

PART I

(For Antenna 1: Vendor:WNC, Model DMA)

Test Report for FCC Part 15 Subpart B & C & E

of

WLAN a+b+g mini-PCI Module

Model

CM9

(Brand: Wistron NeWeb)

Applied by:

Wistron Neweb Corporation
No. 10-1, Li-hsin Road 1,
Science-based Indus
Taiwan, R. O. C.

Test Performed by:

International Standards Laboratory

No. 120, Lane 180, San Ho Tsuen, Hsin Ho Rd.
Lung-Tan Hsiang, Tao Yuan County 325
Taiwan, R.O.C.
Tel:(03)407-1718 Fax:(03)407-1738

Report Number: ISL-04LR018FC

Issue Date: 2004/05/26

HC LAB:NVLAP:200234-0;VCCI: R-341,C-354;NEMKO:ELA 113a,113c;BSMI:SL2-IN-E-0037;SL2-R1-E-0037;CNLA:1178

LT LAB:NVLAP:200234-0;VCCI: R-1435,C-1440;NEMKO:ELA 113b,113d;BSMI:SL2-IN-E-0013;CNLA:0997

ISL-T10-R29-1

Contents of Report

1.	General.....	1
1.1	Certification of Accuracy of Test Data.....	1
2.	Test Results Summary.....	2
3.	Description of Equipment Under Test (EUT).....	3
	The Power Setting of the test program.....	5
4.	TEST RESULTS (802.11a) (for Antenna DMA).....	6
4.1	Maximum Peak Output Power [Section 15.407 (a)(1)(2)(3)].....	6
4.1.1	Test Procedure	6
4.1.2	Test Setup	6
4.1.3	Test Data: (Normal Mode).....	6
4.1.4	Test Data: (Turbo Mode).....	7
4.2	Peak Power Spectral Density [Section 15.407(a)(1)(2)(3)]	14
4.2.1	Test Procedure	14
4.2.2	Test Setup	14
4.2.3	Test Data: (Normal Mode).....	14
4.2.4	Test Data: (Turbo Mode).....	15
4.3	Peak Power Excursion Measurement [Section 15.407(a)(6)].....	22
4.3.1	Test Procedure	22
4.3.2	Test Setup	22
4.3.3	Test Data: (Normal Mode).....	22
4.3.4	Test Data: (Turbo Mode).....	23
4.4	Powerline Conducted Emissions [Section 15.207 & 15.407 (b)(5)]	30
4.4.1	EUT Configuration.....	30
4.4.2	Test Procedure	30
4.4.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	30
4.4.4	Test Data:.....	31
4.5	Radiated Emission Measurement [Section 15.209 & 15.407(b)(5)]	33
4.5.1	EUT Configuration.....	33
4.5.2	Test Procedure	33
4.5.3	EMI Receiver/Spectrum Analyzer Configuration	33
4.5.4	Test Data (30MHz – 1GHz)	34
4.5.5	Test Data (1GHz – 40 GHz, Transmitting)	35
4.6	Band Edge Measurement (Section 15.407 (b) (1) (2)).....	46
4.6.1	Test Procedure (Conducted).....	46
4.6.2	Test Setup (Conducted).....	46
4.6.3	Test Data (conducted):.....	47
4.6.4	Bandedge Measurement Test Procedure (Radiated).....	52
4.6.5	Test Setup (Radiated)	53
4.6.6	Test Data (Radiated):.....	54

4.7	RF Exposure Measurement [Section 15.407(f)(4) & 1.1307(b)].....	64
4.8	Frequency Stability [Section 15.407(g)]	65
4.8.1	Limits of Frequency Stability Measurement	65
4.8.2	Test Procedure	65
4.8.3	Test Setup	65
4.8.4	Test Data.....	66
5.	TEST RESULTS (802.11b) (for Antenna DMA)	67
5.1	Powerline Conducted Emissions [Section 15.207]	67
5.1.1	EUT Configuration.....	67
5.1.2	Test Procedure	67
5.1.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	67
5.1.4	Test Data:.....	68
5.2	Bandwidth for DSSS [Section 15.247 (a)(2)].....	70
5.2.1	Test Procedure	70
5.2.2	Test Setup	70
5.2.3	Test Data:.....	70
5.3	DSSS Maximum Peak Output Power [Section 15.247 (b)(1)].....	73
5.3.1	Test Procedure	73
5.3.2	Test Setup	73
5.3.3	Test Data.....	73
5.4	Radiated Emission Measurement [Section [15.247(c)(4)]	74
5.4.1	EUT Configuration.....	74
5.4.2	Test Procedure	74
5.4.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	74
5.4.4	Test Data (30MHz – 1GHz):.....	75
5.4.5	Test Data (1GHz – 25 GHz)	76
5.5	Band Edge Measurement	79
5.5.1	Test Procedure (Conducted).....	79
5.5.2	Test Setup (Conducted).....	79
5.5.3	Test Data:.....	79
5.5.4	Test Procedure (Radiated)	81
5.5.5	Test Setup (Radiated)	81
5.5.6	Test Data.....	82
5.6	RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)].....	85
5.7	DSSS Peak Power Spectral Density [Section 15.247(d)]	86
5.7.1	Test Procedure	86
5.7.2	Test Setup	86
5.7.3	Test Data.....	86
6.	TEST RESULTS (802.11g).....	89
6.1	Powerline Conducted Emissions [Section 15.207]	89
6.1.1	EUT Configuration.....	89
6.1.2	Test Procedure	89
6.1.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)	89
6.1.4	Test Data:.....	90

6.2	Bandwidth for DSSS [Section 15.247 (a)(2)].....	92
6.2.1	Test Procedure	92
6.2.2	Test Setup	92
6.2.3	Test Data:.....	92
6.3	DSSS Maximum Peak Output Power [Section 15.247 (b)(1)].....	95
6.3.1	Test Procedure	95
6.3.2	Test Setup	95
6.3.3	Test Data.....	95
6.4	Radiated Emission Measurement [Section [15.247(c)(4)]	96
6.4.1	EUT Configuration.....	96
6.4.2	Test Procedure	96
6.4.3	EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested).....	96
6.4.4	Test Data (30MHz – 1GHz):.....	97
6.4.5	Test Data (1GHz – 25 GHz)	98
6.5	Band Edge Measurement	101
6.5.1	Test Procedure (Conducted).....	101
6.5.2	Test Setup (Conducted).....	101
6.5.3	Test Data:.....	101
6.5.4	Test Procedure (Radiated)	103
6.5.5	Test Setup (Radiated)	103
6.5.6	Test Data.....	104
6.6	RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)].....	107
6.7	DSSS Peak Power Spectral Density [Section 15.247(d)]	108
6.7.1	Test Procedure	108
6.7.2	Test Setup	108
6.7.3	Test Data.....	108
7.	Appendix.....	111
7.1	Appendix A: Measurement Procedure for Power line Conducted Emissions	111
7.2	Appendix B: Test Procedure for Radiated Emissions.....	112
7.3	Appendix C: Test Equipment.....	113
7.3.1	Test Equipment List.....	113
7.3.2	Software for Controlling Spectrum/Receiver and Calculating Test Data.....	114
7.4	Appendix D: Layout of EUT and Support Equipment.....	115
7.4.1	General Conducted Test Configuration	115
7.4.2	General Radiation Test Configuration.....	116
7.5	Appendix E: Description of Support Equipment	117
7.5.1	Description of Support Equipment	117
7.5.2	Software for Controlling Support Unit.....	120
7.5.3	I/O Cable Condition of EUT and Support Units.....	121
7.6	Appendix F: Accuracy of Measurement.....	122
7.7	Appendix G: Photographs of EUT Configuration Test Set Up	124
7.8	Appendix H: Antenna Spec.....	127

1. General

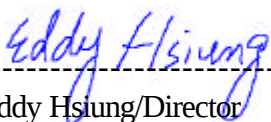
1.1 Certification of Accuracy of Test Data

Standards:	CFR 47 Part 15 Subpart B Class B CFR 47 Part 15 Subpart C (Section 15.247) CFR 47 Part 15 Subpart E (Section 15.407)
Test Procedure:	ANSI C63.4: 2001
Equipment Tested:	WLAN a+b+g mini-PCI Module
Model:	CM9
Applied by:	Wistron Neweb Corporation
Sample received Date:	2004/05/10
Final test Date :	2004/05/11-2004/05/20
Test Site:	Chamber 02, Conduction 02
Temperature	Refer to each site test data
Humidity:	Refer to each site test data
Test Engineer:	Mailes Hsieh

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Approve & Signature



Eddy Hsiung/Director

Test results given in this report apply only to the specific sample(s) tested under stated test conditions.

This report shall not be reproduced other than in full without the explicit written consent of ISL.

This report totally contains 4 parts, this part totally 131 pages, including 1 cover page , 3 contents page, and 127 pages for the test description.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.

This test data shown below is traceable to NIST or national or international standard.

International Standards Laboratory certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

2. Test Results Summary

The 802.11b functions of EUT has been tested according to the FCC regulations listed below:

Tested Standards: 47 CFR Part 15 Subpart C			
Standard Section	Test Type	Result	Remarks
15.207	AC Power Line Emissions	Pass	
15.247(a)(2)	Spectrum Bandwidth Of DSSS device	Pass	
15.247(b)	Max. Peak Output Power	Pass	
15.247(c)	Radiated Emissions 30MHz – 25 GHz	Pass	
15.247 (c)	Band Edge Measurement	Pass	
15.247(b)(4)	Radiation Exposure	Pass	MPE report attached
15.247 (d)	Power Spectral Density	Pass	

The 802.11g functions of EUT has been tested according to the FCC regulations listed below:

Tested Standards: 47 CFR Part 15 Subpart C			
Standard Section	Test Type	Result	Remarks
15.207	AC Power Line Emissions	Pass	
15.247(a)(2)	Spectrum Bandwidth Of DSSS device	Pass	
15.247(b)	Max. Peak Output Power	Pass	
15.247(c)	Radiated Emissions 30MHz – 25 GHz	Pass	
15.247 (c)	Band Edge Measurement	Pass	
15.247(b)(4)	Radiation Exposure	Pass	MPE report attached
15.247 (d)	Power Spectral Density	Pass	

The 802.11a functions of EUT has been tested to the FCC regulations listed below:

Tested Standards: 47 CFR Part 15 Subpart E			
Standard Section	Test Type	Result	Remarks
15.407 (a)(1)(2)(3)	Peak Transmit Power	Pass	
15.407 (a)(1)(2)(3)	Peak Power Spectral Density	Pass	
15.407 (a)(6)	Peak Power Excursion	Pass	
15.407 (b)(5)	AC Power Line Emissions	Pass	
15.407 (b)(5)	Radiated Emissions 30MHz – 40 GHz	Pass	
15.407(f)	Radiation exposure	Pass	MPE report attached
15.407 (g)	Frequency Stability	Pass	

3. Description of Equipment Under Test (EUT)

Description:	WLAN a+b+g Mini- PCI module
Model No.:	CM9
FCC ID:	NKRCM9
Brand:	Wistron NeWeb
Frequency Range 802.11a:	5150~5350 MHz, 5725~5825 MHz
Frequency Range 802.11b/g:	2400~2483.5 MHz
Support channel:	
802.11a Normal mode	12 Channels
802.11a Turbo mode	5 Channels
802.11b/g	11 Channels
Modulation Skill:	
802.11a Normal mode	OFDM (6 Mbps – 54 Mbps)
802.11a Turbo mode	OFDM (12 Mbps – 108 MBps)
802.11b	DBPSK(1Mbps), DQPSK(2Mbps), CCK(5.5/11Mbps)
802.11g	OFDM (6M - 54Mbps)
Antennas Type:	
Antenna 1: PIFA	(DMA , made by Wistron NeWeb)
Antenna 2: Dipole	(GA30038-YMSE , made by GigaAnt Co.)
Antenna 3: Dipole	(FCF-004 , made by Long-Chu Co.)
Antenna 4: Dipole	(DBA-IPEX-01 , made by Long-Chu Co.)
Antenna 5: Dipole	(SRSM5150MRA;SRSM2400MRA , made by CUSLICRAFT)
Antenna 6: Dipole	(DBA-BSMA-01 , made by Long-Chu Co.)
Antenna 7: Dipole	(DBA-SSMA-01, made by Long-Chu Co.)
Antenna 8: Dipole	(DBA-IPEX-02 , made by Long-Chu Co.)
Antenna Connected:	The antenna is connected to the RF connector of the WLAN adapter.
Antenna peak Gain:	
Antenna 1:	2.68 dBi (11b/g) ,4.87 dBi(11a)
Antenna 2:	2.40 dBi (11b/g) ,5.90 dBi(11a)
Antenna 3:	4.00 dBi (11b/g) ,3.50 dBi(11a)
Antenna 4:	1.89 dBi (11b/g) ,3.11 dBi(11a)
Antenna 5:	2.00 dBi (11b/g) ,2.00 dBi(11a)
Antenna 6:	1.34 dBi (11b/g) ,1.65 dBi(11a)
Antenna 7:	1.29 dBi (11b/g) ,2.06 dBi(11a)
Antenna 8:	2.91 dBi (11b/g) ,3.19 dBi(11a)
WLAN Power Type :	3.3V DC from the EUT

The channel and the operation frequency of 802.11b and 802.11g is listed below:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	2412	07	2442
02	2417	08	2447
03	2422	09	2452
04	2427	10	2457
05	2432	11	2462
06	2437		

The channel and the operation frequency of 802.11a Normal Mode is listed below:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	5180	07	5300
02	5200	08	5320
03	5220	09	5745
04	5240	10	5765
05	5260	11	5785
06	5280	12	5805

The channel and the operation frequency of 802.11a Turbo Mode is listed below:

Channel	Frequency(MHz)	Channel	Frequency(MHz)
01	5210	04	5760
02	5250	05	5800
03	5290		

During the test, the EUT was tested as a modular device of a notebook PC using a PCMCIA extender board to extend the EUT outside the notebook PC enclosure. There are eight antennas in the EUT:

Antenna 1 is PIFA type.

Antenna 2 is Dipole in printed type.

Antenna 3, 5,6,7 are Dipole type in reverse SMA connector.

Antenna 4,8 are Dipole type in Hirose connector.

All antennas have been tested. The worse data of each type are shown, so, four sets of radiated data are listed in the test report.

The Power Setting of the test program

802.11b

	Data Rate	11 Mbps
Channel	Frequency(MHz)	Power Setting
Channel 1	2412	21
Channel 6	2437	21.5
Channel 11	2462	21.5

802.11g

	Data Rate	6 Mbps
Channel	Frequency(MHz)	Power Setting
Channel 1	2412	15
Channel 6	2437	15
Channel 11	2462	15

802.11a

Normal Mode	Data Rate	6 Mbps
Channel	Frequency(MHz)	Power Setting
Channel 1	5180	6.5
Channel 4	5240	6.5
Channel 5	5260	11
Channel 8	5320	11
Channel 9	5745	13
Channel 12	5805	12.5
Turbo Mode	Data Rate	12 Mbps
Channel	Frequency(MHz)	Power Setting
Channel 1	5210	10.5
Channel 2	5250	10.5
Channel 3	5290	13
Channel 4	5760	11.5
Channel 5	5800	9

4. TEST RESULTS (802.11a) (for Antenna DMA)

4.1 Maximum Peak Output Power [Section 15.407 (a)(1)(2)(3)]

4.1.1 Test Procedure

The transmitter output of EUT was connected to the peak power analyzer.

4.1.2 Test Setup



Frequency Band	Limit
5.15 – 5.25 GHz	The lesser of 50mW (17dBm) or 4dBm+10logB
5.25 – 5.35GHz	The lesser of 250mW (24dBm) or 11dBm+10logB
5.725-5.825GHz	The lesser of 1W (30dBm) or 17dBm+10logB

Note: B is the 26dB emission bandwidth in MHz

4.1.3 Test Data: (Normal Mode)

Maximum Peak Output Power

Temperature (deg. C): 25

Test Engr: Mailes Hsieh

Humidity (%): 50

Chennel	Frequency (Mhz)	Peak Power Output (dBm)	26 dBc BW/Limit Mhz/dBm	The lesser Limit (dBm)	Pass/Fail
1	5180	14.481	25.83/ 18.12	17.00	Pass
4	5240	13.918	26.28/ 18.20	17.00	Pass
5	5260	18.387	29.88/ 25.75	24.00	Pass
8	5320	17.606	29.88/ 25.75	24.00	Pass
9	5745	20.012	26.28/ 31.20	30.00	Pass
12	5805	20.043	29.34/ 31.67	30.00	Pass

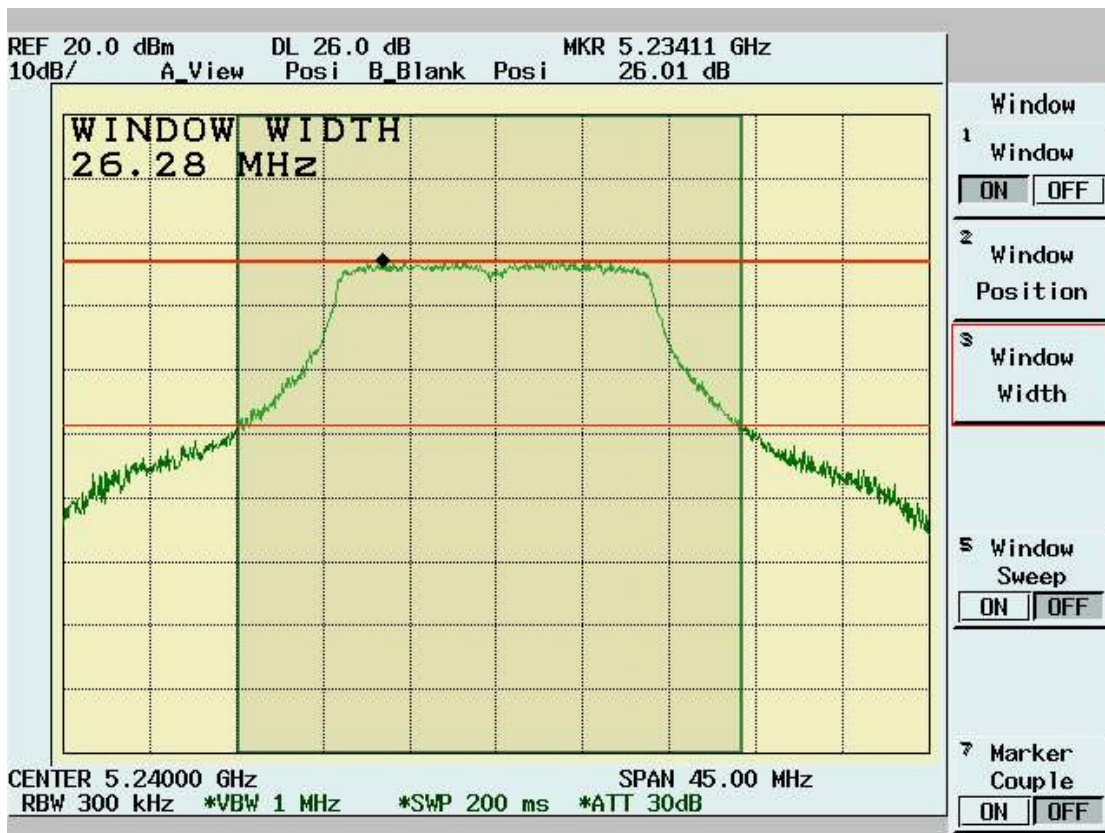
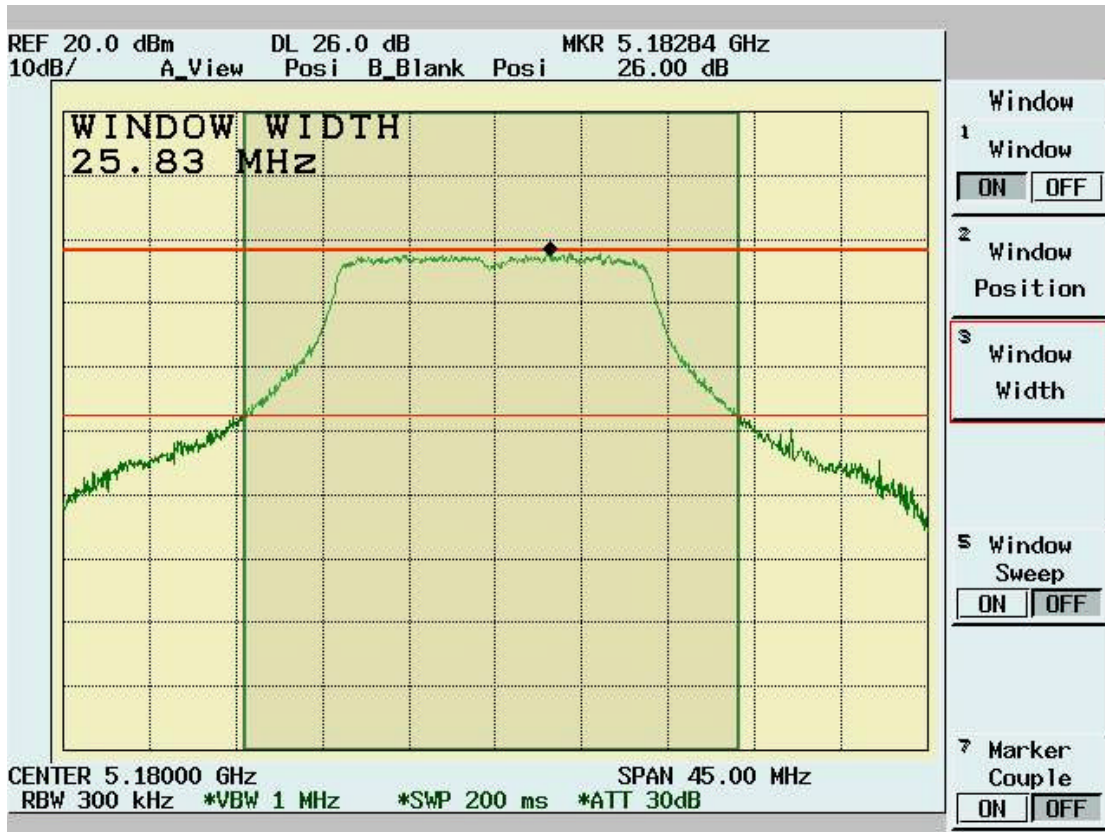
4.1.4 Test Data: (Turbo Mode)**Maximum Peak Output Power**

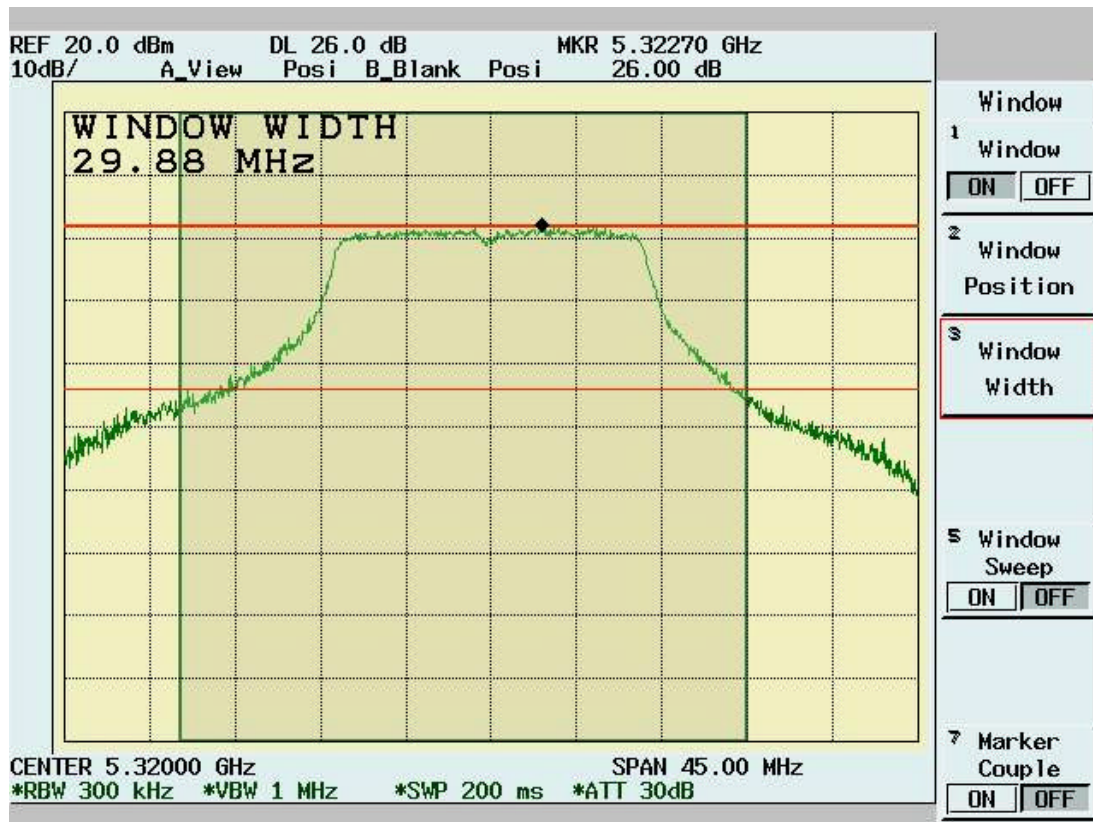
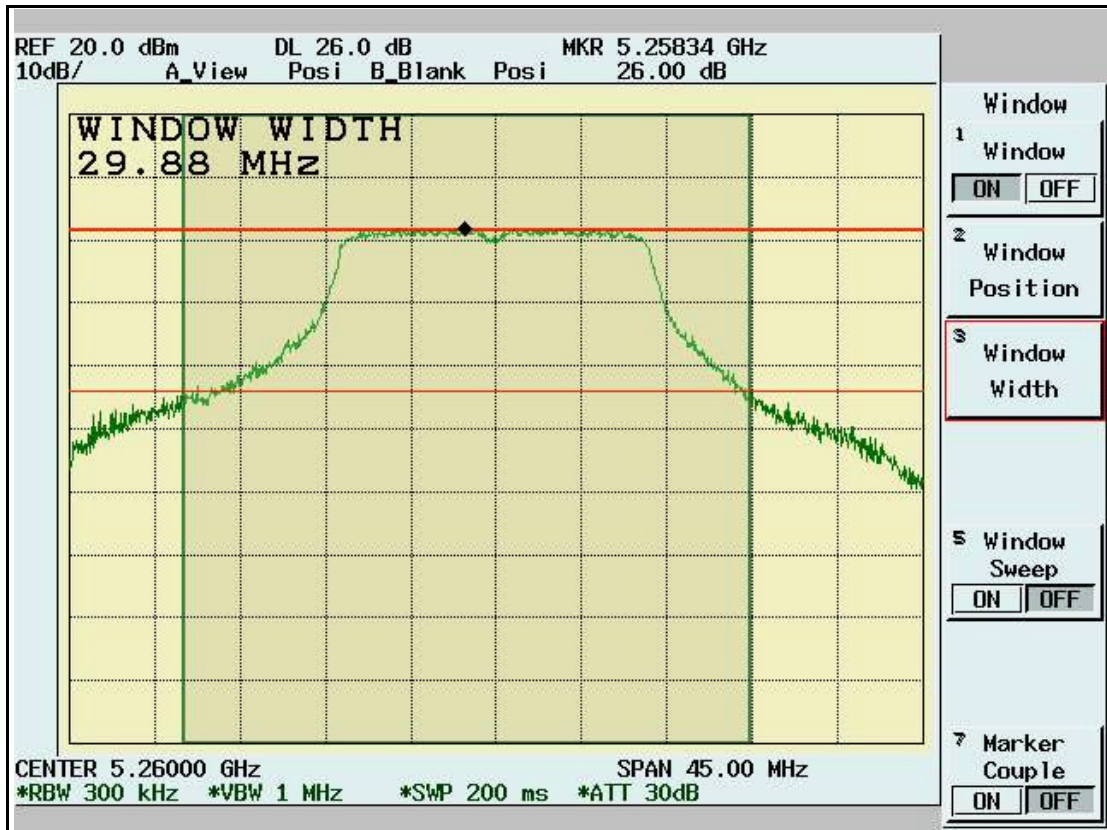
Temperature (deg. C): 25

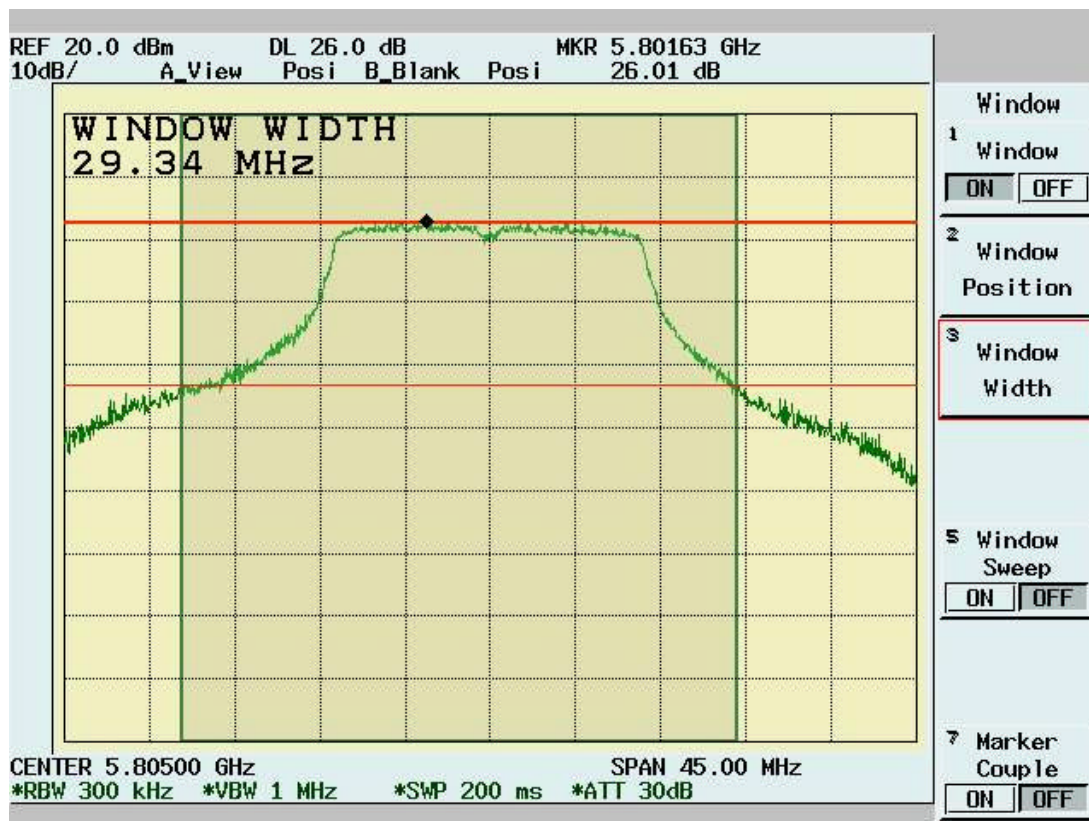
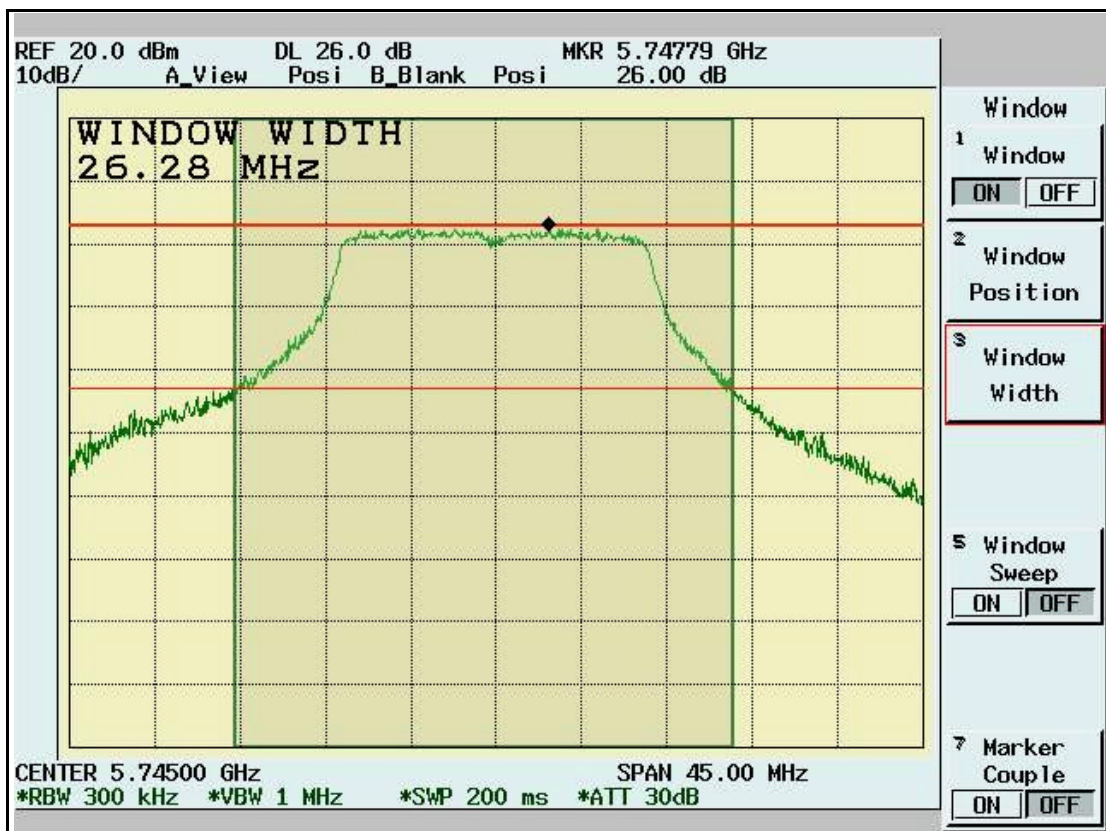
Test Engr: Mailles Hsieh

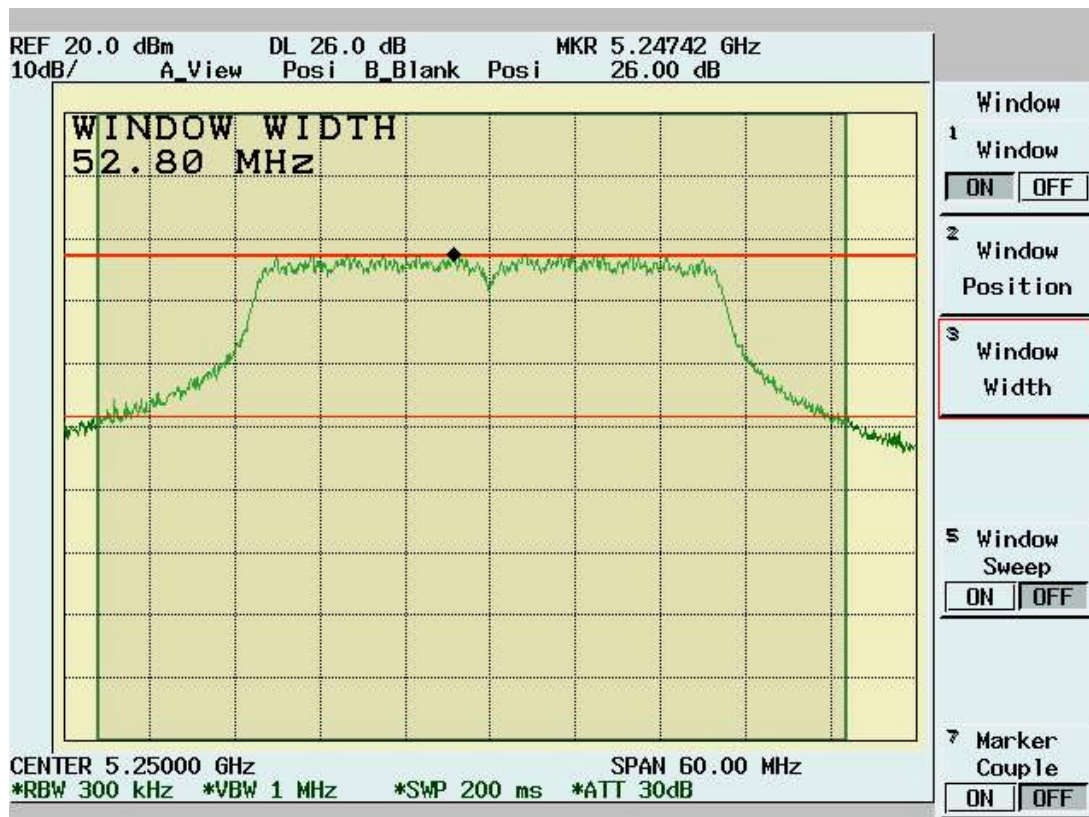
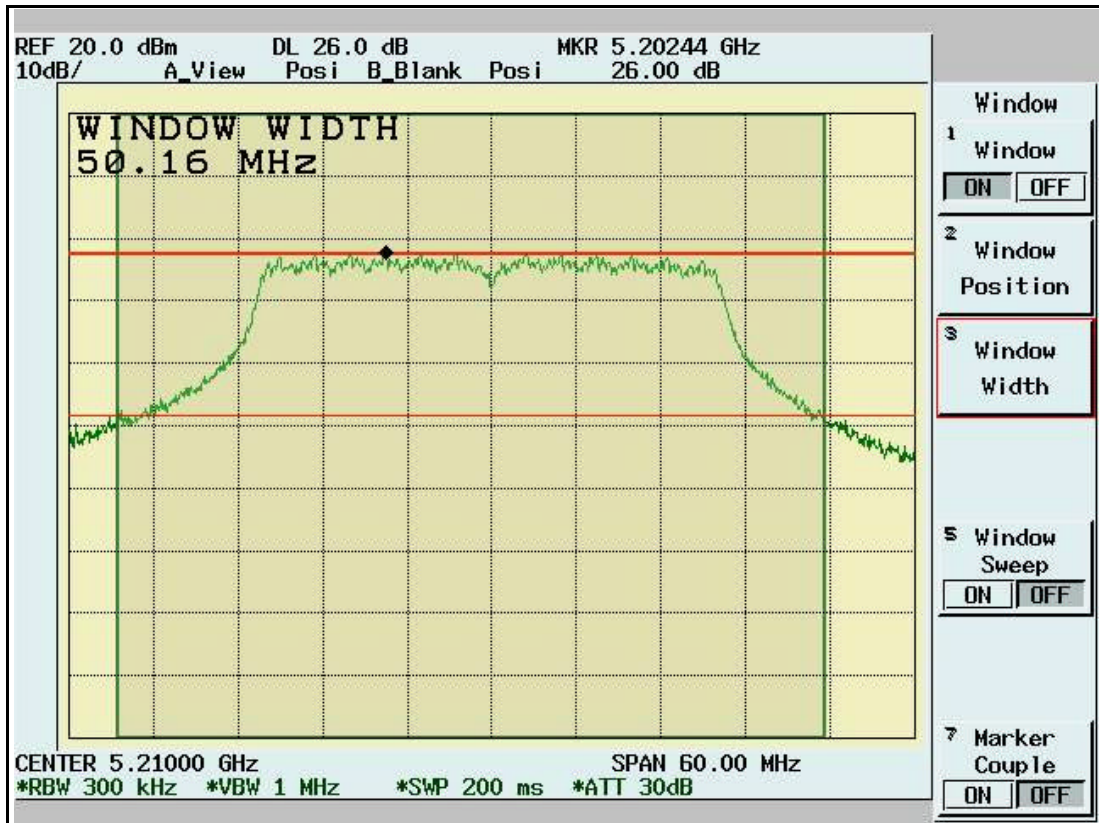
Humidity (%): 50

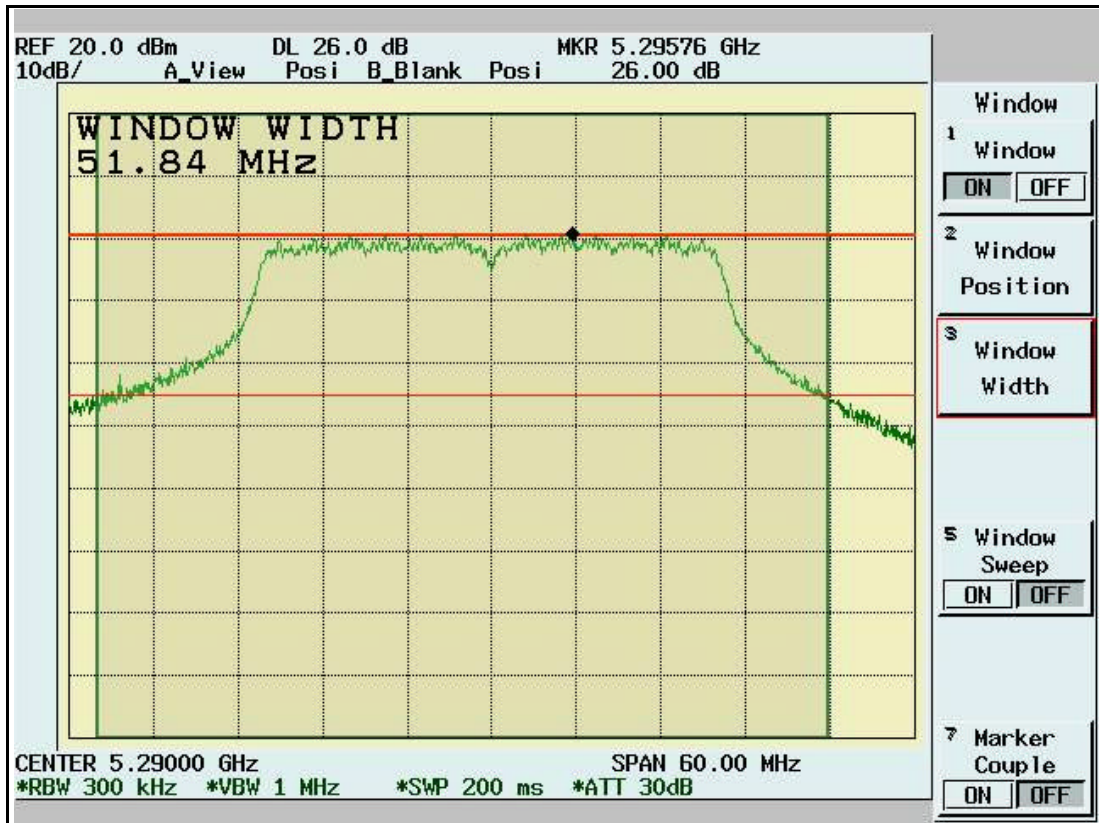
Chennel	Frequency (Mhz)	Peak Power Output (dBm)	26 dBc BW/Limit Mhz/dBm		The lesser Limit (dBm)	Pass/Fail
1	5210	16.825	50.16/	21.00	17.00	Pass
2	5250	16.887	52.8/	21.23	17.00	Pass
3	5290	19.762	51.84/	28.15	24.00	Pass
4	5760	19.293	53.04/	34.25	30.00	Pass
5	5800	17.262	50.88/	34.07	30.00	Pass

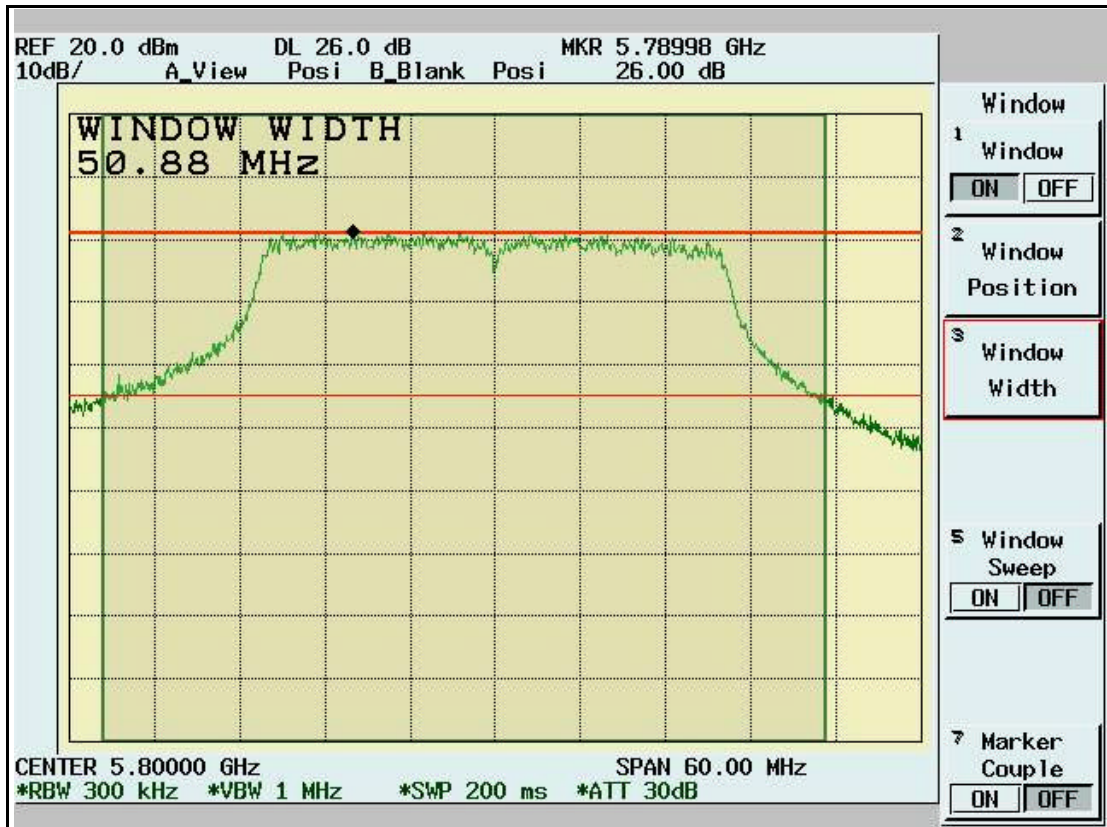










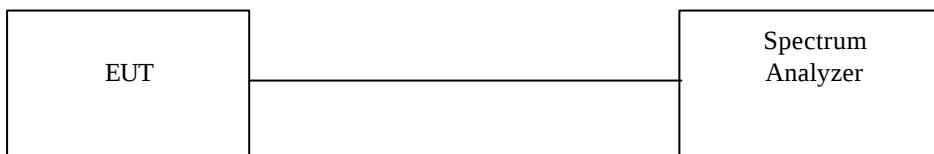


4.2 Peak Power Spectral Density [Section 15.407(a)(1)(2)(3)]

4.2.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
Equipment mode: Spectrum analyzer
Detector function: Peak mode
SPAN: 30MHz or 50MHz
RBW: 1MHz
VBW: 3MHz
Sweep time: 30 or 50 sec.
Center frequency: fundamental frequency tested
2. Peak search was read to the peak power after maximum hold function is completed.

4.2.2 Test Setup



4.2.3 Test Data: (Normal Mode)

Maximum Peak Output Power Density

Temp. (deg. C): 25

Test Engr: Mailes Hsieh

Humidity (%): 50

Channel	Frequency (Mhz)	Spectrum Reading (dBm)	Cable Loss(dB)	Peak Power Output dBm/MHz)	Limit (dBm/Mhz)	Pass/Fail
1	5180	2.68	1.20	3.88	4.00	Pass
4	5240	2.13	1.20	3.33	4.00	Pass
5	5260	6.09	1.20	7.29	11.00	Pass
8	5320	6.10	1.20	7.30	11.00	Pass
9	5745	8.07	1.20	9.27	17.00	Pass
12	5805	8.34	1.20	9.54	17.00	Pass

4.2.4 Test Data: (Turbo Mode)**Maximum Peak Output Power Density**

Temp. (deg. C): 25

Test Engr: Mailes Hsieh

Humidity (%): 50

Channel	Frequency (Mhz)	Spectrum Reading (dBm)	Cable Loss(dB)	Peak Power Output dBm/MHz)	Limit (dBm/Mhz)	Pass/Fail
1	5210	2.60	1.20	3.80	4.00	Pass
2	5250	2.66	1.20	3.86	4.00	Pass
3	5290	2.81	1.20	4.01	11.00	Pass
4	5760	3.79	1.20	4.99	11.00	Pass
5	5800	1.36	1.20	2.56	17.00	Pass

