



FCC RADIO TEST REPORT

Applicant : BROWAN Communications Inc.
Address : No.15-1, Zhonghua Rd., Hsinchu Industrial Park,
Hukou, Hsinchu, Taiwan, 30352.
Equipment : Pico Next Indoor Gateway
Model No. : L0007
Trade Name : BROWAN
FCC ID. : 2AAS9-L0007

I HEREBY CERTIFY THAT:

The sample was received on Aug. 11, 2022 and the testing was completed on Aug. 26, 2022 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
22070015-TRFCC02	Sep. 02, 2022	Original



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 (22070015-TEFV01).



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	WLAN: 2.4GHz: 802.11b: CCK, DQPSK, DBPSK 802.11g/n: BPSK, QPSK, 16QAM, 64QAM
Modulation Technology	DSSS, OFDM
Data Rate	WLAN: 2.4GHz: 802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0 – MCS7, HT20
Antenna Type	Dipole Antenna
Antenna Gain	WLAN: 2400-2483.5MHz: 2.56dBi
Firmware Number	1.1.27
Serial Number	2201060000003
Adapter	Brand: Frecom Model: F18L16-120150SPAU
WIFI Antenna	Brand: TSKY Model: A8-A003-00163
LTE Antenna	Brand: TSKY Model: A8-A003-00163
LoRa Antenna	Brand: TSKY Model: A8-A003-00106
GPS Antenna	Brand: Honglianxing Model: GPS ANT01 Brand: INPAQ Model: GPSGLONASS53D-S6-00

Note:

1. For more details, please refer to the User's manual of the EUT.
2. The difference between GPS Antennas are brand and model only.



2.2 Test Mode and Test Software

- a. During testing, the interface cables and equipment positions were varied according to ANSI C63.4.
- b. An executive program, “wl command” under Windows 10 system was executed to transmit and receive data via WLAN.
- c. The following test modes were performed for the test:

AC Power Line Conducted Emission	
Test Mode 1	802.11g (6Mbps) (120V/60 Hz), Co-located: WLAN 11g CH06 + LTE 1905MHz + LoRa 908.5MHz
Test Mode 2	802.11g (6Mbps) (240V/60 Hz), Co-located: WLAN 11g CH06 + LTE 1905MHz + LoRa 908.5MHz
caused "Test Mode 1" generated the worst case, it was reported as the final data.	
Radiated Emissions (Below 1GHz)	
Test Mode 1	802.11g (6Mbps) (120V/60 Hz), Co-located: WLAN 11g CH06 + LTE 1905MHz + LoRa 908.5MHz
Radiated Emissions (1GHz ~ 25GHz)	
Test Mode 1	802.11g (6Mbps) (120V/60 Hz), Co-located: WLAN 11g CH06 + LTE 1905MHz + LoRa 908.5MHz

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
POE	POE	ZIJIA	N/A	N/A
DC Connector	DC Connector	PHOENIX	0.2m / NS	N/A
CAR-Battery	YUASA	55B24R(S)-CMF II	N/A	N/A
RJ45 Cable*2	TE CONNECTIVITY	CAT5E	1.2m / NS	N/A
RJ45 Cable	TE CONNECTIVITY	CAT5E	15m / NS	N/A

AC Power Line Conducted Emission				
Equipment	Brand	Model	Length/Type	Power cord/Length/Type
POE	POE	ZIJIA	N/A	N/A
Notebook	Lenovo	S1GL2W	N/A	Adapter / 1.8m / NS
RJ45 Cable*2	TE CONNECTIVITY	CAT5E	1.2m / NS	N/A



2.4 General Information of Test

Test Site	CerpPASS 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-12205 for Telecommunication test C-14663 for Conducted emission test R-14218 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
Radiated Emissions	3M02-NK	2022/08/26	22 °C / 45%	Leon Huang
AC Power Line Conducted Emission	CON01-NK	2022/08/26	25 °C / 59%	Leon Huang

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)	±5.7dB
Radiated Spurious Emission(1GHz~25GHz)	±6.8dB



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	275	2021/11/05	2022/11/04
Active Loop Antenna	EMCO	6507	40855	2022/05/25	2023/05/24
Horn Antenna	EMCO	3115	31601	2021/10/14	2022/10/13
Horn Antenna	EMCO	3116	31974	2021/10/04	2022/10/03
EMI Receiver	ROHDE & SCHWARZ	ESCI	100821	2021/11/16	2022/11/15
Spectrum Analyzer	ROHDE & SCHWARZ	FSV 40-N	101329	2022/07/20	2023/07/19
Preamplifier	Agilent	8449B	3008A01954	2022/03/17	2023/03/16
Preamplifier	EMC INSTRUMENTS	EMC184045	980065	2021/11/16	2022/11/15
Preamplifier	EM Electronics corp.	EM330	60658	2021/10/13	2022/10/12
Cable-6m(9k~300M)	NA	EMC5D-BM-B M-6	130605	2021/09/22	2022/09/21
Cable-3in1(30M-1G)	HARBOUR INDUSTRIES	LL142	CCE1315	2022/03/21	2023/03/20
Cable-0.5m(1G-40G)	HUBER SUHNER	SUCOFLEX 102	MY4569/2	2021/09/03	2022/09/02
Cable-1m(1G-40G)	HUBER SUHNER	SUCOFLEX 102	MY5739/2	2021/09/03	2022/09/02
Cable-6m(1G-40G)	HUBER SUHNER	SUCOFLEX 102	MY5740/2	2021/09/03	2022/09/02
Cable-0.5m(1G-40G)	HUBER SUHNER	SUCOFLEX 104	805443/4	2022/01/11	2023/01/10
Cable-3m(1G-40G)	HUBER SUHNER	SUCOFLEX 104	805796/4	2022/01/11	2023/01/10
Cable-8m(1G-26.5G)	WOKEN	WCBA-WCA20 3SM	CCE1374	2022/04/25	2023/04/24
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	100821	2021/11/15	2022/11/14
Line Impedance Stabilization Network	Schwarzbeck	NSLK 8127	8127-516	2021/10/05	2022/10/04
Pulse Limiter	ROHDE & SCHWARZ	ESH3-Z2	101934	2022/03/21	2023/03/20
Cable-6m(9k~300M)	NA	EMC5D-BM-B M-6	130606	2022/03/21	2023/03/20
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 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

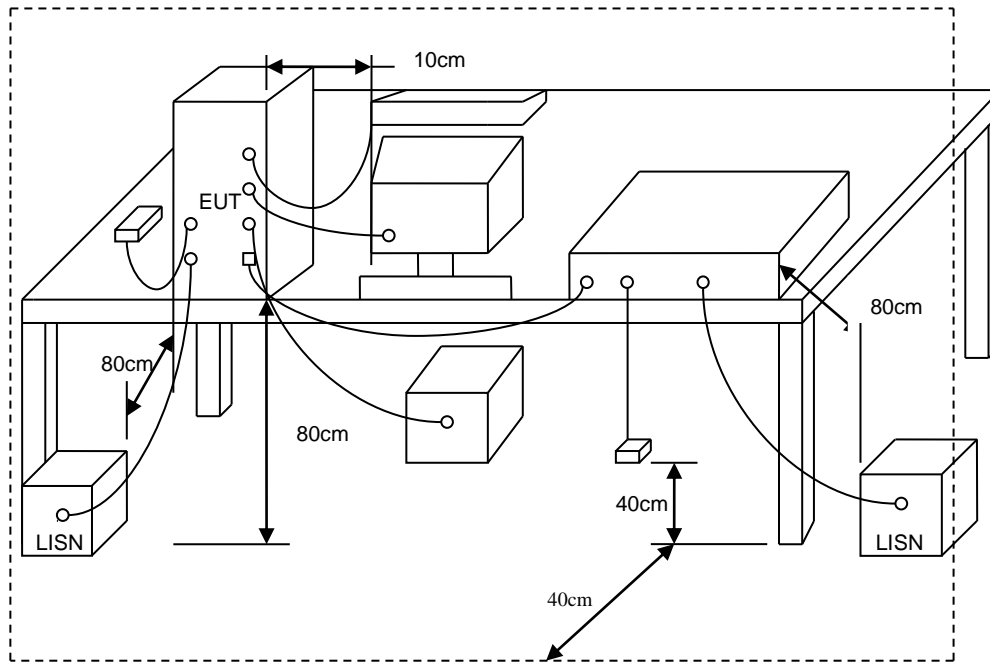
*Decreases with the logarithm of the frequency.

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

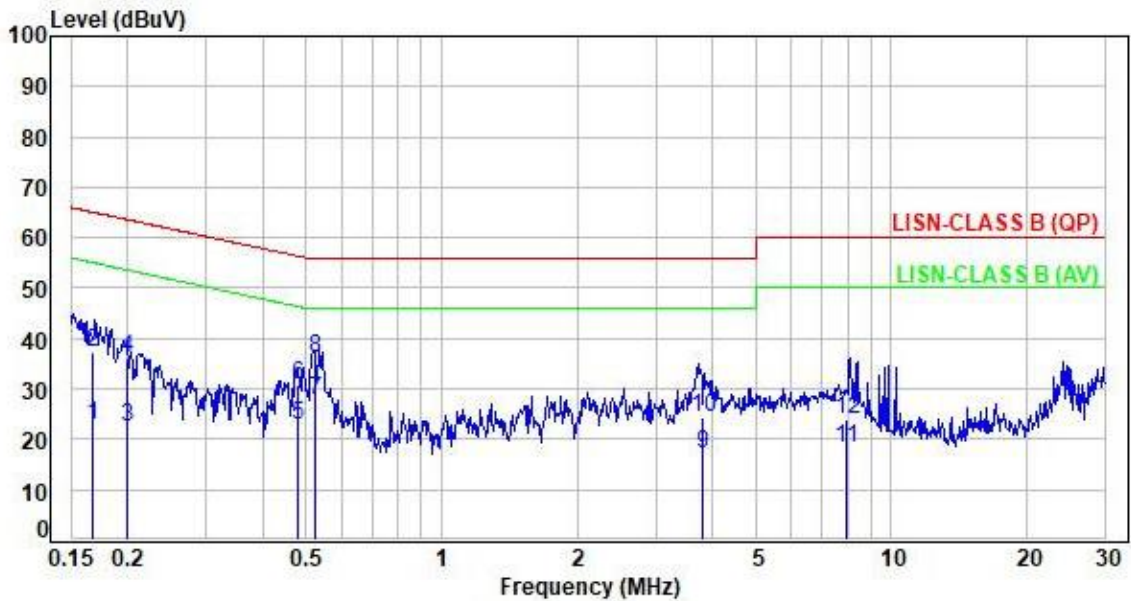




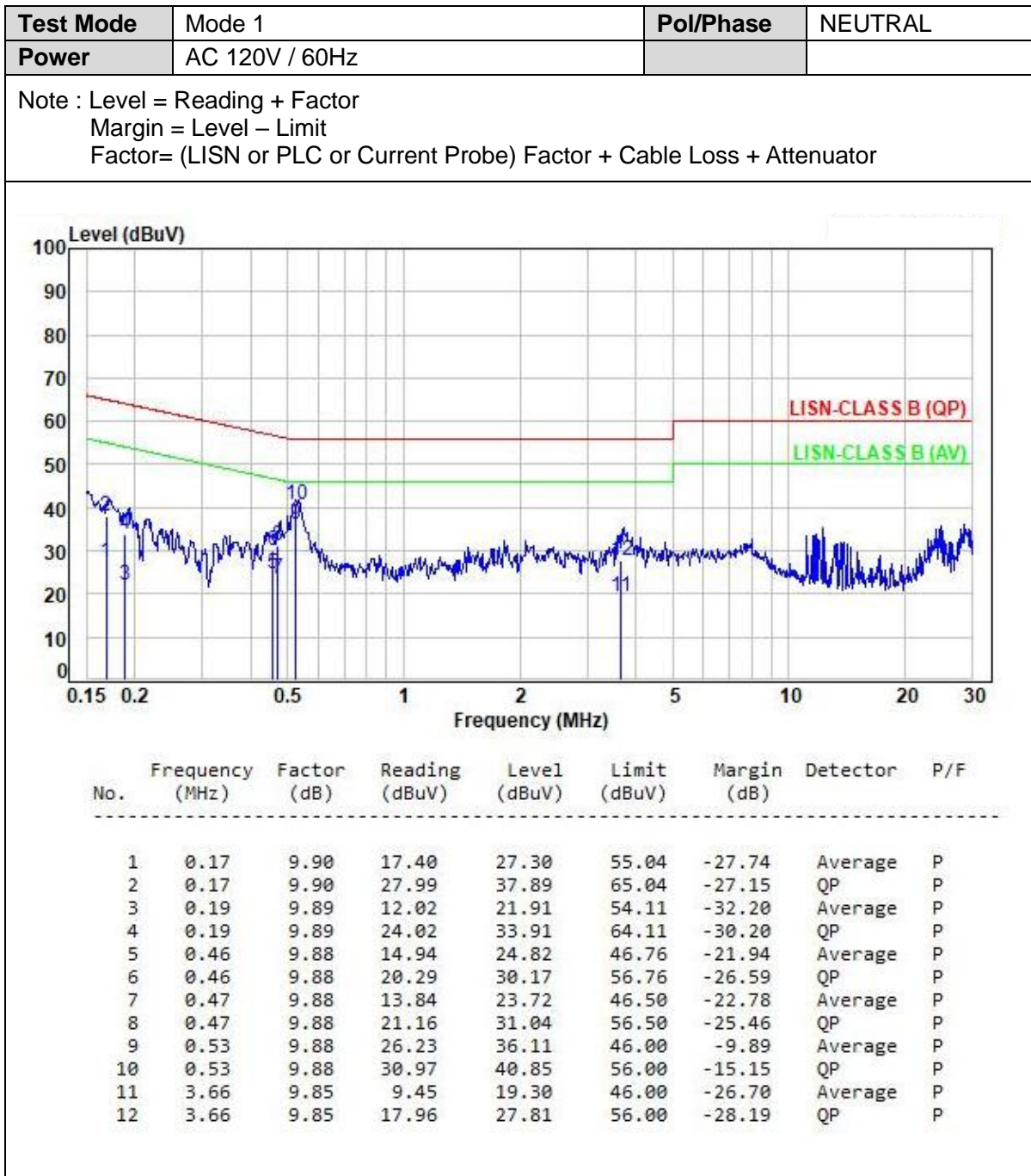
4.4 Test Result and Data

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

Note : Level = Reading + Factor
 Margin = Level – Limit
 Factor= (LISN or PLC or Current Probe) Factor + Cable Loss + Attenuator



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.17	9.92	13.08	23.00	55.11	-32.11	Average	P
2	0.17	9.92	27.33	37.25	65.11	-27.86	QP	P
3	0.20	9.91	12.53	22.44	53.65	-31.21	Average	P
4	0.20	9.91	26.20	36.11	63.65	-27.54	QP	P
5	0.48	9.90	12.92	22.82	46.37	-23.55	Average	P
6	0.48	9.90	20.74	30.64	56.37	-25.73	QP	P
7	0.52	9.91	17.80	27.71	46.00	-18.29	Average	P
8	0.52	9.91	26.15	36.06	56.00	-19.94	QP	P
9	3.80	9.93	7.01	16.94	46.00	-29.06	Average	P
10	3.80	9.93	14.28	24.21	56.00	-31.79	QP	P
11	7.95	10.01	8.12	18.13	50.00	-31.87	Average	P
12	7.95	10.01	13.88	23.89	60.00	-36.11	QP	P





5. Test of Spurious Emission (Radiated)

5.1 Test Limit

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter’s fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Distance Meters	Radiated ($\mu\text{V/m}$)	Radiated ($\text{dB}\mu\text{V/m}$)
30-88	3	100	40.0
88-216	3	150	43.5
216-960	3	200	46.0
Above 960	3	500	54.0

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Magnetic field strength (H-Field) ($\mu\text{A/m}$)	Measurement distance (m)
9 - 490 kHz	$6.37/F$ (F in kHz)	300
490 - 1705 kHz	$63.7/F$ (F in kHz)	30
1.705 - 30 MHz	0.08	30



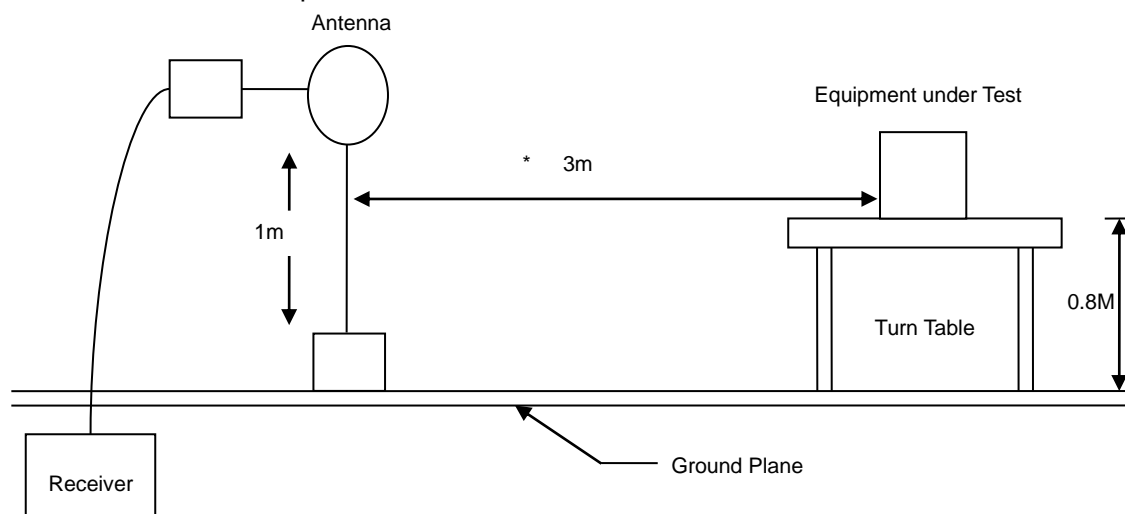
5.2 Test Procedures

- 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.
(Y-AXIS is the worst.)

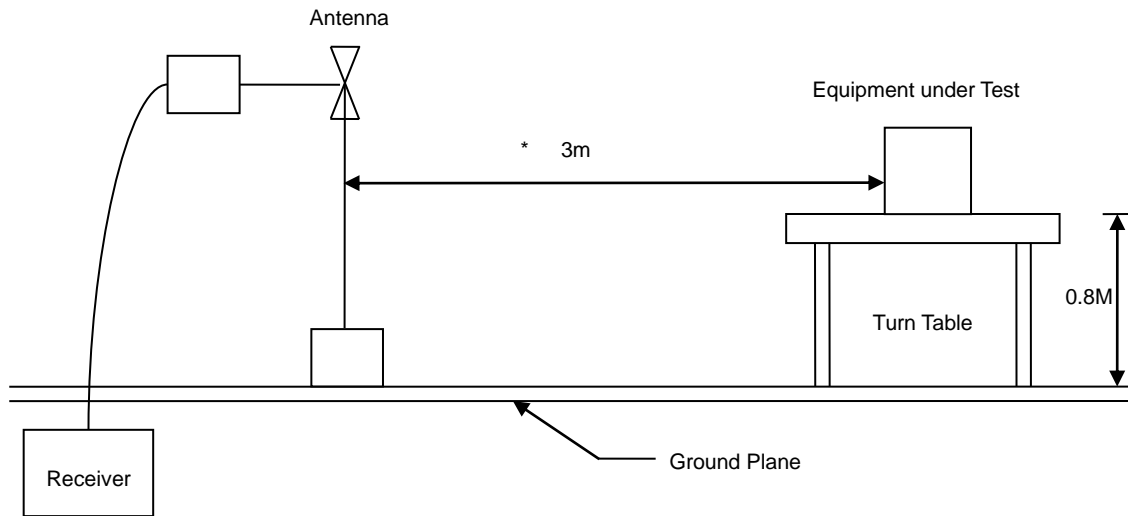
5.3 Typical Test Setup

Below 30MHz test setup

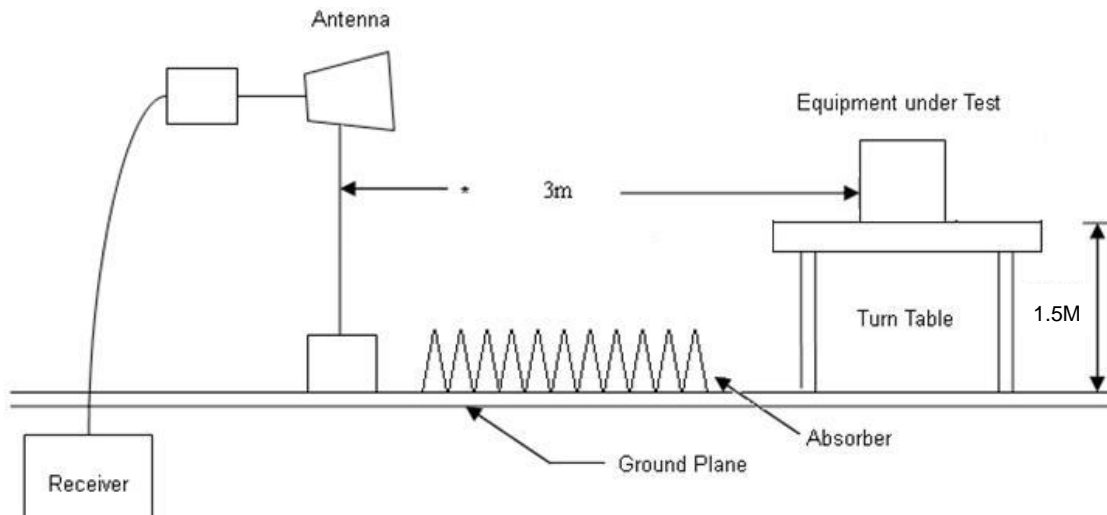




30MHz- 1GHz Test Setup



Above 1GHz Test Setup





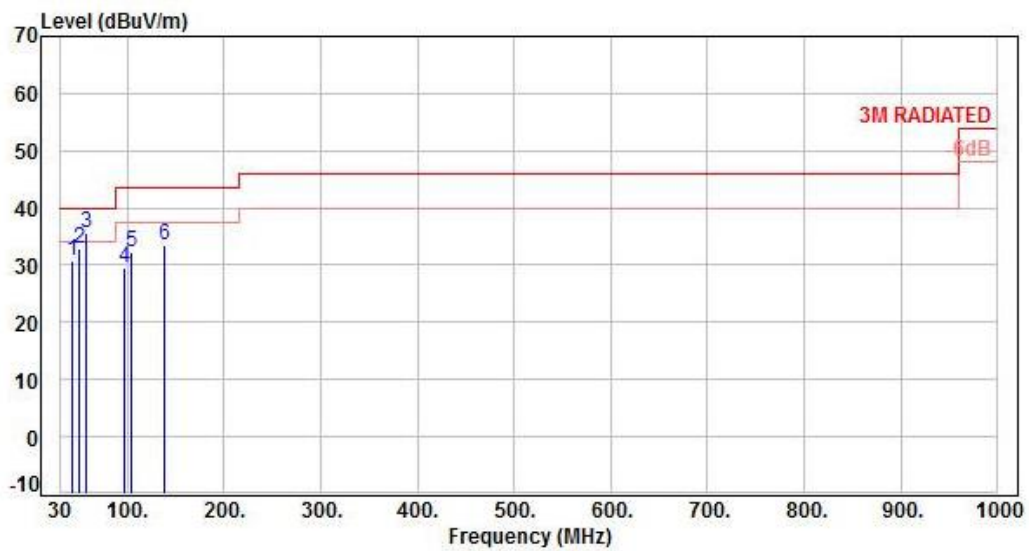
5.4 Test Result and Data (9kHz ~ 30MHz)

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

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

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

Note : Level = Reading + Factor
 Margin = Level – Limit
 Factor = Antenna Factor + Cable Loss – Amplifier Factor

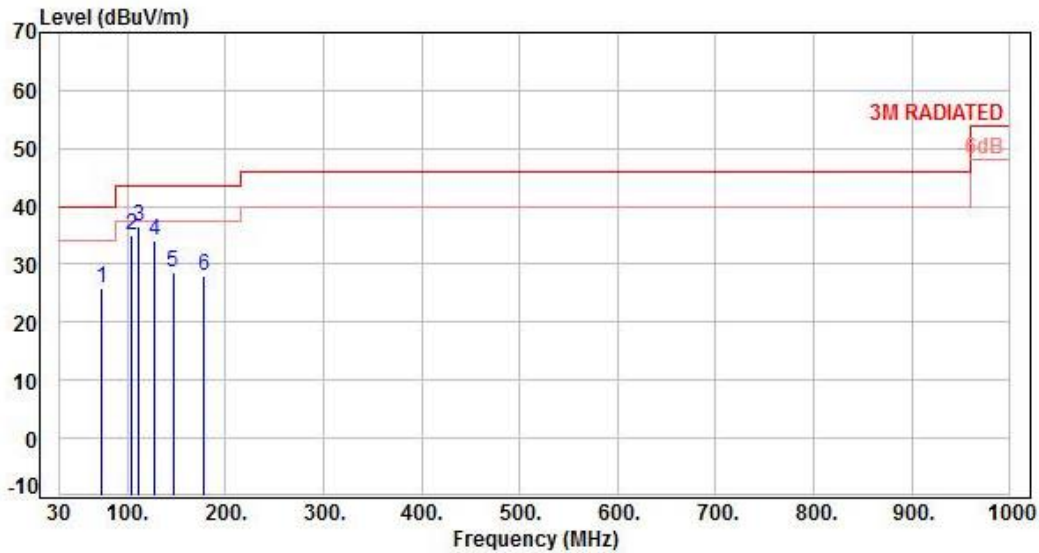


No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	42.61	-11.46	42.25	30.79	40.00	-9.21	Peak	100	360	P
2	50.37	-10.83	43.83	33.00	40.00	-7.00	Peak	100	360	P
3	57.16	-11.38	46.89	35.51	40.00	-4.49	Peak	100	360	P
4	96.93	-15.98	45.38	29.40	43.50	-14.10	Peak	100	360	P
5	103.72	-15.27	47.60	32.33	43.50	-11.17	Peak	100	360	P
6	138.64	-12.15	45.67	33.52	43.50	-9.98	Peak	100	360	P



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

Note : Level = Reading + Factor
 Margin = Level – Limit
 Factor = Antenna Factor + Cable Loss – Amplifier Factor



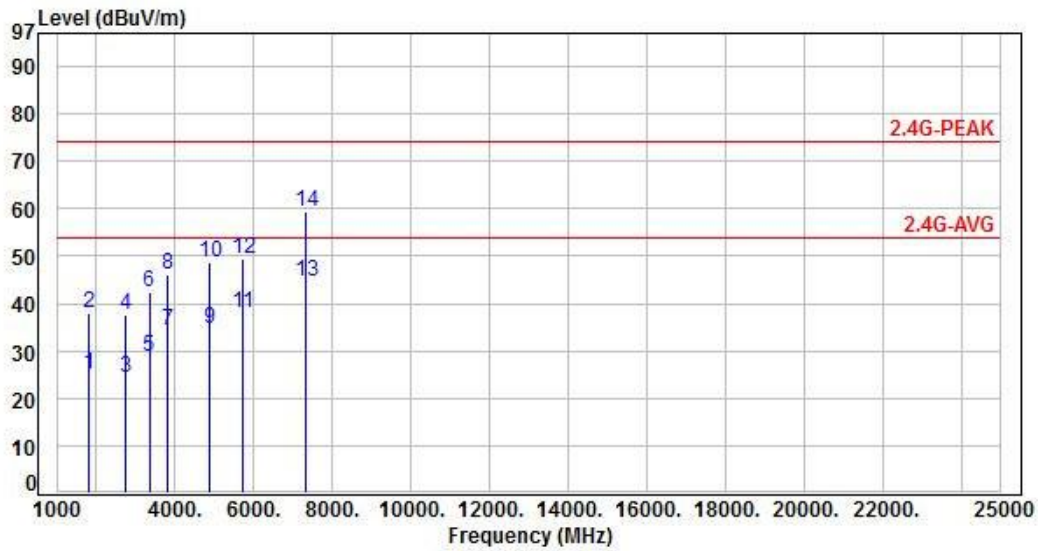
No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	73.65	-14.25	40.13	25.88	40.00	-14.12	Peak	100	0	P
2	104.69	-14.95	50.03	35.08	43.50	-8.42	Peak	100	0	P
3	111.48	-14.46	51.03	36.57	43.50	-6.93	Peak	100	0	P
4	127.97	-13.11	47.15	34.04	43.50	-9.46	Peak	100	0	P
5	146.40	-11.55	40.26	28.71	43.50	-14.79	Peak	100	0	P
6	177.44	-12.66	40.83	28.17	43.50	-15.33	Peak	100	0	P



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

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

Note : Level = Reading + Factor
 Margin = Level – Limit
 Factor = Antenna Factor + Cable Loss – Amplifier Factor

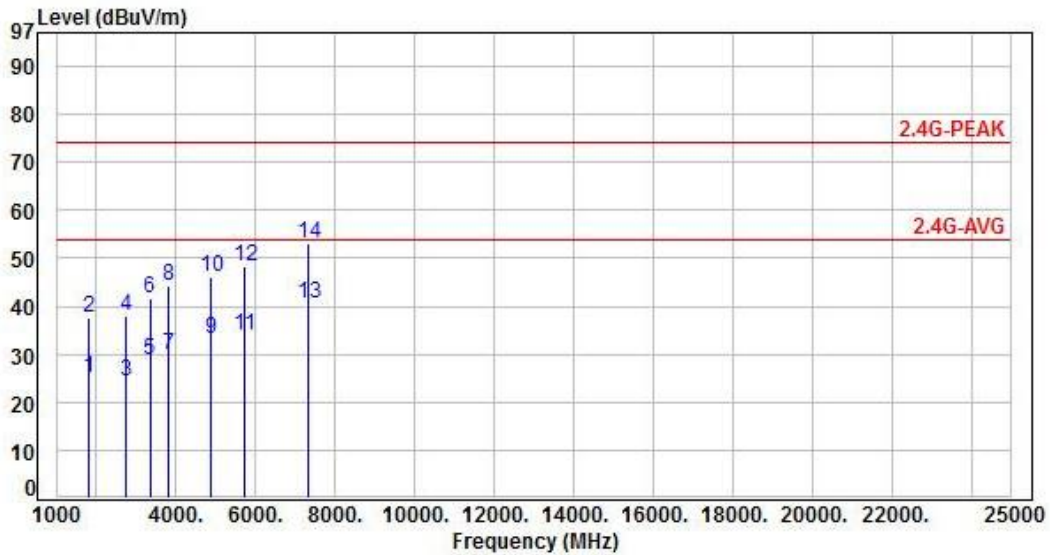


No.	Frequency (MHz)	Factor (dB)	Reading (dBUV)	Level (dBUV/m)	Limit (dBUV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1817.00	-5.19	30.21	25.02	54.00	-28.98	Average	100	321	P
2	1817.00	-5.19	43.31	38.12	74.00	-35.88	Peak	100	321	P
3	2725.50	-1.80	26.17	24.37	54.00	-29.63	Average	100	65	P
4	2725.50	-1.80	39.58	37.78	74.00	-36.22	Peak	100	65	P
5	3345.50	1.28	27.52	28.80	54.00	-25.20	Average	100	278	P
6	3345.50	1.28	41.00	42.28	74.00	-31.72	Peak	100	278	P
7	3810.00	3.42	30.72	34.14	54.00	-19.86	Average	100	284	P
8	3810.00	3.42	42.76	46.18	74.00	-27.82	Peak	100	284	P
9	4874.00	5.18	29.66	34.84	54.00	-19.16	Average	100	178	P
10	4874.00	5.18	43.37	48.55	74.00	-25.45	Peak	100	178	P
11	5715.00	6.60	31.40	38.00	54.00	-16.00	Average	100	25	P
12	5715.00	6.60	42.84	49.44	74.00	-24.56	Peak	100	25	P
13	7311.00	10.16	34.62	44.78	54.00	-9.22	Average	166	136	P
14	7311.00	10.16	49.31	59.47	74.00	-14.53	Peak	166	136	P



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

Note : Level = Reading + Factor
 Margin = Level – Limit
 Factor = Antenna Factor + Cable Loss – Amplifier Factor



No.	Frequency (MHz)	Factor (dB)	Reading (dBuV)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg)	P/F
1	1817.00	-5.19	30.22	25.03	54.00	-28.97	Average	100	264	P
2	1817.00	-5.19	42.83	37.64	74.00	-36.36	Peak	100	264	P
3	2725.50	-1.80	26.28	24.48	54.00	-29.52	Average	100	325	P
4	2725.50	-1.80	39.80	38.00	74.00	-36.00	Peak	100	325	P
5	3345.50	1.28	27.57	28.85	54.00	-25.15	Average	100	128	P
6	3345.50	1.28	40.51	41.79	74.00	-32.21	Peak	100	128	P
7	3810.00	3.42	26.55	29.97	54.00	-24.03	Average	100	185	P
8	3810.00	3.42	40.88	44.30	74.00	-29.70	Peak	100	185	P
9	4874.00	5.18	28.00	33.18	54.00	-20.82	Average	100	153	P
10	4874.00	5.18	41.04	46.22	74.00	-27.78	Peak	100	153	P
11	5715.00	6.60	27.48	34.08	54.00	-19.92	Average	100	217	P
12	5715.00	6.60	41.62	48.22	74.00	-25.78	Peak	100	217	P
13	7311.00	10.16	30.35	40.51	54.00	-13.49	Average	100	267	P
14	7311.00	10.16	42.92	53.08	74.00	-20.92	Peak	100	267	P



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