

# ***Measurement Report***

Part 15 Subpart B & E (15.407)  
ANSI C63.4-2003

**Product**.....: *Wireless Video Module*  
**Applicant**.....: *TURBOCOMM TECH.INC.*  
**FCC ID**.....: *N7ZWVM-1101*  
**Model No.**.....: *WVM1101-TX / WVM1101-RX*  
**Report No.**.....: *MLT0603P15004*  
**Issue Date**.....: *April 20,2006*



**Test By**

**Max Light Technology Co.,Ltd.**

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## CERTIFICATION

*We here by verify that :*

The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2003. All test were conducted by *MLT (Max Light Technology Co., Ltd) Room 5, 8F, No.125, Section 3 Roosevelt Road, Taipei, 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 Class B radiated and conducted emission limit of FCC Rules Part 15 Subpart B & E (15.407).

EUT : Wireless Video Module

Applicant : TURBOCOMM TECH.INC.  
2F, No.19-8 San Chong Road ,Nan-Kang,  
Taipei 115, Taiwan, R.O.C

Manufacturer : TURBOCOMM TECH.INC.  
2F, No.19-8 San Chong Road ,Nan-Kang,  
Taipei 115, Taiwan, R.O.C

Model No : WVM1101-TX / WVM1101-RX

FCC ID : N7ZWVM-1101

Prepared by : Jesse Tien Approved by : Roger Chen  
Jesse Tien Roger Chen



## *I. GENERAL*

### 1.1 Introduction

The following measurement report is submitted on behalf of TURBOCOMM TECH.INC. In support of a Class B Digital Device certification in accordance with Part2 Subpart J and Part 15 Subpart A And B &E of the Commission's and Regulations.

### 1.2 Description of EUT

EUT : Wireless Video Module

Applicant : TURBOCOMM TECH.INC.  
2F,No.19-8 San Chong Road ,Nan-Kang,  
Taipei 115,Taiwan,R.O.C

Manufacturer : TURBOCOMM TECH.INC.  
2F,No.19-8 San Chong Road ,Nan-Kang,  
Taipei 115,Taiwan,R.O.C

Model No : WVM1101-TX / WVM1101-RX

FCC ID : N7ZWVM-1101

Power Type : Input : AC100~240V 0.8A 50~60Hz  
Output : DC3.3V 4A  
Model No.: SA06N3V3 - V

Frequency of Channel: See Next page

Type of Modulation : Orthogonal Frequency Division Multiplexing Scheme

Type of Antenna :  $1/2 \lambda$  DIOPLE Antenna

During testing the EUT was operated at Tx or Rx mode for each emission measured. This was done in order to ensure that maximum emission levels were attained.

Frequency of 5150MHz~5250MHz, 5250MHz~5350MHz(Working Frequency)

Channel No.	Frequency (MHz)
01	5180
02	5200
03	5220
04	5240
05	5260
06	5280
07	5300
08	5320

### 1.3 Summary Of Tests

For frequency 5150MHz – 5350MHz

47 CFR Part 15 Subpart E			
Reference	Test	Results	Note
15.407(b)(5)	AC Power Conducted Emission	PASS	
15.407(b)(1/2/3)(b)(5)	Electronic Filed Strength Spurious, 30MHz ~ 40GHz	PASS	
15.407(a)(1/2/3)	Peak Transmit Power	PASS	
15.407(a)(6)	Peak Power Excursion	PASS	
15.407(a)(1/2/3)	Peak Power Spectral Density	PASS	
15.407(g)	Frequency Stability	PASS	

*Note: (1) The WVM1101-TX / WVM1101-RX802.11a (CH01/CH04/CH05/CH08) have been tested, the testing report only record the worst cases which were 802.11a (CH01).*

*(2) There were no changes made to this EUT (hardware or antenna)*

*(3) The WVM1101-TX and WVM1101-RX are electrically identical.*



#### 1.4 Description of Support Equipment

In order to construct the minimum system which required by the ANSI C63.4-2003, following equipments were used as the support units.

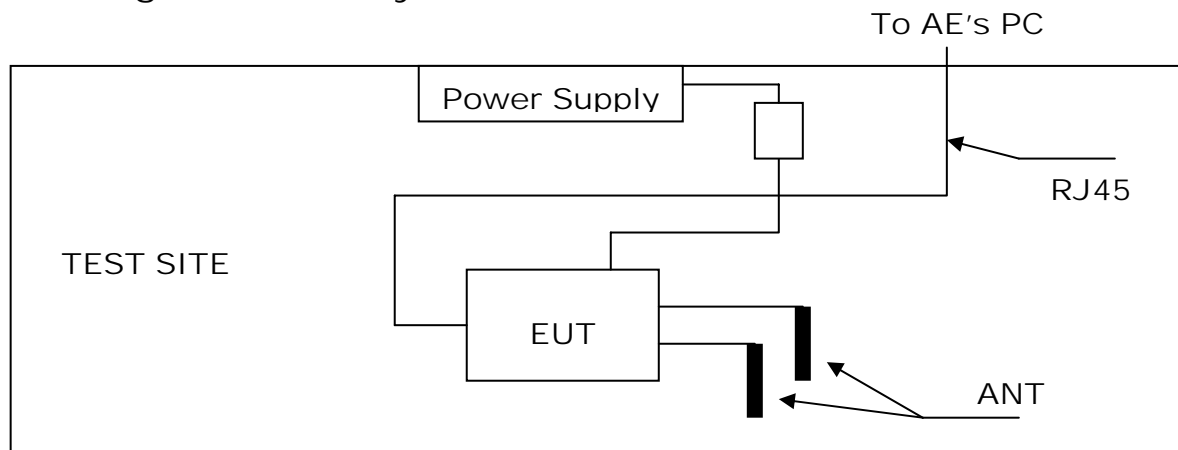
*Computer* : IBM  
Model No. : 16W  
Serial No. : BNL345M  
FCC ID : FCC DOC

*Monitor* : IBM  
Model No. : 10L6145 030  
Serial No. : 23-092079  
FCC ID : FCC DOC

*Keyboard* : IBM  
Model No. : KB-9930  
Serial No. : 09N5395  
FCC ID : FCC DOC

*Mouse* : IBM  
Model No. : 0180-05N  
Serial No. : 23-96142  
FCC ID : EMJMUSJJ

### 1.5 Configuration of System Under Test



During testing the EUT (Wireless Adapter) 's test fixture extender connected to the Desktop PC, and the monitor / modem / keyboard / mouse / printer connected to desktop's PC I/O port.

### 1.6 Test Procedure

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4-2003 "Measurement of un-Intentional Radiators.

### 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. The system's radiated and conducted emissions were investigated while the computer alternately transferred data to the EUT as well as to the monitor and printer. Using a test program which sent a continuous data and transferred data to and from the EUT was proven to worst case emissions. The system's physical layout and cabling was randomly arranged to ensure that maximum emission levels were attained.



## *II. Conducted Emissions Requirements*

### 2.1 General & Setup :

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

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3825/2 Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer 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 2.6.

### 2.2 Test Equipment List:

<i>Item</i>	<i>Mfr/Brand</i>	<i>Instruments</i>	<i>Serial No.</i>	<i>Model/Type No.</i>	<i>Calibrated Date</i>	<i>Next Cali. Date</i>
1.	ADVANTEST	Spectrum Analyzer	91780529	R3131	2006/01/17	2007/01/17
2.	AFJ	EMI Receiver	55090002141	ER 55C	2006/03/31	2007/03/31
3.	EMCO	LISN	2654	3825/2	2006/03/25	2007/03/25
4.	EMCO	LISN	2658	3825/2	2006/03/25	2007/03/25
5.	SCHAFFNER	ISN	16831	ISN T400	N/A	N/A



## 2.3 Test Configuration:



Front View of The Test Configuration



Rear View of The Test Configuration

## 2.4 Test condition:

EUT tested in accordance with the specifications given by the manufacturer , and exercised in the most unfavorable manner.

## 2.5 Conducted Emissions Limits:

<i>Frequency range (MHz)</i>	<i>Limits (dBuV)</i>	
	<i>Quasi-peak</i>	<i>Average</i>
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5.0	56	46
5.0 to 30	60	50

## 2.6 Measurement Data Of Conducted Emissions:

### 2.6.1 Conducted Emissions

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NATURAL conductor of the EUT power.

Applicant : TURBOCOMM TECH.INC.  
 Model No : WVM1101-TX / WVM1101-RX  
 EUT : Wireless Video Module  
 Test Mode : 802.11a(CH01)  
 Test Date : 04/04/2006

Power Line Conducted Emissions (Class B)					
Conductor	Frequency (MHz)	Quasi-Peak (dBuV)	Limits	Average (dBuV)	Limits
L1	0.34	42.20	59.00	--	49.00
	0.63	39.89	56	--	46
	0.92	40.37	56	--	46
	1.43	41.04	56	--	46
	2.43	45.92	56	39.58	46
	4.14	38.43	56	--	46
	17.29	47.70	60	--	50
L2	0.20	42.78	63.27	--	53.27
	0.41	38.40	57.46	--	47.46
	0.99	37.79	56	--	46
	1.51	37.48	56	--	46
	2.45	41.94	56	--	46
	7.69	37.99	60	--	40
	17.38	45.19	60	--	50

Notes : 1.L1: One end & Ground L2: The other end & Ground  
 2.Height of table on which the EUT was placed : 0.8 m.  
 3.The Quasi-Peak Value have already met the Average Value Limit showed on above limits.  
 4.The above test results are obtained under the normal condition.



### 2.6.2 Conducted Emissions

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NATURAL conductor of the EUT power.

Applicant : TURBOCOMM TECH.INC.  
 Model No : WVM1101-TX / WVM1101-RX  
 EUT : Wireless Video Module  
 Test Mode : 802.11a (CH04)  
 Test Date : 04/04/2006

Power Line Conducted Emissions (Class B)					
Conductor	Frequency (MHz)	Quasi-Peak (dBuV)	Limits	Average (dBuV)	Limits
L1	0.35	42.37	58.96	--	48.96
	0.63	40.06	56	--	46
	0.92	40.26	56	--	46
	1.43	40.87	56	--	46
	2.43	45.56	56	39.27	46
	4.16	37.49	56	--	46
	17.20	48.92	60	--	50
L2	0.35	38.96	58.96	--	48.96
	0.70	37.10	56	--	46
	1.21	37.89	56	--	46
	2.37	41.54	56	--	46
	4.16	35.29	56	--	46
	11.93	39.69	60	--	50
	17.47	44.72	60	--	50

- Notes :
- 1.L1: One end & Ground L2: The other end & Ground
  - 2.Height of table on which the EUT was placed : 0.8 m.
  - 3.The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
  - 4.The above test results are obtained under the normal condition.

### 2.6.3 Conducted Emissions

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NATURAL conductor of the EUT power.

Applicant : TURBOCOMM TECH.INC.  
 Model No : WVM1101-TX / WVM1101-RX  
 EUT : Wireless Video Module  
 Test Mode : 802.11a (CH05)  
 Test Date : 04/04/2006

Power Line Conducted Emissions (Class B)					
Conductor	Frequency (MHz)	Quasi-Peak (dBuV)	Limits	Average (dBuV)	Limits
L1	0.34	42.87	59.00	--	49.00
	0.63	40.03	56	--	46
	0.92	40.51	56	--	46
	1.43	40.40	56	--	46
	2.45	46.09	56	39.68	46
	4.22	38.05	56	--	46
	17.38	48.81	60	--	50
L2	0.20	43.33	63.27	--	53.27
	0.34	39.49	59.00	--	49.00
	0.70	36.41	56	--	46
	0.98	36.93	56	--	46
	2.37	41.84	56	--	46
	9.25	39.26	60	--	50
	17.29	45.36	60	--	50

- Notes :
- 1.L1: One end & Ground L2: The other end & Ground
  - 2.Height of table on which the EUT was placed : 0.8 m.
  - 3.The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
  - 4.The above test results are obtained under the normal condition.

### 2.6.4 Conducted Emissions

The following table show a summary of the highest emissions of power line conducted emissions to the HOT and NATURAL conductor of the EUT power.

Applicant : TURBOCOMM TECH.INC.  
 Model No : WVM1101-TX / WVM1101-RX  
 EUT : Wireless Video Module  
 Test Mode : 802.11a (CH08)  
 Test Date : 04/04/2006

Power Line Conducted Emissions (Class B)					
Conductor	Frequency (MHz)	Quasi-Peak (dBuV)	Limits	Average (dBuV)	Limits
L1	0.20	43.35	63.27	--	53.27
	0.34	42.42	59.00	--	49.00
	0.63	40.00	56	--	46
	0.92	40.03	56	--	46
	1.36	40.82	56	--	46
	2.45	45.73	56	39.72	46
	17.29	48.65	60	--	50
L2	0.15	46.02	65.82	--	55.82
	0.56	37.03	56	--	46
	0.98	38.10	56	--	46
	2.45	41.52	56	--	46
	4.53	36.03	56	--	46
	11.93	39.78	60	--	50
	16.93	43.98	60	--	50

- Notes :
- 1.L1: One end & Ground L2: The other end & Ground
  - 2.Height of table on which the EUT was placed : 0.8 m.
  - 3.The Quasi-Peak Value have already met the Average Value Limit showed on above limits.
  - 4.The above test results are obtained under the normal condition.



### *III. Radiated Emissions Requirements*

#### 3.1 General Configuration:

Prior to open-field testing, the EUT was placed in a shielded enclosure and scanned at a close 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 open-field tests. This was done to ensure that the final measurements would demonstrate the worst-case interference potential of the EUT.

#### 3.2 General Configuration:

Final radiation measurements were made on a three-meter, open-field test site. 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 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 40 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, 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.





# *MAX LIGHT*

## MEASUREMENT REPORT

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The field strength below 1 GHz was measured by EMCO Biconilog Antenna (mode 3142) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 40 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in microvolts per meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in microvolts per meter (dBuV/m).

The actual field is intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m)} = \text{FI(dBuV)} + \text{AF(dBuV)} + \text{CL(dBuV)} - \text{Gain(dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

*P.S Amplitude is auto calculate in spectrum analyzer.*

$$(2) \text{ Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(1) For fundamental frequency :

Transmitter Output < +30dBm

(2) For spurious frequency :

Spurious emission limits = fundamental emission limit /10

### 3.2 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	HP	Spectrum Analyzer	73412A00110	8591EM	2006/01/17	2007/01/17
2.	HP	Pre Amplifier	2944A08954	8447D	2006/04/14	2007/04/14
3.	HP	Pre Amplifier	3113A05475	8447F	2006/01/10	2007/01/10
4.	R&S	EMI Receiver	881121/010	354.3000.52	2005/12/10	2006/12/10
5.	EMCO	Biconilog Antenna	1184	3142	2006/02/03	2007/02/03
6.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01
7.	HP	Pre Amplifier	3008A01463	8449B	2006/02/23	2007/02/23
8.	SCHWARZBECK	Horn Antenna	181	BBHA 9170	2005/07/06	2006/07/06
9.	SCHWARZBECK	Horn Antenna	304	BBHA 9120 D	2005/07/06	2006/07/06
10	Agilent	Spectrum Analyzer	US44300422	E4446A	2005/04/27	2006/04/27
11	Herotek	Pre Amplifier	H1005	A402-417	2005/10/04	2006/10/04

### 3.3 Test Configuration:



Front View of The Test Configuration





Rear View of The Test Configuration

### 3.4 Test condition:

EUT tested in accordance with the specifications given by the manufacturer , and exercised in the most unfavorable manner.

### 3.5 Radiated Emissions Limits:

<i>Frequency range (MHz)</i>	<i>Peak(dBuV/ m)</i>
30 to 88	40
88 to 216	43.5
216 to 960	46
Above 960	54



### 3.6.1 Open Field Radiated Emissions

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

Applicant : TURBOCOMM TECH.INC.  
Model No : WVM1101-TX / WVM1101-RX  
EUT : Wireless Video Module  
Test Mode : 802.11a (CH01)  
Test Date : 04/12/2006

Radiated Emissions (HORIZONTAL)					
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Limits(Class B) (dBuV/m)	Margin (dB)
61.30	29.79	1.5	320	40	-10.21
79.30	31.12	2.5	250	40	-8.88
100.00	30.45	2	360	43.5	-13.05
560.03	35.45	1.5	200	46	-10.55
640.00	36.34	1	240	46	-9.66
720.00	34.71	1.8	220	46	-11.29
755.73	34.69	1.3	310	46	-11.31
800.00	35.99	1	300	46	-10.01
875.00	35.79	1	160	46	-10.21
925.13	35.44	1	270	46	-10.56
1000.00	35.62	1	290	46	-10.38

*Notes :*

- 1.Margin= Amplitude - Limits
- 2.Distance of Measurement : 3 Meter (30-1000MHz)
- 3.Height of table for EUT placed: 0.8 Meter.
- 4.ANT= Antenna height.
- 5.Amplitude= Reading Amplitude –Amplifier gain+ Cable loss  
+Antenna factor  
(Auto calculate in spectrum analyzer)

### 3.6.2 Open Field Radiated Emissions

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

Applicant : TURBOCOMM TECH.INC.  
 Model No : WVM1101-TX / WVM1101-RX  
 EUT : Wireless Video Module  
 Test Mode : 802.11a (CH01)  
 Test Date : 04/12/2006

Radiated Emissions (VERTICAL)					
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Limits(Class B) (dBuV/m)	Margin (dB)
101.60	32.83	1	240	43.5	-10.67
113.80	30.63	1	300	43.5	-12.87
400.00	36.23	1.5	260	46	-9.77
500.00	38.83	2	320	46	-7.17
525.02	35.39	1.8	300	46	-10.61
640.00	38.25	2	120	46	-7.75
720.00	35.90	1	210	46	-10.10
800.00	37.68	1.5	170	46	-8.32
863.93	38.53	2.6	230	46	-7.47
875.00	38.19	1.7	160	46	-7.81
960.00	37.12	1.4	280	46	-8.88

Notes : 1.Margin= Amplitude - Limits  
 2.Distance of Measurement : 3 Meter (30-1000MHz)  
 3.Height of table for EUT placed: 0.8 Meter.  
 4.ANT= Antenna height.  
 5.Amplitude= Reading Amplitude -Amplifier gain+ Cable loss  
 +Antenna factor  
 (Auto calculate in spectrum analyzer)

### 3.6.3 Open Field Radiated Emissions

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

*Applicant* : TURBOCOMM TECH.INC.  
*Model No* : WVM1101-TX / WVM1101-RX  
*EUT* : Wireless Video Module  
*Test Mode* : 802.11a(CH01)  
*Test Date* : 04/13/2006

Radiated Emissions (HORIZONTAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
3275.0	33.88 PK	1	260	0	9.54	24.34	74.00	-49.66
6215.0	39.68 PK	1	320	0	9.54	30.14	74.00	-43.86
7146.0	44.39 PK	1	200	0	9.54	34.85	74.00	-39.15
8279.0	46.36 PK	1	270	0	9.54	36.82	74.00	-37.18
10349.0	53.31 PK	1	290	0	9.54	43.77	74.00	-30.23
15542.0	46.27 PK	1	310	0	9.54	36.73	74.00	-37.27

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 1 Meter (1G-26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Dis= Distance extrapolation factor.

7.Amplitude= Reading Amplitude – Amplifier gain+ Cable loss  
+Antenna factor

(Auto calculate in spectrum analyzer)

8.Actual Amp= Amplitude – Duty – Dis.

9.The other emission levels were very low against the limit.





Applicant : TURBOCOMM TECH.INC.  
Model No : WVM1101-TX / WVM1101-RX  
EUT : Wireless Video Module  
Test Mode : 802.11a(CH01)  
Test Date : 04/13/2006

Radiated Emissions (VERTICAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1595.0	40.37 PK	1	270	0	9.54	30.83	74.00	-43.17
4136.0	43.02 PK	1	280	0	9.54	33.48	74.00	-40.52
5340.0	53.92 PK	1	100	0	9.54	44.38	74.00	-29.62
6215.0	52.08 PK	1.2	320	0	9.54	42.54	74.00	-31.46
8279.0	50.62 PK	1	120	0	9.54	41.08	74.00	-32.92
10349.0	52.80 PK	1	260	0	9.54	43.26	74.00	-30.74
15542.0	46.41 PK	1	70	0	9.54	36.87	74.00	-37.13

FCC ID: N7ZWVM-1101

### 3.6.5 Open Field Radiated Emissions

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

*Applicant* : TURBOCOMM TECH.INC.  
*Model No* : WVM1101-TX / WVM1101-RX  
*EUT* : Wireless Video Module  
*Test Mode* : 802.11a (CH04)  
*Test Date* : 04/13/2006

Radiated Emissions (HORIZONTAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1595.0	34.63 PK	1.1	200	0	9.54	25.09	74.00	-48.91
3121.0	34.28 PK	1	60	0	9.54	24.74	74.00	-49.26
4192.0	36.59 PK	1	270	0	9.54	27.05	74.00	-46.95
8387.0	46.54 PK	1	250	0	9.54	37.00	74.00	-37.00
10475.0	49.25 PK	1	140	0	9.54	39.71	74.00	-34.29
14030.0	43.13 PK	1	130	0	9.54	33.59	74.00	-40.41

- Notes :
- 1.Margin= Amplitude - Limits
  - 2.Distance of Measurement : 1 Meter (1G-26.5GHz)
  - 3.Height of table for EUT placed: 0.8 Meter.
  - 4.ANT= Antenna height.
  - 5.Duty= Duty cycle correction factor.
  - 6.Dis= Distance extrapolation factor.
  - 7.Amplitude= Reading Amplitude – Amplifier gain+ Cable loss  
+Antenna factor  
(Auto calculate in spectrum analyzer)
  - 8.Actual Amp= Amplitude – Duty – Dis.
  - 9.The other emission levels were very low against the limit.

### 3.6.6 Open Field Radiated Emissions

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

*Applicant* : TURBOCOMM TECH.INC.  
*Model No* : WVM1101-TX / WVM1101-RX  
*EUT* : Wireless Video Module  
*Test Mode* : 802.11a (CH04)  
*Test Date* : 04/13/2006

Radiated Emissions (VERTICAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1595.0	40.03 PK	1	280	0	9.54	30.49	74.00	-43.51
4192.0	42.27 PK	1	170	0	9.54	32.73	74.00	-41.27
5410.0	52.77 PK	1	220	0	9.54	43.23	74.00	-30.77
6285.0	45.40 PK	1.1	260	0	9.54	35.86	74.00	-38.14
8387.0	51.20 PK	1	100	0	9.54	41.66	74.00	-32.34
10475.0	49.00 PK	1	200	0	9.54	39.46	74.00	-34.54
15704.0	45.37 PK	1	70	0	9.54	35.83	74.00	-38.17

Notes : 1.Margin= Amplitude - Limits

2.Distance of Measurement : 1 Meter (1G-26.5GHz)

3.Height of table for EUT placed: 0.8 Meter.

4.ANT= Antenna height.

5.Duty= Duty cycle correction factor.

6.Dis= Distance extrapolation factor.

7.Amplitude= Reading Amplitude – Amplifier gain+ Cable loss  
+Antenna factor

(Auto calculate in spectrum analyzer)

8.Actual Amp= Amplitude – Duty – Dis.

9.The other emission levels were very low against the limit.



Applicant : TURBOCOMM TECH.INC.  
Model No : WVM1101-TX / WVM1101-RX  
EUT : Wireless Video Module  
Test Mode : 802.11a (CH05)  
Test Date : 04/13/2006

Radiated Emissions (HORIZONTAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
3121.0	33.39 PK	1	220	0	9.54	23.85	74.00	-50.15
4206.0	37.01 PK	1	250	0	9.54	27.47	74.00	-46.53
7111.0	43.02 PK	1	160	0	9.54	33.48	74.00	-40.52
8414.0	45.44 PK	1	170	0	9.54	35.90	74.00	-38.10
10520.0	46.28 PK	1	300	0	9.54	36.74	74.00	-37.26
13877.0	42.91 PK	1	270	0	9.54	33.37	74.00	-40.63
15785.0	41.19 PK	1	270	0	9.54	31.65	74.00	-42.35

FCC ID: N7ZWVM-1101



Applicant : TURBOCOMM TECH.INC.  
Model No : WVM1101-TX / WVM1101-RX  
EUT : Wireless Video Module  
Test Mode : 802.11a (CH05)  
Test Date : 04/13/2006

Radiated Emissions (VERTICAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1441.0	38.45 PK	1	240	0	9.54	28.91	74.00	-45.09
4206.0	43.62 PK	1.1	100	0	9.54	34.08	74.00	-39.92
5340.0	53.53 PK	1	250	0	9.54	43.99	74.00	-30.01
5410.0	52.89 PK	1	80	0	9.54	43.35	74.00	-30.65
8414.0	50.68 PK	1	160	0	9.54	41.14	74.00	-32.86
10520.0	47.69 PK	1	200	0	9.54	38.15	74.00	-35.85
15785.0	42.98 PK	1	130	0	9.54	33.44	74.00	-40.56

*Notes :*

- 1.Margin= Amplitude - Limits
- 2.Distance of Measurement : 1 Meter (1G-26.5GHz)
- 3.Height of table for EUT placed: 0.8 Meter.
- 4.ANT= Antenna height.
- 5.Duty= Duty cycle correction factor.
- 6.Dis= Distance extrapolation factor.
- 7.Amplitude= Reading Amplitude – Amplifier gain+ Cable loss  
+Antenna factor  
(Auto calculate in spectrum analyzer)
- 8.Actual Amp= Amplitude – Duty – Dis.
- 9.The other emission levels were very low against the limit.



Applicant : TURBOCOMM TECH. INC.  
Model No : WVM1101-TX / WVM1101-RX  
EUT : Wireless Video Module  
Test Mode : 802.11a (CH08)  
Test Date : 04/13/2006

Radiated Emissions (HORIZONTAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
3121.0	34.18 PK	1	100	0	9.54	24.64	74.00	-49.36
4255.0	38.44 PK	1	120	0	9.54	28.90	74.00	-45.10
8504.0	46.66 PK	1	240	0	9.54	37.12	74.00	-36.88
10637.0	42.32 PK	1	160	0	9.54	32.78	74.00	-41.22
13247.0	41.45 PK	1	300	0	9.54	31.91	74.00	-42.09
14390.0	43.13 PK	1	290	0	9.54	33.59	74.00	-40.41
15965.0	43.94 PK	1	220	0	9.54	34.40	74.00	-39.60

9.The other emission levels were very low against the limit.



Applicant : TURBOCOMM TECH. INC.  
Model No : WVM1101-TX / WVM1101-RX  
EUT : Wireless Video Module  
Test Mode : 802.11a (CH08)  
Test Date : 04/13/2006

Radiated Emissions (VERTICAL)								
Frequency (MHz)	Amplitude (dBuV/m)	Ant. (m)	Table (Degree)	Duty (dB)	Dist (dB)	Actual Amp (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4255.0	45.71 PK	1	250	0	9.54	36.17	74.00	-37.83
5186.0	53.79 PK	1	280	0	9.54	44.25	74.00	-29.75
5410.0	53.40 PK	1	80	0	9.54	43.86	74.00	-30.14
6376.0	47.62 PK	1	160	0	9.54	38.08	74.00	-35.92
8504.0	50.35 PK	1.1	240	0	9.54	40.81	74.00	-33.19
10637.0	44.62 PK	1	220	0	9.54	35.08	74.00	-38.92
15965.0	42.94 PK	1	190	0	9.54	33.40	74.00	-40.60

Notes :

1. Margin = Amplitude - Limits
2. Distance of Measurement : 1 Meter (1G-26.5GHz)
3. Height of table for EUT placed: 0.8 Meter.
4. ANT = Antenna height.
5. Duty = Duty cycle correction factor.
6. Dis = Distance extrapolation factor.
7. Amplitude = Reading Amplitude - Amplifier gain + Cable loss  
+ Antenna factor  
(Auto calculate in spectrum analyzer)
8. Actual Amp = Amplitude - Duty - Dis.
9. The other emission levels were very low against the limit.

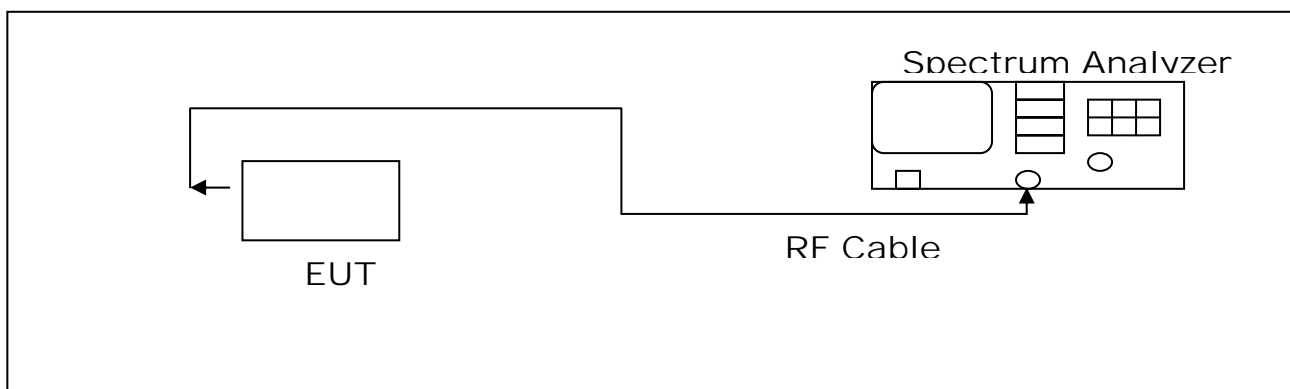
## IV. 802.11a 5150MHz – 5350MHz

### 1. Emission bandwidth Requirements

#### 1.1 Test Limit & Setup :

15.403 (c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

#### 1.2 Test Instruments Configuration:



#### 1.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01





# MAX LIGHT

## MEASUREMENT REPORT

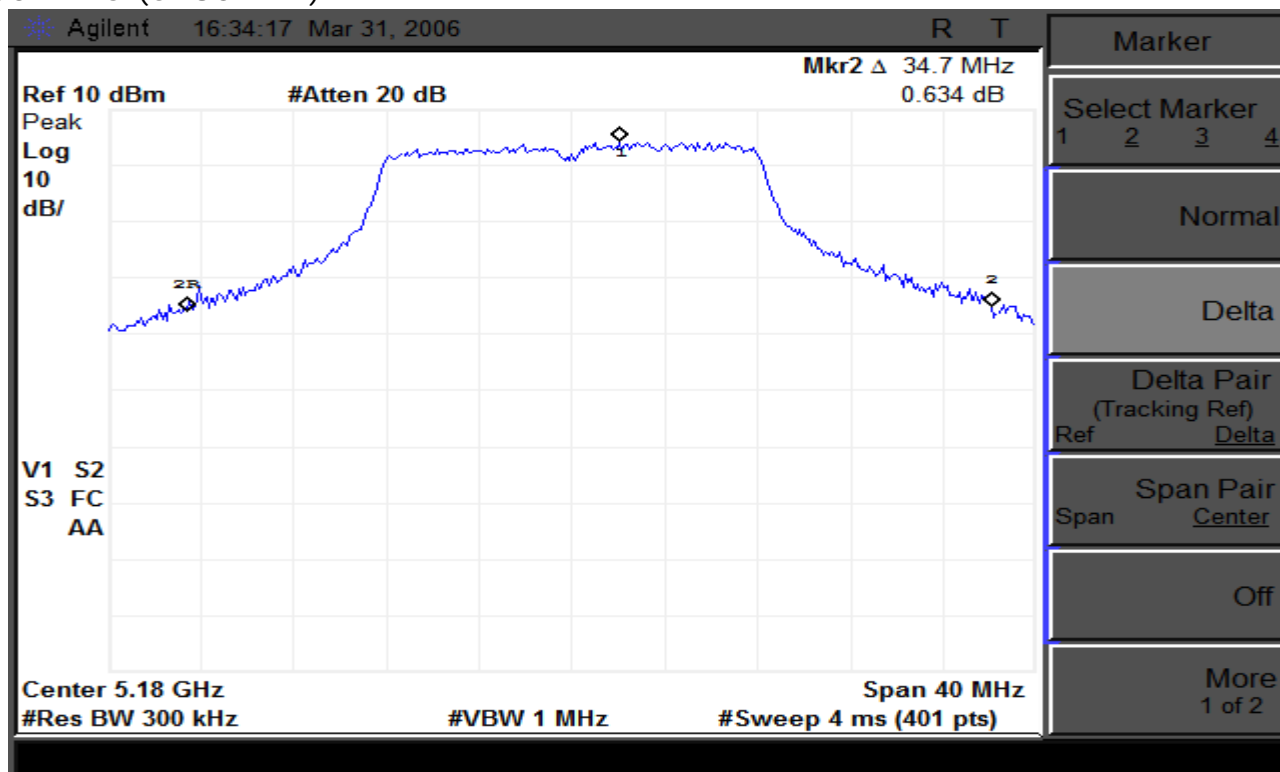
Page: 33/56

### 1.4 Test Result:

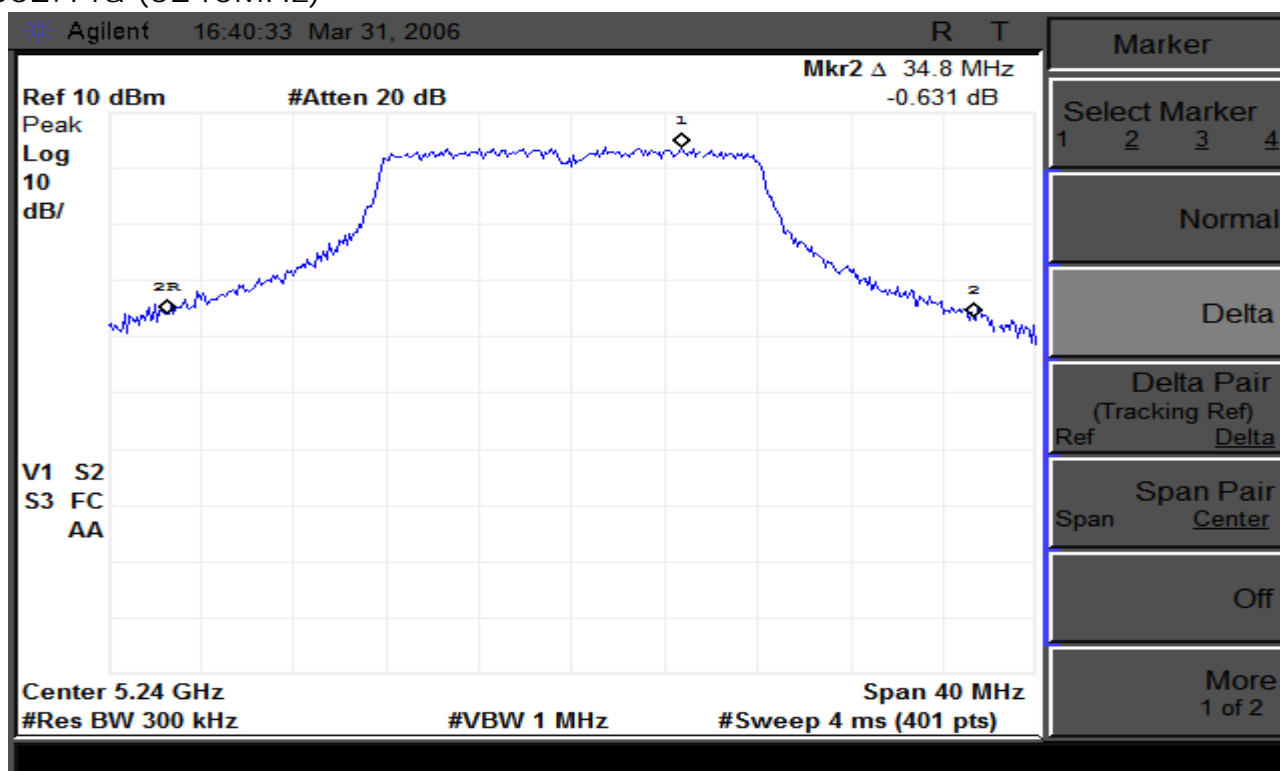
Frequency (MHz)	26dBc Occupied Bandwidth (MHz)	10 log B ( dB )
5180	34.7	15.40
5240	34.8	15.41
5260	33.1	15.19
5320	32.6	15.13

*Note :Test Graphs See next page.*

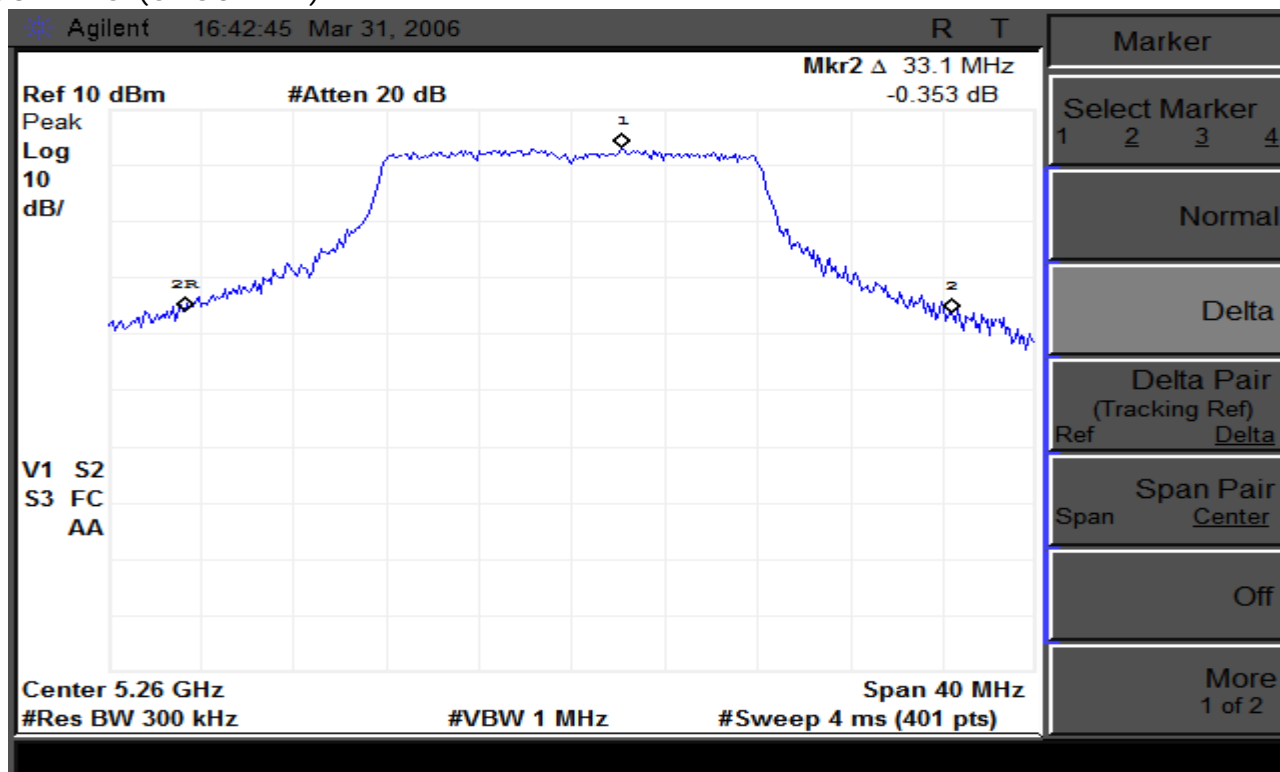
802.11a (5180MHz)



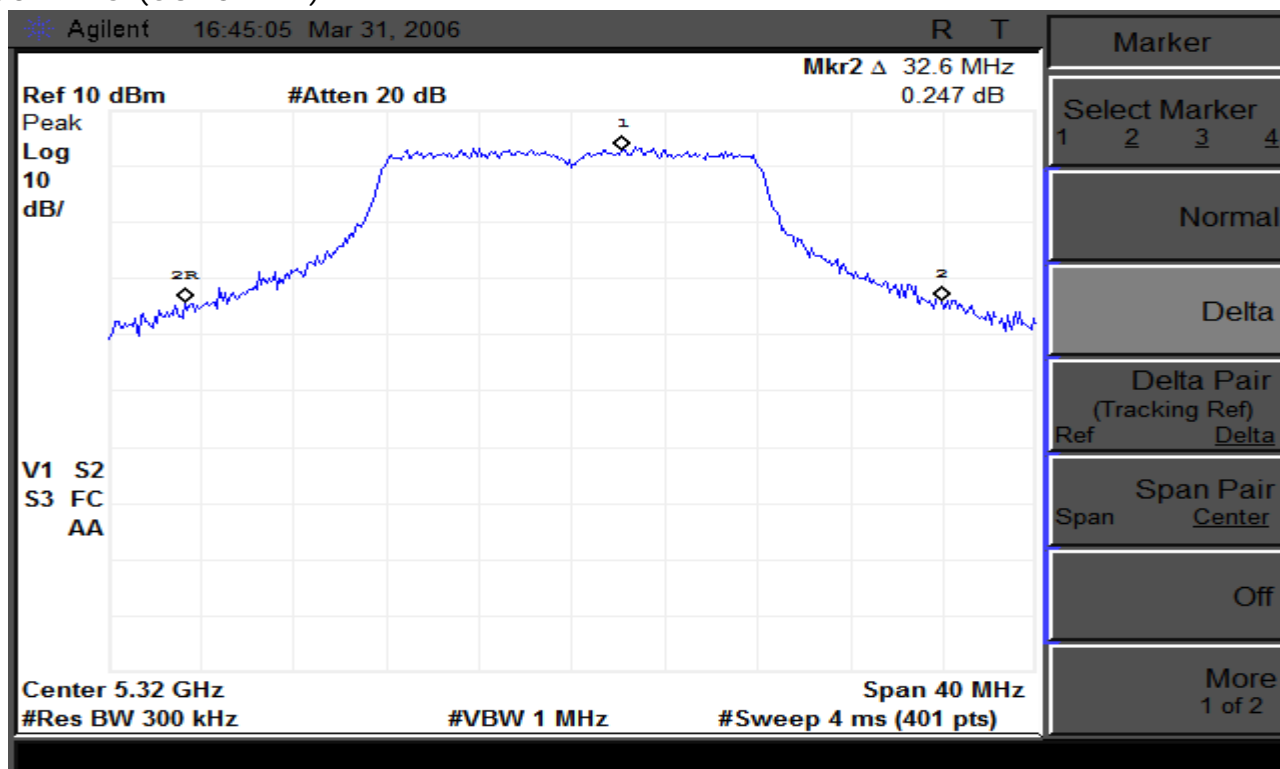
802.11a (5240MHz)



802.11a (5260MHz)



802.11a (5320MHz)



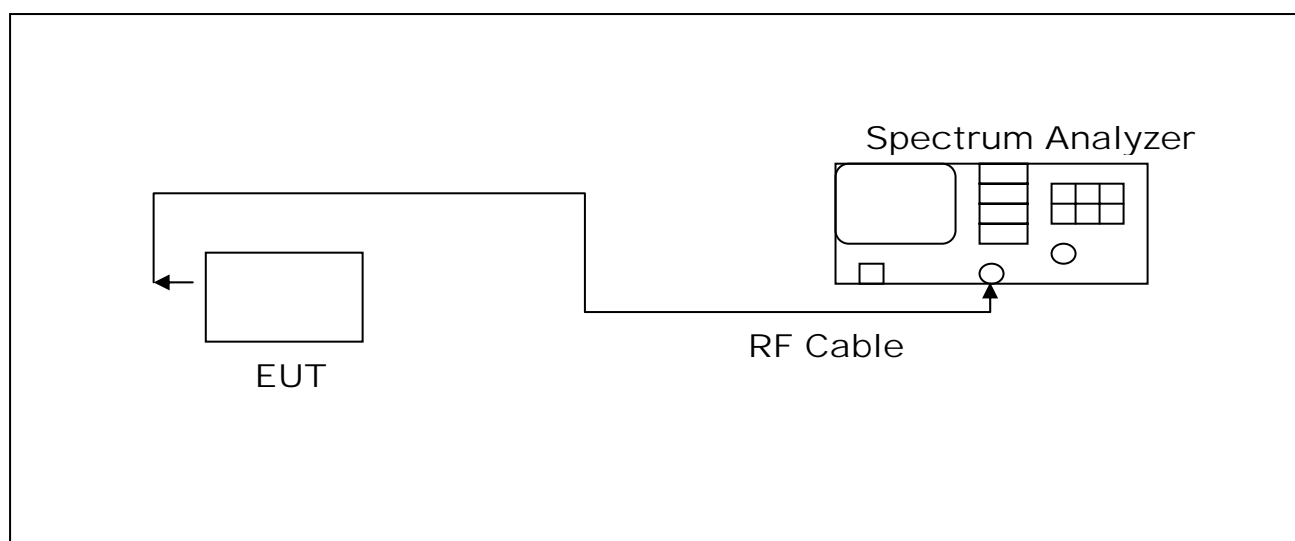
## 2. Peak Transmit Power Requirements

### 2.1 Test Limit & Setup :

15.407(a) (1) For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW (17dBm) or  $4 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

15.407(a) (2) For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW (24dBm) or  $11 \text{ dBm} + 10 \log B$ , where B is the 26-dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 2.2 Test Instruments Configuration:



### 2.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01

#### Limit in 5150MHz – 5250MHz Band

Frequency ( MHz )	26dBc Occupied Bandwidth (MHz)	4 + 10 log B ( dBm )	Antenna Gain ( dBm )	Limit ( dBm )
5180	34.7	19.40	4.0	17
5240	34.8	19.41	4.0	17

#### Limit in 5250MHz – 5350MHz Band

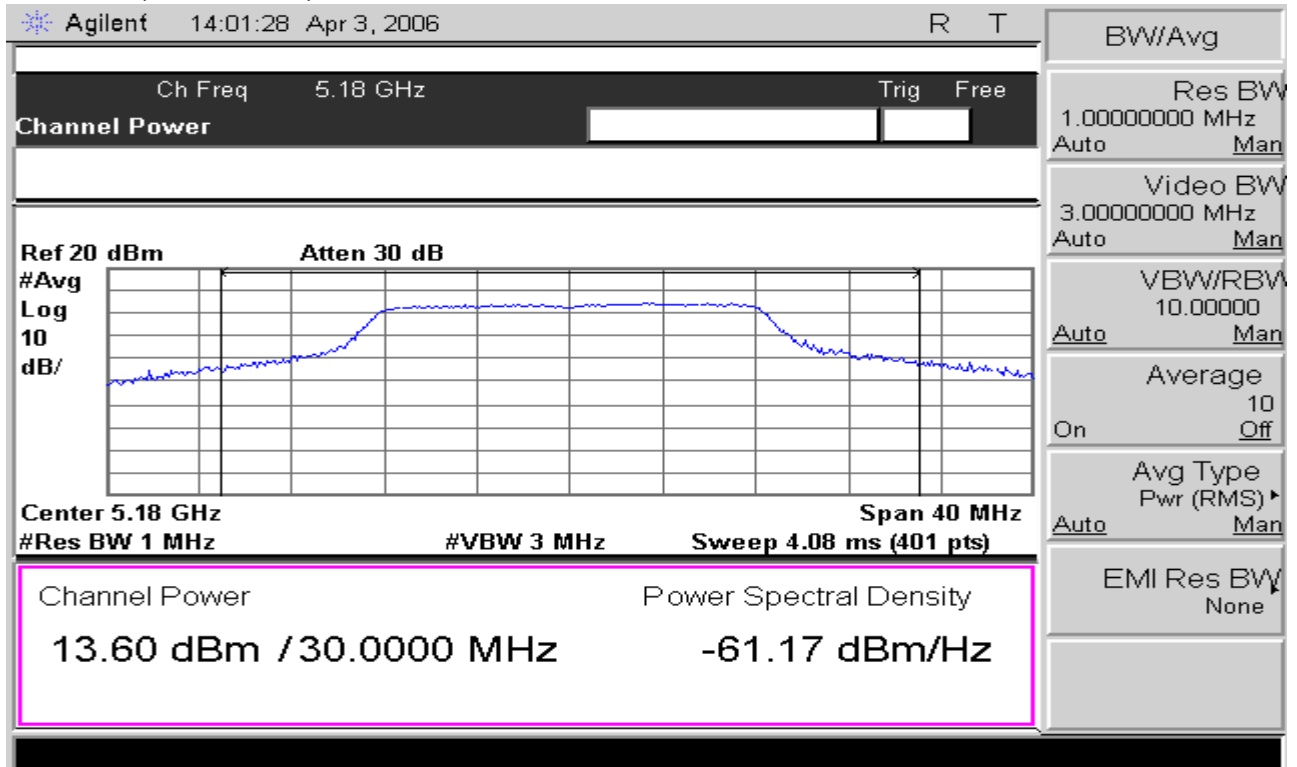
Frequency ( MHz )	26dBc Occupied Bandwidth (MHz)	11 + 10 log B ( dBm )	Antenna Gain ( dBi )	Limit ( dBm )
5260	33.1	26.19	4.0	24
5320	32.6	26.13	4.0	24

### 2.4 Test Result:

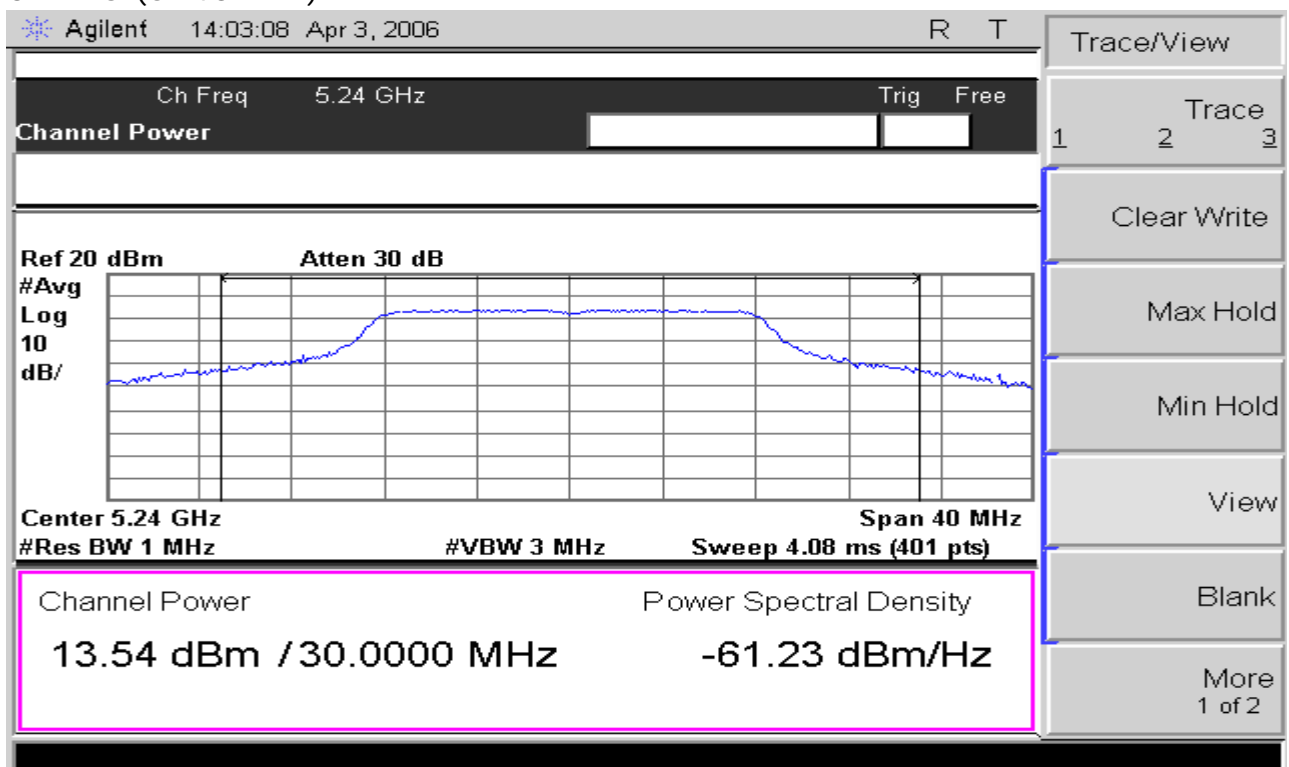
Frequency (MHz)	Output(dBm)	Required Limit
5180	13.60	17.0dBm
5240	13.54	17.0dBm
5260	13.02	24.0dBm
5320	13.29	24.0dBm

*Note : Test Graphs See next page.*

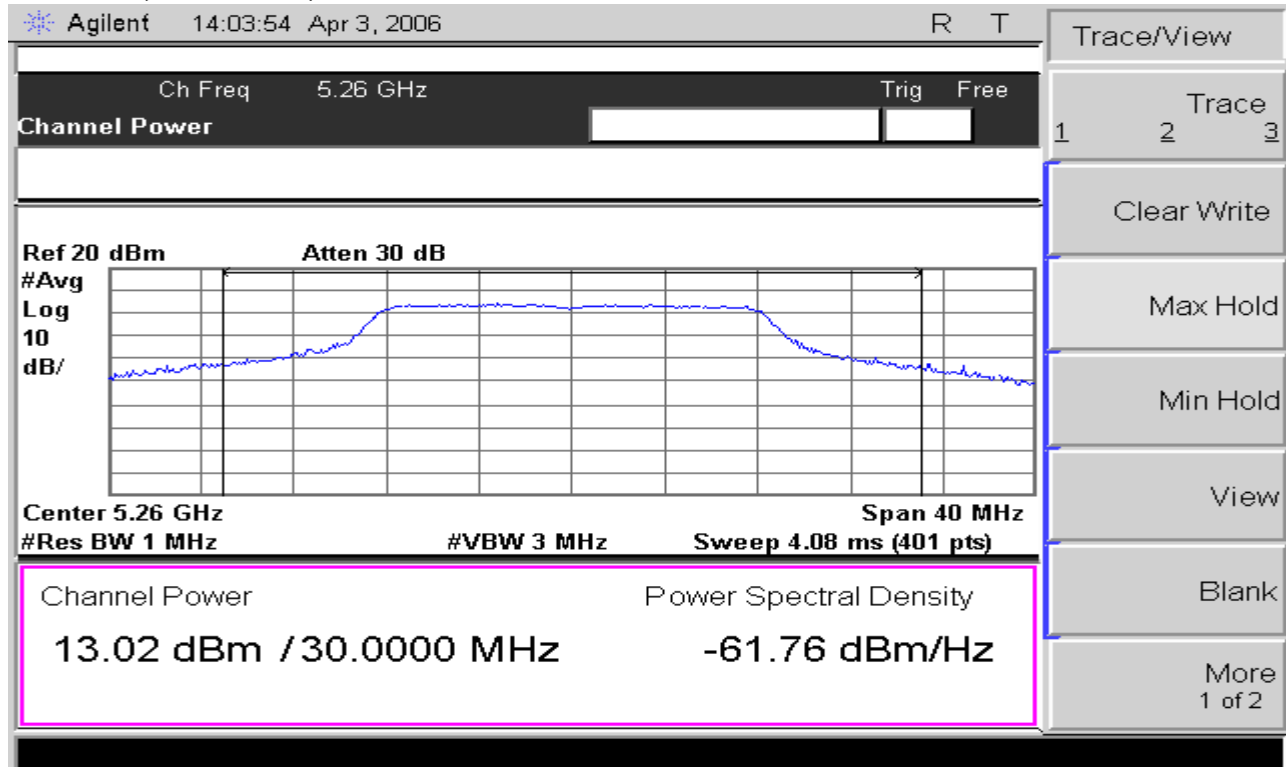
802.11a (5180MHz)



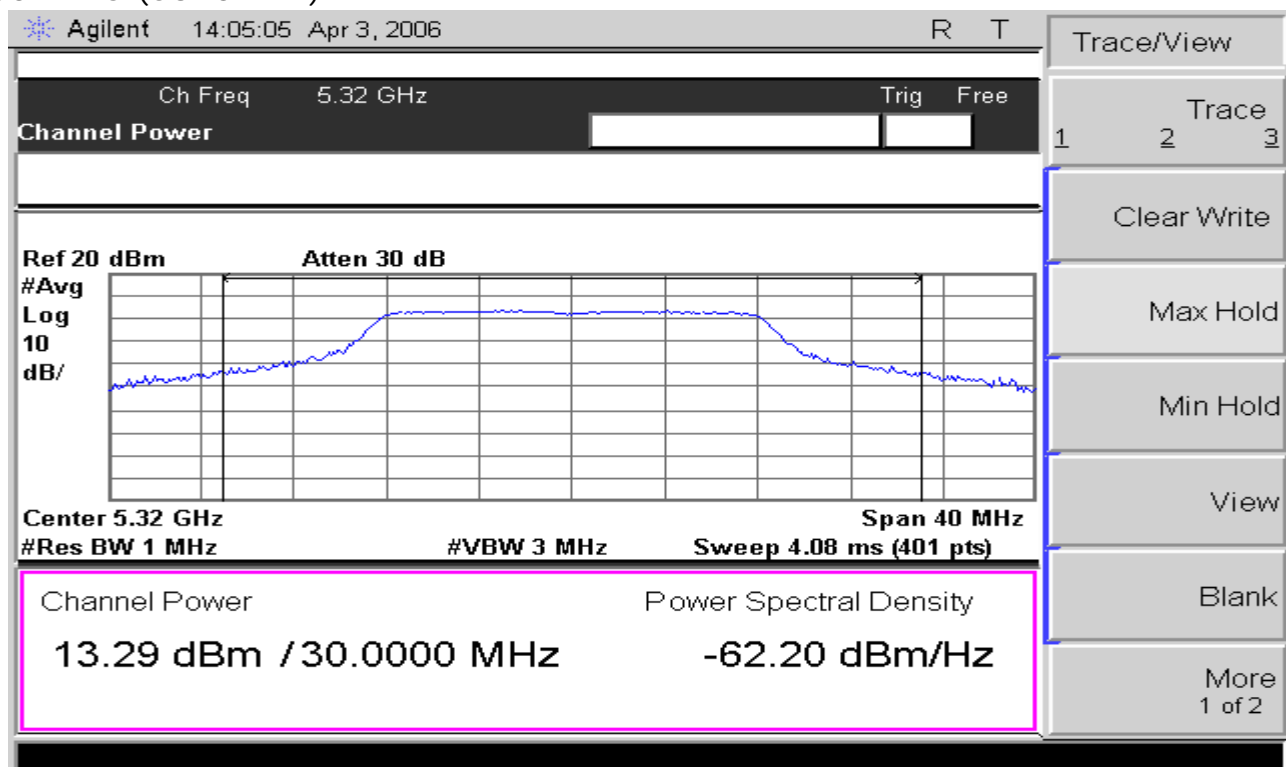
802.11a (5240MHz)



802.11a (5260MHz)



802.11a (5320MHz)

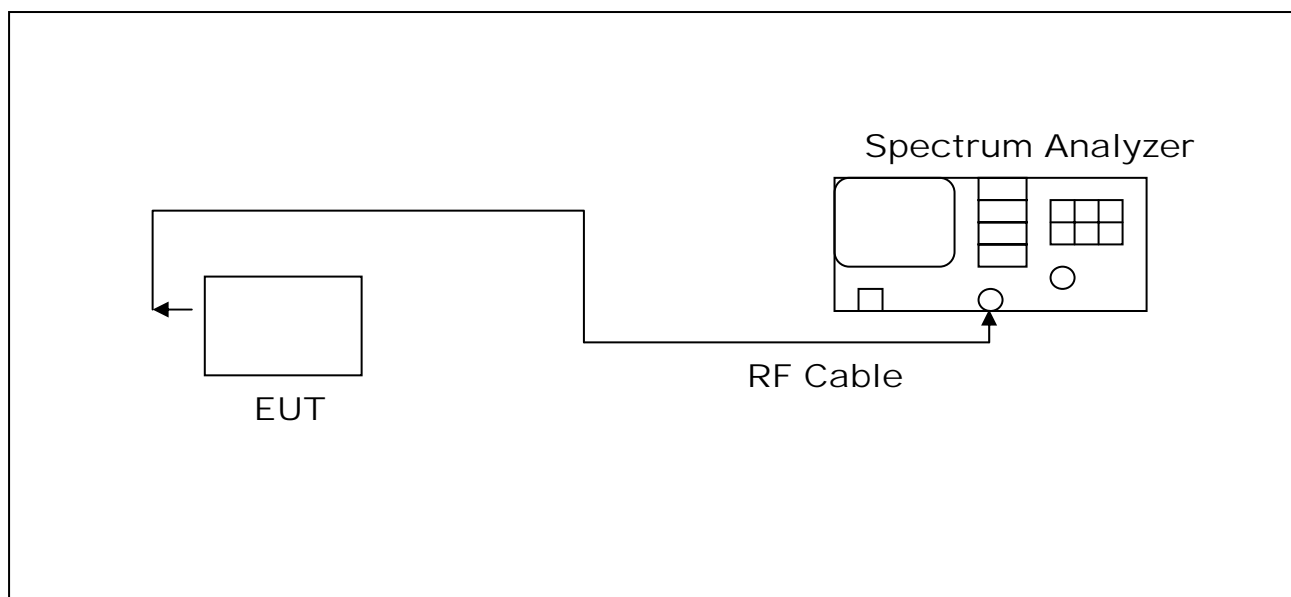


### 3. Peak Power Spectral Density Requirements

#### 3.1 Test Limit & Setup :

Frequency Band (MHz)	Required Limit
5150 - 5250	4dBm
5250 - 5350	11dBm
5725 - 5825	17dBm

#### 3.2 Test Instruments Configuration:



#### 3.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01



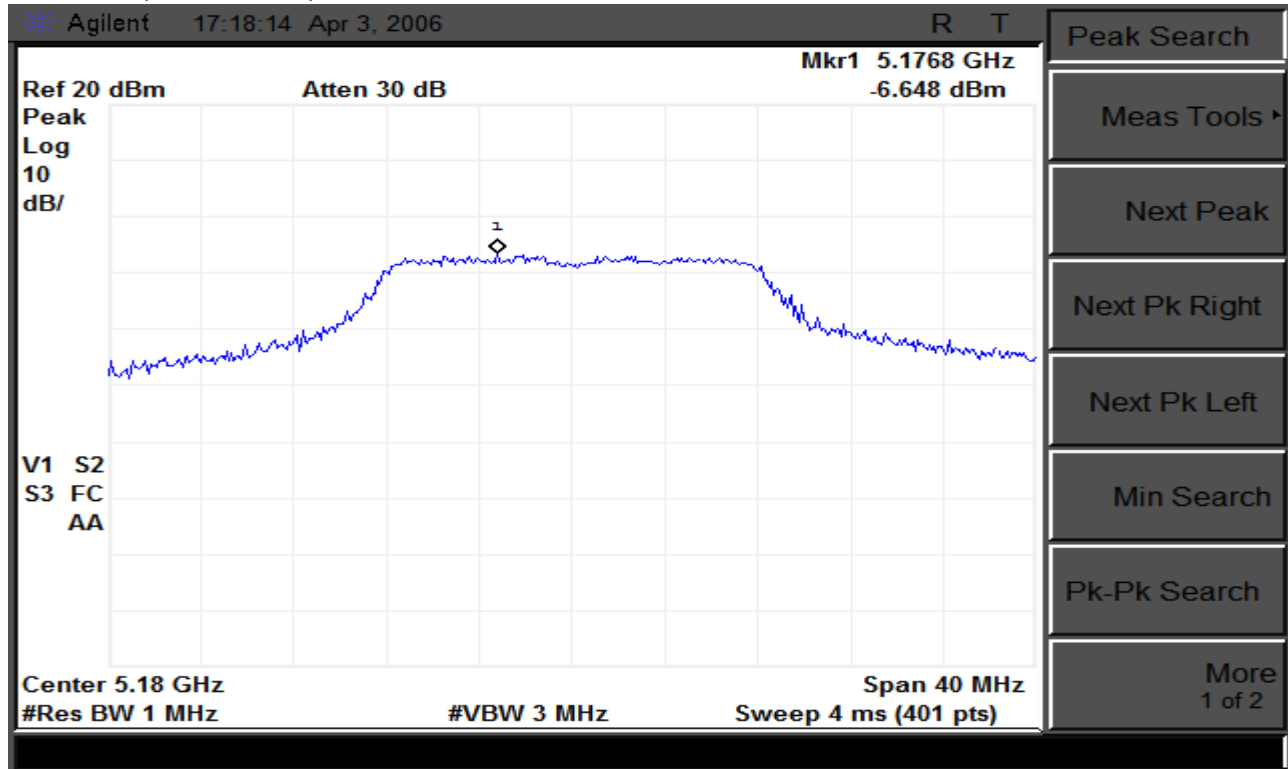


3.4 Test Result:

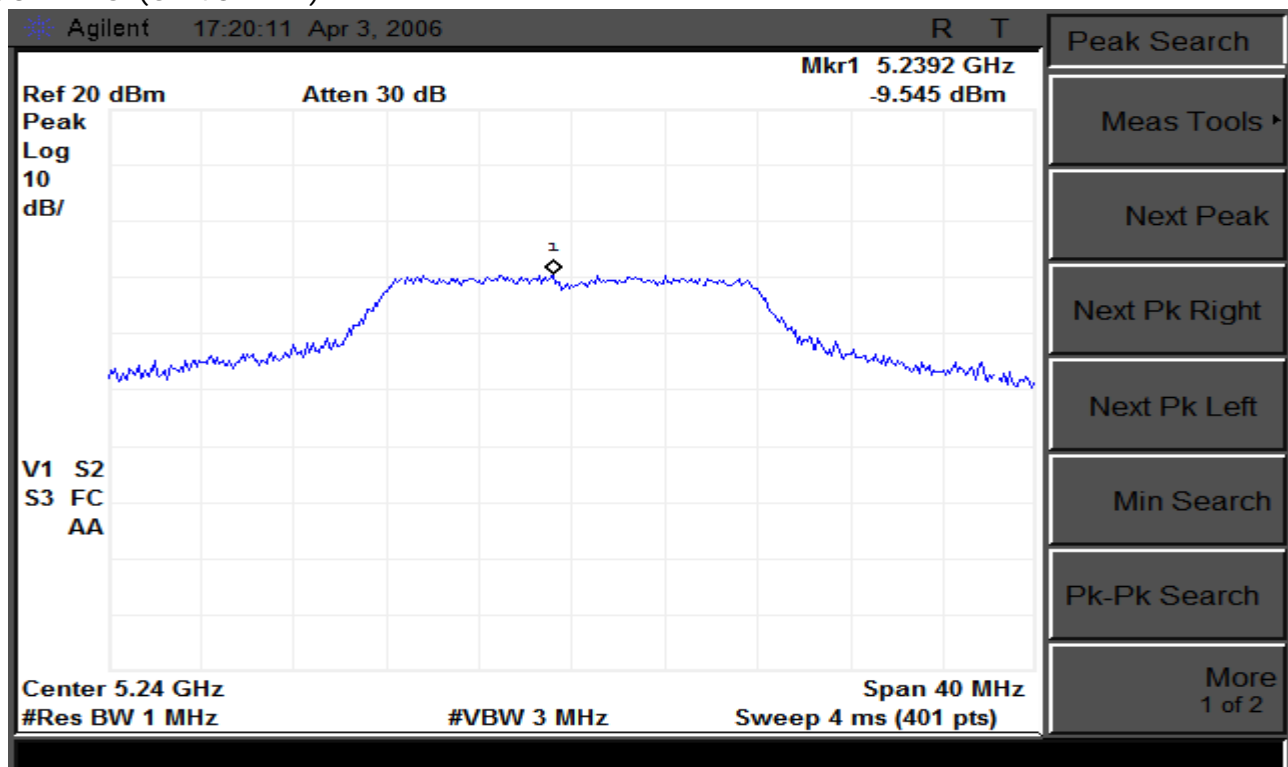
Frequency (MHz)	RF Power Level in 1MHz RBW ( dBm )	Required Limit
5180	-6.648	$\leq 4\text{dBm}$
5240	-9.545	$\leq 4\text{dBm}$
5260	-10.08	$\leq 11\text{dBm}$
5320	-9.002	$\leq 11\text{dBm}$

*Note :Test Graphs See next page.*

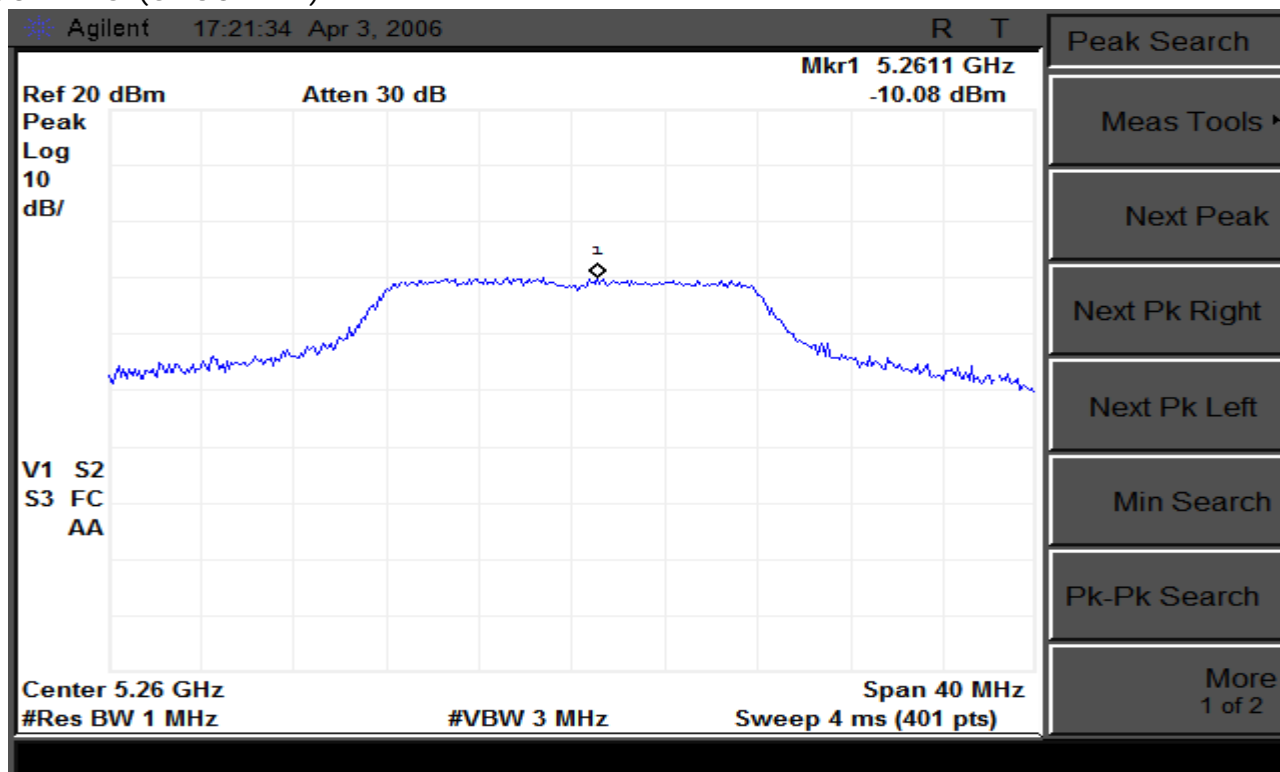
802.11a (5180MHz)



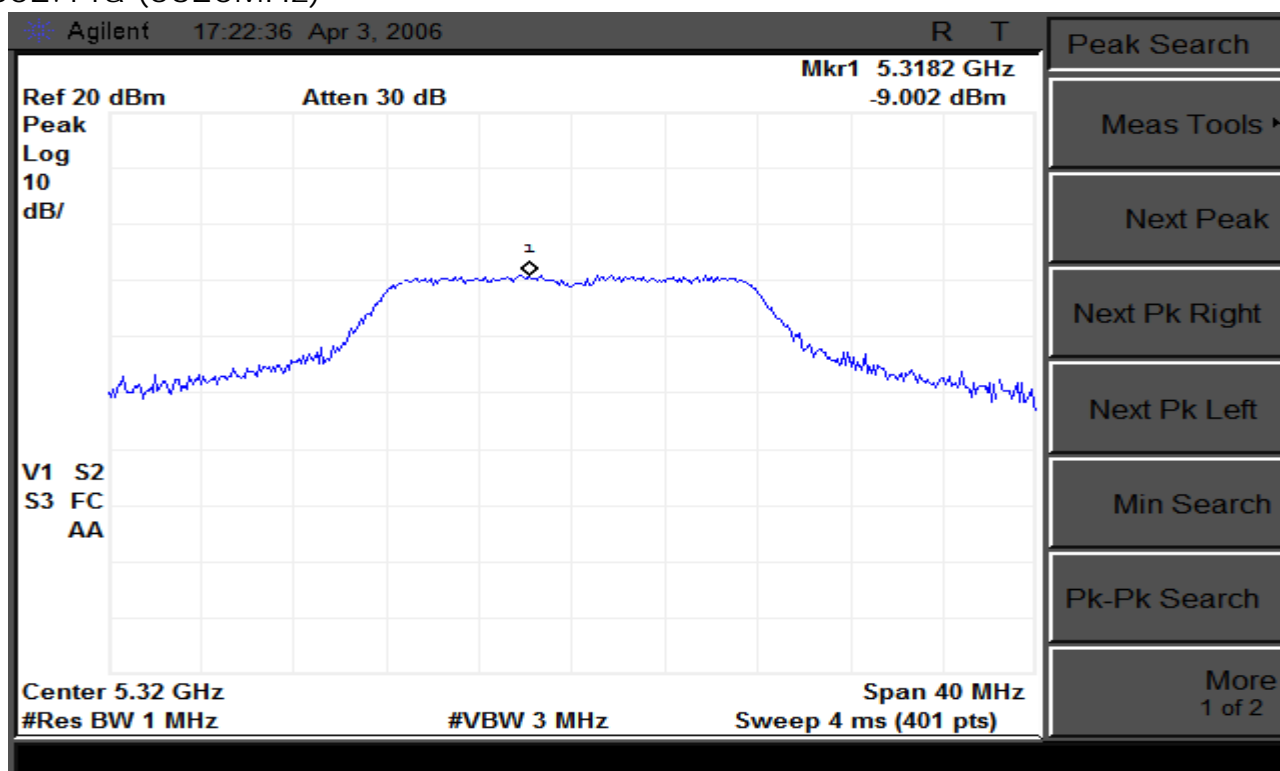
802.11a (5240MHz)



802.11a (5260MHz)



802.11a (5320MHz)



#### 4. Peak Excursion Requirements

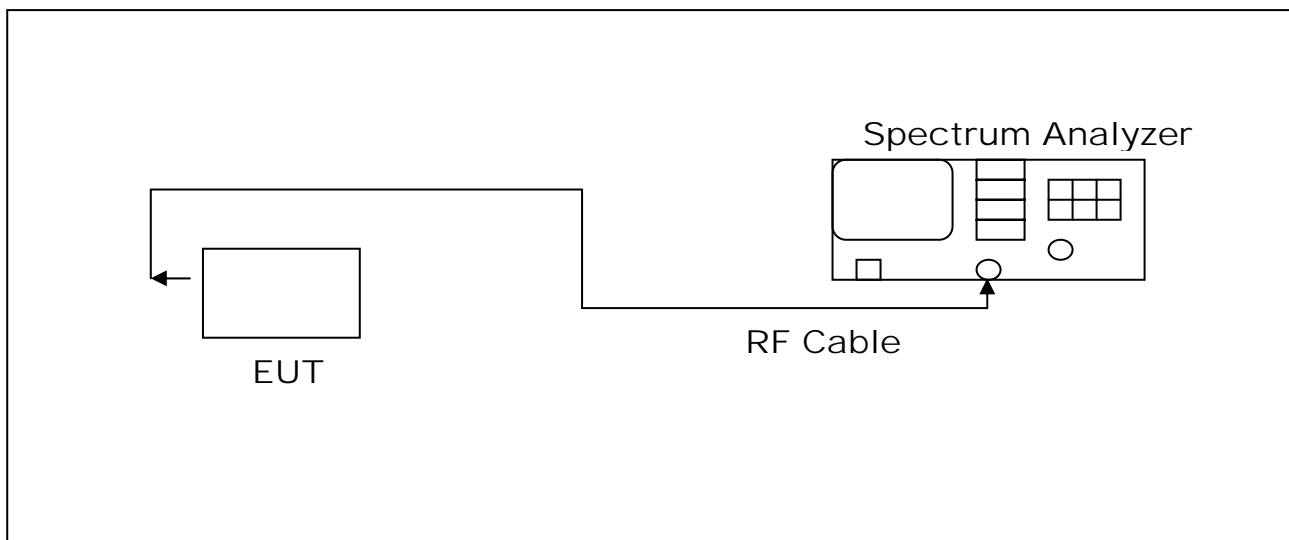
##### 4.1 Test Limit & Setup :

15.407 (a) (6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Spectrum Analyzer Setting :

	RBW	VBW
Trace 1	1MHz	3MHz
Trace 2	1MHz	300KHz

##### 4.2 Test Instruments Configuration:



##### 4.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01



# MAX LIGHT

## MEASUREMENT REPORT

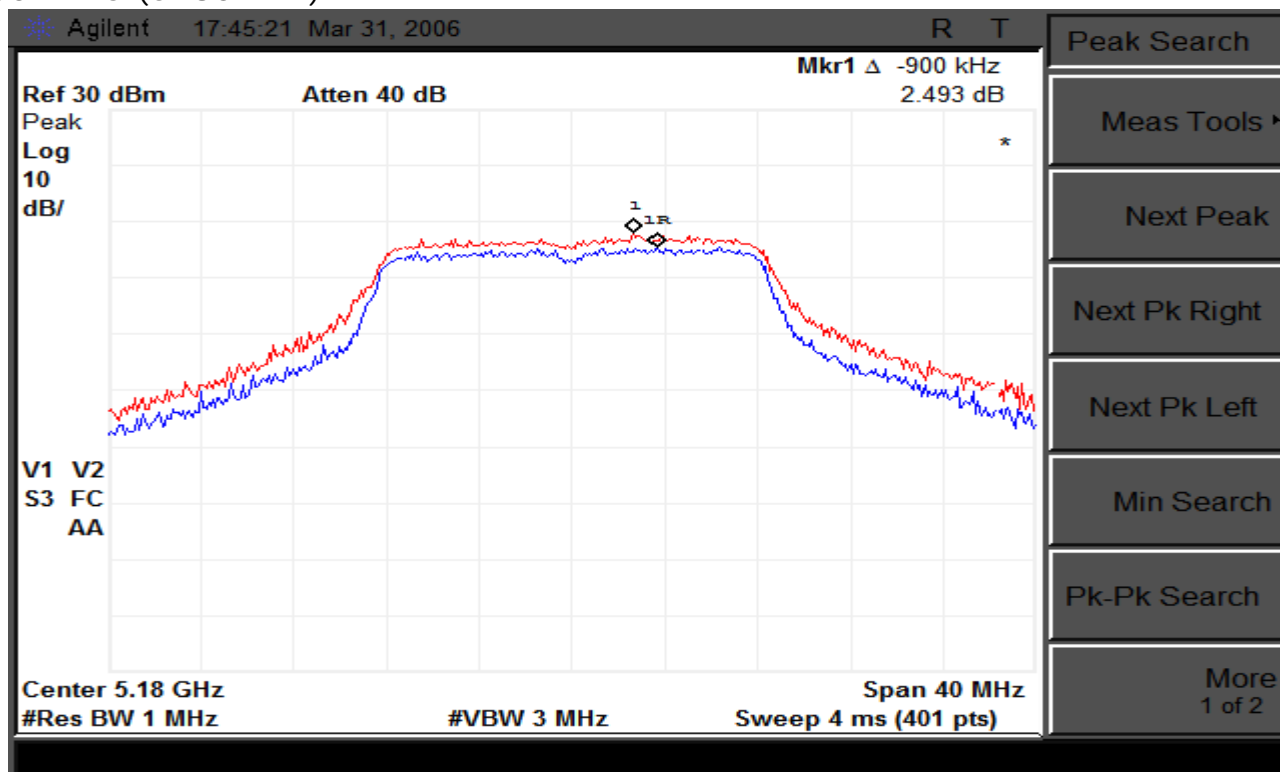
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### 4.4 Test Result:

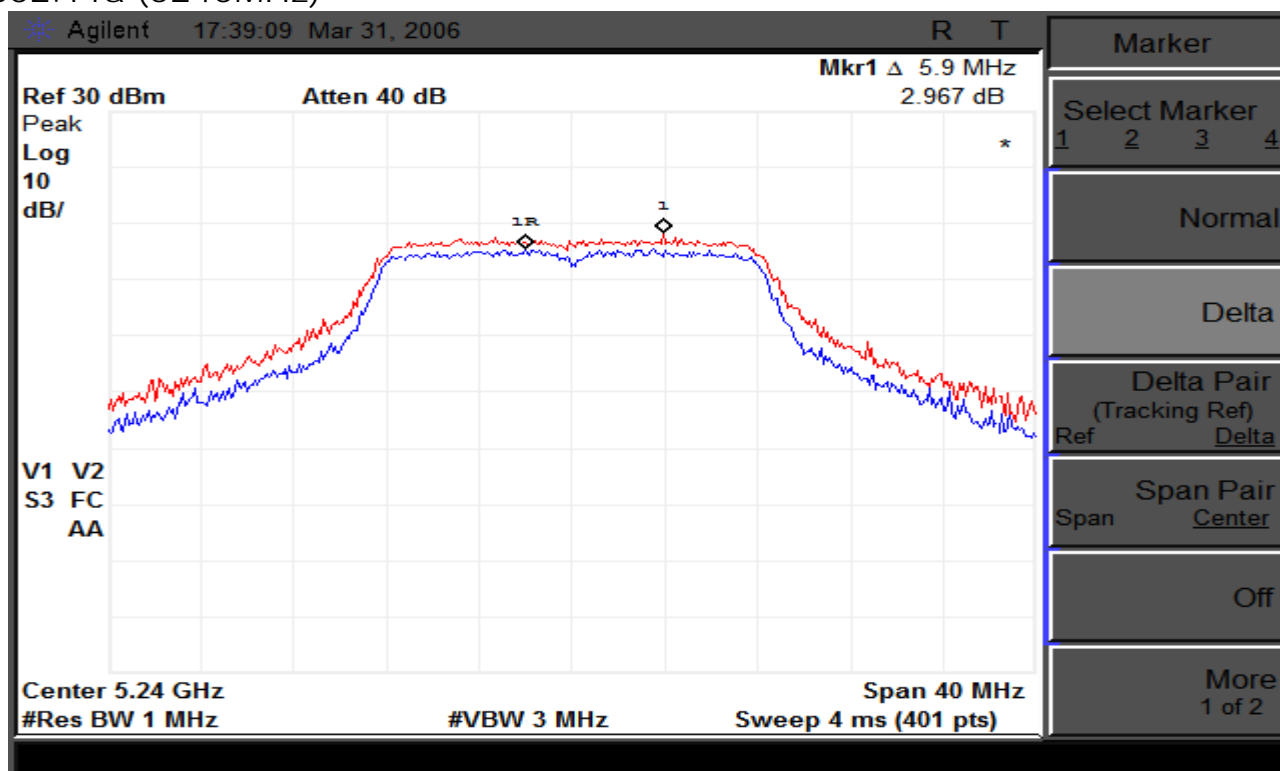
Frequency (MHz)	Peak Excursion ( dB )	Required Limit
5180	2.493	<13dBm
5240	2.967	<13dBm
5260	2.623	<13dBm
5320	2.148	<13dBm

*Note :Test Graphs See next page.*

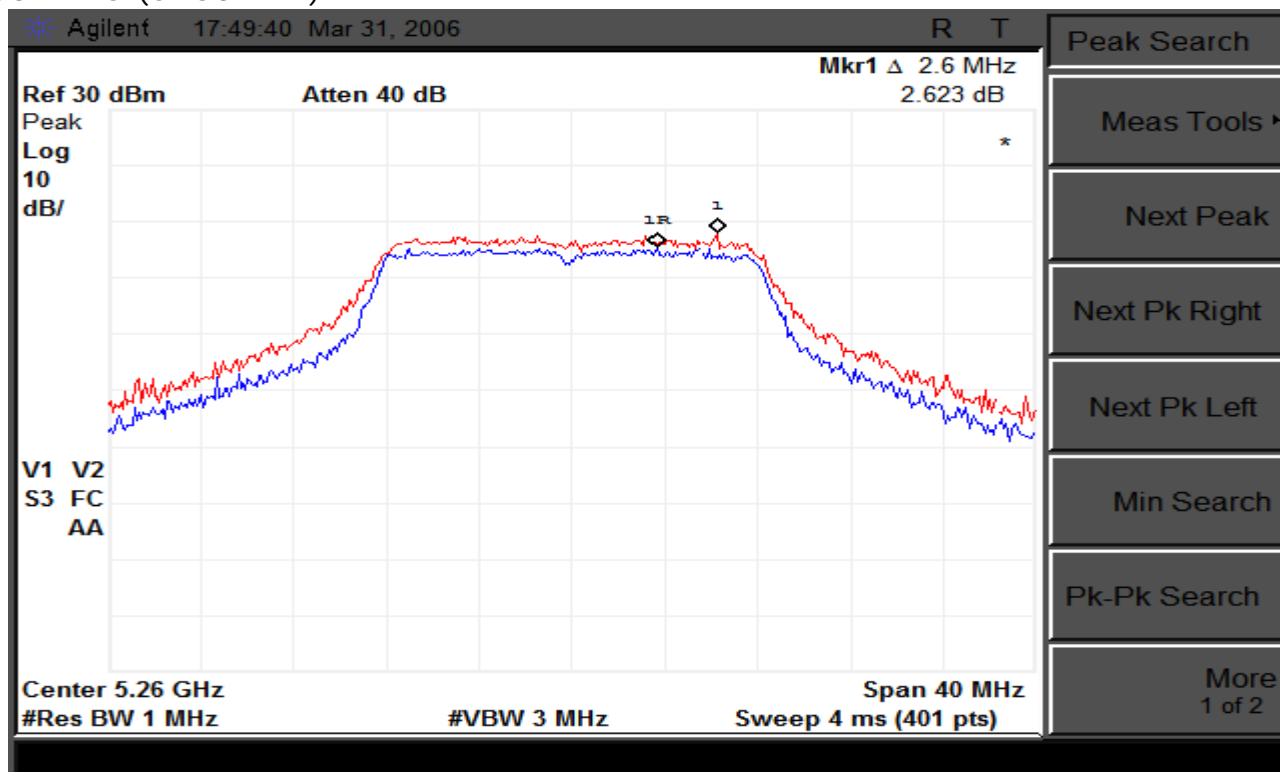
802.11a (5180MHz)



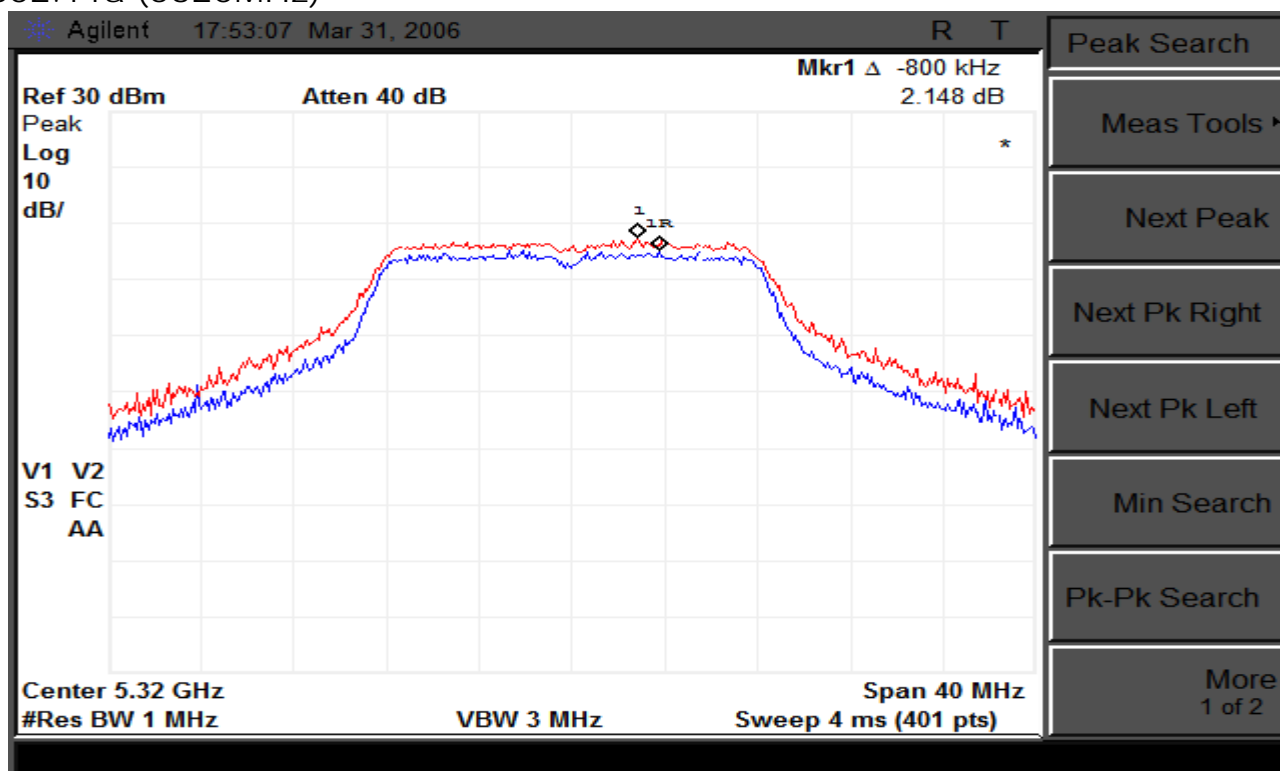
802.11a (5240MHz)



802.11a (5260MHz)



802.11a (5320MHz)



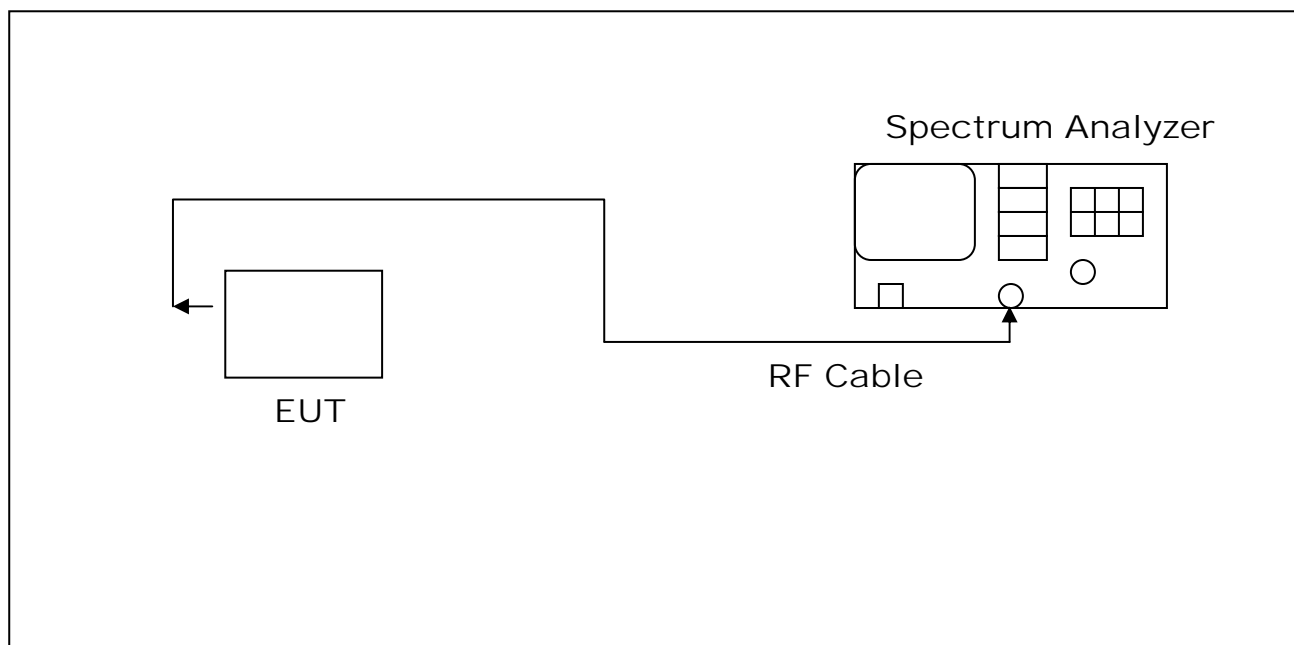


## *5. Band Edges Requirements*

### 5.1 Test Limit & Setup :

In (Peak = RBW set 1MHz and VRB set 1 MHz ) ; (Average = RBW set 1MHz and VRB set 10Hz ) bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band emission, antenna output of the EUT was coupled directly to spectrum analyzer; if an external attenuator and/or cable was used, these losses are compensated for with the analyzer OFFSET function.

### 5.2 Test Instruments Configuration:





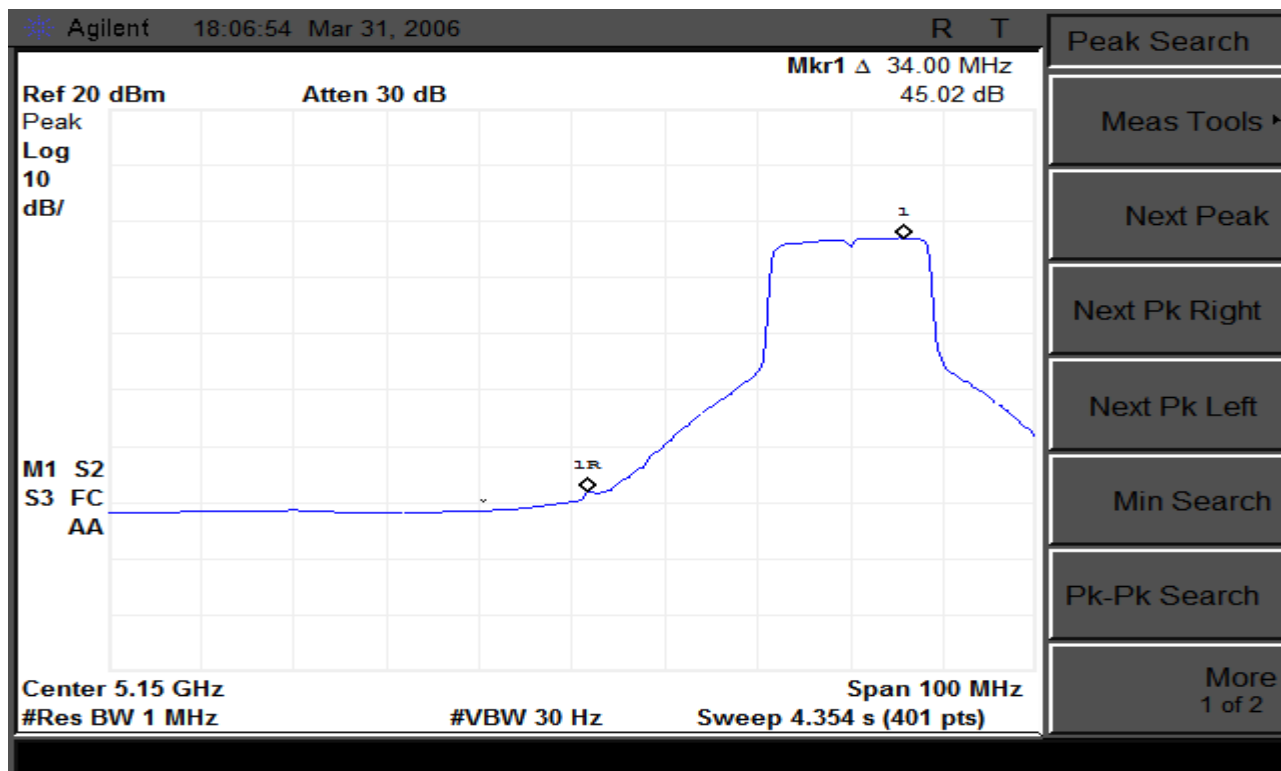
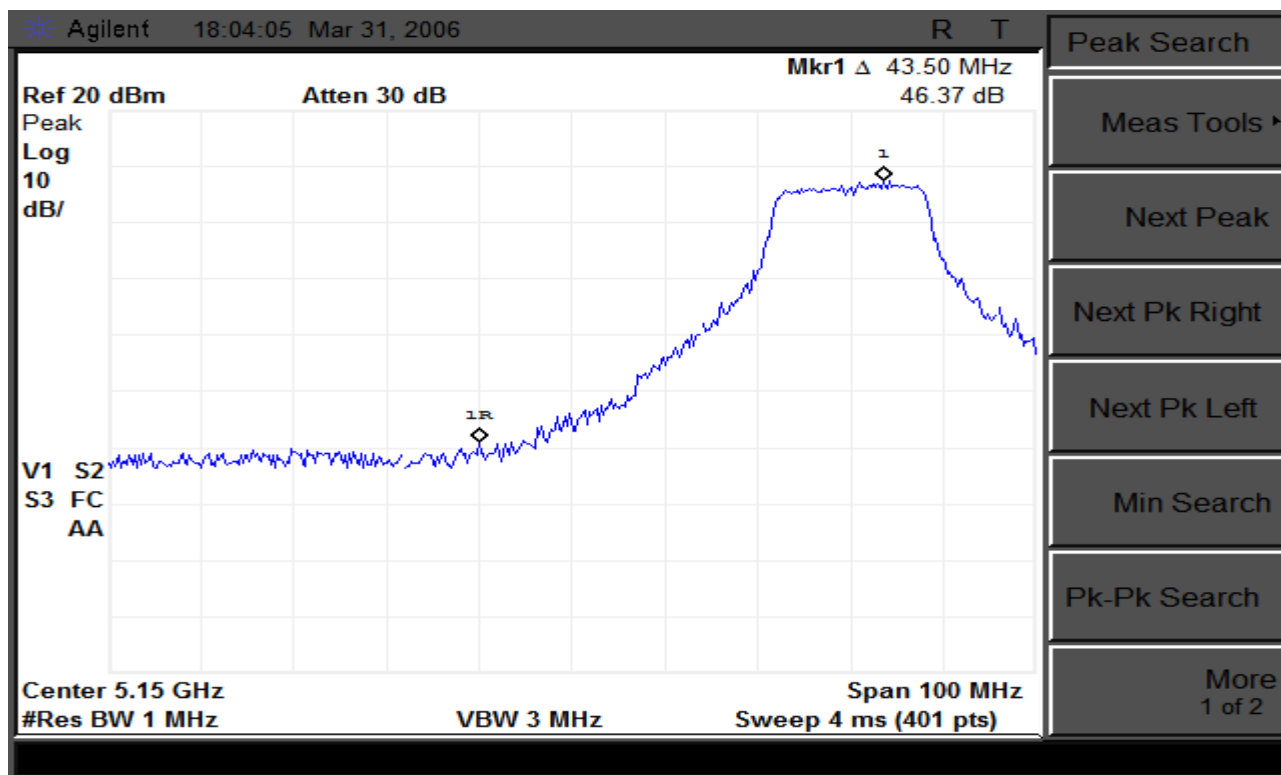
### 5.3 Test Equipment List:

<i>Item</i>	<i>Mfr/Brand</i>	<i>Instruments</i>	<i>Serial No.</i>	<i>Model/Type No.</i>	<i>Calibrated Date</i>	<i>Next Cali. Date</i>
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01
2.	Agilent	Spectrum Analyzer	US44300422	E4446A	2005/04/27	2006/04/27

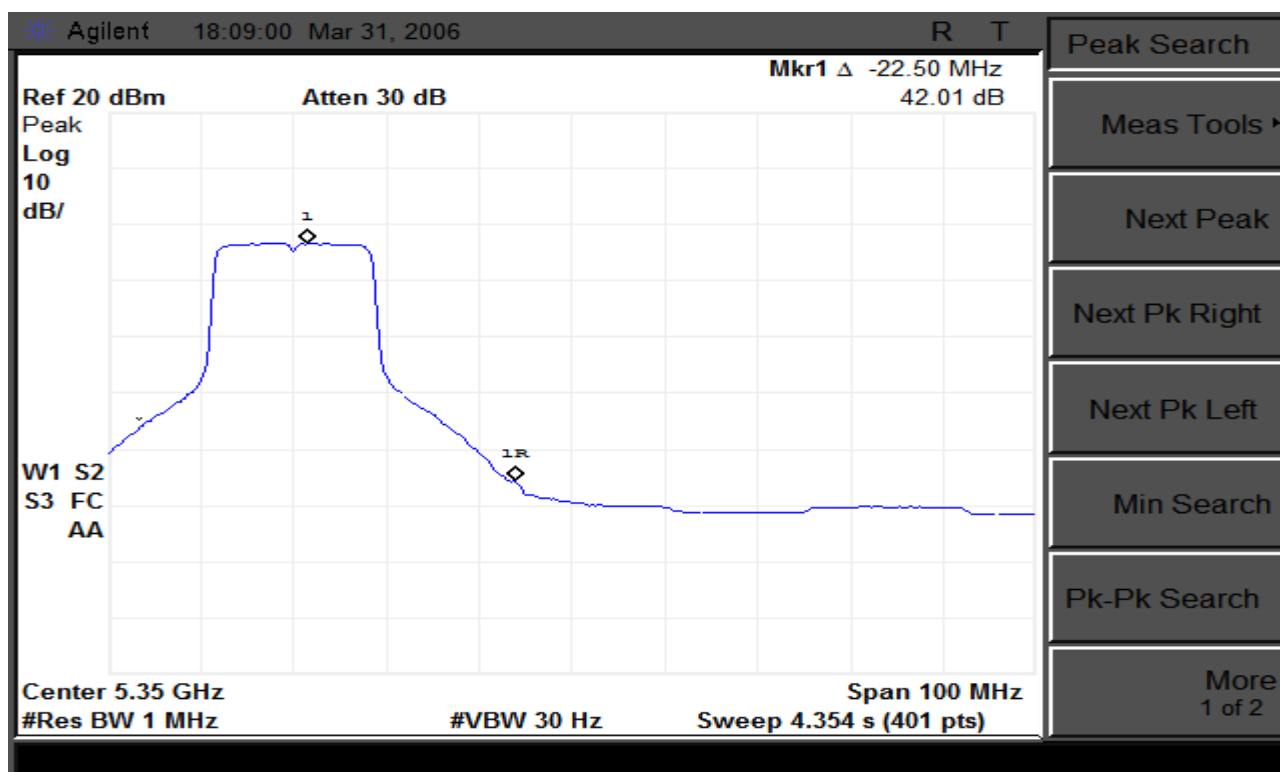
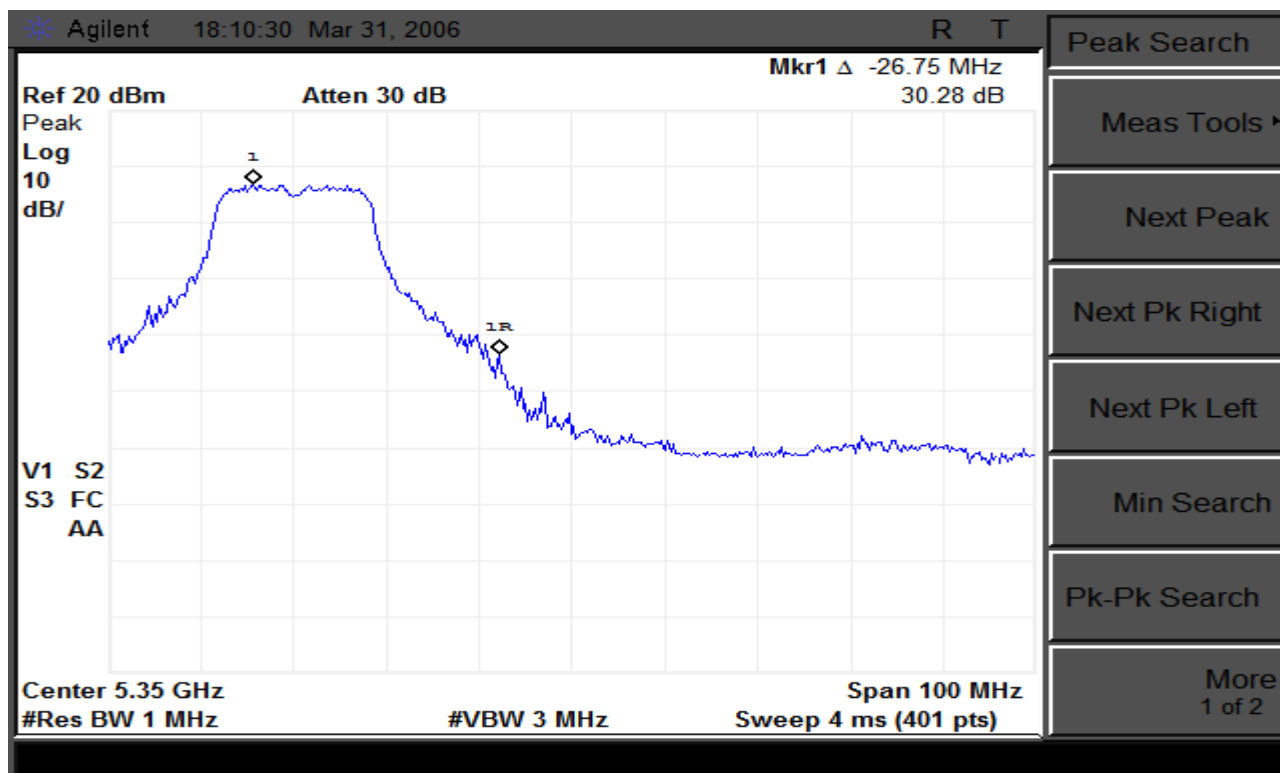
### 5.4 Test Result:

Refer to attached data sheets. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.

802.11a (5180MHz)



802.11a (5320MHz)

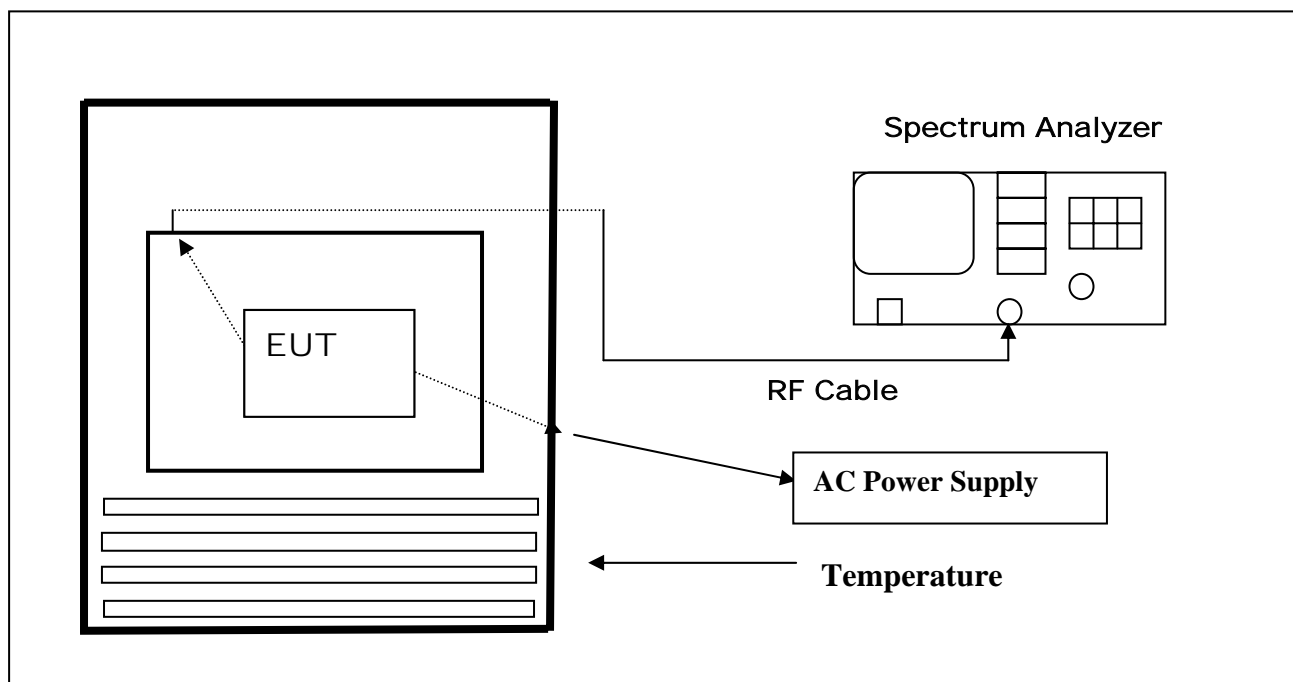


## 6. Frequency Stability Requirements

### 6.1 Test Limit & Setup :

The frequency tolerance of the carrier signal shall be within  $\pm 0.002\%$  of the operating frequency .Variation temperature of  $-30^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  at normal supply voltage and variation AC power supply from 85% to 115% of the rated supply voltage at a temperature of  $20^{\circ}\text{C}$ .

### 6.2 Test Instruments Configuration:



### 6.3 Test Equipment List:

Item	Mfr/Brand	Instruments	Serial No.	Model/Type No.	Calibrated Date	Next Cali. Date
1.	Agilent	Spectrum Analyzer	US39240419	E4407B	2006/02/01	2007/02/01

### 6.4 Test Result:

Frequency : 5320MHz						Limit : $\pm 0.002\%$	
Temp ( $^{\circ}\text{C}$ )	Power ( V AC )	0 minute		5 minute		10 minute	
		MHz	( % )	MHz	( % )	MHz	( % )
50	126.5	5319.9750	0.000469	5319.9751	0.000468	5319.9753	0.000464
	110	5319.9752	0.000466	5319.9754	0.000462	5319.9755	0.000460
	93.5	5319.9754	0.000462	5319.9755	0.000460	5319.9756	0.000458
40	126.5	5319.9763	0.000445	5319.9764	0.000443	5319.9765	0.000441
	110	5319.9764	0.000443	5319.9766	0.000439	5319.9767	0.000437
	93.5	5319.9763	0.000445	5319.9764	0.000443	5319.9766	0.000458
30	126.5	5319.9941	0.000110	5319.9943	0.000107	5319.9945	0.000103
	110	5319.9966	0.000063	5319.9968	0.000060	5319.9969	0.000058
	93.5	5319.9946	0.000101	5319.9947	0.000099	5319.9948	0.000097
20	126.5	5319.9991	0.000016	5319.9992	0.000015	5319.9994	0.000011
	110	5319.9994	0.000011	5319.9996	0.000075	5319.9999	0.000018
	93.5	5319.9989	0.000029	5319.9992	0.000015	5319.9994	0.000011
10	126.5	5319.9983	0.000031	5319.9984	0.000030	5319.9986	0.000026
	110	5319.9986	0.000026	5319.9988	0.000022	5319.9989	0.000020
	93.5	5319.9991	0.000016	5319.9993	0.000013	5319.9995	0.000009
0	126.5	5319.9966	0.000063	5319.9967	0.000062	5319.9969	0.000058
	110	5319.9968	0.000060	5319.9969	0.000058	5319.9971	0.0000545
	93.5	5319.9941	0.000110	5319.9943	0.000107	5319.9944	0.000105
-10	126.5	5319.9888	0.000210	5319.9890	0.000206	5319.9892	0.000203
	110	5319.9886	0.000214	5319.9887	0.000212	5319.9889	0.000208
	93.5	5319.9881	0.000223	5319.9882	0.000221	5319.9885	0.000216
-20	126.5	5319.9984	0.000030	5319.9985	0.000028	5319.9988	0.000022
	110	5319.9986	0.000026	5319.9988	0.000022	5319.9989	0.000020
	93.5	5319.9984	0.000030	5319.9985	0.000028	5319.9988	0.000022
-30	126.5	5319.9976	0.000045	5319.9977	0.000043	5319.9979	0.000394
	110	5319.9978	0.000041	5319.9979	0.000039	5319.9980	0.000375
	93.5	5319.9975	0.000046	5319.9977	0.000043	5319.9978	0.000413

## *V. Antenna Requirements*

### 1.1 Standard Applicable :

For intentional device, according to 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 1.2 Antenna Connector Construction

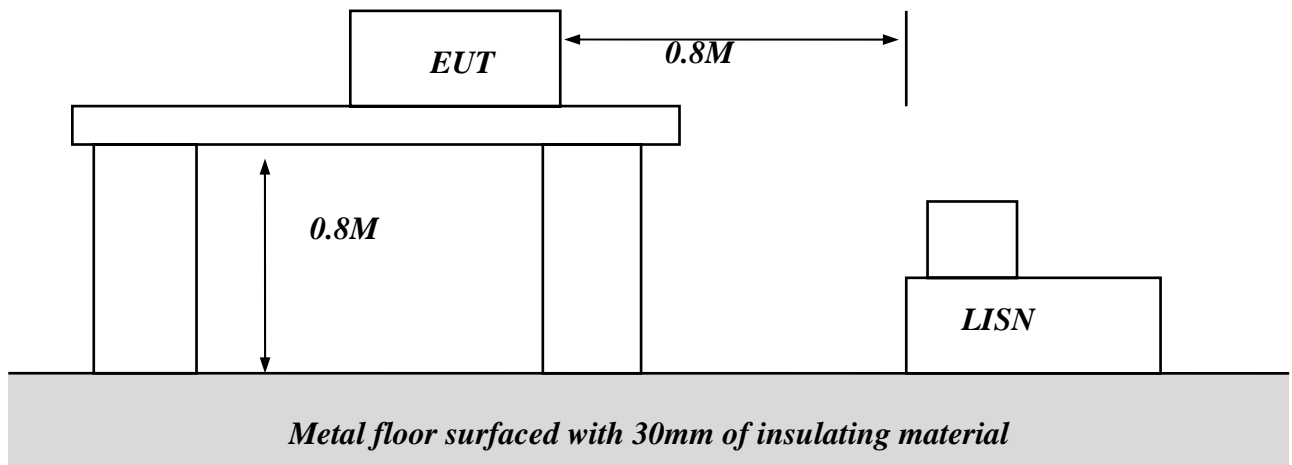
	Product Number	ANT TYPE	GAIN	type of connector
1	AN2450-6401RS	1/2 $\lambda$ DIOPLE antenna	4.0 dBi	Reverse SMA
2	R-AN2450-1901RS	1/2 $\lambda$ DIOPLE antenna	3.9 dBi	Reverse SMA

Note : For WVM1101-TX / WVM1101-RX, AN2450-6401RS is the worst case on all test items.



*Appendix I- EUT Test SETUP*

MEASUREMENT OF USB Portable DVB-T Receiver CONDUCTED  
RFI VOLTAGE



*Appendix I- EUT Test SETUP*

MEASUREMENT OF RADIATED EMISSION

