



Electromagnetic Compatibility Test Report

Test Report No: MOT 061107

Issued on: November 06, 2007

Product Name

VoWLAN

Tested According to

**FCC 47 CFR, Part 15, Subparts C, WLAN
IC RSS-210**

Tests Performed for

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Regis. No: 102724 1633.01

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Test personnel



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QualiTech EMC Laboratory



1633.01

Test Report details:

Test commencement date: 04.11.2007
Test completion date: 06.11.2007
Customer's Representative: Teddy Neeman
Issued on: 06.11.2007

Assessment information:

This report contained 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 (1)	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 (2)	Peak power spectral density	Comply
47 CFR §15.247 (d) & RSS-210 Section A8.5	Conducted Spurious Emissions	Comply
47 CFR §15.247 (d) & §15.205 & 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)	Spurious Radiated Emissions, Restricted Bands	Comply
47 CFR §15.109/209 & RSS-GEN section 7.2.3.2	Radiated Emission, Receive Mode	Comply
47 CFR §15.403(h)(i) & RSS-210A9.2(1)	Emission Bandwidth (26dB BW)	Comply
47 CFR §15.407 (a) (1), (2), (3) & RSS-210A9.2(1)	Maximum Conducted Output Power, 5180-5250 MHz, 5.25-5.35 GHz and 5.47-5.725 GHz	Comply
47 CFR §15.407 (a) (1), (2), (3), (5) & RSS-210A9.2(1)	Peak Power Spectral Density	Comply
47 CFR §15.407 (a) (6)	Peak Excursion	Comply
47 CFR §15.407 (b) (1),(2),(3),(4) & §15.407 (b)(6) & RSS-210A3.3(1)	Conducted Spurious Emissions	Comply
47 CFR §15.407 (b) (7) & RSS-210A3.3(1)	Spurious Radiated Emissions, Restricted Bands	Comply
47 CFR §15.407(g)	Frequency Stability	Comply
47 CFR §15.203 & RSS - Gen. Section 7.1.4	Antenna Connector Requirements	Comply
47 CFR §15.407(h)(2)(i)(B) & §15.407(h)(2)(iii) and FCC 06-96	Dynamic Frequency Selection (DFS)	Comply

Table of Content

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:	7
2.4.	Worst Case Results:.....	7
3.	TEST FACILITY & UNCERTAINTY OF MEASUREMENT.....	8
3.1.	Accreditation/ Registration reference:	8
3.2.	Test Facility description.....	8
3.3.	Uncertainty of Measurement:.....	9
4.	WLAN 802.11B/G: REPORT OF MEASUREMENTS AND EXAMINATIONS	10
4.1.	6 dB Bandwidth	10
4.2.	Maximum Peak Output Power, 2400-2483.5 MHz.....	14
4.3.	Peak power spectral density	15
4.4.	Conducted Spurious Emissions	19
4.5.	Spurious Radiated Emissions, Restricted Bands 2310-2390MHz & 2483.5-2500MHz.....	28
4.6.	Spurious Radiated Emissions, Restricted Bands	37
5.	APPENDIX	52

1. General Description

Description of the EUT system/test Item:

Product name: VoWLAN

Model: F2977A

FCC ID: AZ489FT7031

IC: 109U-89FT7031

Description:

Single Mode VoWLAN 802.11a/b/g phone

Maximum Peak Output Power:

79.3mW for WLAN 802.11b

70.8mW for WLAN 802.11g @ Channels 2-10

Frequency range:

802.11b/g: 2.412 – 2.462 GHz

Transmit Data rate:

Protocol	Rate [Mbps]							
	1	2	5.5	11				
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)
802.11g	DSSS/OFDM (64QAM, 16QAM, QPSK, BPSK, DQPSK, DBPSK)

Antenna Specification:

Type:

WLAN a/b/g: Integral (on board) PIFA Dual Band

Gain:

802.11b/g: 3.7 dBi peak free space.

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 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). 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.

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 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.

2.4. Worst Case Results:

Worst case result is determined as the channel with the highest output power. Pre-scan has been conducted to determine the worst-case. Worst-case results of various modulation modes/data rates were determined as the modulation with the highest output power, and that was reported.

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

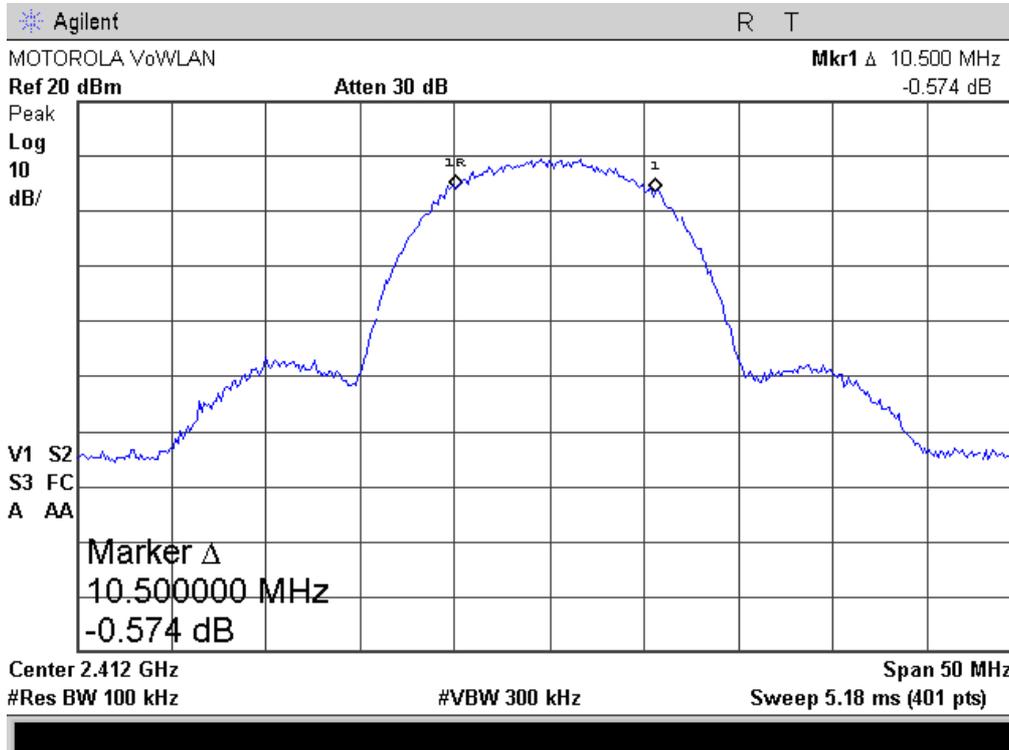
4.1. 6 dB Bandwidth

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: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.1.1 - Plot 4.1.6	

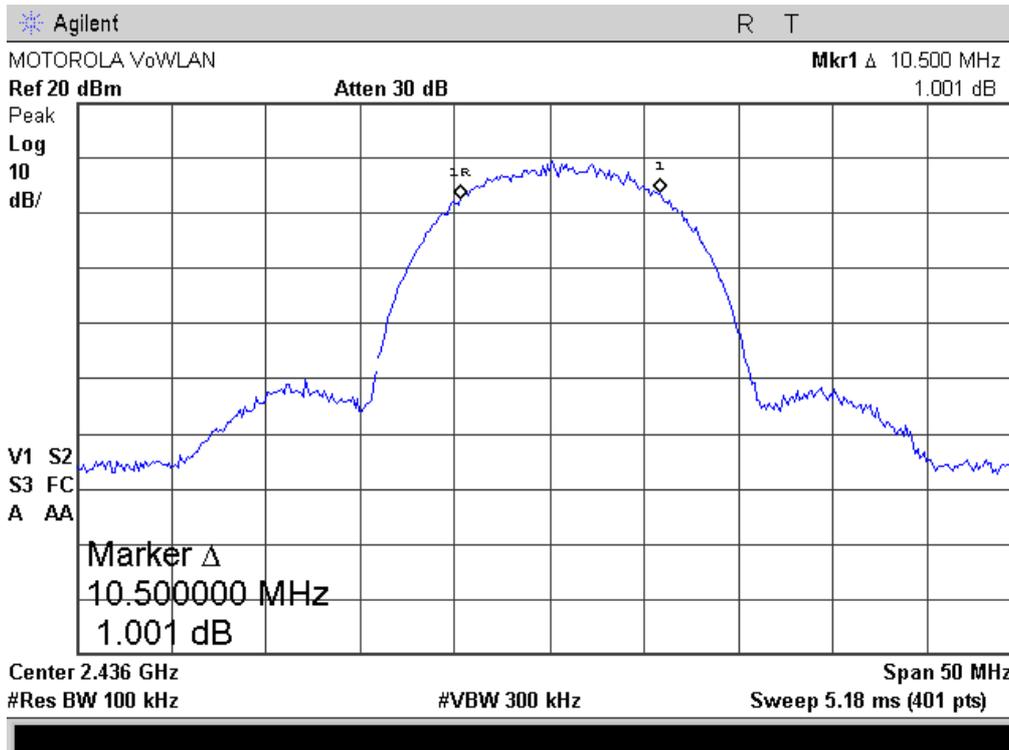
Test results

Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz]	Limit [kHz]	Ref Plots
802.11b Mode				
2412	11	10500	>500	4.1.1
2437	11	10500	>500	4.1.2
2462	11	10750	>500	4.1.3
802.11g Mode				
2412	54	16500	>500	4.1.4
2437	54	16500	>500	4.1.5
2462	54	16375	>500	4.1.6

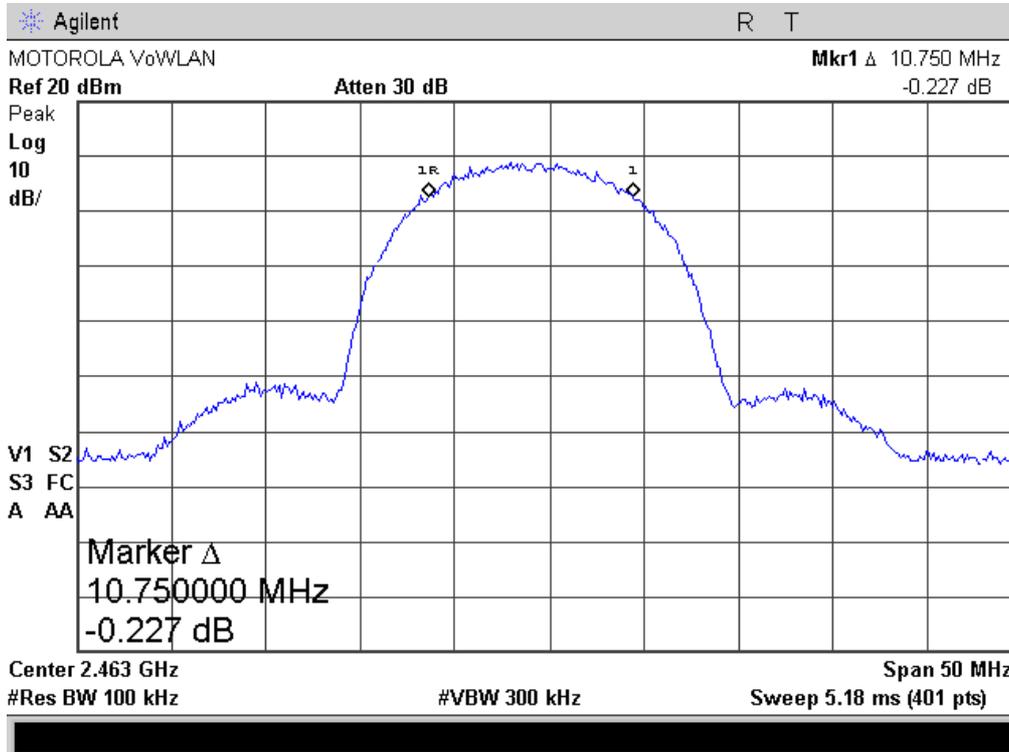
802.11b Mode
Plot 4.1.1



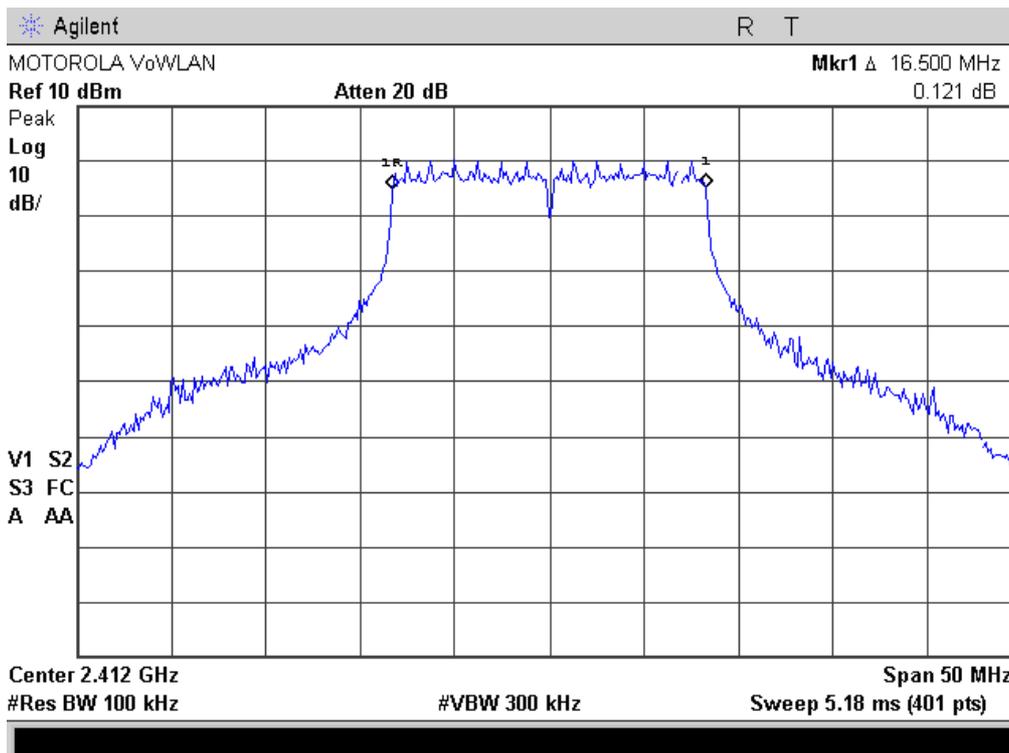
Plot 4.1.2



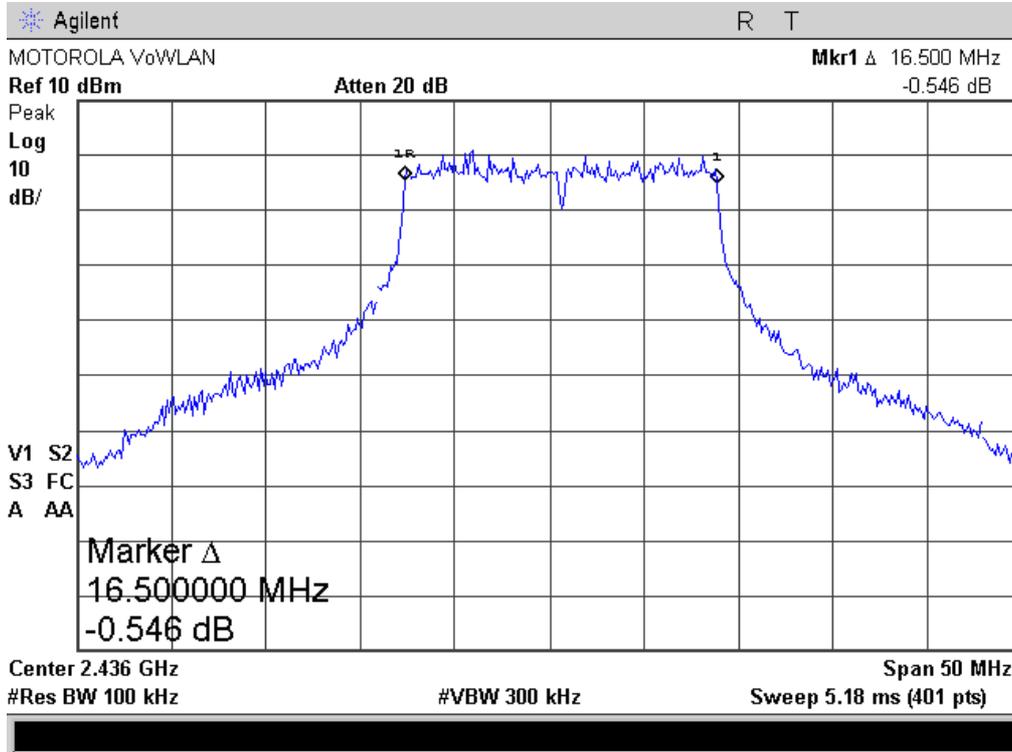
Plot 4.1.3



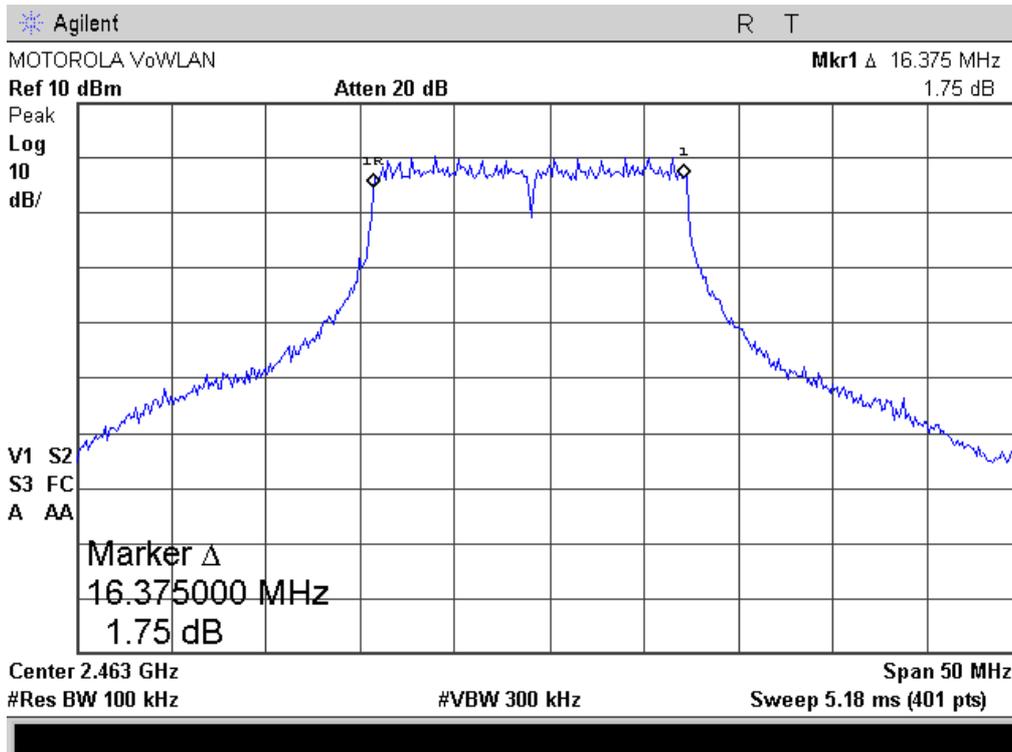
802.11g Mode
Plot 4.1.4



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: 22°C	Relative Humidity: 48%	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	18.7	73.9	15.7	30	-11.3
2427	1	18.8	75.8	15.8	30	-11.2
2437	1	18.3	66.8	15.3	30	-11.7
2462	1	18.1	64.9	15.1	30	-11.9
802.11g Mode						
2412	6	14.0	25.4	11.0	30	-15.9
2437	6	18.2	65.8	15.2	30	-11.8
2462	6	13.9	24.7	10.9	30	-16.1

* Corrected for external attenuations.

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

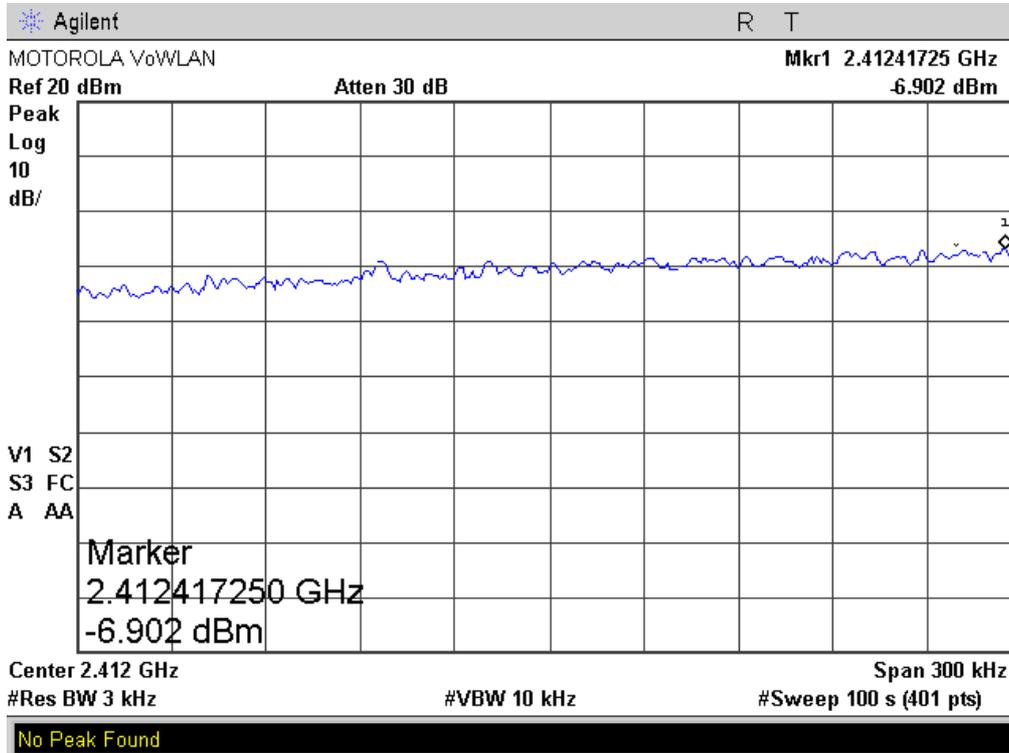
4.3. Peak power spectral density

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	

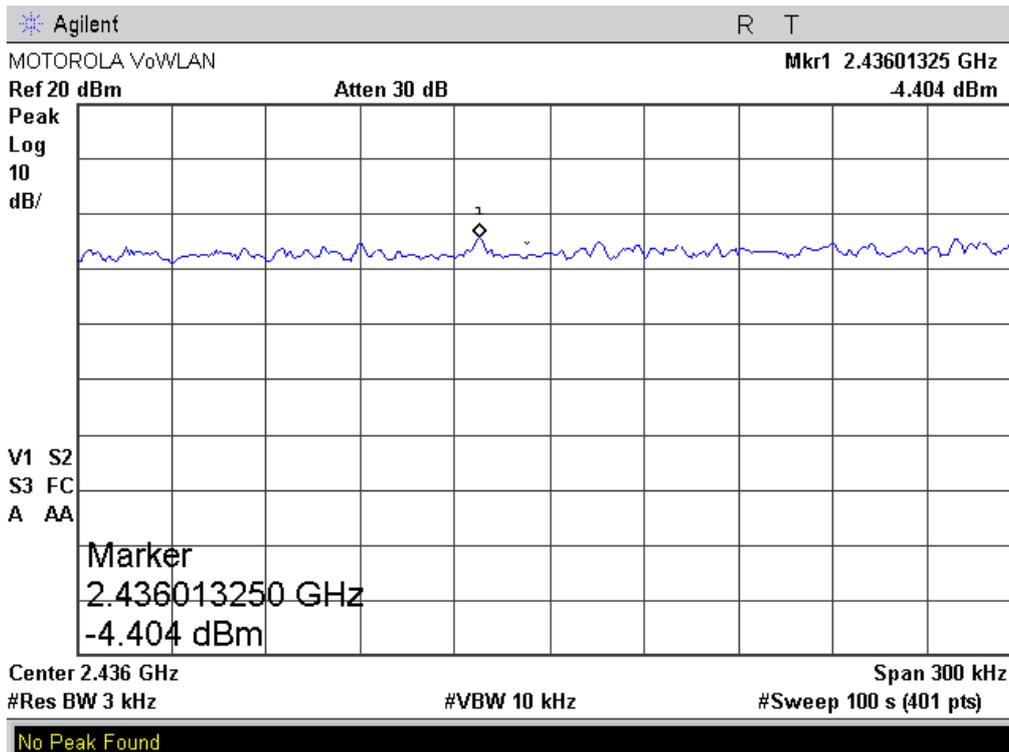
Test Results:

Frequency [MHz]	Data Rate [Mbps]	Measured PSD [dBm/3kHz]	Limit PSD [dBm/3kHz]	Margin [dB]	Reference Plots
802.11b Mode					
2412	1	-6.9	8	-14.9	4.3.1
2437	1	-4.4	8	-12.4	4.3.2
2462	1	-3.5	8	-11.5	4.3.3
802.11g Mode					
2412	6	-12.5	8	-20.5	4.3.4
2437	6	-8.8	8	-16.8	4.3.5
2462	6	-12.3	8	-20.3	4.3.6

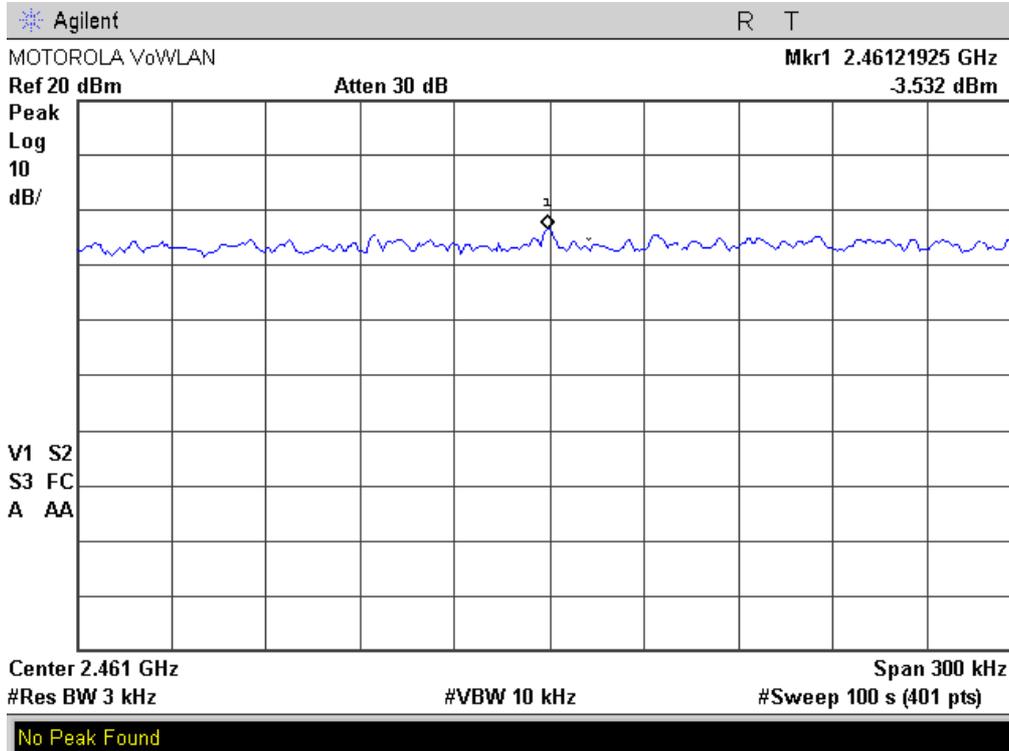
802.11b Mode
Plot 4.3.1



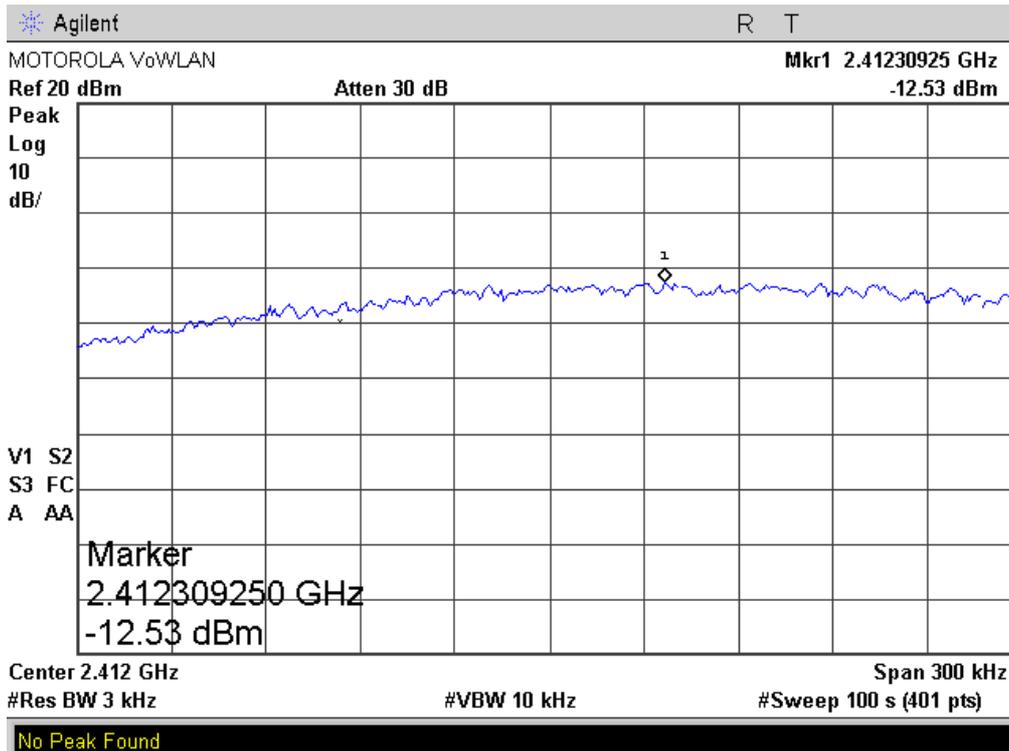
Plot 4.3.2



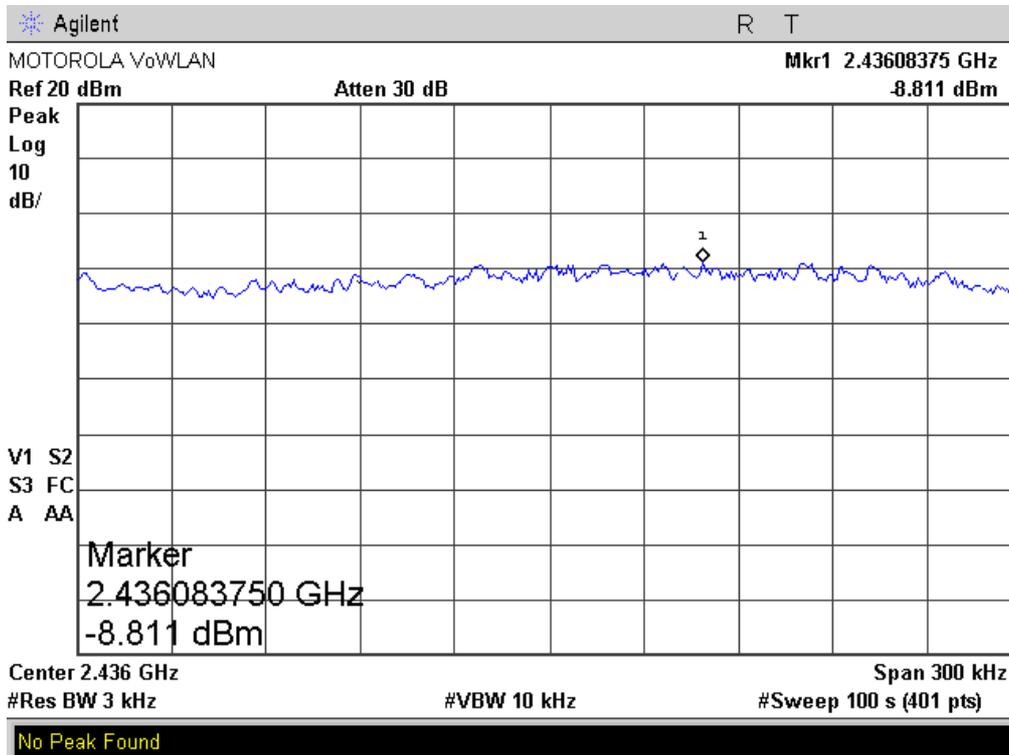
Plot 4.3.3



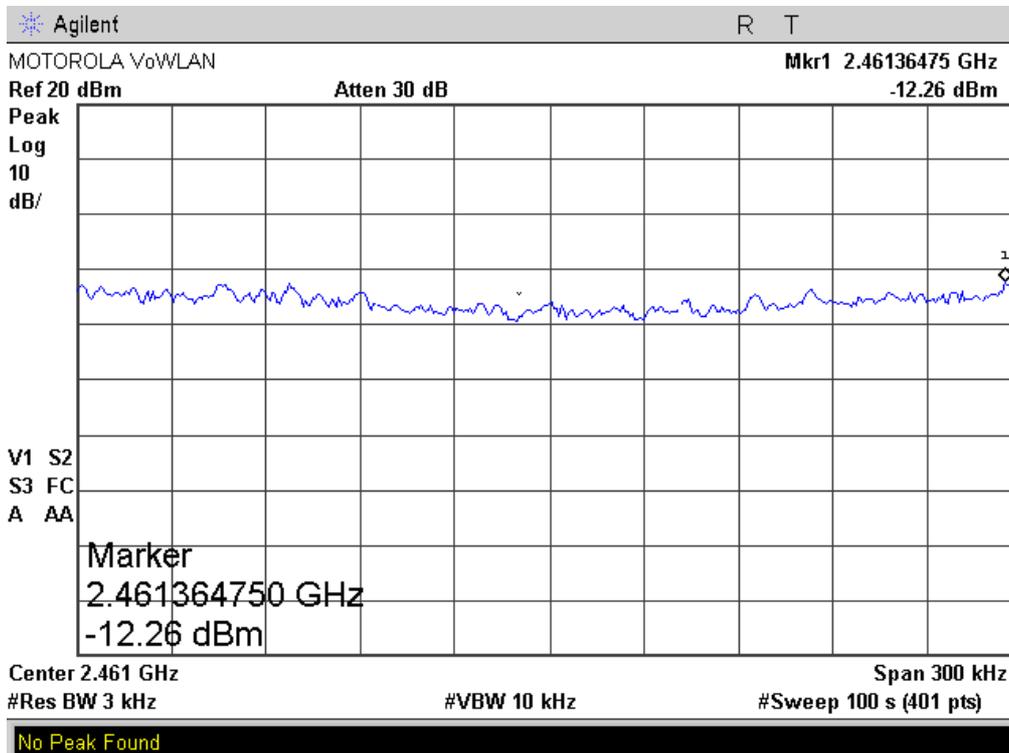
802.11g Mode
Plot 4.3.4



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

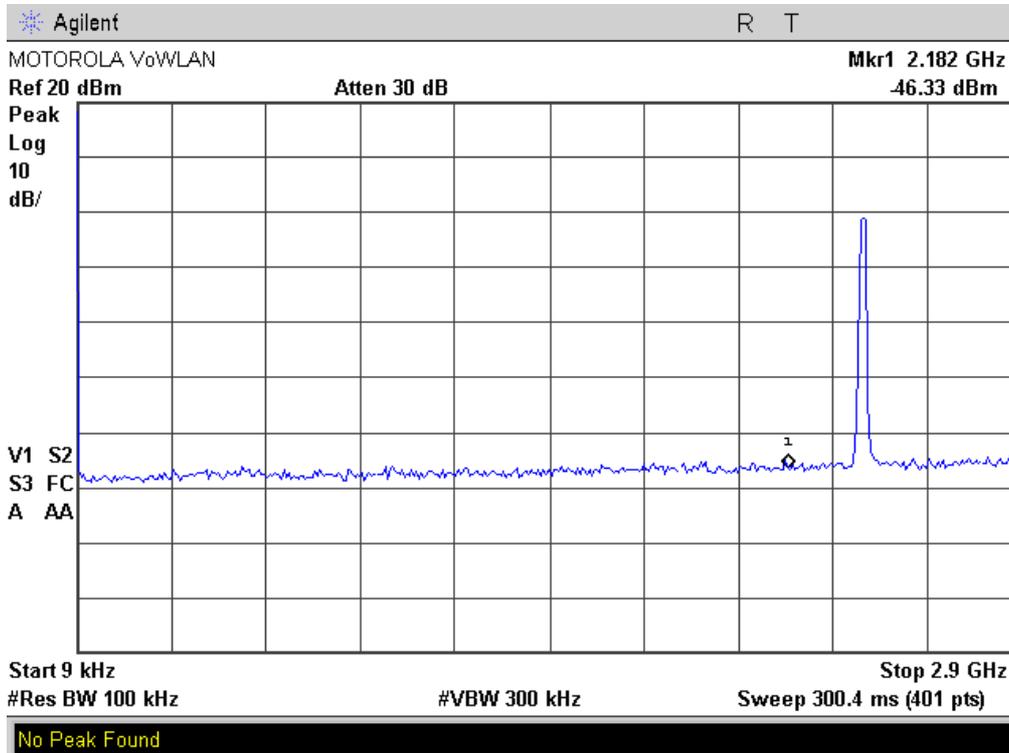
Frequency [MHz]	Data Rate [Mbps]	Measured [dBc]	Limit [dBc]	Reference Plots*	Result
802.11b Mode					
2412	11	*	-30	4.4.1 - 4.4.2	Comply
2437	11	*	-30	4.4.3 - 4.4.4	Comply
2462	11	*	-30	4.4.5 - 4.4.6	Comply
802.11g Mode					
2412	54	*	-30	4.4.7 - 4.4.8	Comply
2437	54	*	-30	4.4.9 - 4.4.10	Comply
2462	54	*	-30	4.4.11 - 4.4.12	Comply

*All emissions at least 15 dB below the limit (45dBc)

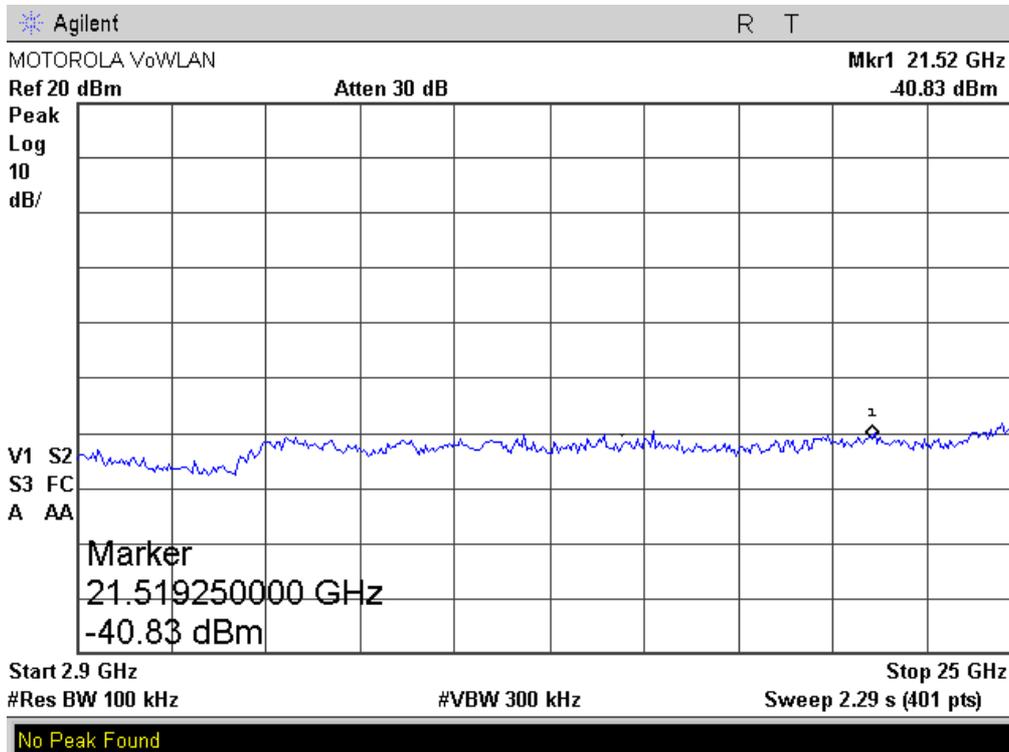
Band Edge

Frequency [MHz]	Data Rate [Mbps]	Measured [dBc]	Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	-34.95	-30	4.4.13	Comply
2462	11	-48.77	-30	4.4.14	Comply
802.11g Mode					
2412	54	-33.26	-30	4.4.15	Comply
2462	54	-42.85	-30	4.4.16	Comply

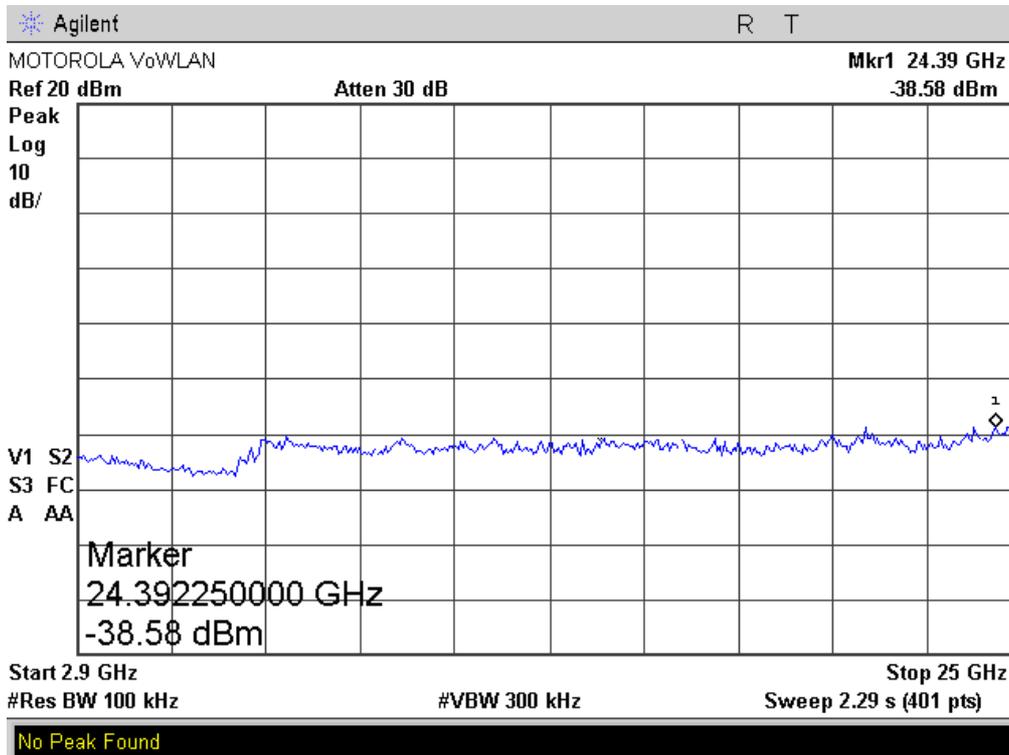
802.11b Mode
Plot 4.4.1



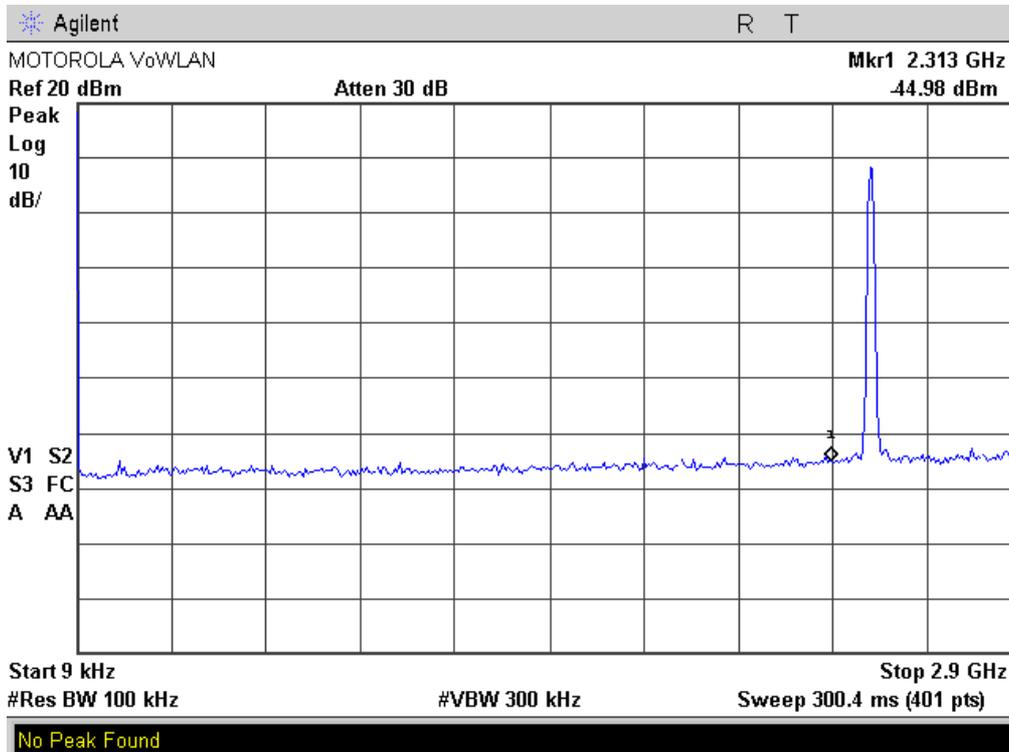
Plot 4.4.2



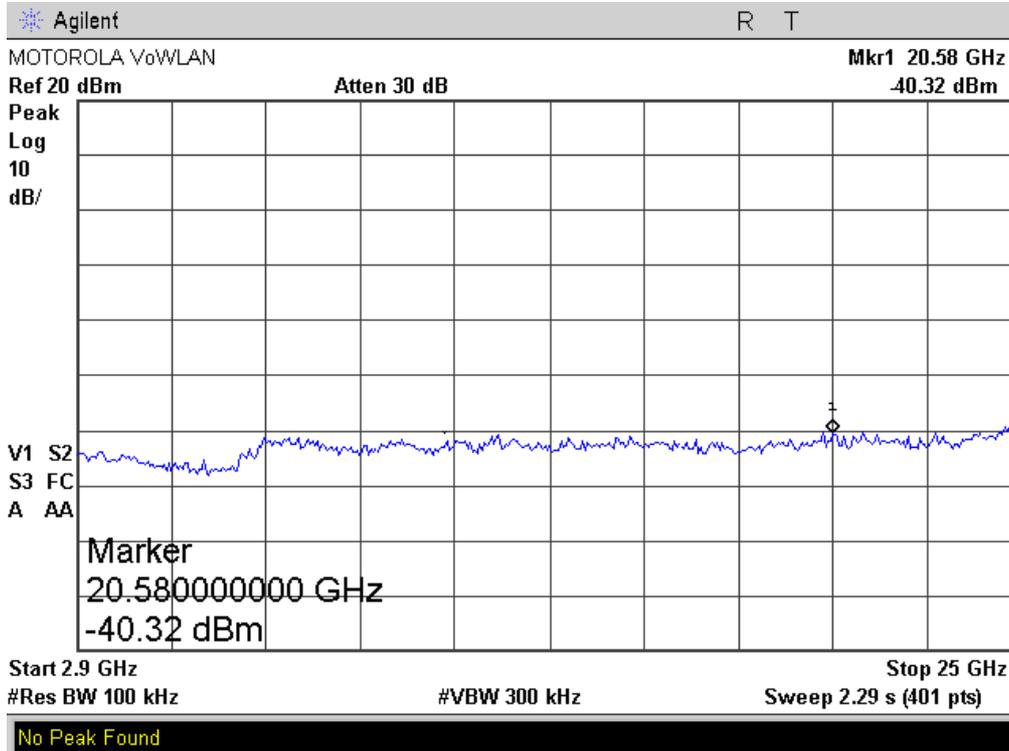
Plot 4.4.3



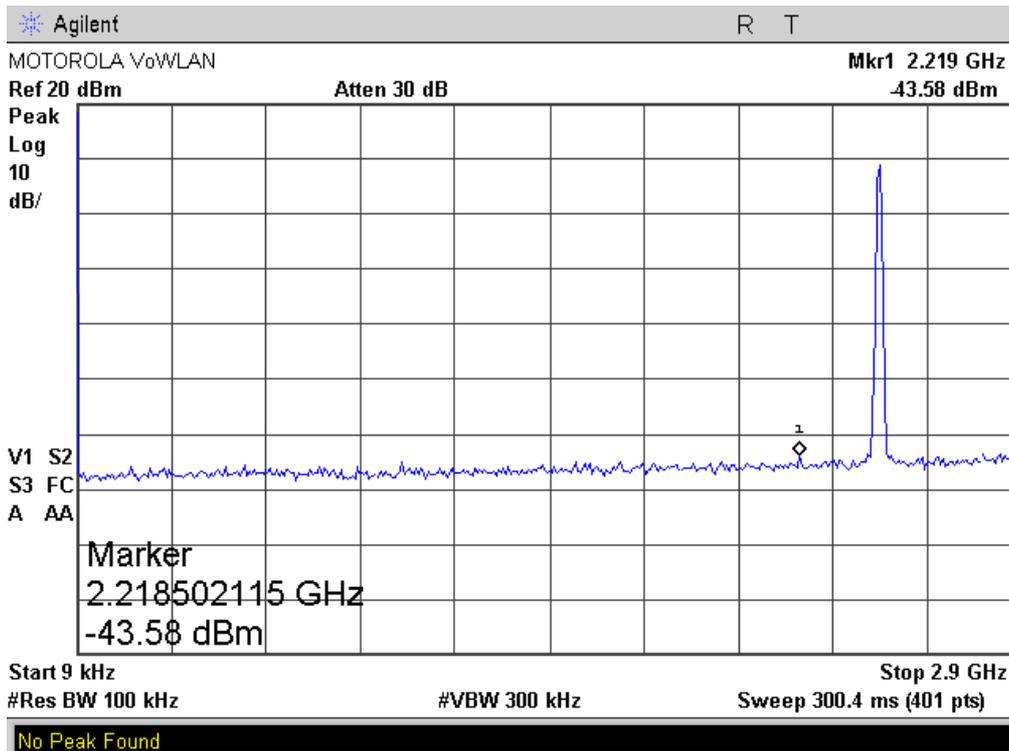
Plot 4.4.4



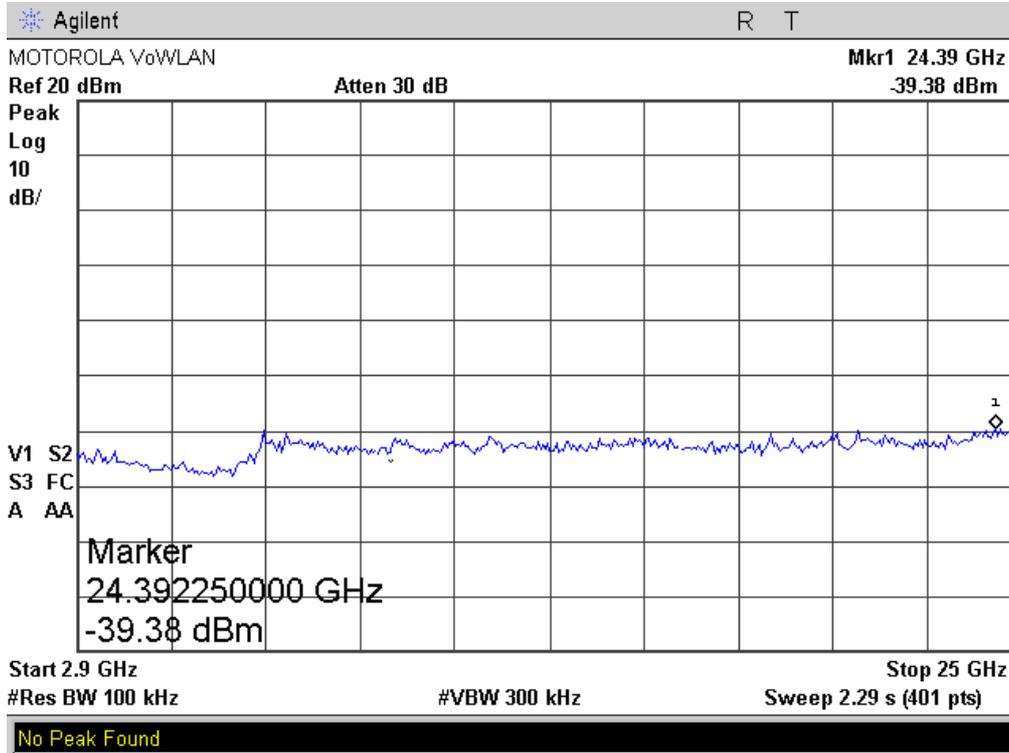
Plot 4.4.5



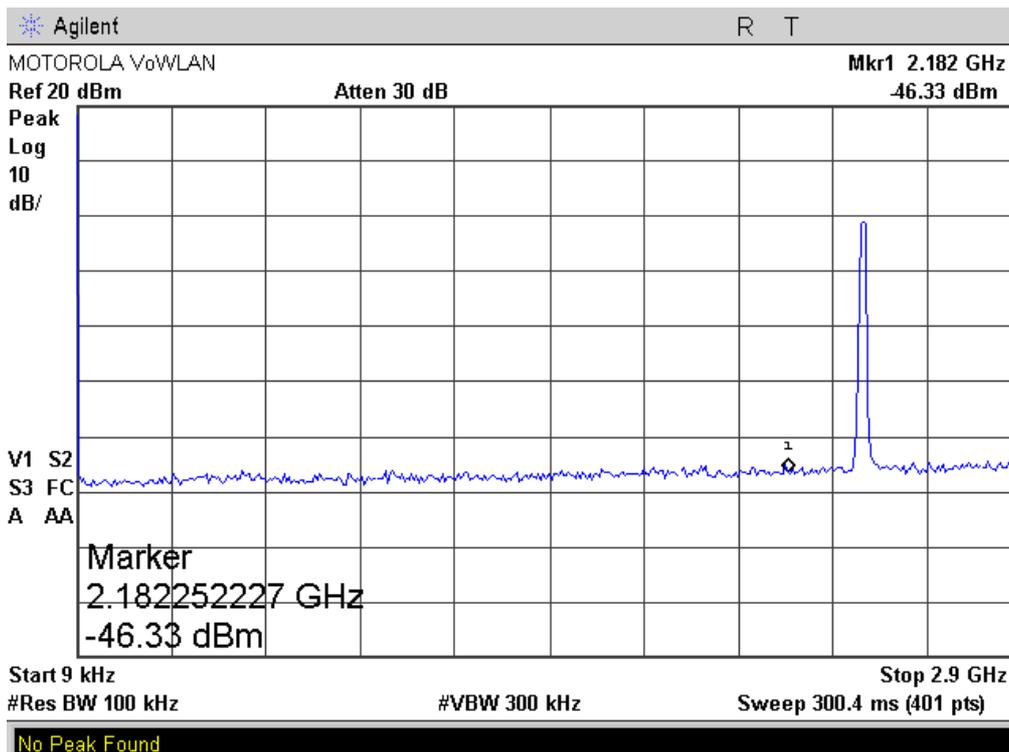
Plot 4.4.6



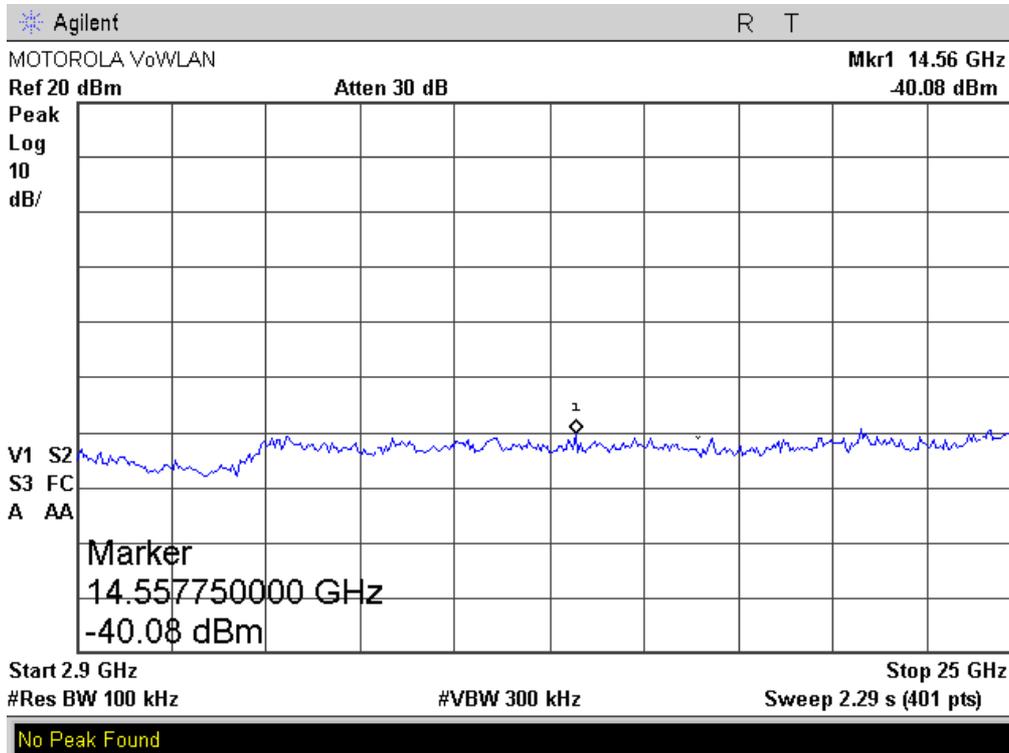
802.11g Mode
Plot 4.4.7



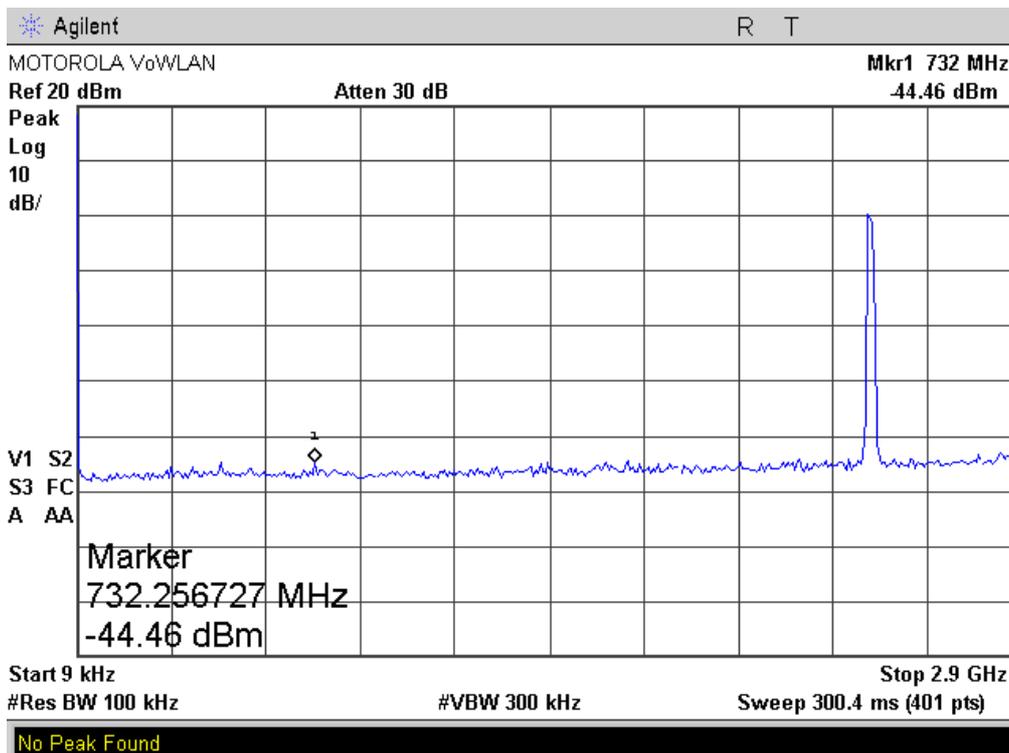
Plot 4.4.8



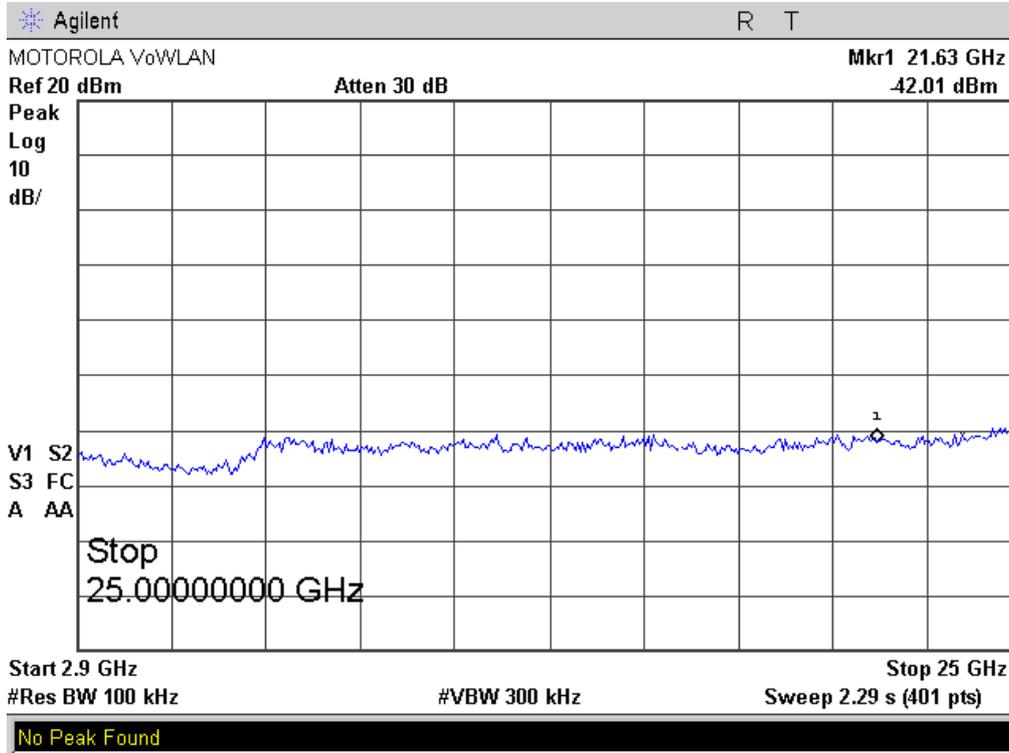
Plot 4.4.9



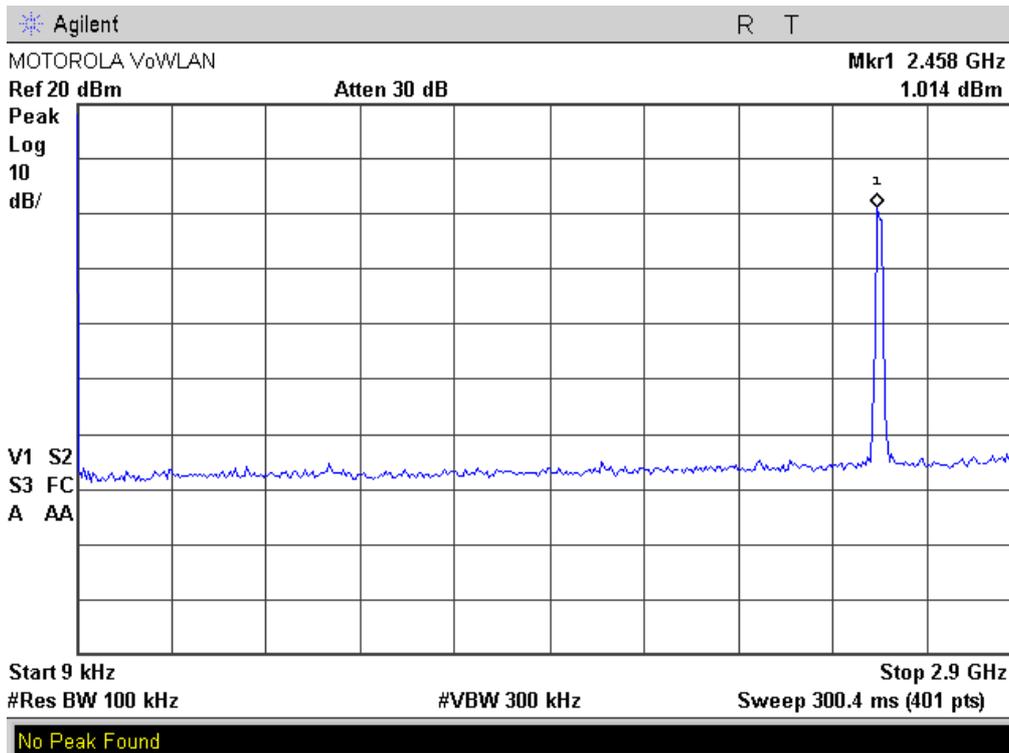
Plot 4.4.10



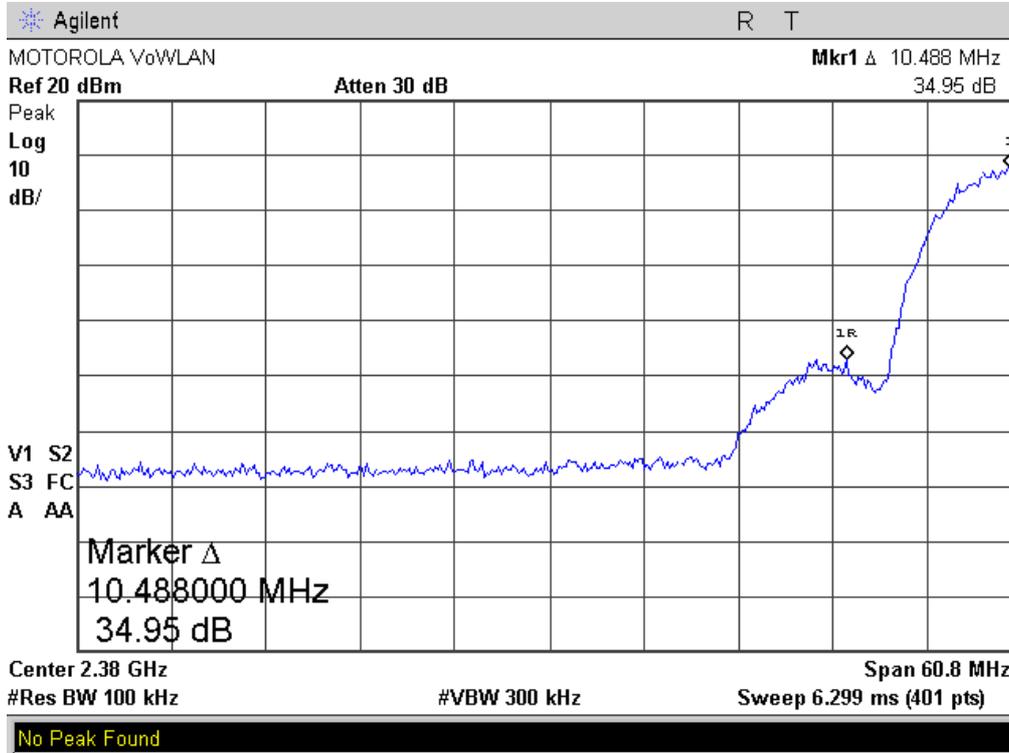
Plot 4.4.11



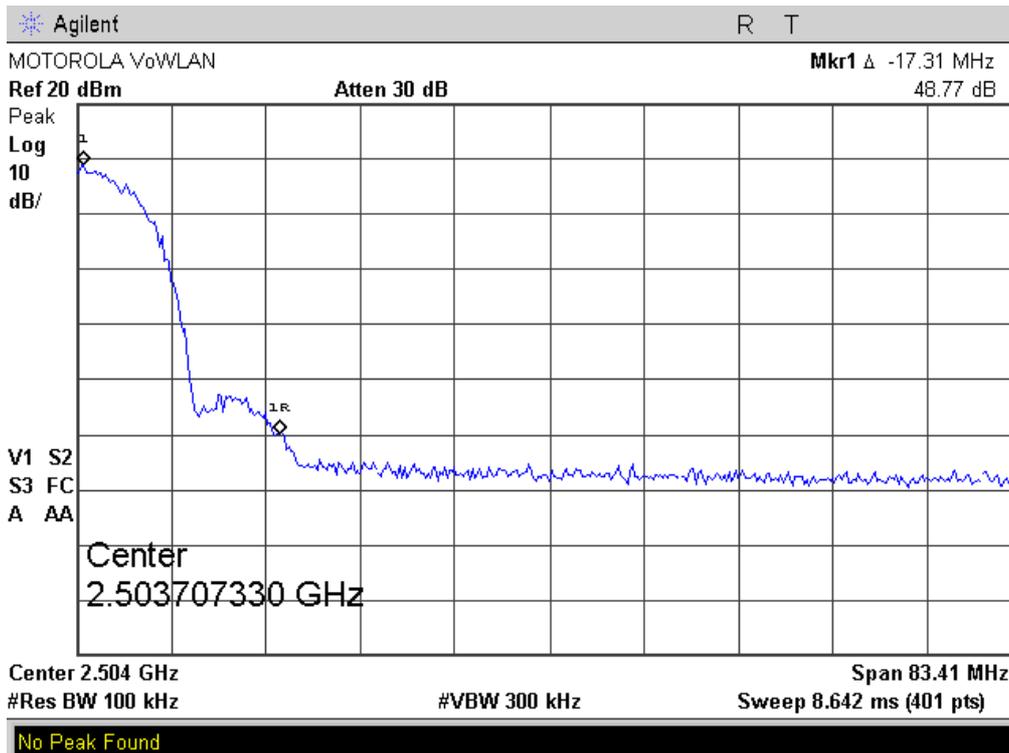
Plot 4.4.12



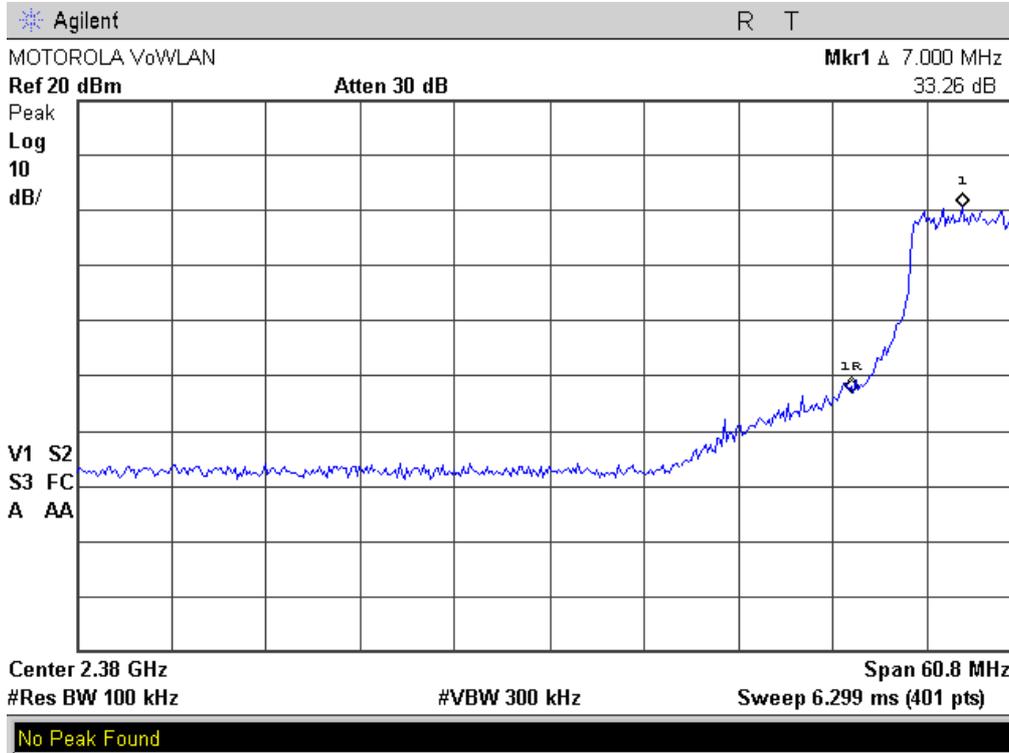
802.11b Mode
Plot 4.4.13



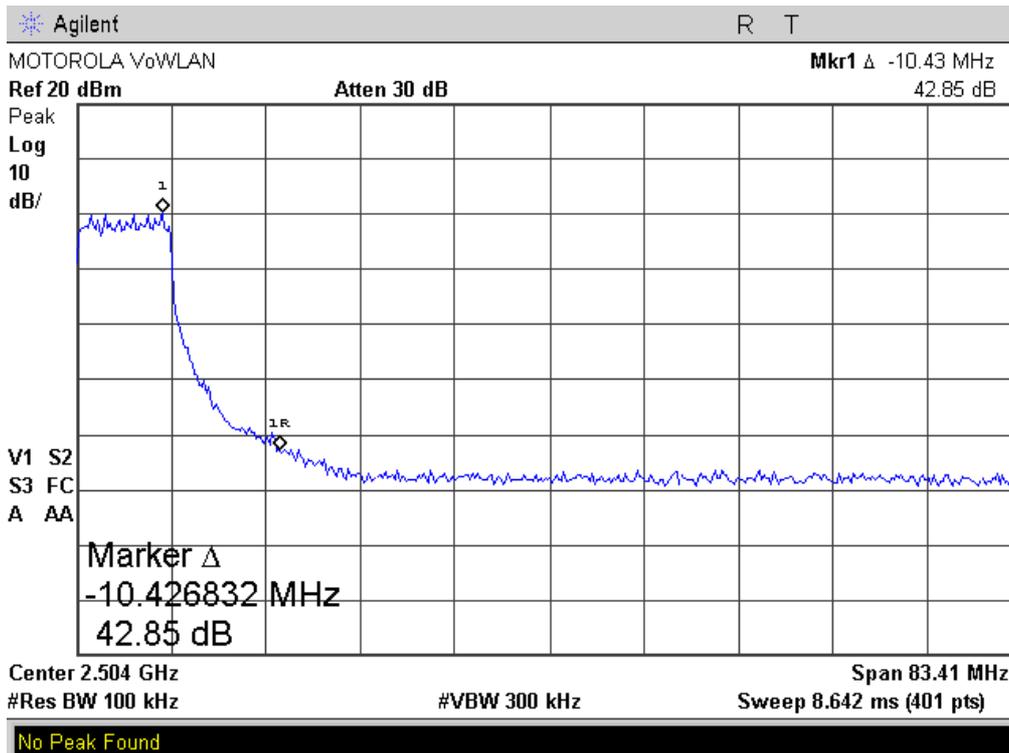
Plot 4.4.14



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= 1MHz, 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 V/H	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
802.11b Mode							
2412	11	2319.58	Avg	H	38.4	54	-15.6
2412	11	2369.53	Peak	H	49.7	74	-24.3
2462	11	2499.90	Avg	H	47.9	54	-6.1
2462	11	2499.30	Peak	H	58.0	74	-16.0
802.11g Mode							
2412	54	2390.00	Avg	H	46.9	54	-7.1
2412	54	2390.00	Peak	H	68.8	74	-5.2
2462	54	2483.50	Avg	H	32.2	54	-21.8
2462	54	2483.50	Peak	H	53.4	74	-20.6

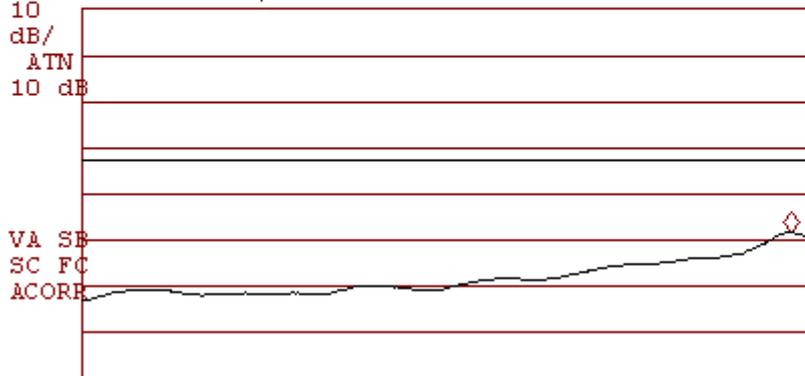
Note: Spurious Emission [dBμV/m] = measured [dBμV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

**11 Mbit, Lowest Frequency
Vertical Polarization
Average
Plot 4.5.1**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38730 GHz
38.37 dB μ V/m

LOG REF 87.0 dB μ V/m



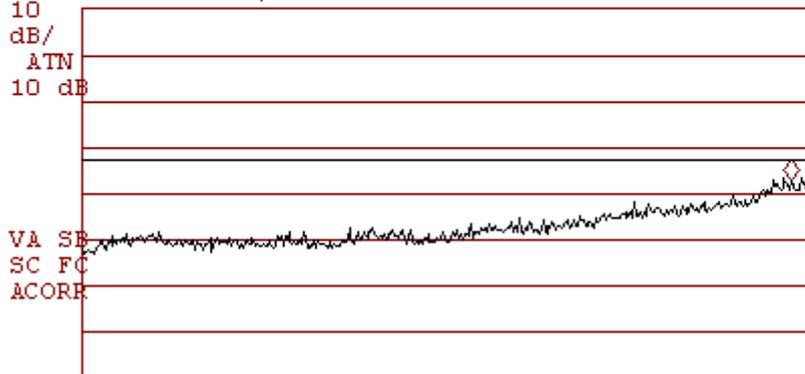
START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 27.0 sec

**Peak
Plot 4.5.2**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38730 GHz
49.67 dB μ V/m

LOG REF 87.0 dB μ V/m

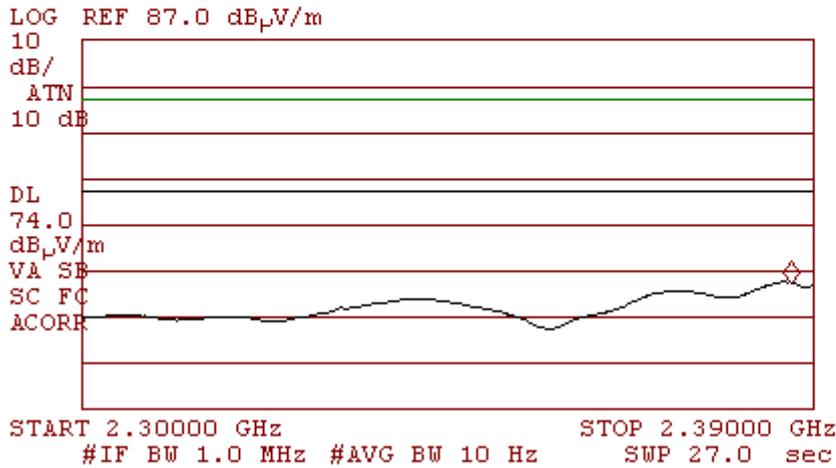


START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec

Horizontal Polarization
Average
Plot 4.5.3

MOTOROLA VoWLAN

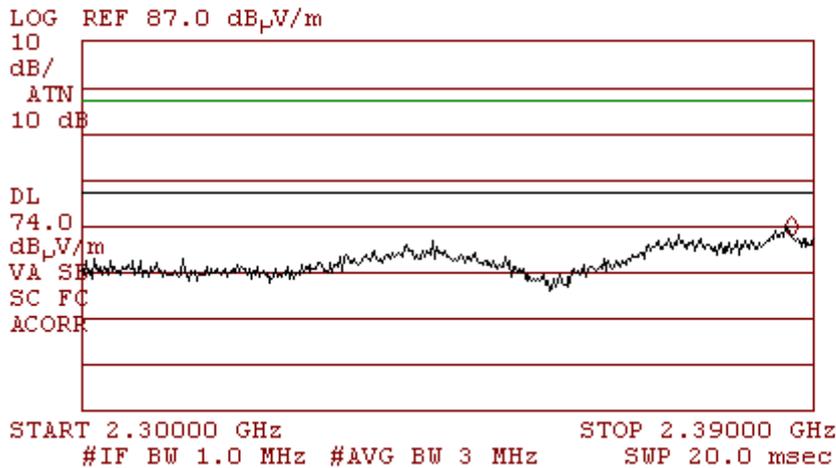
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38730 GHz
34.25 dB_μV/m



Peak
Plot 4.5.4

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38730 GHz
44.52 dB_μV/m



**11 Mbit, Highest Frequency
Horizontal Polarization
Average
Plot 4.5.5**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48672 GHz
47.93 dB μ V/m

LOG REF 107.0 dB μ V/m



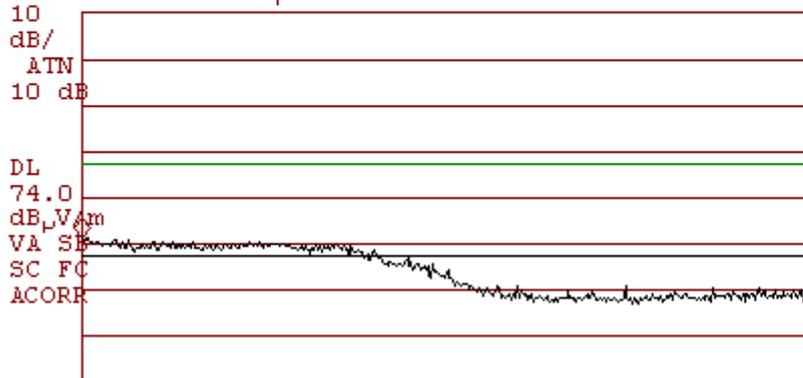
START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 5.00 sec

**Peak
Plot 4.5.6**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48350 GHz
58.02 dB μ V/m

LOG REF 107.0 dB μ V/m

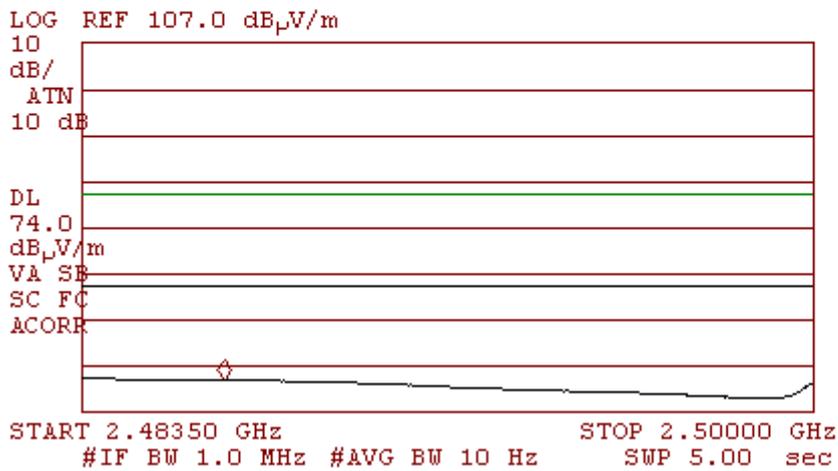


START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec

Vertical Polarization
Average
Plot 4.5.7

MOTOROLA VoWLAN

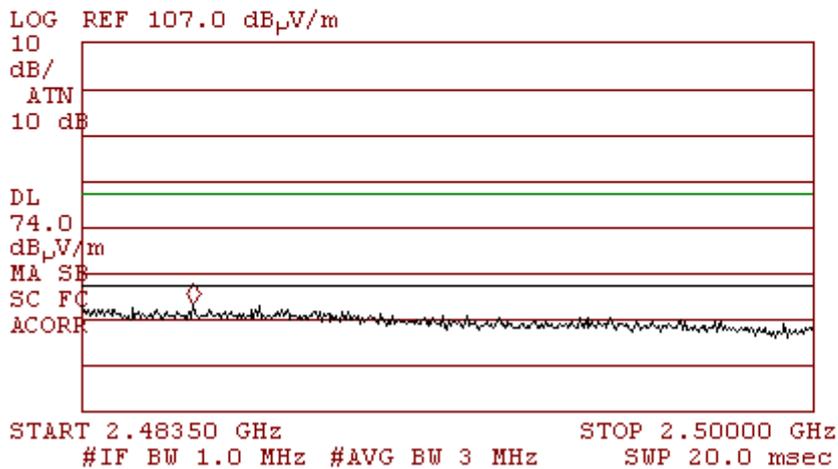
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48672 GHz
33.71 dB_μV/m



Peak
Plot 4.5.8

MOTOROLA VoWLAN

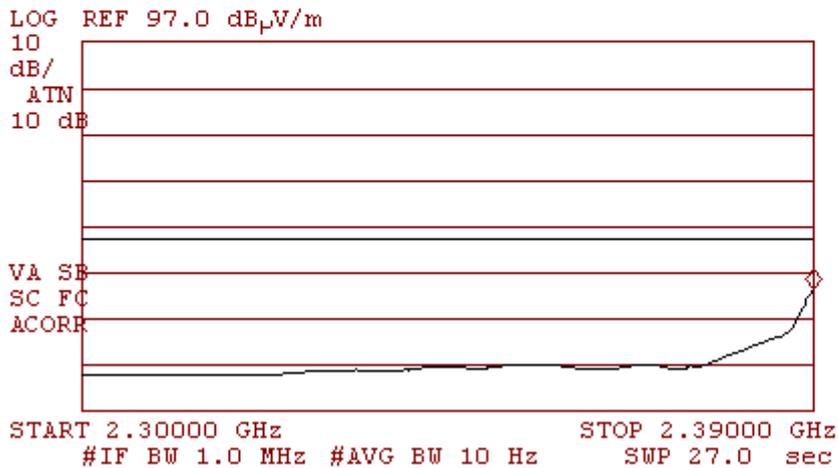
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48602 GHz
50.10 dB_μV/m



**54 Mbit, Lowest Frequency
Vertical Polarization
Average
Plot 4.5.9**

MOTOROLA VoWLAN

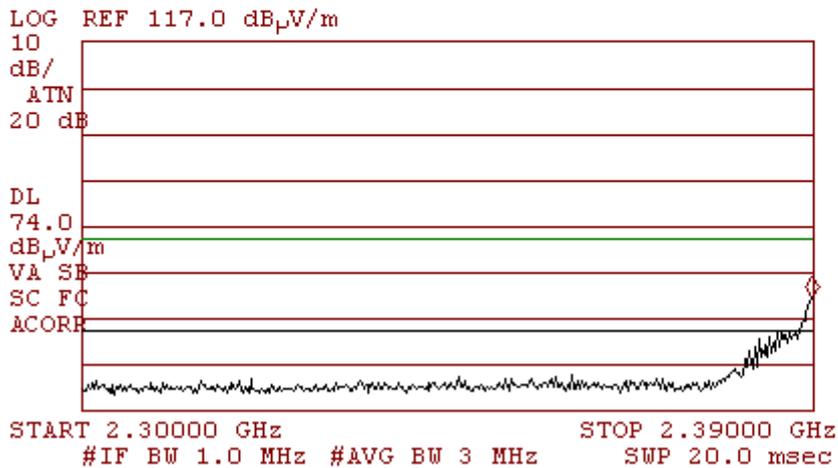
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.39000 GHz
43.09 dB μ V/m



**Peak
Plot 4.5.10**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38978 GHz
61.44 dB μ V/m

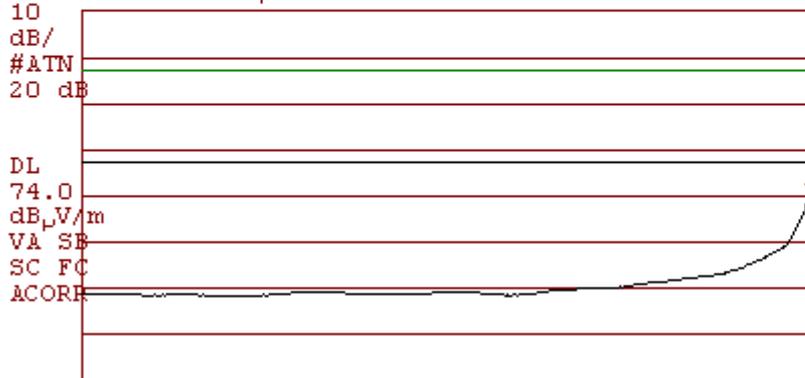


Horizontal Polarization
Average
Plot 4.5.11

~~/~~ MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.39000 GHz
46.92 dB_μV/m

LOG REF 87.0 dB_μV/m



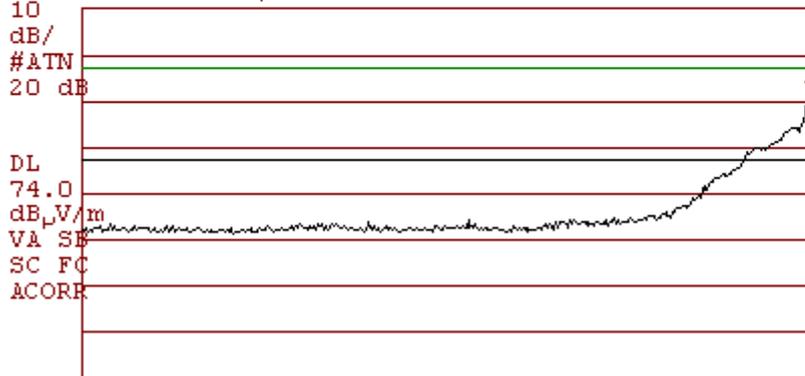
START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 27.0 sec

Peak
Plot 4.5.12

~~/~~ MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.39000 GHz
68.80 dB_μV/m

LOG REF 87.0 dB_μV/m



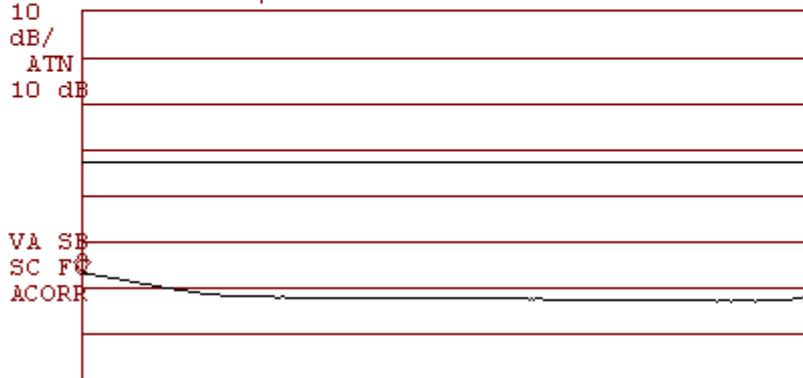
START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec

**54 Mbit, Highest Frequency
Vertical Polarization
Average
Plot 4.5.13**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48350 GHz
30.10 dB μ V/m

LOG REF 87.0 dB μ V/m



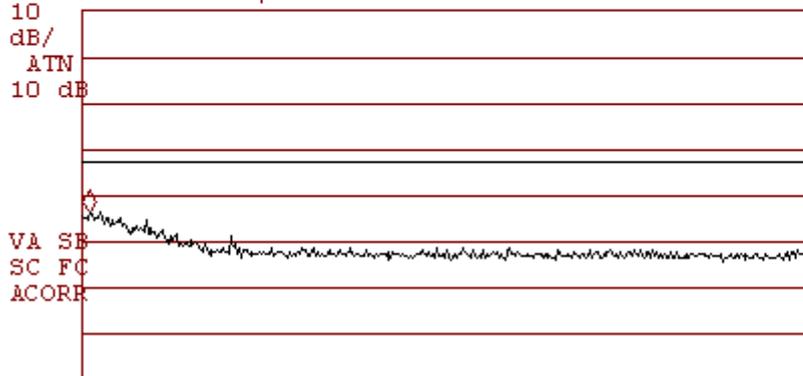
START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 5.00 sec

**Peak
Plot 4.5.14**

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48367 GHz
43.34 dB μ V/m

LOG REF 87.0 dB μ V/m



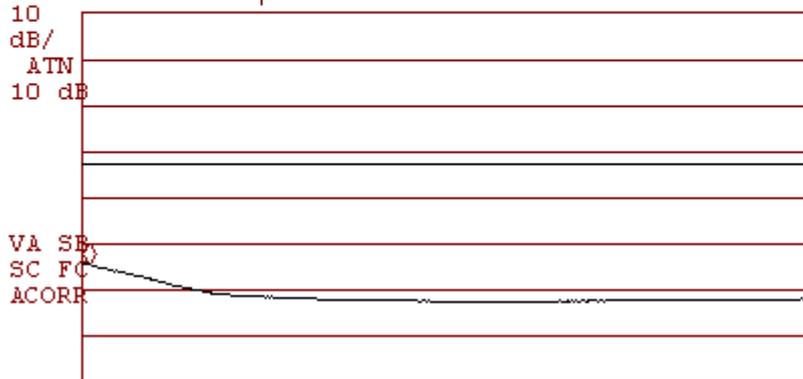
START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz AVG BW 300 kHz SWP 20.0 msec

Horizontal Polarization
Average
Plot 4.5.15

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48367 GHz
32.20 dB μ V/m

LOG REF 87.0 dB μ V/m



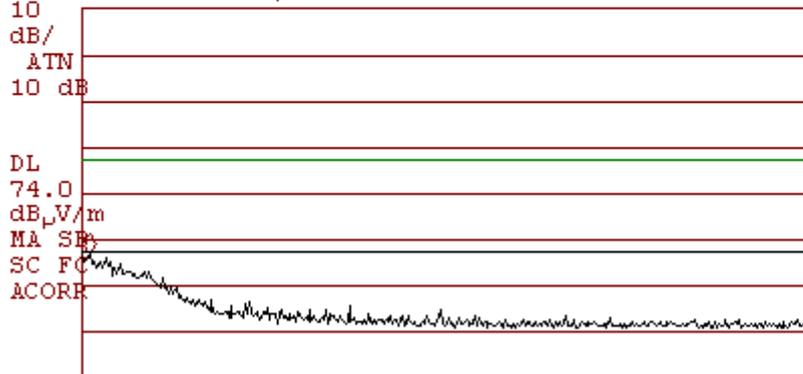
START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 5.00 sec

Peak
Plot 4.5.16

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48367 GHz
53.44 dB μ V/m

LOG REF 107.0 dB μ V/m



START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec

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: 1MHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.6.1 - Plot 4.6.28	

Test result:

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 V/H	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11b Mode							
2437	11	1939	Peak	H	38.9	74	-35.1
2437	11	1939	Avg	H	30.6	54	-23.4
2462	11	1939	Peak	H	39.1	74	-34.9
2462	11	1939	Avg	H	30.7	54	-23.3
All other emissions at least 10 dB below the limit							

Channel Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization V/H	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11g Mode							
2412	54	1939	peak	H	39.8	74	-34.2
2462	54	1939	Avg	H	36.9	54	-17.1
All other emissions at least 10 dB below the limit							

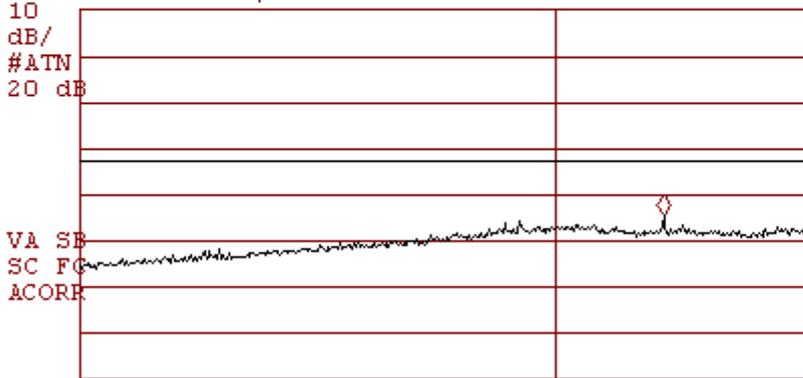
Note: Spurious Emission [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss + Filter I/L.

802.11b Mode
11 Mbit - Lowest Frequency
Vertical & Horizontal Polarization
Plot 4.6.1

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.414 GHz
42.19 dB μ V/m

LOG REF 87.0 dB μ V/m



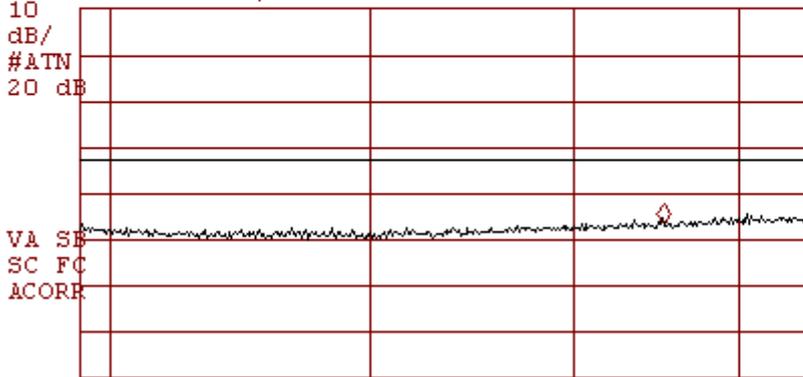
START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 43.9 msec

Vertical & Horizontal Polarization
Plot 4.6.2

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.623 GHz
40.10 dB μ V/m

LOG REF 87.0 dB μ V/m



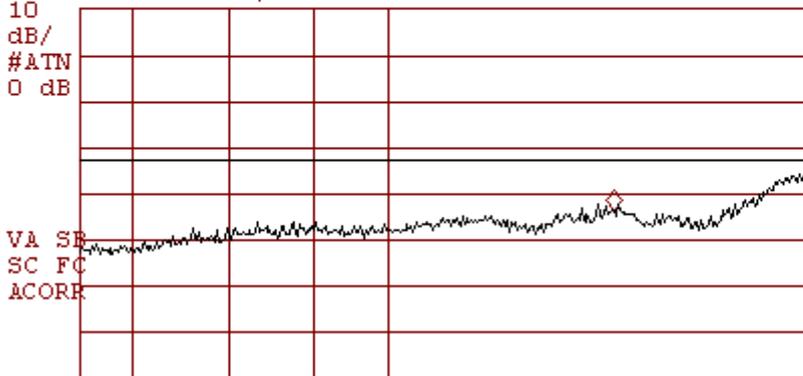
START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 72.0 msec

Vertical & Horizontal Polarization
Plot 4.6.3

MOTOROLA VoWLAN

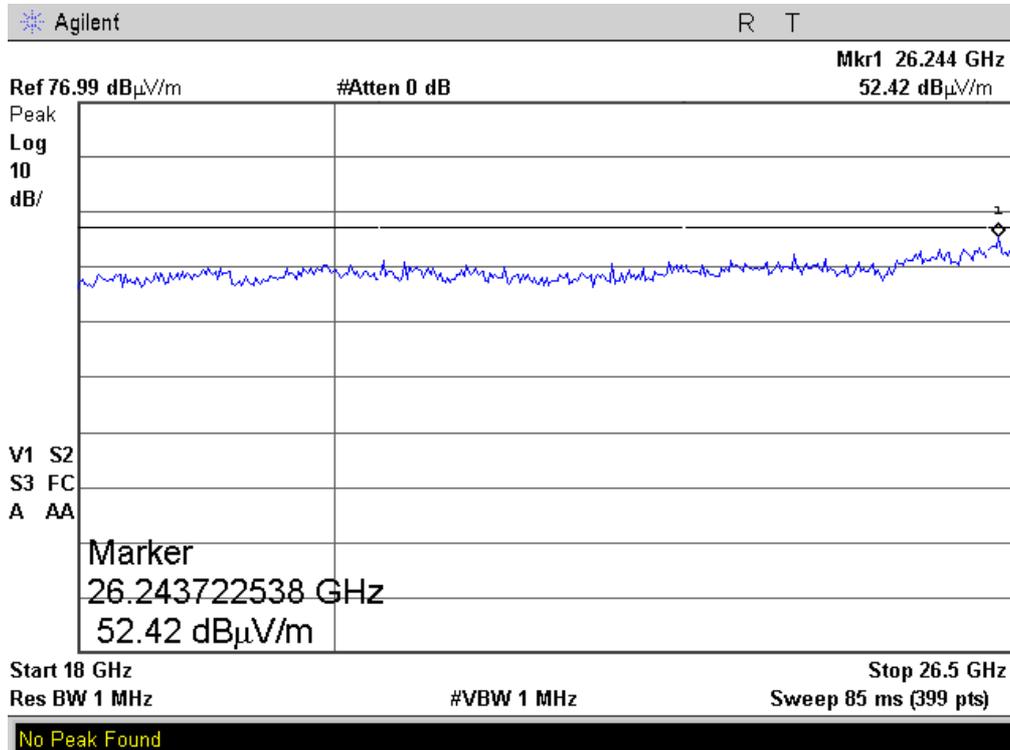
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 14.12 GHz
43.30 dB μ V/m

LOG REF 87.0 dB μ V/m



START 6.50 GHz STOP 18.00 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 230 msec

Vertical & Horizontal Polarization
Plot 4.6.4

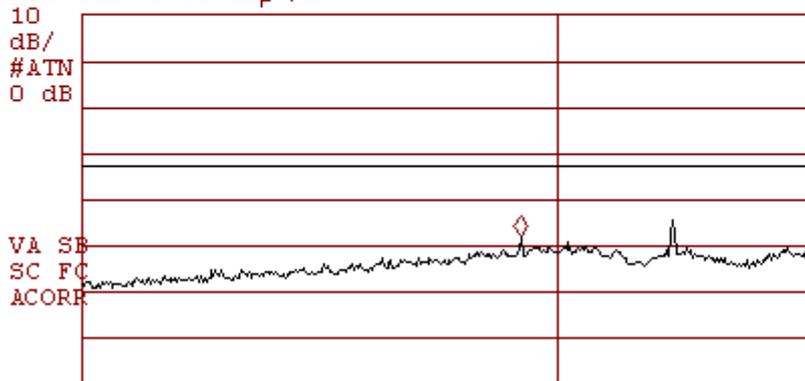


802.11b Mode
11 Mbit – Middle Frequency
Vertical & Horizontal Polarization
Plot 4.6.5

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.939 GHz
38.89 dB μ V/m

LOG REF 87.0 dB μ V/m



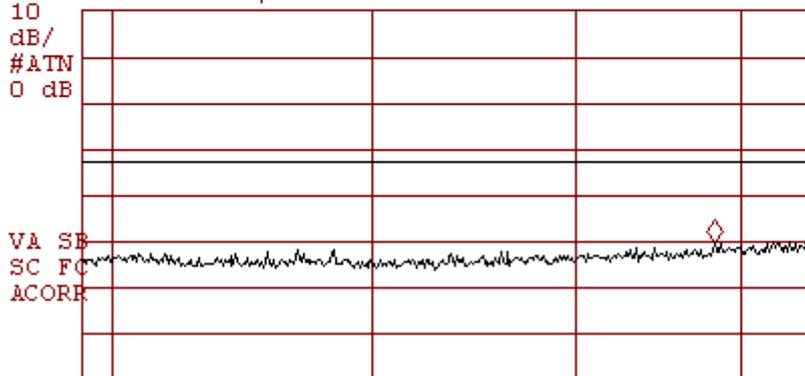
START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 43.9 msec

Vertical & Horizontal Polarization
Plot 4.6.6

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.915 GHz
36.83 dB μ V/m

LOG REF 87.0 dB μ V/m



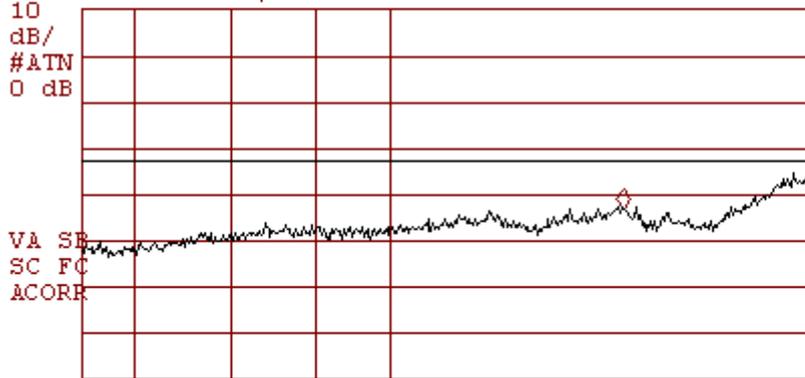
START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 72.0 msec

Vertical & Horizontal Polarization
Plot 4.6.7

MOTOROLA VoWLAN

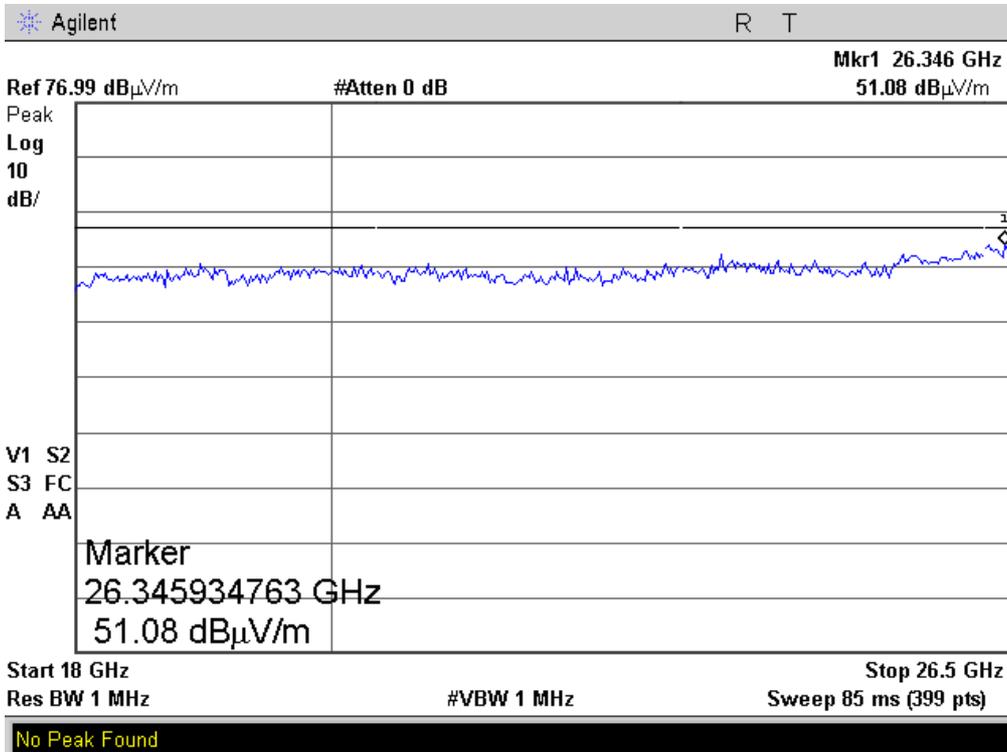
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 14.26 GHz
43.51 dB μ V/m

LOG REF 87.0 dB μ V/m



START 6.50 GHz STOP 18.00 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 230 msec

Vertical & Horizontal Polarization
Plot 4.6.8

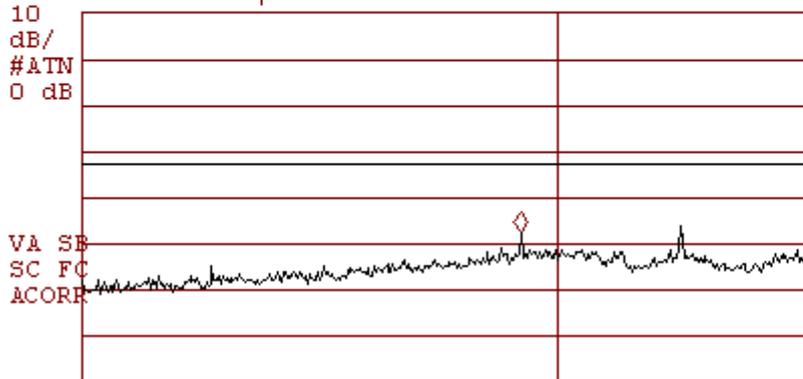


802.11b Mode
11 Mbit – Highest Frequency
Vertical & Horizontal Polarization
Plot 4.6.9

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.939 GHz
39.10 dB μ V/m

LOG REF 87.0 dB μ V/m



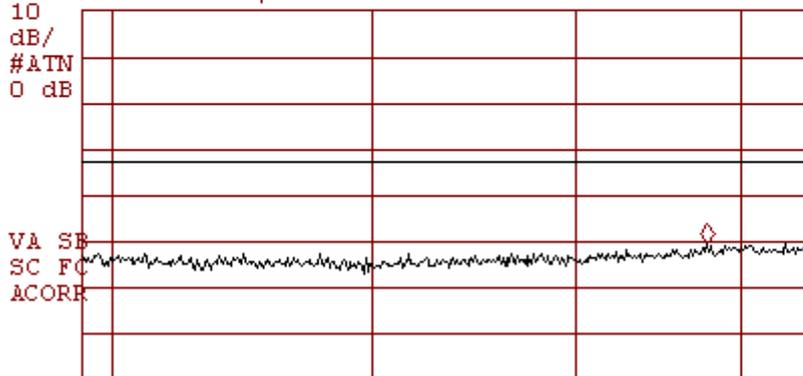
START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 43.9 msec

Vertical & Horizontal Polarization
Plot 4.6.10

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 5.872 GHz
36.34 dB μ V/m

LOG REF 87.0 dB μ V/m



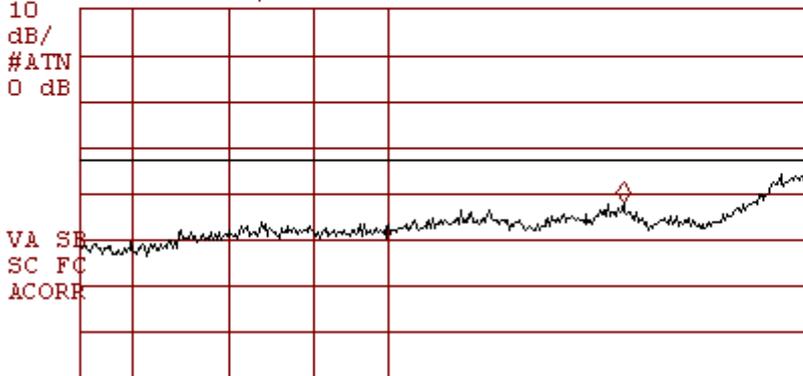
START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 72.0 msec

Vertical & Horizontal Polarization
Plot 4.6.11

MOTOROLA VoWLAN

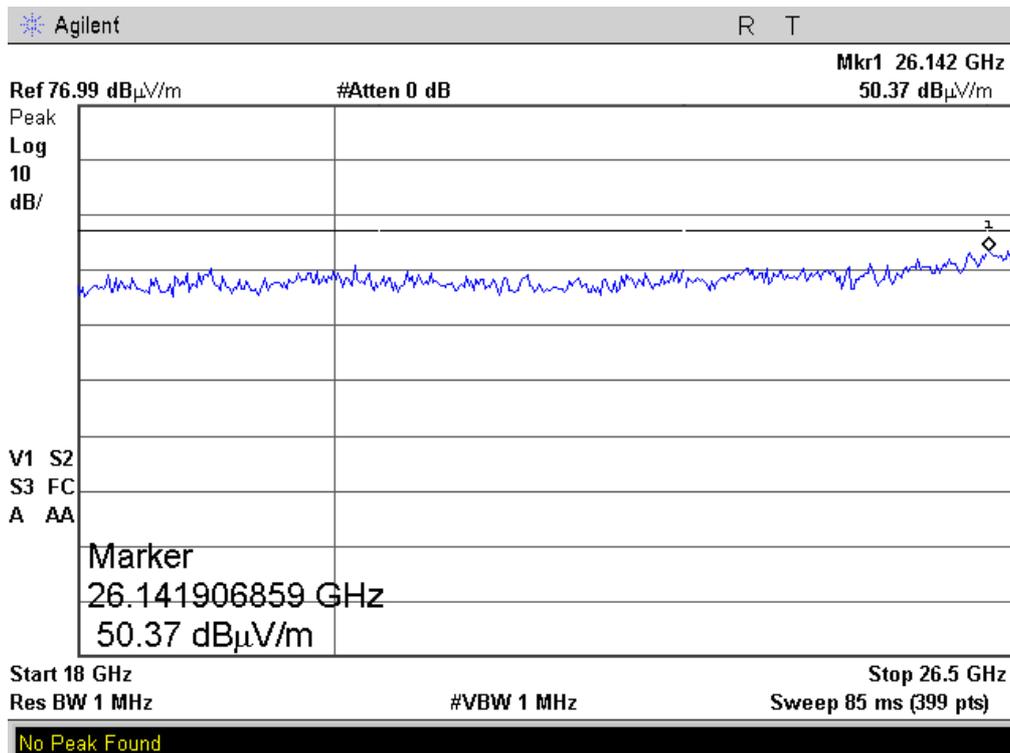
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 14.30 GHz
44.90 dB μ V/m

LOG REF 87.0 dB μ V/m



START 6.50 GHz STOP 18.00 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 230 msec

Vertical & Horizontal Polarization
Plot 4.6.12



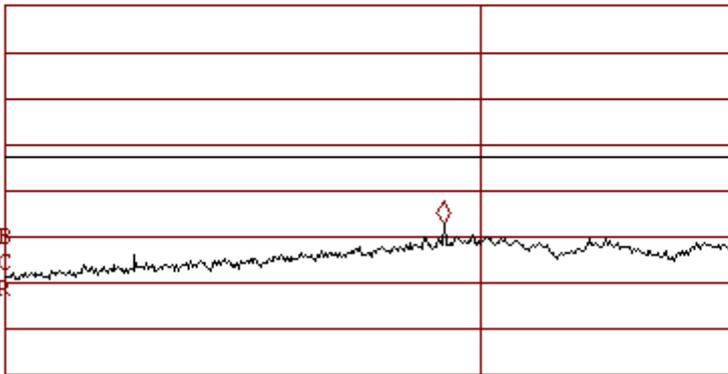
802.11g Mode
54 Mbit – Lowest Frequency
Vertical & Horizontal Polarization
Plot 4.6.13

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 1.939 GHz
39.87 dB μ V/m

LOG REF 87.0 dB μ V/m
10
dB/
#ATN
0 dB

VA SE
SC FC
ACORR



START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 43.9 msec

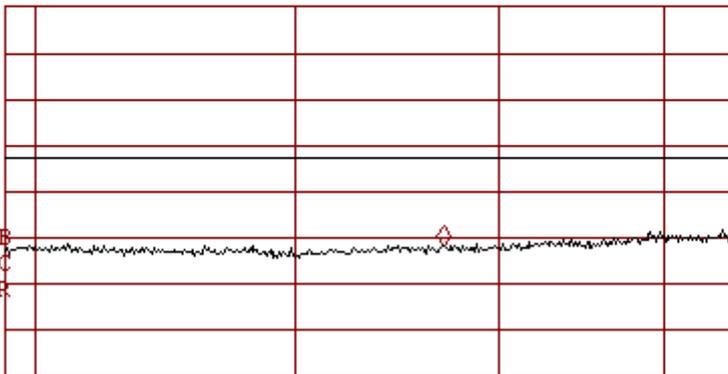
Vertical & Horizontal Polarization
Plot 4.6.14

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.768 GHz
34.93 dB μ V/m

LOG REF 87.0 dB μ V/m
10
dB/
#ATN
0 dB

MA SE
SC FC
ACORR



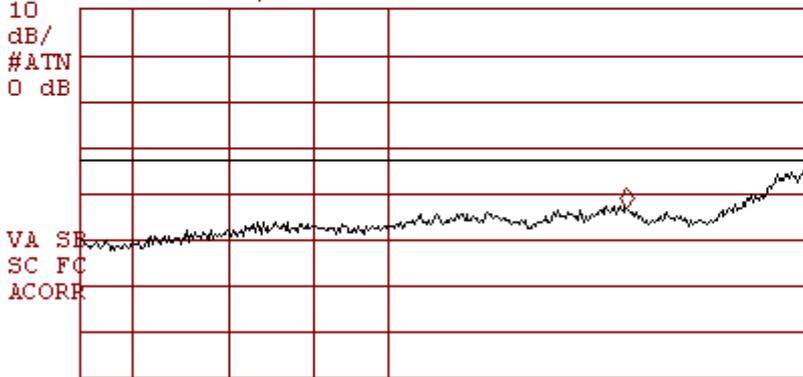
START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 72.0 msec

Vertical & Horizontal Polarization
Plot 4.6.15

✂ MOTOROLA VoWLAN

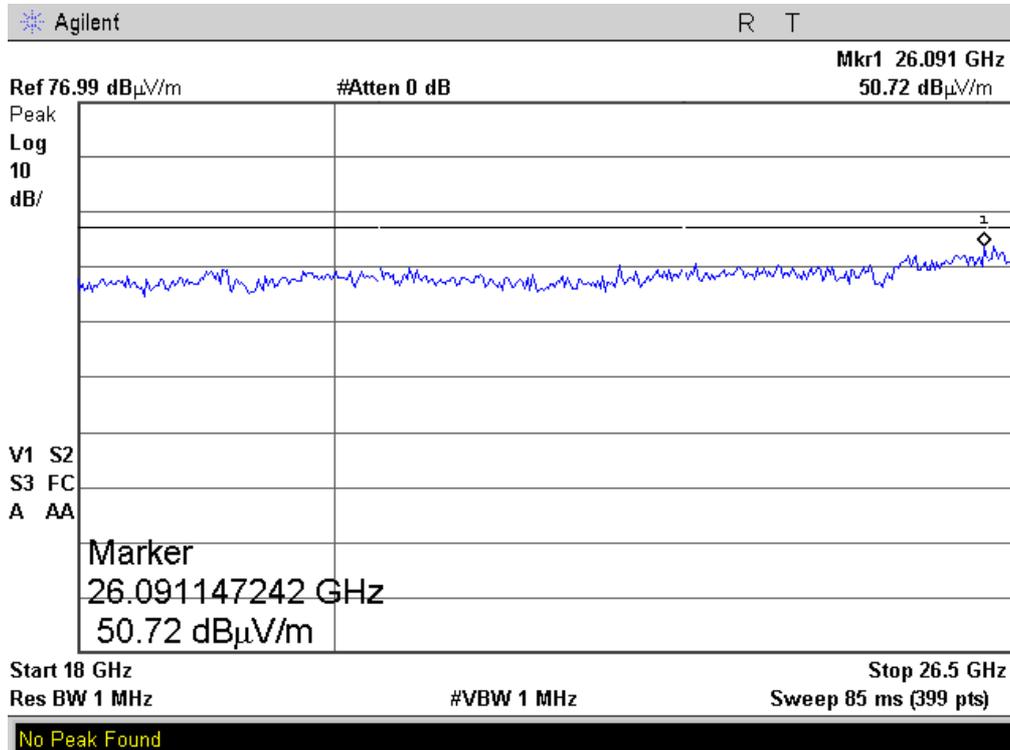
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 14.37 GHz
43.43 dB μ V/m

LOG REF 87.0 dB μ V/m



START 6.50 GHz STOP 18.00 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 230 msec

Vertical & Horizontal Polarization
Plot 4.6.16

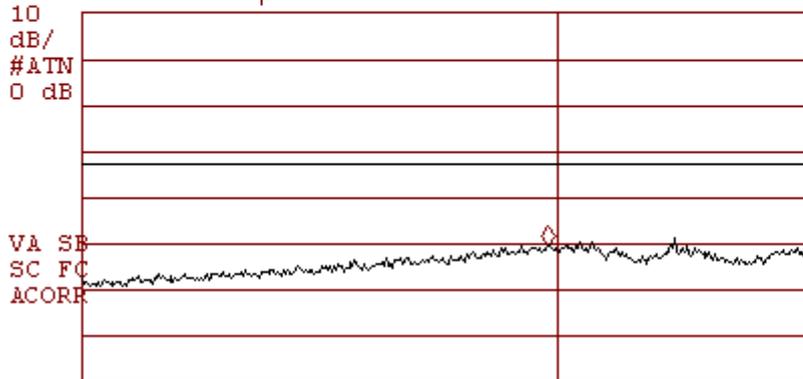


802.11g Mode
54 Mbit – Middle Frequency
Vertical & Horizontal Polarization
Plot 4.6.17

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.029 GHz
36.25 dB μ V/m

LOG REF 87.0 dB μ V/m



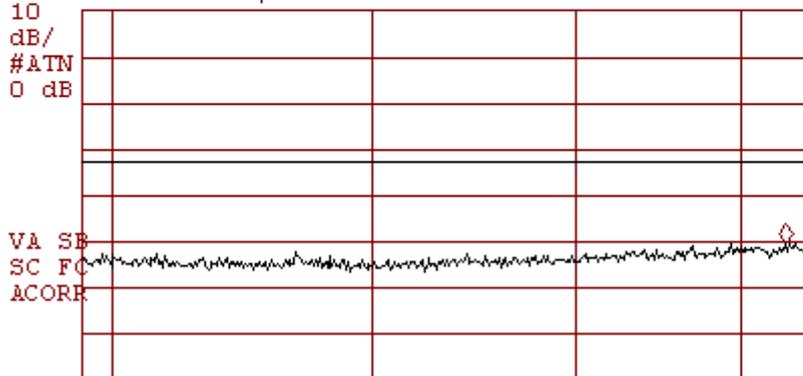
START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 43.9 msec

Vertical & Horizontal Polarization
Plot 4.6.18

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 6.338 GHz
36.28 dB μ V/m

LOG REF 87.0 dB μ V/m



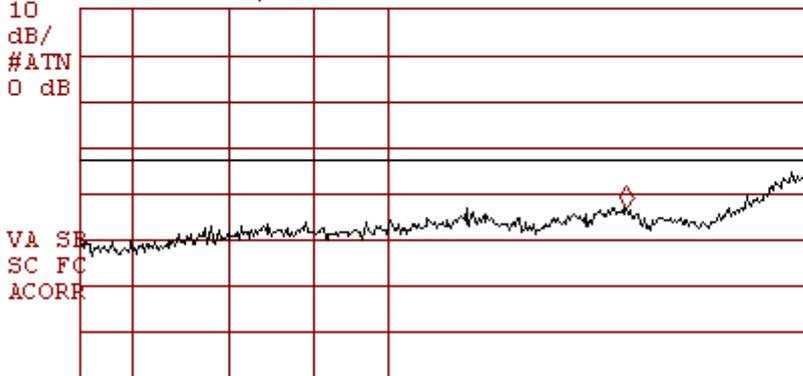
START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 72.0 msec

Vertical & Horizontal Polarization
Plot 4.6.19

MOTOROLA VoWLAN

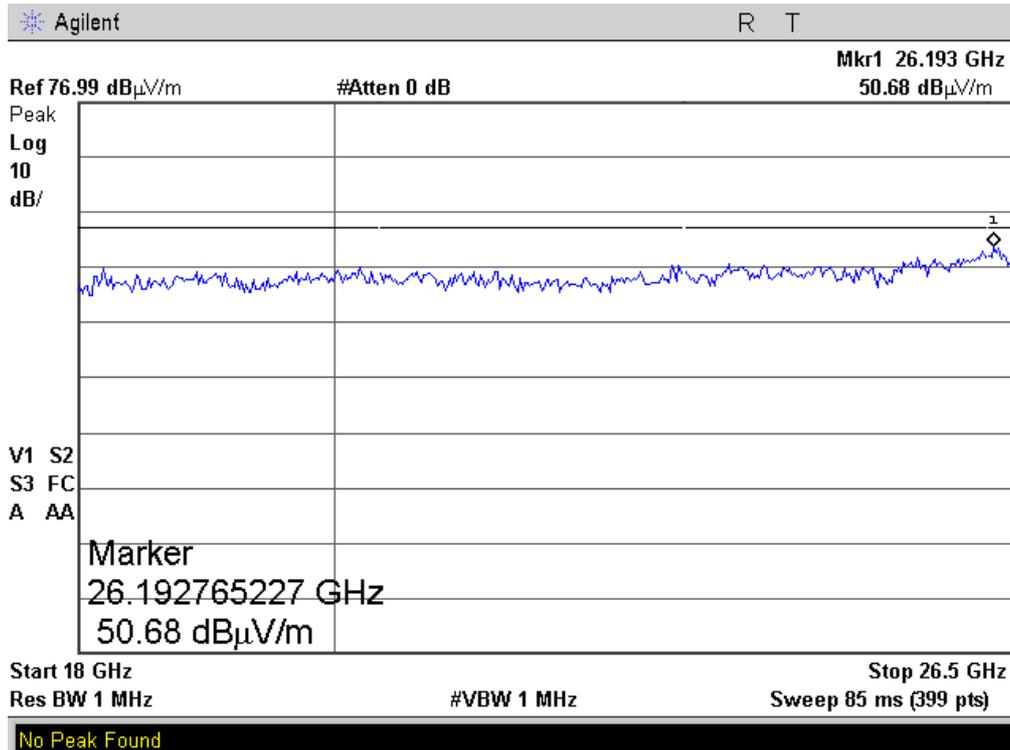
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 14.37 GHz
43.75 dB μ V/m

LOG REF 87.0 dB μ V/m



START 6.50 GHz STOP 18.00 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 230 msec

Vertical & Horizontal Polarization
Plot 4.6.20

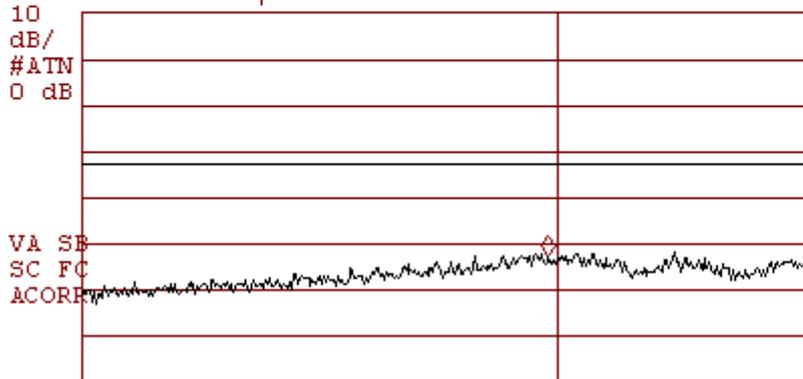


802.11g Mode
54 Mbit –Highest Frequency
Vertical & Horizontal Polarization
Plot 4.6.21

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.029 GHz
34.10 dB μ V/m

LOG REF 87.0 dB μ V/m



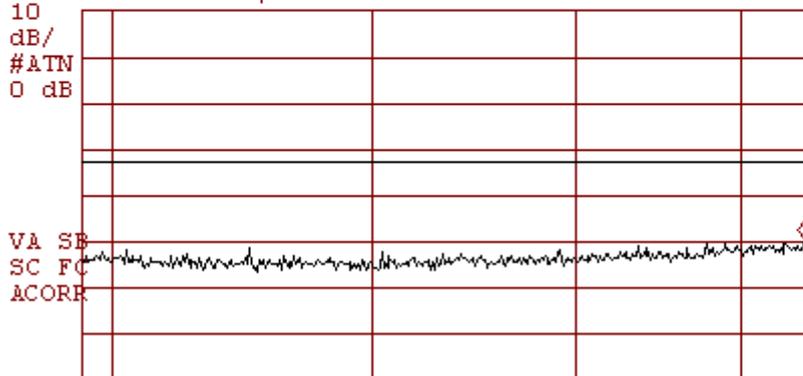
START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 43.9 msec

Vertical & Horizontal Polarization
Plot 4.6.22

MOTOROLA VoWLAN

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 6.446 GHz
37.00 dB μ V/m

LOG REF 87.0 dB μ V/m



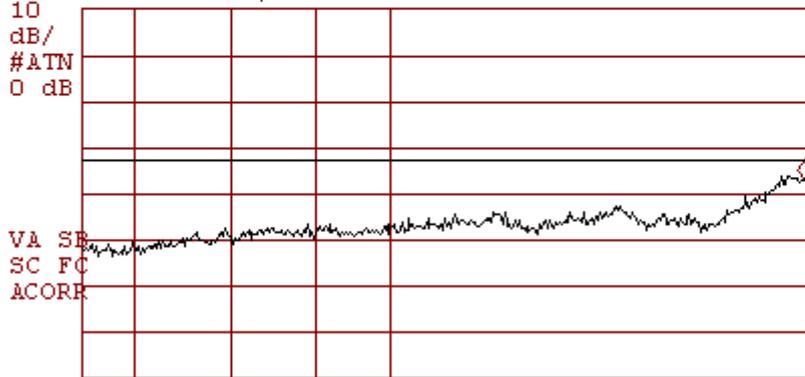
START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 72.0 msec

Vertical & Horizontal Polarization
Plot 4.6.23

~~10~~ MOTOROLA VoWLAN

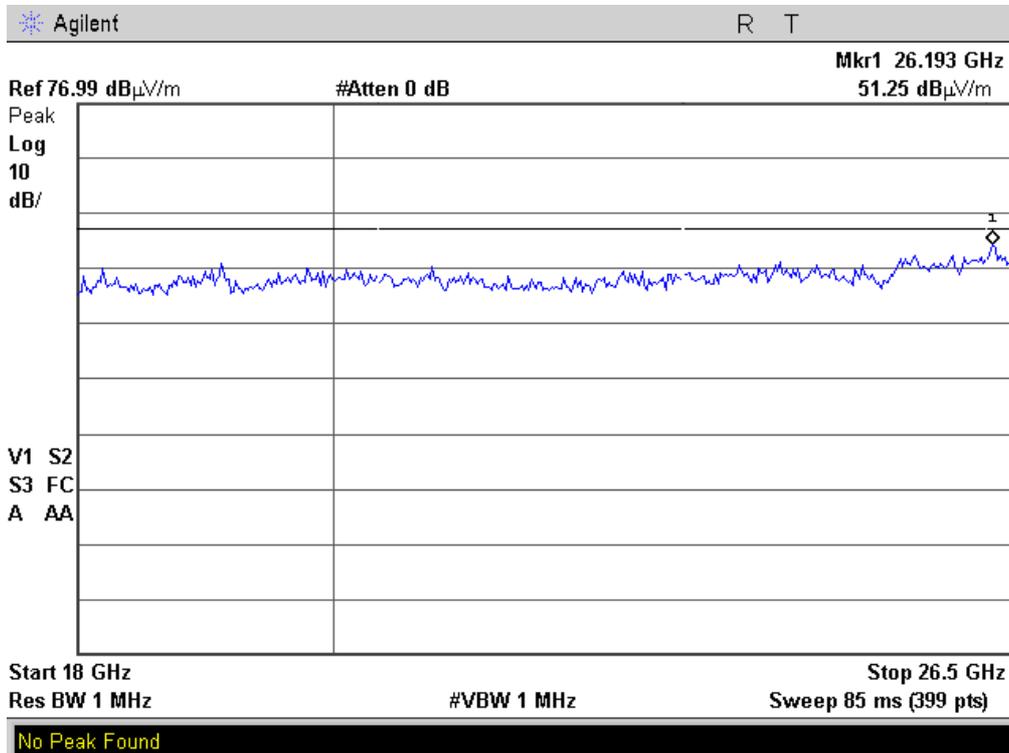
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 17.82 GHz
49.82 dB μ V/m

LOG REF 87.0 dB μ V/m



START 6.50 GHz STOP 18.00 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 230 msec

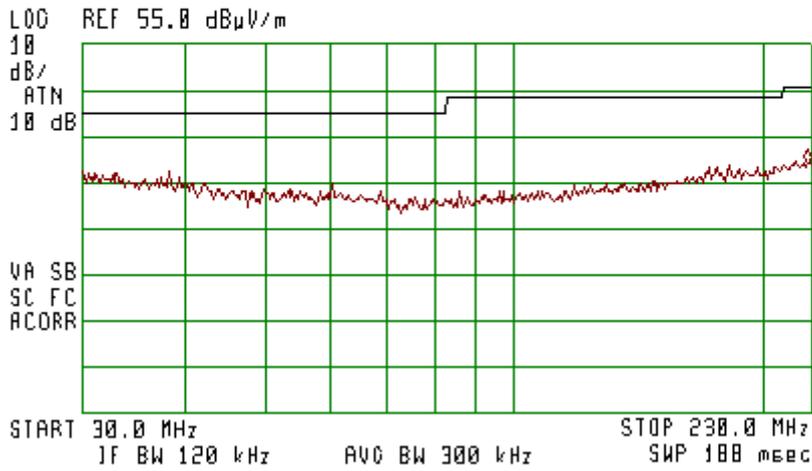
Vertical & Horizontal Polarization
Plot 4.6.24



Below 1 GHz Worst case for all Mode and all channel Radiated Emission
Vertical Polarization
Plot 4.6.25



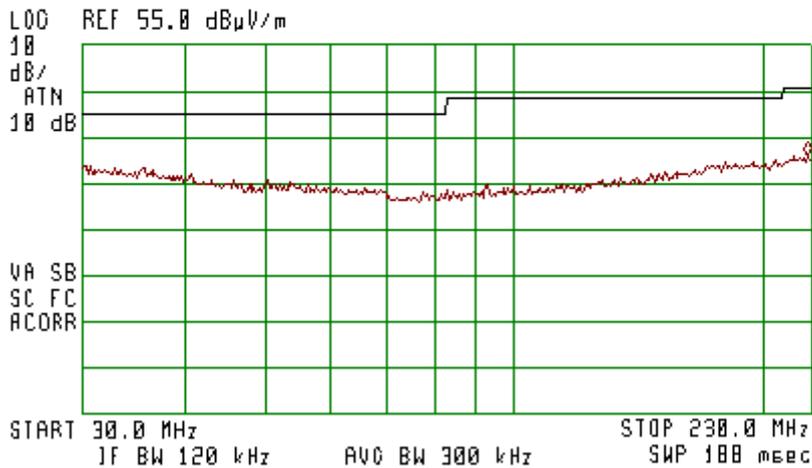
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 227.4 MHz
29.13 dB μ V/m



Horizontal Polarization
Plot 4.6.26



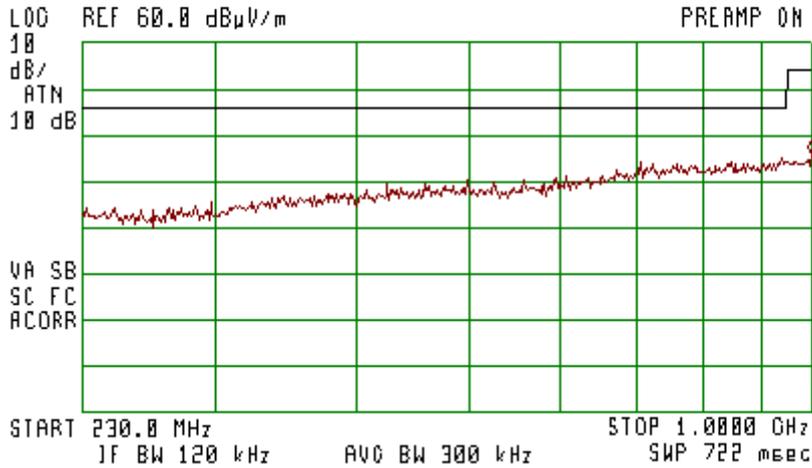
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 227.4 MHz
31.12 dB μ V/m



Horizontal Polarization
Plot 4.6.27



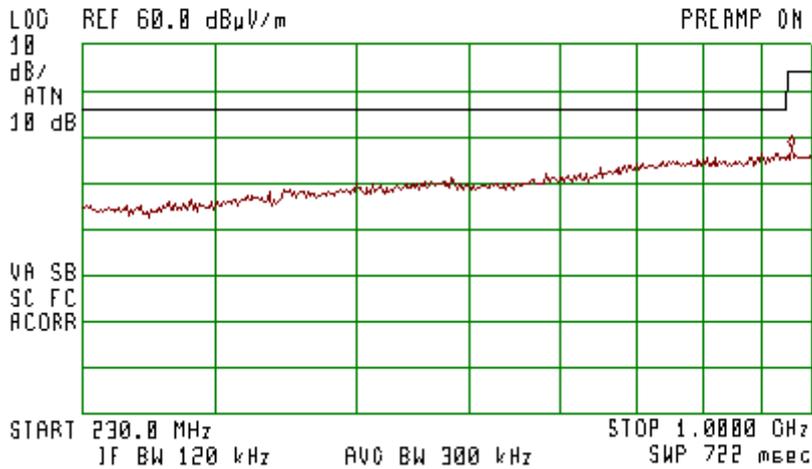
ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 997.1 MHz
35.99 dB μ V/m



Vertical Polarization
Plot 4.6.28



ACTV DET: PEAK
MERS DET: PEAK QP AVG
MKR 965.1 MHz
37.30 dB μ V/m



5. Appendix

Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR16 EMI Receiver	HP8546A	3710A00392	30-06-08
Spectrum Analyzer 9kHz ÷ 22 GHz	HP 8593EM	3536A00131	30-06-08
Spectrum Analyzer 100 Hz ÷ 26.5 GHz	Agilent E7405A	US41160436	30-06-08
LNA Amplifier 1 GHz ÷ 18 GHz	AMP – 5D-010180-30-10P-GW	618653	30-06-08
Power meter	Agilent N1911A	MY45100784	23-02-08
Dual Ridged Guide Ant.1-18 GHz	EMCO 3115	9602-4677	30-06-08
Antenna 18 GHz ÷ 26.5 GHz	Alpha Industry 861A/599	505	30-06-08
Turn table	HD100	100/693	-
Antenna Mast	HD 100	100/693	-
Biconical 20 –200 MHz	Schwarzbeck VHBB9124	9124/0255	16-05-08
Log-Periodic 200 – 1000 MHz	Schwarzbeck VUSLP9111	VUSLP9111184	16-05-08
Pre-Amplifier	MiTeq, AMF-5F-18002650-30-10P	945372	30-06-08
LISN	Fischer 50/250-25-2	-	30-06-08
Transient Limiter	HP11947A	-	30-06-08
Notch Filter	Micro-Tronics BRM50702-05	0001	30-06-08

Appendix B: Accreditation Certificate



End of the Test Report