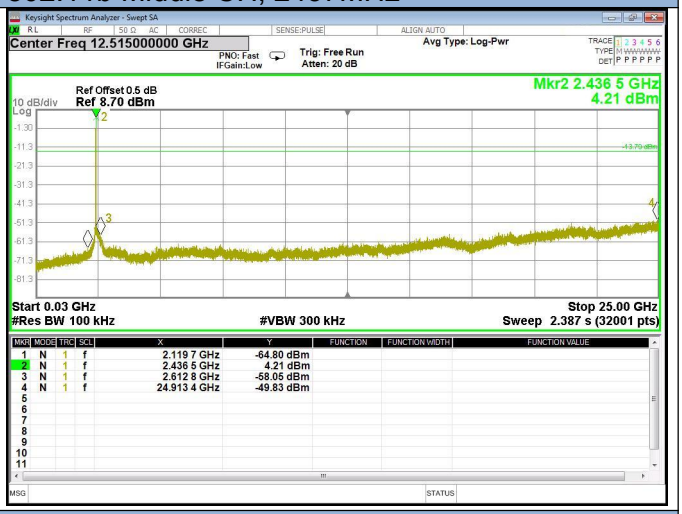
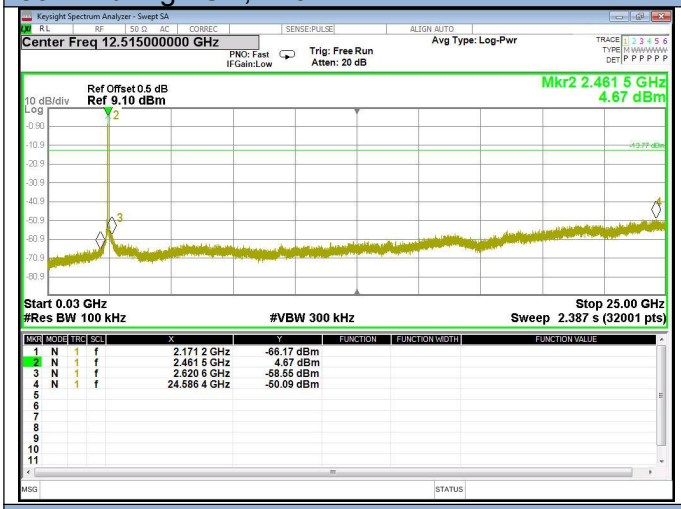
6.6 Spurious emissions

(802.11b) Lowest channel

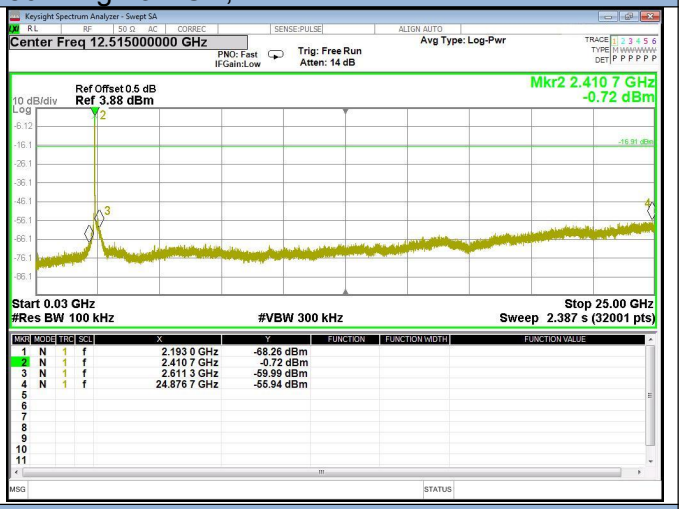
802.11b Middle CH, 2437MHz



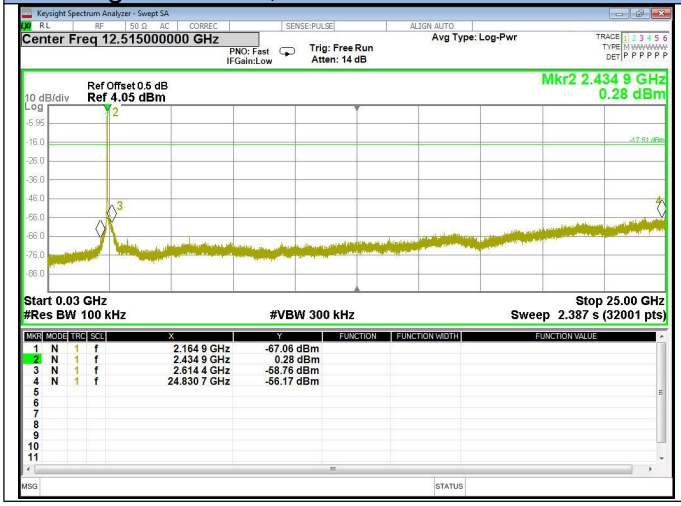
802.11b High CH, 2462MHz



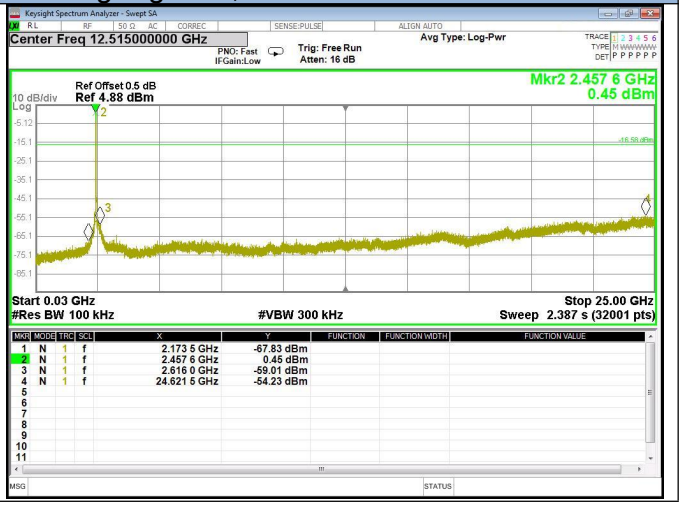
802.11g Low CH, 2412MHz



802.11g Middle CH, 2437MHz

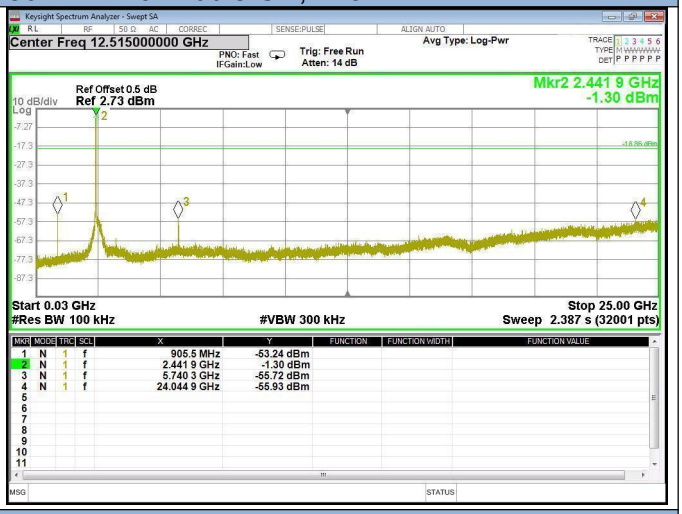


802.11g High CH, 2462MHz

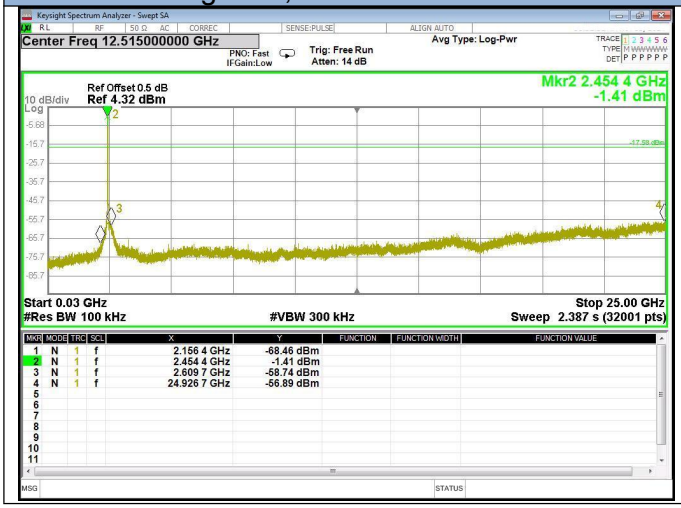


802.11n 20 Low CH, 2412MHz

802.11n 20 Middle CH, 2437MHz



802.11n 20 High CH, 2462MHz



7 RADIATED EMISSION MEASUREMENT

7.1 RADIATED EMISSION LIMITS

In any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the Restricted band specified on Part15.205(a)&209(a) limit in the table and according to ANSI C63.10-2013 below has to be followed

LIMITS OF RADIATED EMISSION MEASUREMENT (0.009MHz - 1000MHz)

Frequencies (MHz)	Field Strength (micorvolts/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

LIMITS OF RADIATED EMISSION MEASUREMENT (1GHz-25 GHz)

FREQUENCY (MHz)	(dBuV/m) (at 3M)	
	PEAK	AVERAGE
Above 1000	74	54

Notes:

(1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

For Radiated Emission

Spectrum Parameter	Setting
Attenuation	Auto
Detector	Peak/AV
Start Frequency	1000 MHz(Peak/AV)
Stop Frequency	10th carrier hamonic(Peak/AV)
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz /10 Hz

For Band edge

Spectrum Parameter	Setting
Detector	Peak/AV
Start/Stop Frequency	Lower Band Edge: 2300 to 2403 MHz Upper Band Edge: 2479 to 2500 MHz
RB / VB (emission in restricted band)	PK=1MHz / 1MHz, AV=1 MHz / 10 Hz

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~90kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	90kHz~110kHz / RB 200Hz for QP
Start ~ Stop Frequency	110kHz~490kHz / RB 200Hz for PK & AV
Start ~ Stop Frequency	490kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

7.2 TEST PROCEDURE

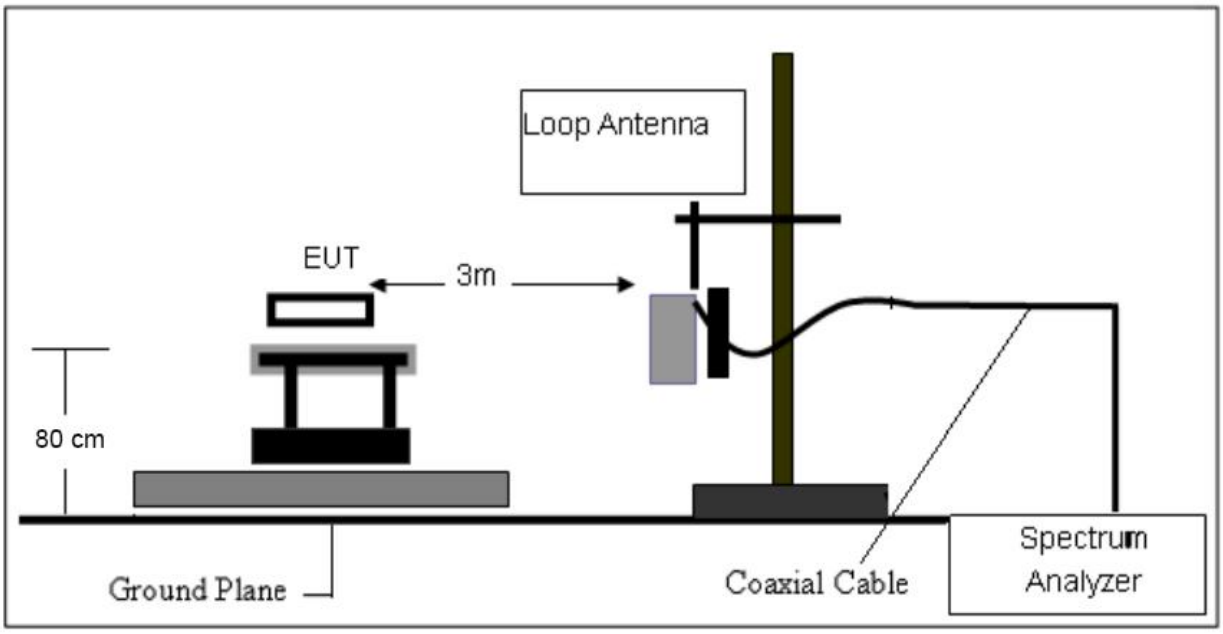
a. The measuring distance of at 3 m shall be used for measurements at frequency 0.009MHz up to 1GHz,and above 1GHz.
b. The EUT was placed on the top of a rotating table 0.8 meters (above 1GHz is 1.5 m) above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment shall be 0.8 m(above 1GHz is 1.5 m); the height of the test antenna shall vary between 1 m to 4 m. horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then QuasiPeak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

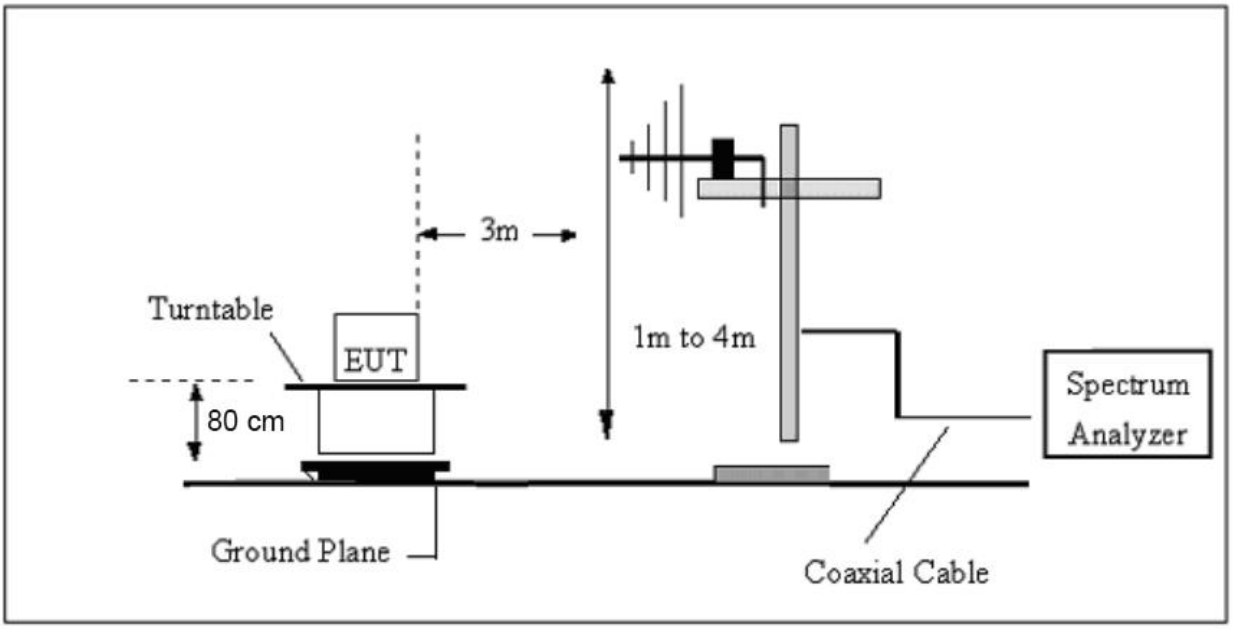
Both horizontal and vertical antenna polarities were tested
and performed pretest to three orthogonal axis. The worst case emissions were reported

7.3 TESTSETUP

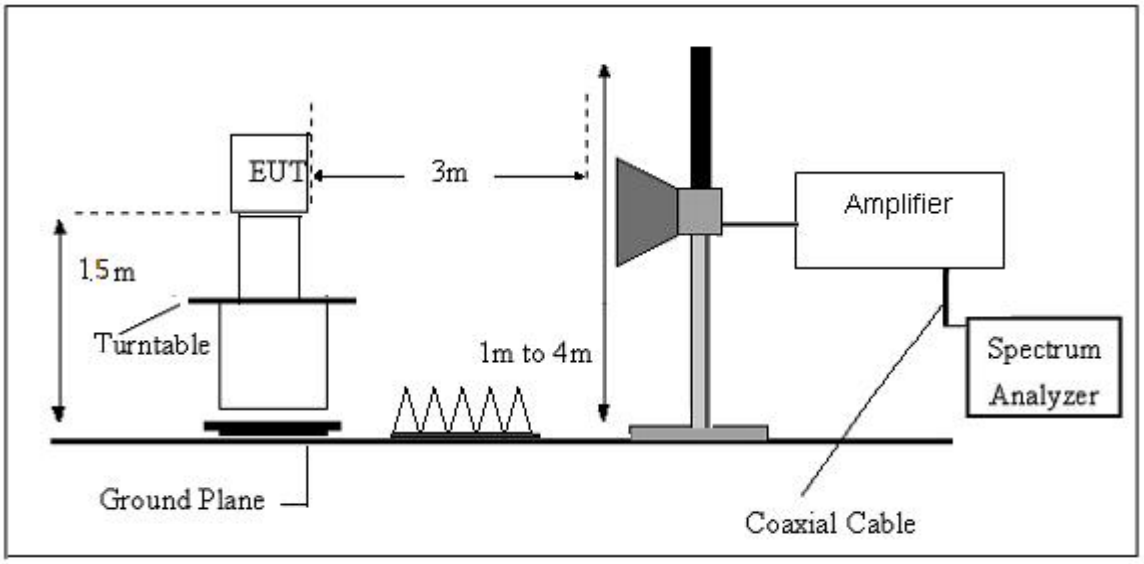
(A) Radiated Emission Test-Up Frequency Below 30MHz



(B) Radiated Emission Test-Up Frequency 30MHz~1GHz



(C) Radiated Emission Test-Up Frequency Above 1GHz



7.4. TEST RESULTS

(9KHz-30MHz)

Temperature:	22.7℃	Relative Humidity:	61%
Test Voltage:	DC 5V	Test Mode:	802.11b

Freq.	Reading	Limit	Margin	State	Test Result
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F	
--	--	--	--	--	PASS
--	--	--	--	--	PASS

Note:

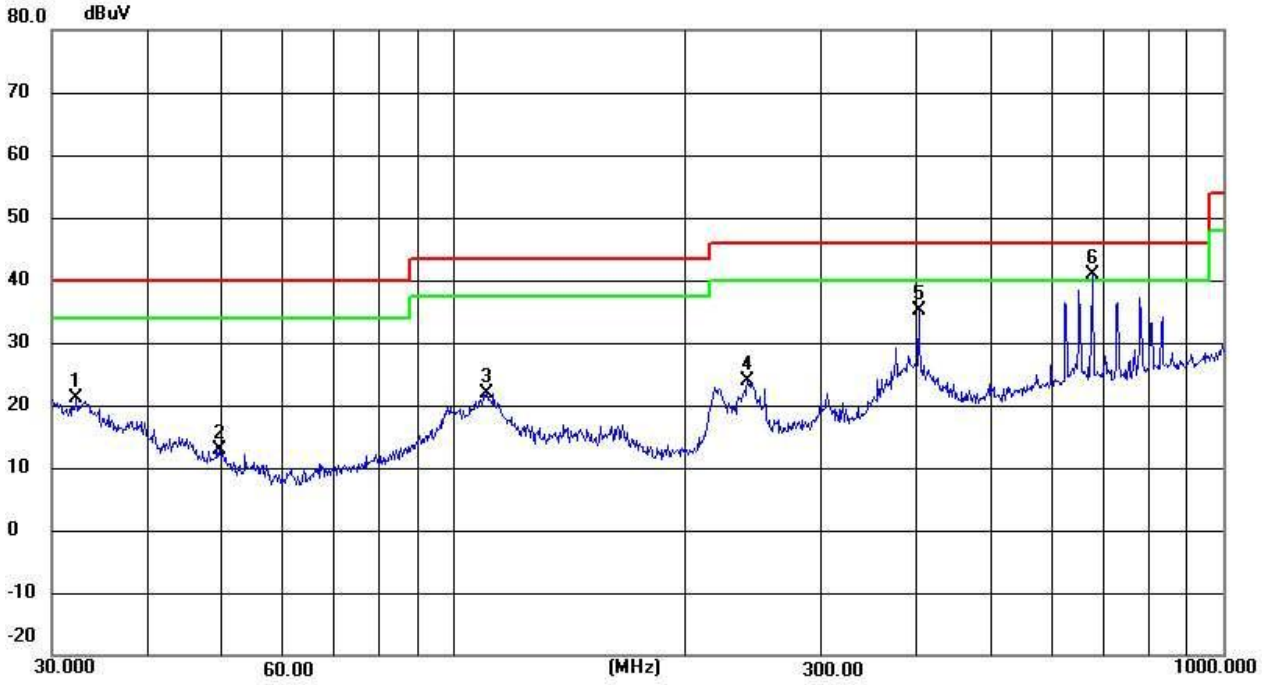
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits (dBuv) + distance extrapolation factor.

(30MHz-1000MHz)

Temperature:	24.7℃	Relative Humidity:	61%
Test Voltage:	DC 5V	Phase:	Horizontal
Test Mode:	802.11b(worst)		



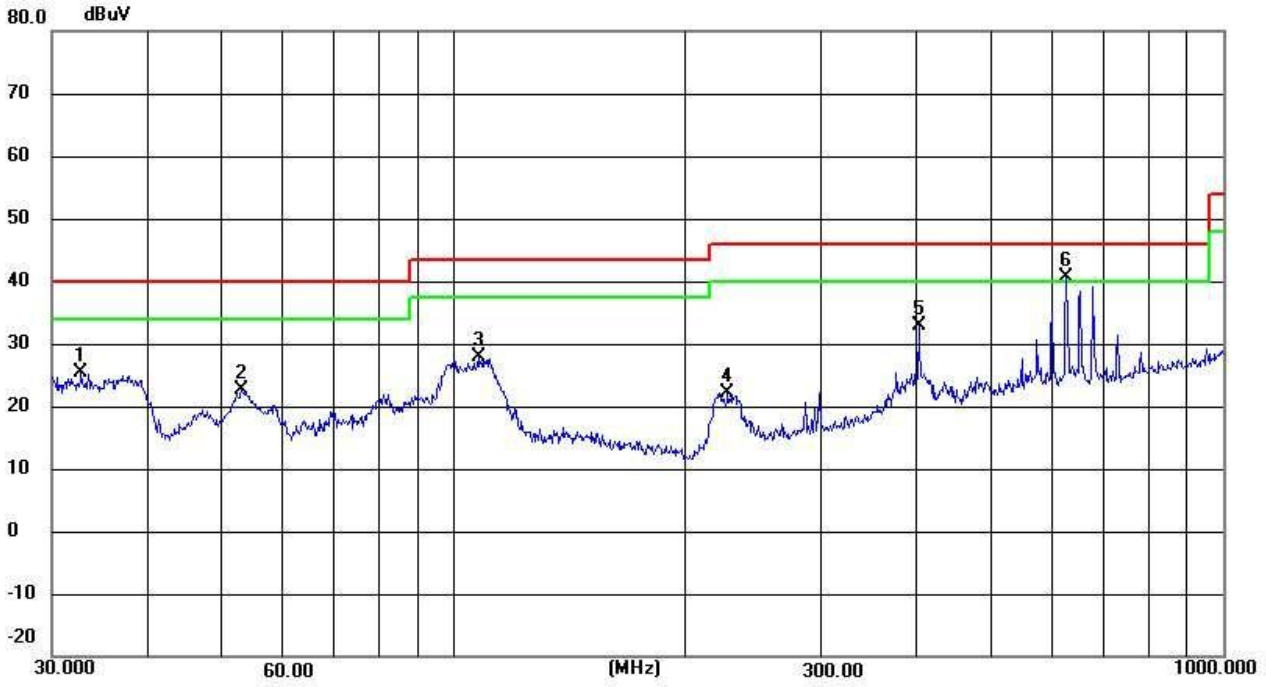
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.2925	29.96	-8.88	21.08	40.00	-18.92	QP
2	49.5328	30.66	- 17.68	12.98	40.00	-27.02	QP
3	110.1816	54.22	-32.29	21.93	43.50	-21.57	QP
4	240.8304	56.04	-32. 16	23.88	46.00	-22.12	QP
5	401.8385	67.10	-32.00	35.10	46.00	-10.90	QP
6	675.2080	72.48	-31.67	40.81	46.00	-5.19	QP

› Note: 1. Margin = Result (Result =Reading + Factor)–Limit

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Temperature:	22.7℃	Relative Humidity:	61%
Test Voltage:	DC 5V	Phase:	Vertical
Test Mode:	802.11b(worst)		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.7486	34.47	-9. 19	25.28	40.00	-14.72	QP
2	52.9453	41.68	- 18.99	22.69	40.00	- 17.31	QP
3	107.5101	60.22	-32.29	27.93	43.50	-15.57	QP
4	226.8936	54.28	-32. 17	22.11	46.00	-23.89	QP
5	401.8385	64.92	-32.00	32.92	46.00	-13.08	QP
6	625.0780	72.47	-31.73	40.74	46.00	-5.26	QP

Note: 1. Margin = Result (Result =Reading + Factor)–Limit

2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

(1GHz~25GHz) Restricted band and Spurious emission Requirements

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4824.00	37.46	31.28	8.62	24.17	53.19	74.00	-20.81	Vertical
7236.00	30.73	35.36	11.68	26.52	51.25	74.00	-22.75	Vertical
9648.00	31.12	37.44	14.16	25.44	57.28	74.00	-16.72	Vertical
12060.00	*					74.00		Vertical
14472.00	*					74.00		Vertical
16884.00	*					74.00		Vertical
4824.00	32.82	31.28	8.62	24.17	48.55	74.00	-25.45	Horizontal
7236.00	27.80	35.36	11.68	26.52	48.32	74.00	-25.68	Horizontal
9648.00	28.06	37.44	14.16	25.44	54.22	74.00	-19.78	Horizontal
12060.00	*					74.00		Horizontal
14472.00	*					74.00		Horizontal
16884.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4824.00	27.79	31.28	8.62	24.17	43.52	54.00	-10.48	Vertical
7236.00	23.46	35.36	11.68	26.52	43.98	54.00	-10.02	Vertical
9648.00	18.64	37.44	14.16	25.44	44.80	54.00	-9.20	Vertical
12060.00	*					54.00		Vertical
14472.00	*					54.00		Vertical
16884.00	*					54.00		Vertical
4824.00	22.90	31.28	8.62	24.17	38.63	54.00	-15.37	Horizontal
7236.00	19.49	35.36	11.68	26.52	40.01	54.00	-13.99	Horizontal
9648.00	20.55	37.44	14.16	25.44	46.71	54.00	-7.29	Horizontal
12060.00	*					54.00		Horizontal
14472.00	*					54.00		Horizontal
16884.00	*					54.00		Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*

802.11b(Worst)-Middle

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4874.00	37.69	32.02	8.66	24.12	54.25	74.00	-19.75	Vertical
7311.00	31.00	36.64	11.71	26.71	52.64	74.00	-21.36	Vertical
9748.00	30.36	38.54	14.25	25.38	57.77	74.00	-16.23	Vertical
12185.00	*					74.00		Vertical
14622.00	*					74.00		Vertical
17059.00	*					74.00		Vertical
4874.00	34.14	32.02	8.66	24.12	50.70	74.00	-23.30	Horizontal
7311.00	27.73	36.64	11.71	26.71	49.37	74.00	-24.63	Horizontal
9748.00	28.45	38.54	14.25	25.38	55.86	74.00	-18.14	Horizontal
12185.00	*					74.00		Horizontal
14622.00	*					74.00		Horizontal
17059.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4874.00	28.05	32.02	8.66	24.12	44.61	54.00	-9.39	Vertical
7311.00	23.43	36.64	11.71	26.71	45.07	54.00	-8.93	Vertical
9748.00	17.78	38.54	14.25	25.38	45.19	54.00	-8.81	Vertical
12185.00	*					54.00		Vertical
14622.00	*					54.00		Vertical
17059.00	*					54.00		Vertical
4874.00	24.33	32.02	8.66	24.12	40.89	54.00	-13.11	Horizontal
7311.00	19.40	36.64	11.71	26.71	41.04	54.00	-12.96	Horizontal
9748.00	19.92	38.54	14.25	25.38	47.33	54.00	-6.67	Horizontal
12185.00	*					54.00		Horizontal
14622.00	*					54.00		Horizontal
17059.00	*					54.00		Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*

802.11b(Worst)-High

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4924.00	38.23	32.14	8.70	24.05	55.02	74.00	-18.98	Vertical
7386.00	30.82	36.75	11.76	26.90	52.43	74.00	-21.57	Vertical
9848.00	30.04	38.79	14.31	25.30	57.84	74.00	-16.16	Vertical
12310.00	*					74.00		Vertical
14772.00	*					74.00		Vertical
17234.00	*					74.00		Vertical
4924.00	33.70	32.14	8.70	24.05	50.49	74.00	-23.51	Horizontal
7386.00	28.07	36.75	11.76	26.90	49.68	74.00	-24.32	Horizontal
9848.00	25.67	38.79	14.31	25.30	53.47	74.00	-20.53	Horizontal
12310.00	*					74.00		Horizontal
14772.00	*					74.00		Horizontal
17234.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4924.00	27.59	32.14	8.70	24.05	44.38	54.00	-9.62	Vertical
7386.00	23.05	36.75	11.76	26.90	44.66	54.00	-9.34	Vertical
9848.00	16.36	38.79	14.31	25.30	44.16	54.00	-9.84	Vertical
12310.00	*					54.00		Vertical
14772.00	*					54.00		Vertical
17234.00	*					54.00		Vertical
4924.00	23.09	32.14	8.70	24.05	39.88	54.00	-14.12	Horizontal
7386.00	19.58	36.75	11.76	26.90	41.19	54.00	-12.81	Horizontal
9848.00	17.14	38.79	14.31	25.30	44.94	54.00	-9.06	Horizontal
12310.00	*					54.00		Horizontal
14772.00	*					54.00		Horizontal
17234.00	*					54.00		Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*

3. Notes：emissions are attenuated 20dB below the limits, so it does not record.
4. The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.

802.11 b low CH

Peak

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	39.77	27.61	5.36	30.18	42.56	74	-31.44	Horizontal
2390.00	38.79	27.59	5.38	30.18	41.58	74	-32.42	Horizontal
2400.00	53.91	27.58	5.39	30.18	56.70	74	-17.30	Horizontal
2310.00	36.80	27.61	5.36	30.18	39.59	74	-34.41	Vertical
2390.00	39.99	27.59	5.38	30.18	42.78	74	-31.22	Vertical
2400.00	44.92	27.58	5.39	30.18	47.71	74	-26.29	Vertical

Avg

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	33.71	27.61	5.36	30.18	36.50	54	-17.50	Horizontal
2390.00	28.82	27.59	5.38	30.18	31.61	54	-22.39	Horizontal
2400.00	41.87	27.58	5.39	30.18	44.66	54	-9.34	Horizontal
2310.00	33.52	27.61	5.36	30.18	36.31	54	-17.69	Vertical
2390.00	31.46	27.59	5.38	30.18	34.25	54	-19.75	Vertical
2400.00	40.20	27.58	5.39	30.18	42.99	54	-11.01	Vertical

1.The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.

802.11 b High CH

Peak

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	38.72	27.53	5.47	29.93	41.79	74	-32.21	Horizontal
2500.00	40.78	27.55	5.49	29.93	43.89	74	-30.11	Horizontal
2483.50	43.51	27.53	5.47	29.93	46.58	74	-27.42	Vertical
2500.00	40.22	27.55	5.49	29.93	43.33	74	-30.67	Vertical

Avg

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	33.78	27.53	5.47	29.93	36.85	54	-17.15	Horizontal
2500.00	32.61	27.55	5.49	29.93	35.72	54	-18.28	Horizontal
2483.50	34.85	27.53	5.47	29.93	37.92	54	-16.08	Vertical
2500.00	30.10	27.55	5.49	29.93	33.21	54	-20.79	Vertical

802.11 g Low CH

Peak

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	38.93	27.61	5.36	30.18	41.72	74	-32.28	Horizontal
2390.00	37.95	27.59	5.38	30.18	40.74	74	-33.26	Horizontal
2400.00	53.07	27.58	5.39	30.18	55.86	74	-18.14	Horizontal
2310.00	35.96	27.61	5.36	30.18	38.75	74	-35.25	Vertical
2390.00	39.15	27.59	5.38	30.18	41.94	74	-32.06	Vertical
2400.00	44.08	27.58	5.39	30.18	46.87	74	-27.13	Vertical

Avg

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2310.00	32.92	27.61	5.36	30.18	35.71	54	-18.29	Horizontal
2390.00	28.03	27.59	5.38	30.18	30.82	54	-23.18	Horizontal
2400.00	41.08	27.58	5.39	30.18	43.87	54	-10.13	Horizontal
2310.00	32.73	27.61	5.36	30.18	35.52	54	-18.48	Vertical
2390.00	30.67	27.59	5.38	30.18	33.46	54	-20.54	Vertical
2400.00	39.41	27.58	5.39	30.18	42.2	54	-11.8	Vertical

1.The amplitude of spurious emissions which are attenuated more than 20 dB below the limits are not reported.

8 CONDUCTED EMISSION TEST

8.1.1 POWER LINE CONDUCTED EMISSION LIMITS

Operating frequency band. In case the emission fall within the restricted band specified on Part 207(a) limit in the table below has to be followed.

FREQUENCY (MHz)	Conducted Emissionlimit (dBuV)	
	Quasi-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Note:

(1) The tighter limit applies at the band edges.

(2) The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

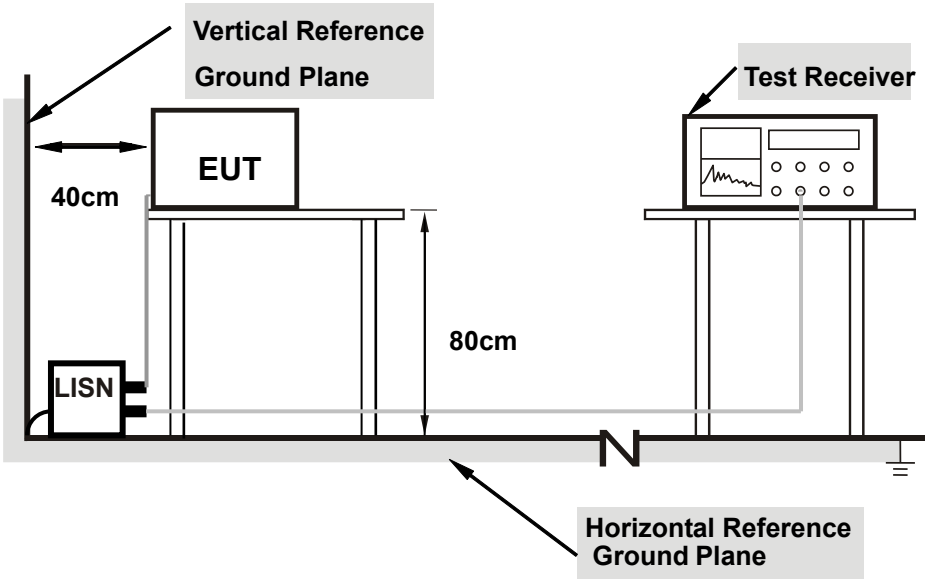
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

8.1.2 TEST PROCEDURE

a. The EUT was 0.8 meters from the horizontal ground plane and 0.4 meters from the vertical ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
d. LISN at least 80 cm from nearest part of EUT chassis.
e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

8.1.3 TEST SETUP



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

8.1.4 TEST RESULT

Temperature:	22.1 ℃	Relative Humidity:	56%
Test Voltage:	N/A	Phase:	N/A
Test Mode:	N/A		

9. ANTENNA REQUIREMENT

9.1 STANDARD REQUIREMENT

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.

9.2 RESULT

The antennas used for this product are PCB antenna and other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is 2.03dBi.

※※※※※END OF THE REPORT※※※※※