



FCC RADIO TEST REPORT

Applicant : SteelSeries ApS.

Address : 656 W Randolph St., Suite 3E Chicago, IL 60661,
USA

Equipment : Wireless Speaker

Model No. : SP-00003SR

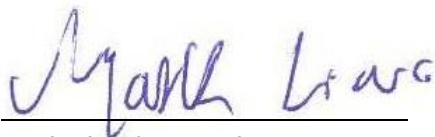
Trade Name : 

FCC ID : ZHK-SP00003SR

I HEREBY CERTIFY THAT :

The sample was received on Jun. 07, 2021 and the testing was completed on Dec. 15, 2021 at CerpPASS Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of CerpPASS Technology Corp., the test report shall not be reproduced except in full.

Approved by:



Mark Liao / Supervisor

Laboratory Accreditation:

CerpPASS Technology Corporation Test Laboratory





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History of this test report

Report No.	Issued Date	Description
21030023-TRFCC03	Dec. 17, 2021	Original



1. Summary of Test Procedure and Test Results

1.1 Applicable Standards

ANSI C63.10:2013

FCC Rules and Regulations Part 15 Subpart C §15.247

FCC Rule	Description of Test	Result
15.203	. Antenna Requirement	PASS
15.207	. AC Power Line Conducted Emission	PASS
15.209 15.205	. Radiated Spurious Emission	PASS
15.247(d)	. Conducted Spurious Emission	PASS
15.247(a)(2)	. 6dB Bandwidth	PASS
15.247(b)	. Maximum Output Power	PASS
15.247(e)	. Power Spectral Density	PASS
2.1091	. Radio Frequency Exposure	PASS

*The lab has reduced the uncertainty risk factor from test equipment, environment and staff technicians which according to the standard on contract. Therefore, the test result will only be determined by standard requirement.

*This EUT has been also tested and compiled with the requirement of FCC Part 15, Subpart B, recorded in a separate test report(21030023-TEFV01).



2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Operation Frequency Range	2400-2483.5MHz
Center Frequency Range	2404-2476MHz
Modulation Type	GFSK
Modulation Technology	DTS
Data Rate	GFSK 2Mbps
Antenna Type	PIFA Antenna
Antenna Gain	ANT A:2.96dBi ANT B:2.39dBi
FRONT SPEAKERS	Brand: steelseries Model: SP-FRONT
CENTER CHANNEL	Brand: steelseries Model: SP-CENTER
OLED CONTROL POD	Brand: steelseries Model: CONTROL-POD
USB-C to USB-A Cable	Brand: DONGGUAN YUE YANG WIRE & CABLE CO LTD Model: YY-162-06
Power Cable	Brand: ZHENJIANG HUAYIN INSTRUMENT & ELECTRICAL EQUIPMENT CO LTD Model: 45-1-000244S
Adapter	Brand: Dongguan Dongsong Electronic Co., Ltd Model: DYS850-180280W-K
Firmware Number	2.1.5
Serial Number	61547PVT322139P0009

For more details, please refer to the User's manual of the EUT.



2.2 Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
*01	2404	14	2430	27	2456
02	2406	15	2432	28	2458
03	2408	16	2434	29	2460
04	2410	17	2436	30	2462
05	2412	18	2438	31	2464
06	2414	*19	2440	32	2466
07	2416	20	2442	33	2468
08	2418	21	2444	34	2470
09	2420	22	2446	35	2472
10	2422	23	2448	36	2474
11	2424	24	2450	*37	2476
12	2426	25	2452	--	--
13	2428	26	2454	--	--

Note: Channels remarked * are selected to perform test.



2.3 Test Mode and Test Software

- During testing, the interface cables and equipment positions were varied according to ANSI C63.10.
- The complete test system included Notebook and EUT for RF test.
- An executive program, "hid_addIC ver. 10.0.19042.1052" under Windows OS system was executed to transmit and receive data via 2.4G.
- The following test modes were performed for the test:

Conducted Emissions from the AC mains power ports	
Test Mode	Operating Description
1	GFSK (2Mbps), AC 120V/60Hz-ANT A
2	GFSK (2Mbps), AC 240V/60Hz-ANT A
caused "Test Mode 2" generated the worst case, it was reported as the final data.	
Radiation Emissions (30MHz ~ 1GHz)	
Test Mode	Operating Description
1	GFSK (2Mbps) AC 120V/60Hz-ANT A
2	GFSK (2Mbps) AC 120V/60Hz-ANT B
caused "Test Mode 1,2" generated the worst case, it was reported as the final data.	
Radiation Emissions (1GHz ~ 25GHz)	
Test Mode	Operating Description
1	GFSK (2Mbps) AC 120V/60Hz-ANT A
2	GFSK (2Mbps) AC 120V/60Hz-ANT B
caused "Test Mode 1,2" generated the worst case, they were reported as the final data.	

Modulation Type	TX CONFIGURATION
GFSK (2Mbps)	1TX



2.4 Description of Test System

RF Conducted				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS
Radiated Emissions				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS
AC Power Line Conducted Emission				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS



2.5 General Information of Test

Test Site	Cerpass Technology Corporation Test Laboratory Address: No.10, Ln. 2, Lianfu St., Luzhu Dist., Taoyuan City 33848, Taiwan (R.O.C.) Tel:+886-3-3226-888 Fax:+886-3-3226-881	
	FCC	TW1439, TW1079
	IC	4934E-1, 4934E-2
	VCCI	T-2205 for Telecommunication test C-4663 for Conducted emission test R-4218 for Radiated emission test G-10812, G-10813 for radiated disturbance above 1GHz
Frequency Range Investigated:	Conducted: from 150kHz to 30 MHz Radiation: from 30 MHz to 25,000MHz	
Test Distance:	The test distance of radiated emission from antenna to EUT is 3 M.	

Test Item	Test Site	Test period	Environmental Conditions	Tested By
RF Conducted	RFCON01-NK	2021/10/28~2021/12/15	26~28°C / 46~49%	Nick Guan
Radiated Emissions	3M03-NK	2021/11/16~2021/12/02	22~23°C / 45~50%	Dian Chen
AC Power Line Conducted Emission	CON01-NK	2021/12/08	22°C / 48%	Dian Chen



2.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))

Measurement Item	Uncertainty
AC Power Line Conduction(150K~30MHz)	±3.12dB
Radiated Spurious Emission(9KHz~30MHz)	±3.4dB
Radiated Spurious Emission(30MHz~1GHz)	±5.6dB
Radiated Spurious Emission(1GHz~25GHz)	±6.6dB
Conducted Spurious Emission	±1.8dB
6dB Bandwidth	±4.4%
20dB Bandwidth	±4.4%
Occupied Bandwidth	±4.4%
Peak Output Power(Conducted Power Meter)	±1.1dB
Dwell Time / Deactivation Time	±1.2%
Power Spectral Density	±1.8dB
Duty Cycle	±1.2%



3. Test Equipment and Ancillaries Used for Tests

Test Item	Radiated Emissions				
Test Site	Semi Anechoic Room (3M03-NK)				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Bilog Antenna	Schwarzbeck	VULB9168	369	2021/04/26	2022/04/25
Active Loop Antenna	EMCO	6507	40855	2021/06/10	2022/06/09
Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-02203	2021/03/16	2022/03/15
Horn Antenna	EMCO	3116	31970	2021/03/29	2022/03/28
EMI Receiver	ROHDE & SCHWARZ	ESCI	101423	2021/06/30	2022/06/29
Spectrum Analyzer	ROHDE & SCHWARZ	FSP 40	100219	2021/08/06	2022/08/05
Preamplifier	EM Electronics corp.	EM330	60820	2021/04/19	2022/04/18
Preamplifier	EM Electronics corp.	EM01G18G	60831	2021/06/25	2022/06/24
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2021/11/16	2022/11/15
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2021/04/19	2022/04/18
Cable-1m(30M-1G)	HUBER SUHNER	RG-214	00419M	2021/06/29	2022/06/28
Cable-1.5m(30M-1G)	HUBER SUHNER	RG-214	00420M	2021/06/29	2022/06/28
Cable-9m(30M-1G)	HUBER SUHNER	RG-214	00430M	2021/06/29	2022/06/28
Cable-6m(9k~300M)	NA	CFD300-NL	NA	2021/03/15	2022/03/14
Cable-1.5m(1G-26.5G)	EMEC	EM104-SMSM-1.5M	EM104-SMSM-1.5M	2021/06/29	2022/06/28
Cable-9m(1G-26.5G)	EMEC	EM104-SMSM-9M	EM104-SMSM-9M	2021/06/29	2022/06/28
E3	AUDIX	v8.2014-8-6	RK-000529	NA	NA

Test Item	RF Conducted				
Test Site	RFCON01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	102151	2021/08/06	2022/08/05
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2021/04/19	2022/04/18
CAX Signal Analyzer	KEYSIGHT	N9000B	MY57100339	2020/12/25	2021/12/24
Attenuator	KEYSIGHT	8491B	MY39250703	2021/04/09	2022/04/08
TEMP & HUMI CHAMBER	T-MACHINE	TMJ-9712	T-12-040111	2021/08/27	2022/08/26
Power Meter	Anritsu	ML2495A	1224005	2021/04/14	2022/04/13
Power Sensor	Anritsu	MA2411B	1207295	2021/04/14	2022/04/13



Test Item	AC Power Line Conducted Emission				
Test Site	CON01-NK				
Instrument	Manufacturer	Model No	Serial No	Calibration Date	Valid Date
EMI Receiver	ROHDE & SCHWARZ	ESCI	101402	2021/03/12	2022/03/11
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-568	2021/06/02	2022/06/01
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	101934	2021/03/10	2022/03/09
Cable-6m(9k~300M)	NA	CFD300-NL	NA	2021/03/15	2022/03/14
E3	AUDIX	v8.2014-8-6	RK-000531	NA	NA



4. Antenna Requirements

4.1 Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.2 Antenna Construction and Directional Gain

Antenna Type	PIFA Antenna
Antenna Gain	ANT A: 2.96 dBi ANT B: 2.39 dBi



5. Test of AC Power Line Conducted Emission

5.1 Test Limit

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz, according to the methods defined in ANSI C63.10-2013. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

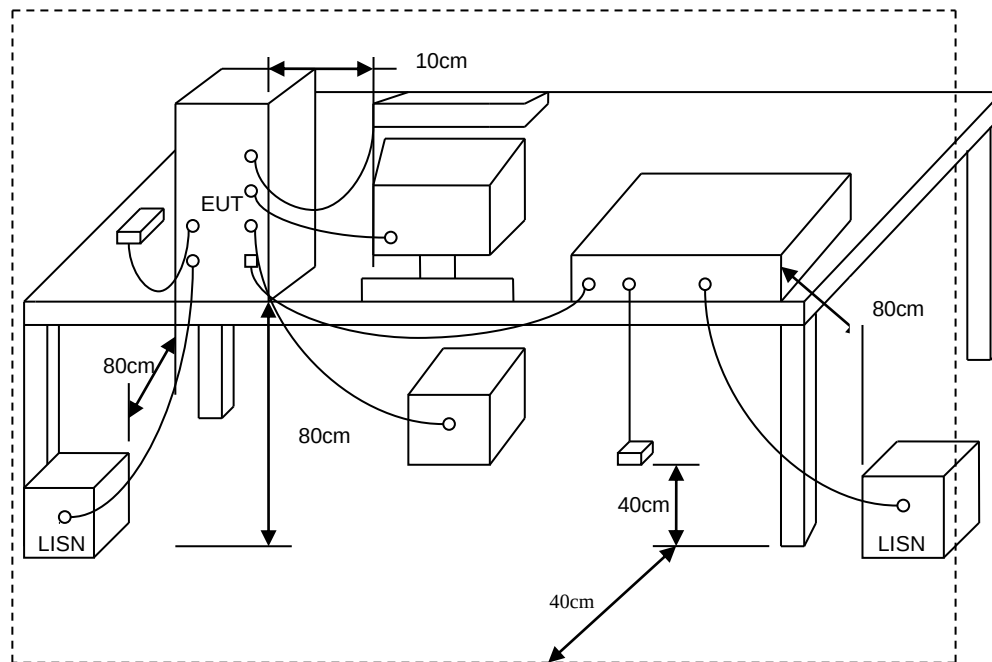
*Decreases with the logarithm of the frequency.

5.2 Test Procedures

- The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- Connect EUT to the power mains through a line impedance stabilization network (LISN).
- All the support units are connecting to the other LISN.
- The LISN provides 50 ohm coupling impedance for the measuring instrument.
- The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- Both sides of AC line were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched.
- Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



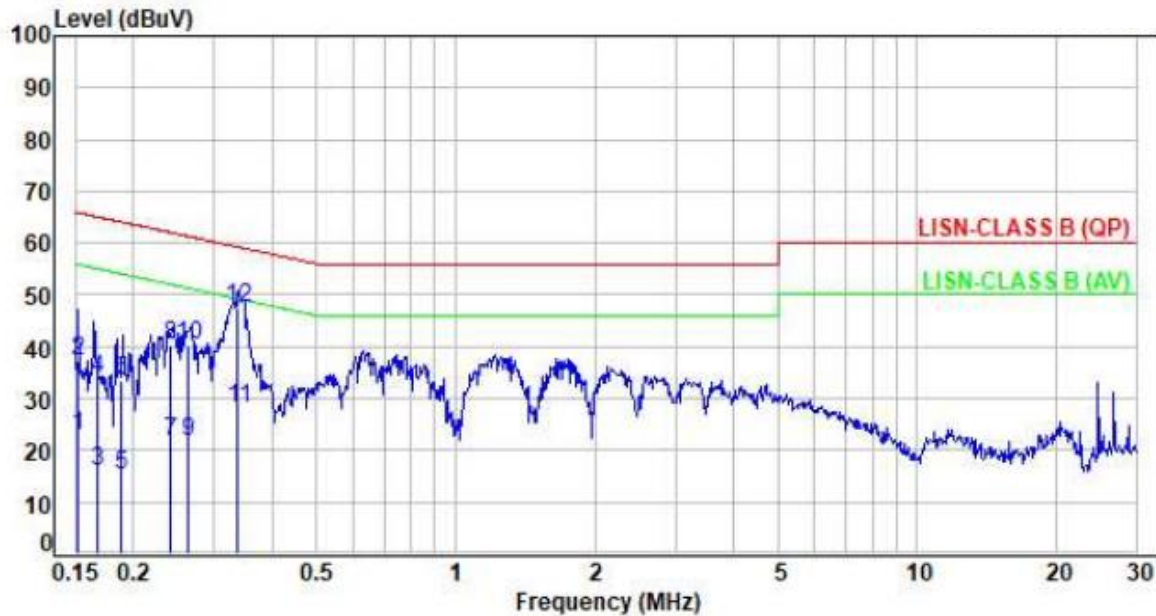
5.3 Typical Test Setup





5.4 Test Result and Data

Power	: AC 240V / 60Hz	Pol/Phase	: LINE
Test Mode	: Mode 2		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.97	12.99	22.96	55.94	-32.98	Average	P
2	0.15	9.97	27.19	37.16	65.94	-28.78	QP	P
3	0.17	9.97	5.88	15.85	55.05	-39.20	Average	P
4	0.17	9.97	23.71	33.68	65.05	-31.37	QP	P
5	0.19	9.97	5.20	15.17	54.09	-38.92	Average	P
6	0.19	9.97	23.64	33.61	64.09	-30.48	QP	P
7	0.24	9.97	11.80	21.77	52.04	-30.27	Average	P
8	0.24	9.97	30.28	40.25	62.04	-21.79	QP	P
9	0.26	9.97	11.85	21.82	51.30	-29.48	Average	P
10	0.26	9.97	30.46	40.43	61.30	-20.87	QP	P
11	0.34	9.98	18.19	28.17	49.25	-21.08	Average	P
12	0.34	9.98	37.57	47.55	59.25	-11.70	QP	P

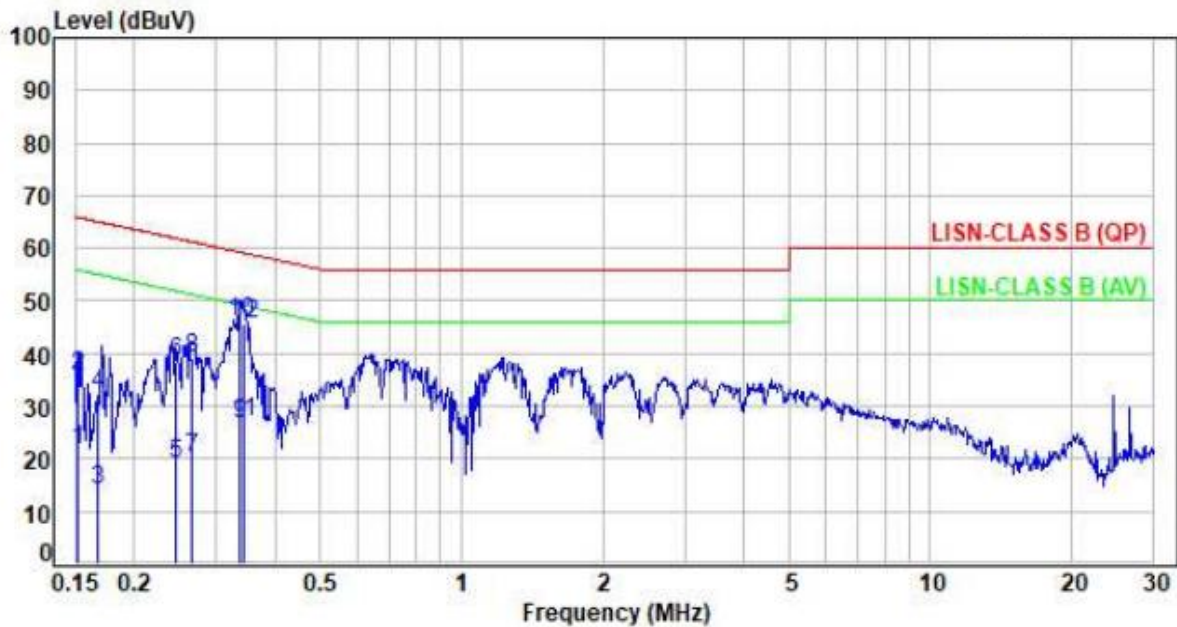
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



Power	: AC 240V / 60Hz	Pol/Phase	: NEUTRAL
Test Mode	: Mode 2		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.97	11.52	21.49	55.93	-34.44	Average	P
2	0.15	9.97	25.82	35.79	65.93	-30.14	QP	P
3	0.17	9.97	4.20	14.17	55.06	-40.89	Average	P
4	0.17	9.97	22.26	32.23	65.06	-32.83	QP	P
5	0.25	9.97	8.97	18.94	51.90	-32.96	Average	P
6	0.25	9.97	28.39	38.36	61.90	-23.54	QP	P
7	0.27	9.97	10.06	20.03	51.22	-31.19	Average	P
8	0.27	9.97	29.22	39.19	61.22	-22.03	QP	P
9	0.34	9.98	16.81	26.79	49.30	-22.51	Average	P
10	0.34	9.98	36.11	46.09	59.30	-13.21	QP	P
11	0.34	9.98	16.83	26.81	49.16	-22.35	Average	P
12	0.34	9.98	35.70	45.68	59.16	-13.48	QP	P

Note: Level=Reading+Factor

Margin=Level-Limit

Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



6. Test of Spurious Emission (Radiated)

6.1 Test Limit

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequency (MHz)	Field Strength (microvolt/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



6.2 Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.
- h. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- i. "Cone of radiation" has been considered to be 3dB bandwidth of the measurement antenna.

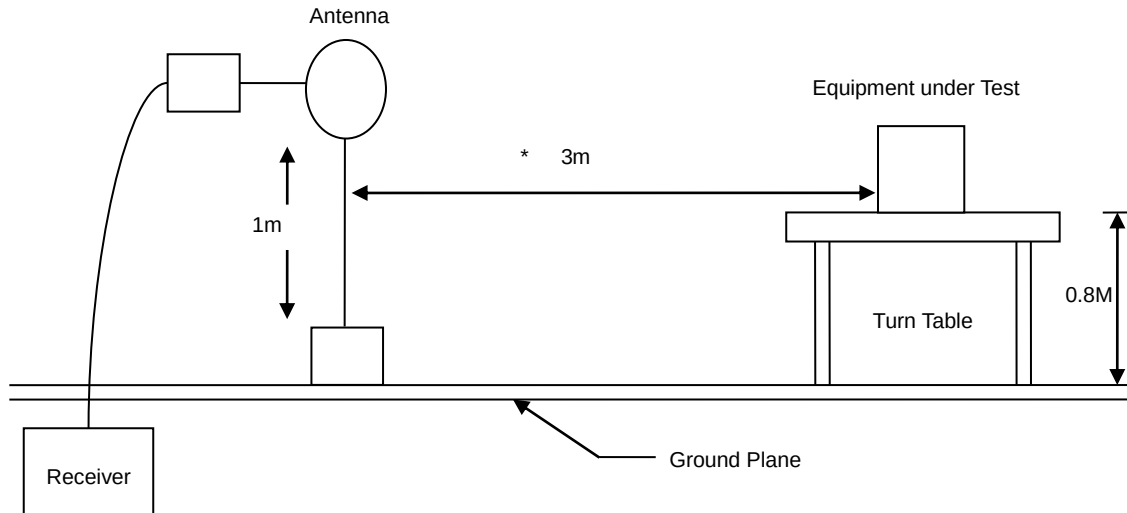
Note:

- 1.The supporting fixture shall permit orientation of the EUT in each of three orthogonal axis positions such that emissions from the EUT are maximized.
- 2.Due to the test software function limit the operation band setting(200dBuV/m).
There's no corresponding limitation in the actual test item.

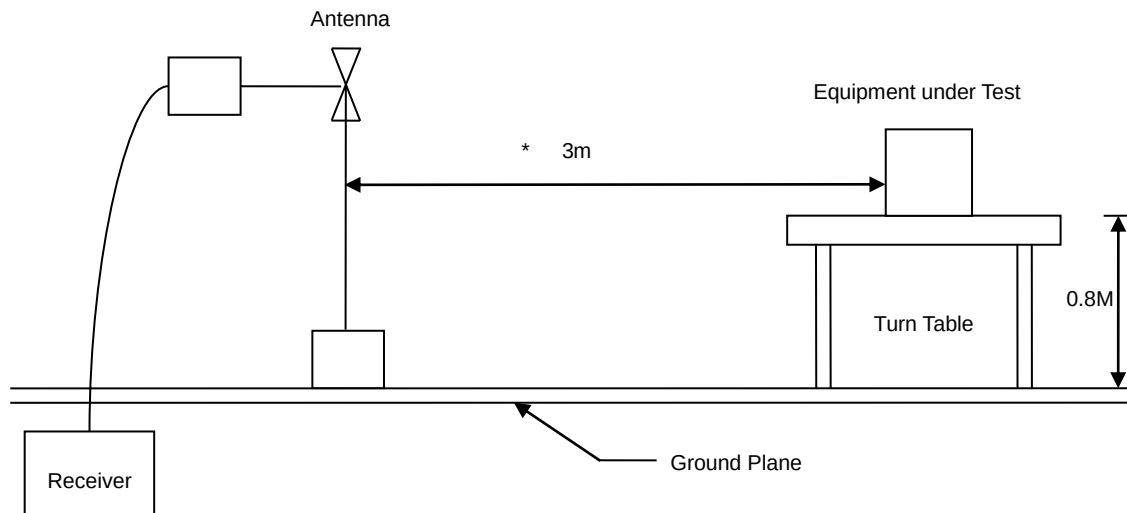


6.3 Typical Test Setup

Below 30MHz test setup

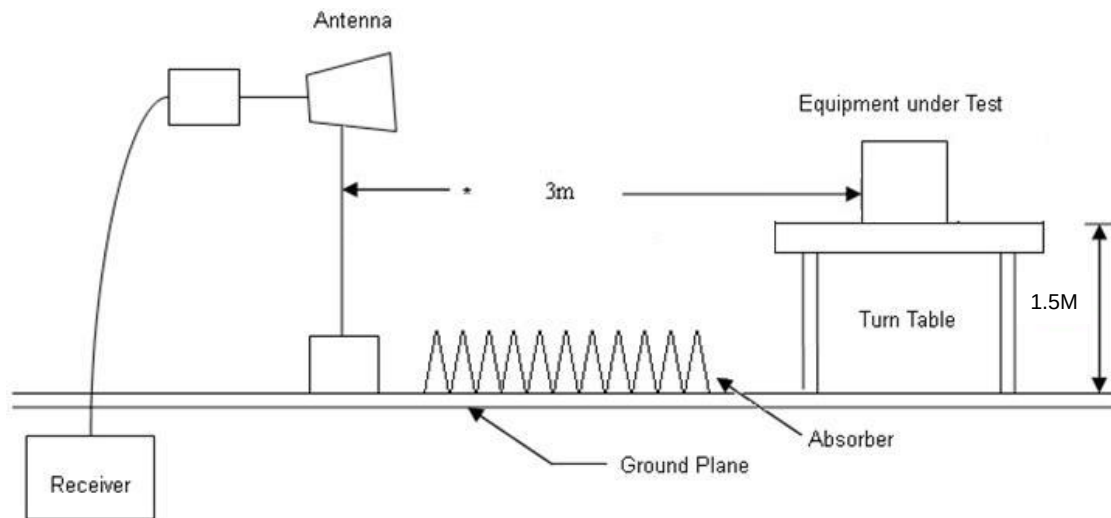


30MHz- 1GHz Test Setup





Above 1GHz Test Setup



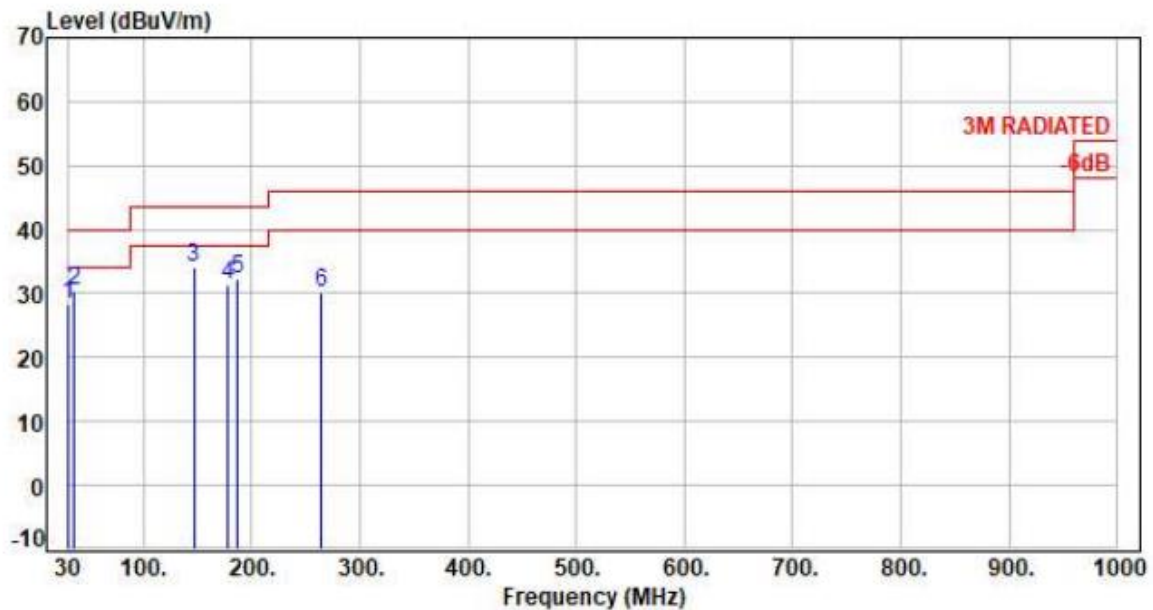


6.4 Test Result and Data (9kHz ~ 30MHz)

The 9kHz - 30MHz spurious emission is under limit 20dB more.

6.5 Test Result and Data (30MHz ~ 1GHz)

Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-11.82	40.15	28.33	40.00	-11.67	Peak	400	360	P
2	35.82	-11.77	42.21	30.44	40.00	-9.56	Peak	400	360	P
3	146.40	-11.51	45.52	34.01	43.50	-9.49	Peak	400	360	P
4	177.44	-12.50	43.88	31.38	43.50	-12.12	Peak	400	360	P
5	187.14	-13.42	45.74	32.32	43.50	-11.18	Peak	400	360	P
6	264.74	-11.64	41.77	30.13	46.00	-15.87	Peak	400	360	P

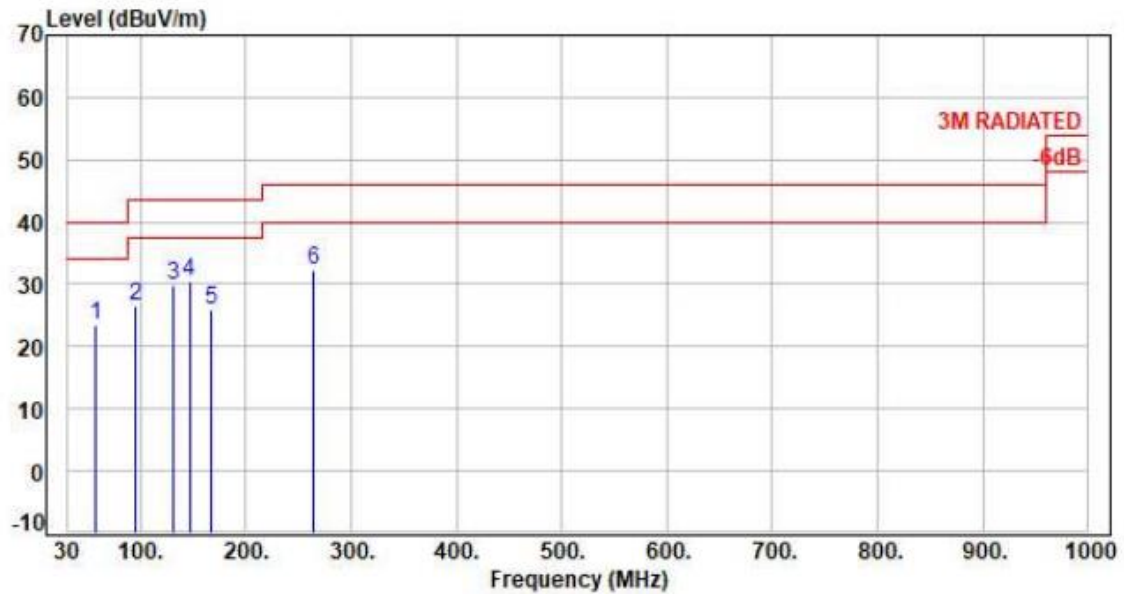
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	57.16	-11.69	35.24	23.55	40.00	-16.45	Peak	400	361	P
2	95.96	-17.18	43.59	26.41	43.50	-17.09	Peak	400	361	P
3	130.88	-12.21	41.98	29.77	43.50	-13.73	Peak	400	361	P
4	146.40	-11.51	42.10	30.59	43.50	-12.91	Peak	400	361	P
5	167.74	-11.48	37.43	25.95	43.50	-17.55	Peak	400	361	P
6	264.74	-11.64	43.88	32.24	46.00	-13.76	Peak	400	361	P

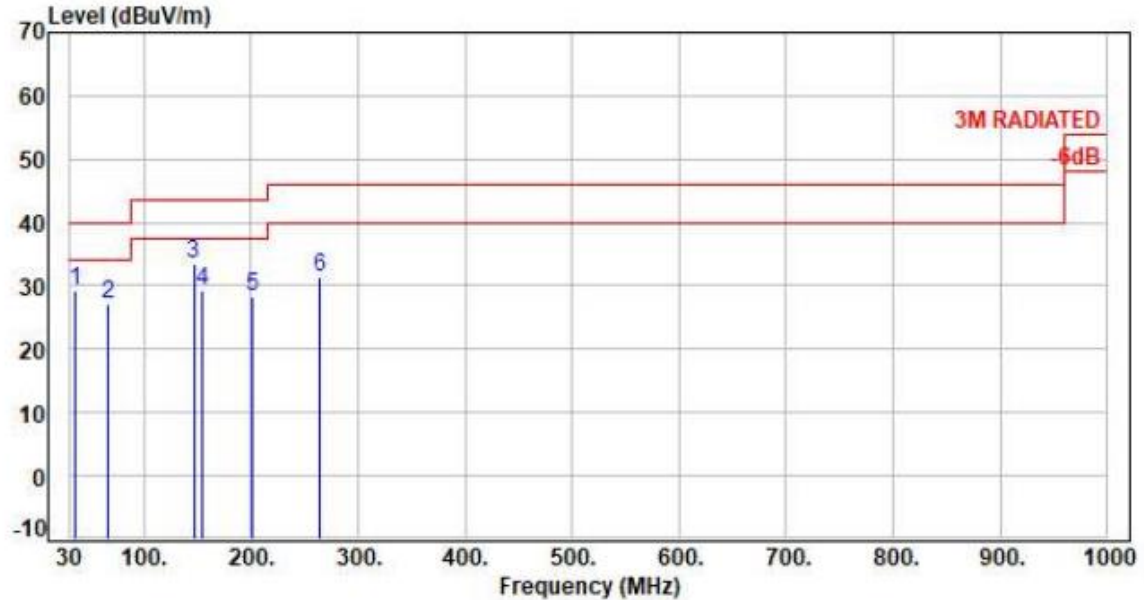
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	35.82	-11.77	41.04	29.27	40.00	-10.73	Peak	400	360	P
2	66.86	-13.13	40.22	27.09	40.00	-12.91	Peak	400	360	P
3	146.40	-11.51	45.11	33.60	43.50	-9.90	Peak	400	360	P
4	154.16	-11.37	40.71	29.34	43.50	-14.16	Peak	400	360	P
5	200.72	-13.85	42.33	28.48	43.50	-15.02	Peak	400	360	P
6	264.74	-11.64	42.86	31.22	46.00	-14.78	Peak	400	360	P

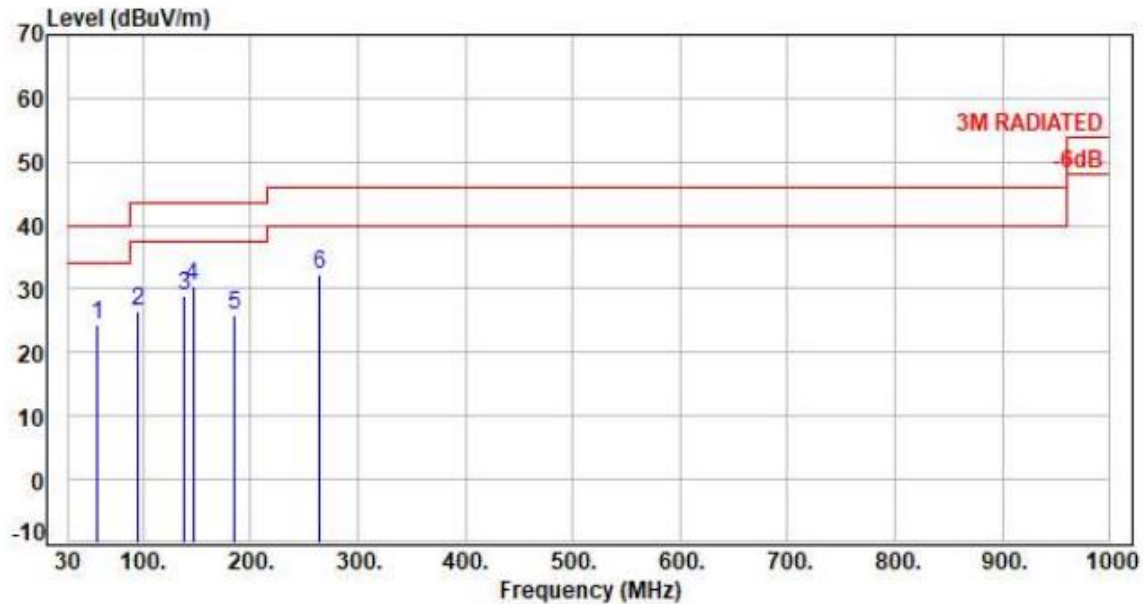
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	57.16	-11.69	35.98	24.29	40.00	-15.71	Peak	400	360	P
2	95.96	-17.18	43.73	26.55	43.50	-16.95	Peak	400	360	P
3	138.64	-11.60	40.53	28.93	43.50	-14.57	Peak	400	360	P
4	146.40	-11.51	41.89	30.38	43.50	-13.12	Peak	400	360	P
5	185.20	-13.25	39.06	25.81	43.50	-17.69	Peak	400	360	P
6	264.74	-11.64	43.96	32.32	46.00	-13.68	Peak	400	360	P

Note: Level=Reading+Factor

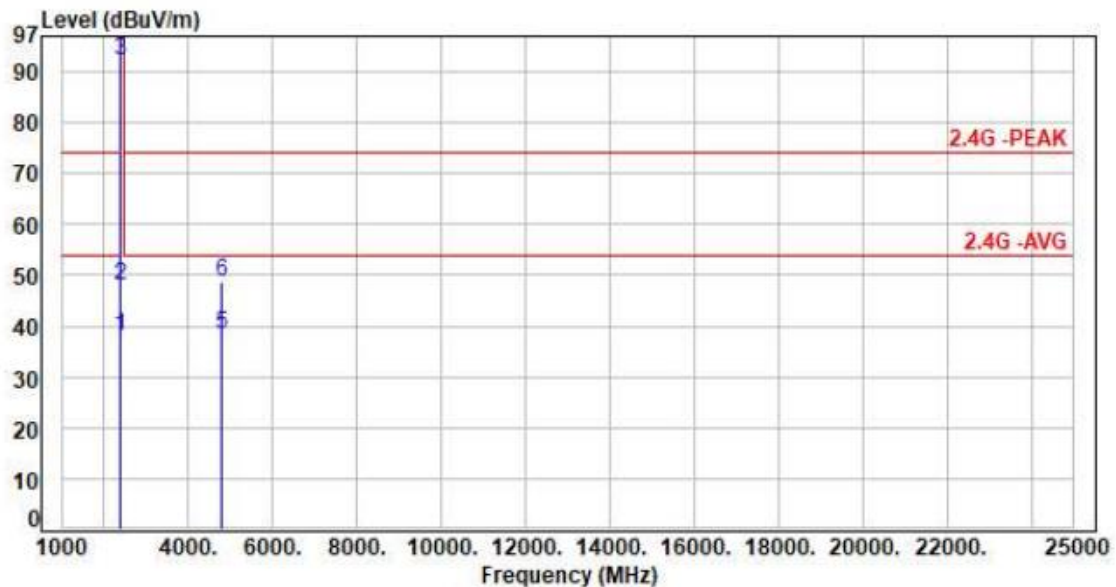
Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



6.6 Test Result and Data (1GHz ~ 25GHz)

Power	: AC 120V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 1, CH01		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	52.07	37.88	54.00	-16.12	Average	377	153	P
2	2390.00	-14.19	62.01	47.82	74.00	-26.18	Peak	377	153	P
3	2404.00	-14.22	106.37	92.15	200.00	-107.85	Average	377	153	P
4	2404.00	-14.22	112.29	98.07	200.00	-101.93	Peak	377	153	P
5	4808.00	-8.39	46.85	38.46	54.00	-15.54	Average	103	119	P
6	4808.00	-8.39	56.98	48.59	74.00	-25.41	Peak	103	119	P

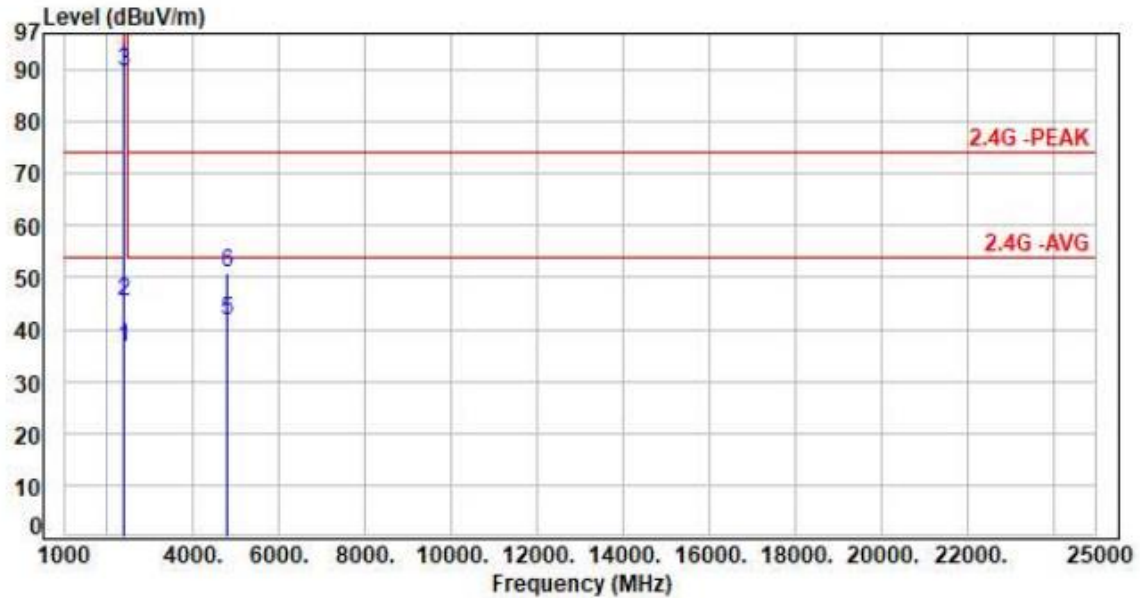
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH01		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	50.80	36.61	54.00	-17.39	Average	288	62	P
2	2390.00	-14.19	59.69	45.50	74.00	-28.50	Peak	288	62	P
3	2404.00	-14.22	103.87	89.65	200.00	-110.35	Average	288	62	P
4	2404.00	-14.22	109.59	95.37	200.00	-104.63	Peak	288	62	P
5	4808.00	-8.39	50.00	41.61	54.00	-12.39	Average	195	98	P
6	4808.00	-8.39	59.39	51.00	74.00	-23.00	Peak	195	98	P

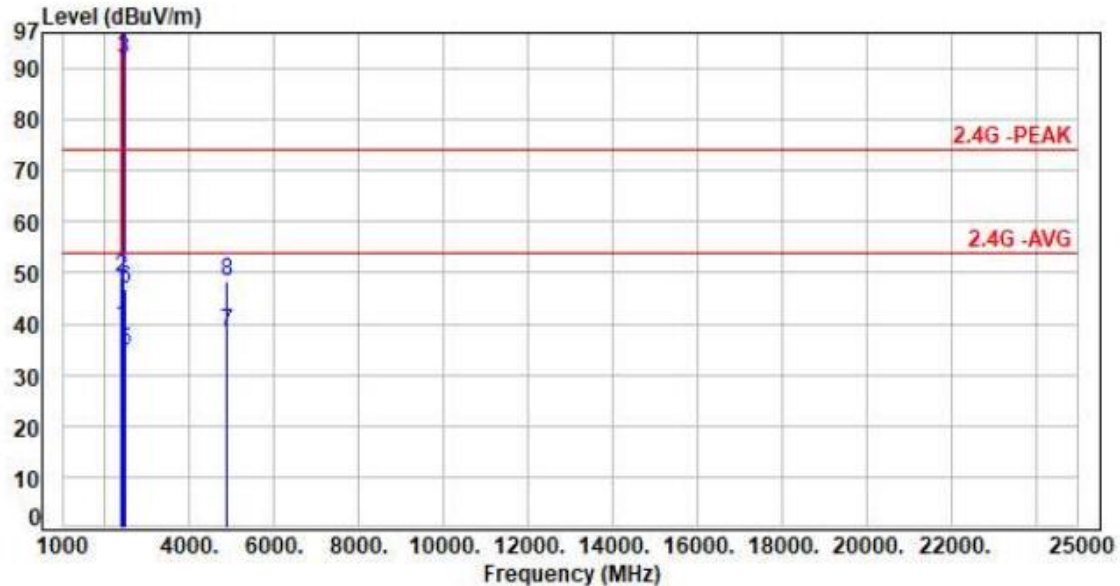
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH19		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	53.66	39.47	54.00	-14.53	Average	362	147	P
2	2390.00	-14.19	63.21	49.02	74.00	-24.98	Peak	362	147	P
3	2440.00	-14.17	105.86	91.69	200.00	-108.31	Average	362	147	P
4	2440.00	-14.17	111.95	97.78	200.00	-102.22	Peak	362	147	P
5	2483.50	-14.12	48.84	34.72	54.00	-19.28	Average	362	147	P
6	2483.50	-14.12	60.83	46.71	74.00	-27.29	Peak	362	147	P
7	4880.00	-8.13	46.63	38.50	54.00	-15.50	Average	100	120	P
8	4880.00	-8.13	56.48	48.35	74.00	-25.65	Peak	100	120	P

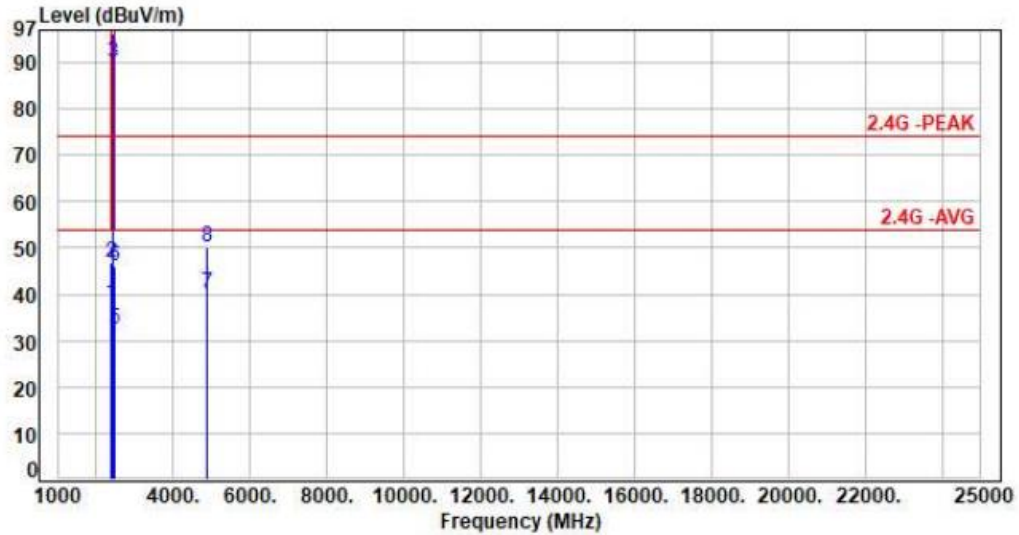
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH19		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	52.19	38.00	54.00	-16.00	Average	274	63	P
2	2390.00	-14.19	61.11	46.92	74.00	-27.08	Peak	274	63	P
3	2440.00	-14.17	104.32	90.15	200.00	-109.85	Average	274	63	P
4	2440.00	-14.17	110.51	96.34	200.00	-103.66	Peak	274	63	P
5	2483.50	-14.12	46.54	32.42	54.00	-21.58	Average	274	63	P
6	2483.50	-14.12	60.24	46.12	74.00	-27.88	Peak	274	63	P
7	4880.00	-8.13	48.49	40.36	54.00	-13.64	Average	190	96	P
8	4880.00	-8.13	58.32	50.19	74.00	-23.81	Peak	190	96	P

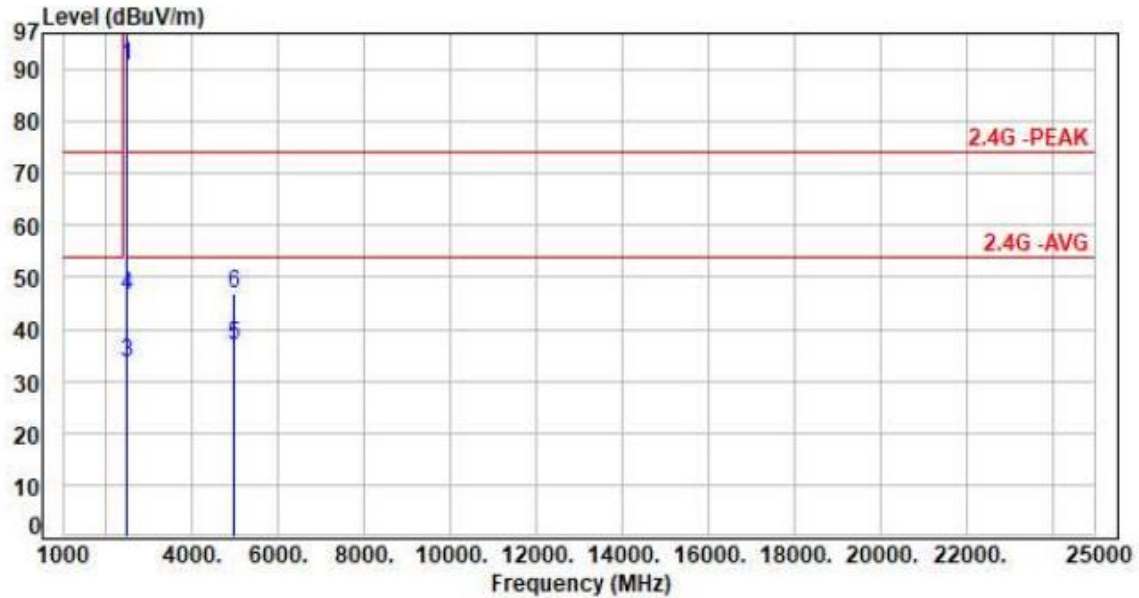
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH37		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2476.00	-14.14	104.91	90.77	200.00	-109.23	Average	394	130	P
2	2476.00	-14.14	110.91	96.77	200.00	-103.23	Peak	394	130	P
3	2483.50	-14.12	47.78	33.66	54.00	-20.34	Average	394	130	P
4	2483.50	-14.12	60.72	46.60	74.00	-27.40	Peak	394	130	P
5	4952.00	-7.84	44.58	36.74	54.00	-17.26	Average	100	121	P
6	4952.00	-7.84	54.66	46.82	74.00	-27.18	Peak	100	121	P

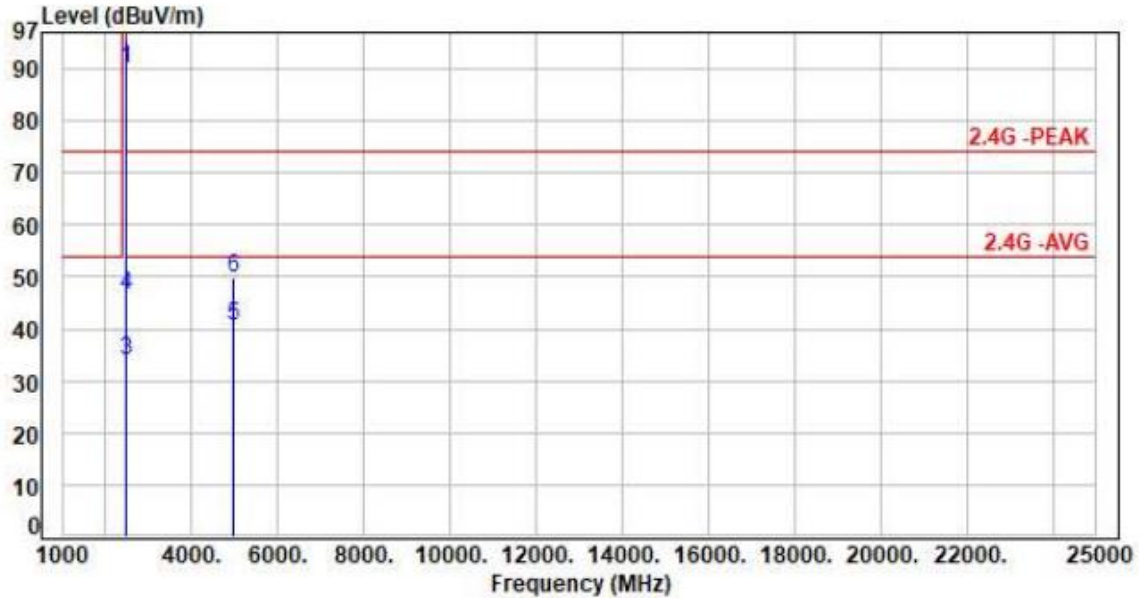
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 1, CH37		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2476.00	-14.14	104.22	90.08	200.00	-109.92	Average	279	79	P
2	2476.00	-14.14	110.21	96.07	200.00	-103.93	Peak	279	79	P
3	2483.50	-14.12	48.04	33.92	54.00	-20.08	Average	279	79	P
4	2483.50	-14.12	60.50	46.38	74.00	-27.62	Peak	279	79	P
5	4952.00	-7.84	48.53	40.69	54.00	-13.31	Average	170	80	P
6	4952.00	-7.84	57.73	49.89	74.00	-24.11	Peak	170	80	P

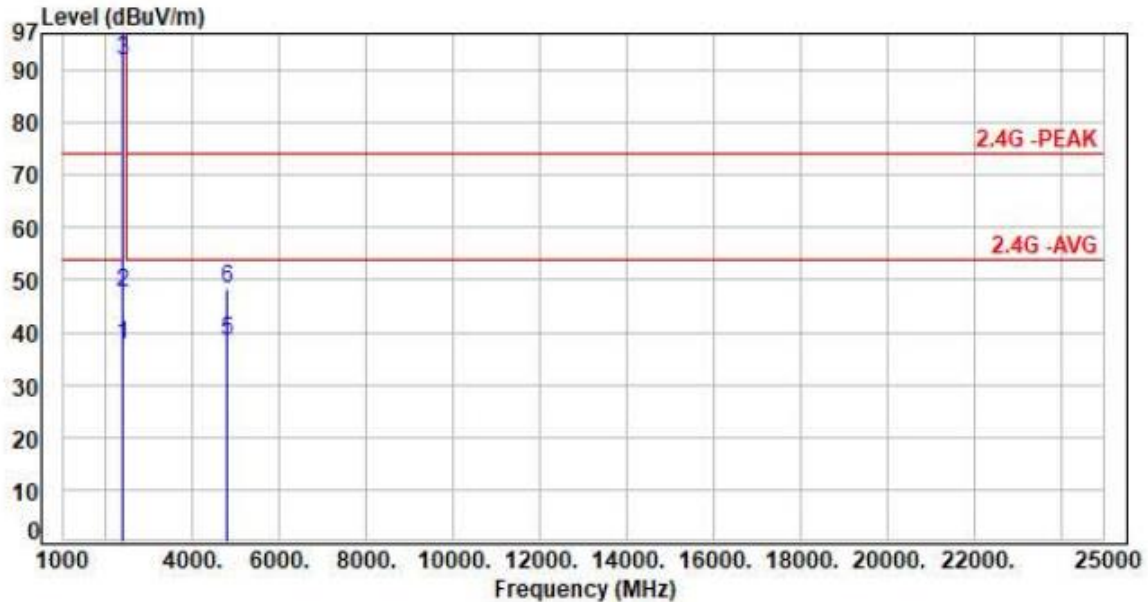
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH01		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	51.76	37.57	54.00	-16.43	Average	368	147	P
2	2390.00	-14.19	61.83	47.64	74.00	-26.36	Peak	368	147	P
3	2404.00	-14.22	105.96	91.74	200.00	-108.26	Average	368	147	P
4	2404.00	-14.22	111.98	97.76	200.00	-102.24	Peak	368	147	P
5	4808.00	-8.39	46.70	38.31	54.00	-15.69	Average	100	128	P
6	4808.00	-8.39	56.74	48.35	74.00	-25.65	Peak	100	128	P

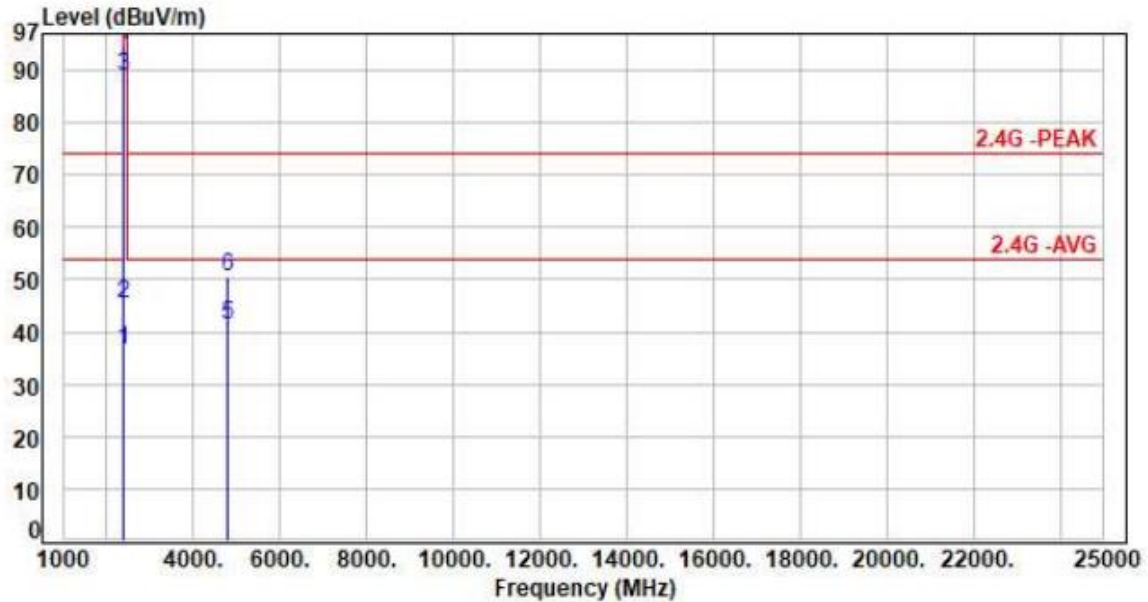
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH01		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	50.59	36.40	54.00	-17.60	Average	293	72	P
2	2390.00	-14.19	59.48	45.29	74.00	-28.71	Peak	293	72	P
3	2404.00	-14.22	103.04	88.82	200.00	-111.18	Average	293	72	P
4	2404.00	-14.22	108.96	94.74	200.00	-105.26	Peak	293	72	P
5	4808.00	-8.39	49.87	41.48	54.00	-12.52	Average	199	89	P
6	4808.00	-8.39	58.88	50.49	74.00	-23.51	Peak	199	89	P

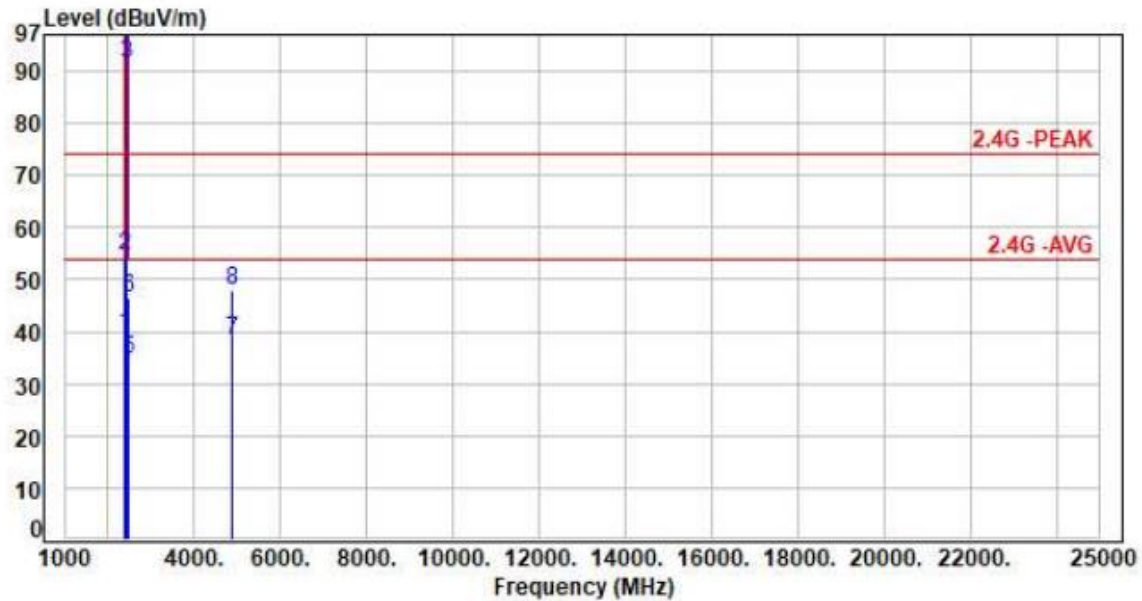
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: VERTICAL
Test Mode	: Mode 2, CH19		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	53.52	39.33	54.00	-14.67	Average	357	136	P
2	2390.00	-14.19	68.94	54.75	74.00	-19.25	Peak	357	136	P
3	2440.00	-14.17	105.48	91.31	200.00	-108.69	Average	357	136	P
4	2440.00	-14.17	111.61	97.44	200.00	-102.56	Peak	357	136	P
5	2483.50	-14.12	48.72	34.60	54.00	-19.40	Average	357	136	P
6	2483.50	-14.12	60.54	46.42	74.00	-27.58	Peak	357	136	P
7	4880.00	-8.13	46.37	38.24	54.00	-15.76	Average	100	134	P
8	4880.00	-8.13	56.21	48.08	74.00	-25.92	Peak	100	134	P

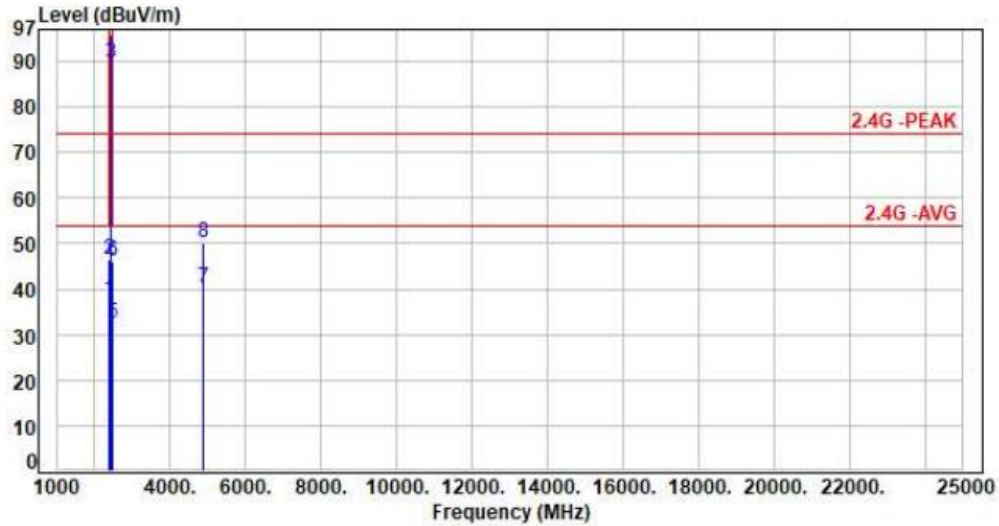
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH19		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2390.00	-14.19	51.85	37.66	54.00	-16.34	Average	263	74	P
2	2390.00	-14.19	60.76	46.57	74.00	-27.43	Peak	263	74	P
3	2440.00	-14.17	103.87	89.70	200.00	-110.30	Average	263	74	P
4	2440.00	-14.17	110.15	95.98	200.00	-104.02	Peak	263	74	P
5	2483.50	-14.12	46.47	32.35	54.00	-21.65	Average	263	74	P
6	2483.50	-14.12	60.10	45.98	74.00	-28.02	Peak	263	74	P
7	4880.00	-8.13	48.27	40.14	54.00	-13.86	Average	184	87	P
8	4880.00	-8.13	58.19	50.06	74.00	-23.94	Peak	184	87	P

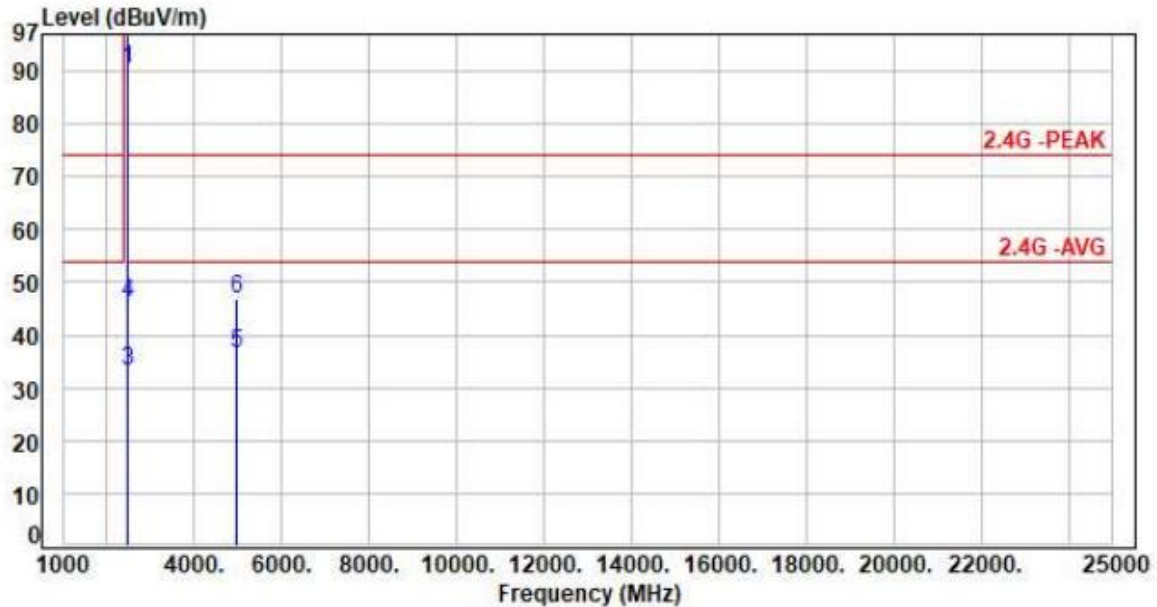
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2, CH37		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2476.00	-14.14	104.57	90.43	200.00	-109.57	Average	388	136	P
2	2476.00	-14.14	110.62	96.48	200.00	-103.52	Peak	388	136	P
3	2483.50	-14.12	47.45	33.33	54.00	-20.67	Average	388	136	P
4	2483.50	-14.12	60.37	46.25	74.00	-27.75	Peak	388	136	P
5	4952.00	-7.84	44.43	36.59	54.00	-17.41	Average	100	128	P
6	4952.00	-7.84	54.52	46.68	74.00	-27.32	Peak	100	128	P

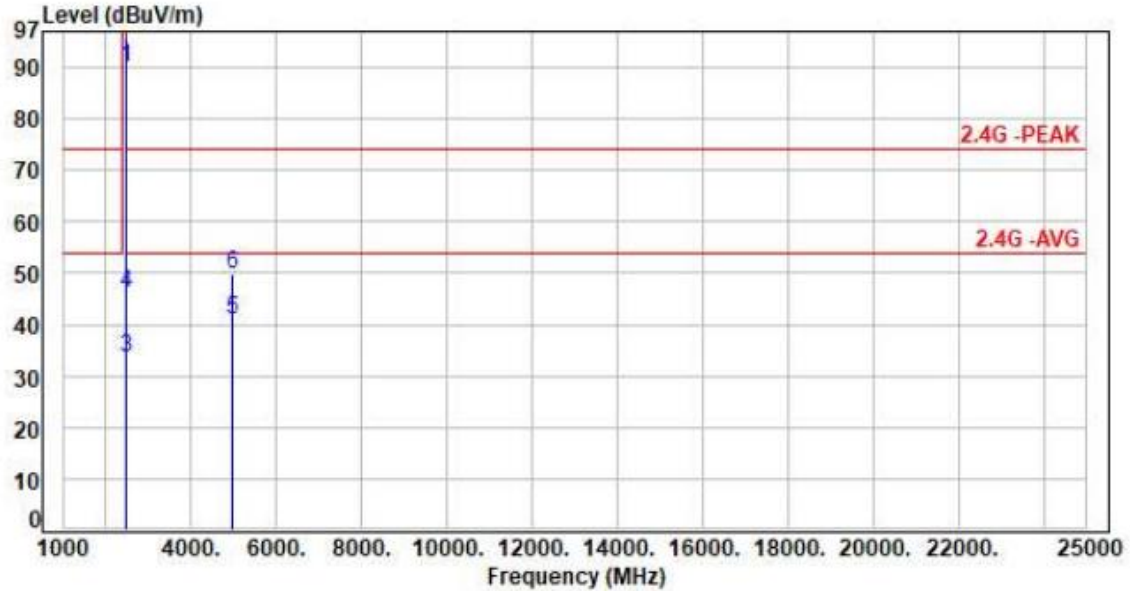
Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



Power	: AC 120V / 60Hz	Pol/Phase	: HORIZONTAL
Test Mode	: Mode 2, CH37		:



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2476.00	-14.14	103.96	89.82	200.00	-110.18	Average	268	82	P
2	2476.00	-14.14	109.92	95.78	200.00	-104.22	Peak	268	82	P
3	2483.50	-14.12	47.84	33.72	54.00	-20.28	Average	268	82	P
4	2483.50	-14.12	60.20	46.08	74.00	-27.92	Peak	268	82	P
5	4952.00	-7.84	48.62	40.78	54.00	-13.22	Average	166	75	P
6	4952.00	-7.84	57.47	49.63	74.00	-24.37	Peak	166	75	P

Note: Level=Reading+Factor

Margin=Level-Limit

Factor=Antenna Factor + cable loss - Amplifier Factor



6.7 Restricted Bands of Operation

Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.09000 – 0.11000	16.42000 – 16.42300	399.9 – 410.0	4.500 – 5.250
0.49500 – 0.505**	16.69475 – 16.69525	608.0 – 614.0	5.350 – 5.460
2.17350 – 2.19050	16.80425 – 16.80475	960.0 – 1240.0	7.250 – 7.750
4.12500 – 4.12800	25.50000 – 25.67000	1300.0 – 1427.0	8.025 – 8.500
4.17725 – 4.17775	37.50000 – 38.25000	1435.0 – 1626.5	9.000 – 9.200
4.20725 – 4.20775	73.00000 – 74.60000	1645.5 – 1646.5	9.300 – 9.500
6.21500 – 6.21800	74.80000 – 75.20000	1660.0 – 1710.0	10.600 – 12.700
6.26775 – 6.26825	108.00000 – 121.94000	1718.8 – 1722.2	13.250 – 13.400
6.31175 – 6.31225	123.00000 – 138.00000	2200.0 – 2300.0	14.470 – 14.500
8.29100 – 8.29400	149.90000 – 150.05000	2310.0 – 2390.0	15.350 – 16.200
8.36200 – 8.36600	156.52475 – 156.52525	2483.5 – 2500.0	17.700 – 21.400
8.37625 – 8.38675	156.70000 – 156.90000	2655.0 – 2900.0	22.010 – 23.120
8.41425 – 8.41475	162.01250 – 167.17000	3260.0 – 3267.0	23.600 – 24.000
12.29000 – 12.29300	167.72000 – 173.20000	3332.0 – 3339.0	31.200 – 31.800
12.51975 – 12.52025	240.00000 – 285.00000	3345.8 – 3358.0	36.430 – 36.500
12.57675 – 12.57725	322.00000 – 335.40000	3600.0 – 4400.0	Above 38.6
13.36000 – 13.41000			

** : Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz



7. Test of Spurious Emission (Conducted)

7.1 Test Limit

According to the methods defined in ANSI C63.10-2013 Section 11.11.1

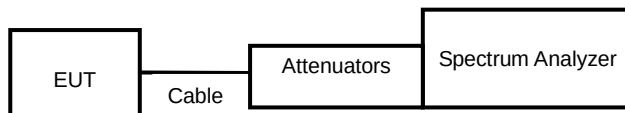
Below –30dB of the highest emission level of operating band (In 100 kHz Resolution Bandwidth)

7.2 Test Procedure

According to the methods defined in ANSI C63.10-2013 Section 11.11.2 & 11.11.3

- The transmitter output was connected to the spectrum analyzer via a low loss cable.
- Set RBW of spectrum analyzer to 100 KHz and VBW of spectrum analyzer to 300 KHz with convenient frequency span including 100 KHz bandwidth from band edge.
- Peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated by at least 30dB relative to the maximum measured in-band peak PSD level.
- The band edges was measured and recorded.

7.3 Test Setup Layout

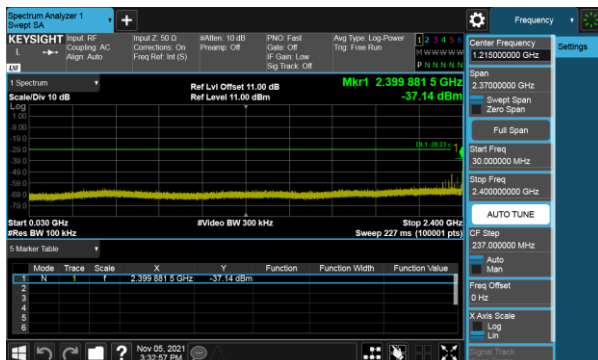
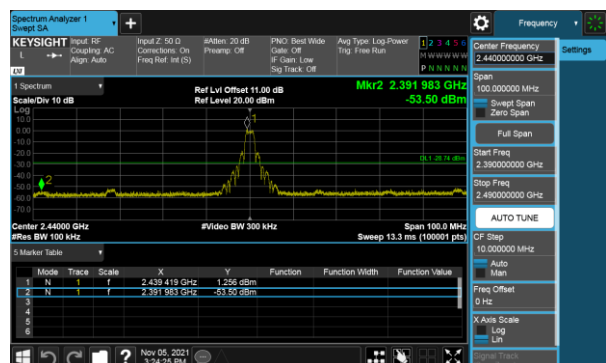
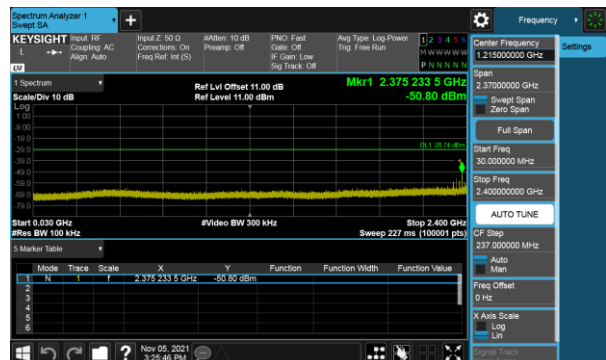


7.4 Test Result and Data

Note: Test plots refer to the following pages.

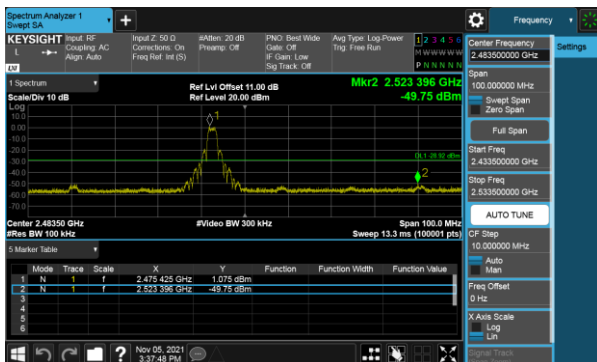
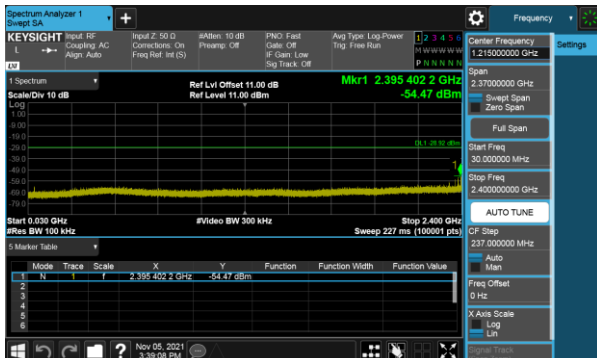


ANT A

Modulation Type: GFSK(2Mbps)
CH01Modulation Type: GFSK(2Mbps)
CH19

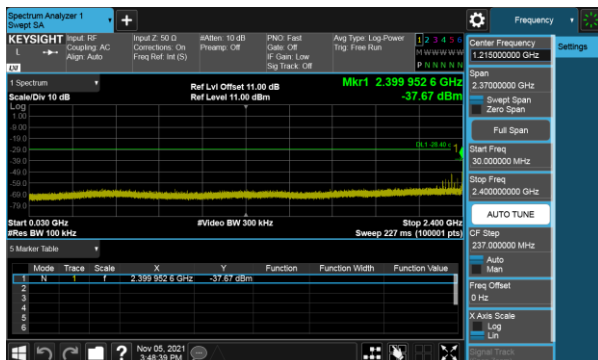
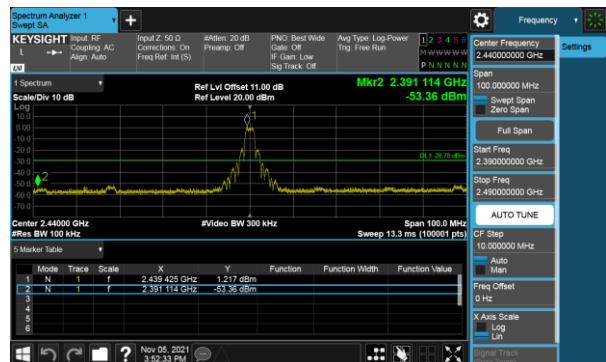
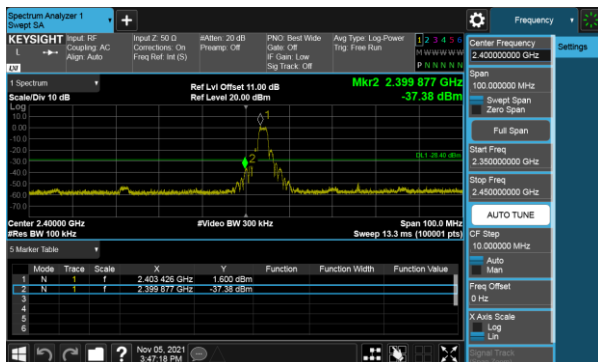
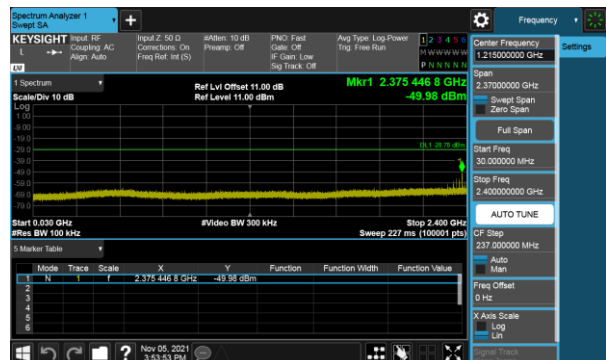


Modulation Type: GFSK(2Mbps)
CH37



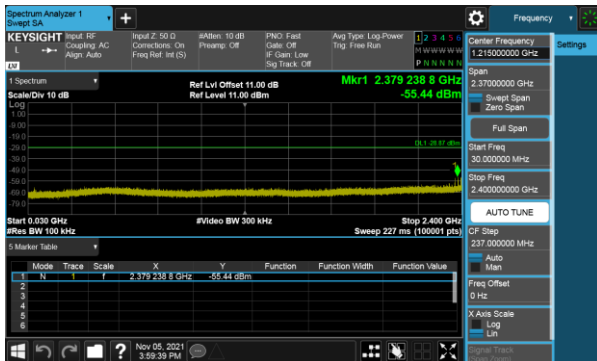


ANT B

Modulation Type: GFSK(2Mbps)
CH01Modulation Type: GFSK(2Mbps)
CH19



Modulation Type: GFSK(2Mbps)
CH37





8. On Time, Duty Cycle and Measurement methods

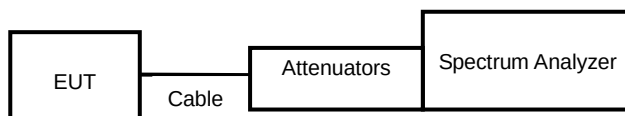
8.1 Test Limit

None; for reporting purposes only.

8.2 Test Procedure

According to the methods defined in ANSI C63.10-2013 Section 11.6
Zero-Span Spectrum Analyzer Method.

8.3 Test Setup Layout



8.4 Test Result and Data

ANTA

Modulation Type	On Time (ms)	Period Time (ms)	Duty Cycle (%)
GFSK(2Mbps)	100.00	100.00	100.00%

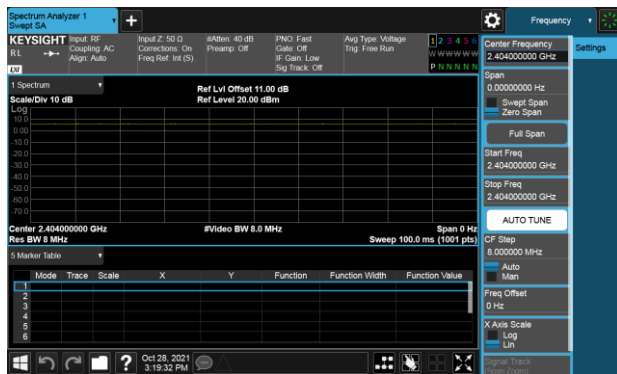
ANTB

Modulation Type	On Time (ms)	Period Time (ms)	Duty Cycle (%)
GFSK(2Mbps)	100.00	100.00	100.00%



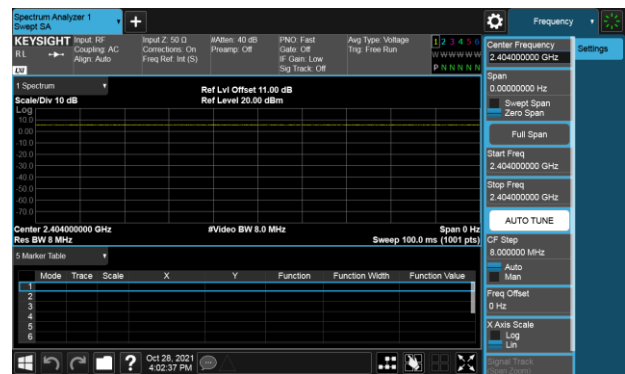
ANT A

Modulation Type: GFSK(2Mbps)



ANT B

Modulation Type: GFSK(2Mbps)





9. 6dB Bandwidth Measurement Data

9.1 Test Limit

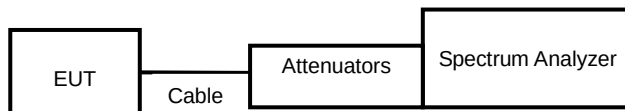
The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

9.2 Test Procedures

According to the methods defined in ANSI C63.10-2013 Section 11.8

- The transmitter output was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 100 KHz and VBW to 300 KHz.
- The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.
- The 6dB Bandwidth was measured and recorded.

9.3 Test Setup Layout



9.4 Test Result and Data

ANT A

Modulation Type	Channel	Frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)
GFSK (2Mbps)	1	2404	1881.00	500
	19	2440	1893.00	500
	37	2476	1881.00	500

ANT B

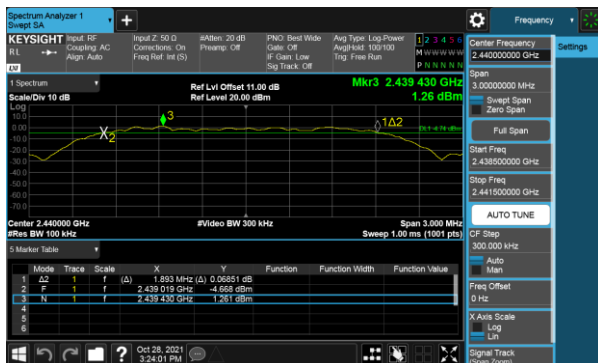
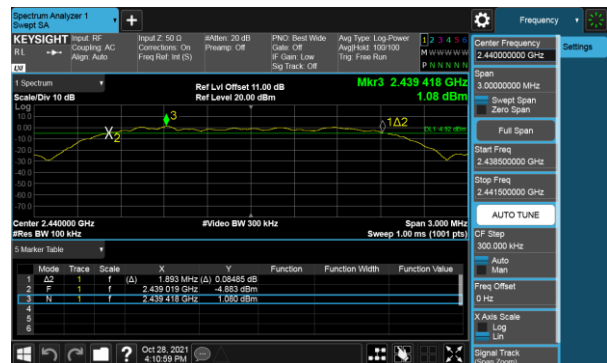
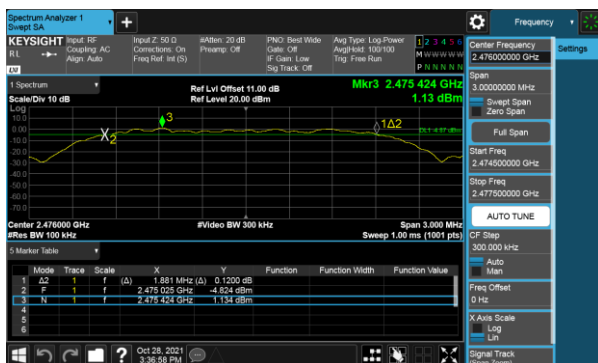
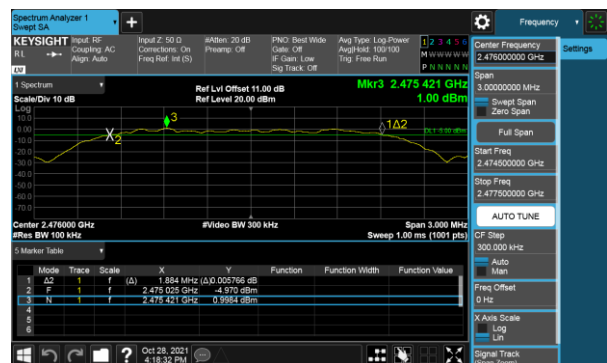
Modulation Type	Channel	Frequency (MHz)	6dB Bandwidth (KHz)	Limit (KHz)
GFSK (2Mbps)	1	2404	1884.00	500
	19	2440	1893.00	500
	37	2476	1884.00	500



ANT A

Modulation Type: GFSK(2Mbps)
CH01

ANT B

Modulation Type: GFSK(2Mbps)
CH01Modulation Type: GFSK(2Mbps)
CH19Modulation Type: GFSK(2Mbps)
CH19Modulation Type: GFSK(2Mbps)
CH37Modulation Type: GFSK(2Mbps)
CH37



10. Maximum Average Output Power

10.1 Test Limit

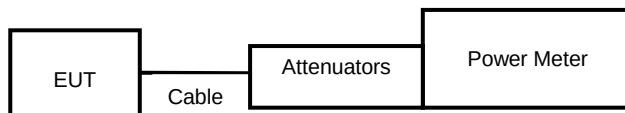
The Maximum Output Power Measurement is 30dBm.

10.2 Test Procedures

According to the methods defined in ANSI C63.10-2013 Section 11.9.2.3.2

The antenna port (RF output) of the EUT was connected to the input (RF input) of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

10.3 Test Setup Layout



10.4 Test Result and Data

ANT A

GFSK (2Mbps)

Power Set	Modulation Type	Channel	Frequency (MHz)	Power Output (dBm)	Power Output (mW)
				Average	Average
Default	GFSK (2Mbps)	1	2404	5.1	3.236
Default		19	2440	4.64	2.911
Default		37	2476	4.32	2.704

ANT B

GFSK (2Mbps)

Power Set	Modulation Type	Channel	Frequency (MHz)	Power Output (dBm)	Power Output (mW)
				Average	Average
Default	GFSK (2Mbps)	1	2404	5.02	3.177
Default		19	2440	4.69	2.944
Default		37	2476	4.33	2.710



11. Power Spectral Density

11.1 Test Limit

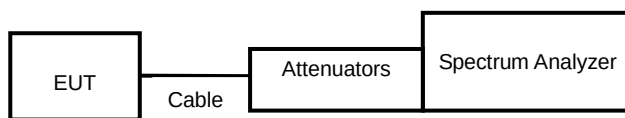
The Maximum of Power Spectral Density Measurement is 8dBm.

If transmitting antennas of directional gain greater than 6 dBi are used, the power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

11.2 Test Procedures

According to the methods defined in ANSI C63.10-2013 Section 11.10.1

11.3 Test Setup Layout



11.4 Test Result and Data

ANT A

Modulation Type	Channel	Frequency (MHz)	Maximum Power Density of 10KHz Bandwidth(dBm)	Limit
GFSK (2Mbps)	1	2404	-11.58	8.00
	19	2440	-12.51	8.00
	37	2476	-11.52	8.00

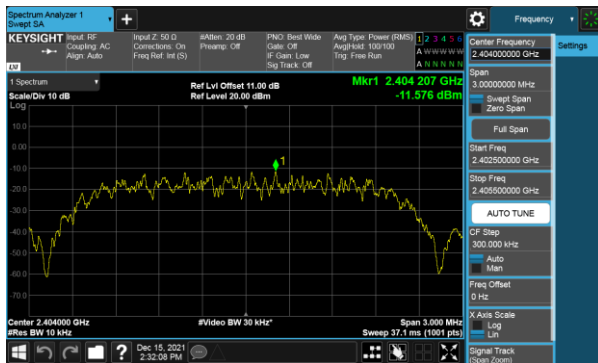
ANT B

Modulation Type	Channel	Frequency (MHz)	Maximum Power Density of 10KHz Bandwidth(dBm)	Limit
GFSK (2Mbps)	1	2404	-12.02	8.00
	19	2440	-12.92	8.00
	37	2476	-12.31	8.00



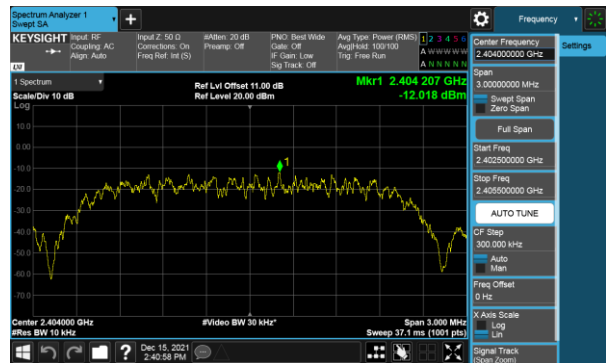
ANT A

Modulation Type: GFSK(2Mbps)
CH01

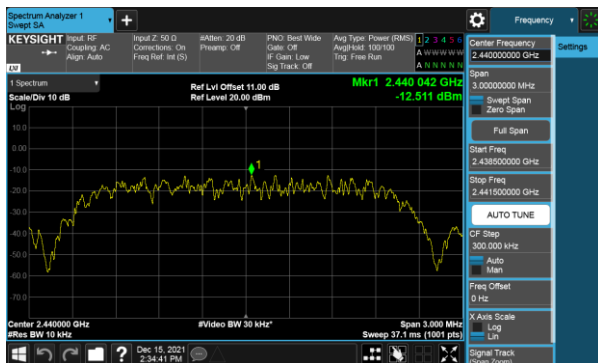


ANT B

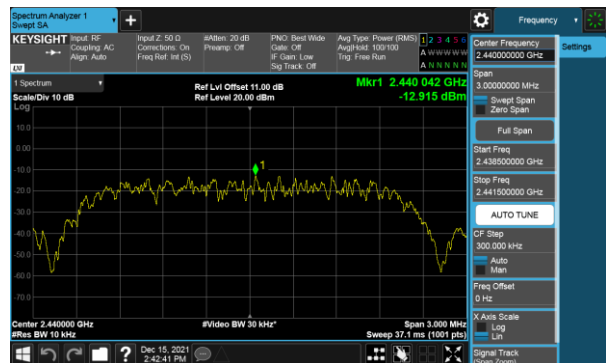
Modulation Type: GFSK(2Mbps)
CH01



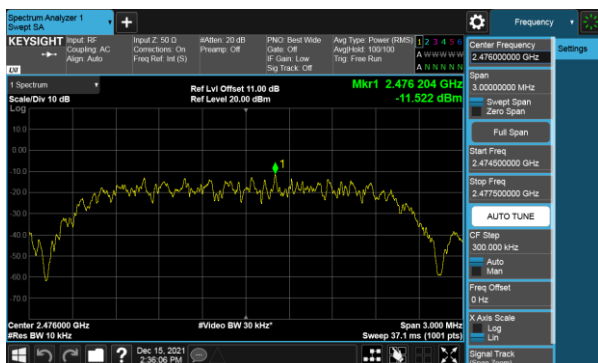
Modulation Type: GFSK(2Mbps)
CH19



Modulation Type: GFSK(2Mbps)
CH19



Modulation Type: GFSK(2Mbps)
CH37



Modulation Type: GFSK(2Mbps)
CH37

