MEASUREMENT REPORT
of
WIRELESS LAN GATEWAY

Applicant : ASUSTeK Computer Inc.
Model No. : WL500
EUT : ASUS SpaceLink Home Gateway
FCC ID : MSQWLHGWSWL500
Report No. : A5415562

Tested by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440
255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C.

CERTIFICATION

We here by verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made mainly in accordance with the procedures given in ANSI C63.4 (1992) as a reference. All test were conducted by ***Training Research Co., Ltd.***, 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is **in compliance with** the technical requirements set forth in the FCC Rules Part 15 Subpart C Section 15.247.

Applicant : ASUSTeK Computer Inc.

Model No. : WL500

EUT : ASUS SpaceLink Wireless Home Gateway

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Test Date : August 26, 2002

Prepared by: *Eric Wong*

Approved by: *Frank Tsai*

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Ⅰ. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a *WLAN Home Gateway* certification in accordance with Part 2 Subpart J and Part 15 Subpart A and C of the Commission's Rules and Regulations.

1.2 Description of EUT

EUT	**:**	ASUS SpaceLink Wireless Home Gateway
Model No.	**:**	WL500
Granted FCC ID	**:**	MSQWLHGWSWL500
Frequency Range	**:**	2.412 GHz ~ 2.462GHz
Antenna Kit	**:**	1 external dipole antenna
Supported Channel:		11 Channel
Modulation Skill	**:**	DBPSK, DQPSK, CCK
Power Cable	**:**	Non-shielded, 180cm long, w/ ferrite bead
Data Cable	**:**	RJ45: Non-shielded, 10-meter, No ferrite bead
Power Type	**:**	AC to DC Switching Adapter
		Input: 100 ~ 240VAC, 50/60Hz, 0.3A
		Output: +5VDC, 2A
Applicant	**:**	ASUSTeK Computer Inc.
		4/F, 150 Li-Te Rd., Peitou, Taipei, Taiwan, R.O.C.

1.3 Description of Support Equipment

In order to construct the minimum testing, following equipment were used as the support units.

Notebook	**:**	**ASUSTeK Computer Inc.**
Type No.	:	None
Serial No.	:	None
FCC ID	:	DoC Approved

AC Adaptor	**:**	**Delta Electronics, Inc.**
Model No.	:	ADP-50SP
Serial No.	:	FGD0103005330
FCC ID	:	DoC Approved
Power Core	:	Non-shielded, Plastic hoods, with ferrite bead
Power type	:	100 ~ 240VAC, 50 ~ 60Hz;,1.5A / 19VDC, 2.64A

HUB	**:**	**Cameo Communications, Inc.**
Model No.	:	SOHO-SW16A
Serial No.	:	N/A
Power Type	:	Switch
FCC ID	:	N/A, DoC Approved
Power cord	:	Non-shielded, 1.95m long, Plastic, No ferrite core

Printer	**:**	**HEWLETT-PACKARD**
Type No.	:	C4562A (Deskjet 690C)
Serial No.	:	SG73E1B2GY
FCC ID	:	B94C2164X

AC Adaptor	**:**	**NMB**
Model No.	:	C2175A
Serial No.	:	1607496
FCC ID	:	DoC Approved
Power Core	:	Shielded, Plastic hoods, w/o ferrite bead
Power type	:	120VAC, 60Hz, 0.22A / 30VDC, 400mA

1.4 Configuration of System Under Test

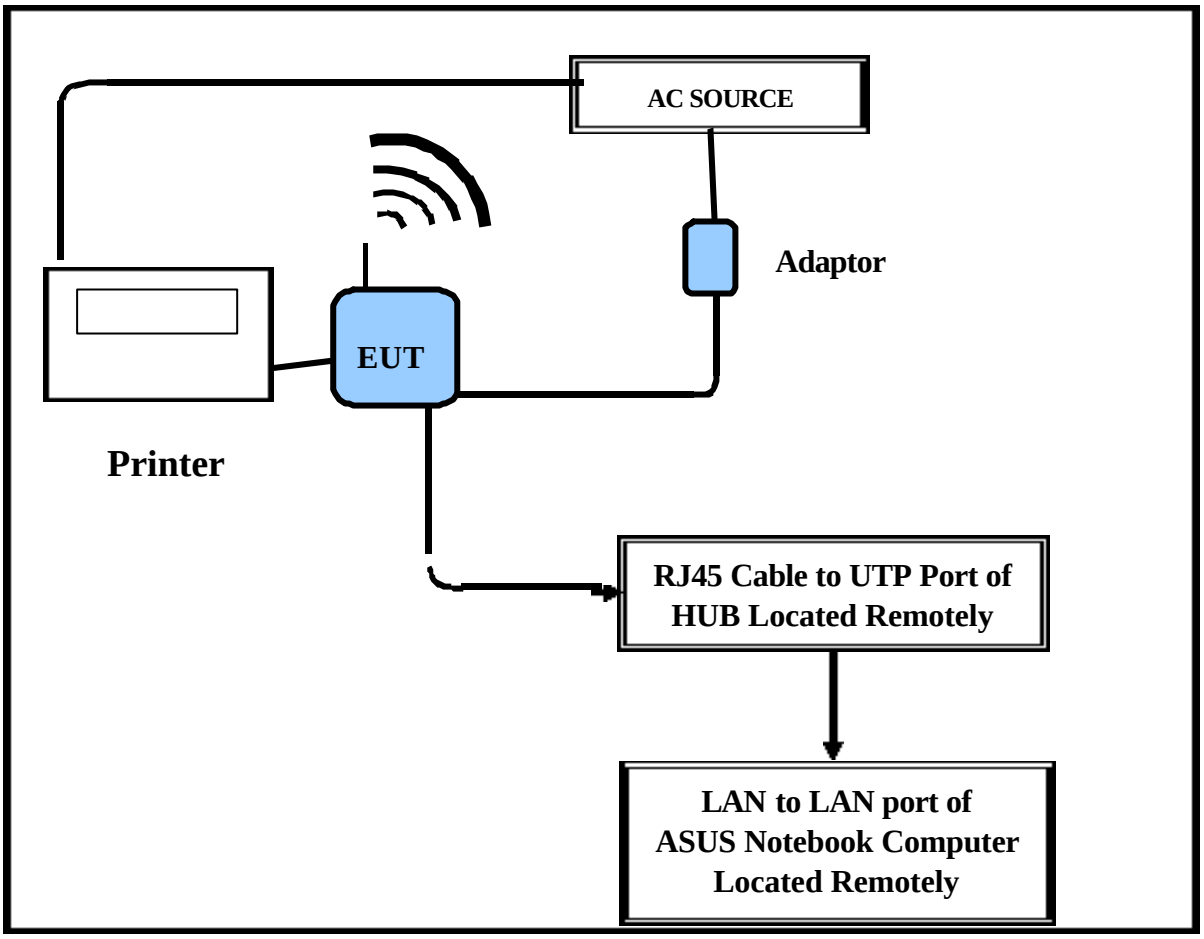


Fig. 1 Configuration of system under test

The testes below are run with the EUT transmitter set at high power in TDD mode. LAN port of notebook computer is connected to the Ethernet HUB then UTP port of hub remotely connected to UTP port of EUT by RJ45 cable. The remaining Ethernet ports of the gateway are loaded with the dummy loaded and the parallel port is connected with a printer also located in the chamber. The EUT is forced on selecting of specified output power level and channel number for the testing status by the utility installed in the notebook computer.

The setting up procedure was recorded in <Appendix A.>.

1.5 Verify the Frequency and Channel

Channel	Frequency (GHz)
1	2.412
2	2.417
3	2.422
4	2.427
5	2.432
6	2.437
7	2.442
8	2.447
9	2.452
10	2.457
11	2.462

Note:

1. This is for sure that all frequencies are in 2.412GHz to 2.462GHz.
2. Section 15.31(m): Measurements on intentional radiators or receivers shall be performed at three frequencies for operating frequency range over 10 MHz.
   (The locations of these frequencies one near the top, one near the middle and one near the bottom.)

   After tests, the EUT operating frequencies are in 2.412GHz to 2.462GHz. So all the items as followed in testing report are need to test these three frequencies:
   Top: Channel – 1; Middle: Channel – 6; Bottom: Channel – 11.

1.6 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in ANSI C63.4 (1992) and the pre-setup was written on Appendix A, the detail setup was written on each test item.

1.7 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter**, **Anechoic Chamber (Registration Number: 93906)** maintained by *Training Research Co., Ltd.* 1F, No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. Complete description and measurement data have been placed on file with the commission. The conducted power line emissions tests and other test items were performed in a anechoic chamber also located at Training Research Co., Ltd.

No. 255 Nanyang Street, Shijr, Taipei Hsien 221, Taiwan, R.O.C. *Training Research Co., Ltd.* is listed by the FCC as a facility available to do measurement work for others on a contract basis.

1.8 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions, which the EUT was considered likely to encounter in normal use were investigated.

In test, they were set in high power and continuously transmitting mode that controlled by notebook computer. The Ch01, Ch06 and Ch11 of EUT were all tested. The setting up procedure is recorded on <Appendix A>.

II. Section 15.203 : Antenna Requirement

The EUT equipped with an *external dipole antenna* via a connector. The *connector is unique and no antenna other than that furnished by the responsible party shall be used with* (the antenna isn't develop by applicant) - Refer to the <Antenna Specification>. This complies with the Antenna requirement stated in Sect.15.203.

III. Section 15.207: Power Line Conducted Emissions for AC Powered Units

3.1 Test Condition & Setup

The power line conducted emission measurements were performed in an anechoic chamber. The EUT was assembled on a wooden table, which is 80 centimeters high, was placed 40 centimeters from the back-wall and at least 1 meter from the side-wall.

Power was fed to the EUT from the public utility power grid through a line filter and Line Impedance Stabilization Networks (LISNs). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer (or EMI receiver) was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPER quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 450 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 2.4.

There is a test condition apply in this test item, the test procedure description as follow:

EUT transmit only:

Using LAN port of notebook computer and software to control the EUT through. Then making access to the mode of continuous transmission and set testing channel and internal antenna kit. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

The setting up procedure is recorded on <Appendix A>.

3.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/02	06/29/03
RF Filter Section	85460A	H P	3448A00217	06/29/02	06/29/03
LISN (EUT)	LISN-01	TRC	9912-03,04	12/09/01	12/09/02
LISN (Support E.)	LISN-01	TRC	9912-05	01/04/02	01/04/03
Switch/Control Unit (< 30MHz)	3488A	HP	N/A	11/20/01	11/20/02
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/01	11/20/02

3.3 Test configuration

Conducted Emissions Test Placement

3.4 Test Result of Conducted Emissions

EUT station transmit only

The following table shows a summary of the highest emissions of power line conducted emissions on the LINE and NETURAL conductors of the EUT power cord.

Table 1 Power Line Conducted Emissions (Channel 1, Transmitter Mode)

Test Conditions: Testing room : Temperature : 27.3 ° C Humidity : 71.9 % RH

Testing site : Temperature : 28.9 ° C Humidity : 77.8 % RH

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	531.900	40.97	---	48.00	-7.03
	664.500	41.57	---	48.00	-6.43
	992.100	40.62	---	48.00	-7.38
	1085.700	41.17	---	48.00	-6.83
	1573.200	40.34	---	48.00	-7.66
	5570.000	43.39	---	48.00	-4.61
	5780.000	43.65	---	48.00	-4.35
	16700.000	35.14	---	48.00	-12.86
	17680.000	28.55	---	48.00	-19.45
	22510.000	22.24	---	48.00	-25.76
Line 2	524.100	39.70	---	48.00	-8.30
	660.600	41.90	---	48.00	-6.10
	996.000	39.21	---	48.00	-8.79
	1561.500	41.24	---	48.00	-6.76
	1713.600	41.41	---	48.00	-6.59
	5780.000	40.97	---	48.00	-7.03
	7110.000	39.90	---	48.00	-8.10
	16420.000	35.78	---	48.00	-12.22
	17750.000	27.51	---	48.00	-20.49
	22300.000	21.36	---	48.00	-26.64

NOTE:

1. Margin = Peak Amplitude - Limit
2. A "+" sign in the margin column means the emission is OVER the Class B Limit and "–" sign of means UNDER the Class B limit

Table 2 Power Line Conducted Emissions (Channel 6, Transmitter Mode)

Test Conditions: Testing room : Temperature : 27.3 ° C Humidity : 71.9 % RH

Testing site : Temperature : 28.9 ° C Humidity : 77.8 % RH

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dBμV)***	***QP Amplitude (dBμV)***	***Limit (dBμV)***	***Margin (dB)***
Line 1	524.100	41.85	---	48.00	-6.15
	672.300	42.81	---	48.00	-5.19
	789.300	41.38	---	48.00	-6.62
	937.500	41.06	---	48.00	-6.94
	1319.700	41.43	---	48.00	-6.57
	1565.400	41.17	---	48.00	-6.83
	5150.000	43.91	---	48.00	-4.09
	5850.000	43.86	---	48.00	-4.14
	16420.000	34.47	---	48.00	-13.53
	17890.000	29.02	---	48.00	-18.98
Line 2	528.000	39.74	---	48.00	-8.26
	664.500	42.06	---	48.00	-5.94
	781.500	37.82	---	48.00	-10.18
	992.100	39.70	---	48.00	-8.30
	1319.700	40.79	---	48.00	-7.21
	1561.500	41.38	---	48.00	-6.62
	1713.600	40.99	---	48.00	-7.01
	5780.000	40.88	---	48.00	-7.12
	6830.000	40.86	---	48.00	-7.14
	16280.000	34.61	---	48.00	-13.39

****The reading amplitudes are all under limit.***

Table 3 Power Line Conducted Emissions (Channel 11, Transmitter Mode)

Test Conditions: Testing room : Temperature : 27.3 ° C Humidity : 71.9 % RH

Testing site : Temperature : 28.9 ° C Humidity : 77.8 % RH

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	524.100	39.81	---	48.00	-8.19
	606.000	41.81	---	48.00	-6.19
	664.500	42.39	---	48.00	-5.61
	785.400	40.37	---	48.00	-7.63
	937.500	41.99	---	48.00	-6.01
	1311.900	41.69	--	48.00	-6.31
	1569.300	41.01	---	48.00	-6.99
	5080.000	43.32	---	48.00	-4.68
	5850.000	44.03	---	48.00	-3.97
	16280.000	35.00	---	48.00	-13.00
Line 2	535.800	37.99	---	48.00	-10.01
	648.900	41.03	---	48.00	-6.97
	789.300	40.32	---	48.00	-7.68
	999.900	39.14	---	48.00	-8.86
	1089.600	39.46	---	48.00	-8.54
	1565.400	41.06	---	48.00	-6.94
	1850.100	40.95	---	48.00	-7.05
	5080.000	41.15	---	48.00	-6.85
	6690.000	39.97	---	48.00	-8.03
	16420.000	32.69	---	48.00	-15.31

****The reading amplitudes are all under limit.***

IV. Section 15.247 (a): Technical description of the EUT

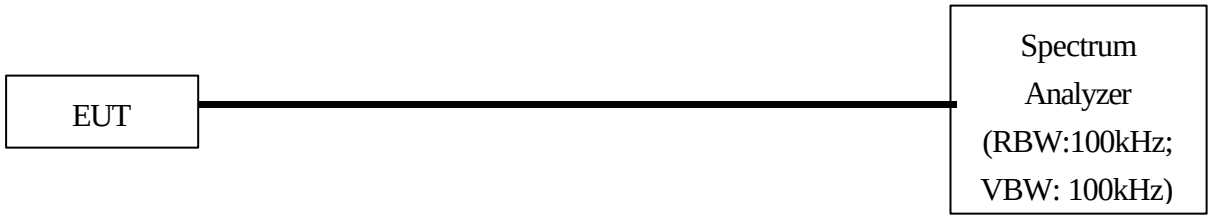
Based on the Section 2.1, *Direct Sequence System* is a spread spectrum system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted signal. In the *operational description* demonstrates the operation principles of the baseband processor employed by the EUT, shows that which is a complete DSSS baseband processor and meets the definition of the Direct Sequence Spread Spectrum System.

Ⅴ. Section 15.247(a)(2): Bandwidth for Direct Sequence System.

5.1 Test Condition & Setup

The transmitter bandwidth measurements were performed by the contact manner. The EUT was set to transmit continuously, also various channels were investigated to find the maximum occupied bandwidth.. The output of the EUT was connected to the spectrum analyzer. The bandwidth of the fundamental frequency is observed by the spectrum analyzer with 100kHz RBW and 100kHz VBW.

5.2 Test Instruments Configuration



Test Configuration of Bandwidth for Direct Sequence System

P.S.: Notebook computer to control the EUT at maximal power output and channel Number and set antenna kit

5.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8592A	H P	3003AD1401	01/02/02	01/01/03

5.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth	:	10.35 MHz
The min. 6 dB BW at least	:	500 KHz

Bandwidth of Channel 6

Bandwidth	:	10.35 MHz
The min. 6 dB BW at least	:	500 KHz

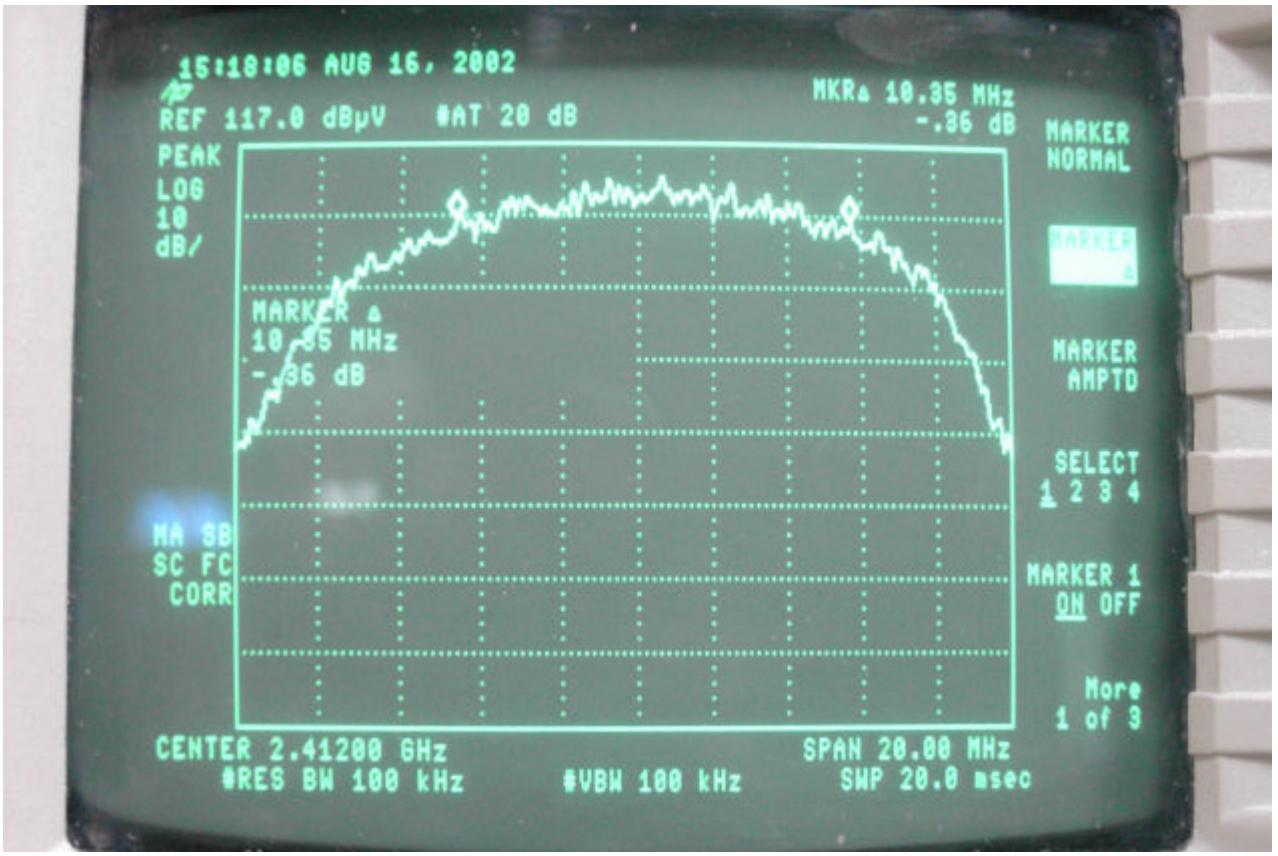
Bandwidth of Channel 11

Bandwidth	:	9.05 MHz
The min. 6 dB BW at least	:	500 KHz

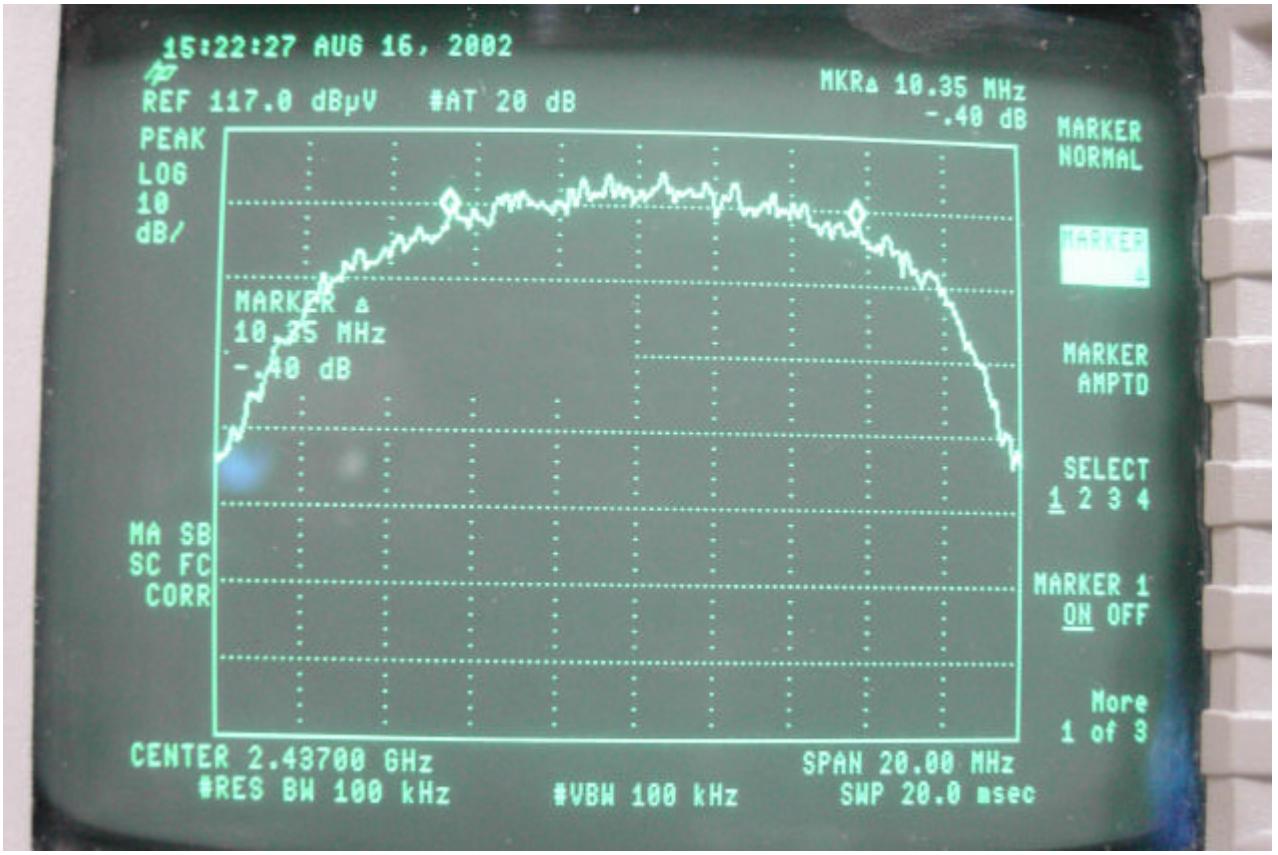
Note:

1. The data in the above table are summarizing the following attachment spectrum analyzer hard copy.

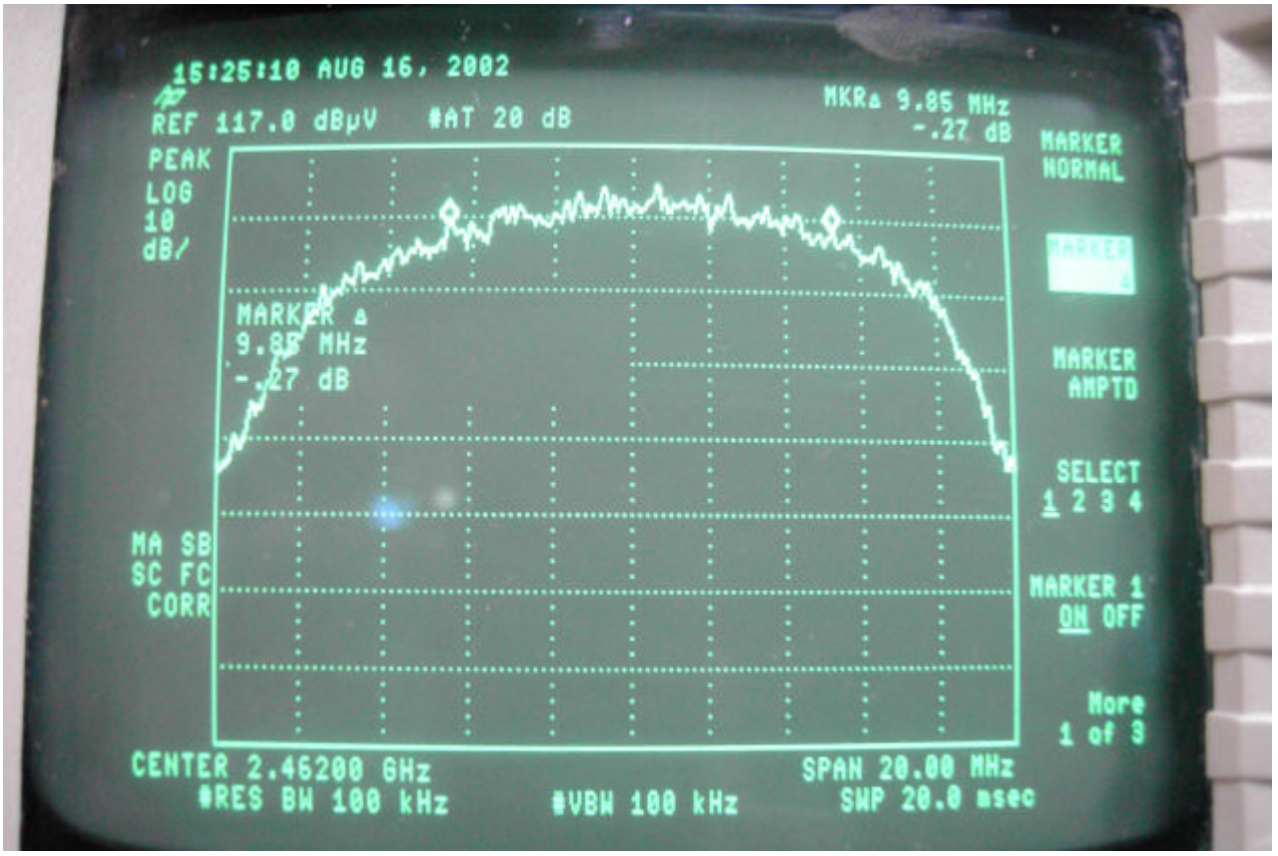
Bandwidth of Channel 1: 10.35 MHz



Bandwidth of Channel 6: 10.35 MHz

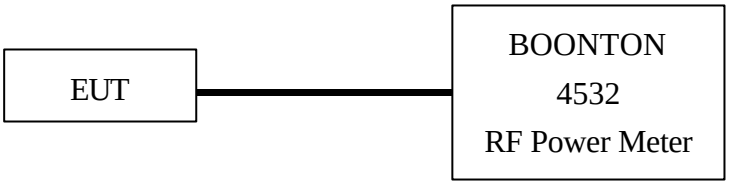


Bandwidth of Channel 11: 9.05 MHz



VI. Section 15.247(b): Power Output

6.1 Test Condition & Setup



1. The output of the transmitter is connected to the BOONTON RF Power Meter.
2. The calibration is performed before every tests. The values of the output power of the EUT will shown in the dBm directly are the transmitter output peak power. Recording as follows.

6.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last Cali.	Due On
RF Power Meter	4532	BOONTON	117501	02/03/21	03/03/21

6.3 Test Result

Formula:
Signal generator + |Cable loss| = Output peak power

Channel	Signal Generator	Cable Loss	Limit	Output peak power	
	dBm	dBm	(DTS)	dBm	mW
CH1	15.51	0.00	100mW	15.51	35.56
CH6	15.24	0.00	100mW	15.24	33.42
CH11	14.78	0.00	100mW	14.78	30.06

Note:
The limit is varying according to the equipment class, listed below:

1. Digital Transmission System (DTS): 100mW
2. Spread Spectrum Transmitter (DSS): 1W

Ⅶ. Section 15.247(c): Spurious Emissions (Radiated)

7.1 Test Condition & Setup

The EUT was placed in an anechoic chamber and scanned at 3-meter distance to determine its emission characteristics. The physical arrangement of the EUT was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude, directivity, and frequency. The exact system configuration, which produced the highest emissions was noted so it could be reproduced later during the final tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

Final radiation measurements were made on a three-meter, anechoic chamber. The EUT system was placed on a nonconductive turntable, which is 0.8 meters height, top surface 1.0 x 1.5 meter.

The spectrum was examined from 30 MHz to 1000 MHz using an Hewlett Packard 85460A EMI Receiver, Schaffner whole range Bi-Log antenna (Model No.: CBL6141A) is used to measure frequency from 30 MHz to 1GHz.The final test is used the spectrum HP 85460A and spectrum was examined from 1GHz to 18GHz using an Hewlett Packard 8564E Spectrum Analyzer, EMCO Horn Antenna (Model 3115) for 1G ~ 18GHz.

At each frequency, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. There are two spectrum analyzers use on this testing, HP 85460A for frequency 30MHz to 1000MHz, and 8564E for frequency 1GHz to 18GHz. No post-detector video filters were used in the test. The spectrum analyzer's 6dB bandwidth was set to 120KHz (spectrum was examined from 30 MHz to 1000 MHz)and the analyzer was operated in quasi-peak mode. Also, the spectrum analyzer's 6 dB bandwidth was set to 1 MHz (spectrum was examined from 1GHz to 18GHz) and the analyzer was operated in the peak and average mode. There is a test condition apply in this test item, the test procedure description as the following:

EUT transmit only:

Using the LAN port of Notebook computer and software to control the EUT through Ethernet hub. Then making access to the mode of continuous transmission. Three channels is tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).

With the transmitter operating from a AC source and using the internal of EUT, radiates spurious emissions falling within the restricted bands of 15.209 were measured at operating frequencies corresponding to low, mid and high channels in the 2400 ~ 2483.5 MHz band.

The actual field intensity in decibels referenced to 1 microvolt per meter (dBμV/m) is determined by algebraically adding the measured reading in dBμV, the antenna factor (dB), and cable loss (dB) at the appropriate frequency.

For frequency between 30MHz to 1000MHz

FIa (dBuV/m) = FIr (dBμV) – Correction Factors

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

For frequency between 1 GHz to 18 GHz

FIa (dBμV/m) = FIr (dBμV) + Correction Factor

FIa : Actual Field Intensity

FIr : Reading of the Field Intensity

Correction Factors = Antenna Factor + Cable Loss – Amplifier Gain

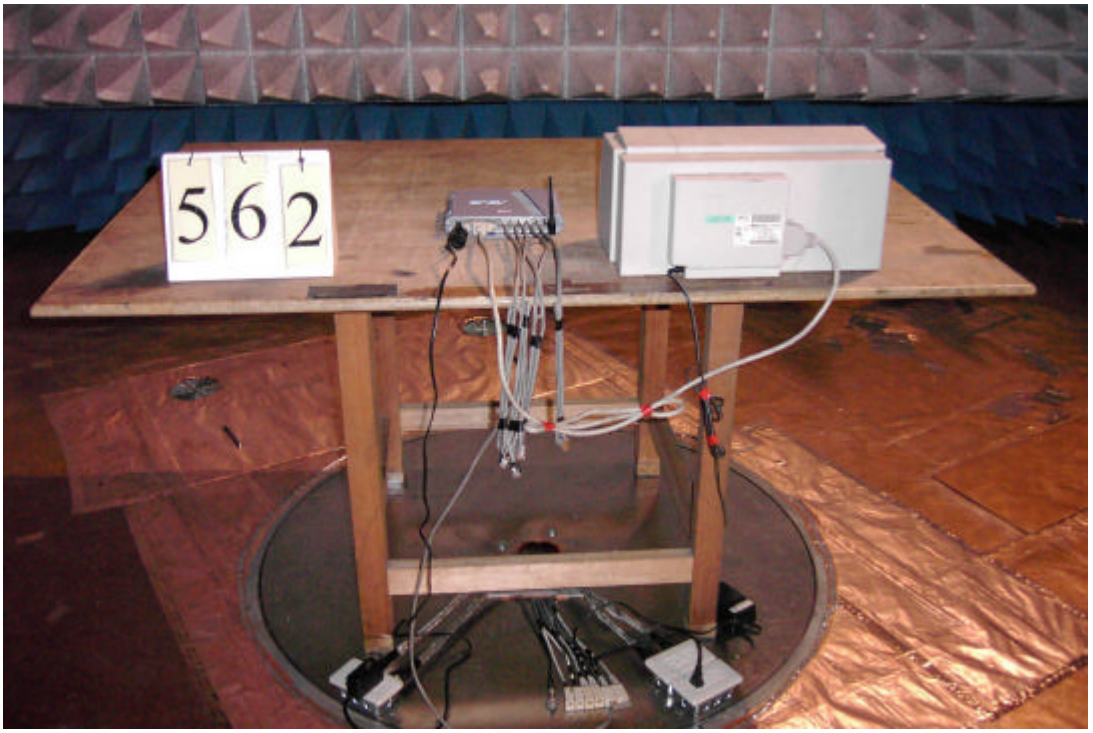
The setting up procedure is recorded on Appendix A.

7.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/02	06/29/03
RF Filter Section	85460A	H P	3448A00217	06/29/02	06/29/03
Bi-log Antenna	CBL6141A	Schaffner	4206	03/09/02	03/09/03
Switch/Control Unit (> 30MHz)	3488A	HP	N/A	11/20/01	11/20/02
Auto Switch Box (> 30MHz)	ASB-01	TRC	9904-01	11/20/01	11/20/02
Spectrum Analyzer	8564E	HP	US36433002	08/01/02	08/01/03
Microwave Preamplifier	83051A	HP	3232A00347	08/01/02	08/01/03
Horn Antenna	3115	EMCO	9704 – 5178	08/01/02	08/01/03
Anechoic Chamber (cable calibrated together)				05/20/02	05/20/03

7.3 Test Instruments Configuration

Front View of the Test Configuration



Rear View of the Test Configuration

The test configuration for frequency between 1GHz to 18GHz is same as above.

7.4 Test Result of Spurious Radiated Emissions

EUT's transmit only

The highest peak values of radiated emissions form the EUT at various antenna heights, antenna polarizations, EUT orientation, etc. The worse case (high gain antenna) are recorded on the following.

FCC ID : MSQWLHGWSWL500

EUT : ASUS SpaceLink Wireless Home Gateway (WL500)

Test Conditions: Testing room : Temperature : 27.3 °C Humidity : 71.9 % RH
Testing site : Temperature : 28.9 ° C Humidity : 77.8 % RH

Table 5 Radiated Emissions for 30MHz 1GHz [CH 1, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*FCC Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBmV/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*(dBmV/m)*	*Limit (dBmV/m)*	*Margin (dB)*
206.44	15.13	2.50	314	17.51	32.64	43.50	-10.86
309.67	19.42	1.00	161	21.72	41.14	46.00	-4.86
400.00	10.81	1.00	108	25.33	36.14	46.00	-9.86
516.51	5.10	1.00	54	28.49	33.59	46.00	-12.41
723.19	7.58	2.50	181	32.62	40.20	46.00	-5.80
826.87	6.32	1.00	202	34.22	40.54	46.00	-5.46

Note:

1. Margin = Corrected Amplitude – Limit.
2. Peak Amplitude – Correction Factors = Corrected Amplitude

Table 6 Radiated Emissions for 30MHz 1GHz [CH 1, Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
206.44	13.36	2.50	0	17.51	30.87	43.50	-12.63
309.02	13.56	1.00	140	21.71	35.27	46.00	-10.73
516.51	7.31	2.50	325	28.46	35.77	46.00	-10.23
618.50	3.56	1.00	295	30.54	34.10	46.00	-11.90
723.19	4.22	1.00	23	32.62	36.84	46.00	-9.16
826.87	4.42	1.00	159	34.22	38.64	46.00	-7.36

Table 7 Open Field Radiated Emissions for 1GHz 18GHz [Channel 1, Horizontal]

Radiated Emission				Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	Peak	Average	Limit		Margin (dB)
						Peak	Ave.	
2.413	102.11	1.00	84	102.11	---	---	---	---
*4.076	42.44	1.00	183	42.44	---	74.0	54.0	-11.56
*4.825	43.44	1.00	27	43.44	---	74.0	54.0	-10.56

Table 8 Open Field Radiated Emissions for 1GHz 18GHz [Channel 1, Vertical]

Radiated Emission				Corrected Amplitude		FCC Class B (3m)		
Frequency (Hz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	Peak	Average	Limit		Margin (dB)
						Peak	Ave.	
2.413	107.92	1.00	289	107.92	---	---	---	---
*4.076	45.77	1.00	21	45.77	---	74.0	54.0	-8.23
*4.825	47.94	1.00	84	47.94	---	74.0	54.0	-6.06

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected
3. The " * " means restricted bands.
4. As stated in Section 15.35(b), for any frequencies above 1000MHz, radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. As the results of our test, the peak amplitudes are already below the FCC limit. Thus the average amplitudes of the rest are omitted.

Table 9 Radiated Emissions for 30MHz 1GHz [CH 6, Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
205.80	9.21	1.00	126	17.48	26.69	43.50	-16.81
310.31	17.70	2.50	86	21.74	39.44	46.00	-6.56
401.27	1.95	1.00	110	25.33	27.28	46.00	-18.72
516.29	9.42	1.00	72	28.45	37.87	46.00	-8.13
722.74	2.62	2.50	220	32.60	35.22	46.00	-10.78
826.88	6.13	1.00	180	34.22	40.35	46.00	-5.65

Table 10 Radiated Emissions for 30MHz 1GHz [CH 6, Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
206.44	12.12	2.50	52	17.51	29.63	43.50	-13.87
310.31	17.18	1.00	132	21.74	38.92	46.00	-7.08
515.28	7.98	2.50	336	28.43	36.41	46.00	-9.59
619.51	4.42	1.00	291	30.56	34.98	46.00	-11.02
723.20	4.45	1.00	26	32.62	37.07	46.00	-8.93
826.60	4.72	1.00	156	34.21	38.93	46.00	-7.07

Table 11 Open Field Radiated Emissions for 1GHz 18GHz [Channel 6, Horizontal]

Radiated Emission				Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
2.439	101.33	1.00	8	101.33	---	---	---	---
*4.124	43.94	1.00	134	43.94	---	74.0	54.0	-10.06
*4.873	42.11	1.00	287	42.11	---	74.0	54.0	-11.89

Table 12 Open Field Radiated Emissions for 1GHz 18GHz [Channel 6, Vertical]

Radiated Emission				Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
2.439	107.35	1.00	13	107.35	---	---	---	---
*4.124	47.94	1.00	113	47.94	---	74.0	54.0	-6.06
*4.873	46.44	1.00	29	46.44	---	74.0	54.0	-7.56

Table 13 Radiated Emissions for 30MHz 1GHz [CH11, Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
205.80	10.06	1.00	67	17.48	27.54	43.50	-15.96
309.67	17.61	2.50	102	21.72	39.33	46.00	-6.67
364.50	1.69	1.00	129	23.37	25.06	46.00	-20.94
515.28	7.77	2.50	264	28.43	36.20	46.00	-9.80
616.57	-2.83	2.50	273	30.50	27.67	46.00	-18.33
825.95	4.55	1.00	188	34.19	38.74	46.00	-7.26

Table 14 Radiated Emissions for 30MHz 1GHz [CH 11, Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	FCC Class B (3 m)	
Frequency (MHz)	Amplitude (dBmV/m)	Ant. H. (m)	Table (°)	(dB)	(dBmV/m)	Limit (dBmV/m)	Margin (dB)
206.45	15.65	2.50	322	17.51	33.16	43.50	-10.34
310.31	13.17	1.00	132	21.74	34.91	46.00	-11.09
516.29	4.79	2.50	342	28.45	33.24	46.00	-12.76
618.03	2.60	1.00	298	30.53	33.13	46.00	-12.87
722.06	2.98	1.00	357	32.57	35.55	46.00	-10.45
825.95	3.08	1.00	153	34.19	37.27	46.00	-8.73

Table 15 Open Field Radiated Emissions for 1Hz 18Hz [Channel 11, Horizontal]

Radiated Emission				Corrected Amplitude		FCC Class B (3m)		
Frequency (Hz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
2.465	100.12	1.00	216	100.12	---	---	---	---
*4.177	42.27	1.00	8	42.27	---	74.0	54.0	-11.73

Table 16 Open Field Radiated Emissions for 1GHz 18GHz [Channel 11, Vertical]

Radiated Emission				Corrected Amplitude		FCC Class B (3m)		
Frequency (Hz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
2.465	108.35	1.00	33	108.35	---	---	---	---
*4.177	46.44	1.00	250	46.44	---	74.0	54.0	-7.56
*4.925	44.27	1.00	117	44.27	---	74.0	54.0	-9.73

7.5 Test Result of Band-edge Compliance

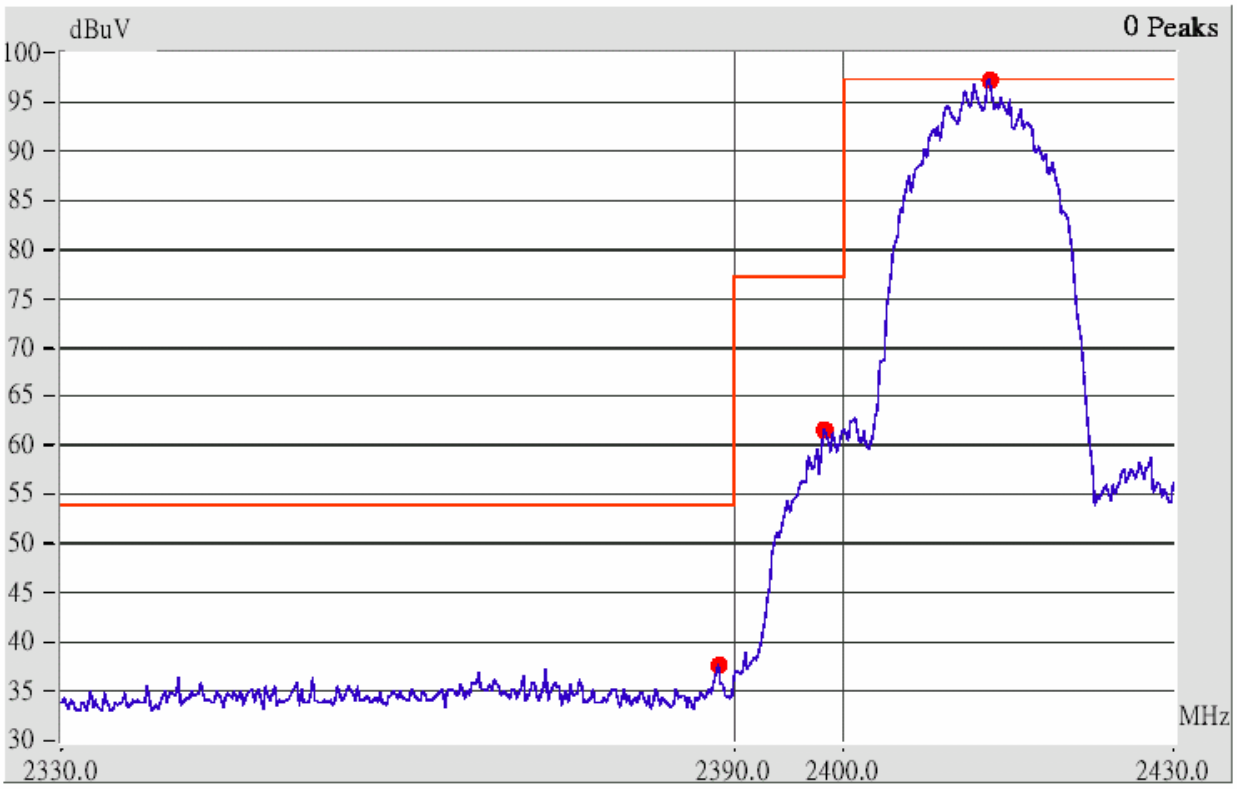
If any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either *at least 20 dB below that in any 100 kHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified id §15.209(a),*

We perform this section by the *conducted* manner, the RBW is set to 100kHz and VBW>RBW. We'd made the observation *up to 10th harmonics and the criterion is all the harmonic/spurious emissions must be 20dB below the highest emission level measured.* If the emissions fall in the restricted bands stated in the Part15.205(a) must also *comply with the radiated emission limits specified in Part15.209(a).*

The following pages show our observations referring to the channel 1 and 11 respectively.

Test Condition & Setup: same as 3.1

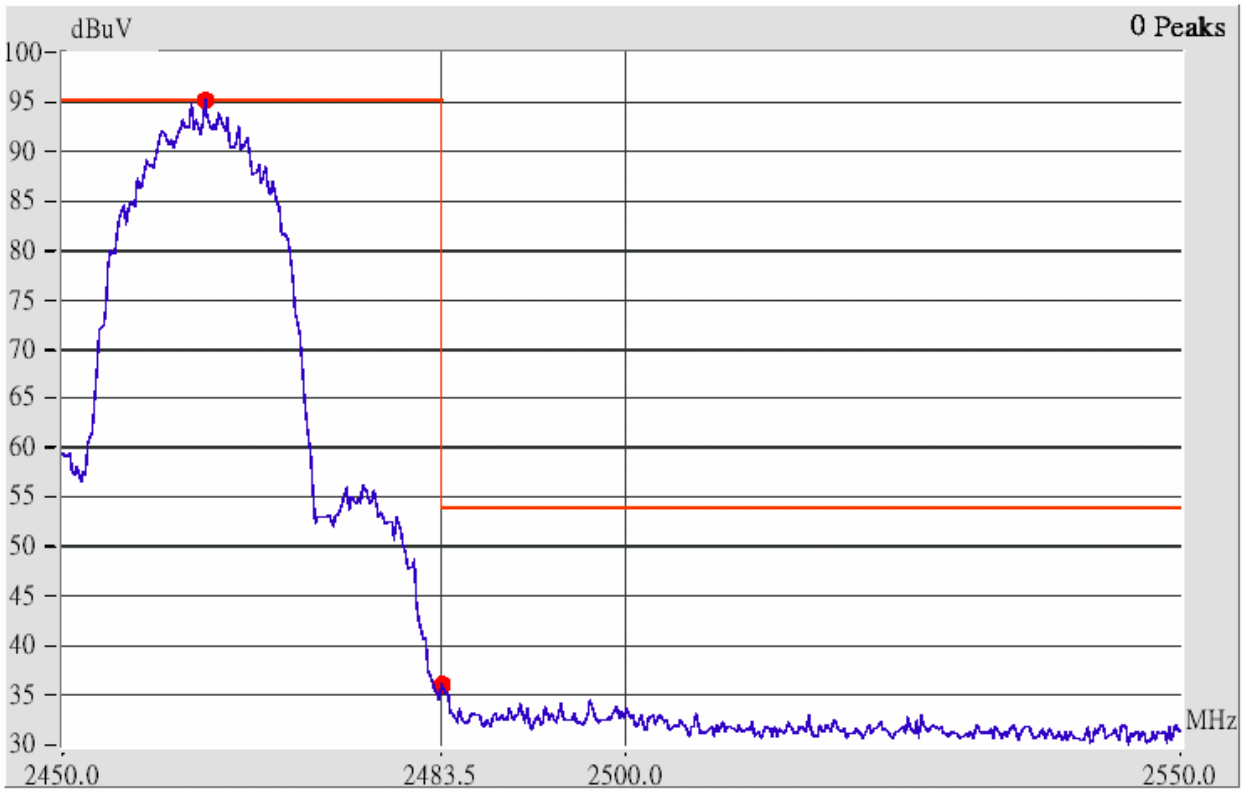
Channel 1



This is the hard copy of our band-edge measurement generated by our band-edge testing program. The picture shown above is the band-edge of channel 1.

1. The lobe right by the fundamental side is already 20dB below the highest emission level.
2. The emissions recorded in the restricted band (<2400MHz) is do comply with the Part 15.209(a) – under the limited line marked in red color.

Channel 11



This is the hard copy of our band-edge measurement generated by our band-edge testing program. The picture shown above is the band-edge of channel 11.

3. The lobe right by the fundamental side is already 20dB below the highest emission level.
4. The emissions recorded in the restricted band (>2483.5MHz) is do comply with the Part 15.209(a) – under the limited line marked in red color.

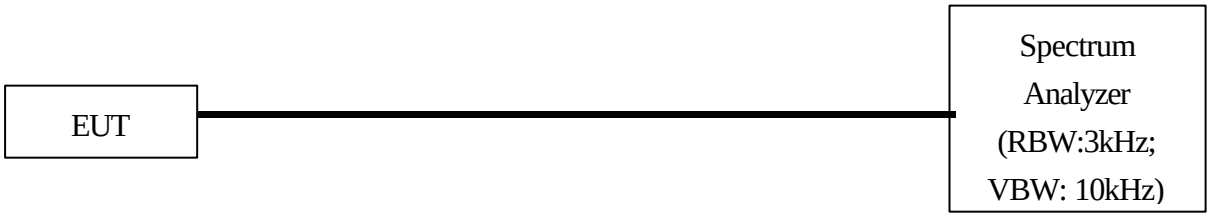
VIII. Section 15.247(d): Power Spectral Density

8.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power in TDD mode .A LAN port from a notebook computer connect to the EUT. The EUT is needed to force selection of output power level and channel number. While testing, the EUT was set to transmit continuously and to be tested by the contact manner with the spectrum analyzer.

The attachments below show our observation.

8.2 Test Instruments Configuration



Test Configuration of Power Spectral Density

P.S.: Notebook computer to control the EUT at maximal power output and channel Number and set antenna kit

8.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
Spectrum Analyzer	8592A	H P	3003AD1401	01/02/02	01/01/03

8.4 Test Result of Power spectral density

The following table shows a summary of the highest power out of EUT.

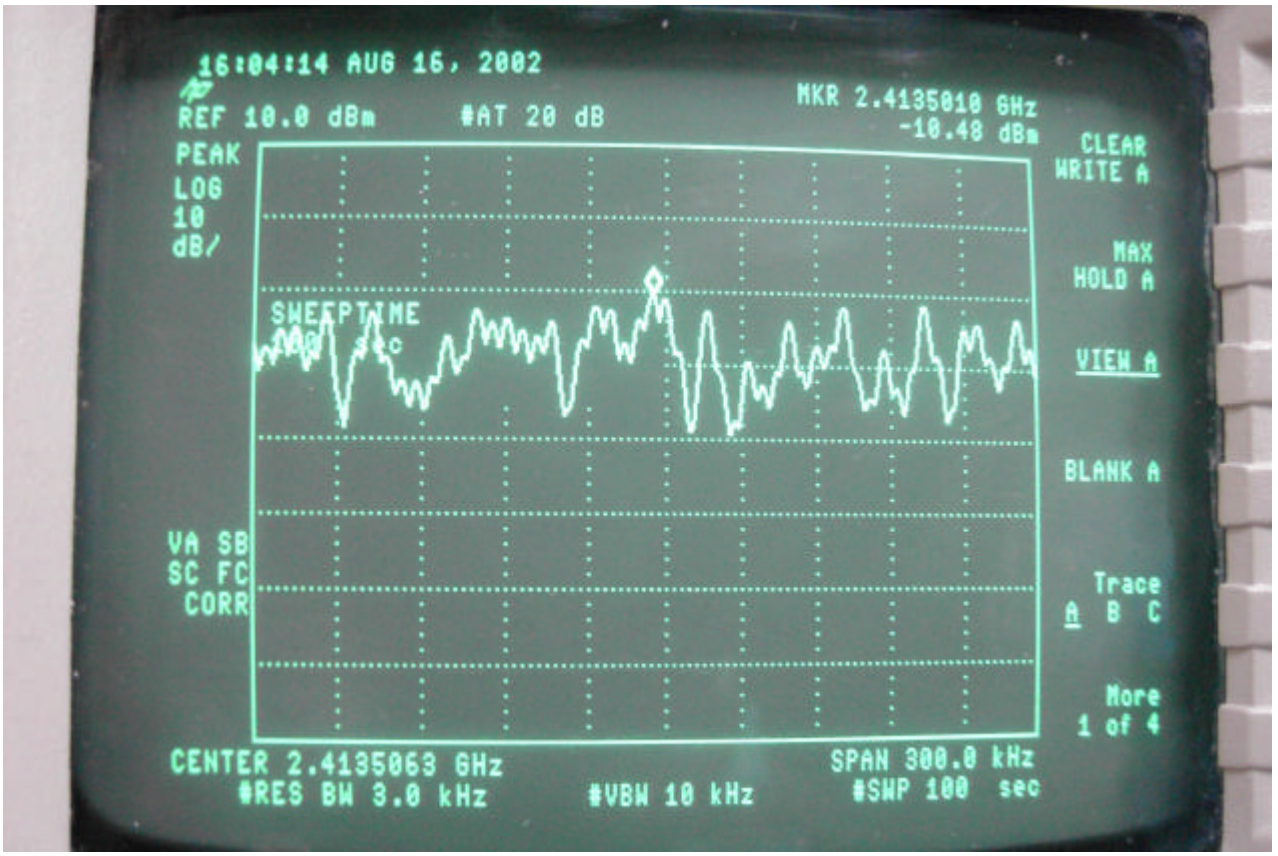
FCC ID : MSQWLHGWSWL500

Channel	*Frequency (GHz)*	*Ppr (dBm)*	*CF (dB)*	*Ppq (dBm)*	*Limit (dB)*	*Margin (dB)*
CH 01	2.413	-10.48	0.00	-10.48	8.00	-18.48
CH 06	2.438	-11.17	0.00	-11.17	8.00	-19.17
CH 11	2.463	-11.60	0.00	-11.60	8.00	-19.60

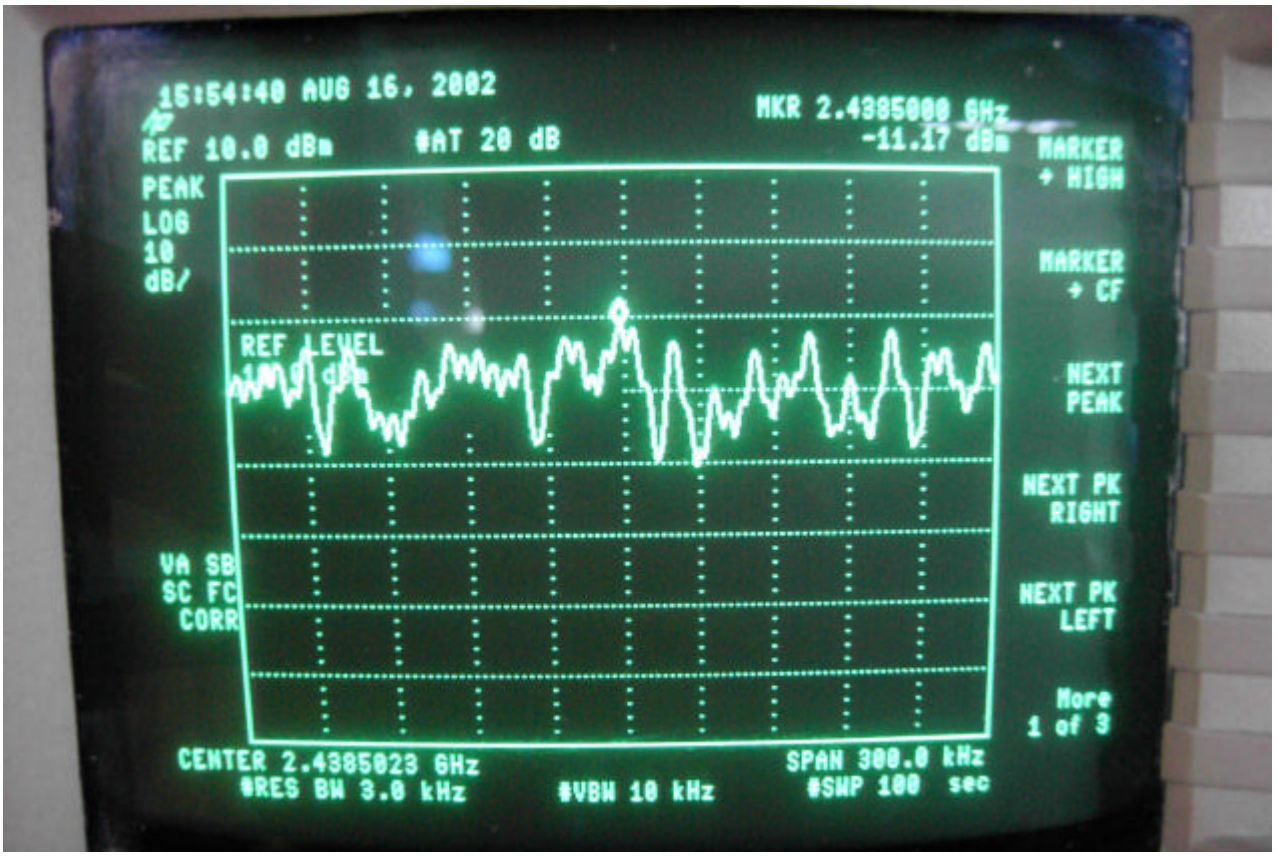
Note:

1. The attachment follow by this page and there is no page number.
2. Ppr: spectrum read power density (using peak search mode), CF: correct factor, Ppq: actual peak power density in the spread spectrum band.
3. Ppq = Ppr + |CF|

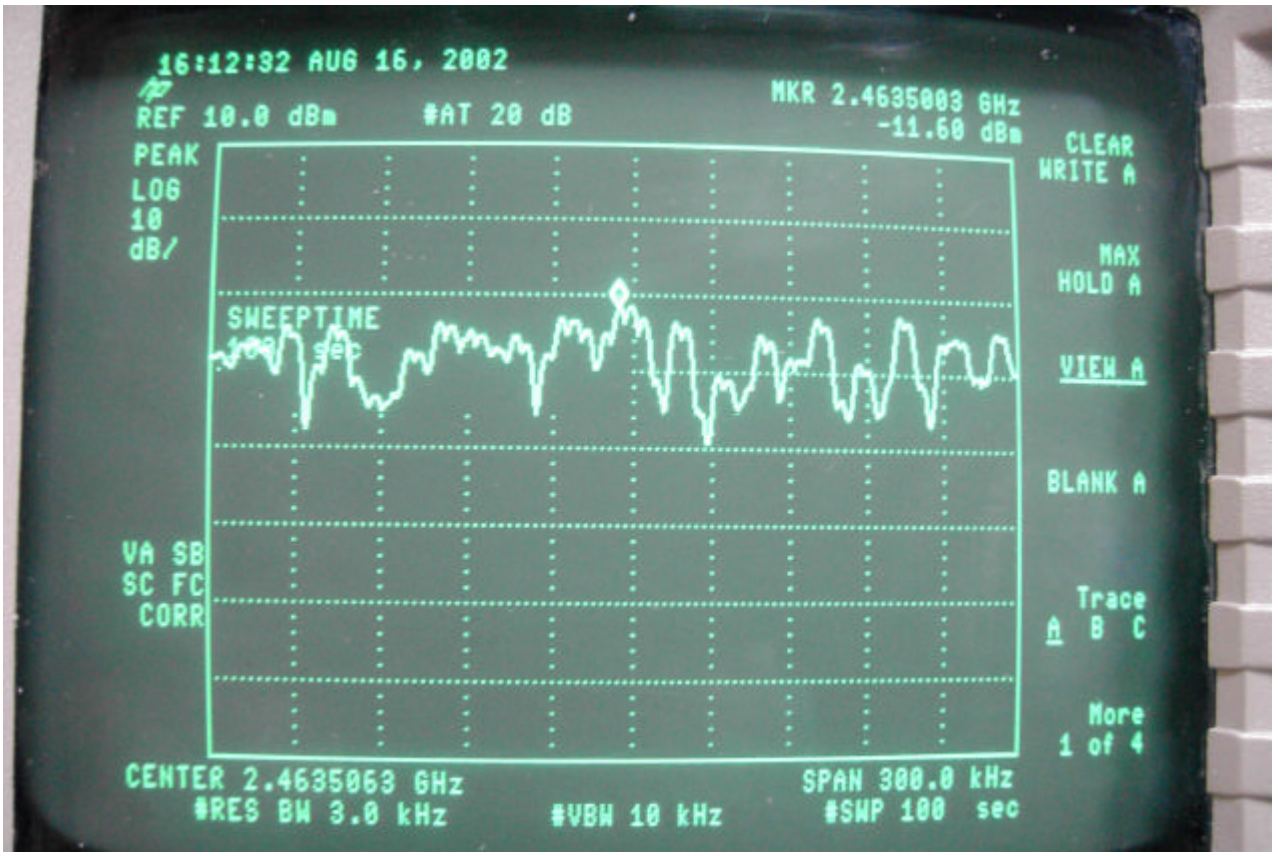
Channel 01


16:04:14 AUG 16, 2002
REF 10.0 dBm
#AT 20 dB
MKR 2.4135010 GHz
-10.48 dBm
PEAK
LOG
10
dB/
SWEEPTIME
sec
CLEAR
WRITE A
MAX
HOLD A
VIEW A
BLANK A
VA SB
SC FC
CORR
Trace
A B C
More
1 of 4
CENTER 2.4135063 GHz
#RES BW 3.0 kHz
#VBW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Channel 06


15:54:40 AUG 16, 2002
MKR 2.4385000 GHz
REF 10.0 dBm
#AT 20 dB
-11.17 dBm
PEAK
LOG
10
dB/
REF LEVEL
MARKER
+ HIGH
MARKER
+ CF
NEXT
PEAK
NEXT PK
RIGHT
NEXT PK
LEFT
More
1 of 3
VA SB
SC FC
CORR
CENTER 2.4385023 GHz
#RES BW 3.0 kHz
#VBW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Channel 11


16:12:32 AUG 16, 2002
REF 10.0 dBm
#AT 20 dB
MKR 2.4635003 GHz
-11.60 dBm
PEAK
LOG
10
dB/
SWEEPTIME
CLEAR
WRITE A
MAX
HOLD A
VIEW A
BLANK A
VA SB
SC FC
CORR
Trace
A B C
More
1 of 4
CENTER 2.4635063 GHz
#RES BW 3.0 kHz
#VBW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Appendix A

Setting up Procedure

1. LAN port of notebook computer is connected to the Ethernet HUB then UTP port of hub remotely connected to UTP port of EUT by RJ45 cable. The remaining Ethernet ports of the gateway are loaded with the dummy loaded and the parallel port is connected with a printer also located in the chamber.

2. The EUT is forced on selecting of specified output power level and channel number for the testing status by the utility installed in the notebook computer.

3. Then making access to the mode of continuous transmission and set testing channel.