




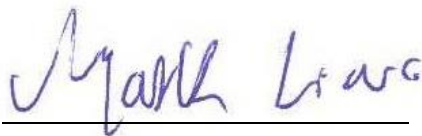
# FCC RADIO TEST REPORT

Applicant : SteelSeries ApS.  
Address : 656 W Randolph St., Suite 3E Chicago, IL 60661,  
USA  
Equipment : 5.1 Surround Speaker System  
Model No. : SP-00003  
Trade Name :   
FCC ID. : ZHK-SP00003

**I HEREBY CERTIFY THAT :**

The sample was received on Jun. 07, 2021 and the testing was completed on Dec. 08, 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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# 1. Summary of Test Procedure and Test Results

## 1.1 Applicable Standards

### ANSI C63.10:2013

Description of Test	Result
CO-LOCATION	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	2.4G:2404-2476MHz BT :2402-2480MHz
Modulation Type	2.4G: GFSK BT: GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS, DTS
Data Rate	2.4G: GFSK 2Mbps BT:GFSK: 1Mbps, $\pi/4$ -DQPSK: 2Mbps, 8DPSK: 3Mbps
Antenna Type	2.4G: PIFA Antenna BT:PCB Antenna
Antenna Gain	2.4G: 2.9dBi BT:2.28dBi
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	FW_ARENA9_DV_SUB_2.0.34_202100918_CRC
Serial Number	61547PVT322139P0021

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



### 2.2 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- b. The complete test system included Notebook and EUT for RF test.
- c. An executive program, "Airoha AB152xS LAB Test Tool ver. 2.1.0.13699" under Windows OS system was executed to transmit and receive data via Bluetooth.
- d. An executive program, "HID\_Fwupdate ver. v5.9" under Windows OS system was executed to transmit and receive data via 2.4G.
- e. The following test modes were performed for the test:

Conducted Emissions from the AC mains power ports	
Test Mode	Operating Description
1	SRD GFSK CH01 (2Mbps)+ BT GFSK CH39 AC 120V/60Hz
2	SRD GFSK CH01 (2Mbps)+ BT GFSK CH39 AC 240V/60Hz
caused "Test Mode 1" generated the worst case, it was reported as the final data.	
Radiation Emissions (9KHz ~30MHz & 30MHz ~ 1GHz)	
Test Mode	Operating Description
1	SRD GFSK CH01 (2Mbps)+ BT GFSK CH39 AC 120V/60Hz
caused "Test Mode 1" generated the worst case, it was reported as the final data.	
Radiation Emissions (1GHz ~ 25GHz)	
Test Mode	Operating Description
1	SRD GFSK CH01 (2Mbps)+ BT GFSK CH39 AC 120V/60Hz
caused "Test Mode 1" generated the worst case, it was reported as the final data.	

Note:

There are two kinds of test voltage: AC 120V / 60Hz and AC 240V / 60Hz.  
 For AC Power Line Conducted Emission, AC 120V / 60Hz is worst case.  
 For Radiated Spurious Emission, (9KHz ~30MHz & 30MHz ~ 1GHz), AC 120V / 60Hz is worst case.



### 2.3 Description of Test System

Radiated Emissions				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS
audio cable	YD-TECH	3.5 mm connecter	1.8m / NS	N/A
Earphone	Apple	Earpods	1.2m / NS	N/A
Optical Fiber*2	Cerpass	F1	1.8m / NS	N/A
Speaker	EDIFIER	Studio7	1.8m / NS	N/A
PS4	SONY	PS4 Pro	N/A	N/A
AC Power Line Conducted Emission				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	lenovo	S1GL2W	N/A	Adapter / 1.8m / NS
audio cable	YD-TECH	3.5 mm connecter	1.8m / NS	N/A
Earphone	Apple	Earpods	1.2m / NS	N/A
Optical Fiber*2	Cerpass	F1	1.8m / NS	N/A
Speaker	EDIFIER	Studio7	1.8m / NS	N/A
PS4	SONY	PS4 Pro	N/A	N/A

**2.4 General Information of Test**

Test Site	<b>CerpPASS Technology Corporation Test Laboratory</b> 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 40,000MHz	
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
Radiated Emissions	3M03-NK	2021/12/2~2021/12/4	21°C / 48~50%	Dian Chen
AC Power Line Conducted Emission	CON01-NK	2021/12/08	23°C / 49%	Dian Chen





## 2.5 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



### 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	Sunol	JB1	A080713	2021/11/5	2022/11/4
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	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. Test of AC Power Line Conducted Emission

### 4.1 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 $\mu$ V)	Average (dB $\mu$ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

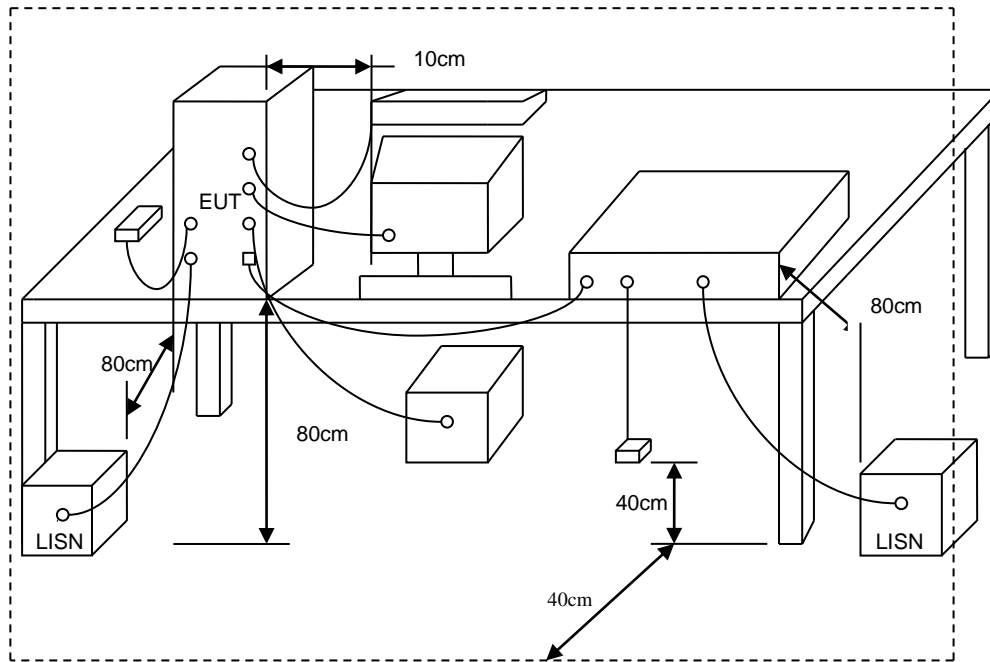
\*Decreases with the logarithm of the frequency.

### 4.2 Test Procedures

- a. 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.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connecting to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 micro-Henry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.



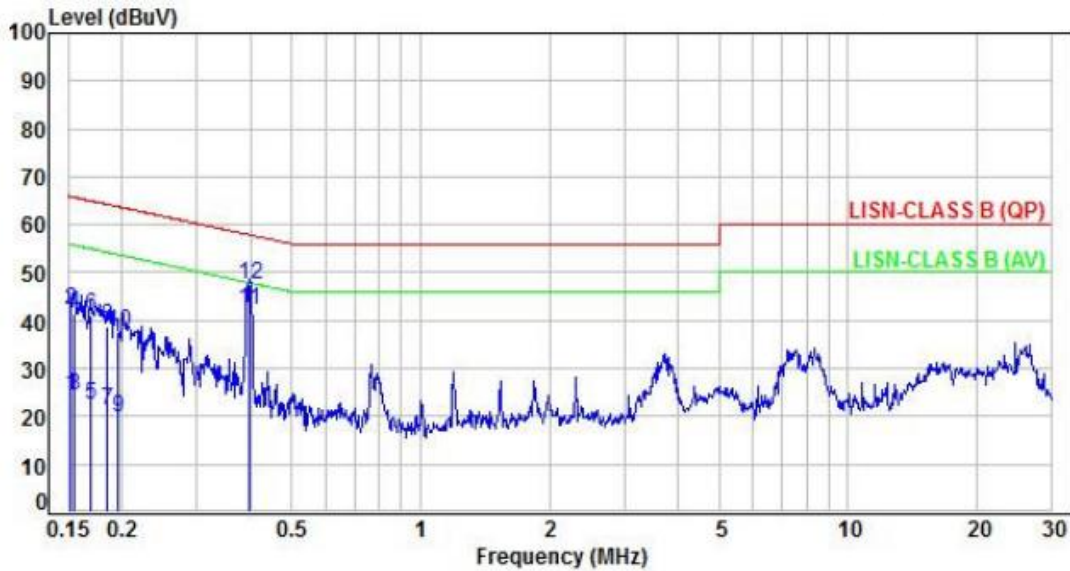
### 4.3 Typical Test Setup





4.4 Test Result and Data

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

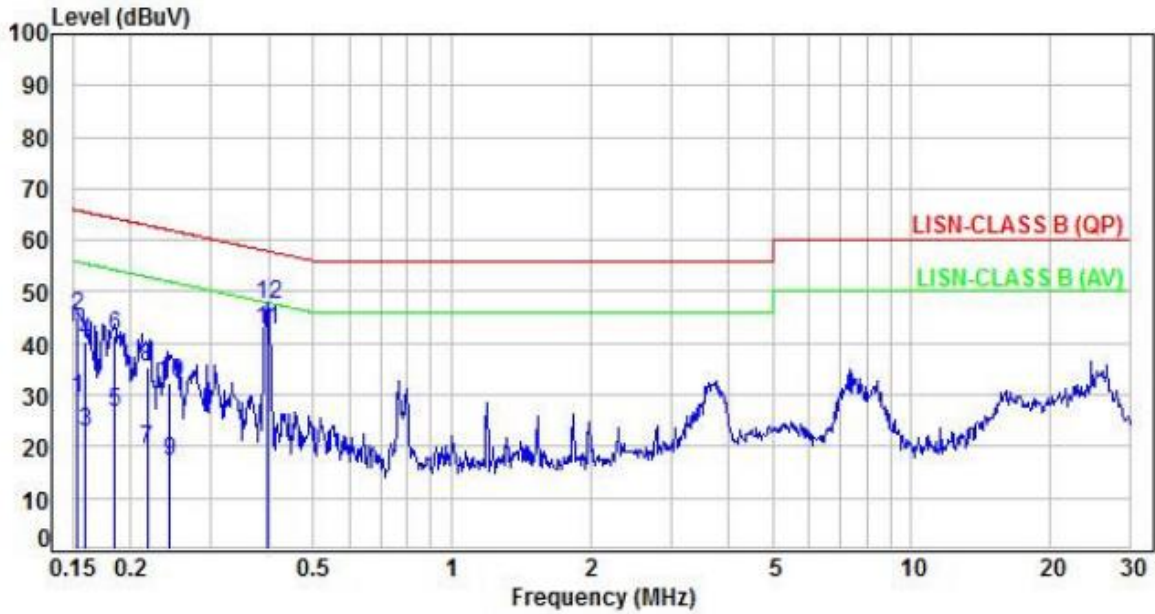


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.97	14.19	24.16	55.92	-31.76	Average	P
2	0.15	9.97	32.39	42.36	65.92	-23.56	QP	P
3	0.16	9.97	14.33	24.30	55.72	-31.42	Average	P
4	0.16	9.97	31.48	41.45	65.72	-24.27	QP	P
5	0.17	9.97	12.63	22.60	54.97	-32.37	Average	P
6	0.17	9.97	30.94	40.91	64.97	-24.06	QP	P
7	0.18	9.97	11.28	21.25	54.26	-33.01	Average	P
8	0.18	9.97	28.67	38.64	64.26	-25.62	QP	P
9	0.20	9.97	9.62	19.59	53.76	-34.17	Average	P
10	0.20	9.97	27.58	37.55	63.76	-26.21	QP	P
11	0.40	9.98	32.37	42.35	47.90	-5.55	Average	P
12	0.40	9.98	37.67	47.65	57.90	-10.25	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



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



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.15	9.97	19.48	29.45	55.85	-26.40	Average	P
2	0.15	9.97	35.39	45.36	65.85	-20.49	QP	P
3	0.16	9.97	12.84	22.81	55.48	-32.67	Average	P
4	0.16	9.97	30.16	40.13	65.48	-25.35	QP	P
5	0.18	9.97	16.77	26.74	54.27	-27.53	Average	P
6	0.18	9.97	31.64	41.61	64.27	-22.66	QP	P
7	0.22	9.97	9.34	19.31	52.92	-33.61	Average	P
8	0.22	9.97	25.30	35.27	62.92	-27.65	QP	P
9	0.24	9.97	7.11	17.08	51.98	-34.90	Average	P
10	0.24	9.97	22.40	32.37	61.98	-29.61	QP	P
11	0.40	9.98	32.59	42.57	47.91	-5.34	Average	P
12	0.40	9.98	37.37	47.35	57.91	-10.56	QP	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=(LISN or ISN or Current Probe)Factor + Cable Loss



## 5. Test of Spurious Emission (Radiated)

### 5.1 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



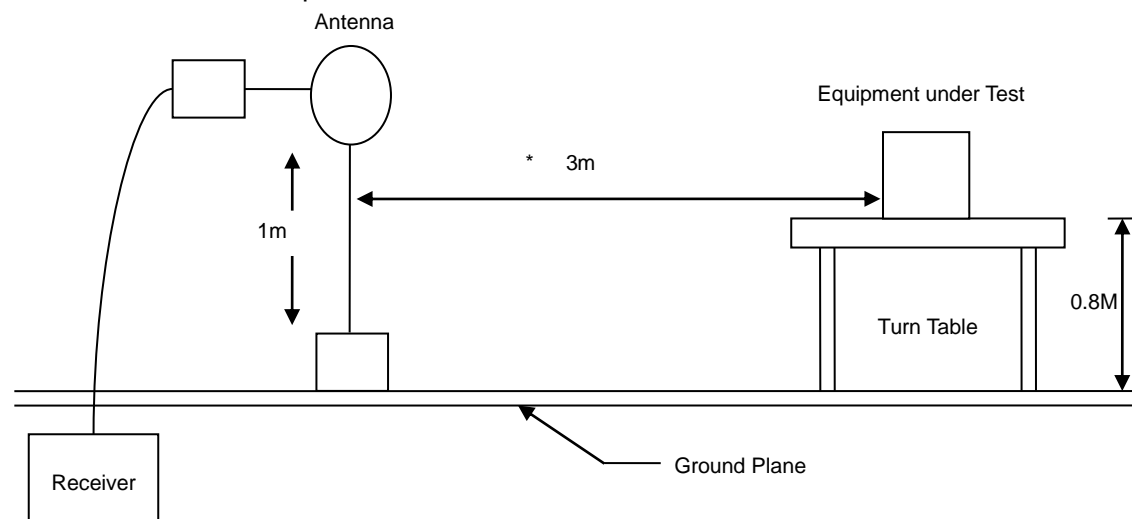
### 5.2 Test Procedures

- 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: The supporting fixture shall permit orientation of the EUT in each of three orthogonal axis positions such that emissions from the EUT are maximized.

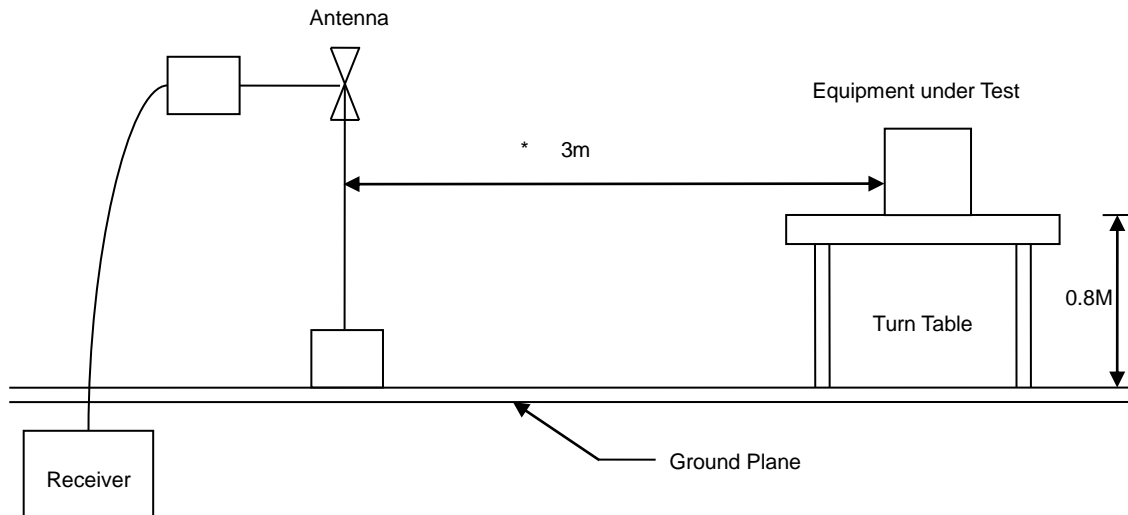
### 5.3 Typical Test Setup

Below 30MHz test setup

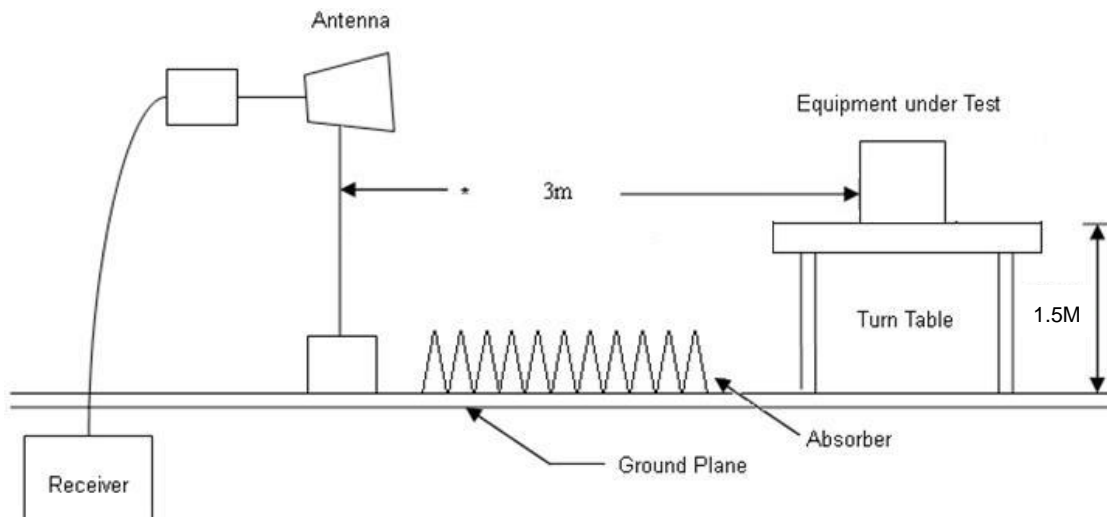


30MHz- 1GHz Test Setup





Above 1GHz Test Setup



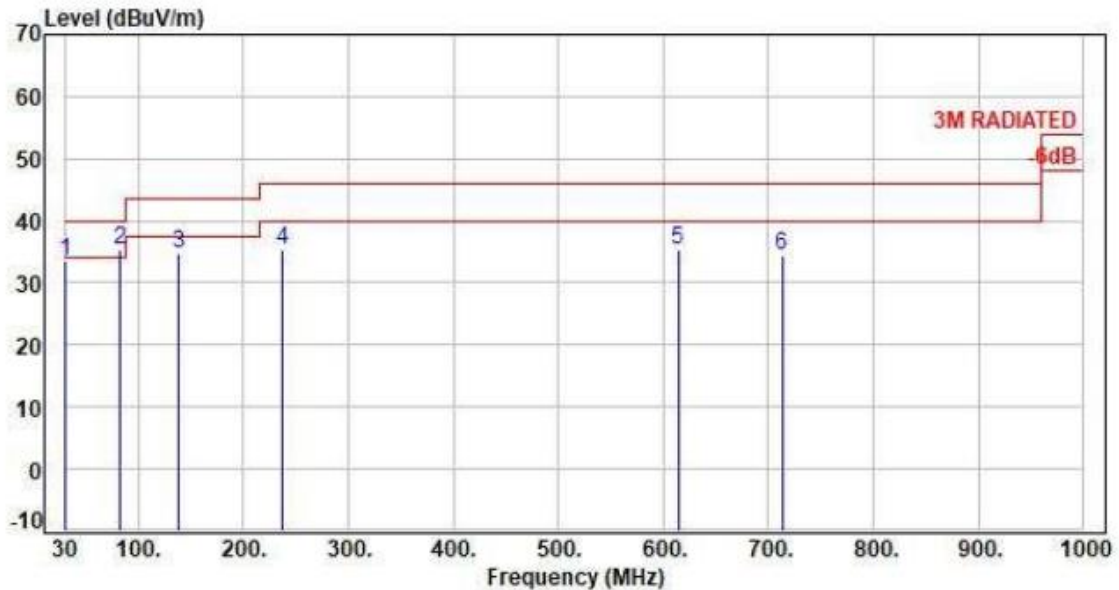


### 5.4 Test Result and Data (9kHz ~ 30MHz)

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

### 5.5 Test Result and Data (30MHz ~ 1GHz)

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

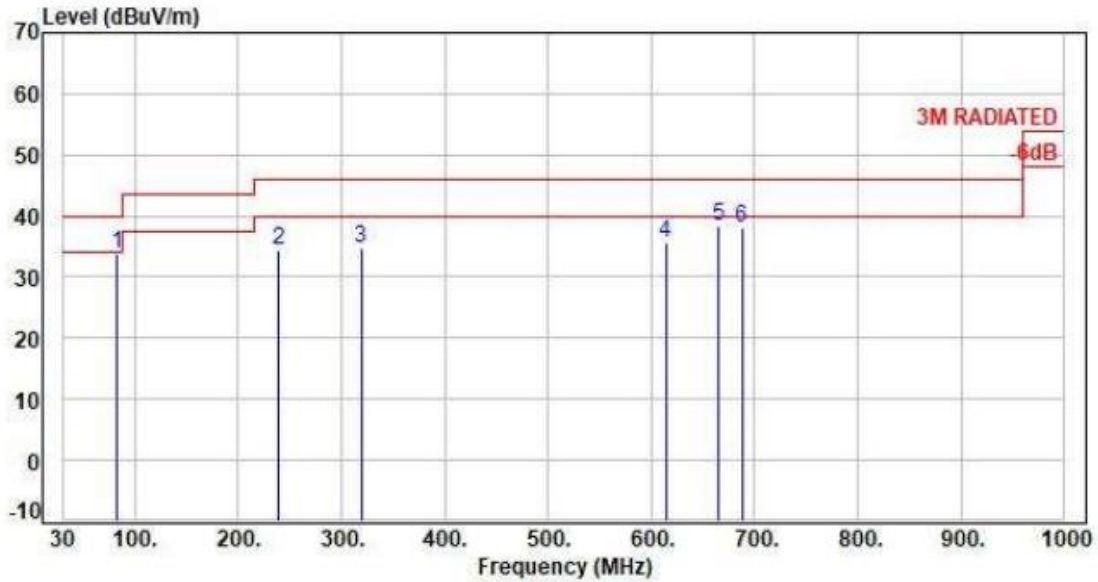


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.00	-11.82	45.35	33.53	40.00	-6.47	Peak	400	360	P
2	82.38	-16.38	51.75	35.37	40.00	-4.63	Peak	400	360	P
3	138.64	-11.60	46.25	34.65	43.50	-8.85	Peak	400	360	P
4	237.58	-12.53	47.96	35.43	46.00	-10.57	Peak	400	360	P
5	613.94	-2.92	38.14	35.22	46.00	-10.78	Peak	400	360	P
6	712.88	-1.80	36.27	34.47	46.00	-11.53	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		:



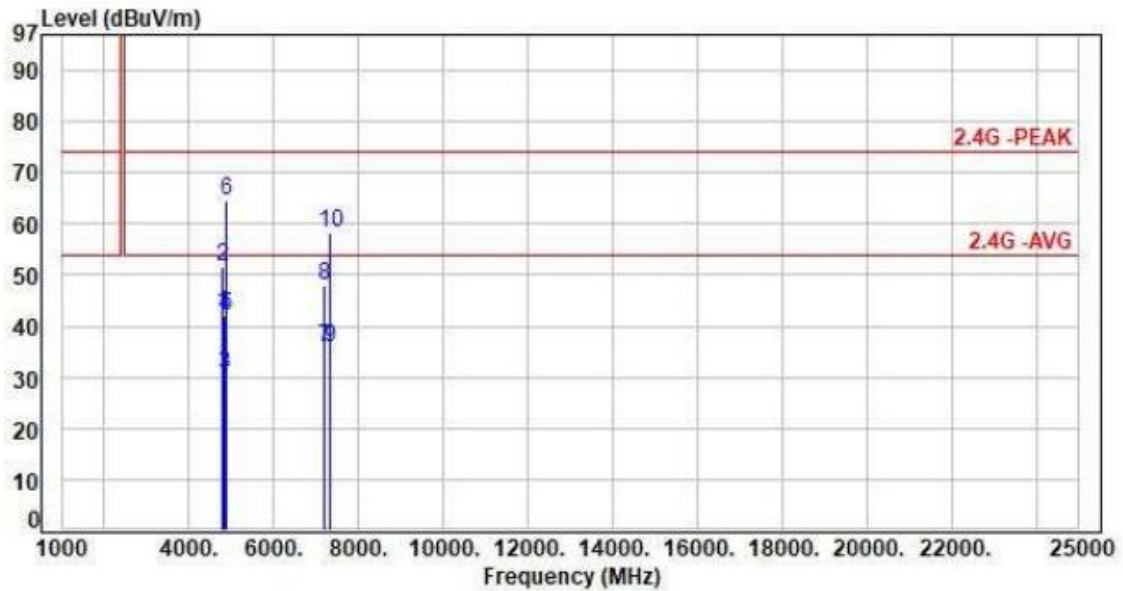
No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	82.38	-16.38	50.29	33.91	40.00	-6.09	Peak	400	360	P
2	239.52	-12.47	46.91	34.44	46.00	-11.56	Peak	400	360	P
3	319.06	-9.81	44.44	34.63	46.00	-11.37	Peak	400	360	P
4	613.94	-2.92	38.51	35.59	46.00	-10.41	Peak	400	360	P
5	664.38	-2.33	40.78	38.45	46.00	-7.55	Peak	400	360	P
6	687.66	-1.98	40.18	38.20	46.00	-7.80	Peak	400	360	P

Note: Level=Reading+Factor  
Margin=Level-limit  
Factor=Antenna Factor + cable loss - Amplifier Factor



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

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

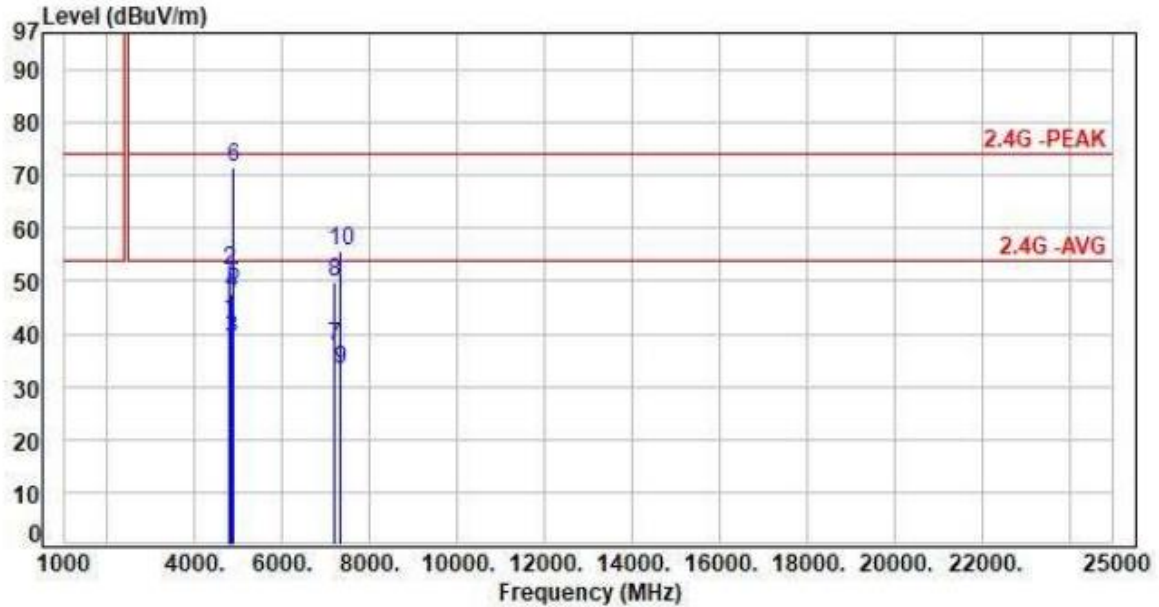


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	4808.00	-7.22	49.53	42.31	54.00	-11.69	Average	373	341	P
2	4808.00	-7.22	58.82	51.60	74.00	-22.40	Peak	373	341	P
3	4845.00	-7.17	37.92	30.75	54.00	-23.25	Average	100	178	P
4	4845.00	-7.17	49.37	42.20	74.00	-31.80	Peak	100	178	P
5	4882.00	-7.00	49.09	42.09	54.00	-11.91	Average	283	279	P
6	4882.00	-7.00	71.59	64.59	74.00	-9.41	Peak	283	279	P
7	7212.00	-0.59	36.27	35.68	54.00	-18.32	Average	362	337	P
8	7212.00	-0.59	48.41	47.82	74.00	-26.18	Peak	362	337	P
9	7323.00	-0.32	35.98	35.66	54.00	-18.34	Average	100	39	P
10	7323.00	-0.32	58.48	58.16	74.00	-15.84	Peak	100	39	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	4808.00	-7.22	49.76	42.54	54.00	-11.46	Average	100	313	P
2	4808.00	-7.22	59.38	52.16	74.00	-21.84	Peak	100	313	P
3	4845.00	-7.17	46.13	38.96	54.00	-15.04	Average	100	48	P
4	4845.00	-7.17	54.88	47.71	74.00	-26.29	Peak	100	48	P
5	4882.00	-7.00	56.02	49.02	54.00	-4.98	Average	100	43	P
6	4882.00	-7.00	78.52	71.52	74.00	-2.48	Peak	100	43	P
7	7212.00	-0.59	38.14	37.55	54.00	-16.45	Average	100	24	P
8	7212.00	-0.59	50.25	49.66	74.00	-24.34	Peak	100	24	P
9	7323.00	-0.32	33.62	33.30	54.00	-20.70	Average	100	74	P
10	7323.00	-0.32	56.12	55.80	74.00	-18.20	Peak	100	74	P

Note: Level=Reading+Factor  
 Margin=Level-Limit  
 Factor=Antenna Factor + cable loss - Amplifier Factor



### 5.7 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