9 SPURIOUS EMISSION - RF CONDUCTED MEASUREMENT

9.1 Standard Applicable

According to 12.247 (c) , in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

9.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 2. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

9.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Spectrum Analyzer	Hewlett-Packard	8564EC	09/16/2005

9.4 Measurement Data

Test Date: Aug. 31, 2004 Temperature: 25 ℃ Humidity: 61 %

(1) IEEE 802.11b

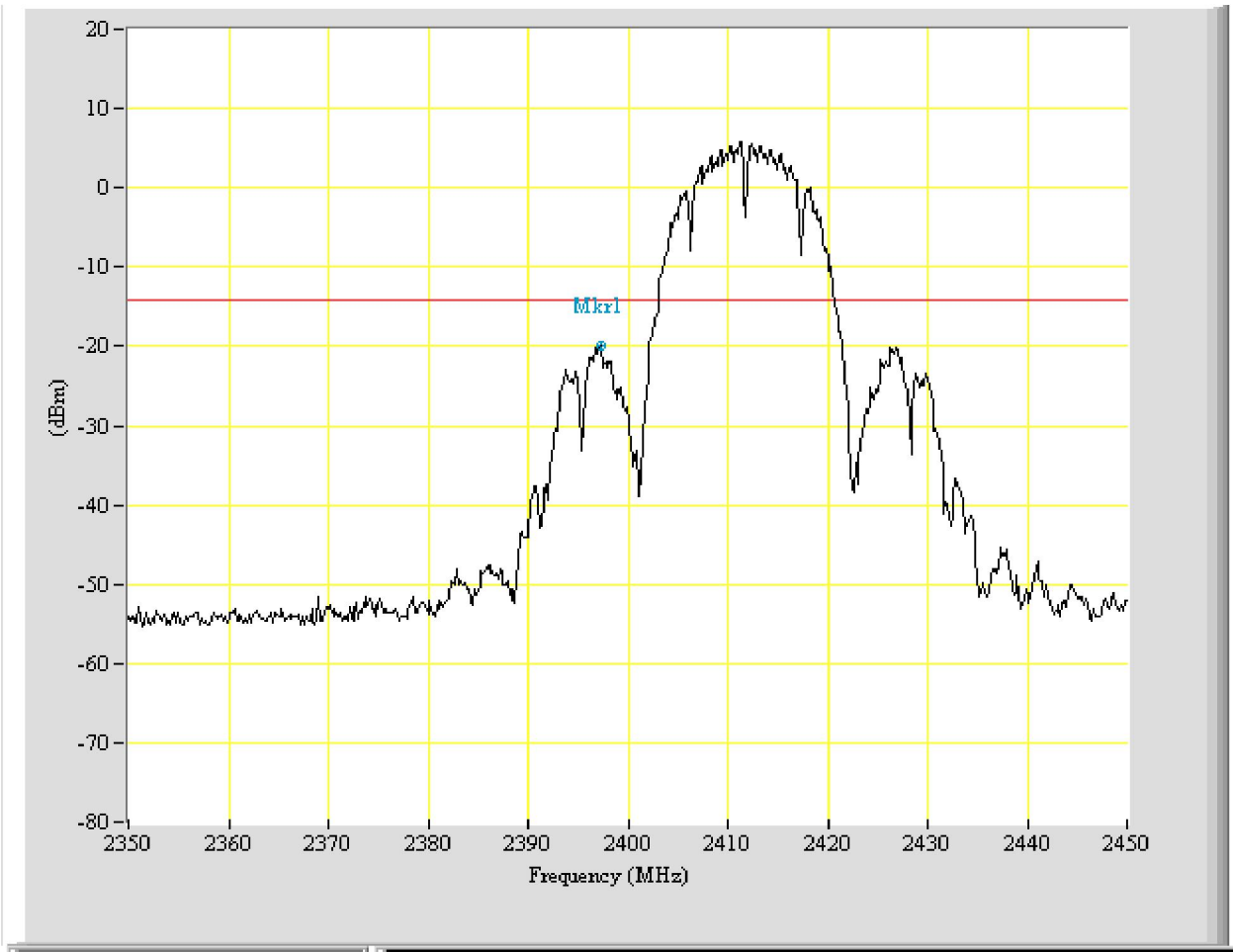
Channel	Frequency(MHz)	Chart
1	2412	Page 45, Page 46
6	2437	Page 47
11	2462	Page 48, Page 49

(2) IEEE 802.11g

Channel	Frequency(MHz)	Chart
1	2412	Page 50, Page 51
6	2437	Page 52
11	2462	Page 53, Page 54

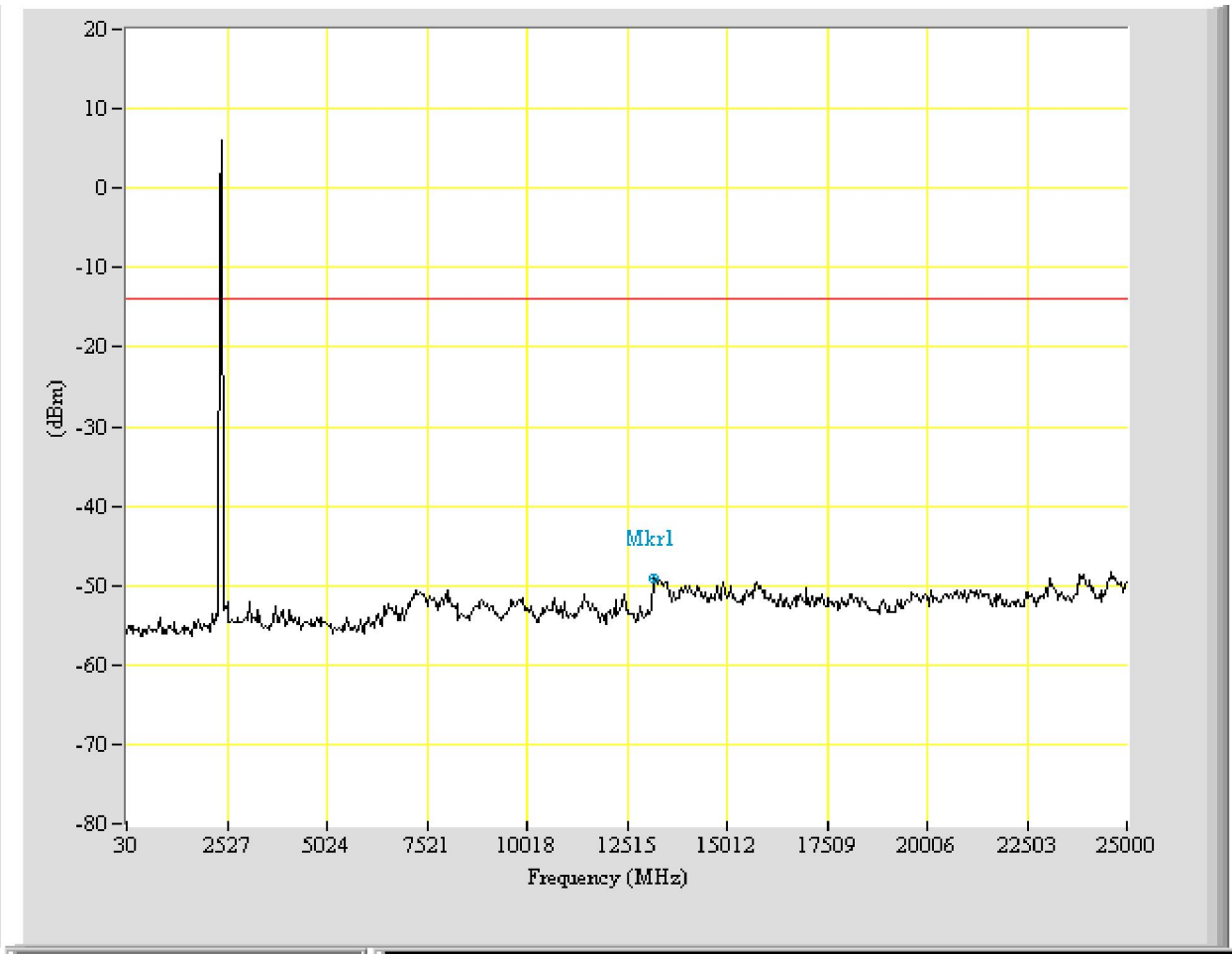
All out-of –band conducted emissions were more than 20dB below the carrier.

Note: Please refer to page 45 to page 54 for chart



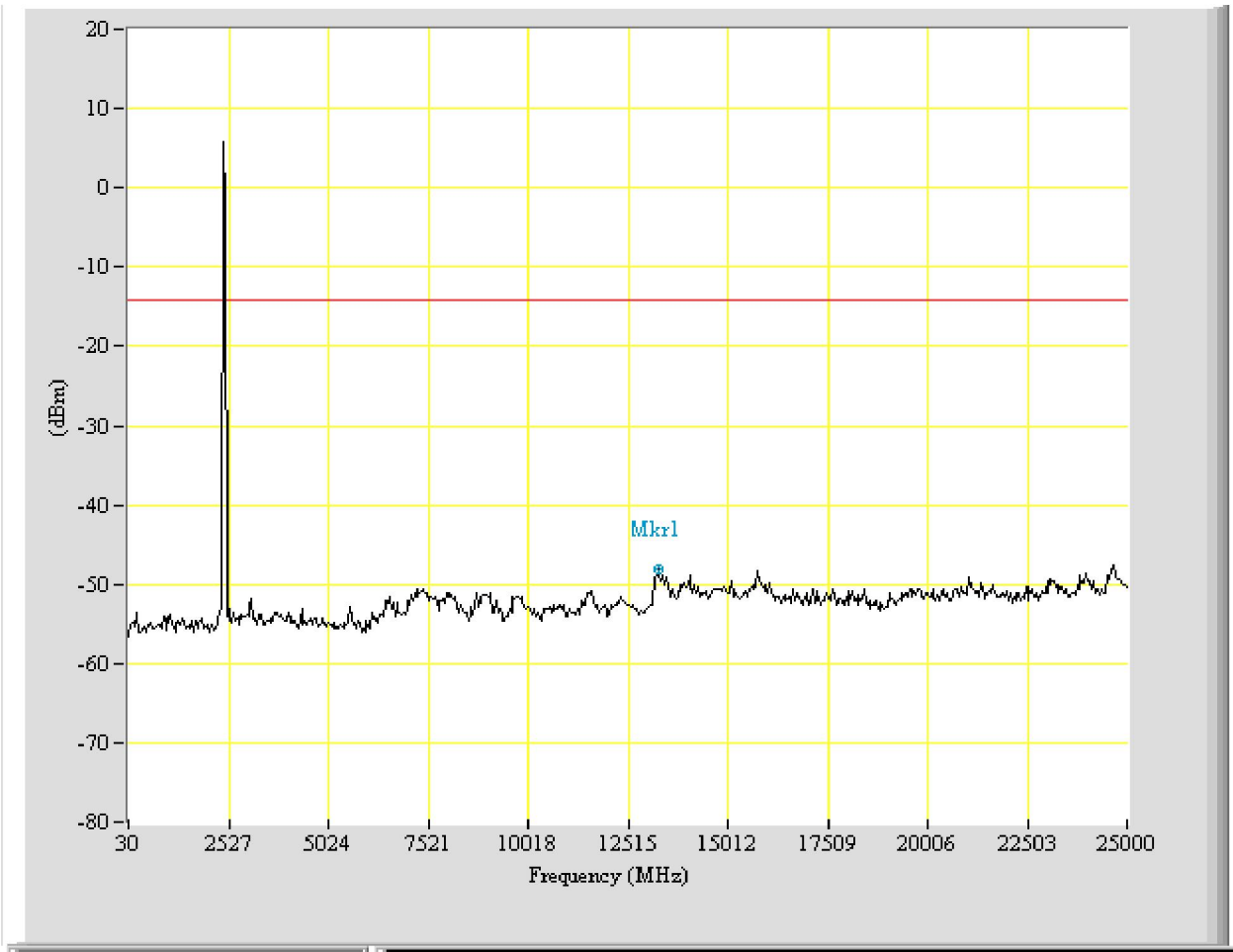
*Center 2400.0000MHz *SPAN 100.0000MHz *RBW 100.00kHz *VBW 300.00kHz *SWP 50.00msec *ATTEN 30.00dB *RL 20.00dBm	Display Line -14.160dBm Marker 2397.333MHz -20.000dBm

EUT: DMA-10W
Purpose: Band_Edge
Condition: 802,11b_CH01
Note:



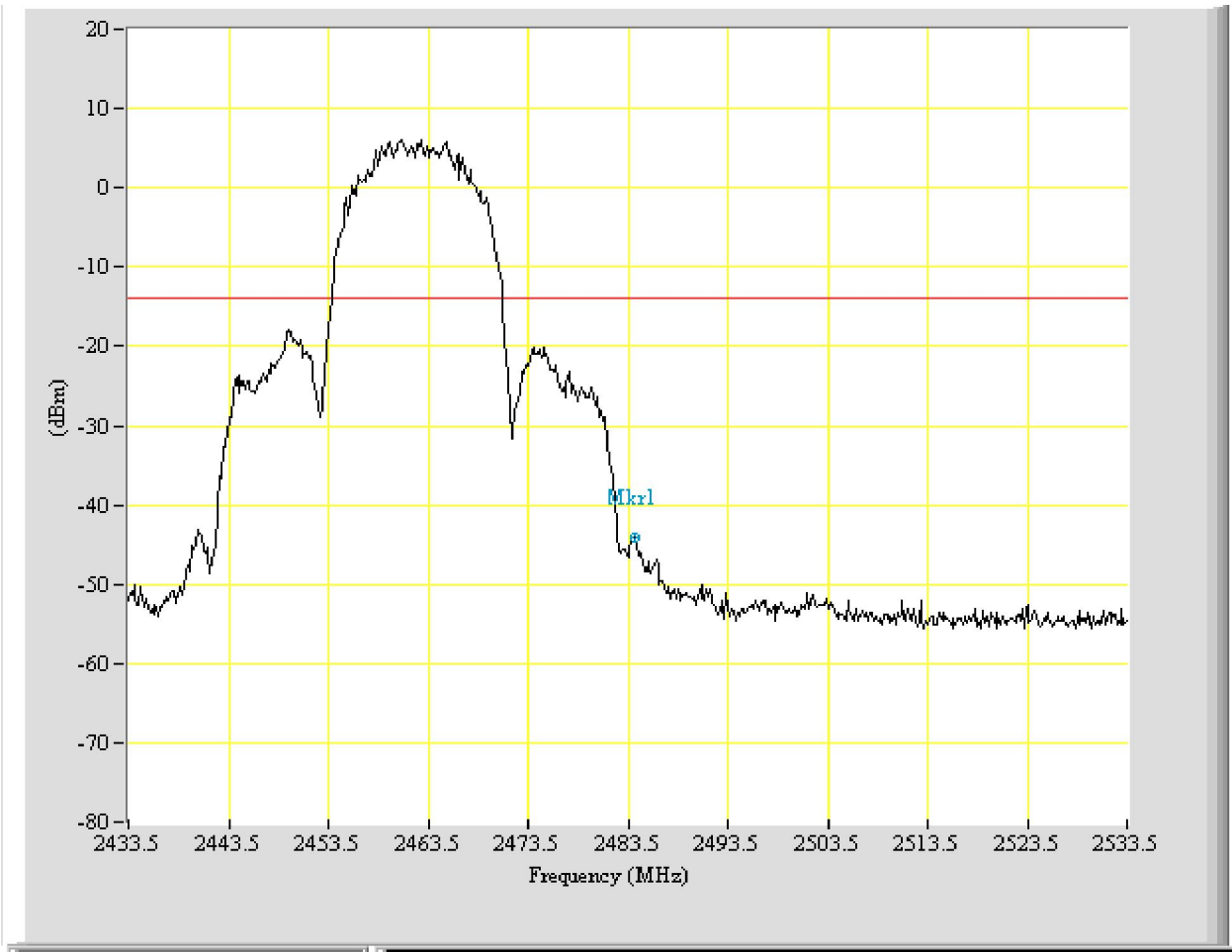
*Center 12515.0000MHz *SPAN 24970.0000MHz *RBW 100.00kHz *VBW 300.00kHz *SWP 6300.00msec *ATTEN 30.00dB *RL 20.00dBm	Display Line -14.000dBm Marker 13180.867MHz -49.160dBm

EUT: DMA-10W
Purpose: Band_Edge_All
Condition: 802,11b_CH01
Note:



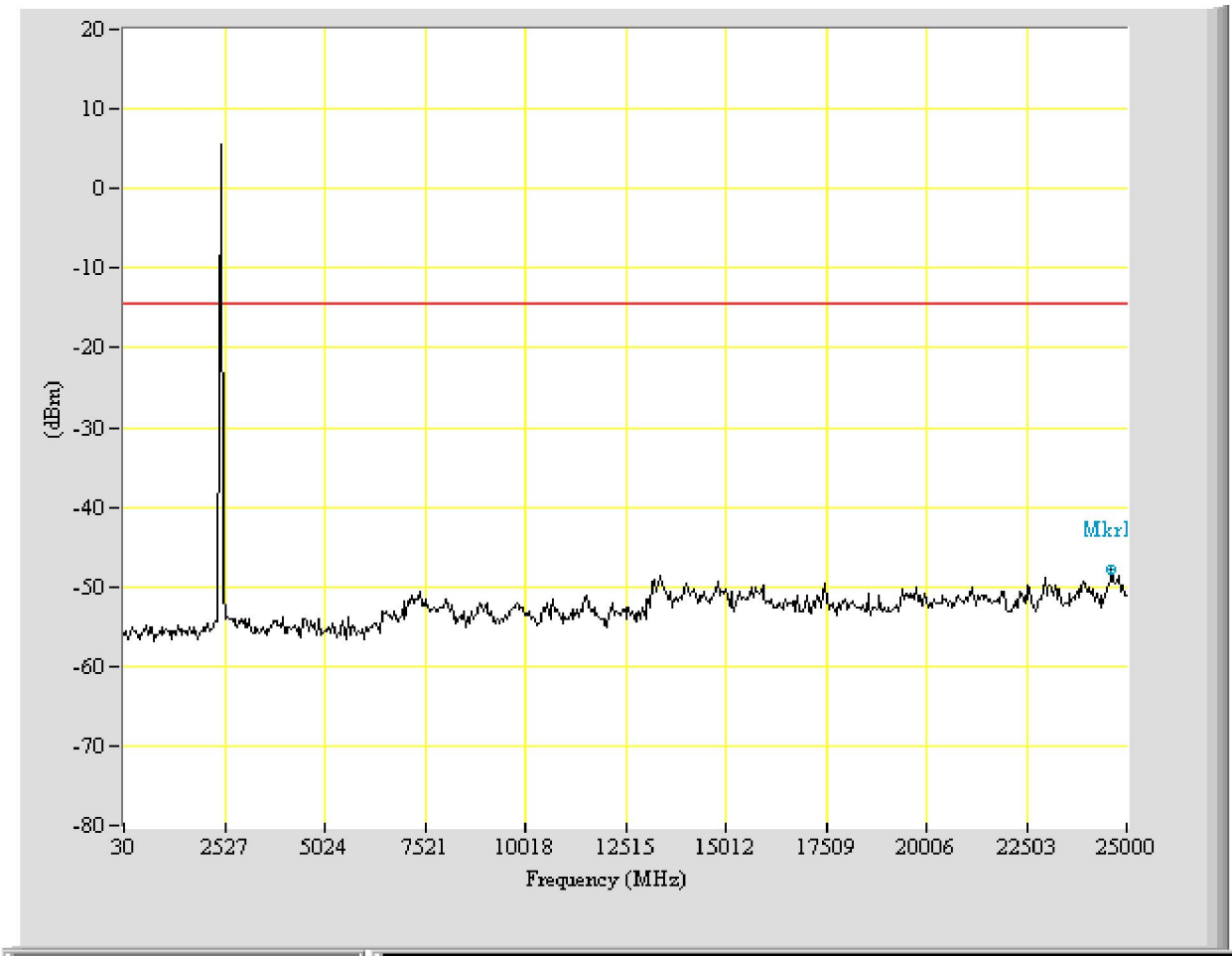
*Center 12515.0000MHz	Display Line -14.160dBm
*SPAN 24970.0000MHz	Marker 13264.100MHz -48.160dBm
*RBW 100.00kHz	
*VBW 300.00kHz	
*SWP 6300.00msec	
*ATTEN 30.00dB	
*RL 20.00dBm	

EUT: DMA-10W
Purpose: Band_Edge_All
Condition: 802,11b_CH06
Note:



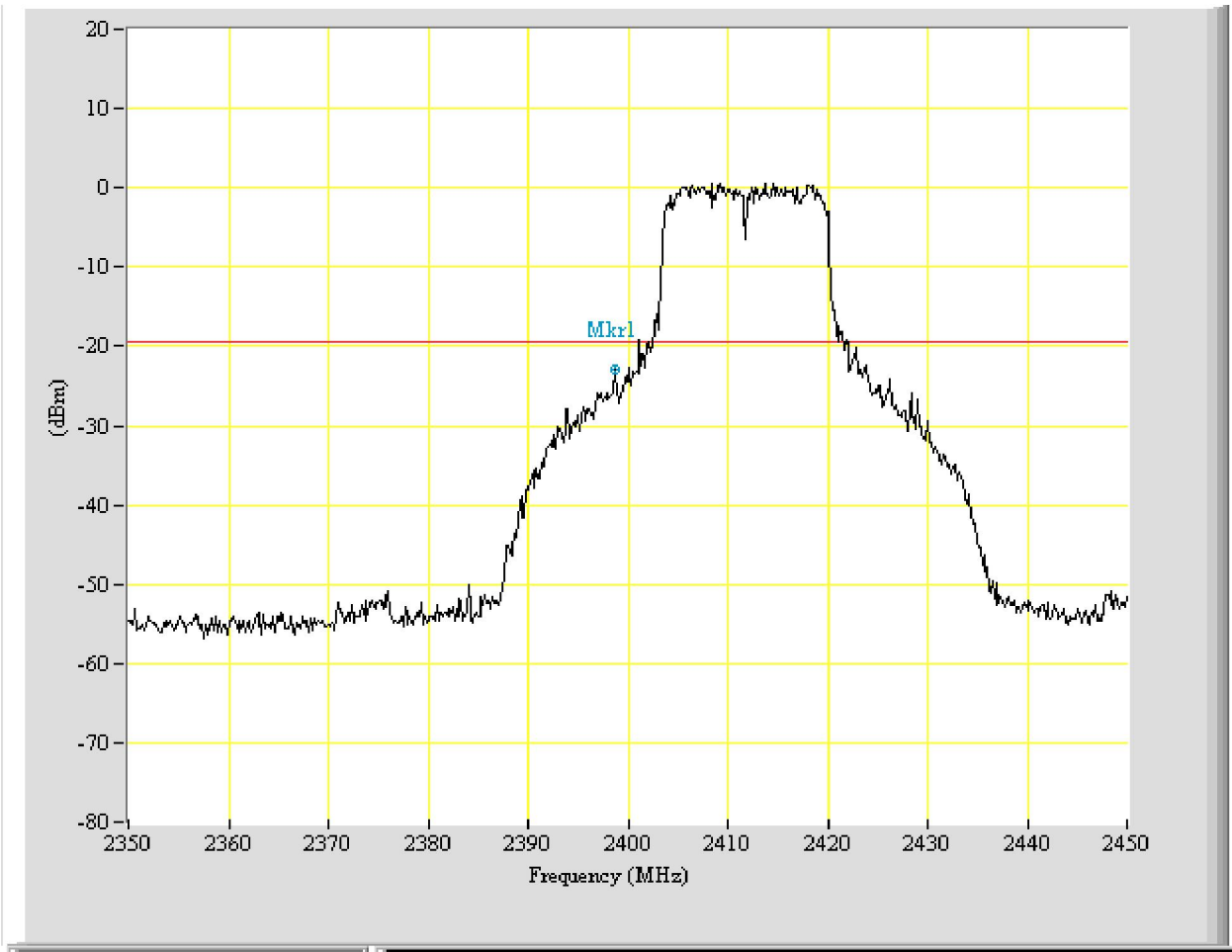
*Center 2483.5000MHz	Display Line -14.000dBm
*SPAN 100.0000MHz	Marker 2484.167MHz -44.160dBm
*RBW 100.00kHz	
*VBW 300.00kHz	
*SWP 50.00msec	
*ATTEN 30.00dB	
*RL 20.00dBm	

EUT: DMA-10W
Purpose: Band_Edge
Condition: 802,11b_CH11
Note:



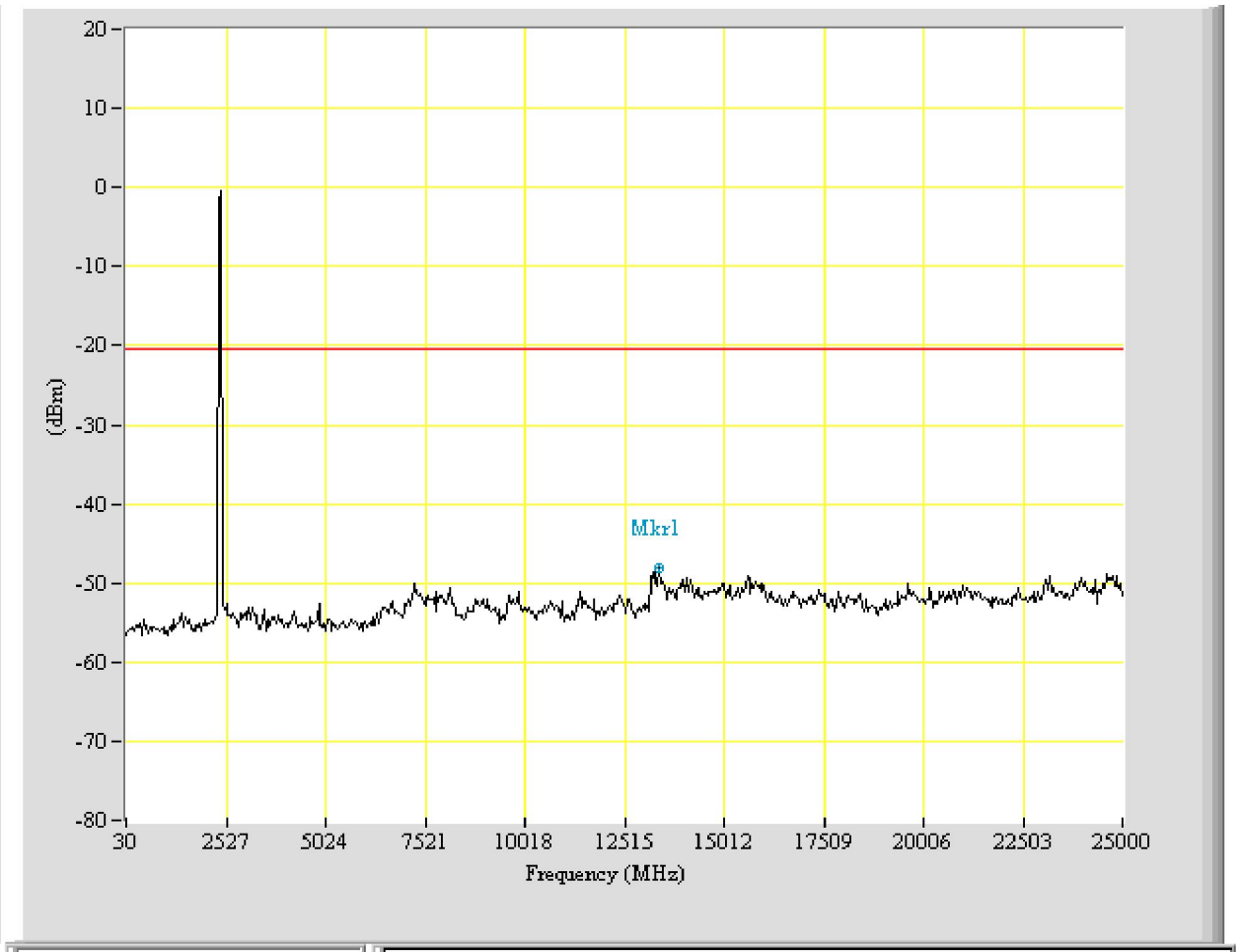
*Center 12515.0000MHz *SPAN 24970.0000MHz *RBW 100.00kHz *VBW 300.00kHz *SWP 6300.00msec *ATTEN 30.00dB *RL 20.00dBm	Display Line -14.500dBm Marker 24625.450MHz -47.830dBm

EUT: DMA-10W
Purpose: Band_Edge_All
Condition: 802,11b_CH11
Note:



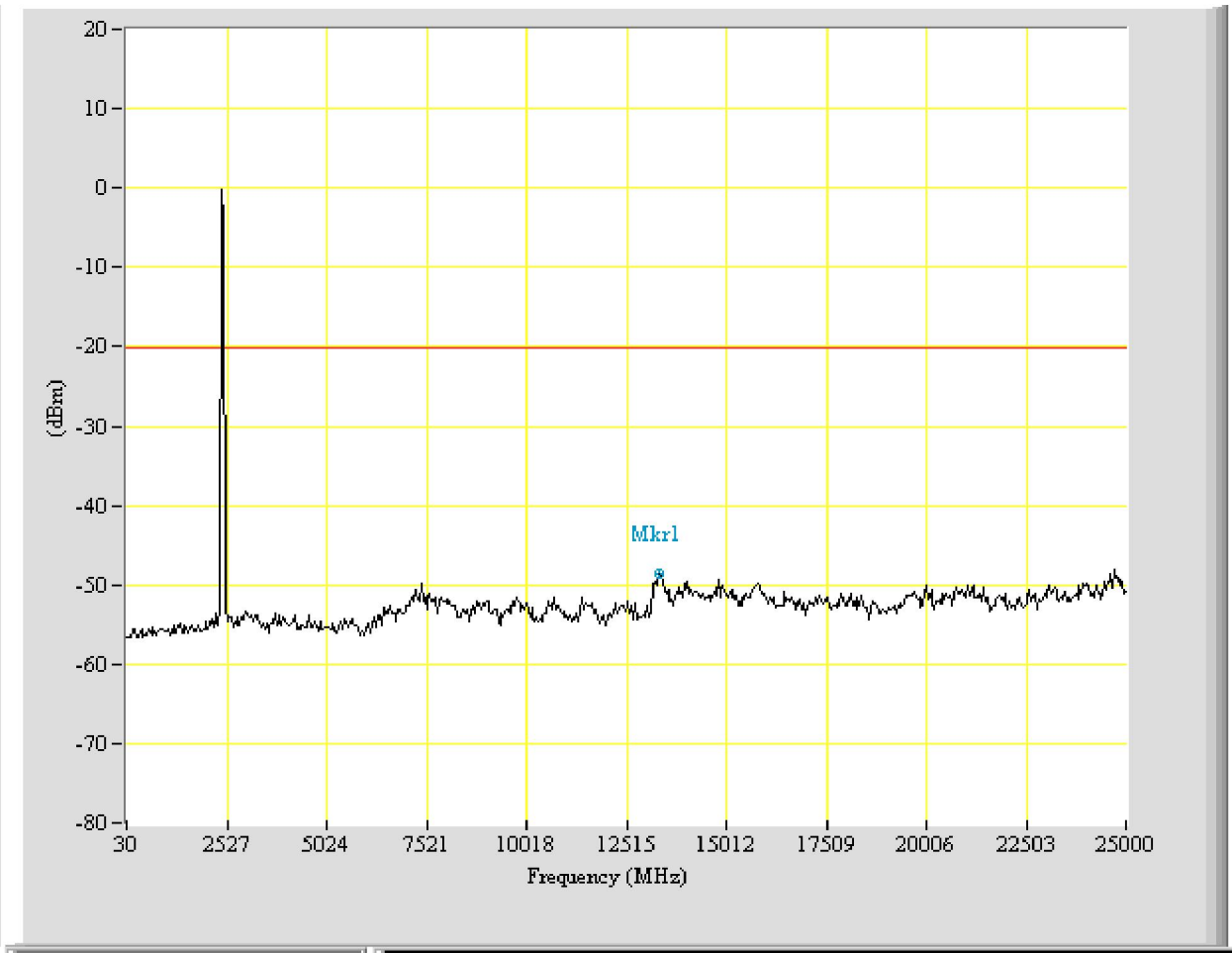
*Center 2400.0000MHz	Display Line -19.330dBm
*SPAN 100.0000MHz	Marker 2398.667MHz -23.000dBm
*RBW 100.00kHz	
*VBW 300.00kHz	
*SWP 50.00msec	
*ATTEN 30.00dB	
*RL 20.00dBm	

EUT: DMA-10W
Purpose: Band_Edge
Condition: 802,11g_CH01
Note:



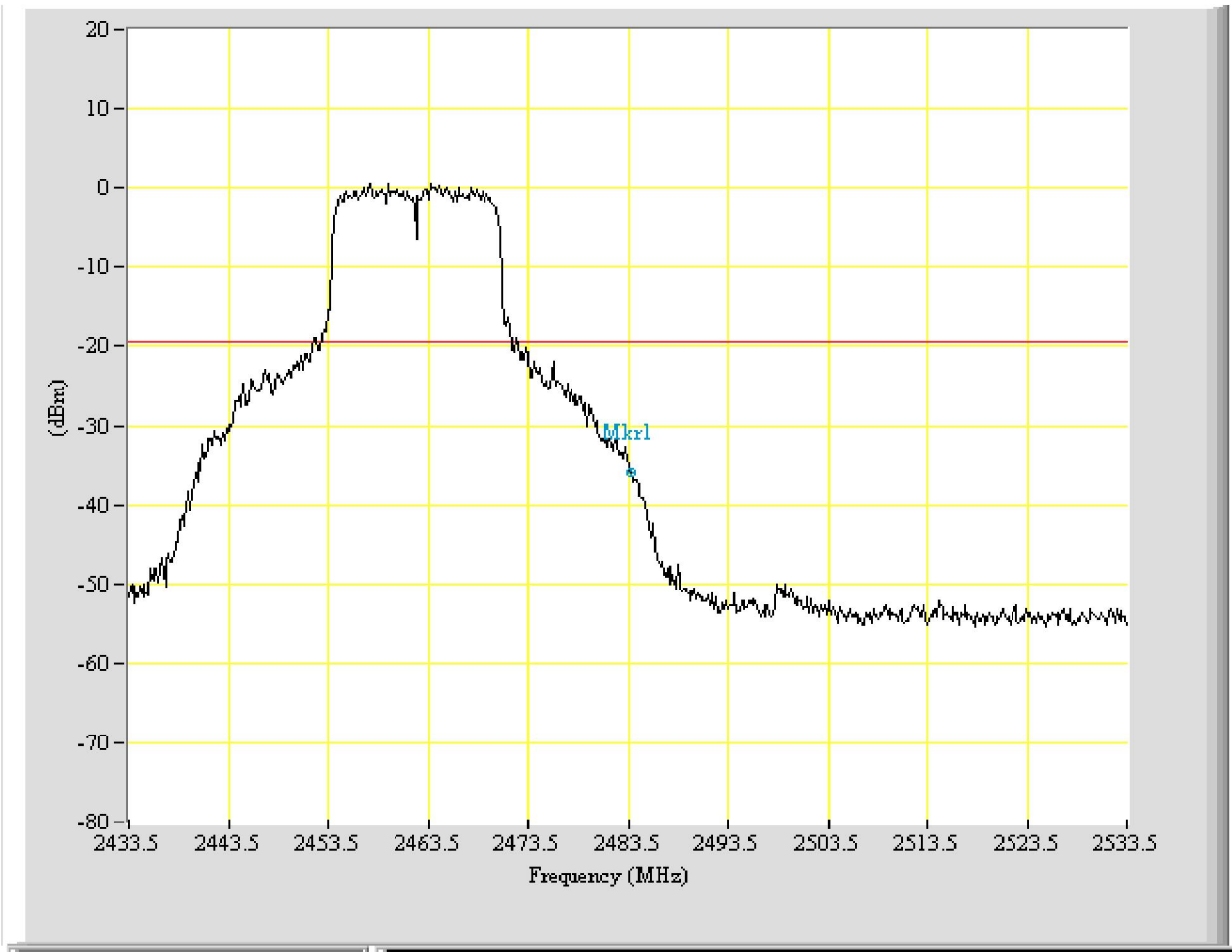
*Center 12515.0000MHz	Display Line -20.500dBm
*SPAN 24970.0000MHz	Marker 13388.950MHz -48.000dBm
*RBW 100.00kHz	
*VBW 300.00kHz	
*SWP 6300.00msec	
*ATTEN 30.00dB	
*RL 20.00dBm	

EUT: DMA-10W
Purpose: Band_Edge_All
Condition: 802,11g_CH01
Note:



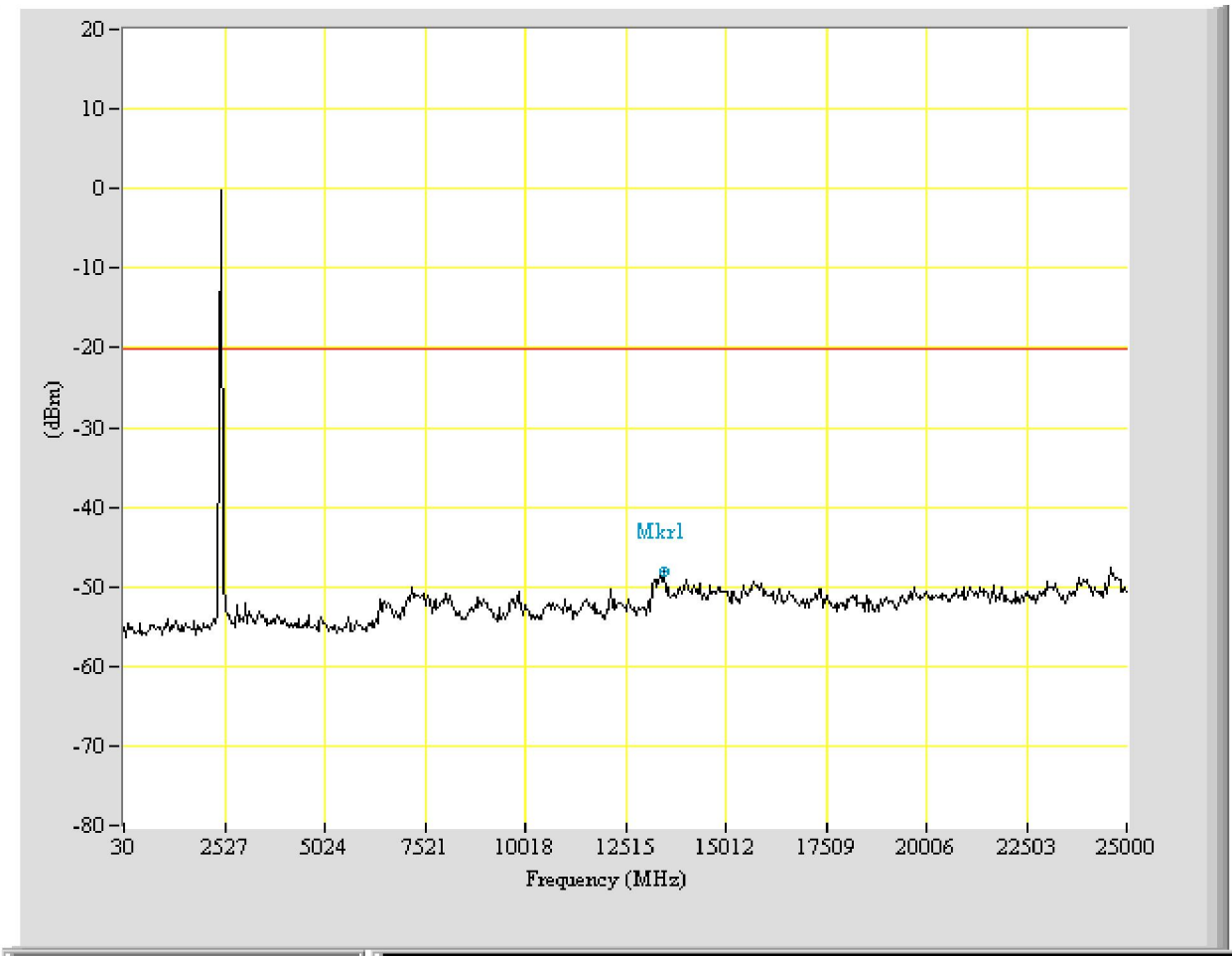
*Center 12515.0000MHz *SPAN 24970.0000MHz *RBW 100.00kHz *VBW 300.00kHz *SWP 6300.00msec *ATTEN 30.00dB *RL 20.00dBm	Display Line -20.160dBm Marker 13347.333MHz -48.660dBm

EUT: DMA-10W
Purpose: Band_Edge_All
Condition: 802,11g_CH06
Note:



*Center 2483.5000MHz	Display Line -19.500dBm
*SPAN 100.0000MHz	Marker 2483.833MHz -35.830dBm
*RBW 100.00kHz	
*VBW 300.00kHz	
*SWP 50.00msec	
*ATTEN 30.00dB	
*RL 20.00dBm	

EUT: DMA-10W
Purpose: Band_Edge
Condition: 802,11g_CH11
Note:



*Center 12515.0000MHz	Display Line -20.160dBm
*SPAN 24970.0000MHz	Marker 13472.183MHz -48.160dBm
*RBW 100.00kHz	
*VBW 300.00kHz	
*SWP 6300.00msec	
*ATTEN 30.00dB	
*RL 20.00dBm	

EUT: DMA-10W
Purpose: Band_Edge_All
Condition: 802,11g_CH11
Note:

10 RADIATED EMISSION MEASUREMENT

10.1 Standard Applicable

For unintentional radiator, the radiated emission shall comply with §15.109(a).

For intentional radiators, according to §15.247 (a), operation under this provision is limited to frequency hopping and direct sequence spread spectrum, and the out band emission shall be comply with §15.247 (c)

10.2 Measurement Procedure

1. Setup the configuration per figure 4 and 5 for frequencies measured below and above 1 GHz respectively.
2. For emission frequencies measured below 1 GHz, it is performed in a semi-anechoic chamber to determine the accurate frequencies of higher emissions. For emission frequencies measured above 1 GHz, a pre-scan be performed with a 1 meter measuring distance before final test.
3. For emission frequencies measured below and above 1 GHz, set the spectrum analyzer on a 120 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.
4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading. A RF test receiver is also used to confirm emissions measured.

   Note : A filter was used to avoid pre-amplifier saturated when measure TX operation mode.
5. Repeat step 4 until all frequencies need to be measured were complete.
6. Repeat step 5 with search antenna in vertical polarized orientations.
7. Check the three frequencies of highest emission with varying the datarate, placement of ANT. cables associated with EUT to obtain the worse case and record the result.

Figure 4 : Frequencies measured below 1 GHz configuration

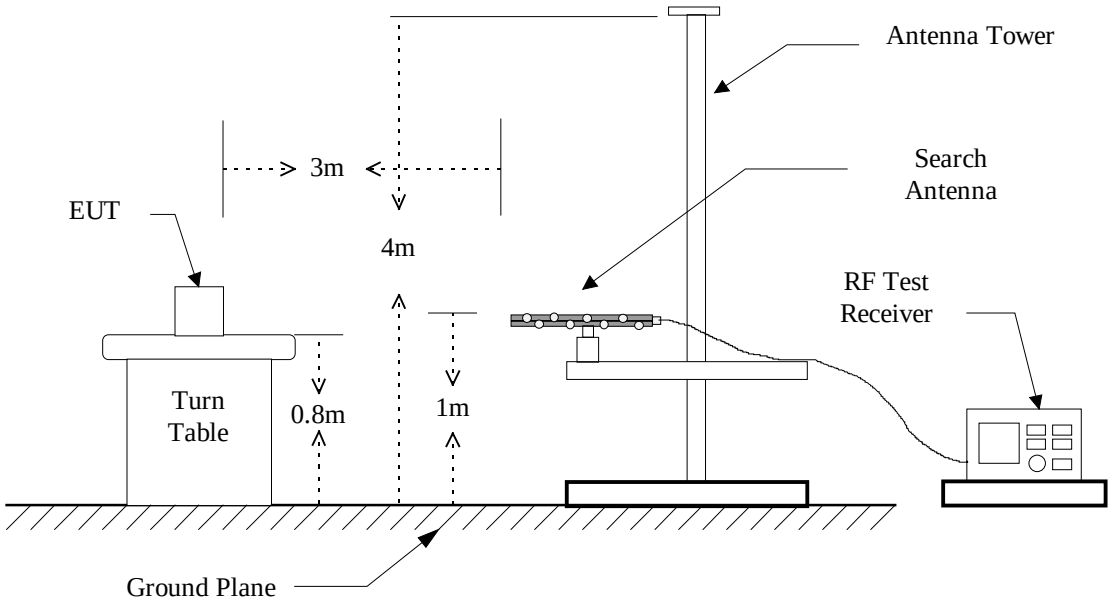
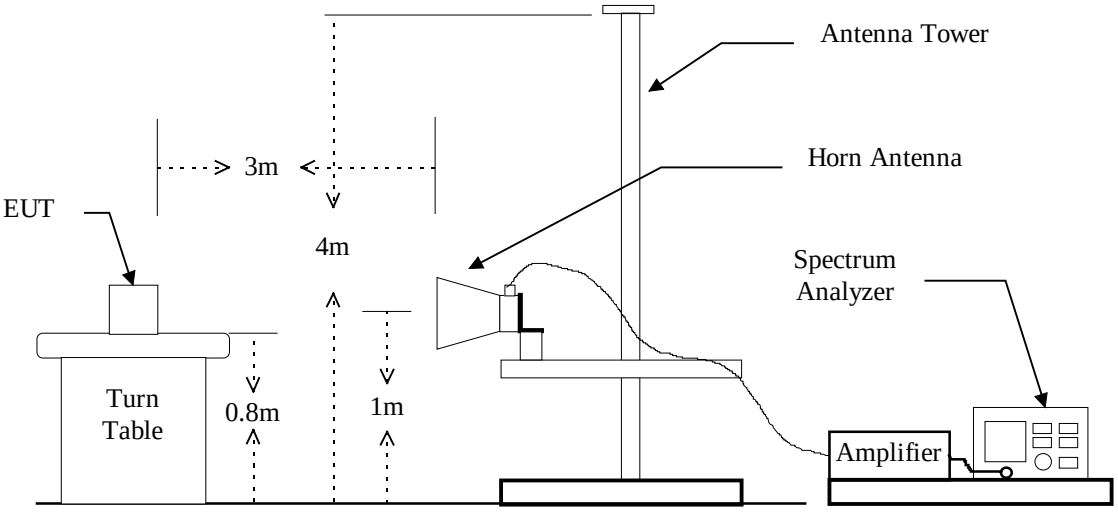


Figure 5 : Frequencies measured above 1 GHz configuration



10.3 Measuring Instrument

The following instrument are used for radiated emissions measurement :

Equipment	Manufacturer	Model No.	Next Cal. Due
EMI Test Receiver	Hewlett-Packard	8546A	01/31/2005
BiconiLog Antenna	Schwarzbeck	9160	10/18/2004
Horn Antenna	EMCO	3115	05/09/2005
Horn Antenna	EMCO	3116	06/28/2005
Preamplifier	Hewlett-Packard	8449B	09/17/2005
Spectrum Analyzer	Hewlett-Packard	8564EC	09/16/2005

Measuring instrument setup in measured frequency band when specified detector function is used :

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	RF Test Receiver	Quasi-Peak	120 kHz	300 kHz
	Spectrum Analyzer	Peak	120 kHz	300 kHz
Above 1000	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

Measuring instrument setup in measured frequency band when specified detector function is used:

Frequency Band (MHz)	Instrument	Function	Resolution bandwidth	Video Bandwidth
2390 & 2483.5	Spectrum Analyzer	Peak	1 MHz	1 MHz
	Spectrum Analyzer	Average	1 MHz	10 Hz

10.4 Radiated Emission Data

10.4.1 Harmonic

10.4.1.1 IEEE 802.11b
Operation Mode: Receiving /Transmitting
Test Date: Sep. 01, 2004 Temperature: 25 ℃ Humidity: 63 %

a) Channel 1
Fundamental Frequency: 2412 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m		Margin (dB)	Table	Ant.
	H		V		(dB)	(dBuV/m)		(dBuV/m)			Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.		(Deg.)	(m)
4824.000	49.5	38.1	49.5	39.7	-4.4	45.1	35.3	74.0	54.0	18.7	98	1.0
7236.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
12060.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
14472.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19296.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---

b) Channel 6
Fundamental Frequency: 2437 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m		Margin (dB)	Table	Ant.
	H		V		(dB)	(dBuV/m)		(dBuV/m)			Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.		(Deg.)	(m)
4874.000	48.1	37.9	50.5	40.4	-4.4	46.1	36.0	74.0	54.0	18.0	98	1.0
7311.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
12185.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19496.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---

c) Channel 11
Fundamental Frequency: 2462 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m		Margin (dB)	Table	Ant.
	H		V		(dB)	(dBuV/m)		(dBuV/m)			Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.		(Deg.)	(m)
4924.000	48.2	37.8	50.5	40.5	-4.4	46.1	36.1	74.0	54.0	17.9	98	1.0
7386.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19696.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
22158.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19296.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---

Note :
1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emissions level is too low to be measured.
3. Item "Margin" referred to Average limit while there is only peak result.

10.4.1.2 IEEE 802.11g
Operation Mode: Receiving /Transmitting
Test Date: Sep. 01, 2004 Temperature: 25 ℃ Humidity: 63 %

a) Channel 1
Fundamental Frequency: 2412 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m		Margin	Table	Ant.
	H		V		(dB)	(dBuV/m)		(dBuV/m)		(dB)	Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.		(Deg.)	(m)
4824.000	48.9	38.2	48.6	38.2	-4.4	44.5	33.8	74.0	54.0	20.2	100	1.0
7236.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
12060.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
14472.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19296.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---

b) Channel 6
Fundamental Frequency: 2437 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m		Margin	Table	Ant.
	H		V		(dB)	(dBuV/m)		(dBuV/m)		(dB)	Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.		(Deg.)	(m)
4874.000	49.2	38.2	49.7	38.6	-4.4	45.3	34.2	74.0	54.0	19.8	100	1.0
7311.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
12185.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19496.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---

c) Channel 11
Fundamental Frequency: 2462 MHz

Frequency	Reading (dBuV)				Factor	Result @3m		Limit @3m		Margin	Table	Ant.
	H		V		(dB)	(dBuV/m)		(dBuV/m)		(dB)	Deg.	High
(MHz)	Peak	Ave	Peak	Ave	Corr.	Peak	Ave	Peak	Ave.		(Deg.)	(m)
4924.000	48.8	38.1	49.8	39.8	-4.4	45.4	35.4	74.0	54.0	18.6	100	1.0
7386.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19696.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
22158.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---
19296.000	---	---	---	---	---	---	---	74.0	54.0	---	---	---

Note :
1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emissions level is too low to be measured.
3. Item "Margin" referred to Average limit while there is only peak result.

10.4.2 Spurious Emission

10.4.2.1 IEEE 802.11b

Test Date: Sep. 01, 2004 Temperature: 25 ℃ Humidity: 63 %

a) Emission frequencies below 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
30.000	H	15.6	13.1	28.7	40.0	-11.3
30.000	V	17.7	13.1	30.8	40.0	-9.2
77.530	V	10.5	9.9	20.4	40.0	-19.6
247.280	H	14.5	14.6	29.1	46.0	-16.9
247.280	V	18.5	14.6	33.1	46.0	-12.9
305.480	H	13.5	16.8	30.3	46.0	-15.7
373.380	V	9.0	18.8	27.8	46.0	-18.2
552.830	V	8.3	22.9	31.2	46.0	-14.8
574.140	H	8.4	23.6	32.0	46.0	-14.0
775.930	H	8.5	27.2	35.7	46.0	-10.3
809.880	H	14.1	27.6	41.7	46.0	-4.3
809.880	V	13.8	27.6	41.4	46.0	-4.6

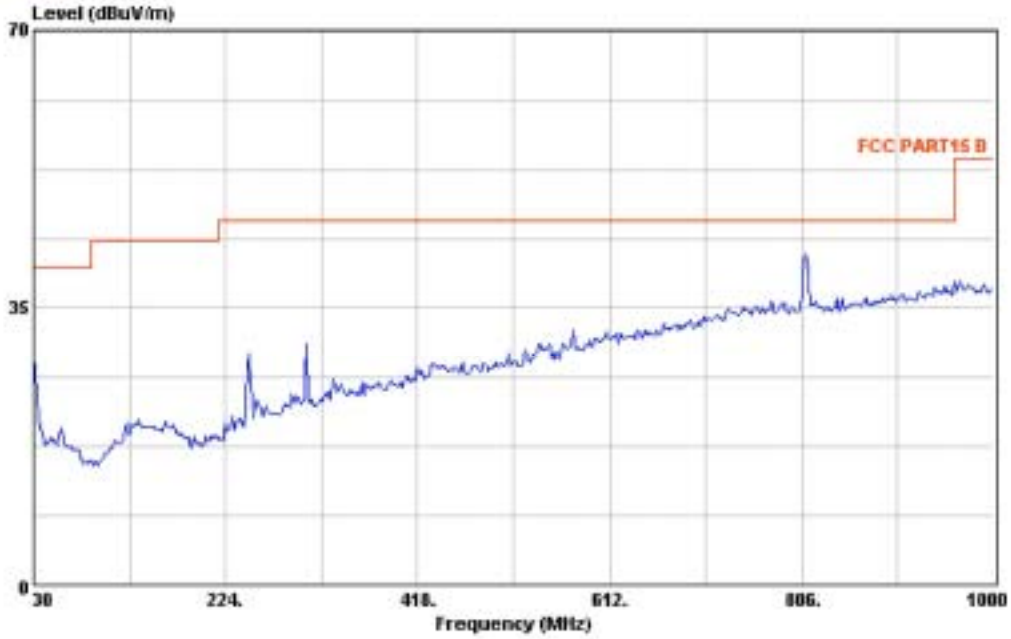
b) Emission frequencies above 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

Note : Please refer to page 61 to page 62 for chart

ETC TEST LABORTARY

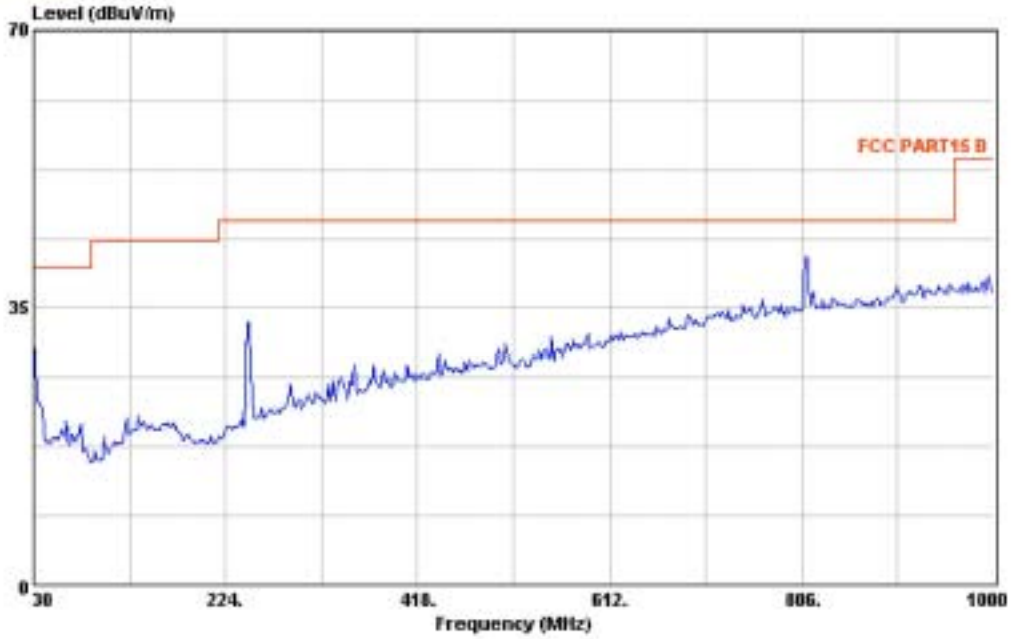
Data#: 1128 File#: C:\Program Files\e3\TestHsu.emi



Site : M00 SITE
Condition : FCC PART15 B 3m HORIZONTAL
EUT : WIRELESS DIGITAL MEDIA ADAPTOR
Model : DMA-10W
Memo : 802.11b

ETC TEST LABORTARY

Data#: 1127 File#: C:\Program Files\e3\TestHsu.emi



Site : M00 SITE
Condition : FCC PART15 B 3m VERTICAL
EUT : WIRELESS DIGITAL MEDIA ADAPTOR
Model : DMA-10W
Memo : 802.11b

10.4.2.2 IEEE 802.11g

Test Date: Sep. 01, 2004 Temperature: 25 ℃ Humidity: 63 %

a) Emission frequencies below 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
30.000	H	21.0	13.1	34.1	40.0	-5.9
30.000	V	18.2	13.1	31.3	40.0	-8.7
58.130	V	11.7	13.2	24.9	40.0	-15.1
245.340	H	15.5	14.6	30.1	46.0	-15.9
245.340	V	18.1	14.6	32.7	46.0	-13.3
288.990	V	9.5	16.8	26.3	46.0	-19.7
332.640	H	10.2	17.5	27.7	46.0	-18.3
407.330	H	8.8	19.4	28.2	46.0	-17.8
543.130	H	8.4	22.9	31.3	46.0	-14.7
589.690	V	7.9	23.8	31.7	46.0	-14.3
809.880	H	14.7	27.6	42.3	46.0	-3.7
809.880	V	13.7	27.6	41.3	46.0	-4.7

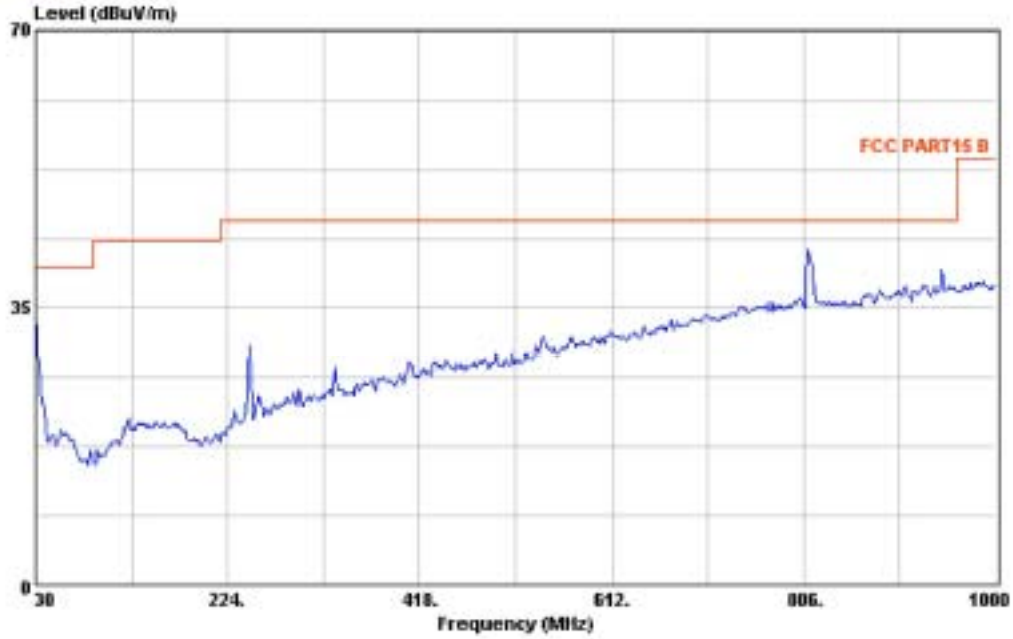
b) Emission frequencies above 1 GHz

Frequency (MHz)	Ant-Pol H/V	Meter Reading (dBuV)	Corrected Factor (dB)	Result @3m (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
Radiated emission frequencies above 1 GHz to 25 GHz were too low to be measured.						

Note : Please refer to page 64 to page 65 for chart

ETC TEST LABORTARY

Data#: 1126 File#: C:\Program Files\e3\TestHsu.emi

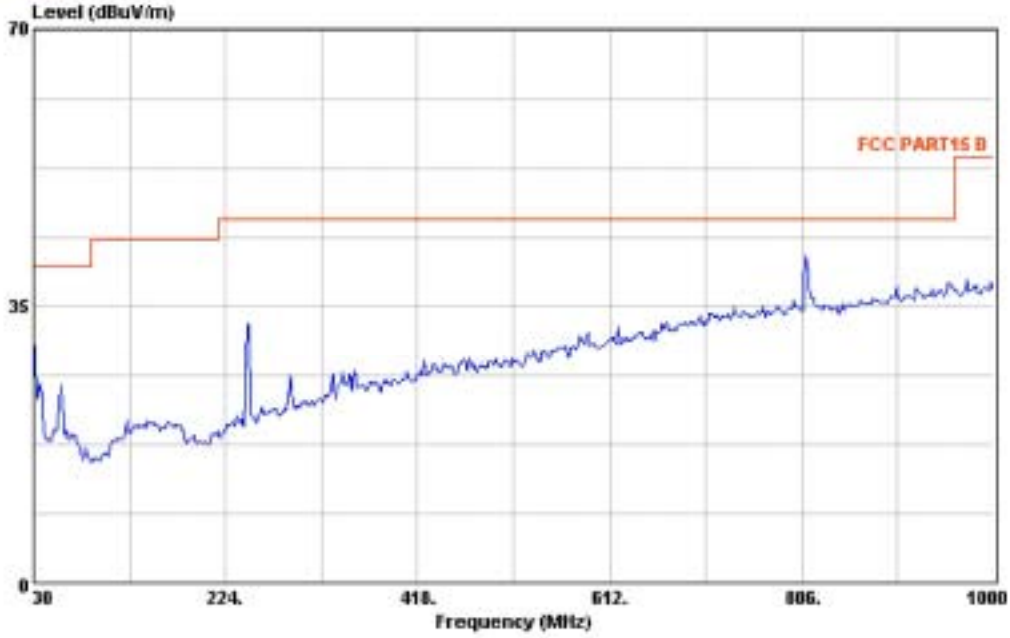


Site : HOO SITE
Condition : FCC PART15 B 3m HORIZONTAL
EUT : WIRELESS DIGITAL MEDIA ADAPTOR
Model : DMA-10W
Memo : 802.11g

- 1 -

ETC TEST LABORTARY

Data#: 1125 File#: C:\Program Files\e3\TestHsu.emi



Site : M00 SITE
Condition : FCC PART15 B 3m VERTICAL
EUT : WIRELESS DIGITAL MEDIA ADAPTOR
Model : DMA-10W
Memo : 802.11g

10.4.3 Radiated Measurement at Bandedge with Fundamental Frequencies

(1) IEEE 802.11b

Test Date: Sep. 01, 2004 Temperature: 25℃ Humidity: 63 %

Operation Mode: Receiving /Transmitting

Frequency	Reading (dBuV)				Factor	Result @3m (dBuV/m)		Limit @3m (dBuV/m)		Margin	Table Deg.	Ant. High
	H		V		(dB)	Peak	Ave	Peak	Ave.	(dB)	(Deg.)	
(MHz)	Peak	Ave	Peak	Ave	Corr.							(m)
2390.000	29.8	18.0	32.7	21.7	28.3	61.0	50.0	74.0	54.0	4.0	98	1.0
2483.500	30.7	18.0	33.3	22.0	28.3	61.6	50.3	74.0	54.0	3.7	98	1.0

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emissions level is too low to be measured.
3. Item "Margin" referred to Average limit while there is only peak result.

(2) IEEE 802.11g

Test Date: Sep. 01, 2004 Temperature: 25℃ Humidity: 63 %

Operation Mode: Receiving /Transmitting

Frequency (MHz)	Reading (dBuV) H Peak	H Ave	V Peak	V Ave	Factor (dB) Corr.	Result @3m (dBuV/m) Peak	Result @3m (dBuV/m) Ave	Limit @3m (dBuV/m) Peak	Limit @3m (dBuV/m) Ave.	Margin (dB)	Table Deg. (Deg.)	Ant. High (m)
2390.00	30.1	20.2	30.5	19.7	28.3	58.5	48.5	74.0	54.0	5.5	100	1.0
2483.500	30.2	20.3	32.1	21.4	28.3	60.4	49.7	74.0	54.0	4.3	100	1.0

Note :

1. Item of margin shown in above table refer to average limit.
2. Remark "---" means that the emissions level is too low to be measured.
3. Item "Margin" referred to Average limit while there is only peak result.

10.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, High Pass Filter Loss(if used) and Cable Loss, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

where

Corrected Factor = Antenna Factor + Cable Loss + High Pass Filter Loss - Amplifier Gain