MEASUREMENT REPORT
of
RISC-based Ready-to-Run Wireless Embedded Computer

Applicant	**:**	Moxa Technologies Co., Ltd.
EUT	**:**	RISC-based Ready-to-Run Wireless Embedded Computer
Model No.	**:**	ThinkCore W321, ThinkCore W321-LX
FCC ID	**:**	SLEW321

Tested by :

Training Research Co., Ltd.

TEL : 886-2-26935155 FAX : 886-2-26934440

No. 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 (2003) 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 E Section 15.407.

Applicant	**:**	Moxa Technologies Co., Ltd.
Applicant address	**:**	Fl. 4, No. 135, Lane 235, Pao-Chiao Rd., Shing Tien City, Taipei, Taiwan, R.O.C.
FCC ID	**:**	SLEW321
Report No.	**:**	M4715060804
Test Date	**:**	May 12, 2007

Prepared by: Jack Tsai *Jack Tsai* **Approved by:** Frank Tsai *Frank Tsai*

Conditions of issue :

(1) ***This test report shall not be reproduced except in full, without written approval of TRC. And the test result contained within this report only relate to the sample submitted for testing.***

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

(3) ***This test report, measurements made by TRC are traceable to the NIST only Conducted and Radiated Method.***

NVLAP LAB CODE 200174-0

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Ⅰ. GENERAL

1.1 Introduction

The following measurement report is submitted on behalf of applicant in support that the certification in accordance with Part 2 Subpart J and Part 15 Subpart A, E of the Commission's Rules and Regulations.

1.2 Description of EUT

FCC ID	**:**	SLEW321
Product Name	**:**	RISC-based Ready-to-Run Wireless Embedded Computer
Model Name	**:**	ThinkCore W321, ThinkCore W321-LX
Frequency Range	**:**	5.150GHz ~ 5.250GHz
Operating Frequency	**:**	5.180GHz ~ 5.240GHz
Channel Spacing	**:**	5MHz
Support Channel	**:**	13 Channels
Modulation Skill	**:**	DBPSK, DQPSK, CCK, OFDM
Power Type	**:**	Powered by the switching adapter, Manufacture: BALANCE ELECTRONICS CO., LTD. Model: GPSA-1200125 I/P: 100 ~ 240VAC ~ 50/60Hz 0.5A O/P: 12VDC 1.2A. Primary: 182cm length, non-shielded, without ferrite core Secondary: 186cm length, non-shielded, without ferrite core
Data Cable	**:**	Eithernet Cable x 1, 10m length, non-shielded, without ferrite core

1.3 Test method

1. The DC-In connected to AC mains supply by switching adapter.
2. The LAN port of EUT connected to far LAN card.
3. The two RS-232/422/485 ports connected with terminators.
4. The notebook PC and test fixture is connected by USB transfer to RS-232 cable, and then test fixture connected with EUT setting test mode.
5. The Notebook PC and test fixture is moving when test mode set finish. The software provided by the manufacturer, the test is performed under the specific conditions.
6. Set different channel and data rate being tested and repeat the procedures above.
   (a) Conducted test and Radiated:
   making EUT to the mode of continuous transmission

1.4 Description of Support Equipment

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

PC	**:**	**HP**
Model No.	:	Pavilion t1000
Serial No.	:	TWL3320051
FCC ID	:	N/A, DoC (Declaration of Confirmation) Approved
BSMI	:	R33001
Power type	:	100 ~ 127VAC/200 ~ 240VAC, 6A/3A, 50 ~ 60Hz, Switching
Power cord	:	Non-shielded, 1.80m length, Plastic hood, No ferrite core

Monitor	**:**	**HP Flat Panel Monitor**
Model No.	:	PE1234
Serial No.	:	CNN4120K7T
FCC ID	:	DoC Approved
BSMI	:	T3A002
Power type	:	100 ~ 240 VAC / 50 ~ 60 Hz, Switching
Power cord	:	Shielded, 1.83m length, No ferrite core
Data cable	:	Shielded, 1.80m length, with two ferrite cores

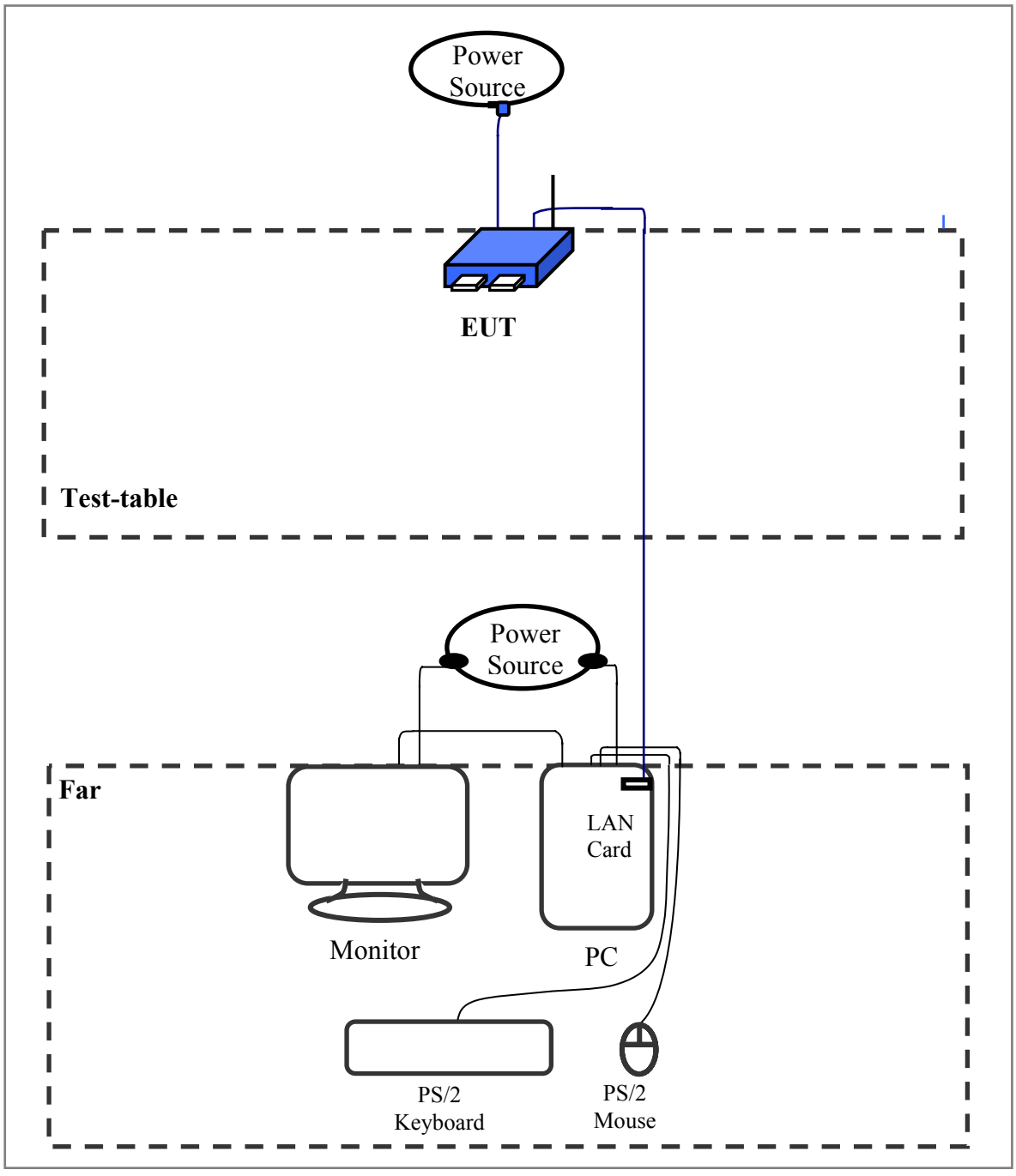
Mouse	**:**	**HP**
Model No.	:	M-UR89
Serial No.	:	LZS21750238
FCC ID	:	DoC Approved
BSMI	:	3892D767
Power type	:	By PC
Power cord	:	Non-shielded, 1.88m length, No ferrite core

Keyboard	**:**	**HP**
Model No.	:	5187-0343
Serial No.	:	BE21700404
FCC ID	:	DoC Approved
BSMI	:	3892C981
Power type	:	By PC
Data cable	:	Shielded, 1.73m length, Plastic hood, No ferrite core

LAN Card	**:**	**D-Link**
Model No.	:	DFE-530TX
Serial No.	:	0050BAE32FF3, 0050BAE3158B
FCC ID	:	N/A, DoC Approved
Power type	:	Powered by PC

1.5 Configuration of System Under Test

1.5.1 Conducted and Radiated



The tests below are carried with the EUT transmitter set at high power in TDD mode. The EUT is forced to select of output power level and channel number by notebook computer.

The setting up procedure was recorded in 1.3 test method.

Connections of equipment

PC:

* VGA Port …..... a monitor

* PS/2-key Port ……. a PS/2 keyboard

* PS/2-mouse Port …… a PS/2 mouse

* LAN Port ……... **EUT**

1.6 Verify the Frequency and Channel

Channel	Frequency (GHz)
36	5.180
37	5.185
38	5.190
39	5.195
40	5.200
41	5.205
42	5.210
43	5.215
44	5.220
45	5.225
46	5.230
47	5.235
48	5.240

Note:

1. This is for confirming that all frequencies are in 5.180GHz to 5.240GHz.
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 5.180GHz to 5.240GHz. So all the items as followed in testing report are need to test these three frequencies:
   Lowest: Channel – 36; Middle: Channel – 40; Highest: Channel – 48.

1.7 Test Procedure

All measurements contained in this report were performed mainly according to the techniques described in ANSI C63.4 (2003) and the pre-setup was written on 1.3 test method, the detail setup was written on each test item.

1.8 Location of the Test Site

The radiated emissions measurements required by the rules were performed on the **three-meter**, **Anechoic Chamber (FCC 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.

1.9 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 computer. The lowest; middle and highest channels of EUT were all tested. The setting up procedure is recorded on 1.3 test method.

II. Section 15.203: Antenna requirement

The EUT can be equipped with detachable antenna. The external antenna is affixed to the EUT using a unique connector, which allows for replacement of a broken antenna, but does not use a standard antenna jack or electrical connector. The antenna requirement stated in Section15.203 is inapplicable to this EUT.

The custom antenna specification of list as below:

Manufacturer	:	SmartAnt Telecom Co., Ltd.
Part No	:	SAA05-220420
Connector	:	RP SMA Plug
Antenna Gain	:	2.0dBi (MAX.)

III. Section 15.407(b)(6): 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 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 CISPR quasi-peak and average 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 4.3

There is a test condition apply in this test item, the test procedure description as <1.3>. Three channels were tested, one in the lowest (CH36), one in the middle (CH40) and the other in highest (CH48) for IEEE 802.11a. The setting up procedure is recorded on <1.3>

3.2 List of Test Instruments

Calibration Date

Instrument Name	Model	Brand	Serial No.	Next time
EMI Receiver	8546A	HP	3520A00242	09/06/07
RF Filter Section	85460A	HP	3448A00217	09/06/07
LISN (EUT)	LISN-01	TRC	99-05	06/10/07
LISN (Support E.)	LISN-01	TRC	9912-03, 04	05/26/07
Pre-amplifier	15542 ZFL-500	Mini – Circuits	0 0117	05/20/07
6dB Attenuator	MCL BW-S6W2	Mini – Circuits	9915 – Conducted	05/20/07
10dB Attenuator	A5542 VAT010	Mini – Circuits	0215 – Conducted	05/20/07
Coaxial Cable (2.0 meter)	A30A30-0058-50FS-2M	Jyebao	SMA-08	05/20/07
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	Jyebao	SMA-09	05/20/07
Coaxial Cable (20 meter)	RG-214/U	Jyebao	NP-01	05/20/07
Coaxial Cable (20 meter)	RG-214/U	Jyebao	NP-02	05/20/07
Auto Switch Box (< 30MHz)	ASB-01	TRC	9904-01	05/20/07

3.3 Test Result of Power Line Conducted Emissions

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

Test Conditions: Temperature : 25 °C Humidity : 73 % RH

Test mode: IEEE 802.11a Channel 36

Power Connected Emissions					*Class B*		
Conductor	***Frequency (KHz)***	***Peak (dBμV)***	***QP (dBμV)***	***Average (dBμV)***	***QP-limit (dBμV)***	***AVG-limit (dBμV)***	***Margin (dB)***
Line 1	159.360	59.72	53.41	19.81	65.69	55.69	-12.28
	197.495	58.27	51.92	18.76	64.40	54.40	-12.48
	250.225	56.41	49.80	16.78	62.89	52.89	-13.09
	396.810	52.84	46.64	13.04	58.71	48.71	-12.07
	601.045	49.15	43.07	10.87	56.00	46.00	-12.93
	1006.000	39.13	---	---	56.00	46.00	-6.87
Line 2	156.585	59.20	52.91	19.56	65.86	55.86	-12.95
	199.135	56.85	50.57	16.99	64.34	54.34	-13.77
	305.180	52.66	46.06	12.54	61.31	51.31	-15.25
	466.450	46.59	40.07	7.00	56.71	46.71	-16.64
	893.000	33.12	---	---	56.00	46.00	-12.88
	20200.000	38.34	---	---	60.00	50.00	-11.66

NOTE:

(1)Margin = Peak Amplitude – Limit, *The reading amplitudes are all under 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

Test mode: IEEE 802.11a Channel 40

Power Connected Emissions					*Class B*		
Conductor	*Frequency (KHz)*	*Peak (dBμV)*	*QP (dBμV)*	*Average (dBμV)*	*QP-limit (dBμV)*	*AVG-limit (dBμV)*	*Margin (dB)*
Line 1	159.360	59.59	53.64	19.73	65.69	55.69	-12.05
	197.495	58.06	51.90	18.47	64.40	54.40	-12.50
	250.225	56.35	50.00	16.82	62.89	52.89	-12.89
	396.810	52.65	46.77	13.21	58.71	48.71	-11.94
	601.045	49.19	43.05	10.54	56.00	46.00	-12.95
	1006.000	38.96	---	---	56.00	46.00	-7.04
Line 2	156.585	58.81	52.52	19.11	65.86	55.86	-13.34
	199.135	57.06	50.34	16.93	64.34	54.34	-14.00
	305.180	52.29	46.14	12.62	61.31	51.31	-15.17
	466.450	46.68	40.46	7.17	56.71	46.71	-16.25
	893.000	33.00	---	---	56.00	46.00	-13.00
	20200.000	38.26	---	---	60.00	50.00	-11.74

Test mode: IEEE 802.11a Channel 48

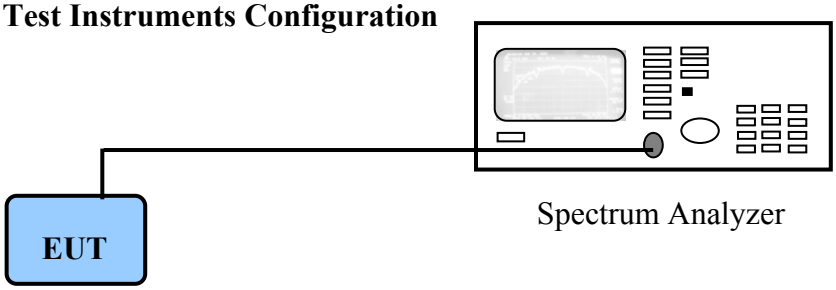
Power Connected Emissions					*Class B*		
Conductor	*Frequency (KHz)*	*Peak (dBμV)*	*QP (dBμV)*	*Average (dBμV)*	*QP-limit (dBμV)*	*AVG-limit (dBμV)*	*Margin (dB)*
Line 1	159.360	59.59	53.78	20.04	65.69	55.69	-11.91
	197.495	57.88	51.64	18.60	64.40	54.40	-12.76
	250.225	56.39	50.31	16.82	62.89	52.89	-12.58
	396.810	52.55	46.54	12.94	58.71	48.71	-12.17
	601.045	49.52	42.97	10.93	56.00	46.00	-13.03
	1006.000	38.90	---	---	56.00	46.00	-7.10
Line 2	156.585	58.91	52.65	19.21	65.86	55.86	-13.21
	199.135	56.99	50.26	16.83	64.34	54.34	-14.08
	305.180	52.35	46.20	12.75	61.31	51.31	-15.11
	466.450	46.86	40.09	6.86	56.71	46.71	-16.62
	893.000	33.33	---	---	56.00	46.00	-12.67
	20200.000	38.13	---	---	60.00	50.00	-11.87

IV. Section 15.407(a): Bandwidth for Unlicensed National Information Infrastructure.

4.1 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 RBW 300kHz and VBW 1MHz.

4.2 Test Instruments Configuration



PC to control the EUT at maximal power output and channel number and set antenna kit

4.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	12/11/07

4.4 Test Result of Bandwidth

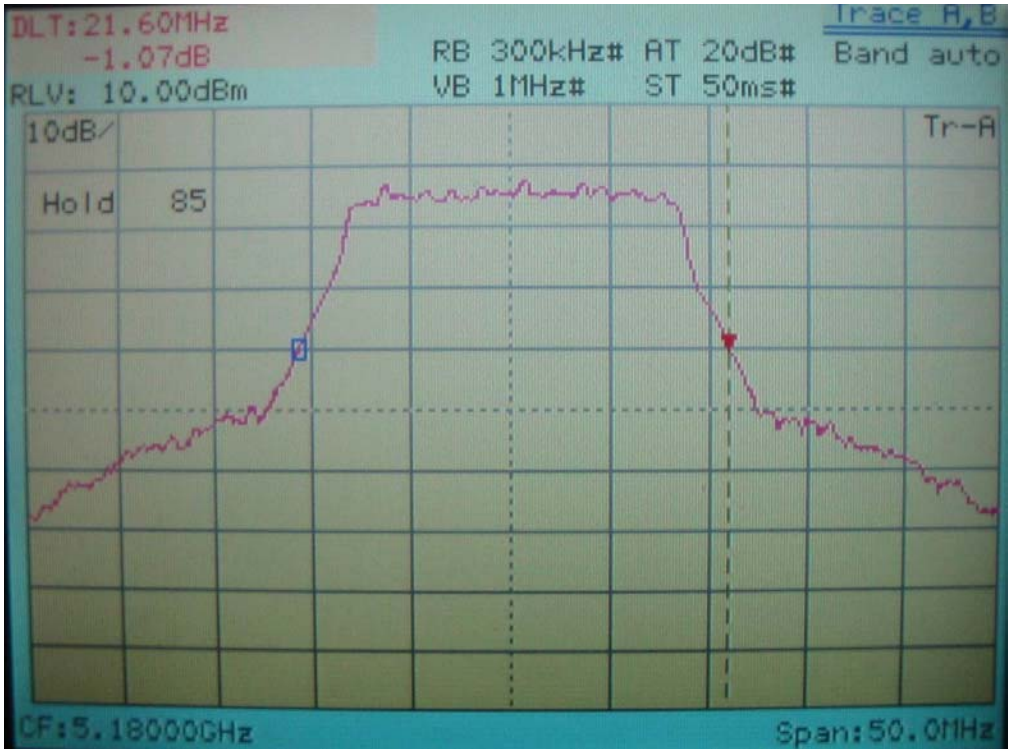
IEEE 802.11a

Channel	26dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
38	21.60	17.00
40	21.60	17.00
46	21.50	17.00

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*. The results show the measured 26dB and 99% Occupied bandwidth.

2. The attachments show these on the following pages.

26dB Bandwidth of Channel CH36 IEEE 802.11a , 5180MHz



26dB Bandwidth of Channel CH40 IEEE 802.11a , 5200MHz

26dB Bandwidth of Channel CH48 IEEE 802.11a , 5240MHz

99% Occupied Bandwidth of Channel CH36 IEEE 802.11a , 5180MHz

99% Occupied Bandwidth of Channel CH40 IEEE 802.11a , 5200MHz

99% Occupied Bandwidth of Channel CH48 IEEE 802.11a , 5240MHz

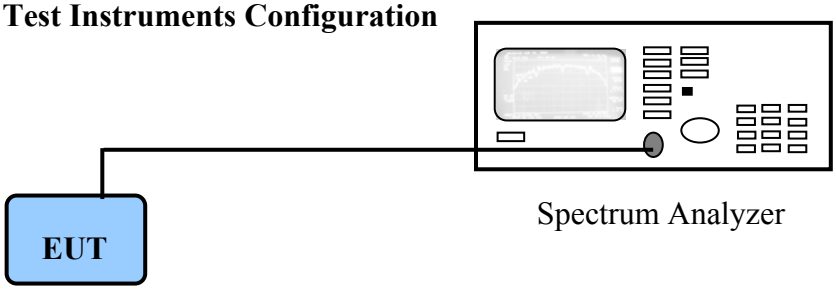
V. Section 15.407(a)(1): Maximum Conducted Output Power

5.1 Test Condition & Setup

The test is performed accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.(FCC Public Notice DA02-2138A1)

The transmitter output operates continuously therefore Method # 3 is used.

5.2 Test Instruments Configuration



PC to control the EUT at maximal power output and channel number and set antenna kit

1. The output of the transmitter is connected to the Spectrum Analyzer.
2. The calibration is performed before every test. The values of the output power of the EUT will shown in the dBm directly are the transmitter output maximum power. Recording as follows.

5.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	12/11/07

5.4 Test Result

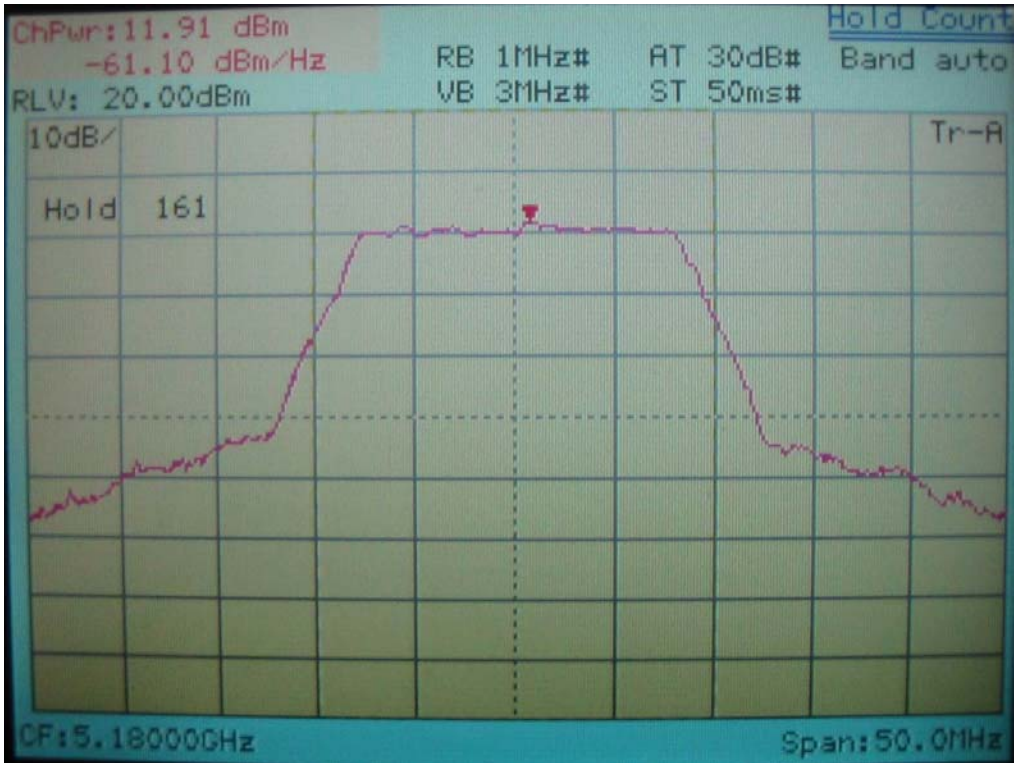
Formula:

RF Output of EUT + |Cable Loss| = Output Maximum Power

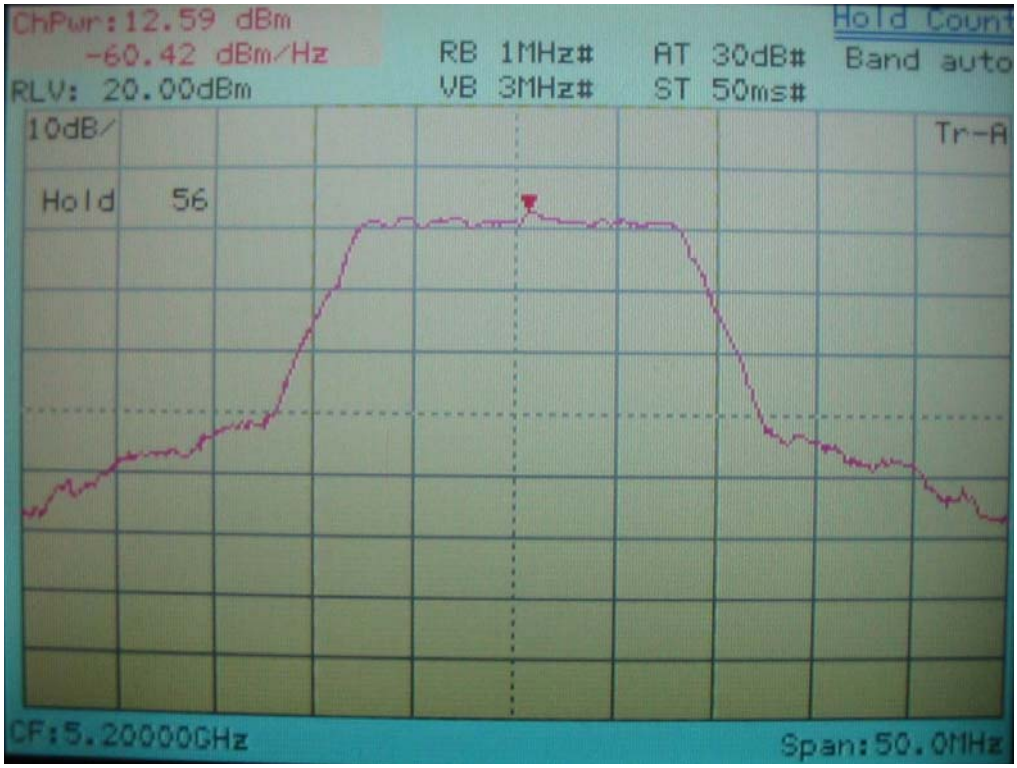
Channel	RF Output	Cable Loss	Output Maximum Power	
	dBm	dBm	dBm	mW
802.11a CH36	11.91	0.70	12.61	18.24
802.11a CH40	12.59	0.70	13.29	21.33
802.11a CH48	12.54	0.70	13.24	21.09

Limit: For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.

Power Spectral Density for IEEE 802.11a Channel 36, 5180MHz



Power Spectral Density for IEEE 802.11a Channel 40, 5200MHz



Power Spectral Density for IEEE 802.11a Channel 48, 5240MHz

VI. Section 15.407 (b)(6), (b)(7): Spurious Emissions (Radiated)

6.1 Test Condition & Setup

We'd performed the test by 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 30MHz to 1000MHz using an Hewlett Packard 85460A EMI Receiver, SCHWARZECK whole range Small Biconical Antenna (Model No.: UBAA9114 & BBVU9135) is used to measure frequency from 30 MHz to 1GHz. The final test is used the HP 85460A spectrum and 8564E spectrum was examined from 1GHz to 40GHz using an Hewlett Packard Spectrum Analyzer, EMCO/HP Horn Antenna (Model 3115 / 84125-80008/84125-80001) for 1G –40GHz.

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 40GHz. 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), the spectrum analyzer's 6 dB bandwidth was set to 1 MHz (spectrum was examined from 1GHz to 40GHz) and the analyzer was operated in the maximum hold mode. There is a test condition applies in this test item, the test procedure description as the following:

Three channels were tested, one in the lowest (CH36), one in the middle (CH40) and the other in highest (CH48) for IEEE 802.11a. The setting up procedure is recorded on <1.3>

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 upper, middle and bottom channels in the 5150 ~ 5250 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.

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) + Switching Box Loss

For frequency between 1GHz to 40GHz

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) + Switching Box Loss

6.2 List of Test Instruments

Calibration Date

Instrument Name	Model	Brand	Serial No.	Next time
EMI Receiver	8546A	HP	3520A00242	09/06/07
RF Filter Section	85460A	HP	3448A00217	09/06/07
Small Biconical Antenna	UBAA9114 & BBVU9135	SCHWARZECK	127	12/07/07
Pre-amplifier	PA1F	TRC	1FAC	05/20/07
Auto Switch Box (>30MHz)	ASB-01	TRC	9904-01	05/20/07
Coaxial Cable (Double shielded, 15 meter)	A30A30-0058-50FS-15M	JYEBAO	SMA-01	05/20/07
Coaxial Cable (1.1 meter)	A30A30-0058-50FS-1M	JYEBAO	SMA-02	05/20/07
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07
Microwave Preamplifier	84125C	HP	US36433002	11/18/07
Horn Antenna	3115	EMCO	9104-3668	02/05/08
Standard Guide Horn Antenna	84125-80008	HP	18-26.5GHz	12/12/07
Standard Guide Horn Antenna	84125-80001	HP	26.5-40GHz	12/12/07
Horn Antenna	1196E (3115)	HP (EMCO)	9704-5178	02/12/08
Pre-amplifier	PA2F	TRC	2F1GZ	06/20/07
Coaxial Cable (3 miter)	A30A30-0058-50FST118	JYEBAO	MSA-05	06/20/07
Coaxial Cable (1 meter)	A30A30-0058-50FST118	JYEBAO	MSA-04	06/20/07

6.3 Test Result of Spurious Radiated Emissions

The highest peak values of radiated emissions form the EUT at various antenna heights, antenna polarizations, EUT orientation, etc. are recorded on the following.

Test Conditions: Temperature : 23 ° C Humidity : 68 % RH

Test mode: IEEE 802.11a CH36 for 30MHz to 1GHz [Horizontal]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBμV)*	*Ant. H. (m)*	*Table ( )*	*(dB)*	*(dBμV/m)*	*Limit (dBμV/m)*	*Margin (dB)*
194.90	38.50	1.00	205	-3.52	34.98	43.50	-8.52
253.10	40.11	1.00	205	-3.38	36.73	46.00	-9.27
290.69	34.67	1.00	326	-3.34	31.33	46.00	-14.67
483.47	33.47	1.00	320	1.56	35.03	46.00	-10.97
576.84	27.86	1.00	350	5.81	33.67	46.00	-12.33
865.41	26.23	1.00	226	13.85	40.08	46.00	-5.92

Test mode: IEEE 802.11a CH36 for 30MHz to 1GHz [Vertical]

Radiated Emission				*Correction Factors*	*Corrected Amplitude*	*Class B (3 m)*	
Frequency (MHz)	*Amplitude (dBμV)*	*Ant. H. (m)*	*Table ( )*	*(dB)*	*(dBμV/m)*	*Limit (dBμV/m)*	*Margin (dB)*
194.90	37.69	1.00	0	-3.52	34.17	43.50	-9.33
243.40	36.39	1.00	70	-3.54	32.85	46.00	-13.15
268.86	36.34	1.00	240	-3.91	32.43	46.00	-13.57
576.84	25.50	1.00	226	5.81	31.31	46.00	-14.69
768.41	22.33	1.00	55	10.63	32.96	46.00	-13.04
865.41	24.12	1.00	14	13.85	37.97	46.00	-8.03

Note:

1. Margin = Amplitude – limit, *if margin is minus means under limit.*
2. Corrected Amplitude = Reading Amplitude + Correction Factors
3. Correction factor = Antenna factor + (Cable Loss – Amplitude gain) + Switching Box Loss

Test mode: IEEE 802.11a CH36 for 1GHz to 40GHz [Horizontal]

Frequency	*Ant. H.*	*Table*	*Amplitude Peak / Ave.*		*Correction Factor*	*Corrected Amplitude Peak / Ave.*		*Limit Peak / Ave.*		*Margin*
MHz	*m*	*degree*	*dBμV*		*dB/m*	*dBμV/m*		*dBμV/m*		*dB*
5820.83	1.00	307	34.33	---	16.66	50.99	---	73.96	53.96	-2.97
7101.83	1.00	202	37.94	---	9.52	47.46	---	73.96	53.96	-6.50
10360.08	1.00	356	35.94	---	11.51	47.45	---	73.96	53.96	-6.51
25901.46	1.00	287	48.73	---	1.27	50.00	---	73.96	53.96	-3.96
31078.75	1.00	204	48.49	---	3.08	51.57	---	73.96	53.96	-2.39
36259.37	1.00	74	47.03	---	3.79	50.82	---	73.96	53.96	-3.14

Test mode: IEEE 802.11a CH36 for 1GHz to 40GHz [Vertical]

Frequency	*Ant. H.*	*Table*	*Amplitude Peak / Ave.*		*Correction Factor*	*Corrected Amplitude Peak / Ave.*		*Limit Peak / Ave.*		*Margin*
MHz	*m*	*degree*	*dBμV*		*dB/m*	*dBμV/m*		*dBμV/m*		*dB*
5054.17	1.00	23	35.66	---	15.04	50.70	---	73.96	53.96	-3.26
5750.00	1.00	43	33.67	---	16.56	50.23	---	73.96	53.96	-3.73
17418.08	1.00	237	37.27	---	10.37	47.64	---	73.96	53.96	-6.32
10360.08	1.00	222	36.10	---	11.51	47.61	---	73.96	53.96	-6.35
25901.46	1.00	146	49.02	---	1.27	50.29	---	73.96	53.96	-3.67
36259.37	1.00	221	47.64	---	3.79	51.43	---	73.96	53.96	-2.53

Note:

1. Margin = Corrected - Limit.
2. The EUT utilizes a *permanently attached antenna*. In addition the spurious RF radiated emissions levels do comply with the limit both at its bandedges and other spurious emissions.
3. 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.

Test mode: IEEE 802.11a CH40 for 30MHz to 1GHz [Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
194.90	38.20	1.00	211	-3.52	34.68	43.50	-8.82
253.10	39.53	1.00	198	-3.38	36.15	46.00	-9.85
290.69	34.90	1.00	20	-3.34	31.56	46.00	-14.44
483.47	32.32	1.00	297	1.56	33.88	46.00	-12.12
576.84	27.08	1.00	343	5.81	32.89	46.00	-13.11
865.41	25.84	1.00	226	13.85	39.69	46.00	-6.31

Test mode: IEEE 802.11a CH40 for 30MHz to 1GHz [Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
130.64	30.36	1.00	150	-3.05	27.31	43.50	-16.19
194.90	38.08	1.00	357	-3.52	34.56	43.50	-8.94
239.76	38.66	1.00	237	-3.74	34.92	46.00	-11.08
483.47	28.40	1.00	193	1.56	29.96	46.00	-16.04
576.84	25.54	1.00	137	5.81	31.35	46.00	-14.65
865.41	24.42	1.00	27	13.85	38.27	46.00	-7.73

Test mode: IEEE 802.11a CH40 for 1GHz to 40GHz [Horizontal]

Frequency	*Ant. H.*	*Table*	*Amplitude*		*Correction Factor*	*Corrected Amplitude*		*Limit*		*Margin*
			Peak / Ave.			*Peak / Ave.*		*Peak / Ave.*		
MHz	*m*	*degree*	*dBμV*		*dB/m*	*dBμV/m*		*dBμV/m*		*dB*
5783.33	1.00	134	34.33	---	16.61	50.94	---	73.96	53.96	-3.02
7212.75	1.00	220	38.44	---	9.96	48.40	---	73.96	53.96	-5.56
10400.92	1.00	206	36.11	---	11.35	47.46	---	73.96	53.96	-6.50
20801.46	1.00	279	44.65	---	4.94	49.59	---	73.96	53.96	-4.37
31202.50	1.00	84	47.62	---	3.22	50.84	---	73.96	53.96	-3.12
36400.00	1.00	206	46.94	---	3.65	50.59	---	73.96	53.96	-3.37

Test mode: IEEE 802.11a CH40 for 1GHz to 40GHz [Vertical]

Frequency	*Ant. H.*	*Table*	*Amplitude*		*Correction Factor*	*Corrected Amplitude*		*Limit*		*Margin*
			Peak / Ave.			*Peak / Ave.*		*Peak / Ave.*		
MHz	*m*	*degree*	*dBμV*		*dB/m*	*dBμV/m*		*dBμV/m*		*dB*
5750.00	1.00	211	34.50	---	16.56	51.06	---	73.96	53.96	-2.90
7833.33	1.00	260	37.11	---	10.84	47.95	---	73.96	53.96	-6.01
10400.92	1.00	341	36.44	---	11.35	47.79	---	73.96	53.96	-6.17
20801.46	1.00	76	44.82	---	4.94	49.76	---	73.96	53.96	-4.20
31202.50	1.00	132	47.65	---	3.22	50.87	---	73.96	53.96	-3.09
36400.00	1.00	48	47.08	---	3.65	50.73	---	73.96	53.96	-3.23

Test mode: IEEE 802.11a CH48 for 30MHz to 1GHz [Horizontal]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
193.69	39.11	1.00	207	-3.58	35.53	43.50	-7.97
253.10	39.97	1.00	230	-3.38	36.59	46.00	-9.41
290.69	34.08	1.00	347	-3.34	30.74	46.00	-15.26
481.05	32.88	1.00	317	1.53	34.41	46.00	-11.59
576.84	27.08	1.00	7	5.81	32.89	46.00	-13.11
865.41	24.96	1.00	219	13.85	38.81	46.00	-7.19

Test mode: IEEE 802.11a CH48 for 30MHz to 1GHz [Vertical]

Radiated Emission				Correction Factors	Corrected Amplitude	Class B (3 m)	
Frequency (MHz)	Amplitude (dBμV)	Ant. H. (m)	Table (°)	(dB)	(dBμV/m)	Limit (dBμV/m)	Margin (dB)
193.69	37.29	1.00	40	-3.58	33.71	43.50	-9.79
290.69	32.00	1.00	27	-3.34	28.66	46.00	-17.34
483.47	27.98	1.00	145	1.56	29.54	46.00	-16.46
576.84	25.65	1.00	225	5.81	31.46	46.00	-14.54
768.41	22.70	1.00	190	10.63	33.33	46.00	-12.67
865.41	24.01	1.00	24	13.85	37.86	46.00	-8.14

Test mode: IEEE 802.11a CH48 for 1GHz to 40GHz [Horizontal]

Frequency	*Ant. H.*	*Table*	*Amplitude*		*Correction Factor*	*Corrected Amplitude*		*Limit*		*Margin*
			Peak / Ave.			*Peak / Ave.*		*Peak / Ave.*		
MHz	*m*	*degree*	*dBμV*		*dB/m*	*dBμV/m*		*dBμV/m*		*dB*
5725.00	1.00	208	34.67	---	16.53	51.20	---	73.96	53.96	-2.76
7659.17	1.00	248	36.27	---	10.98	47.25	---	73.96	53.96	-6.71
10482.58	1.00	139	37.44	---	10.79	48.23	---	73.96	53.96	-5.73
20960.83	1.00	209	46.23	---	5.06	51.29	---	73.96	53.96	-2.67
26202.50	1.00	258	48.65	---	3.18	51.83	---	73.96	53.96	-2.13
31438.75	1.00	34	46.74	---	4.15	50.89	---	73.96	53.96	-3.07

Test mode: IEEE 802.11a CH48 for 1GHz to 40GHz [Vertical]

Frequency	*Ant. H.*	*Table*	*Amplitude*		*Correction Factor*	*Corrected Amplitude*		*Limit*		*Margin*
			Peak / Ave.			*Peak / Ave.*		*Peak / Ave.*		
MHz	*m*	*degree*	*dBμV*		*dB/m*	*dBμV/m*		*dBμV/m*		*dB*
5358.33	1.00	14	36.00	---	15.86	51.86	---	73.96	53.96	-2.10
7445.58	1.00	180	37.27	---	10.32	47.59	---	73.96	53.96	-6.37
15721.50	1.00	113	41.94	---	6.05	47.99	---	73.96	53.96	-5.97
26202.50	1.00	201	49.76	---	1.59	51.35	---	73.96	53.96	-2.61
31438.75	1.00	255	45.59	---	4.15	49.74	---	73.96	53.96	-4.22
36681.25	1.00	332	47.39	---	3.23	50.62	---	73.96	53.96	-3.34

VII. Section 15.247(d): Power Spectral Density

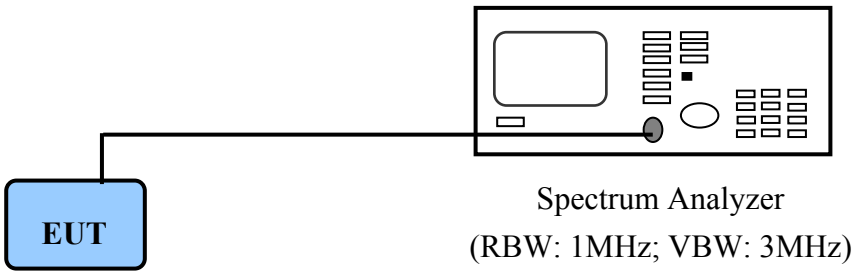
7.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power mode. 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 test is performed accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.(FCC Public Notice DA02-2138A1)

The transmitter output operates continuously therefore Method # 1 is used.

7.2 Test Instruments Configuration



PC to control the EUT at maximal power output and channel number and set antenna kit

7.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	12/11/07

7.4 Test Result of Power spectral density

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

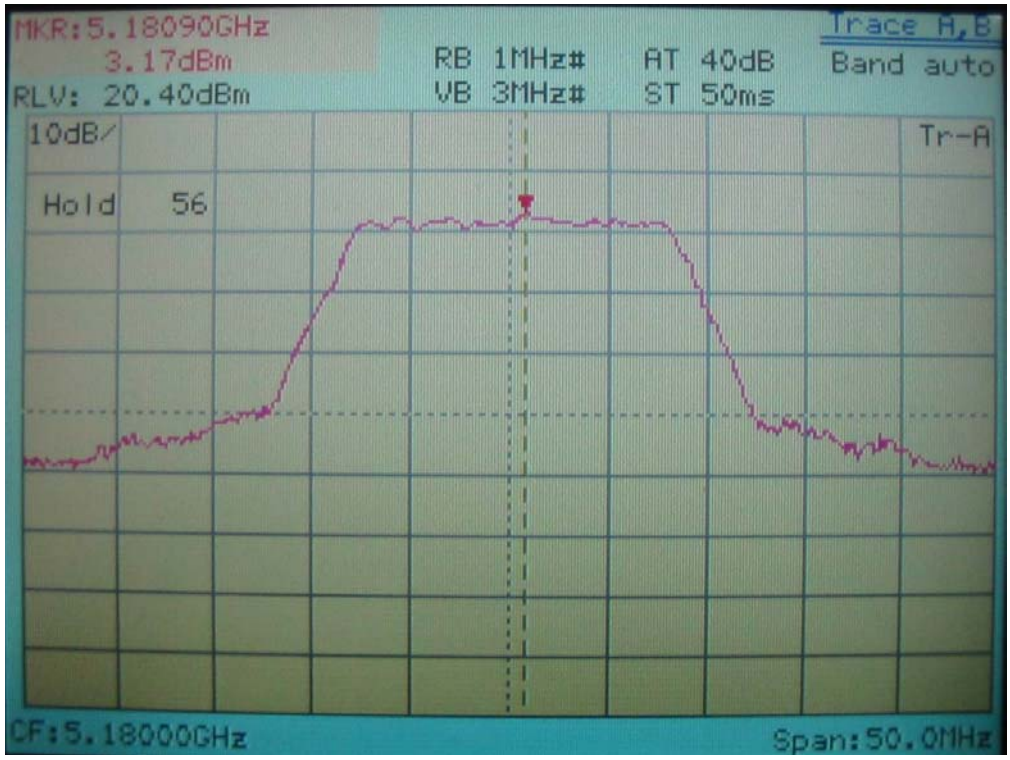
IEEE 802.11a

Channel	*Ppr (dBm)*	*Cable Loss (dB)*	*Ppq (dBm)*	*Limit (dBm/MHz)*	*Margin (dB)*
CH 36	3.17	0.70	3.87	4.00	-0.13
CH 40	3.15	0.70	3.85	4.00	-0.15
CH 48	2.51	0.70	3.21	4.00	-0.79

Note:

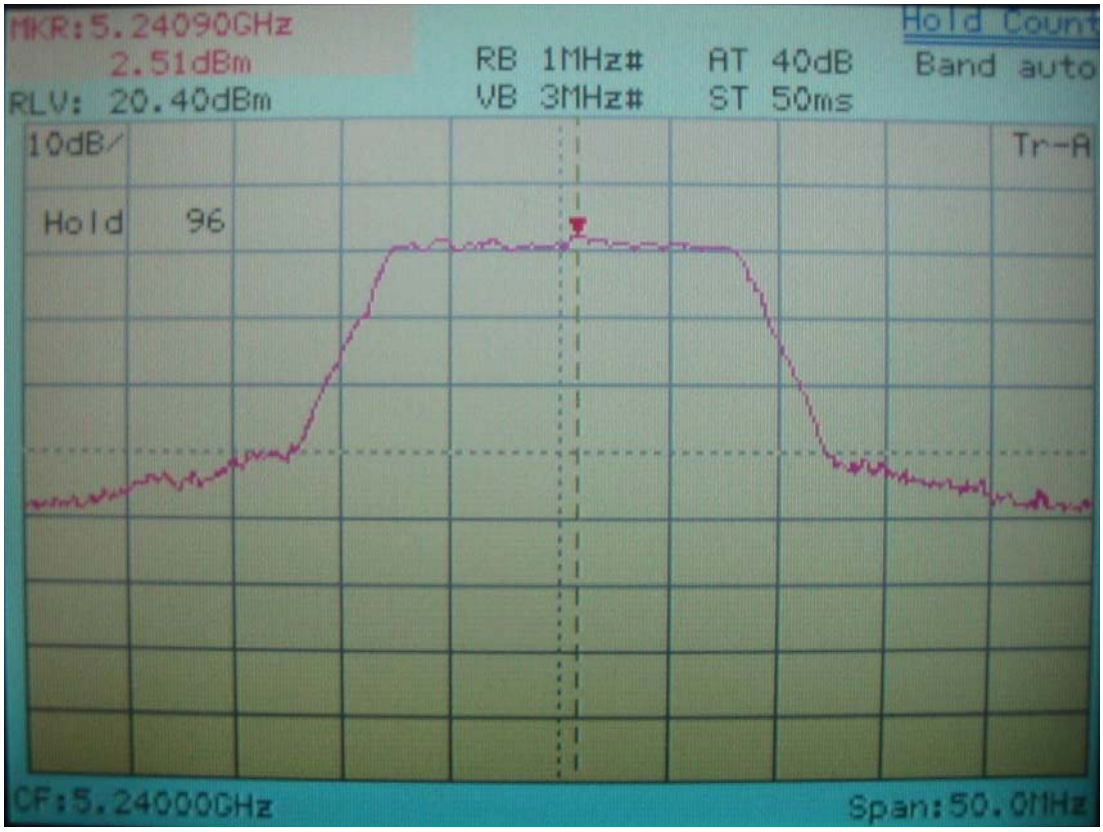
1. The following pages show the results of spectrum reading.
2. Ppr: spectrum read power density (using peak search mode),
   Ppq: actual peak power density in the spread spectrum band.
3. Ppq = Ppr + Cable Loss

Power Spectral Density for IEEE 802.11a Channel 36, 5180MHz



Power Spectral Density for IEEE 802.11a Channel 40, 5200MHz

Power Spectral Density for IEEE 802.11a Channel 48, 5240MHz



VIII. Section 15.407(a)(6): Peak Excursion Measurement

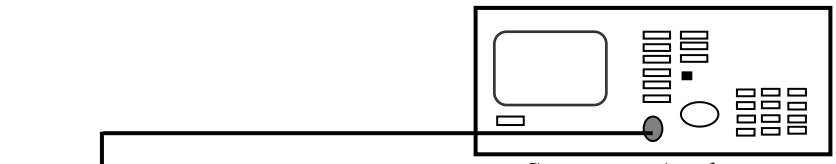
8.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power mode. 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 test is performed accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.(FCC Public Notice DA02-2138A1)

The transmitter output operates continuously therefore 2nd trace of Method # 3 is used.

8.2 Test Instruments Configuration



Spectrum Analyzer
(Trace #1: RBW: 1MHz; VBW: 3MHz) Peak Trace
(Trace #2: RBW: 1MHz; VBW: 300kHz) Avg. Trace

PC 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.	Next time
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	12/11/07

8.4 Test Result of Peak Excursion

The following table shows a summary of the test results of the Peak Excursion.

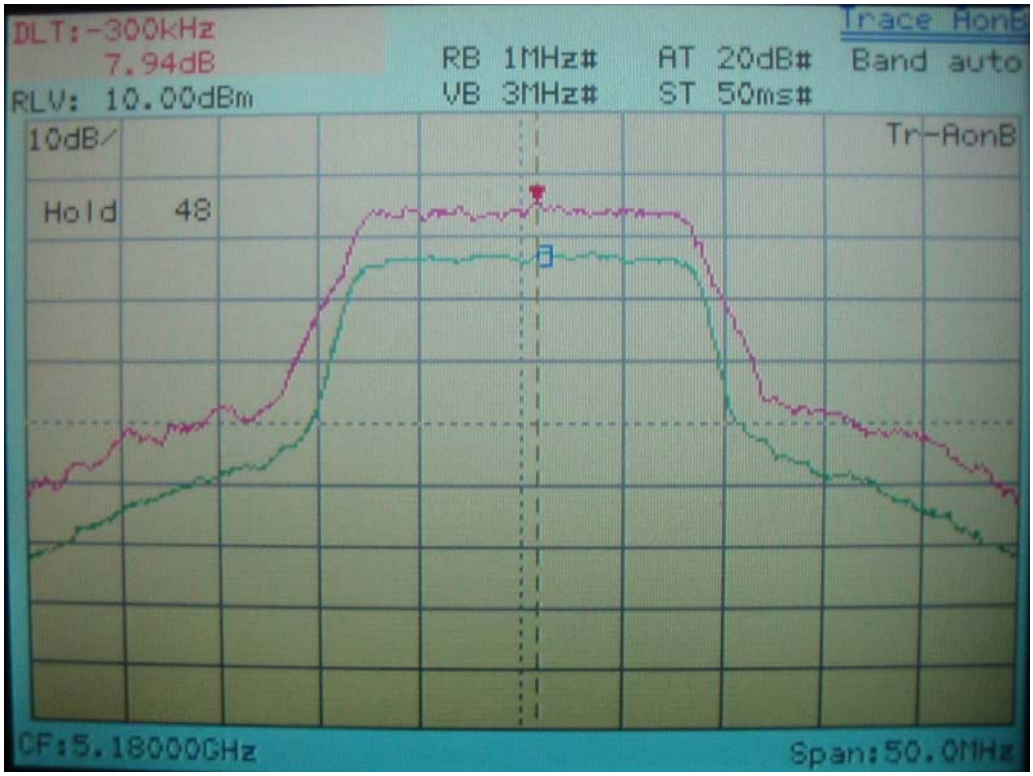
IEEE 802.11a

Channel	*Peak Excursion (dB)*	*Limit (dB)*	*Margin (dB)*
CH 36	7.94	13.00	-5.06
CH 40	7.46	13.00	-5.54
CH 48	7.76	13.00	-5.24

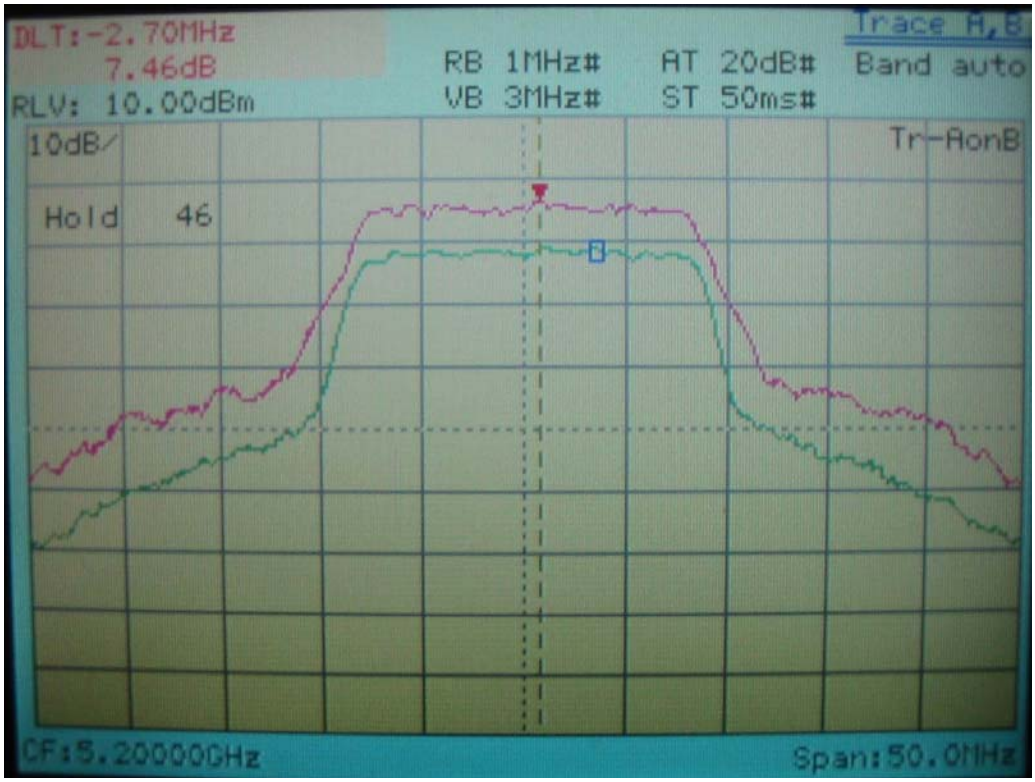
Note:

1. The following pages show the results of spectrum reading.

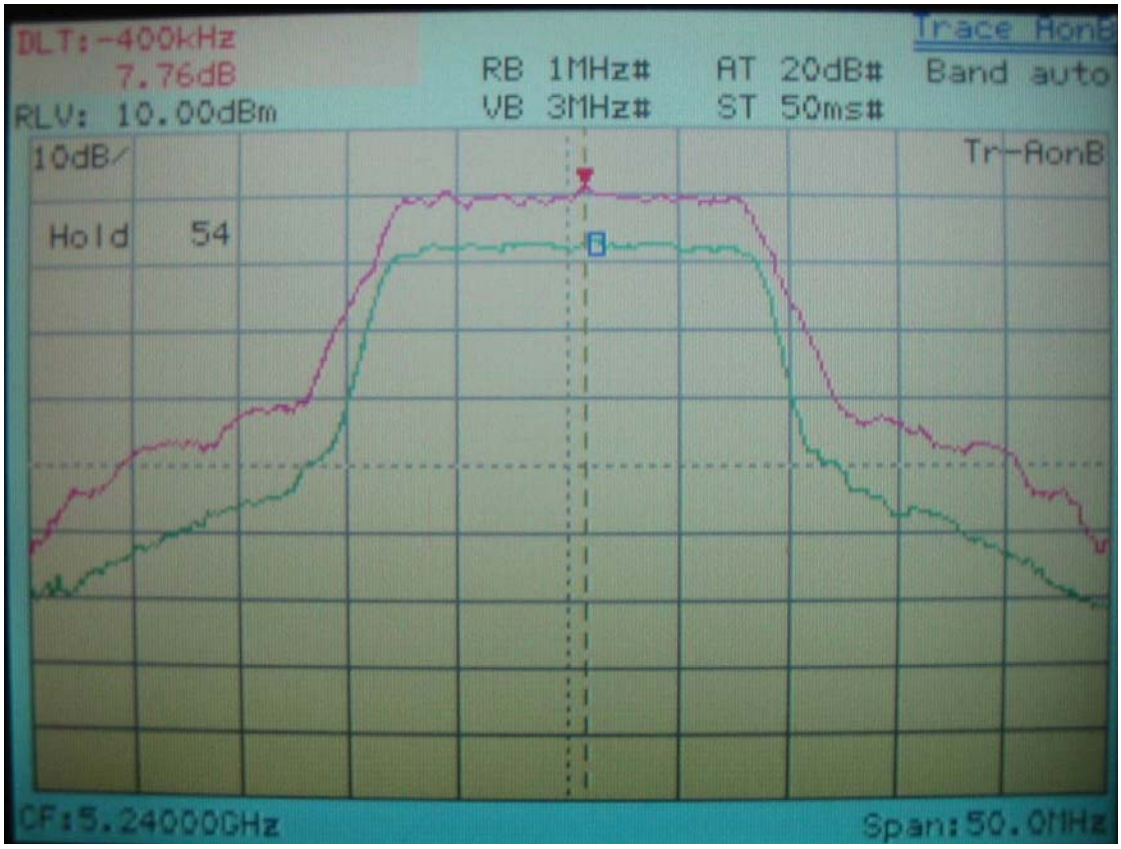
IEEE 802.11a Channel 36, 5180MHz



IEEE 802.11a Channel 40, 5200MHz



IEEE 802.11a Channel 48, 5240MHz



IX. Section 15.407(b)(1), (b)(7): Undesirable Emission and Bandedge

9.1 Undesirable Emission

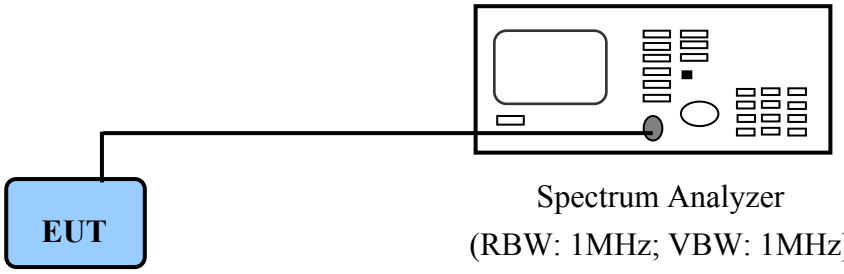
Limited: For transmitters operating in the 5.15 - 5.25 GHz band shall not exceed an EIRP of -27 dBm / MHz.

9.1.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power mode. 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.

We perform this section by the conducted manner, the RBW is set to RBW= VBW= 1MHz. We'd made the observation up to 40GHz and the criterion is all the harmonic/spurious emissions must be -27dBm/MHz below the highest emission level measured.

9.1.2 Test Instruments Configuration



PC to control the EUT at maximal power output and channel number and set antenna kit

9.1.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07

9.1.4 Test Result of Undesirable Emission

IEEE 802.11a

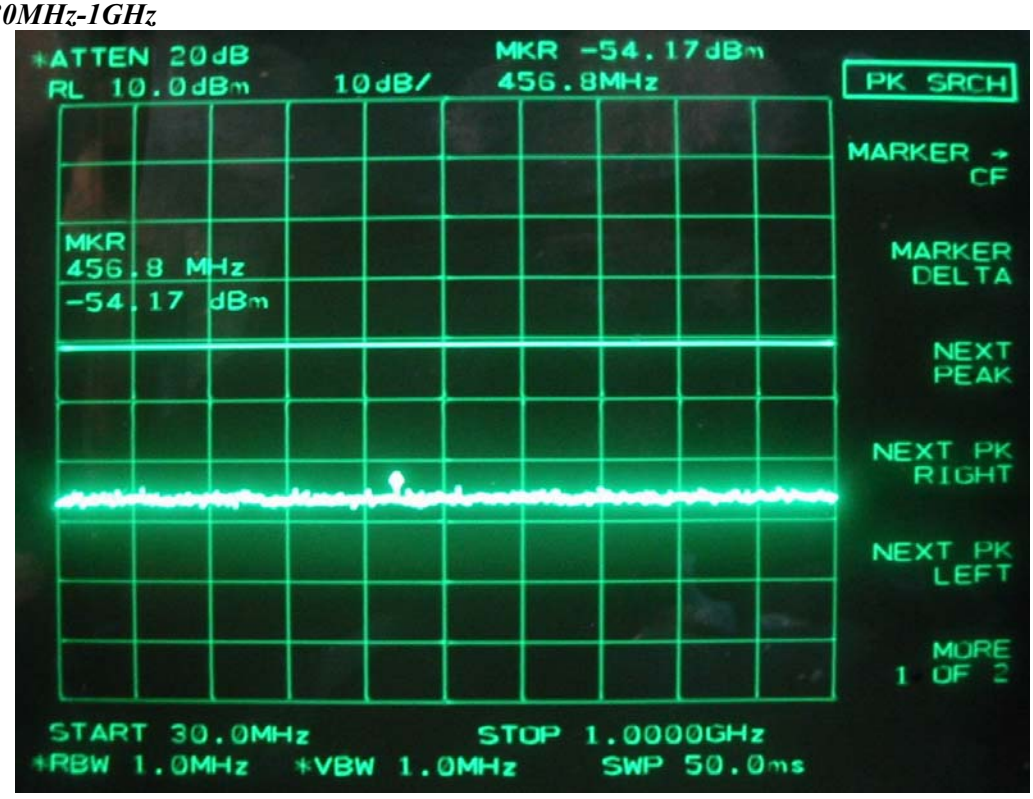
Channel	*Max Read Value (dBm/MHz)*	*Cable Loss (dB)*	*Correction Value (dBm/MHz)*	*Limit (dBm/MHz)*	*Margin (dB)*
CH 36	-40.50	0.70	-39.80	-27.00	-12.80
CH 40	-41.00	0.70	-40.30	-27.00	-13.30
CH 48	-41.50	0.70	-40.80	-27.00	-13.80

Note:

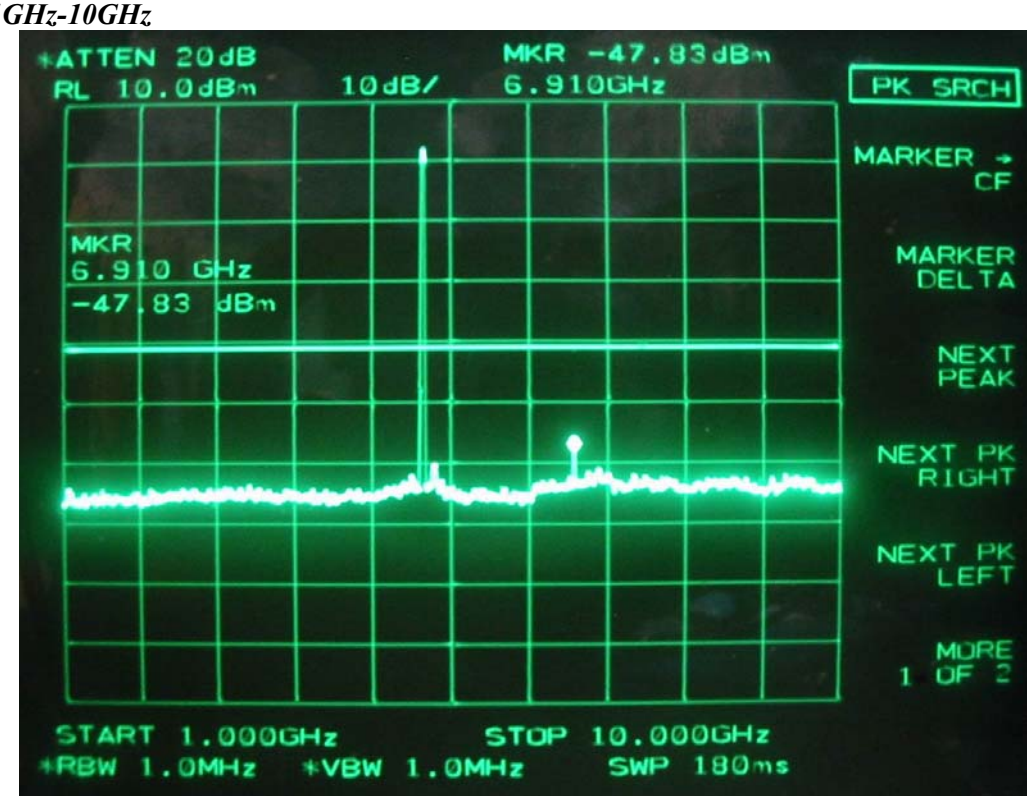
1. The following pages show the results of spectrum reading.
2. Correction Value: spectrum read power density (using peak search mode),
   Correction Value: actual peak power density in the spread spectrum band.
3. Correction Value = Max Read Value + Cable Loss

IEEE 802.11a Channel 36, 5180MHz

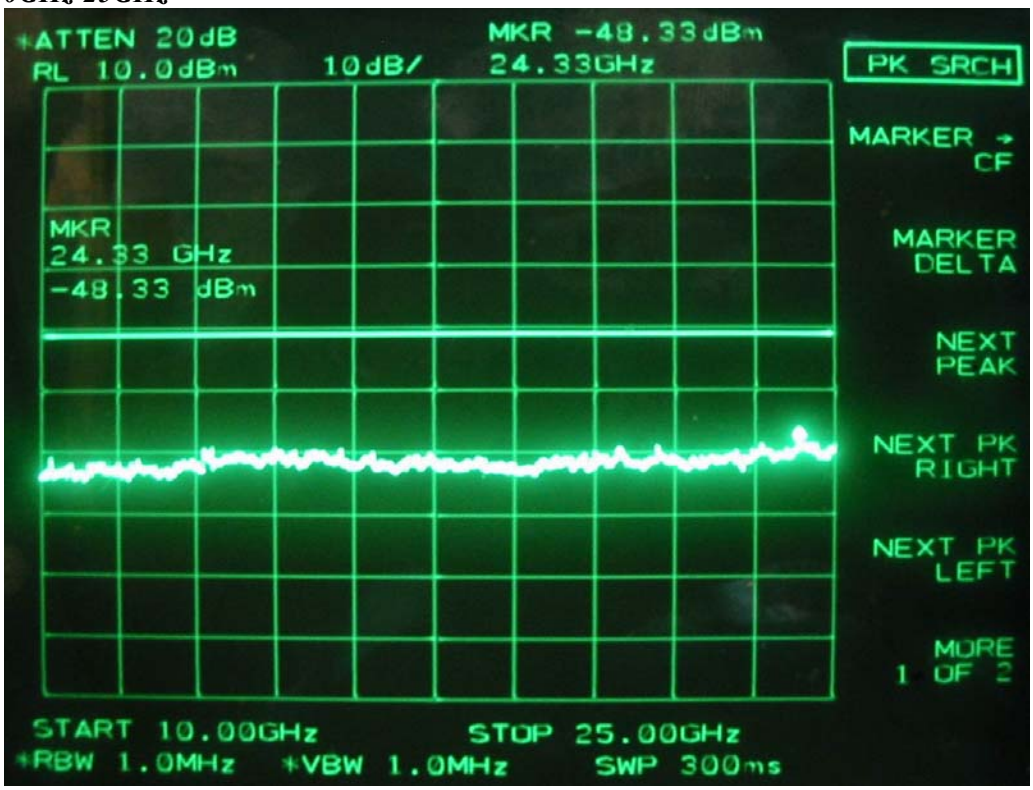
30MHz-1GHz



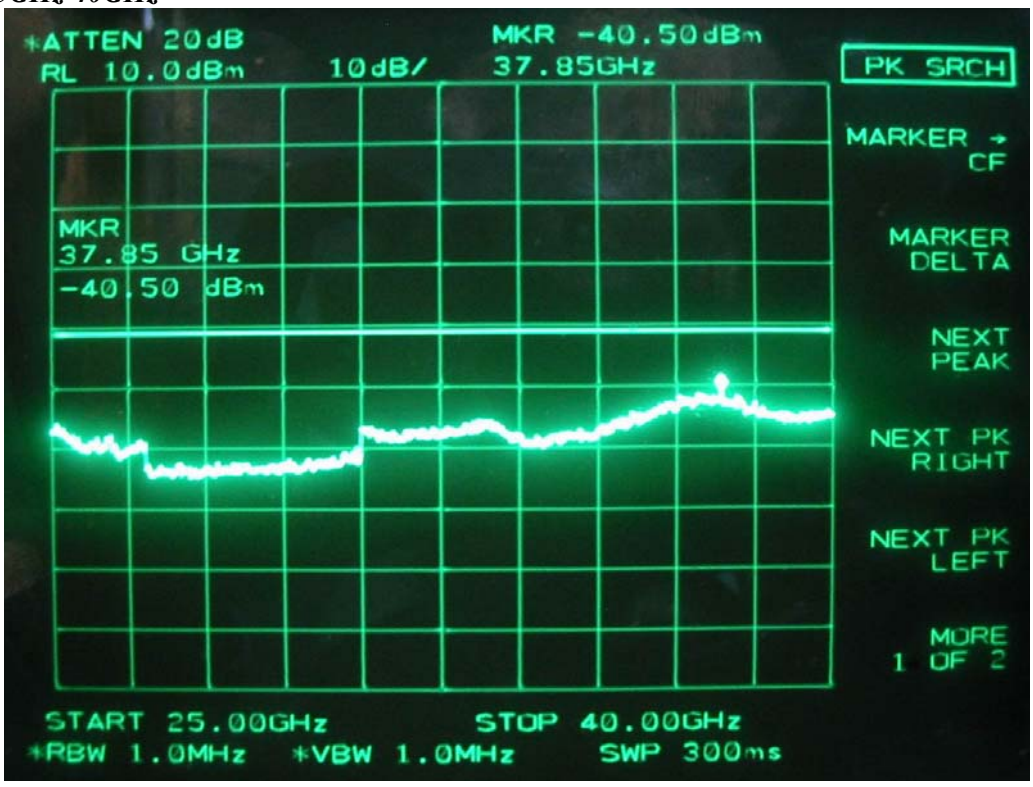
1GHz-10GHz



10GHz-25GHz

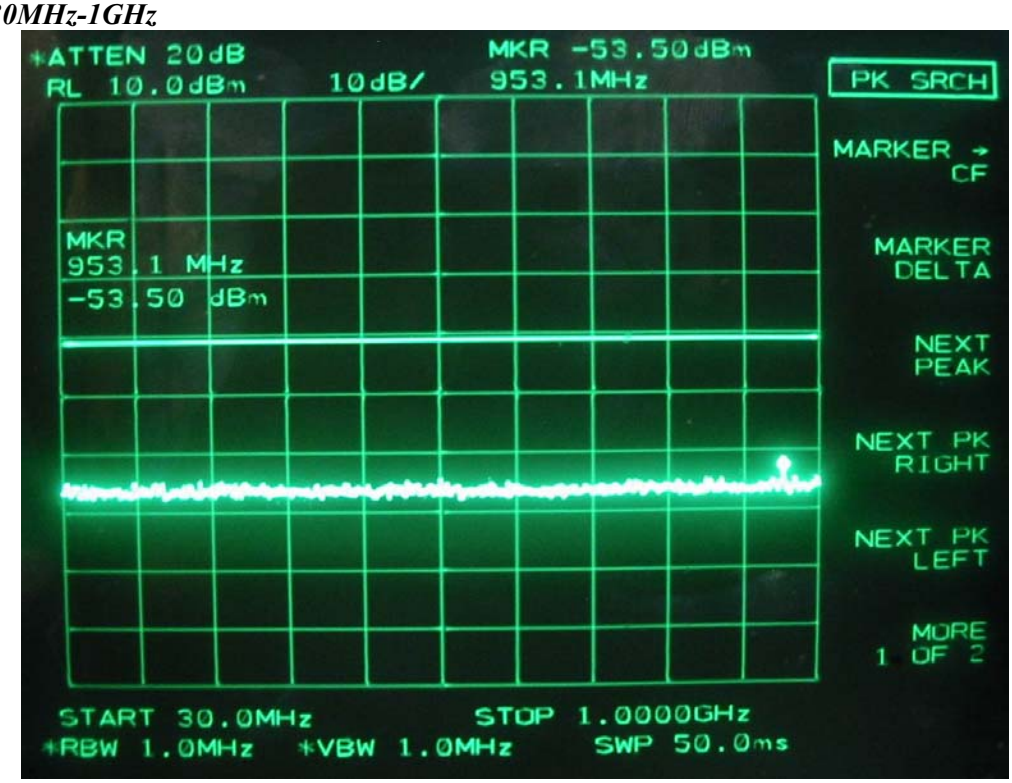


25GHz-40GHz

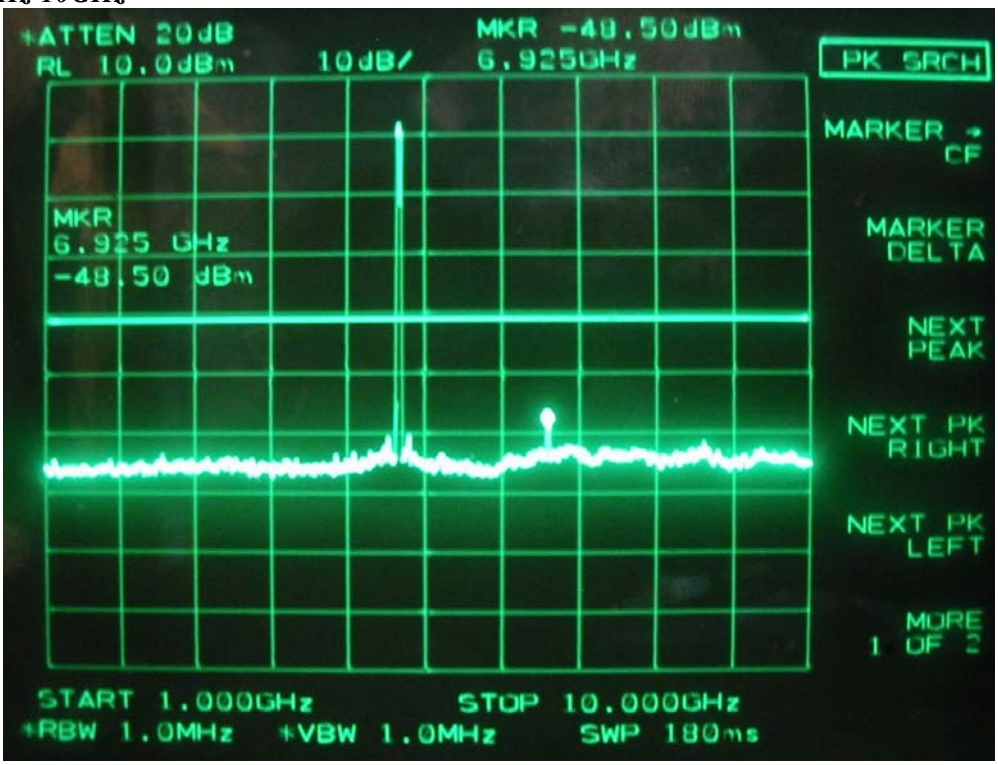


IEEE 802.11a Channel 40, 5200MHz

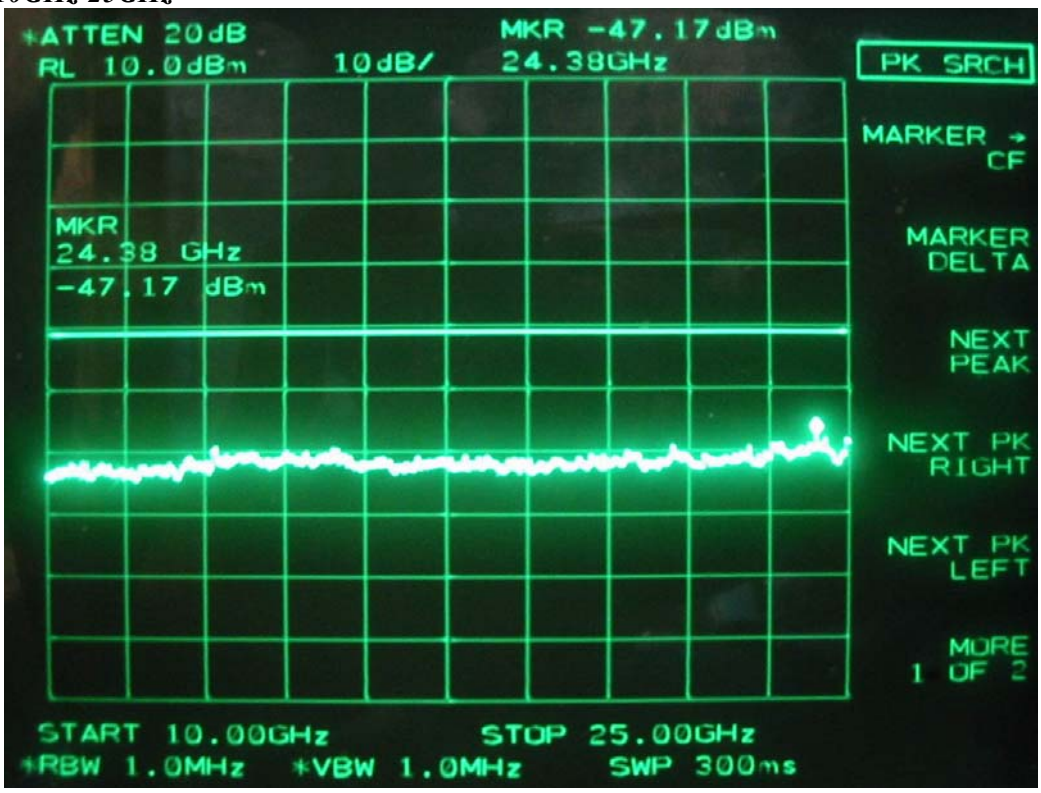
30MHz-1GHz



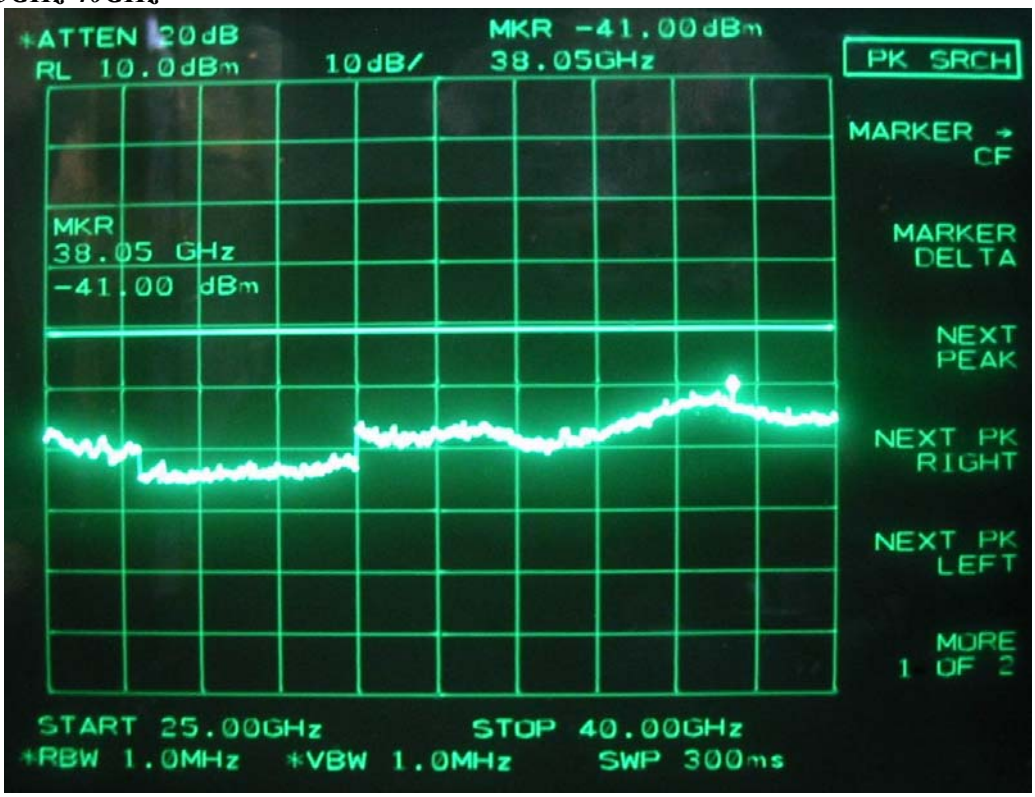
1GHz-10GHz



10GHz-25GHz

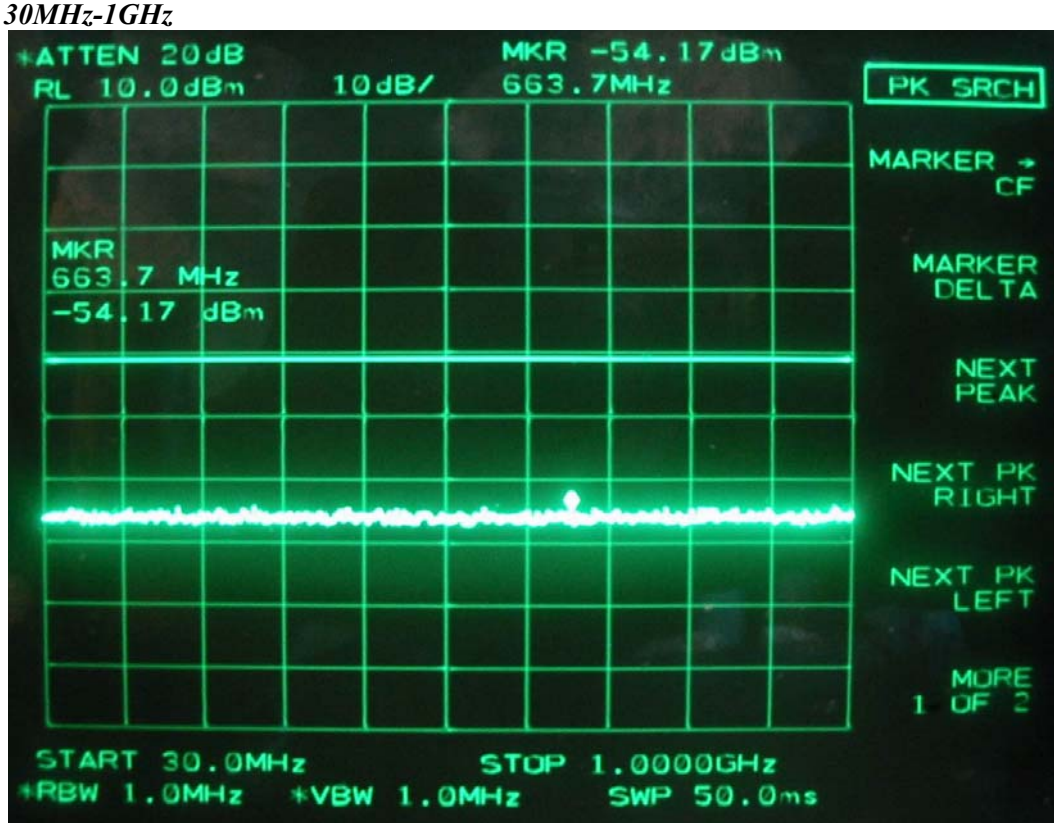


25GHz-40GHz

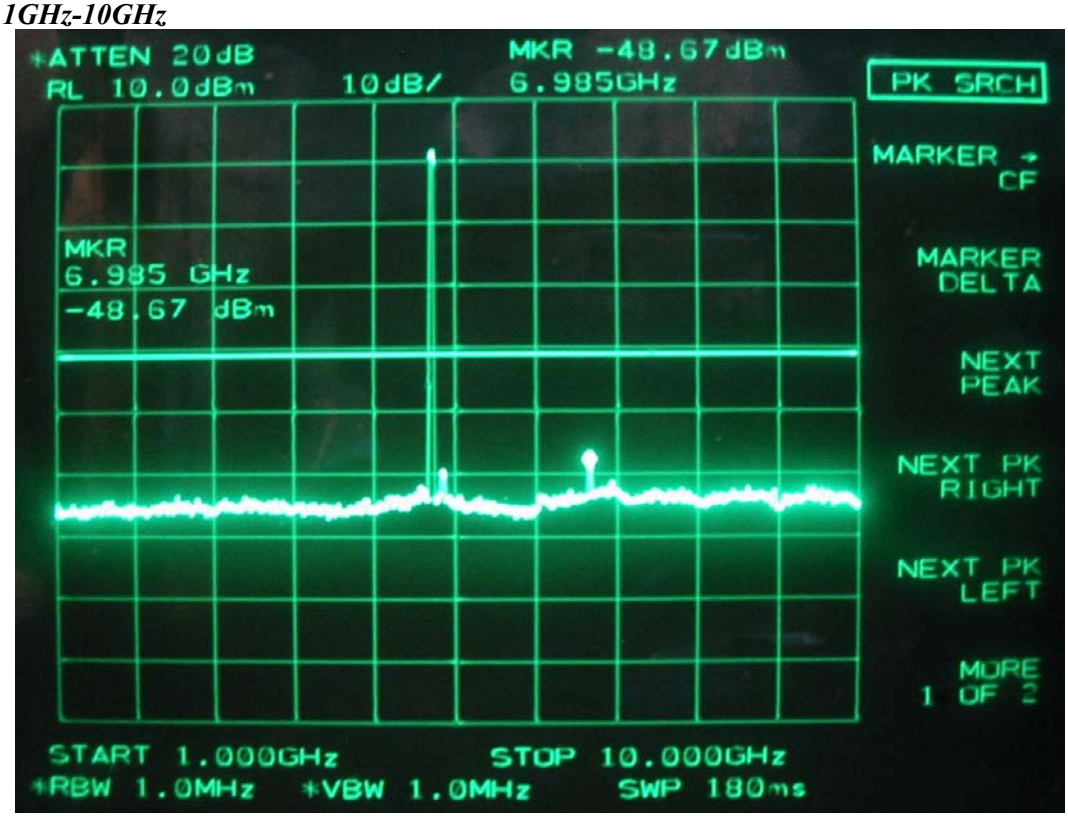


IEEE 802.11a Channel 48, 5240MHz

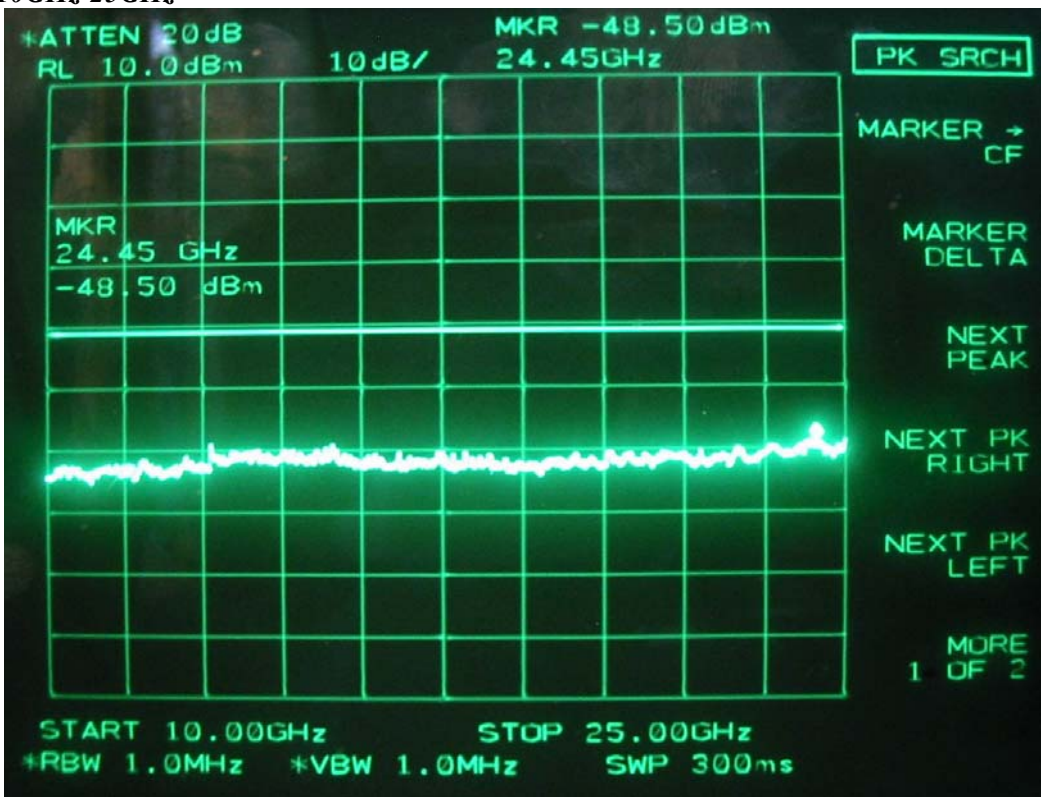
30MHz-1GHz



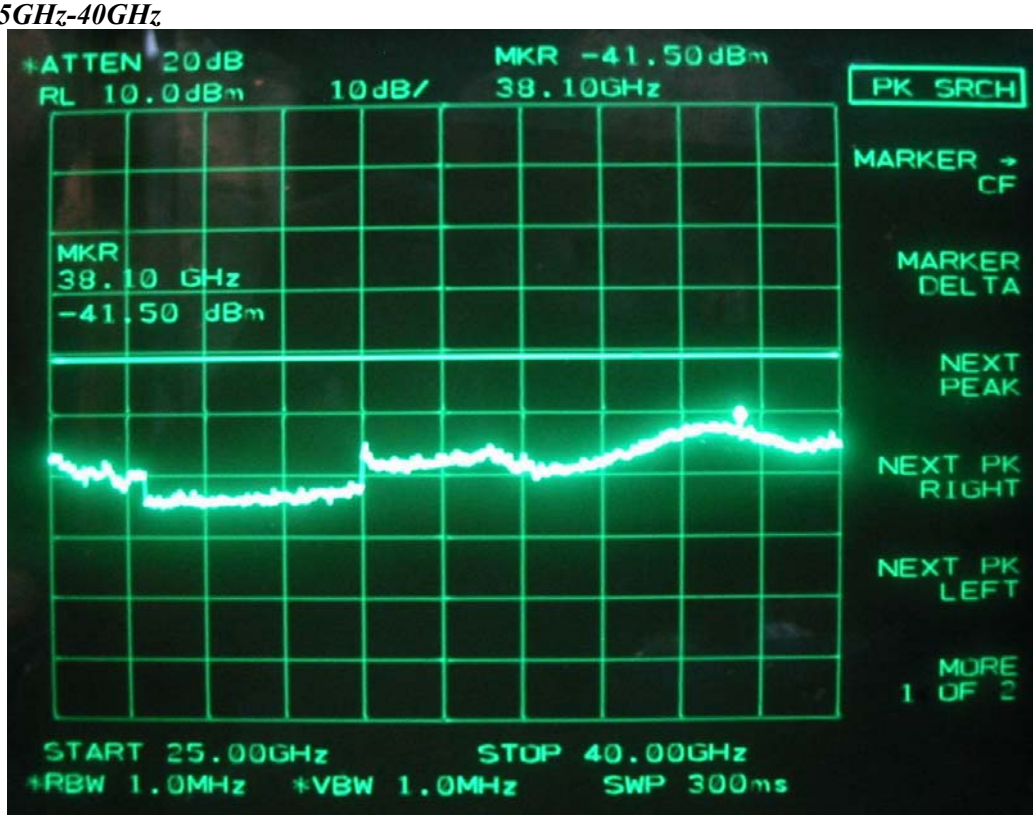
1GHz-10GHz



10GHz-25GHz



25GHz-40GHz



9.2 Bandedge

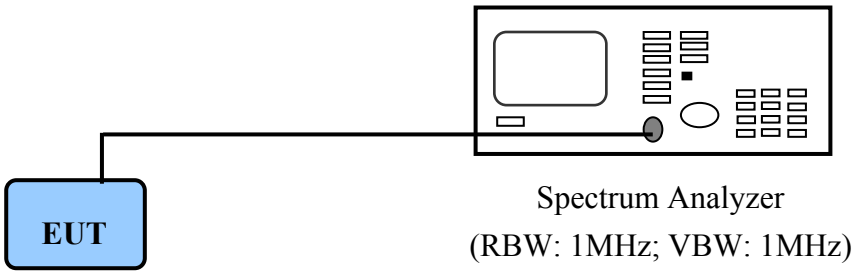
Limit: The provisions of Section 15.205 apply to intentional radiators operating under this section.

9.2.1 Test Condition & Setup

The tests below are running with the EUT transmitter set at high power mode. 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.

We perform this section by the conducted manner. 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). (Peak mode: RBW=VBW=1MHz, Average mode: RBW=1MHz; VBW=10Hz)
The following pages show our observations referring to the channel lowest and highest respectively.

9.2.2 Test Instruments Configuration



PC to control the EUT at maximal power output and channel number and set antenna kit

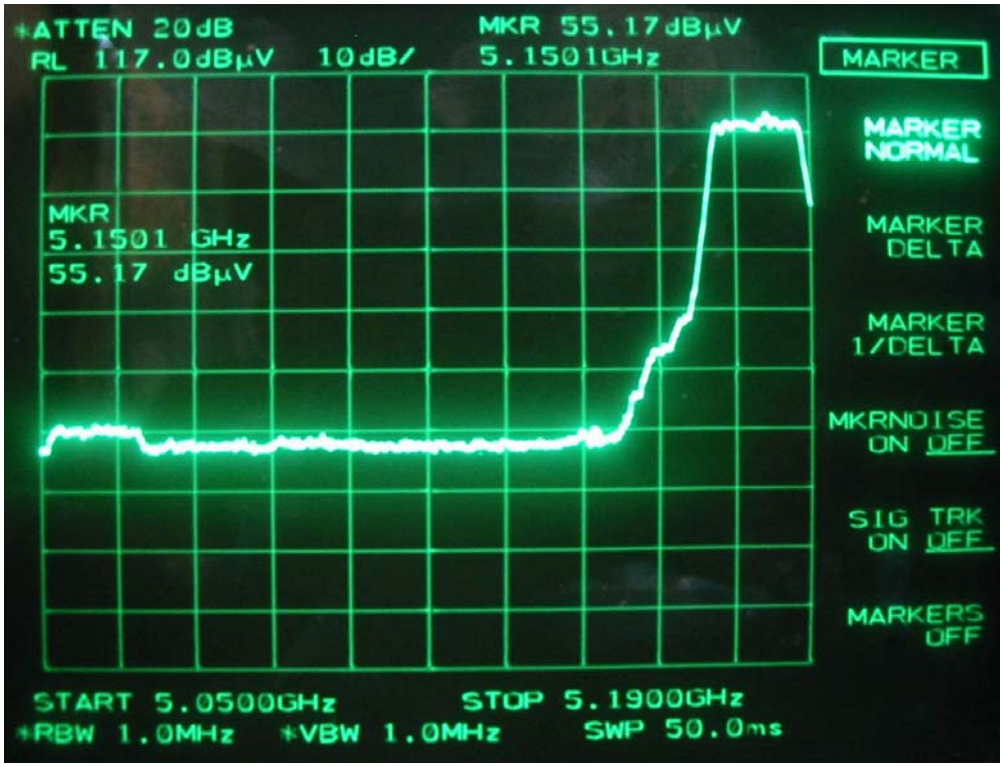
9.2.3 List of Test Instruments

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	8564E	HP	3720A00840	12/11/07

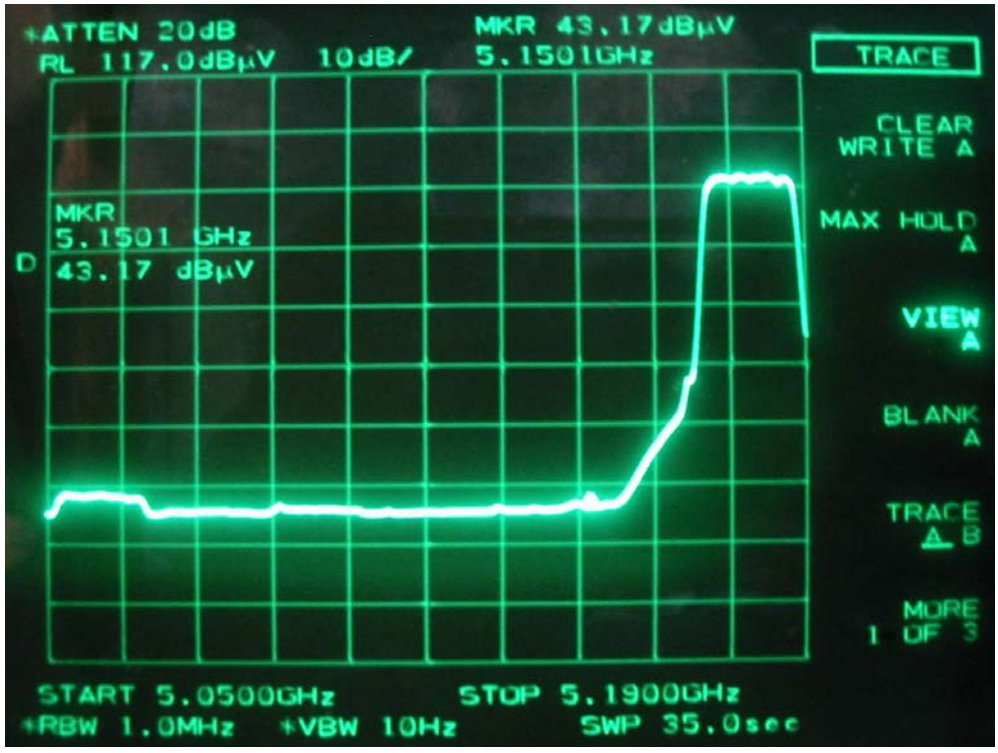
9.2.4 Test Result of Bandedge

Channel 36 of IEEE 802.11a

Peak

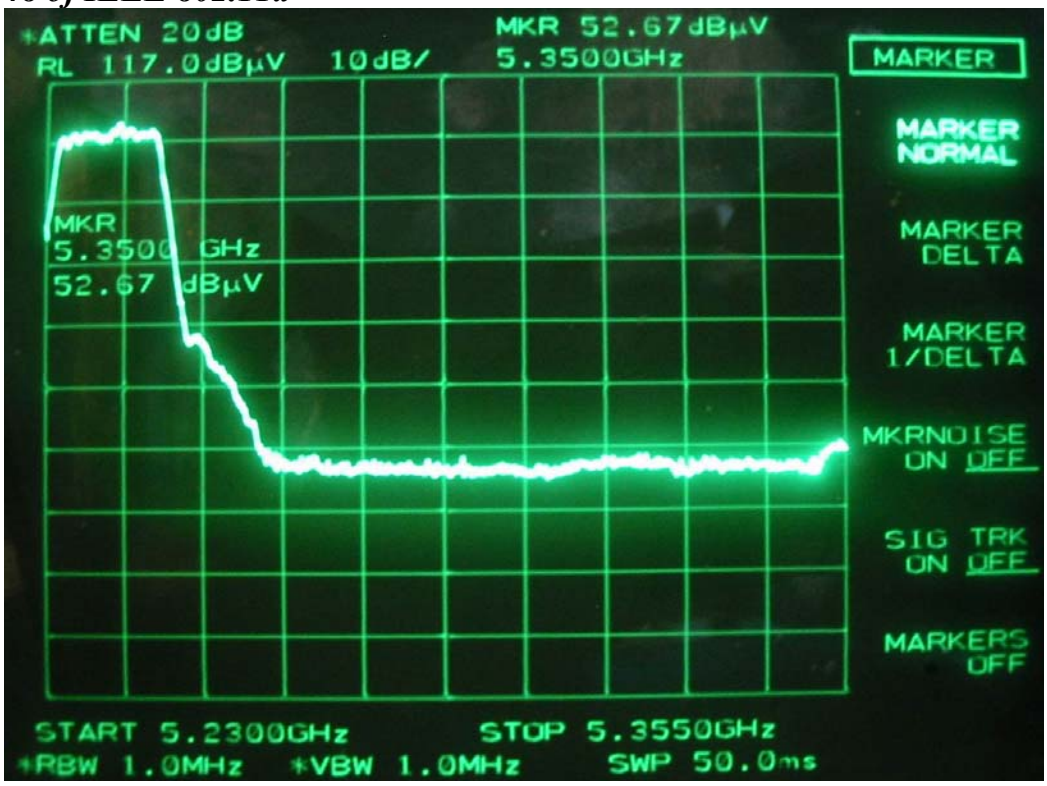


Avg

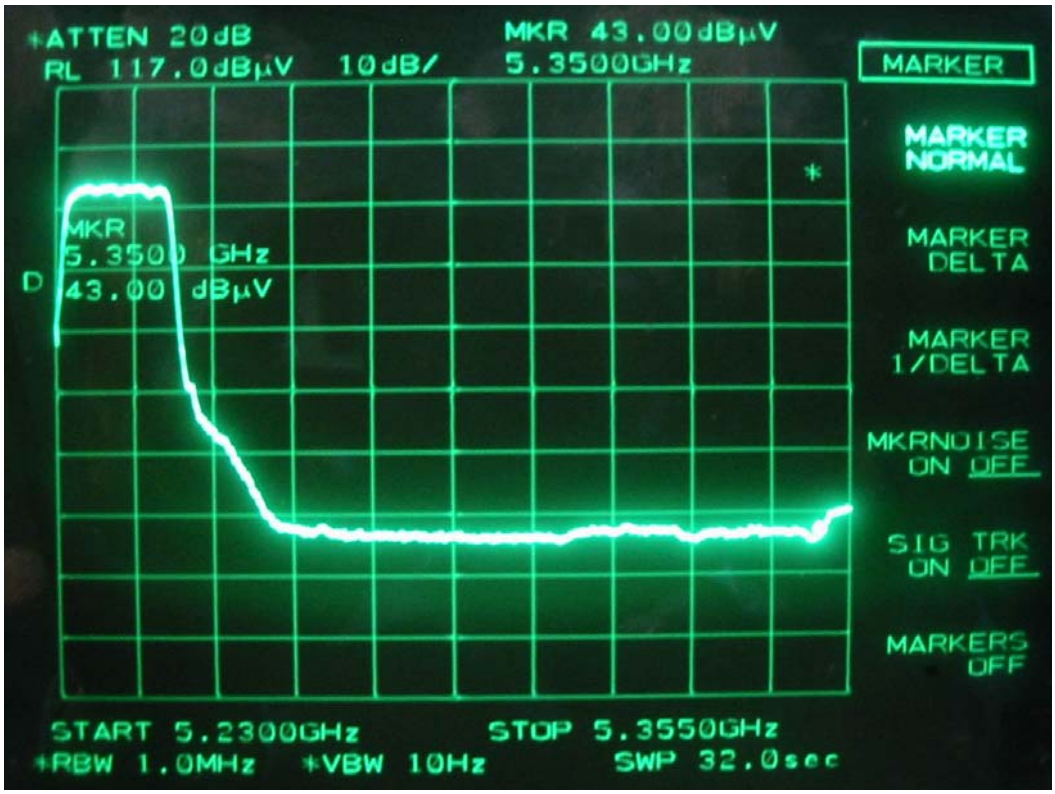


Channel 48 of IEEE 802.11a

Peak



Avg



This is the hard copy of our bandedge measurement generated by our bandedge testing program. The plot shown above is the bandedge of channels 36 and 48.

The emissions recorded in the restricted band is do comply with the Part 15.209(a) – as below.

Frequency	***Amplitude***		***Cable Loss***	***Corrected Amplitude***		***Limit***		***Margin***
	Peak / Ave.			***Peak / Ave.***		***Peak / Ave.***		
MHz	***dBμV***		***dB***	***dBμV/m***		***dBμV/m***		***dB***
5150.10	55.17	43.17	0.70	54.47	42.47	73.96	53.96	-11.49
5350.00	52.67	43.00	0.70	51.97	42.30	73.96	53.96	-11.66

X. Section 15.407(g)(1): Frequency Stability Tolerance Measurement

10.1 Rules and Specification Limits

Limit: Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual or IEEE802.11a specification.

The frequency tolerance of the transmitter shall be ±20 ppm (IEEE802.11a specification).

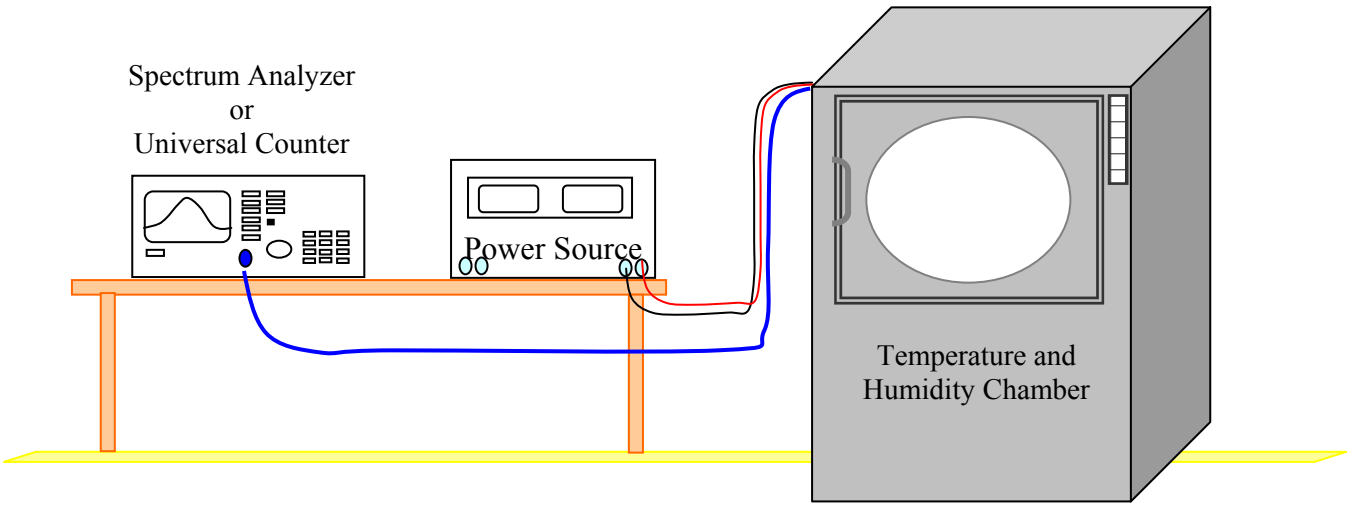
10.2 Measurement Condition & Setup with Temperature Variation

1. Place the EUT in the chamber, powered in its normal operation.
2. Set the temperature of the chamber -10 degree Centigrade. Allow the equipment to stabilize at that temperature.
3. Measured the carrier frequency (un-modulation) using preamplifier and frequency counter/ Spectrum Analyzer.
4. Repeated procedures 1 to 3 from -30 to 50 degree Centigrade at internals of 10 degree.

10.3 List of Measurement Instruments with Temperature Variation List of test Instrument

Instrument Name	Model No.	Brand	Serial No.	Next time
Spectrum Analyzer	MS2665C	ANRITSU	6200175476	12/11/07
Universal Counter	5313A	HP	356A11550	12/07/07
Temperature and Humidity Chamber	THS-ML1	King Son	240	12/26/07

10.4 Measurement Configuration of Temperature Variation Test:



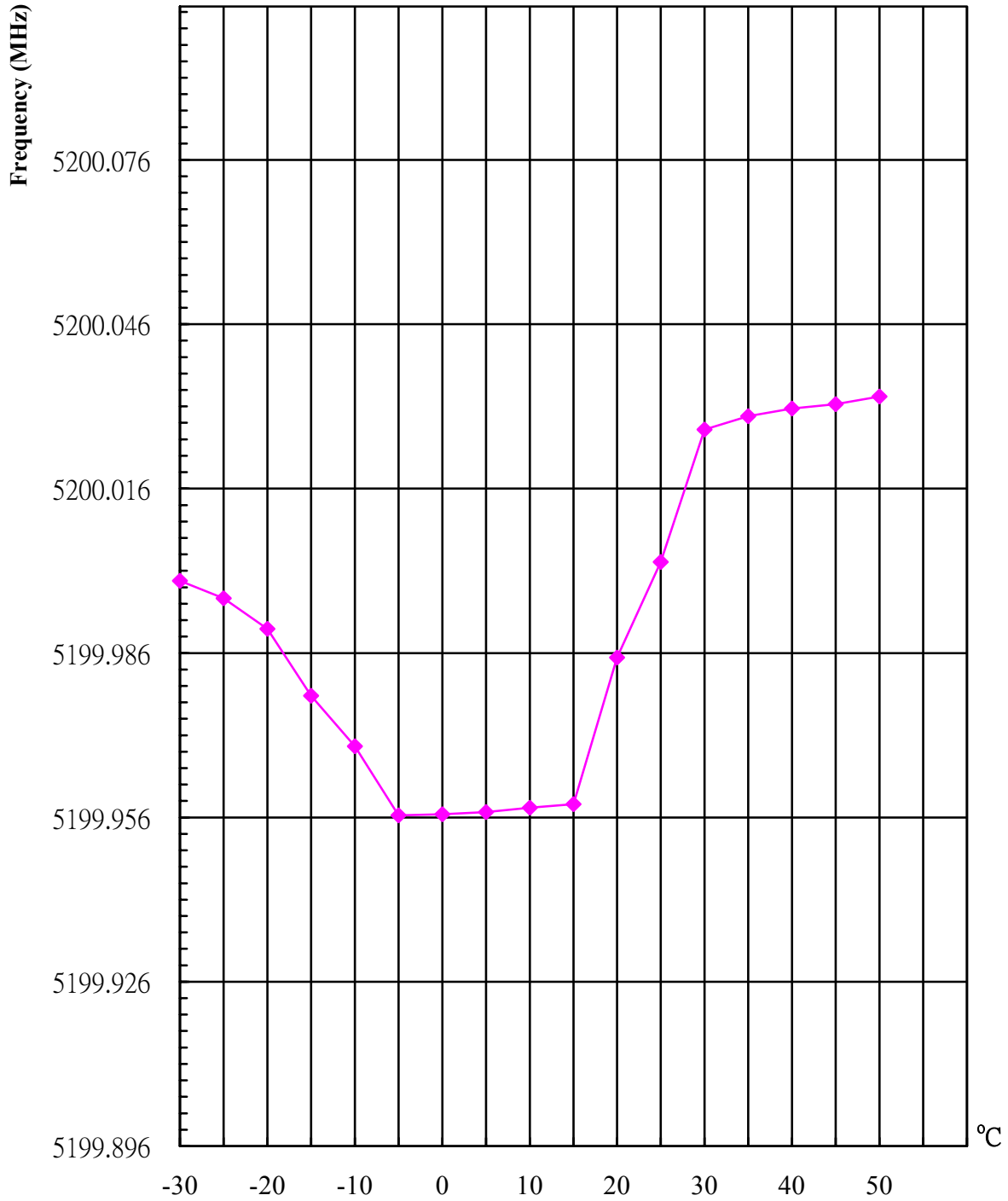
10.5 Measurement Result with Temperature Variation

A table is presented which illustrates compliance with the rule where the center frequency is 5200.000000MHz.

Temperature Variation Table

Temperature (Centigrade)	*Frequency (MHz)*
-30	5199.9992
-25	5199.9960
-20	5199.9904
-15	5199.9782
-10	5199.9690
-5	5199.9564
0	5199.9566
5	5199.9470
10	5199.9578
15	5199.9584
20	5199.9852
25	5200.0026
30	5200.0268
35	5200.0292
40	5200.0306
45	5200.0314
50	5200.0328
Max Deviation (MHz)	0.0328
Max Tolerance (ppm)	6.3

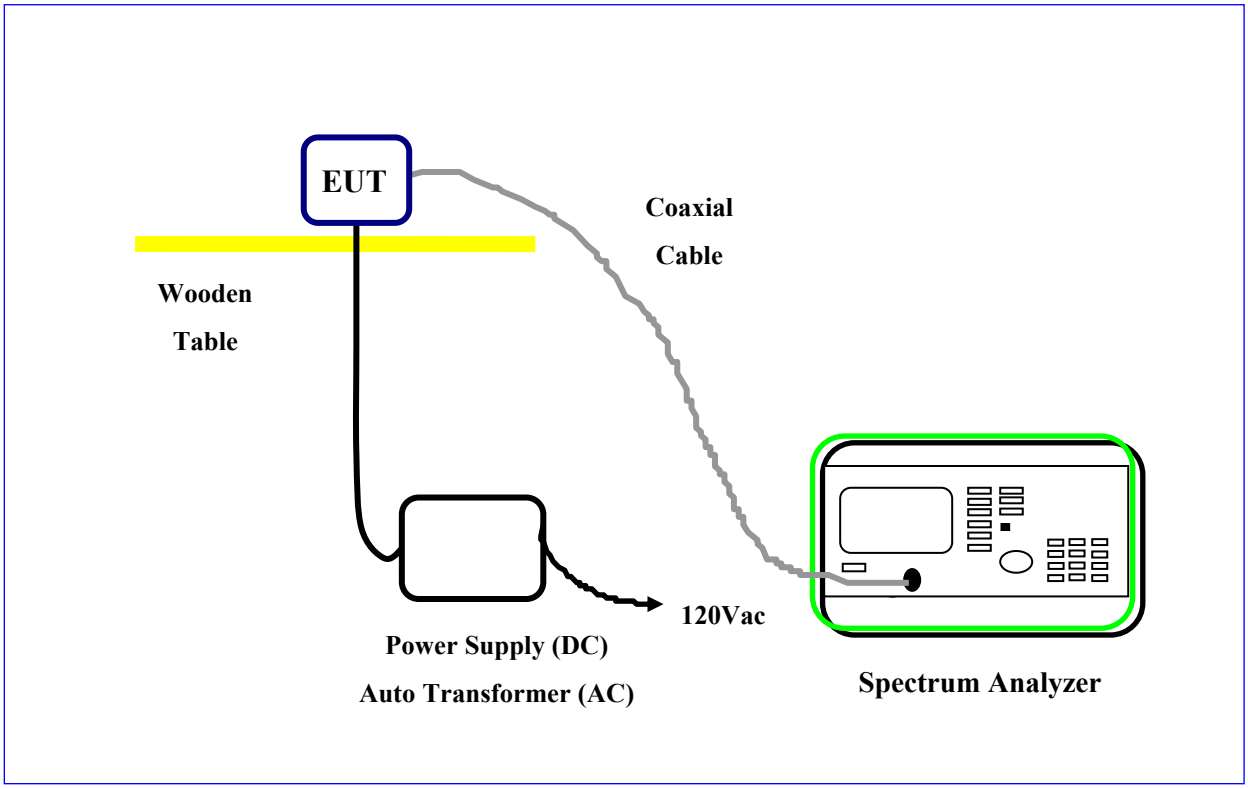
Chart 10.1 Temperatuer Variation Vs. Frequency



10.6 Measurement Condition & Setup with Voltage Variation

1. Attached the power line of the power supply to the power position of the EUT.
2. Tuned the output power level to power source 85 %, 100%, 115% of the normal operation power of EUT.
3. Recorded the frequency with a frequency counter / .Spectrum Analyzer

10.7 Configuration of Voltage Variation Test



10.8 Measurement Result with Voltage Variation

Frequency Stability of Voltage Variation Measurement Table

Supply Voltage (Volt)	*Frequency (MHz)*
102 (85%)	5200.0022
120 (100%)	5200.0024
138 (115%)	5200.0028
Max Deviation (MHz)	0.0028
Max Tolerance (ppm)	0.5

Chart 10.2 Voltage Variation Vs. Frequency