Electromagnetic Compatibility
Test Report

Test Report No: MOT 091106
Issued on: November 9, 2006

Product Name
HC700L - Handheld Computer
Model: F3129AG
FCC ID: AZ489FT7028
IC: 109U-89FT7028

Tested According to
FCC 47 CFR Part 15, Subparts B & C

Tests Performed for
Motorola Israel Ltd.
3, Kremenitski Street, Tel Aviv, Israel
Tel: (972) 3-565 9581

QualiTech EMC Laboratory
30 Hasivim St,
Petah-Tikva, 49517, Israel
Tel: 972-3-926 8443
Fax: 972-3-928 7490

ACCREDITED
1633.01

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Test personnel

Tests Performed By: ----------
Rami Nataf

Report Prepared By: ----------
Bina Talkar

Report Reviewed By: ----------
Y. Zucker
QA and Lab. Manager
QualiTech EMC Laboratory

ACCREDITED
1633.01

Assessment information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None.

Modifications made to the Test Standard

None.

Summary of Compliance Status

Bluetooth: FCC 47 CFR, Part 15, Subparts B & C, RSS- 210 Annex.8 Issue 6

Test Spec. Clause	Test Case	Remarks
§15.247 (a) (1) & RSS-210 section A8.1 (2)	Carrier Frequency Separation	**Pass**
§15.247 (a) (1)(iii) & RSS-210 section A8.1 (3)	Number of Hopping Channels	**Pass**
§15.247 (a) (1)(iii) & RSS-210 section A8.1 (4)	Time Occupancy (Dwell Time)	**Pass**
§15.247 (a) (1) (ii) & RSS-210 section A8.1 (1)	Spectrum Bandwidth of a FHSS system/ Maximum 20dB BW	**Pass**
§15.247 (b) (1) & RSS-210 section A8.4 (2)	Maximum Peak Output Power	**Pass**
§15.247 (d) & RSS-210 section A8.5	Band-Edge compliance of RF Conducted Emission	**Pass**
§15.205& RSS-210 section A8.5	Radiated Emission, Restricted Bands	**Pass**
§15.247 (d) & RSS-210 section A8.5	Spurious Emission Conducted	**Pass**
§15.247 (d) & RSS-210 section A8.5	Spurious Emission Radiated	**Pass**
§15.109 & ICES-003, RSS-GEN, Section 7.2.3.2	Radiated Emission (receiver)	**Pass**
§15.203 & RSS-Gen, Section 7.1.4	Antenna Connector requirement	**Pass**

WLAN: 802.11b/g: FCC 47 CFR Part 15, Subparts B & C, RSS- 210 Annex.8 Issue 6

Test Spec. Clause	Test Case	Remarks
§15.247 (a) (2) & RSS-210 section A8.2 (1)	6 dB Bandwidth	**Pass**
§15.247 (b) (3) & RSS-210 section A8.4 (4)	Peak Output Power	**Pass**
§15.247 (e) & RSS-210 Section A8.2 (2)	Peak Power Spectral Density	**Pass**
§15.247 (d) & RSS-210 Section A8.5	Conducted Spurious Emissions	**Pass**
§15.247 (d) & §15.205	Radiated Spurious Emissions, Restricted Bands (2310-2390MHz, 2483.5-2500MHz)	**Pass**
§15.247 (d) & §15.205 & RSS-210 section A8.5	Radiated Emissions, Restricted Bands	**Pass**
§15.209& RSS-210 section A8.5	Radiated Emissions (Receive mode)	**Pass**
§15.203 & RSS-Gen.Section 7.1.4	Antenna Connector requirement	**Pass**

Emission Tests w/Cradle configuration

Test type	Test Method	Class applied	Frequency Range	Test results
Radiated Emission	ANSI C63.4	B	30MHz÷1GHz	**Comply**
Power line Emission, 110 VAC	ANSI C63.4	B	150kHz÷30MHz	**Comply**

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1. General Description

1.1. Description of the EUT system/test Item:

Product name: HC700L - Handheld Computer

S/N: 629SGU398

FCC ID: AZ489FT7028

IC: 109U-89FT7028

EUT Description:
The HC700 is a rugged handheld computer. The HC700 is designed for field applications where fast data acquisition and exchange is required. The HC700-L serves as a Personal Digital Assistant (PDA) that enables portable access to Microsoft Pocket PC 2003 applications. It contains a built-in imager (camera) capable of reading 1D and 2D barcode (optional) labels. The imager can also capture handwritten images such as signatures and correlate the signature to an adjacent barcode. Wireless communication enables access to the outside world through 802.11b/g Wireless Local Area Network (WLAN, WiFi).

WLAN:

The WLAN transmitter was tested and investigated with maximum transmitted power. All data rates were investigated and worst-case rates were selected and plotted. PRBS data was transmitted during testing. The transmitter was operated during testing at 100% duty cycle.

Average Conducted Output Power: 31.3 mW, for 802.11g

Average Conducted Output Power: 39.7 mW, for 802.11b

Type of Multiplexing: TDD

Data Rates for 802.11b/g:

Protocol	Rate [Mbps]
OFDM, 802.11g	6
	9
	12
	18
	24
	36
	48
	54
CCK, 802.11b	1
	2
	5.5
	11

Bluetooth:

The Bluetooth transmitter was tested and investigated with maximum transmitted power. All data rates were investigated and worst-case rates were selected and plotted. PRBS data was transmitted during testing. The transmitter was operated during testing at 100% duty cycle.

Max. Peak Output Power: 2mW

Type of Modulation: GFSK

Type of Multiplexing: TDD

2. Method of Measurements

2.1. Conducted Measurements:

The RF output of the transmitter under test was directly connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified. The external attenuator and cable loss were added to the reading. Worst-case results of the various modulation modes (where applicable) were reported.

For carrier frequency separation, number of hopping frequencies, time of occupancy, 20dB BW, peak output power, band edge emissions, and spurious emissions were measured according the guidelines in DA 00-705.

For PSD, emission peak was zoomed within the pass band with spectrum analyzer's settings as reported (Sweep time=Span/3kHz).

For Maximum Conducted Output Power per §15.247(b)(3), the spectrum analyzer was set for video trigger, and 100 traces were averaged in power averaging mode. The power was integrated across a bandwidth of the 26dB EBW of the signal, using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges.

2.2. Measurements of Radiated Emissions in the Restricted Bands:

For radiated emissions, which fall in the restricted bands the spectrum from 1MHz to 25GHz was investigated following the guidelines in ANSI C63.4-2003, with the transmitter set to the lowest, middle and highest channel frequencies. Measurements were performed with peak detector and repeated averaged with VBW=10Hz.

2.3. Radiated Emission measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at in receive mode.

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions.
An appropriate antenna depending upon the frequency range, per ANSI C63.4-2003 clause 4.1.5 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 9kHz to 25GHz. The highest radiated emission was detected by manipulating the system cables to the worst-case position. This process was repeated for both antenna polarizations.
The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.4-2003 clause 4.2.

2.4. Power line Emission measurements:

The EUT was placed on a non-conductive table/support 80 cm above the reference ground plane. The EUT was configured in accordance with ANSI C63.4-2003 using a 50µH/50 ohm LISN.

Compliance with the provisions was based on the measurements of the radio frequency voltage between each line and the ground at the power terminal.

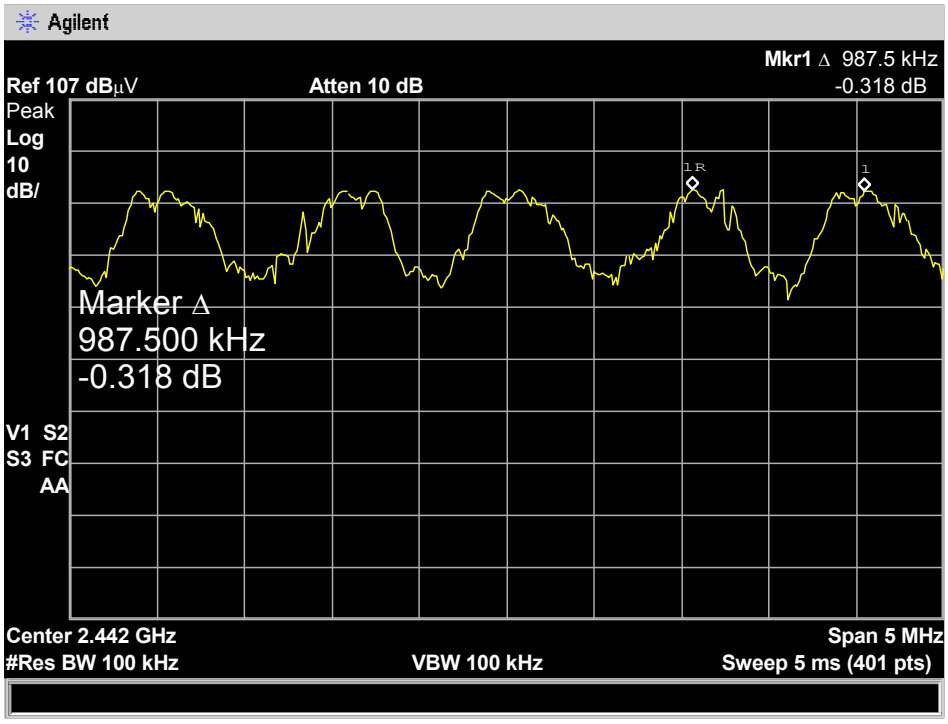
3. Bluetooth: Report of Measurements and examinations

3.1. Carrier Frequency Separation

Reference document:	**47 CFR §15.247 (a) (1) & DA 00-705**		
Test Requirements:	Hopping channels carrier frequencies separated by a minimum of 25kHz or 20dB Bandwidth of the hopping channel, whichever is greater.		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 100kHz, VBW: 100kHz		
Hopping function:	Enabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Plot 3.1	

20dB BW [kHz]	Carrier separation [kHz]	Result
861	988	Pass

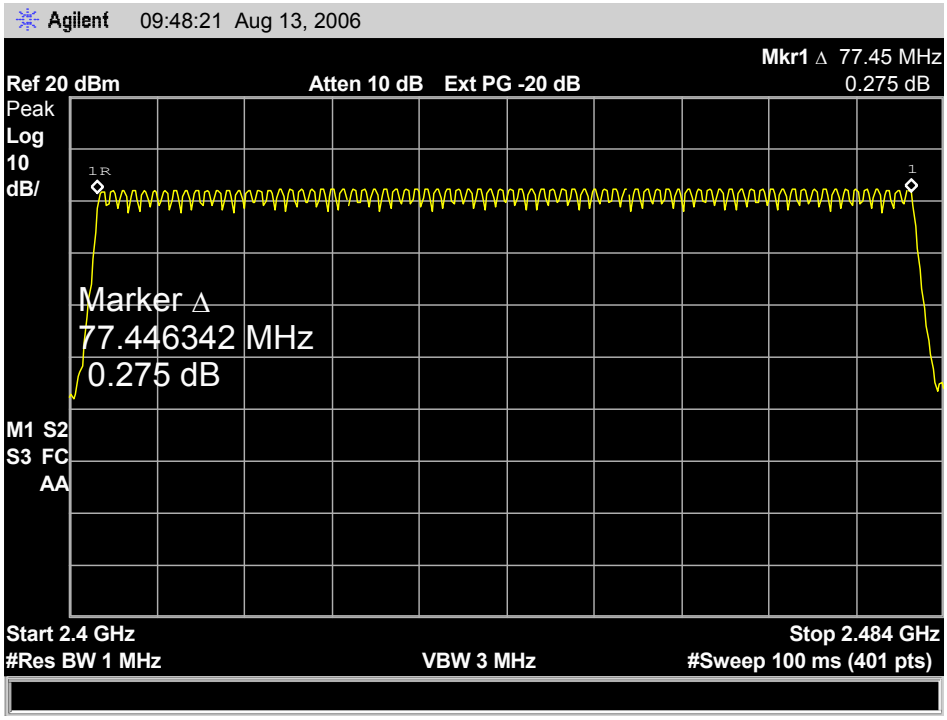
Plot 3.1



3.2. Number of Hopping Channels

Reference document:	**47 CFR §15.247 (a) (1)(iii) & DA 00-705**		
Test Requirements:	Hopping system shall use at least 15 non-overlapping channels.		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz		
Hopping function:	Enabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	79 hopping channels	Plot 3.2	

Plot 3.2



3.3. Average Time of Occupancy (Dwell Time)

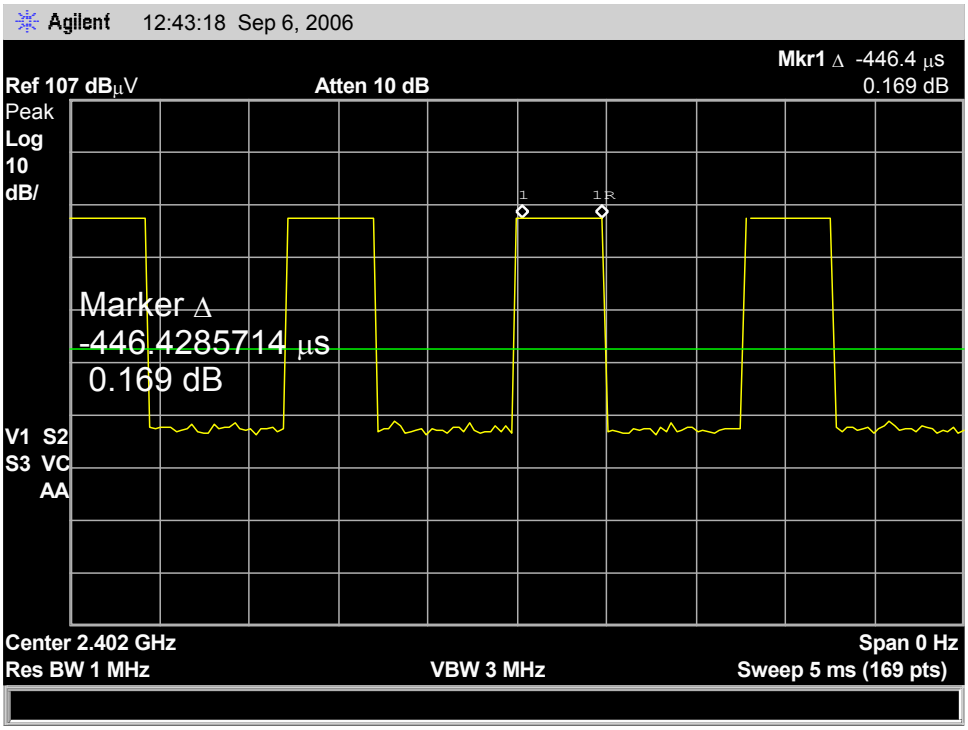
Reference document:	**47 CFR §15.247 (a) (1) (iii) & DA 00-705**		
Test Requirements:	The average time of occupancy on any channel shall not be greater than 0.4seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz, Span:0 centered on hopping channel		
Hopping function:	Disabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.3.1– Plot 3.3.3	

Test results:

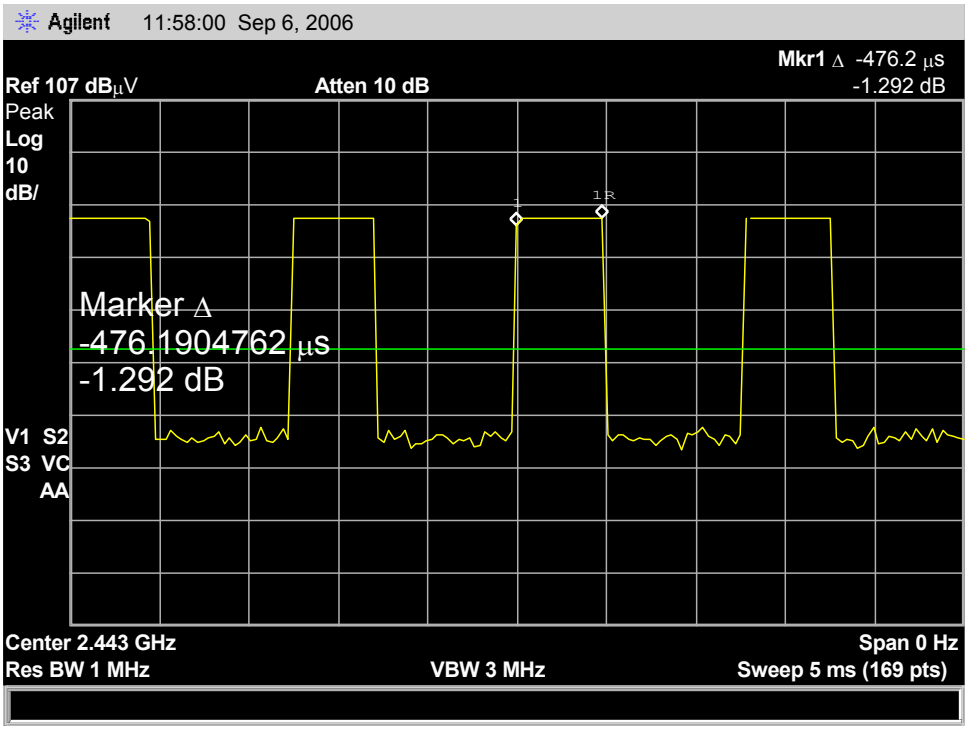
Frequency [GHz]	Time slot length [msec]	Reference	Dwell time [Sec]	Limit [Sec]	Result
2.402	0.4464	Plot 3.3.1	0.286	0.4	Pass
2.443	0.4762	Plot 3.3.2	0.305	0.4	Pass
2.480	0.4762	Plot 3.3.3	0.305	0.4	Pass

Dwell Time = Time Slot Length * Hop Rate/Number of Hopping Channels* Period Time
Period Time= 0.4sec * 79, Hop Rate =1600 1/s

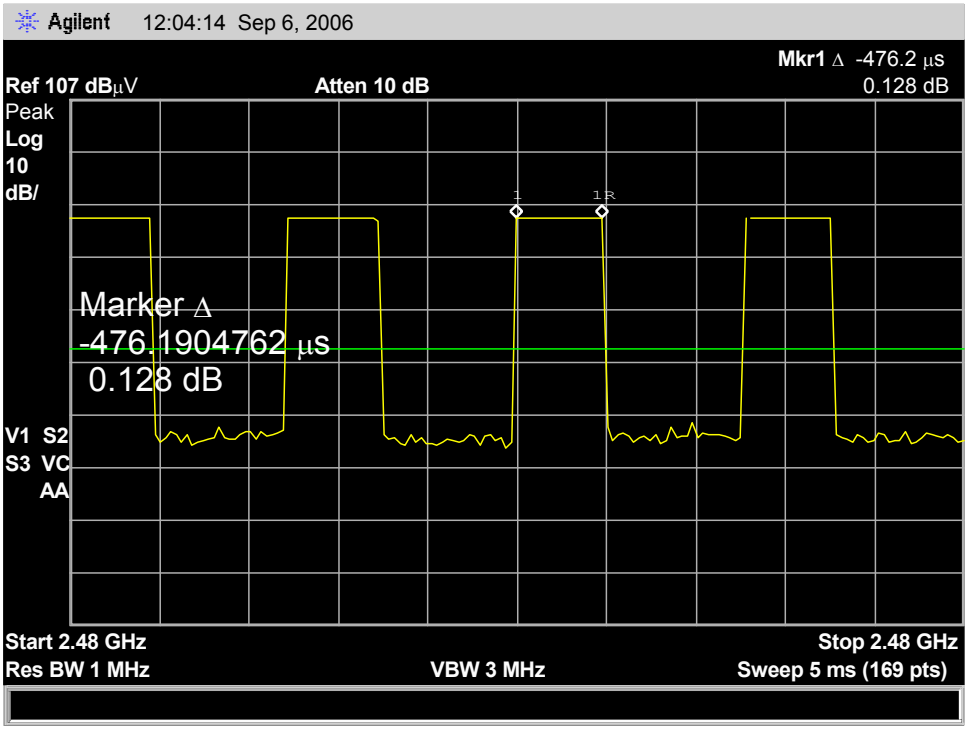
Plot 3.3.1



Plot 3.3.2



Plot 3.3.3


Agilent 12:04:14 Sep 6, 2006
Mkr1 Δ -476.2 µs
0.128 dB
Ref 107 dBµV
Atten 10 dB
Peak
Log
10
dB/
Marker Δ
-476.1904762 µs
0.128 dB
V1 S2
S3 VC
AA
Start 2.48 GHz
Res BW 1 MHz
VBW 3 MHz
Stop 2.48 GHz
Sweep 5 ms (169 pts)

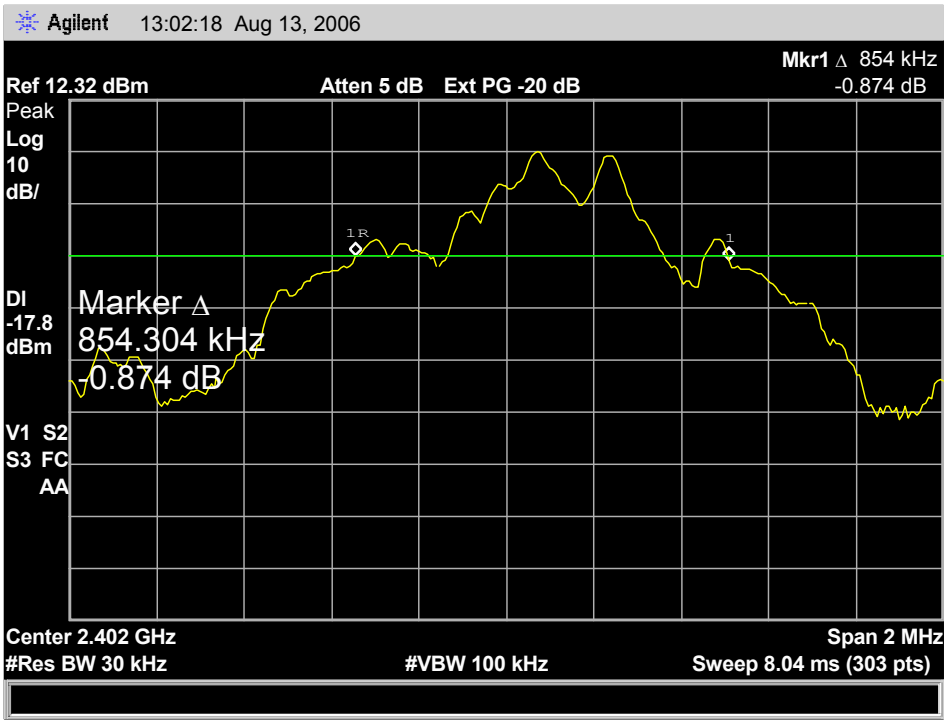
3.4. Maximum 20dB Bandwidth

Reference document:	47 CFR §15.247 (a) (1)(iii) & DA 00-705		
Test Requirements:	Hopping channels carrier frequencies separated by a minimum of 25kHz or 20dB Bandwidth of the hopping channel, whichever is greater.		
Test setup:	See Sec. 2.1	Pass	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 30kHz, VBW: 100kHz, Span: 2MHz		
Hopping function:	Disabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.4.1 – Plot 3.4.3	

Test results:

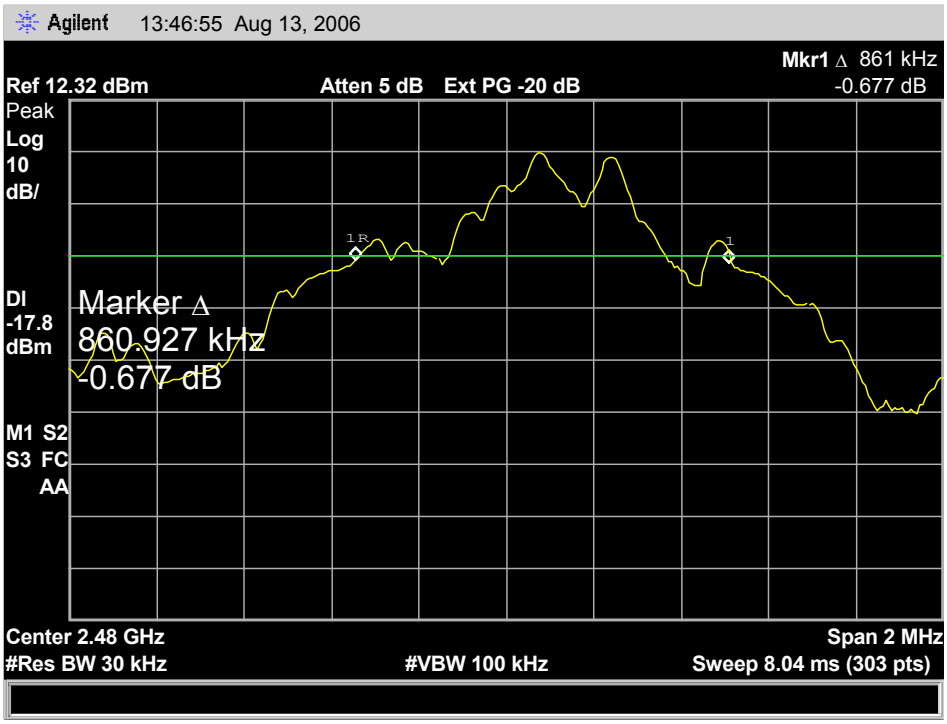
Frequency [GHz]	20dB BW [kHz]	Reference
2.402	854	Plot 3.4.1
2.443	848	Plot 3.4.2
2.480	861	Plot 3.4.3

Plot 3.4.1



Plot 3.4.2

Plot 3.4.3


Agilent 13:46:55 Aug 13, 2006
Mkr1 Δ 861 kHz
-0.677 dB
Ref 12.32 dBm
Atten 5 dB Ext PG -20 dB
Peak
Log
10
dB/
Dl
-17.8
dBm
Marker Δ
860.927 kHz
-0.677 dB
M1 S2
S3 FC
AA
Center 2.48 GHz
Span 2 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 8.04 ms (303 pts)

3.5. Maximum Peak Output Power

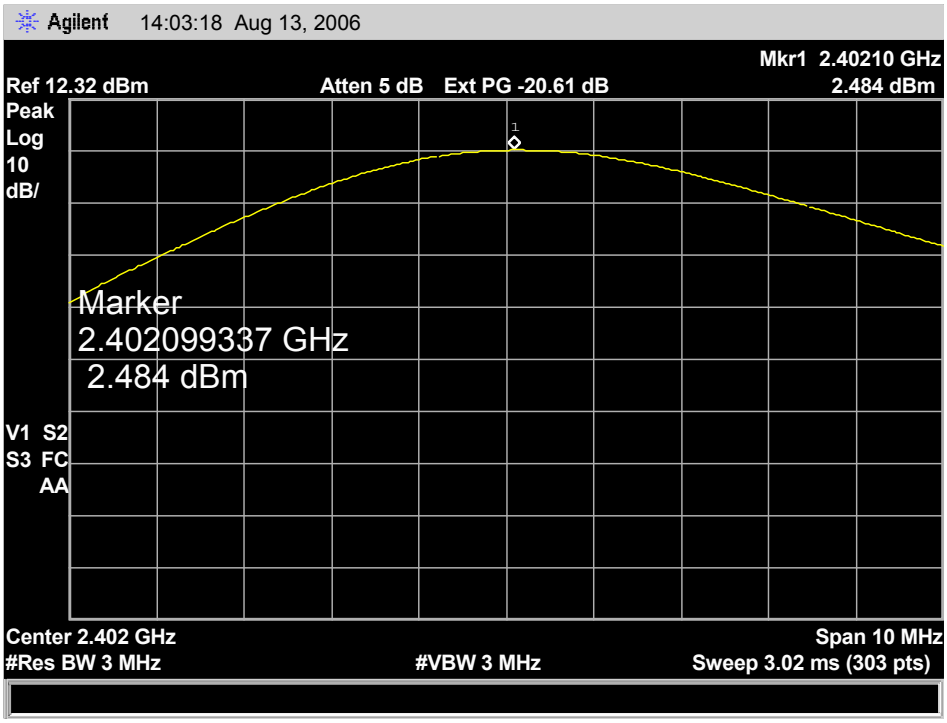
Reference document:	**47 CFR §15.247 (b) (1) & DA 00-705**		
Test Requirements:	The maximum peak output power shall not exceed 1Watt (30dBm)		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 3MHz, VBW: 3MHz,		
Hopping function:	Disabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.5.1 – Plot 3.5.3	

Test results:

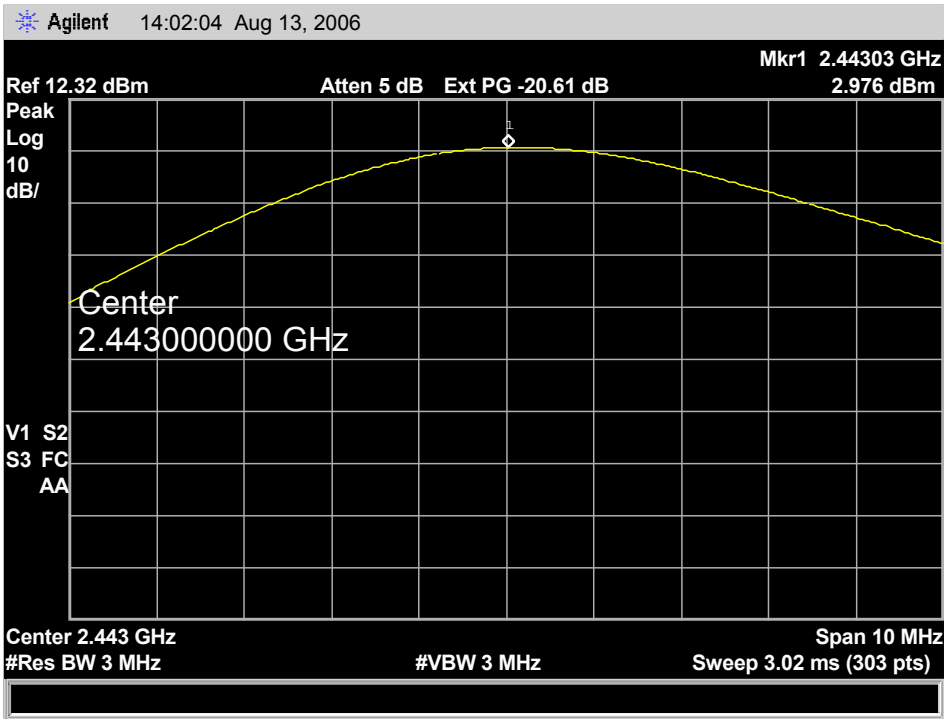
Frequency [GHz]	Cable Loss [dB]	Max. Peak Output power* [dBm]	Max. Peak Output power* [mW]	Reference	Result
2.402	0.45	2.484	1.772	Plot 3.5.1	Pass
2.443	0.45	2.976	1.984	Plot 3.5.2	Pass
2.480	0.45	2.775	1.895	Plot 3.5.3	Pass

*Corrected for external attenuations

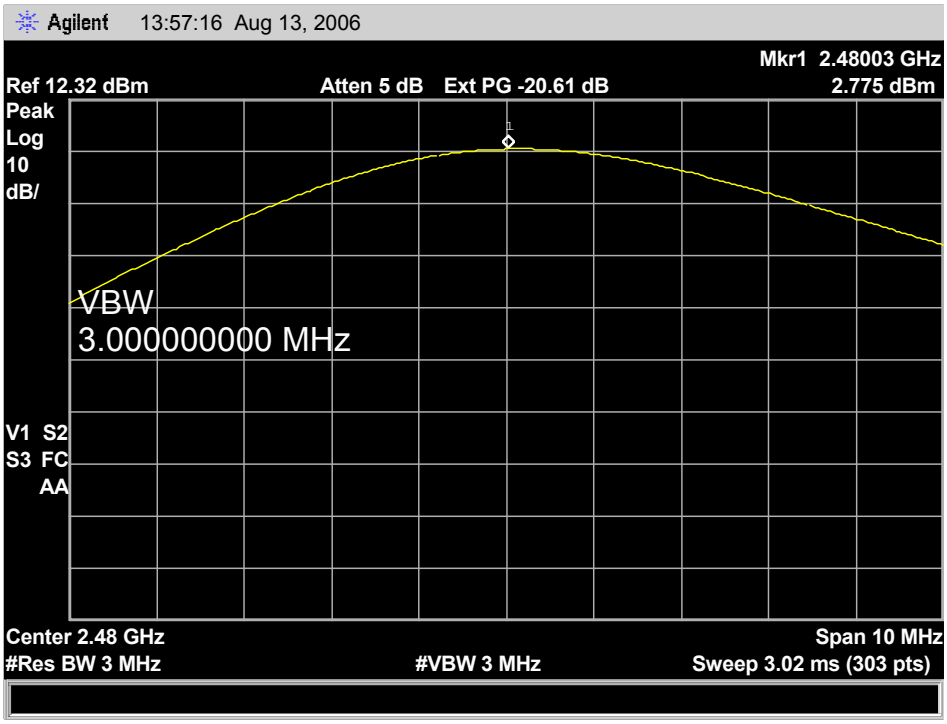
Plot 3.5.1



Plot 3.5.2



Plot 3.5.3


Agilent 13:57:16 Aug 13, 2006
Mkr1 2.48003 GHz
Ref 12.32 dBm
Atten 5 dB Ext PG -20.61 dB
2.775 dBm
Peak
Log
10
dB/
VBW
3.000000000 MHz
V1 S2
S3 FC
AA
Center 2.48 GHz
Span 10 MHz
#Res BW 3 MHz
#VBW 3 MHz
Sweep 3.02 ms (303 pts)

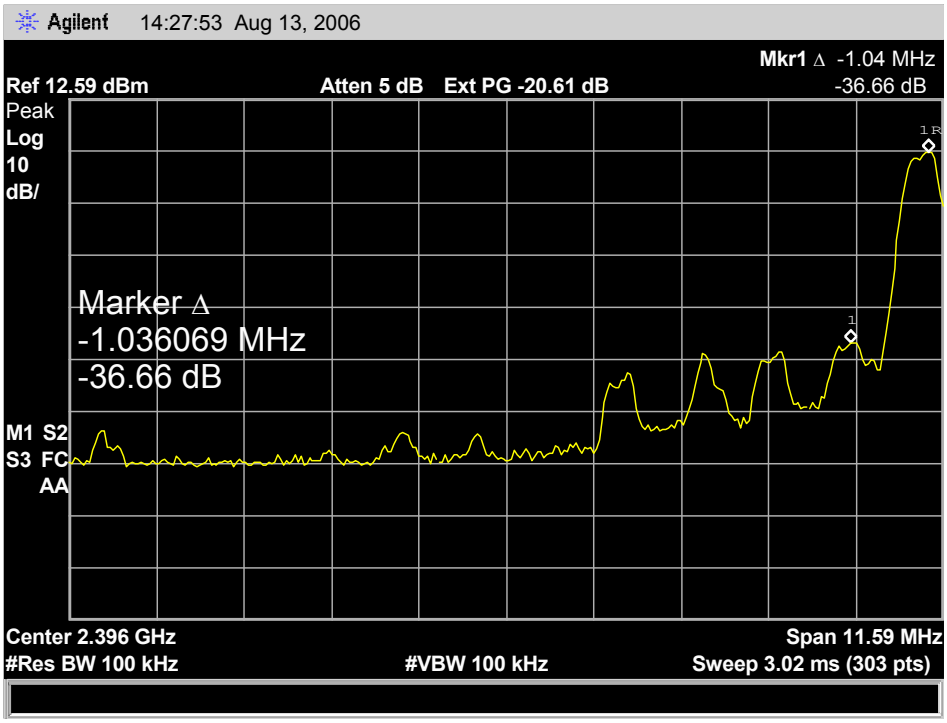
3.6. Band-edge compliance of RF Conducted Emission

Reference document:	**47 CFR §15.247 (d) & DA 00-705**		
Test Requirements and limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be **at least 20 dB below** that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c).		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 100kHz, VBW: 100kHz		
Hopping function:	Disabled/Enabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.6.1 – Plot 3.6.4	

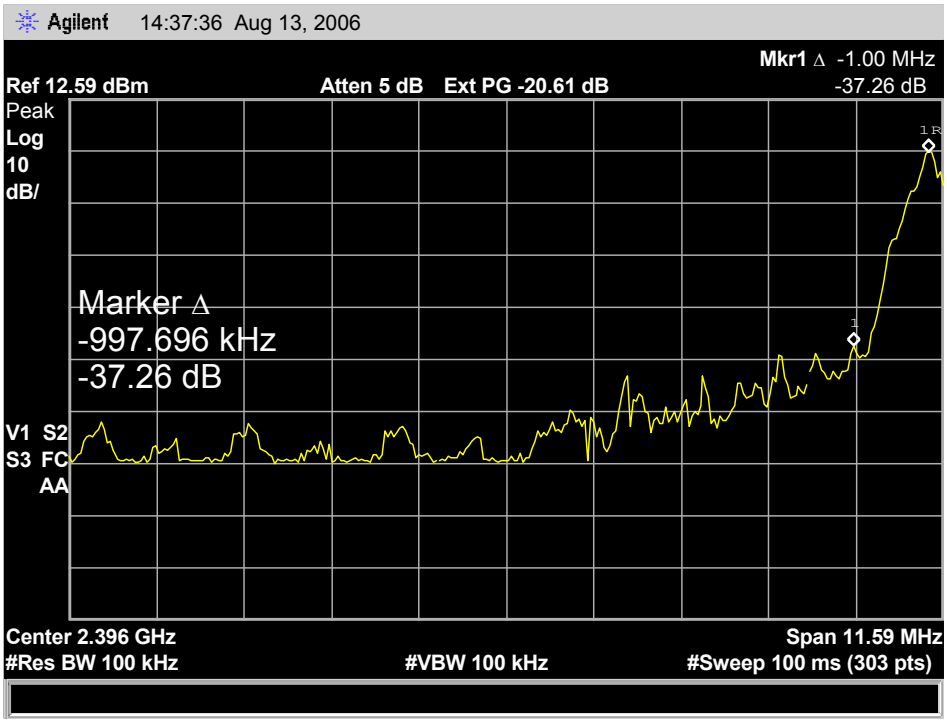
Test results of

Activity	Measured emission [dBc]	Limit [dBc]	Reference	Result
Hopping off, lowest frequency	-36.66	-20	Plot 3.6.1	Pass
Hopping on, lowest frequency	-37.26	-20	Plot 3.6.2	Pass
Hopping off, highest frequency	-31.21	-20	Plot 3.6.3	Pass
Hopping on, highest frequency	-30.89	-20	Plot 3.6.4	Pass

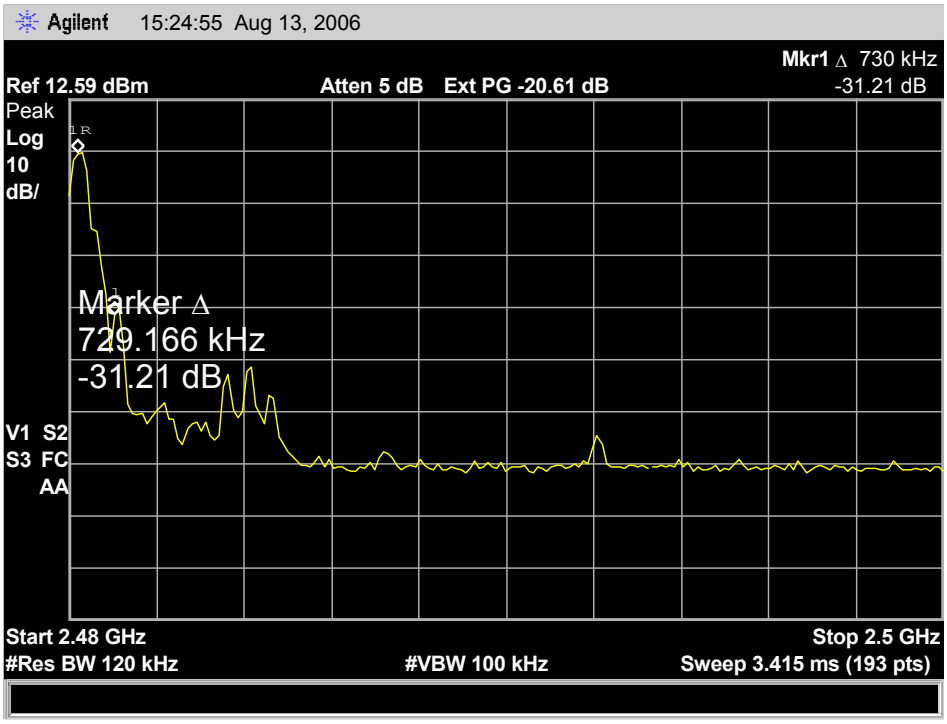
Plot 3.6.1



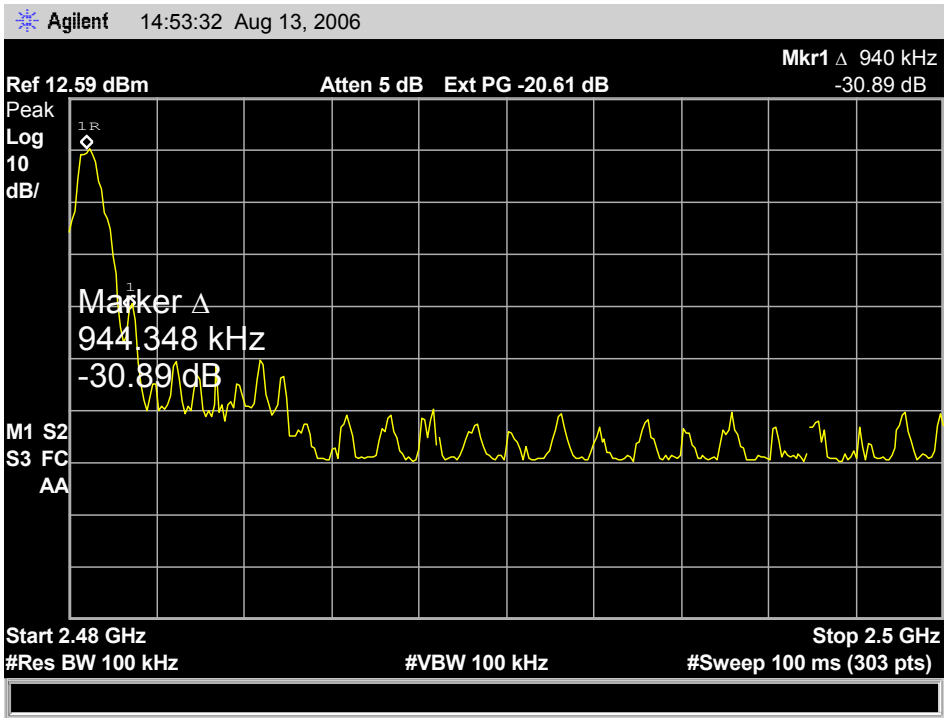
Plot 3.6.2



Plot 3.6.3



Plot 3.6.4



3.7. Spurious RF Conducted Emission

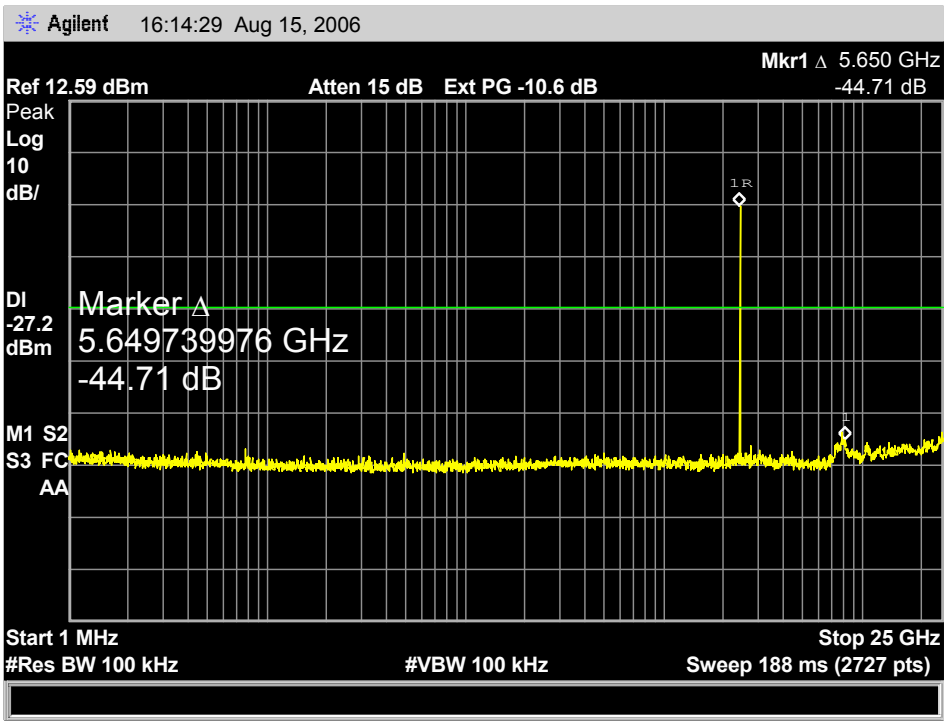
Reference document:	**47 CFR §15.247 (d) & DA 00-705**		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band at least 20 dB below the highest level of the desired power.		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 100kHz, VBW: 100kHz,		
Hopping function:	Disabled (lowest, middle, and highest)		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.7.1 – Plot 3.7.3	

Test results:

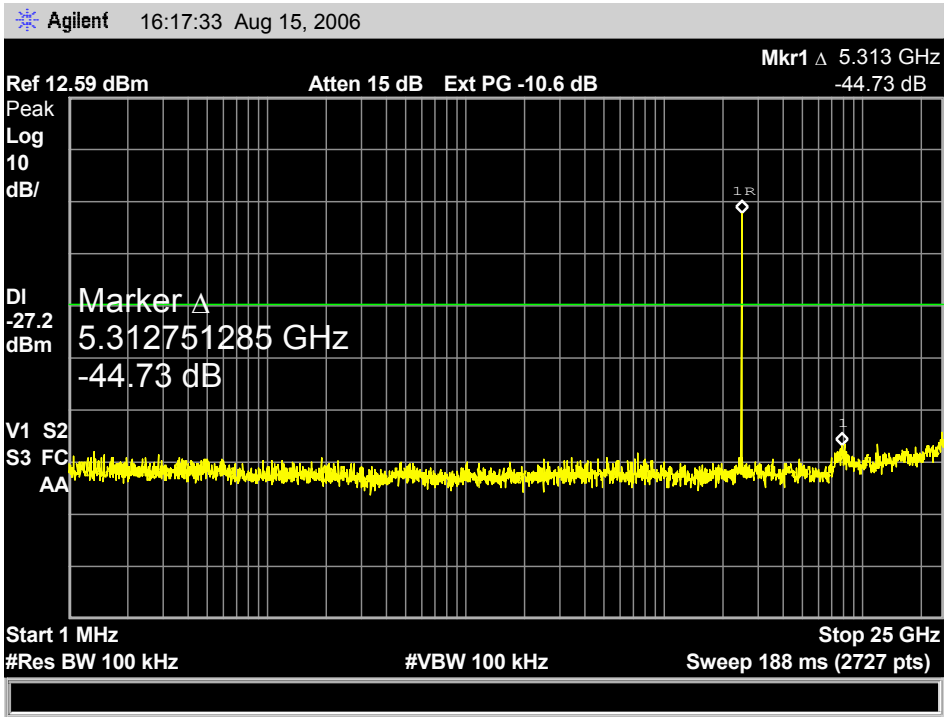
Frequency [GHz]	Spurious Frequency [GHz]	Measured [dBc]	Emissions limit	Reference	Result
2.402	-	At least -40dBc	-20dBc	Plot 3.7.1	Pass
2.443	-	At least - 40dBc		Plot 3.7.2	Pass
2.480	-	At least -40dBc		Plot 3.7.3	Pass

Sec. 3.8 Spurious Emission- Conducted

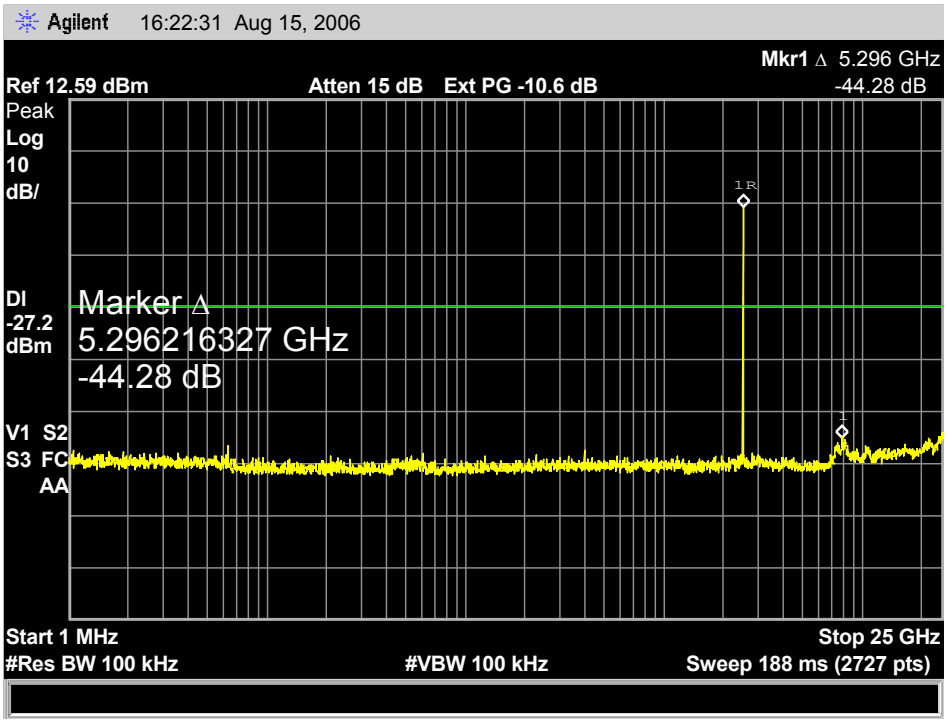
Low frequency
Plot 3.7.1



Middle frequency
Plot 3.7.2



High frequency
Plot 3.7.3



3.8. Spurious Radiated Emissions, Restricted Bands

Reference document:	**47 CFR §15.205 & DA 00-705**		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c).		
Test setup:	See Sec. 2.2	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	f <1GHz: RBW: 120kHz,VBW: 1MHz f >1GHz: RBW: 1MHz, VBW: 3MHz		
Hopping function:	Disabled		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 3.8.1 – Plot 3.8.8 & Appendix A	

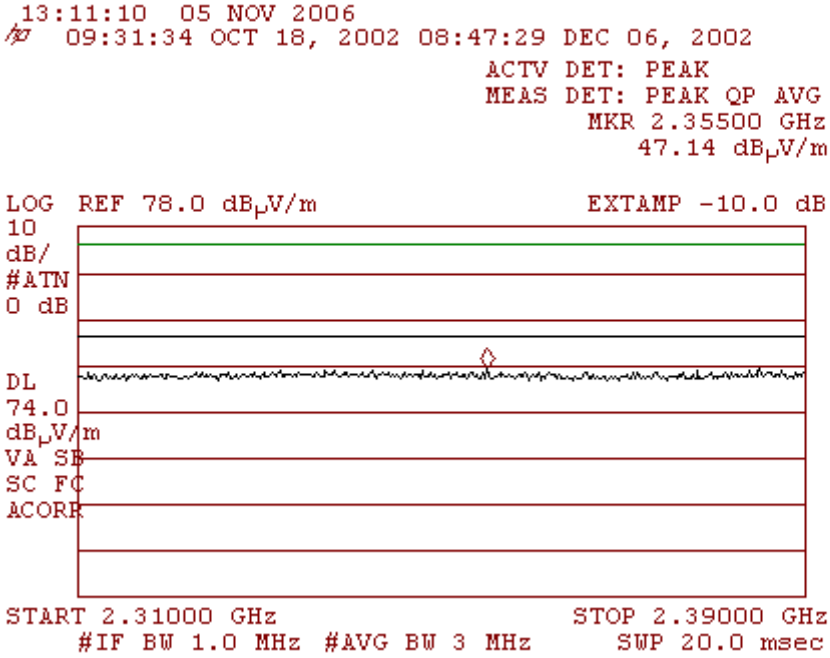
Test results:

All measurements were done in horizontal and vertical polarizations; the results show the worst case

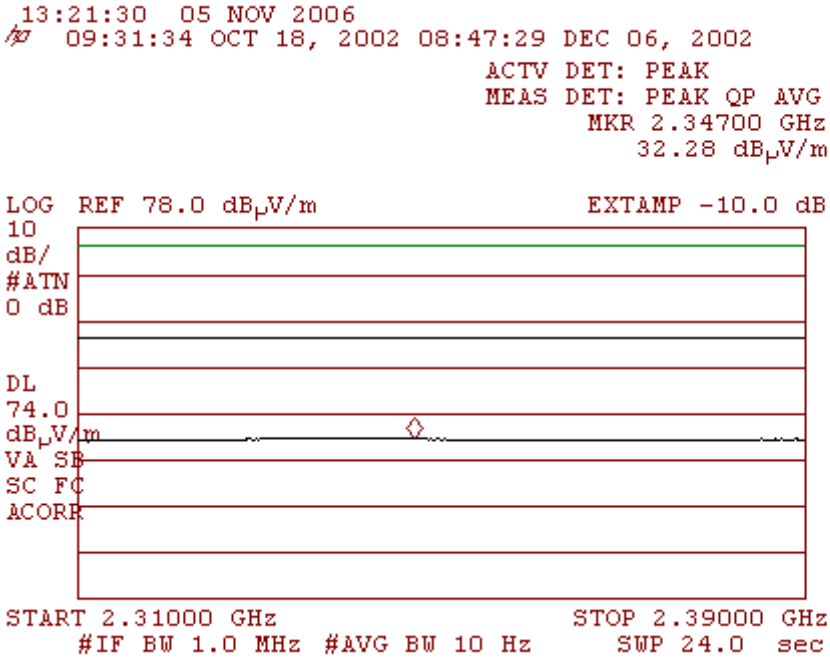
Lowest channel, 2402 MHz					
Spurious Frequency [MHz]	Detector type	Spurious level [dBµV/m]	Limit [dBµV/m]	Reference Plot	Result
2355.00	Peak	47.14	74	Plot 3.8.2	Pass
2347.00	Average	32.28	54	Plot 3.8.1	Pass
4804.00	Peak	38.62	74	Appendix A Plot 2	Pass
4804.00	Average	24.83	54	Appendix A Plot 2	Pass

Highest channel, 2480 MHz					
Spurious Frequency [MHz]	Detector type	Spurious level [dBµV/m]	Limit [dBµV/m]	Reference Plot	Result
2484.08	Peak	52.24	74	Plot 3.8.7	Pass
2483.91	Average	33.95	54	Plot 3.8.8	Pass
4960.00	Peak	38.53	74	Appendix A Plot 10	Pass
4960.00	Average	24.71	54	Appendix A Plot 10	Pass

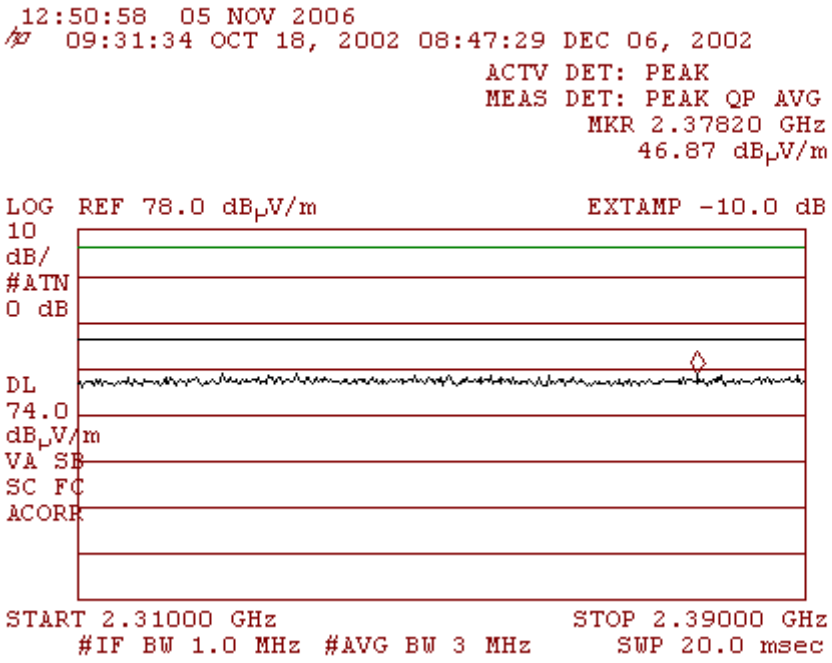
Single mode Lowest Frequency
Vertical Polarization
Peak
Plot 3.8.1



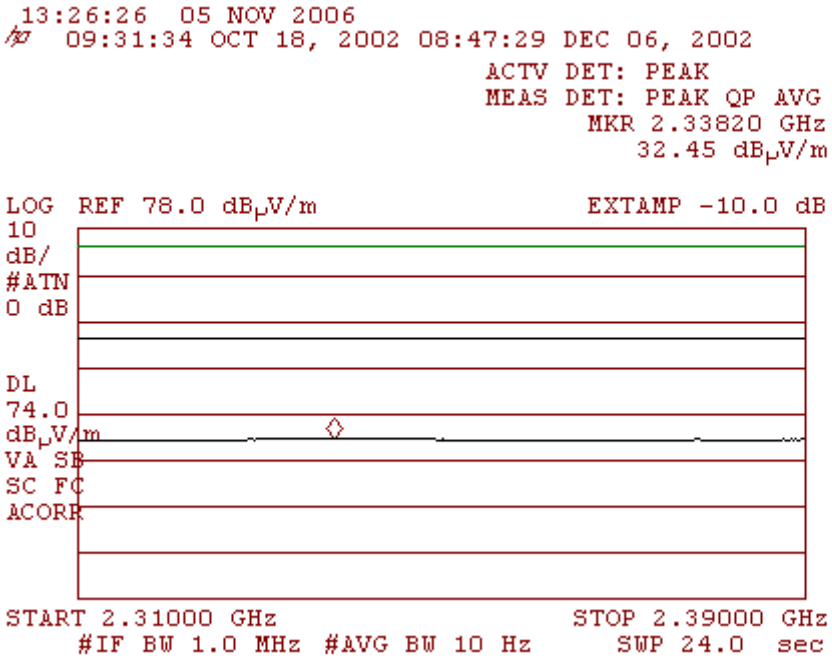
Average
Plot 3.8.2



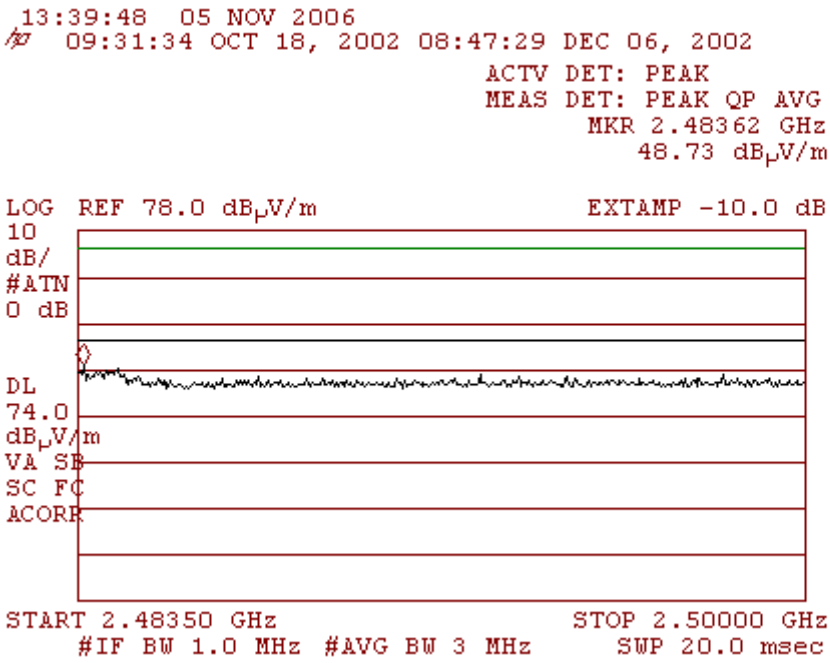
Single mode Lowest Frequency
Horizontal Polarization
Peak
Plot 3.8.3



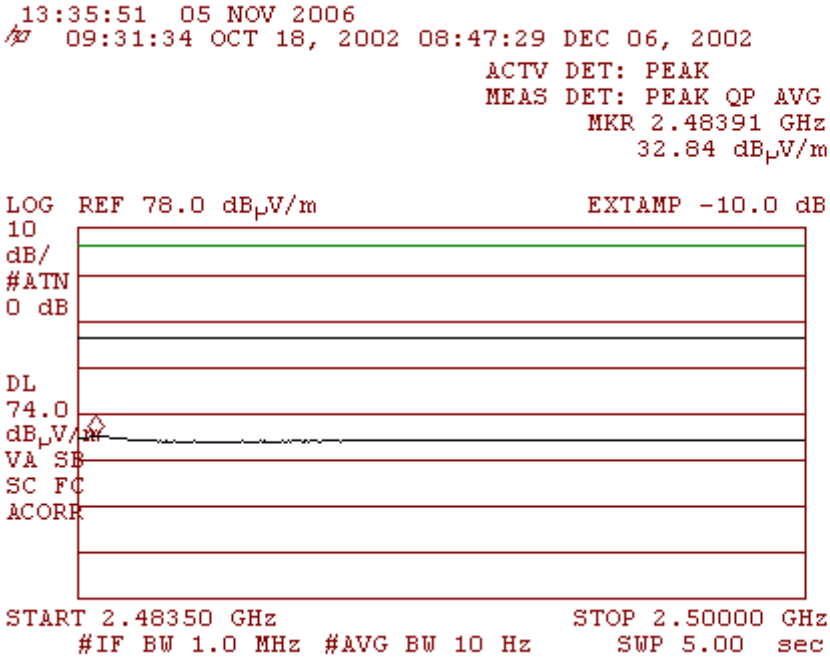
Average
Plot 3.8.4



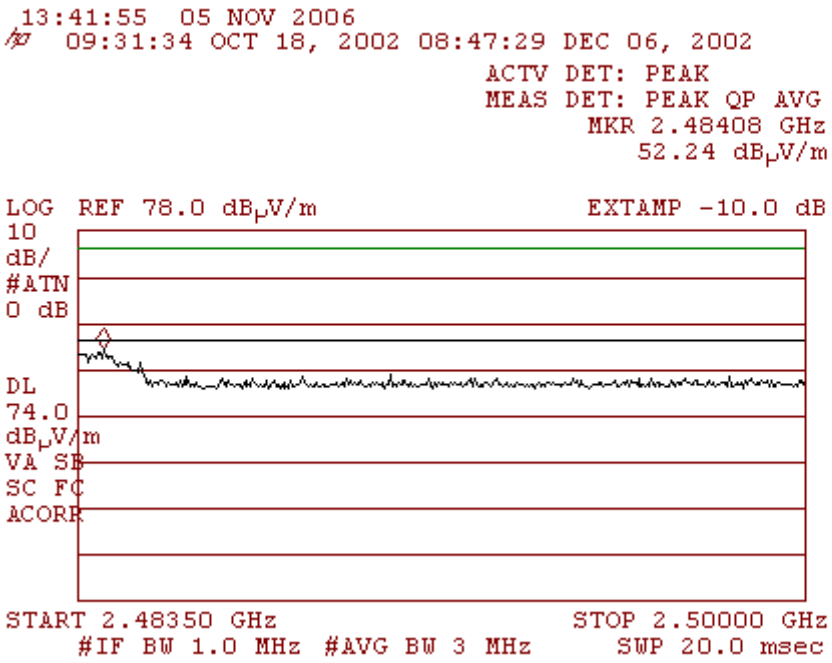
Single mode Highest Frequency
Vertical Polarization
Peak
Plot 3.8.5



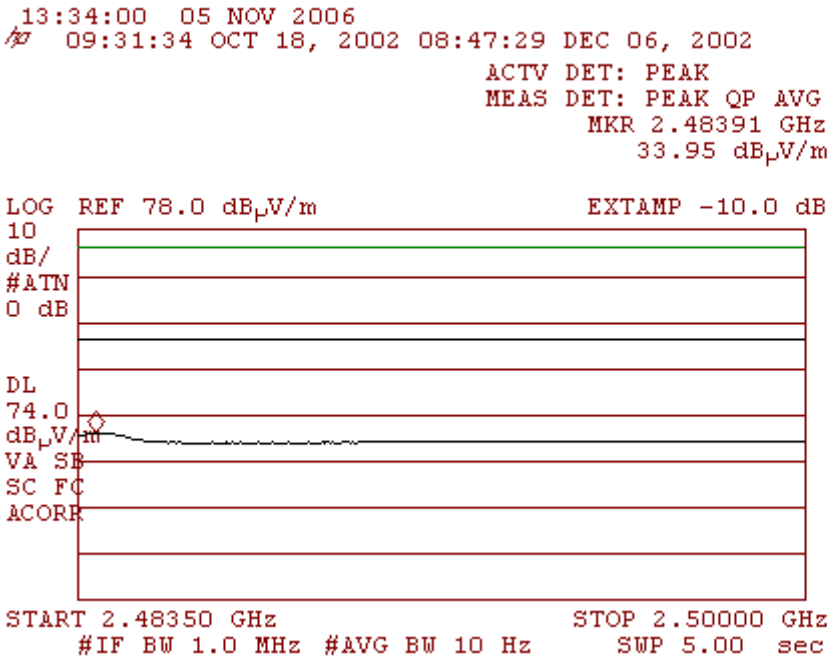
Average
Plot 3.8.6



Single mode Highest Frequency
Horizontal Polarization
Peak
Plot 3.8.7



Average
Plot 3.8.8



3.9. Unintentional Radiated Emission- (Receive mode)

Reference document:	**47 CFR §15.109**		
Test Requirements:	Emission Level shall not exceed §15.109 limits		
Test setup:	See Sec. 2.3	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	F <1GHz: RBW: 120kHz,VBW: 1MHz F >1GHz: RBW: 1MHz, VBW: 3MHz		
Mode of operation:	Receive		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	All readings were at least 10 db below the limit	Appendix B	

3.10. Antenna Connector Requirements

Reference document:	**47 CFR §15.203**	
Test Requirements:	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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Test Result:	The HC700L - Handheld Computer employs a unique UFL connector type.	**Comply**

4. WLAN 802.11b/g: Report of Measurements and examinations

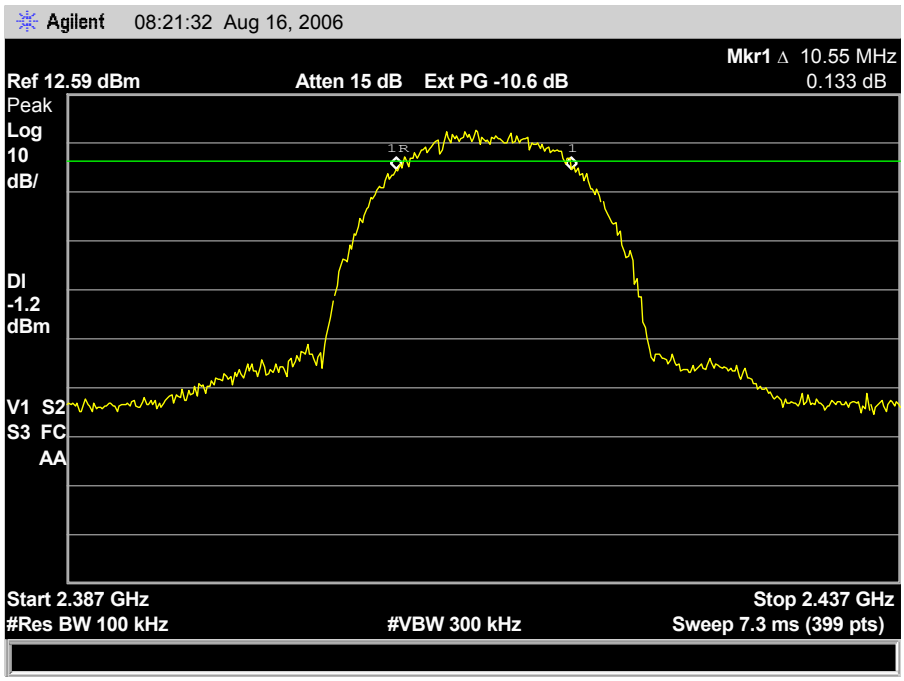
4.1. 6 dB Bandwidth

Reference document:	**47 CFR §15.247 (a) (2)**		
Test Requirements:	Systems using digital modulation techniques may operate in 2400-2483.5 MHz band. The minimum 6dB bandwidth shall be at least 500 kHz.		
Test setup:	See Sec. 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.1.1 - Plot 4.1.6	

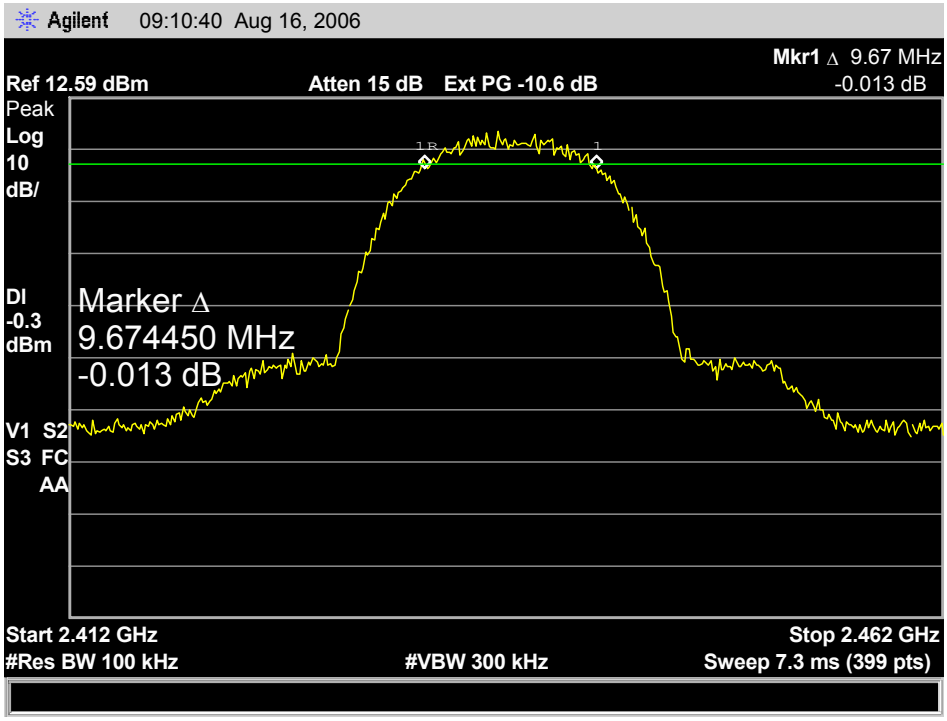
Test results

Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz]	Limit [kHz]	Test Result	Reference
802.11b Mode					
2412	11	10550	>500	Pass	Plot 4.1.1
2437	11	9670	>500	Pass	Plot 4.1.2
2462	11	10180	>500	Pass	Plot 4.1.3
802.11g Mode					
2412	54	16460	>500	Pass	Plot 4.1.4
2437	54	16580	>500	Pass	Plot 4.1.5
2462	54	16330	>500	Pass	Plot 4.1.6

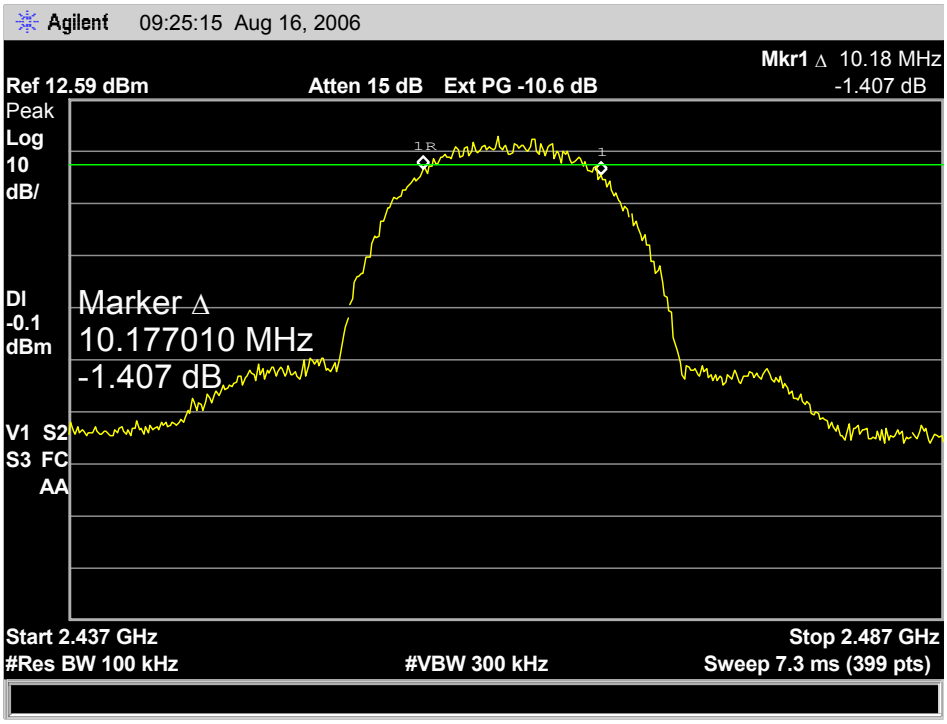
802.11b Mode
Plot 4.1.1



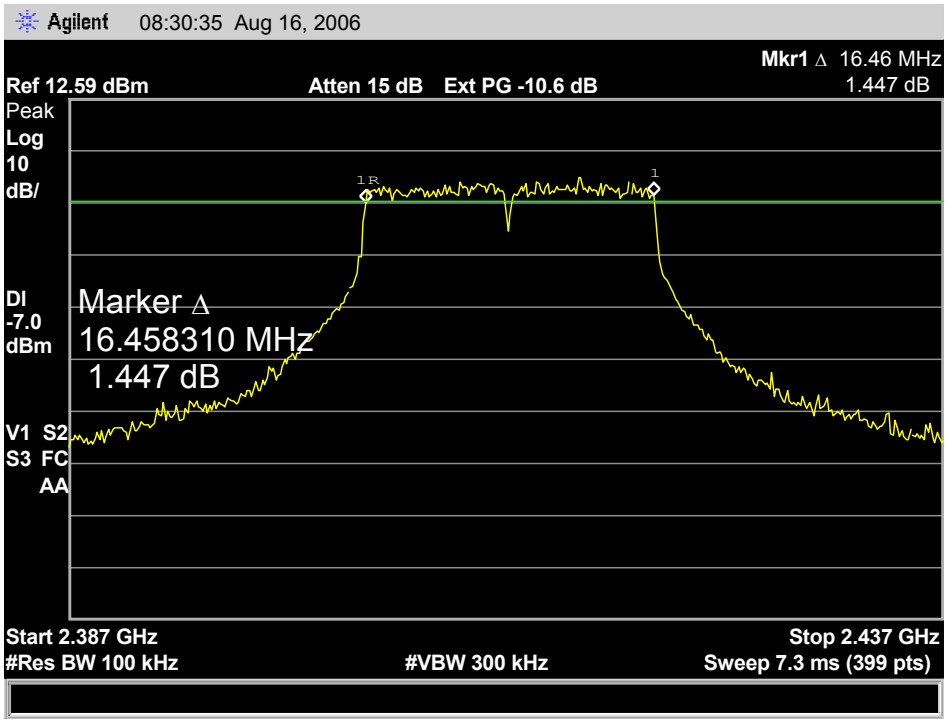
Plot 4.1.2



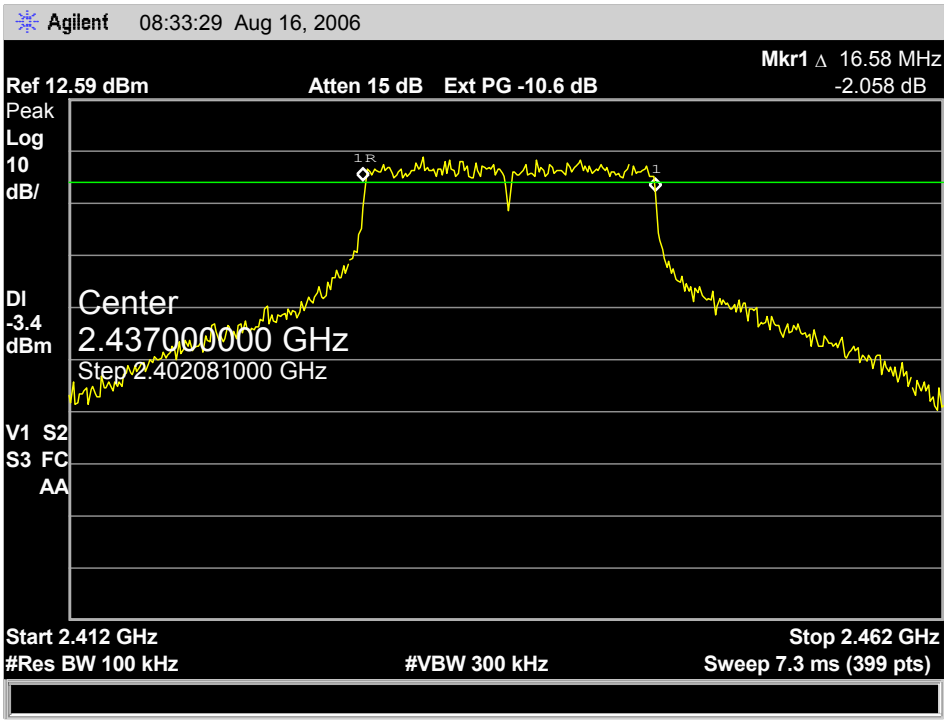
Plot 4.1.3



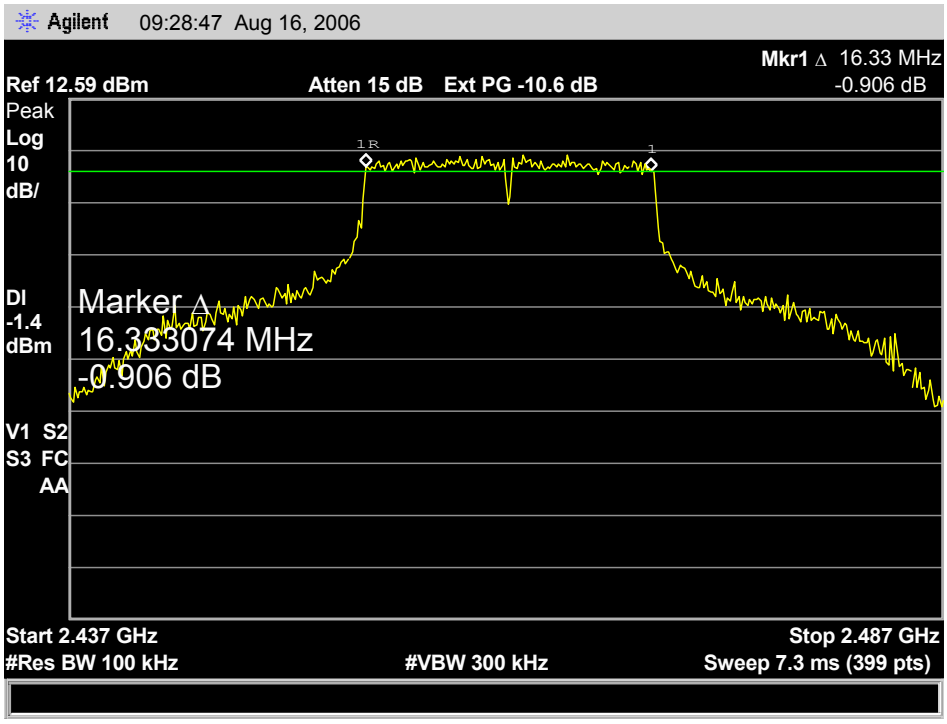
802.11g Mode
Plot 4.1.4



Plot 4.1.5



Plot 4.1.6



4.2. Maximum Conducted Output Power

Reference document:	**47 CFR §15.247 (b) (3)**		
Test Requirements:	The maximum conducted output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt.		
Test setup:	See Sec. 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz, Average: 100 traces,		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.2.1 - Plot 4.2.12	

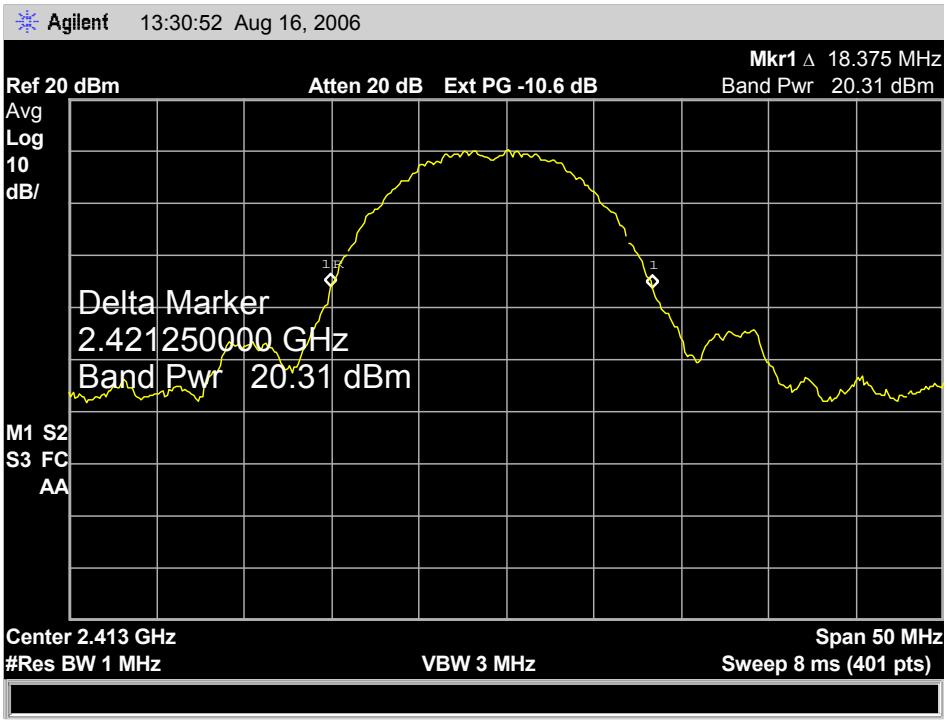
Test Results

Frequency [MHz]	Data Rate [Mbps]	Max. Conducted Output Power* [dBm]	Max. Conducted Output Power* [mW]	Average** Output power [dBm]	Limit [dBm]	Margin [dB]	Reference
802.11bMode							
2412	1	20.31	107.40	15.98	30	-9.69	Plot 4.2.1
2432	1	18.71	74.30	15.87	30	-11.29	Plot 4.2.2
2462	1	19.11	81.47	15.75	30	-10.89	Plot 4.2.3
2412	11	21.33	135.83	15.23	30	-8.67	Plot 4.2.4
2432	11	21.56	143.22	15.17	30	-8.44	Plot 4.2.5
2462	11	21.88	154.17	15.20	30	-8.12	Plot 4.2.6
802.11g Mode							
2412	6	21.19	131.52	14.82	30	-8.81	Plot 4.2.7
2432	6	22.31	170.22	14.92	30	-7.69	Plot 4.2.8
2462	6	22.22	166.72	14.95	30	-7.78	Plot 4.2.9
2412	54	20.74	118.58	14.75	30	-9.26	Plot 4.2.10
2432	54	22.85	192.75	14.81	30	-7.15	Plot 4.2.11
2462	54	22.67	184.93	14.85	30	-7.33	Plot 4.2.12

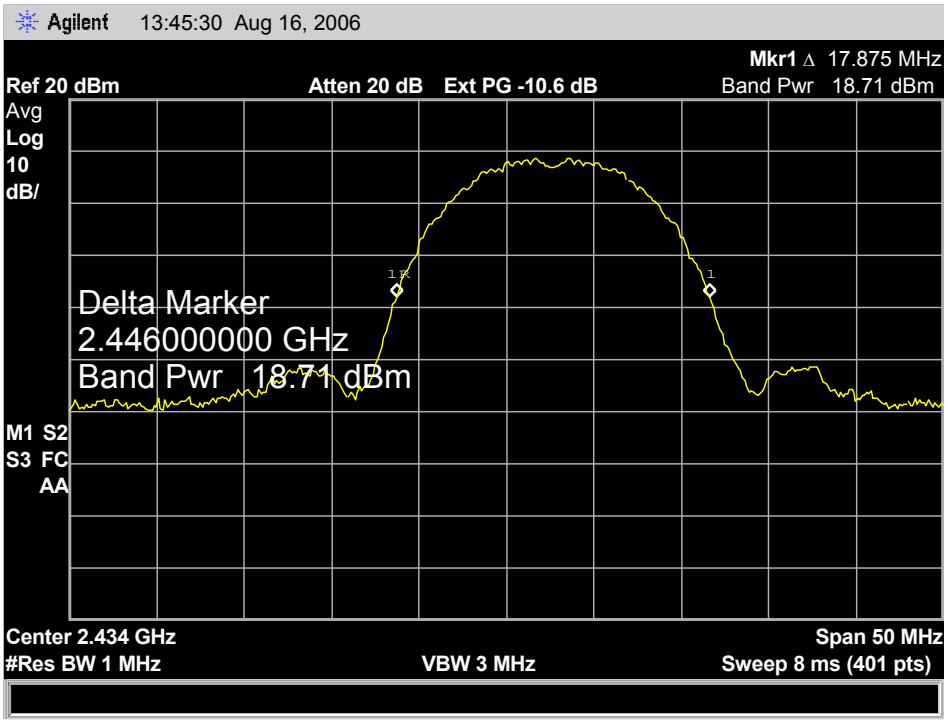
*Corrected for external attenuations
** Maximum Conducted Peak Output Power is not a factor to determine the final Average Output Power. Please refer to Average Output Power.

802.11b Mode

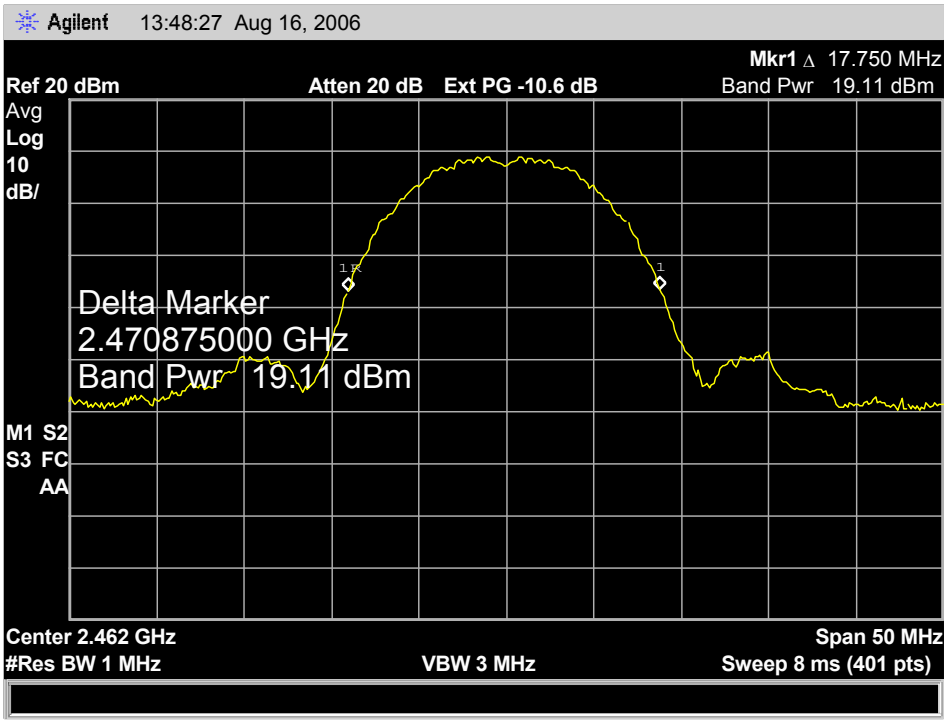
Plot 4.2.1



Plot 4.2.2

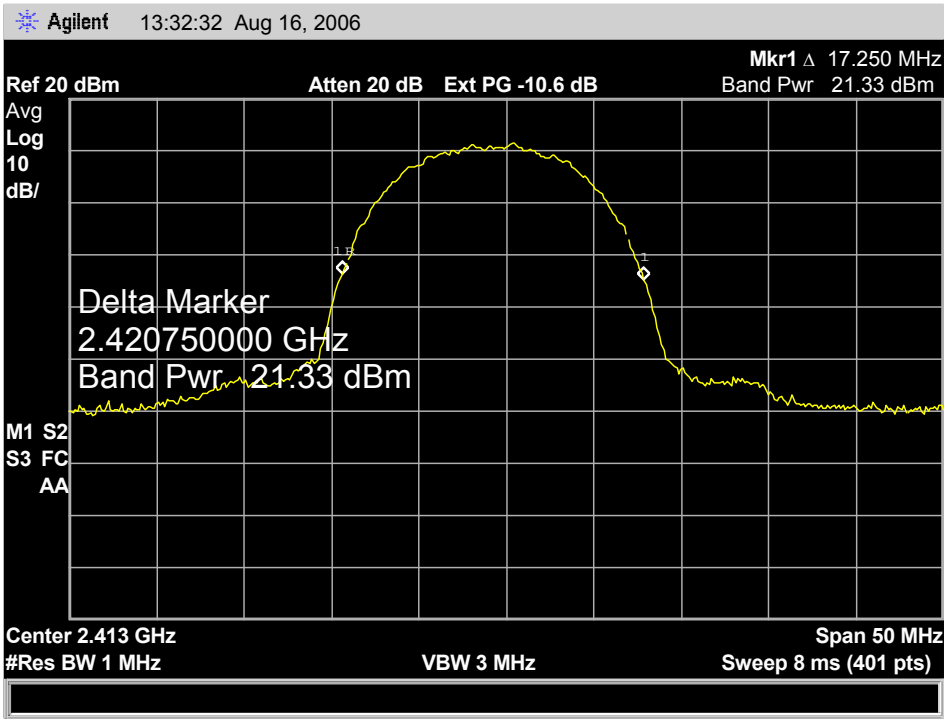


Plot 4.2.3

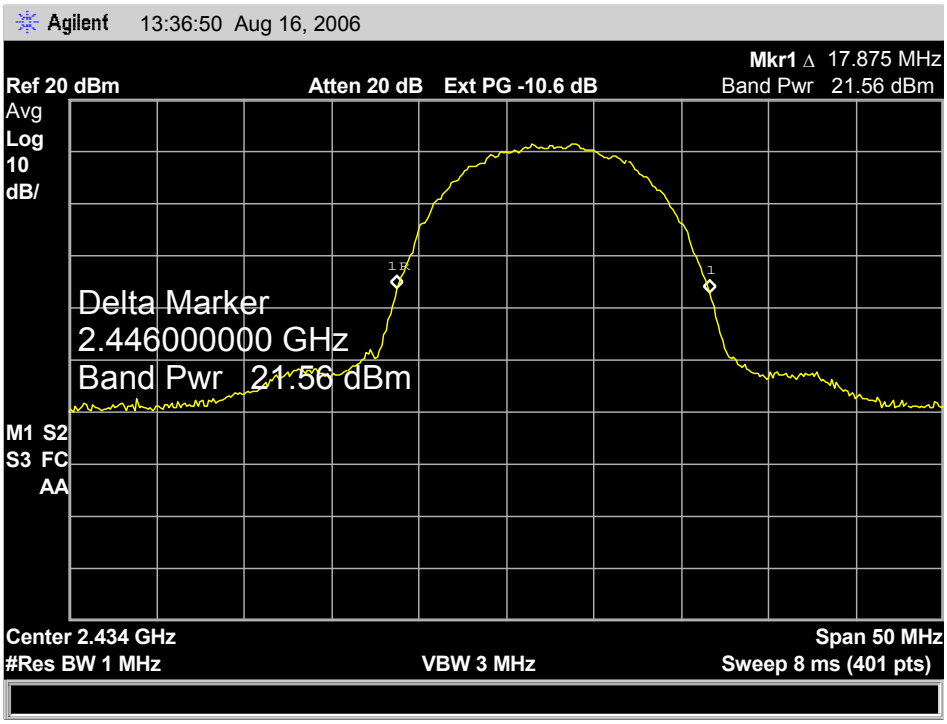


802.11g Mode

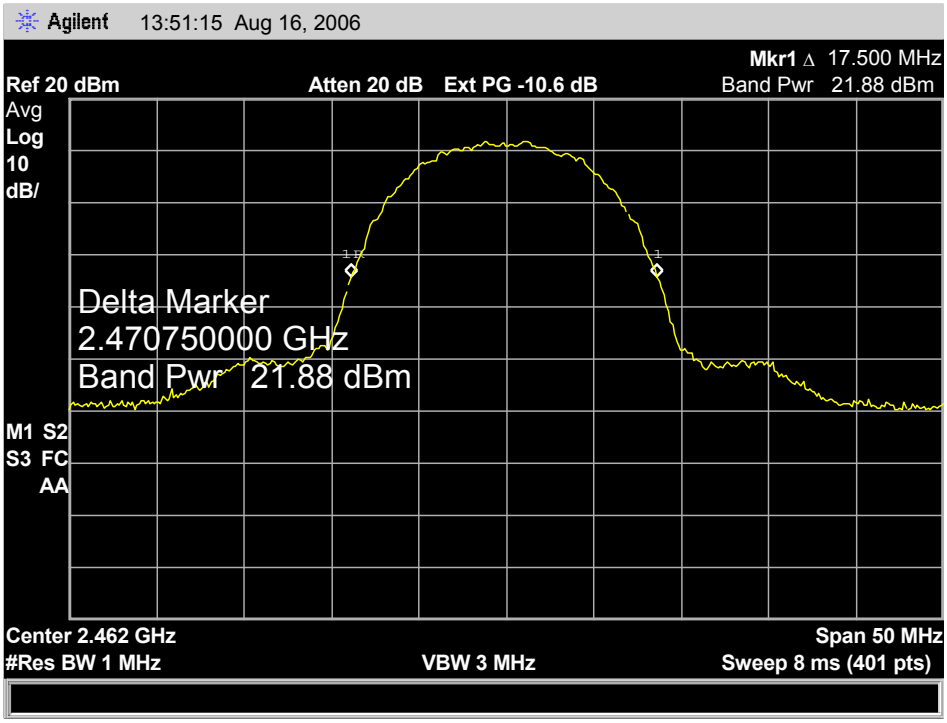
Plot 4.2.4



Plot 4.2.5

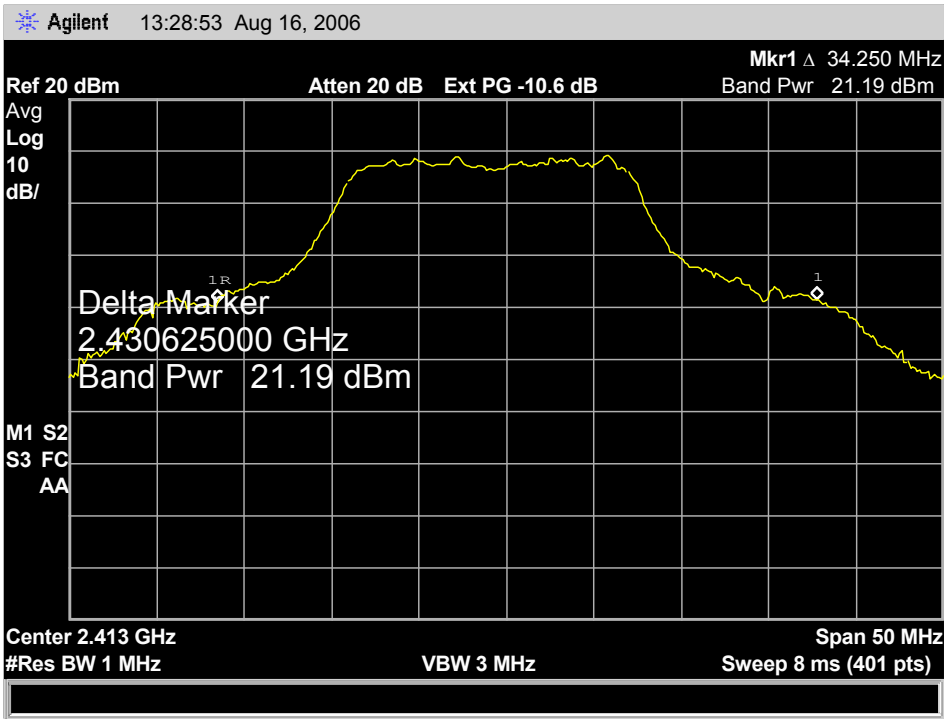


Plot 4.2.6

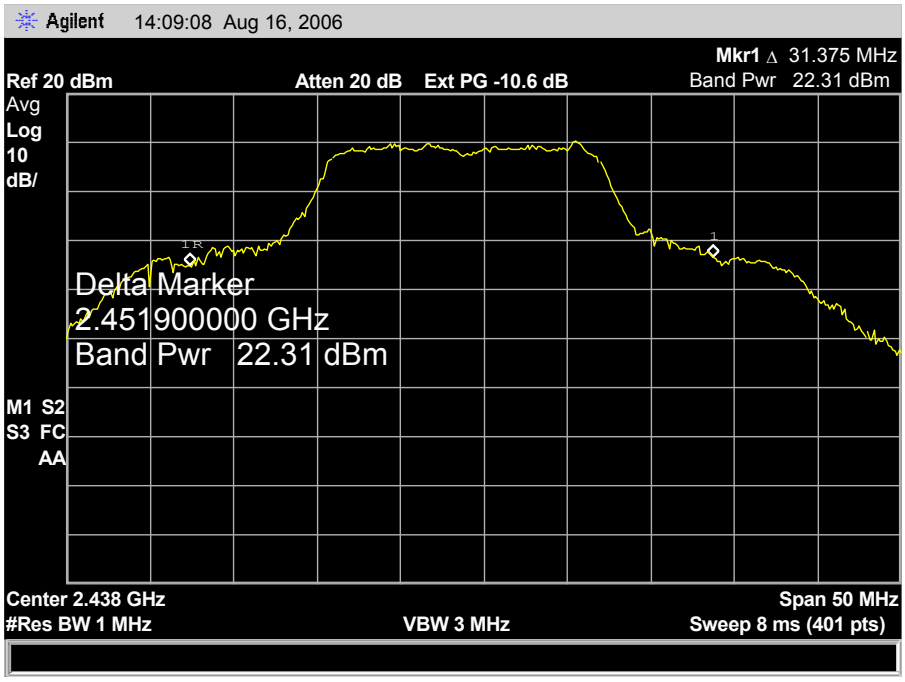


802.11g Mode

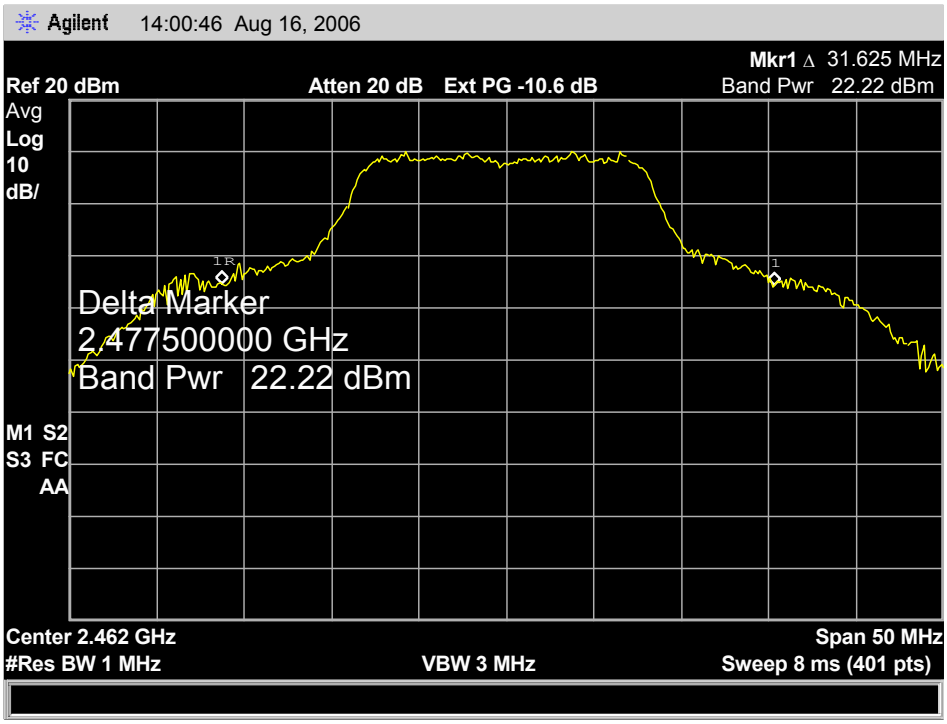
Plot 4.2.7



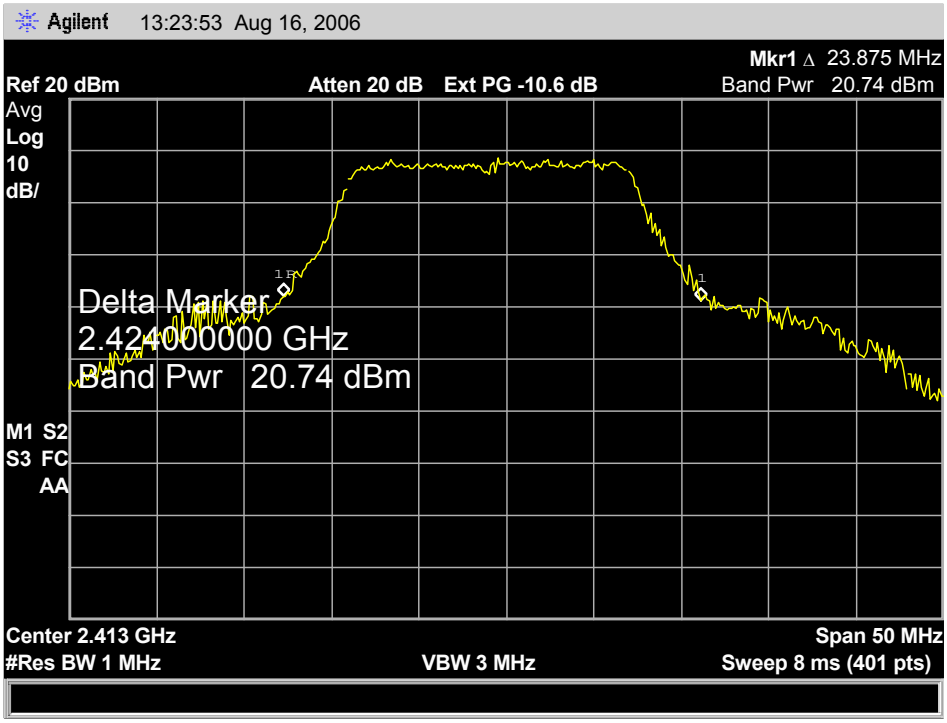
Plot 4.2.8



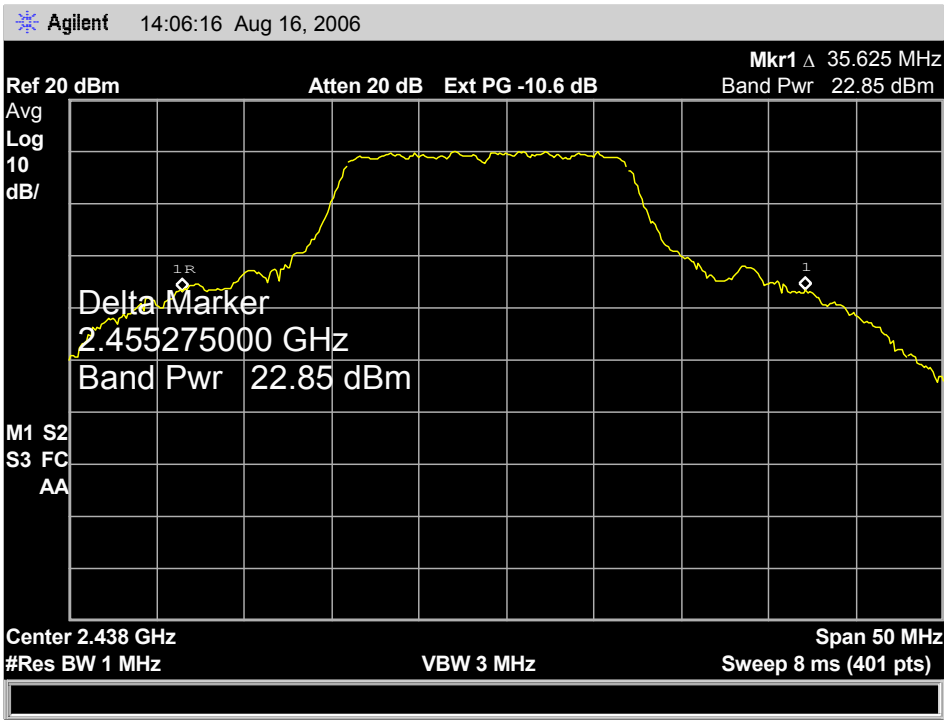
Plot 4.2.9



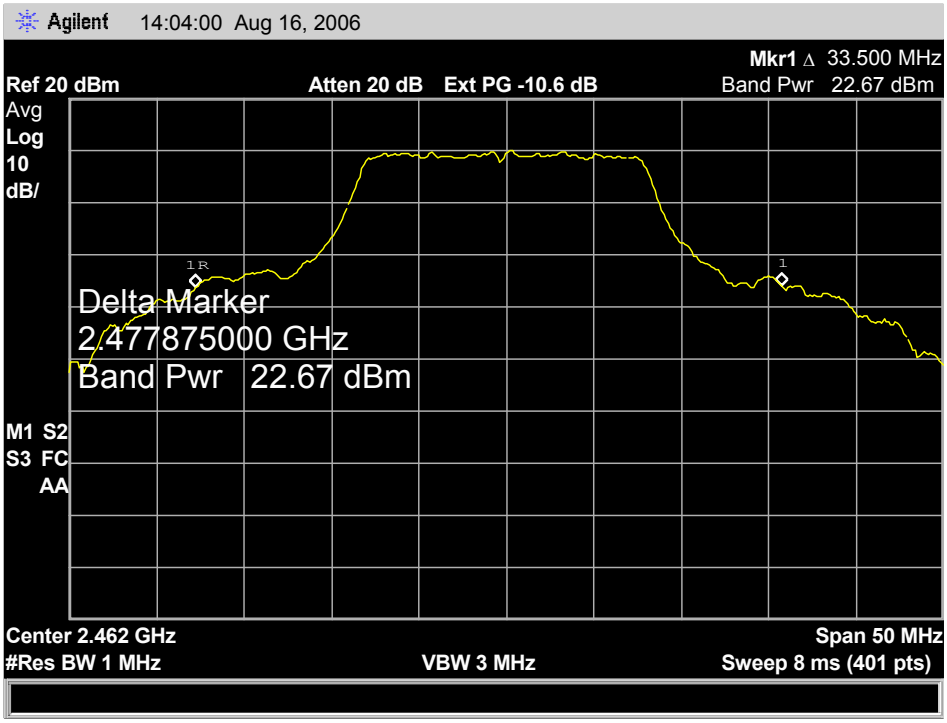
Plot 4.2.10



Plot 4.2.11



Plot 4.2.12



4.3. Peak Power Spectral Density

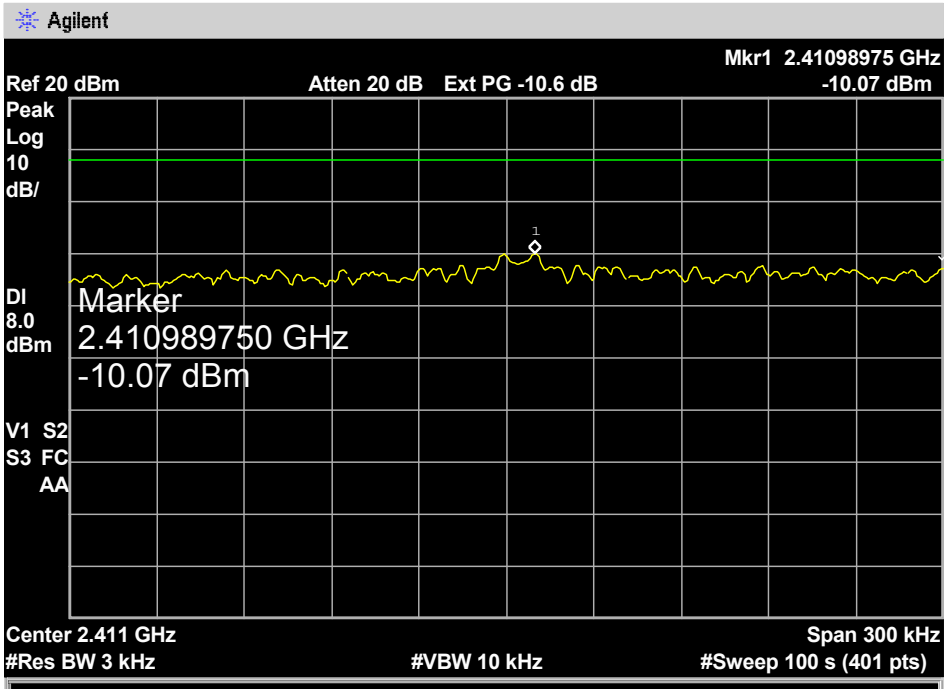
Reference document:	**47 CFR §15.247 (e)**		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.		
Test setup:	See Sec. 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3 kHz, VBW: 10 kHz, Span=300kHz, Sweep Time: 100s		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.3.1 - 4.3.12	

Test results:

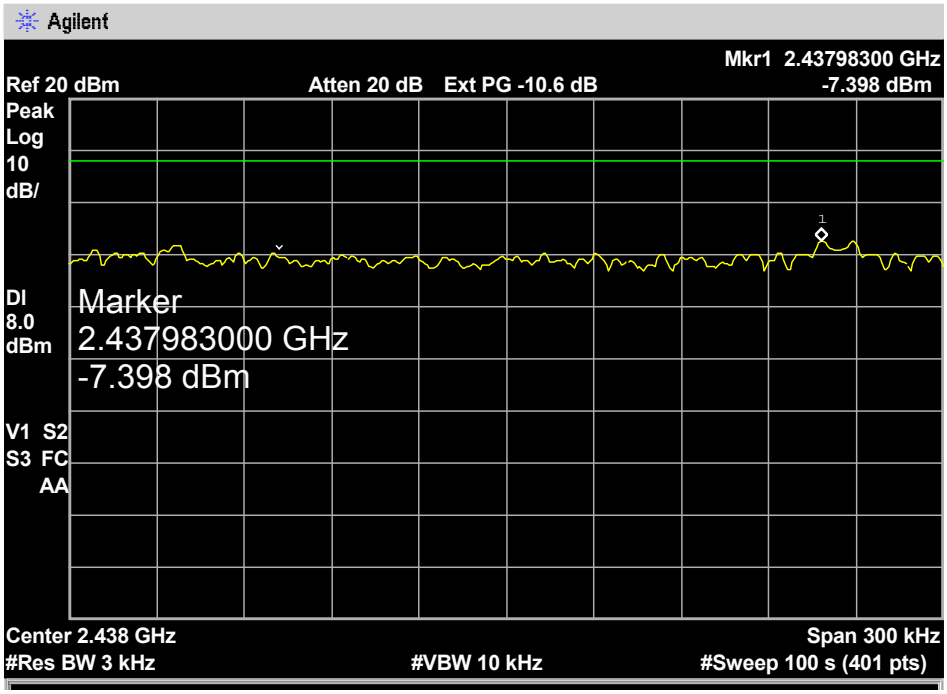
Frequency [MHz]	Data Rate [Mbps]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]	Reference
802.11b Mode					
2412	1	-10.07	8	18.07	Plot 4.3.1
2437	1	-7.398	8	15.398	Plot 4.3.2
2462	1	-6.897	8	14.897	Plot 4.3.3
2412	11	-10.45	8	18.45	Plot 4.3.4
2437	11	-8.708	8	16.708	Plot 4.3.5
2462	11	-9.368	8	17.368	Plot 4.3.6
802.11g Mode					
2412	6	-11.95	8	19.95	Plot 4.3.7
2437	6	-12.03	8	20.03	Plot 4.3.8
2462	6	-11.36	8	19.36	Plot 4.3.9
2412	54	-10.62	8	18.62	Plot 4.3.10
2437	54	-11.1	8	19.1	Plot 4.3.11
2462	54	-11.79	8	19.79	Plot 4.3.12

802.11b Mode

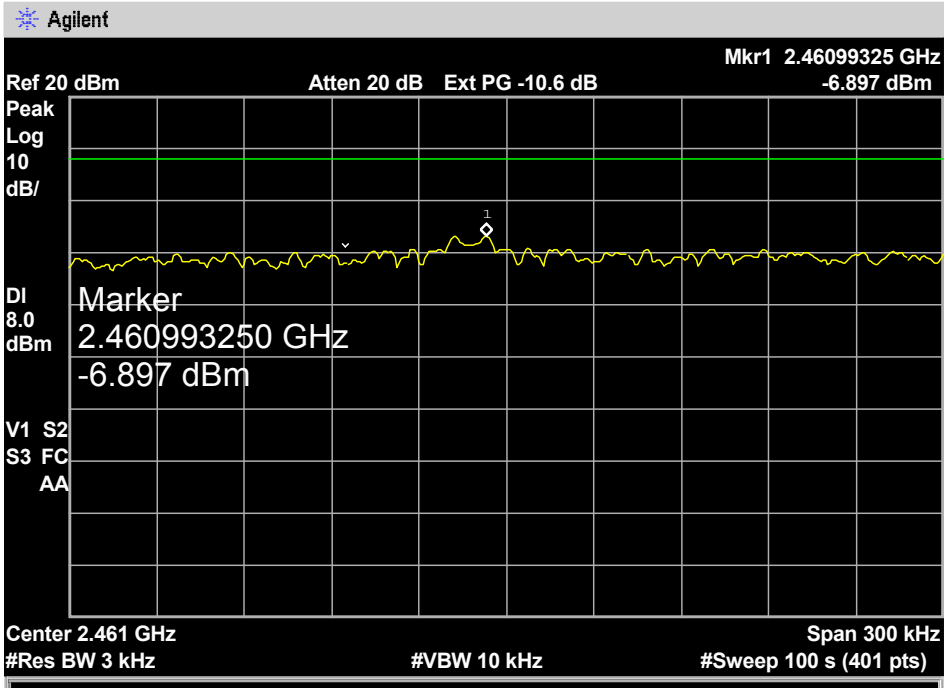
Plot 4.3.1



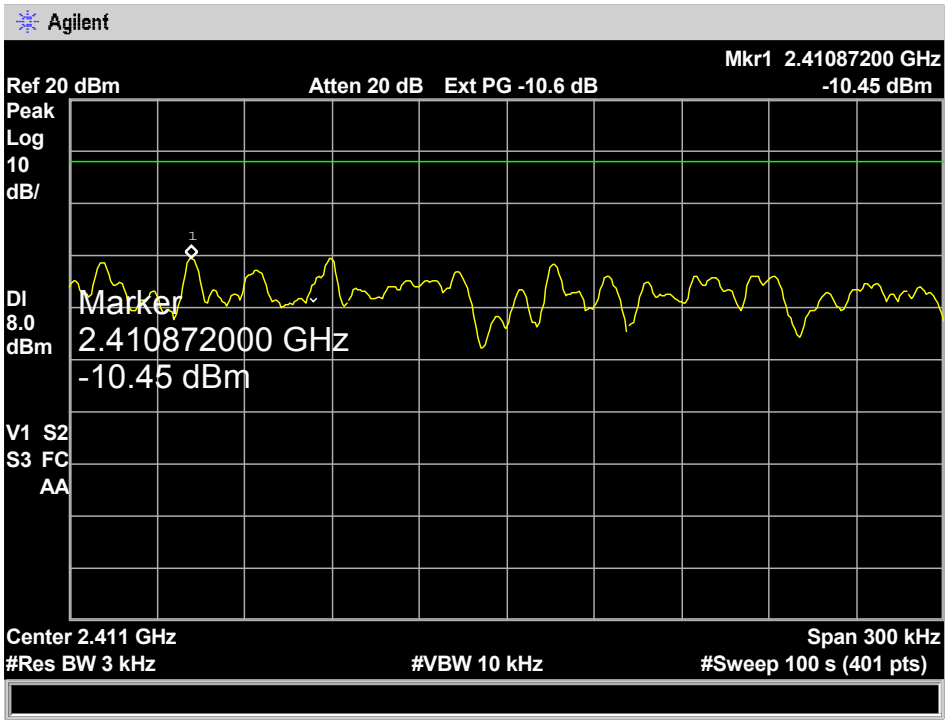
Plot 4.3.2



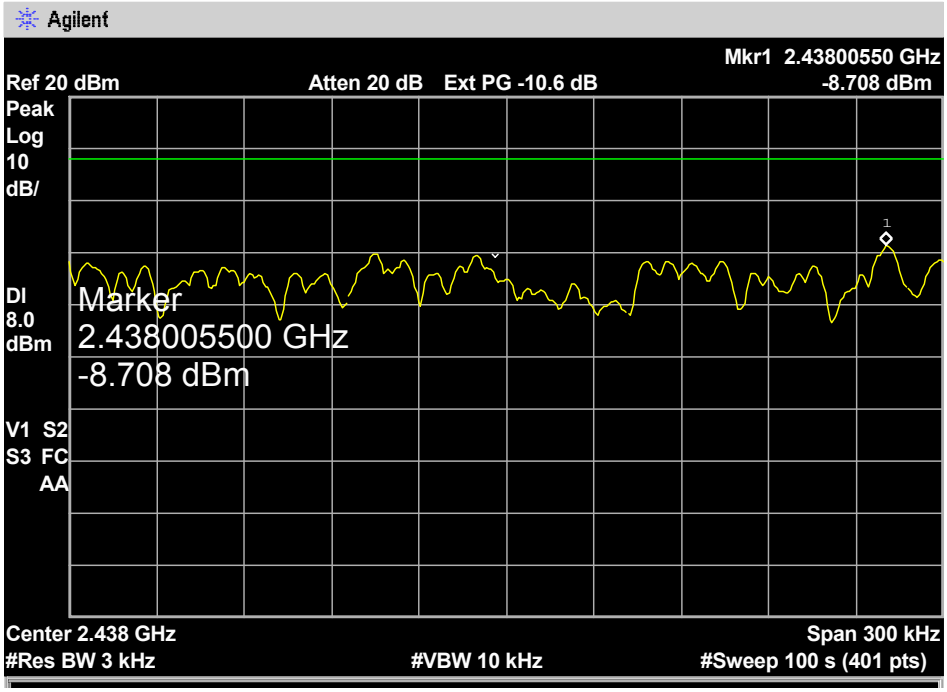
Plot 4.3.3



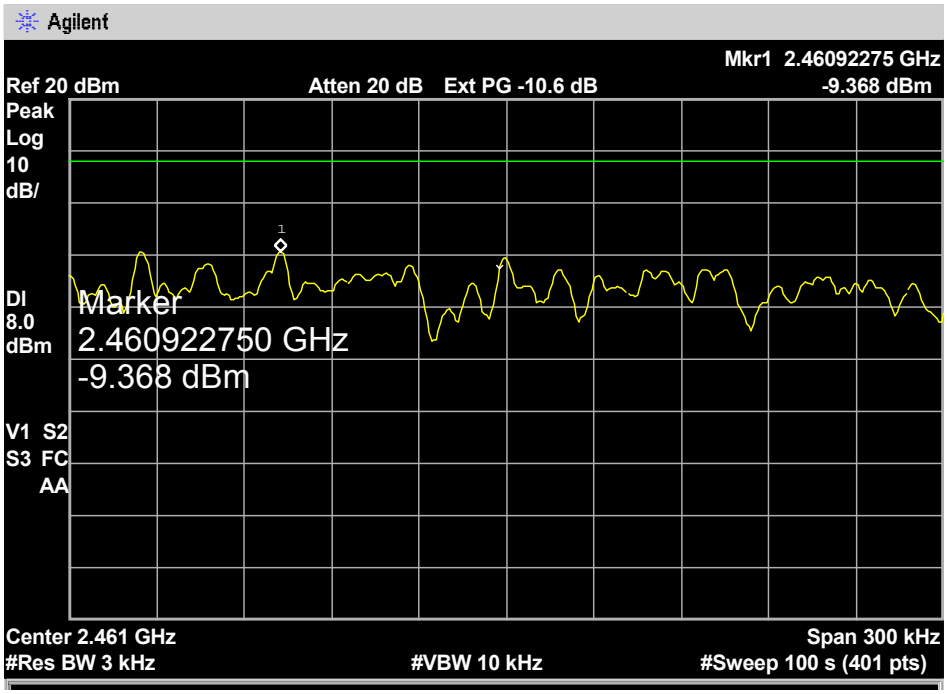
Plot 4.3.4



Plot 4.3.5

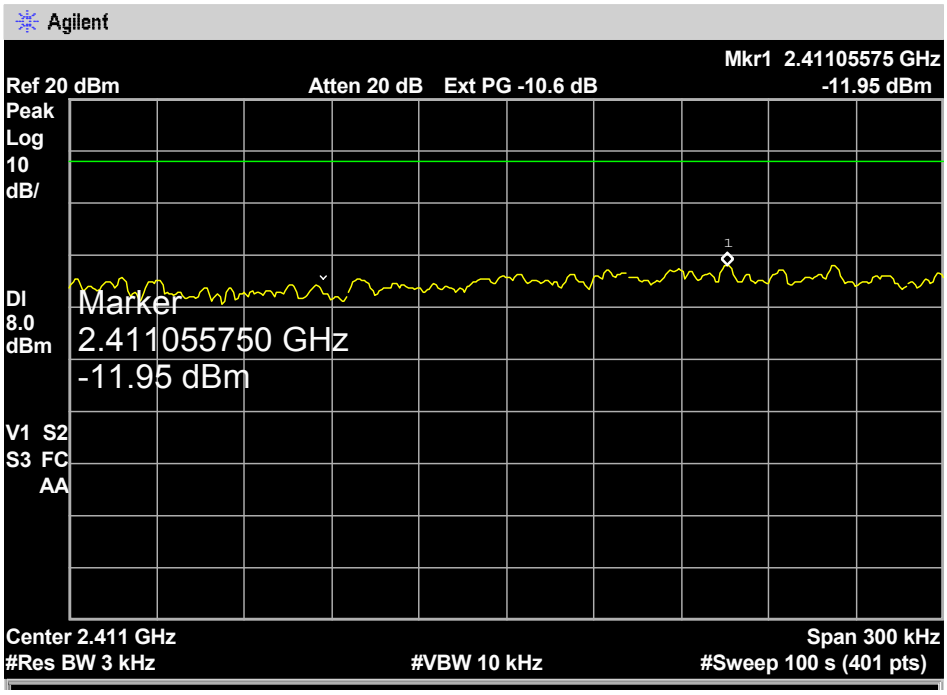


Plot 4.3.6

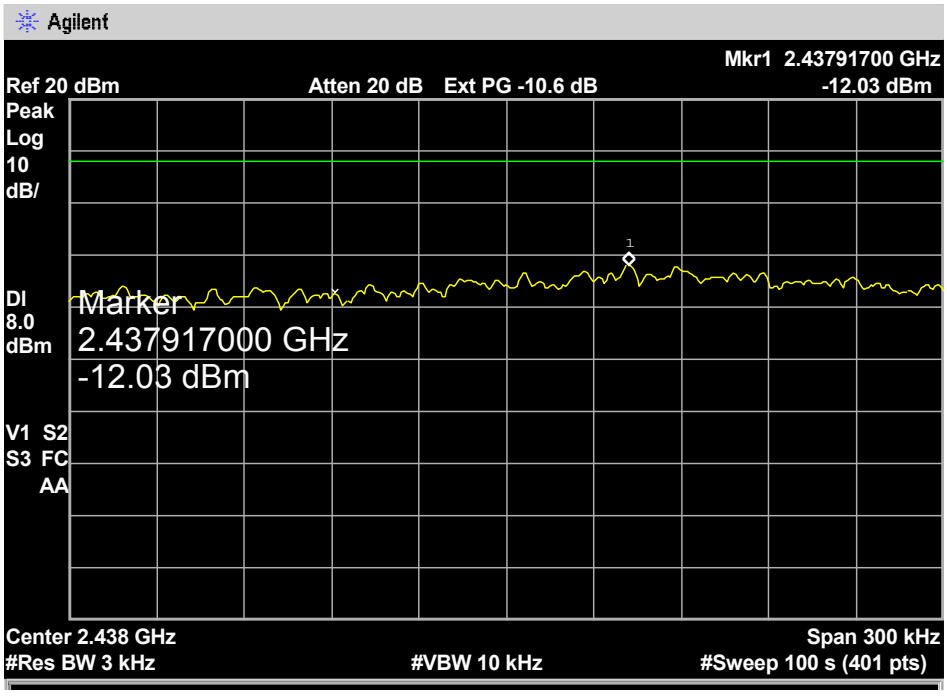


802.11g Mode

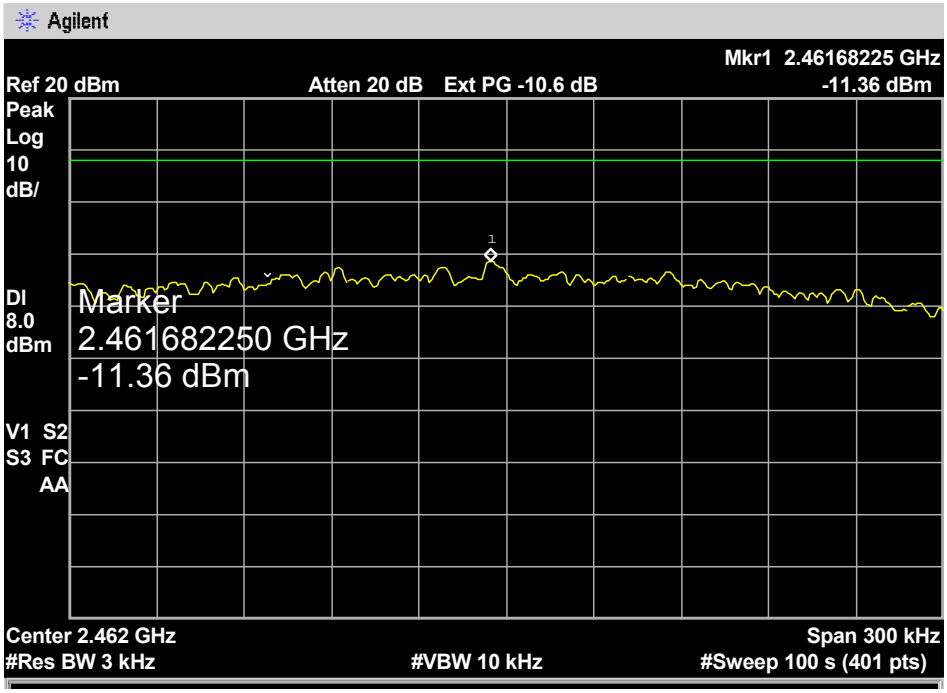
Plot 4.3.7



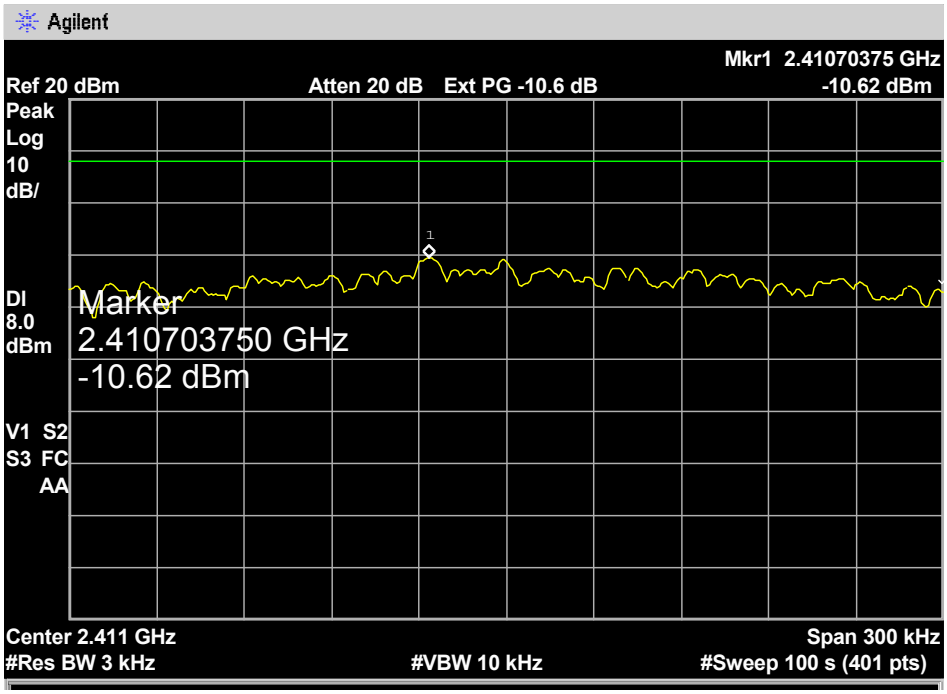
Plot 4.3.8



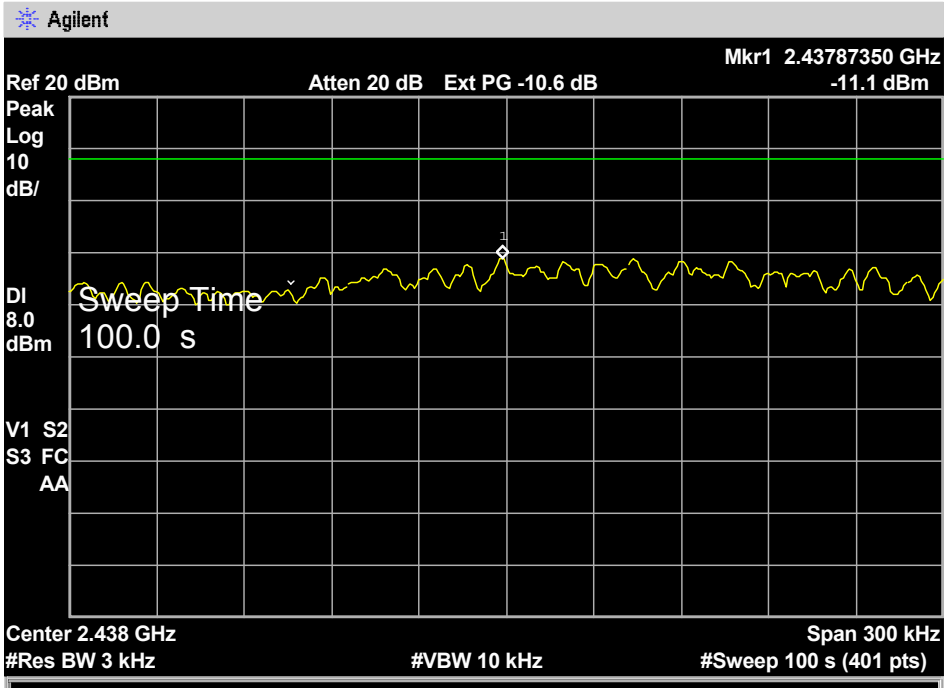
Plot 4.3.9



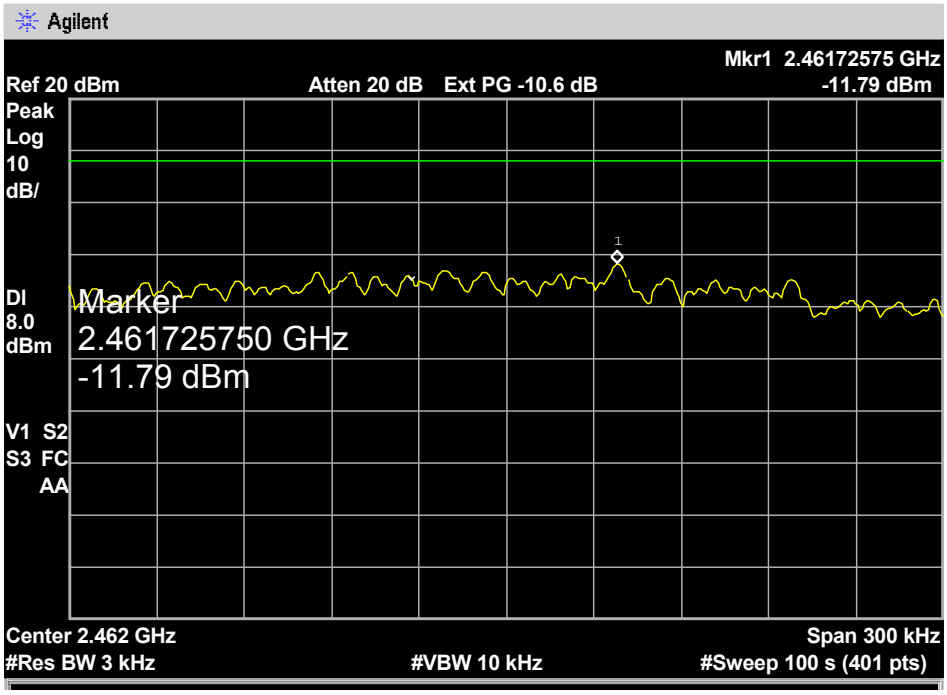
Plot 4.3.10



Plot 4.3.11



Plot 4.3.12



4.4. Conducted Spurious Emissions

Reference document:	**47 CFR §15.247 (d)**		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band in which the digitally modulated radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in Section §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (See §15.205(c).		
Test setup:	See Sec. 2.1	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.4.1 - 4.4.10	

Test results:

Spurious

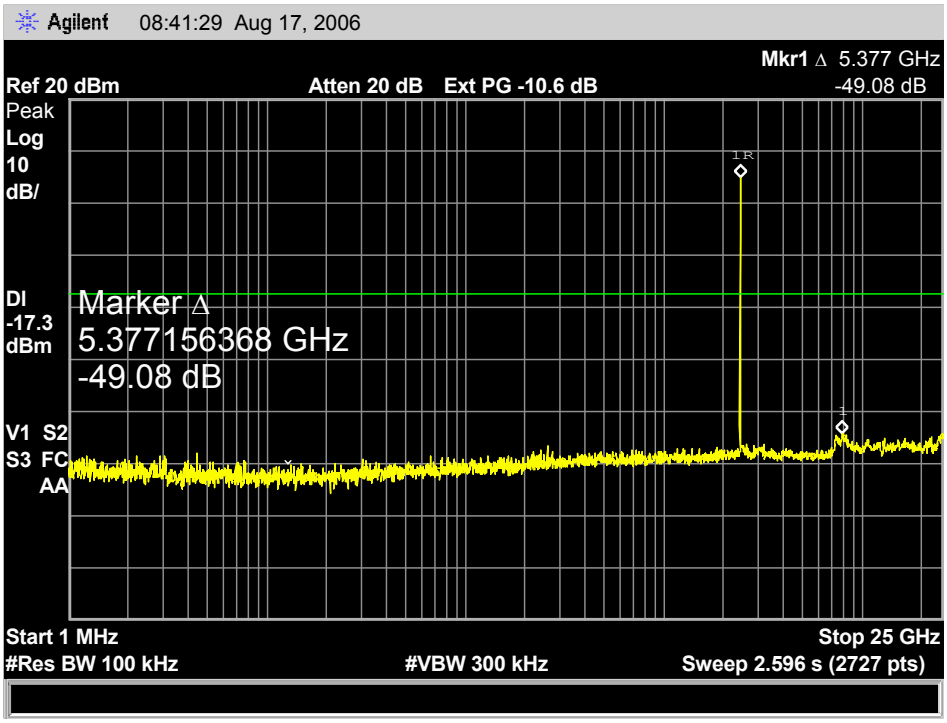
Frequency [MHz]	Data Rate [Mbps]	Measured Emission [dBc]	Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	*	-30	Plot 4.4.1	Pass
2437	11	*	-30	Plot 4.4.2	Pass
2462	11	*	-30	Plot 4.4.3	Pass
802.11g Mode					
2412	54	*	-30	Plot 4.4.4	Pass
2437	54	*	-30	Plot 4.4.5	Pass
2462	54	*	-30	Plot 4.4.6	Pass

Band edge

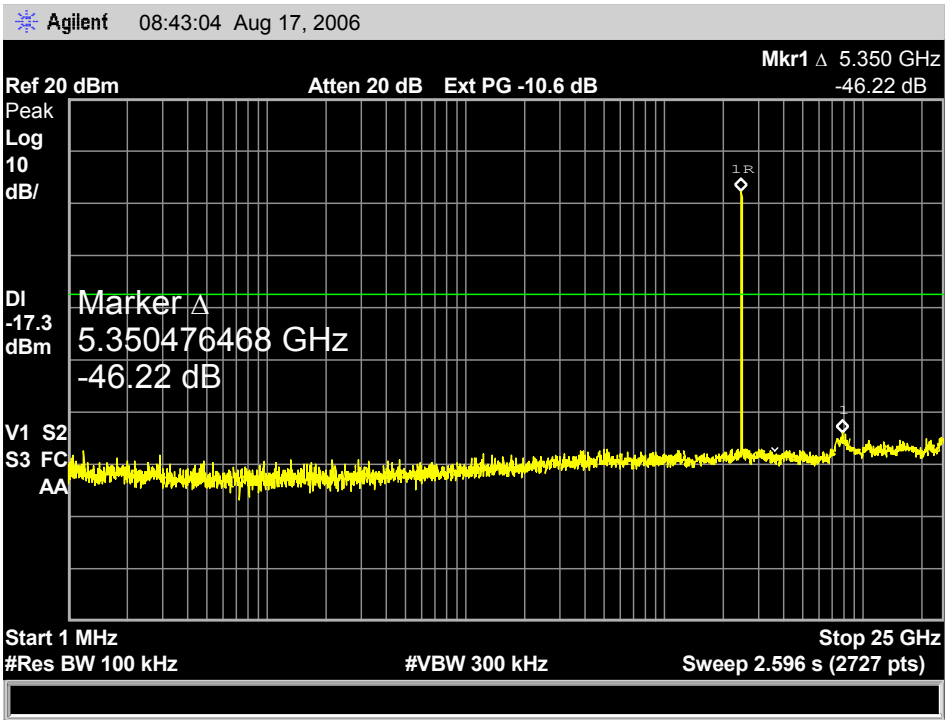
Frequency [MHz]	Data Rate [Mbps]	Measured Emission [dBc]	Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	*	-30	Plot 4.4.7	Pass
2462	11	*	-30	Plot 4.4.8	Pass
802.11g Mode					
2412	54	*	-30	Plot 4.4.9	Pass
2462	54	*	-30	Plot 4.4.10	Pass

*All emission at least 30 dB below the limit (-40dBc)

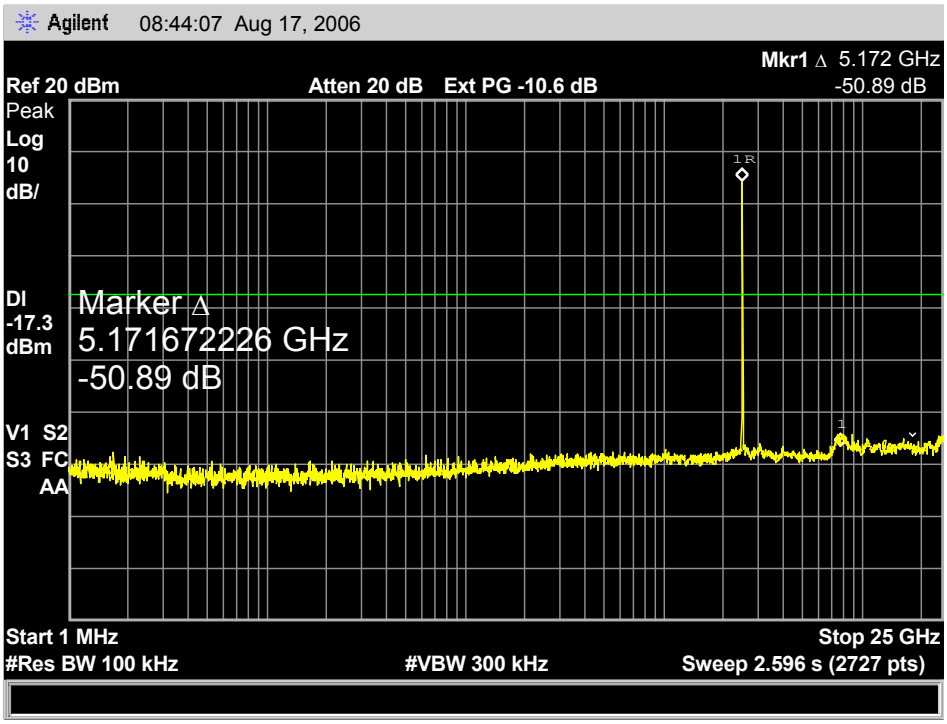
Spurious: 802.11b Mode
Plot 4.4.1



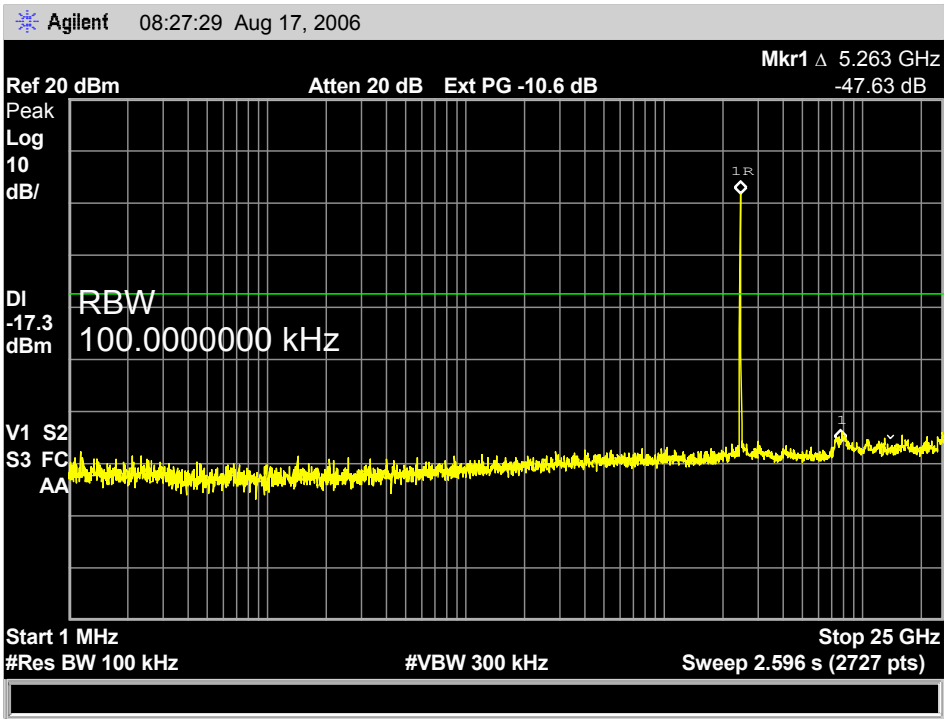
Plot 4.4.2



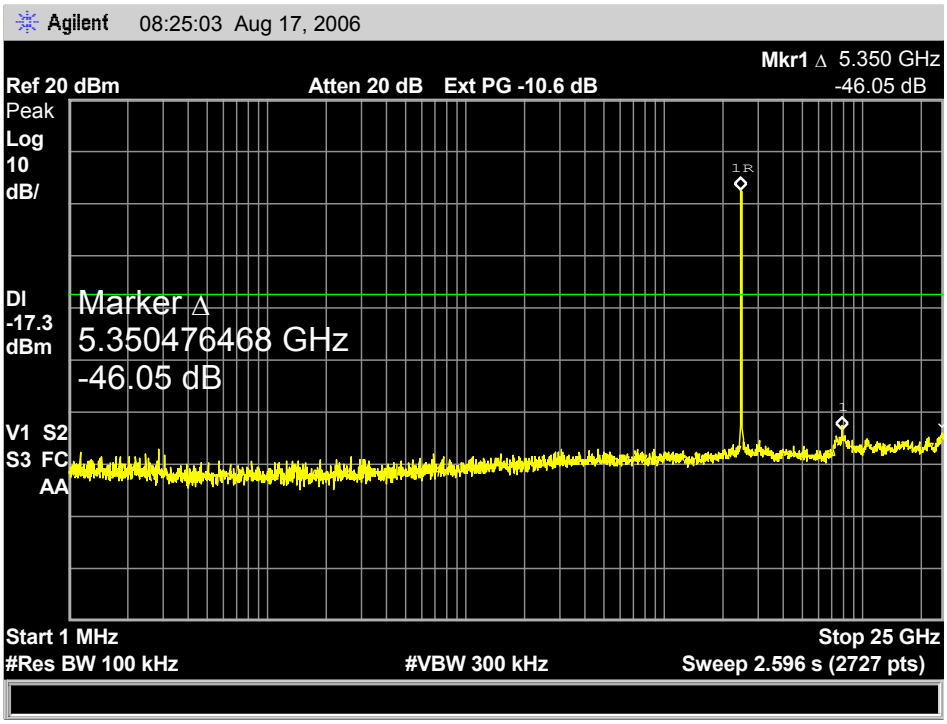
Plot 4.4.3



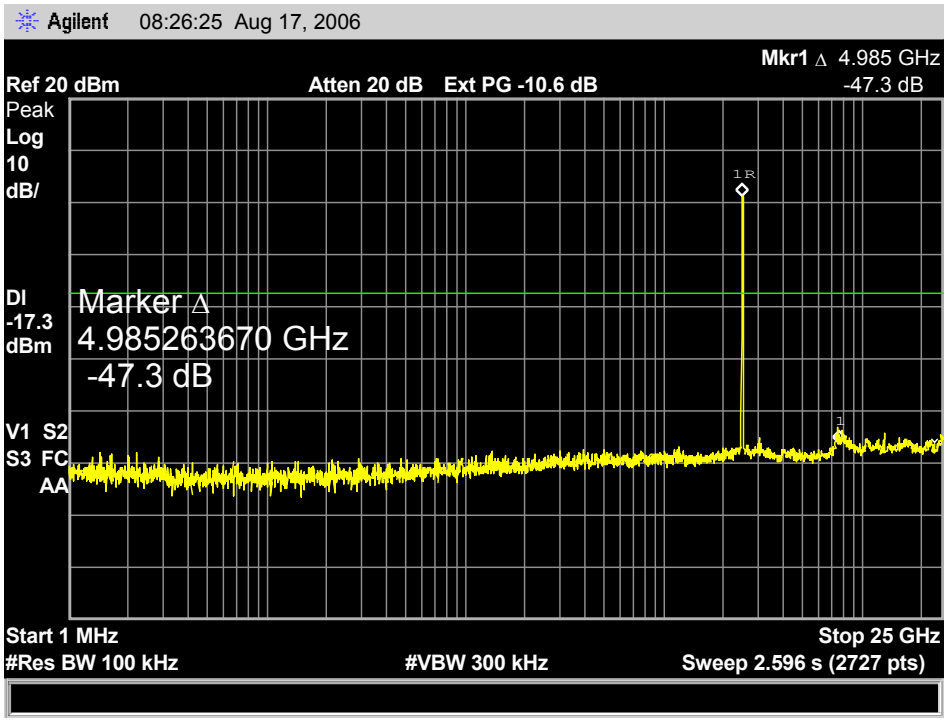
Spurious: 802.11g Mode
Plot 4.4.4



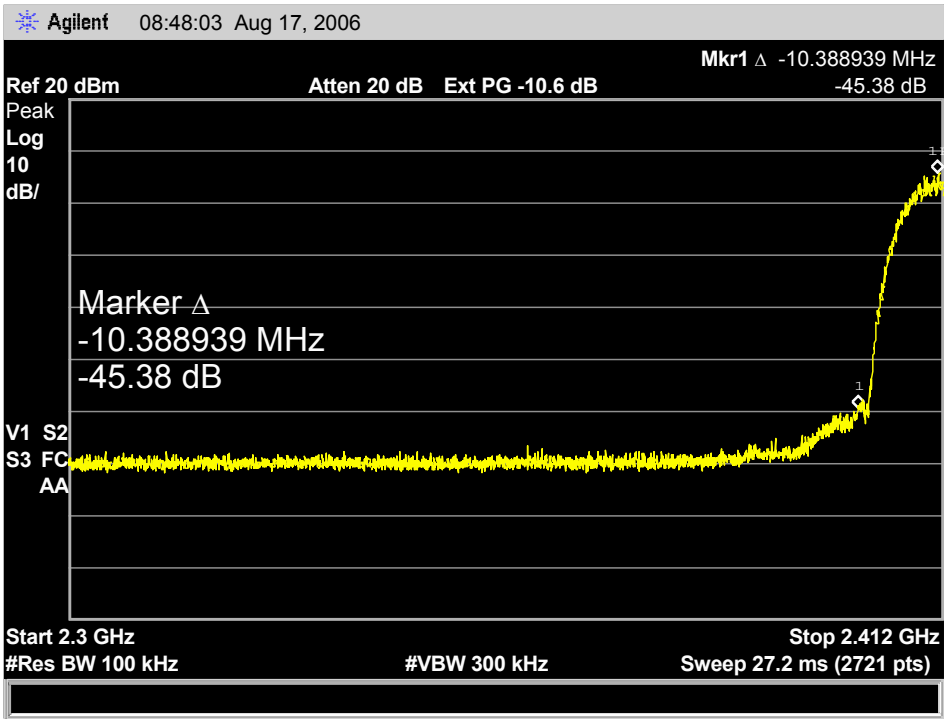
Plot 4.4.5



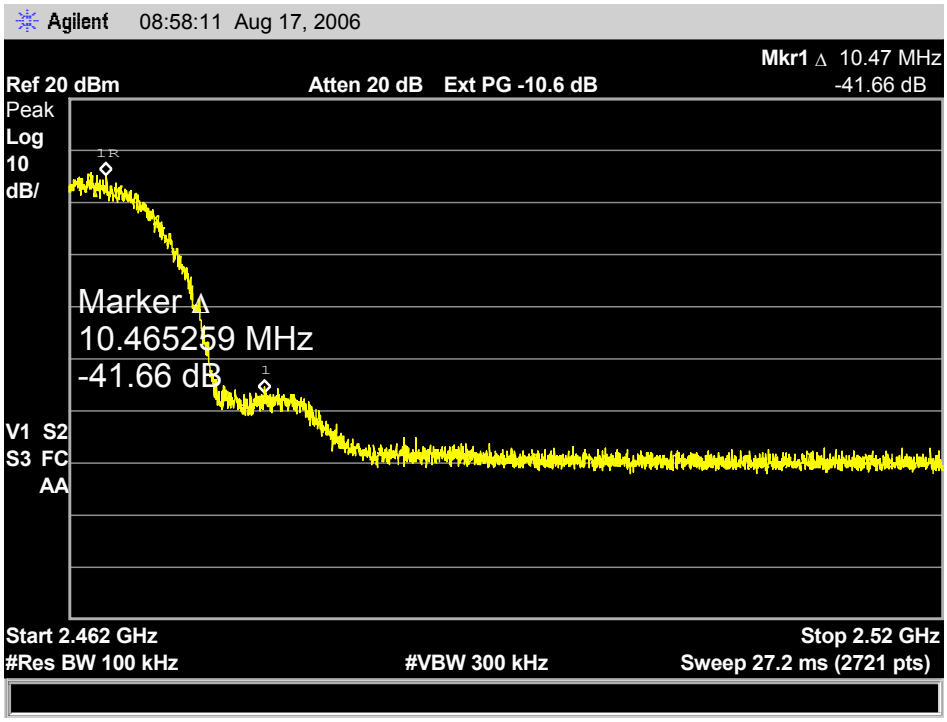
Plot 4.4.6



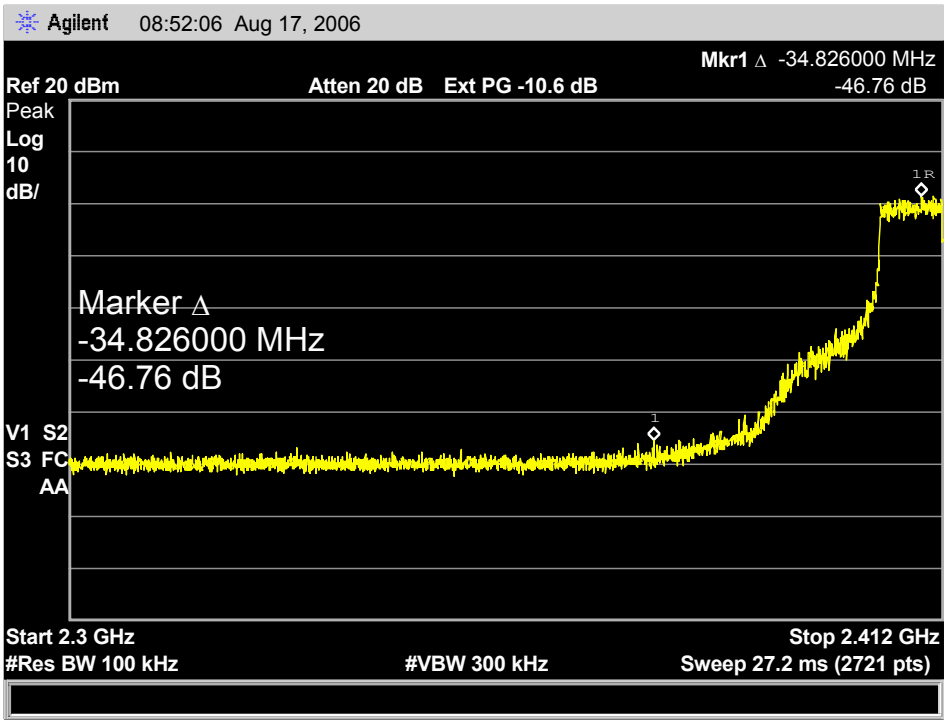
Band Edge: 802.11b Mode
Plot 4.4.7



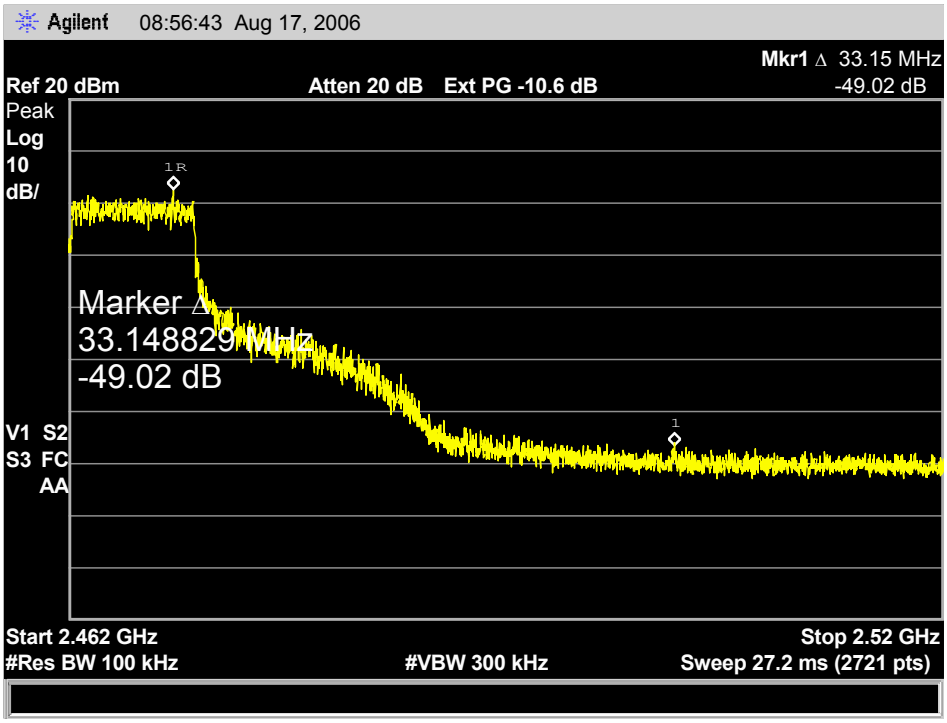
Plot 4.4.8



Band Edge: 802.11g Mode
Plot 4.4.9



Plot 4.4.10



4.5. Spurious Radiated Emissions, Restricted Bands

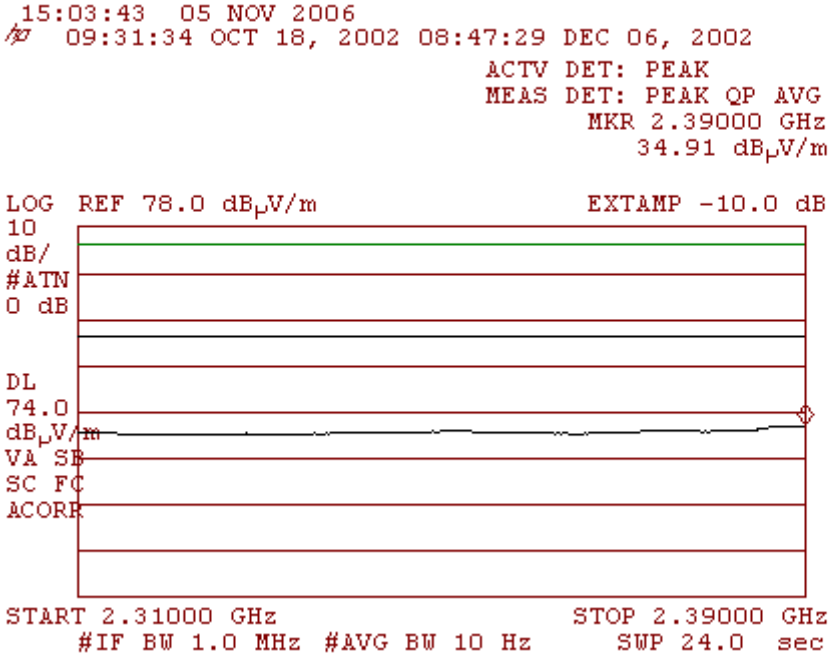
Reference document:	**47 CFR §15.247 (d) & §15.205**		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).		
Test setup:	See Sec. 2.2	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz, Average: VBW: 10Hz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.5.1 - 4.5.16 and Appendix A	

Test results:

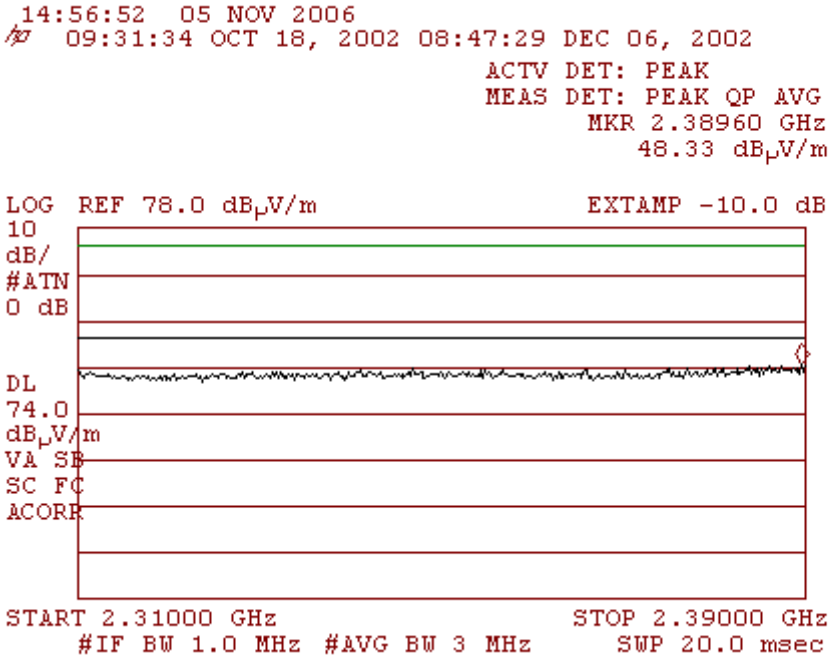
Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Emission Level [dBµV/m]	Limit [dBµV/m]	Test results
802.11b Mode						
2412	11	2390.00	Average	34.91	54	Pass
2412	11	2389.60	Peak	48.33	74	Pass
2462	11	2496.78	Average	34.87	54	Pass
2462	11	2496.08	Peak	48.06	74	Pass
802.11g Mode						
2412	54	2390.00	Average	39.99	54	Pass
2412	54	2390.00	Peak	59.42	74	Pass
2462	54	2483.50	Average	47.25	54	Pass
2462	54	2484.24	Peak	62.53	74	Pass
All other emission at least 20 dB below the limit						

Note: Spurious Emission [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

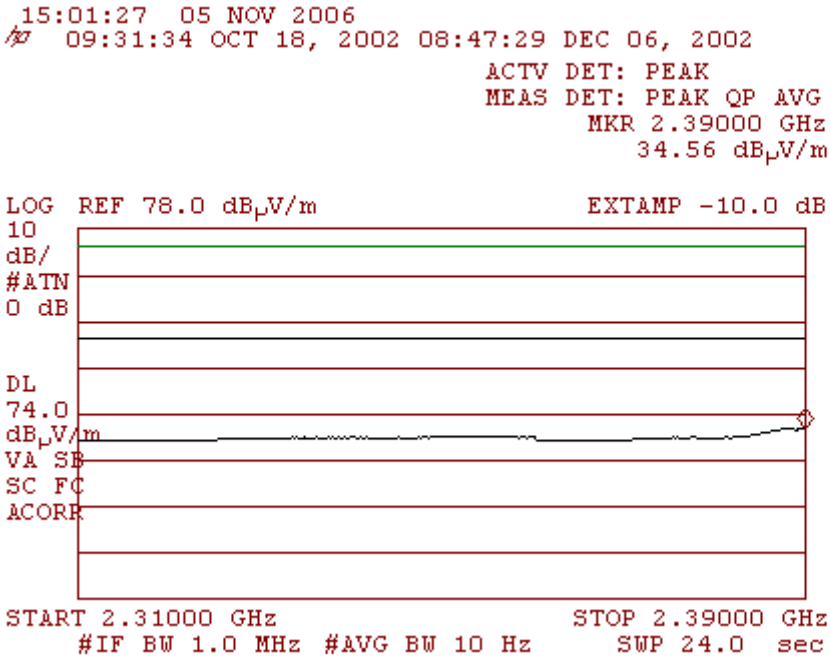
802.11b: 11 Mbps
Lowest Frequency
Horizontal Polarization
Average
Plot 4.5.1



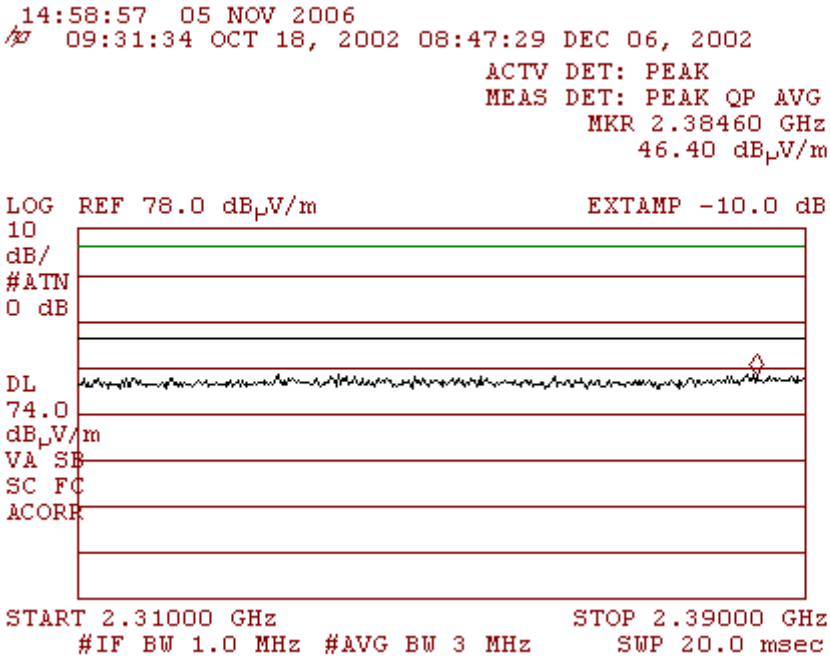
Peak
Plot 4.5.2



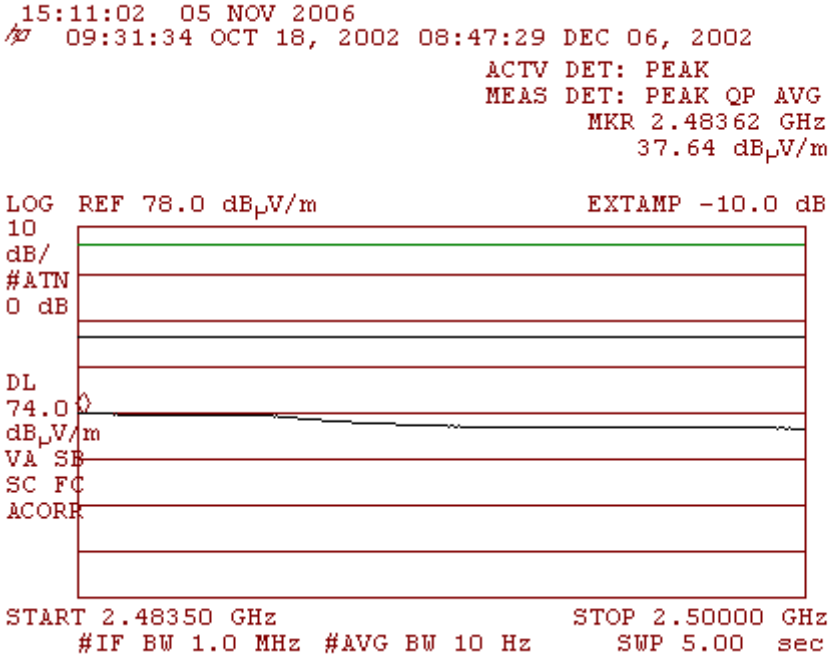
Vertical Polarization
Average
Plot 4.5.3



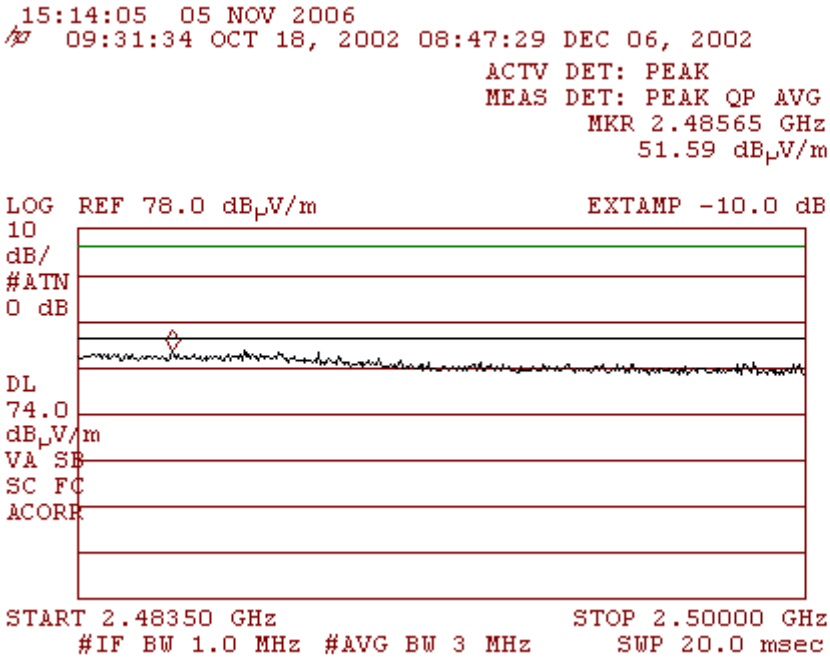
Peak
Plot 4.5.4



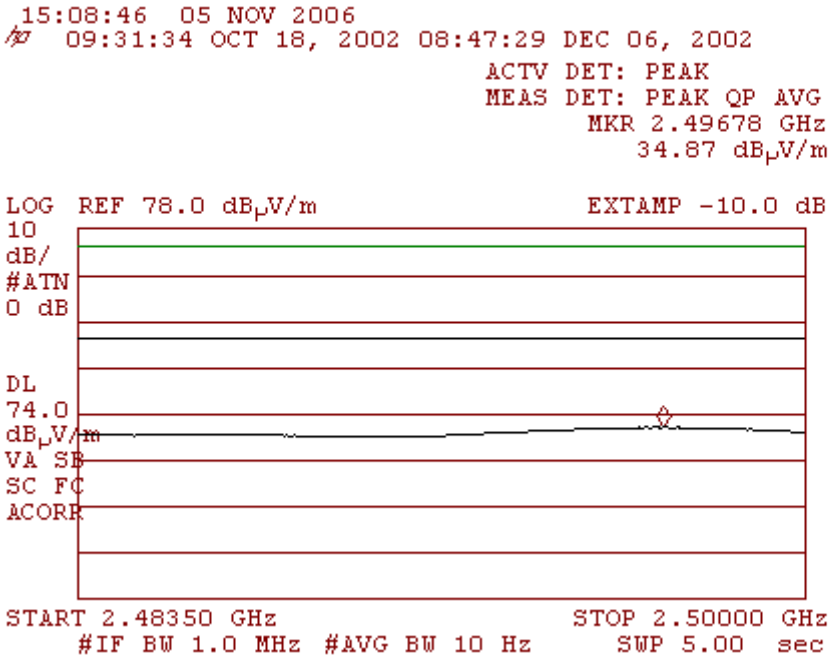
802.11b: 11 Mbps
Highest Frequency
Vertical Polarization
Average
Plot 4.5.5



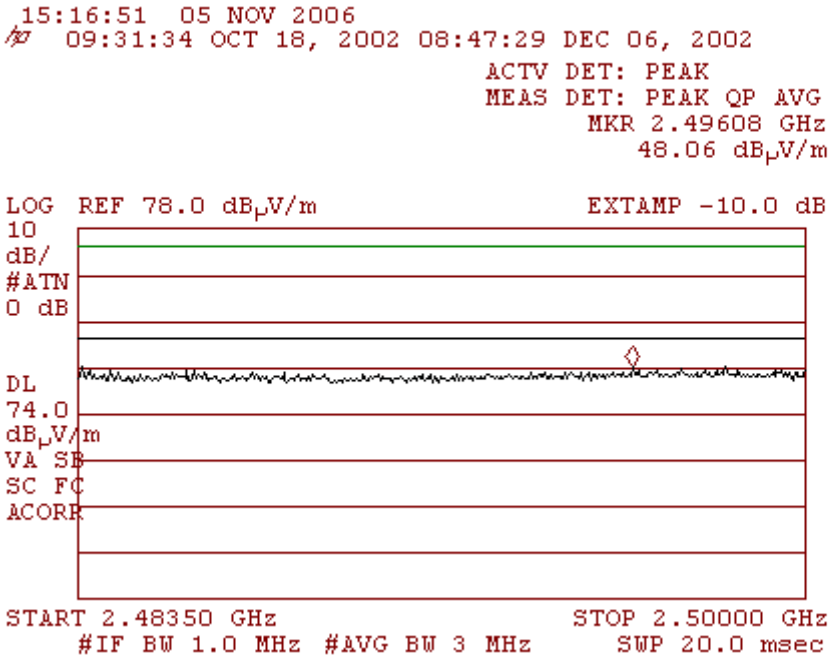
Peak
Plot 4.5.6



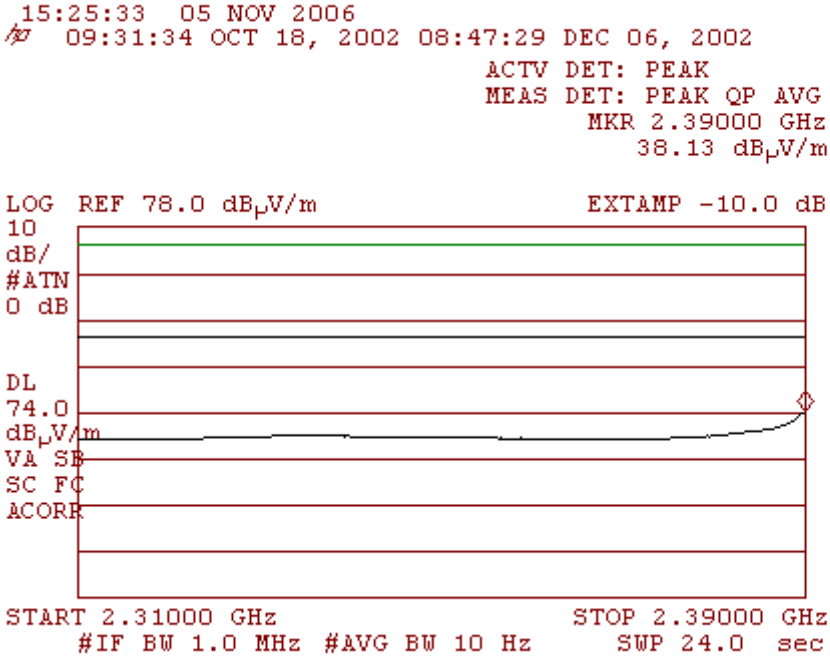
Horizontal Polarization
Average
Plot 4.5.7



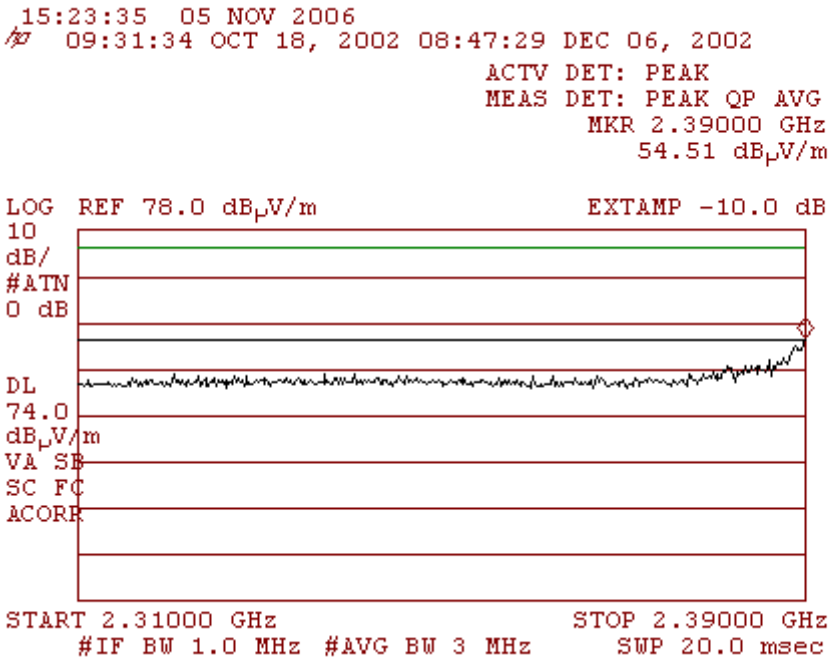
Peak
Plot 4.5.8



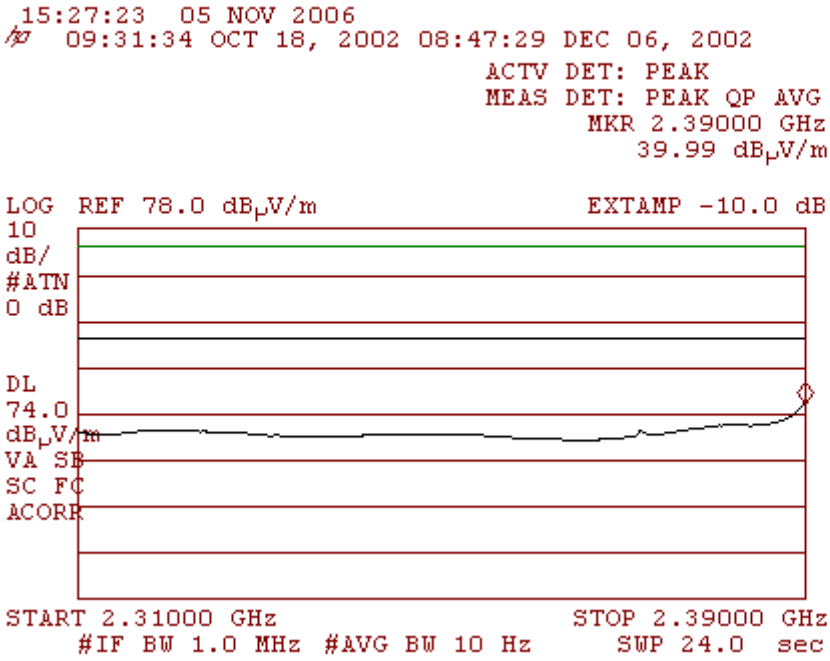
802.11g: 54 Mbps
Lowest Frequency
Vertical Polarization
Average
Plot 4.5.9



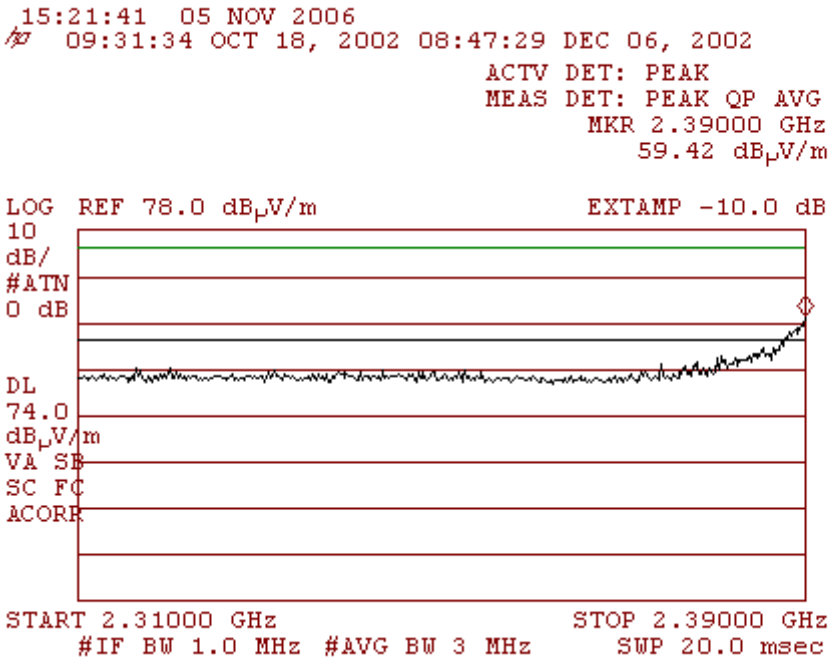
Peak
Plot 4.5.10



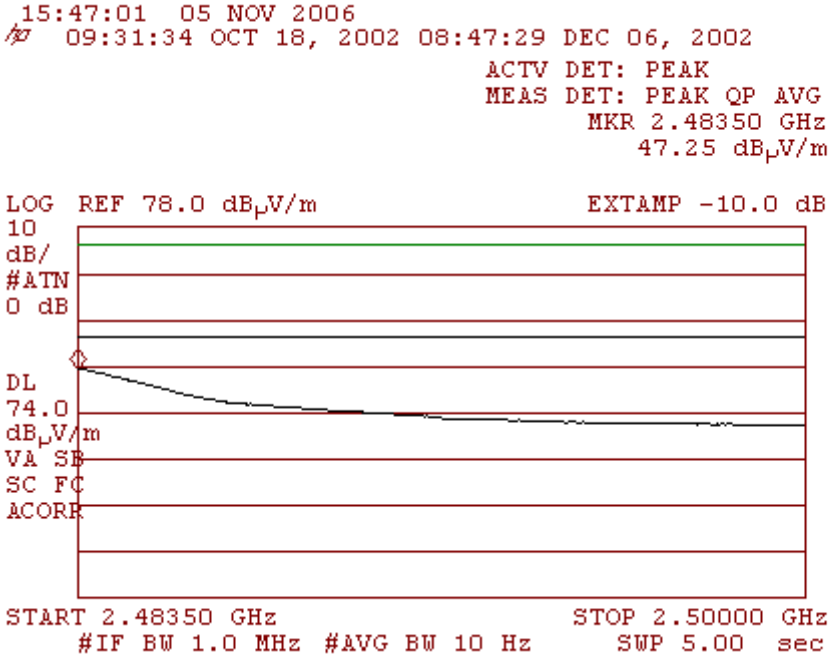
Horizontal Polarization
Average
Plot 4.5.11



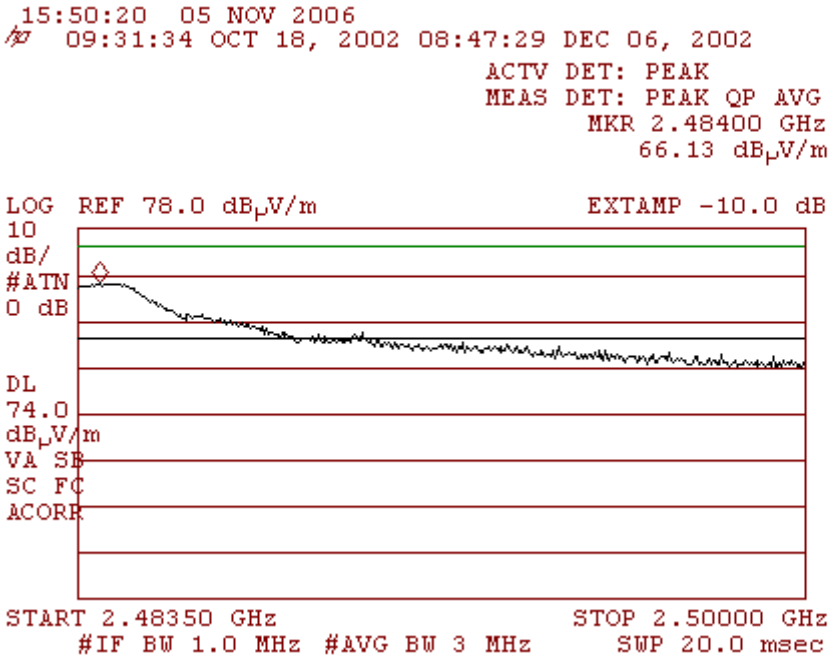
Peak
Plot 4.5.12



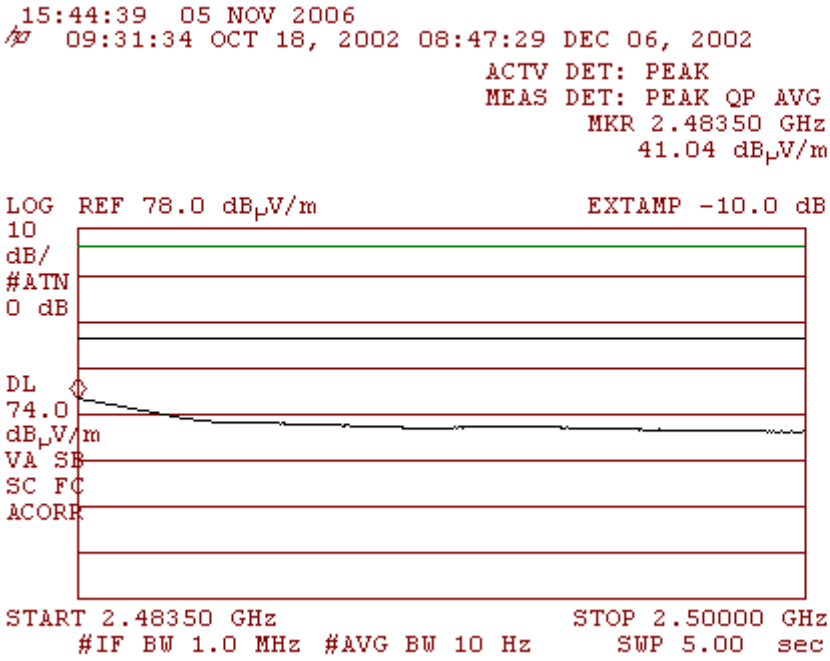
802.11g: 54 Mbps
Highest Frequency
Vertical Polarization
Average
Plot 4.5.13



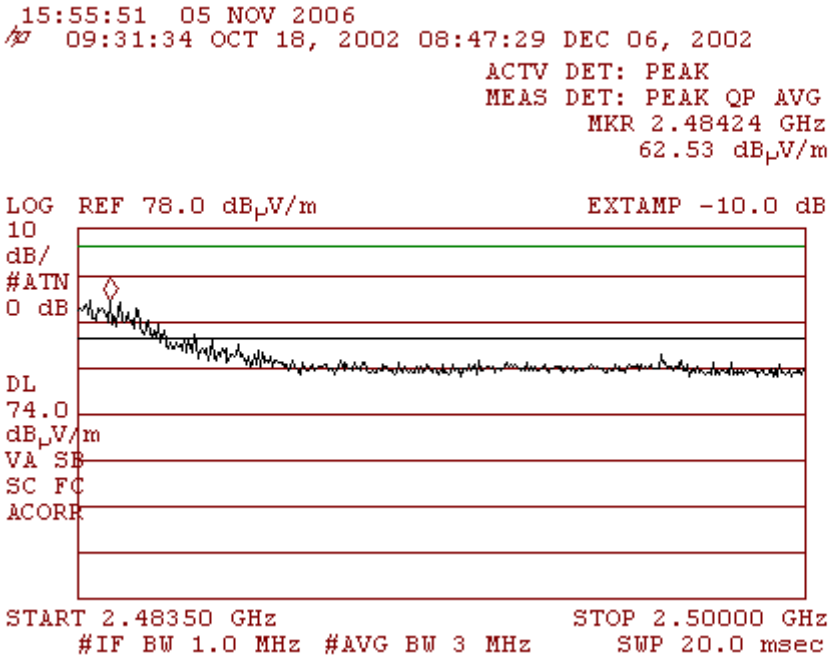
Peak
Plot 4.5.14



Horizontal Polarization
Average
Plot 4.5.15



Peak
Plot 4.5.16



4.6. Radiated Emission (Receive mode)

Reference document:	**47 CFR §15.109**		
Test Requirements:	Emission Level shall not exceed §15.109(a) limits		
Test setup:	See Sec. 2.3	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 120kHz,VBW**:** 300kHz		
Mode of operation:	Receive		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	All peak reading at least 20 dB blow the limit	Appendix B	

Note: Emission Level [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

4.7. Antenna Connector Requirements

Reference document:	**47 CFR §15.203**	
Test Requirements:	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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Result:	The F3129AG employs an integral antenna without any connector.	**Comply**

5. EUT docking into Cradle Model: F3158A configuration

5.1. Radiated Emission measurements

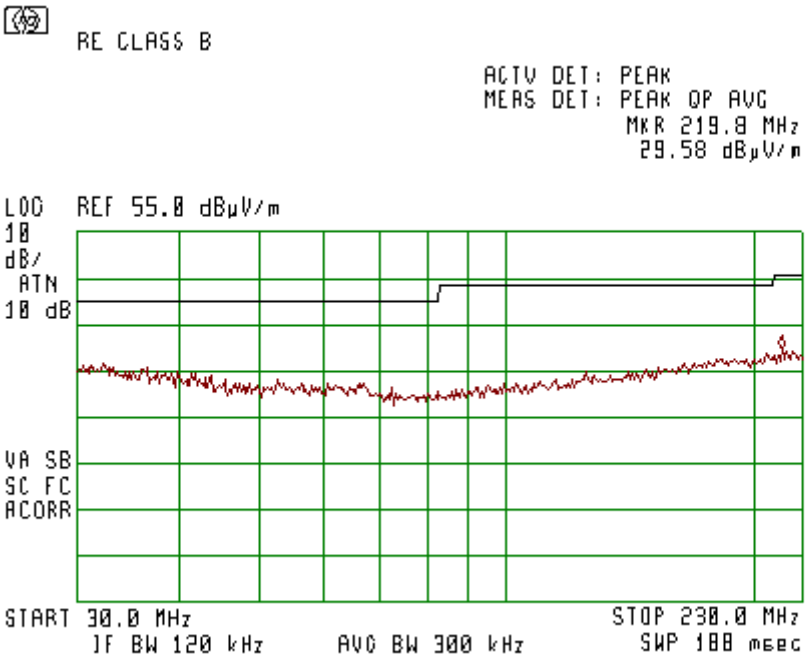
Reference document:	**47 CFR §15.109**		
Test Requirements:	The field strength of radiated emissions from an unintentional radiator shall not exceed the levels specified in §15.109		
Test setup:	See Sec. 2.3		
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	f <1GHz: RBW: 120kHz,VBW**:** 1MHz		
Radio device:	Idle		
Environment conditions:	Ambient Temperature: 21°c	Relative Humidity: 53%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See plots 5.1.1-5.1.4	

Test Results:

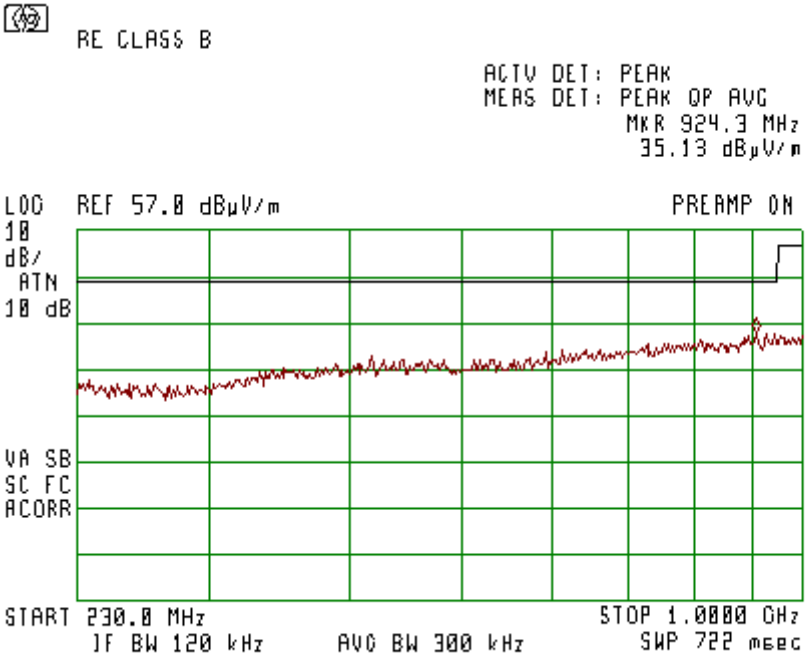
All QP readings were at least 10 dB below the limit.

Upper frequency measurement: 1GHz (highest frequency used in the device <108MHz).

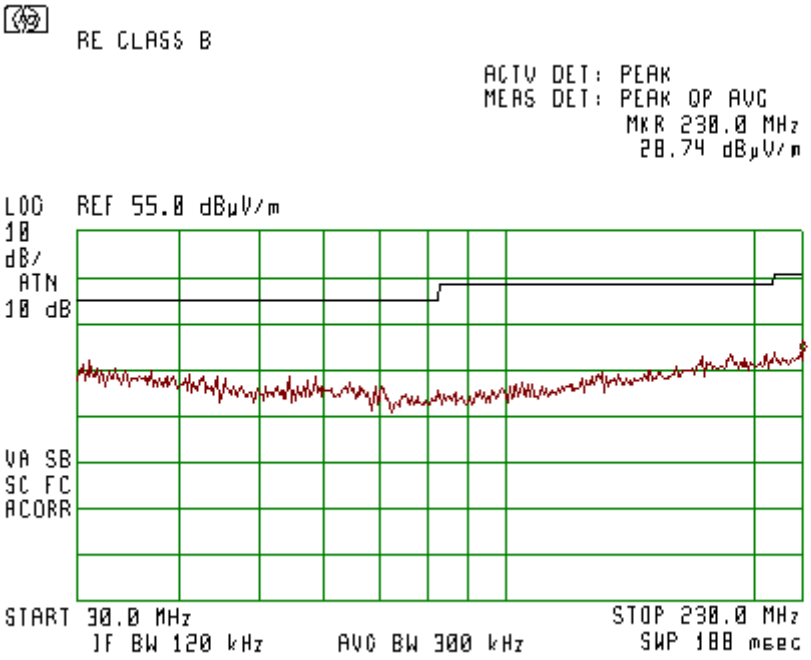
Plot 5.1.1
Horizontal Polarization
30MHz-230MHz



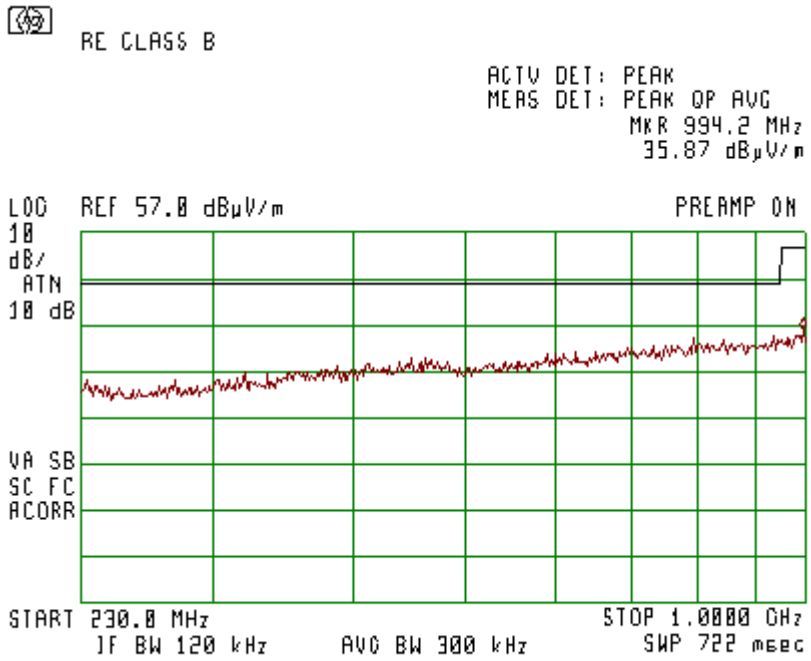
Plot 5.1.2
Horizontal Polarization
230MHz-1GHz



Plot 5.1.3
Vertical Polarization
30MHz-230MHz



Plot 5.1.4
Vertical Polarization
230MHz-1GHz



5.2. Power line Emission measurements

Reference document:	**47 CFR §15.107**		
Test Requirements:	The radio frequency voltage that is conducted back onto the AC power line shall not exceed the limits specified in §15.107		
Date of Test:	29.10.2006	**Pass**	
Test setup:	See Sec. 2.4		
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	f <30MHz: RBW: 9kHz, VBW:30kHz		
Radio device:	Idle		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 54%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plots 5.2.1 to 5.2.2	

Test Results:

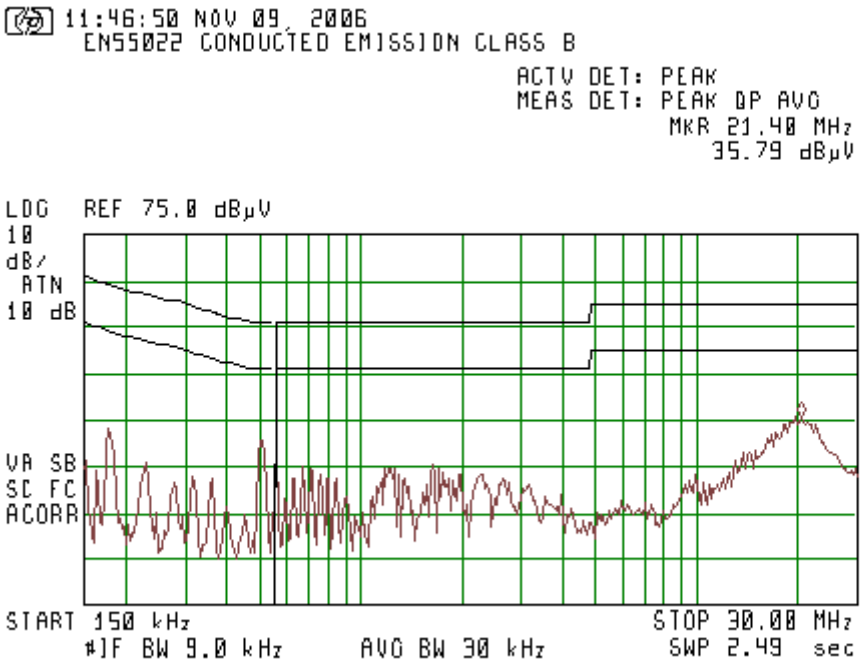
"Phase" Lead, 110 VAC

Frequency [MHz]	Measured Result [dBµV]		Class B Limits [dBµV]		Margin [dB]		Pass/Fail
	QP	AVR	QP	AVR	QP	AVR	
0.163464	42.9	35.8	65.29	55.29	-22.39	-19.49	Pass
0.216858	35.7	27	62.94	52.94	-27.24	-25.94	Pass
0.271701	29.8	21.4	61.07	51.07	-31.27	-29.67	Pass
0.541754	34.5	33.6	56.00	46.00	-21.50	-12.40	Pass
1.197378	25	19.2	56.00	46.00	-31.00	-26.80	Pass

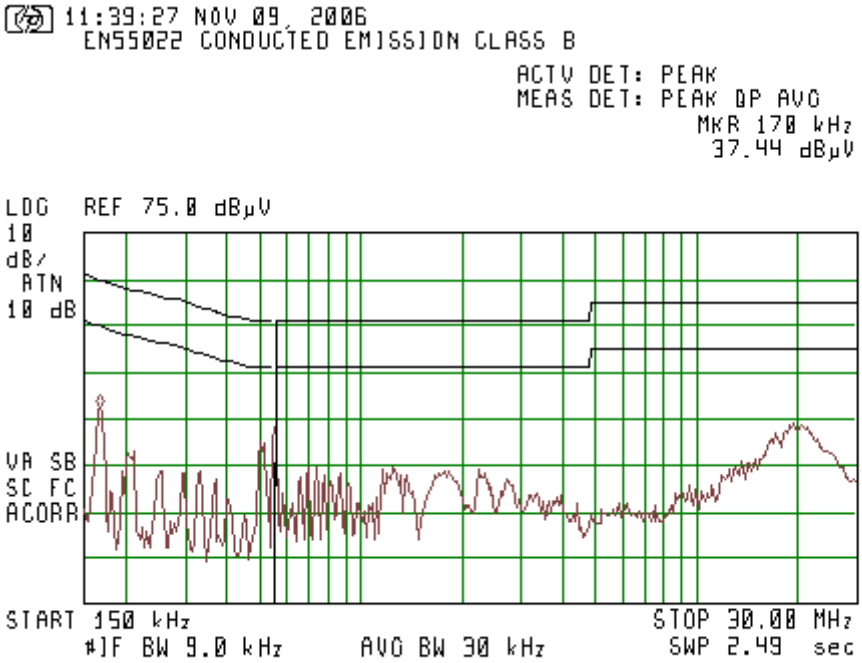
"Neutral" Lead, 110 VAC

Frequency [MHz]	Measured Result [dBµV]		Class B Limits [dBµV]		Margin [dB]		Pass/Fail
	QP	AVR	QP	AVR	QP	AVR	
0.153154	42.8	35.8	65.83	55.83	-23.03	-20.03	Pass
0.205757	36	28.3	63.37	53.37	-27.37	-25.07	Pass
0.517802	29.9	24.9	56.00	46.00	-26.10	-21.10	Pass
0.71306	29.2	26.9	56.00	46.00	-26.80	-19.10	Pass
1.287292	28.9	26.7	56.00	46.00	-27.10	-19.30	Pass

Plot 5.2.1
Power Supply ports
150kHz – 30MHz
"Phase" Lead



Plot 5.2.2
Power Supply ports
150kHz – 30MHz
"Neutral" Lead



6. Appendix

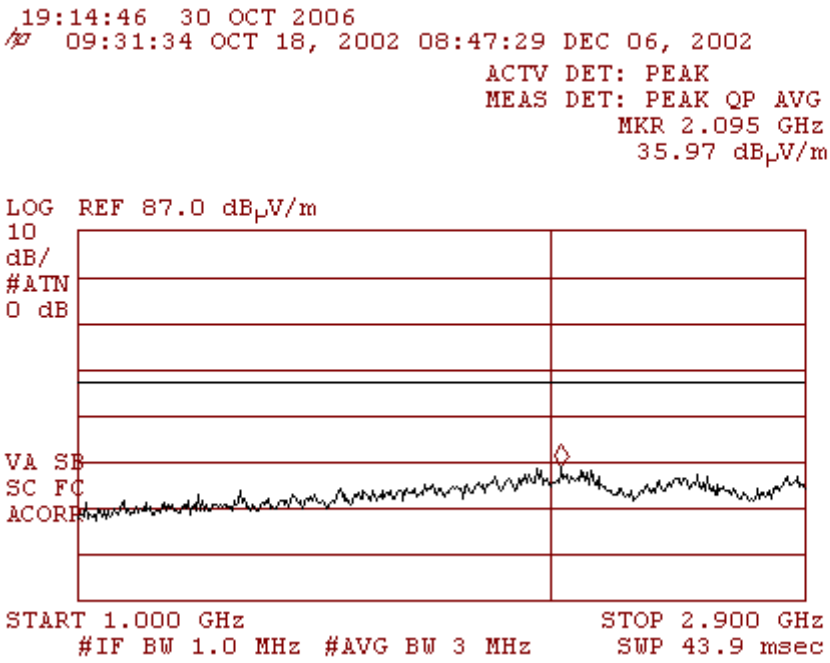
Appendix A: Spurious emissions test plots

Simultaneously Operated: Bluetooth (2402 MHz) & WLAN 802.1 b 11 Mbps channel 1

Lowest frequency

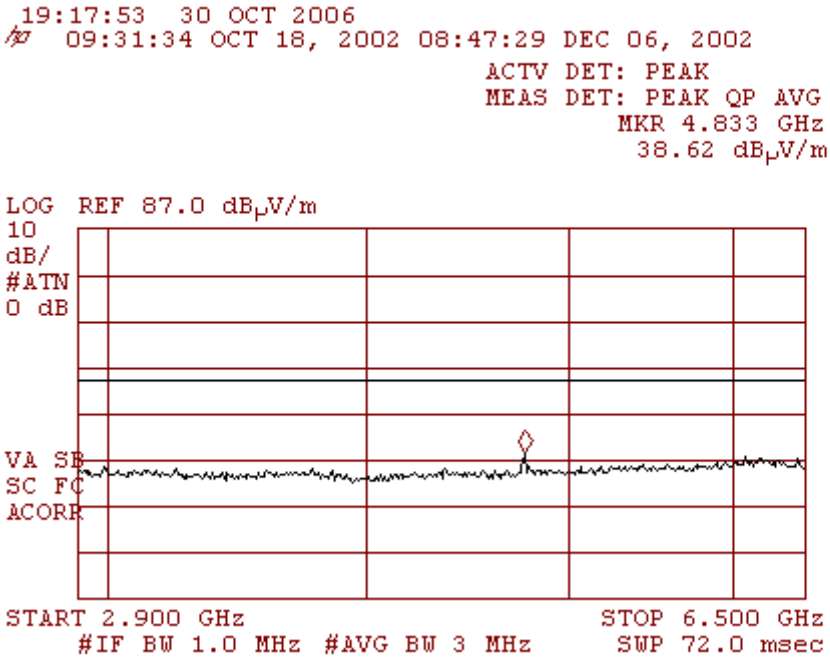
Horizontal & Vertical Polarization

Plot 1

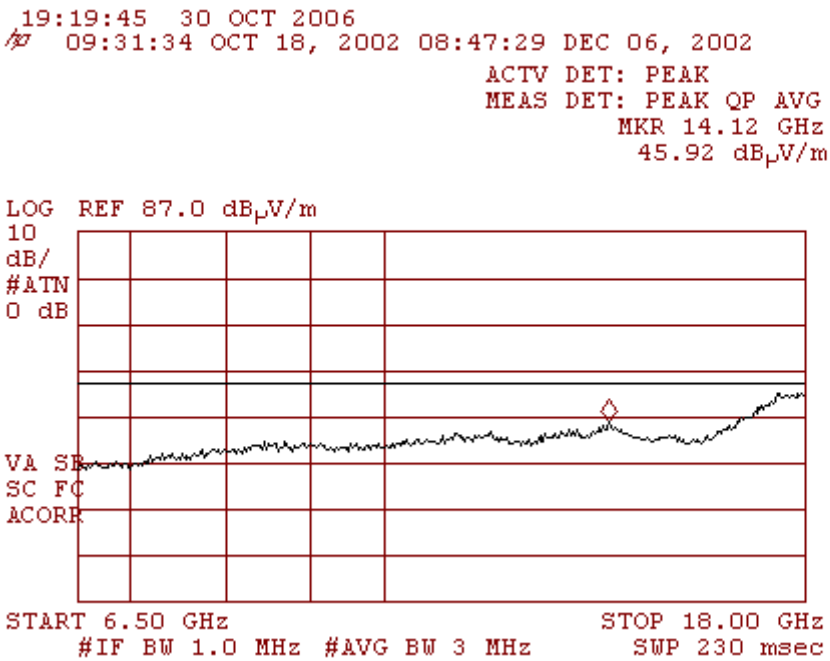


Horizontal & Vertical Polarization

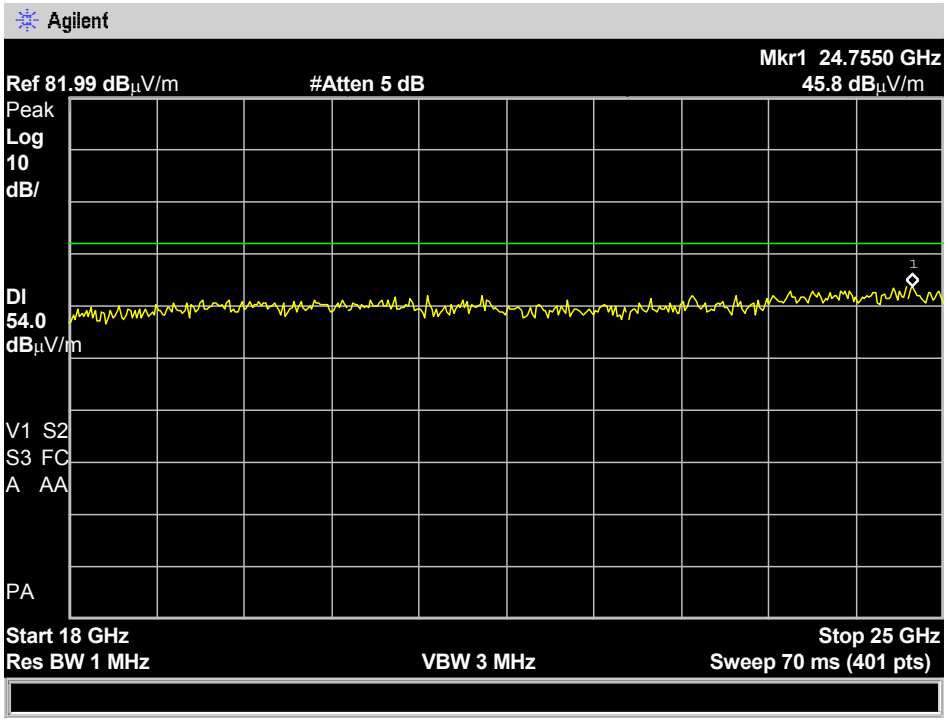
Plot 2



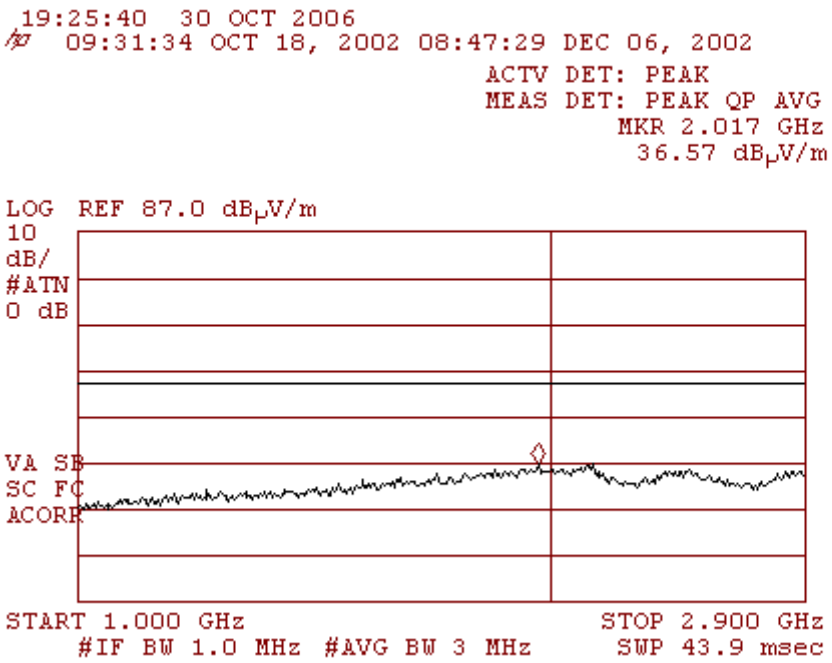
Horizontal & Vertical Polarization
Plot 3



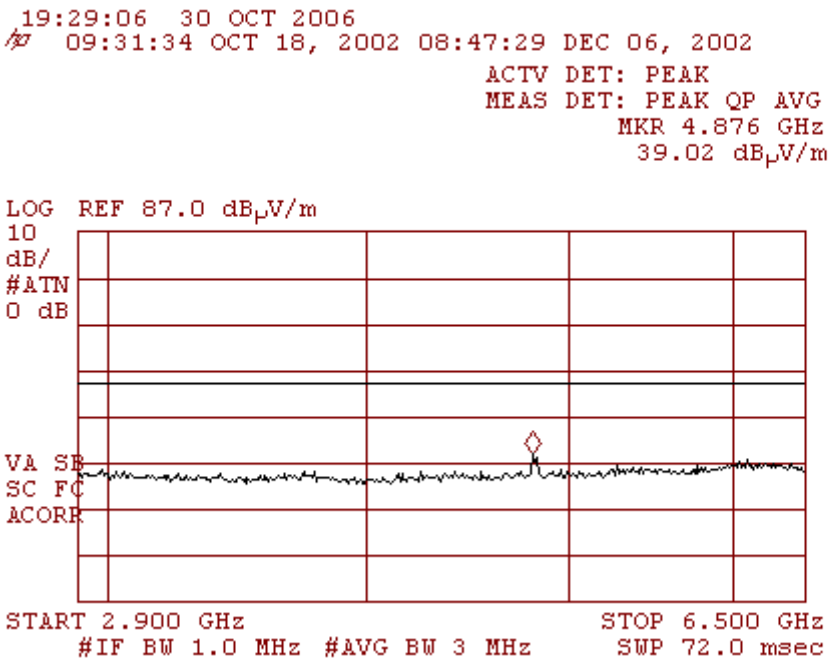
Horizontal & Vertical Polarization
Plot 4



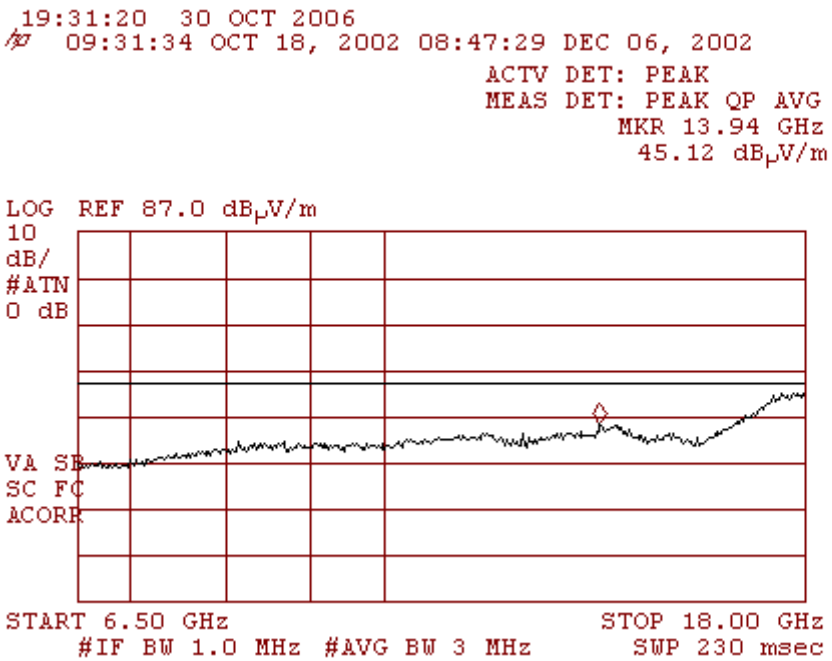
Middle frequency
Horizontal & Vertical Polarization
Plot 5



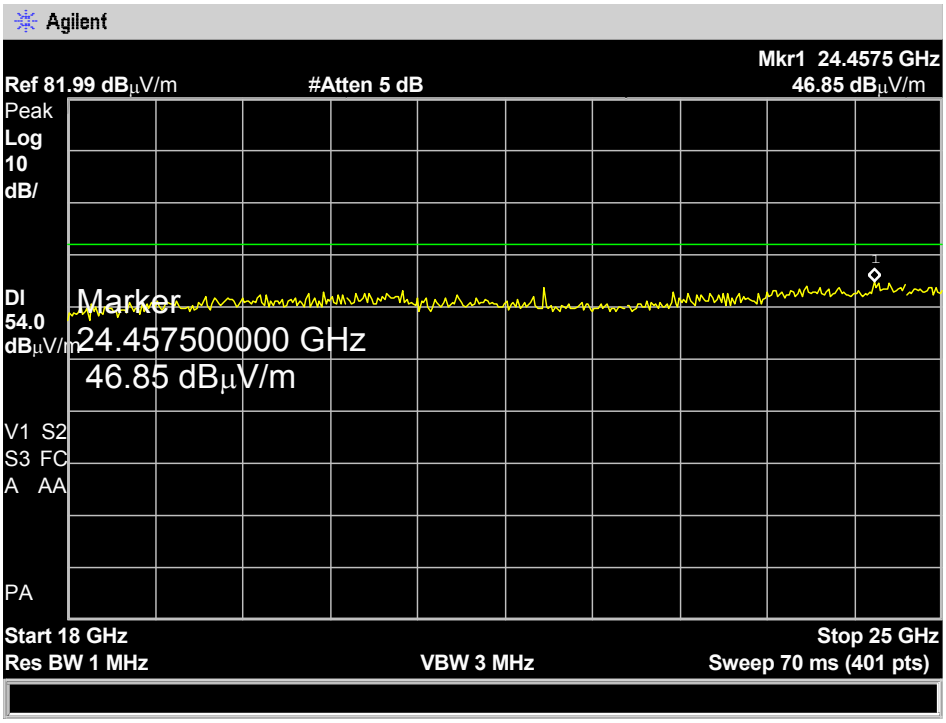
Horizontal & Vertical Polarization
Plot 6



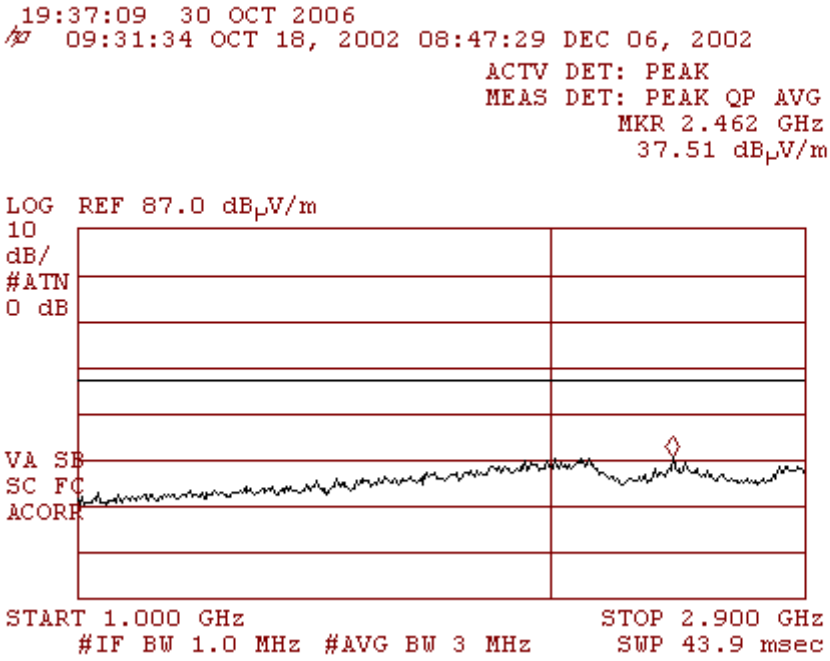
Horizontal & Vertical Polarization
Plot 7



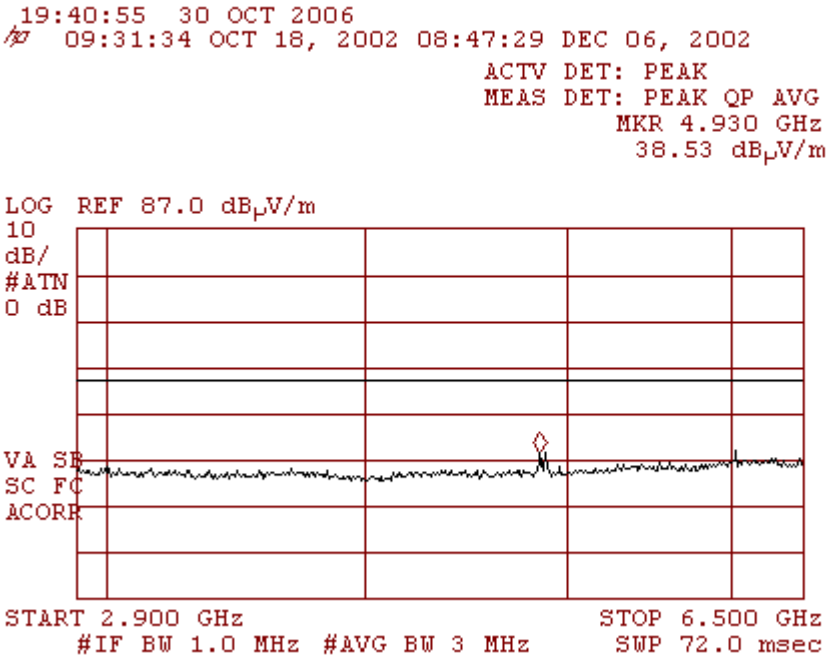
Horizontal & Vertical Polarization
Plot 8



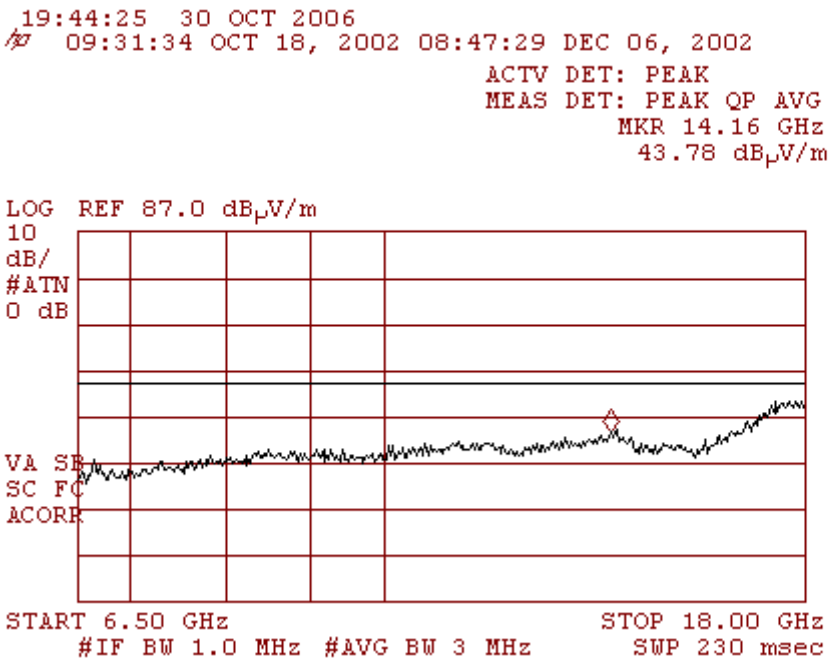
Highest frequency
Horizontal & Vertical Polarization
Plot 9



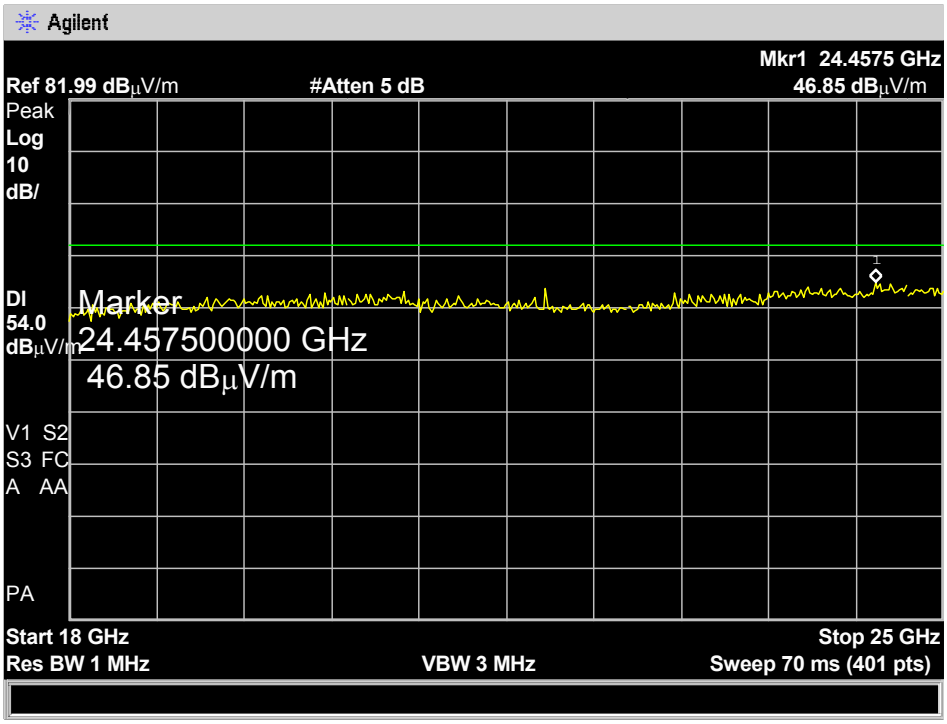
Horizontal & Vertical Polarization
Plot 10



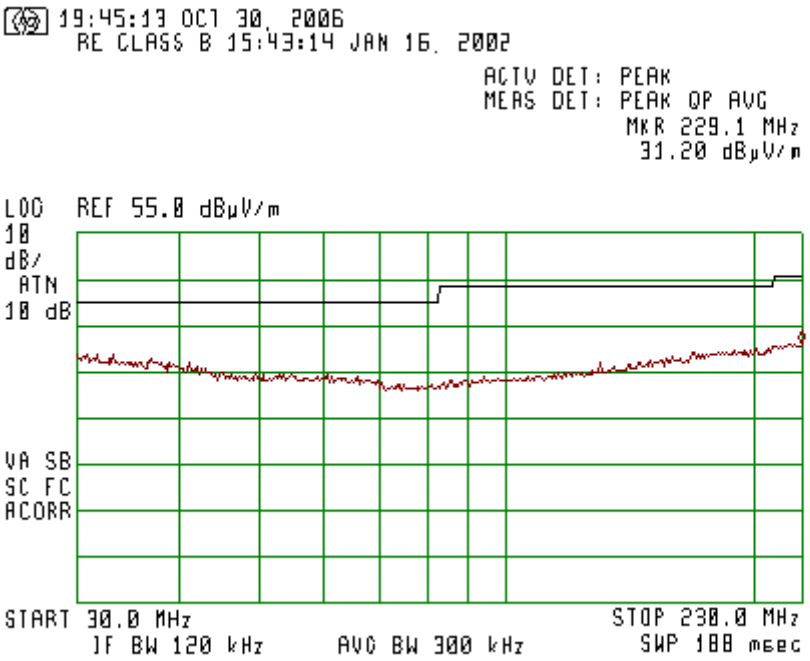
Horizontal & Vertical Polarization
Plot 11



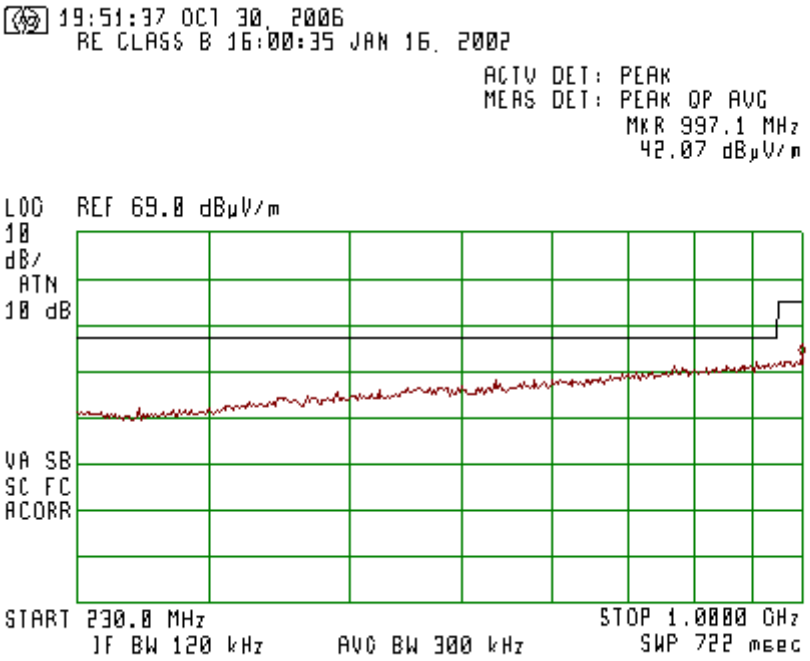
Horizontal & Vertical Polarization
Plot 12



Horizontal & Vertical Polarization
3 channels simultaneously
Plot 13

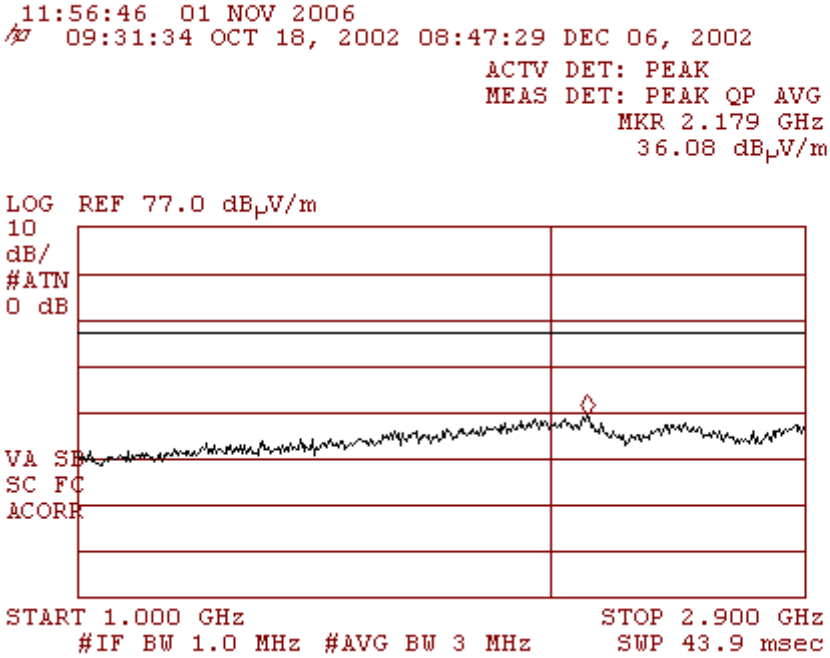


Horizontal & Vertical Polarization
3 channels simultaneously
Plot 14

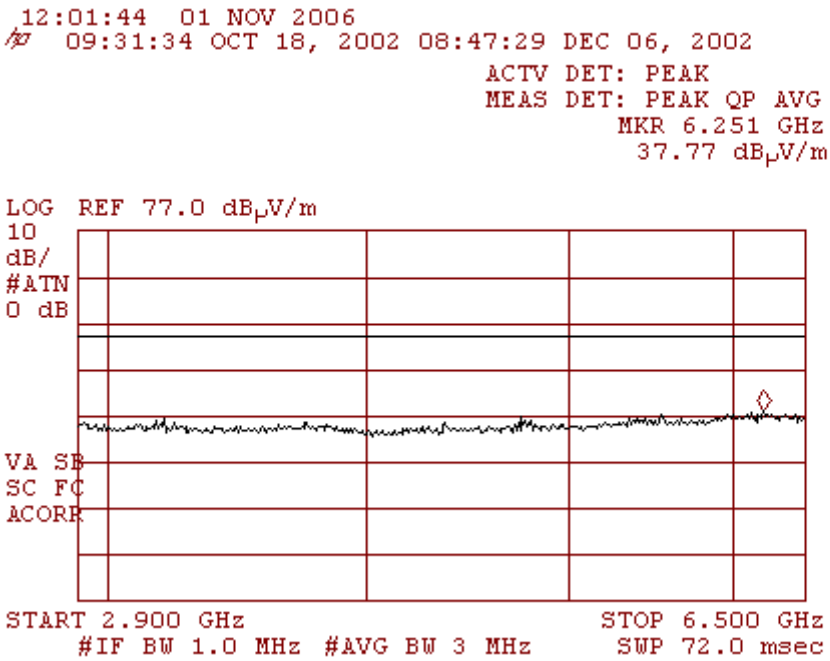


Simultaneously Operated: Bluetooth (2402 MHz) & WLAN 802.1 g 54 Mbps channel 1

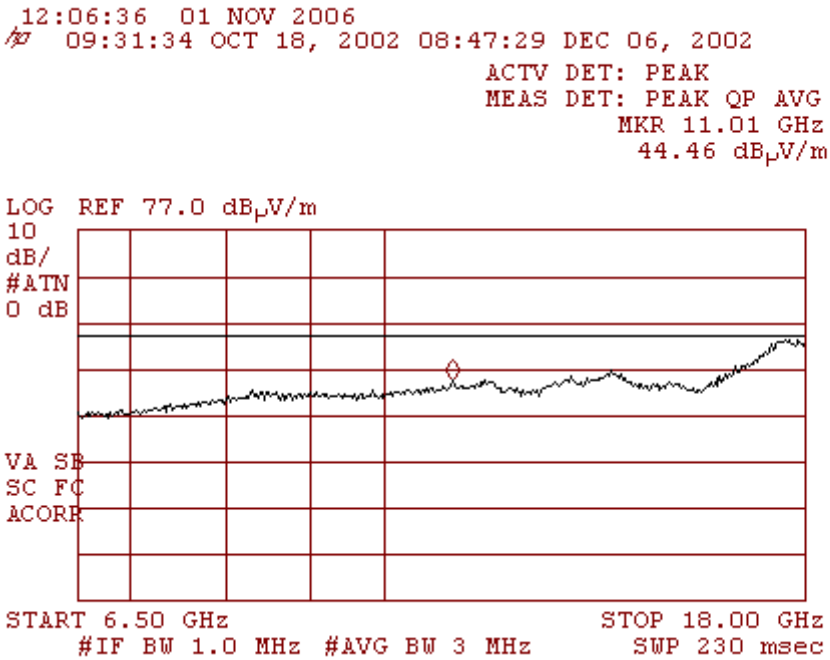
Lowest frequency
Horizontal & Vertical Polarization
Plot 15



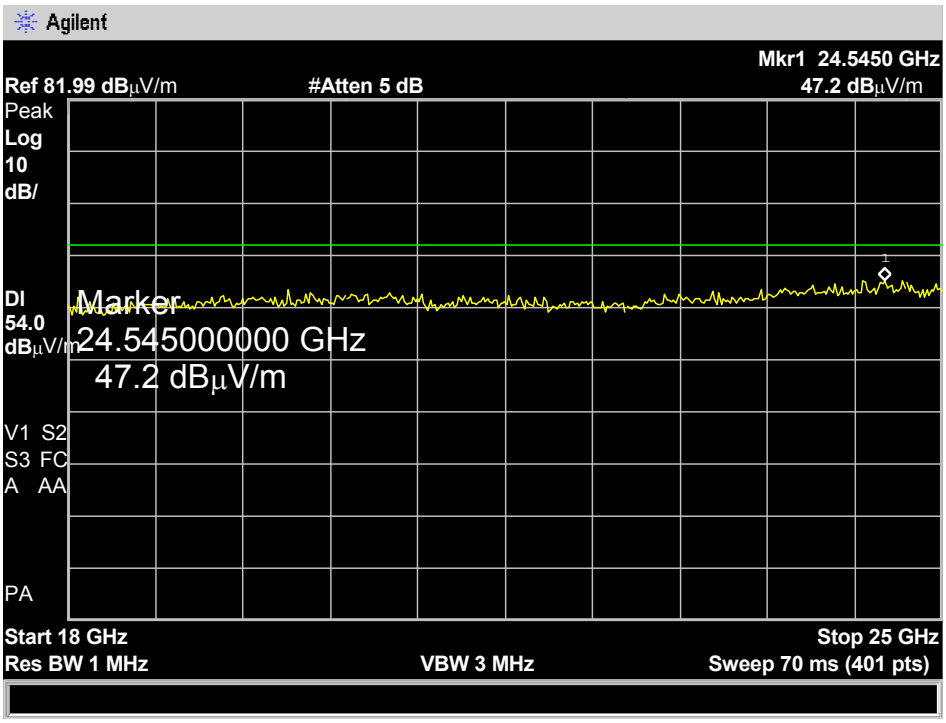
Horizontal & Vertical Polarization
Plot 16



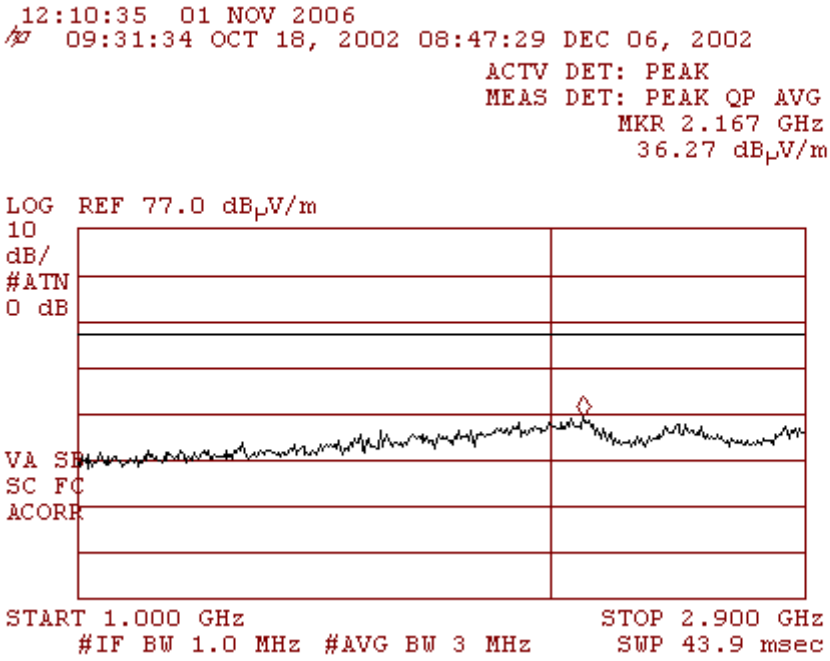
Horizontal & Vertical Polarization
Plot 17



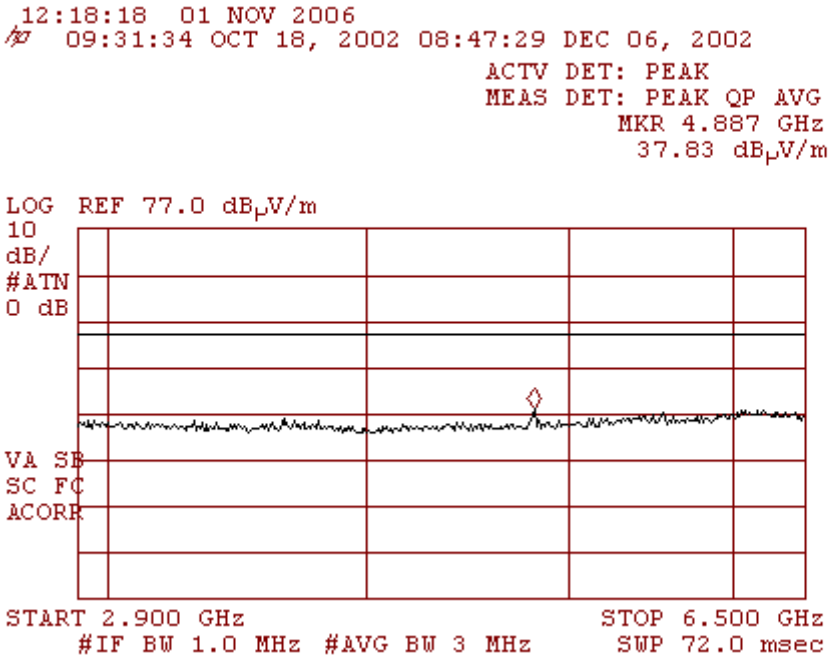
Horizontal & Vertical Polarization
Plot 18



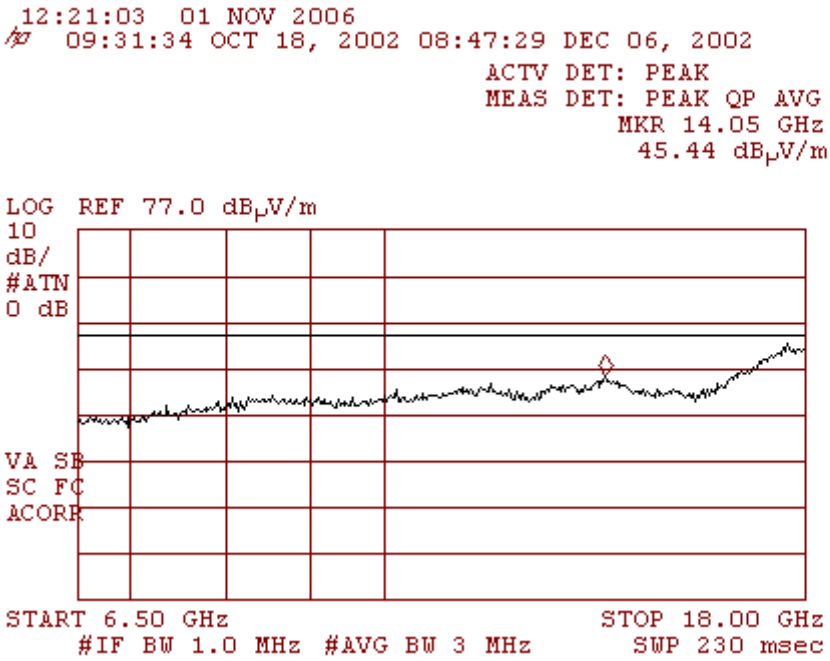
Middle frequency
Horizontal & Vertical Polarization
Plot 19



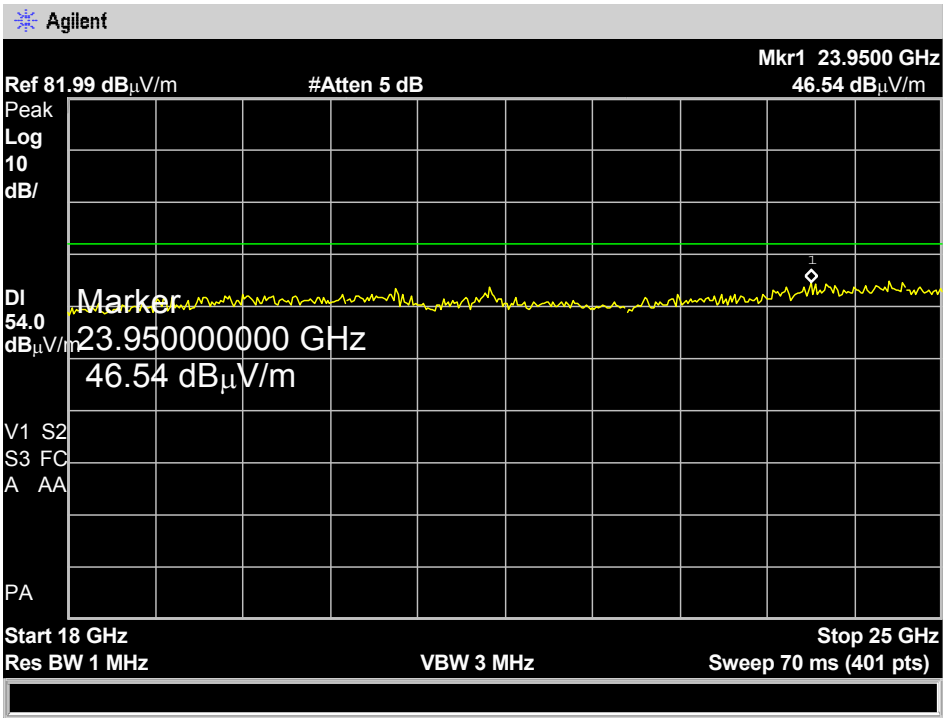
Horizontal & Vertical Polarization
Plot 20



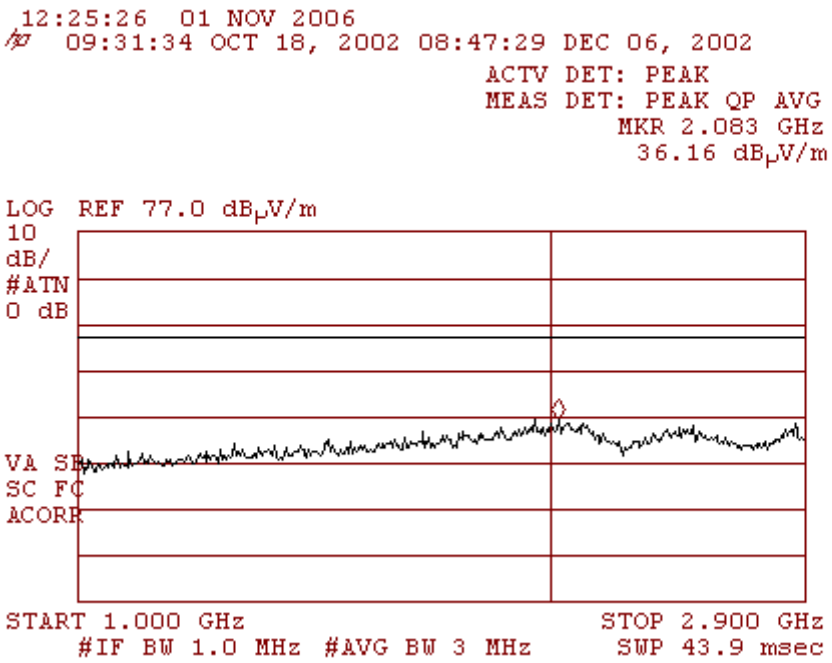
Horizontal & Vertical Polarization
Plot 21



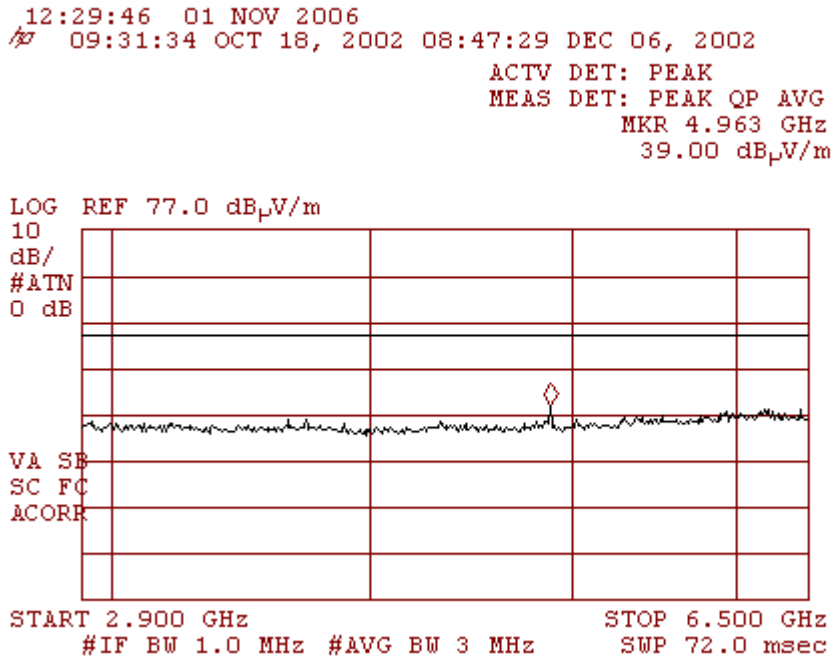
Horizontal & Vertical Polarization
Plot 22



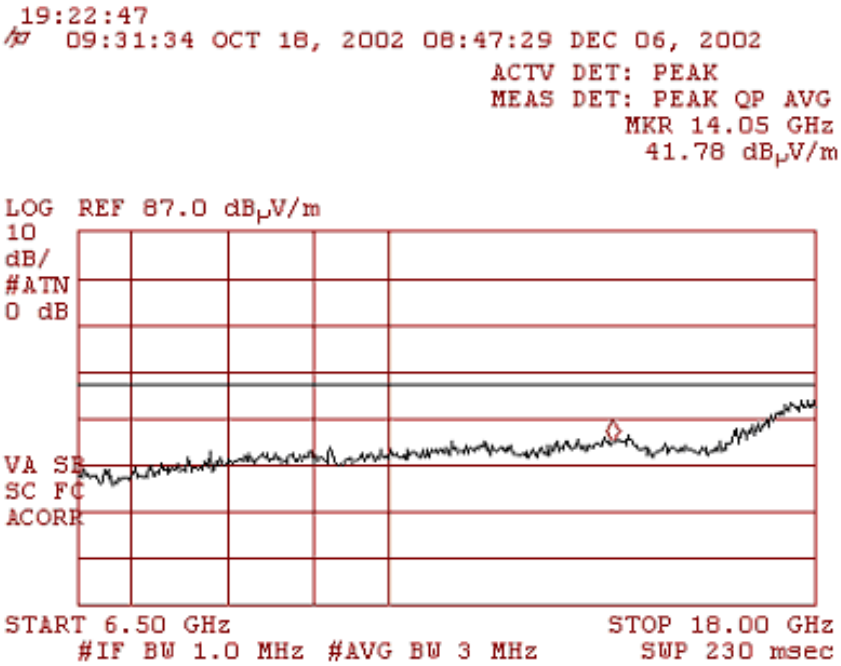
Highest frequency
Horizontal & Vertical Polarization
Plot 23



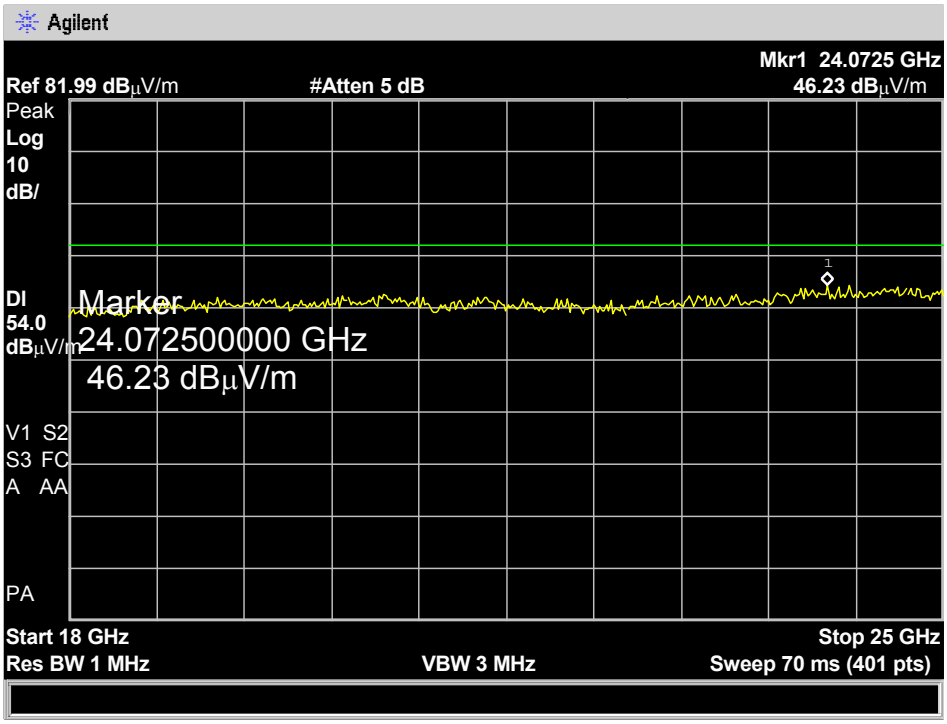
Horizontal & Vertical Polarization
Plot 24



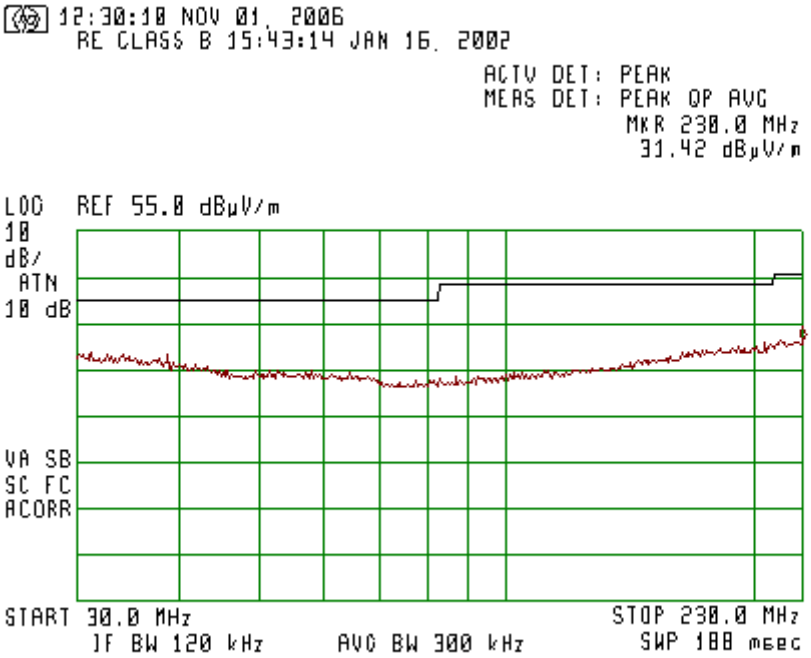
Horizontal & Vertical Polarization
Plot 25



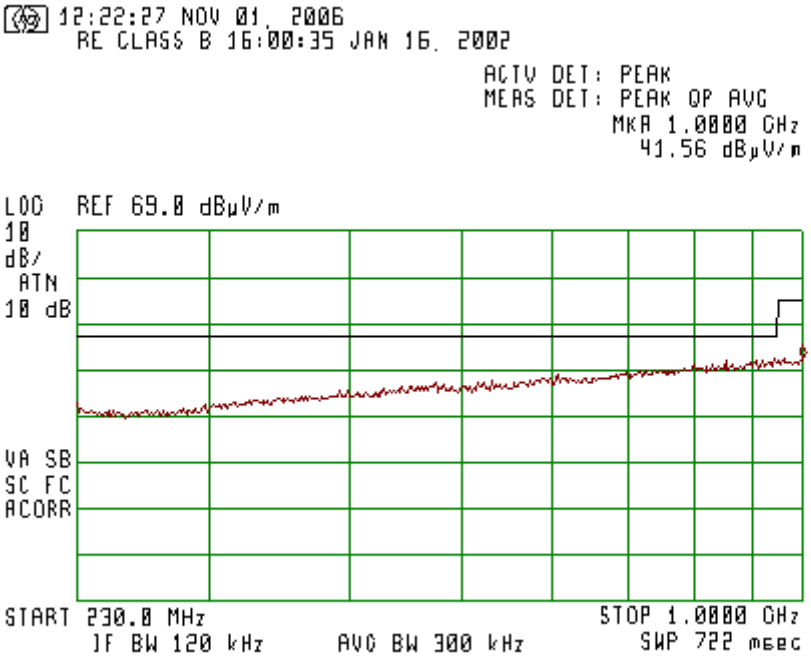
Horizontal & Vertical Polarization
Plot 26



Horizontal & Vertical Polarization
3 channels simultaneously
Plot 27

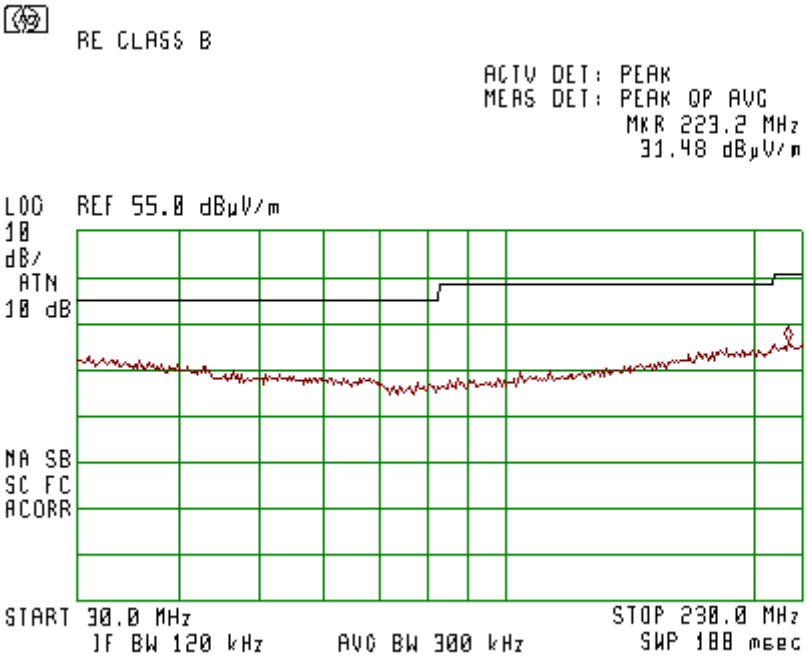


Horizontal & Vertical Polarization
3 channels simultaneously
Plot 28

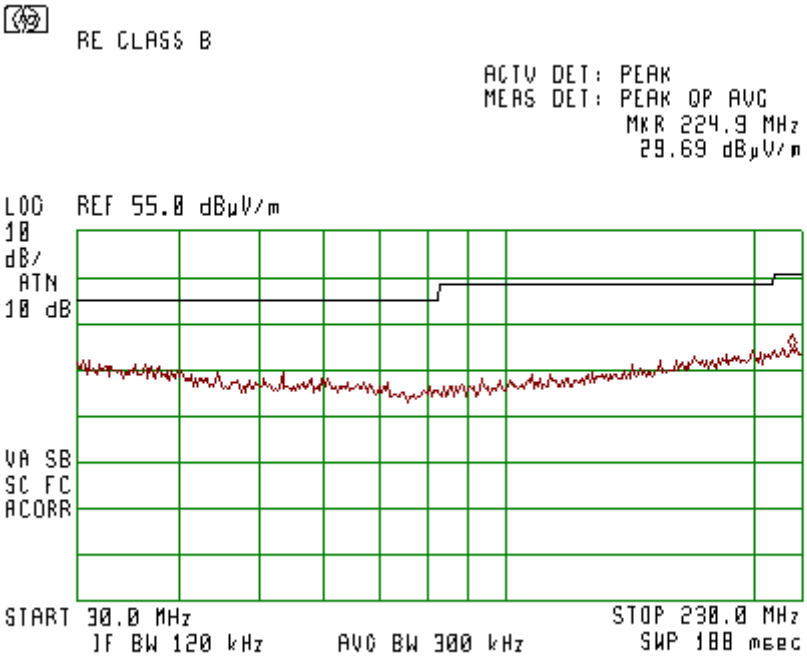


Appendix B: Receive Mode test plots

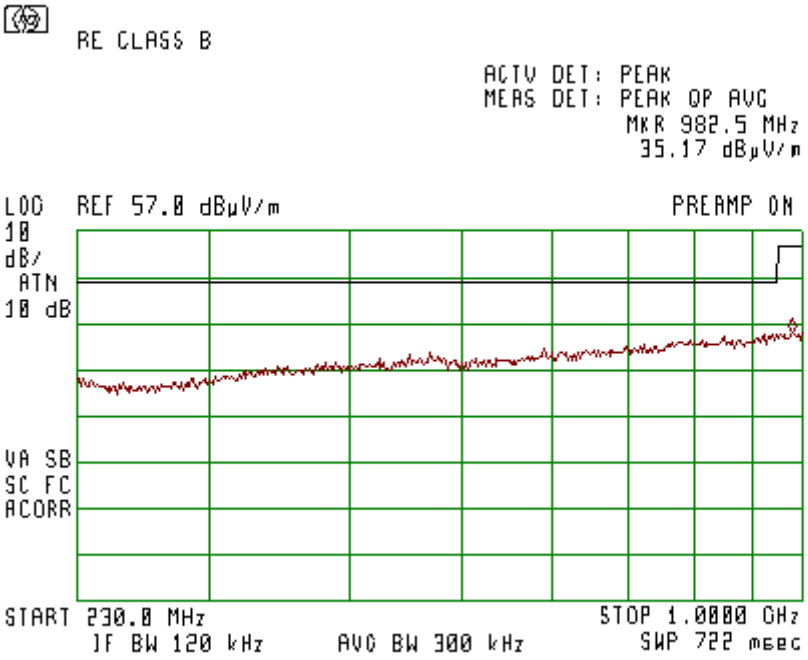
Horizontal Polarization
Plot 1



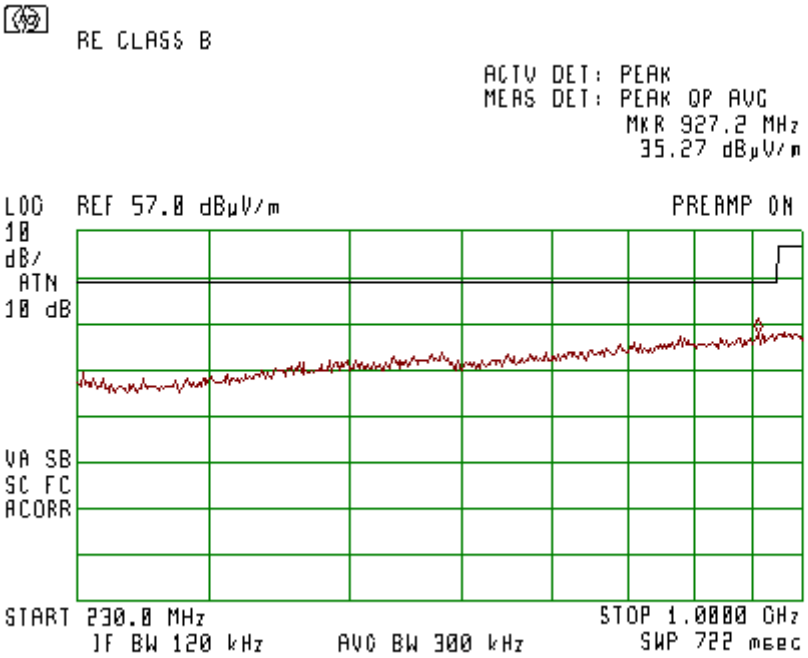
Vertical Polarization
Plot 2



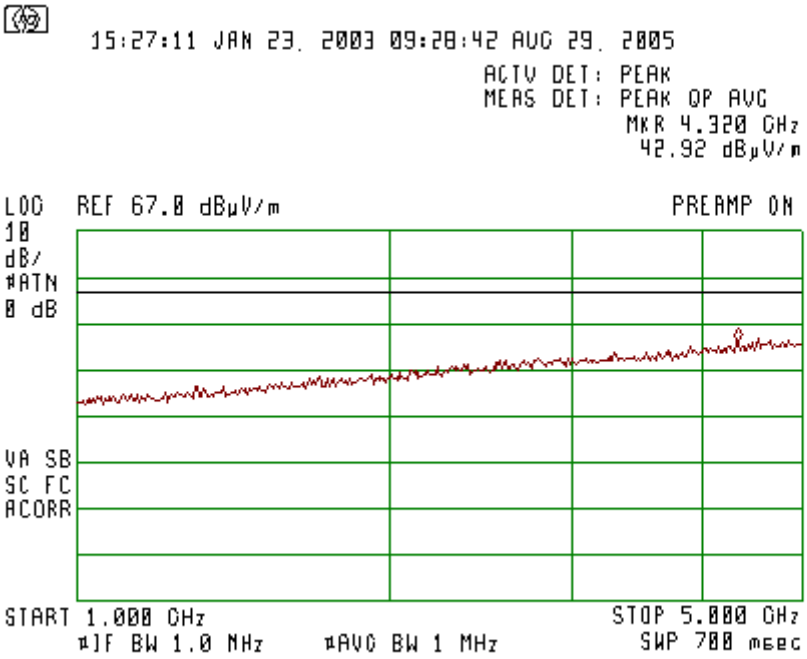
Horizontal Polarization
Plot 3



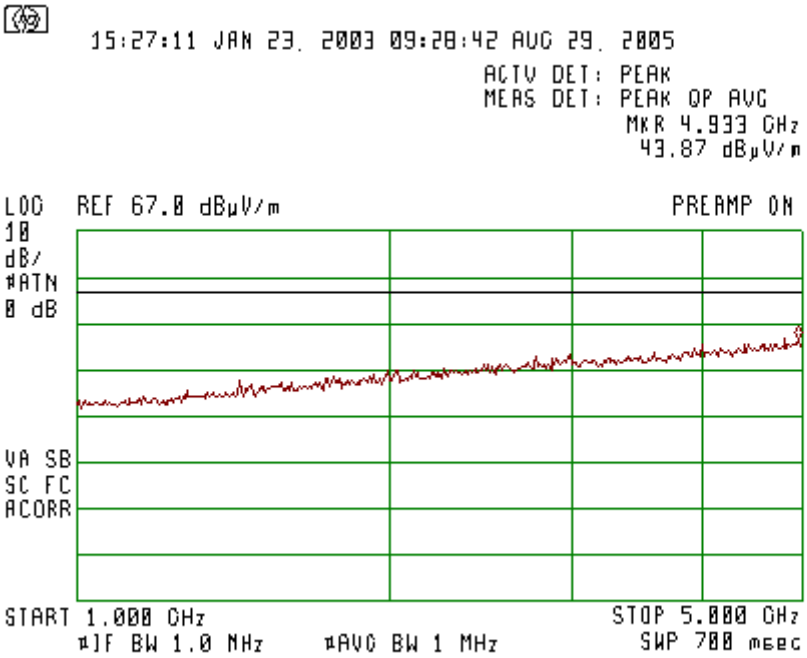
Vertical Polarization
Plot 4



Horizontal Polarization
Plot 5



Vertical Polarization
Plot 6



Appendix C: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR16 EMI Receiver	HP8546A	3710A00392	30.06.2007
Spectrum Analyzer 9kHz ÷ 22 GHz	HP 8593EM	3536A00131	30.06.2007
Spectrum Analyzer 100 Hz ÷ 26.5 GHz	Agilent E7405A	US41160436	30.06.2007
LNA Amplifier 1 GHz ÷ 18 GHz	AMP – 5D-010180-30-10P-GW	618653	01.01.2007
Dual Ridged Guide Ant.1-18 GHz	EMCO 3115	9602-4677	01.01.2007
Antenna 18 GHz ÷ 26.5 GHz	Alpha Industry 861A/599	505	01.01.2007
Turn table	HD100	100/693	-
Antenna Mast	HD 100	100/693	-
Biconical 20 –200 MHz	Schwarzbeck VHBB9124	9124/0255	30.06.2007
Log-Periodic 200 – 1000 MHz	Schwarzbeck VUSLP9111	VUSLP9111184	30.06.2007
Pre-Amplifier	MiTeq, AMF-5F-18002650-30-10P	945372	01.01.2007
LISN	Fischer 50/250-25-2	-	30.06.2007
Transient Limiter	HP11947A	-	30.06.2007
Notch Filter	Micro-Tronics BRM50702-05	0001	01.01.2007
Antenna 15G-40 GHz	Schwarzbeck BBHA 9170	BBHA9170214	01.01.2007
High pass Filter	Wainwright WHK 1.2/15G-10EF	3	30.06.2007
High pass Filter	Wainwright WHK2.4/18G-10EF	1	30.06.2007
Oven	Tenneg Ten	10.158-5	30.06.2007
LISN	Fischer 50/250-25-2	-	30.06.2007
Transient Limiter	HP11947A	-	30.06.2007

End of the Test Report