



Electromagnetic Compatibility Test Report

Test Report No: MOT 230510
Issued on: May 23, 2010

Product Name
WiMAX VSM VM2500
Model: F7400A

Tested According to
FCC 47 CFR, Part 15, Subparts C
& RSS-210

Tests Performed for
Motorola Inc.

One Motorola Plaza, Holtsville, N.Y 11742, USA

QualiTech EMC Laboratory, ECI Telecom

30 Hasivim Street,
Petah-Tikva, 49517, Israel
Tel: +972-3-926 8443
Fax: +972-3-928 7490



ELECTRICAL TESTING
CERT #1633.01

The information contained herein is the property of QualiTech, EMC Lab and is supplied without liability for errors or omissions.

*The copyright for this document vests in QualiTech, EMC Lab.
All rights reserved.*

This Test Report may not be reproduced, by any method, without the written permission of the QualiTech, EMC Lab.

If and when such permission is granted, the report must be reproduced only in the full format.

Test Personnel



Tests Performed By:

Rami Nataf

Sergey Kapustin

Report Prepared By:

Bina Talkar

Report Reviewed By:

Y. Zucker
QA and Lab. Manager
QualiTech EMC Laboratory

Test Report details:

Test commencement date: 28.04.2010
Test completion date: 10.05.2010
Customer's representative: Assi Gershon
Issued on: 23.05.2010

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

WLAN 802.11b/g

Test Spec. Clause	Test Case	Remarks
47 CFR §15.247 (a) (2) & RSS-210 section A8.2 (a)	6 dB Bandwidth	Comply
47 CFR §15.247 (b) (3) & RSS-210 section A8.4 (4)	Maximum Peak Output Power, 2400-2483.5 MHz	Comply
47 CFR §15.247 (e) & RSS-210 Section A8.2 (b)	Peak power spectral density	Comply
47 CFR §15.247 (d) & RSS-210 Section A8.5	Conducted Out of Band Spurious Emissions	Comply
47 CFR §15.247 (d) & RSS-210 section A8.5	Spurious Radiated Emissions, Restricted Bands 2310-2390MHz & 2483.5-2500MHz	Comply
47 CFR §15.247 (d) & §15.205, & §15.209(a) & RSS-210 section A8.5 Tab. 2 & 3	Spurious Radiated Emissions, Restricted Bands	Comply
47 CFR §15.209 & RSS-210 section A8.5 Tab. 2 & 3	Radiated Emission, Transmit Mode	Comply
47 CFR §15.203 & RSS - Gen. Section 7.1.4	Antenna Connector Requirements	Comply

Table of Contents

1. GENERAL DESCRIPTION.....	6
2. METHOD OF MEASUREMENTS	7
2.1. Conducted RF Measurements:	7
2.2. Radiated Emissions Measurements in the restricted bands:	7
2.3. Radiated Emission measurements:.....	8
2.4. Worst Case Results:	8
3. TEST FACILITY & UNCERTAINTY OF MEASUREMENT	9
3.1. Accreditation/ Registration reference:.....	9
3.2. Test Facility description	9
3.3. Uncertainty of Measurement:	10
4. WLAN 802.11B/G: REPORT OF MEASUREMENTS AND EXAMINATIONS	11
4.1. 6 dB Bandwidth	11
4.2. Maximum Peak Output Power, 2400-2483.5 MHz	15
4.3. Peak power spectral density	16
4.4. Conducted Spurious Emissions.....	20
4.5. Spurious Radiated Emissions, Restricted Bands 2310-2390MHz & 2483.5-2500MHz	29
4.6. Spurious Radiated Emissions, Restricted Bands.....	38
4.7. Antenna Connector Requirements	59
5. APPENDIX	60

1. General Description

Description of the EUT System/Test Item:

Product Name: VSM

Model: F7400A

FCC ID: AZ492FT7041

IC: 109U-92FT7041

Description:

Wimax and Wifi (802.11b/g) Vehicular Subscriber Module

Maximum Peak Output Power:

160mW for WLAN 802.11b@ channels 1-6

160mW for WLAN 802.11g@ channels 1-6

Frequency Range:

802.11b/g: 2.412 – 2.437 GHz

Transmit Data Rate:

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

Type of Modulation:

Protocol	Modulation
802.11b	DSSS (DQPSK, DBPSK), CCK
802.11g	DSSS/OFDM (64QAM, 16QAM, QPSK, BPSK, DQPSK, DBPSK)

Antenna Specification:

Type: Standard Antenna: Vehicular Dual Helix Monopole

Optional Antenna: Vehicular Whip Monopole

Gain: Standard Antenna: 802.11b/g: 5dBi

Optional Antenna: 802.11b/g: 5dBi

2. Method of Measurements

2.1. Conducted RF 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.

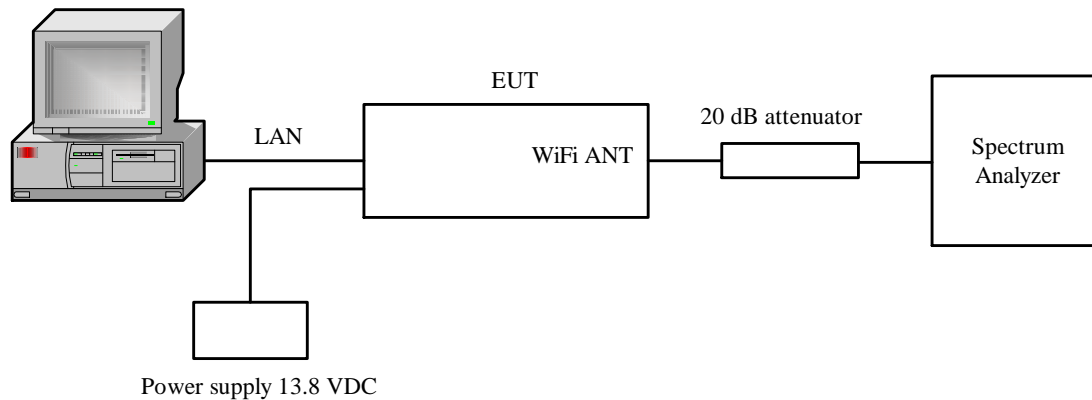
For PSD, emission peak was zoomed within the pass band with spectrum analyzer's settings as reported (Sweep time = Span/3kHz). Transmitter outputs transmitting simultaneously were aggregated through a combiner.

For Maximum Conducted Output Power, the spectrum analyzer was set for free ran, and 100 traces were averaged in power averaging mode. The transmitter was continuously transmitting, at a duty cycle of about 99%, and 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. Alternatively, Peak Output Power was measured using a Peak Power Meter.

For spurious emissions measurement, the spectrum from 9 KHz to 40GHz was investigated with the transmitter set to the lowest, middle and highest channel frequencies.

Test Setup

PC with test application



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. Only Peak detection plots are presented.

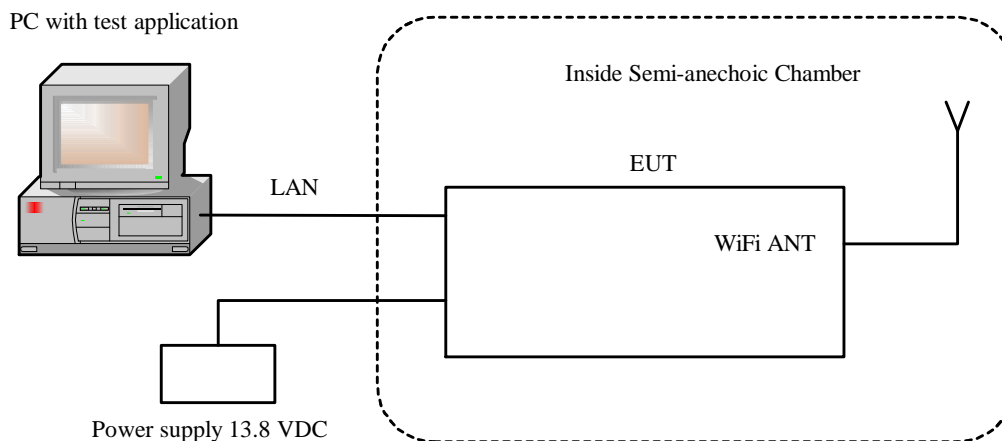
2.3. Radiated Emission measurements:

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. The test program of exercising the equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances.

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 30MHz to 1GHz. 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 spectrum up to 40GHz was investigated for spurious emissions, using a band-reject filter where appropriate.

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.

Test Setup



2.4. Worst Case Results:

Worst case result is determined for applicable modulation types and data rates. Pre-scan has been conducted to determine the worst-case.

3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/ Registration reference:

- A2LA Certificate Number: 1633.01

3.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom Group

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: 972-3-926-8443

3m Anechoic Chamber:

The 3m-screened chamber is used in two configurations: the semi-anechoic configuration for Radiated Emission measurements and the full-anechoic configuration for Radiated Immunity tests.

Semi Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	9.5m x 6.5m x 5.2m
Antenna height	1 - 4m
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	± 3.49 dB, 30MHz to 1GHz
Transmission Loss measured at 5 positions, at 1.5m height	± 3 dB, 1GHz to 18GHz

Full-Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	7m x 4m x 3m
Antenna height	1.55m at Horizontal & Vertical polarizations
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Frankonia hybrid absorbing material in selected positions on the walls and floor
Field Uniformity to EN61000-4-3	± 3 dB 80MHz to 18GHz

3.3. Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Combined std. Uc(y) [dB]	Expanded U [dB]
Radiated Emission	30MHz÷230MHz, Horiz. polar.	1.8	3.6
	30MHz÷230MHz, Ver. polar.	2.0	3.9
	230MHz÷1000MHz, Horiz. polar.	1.5	3.0
	230MHz÷1000MHz, Vert. polar.	1.5	3.0
Conducted Emission	9 kHz÷150 kHz	1.4	2.8
	150 kHz÷30MHz	1.1	2.2

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

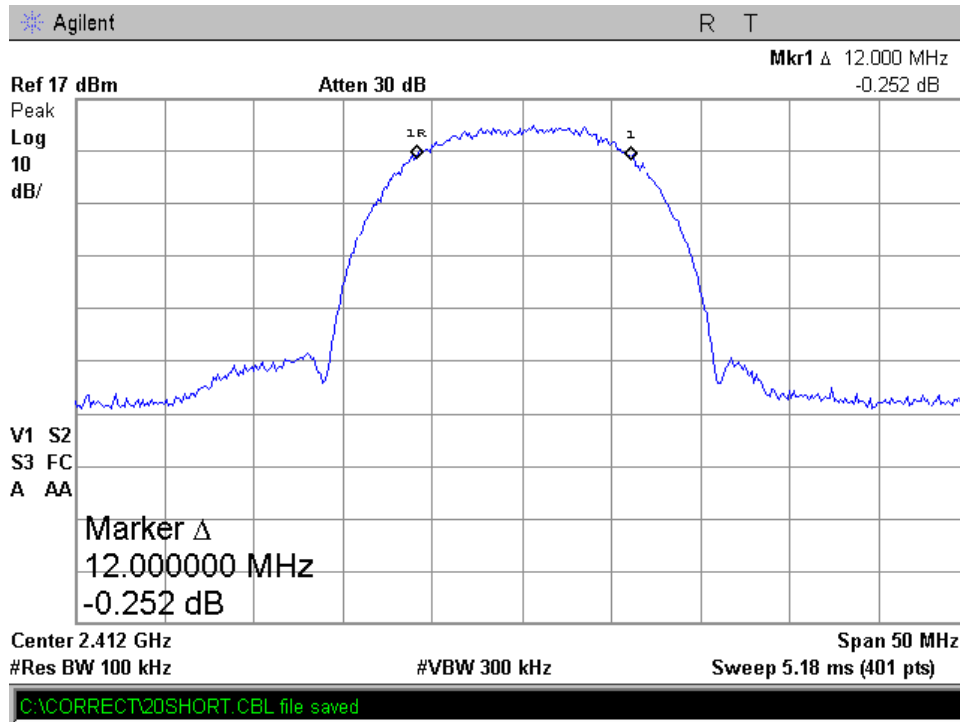
4.1. 6 dB Bandwidth

Reference document:	47 CFR §15.247 (a) (2)		
Test Requirements:	Systems using digital modulation techniques may operate in 2400-2483.5 MHz MHz-z 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: 23.1°C	Relative Humidity: 55.4%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.1.1 - Plot 4.1.6	

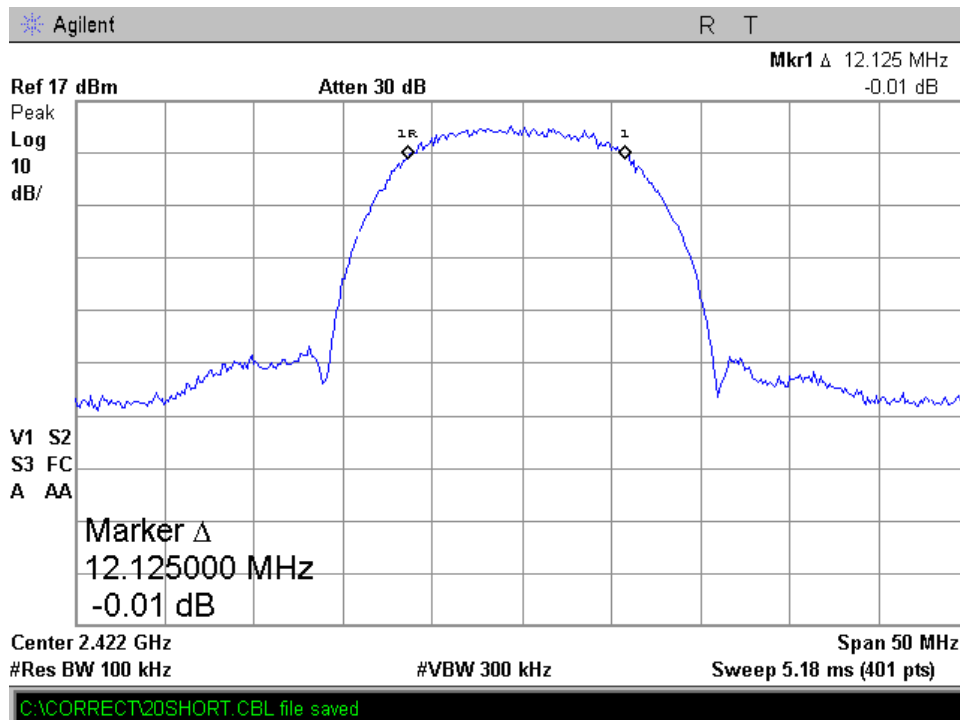
Test results:

Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz]	Limit [kHz]	Ref Plots
802.11b Mode				
2412	11	12000	>500	4.1.1
2422	11	12125	>500	4.1.2
2437	11	12000	>500	4.1.3
802.11g Mode				
2412	54	16500	>500	4.1.4
2422	54	16500	>500	4.1.5
2437	54	16500	>500	4.1.6

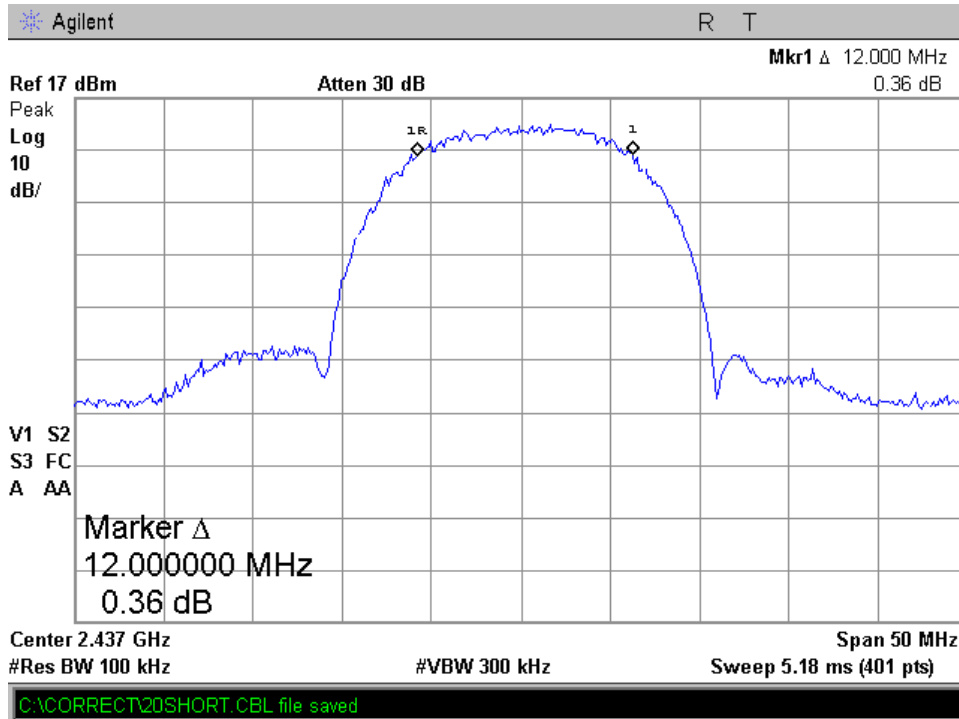
802.11b Mode
Plot 4.1.1



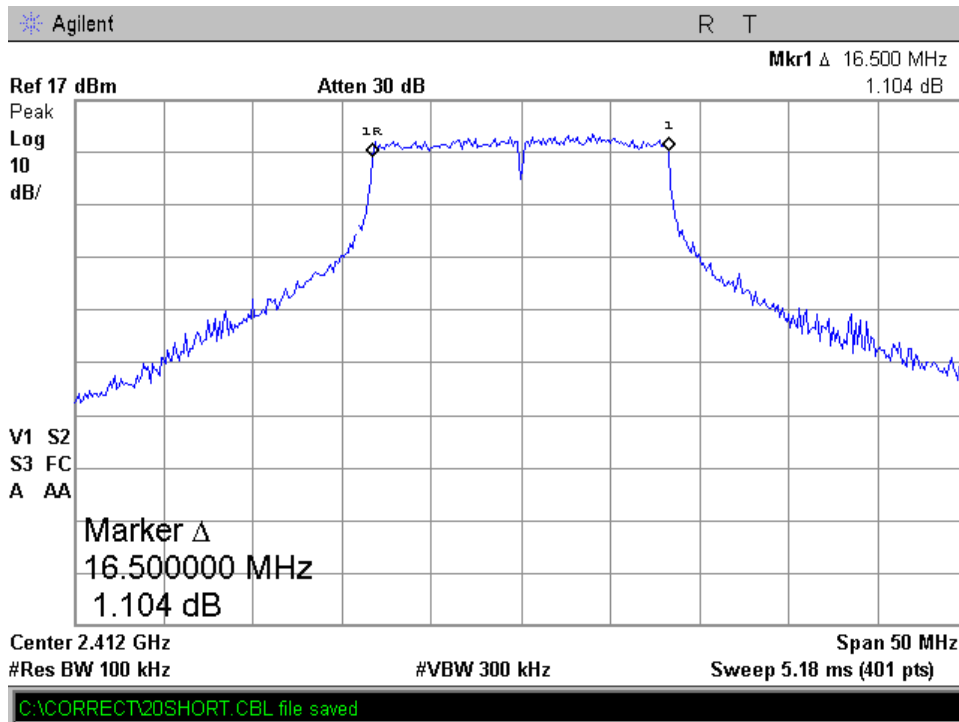
Plot 4.1.2



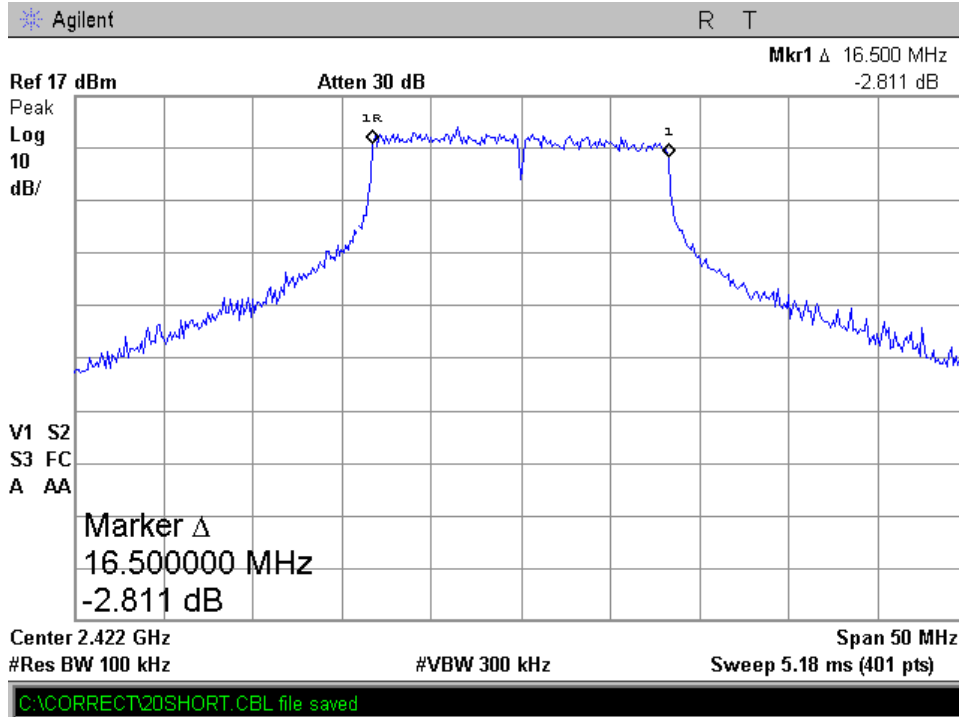
Plot 4.1.3



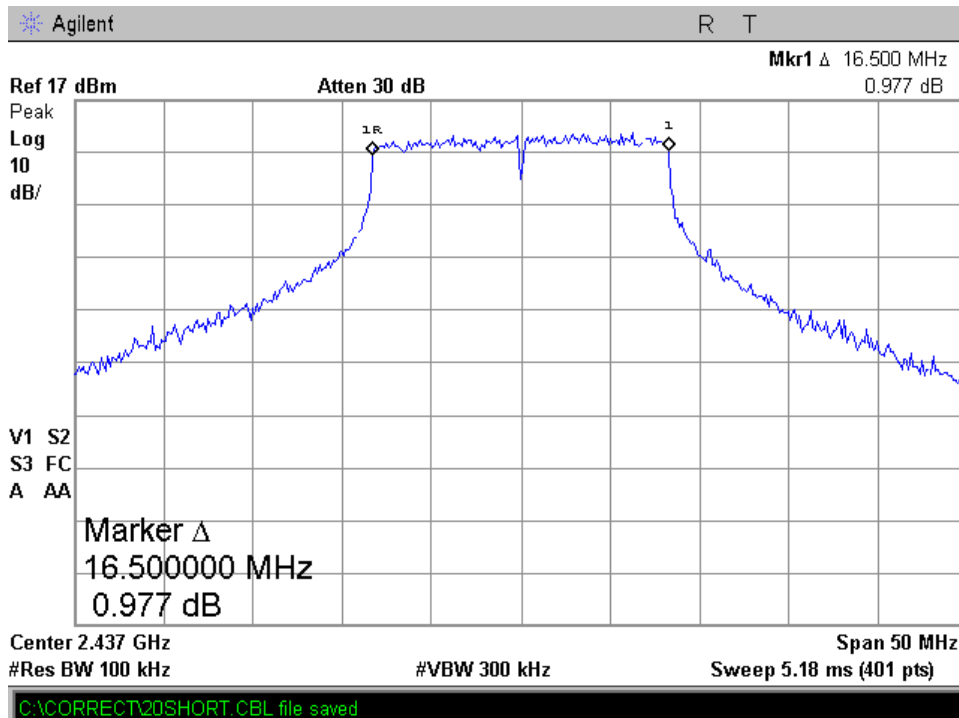
802.11g Mode
Plot 4.1.4



Plot 4.1.5



Plot 4.1.6



4.2. Maximum Peak Output Power, 2400-2483.5 MHz

Reference document:	47 CFR §15.247 (b) (3)		
Test Requirements:	The maximum peak output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt. Transmitters operating in the 2400-2483.5 MHz bands that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the arrays, i.e. the sum of the power sullied to the antenna elements, shall not exceed the limit calculated below. The total conducted output power shall be reduced by 1dB below the specified limit for each 3 dB that the directional gain of the antenna array exceeds 6dBi.		
Test setup:	See sec 2.1	Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 23.1°C	Relative Humidity: 55.4%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	---	

Test Results:

2400-2483.5 MHz Band

Frequency [MHz]	Data Rate [Mbps]	Peak Output Power* [dBm]	Peak Output Power* [mW]	Average Output power** [dBm]	Limit [dBm]	Margin [dB]
802.11b Mode						
2412	1	20.92	123.59	17.91	30	-9.08
2422	1	20.94	124.17	17.93	30	-9.06
2437	1	21.10	128.82	18.09	30	-8.90
802.11g Mode						
2412	6	21.47	140.28	18.46	30	-8.53
2422	6	21.56	143.22	18.55	30	-8.44
2437	6	21.89	154.53	18.88	30	-8.11

* Using a Peak Power Meter & Corrected for external attenuations.

** Calculated (50% duty cycle), for reporting purposes only.

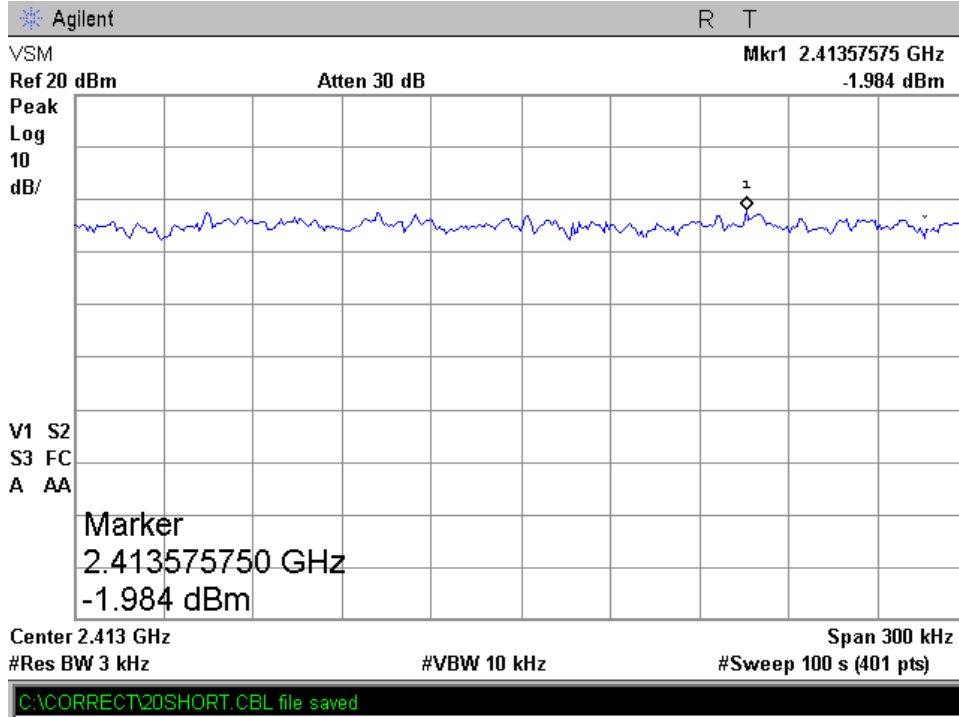
4.3. Peak power spectral density

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 8dBm 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, 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 - Plot 4.3.6	

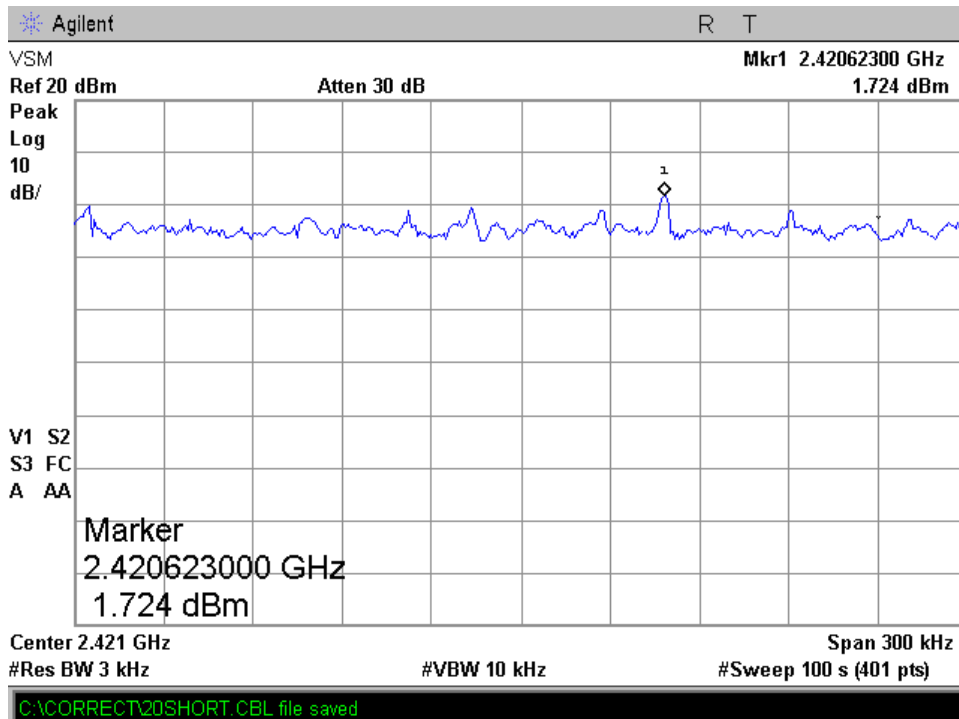
Test Results:

Frequency [MHz]	Data Rate [Mbps]	Measured PSD [dBm/3kHz]	Limit PSD [dBm/3kHz]	Margin [dB]	Reference Plots
802.11b Mode					
2412	11	-1.984	8	-9.984	4.3.1
2422	11	1.724	8	-6.276	4.3.2
2437	11	1.474	8	-6.526	4.3.3
802.11g Mode					
2412	54	-0.676	8	-8.676	4.3.4
2422	54	-1.088	8	-9.088	4.3.5
2437	54	-1.279	8	-9.279	4.3.6

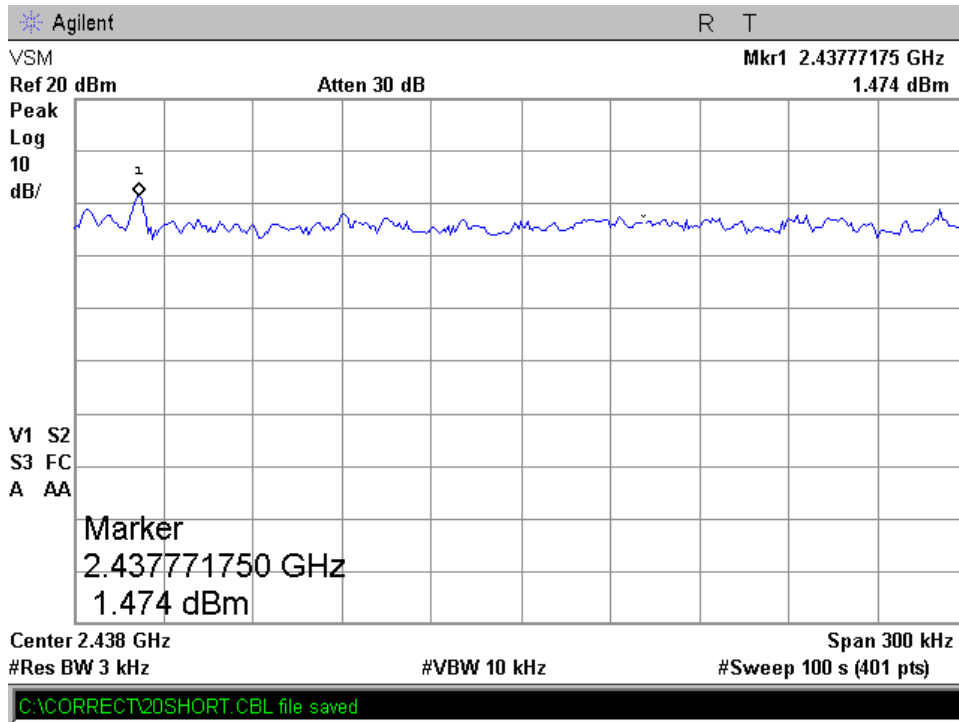
802.11b Mode
Plot 4.3.1



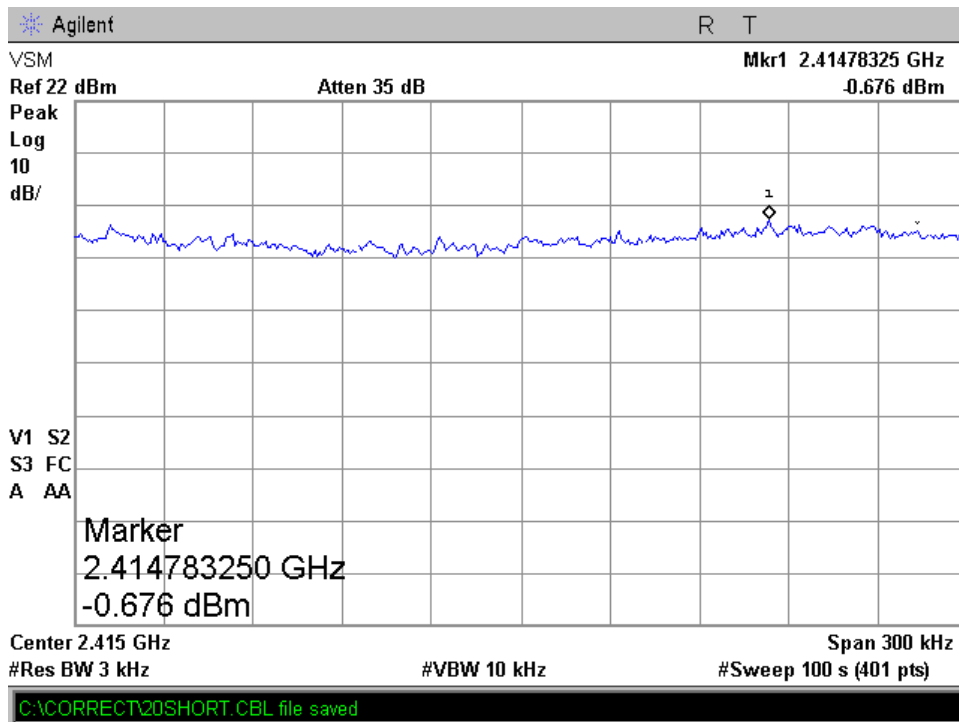
Plot 4.3.2



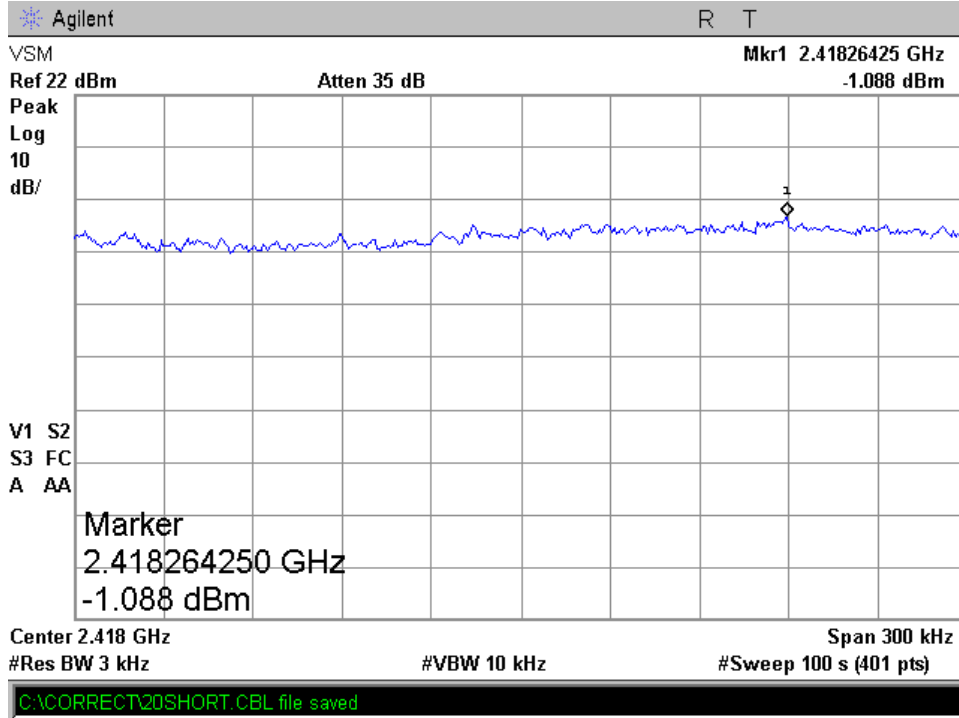
Plot 4.3.3



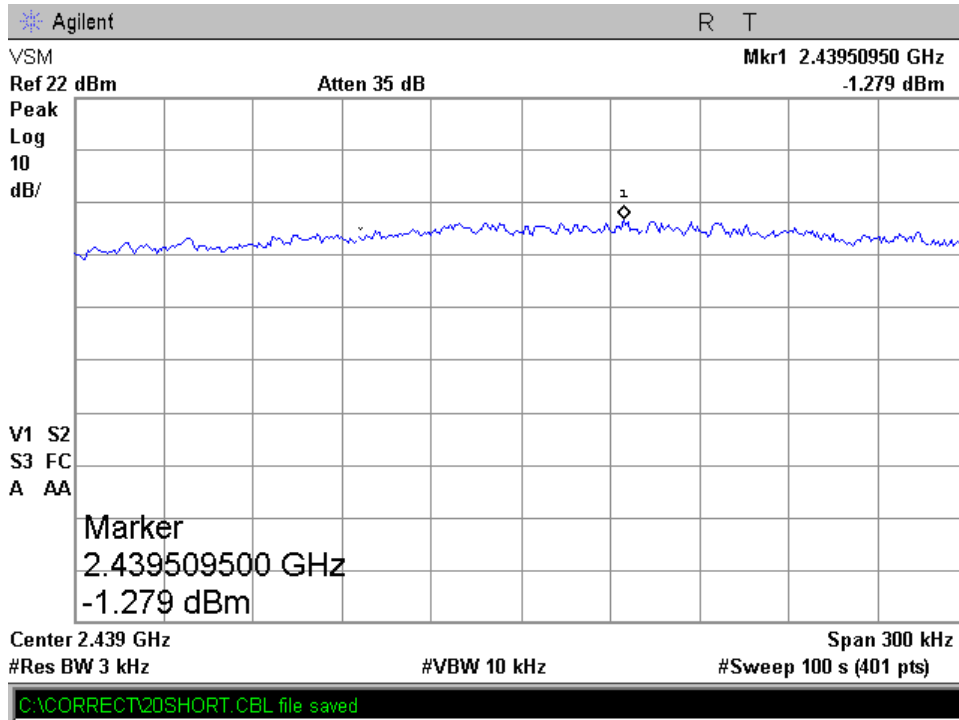
802.11g Mode
Plot 4.3.4



Plot 4.3.5



Plot 4.3.6



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- Plot 4.4.16	

Test results: 2400-2483.5 MHz Band

Spurious

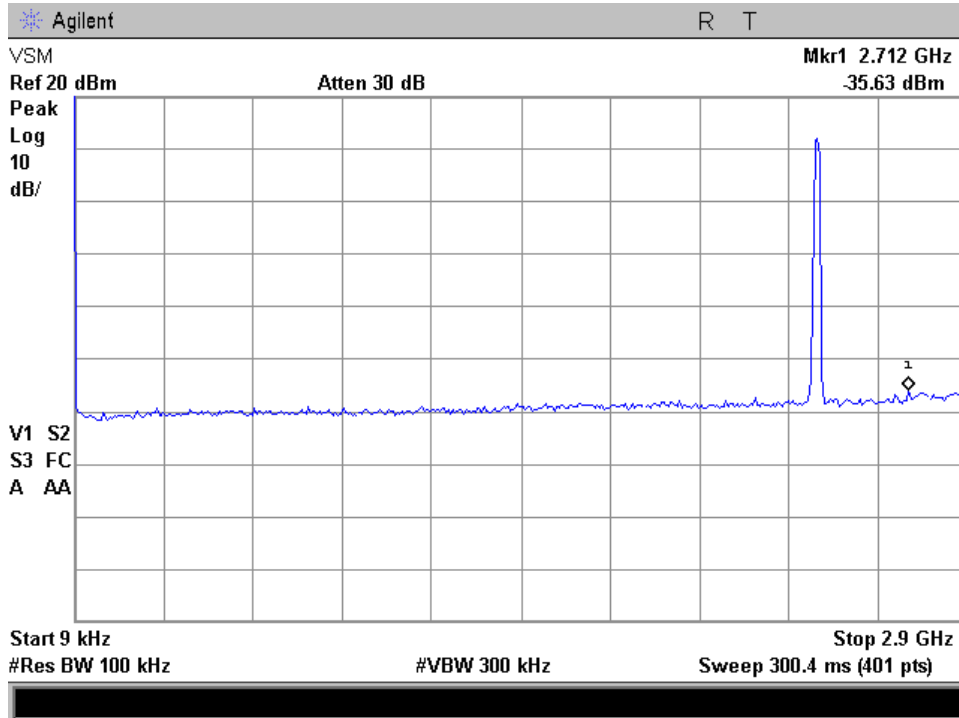
Frequency [MHz]	Data Rate [Mbps]	Measured [dBc]	Limit [dBc]	Reference Plots*	Result
802.11b Mode					
2412	1	*	-20	4.4.1 - 4.4.2	Comply
2422	1	*	-20	4.4.3 - 4.4.4	Comply
2437	1	*	-20	4.4.5 - 4.4.6	Comply
802.11g Mode					
2412	6	*	-20	4.4.7 - 4.4.8	Comply
2422	6	*	-20	4.4.9 - 4.4.10	Comply
2437	6	*	-20	4.4.11 - 4.4.12	Comply

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

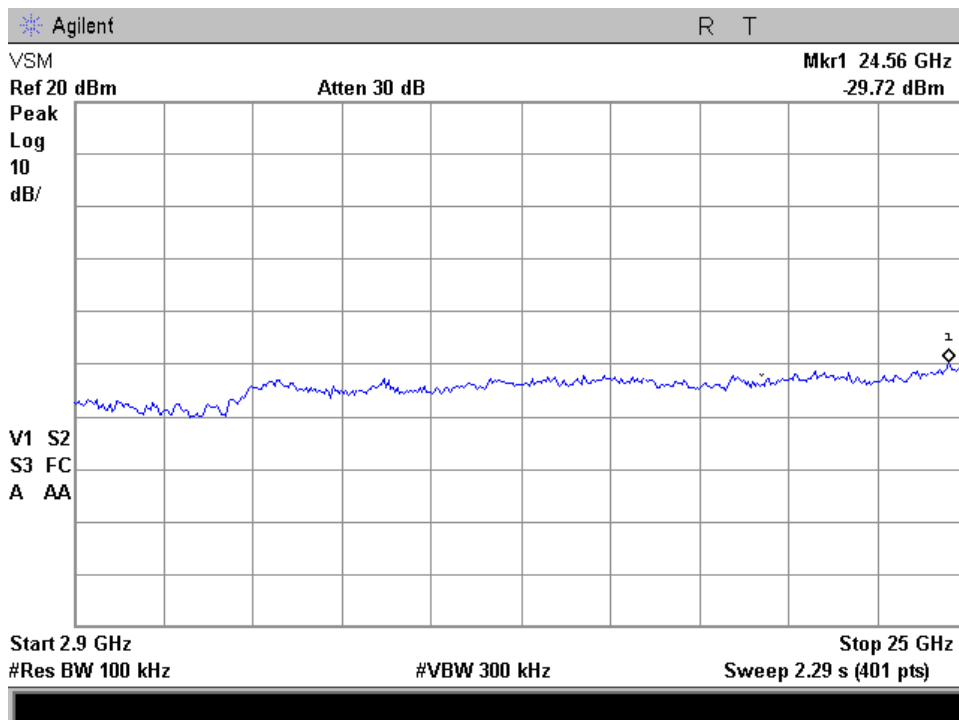
Band Edge

Frequency [MHz]	Data Rate [Mbps]	Measured [dBc]	Limit [dBc]	Reference	Result
802.11b Mode					
2412	1	-44.04	-20	4.4.13	Comply
2437	1	-50.85	-20	4.4.14	Comply
802.11g Mode					
2412	6	-26.20	-20	4.4.15	Comply
2437	6	-46.49	-20	4.4.16	Comply

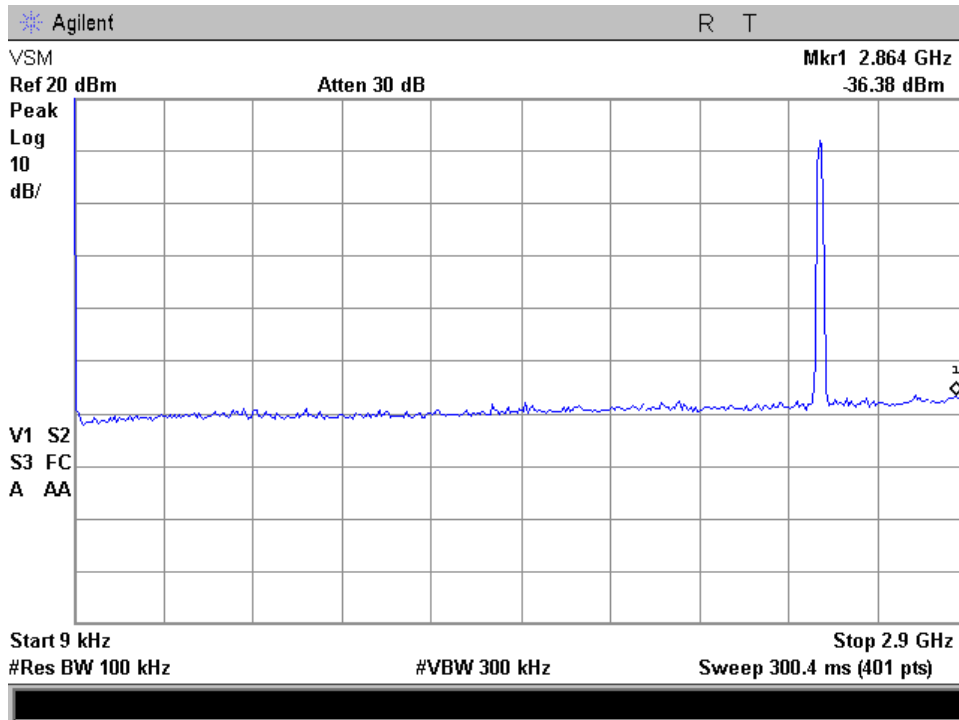
802.11b Mode
Plot 4.4.1



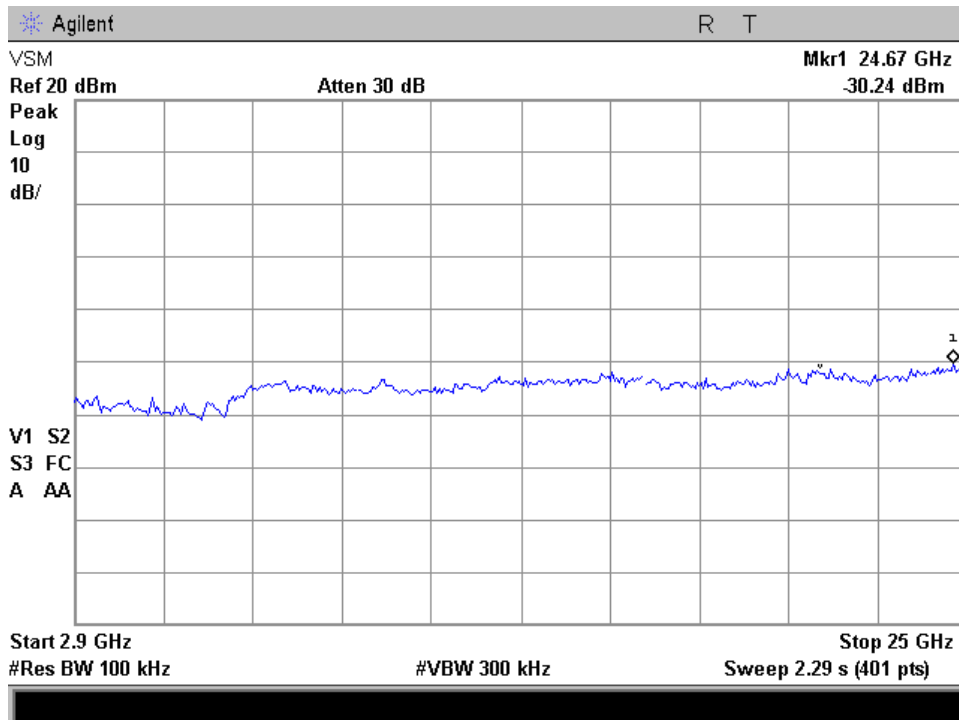
Plot 4.4.2



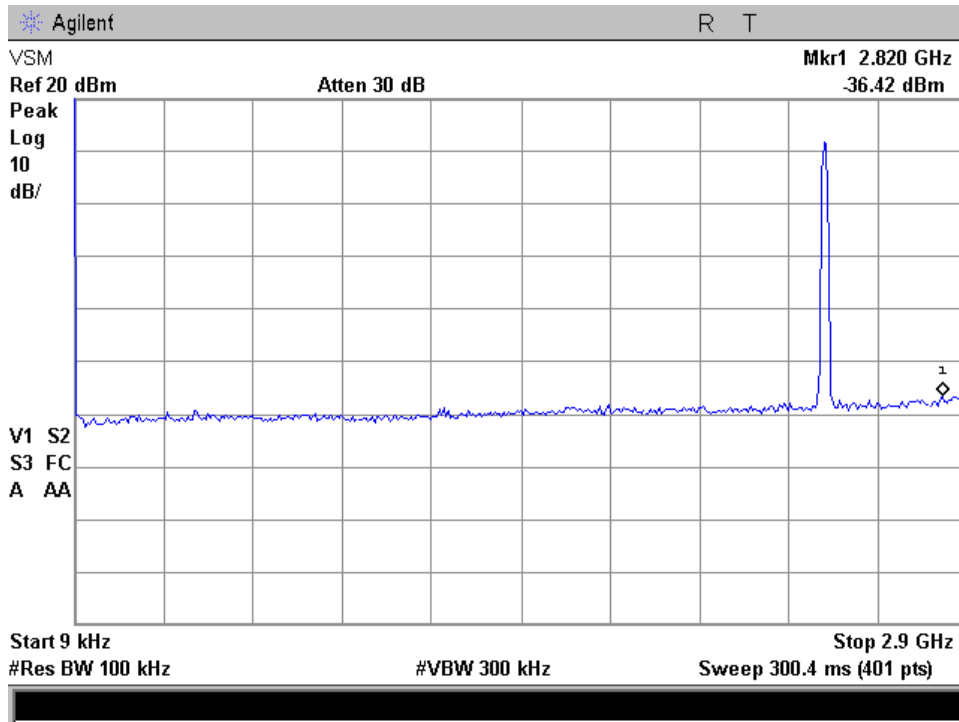
Plot 4.4.3



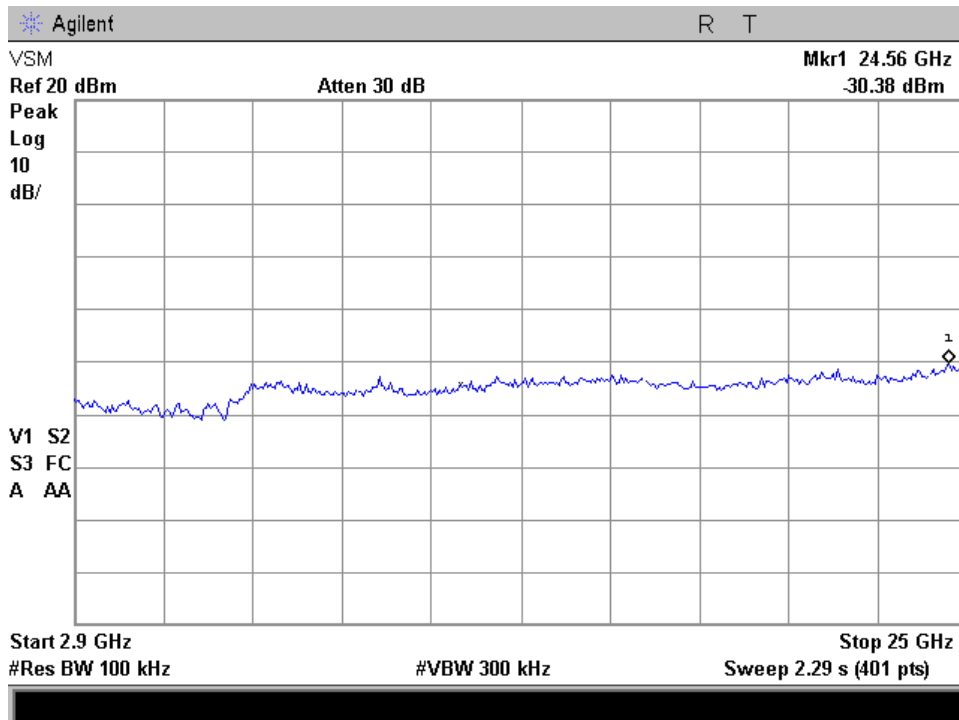
Plot 4.4.4



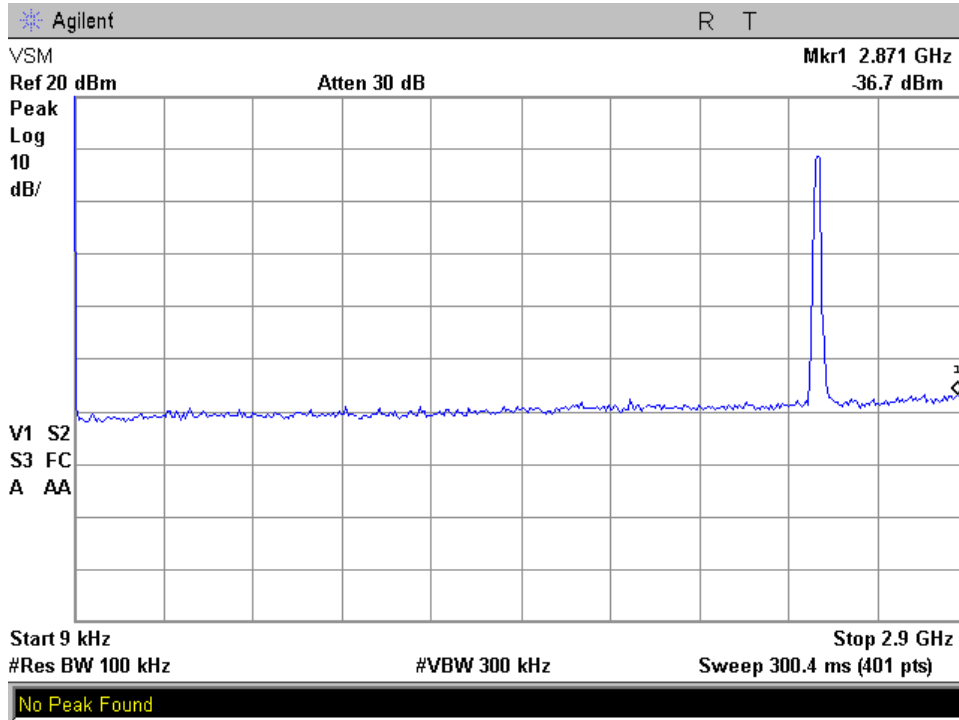
Plot 4.4.5



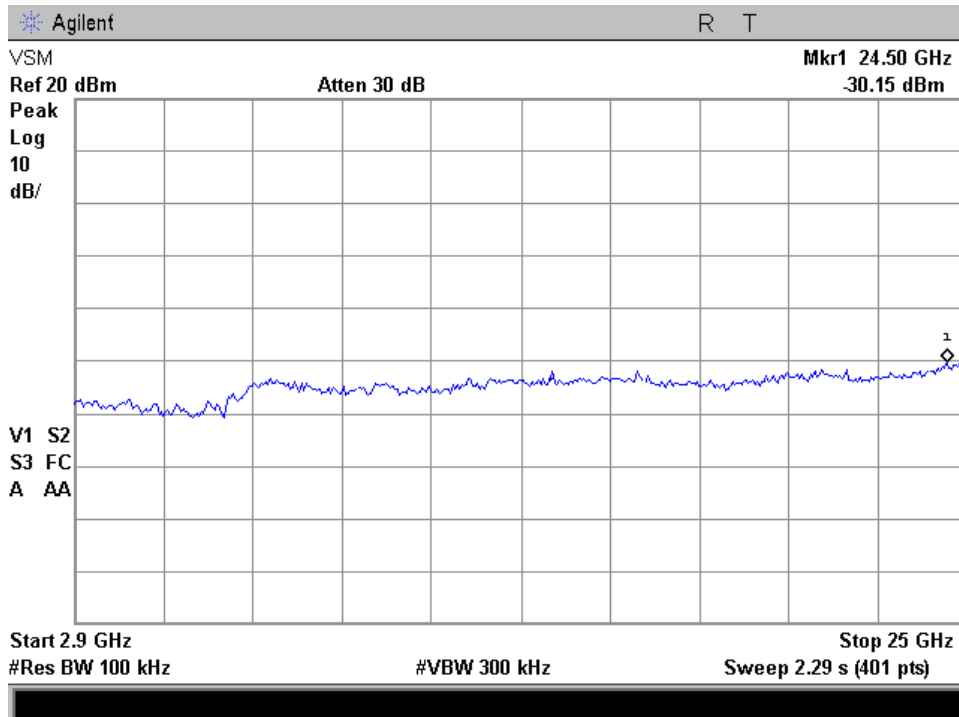
Plot 4.4.6



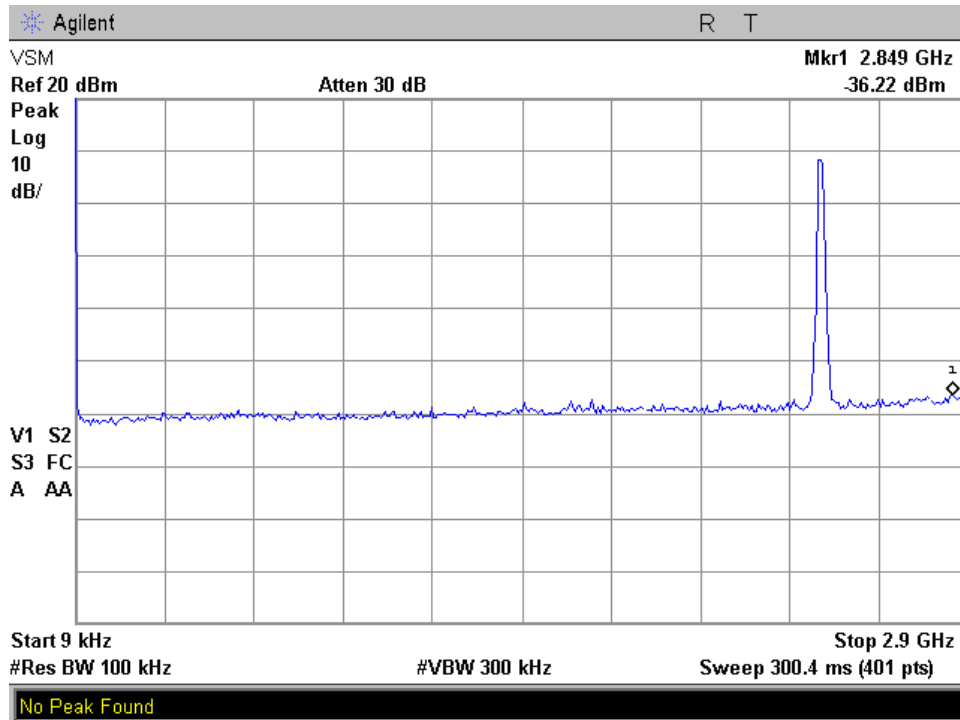
802.11g Mode
Plot 4.4.7



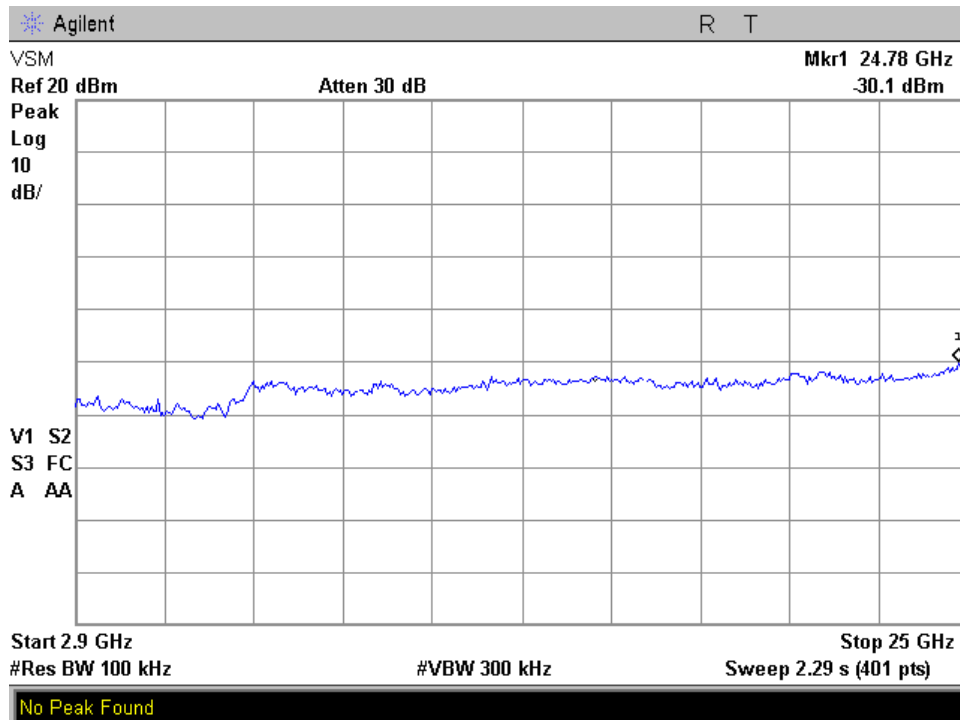
Plot 4.4.8



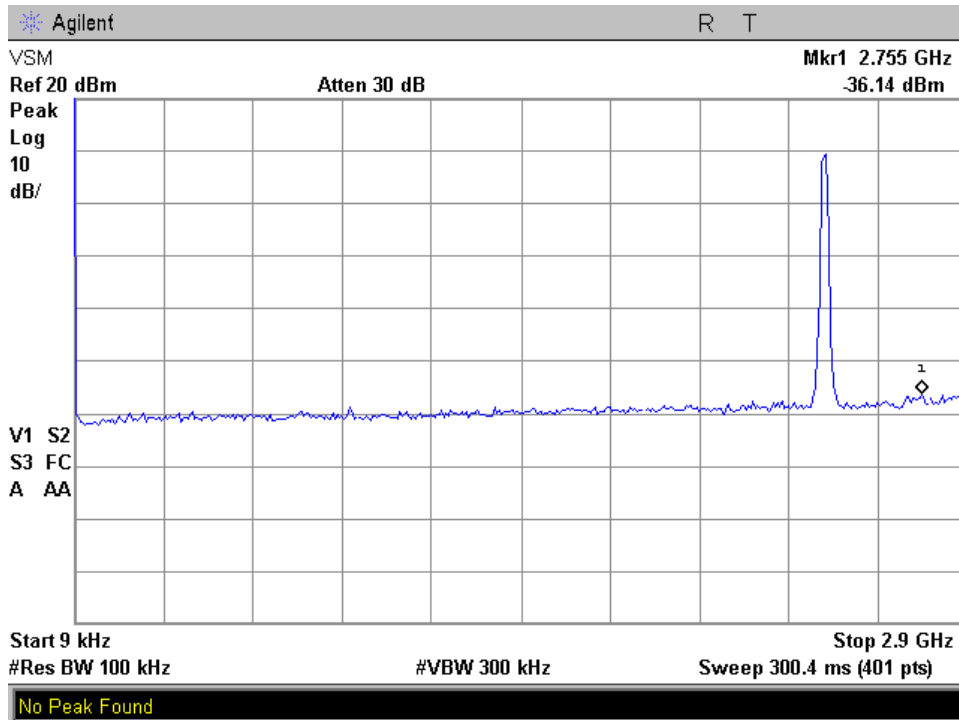
Plot 4.4.9



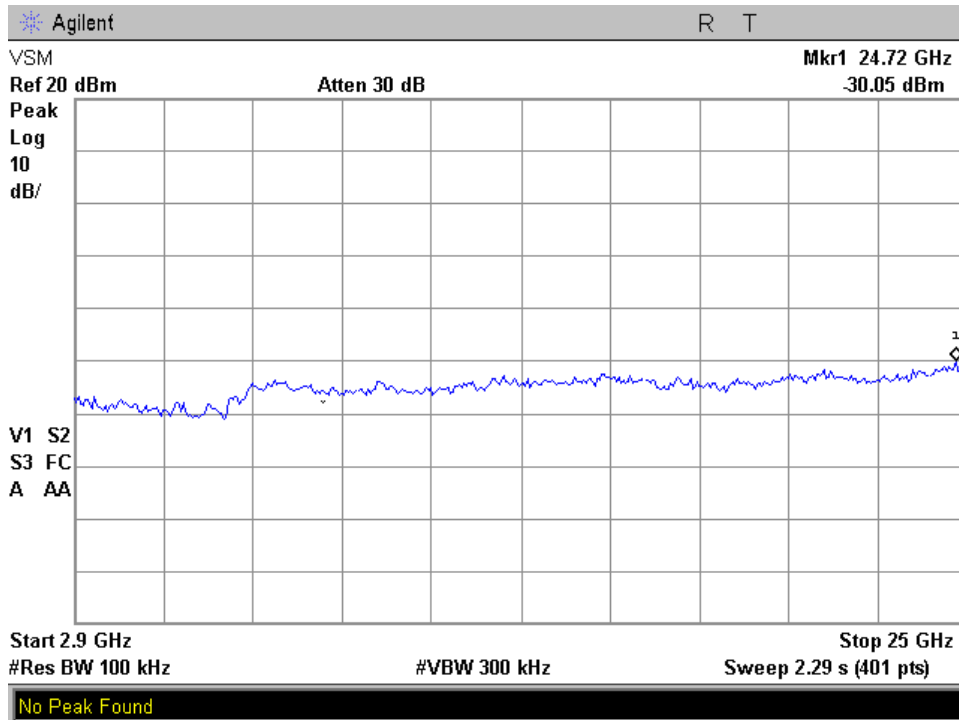
Plot 4.4.10



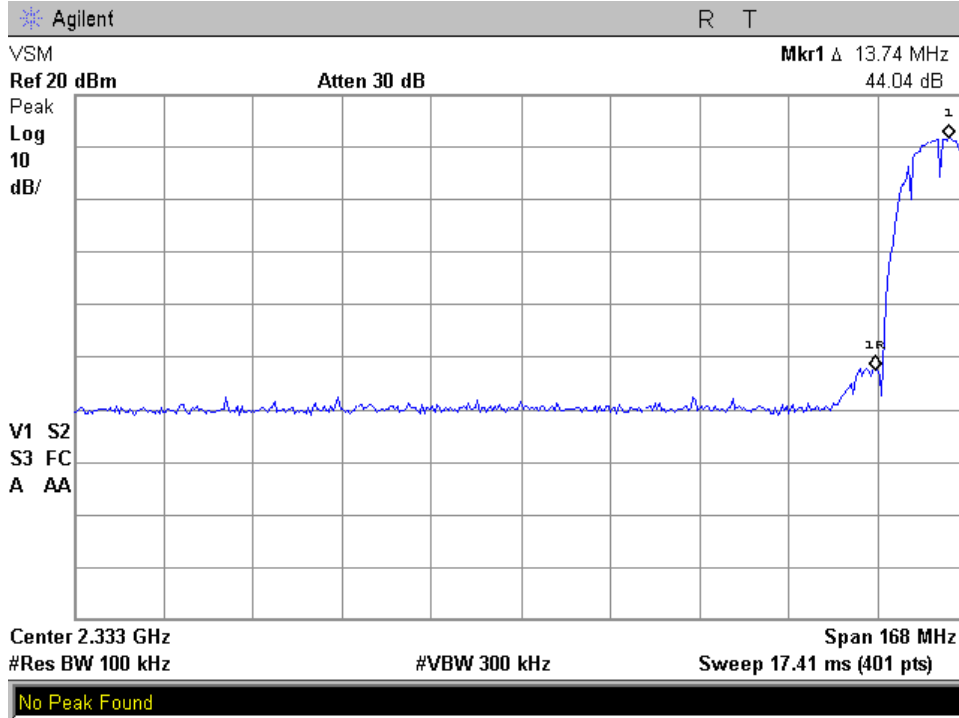
Plot 4.4.11



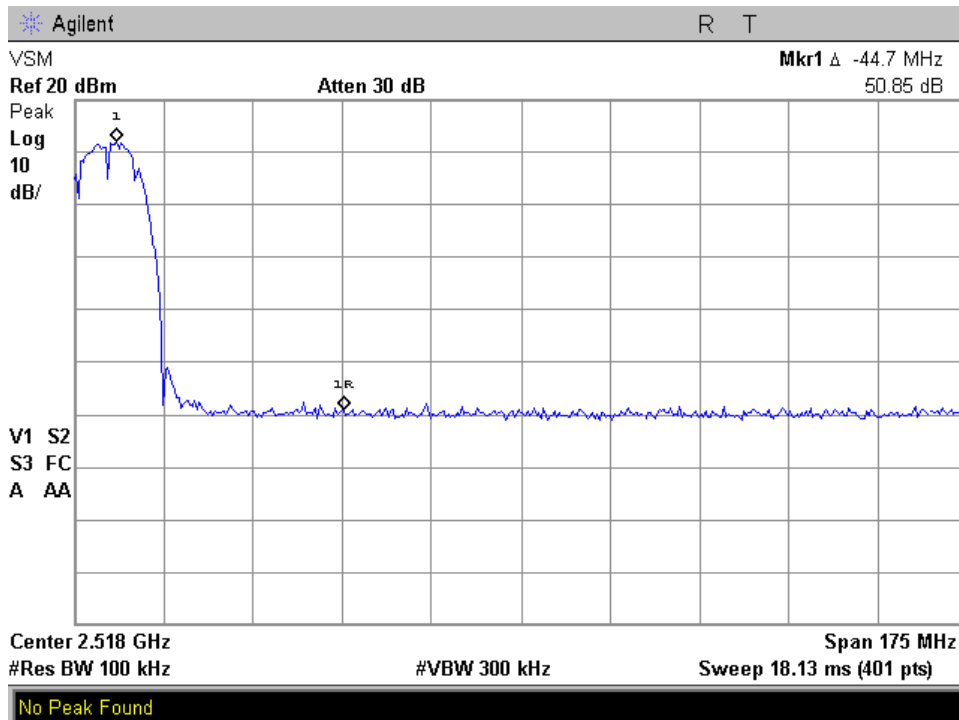
Plot 4.4.12



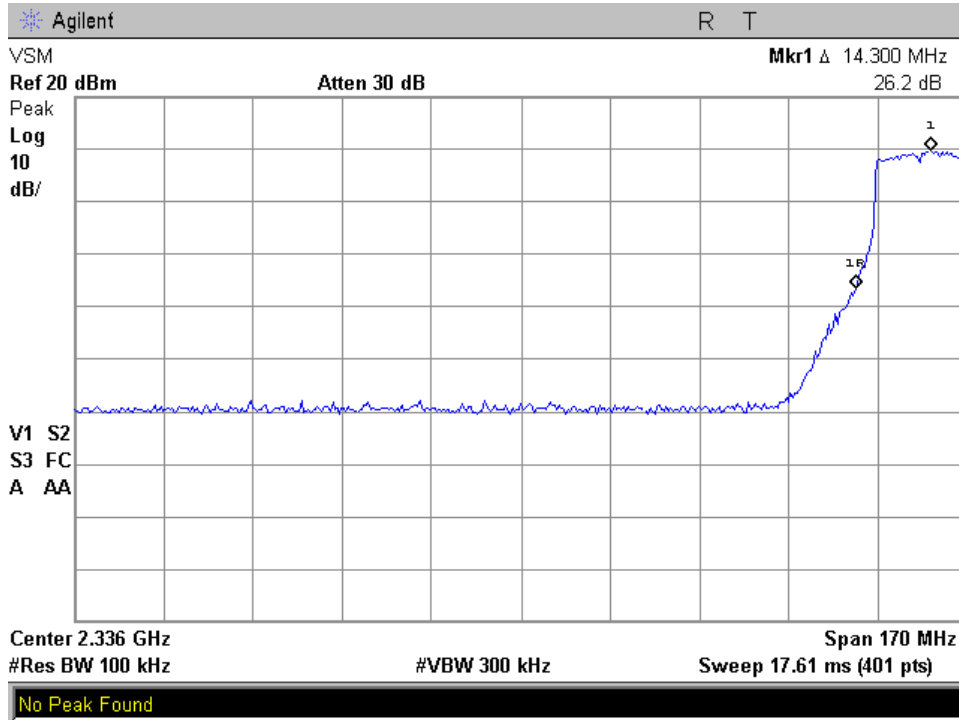
802.11b Mode
Plot 4.4.13



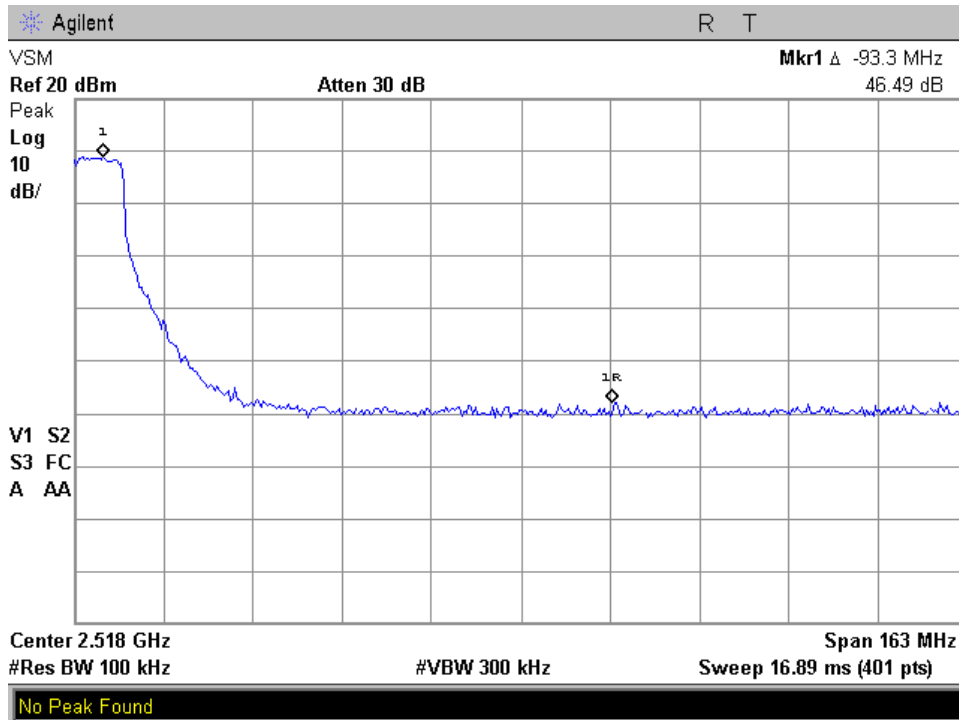
Plot 4.4.14



802.11g Mode
Plot 4.4.15



Plot 4.4.16



4.5. Spurious Radiated Emissions, Restricted Bands 2310-2390MHz & 2483.5-2500MHz

Reference document:	47 CFR §15.247 (d) & §15.205		
Test Requirements:	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 2.2	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	Peak: RBW= 1MHz, VBW= 3MHz, Average: VBW= 10 Hz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.5.1 to Plot 4.5.16	

Test results:

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

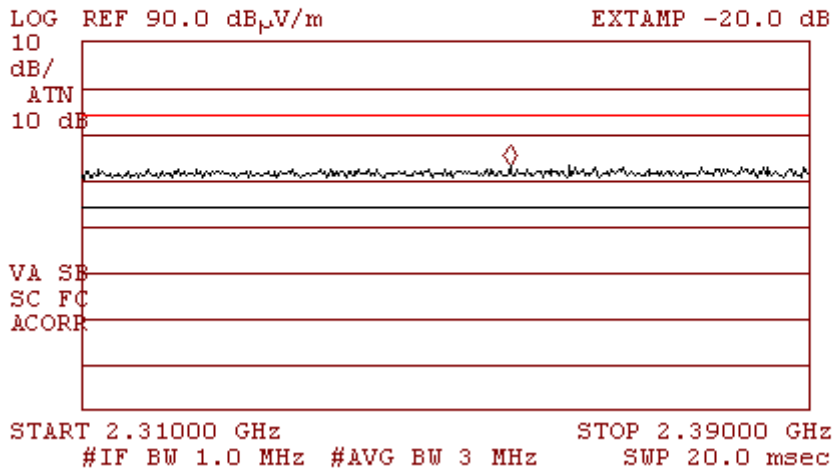
Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization H/V	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
WLAN 802.11b							
2412	1	2357.00	Peak	H	63.03	74	-10.97
2412	1	2370.60	Avg	H	48.53	54	-5.47
2437	1	2497.94	Peak	H	63.15	74	-10.85
2437	1	2497.61	Avg	H	48.47	54	-5.53
WLAN 802.11g							
2412	6	2389.60	Peak	V	68.05	74	-5.95
2412	6	2390.00	Avg	V	53.10	54	-0.9
2437	6	2484.20	Peak	V	62.61	74	-11.39
2437	6	2483.67	Avg	V	48.56	54	-5.44

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

WLAN 802.11b, 2412 MHz, 1 Mbps
Lowest Frequency
Horizontal Polarization
Peak
Plot 4.5.1

/p VSM

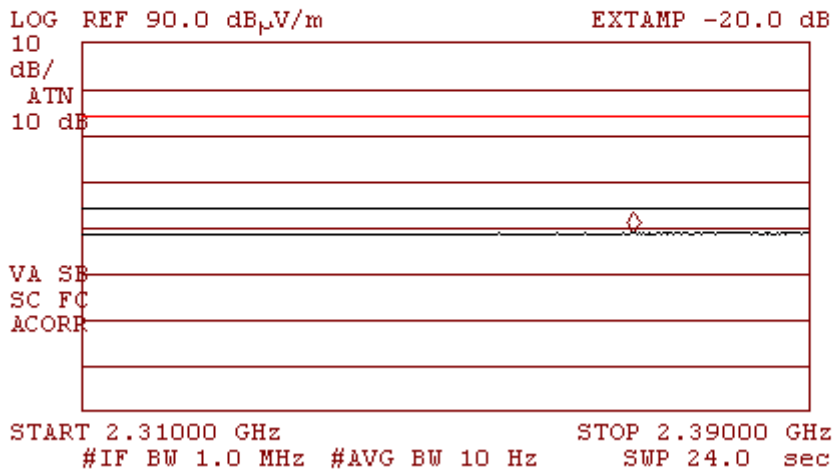
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.35700 GHz
63.03 dB μ V/m



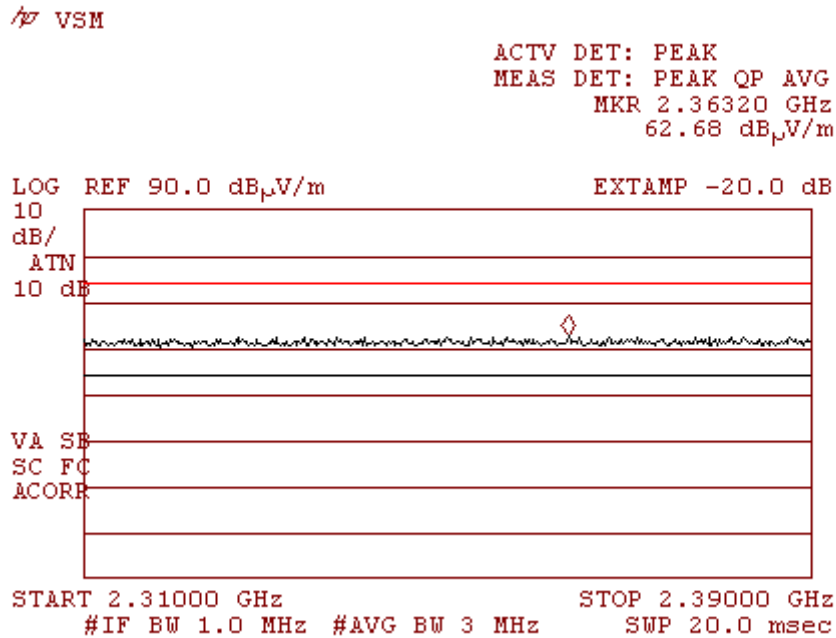
Horizontal Polarization
Average
Plot 4.5.2

/p VSM

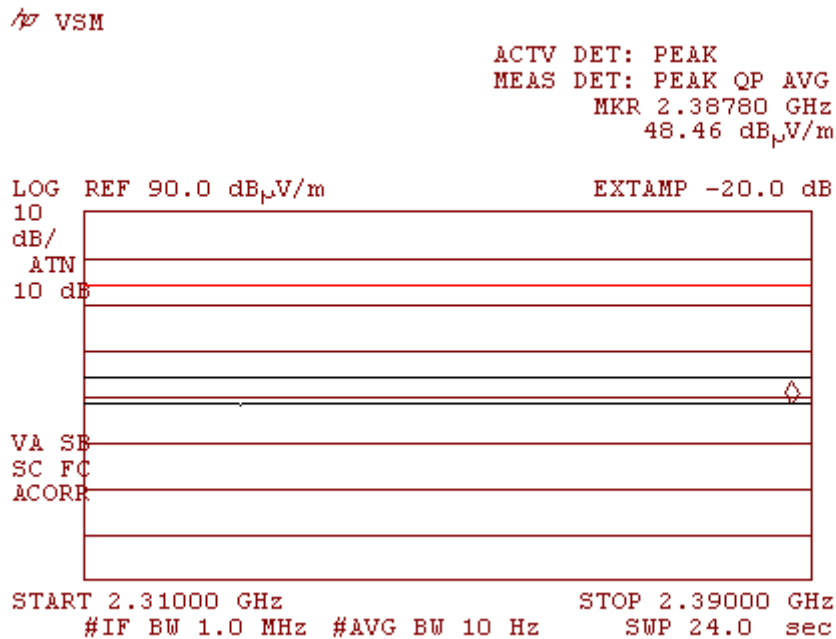
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.37060 GHz
48.53 dB μ V/m



**Vertical Polarization
Peak
Plot 4.5.3**



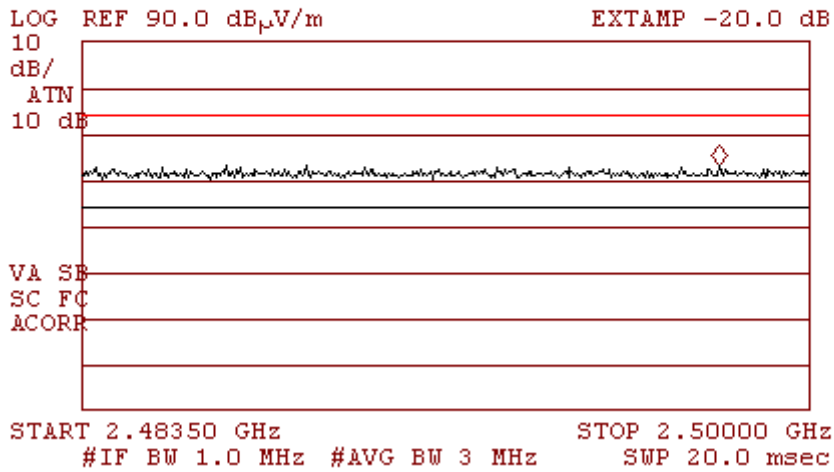
**Vertical Polarization
Average
Plot 4.5.4**



WLAN 802.11b, 2437 MHz, 1 Mbps
Highest Frequency
Horizontal Polarization
Peak
Plot 4.5.5

/p VSM

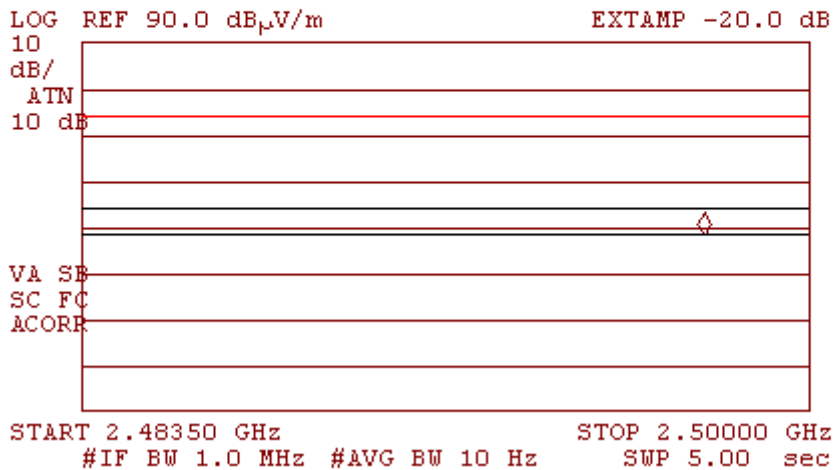
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.49794 GHz
63.15 dB μ V/m



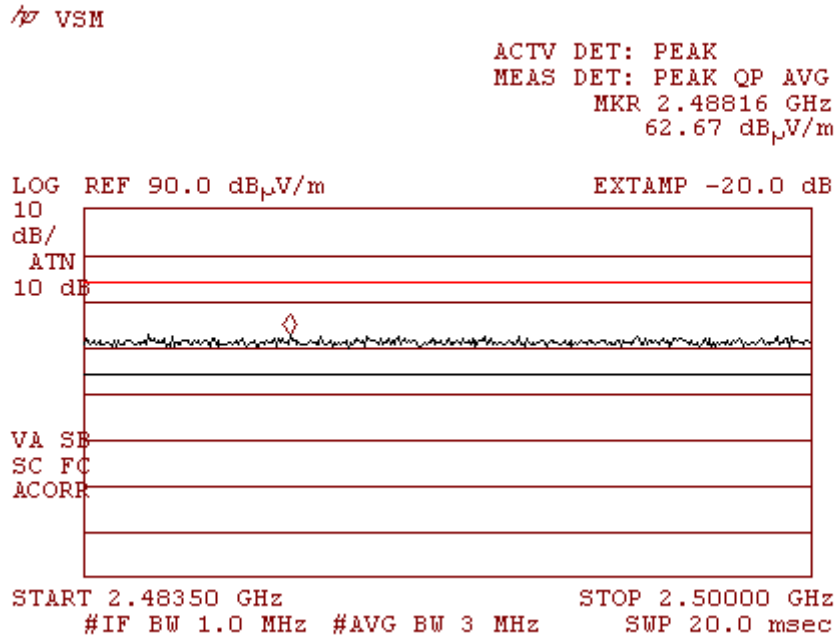
Horizontal Polarization
Average
Plot 4.5.6

/p VSM

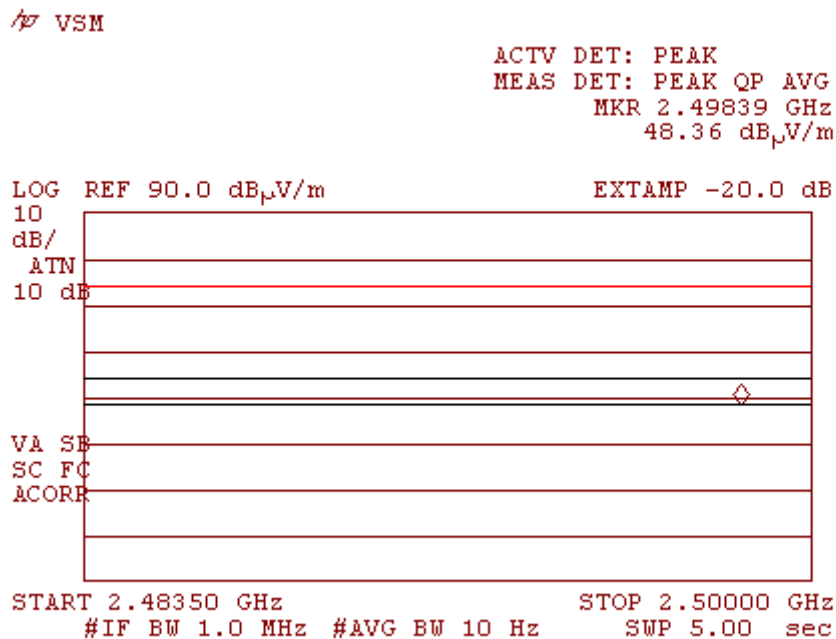
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.49761 GHz
48.47 dB μ V/m



**Vertical Polarization
Peak
Plot 4.5.7**



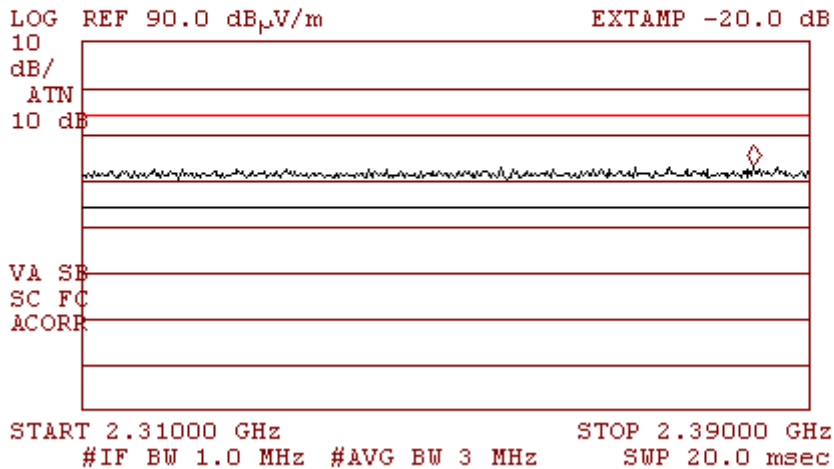
**Vertical Polarization
Average
Plot 4.5.8**



WLAN 802.11g, 2412 MHz, 6 Mbps
Lowest Frequency
Horizontal Polarization
Peak
Plot 4.5.9

/p VSM

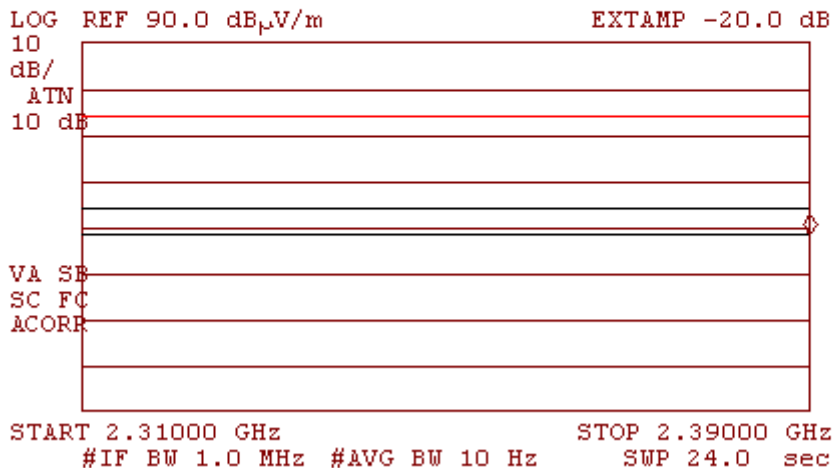
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38380 GHz
62.89 dB μ V/m



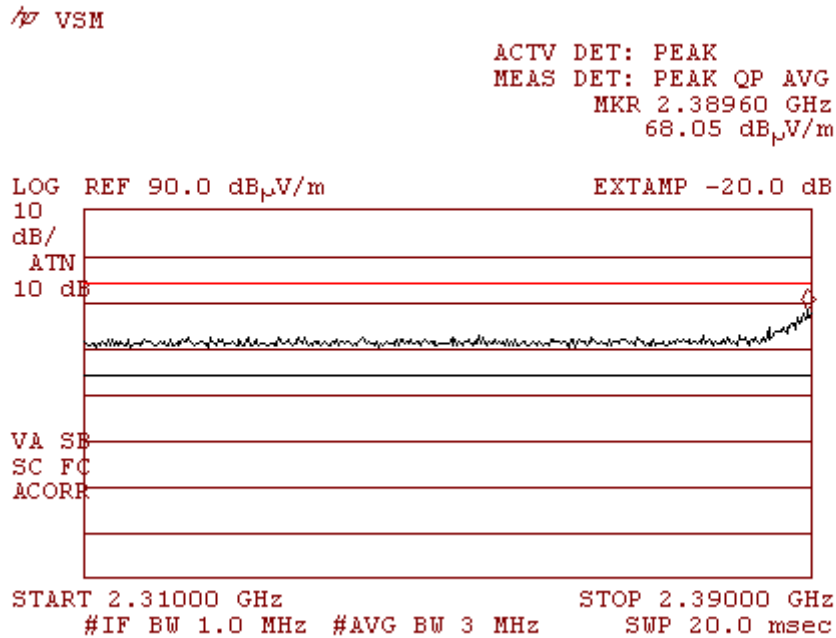
Horizontal Polarization
Average
Plot 4.5.10

/p VSM

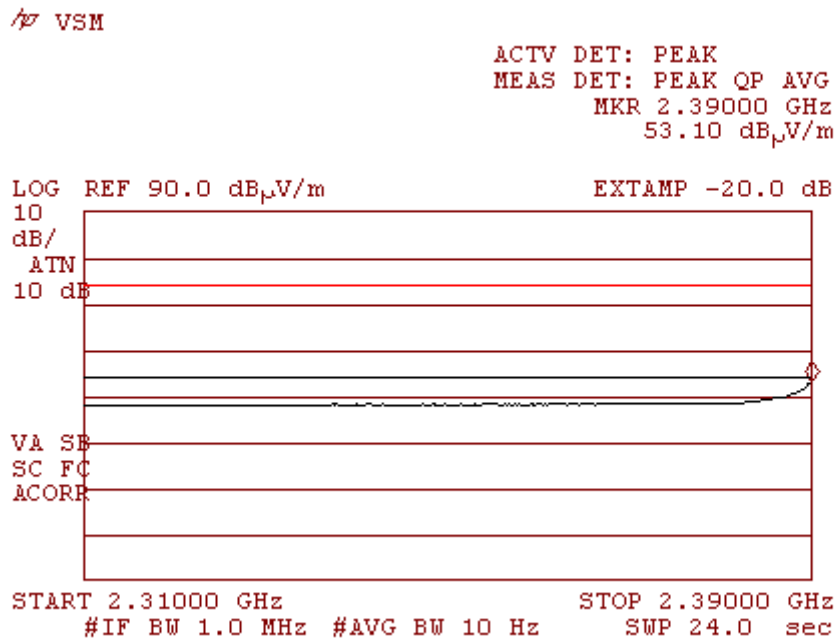
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.39000 GHz
48.41 dB μ V/m



**Vertical Polarization
Peak
Plot 4.5.11**



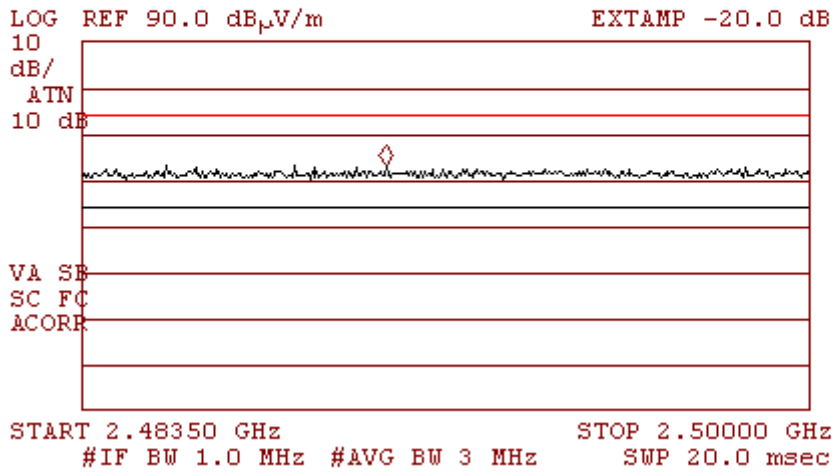
**Vertical Polarization
Average
Plot 4.5.12**



WLAN 802.11g, 2437 MHz, 6 Mbps
Highest Frequency
Horizontal Polarization
Peak
Plot 4.5.13

/p VSM

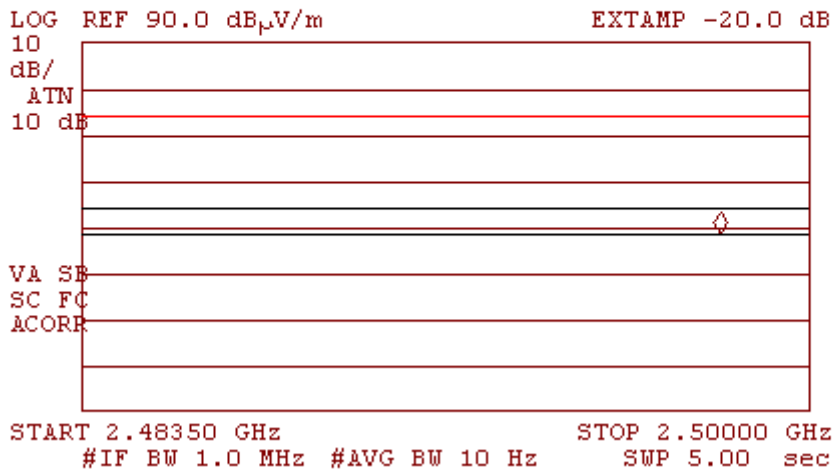
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.49039 GHz
62.95 dB μ V/m



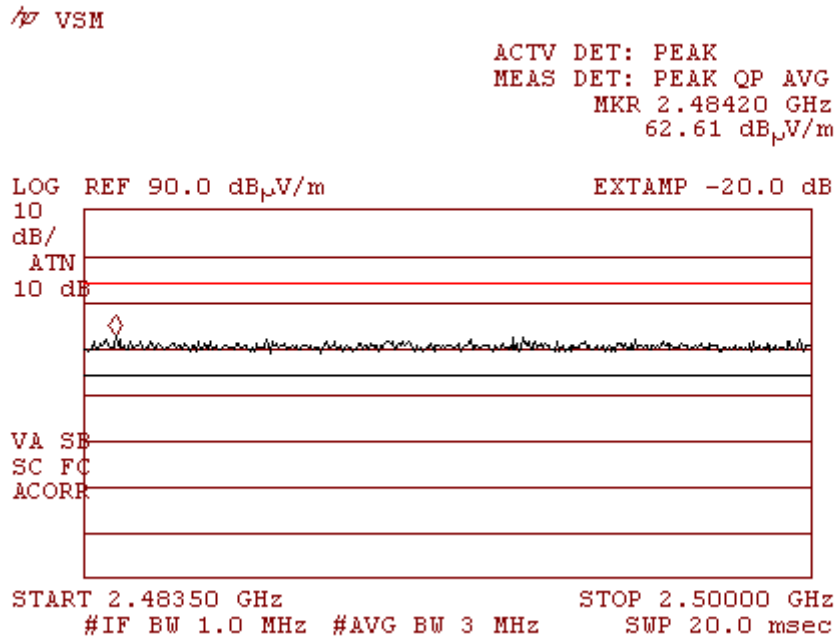
Horizontal Polarization
Average
Plot 4.5.14

/p VSM

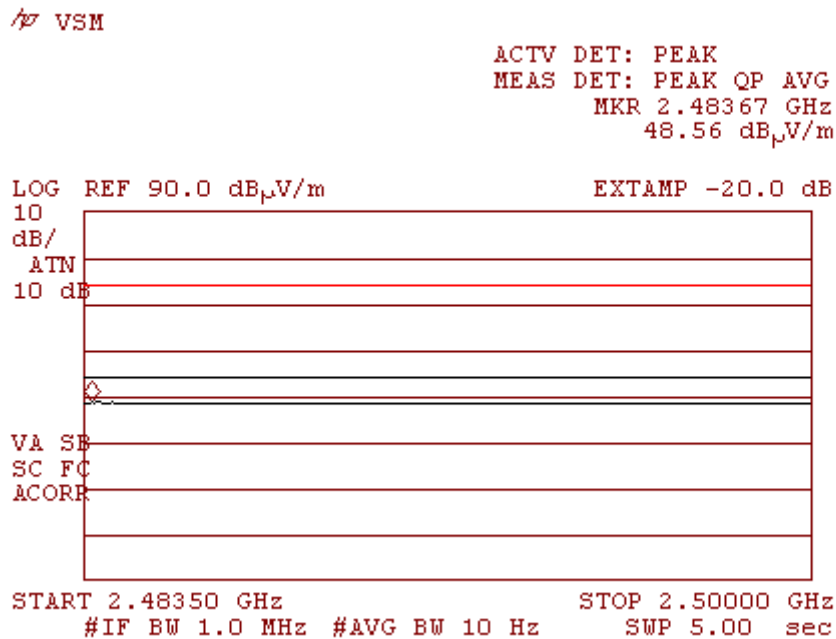
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.49798 GHz
48.50 dB μ V/m



**Vertical Polarization
Peak
Plot 4.5.15**



**Vertical Polarization
Average
Plot 4.5.16**



4.6. Spurious Radiated Emissions, Restricted Bands

Reference document:	47 CFR §15.247 (d), & §15.205, & §15.209(a)		
Test Requirements:	The emissions from an intentional radiator shall not exceed the field strength levels specified in §15.209(a).		
Test setup:	See sec 2.2, with Band Reject filter	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f >1GHz: Peak: RBW= 1MHz, VBW= 3MHz, Average: VBW= 10 Hz f <1GHz: RBW: 120kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.6.1 - Plot 4.6.34	

Test results:

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

Channel Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization H/V	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
WLAN 802.11b							
2412	1	4824	Peak	V	52.7	74	-21.3
2412	1	4824	Avg	V	47.8	54	-6.2
2422	1	4844	Peak	V	52.8	74	-21.2
2422	1	4844	Avg	V	47.6	54	-6.4
2437	1	4874	Peak	V	52.1	74	-21.9
2437	1	4874	Avg	V	46.0	54	-8.0
All other emissions at least 10 dB below the limit							

Channel Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization H/V	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
WLAN 802.11g							
2412	6	4817	Peak	V	58.5	74	-15.5
2412	6	4817	Avg	V	38.4	54	-15.6
2422	6	4842	Peak	V	51.7	74	-22.3
2422	6	4842	Avg	V	37.5	54	-16.5
2437	6	4869	Peak	V	51.6	74	-22.4
2437	6	4869	Avg	V	36.1	54	-17.9
All other emissions at least 10 dB below the limit							

Test results below 1GHz:

All measurements were done in horizontal and vertical polarizations; the results show the worst case for all frequencies.

Emission Frequency [MHz]	Detector Type	Polarization H/V	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
36.1	QP	V	27.2	40	-12.8
106.7	QP	V	27.1	43.5	-16.4
875.0	QP	H	37.1	46	-8.9

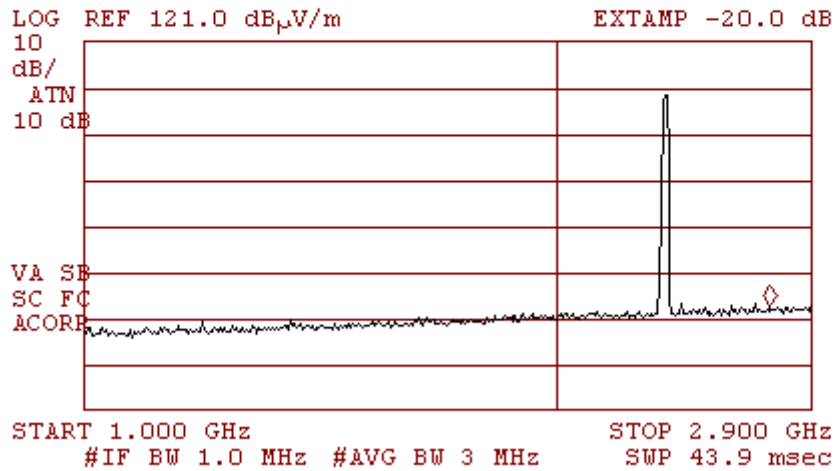
Note: Spurious Emission [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]

Correction Factor = Antenna factor + Cable Loss + Filter I/L.

WLAN 802.11b, 2412 MHz, 1 Mbps
Lowest Frequency
Horizontal & Vertical Polarization
Plot 4.6.1

VSM

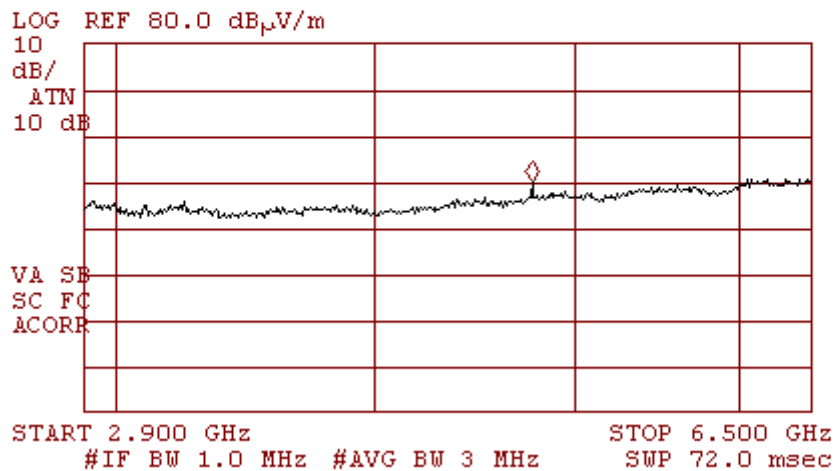
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.762 GHz
63.75 dB μ V/m



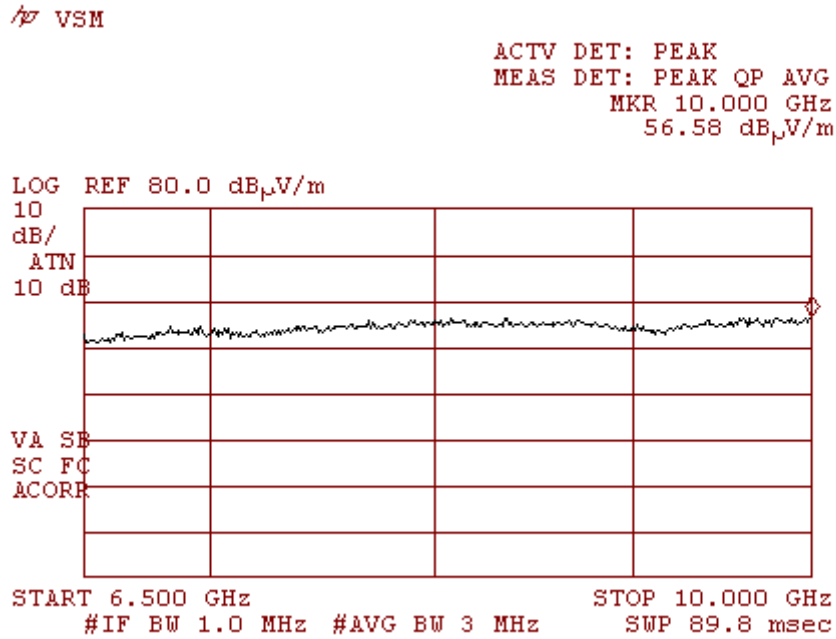
Horizontal & Vertical Polarization
Plot 4.6.2

VSM

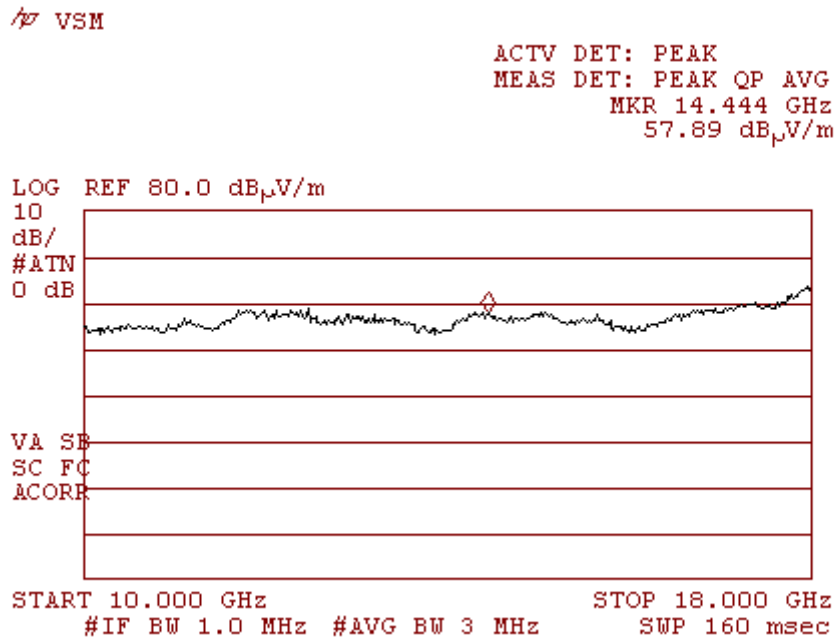
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.833 GHz
49.99 dB μ V/m



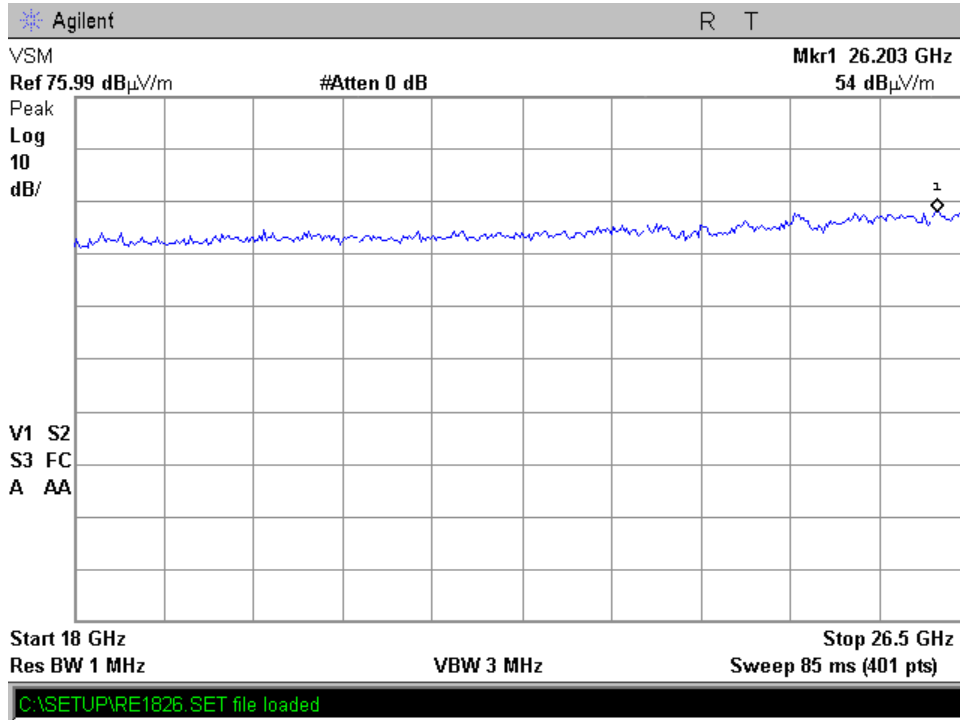
Horizontal & Vertical Polarization
Plot 4.6.3



Horizontal & Vertical Polarization
Plot 4.6.4



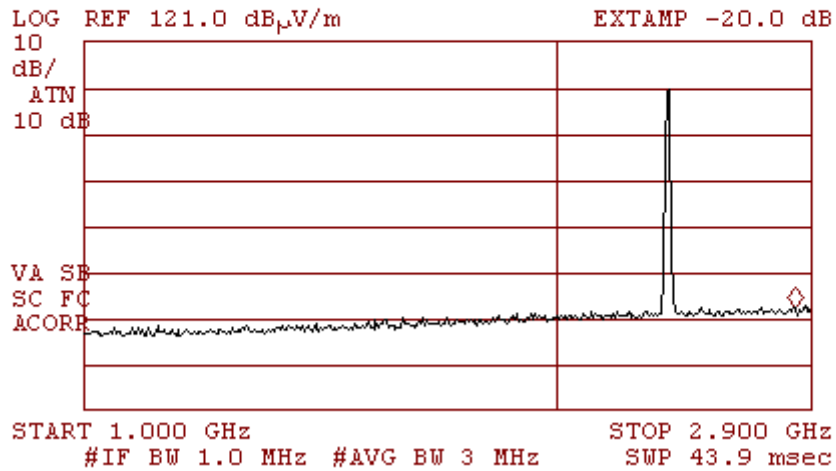
**Horizontal & Vertical Polarization
Plot 4.6.5**



WLAN 802.11b, 2422 MHz, 1 Mbps
Middle Frequency
Horizontal & Vertical Polarization
Plot 4.6.6

VSM

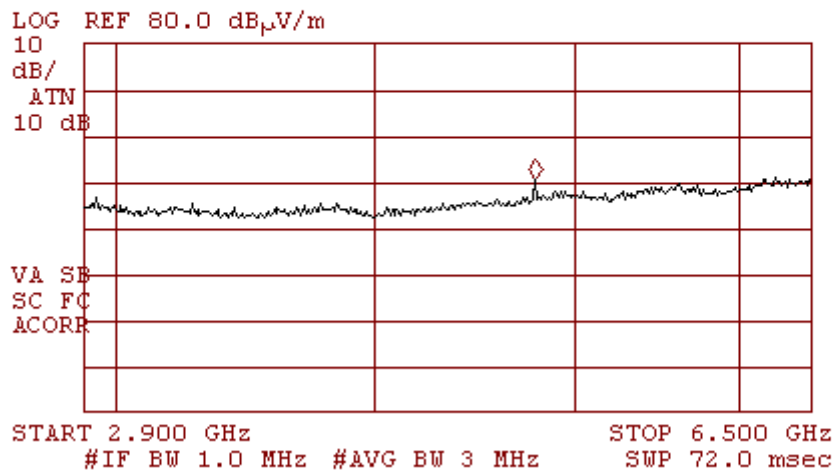
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.846 GHz
63.40 dB_μV/m



Horizontal & Vertical Polarization
Plot 4.6.7

VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.855 GHz
50.45 dB_μV/m

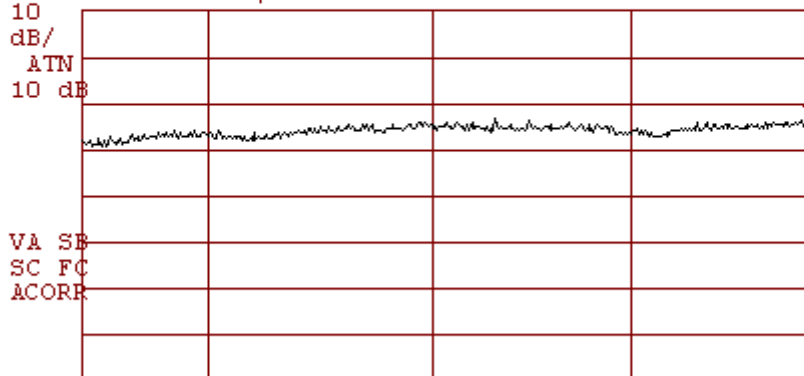


Horizontal & Vertical Polarization
Plot 4.6.8

/p VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 10.000 GHz
56.93 dB_μV/m

LOG REF 80.0 dB_μV/m



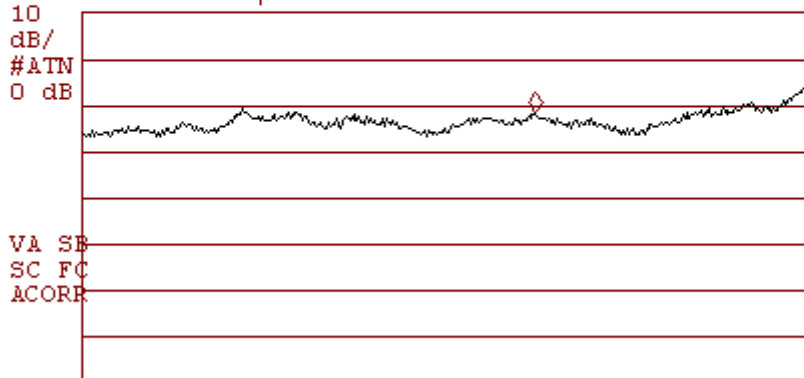
START 6.500 GHz STOP 10.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 89.8 msec

Horizontal & Vertical Polarization
Plot 4.6.9

/p VSM

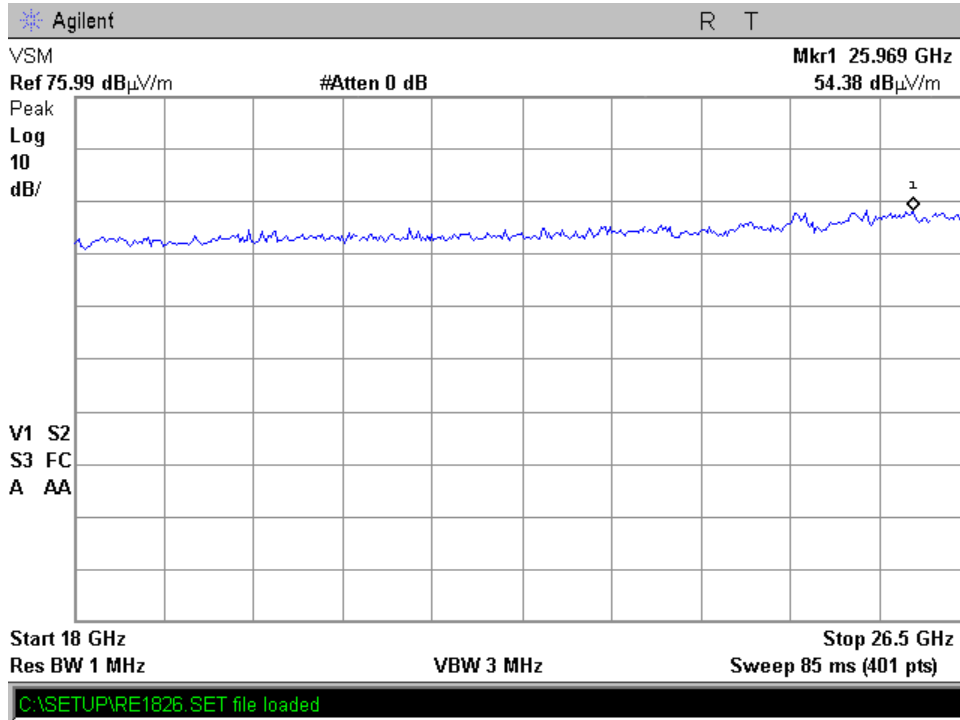
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 14.983 GHz
58.13 dB_μV/m

LOG REF 80.0 dB_μV/m



START 10.000 GHz STOP 18.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 160 msec

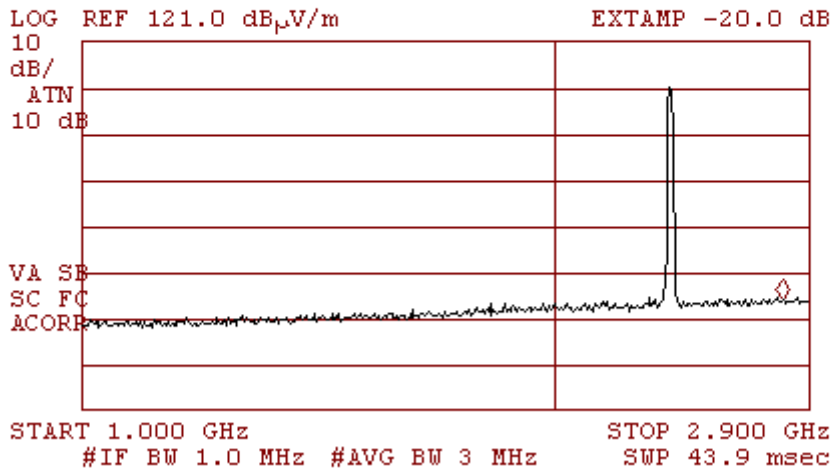
Horizontal & Vertical Polarization
Plot 4.6.10



WLAN 802.11b, 2437 MHz, 1 Mbps
Highest Frequency
Horizontal & Vertical Polarization
Plot 4.6.11

VSM

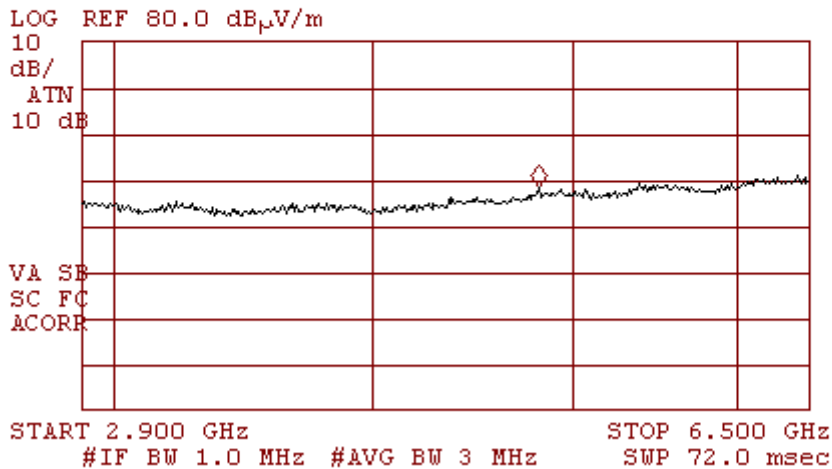
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.810 GHz
65.15 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.6.12

VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.887 GHz
48.46 dB μ V/m

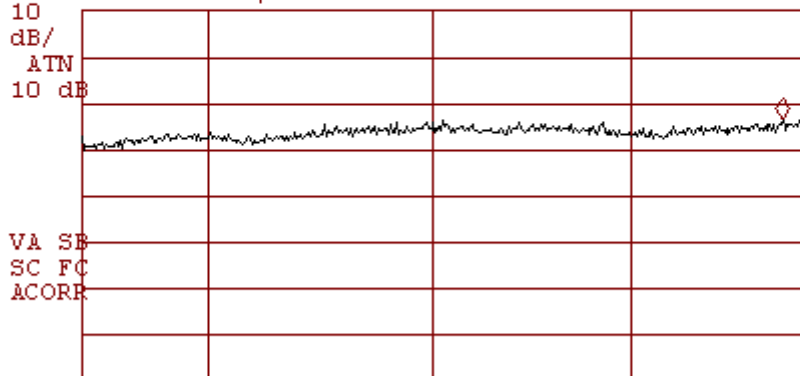


Horizontal & Vertical Polarization
Plot 4.6.13

/p VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.869 GHz
56.27 dB_μV/m

LOG REF 80.0 dB_μV/m



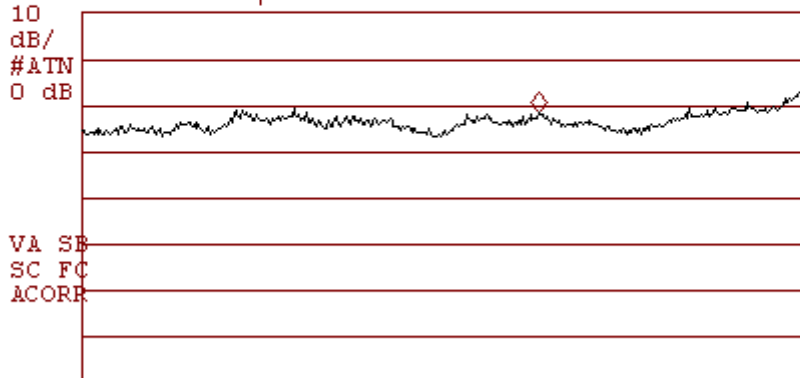
START 6.500 GHz STOP 10.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 89.8 msec

Horizontal & Vertical Polarization
Plot 4.6.14

/p VSM

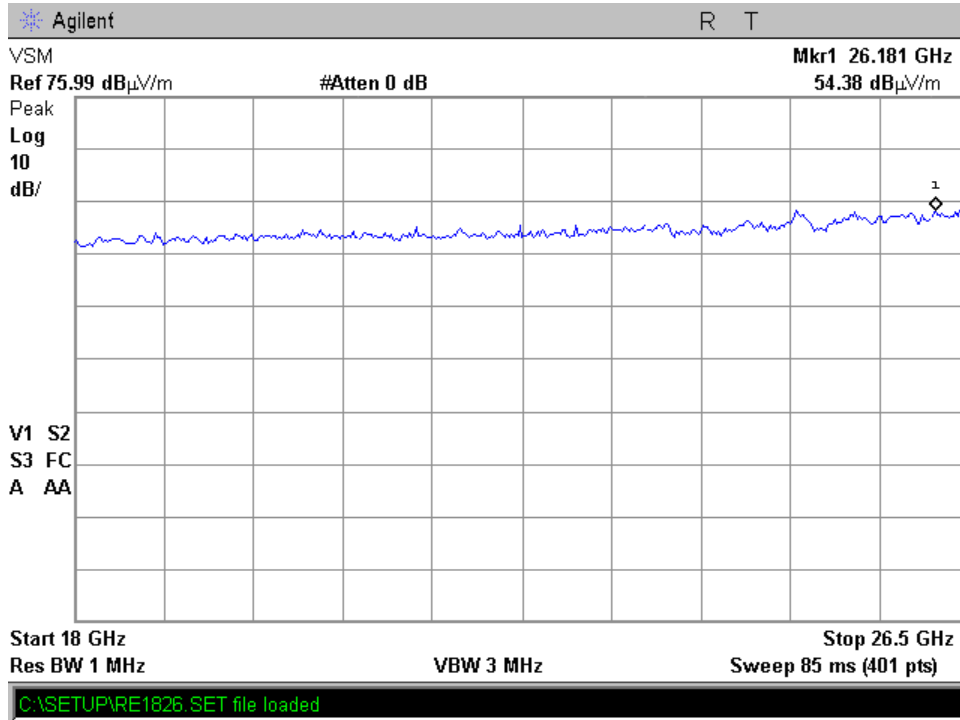
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 15.023 GHz
58.22 dB_μV/m

LOG REF 80.0 dB_μV/m



START 10.000 GHz STOP 18.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 160 msec

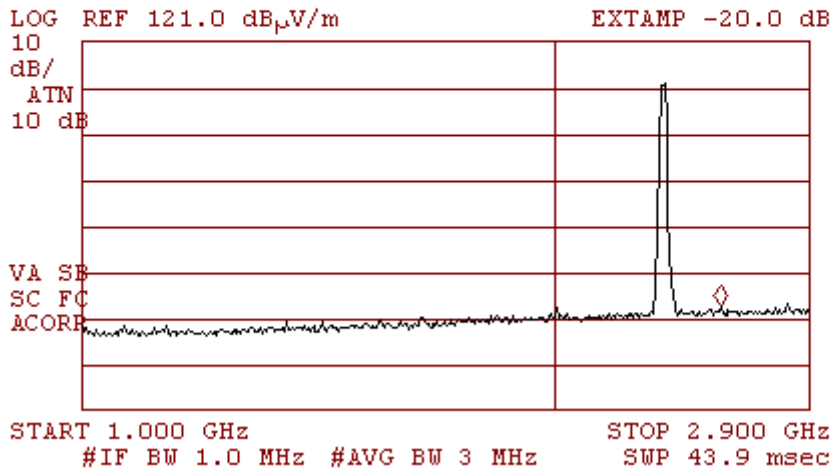
Horizontal & Vertical Polarization
Plot 4.6.15



WLAN 802.11g, 2412 MHz, 6 Mbps
Lowest Frequency
Horizontal & Vertical Polarization
Plot 4.6.16

VSM

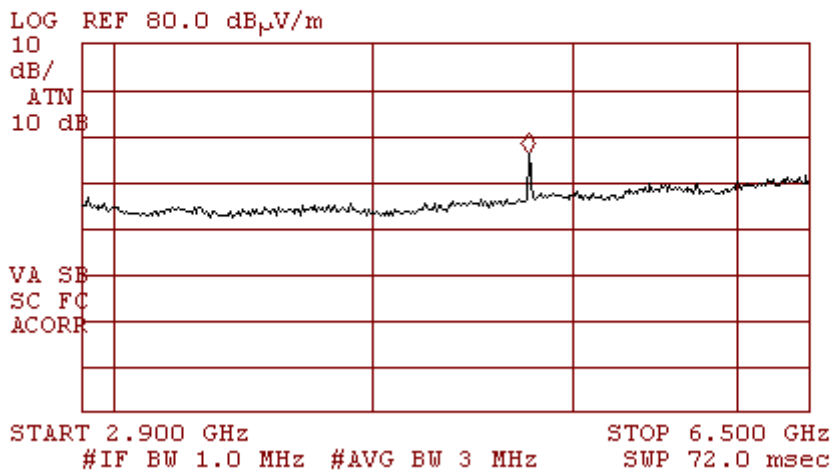
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.606 GHz
63.58 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.6.17

VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.822 GHz
55.93 dB μ V/m

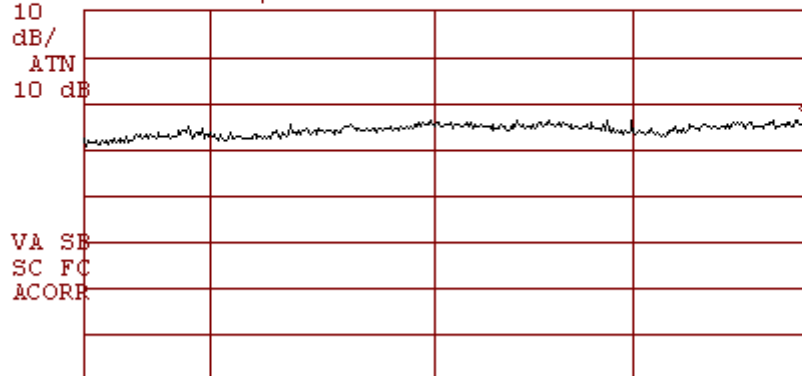


Horizontal & Vertical Polarization
Plot 4.6.18

VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.974 GHz
56.61 dB μ V/m

LOG REF 80.0 dB μ V/m



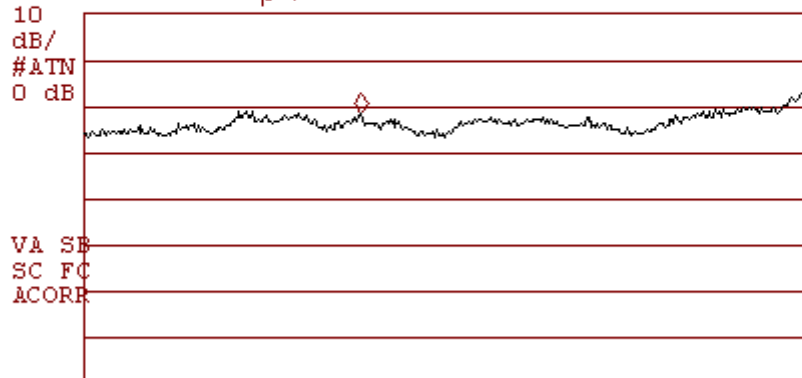
START 6.500 GHz STOP 10.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 89.8 msec

Horizontal & Vertical Polarization
Plot 4.6.19

VSM

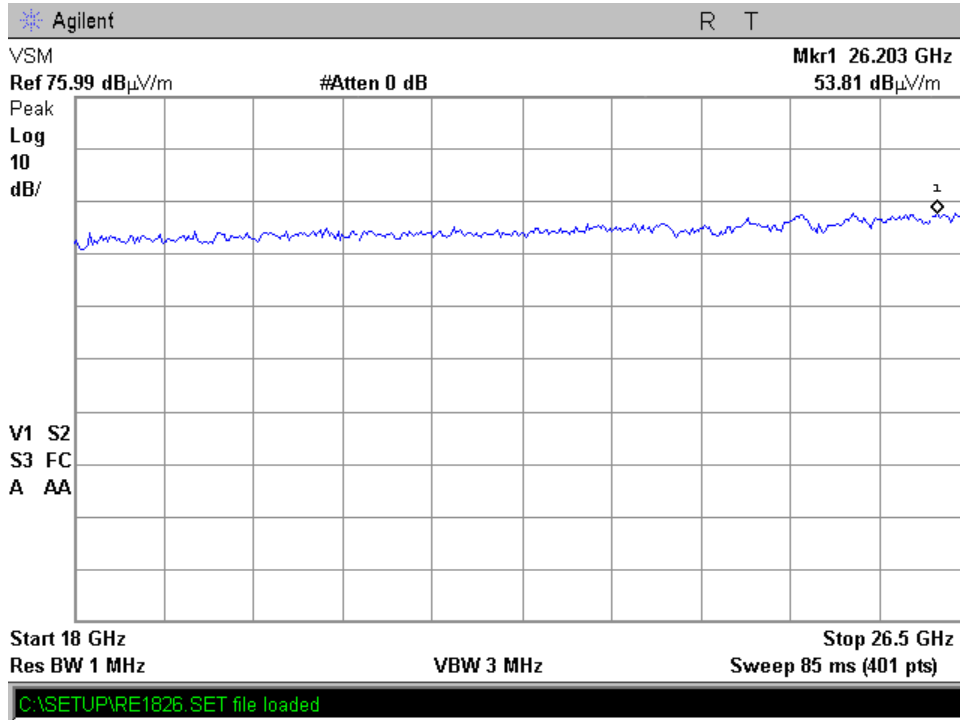
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 13.046 GHz
58.02 dB μ V/m

LOG REF 80.0 dB μ V/m



START 10.000 GHz STOP 18.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 160 msec

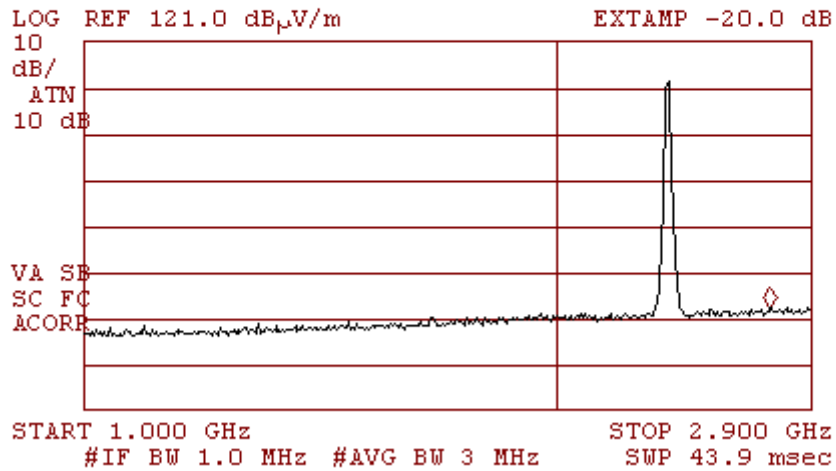
Horizontal & Vertical Polarization
Plot 4.6.20



WLAN 802.11g, 2422 MHz, 6 Mbps
Middle Frequency
Horizontal & Vertical Polarization
Plot 4.6.21

VSM

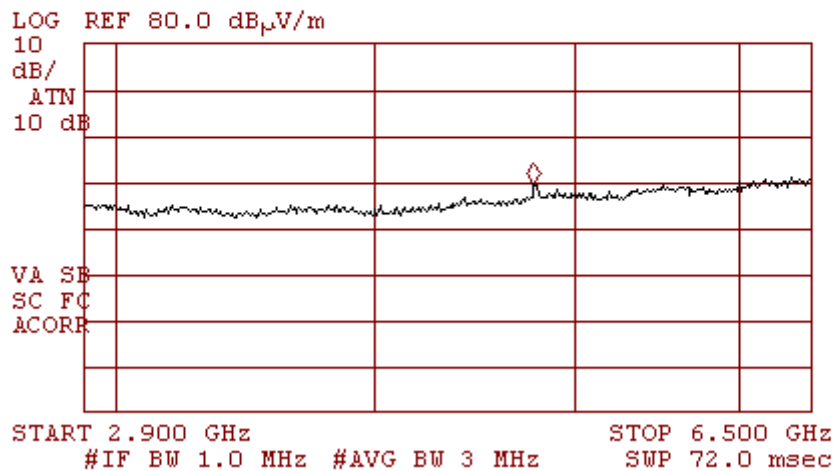
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.762 GHz
63.28 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.6.22

VSM

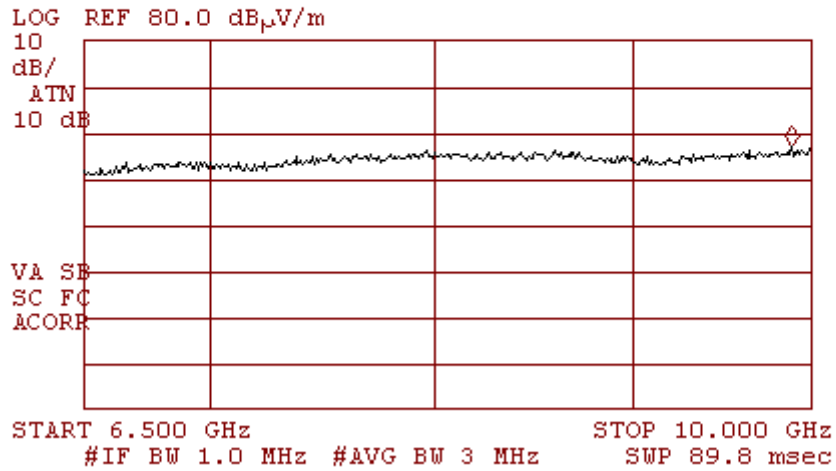
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.844 GHz
49.69 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.6.23

VSM

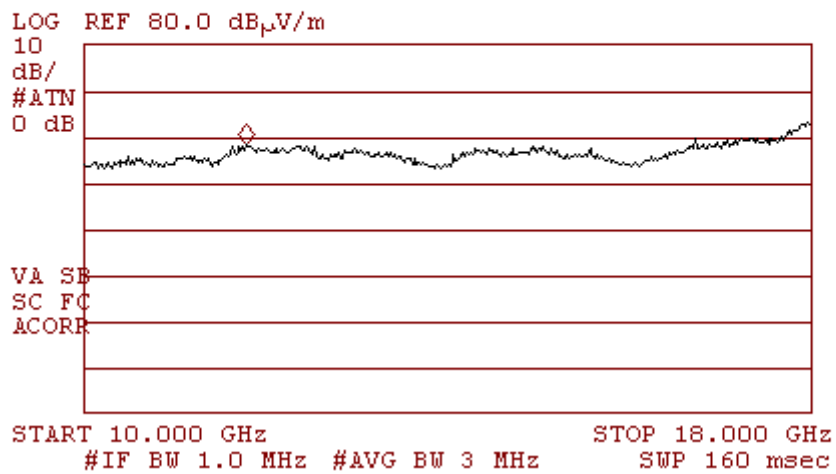
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 9.904 GHz
56.85 dB μ V/m



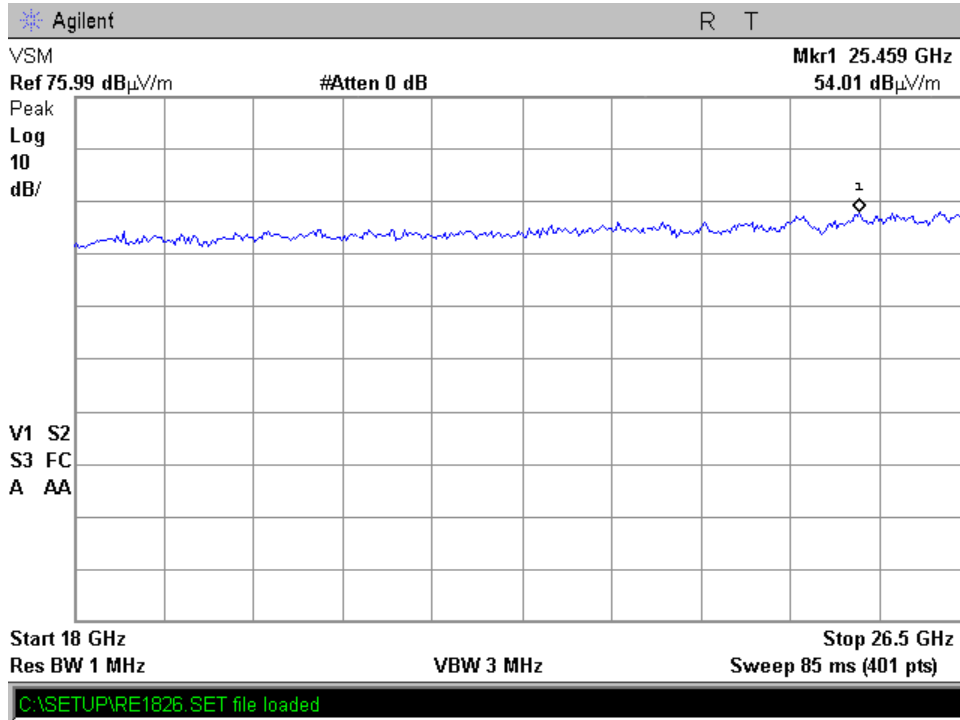
Horizontal & Vertical Polarization
Plot 4.6.24

VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 11.784 GHz
58.33 dB μ V/m



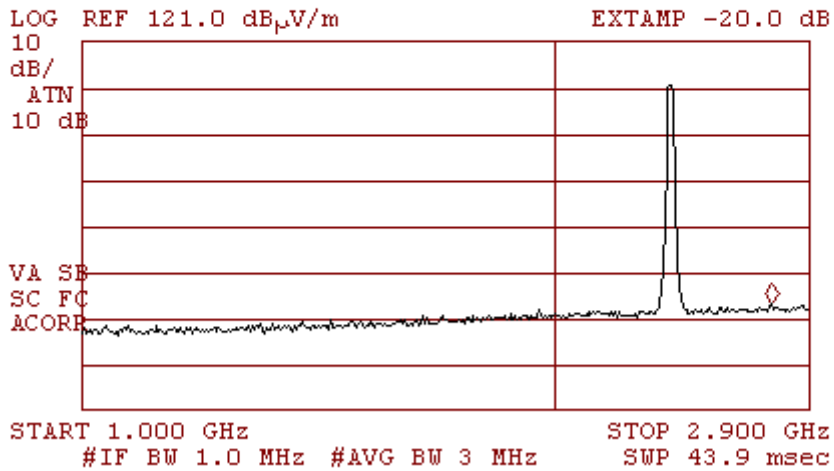
Horizontal & Vertical Polarization
Plot 4.6.25



WLAN 802.11g, 2437 MHz, 6 Mbps
Highest Frequency
Horizontal & Vertical Polarization
Plot 4.6.26

VSM

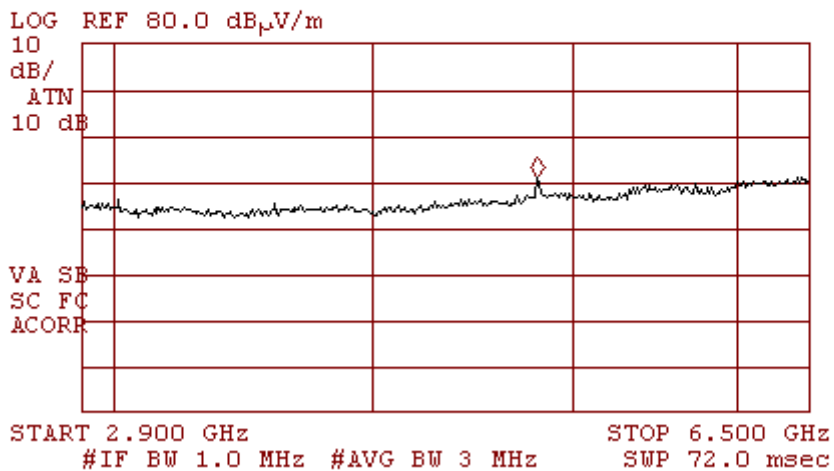
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.774 GHz
64.09 dB μ V/m



Horizontal & Vertical Polarization
Plot 4.6.27

VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.876 GHz
50.76 dB μ V/m

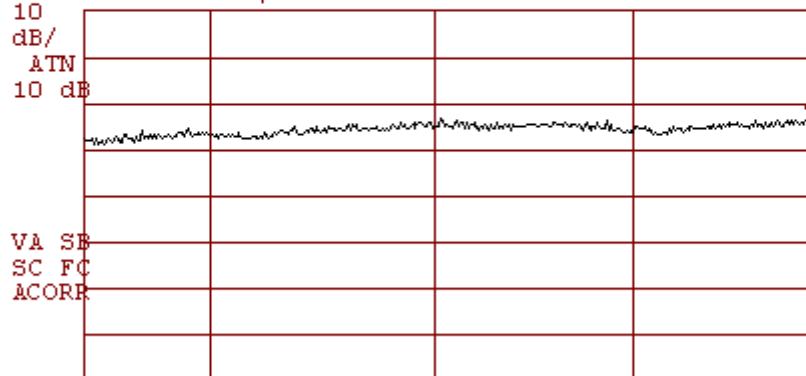


Horizontal & Vertical Polarization
Plot 4.6.28

/p VSM

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 10.000 GHz
56.65 dB_μV/m

LOG REF 80.0 dB_μV/m



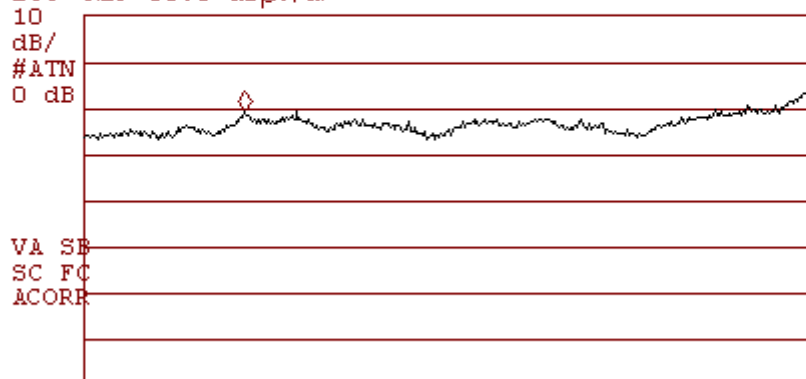
START 6.500 GHz STOP 10.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 89.8 msec

Horizontal & Vertical Polarization
Plot 4.6.29

/p VSM

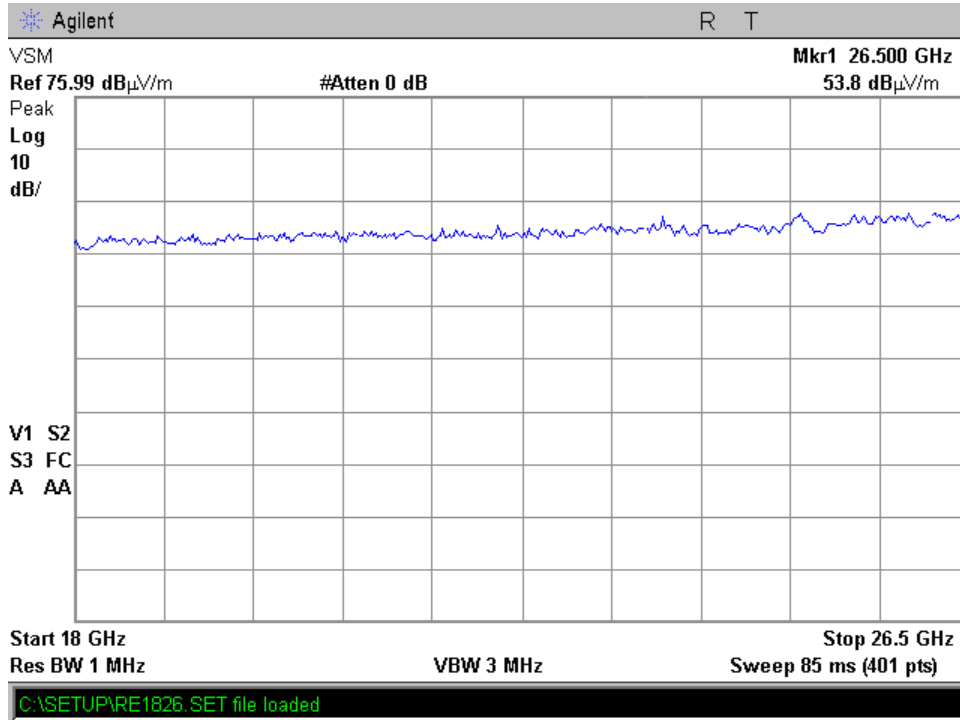
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 11.764 GHz
59.13 dB_μV/m

LOG REF 80.0 dB_μV/m

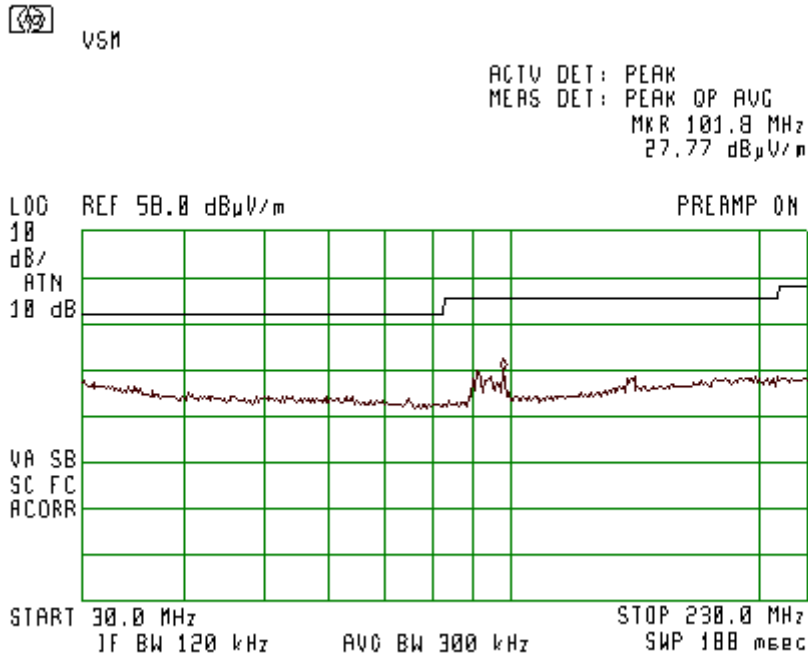


START 10.000 GHz STOP 18.000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 160 msec

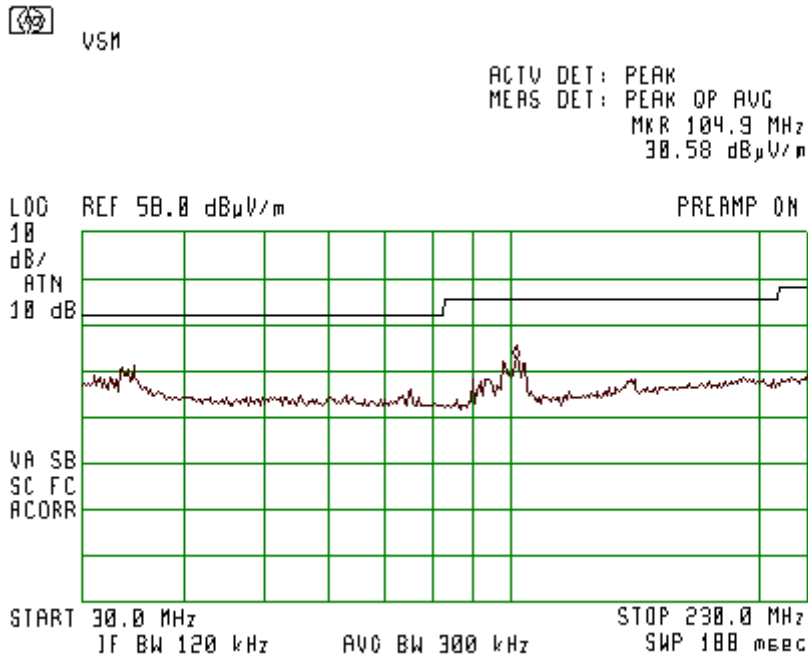
Horizontal & Vertical Polarization
Plot 4.6.30



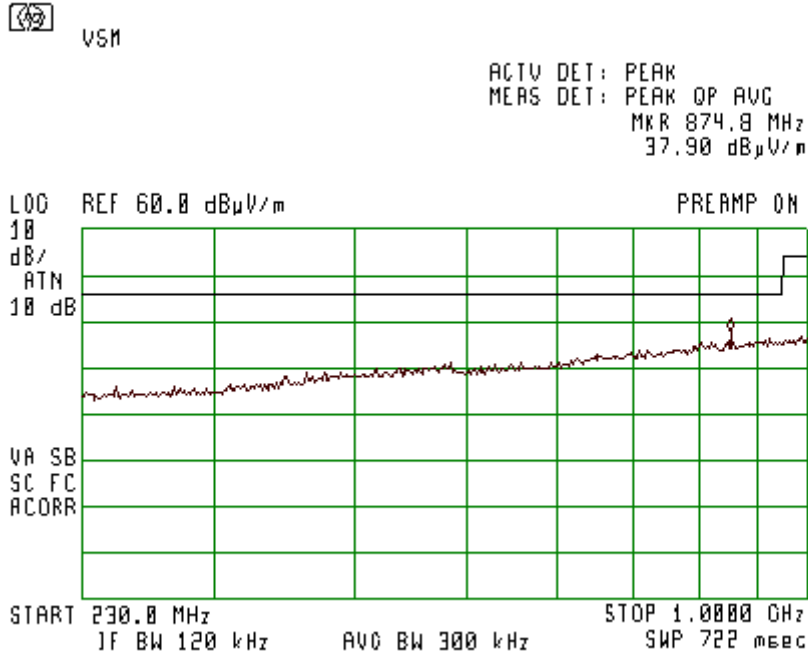
Radiated Spurious Emissions Below 1 GHz
Worst case for all modes and all frequencies
Horizontal Polarization
Plot 4.6.31



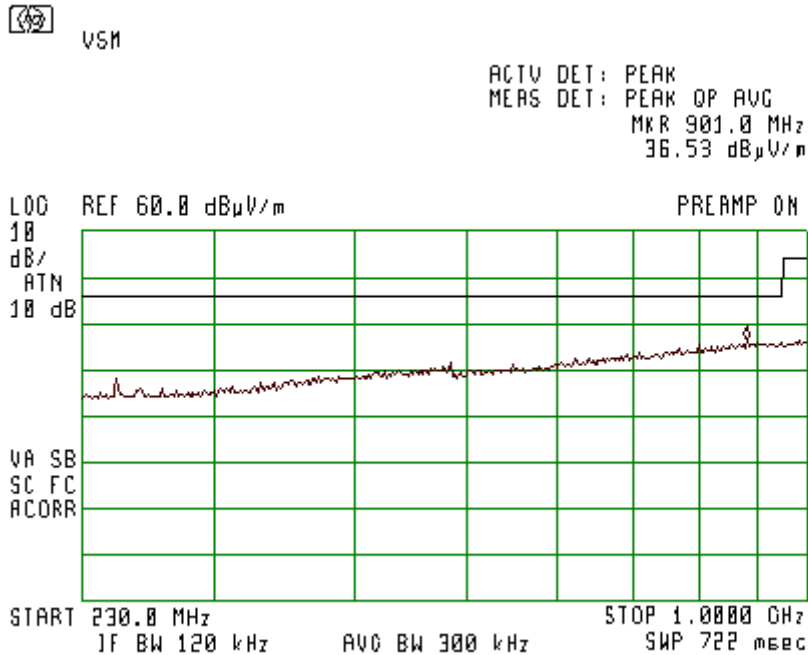
Vertical Polarization
Plot 4.6.32



Horizontal Polarization
Plot 4.6.33



Vertical Polarization
Plot 4.6.34



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 Wimax VSM employs two types of antennas: Standard Antenna, Vehicular Dual Helix Monopole with reverse SMA connector or Optional Antenna, Vehicular Whip Monopole with reverse SMA connector. Only one type of the antennas can be connected at a certain time.	Comply

5. Appendix

Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR16 EMI Receiver	HP8546A	3710A00392	30-06-10
Spectrum Analyzer 9kHz ÷ 22 GHz	HP 8593EM	3536A00131	30-06-10
Spectrum Analyzer 100 Hz ÷ 26.5 GHz	Agilent E7405A	US41160436	30-06-10
LNA Amplifier 1 GHz ÷ 18 GHz	AMP – 5D-010180-30-10P-GW	618653	30-06-10
Power meter	Agilent N1911A	MY45100784	23-02-11
Dual Ridged Guide Ant.1-18 GHz	EMCO 3115	9602-4677	30-06-10
Antenna 18 GHz ÷ 26.5 GHz	Alpha Industry 861A/599	505	30-06-10
Turn table	HD100	100/693	-
Antenna Mast	HD 100	100/693	-
Biconical 20 –200 MHz	Schwarzbeck VHBB9124	9124/0255	16-05-11
Log-Periodic 200 – 1000 MHz	Schwarzbeck VUSLP9111	VUSLP9111184	16-05-11
Pre-Amplifier	MiTeq, AMF-5F-18002650-30-10P	945372	30-06-10
LISN	Fischer 50/250-25-2	-	30-06-10
Transient Limiter	HP11947A	-	30-06-10
Notch Filter	Micro-Tronics BRM50702-05	0001	30-06-10

Appendix B: Accreditation Certificate



The American Association for Laboratory Accreditation
World Class Accreditation

Accredited Laboratory
A2LA has accredited
QUALITECH (ECI TELECOM)
Petach-Tikva, Israel
for technical competence in the field of
Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 27th day of May 2009.



Peter Meyer
President & CEO
For the Accreditation Council
Certificate Number 1633.01
Valid to September 30, 2010

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

End of the Test Report