

# **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.

<b>Frequencies (MHz)</b>	<b>Field Strength (micorvolts/meter)</b>	<b>Measurement Distance (meters)</b>
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.

<b>Spectrum Parameter</b>	<b>Setting</b>
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)	100KHz / 100KHz for peak

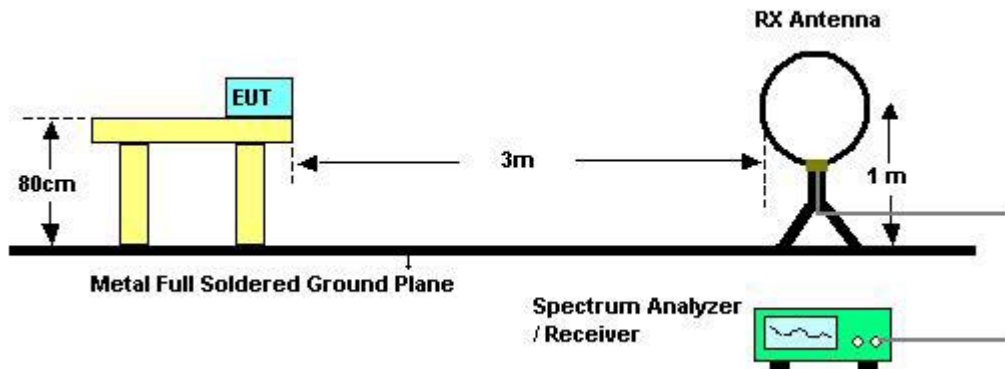
<b>Receiver Parameter</b>	<b>Setting</b>
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

**1.1.3. Test Procedures**

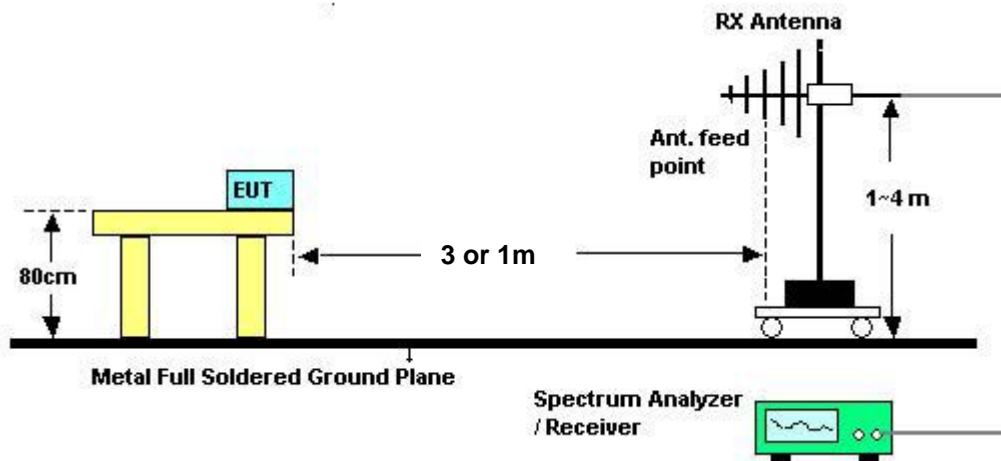
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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)**

<b>Test date</b>	Sep. 19, 2008	<b>Test Site No.</b>	03CH03-HY
<b>Temperature</b>	26	<b>Humidity</b>	54%
<b>Test Engineer</b>	Duncan		

<b>Freq. (MHz)</b>	<b>Level (dBuV)</b>	<b>Over Limit (dB)</b>	<b>Limit Line (dBuV)</b>	<b>Remark</b>
-	-	-	-	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);

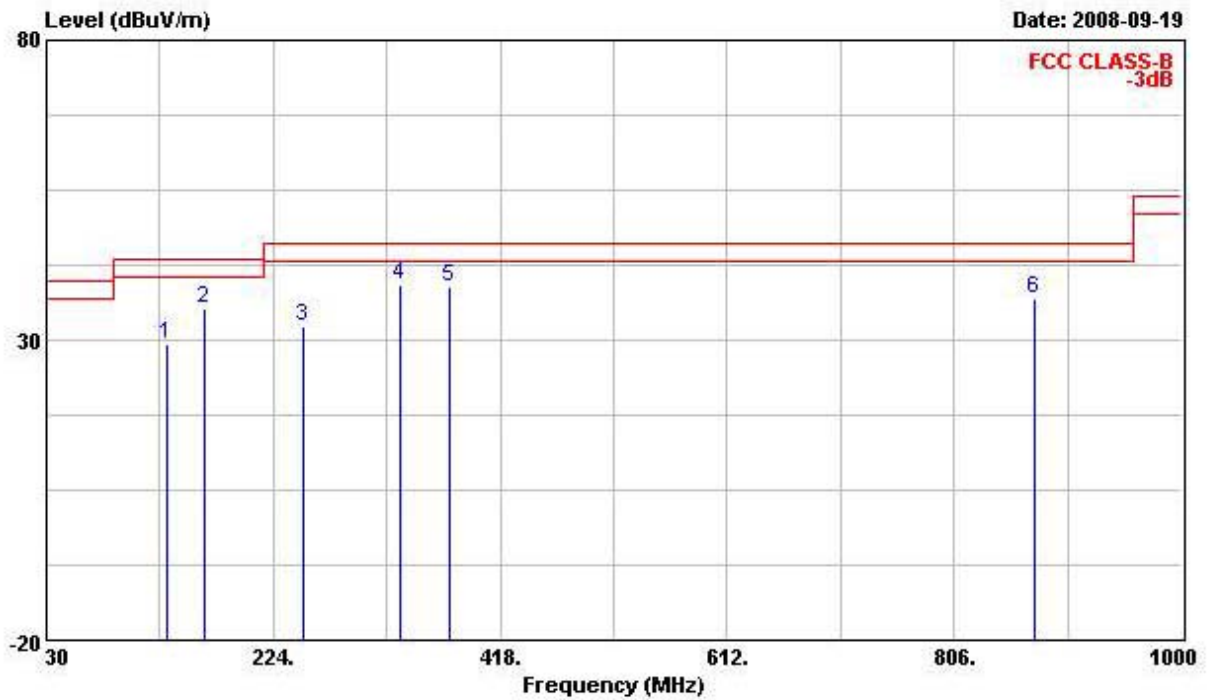
Limit line = specific limits (dBuV) + distance extrapolation factor.

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

External Omni-Direction Antenna (3CWE591)

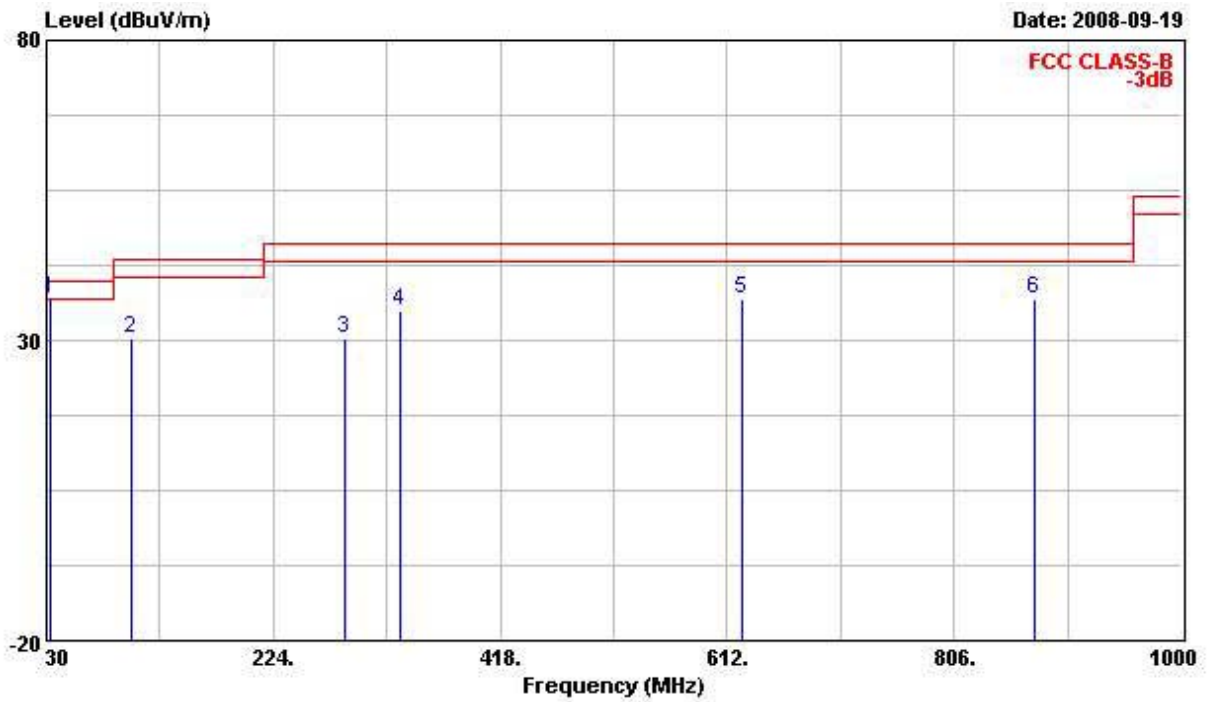
Test date	Sep. 19, 2008	Test Site No.	03CH03-HY
Temperature	26	Humidity	54%
Test Engineer	Duncan	Configuration	802.11a Ch36 & 802.11b Ch06

Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	132.820	29.22	-14.28	43.50	42.94	12.10	2.05	27.87	Peak
2	164.830	35.28	-8.22	43.50	51.20	9.89	2.17	27.98	Peak
3	249.220	32.20	-13.80	46.00	45.18	12.58	2.69	28.25	Peak
4	331.670	39.15	-6.85	46.00	50.09	14.59	3.11	28.64	Peak
5	374.350	38.75	-7.25	46.00	48.47	15.62	3.42	28.76	Peak
6	874.870	36.95	-9.05	46.00	40.03	20.94	5.15	29.17	Peak

Vertical



	Freq	Level	Over Limit	Limit Line	ReadAntenna	Cable	Preamp	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB
1	32.910	36.82	-3.18	40.00	46.78	16.71	1.03	27.70 QP
2	102.750	30.36	-13.14	43.50	44.87	11.56	1.74	27.81 Peak
3	285.110	30.48	-15.52	46.00	42.71	13.32	2.83	28.38 Peak
4	331.670	34.78	-11.22	46.00	45.72	14.59	3.11	28.64 Peak
5	625.580	36.99	-9.01	46.00	42.73	19.47	4.29	29.50 Peak
6	874.870	37.05	-8.95	46.00	40.13	20.94	5.15	29.17 Peak

Note:

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

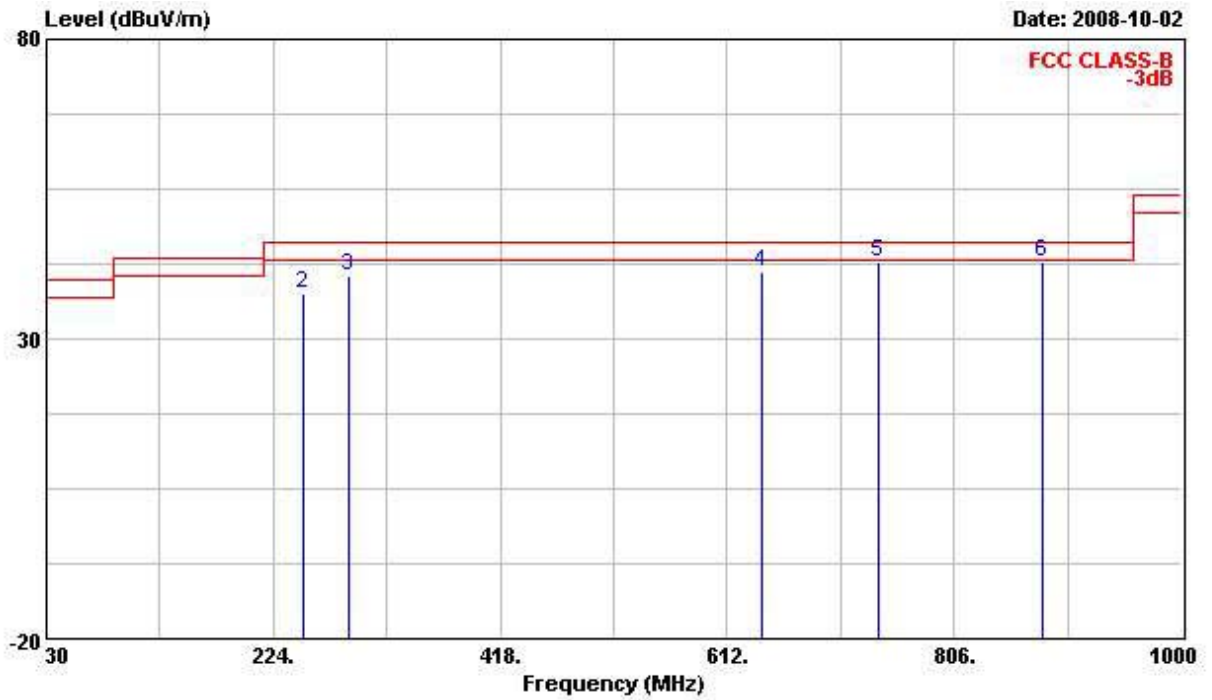
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

External Panel Antenna (3CWE596)

Test date	Oct, 02, 2008	Test Site No.	03CH03-HY
Temperature	26	Humidity	54%
Test Engineer	Duncan	Configuration	802.11n Ch06 (20MHz) & 802.11n Ch46 (40MHz)

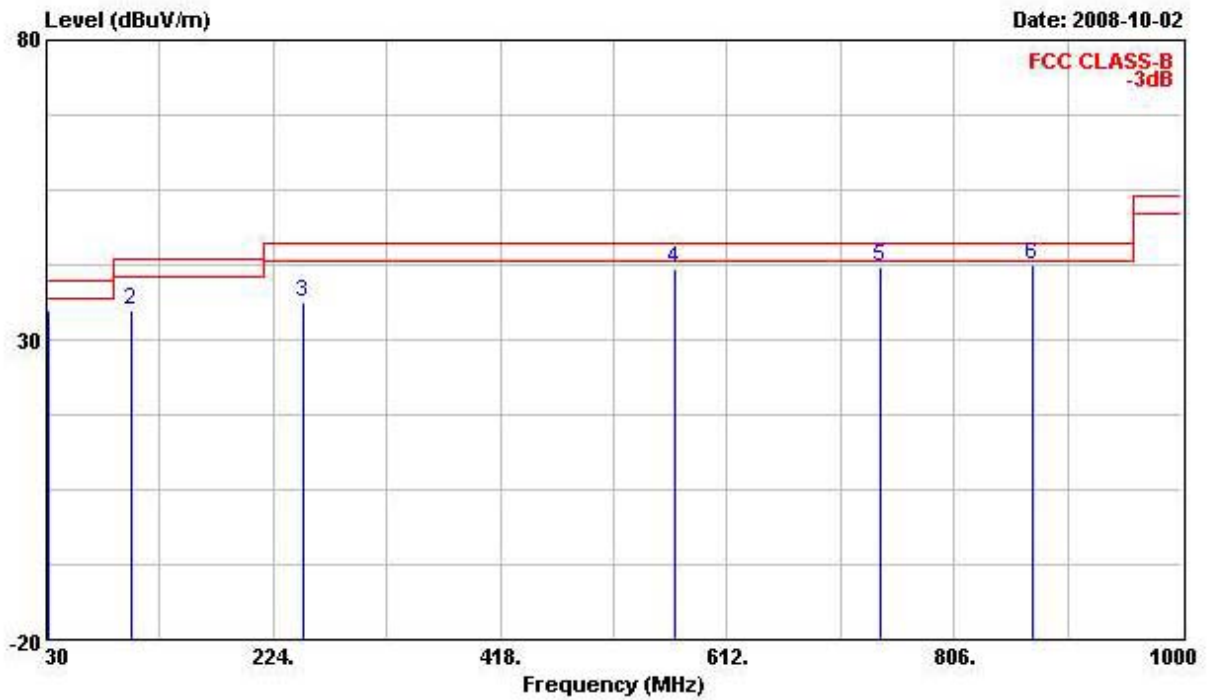
Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	30.000	36.90	-3.10	40.00	45.09	18.48	1.01	27.68	Peak
2	249.220	37.51	-8.49	46.00	50.49	12.58	2.69	28.25	Peak
3	288.990	40.42	-5.58	46.00	52.63	13.39	2.81	28.40	Peak
4	642.070	41.20	-4.80	46.00	46.79	19.58	4.33	29.50	Peak
5	741.980	42.84	-3.16	46.00	47.20	20.59	4.66	29.61	Peak
6	881.660	42.78	-3.22	46.00	45.82	20.96	5.14	29.14	Peak



Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	31.940	34.90	-5.10	40.00	44.27	17.30	1.02	27.69	QP
2	102.750	34.97	-8.53	43.50	49.48	11.56	1.74	27.81	Peak
3	249.220	36.10	-9.90	46.00	49.08	12.58	2.69	28.25	Peak
4	567.380	41.73	-4.27	46.00	47.23	19.30	4.09	28.90	Peak
5	742.950	42.11	-3.89	46.00	46.46	20.60	4.66	29.60	Peak
6	873.900	42.60	-3.40	46.00	45.69	20.93	5.16	29.18	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).

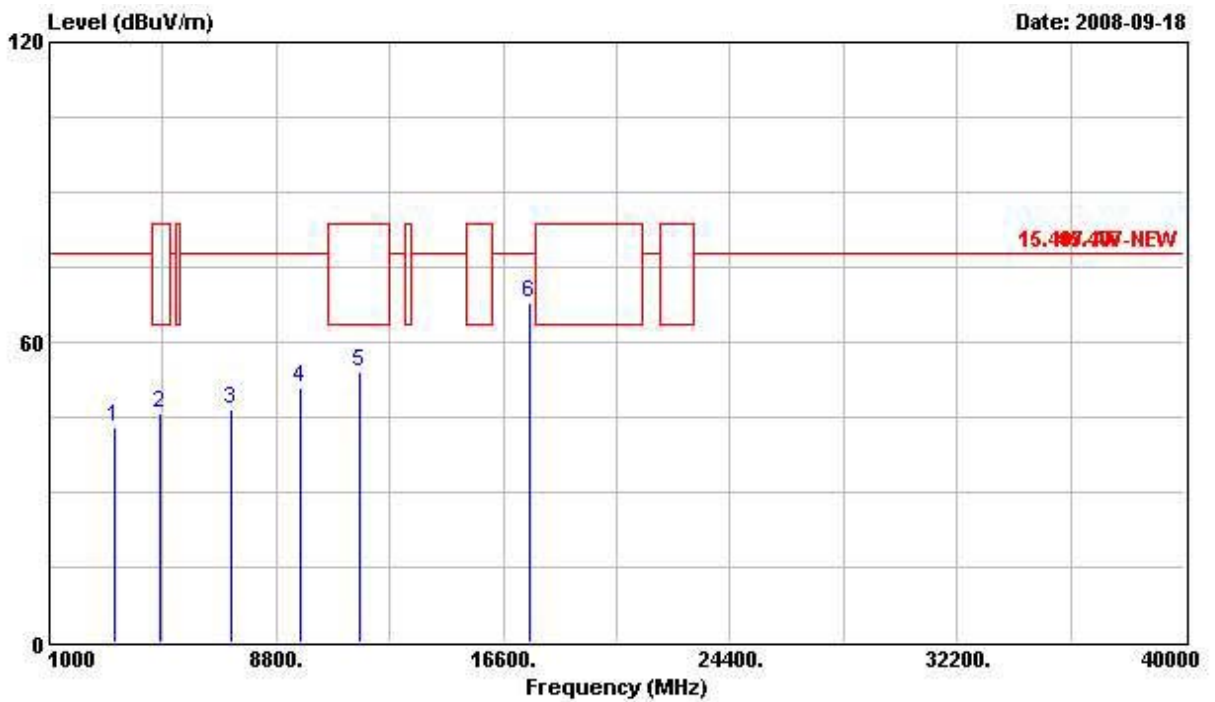
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

1.1.9. Results for Radiated Emissions (1GHz~10<sup>th</sup> Harmonic)

External Omni-Direction Antenna (3CWE591)

Test date	Sep. 18, 2008	Test Site No.	03CH03-HY
Temperature	26	Humidity	54%
Test Engineer	Duncan	Configuration	802.11a Ch165 (20MHz) & 802.11b Ch01

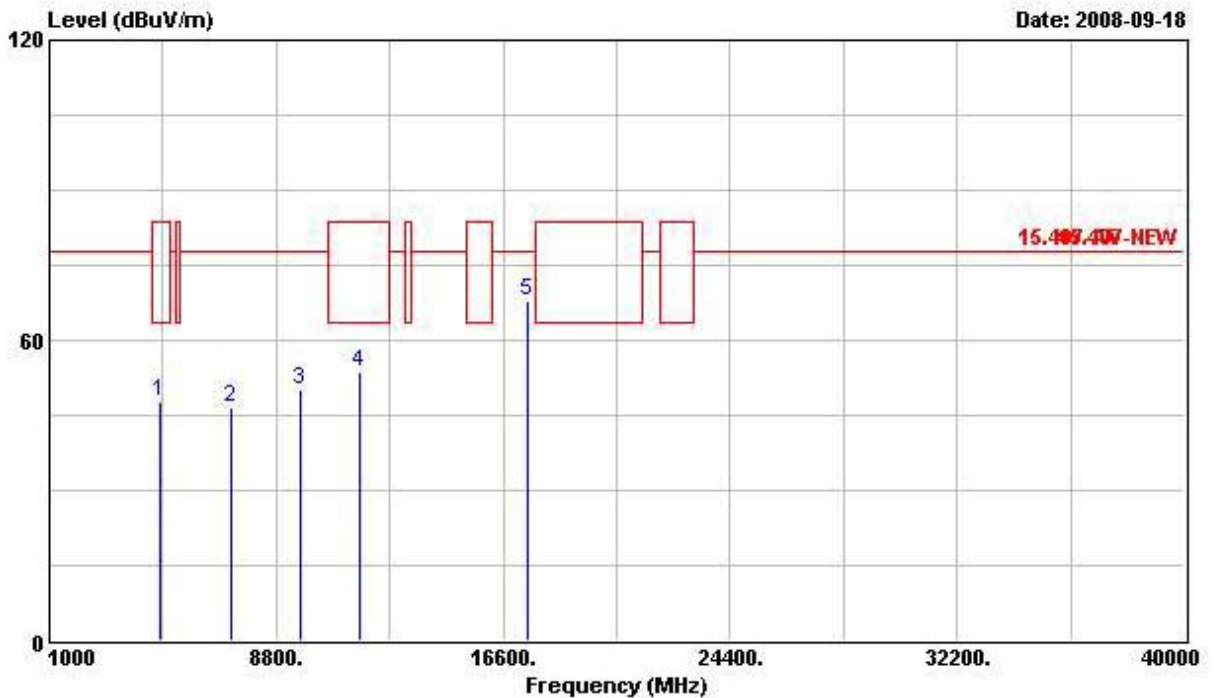
Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBUV/m	dB	dBUV/m	dBUV	dB/m	dB	dB	
1	3216.000	42.91	-34.93	77.84	42.24	31.10	2.47	32.91	PEAK
2	4824.000	45.92	-37.62	83.54	40.61	33.75	4.03	32.47	PEAK
3	7236.000	46.66	-31.18	77.84	39.13	36.68	3.67	32.82	PEAK
4	9652.000	50.79	-27.05	77.84	39.89	38.64	5.21	32.95	PEAK
5	11650.000	54.22	-29.32	83.54	40.68	39.56	6.57	32.59	PEAK
6	17479.000	67.77	-10.07	77.84	43.28	45.22	7.84	28.57	PEAK

Note: Items 1, 3 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	Remark
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	
			dB	dBuV/m	dBuV	dB	dB	
1	4828.000	47.69	-35.85	83.54	42.38	33.75	4.03	32.47 PEAK
2	7236.000	46.40	-31.44	77.84	38.87	36.68	3.67	32.82 PEAK
3	9648.000	49.97	-27.87	77.84	39.07	38.64	5.21	32.95 PEAK
4	11654.000	53.61	-29.93	83.54	40.09	39.54	6.57	32.59 PEAK
5 @	17475.000	67.88	-9.96	77.84	43.39	45.22	7.84	28.57 PEAK

Note: Items 2, 3 and 5 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

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

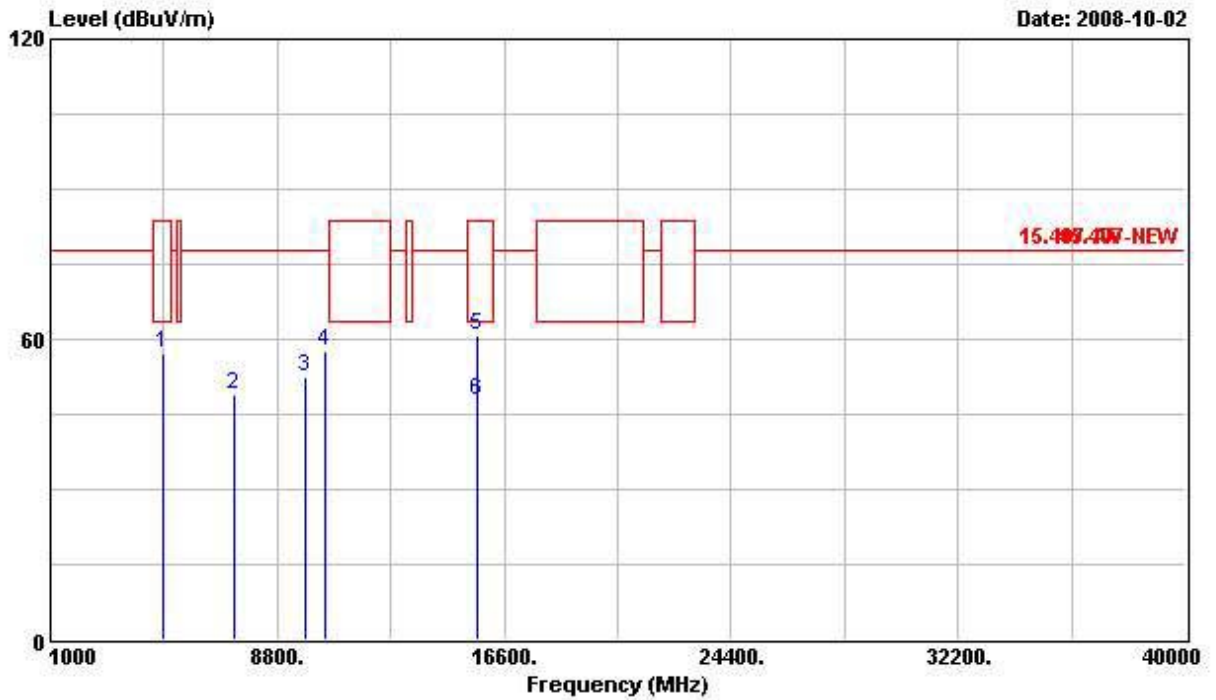
Emission level (dBuV/m) = 20 log Emission level (uV/m).

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

External Panel Antenna (3CWE596)

Test date	Oct. 02, 2008	Test Site No.	03CH03-HY
Temperature	26	Humidity	54%
Test Engineer	Duncan	Configuration	802.11a Ch165 (20MHz) & 802.11b Ch01

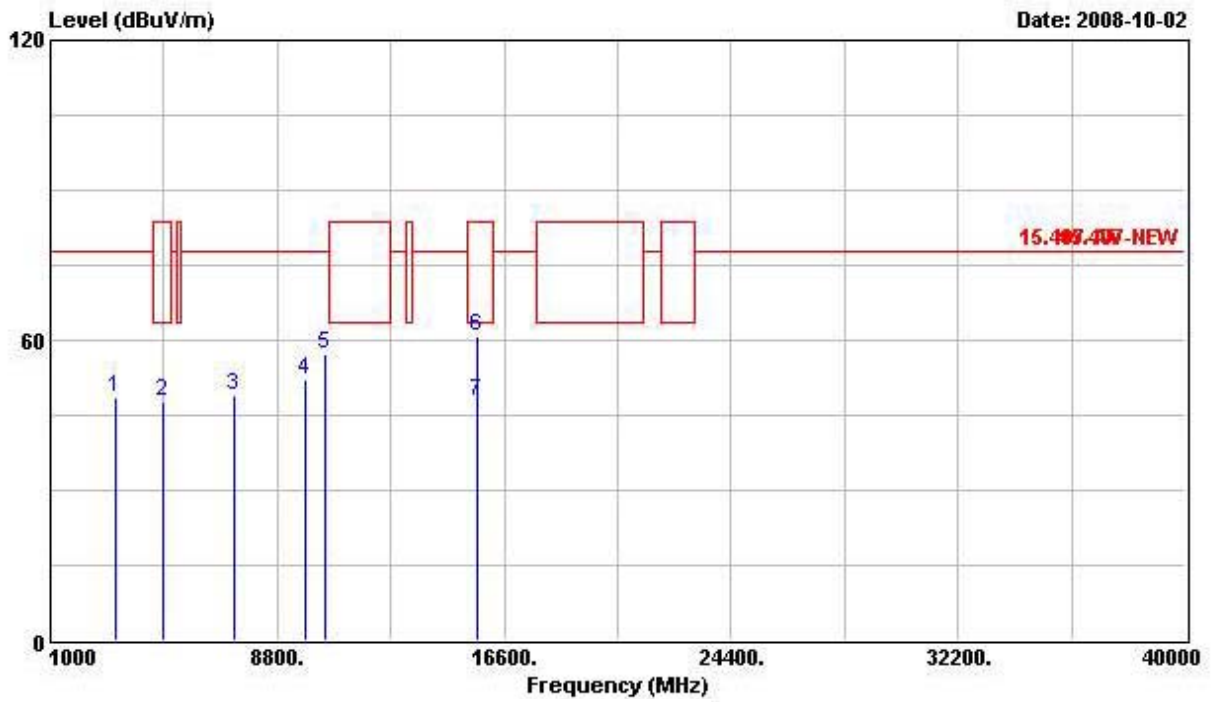
Horizontal



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	4878.000	57.43	-26.11	83.54	51.99	33.89	4.02	32.47	PEAK
2	7315.000	49.05	-28.79	77.84	41.16	36.84	3.91	32.87	PEAK
3	9752.000	52.37	-25.47	77.84	41.11	38.87	5.31	32.92	PEAK
4	10464.000	57.45	-20.39	77.84	43.25	39.31	6.23	31.34	PEAK
5	15690.000	60.96	-22.58	83.54	45.60	37.58	7.40	29.61	PEAK
6	15690.000	47.80	-15.74	63.54	32.43	37.58	7.40	29.61	Average

Note: Items 3 and 4 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	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	
1	3248.000	48.61	-29.23	77.84	47.86	31.18	2.48	32.91	PEAK
2	4874.000	47.63	-35.91	83.54	42.19	33.89	4.02	32.47	PEAK
3	7315.000	48.81	-29.03	77.84	40.92	36.84	3.91	32.87	PEAK
4	9744.000	52.23	-25.61	77.84	41.00	38.83	5.31	32.92	PEAK
5	10464.000	57.04	-20.80	77.84	42.84	39.31	6.23	31.34	PEAK
6	15690.000	60.90	-22.64	83.54	45.54	37.58	7.40	29.61	PEAK
7	15690.000	47.85	-15.69	63.54	32.48	37.58	7.40	29.61	Average

Note: Items 1, 4 and 5 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

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.

**2. LIST OF MEASURING EQUIPMENTS**

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Characteristics</b>	<b>Calibration Date</b>	<b>Remark</b>
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 13, 2008	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	COA9231A	18667	9 kHz - 2 GHz	Jan. 14, 2008	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	Jul. 21, 2008	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP30	100023	9 kHz - 30 GHz	Jan. 10, 2008	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz – 1 GHz	Jul. 12, 2008	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	Mar. 04, 2008	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	Jan.18, 2008	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Dec. 03, 2007	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec. 03, 2007	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 – 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)

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

<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No.</b>	<b>Serial No.</b>	<b>Characteristics</b>	<b>Calibration Date</b>	<b>Remark</b>
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5 GHz - 40 GHz	Jan. 22, 2007*	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 22, 2008*	Radiation (03CH03-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, Taiwan 221, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 <sup>nd</sup> 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