

MEASUREMENT REPORT
of
WIRELESS LAN CARD

Applicant : ASUSTeK COMPUTER INC.
Model No. : WL-200
EUT : ASUS SpaceLink WL-200 Dual Band WLAN CardBus Card
FCC ID : MSQPCCWL200
Report No. : A5415843

Tested by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440
255, Nanyang St., 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 St., 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 for the *Unlicensed National Information Infrastructure (UNII)* set forth in the FCC Rules Part 15 Subpart E.

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Model No. : WL-200

EUT : ASUS SpaceLink WL-200 Dual Band WLAN CardBus Card

FCC ID : MSQPCCWL200

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Test Date : November 20, 2002

Prepared by: _____
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Approved by: _____
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I . GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of Applicant in support of a WLAN PCMCIA card certification in accordance with Part 2 Subpart J and Part 15 Subpart E (15.407) of the Commission's Rules and Regulations.

1.2 Description of EUT

EUT : ASUS SpaceLink WL-200 Dual Band WLAN CardBus Card
Model No. : WL-200
FCC ID : MSQPCCWL200
Frequency Range : 5.15GHz ~ 5.25GHz / 5.25GHz ~ 5.35GHz (UNII Band)
Modulation Skill : OFDM
Interface : PCMCIA Interface
Power Type : By PCMCIA slot of the client's device
Applicant : ASUSTeK COMPUTER INC.
4/F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan, R.O.C.

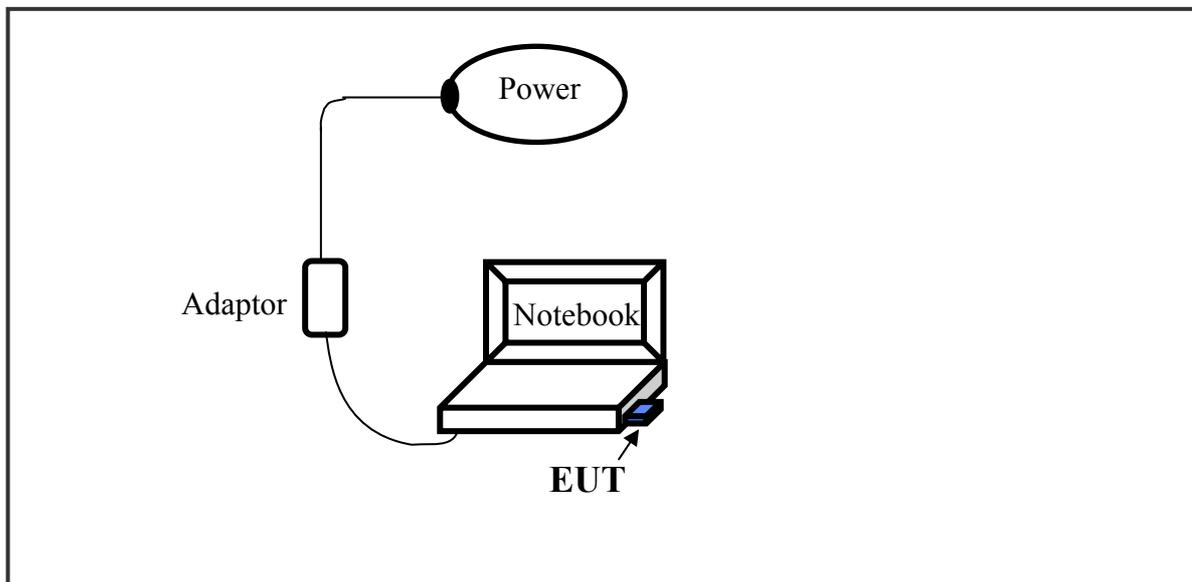
1.3 Description of Support Equipment

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

Notebook : **IBM COMPUTER INC.**
Type No. : 08N1180
Serial No. : 11SO8K6451ZFX0820AJOLB
FCC ID : DoC Approved

AC Adaptor : **ASTEC INC. (China)**
Model No. : 02K6654
Serial No. : 11SO2K6654Z1Z0Z40325LE
FCC ID : DoC Approved
Power Core : Non-shielded, Plastic hoods, with ferrite bead
Power type : 100 ~ 240VAC, 50 ~ 60Hz, 1.2A-0.5A / 16VDC, 4.5A

1.4 Configuration of System Under Test



The EUT was inserted into the PCMCIA. The EUT is needed to force selection of output power level and channel number.

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

1.5 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.

1.6 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.* - 255, Nanyang St., 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.

255, Nanyang St., 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.

1.7 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 15.405: Cross Reference

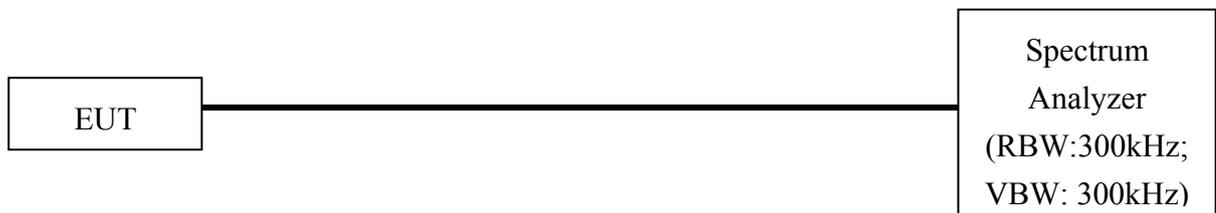
The EUT is set out for complying the Rules subpart E – Unlicensed National Information Infrastructure (UNII) devices operating in the 5.15GHz-5.35GHz and 5.725GHz-5.825GHz. Section 15.405 requires the complement about the conformity with the subparts A, B and C, if applicable. Items required on each part are all performed respectively and prepared in their issue separately. We dropped this part as the results will be repeated as the parts we've mentioned above.

III. Section 15.407(a)(1)/(2): Bandwidth Measurement

3.1 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 300kHz RBW and 300kHz VBW.

3.2 Test Instruments Configuration



Test Configuration of Bandwidth Measurement

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

3.3 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

3.4 Test Result of Bandwidth Measurement

Lowest Channel

	Base Mode (5180 MHz)	Turbo Mode (5210 MHz)
6 dB Bandwidth	16.50 MHz	32.67 MHz
26dB Bandwidth	27.50 MHz	47.00 MHz

Middle Channel

	Base Mode (5260 MHz)	Turbo Mode (5250 MHz)
6 dB Bandwidth	16.43 MHz	32.75 MHz
26dB Bandwidth	27.08 MHz	46.50 MHz

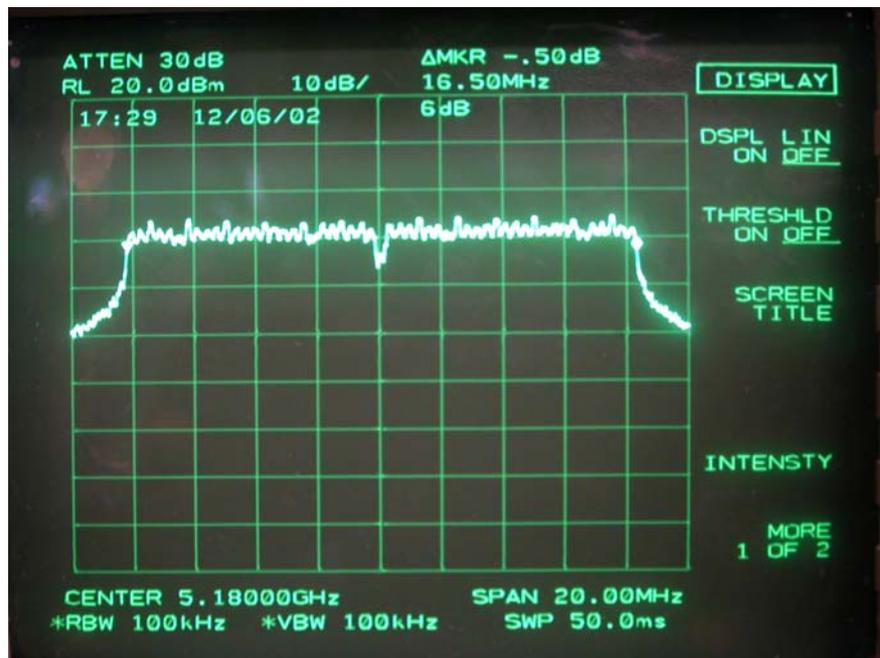
Highest Channel

	Base Mode (5320 MHz)	Turbo Mode (5290 MHz)
6 dB Bandwidth	16.50 MHz	32.92 MHz
26dB Bandwidth	27.33 MHz	47.50 MHz

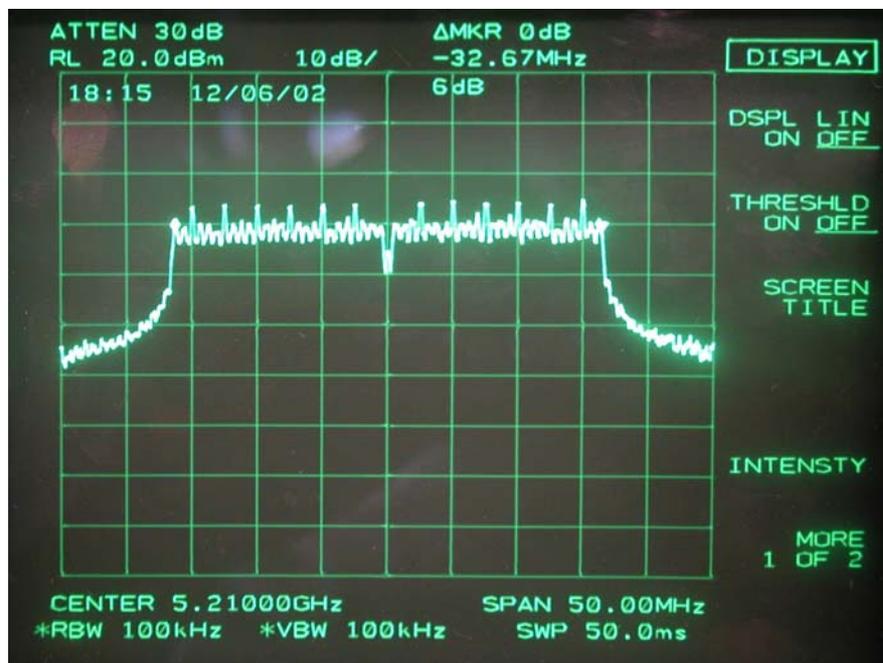
Note:

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*)=300kHz and set the *span*>>*RBW*.
2. The attachments show these on the following pages.

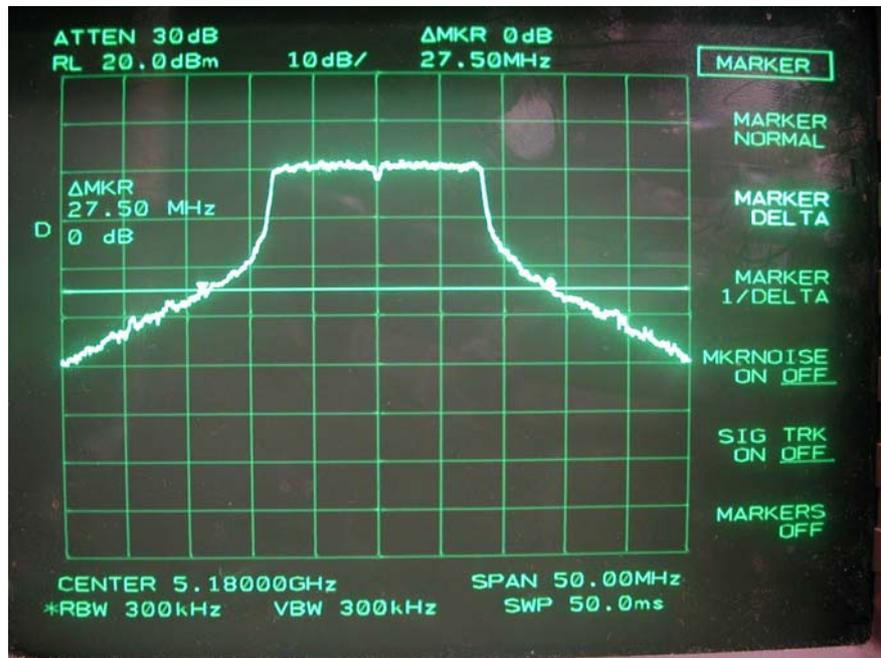
6 dB Bandwidth of Lowest Channel (Base mode)



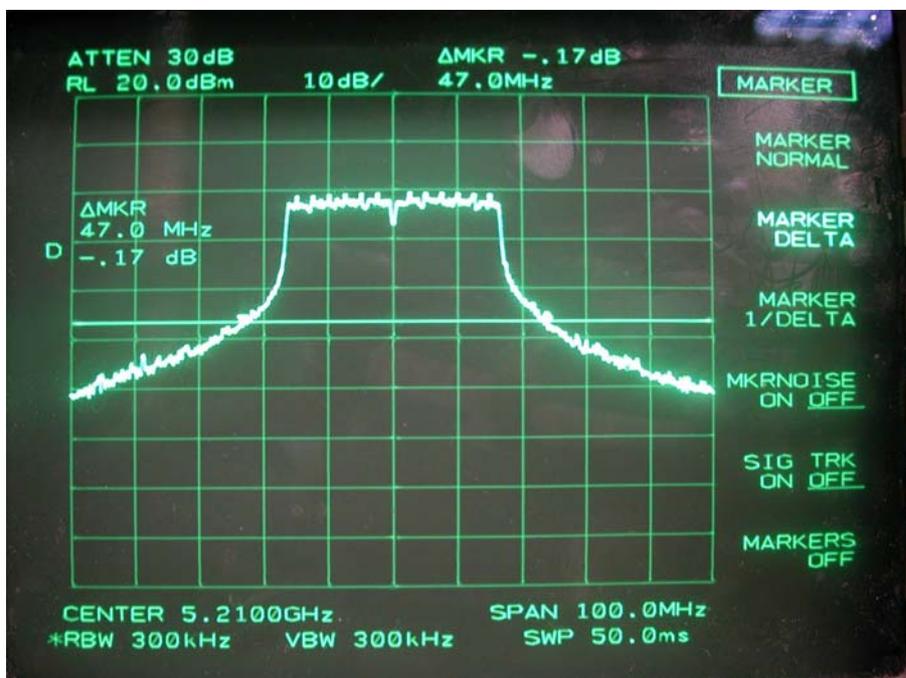
6 dB Bandwidth of Lowest Channel (Turbo mode)



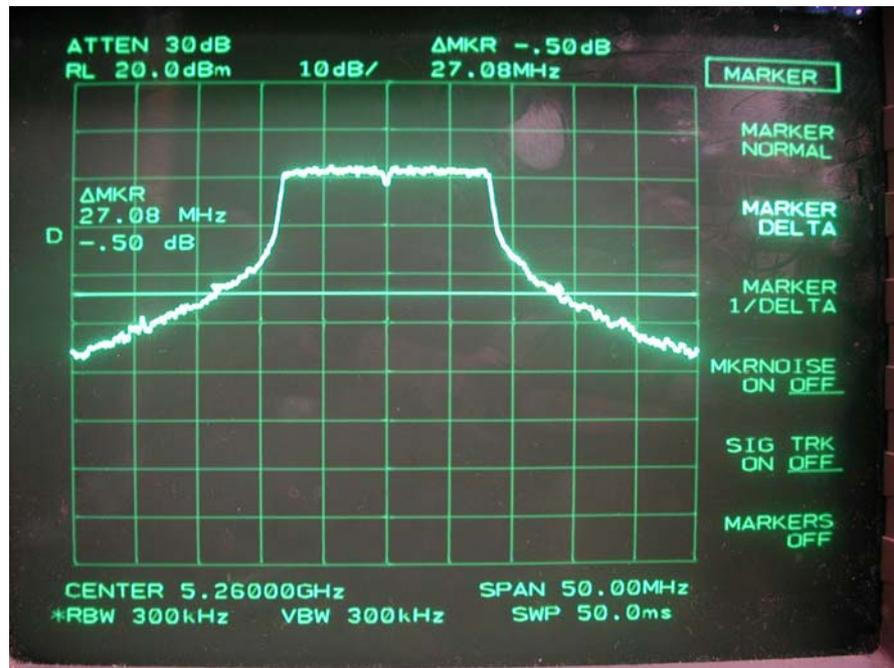
26 dB Bandwidth of Lowest Channel (Base mode)



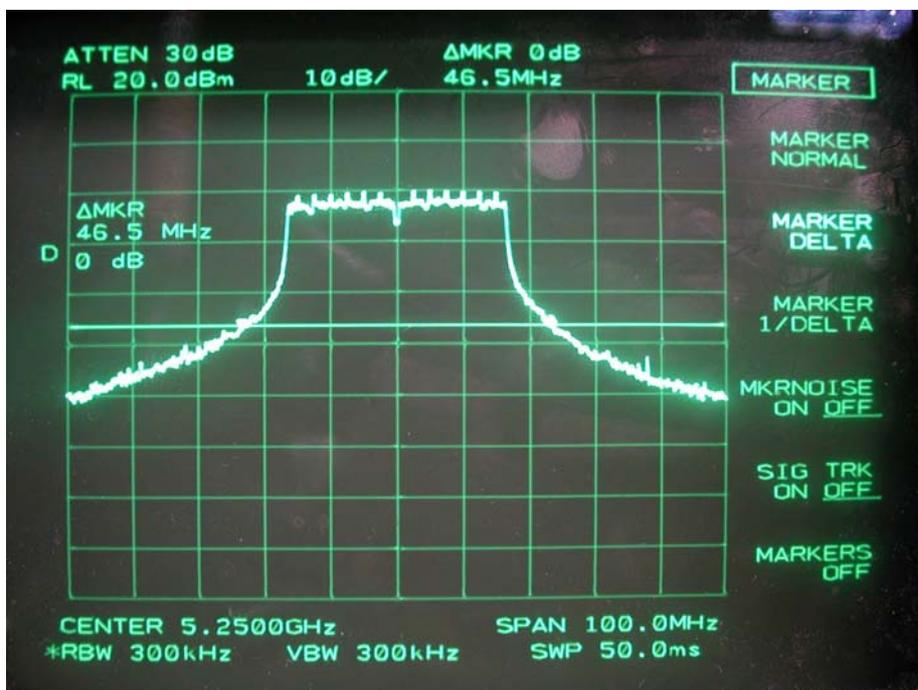
26 dB Bandwidth of Lowest Channel (Turbo mode)



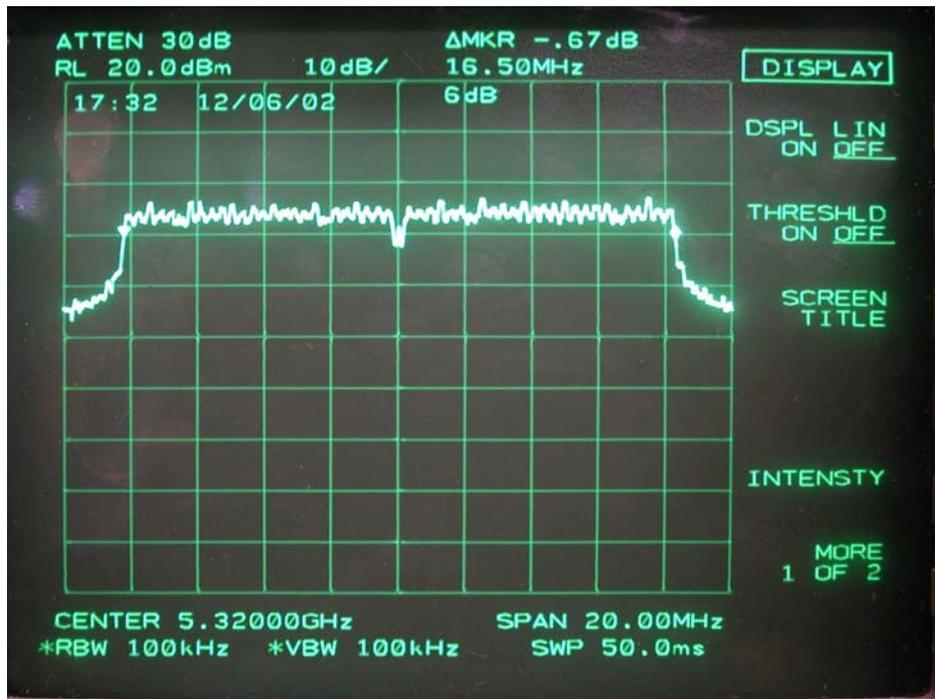
26 dB Bandwidth of Middle Channel (Base mode)



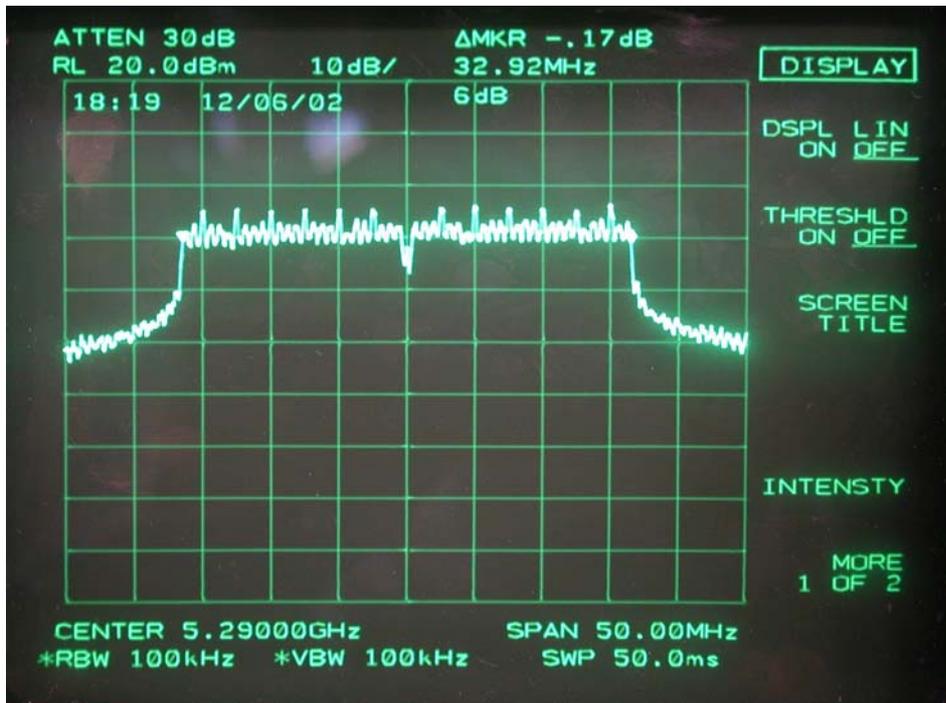
26 dB Bandwidth of Middle Channel (Turbo mode)



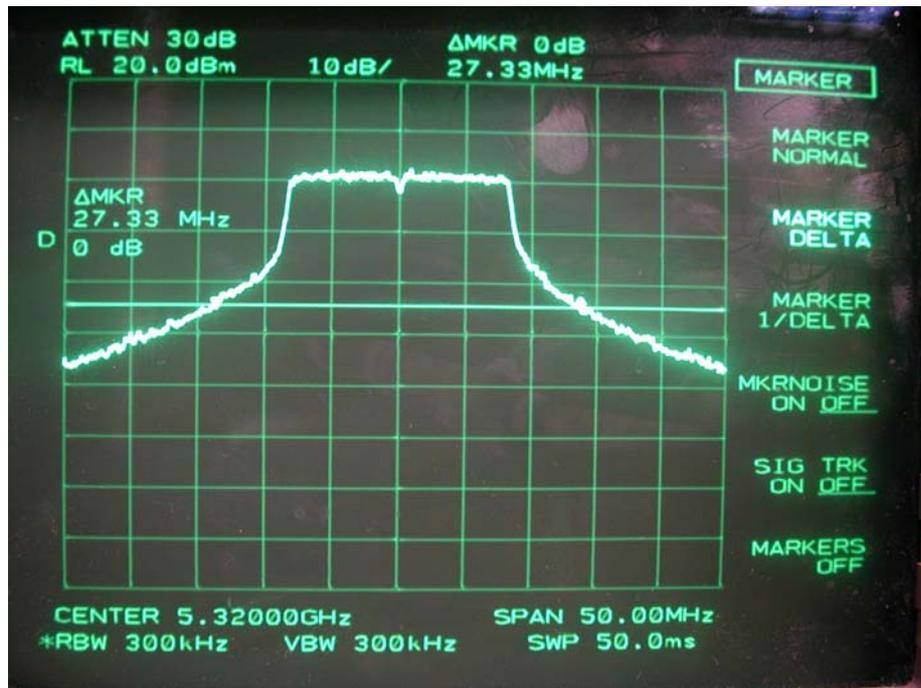
6 dB Bandwidth of Highest Channel (Base mode)



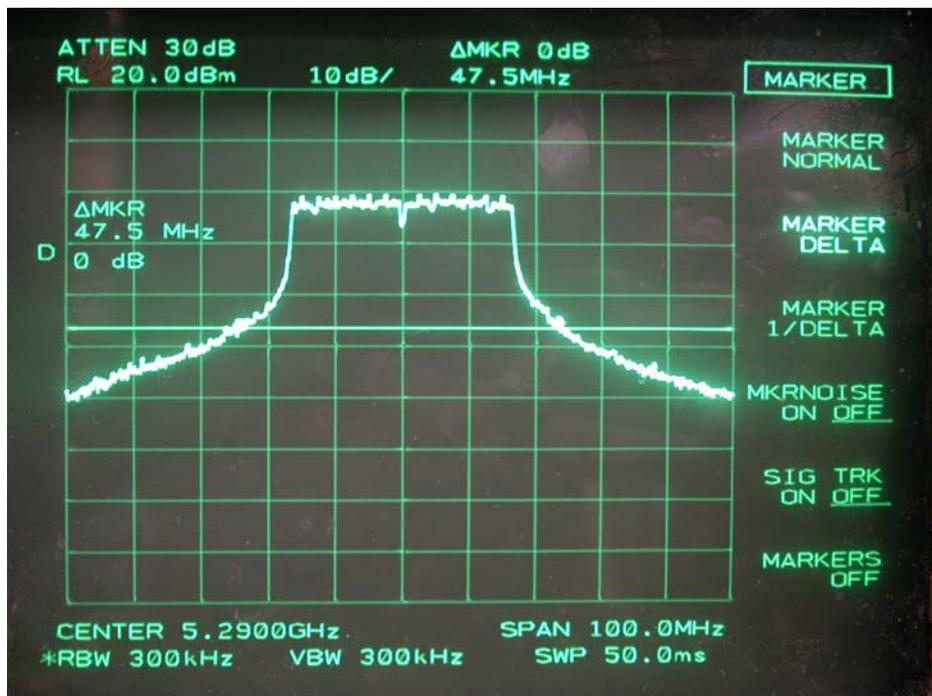
6 dB Bandwidth of Highest Channel (Turbo mode)



26 dB Bandwidth of Highest Channel (Base mode)

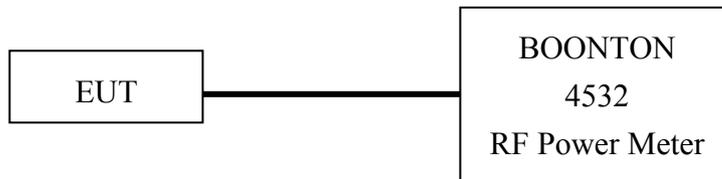


26 dB Bandwidth of Highest Channel (Turbo mode)



IV. Section 15.407(a)(1)/(2): Power Output Measurement

4.1 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.

4.2 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

4.3 Test Result of Power Output Measurement

Base Mode

Channel	Frequency	Power Meter Reading	Cable Loss	Limit	Output peak power	
	MHz	dBm	dB _i	dBm	dBm	mW
Lowest	5180	16.07	0.20	17.00	16.27	42.36
Middle	5260	18.27	0.20	24.00	18.47	70.31
Highest	5320	19.01	0.20	24.00	19.21	83.37

Turbo Mode

Channel	Frequency	Power Meter Reading	Cable Loss	Limit	Output peak power	
	MHz	dBm	dB _i	dBm	dBm	mW
Lowest	5210	16.13	0.20	17.00	16.33	42.95
Middle	5250	16.24	0.20	17.00	16.44	44.06
Highest	5290	18.58	0.20	24.00	18.78	75.51

Note:

- 1. The readings are all under the limits.*

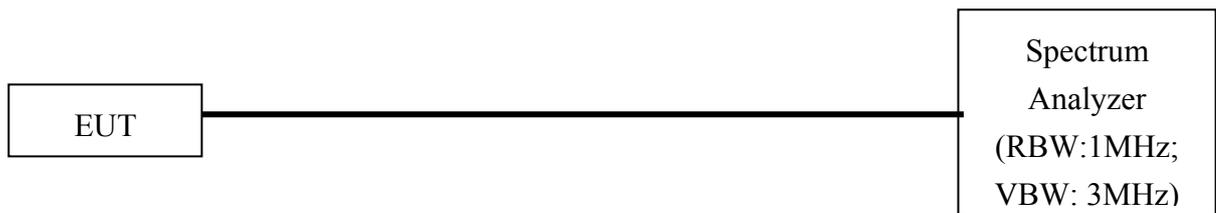
V. Section 15.407(a)(1)/(2): Power Spectral Density

5.1 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.

5.2 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)

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 Peak Power Spectral Density

The following table shows a summary of the test results of the Power Spectral Density.

Base Mode

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>PPSD (dBm)</i>	<i>Cable Loss (dB)</i>	<i>Ppq (dBm)</i>	<i>Limit (dB)</i>	<i>Margin (dB)</i>
Lowest	5180	0.00	0.20	0.20	4.00	-3.80
Middle	5260	-0.50	0.20	-0.30	11.00	-11.30
Highest	5320	0.00	0.20	0.20	11.00	-10.80

Turbo Mode

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>PPSD (dBm)</i>	<i>Cable Loss (dB)</i>	<i>Ppq (dBm)</i>	<i>Limit (dB)</i>	<i>Margin (dB)</i>
Lowest	5210	-8.00	0.20	-7.80	4.00	-11.80
Middle	5250	-8.17	0.20	-7.97	4.00	-11.97
Highest	5290	-7.83	0.20	-7.63	11.00	-18.63

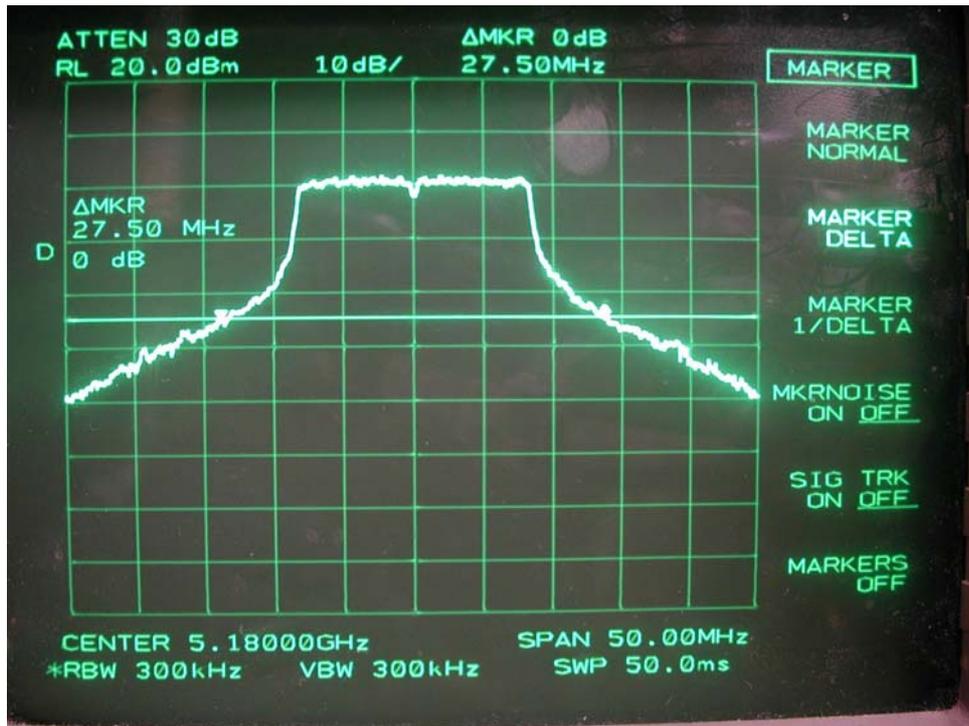
Note:

1.Ppr: spectrum read power density (using peak search mode),

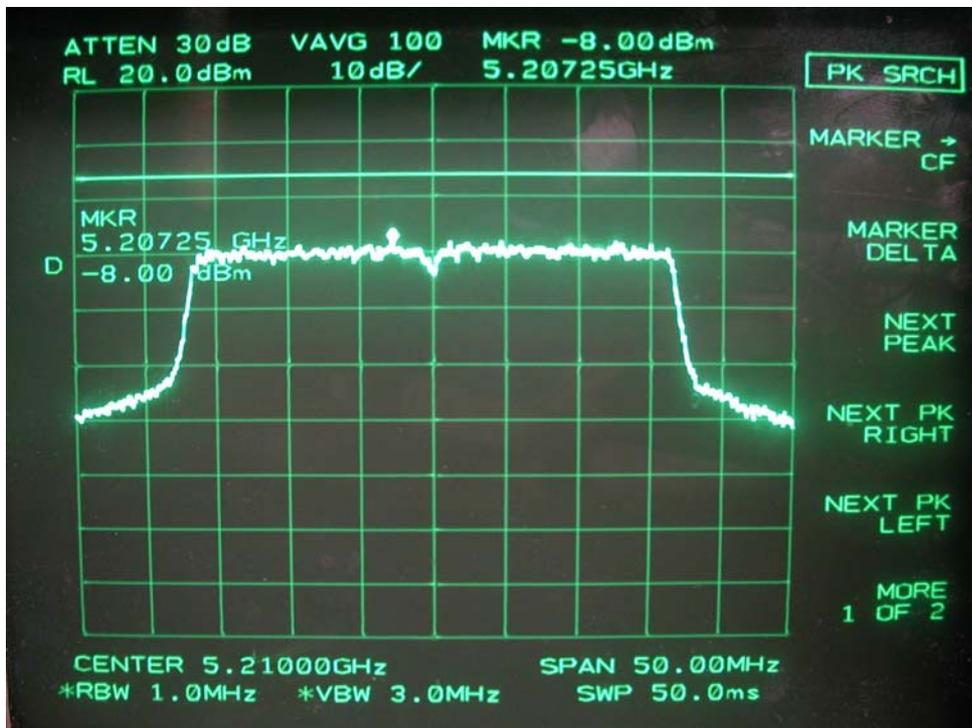
Ppq: actual peak power density in the spread spectrum band.

2.Ppq = Ppr + |Cable Loss|

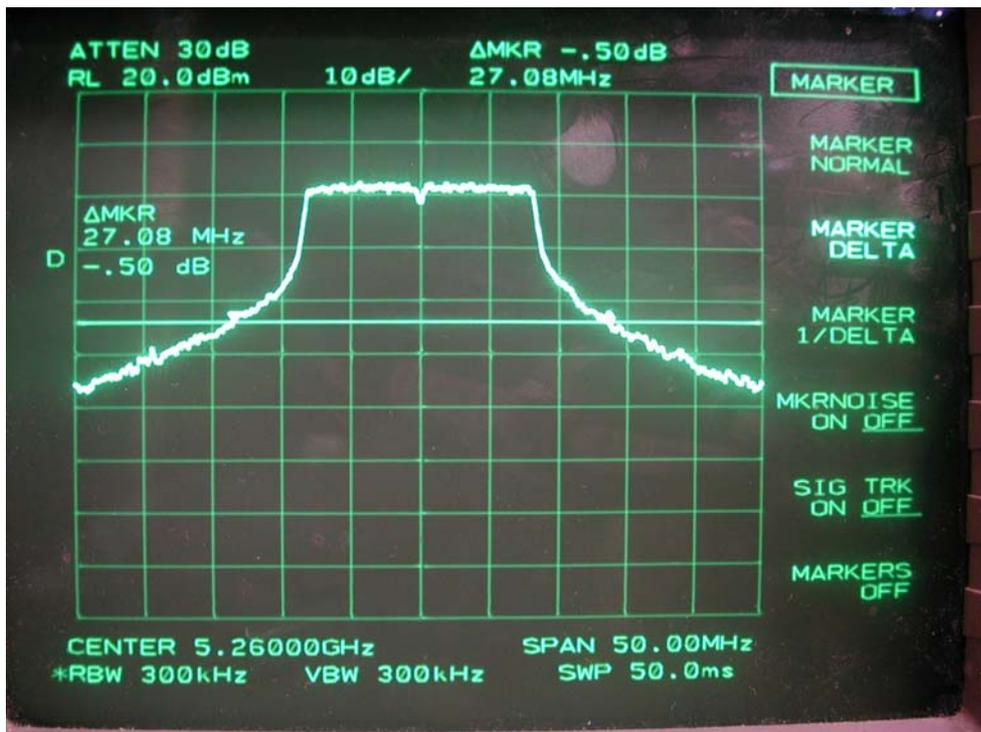
Lowest Channel (Base mode)



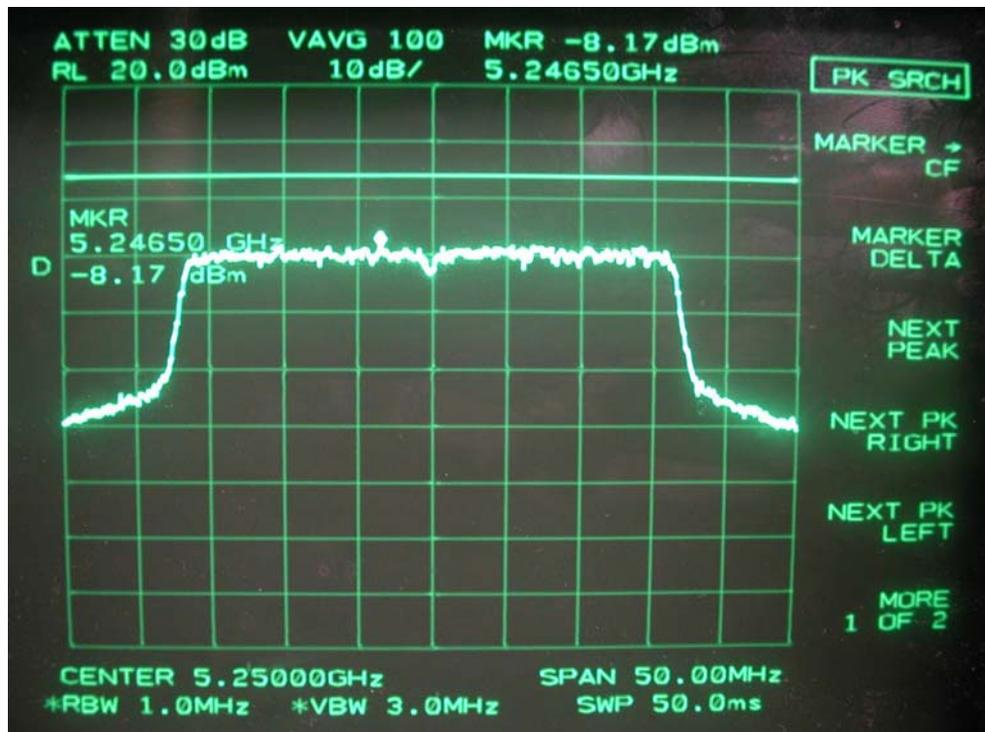
Lowest Channel (Turbo mode)



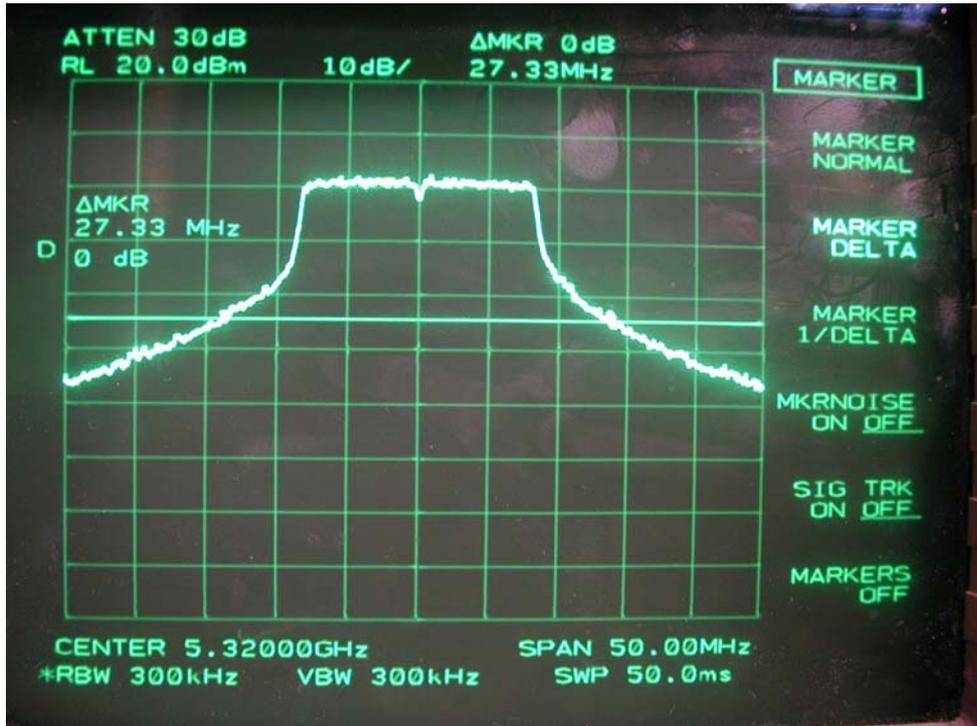
Middle Channel (Base mode)



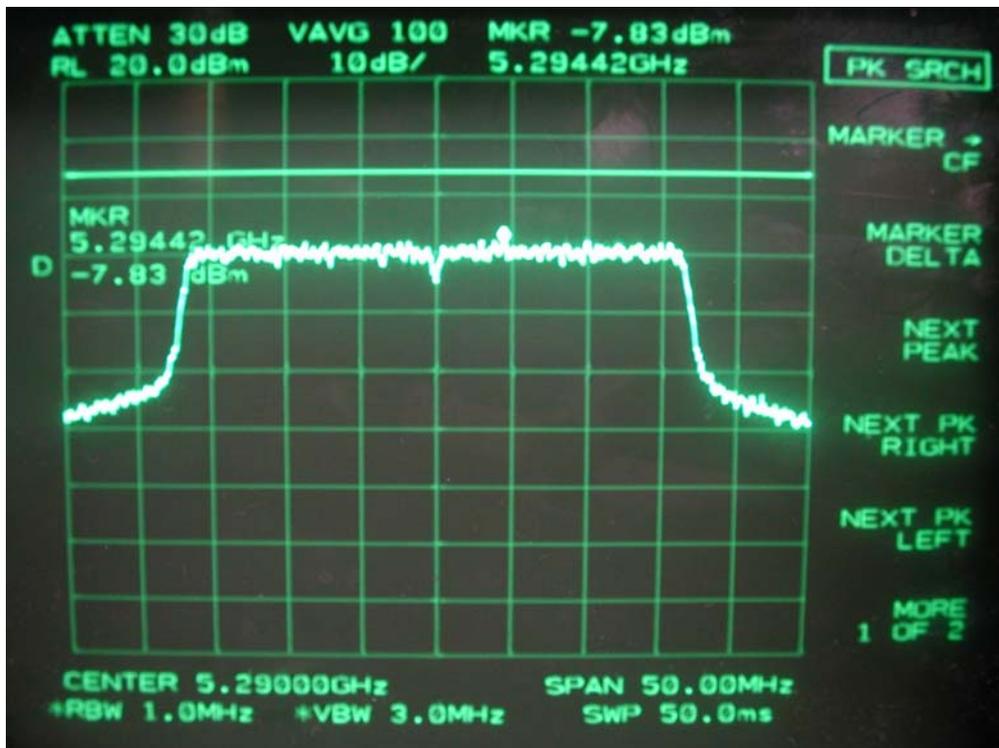
Middle Channel (Turbo Mode)



Highest Channel (Base mode)



Highest Channel (Turbo mode)



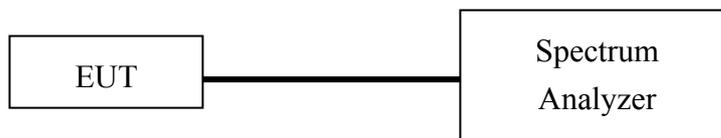
VI. Section 15.407(a)(6): Peak Excursion Ratio

6.1 Test Condition & Setup

This test is performed by connecting the EUT to the spectrum analyzer by the contact manner. The RBW is set at 1 MHz with the VBW at 1 MHz at first, then VIEW and HOLD the trace named A. By VIEW the other trace named B with the VBW 30kHz.

Place the marker between these 2 traces. The Peak Excursion will be found by the differences between these 2 traces.

6.2 Test Instruments Configuration



Test Configuration of Peak Excursion Ratio

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

6.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Last Cali.	Due on
Spectrum Analyzer	8564A	H P	U536433002	01/01/02	01/01/03

6.4 Test Result of Peak Excursion Ratio

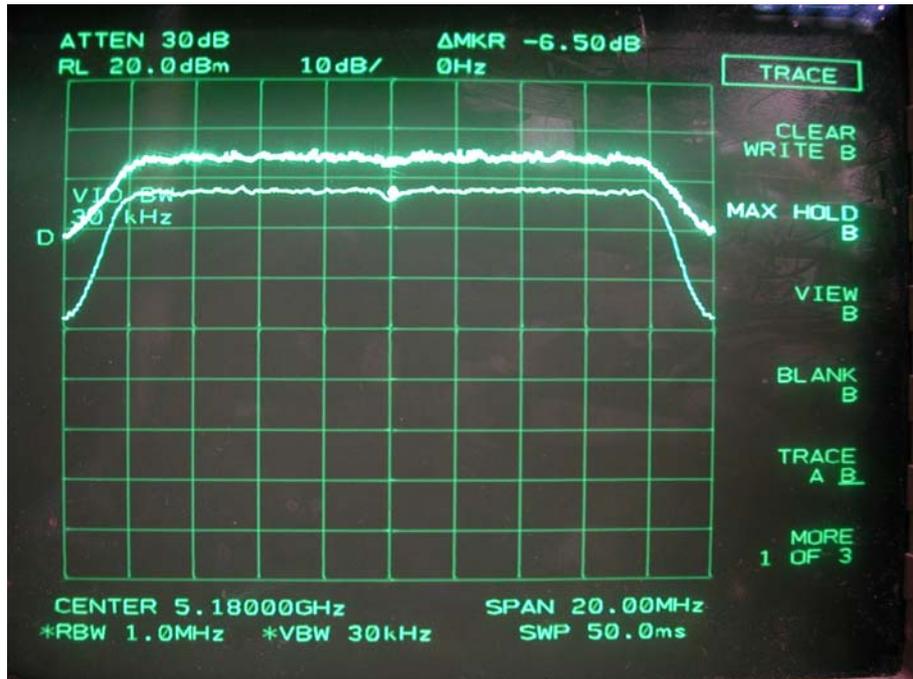
Base Mode

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>P.Excursion (dB)</i>	<i>Limit (dB)</i>	<i>Margin (dB)</i>
Lowest	5180	6.50	13.00	-6.50
Middle	5260	6.67	13.00	-6.33
Highest	5320	7.66	13.00	-5.34

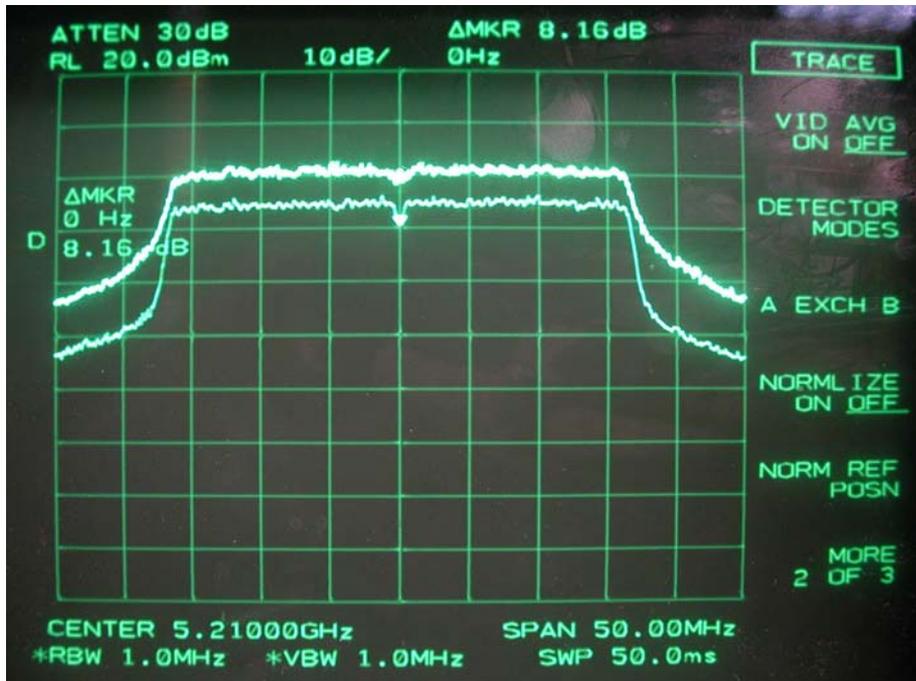
Turbo Mode

<i>Channel</i>	<i>Frequency (MHz)</i>	<i>P.Excursion (dB)</i>	<i>Limit (dB)</i>	<i>Margin (dB)</i>
Lowest	5210	8.16	13.00	-4.84
Middle	5250	8.16	13.00	-4.84
Highest	5290	8.50	13.00	-4.50

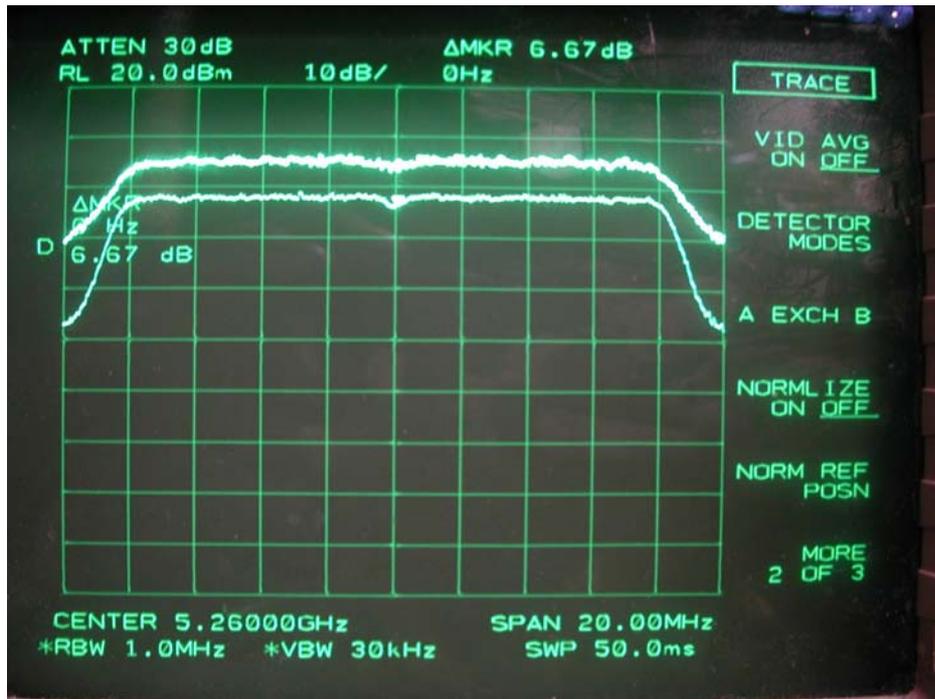
Lowest Channel (Base mode)



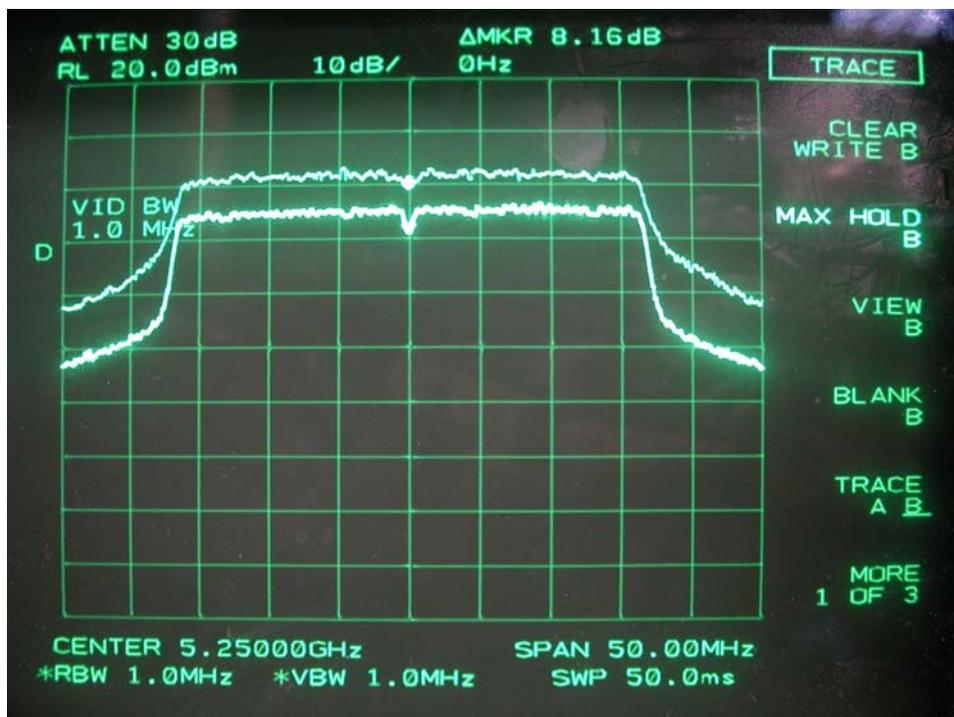
Lowest Channel (Turbo mode)



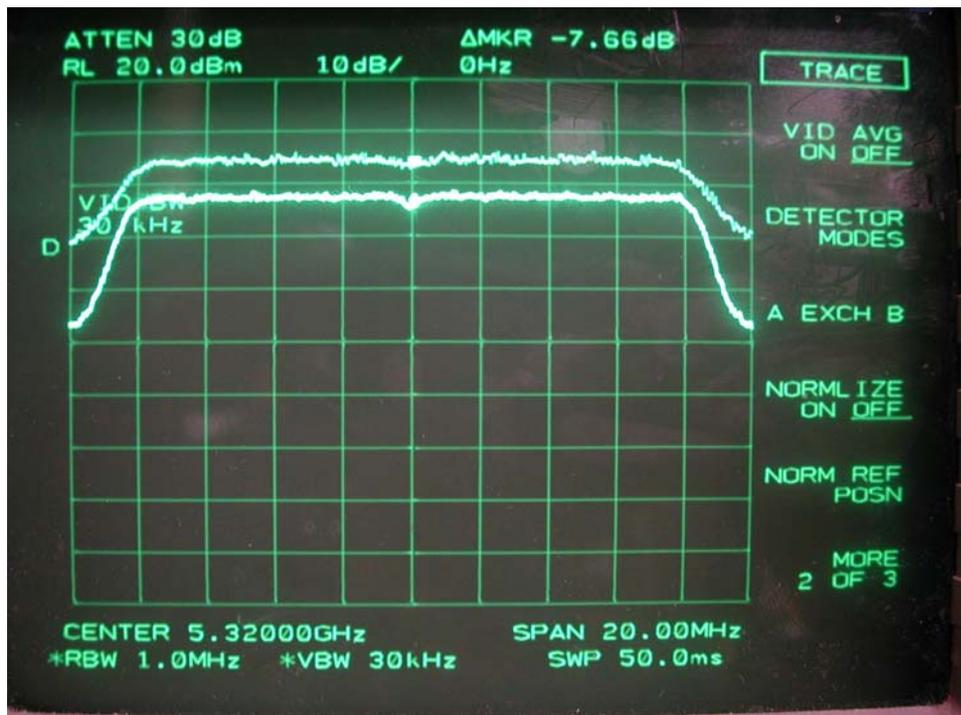
Middle Channel (Base mode)



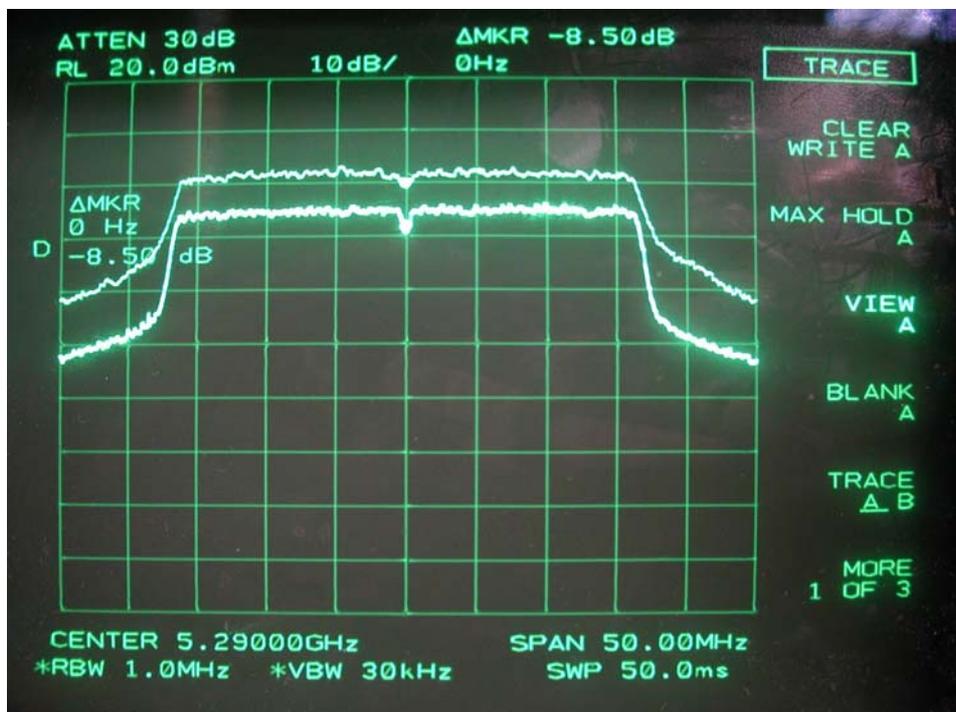
Middle Channel (Turbo mode)



Highest Channel (Base mode)



Highest Channel (Turbo mode)



VII. Section 15.407(b): Power Line Conducted Emissions for AC Powered Units

7.1 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 150 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:

EUT transmit only:

Using the PCMCIA slot of notebook computer and software to control the EUT. Then making access to the mode of continuous transmission and setting the testing channel.

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

7.2 List of Test Instruments

<u>Instrument Name</u>	<u>Model No.</u>	<u>Brand</u>	<u>Serial No.</u>	<u>Last time</u>	<u>Next time</u>
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	12/09/01	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

7.3 Test configuration

Conducted Emissions Test Configuration



7.4 Test Result of Conducted Emissions

Testing Condition: Temperature: 22.5° C Humidity: 55.8 % RH

Line 1

Frequency (KHz)	READING AMPLITUDE			LIMIT		Margin (dB)
	Peak (dBµV/m)	Quasi-Peak (dBµV/m)	Average (dBµV/m)	Quasi-Peak (dBµV/m)	Average (dBµV/m)	
159.250	56.35	53.15	48.89	65.74	55.74	-6.85
237.875	46.89	---	---	63.49	53.49	-16.60
321.125	42.57	---	---	61.11	51.11	-18.54
483.000	40.03	---	---	56.49	46.49	-16.46
649.500	37.96	---	---	56.00	46.00	-18.04
1190.625	39.51	---	---	56.00	46.00	-16.49
4030.000	38.21	---	---	56.00	46.00	-17.79
4940.000	35.32	---	---	56.00	46.00	-20.68
6200.000	34.27	---	---	60.00	50.00	-25.73
8090.000	33.00	---	---	60.00	50.00	-27.00

Line 2

Frequency (KHz)	READING AMPLITUDE			LIMIT		Margin (dB)
	Peak (dBµV/m)	Quasi-Peak (dBµV/m)	Average (dBµV/m)	Quasi-Peak (dBµV/m)	Average (dBµV/m)	
159.250	55.91	51.22	47.52	65.74	55.74	-8.22
228.625	46.91	---	---	63.75	53.75	-16.84
316.500	41.35	---	---	61.24	51.24	-19.89
455.250	38.78	---	---	57.28	47.28	-18.50
635.625	37.84	---	---	56.00	46.00	-18.16
917.750	38.12	---	---	56.00	46.00	-17.88
1435.750	39.09	---	---	56.00	46.00	-16.91
3750.000	37.69	---	---	56.00	46.00	-18.31
4870.000	35.62	---	---	56.00	46.00	-20.38
8300.000	29.74	---	---	60.00	50.00	-30.26

(NOTE: Margin = Peak Amplitude – Limit)

VIII. Section 15.407(c): Automatic Discontinuation of Operation Specifications

In order to comply the rules, the operational should be terminated when the information is absent. For the issue about this, please refer to the <Theory of the operations> for the detailed information.

IX. Section 15.407(g): Frequency Stability Specifications

The rules requests that stability of frequency should be within the -20ppm. Further info about the compliance can be found in the <Theory of the operations>.

X. Section 15.407 (f): RF Exposure Requirements

The SAR Compliance is performed for this issue by the Dept. of Electrical and Computer Engineering, University of Utah, attached in the <Appendix B>.

Reference:

1. <SAR COMPLIANCE TESTING OF ASUS SPACELINK WL-200 CARDBUS CARD> (23 Pages)

Appendix A

Setting up Procedure

1. The EUT inserted into the PCMCIA slot of the notebook computer
2. Use the software that is given by the manufacturer to control the EUT at specific mode of transmission.
3. Then making access to the mode of continuous transmission and set the testing channel.

Appendix B

SAR Compliance Report