



Electromagnetic Compatibility Test Report

Test Report No: MOT 290414
Issued on: April 29, 2014

Product Name
VML750 Model: FLN0058A

Tested According to
FCC 47 CFR, Part 15, Subpart C

Tests Performed for
Motorola Israel Ltd.
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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: 29.04.2014

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 Case	Remarks
6 dB Bandwidth	Pass
Maximum Conducted (Average) Output Power	Pass
Peak Power Spectral Density(peak PSD)	Pass
Conducted Spurious Emissions	Pass
Radiated Spurious Emissions, Restricted Bands	Pass
Radiated Spurious Emissions	Pass

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1. General Description

Description of the EUT system/test Item:

Product name: VML750

Model: 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

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:

2412MHz – Max 10dBi

2437MHz – Max 10dBi

2462MHz – Max 10dBi

2472MHz – Max 10dBi

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 1MHz to 25GHz was investigated following the guidelines in ANSI C63.4-2003, with the transmitter set to the lowest, middle and highest channel frequencies. Measurements were performed with peak detector and repeated averaged with VBW=10Hz. Only Peak detection plots are presented.

2.3. Radiated Emission measurements:

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions. The test program of exercising the equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances.

An appropriate antenna depending upon the frequency range, per ANSI C63.4-2003 clause 4.1.5 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 30MHz to 1GHz. The highest radiated emission was detected by manipulating the system cables to the worst-case position. This process was repeated for both antenna polarizations. The spectrum up to 40GHz was investigated for spurious emissions, using a band-reject filter where appropriate.

The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.4-2003 clause 4.2.

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

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 ≥ 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 Emerson and Cuming absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	± 3.9 dB, 30MHz to 200MHz ± 3 dB, 200MHz to 1000MHz
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

3.1. Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Expanded U	Ucisp
Radiated Emission	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	5.18
	6.0GHz-18.0GHz	4.28	5.48
		5.10	
Conducted Emission	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

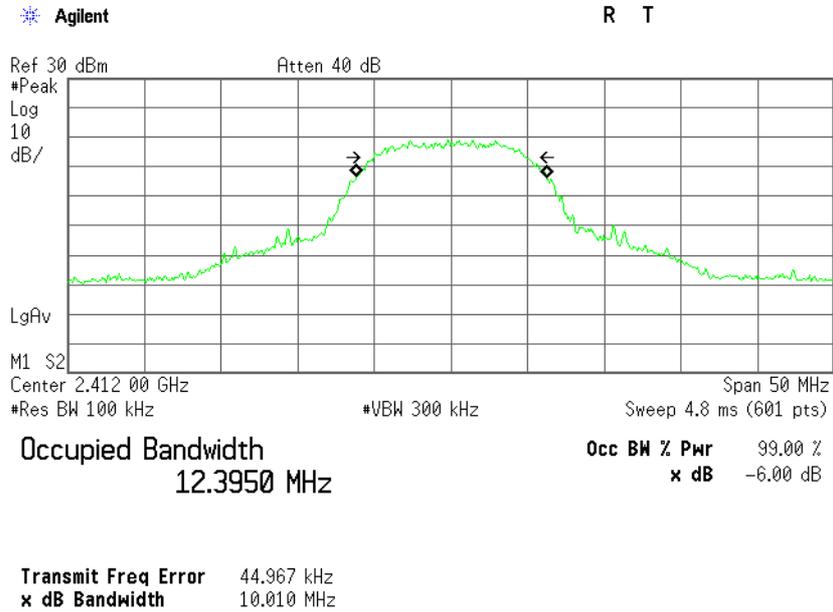
4.1. 6 dB Bandwidth

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	Pass	
Method of testing:	Conducted KDB 558074 D01 v03, 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	

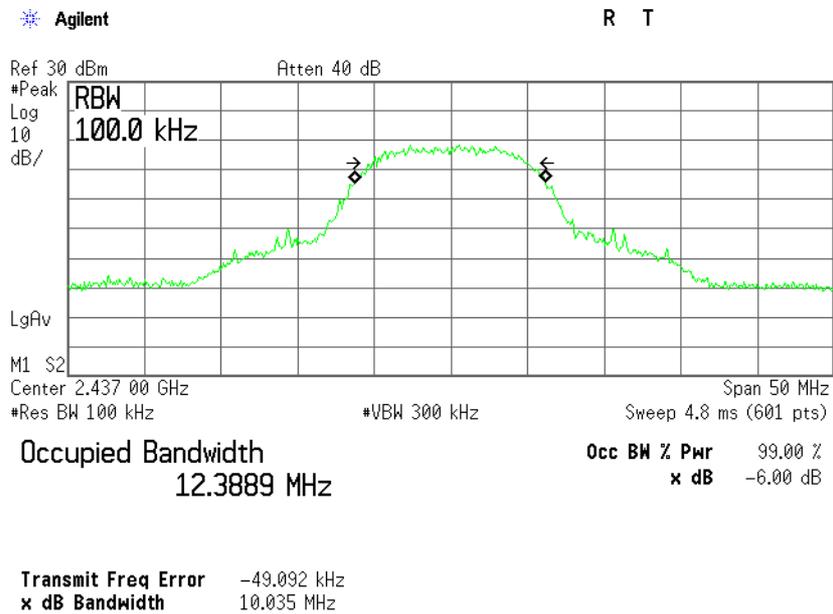
Test results

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

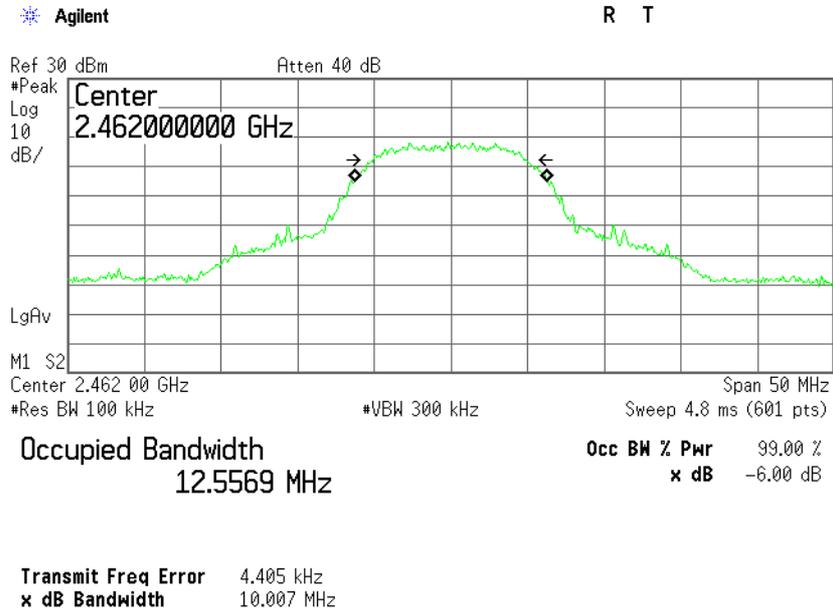
Plot 4.1.1 6dB bandwidth test results, 802.11b Mode, Fc = 2412 MHz



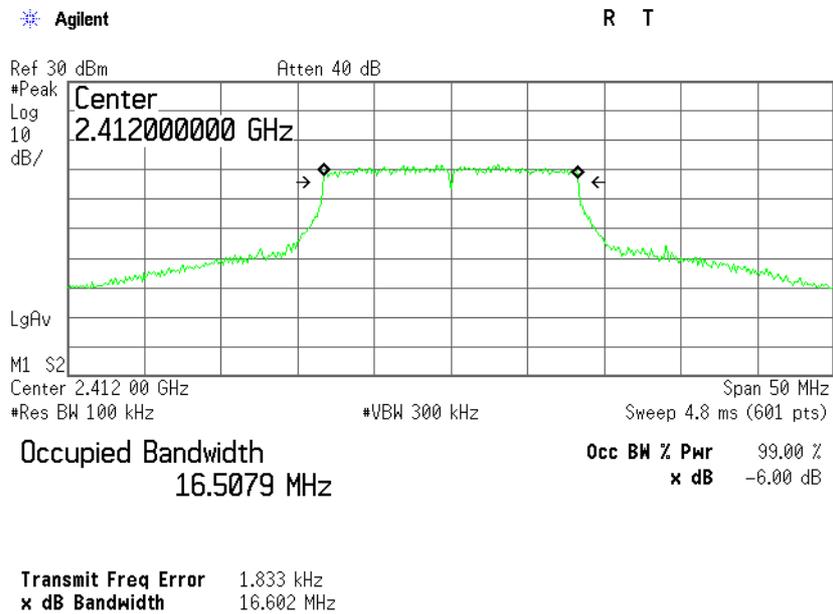
Plot 4.1.2 6dB bandwidth test results, 802.11b Mode, Fc = 2437 MHz



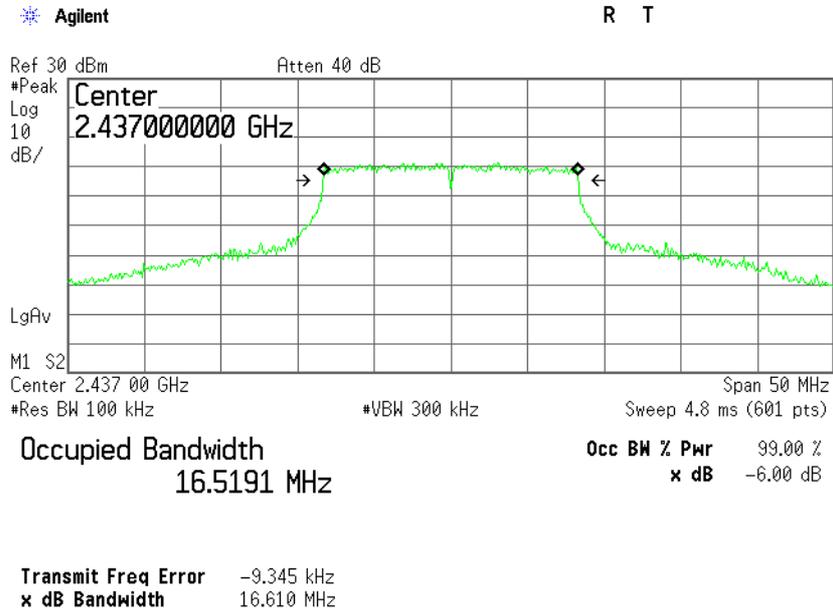
Plot 4.1.3 6dB bandwidth test results, 802.11b Mode, Fc = 2462 MHz



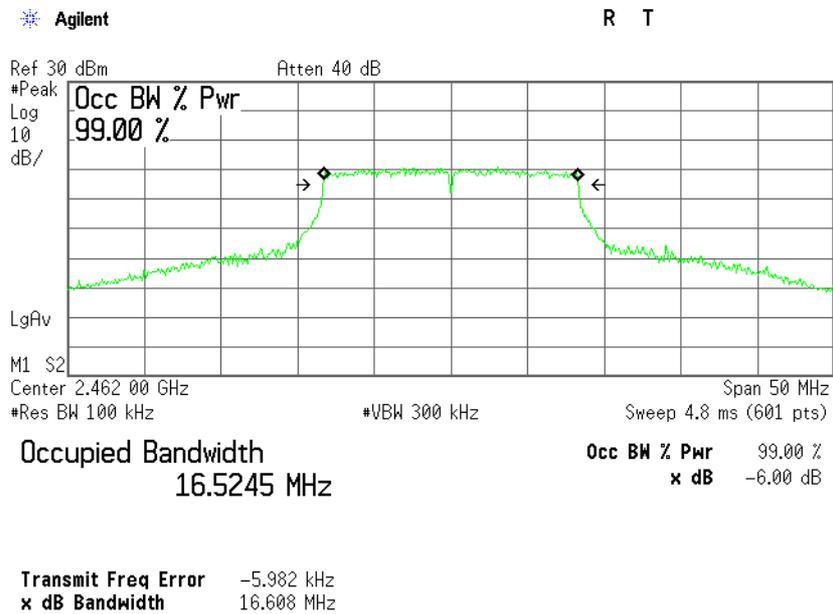
Plot 4.1.4 6dB bandwidth test results, 802.11g Mode, Fc = 2412 MHz



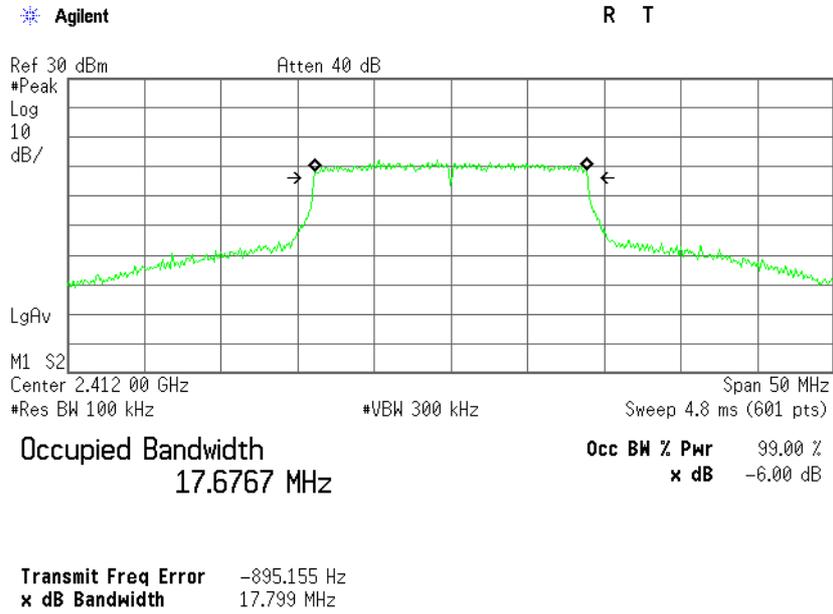
Plot 4.1.5 6dB bandwidth test results, 802.11g Mode, Fc = 2437 MHz



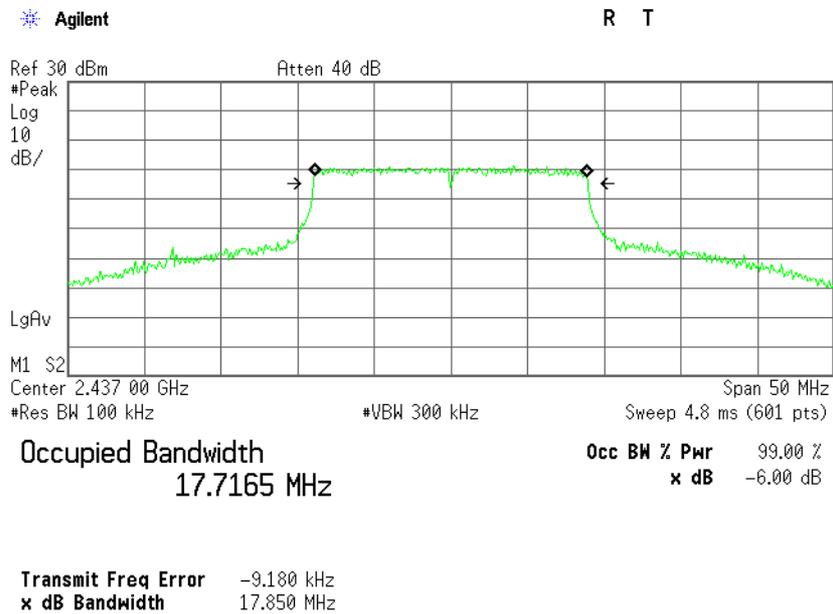
Plot 4.1.6 6dB bandwidth test results, 802.11g Mode, Fc = 2462 MHz



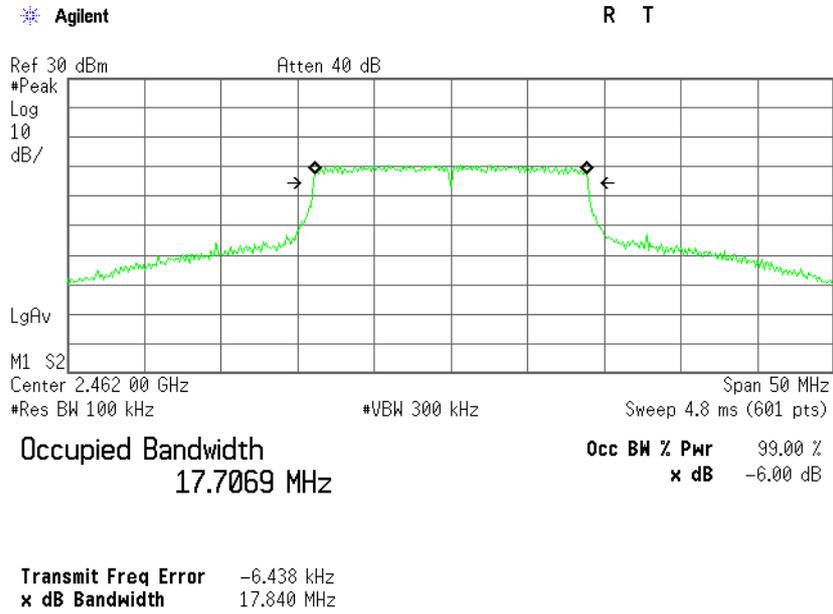
Plot 4.1.7 6dB bandwidth test results, 802.11n 20MHz Mode, Fc = 2412 MHz



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:	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 & 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	Pass	
Method of testing:	Conducted KDB 558074 D01 v03, 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
802.11bMode						
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
802.11g Mode						
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
802.11n Mode						
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)

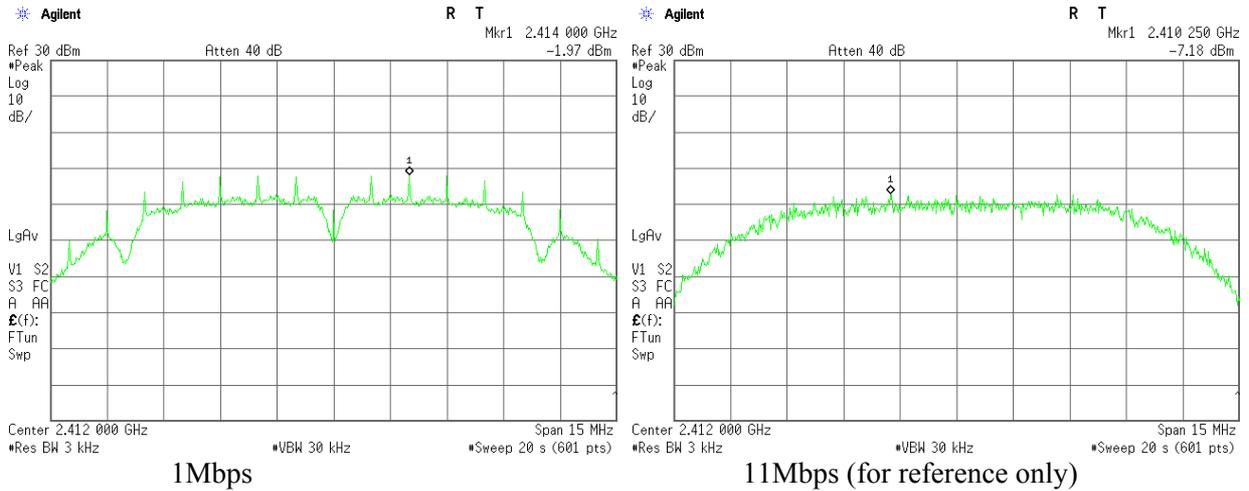
Reference document:	47 CFR §15.247 (e)		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.		
Test setup:	See sec 2.1	Pass	
Method of testing:	Conducted KDB 558074 D01 v03, 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:

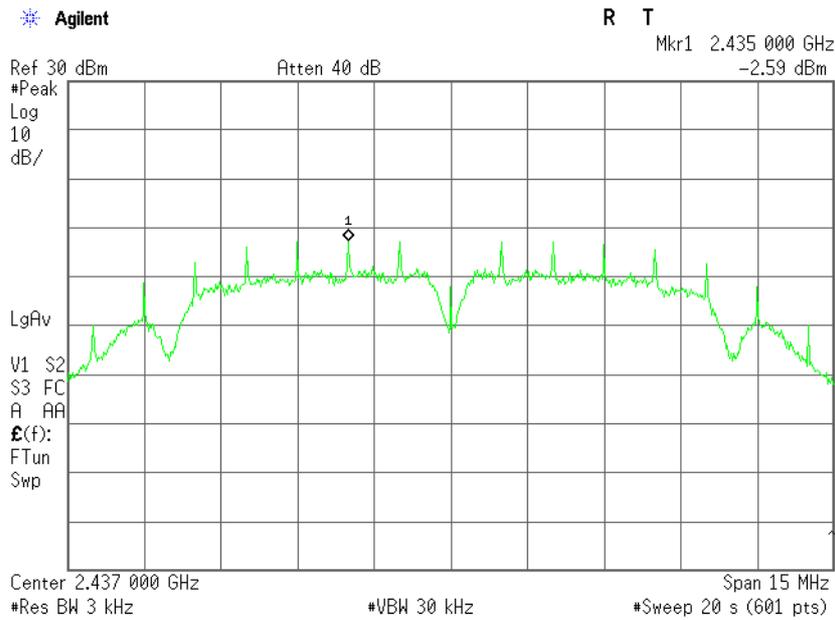
Frequency, [MHz]	Data Rate, [Mbps]*	Measured PSD, [dBm/3kHz]	Limit PSD, [dBm/3kHz]	Margin, [dB]	Pass/Fail
802.11b Mode					
2412	1	-1.97	8.00	-9.97	Pass
2437	1	-2.59	8.00	-10.59	Pass
2462	1	-2.98	8.00	-10.98	Pass
802.11g Mode					
2412	6	-11.67	8.00	-19.67	Pass
2437	6	-12.30	8.00	-20.3	Pass
2462	6	-12.44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

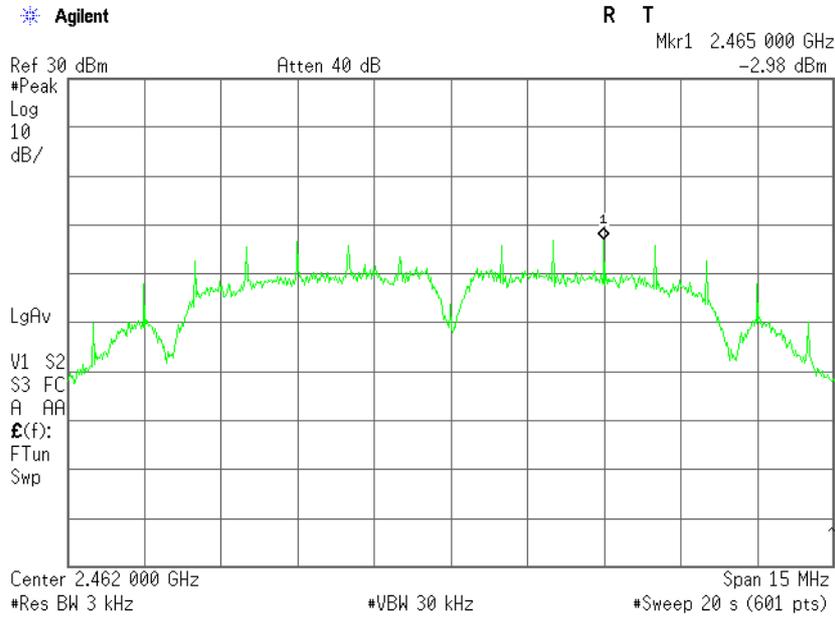
Plot 4.3.1 Peak PSD test results, 802.11b Mode, Fc = 2412 MHz



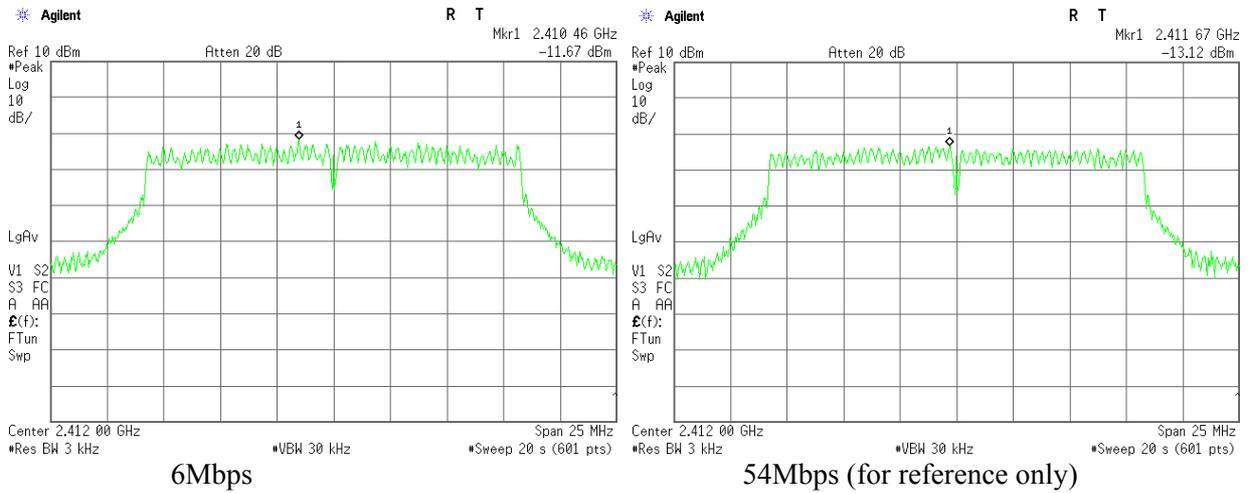
Plot 4.3.2 Peak PSD test results, 802.11b Mode, Fc = 2437 MHz



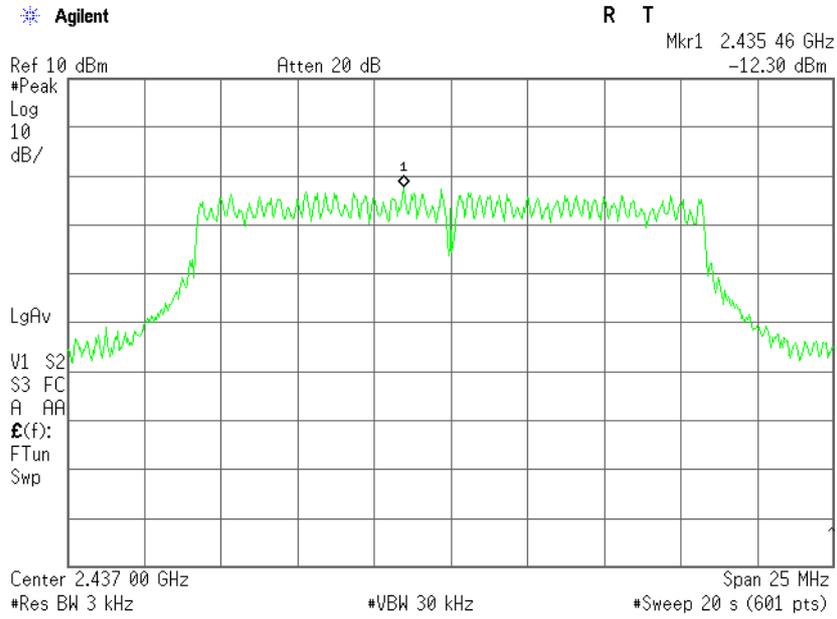
Plot 4.3.3 Peak PSD test results, 802.11b Mode, Fc = 2462 MHz



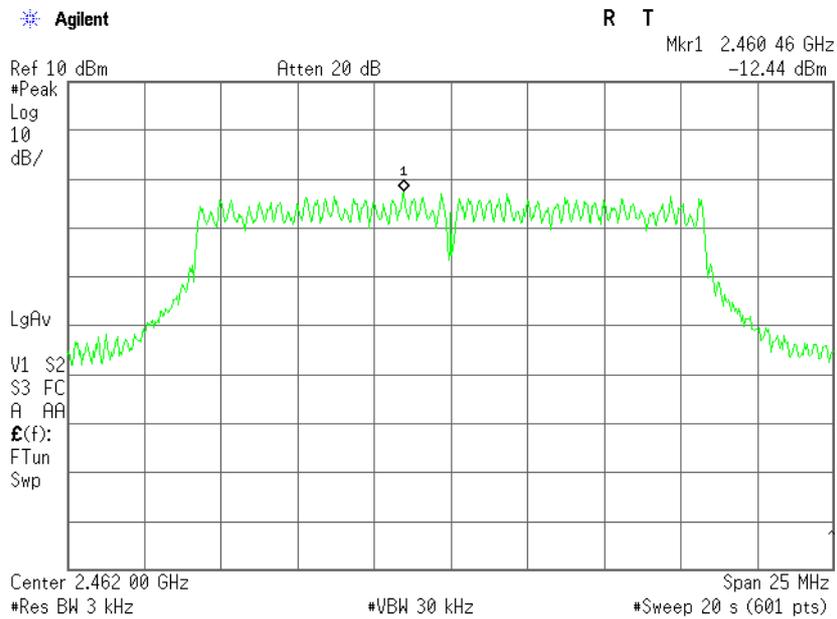
Plot 4.3.4 Peak PSD test results, 802.11g Mode, Fc = 2412 MHz



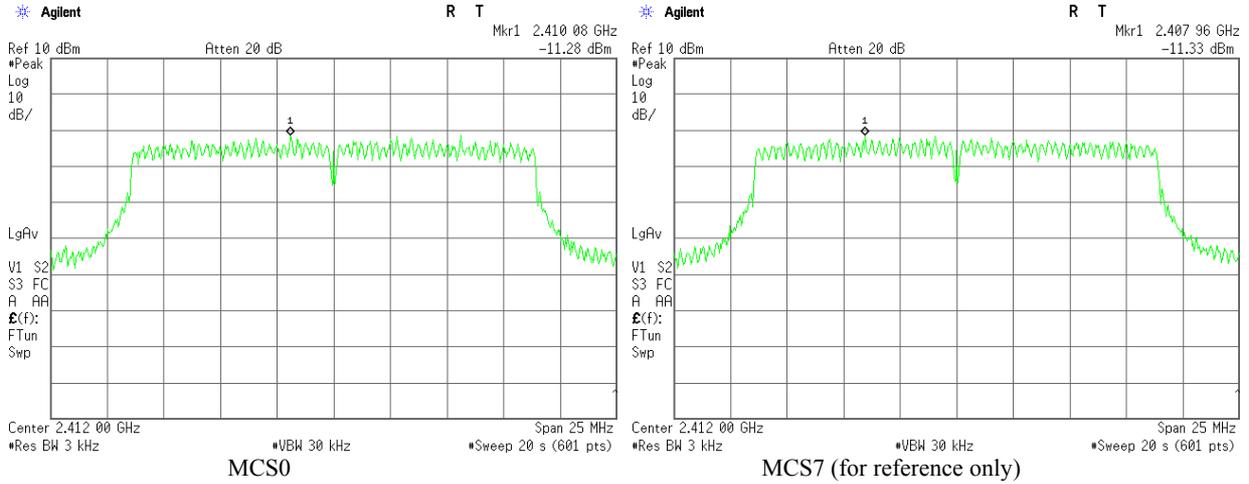
Plot 4.3.5 Peak PSD test results, 802.11g Mode, Fc = 2437 MHz



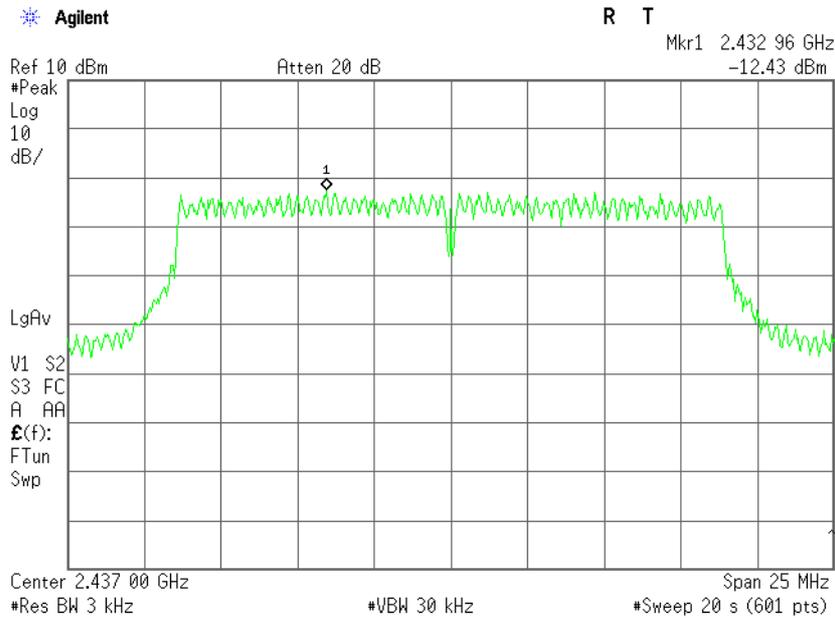
Plot 4.3.6 Peak PSD test results, 802.11g Mode, Fc = 2462 MHz



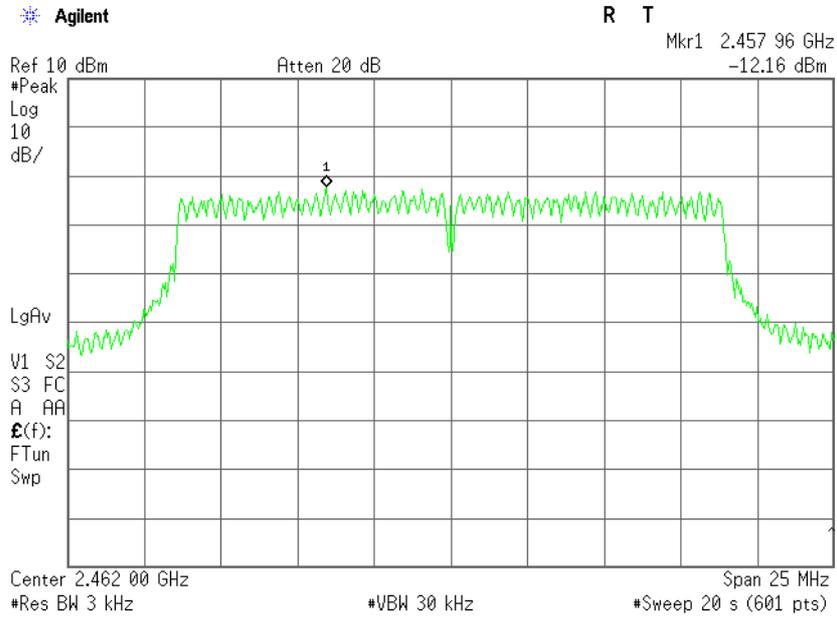
Plot 4.3.7 Peak PSD test results, 802.11n 20MHz Mode, Fc = 2412 MHz



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	Pass	
Method of testing:	Conducted KDB 558074 D01 v03, 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:

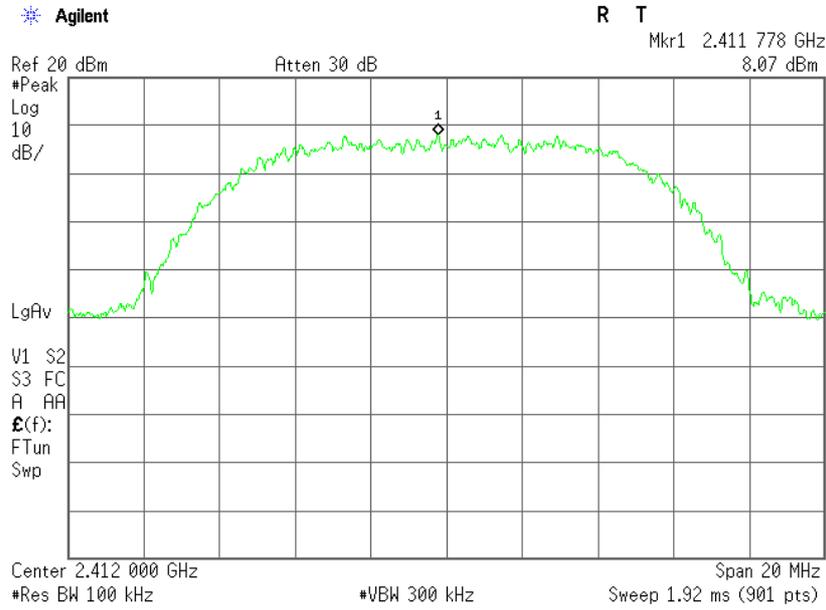
Fundamental Frequency, [MHz]	Data Rate, [Mbps]	Fundamental Emission Reference Level, [dBm]	Unwanted Emissions Frequency, [MHz]	Unwanted Emissions Level, [dBm]	Attenuation below Reference Level, [dBc]	Limit, [dBc]	Margin [dB]
802.11b Mode							
2412	11	8.07	*	*	*	≥ 30	> 15
2437	11	7.62	*	*	*	≥ 30	> 15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

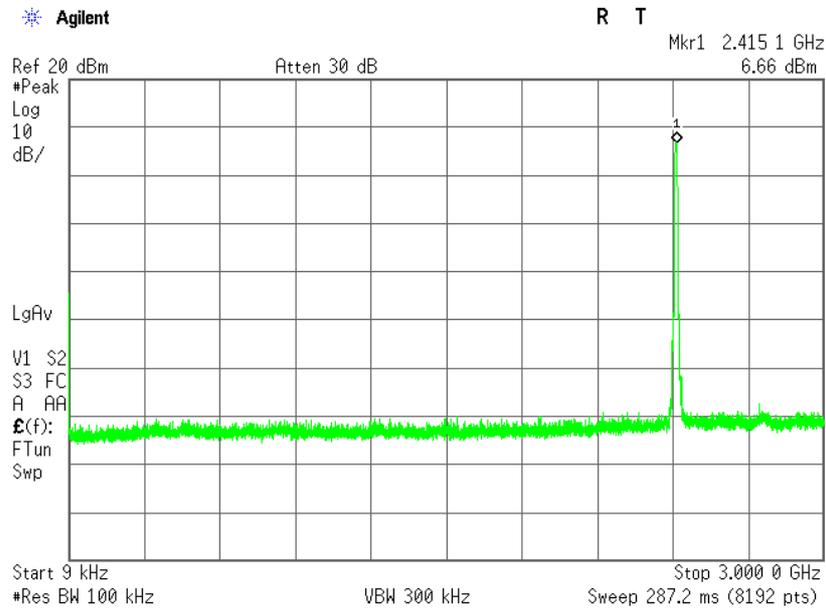
Band Edge

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

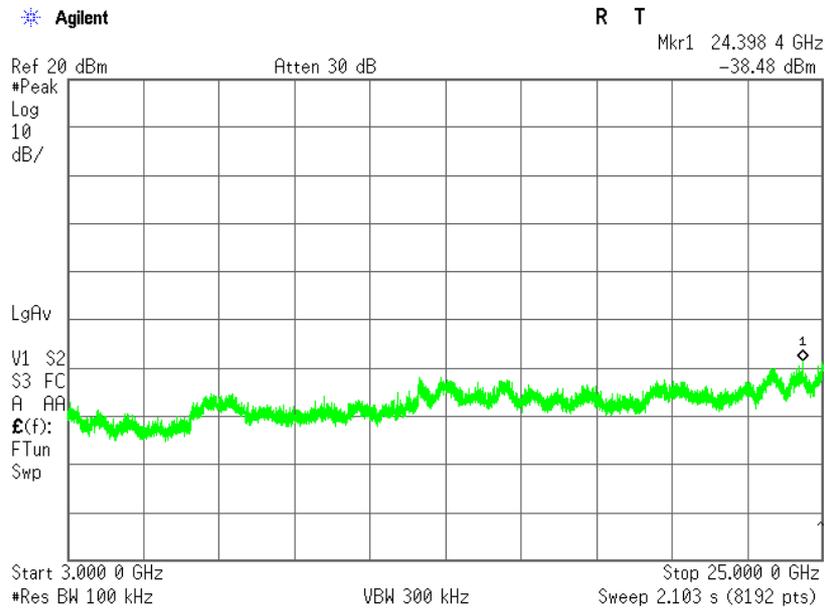
Plot 4.4.1 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2412 MHz, reference level



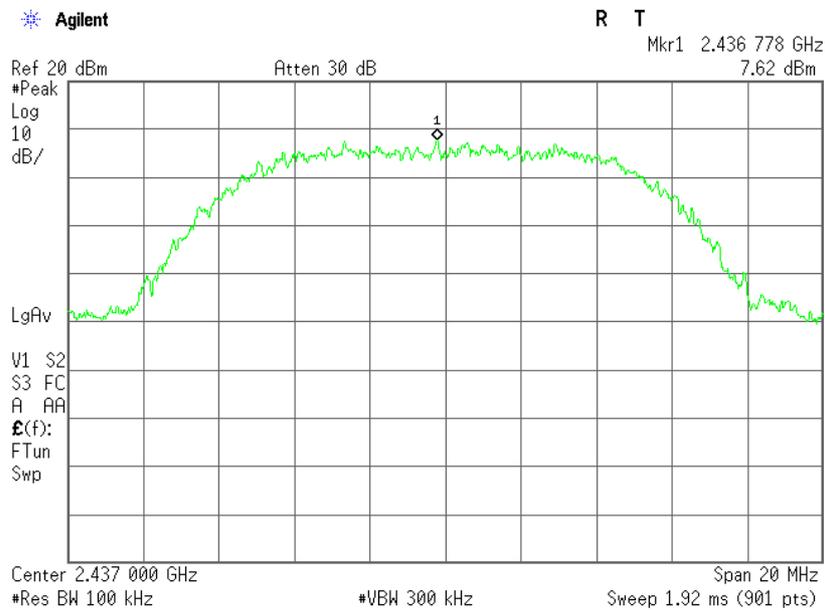
Plot 4.4.2 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2412 MHz, 9 kHz – 3 GHz range



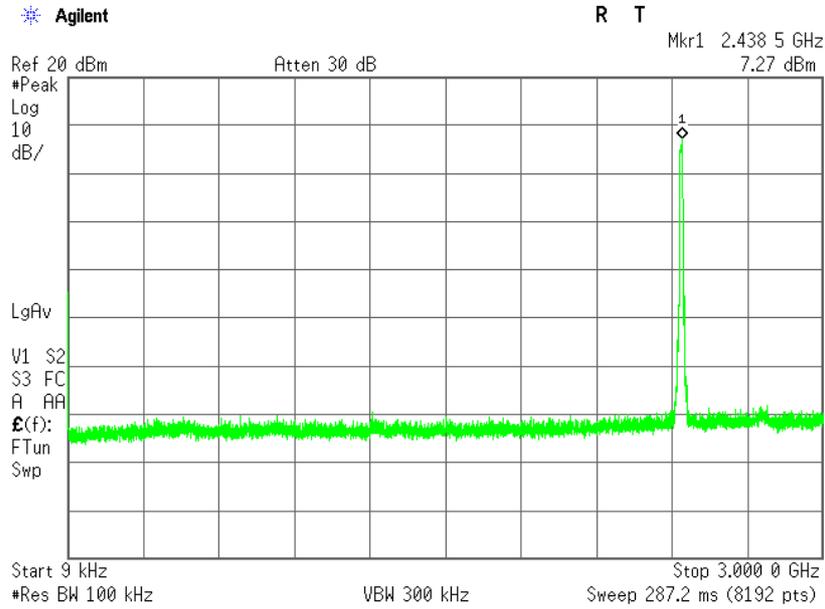
Plot 4.4.3 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2412 MHz, 3 GHz – 25 GHz range



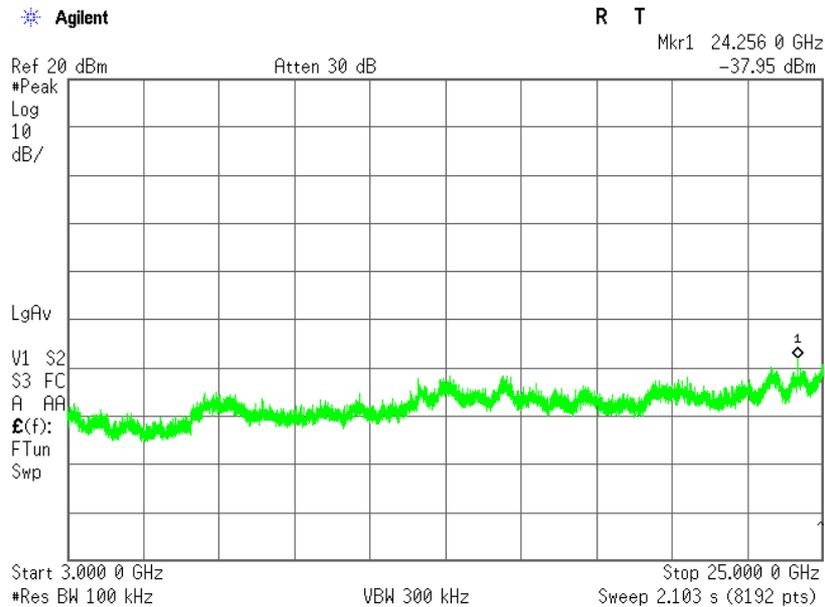
Plot 4.4.4 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2437 MHz, reference level



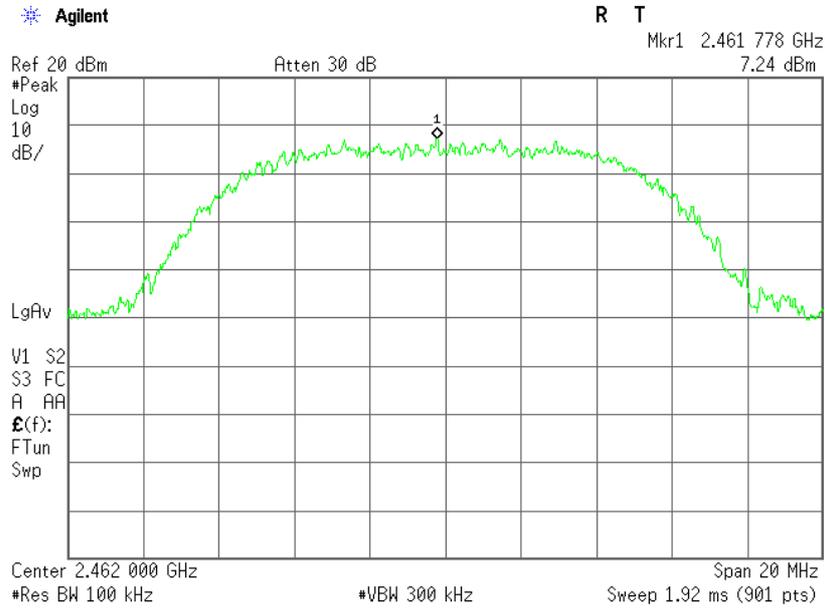
Plot 4.4.5 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2437 MHz, 9 kHz – 3 GHz range



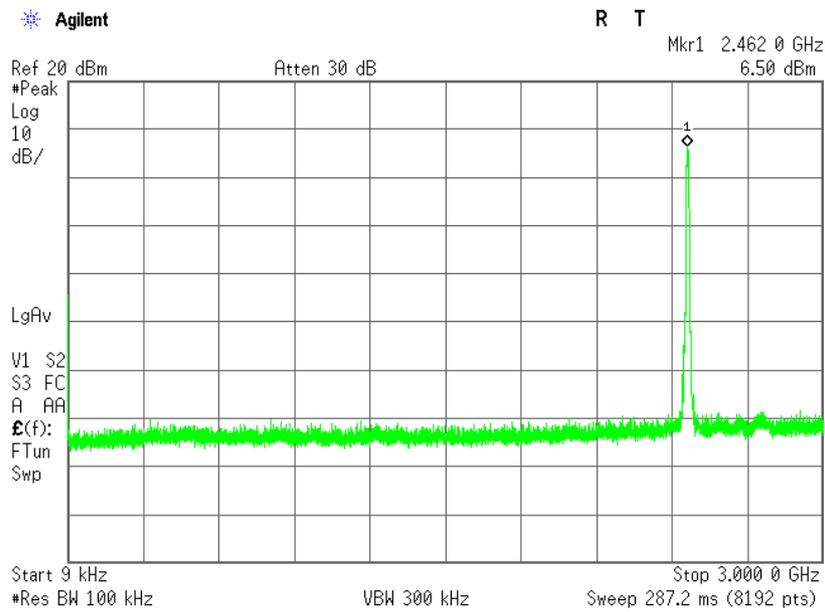
Plot 4.4.6 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2437 MHz, 3 GHz – 25 GHz range



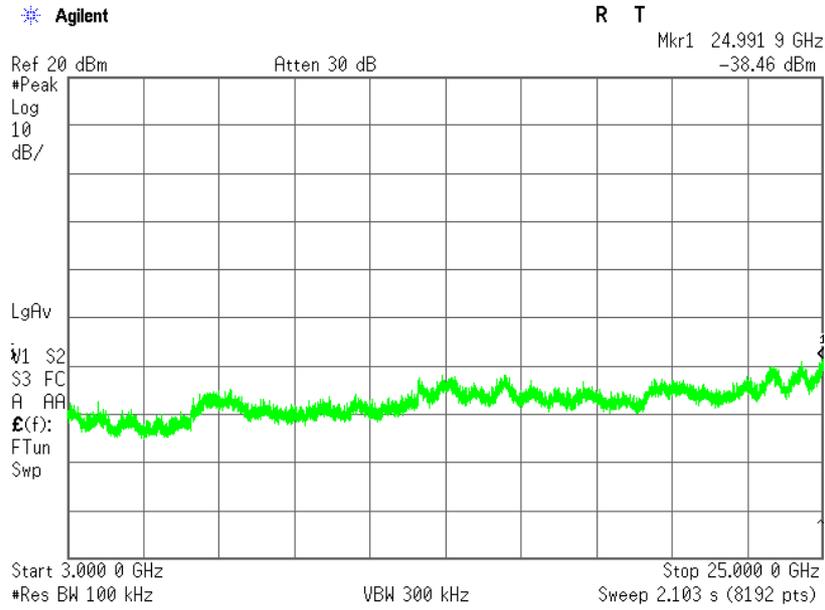
Plot 4.4.7 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2462 MHz, reference level



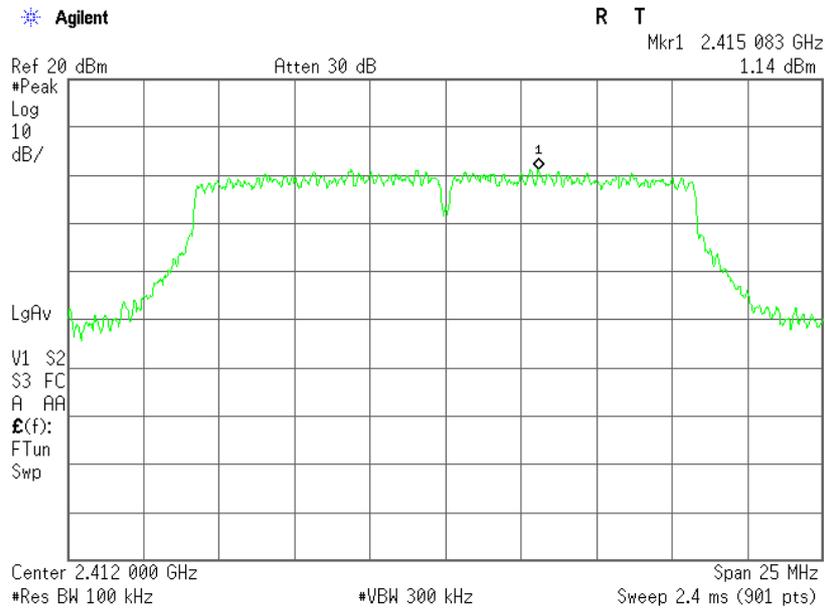
Plot 4.4.8 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2462 MHz, 9 kHz – 3 GHz range



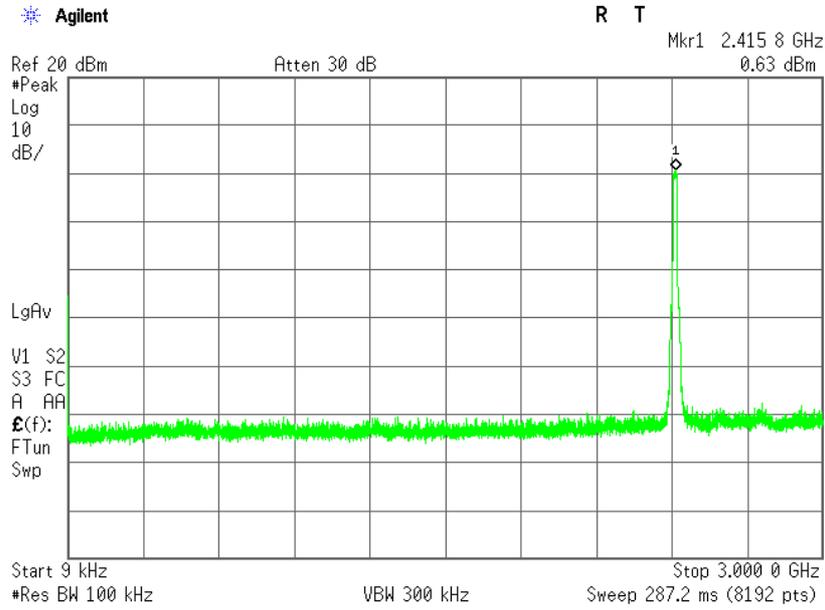
Plot 4.4.9 Conducted Spurious Emissions test results, 802.11b Mode, Fc = 2462 MHz, 3 GHz – 25 GHz range



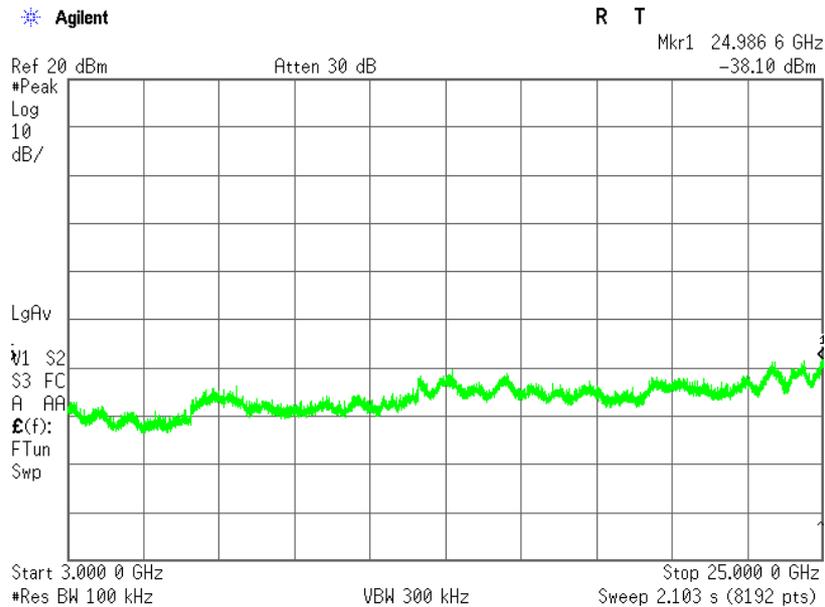
Plot 4.4.10 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2412 MHz, reference level



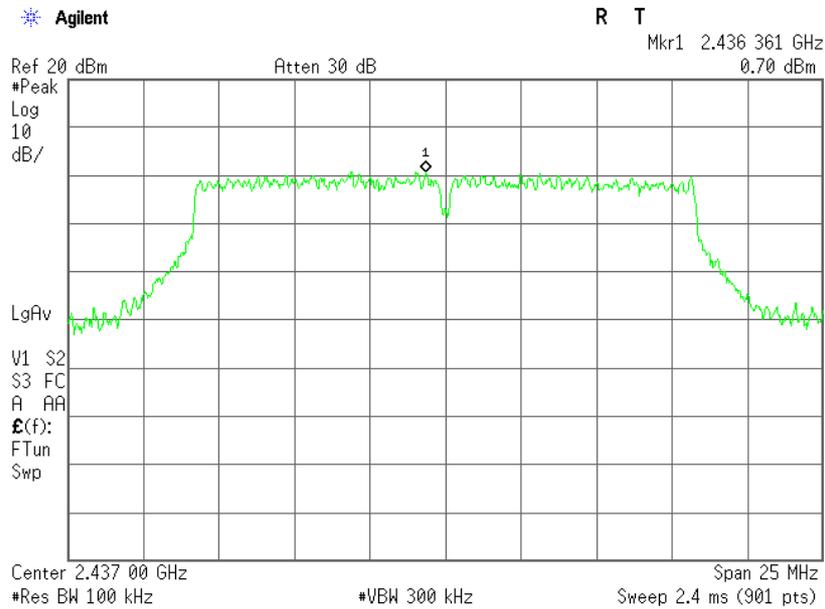
Plot 4.4.11 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2412 MHz, 9 kHz – 3 GHz range



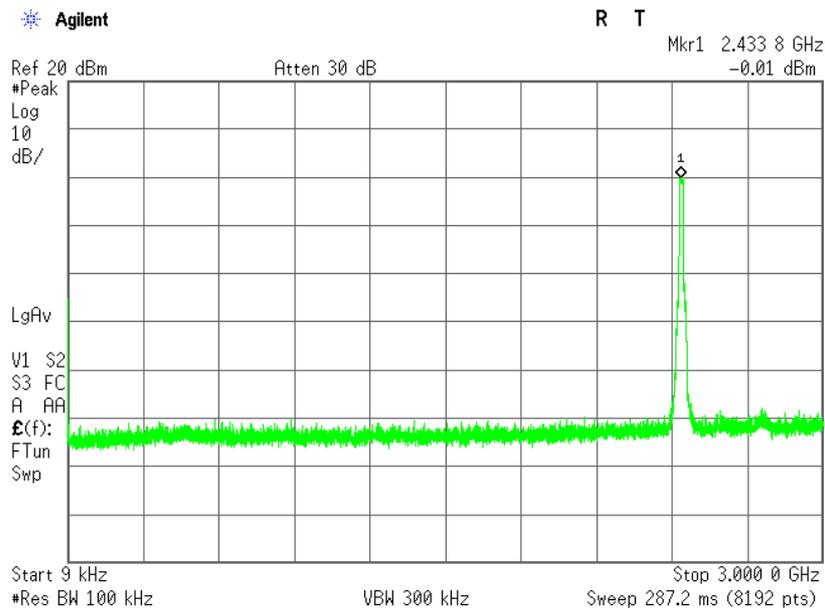
Plot 4.4.12 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2412 MHz, 3 GHz – 25 GHz range



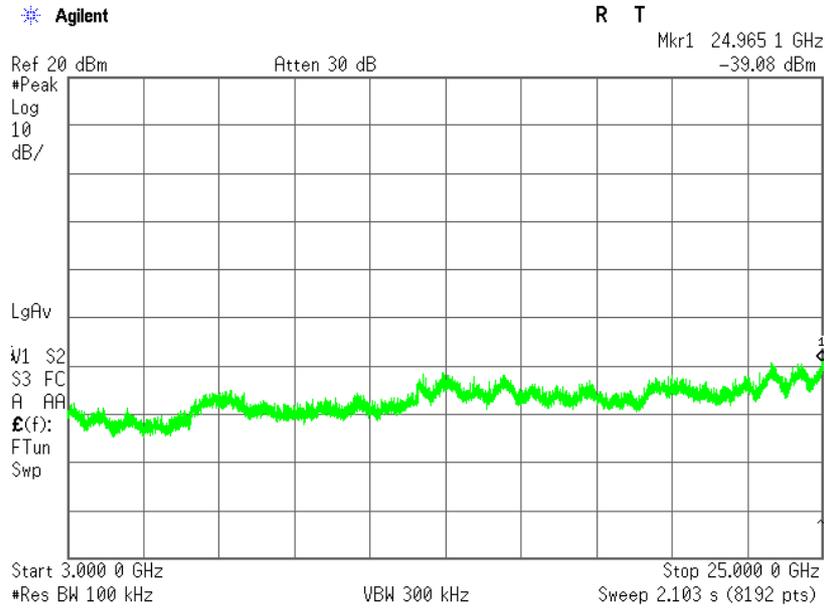
Plot 4.4.13 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2437 MHz, reference level



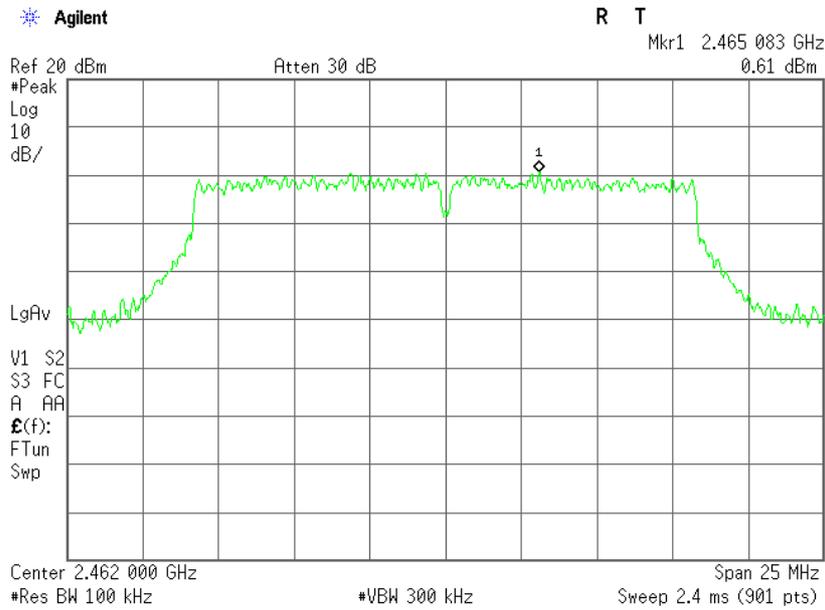
Plot 4.4.14 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2437 MHz, 9 kHz – 3 GHz range



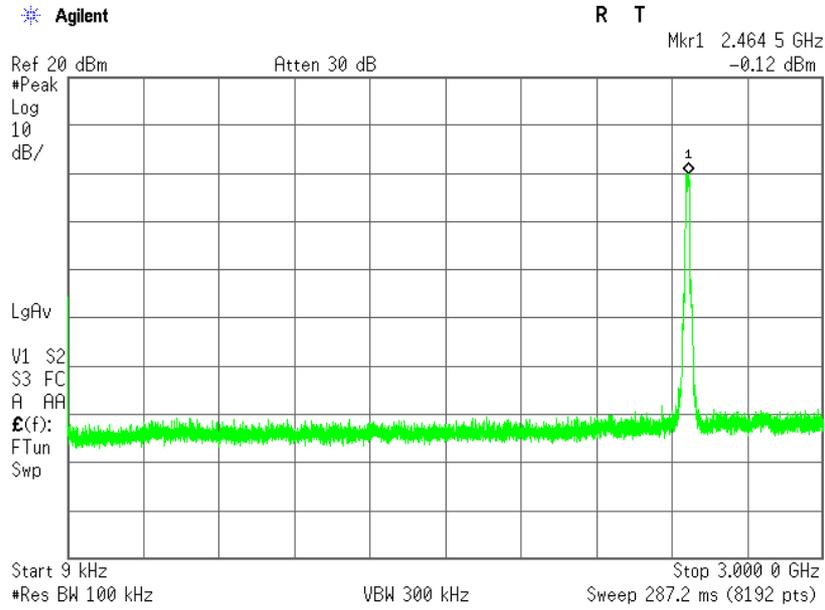
Plot 4.4.15 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2437 MHz, 3 GHz – 25 GHz range



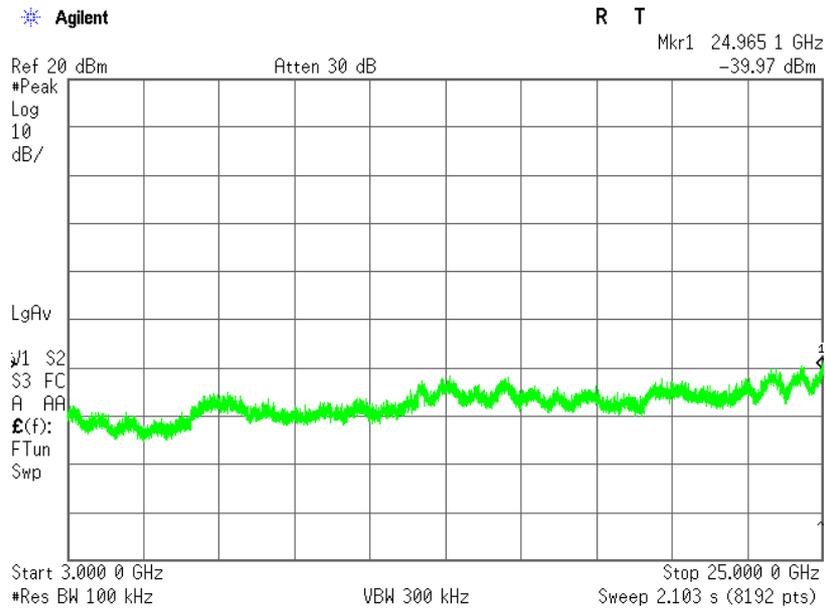
Plot 4.4.16 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2462 MHz, reference level



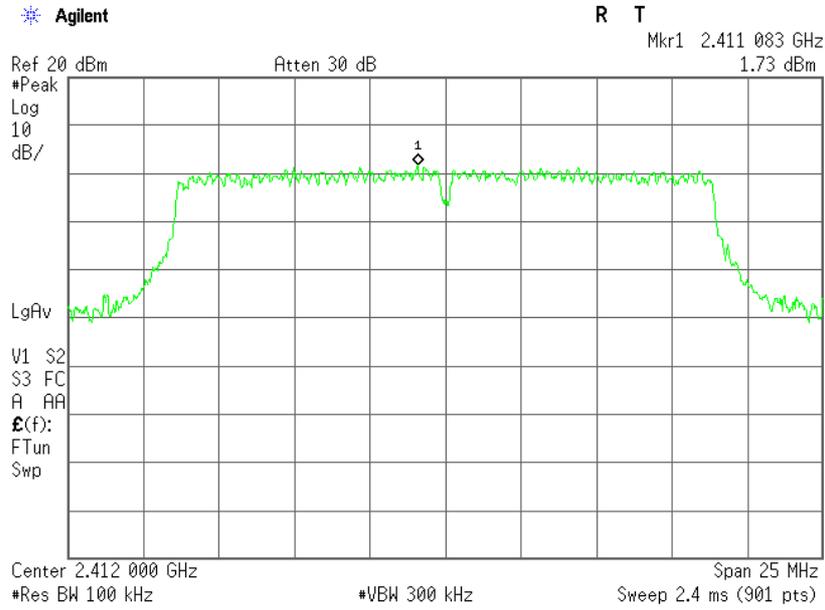
Plot 4.4.17 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2462 MHz, 9 kHz – 3 GHz range



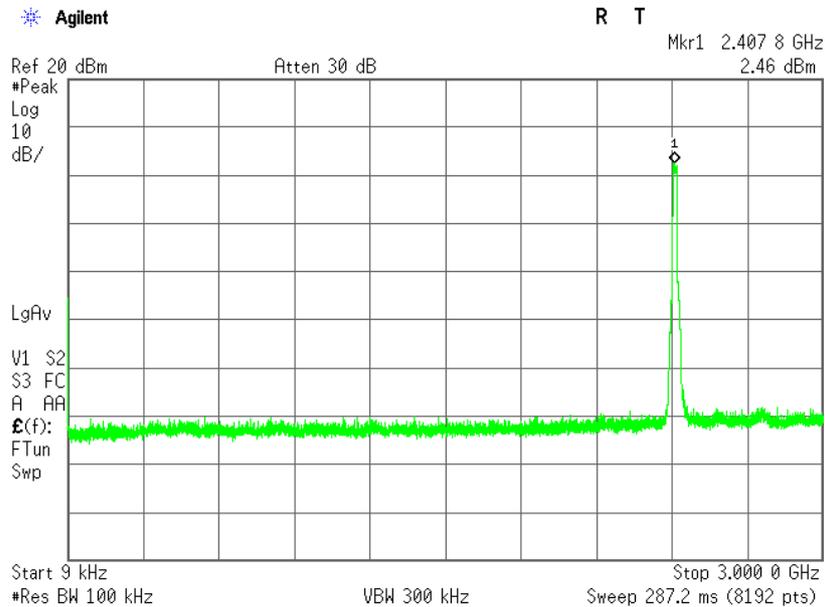
Plot 4.4.18 Conducted Spurious Emissions test results, 802.11g Mode, Fc = 2462 MHz, 3 GHz – 25 GHz range



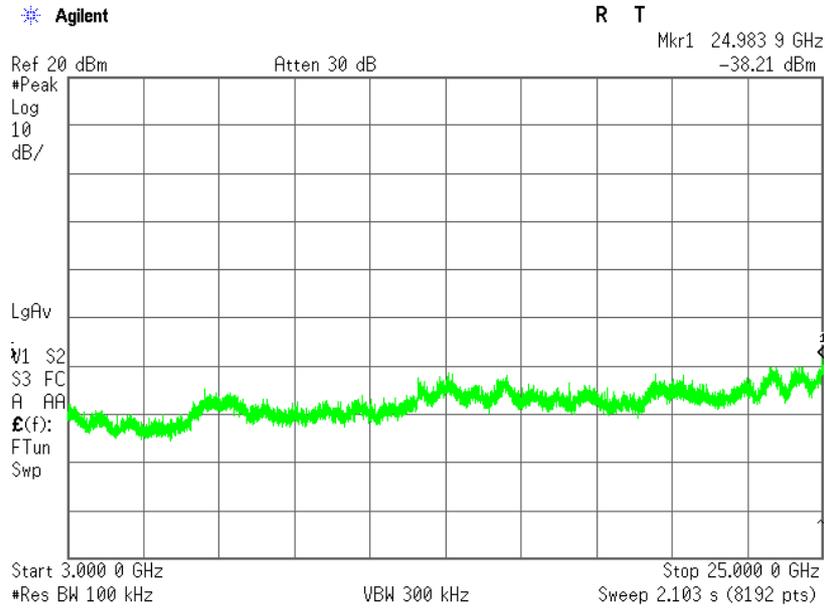
Plot 4.4.19 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2412 MHz, reference level



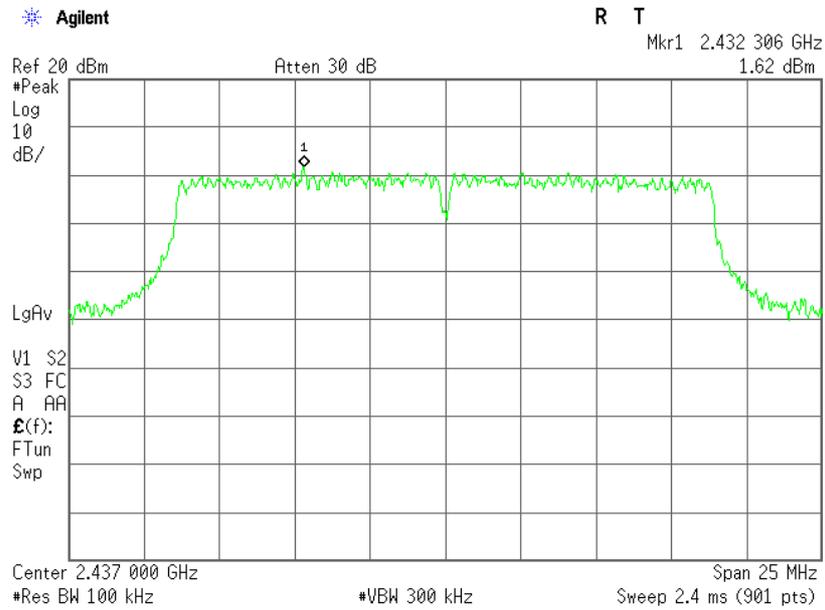
Plot 4.4.20 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2412 MHz, 9 kHz – 3 GHz range



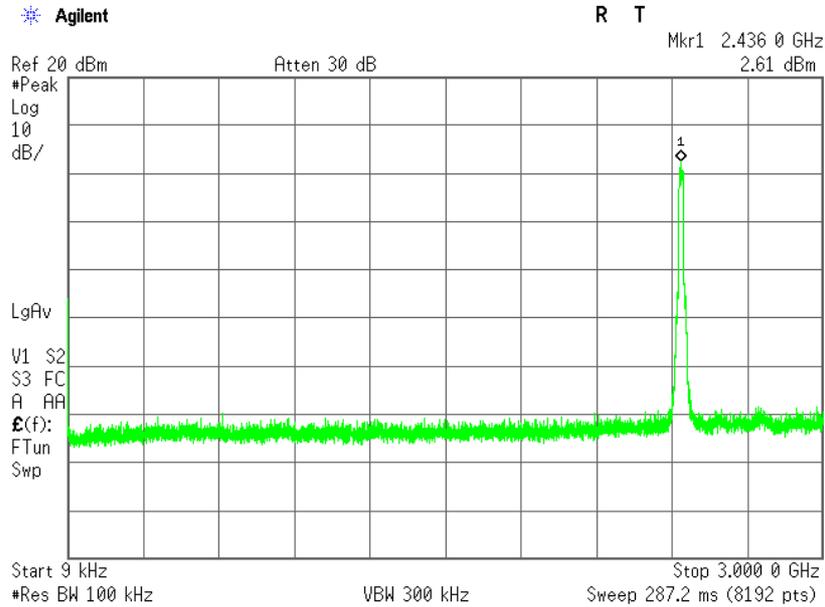
Plot 4.4.21 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2412 MHz, 3 GHz – 25 GHz range



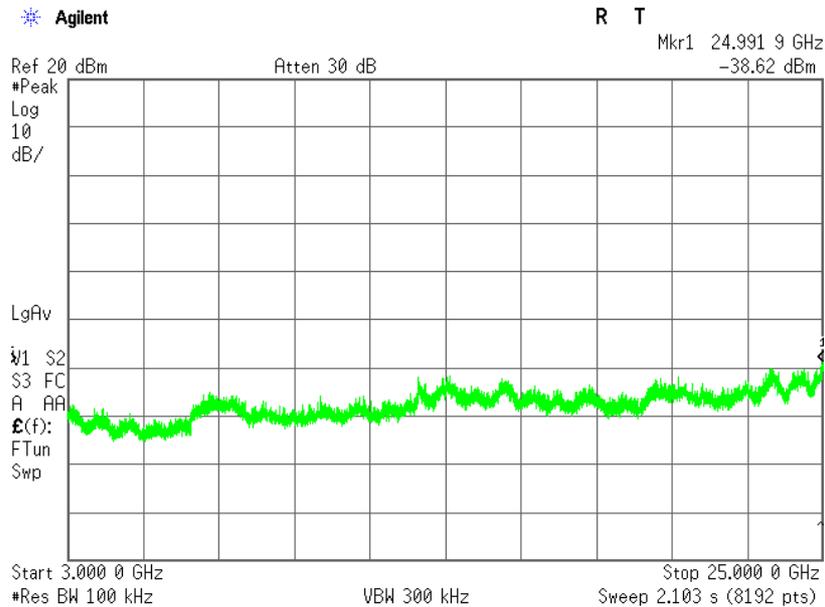
Plot 4.4.22 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2437 MHz, reference level



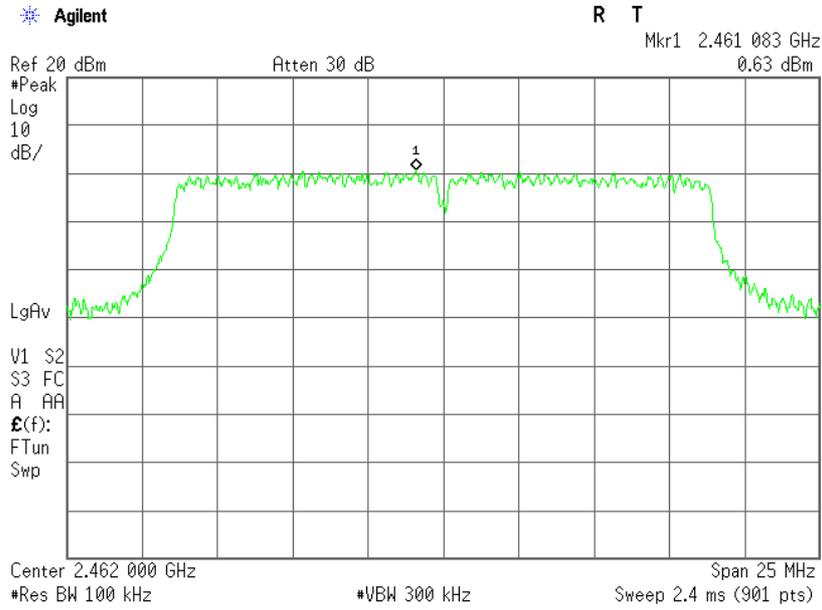
Plot 4.4.23 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2437 MHz, 9 kHz – 3 GHz range



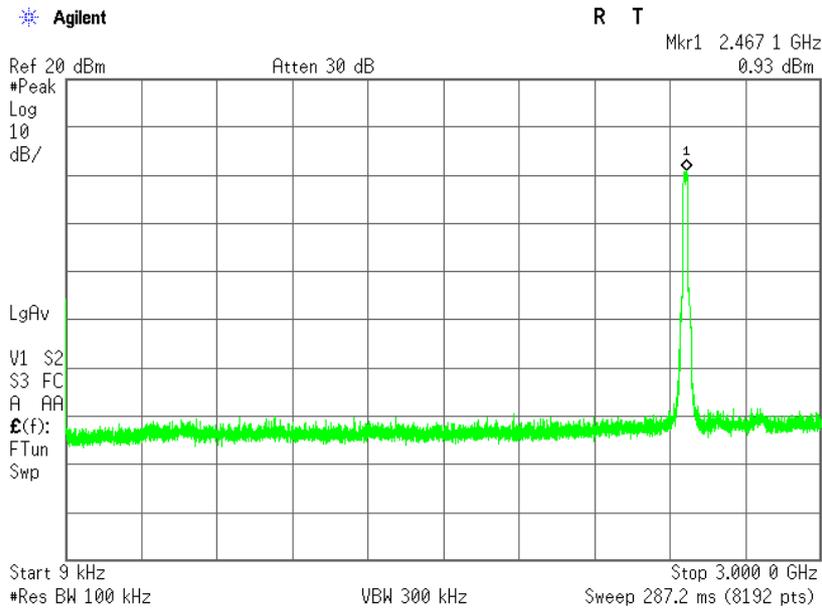
Plot 4.4.24 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2437 MHz, 3 GHz – 25 GHz range



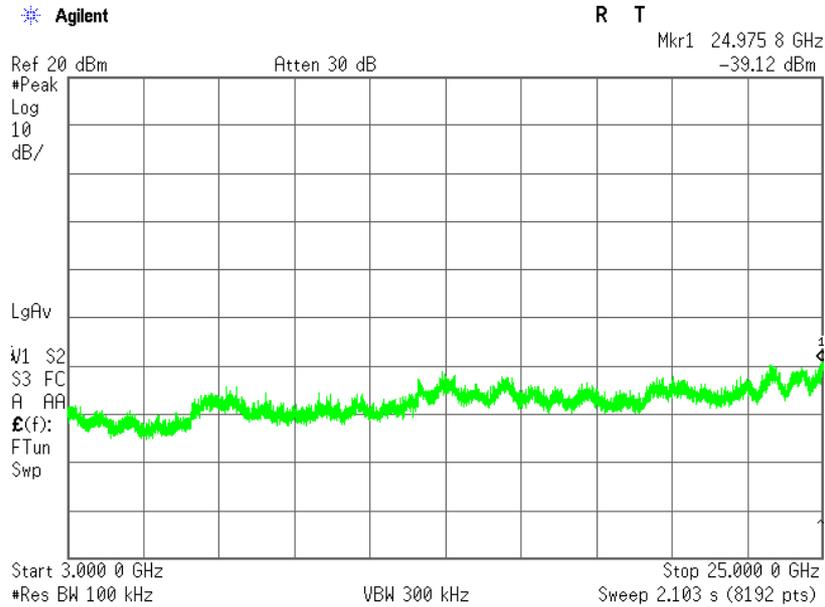
Plot 4.4.25 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2462 MHz, reference level



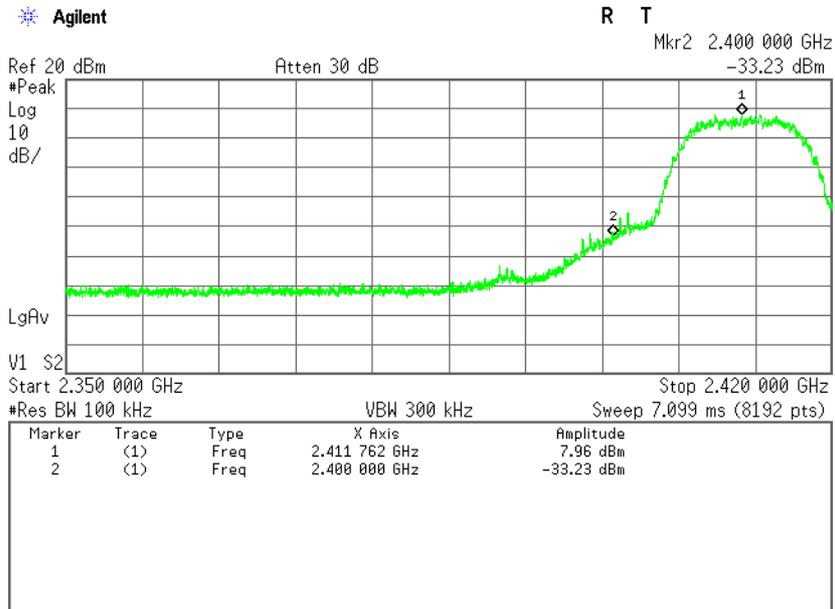
Plot 4.4.26 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2462 MHz, 9 kHz – 3 GHz range



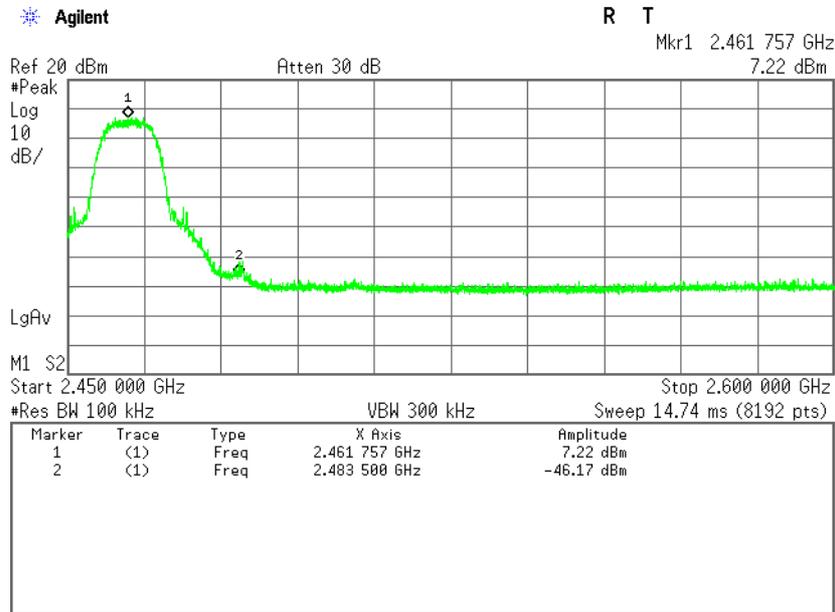
Plot 4.4.27 Conducted Spurious Emissions test results, 802.11n 20MHz Mode, Fc = 2462 MHz, 3 GHz – 25 GHz range



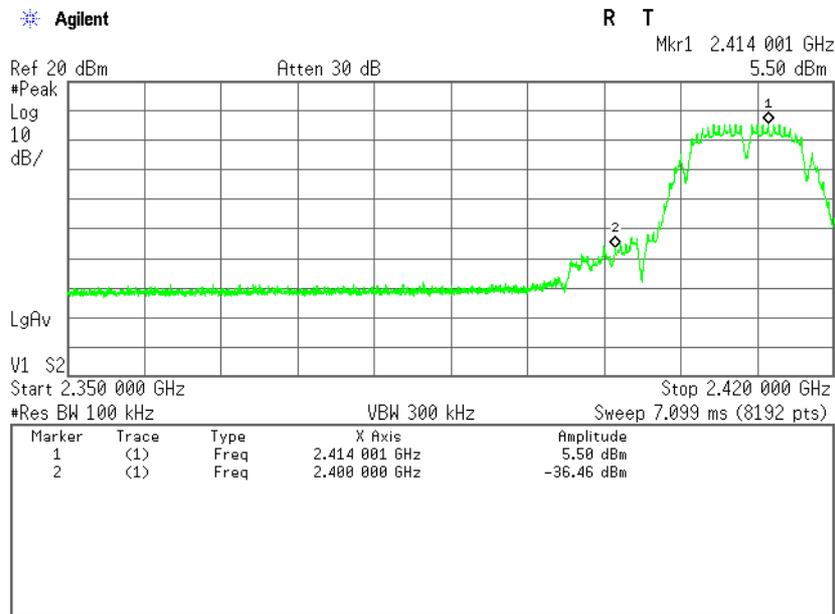
Plot 4.4.28 Band Edge test results, 802.11b Mode, Fc = 2412 MHz



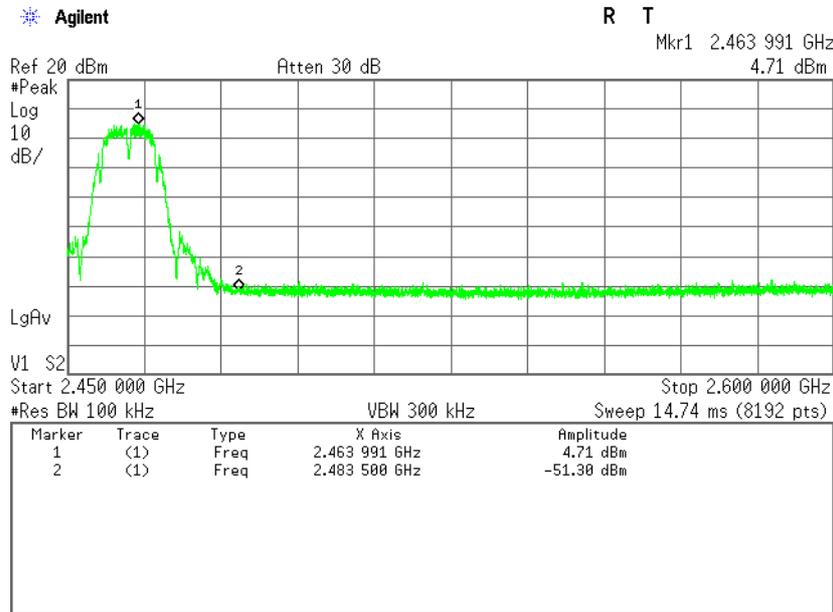
Plot 4.4.29 Band Edge test results, 802.11b Mode, Fc = 2462 MHz



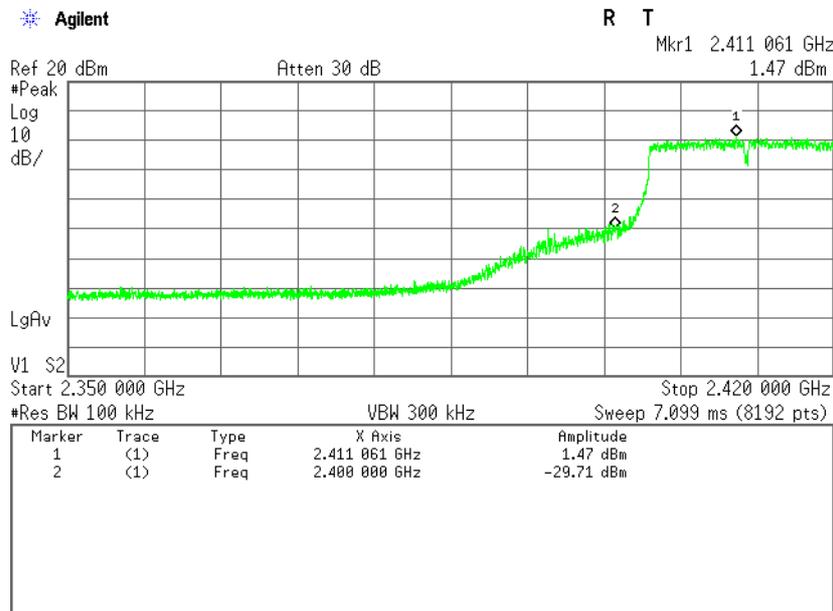
Plot 4.4.30 Band Edge test results, 802.11g Mode, Fc = 2412 MHz



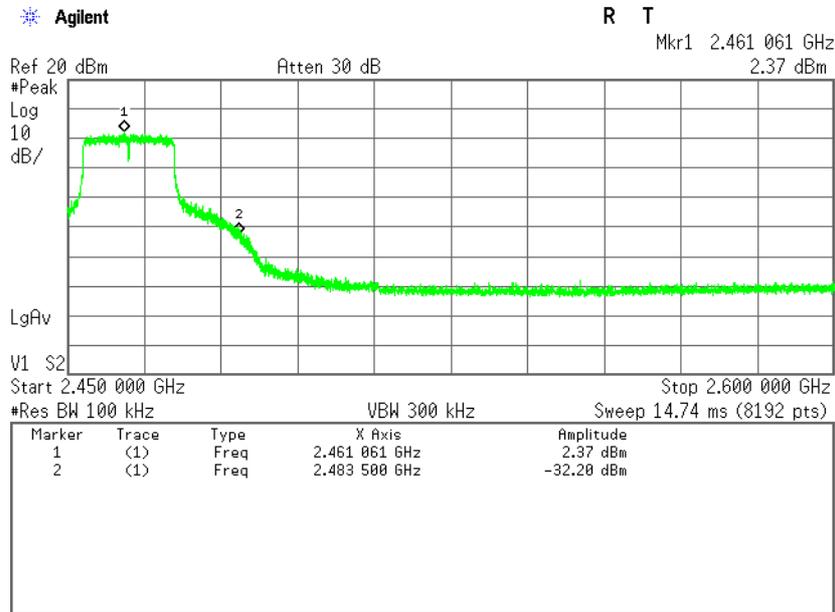
Plot 4.4.31 Band Edge test results, 802.11g Mode, Fc = 2462 MHz



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	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	Peak: RBW= 1MHz, VBW= 3MHz, Average: VBW= 10 Hz		
Environment conditions:	Ambient Temperature: 22 °c	Relative Humidity:48%	Atmospheric Pressure: hPa
Test Result:	See below	See Plot 4.5.1 to Plot 4.5.12	

Test results:

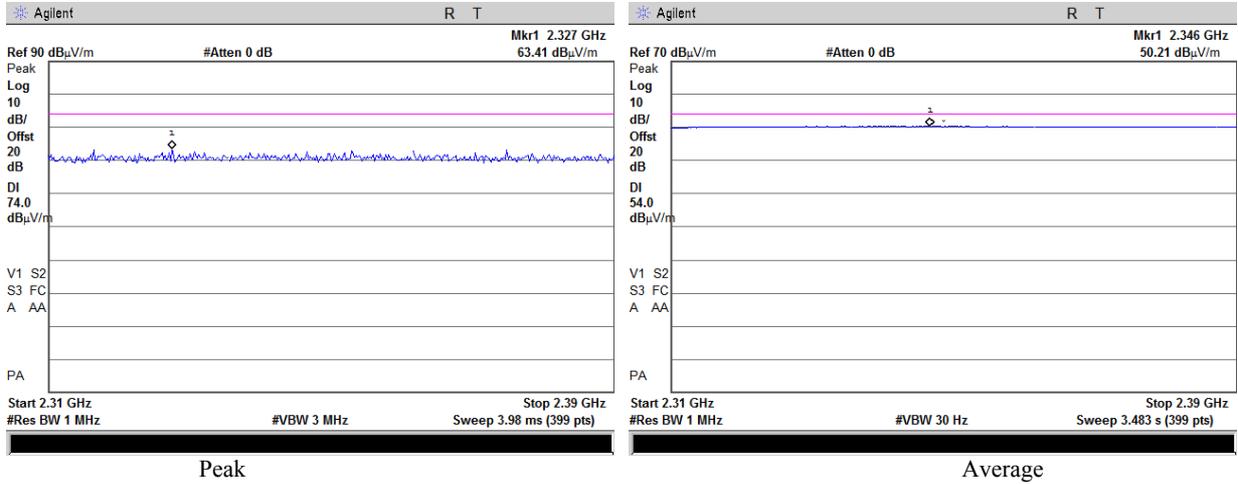
All measurements were performed in horizontal and vertical polarizations; the results show the worst case.

Frequency, [MHz]	Data Rate, [Mbps]	Emission Frequency, [MHz]	Detector Type	Antenna Polarization	Emission Level, [dBµV/m]	Limit, [dBµV/m]	Margin, [dB]
802.11b Mode							
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
802.11g Mode							
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

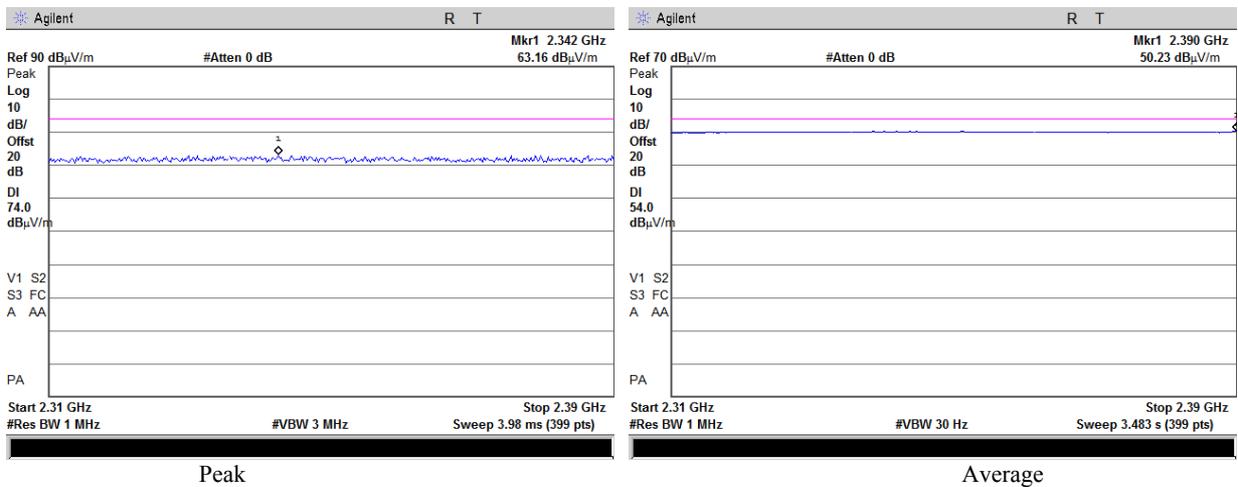
Frequency, [MHz]	Data Rate, [Mbps]	Emission Frequency, [MHz]	Detector Type	Antenna Polarization	Emission Level, [dBμV/m]	Limit, [dBμV/m]	Margin, [dB]
802.11n 20MHz Mode							
2412	MCS7	2357	Peak	H	63.54	74.00	-10.46
2412	MCS7	2390	Average	H	50.46	54.00	-3.54
2412	MCS7	2389	Peak	V	68.54	74.00	-5.46
2412	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 [dBμV/m] = measured [dBμV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

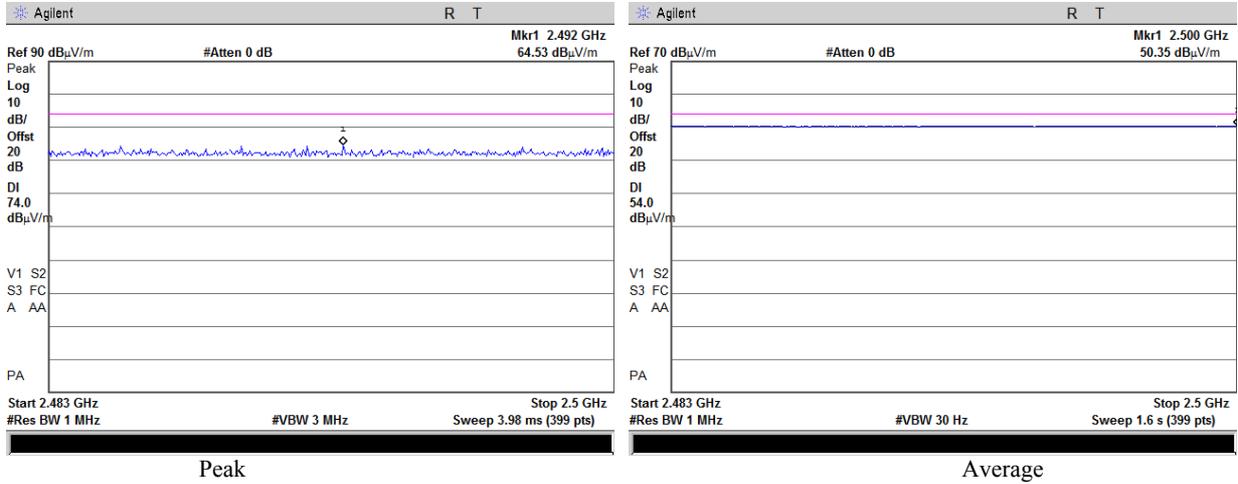
Plot 4.5.1 Radiated Spurious Emission, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal



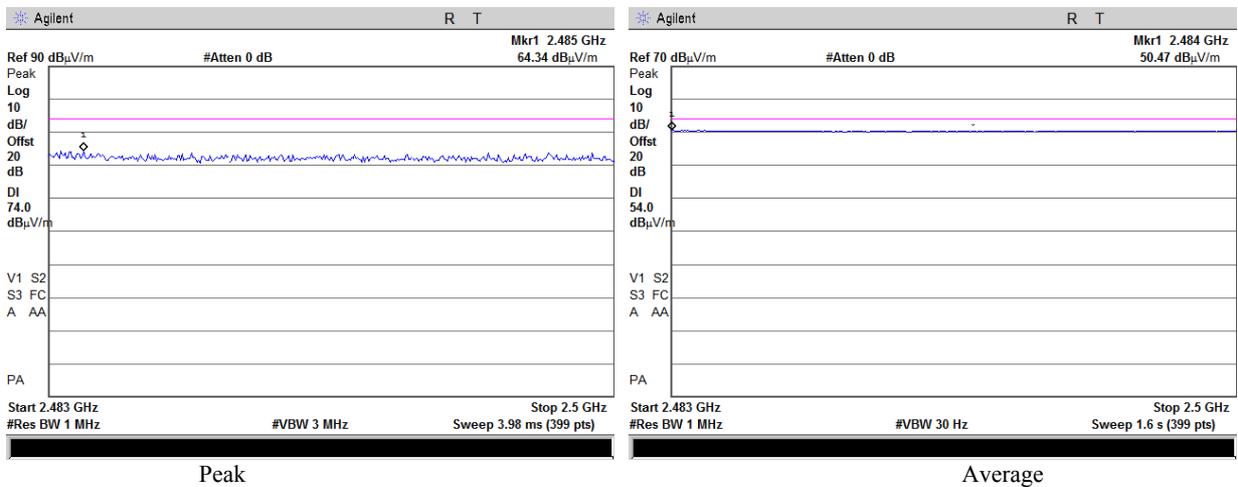
Plot 4.5.2 Radiated Spurious Emission, 802.11b, Fc = 2412 MHz, 11Mbps, Vertical



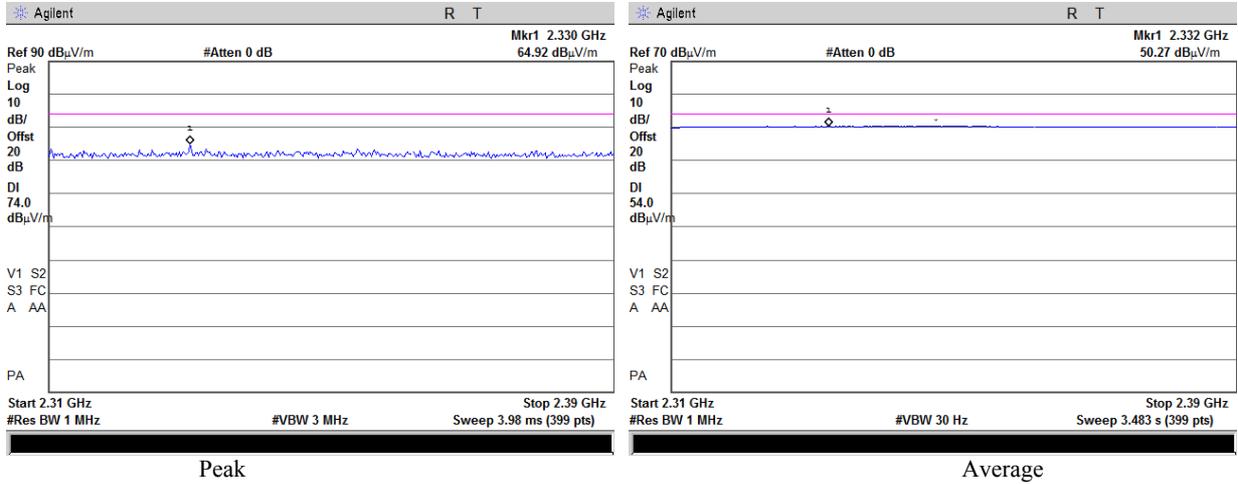
Plot 4.5.3 Radiated Spurious Emission, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal



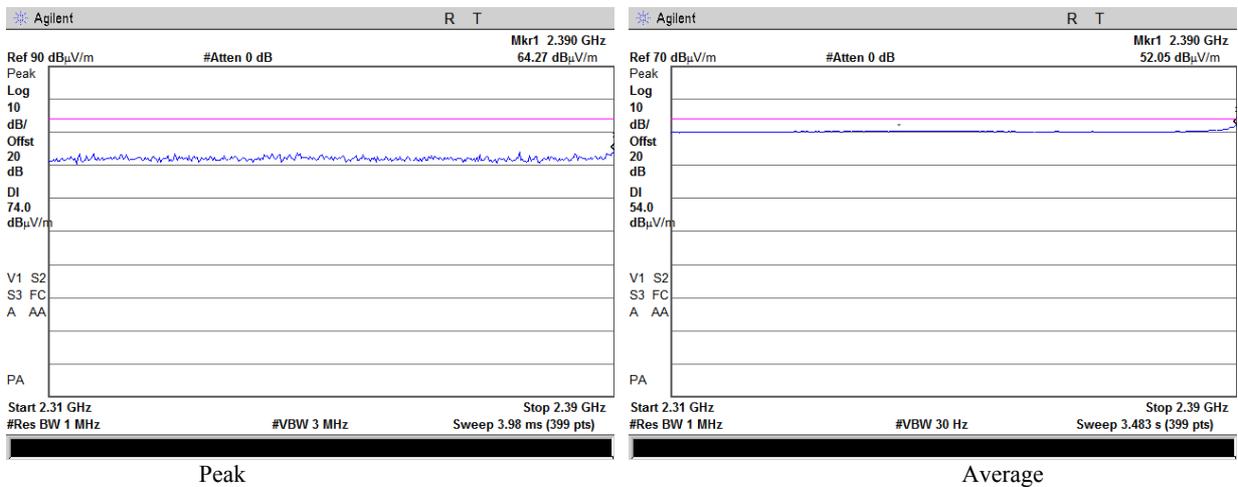
Plot 4.5.4 Radiated Spurious Emission, 802.11b, Fc = 2462 MHz, 11Mbps, Vertical



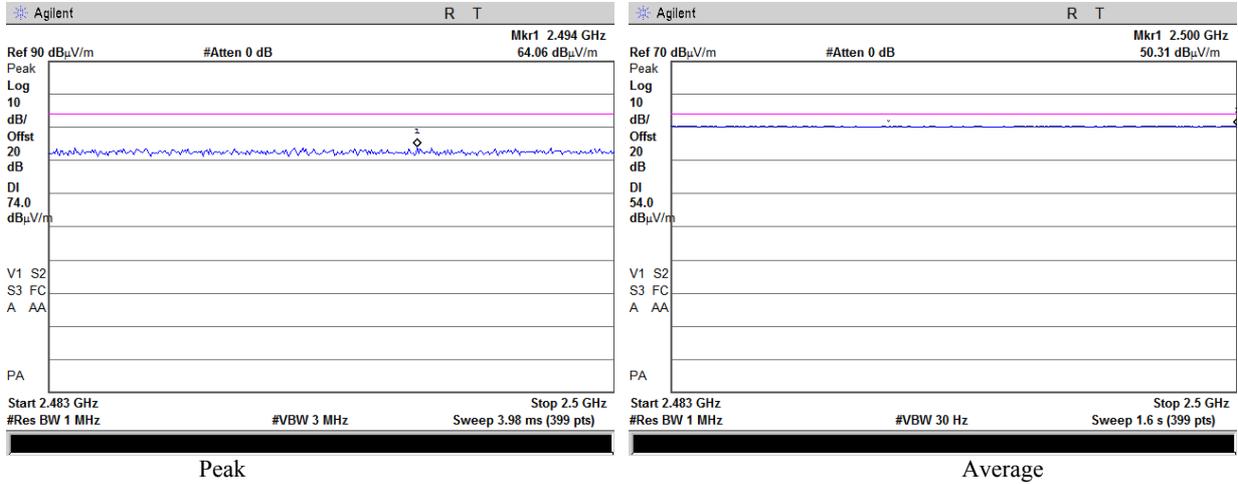
Plot 4.5.5 Radiated Spurious Emission, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal



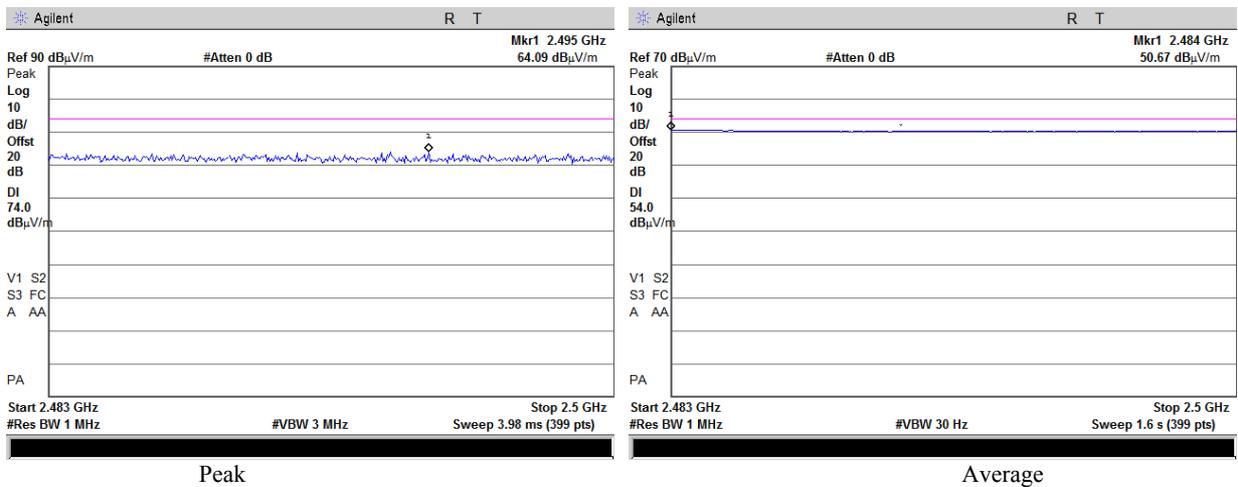
Plot 4.5.6 Radiated Spurious Emission, 802.11g, Fc = 2412 MHz, 54Mbps, Vertical



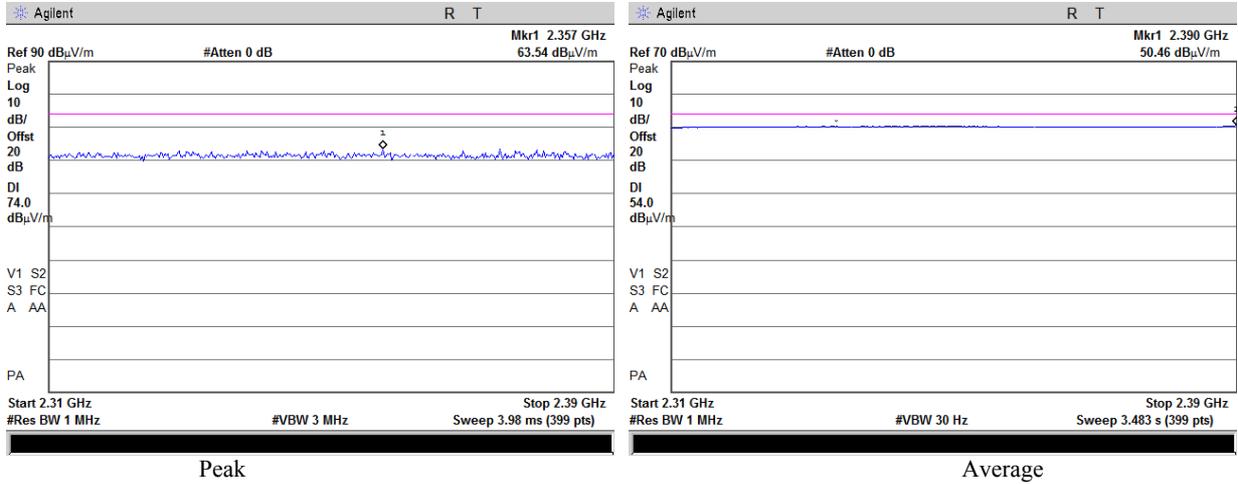
Plot 4.5.7 Radiated Spurious Emission, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal



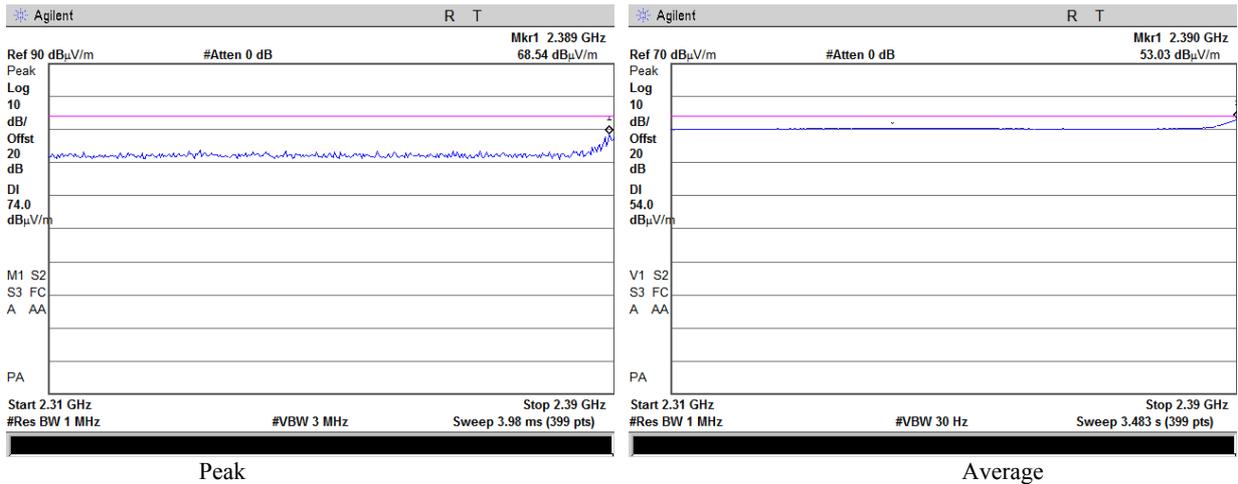
Plot 4.5.8 Radiated Spurious Emission, 802.11g, Fc = 2462 MHz, 54Mbps, Vertical



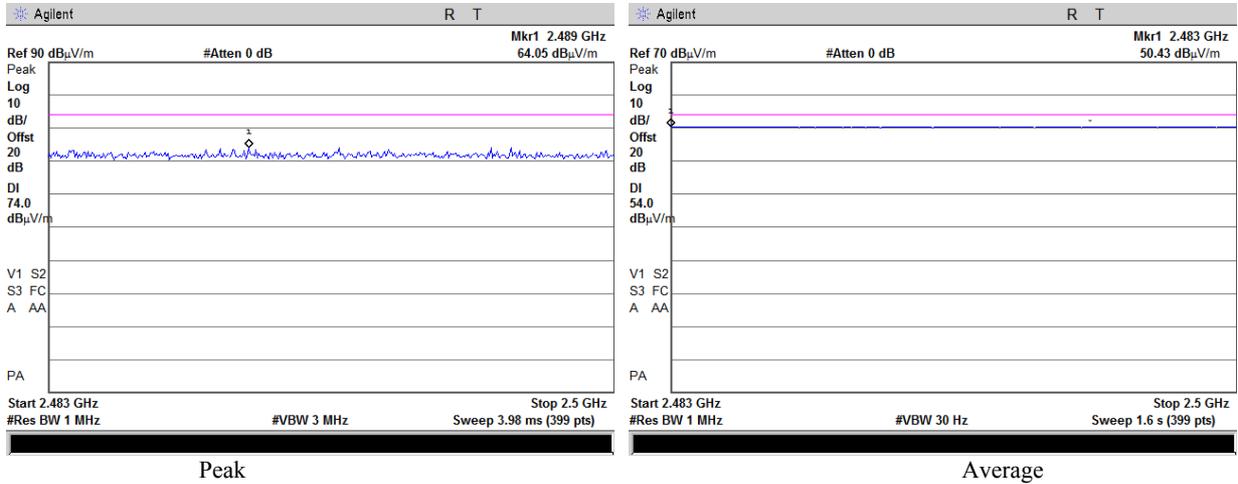
Plot 4.5.9 Radiated Spurious Emission, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal



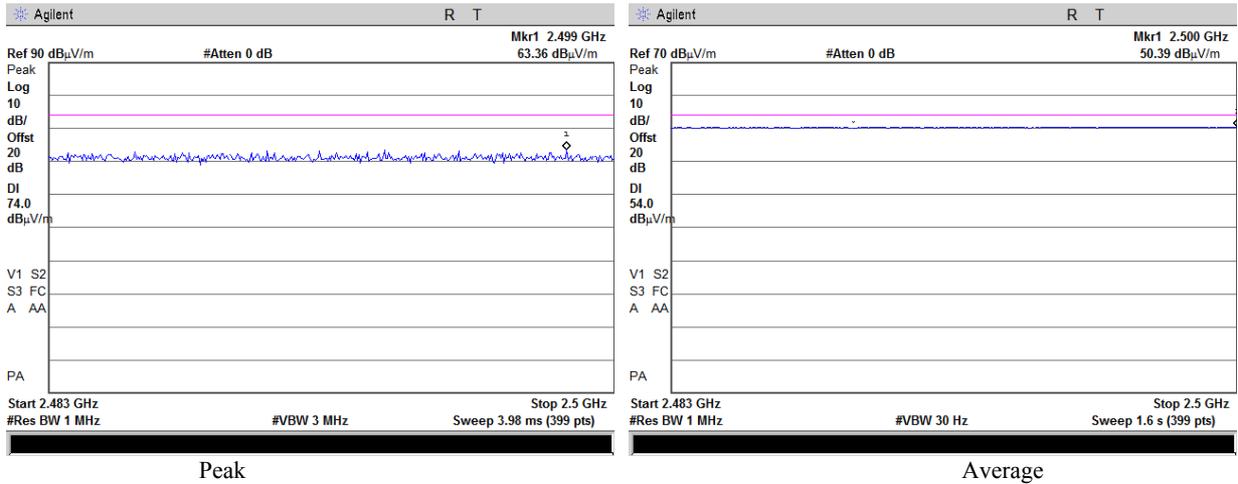
Plot 4.5.10 Radiated Spurious Emission, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Vertical



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	Pass	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f > 1GHz: Peak: RBW= 1MHz, VBW= 3MHz, Average: VBW= 10 Hz f < 1GHz: RBW: 120kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22 °c		
Test Result:	See below	See Plot 4.6.1 - Plot 4.6.29	

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]
802.11b							
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
802.11g							
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
802.11n 20MHz							
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

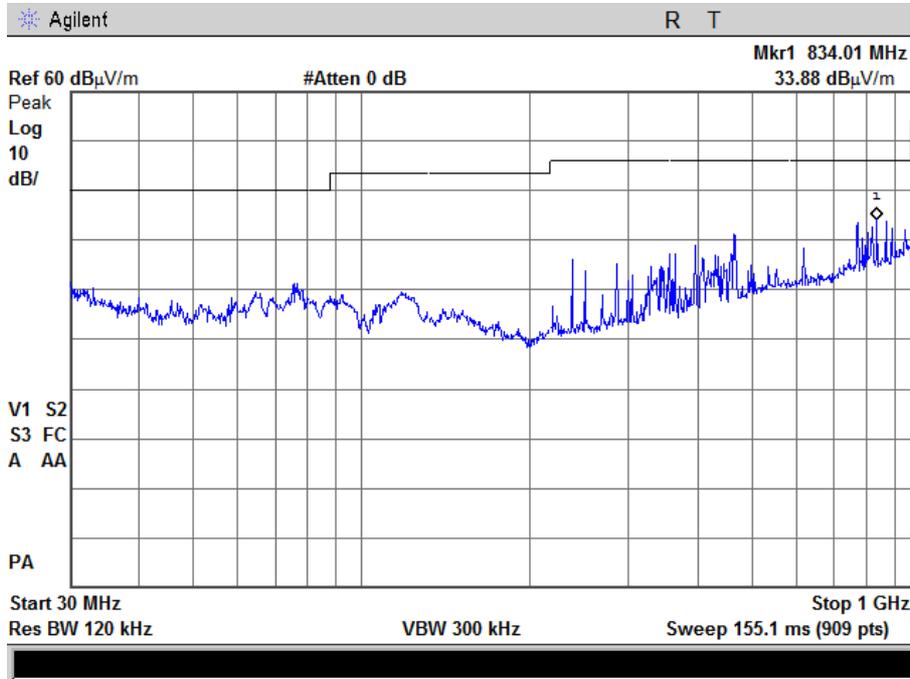
Test results below 1GHz:

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

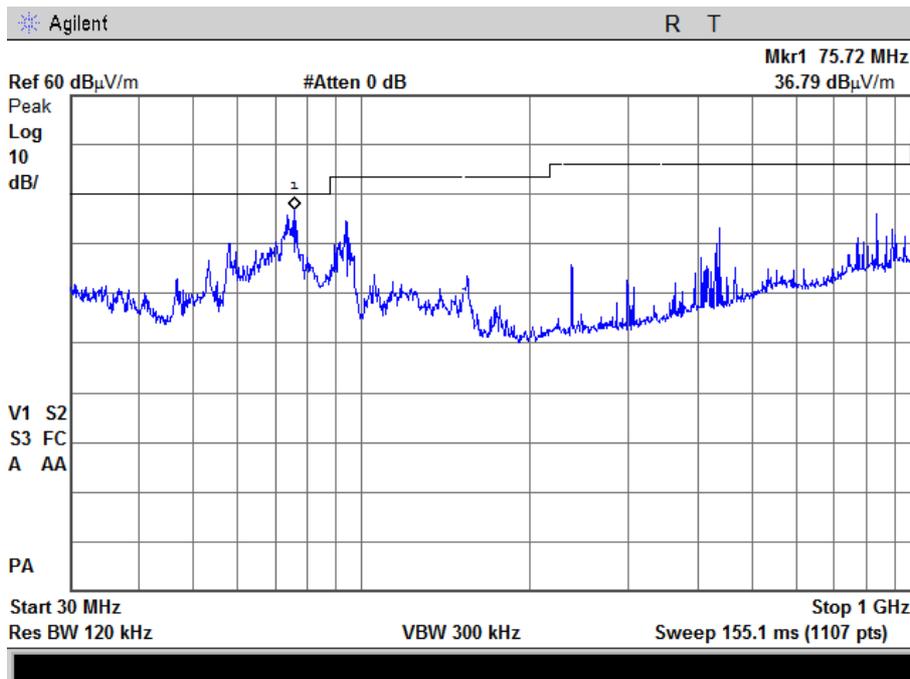
Emission Frequency [MHz]	Detector Type	Polarization H/V	Emission Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]
77.200	QP	V	35.87	40.00	-4.13
94.350	QP	V	33.47	43.00	-9.53
848.000	QP	V	32.78	46.00	-13.22

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

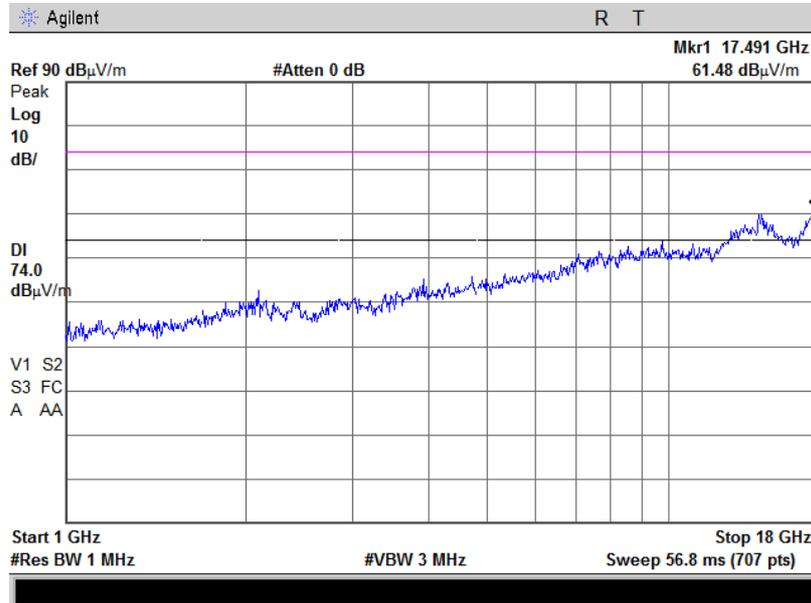
Plot 4.6.1 Radiated Spurious Emission in 30MHz-1GHz range, Worst case for all modes and all frequencies, Horizontal



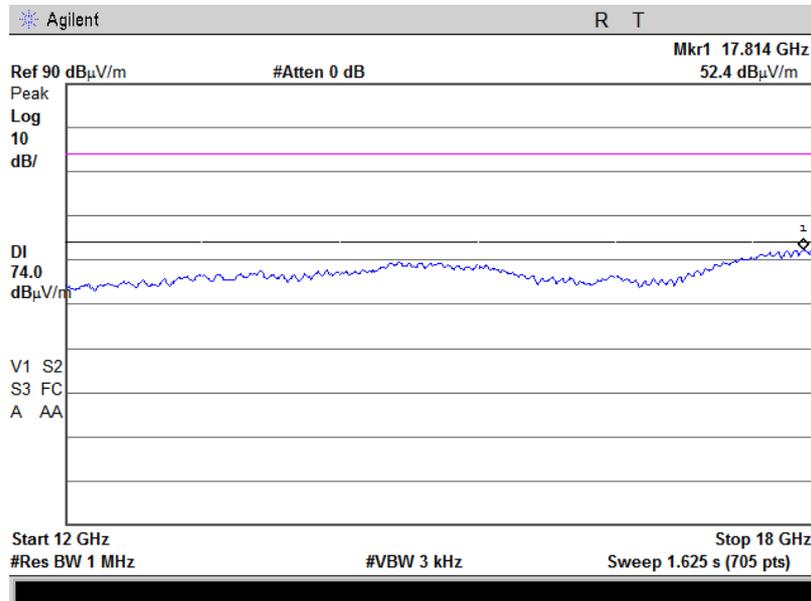
Plot 4.6.2 Radiated Spurious Emission in 30MHz-1GHz range, Worst case for all modes and all frequencies, Vertical



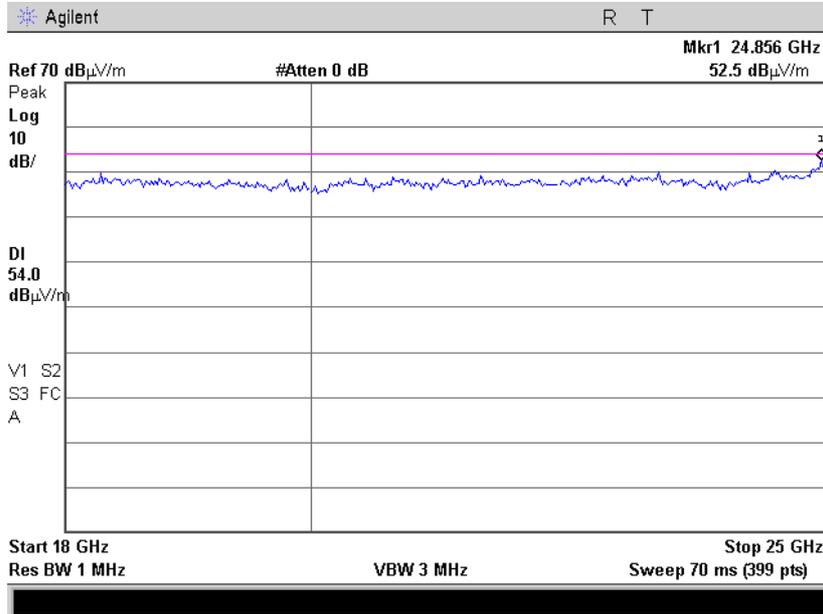
Plot 4.6.3 Radiated Spurious Emission in 1-18GHz range, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal & Vertical, Peak



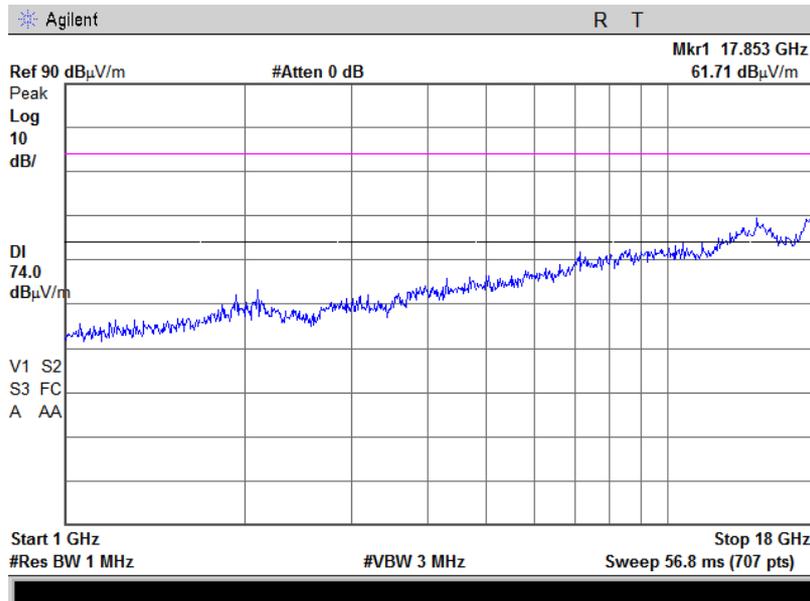
Plot 4.6.4 Radiated Spurious Emission in 12-18GHz range, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal & Vertical, Average



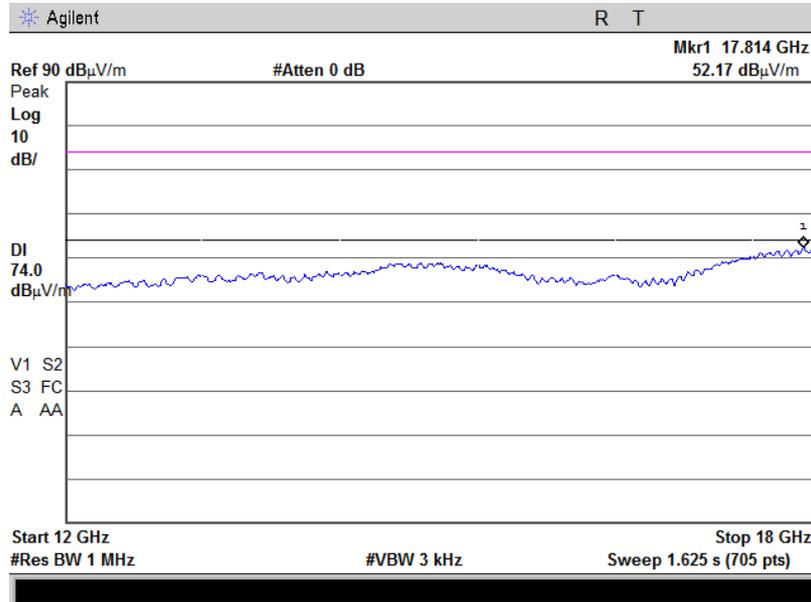
Plot 4.6.5 Radiated Spurious Emission in 18-25GHz range, 802.11b, Fc = 2412 MHz, 11Mbps, Horizontal & Vertical, Peak



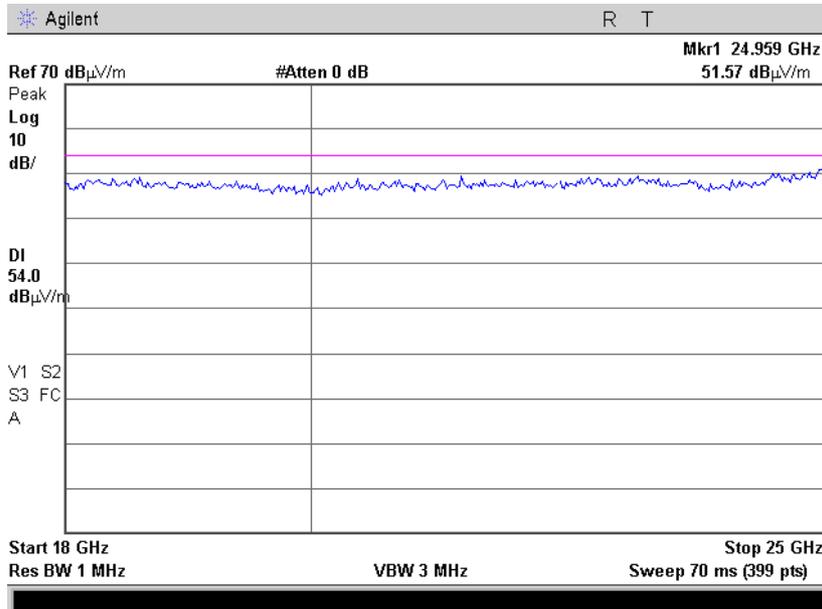
Plot 4.6.6 Radiated Spurious Emission in 1-18GHz range, 802.11b, Fc = 2437 MHz, 11Mbps, Horizontal & Vertical, Peak



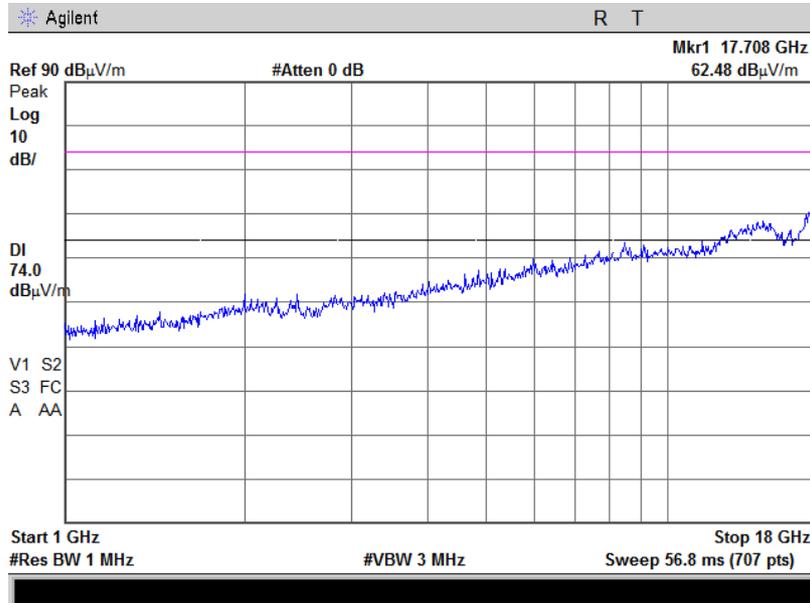
Plot 4.6.7 Radiated Spurious Emission in 12-18GHz range, 802.11b, Fc = 2437 MHz, 11Mbps, Horizontal & Vertical, Average



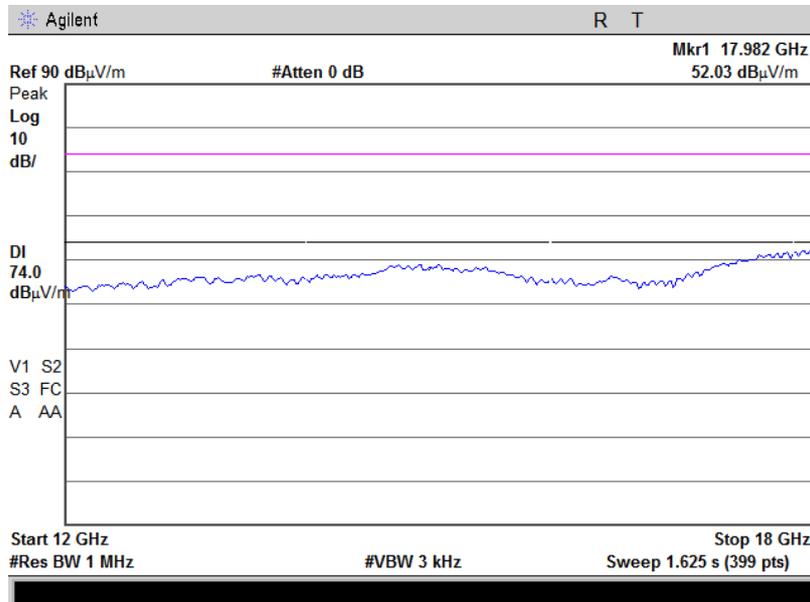
Plot 4.6.8 Radiated Spurious Emission in 18-25GHz range, 802.11b, Fc = 2437 MHz, 11Mbps, Horizontal & Vertical, Peak



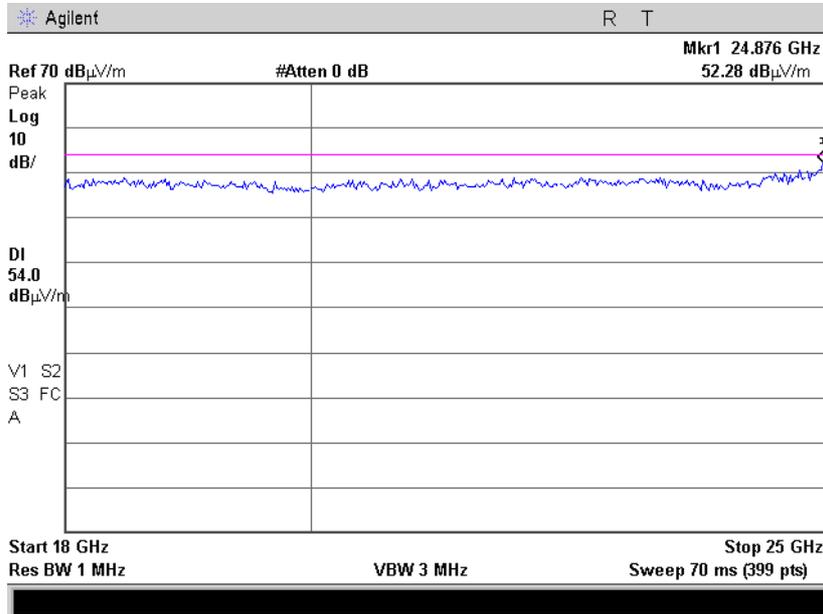
Plot 4.6.9 Radiated Spurious Emission in 1-18GHz range, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal & Vertical, Peak



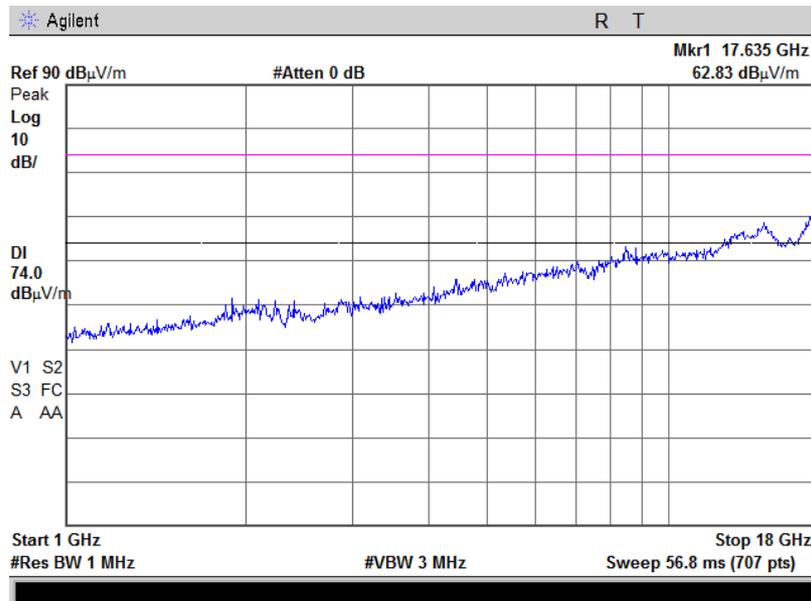
Plot 4.6.10 Radiated Spurious Emission in 12-18GHz range, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal & Vertical, Average



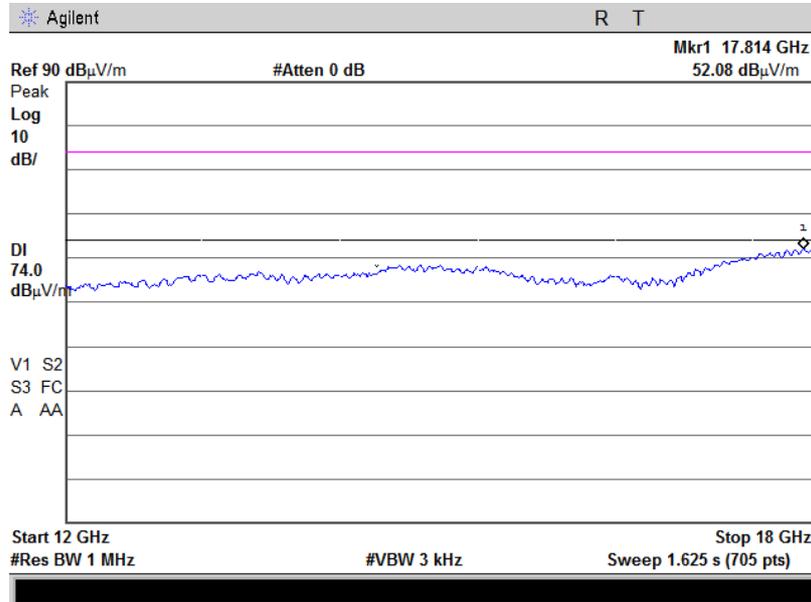
Plot 4.6.11 Radiated Spurious Emission in 18-25GHz range, 802.11b, Fc = 2462 MHz, 11Mbps, Horizontal & Vertical, Peak



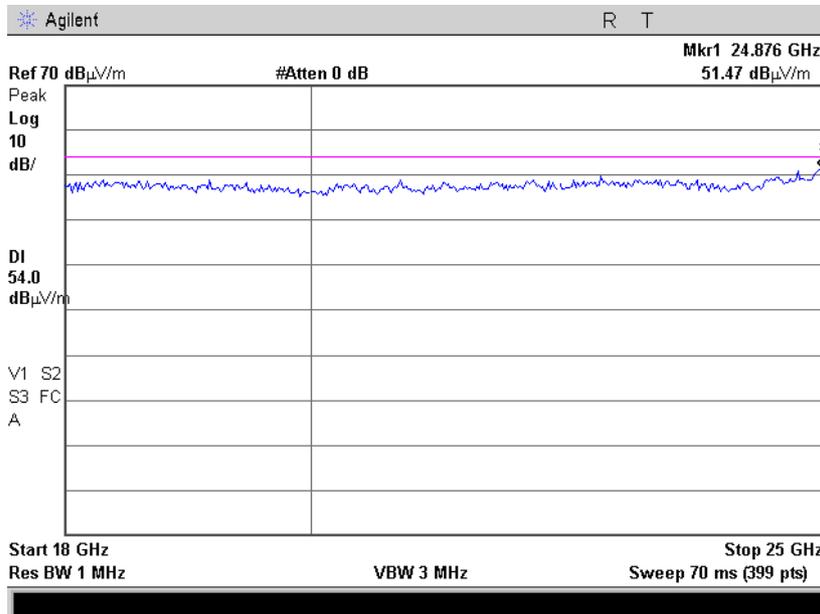
Plot 4.6.12 Radiated Spurious Emission in 1-18GHz range, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal & Vertical, Peak



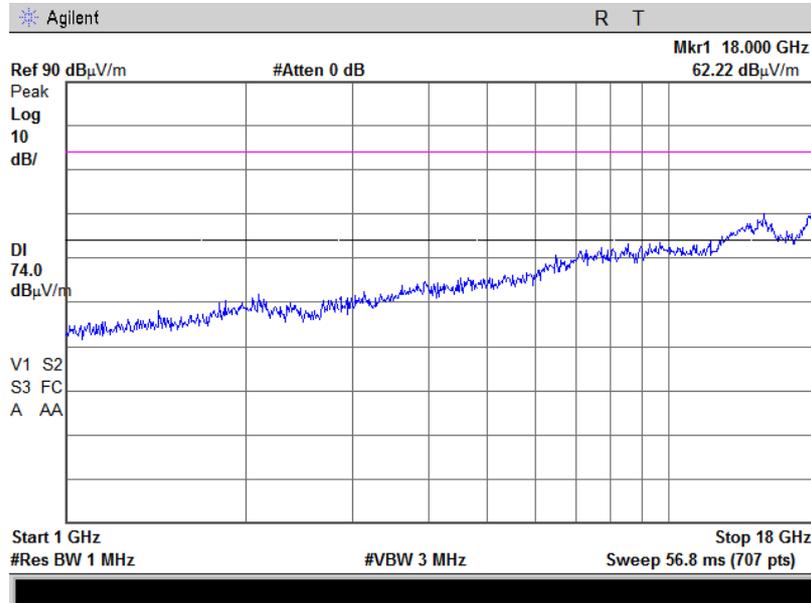
Plot 4.6.13 Radiated Spurious Emission in 12-18GHz range, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal & Vertical, Average



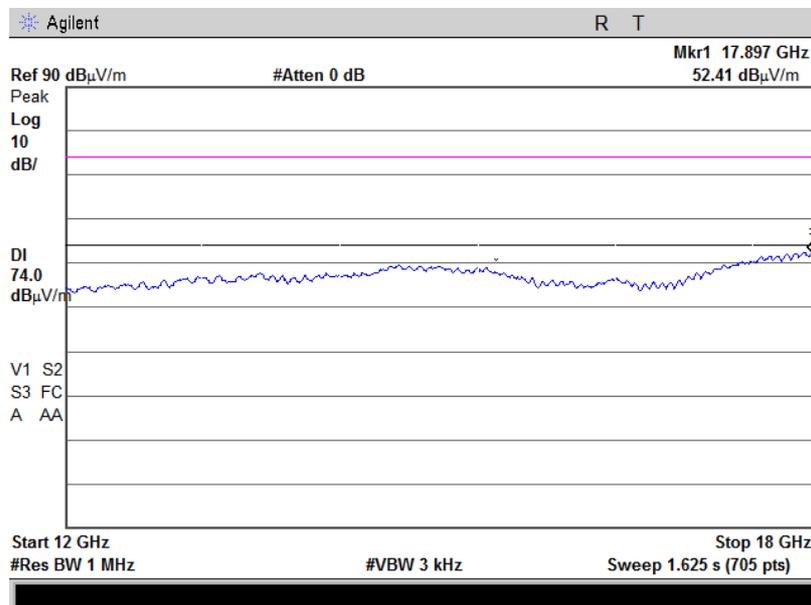
Plot 4.6.14 Radiated Spurious Emission in 18-25GHz range, 802.11g, Fc = 2412 MHz, 54Mbps, Horizontal & Vertical, Peak



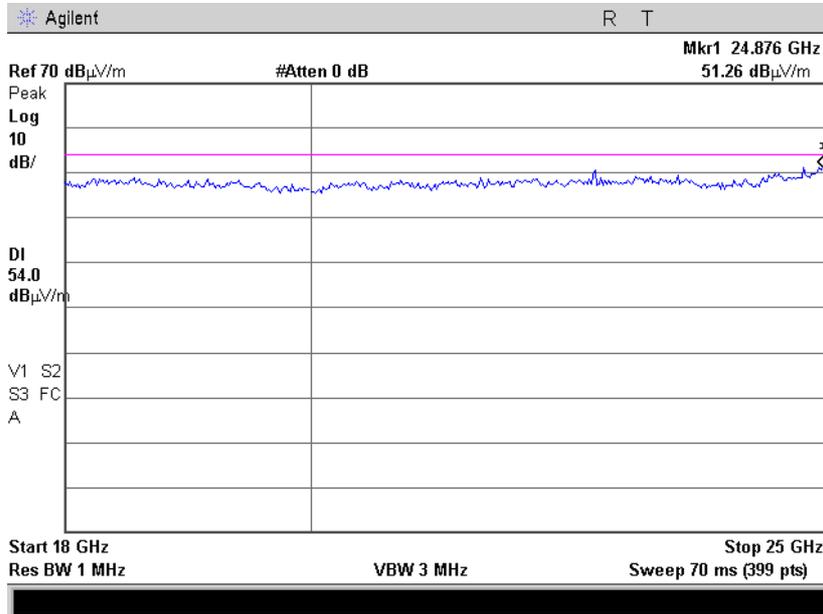
Plot 4.6.15 Radiated Spurious Emission in 1-18GHz range, 802.11g, Fc = 2437 MHz, 54Mbps, Horizontal & Vertical, Peak



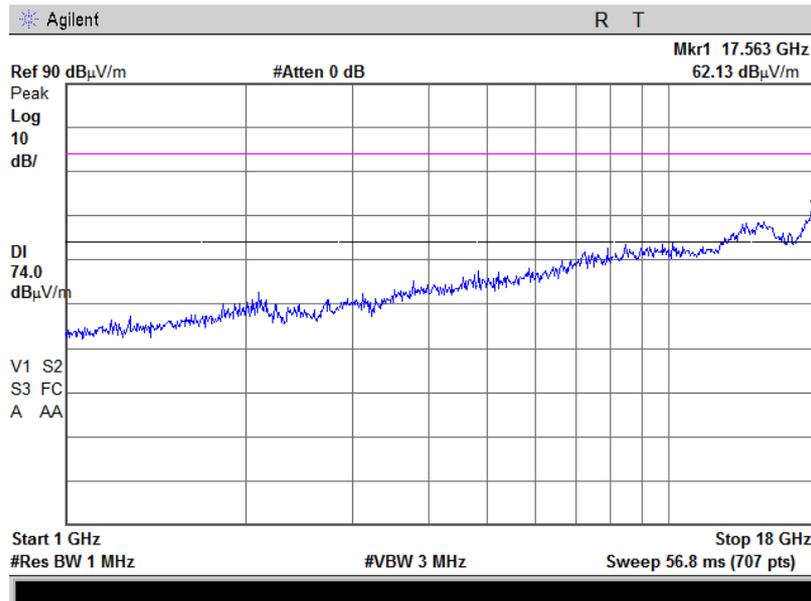
Plot 4.6.16 Radiated Spurious Emission in 12-18GHz range, 802.11g, Fc = 2437 MHz, 54Mbps, Horizontal & Vertical, Average



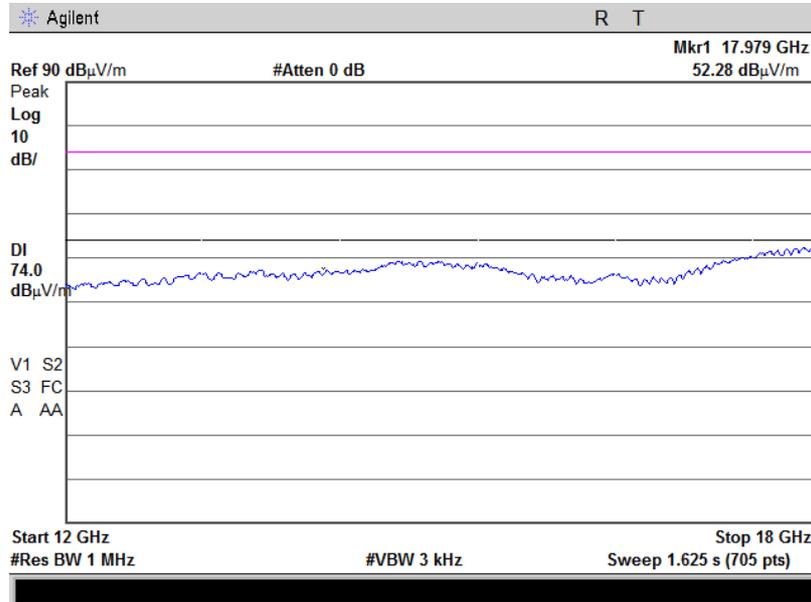
Plot 4.6.17 Radiated Spurious Emission in 18-25GHz range, 802.11g, Fc = 2437 MHz, 54Mbps, Horizontal & Vertical, Peak



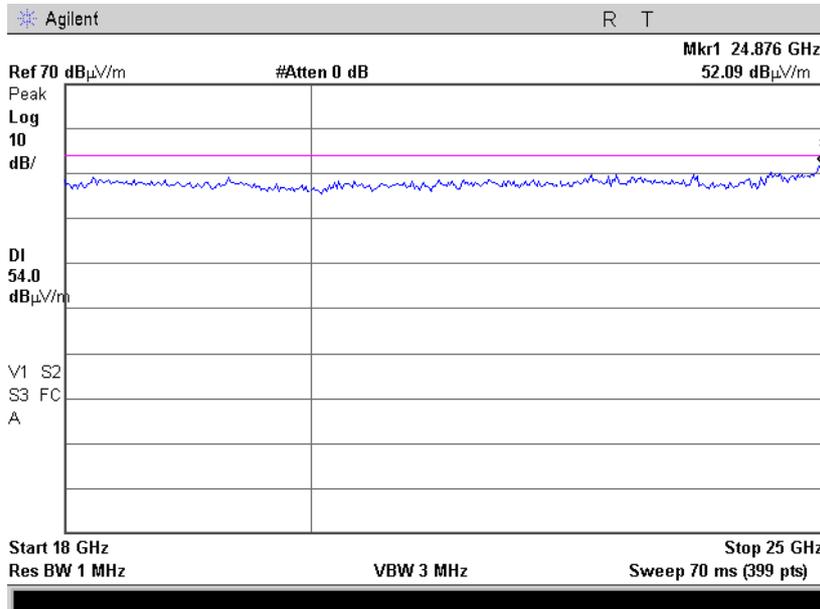
Plot 4.6.18 Radiated Spurious Emission in 1-18GHz range, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal & Vertical, Peak



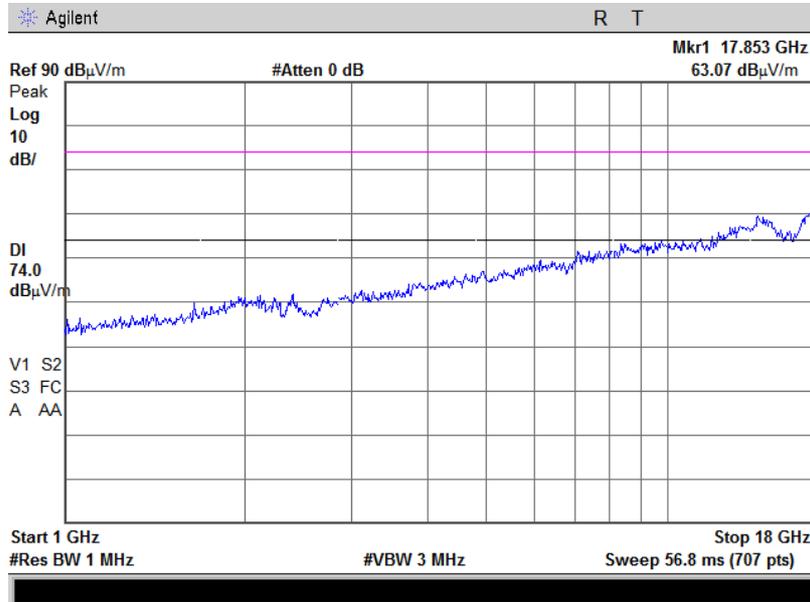
Plot 4.6.19 Radiated Spurious Emission in 12-18GHz range, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal & Vertical, Average



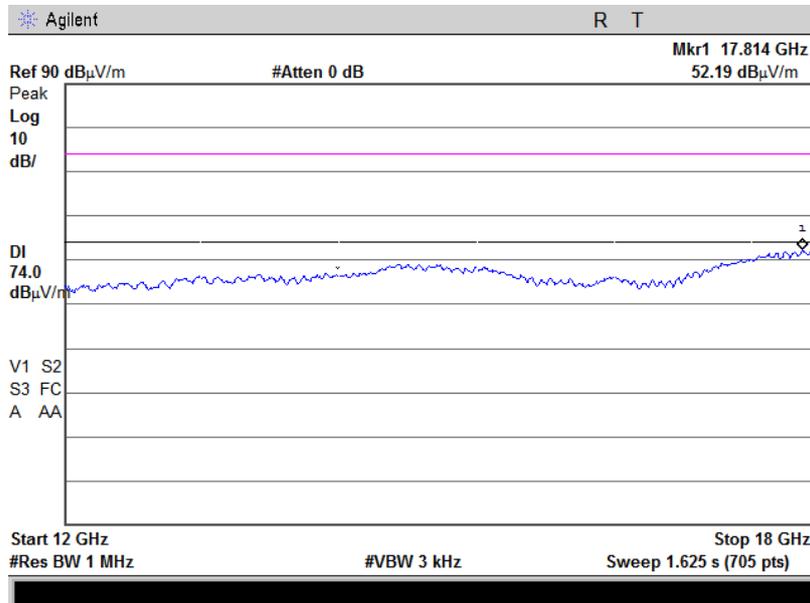
Plot 4.6.20 Radiated Spurious Emission in 18-25GHz range, 802.11g, Fc = 2462 MHz, 54Mbps, Horizontal & Vertical, Peak



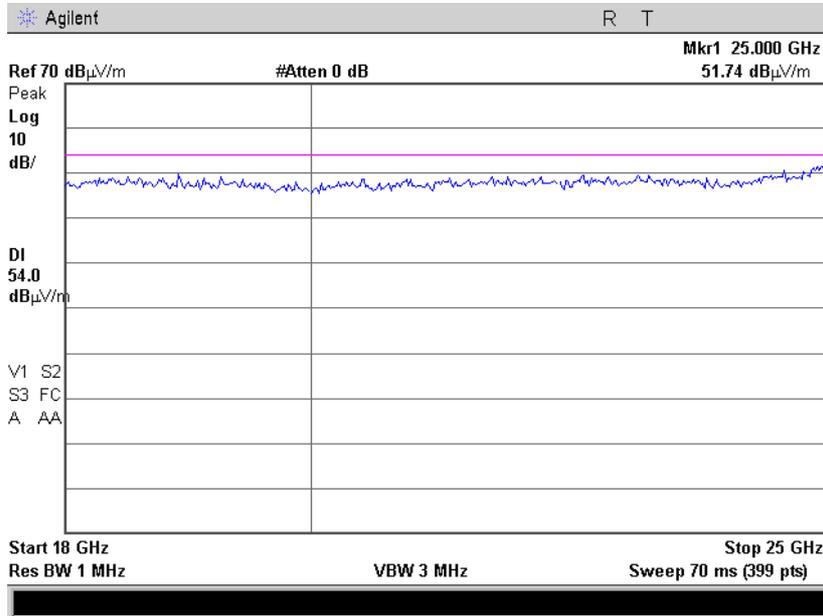
Plot 4.6.21 Radiated Spurious Emission in 1-18GHz range, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal & Vertical, Peak



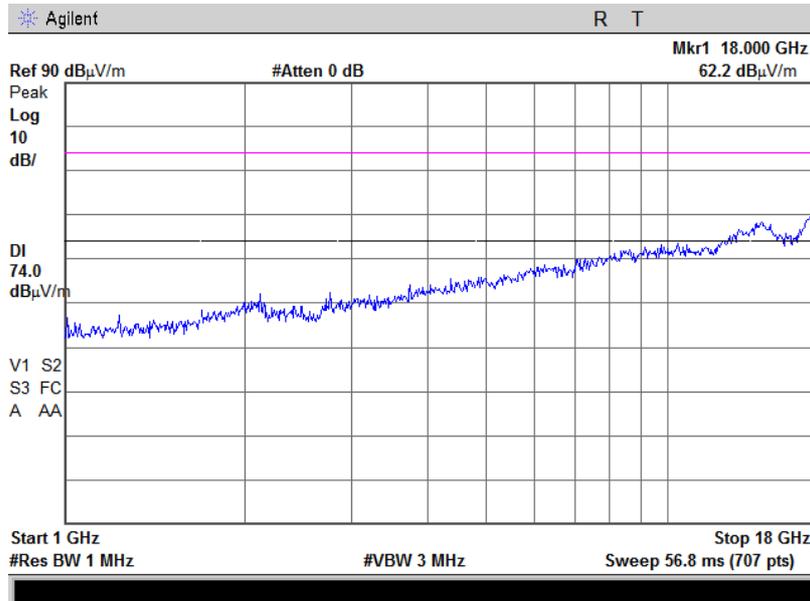
Plot 4.6.22 Radiated Spurious Emission in 12-18GHz range, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal & Vertical, Average



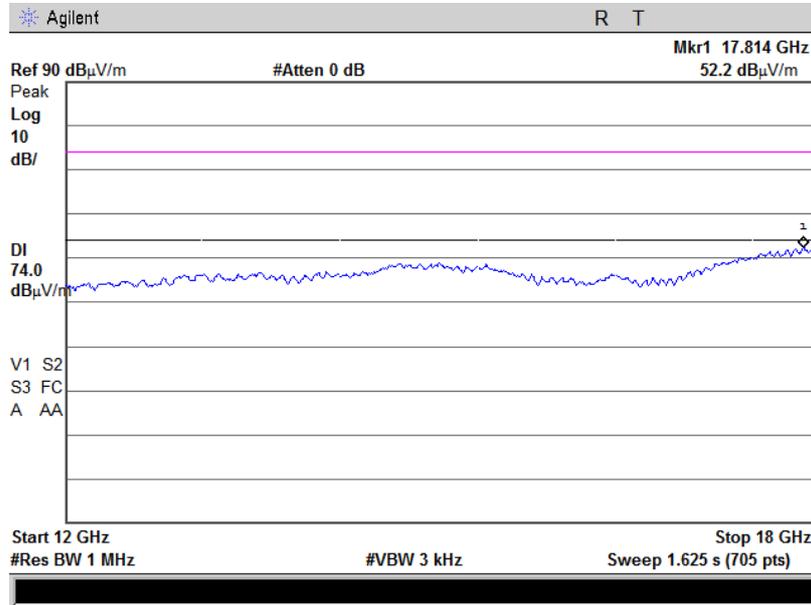
Plot 4.6.23 Radiated Spurious Emission in 18-25GHz range, 802.11n 20MHz, Fc = 2412 MHz, MCS7, Horizontal & Vertical, Peak



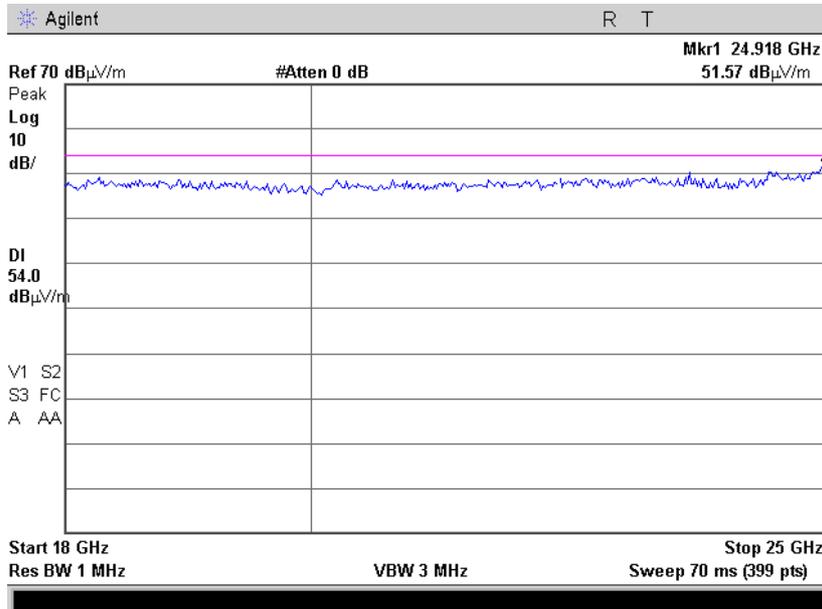
Plot 4.6.24 Radiated Spurious Emission in 1-18GHz range, 802.11n 20MHz, Fc = 2437 MHz, MCS7, Horizontal & Vertical, Peak



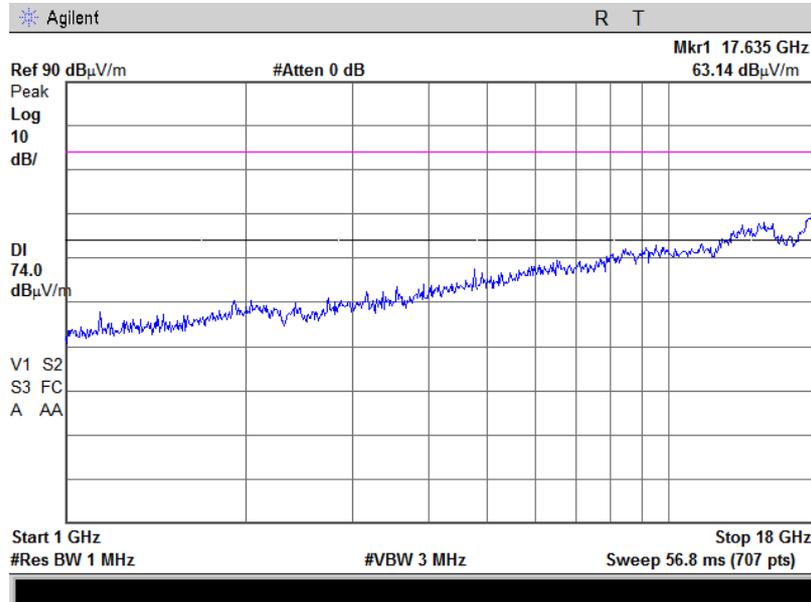
Plot 4.6.25 Radiated Spurious Emission in 12-18GHz range, 802.11n 20MHz, Fc = 2437 MHz, MCS7, Horizontal & Vertical, Average



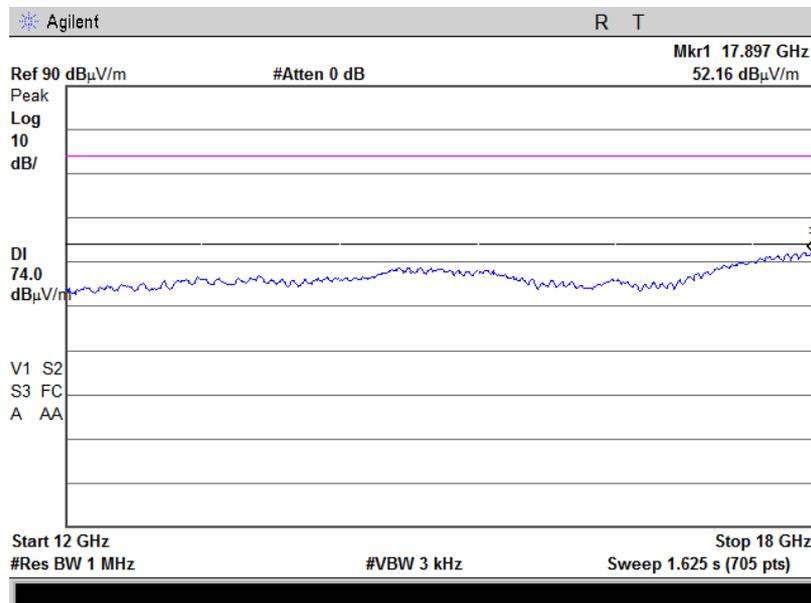
Plot 4.6.26 Radiated Spurious Emission in 18-25GHz range, 802.11n 20MHz, Fc = 2437 MHz, MCS7, Horizontal & Vertical, Peak



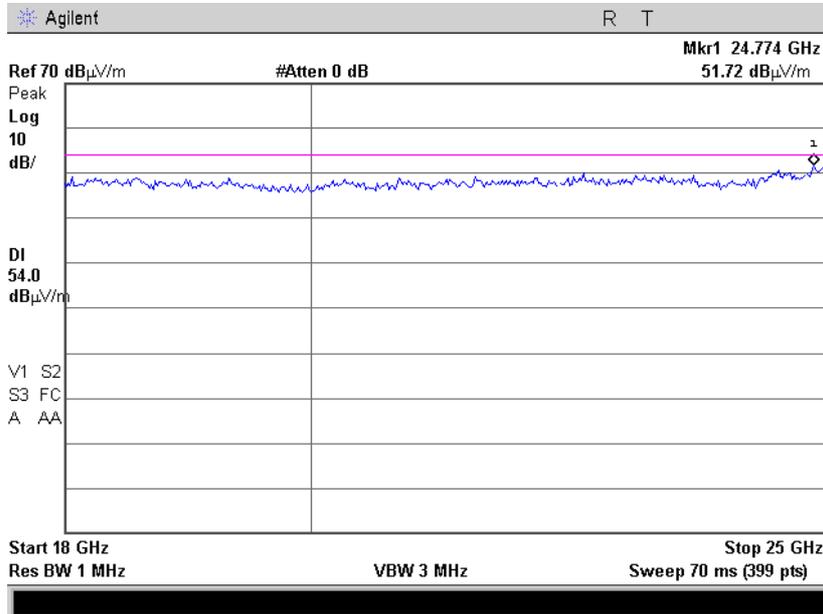
Plot 4.6.27 Radiated Spurious Emission in 1-18GHz range, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal & Vertical, Peak



Plot 4.6.28 Radiated Spurious Emission in 12-18GHz range, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal & Vertical, Average



Plot 4.6.29 Radiated Spurious Emission in 18-25GHz range, 802.11n 20MHz, Fc = 2462 MHz, MCS7, Horizontal & Vertical, Peak



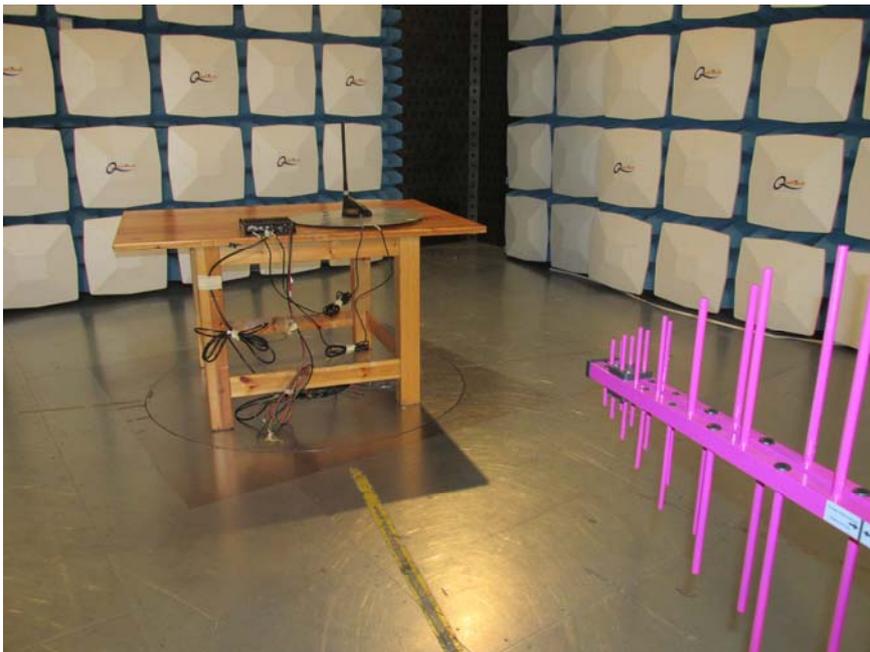
5. Appendix

Appendix A: Test Photographs

Photograph 1



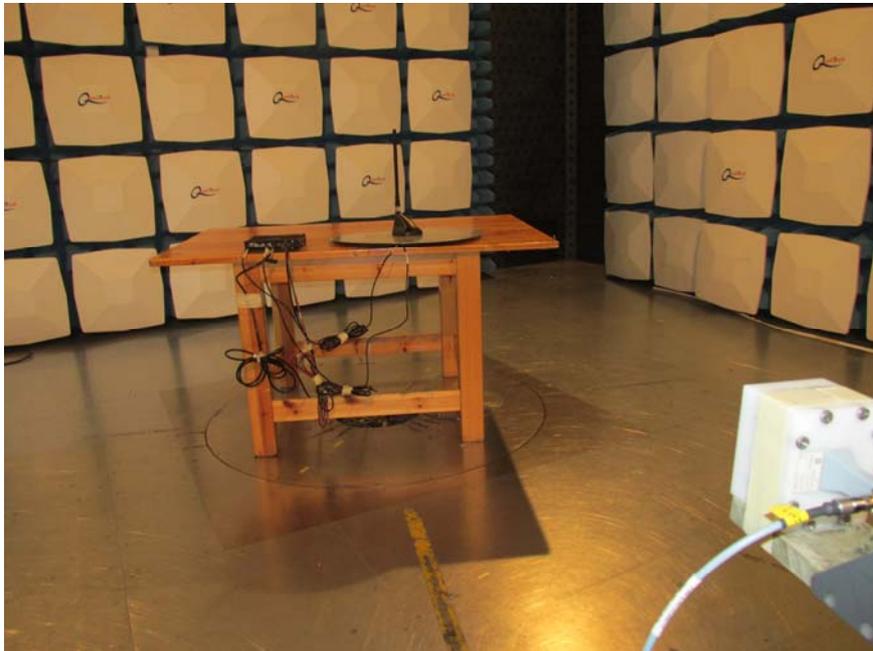
Photograph 2



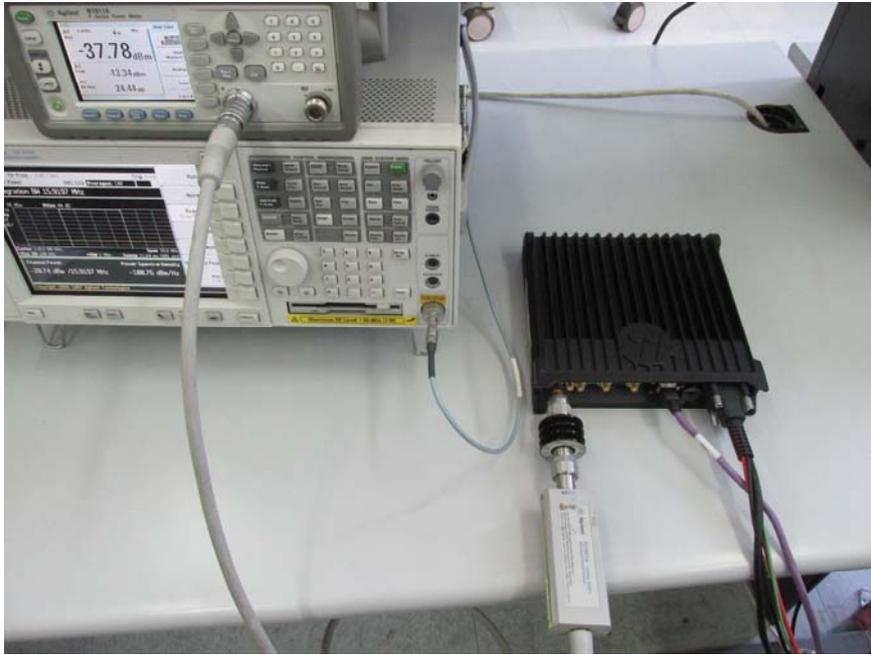
Photograph 3



Photograph 4



Photograph 5



Appendix B: List of Measuring Equipment used:

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date
CISPR16 EMI Receiver	HP	8546A	3710A00392	14.05.2014
EMC Analyzer	HP	8593EM	3536A00131	10.05.2014
Billoq Antenna	Teseq	CBL 6141B	34119	03.07.2015
Double Ridge Guide Horn antenna	A.R.A	DRG-118/A	17188	22.01.2015
LISN	Fischer	50/250-25-2	9705	26.06.2014
V-LISN	Schwarzbeck	NNBL 8226-2	120	14.06.2014
Transient Limiter	Agilent	11947A	3107A04121	14.06.2014
Current Probe	Fischer	F35A	44	25.06.2014
CDN	Fischer	T2	9953	31.01.2015
CDN	Fischer	T4	9817	31.01.2015
Universal Telecom	Fischer	ISN F-071115-1057-1	20616	31.01.2015
Discharge Simulator	Noiseken	ESS-2000	8000c03235	10.05.2015
RF Signal Generator	Marconi (IFR)	2025	202301/940	12.05.2014
Power Meter	Boonton	4230	26203	04.05.2014
Power Sensor	Boonton	51015	31821	04.05.2014
EFT Generator	EMtest	EFT 500 N8	V114911192	27.07.2014
Coupling/Decoupling network for burst and surge	EMTest	CNI 503 A18/ 32A	V0947105536	04.08.2014
Surge Generator combination wave,	EMTest	VCS 500 N10	V0824103874	04.08.2014
RF Signal Generator	Marconi	2024	1122681029	08.05.2014
Power Meter	Boonton	4235	26203	10.05.2014
Power Sensor	Boonton	51015	31821	10.05.2014
EM Injection Clamp	Fischer	F2031	348	31.01.2015
CDN	Fischer	C1	9815	31.01.2015
CDN	Fischer	M2	9824	31.01.2015
CDN	Fischer	M3	9840	31.01.2015
CDN	Fischer	T4	9817	02.01.2015
ESD Generator	Noiseken	ESS-2000	8000C03235	10.06.2014
ELF Magnetic Field Meter,	Holiday	HI-3624A	00034615	20.06.2014
Power Source & Analyzer	Pacific Power	140TMX	0233	10.05.2014
Harmonics & Flickers Analyzer,	EM Test	DPA 500	V0627101584	01.06.2014

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-IAF Communiqué dated 8 January 2009).

Presented this 7th day of December 2012.



Peter Abaya
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