MEASUREMENT REPORT
of
WIRELESS LAN PCMCIA CARD

Applicant : ASUSTeK COMPUTER INC.
Model No. : AC-100
EUT : ASUS SpaceLink AC100 WLAN PCMCIA Card
FCC ID : MSQPCCAC100
Report No. : A5415634

Test by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440
2, Lane 194, Huan-Ho Street, Hsichih, 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.***, 2, Lane 194, Huan-Ho Street, Hsichih, 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. : AC-100

EUT : ASUA SpaceLink AC100 WLAN PCMCIA Card

FCC ID : MSQPCCAC100

Report No. : A5415634

Test Date : September 24, 2001

Prepared by: Jack Tsai *Jack Tsai*

Approved by: Frank Tsai *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 wireless access point 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	**:**	ASUA SpaceLink AC100 WLAN PCMCIA Card
Model No.	**:**	AC-100
Granted FCC ID	**:**	MSQPCCAC100
Frequency Range	**:**	2.412 GHz ~ 2.462GHz
Support Channel	**:**	11 Channel
Modulation Skill	**:**	DBPSK, DQPSK, CCK
Style Interface	**:**	PCMCIA
Power Type	**:**	By Notebook computer
Applicant	**:**	ASUSTek COMPUTER INC.
		4 Fl., No. 150, Li-Te Rd., Peitou, Taipei, Taiwan, R.O.C.

1.3 Description of Support Equipment

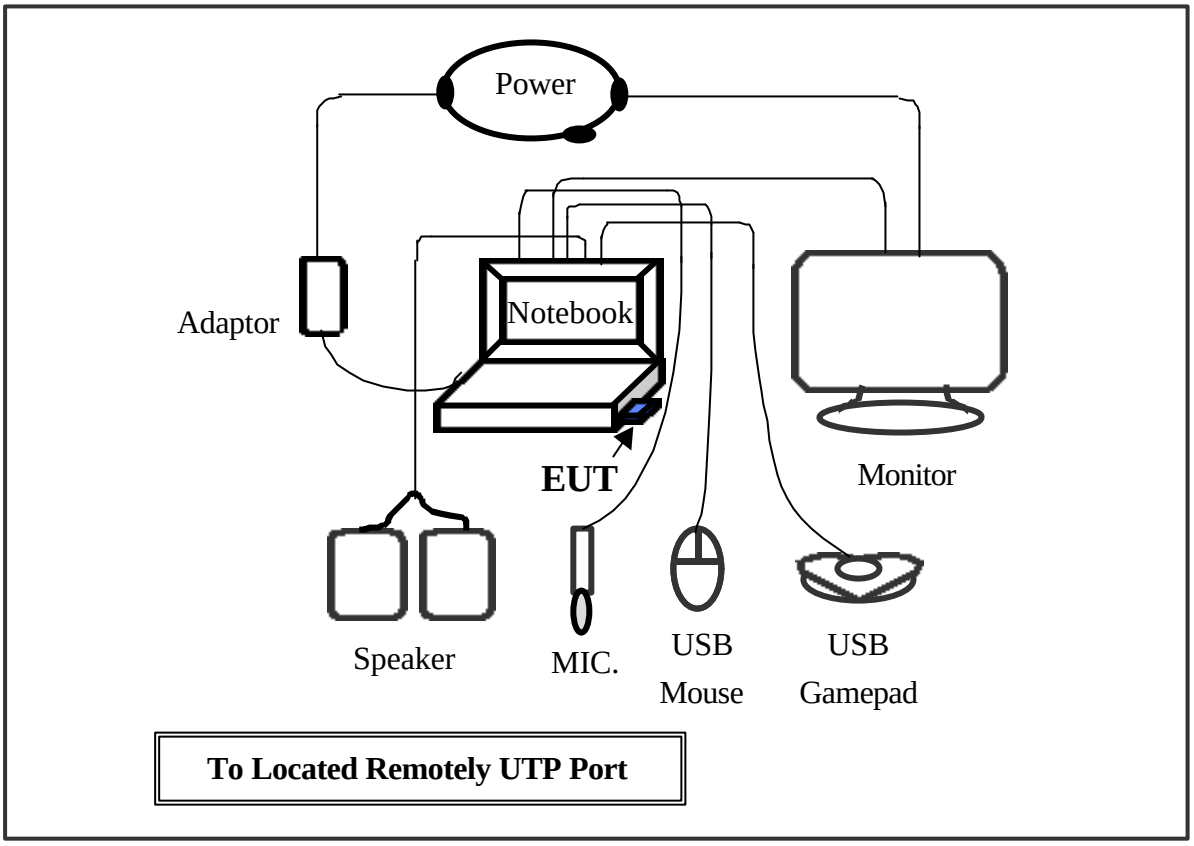
In order to construct the minimum testing, following equipment were used as the support units.

Notebook	**:**	**ASUSTek COMPUTER INC.**
Type No.	:	
Serial No.	:	None
FCC ID	:	Doc Approved
AC Adaptor	**:**	**DELTA ELECTRONICS, INC.**
Model No.	:	ADP-50SB
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
Monitor	**:**	**HP 15' Color Monitor**
Model No.	:	D2827A
Serial No.	:	KR91161717
FCC ID	:	C5F7NFCMC1518X
檢磁	:	3872B039
Power type	:	100 ~ 240 VAC / 50 ~ 60 Hz, Switching
Power cord	:	Shielded, 1.83m long, No ferrite core
Data cable	:	Shielded, 1.46m long, with two ferrite cores
Microphone	**:**	**KOKA**
Model No.	:	DM-515
Power type	:	Dynamic
Data Cable	:	Non-shielded, 3m long, Plastic hood, No ferrite core
Speaker	**:**	**Genius**
Model No.	:	SP-220
Data cable	:	Non-shielded, 1.6 m
Power type	:	Powered by Computer

USB Mouse	**:**	**Logitech**
Model No.	:	M-BA47
Serial No.	:	LZE92250027
FCC ID	:	Doc Approved
檢磁	:	4872A220
Power type	:	Powered by Computer
Power Cable	:	Shielded, 1.5m long, Plastic hoods, No ferrite bead

USB Gamepad	**:**	**Padix**
Model No.	:	QF-606U
Serial No.	:	None
FCC ID	:	Doc Approval
Power type	:	Powered by PC
Power Cable	:	Shielded, 1.5m long, No ferrite bead data cable

1.4 Configuration of System Under Test



The tests below are run with the EUT transmitter set at high power mode. The EUT build in PCMCIA socket of notebook computer. The EUT is needed to force selection of output power level and channel number.

The setting up procedure was recorded in Appendix A.

Notebook:

*DC IN Jack --- an external power adaptor
*VGA Port --- a monitor
*Line Jack --- connected a RJ11 cable with 600ohm terminal
*LAN Jack --- connected a RJ45 cable with 100ohm terminal
*USB A Port --- a gamepad
*USB B Port --- a mouse
*MIC. Jack --- a dynamic microphone
*SPK. Jack --- a pair of speakers
(Each port on notebook is connected with suitable device)

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.)
3. After test, 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. 2, Lane 194, Huan-Ho Street, Hsichih, 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. 2, Lane 194, Huan-Ho Street, Hsichih, 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 15.101(a): Equipment authorization of unintentional radiators

The EUT equipped with a PCMCIA interface and should be operated with the notebook computer, was categorized to *Class B personal computers and peripherals.* The authorization requires Certification and the items required such as Sect.15.107 (Conducted limits) and Sect.15.109 (Radiated emission limits) is same as Sect.15.207 and 15.247(C) we'd performed respectively. We dropped this part, as the result will be repeated as the part we mentioned above.

III. Section 15.203: Antenna requirement

The EUT has 2 integrated antennas, one external dipole antenna and the internal inverted-F antenna. The external antenna is non-detachable. The EUT has the mechanism that while the external antenna is not removed, the internal antenna will be set active to ensure the transmission. The external antenna is designed exclusively for the EUT to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This complies with the Antenna requirement stated in Sect.15.203.

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

4.1 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 backwall and at least 1 meter from the sidewall.

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 the following:

1. EUT transmit only:
   Using PCMCIA interface of notebook computer and software to control the EUT through. Then making access to the mode of continuous transmission and set testing channel. Three channels were tested, one in the top (CH01), one in the middle (CH06) and the other in bottom (CH11).
2. Idle state (Rx mode)

The setting up procedure is recorded on Appendix A.

4.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
LISN (EUT)	LISN-01	TRC	9912-03,04	12/09/00	12/09/01
LISN (Support E.)	LISN-01	TRC	9912-05	01/04/01	01/04/02
Switch/Control Unit (< 30MHz)	3488A	HP	N/A	11/20/00	11/20/01
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/01

4.3 Test configuration

Conducted Emissions Test Placement

4.4 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 HOT and NATURAL conductors of the EUT power cord.

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

Power Connected Emissions				*FCC Class B*	
Conductor	*Frequency (KHz)*	*Peak Amplitude (dB μV)*	*QP Amplitude (dB μV)*	*Limit (dB μV)*	*Margin (dB)*
Line 1	486.00	28.69	---	48.00	-19.31
	1120.00	27.24	---	48.00	-20.76
	1184.00	27.84	---	48.00	-20.16
	1257.00	26.88	---	48.00	-21.12
	1332.00	27.62	---	48.00	-20.38
	1468.00	26.70	---	48.00	-21.30
	1535.00	27.32	---	48.00	-20.68
	1612.00	27.44	---	48.00	-20.56
	1747.00	27.48	---	48.00	-20.52
	2010.00	27.29	---	48.00	-20.71
Line 2	493.00	25.05	---	48.00	-22.95
	556.00	24.64	---	48.00	-23.36
	701.00	23.89	---	48.00	-24.11
	839.00	24.03	---	48.00	-23.97
	910.00	25.04	---	48.00	-22.96
	1257.00	24.13	---	48.00	-23.87
	3560.00	24.10	---	48.00	-23.90
	4380.00	26.05	---	48.00	-21.95
	4950.00	24.94	---	48.00	-23.06
	24300.00	24.07	---	48.00	-23.93

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)

Power Connected Emissions				*FCC Class B*	
Conductor	*Frequency (KHz)*	*Peak Amplitude (dB μV)*	*QP Amplitude (dB μV)*	*Limit (dB μV)*	*Margin (dB)*
Line 1	489.00	29.08	---	48.00	-18.92
	1048.00	27.90	---	48.00	-20.10
	1332.00	26.87	---	48.00	-21.13
	1458.00	27.30	---	48.00	-20.70
	1535.00	27.96	---	48.00	-20.04
	1758.00	26.98	---	48.00	-21.02
	1814.00	26.91	---	48.00	-21.09
	1961.00	27.24	---	48.00	-20.76
	2010.00	26.78	---	48.00	-21.22
	2220.00	26.92	---	48.00	-21.08
Line 2	486.00	28.02	---	48.00	-19.98
	560.00	24.44	---	48.00	-23.56
	628.00	25.54	---	48.00	-22.46
	697.00	25.63	---	48.00	-22.37
	773.00	26.32	---	48.00	-21.68
	839.00	25.44	---	48.00	-22.56
	910.00	26.65	---	48.00	-21.35
	1184.00	23.95	---	48.00	-24.05
	1257.00	24.60	---	48.00	-23.40
	1400.00	23.74	---	48.00	-24.26

**The reading amplitudes are all under limit.*

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

Power Connected Emissions				*FCC Class B*	
Conductor	*Frequency (KHz)*	*Peak Amplitude (dB μV)*	*QP Amplitude (dB μV)*	*Limit (dB μV)*	*Margin (dB)*
Line 1	486.00	27.32	---	48.00	-20.68
	839.00	26.08	---	48.00	-21.92
	910.00	25.93	---	48.00	-22.07
	1048.00	28.81	---	48.00	-19.19
	1120.00	27.31	---	48.00	-20.69
	1257.00	26.22	---	48.00	-21.78
	1468.00	26.11	---	48.00	-21.89
	1612.00	27.44	---	48.00	-20.56
	1814.00	26.16	---	48.00	-21.84
	1961.00	26.48	---	48.00	-21.52
Line 2	493.00	26.76	---	48.00	-21.24
	628.00	24.02	---	48.00	-23.98
	697.00	25.49	---	48.00	-22.51
	839.00	22.58	---	48.00	-25.42
	910.00	23.45	---	48.00	-24.55
	1184.00	23.07	---	48.00	-24.93
	1400.00	22.89	---	48.00	-25.11
	1535.00	23.82	---	48.00	-24.18
	3970.00	23.14	---	48.00	-24.86
	29590.00	22.86	---	48.00	-25.14

**The reading amplitudes are all under limit.*

Table 4 Power Line Conducted Emissions (Standby mode)

Power Connected Emissions				*FCC Class B*	
Conductor	***Frequency (KHz)***	***Peak Amplitude (dB μV)***	***QP Amplitude (dB μV)***	***Limit (dB μV)***	***Margin (dB)***
Line 1	560.00	27.70	---	48.00	-20.30
	1120.00	27.47	---	48.00	-20.53
	1184.00	27.72	---	48.00	-20.28
	1257.00	28.91	---	48.00	-19.09
	1535.00	27.71	---	48.00	-20.29
	1612.00	27.53	---	48.00	-20.47
	1747.00	29.20	---	48.00	-18.80
	1814.00	27.71	---	48.00	-20.29
	1896.00	28.41	---	48.00	-19.59
	1961.00	28.35	---	48.00	-19.65
Line 2	493.00	24.82	---	48.00	-23.18
	701.00	22.92	---	48.00	-25.08
	839.00	23.20	---	48.00	-24.80
	910.00	24.01	---	48.00	-23.99
	1120.00	24.29	---	48.00	-23.71
	1324.00	23.44	---	48.00	-24.56
	1400.00	22.98	---	48.00	-25.02
	3970.00	24.09	---	48.00	-23.91
	27780.00	22.56	---	48.00	-25.44
	30000.00	24.44	---	48.00	-23.56

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

V. 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 Exhibit H, 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.

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

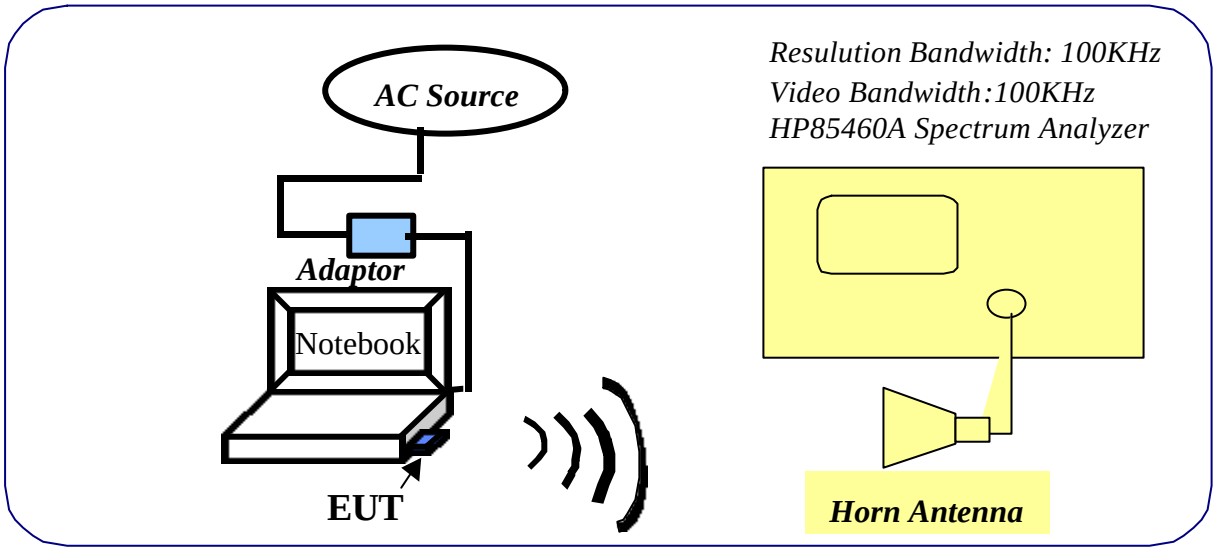
6.1 Test Condition & Setup

The transmitter bandwidth measurements were performed in an anechoic chamber. The EUT was placed on a wooded table, which is 0.8 meters height. The EUT was set to transmit continuously. Various channels were also investigated to find the maximum occupied bandwidth. The minimum 6 dB bandwidth shall be at least 500 KHz.

Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 KHz. Set the span>> RBW. The detector function was set to peak and hold mode to clearly observe the components.

Setting up procedure is written on Appendix A.

6.2 Test Instruments Configuration



P.S.: PCMCIA interface from notebook computer to control the EUT at maximal power output and channel Number.

Test Configuration of Bandwidth for Direct Sequence System

6.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
Horn Antenna	3115	EMCO	9704 – 5178	08/01/01	08/01/02

6.4 Test Result of Bandwidth

Bandwidth of Channel 1

Bandwidth : 10.0 MHz

The min. 6 dB BW at least : 500 KHz

Bandwidth of Channel 6

Bandwidth : 10.25 MHz

The min. 6 dB BW at least : 500 KHz

Bandwidth of Channel 11

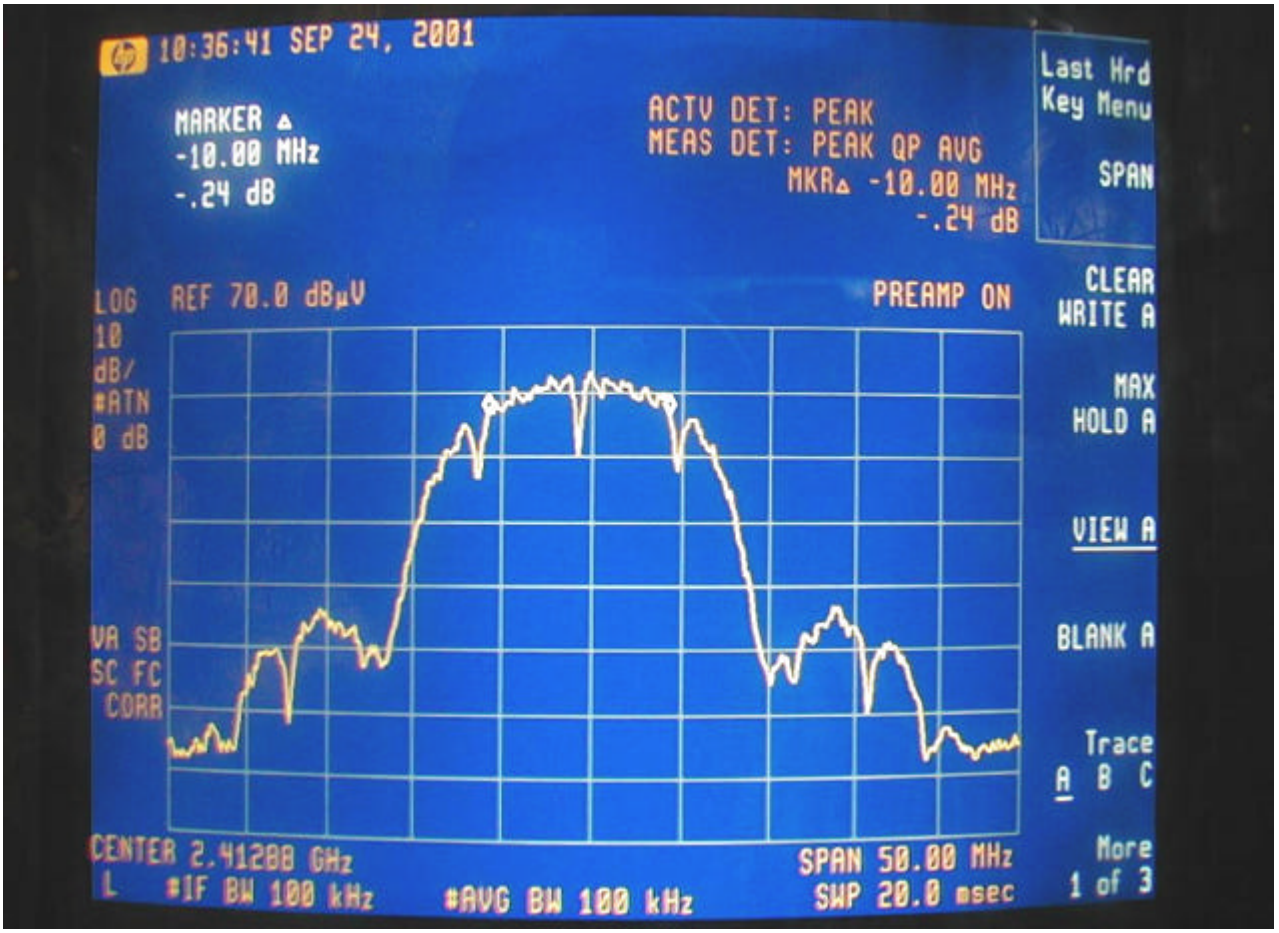
Bandwidth : 9.75 MHz

The min. 6 dB BW at least : 500 KHz

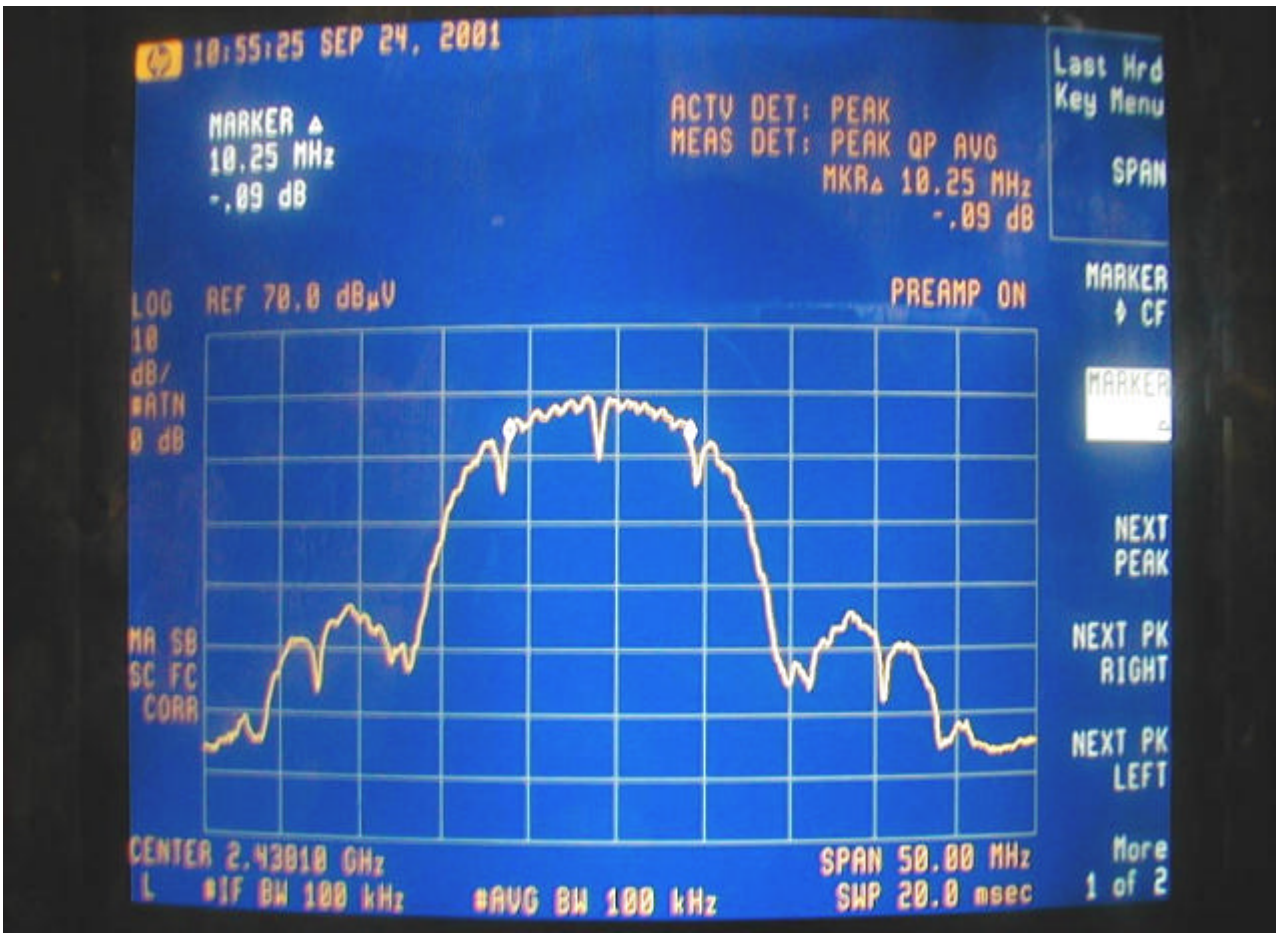
Note:

1. The data in the above table are summarizing the following attachment spectrum analyzer hard copy. According to the guidance, we'd made the measurement with the spectrum analyzer's resolution bandwidth *(RBW)=100kHz* and set the *span>>RBW*. The results show the measured 6dB bandwidth comply with the minimum 500kHz requirement.
2. The attachments show these on the following pages.

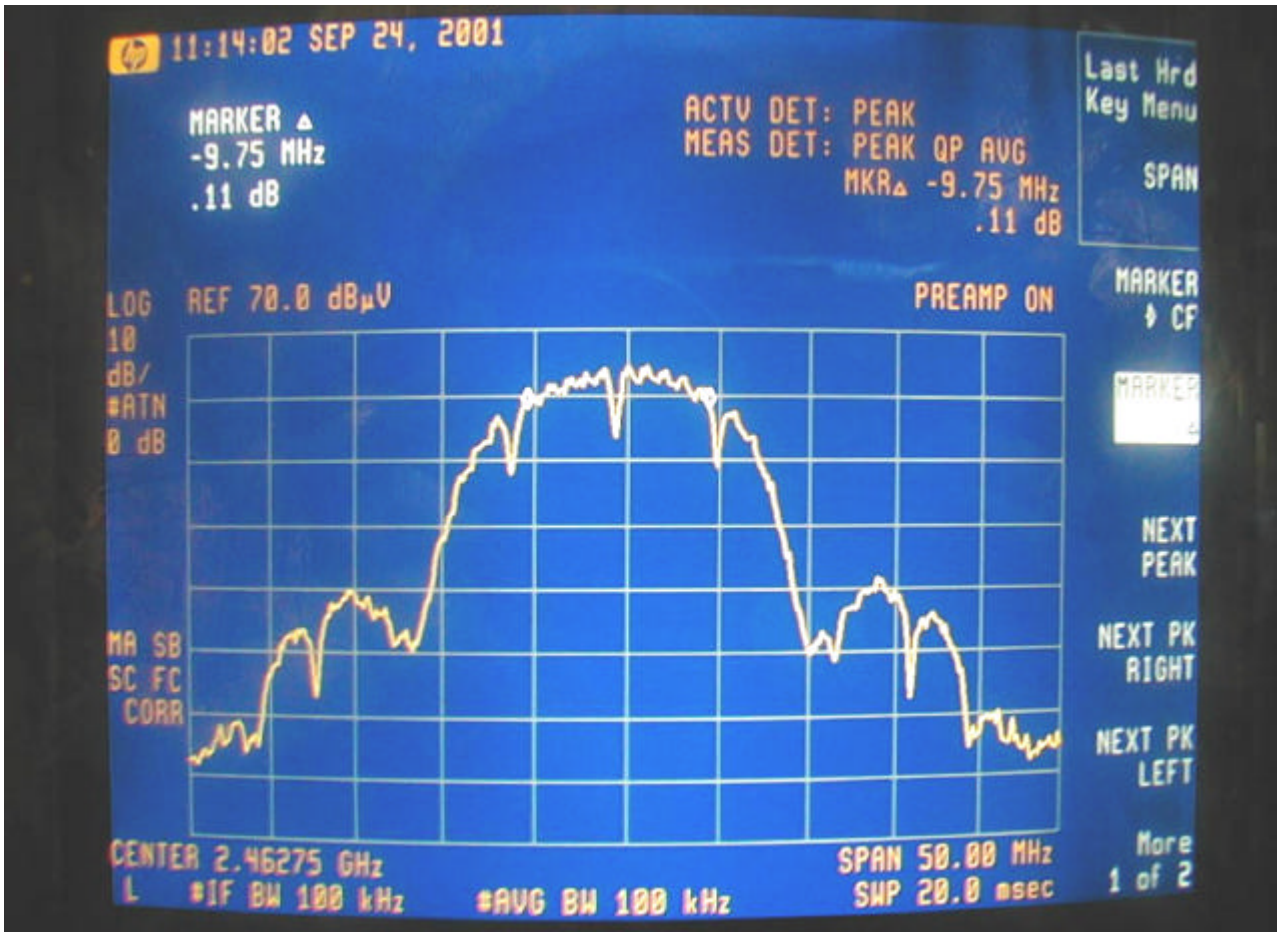
Bandwidth of Channel 1: 10.0 MHz



Bandwidth of Channel 6: 10.25 MHz



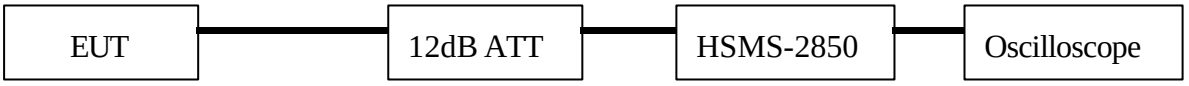
Bandwidth of Channel 11: 9.75 MHz



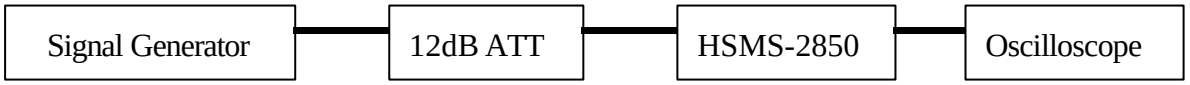
VII. Section 15.247(b): Power Output

7.1 Test Condition & Setup

A:



B:



1. The output of the transmitter thought 12dB attenuator and terminated by Schottkey Detector Diode (Hewlett- Packard HSMS-2850)
2. The output of the Shocttkey Diode Detector connected to the vertical channel of an oscilloscope. The observed trace of the oscilloscope shall be recorded as "A".
3. The combination of the diode detector and the oscilloscope capable of faithfully reproducing the envelop peaks and the duty cycle of the transmitter output signal.
4. The transmitter replaced by a signal generator. The output frequency of the signal made equal to the center of the frequency range occupied by the transmitter and unmodulated.
5. The output of the signal generator raised to reach the peak of trace "A" named X.
6. The signal generator output level X(mW) is the transmitter output peak power. Recording the following.

7.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.
Oscilloscope	54600A	H P	
Signal Generator	83711A	H P	3429A00434
Shocttkey Diode	HSMS-2850	H P	
Attenuator	MCL BW-S6W2	Mini-Circuits	

7.3 Test Result

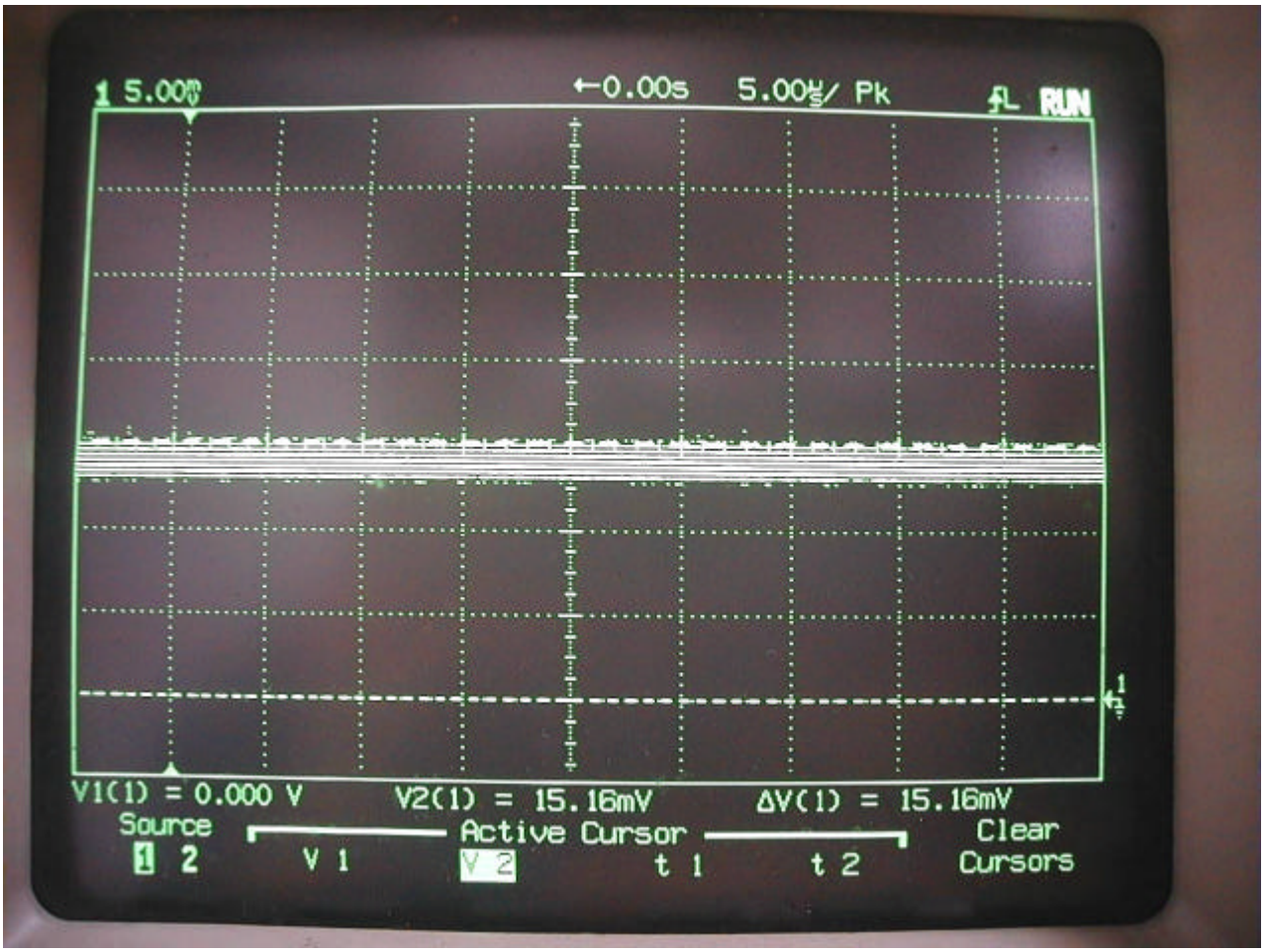
Channel	Signal Generator	Antenna Gain	Output peak power	
	dBm	dBi	dBm	mW
CH1	13.62	2.29	15.91	38.99
CH6	13.58	2.29	15.87	38.64
CH11	13.56	2.29	15.85	38.46

Note:

1. As the results of the test of Power Output, the readings of the test comply with the de facto EIRP limit. The reduction is not necessary since the readings are already below the limit.
2. The test shows the worst-case in the RF exposure. The reading complies with the EIRP limit without adjusting output power with single antenna. Thus no professional installation is required.
3. The EUT equipped with a PCMCIA interface and should operate with the notebook computer. It's not be classified as fixed, point-to-point operation. Furthermore, the worst-case do comply with de facto +36dBm EIRP limit: (13.62dBm+2.29dBi=15.91dBm(EIRP))
4. The warnings included in the user's manual shown in the <Safety information>.

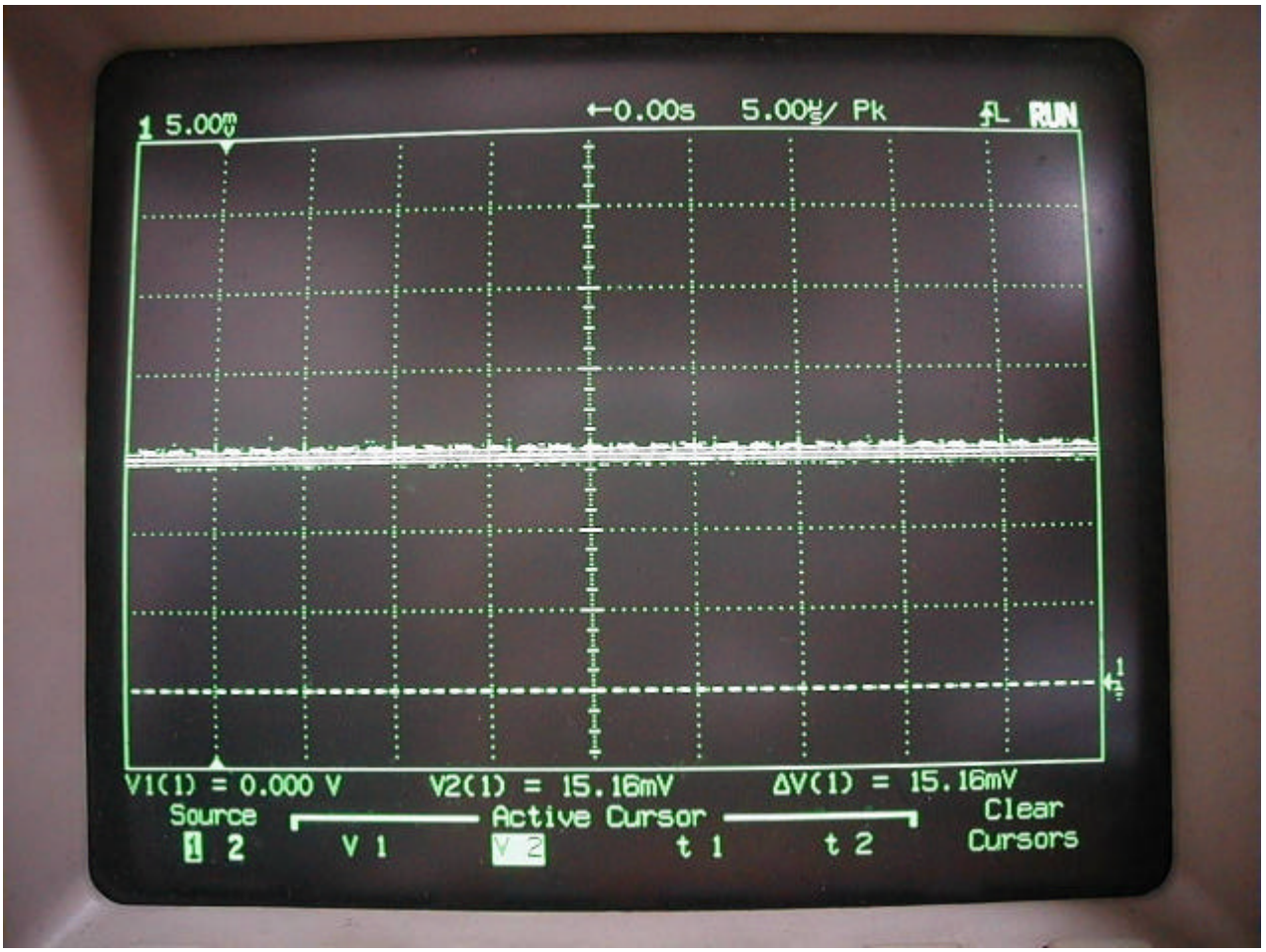
Oscilloscope set in Autostore mode use data V function measure the Peak Output Voltage.

CH 1



Adjust CW Signal Generator output level until the same data V Voltage is reaching.

<u>CH 1</u>



VIII. Section 15.247 (C): Spurious Emissions (Radiated)

8.1 Test Condition & Setup

We'd performed the test with the *radiated emission* skill: The EUT was placed in an anechoic chamber, and set the EUT transmitting continuously 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. For the measurement above 1GHz, according to the guidance we'd set the spectrum analyzer's 6dB bandwidth RBW to 1MHz.

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 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 PCMCIA interface 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. Since the EUT was set to transmit continuously, no *duty cycle* is present.

The EUT have 2 antennas, both of these antennas were tested under our pre-scan. We found that the *dipole* is the worst-case in comparison with the *inverted-F* antenna. The report exhibits only the highest gain in the pre-scan. We'd also test the lowest one but only present the worst-case data in our report.

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.

8.2 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
Bi-log Antenna	CBL6141A	Schaffner	4206	03/09/01	03/09/02
Switch/Control Unit (> 30MHz)	3488A	HP	N/A	11/20/00	11/20/01
Auto Switch Box (> 30MHz)	ASB-01	TRC	9904-01	11/20/00	11/20/01
Spectrum Analyzer	8564E	HP	US36433002	08/01/01	08/01/02
Microwave Preamplifier	83051A	HP	3232A00347	08/01/01	08/01/02
Horn Antenna	3115	EMCO	9704 – 5178	08/01/01	08/01/02
Anechoic Chamber (cable calibrated together)				05/20/01	05/20/02

8.3 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.

8.4 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. are recorded on the following.

FCC ID : MSQPCCAC100

EUT : ASUS SpaceLink AC100 WLAN PCMCIA Card

Test Conditions: Testing room : Temperature : 26 ° C Humidity : 73 % RH
Testing site : Temperature : 31 ° C Humidity : 75 % 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)*
196.611	17.19	1.00	16	-13.19	30.38	43.50	-13.12
245.764	20.50	1.00	90	-15.36	35.86	46.00	-10.14
286.000	15.27	1.00	42	-15.69	30.96	46.00	-15.04
294.916	19.61	1.00	26	-15.94	35.55	46.00	-10.45
344.067	23.21	1.00	49	-17.76	40.97	46.00	-5.03
393.221	18.40	1.00	24	-19.37	37.77	46.00	-8.23

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)*
320.721	17.64	2.43	2	-17.84	35.48	46.00	-10.52
360.813	18.10	1.00	50	-18.08	36.18	46.00	-9.82
400.903	16.21	1.00	1	-19.29	35.50	46.00	-10.50
481.082	17.19	1.00	16	-21.36	38.55	46.00	-7.45
521.175	12.29	1.00	51	-22.19	34.48	46.00	-11.52
561.261	15.26	1.00	20	-24.04	39.30	46.00	-6.70

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit		Margin (dB)
							Peak	Ave.	
*4.070	38.79	1.00	224	3.91	42.70	---	74.0	53.9	-11.20
7.210	38.15	1.00	87	9.72	47.87	---	74.0	---	-26.13

Note:

1. Margin = Corrected - Limit.
2. Peak Amplitude + Correction Factor = Corrected
3. The " * " means restricted bands.
4. The EUT utilizes a *permanently attached antenna*. In addition the spurious RF conducted emissions levels do comply with the *20dBc limit* both at its bandedges and other spurious emissions.
5. 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.
6. **Above emissions of 10GHz, they are all under the limits of 20dB in Test Site.**

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.070	42.12	1.00	45	3.91	46.03	---	74.0	53.9	-7.87
*8.150	38.98	1.00	113	9.72	48.70	---	74.0	53.9	-5.20

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)*
196.612	15.97	1.00	13	-13.19	29.16	43.50	-14.34
245.764	20.83	1.00	81	-15.36	36.19	46.00	-9.81
280.634	20.74	1.00	1	-15.47	36.21	46.00	-9.79
344.069	23.44	1.00	33	-17.76	41.20	46.00	-4.80
393.221	18.70	1.00	55	-19.37	38.07	46.00	-7.93
442.373	17.22	2.43	24	-20.19	37.41	46.00	-8.59

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)*
320.722	17.41	2.44	22	-17.84	35.25	46.00	-10.75
360.812	18.24	1.00	1	-18.08	36.32	46.00	-9.68
400.902	16.11	1.00	6	-19.29	35.40	46.00	-10.60
440.993	17.09	1.00	15	-20.20	37.29	46.00	-8.71
481.084	17.17	1.00	43	-21.36	38.53	46.00	-7.47
561.264	15.17	1.00	21	-24.04	39.21	46.00	-6.79

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.120	39.46	1.00	66	3.91	43.37	---	74.0	53.9	-10.53

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

Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBμV/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*4.120	39.79	1.00	24	3.91	43.70	---	74.0	53.9	-10.20
*8.250	40.31	1.00	194	9.72	50.03	---	74.0	53.9	-3.87

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)*
240.543	19.60	1.00	136	-15.12	34.72	46.00	-11.28
280.633	20.84	1.00	103	-15.47	36.31	46.00	-9.69
294.917	20.18	1.00	55	-15.94	36.12	46.00	-9.88
344.069	23.54	1.00	39	-17.76	41.30	46.00	-4.70
393.221	19.26	1.00	56	-19.37	38.63	46.00	-7.37
442.373	17.36	2.43	25	-20.19	37.55	46.00	-8.45

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)*
320.723	17.03	2.43	5	-17.84	34.87	46.00	-11.13
360.814	17.99	1.00	2	-18.08	36.07	46.00	-9.93
400.902	16.30	1.00	9	-19.29	35.59	46.00	-10.41
440.993	17.32	1.00	13	-20.20	37.52	46.00	-8.48
481.081	17.26	1.00	42	-21.36	38.62	46.00	-7.38
561.263	15.35	1.00	24	-24.04	39.39	46.00	-6.61

Table 15 Open Field Radiated Emissions For 1GHz 18GHz [Channel 6, Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*		*FCC Class B (3m)*		
Frequency (GHz)	*Amplitude (dBm V/m)*	*Ant. H. (m)*	*Table (°)*	*(dB)*	*Peak*	*Average*	*Limit*		*Margin (dB)*
							Peak	*Ave.*	

Table 16 Open Field Radiated Emissions For 1GHz 18GHz [Channel 6, Vertical]

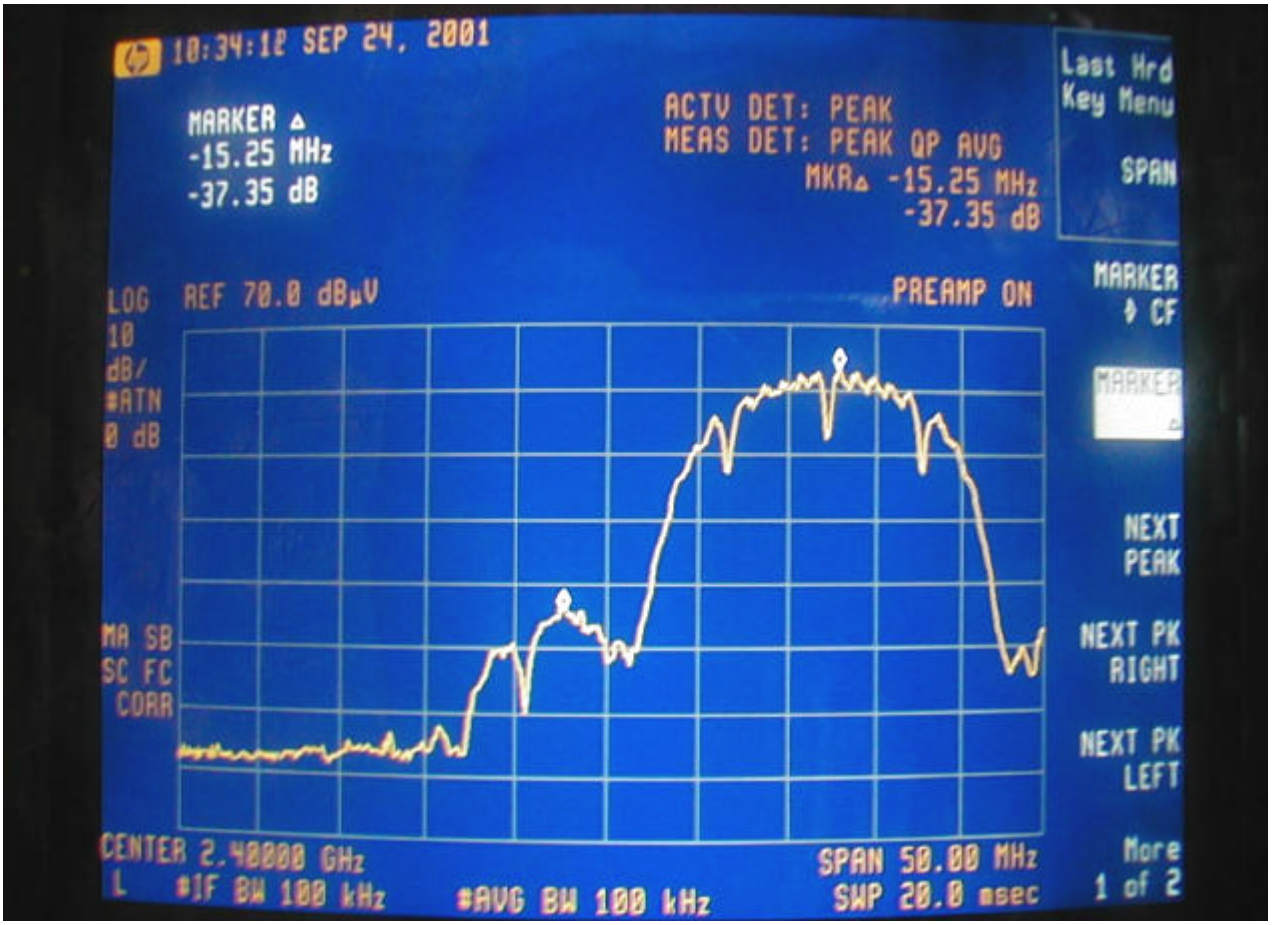
Radiated Emission				Correction Factors	Corrected Amplitude		FCC Class B (3m)		
Frequency (GHz)	Amplitude (dBm V/m)	Ant. H. (m)	Table (°)	(dB)	Peak	Average	Limit Peak	Limit Ave.	Margin (dB)
*8.340	45.62	1.00	346	3.91	49.53	---	74.0	53.9	-4.37

8.5 Test Result of the Bandedge

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), whichever results in the lesser attenuation.

Test Condition & Setup: same as 3.1

Channel 1



#This is the hard copy of our measurement of channel 1 bandedge. The spectrum plot extended to the 2390MHz (restriction band) is below 10dBuV. By involving our correction factor 35.6dB(1/m), the field strength should be also below 45.6dBuV/m. According to the Sect.15.205, The EUT comply with all the the spurious emission below 54dbuV/m.

#The EUT have 2 antennas, both of these antennas are tested under our pre-scan. We have noticed that the *dipole* is the worst-case in comparison with the *inverted-F* antenna. The report exhibits only the highest gain in the pre-scan. We'd also test the lowest one but only present the worst-case data in our report.

Channel 11

#This is the hard copy of our measurement of channel 11 bandedge. The spectrum plot extended to the 2483.5MHz (restriction band) is below 10dBuV. By involving our correction factor 35.6dB(1/m), the field strength should be also below 45.6dBuV/m. According to the Sect.15.205, The EUT comply with all the the spurious emission below 54dbuV/m.

#The EUT have 2 antennas, both of these antennas are tested under our pre-scan. We have noticed that the *dipole* is the worst-case in comparison with the *inverted-F* antenna. The report exhibits only the highest gain in the pre-scan. We'd also test the lowest one but only present the worst-case data in our report.

IX. Section 15.247(d): Power Spectral Density

9.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power mode .A PCMCIA port from a notebook computer to the EUT. The EUT is needed to force selection of output power level and channel number. While testing, EUT was set to transmit continuously. A horn antenna was connected with the spectrum analyzer.

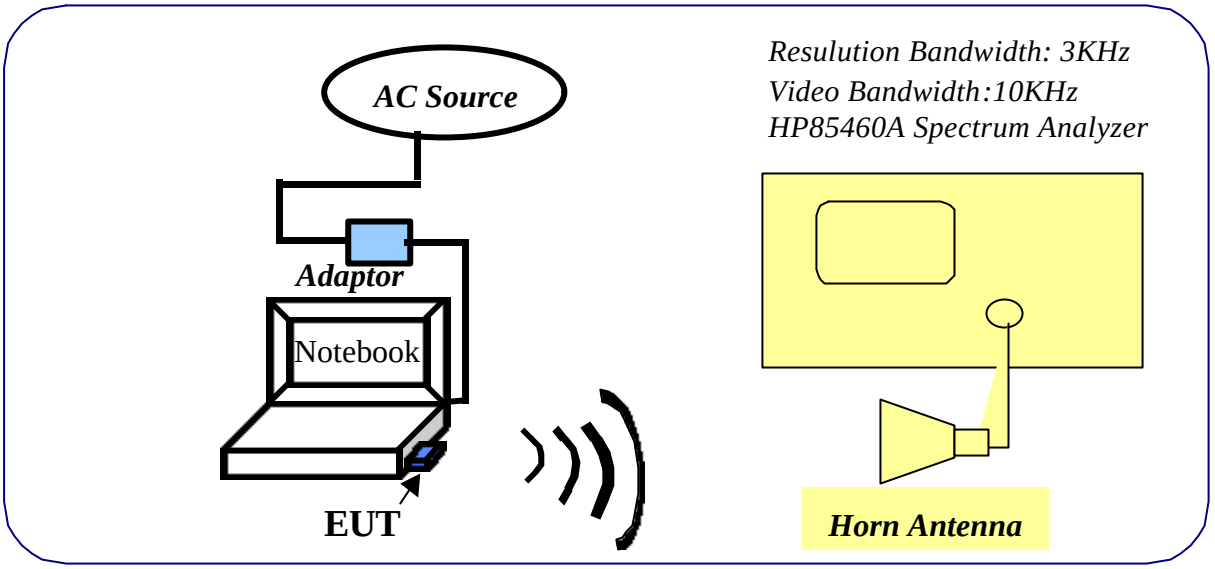
The EUT is tested in open field site. Put EUT on the middle of a wooden table. Set spectrum analyzer RBW = 3 KHz, VBW > RBW (e.g. VBW = 10 KHz), Span = 2 MHz. Turn around the table to find maximum emission. Then set the Span = 300 KHz and sweep time = 100 sec. Peak the maximum emission again. The peak level measured must be no greater than + 8dBm.

The setting up procedure is recorded on Appendix A.

According to the guidance, *sweep=(SPAN/3kHz)*. We'd used the *SPAN=300kHz* and *sweep time=100sec* in our configuration. The EUT was set transmitting continuously and force selection of output power level and channel number. We'd observed that the peak levels aren't greater than +8dBm limit.

The attachments below show our observation.

9.2 Test Instruments Configuration



Test Configuration of Power Spectral Density

9.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last time	Next time
EMI Receiver	8546A	H P	3520A00242	06/29/01	06/29/02
RF Filter Section	85460A	H P	3448A00217	06/29/01	06/29/02
Horn Antenna	3115	EMCO	9704 – 5178	08/01/01	08/01/02

9.4 Test Result of Power spectral density

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

FCC ID : MSQPCCAC100

Channel	*Frequency (GHz)*	*Ppr (dBuV)*	*CF (dB)*	*Ppq (dBm)*	*Limit (dB)*	*Margin (dB)*
CH 01	2.411	50.85	35.60	-8.78	8.00	-16.78
CH 06	2.438	50.40	35.60	-9.23	8.00	-17.23
CH 11	2.462	51.73	35.60	-7.90	8.00	-15.90

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 (=Antenna factor + cable loss), Ppq: actual peak
   power density in the spread spectrum band.
3. Ppq = Ppr + CF
4. Effective Radiation Power (E.R.P.) = $(E\ d)^2 / 30G$

"E" is the measured maximum field strength in V/m utilizing the maximum hold mode RBW (3KHz)

"G" is the numeric gain of the transmitting antenna over an isotropic radiator (1.00).

"d" is the distance in meters from which the field strength was measured (3M).

Example: the Max Radiation Emission = 51.73 + (35.60) = 87.33 dBμV/m

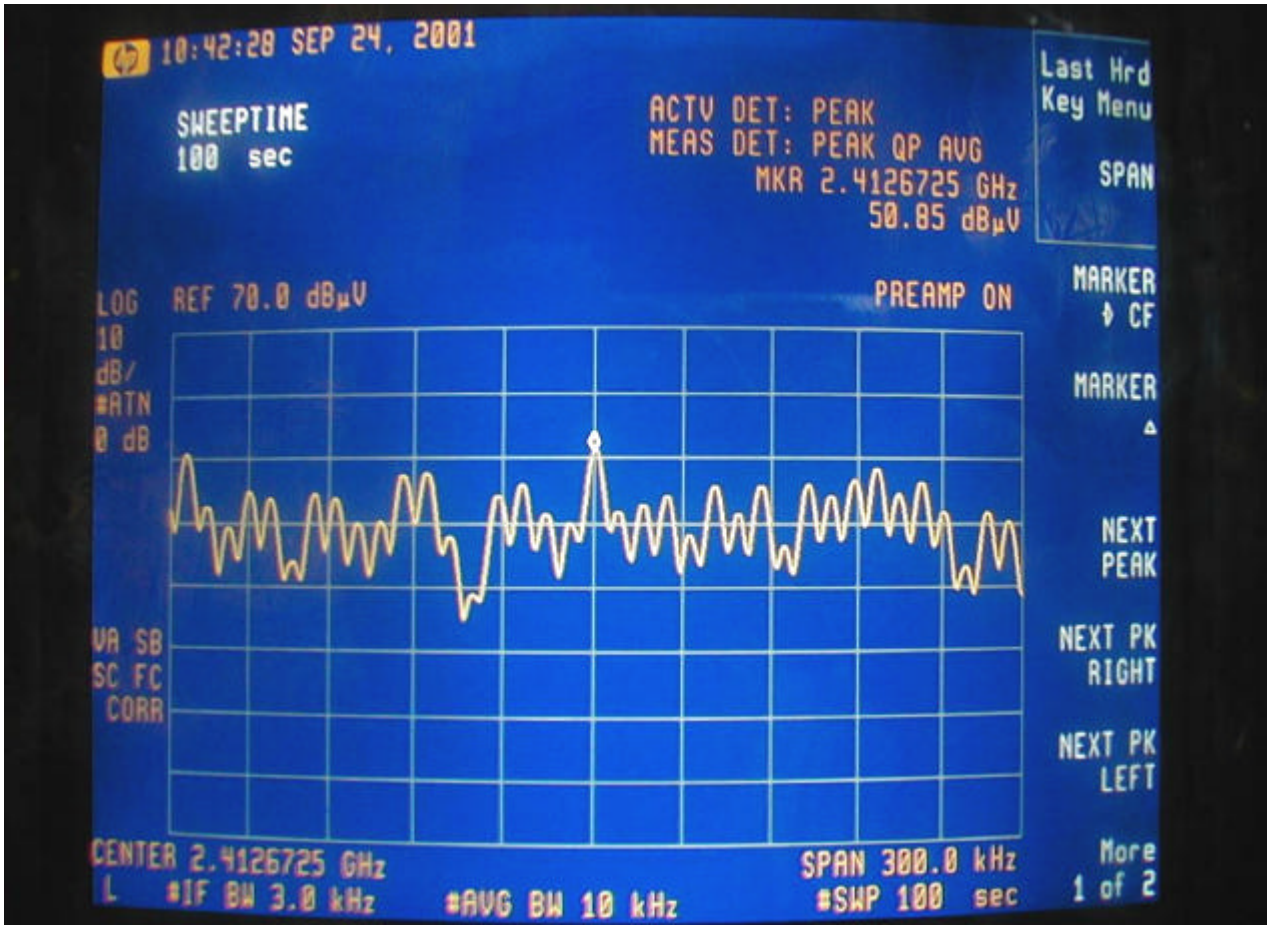
$10^{(87.33/20)} \times 10^{-6} = 0.023254$ V

E.I.R.P. = $(0.023254 \times 3)^2 / 30 = 0.162226$ mW

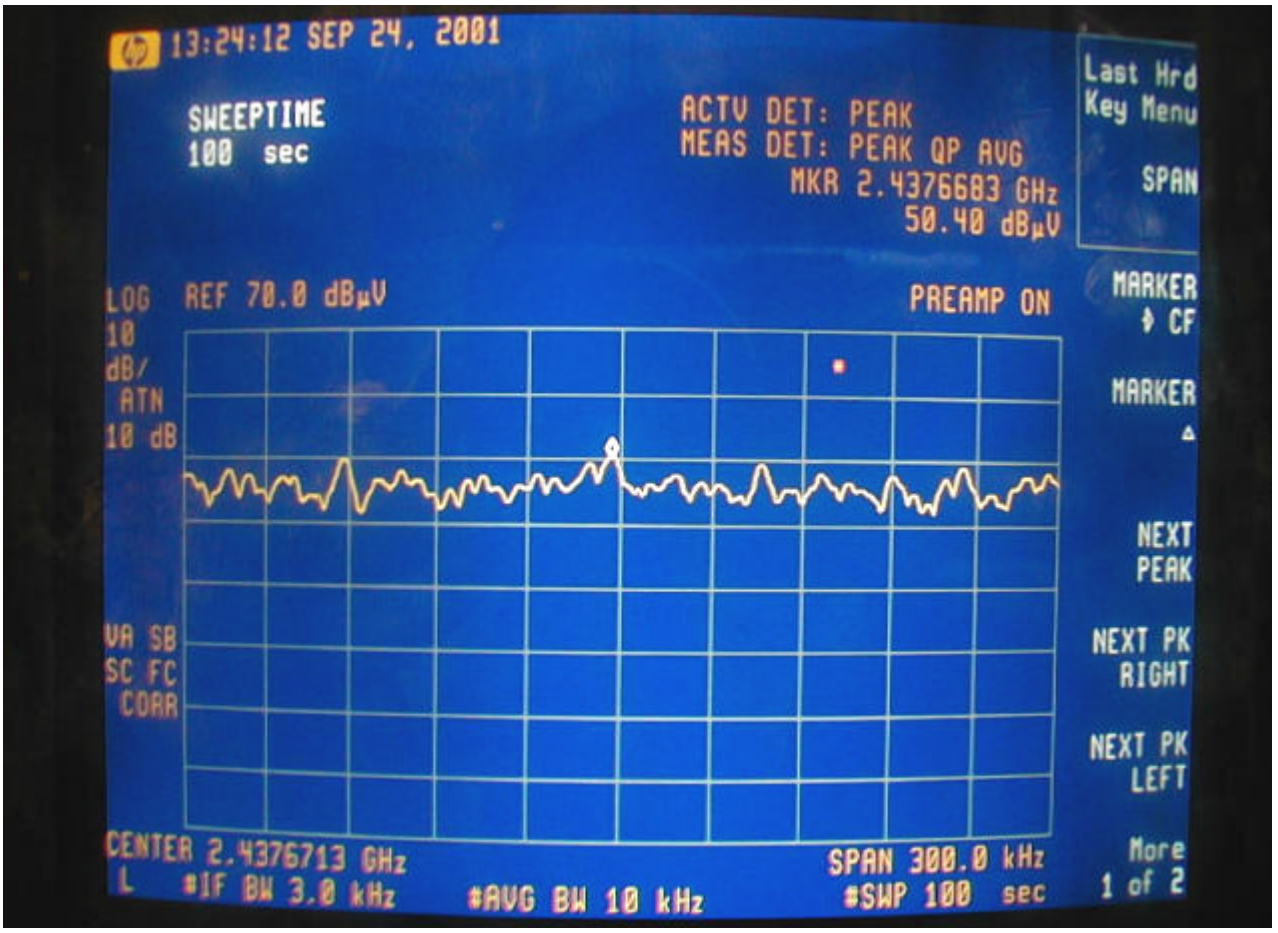
= 10 x log (0.162226 mW/1mW)

= -7.90 dBm

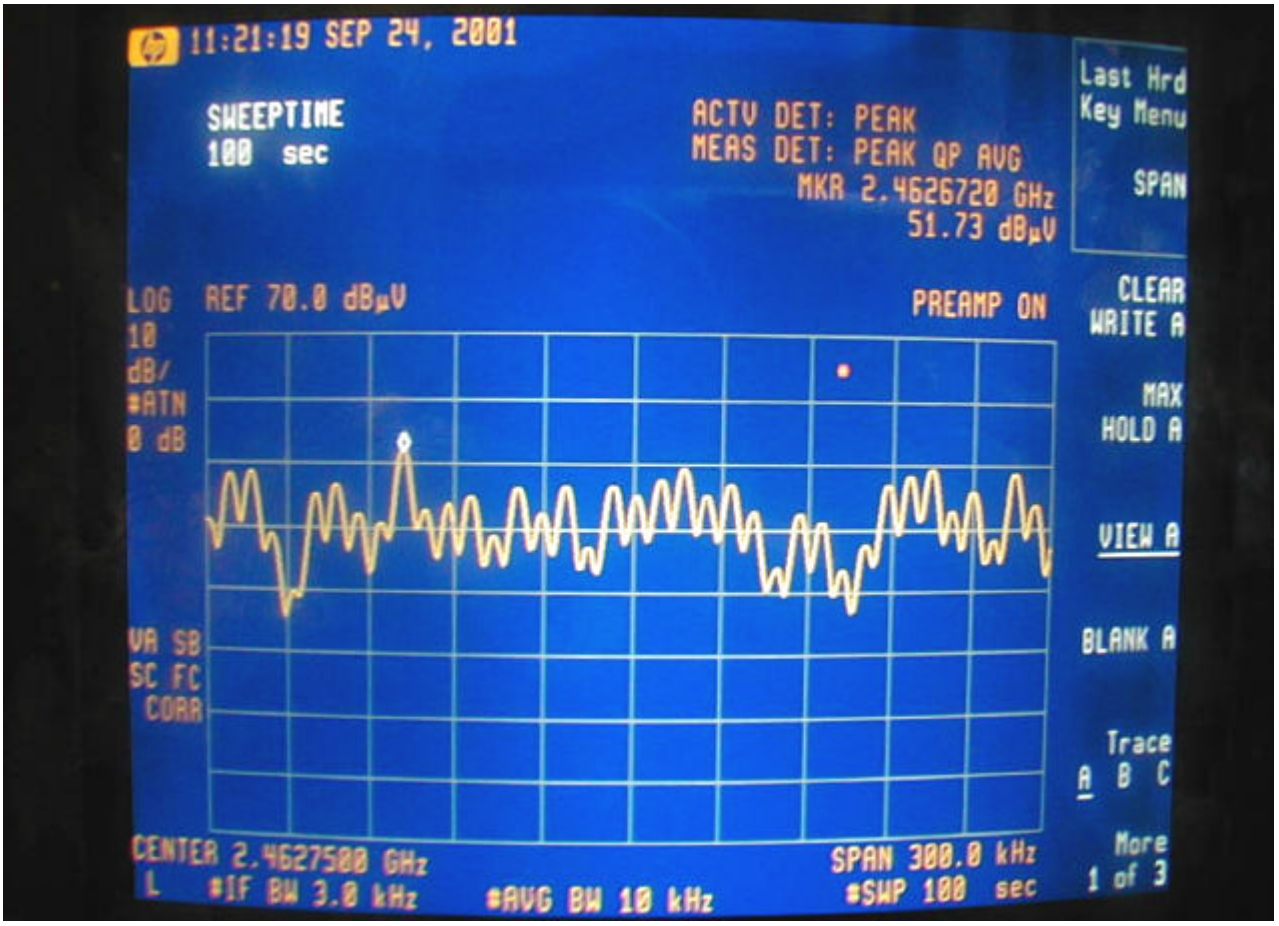
Channel 01


10:42:28 SEP 24, 2001
SWEEPTIME
100 sec
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4126725 GHz
50.85 dBµV
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
VA SB
SC FC
CORR
CENTER 2.4126725 GHz
#IF BW 3.0 kHz
#AVG BW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Channel 06


13:24:12 SEP 24, 2001
SWEEPTIME
100 sec
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4376683 GHz
50.40 dBµV
Last Hrd Key Menu
SPAN
LOG
10
dB/
ATN
10 dB
REF 70.0 dBµV
PREAMP ON
MARKER → CF
MARKER Δ
NEXT PEAK
NEXT PK RIGHT
NEXT PK LEFT
More 1 of 2
VA SB
SC FC
CORR
CENTER 2.4376713 GHz
L #IF BW 3.0 kHz
#AVG BW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec

Channel 11


11:21:19 SEP 24, 2001
SWEEPTIME
100 sec
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.4626720 GHz
51.73 dBµV
Last Hrd Key Menu
SPAN
LOG
10
dB/
#ATN
0 dB
REF 70.0 dBµV
PREAMP ON
CLEAR WRITE A
MAX HOLD A
VIEW A
BLANK A
VA SB
SC FC
CORR
Trace
A B C
CENTER 2.4627500 GHz
L #IF BW 3.0 kHz
#AVG BW 10 kHz
SPAN 300.0 kHz
#SWP 100 sec
More
1 of 3

Appendix A

Setting up Procedure

1. The EUT build in PCMCIA interface of notebook computer. Using the PCMCIA port of Notebook Computer and software to control the wireless LAN card.

2. Use the software that is given by the customer and operated in the windows to control the EUT's continuous transmission.

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