

## 4.5. Radiated Emissions Measurement

### 4.5.1. 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 (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

### 4.5.2. Measuring Instruments and Setting

Please refer to section 5 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)	1000KHz / 1000KHz for peak

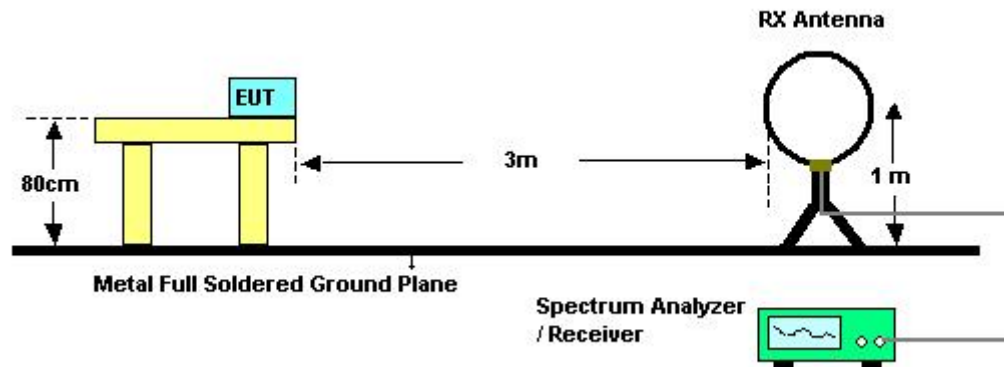
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

#### 4.5.3. Test Procedures

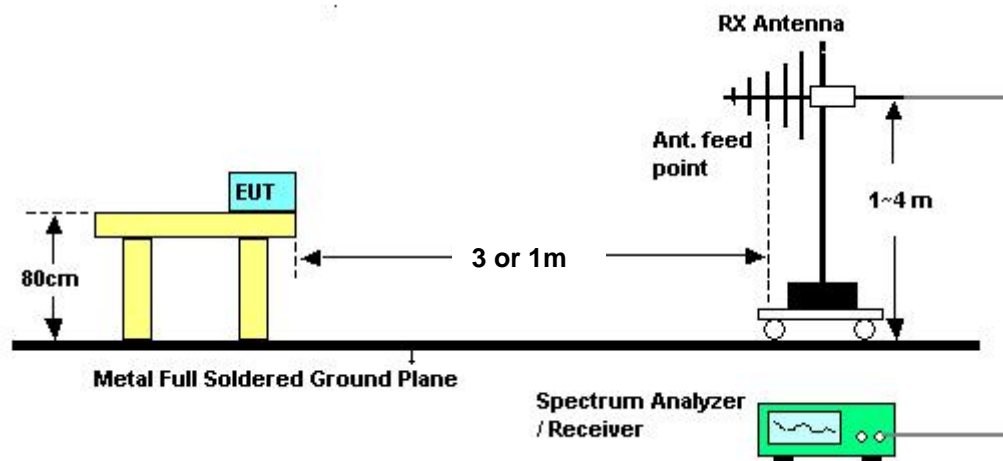
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting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

#### 4.5.4. 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].

#### 4.5.5. Test Deviation

There is no deviation with the original standard.

#### 4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.5.7. Results of Radiated Emissions (9kHz~30MHz)

<b>Temperature</b>	24°C	<b>Humidity</b>	64%
<b>Test Engineer</b>	Leo Hung	<b>Configurations</b>	802.11n Ch 6 40MHz Ant. A + Ant. B

<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 which are attenuated by more than 20 dB below the permissible value has no need to be reported.

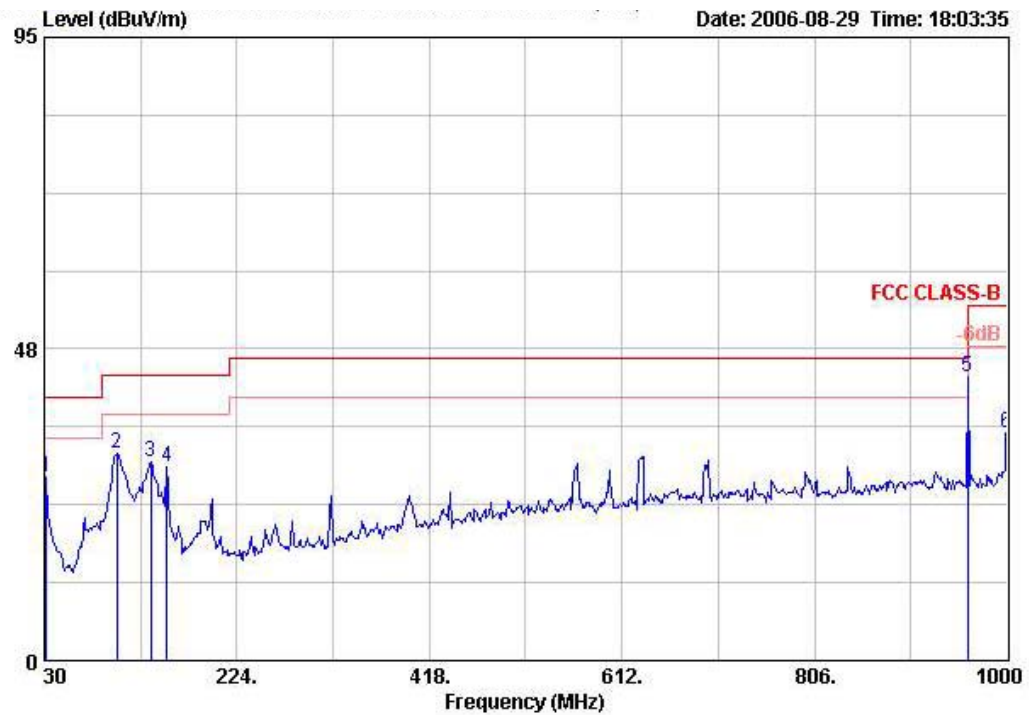
Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

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

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

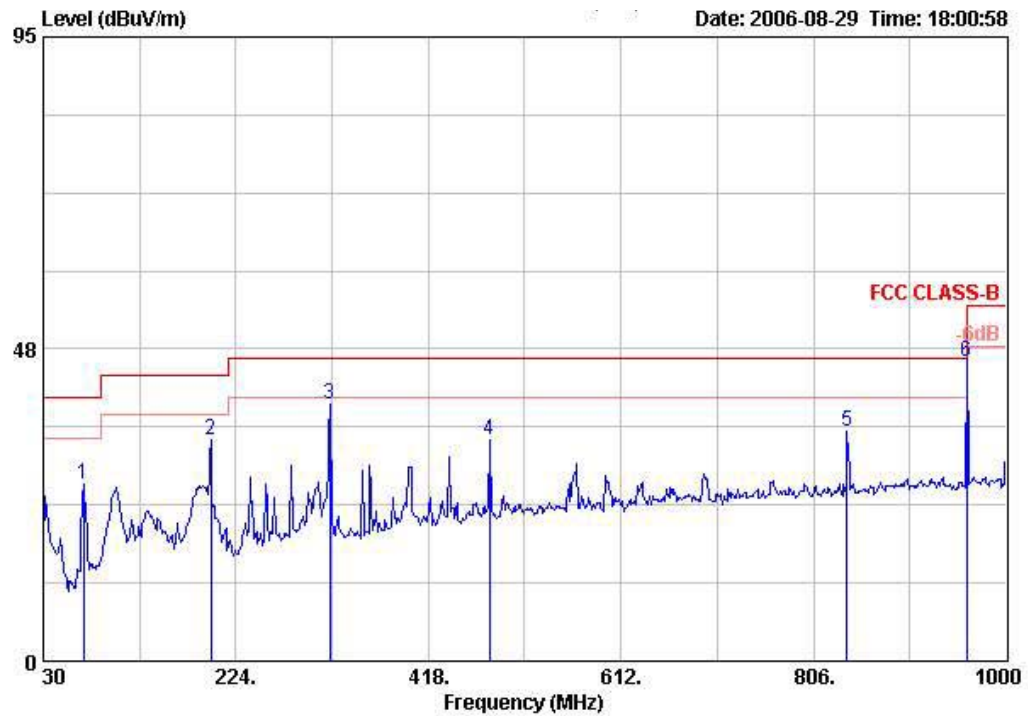
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n 40MHz Ch 6 Ant. A

Vertical



	Freq	Level	Over	Limit	Read	Cable	Preamp		Ant	TableAntenna
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB		cm	deg dB/m
1	31.940	28.06	-11.94	40.00	40.15	0.93	31.67	Peak	---	18.66
2	102.750	31.54	-11.96	43.50	50.08	1.50	31.72	Peak	---	11.68
3	137.670	30.22	-13.28	43.50	48.17	1.70	31.59	Peak	---	11.94
4	153.190	29.48	-14.02	43.50	48.09	1.90	31.53	Peak	---	11.02
5 !	959.966	43.27	-2.73	46.00	46.90	3.92	29.49	QP	---	21.94
6	1000.000	34.63	-19.37	54.00	37.90	4.00	29.37	Peak	---	22.10

## Horizontal



	Freq	Level	Over	Limit	Read	Cable	Preamp		Ant	TableAntenna
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos Factor
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB		cm	deg dB/m
1	70.740	26.95	-13.05	40.00	50.57	1.43	31.74	Peak	---	6.69
2	198.780	33.77	-9.73	43.50	53.08	2.00	31.45	Peak	---	10.14
3	319.060	39.10	-6.90	46.00	53.57	2.28	31.29	Peak	---	14.54
4	479.110	33.58	-12.42	46.00	43.78	3.13	30.93	Peak	---	17.60
5	839.950	34.82	-11.18	46.00	39.81	3.96	30.13	Peak	---	21.18
6	959.966	45.65	-0.35	46.00	49.28	3.92	29.49	QP	---	21.94

## Note:

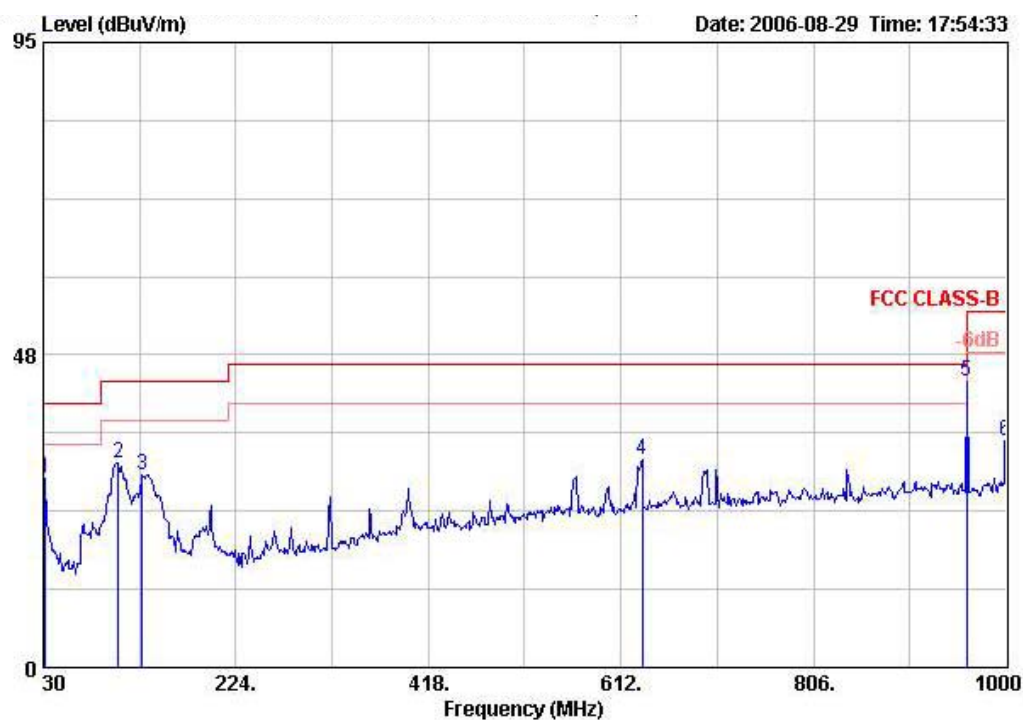
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

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

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

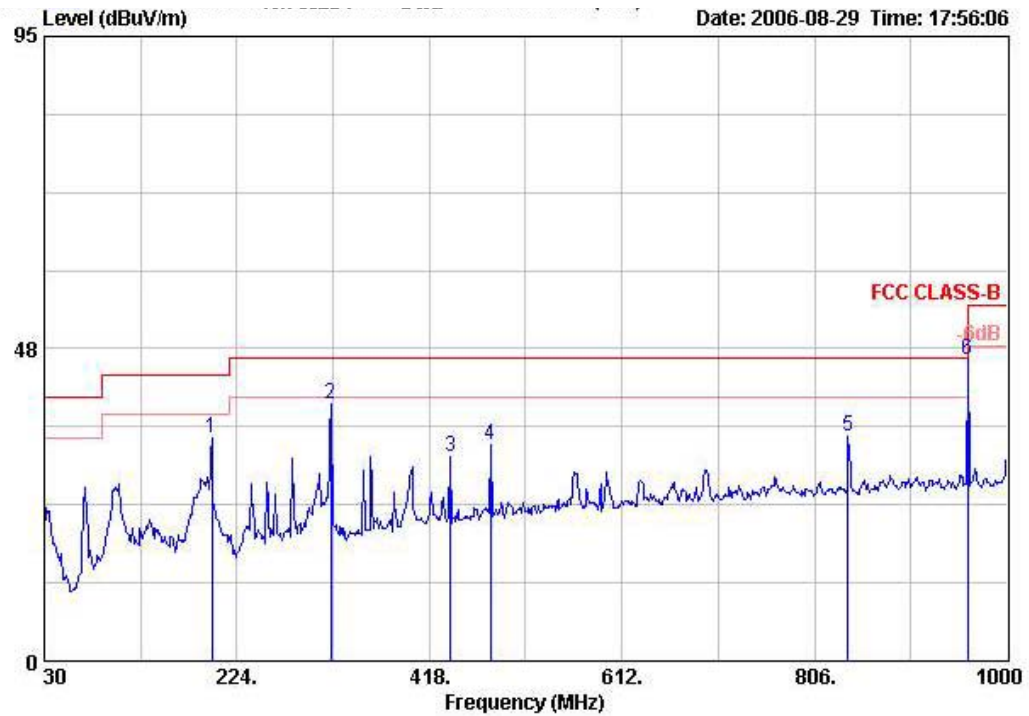
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n 40MHz Ch 6 Ant. A+ Ant. B

Vertical



	Freq	Level	Over	Limit	Read	Cable	Preamp	Remark	Ant	TableAntenna
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor		Pos	Pos Factor
			dB	dBuV/m	dBuV	dB	dB		cm	deg dB/m
1	31.940	28.65	-11.35	40.00	40.74	0.93	31.67	Peak	---	18.66
2	105.660	31.17	-12.33	43.50	49.23	1.50	31.72	Peak	---	12.16
3	129.910	29.31	-14.19	43.50	46.78	1.70	31.67	Peak	---	12.50
4	633.340	31.64	-14.36	46.00	39.30	3.36	30.45	Peak	---	19.43
5 !	959.966	43.57	-2.43	46.00	47.20	3.92	29.49	QP	---	21.94
6	1000.000	34.34	-19.66	54.00	37.61	4.00	29.37	Peak	---	22.10

## Horizontal



	Freq	Level	Over	Limit	Read	Cable	Preamp		Ant	TableAntenna
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos Factor
			dB	dBuV/m	dBuV	dB	dB		cm	deg dB/m
1	198.780	33.97	-9.53	43.50	53.28	2.00	31.45	Peak	---	10.14
2	319.060	39.18	-6.82	46.00	53.65	2.28	31.29	Peak	---	14.54
3	439.340	31.19	-14.81	46.00	42.20	2.86	30.94	Peak	---	17.07
4	479.110	32.93	-13.07	46.00	43.12	3.13	30.93	Peak	---	17.60
5	839.950	34.28	-11.72	46.00	39.27	3.96	30.13	Peak	---	21.18
6	960.230	45.72	-8.28	54.00	49.35	3.92	29.49	Peak	---	21.94

## Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.

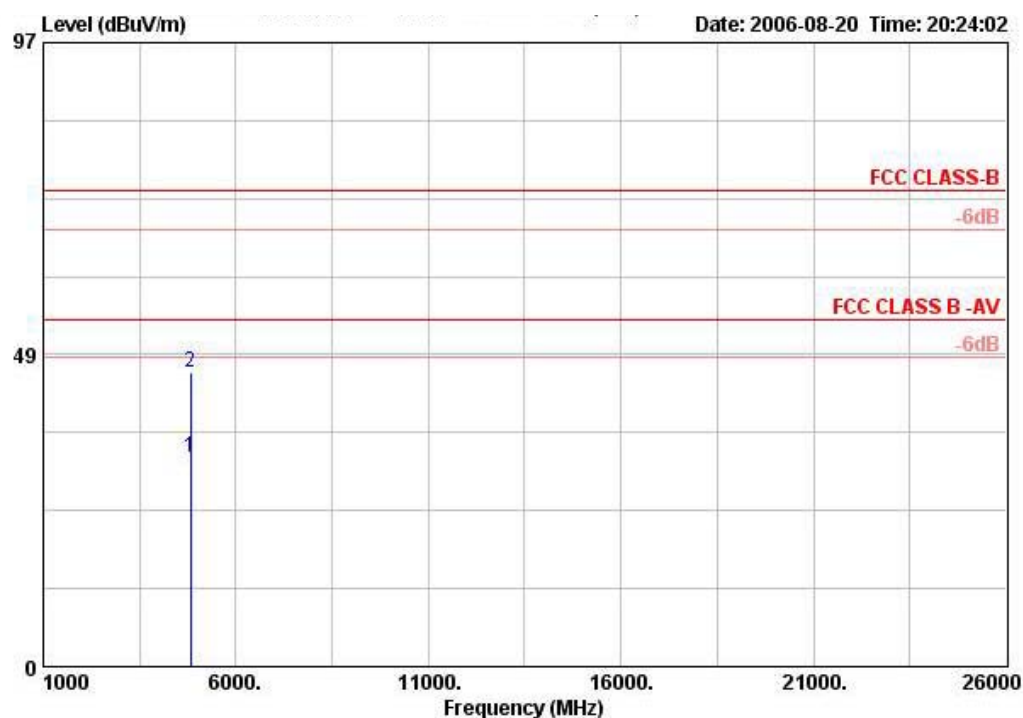
Pol. : V is Vertical Polarization ; H is Horizontal Polarization.



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

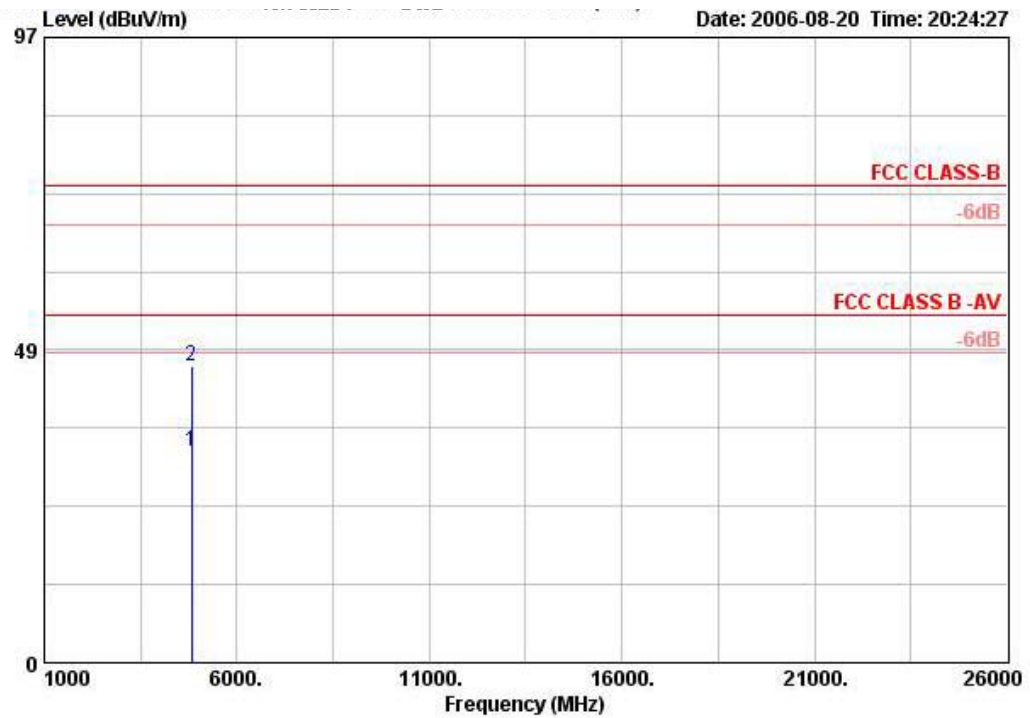
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch 1 Ant. A

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	m
			dB	dBuV/m	dBuV	dB/m	dB	dB		
1	4820.520	32.44	-21.56	54.00	30.09	33.22	4.30	35.16	AVERAGE	3
2	4821.360	45.77	-28.23	74.00	43.41	33.22	4.30	35.16	PEAK	3

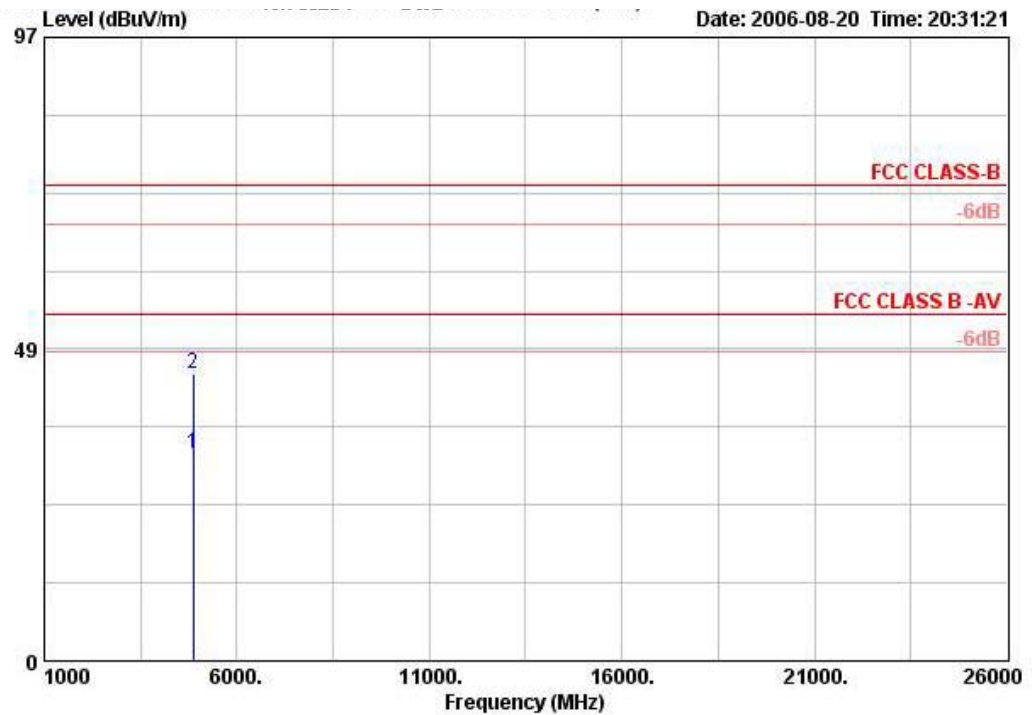
## Horizontal



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	Level	Loss	Factor	Remark		m
					Factor					
1	4820.080	32.66	-21.34	54.00	30.31	33.22	4.30	35.16 AVERAGE	HORIZONTAL	3
2	4827.880	45.98	-28.02	74.00	43.63	33.22	4.30	35.16 PEAK	HORIZONTAL	3

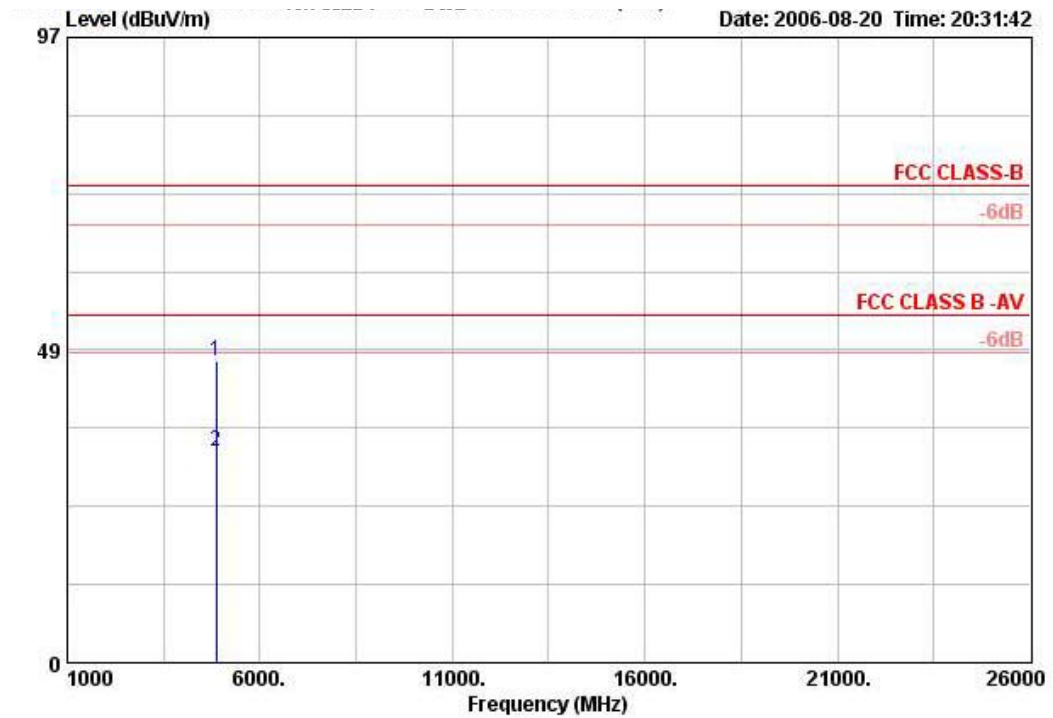
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch 6 Ant. A

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	4877.140	32.37	-21.63	54.00	29.86	33.36	4.30	35.15	AVERAGE	3
2	4877.860	44.60	-29.40	74.00	42.09	33.36	4.30	35.15	PEAK	3

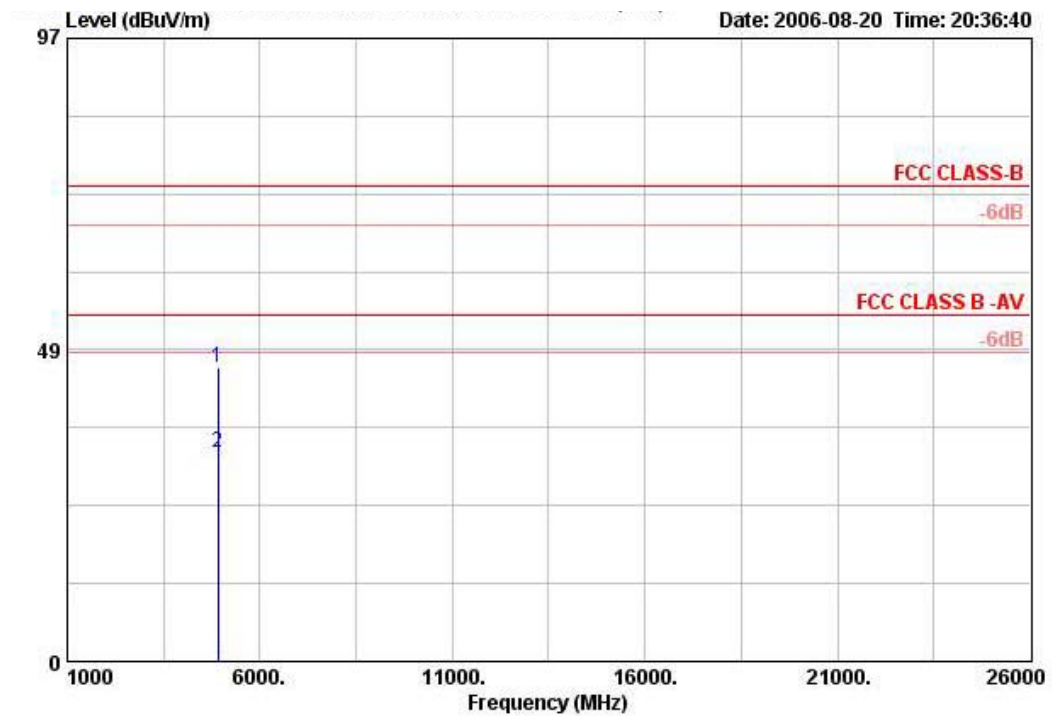
## Horizontal



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	4873.780	46.70	-27.30	74.00	44.19	33.36	4.30	35.15	PEAK	3
2	4875.640	32.83	-21.17	54.00	30.32	33.36	4.30	35.15	AVERAGE	3

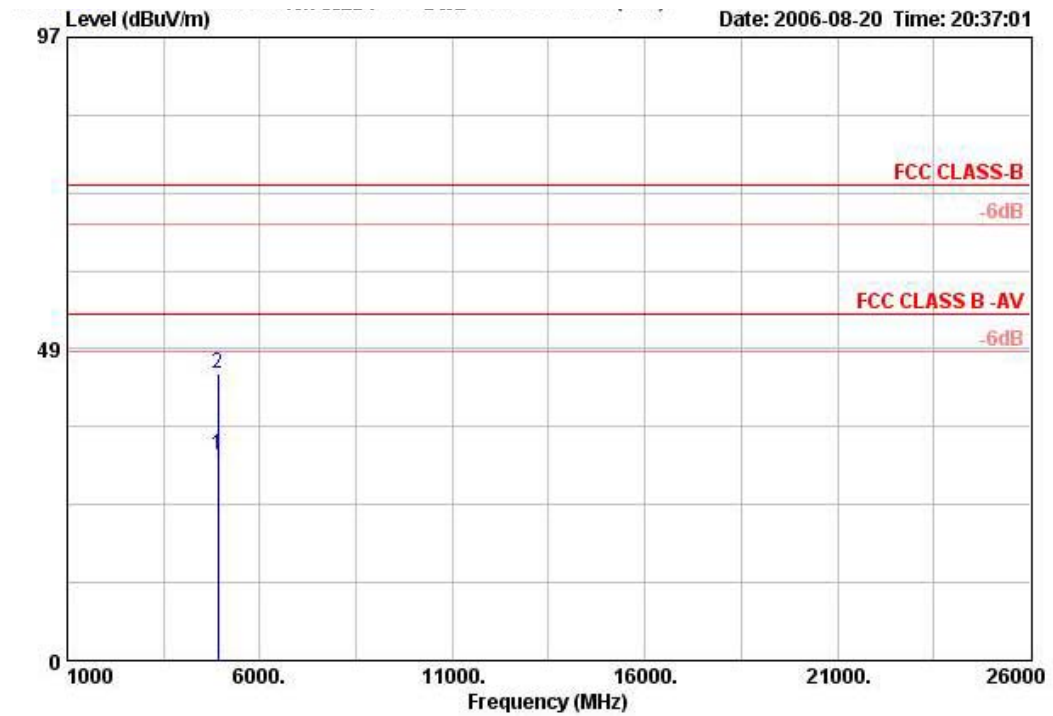
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch11 Ant. A

Vertical



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4922.620	45.81	-28.19	74.00	43.15	33.51	4.30	35.14	PERK	VERTICAL	3
2	4923.340	32.54	-21.46	54.00	29.87	33.51	4.30	35.14	AVERAGE	VERTICAL	3

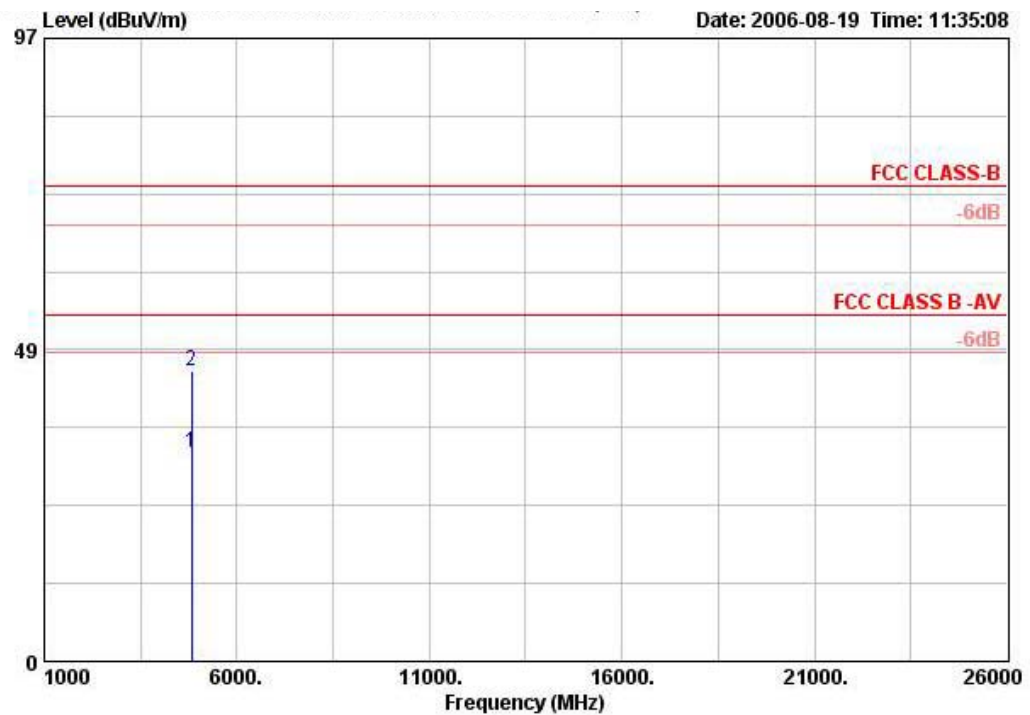
## Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4923.040	32.07	-21.93	54.00	29.41	33.51	4.30	35.14	AVERAGE	HORIZONTAL	3
2	4924.000	44.68	-29.32	74.00	42.01	33.51	4.30	35.14	PEAK	HORIZONTAL	3

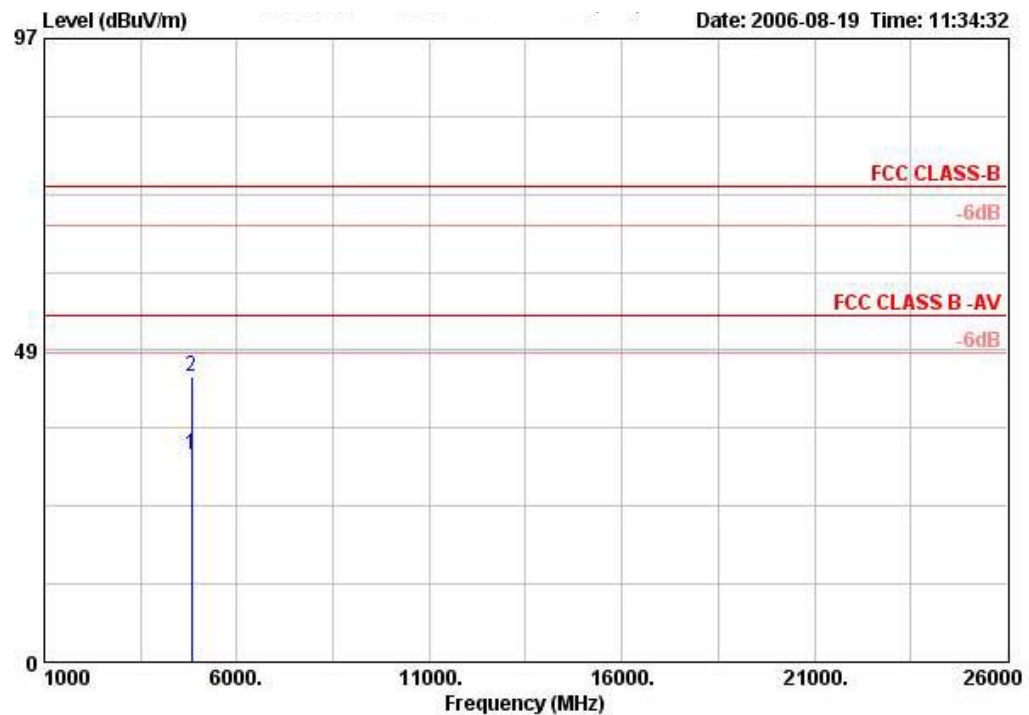
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch 1 Ant. A + Ant. B

Vertical



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4820.760	32.55	-21.45	54.00	30.19	33.22	4.30	35.16	AVERAGE	VERTICAL	3
2	4822.420	45.21	-28.79	74.00	42.85	33.22	4.30	35.16	PEAK	VERTICAL	3

## Horizontal

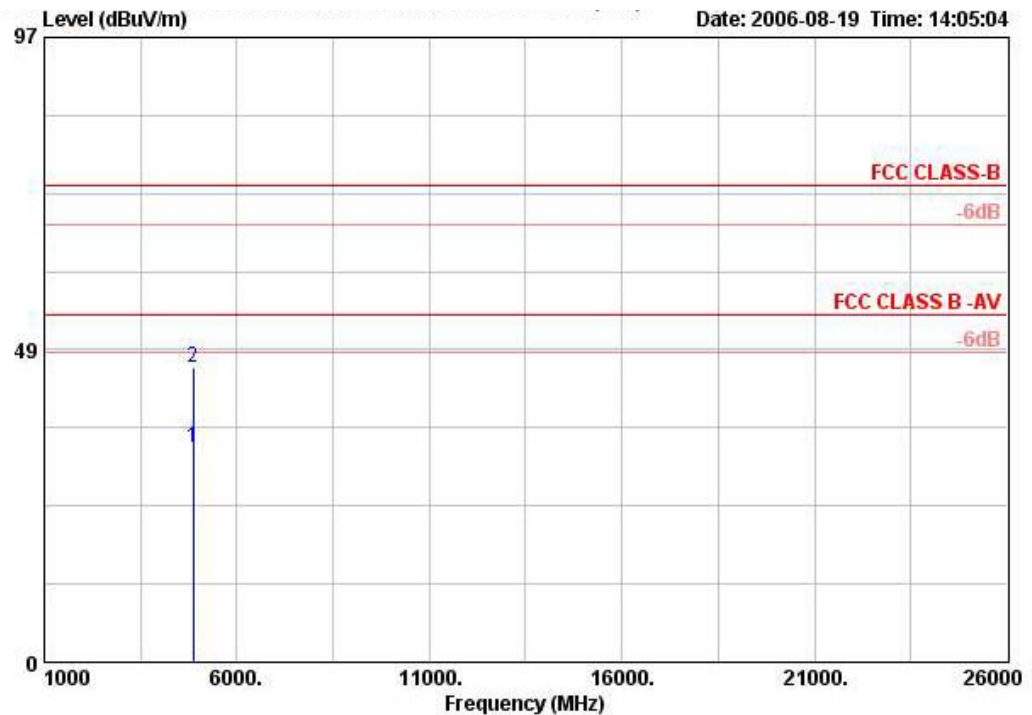


	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase
			dB	dBuV/m	dBuV	dB/m	dB	dB		Distance
										m
1	4821.380	32.15	-21.85	54.00	29.79	33.22	4.30	35.16	AVERAGE	HORIZONTAL
2	4824.980	44.48	-29.52	74.00	42.13	33.22	4.30	35.16	PEAK	HORIZONTAL



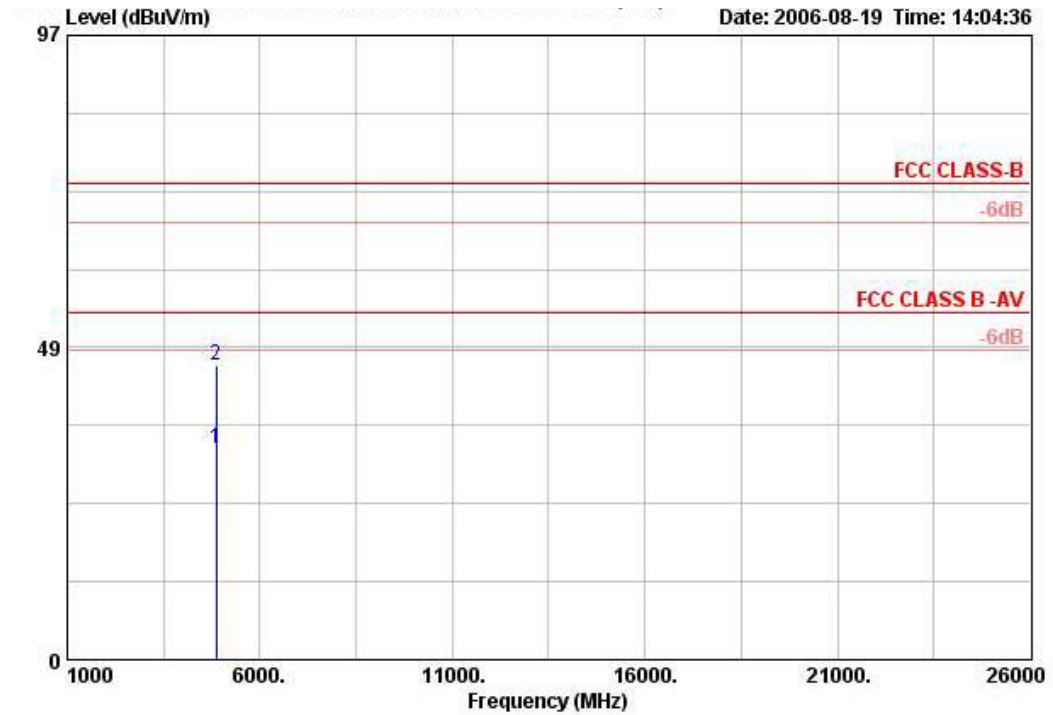
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch 6 Ant. A + Ant. B

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp				
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4869.200	33.19	-20.81	54.00	30.68	33.36	4.30	35.15	AVERAGE	VERTICAL	3
2	4871.420	45.74	-28.26	74.00	43.23	33.36	4.30	35.15	PEAK	VERTICAL	3

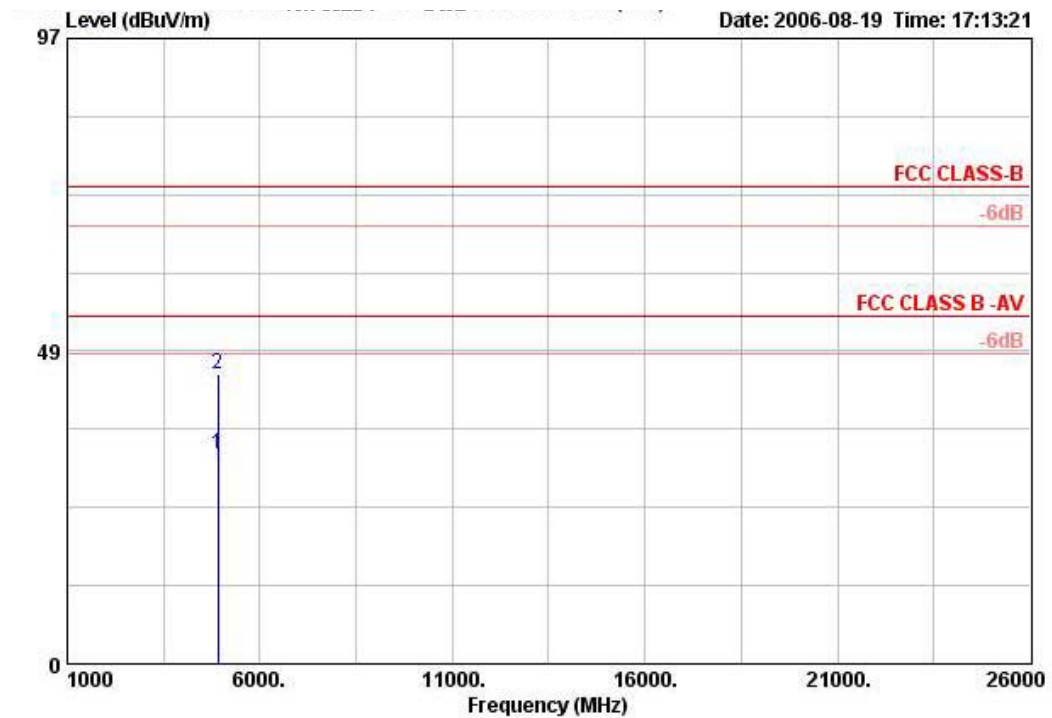
## Horizontal



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp				
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4869.700	32.89	-21.11	54.00	30.39	33.36	4.30	35.15	AVERAGE	HORIZONTAL	3
2	4871.480	45.80	-28.20	74.00	43.29	33.36	4.30	35.15	PEAK	HORIZONTAL	3

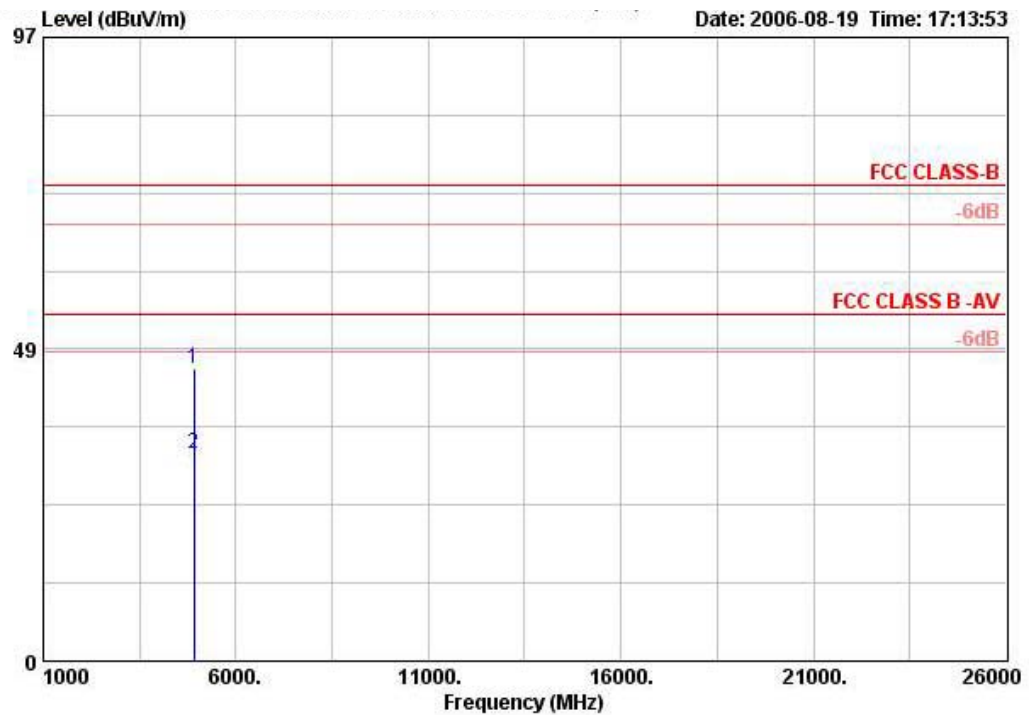
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch11 Ant. A + Ant. B

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp				
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4923.100	32.56	-21.44	54.00	29.89	33.51	4.30	35.14	AVERAGE	VERTICAL	3
2	4923.440	44.82	-29.18	74.00	42.15	33.51	4.30	35.14	PEAK	VERTICAL	3

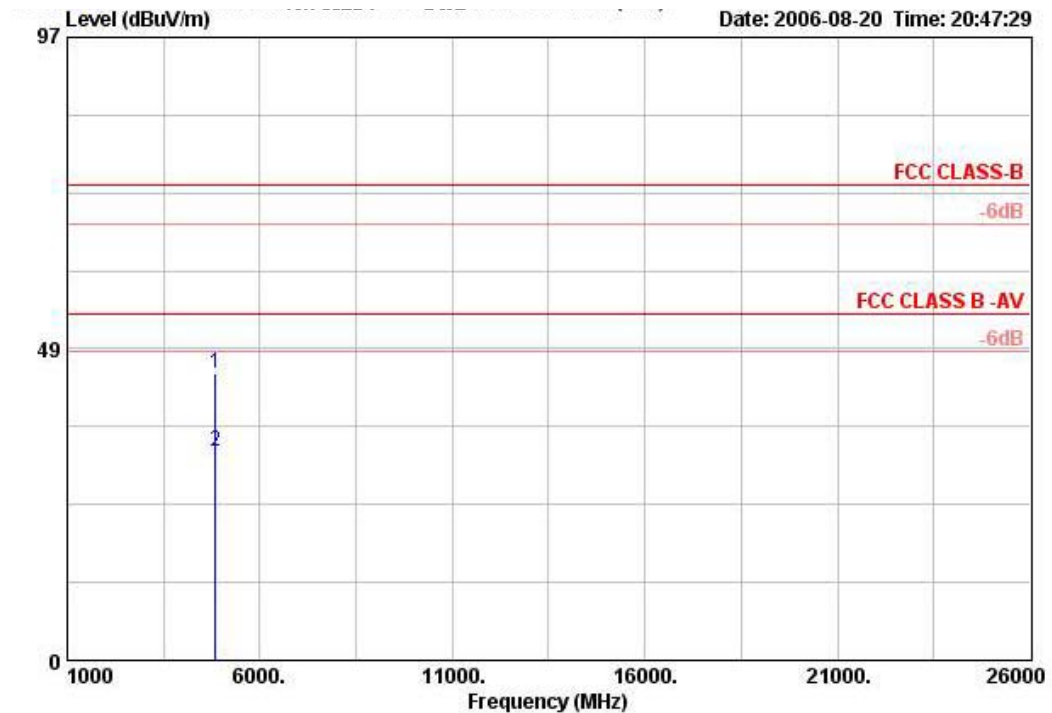
## Horizontal



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase
			dB	dBuV/m	dBuV	dB/m	dB	dB		Distance
										m
1	4923.400	45.41	-28.59	74.00	42.75	33.51	4.30	35.14	PEAK	HORIZONTAL
2	4923.440	32.24	-21.76	54.00	29.58	33.51	4.30	35.14	AVERAGE	HORIZONTAL

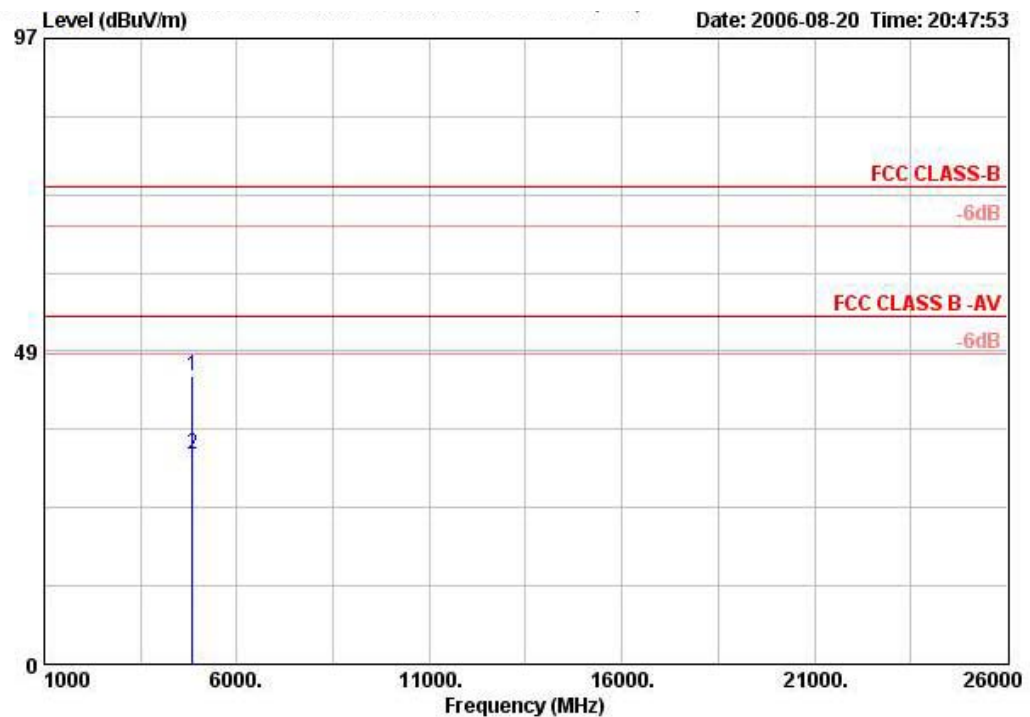
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 3 Ant. A

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	4844.200	44.68	-29.32	74.00	42.28	33.27	4.30	35.16	PEAK	3
2	4848.720	32.62	-21.38	54.00	30.21	33.27	4.30	35.16	AVERAGE	3

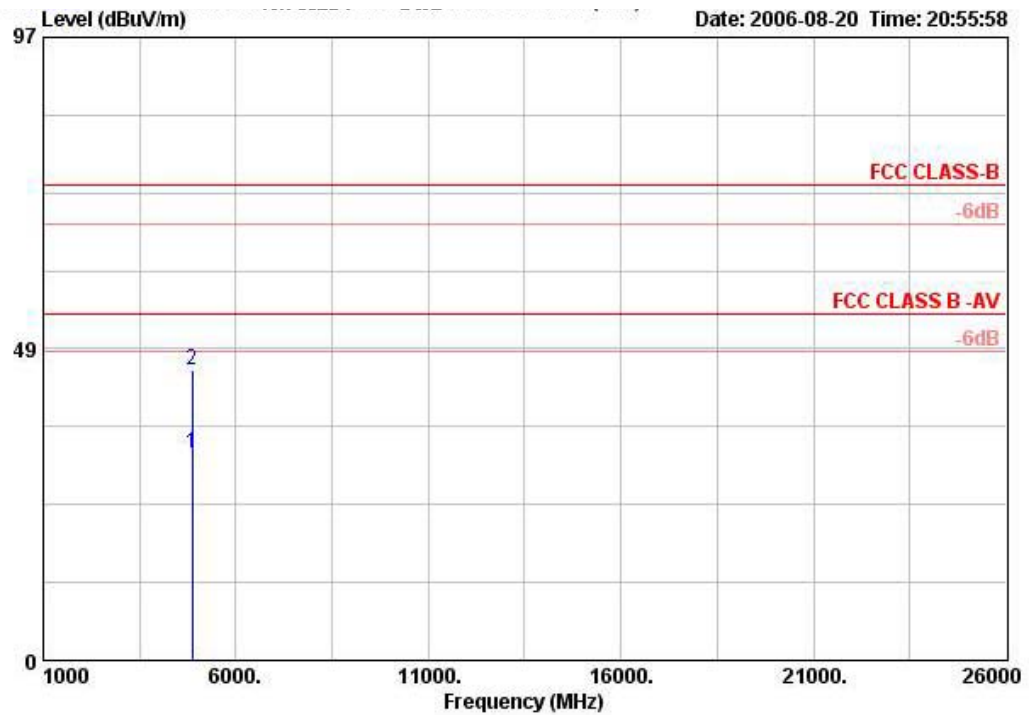
## Horizontal



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBUV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
			dB	dBUV/m	dBuV	dB/m	dB	dB		m
1	4838.440	44.78	-29.22	74.00	42.38	33.27	4.30	35.16	PEAK	3
2	4838.840	32.47	-21.53	54.00	30.06	33.27	4.30	35.16	AVERAGE	3

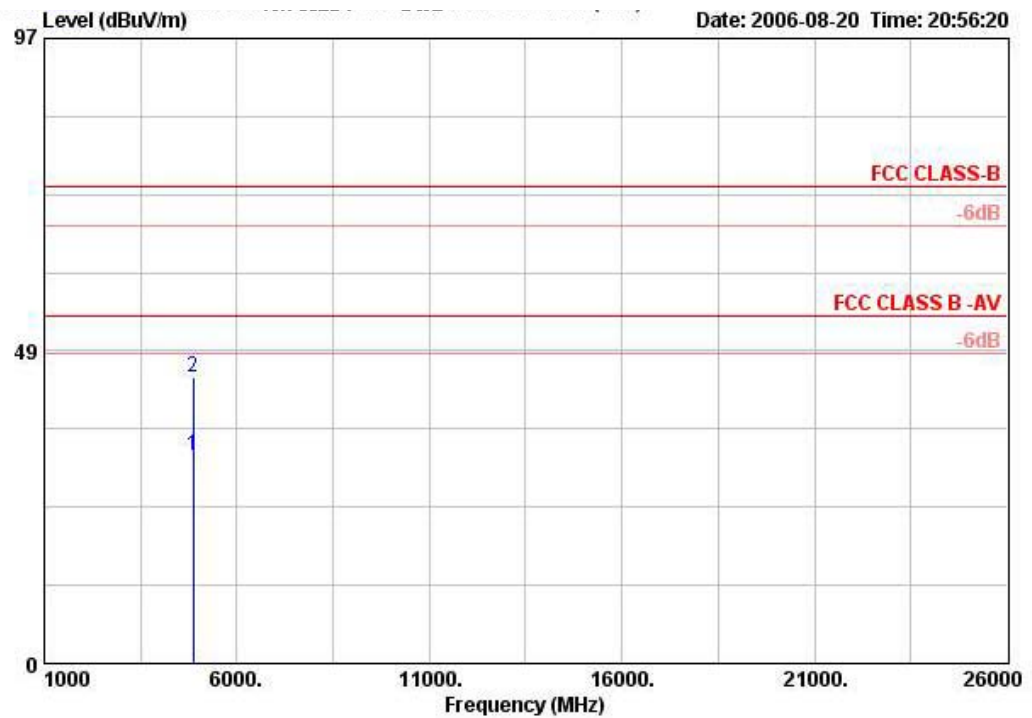
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 6 Ant. A

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark		m
1	4867.040	32.29	-21.71	54.00	29.83	33.31	4.30	35.15 AVERAGE	VERTICAL	3
2	4879.360	45.16	-28.84	74.00	42.65	33.36	4.30	35.15 PEAK	VERTICAL	3

## Horizontal

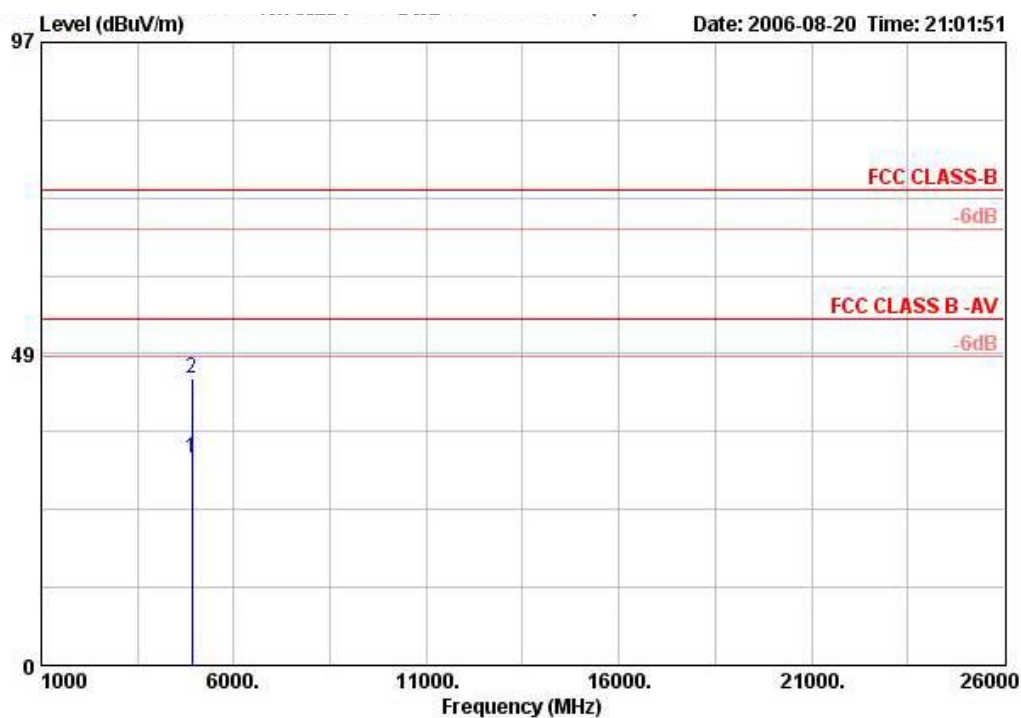


	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	4866.000	32.14	-21.86	54.00	29.68	33.31	4.30	35.15	AVERAGE	3
2	4874.640	44.52	-29.48	74.00	42.02	33.36	4.30	35.15	PEAK	3



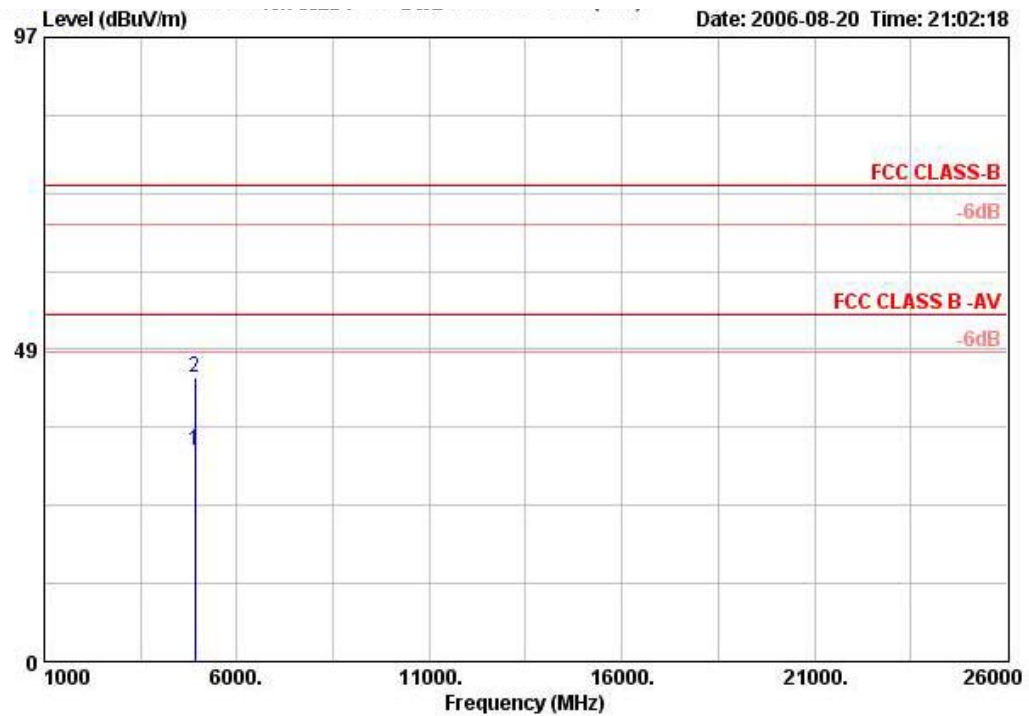
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 9 Ant. A

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	m
			dB	dBuV/m	dBuV	dB/m	dB	dB		
1	4903.360	32.15	-21.85	54.00	29.54	33.46	4.30	35.15	AVERAGE	3
2	4903.600	44.57	-29.43	74.00	41.96	33.46	4.30	35.15	PEAK	3

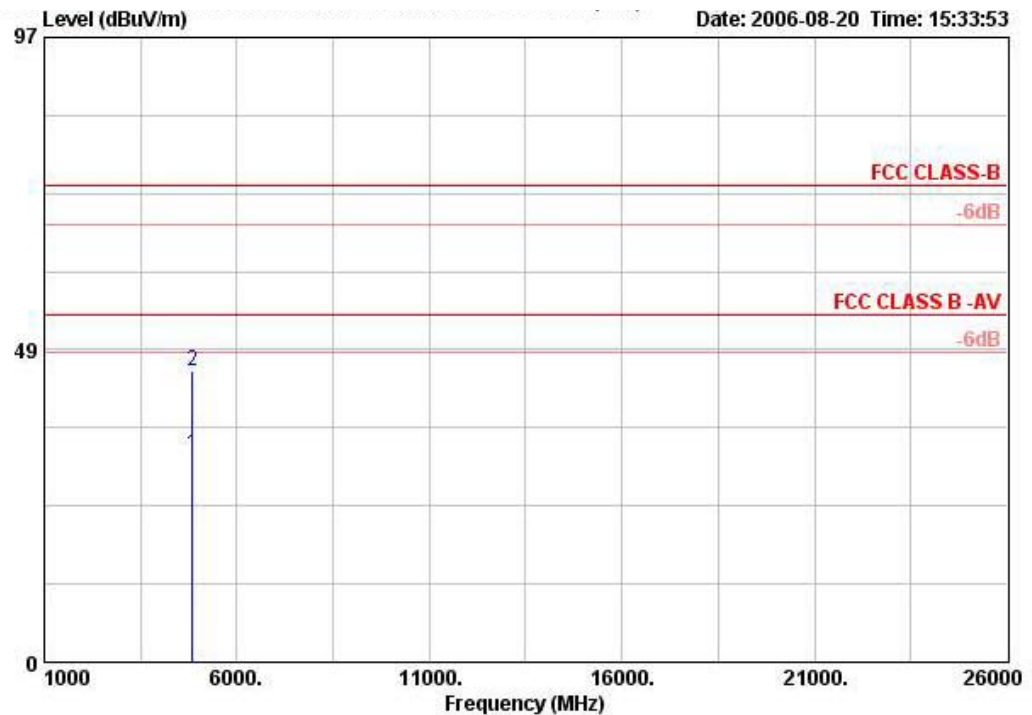
## Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark		m
1	4903.120	32.83	-21.17	54.00	30.21	33.46	4.30	35.15	AVERAGE	HORIZONTAL	3
2	4903.120	44.04	-29.96	74.00	41.43	33.46	4.30	35.15	PEAK	HORIZONTAL	3

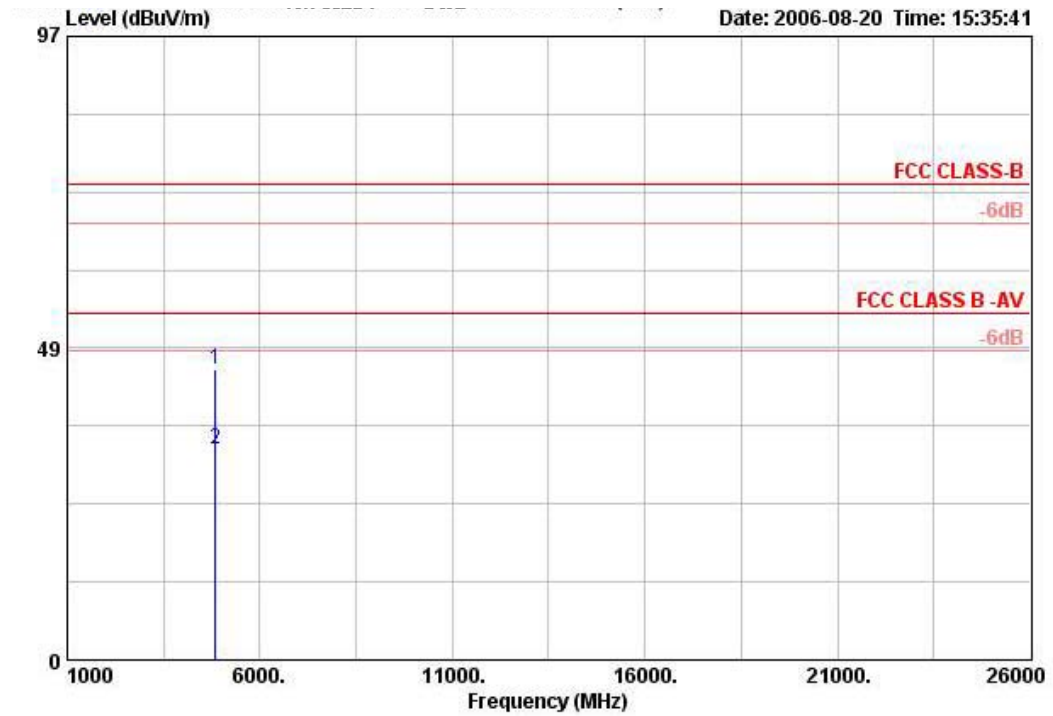
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 3 Ant. A + Ant. B

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp				
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4843.800	32.13	-21.87	54.00	29.72	33.27	4.30	35.16	AVERAGE	VERTICAL	3
2	4845.860	45.17	-28.83	74.00	42.76	33.27	4.30	35.16	PEAK	VERTICAL	3

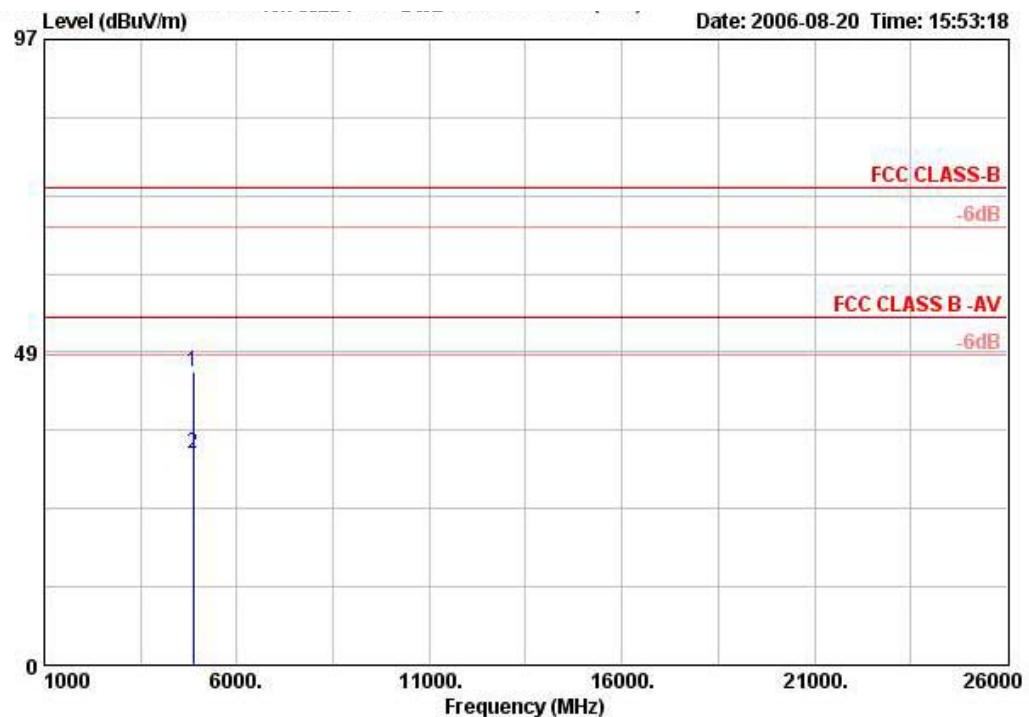
## Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4839.600	45.33	-28.67	74.00	42.92	33.27	4.30	35.16	PERK	HORIZONTAL	3
2	4848.760	32.64	-21.36	54.00	30.24	33.27	4.30	35.16	AVERAGE	HORIZONTAL	3

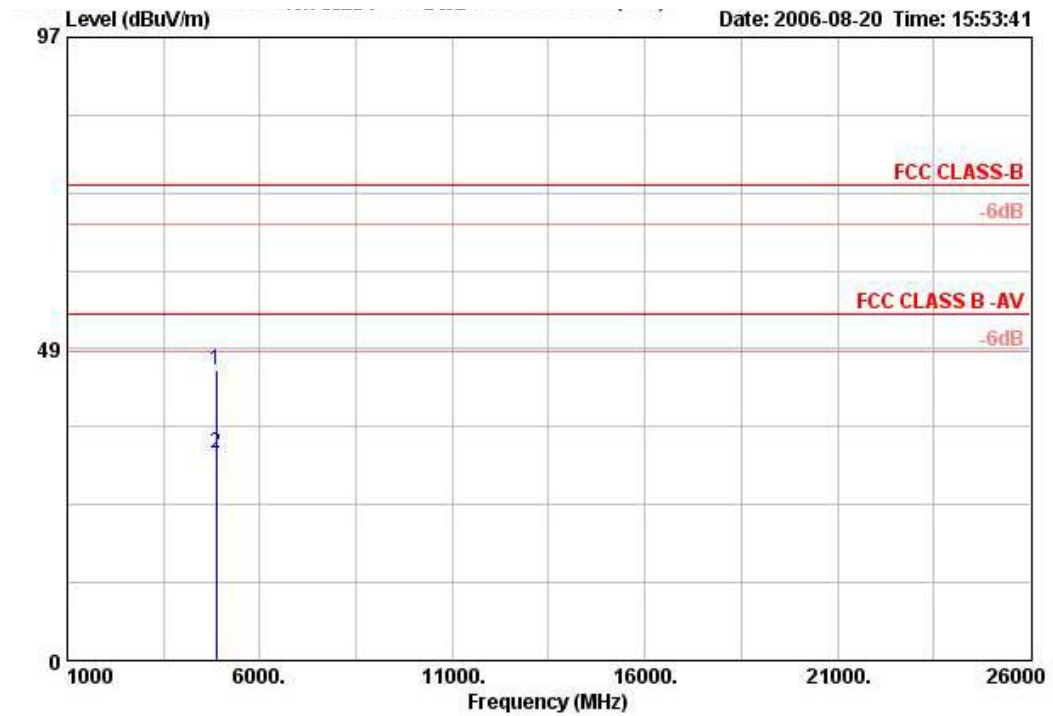
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 6 Ant. A + Ant. B

Vertical



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	4873.260	45.33	-28.67	74.00	42.83	33.36	4.30	35.15	PEAK	3
2	4876.760	32.80	-21.20	54.00	30.29	33.36	4.30	35.15	AVERAGE	3

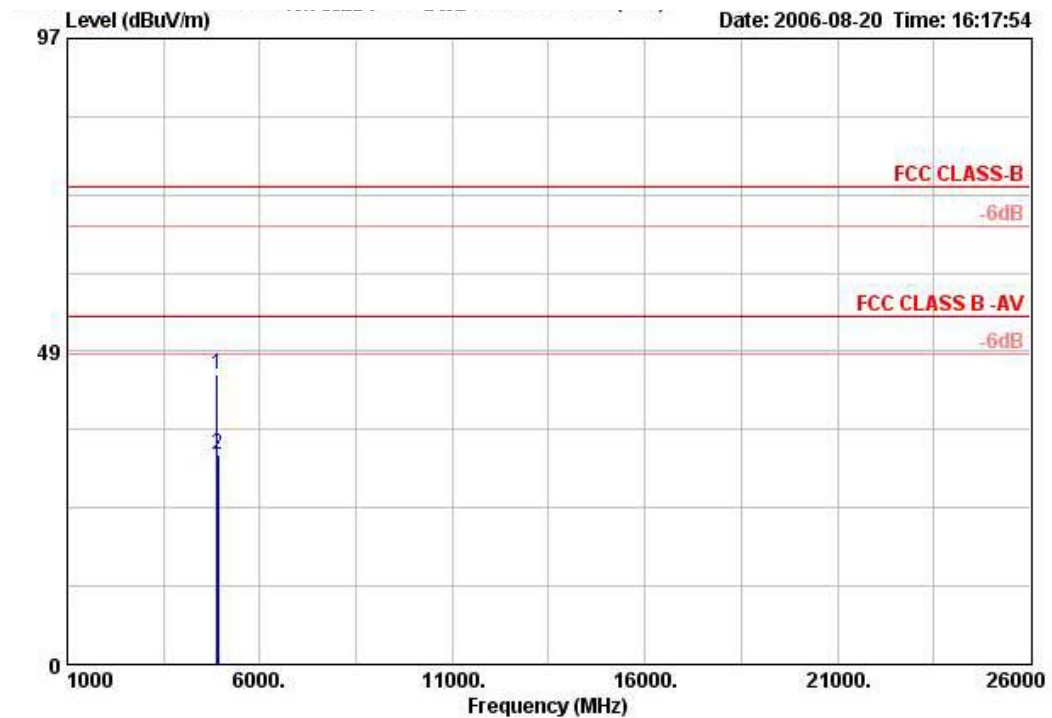
## Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	4869.300	45.19	-28.81	74.00	42.68	33.36	4.30	35.15	PEAK	HORIZONTAL	3
2	4875.660	32.31	-21.69	54.00	29.80	33.36	4.30	35.15	AVERAGE	HORIZONTAL	3

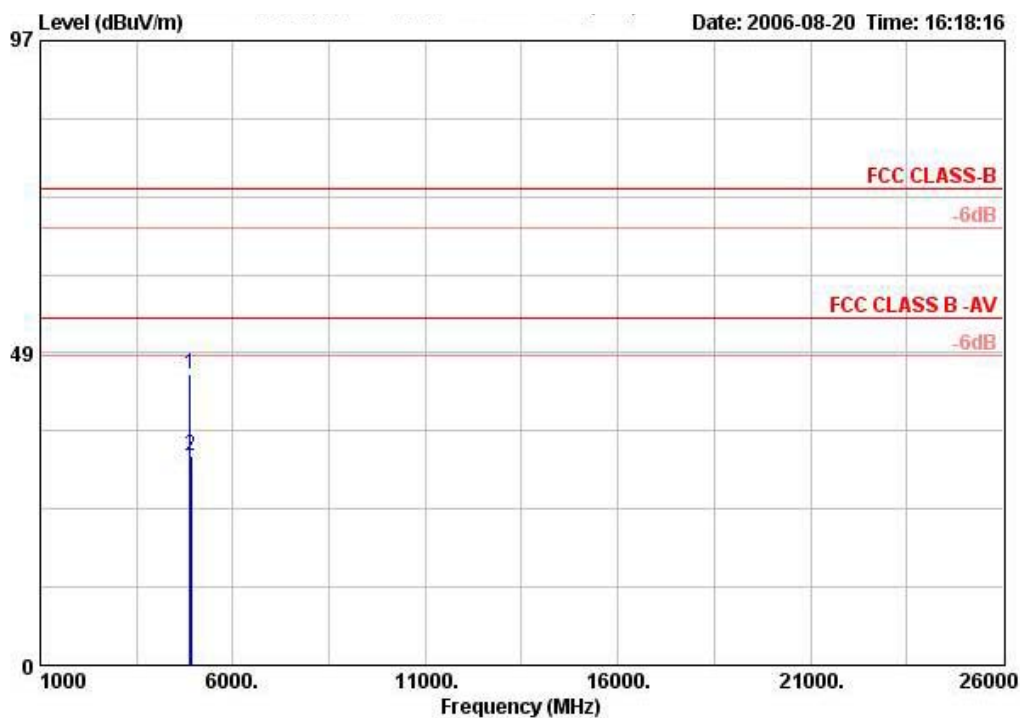
Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 9 Ant. A + Ant. B

Vertical



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark		m
1	4897.880	44.99	-29.01	74.00	42.43	33.41	4.30	35.15	PEAK	VERTICAL	3
2	4904.720	32.38	-21.62	54.00	29.77	33.46	4.30	35.15	AVERAGE	VERTICAL	3

## Horizontal



	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark		m
1	4896.800	45.32	-28.68	74.00	42.76	33.41	4.30	35.15	PEAK	HORIZONTAL	3
2	4904.680	32.58	-21.42	54.00	29.97	33.46	4.30	35.15	AVERAGE	HORIZONTAL	3

## Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.



## 4.6. Band Edge Emissions Measurement

### 4.6.1. 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 (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

### 4.6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz /100 KHz for Peak

### 4.6.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

### 4.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

### 4.6.5. Test Deviation

There is no deviation with the original standard.

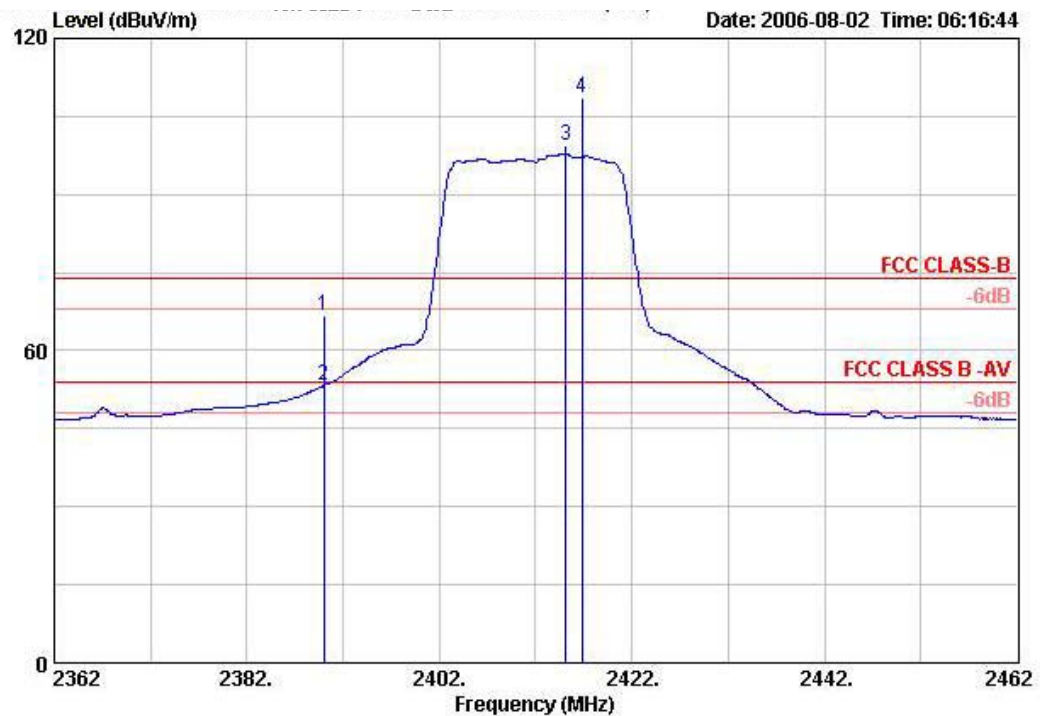
### 4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch 1, 11 Ant. A

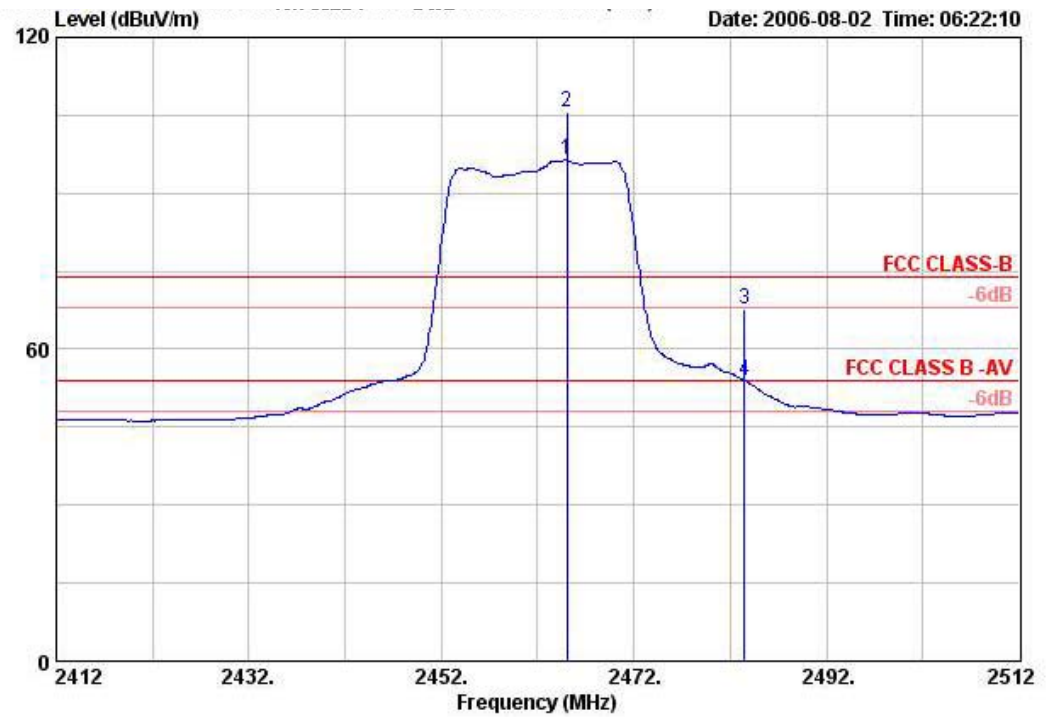
Channel 1



	Freq	Level	Over	Limit	Read	Cable	Preamp		Ant	Table	Antenna
	MHz	dBuV/m	Limit	Line	Level	Loss	Factor	Remark	Pos	Pos	Factor
			dB	dBuV/m	dBuV	dB	dB		cm	deg	dB/m
1	2390.000	66.70	-7.30	74.00	33.49	2.76	0.00	Peak	118	188	30.44
2 !	2390.000	53.25	-0.75	54.00	20.04	2.76	0.00	AVERAGE	118	188	30.44
3 @	2415.100	99.30			66.08	2.79	0.00	Average	---	---	30.43
4 over	2416.800	108.42			75.20	2.79	0.00	Peak	118	188	30.43

Item 3, 4 are the fundamental frequency at 2412 MHz.

## Channel 11

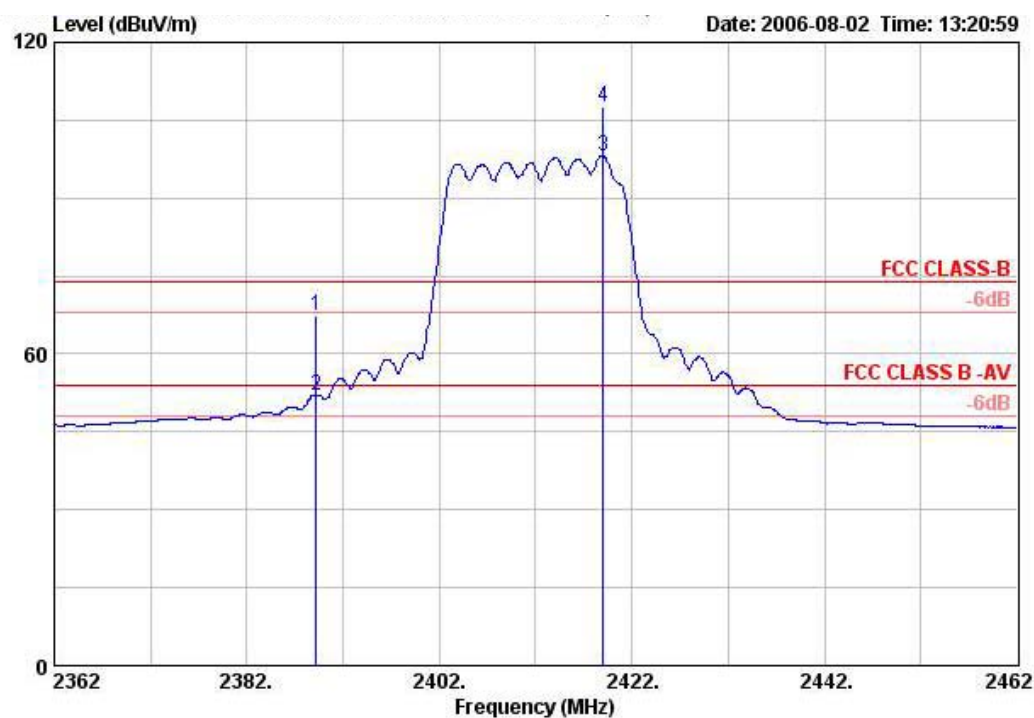


	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	Level	Factor	Loss	Factor	Remark	m
1	2465.000	96.32			64.55	28.96	2.81	0.00	Average	3
2	2465.000	105.51			73.74	28.96	2.81	0.00	PEAK	3
3	2483.500	67.64	-6.36	74.00	35.82	28.98	2.84	0.00	PEAK	3
4	2483.500	53.88	-0.12	54.00	22.06	28.98	2.84	0.00	AVERAGE	3

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 20MHz Ch 1, 11 Ant. A + Ant. B

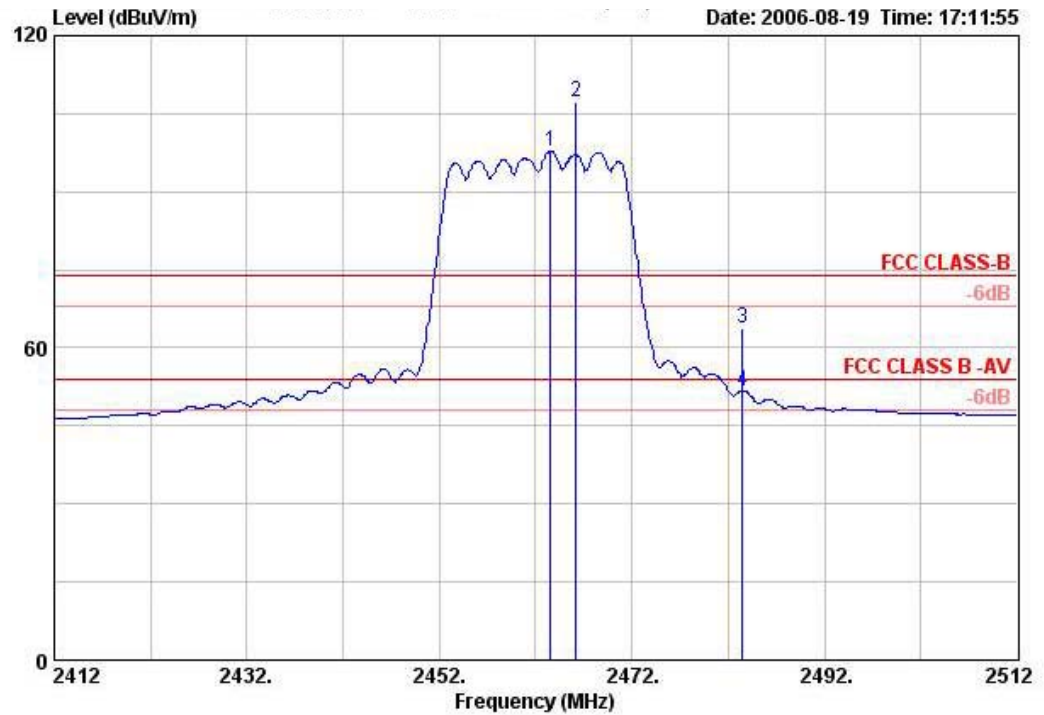
## Channel 1



	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Preamp	Factor	Remark	Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	2389.200	67.20	-6.80	74.00	35.56	28.88	2.76	0.00 PEAK	HORIZONTAL	3
2	2389.200	52.11	-1.89	54.00	20.47	28.88	2.76	0.00 AVERAGE	HORIZONTAL	3
3	2419.000	98.08			66.39	28.90	2.79	0.00 AVERAGE	HORIZONTAL	3
4	2419.000	107.67			75.98	28.90	2.79	0.00 PEAK	HORIZONTAL	3

Item 3, 4 are the fundamental frequency at 2412 MHz.

## Channel 11

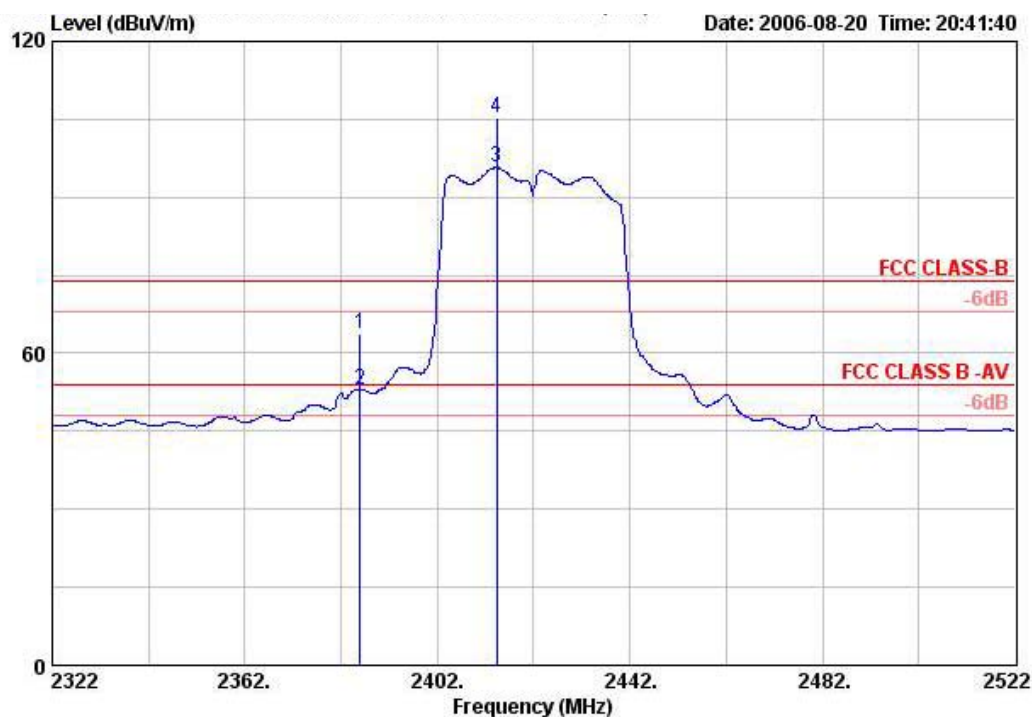


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB			m
1	2463.500	97.74			64.51	30.41	2.81	0.00	Average	VERTICAL	3
2	2466.200	107.09			73.87	30.41	2.81	0.00	PEAK	VERTICAL	3
3	2483.500	63.68	-10.32	74.00	30.43	30.41	2.84	0.00	PEAK	VERTICAL	3
4	2483.500	51.80	-2.20	54.00	18.56	30.41	2.84	0.00	AVERAGE	VERTICAL	3

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 3, 9 Ant. A

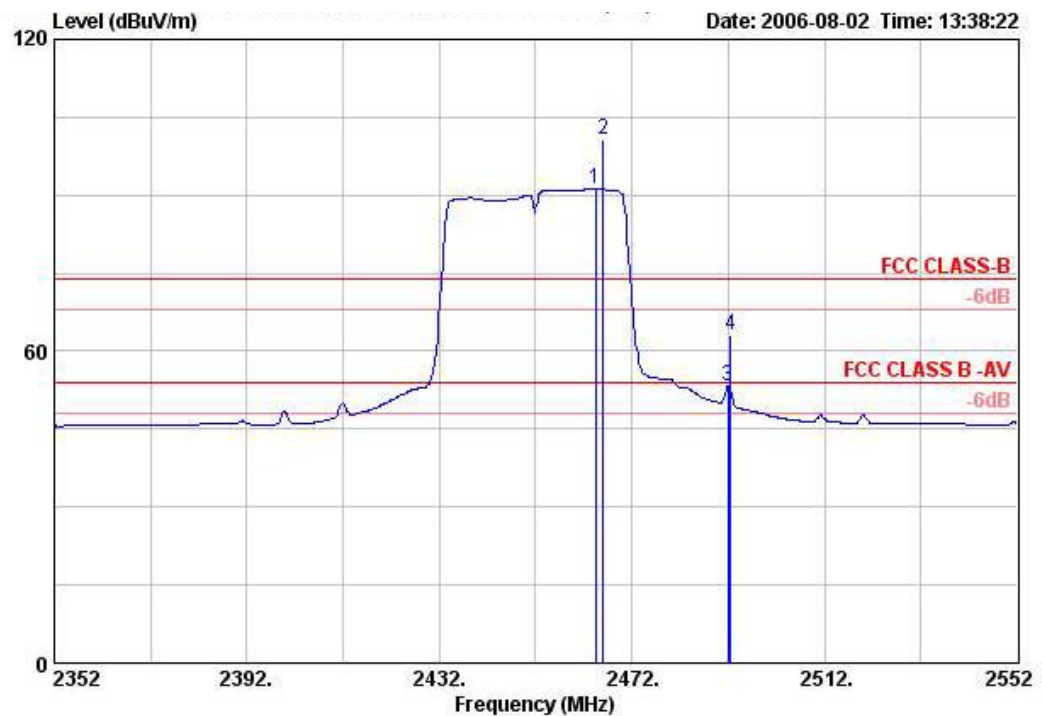
### Channel 3



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Distance
			dB	dBuV/m	dBuV	dB/m	dB	dB		m
1	2386.000	63.74	-10.26	74.00	30.54	30.44	2.76	0.00	PEAK	3
2 !	2386.000	53.10	-0.90	54.00	19.89	30.44	2.76	0.00	AVERAGE	3
3 over	2414.400	95.70			62.48	30.43	2.79	0.00	Average	3
4 over	2414.400	105.17			71.95	30.43	2.79	0.00	PEAK	3

Item 3, 4 are the fundamental frequency at 2422 MHz.

## Channel 9



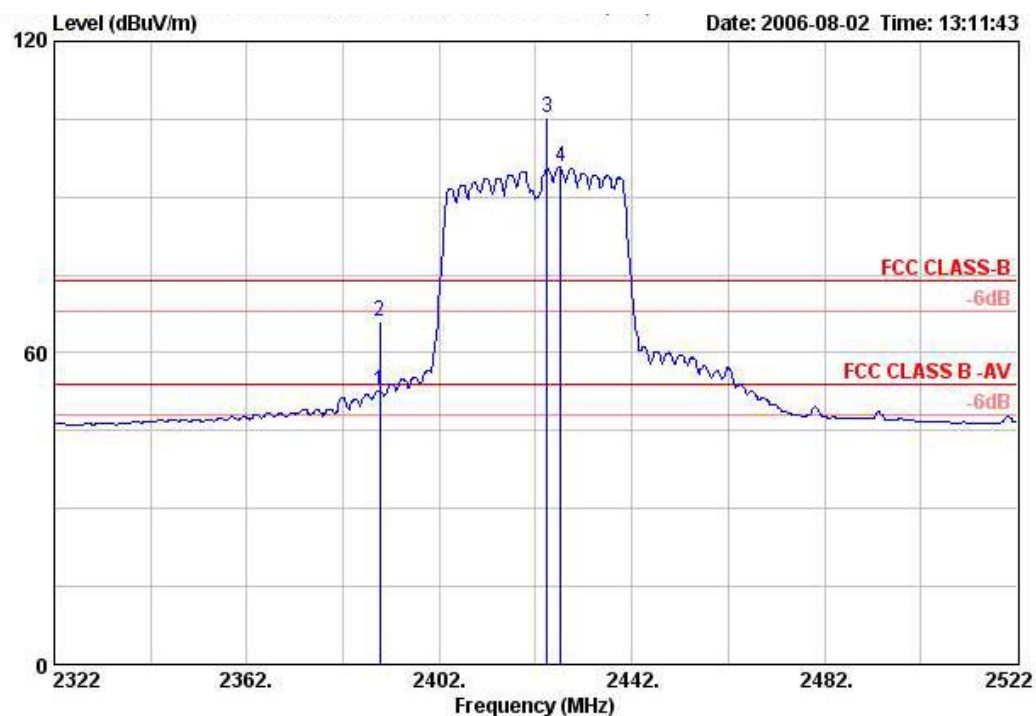
	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp		Pol/Phase	Distance
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	m
			dB	dBuV/m	dBuV	dB/m	dB	dB		
1	2464.400	91.18			59.41	28.96	2.81	0.00	AVERAGE	3
2	2466.000	100.60			68.82	28.96	2.81	0.00	PEAK	3
3	2491.900	53.18	-0.82	54.00	21.34	29.00	2.84	0.00	AVERAGE	3
4	2492.400	63.08	-10.92	74.00	31.24	29.00	2.84	0.00	PEAK	3

Item 1, 2 are the fundamental frequency at 2452 MHz.



Temperature	24°C	Humidity	64%
Test Engineer	Leo Hung	Configurations	802.11n MCS8 40MHz Ch 3, 9 Ant. A + Ant. B

### Channel 3

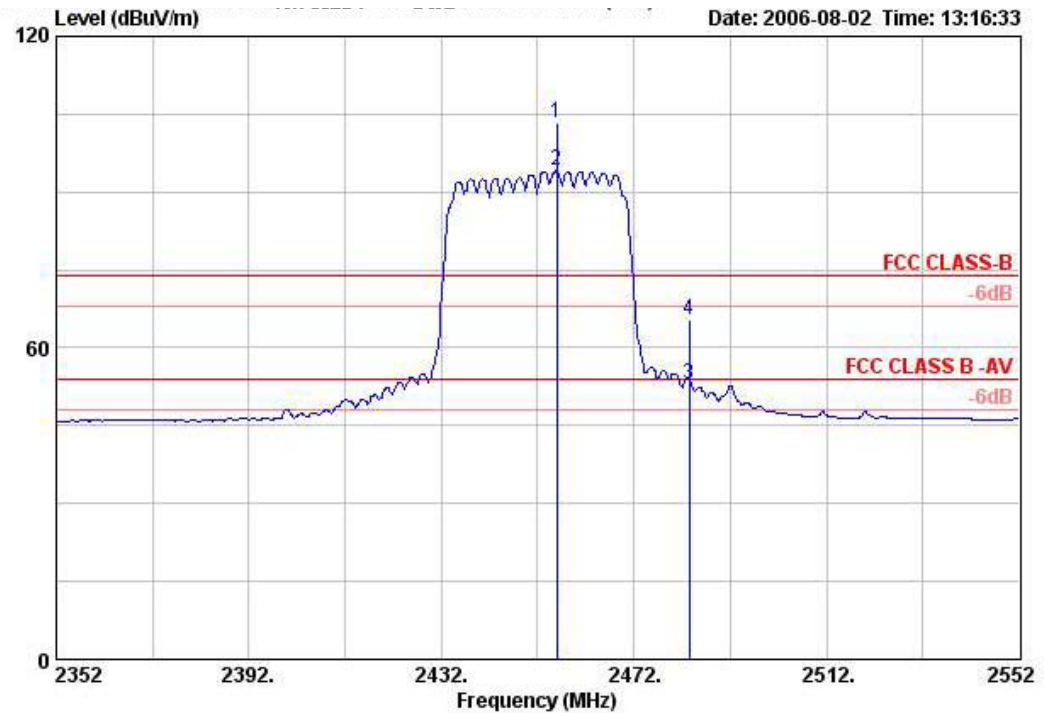


	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Pol/Phase	Distance
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB			m
1 ☒	2389.600	52.76	-1.24	54.00	21.12	28.88	2.76	0.00	AVERAGE	HORIZONTAL	3
2	2389.600	66.20	-7.80	74.00	34.56	28.88	2.76	0.00	PEAK	HORIZONTAL	3
3 ☒	2424.400	105.28			73.58	28.92	2.79	0.00	PEAK	HORIZONTAL	3
4 ☒	2427.200	95.67			63.96	28.92	2.79	0.00	AVERAGE	HORIZONTAL	3

Item 3, 4 are the fundamental frequency at 2422 MHz.



## Channel 9



	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp			
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pol/Phase
			dB	dBuV/m	dBuV	dB/m	dB	dB		Distance
										m
1	2456.000	103.31			71.53	28.96	2.81	0.00	PEAK	HORIZONTAL
2	2456.000	94.01			62.24	28.96	2.81	0.00	AVERAGE	HORIZONTAL
3	2483.500	52.95	-1.05	54.00	21.13	28.98	2.84	0.00	AVERAGE	HORIZONTAL
4	2483.500	65.31	-8.69	74.00	33.49	28.98	2.84	0.00	PEAK	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2452 MHz.

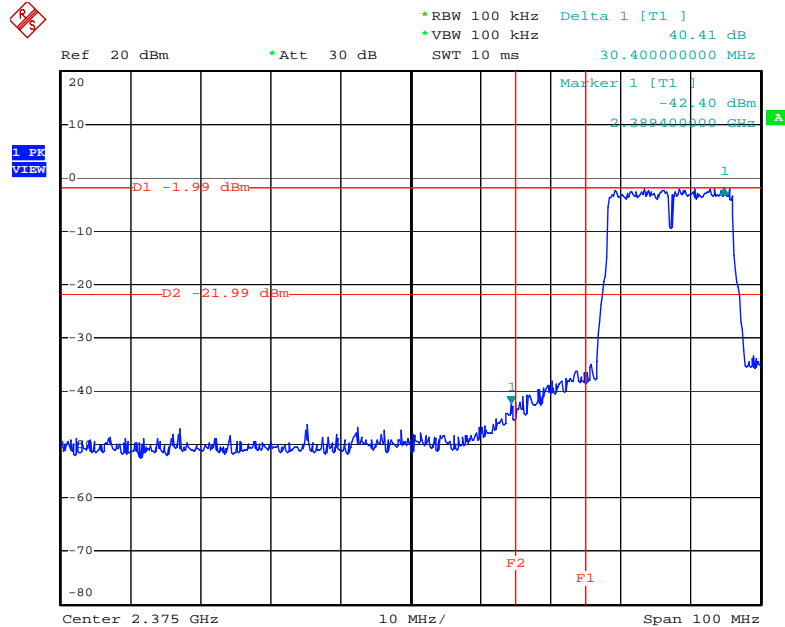
Note:

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

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

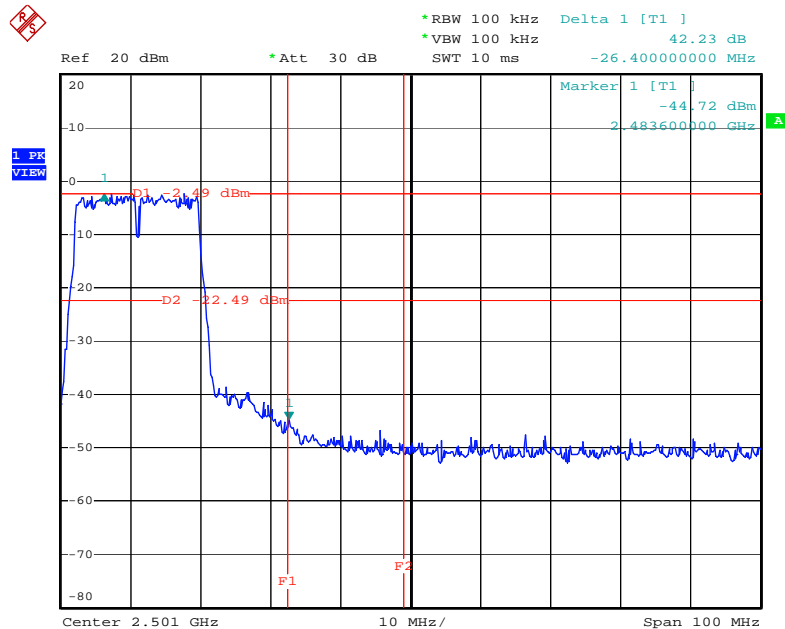
For Emission not in Restricted Band

Low Band Edge Plot on Configuration IEEE 802.11n MCS8 20MHz Ant. A / 2412 MHz



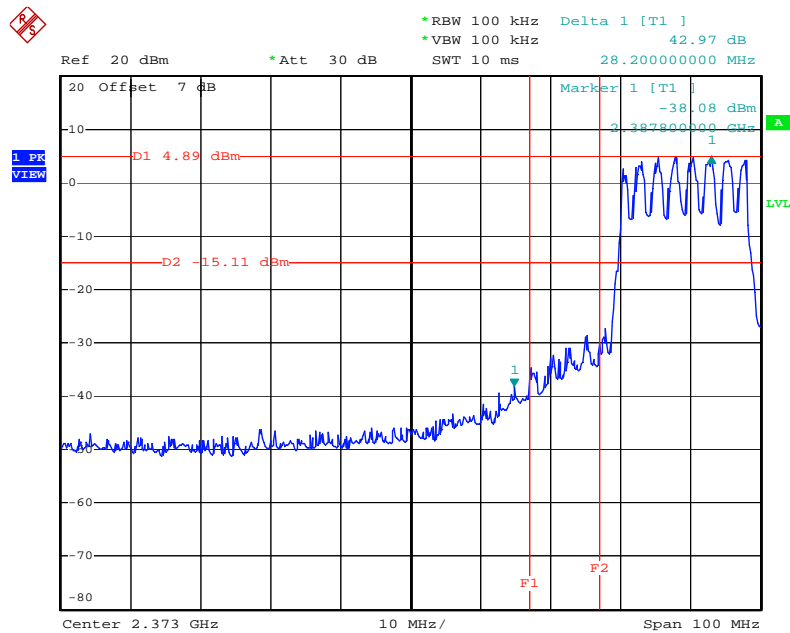
Date: 17.AUG.2006 09:47:02

High Band Edge Plot on Configuration IEEE 802.11n MCS8 20MHz Ant. A / 2462 MHz



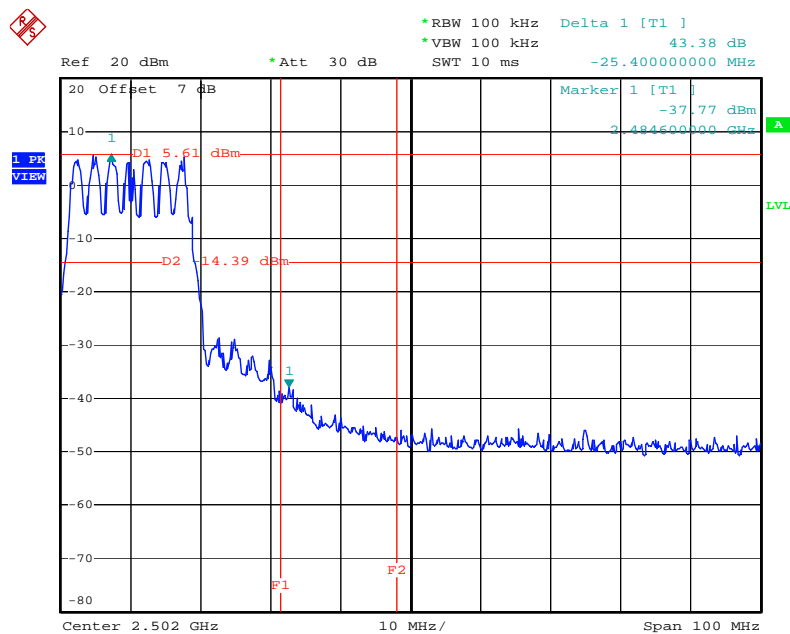
Date: 17.AUG.2006 09:51:24

### Low Band Edge Plot on Configuration IEEE 802.11n MCS8 20MHz Ant. A + Ant. B / 2412 MHz



Date: 17.AUG.2006 05:57:52

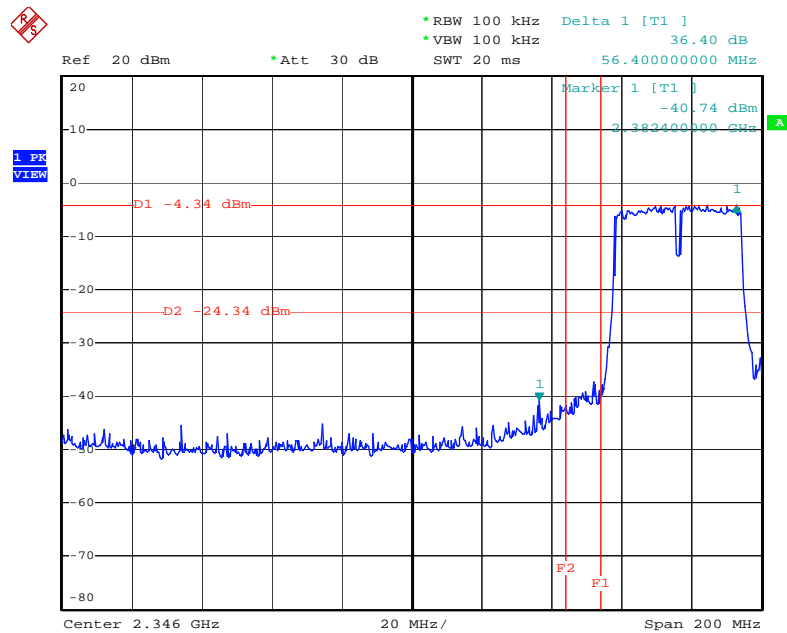
### High Band Edge Plot on Configuration IEEE 802.11n MCS8 20MHz Ant. A + Ant. B / 2462 MHz



Date: 17.AUG.2006 06:03:08

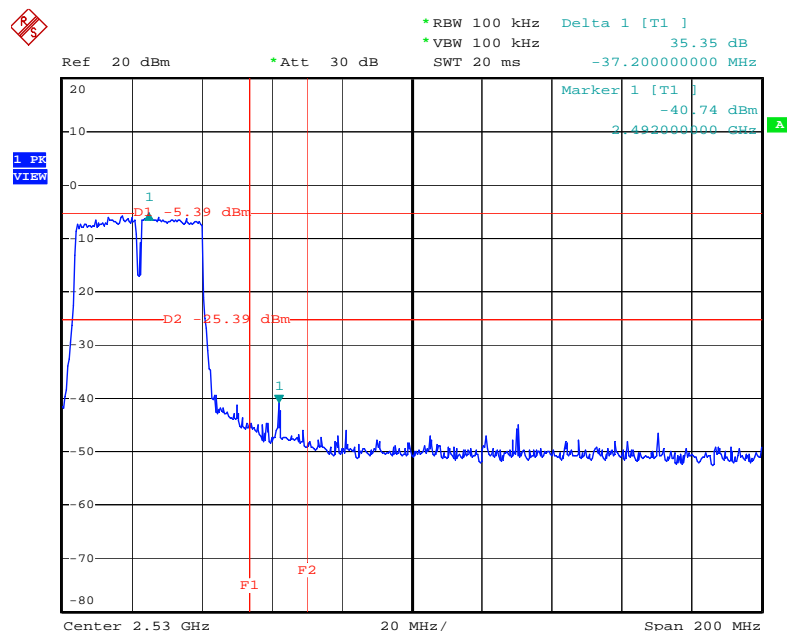
# For Emission not in Restricted Band

## Low Band Edge Plot on Configuration IEEE 802.11n MCS8 40MHz Ant. A / 2422 MHz



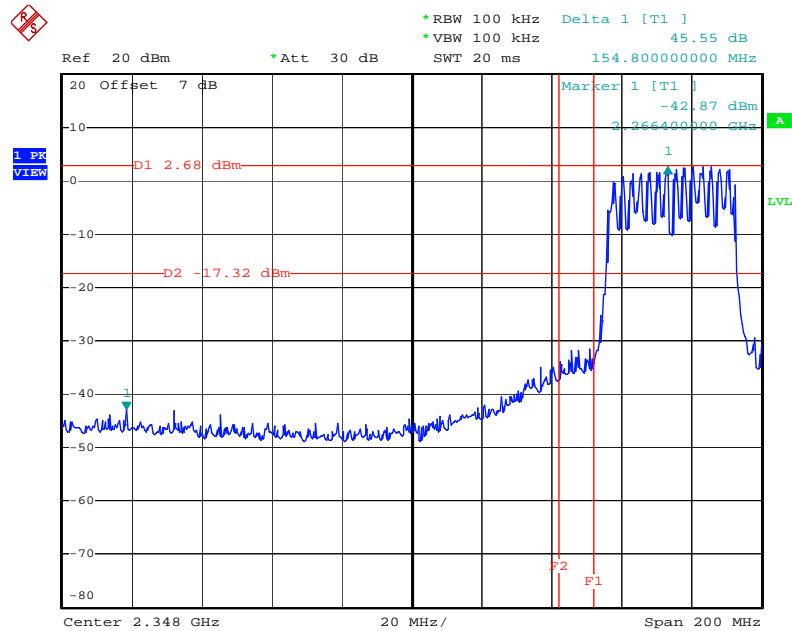
Date: 17.AUG.2006 10:02:12

## High Band Edge Plot on Configuration IEEE 802.11n MCS8 40MHz Ant. A / 2452 MHz



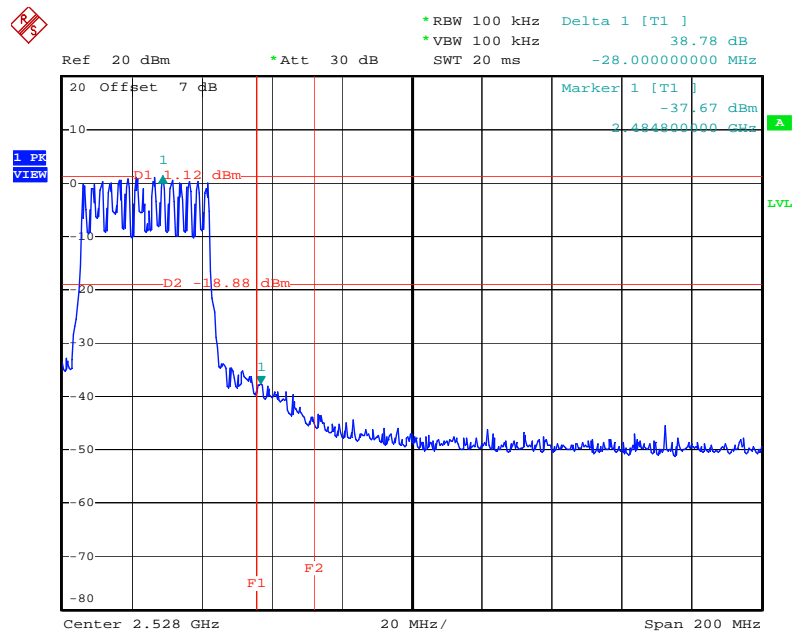
Date: 17.AUG.2006 10:07:39

### Low Band Edge Plot on Configuration IEEE 802.11n MCS8 40MHz Ant. A + Ant. B / 2422 MHz



Date: 17.AUG.2006 08:04:28

### High Band Edge Plot on Configuration IEEE 802.11n MCS8 40MHz Ant. A + Ant. B / 2452 MHz



Date: 17.AUG.2006 08:09:37

## **4.7. Antenna Requirements**

### **4.7.1. Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### **4.7.2. Antenna Connector Construction**

Please refer to section 3.3 in this test report, antenna connector complied with the requirements.

## 5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 15, 2006	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	CPA9231A	3565	9 kHz - 2 GHz	Jan. 18, 2006	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	May 29, 2006	Radiation (03CH03-HY)
Amplifier	MITEQ	AMF-6F-260400	923364	26.5 GHz - 40 GHz	Jan. 24, 2006*	Radiation (03CH03-HY)
Spectrum Analyzer	R&S	FSP40	100004/040	9 kHz - 40 GHz	Sep. 30, 2005	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz - 30 MHz	May 23, 2006*	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL 6112D	22237	30 MHz - 1 GHz	Jul. 24, 2006	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6903	1GHz ~ 18GHz	Mar. 15, 2006	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15 GHz - 40 GHz	NCR	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Dec.02, 2005	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec.02, 2005	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)
EMC Receiver	R&S	ESCS 30	100174	9kHz - 2.75GHz	Feb. 22, 2006	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	99079	9kHz - 30MHz	Dec. 19, 2005	Conduction (CO04-HY)
LISN (Support Unit)	EMCO	3810/2NM	9708-1839	9kHz - 30MHz	Mar. 18, 2006	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz - 30MHz	Apr. 20, 2006	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
Spectrum analyzer	R&S	FSP30	100023	9kHz ~ 30GHz	Nov. 26, 2005	Conducted (TH01-HY)
Power meter	R&S	NRVS	100764	DC ~ 40GHz	Jul, 20, 2006	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Jun, 10, 2006	Conducted (TH01-HY)
AC power source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Apr. 21, 2005*	Conducted (TH01-HY)

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

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

Note: NCR means Non-Calibration required.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
DC power source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Dec. 28, 2005	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2005	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 30, 2005	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 30, 2005	Conducted (TH01-HY)
Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Jun. 20, 2006	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Dec. 30, 2005	Conducted (TH01-HY)
Data Generator	Tektronix	DG2030	063-2920-50	0.1Hz~400MHz	Jun. 16, 2006	Conducted (TH01-HY)

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



## 6. 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
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