Electromagnetic Compatibility
Test Report

Test Report No: MOT 181006
Issued on: October 18, 2006

Product Name
HC700-iDen
Model: F3130A, F3162A
FCC ID: AZ489FT7017
IC: 109U-89FT7017

Tested According to
FCC 47 CFR Part 15, Subparts B & C
FCC 47 CFR, Part 90 & Part 15.247
Industry Canada ICES-003, RSS-119, and RSS-210

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ACCREDITED
1633.01

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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**

Land Mobile Services: FCC 47 CFR Part 90, RSS-119 Issue 7

Test Spec. Clause	Test Case	Remarks
§2.1049(h) & §90.210(g), §90.669(a), and §90.691, RSS-119 sec.5.8.6	Occupied Bandwidth	**Pass**
§2.1049(h), §2.1053, §90.210(g) (3), §90.691(a) (2), RSS-119 sec.5.8.6	Radiated Spurious Emissions	**Pass**
§2.1051, 2.1057, 90.210(g) and 90.691, RSS-119 sec.5.8.6	Conducted Spurious Emission	**Pass**
§2.1055(a) (1)& (b), §2.1055(d) (2), and §90.213, RSS-119 sec.5.3	Frequency stability	**Pass**
§2.947(c), §90.635(d), RSS –119 sec 4.1	Effective Radiated Power (ERP)	**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: HC700-i

S/N: 629SGS0309

FCC ID: AZ489FT7017

IC: 109U-89FT7017

EUT Description:
The HC700-i is a portable data terminal based on Intel PXA270 CPU and the industry standard Microsoft pocket pc Phone Edition Operating system. The display is a 64K color QVGA 3.5 inch transflective TFT LCD with backlight and touch screen. Serial (RS-232, and USB) interfaces and Bluetooth wireless communications are standard. Mobile communication is available via Motorola LPK iO270 radio, iDEN LPK Modem is an iDEN modem which provides circuit/packet data connectivity and voice services. The modem is designed to operate in iDEN 800 & 900 MHz networks initially using the iDEN Packet-switched and Circuit-switched Data protocols. iDEN LPK Modem has a standard interface consisting of a main board to board connector, and 2 RF antenna connectors.
GPS data is available at a separate dedicated serial port.
Ethernet LAN communications is also available via the Communications and charging cradles.
Standard features also include a 1D/2D imager based barcode scanner with signature capture and an alphanumeric keypad with backlight

Only two radios can operate (transmit) simultaneously:

- The iDEN (800MHz/900MHz) and WLAN do not work simultaneously when used in the present configuration;
- The iDEN (800MHz/900MHz) and Bluetooth transmitters may work simultaneously when used in the present configuration;
- The WLAN and Bluetooth transmitters may work simultaneously.

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.

Max. Average Conducted Output Power: 39.627 mW for 802.11b

Max. Average Conducted Output Power: 31.260 mW for 802.11 g

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

Private Land Mobile Services:

The iDEN 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 16.67% duty cycle.

Pulse Average Conducted RF power (Antenna port): 0.7Watt

Type of Modulation: QPSK

Type of Multiplexing: TDMA

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. Radiated Emissions Measurements 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.

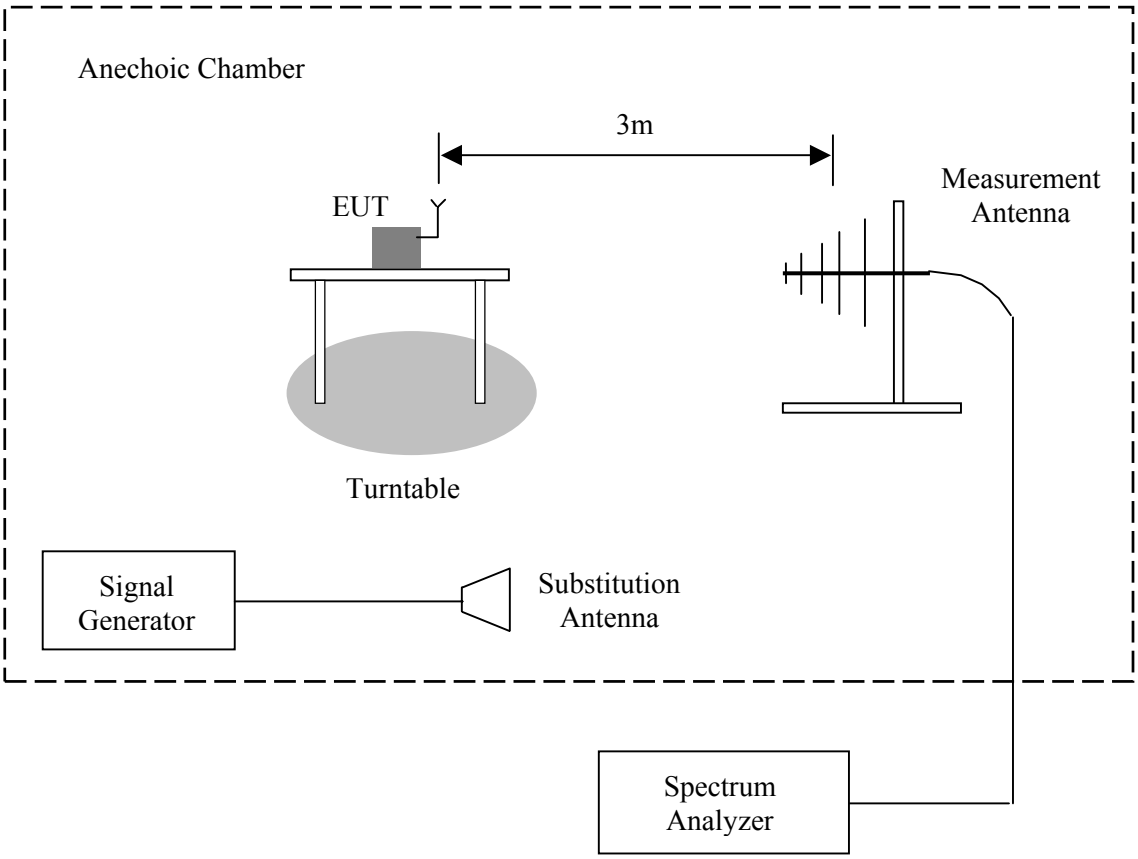
2.3. Radiated Peak Output Power Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and PRBS data modulation.

The EUT was placed in an anechoic chamber, on a non-metallic table/support, 0.8m above the turntable, at 3 meter from the receive antenna, and the received emission was maximized by rotating the turntable and adjusting the height of the receiving antenna. See test Setup # 1.
The peak emission was measured and recorded. The measurement was repeated for the other polarization.

Using the Substitution Method in accordance to TIA/EIA 603, an antenna with a known gain substituted the EUT, and an RF signal source was connected to the antenna input by means of coaxial cable with known loss. The center of the substitution antenna was placed precisely in the same location as the antenna of the DUT. The signal source level was adjusted until the previously recorded peak reading was obtained. The power source reading was corrected for the cable loss, and the antenna gain was added to obtain the EIRP/ERP peak power. EIRP/ERP measurements were made at the upper, center, and lower carrier frequencies of the iDEN 800 and iDEN 900 bands.

Test Setup # 1



2.4. Radiated Spurious Emissions Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum power, continuous transmission and PRBS data modulation.

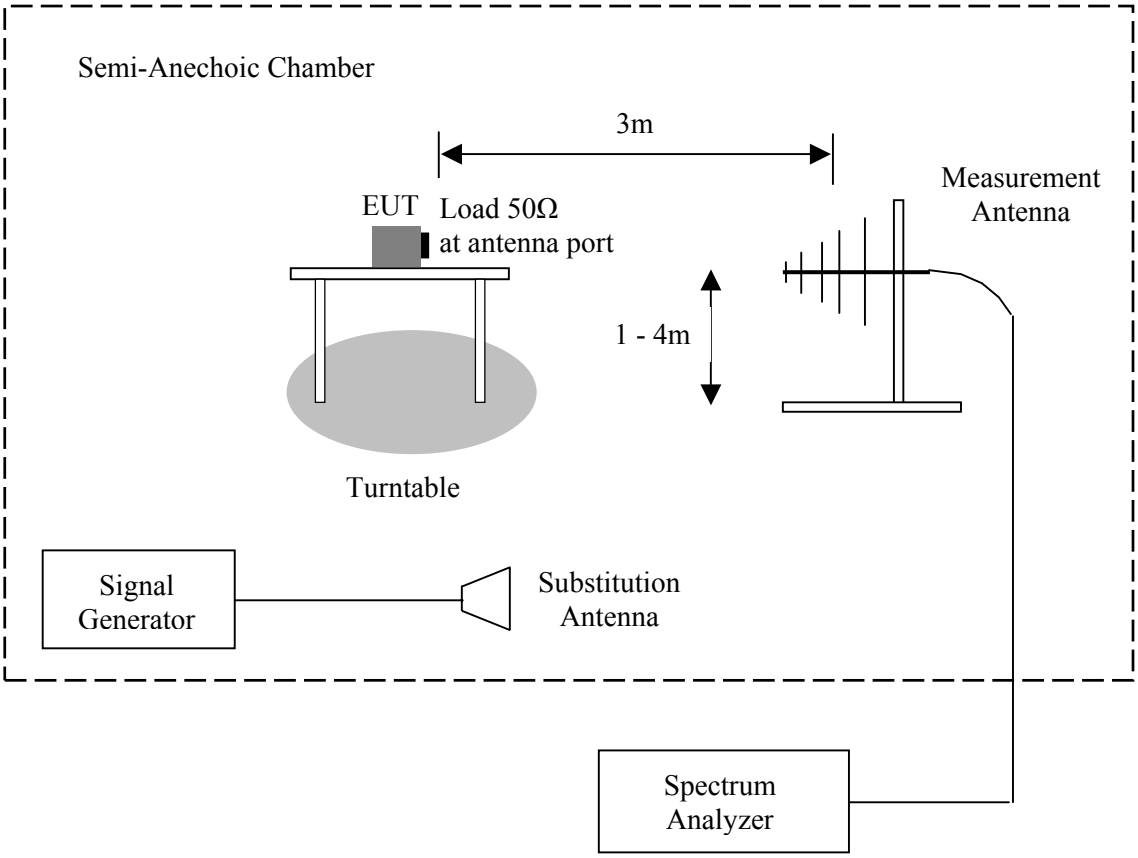
The antenna output was terminated with 50 Ω load.

The EUT was placed in an anechoic chamber, on a non-metallic table/support, 0.8m above the turntable, at 3 meter from the receive antenna, and for each spurious frequency, the emission was maximized by rotating the turntable and adjusting the height of the receiving antenna. See test Setup # 2.

The spectrum was scanned from 30MHz to the 10th harmonic of the highest frequency generated within the EUT, which is the transmitted carrier that can be as high as 10 GHz. The peak readings were recorded. The measurement was repeated for the other polarization.
Radiated emissions measurements were made at the upper, center, and lower carrier frequencies of the iDEN 800 and iDEN 900 bands.

Using the Substitution Method in accordance to TIA/EIA 603, an antenna with a known gain substituted the EUT, and an RF signal source was connected to the antenna input by means of coaxial cable with known loss. The center of the substitution antenna was placed precisely in the same location as the antenna of the DUT. The signal source level was adjusted until the previously recorded peak reading was obtained. The power source reading was corrected for the cable loss, and the antenna gain was added to obtain the EIRP/ERP peak power. EIRP/ERP measurements were made at the upper, center, and lower carrier frequencies of the iDEN 800 and iDEN 900 bands.

Test Setup # 2


Semi-Anechoic Chamber
3m
EUT
Load 50Ω
at antenna port
Measurement
Antenna
1 - 4m
Turntable
Signal
Generator
Substitution
Antenna
Spectrum
Analyzer

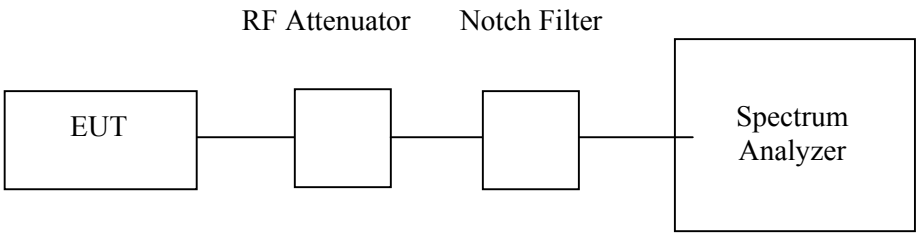
2.5. Conducted Spurious Emissions Measurements:

During the testing process, the EUT was controlled via dedicated software. The EUT was operated at maximum and minimum output power, continuous transmission and PRBS data modulation.

Using a test method in accordance to TIA/EIA 603 sec.2.2.13, the transmitter output was connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified and a Notch Filter. The external attenuators and cable loss were added to the reading. See test Setup # 3.

For spurious emissions measurement, the spectrum from the lowest radio frequency to the 10th harmonic of the carrier, that can be as high as 10GHz, was investigated with the transmitter set to the lowest, middle and highest channel frequencies of the iDEN 800 and iDEN 900 bands.

Test Setup # 3



2.6. Occupied BW Measurements:

The transmitter output was connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified.

The transmitter was operated at its maximum (and repeated at minimum) power settings, employing a pseudo random data sequence per §2.1049(h). The spectrum analyzer was set for peak detection with a VBW of 3 times the RBW, a span of 100kHz, and a sweep time of 100seconds.

Using a 300kHz RBW, a “rainbow” reference curve was produced with maximum (and repeated with minimum) unmodulated carrier, and the settings were adjusted so that the crest of the curve equals the 0dB reference line.

The RBW was then reduced to 300kHz to characterize the transmitter emission on-channel and adjacent channels spectral performance.

The applicable emission mask was overlaid on the analyzer display, and the emission curve was compared to the mask.

2.7. 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.

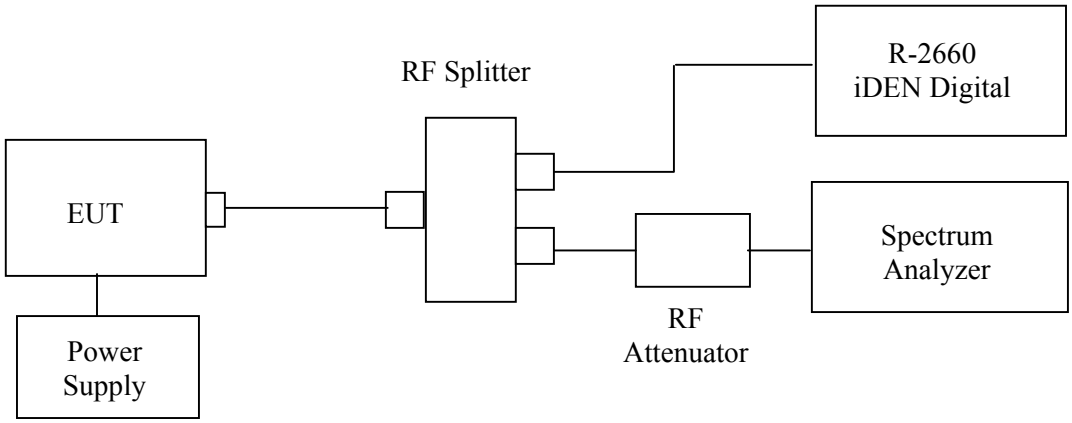
2.8. Frequency stability measurements:

During the process of testing, the EUT was controlled via communications system analyzer R-2660 iDEN Digital in “RF Control Monitors ” mode on center channel, 800 band and 900 band, under AFC lock, with settings to operate at maximum power transmission and proper modulation. See Setup # 4.

With the EUT powered with 7.2 VDC, the carrier frequency was measured at room temperature.
Carrier frequency measurement was repeated at 10°C increments from -30°C to +50°C. At least 0.5hour was allowed at each temperature un-powered, before measurement was made. The measurements were made within 1 minute of powering up the EUT to prevent significant self-warming, and no more than 10 minutes, in 1 minute intervals to indicate clearly that the frequency has stabilized.

With the EUT powered with 7.2 VDC , the carrier frequency was re-measured at room temperature.
Supply voltage was varied from 7.2 VDC to 8.3 Vdc in steps of 0.1V, re-measuring carrier frequency at each voltage.

Test Setup # 4



2.9. 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.

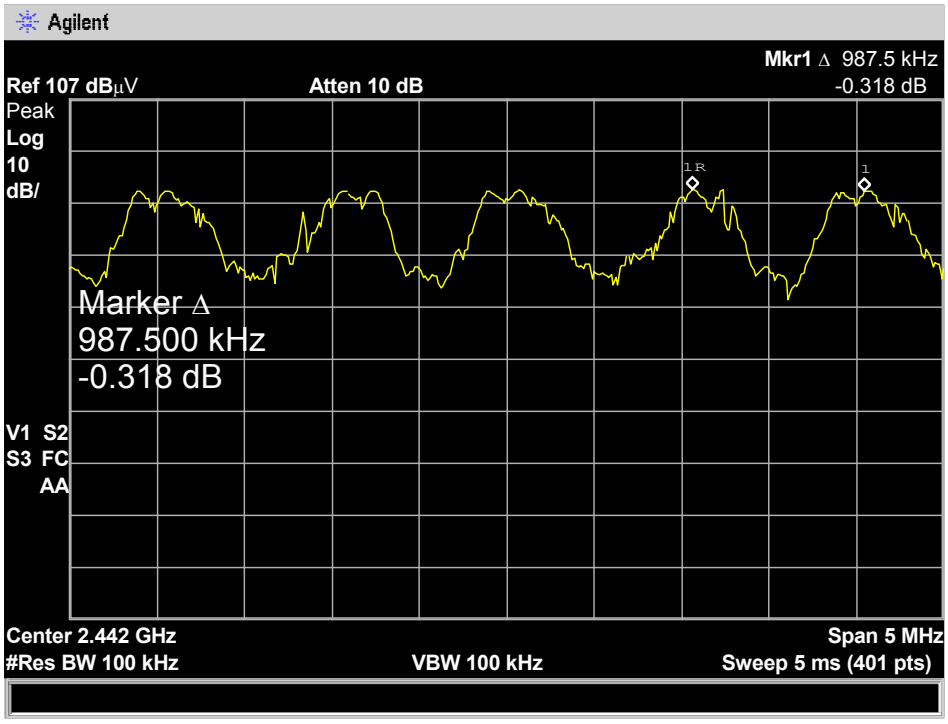
3. Bluetooth: Report of Measurements and examinations

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

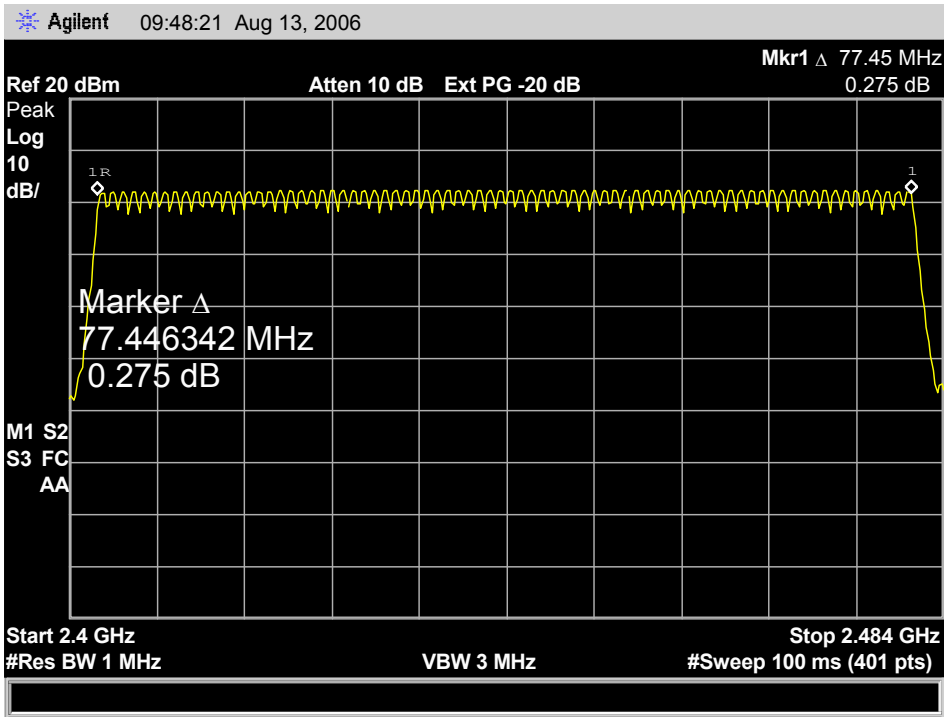
Plot 3.1



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)

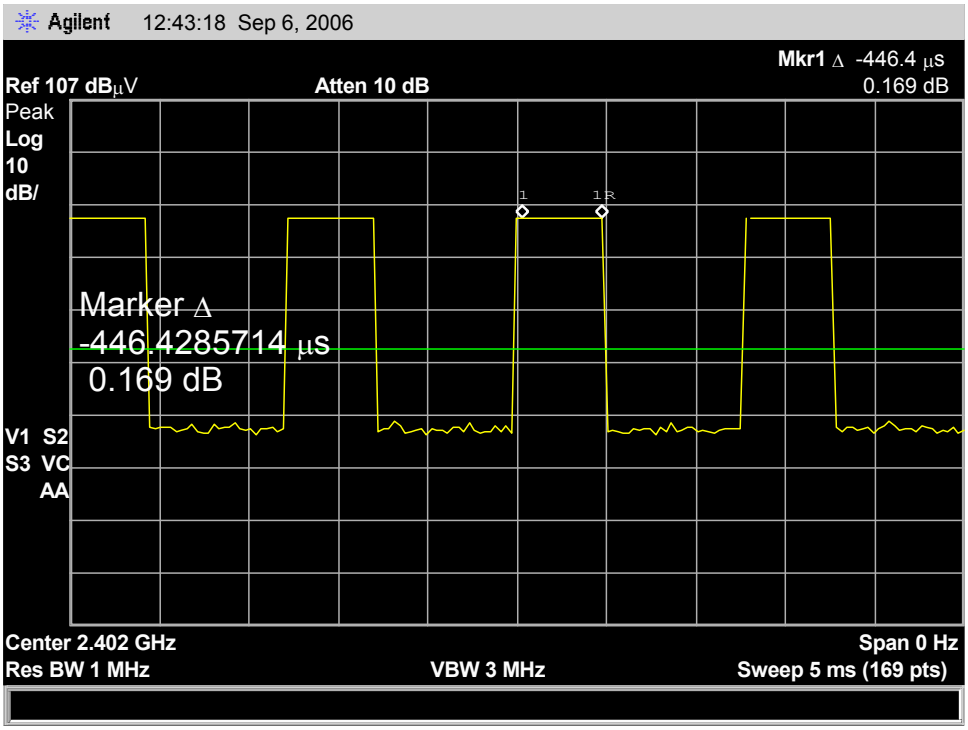
Reference document:	**47 CFR §15.247 (a) (1) (iii) & DA 00-705**		
Test Requirements:	The average time of occupancy on any channel shall not be greater than 0.4seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.		
Test setup:	See Sec. 2.1	**Pass**	
Operating 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:

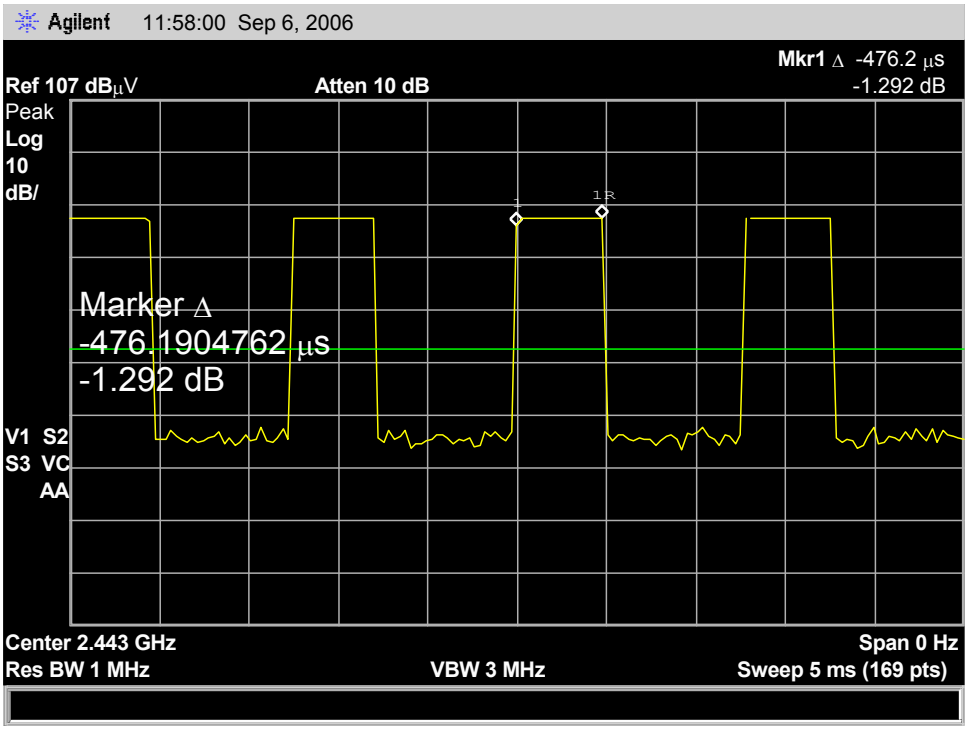
Frequency [GHz]	Time slot length [msec]	Reference	Dwell time [Sec]	Limit [Sec]	Result
2.402	0.4464	Plot 3.3.1	0.286	0.4	Pass
2.443	0.4762	Plot 3.3.2	0.305	0.4	Pass
2.480	0.4762	Plot 3.3.3	0.305	0.4	Pass

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

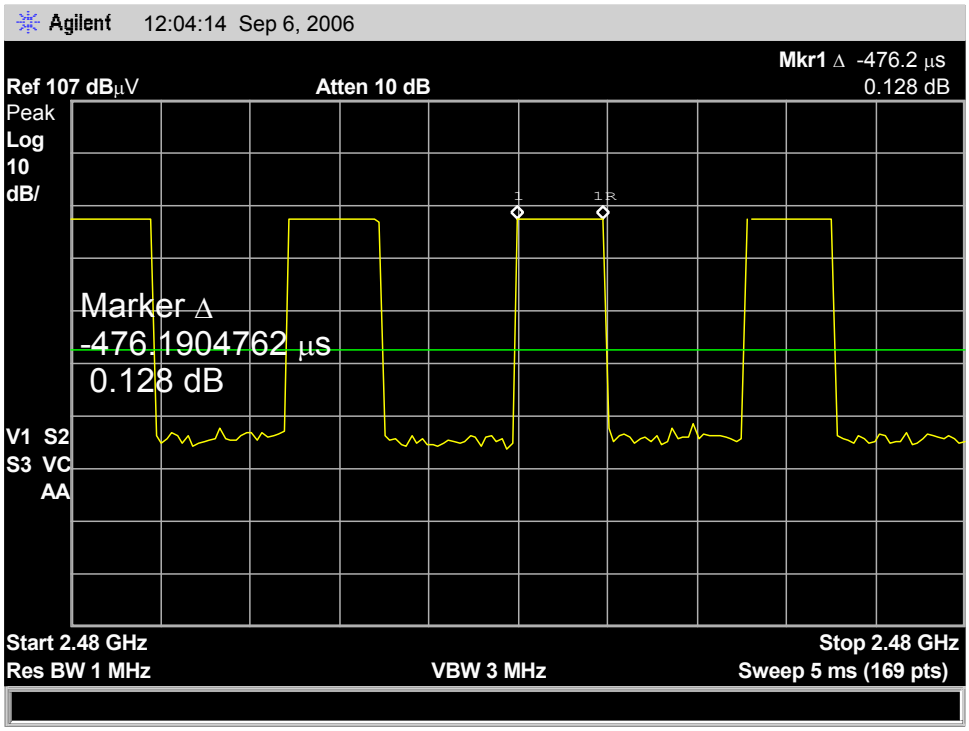
Plot 3.3.1



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)

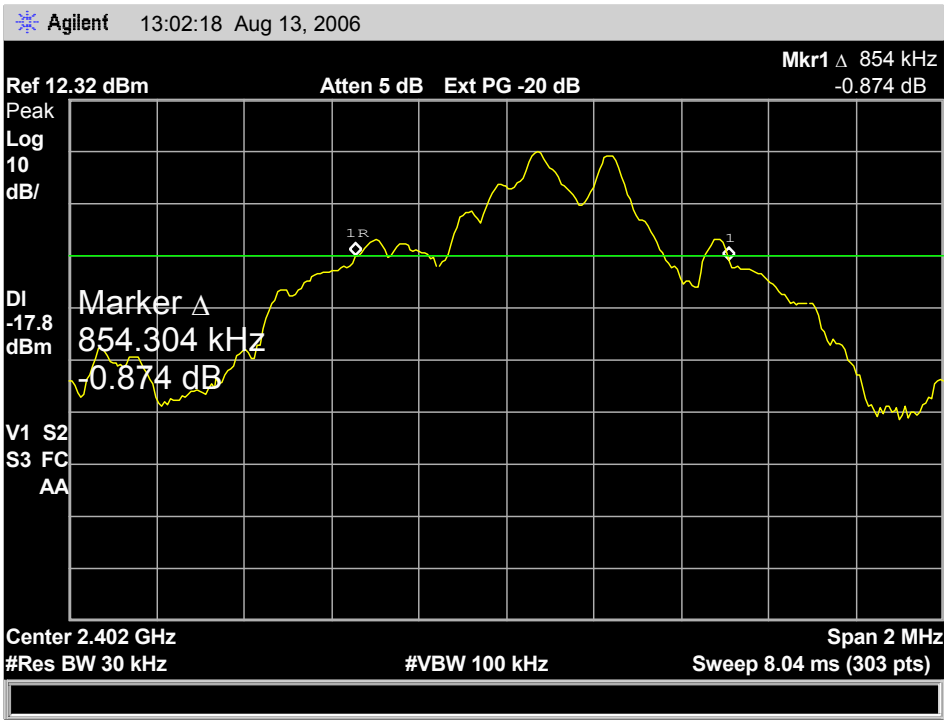
3.4. Maximum 20dB Bandwidth

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:

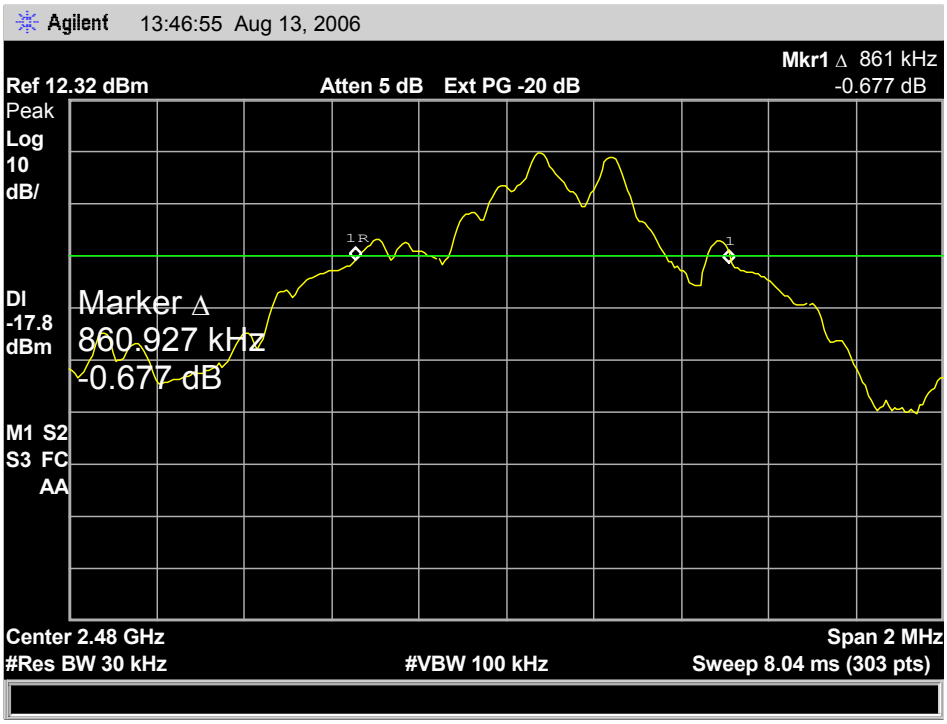
Frequency [GHz]	20dB BW [kHz]	Reference
2.402	854	Plot 3.4.1
2.443	848	Plot 3.4.1
2.480	861	Plot 3.4.1

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

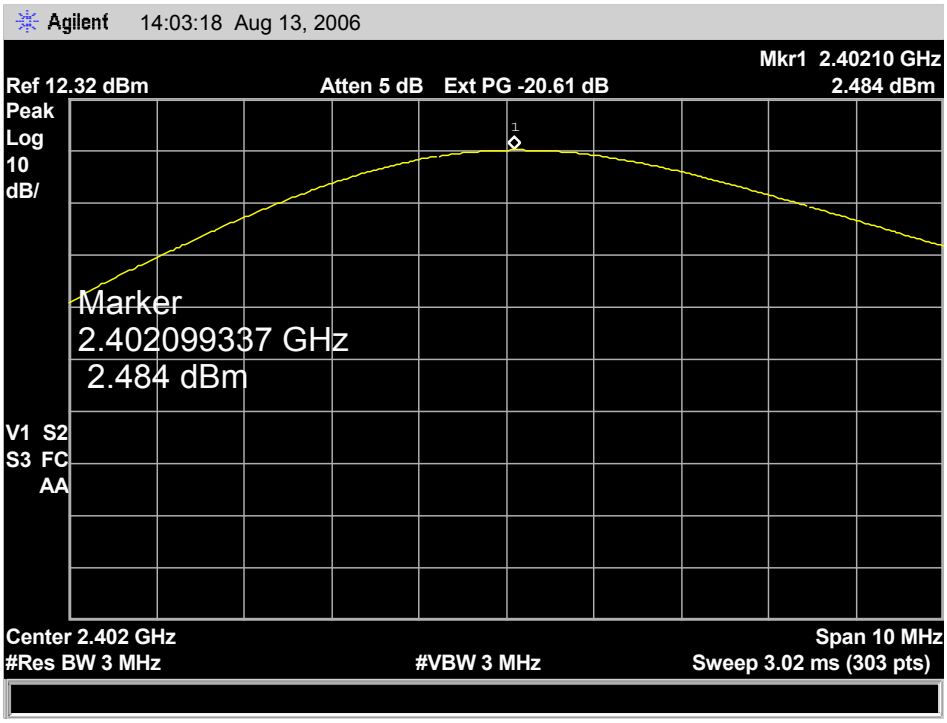
Reference document:	**47 CFR §15.247 (b) (1) & DA 00-705**		
Test Requirements:	The maximum peak output power shall not exceed 1Watt (30dBm)		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
S.A. Settings:	RBW: 3MHz, VBW: 3MHz,		
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:

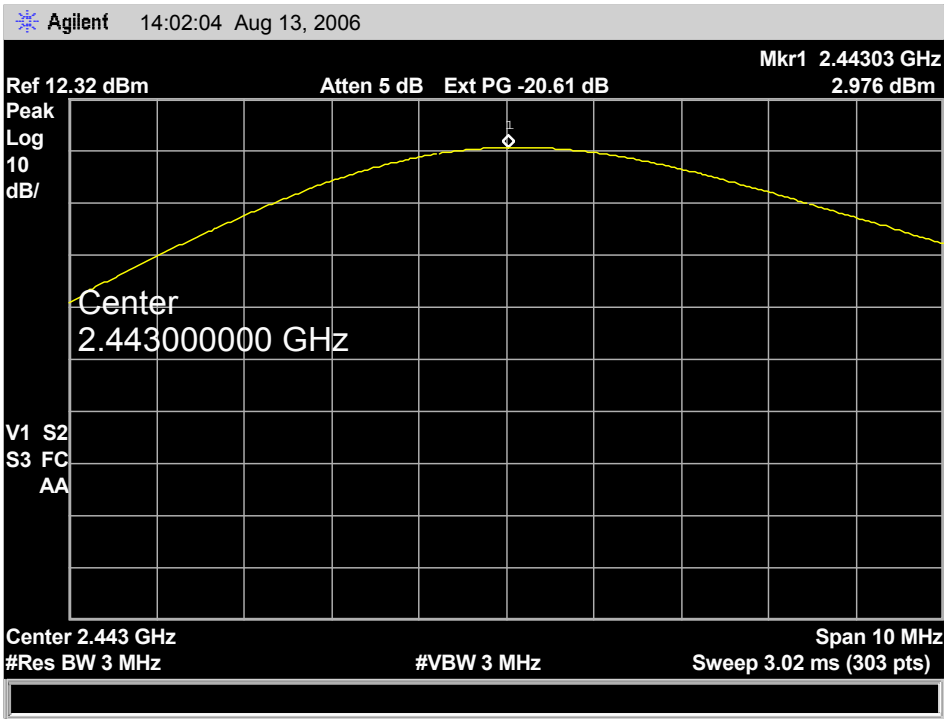
Frequency [GHz]	Cable Loss [dB]	Max. Peak Output power* [dBm]	Max. Peak Output power* [mW]	Reference	Result
2.402	0.45	2.484	1.772	Plot 3.5.1	Pass
2.443	0.45	2.976	1.984	Plot 3.5.2	Pass
2.480	0.45	2.775	1.895	Plot 3.5.3	Pass

*Corrected for external attenuations

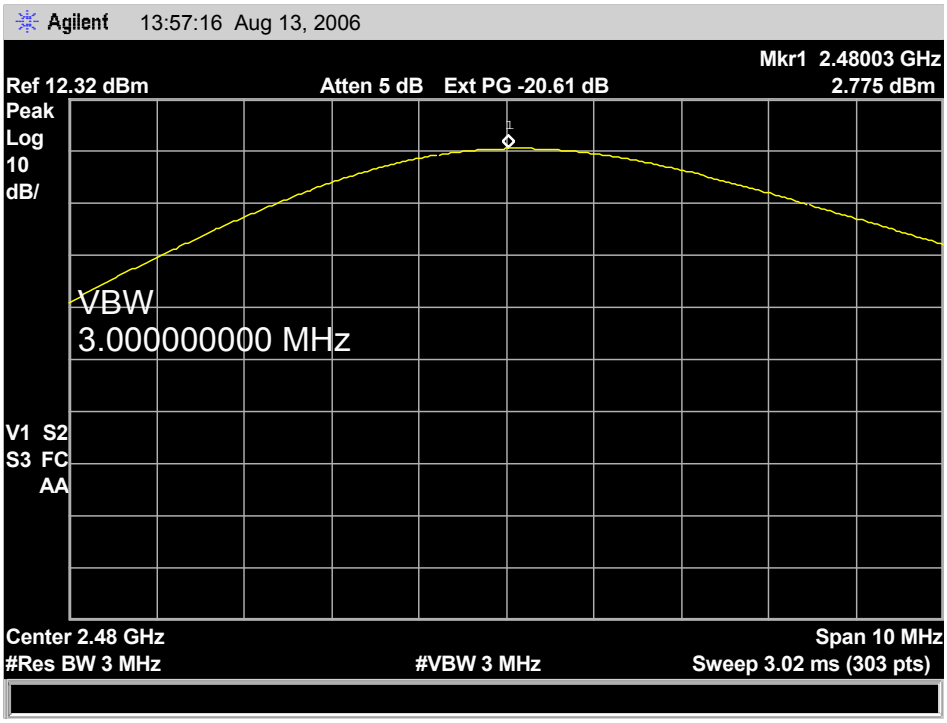
Plot 3.5.1



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)

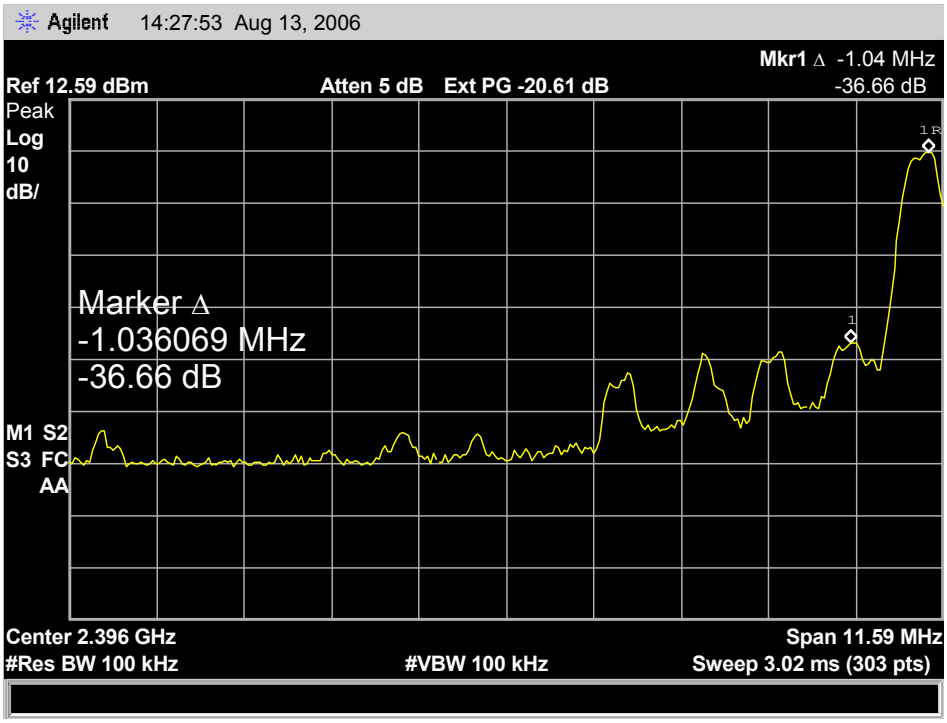
3.6. Band-edge compliance of RF Conducted Emission

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	

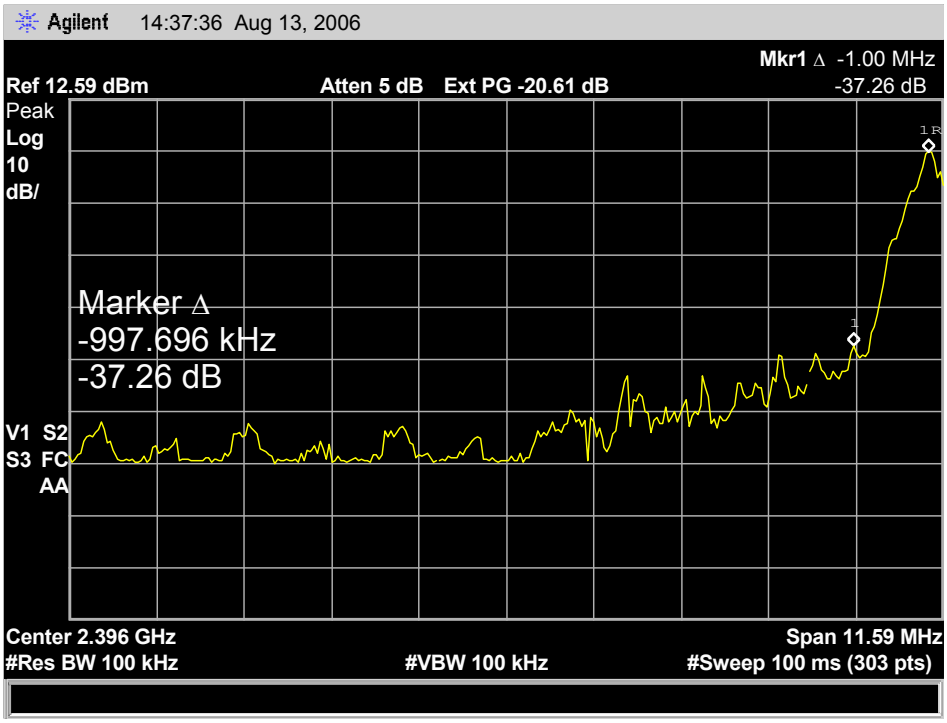
Test results

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

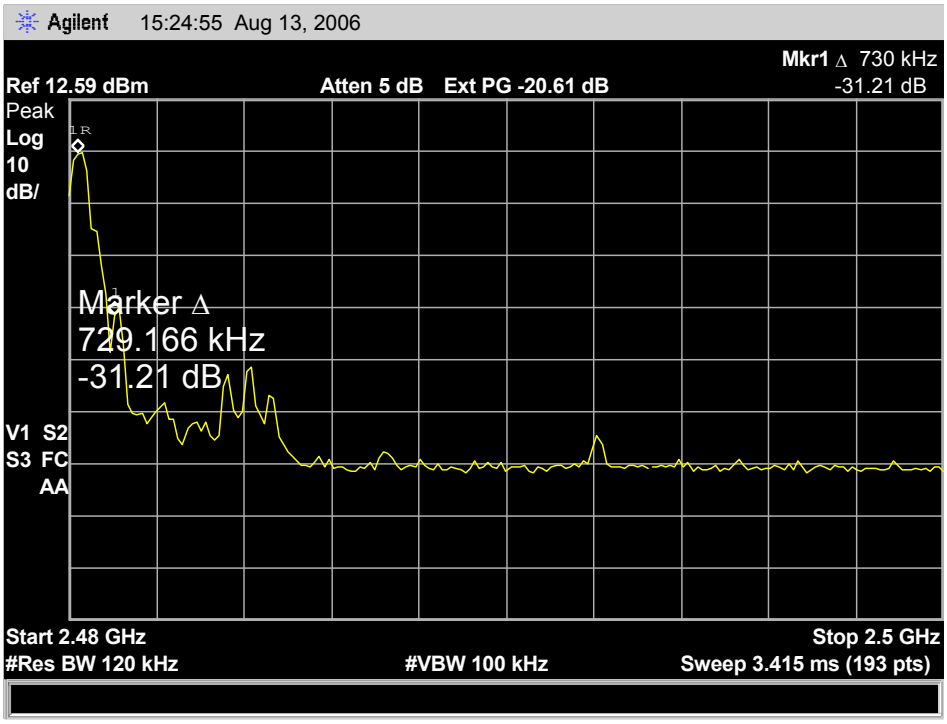
Plot 3.6.1



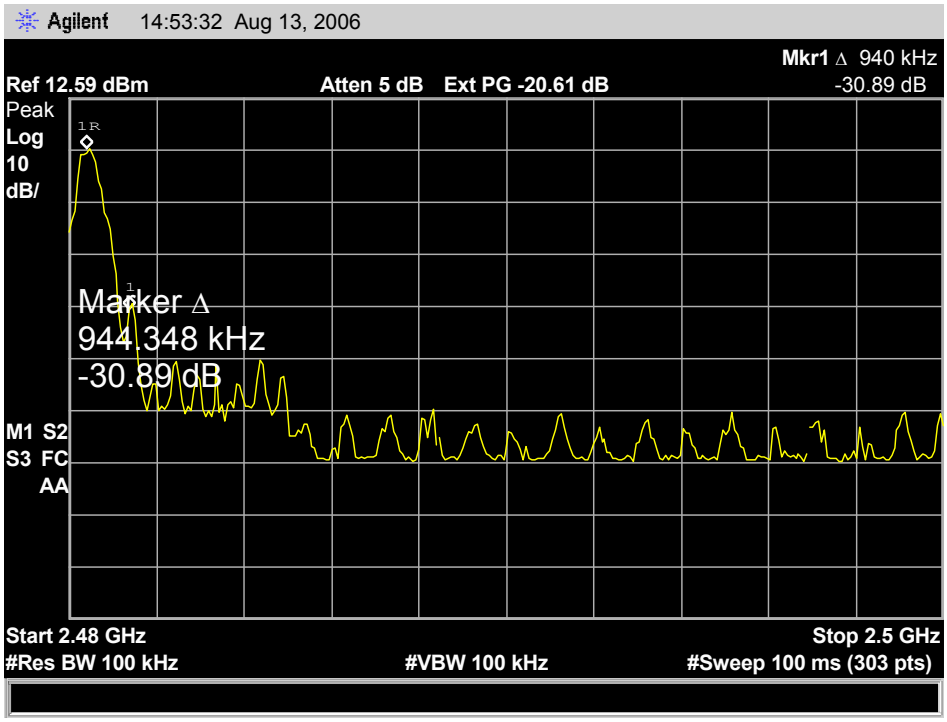
Plot 3.6.2



Plot 3.6.3



Plot 3.6.4



3.7. Spurious RF Conducted Emission

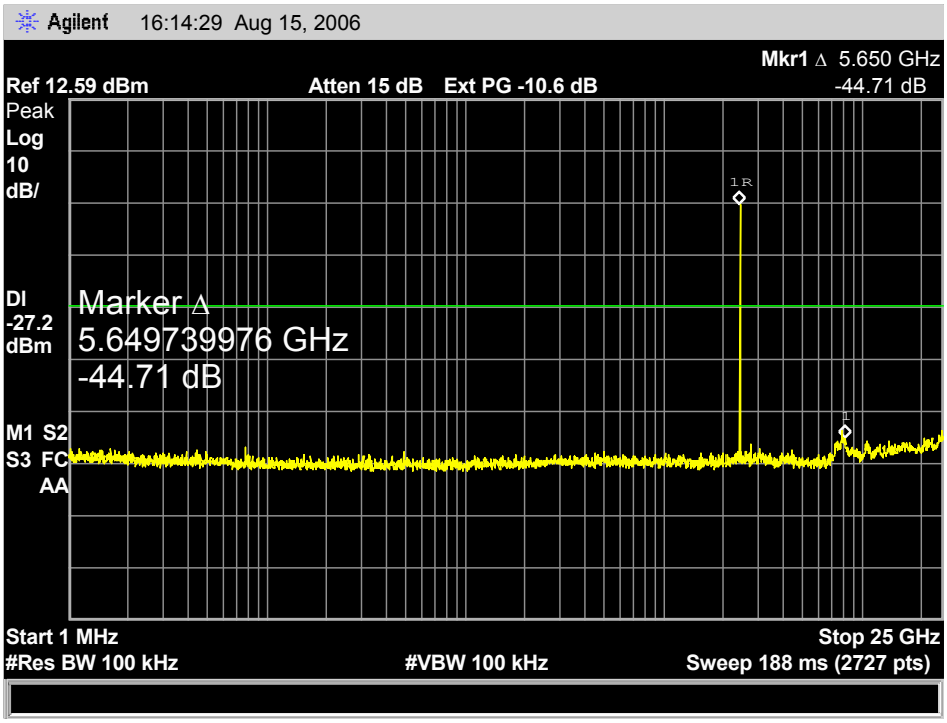
Reference document:	**47 CFR §15.247 (d) & DA 00-705**		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band at least 20 dB below the highest level of the desired power.		
Test setup:	See Sec. 2.1	**Pass**	
Operating conditions:	Under normal test conditions		
Method of testing:	Conducted		
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 3.8.1 – Plot 3.8.3	

Test results:

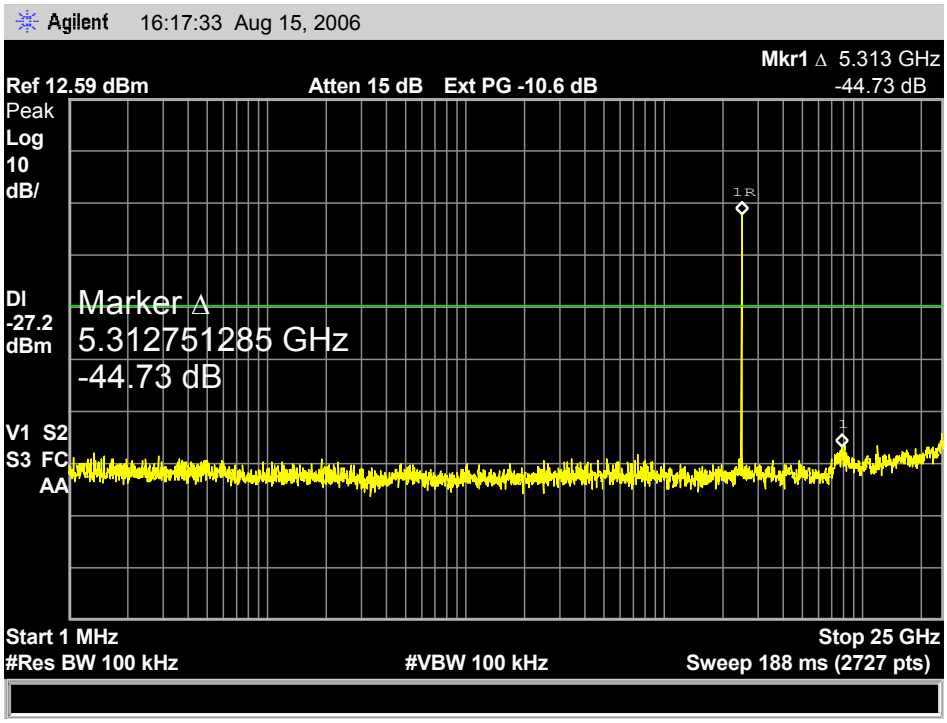
Frequency [GHz]	Spurious Frequency [GHz]	Measured [dBc]	Emissions limit	Reference	Result
2.402	-	At least -40dBc	-20dBc	Plot 3.8.1	Pass
2.443	-	At least - 40dBc		Plot 3.8.2	Pass
2.480	-	At least -40dBc		Plot 3.8.3	Pass

Sec. 3.8 Spurious Emission- Conducted

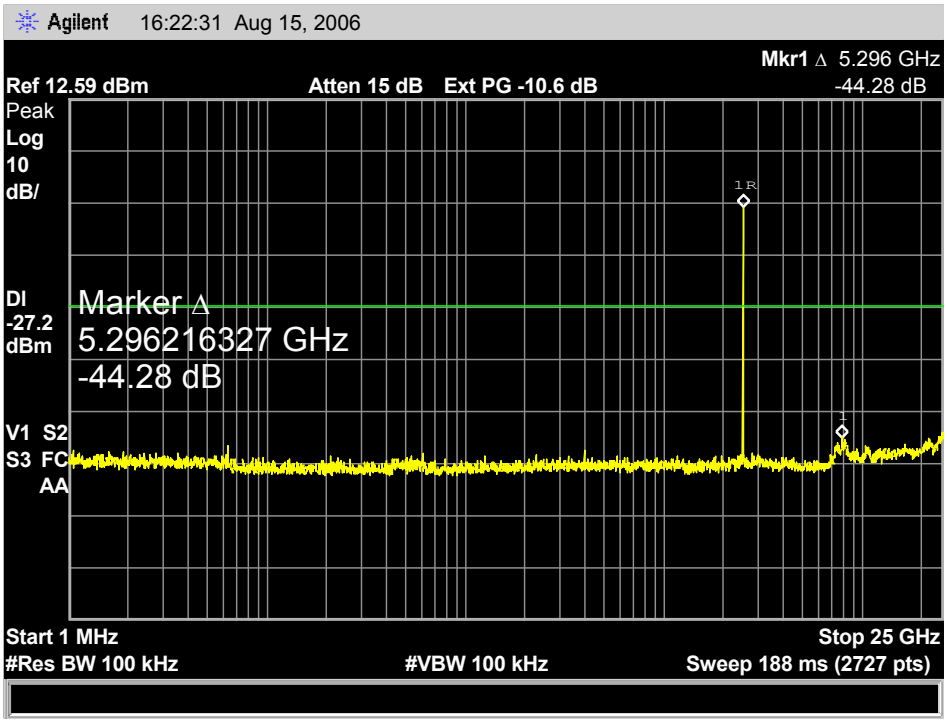
Low frequency
Plot 3.8.1



Middle frequency
Plot 3.8.2



High frequency
Plot 3.8.3



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 3.7.1 – Plot 3.7.12 & Appendix A	

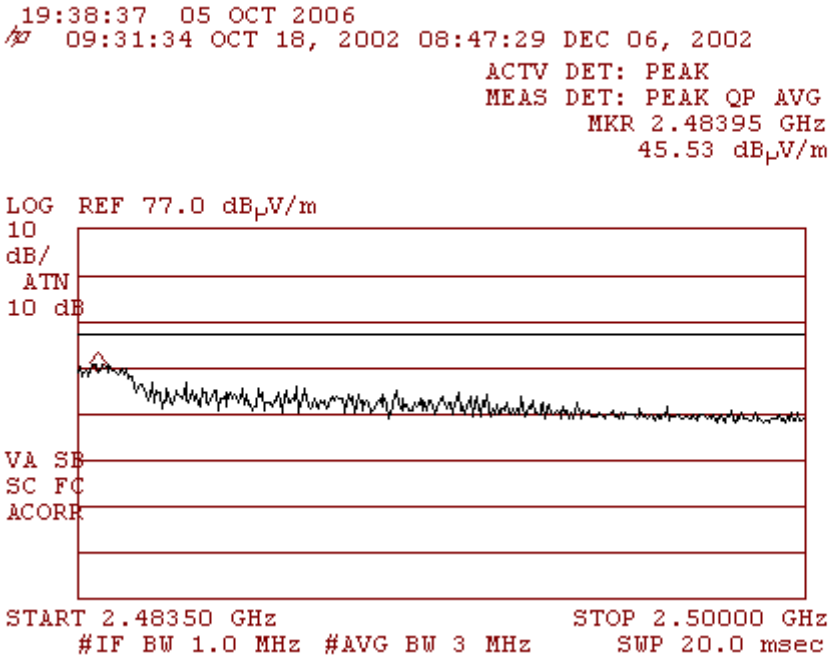
Test results:

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

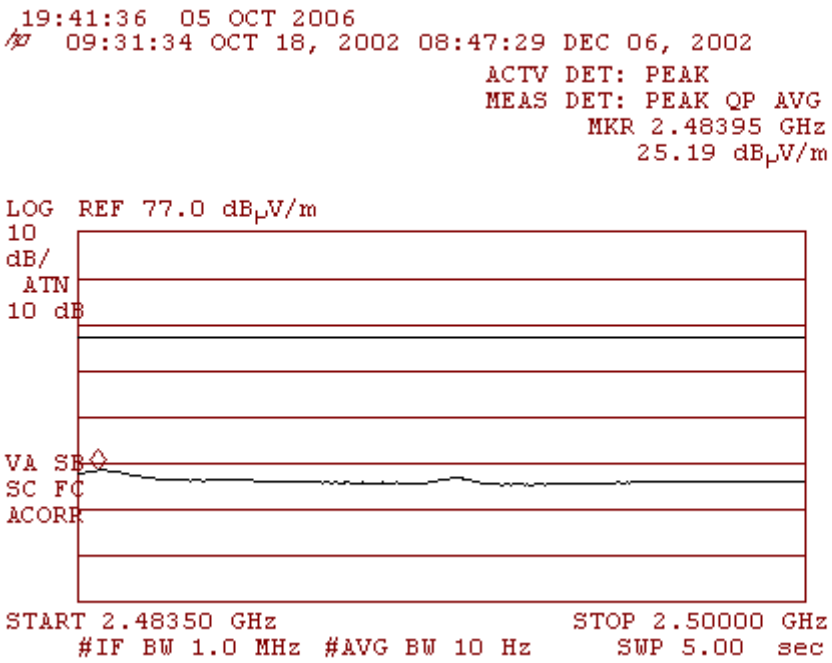
Lowest channel, 2402 MHz					
Spurious Frequency [MHz]	Detector type	Spurious level [dBµV/m]	Limit [dBµV/m]	Reference Plot	Result
2378.40	Average	28.45	54	Plot 3.7.12	Pass
2378.40	Peak	47.33	74	Plot 3.7.11	Pass
4804	Peak	40.43	74	Appendix A Plot 30	Pass
4804	Average	25.87	54	-	Pass

Highest channel, 2480 MHz					
Spurious Frequency [MHz]	Detector type	Spurious level [dBµV/m]	Limit [dBµV/m]	Reference Plot	Result
2483.95	Average	32.56	54	Plot 3.7.4	Pass
2483.95	Peak	47.87	74	Plot 3.7.3	Pass
4960	Peak	37.26	74	Appendix A Plot 38	Pass
4960	Average	23.62	54	-	Pass

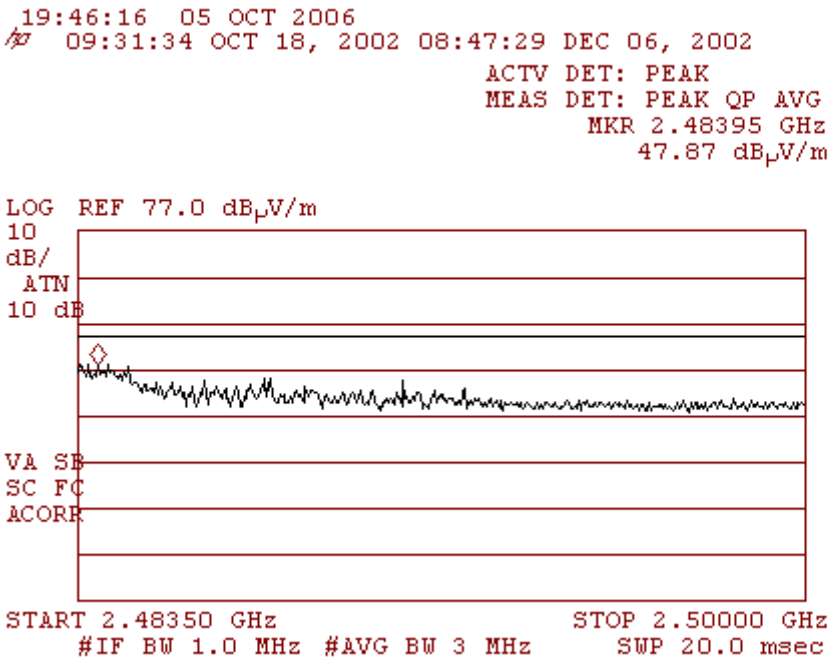
Single mode Highest Frequency
Vertical Polarization
Peak
Plot 3.7.1



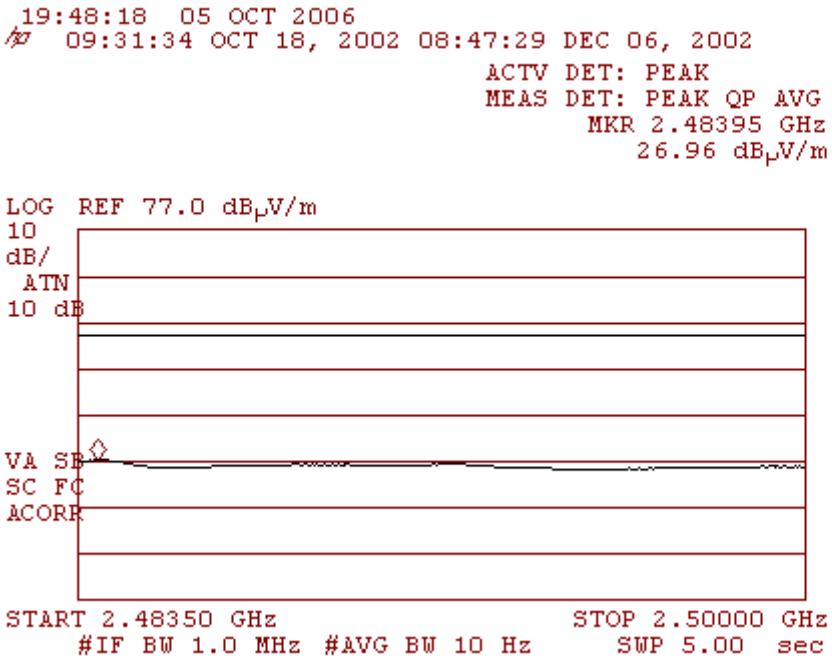
Average
Plot 3.7.2



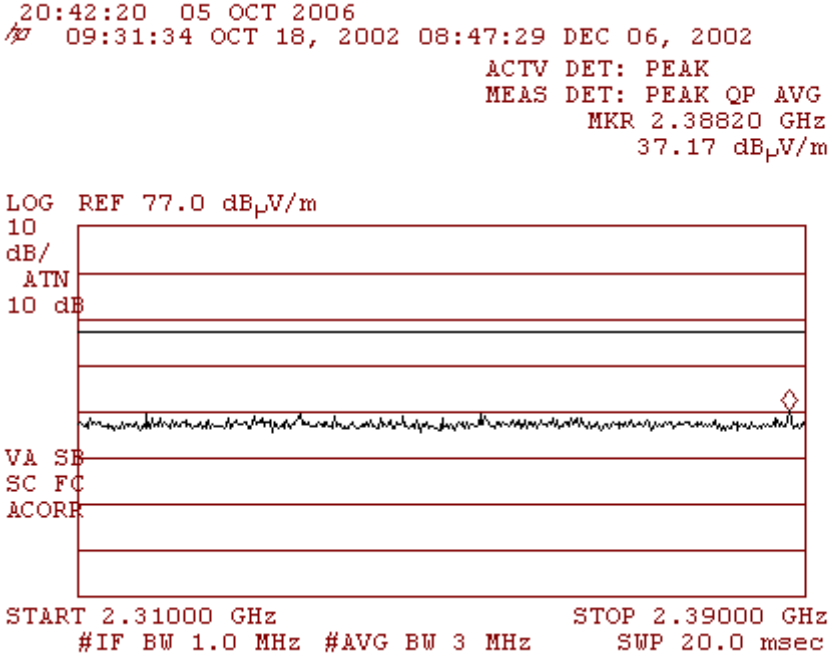
Single mode Highest Frequency
Horizontal Polarization
Peak
Plot 3.7.3



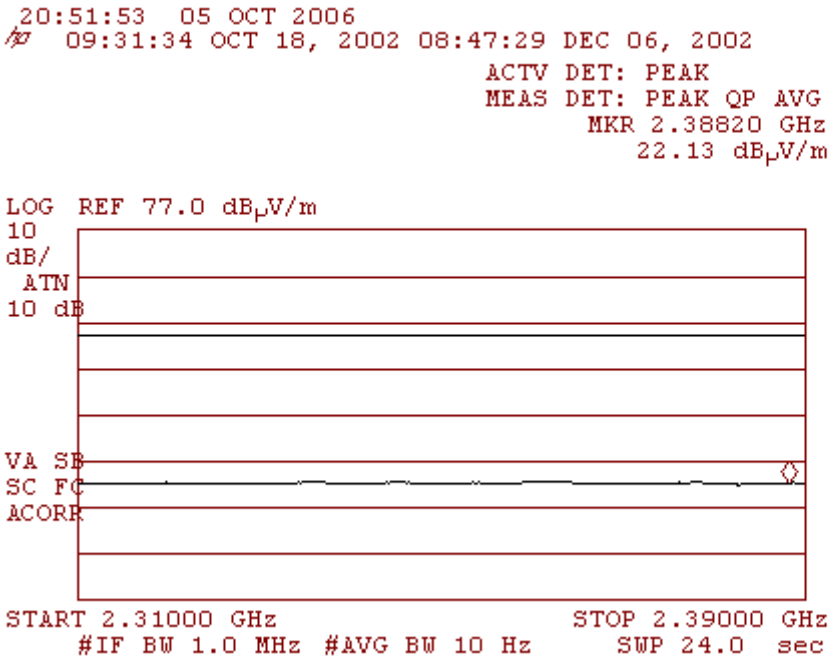
Average
Plot 3.7.4



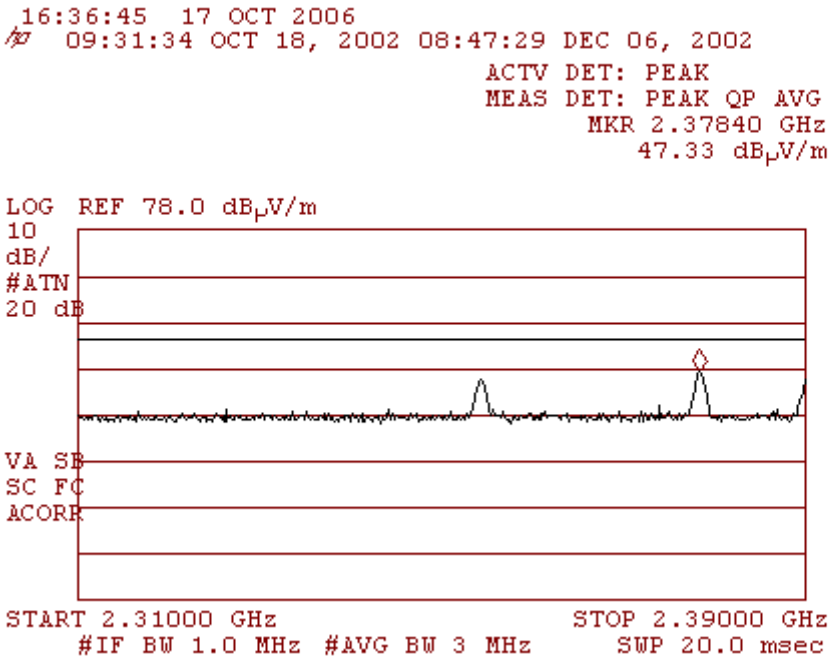
Single mode Lowest Frequency
Vertical Polarization
Peak
Plot 3.7.9



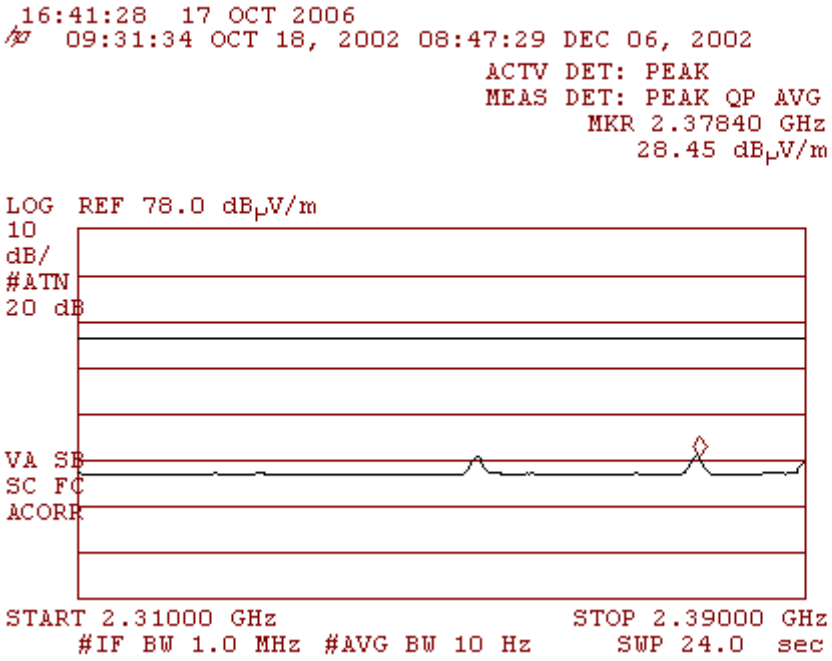
Average
Plot 3.7.10



Single mode Lowest Frequency
Horizontal Polarization
Peak
Plot 3.7.11



Average
Plot 3.7.12



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. 2.7	**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 iDEN employs a unique UFL connector type.	**Comply**

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

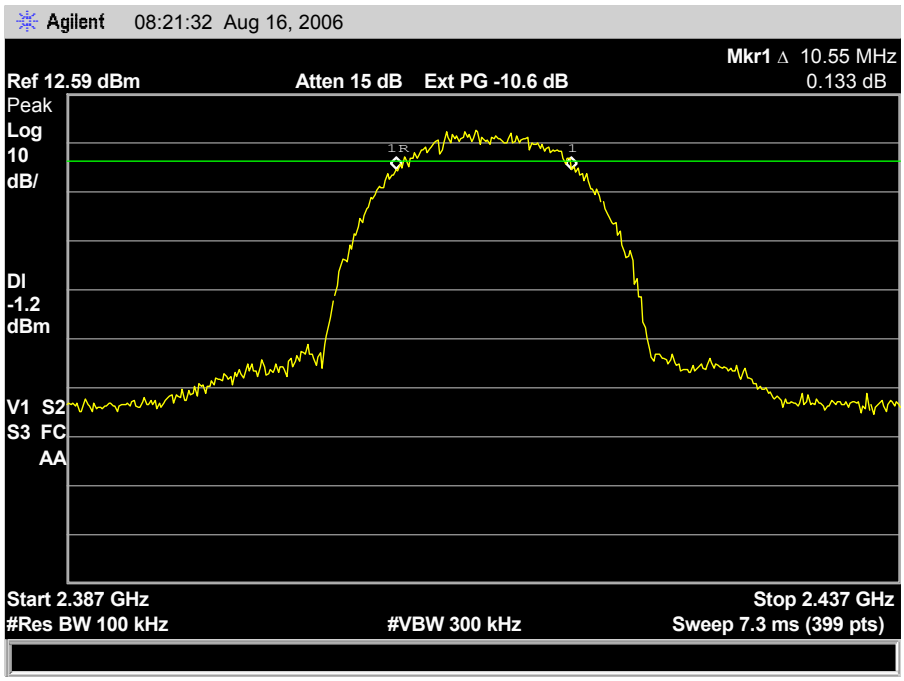
4.1. 6 dB Bandwidth

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	

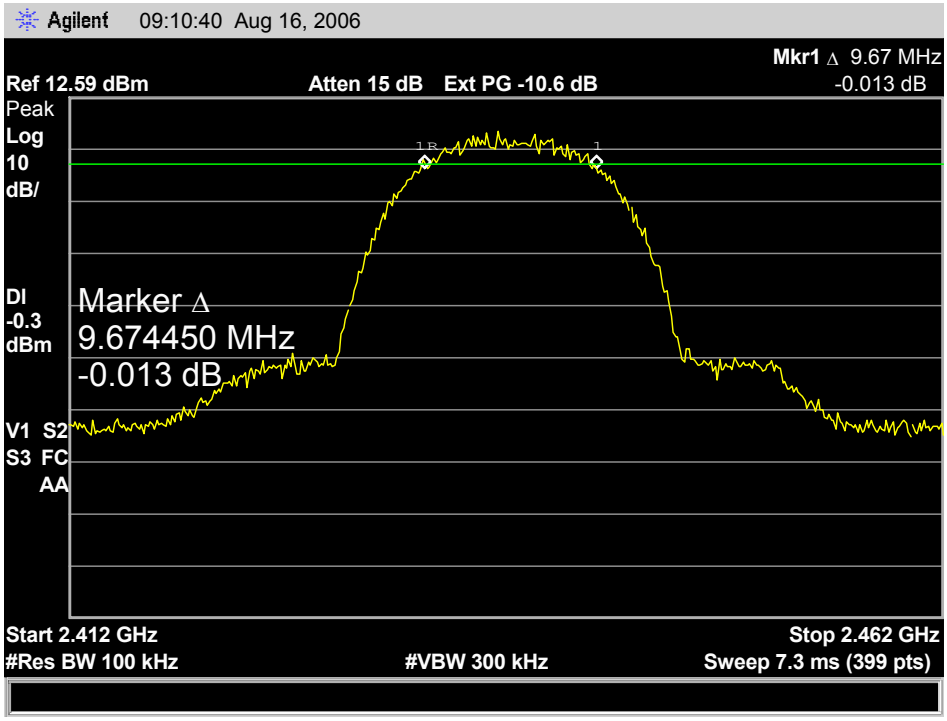
Test results

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

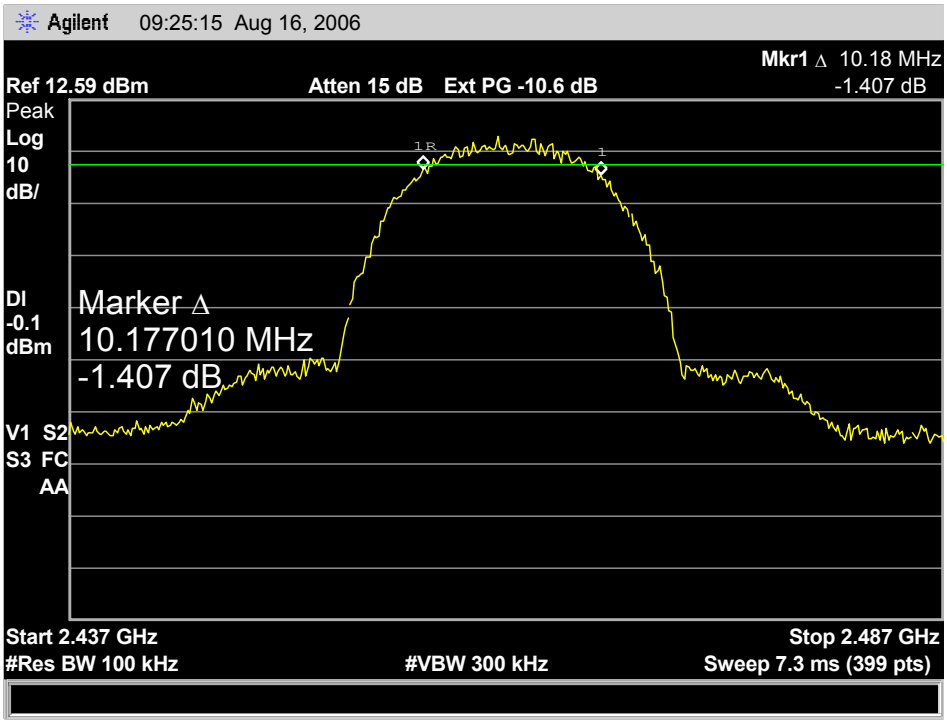
802.11b Mode
Plot 4.1.1



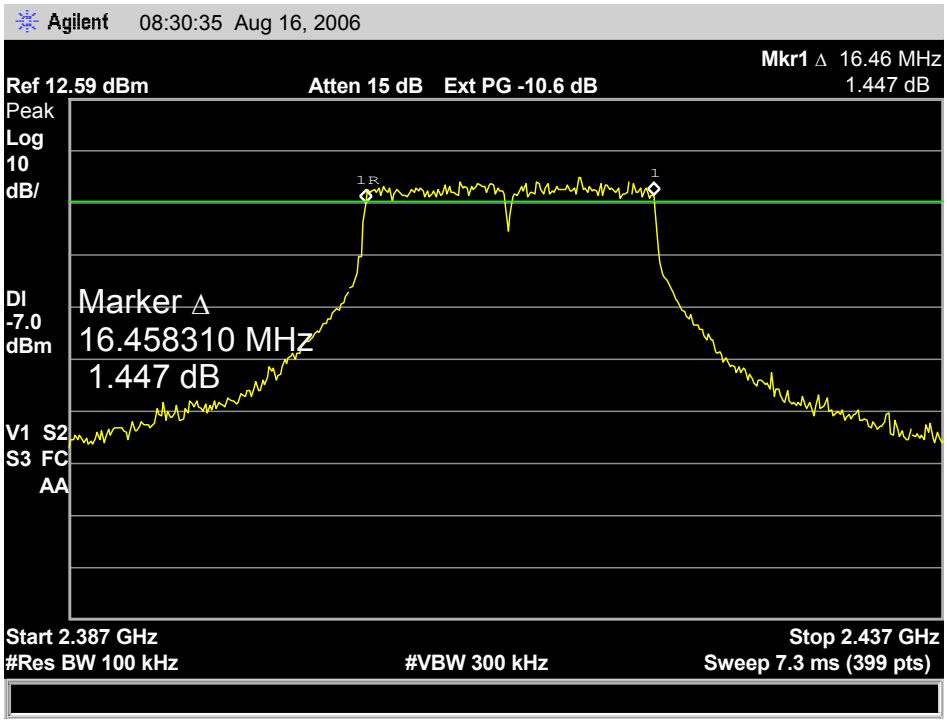
Plot 4.1.2



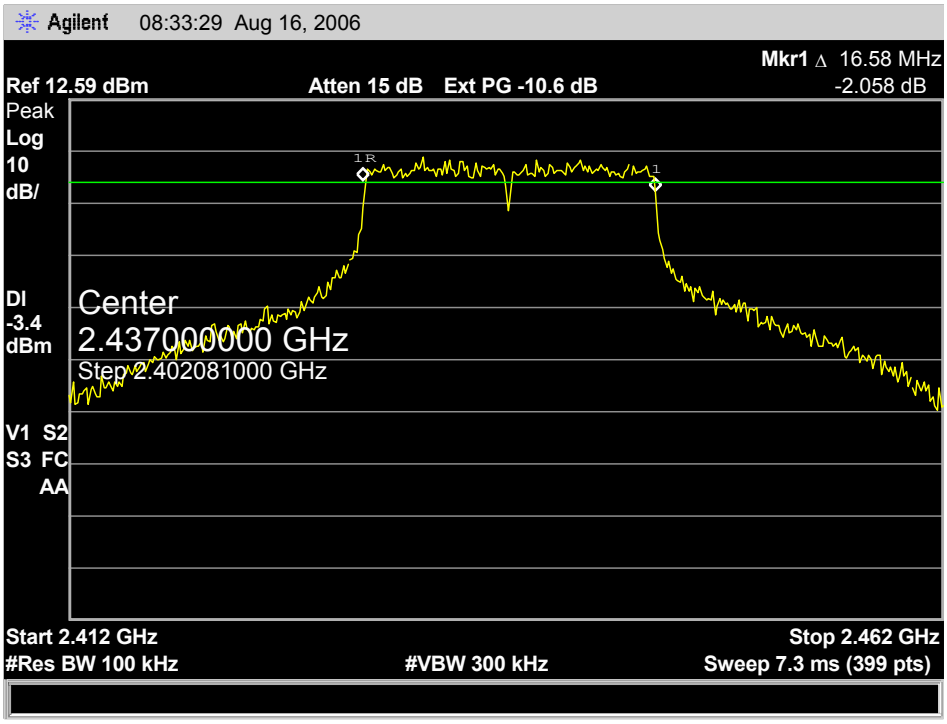
Plot 4.1.3



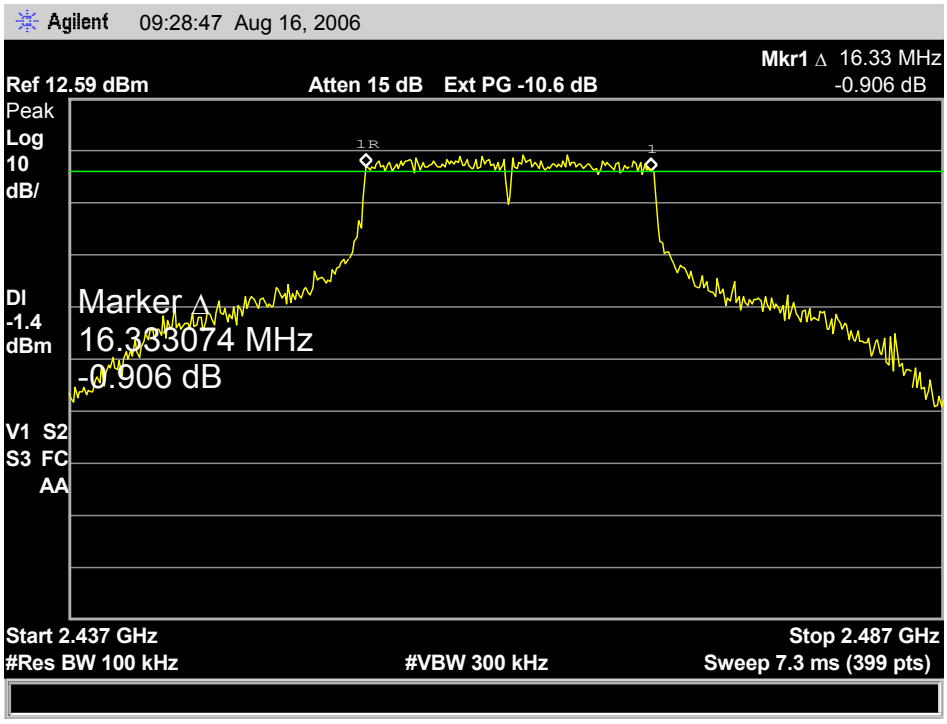
802.11g Mode
Plot 4.1.4



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	

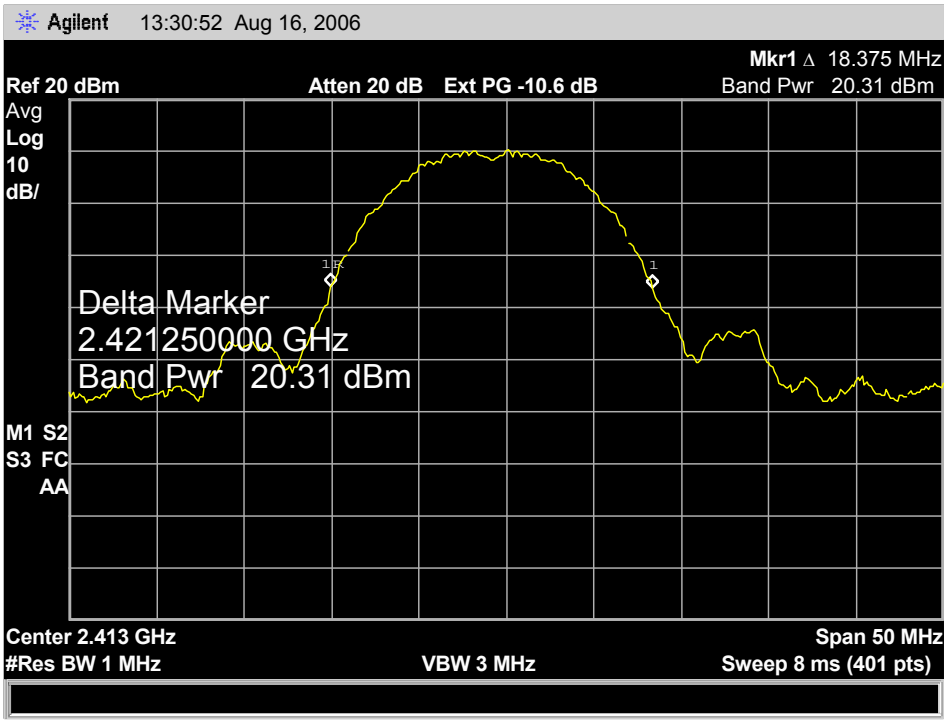
Test Results

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

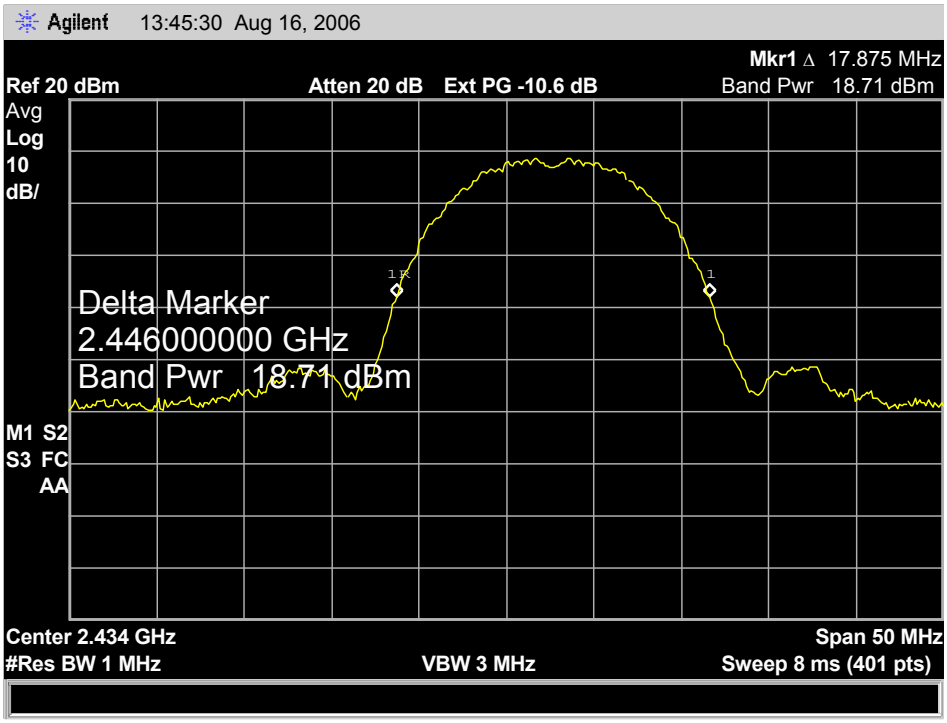
*Corrected for external attenuations
** Maximum Conducted Peak Output Power is not a factor to determine the final Average Output Power. Please refer to Average Output Power.

802.11b Mode

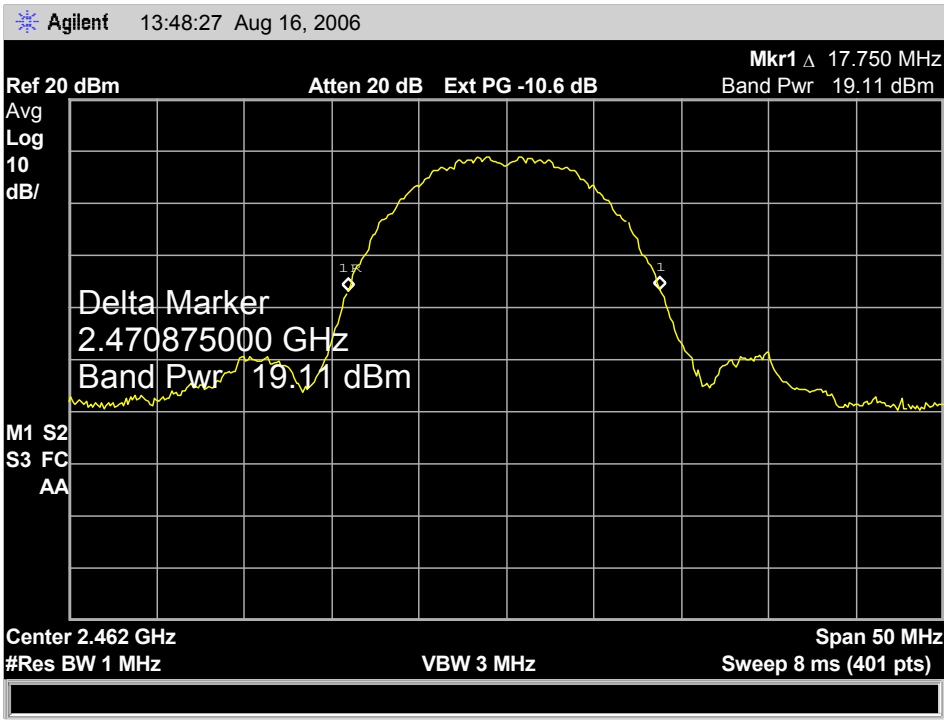
Plot 4.2.1



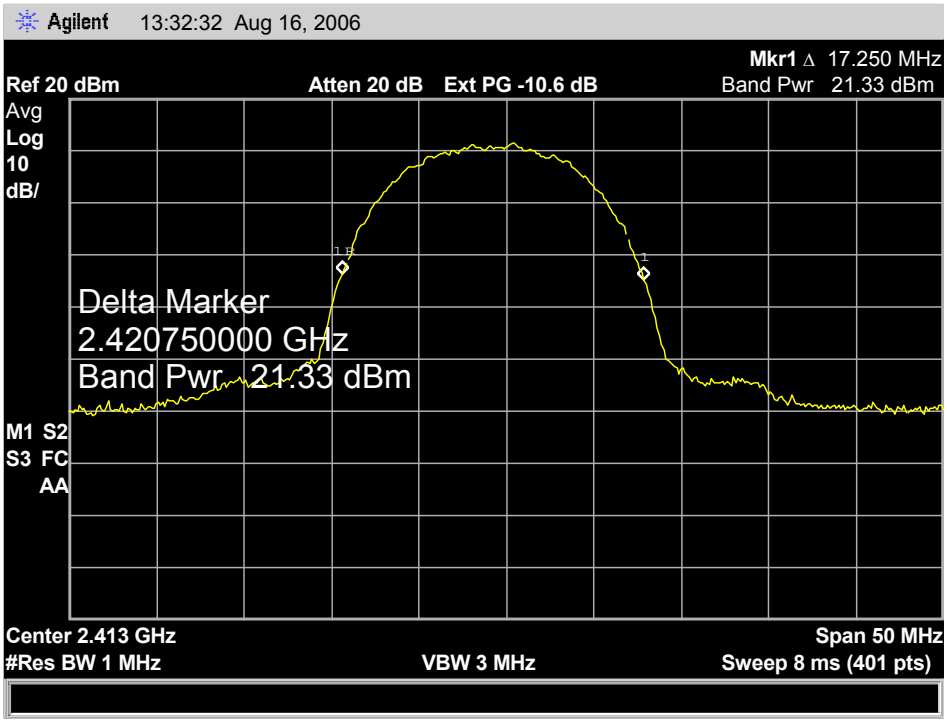
Plot 4.2.2



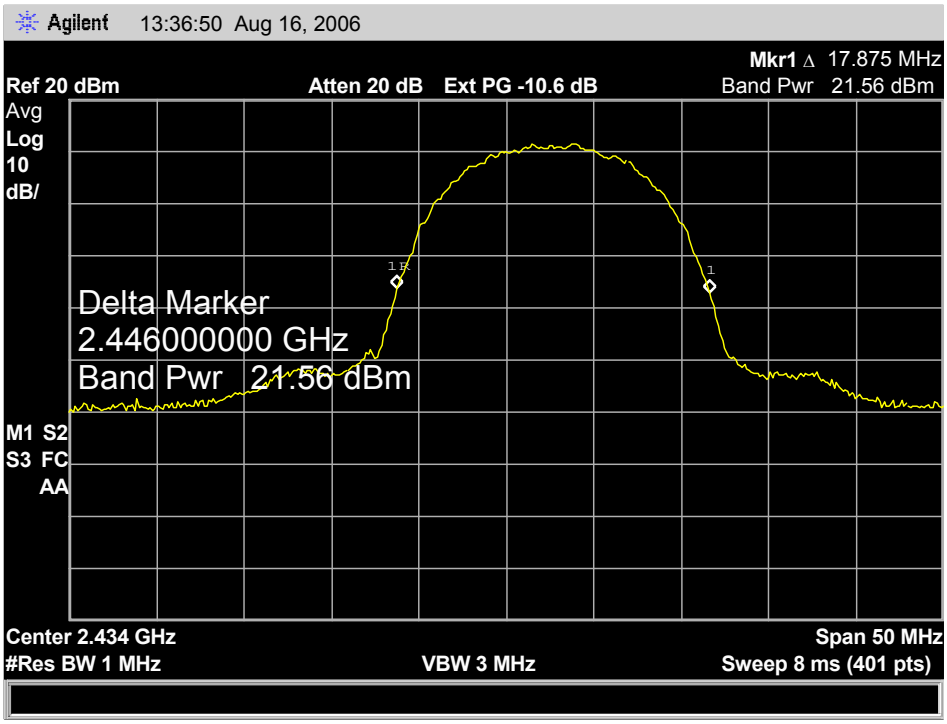
Plot 4.2.3



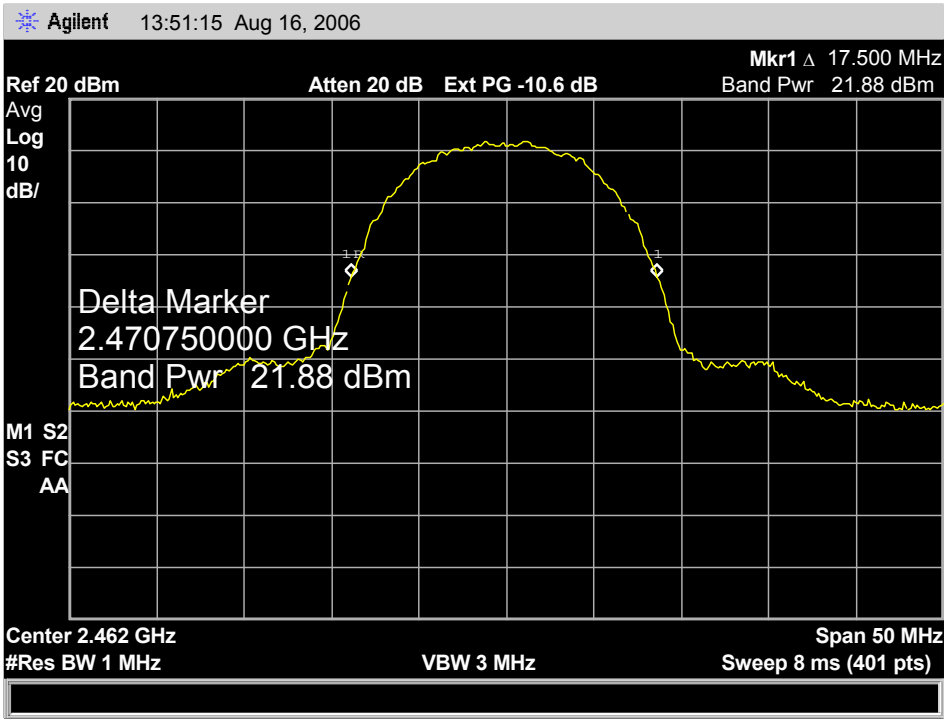
802.11g Mode
Plot 4.2.4



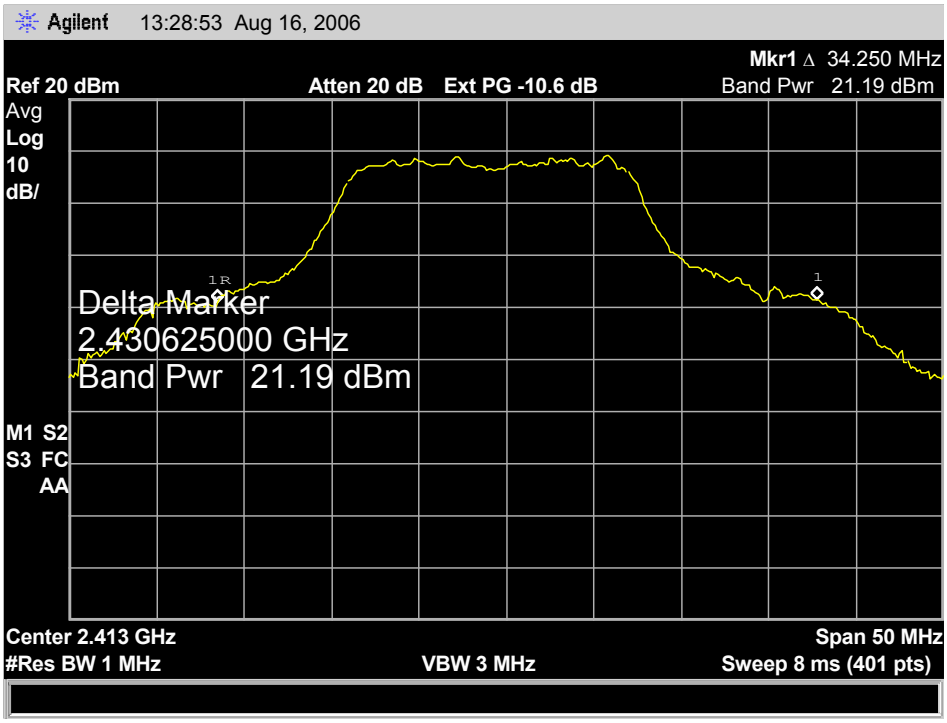
Plot 4.2.5



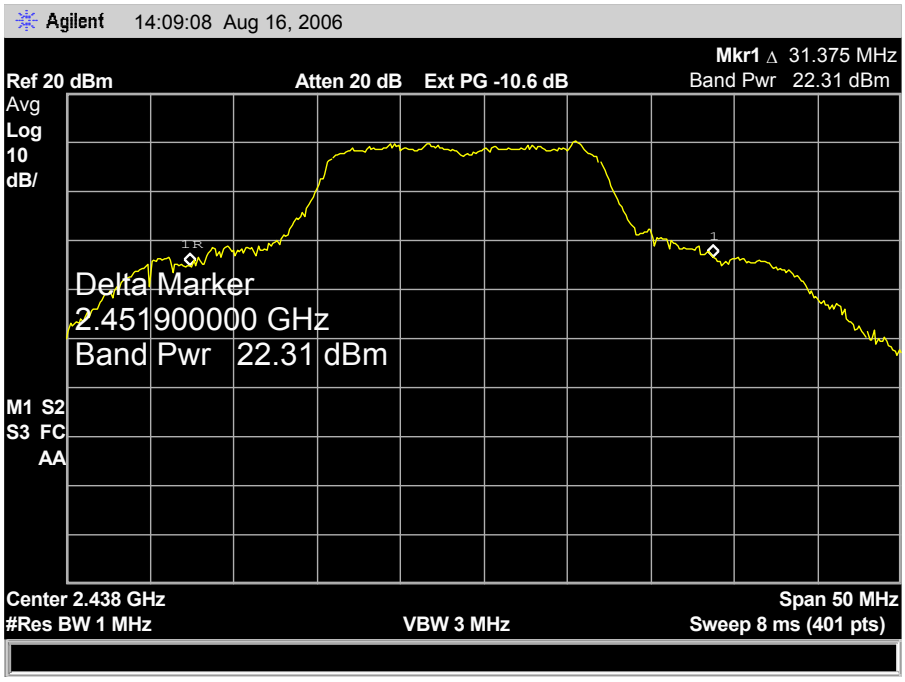
Plot 4.2.6



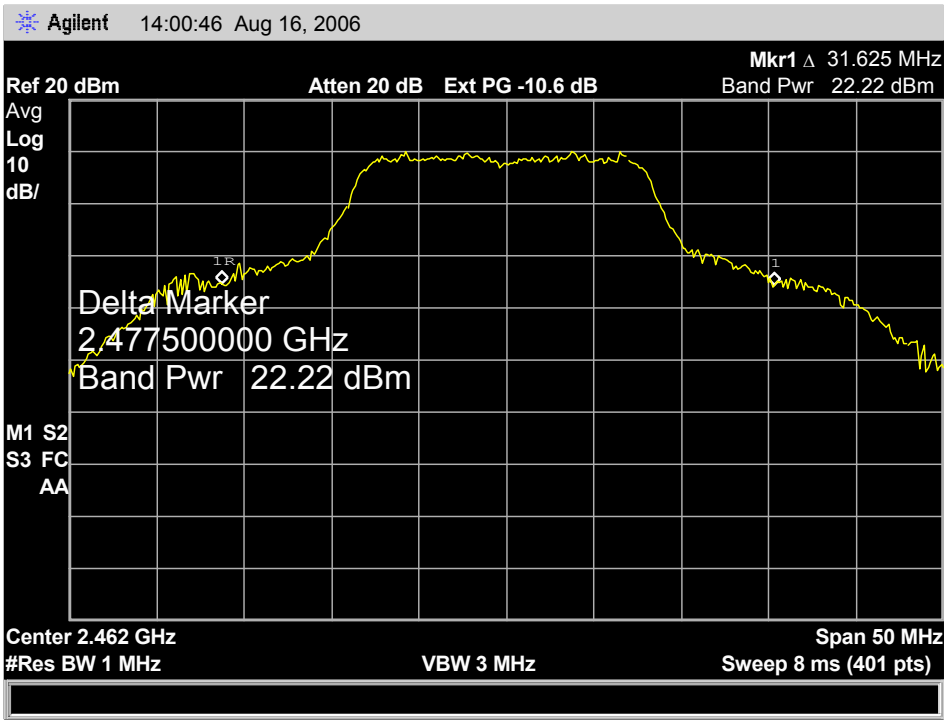
802.11g Mode
Plot 4.2.7



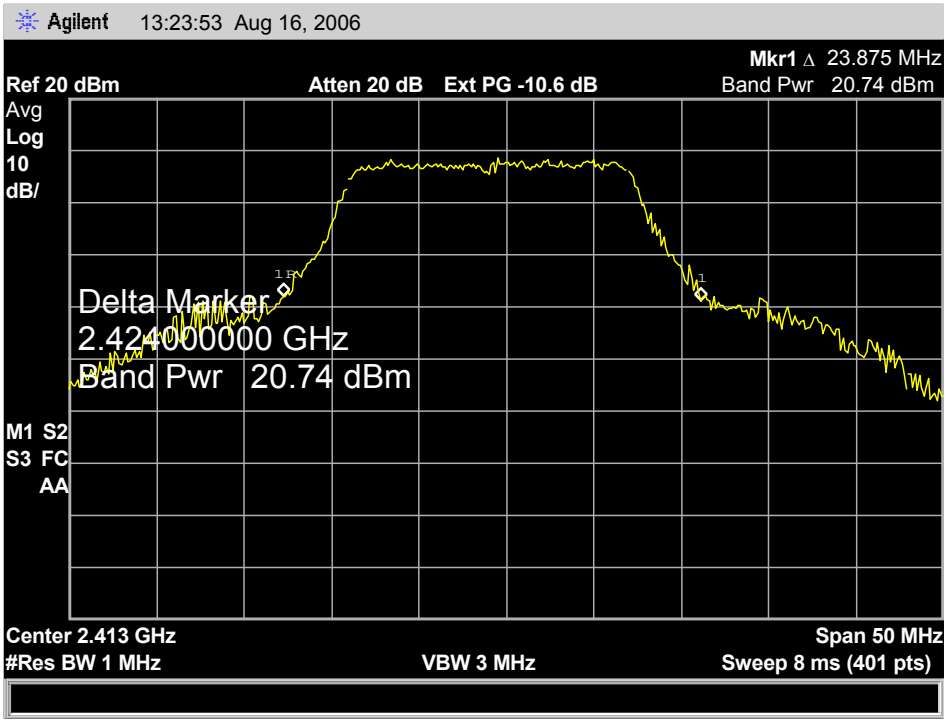
Plot 4.2.8



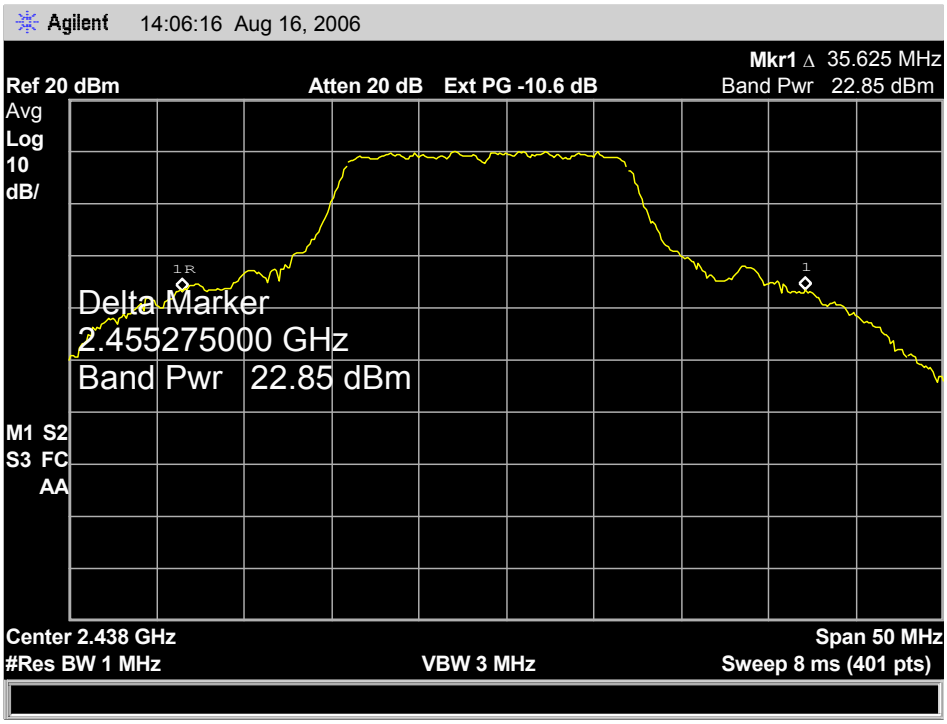
Plot 4.2.9



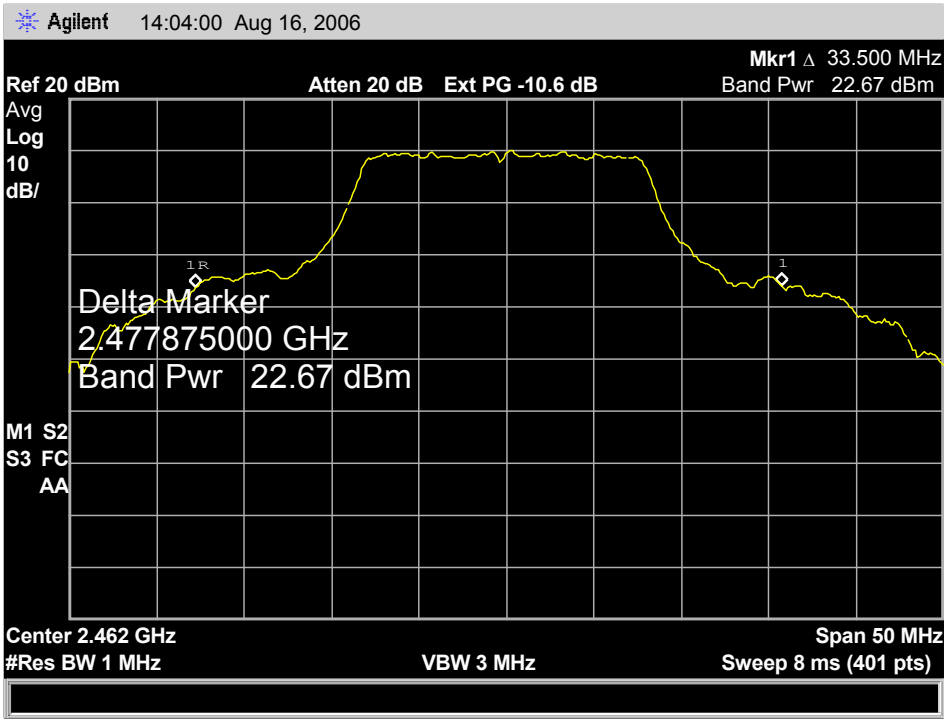
Plot 4.2.10



Plot 4.2.11



Plot 4.2.12



4.3. Peak Power Spectral Density

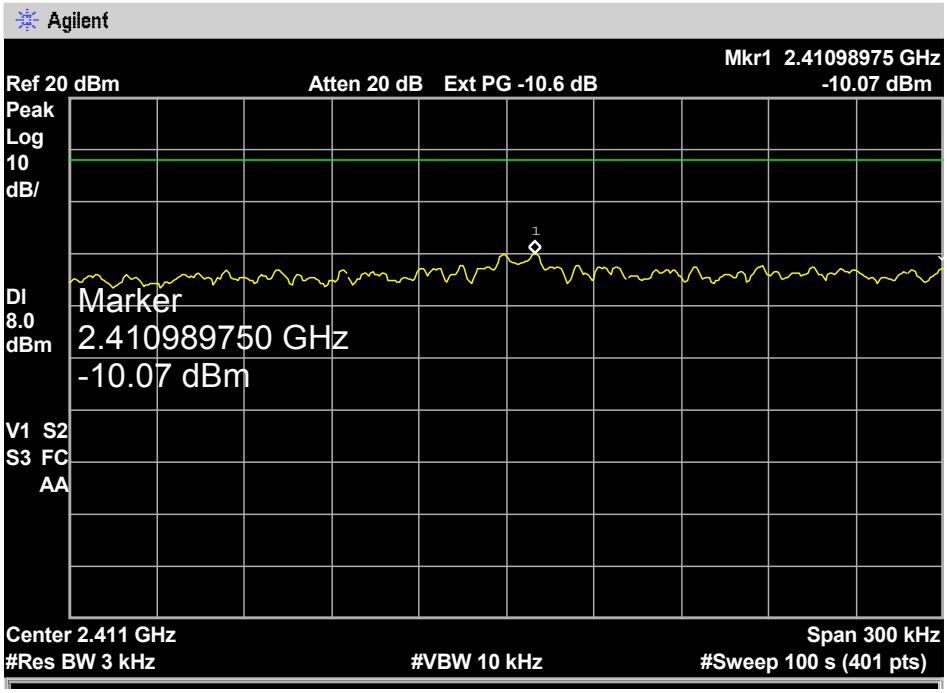
Reference document:	**47 CFR §15.247 (e)**		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.		
Test setup:	See Sec. 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:

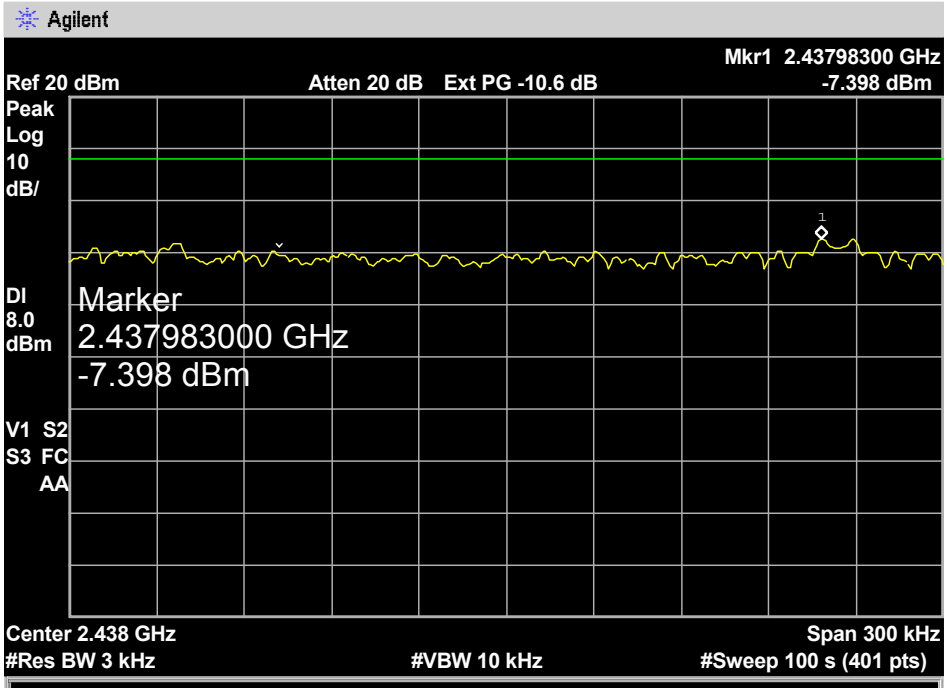
Frequency [MHz]	Data Rate [Mbps]	PSD [dBm/3kHz]	Limit [dBm/3kHz]	Margin [dB]	Reference
802.11b Mode					
2412	1	-10.07	8	18.07	Plot 4.3.1
2437	1	-7.398	8	15.398	Plot 4.3.2
2462	1	-6.897	8	14.897	Plot 4.3.3
2412	11	-10.45	8	18.45	Plot 4.3.4
2437	11	-8.708	8	16.708	Plot 4.3.5
2462	11	-9.368	8	17.368	Plot 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

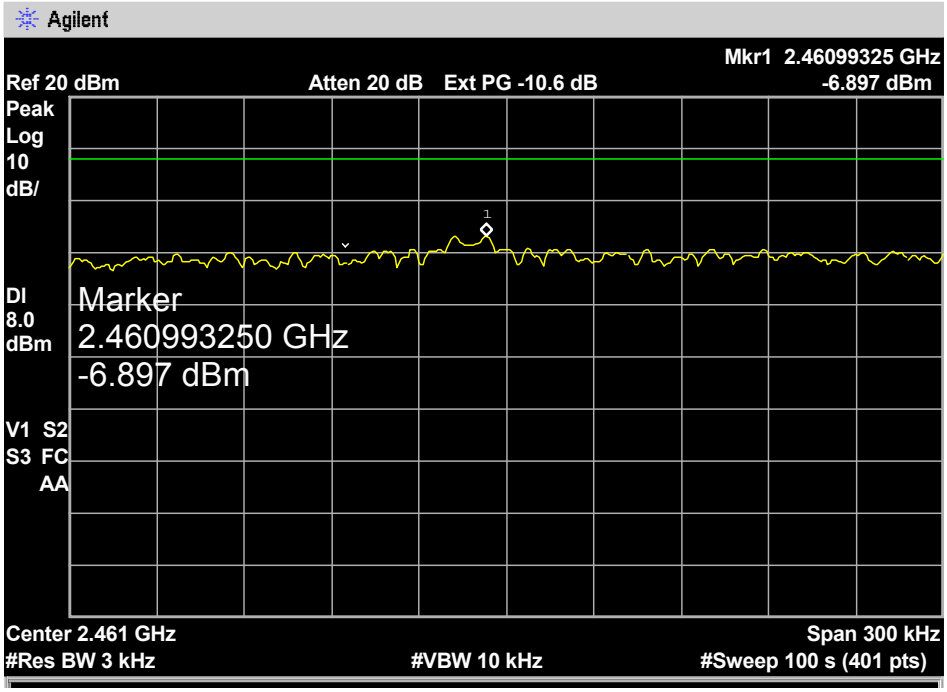
Plot 4.3.1



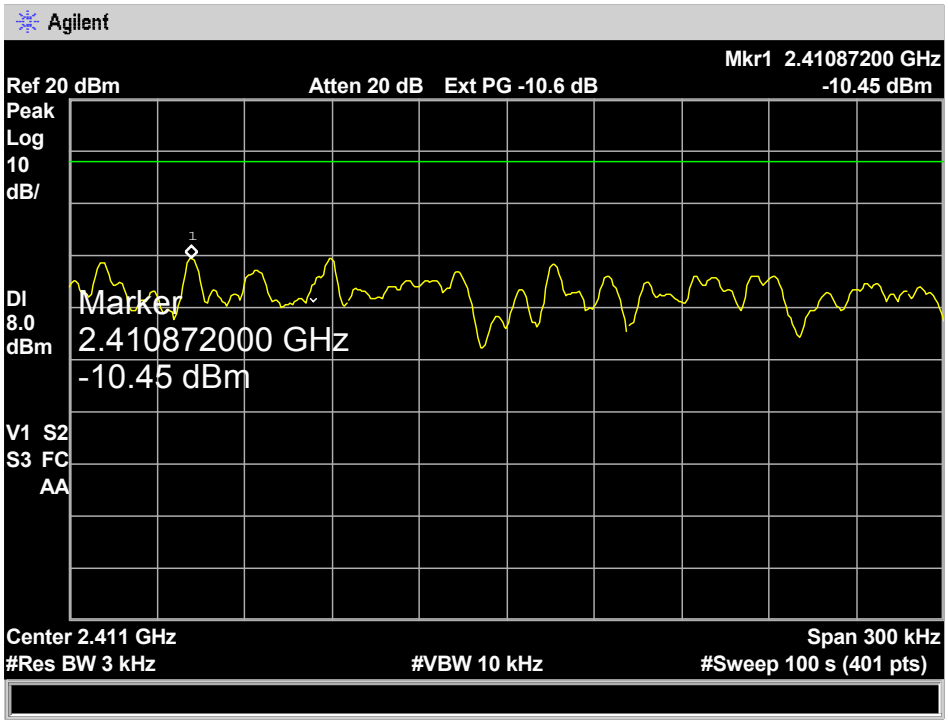
Plot 4.3.2



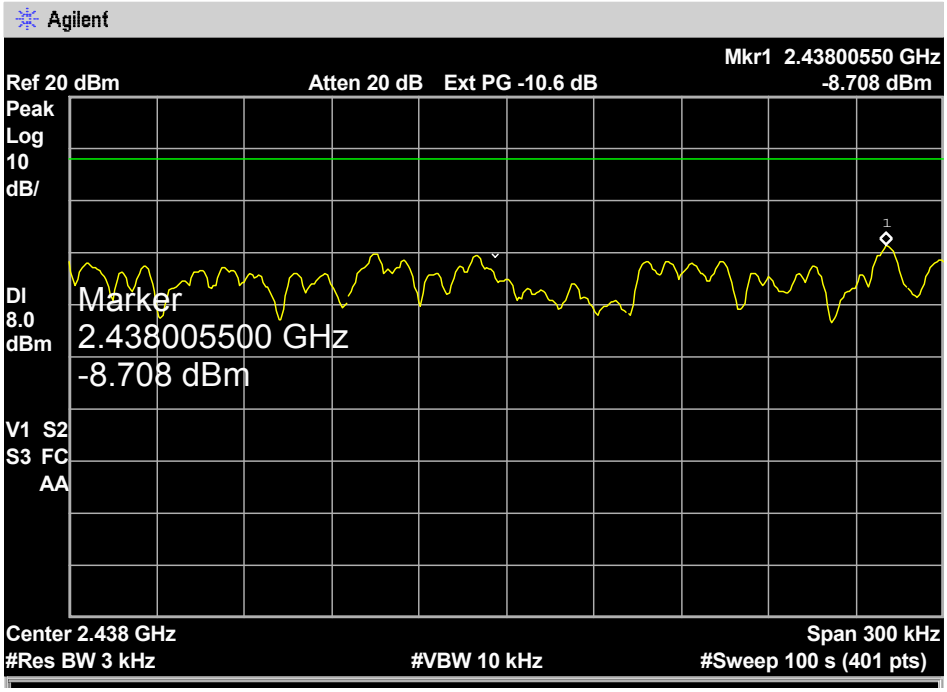
Plot 4.3.3



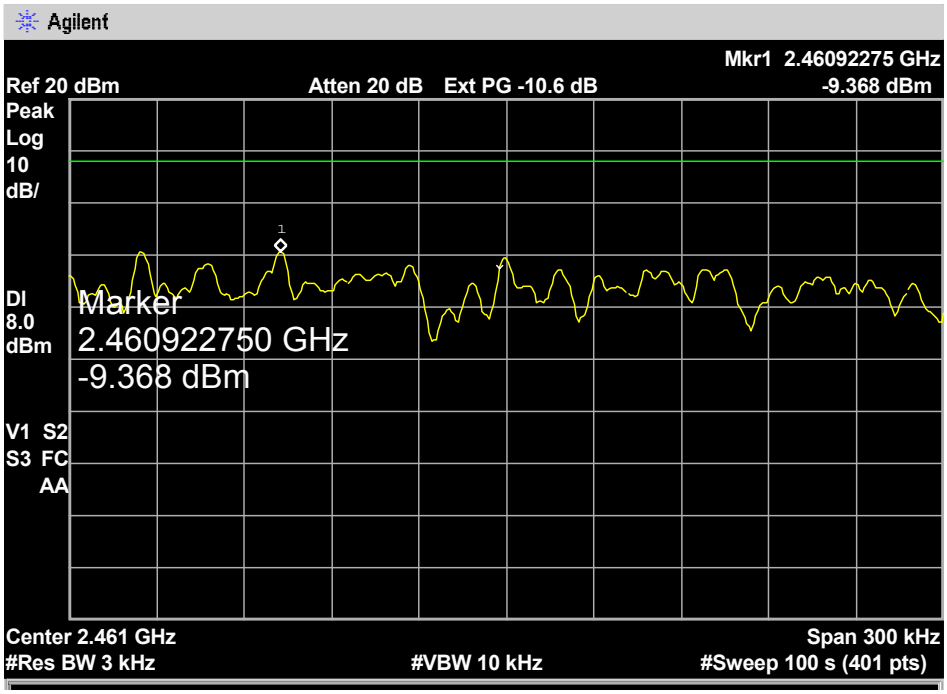
Plot 4.3.4



Plot 4.3.5

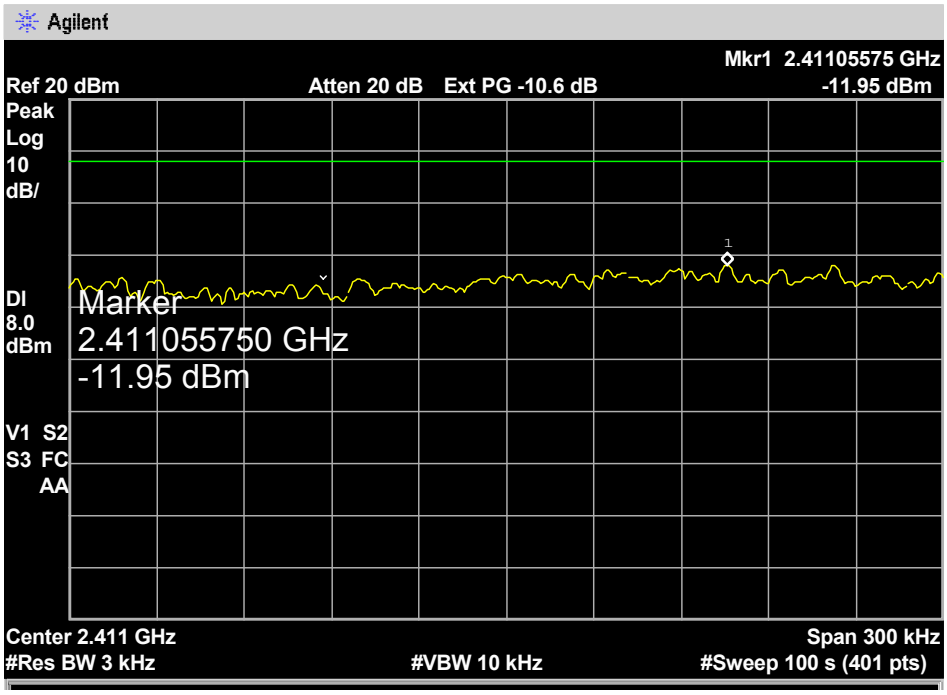


Plot 4.3.6

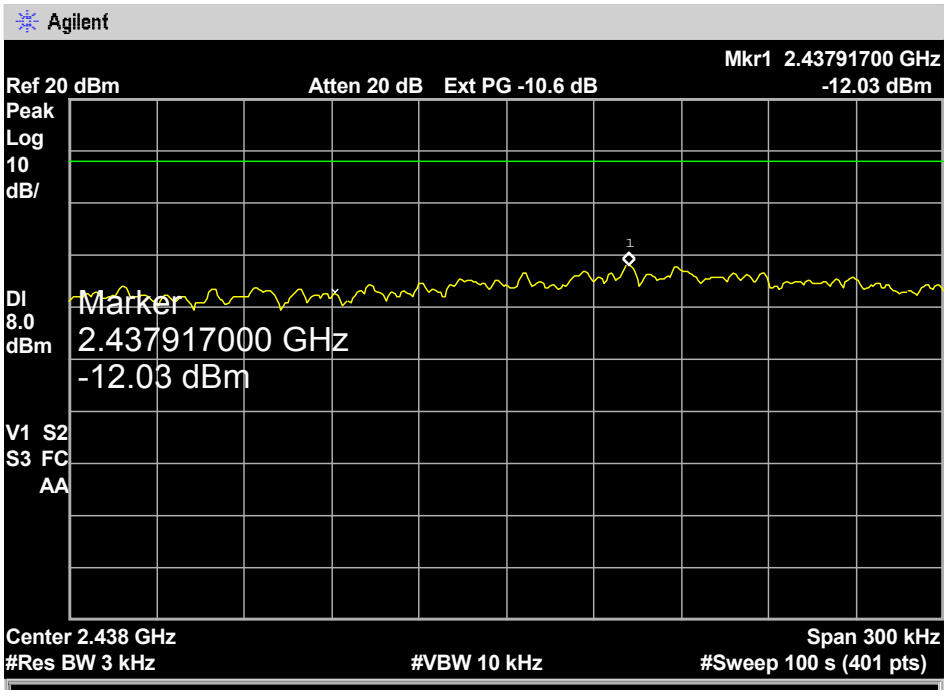


802.11g Mode

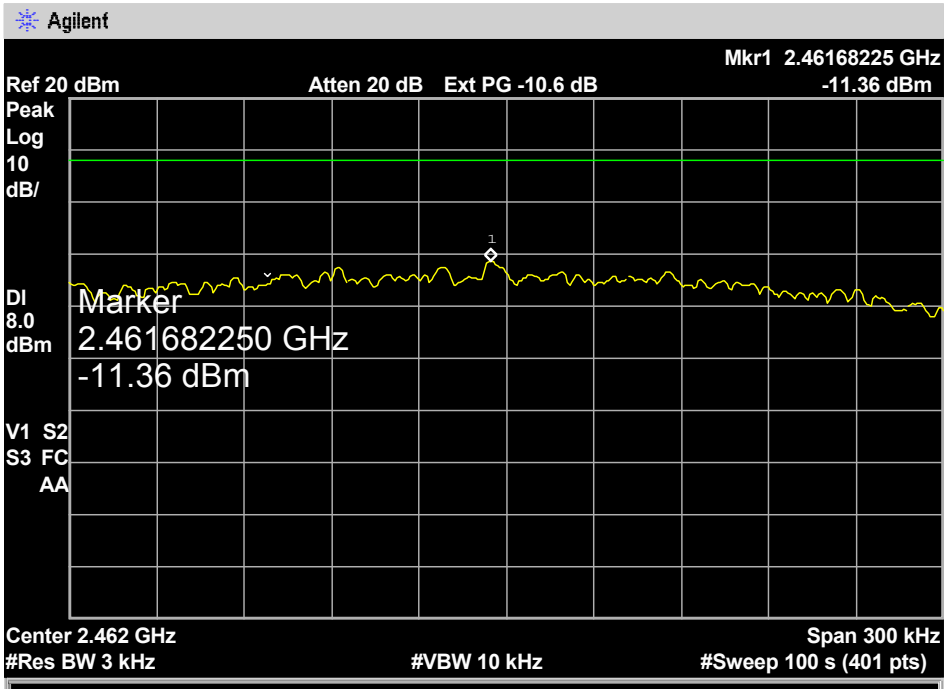
Plot 4.3.7



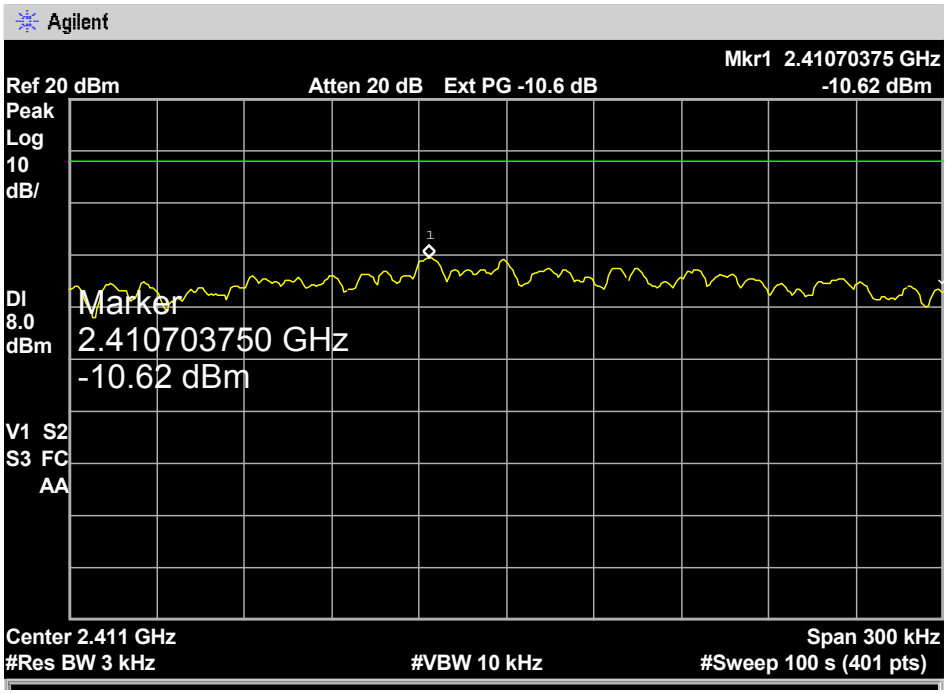
Plot 4.3.8



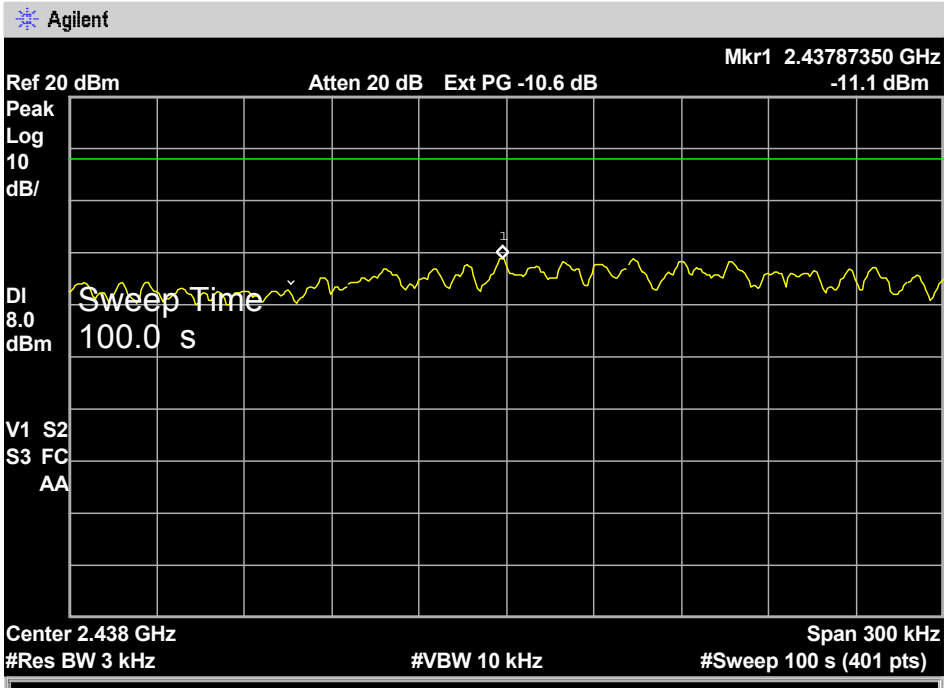
Plot 4.3.9



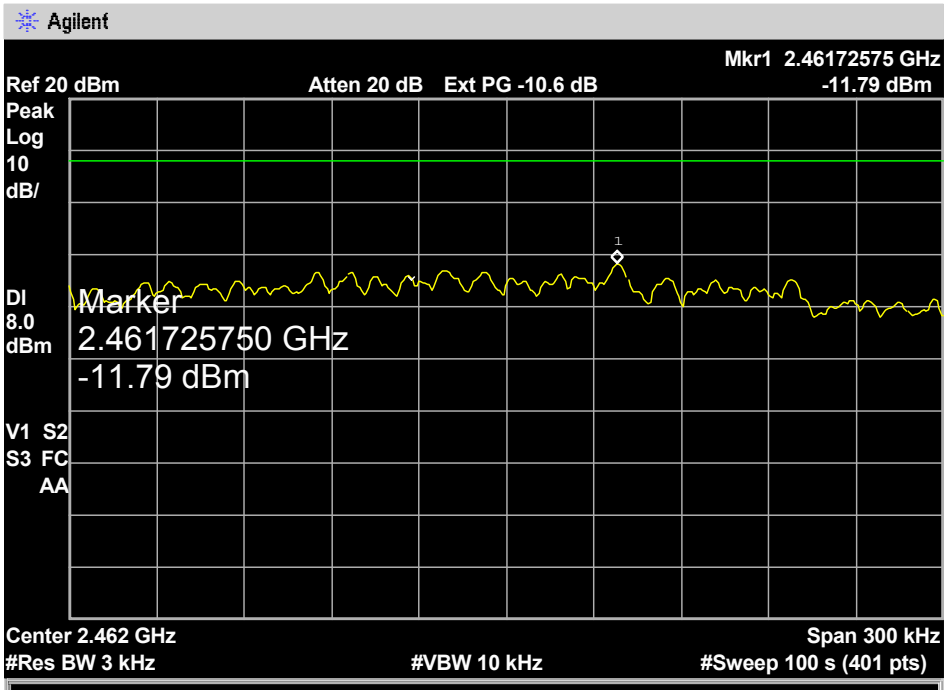
Plot 4.3.10



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

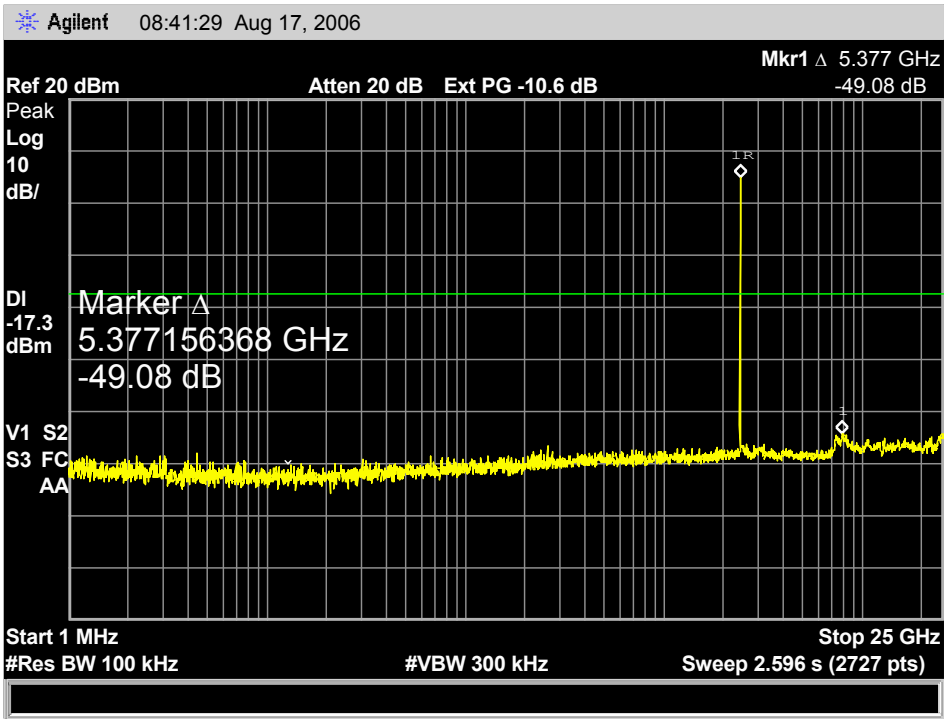
Frequency [MHz]	Data Rate [Mbps]	Measured Emission [dBc]	Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	*	-30	Plot 4.4.1	Pass
2437	11	*	-30	Plot 4.4.2	Pass
2462	11	*	-30	Plot 4.4.3	Pass
802.11g Mode					
2412	54	*	-30	Plot 4.4.4	Pass
2437	54	*	-30	Plot 4.4.5	Pass
2462	54	*	-30	Plot 4.4.6	Pass

Band edge

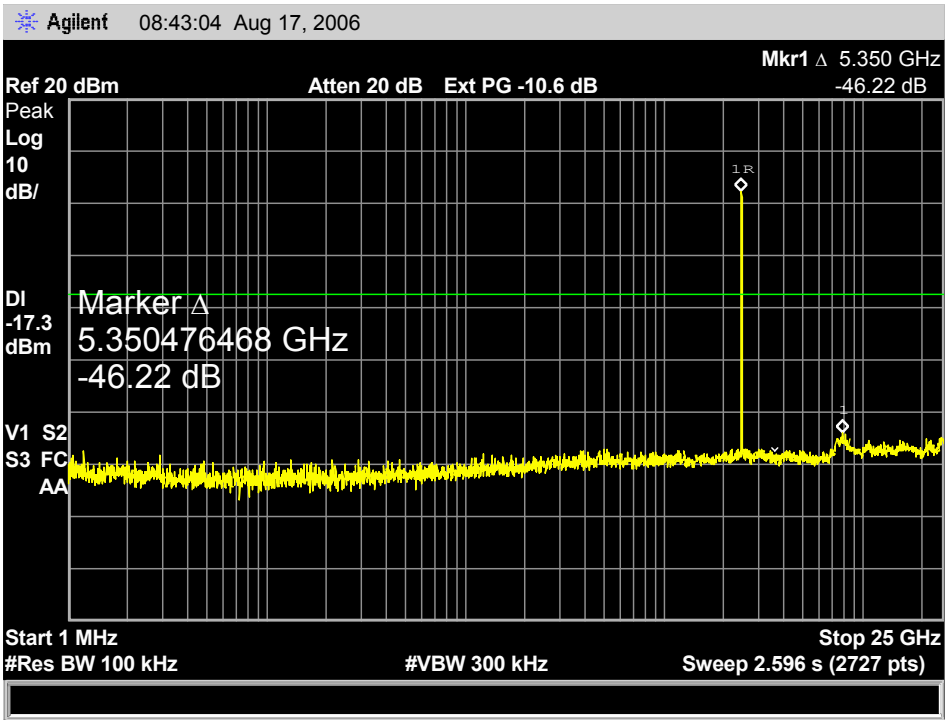
Frequency [MHz]	Data Rate [Mbps]	Measured Emission [dBc]	Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	*	-30	Plot 4.4.7	Pass
2462	11	*	-30	Plot 4.4.8	Pass
802.11g Mode					
2412	54	*	-30	Plot 4.4.9	Pass
2462	54	*	-30	Plot 4.4.10	Pass

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

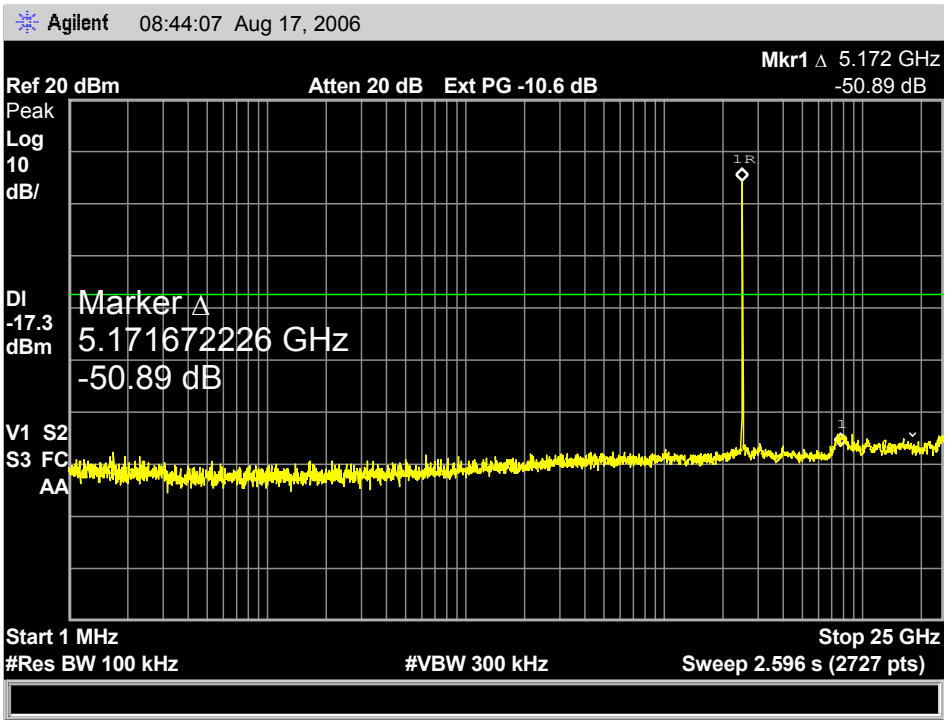
Spurious: 802.11b Mode
Plot 4.4.1



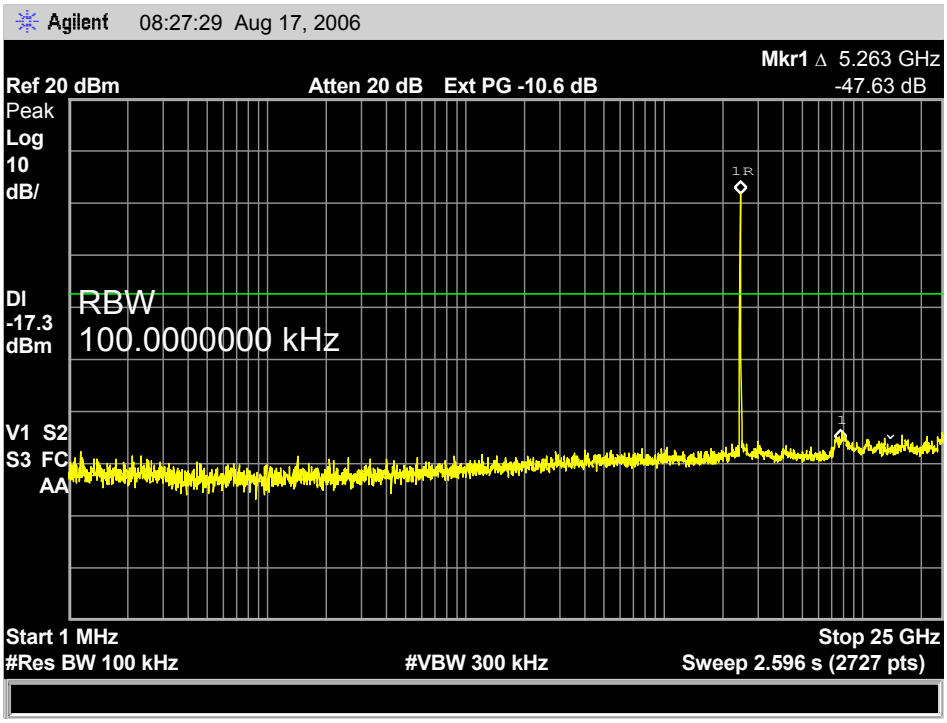
Plot 4.4.2



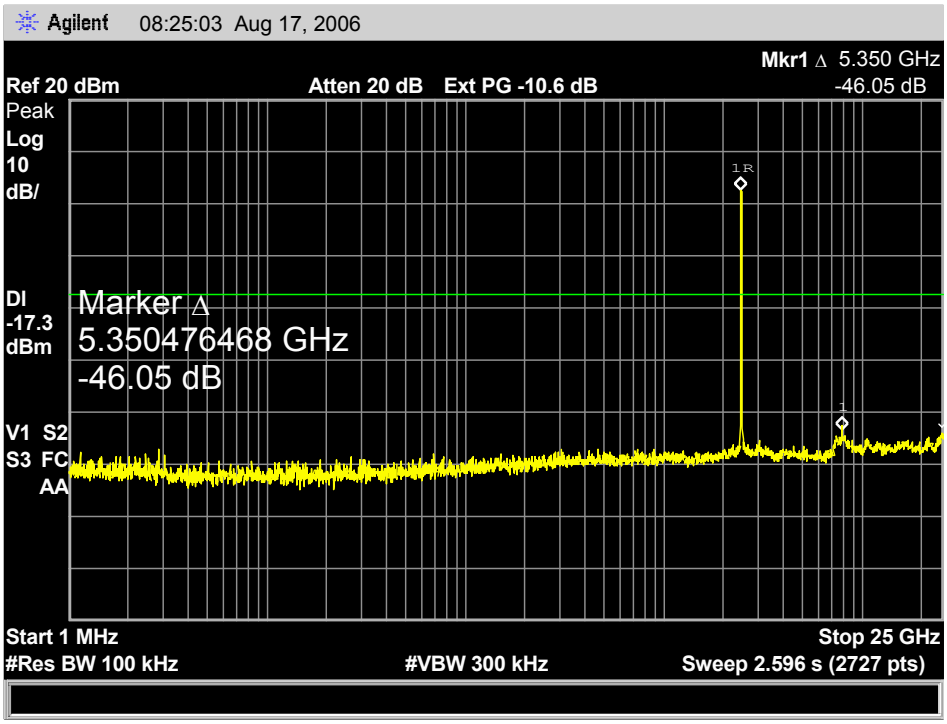
Plot 4.4.3



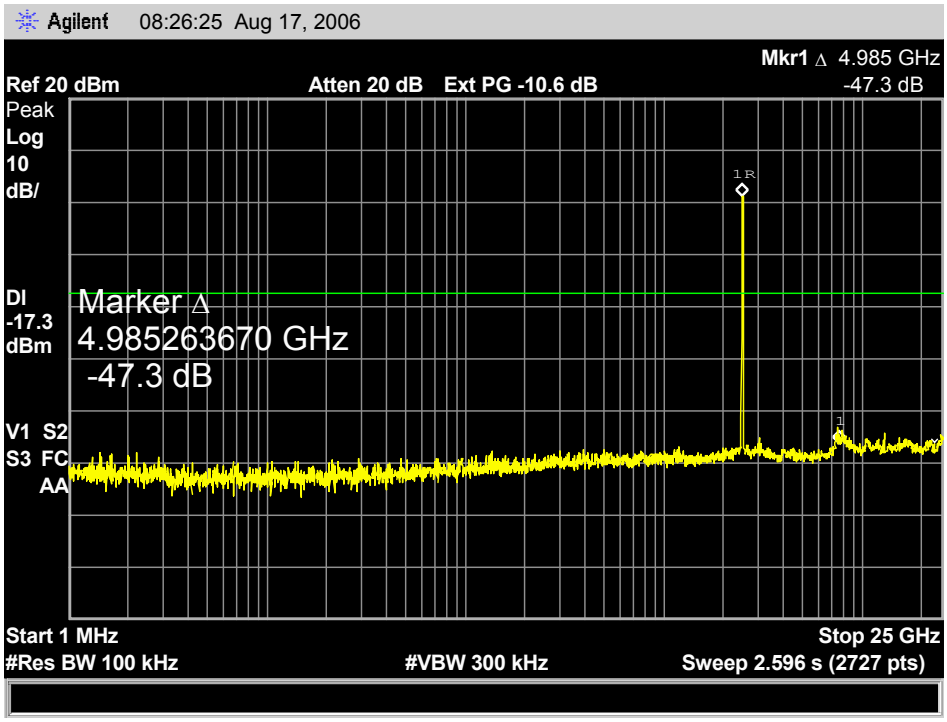
Spurious: 802.11g Mode
Plot 4.4.4



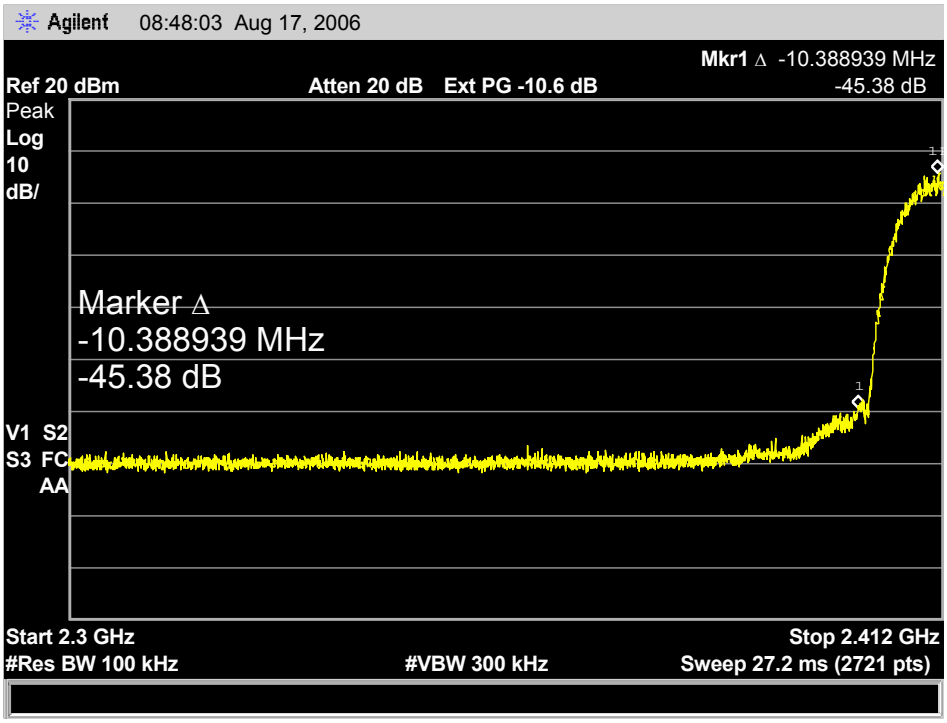
Plot 4.4.5



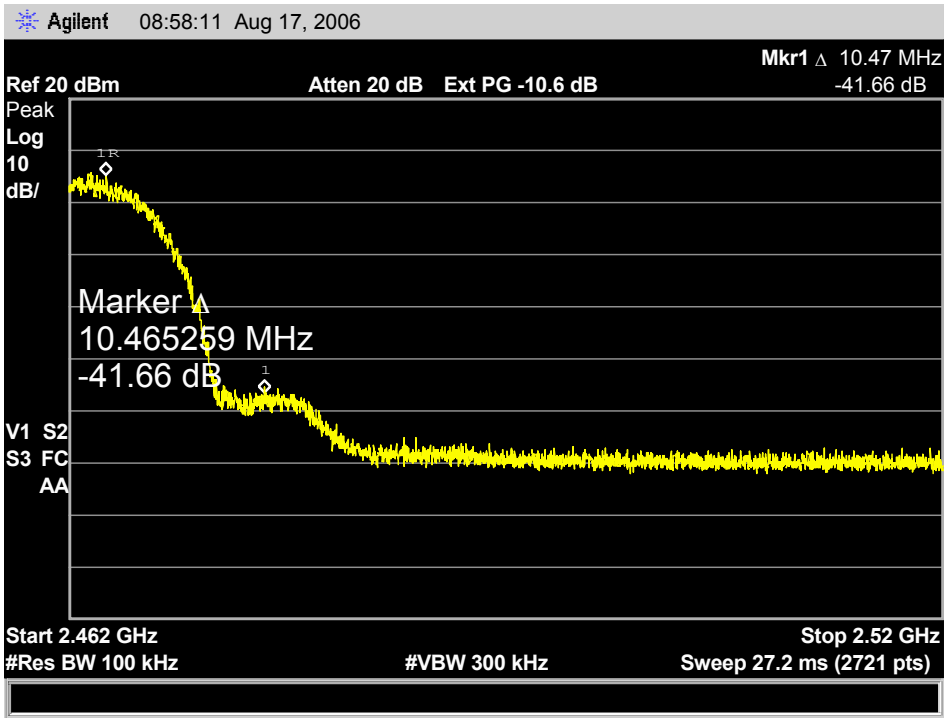
Plot 4.4.6



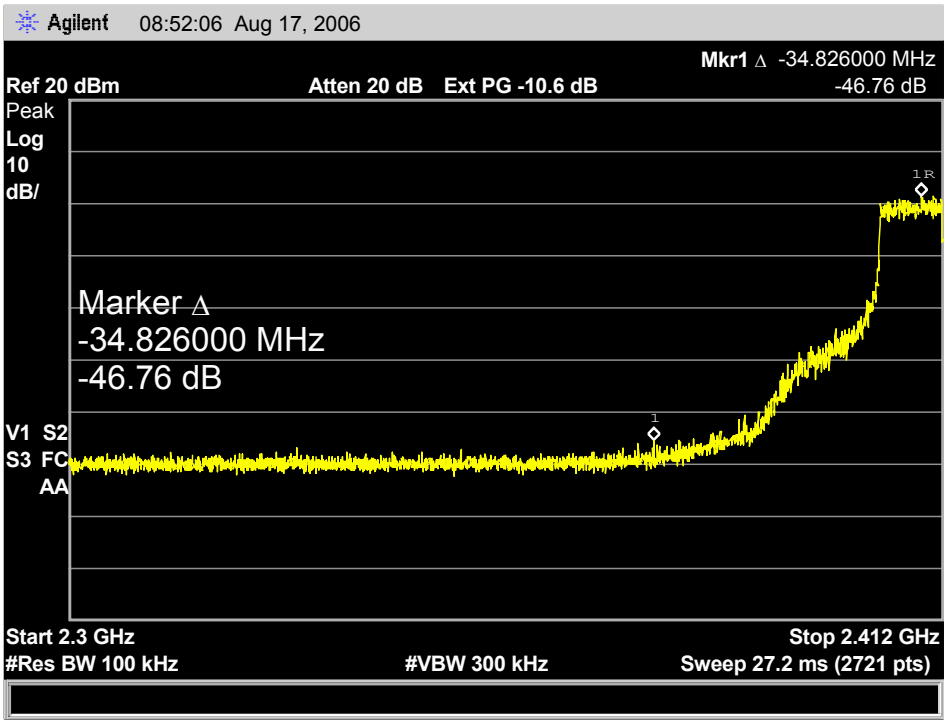
Band Edge: 802.11b Mode
Plot 4.4.7



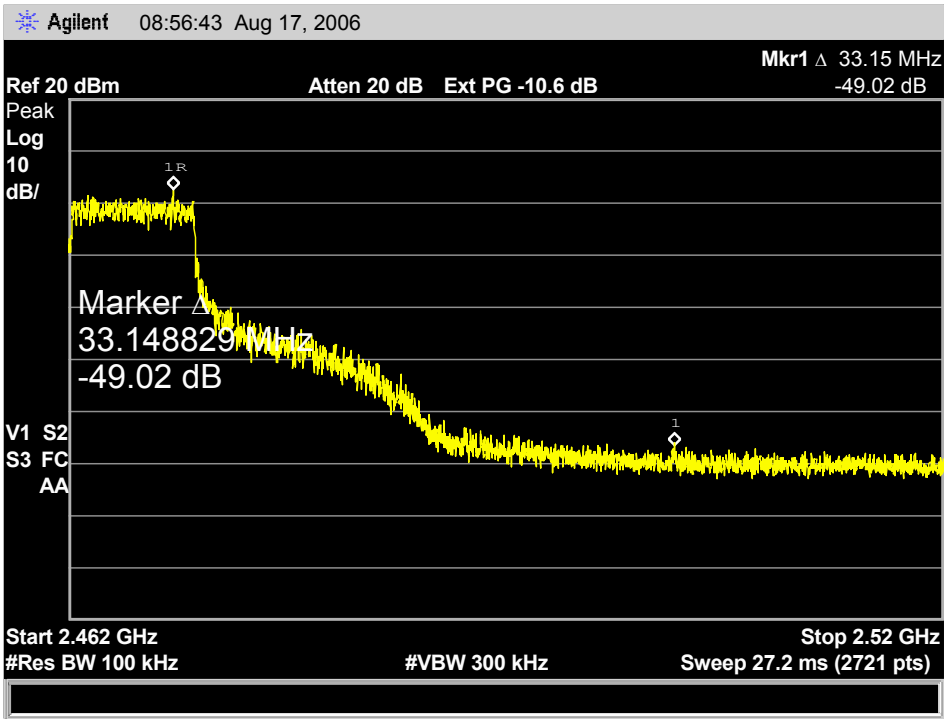
Plot 4.4.8



Band Edge: 802.11g Mode
Plot 4.4.9



Plot 4.4.10



4.5. Spurious Radiated Emissions, Restricted Bands

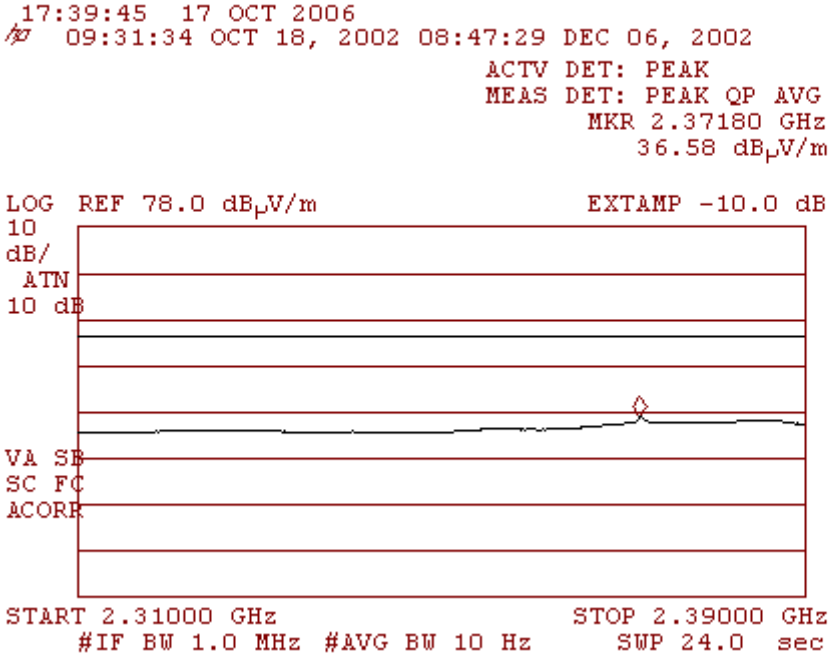
Reference document:	**47 CFR §15.247 (d) & §15.205**		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).		
Test setup:	See Sec. 2.2	**Pass**	
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: Plot 29 – Plot 56	

Test results:

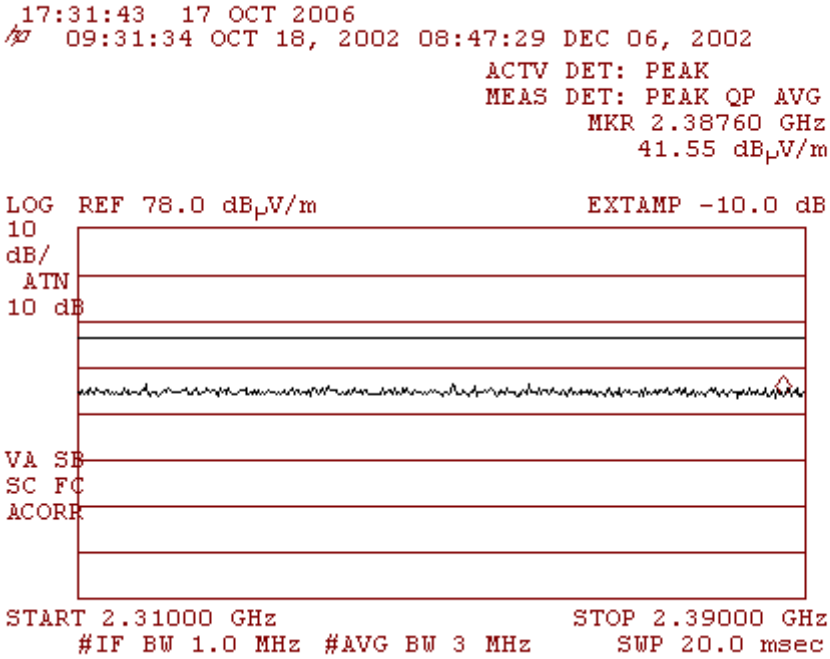
Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Pol. V/H	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11b Mode							
2412	11	2371.80	Average	H	36.58	54	-17.8
2412	11	2371.80	Peak	H	46.83	74	-25.06
2462	11	2484.16	Average	V	31.32	54	-17.87
2462	11	2484.16	Peak	V	44.23	74	-22.95
802.11g Mode							
2412	54	2390.00	Average	H	39.44	54	-9
2412	54	2390.00	Peak	H	54.56	74	-14.2
2462	54	2483.54	Average	V	40.85	54	-8.5
2462	54	2483.54	Peak	V	58.94	74	-13.46
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

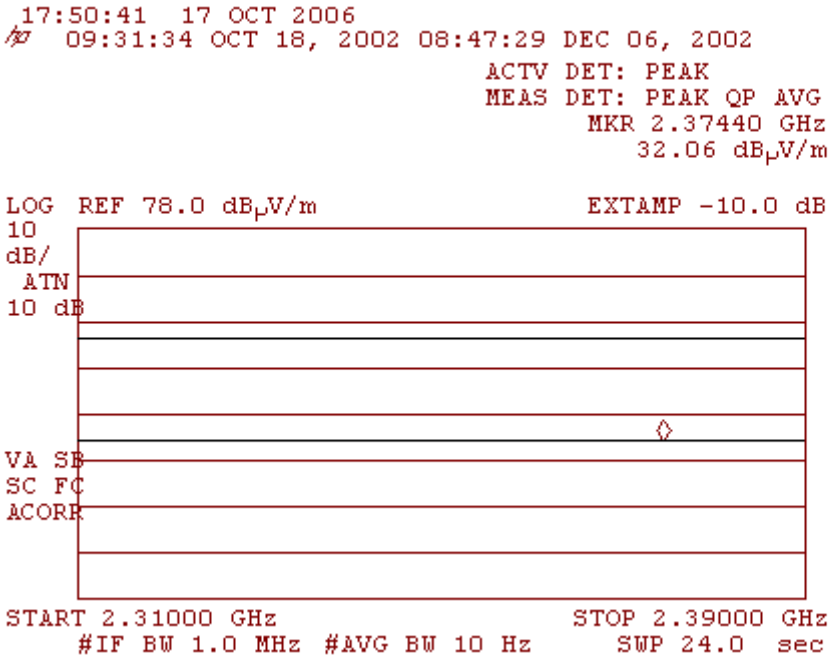
802.11b: 11 Mbps
Lowest Frequency
Horizontal Polarization
Average
Plot 4.5.1



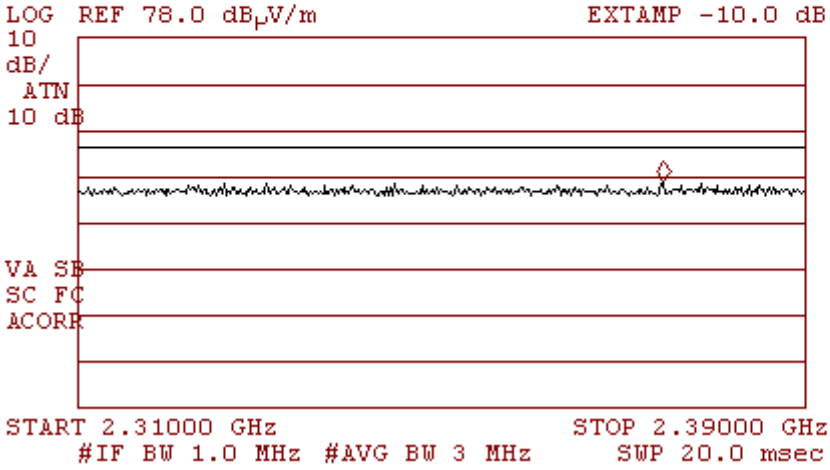
Peak
Plot 4.5.2



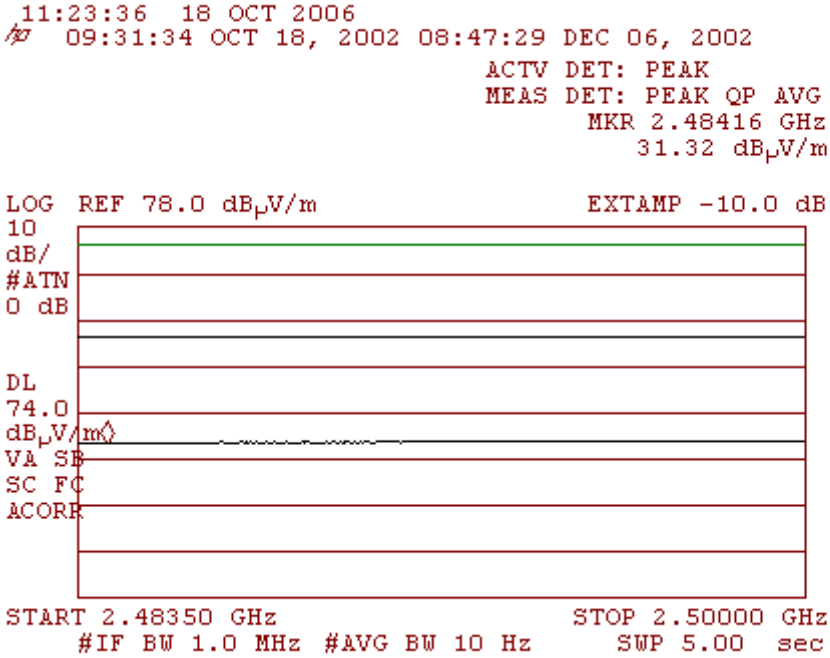
Vertical Polarization
Average
Plot 4.5.3



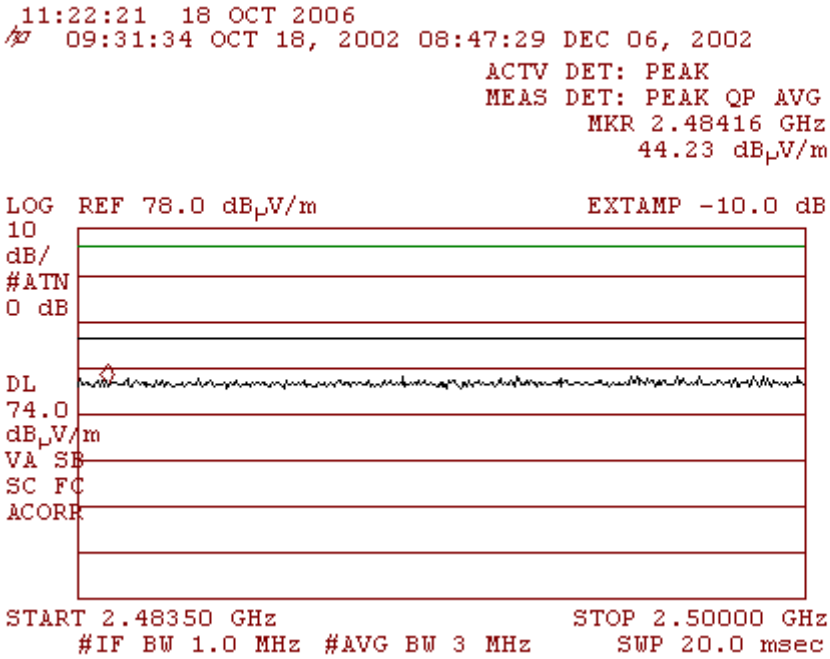
Peak
Plot 4.5.4



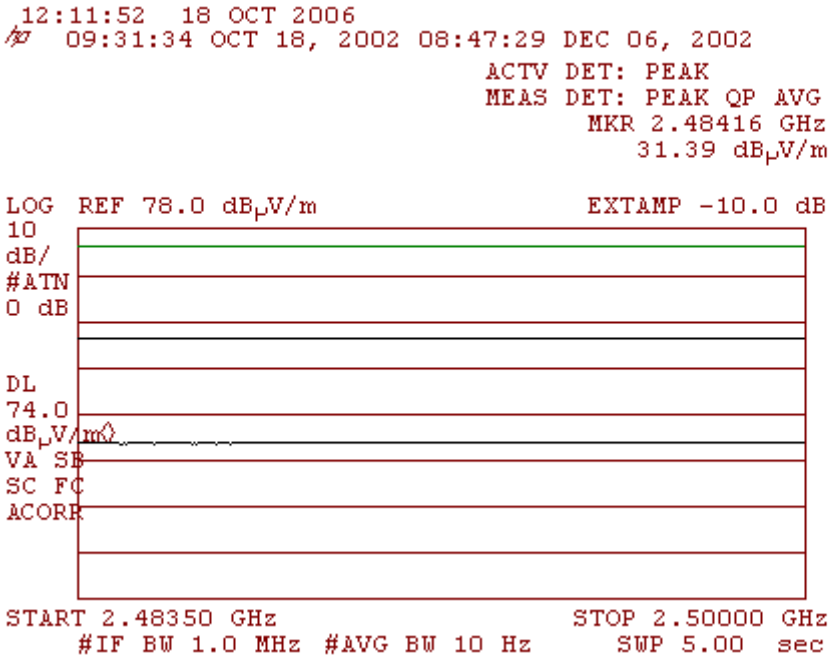
802.11b: 11 Mbps
Highest Frequency
Vertical Polarization
Average
Plot 4.5.5



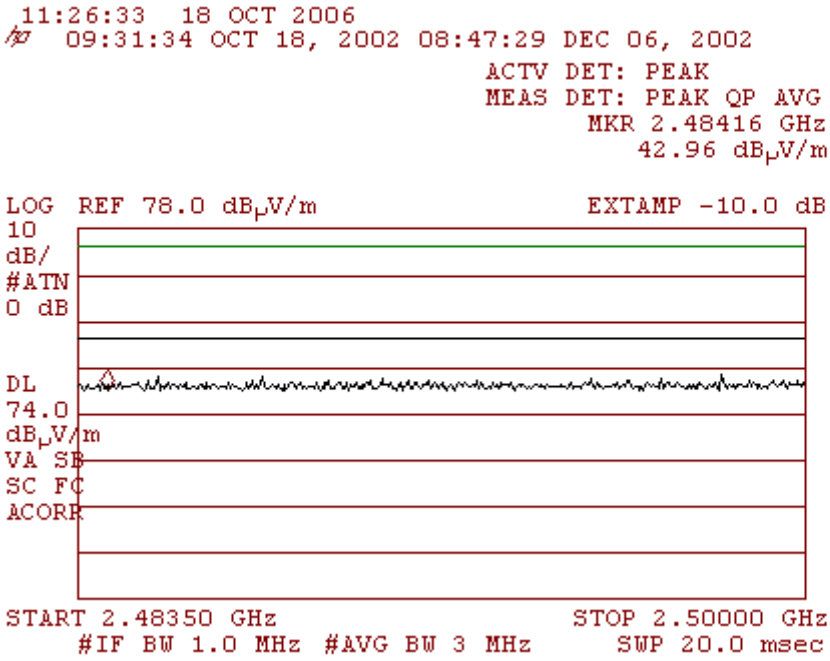
Peak
Plot 4.5.6



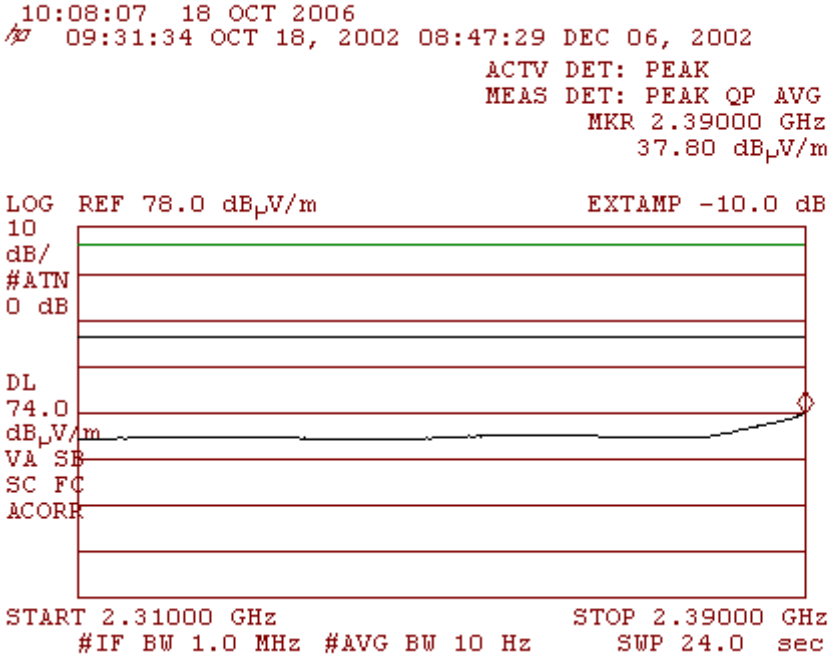
Horizontal Polarization
Average
Plot 4.5.7



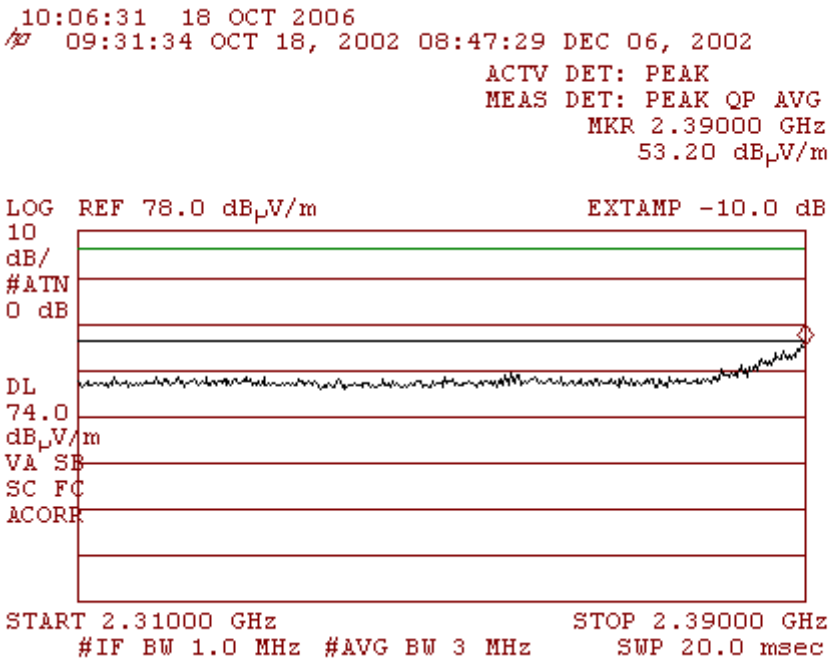
Peak
Plot 4.5.8



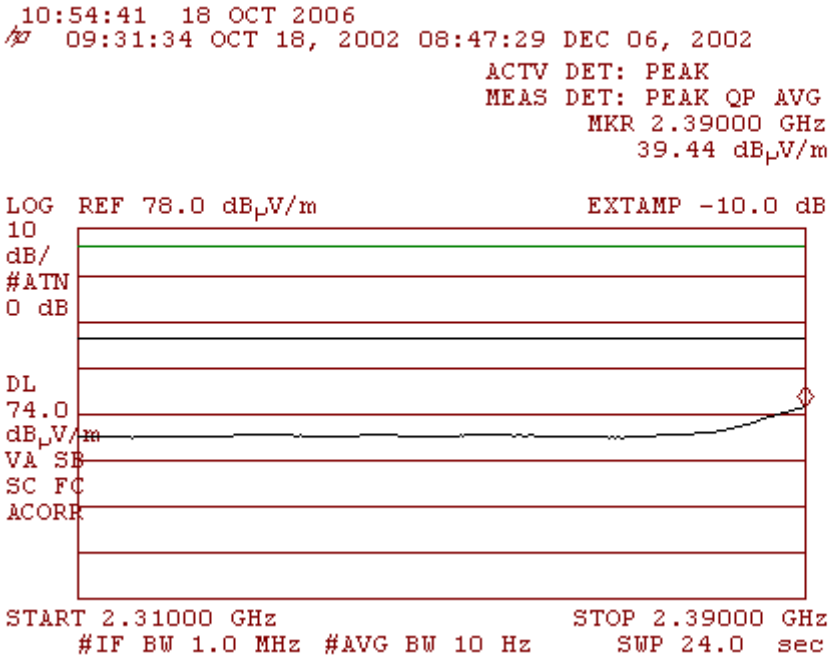
802.11g: 54 Mbps
Lowest Frequency
Vertical Polarization
Average
Plot 4.5.9



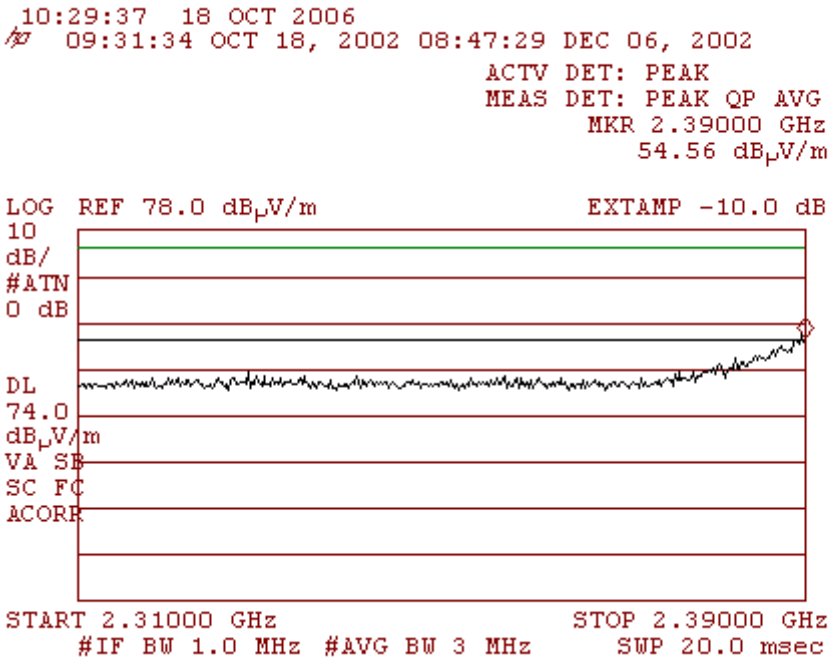
Peak
Plot 4.5.10



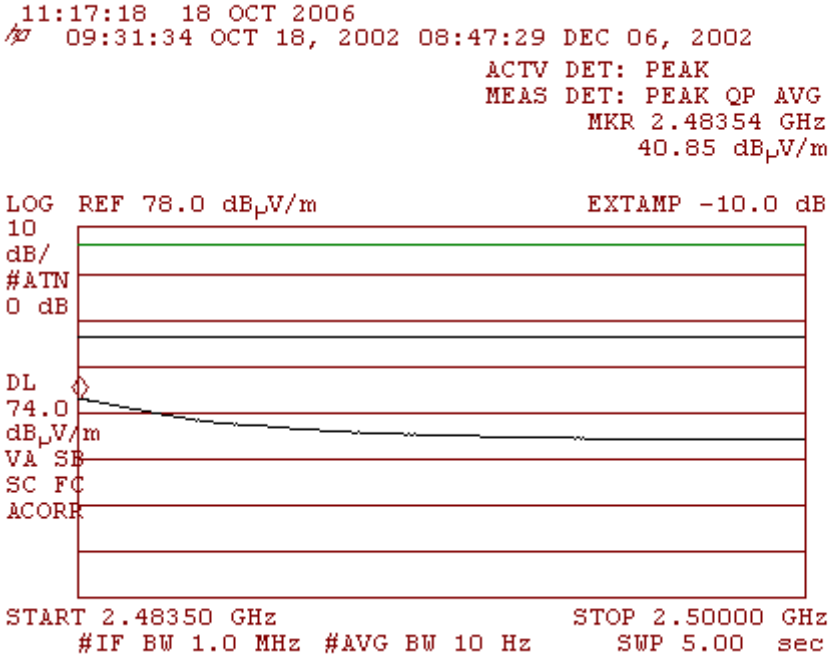
Horizontal Polarization
Average
Plot 4.5.11



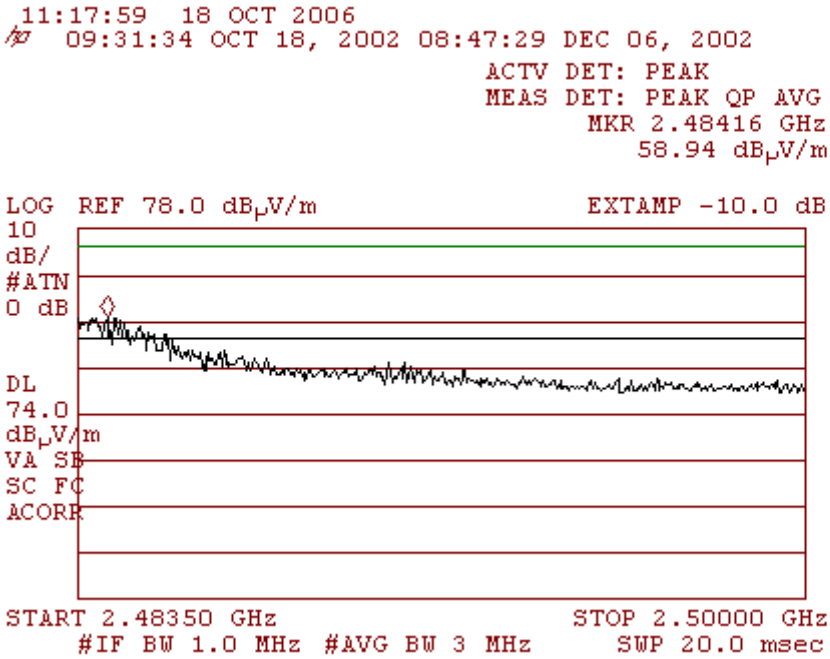
Peak
Plot 4.5.12



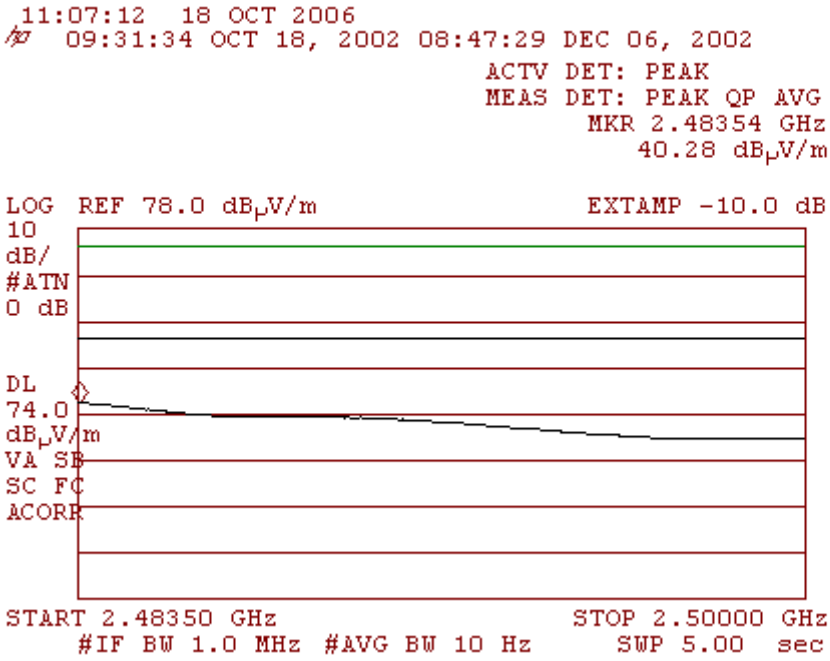
802.11g: 54 Mbps
Highest Frequency
Vertical Polarization
Average
Plot 4.5.13



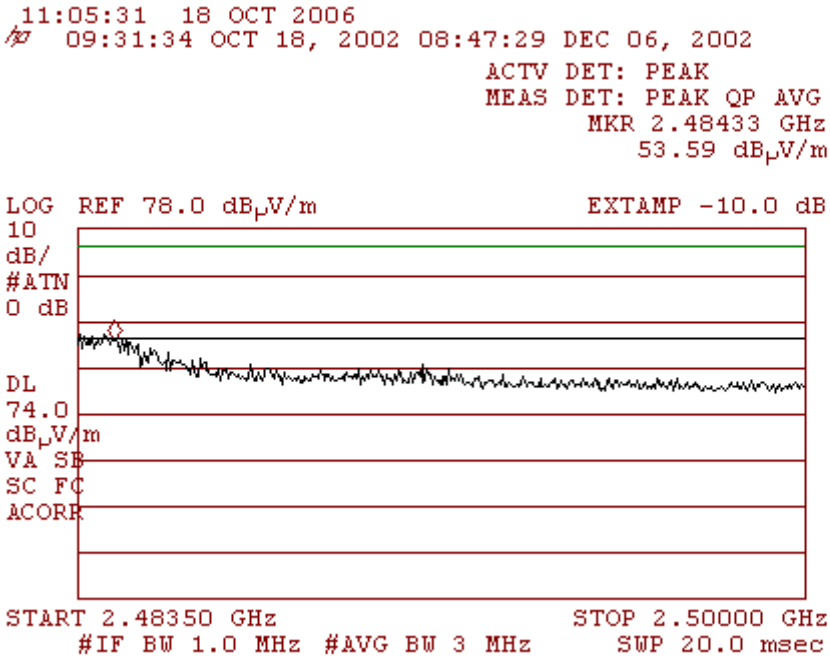
Peak
Plot 4.5.14



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. 2.7	**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 iDEN employs an integral antenna without any connector.	**Comply**

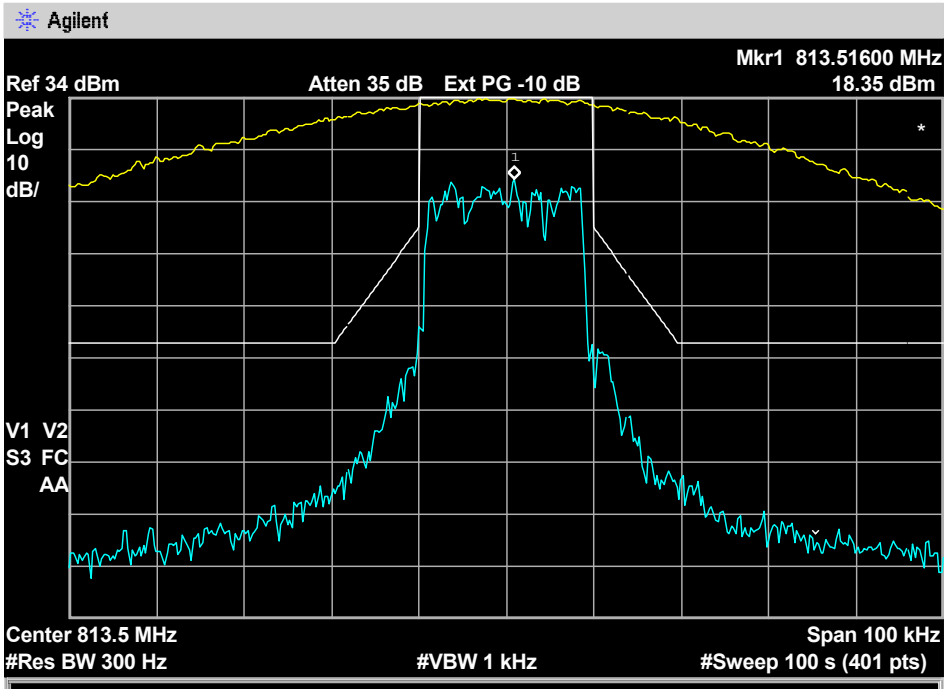
5. Land Mobile Services: Report of Measurements and examinations

5.1. Occupied Bandwidth

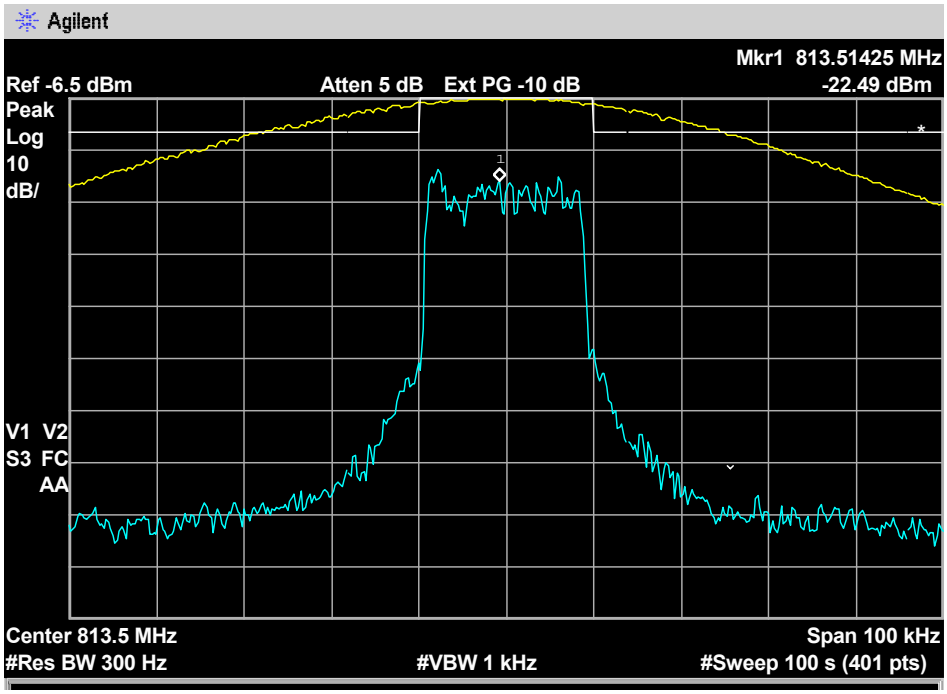
Reference document:	**47 CFR §2.1049(h) & §90.210(g), §90.669(a), and §90.691**		
Test Requirements:	For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows: (1) on any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5kHz, but no more than 10kHz:at least 83 log (f_d/5) dB. (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10kHz, but no more than 250% of the authorized bandwidth; at least 116 log (f_d/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation. On any frequency in an MTA licensee's spectrum block that is adjacent to a non-MTA frequency, the power of any emission shall be attenuated below the transmitter power (P) in Watts by at least 43 + 10log (P) dB or 80dB, whichever is lesser attenuation. For EA-based systems: (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5kHz, the power of any emission shall be attenuated below the transmitter power (P) in Watts by at least 116 log (f/6.1) dB or 50 + 10 log (P) dB, or 80dB, whichever is lesser attenuation. (2) For any frequency removed from the EA licensee's frequency block greater than 37.5kHz, the power of any emission shall be attenuated below the transmitter power (P) in Watts by at least 43 + 10log (P) dB or 80dB, whichever is lesser attenuation.		
Test setup:	See Sec. 2.6	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW=300Hz, VBW=1kHz, Span=100kHz, Sweep=100s		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Results: see plots below: Plot 5.1 – Plot 5.84			

800 MHz Band Operation Measured Data
FCC Limits Per 47CFR90.210(g) & Per EA SMR GMASK emission Mask 47CFR §90.691(a)

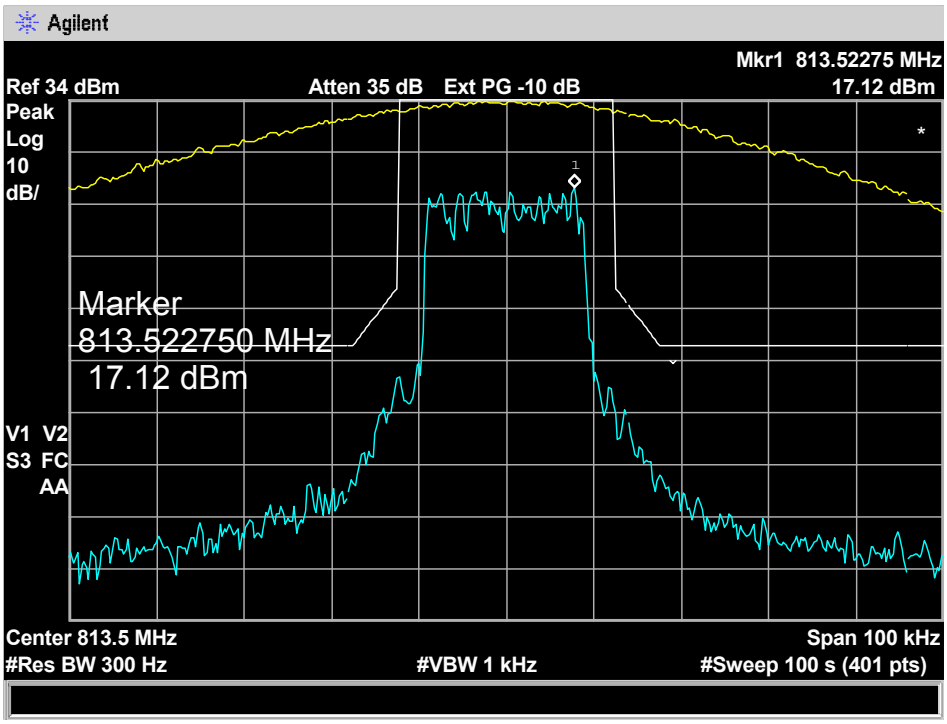
Quad-QPSK Modulation performance relative to GMASK 47 CFR §90.210(g)
(Maximum Power Setting)
Plot 5.1



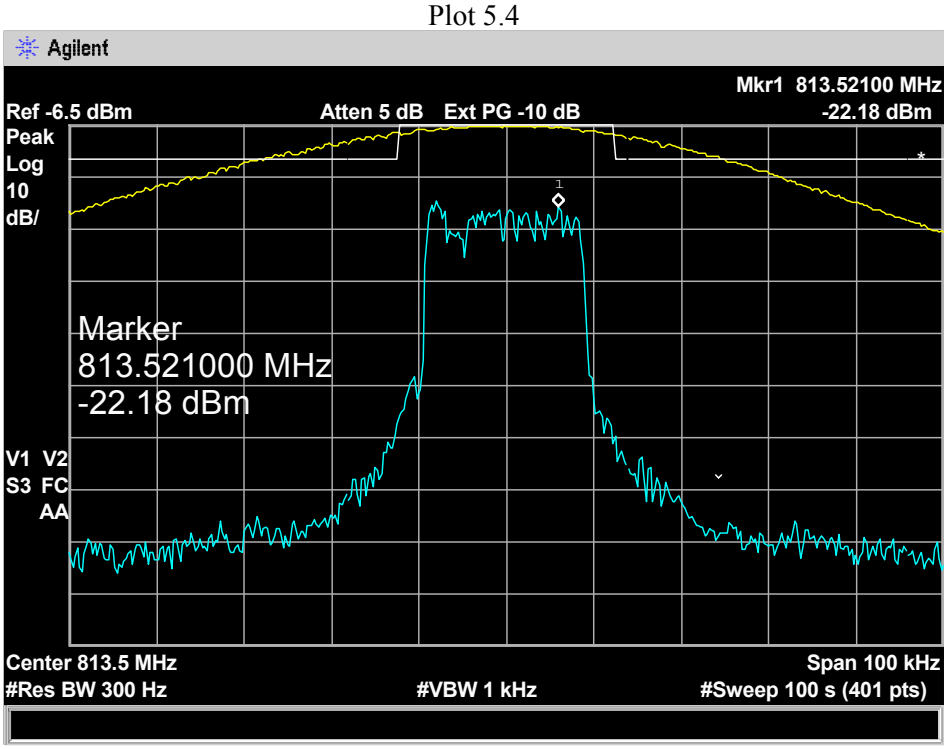
Quad-QPSK Modulation performance relative to GMASK 47 CFR 90.210(g)
(Minimum Power Setting)
Plot 5.2



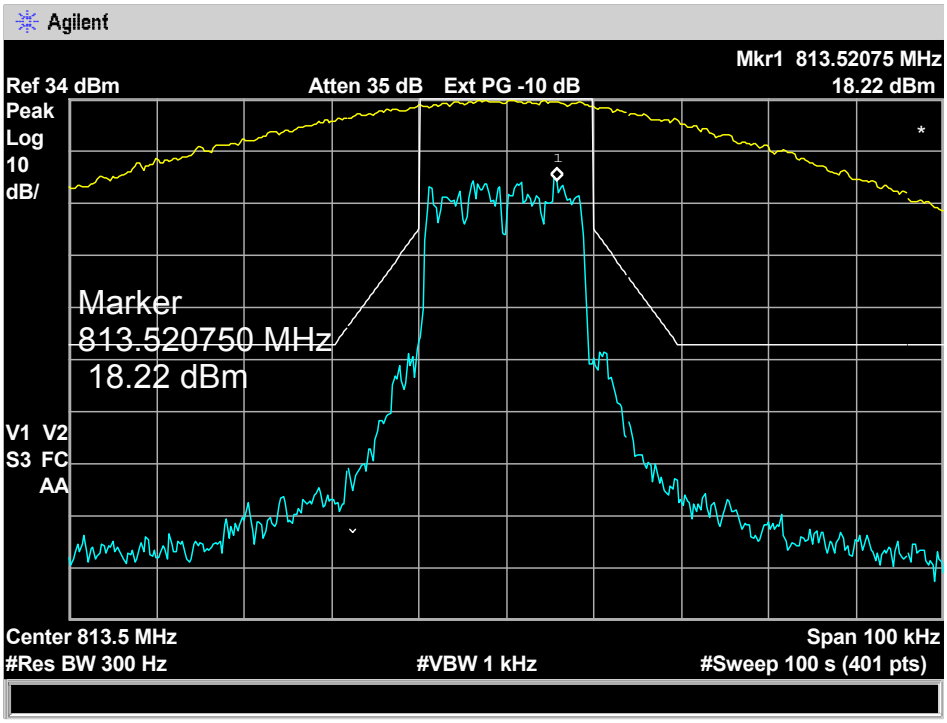
Quad-QPSK Modulation performance relative to EA-mask 47 CFR 90.691
(Maximum Power Setting)
Plot 5.3



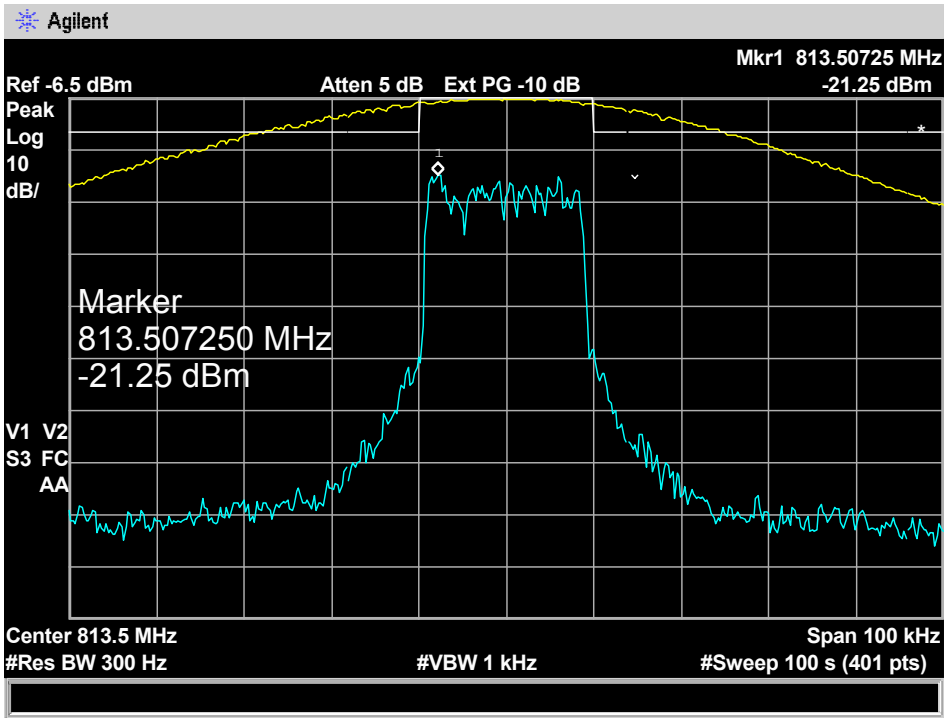
Quad-QPSK Modulation performance relative to EA-mask 47 CFR 90.691
(Minimum Power Setting)
Plot 5.4



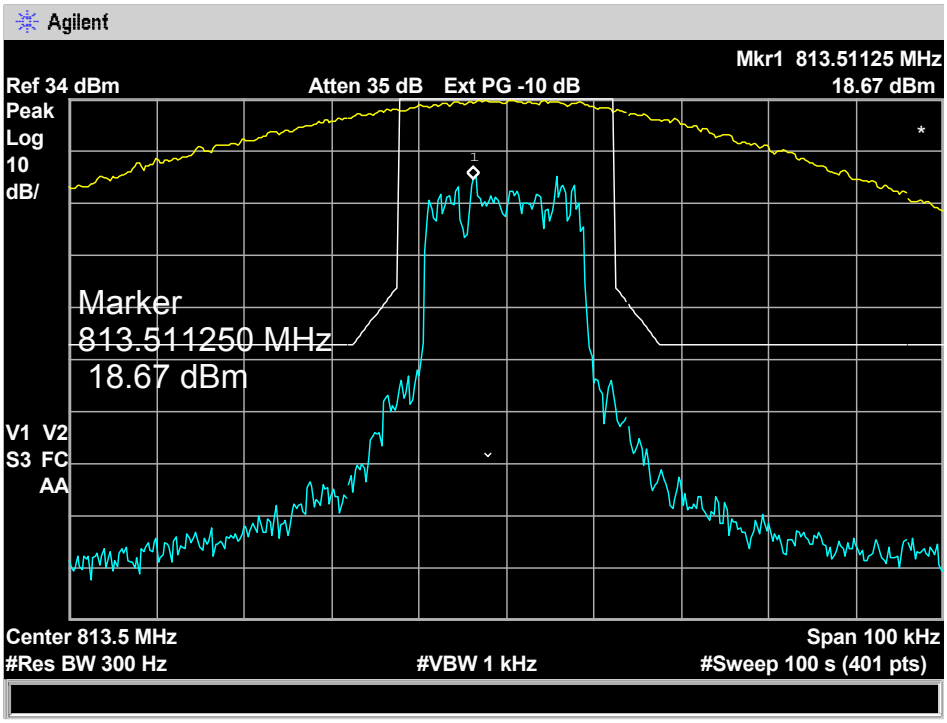
Quad-16QAM Modulation performance relative to G-Mask 47 CFR 90.210(g)
(Maximum Power Setting)
Plot 5.5



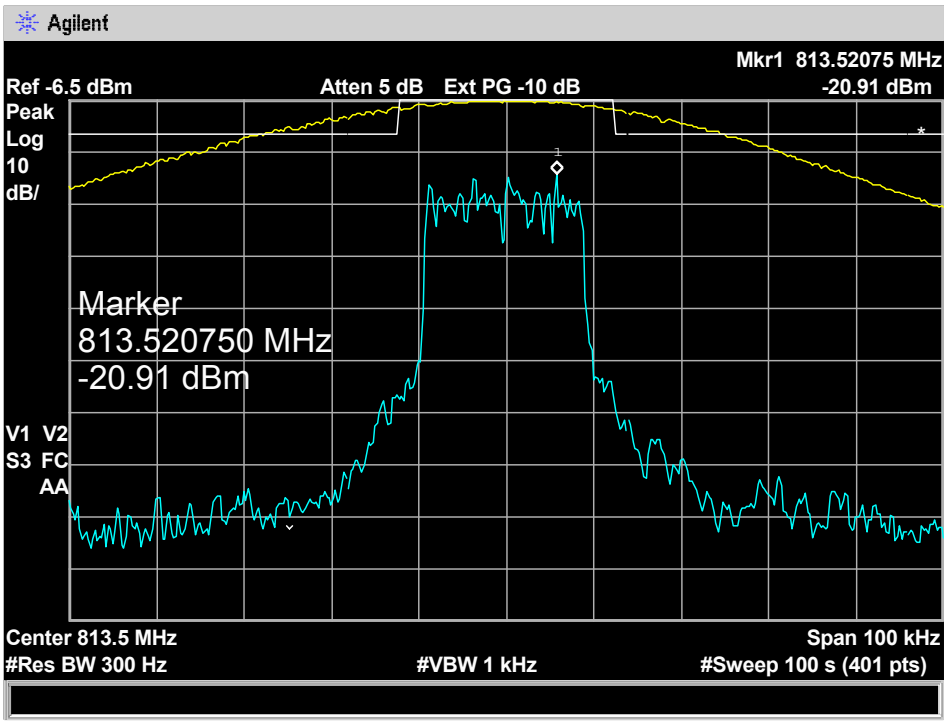
Quad-16QAM Modulation performance relative to G-Mask 47 CFR 90.210(g)
(Minimum Power Setting)
Plot 5.6



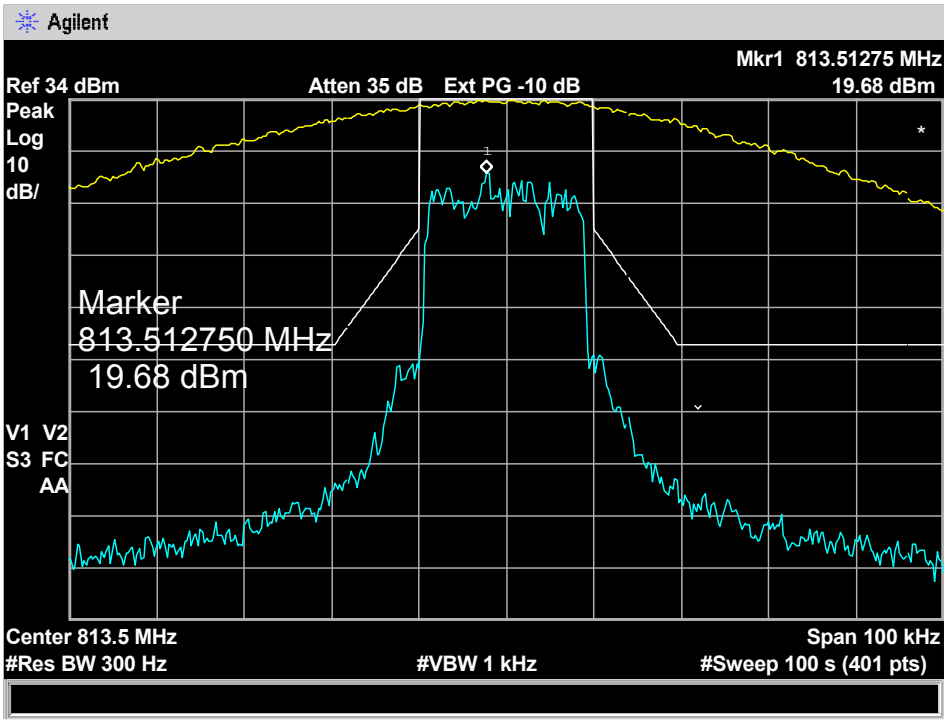
Quad-16QAM Modulation performance relative to EA-Mask 47 CFR 90.691
(Maximum Power Setting)
Plot 5.7



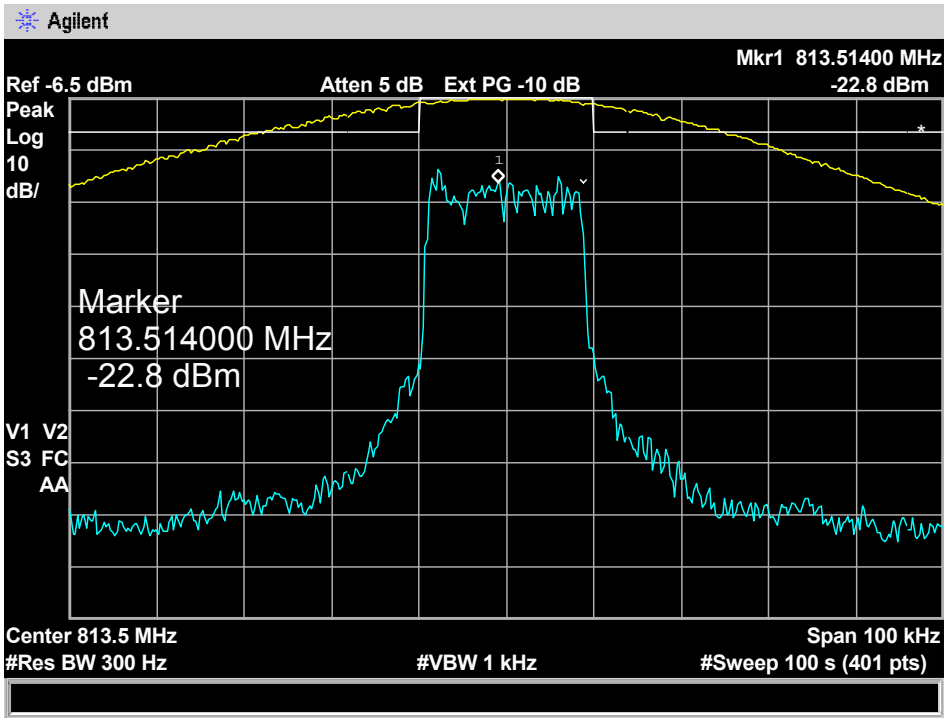
Quad-16QAM Modulation performance relative to EA-mask 47 CFR 90.691
(Minimum Power Setting)
Plot 5.8



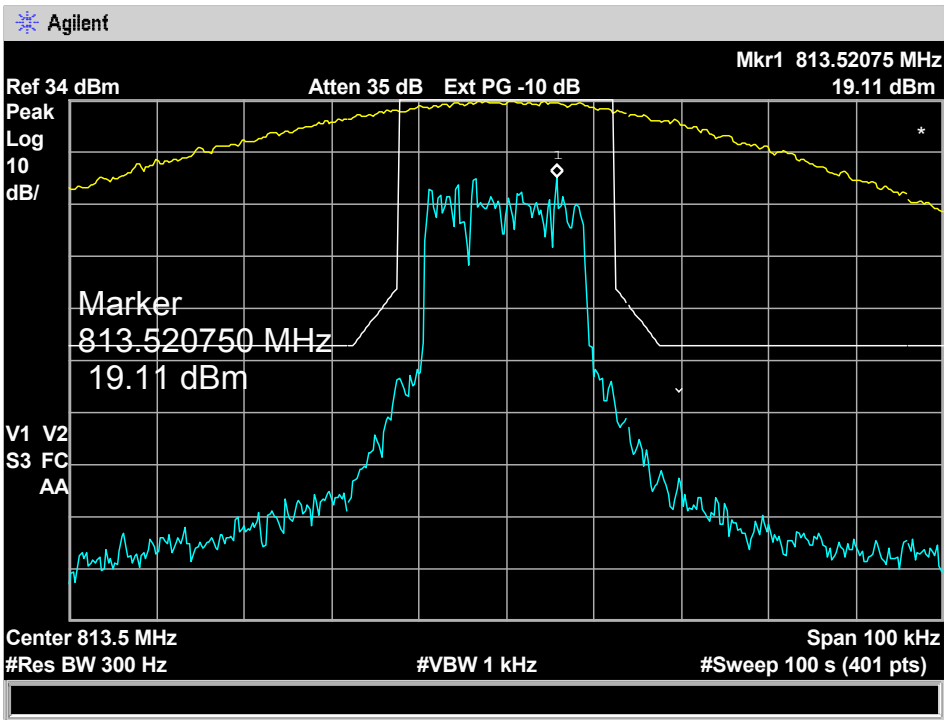
Quad-64QAM Modulation performance relative to G-mask 47 CFR 90.210(g)
(Maximum Power setting)
Plot 5.9



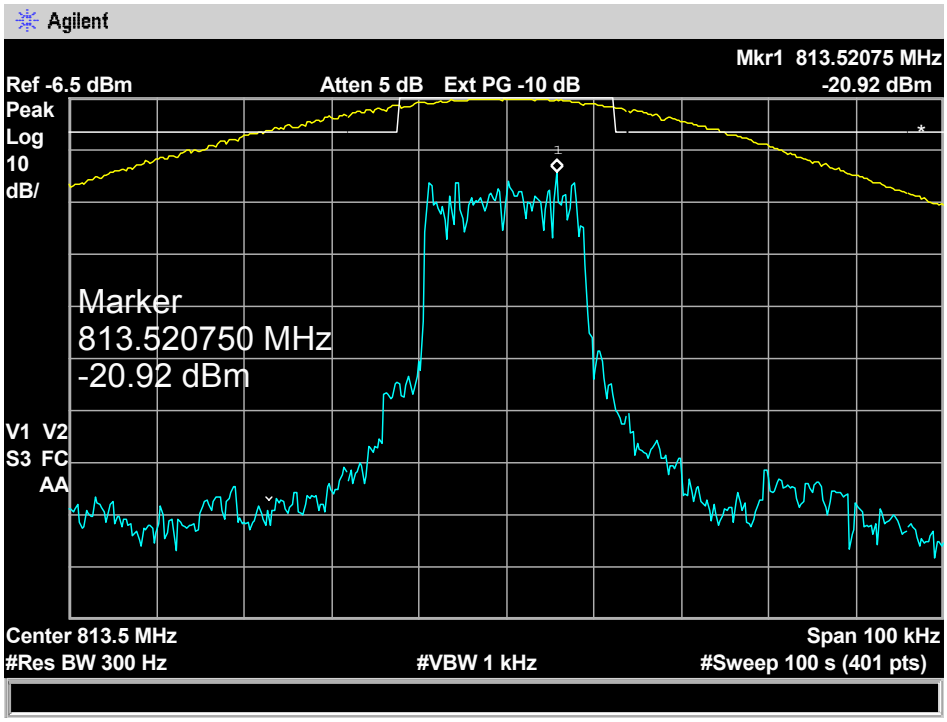
Quad-64QAM Modulation performance relative to G-mask 47 CFR 90.210(g)
(Minimum Power setting)
Plot 5.10



Quad-64QAM Modulation performance relative to EA-mask 47 CFR 90.691(g)
(Maximum Power setting)
Plot 5.11

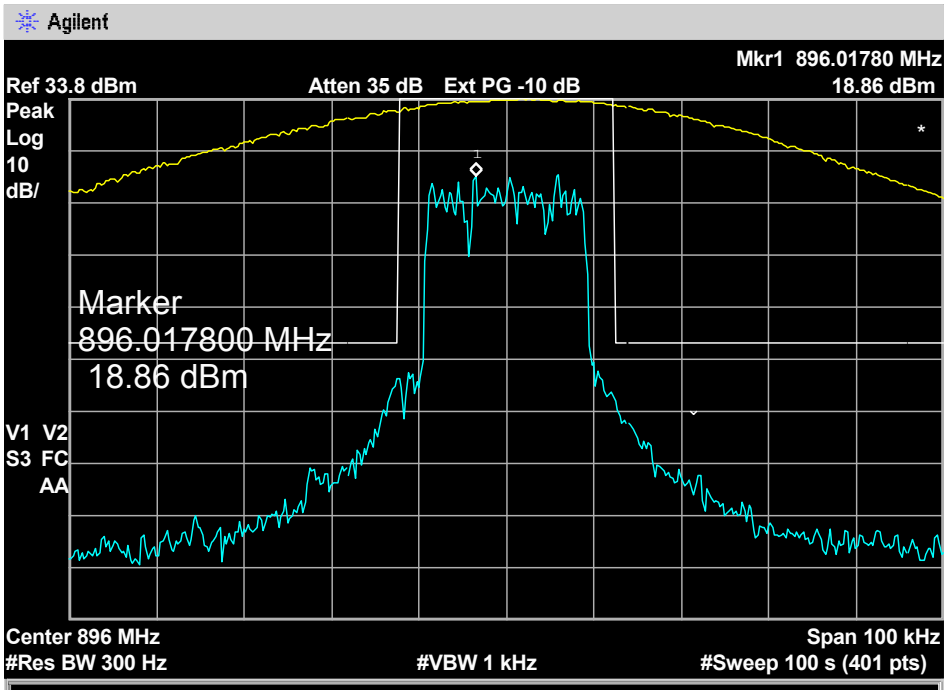


Quad-64QAM Modulation performance relative to EA-mask 47 CFR 90.691(g)
(Minimum Power setting)
Plot 5.12

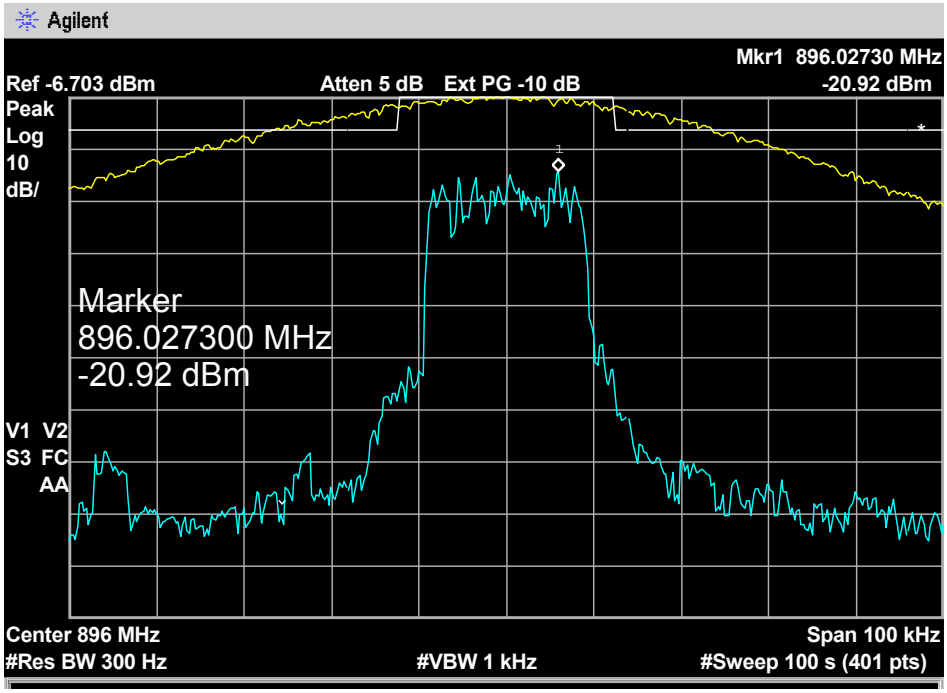


6.3.2 900 MHz Band Operation Measured Data
FCC Limits per 47 CFR 90.669(a)

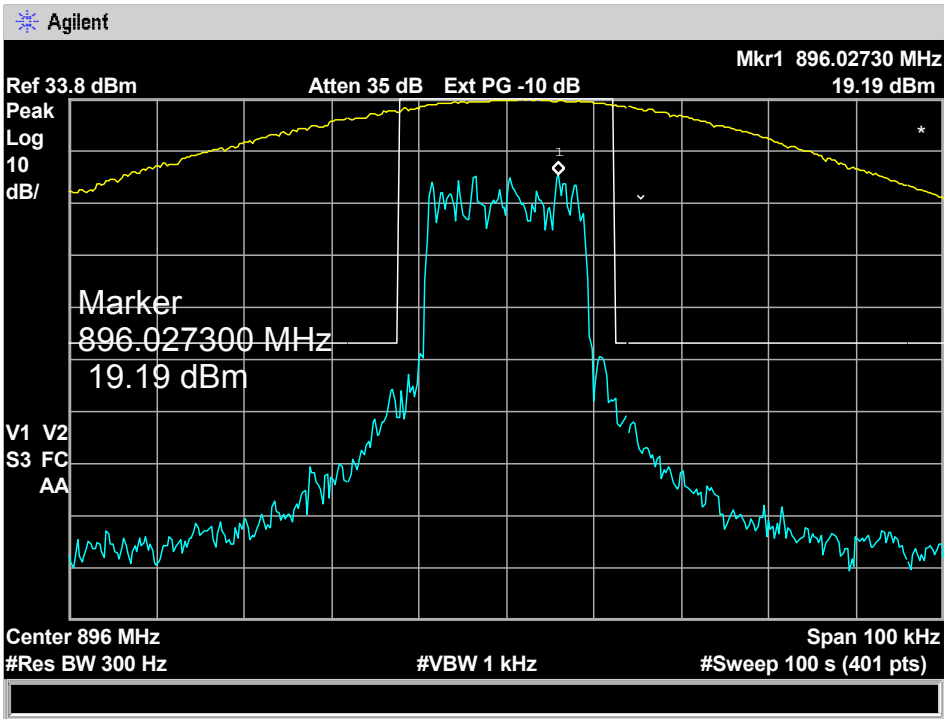
Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.13



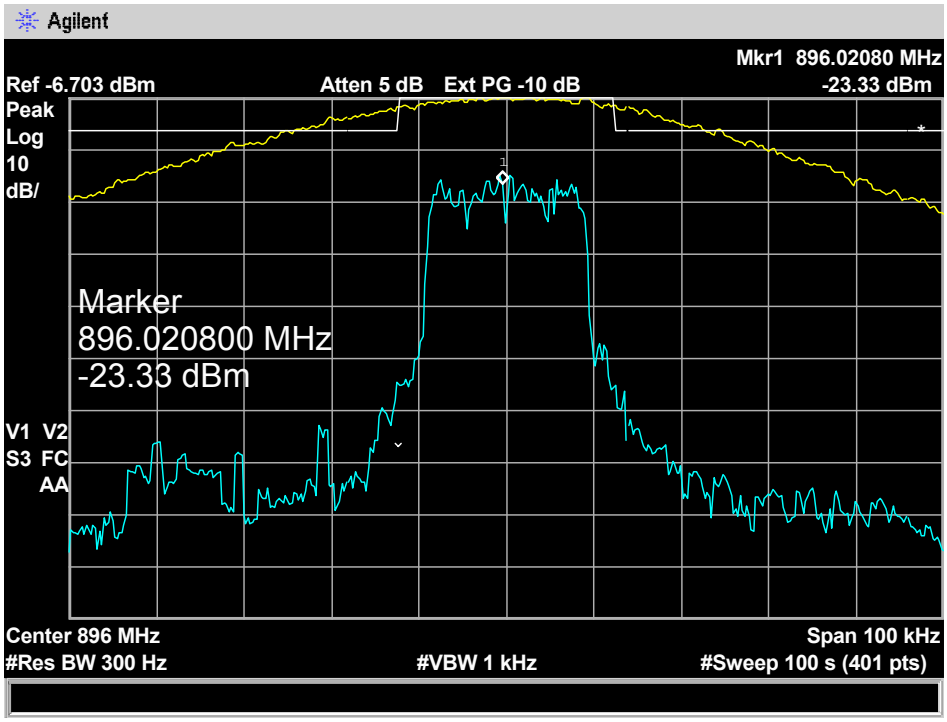
Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.14



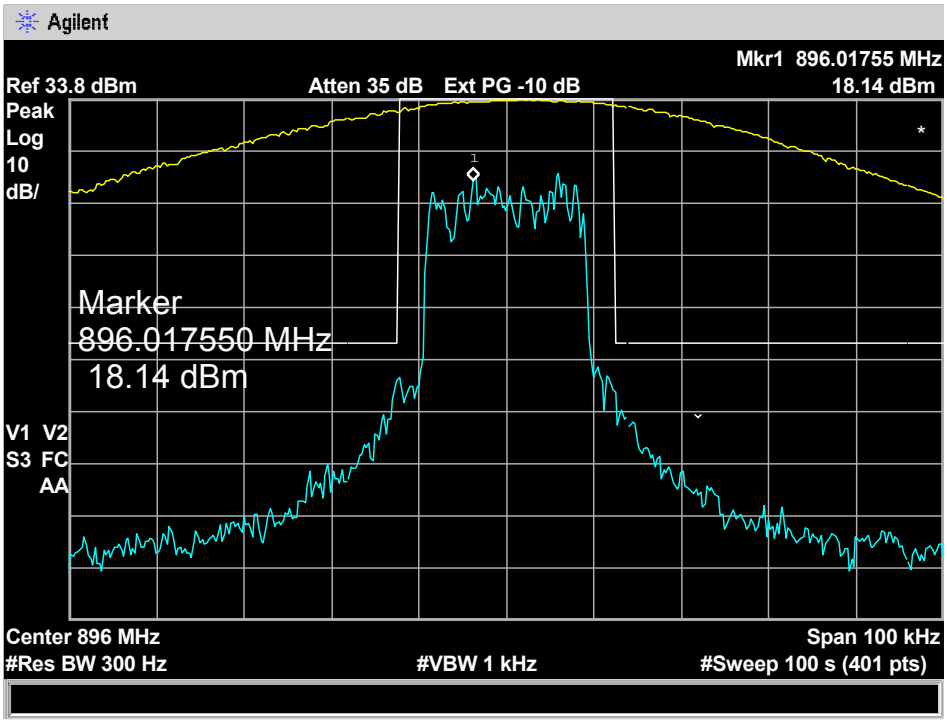
Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.15



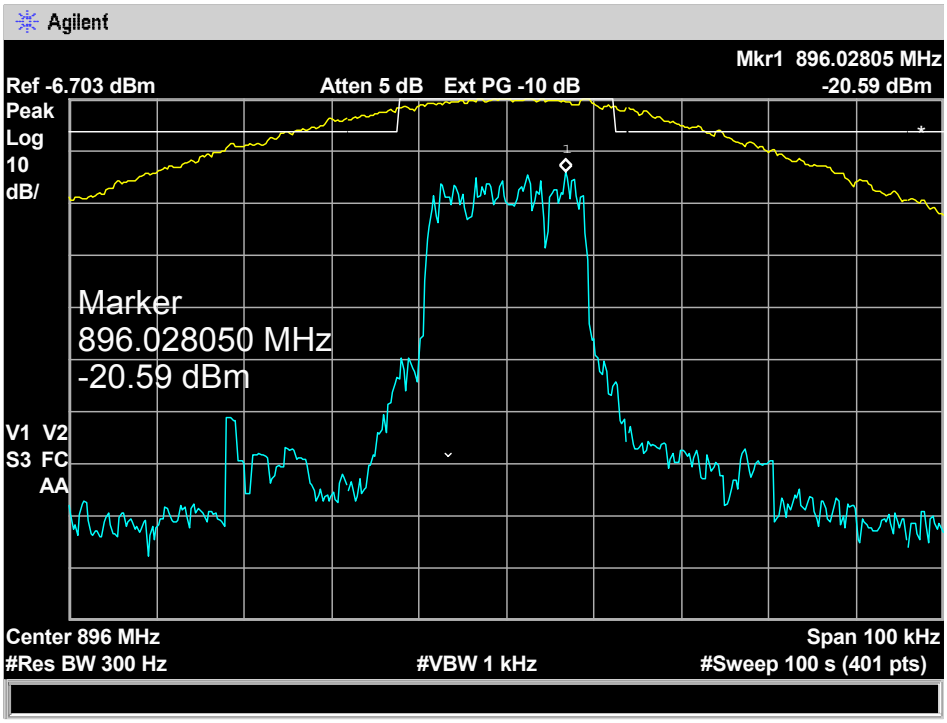
Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.16



Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.17

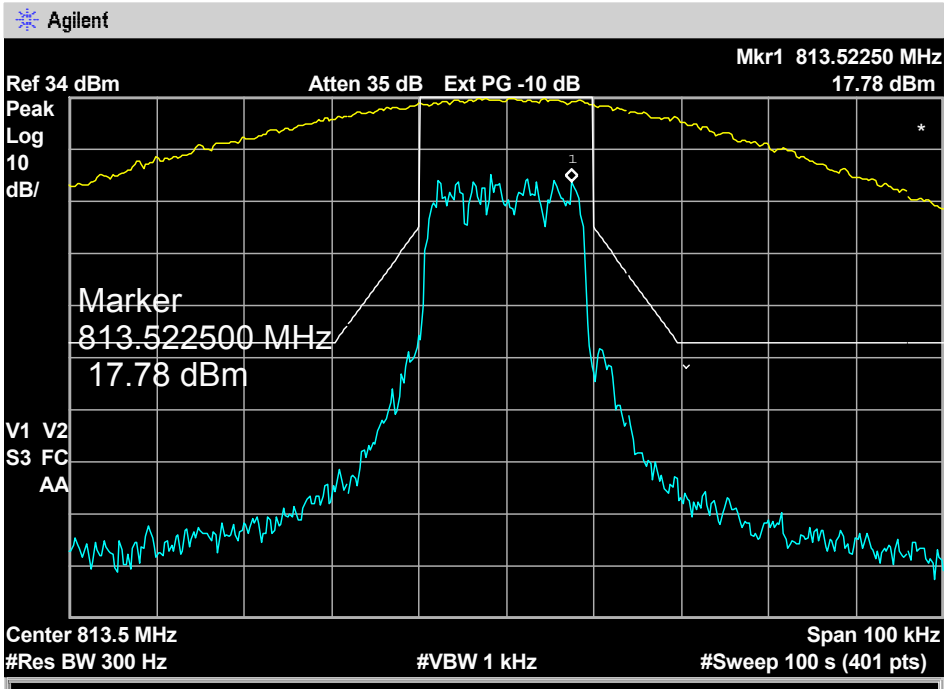


Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.18

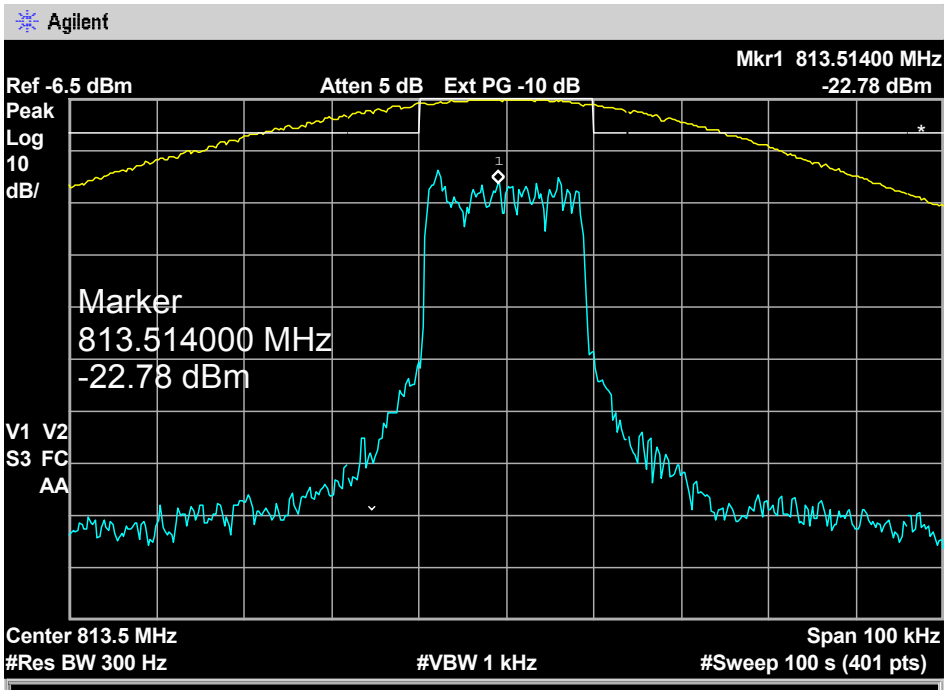


800 MHz Band WiDEN25 Operation Measured Data
FCC Limits per 47 CFR 90.210(g) & Per EA SMR Emission Mask, 47 CFR 90.691(a)

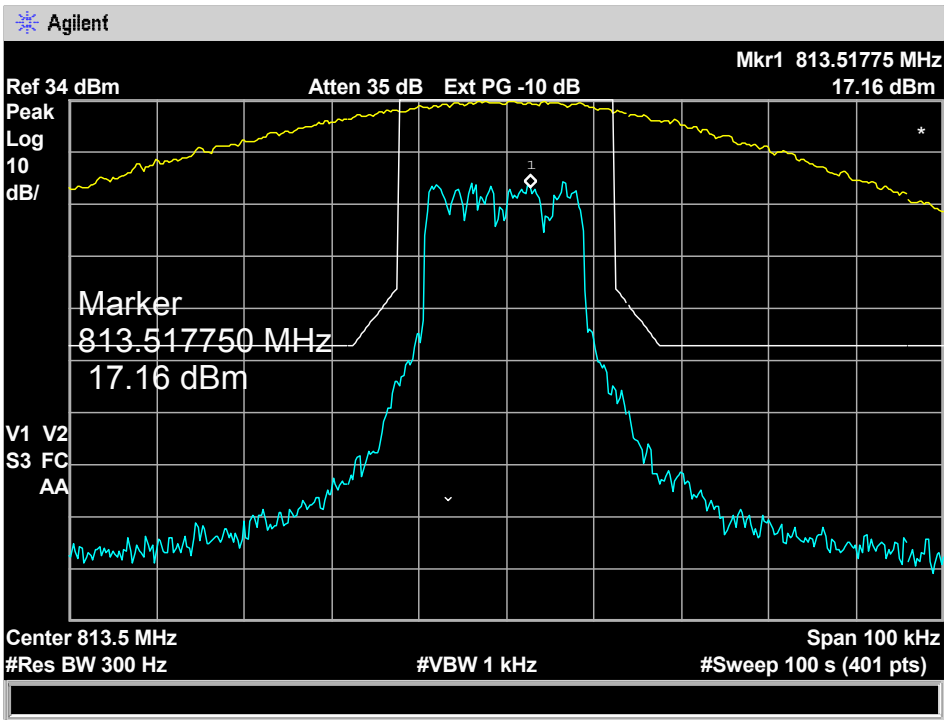
WiDEN25 Quad-QPSK Modulation performance relative to mask 47 CFR 90.210 (g)
(Maximum Power setting)
Plot 5.19



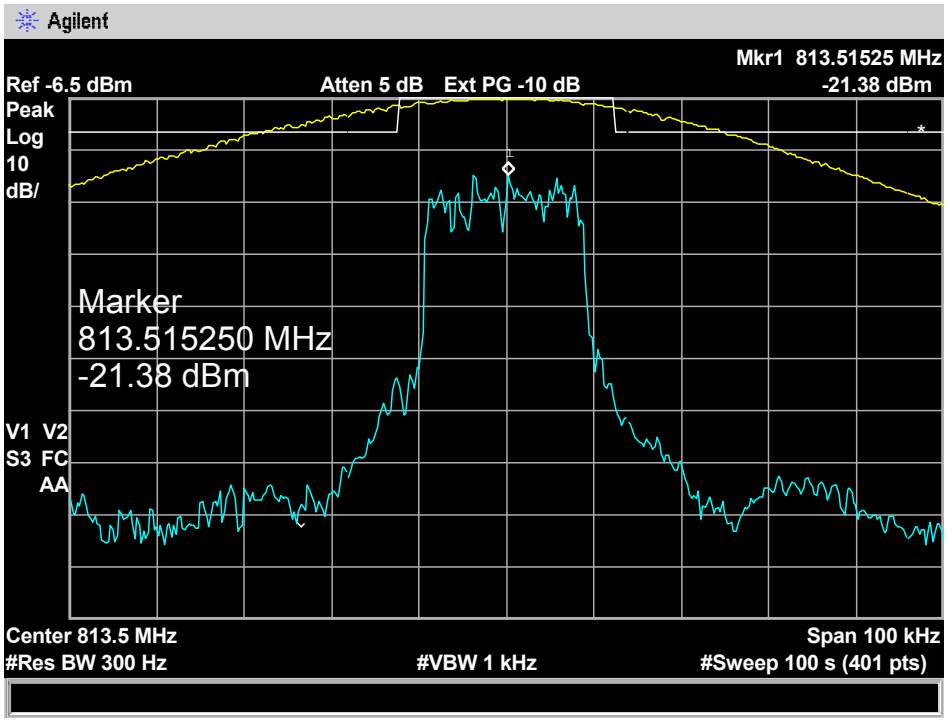
WiDEN25 Quad-QPSK Modulation performance relative to mask 47 CFR 90.210 (g)
(Minimum Power setting)
Plot 5.20



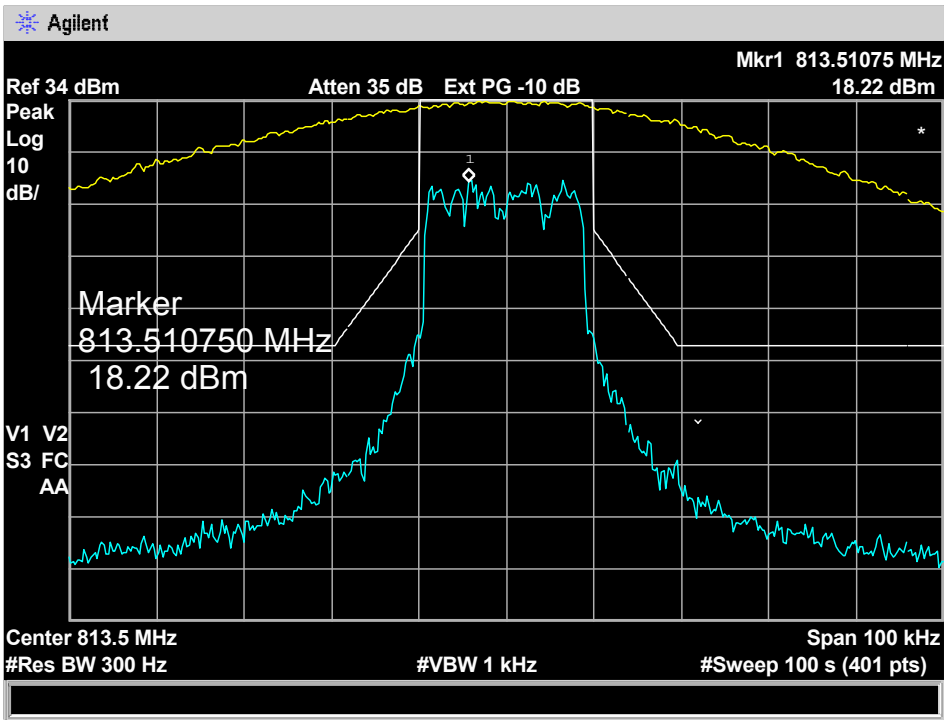
WiDEN25 Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.21



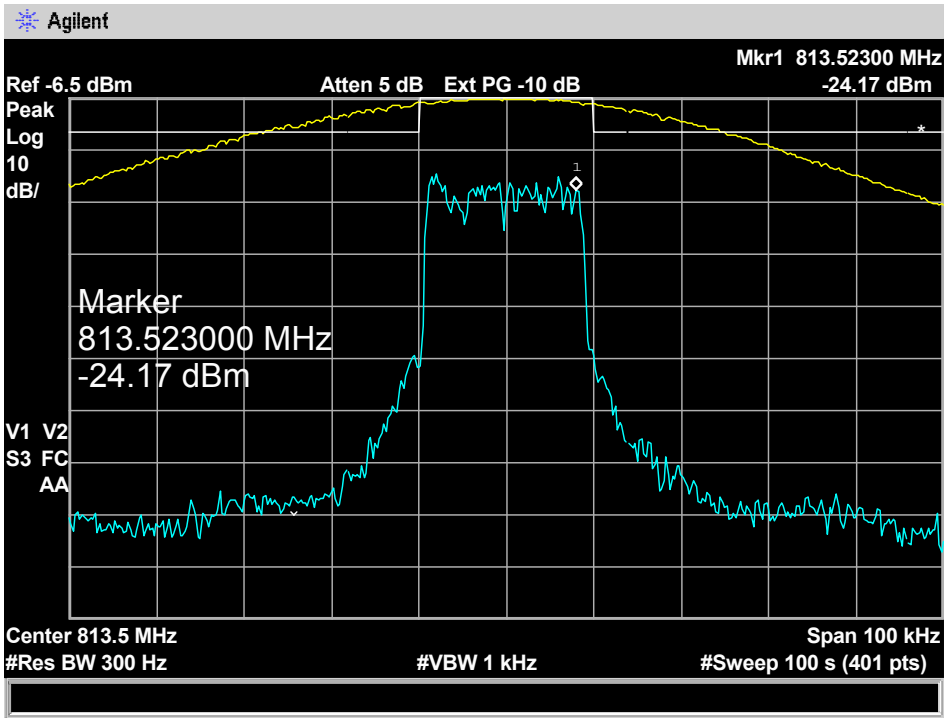
WiDEN25 Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.22



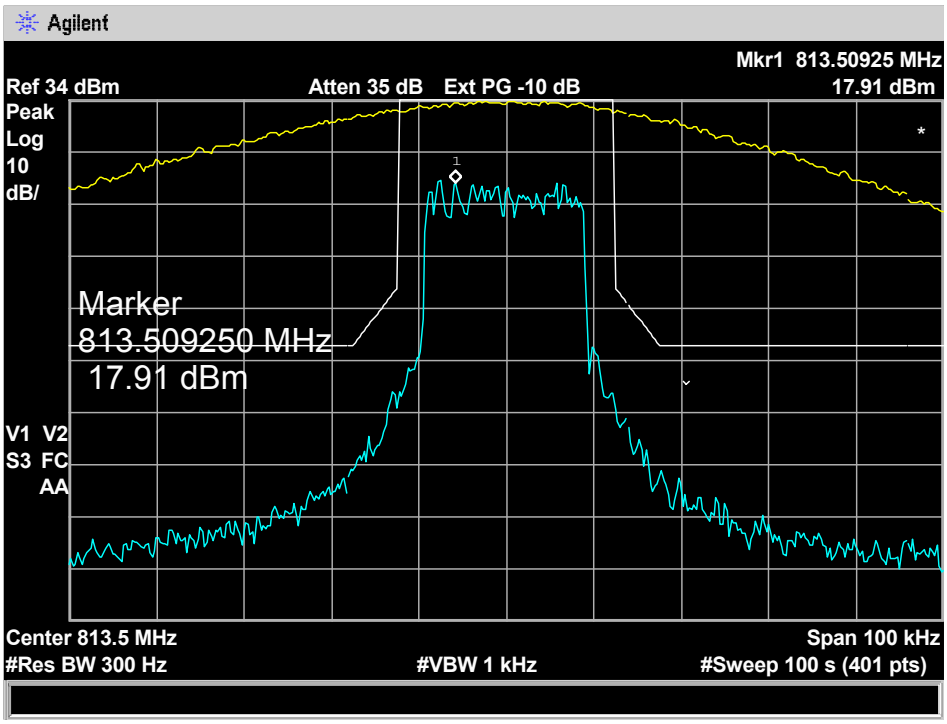
WiDEN25 Quad-16QAM Modulation performance relative to mask 47 CFR 90.210(g)
(Maximum Power setting)
Plot 5.23



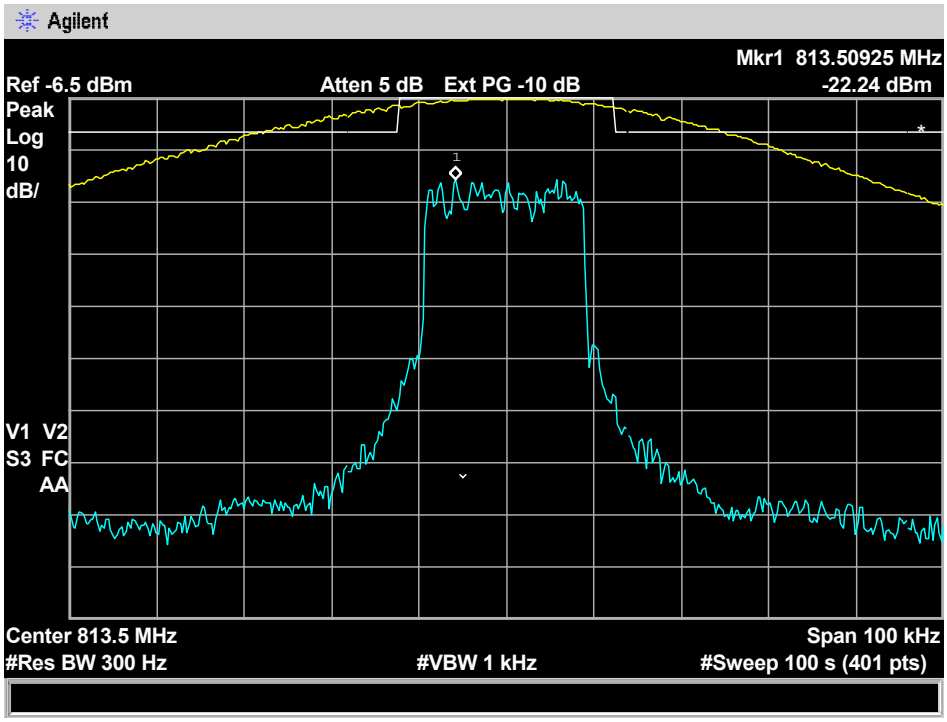
WiDEN25 Quad-16QAM Modulation performance relative to mask 47 CFR 90.210(g)
(Minimum Power setting)
Plot 5.24



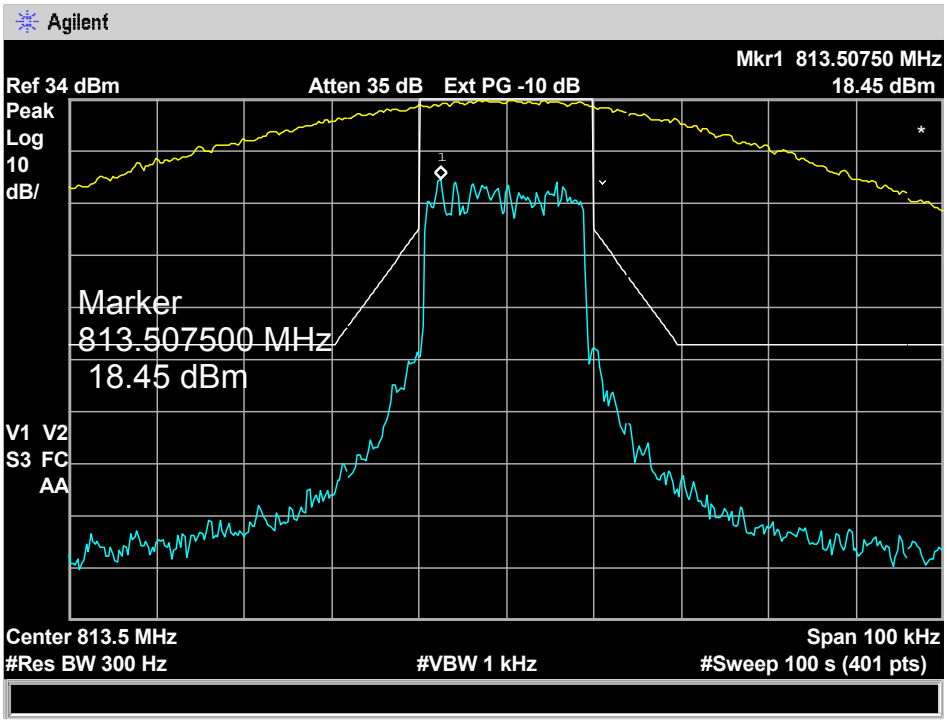
WiDEN25 Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.25



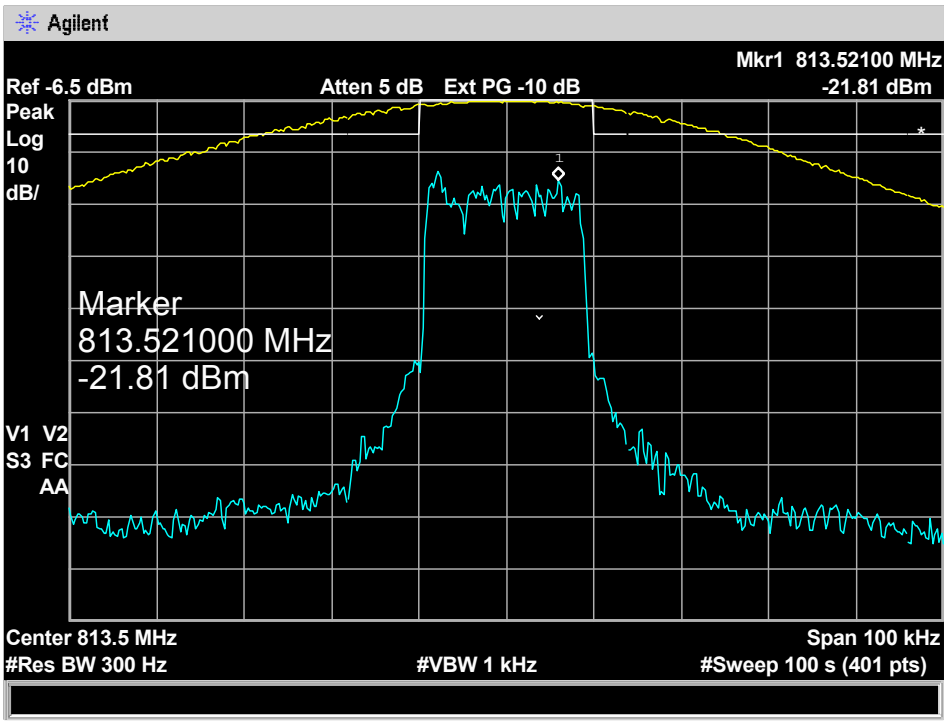
WiDEN25 Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.26



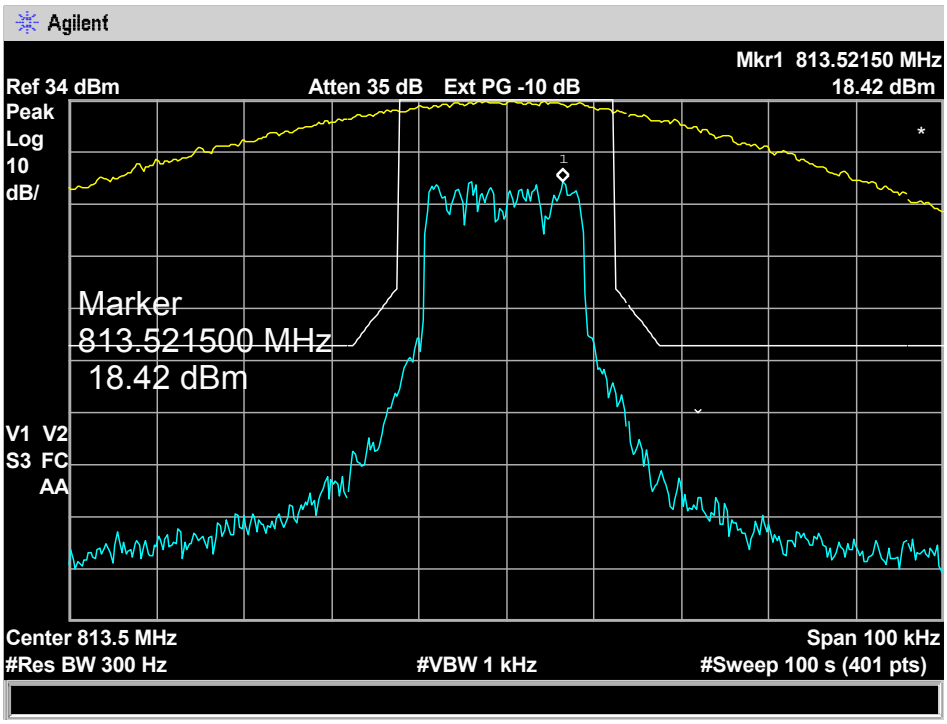
WiDEN25 Quad-64QAM Modulation performance relative to mask 47 CFR 90.210(g)
(Maximum Power setting)
Plot 5.27



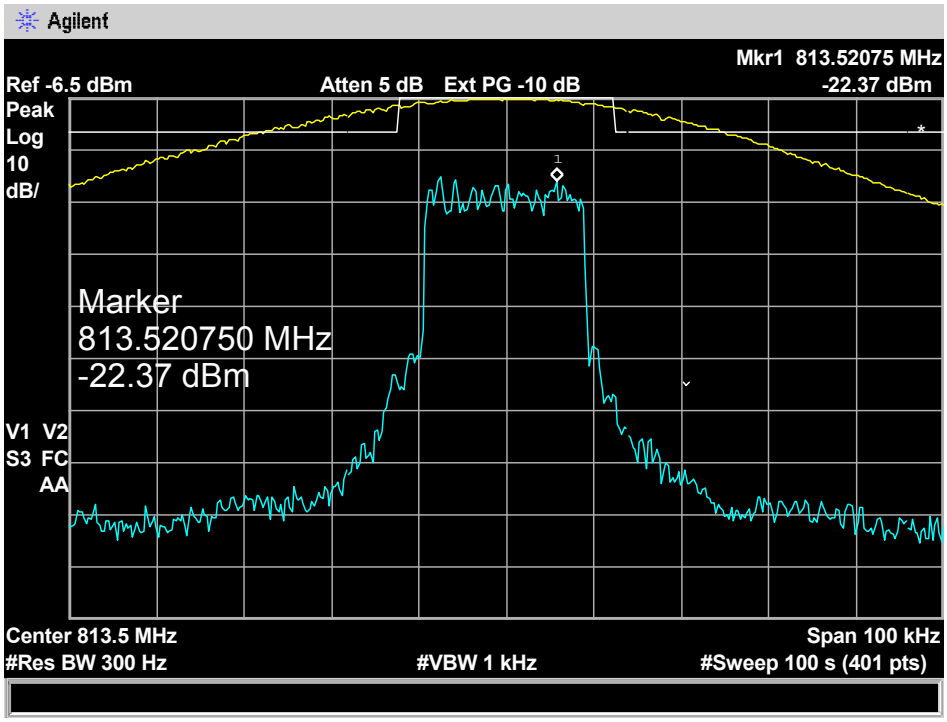
WiDEN25 Quad-64QAM Modulation performance relative to mask 47 CFR 90.210(g)
(Minimum Power setting)
Plot 5.28



WiDEN25 Quad-64QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.29

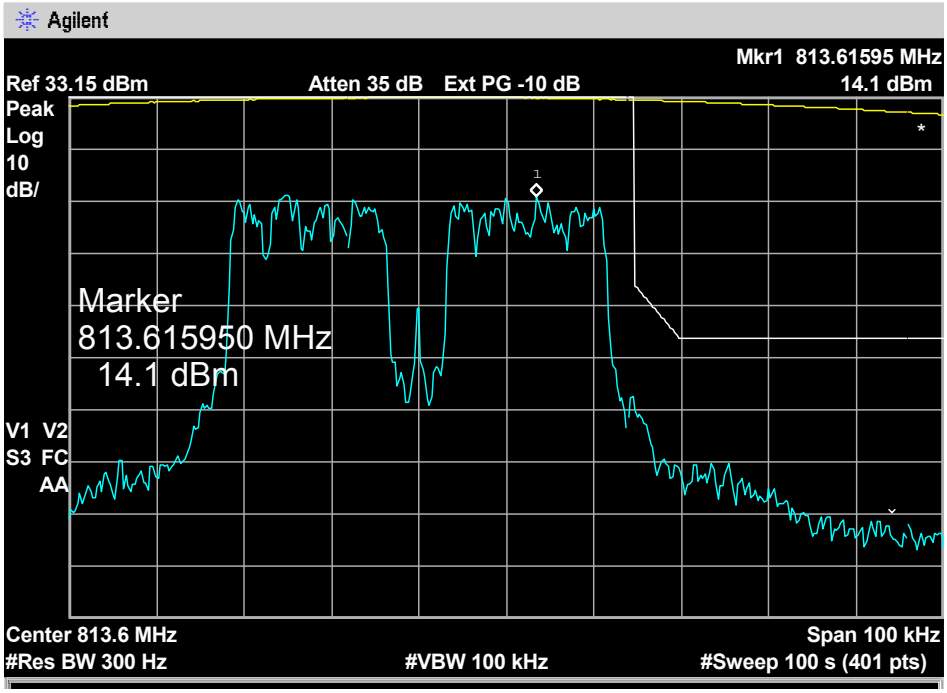


WiDEN25 Quad-64QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.30

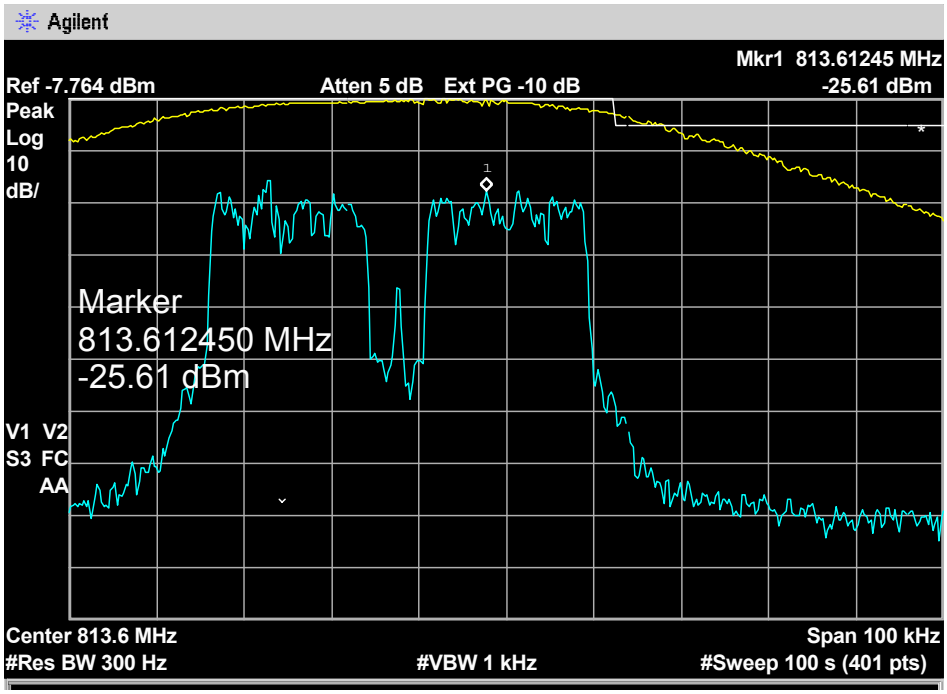


800 MHz Band Operation Measured Data – Emission Designator 43K3D7D
FCC Limits per EA SMR Emission Mask 47 CFR 90.691(a)

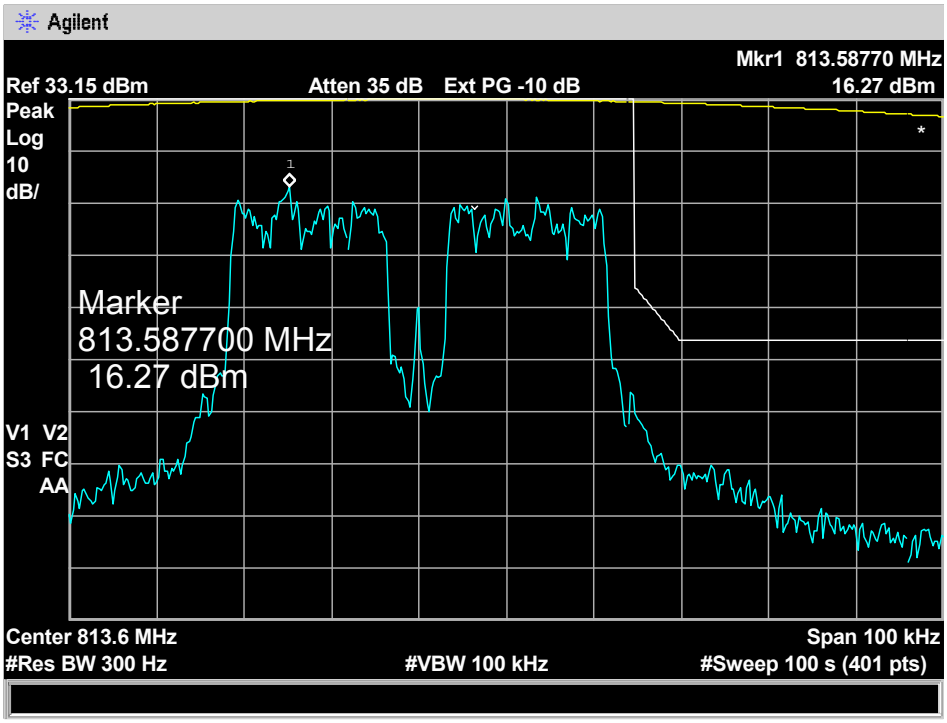
WiDEN50 Adjacent Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.31



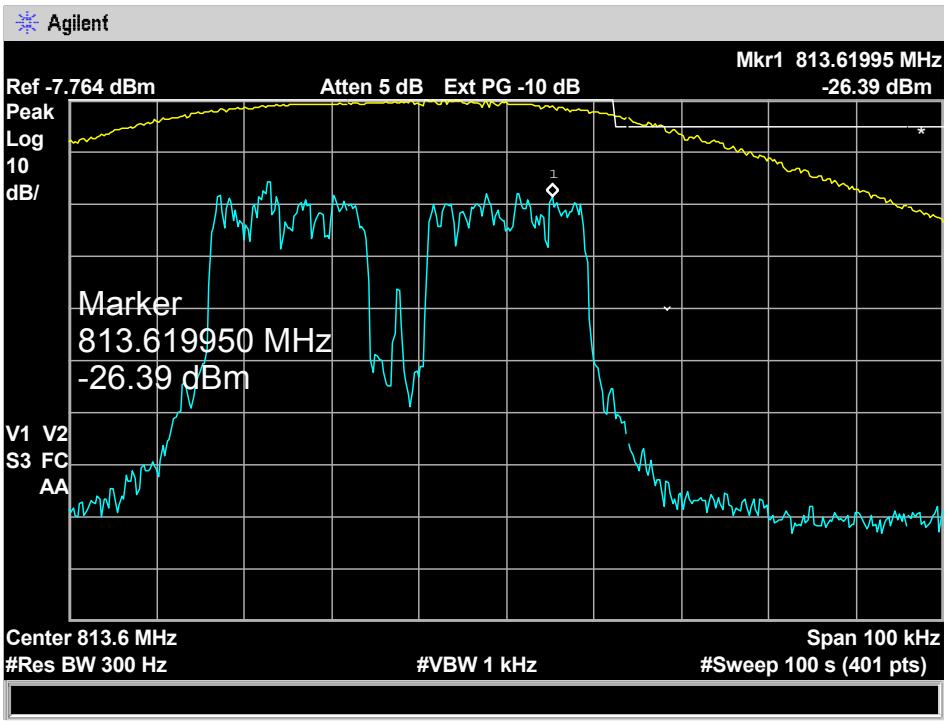
WiDEN50 Adjacent Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.32



WiDEN50 Adjacent Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.33



WiDEN50 Adjacent Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.34



WiDEN50 Adjacent Quad-64QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.35

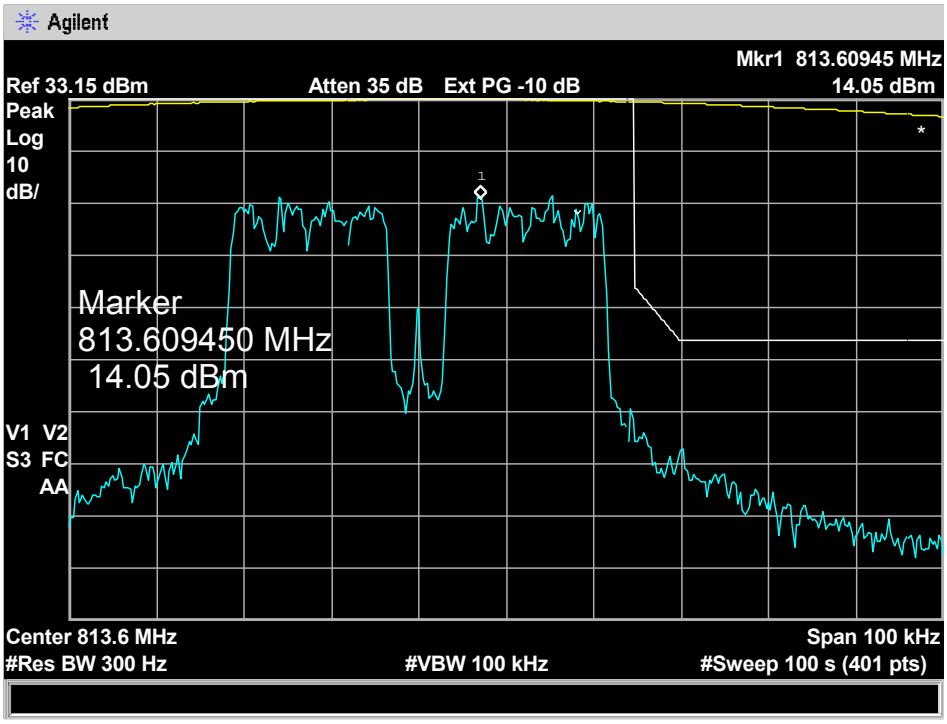
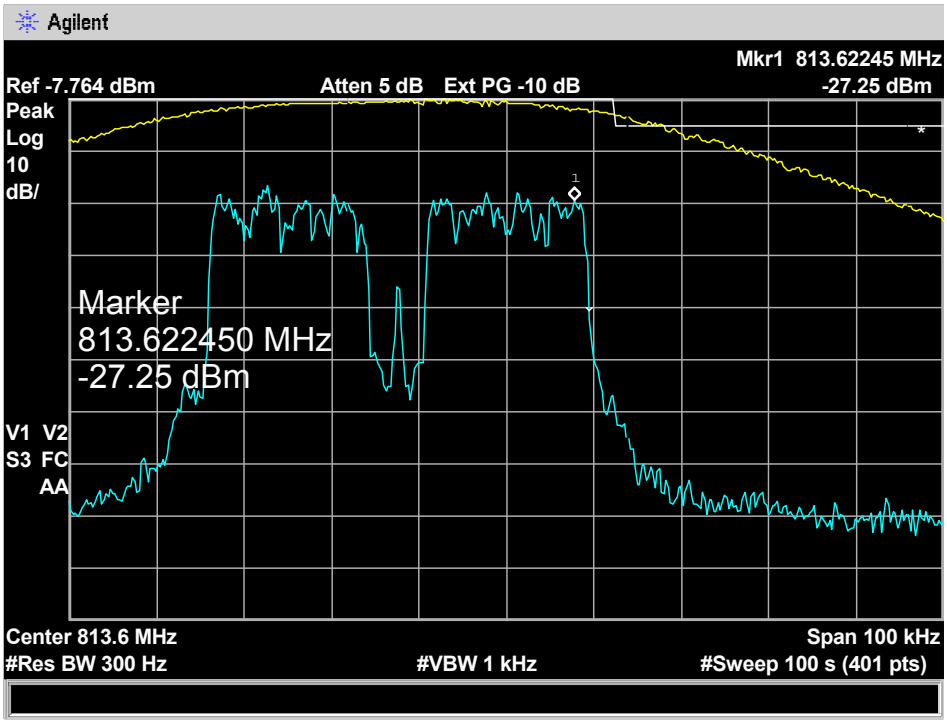
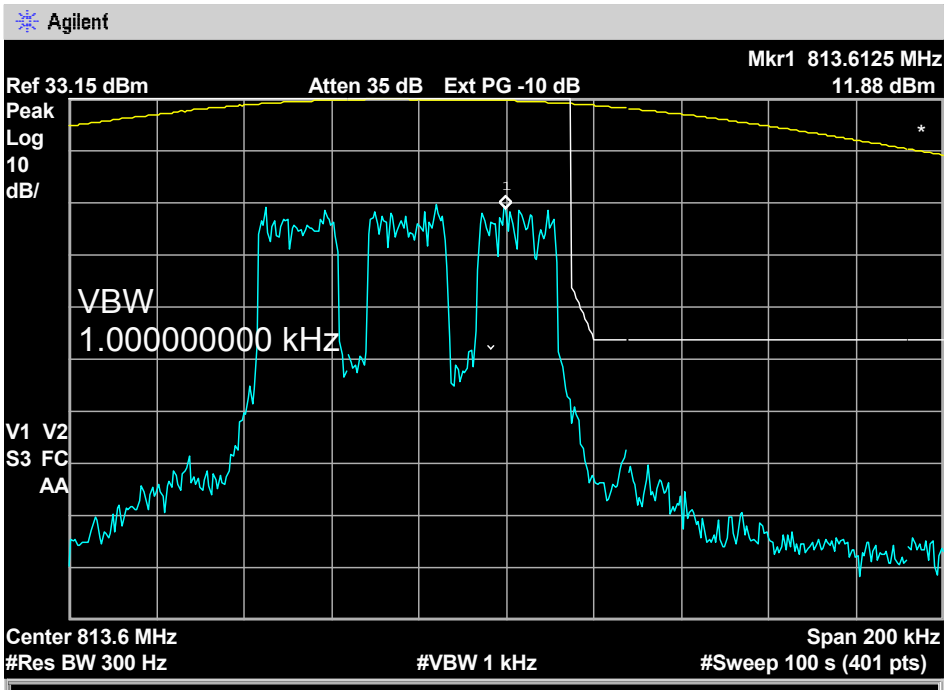


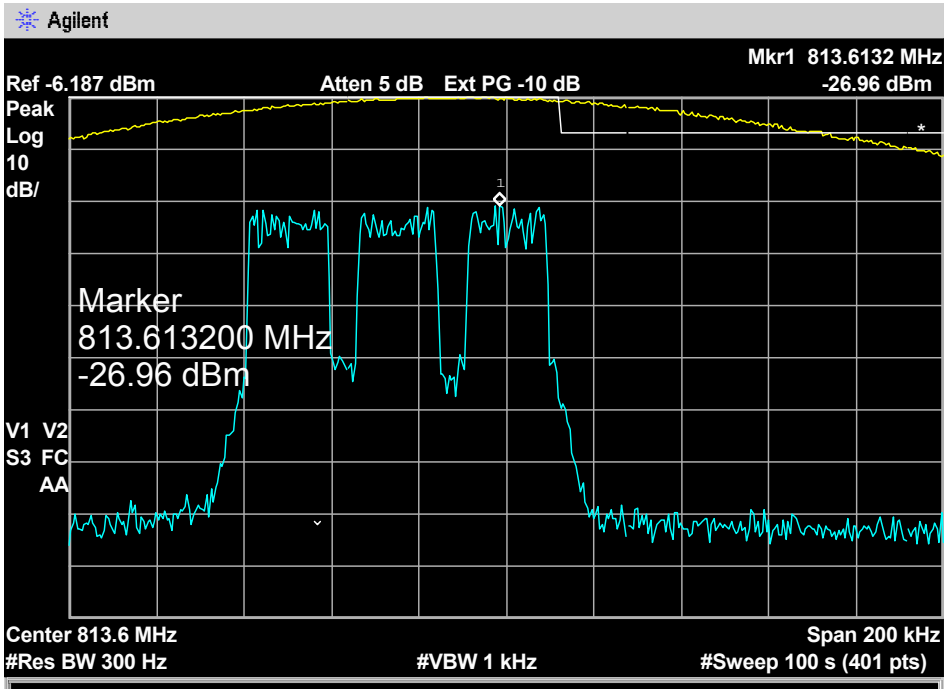
Figure 6-40: WiDEN50 Adjacent Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.36



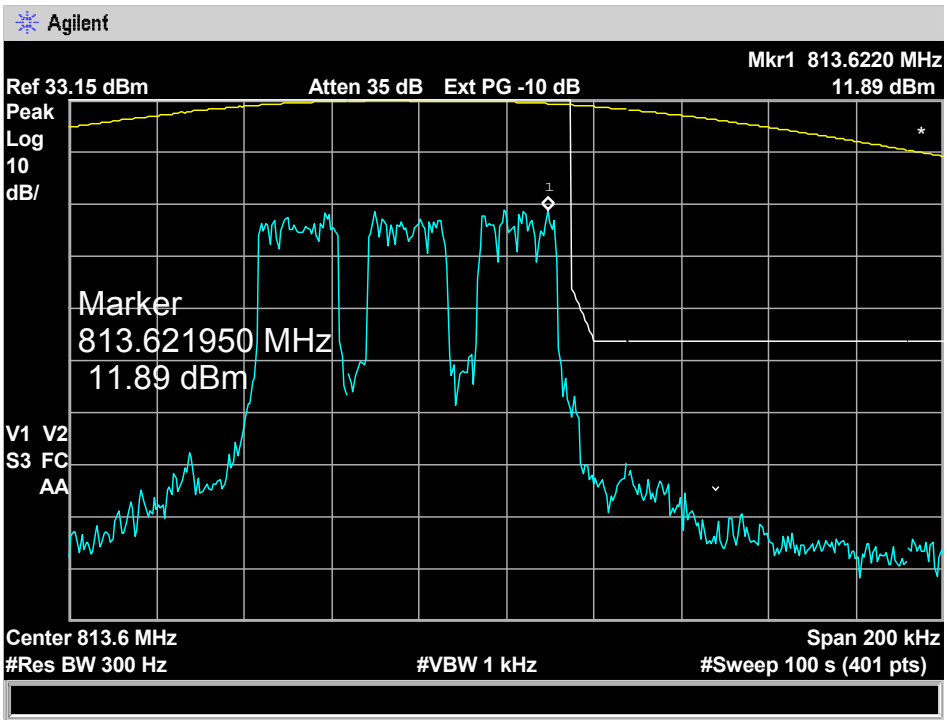
800 MHz band Operation Measured Data – Emission Designator 68K3D7D
FCC Limits per EA SMR Emission Mask 47 CFR 90.691(a)
WiDEN75 Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.37



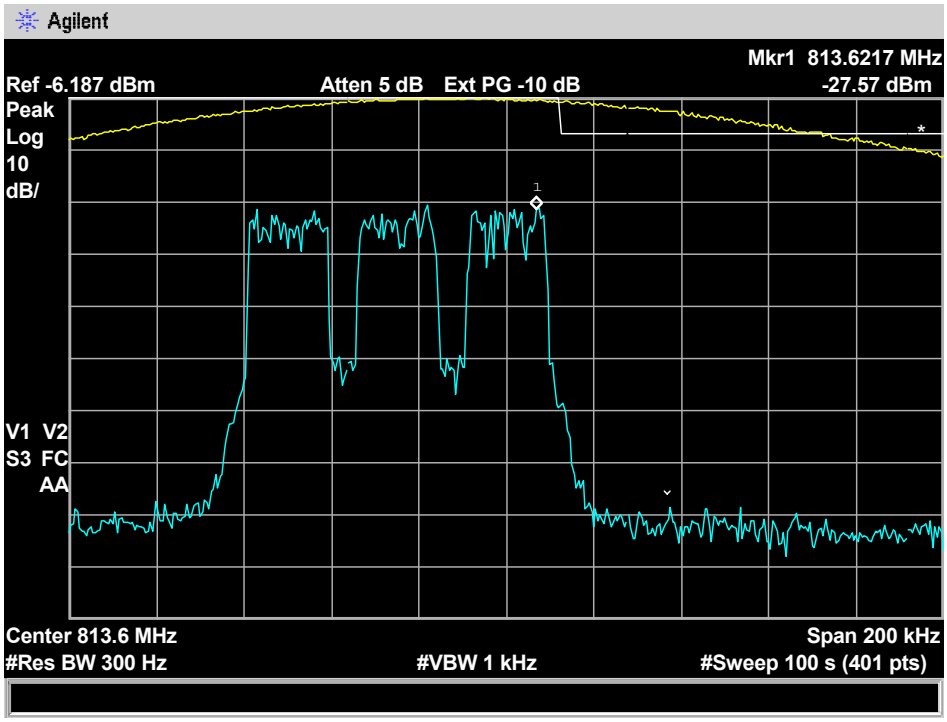
WiDEN75 Adjacent Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.38



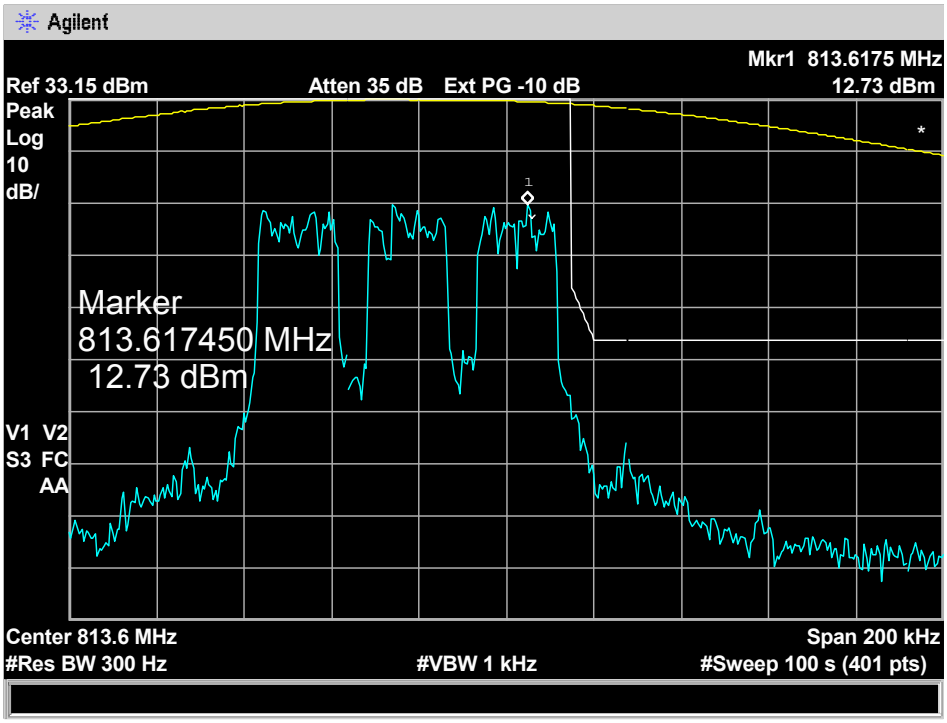
WiDEN75 Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.39



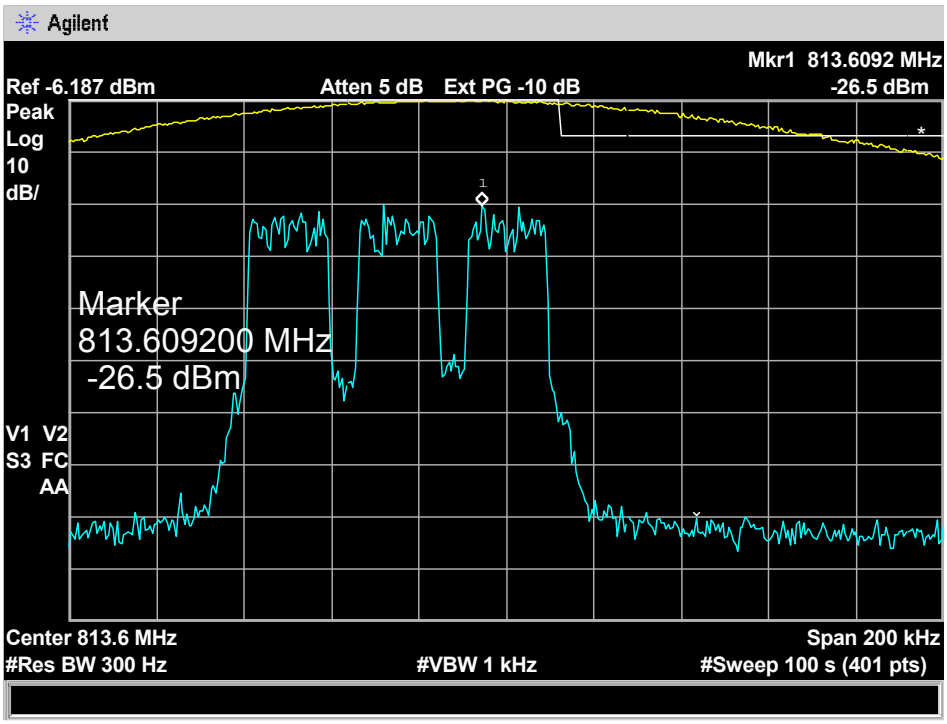
WiDEN75 Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.40



WiDEN75 Quad-646QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.41

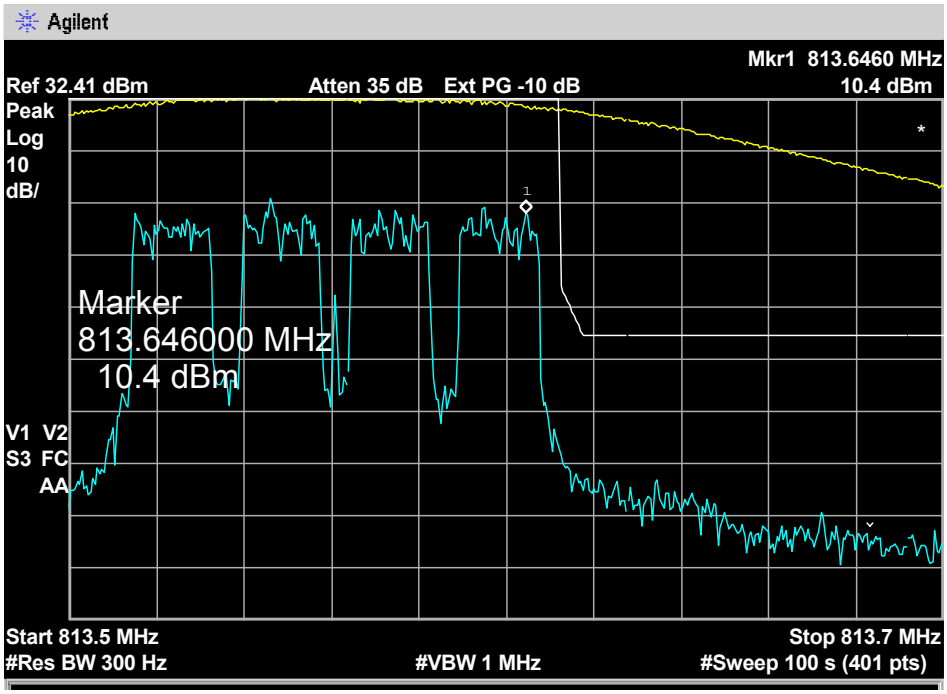


WiDEN75 Quad-646QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.42

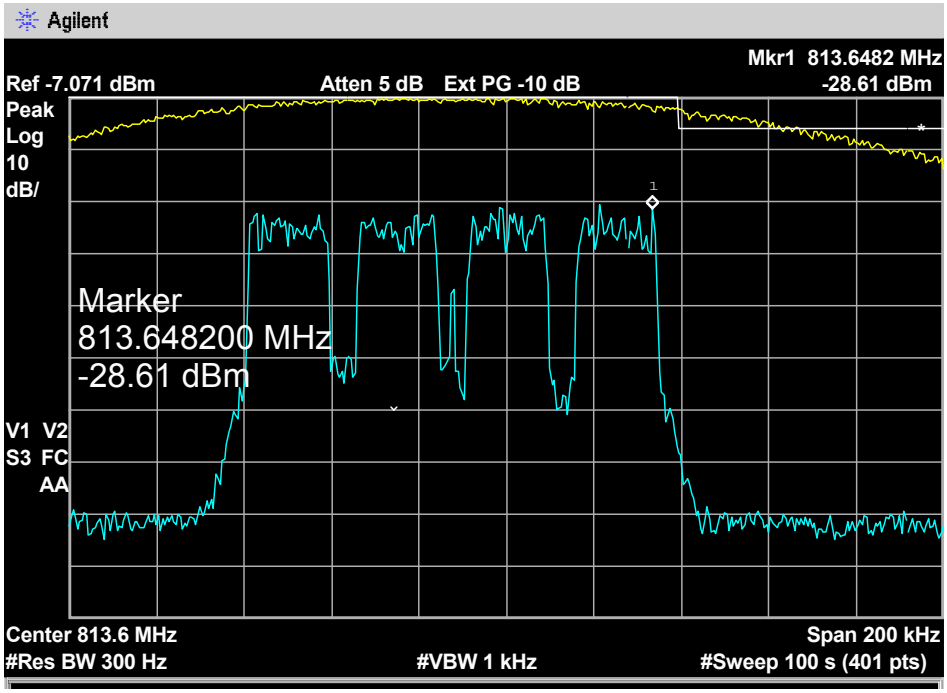


800 MHz Band Operation Measured Data – Emission Designator 93K3D7D
FCC Limits per EA SMR Emission Mask 47 CFR 90.691(a)

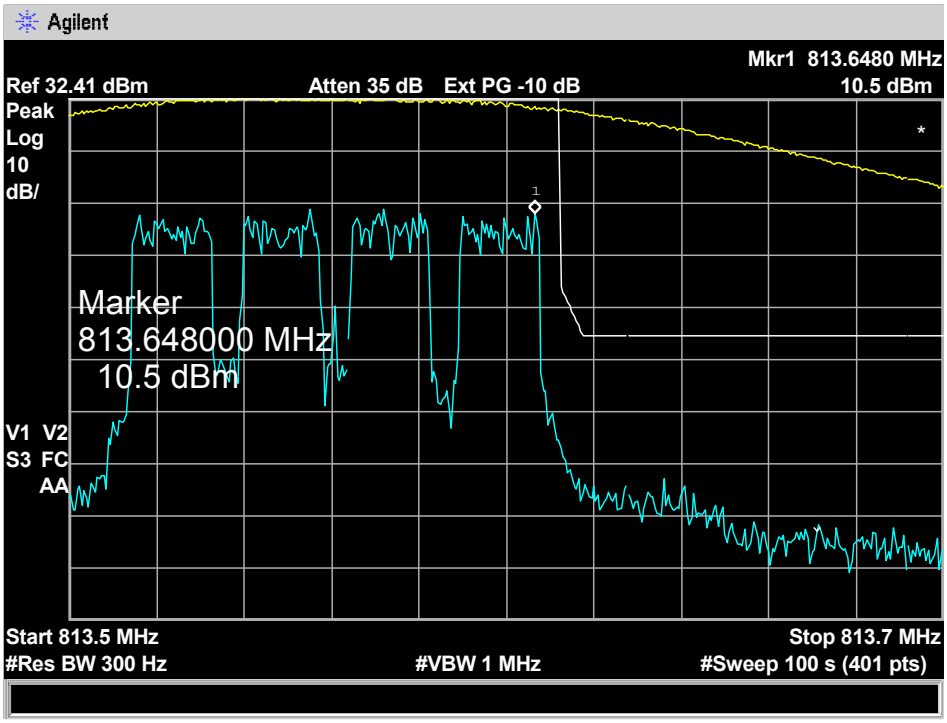
WiDEN100 Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.43



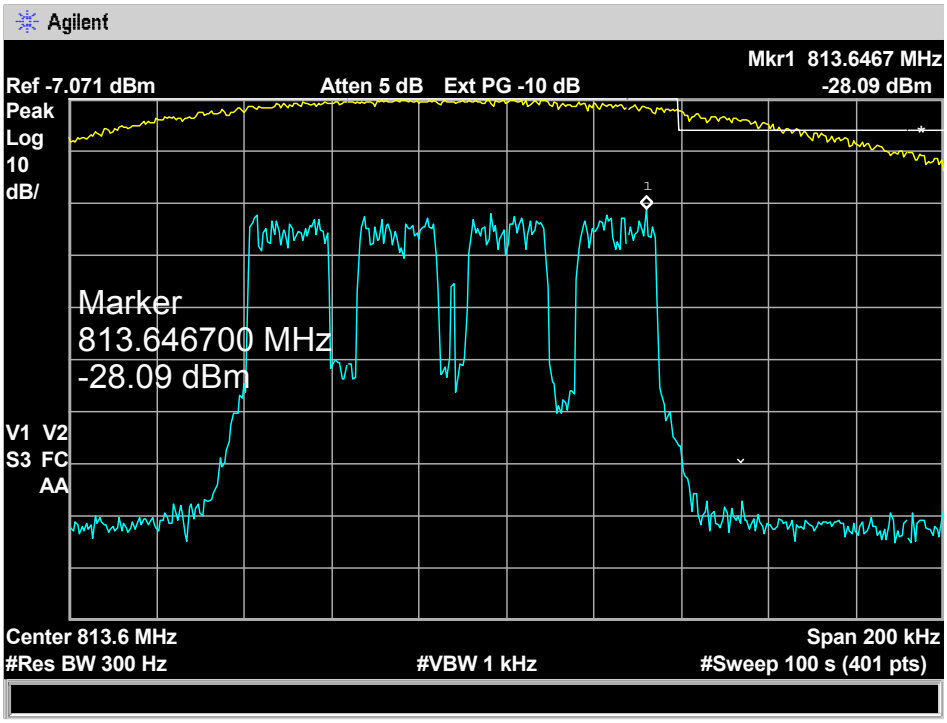
WiDEN100 Continuous Quad- QPSK Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.44



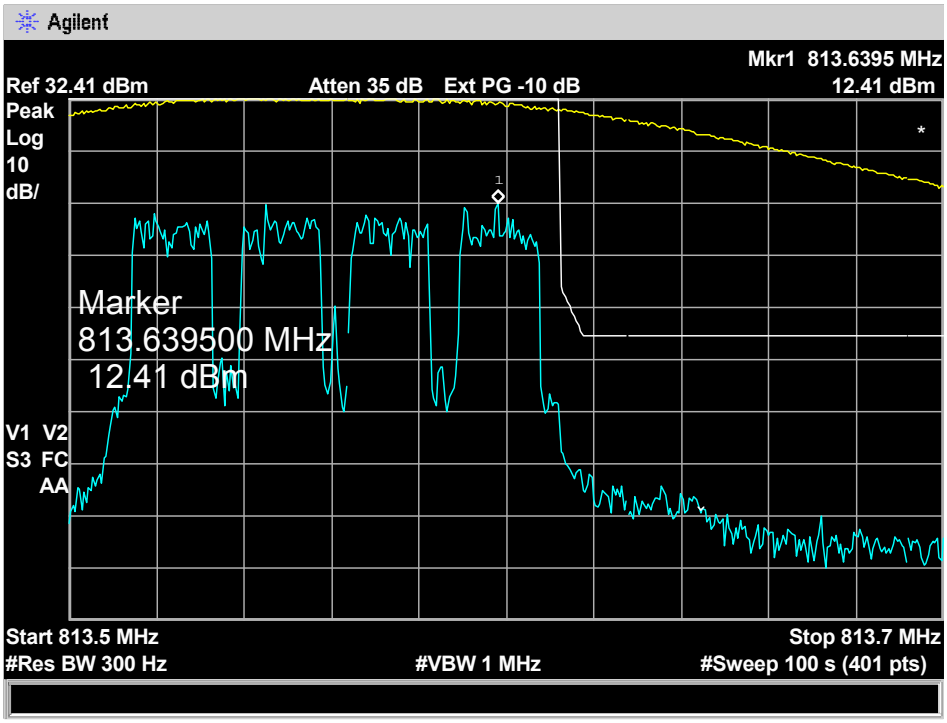
WiDEN100 Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.45



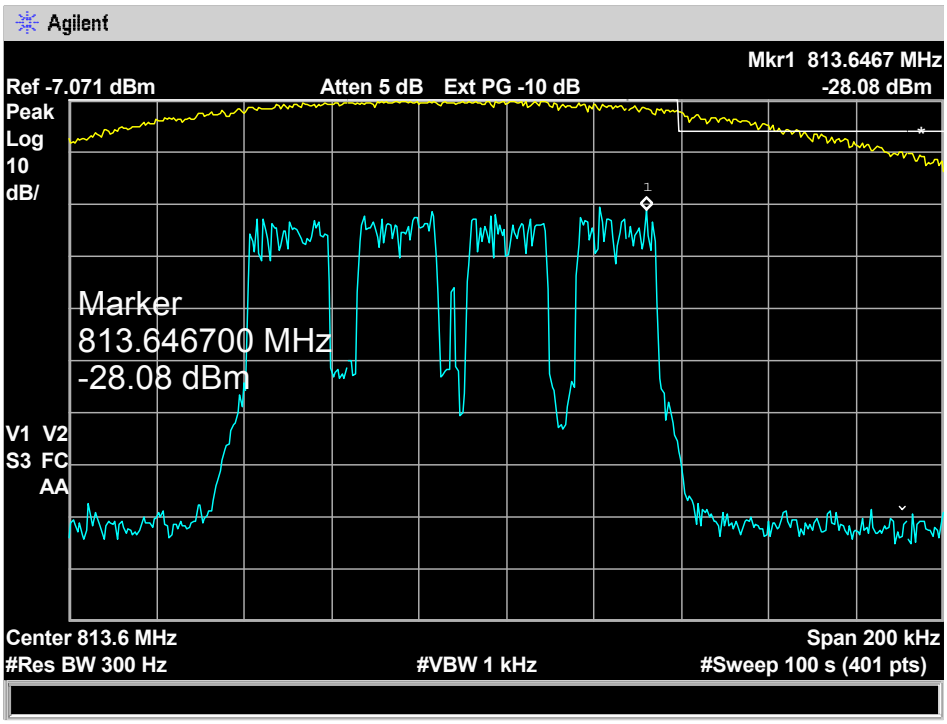
WiDEN100 Continuous Quad- 16QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.46



WiDEN100 Quad-64QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.47



WiDEN100 Quad- 64QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.48



800 MHz Band WiDEN50 Split Operation Measured Data
FCC Limits per EA SMR Emission Mask 47 CFR 90.691(a)
WiDEN50 Split Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.49

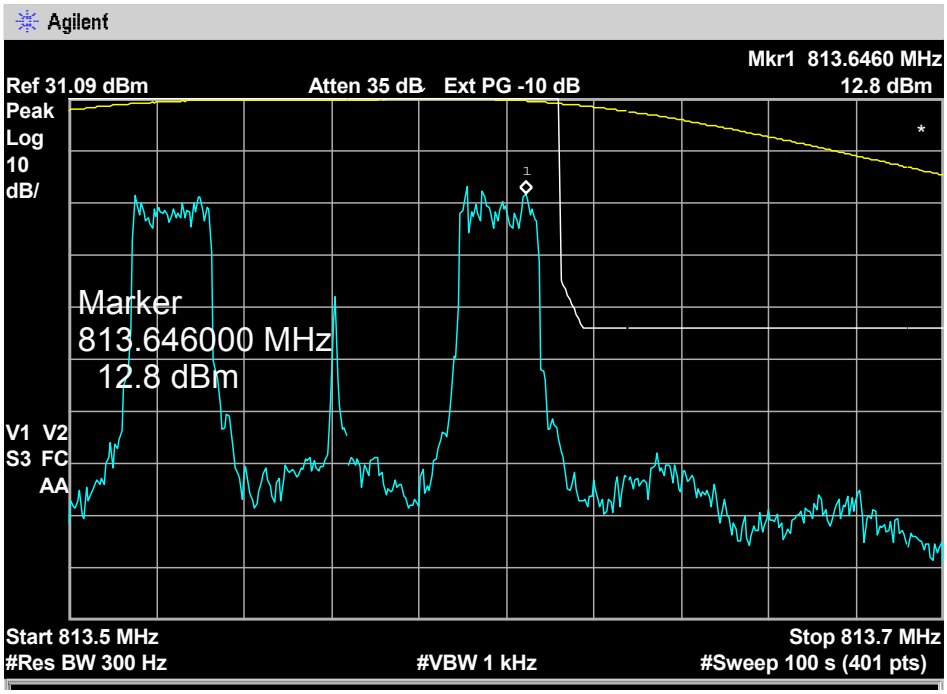
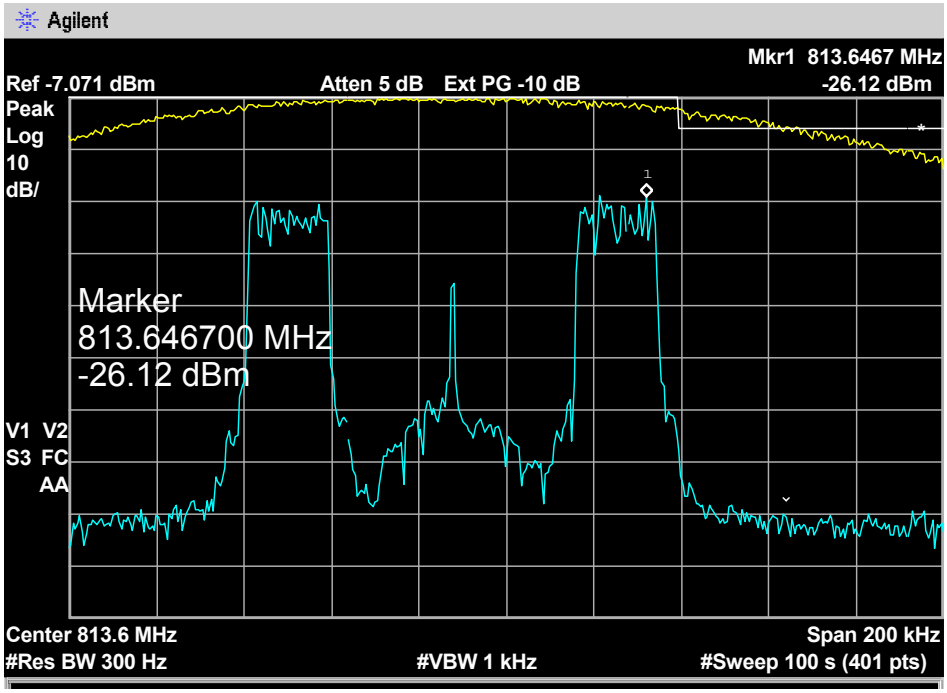
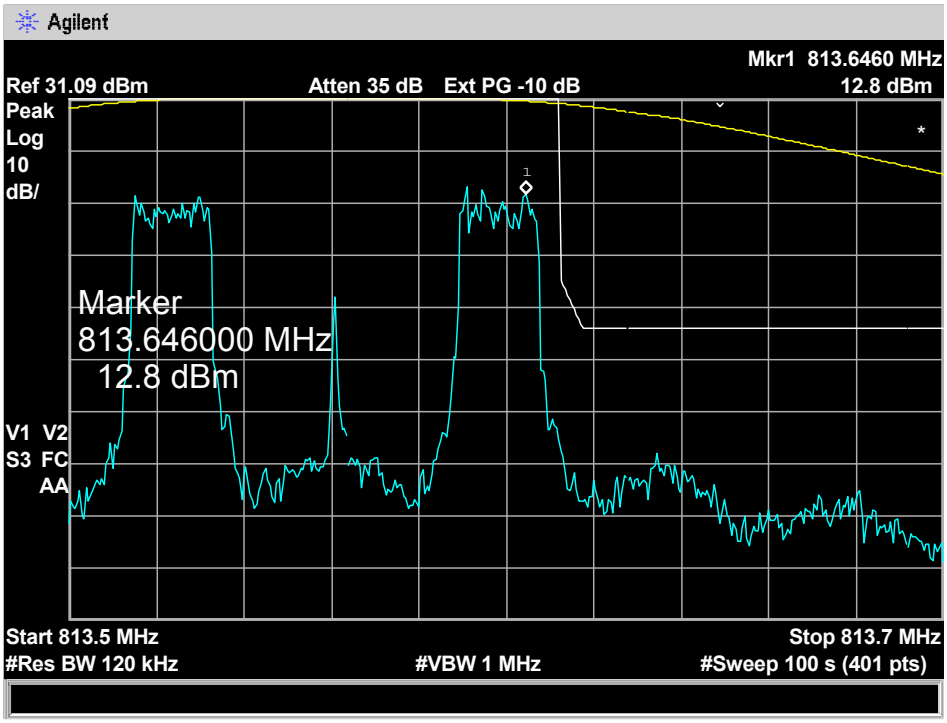


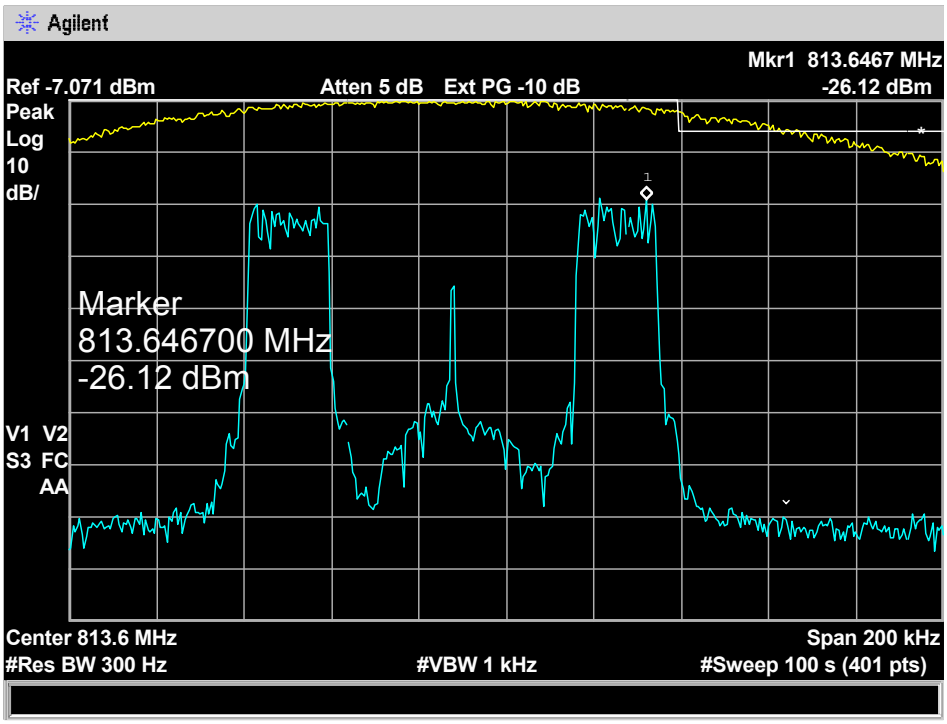
Figure 6-54: WiDEN50 Split Quad-QPSK Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.50



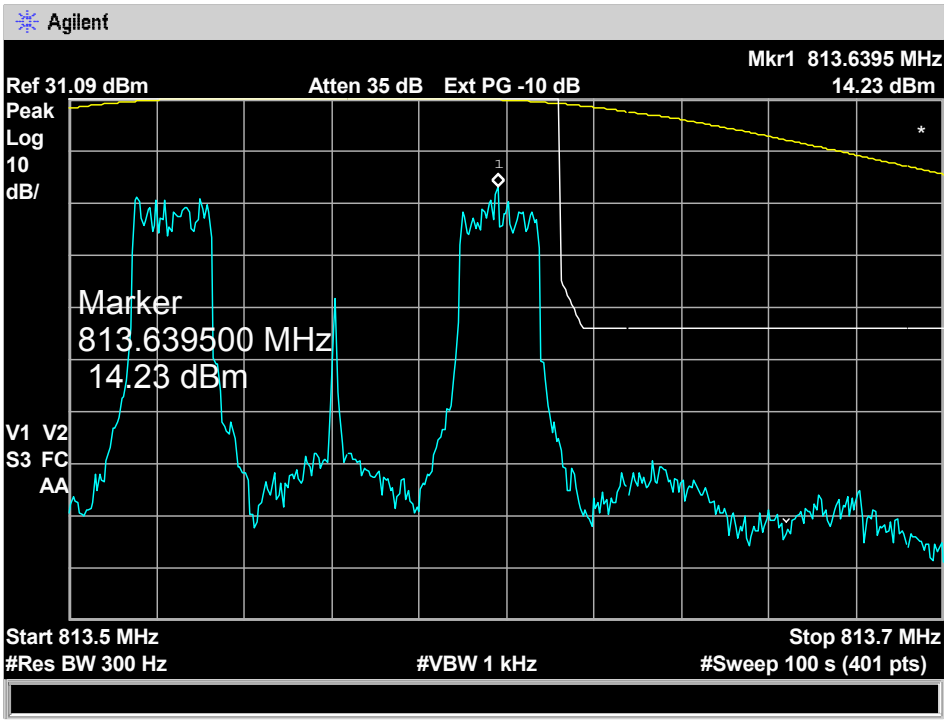
WiDEN50 Split Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.51



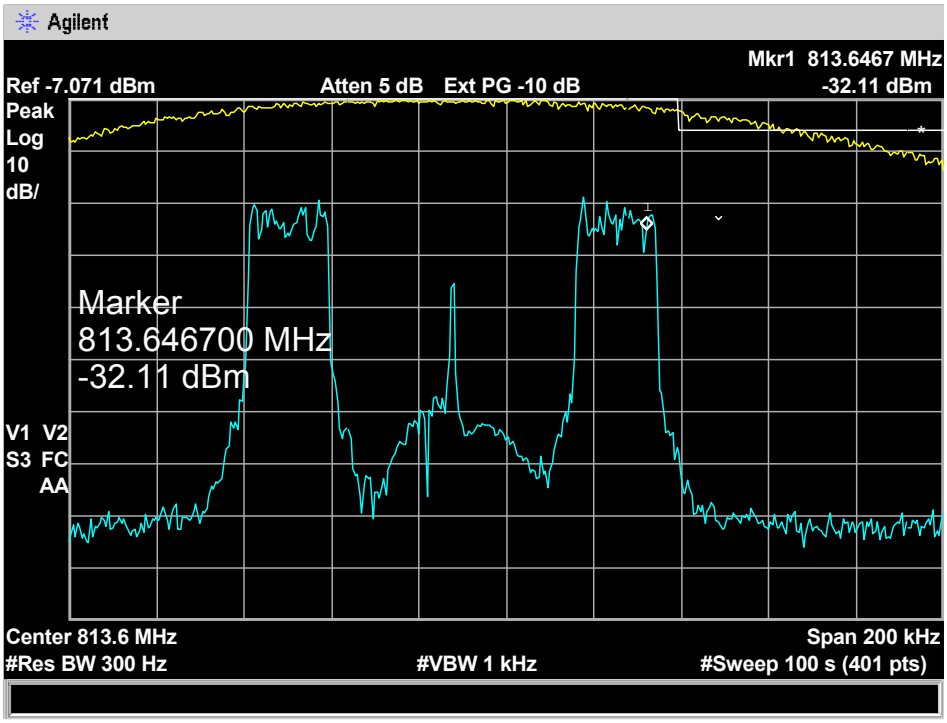
WiDEN50 Split Quad-16QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.52



WiDEN50 Split Quad-64QAM Modulation performance relative to mask 47 CFR 90.691
(Maximum Power setting)
Plot 5.53

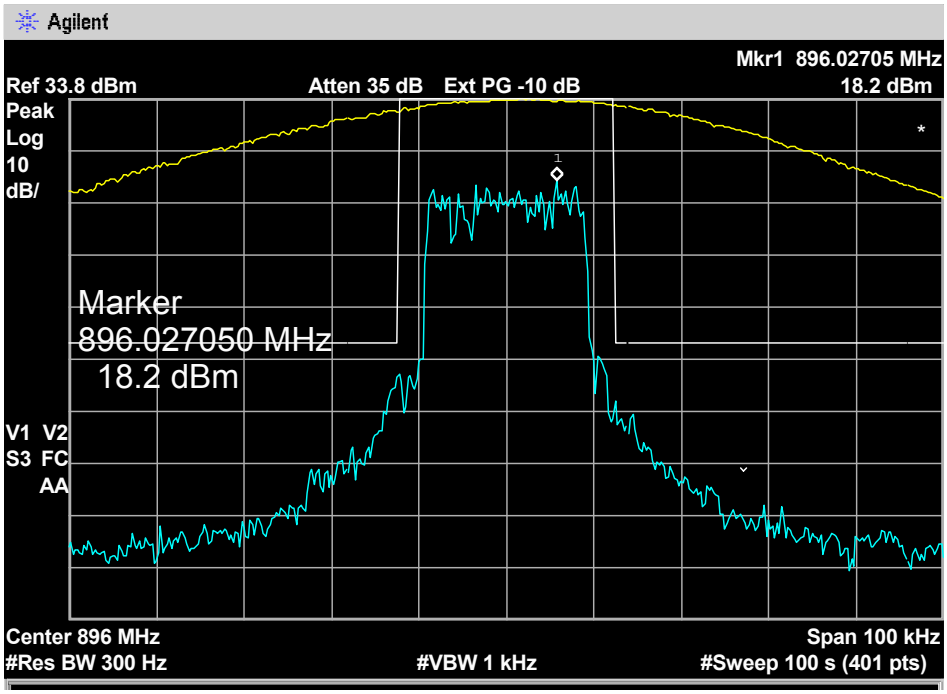


WiDEN50 Split Quad-64QAM Modulation performance relative to mask 47 CFR 90.691
(Minimum Power setting)
Plot 5.54

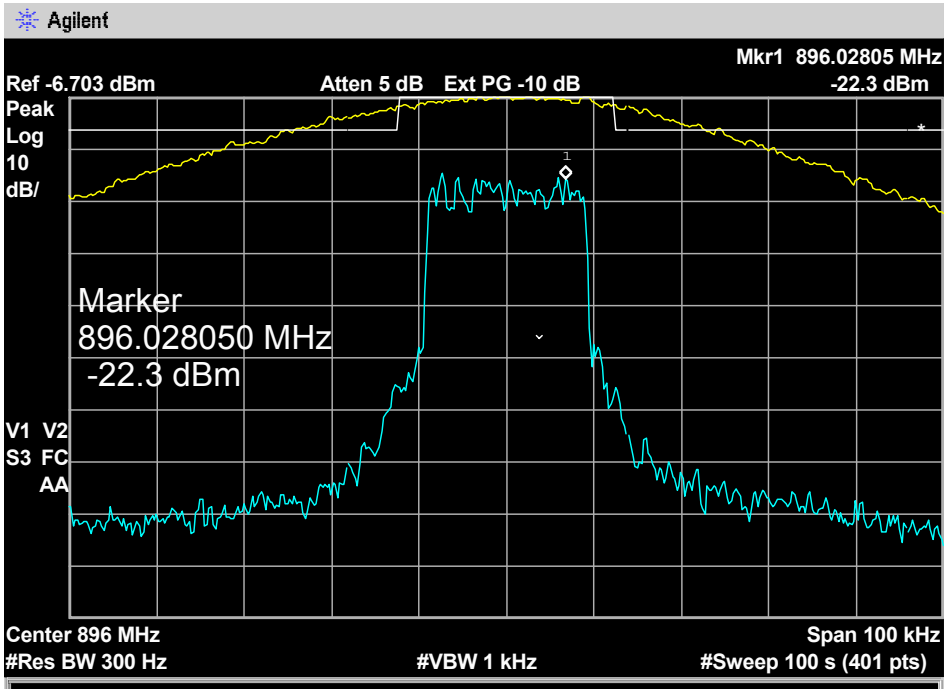


900 MHz Band WiDEN25 Split Operation Measured Data
FCC Limits per 47 CFR 90.669(a)

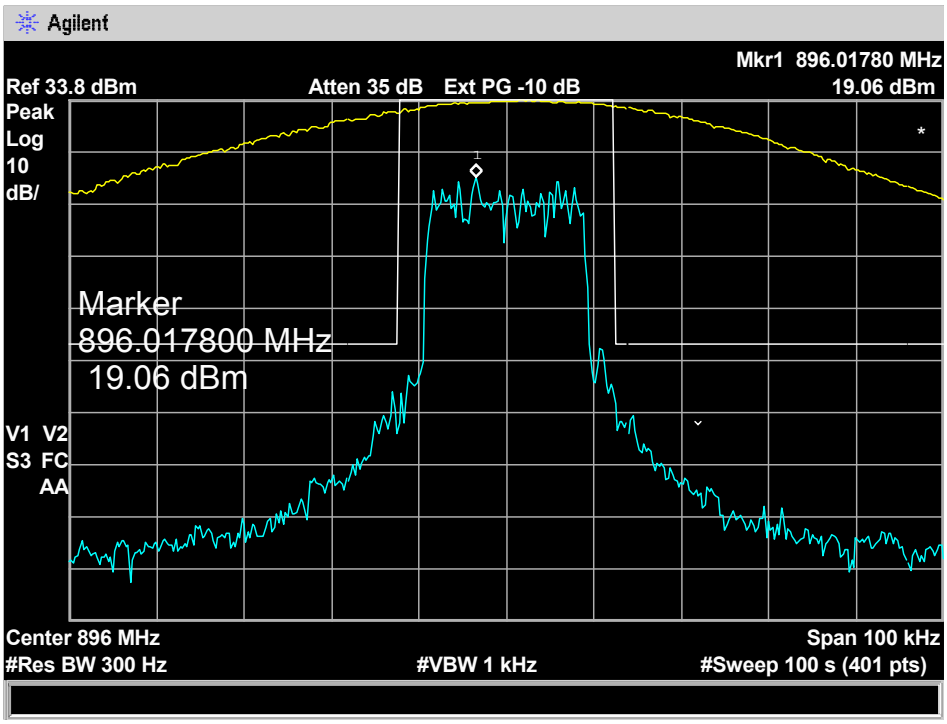
WiDEN25 Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.55



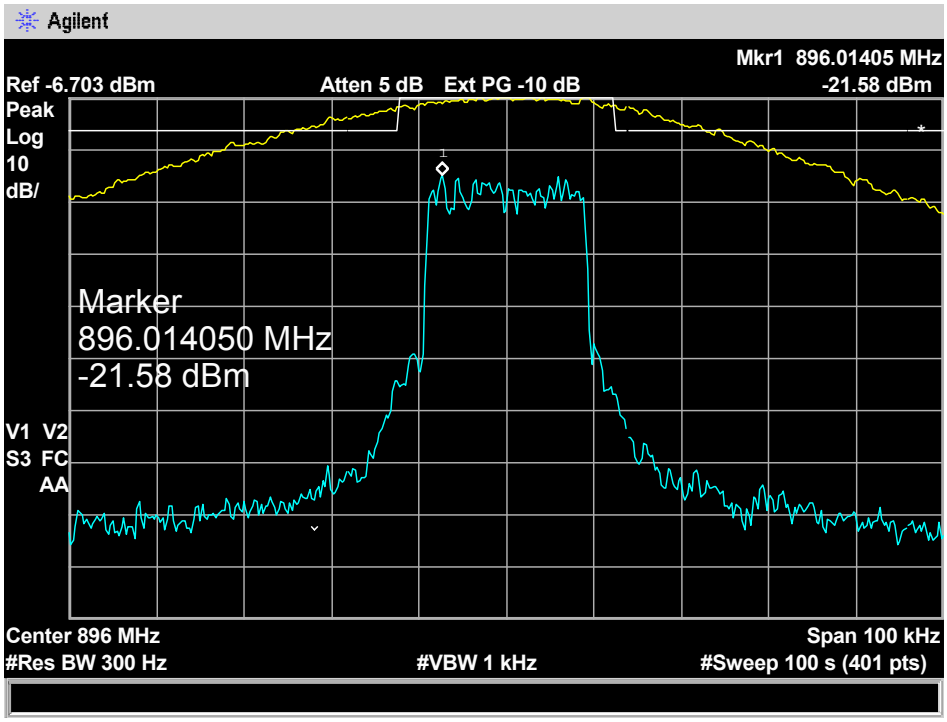
WiDEN25 Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.56



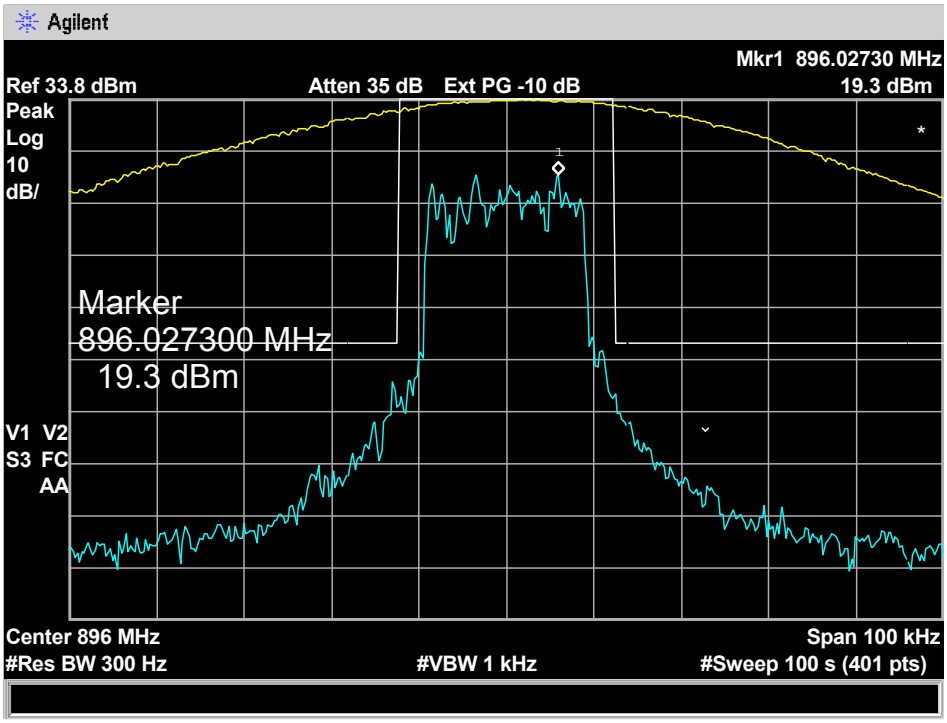
WiDEN25 Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.57



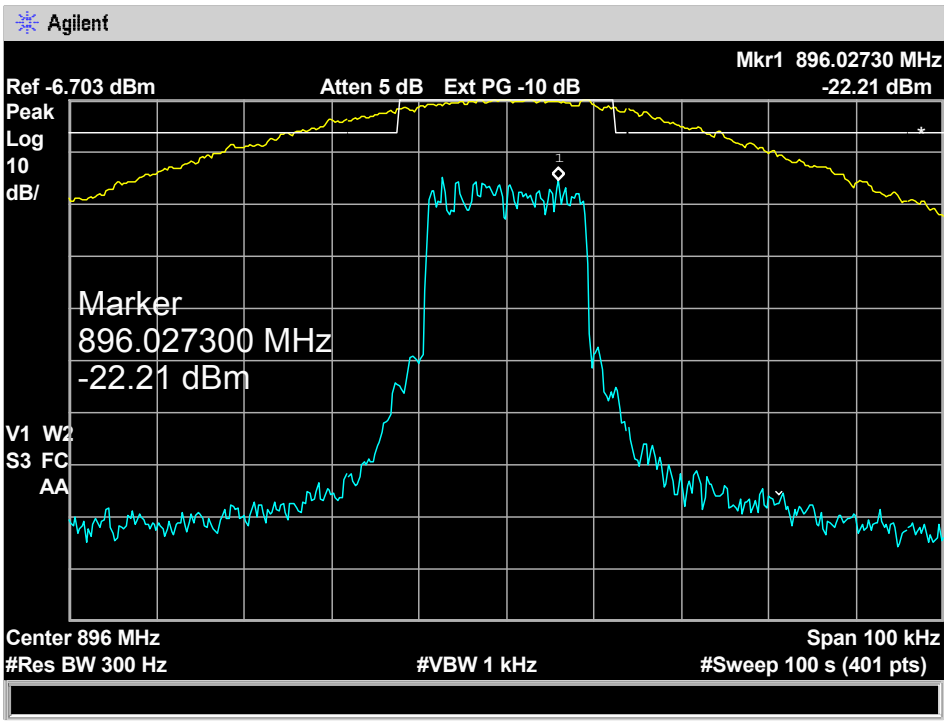
WiDEN25 Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a) (Minimum Power setting)
Plot 5.58



WiDEN25 Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.59

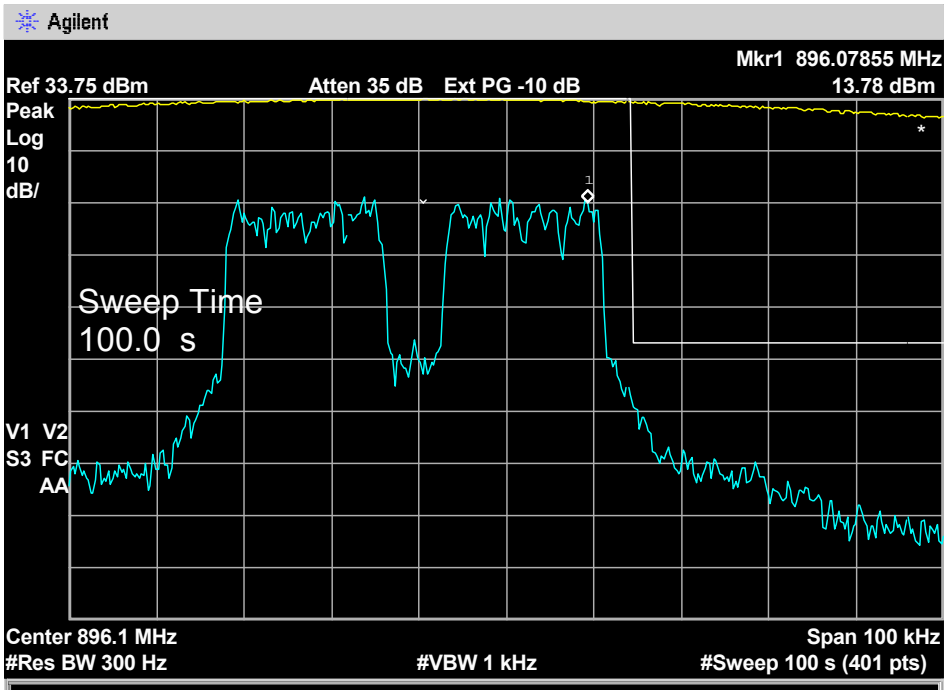


WiDEN25 Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.60

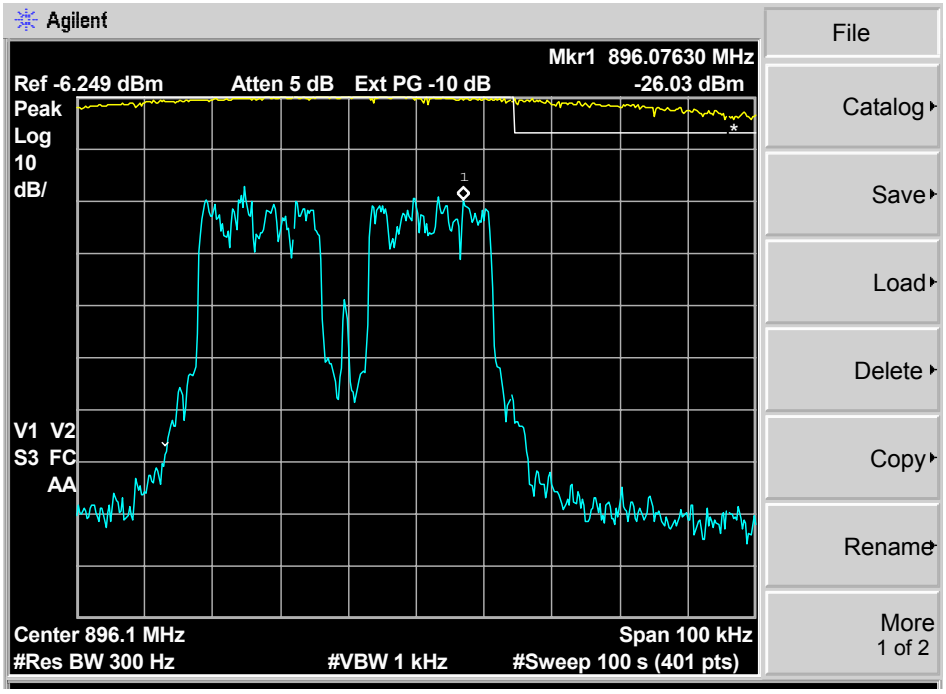


900 MHz Band Operation Measured Data – Emission Designator 43K3D7D
FCC Limits per 47 CFR 90.669(a)

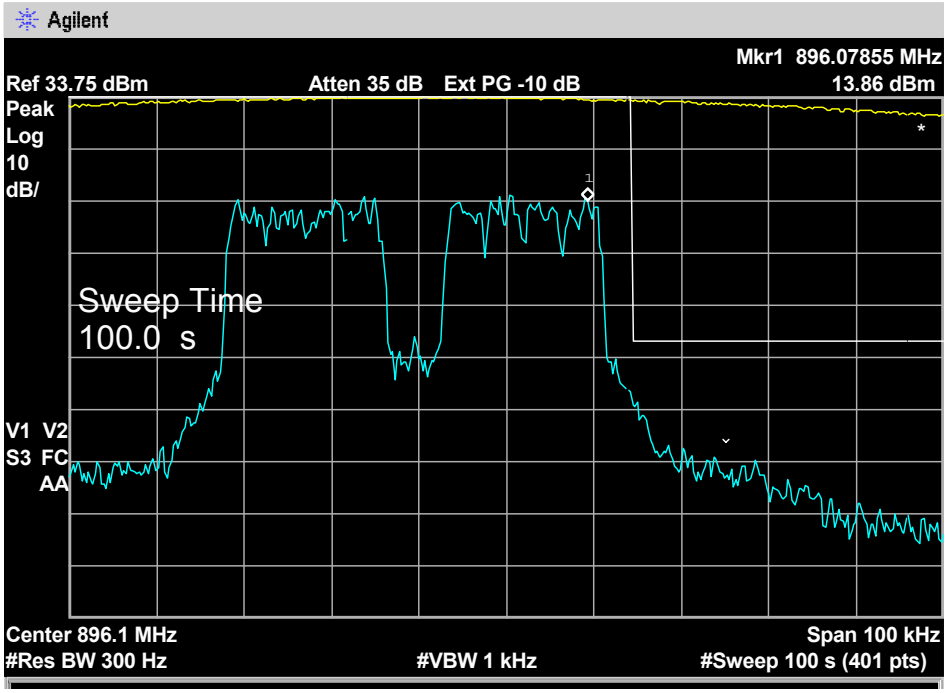
WiDEN50 Adjacent Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.61



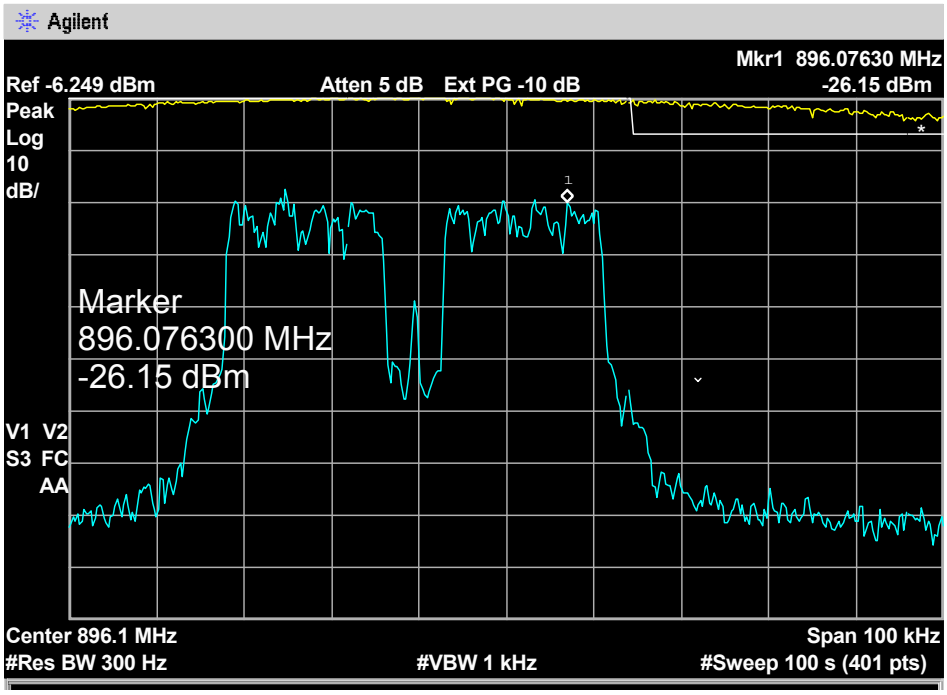
WiDEN50 Adjacent Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.62



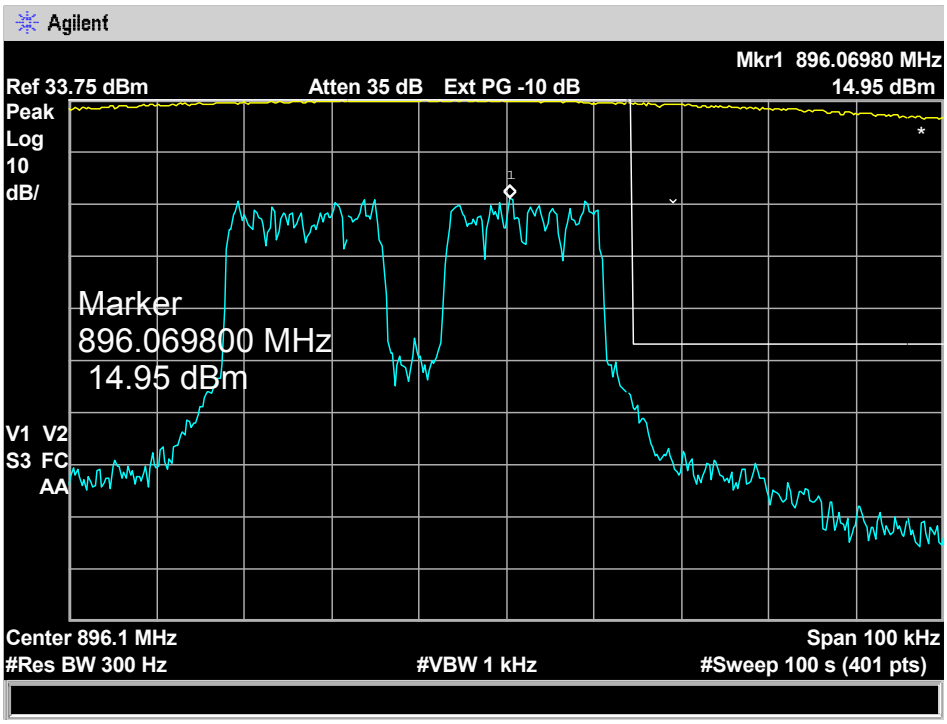
WiDEN50 Adjacent Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.63



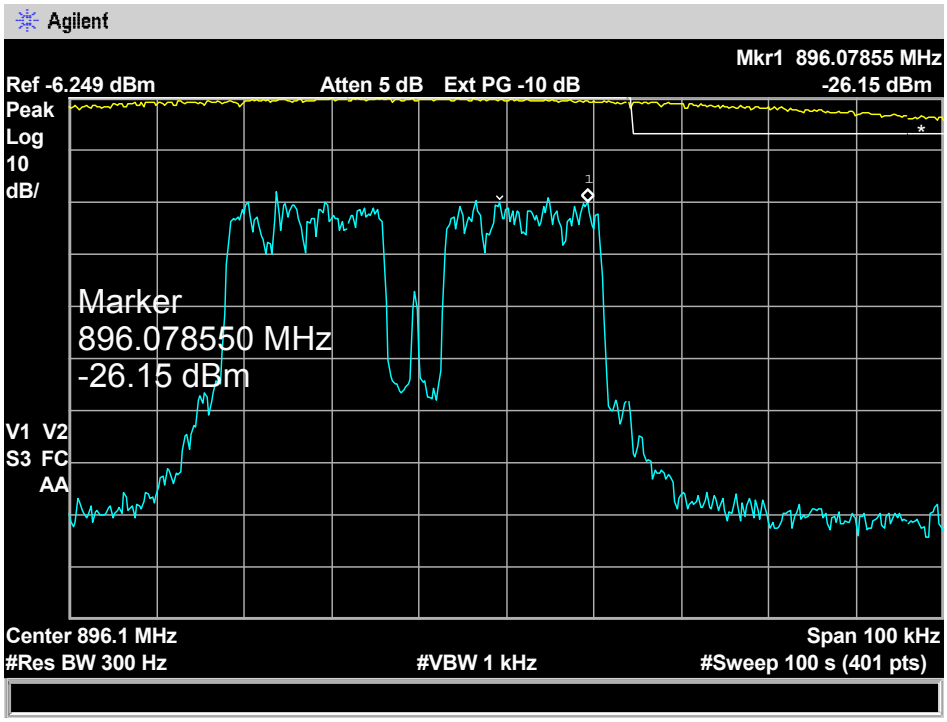
WiDEN50 Adjacent Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.64



WiDEN50 Adjacent Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.65

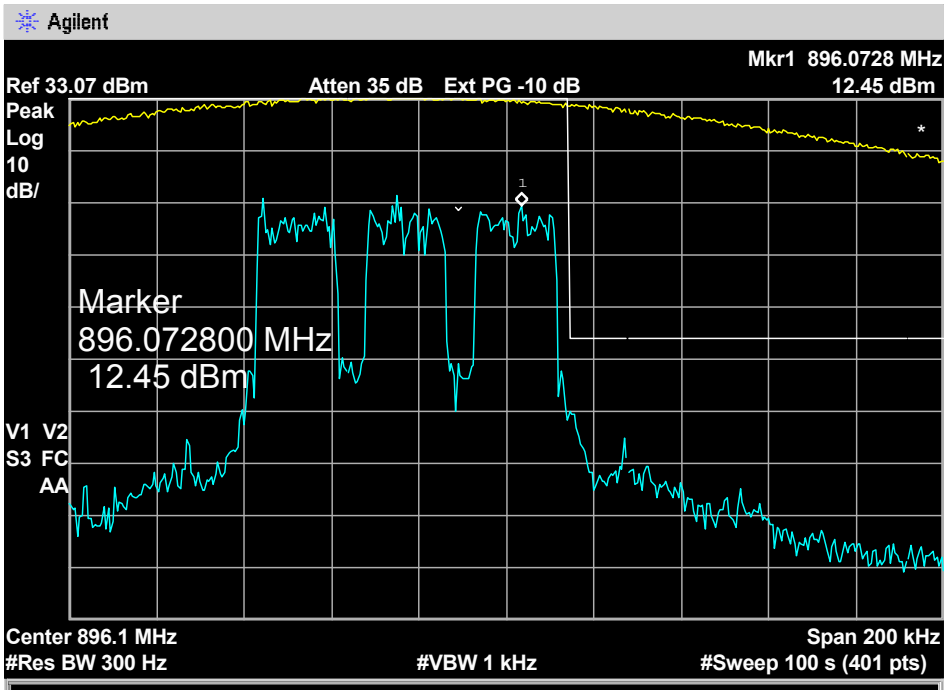


WiDEN50 Adjacent Quad-646QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.66

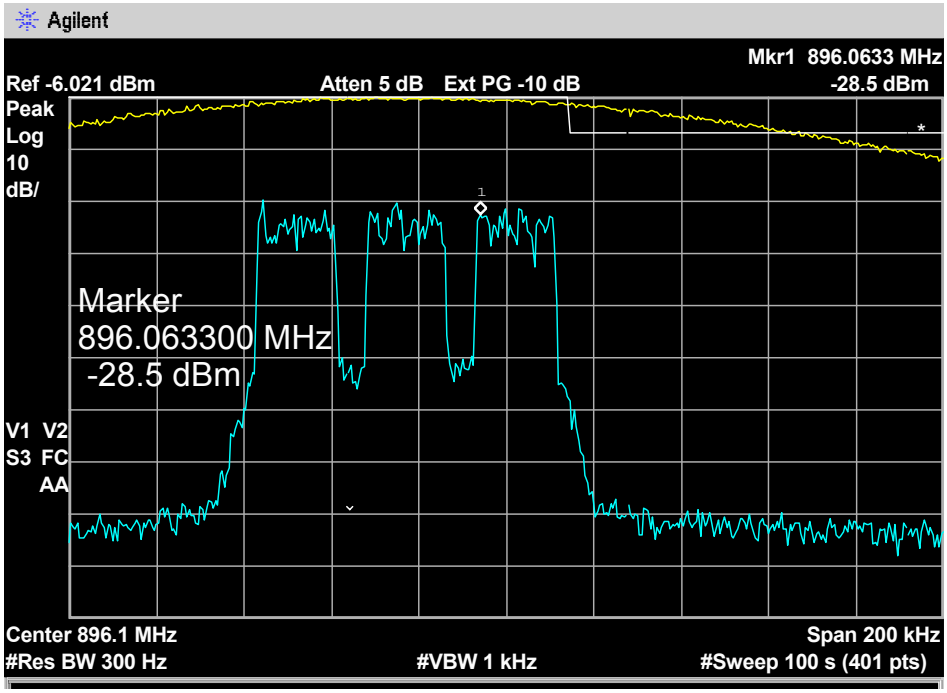


900 MHz Band Operation Measured Data – Emission Designator 68K3D7D
FCC Limits per 47 CFR 90.669(a)

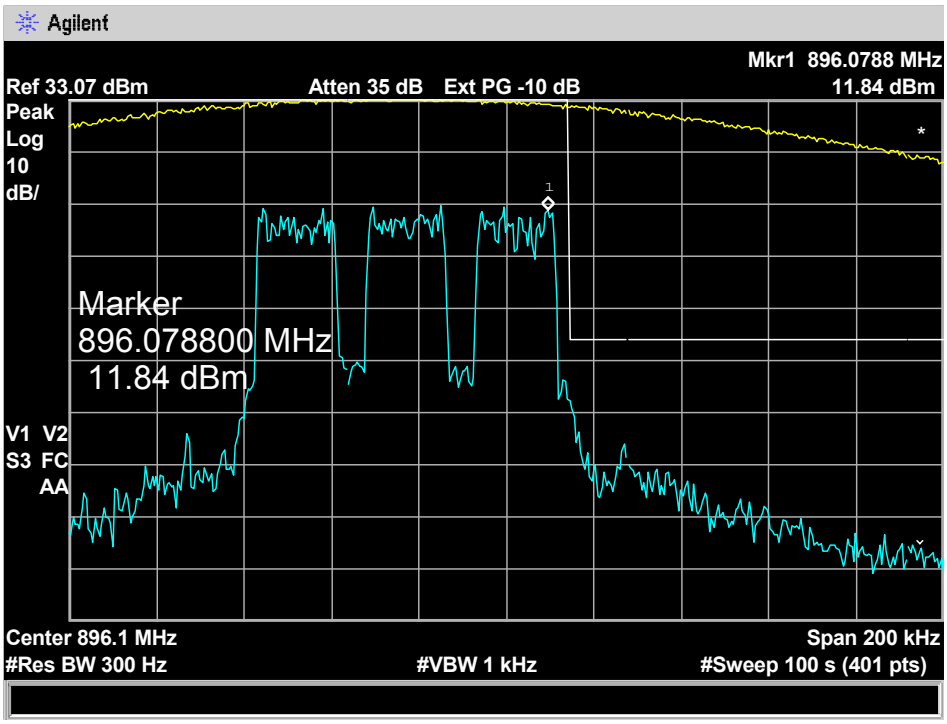
WiDEN75 Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.67



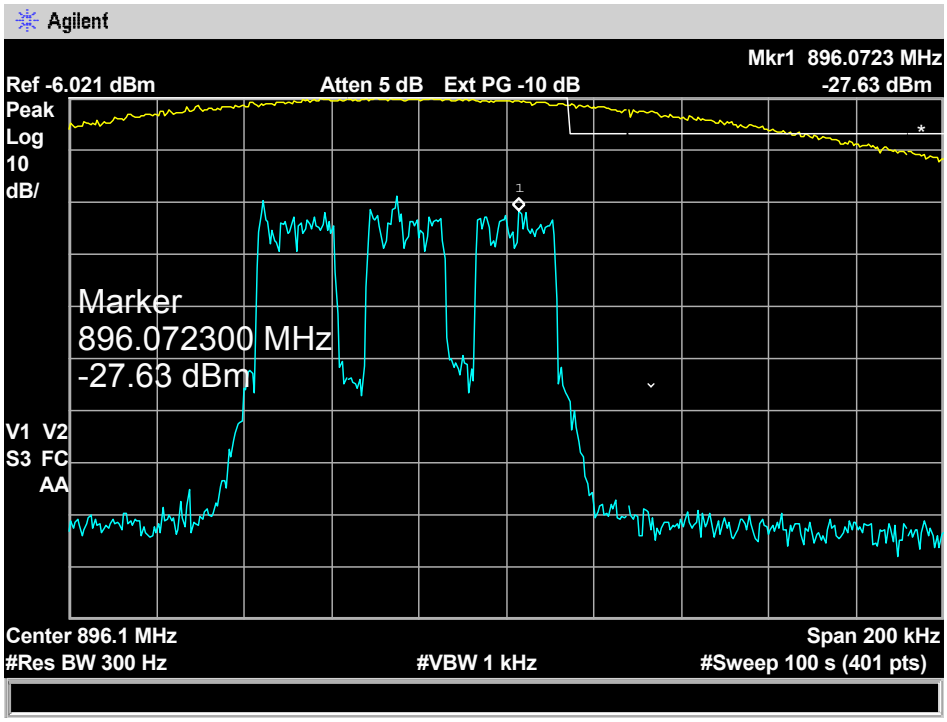
WiDEN75 Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.68



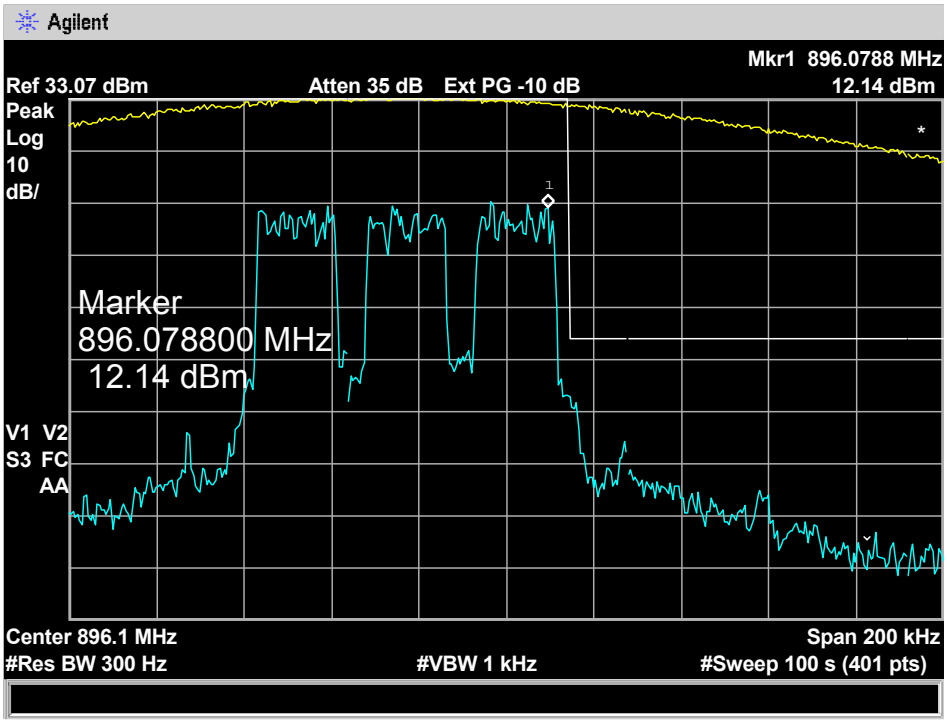
WiDEN75 Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.69



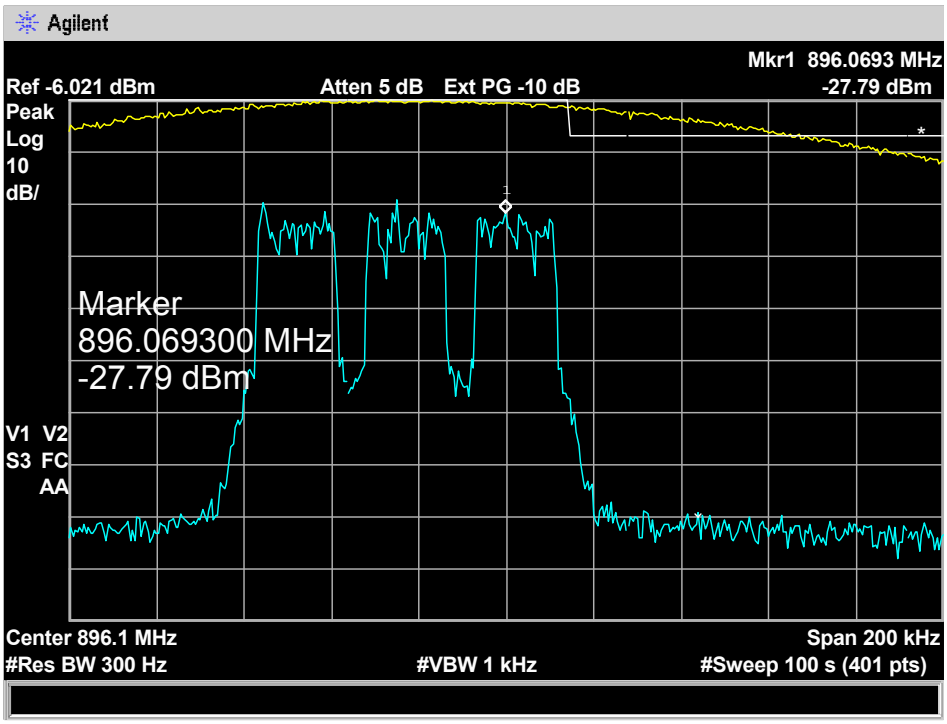
WiDEN75 Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.70



WiDEN75 Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.71

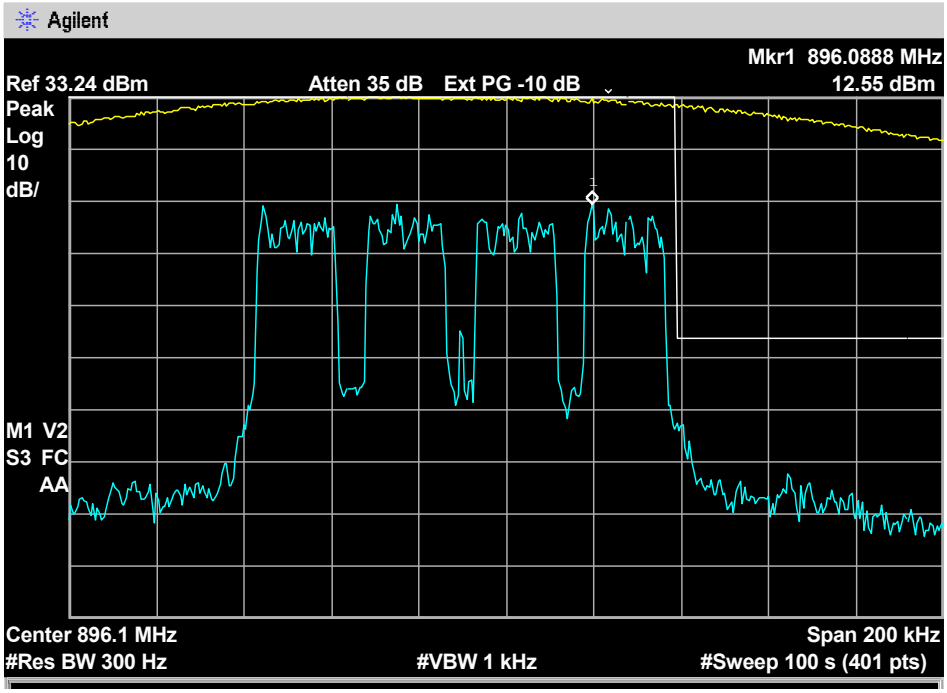


WiDEN75 Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.72

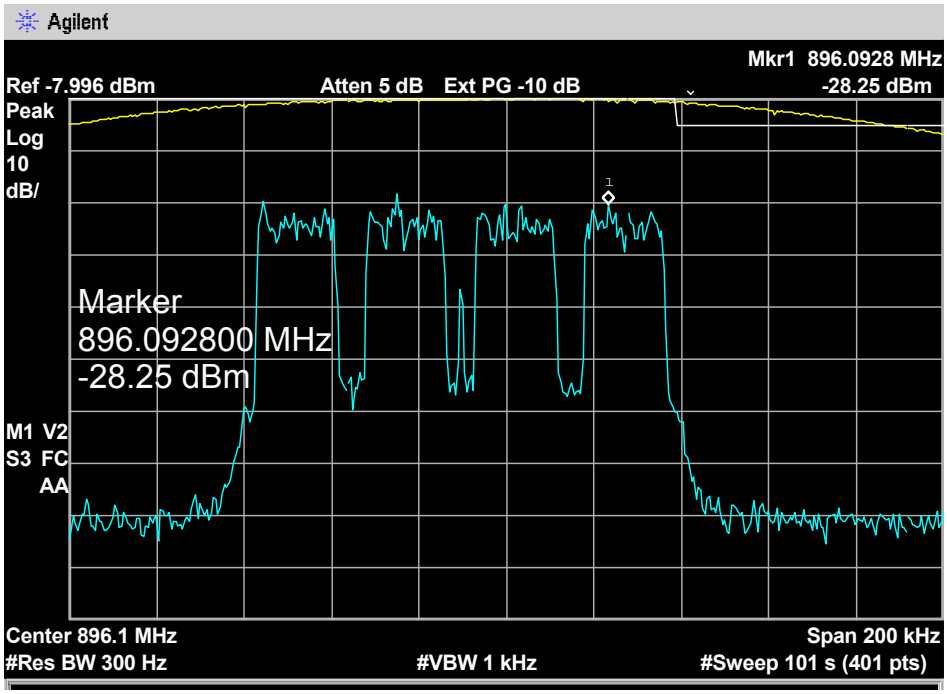


900 MHz Band Operation Measured Data – Emission Designator 938K3D7D
FCC Limits per 47 CFR 90.669(a)

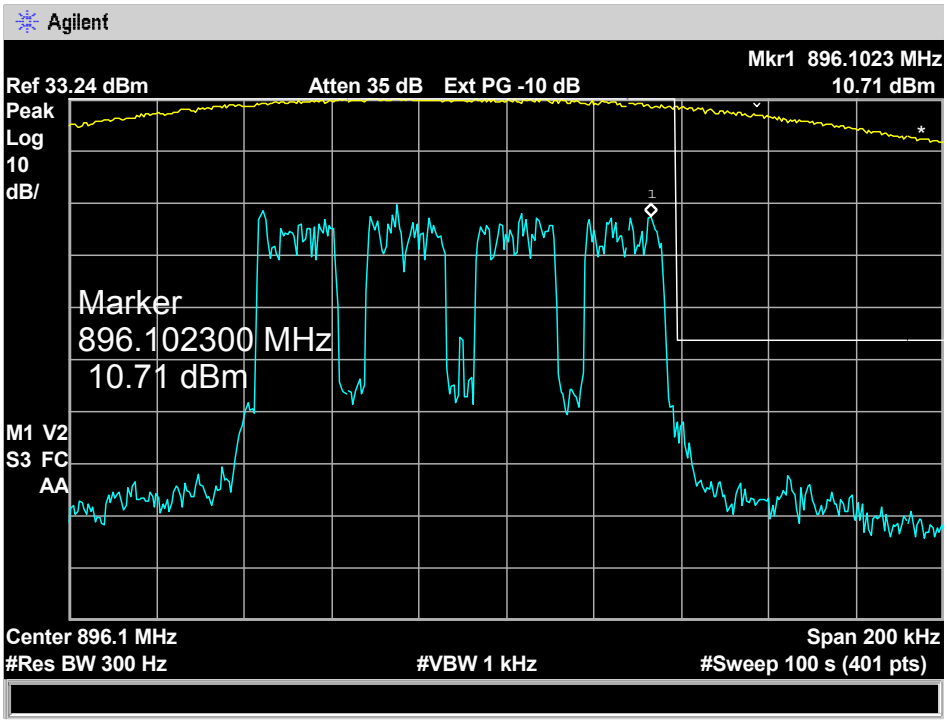
WiDEN100 Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.73



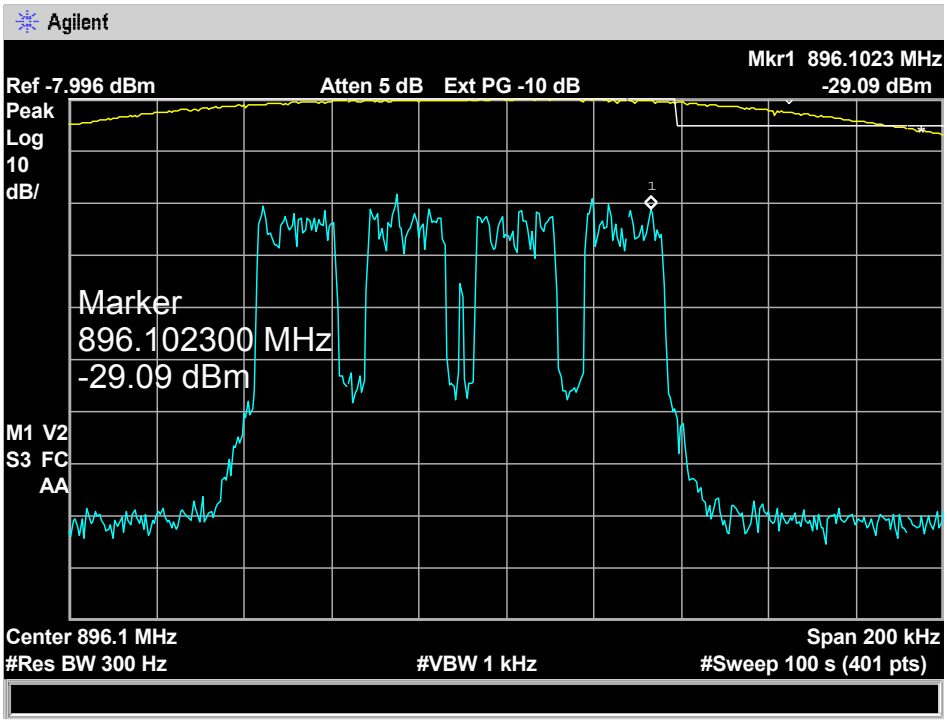
WiDEN100 Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.74



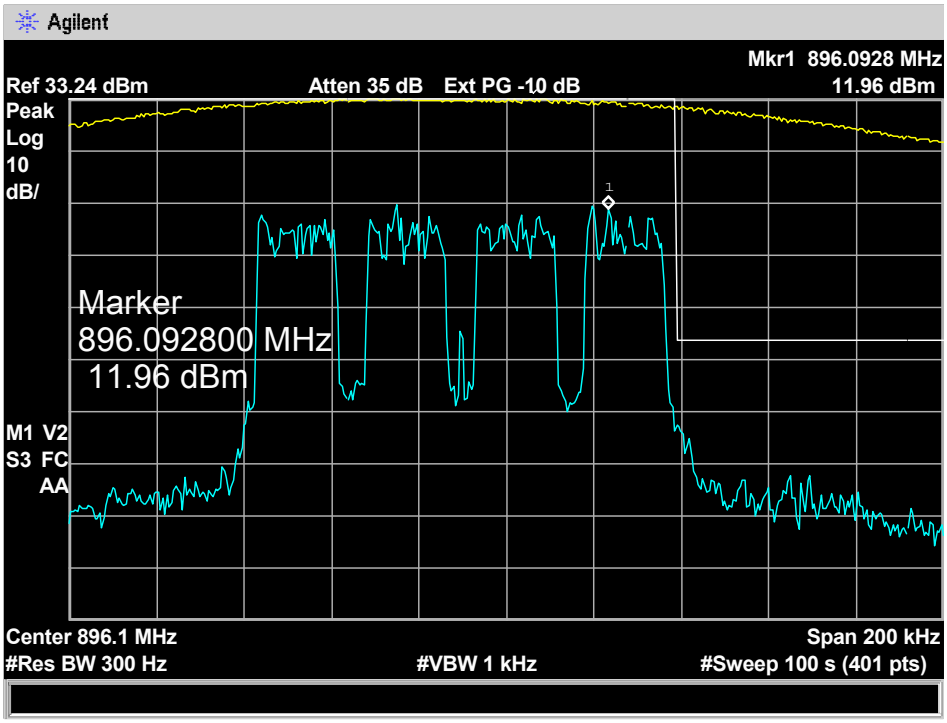
WiDEN100Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.75



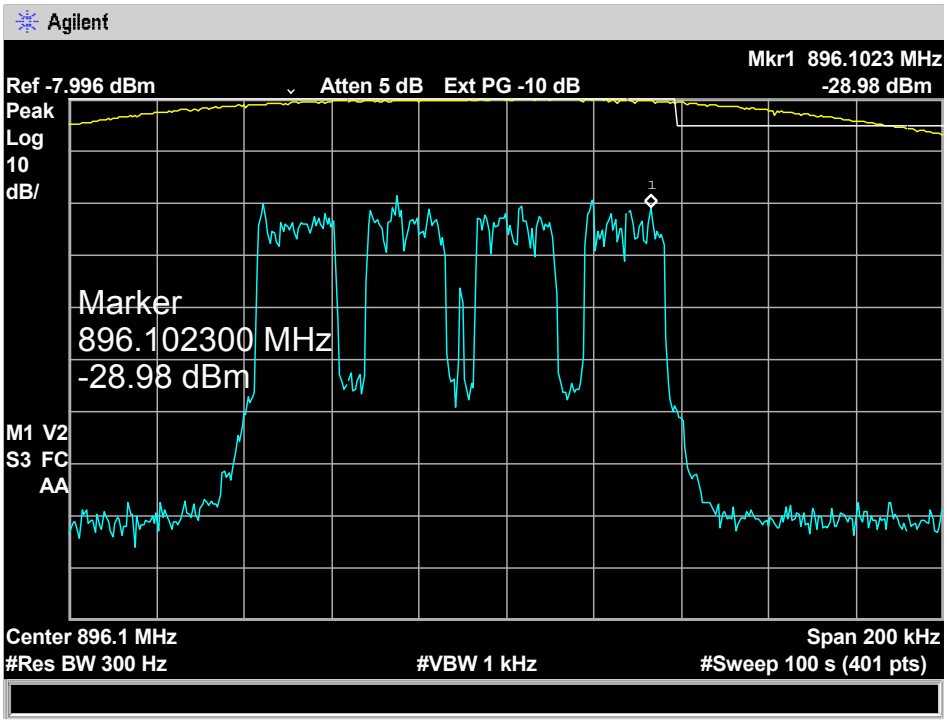
WiDEN100 Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.76



WiDEN100 Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.77

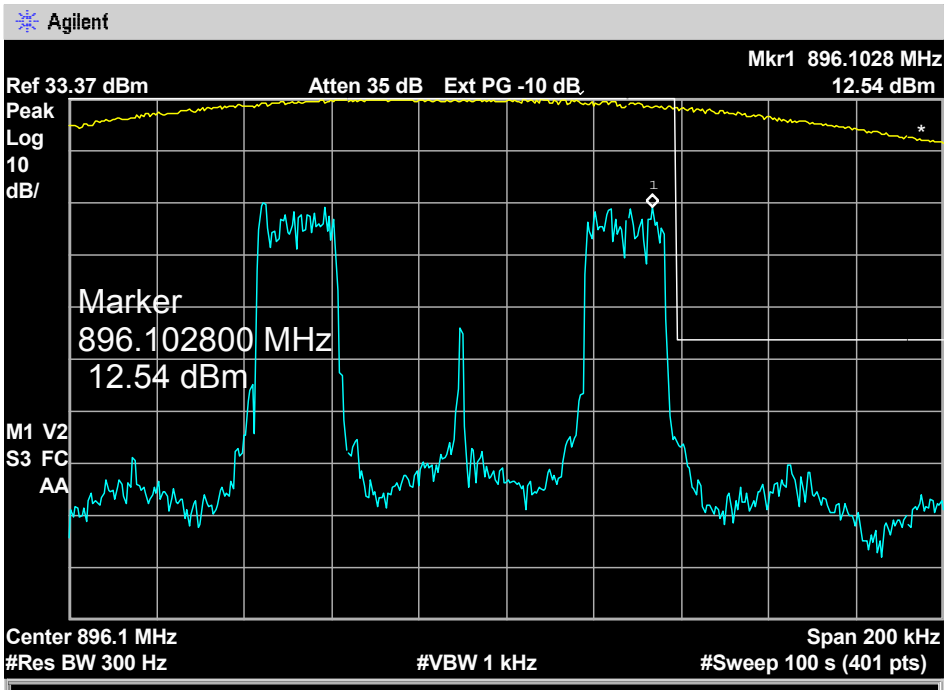


WiDEN100 Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.78

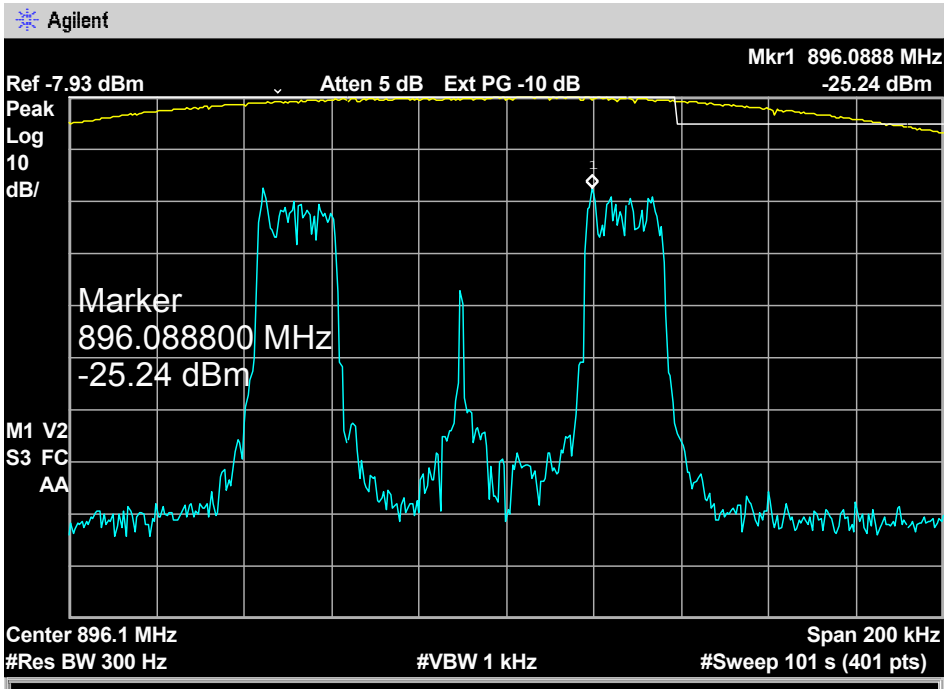


900 MHz Band WiDEN50 Split Operation Measured Data
FCC Limits per 47 CFR 90.669(a)

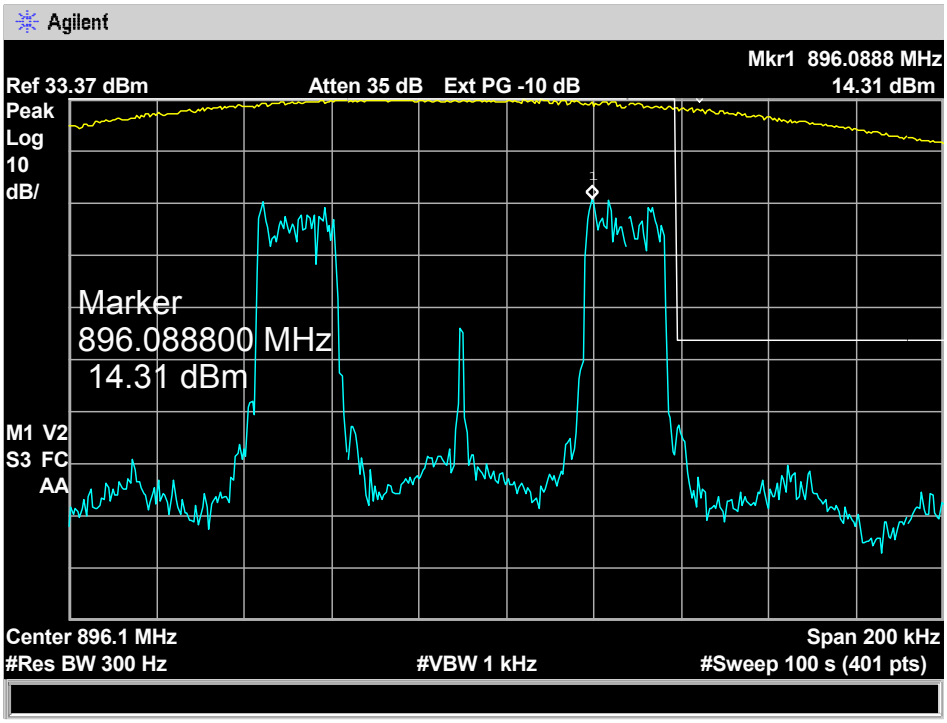
WiDEN50 Split Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.79



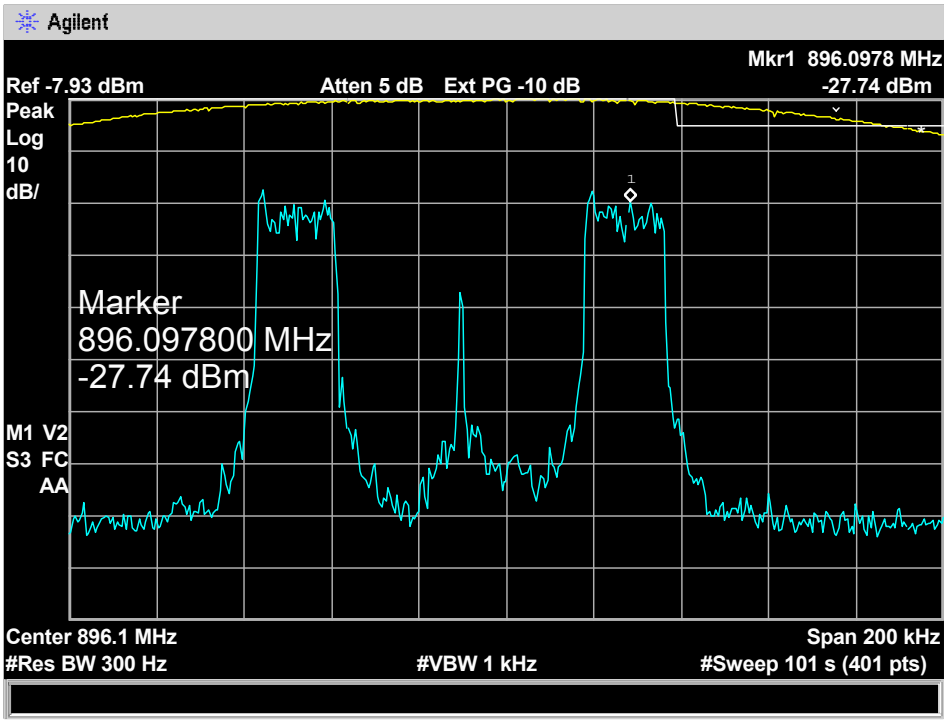
WiDEN50 Split Quad-QPSK Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.80



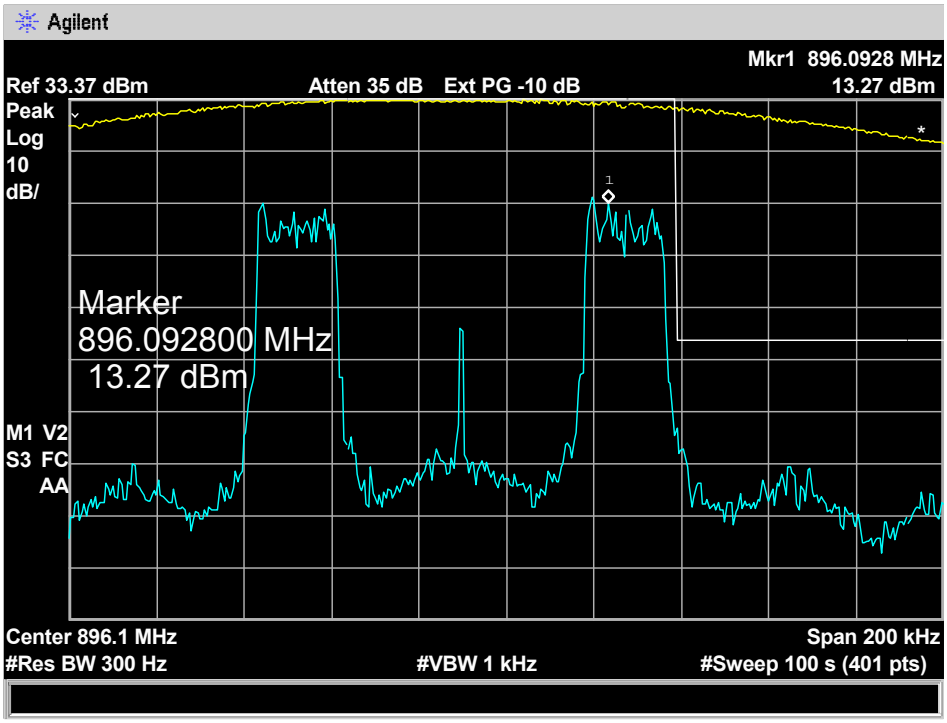
WiDEN50 Split Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.81



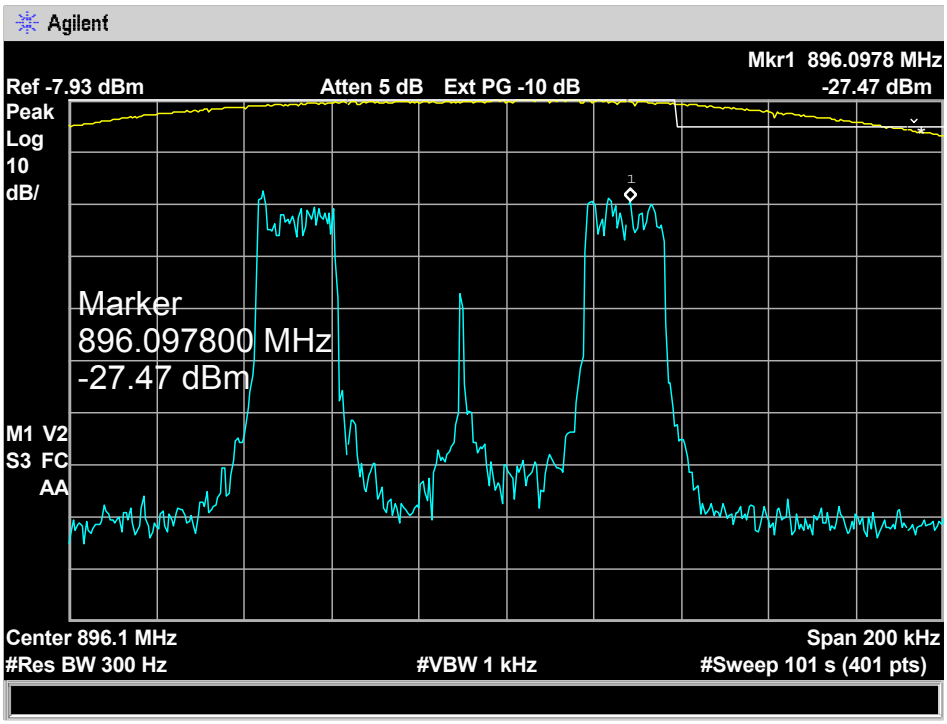
WiDEN50 Split Quad-16QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.82



WiDEN50 Split Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Maximum Power setting)
Plot 5.83



WiDEN50 Split Quad-64QAM Modulation performance relative to mask 47 CFR 90.669(a)
(Minimum Power setting)
Plot 5.84



5.2. Radiated Spurious Emissions

Reference document:	**47 CFR §2.1049(h), §2.1053, §90.210(g) (3), §90.691(a) (2)**		
Test Requirements:	Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, under normal conditions of installation and operation. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows: On any frequency removed from the center of the authorized bandwidth by more than 250% of the authorized bandwidth: At least 43 +10 log (P) dB. For any frequency removed from the EA licensee's frequency block greater than 37.5kHz, the power of any emission shall be attenuated below the transmitter power (P) in Watts by at least 43 log (P) dB, effective **limit –13dBm** for any transmitter power level.		
Test setup:	See Sec. 2.4	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Appendix A: Plot 1- Plot 28	

Test results

Frequency [MHz]	Measured Field Strength [dBµV/m]	Measured Power [dBm]	Limit [dB]	Margin [dB]
Fundamental frequency: 806.0625 MHz				
1612.125	48.67	-47.79	-13	-34.79
2418.188	59.71	-28.42	-13	-15.42
3224.25	37.4	-50.47	-13	-37.47
Fundamental frequency: 813.5625 MHz				
1627.125	48.94	-48.09	-13	-35.09
2440.688	54.41	-33.52	-13	-20.52
3254.25	38.05	-49.17	-13	-36.17
Fundamental frequency: 824.9875 MHz				
1649.975	48.44	-47.77	-13	-34.77
2474.963	55.53	-32.64	-13	-19.64
3299.95	39.3	-47.97	-13	-34.97
Fundamental frequency: 896.01875 MHz				
1792.038	44.66	-50.22	-13	-37.22
2688.056	52.9	-37.66	-13	-24.66
3584.075	42.7	-50.57	-13	-37.57
Fundamental frequency: 898.51875MHz				
1797.038	45.52	-49.42	-13	-36.42
2695.556	51.78	-38.86	-13	-25.86
3594.075	41.31	-51.37	-13	-38.37
Fundamental frequency: 901.98125MHz				
1803.963	43.82	-51.02	-13	-38.02
2705.944	52.64	-37.97	-13	-24.97
3607.925	40.71	-51.97	-13	-38.97

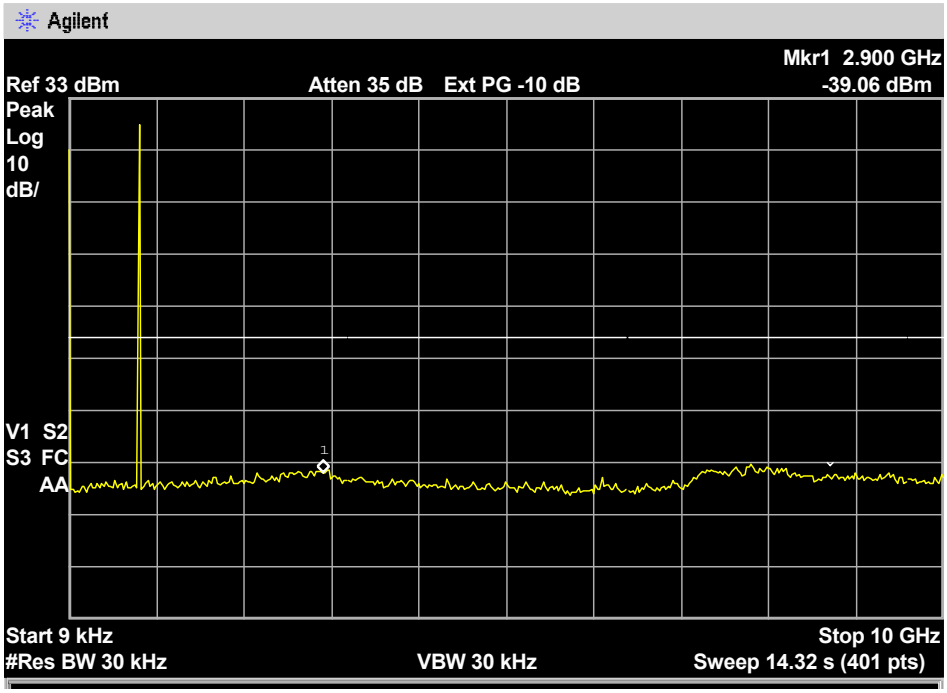
5.3. Conducted Spurious Emission

Reference document:	**47 CFR §2.1051, 2.1057, 90.210(g) and 90.691**		
Test Requirements:	The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. The power of any emission shall be attenuated below the transmitter power (P) in Watts by at least 43 +10 log (P) dB, effective **limit –13dBm** for any transmitter power level. The magnitude of spurious emissions, which are attenuated more than 20dB below the permissible value, need not be specified.		
Test setup:	See Sec. 2.5	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings	f <1GHz: RBW: 30kHz,VBW: 30kHz f >1GHz: RBW: 1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	Plots 5.1 to Plot 5.6	

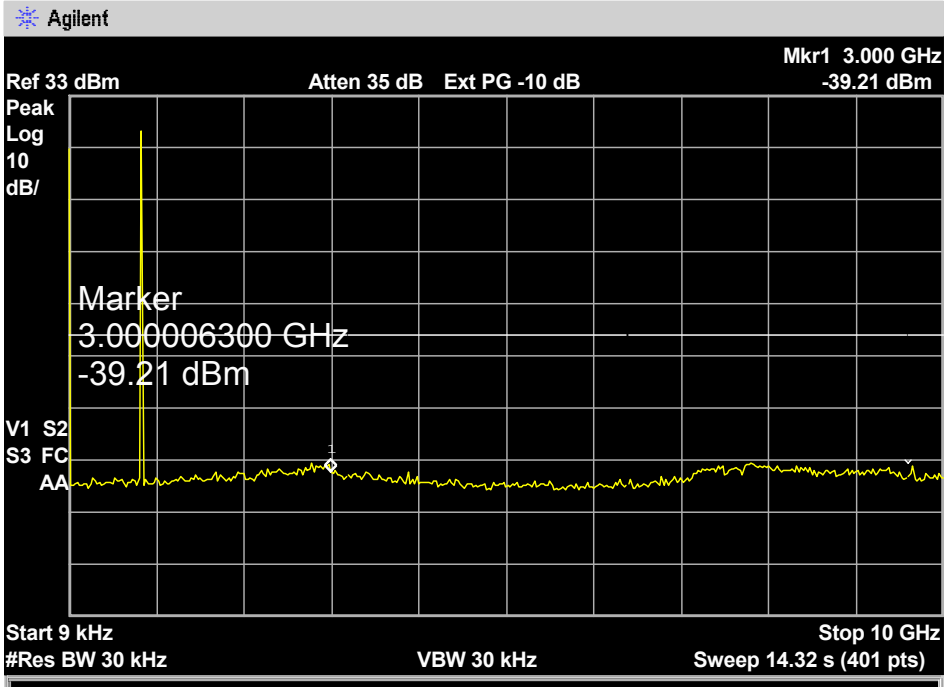
Test results

Harmonic	Frequency [MHz]	Measured Power [dBm]	Margin [dB]
Fundamental frequency: 806.0625 MHz			
2nd to 10th	All	< -33	>20dB
Fundamental frequency: 813.56250 MHz			
2nd to 10th	All	< -33	>20dB
Fundamental frequency: 824.9875MHz			
2nd to 10th	All	< -33	>20dB
Fundamental frequency: 896.018755MHz			
2nd to 10th	All	< -33	>20dB
Fundamental frequency: 898.51875 MHz			
2nd to 10th	All	< -33	>20dB
Fundamental frequency: 900.98125 MHz			
2nd to 10th	All	< -33	>20dB

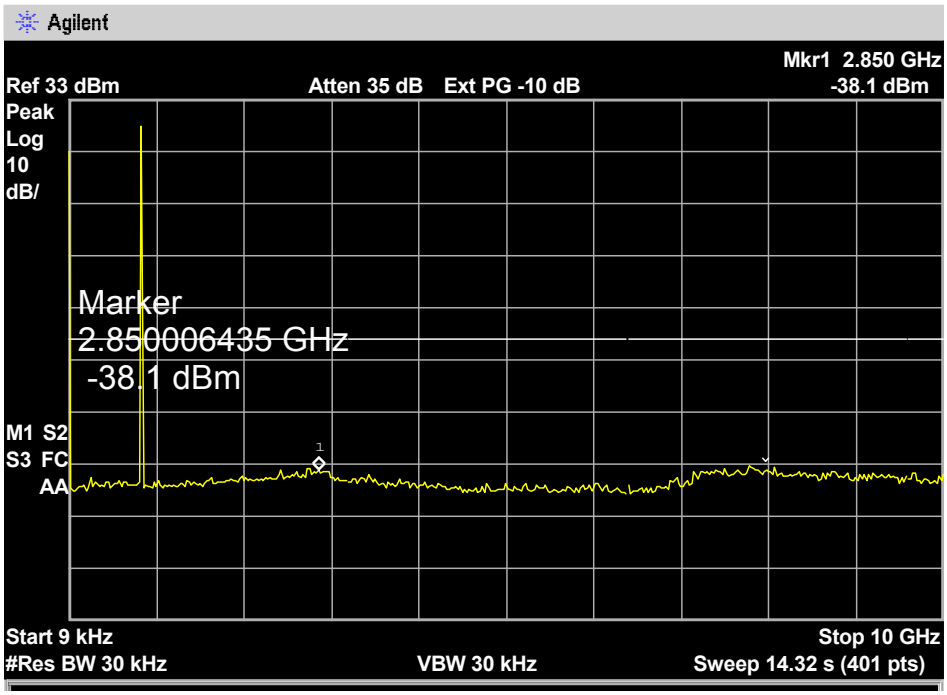
Fundamental Frequency: 806.0625 MHz
Plot 5.1



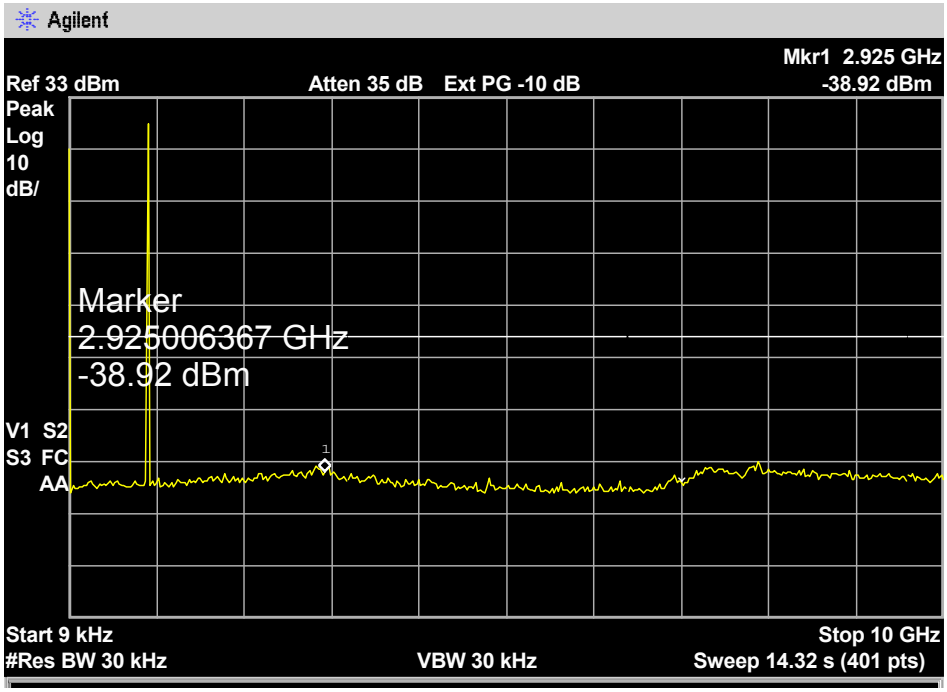
Fundamental Frequency: 813.56250 MHz
Plot 5.2



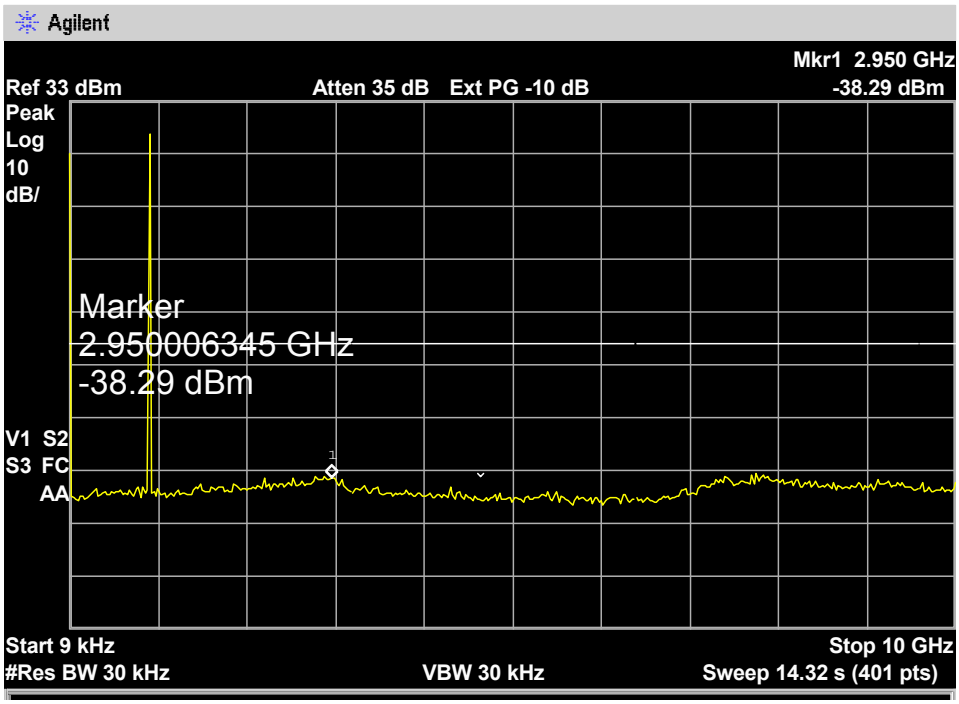
Fundamental Frequency 824.9875 MHz
Plot 5.3



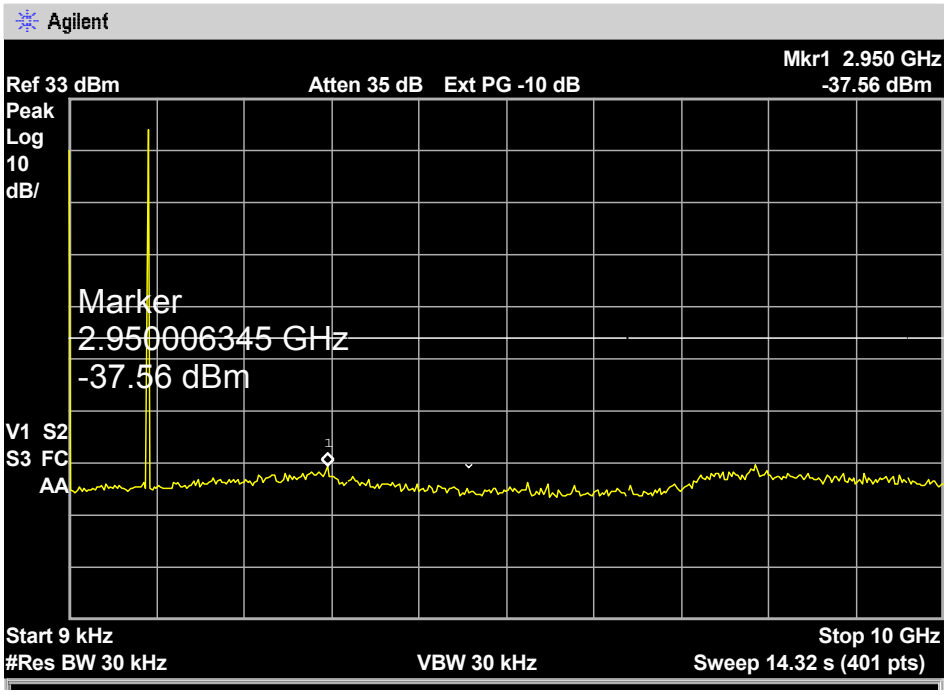
Fundamental Frequency: 896.018755 MHz
Plot 5.4



Fundamental Frequency: 898.51875 MHz
Plot 5.5



Fundamental Frequency: 900.98125 MHz
Plot 5.6



5.4. Frequency stability

Reference document:	**47 CFR §2.1055(a) (1)& (b), §2.1055(d) (2), and §90.213**		
Test Requirements:	The frequency stability shall be measured with variations of ambient temperature from -30°C to +50°C. Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of 10°C. The frequency stability shall be measured with variations of primary supply voltage to the battery-operating end point, which shall be specified by the manufacturer.		
Test setup:	See Sec. 2.8	**Pass**	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	-	

Test results

iDEN 900
Frequency Stability vs. Voltage

Voltage [V]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Test Result
Carrier frequency at 22°C (7.2VDC): 898.51875MHz					
7.2 - 8.3	No Frequency Error Appeared			1.5	Pass

AFC Frequency error vs. Temperature

Temperature [°C]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Margin [ppm]
Carrier frequency at 22°C (7.2VDC): 898.51875MHz					
-30	335	0.0000178191	0.178191489	1.5	Pass
-20	500	0.0000265957	0.265957447	1.5	Pass
-10	525	0.0000279255	0.279255319	1.5	Pass
0	205	0.0000109043	0.109042553	1.5	Pass
10	-106	-0.0000056383	-0.056382979	1.5	Pass
20	-5	-0.0000002660	-0.002659574	1.5	Pass
30	60	0.0000031915	0.031914894	1.5	Pass
40	129	0.0000068617	0.068617021	1.5	Pass
50	205	0.0000109043	0.109042553	1.5	Pass

iDEN 800
AFC Frequency error vs. Voltage

Voltage [V]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Test Result
Carrier frequency at 22°C (7.2VDC): 813.5625 MHz					
7.2-8.3	No Frequency Error Appeared			2.5	Pass

AFC Frequency error vs. Temperature

Temperature [°C]	Frequency Error [Hz]	Frequency Error [%]	Frequency Error [ppm]	Limit [ppm]	Margin [ppm]
Carrier frequency at 22°C (7.2VDC): 813.5625 MHz					
-30	315	0.0000167553	0.167553191	2.5	Pass
-20	405	0.0000215426	0.215425532	2.5	Pass
-10	485	0.0000257979	0.257978723	2.5	Pass
0	151	0.0000080319	0.080319149	2.5	Pass
10	-85	-0.0000045213	-0.045212766	2.5	Pass
20	-7	-0.0000003723	-0.003723404	2.5	Pass
30	9	0.0000004787	0.004787234	2.5	Pass
40	15	0.0000007979	0.007978723	2.5	Pass
50	17	0.0000009043	0.009042553	2.5	Pass

5.5. Effective Radiated Power (ERP)

Reference document:	**47 CFR §2.947(c), §90.635(d)**		
Test Requirements:			
Test setup:	See Sec. 2.3	**Pass**	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	-	

Test results

Frequency [MHz]	Signal Source* [dBm]	Reference Antenna Gain [dBd]	ERP Peak [dBm]	ERP Peak [Watt]	ERP Pulse Average** [Watt]	Peak Conducted RF Power @ Antenna Port [dBm]	Average** Conducted RF Power @ Antenna Port [dBm]
806.0625	27.25	5.06	32.31	1.70	0.47	33.92	28.32
813.5625	27.95	4.86	32.81	1.91	0.53	33.62	28.02
824.9875	27.25	4.76	32.01	1.59	0.44	33.92	28.32
896.01875	25.95	3.26	29.21	0.83	0.23	34.01	28.41
898.51875	26.15	3.26	29.41	0.87	0.24	33.87	28.27
901.98125	26.15	3.26	29.41	0.87	0.24	33.72	28.12

*Corrected for cable loss
* * The iDEN is characterized by transmission mode of one time slot allocated per frame with a duty-cycle of 16.67%. Therefore, the peak-to-average power ratio is 5.6dB. In order to calculate the Pulse Average Transmitted ERP, the peak-to-average ratio was subtracted from the peak result.

6. HC700-iDen Terminal docking into Cradle Model: F3158A configuration

6.1. Radiated Emission measurements

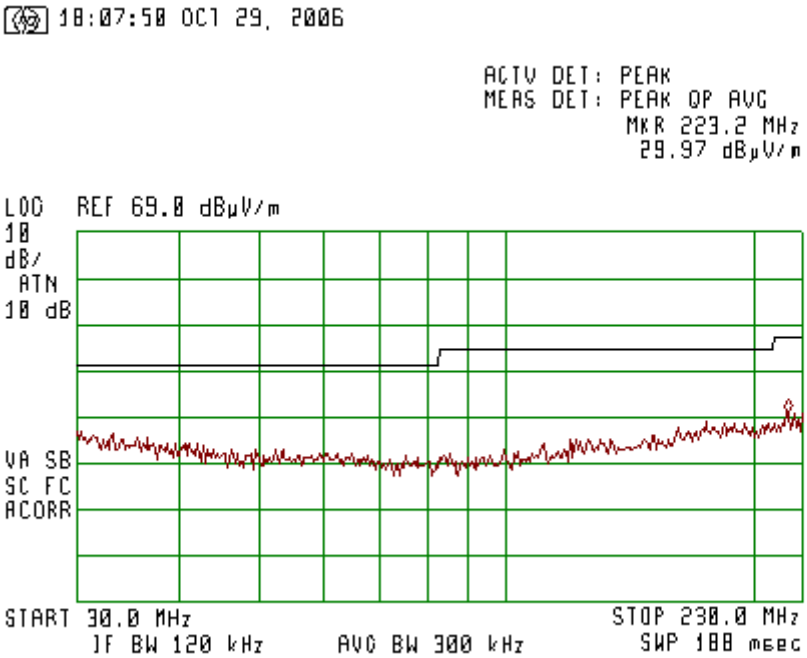
Reference document:	**47 CFR §15.109**		
Test Requirements:	The field strength of radiated emissions from an unintentional radiator shall not exceed the levels specified in §15.109		
Test setup:	See Sec. 2.7		
Operating conditions:	Under normal test conditions		
Method of testing:	Radiated		
S.A. Settings:	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 6.1.1-6.1.4	

Test Results:

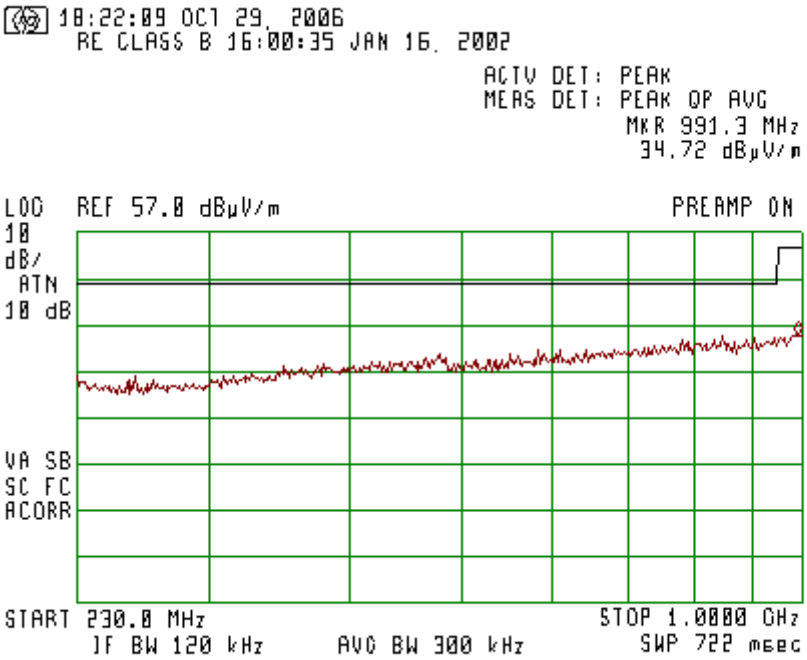
All QP readings were at least 10 dB below the limit.

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

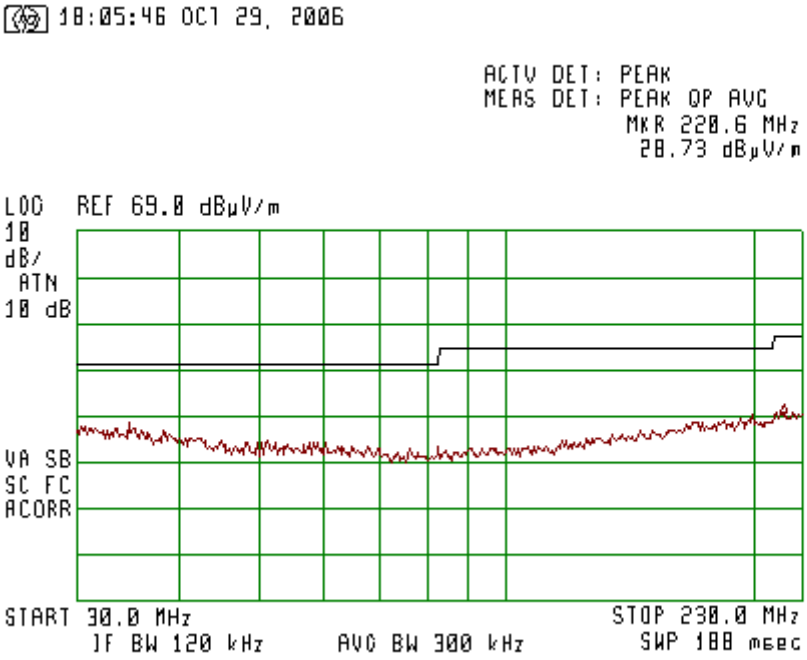
Plot 6.1.1
Horizontal Polarization
30MHz-230MHz



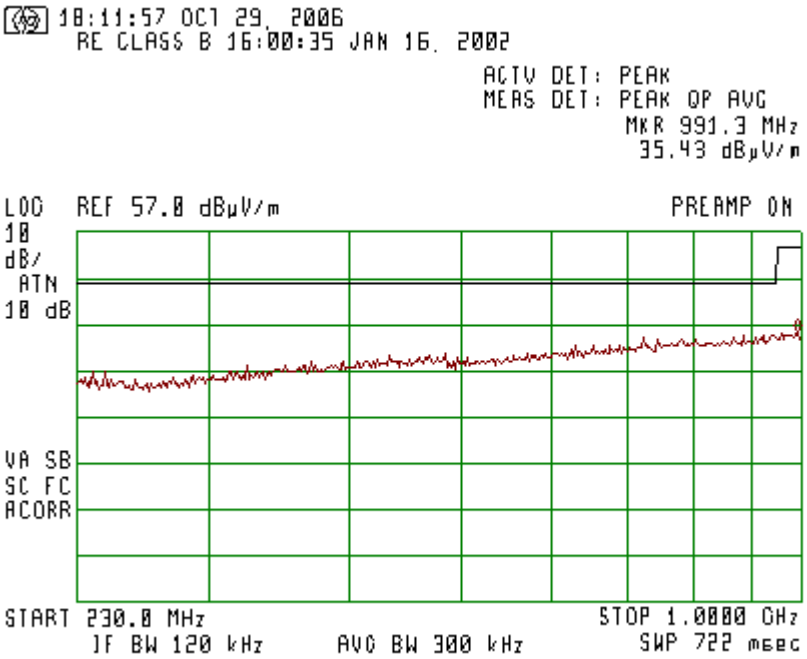
Plot 6.1.2
Horizontal Polarization
230MHz-1GHz



Plot 6.1.3
Vertical Polarization
30MHz-230MHz



Plot 6.1.4
Vertical Polarization
230MHz-1GHz



6.2. 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. 2.9		
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 6.2.1 to 6.2.2	

Test Results:

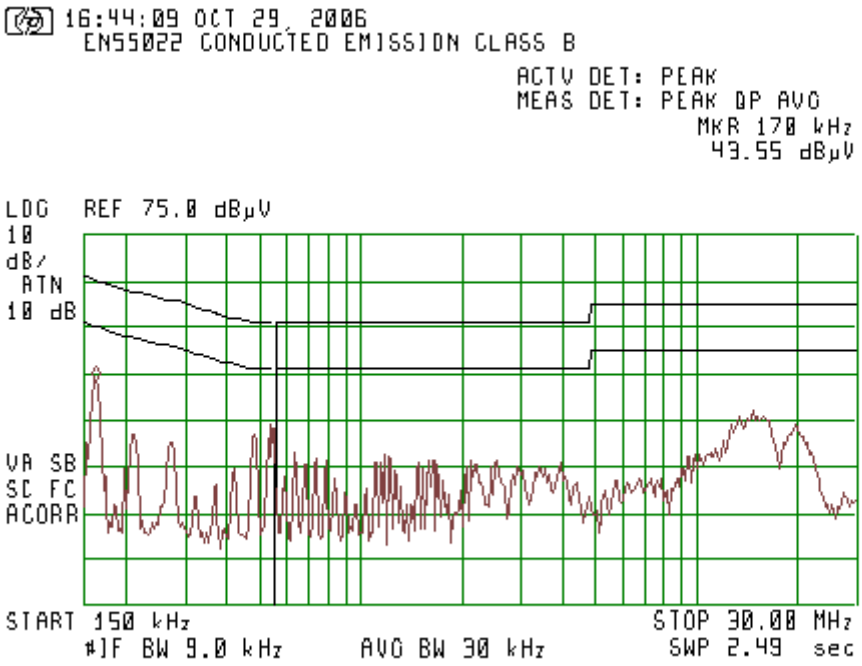
"Phase" Lead, 110 VAC

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

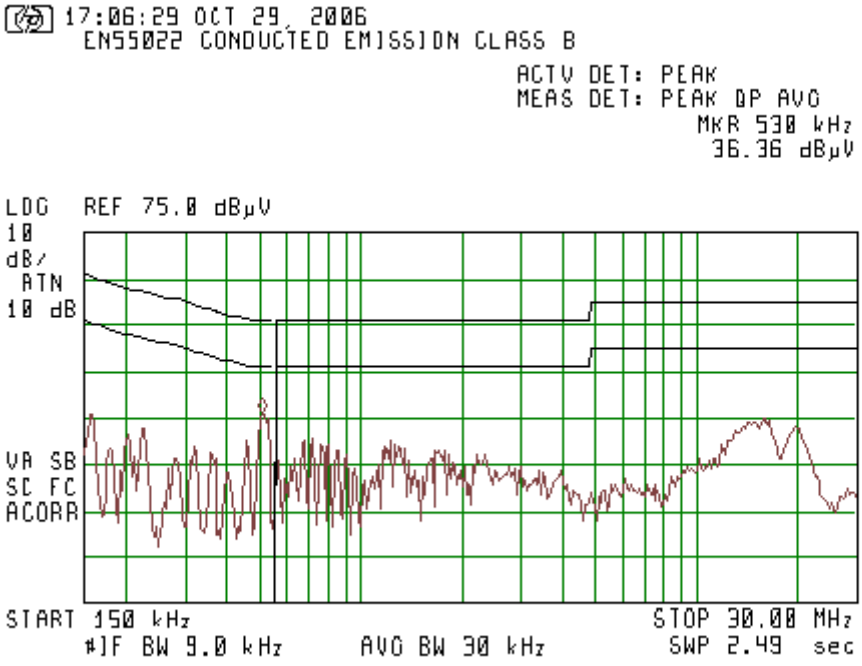
"Neutral" Lead, 110 VAC

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 6.2.1
Power Supply ports
150kHz – 30MHz
"Phase" Lead



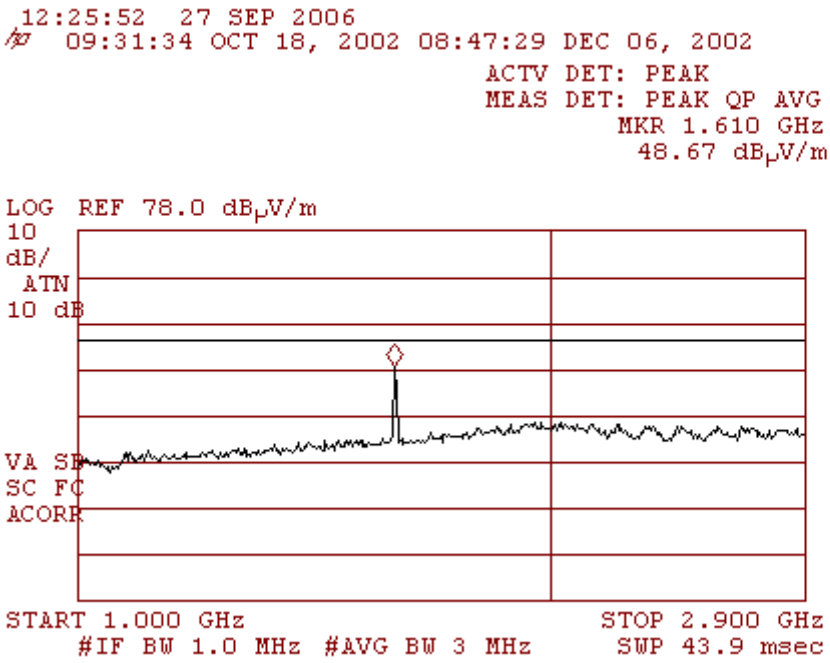
Plot 6.2.2
Power Supply ports
150kHz – 30MHz
"Neutral" Lead



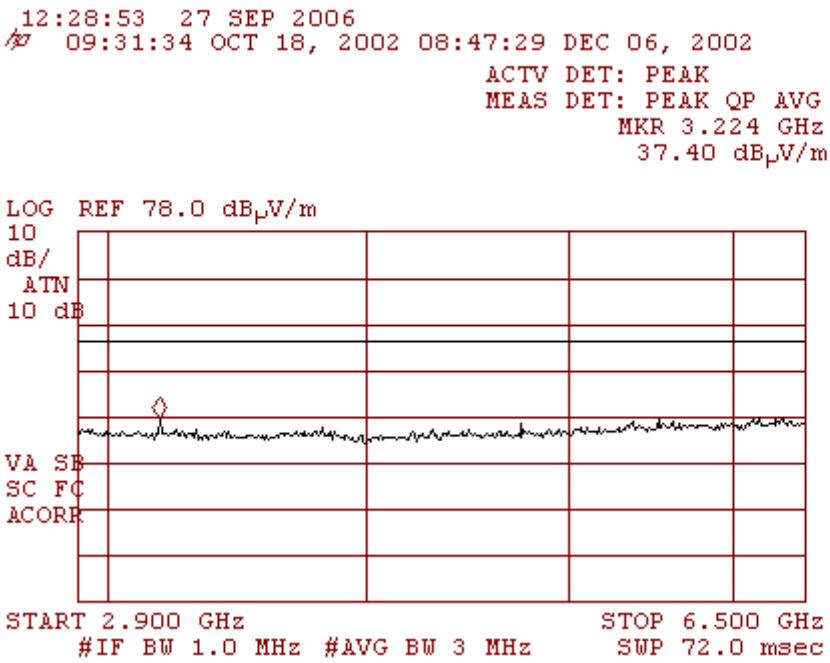
7. Appendix

Appendix A: Spurious emissions test plots

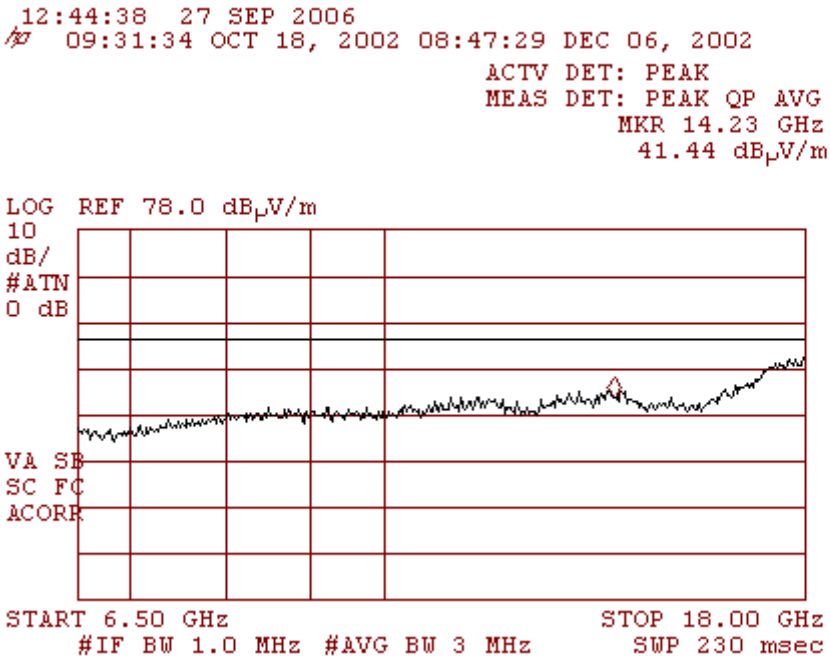
Simultaneously Operated: Bluetooth (2402 MHz) +iDen 800(806.0625MHz)
Lowest frequency
Horizontal & Vertical Polarization
Plot 1



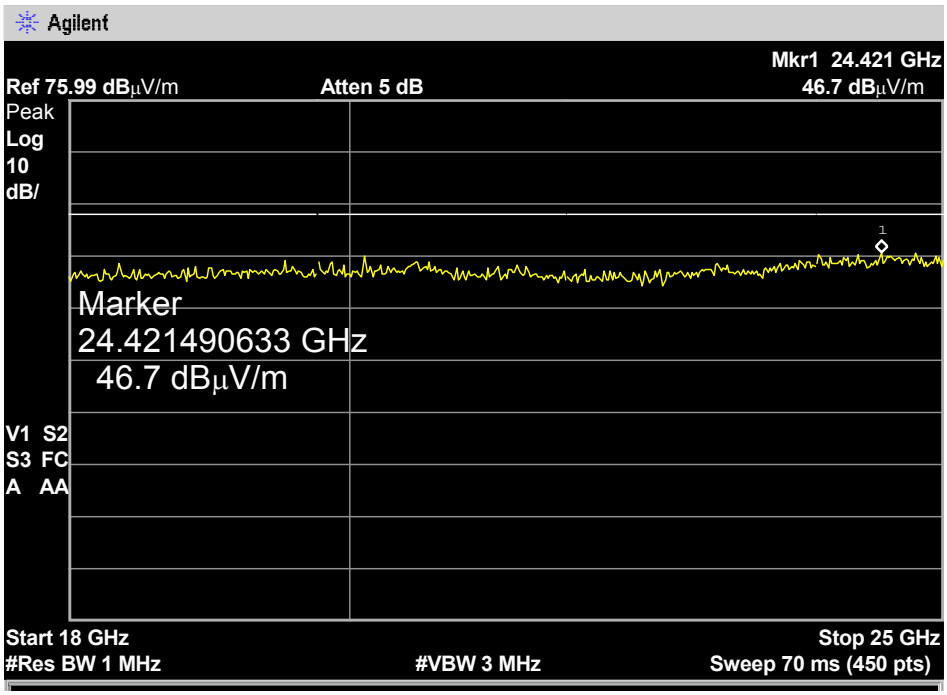
Horizontal & Vertical Polarization
Plot 2



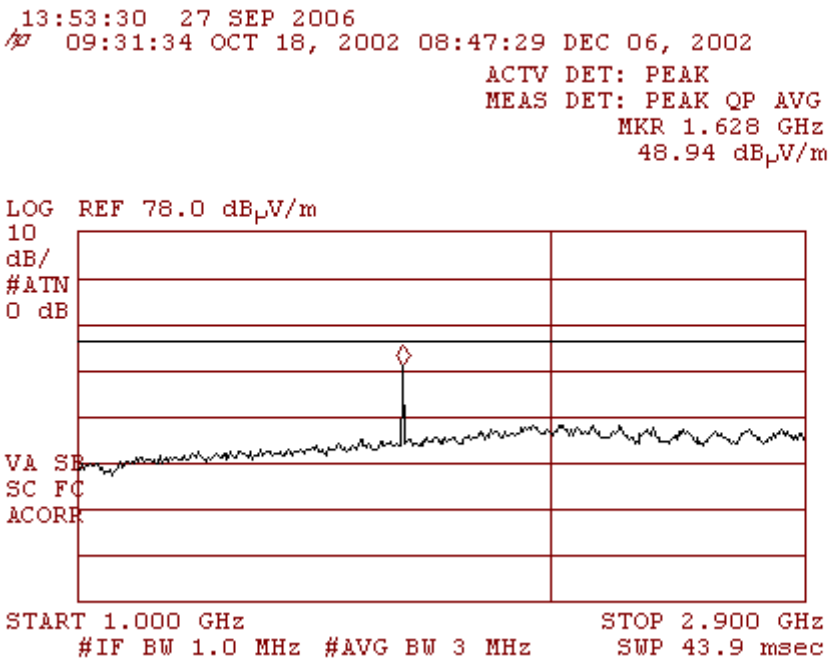
Horizontal & Vertical Polarization
Plot 3



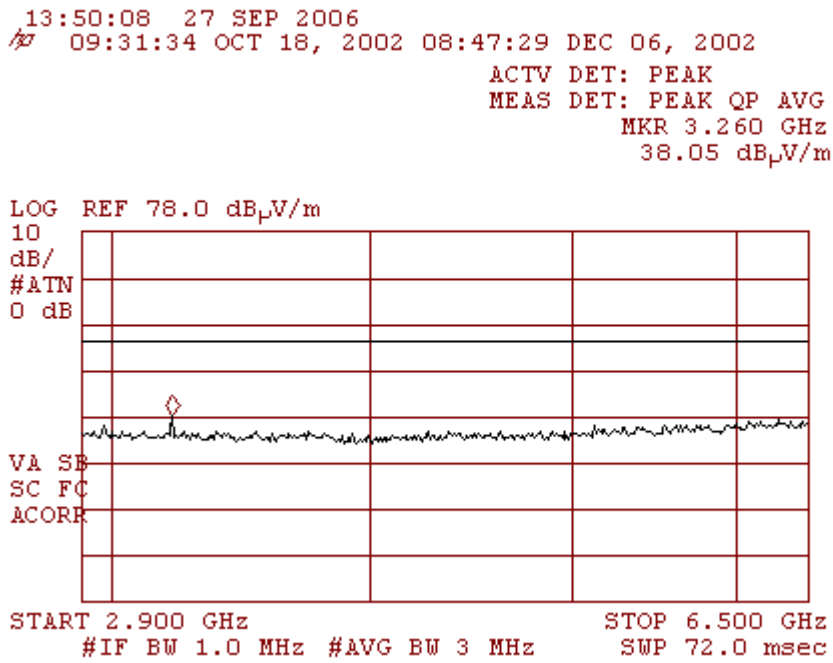
Horizontal & Vertical Polarization
Plot 4



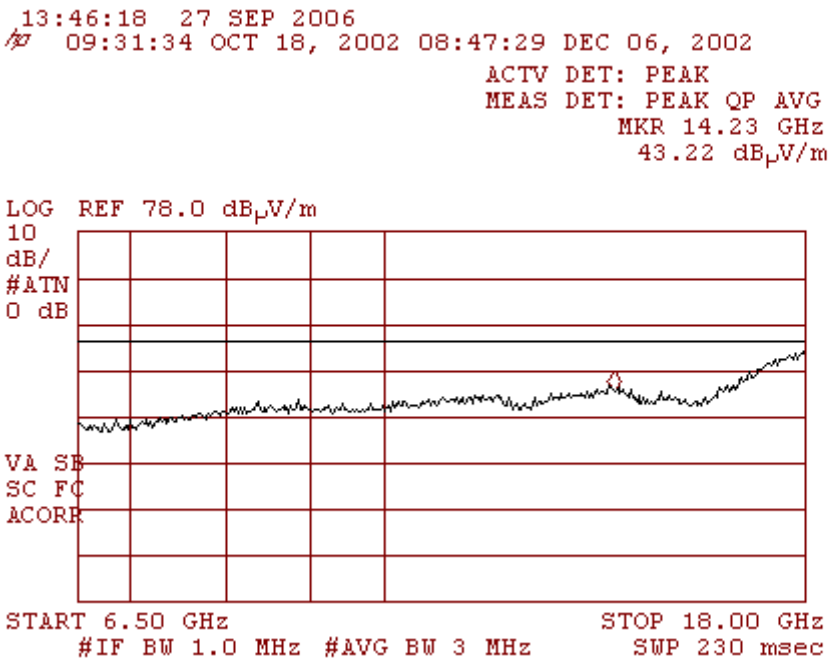
Middle frequency
Horizontal & Vertical Polarization
Plot 5



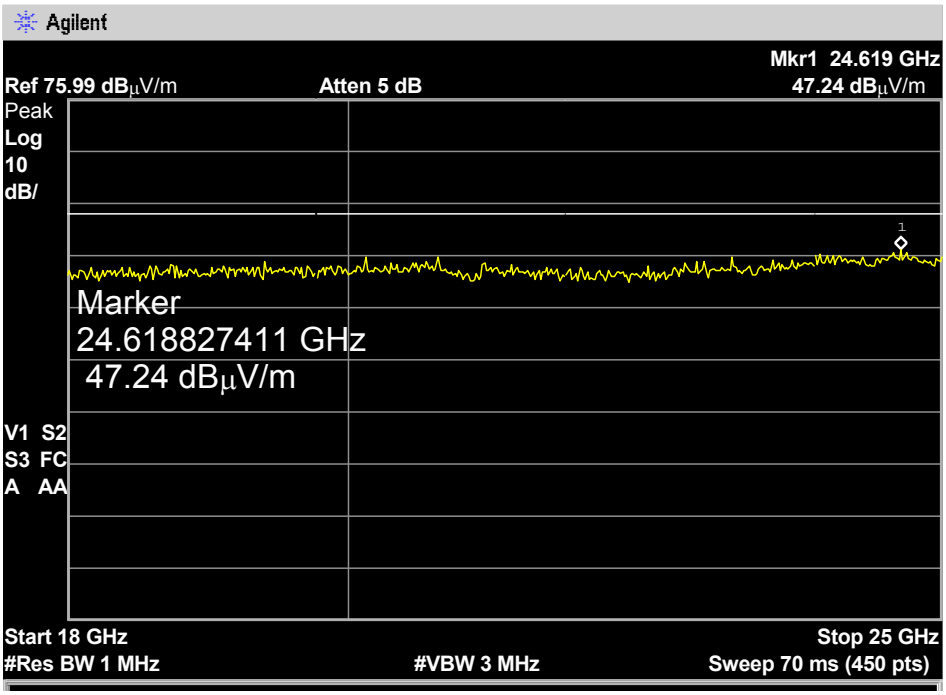
Horizontal & Vertical Polarization
Plot 6



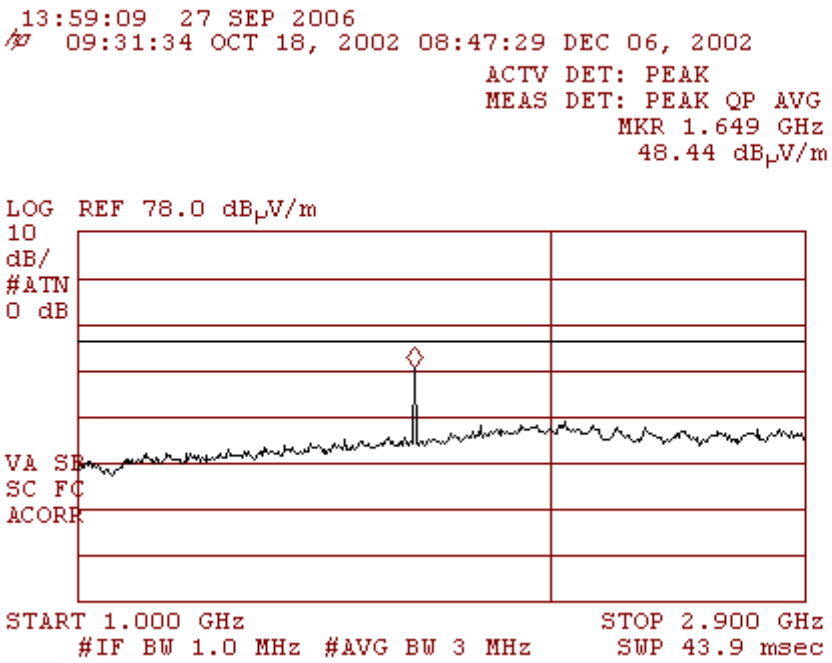
Horizontal & Vertical Polarization
Plot 7



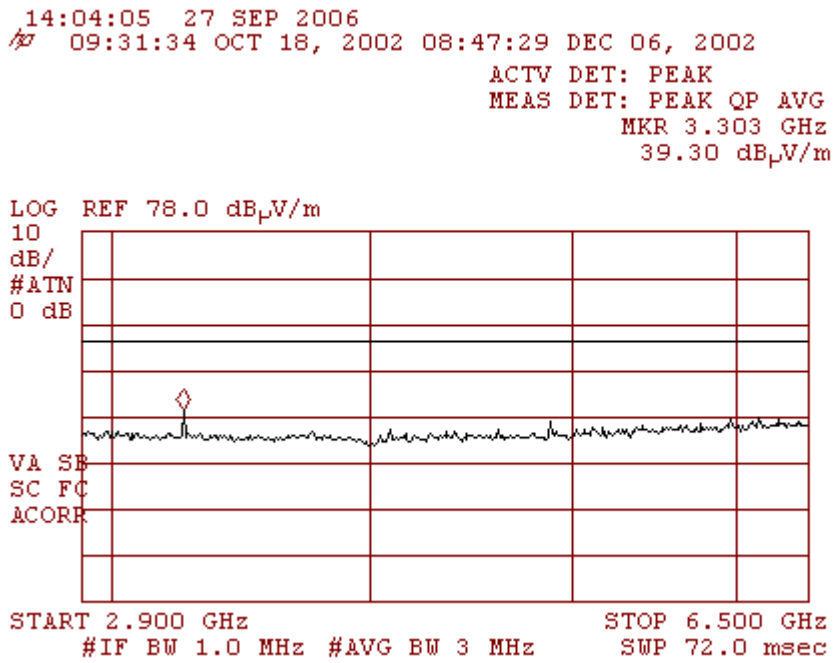
Horizontal & Vertical Polarization
Plot 8



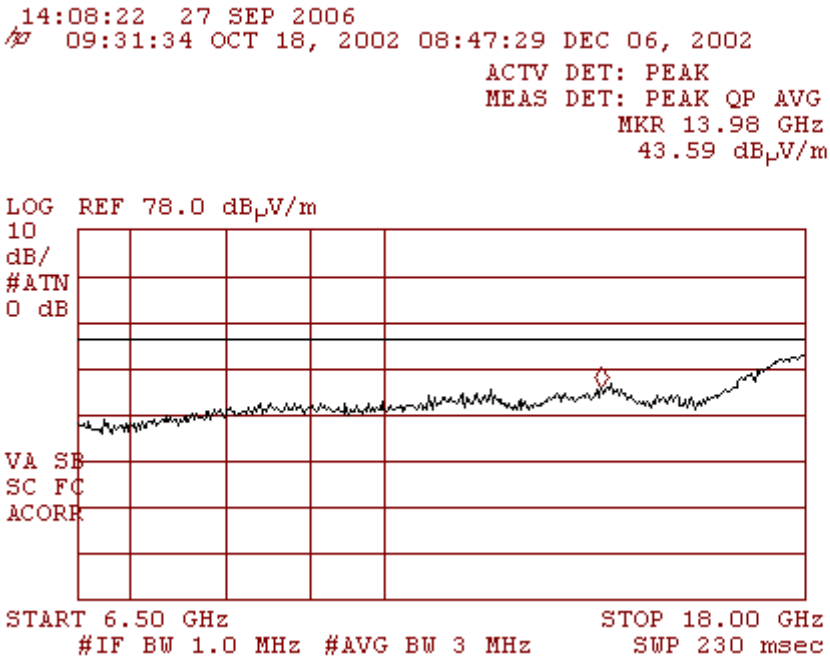
Highest frequency
Horizontal & Vertical Polarization
Plot 9



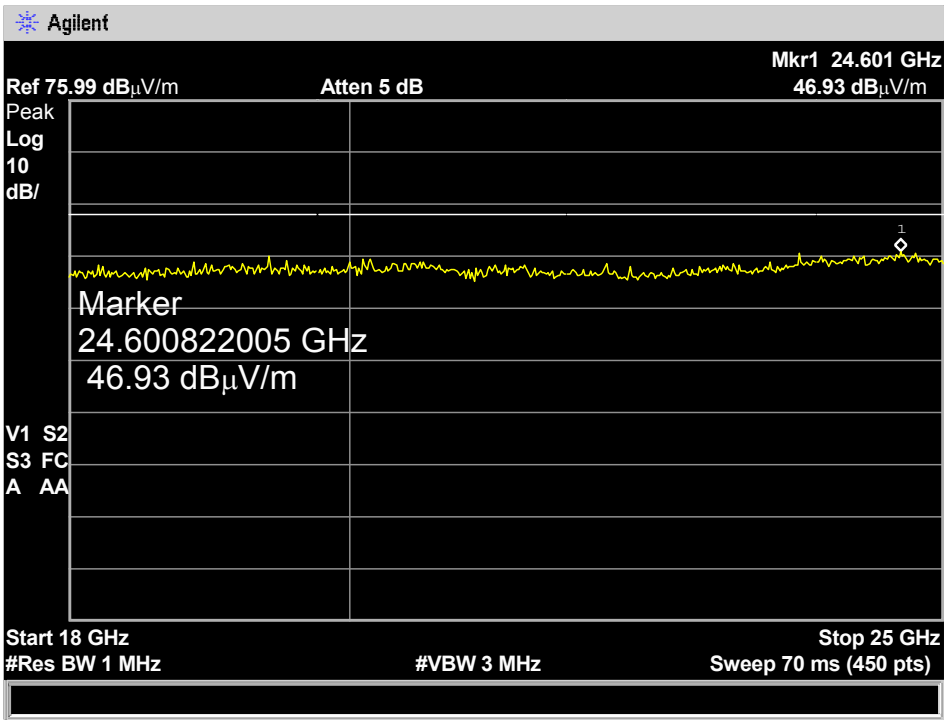
Horizontal & Vertical Polarization
Plot 10



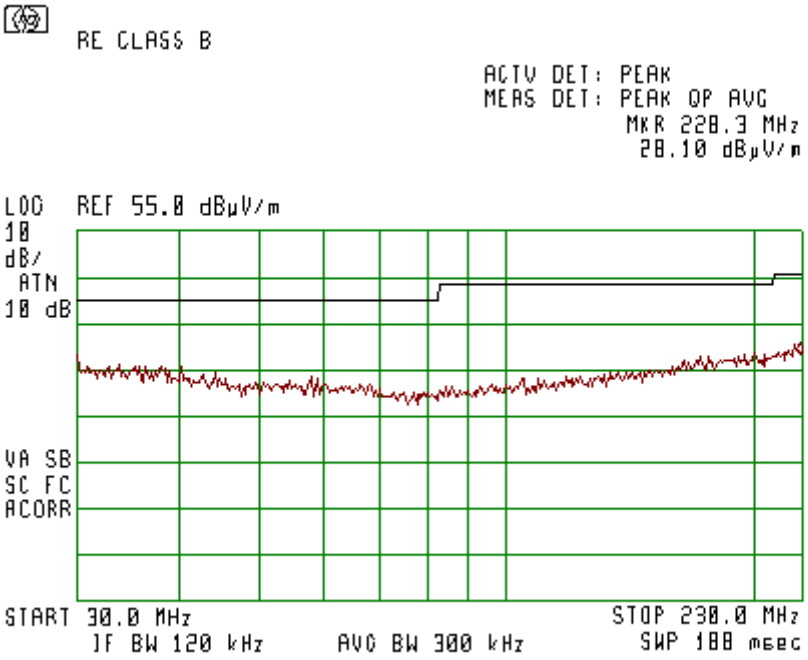
Horizontal & Vertical Polarization
Plot 11



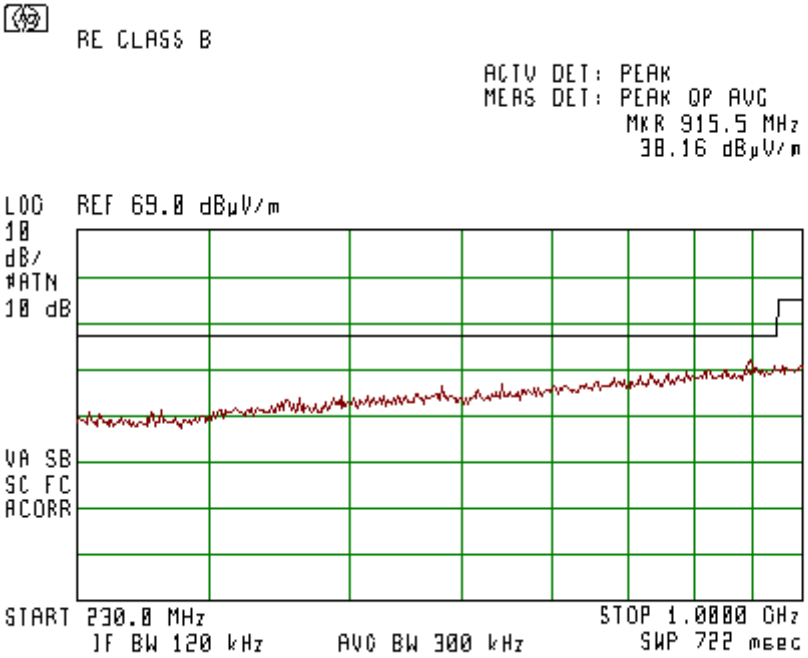
Horizontal & Vertical Polarization
Plot 12



Horizontal & Vertical Polarization 3 channels simultaneously
Plot 13

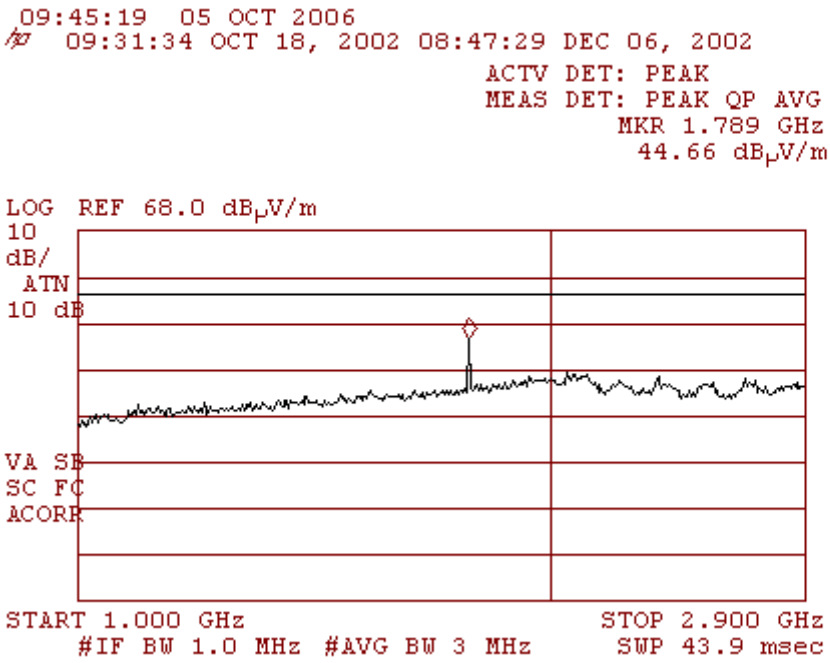


Horizontal & Vertical Polarization 3 channels simultaneously
Plot 14

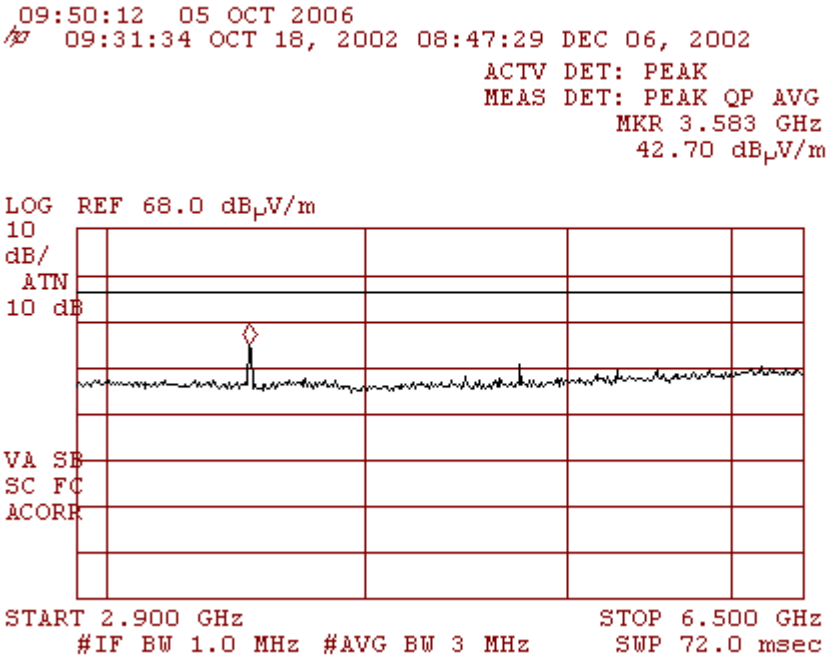


Simultaneously Operated: Bluetooth (2402 MHz) +iDen 900 (896.01875 MHz)

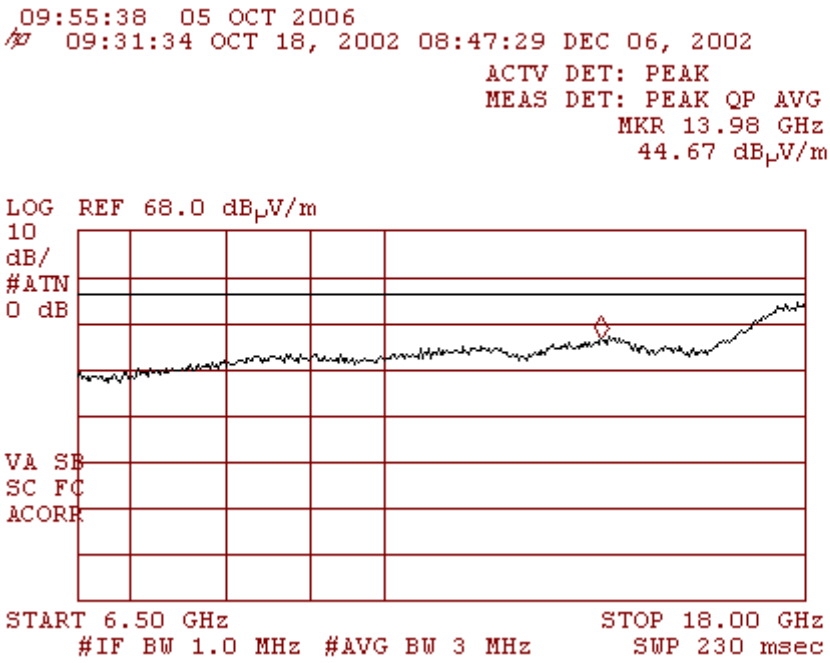
Lowest frequency
Horizontal & Vertical Polarization
Plot 15



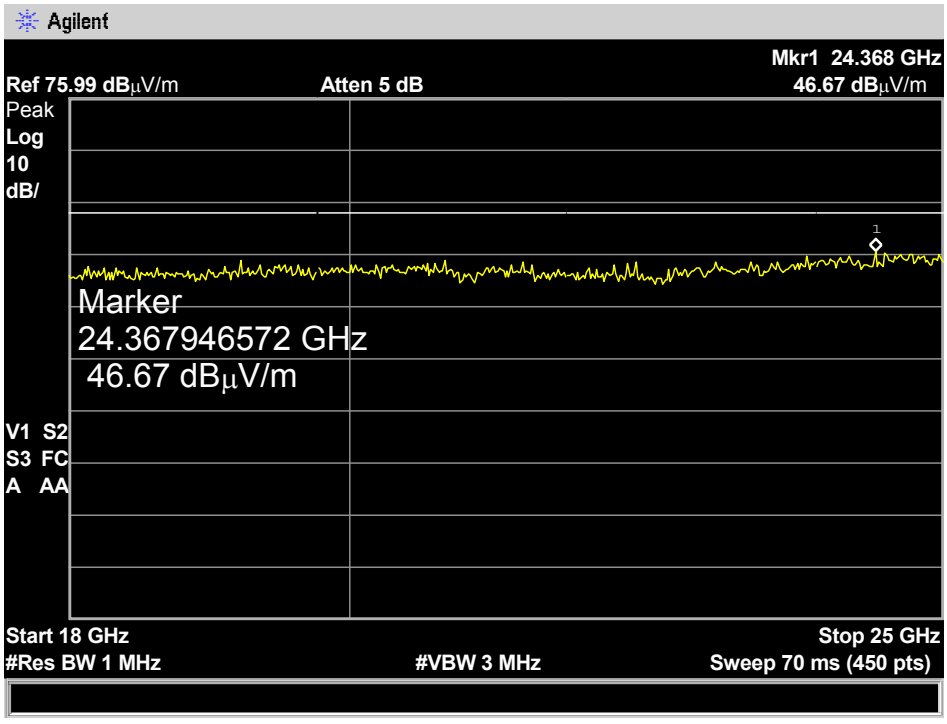
Horizontal & Vertical Polarization
Plot 16



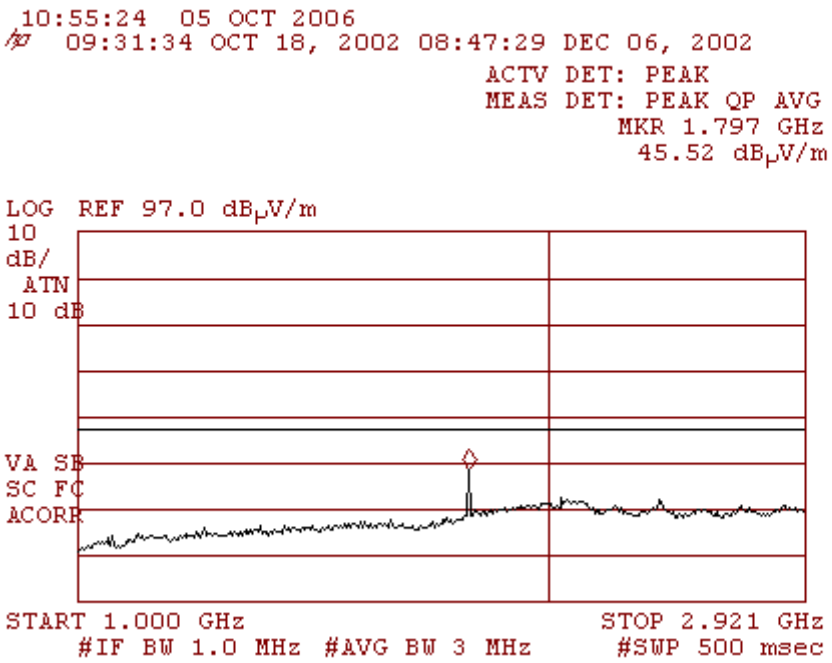
Horizontal & Vertical Polarization
Plot 17



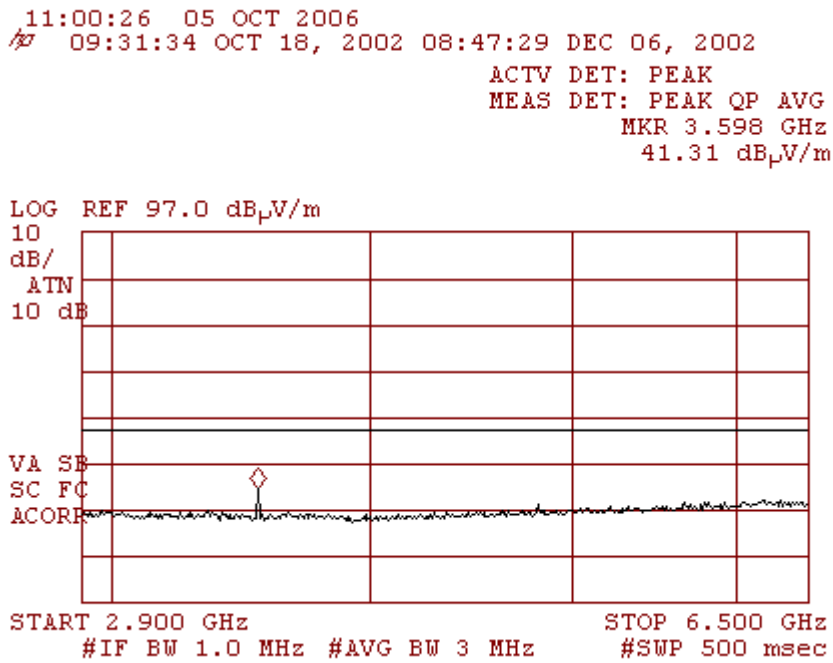
Horizontal & Vertical Polarization
Plot 18



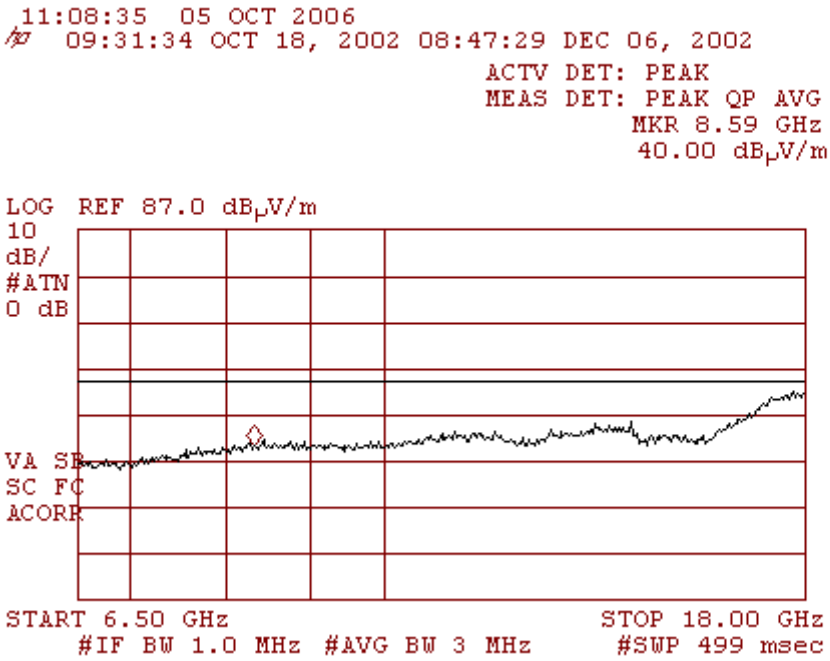
Middle frequency
Horizontal & Vertical Polarization
Plot 19



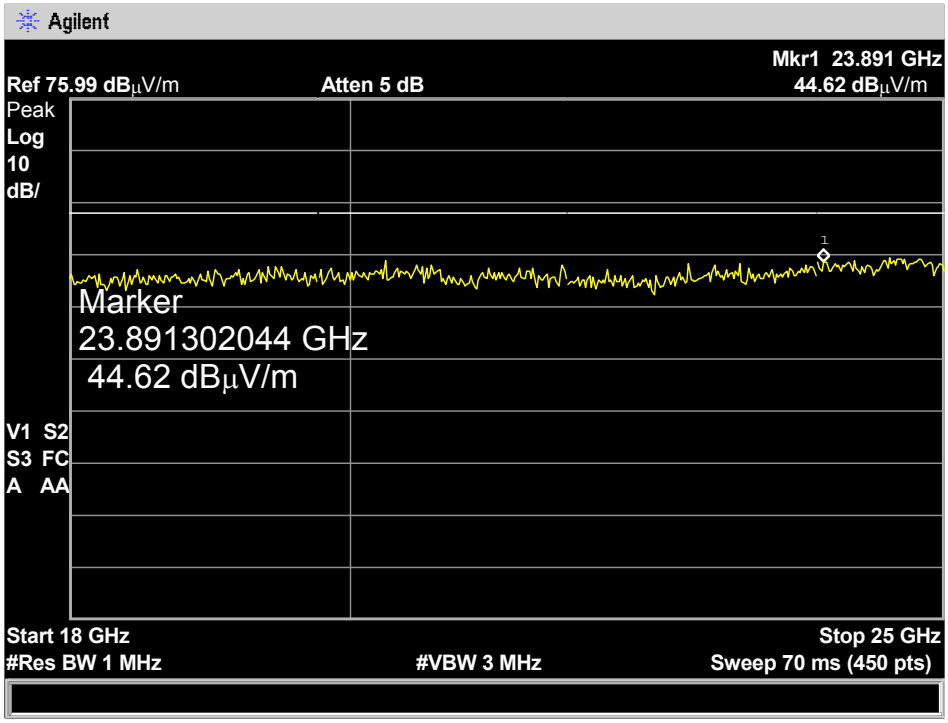
Horizontal & Vertical Polarization
Plot 20



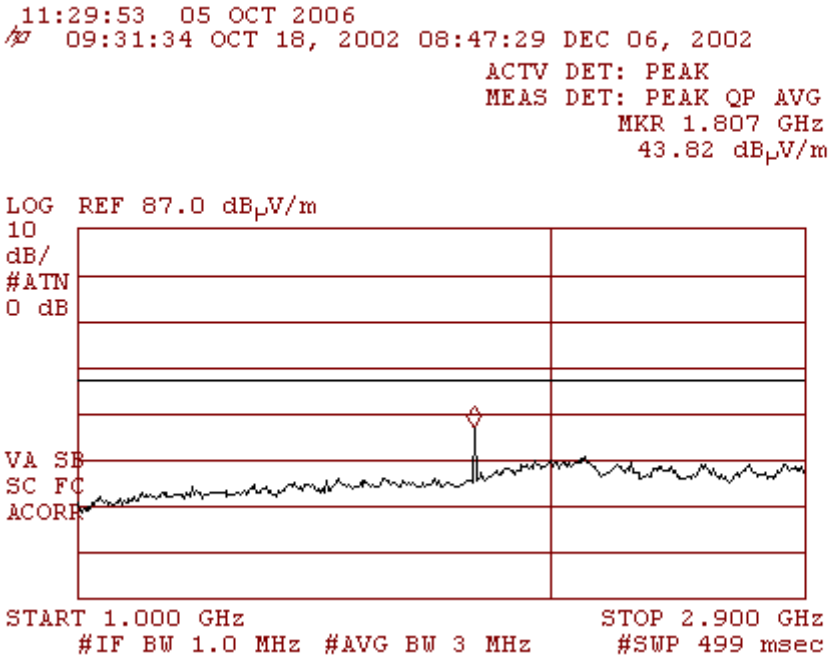
Horizontal & Vertical Polarization
Plot 21



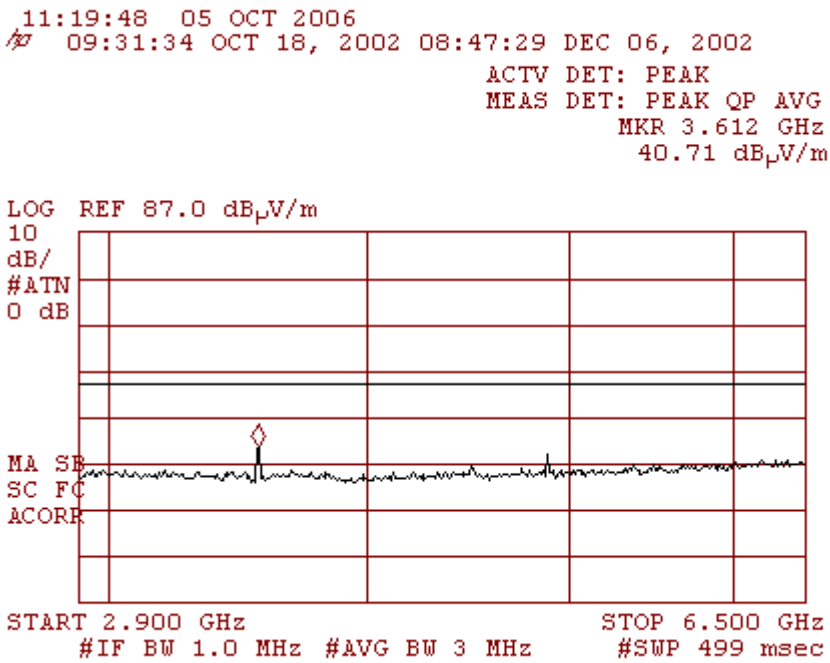
Horizontal & Vertical Polarization
Plot 22



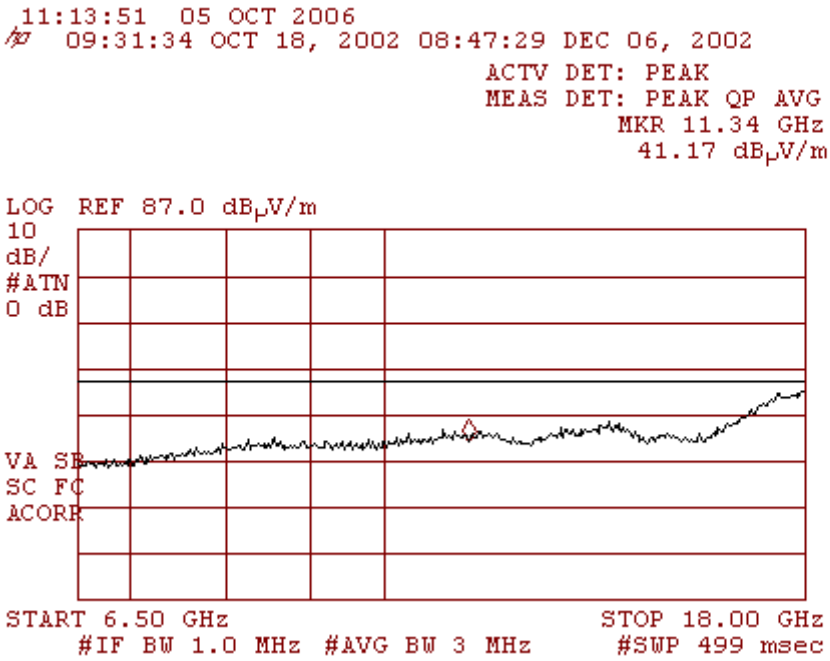
Highest frequency
Plot 23
Horizontal & Vertical Polarization



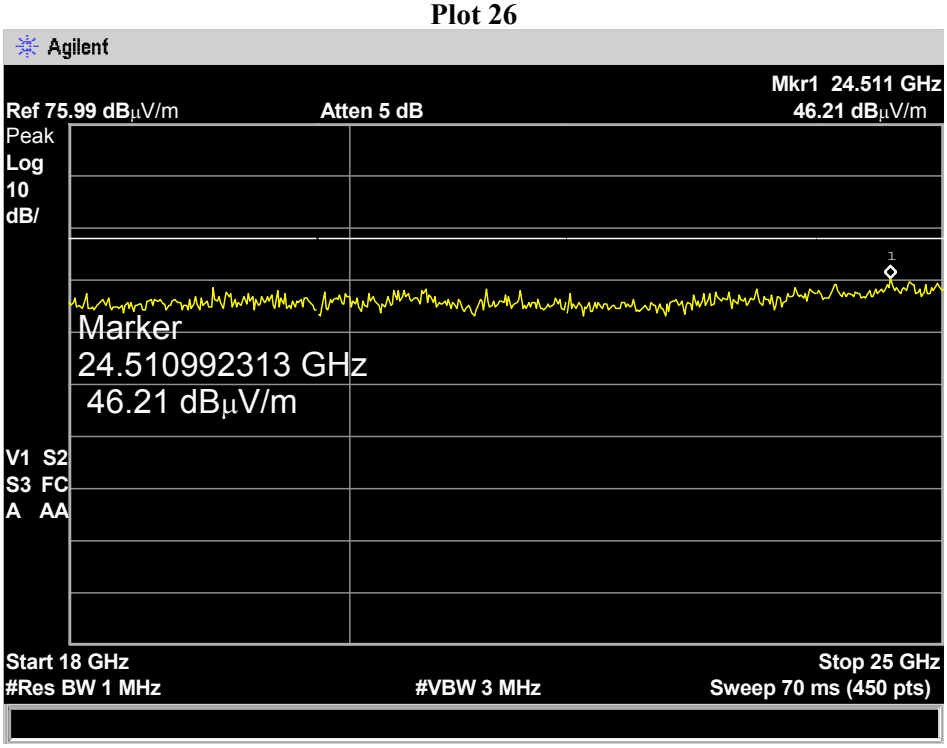
Plot 24
Horizontal & Vertical Polarization



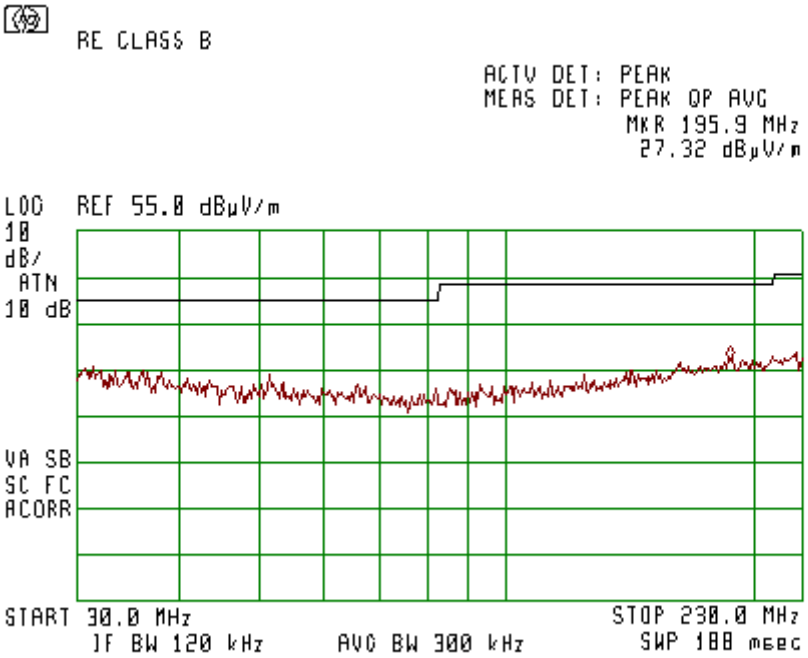
Horizontal & Vertical Polarization
Plot 25



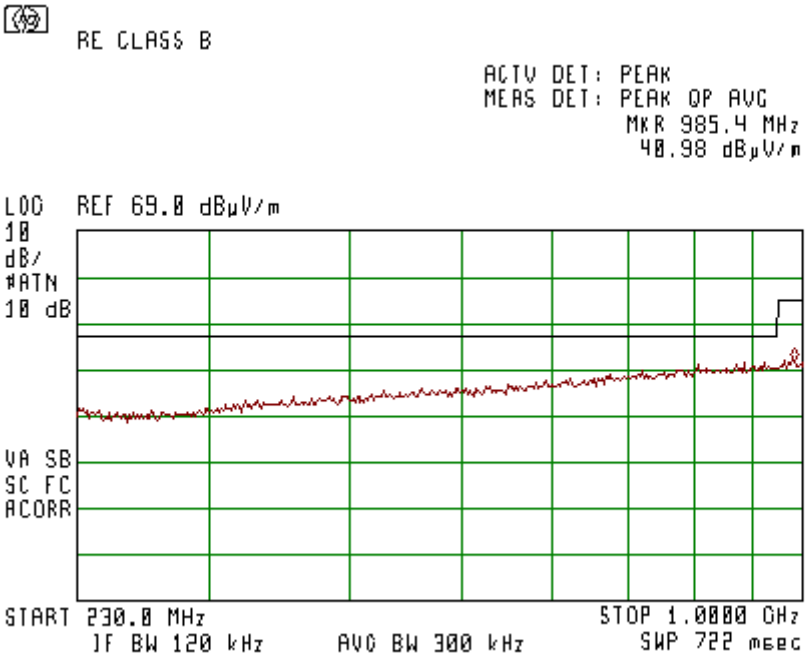
Horizontal & Vertical Polarization
Plot 26



Horizontal & Vertical Polarization 3 channels simultaneously
Plot 27

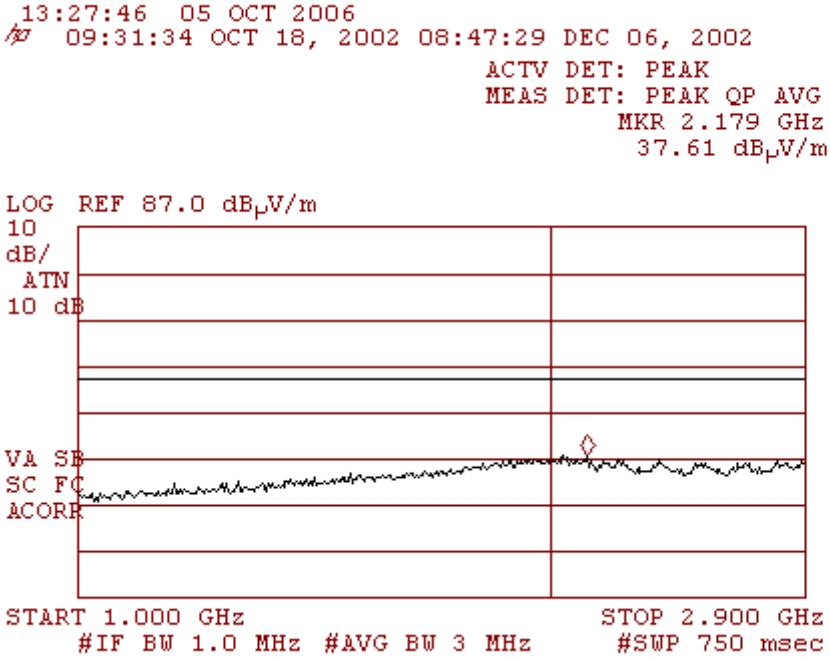


Horizontal & Vertical Polarization 3 channels simultaneously
Plot 28

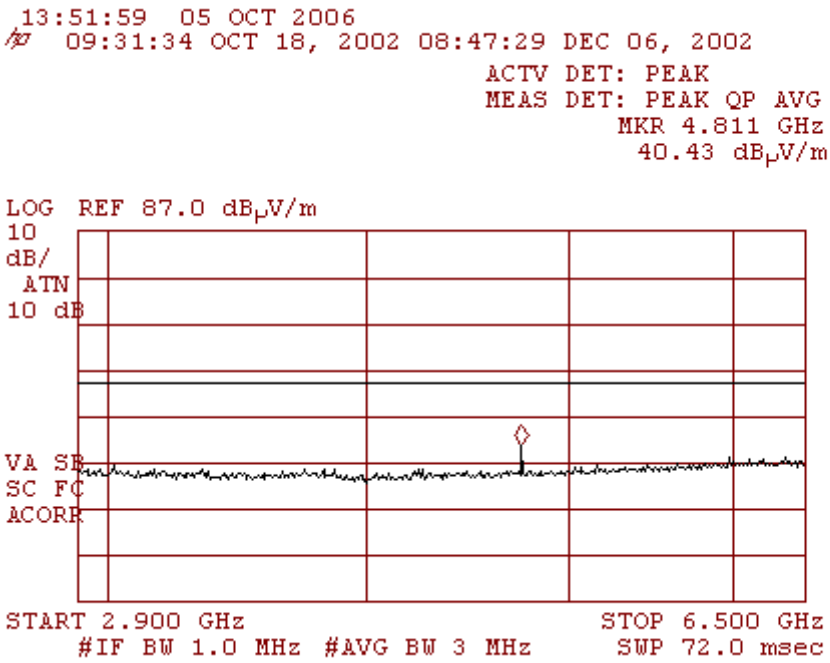


Simultaneously Operated: Bluetooth (2402 MHz) & WLAN 802.1 b 11 Mbps channel 1

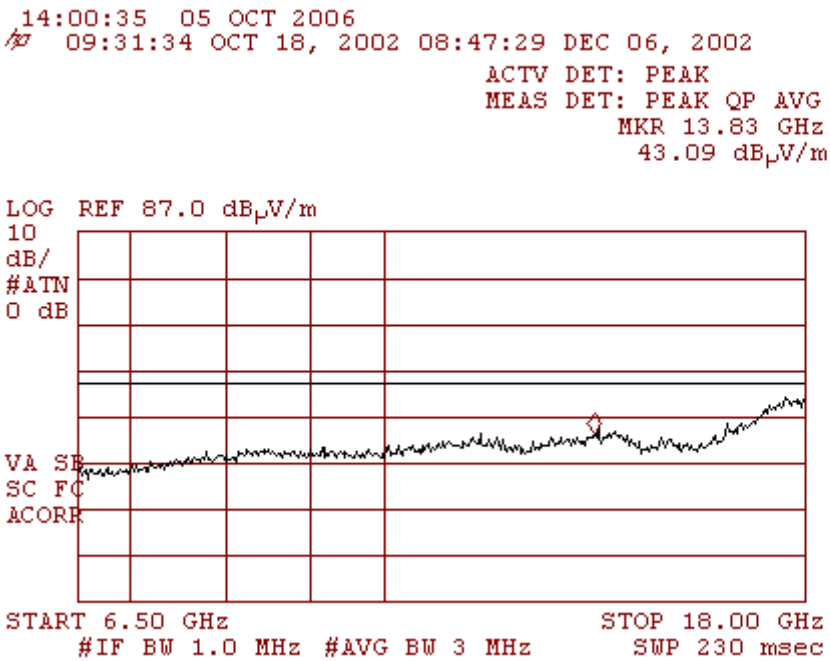
Lowest frequency
Horizontal & Vertical Polarization
Plot 29



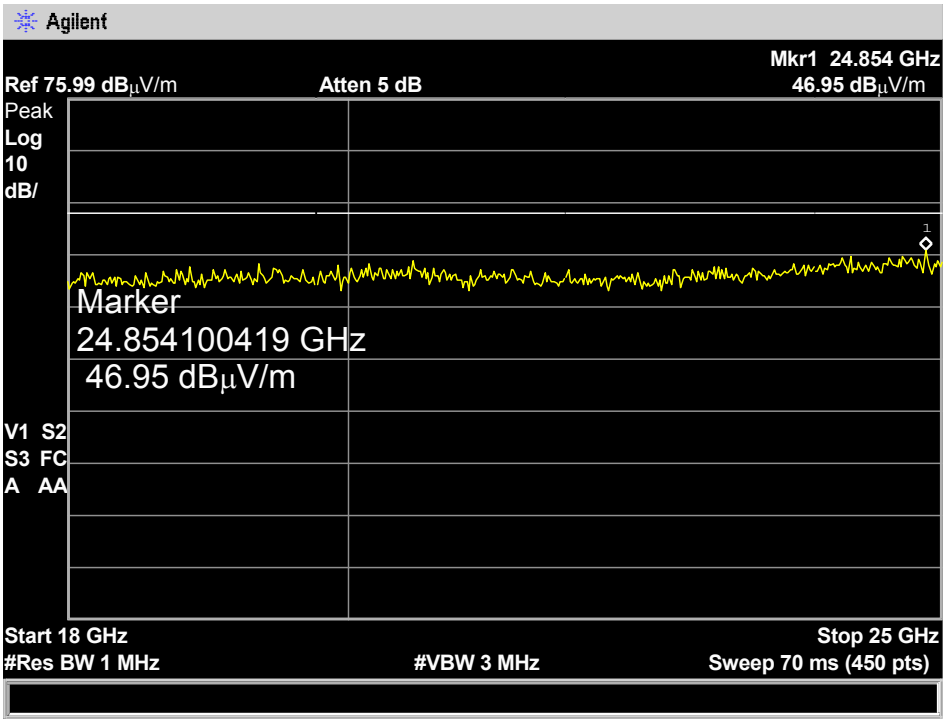
Horizontal & Vertical Polarization
Plot 30



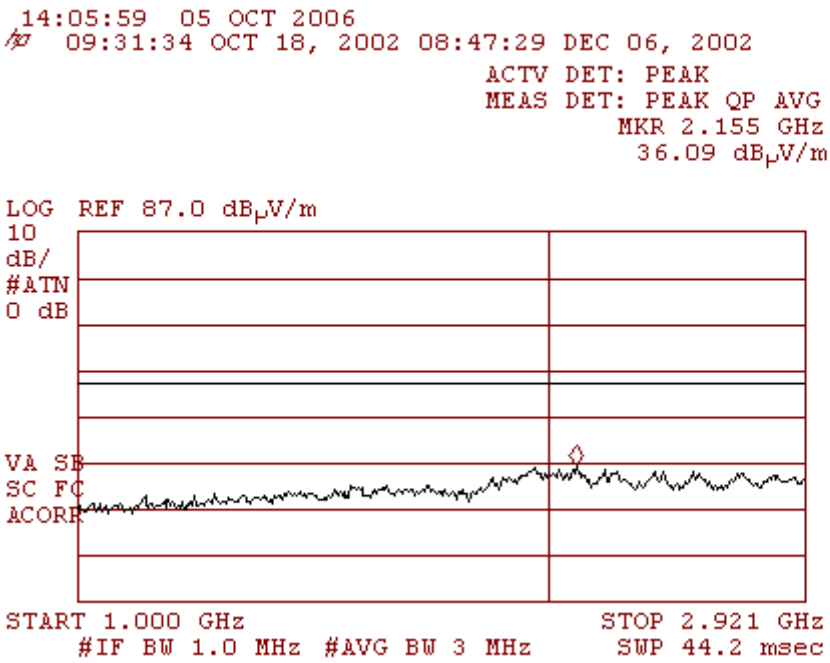
Horizontal & Vertical Polarization
Plot 31



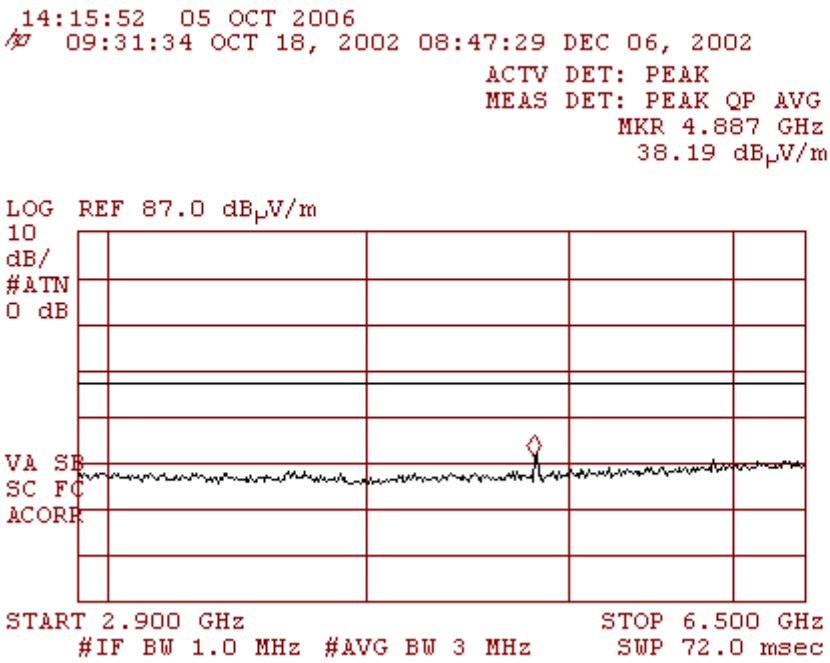
Horizontal & Vertical Polarization
Plot 32



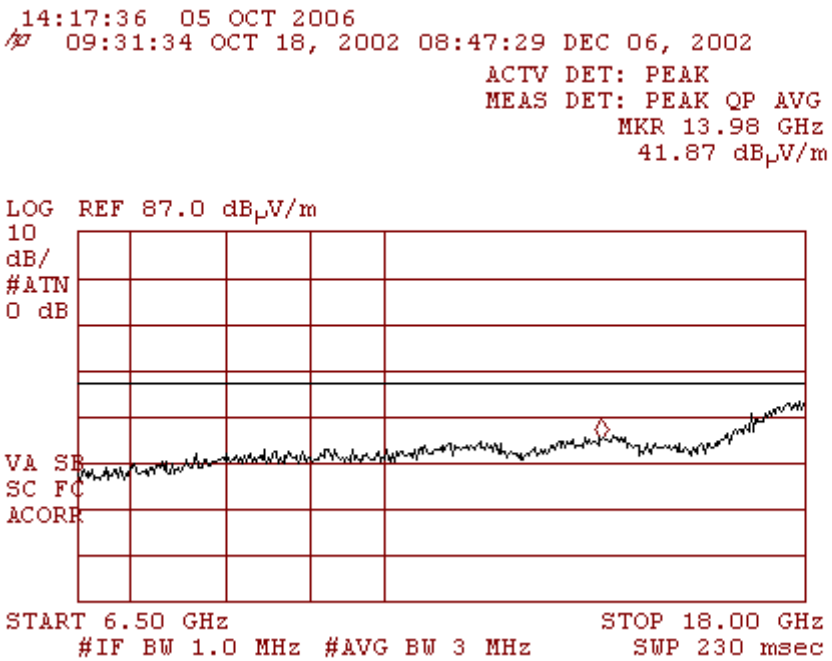
Middle frequency
Horizontal & Vertical Polarization
Plot 33



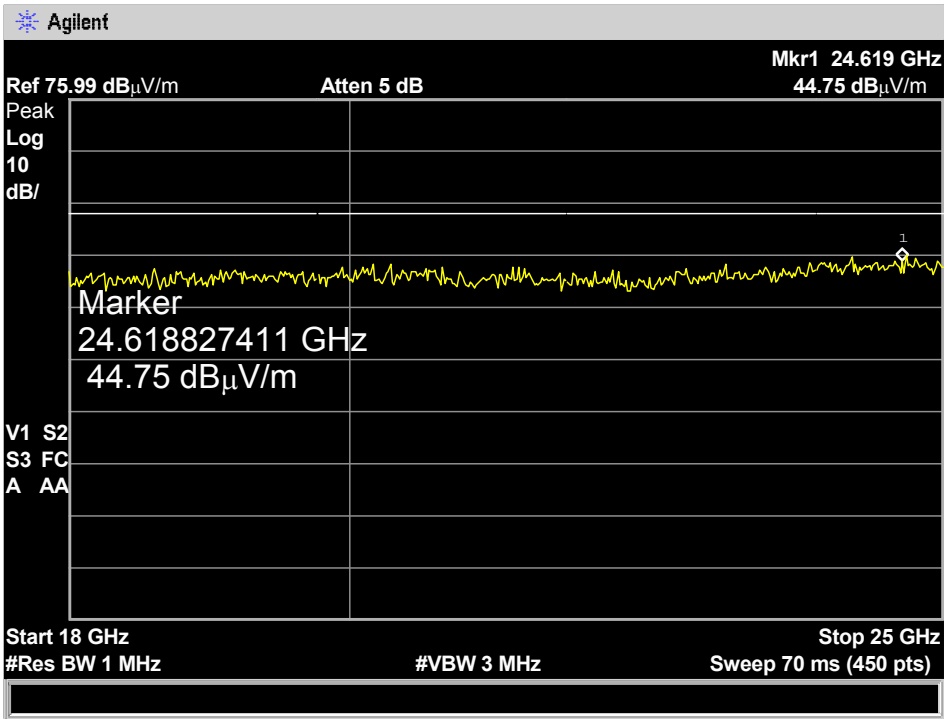
Horizontal & Vertical Polarization
Plot 34



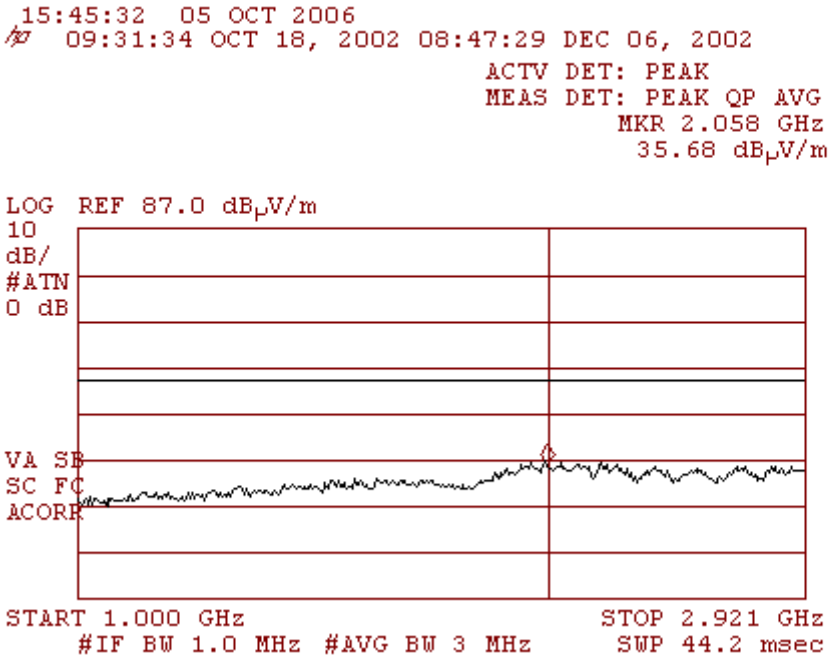
Horizontal & Vertical Polarization
Plot 35



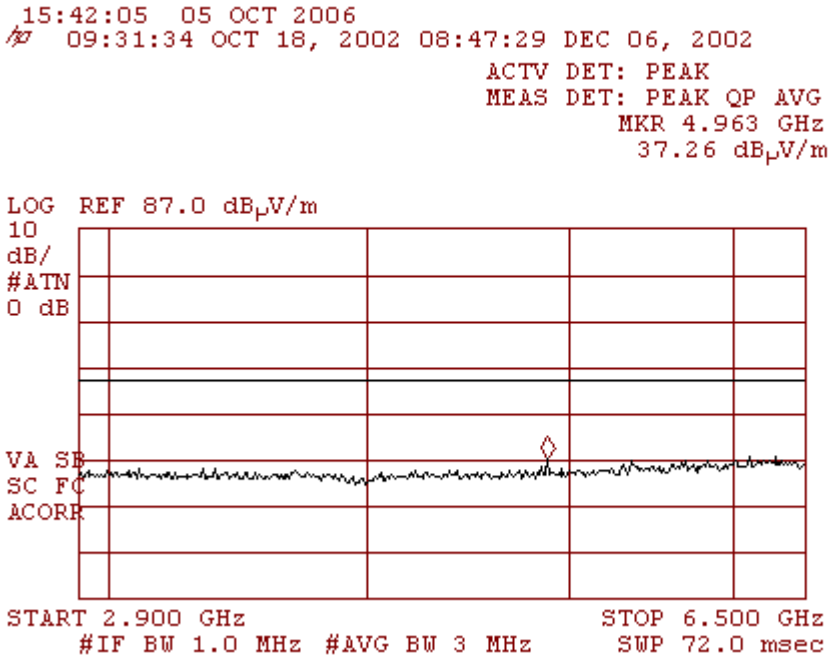
Horizontal & Vertical Polarization
Plot 36



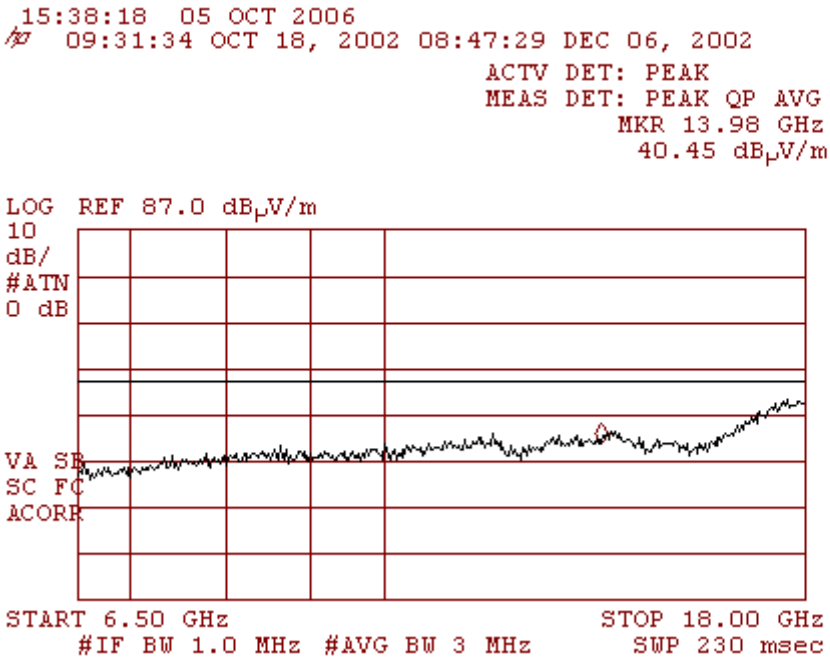
Highest frequency
Horizontal & Vertical Polarization
Plot 37



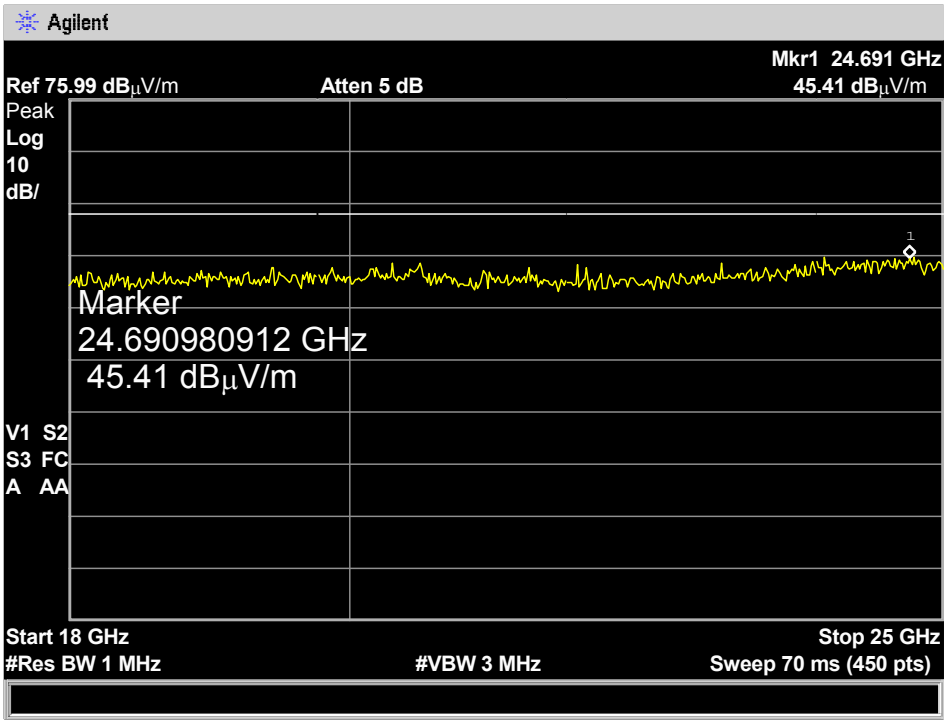
Horizontal & Vertical Polarization
Plot 38



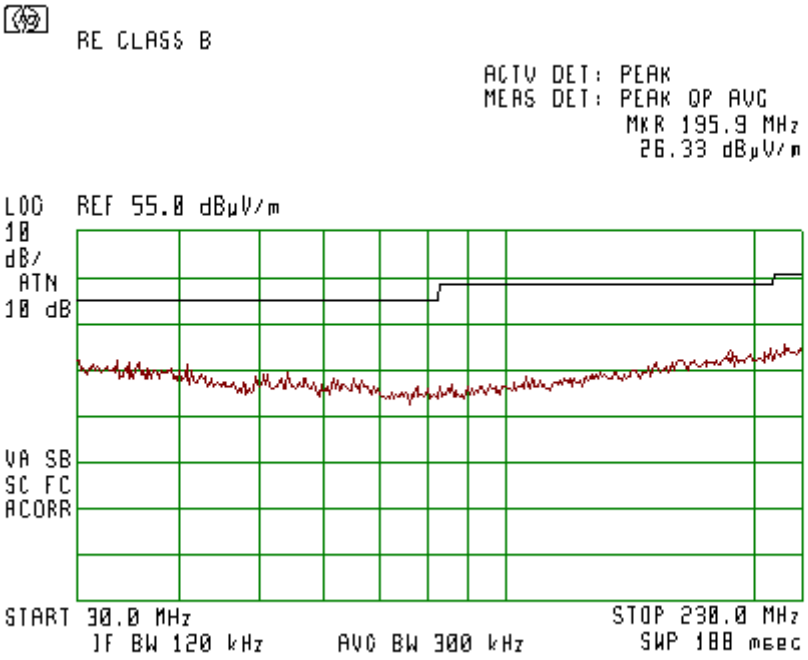
Horizontal & Vertical Polarization
Plot 39



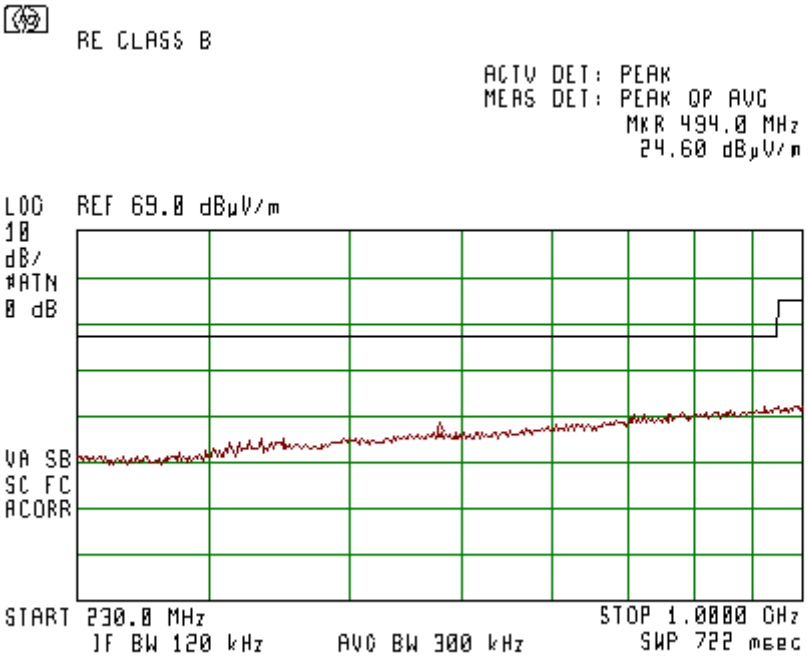
Horizontal & Vertical Polarization
Plot 40



Horizontal & Vertical Polarization3 channels simultaneously
Plot 41

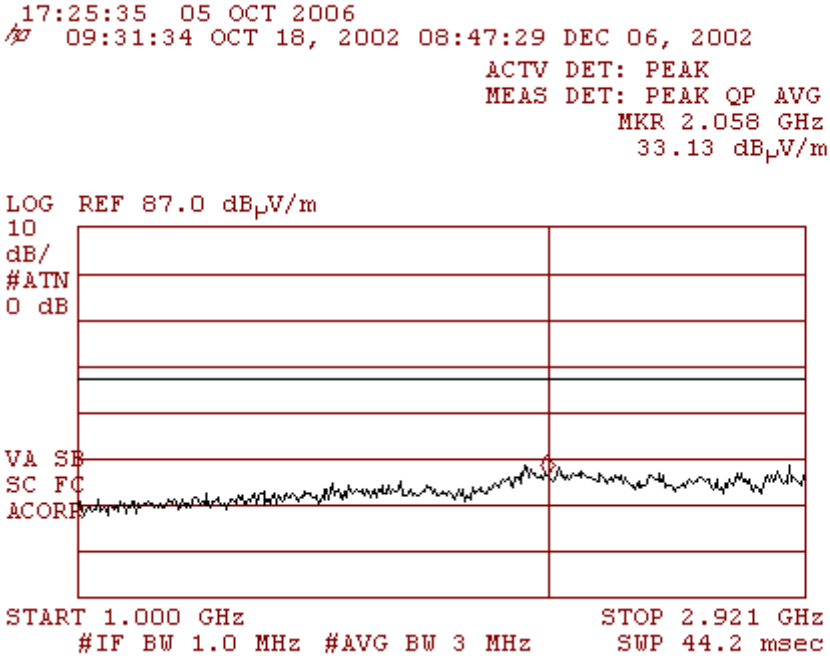


Horizontal & Vertical Polarization
(Vertical Polarization +Horizontal Polarization 3 channels simultaneously)
Plot 42

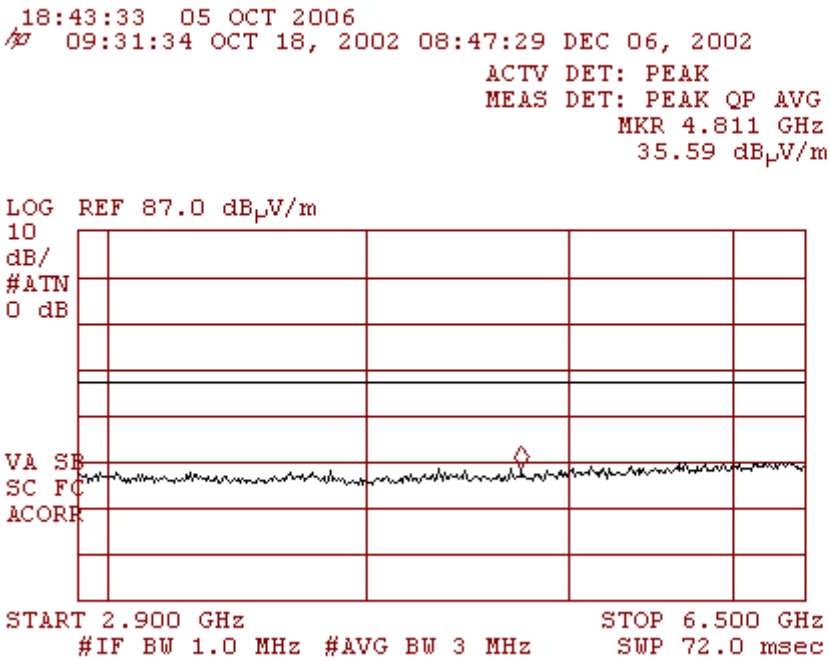


Simultaneously Operated: Bluetooth (2402 MHz) & WLAN 802.1 b 54 Mbps channel 1

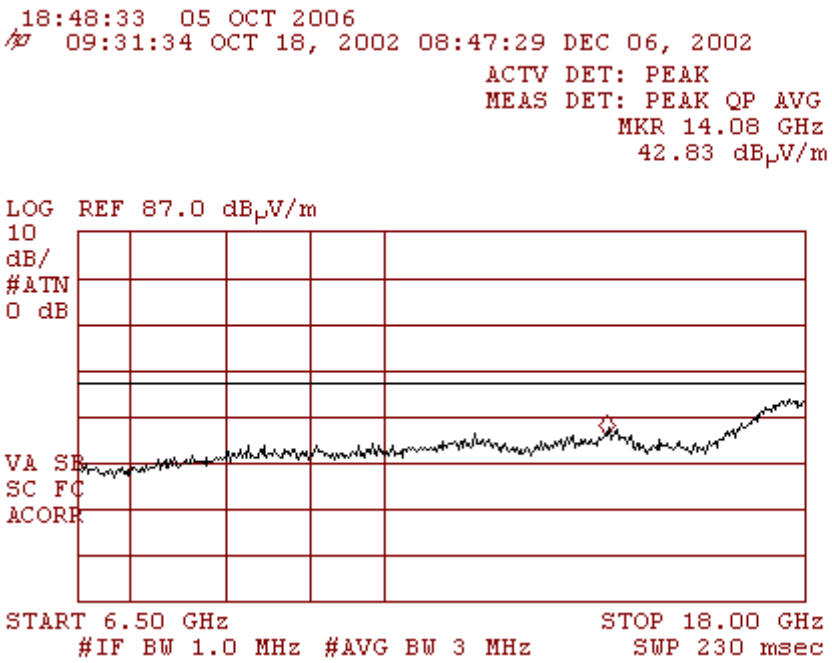
Lowest frequency
Horizontal & Vertical Polarization
Plot 43



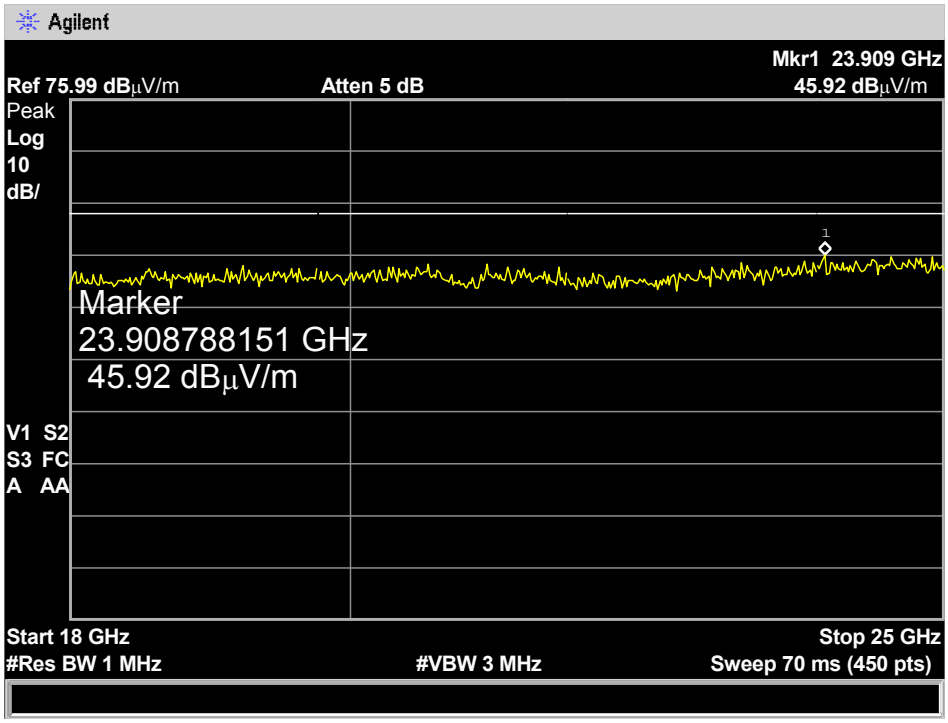
Horizontal & Vertical Polarization
Plot 44



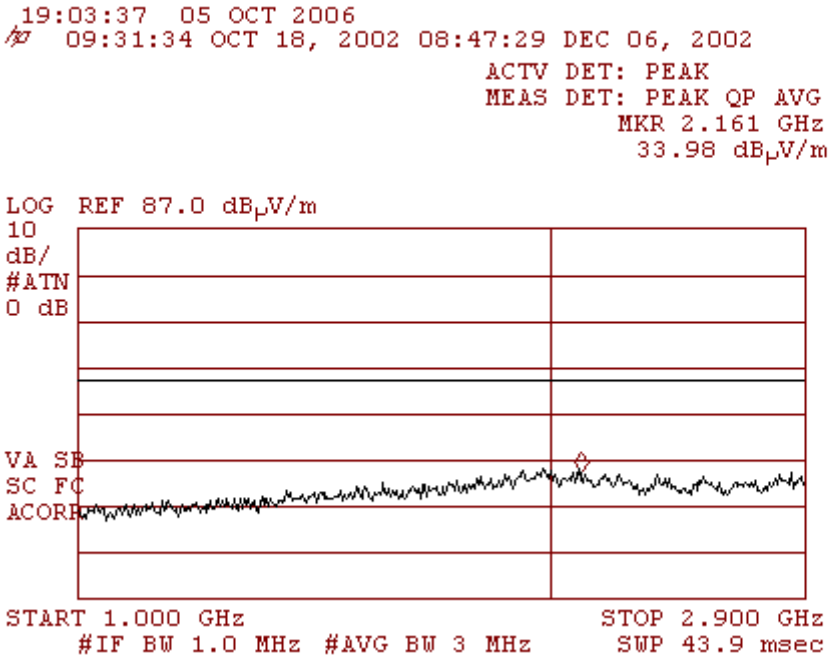
Horizontal & Vertical Polarization
Plot 45



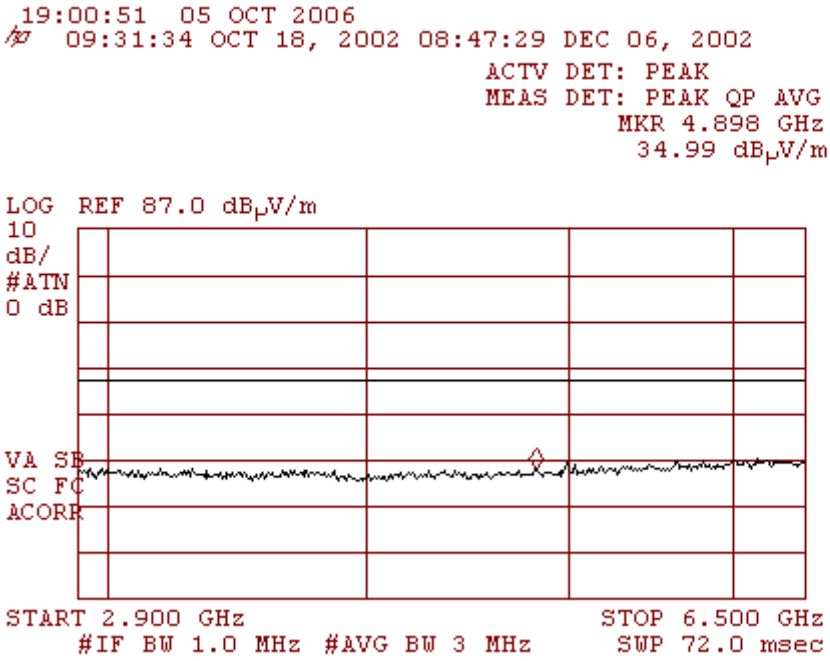
Horizontal & Vertical Polarization
Plot 46



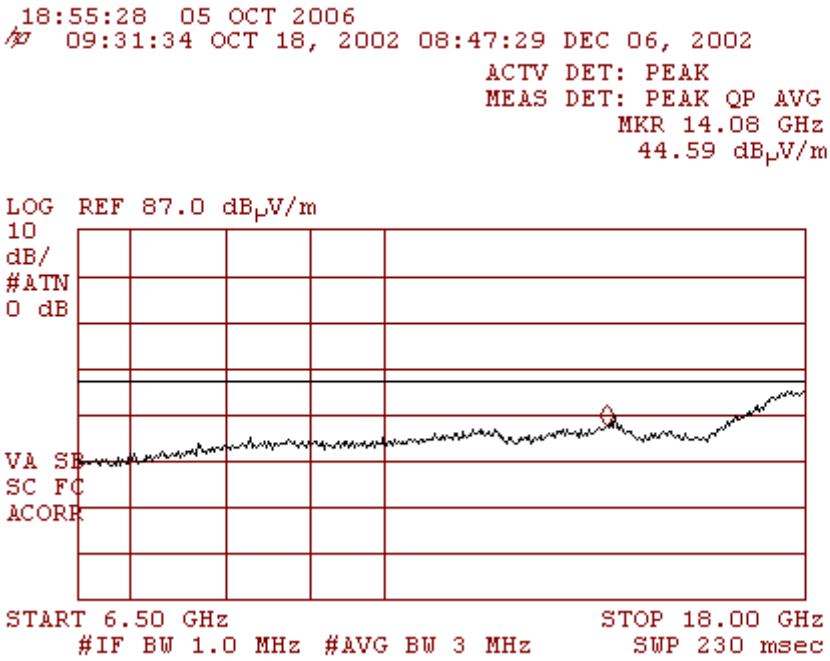
Middle frequency
Horizontal & Vertical Polarization
Plot 47



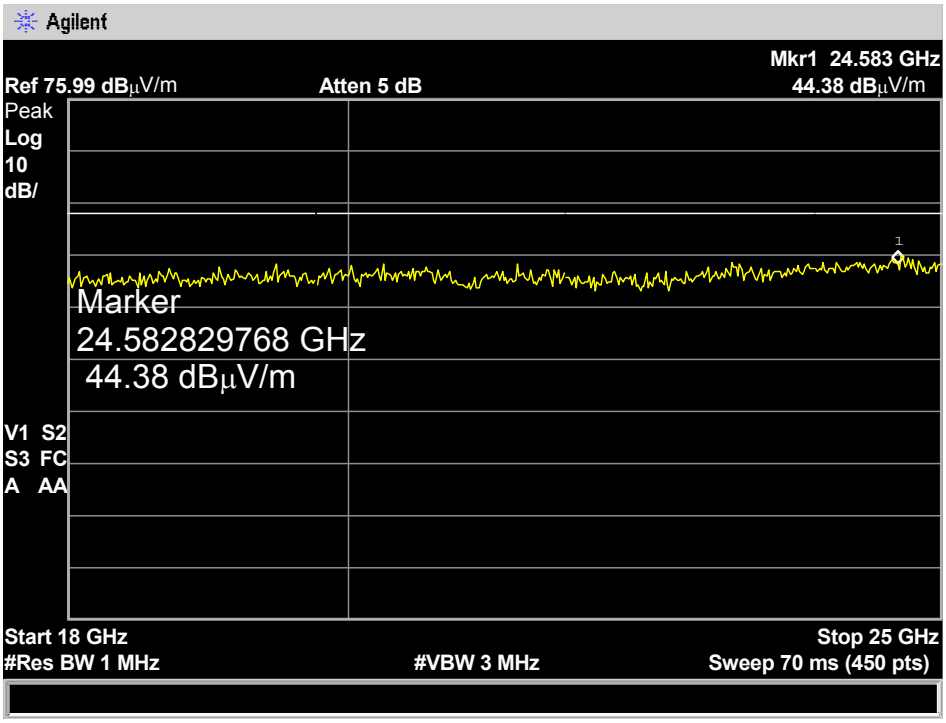
Horizontal & Vertical Polarization
Plot 48



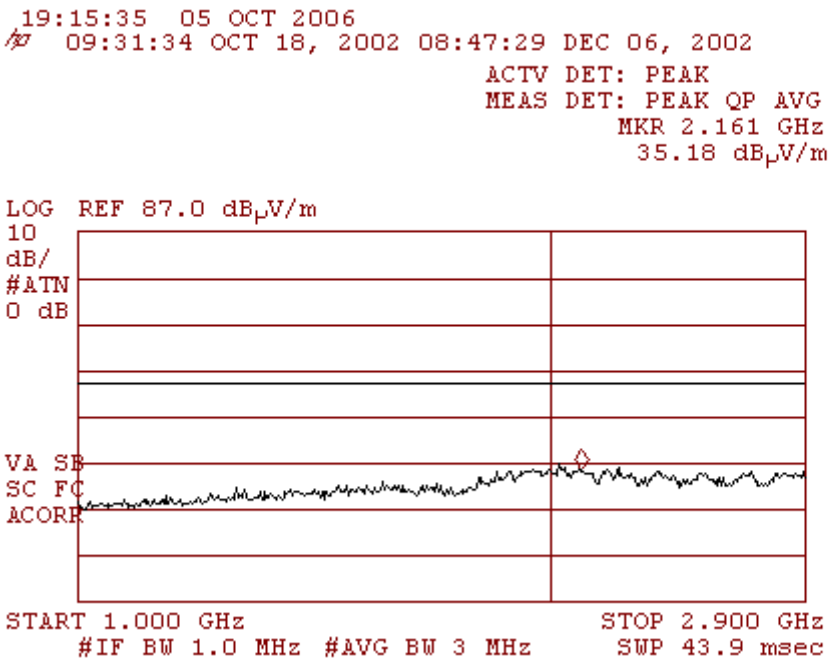
Horizontal & Vertical Polarization
Plot 49



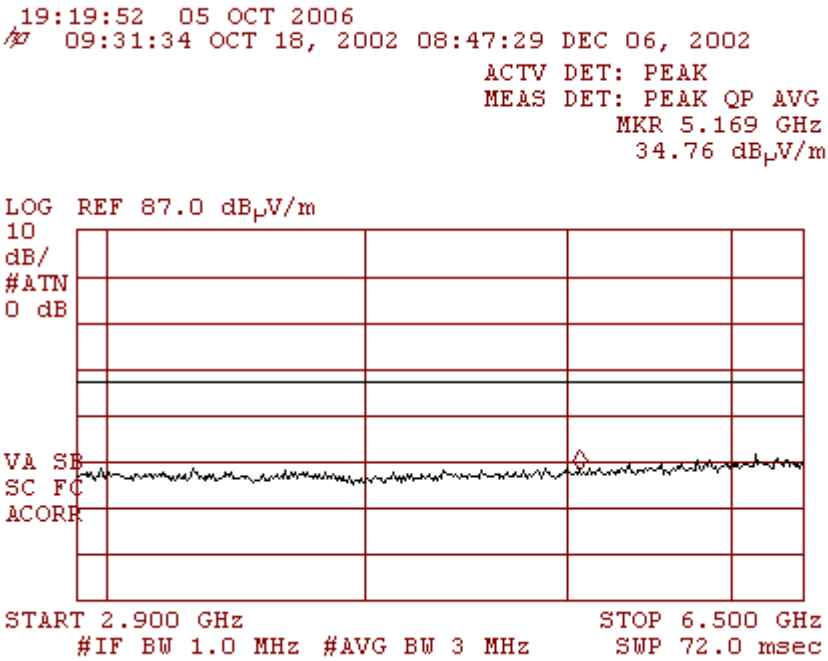
Horizontal & Vertical Polarization
Plot 50



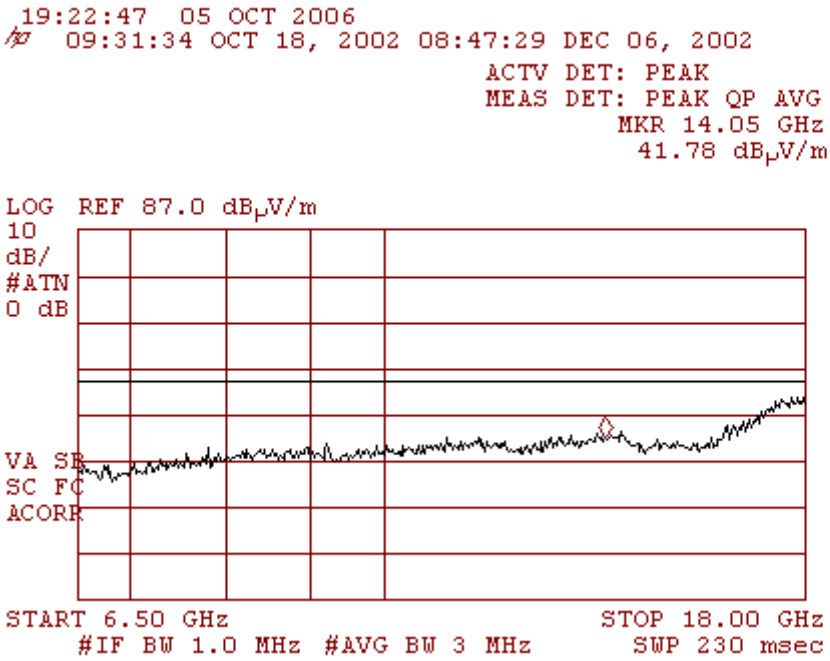
Highest frequency
Horizontal & Vertical Polarization
Plot 51



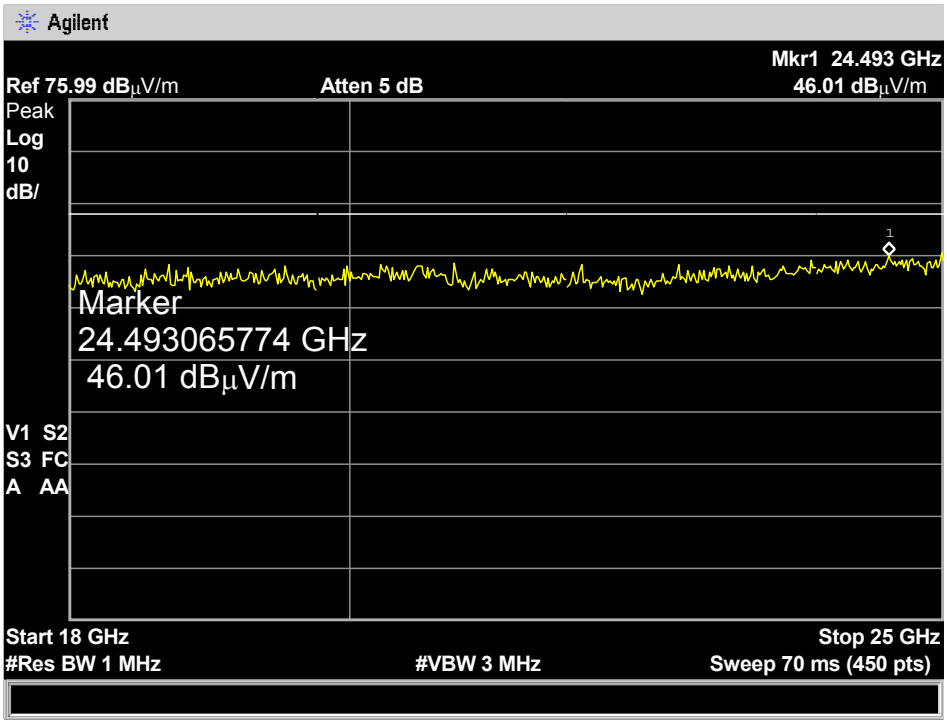
Horizontal & Vertical Polarization
Plot 52



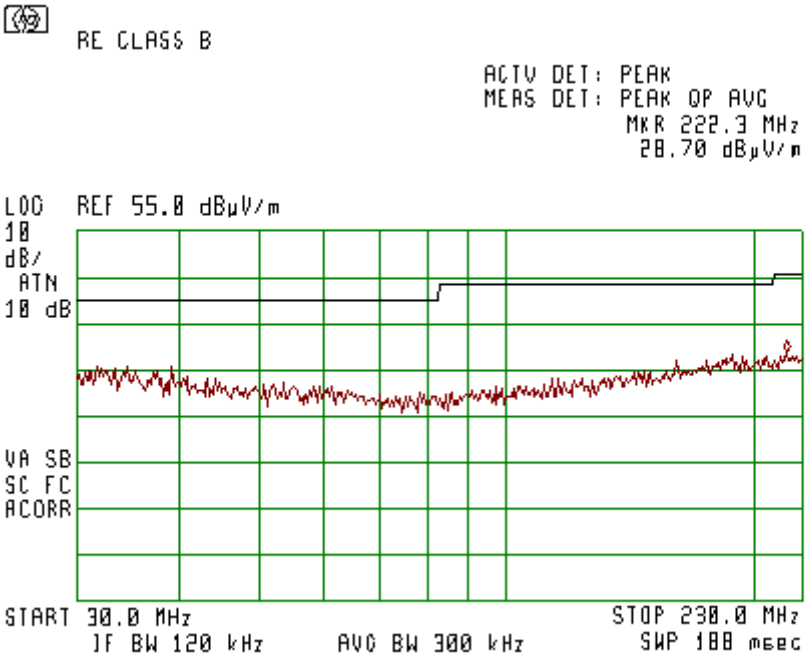
Horizontal & Vertical Polarization
Plot 53



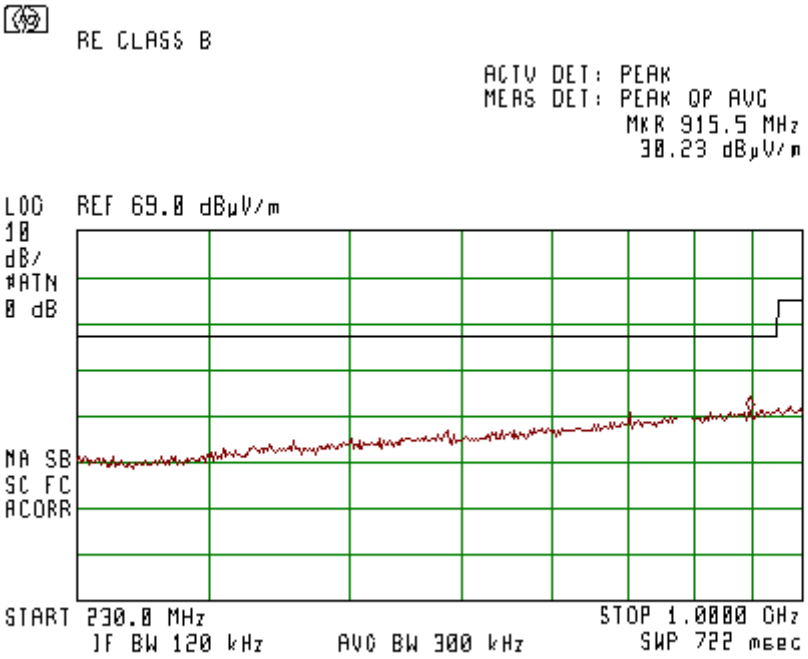
Horizontal & Vertical Polarization
Plot 54



Horizontal & Vertical Polarization 3 channels simultaneously
Plot 55

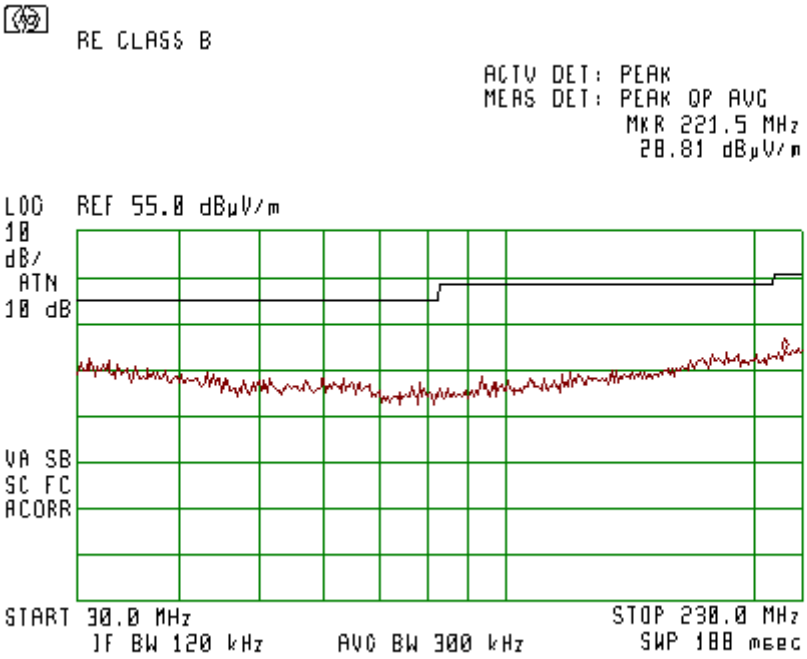


Horizontal & Vertical Polarization
(Vertical Polarization +Horizontal Polarization 3 channels simultaneously)
Plot 56

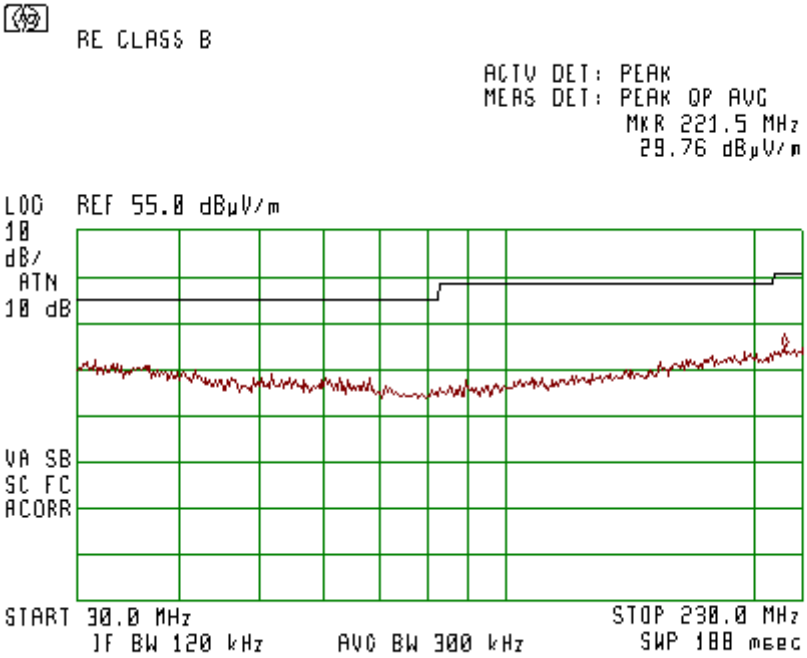


Appendix B: Receive Mode test plots

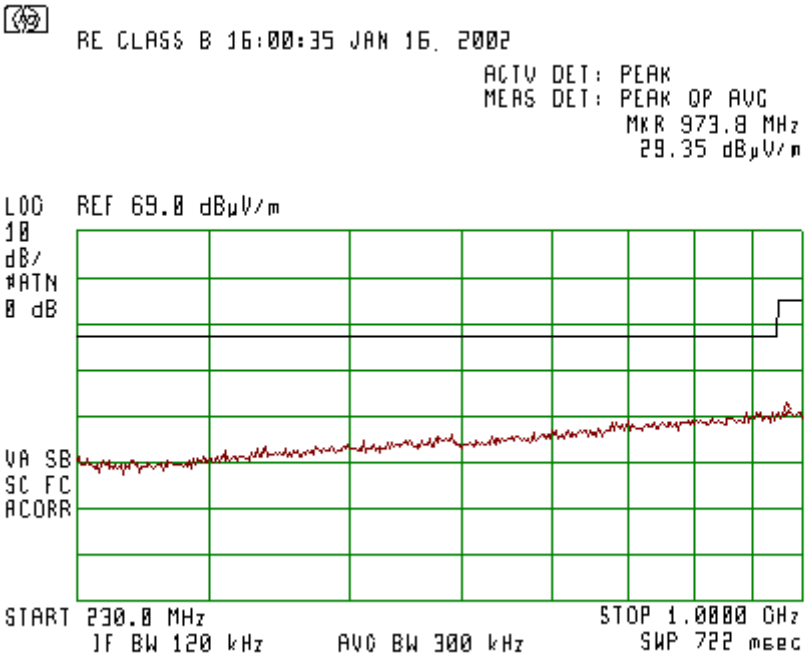
Horizontal Polarization
Plot 1



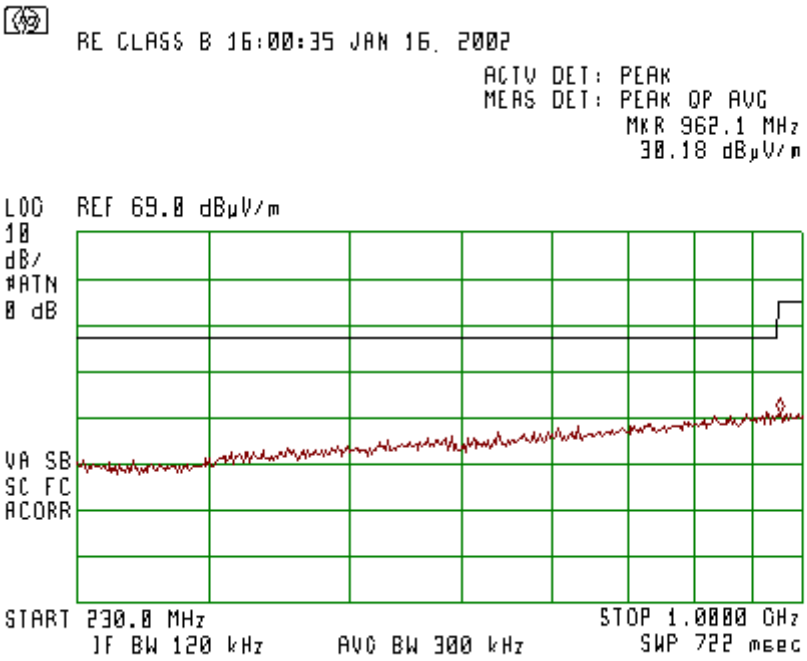
Vertical Polarization
Plot 2



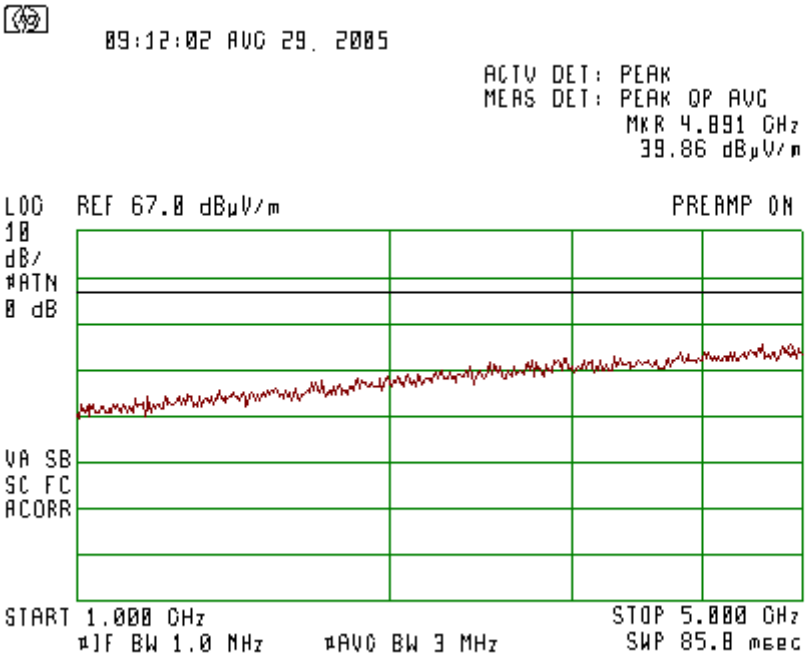
Horizontal Polarization
Plot 3



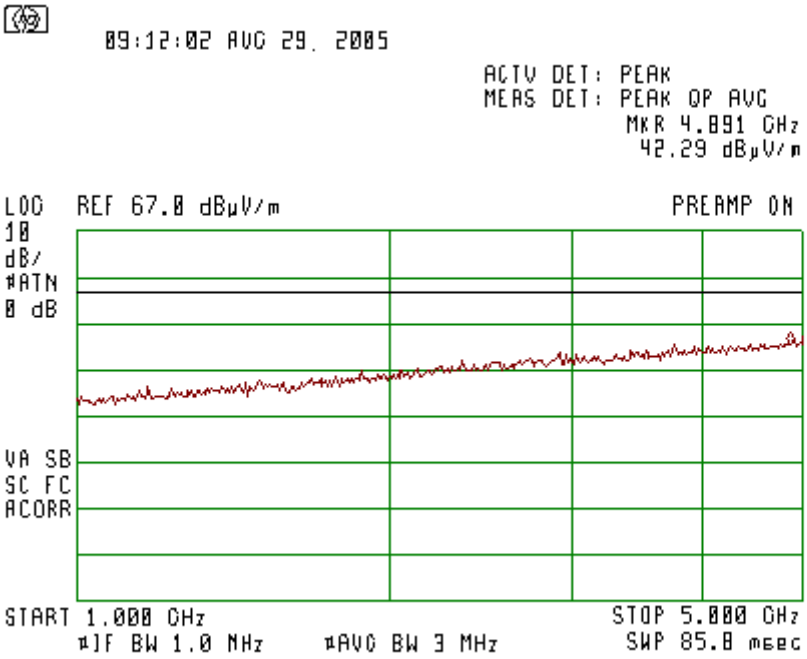
Vertical Polarization
Plot 4



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