

Co-location Report

1 TEST RESULT

1.1 Radiated Emissions Measurement

1.1.1 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micровolts/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

1.1.2 Measuring Instruments and Setting

Please refer to section 2 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for peak

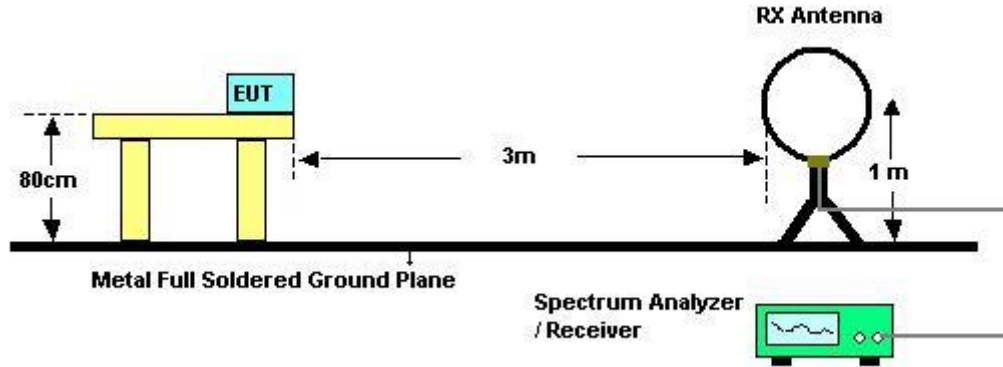
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

1.1.3 Test Procedures

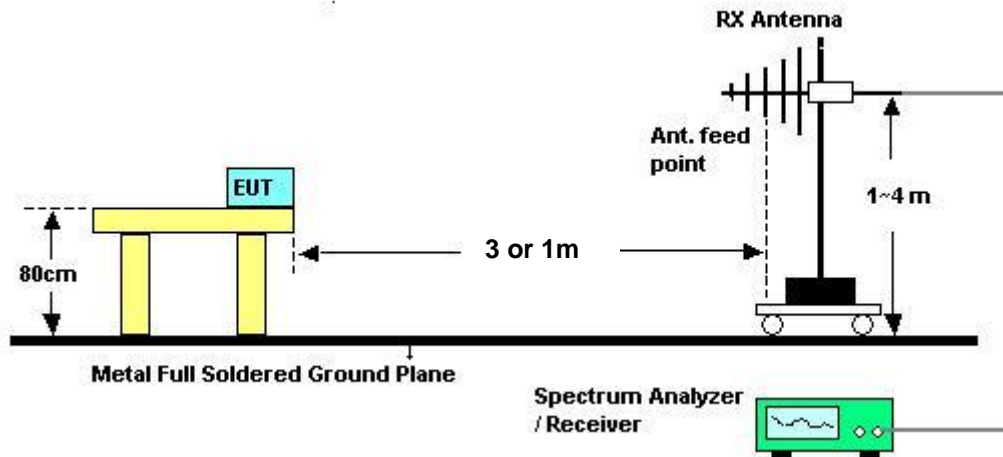
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average 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 for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions 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.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

1.1.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = $20 \log(\text{specific distance [3m]} / \text{test distance [1m]})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

1.1.5 Test Deviation

There is no deviation with the original standard.

1.1.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

1.1.7 Results of Radiated Emissions (9kHz~30MHz)

Final Test Date	Aug. 09, 2012	Test Site No.	03CH02-HY
Temperature	23°C	Humidity	59%
Test Engineer	Hsiao		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

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

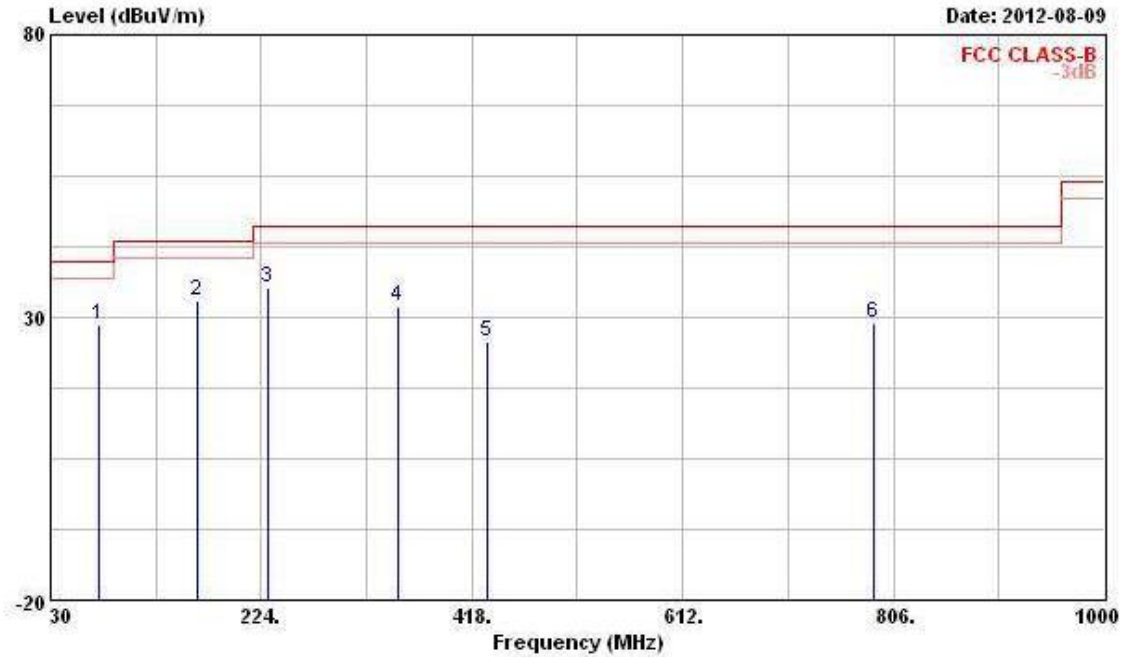
Distance extrapolation factor = $40 \log(\text{specific distance} / \text{test distance})$ (dB);

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

1.1.8 Results of Radiated Emissions (30MHz~1GHz)

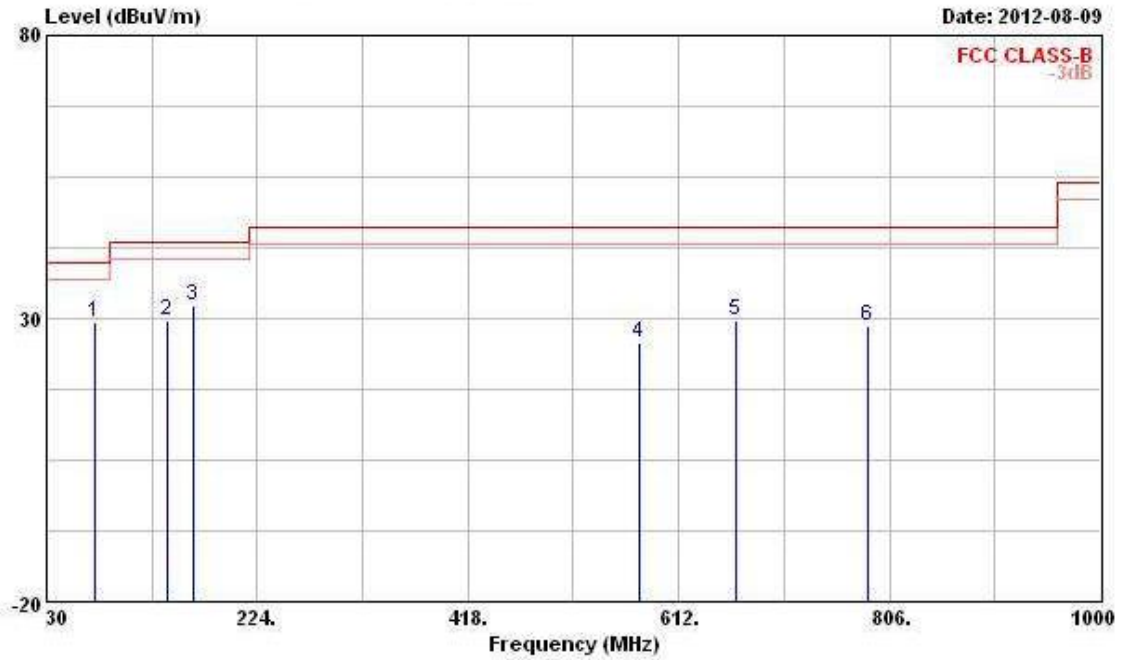
Final Test Date	Aug. 09, 2012	Test Site No.	03CH02-HY
Temperature	23°C	Humidity	59%
Test Engineer	Hsiao	Configuration	TX 11b 2437MHz and Zigbee 2440 MHz (Battery : ALT)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	74.620	28.68	-11.32	40.00	48.02	7.05	1.46	27.85	Peak	---	---
2	164.830	33.06	-10.44	43.50	48.14	10.34	2.14	27.56	Peak	---	---
3	230.790	35.42	-10.58	46.00	47.74	12.37	2.64	27.33	Peak	---	---
4	350.100	31.92	-14.08	46.00	41.78	14.48	3.18	27.52	Peak	---	---
5	431.580	25.60	-20.40	46.00	34.22	15.90	3.51	28.03	Peak	---	---
6	788.540	29.15	-16.85	46.00	32.18	20.10	4.85	27.98	Peak	---	---

Vertical



Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	74.620	29.43	-10.57	40.00	48.77	7.05	1.46	27.85 Peak	---	---
2	141.550	29.59	-13.91	43.50	43.48	11.78	2.00	27.67 Peak	---	---
3	164.830	32.25	-11.25	43.50	47.33	10.34	2.14	27.56 Peak	---	---
4	575.140	25.59	-20.41	46.00	30.44	19.45	4.14	28.44 Peak	---	---
5	664.380	29.80	-16.20	46.00	34.39	19.32	4.43	28.34 Peak	---	---
6	785.630	28.84	-17.16	46.00	31.93	20.06	4.84	27.99 Peak	---	---

Note:

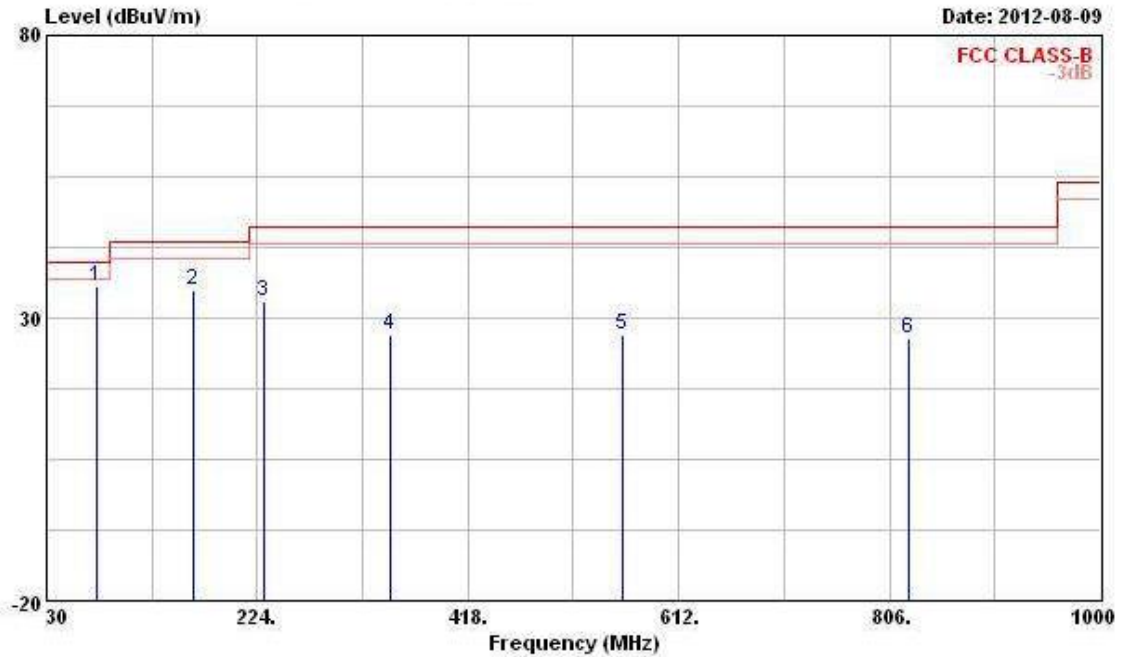
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

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

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

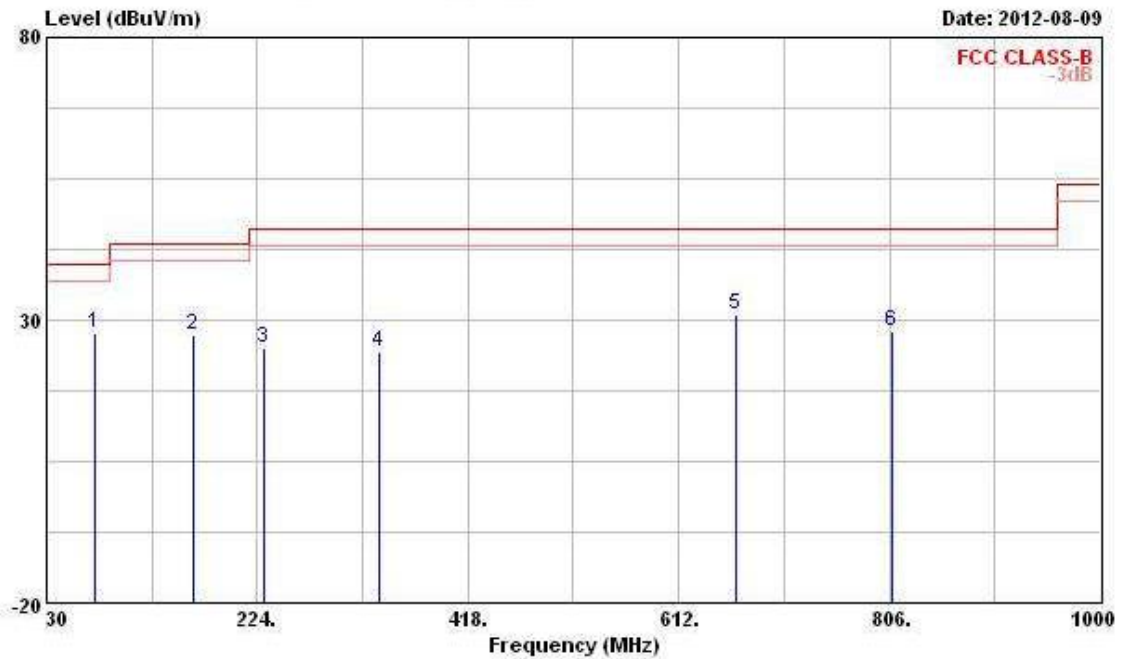
Final Test Date	Aug. 09, 2012	Test Site No.	03CH02-HY
Temperature	23°C	Humidity	59%
Test Engineer	Hsiao	Configuration	TX 11b 2437MHz and Zigbee 2440 MHz (Battery : Samsung)

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	75.590	35.47	-4.53	40.00	54.74	7.11	1.47	27.85	Peak	---	---
2	164.830	34.83	-8.67	43.50	49.91	10.34	2.14	27.56	Peak	---	---
3	230.790	33.05	-12.95	46.00	45.37	12.37	2.64	27.33	Peak	---	---
4	347.190	27.17	-18.83	46.00	37.06	14.43	3.17	27.49	Peak	---	---
5	559.620	26.93	-19.07	46.00	32.27	19.00	4.08	28.42	Peak	---	---
6	824.430	26.45	-19.55	46.00	29.13	20.21	4.97	27.86	Peak	---	---

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	74.620	27.63	-12.37	40.00	46.97	7.05	1.46	27.85	Peak	---	---
2	164.830	27.48	-16.02	43.50	42.56	10.34	2.14	27.56	Peak	---	---
3	230.790	25.02	-20.98	46.00	37.34	12.37	2.64	27.33	Peak	---	---
4	335.550	24.57	-21.43	46.00	34.60	14.26	3.12	27.41	Peak	---	---
5	665.350	31.09	-14.91	46.00	35.68	19.31	4.44	28.34	Peak	---	---
6	807.940	28.17	-17.83	46.00	30.91	20.25	4.92	27.91	Peak	---	---

Note:

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

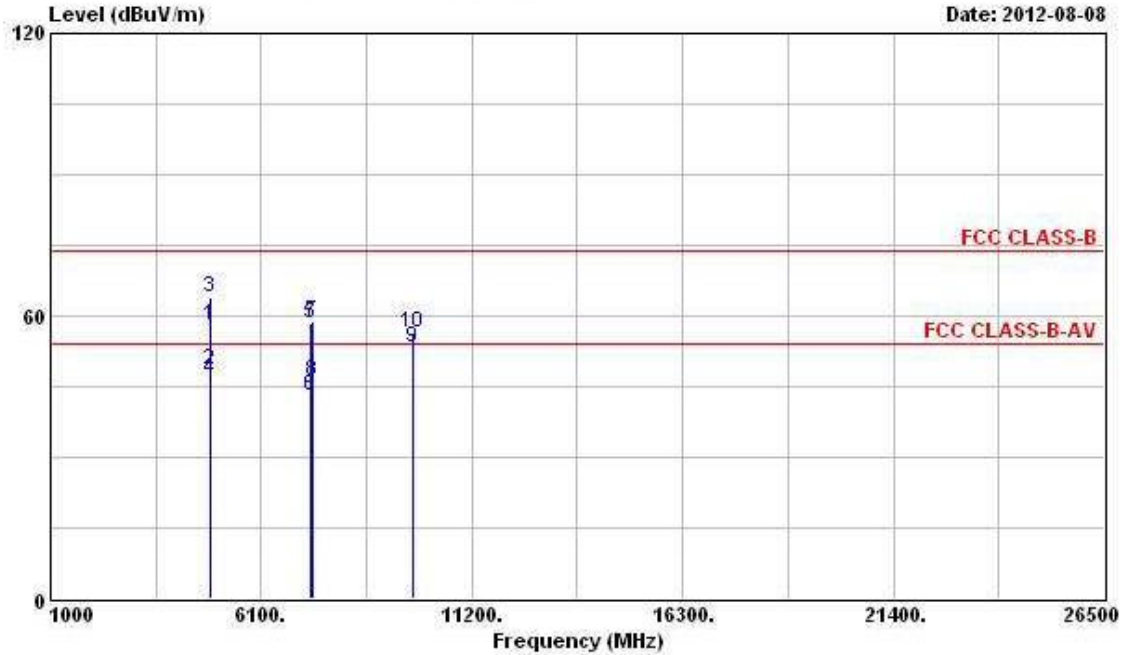
Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

1.1.9 Results for Radiated Emissions (1GHz~10th Harmonic)

Final Test Date	Aug. 08, 2012	Test Site No.	03CH02-HY
Temperature	23°C	Humidity	59%
Test Engineer	Hsiao	Configuration	TX 11b 2437MHz and Zigbee 2440 MHz (Battery : Samsung)

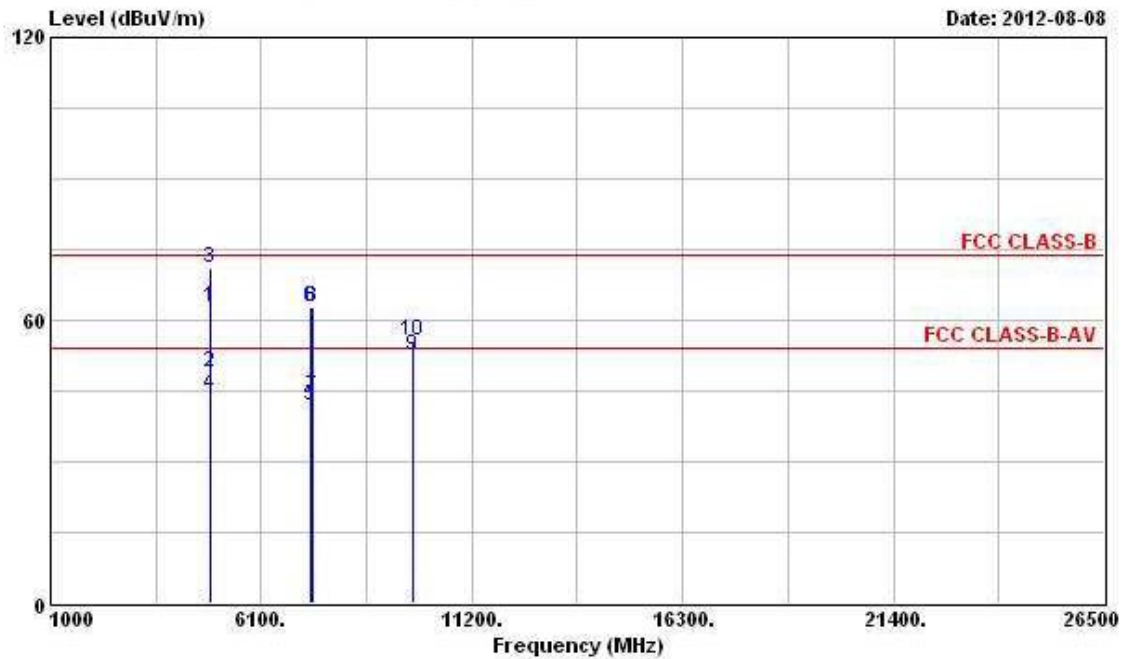
Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	57.88	-16.12	74.00	52.22	35.83	4.61	34.78	Peak	---	---
2	4874.000	48.66	-5.34	54.00	43.00	35.83	4.61	34.78	Average	---	---
3	4880.000	64.07	-9.93	74.00	58.41	35.83	4.61	34.78	Peak	---	---
4	4880.000	46.58	-7.42	54.00	40.92	35.83	4.61	34.78	Average	---	---
5	7311.000	58.37	-15.63	74.00	49.97	37.86	5.64	35.10	Peak	---	---
6	7311.000	43.08	-10.92	54.00	34.68	37.86	5.64	35.10	Average	---	---
7	7320.000	58.91	-15.09	74.00	50.50	37.87	5.64	35.10	Peak	---	---
8	7320.000	46.31	-7.69	54.00	37.90	37.87	5.64	35.10	Average	---	---
9	9748.000	53.48			43.09	39.51	6.36	35.48	Peak	---	---
10	9760.000	56.34			45.95	39.51	6.36	35.48	Peak	---	---

Note: The Items 9 and 10 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	4874.000	62.89	-11.11	74.00	57.88	35.18	4.61	34.78	Peak	---	---
2	4874.000	49.13	-4.87	54.00	44.12	35.18	4.61	34.78	Average	---	---
3	4880.000	70.88	-3.12	74.00	65.87	35.18	4.61	34.78	Peak	---	---
4	4880.000	44.14	-9.86	54.00	39.13	35.18	4.61	34.78	Average	---	---
5	7311.000	41.82	-12.18	54.00	34.36	36.92	5.64	35.10	Average	---	---
6	7311.000	62.64	-11.36	74.00	55.18	36.92	5.64	35.10	Peak	---	---
7	7320.000	43.80	-10.20	54.00	36.33	36.93	5.64	35.10	Average	---	---
8	7320.000	62.94	-11.06	74.00	55.47	36.93	5.64	35.10	Peak	---	---
9	9748.000	52.50			42.91	38.71	6.36	35.48	Peak	---	---
10	9760.000	55.81			46.22	38.71	6.36	35.48	Peak	---	---

Note: The Items 9 and 10 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

2 LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Sep. 01, 2011	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 10, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 23, 2012	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1GHz ~ 26.5GHz	Aug. 06, 2012	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 15, 2011	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Nov. 11, 2011	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1GHz ~ 40GHz	Mar. 06, 2012	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2011	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2010*	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is two year.

3 TEST LOCATION

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei 221, Taiwan, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C TEL : 886-3-327-3456 FAX : 886-3-327-0973
LINKOU	ADD : No. 30-2, Dingfu Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C. TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei 114, Taiwan, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei 235, Taiwan, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 nd Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085