FCC RADIO TEST REPORT

Applicant	:	Ring LLC
Address	:	1523 26th Street, Santa Monica,CA 90404 United States
Equipment	:	Chime (2nd Generation)
Model No.	:	5F67E9
Trade Name	:	Ring
FCC ID	:	2AEUPBHACM022

I HEREBY CERTIFY THAT :

The sample was received on Sep. 27, 2021 and the testing was completed on Oct. 13, 2021 at Cerpass Technology Corp. The test result refers exclusively to the test presented test model / sample. Without written approval of Cerpass Technology Corp., the test report shall not be reproduced except in full.

Approved by:

Mark Liao / Supervisor

Laboratory Accreditation:

Cerpass Technology Corporation Test Laboratory

Contents

History of this test report

Report No.	Issue Date	Description
21090073-TRFCC01	Nov. 03, 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)	. 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.

2. Test Configuration of Equipment under Test

2.1 Feature of Equipment under Test

Operation Frequency Range	802.11b/g/n: 2400-2483.5MHz
Center Frequency Range	802.11b/g/n: 2412MHz~2462MHz
Modulation Type	802.11b: CCK, DQPSK, DBPSK 802.11g/n: BPSK, QPSK, 16QAM, 64QAM
Modulation Technology	DSSS, OFDM
Data Rate	802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS7, HT20
Antenna Type	Metal Stamping Antenna
Antenna Gain	2.2dBi
Firmware Number	N/A
Serial Number	G5X1A9021262BD3W

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

2.2 Carrier Frequency of Channels

802.11b, 802.11g, 802.11n HT20 (2412MHz~2462MHz)

Channel	Frequency(MHz)	Channel	Frequency(MHz)
***01**	**2412**	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	***11**	**2462**
***06**	**2437**	---	---

Note: Channels remarked * are selected to perform test.

2.3 Test Mode and Test Software

a. During testing, the interface cables and equipment positions were varied according to ANSI C63.10.

b. The complete test system included remote workstation and EUT for RF test. The remote workstation included Notebook.

c. An executive program, ” MT7686 QA ver.0.3.2.4” under Windows OS system was executed to transmit and receive data via WLAN.

d. The following test modes were performed for the test:

Conducted Emissions from the AC mains power ports	
Test Mode	Operating Description
1	802.11b (1Mbps) , (120V/60 Hz)
2	802.11g (6Mbps) , (120V/60 Hz)
3	802.11n HT20 (6.5Mbps) , (120V/60 Hz)
4	802.11b (1Mbps) , (240V/60 Hz)
5	802.11g (6Mbps) , (240V/60 Hz)
6	802.11n HT20 (6.5Mbps) , (240V/60 Hz)
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	802.11b (1Mbps)
2	802.11g (6Mbps)
3	802.11n HT20 (6.5Mbps)
caused “Test Mode 1” generated the worst case, it was reported as the final data.	
Radiation Emissions (1GHz ~ 25GHz)	
Test Mode	Operating Description
1	802.11b (1Mbps)
2	802.11g (6Mbps)
3	802.11n HT20 (6.5Mbps)
caused “Test Mode 1~3” generated the worst case, they were reported as the final data.	

Modulation Type	TX CONFIGURATION
802.11b	1TX
802.11g	1TX
802.11n HT20	1TX

2.4 Description of Test System

RF Conducted				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	DELL	Latitude E5270	N/A	Adapter / 1.8m / NS
Type B Cable	Longwell	E174089	1.8m / S	N/A
test fixture	Alpha	8WAPAC43DBA1G	N/A	N/A
Radiated Emissions				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	DELL	Latitude E5270	N/A	Adapter / 1.8m / NS
Type B Cable	Longwell	E174089	1.8m / S	N/A
test fixture	Alpha	8WAPAC43DBA1G	N/A	N/A
AC Power Line Conducted Emission				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
Notebook	ASUS	P2430U	N/A	Adapter / 1.8m / NS
Type B Cable	Longwell	E174089	1.8m / S	N/A
test fixture	Alpha	8WAPAC43DBA1G	N/A	N/A

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	2021/10/06	25℃ / 46%	Nick Guan
Radiated Emissions	3M02-NK	2021/09/30~2021/10/01	24~26℃ / 45~48%	Nick Guan
AC Power Line Conducted Emission	CON01-NK	2021/10/13	25℃ / 58%	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)	±3.63dB
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(3M02-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	EMCO	3115	31601	2020/10/16	2021/10/15
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	FSV 40-N	102151	2021/08/06	2022/08/05
Preamplifier	EM Electronics corp.	EM330	60658	2020/10/20	2021/10/19
Preamplifier	EM Electronics corp.	EM330	60660	2021/03/18	2022/03/17
Preamplifier	Agilent	8449B	3008A01954	2021/03/22	2022/03/21
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2020/11/06	2021/11/05
Bluetooth Tester	ROHDE & SCHWARZ	CBT	101133	2021/04/19	2022/04/18
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2021/04/12	2022/04/11
Cable-0.5m(1G-18G)	EMEC	EM104-SMSM-0.5M	CCE1354	2021/05/06	2022/05/05
Cable-3m(1G-18G)	EMEC	EM104-SMSM-3M	CCE1355	2021/05/06	2022/05/05
Cable-8m(1G-18G)	EMEC	EM104-SMSM-8M	CCE1356	2021/05/06	2022/05/05
Cable-0.5m(30M-40G)	HUBER SUHNER	SUCOFLEX 102	28420/2	2021/04/03	2022/04/02
Cable-3m(30M-40G)	HUBER SUHNER	SUCOFLEX 102	MY2608/2	2021/04/09	2022/04/08
Cable-0.5m(1G-40G)	Rapidtek	40GHZ 50CM	38MS-38MS50 314	2021/04/08	2022/04/07
Cable-6m(9k~300M)	NA	CFD300-NL	NA	2021/03/15	2022/03/14
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	Metal Stamping Antenna
Antenna Gain	2412-2462MHz: 2.2dBi

2412-2462MHz
For Power directional gain = 2.2 (dBi)
For PSD directional gain = 2.2 (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 C63.4-2014. 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.

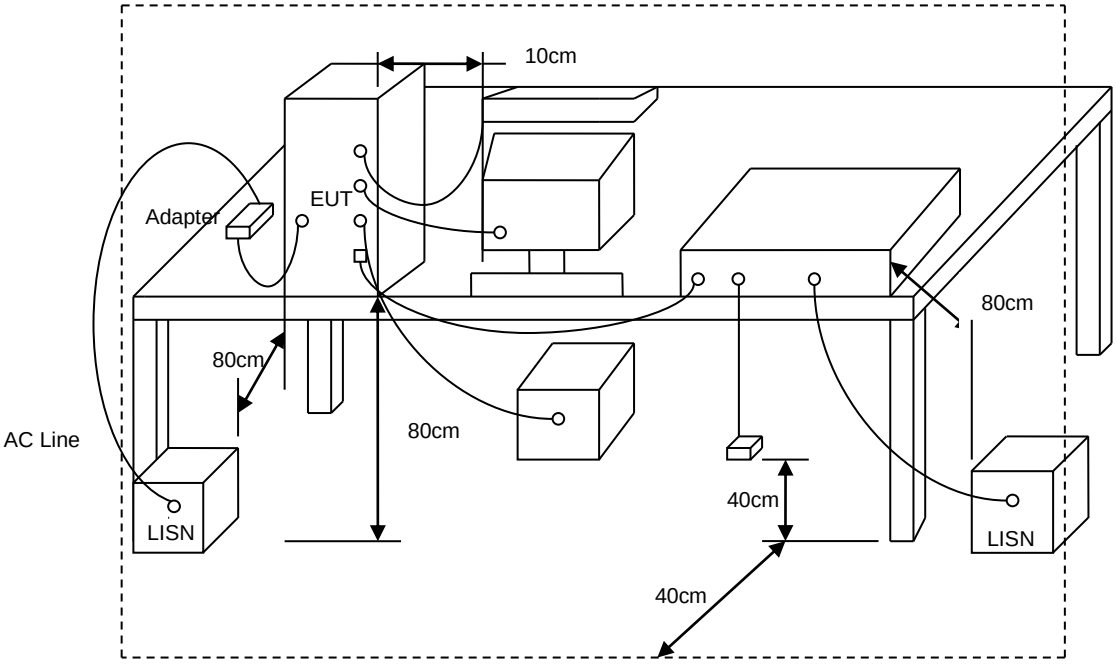
Frequency (MHz)	Quasi Peak (dB μ V)	Average (dB μ V)
0.15 – 0.5	66-56*	56-46*
0.5 – 5.0	56	46
5.0 – 30.0	60	50

*Decreases with the logarithm of the frequency.

5.2 Test Procedures

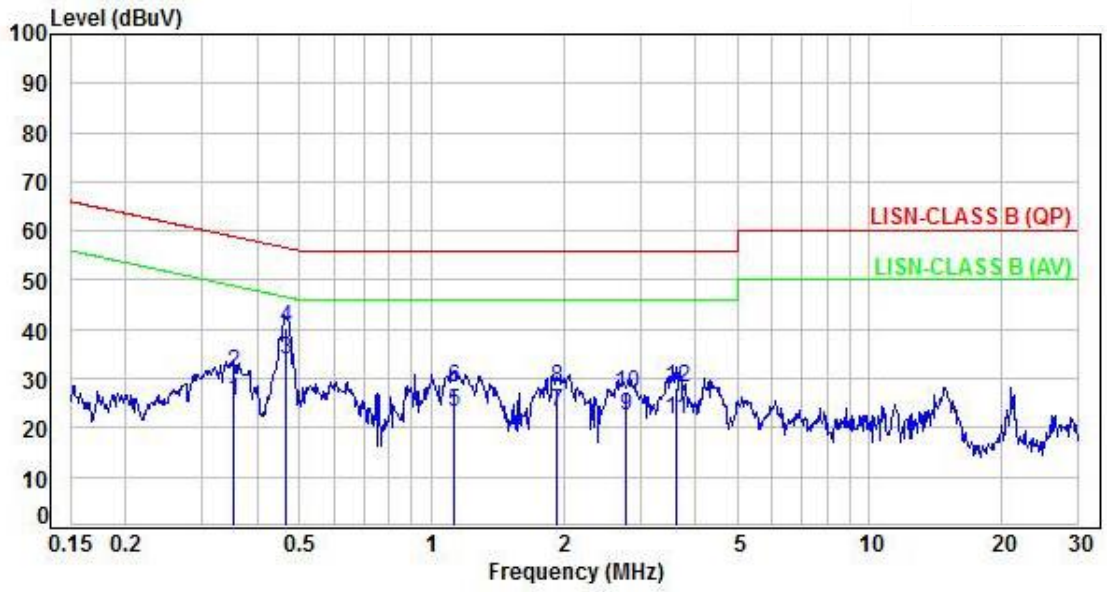
a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
c. All the support units are connecting to the other LISN.
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.

5.3 Typical Test Setup



5.4 Test Result and Data

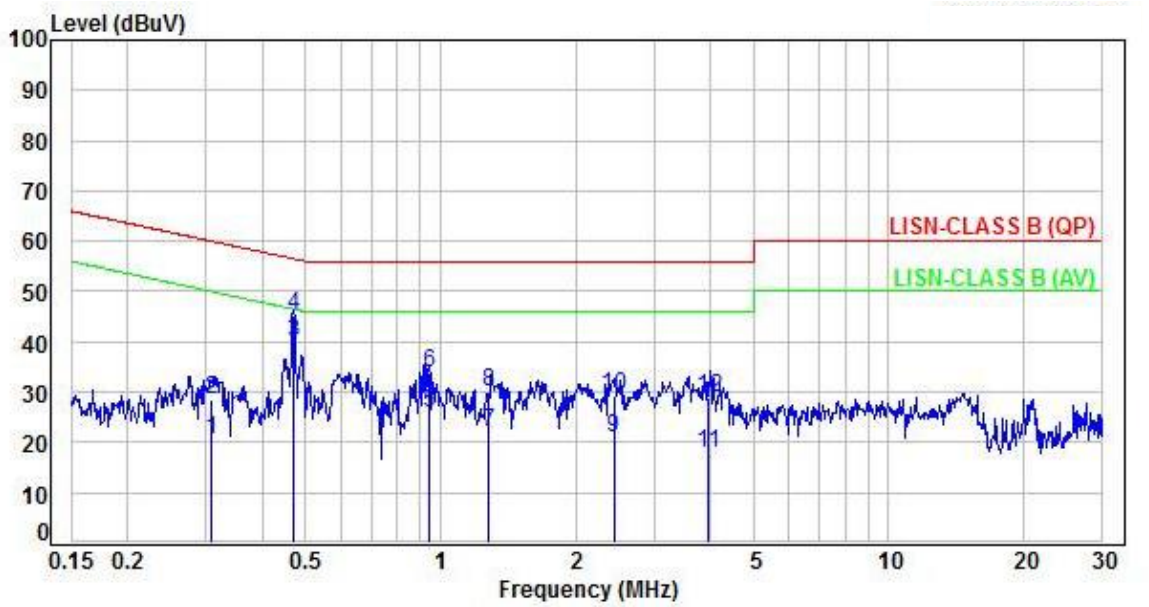
Power	:	AC 120V / 60Hz	Pol/Phase	:	LINE
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.35	9.98	15.54	25.52	48.92	-23.40	Average	P
2	0.35	9.98	21.25	31.23	58.92	-27.69	QP	P
3	0.47	9.98	23.89	33.87	46.60	-12.73	Average	P
4	0.47	9.98	30.25	40.23	56.60	-16.37	QP	P
5	1.13	10.06	13.22	23.28	46.00	-22.72	Average	P
6	1.13	10.06	18.22	28.28	56.00	-27.72	QP	P
7	1.94	10.12	13.01	23.13	46.00	-22.87	Average	P
8	1.94	10.12	17.89	28.01	56.00	-27.99	QP	P
9	2.78	10.14	12.43	22.57	46.00	-23.43	Average	P
10	2.78	10.14	16.92	27.06	56.00	-28.94	QP	P
11	3.62	10.18	11.47	21.65	46.00	-24.35	Average	P
12	3.62	10.18	17.89	28.07	56.00	-27.93	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	0.31	9.97	10.53	20.50	50.05	-29.55	Average	P
2	0.31	9.97	18.57	28.54	60.05	-31.51	QP	P
3	0.47	9.98	29.88	39.86	46.51	-6.65	Average	P
4	0.47	9.98	35.19	45.17	56.51	-11.34	QP	P
5	0.94	10.03	16.01	26.04	46.00	-19.96	Average	P
6	0.94	10.03	23.65	33.68	56.00	-22.32	QP	P
7	1.28	10.06	11.90	21.96	46.00	-24.04	Average	P
8	1.28	10.06	20.02	30.08	56.00	-25.92	QP	P
9	2.43	10.12	10.94	21.06	46.00	-24.94	Average	P
10	2.43	10.12	19.13	29.25	56.00	-26.75	QP	P
11	3.96	10.16	7.82	17.98	46.00	-28.02	Average	P
12	3.96	10.16	18.89	29.05	56.00	-26.95	QP	P

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

6. Test of Radiated Spurious Emission

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.

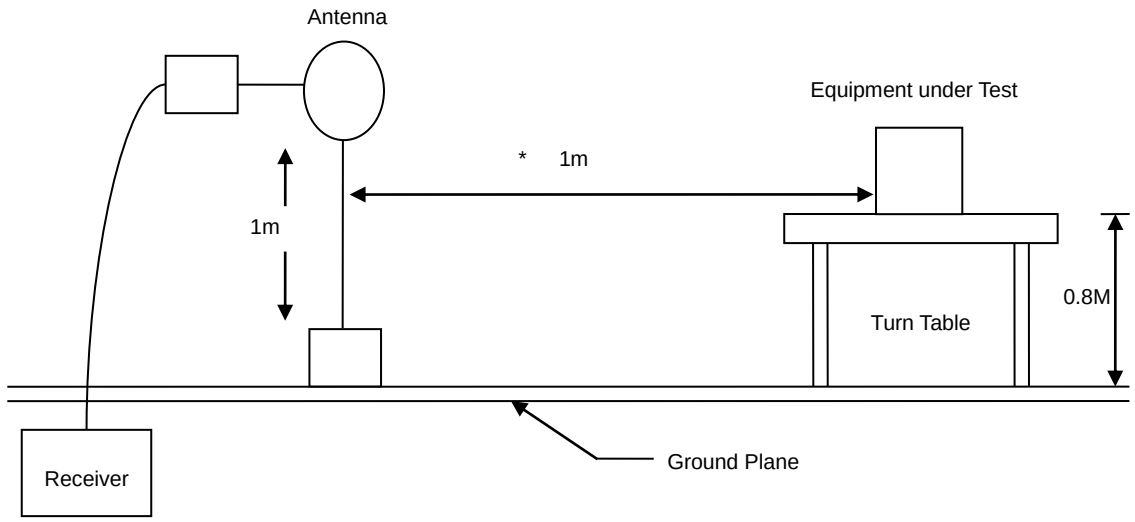
Note:

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.
(Z-AXIS is the worst.)

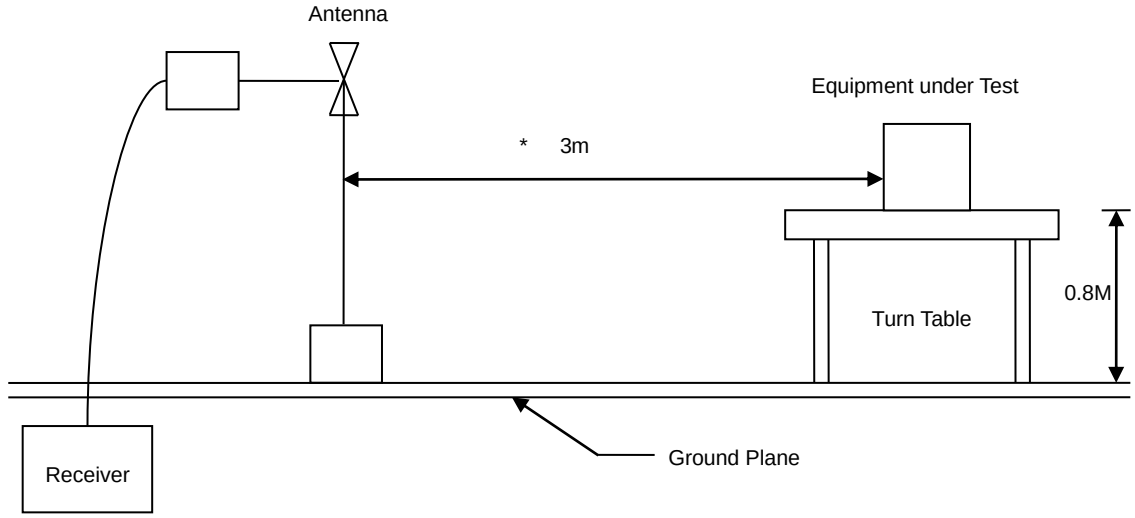
2.Due to the test software function limit the operation band setting(200dBuV/m).
There's no corresponding limitation in the actual test item.

6.3 Typical Test Setup

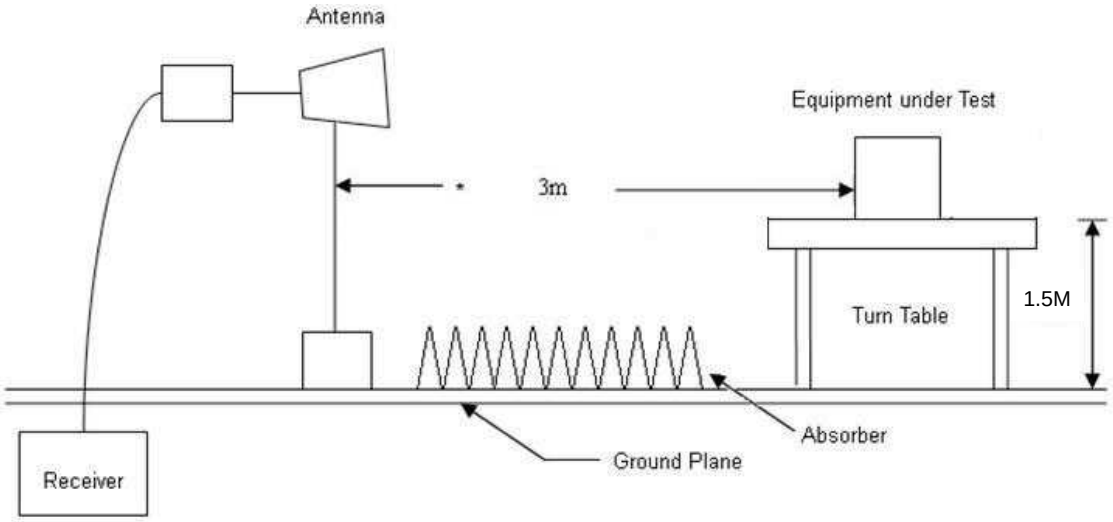
Below 30MHz test setup



30MHz- 1GHz Test Setup



Above 1GHz Test Setup

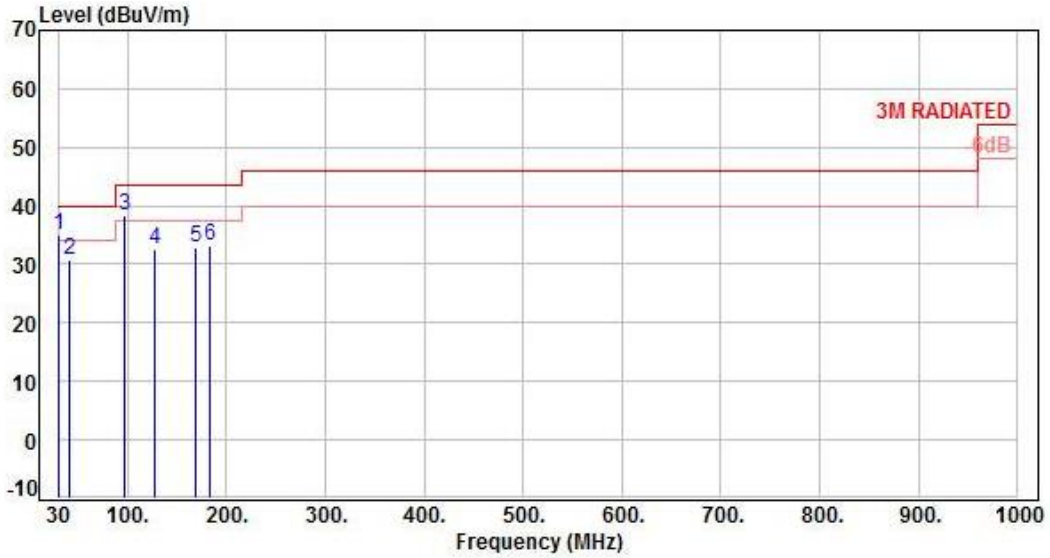


6.4 Test Result and Data (9KHz ~ 30MHz)

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

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

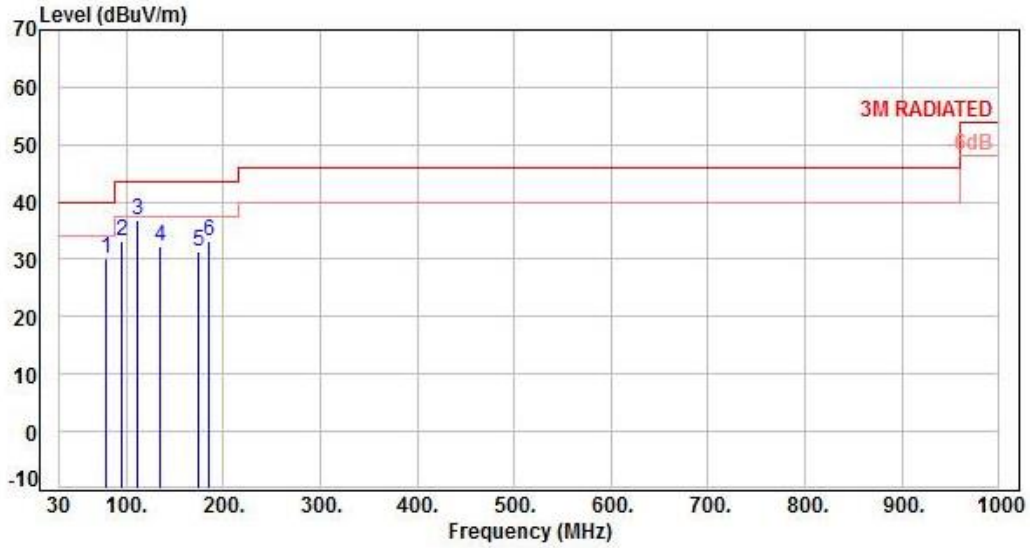
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	30.45	-11.76	46.87	35.11	40.00	-4.89	Peak	400	360	P
2	41.61	-10.89	41.62	30.73	40.00	-9.27	QP	100	279	P
3	97.73	-16.18	54.69	38.51	43.50	-4.99	Peak	400	360	P
4	127.39	-12.22	44.89	32.67	43.50	-10.83	Peak	400	360	P
5	169.33	-10.91	43.67	32.76	43.50	-10.74	Peak	400	360	P
6	183.51	-12.49	45.58	33.09	43.50	-10.41	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		:	

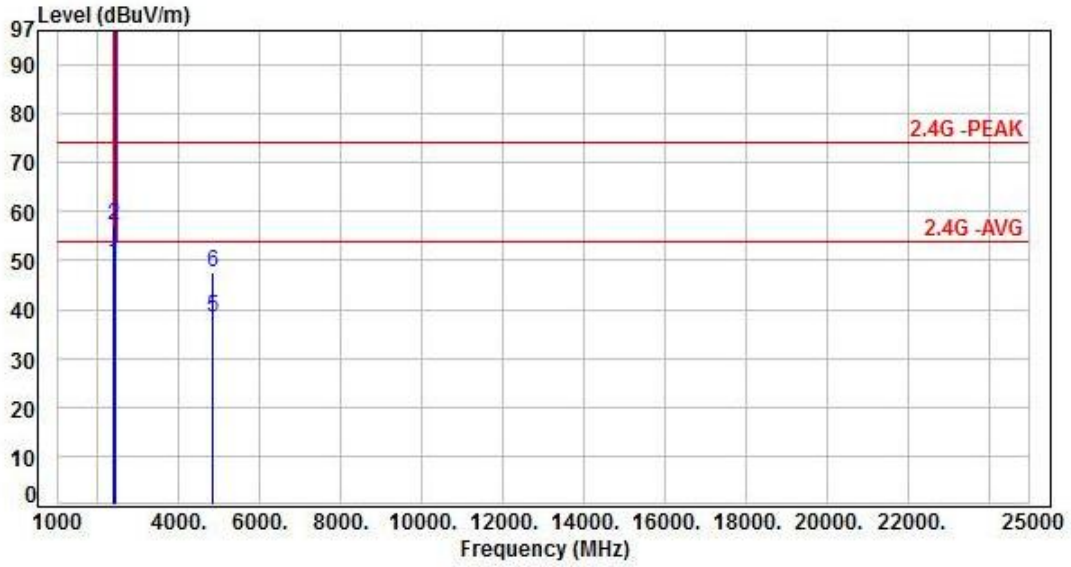


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	78.29	-14.33	44.62	30.29	40.00	-9.71	Peak	400	360	P
2	95.53	-16.62	49.73	33.11	43.50	-10.39	Peak	400	360	P
3	111.26	-13.97	50.81	36.84	43.50	-6.66	Peak	400	360	P
4	134.54	-11.45	43.83	32.38	43.50	-11.12	Peak	400	360	P
5	173.49	-11.34	42.76	31.42	43.50	-12.08	Peak	400	360	P
6	185.19	-12.65	45.72	33.07	43.50	-10.43	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)

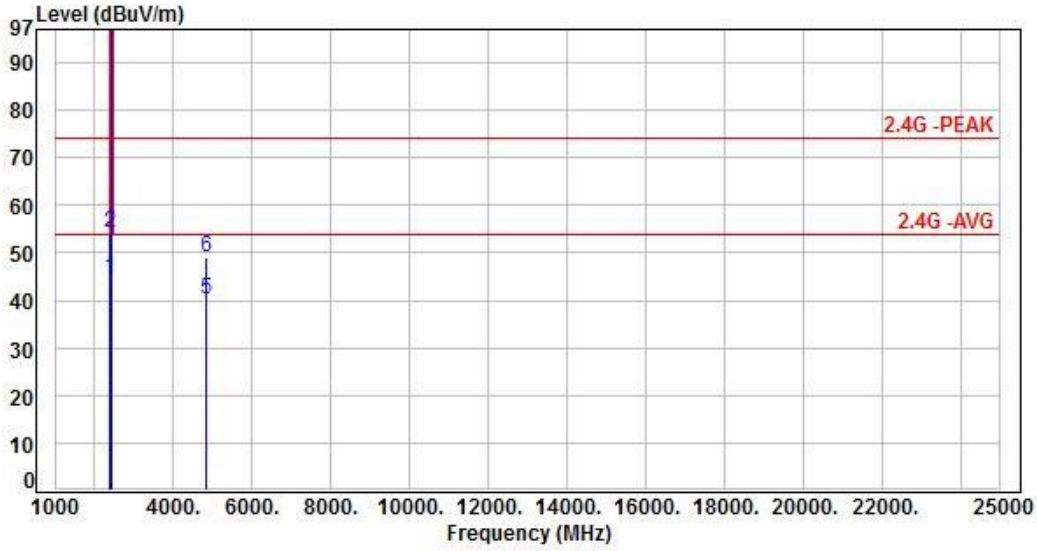
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH01		:	



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	-3.62	52.95	49.33	54.00	-4.67	Average	339	269	P
2	2390.00	-3.62	60.76	57.14	74.00	-16.86	Peak	339	269	P
3	2412.00	-3.60	110.70	107.10	200.00	-92.90	Average	339	269	P
4	2412.00	-3.60	113.63	110.03	200.00	-89.97	Peak	339	269	P
5	4824.00	3.73	34.56	38.29	54.00	-15.71	Average	115	302	P
6	4824.00	3.73	43.84	47.57	74.00	-26.43	Peak	115	302	P

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

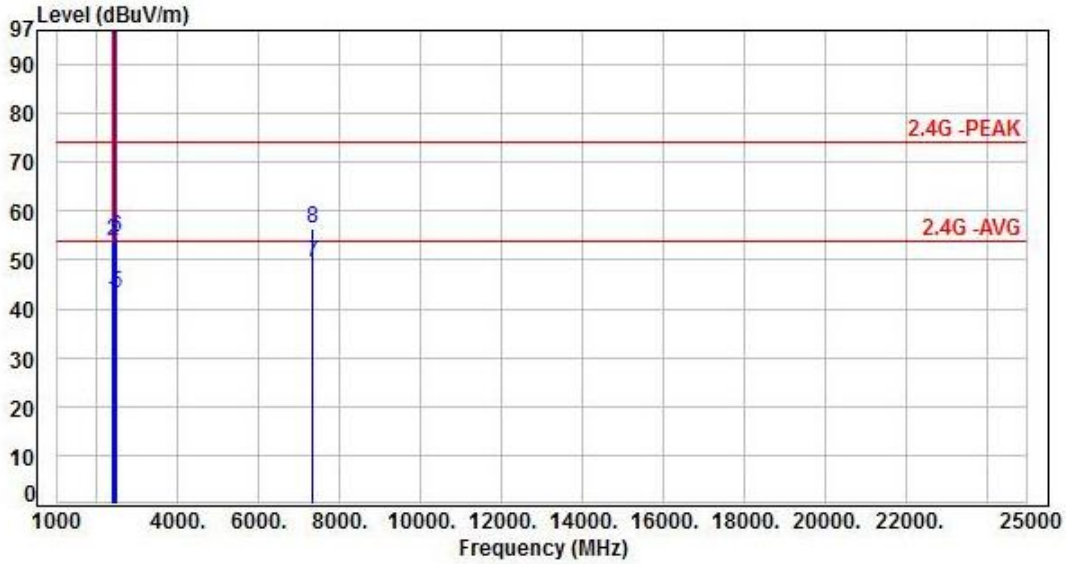
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1, CH01		:	



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	-3.62	48.18	44.56	54.00	-9.44	Average	100	17	P
2	2390.00	-3.62	57.83	54.21	74.00	-19.79	Peak	100	17	P
3	2412.00	-3.60	103.66	100.06	200.00	-99.94	Average	100	17	P
4	2412.00	-3.60	106.72	103.12	200.00	-96.88	Peak	100	17	P
5	4824.00	3.73	36.42	40.15	54.00	-13.85	Average	100	212	P
6	4824.00	3.73	45.23	48.96	74.00	-25.04	Peak	100	212	P

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

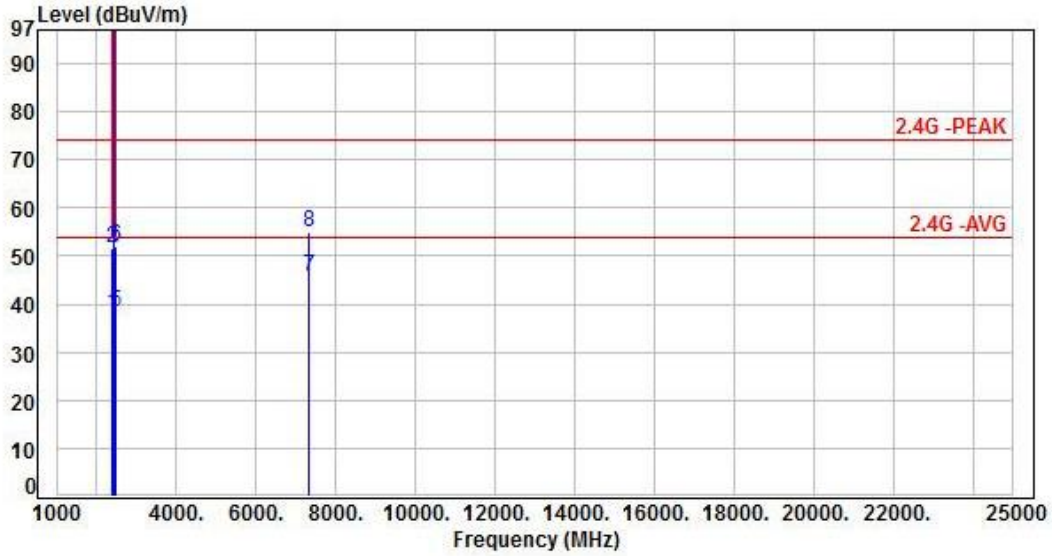
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH06		:	



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	-3.62	45.45	41.83	54.00	-12.17	Average	225	334	P
2	2390.00	-3.62	57.47	53.85	74.00	-20.15	Peak	225	334	P
3	2437.00	-3.57	110.62	107.05	200.00	-92.95	Average	225	334	P
4	2437.00	-3.57	113.52	109.95	200.00	-90.05	Peak	225	334	P
5	2483.50	-3.40	46.56	43.16	54.00	-10.84	Average	225	334	P
6	2483.50	-3.40	58.00	54.60	74.00	-19.40	Peak	225	334	P
7	7311.00	8.48	40.84	49.32	54.00	-4.68	Average	100	197	P
8	7311.00	8.48	47.98	56.46	74.00	-17.54	Peak	100	197	P

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

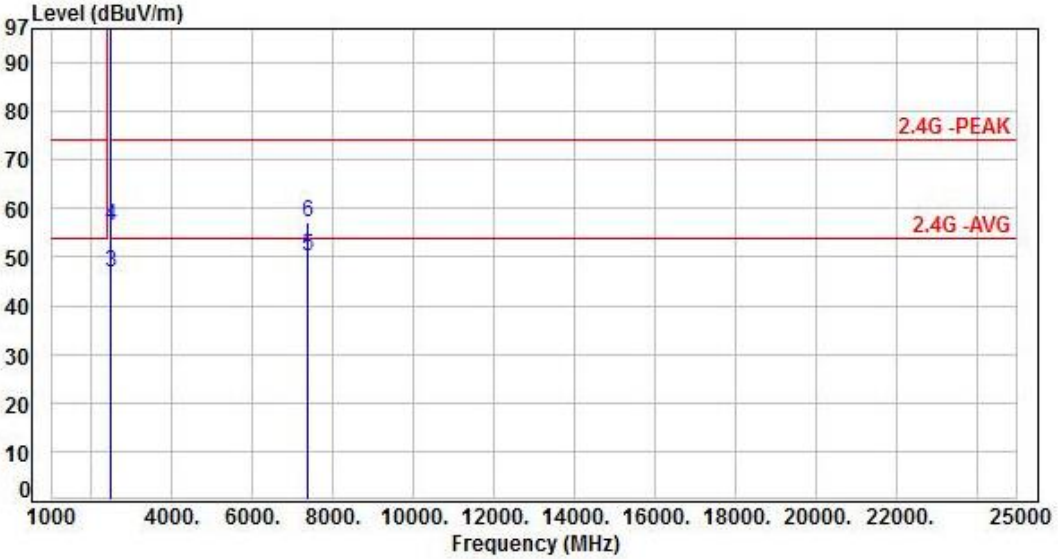
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1, CH06		:	



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	-3.62	41.60	37.98	54.00	-16.02	Average	121	29	P
2	2390.00	-3.62	55.34	51.72	74.00	-22.28	Peak	121	29	P
3	2437.00	-3.57	103.13	99.56	200.00	-100.44	Average	121	29	P
4	2437.00	-3.57	106.33	102.76	200.00	-97.24	Peak	121	29	P
5	2483.50	-3.40	41.69	38.29	54.00	-15.71	Average	121	29	P
6	2483.50	-3.40	55.50	52.10	74.00	-21.90	Peak	121	29	P
7	7311.00	8.48	37.41	45.89	54.00	-8.11	Average	100	143	P
8	7311.00	8.48	46.29	54.77	74.00	-19.23	Peak	100	143	P

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

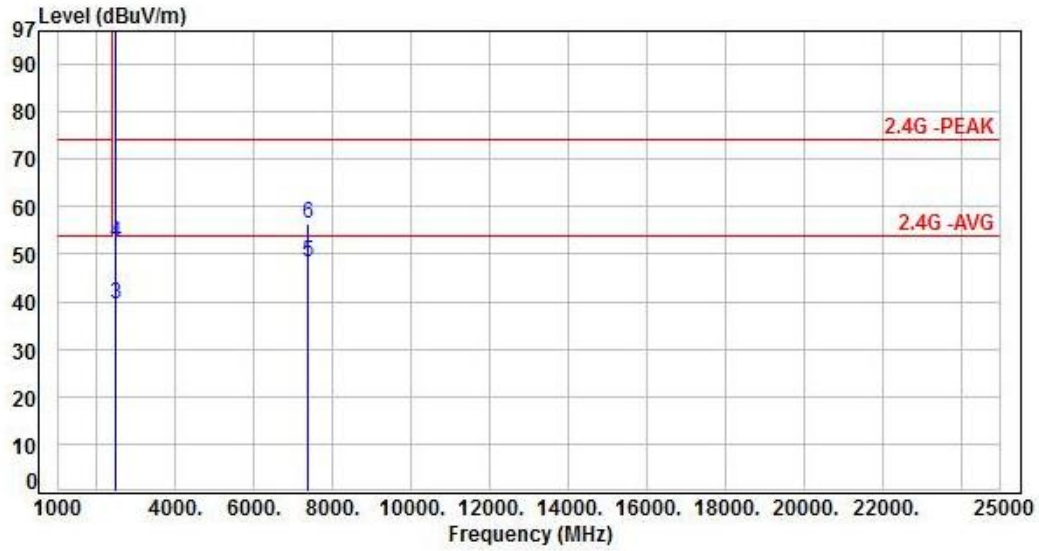
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 1, CH11		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2462.00	-3.50	111.42	107.92	200.00	-92.08	Average	204	348	P
2	2462.00	-3.50	114.25	110.75	200.00	-89.25	Peak	204	348	P
3	2483.50	-3.40	50.15	46.75	54.00	-7.25	Average	204	348	P
4	2483.50	-3.40	59.97	56.57	74.00	-17.43	Peak	204	348	P
5	7386.00	8.59	41.63	50.22	54.00	-3.78	Average	240	190	P
6	7386.00	8.59	48.52	57.11	74.00	-16.89	Peak	240	190	P

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

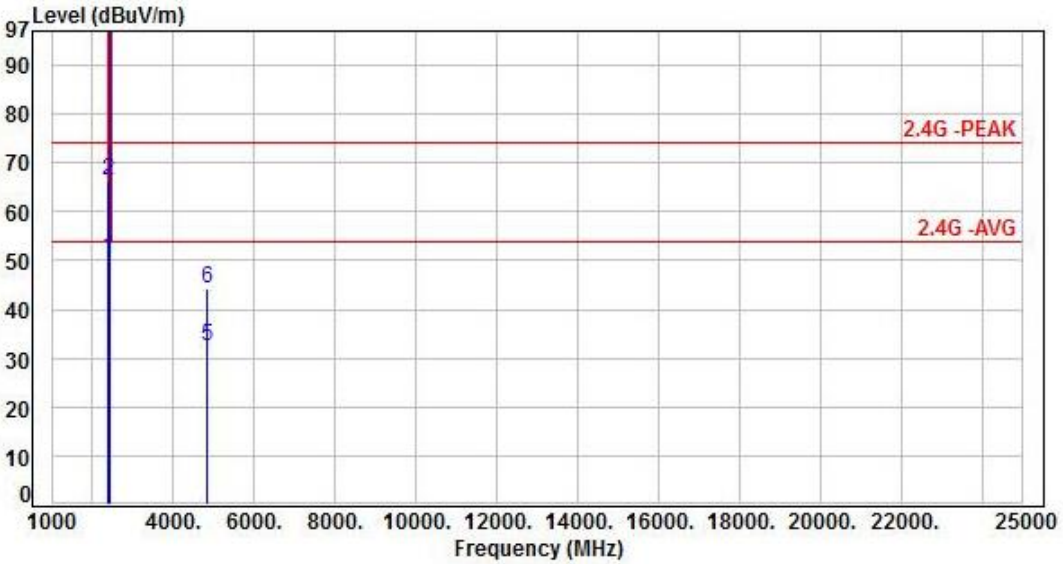
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 1, CH11		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2462.00	-3.50	103.31	99.81	200.00	-100.19	Average	104	34	P
2	2462.00	-3.50	106.22	102.72	200.00	-97.28	Peak	104	34	P
3	2483.50	-3.40	43.04	39.64	54.00	-14.36	Average	104	34	P
4	2483.50	-3.40	55.74	52.34	74.00	-21.66	Peak	104	34	P
5	7386.00	8.59	39.59	48.18	54.00	-5.82	Average	103	143	P
6	7386.00	8.59	47.74	56.33	74.00	-17.67	Peak	103	143	P

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

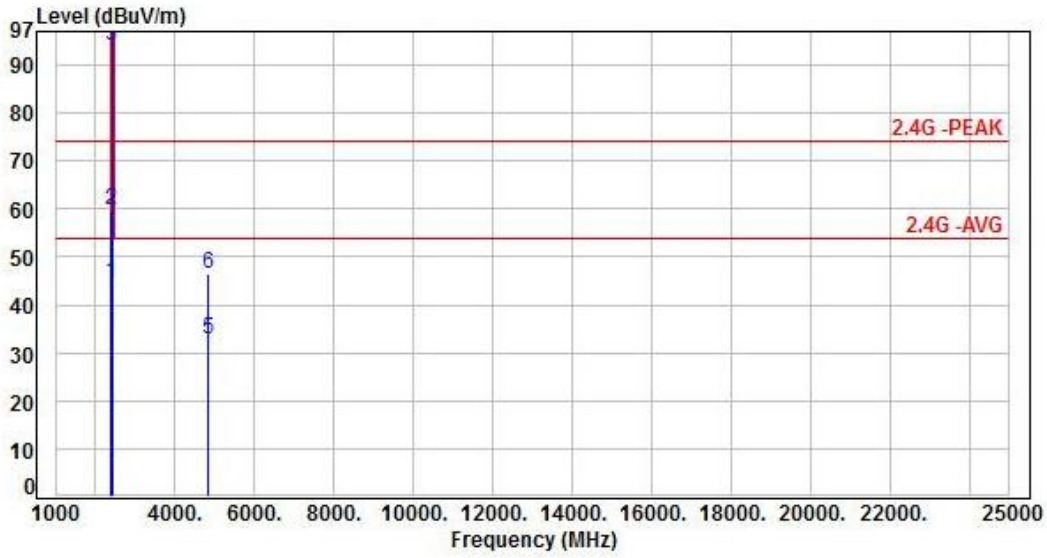
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2, CH01		:	



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	-3.62	53.99	50.37	54.00	-3.63	Average	161	337	P
2	2390.00	-3.62	70.17	66.55	74.00	-7.45	Peak	161	337	P
3	2412.00	-3.60	104.51	100.91	200.00	-99.09	Average	161	337	P
4	2412.00	-3.60	114.23	110.63	200.00	-89.37	Peak	161	337	P
5	4824.00	3.73	28.87	32.60	54.00	-21.40	Average	100	211	P
6	4824.00	3.73	40.37	44.10	74.00	-29.90	Peak	100	211	P

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

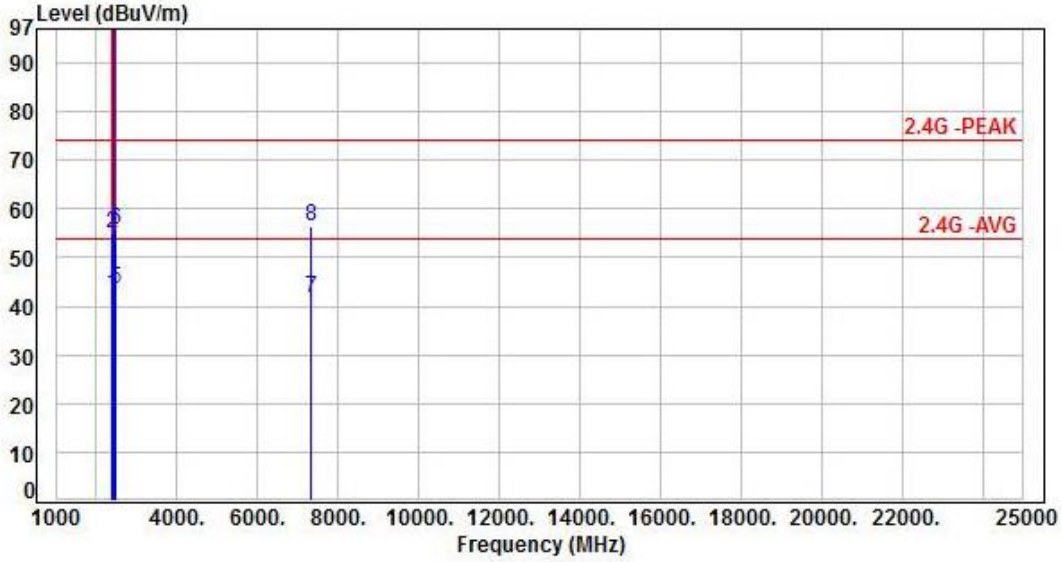
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2, CH01		:	



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	-3.62	48.23	44.61	54.00	-9.39	Average	100	15	P
2	2390.00	-3.62	63.55	59.93	74.00	-14.07	Peak	100	15	P
3	2412.00	-3.60	97.67	94.07	200.00	-105.93	Average	100	15	P
4	2412.00	-3.60	107.33	103.73	200.00	-96.27	Peak	100	15	P
5	4824.00	3.73	29.22	32.95	54.00	-21.05	Average	100	219	P
6	4824.00	3.73	42.76	46.49	74.00	-27.51	Peak	100	219	P

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

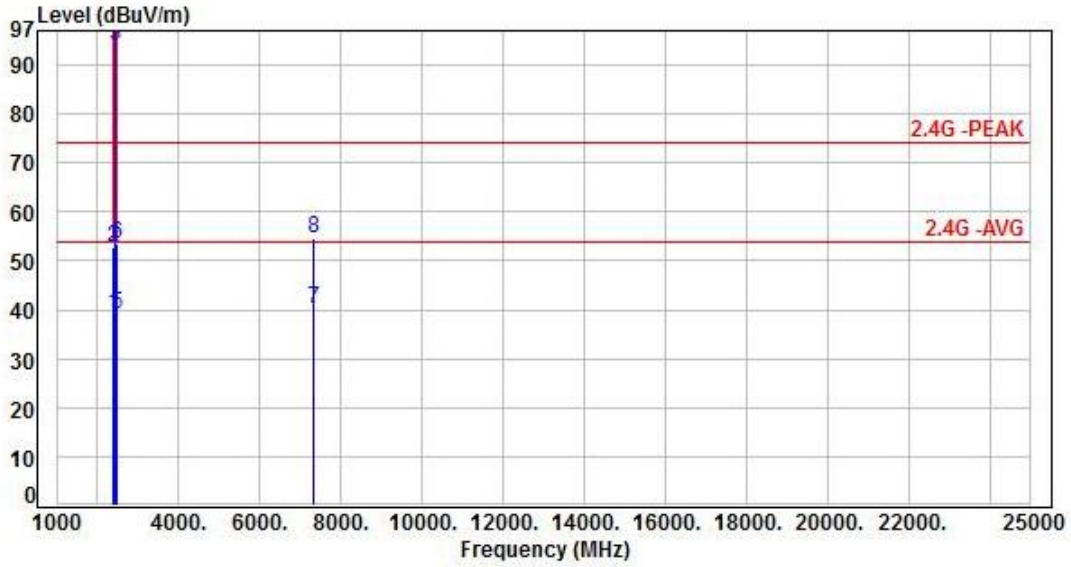
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2, CH06		:	



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	-3.62	46.01	42.39	54.00	-11.61	Average	100	341	P
2	2390.00	-3.62	58.65	55.03	74.00	-18.97	Peak	100	341	P
3	2437.00	-3.57	105.50	101.93	200.00	-98.07	Average	100	341	P
4	2437.00	-3.57	114.36	110.79	200.00	-89.21	Peak	100	341	P
5	2483.50	-3.40	47.04	43.64	54.00	-10.36	Average	100	341	P
6	2483.50	-3.40	59.25	55.85	74.00	-18.15	Peak	100	341	P
7	7311.00	8.48	33.14	41.62	54.00	-12.38	Average	100	212	P
8	7311.00	8.48	47.90	56.38	74.00	-17.62	Peak	100	212	P

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

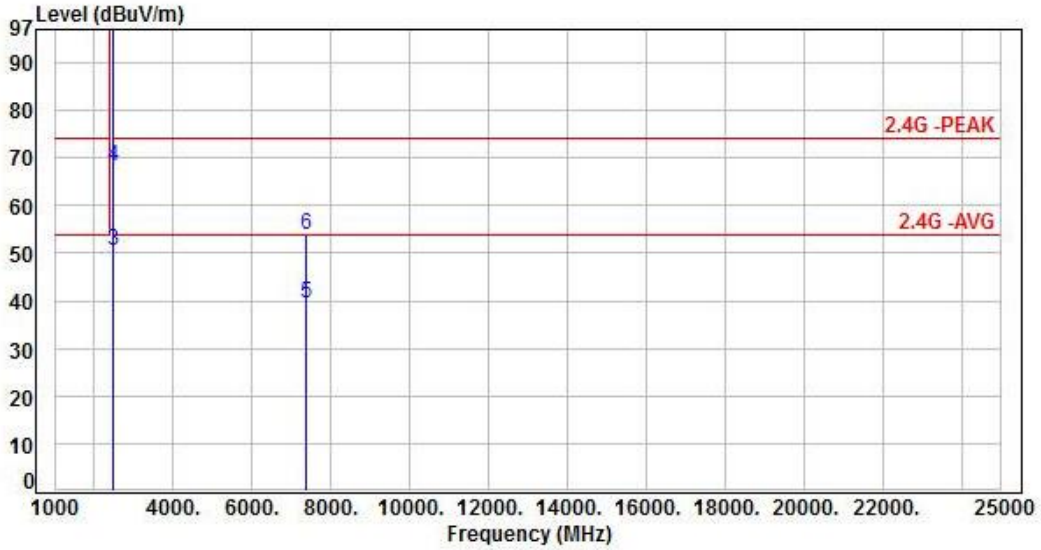
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2, CH06		:	



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	-3.62	42.78	39.16	54.00	-14.84	Average	100	38	P
2	2390.00	-3.62	56.24	52.62	74.00	-21.38	Peak	100	38	P
3	2437.00	-3.57	97.66	94.09	200.00	-105.91	Average	100	38	P
4	2437.00	-3.57	107.11	103.54	200.00	-96.46	Peak	100	38	P
5	2483.50	-3.40	42.48	39.08	54.00	-14.92	Average	100	38	P
6	2483.50	-3.40	56.99	53.59	74.00	-20.41	Peak	100	38	P
7	7311.00	8.48	31.88	40.36	54.00	-13.64	Average	100	143	P
8	7311.00	8.48	46.23	54.71	74.00	-19.29	Peak	100	143	P

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

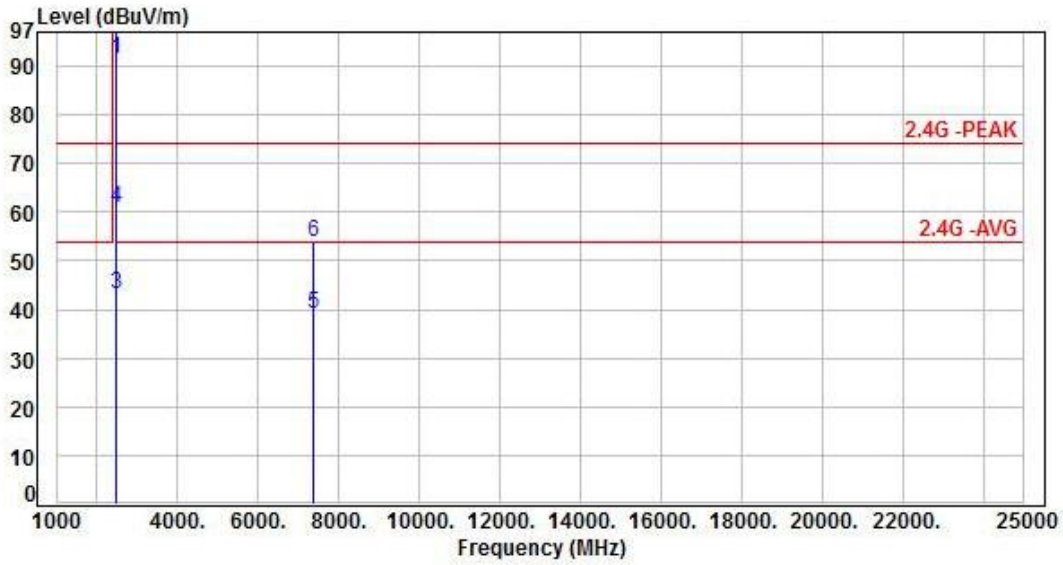
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 2, CH11		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2462.00	-3.50	103.11	99.61	200.00	-100.39	Average	205	339	P
2	2462.00	-3.50	112.83	109.33	200.00	-90.67	Peak	205	339	P
3	2483.50	-3.40	54.03	50.63	54.00	-3.37	Average	205	339	P
4	2483.50	-3.40	71.80	68.40	74.00	-5.60	Peak	205	339	P
5	7386.00	8.59	31.02	39.61	54.00	-14.39	Average	100	187	P
6	7386.00	8.59	45.18	53.77	74.00	-20.23	Peak	100	187	P

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

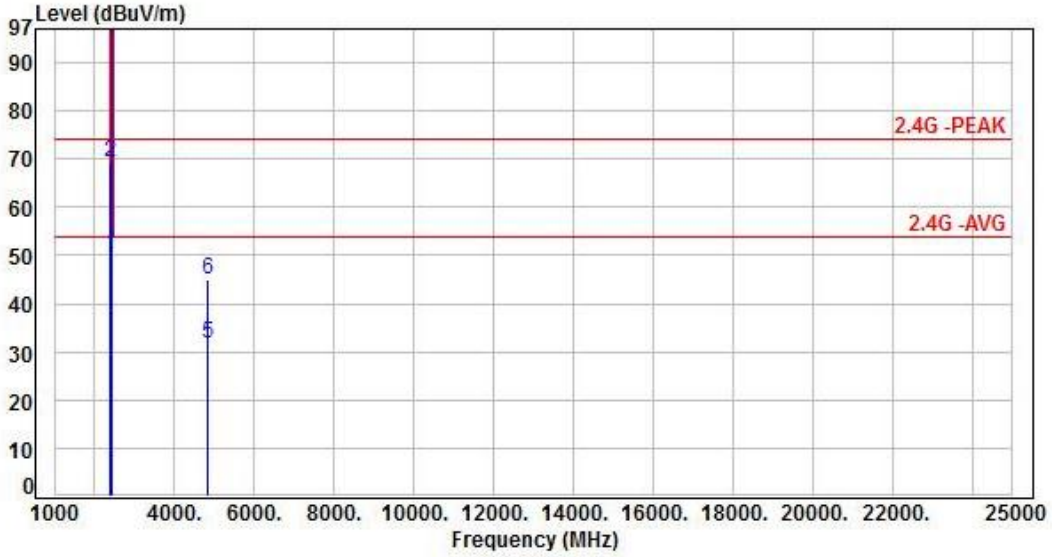
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 2, CH11		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2462.00	-3.50	94.99	91.49	200.00	-108.51	Average	100	36	P
2	2462.00	-3.50	104.34	100.84	200.00	-99.16	Peak	100	36	P
3	2483.50	-3.40	46.53	43.13	54.00	-10.87	Average	100	36	P
4	2483.50	-3.40	64.40	61.00	74.00	-13.00	Peak	100	36	P
5	7386.00	8.59	30.40	38.99	54.00	-15.01	Average	100	138	P
6	7386.00	8.59	45.10	53.69	74.00	-20.31	Peak	100	138	P

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

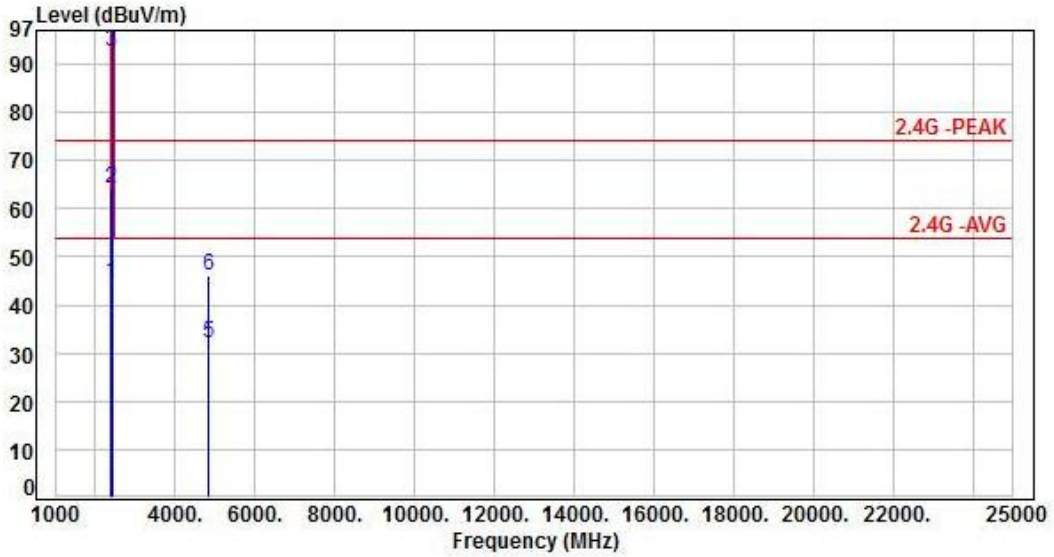
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 3, CH01		:	



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	-3.62	53.78	50.16	54.00	-3.84	Average	129	340	P
2	2390.00	-3.62	73.05	69.43	74.00	-4.57	Peak	129	340	P
3	2412.00	-3.60	102.90	99.30	200.00	-100.70	Average	129	340	P
4	2412.00	-3.60	112.40	108.80	200.00	-91.20	Peak	129	340	P
5	4824.00	3.73	28.12	31.85	54.00	-22.15	Average	100	216	P
6	4824.00	3.73	41.19	44.92	74.00	-29.08	Peak	100	216	P

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

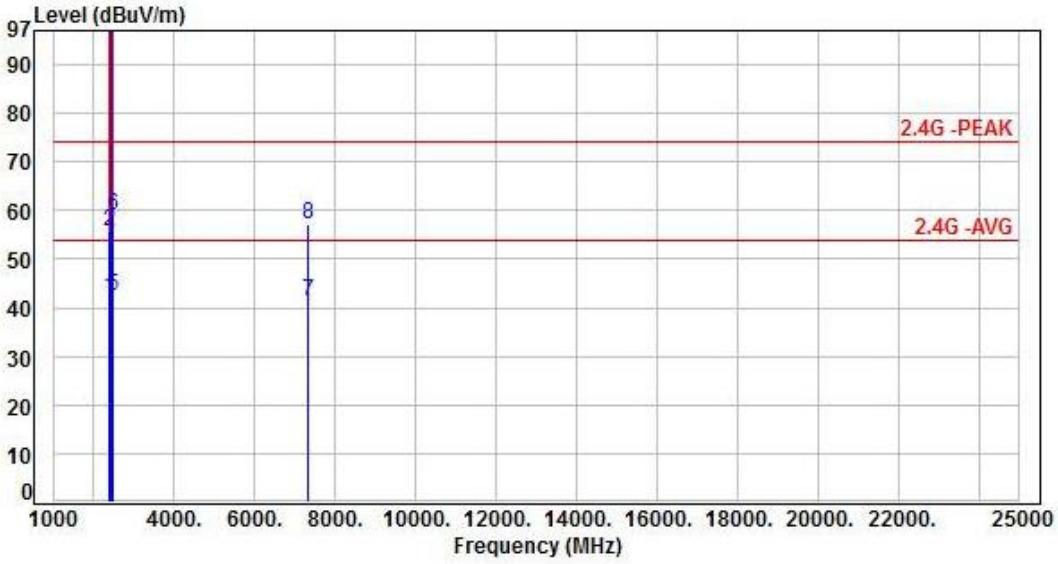
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 3, CH01		:	



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	-3.62	48.25	44.63	54.00	-9.37	Average	100	20	P
2	2390.00	-3.62	67.94	64.32	74.00	-9.68	Peak	100	20	P
3	2412.00	-3.60	96.04	92.44	200.00	-107.56	Average	100	20	P
4	2412.00	-3.60	105.53	101.93	200.00	-98.07	Peak	100	20	P
5	4824.00	3.73	28.27	32.00	54.00	-22.00	Average	100	214	P
6	4824.00	3.73	42.39	46.12	74.00	-27.88	Peak	100	214	P

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

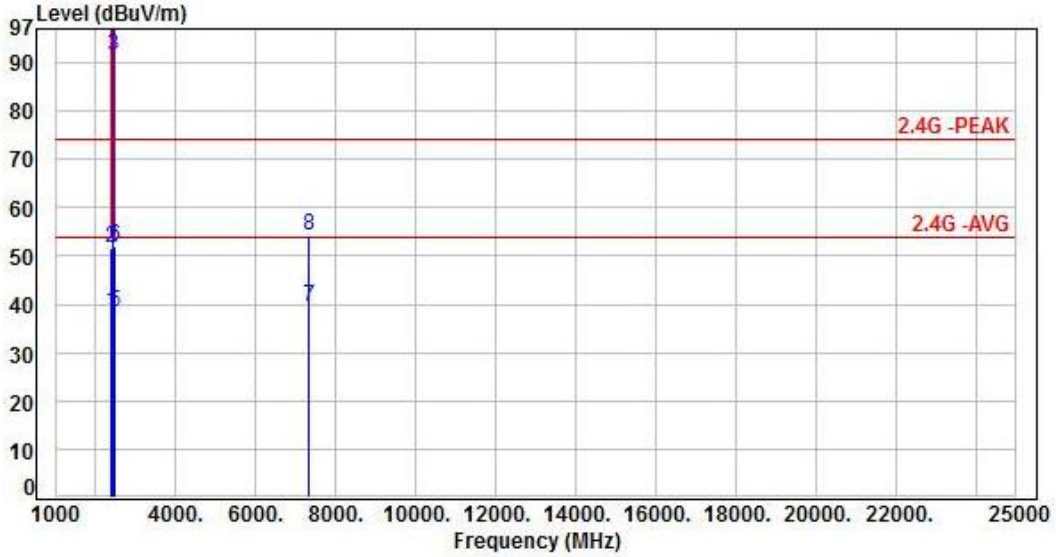
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 3, CH06		:	



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	-3.62	45.65	42.03	54.00	-11.97	Average	104	341	P
2	2390.00	-3.62	59.15	55.53	74.00	-18.47	Peak	104	341	P
3	2437.00	-3.57	103.70	100.13	200.00	-99.87	Average	104	341	P
4	2437.00	-3.57	113.18	109.61	200.00	-90.39	Peak	104	341	P
5	2483.50	-3.40	45.95	42.55	54.00	-11.45	Average	104	341	P
6	2483.50	-3.40	62.45	59.05	74.00	-14.95	Peak	104	341	P
7	7311.00	8.48	32.98	41.46	54.00	-12.54	Average	244	191	P
8	7311.00	8.48	48.72	57.20	74.00	-16.80	Peak	244	191	P

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

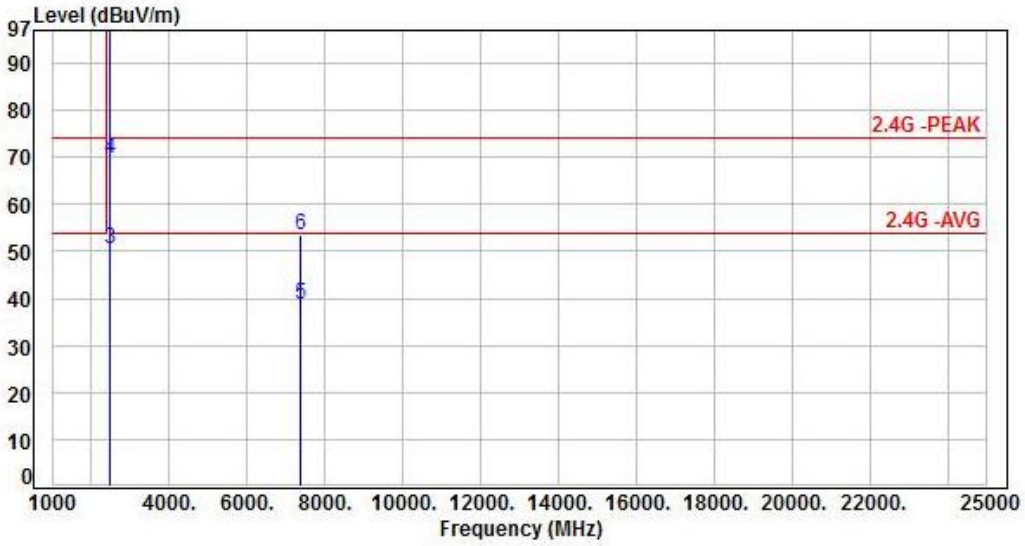
Power	:	AC 120V / 60Hz	Pol/Phase	:	HORIZONTAL
Test Mode	:	Mode 3, CH06		:	



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	-3.62	41.98	38.36	54.00	-15.64	Average	100	38	P
2	2390.00	-3.62	55.08	51.46	74.00	-22.54	Peak	100	38	P
3	2437.00	-3.57	95.07	91.50	200.00	-108.50	Average	100	38	P
4	2437.00	-3.57	104.64	101.07	200.00	-98.93	Peak	100	38	P
5	2483.50	-3.40	41.66	38.26	54.00	-15.74	Average	100	38	P
6	2483.50	-3.40	55.25	51.85	74.00	-22.15	Peak	100	38	P
7	7311.00	8.48	30.87	39.35	54.00	-14.65	Average	100	142	P
8	7311.00	8.48	45.82	54.30	74.00	-19.70	Peak	100	142	P

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

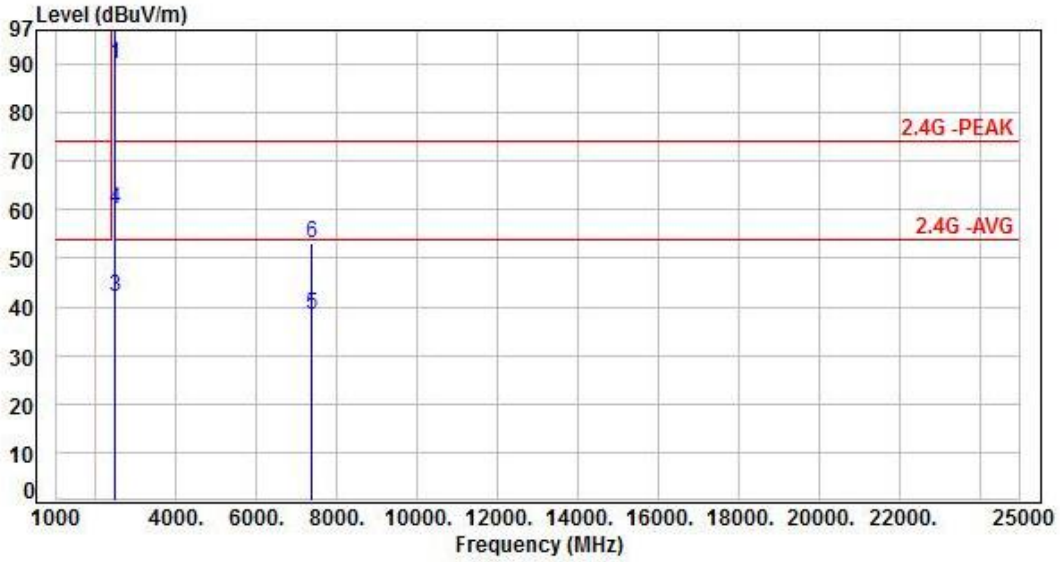
Power	:	AC 120V / 60Hz	Pol/Phase	:	VERTICAL
Test Mode	:	Mode 3, CH11		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2462.00	-3.50	102.07	98.57	200.00	-101.43	Average	120	339	P
2	2462.00	-3.50	112.12	108.62	200.00	-91.38	Peak	120	339	P
3	2483.50	-3.40	53.97	50.57	54.00	-3.43	Average	120	339	P
4	2483.50	-3.40	73.00	69.60	74.00	-4.40	Peak	120	339	P
5	7386.00	8.59	30.26	38.85	54.00	-15.15	Average	100	191	P
6	7386.00	8.59	44.92	53.51	74.00	-20.49	Peak	100	191	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 3, CH11		:	



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	2462.00	-3.50	93.62	90.12	200.00	-109.88	Average	104	34	P
2	2462.00	-3.50	103.39	99.89	200.00	-100.11	Peak	104	34	P
3	2483.50	-3.40	45.32	41.92	54.00	-12.08	Average	104	34	P
4	2483.50	-3.40	63.50	60.10	74.00	-13.90	Peak	104	34	P
5	7386.00	8.59	29.71	38.30	54.00	-15.70	Average	100	143	P
6	7386.00	8.59	44.37	52.96	74.00	-21.04	Peak	100	143	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 Conducted Spurious Emission

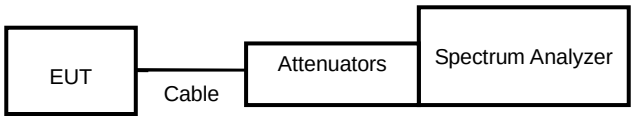
7.1 Test Limit

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

7.2 Test Procedure

a. The transmitter output was connected to the spectrum analyzer via a low loss cable.
b. 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.
c. 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.
d. The band edges was measured and recorded.

7.3 Test Setup Layout

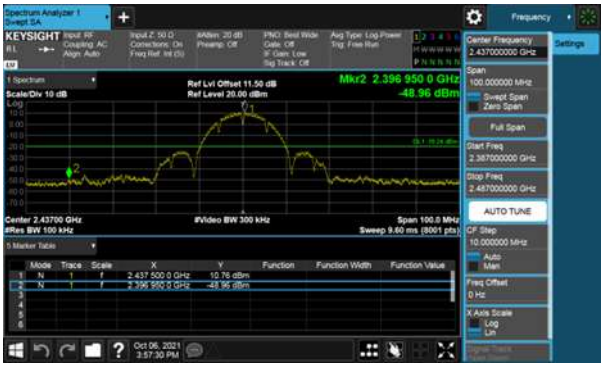


7.4 Test Result and Data

Note: Test plots refers to the following pages.

Modulation Type: 802.11b, CH 01

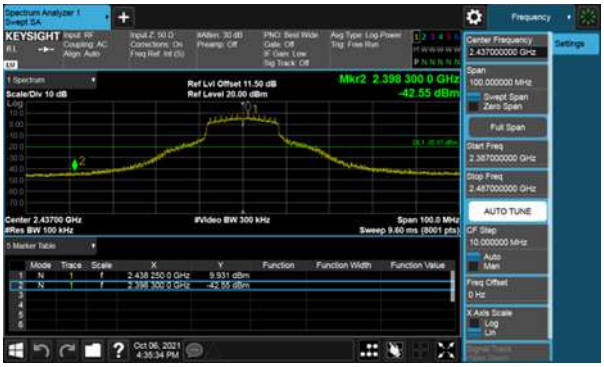
Modulation Type: 802.11b, CH 06



Modulation Type: 802.11b, CH 11

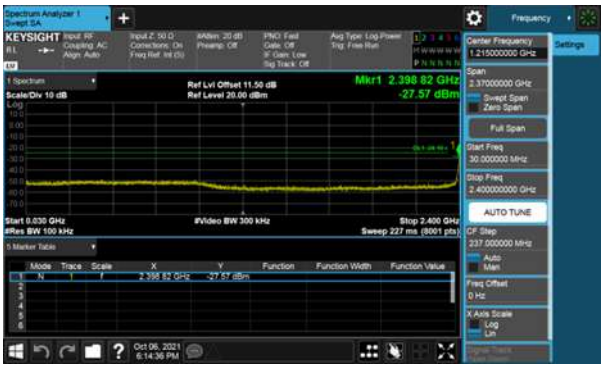
Modulation Type: 802.11g, CH 01

Modulation Type: 802.11g, CH 06

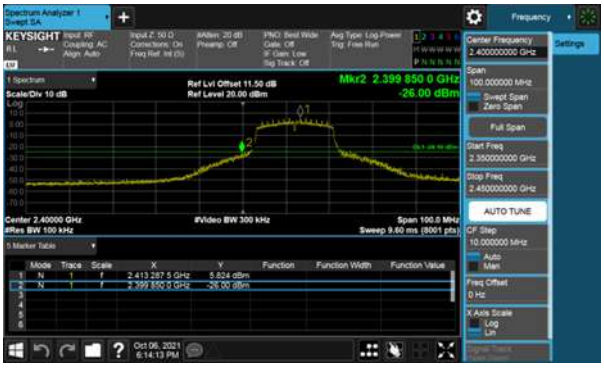


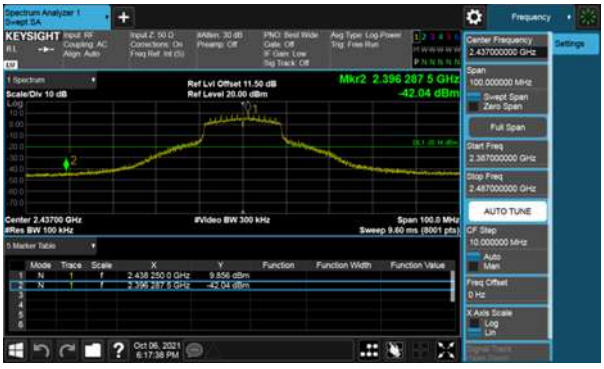
Modulation Type: 802.11g, CH 11

Modulation Type: 802.11n HT20, CH01



Modulation Type: 802.11n HT20, CH06





Modulation Type: 802.11n HT20, CH11

8. On Time, Duty Cycle and Measurement methods

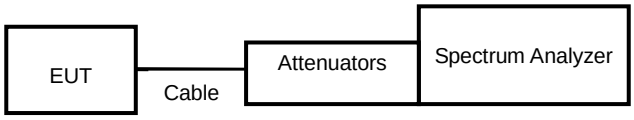
8.1 Test Limit

None; for reporting purposes only.

8.2 Test Procedure

Zero-Span Spectrum Analyzer Method.

8.3 Test Setup Layout



8.4 Test Result and Data

Modulation Type	On Time (ms)	Period Time (ms)	Duty Cycle (%)
11b,1M	8.46	8.52	99.30%
11g,6M	1.40	1.58	88.61%
11n HT20	1.31	1.53	86.03%

Modulation Type: 802.11b(1Mbps)

Modulation Type: 802.11g(6Mbps)

Modulation Type: 802.11n HT20(6.5Mbps)

9. 6dB Bandwidth Measurement Data

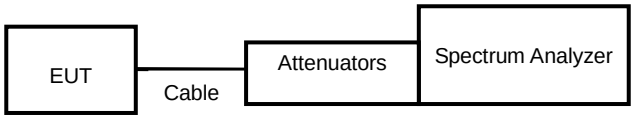
9.1 Test Limit

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

9.2 Test Procedures

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

9.3 Test Setup Layout



9.4 Test Result and Data

Modulation Type	Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
			ANT A	
11b	1	2412	10.02	0.5
	6	2437	10.05	0.5
	11	2462	10.05	0.5
11g	1	2412	15.09	0.5
	6	2437	15.09	0.5
	11	2462	15.09	0.5
11n HT20	1	2412	15.09	0.5
	6	2437	15.09	0.5
	11	2462	15.09	0.5

Modulation Type: 802.11b
CH01

Modulation Type: 802.11g
CH01

CH06

CH06

CH11

CH11

Modulation Type: 802.11n HT20
CH01

CH06

CH11

10. Maximum Average Output Power

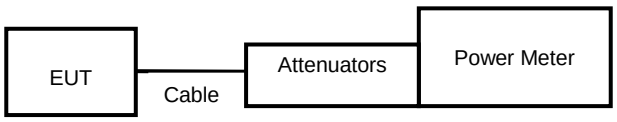
10.1 Test Limit

The Maximum Average Output Power Measurement is 30dBm.
If transmitting antennas of directional gain greater than 6 dBi are used, the average output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

10.2 Test Procedures

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

Setting	Modulation Mode	Channel	Frequency (MHz)	Conducted(average) output power (dBm)	Total AV power (dBm)	Total AV power (mW)	Powe Limit (dBm)
				ANT A			
23	11b	1	2412	19.92	19.92	98.175	30.00
24		6	2437	20.86	20.86	121.899	30.00
24		11	2462	21.09	21.09	128.529	30.00
1E	11g	1	2412	16.63	16.63	46.026	30.00
23		6	2437	19.27	19.27	84.528	30.00
1D		11	2462	16.64	16.64	46.132	30.00
1F	11n HT20	1	2412	16.22	16.22	41.879	30.00
25		6	2437	19.19	19.19	82.985	30.00
1E		11	2462	16.15	16.15	41.210	30.00

11. Power Spectral Density

11.1 Test Limit

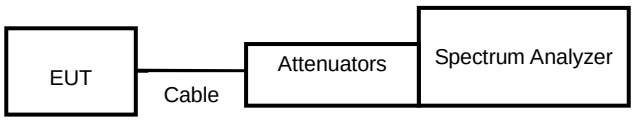
The Maximum of Power Spectral Density Measurement is 8dBm.

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

Reference to KDB558074 DTS Meas Guidance v05r02 D01

11.3 Test Setup Layout

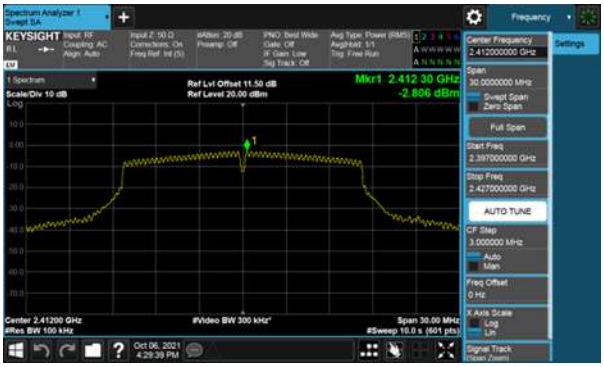


11.4 Test Result and Data

Modulation Type	Channel	Frequency (MHz)	Maximum Power Density of 100KHz Bandwidth(dBm) ANT A	Sum chain (dBm)	Duty Cycle CF(dB)	Total PSD (dBm)	Limit (dBm)
11b	1	2412	1.009	1.01	0.00	1.01	8.00
	6	2437	2.103	2.10	0.00	2.10	8.00
	11	2462	2.109	2.11	0.00	2.11	8.00
11g	1	2412	-2.806	-2.81	0.53	-2.28	8.00
	6	2437	-0.255	-0.26	0.53	0.28	8.00
	11	2462	-2.778	-2.78	0.53	-2.25	8.00
11n HT20	1	2412	-3.662	-3.66	0.65	-3.01	8.00
	6	2437	-0.61	-0.61	0.65	0.04	8.00
	11	2462	-3.131	-3.13	0.65	-2.48	8.00

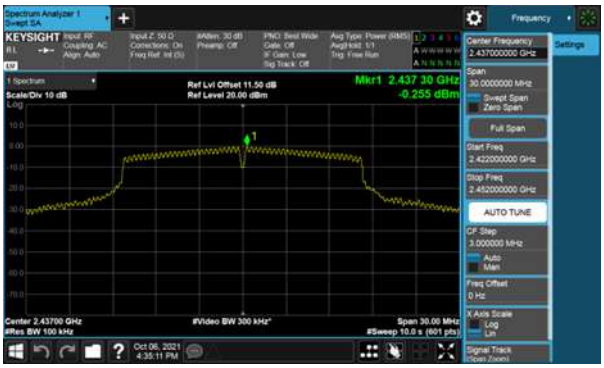
Modulation Type: 802.11b
CH01

Modulation Type: 802.11g
CH01



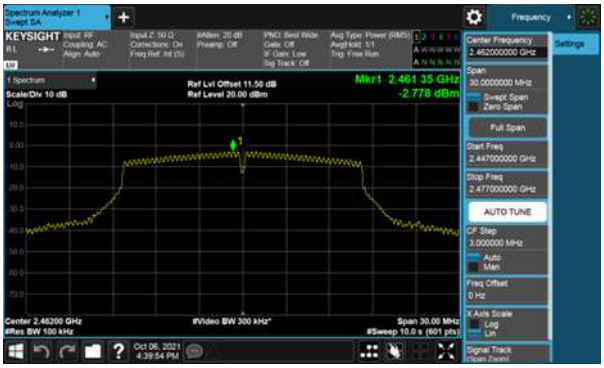
CH06

CH06

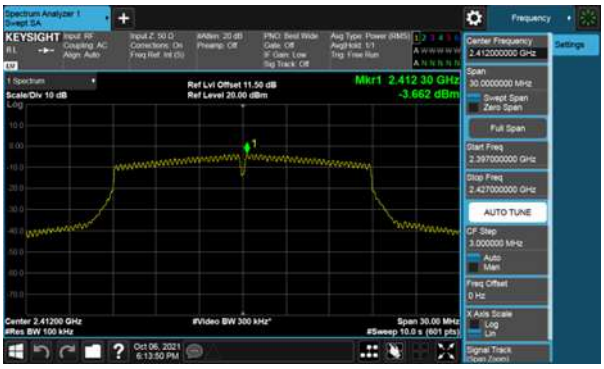


CH11

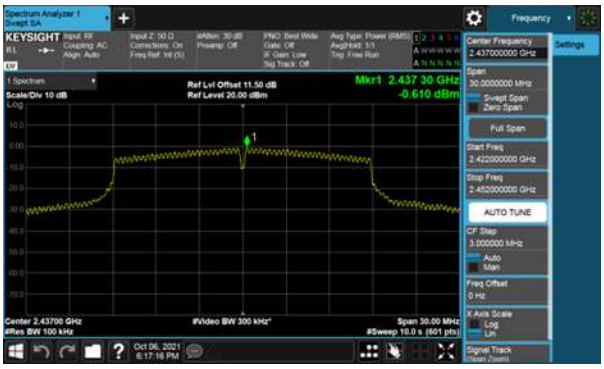
CH11



Modulation Type: 802.11n HT20
CH01



CH06



CH11