



## **Electromagnetic Compatibility Test Report**

**Test Report No: MOT 290414 Rev.4  
Issued on: April 19, 2015**

**Product Name  
VML750  
VSM LTE band 14 & WiFi Transmitter  
Model: F0025A (FLN0058A)  
&  
WiFi Transmitter  
Model: F0025A (FLN2058A)**

**Tested According to  
FCC 47 CFR, Part 15, Subpart C  
IC RSS-210, Issue 8**

**Tests Performed for  
Motorola Israel Ltd.  
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Tel: (972) 03-565888**

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### Test Report details:

Test commencement date: 22.04.2014  
 Test completion date: 24.04.2014  
 Customer's representative: Moti Rachmilov  
 Issued on: 19.04.2015

### Revision details:

Version	Date	Details/Reasons
Rev. 1	29.04.2014	-
Rev. 2	12.01.2015	Per customer's request additional model "F0025A (FLN2058A)" is included in the test report. Per customer's declaration there is no change (from FCC point of view) between tested model number F0025A (FLN0058) and additional model number F0025 (FLN2058A)
Rev.3	03.02.2015	Minor typographical errors/omissions corrected on page 6. Industry Canada ICES-003, Issue 5 included in the test report
Rev.4	19.04.2015	Radiated emissions testing results in 9kHz -30MHz frequency range was added and correction per TCB's comments

### 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

Test Spec. Clause	Test Case	Remarks
47 CFR §15.247 (a) (2) RSS-210 section A8.2 (a)	6 dB Bandwidth	Pass
47 CFR §15.247 (b) (3) & RSS-210 section A8.4 (4)	Maximum Conducted (Average) Output Power	Pass
47 CFR §15.247 (e) & RSS-210 Section A8.2 (b)	Peak Power Spectral Density(peak PSD)	Pass
47 CFR §15.247 (d) & RSS-210 Section A8.5	Conducted Spurious Emissions	Pass
47 CFR §15.247 (d) & §15.205 & RSS-210 section A8.5	Radiated Spurious Emissions, Restricted Bands	Pass
47 CFR §15.247 (d), & §15.205, & §15.209(a)	Radiated Spurious Emissions	Pass

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## 1. General Description

### Description of the EUT system/test Item:

**Product name:** VML750

**1. Model:** F0025A (FLN0058A)

**FCC ID:** AZ492FT7060

**IC ID:** 109U-92FT7060

**Description:** The VML750 is router contained WiFi module, GPS module, 4G modem (band 13&14).

**Maximum Peak Output Power:** 50 mW

**Frequency range:** 2401-2473MHz

**Description:** The VML750 supports the following modulation/spectrum schemes:

- 700MHz LTE FDD (LTE Band 13/14)

- WLAN 802.11b/g/n

**2. Model:** F0025A (FLN2058A)

**FCC ID:** AZ492FT7058

**IC ID:** 109U-92FT7058

**Description:** The VML750 is router contained WiFi module.

**Maximum Peak Output Power:** 50 mW

**Frequency range:** 2401-2473MHz

The VML750 supports WLAN 802.11b/g/n.

### Transmit Data rate: Protocol

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
802.11n	6.50	13	19.5	26	39	52	58.5	65

### Antenna Specification:

Type: folded monopole for WLAN b/g/n

### Antenna Gain:

2401-2473 MHz – Max 10 dBi

## 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.

### 2.2. Radiated Emissions Measurements in the restricted bands:

For radiated emissions, which fall in the restricted bands the spectrum from 9kHz 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.

### 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
- Industry Canada File Number: IC4808

#### 3.2. Test Facility description

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

**Address:** 30, Hasivim St., Petah Tikva, Israel.  
Tel: 972-3-926-6994

#### 3m Anechoic Chamber:

Two 3m-screened chambers are used in two configurations: the semi-anechoic chamber for Radiated Emission measurements and the full-anechoic chamber 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 $\geq 80$ dB at 15 kHz $\geq 90$ 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 Emerson and Cuming absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	$\pm 3.9$ dB, 30MHz to 200MHz $\pm 3$ dB, 200MHz to 1000MHz
Transmission Loss measured at 5 positions, at 1.5m height	$\pm 3$ 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 $\geq 80$ dB at 15 kHz $\geq 90$ 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	$\pm 3$ dB 80MHz to 18GHz

**3.1. Uncertainty of Measurement:**

Test Name	Test Method & Range	Uncertainty	
		Expanded U	Ucisp
<b>Radiated Emission</b>	30MHz÷230MHz, Horiz. polar.	[dB]	[dB]
	30MHz÷230MHz, Ver. polar.	4.92	5.06
	230MHz÷1000MHz, Horiz. polar.	5.06	5.07
	230MHz÷1000MHz, Vert. polar.	5.30	5.34
	1.0GHz -6.0GHz	5.30	5.34
	6.0GHz-18.0GHz	4.28	5.18
		5.10	5.48
<b>Conducted Emission</b>	9 kHz÷150 kHz	[dB]	[dB]
	150 kHz÷30MHz	3.5	3.83
		3.06	3.44

**Note:** Note: QualiTech EMC labs expanded measurement instrumentation has less uncertainty than the industry norm and compliance is deemed to occur as no measured disturbance exceeds the disturbance limit.

**Note:** The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

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

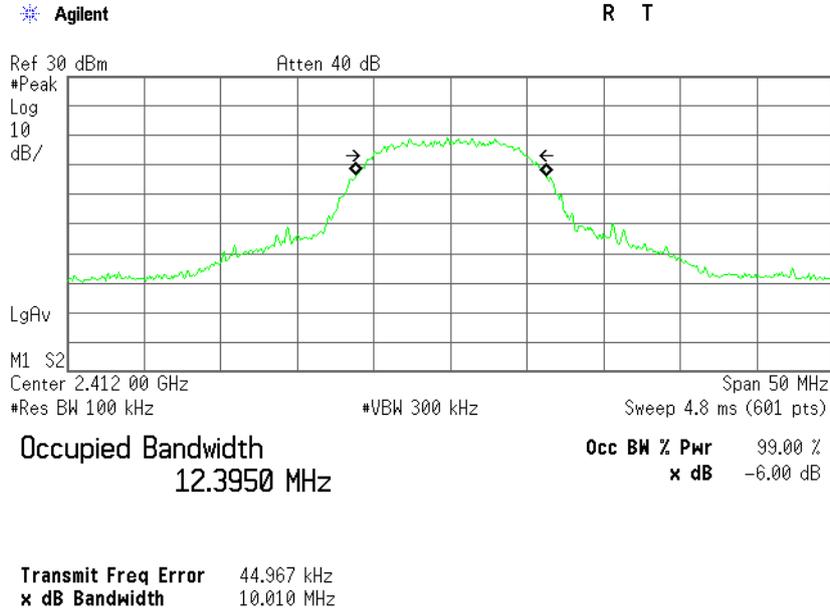
##### 4.1. 6 dB Bandwidth

Reference document:	47 CFR §15.247 (a) (2)		
Test Requirements:	Systems using digital modulation techniques may operate in 2400-2483.5 MHz and 5725–5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.		
Test setup:	See sec 2.1	<b>Pass</b>	
Method of testing:	Conducted KDB 558074 D01 v03r02, Sec.8, option 2		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 56%	Atmospheric Pressure: hPa
Test Result:	See below	See Plot 4.1.1 - Plot 4.1.9	

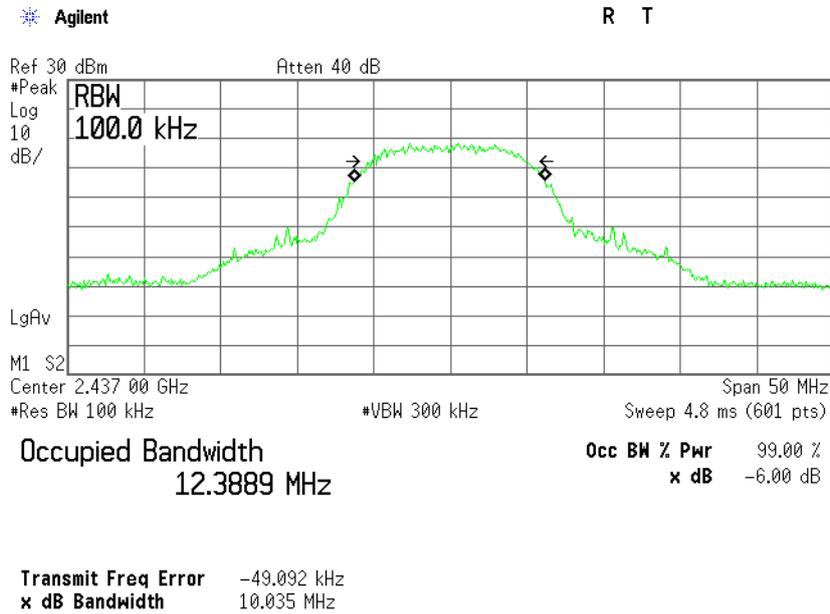
##### Test results

Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz]	Limit [kHz]
<b>802.11b Mode</b>			
2412	11	10010	>500
2437	11	10035	>500
2462	11	10007	>500
<b>802.11g Mode</b>			
2412	54	16602	>500
2437	54	16610	>500
2462	54	16608	>500
<b>802.11n -20 MHz Mode</b>			
2412	MCS7	17799	>500
2437	MCS7	17850	>500
2462	MCS7	17840	>500

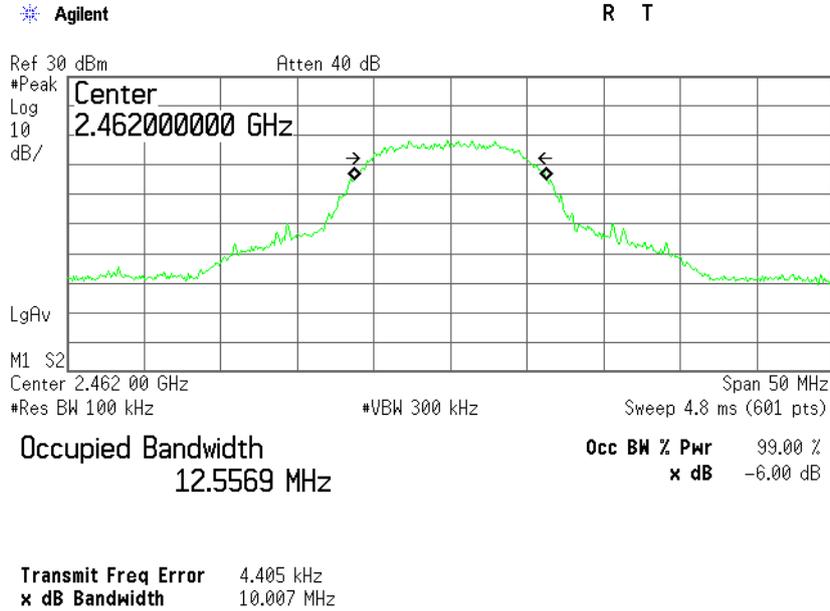
**Plot 4.1.1 6dB bandwidth test results, 802.11b Mode, Fc = 2412 MHz**



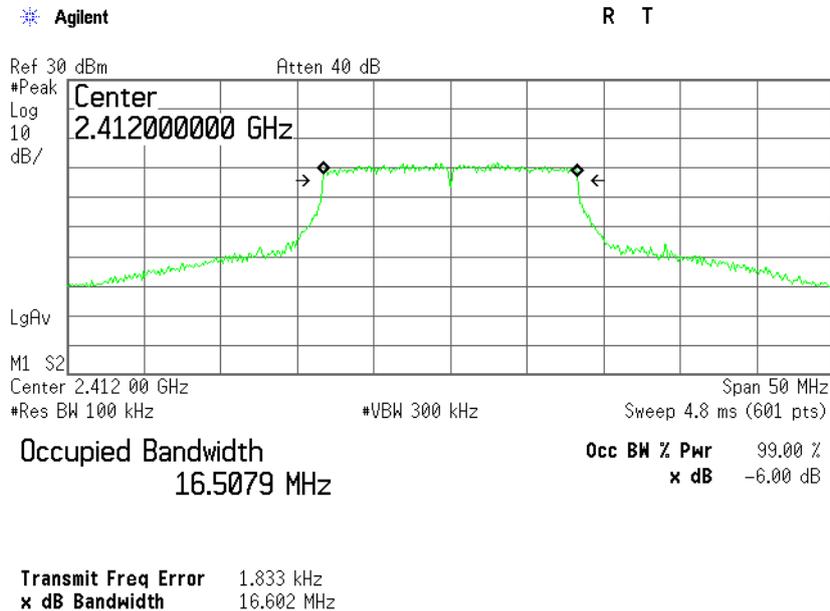
**Plot 4.1.2 6dB bandwidth test results, 802.11b Mode, Fc = 2437 MHz**



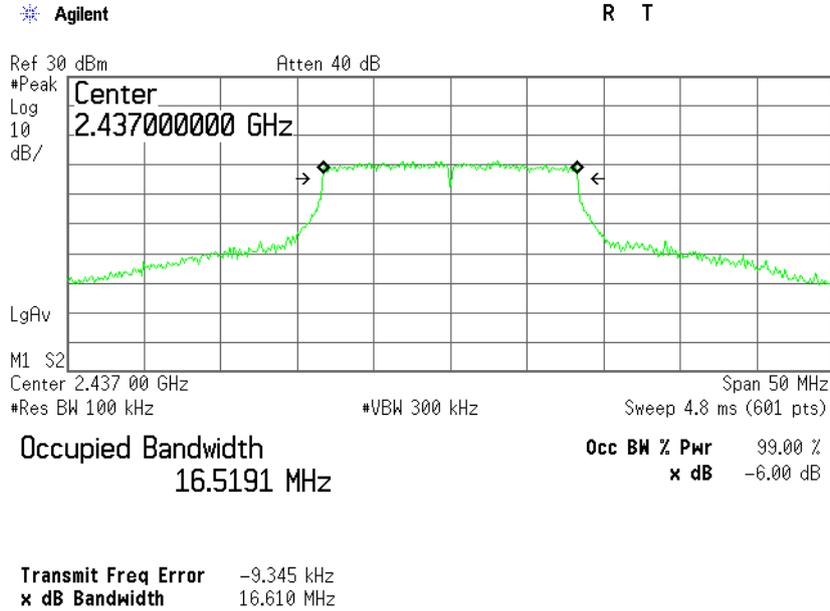
**Plot 4.1.3 6dB bandwidth test results, 802.11b Mode, Fc = 2462 MHz**



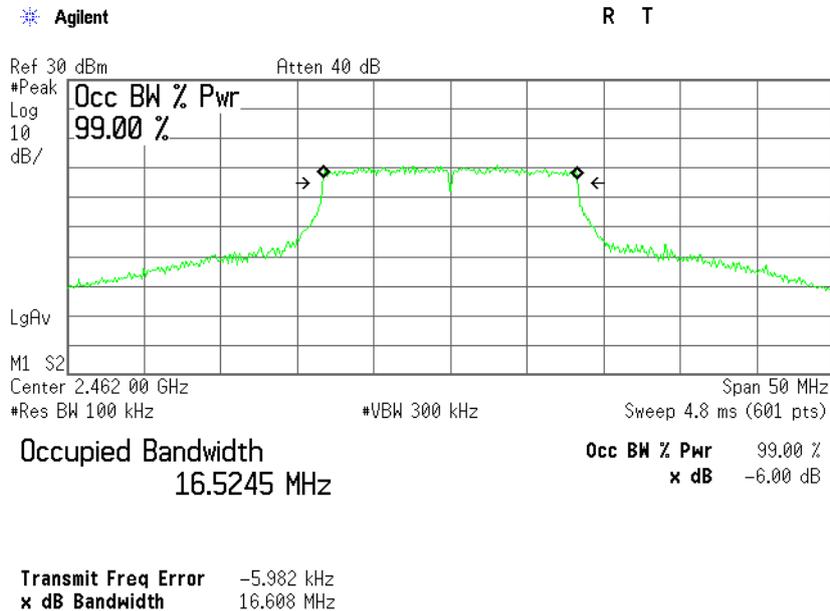
**Plot 4.1.4 6dB bandwidth test results, 802.11g Mode, Fc = 2412 MHz**



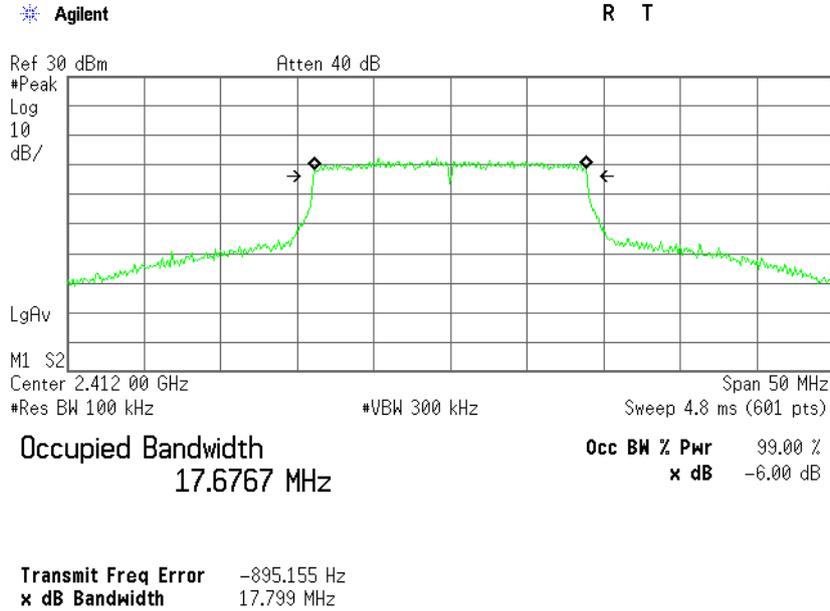
**Plot 4.1.5 6dB bandwidth test results, 802.11g Mode, Fc = 2437 MHz**



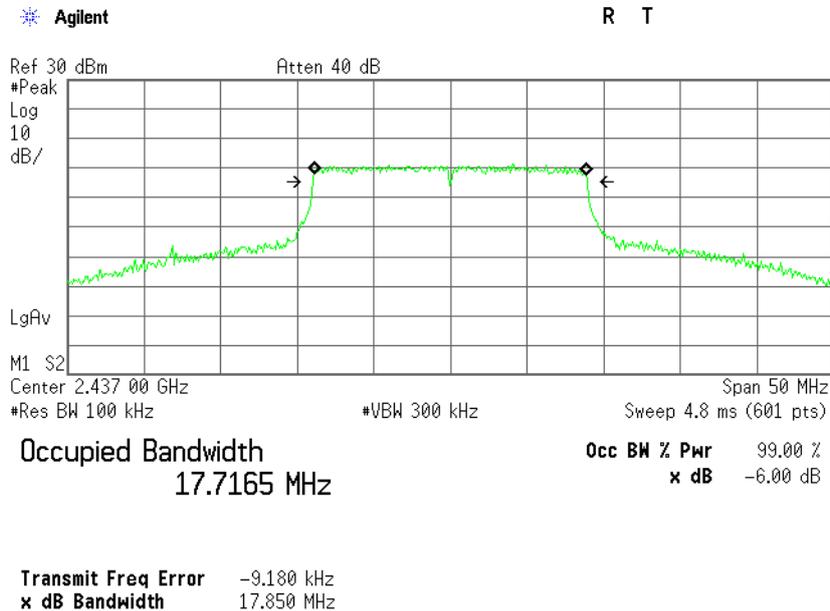
**Plot 4.1.6 6dB bandwidth test results, 802.11g Mode, Fc = 2462 MHz**



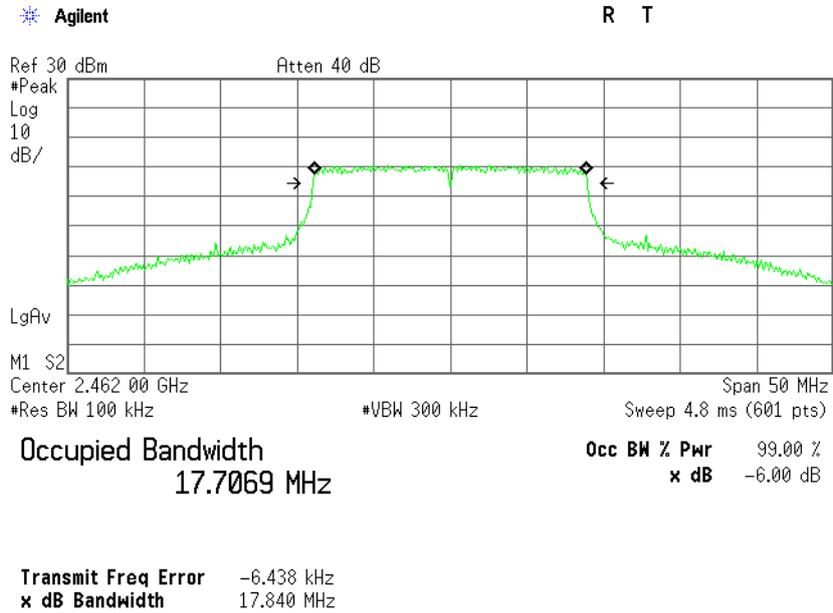
**Plot 4.1.7 6dB bandwidth test results, 802.11n 20MHz Mode, Fc = 2412 MHz**



**Plot 4.1.8 6dB bandwidth test results, 802.11n 20MHz Mode, Fc = 2437 MHz**



**Plot 4.1.9 6dB bandwidth test results, 802.11n 20MHz Mode, Fc = 2462 MHz**



**4.2. Maximum conducted (average) output power, 2400-2483.5 MHz**

Reference document:	<b>47 CFR §15.247 (b) (3)</b>		
Test Requirements:	The maximum peak output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz & 5725-5850 MHz bands shall not exceed 1 Watt. Transmitters operating in the 2400-2483.5 & 5725-5850 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	<b>Pass</b>	
Method of testing:	Conducted KDB 558074 D01 v03r02, Sec.9, 9.2.3.2		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22 °c	Relative Humidity: 56%	Atmospheric Pressure: hPa
Test Result:	See below	---	

**Test Results:**

Frequency, [MHz]	Data Rate, [Mbps]	Measured Output (average) Power*, [dBm]	Measured Output (average) Power*, [mW]	Limit, [dBm]	Margin, [dB]	Pass/Fail
<b>802.11bMode</b>						
2412	11	16.70	46.77	30.00	-13.30	Pass
2437	11	16.35	43.15	30.00	-13.65	Pass
2462	11	16.00	39.81	30.00	-14.00	Pass
<b>802.11g Mode</b>						
2412	54.00	13.61	22.96	30.00	-16.39	Pass
2437	54.00	14.36	27.29	30.00	-15.64	Pass
2462	54.00	14.06	25.47	30.00	-15.94	Pass
<b>802.11n Mode</b>						
2412	MCS7	13.38	21.77	30.00	-16.62	Pass
2437	MCS7	14.62	28.97	30.00	-15.38	Pass
2462	MCS7	14.30	26.92	30.00	-15.70	Pass

\*Corrected for external attenuations.

#### 4.3. Peak power spectral density (peak PSD)

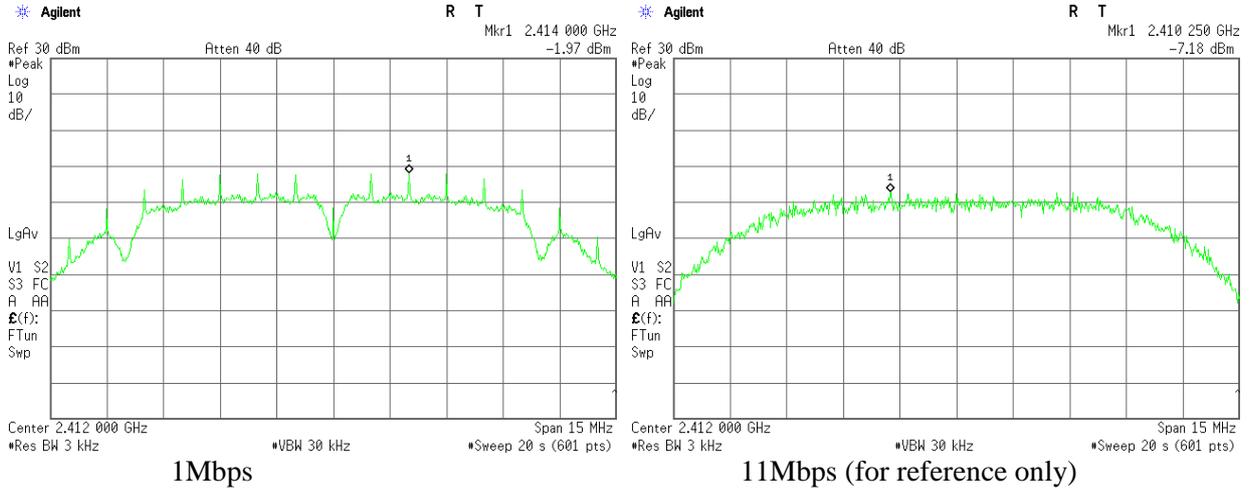
Reference document:	47 CFR §15.247 (e)		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.		
Test setup:	See sec 2.1	<b>Pass</b>	
Method of testing:	Conducted KDB 558074 D01 v03r02, Sec.10.2		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3 kHz, VBW: 10 kHz, Sweep Time: Auto		
Environment conditions:	Ambient Temperature: 22 °C	Relative Humidity: 56%	Atmospheric Pressure: hPa
Test Result:	See below	See Plot 4.3.1 - Plot 4.3.9	

#### Test Results:

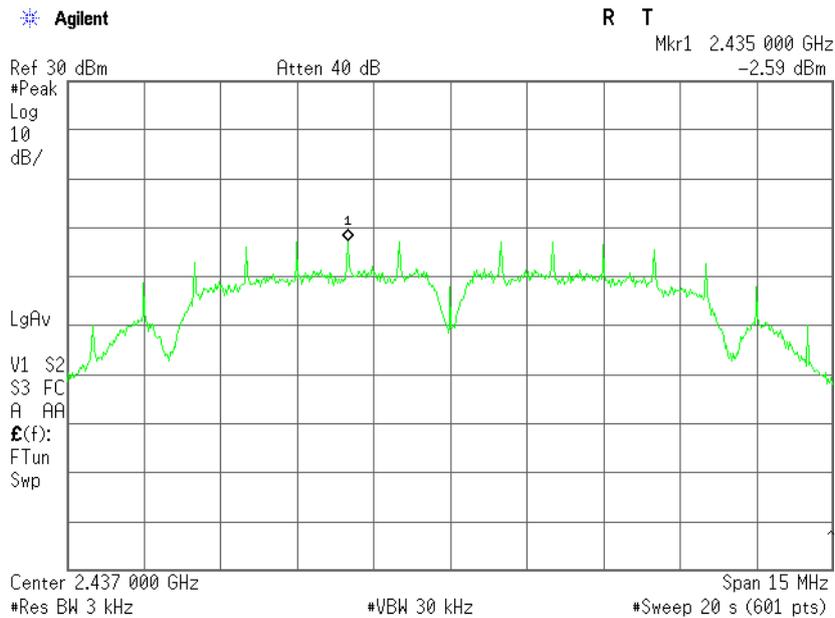
Frequency, [MHz]	Data Rate, [Mbps]*	Measured PSD, [dBm/3kHz]	Limit PSD, [dBm/3kHz]	Margin, [dB]	Pass/Fail
<b>802.11b Mode</b>					
2412	1	-1.97	8.00	-9.97	Pass
2437	1	-2.59	8.00	-10.59	Pass
2462	1	-2.98	8.00	-10.98	Pass
<b>802.11g Mode</b>					
2412	6	-11.67	8.00	-19.67	Pass
2437	6	-12.30	8.00	-20.3	Pass
2462	6	-12.44	8.00	-20.44	Pass
<b>802.11n 20MHz Mode</b>					
2412	MCS0	-11.28	8.00	-19.28	Pass
2437	MCS0	-12.43	8.00	-20.43	Pass
2462	MCS0	-12.16	8.00	-20.16	Pass

\*The worst case of Data rate

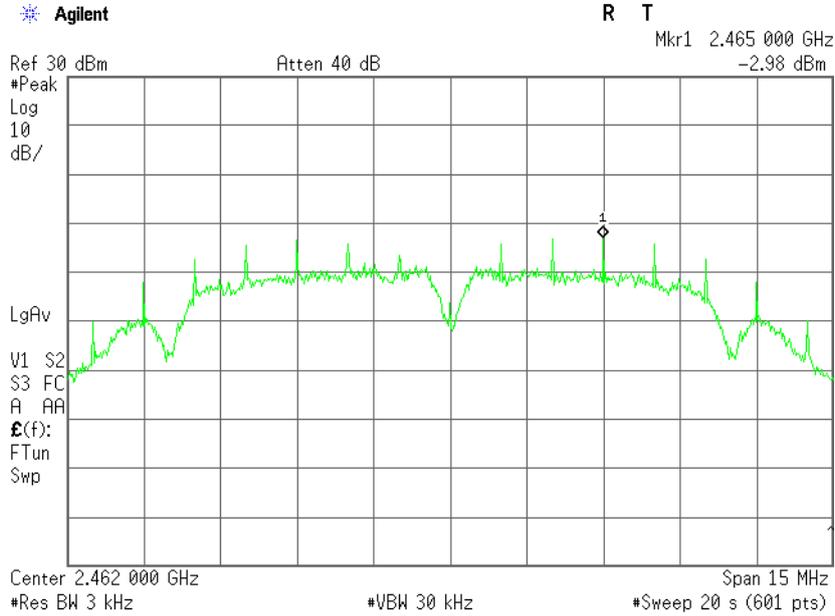
**Plot 4.3.1 Peak PSD test results, 802.11b Mode, Fc = 2412 MHz**



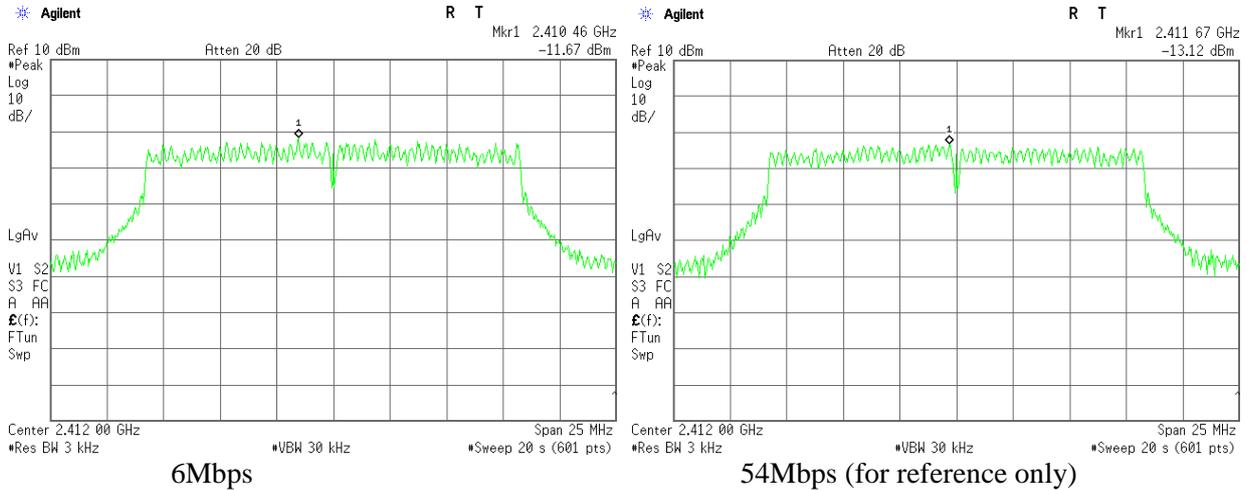
**Plot 4.3.2 Peak PSD test results, 802.11b Mode, Fc = 2437 MHz**



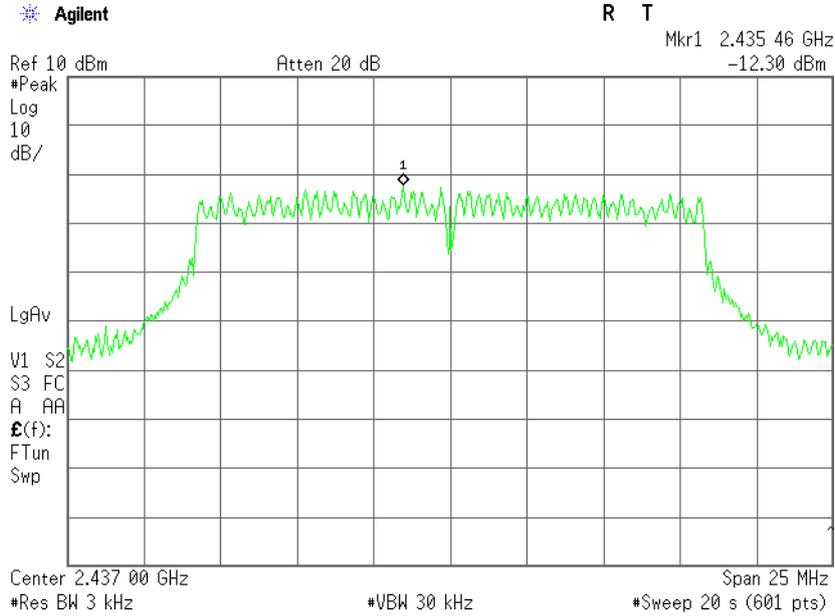
**Plot 4.3.3 Peak PSD test results, 802.11b Mode, Fc = 2462 MHz**



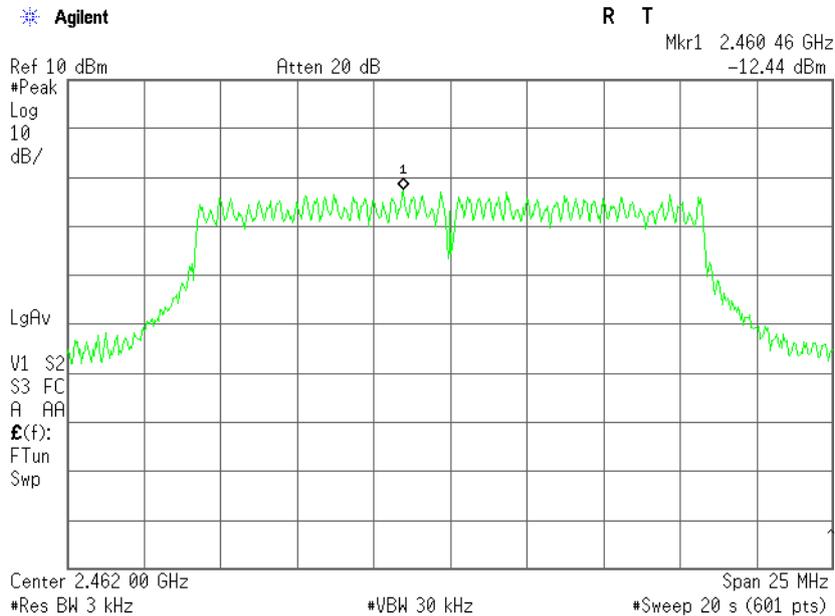
**Plot 4.3.4 Peak PSD test results, 802.11g Mode, Fc = 2412 MHz**



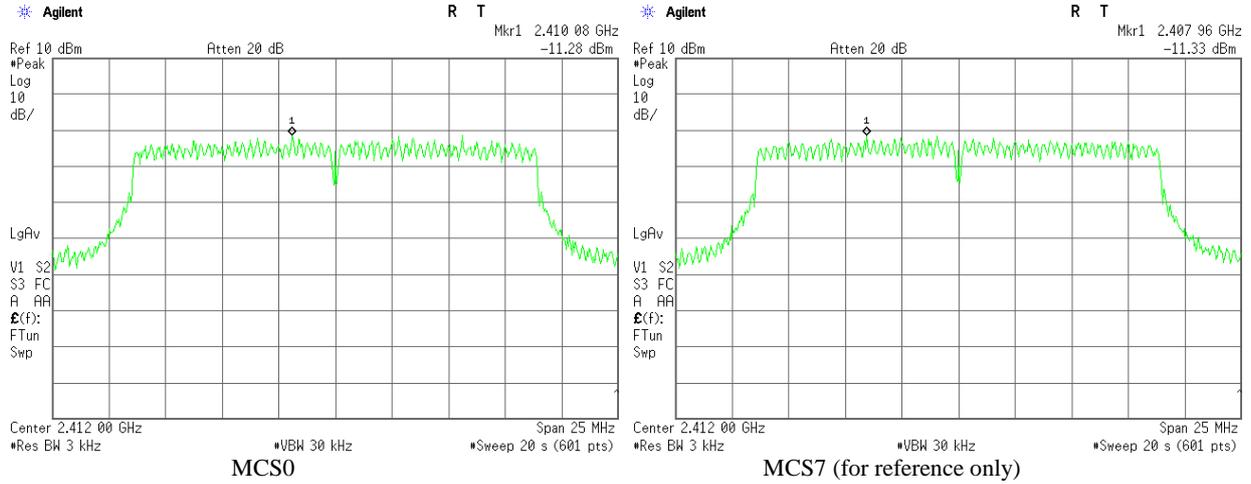
**Plot 4.3.5 Peak PSD test results, 802.11g Mode, Fc = 2437 MHz**



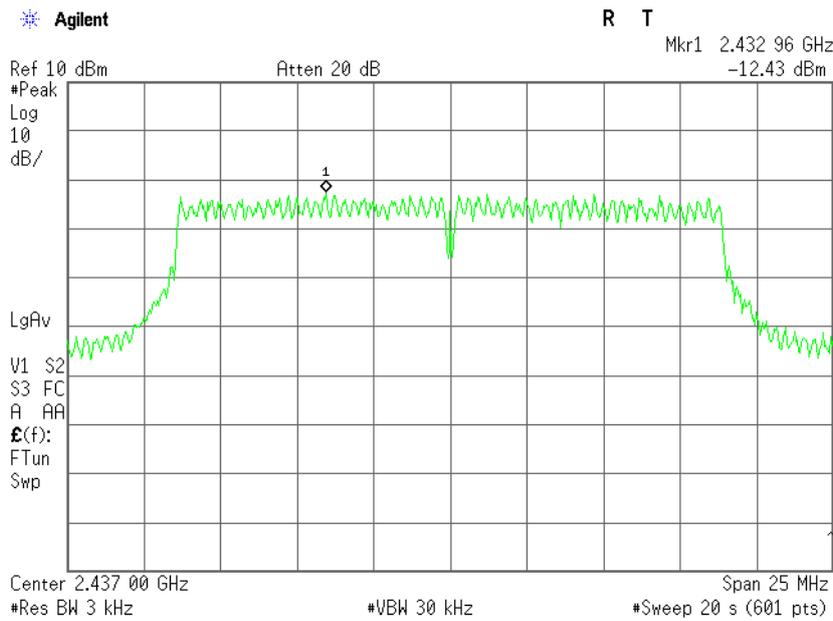
**Plot 4.3.6 Peak PSD test results, 802.11g Mode, Fc = 2462 MHz**



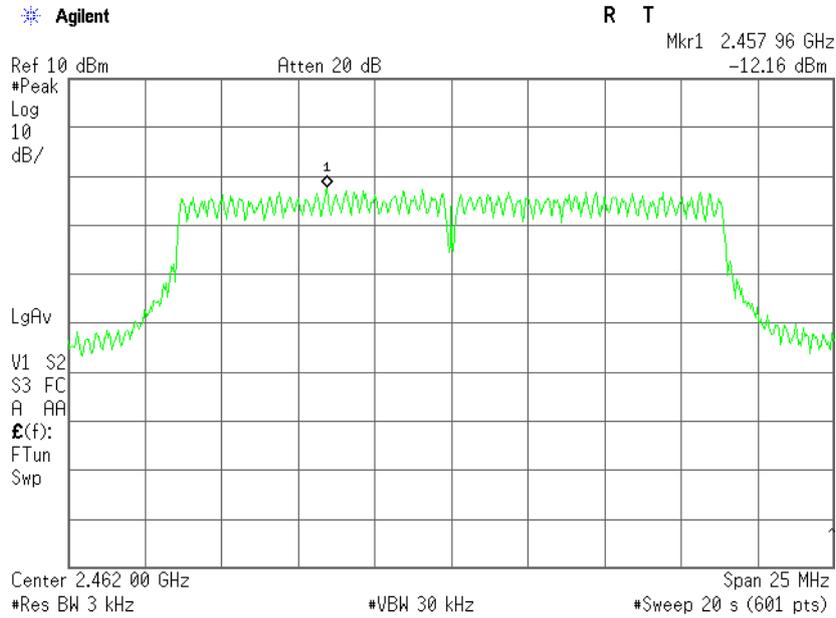
**Plot 4.3.7 Peak PSD test results, 802.11n 20MHz Mode, Fc = 2412 MHz**



**Plot 4.3.8 Peak PSD test results, 802.11n 20MHz Mode, Fc = 2437 MHz**



**Plot 4.3.9 Peak PSD test results, 802.11n 20MHz Mode, Fc = 2462 MHz**



#### 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	<b>Pass</b>	
Method of testing:	Conducted KDB 558074 D01 v03r02, Sec.11.0		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW:300kHz		
Environment conditions:	Ambient Temperature: 22 °C	Relative Humidity: 56%	Atmospheric Pressure: hPa
Test Result:	See below	See Plot 4.4.1- Plot 4.4.33	

#### Test Results:

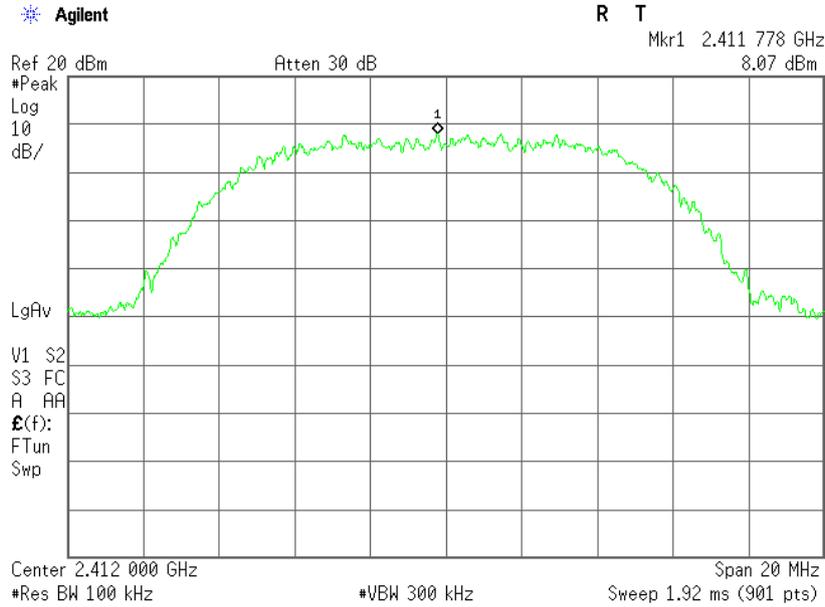
Fundamental Frequency, [MHz]	Data Rate, [Mbps]	Fundamental Emission Reference Level, [dBm]	Unwanted Emissions Frequency, [MHz]	Unwanted Emissions Level, [dBm]	Attenuation below Reference Level, [dBc]	Limit, [dBc]	Margin [dB]
<b>802.11b Mode</b>							
2412	11	8.07	*	*	*	≥ 30	> 15
2437	11	7.62	*	*	*	≥ 30	> 15
2462	11	7.24	*	*	*	≥ 30	> 15
<b>802.11g Mode</b>							
2412	54	1.14	*	*	*	≥ 30	> 15
2437	54	0.70	*	*	*	≥ 30	> 15
2462	54	0.61	*	*	*	≥ 30	> 15
<b>802.11n – 20MHz mode</b>							
2412	MCS7	1.73	*	*	*	≥ 30	> 15
2437	MCS7	1.62	*	*	*	≥ 30	> 15
2462	MCS7	0.63	*	*	*	≥ 30	> 15

\*All emissions at least 20 dB below the limit

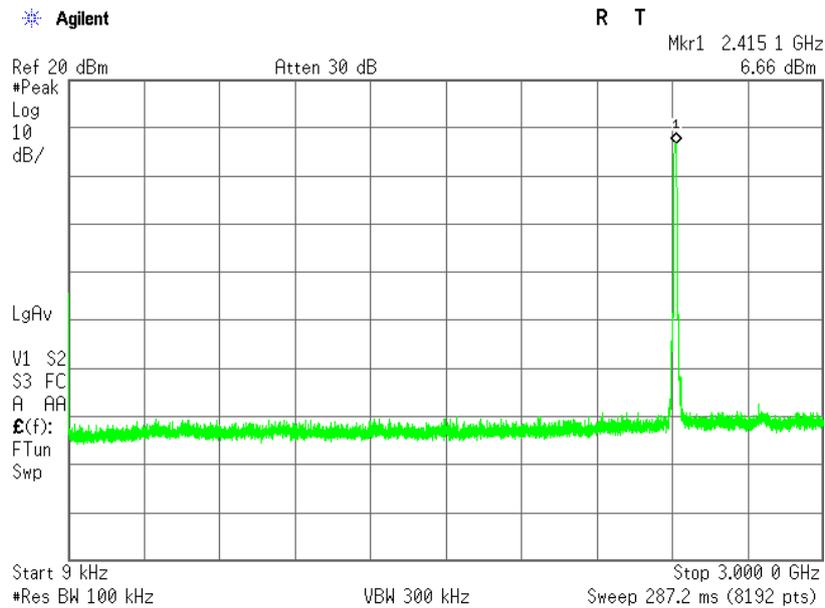
**Band Edge**

Frequency, [MHz]	Data Rate, [Mbps]	Measured, [dBc]	Limit, [dBc]	Margin
<b>802.11b Mode</b>				
2412	11	-41.19	-30.00	-11.19
2462	11	-53.39	-30.00	-23.39
<b>802.11g Mode</b>				
2412	54	-41.96	-30.00	-11.96
2462	54	-56.01	-30.00	-26.01
<b>802.11n 20MHz Mode</b>				
2412	MCS7	-31.18	-30.00	-1.18
2462	MCS7	-34.57	-30.00	-4.57

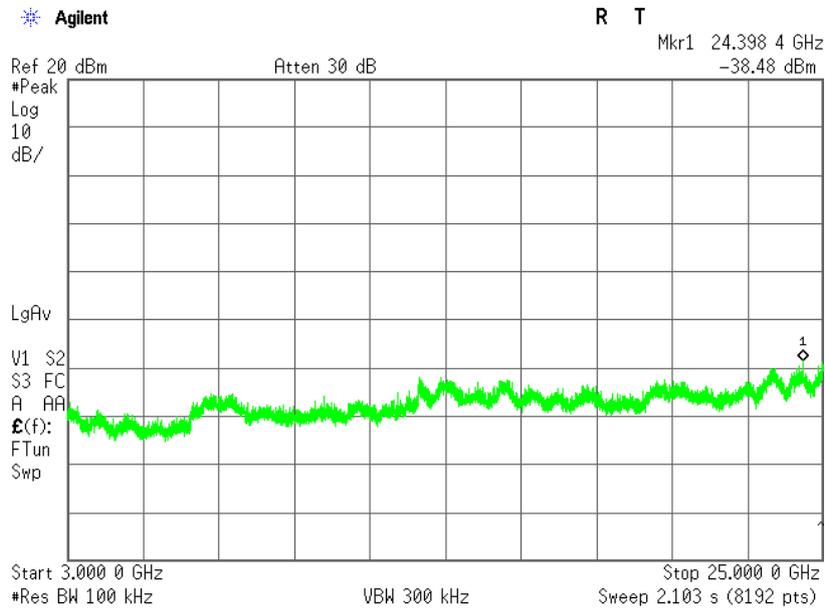
**Plot 4.4.1 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2412 MHz, reference level**



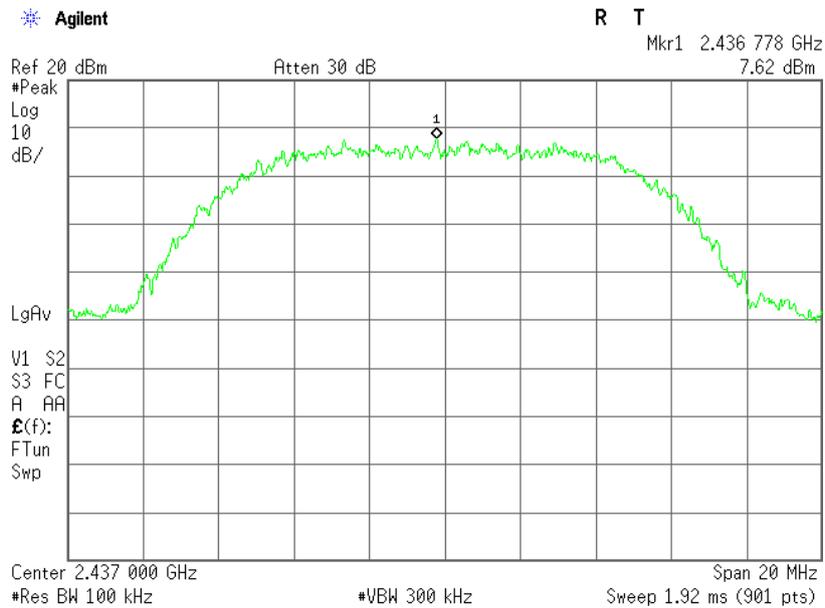
**Plot 4.4.2 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2412 MHz, 9 kHz – 3 GHz range**



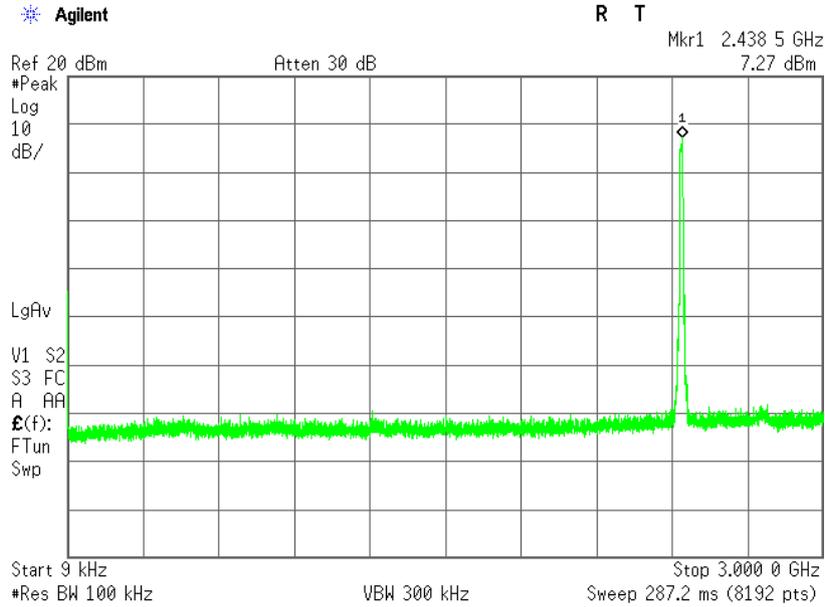
**Plot 4.4.3 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2412 MHz, 3 GHz – 25 GHz range**



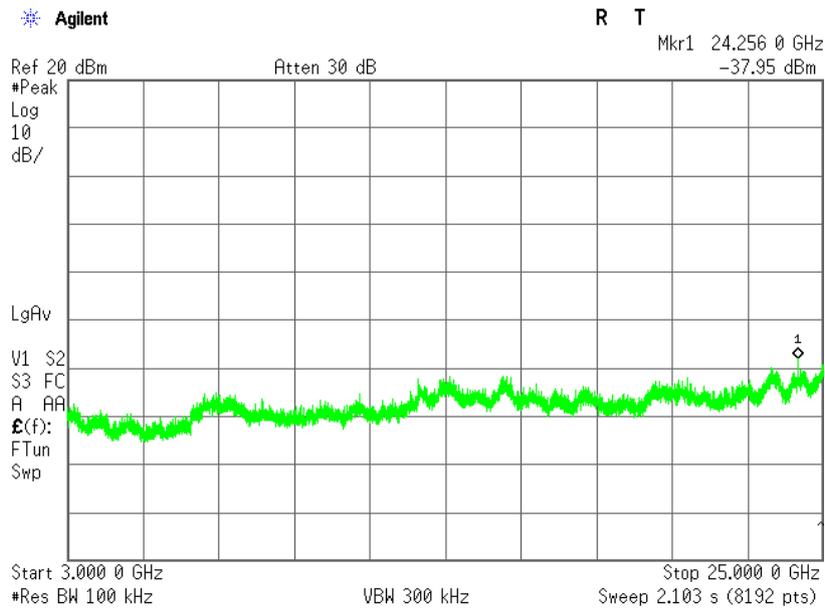
**Plot 4.4.4 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2437 MHz, reference level**



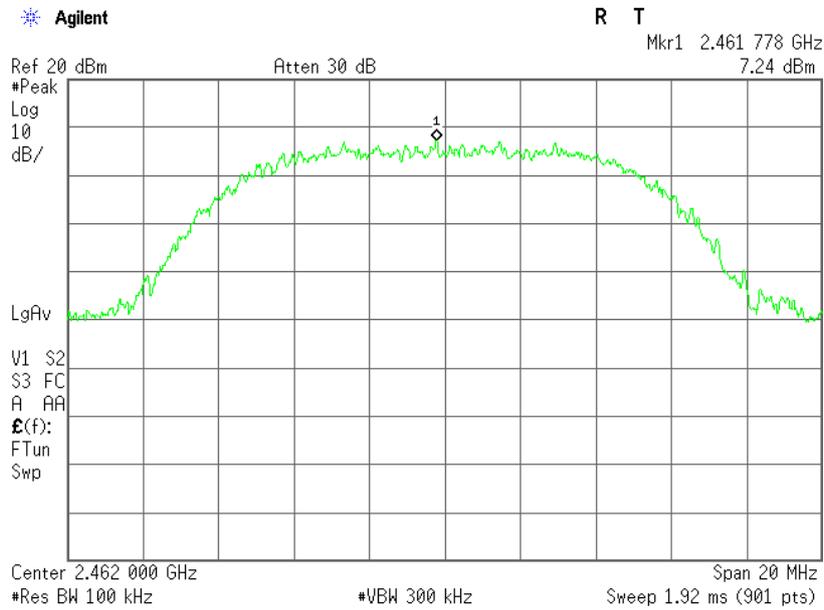
**Plot 4.4.5 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2437 MHz, 9 kHz – 3 GHz range**



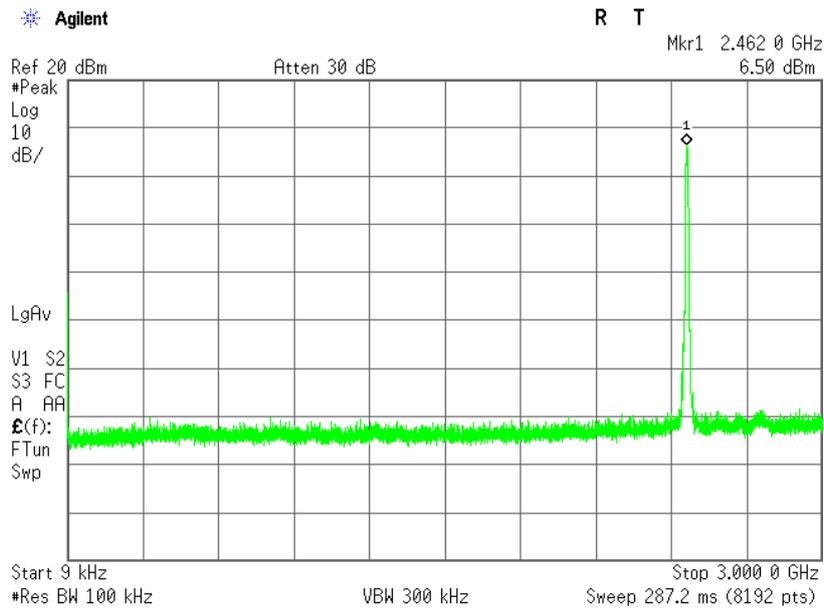
**Plot 4.4.6 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2437 MHz, 3 GHz – 25 GHz range**



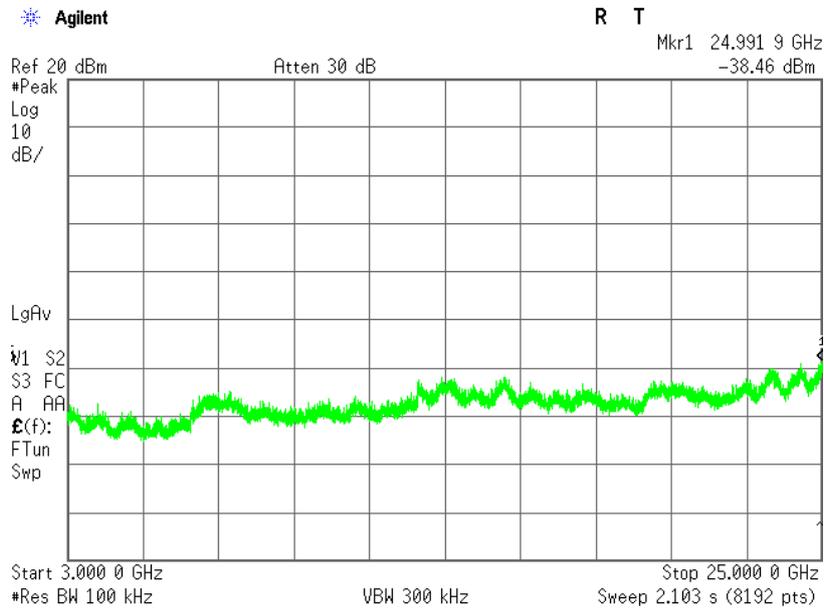
**Plot 4.4.7 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2462 MHz, reference level**



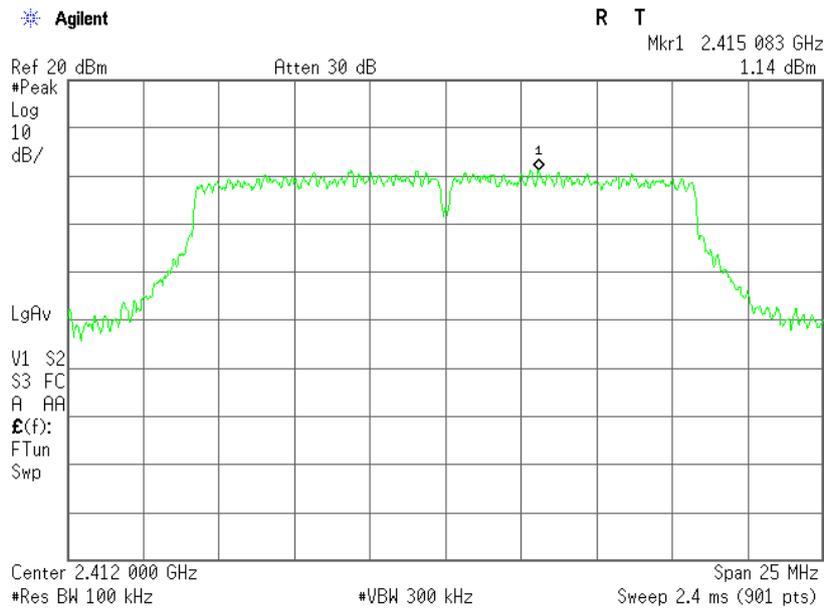
**Plot 4.4.8 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2462 MHz, 9 kHz – 3 GHz range**



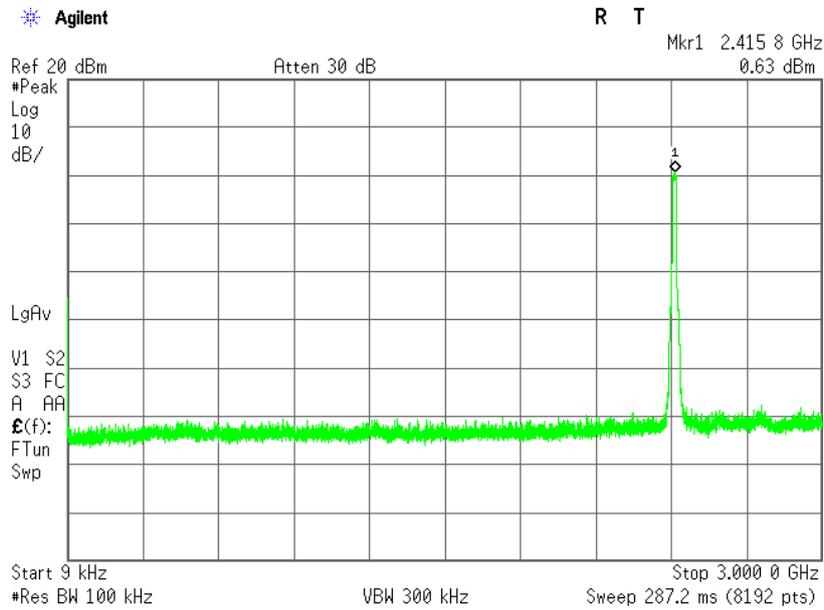
**Plot 4.4.9 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2462 MHz, 3 GHz – 25 GHz range**



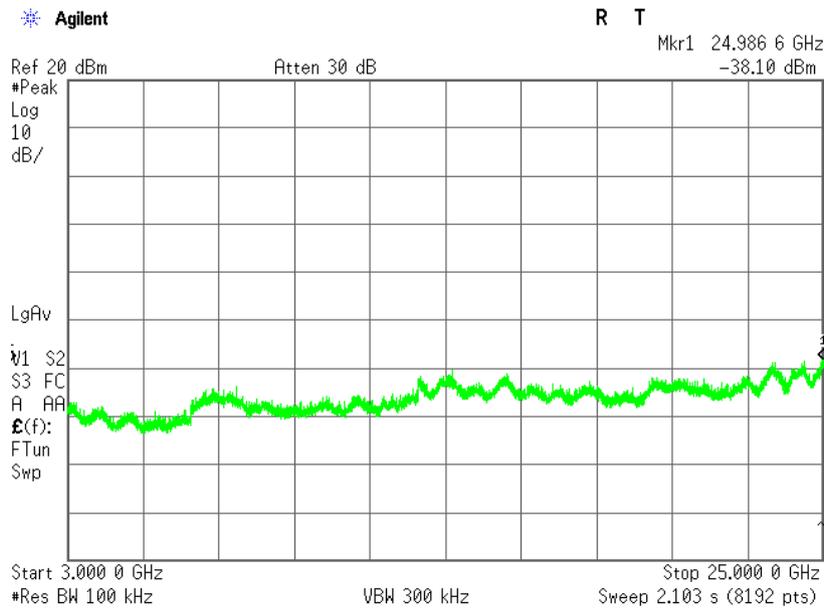
**Plot 4.4.10 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2412 MHz, reference level**



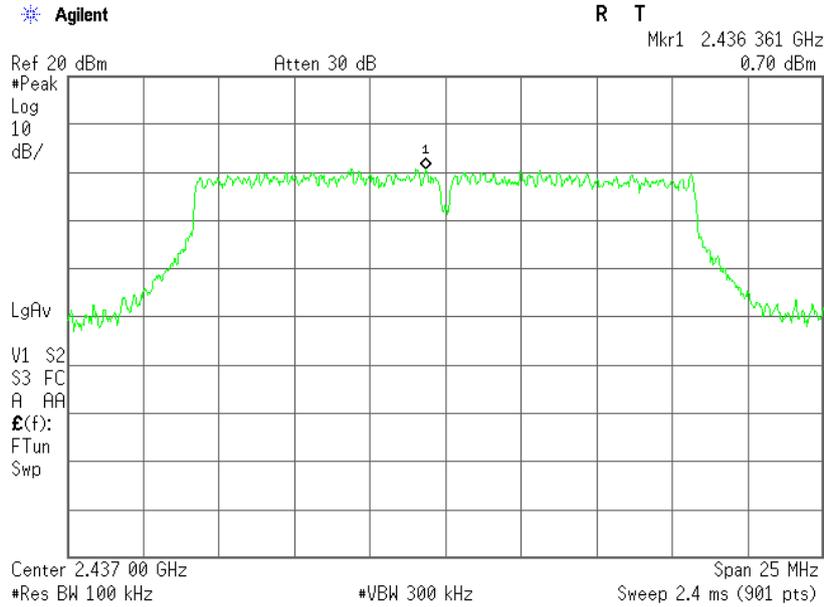
**Plot 4.4.11 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2412 MHz, 9 kHz – 3 GHz range**



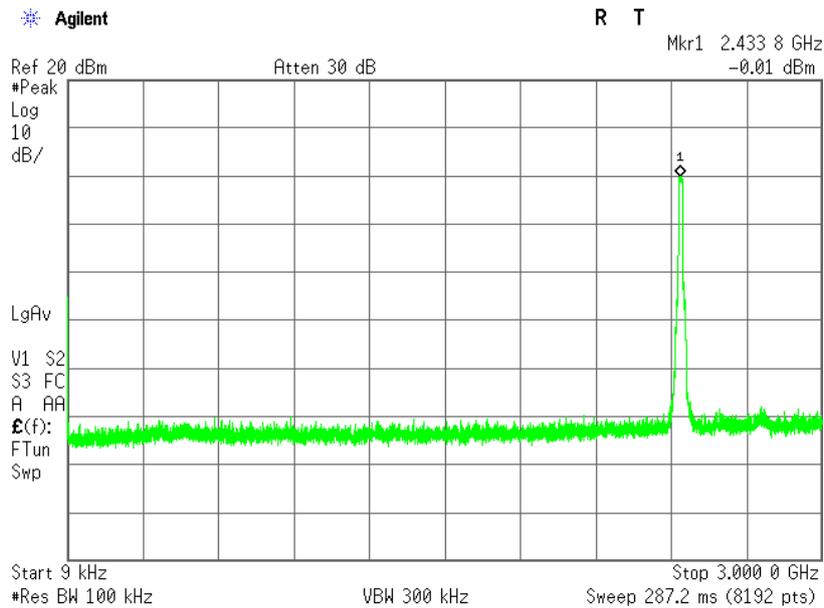
**Plot 4.4.12 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2412 MHz, 3 GHz – 25 GHz range**



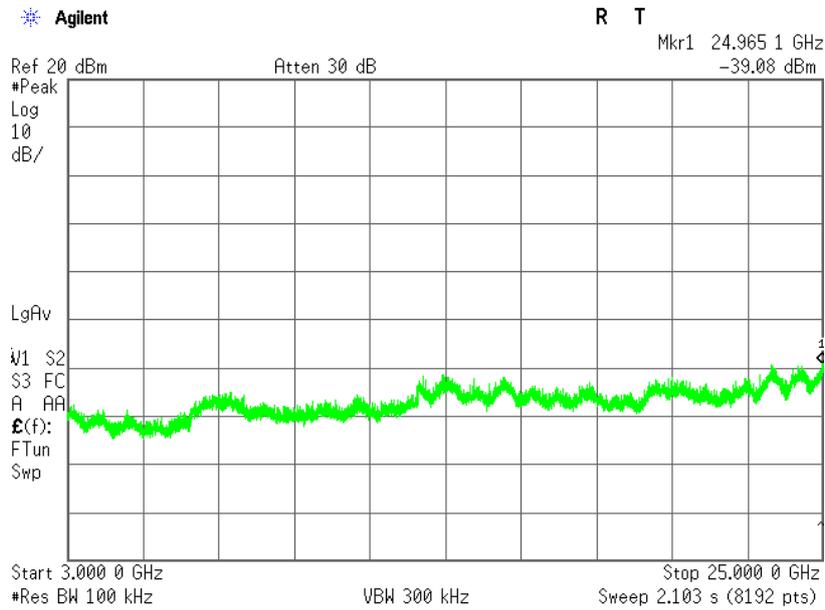
**Plot 4.4.13 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2437 MHz, reference level**



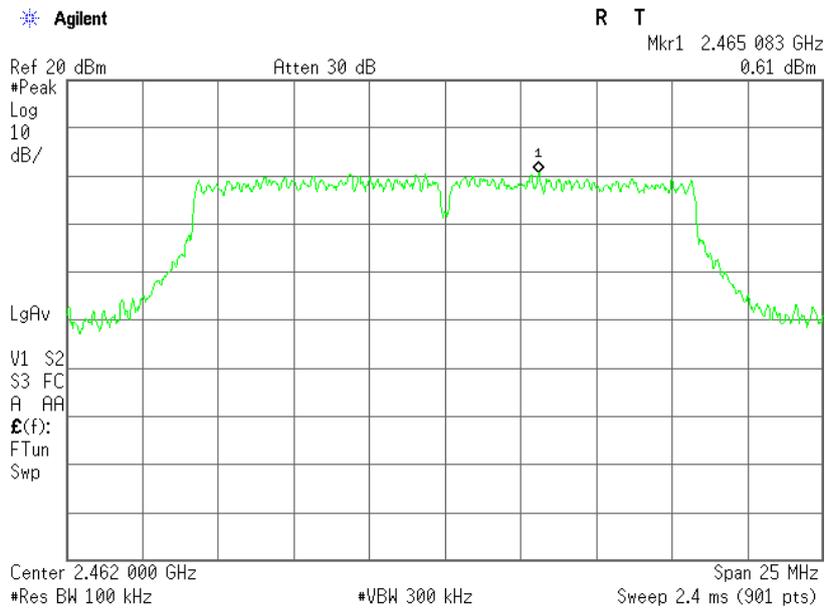
**Plot 4.4.14 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2437 MHz, 9 kHz – 3 GHz range**



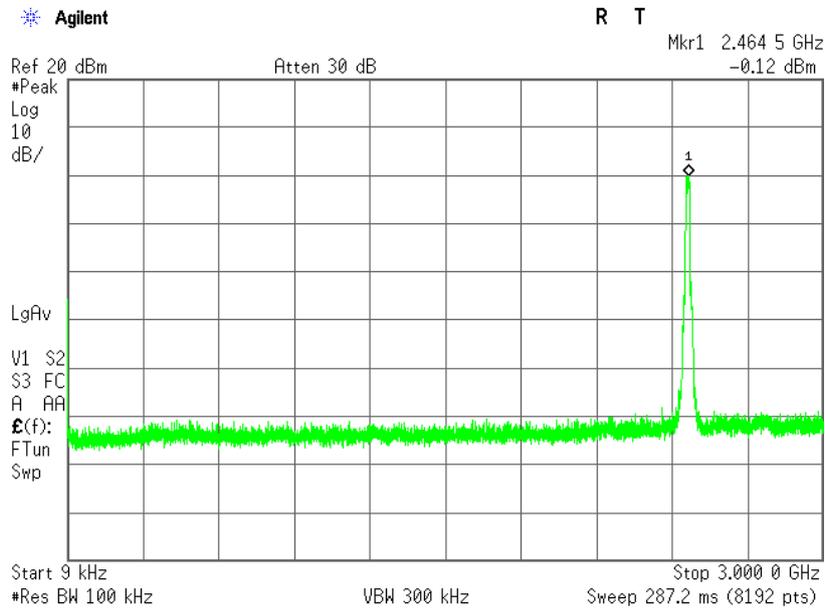
**Plot 4.4.15 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2437 MHz, 3 GHz – 25 GHz range**



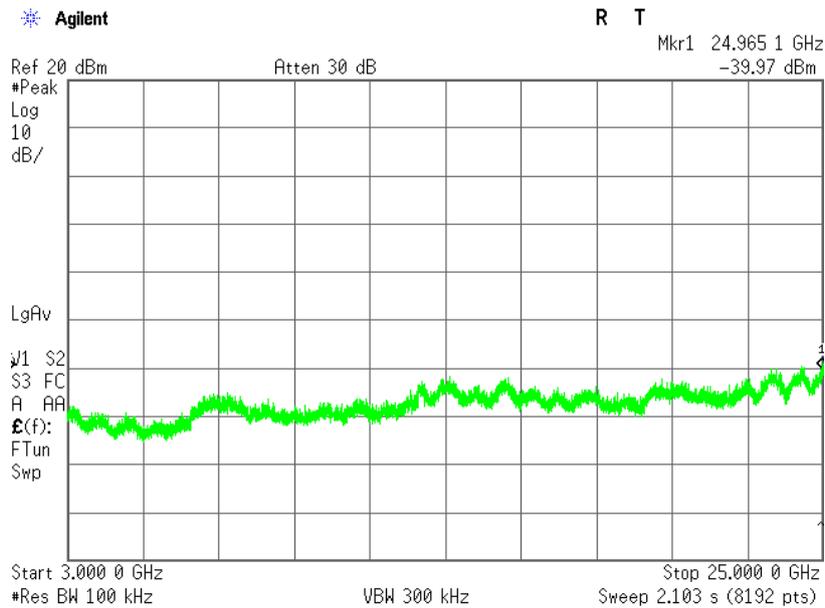
**Plot 4.4.16 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2462 MHz, reference level**



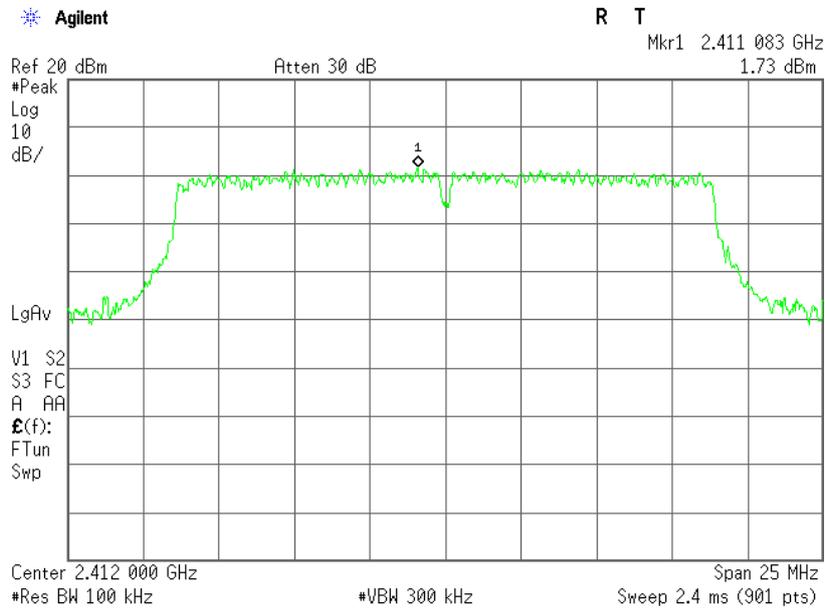
**Plot 4.4.17 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2462 MHz, 9 kHz – 3 GHz range**



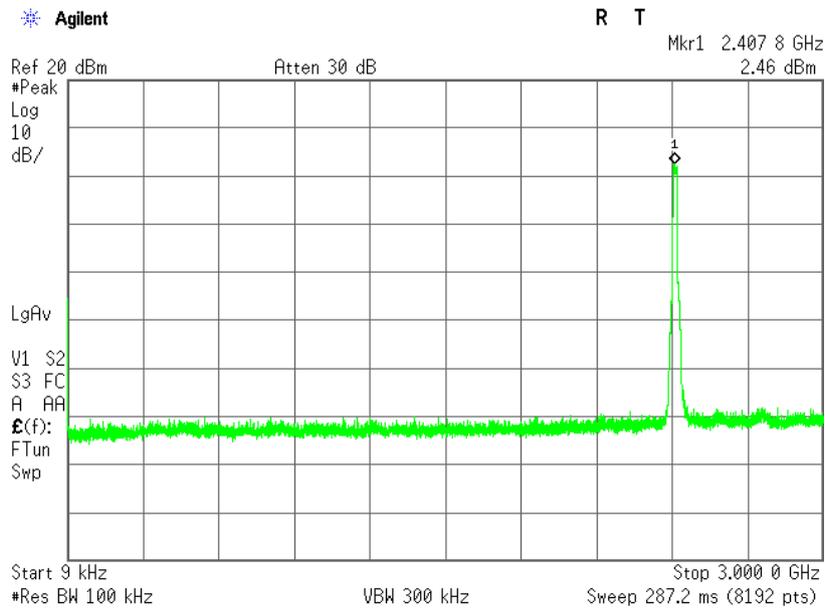
**Plot 4.4.18 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2462 MHz, 3 GHz – 25 GHz range**



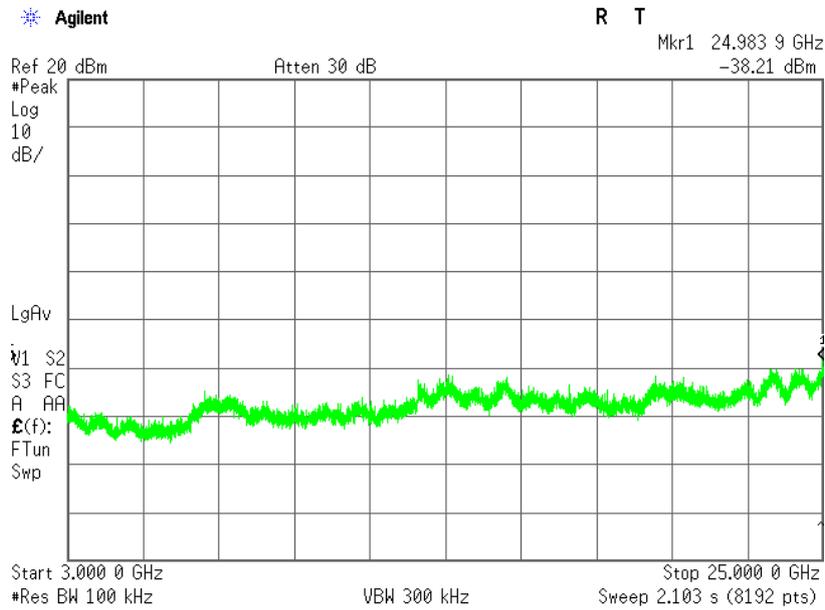
**Plot 4.4.19 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2412 MHz, reference level**



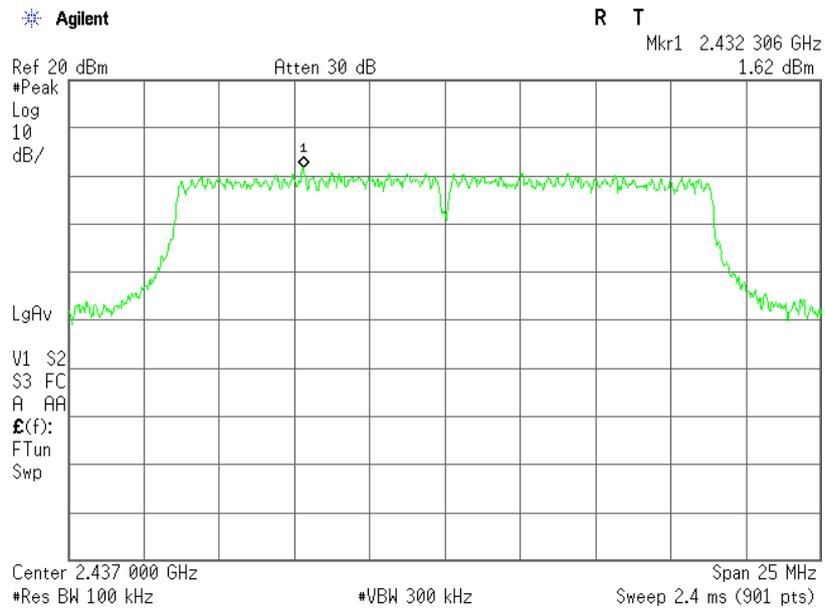
**Plot 4.4.20 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2412 MHz, 9 kHz – 3 GHz range**



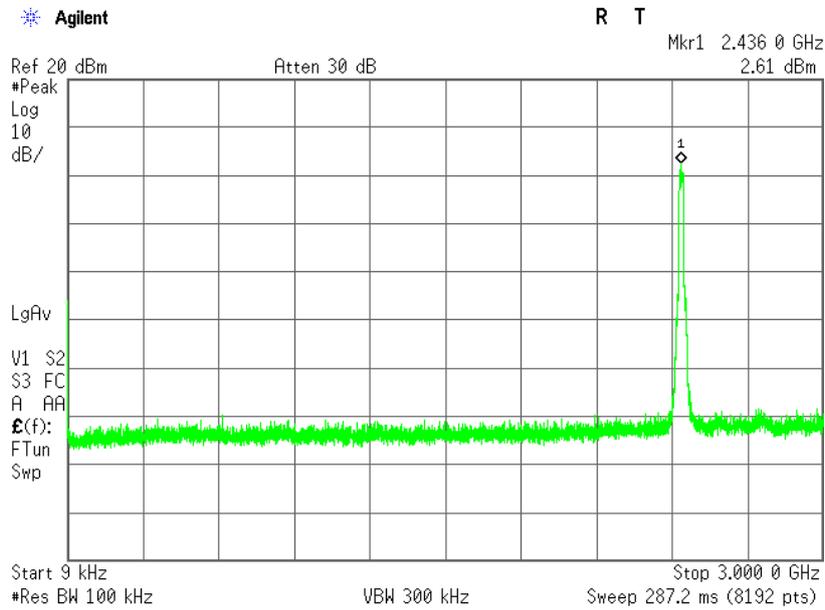
**Plot 4.4.21 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2412 MHz, 3 GHz – 25 GHz range**



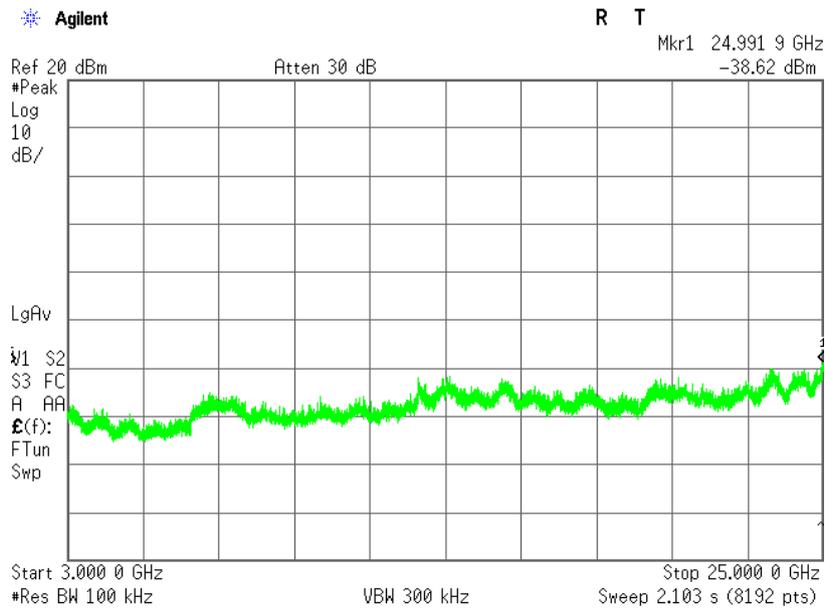
**Plot 4.4.22 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2437 MHz, reference level**



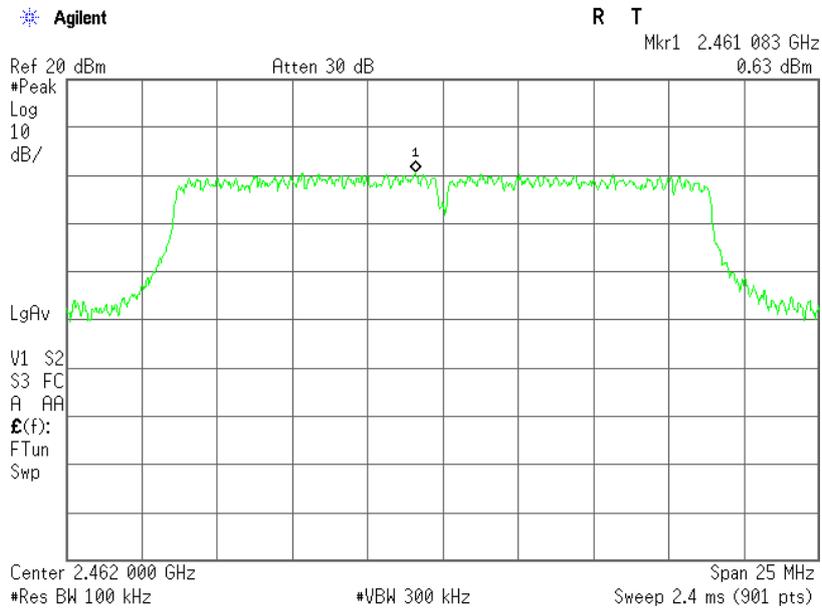
**Plot 4.4.23 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2437 MHz, 9 kHz – 3 GHz range**



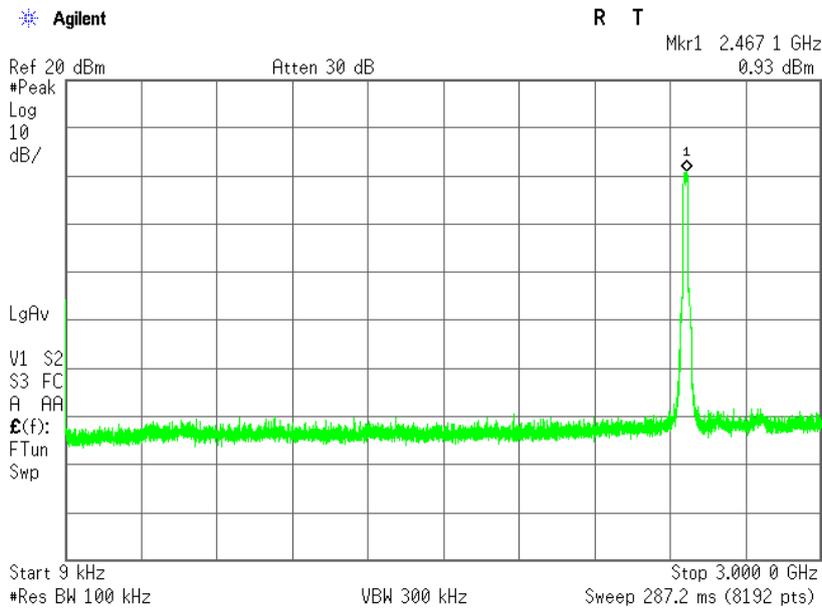
**Plot 4.4.24 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2437 MHz, 3 GHz – 25 GHz range**



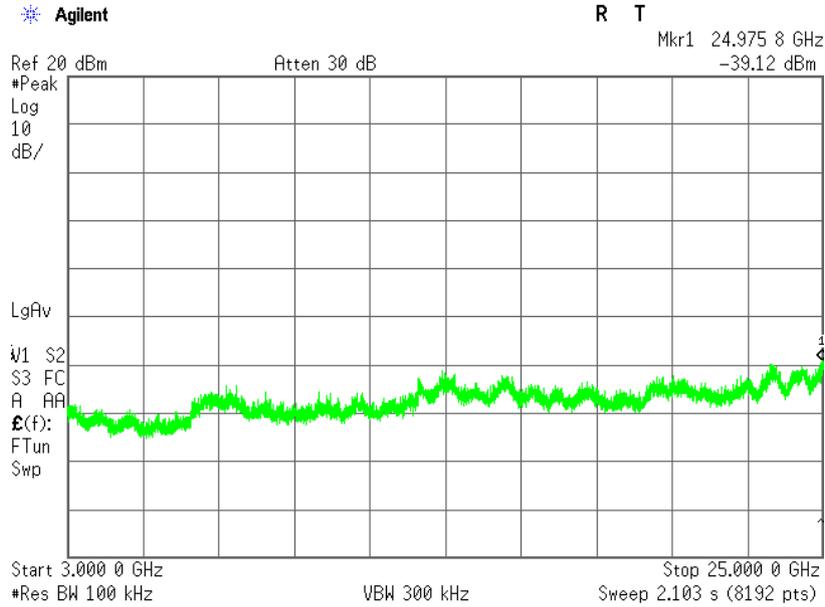
**Plot 4.4.25 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2462 MHz, reference level**



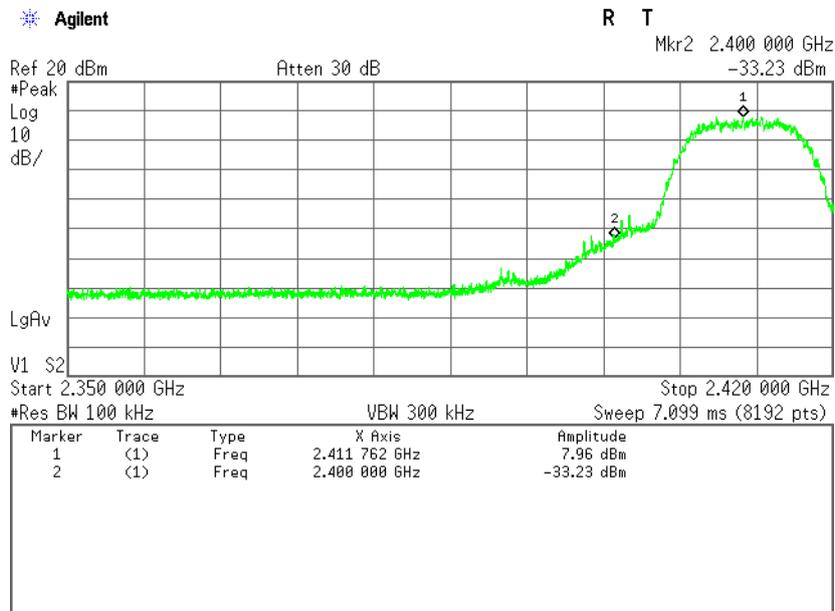
**Plot 4.4.26 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2462 MHz, 9 kHz – 3 GHz range**



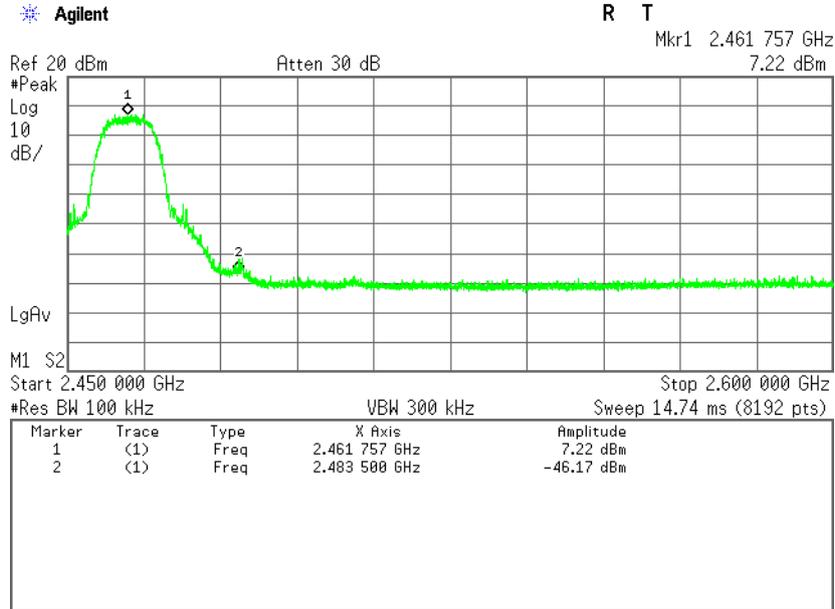
**Plot 4.4.27 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2462 MHz, 3 GHz – 25 GHz range**



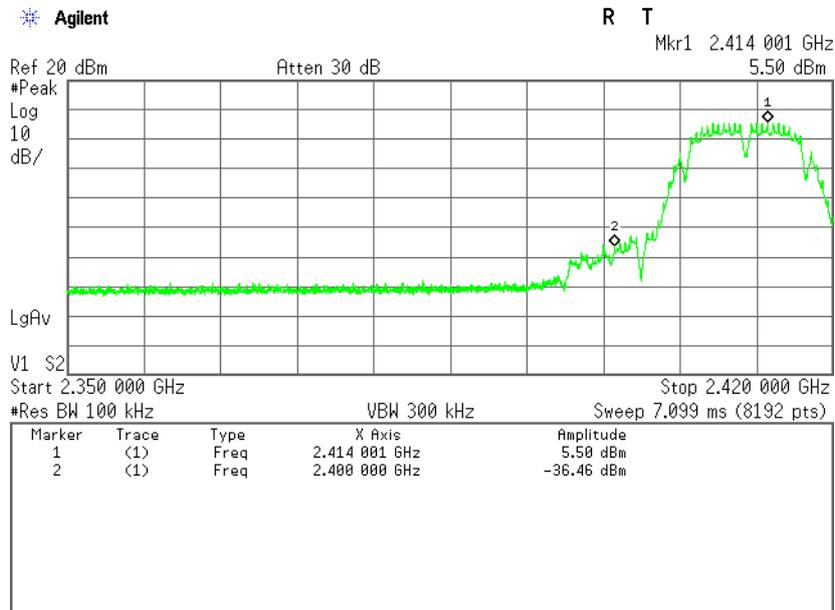
**Plot 4.4.28 Band Edge test results, 802.11b Mode, Fc = 2412 MHz**



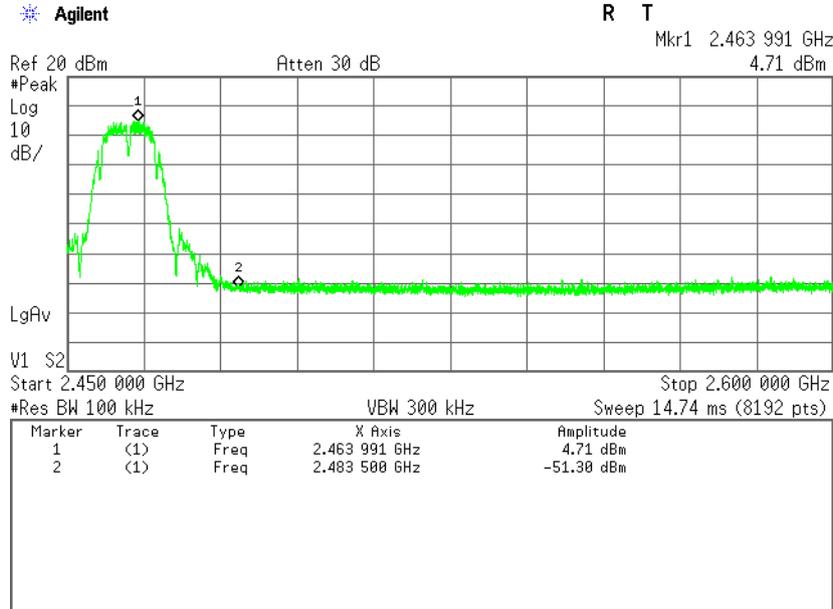
**Plot 4.4.29 Band Edge test results, 802.11b Mode, Fc = 2462 MHz**



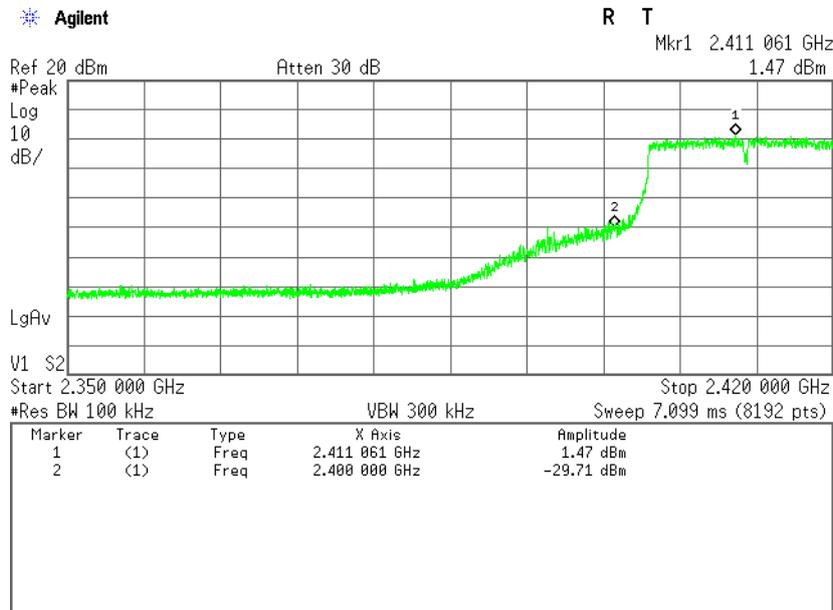
**Plot 4.4.30 Band Edge test results, 802.11g Mode, Fc = 2412 MHz**



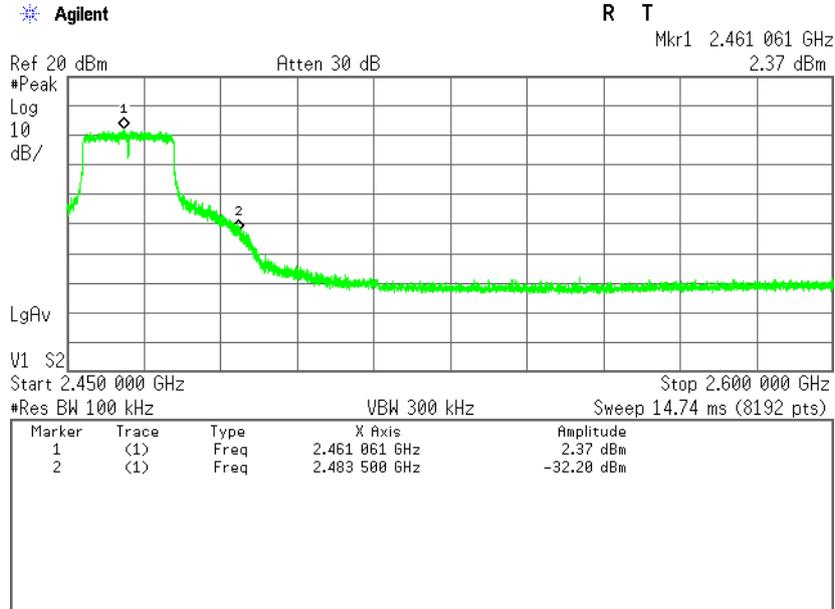
**Plot 4.4.31 Band Edge test results, 802.11g Mode, Fc = 2462 MHz**



**Plot 4.4.32 Band Edge test results, 802.11n 20MHz Mode, Fc = 2412 MHz**



**Plot 4.4.33 Band Edge test results, 802.11n 20MHz Mode, Fc = 2462 MHz**



#### 4.5. Radiated Spurious 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	<b>Pass</b>	
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: hPa
Test Result:	See below	See Plot 4.5.1 to Plot 4.5.12	

#### Test results:

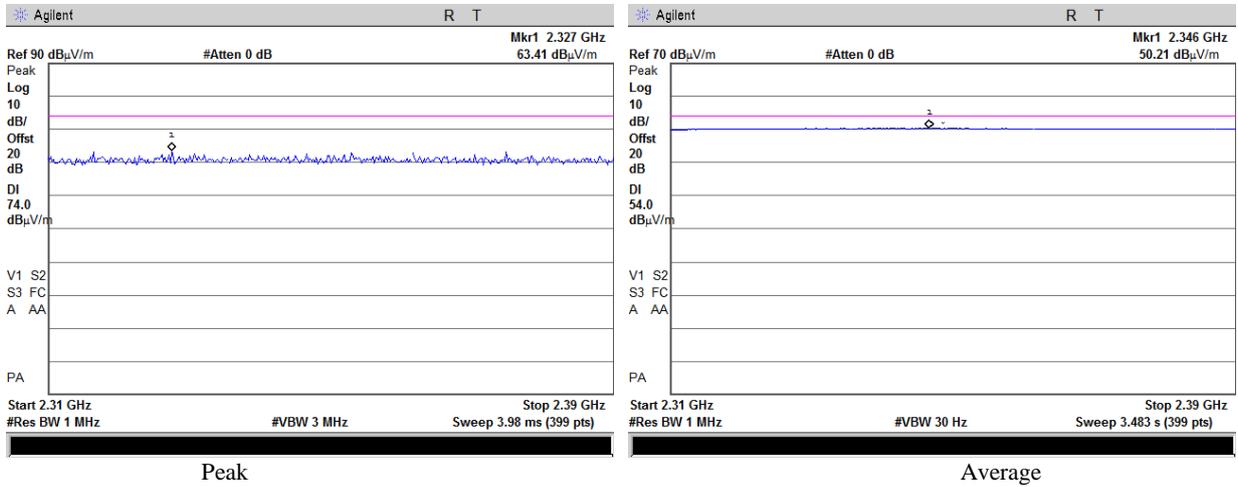
All measurements were performed in horizontal and vertical polarizations; the results show the worst case.

Frequency, [MHz]	Data Rate, [Mbps]	Emission Frequency, [MHz]	Detector Type	Antenna Polarization	Emission Level, [dBµV/m]	Limit, [dBµV/m]	Margin, [dB]
<b>802.11b Mode</b>							
2412	11	2327	Peak	H	63.41	74.00	-10.59
2412	11	2346	Average	H	50.21	54.00	-3.79
2412	11	2342	Peak	V	63.16	74.00	-10.84
2412	11	2390	Average	V	50.23	54.00	-3.77
2462	11	2492	Peak	H	64.53	74.00	-9.47
2462	11	2500	Average	H	50.35	54.00	-3.65
2462	11	2485	Peak	V	64.34	74.00	-9.66
2462	11	2484	Average	V	50.47	54.00	-3.53
<b>802.11g Mode</b>							
2412	54	2330	Peak	H	64.92	74.00	-9.08
2412	54	2332	Average	H	50.27	54.00	-3.73
2412	54	2390	Peak	V	64.27	74.00	-9.73
2412	54	2390	Average	V	52.05	54.00	-1.95
2462	54	2494	Peak	H	64.06	74.00	-9.94
2462	54	2500	Average	H	50.31	54.00	-3.69
2462	54	2495	Peak	V	64.09	74.00	-9.91
2462	54	2484	Average	V	50.67	54.00	-3.33

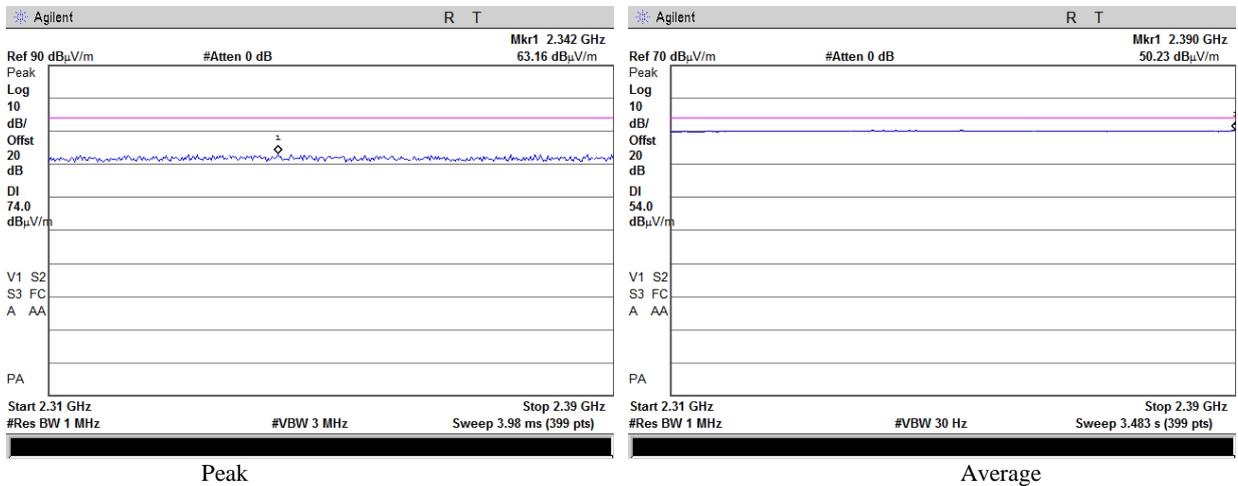
Frequency, [MHz]	Data Rate, [Mbps]	Emission Frequency, [MHz]	Detector Type	Antenna Polarization	Emission Level, [dB $\mu$ V/m]	Limit, [dB $\mu$ V/m]	Margin, [dB]
<b>802.11n 20MHz Mode</b>							
2412	MCS7	2357	Peak	H	63.54	74.00	-10.46
2412	MCS7	2390	Average	H	50.46	54.00	-3.54
2412	MCS7	2389	Peak	V	68.54	74.00	-5.46
2412	MCS7	2390	Average	V	53.03	54.00	-0.97
2462	MCS7	2489	Peak	H	64.05	74.00	-9.95
2462	MCS7	2483	Average	H	50.43	54.00	-3.57
2462	MCS7	2499	Peak	V	63.36	74.00	-10.64
2462	MCS7	2500	Average	V	50.39	54.00	-3.61

**Note:** Spurious Emission [dB $\mu$ V/m] = measured [dB $\mu$ V] + Correction-factor [dB (1/m)]  
Correction Factor = Antenna factor + Cable Loss

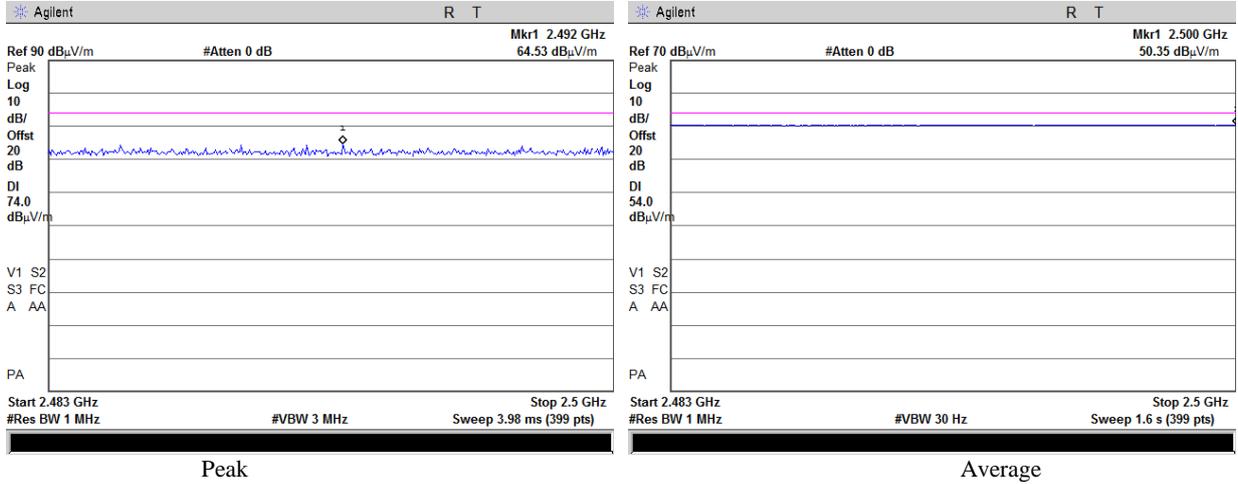
**Plot 4.5.1 Radiated Spurious Emission, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal**



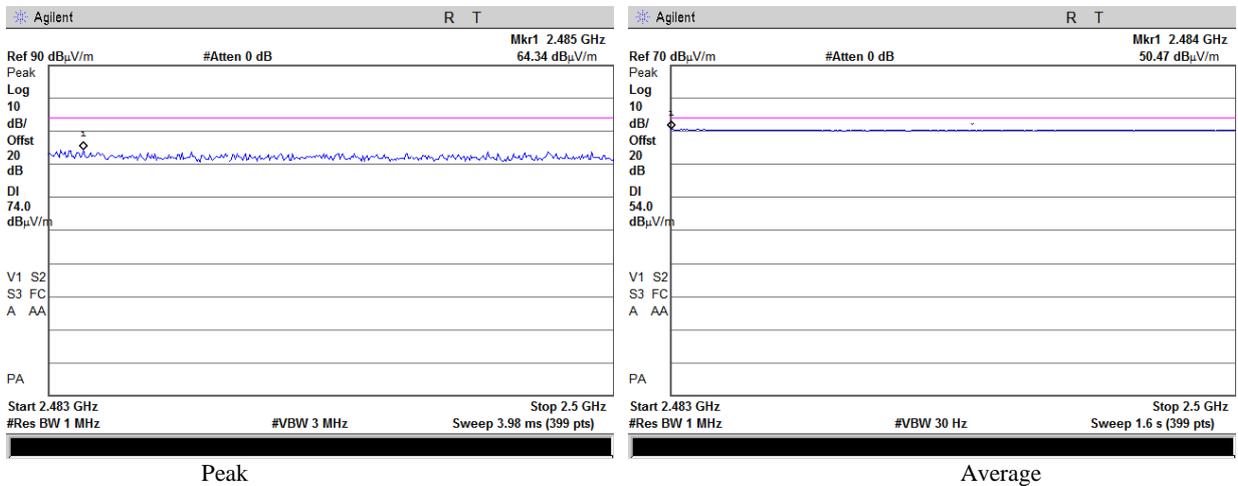
**Plot 4.5.2 Radiated Spurious Emission, 802.11b, Fc = 2412 MHz, 11Mbps, Vertical**



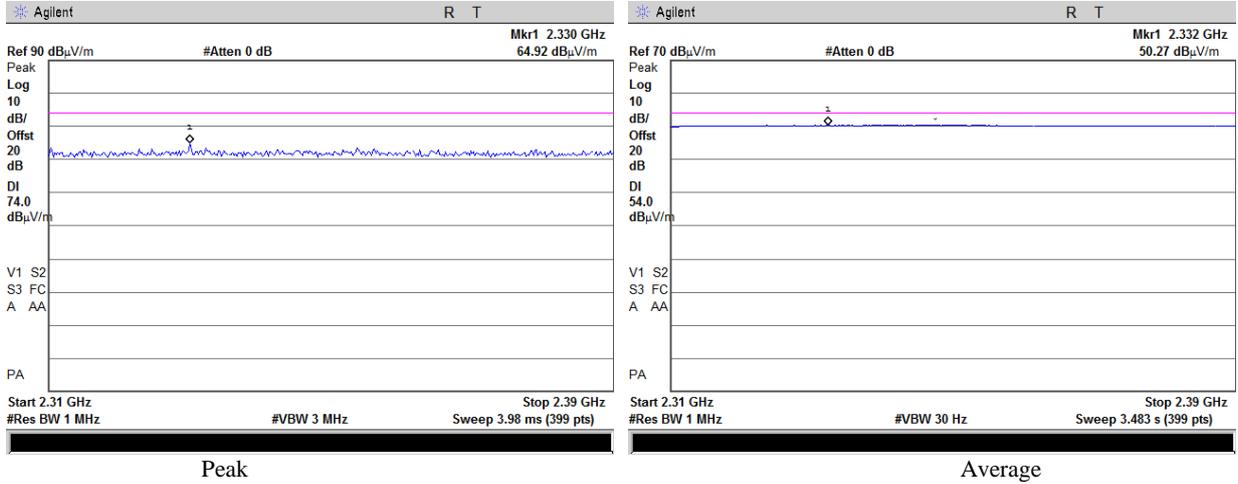
**Plot 4.5.3 Radiated Spurious Emission, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal**



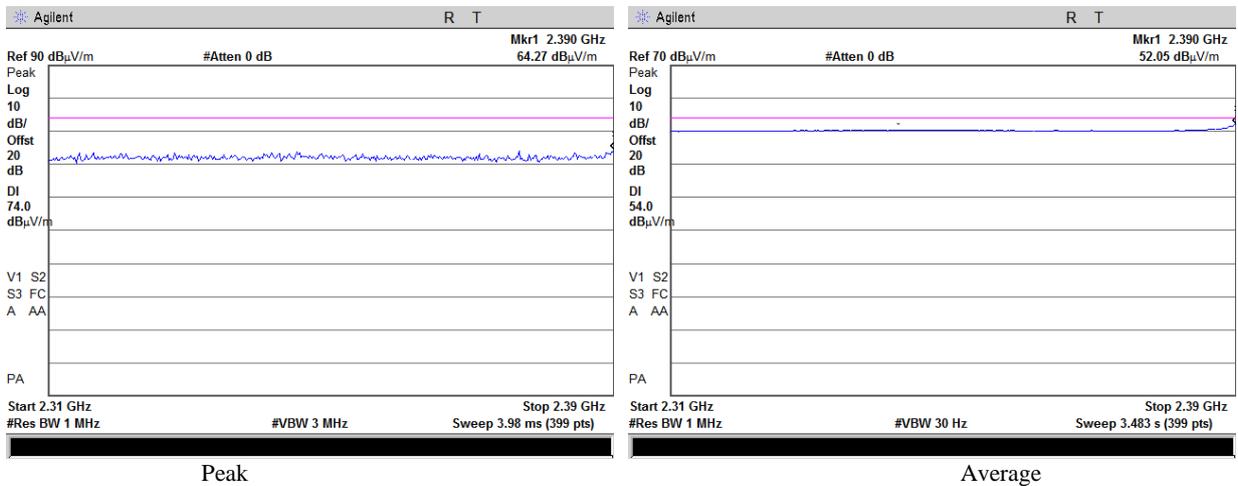
**Plot 4.5.4 Radiated Spurious Emission, 802.11b, Fc = 2462 MHz, 11Mbps, Vertical**



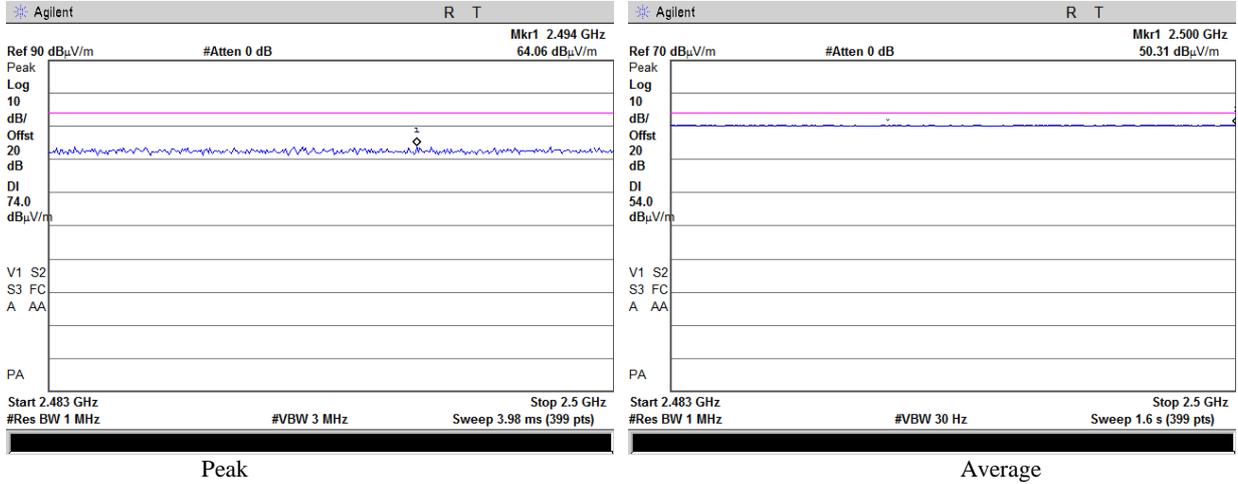
**Plot 4.5.5 Radiated Spurious Emission, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal**



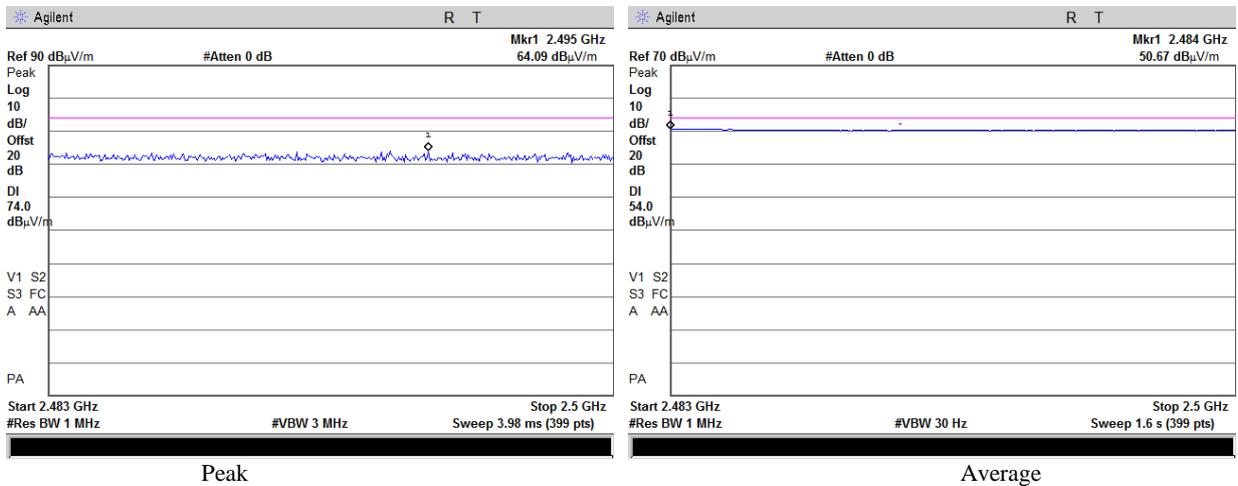
**Plot 4.5.6 Radiated Spurious Emission, 802.11g, Fc = 2412 MHz, 54Mbps, Vertical**



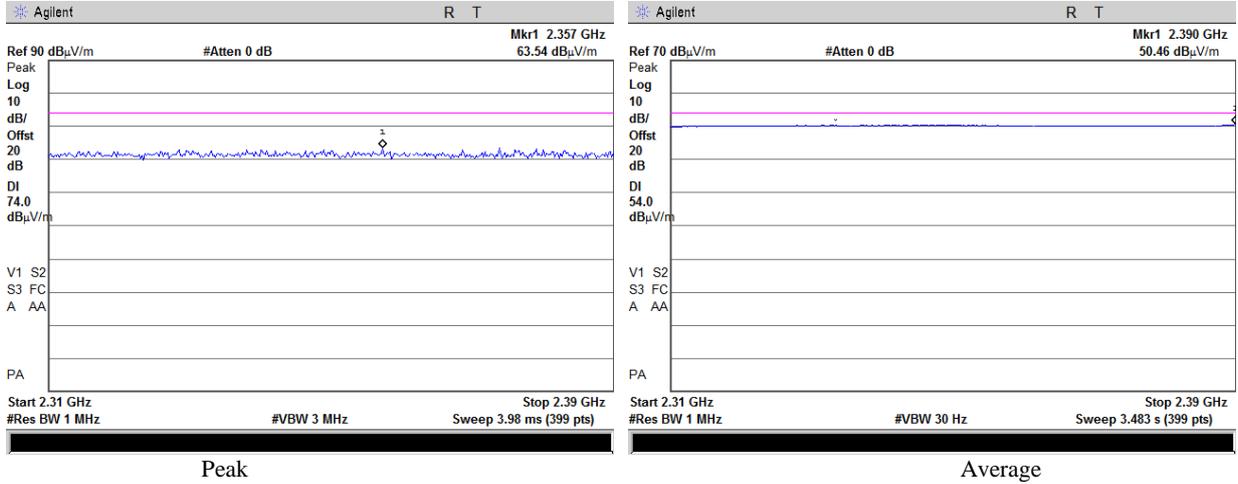
**Plot 4.5.7 Radiated Spurious Emission, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal**



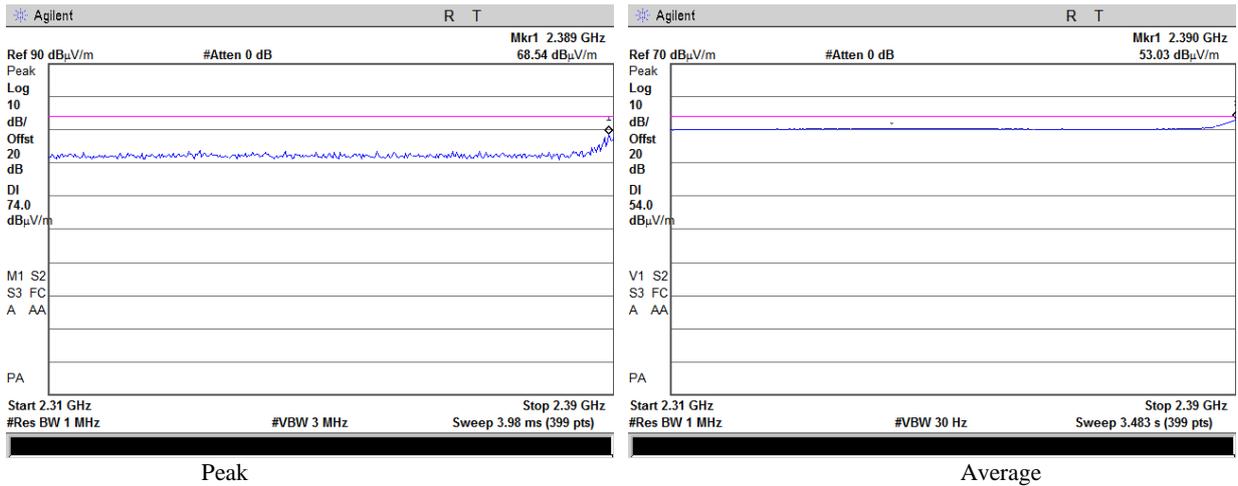
**Plot 4.5.8 Radiated Spurious Emission, 802.11g, Fc = 2462 MHz, 54Mbps, Vertical**



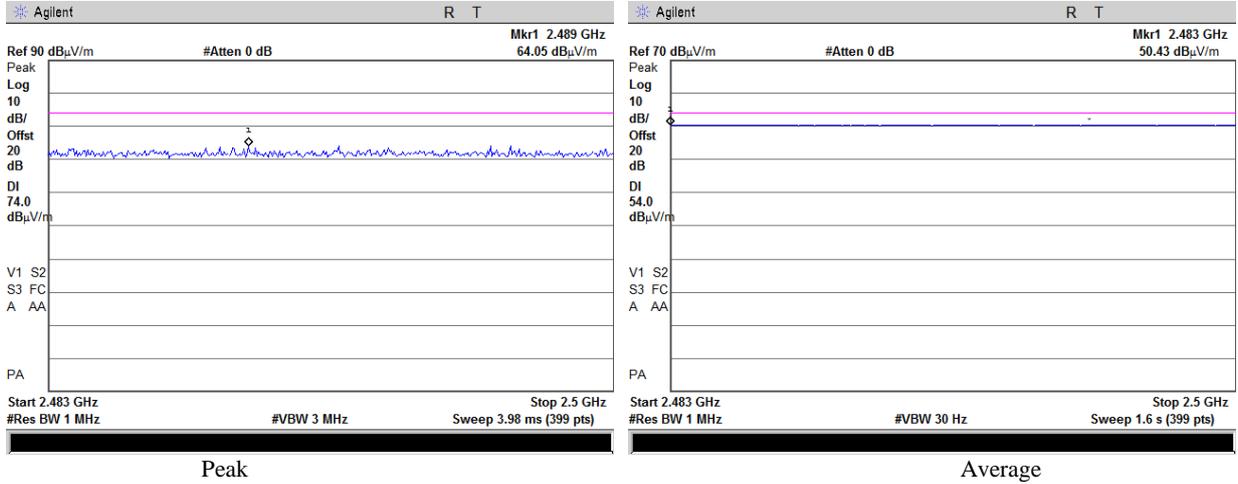
**Plot 4.5.9 Radiated Spurious Emission, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal**



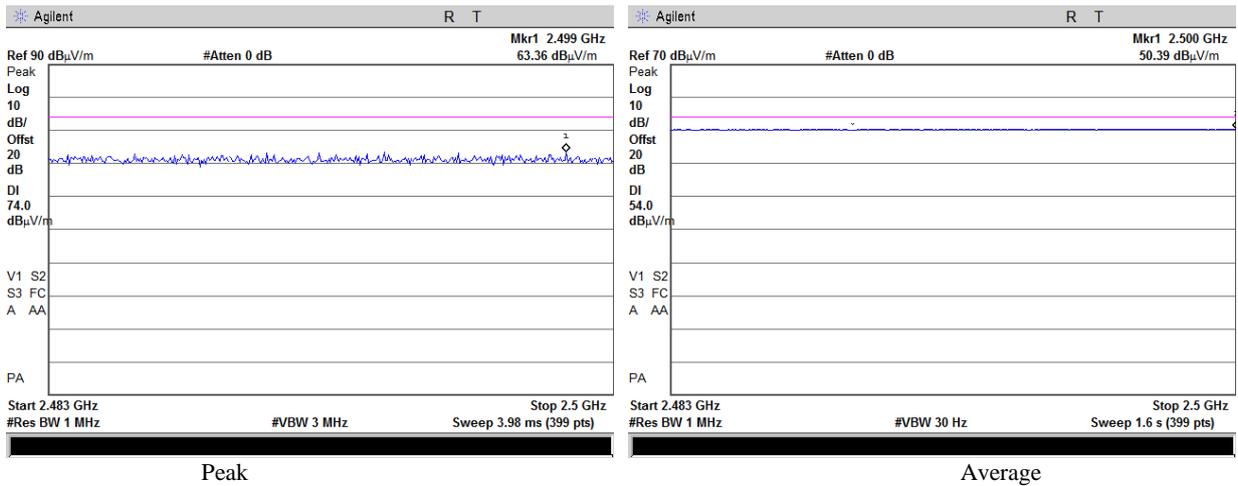
**Plot 4.5.10 Radiated Spurious Emission, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Vertical**



**Plot 4.5.11 Radiated Spurious Emission, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal**



**Plot 4.5.12 Radiated Spurious Emission, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Vertical**



#### 4.6. Radiated Spurious Emissions

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	<b>Pass</b>	
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- 30 MHz-1GHz: RBW: 120kHz, VBW: 300kHz f- 9kHz-150kHz, RBW: 200Hz, VBW: 300Hz f- 150kHz-30MHz, RBW: 9kHz, VBW: 30kHz		
Environment conditions:	Ambient Temperature: 22 °c	Relative Humidity: 48%	Atmospheric Pressure: hPa
Test Result:	See below	See Plot 4.6.1 - Plot 4.6.33	

#### Test results: 2.4 GHz Bands

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	Antenna Polarization	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
<b>802.11b</b>							
2412.0	11	17491.0	Peak	V&H	61.48	74.00	-12.52
2412.0	11	17814.0	Average	V&H	52.40	54.00	-1.60
2437.0	11	17853.0	Peak	V&H	61.71	74.00	-12.29
2437.0	11	17814.0	Average	V&H	52.17	54.00	-1.83
2462.0	11	17708.0	Peak	V&H	62.48	74.00	-11.52
2462.0	11	17982.0	Average	V&H	52.03	54.00	-1.97
<b>802.11g</b>							
2412.0	54	17635	Peak	V&H	62.83	74.00	-11.17
2412.0	54	17814.0	Average	V&H	52.08	54.00	-1.92
2437.0	54	18000	Peak	V&H	62.22	74.00	-11.78
2437.0	54	17897.0	Average	V&H	52.41	54.00	-1.59
2462.0	54	17563.0	Peak	V&H	62.13	74.00	-11.87
2462.0	54	17979.0	Average	V&H	52.28	54.00	-1.72
<b>802.11n 20MHz</b>							
2412.0	MCS7	17853.0	Peak	V&H	63.07	74.00	-10.93
2412.0	MCS7	17814.0	Average	V&H	52.19	54.00	-1.81
2437.0	MCS7	18000.0	Peak	V&H	62.20	74.00	-11.80

2437.0	MCS7	17814.0	Average	V&H	52.20	54.00	-1.80
2462.0	MCS7	17635.0	Peak	V&H	63.14	74.00	-10.86
2462.0	MCS7	17897.0	Average	V&H	52.16	54.00	-1.84

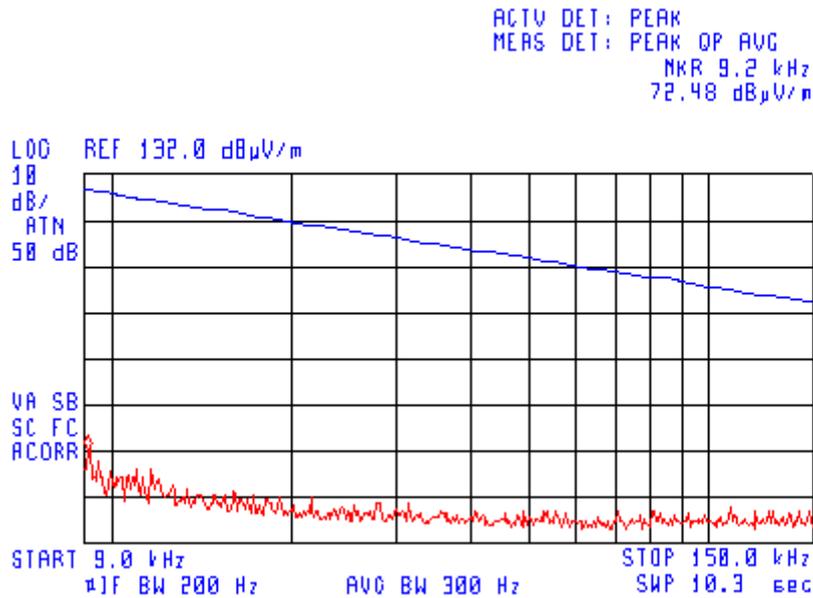
**Test results- 9 kHz-1GHz:**

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

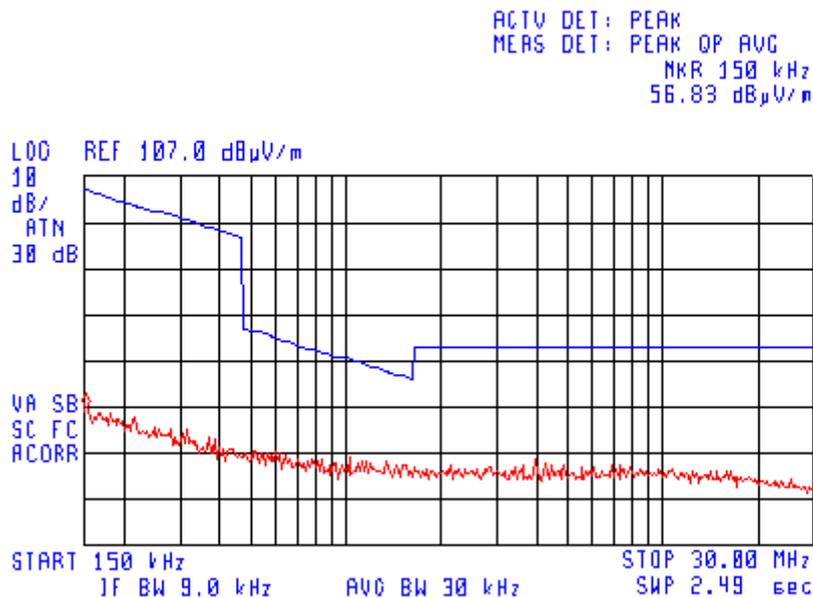
Emission Frequency [MHz]	Detector Type	Polarization H/V	Emission Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
77.200	QP	V	35.87	40.00	-4.13
94.350	QP	V	33.47	43.00	-9.53
848.000	QP	V	32.78	46.00	-13.22

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

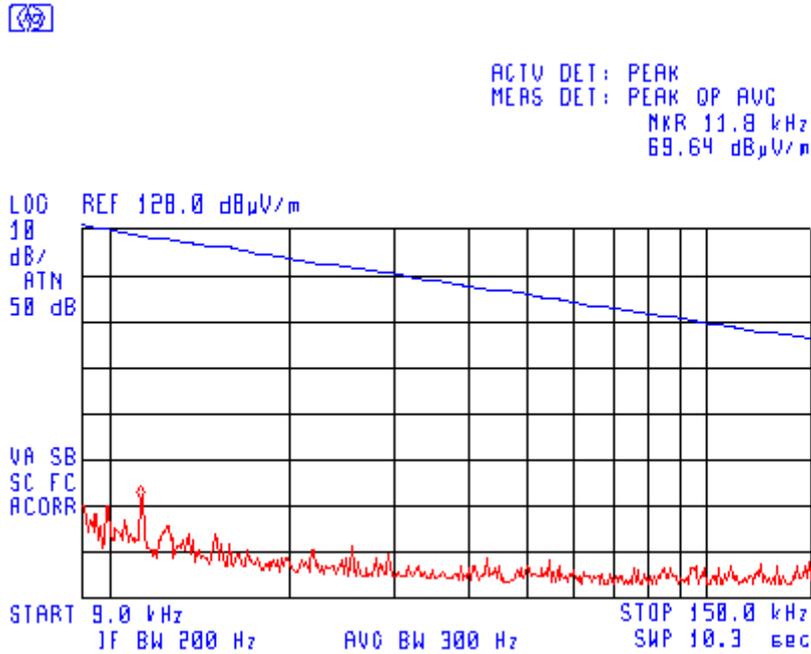
**Plot 4.6.1 Radiated Spurious Emission in 9 kHz-150 kHz range coaxial Polarization**



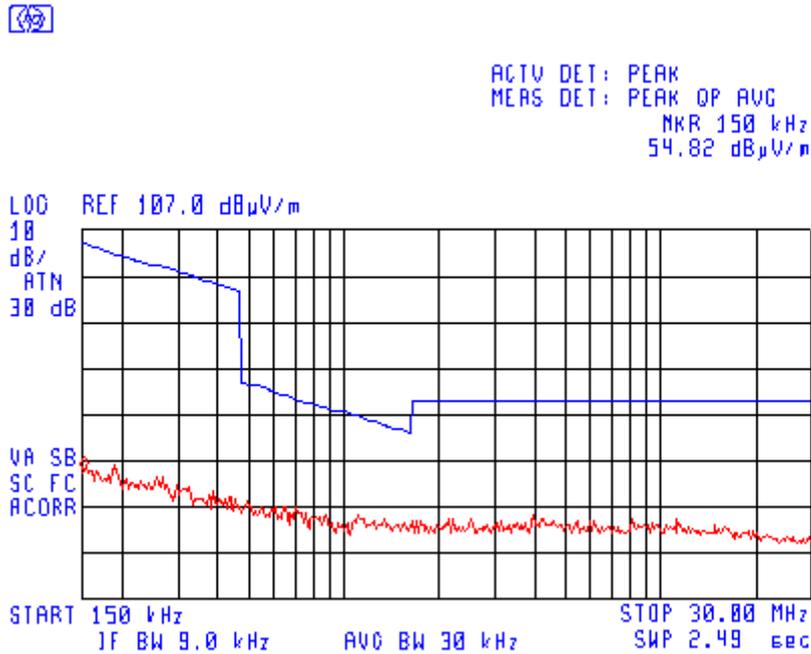
**Plot 4.6.2 Radiated Spurious Emission in 150 kHz-30 MHz range coaxial Polarization**



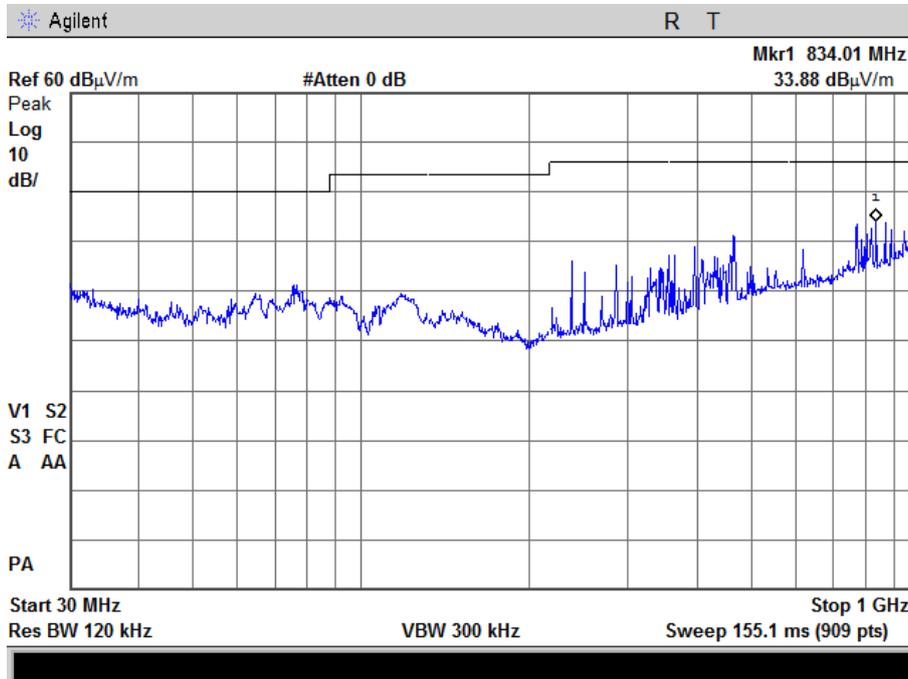
**Plot 4.6.3 Radiated Spurious Emission in 9 kHz-150 kHz range planar Polarization**



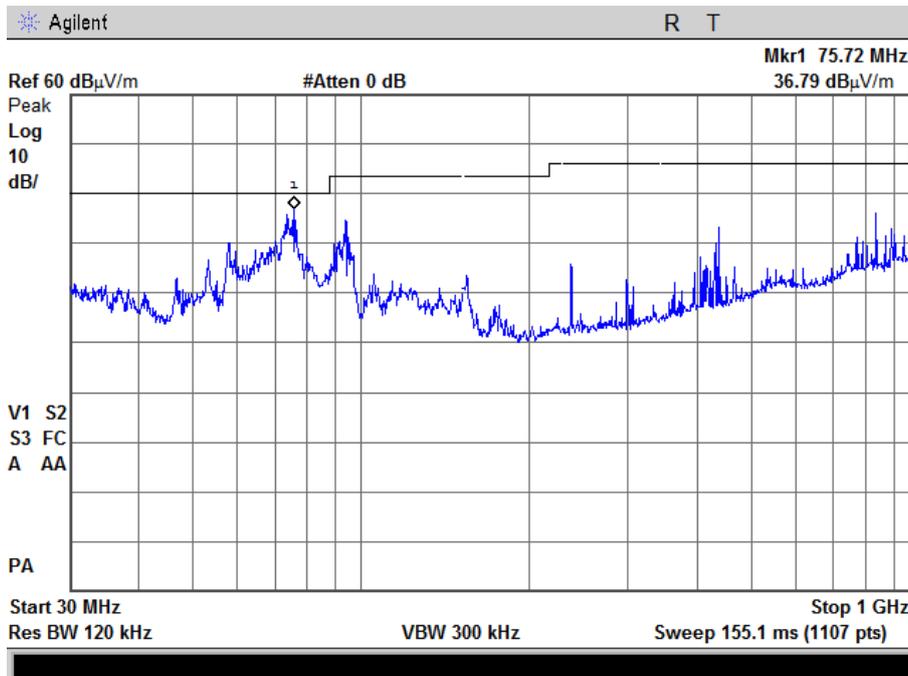
**Plot 4.6.4 Radiated Spurious Emission in 150 kHz-30 MHz range planar Polarization**



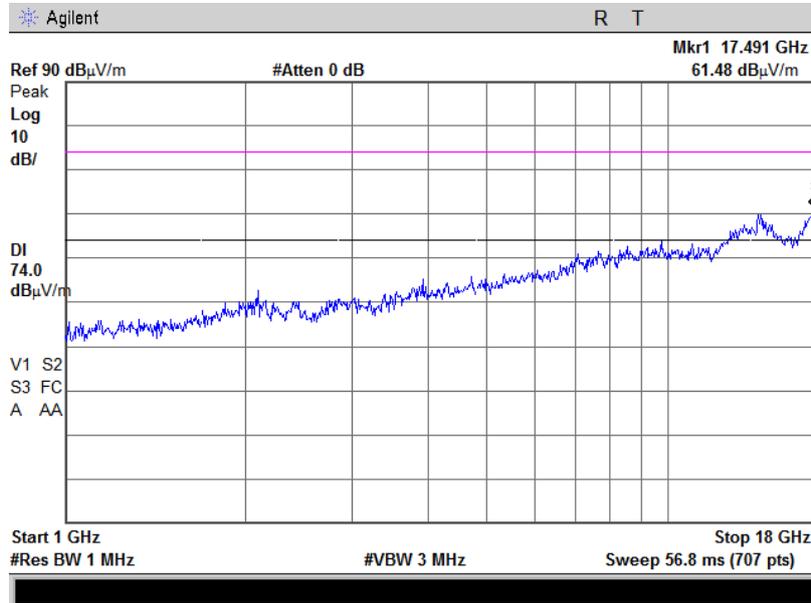
**Plot 4.6.5 Radiated Spurious Emission in 30MHz-1GHz range, Worst case for all modes and all frequencies, Horizontal**



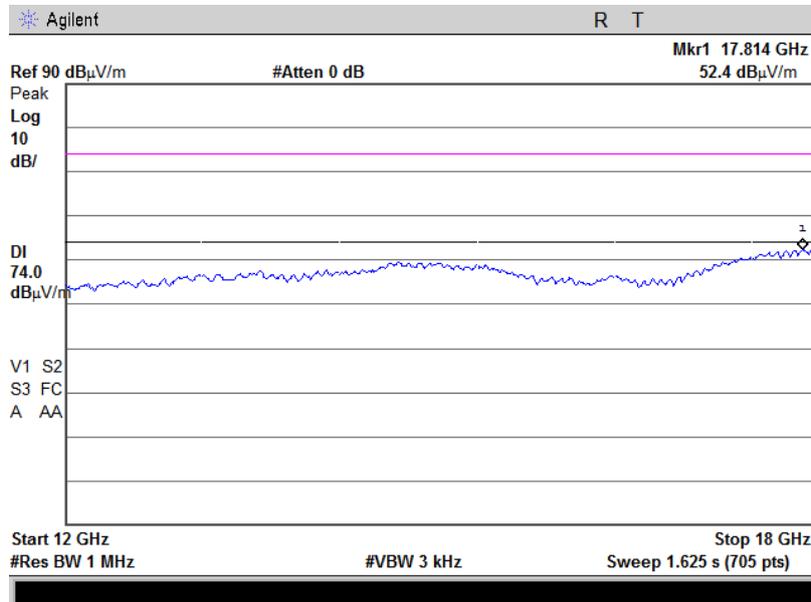
**Plot 4.6.6 Radiated Spurious Emission in 30MHz-1GHz range, Worst case for all modes and all frequencies, Vertical**



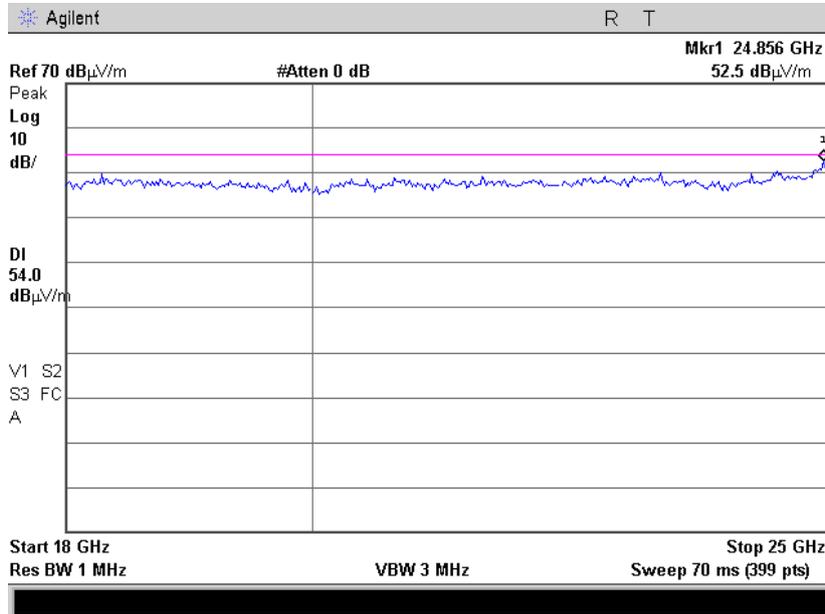
**Plot 4.6.7 Radiated Spurious Emission in 1-18GHz range, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal & Vertical, Peak**



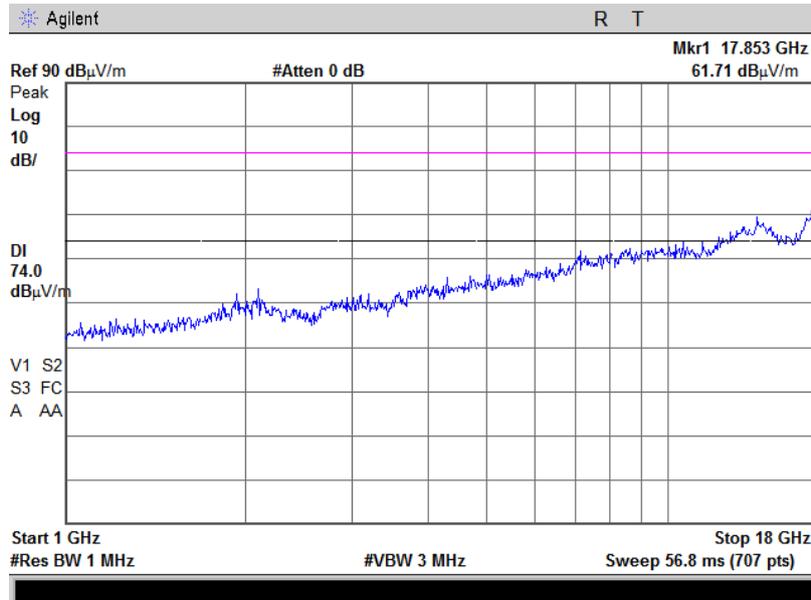
**Plot 4.6.8 Radiated Spurious Emission in 12-18GHz range, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal & Vertical, Average**



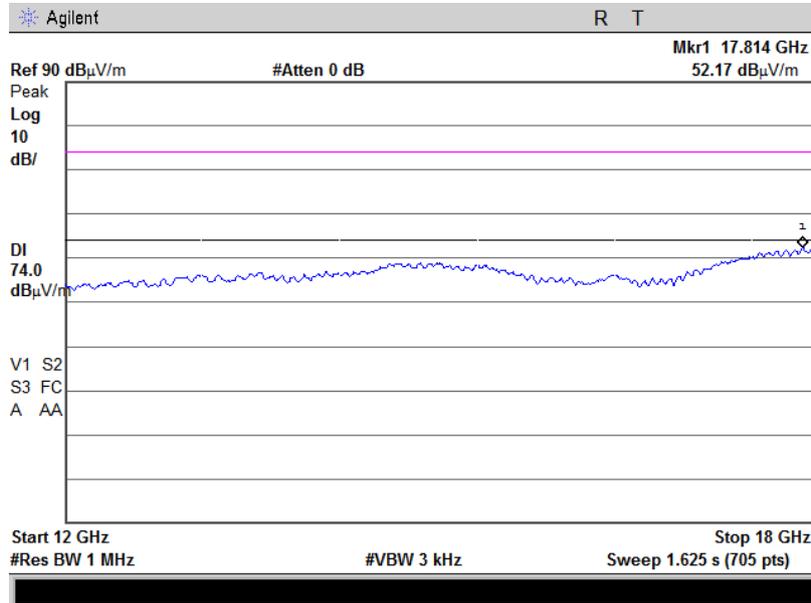
**Plot 4.6.9 Radiated Spurious Emission in 18-25GHz range, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal & Vertical, Peak**



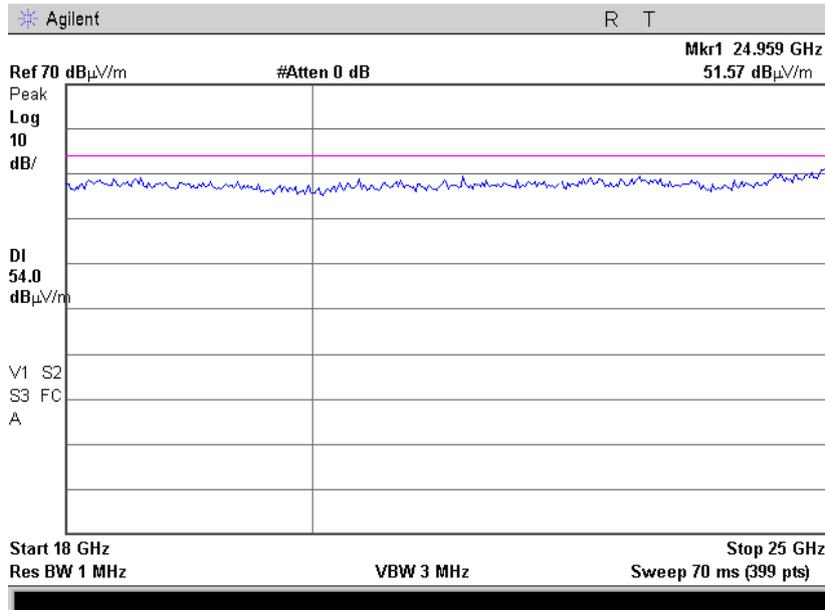
**Plot 4.6.10 Radiated Spurious Emission in 1-18GHz range, 802.11b, Fc = 2437 MHz, 11Mbps, Horizontal & Vertical, Peak**



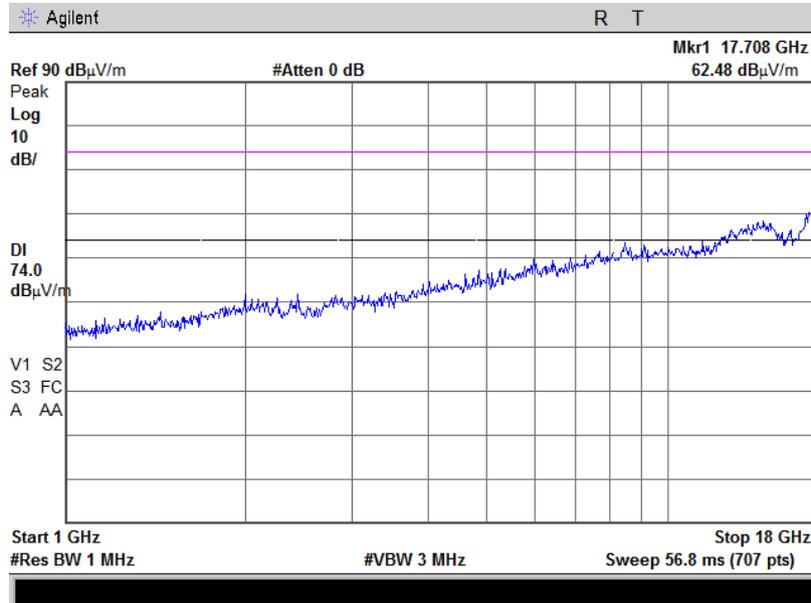
**Plot 4.6.11 Radiated Spurious Emission in 12-18GHz range, 802.11b, Fc = 2437 MHz, 11Mbps, Horizontal & Vertical, Average**



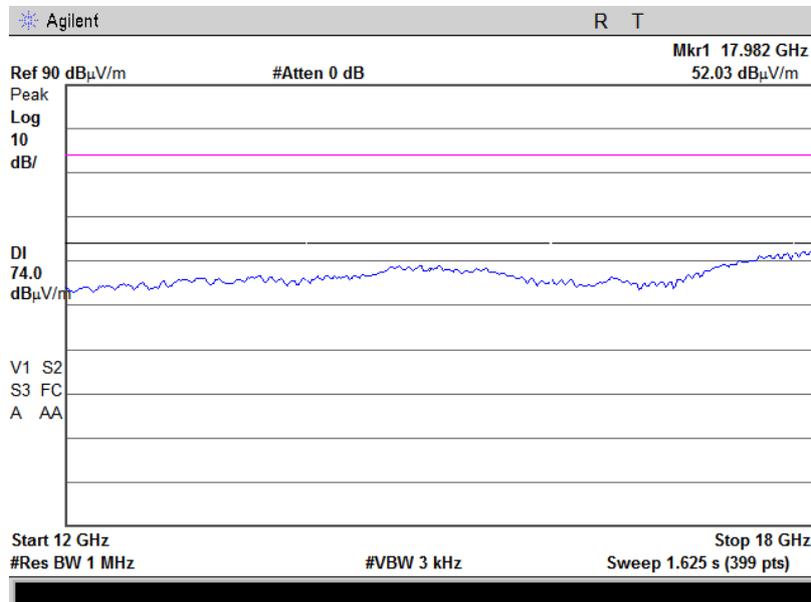
**Plot 4.6.12 Radiated Spurious Emission in 18-25GHz range, 802.11b, Fc = 2437 MHz, 11Mbps, Horizontal & Vertical, Peak**



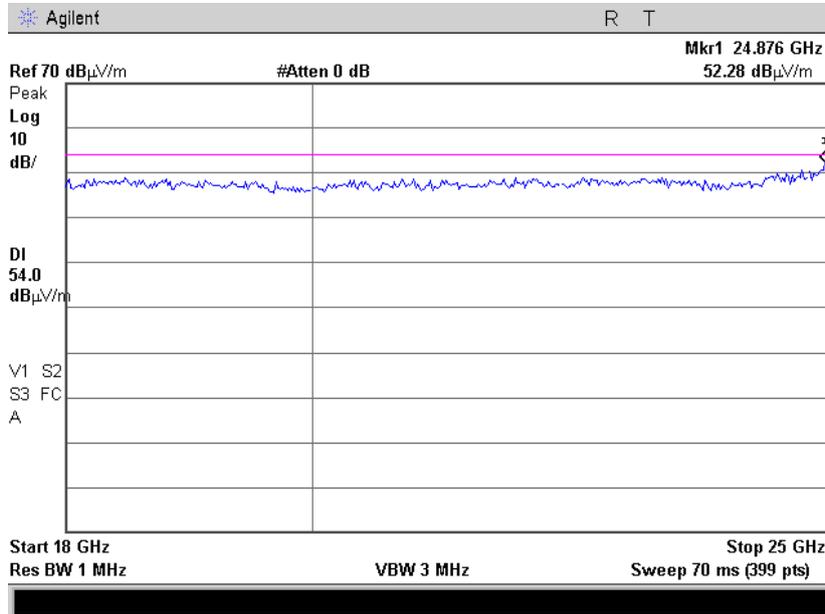
**Plot 4.6.13 Radiated Spurious Emission in 1-18GHz range, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal & Vertical, Peak**



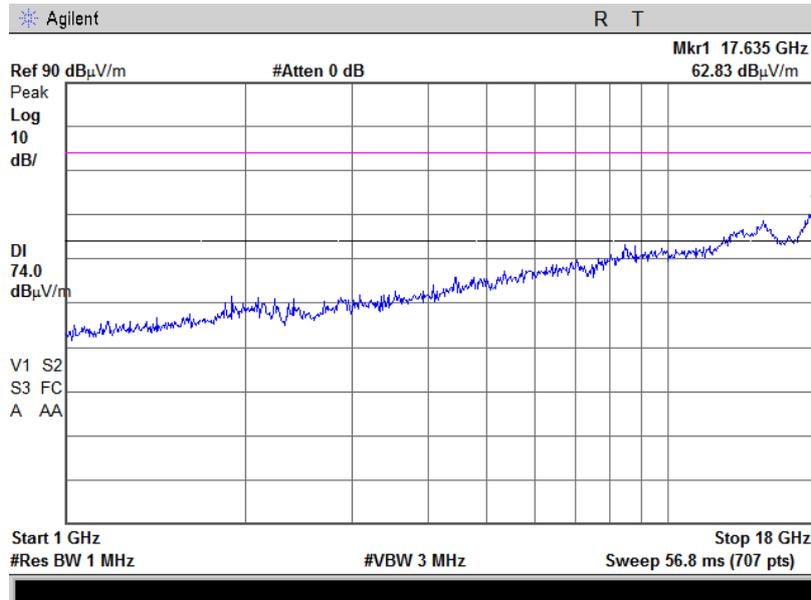
**Plot 4.6.14 Radiated Spurious Emission in 12-18GHz range, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal & Vertical, Average**



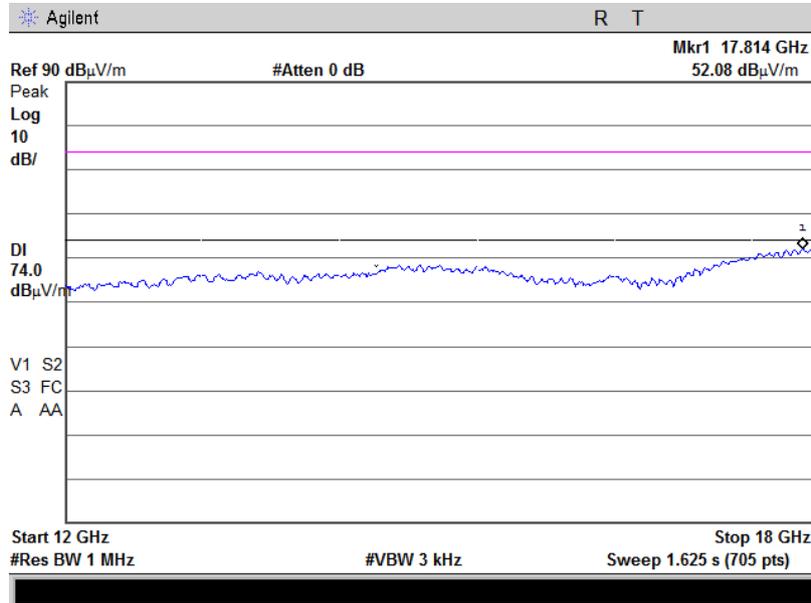
**Plot 4.6.15 Radiated Spurious Emission in 18-25GHz range, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal & Vertical, Peak**



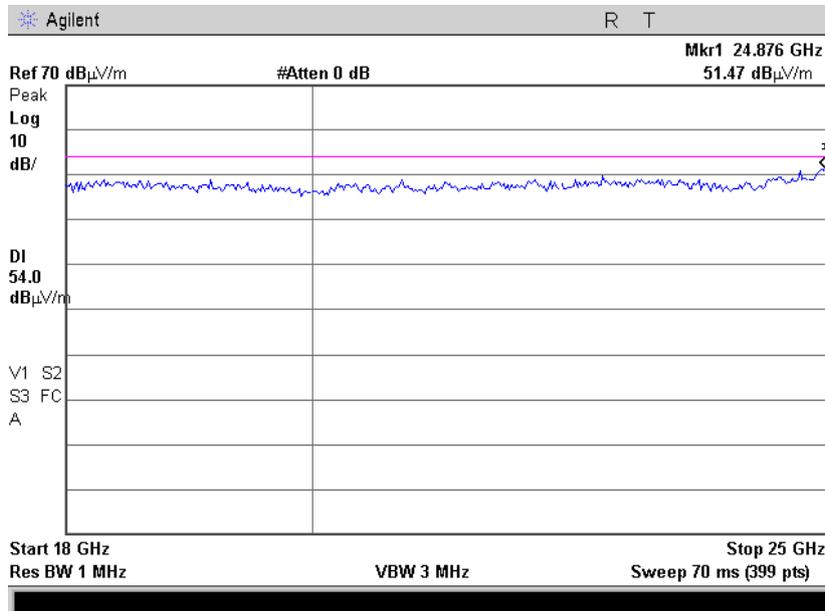
**Plot 4.6.16 Radiated Spurious Emission in 1-18GHz range, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal & Vertical, Peak**



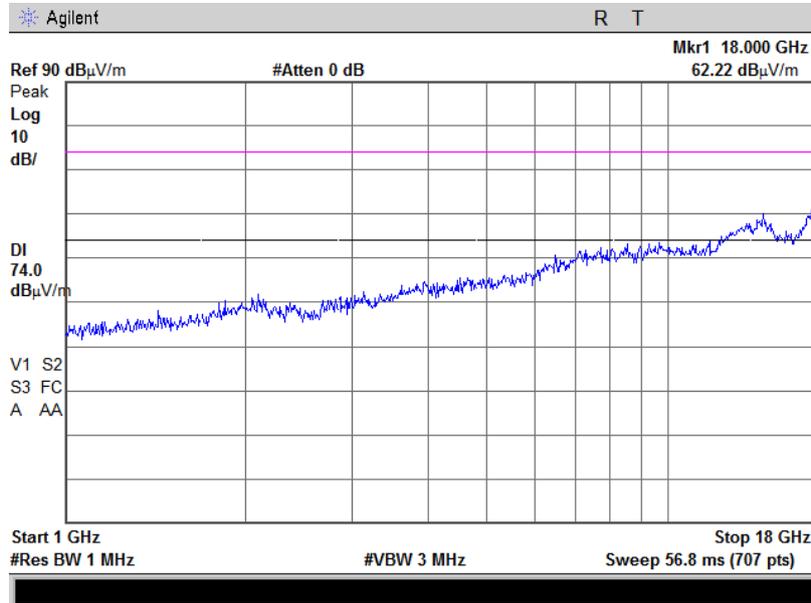
**Plot 4.6.17 Radiated Spurious Emission in 12-18GHz range, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal & Vertical, Average**



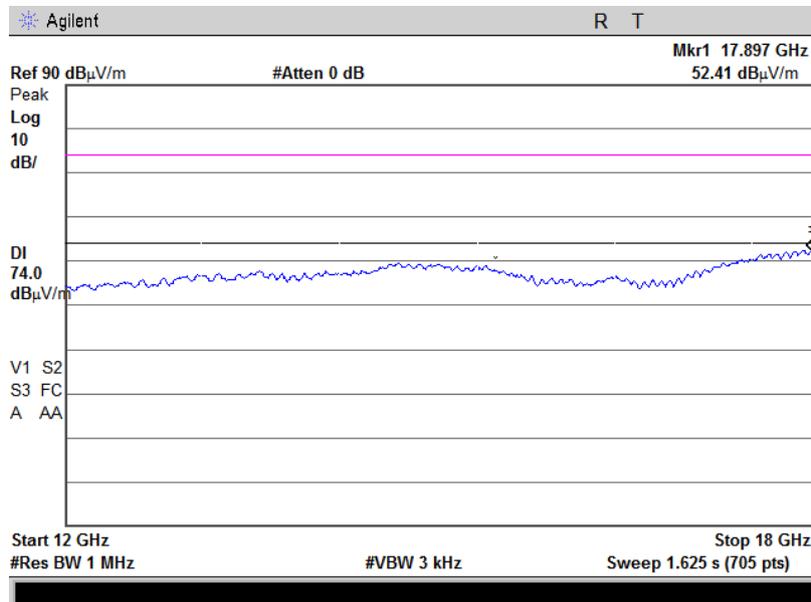
**Plot 4.6.18 Radiated Spurious Emission in 18-25GHz range, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal & Vertical, Peak**



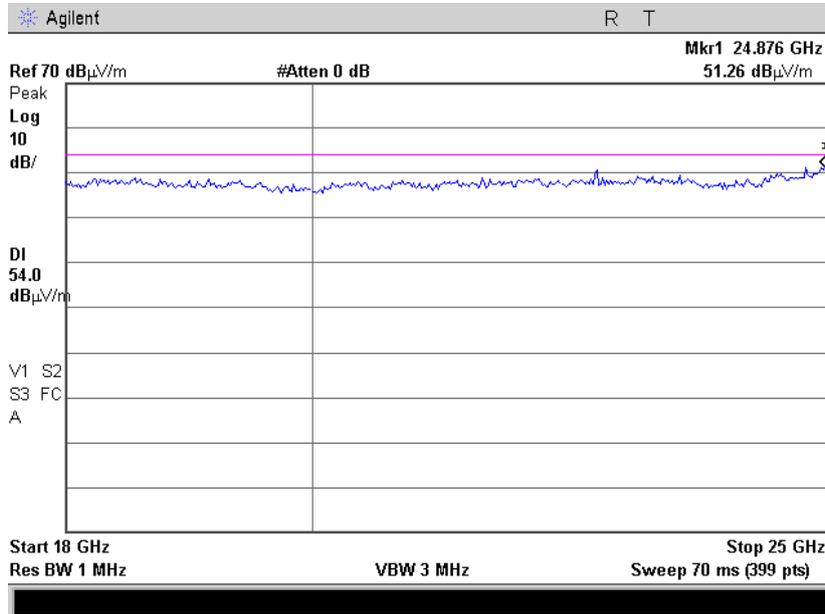
**Plot 4.6.19 Radiated Spurious Emission in 1-18GHz range, 802.11g, Fc = 2437 MHz, 54Mbps, Horizontal & Vertical, Peak**



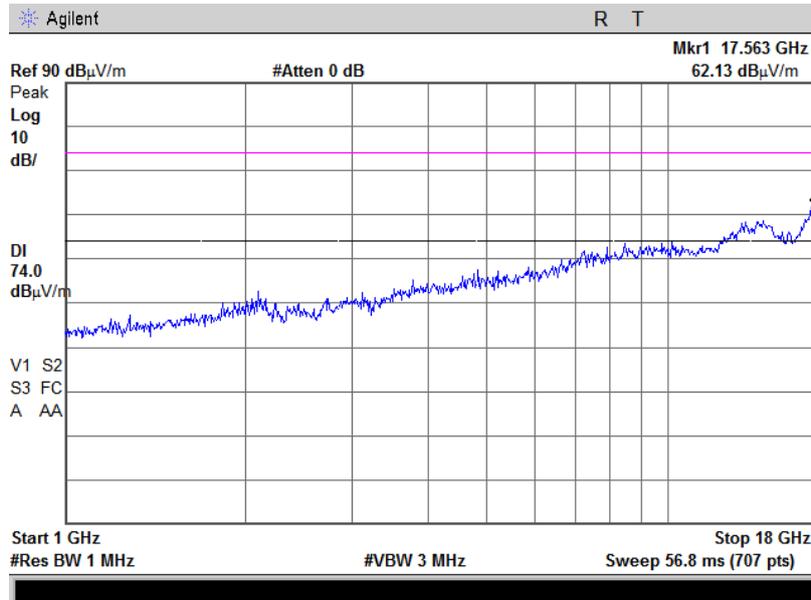
**Plot 4.6.20 Radiated Spurious Emission in 12-18GHz range, 802.11g, Fc = 2437 MHz, 54Mbps, Horizontal & Vertical, Average**



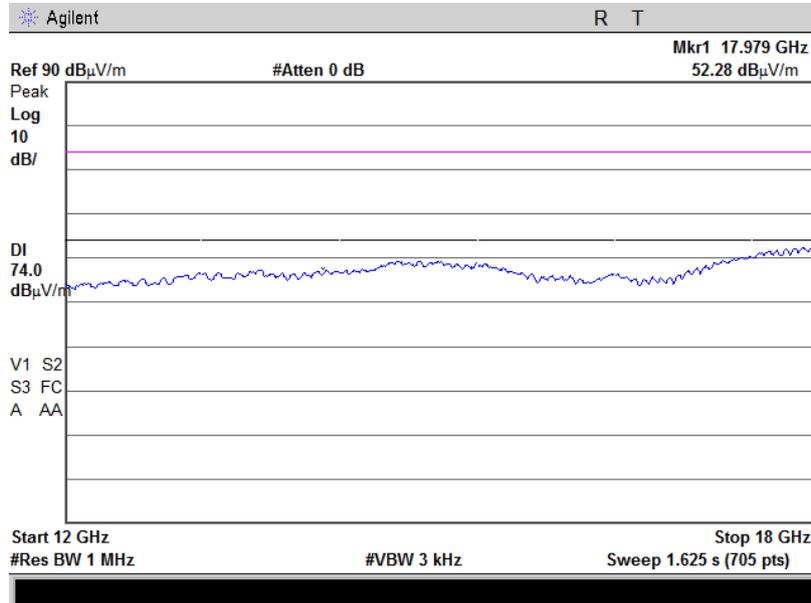
**Plot 4.6.21 Radiated Spurious Emission in 18-25GHz range, 802.11g, Fc = 2437 MHz, 54Mbps, Horizontal & Vertical, Peak**



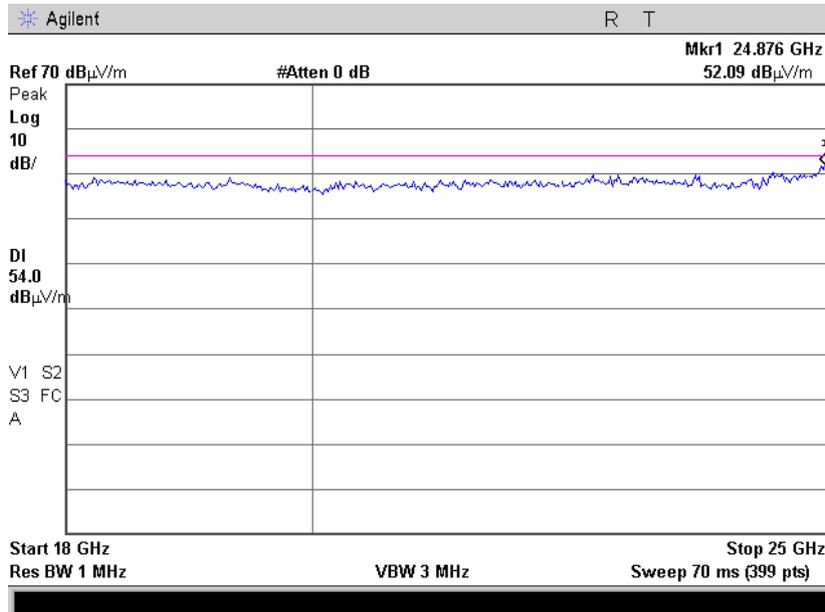
**Plot 4.6.22 Radiated Spurious Emission in 1-18GHz range, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal & Vertical, Peak**



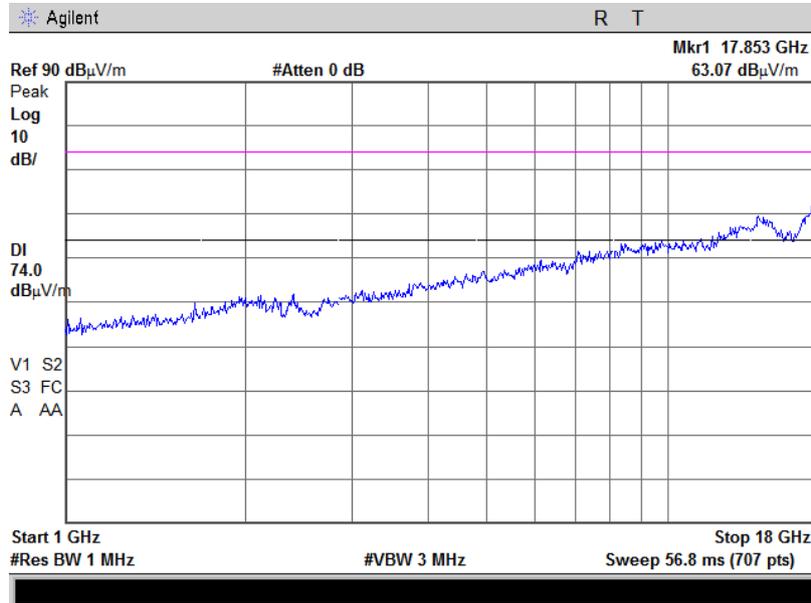
**Plot 4.6.23 Radiated Spurious Emission in 12-18GHz range, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal & Vertical, Average**



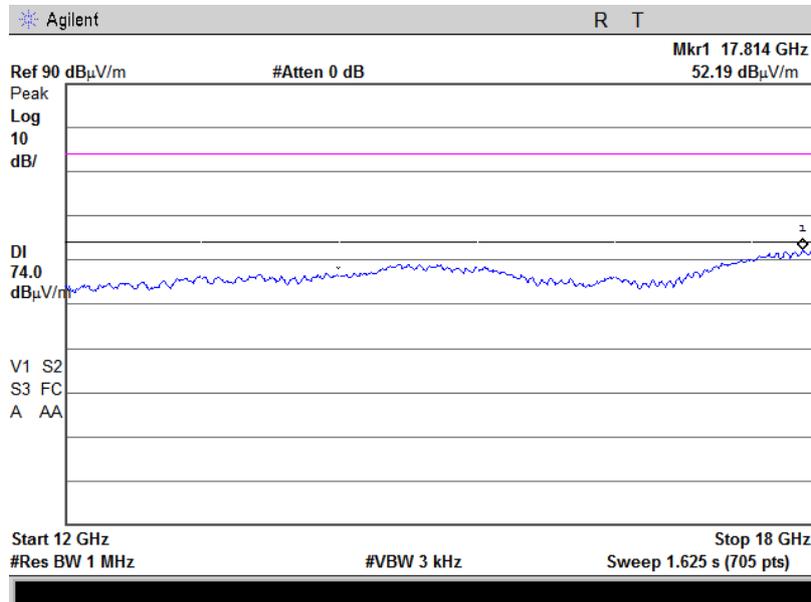
**Plot 4.6.24 Radiated Spurious Emission in 18-25GHz range, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal & Vertical, Peak**



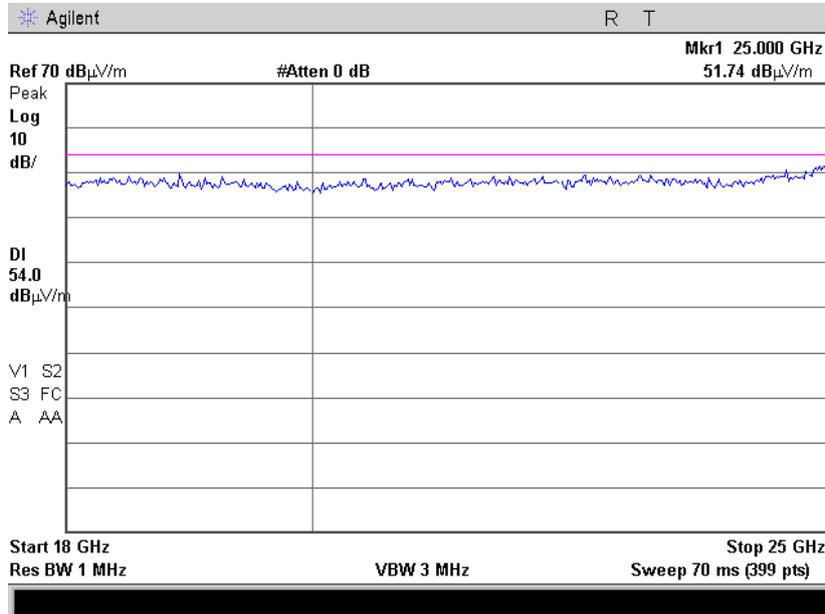
**Plot 4.6.25 Radiated Spurious Emission in 1-18GHz range, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal & Vertical, Peak**



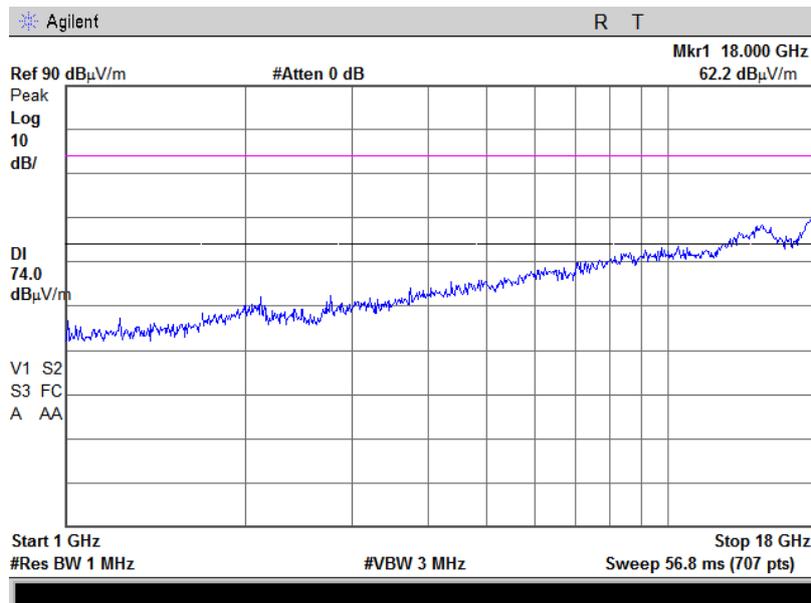
**Plot 4.6.26 Radiated Spurious Emission in 12-18GHz range, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal & Vertical, Average**



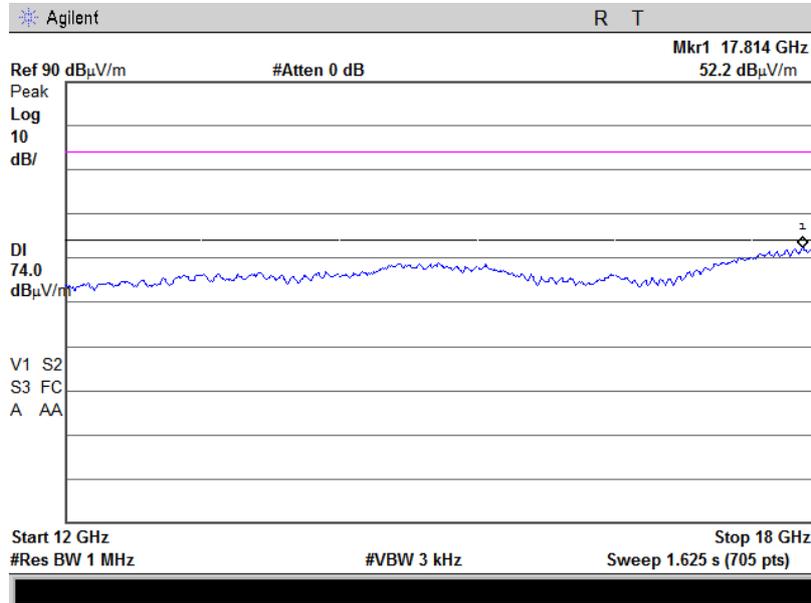
**Plot 4.6.27 Radiated Spurious Emission in 18-25GHz range, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal & Vertical, Peak**



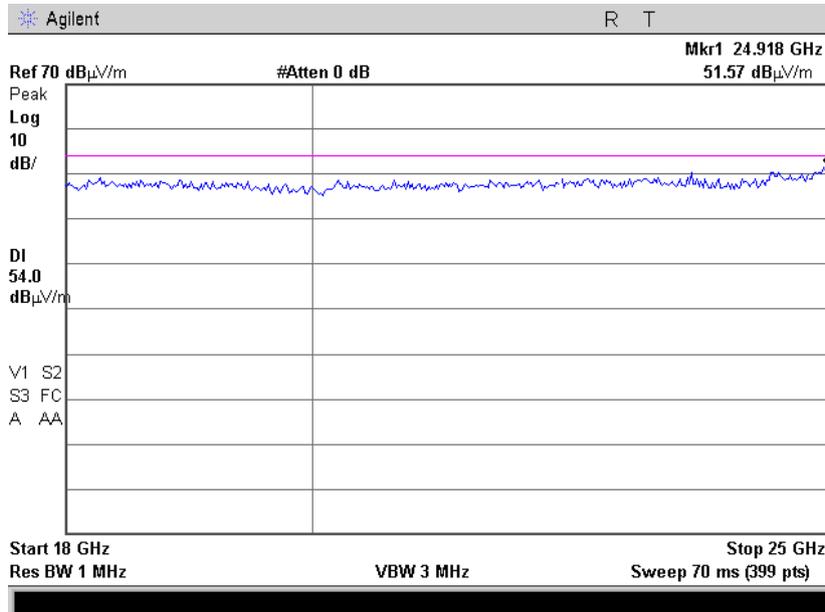
**Plot 4.6.28 Radiated Spurious Emission in 1-18GHz range, 802.11n 20MHz, Fc = 2437 MHz, MCS7, Horizontal & Vertical, Peak**



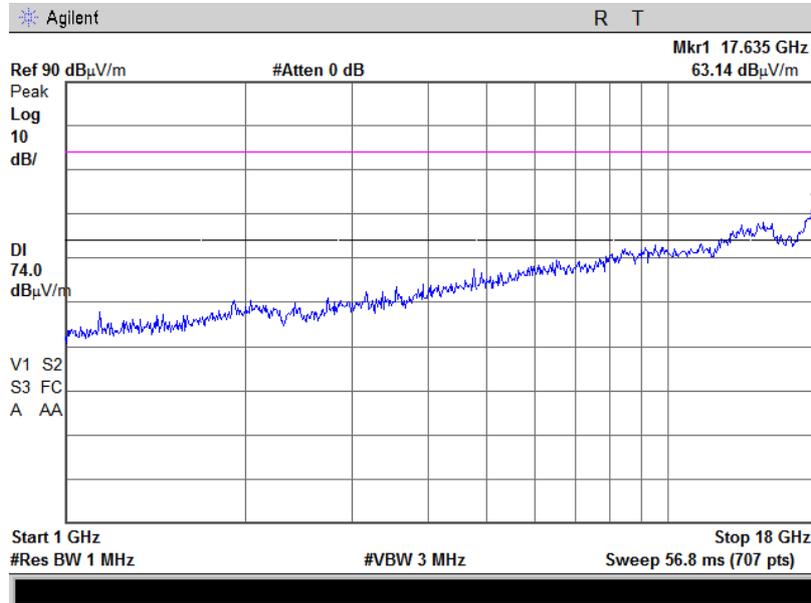
**Plot 4.6.29 Radiated Spurious Emission in 12-18GHz range, 802.11n 20MHz, Fc = 2437 MHz, MCS7, Horizontal & Vertical, Average**



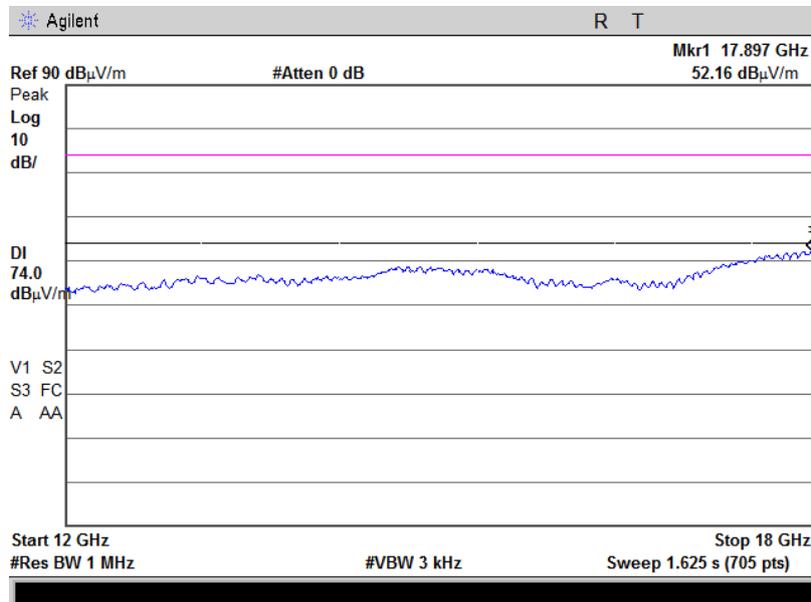
**Plot 4.6.30 Radiated Spurious Emission in 18-25GHz range, 802.11n 20MHz, Fc = 2437 MHz, MCS7, Horizontal & Vertical, Peak**



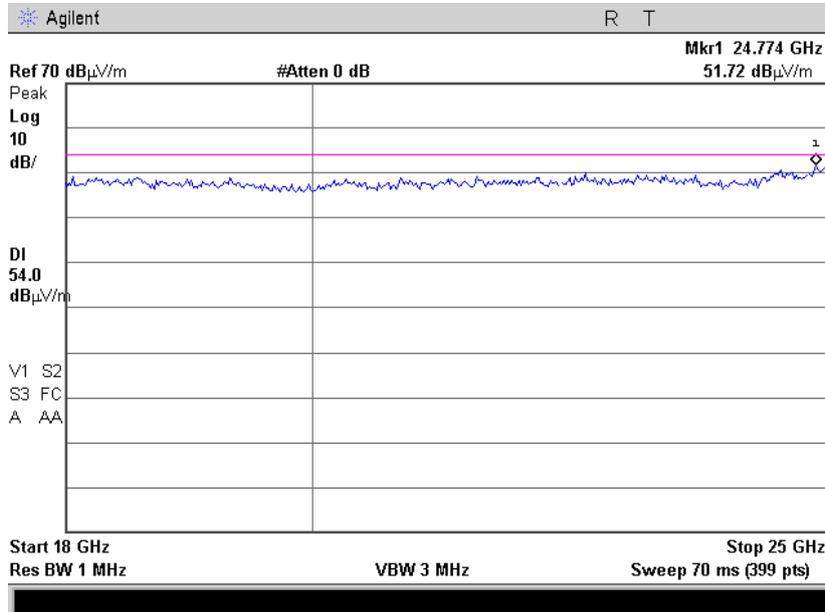
**Plot 4.6.31 Radiated Spurious Emission in 1-18GHz range, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal & Vertical, Peak**



**Plot 4.6.32 Radiated Spurious Emission in 12-18GHz range, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal & Vertical, Average**



**Plot 4.6.33 Radiated Spurious Emission in 18-25GHz range, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal & Vertical, Peak**



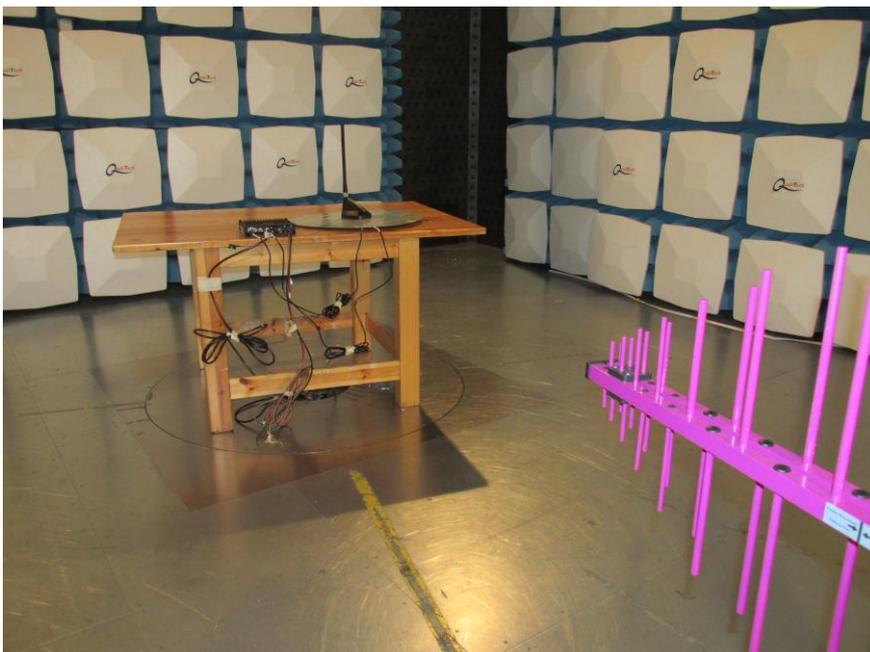
## 5. Appendix

### Appendix A: Test Photographs

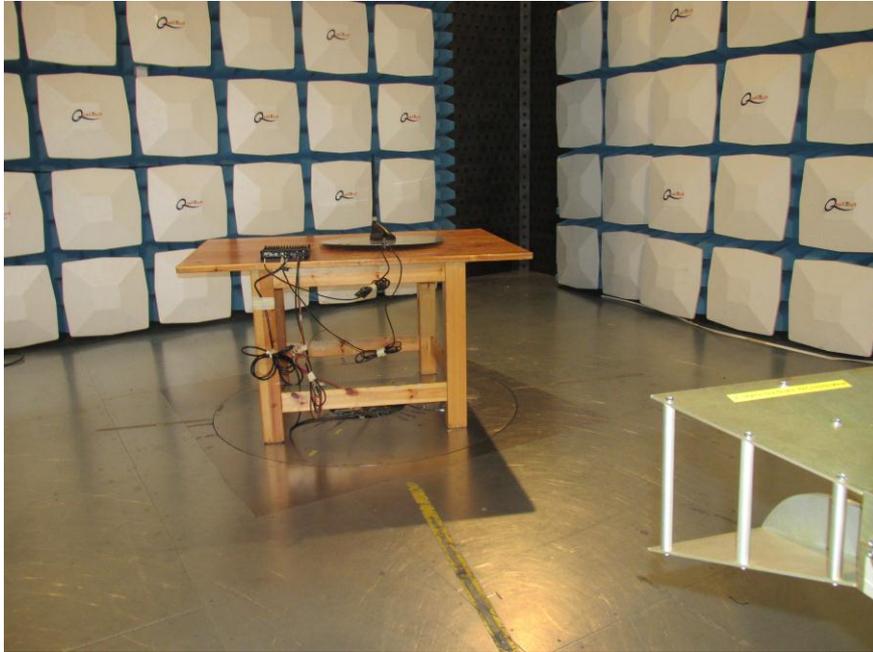
**Photograph 1**



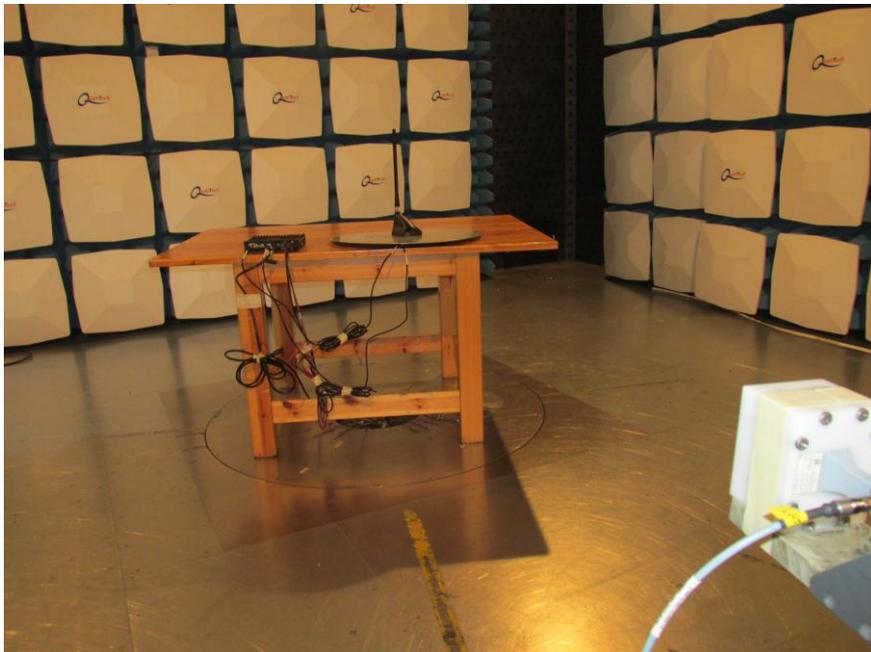
**Photograph 2**



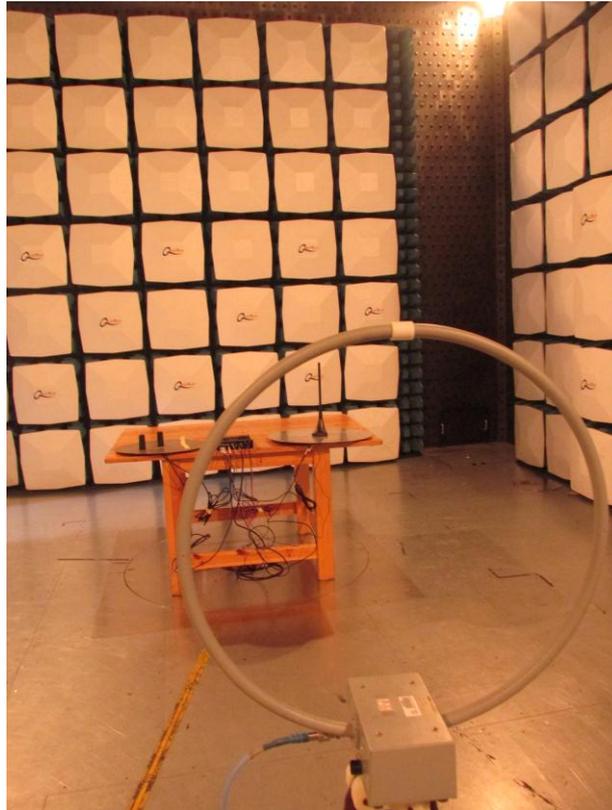
**Photograph 3**



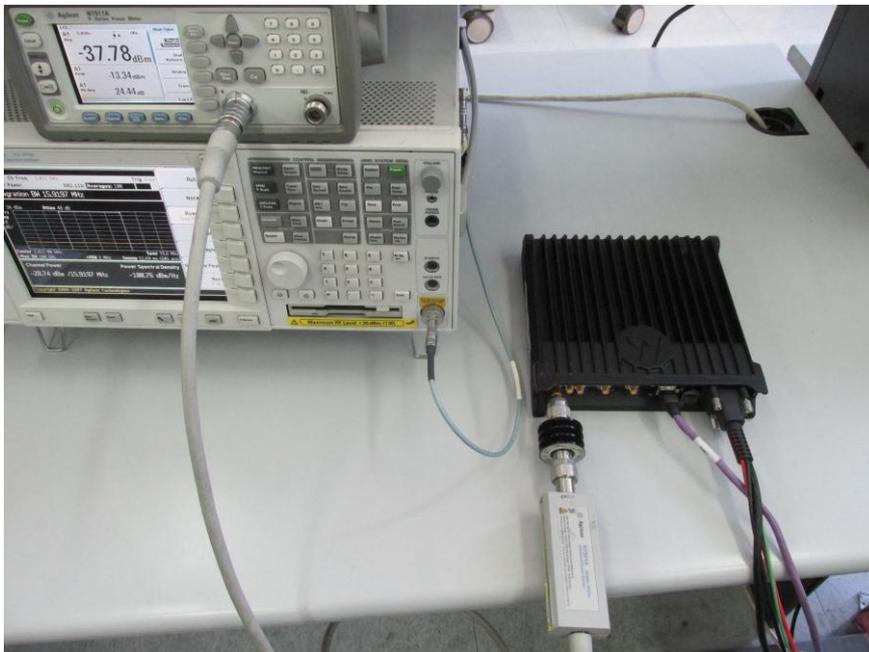
**Photograph 4**



**Photograph 5**



**Photograph 6**



**Appendix B: List of Measuring Equipment used:**

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due	Interval
Teseq	CBL 6141B	Bilog Antenna	34119	03/07/2012	03/07/2015	3
HP	8593EM	Spectrum Analyzer 9KHz-22GHz	3536A00131	13/07/2014	13/07/2015	1
HP	8546A	EMI Receiver (6.5GHz)	3710A00392	29/12/2014	29/12/2015	1
Agilent	11947A	RF Transient Limiter	3107A04121	01/01/2015	01/01/2016	1
FCC	50/250-25-2	LISN	9705	01/01/2015	01/01/2016	1
Schwarzbeck	NNBL 8226-2	LISN	8226120	01/01/2015	01/01/2016	1
A.R.A	DRG-118/A	Horn Antenna (EMM)	17188	06/03/2015	06/03/2018	3
Agilent	E4446A	Spectrum Analyzer 3Hz-44GHz	MY46180602	13/11/2014	13/11/2016	2
Schwarzbeck	BBHA 9170	Horn Antenna 15-40 GHz	BBHA9170214	06/03/2015	06/03/2018	3
EMCO	6502	Antenna, loop, 10 kHz to 30 MHz	3424	26/03/2014	26/03/2016	2
Miteq	AMF-5F- 18002650-30- 10P	Low-Noise Amplifier 18 - 26.5 GHz	945372	07/07/2014	07/07/2015	1
AMP	7D-010180-30- 10P-GW	LNA Amplifier 1 GHz to 18 GHz	618653	05/03/2015	05/03/2016	1

**Appendix C: Accreditation Certificate**



**American Association for Laboratory Accreditation**

**Accredited Laboratory**

A2LA has accredited

**QUALITECH**

*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-LAF Communiqué dated 8 January 2009).

Presented this 7<sup>th</sup> day of December 2012.



  
\_\_\_\_\_  
President & CEO  
For the Accreditation Council  
Certificate Number 1633.01  
Valid to September 30, 2014

*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*