



Electromagnetic Compatibility Test Report

Test Report No: EXT 130308

Issued on: March 13, 2008

Product Name
Access Point – EXRP 20E/40E

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

Tests Performed for
Extricom Ltd.

Haim Levanon Street, P.O. Box 39040, Tel-Aviv 61390, Israel
Tel: +972-3-7451000, Fax: +972-3-7451001"

QualiTech EMC Laboratory, ECI Telecom

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



Regis. No: 102724 1633.01

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Test personnel



Tests Performed By: -----

Rami Nataf



Report Prepared By: -----

Bina Talkar



Report Reviewed By: -----

Y. Zucker
QA and Lab. Manager
QualiTech EMC Laboratory



1633.01

Test Report details:

Test commencement date: 20.02.2008
Test completion date: 10.03.2008
Customer's Representative: A.Y. Erez
Issued on: 13.03.2008

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
§15.247 (a) (2) & RSS-210 §A8.2 (a)	6 dB Bandwidth	Comply
§15.247 (b) (3) & RSS-210 §A8.4 (4)	Maximum Peak Output Power	Comply
§15.247 (e) & RSS-210 §A8.2 (b), RSS-210 § A9.5(2)	Peak power spectral density	Comply
§15.247 (d) & RSS-210 §A8.5, §2.2	Conducted Spurious Emissions	Comply
§15.247 (d) & §15.205 & RSS-210 §A8.5, §2.2	Radiated Emissions, Restricted Bands	Comply
§15.209 & RSS- Gen. §6 & §7.2.3.2, RSS-210 section A8.5, §2.2 & RSS-GEN 4.10	Radiated Emissions (Receive mode)	Comply
§15.203 & RSS- Gen.Section 7.1.4	Antenna Connector requirement	Comply



1633.01

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1. General Description

Description of the EUT system/test Item:

Product name: IEEE 802.11a/b/g Wireless Access Point

Model: Access Point – EXRP 20E/40E

FCC ID: VDJ-EXRP-20E and VDJ-EXRP-40E

IC: 7180A-EXRP20E and 7180A-EXRP40E

Transmit Power:

802.11b: 72mW

802.11g: 180mW

802.11a: 75mW

Frequency range:

802.11b/g: 2.412 – 2.462 GHz

802.11a: 5.15-5.250, 5.745-5.825 GHz

Transmit Data rate:

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

Type of Modulation:

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

Antenna Specification:

Type: Omni-Directional Dual band Rubber Duck for indoor use.

Gain:

802.11b/g: 3 dBi

802.11a: 5 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 measuring instrument 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.

DTS Measurements procedures published on Apr. 16 2007 were applied.

- a. Maximum Conducted Peak Output Power per §15.247(b)(3): Power output option 1 was applied using a Peak Power Meter.
- b. PSD: option 1 was used. Emission peak was zoomed within the pass band with spectrum analyzer's settings as reported (Sweep time=Span/3kHz).
- c. Conducted spurious emissions: the spectrum from 30 MHz to 40GHz was investigated with the transmitter set to the lowest, middle and highest channel frequencies.

2.2. 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 emissions.

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 through 360 degrees, 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.

2.3. Worst Case Results:

Worst case result is determined as the channel with the highest output power. Worst-case results of various modulation modes were determined as the modulation with the highest output power, and that was reported.

3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/ Registration reference:

- A2LA Certificate Number: 1633.01

3.2. Test Facility description

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

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

3m Anechoic Chamber:

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

Semi Anechoic Configuration:

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

Full-Anechoic Configuration:

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

3.3. Uncertainty of Measurement:

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

4. Report of Measurements and Examinations

4.1. 6 dB Bandwidth

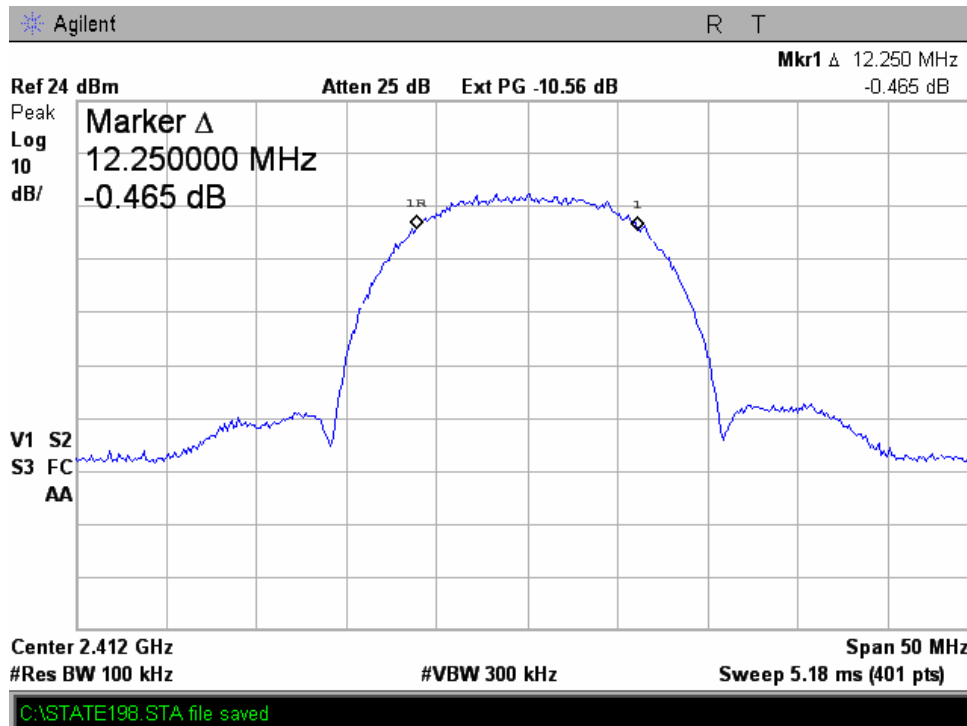
Reference document:	47 CFR §15.247 (a) (2)		
Test Requirements:	Systems using digital modulation techniques may operate in 2400-2483.5 MHz and 5725 MHz-5850 MHz bands. The minimum 6dB bandwidth shall be at least 500 kHz.		
Test Method:	See Sec 2.1	Comply	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.1.1 to 4.1.9	

Test results

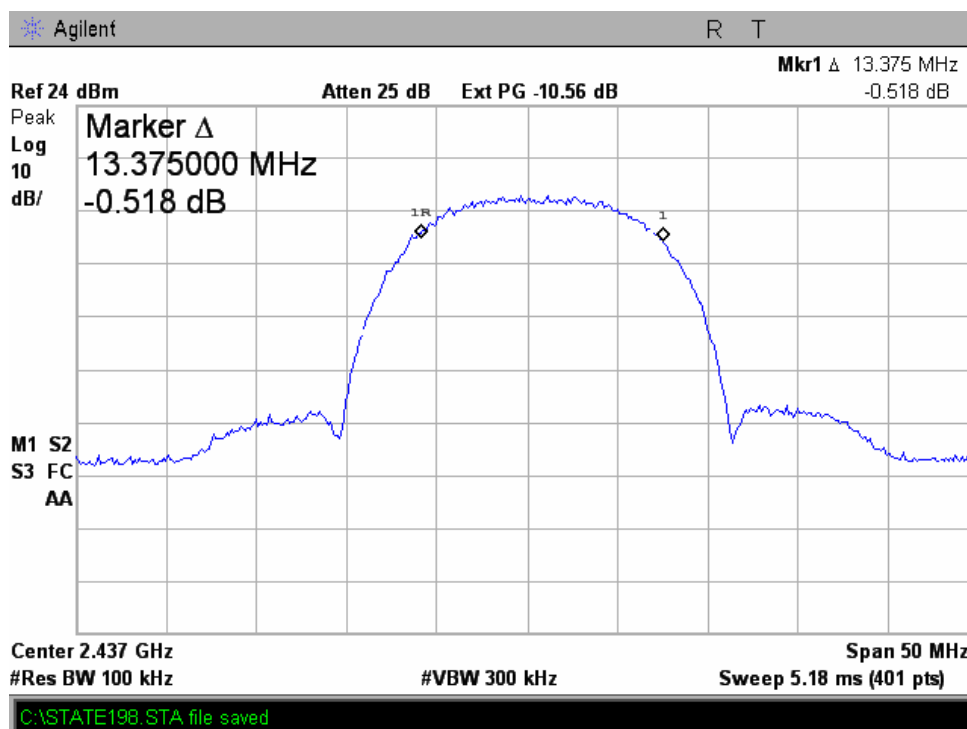
Worst case output of the four individual transmitters.

Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz]	Limit [kHz]	Ref Plot
802.11b Mode				
2412	11	12250	>500	4.1.1
2437	11	13375	>500	4.1.2
2462	11	13250	>500	4.1.3
802.11g Mode				
2412	54	16375	>500	4.1.4
2437	54	16500	>500	4.1.5
2462	54	16500	>500	4.1.6
802.11a Mode				
5745	54	16500	>500	4.1.7
5785	54	16500	>500	4.1.8
5825	54	16375	>500	4.1.9

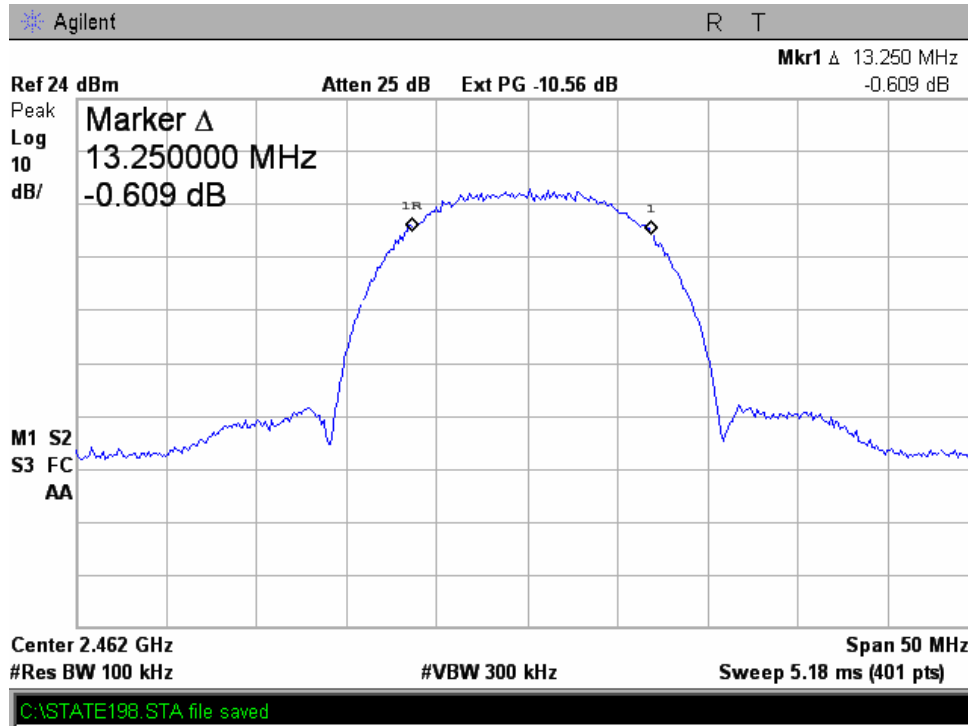
802.11b Mode Plot 4.1.1



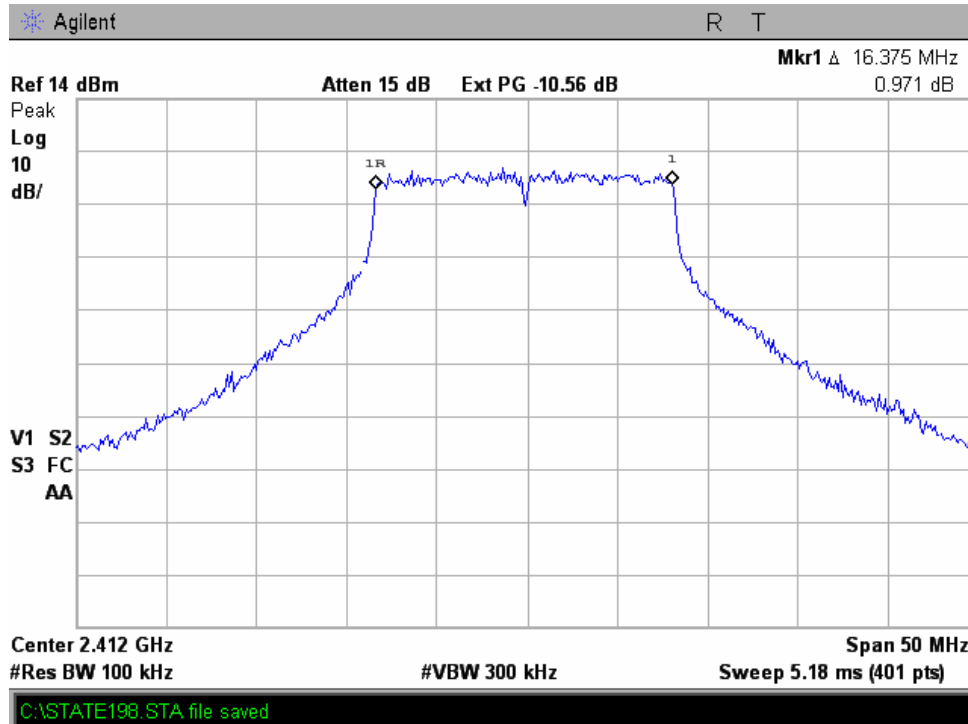
Plot 4.1.2



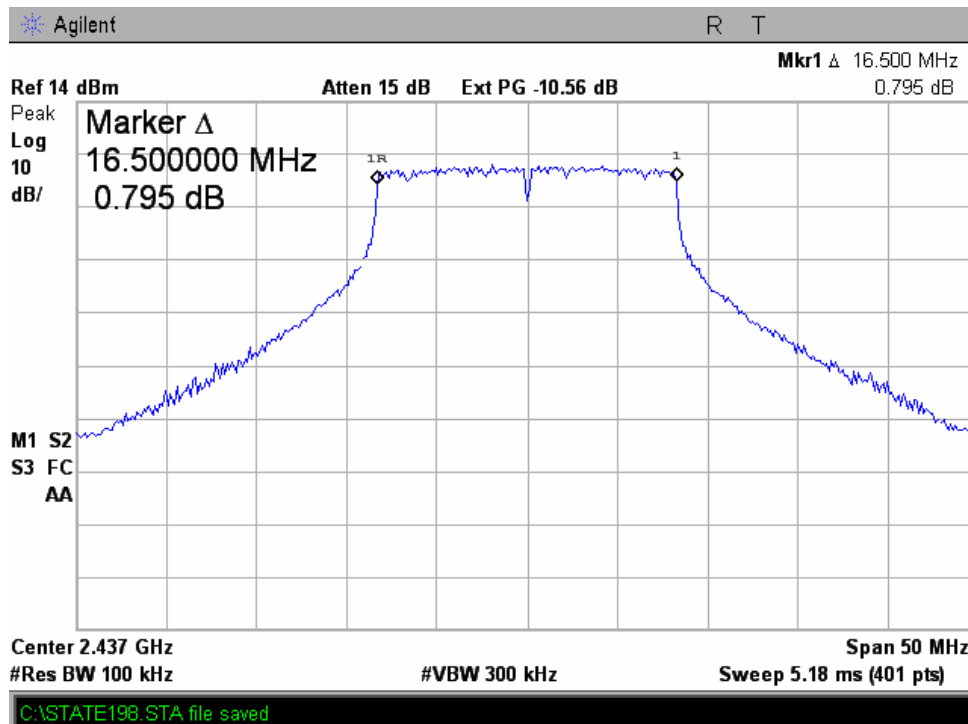
Plot 4.1.3



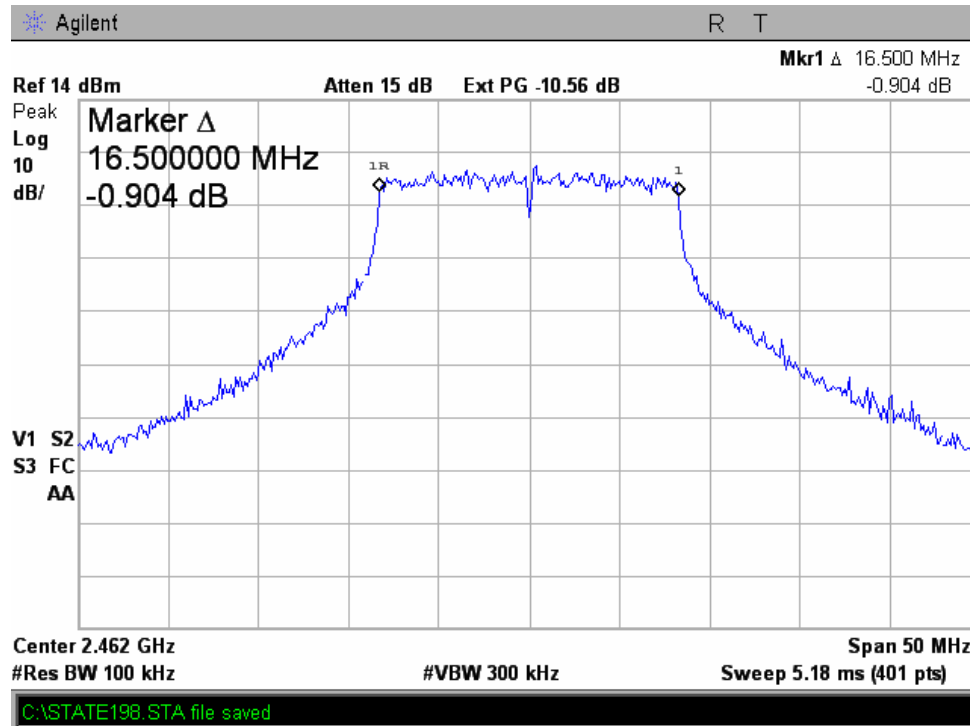
802.11g Mode Plot 4.1.4



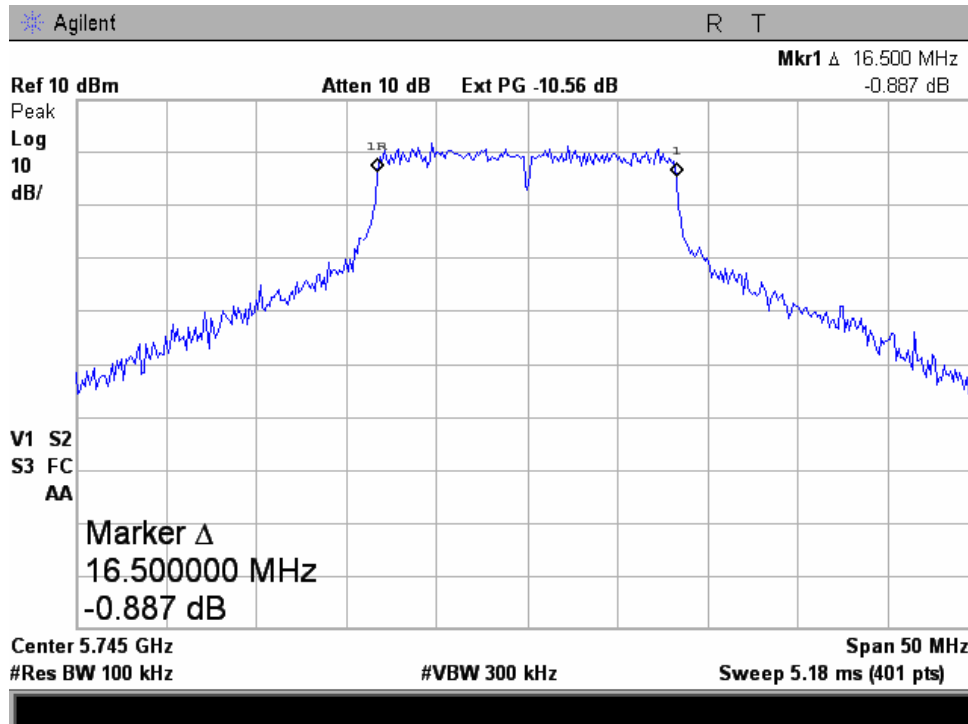
Plot 4.1.5



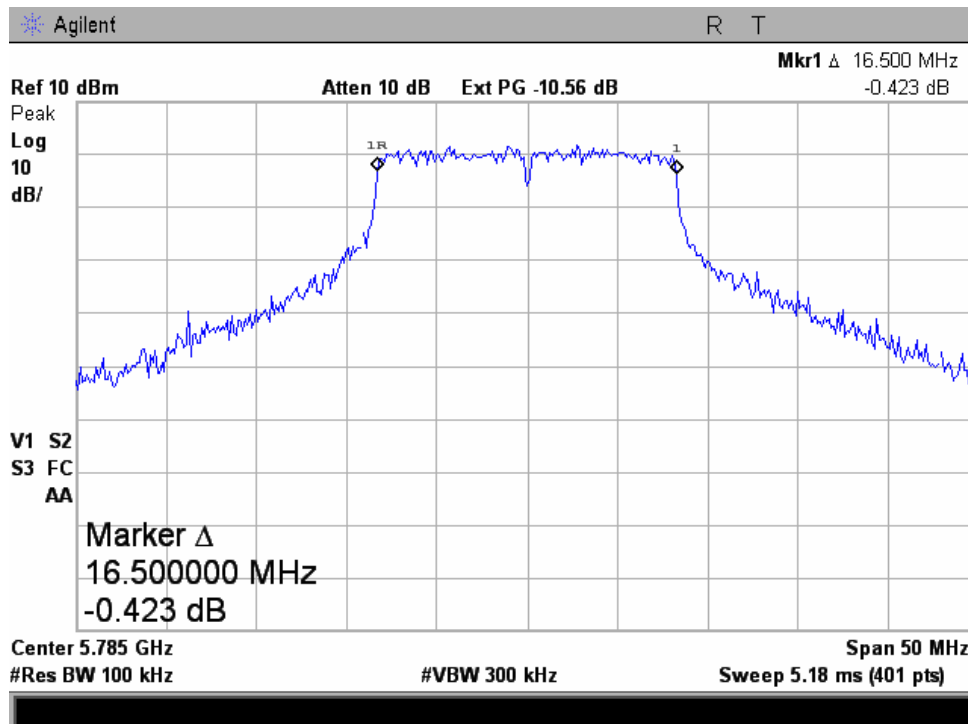
Plot 4.1.6



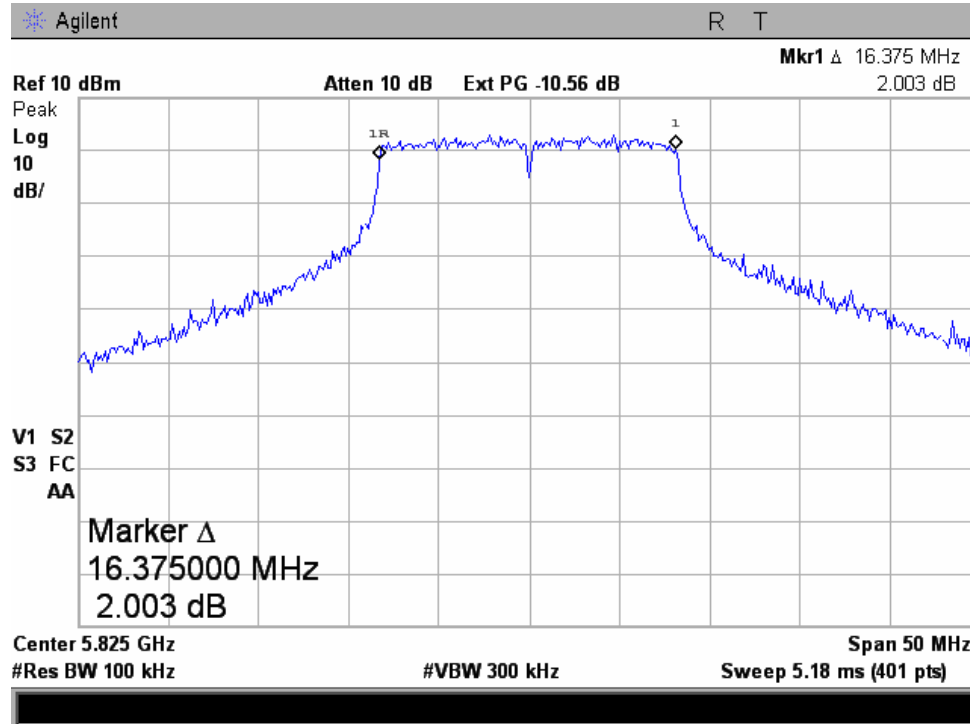
802.11a Mode Plot 4.1.7



Plot 4.1.8



Plot 4.1.9



4.2. Maximum Peak Output Power, 2400-2483.5 MHz

Reference document:	47 CFR §15.247 (b) (3) & §15.247 (c) (2)(ii) & §15.247 (c) (2)(iii)		
Test Requirements:	<p>The maximum peak output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt.</p> <p>Transmitters operating in the 2400-2483.5 MHz bands that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the arrays, i.e. the sum of the power sullied to the antenna elements, shall not exceed the limit calculated below. The total conducted output power shall be reduced by 1dB below the specified limit for each 3 dB that the directional gain of the antenna array exceeds 6dBi.</p> <p>If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, and if the transmitted beams overlap, the power shall be reduced to ensure that their aggregate power transmitted simultaneously on all beams does not exceed the limit calculated above by more than 8dB.</p>		
Test Method:	See sec 2.1a (Option 1)	Comply	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below		

Maximum Peak Output Power, 5725-5850MHz

Reference document:	47 CFR §15.247 (b) (3) & §15.247 (c) (1)(ii).		
Test Requirements:	<p>The maximum peak output power of the intentional radiator for systems using digital modulation in the 5725–5850 MHz band shall not exceed 1 Watt. Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.</p>		
Test setup:	See sec 2.1a (Option 1)	Comply	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below		

Test Results:

Worst case output of the four individual transmitters.

Maximum Peak Output Power Results:

2400-2483.5 MHz Band:

Frequency [MHz]	Data Rate [Mbps]	Maximum Peak Output Power [dBm]	Maximum Peak Output Power [mW]	Limit (P _L) [dBm]	Margin [dB]	Results
802.11b Mode						
2412	1	18.03	63.5	30.00	-12.0	Pass
2437	1	18.43	69.7	30.00	-11.6	Pass
2462	1	18.56	71.8	30.00	-11.4	Pass
802.11g Mode						
2412	6	22.54	179.5	30.00	-7.5	Pass
2437	6	22.37	172.6	30.00	-7.6	Pass
2462	6	22.13	163.3	30.00	-7.9	Pass

5725-5850MHz Band:

Frequency [MHz]	Data Rate [Mbps]	Maximum Peak Output Power [dBm]	Maximum Peak Output Power [mW]	Limit (P _L) [dBm]	Margin [dB]	Results
802.11a Mode						
5745	6	18.33	68.1	30.00	-11.7	Pass
5785	6	18.75	75.0	30.00	-11.3	Pass
5825	6	18.54	71.4	30.00	-11.5	Pass

4.3. Peak Power Spectral Density

Reference document:	47 CFR §15.247 (e)		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.		
Test Method:	See sec 2.1b (Option 1)	Comply	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3 kHz, VBW: 10 kHz, Sweep Time: 100s		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.3.1 to 4.3.9	

Test Results:

Worst case output of the four individual transmitters.

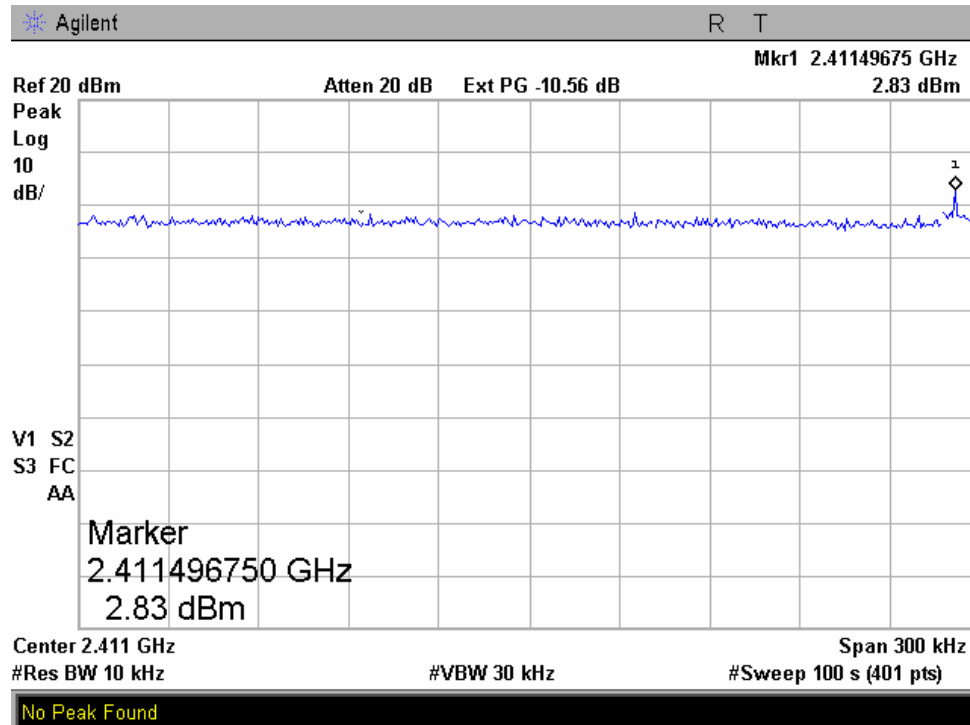
2400-2483.5 MHz Band:

Frequency [MHz]	Data Rate [Mbps]	PSD [dBm/3kHz]	Limit PSD [dBm/3kHz]	Margin [dB]	Ref Plot
802.11b Mode					
2412	1	+2.83	8	-5.17	4.3.1
2437	1	-1.36	8	-9.36	4.3.2
2462	1	-1.16	8	-8.12	4.3.3
802.11g Mode					
2412	6	-1.30	8	-9.30	4.3.4
2437	6	-1.91	8	-9.91	4.3.5
2462	6	-2.60	8	-10.60	4.3.6

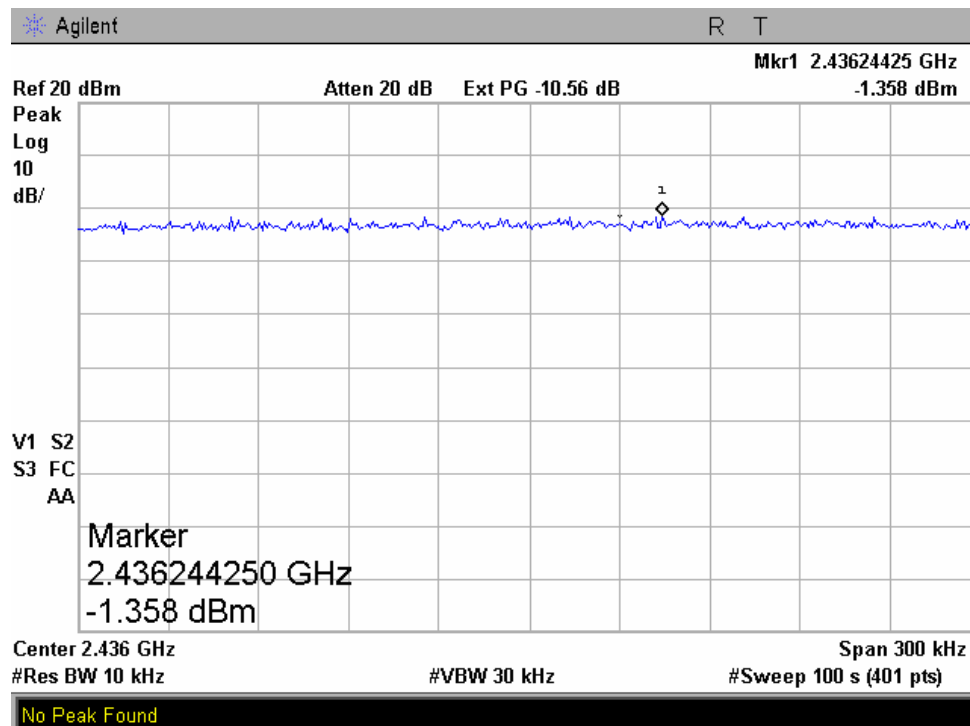
5725-5850MHz Band:

Frequency [MHz]	Data Rate [Mbps]	PSD [dBm/3kHz]	Limit PSD [dBm/3kHz]	Margin [dB]	Ref Plot
802.11a Mode					
5745	6	-9.01	8	-17.01	4.3.7
5785	6	-8.72	8	-16.72	4.3.8
5825	6	-8.01	8	-16.01	4.3.9

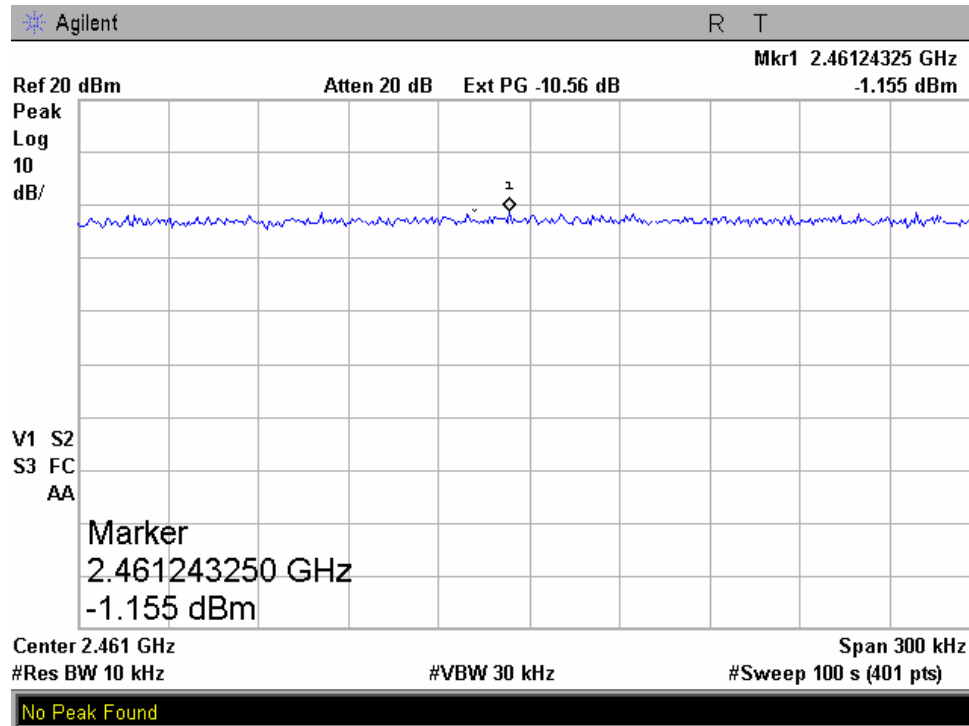
802.11b Mode Plot 4.3.1



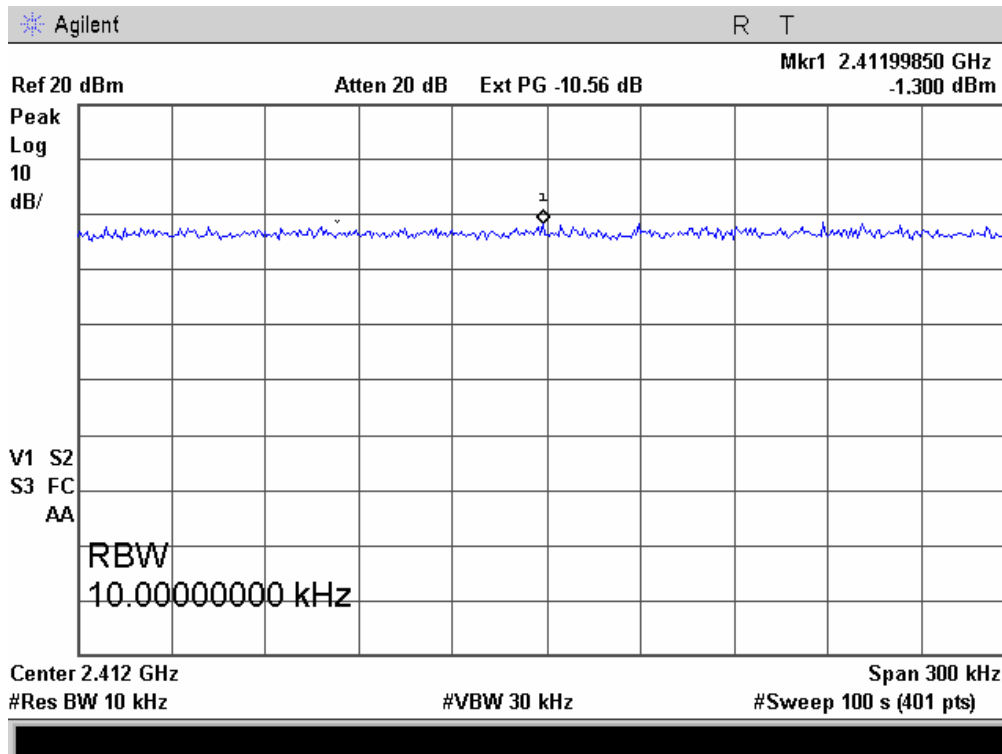
Plot 4.3.2



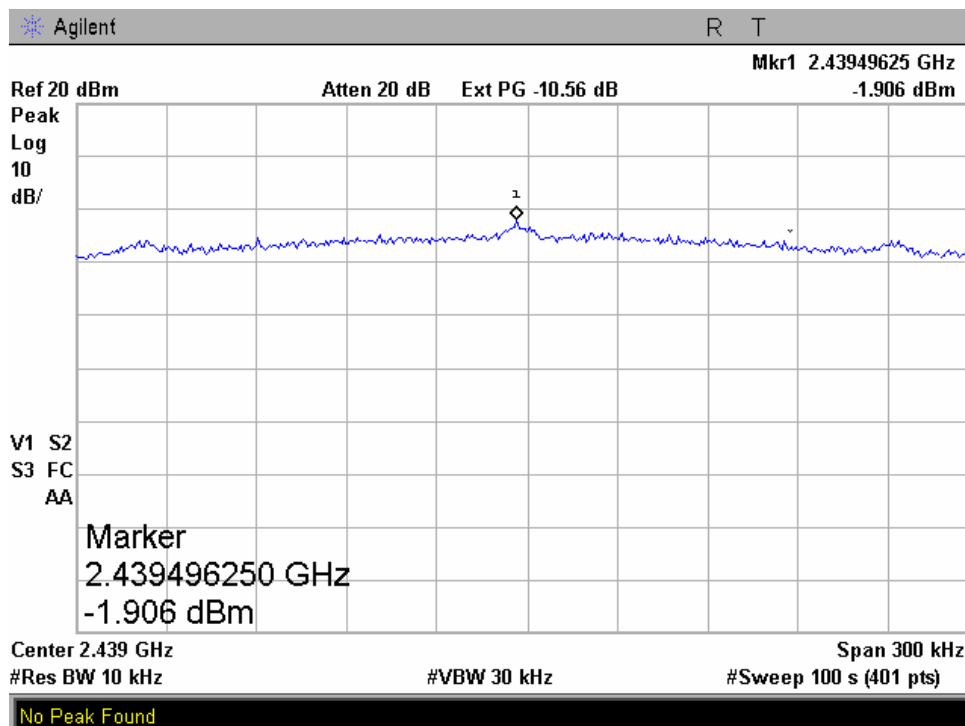
Plot 4.3.3



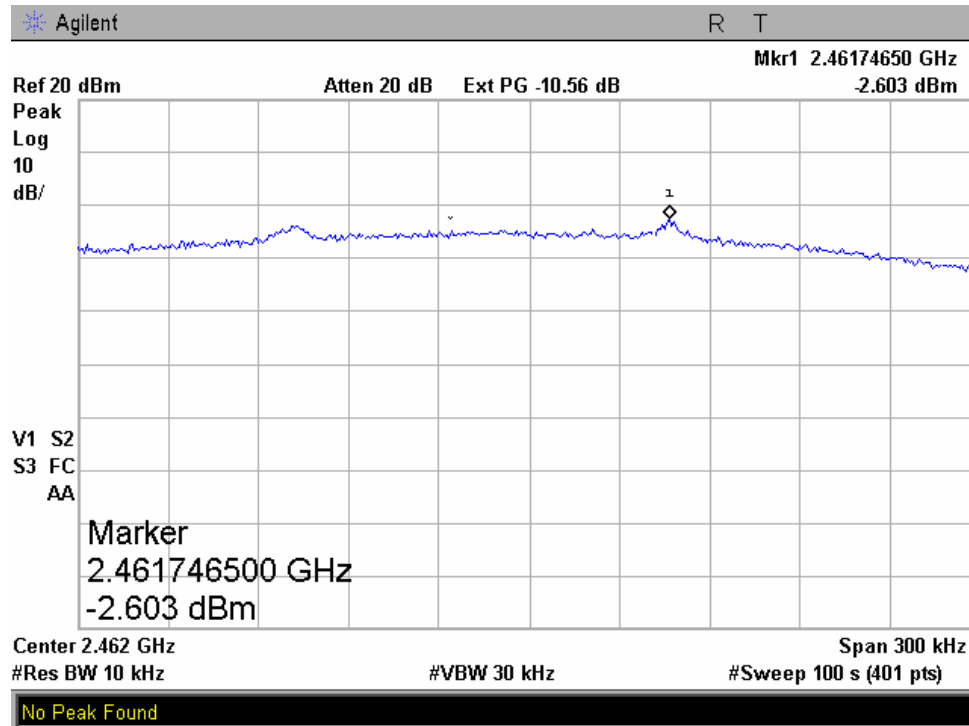
802.11g Mode
Plot 4.3.4



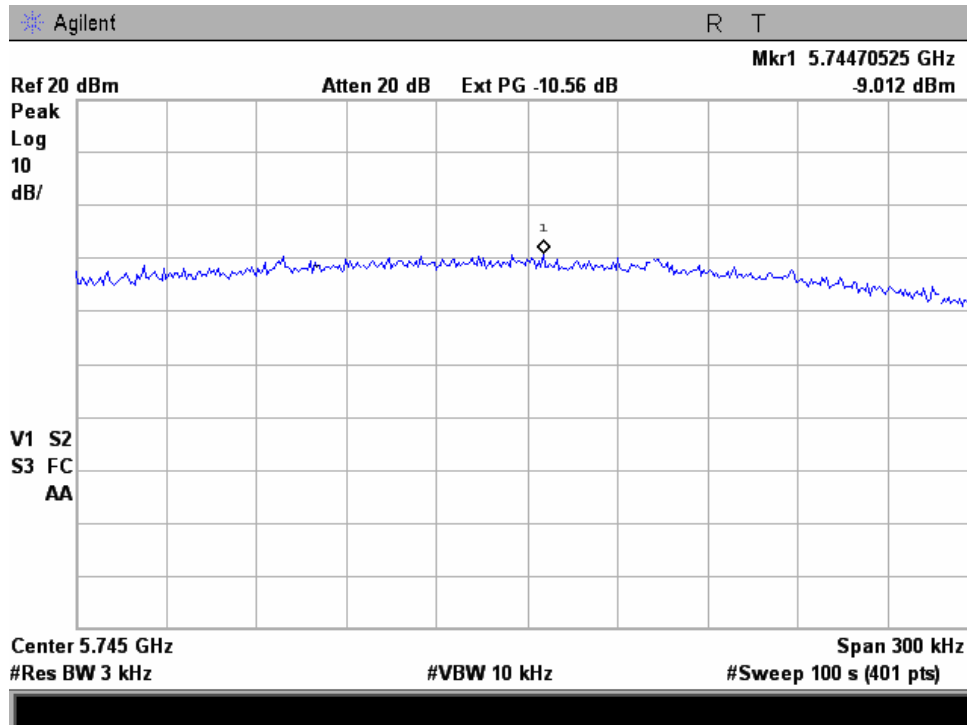
Plot 4.3.5



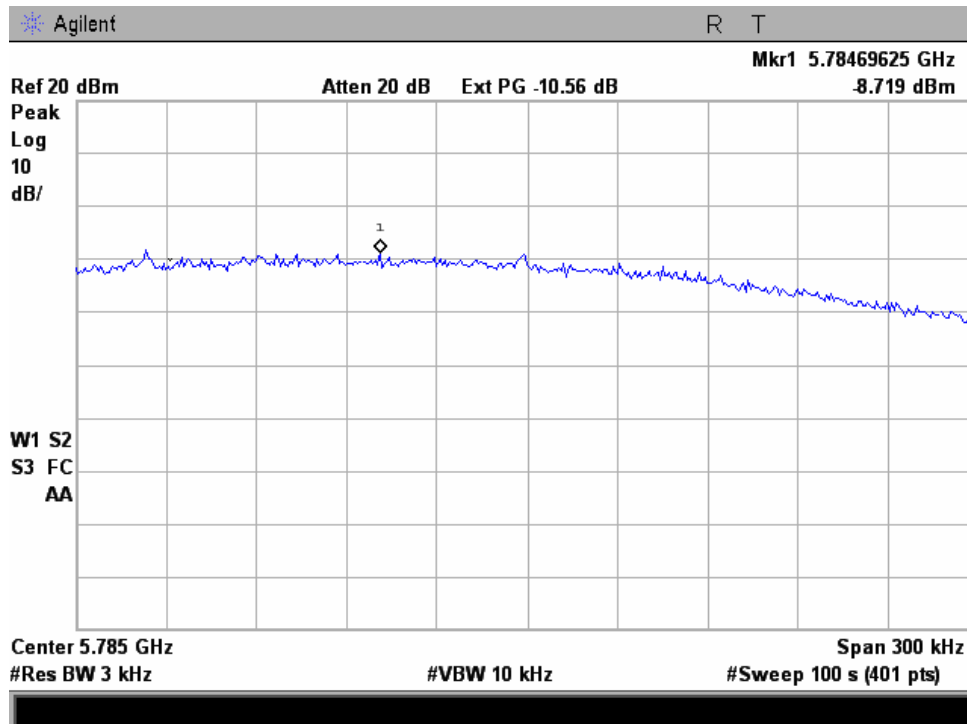
Plot 4.3.6



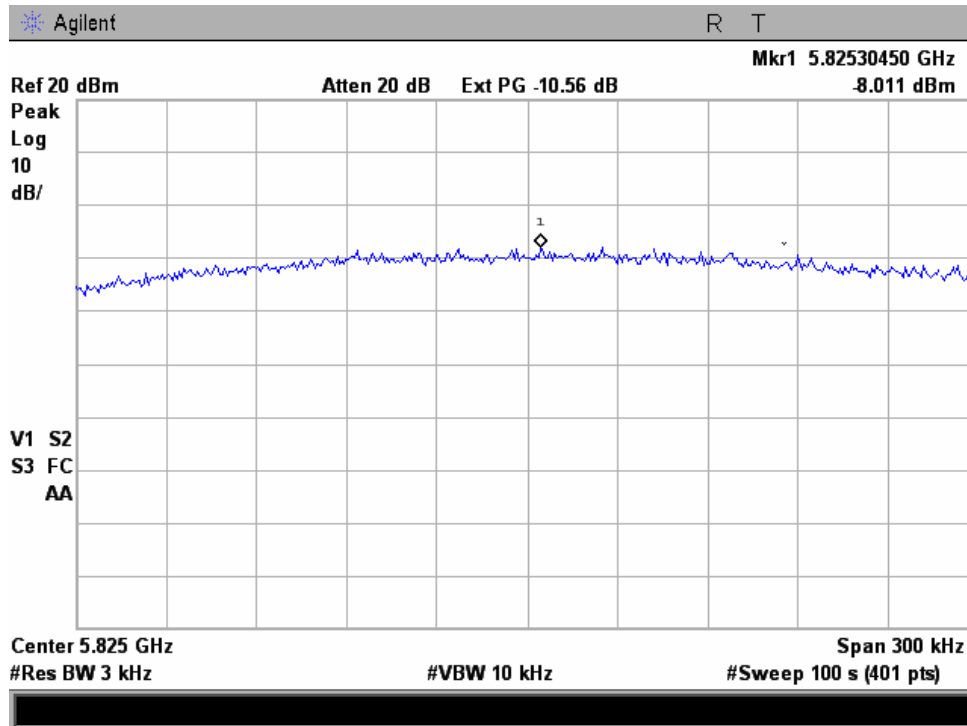
802.11a Mode
Plot 4.3.7



Plot 4.3.8



Plot 4.3.9



4.4. Peak Power Spectral Density

Reference document:	RSS-210 § A9.5(2)		
Test Requirements:	Within the emission bandwidth, when the peak spectral density per MHz over any continuous transmission exceeds the average (10 log10 B) value by more than 3 dB, the permissible power spectral density shall be reduced by the excess amount.		
Test Method:	DA 02-2138 Method 2	Comply	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz , VBW: 3MHz Sweep Time: Auto		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.4.1 to 4.4.9	

Note: 10 log10 B = 13dB

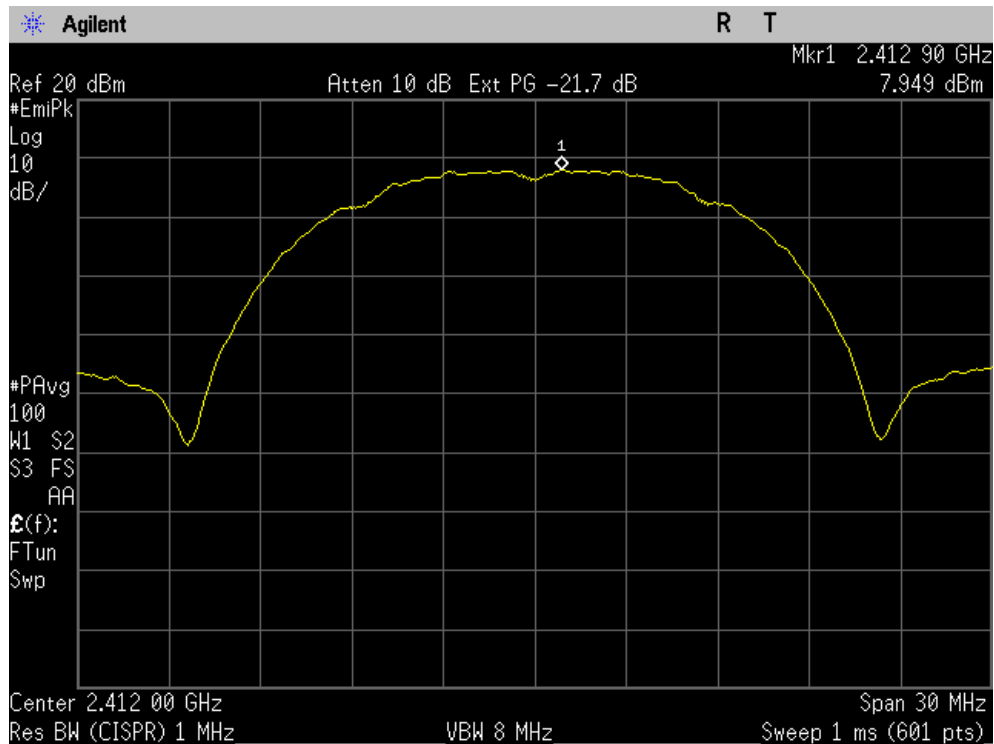
2400-2483.5 MHz Band:

Frequency [MHz]	Data Rate [Mbps]	PPSD [dBm/1MHz]	Limit PPSS [dBm/1MHz]	Margin [dB]	Ref Plot
802.11b Mode					
2412	1	7.95	13	-5.05	4.4.1
2437	1	8.07	13	-4.93	4.4.2
2462	1	7.78	13	-4.93	4.4.3
802.11g Mode					
2412	6	6.14	13	-6.86	4.4.4
2437	6	6.60	13	-6.40	4.4.5
2462	6	6.80	13	-6.20	4.4.6

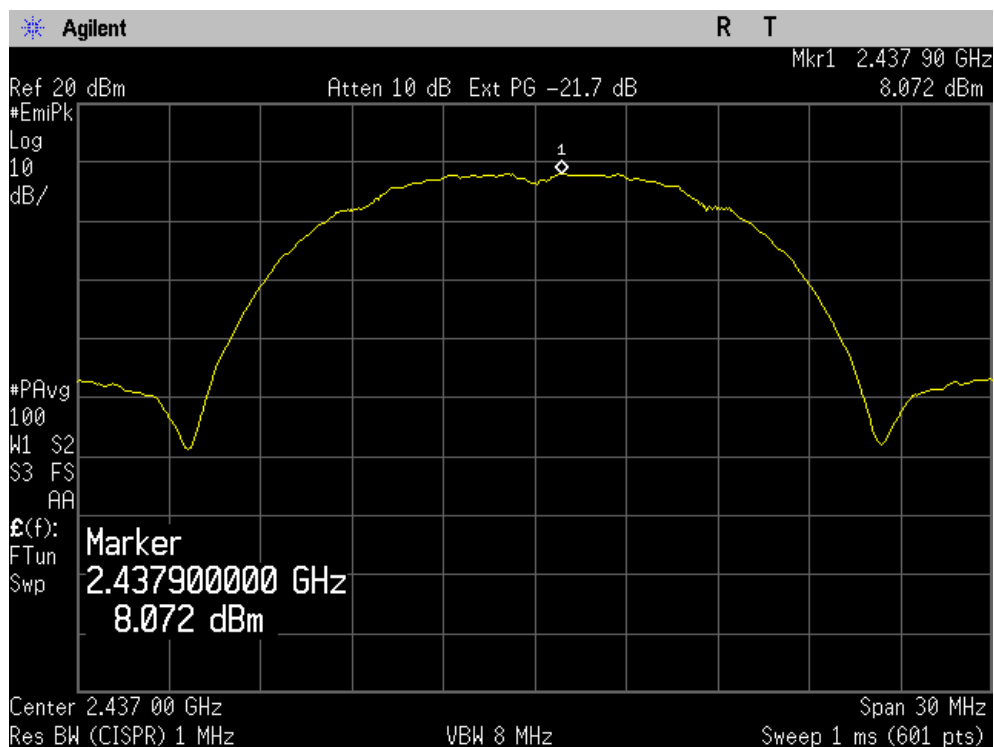
5725-5850MHz Band:

Frequency [MHz]	Data Rate [Mbps]	PPSD [dBm/1MHz]	Limit PPSS [dBm/1MHz]	Margin [dB]	Ref Plot
802.11a Mode					
5745	6	3.47	13	-9.53	4.4.7
5785	6	3.30	13	-9.70	4.4.8
5825	6	3.93	13	-9.07	4.4.9

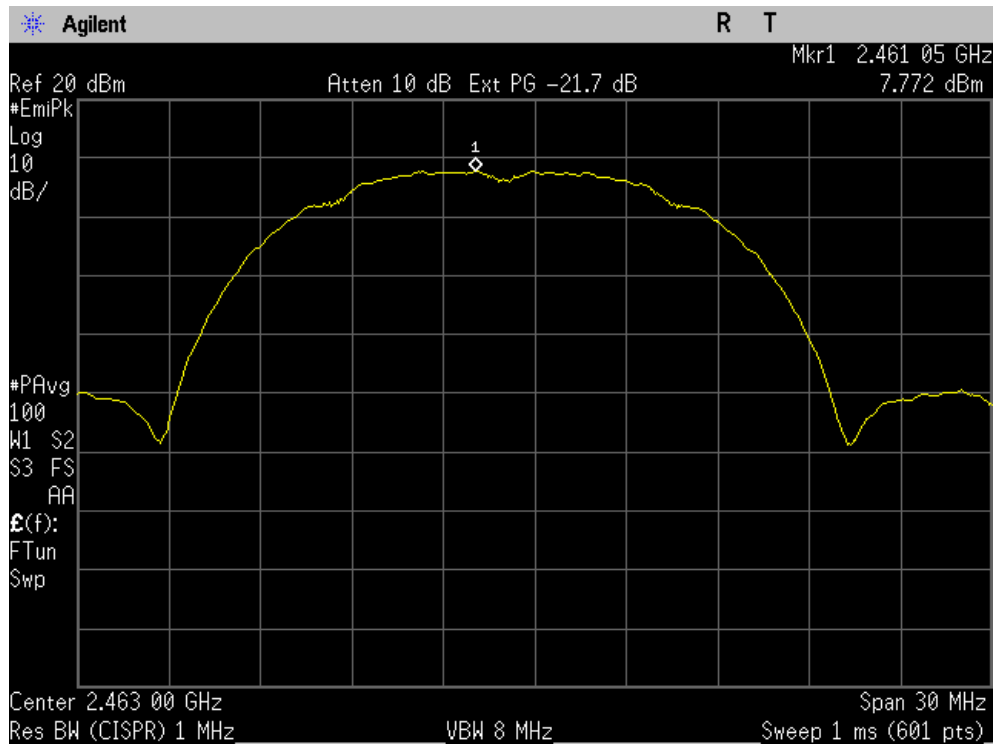
Plot 4.4.1



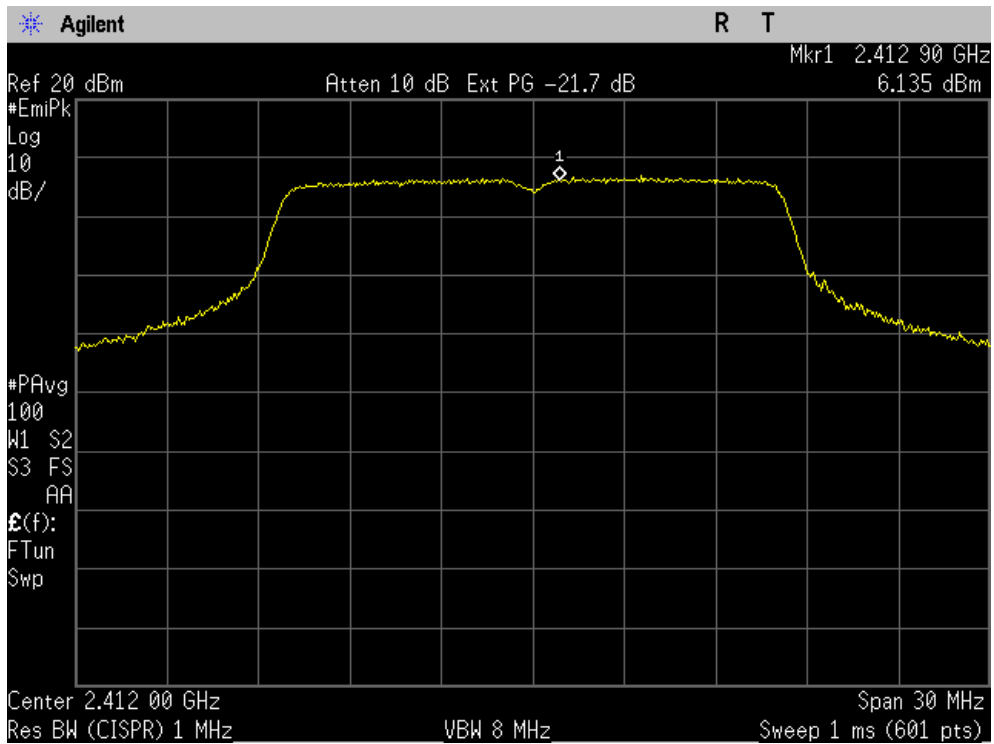
Plot 4.4.2



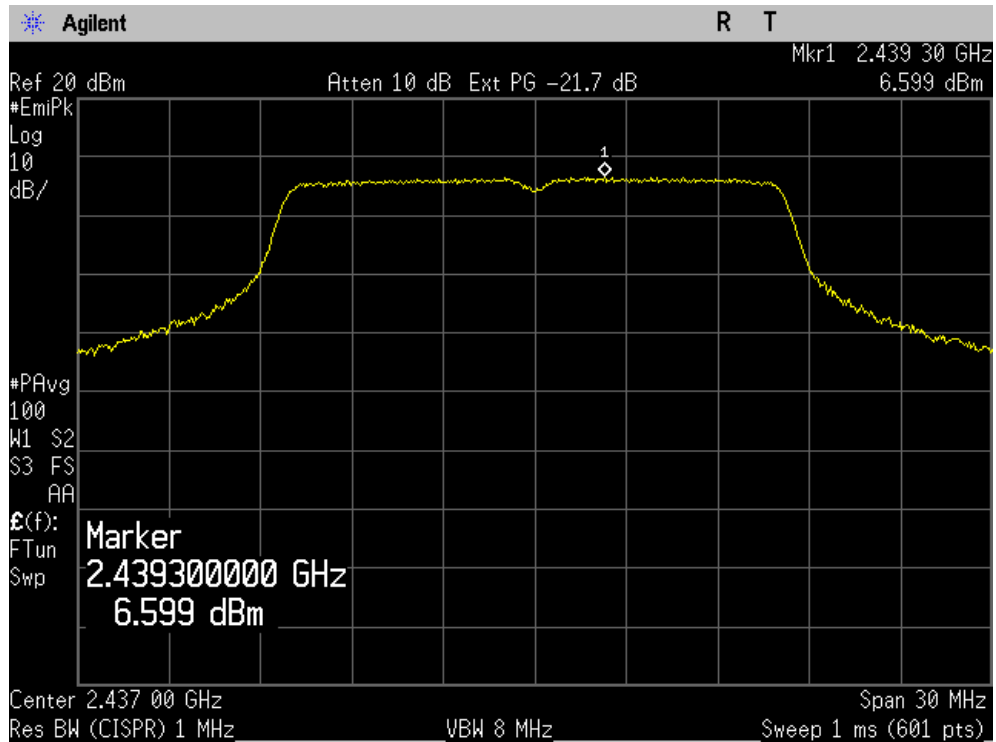
Plot 4.4.3



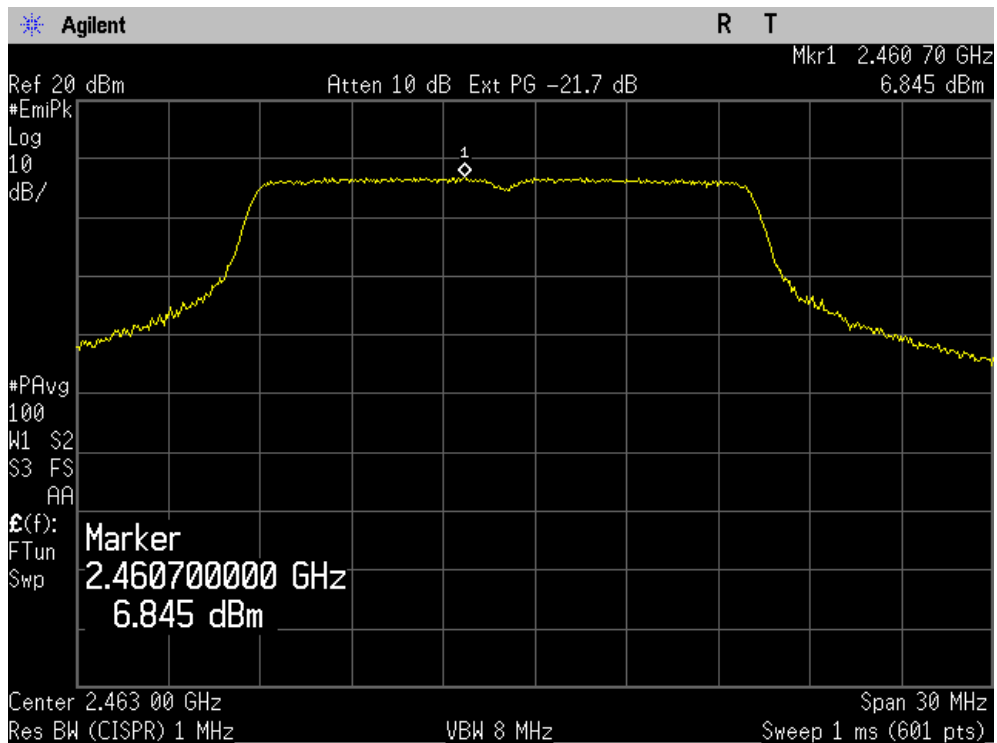
Plot 4.4.4



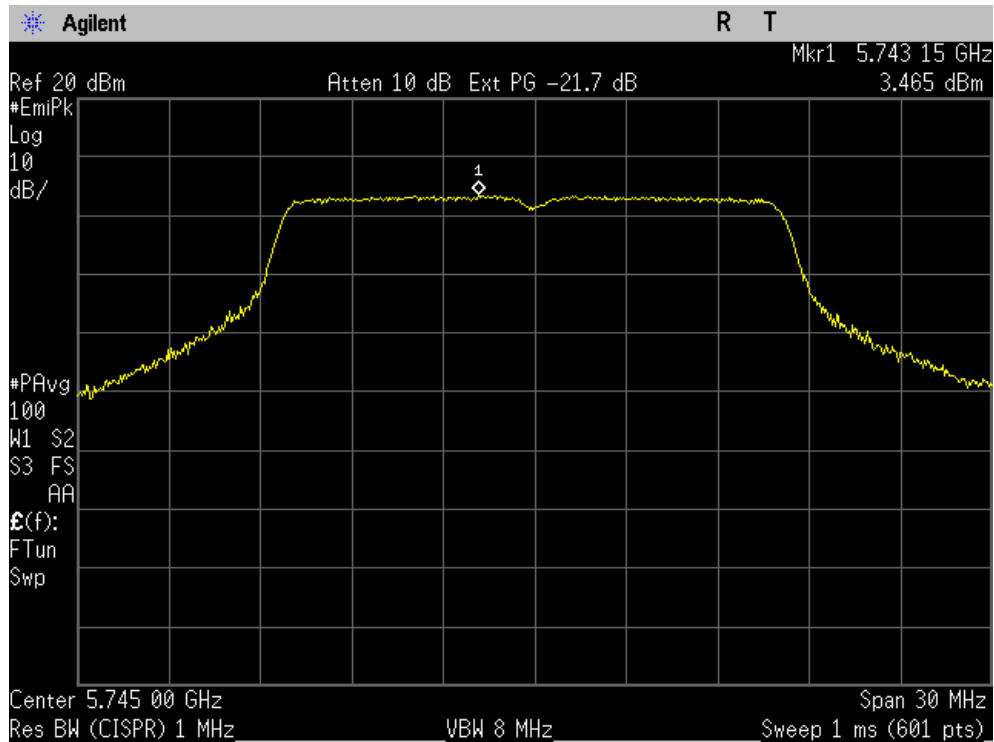
Plot 4.4.5



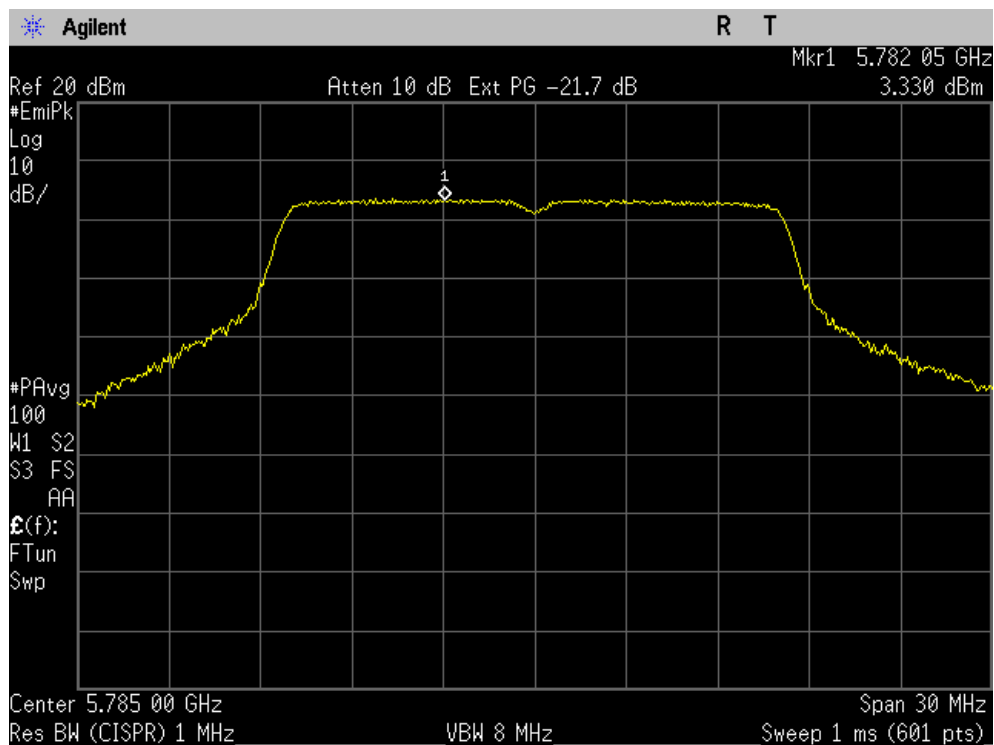
Plot 4.4.6



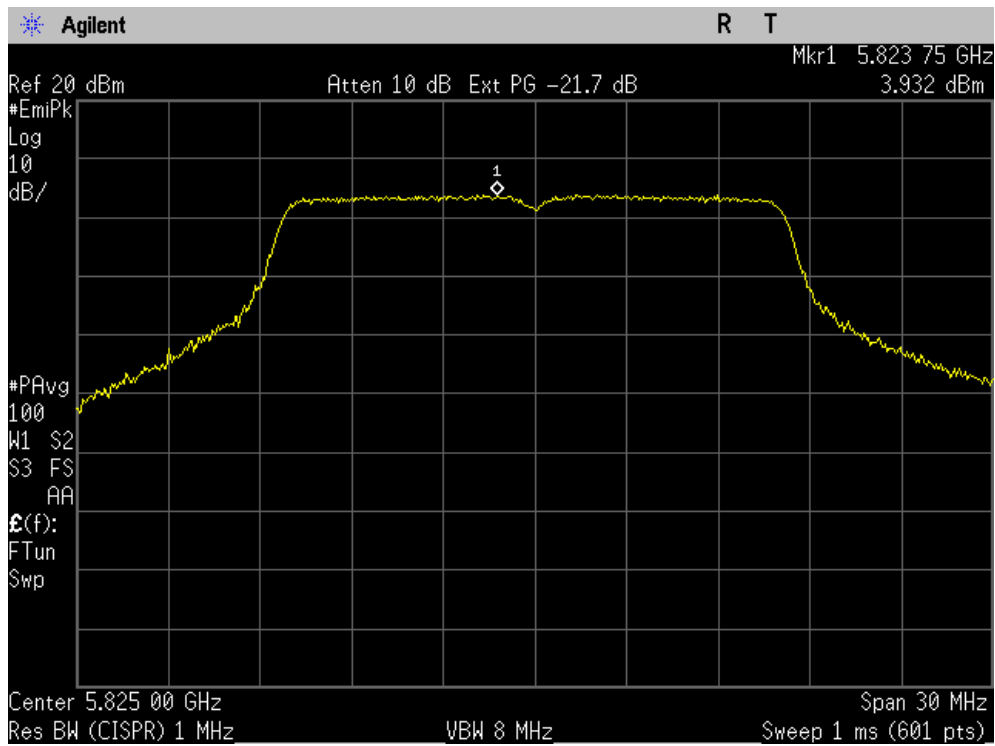
Plot 4.4.7



Plot 4.4.8



Plot 4.4.9



4.5. Conducted Spurious Emissions

Reference document:	47 CFR §15.247 (d)		
Test Requirements:	<p>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).</p>		
Test Method:	See sec 2.1c	Comply	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW:300kHz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.5.1 to 4.5.24	

Test results:

Worst case output of the four individual transmitters.

2400-2483.5 MHz Band:
Spurious

Frequency [MHz]	Data Rate [Mbps]	Delta value [dBc]	Delta value Limit [dBc]	Reference Plot*	Result
802.11b Mode					
2412	11	*	-20	4.5.1 - 4.5.2	Comply
2437	11	*	-20	4.5.3 - 4.5.4	Comply
2462	11	*	-20	4.5.5 - 4.5.6	Comply
802.11g Mode					
2412	54	*	-20	4.5.7 - 4.5.8	Comply
2437	54	*	-20	4.5.9 - 4.5.10	Comply
2462	54	*	-20	4.5.11 - 4.5.12	Comply

*All emissions at least 25 dB below the limit (45dBc)

Band edge

Frequency [MHz]	Data Rate [Mbps]	Delta value [dBc]	Delta value Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	-48.54	-20	4.5.13	Comply
2462	11	-48.64	-20	4.5.14	Comply
802.11g Mode					
2412	54	-25.70	-20	4.5.15	Comply
2462	54	-43.27	-20	4.5.16	Comply

5725-5850MHz Band:
Spurious

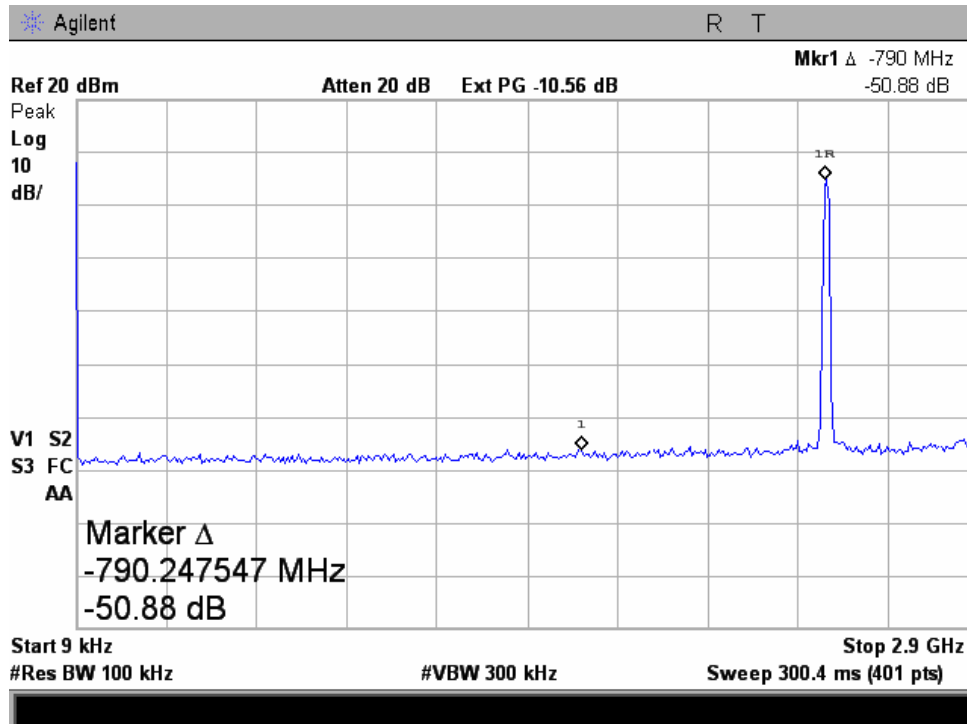
Frequency [MHz]	Data Rate [Mbps]	Delta value [dBc]	Delta value Limit [dBc]	Reference	Result
802.11a Mode					
5745	54	*	-20	4.5.17 - 4.5.18	Comply
5785	54	*	-20	4.5.19 - 4.5.20	Comply
5825	54	*	-20	4.5.21 - 4.5.22	Comply

*All emissions at least 25 dB below the limit (45dBc)

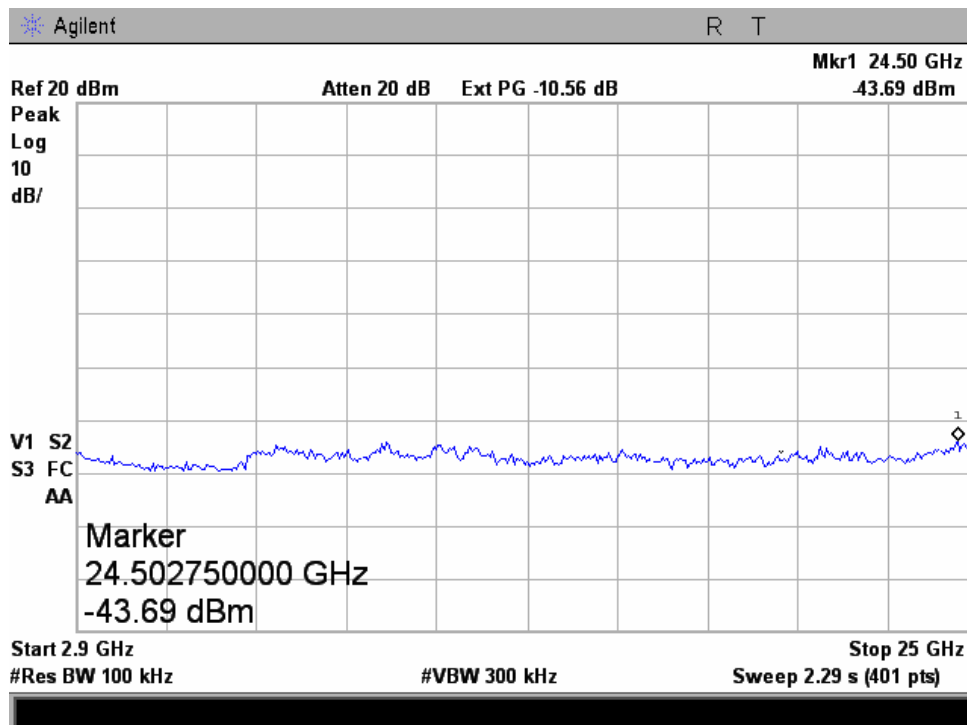
Band edge

Frequency [MHz]	Data Rate [Mbps]	Delta value [dBc]	Delta value Limit [dBc]	Reference	Result
802.11a Mode					
5745	54	-48.16	-20	4.5.23	Comply
5825	54	-47.99	-20	4.5.24	Comply

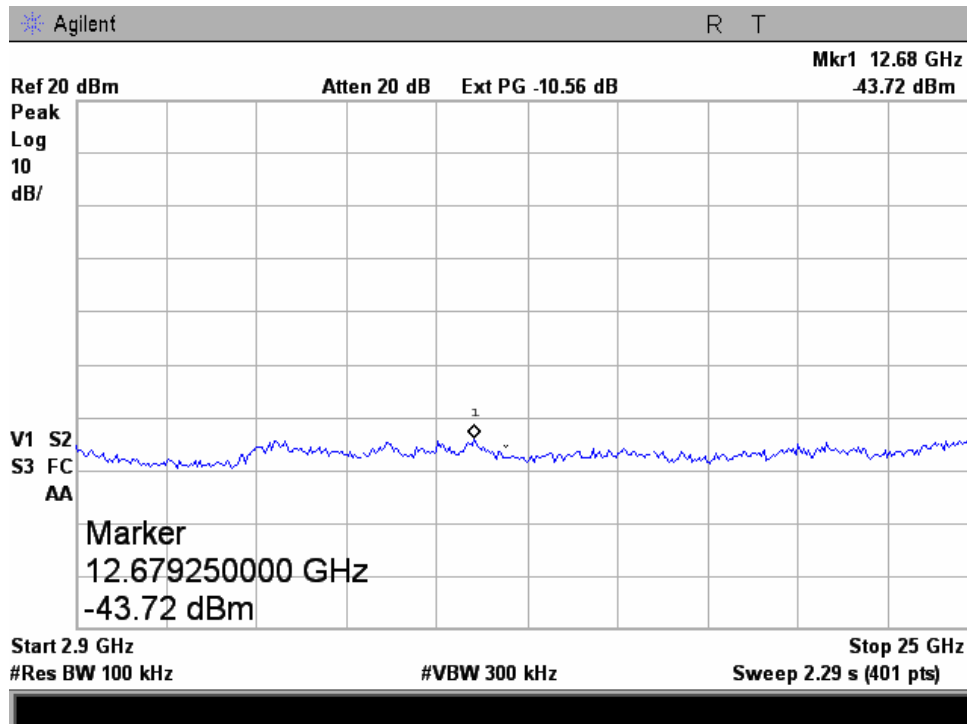
802.11b Mode
Plot 4.5.1



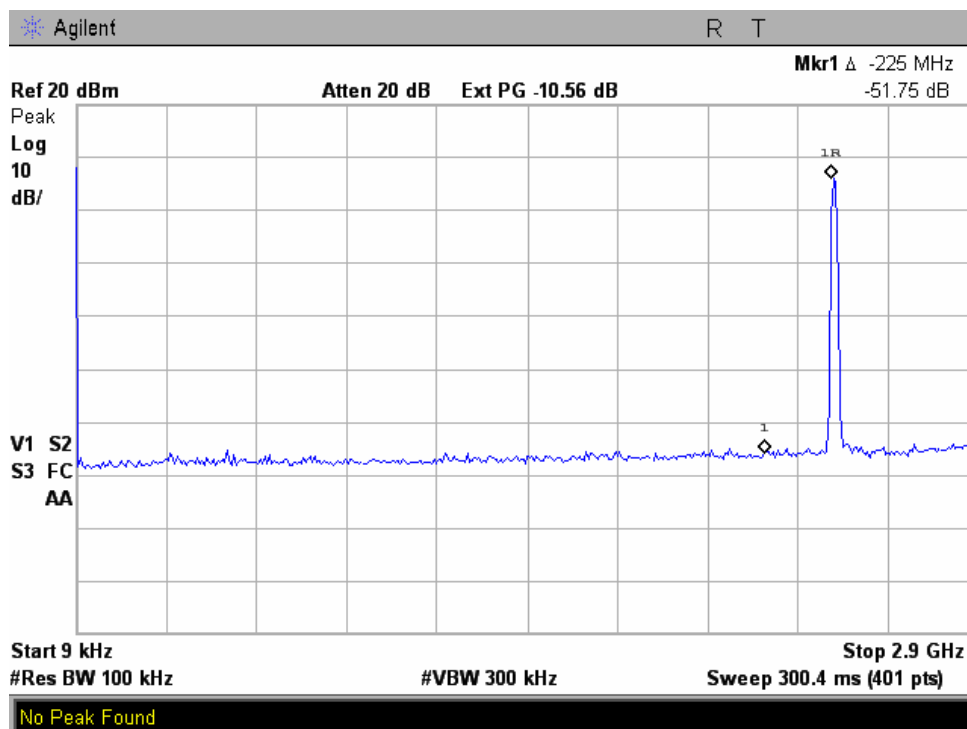
Plot 4.5.2



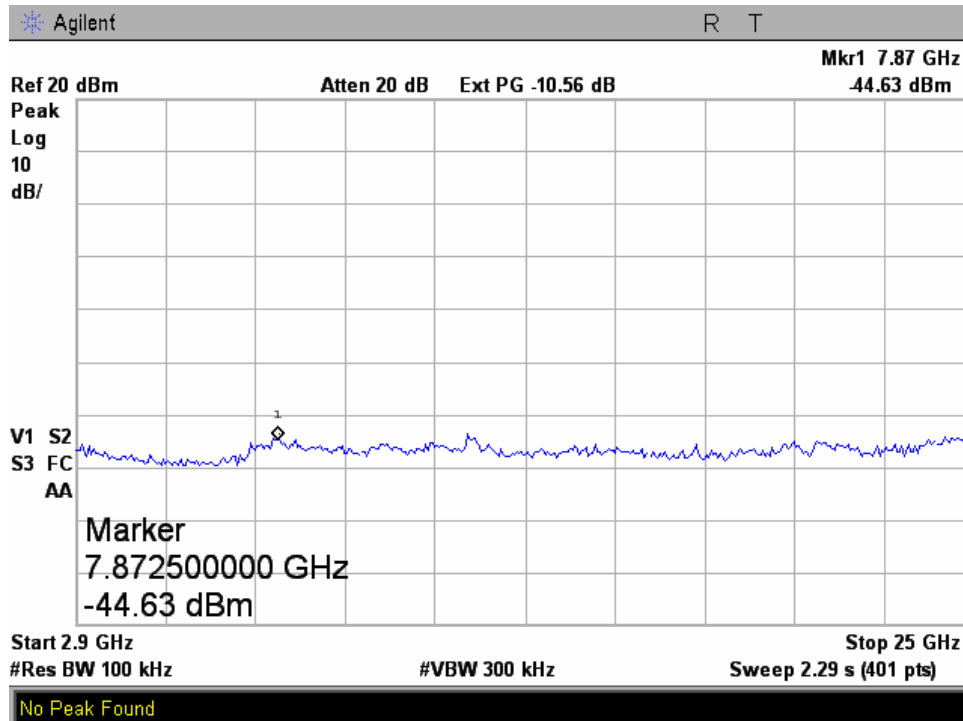
Plot 4.5.3



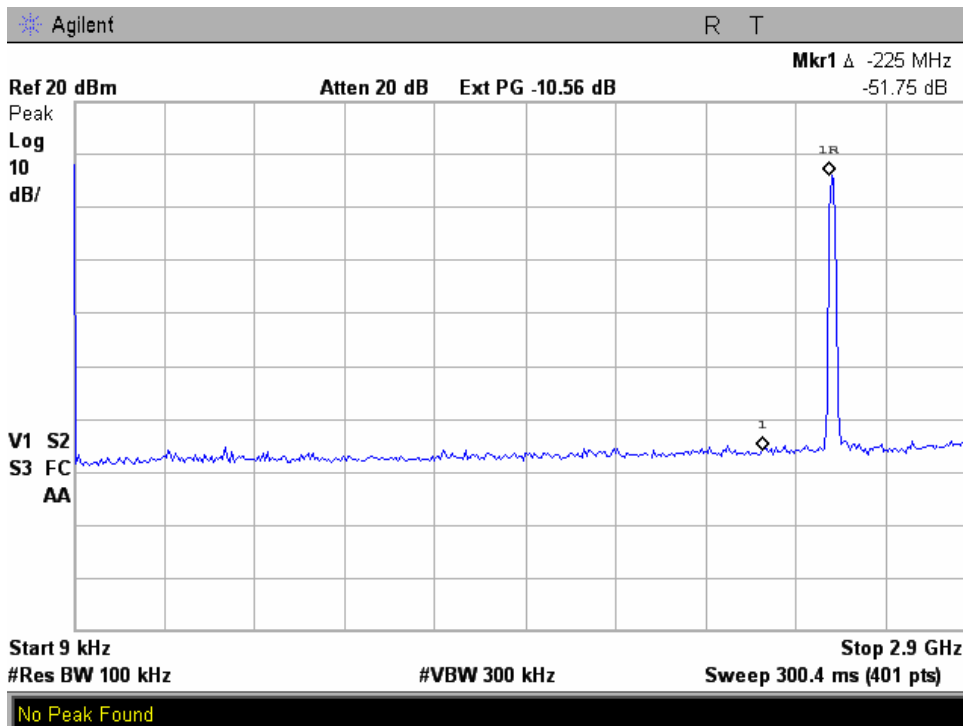
Plot 4.5.4



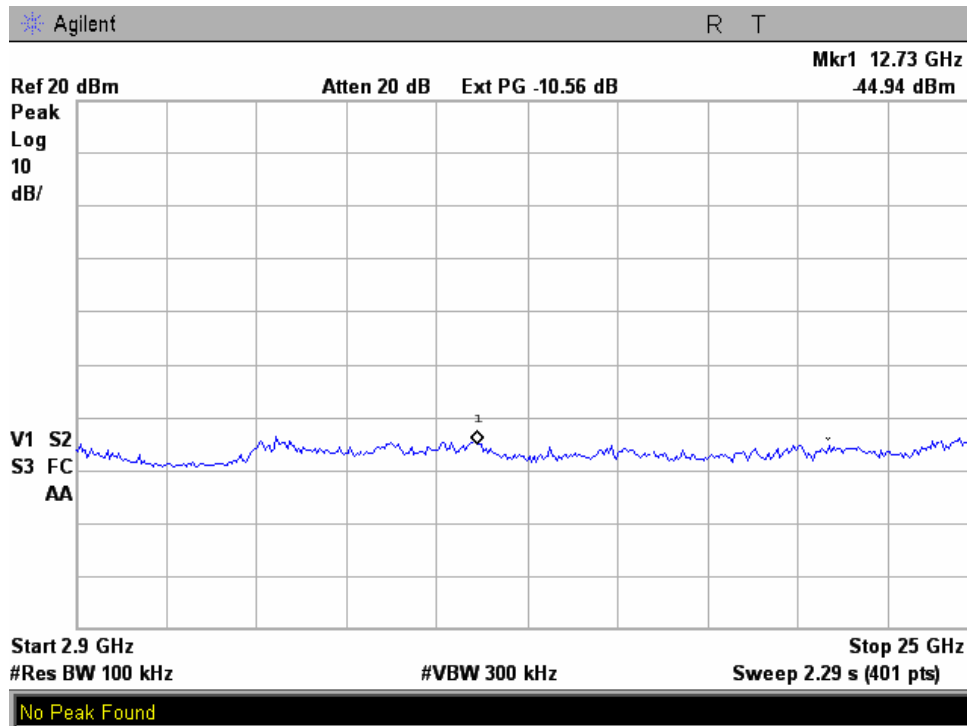
Plot 4.5.5



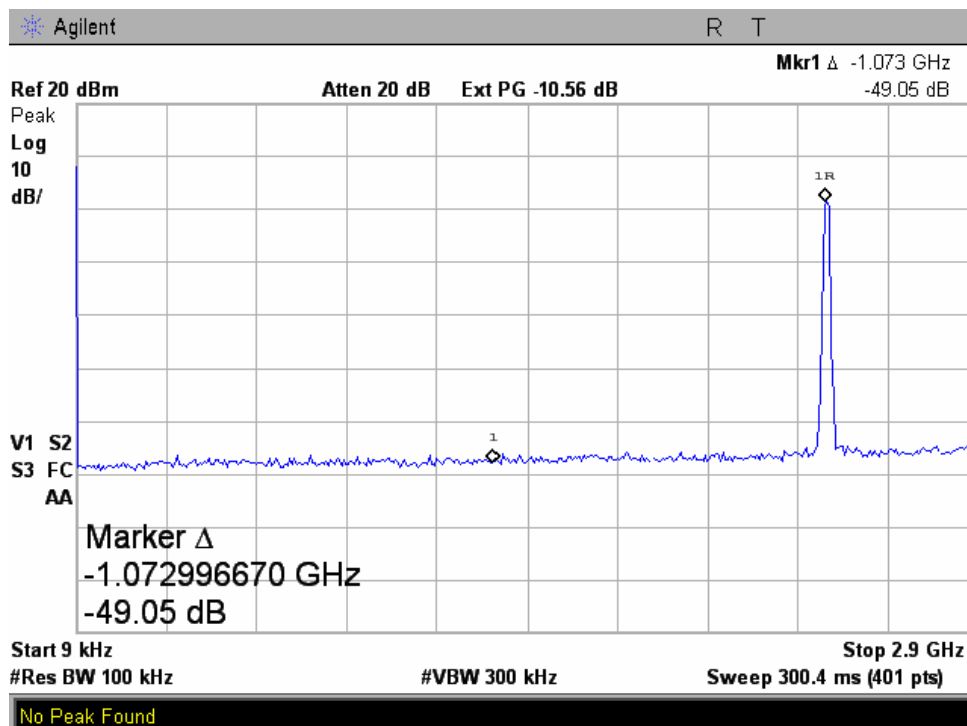
Plot 4.5.6



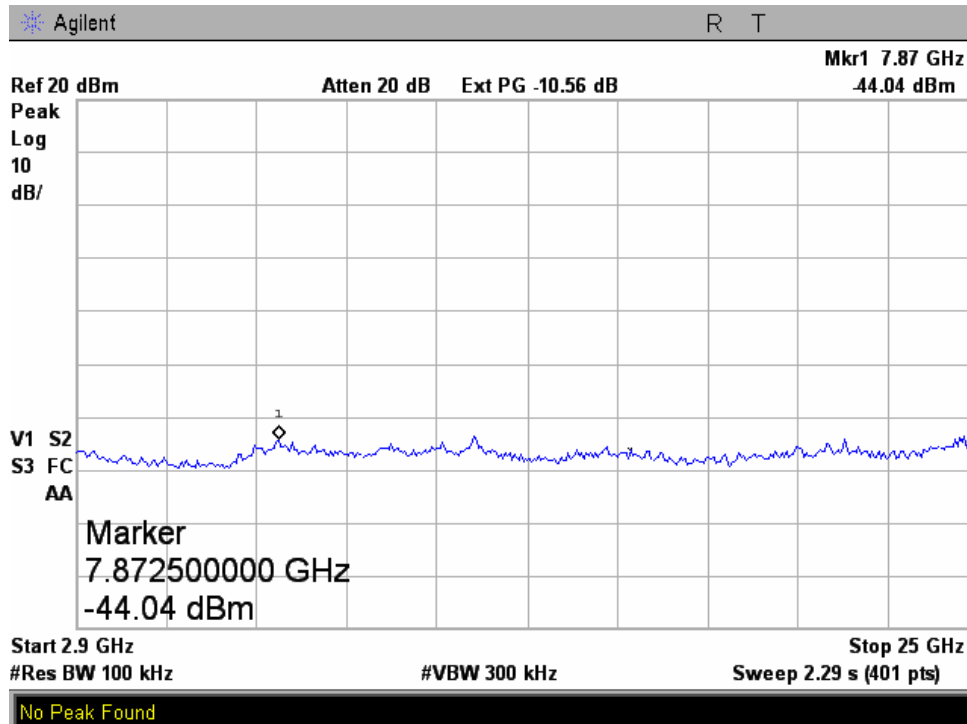
802.11g Mode
Plot 4.5.7



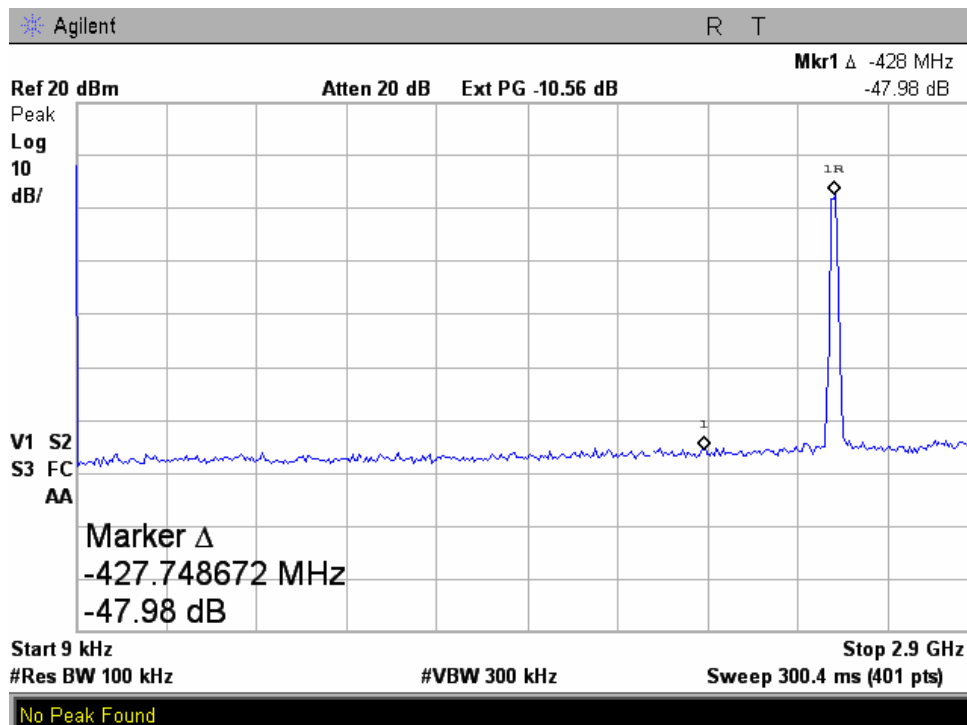
Plot 4.5.8



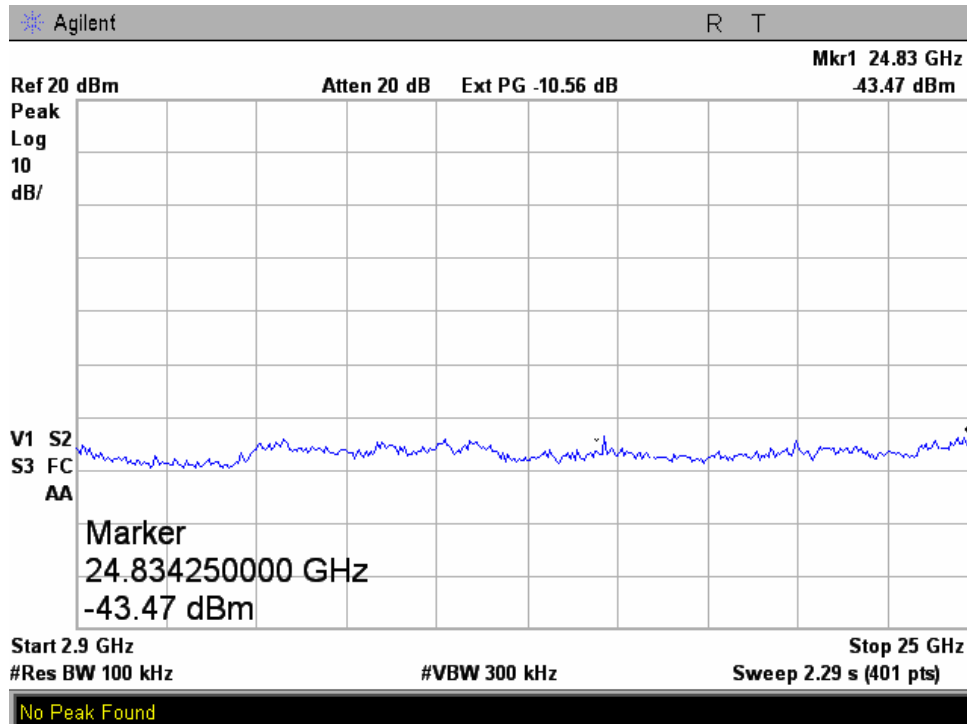
Plot 4.5.9



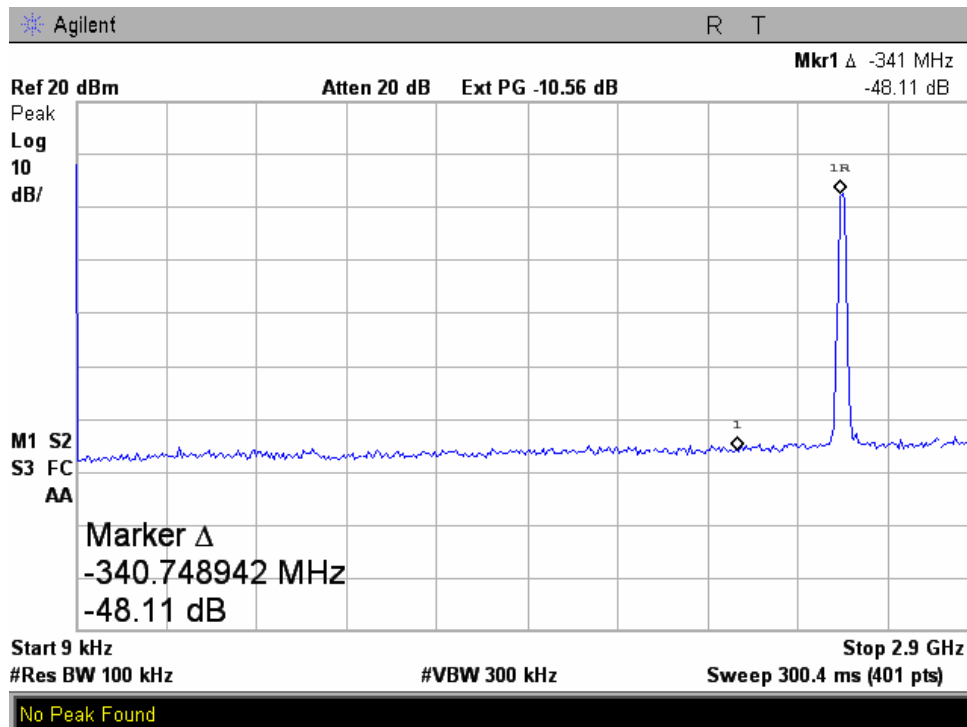
Plot 4.5.10



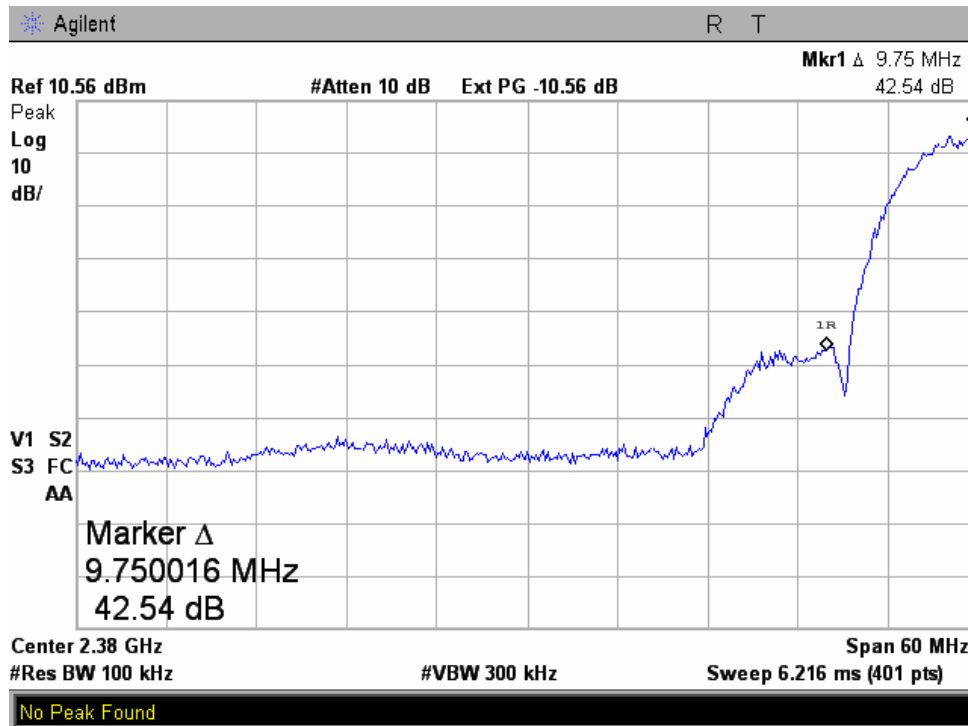
Plot 4.5.11



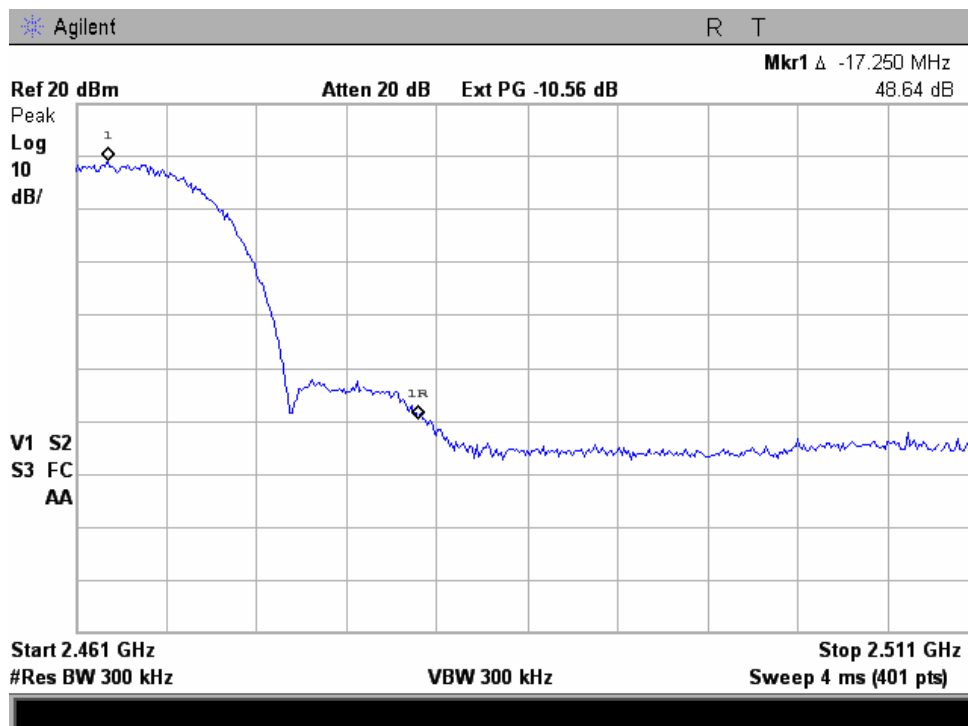
Plot 4.5.12



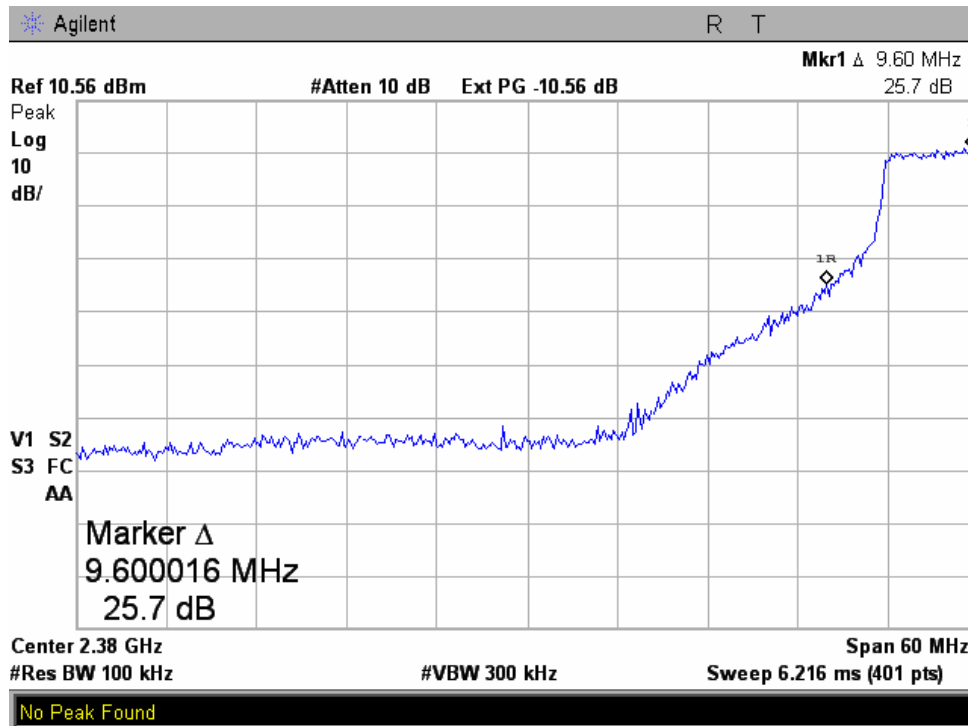
802.11b Mode
Plot 4.5.13



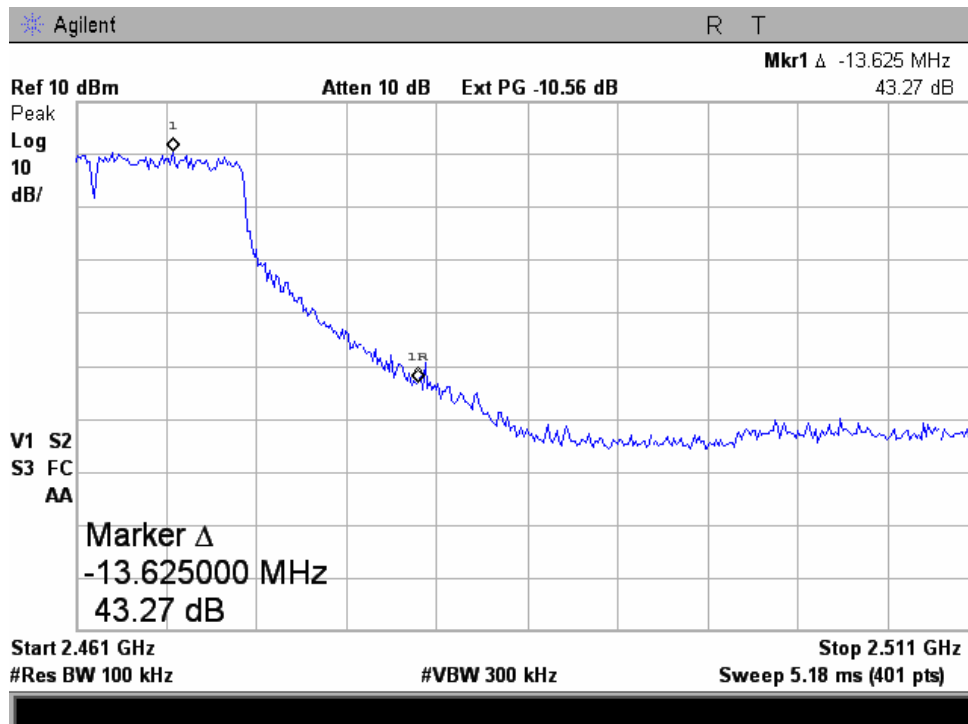
Plot 4.5.14



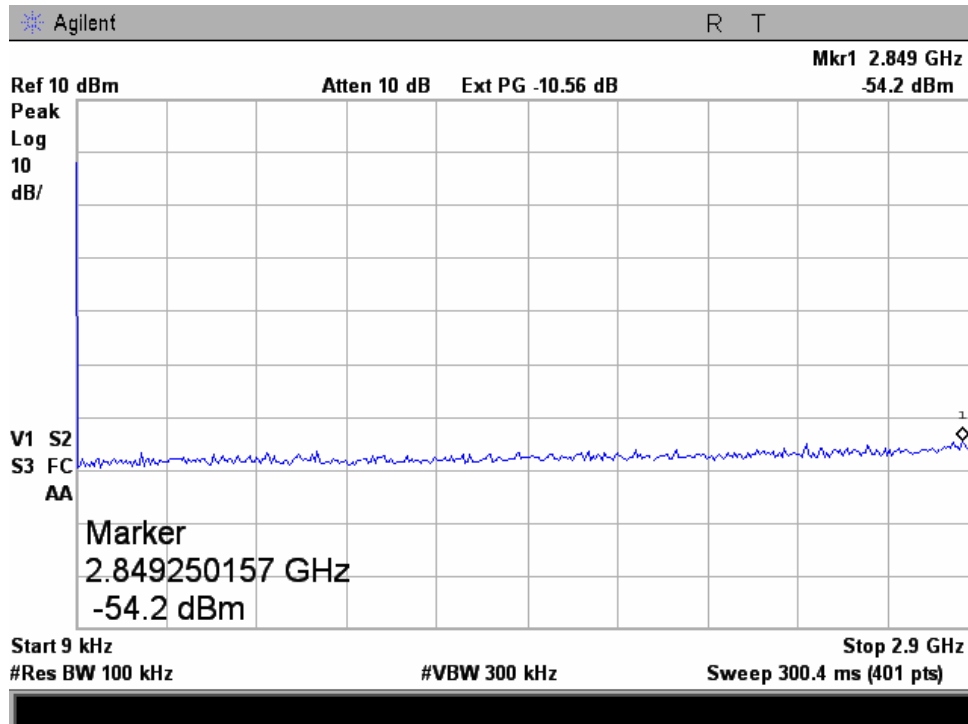
802.11g Mode
Plot 4.5.15



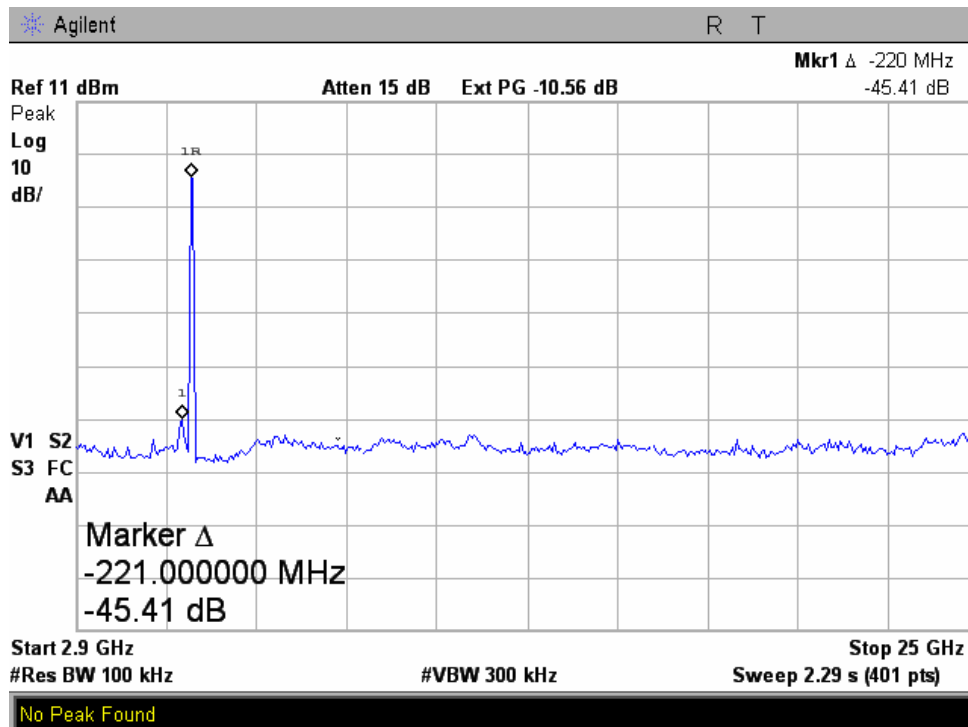
Plot 4.5.16



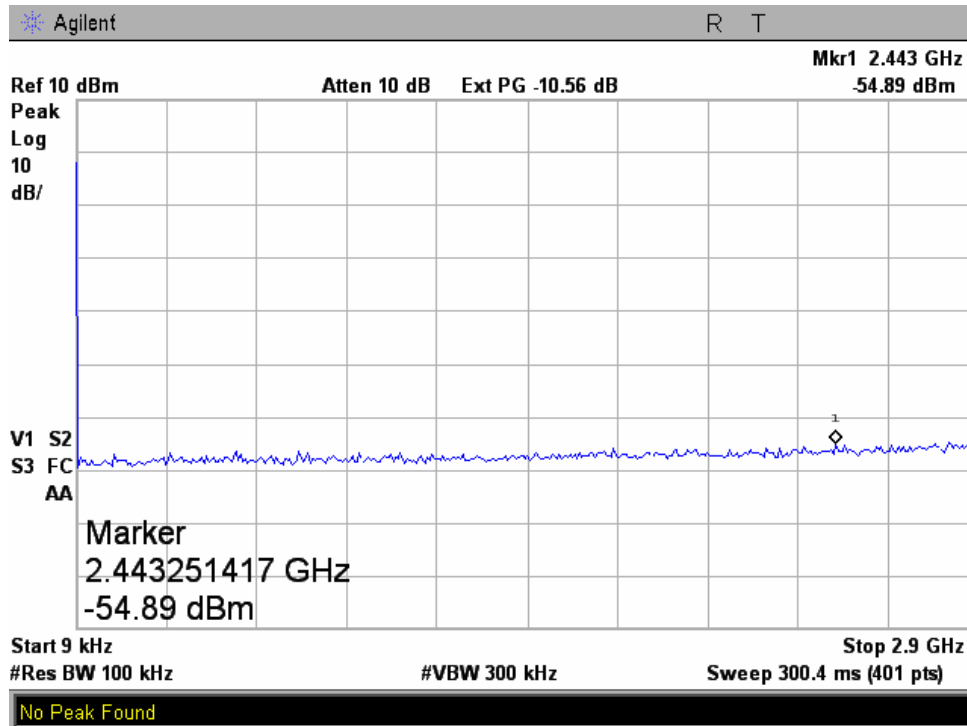
802.11a Mode
Plot 4.5.17



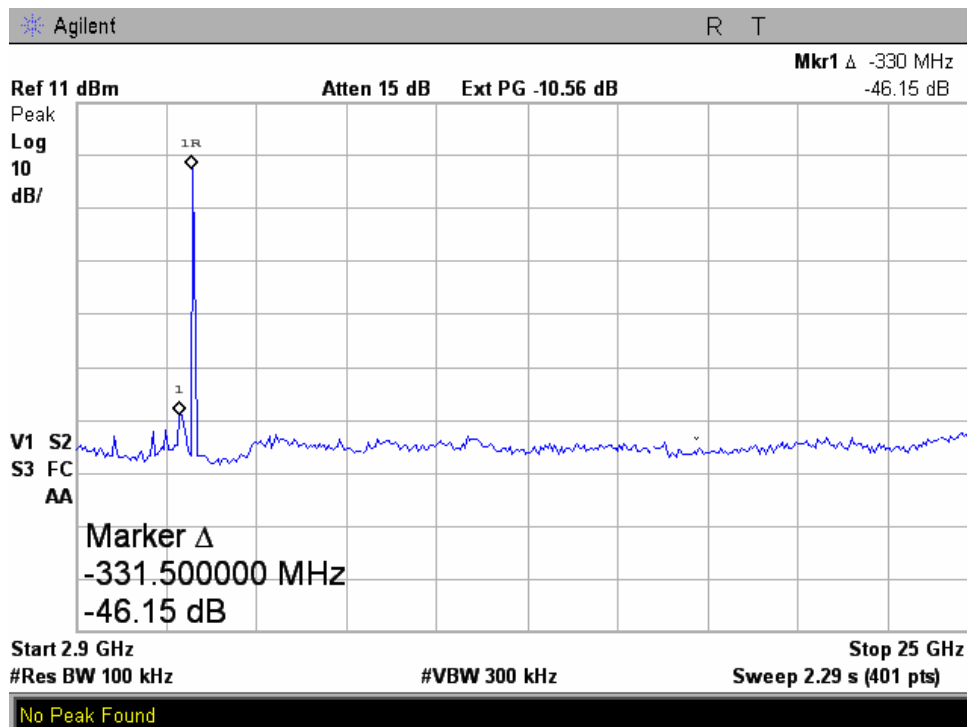
Plot 4.5.18



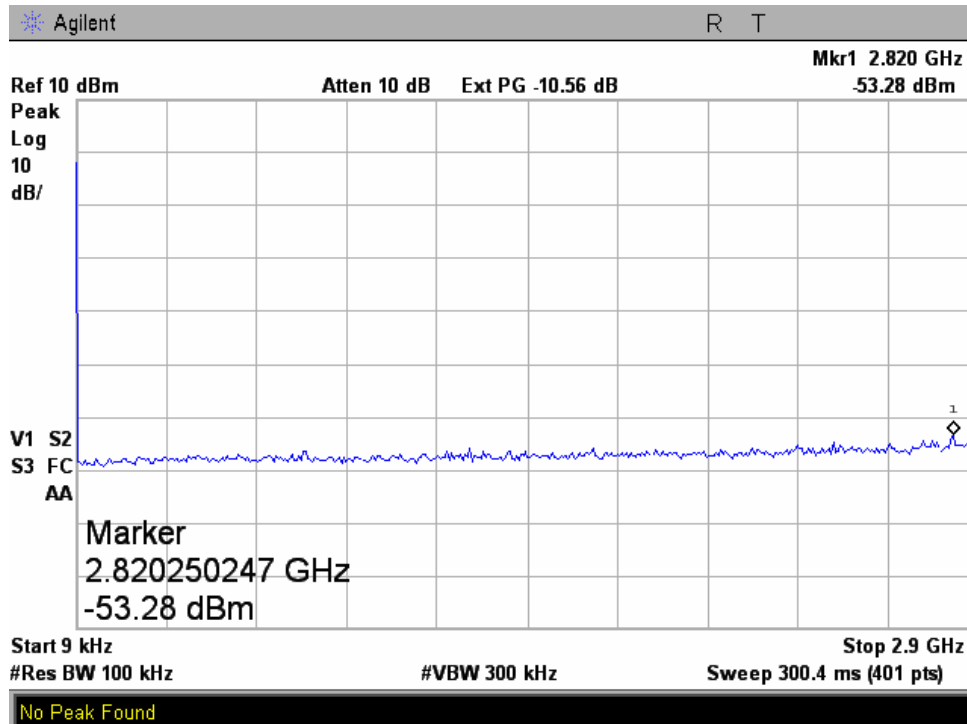
Plot 4.5.19



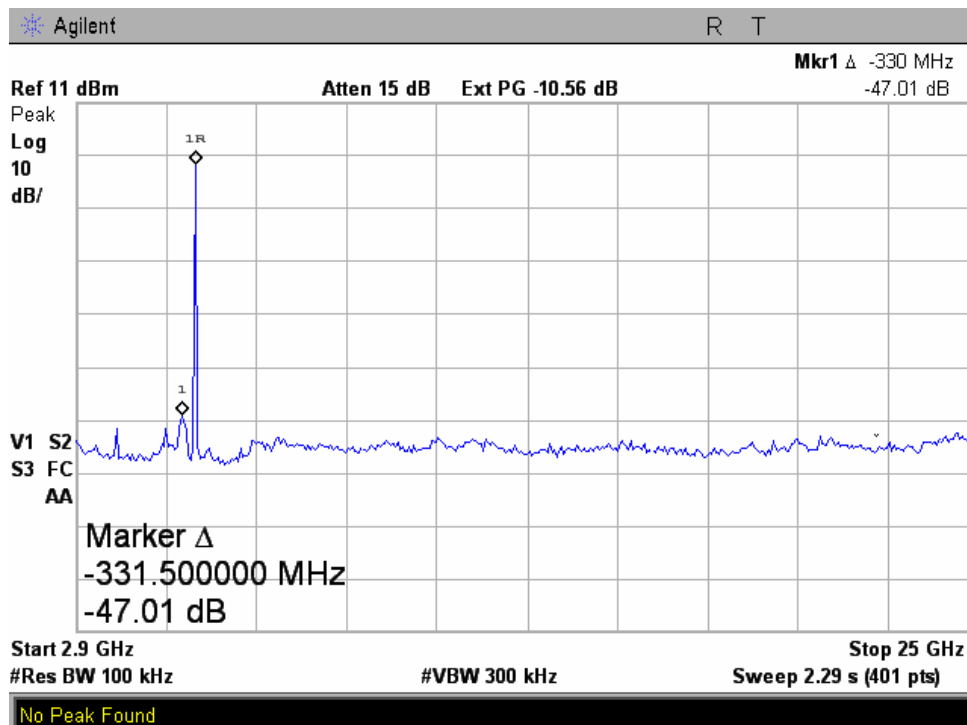
Plot 4.5.20



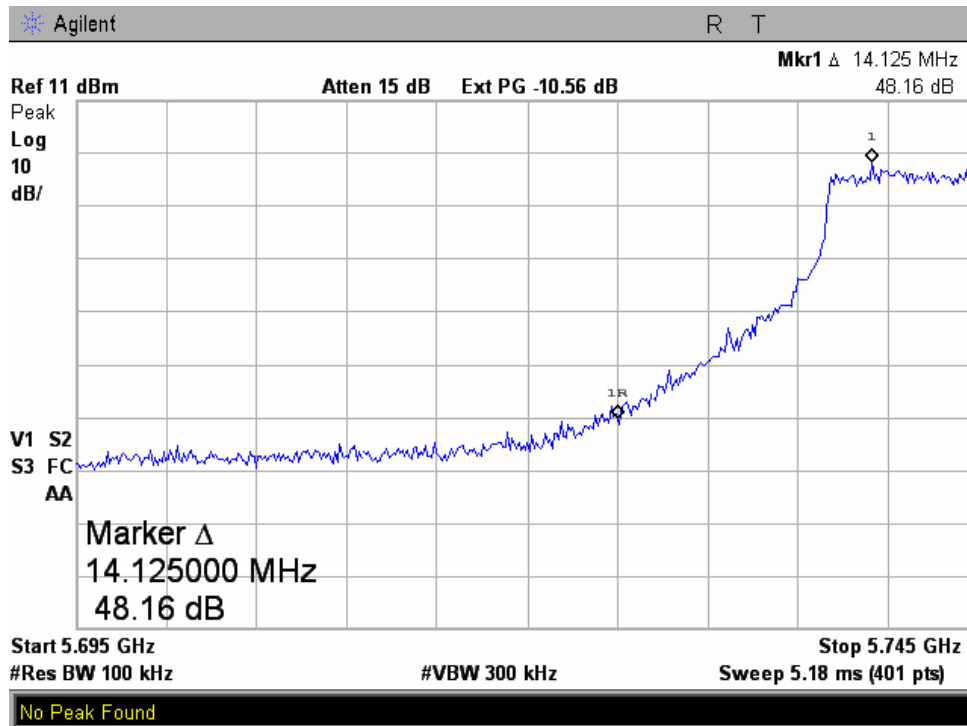
Plot 4.5.21



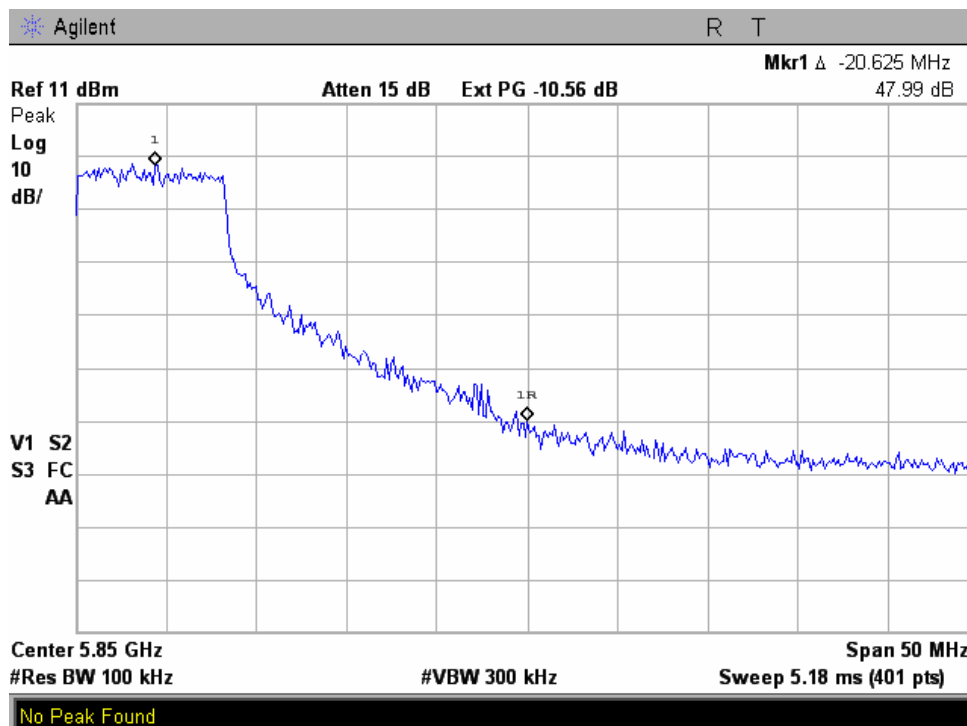
Plot 4.5.22



802.11a Mode
Plot 4.5.23



Plot 4.5.24



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

Reference document:	47 CFR §15.247 (d) & §15.205		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (See §15.205(c)).		
Test Method:	See sec 2.2	Comply	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	Peak: RBW= 1MHz, VBW= 1MHz, Average: VBW= 10 Hz		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.6.1 to 4.6.16	

Test results:

Worst case emission of the four transmitters operating simultaneously.

Frequency [MHz]	Data Rate [Mbps]	Antenna Gain [dBi]	Emission Frequency [MHz]	Detector Type	Polarization V/H	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
802.11b Mode								
2412	11	3	2310.8	Avg	H	26.41	54	-27.59
2412	11	3	2390	Peak	H	45.33	74	-28.67
2462	11	3	2483.5	Avg	H	37.31	54	-16.69
2462	11	3	2483.5	Peak	H	50.20	74	-23.8
802.11g Mode								
2412	54	3	2390.00	Avg	H	34.25	54	-19.75
2412	54	3	2390.00	Peak	H	52.17	74	-21.83
2462	54	3	2483.50	Avg	H	32.21	54	-21.79
2462	54	3	2484.37	Peak	H	53.87	74	-20.13

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

Correction Factor = Antenna factor + Cable Loss

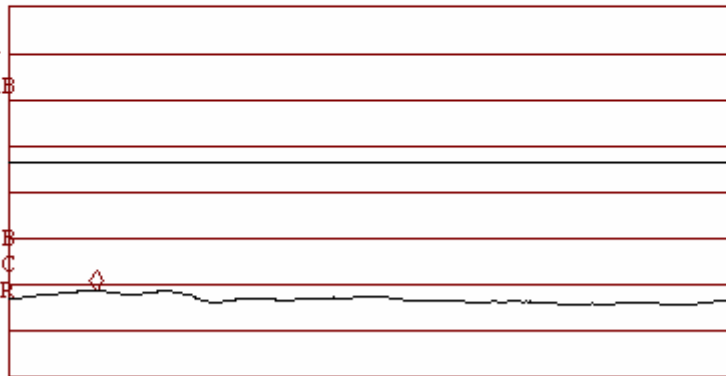
**11 Mbit, Lowest Frequency
Vertical Polarization
Average
Plot 4.6.1**

~~/30~~ EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.31080 GHz
26.41 dB μ V/m

LOG REF 88.0 dB μ V/m
10
dB/
ATN
10 dB

VA SB
SC FC
ACORR



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

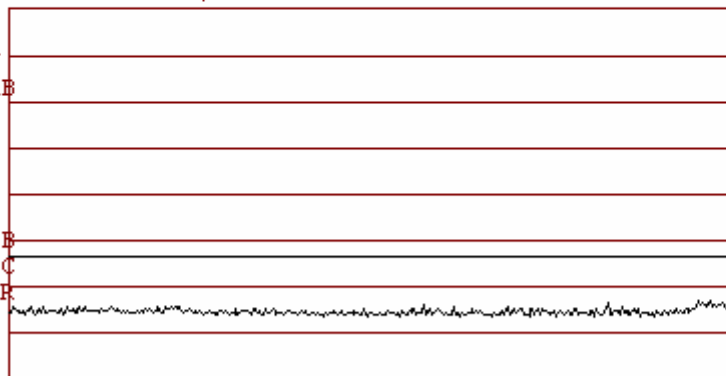
**Peak
Plot 4.6.2**

~~/30~~ EXRP E

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

LOG REF 108.0 dB μ V/m
10
dB/
ATN
20 dB

VA SB
SC FC
ACORR



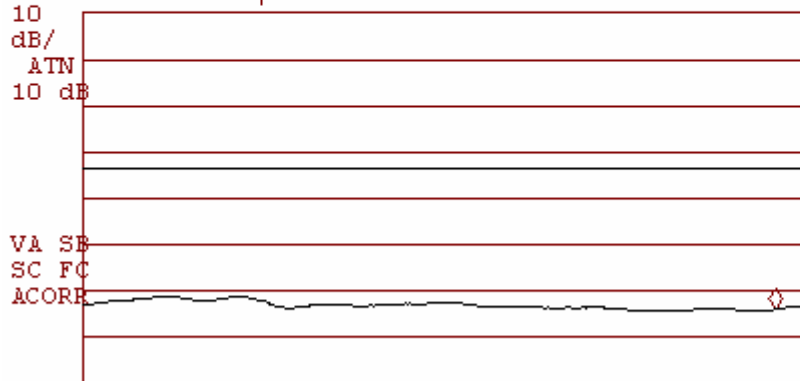
START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec

Horizontal Polarization
Average
Plot 4.6.3

~~/~~ EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38573 GHz
23.70 dB μ V/m

LOG REF 88.0 dB μ V/m



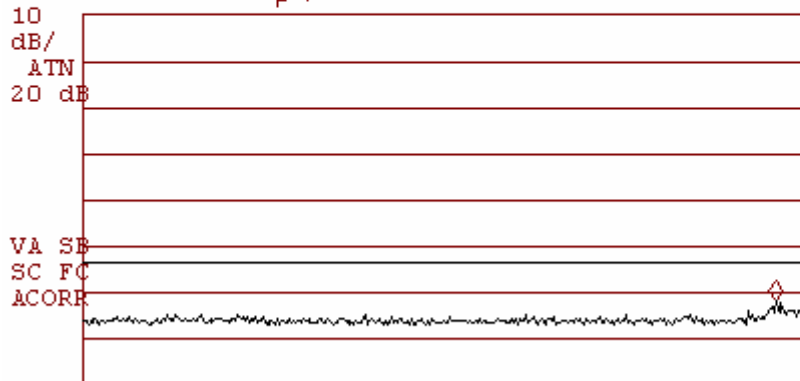
START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 27.0 sec

Peak
Plot 4.6.4

~~/~~ EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38573 GHz
46.05 dB μ V/m

LOG REF 108.0 dB μ V/m



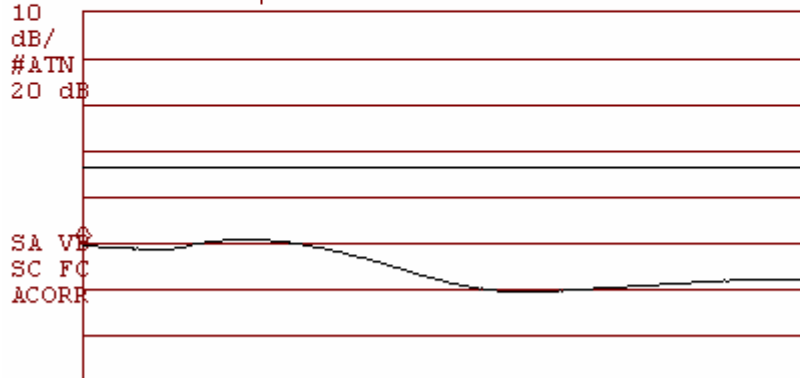
START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz SWP 20.0 msec

**11 Mbit, Highest Frequency
Horizontal Polarization
Average
Plot 4.6.5**

/p EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48350 GHz
37.31 dB_μV/m

LOG REF 88.0 dB_μV/m



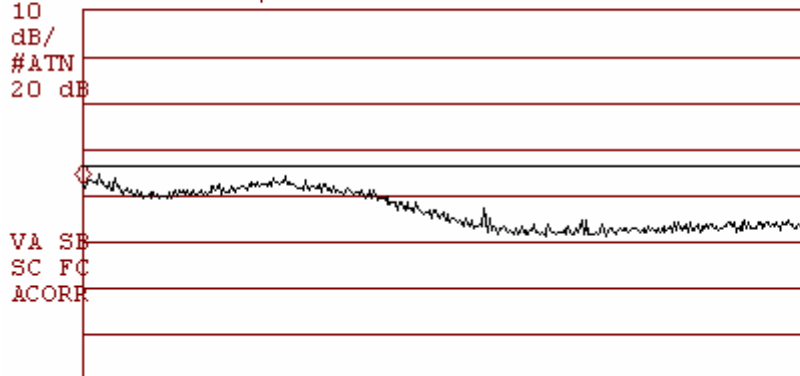
START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 10 Hz SWP 5.00 sec

**Peak
Plot 4.6.6**

/p EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48350 GHz
50.20 dB_μV/m

LOG REF 88.0 dB_μV/m



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

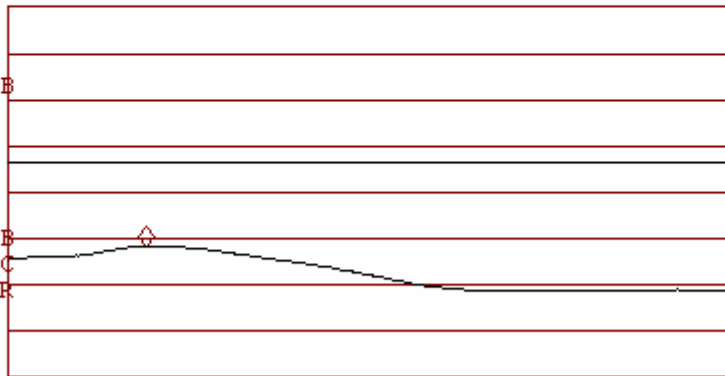
Vertical Polarization
Average
Plot 4.6.7

~~/~~ EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.48664 GHz
36.05 dB μ V/m

LOG REF 88.0 dB μ V/m
10
dB/
#ATN
20 dB

VA SB
SC FC
ACORR



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

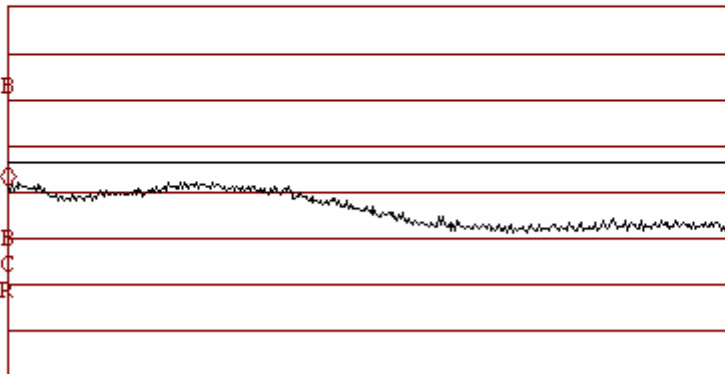
Peak
Plot 4.6.8

~~/~~ EXRP E

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

LOG REF 88.0 dB μ V/m
10
dB/
#ATN
20 dB

VA SB
SC FC
ACORR



START 2.48350 GHz STOP 2.50000 GHz
#IF BW 1.0 MHz #AVG BW 1 MHz SWP 20.0 msec

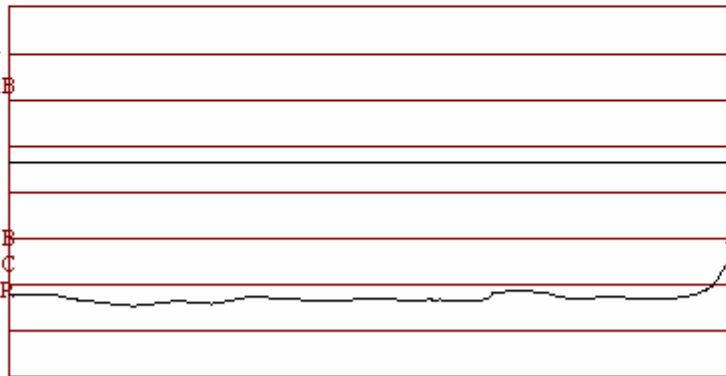
**54 Mbit, Lowest Frequency
Vertical Polarization
Average
Plot 4.6.9**

~~/~~ EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.38955 GHz
34.48 dB μ V/m

LOG REF 88.0 dB μ V/m
10
dB/
ATN
10 dB

VA SE
SC FC
ACORR



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

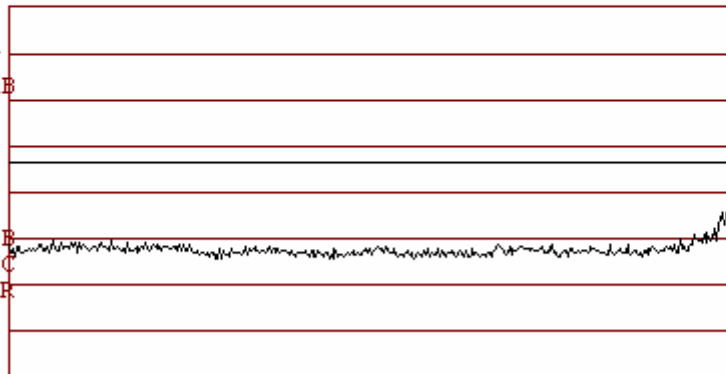
**Peak
Plot 4.6.10**

~~/~~ EXRP E

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

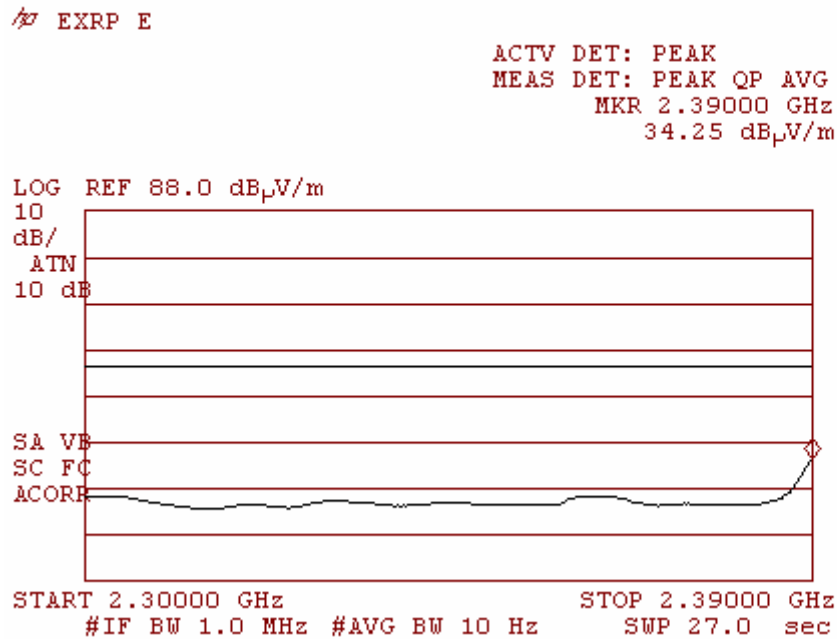
LOG REF 88.0 dB μ V/m
10
dB/
ATN
10 dB

VA SE
SC FC
ACORR

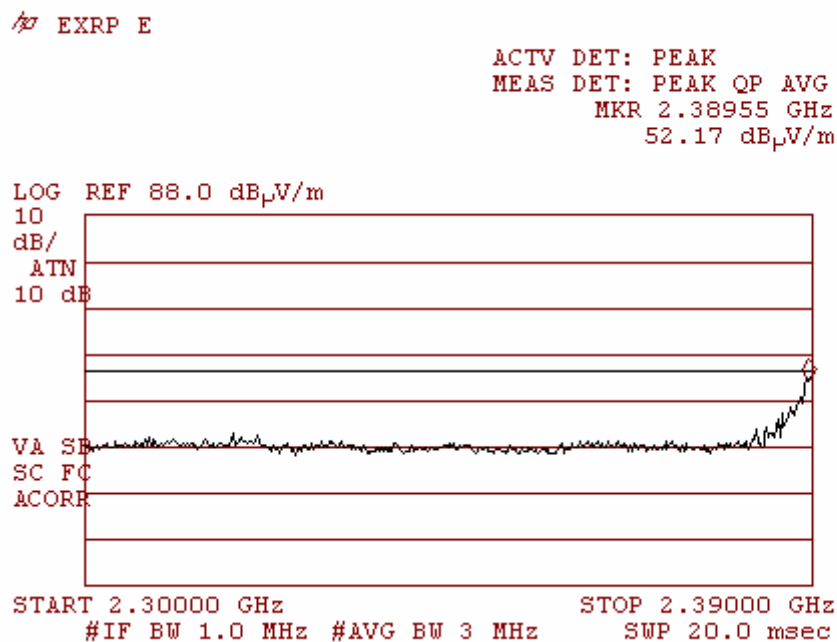


START 2.30000 GHz STOP 2.39000 GHz
#IF BW 1.0 MHz AVG BW 300 kHz SWP 20.0 msec

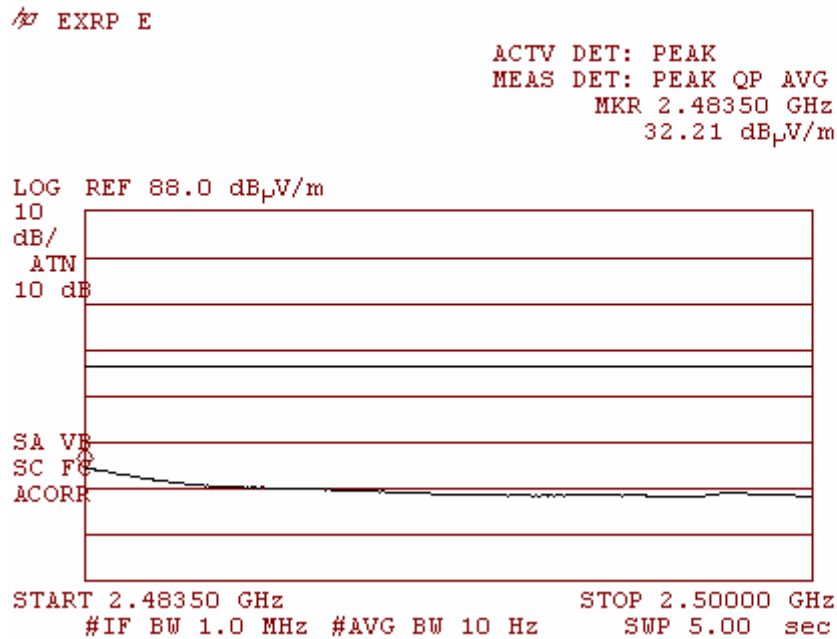
Horizontal Polarization
Average
Plot 4.6.11



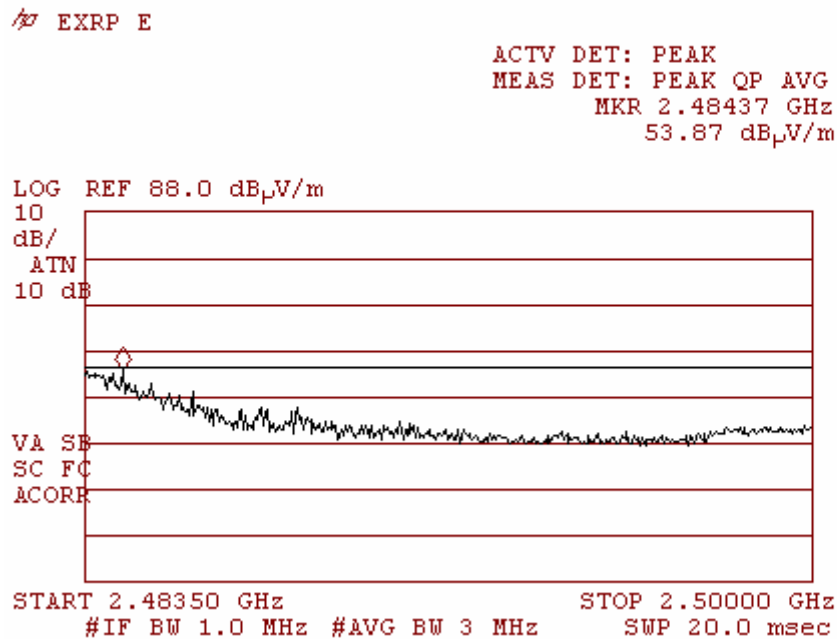
Peak
Plot 4.6.12



**54 Mbit, Highest Frequency
Vertical Polarization
Average
Plot 4.6.13**



**Peak
Plot 4.6.14**



Horizontal Polarization
Average
Plot 4.6.15

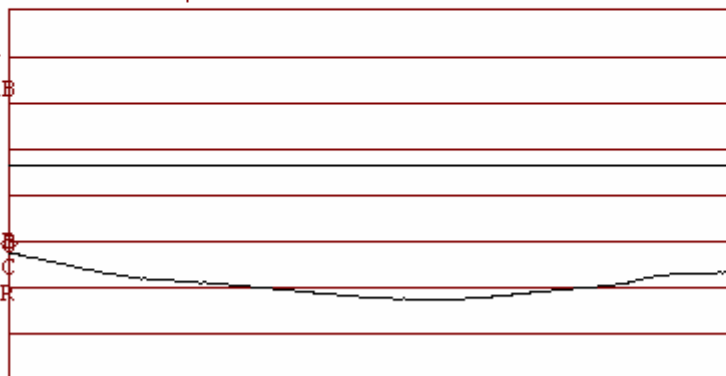
/p EXRP E

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

LOG REF 88.0 dB μ V/m

10
dB/
ATN
10 dB

VA S0
SC FC
ACORR



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

Peak
Plot 4.6.16

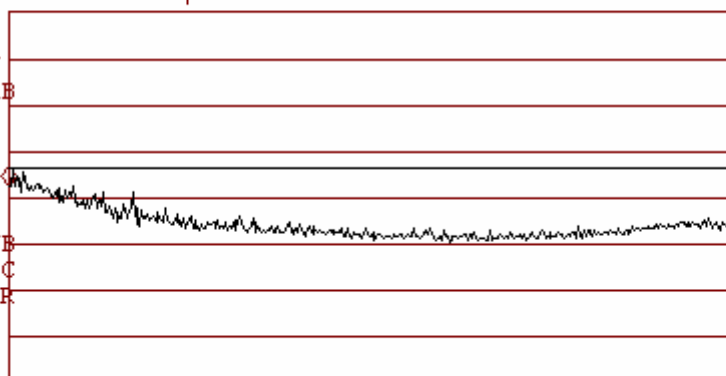
/p EXRP E

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

LOG REF 88.0 dB μ V/m

10
dB/
ATN
10 dB

SA VB
SC FC
ACORR



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

4.7. Spurious Radiated Emissions, Restricted Bands

Reference document:	47 CFR §15.247 (d), & §15.205, & §15.209(a)		
Test Requirements:	The emissions from an intentional radiator shall not exceed the field strength levels specified in §15.209(a).		
Test Method:	See sec 2.2, with Band Reject filter where appropriate	Comply	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f>Peak: RBW= 1MHz, VBW= 1MHz, Average: VBW= 10 Hz f<1GHz: RBW= 120kHz, VBW= 300kHz,		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.7.1 to 4.7.16	

Test result:

Worst case emission while four transmitters operating simultaneously.

- Operating:
- 1) 802.11b Modes and 802.11a Modes transmitting simultaneously
 - 2) 802.11g Modes and 802.11a Modes transmitting simultaneously
 - 3) 802.11 a Modes transmitting simultaneously

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

Channel Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization V/H	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
802.11b Mode							
2412	11	4824	Peak	H	52.37	74	-21.63
2412	11	4824	Avg	H	40.75	54	-13.25
2437	11	4874	Peak	H	51.36	74	-22.64
2437	11	4874	Avg	H	39.84	54	-14.16
2462	11	4924	Peak	H	53.52	74	-20.48
2462	11	4924	Avg	H	41.68	54	-12.32
All other emissions at least 30 dB below the limit							

Channel Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization V/H	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
802.11g Mode							
2412	54	4824	Peak	H	50.99	74	-23.01
2412	54	4824	Avg	H	39.44	54	-14.56
2437	54	4874	Peak	H	51.20	74	-22.80
2437	54	4874	Avg	H	38.36	54	-15.64
2462	54	4924	Peak	H	51.59	74	-22.41
2462	54	4924	Avg	H	39.95	54	-14.05
All other emissions at least 30 dB below the limit							

802.11a Mode							
Channel Frequency [MHz]	Data Rate [Mbps]	Emission Frequency [MHz]	Detector Type	Polarization V/H	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
All emissions at least 20 dB below the limit							

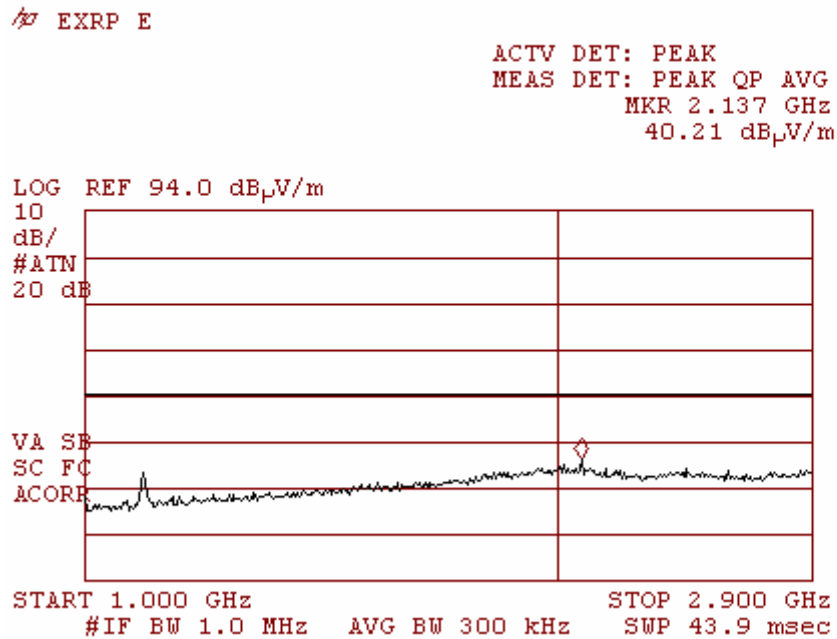
Test results below 1GHz:

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

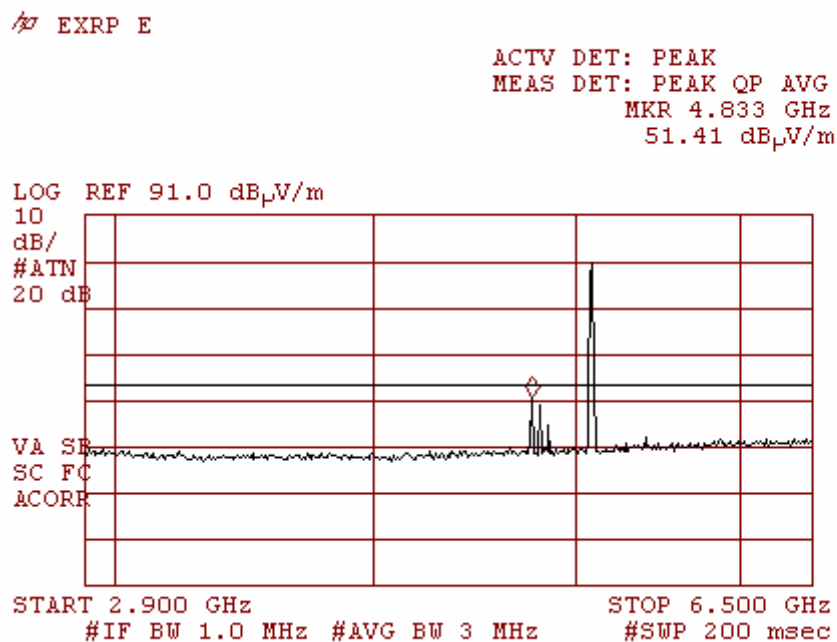
Frequency [MHz]	Emission Level [dBμV/m]	Detector Type	Polarization V/H	Limit [dBμV/m]	Margin [dB]
30.59	31.3	QP	V	40	-8.7
67.95	33.2	QP	V	40	-6.8
100	33.0	QP	V	43.5	-10.5
200	38.7	QP	H	43.5	-4.8
250	40.9	QP	H	46.5	-5.6
500	39.5	QP	H	46.5	-7
750	33.8	QP	H	46.5	-12.7

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

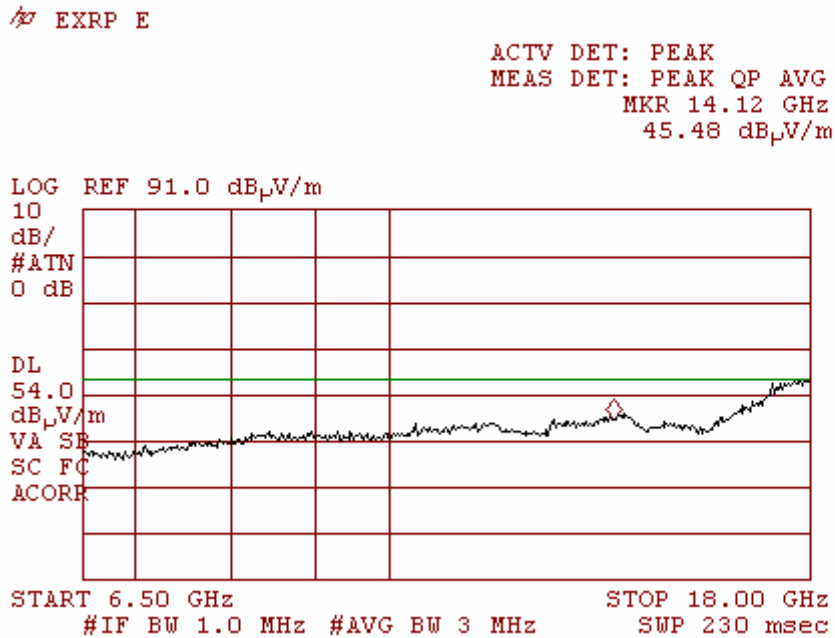
Vertical & Horizontal Polarization
Plot 4.7.1



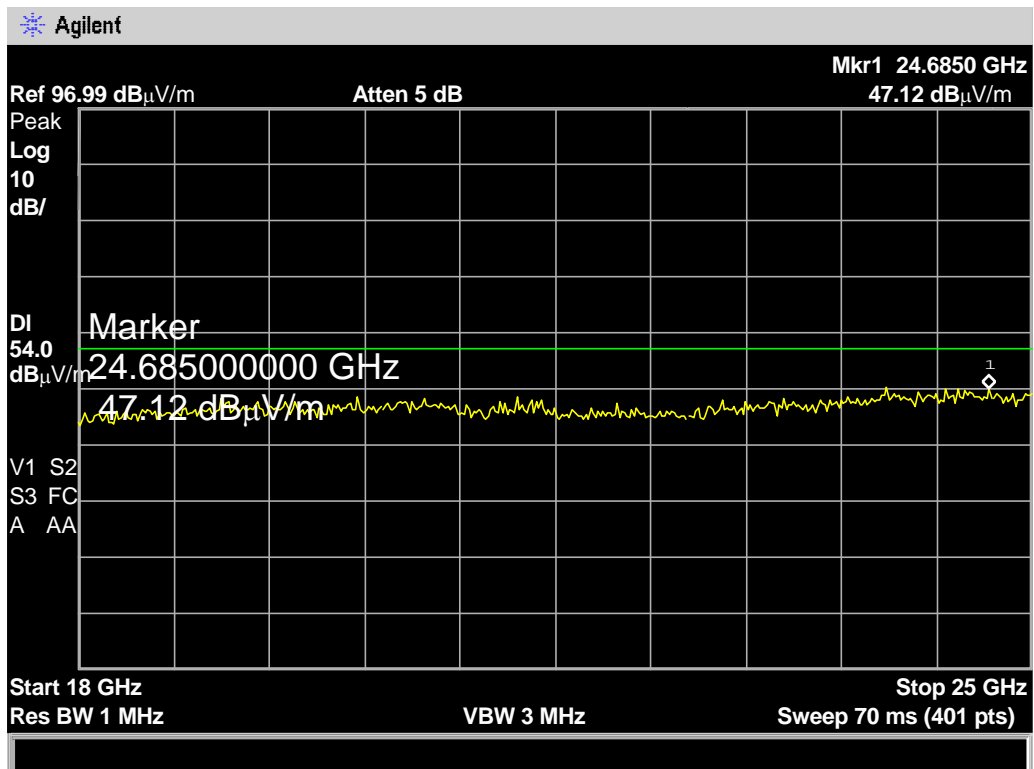
Vertical & Horizontal Polarization
Plot 4.7.2



Vertical & Horizontal Polarization
Plot 4.7.3



Vertical & Horizontal Polarization
Plot 4.7.4

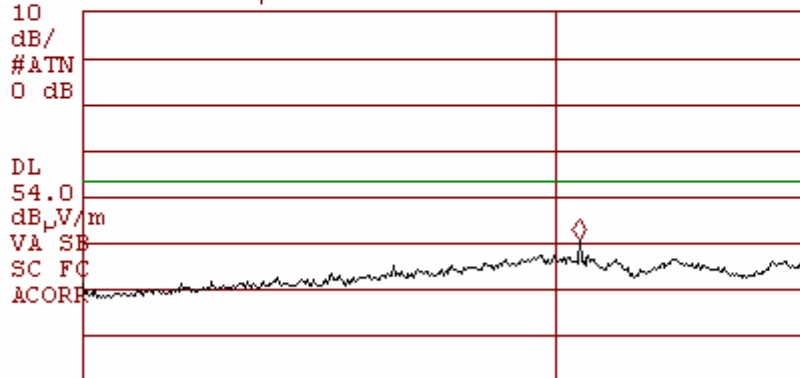


Vertical & Horizontal Polarization
Plot 4.7.5

EXRP E

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 2.137 GHz
41.66 dB μ V/m

LOG REF 91.0 dB μ V/m



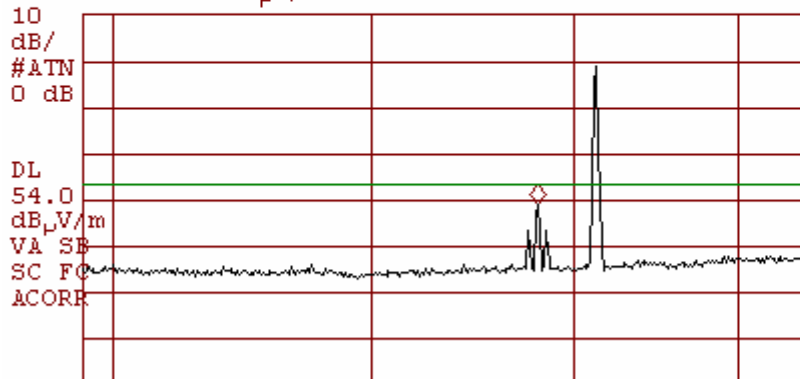
START 1.000 GHz STOP 2.900 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz #SWP 1.50 sec

Vertical & Horizontal Polarization
Plot 4.7.6

EXRP E

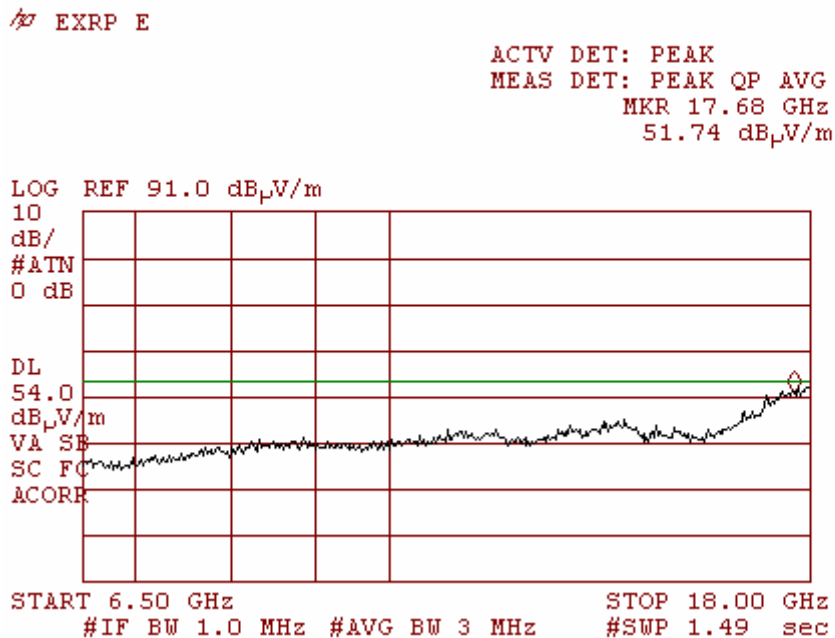
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 4.876 GHz
49.85 dB μ V/m

LOG REF 91.0 dB μ V/m

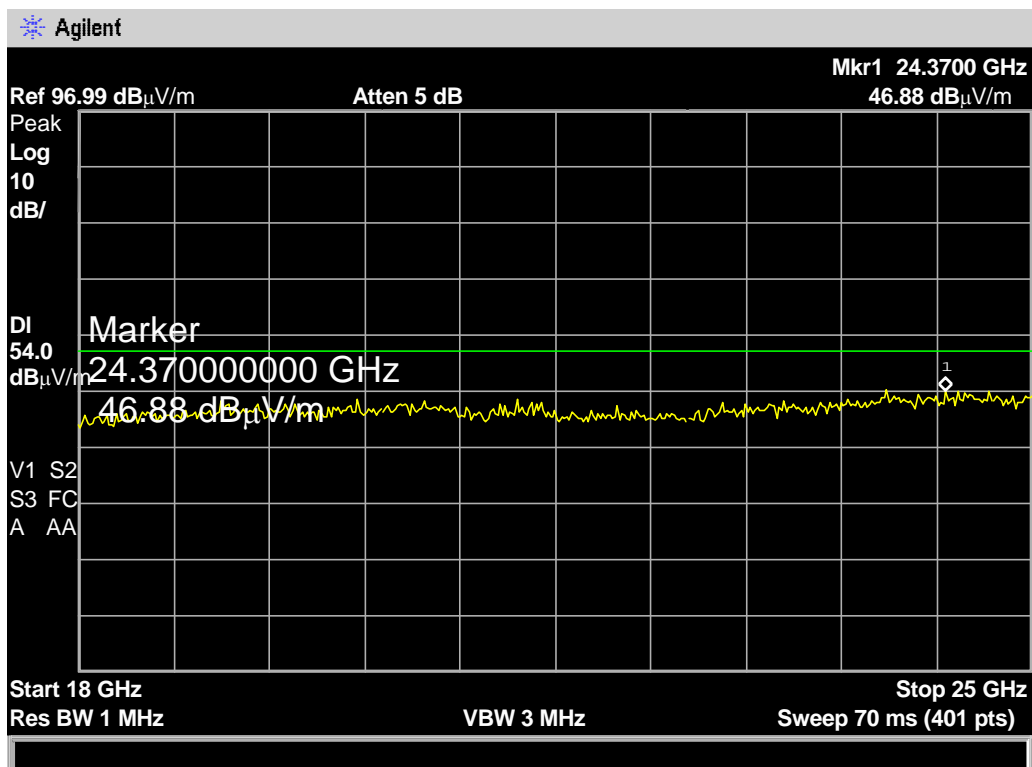


START 2.900 GHz STOP 6.500 GHz
#IF BW 1.0 MHz #AVG BW 3 MHz #SWP 1.50 sec

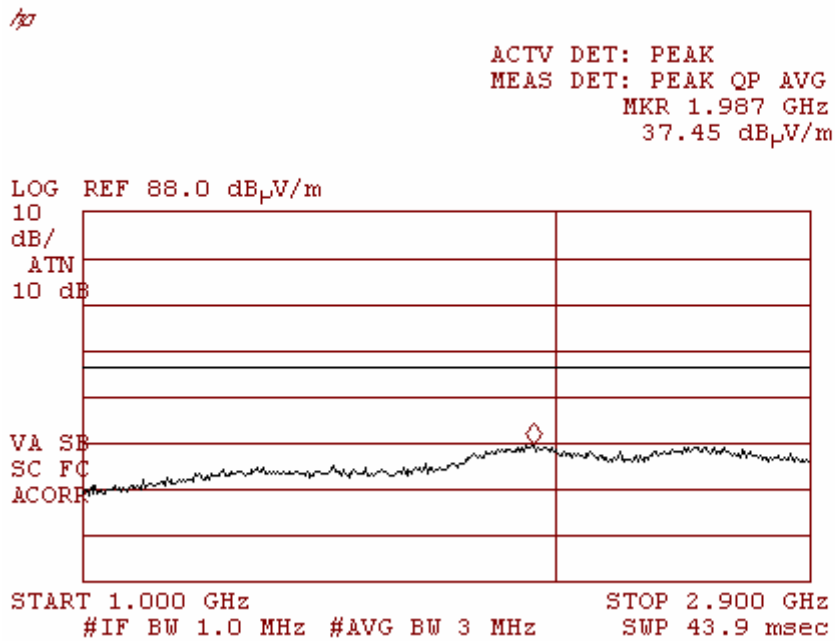
Vertical & Horizontal Polarization
Plot 4.7.7



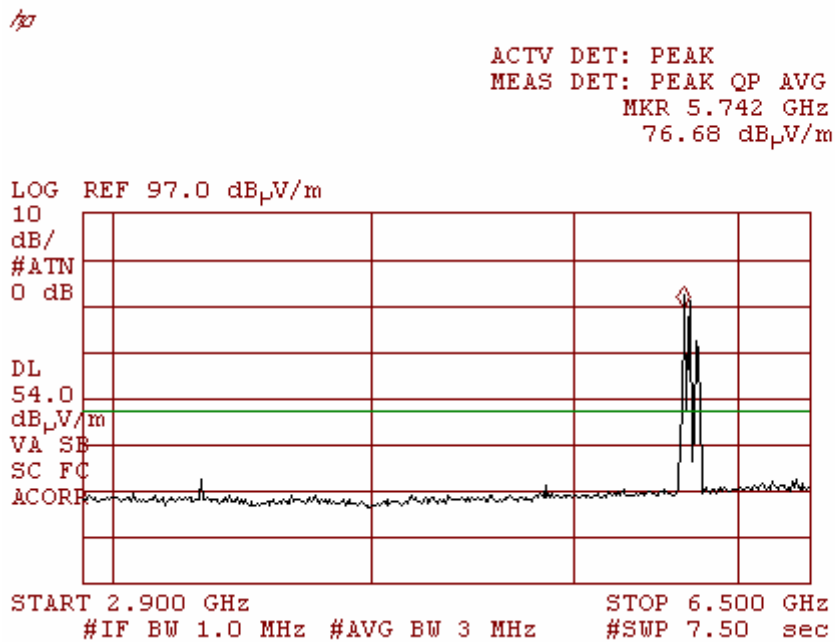
Vertical & Horizontal Polarization
Plot 4.7.8



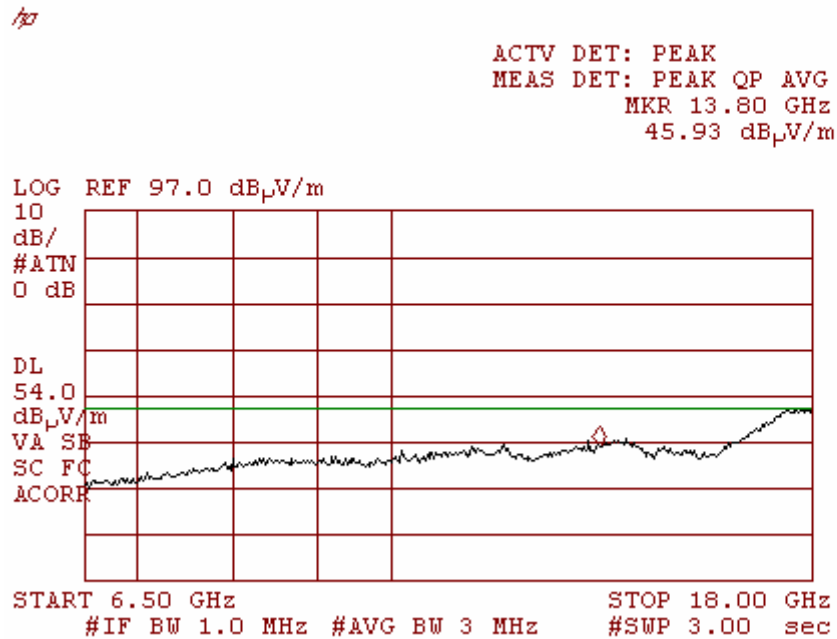
Vertical & Horizontal Polarization
Plot 4.7.9



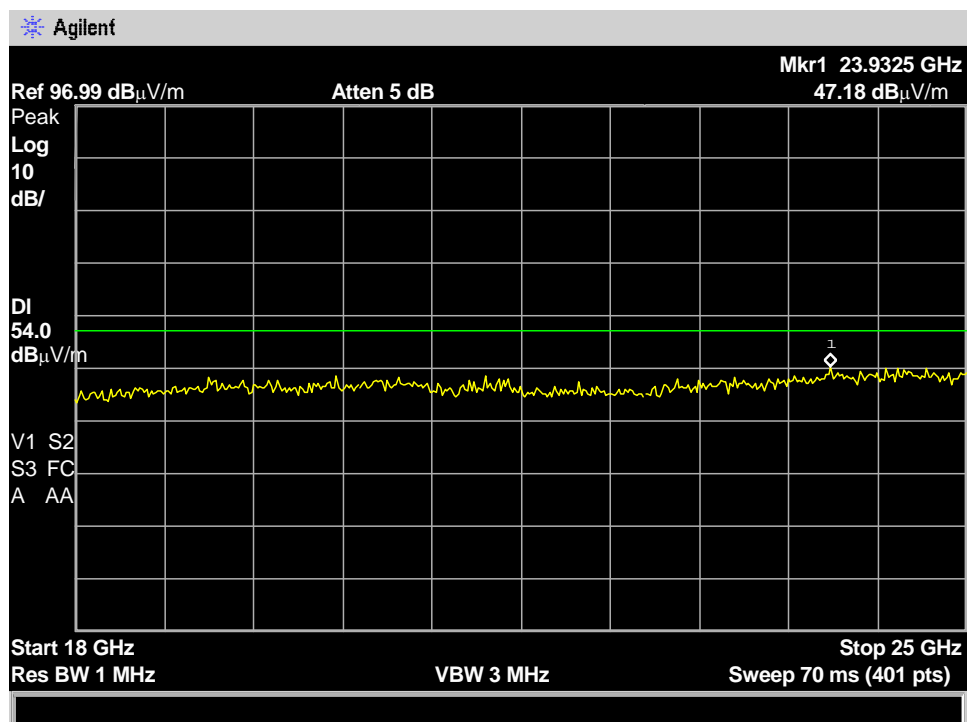
Vertical & Horizontal Polarization
Plot 4.7.10



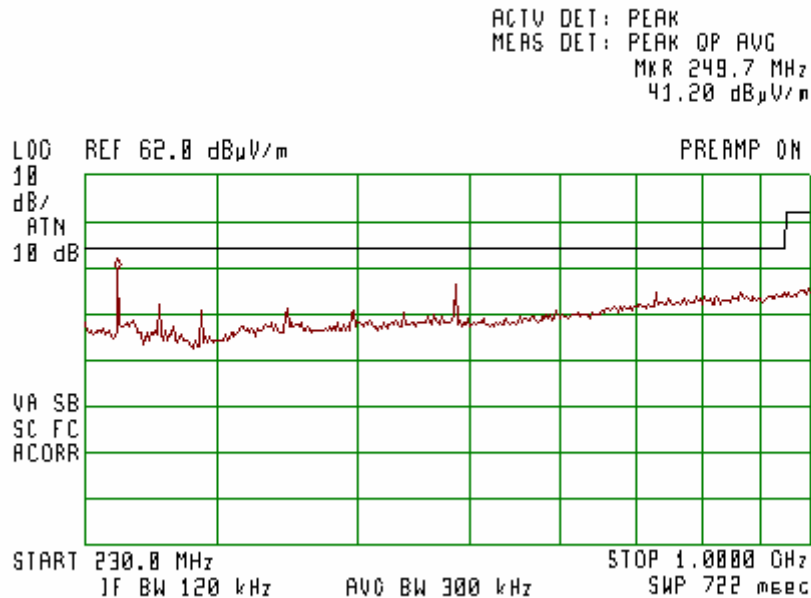
Vertical & Horizontal Polarization
Plot 4.7.11



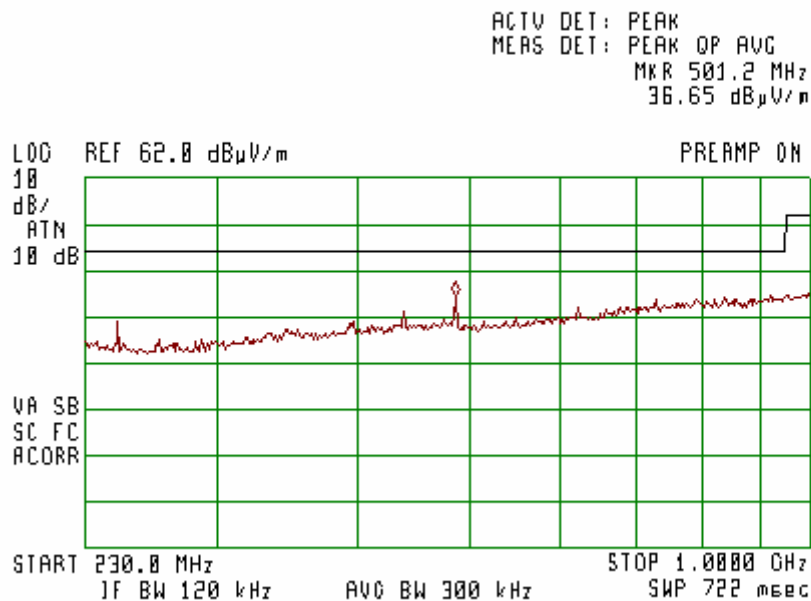
Vertical & Horizontal Polarization
Plot 4.7.12



Worst case for all Mode and all channel
Horizontal Polarization
Plot 4.7.13



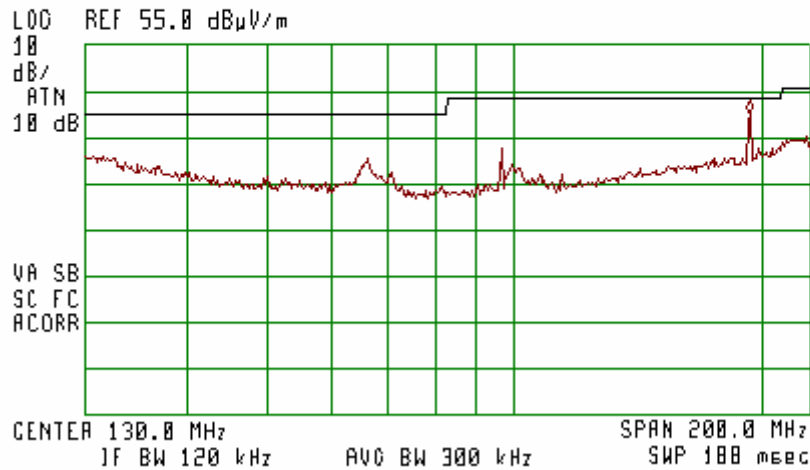
Vertical Polarization
Plot 4.7.14



Horizontal Polarization
Plot 4.7.15

(45)

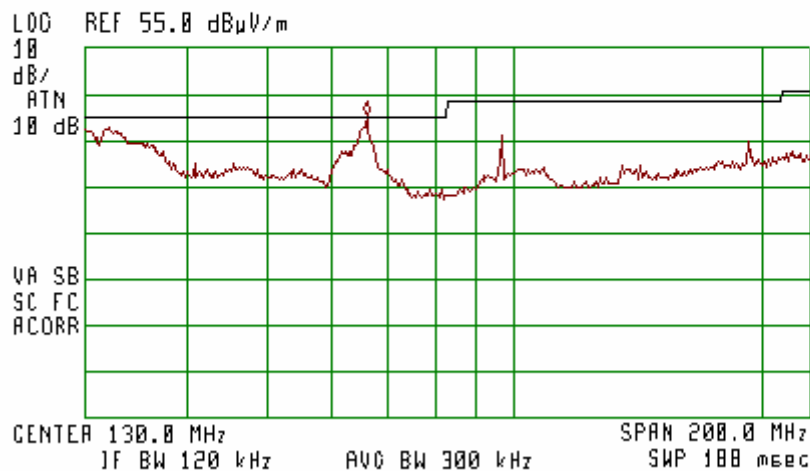
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 201.0 MHz
40.06 dB μ V/m



Vertical Polarization
Plot 4.7.16

(45)

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 60.3 MHz
40.67 dB μ V/m



4.8. Radiated Emission, Receive Mode

Reference document:	47 CFR §15.109/209		
Test Requirements:	Emission Level shall not exceed §15.109 & §15.209(a) limits		
Test Method:	See sec 2.2	Comply	
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	f<1GHz: RBW= 120kHz, VBW= 300kHz, QP f> RBW= 1MHz, VBW= 3MHz for peak and 10 Hz for Average		
Mode of operation:	Receive		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.8.1 to Plot 4.8.8	

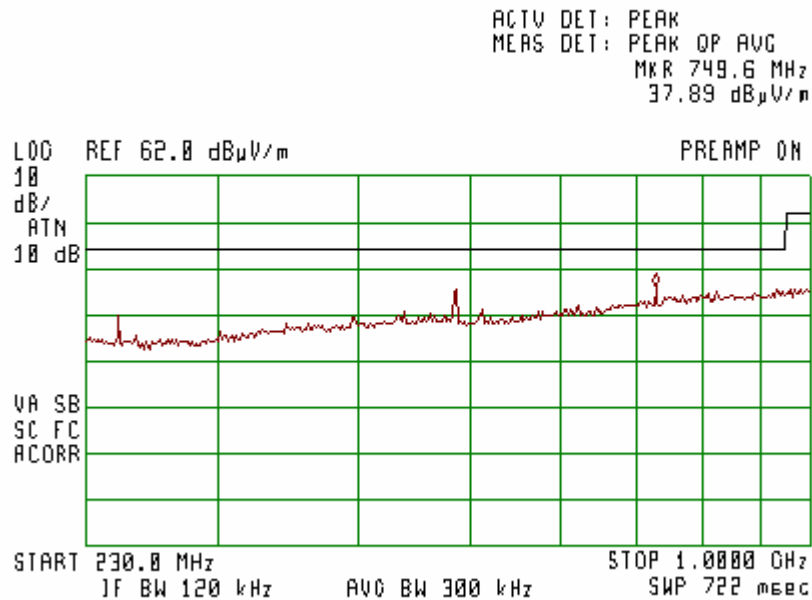
Test results:

All measurements were done in horizontal and vertical polarizations; all transmitters in receive mode, the results show the worst case.

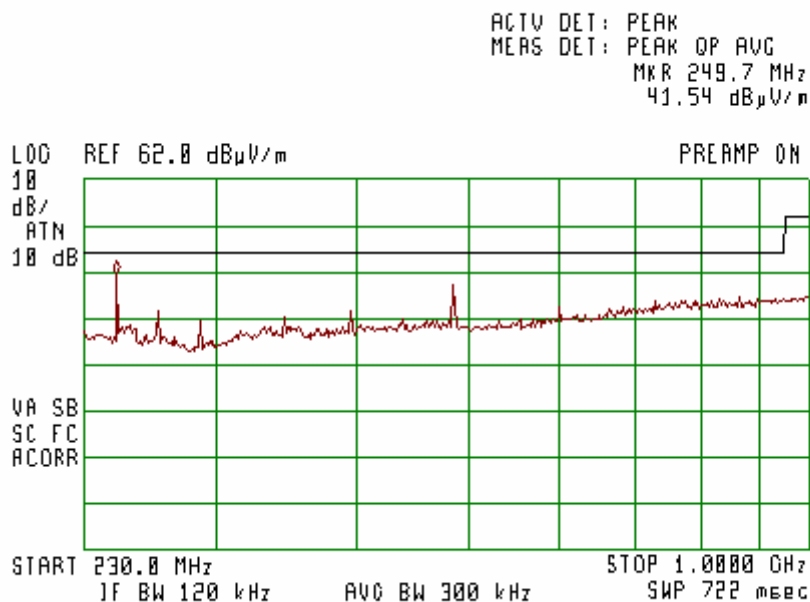
Frequency [MHz]	Emission Level [dBμV/m]	Detector Type	Polarization V/H	Limit [dBμV/m]	Margin [dB]
32.85	31.4	QP	V	40	-8.6
67.95	32.8	QP	V	40	-7.2
100	33.5	QP	V	43.5	-10
200	38.3	QP	H	43.5	-5.2
250	41.2	QP	H	46.5	-5.3
500	40.6	QP	H	46.5	-5.9
750	34.2	QP	V	46.5	-12.3
>1GHz	No further emissions were detected above the noise floor of the receiver				

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

Vertical Polarization
Plot 4.8.1



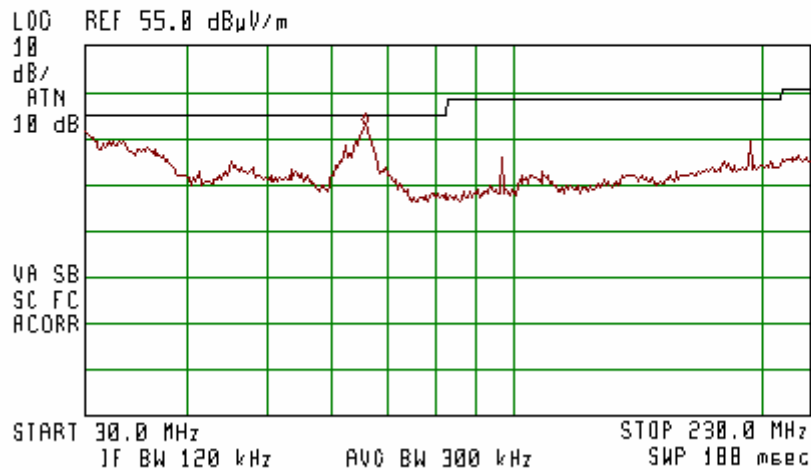
Horizontal Polarization
Plot 4.8.2



Vertical polarization
Plot 4.8.3

(45)

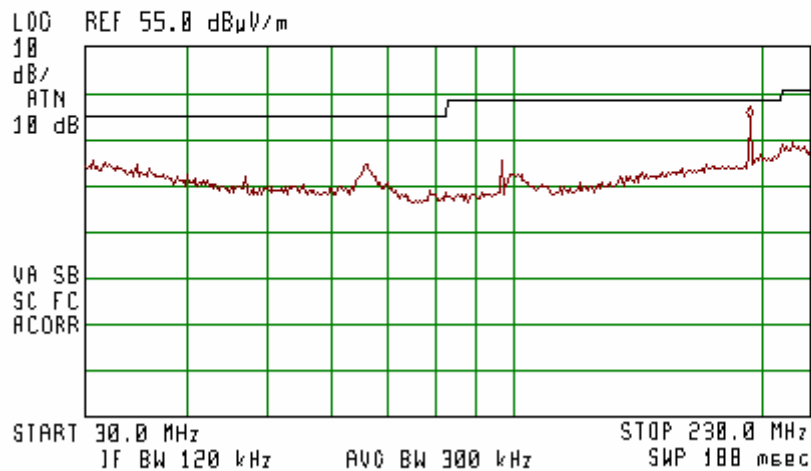
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 67.9 MHz
37.65 dB μ V/m



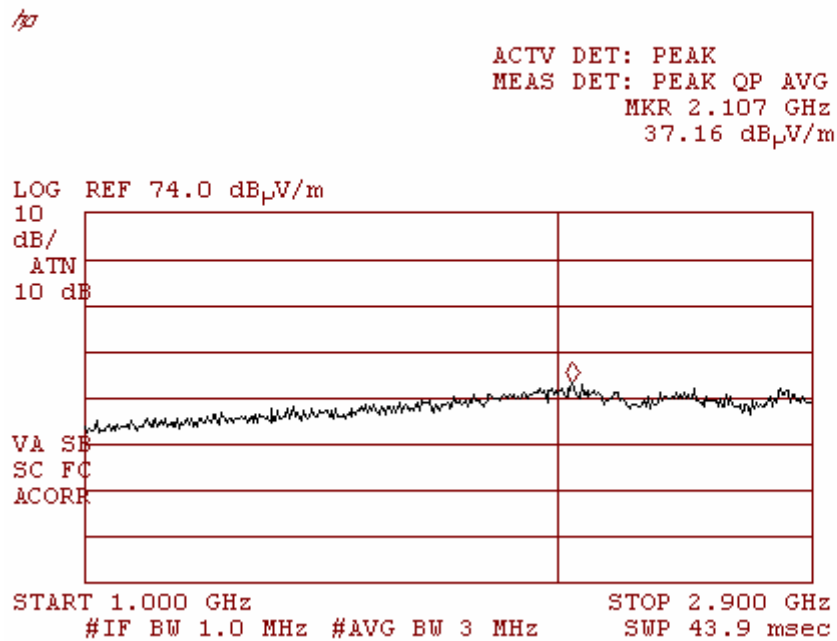
Horizontal polarization
Plot 4.8.4

(45)

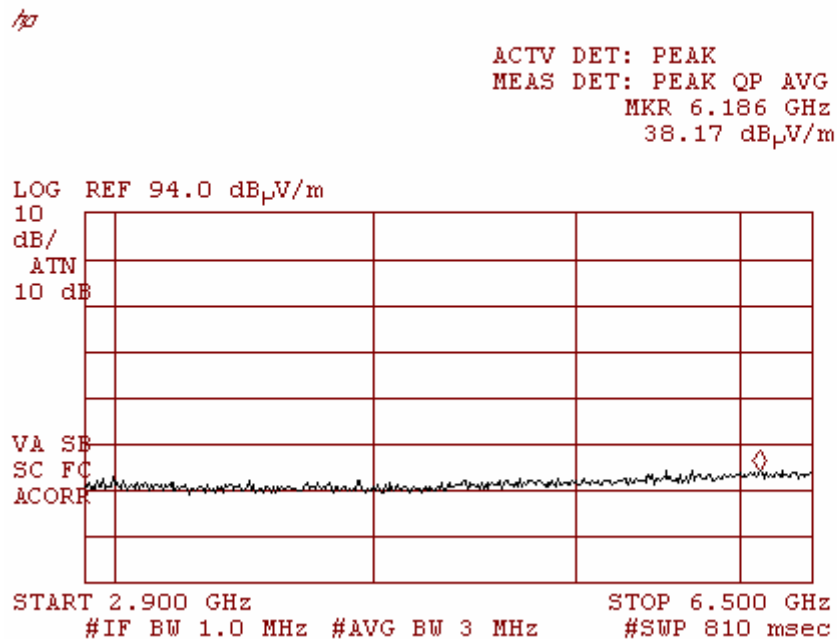
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 201.0 MHz
39.51 dB μ V/m



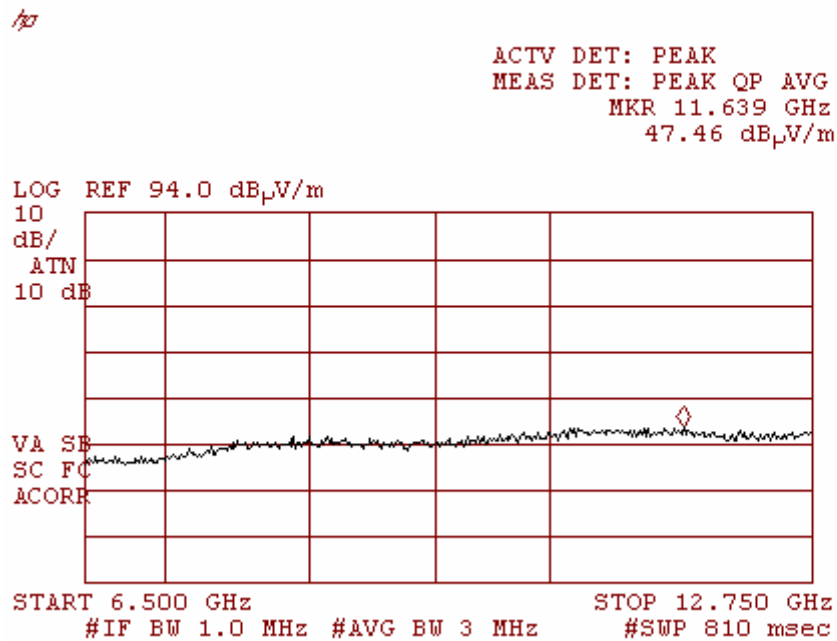
Vertical polarization
Plot 4.8.5



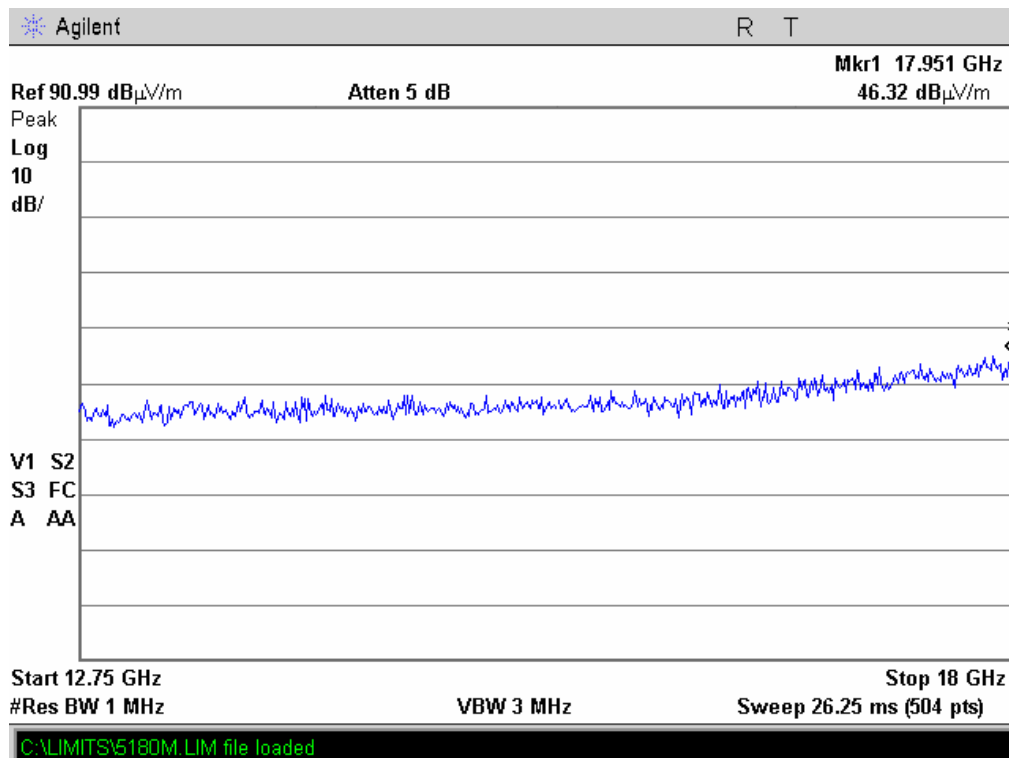
Horizontal Polarization
Plot 4.8.6



Vertical polarization
Plot 4.8.7



Horizontal Polarization
Plot 4.8.8



4.9. Antenna Connector Requirements

Reference document:	47 CFR §15.203	
Test Requirements:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Result:	The Access Point – EXRP 20E/40E employs Omni-Directional Dual band Rubber Duck antennas with reverse Polarity SMA Connectors.	Comply

5. Appendix

Appendix: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR16 EMI Receiver	HP8546A	3710A00392	30-06-08
Spectrum Analyzer 9kHz ÷ 22 GHz	HP 8593EM	3536A00131	30-06-08
Spectrum Analyzer 100 Hz ÷ 26.5 GHz	Agilent E7405A	US41160436	30-06-08
LNA Amplifier 1 GHz ÷ 18 GHz	AMP – 5D-010180-30-10P-GW	618653	30-06-08
Power meter	Agilent N1911A	MY45100784	23-02-08
Dual Ridged Guide Ant. 1-18 GHz	EMCO 3115	9602-4677	30-06-08
Antenna 18 GHz ÷ 26.5 GHz	Alpha Industry 861A/599	505	30-06-08
Turn table	HD100	100/693	-
Antenna Mast	HD 100	100/693	-
Biconical 20 – 200 MHz	Schwarzbeck VHBB9124	9124/0255	16-05-08
Log-Periodic 200 – 1000 MHz	Schwarzbeck VUSLP9111	VUSLP9111184	16-05-08
Pre-Amplifier	MiTeq, AMF-5F-18002650-30-10P	945372	30-06-08
LISN	Fischer 50/250-25-2	-	30-06-08
Transient Limiter	HP11947A	-	30-06-08
Notch Filter	Micro-Tronics BRM50702-05	0001	30-06-08
Spectrum Analyzer 3Hz-44GHz	Agilent E4446A	MY46180602	07.03.09
Peak Power Meter	Agilent N1911A	MY45100784	31.07.08
Wideband Power Sensor	Agilent N1921A	MY45241242	31.07.08

End of the Test Report