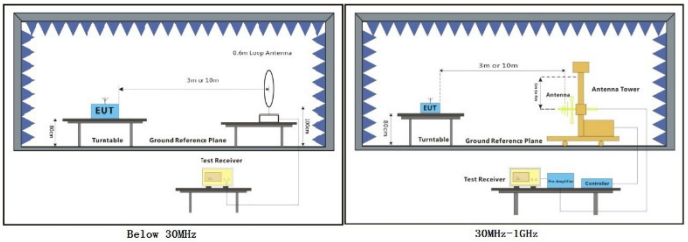
Operating Environment:

Temperature: 25.8 °C Humidity: 63.6 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	04	TX mode_Keep the EUT in transmitting with modulation mode.

7.5.3 Test Setup Diagram



7.5.4 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) For emission below 1GHz, through pre-scan found the worst case is the lowest channel. Only the worst case is recorded in the report.

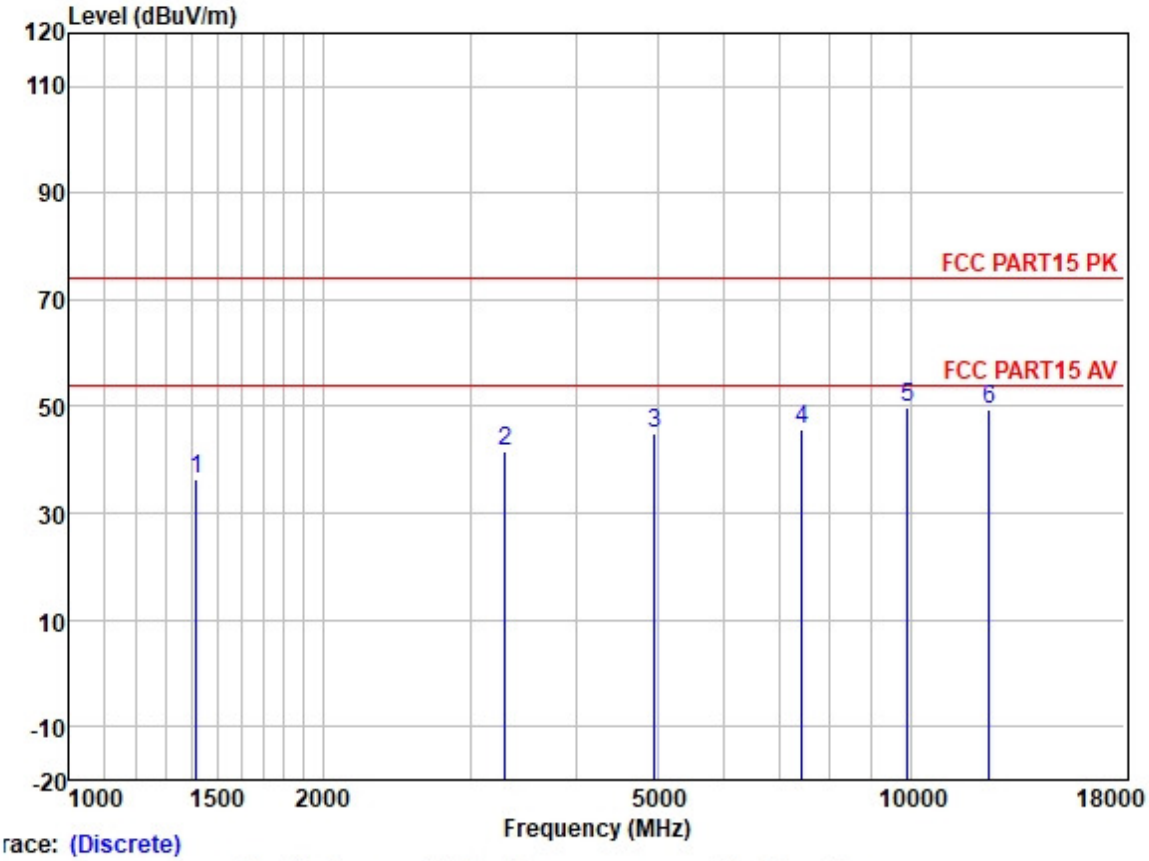
2) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

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

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and 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.

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

Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:High;



race: (Discrete)

	Freq	ReadLevel	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	1414.597	46.54	25.41	2.63	38.20	36.38	74.00	-37.62	HORIZONTAL	Peak
2	3299.344	45.66	28.75	4.06	37.03	41.44	74.00	-32.56	HORIZONTAL	Peak
3	4960.151	44.57	31.65	5.65	36.84	45.03	74.00	-28.97	HORIZONTAL	Peak
4	7440.417	40.64	36.27	6.22	37.47	45.66	74.00	-28.34	HORIZONTAL	Peak
5	9920.040	41.72	38.65	6.96	37.40	49.93	74.00	-24.07	HORIZONTAL	Peak
6	12400.070	39.65	38.57	7.97	36.88	49.31	74.00	-24.69	HORIZONTAL	Peak

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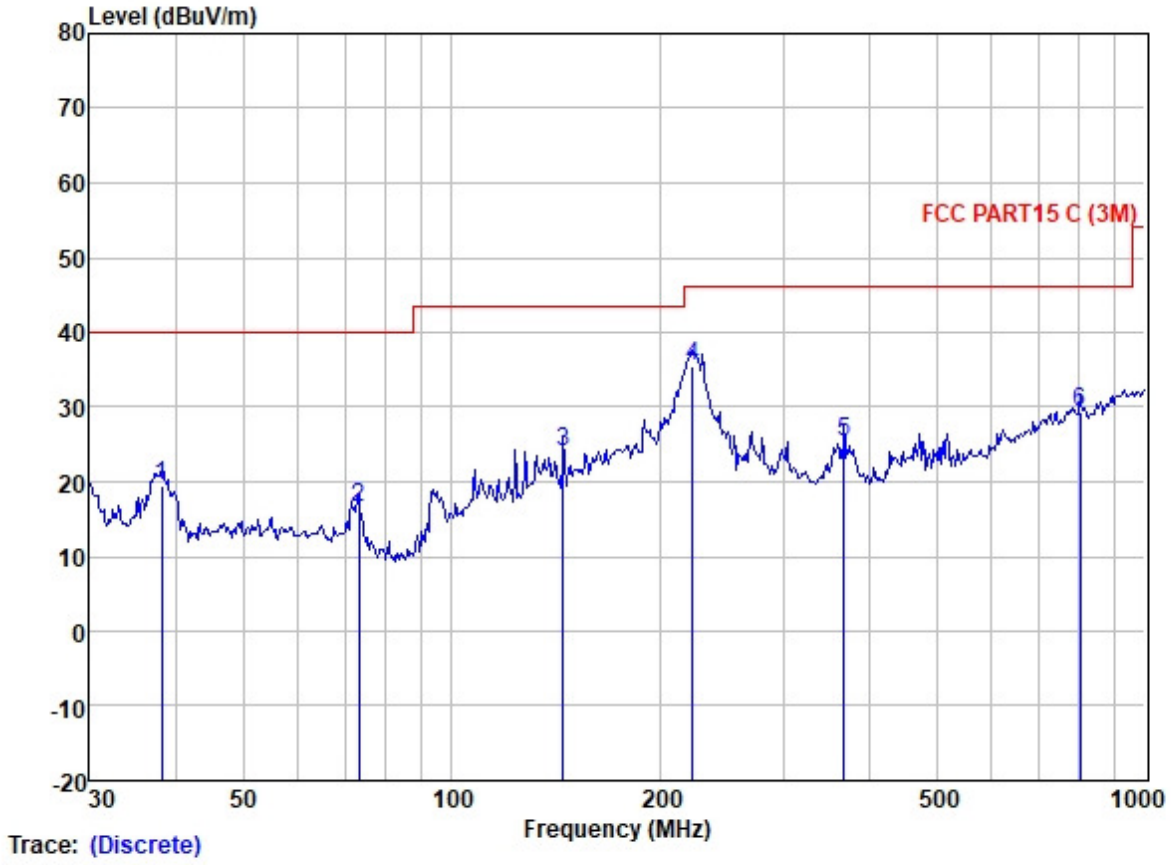
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:Low;

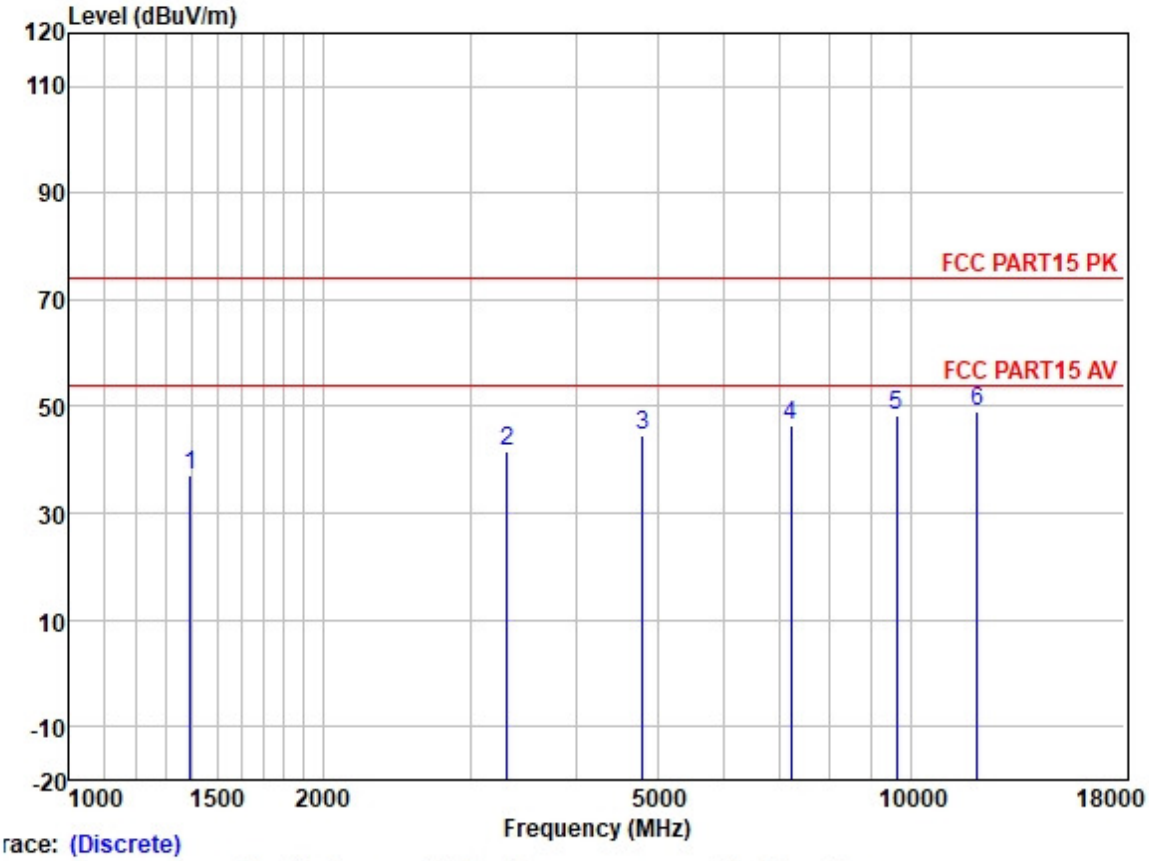


Trace: (Discrete)

Site : SGS
Condition : FCC PART15 C (3M) HORIZONTAL
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	38.08	32.25	13.31	1.09	27.18	19.47	40.00	-20.53	HORIZONTAL	QP
2	73.36	31.10	11.09	1.44	27.11	16.52	40.00	-23.48	HORIZONTAL	QP
3	144.84	35.08	13.65	2.18	26.87	24.04	43.50	-19.46	HORIZONTAL	QP
4	222.17	49.70	9.84	2.67	26.70	35.51	46.00	-10.49	HORIZONTAL	QP
5	368.11	33.68	15.13	3.76	27.18	25.39	46.00	-20.61	HORIZONTAL	QP
6	804.60	28.66	22.65	6.17	28.03	29.45	46.00	-16.55	HORIZONTAL	QP

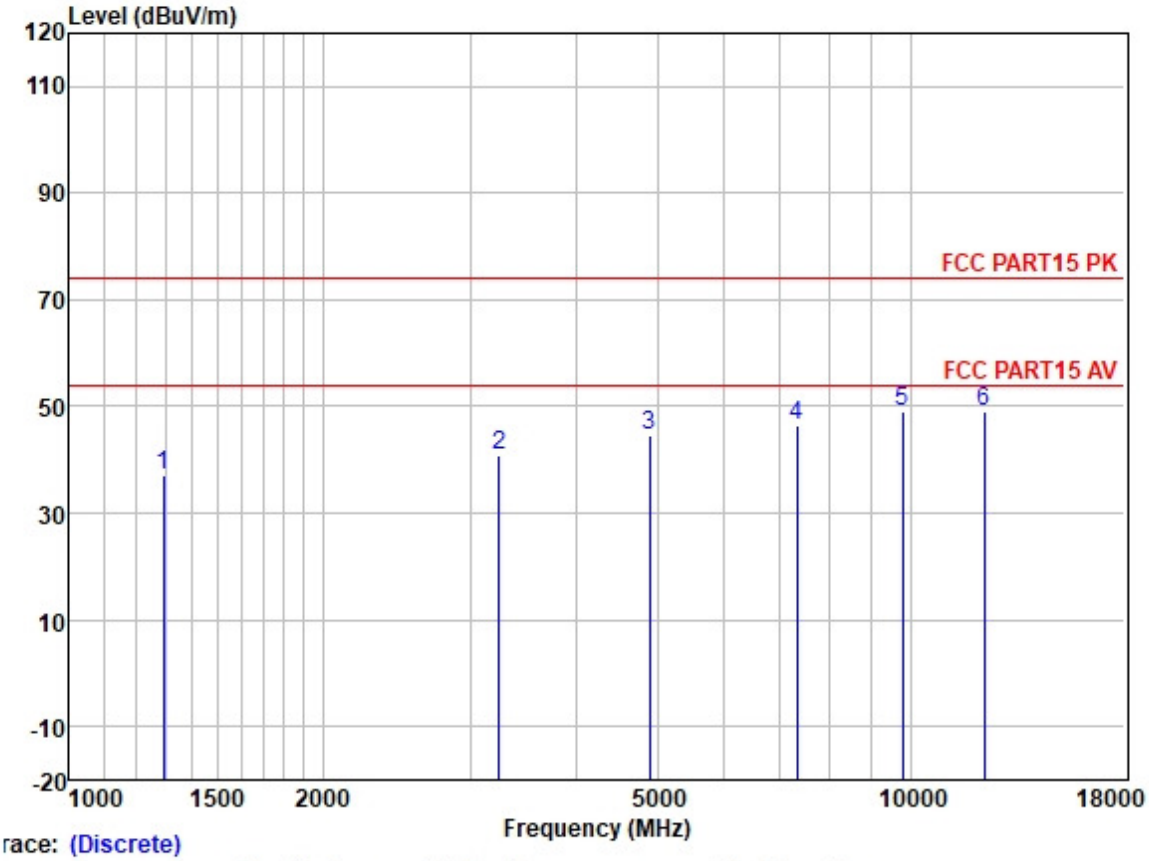
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:Low;



race: (Discrete)

	Freq	ReadLevel	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	1394.300	47.46	25.38	2.60	38.22	37.22	74.00	-36.78	HORIZONTAL	Peak
2	3318.471	45.65	28.77	4.07	37.02	41.47	74.00	-32.53	HORIZONTAL	Peak
3	4808.075	44.76	31.42	5.40	36.83	44.75	74.00	-29.25	HORIZONTAL	Peak
4	7212.441	42.12	35.62	6.01	37.38	46.37	74.00	-27.63	HORIZONTAL	Peak
5	9616.172	40.14	38.37	7.07	37.42	48.16	74.00	-25.84	HORIZONTAL	Peak
6	12020.860	38.89	38.90	8.19	37.09	48.89	74.00	-25.11	HORIZONTAL	Peak

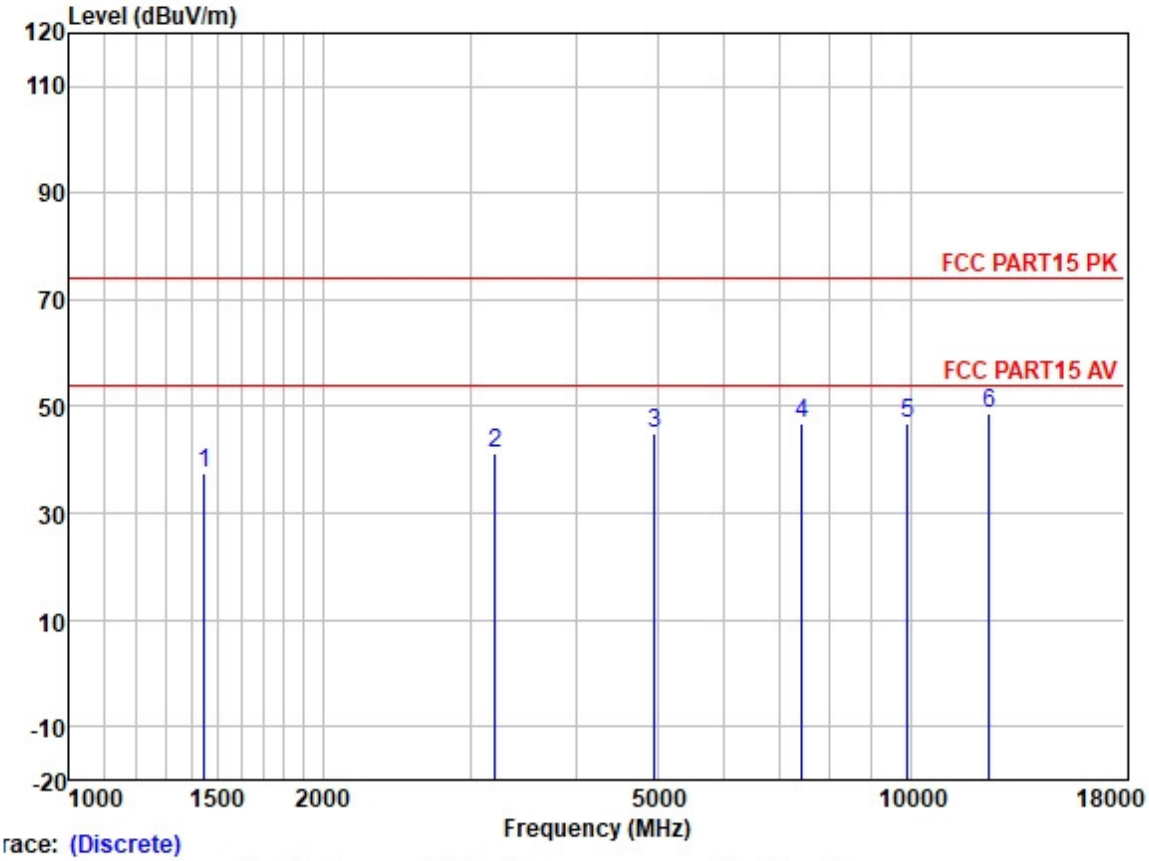
Test Mode: 04; Polarity: Horizontal; Modulation:FSK; ; Channel:middle;



race: (Discrete)

	Freq	ReadAntenna Level	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	1293.359	47.63	25.18	2.57	38.31	37.07	74.00	-36.93	HORIZONTAL	Peak
2	3242.619	45.18	28.67	4.02	37.06	40.81	74.00	-33.19	HORIZONTAL	Peak
3	4890.499	44.35	31.56	5.52	36.84	44.59	74.00	-29.41	HORIZONTAL	Peak
4	7335.195	41.84	36.00	6.13	37.43	46.54	74.00	-27.46	HORIZONTAL	Peak
5	9780.806	40.91	38.53	7.01	37.41	49.04	74.00	-24.96	HORIZONTAL	Peak
6	12225.860	39.16	38.74	8.08	36.99	48.99	74.00	-25.01	HORIZONTAL	Peak

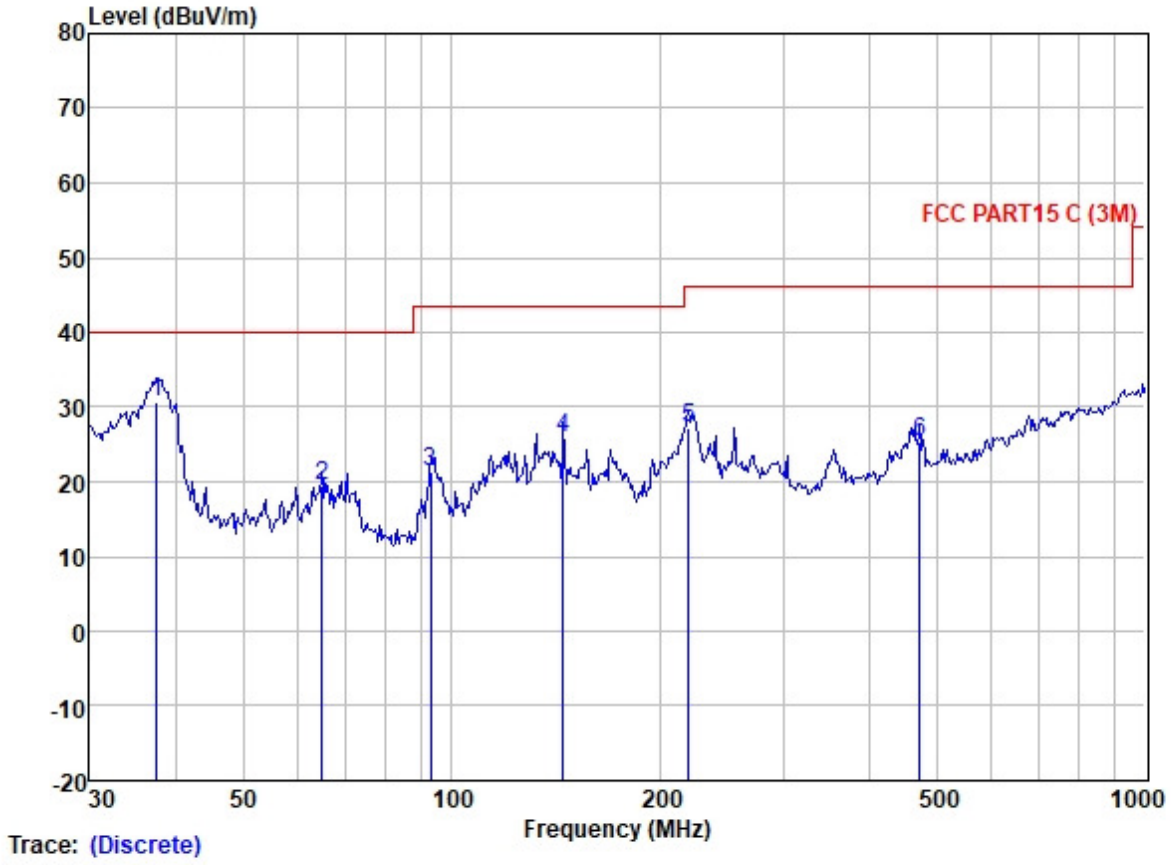
Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:High;



race: (Discrete)

	Freq	ReadLevel	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	1447.688	47.56	25.45	2.70	38.17	37.54	74.00	-36.46	VERTICAL	Peak
2	3205.345	45.56	28.60	4.00	37.09	41.07	74.00	-32.93	VERTICAL	Peak
3	4960.136	44.36	31.65	5.65	36.84	44.82	74.00	-29.18	VERTICAL	Peak
4	7440.529	41.96	36.27	6.22	37.47	46.98	74.00	-27.02	VERTICAL	Peak
5	9920.890	38.63	38.65	6.96	37.40	46.84	74.00	-27.16	VERTICAL	Peak
6	12400.740	38.99	38.57	7.97	36.88	48.65	74.00	-25.35	VERTICAL	Peak

Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:Low;

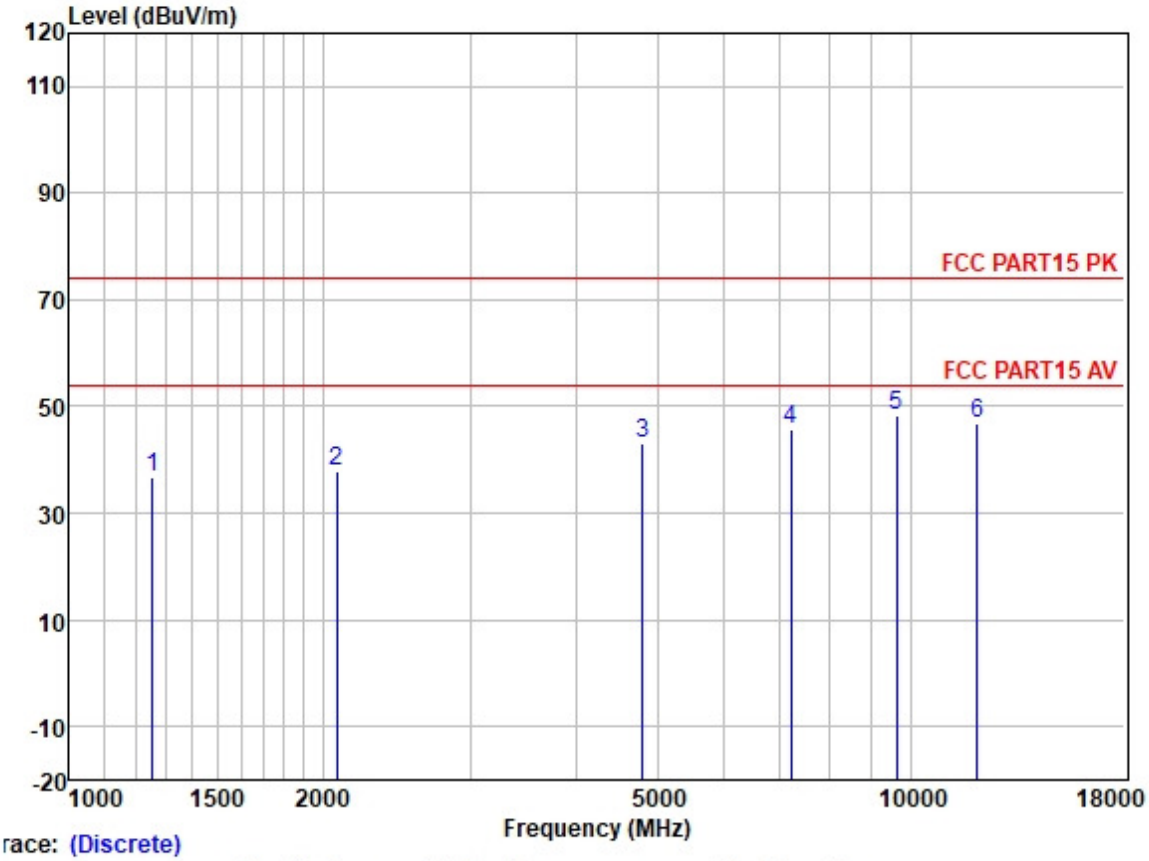


Trace: (Discrete)

Site : SGS
Condition : FCC PART15 C (3M) VERTICAL
Job :
Model :
Power :
Test Mode :

	Freq	Read Level	Anterna Factor	Cable Loss	Preamp Factor	Measured Level	Limit Line	Over Limit	Pol/ Phase	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dBuV		
1	37.55	43.61	13.25	1.09	27.18	30.77	40.00	-9.23	VERTICAL	QP
2	64.89	32.45	12.75	1.35	27.15	19.40	40.00	-20.60	VERTICAL	QP
3	93.11	38.55	8.20	1.67	27.08	21.34	43.50	-22.16	VERTICAL	QP
4	144.84	36.95	13.65	2.18	26.87	25.91	43.50	-17.59	VERTICAL	QP
5	219.08	41.57	9.80	2.63	26.71	27.29	46.00	-18.71	VERTICAL	QP
6	472.18	31.41	17.50	4.29	27.86	25.34	46.00	-20.66	VERTICAL	QP

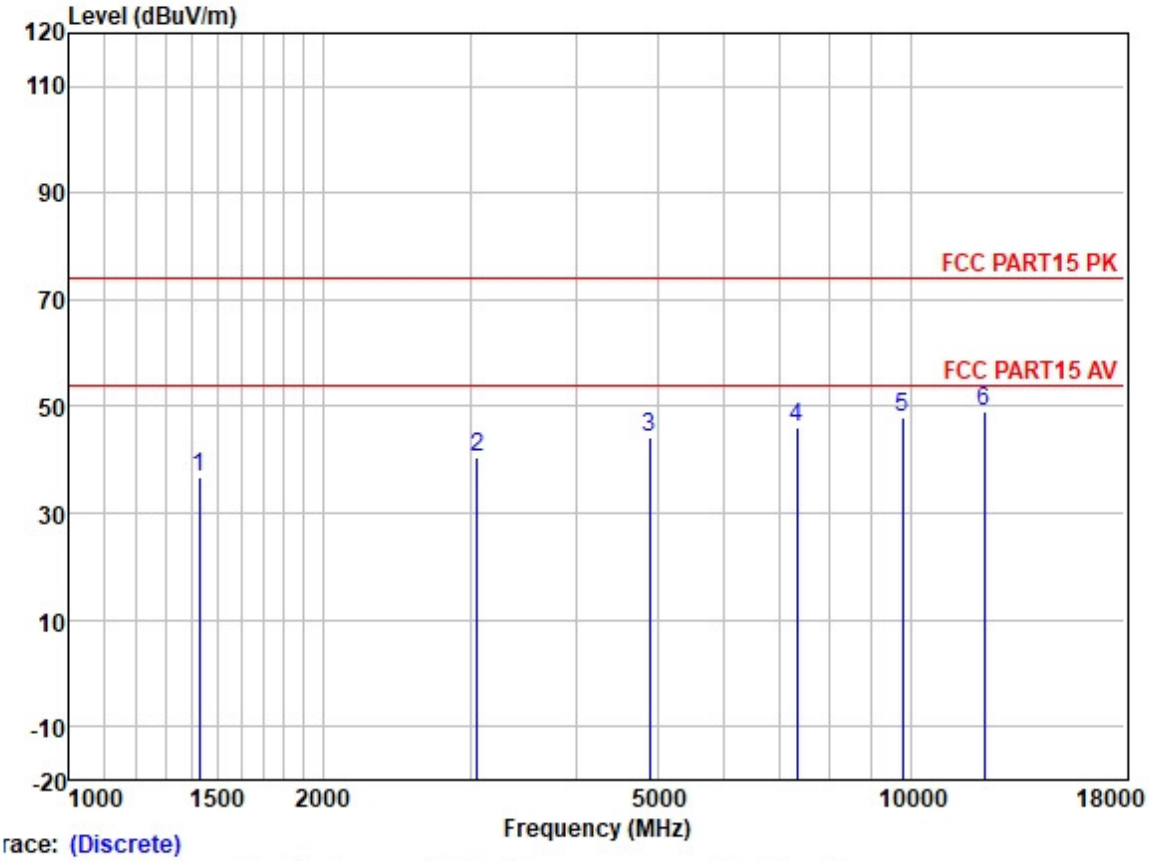
Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:Low;



race: (Discrete)

	Freq	ReadAntenna Level	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	1256.512	47.55	25.05	2.38	38.35	36.63	74.00	-37.37	VERTICAL	Peak
2	2077.705	46.04	26.24	3.14	37.68	37.74	74.00	-36.26	VERTICAL	Peak
3	4808.699	43.20	31.42	5.40	36.83	43.19	74.00	-30.81	VERTICAL	Peak
4	7212.638	41.50	35.62	6.01	37.39	45.74	74.00	-28.26	VERTICAL	Peak
5	9616.654	40.19	38.37	7.07	37.42	48.21	74.00	-25.79	VERTICAL	Peak
6	12020.280	36.84	38.90	8.19	37.09	46.84	74.00	-27.16	VERTICAL	Peak

Test Mode: 04; Polarity: Vertical; Modulation:FSK; ; Channel:middle;



race: (Discrete)

	Freq	ReadLevel	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	1426.916	46.81	25.43	2.65	38.20	36.69	74.00	-37.31	VERTICAL	Peak
2	3051.653	45.29	28.44	3.85	37.20	40.38	74.00	-33.62	VERTICAL	Peak
3	4890.110	44.15	31.56	5.52	36.84	44.39	74.00	-29.61	VERTICAL	Peak
4	7335.292	41.48	36.00	6.13	37.43	46.18	74.00	-27.82	VERTICAL	Peak
5	9780.982	39.94	38.53	7.01	37.41	48.07	74.00	-25.93	VERTICAL	Peak
6	12225.860	39.30	38.74	8.08	36.99	49.13	74.00	-24.87	VERTICAL	Peak

- End of the Report -

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