TRaC Wireless Test Report : TRA-007055WJP1

Applicant : Digi International Ltd.

Apparatus : Wi-i.MX53

Specification : Ordinance Regulating Radio Equipment
Referenced under the Japanese Radio Law

Authorised by :

: Radio Product Manager

Issue Date : **8th July 2013**

Authorised Copy Number : *PDF*

Total number of pages : 157

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Section 1: Introduction

1.1 General

This report contains an assessment of an apparatus based upon tests carried out on samples submitted to the Laboratory.

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1.2 Tests Requested By

This testing in this report was requested by:

Digi International Ltd.
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1.3 Manufacturer

Digi International
10000 W 75th Street
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1.4 Apparatus Assessed

The following apparatus was assessed between 05/03/12 and 07/06/13

Wi-i.MX53

The above device is a Wi-Fi transmitter module capable of generating 802.11b, 802.11g and 802.11n HT20 signals.

1.5 Test Result Summary

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

The statements relating to compliance with the standards below apply ONLY as qualified in the notes and deviations stated in sections 1.6 to 1.7 of this test report.

Full details of test results are contained within Appendix A. The following table summarises the results of the assessment.

This report contains an assessment of an apparatus against the applicable articles of the Ordinance Regulating Radio Equipment based upon tests carried out on samples submitted to the Laboratory.

Test Type	Application	Ordinance Reference	Appendix no in this report	Mod no.	Result
Antenna Power	Test Fixture	49.20, 1) (e) (2) & (3)	A1-A4	0	Pass
Tolerances of Antenna Power	Test Fixture	14, 7 (5)	A5	0	Pass
Absolute gain of transmitting antenna	Antenna or Test Fixture	49.20, 1) f (1)	A6	0	Pass
Angular Width of Principal radiation	Antenna or Test Fixture	49.20, 1) f (2)	A7	0	Pass
Tolerance Of Occupied Bandwidth	Test Fixture	6 Table 2 Note XXX 1 (3)	A8/A15	0	Pass
Tolerance Of Unwanted Emission Intensity	Test Fixture	7 Table 3, note 25	A15	0	Pass
Secondary Emissions	Test Fixture	24 (1 & 2)	A16/A19	0	Pass
Spreading Bandwidth	Test Fixture	49.20, 1) h	A20/A23	0	Pass
Tolerance Of Frequency	Test Fixture	5 Table 1 row 7 Item 10	A24/A25	0	Pass

1.6 Summary Of Compliance

The samples, as assessed, satisfied the relevant articles of the Ordinance Regulating Radio Equipment, as detailed in section 2.1 of this test report.

1.7 Notes Relating To The Assessment

With regard to this assessment, the following points should be noted:

The results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 1.7 of this test report (Deviations from Test Standards).

For emissions testing, throughout this test report, “Pass” indicates that the results for the sample as tested were below the specified limit (refer also to Section 2, Measurement Uncertainty).

All testing with the exception of testing at the Open Area Test Site was performed under the following environmental conditions:

Temperature	: 15 to 23 °C
Humidity	: 63 to 73 %
Barometric Pressure	: 86 to 106 kPa

Note that temperature and humidity conditions can be found in the relevant test results appendix A.

All dates used in this report are in the format dd/mm/yy.

1.8 Deviations from Test Standards

No deviations were made from test standards

Section 2: Measurement Uncertainty

2.1 Measurement Uncertainty Values

For any test data recorded in accordance with note (iii) of Section 2.1 the following measurement uncertainty was calculated:

Test type	Quantity	Quantity frequency range	Uncertainty
Radiated electric field emissions 3m alternative test site Effective Radiated Power 3m alternative test site	Amplitude	30MHz to 300MHz Horizontal	±4.6dB
		30MHz to 300MHz Vertical	±5.1dB
		300MHz to 1000MHz Horizontal	±5.2dB
		300MHz to 1000MHz Vertical	±5.5dB
		1GHz to 26.5GHz Horizontal and Vertical	±4.1dB
Conducted emissions		N/A	±0.9 dB
Absolute RF power (via antenna connector)		N/A	±0.9 dB
PSD		N/A	±0.9 dB
Frequency Range	Frequency	9kHz to 26.5GHz	3.611kHz

Section 3: Modifications

3.1 Modifications Performed During Assessment

No modifications were performed during the assessment

Appendix A: Formal Emission Test Results

Abbreviations used in the tables in this appendix:

Spec	: Specification
Mod	: Modification
EUT	: Equipment Under Test
SE	: Support Equipment
L	: Live Power Line
N	: Neutral Power Line
E	: Earth Power Line
Pk	: Peak Detector
QP	: Quasi-Peak Detector
Av	: Average Detector

ALSR	: Absorber Lined Screened Room
OATS	: Open Area Test Site
ATS	: Alternative Test Site
Ref	: Reference
Freq	: Frequency
MD	: Measurement Distance
SD	: Spec Distance
Pol	: Polarisation
H	: Horizontal Polarisation
V	: Vertical Polarisation
CDN	: Coupling & decoupling network

A1 Antenna Power 2400MHz to 2483.5MHz 802.11b

Test Details: Antenna Power Wi-Fi device 802.11b CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) (e) (2) & (3)
Frequency range	2400MHz – 2483.5MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

802.11b 1Mbps Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2412	1	-29.7	1.26	0.8	1.20226	10	8.7977	Pass
2442	1	-30.4	0.56	0.1	1.02329	10	8.9767	Pass
2472	1	-30.6	0.17	-0.3	0.93325	10	9.0667	Pass

802.11b 11Mbps Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2412	1	-27.9	3.00	2.5	1.77828	10	8.2217	Pass
2442	1	-28.2	2.56	2.1	1.62181	10	8.3782	Pass
2472	1	-28.5	2.37	1.9	1.54882	10	8.4512	Pass

CH	Freq (MHz)
1	2412
7	2442
13	2472

Articles 49.20, 1) (e) (2) & (3)

The antenna power shall be equal to or less than 10mW e.i.r.p. within the band of Radio bands 2400MHz and 2483.5MHz.

A2 Antenna Power 2484MHz 802.11b

Test Details: Antenna Power Wi-Fi device 802.11b CH14	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) (e) (2) & (3)
Frequency range	2484MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

802.11b 1Mbps Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2484	1	-30.6	0.40	-0.1	0.97724	10	9.0228	Pass

802.11b 11Mbps Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2484	1	-28.5	2.30	1.8	1.51356	10	8.4864	Pass

CH	Freq (MHz)
14	2484

Articles 49.20, 1) (e) (2) & (3)

The antenna power shall be equal to or less than 10mW e.i.r.p. within the band of Radio bands 2400MHz and 2483.5MHz.

A3 Antenna Power 2400MHz to 2483.5MHz 802.11g

Test Details: Antenna Power Wi-Fi device 802.11g CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) (e) (2) & (3)
Frequency range	2400MHz – 2483.5MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

802.11g 6Mbps Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2412	1	-32.8	-1.84	-2.3	0.58884	10	9.4112	Pass
2442	1	-33.1	-2.24	-2.7	0.53703	10	9.4630	Pass
2472	1	-32.8	-2.03	-2.6	0.54954	10	9.4505	Pass

802.11g 54Mbps Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2412	1	-32.1	-1.44	-1.9	0.64565	10	9.3543	Pass
2442	1	-33.2	-2.24	-2.7	0.53703	10	9.4630	Pass
2472	1	-33.2	-2.23	-2.7	0.53703	10	9.4630	Pass

CH	Freq (MHz)
1	2412
7	2442
13	2472

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Article 49.20, 1) (e) (2) & (3)

Although the Ordinance limit on Antenna Power for devices using OFDM modulation is based on 5mW, as the measured Tolerance of occupied bandwidth <26MHz (refer to section A5 of the test report) the antenna power shall be equal to or less than 10mW. Reference to Article 49.20, 1) (e) (3)(i)

A4 Antenna Power 2400MHz to 2483.5MHz 802.11n

Test Details: Antenna Power Wi-Fi device 802.11n CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) (e) (2) & (3)
Frequency range	2400MHz – 2483.5MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

802.11n MCS0 Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2412	1	-32.3	-1.44	-1.9	0.64565	10	9.3543	Pass
2442	1	-33.0	-2.24	-2.7	0.53703	10	9.4630	Pass
2472	1	-33.1	-2.23	-2.7	0.53703	10	9.4630	Pass

802.11n MCS7 Antenna Port								
Freq (MHz)	RBW (MHz)	Power meter (dBm)	Signal generator (dBm)	Result (dBm)	Result (mW/MHz)	Limit (mW/MHz)	Margin (mW/MHz)	Summary
2412	1	-32.3	-1.44	-1.9	0.64565	10	9.3543	Pass
2442	1	33.1	-2.24	-2.7	0.53703	10	9.4630	Pass
2472	1	-33.0	-2.23	-2.7	0.53703	10	9.4630	Pass

CH	Freq (MHz)
1	2412
7	2442
13	2472

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Article 49.20, 1) (e) (2) & (3)

Although the Ordinance limit on Antenna Power for devices using OFDM modulation is based on 5mW, as the measured Tolerance of occupied bandwidth <26MHz (refer to section A5 of the test report) the antenna power shall be equal to or less than 10mW. Reference to Article 49.20, 1) (e) (3)(i)

A5 Tolerances of Antenna Power

CH1,CH7 and CH13: 802.11b/g mode:2400MHz to 2483.5MHz

Software Setting used	TRaC max measured power (Port A 11MBps mode)	HP 3COM Declared tolerance of power	-80% of Calculated Average	+20% of Calculated Average
16	4.518mW	**5mW/MHz**	0.9036mW	5.421mW

Limit Article 14, (7) (5)

The tolerance of antenna power shall have an upper limit = 20% and the lower limit = 80%

A6 Absolute Gain of Transmitting Antenna

The maximum antenna gain for any antenna to be used with the EUT is 5dBi. Please refer to Annex D for Manufacturers data sheet.

Limit Article 49.20, 1) f (1)

The maximum antenna gain shall be 12.14 dB or less

A7 Angular Width of Principal Radiation

Test Details: TX Mode	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) (f) (2)
Frequency range	2400MHz – 2483.5MHz and 2471MHz – 2497MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

From Article 49.20, 1) (f) (2) of the Ordinance Regulating Radio Equipment, the principal radiation from the transmit antenna shall not exceed 360/A degrees where:

As the EUT uses A Combination of systems using: **FH**, (DSSS + FH) or (OFDM+FH) then the Angular width of principal radiation will need to be determined over the required frequency ranges:

> Pe = a radiated power equivalent to an RF power of 10 mW applied to an antenna of 2.14 dBi gain. (10mW with a 2.14dBi gain antenna = 16.36mW)

$$A = \frac{EIRP}{Pe}$$

$$For\ \mathrm{A} < 1\ \text{then}\ \mathrm{A} = 1$$

$$\mathrm{Limit} = \frac{360}{1} = 360$$

Frequency Operating range (MHz)	(Conducted) mW/MHz	EIRP mW	Pe (mW)	Calculated A	For Calculated A <1 then A = 1	Limit	Result	Summary
2400 to 2483.5	1.77828	5.62341	16.36	0.34373	<1	360/A	360	Pass

limit = 360/1 = 360

As A< 1 then A=1

Therefore EUT is compliant with this requirement by default.

A8 Tolerance of Occupied Bandwidth 2400MHz to 2483.5MHz 802.11b.

Test Details: Wi-Fi device 802.11b CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 6 Table 2 Note XXX 1(3)
Frequency range	2400MHz – 2483.5MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Occupied bandwidth (MHz)		Result
	1Mbps	11Mbps	
2412	12.3094	11.7856	Pass
2442	12.1577	11.7261	Pass
2472	12.1593	12.2164	Pass

Limit Article 6 Table 2 Note XXX 1(3) of the Ordinance Regulating Radio Equipment

The occupied bandwidth shall be less than 26MHz

A9 Tolerance of Occupied Bandwidth 2484MHz 802.11b.

Test Details: Wi-Fi device 802.11b CH14	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 6 Table 2 Note XXX 1(3)
Frequency range	2484MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Occupied bandwidth (MHz)		Result
	1Mbps	11Mbps	
2484	11.9365	12.1362	Pass

Limit Article 6 Table 2 Note XXX 1(3) of the Ordinance Regulating Radio Equipment

The occupied bandwidth shall be less than 26MHz

A10 Tolerance of Occupied Bandwidth 2400MHz to 2483.5MHz 802.11g

Test Details: Wi-Fi device 802.11g CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 6 Table 2 Note XXX 1(3)
Frequency range	2400MHz – 2483.5MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Occupied bandwidth (MHz)		Result
	6Mbps	54Mbps	
2412	16.3189	16.3922	Pass
2442	16.3008	16.4859	Pass
2472	16.3003	16.2998	Pass

Limit Article 6 Table 2 Note XXX 1(3) of the Ordinance Regulating Radio Equipment

The occupied bandwidth shall be less than 38MHz

A11 Tolerance of Occupied Bandwidth 2400MHz to 2483.5MHz 802.11n

Test Details: Wi-Fi device 802.11n CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 6 Table 2 Note XXX 1(3)
Frequency range	2400MHz – 2483.5MHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Occupied bandwidth (MHz)		Result
	MCS0	MCS7	
2412	17.5637	17.4987	Pass
2442	17.5286	17.6905	Pass
2472	17.6202	17.6465	Pass

Limit Article 6 Table 2 Note XXX 1(3) of the Ordinance Regulating Radio Equipment

The occupied bandwidth shall be less than 38MHz

A12 Tolerance of Unwanted Emissions Intensity (Conducted) 2400MHz to 2483.5MHz 802.11b

Preview measurements were performed using a peak detector with the RBW set to 100 kHz and the VBW>RBW. Frequencies were scanned up through to the 4th harmonic with the EUT transmitting on its lowest, centre and highest carrier frequency in turn. Formal measurements were made using a RBW of 100 kHz for frequencies below 1GHz and 1MHz for frequencies above 1 GHz.

Test Details: TX Mode: Wi-Fi device 802.11b CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 7 Table 3 Note 25
Frequency range	9kHz to 7.5GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Transmitting Bottom Channel 1: 2412MHz @ 1Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.043075	Pk	200Hz	-110.66	-26	84.66	Pass
150kHz	30MHz	1.0	Pk	9kHz	-76.18	-26	50.18	Pass
30MHz	1000MHz	455.2	Pk	1MHz	-70.11	-26	44.11	Pass
1000MHz	2387MHz	2292.2	Pk	1MHz	-65.12	-26	39.12	Pass
2387MHz	2400MHz	2399.1	Pk	1MHz	-38.72	-16	22.72	Pass
2483.5MHz	2496.5MHz	2495.6	Pk	1MHz	-69.59	-16	53.59	Pass
2496.5MHz	7500MHz	4823.0	Pk	1MHz	-68.78	-26	42.78	Pass

Transmitting Bottom Channel 1: 2412MHz @ 11Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.095715	Pk	200Hz	-103.92	-26	77.92	Pass
150kHz	30MHz	11.0	Pk	9kHz	-78.01	-26	52.01	Pass
30MHz	1000MHz	450.3	Pk	1MHz	-66.42	-26	40.42	Pass
1000MHz	2387MHz	2292.2	Pk	1MHz	-65.63	-26	39.63	Pass
2387MHz	2400MHz	2399.3	Pk	1MHz	-43.29	-16	27.29	Pass
2483.5MHz	2496.5MHz	2495.8	Pk	1MHz	-67.61	-16	51.61	Pass
2496.5MHz	7500MHz	4823.0	Pk	1MHz	-71.67	-26	45.67	Pass

Tolerance of Unwanted Emissions Intensity (Conducted).continued

Transmitting Middle Channel 7: 2442MHz @ 1Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.028035	Pk	200Hz	-101.60	-26	75.60	Pass
150kHz	30MHz	1.0	Pk	9kHz	-75.88	-26	49.88	Pass
30MHz	1000MHz	481.0	Pk	1MHz	-65.59	-26	39.59	Pass
1000MHz	2387MHz	2322.3	Pk	1MHz	-63.56	-26	37.56	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-66.28	-16	50.28	Pass
2483.5MHz	2496.5MHz	2495.9	Pk	1MHz	-68.06	-16	52.06	Pass
2496.5MHz	7500MHz	7325.0	Pk	1MHz	-68.46	-26	42.46	Pass

Transmitting Middle Channel 7: 2442MHz @ 11Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.026860	Pk	200Hz	-101.08	-26	75.08	Pass
150kHz	30MHz	11.0	Pk	9kHz	-78.44	-26	52.44	Pass
30MHz	1000MHz	479.4	Pk	1MHz	-74.34	-26	48.34	Pass
1000MHz	2387MHz	2322.3	Pk	1MHz	-65.59	-26	39.59	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-66.88	-16	50.88	Pass
2483.5MHz	2496.5MHz	2495.9	Pk	1MHz	-66.75	-16	50.75	Pass
2496.5MHz	7500MHz	4882.0	Pk	1MHz	-71.34	-26	45.34	Pass

Tolerance of Unwanted Emissions Intensity (Conducted).continued

Transmitting Top Channel 13: 2472MHz @ 1Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.106760	Pk	200Hz	-102.63	-26	76.63	Pass
150kHz	30MHz	1.0	Pk	9kHz	-76.14	-26	50.14	Pass
30MHz	1000MHz	511.8	Pk	1MHz	-69.06	-26	43.06	Pass
1000MHz	2387MHz	2315.3	Pk	1MHz	-65.12	-26	39.12	Pass
2387MHz	2400MHz	2399.3	Pk	1MHz	-68.48	-16	52.48	Pass
2483.5MHz	2496.5MHz	2483.8	Pk	1MHz	-39.18	-16	2318	Pass
2496.5MHz	7500MHz	7415.0	Pk	1MHz	-69.68	-26	43.68	Pass

Transmitting Top Channel 13: 2472MHz @11Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.14715	Pk	200Hz	-106.44	-26	80.44	Pass
150kHz	30MHz	11.0	Pk	9kHz	-79.37	-26	53.37	Pass
30MHz	1000MHz	510.2	Pk	1MHz	-69.67	-26	43.67	Pass
1000MHz	2387MHz	2352.3	Pk	1MHz	-65.17	-26	39.17	Pass
2387MHz	2400MHz	2399.7	Pk	1MHz	-67.32	-16	51.32	Pass
2483.5MHz	2496.5MHz	2484.9	Pk	1MHz	-46.51	-16	30.51	Pass
2496.5MHz	7500MHz	4.940.0	Pk	1MHz	-70.79	-26	44.79	Pass

Limit Article 7 Table 3 Note 25 of the Ordinance Regulating Radio Equipment

Frequencies below 2387MHz	2387 to 2400MHz & 2483.5 to 2496.5MHz	Other frequencies above 2496.5MHz
2.5µW	25µW	2.5µW

A13 Tolerance of Unwanted Emissions Intensity (Conducted) 2400MHz to 2483.5MHz 802.11b

Preview measurements were performed using a peak detector with the RBW set to 100 kHz and the VBW>RBW. Frequencies were scanned up through to the 4th harmonic with the EUT transmitting on its lowest, centre and highest carrier frequency in turn. Formal measurements were made using a RBW of 100 kHz for frequencies below 1GHz and 1MHz for frequencies above 1 GHz.

Test Details: TX Mode: Wi-Fi device 802.11b CH14	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 7 Table 3 Note 25
Frequency range	9kHz to 7.5GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Transmitting Channel 14: 2484MHz @ 1Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.012525	Pk	200Hz	-99.03	-26	73.03	Pass
150kHz	30MHz	1.0	Pk	9kHz	-76.79	-26	50.79	Pass
30MHz	1000MHz	523.1	Pk	1MHz	-57.99	-26	31.99	Pass
1000MHz	2458MHz	2458.0	Pk	1MHz	-64.18	-26	38.18	Pass
2458MHz	2471MHz	2471.0	Pk	1MHz	-43.38	-16	27.38	Pass
2497MHz	2510MHz	2497.0	Pk	1MHz	-42.63	-16	26.63	Pass
2510MHz	7500MHz	2510.0	Pk	1MHz	-66.03	-26	40.03	Pass

Transmitting Channel 14: 2484MHz @ 11Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.064460	Pk	200Hz	-101.54	-26	75.54	Pass
150kHz	30MHz	11.0	Pk	9kHz	-79.15	-26	53.15	Pass
30MHz	1000MHz	524.7	Pk	1MHz	-68.16	-26	42.16	Pass
1000MHz	2458MHz	2324.4	Pk	1MHz	-63.00	-26	37.00	Pass
2458MHz	2471MHz	2471.0	Pk	1MHz	-46.94	-16	30.94	Pass
2497MHz	2510MHz	2497.0	Pk	1MHz	-46.99	-16	30.99	Pass
2510MHz	7500MHz	2510.0	Pk	1MHz	-65.70	-26	39.70	Pass

Limit Article 7 Table 3 Note 25 of the Ordinance Regulating Radio Equipment

Frequencies below 2458MHz	2458 to 2471MHz & 2497 to 2510MHz	Other frequencies above 2510MHz
2.5µW	25µW	2.5µW

A14 Tolerance of Unwanted Emissions Intensity (Conducted) 2400MHz to 2483.5MHz 802.11g

Test Details: TX Mode: Wi-Fi device 802.11g CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 7 Table 3, Note 25
Frequency range	9kHz to 7.5GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Transmitting Bottom Channel 1: 2412MHz @ 6Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.047305	Pk	200Hz	-96.40	-26	70.40	Pass
150kHz	30MHz	9.75	Pk	9kHz	-79.70	-26	53.70	Pass
30MHz	1000MHz	450.3	Pk	1MHz	-69.55	-26	43.55	Pass
1000MHz	2387MHz	2387.0	Pk	1MHz	-55.12	-26	29.12	Pass
2387MHz	2400MHz	2400.0	Pk	1MHz	-34.85	-16	18.85	Pass
2483.5MHz	2496.5MHz	2490.0	Pk	1MHz	-66.27	-16	63.42	Pass
2496.5MHz	7500MHz	4823.0	Pk	1MHz	-74.40	-26	48.40	Pass

Transmitting Bottom Channel 1: 2412MHz @ 54Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.087725	Pk	200Hz	-94.07	-26	68.07	Pass
150kHz	30MHz	1.54	Pk	9kHz	-81.12	-26	55.12	Pass
30MHz	1000MHz	450.3	Pk	1MHz	-69.00	-26	43.00	Pass
1000MHz	2387MHz	2387.0	Pk	1MHz	-57.06	-26	31.06	Pass
2387MHz	2400MHz	2400.0	Pk	1MHz	-35.06	-16	19.06	Pass
2483.5MHz	2496.5MHz	2492.1	Pk	1MHz	-66.63	-16	50.63	Pass
2496.5MHz	7500MHz	4823.0	Pk	1MHz	-75.32	-26	49.32	Pass

Tolerance of Unwanted Emissions Intensity (Conducted).continued

Transmitting Middle Channel 7: 2442MHz @ 6Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.094540	Pk	200Hz	-96.32	-26	70.32	Pass
150kHz	30MHz	9.75	Pk	9kHz	-83.66	-26	57.66	Pass
30MHz	1000MHz	481.0	Pk	1MHz	-75.64	-26	49.64	Pass
1000MHz	2387MHz	2322.3	Pk	1MHz	-64.43	-26	38.43	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-66.20	-16	50.2	Pass
2483.5MHz	2496.5MHz	2488.3	Pk	1MHz	-64.63	-16	48.63	Pass
2496.5MHz	7500MHz	4882.0	Pk	1MHz	-73.71	-26	47.71	Pass

Transmitting Middle Channel 7: 2442MHz @ 54Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.087725	Pk	200Hz	-93.64	-26	67.64	Pass
150kHz	30MHz	5.97	Pk	9kHz	-82.56	-26	56.56	Pass
30MHz	1000MHz	479.4	Pk	1MHz	-76.13	-26	50.13	Pass
1000MHz	2387MHz	2329.2	Pk	1MHz	-65.17	-26	39.17	Pass
2387MHz	2400MHz	2399.6	Pk	1MHz	-63.39	-16	47.39	Pass
2483.5MHz	2496.5MHz	2490.8	Pk	1MHz	-65.84	-16	49.84	Pass
2496.5MHz	7500MHz	4882.0	Pk	1MHz	-74.75	-26	48.75	Pass

Tolerance of Unwanted Emissions Intensity (Conducted).continued

Transmitting Top Channel 13: 2472MHz @ 6Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.094540	Pk	200Hz	-96.51	-26	70.51	Pass
150kHz	30MHz	9.75	Pk	9kHz	-81.92	-26	55.92	Pass
30MHz	1000MHz	510.2	Pk	1MHz	-72.18	-26	46.18	Pass
1000MHz	2387MHz	2315.3	Pk	1MHz	-66.24	-26	40.24	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-67.21	-16	51.24	Pass
2483.5MHz	2496.5MHz	2486.6	Pk	1MHz	-36.18	-16	20.18	Pass
2496.5MHz	7500MHz	2496.5	Pk	1MHz	-55.59	-26	29.59	Pass

Transmitting Top Channel 13: 2472MHz @ 54Mbps

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.087725	Pk	200Hz	-93.30	-26	67.30	Pass
150kHz	30MHz	11.49	Pk	9kHz	-86.39	-26	60.39	Pass
30MHz	1000MHz	511.8	Pk	1MHz	-73.14	-26	47.14	Pass
1000MHz	2387MHz	2317.6	Pk	1MHz	-65.46	-26	39.46	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-66.76	-16	50.76	Pass
2483.5MHz	2496.5MHz	2486.7	Pk	1MHz	-40.10	-16	24.10	Pass
2496.5MHz	7500MHz	2496.5	Pk	1MHz	-57.78	-26	31.78	Pass

Limit Article 7 Table 3 Note 25 of the Ordinance Regulating Radio Equipment

Frequencies below 2387MHz	2387 to 2400MHz & 2483.5 to 2496.5MHz	Other frequencies above 2496.5MHz
2.5µW	25µW	2.5µW

A15 Tolerance of Unwanted Emissions Intensity (Conducted) 2400MHz to 2483.5MHz 802.11n

Test Details: TX Mode: Wi-Fi device 802.11n CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 7 Table 3, Note 25
Frequency range	9kHz to 7.5GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	None
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Transmitting Bottom Channel 1: 2412MHz (MCS0)

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.102295	Pk	200Hz	-101.30	-26	75.30	Pass
150kHz	30MHz	5.57	Pk	9kHz	-83.44	-26	57.44	Pass
30MHz	1000MHz	452.0	Pk	1MHz	-69.50	-26	43.50	Pass
1000MHz	2387MHz	2387.0	Pk	1MHz	-50.70	-26	24.70	Pass
2387MHz	2400MHz	2399.7	Pk	1MHz	-32.22	-16	16.22	Pass
2483.5MHz	2496.5MHz	2496.2	Pk	1MHz	-67.83	-16	51.83	Pass
2496.5MHz	7500MHz	4823.0	Pk	1MHz	-74.13	-26	48.13	Pass

Transmitting Bottom Channel 1: 2412MHz (MCS7)

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.102295	Pk	200Hz	-95.91	-26	69.91	Pass
150kHz	30MHz	1.59	Pk	9kHz	-80.76	-26	54.76	Pass
30MHz	1000MHz	450.3	Pk	1MHz	-68.59	-26	42.59	Pass
1000MHz	2387MHz	2387.0	Pk	1MHz	-51.05	-26	25.05	Pass
2387MHz	2400MHz	2400.0	Pk	1MHz	-34.56	-16	18.56	Pass
2483.5MHz	2496.5MHz	2494.5	Pk	1MHz	-66.85	-16	50.85	Pass
2496.5MHz	7500MHz	4823	Pk	1MHz	-74.13	-26	48.13	Pass

Tolerance of Unwanted Emissions Intensity (Conducted).continued

Transmitting Middle Channel 7: 2442MHz (MCS0)

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.147650	Pk	200Hz	-96.82	-26	70.82	Pass
150kHz	30MHz	6.87	Pk	9kHz	-83.10	-26	57.10	Pass
30MHz	1000MHz	479.4	Pk	1MHz	-76.00	-26	50.00	Pass
1000MHz	2387MHz	2329.2	Pk	1MHz	-65.59	-26	39.59	Pass
2387MHz	2400MHz	2399.5	Pk	1MHz	-64.26	-16	48.26	Pass
2483.5MHz	2496.5MHz	2496.0	Pk	1MHz	-66.52	-16	50.52	Pass
2496.5MHz	7500MHz	4882.0	Pk	1MHz	-74.52	-26	48.52	Pass

Transmitting Middle Channel 7: 2442MHz (MCS7)

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.102295	Pk	200Hz	-96.00	-26	70.00	Pass
150kHz	30MHz	9.35	Pk	9kHz	-83.29	-26	57.29	Pass
30MHz	1000MHz	476.2	Pk	1MHz	-78.26	-26	52.26	Pass
1000MHz	2387MHz	2322.3	Pk	1MHz	-64.05	-26	38.05	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-66.36	-16	50.36	Pass
2483.5MHz	2496.5MHz	2496.0	Pk	1MHz	-68.17	-16	52.17	Pass
2496.5MHz	7500MHz	4882.0	Pk	1MHz	-73.97	-26	47.97	Pass

Tolerance of Unwanted Emissions Intensity (Conducted).continued

Transmitting Top Channel 13: 2472MHz (MCS0)

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.025685	Pk	200Hz	-99.02	-26	73.02	Pass
150kHz	30MHz	7.8	Pk	9kHz	-82.59	-26	56.59	Pass
30MHz	1000MHz	511.8	Pk	1MHz	-72.42	-26	46.42	Pass
1000MHz	2387MHz	2313.0	Pk	1MHz	-65.49	-26	39.49	Pass
2387MHz	2400MHz	2399.3	Pk	1MHz	-67.34	-16	51.34	Pass
2483.5MHz	2496.5MHz	2485.9	Pk	1MHz	-35.57	-16	19.57	Pass
2496.5MHz	7500MHz	2496.5	Pk	1MHz	-52.31	-26	26.31	Pass

Transmitting Top Channel 13: 2472MHz (MCS7)

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.012295	Pk	200Hz	-96.77	-26	70.77	Pass
150kHz	30MHz	6.62	Pk	9kHz	-84.10	-26	58.10	Pass
30MHz	1000MHz	511.8	Pk	1MHz	-72.47	-26	46.47	Pass
1000MHz	2387MHz	2320.0	Pk	1MHz	-65.93	-26	39.93	Pass
2387MHz	2400MHz	2399.4	Pk	1MHz	-67.81	-16	51.81	Pass
2483.5MHz	2496.5MHz	2484.9	Pk	1MHz	-35.40	-16	19.40	Pass
2496.5MHz	7500MHz	2496.5	Pk	1MHz	-51.13	-26	25.13	Pass

Limit Article 7 Table 3 Note 25 of the Ordinance Regulating Radio Equipment

Frequencies below 2387MHz	2387 to 2400MHz & 2483.5 to 2496.5MHz	Other frequencies above 2496.5MHz
2.5µW	25µW	2.5µW

A16 Limit of Secondary Emissions (Conducted) 2400MHz to 2483.5MHz 802.11b

Preview measurement of secondary radio emissions was performed using a peak detector with the RBW set to 100kHz and the VBW>RBW. Frequencies were scanned up through to the 4th harmonic with the EUT in receive mode on its lowest, centre and highest receive frequency in turn. Formal measurements were made using a RBW of 100 kHz for frequencies below 1 GHz and 1MHz for frequencies above 1 GHz.

Test Details: Receive Mode: Wi-Fi device 802.11b CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 24 (1 & 2)
Frequency range	9kHz to 10 GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst-case emission measurements for spurious emissions and harmonics are listed below:

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.016755	Sample	200Hz	-101.69	-54	47.69	Pass
150kHz	30MHz	0.300	Sample	9kHz	-92.23	-54	38.23	Pass
30MHz	1000MHz	468.1	Sample	100kHz	-83.63	-54	29.63	Pass
1000MHz	5000MHz	3093.0	Sample	1MHz	-80.73	-47	33.73	Pass
5000MHz	10000MHz	7142.0	Sample	1MHz	-80.03	-47	33.03	Pass

Limit Article 24 (1 & 2) of the Ordinance Regulating Radio Equipment

Frequency range	Limit
9kHz to 1 GHz	4 nW (-54dBm)
Above 1 GHz	20nW (-47dBm)

A17 Limit of Secondary Emissions (Conducted) 2484MHz 802.11b

Preview measurement of secondary radio emissions was performed using a peak detector with the RBW set to 100kHz and the VBW>RBW. Frequencies were scanned up through to the 4th harmonic with the EUT in receive mode on its lowest, centre and highest receive frequency in turn. Formal measurements were made using a RBW of 100 kHz for frequencies below 1 GHz and 1MHz for frequencies above 1 GHz.

Test Details: Receive Mode: Wi-Fi device 802.11b CH14	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 24 (1 & 2)
Frequency range	9kHz to 10 GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst-case emission measurements for spurious emissions and harmonics are listed below:

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.016755	Sample	200Hz	-101.69	-54	47.69	Pass
150kHz	30MHz	0.300	Sample	9kHz	-92.23	-54	38.23	Pass
30MHz	1000MHz	468.1	Sample	100kHz	-83.63	-54	29.63	Pass
1000MHz	5000MHz	3093.0	Sample	1MHz	-80.73	-47	33.73	Pass
5000MHz	10000MHz	7142.0	Sample	1MHz	-80.03	-47	33.03	Pass

Limit Article 24 (1 & 2) of the Ordinance Regulating Radio Equipment

Frequency range	Limit
9kHz to 1 GHz	4 nW (-54dBm)
Above 1 GHz	20nW (-47dBm)

A18 Limit of Secondary Emissions (Conducted) 2400MHz to 2483.5MHz 802.11g

Preview measurement of secondary radio emissions was performed using a peak detector with the RBW set to 100kHz and the VBW>RBW. Frequencies were scanned up through to the 4th harmonic with the EUT in receive mode on its lowest, centre and highest receive frequency in turn. Formal measurements were made using a RBW of 100 kHz for frequencies below 1 GHz and 1 MHz for frequencies above 1 GHz.

Test Details: Receive Mode: Wi-Fi device 802.11g CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 24 (1 & 2)
Frequency range	9kHz to 10 GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst-case emission measurements for spurious emissions and harmonics are listed below:

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.016755	Sample	200Hz	-101.69	-54	47.69	Pass
150kHz	30MHz	0.300	Sample	9kHz	-92.23	-54	38.23	Pass
30MHz	1000MHz	468.1	Sample	100kHz	-83.63	-54	29.63	Pass
1000MHz	5000MHz	3093.0	Sample	1MHz	-80.73	-47	33.73	Pass
5000MHz	10000MHz	7142.0	Sample	1MHz	-80.03	-47	33.03	Pass

Limit Article 24 (1 & 2) of the Ordinance Regulating Radio Equipment

Frequency range	Limit
9kHz to 1 GHz	4 nW (-54dBm)
Above 1 GHz	20nW (-47dBm)

A19 Limit of Secondary Emissions (Conducted) 2400MHz to 2483.5MHz 802.11n

Preview measurement of secondary radio emissions was performed using a peak detector with the RBW set to 100kHz and the VBW>RBW. Frequencies were scanned up through to the 4th harmonic with the EUT in receive mode on its lowest, centre and highest receive frequency in turn. Formal measurements were made using a RBW of 100 kHz for frequencies below 1 GHz and 1MHz for frequencies above 1 GHz.

Test Details: Receive Mode: Wi-Fi device 802.11n CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 24 (1 & 2)
Frequency range	9kHz to 10 GHz
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

The worst-case emission measurements for spurious emissions and harmonics are listed below:

Freq range (MHz)		Measured Frequency (MHz)	Detector (Peak or Sample)	RBW	Result (dBm)	Limit dBm	Margin dB	Summary
From	To							
9kHz	150kHz	0.016755	Sample	200Hz	-101.69	-54	47.69	Pass
150kHz	30MHz	0.300	Sample	9kHz	-92.23	-54	38.23	Pass
30MHz	1000MHz	468.1	Sample	100kHz	-83.63	-54	29.63	Pass
1000MHz	5000MHz	3093.0	Sample	1MHz	-80.73	-47	33.73	Pass
5000MHz	10000MHz	7142.0	Sample	1MHz	-80.03	-47	33.03	Pass

Limit Article 24 (1 & 2) of the Ordinance Regulating Radio Equipment

Frequency range	Limit
9kHz to 1 GHz	4 nW (-54dBm)
Above 1 GHz	20nW (-47dBm)

A20 Spreading Bandwidth 2400MHz to 2483.5MHz 802.11b

Test Details: Transmit Mode: Wi-Fi device 802.11b CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) h
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Measured Diffusion Bandwidth (MHz)		Limit	Summary
	1Mbps	11Mbps		
2412	9.7934	9.8959	>500kHz	Pass
2442	9.6471	10.4184	>500kHz	Pass
2472	9.8159	9.9051	>500kHz	Pass

Limit Article 49.20, 1) (h) of the Ordinance Regulating Radio Equipment

The spread bandwidth shall be more than 500kHz

A21 Spreading Bandwidth 2484MHz 802.11b

Test Details: Transmit Mode: Wi-Fi device 802.11b CH14	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) h
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Measured Diffusion Bandwidth (MHz)		Limit	Summary
	1Mbps	11Mbps		
2484	9.7160	9.6858	>500kHz	Pass

Limit Article 49.20, 1) (h) of the Ordinance Regulating Radio Equipment

The spread bandwidth shall be more than 500kHz

A22 Spreading Bandwidth 2400MHz to 2483.5MHz 802.11g

Test Details: Transmit Mode: Wi-Fi device 802.11g CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) h
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Measured Diffusion Bandwidth (MHz)		Limit	Summary
	6Mbps	54Mbps		
2412	15.8691	15.5609	>500kHz	Pass
2442	15.6789	16.0992	>500kHz	Pass
2472	15.8674	15.5634	>500kHz	Pass

Limit Article 49.20, 1) (h) of the Ordinance Regulating Radio Equipment

The spread bandwidth shall be more than 500kHz

A23 Spreading Bandwidth 2400MHz to 2483.5MHz 802.11n

Test Details: Transmit Mode: Wi-Fi device 802.11n CH1, CH7 and CH13	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 49.20, 1) h
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Freq (MHz)	Measured Diffusion Bandwidth (MHz)		Limit	Summary
	MCS0	MCS7		
2412	16.7800	16.7863	>500kHz	Pass
2442	17.0021	16.7842	>500kHz	Pass
2472	17.0076	16.9141	>500kHz	Pass

Limit Article 49.20, 1) (h) of the Ordinance Regulating Radio Equipment

The spread bandwidth shall be more than 500kHz

A24 Tolerance of Frequency 2400MHz to 2483.5MHz 802.11b

Test Details: Transmit	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 5 Table 1 Row 7 Item 10
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Test Conditions	Channel 1	Channel 7	Channel 13
Wanted Frequency (MHz)	2412	2442	2472
Frequency Error (ppm)	21.2	19.4	20.5
Margin (ppm)	28.8	30.6	29.5
Result	Pass	Pass	Pass
Limit	±50 ppm		

Limit Article 5 Table 1 Row 7 Item 10 of the Ordinance Regulating Radio Equipment

±50 ppm

A25 Tolerance of Frequency 2400MHz to 2483.5MHz 802.11g

Test Details: Transmit	
Standard	Ordinance Regulating Radio Equipment
Reference clause	Article 5 Table 1 Row 7 Item 10
Application	Temporary Antenna Connector
EUT sample number	TRA-007055S17
Modification state	0
SE in test environment	REF1270
SE isolated from EUT	None
EUT set up	Refer to Appendix C

Test Conditions	Channel 1	Channel 7	Channel 13
Wanted Frequency (MHz)	2412	2442	2472
Frequency Error (ppm)	18.4	19.1	18.8
Margin (ppm)	31.6	30.9	31.2
Result	Pass	Pass	Pass
Limit	±50 ppm		

Limit Article 5 Table 1 Row 7 Item 10 of the Ordinance Regulating Radio Equipment

±50 ppm

Appendix B: Supporting Graphical Data

This appendix contains graphical data obtained during testing.

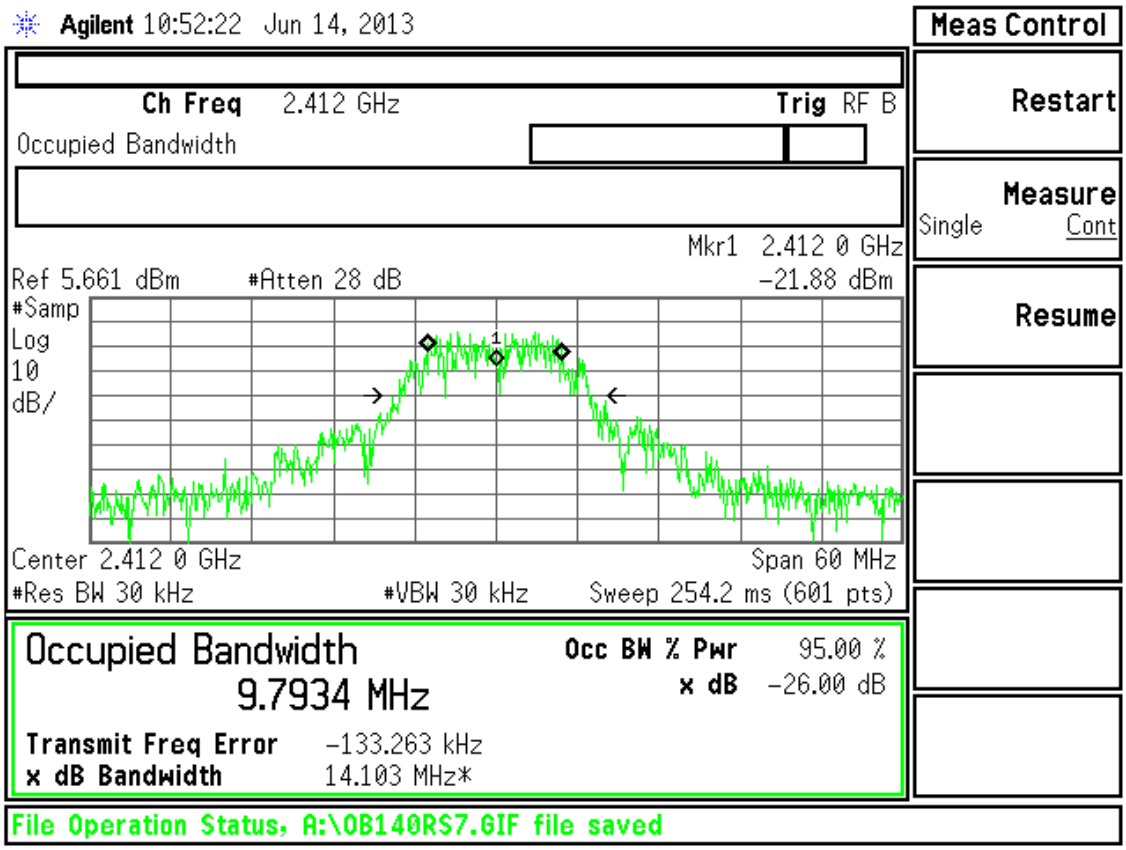
Notes:

a) The graphical data in this appendix is preview data. For details of formal results, refer to Appendix A

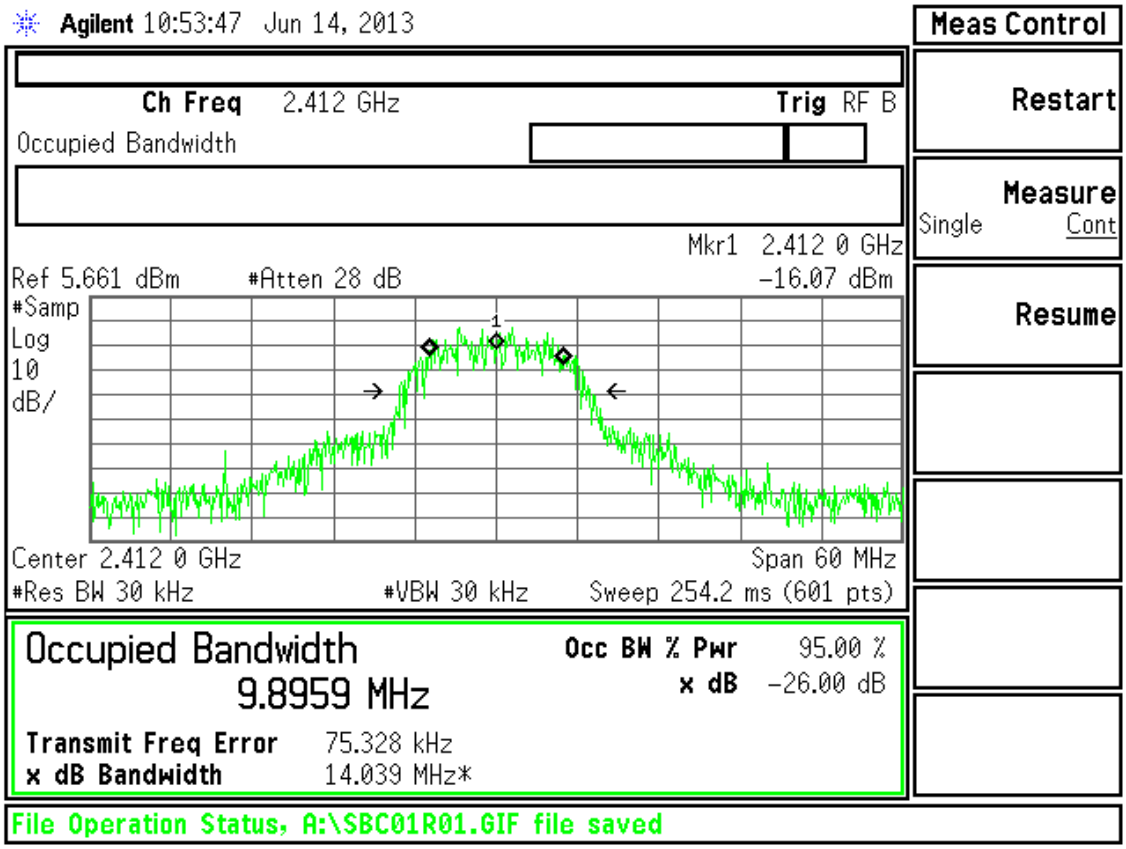
b) The time and date on the plots do not necessarily equate to the time of the test.

c) Appendix C details the numbering system used to identify the sample and its modification state.

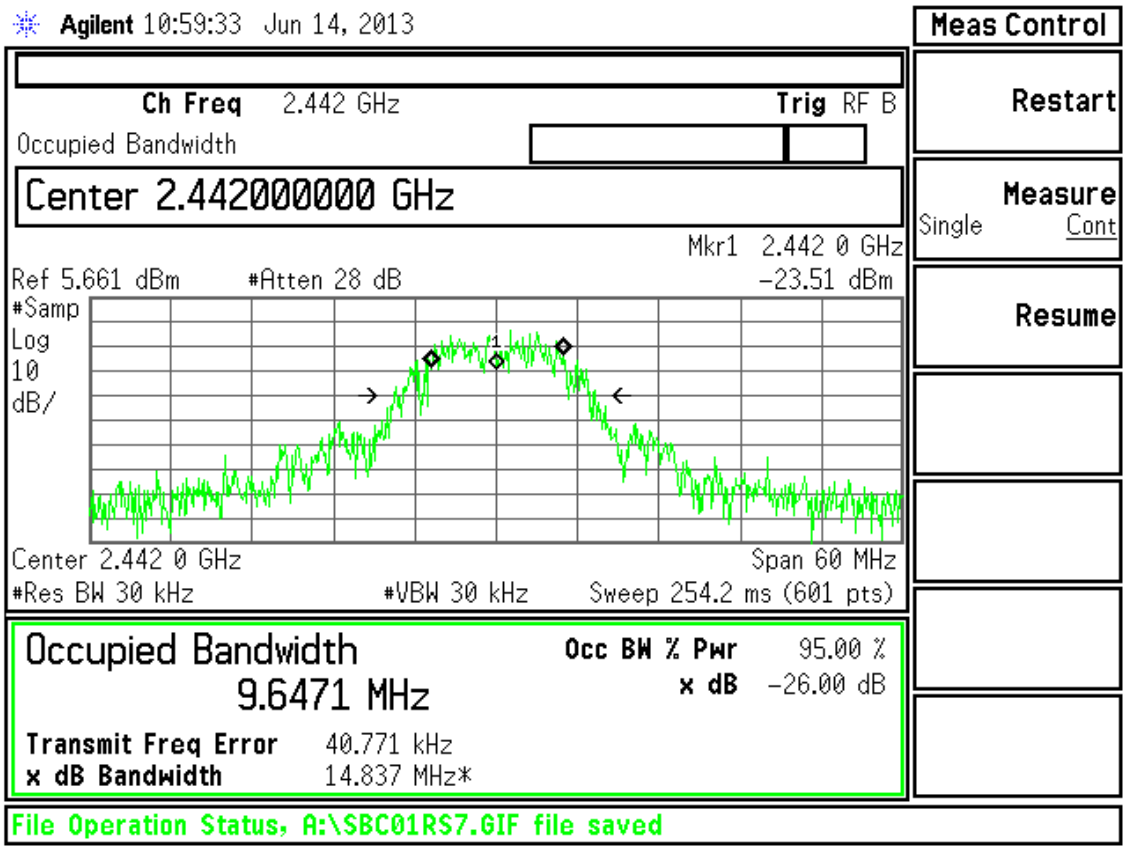
d) The plots presented in this appendix may not be a complete record of the measurements performed, but are a representative sample, relative to the final assessment.



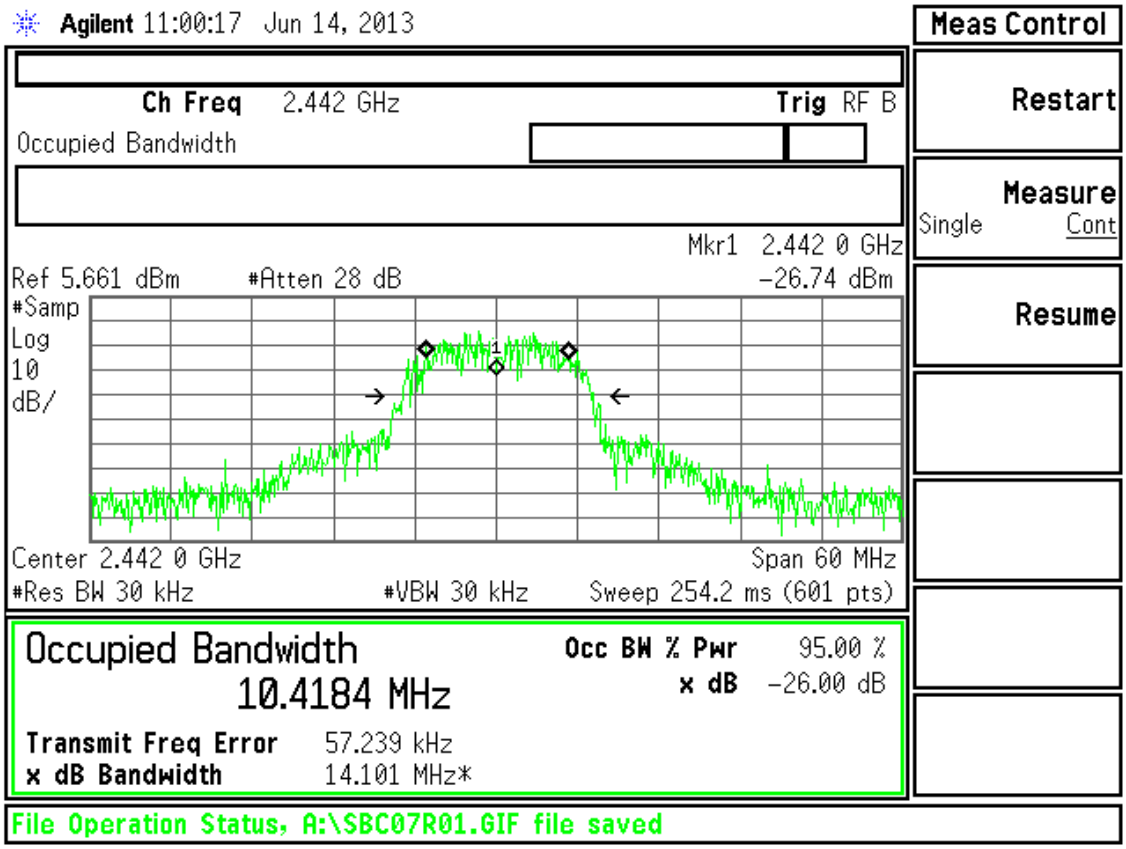
95% Spreading Bandwidth – 802.11b CH1 (2412MHz) 1Mbps



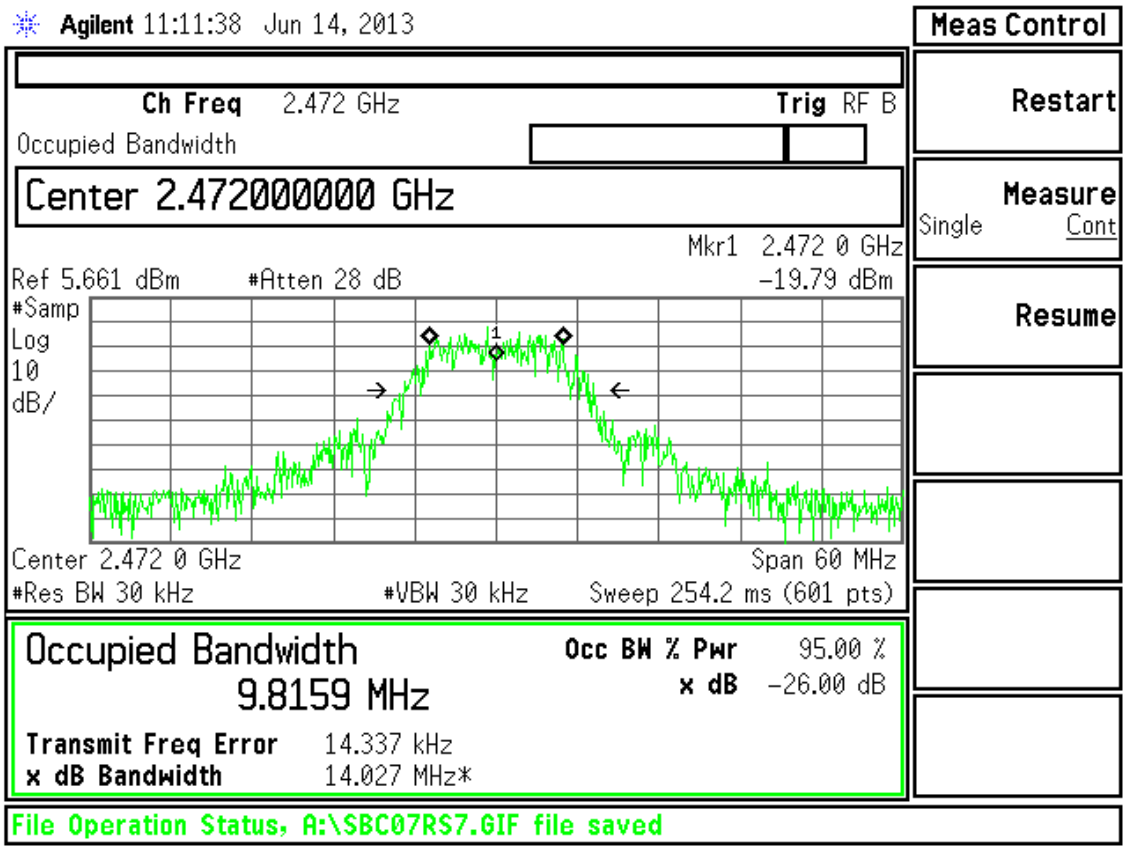
95% Spreading Bandwidth – 802.11b CH1 (2412MHz) 11Mbps



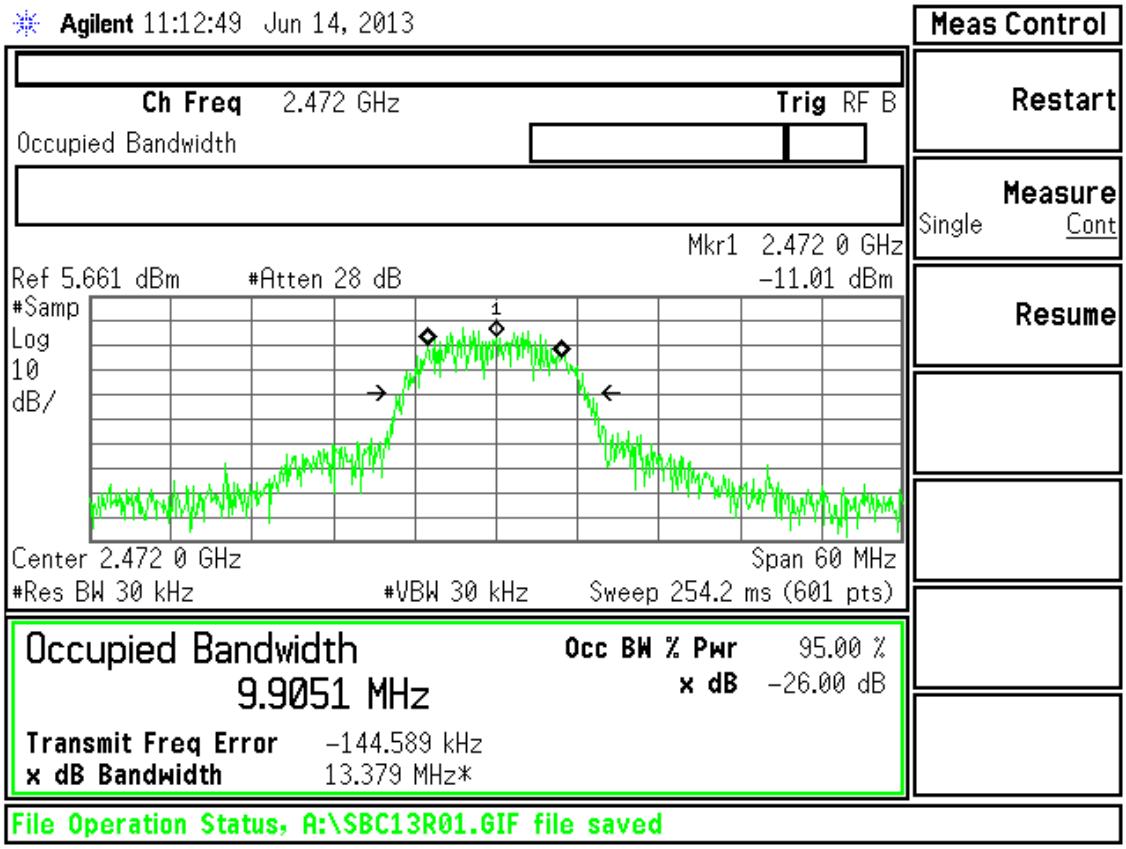
95% Spreading Bandwidth – 802.11b CH7 (2442MHz) 1Mbps



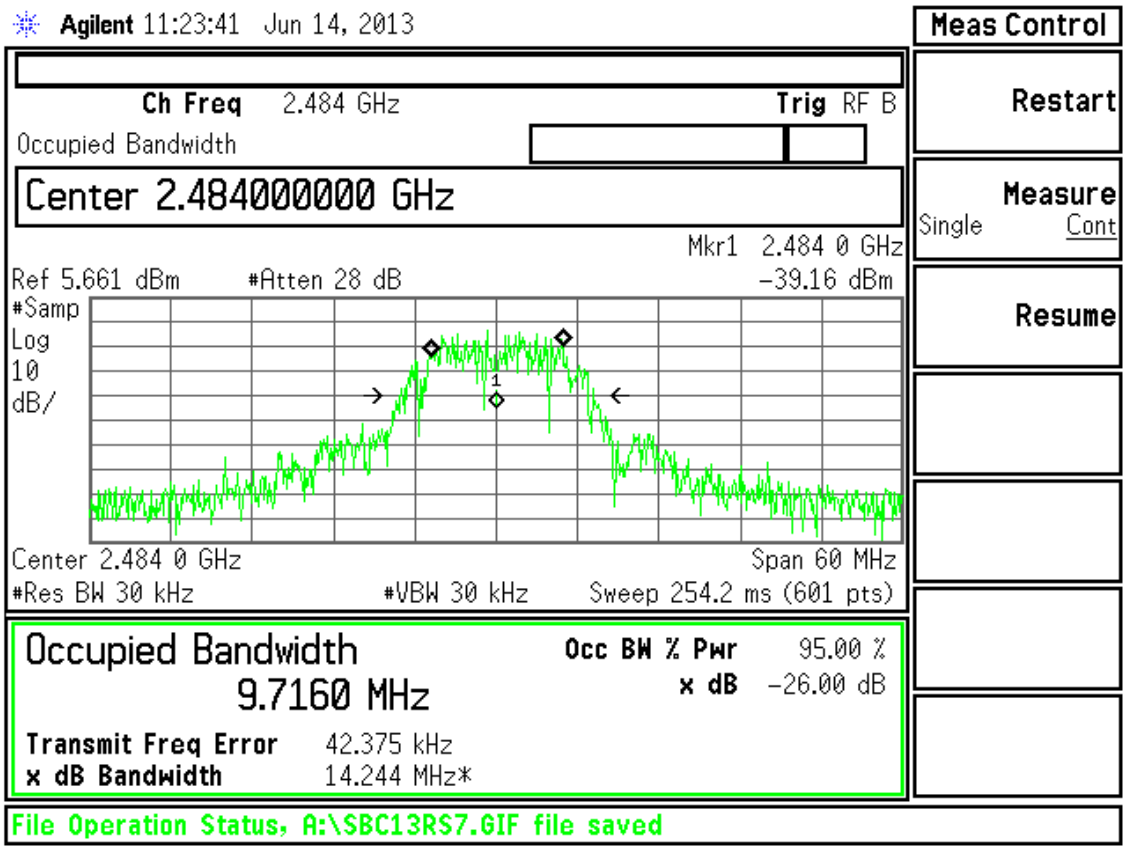
95% Spreading Bandwidth – 802.11b CH7 (2442MHz) 11Mbps



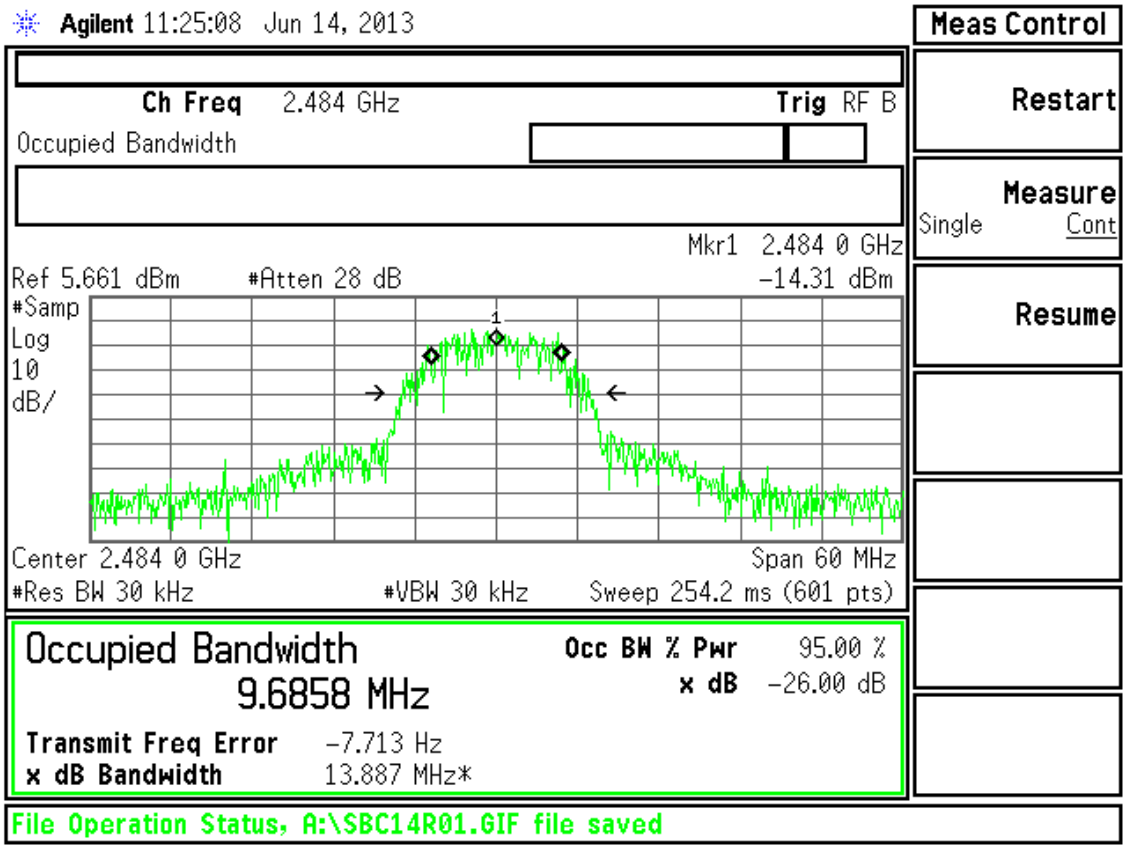
95% Spreading Bandwidth – 802.11b CH13 (2472MHz) 1Mbps



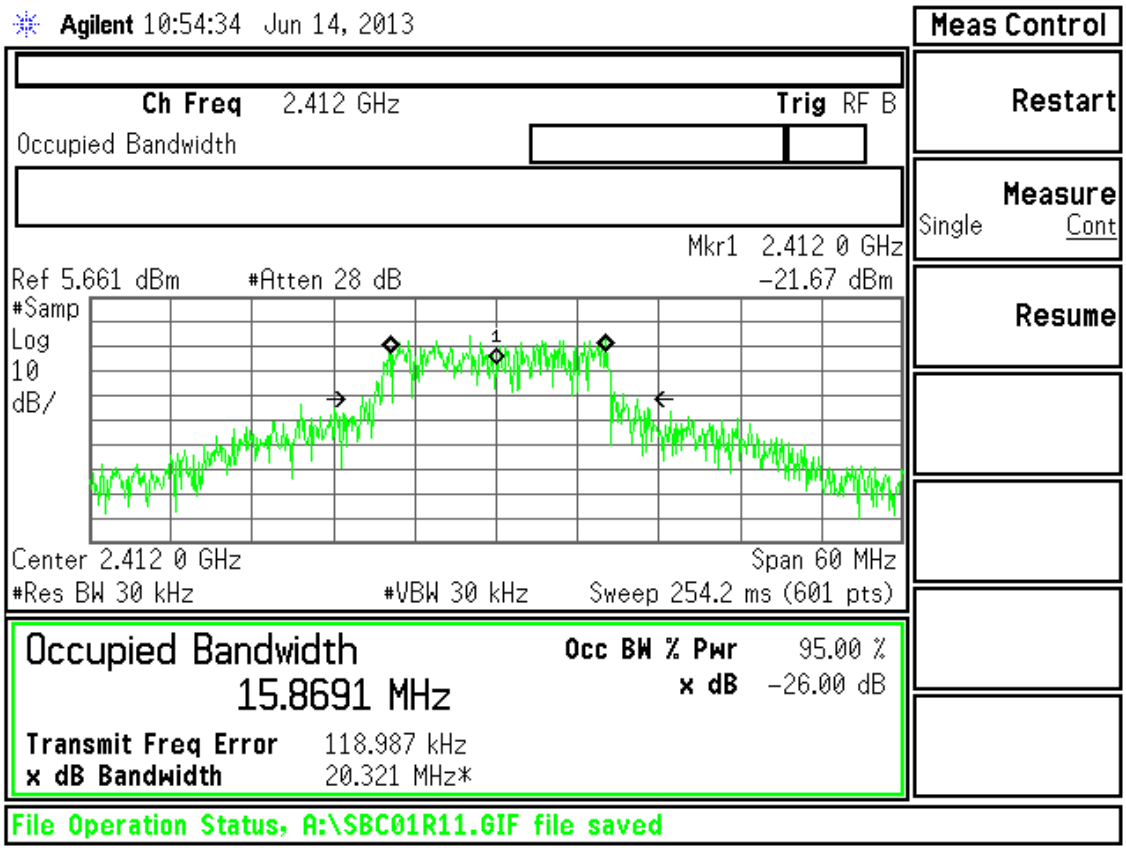
95% Spreading Bandwidth – 802.11b CH13 (2472MHz) 11Mbps



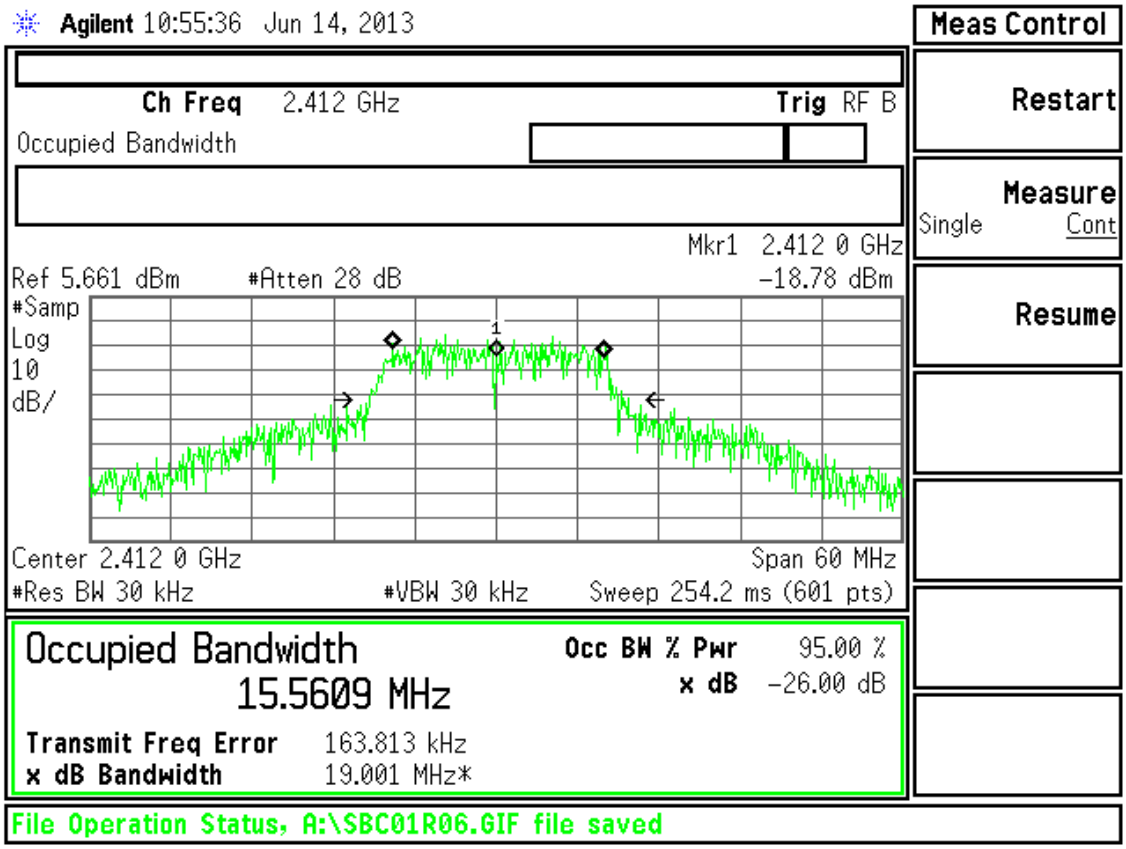
95% Spreading Bandwidth – 802.11b CH14 (2484MHz) 1Mbps



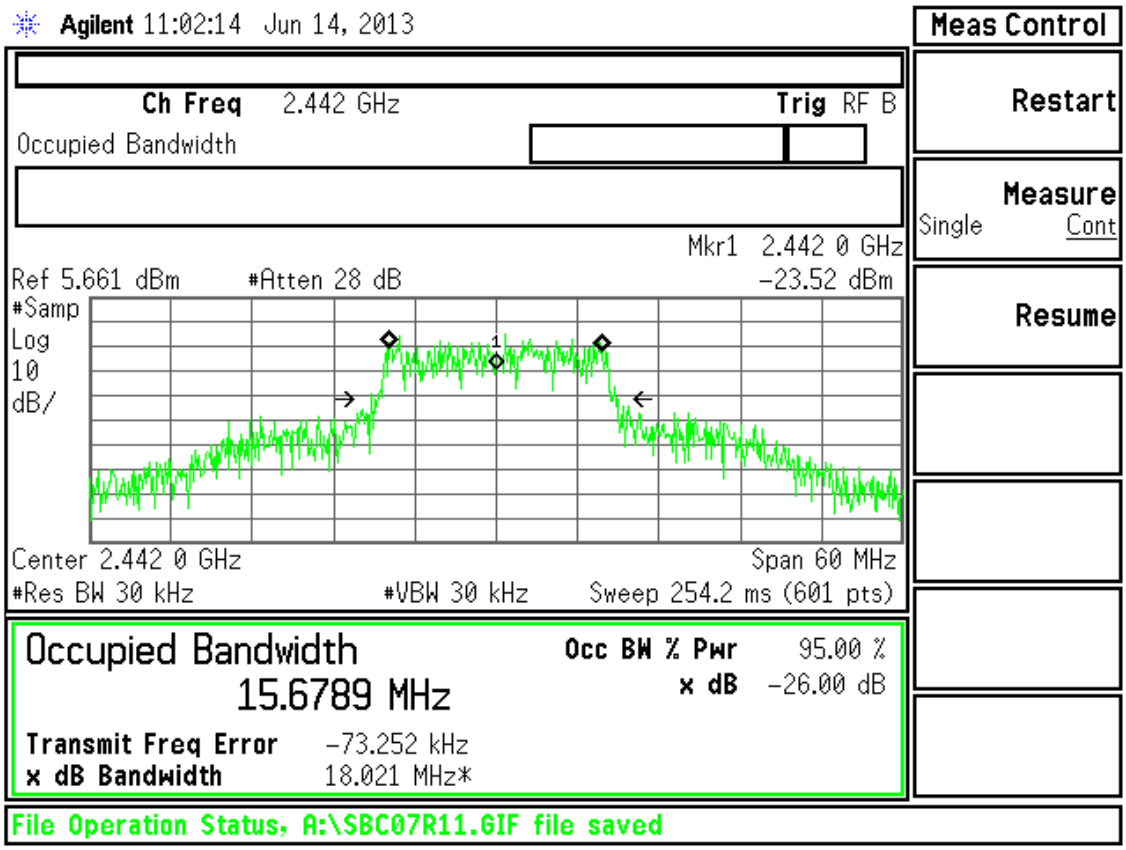
95% Spreading Bandwidth – 802.11b CH14 (2484MHz) 11Mbps



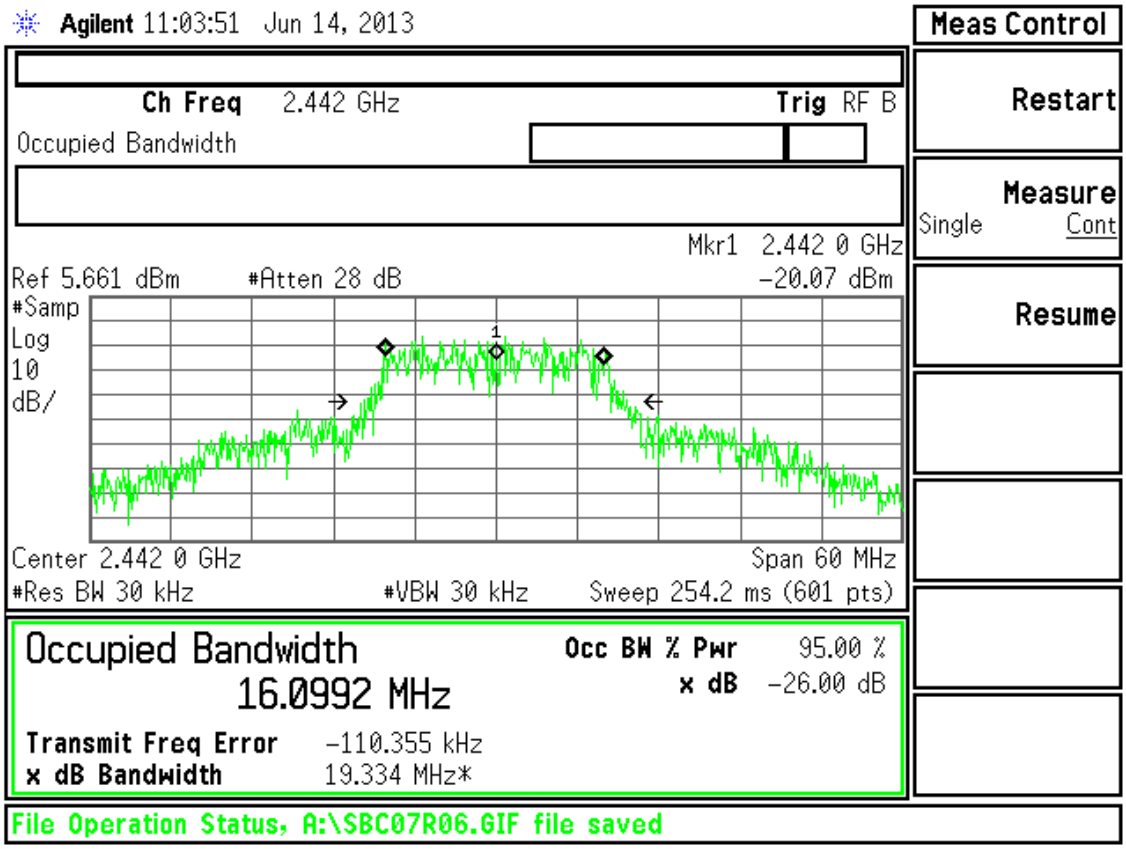
95% Spreading Bandwidth – 802.11g CH1 (2412MHz) 6Mbps



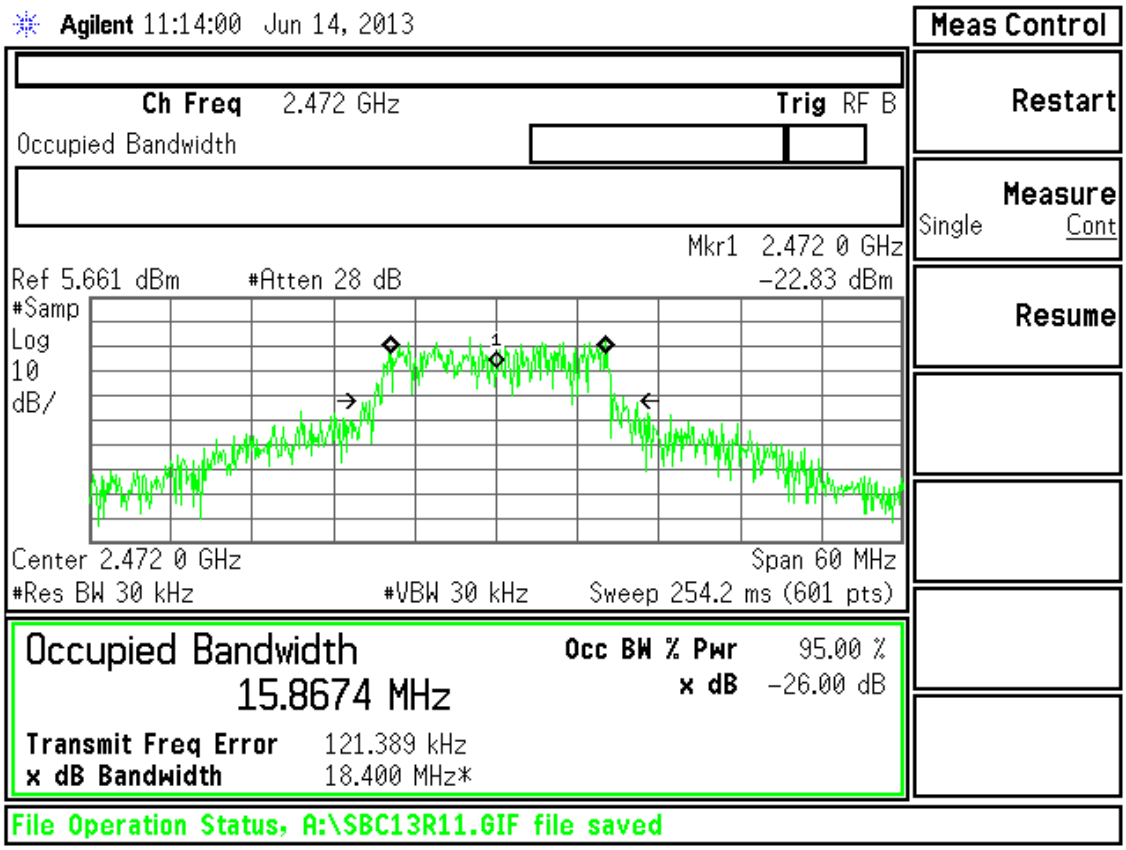
95% Spreading Bandwidth – 802.11g CH1 (2412MHz) 54Mbps



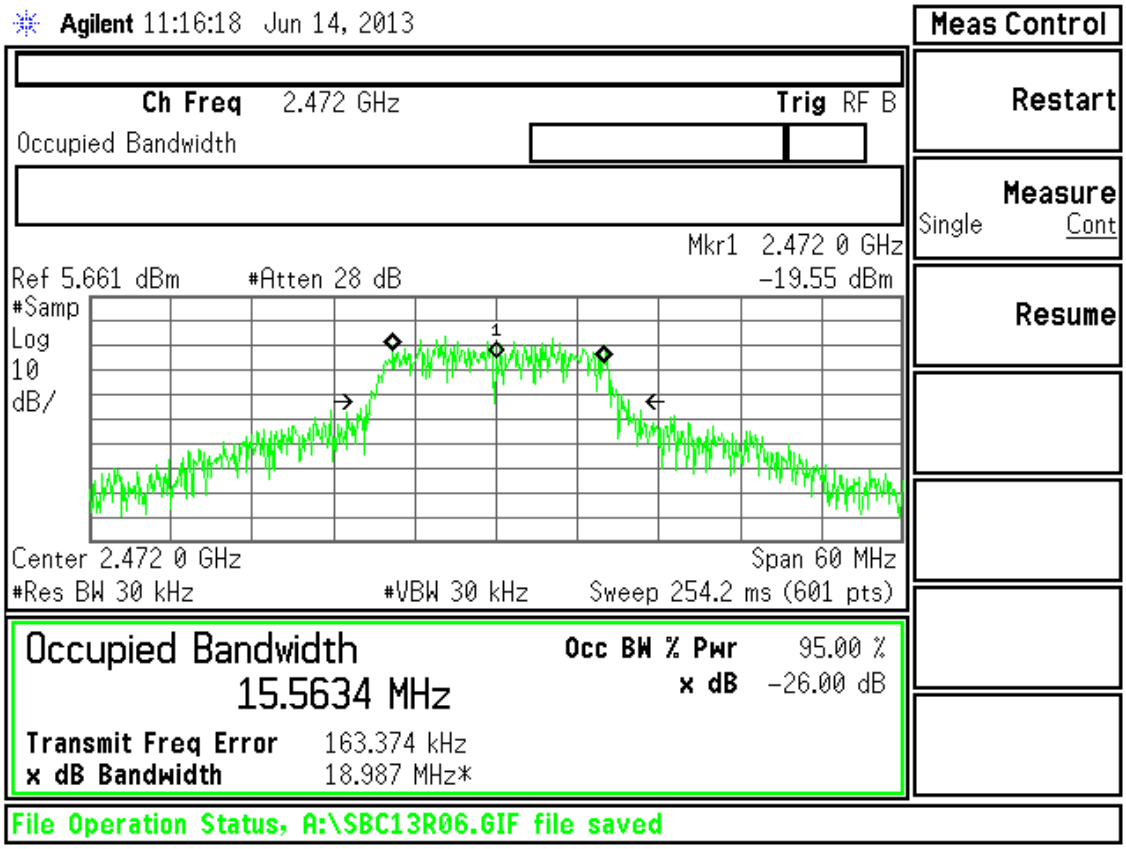
95% Spreading Bandwidth – 802.11g CH7 (2442MHz) 6Mbps



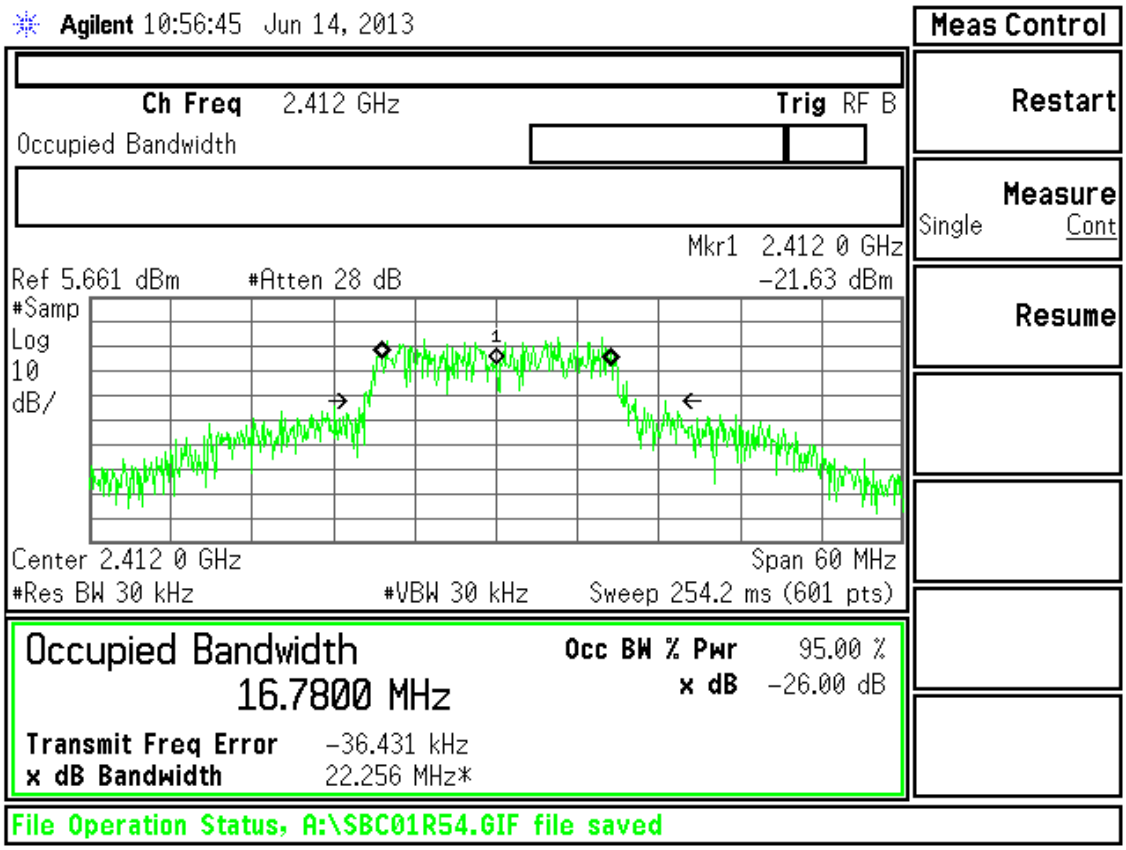
95% Spreading Bandwidth – 802.11g CH7 (2442MHz) 54Mbps



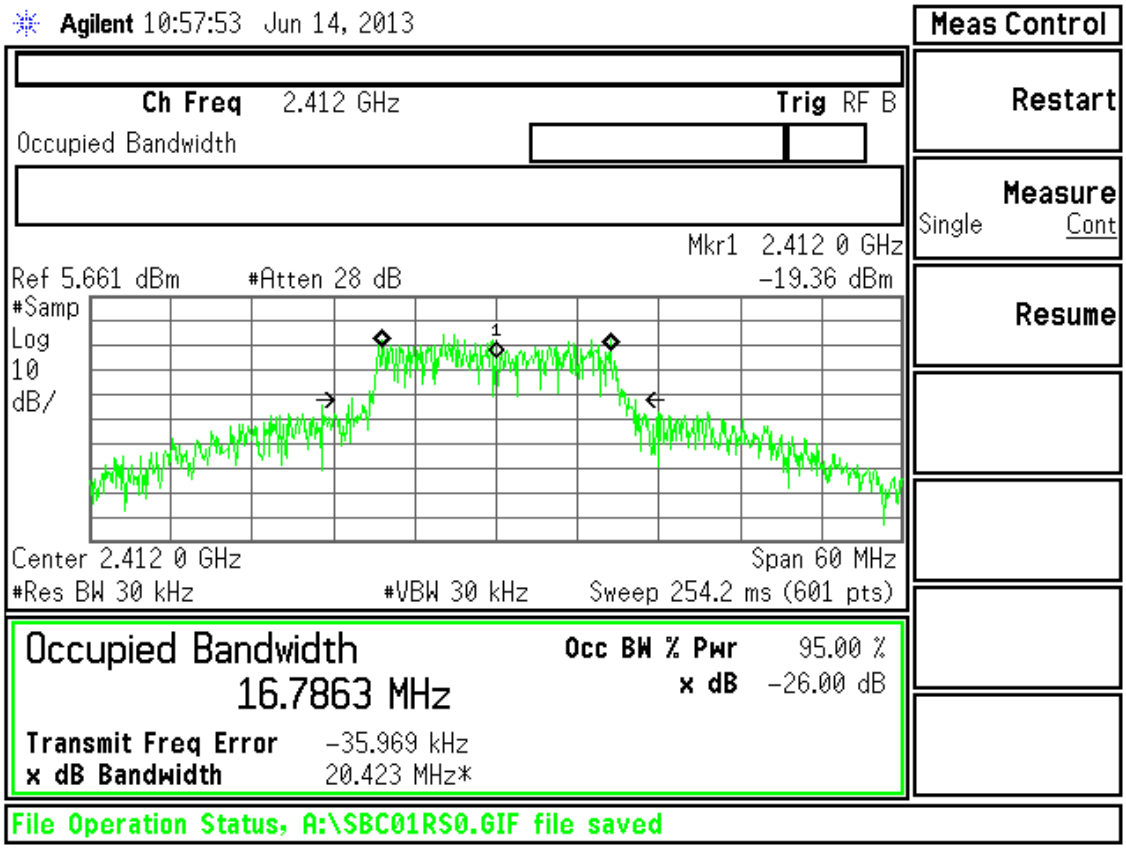
95% Spreading Bandwidth – 802.11g CH13 (2472MHz) 6Mbps



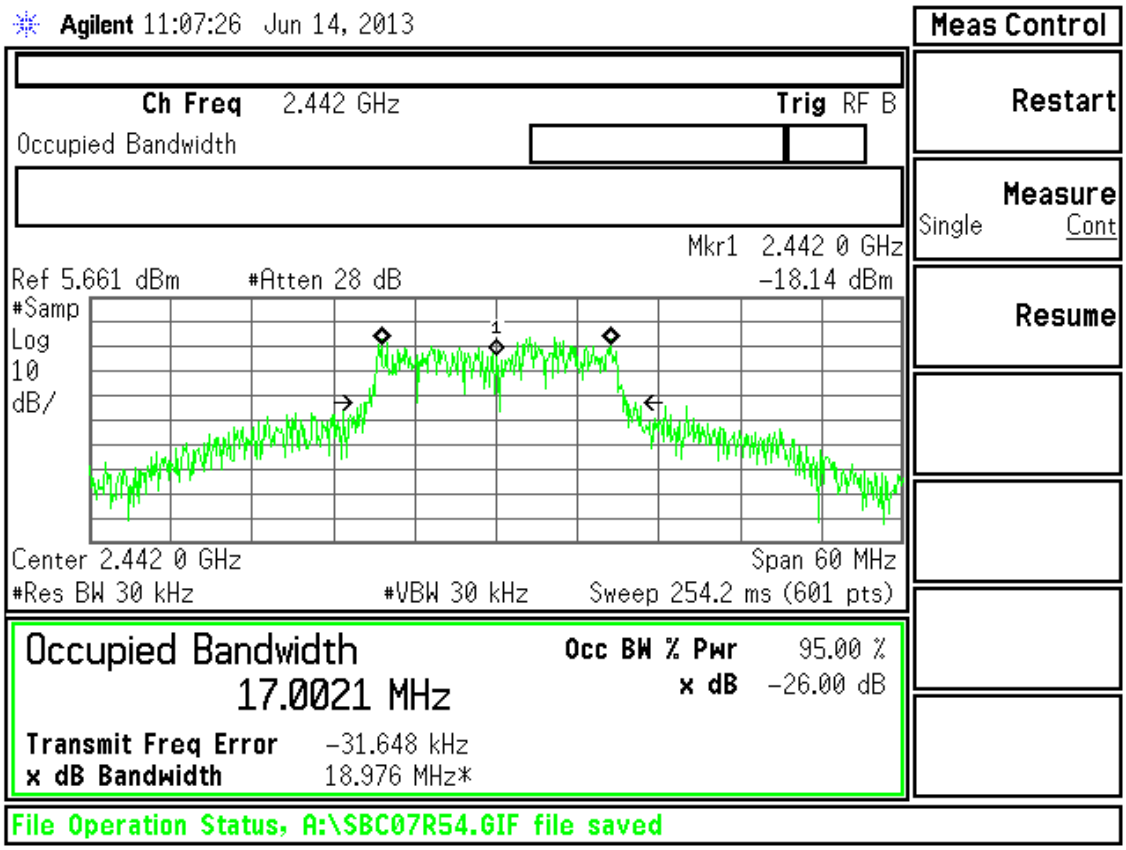
95% Spreading Bandwidth – 802.11g CH13 (2472MHz) 54Mbps



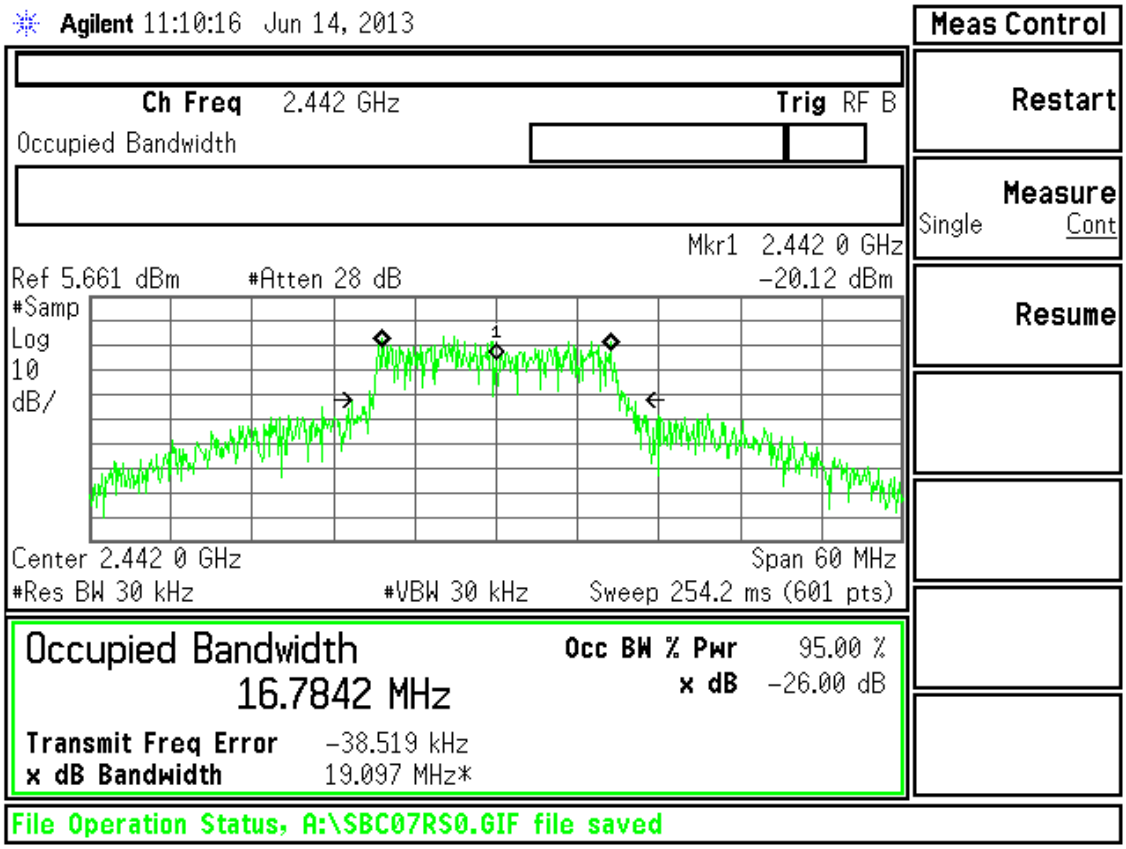
95% Spreading Bandwidth – 802.11n CH1 (2412MHz) MCS0



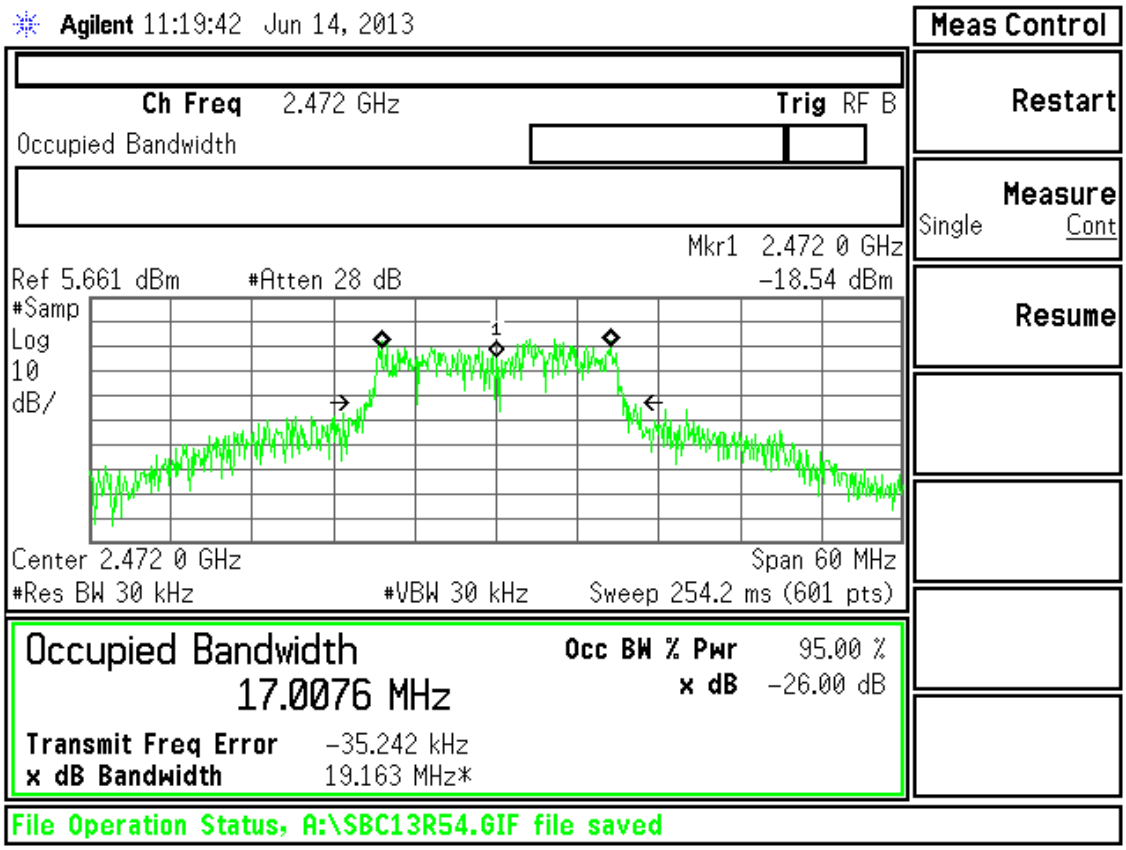
95% Spreading Bandwidth – 802.11n CH1 (2412MHz) MCS7



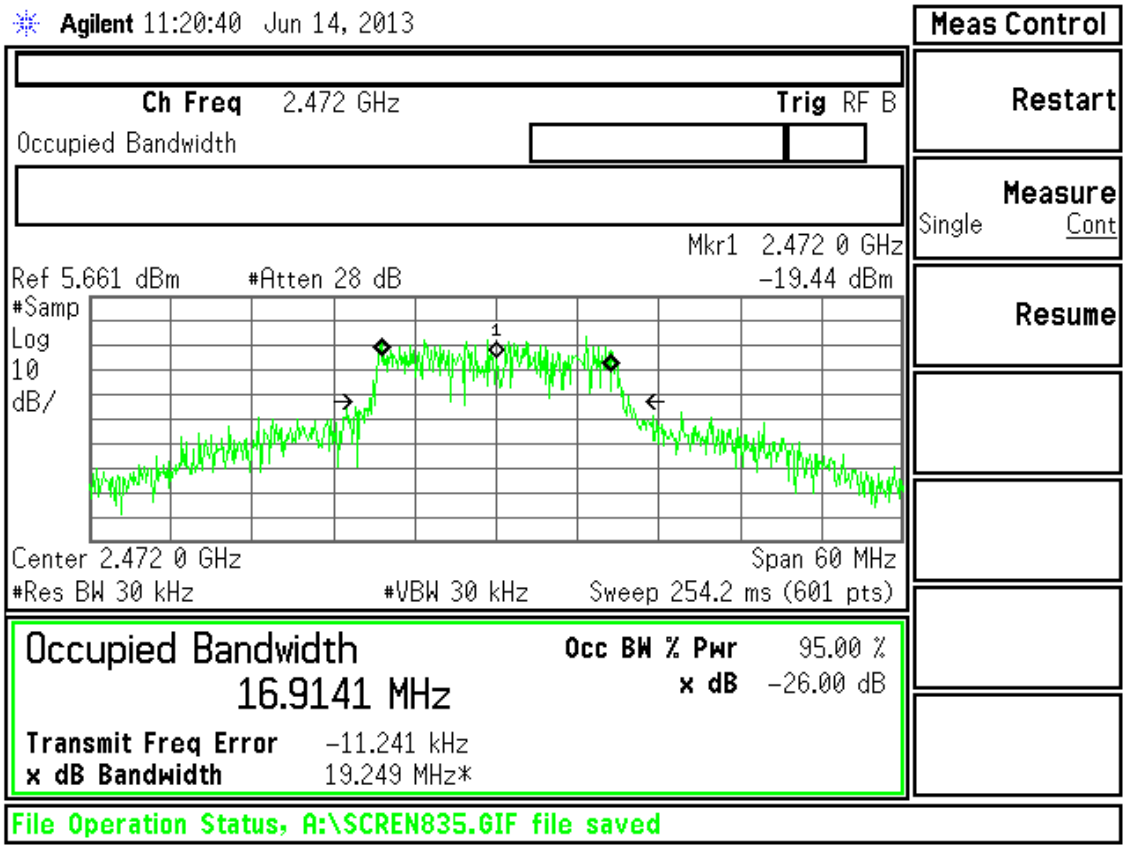
95% Spreading Bandwidth – 802.11n CH7 (2442MHz) MCS0



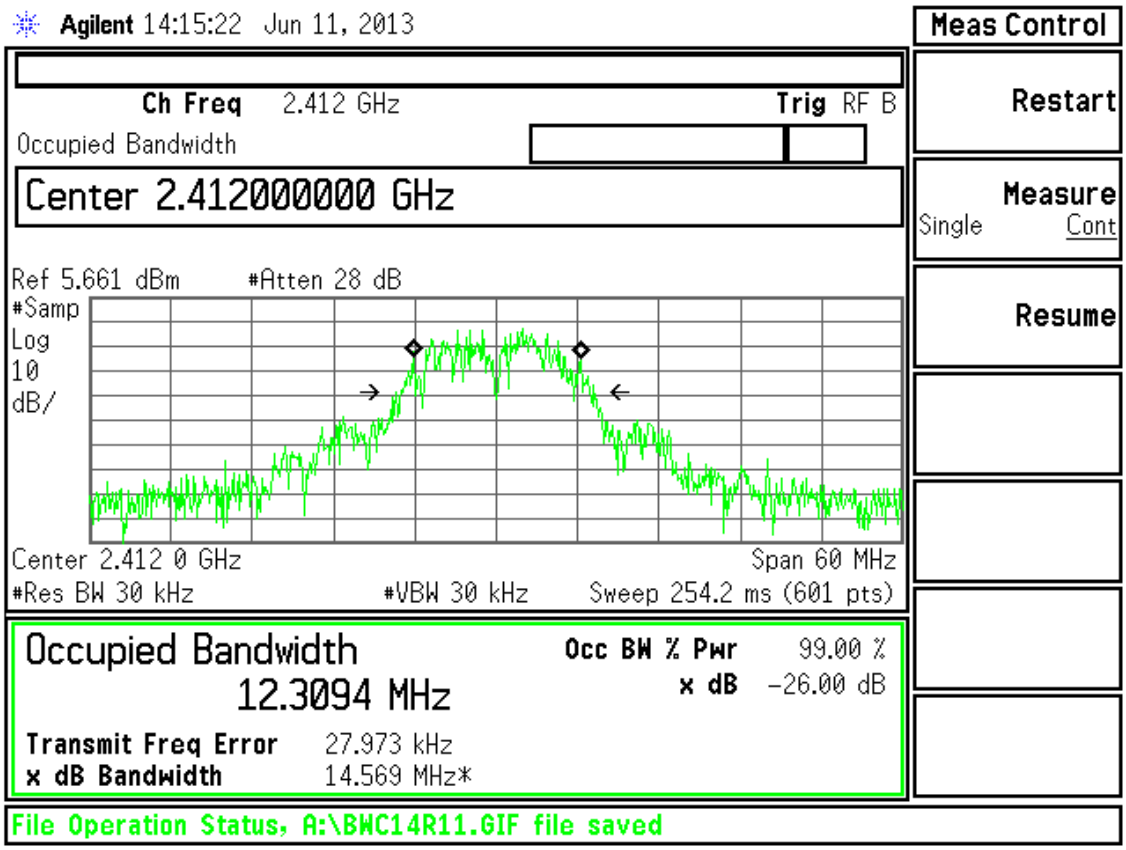
95% Spreading Bandwidth – 802.11n CH7 (2442MHz) MCS7



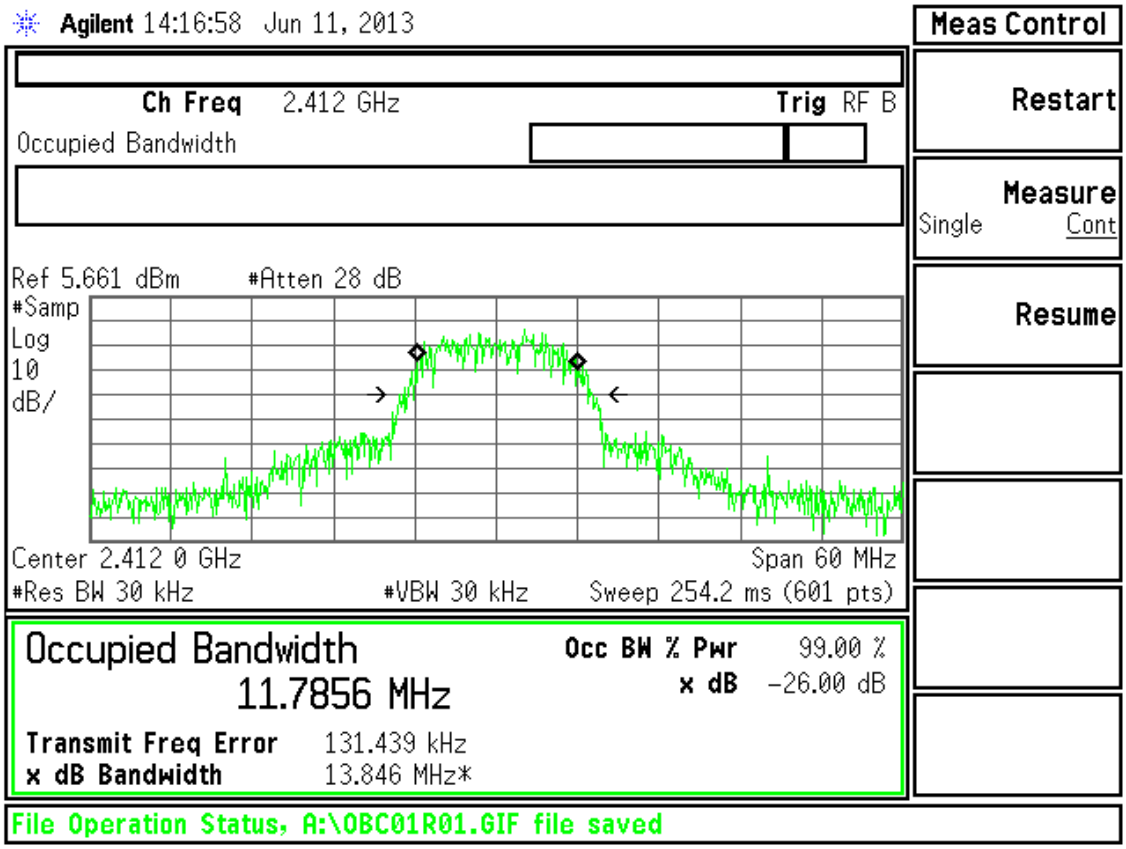
95% Spreading Bandwidth – 802.11n CH13 (2472MHz) MCS0



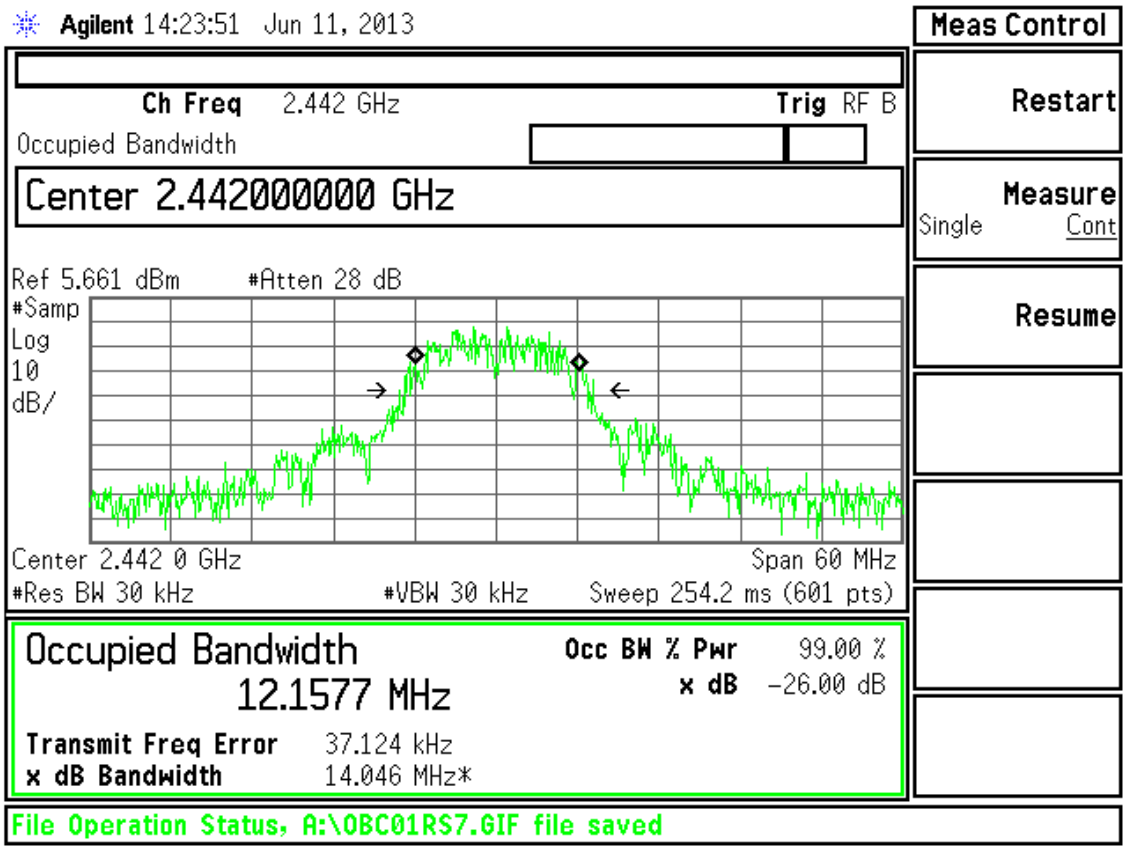
95% Spreading Bandwidth – 802.11n CH13 (2472MHz) MCS7



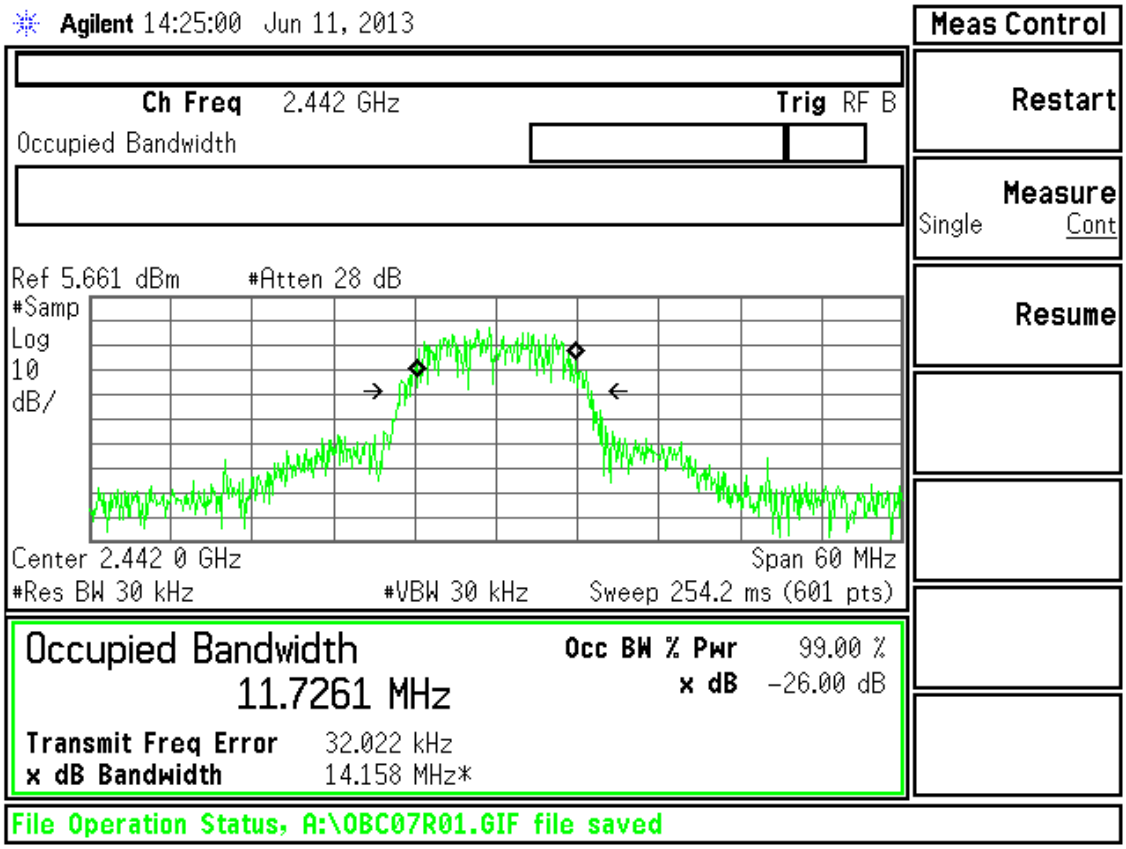
99.5% Occupied Bandwidth – 802.11b CH1 (2412MHz) 1Mbps



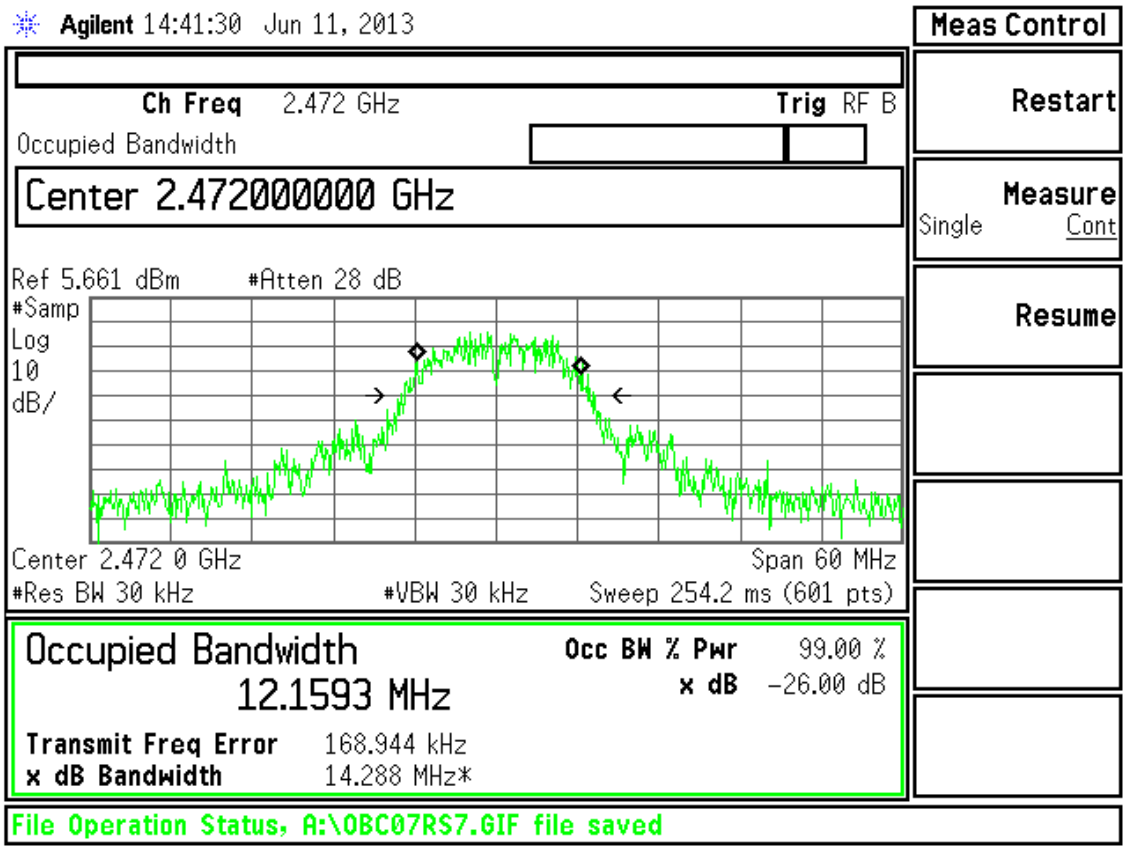
99.5% Occupied Bandwidth – 802.11b CH1 (2412MHz) 11Mbps



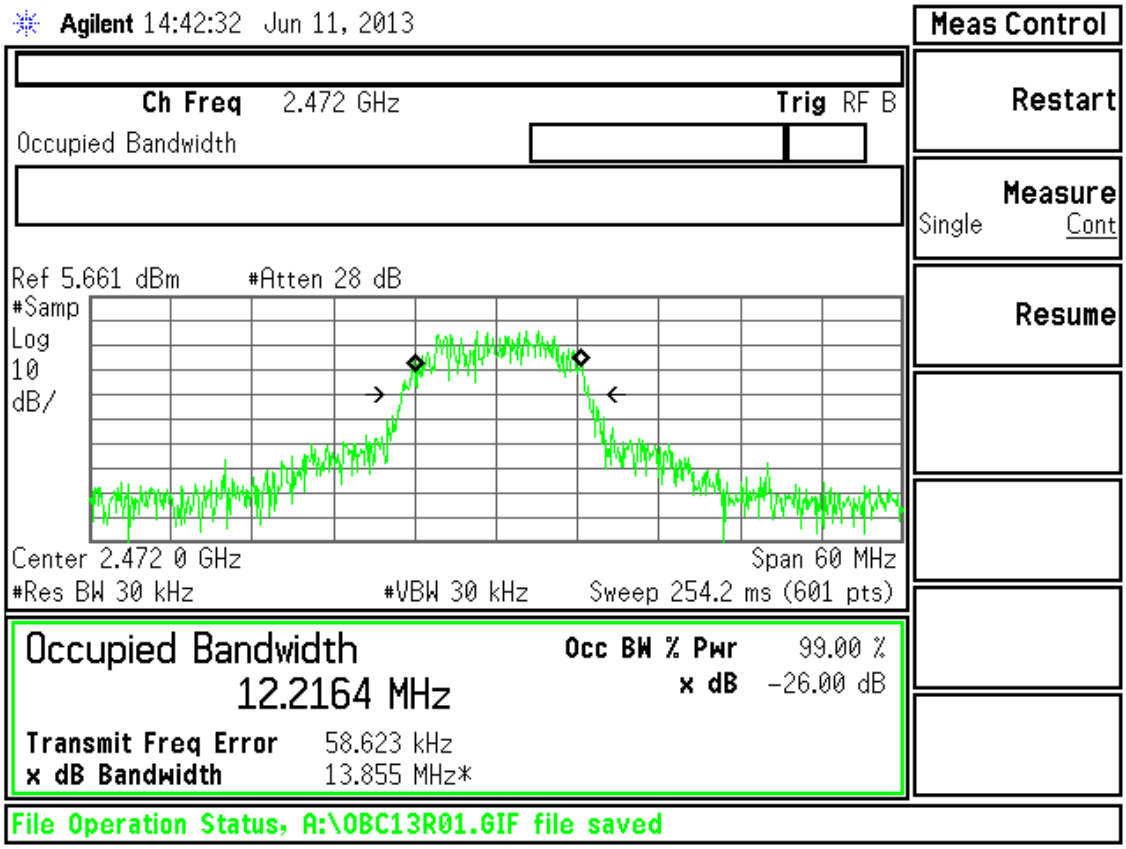
99.5% Occupied Bandwidth – 802.11b CH7 (2442MHz) 1Mbps



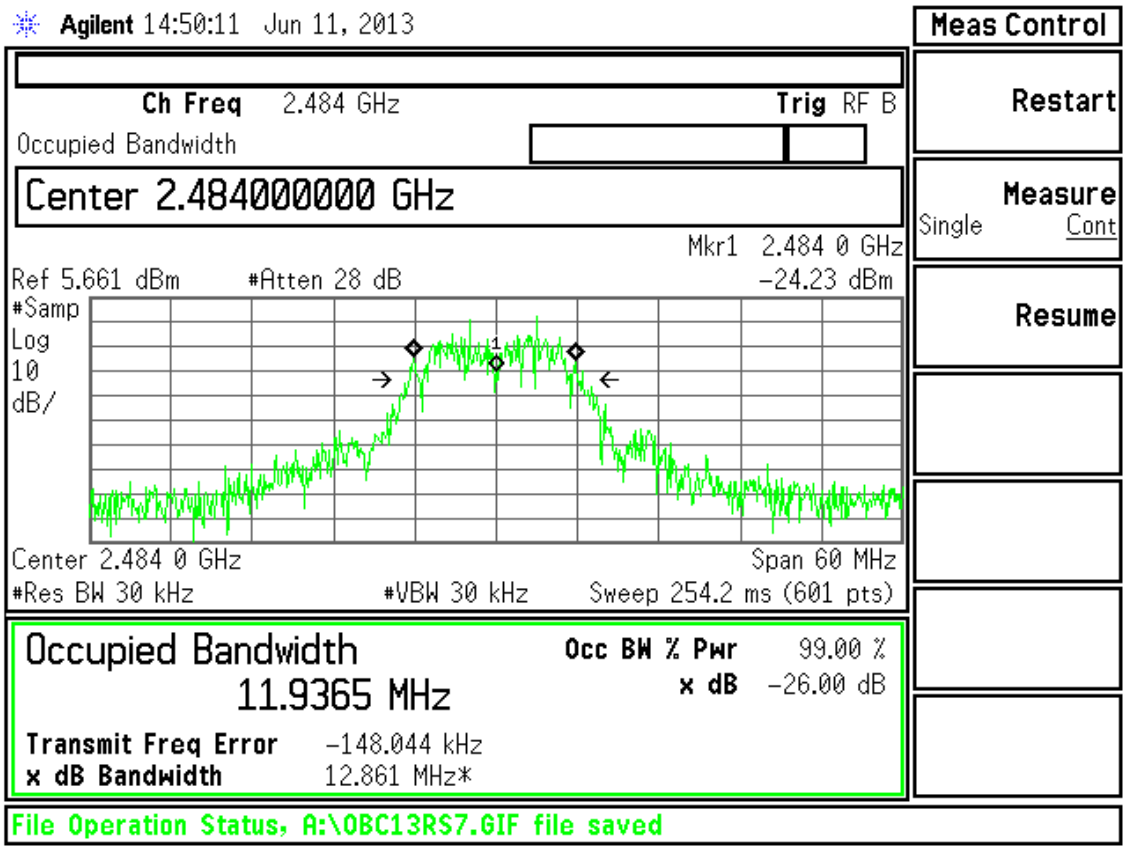
99.5% Occupied Bandwidth – 802.11b CH7 (2442MHz) 11Mbps



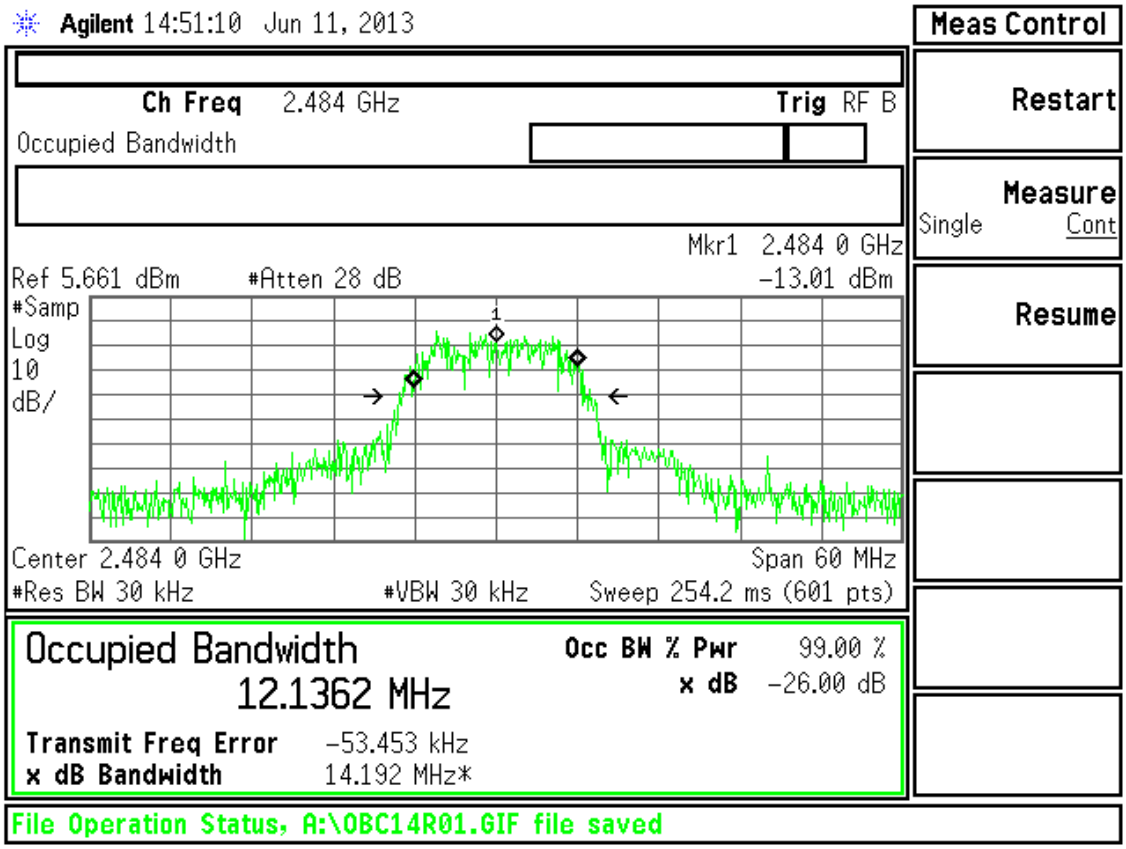
99.5% Occupied Bandwidth – 802.11b CH13 (2472MHz) 1Mbps



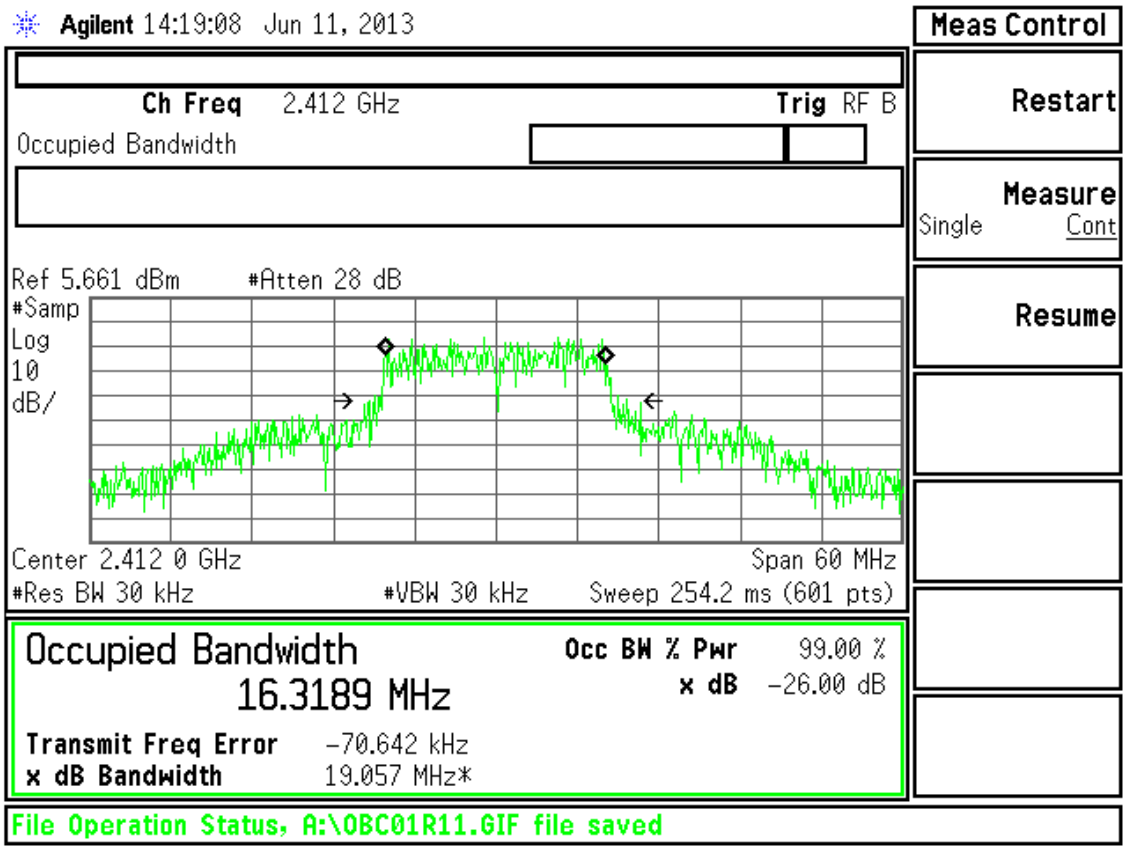
99.5% Occupied Bandwidth – 802.11b CH13 (2472MHz) 11Mbps



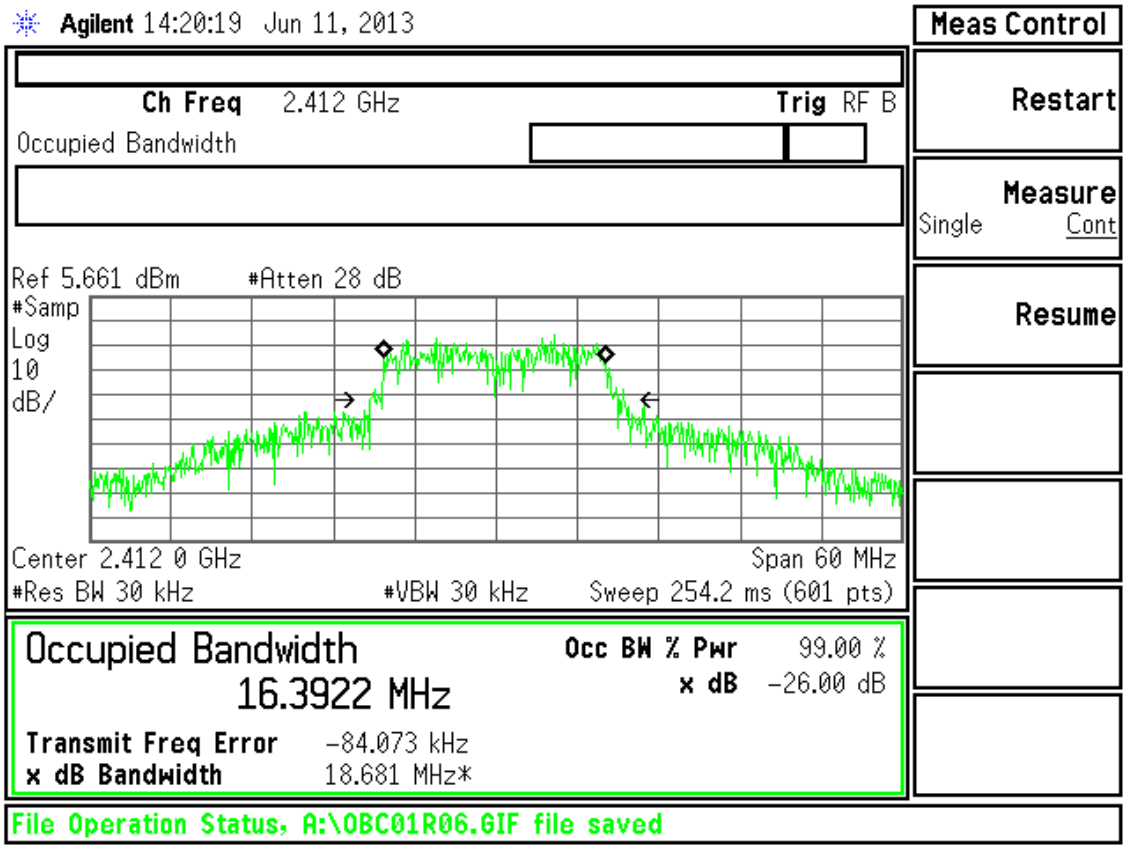
99.5% Occupied Bandwidth – 802.11b CH14 (2484MHz) 1Mbps



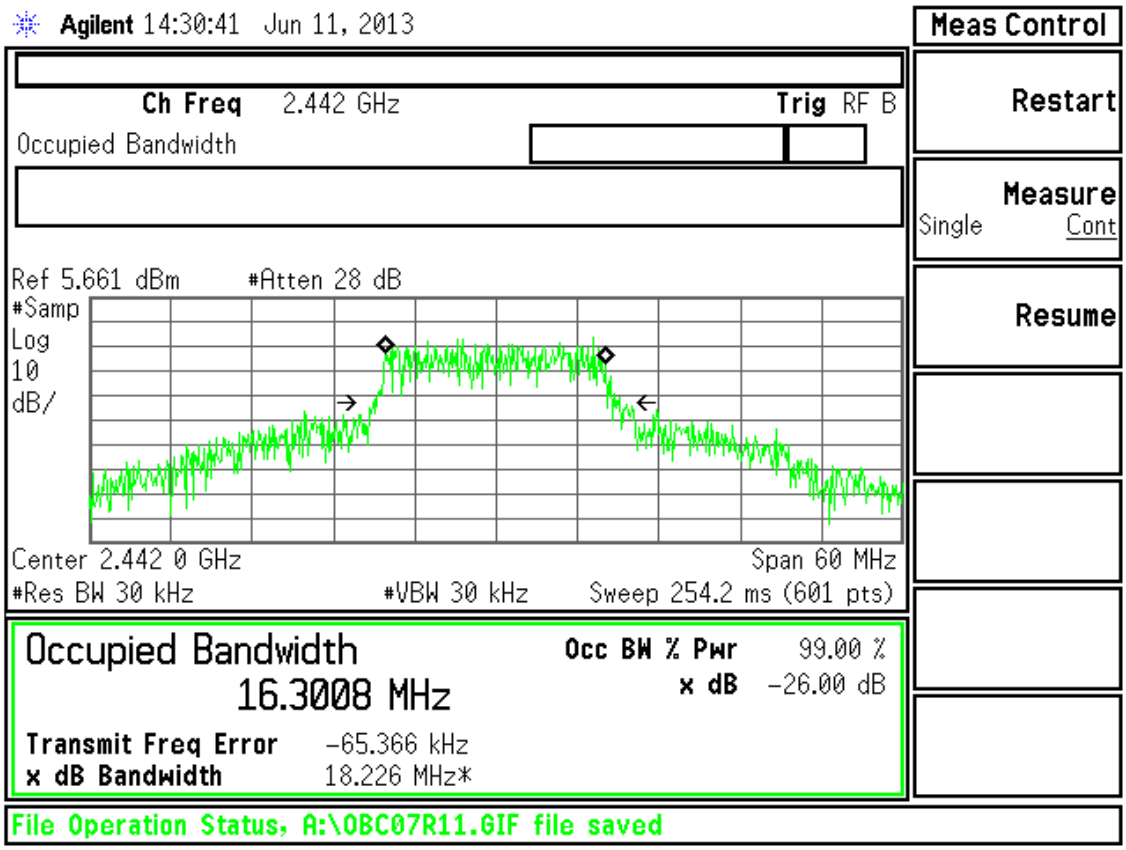
99.5% Occupied Bandwidth – 802.11b CH14 (2484MHz) 11Mbps



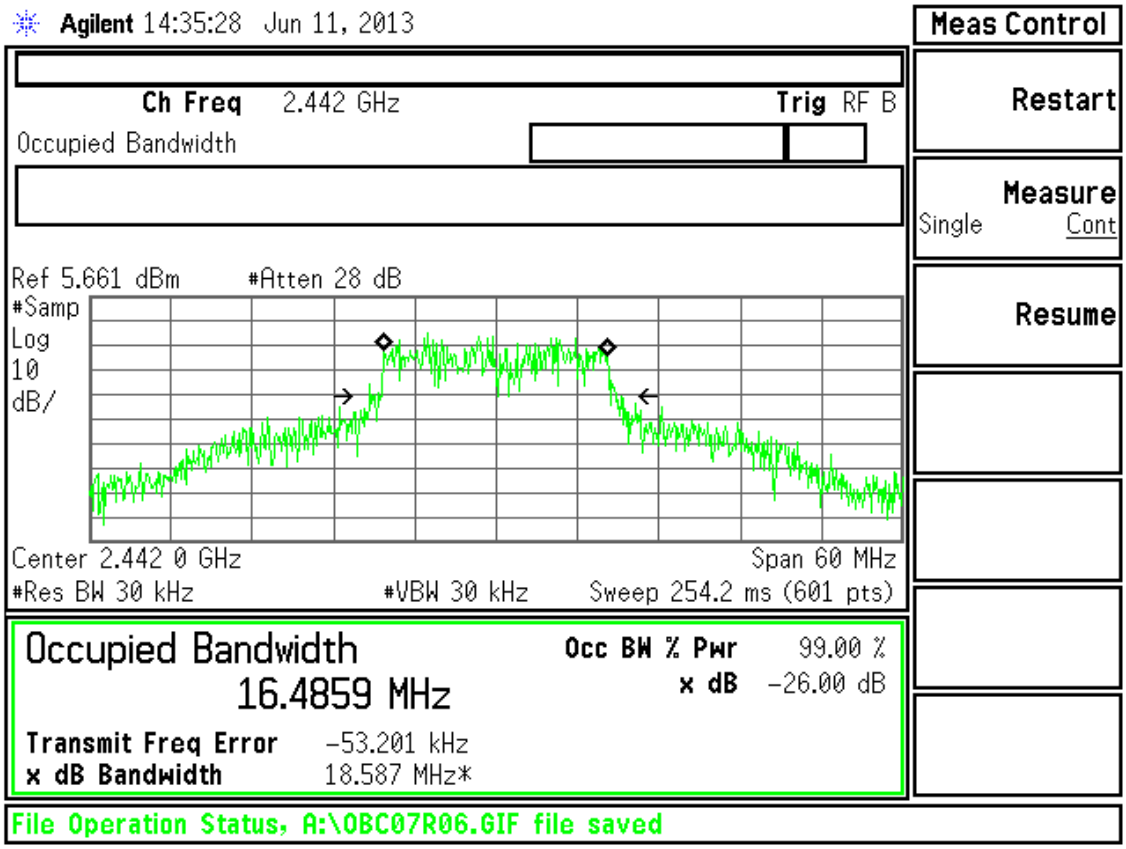
99.5% Occupied Bandwidth – 802.11g CH1 (2412MHz) 6Mbps



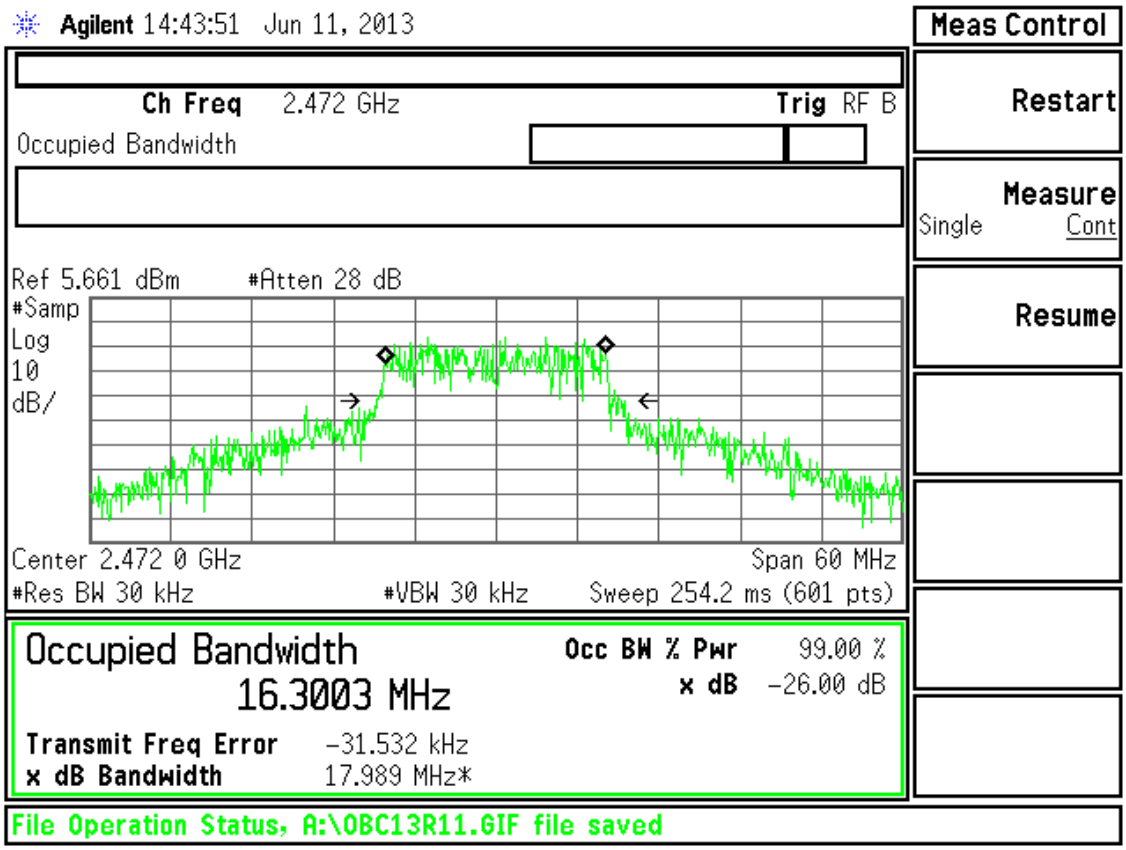
99.5% Occupied Bandwidth – 802.11g CH1 (2412MHz) 54Mbps



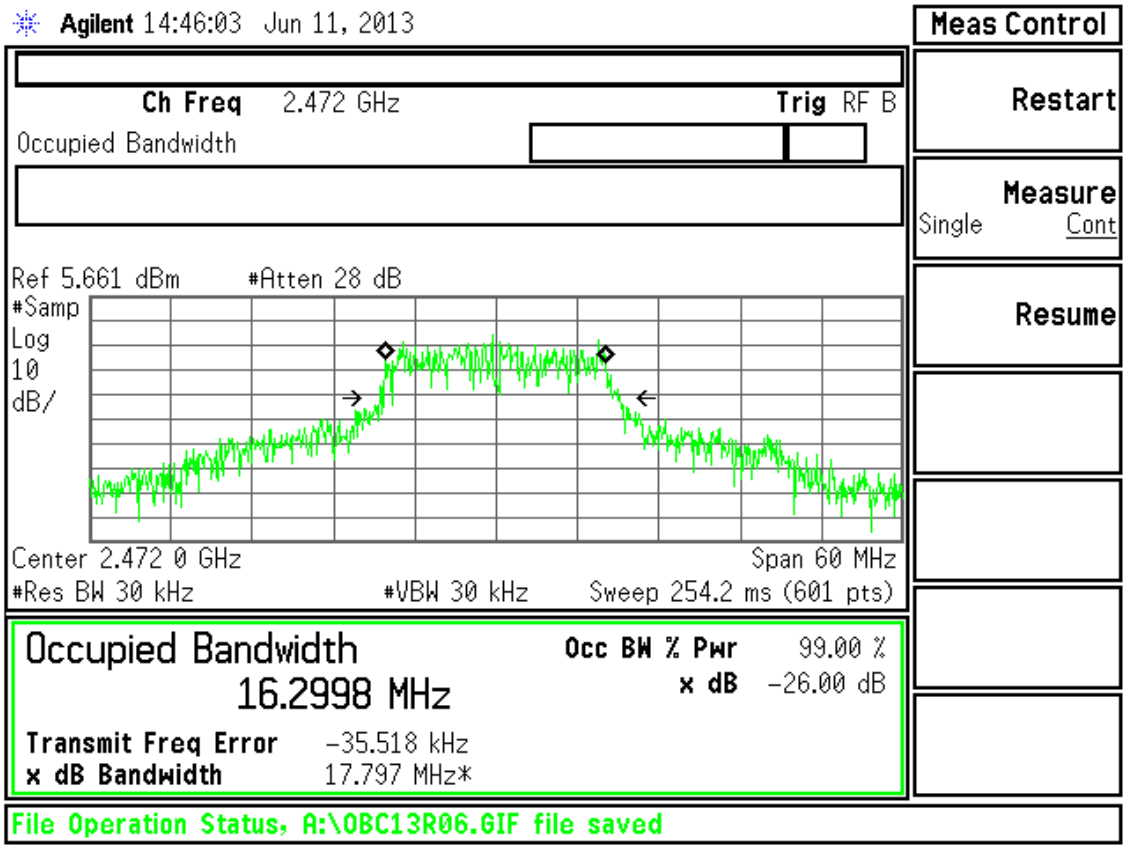
99.5% Occupied Bandwidth – 802.11g CH7 (2442MHz) 6Mbps



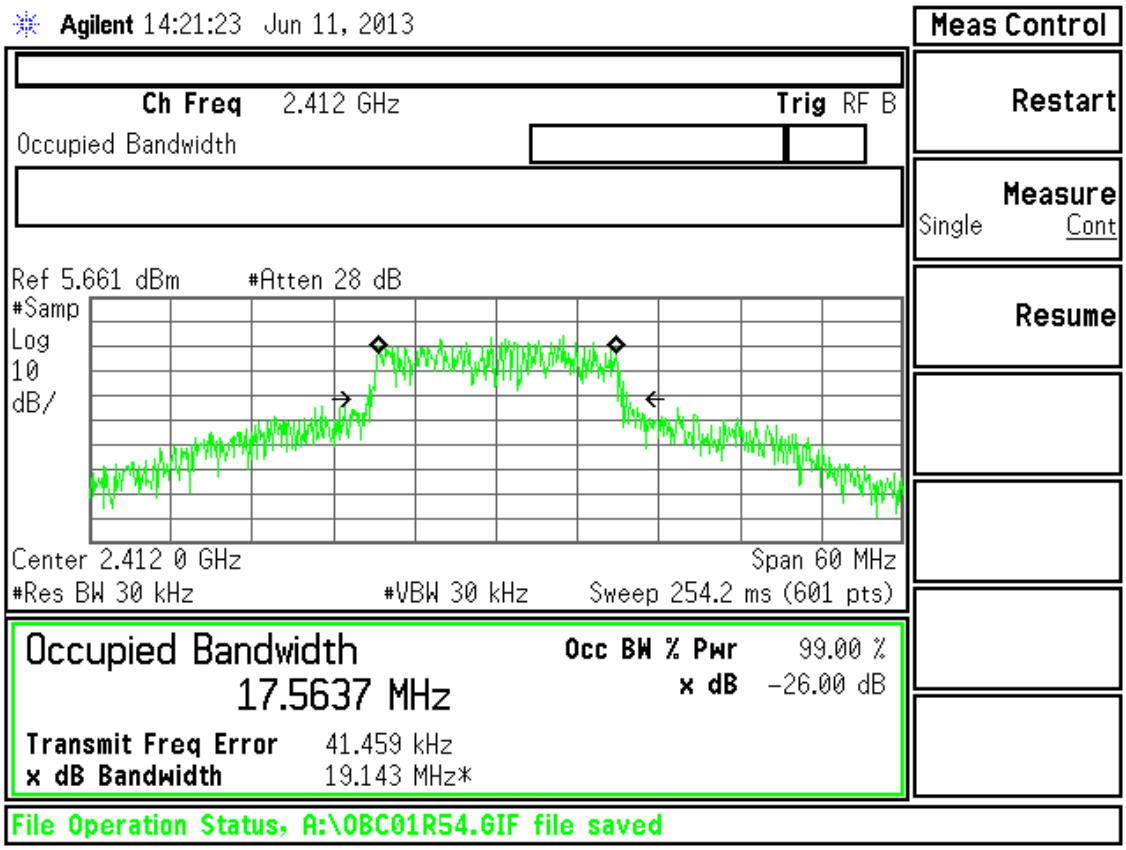
99.5% Occupied Bandwidth – 802.11g CH7 (2442MHz) 54Mbps



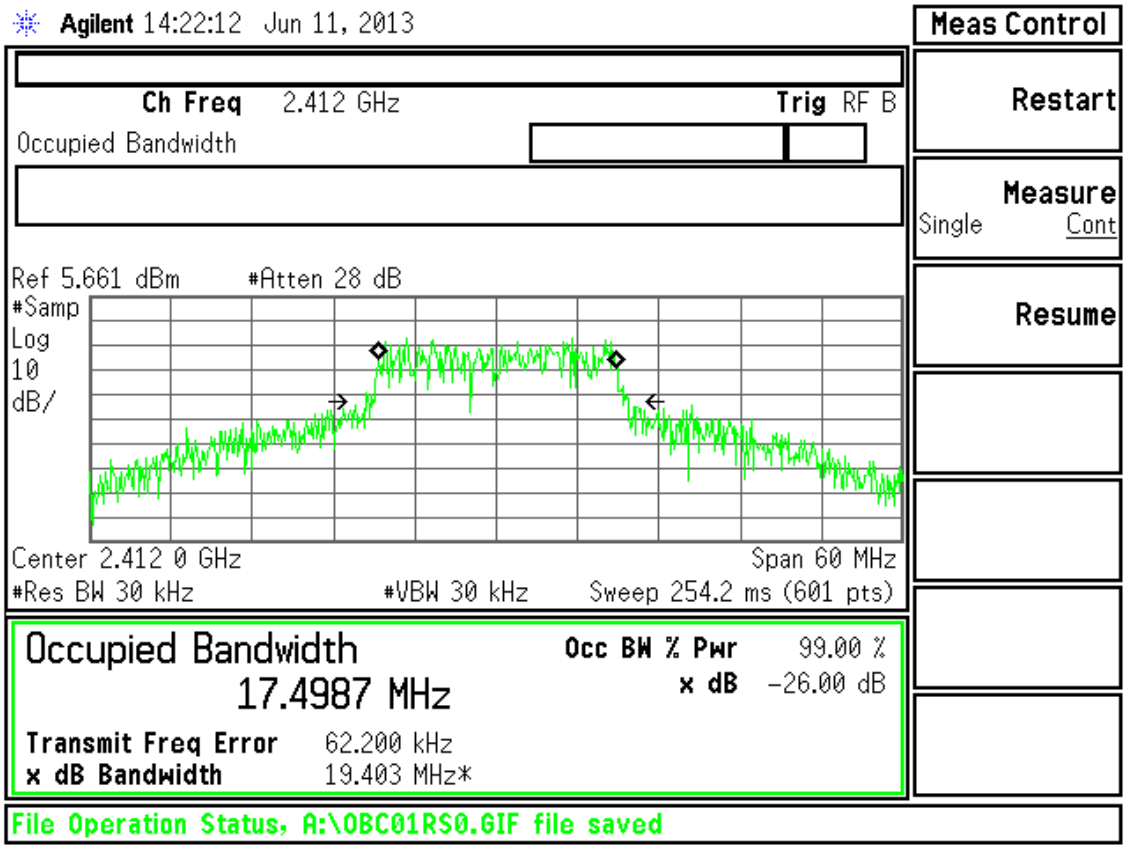
99.5% Occupied Bandwidth - 802.11g CH13 (2472MHz) 6Mbps



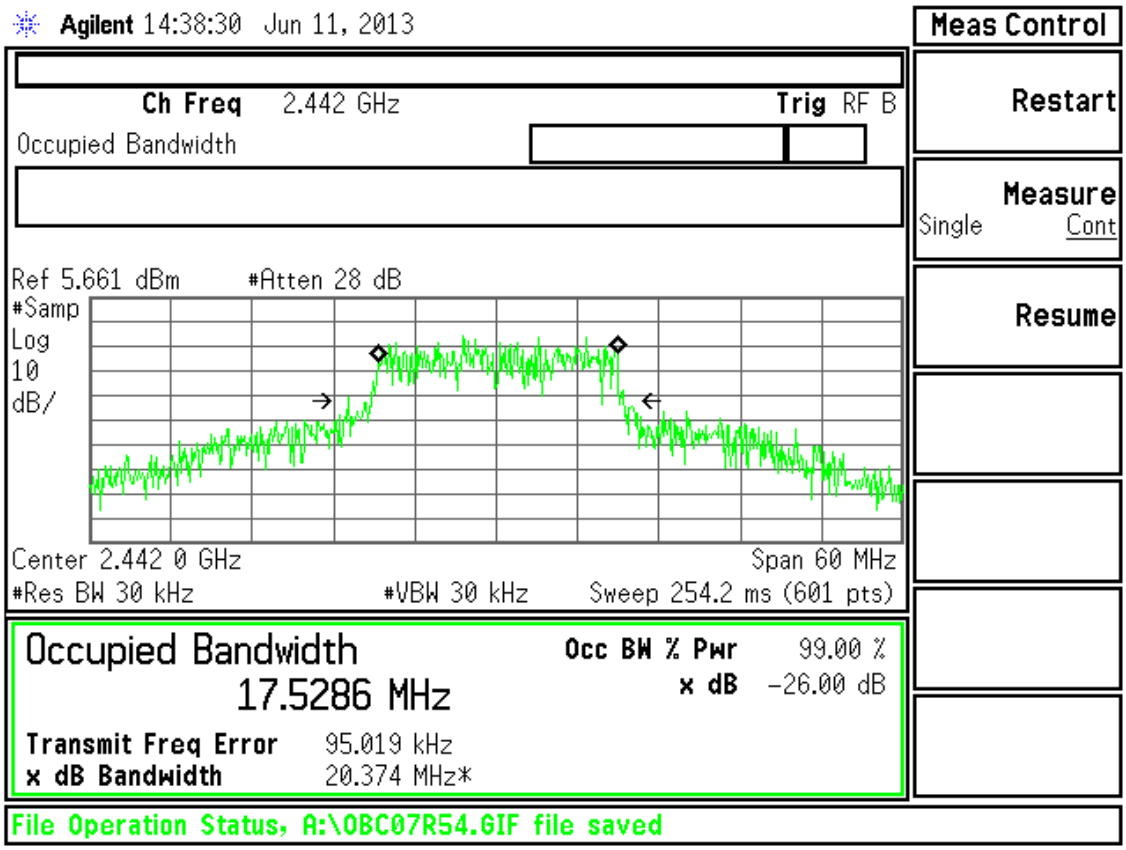
99.5% Occupied Bandwidth - 802.11g CH13 (2472MHz) 54Mbps



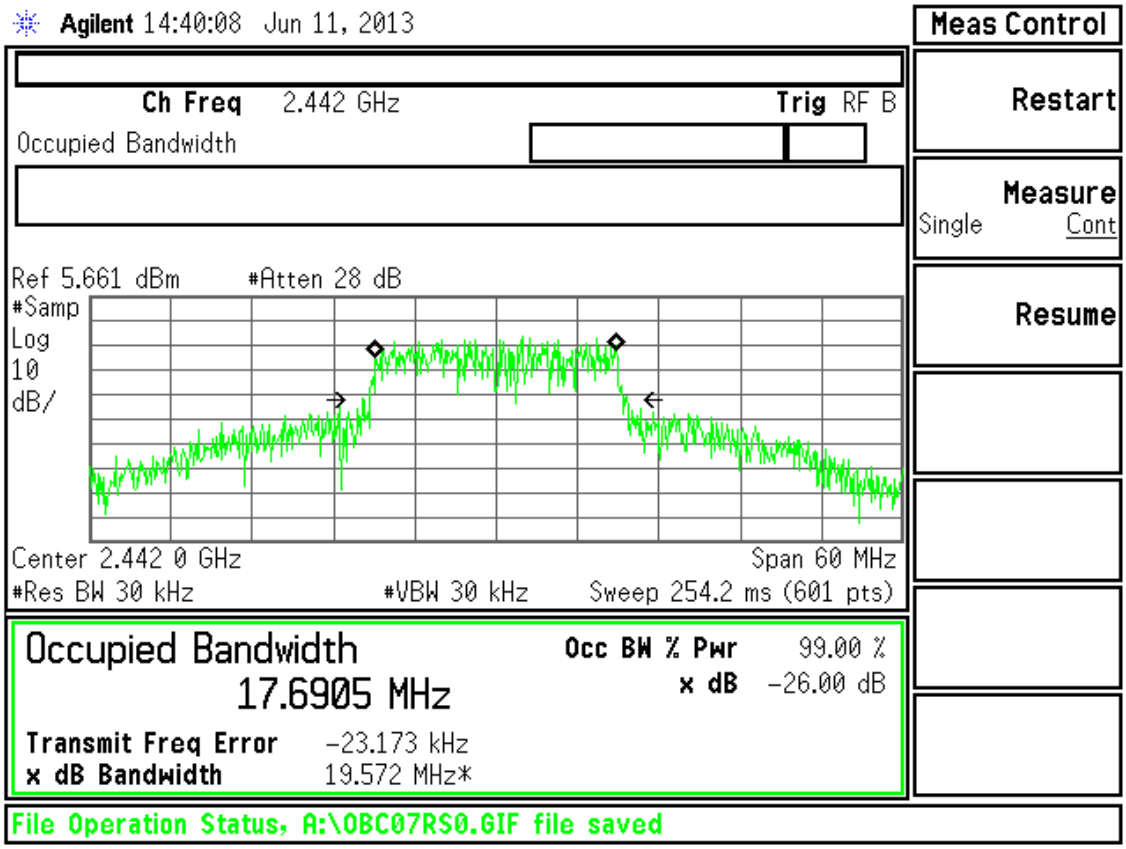
99.5% Occupied Bandwidth – 802.11n CH1 (2412MHz) MCS0



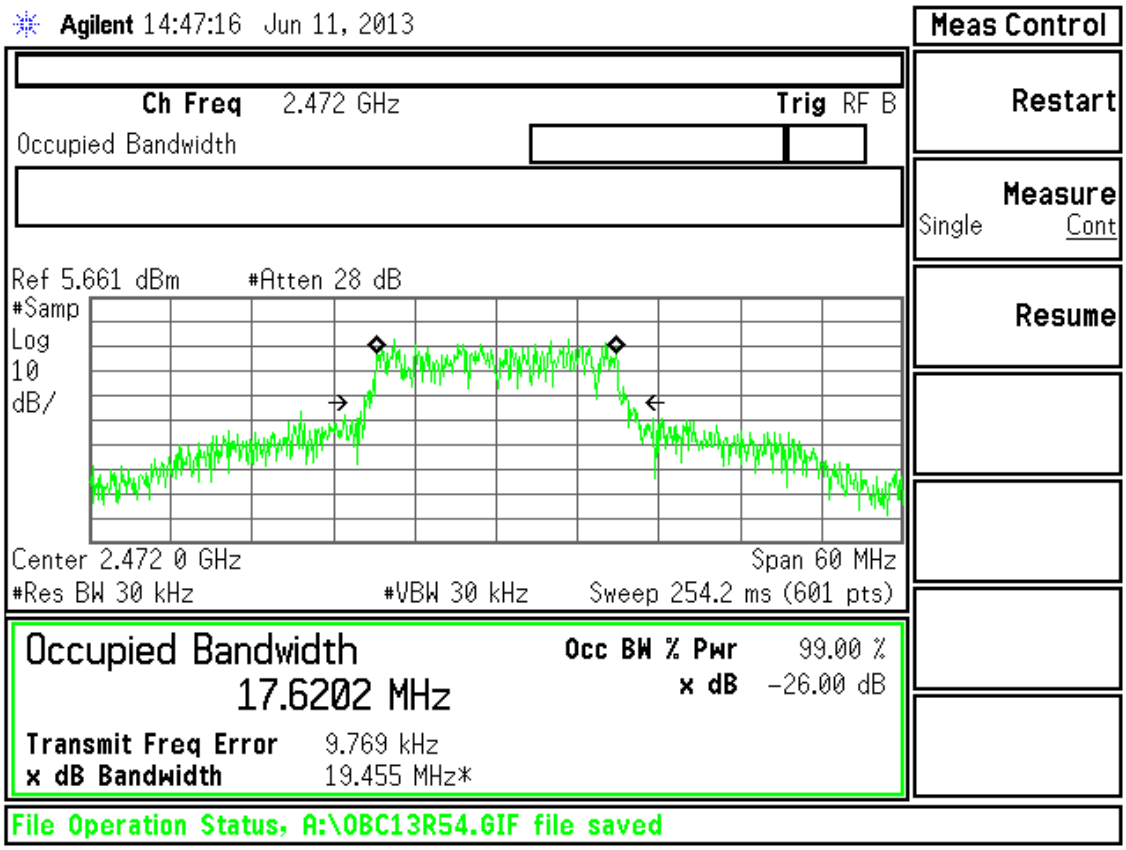
99.5% Occupied Bandwidth – 802.11n CH1 (2412MHz) MCS7



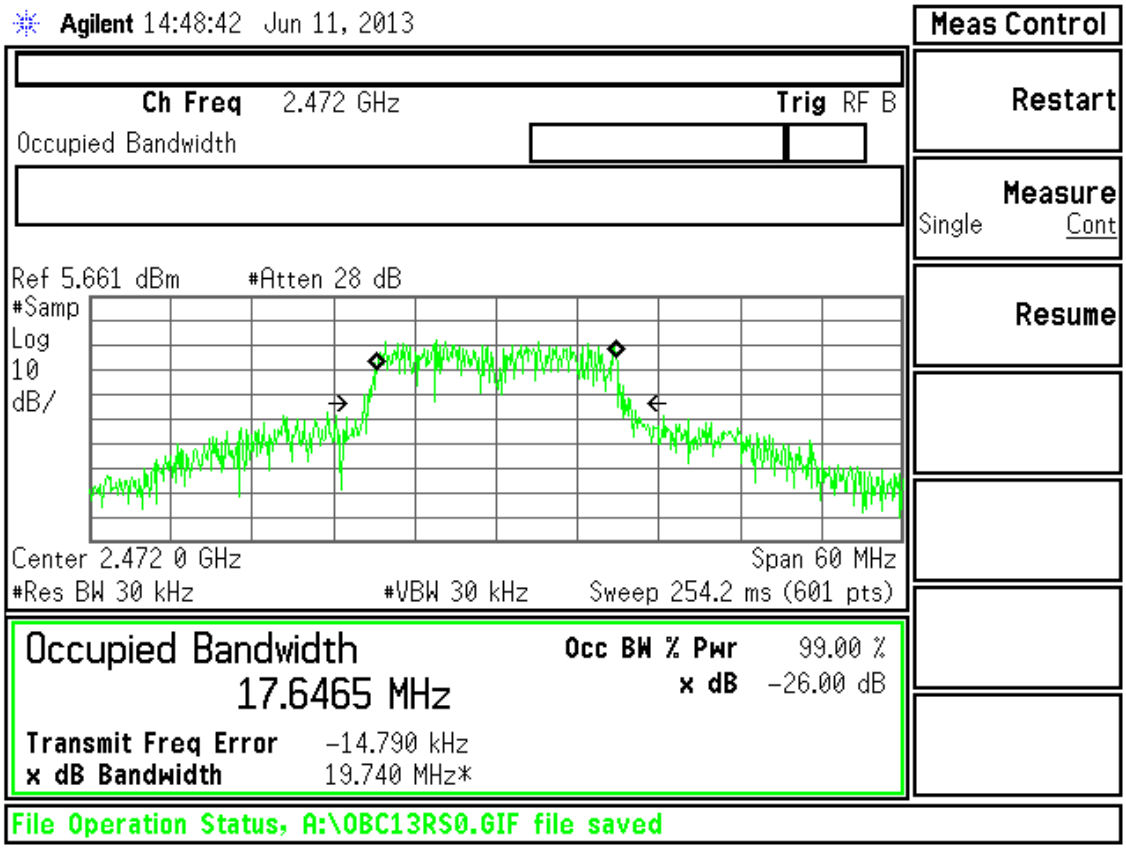
99.5% Occupied Bandwidth – 802.11n CH7 (2442MHz) MCS0



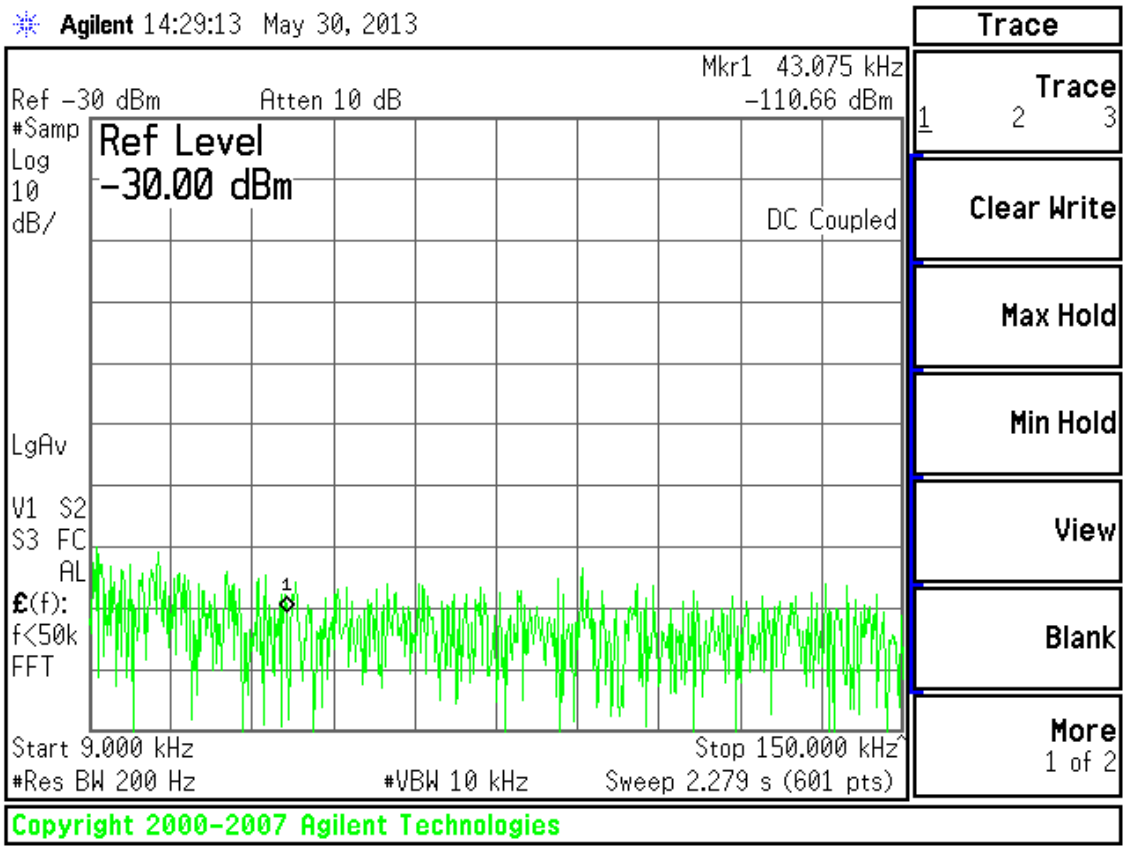
99.5% Occupied Bandwidth – 802.11n CH7 (2442MHz) MCS7



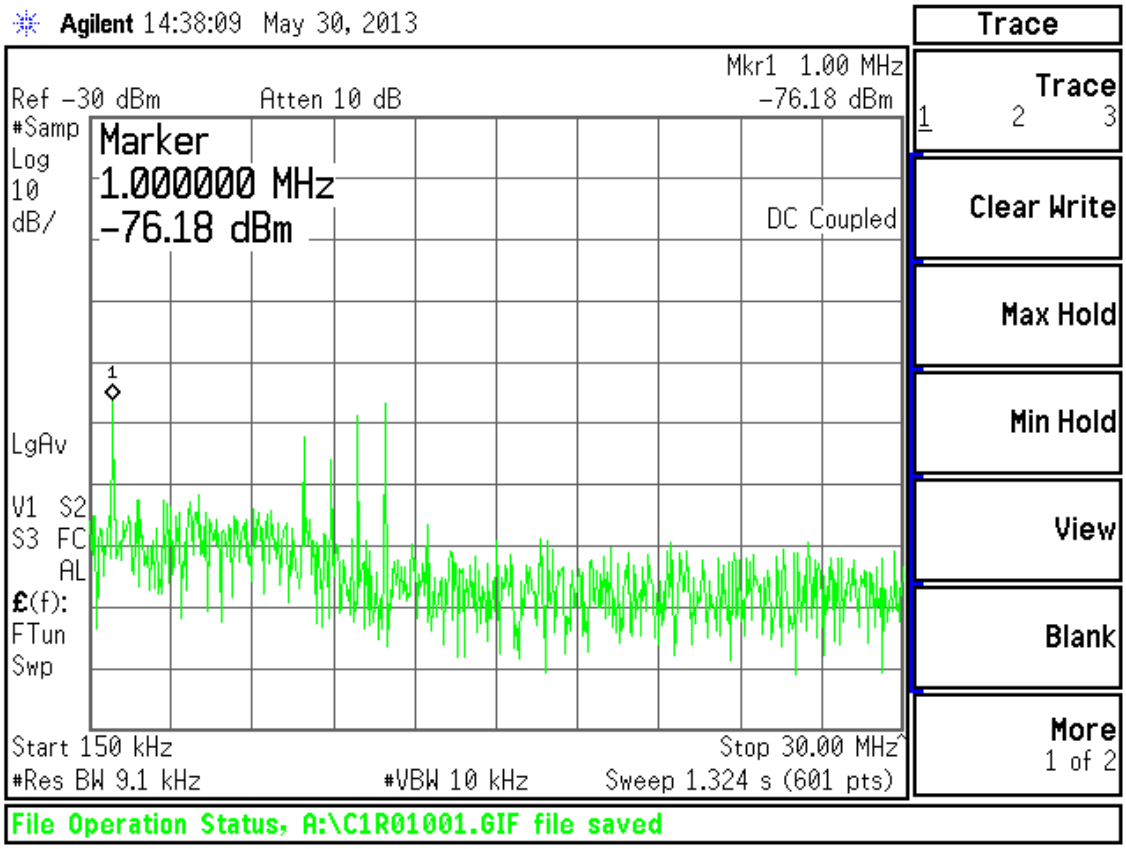
99.5% Occupied Bandwidth - 802.11n CH13 (2472MHz) MCS0



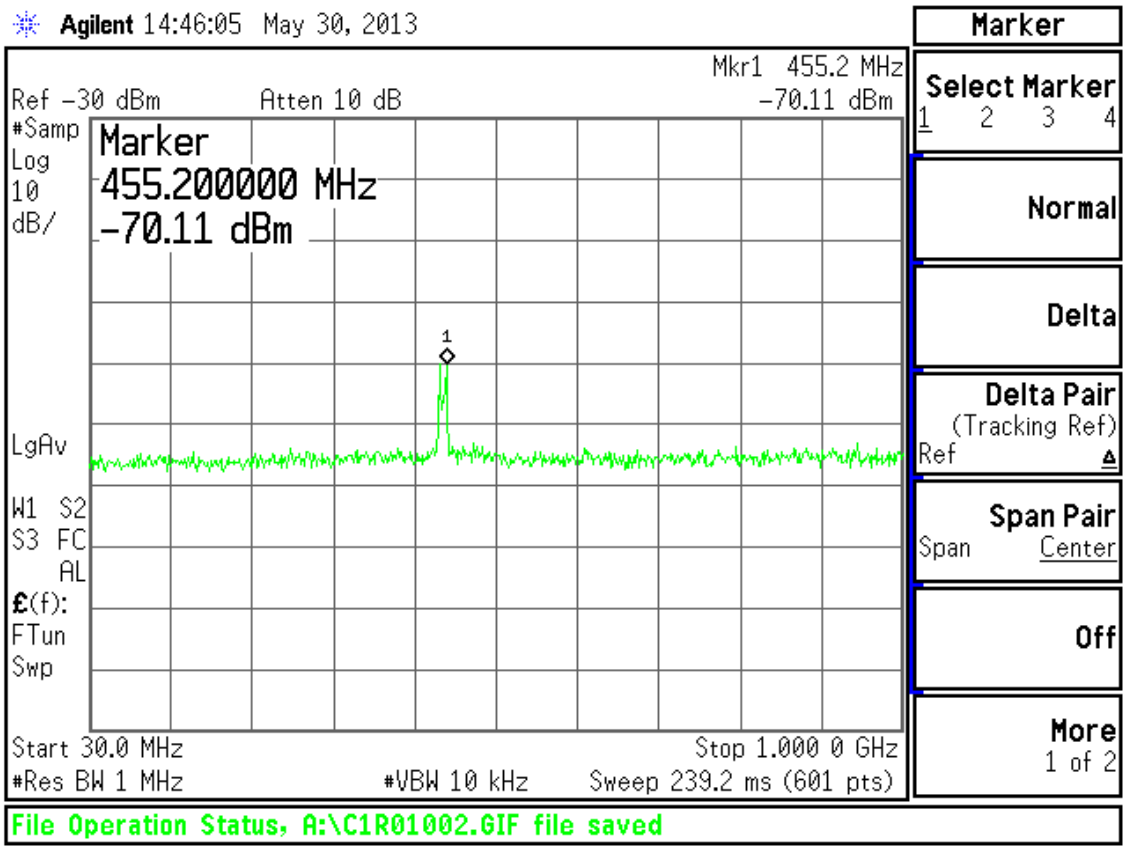
99.5% Occupied Bandwidth - 802.11n CH13 (2472MHz) MCS7



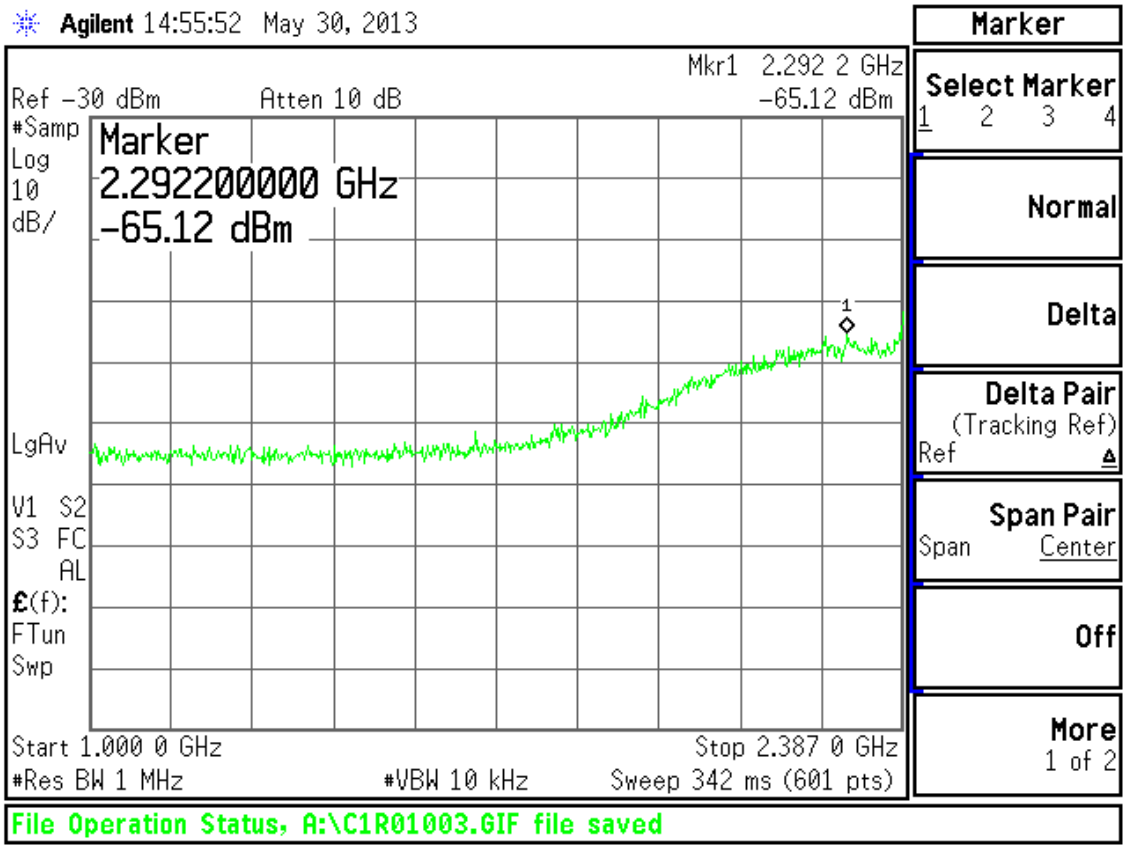
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



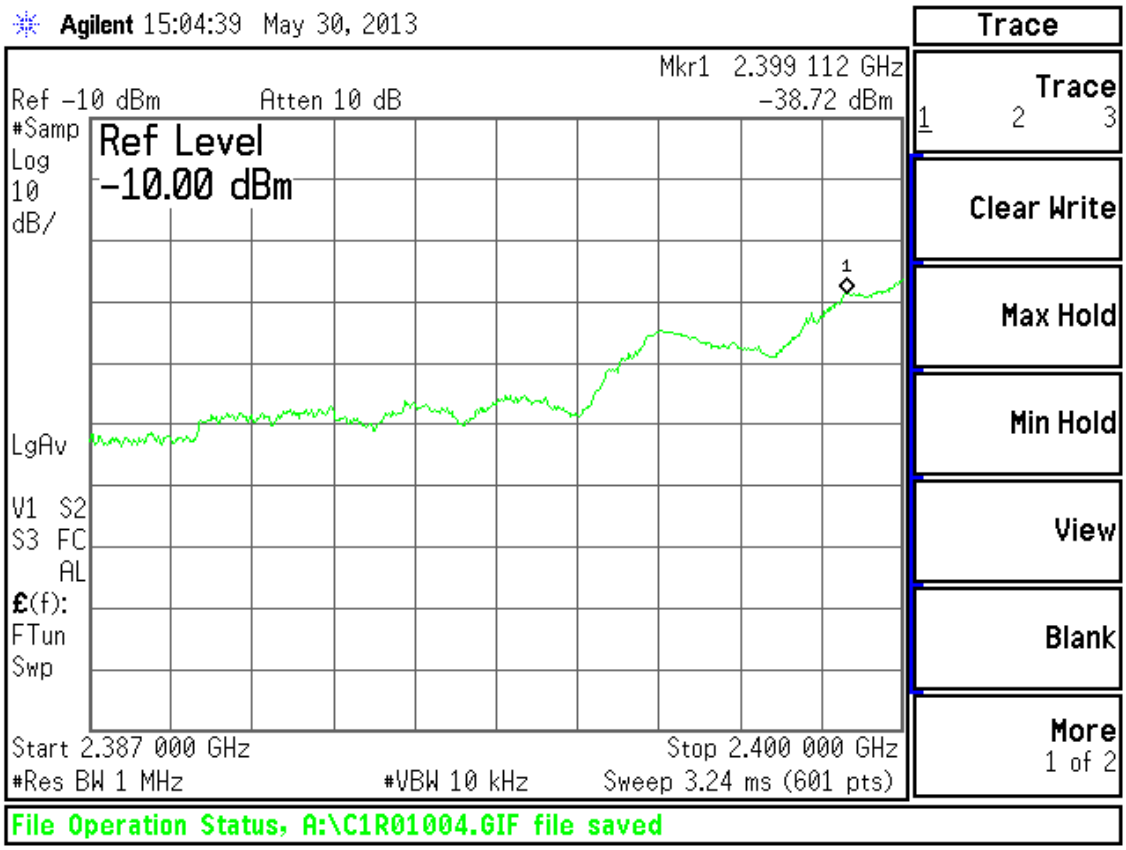
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



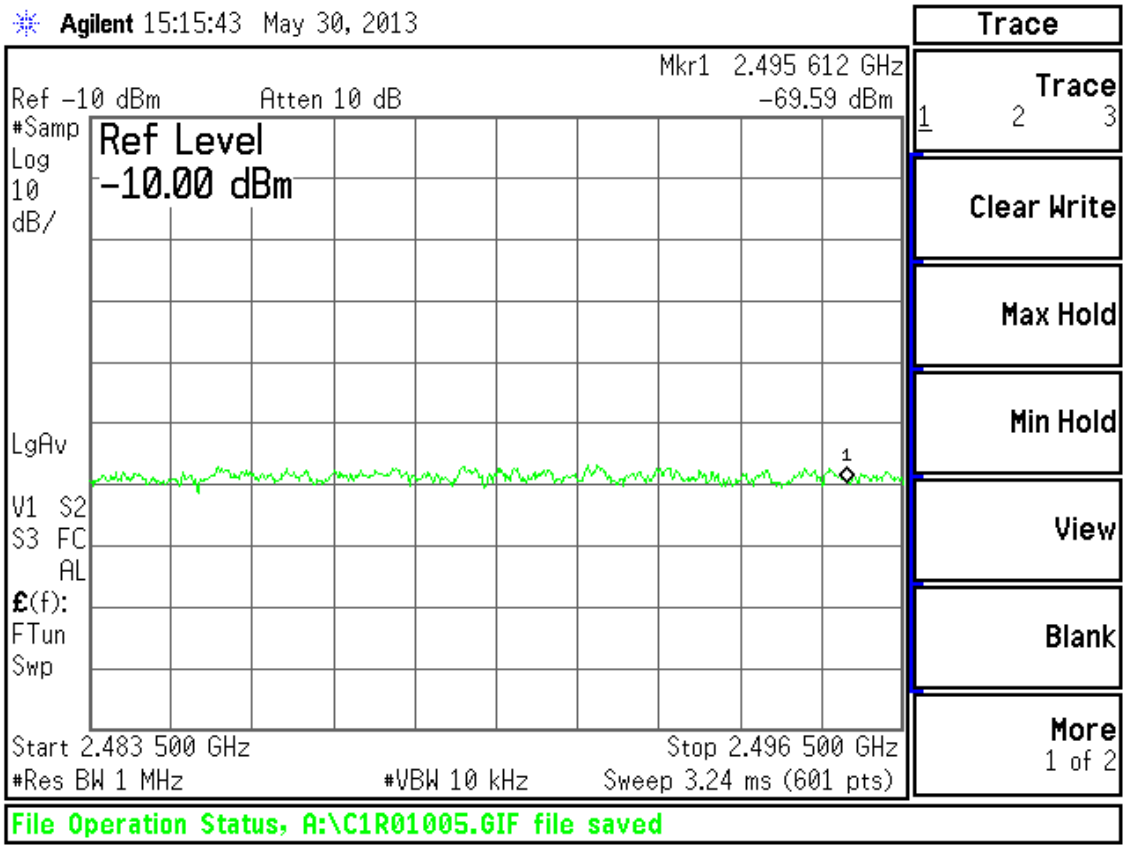
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



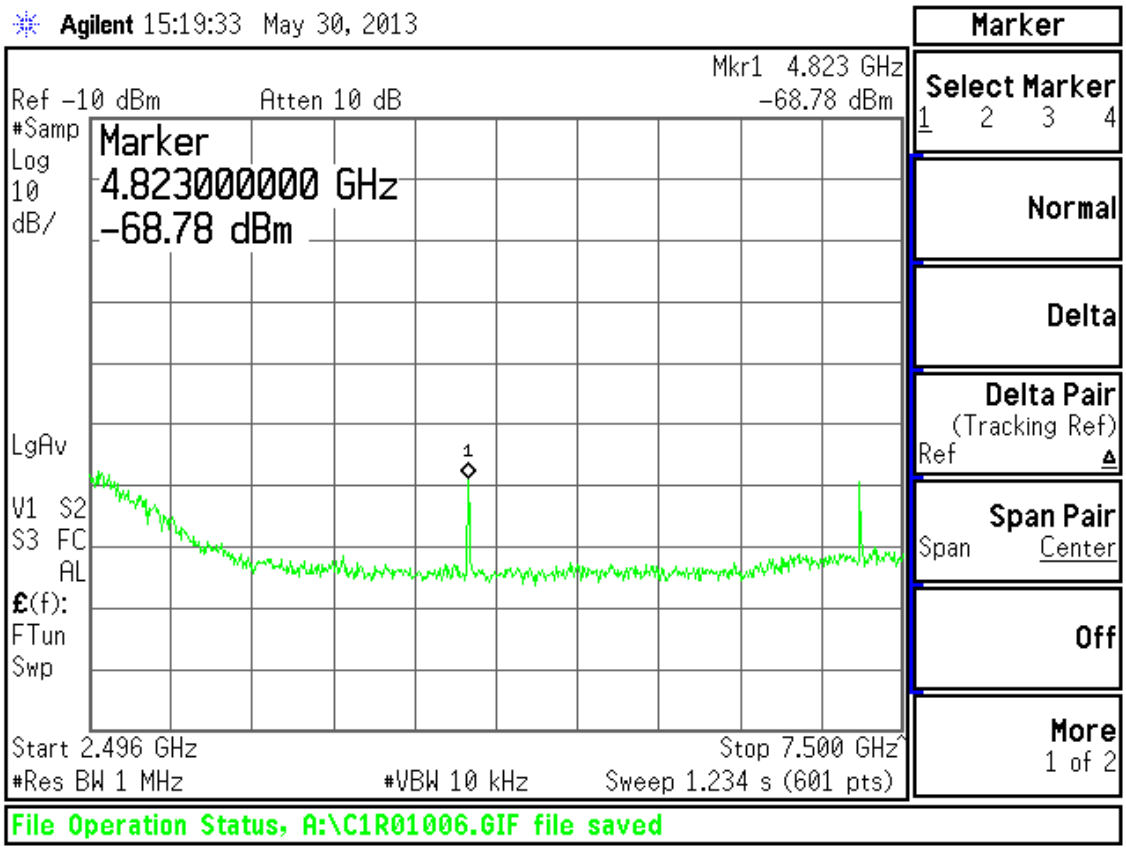
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



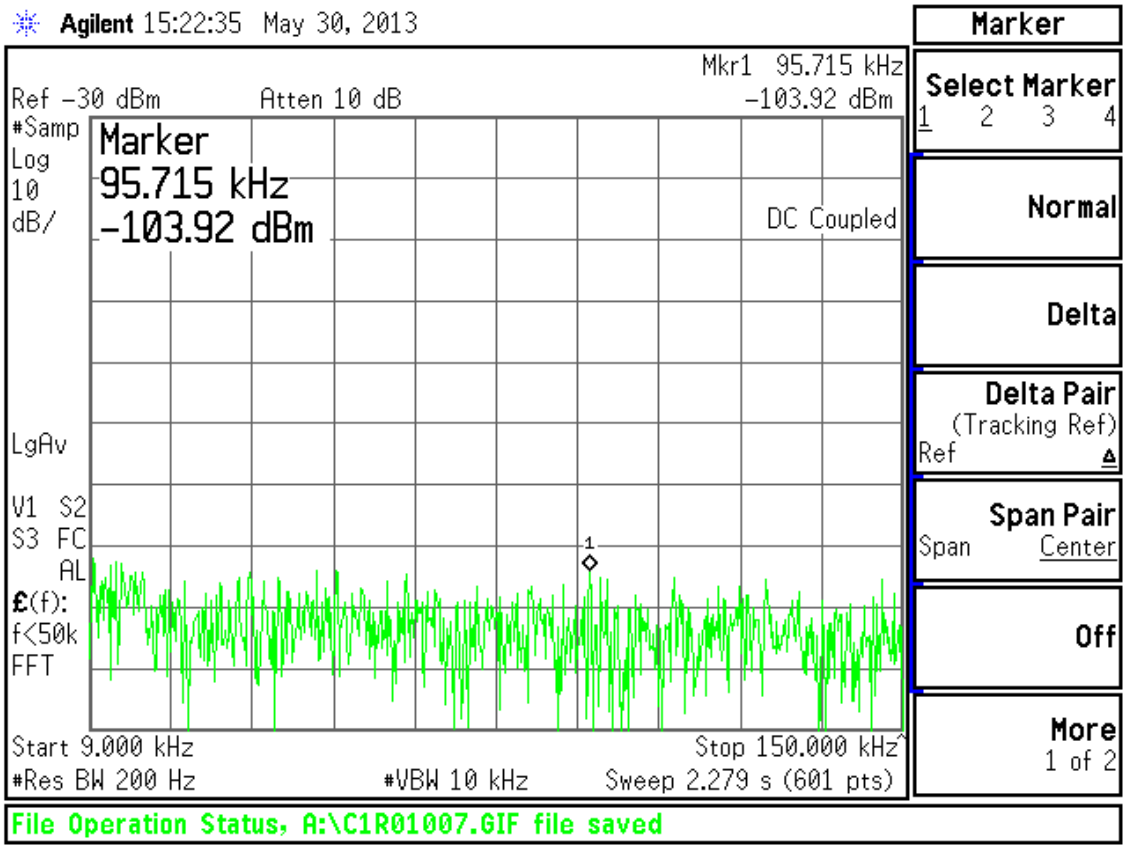
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



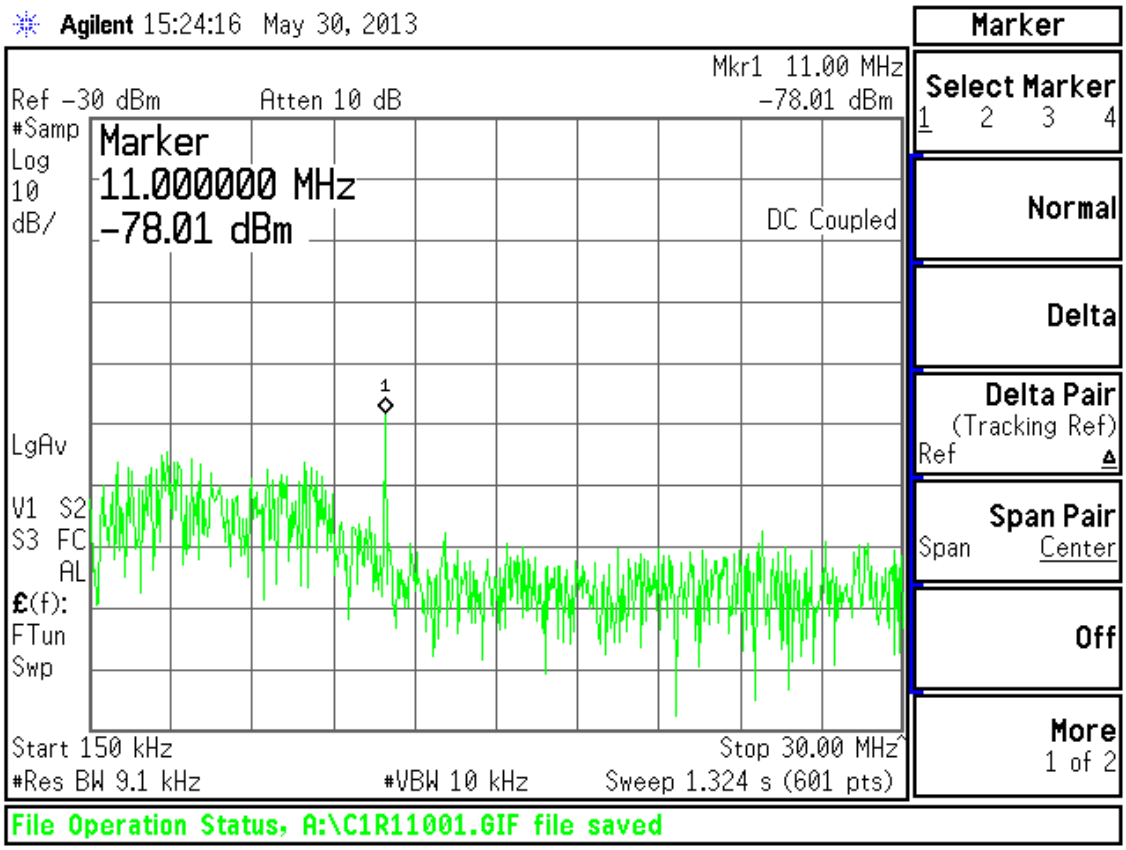
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



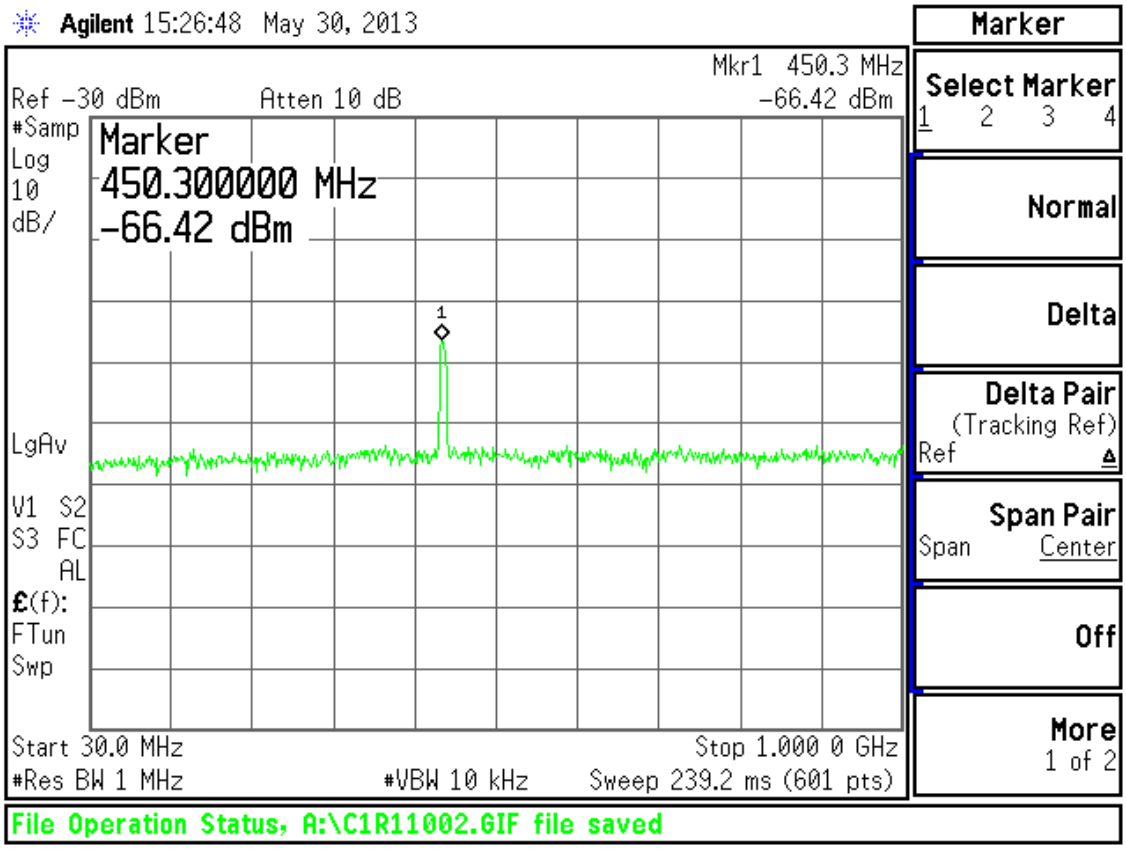
CH 1 802.11b Tx Conducted Emissions @ 1Mbps



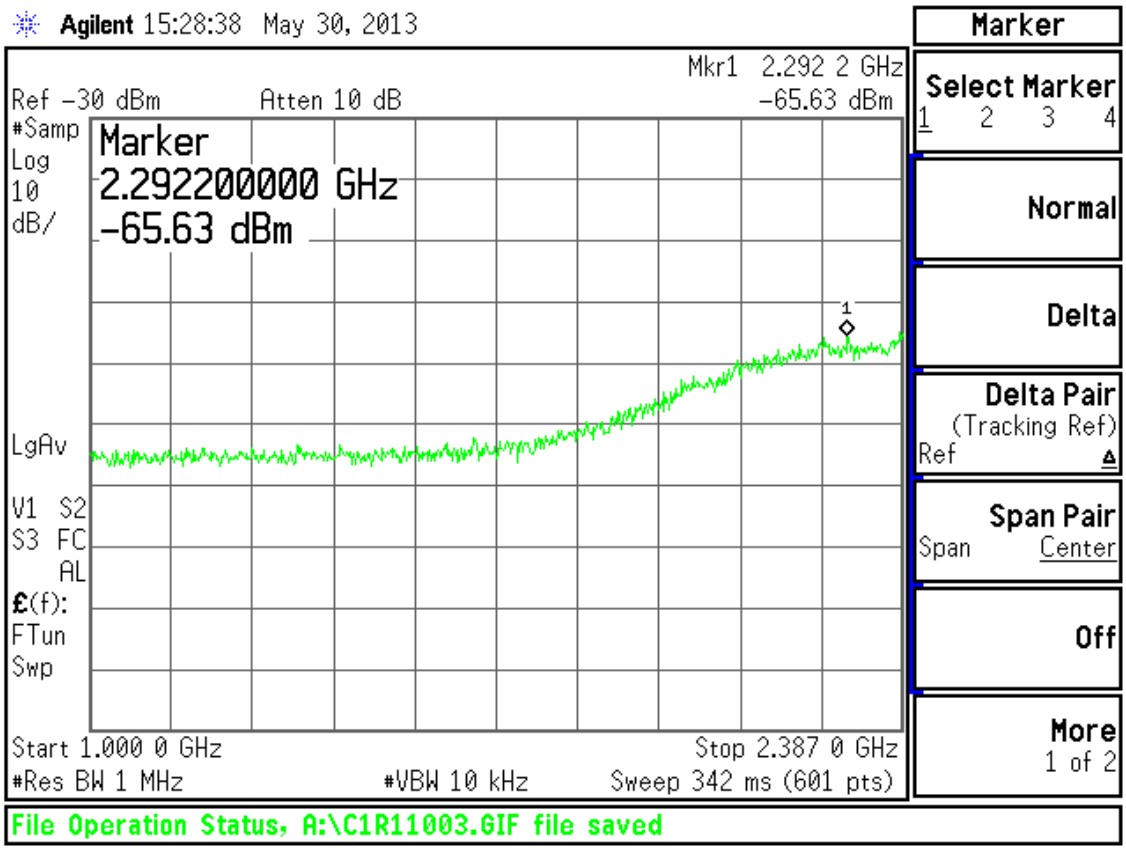
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



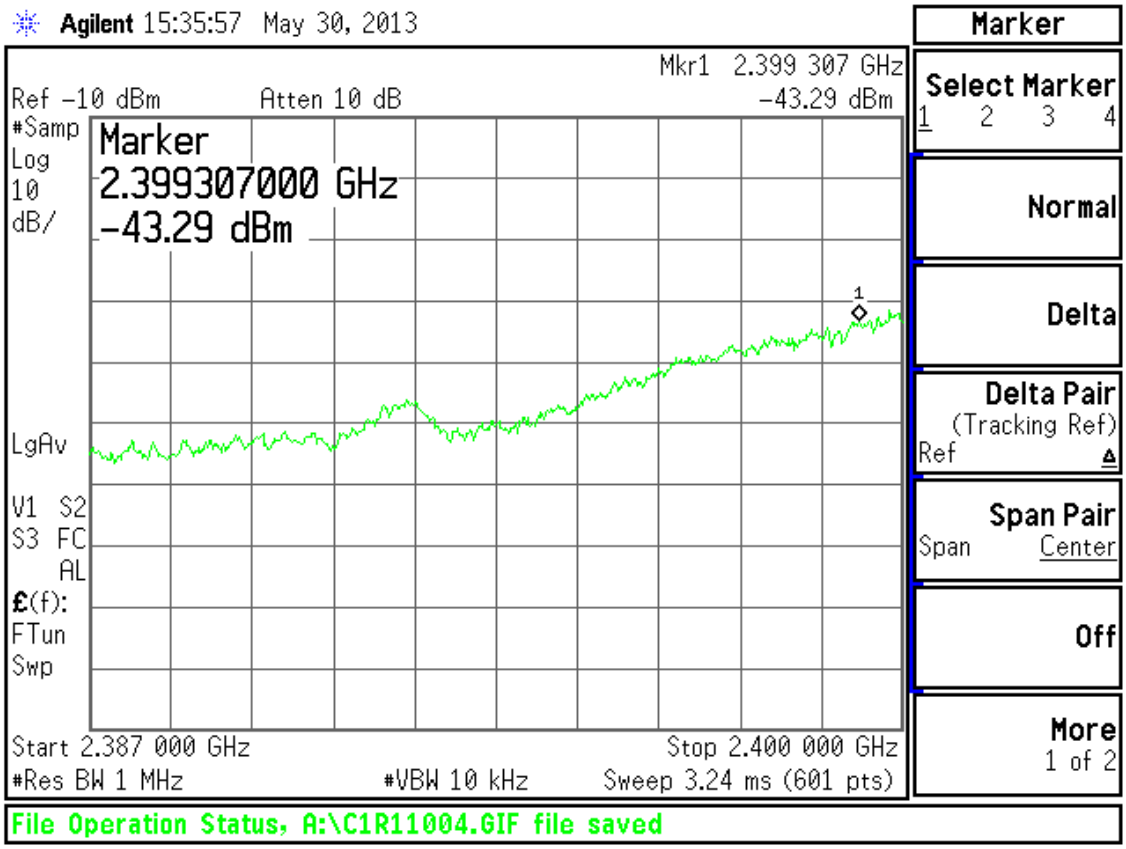
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



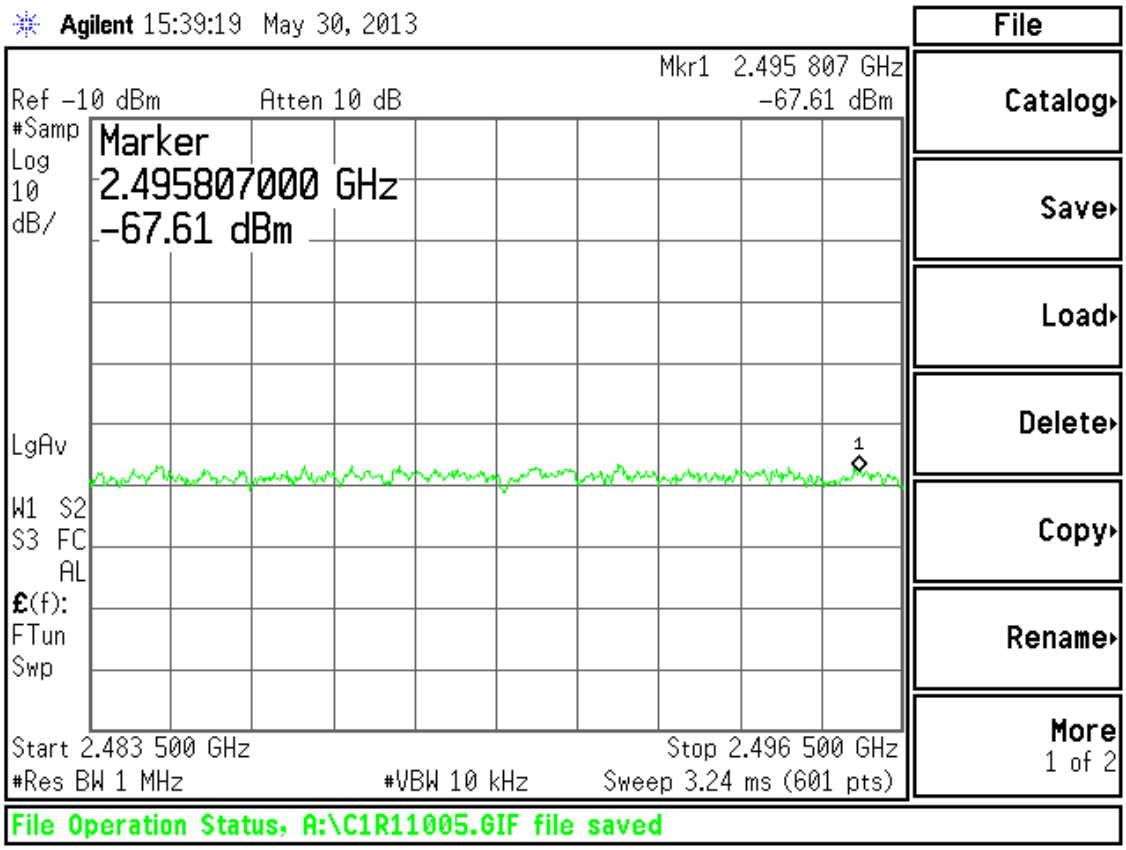
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



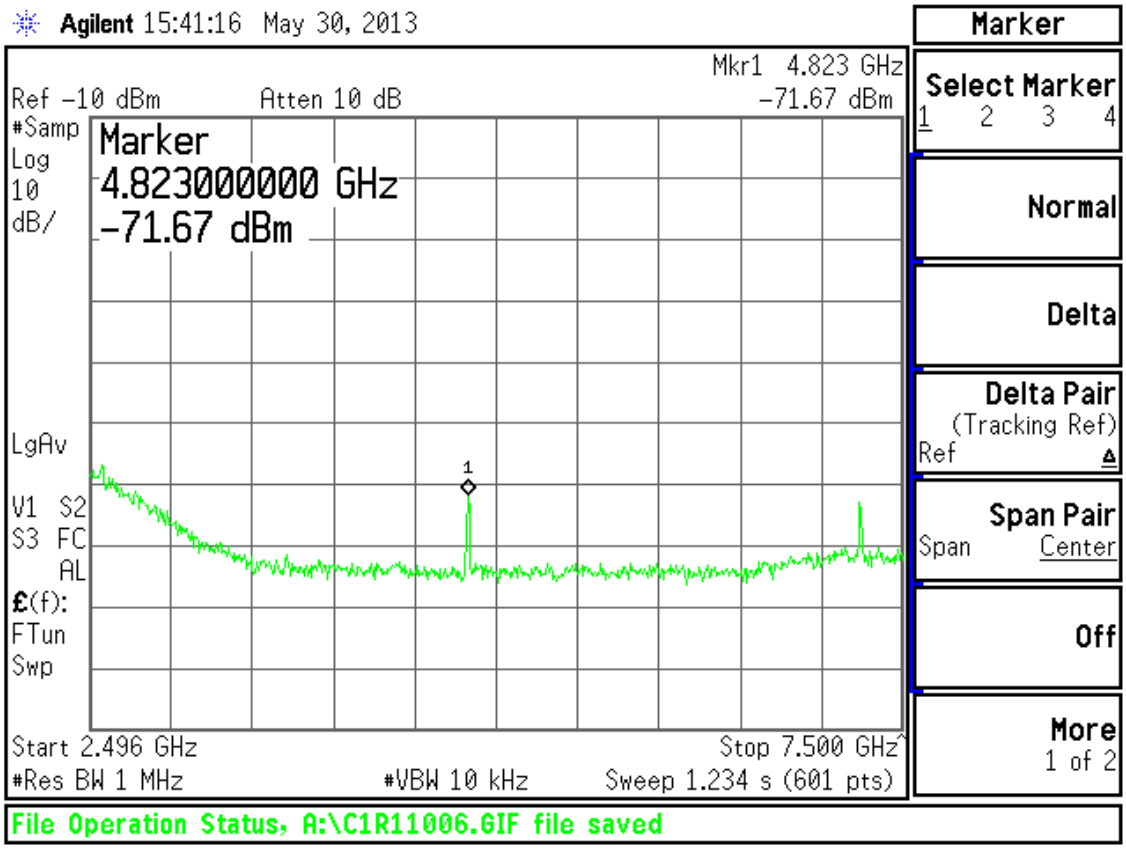
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



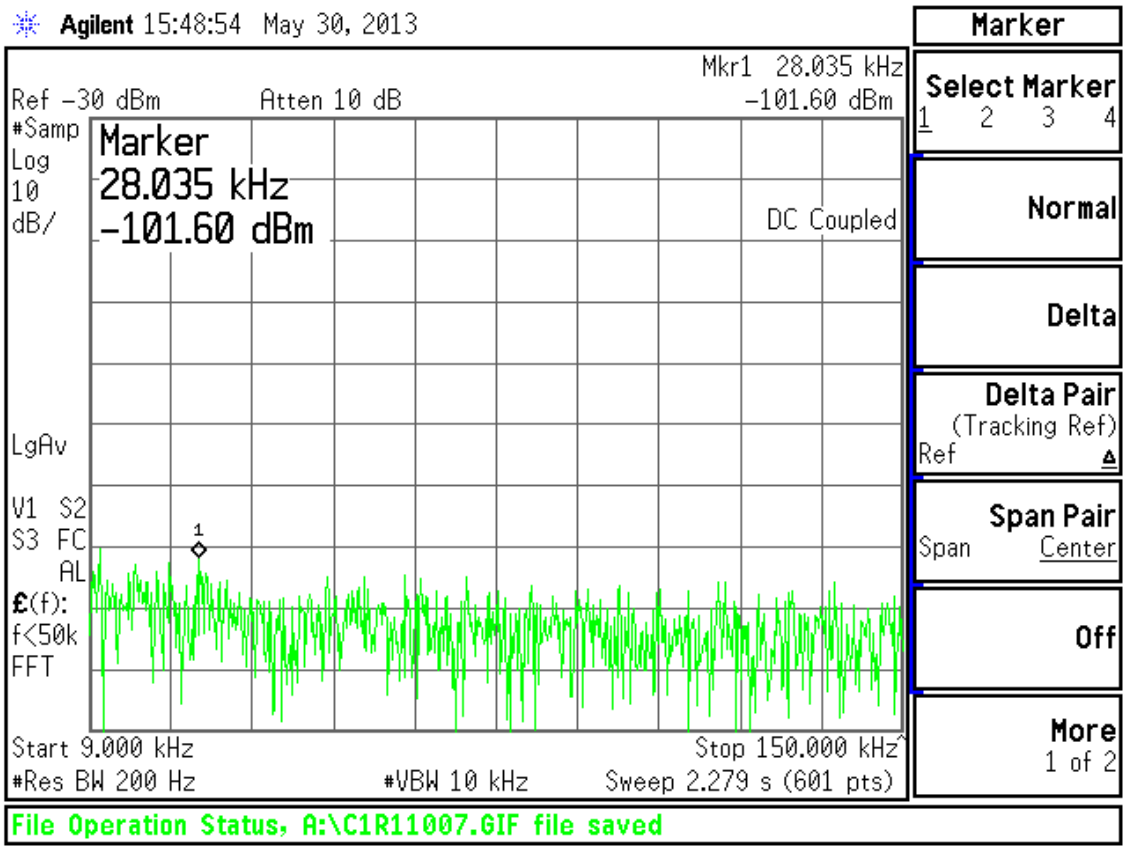
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



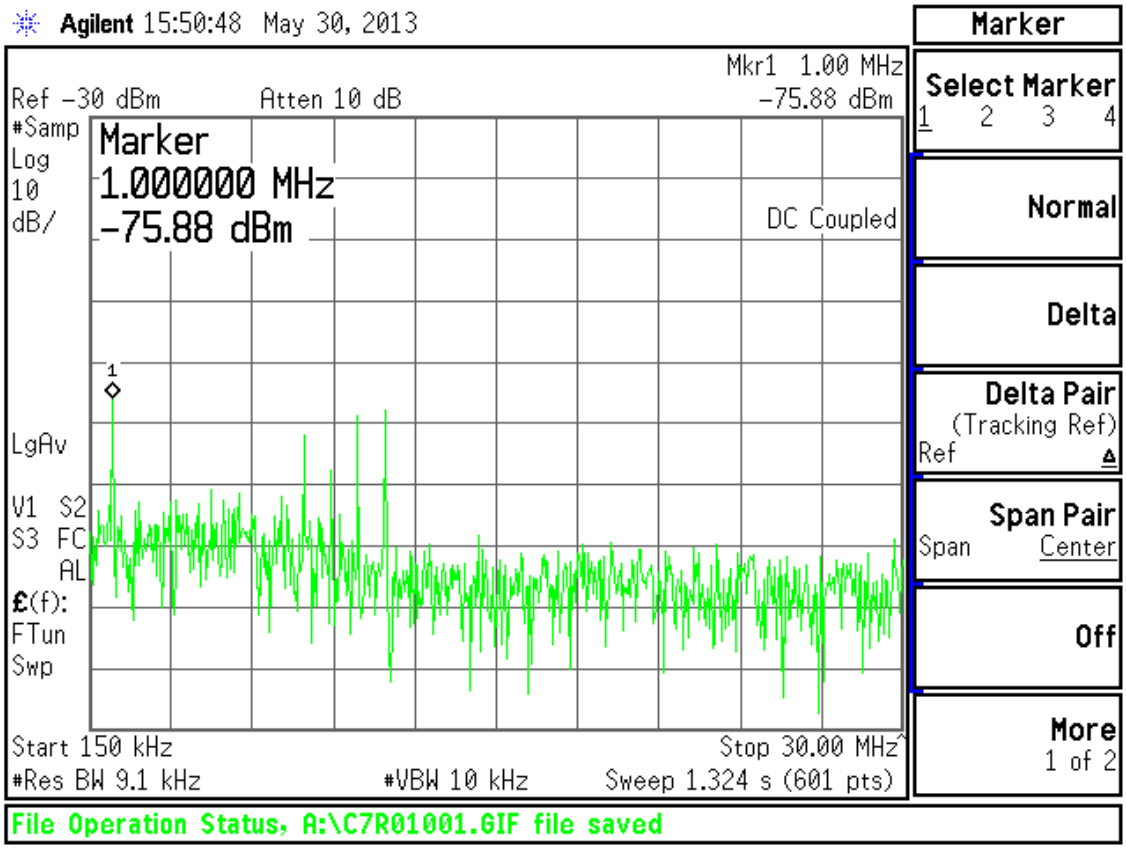
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



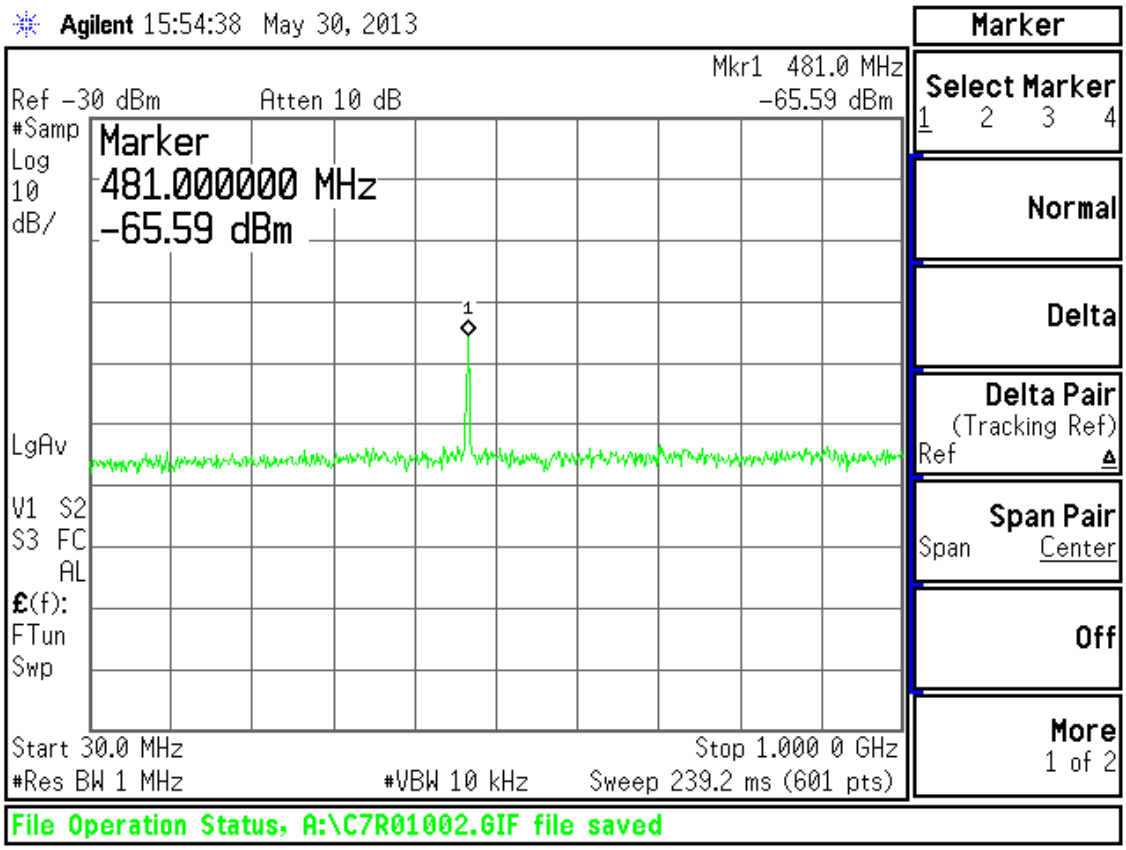
CH 1 802.11b Tx Conducted Emissions @ 11Mbps



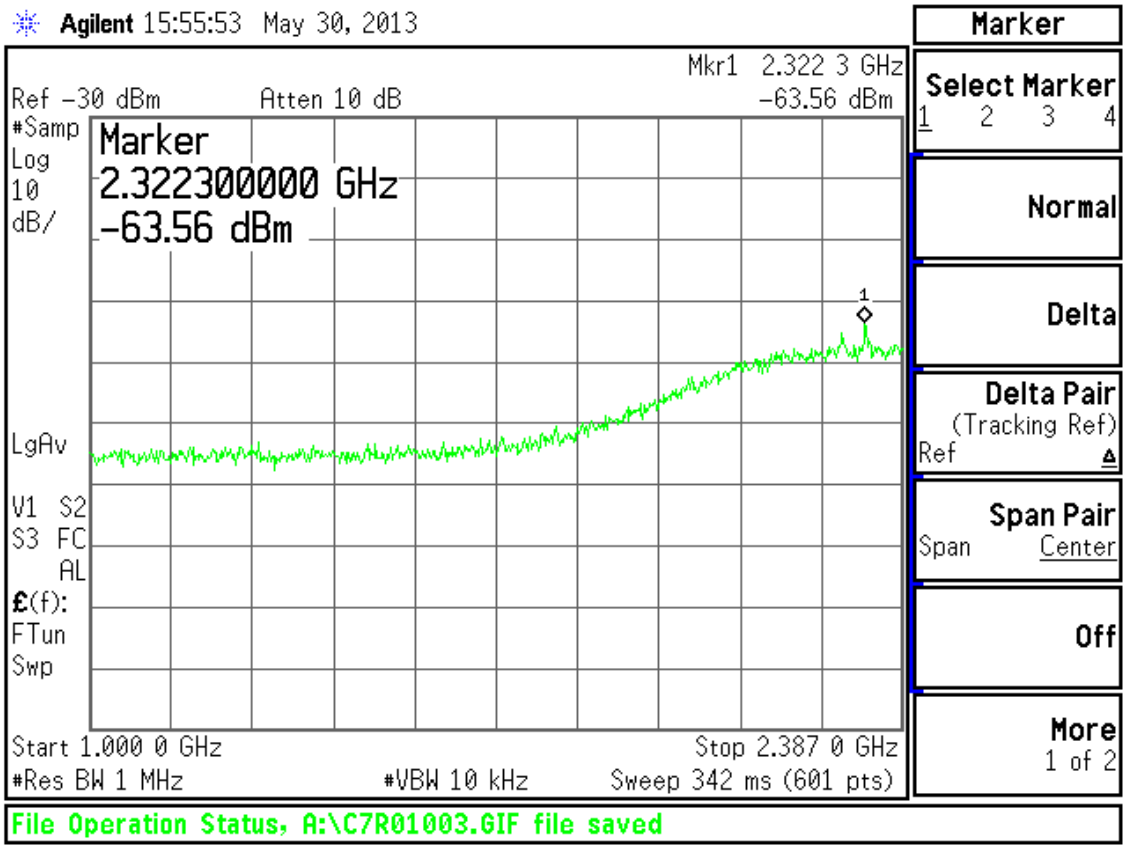
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



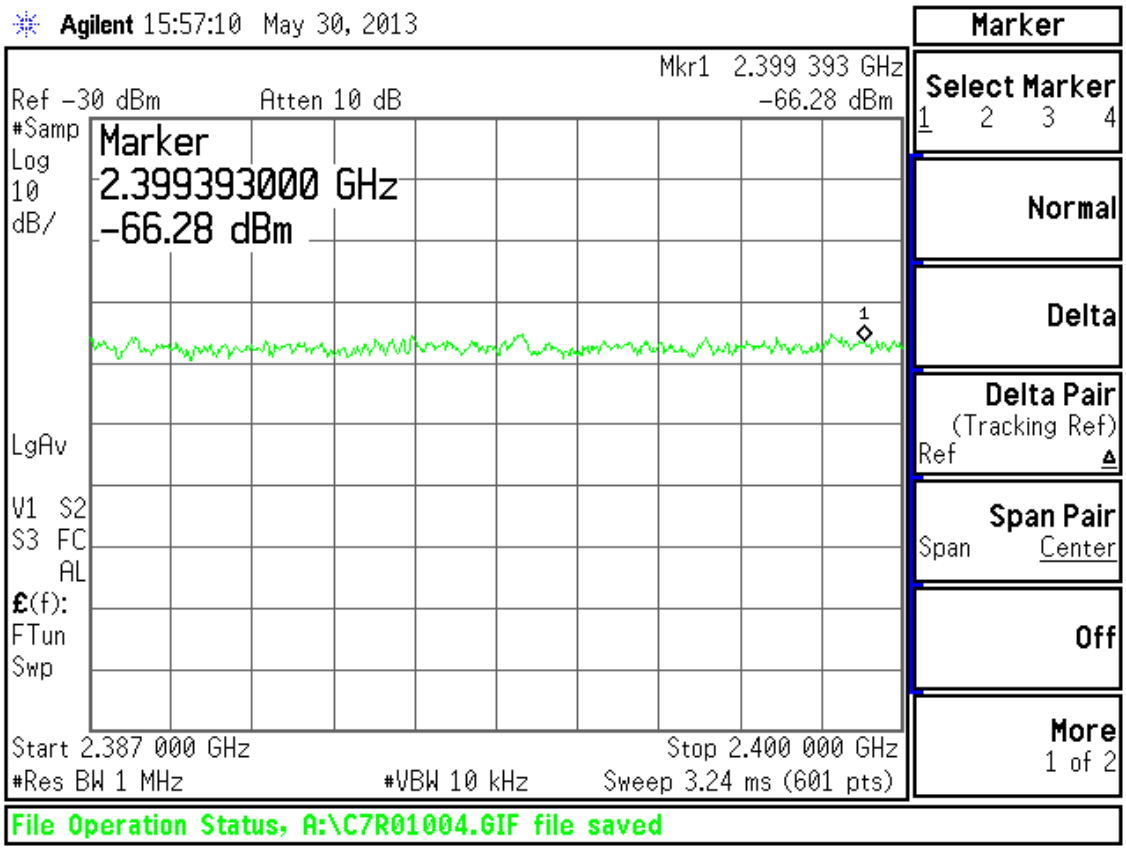
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



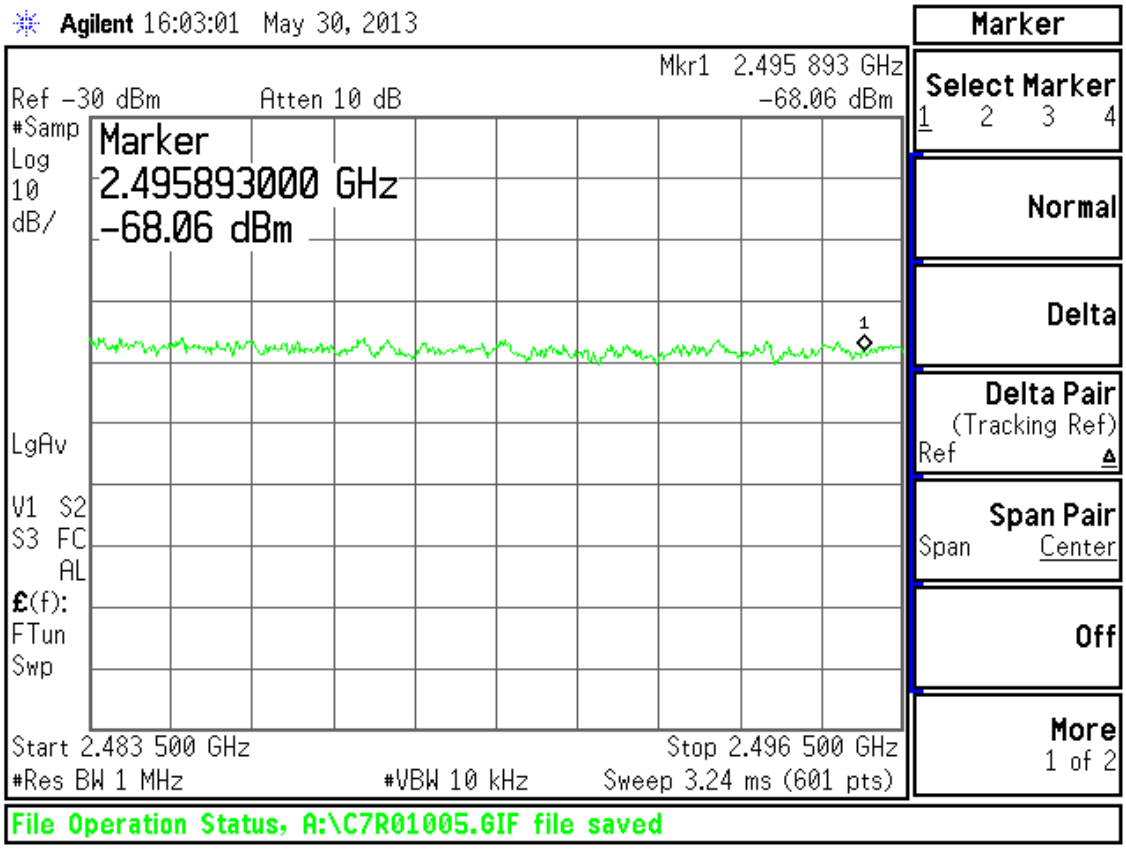
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



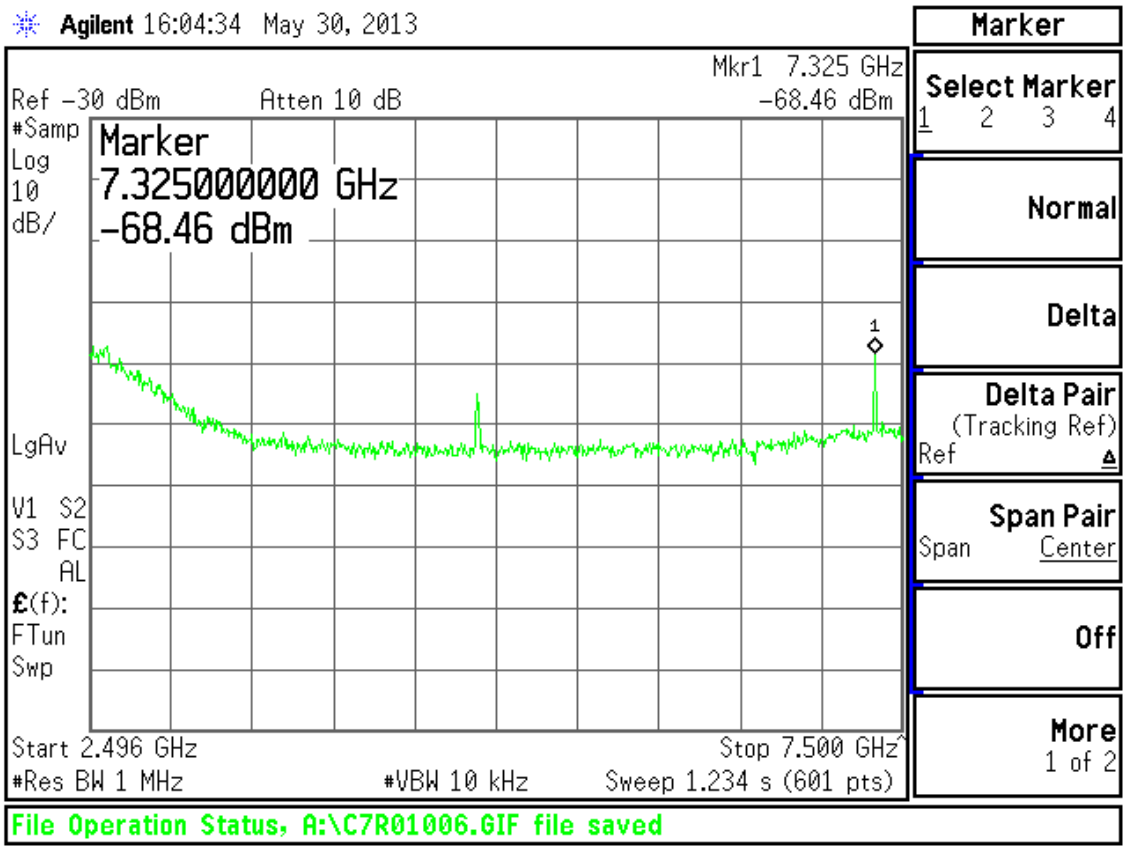
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



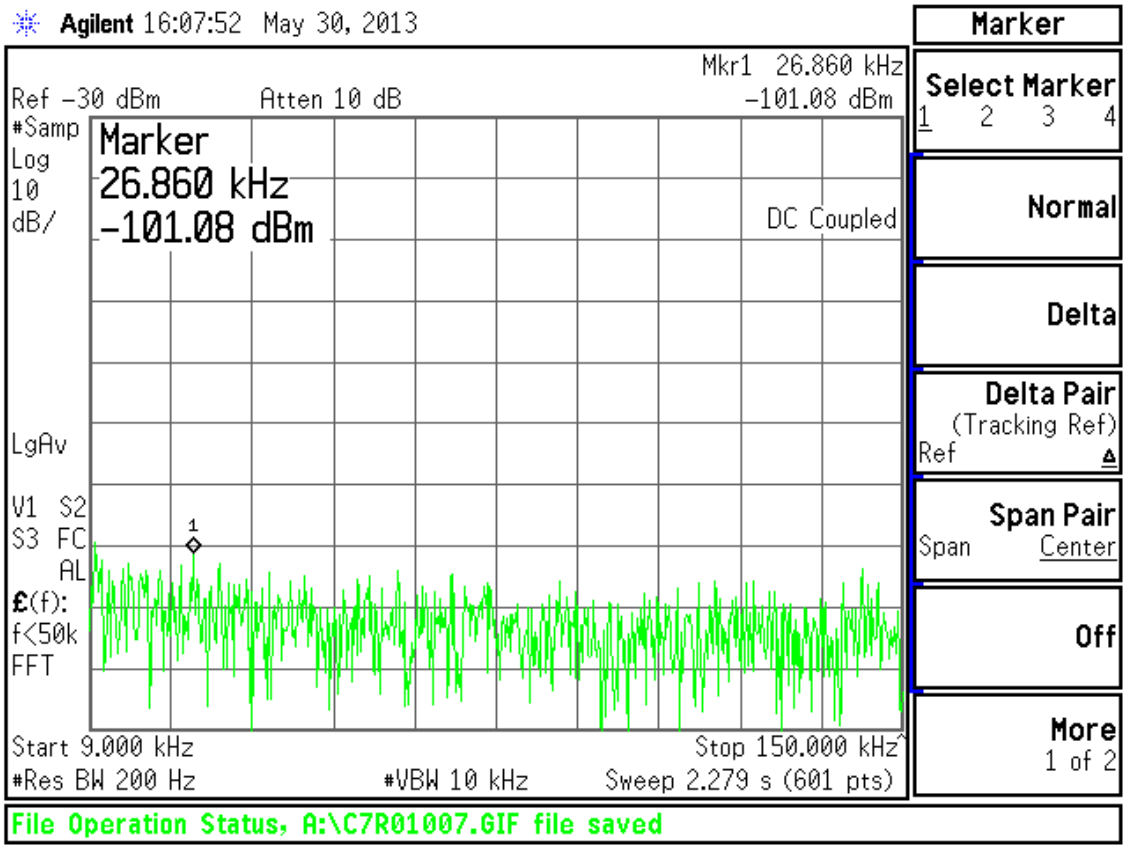
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



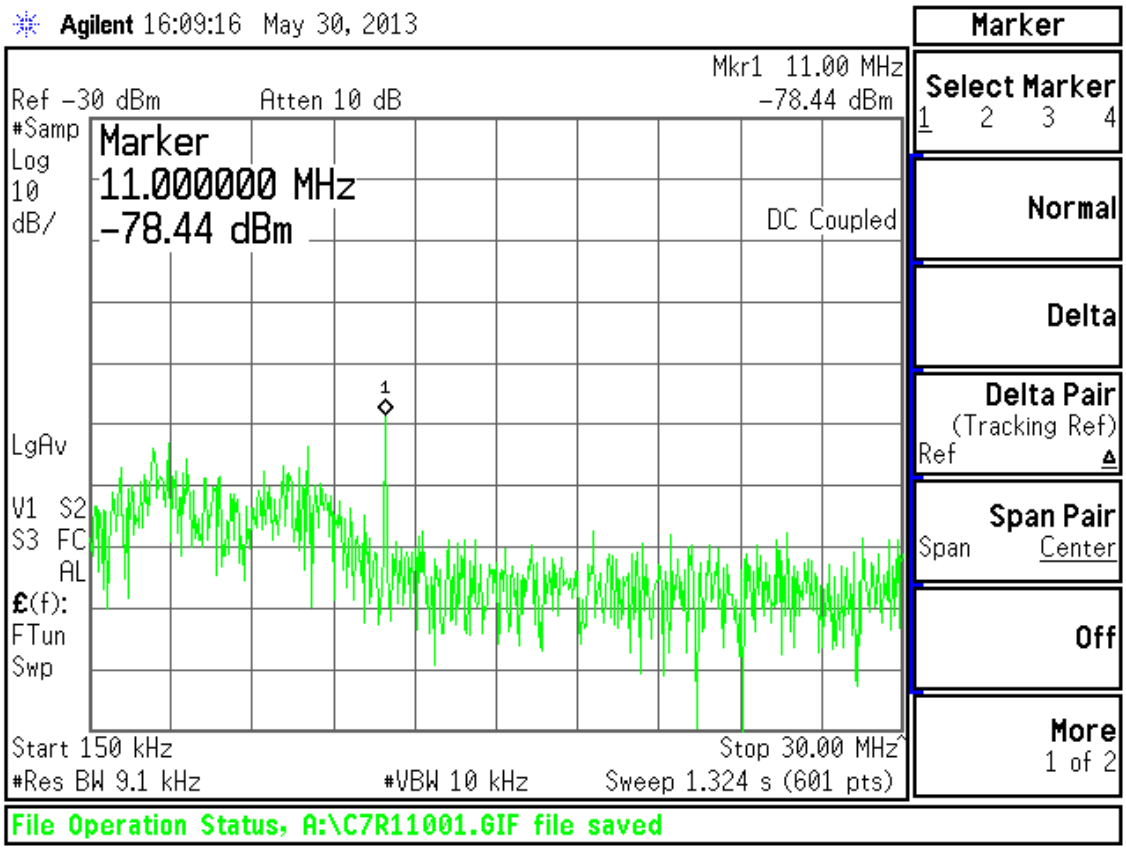
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



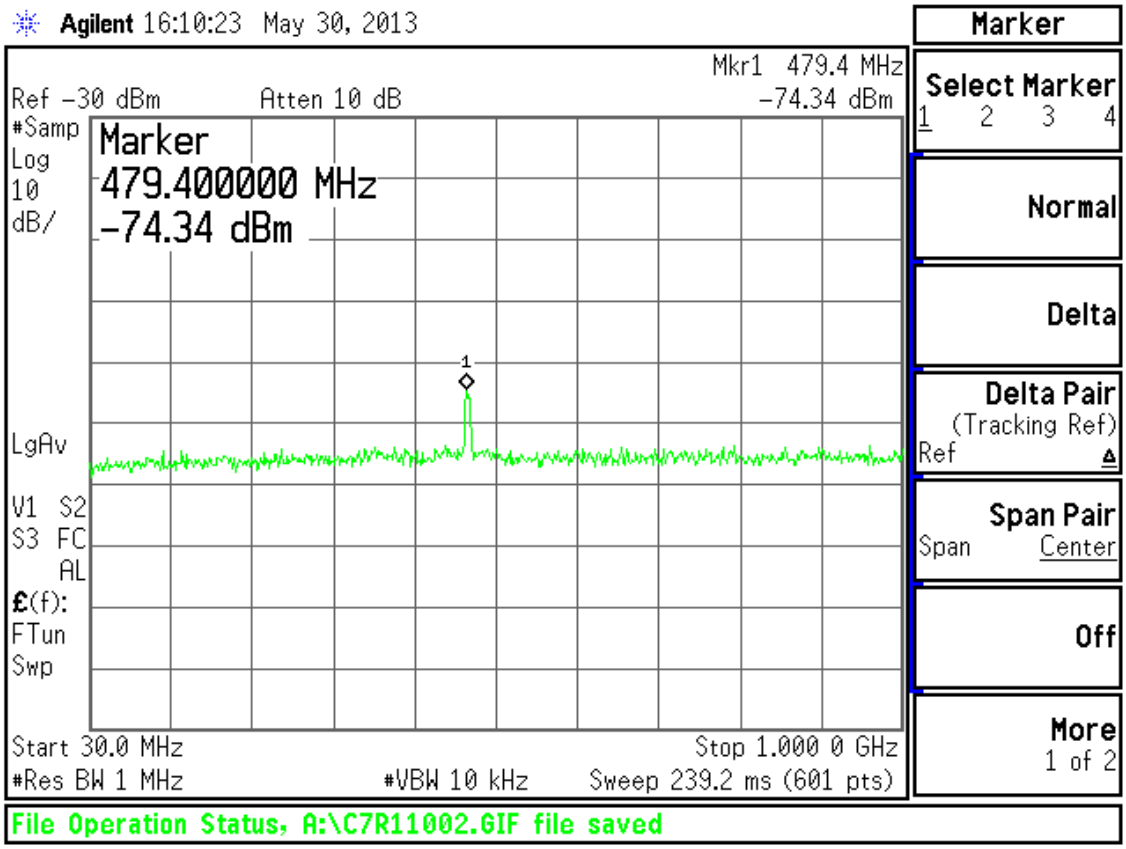
CH 7 802.11b Tx Conducted Emissions @ 1Mbps



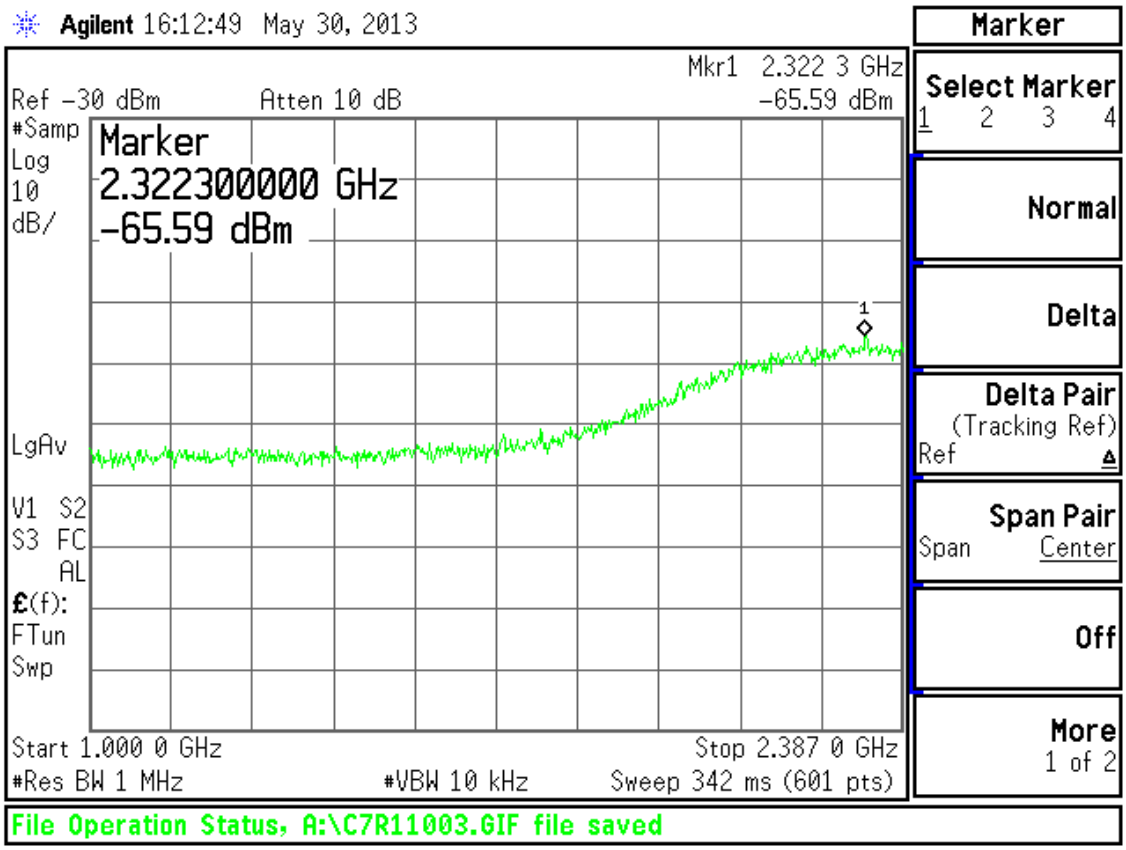
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



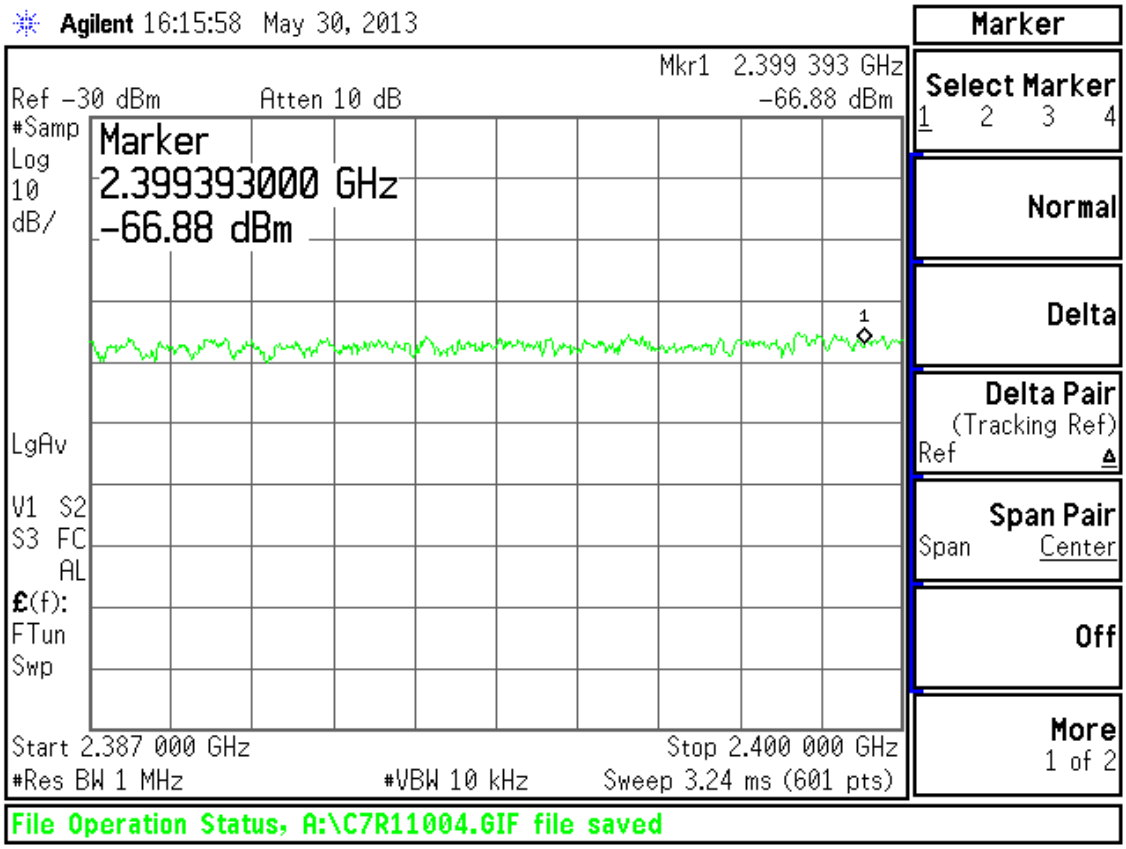
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



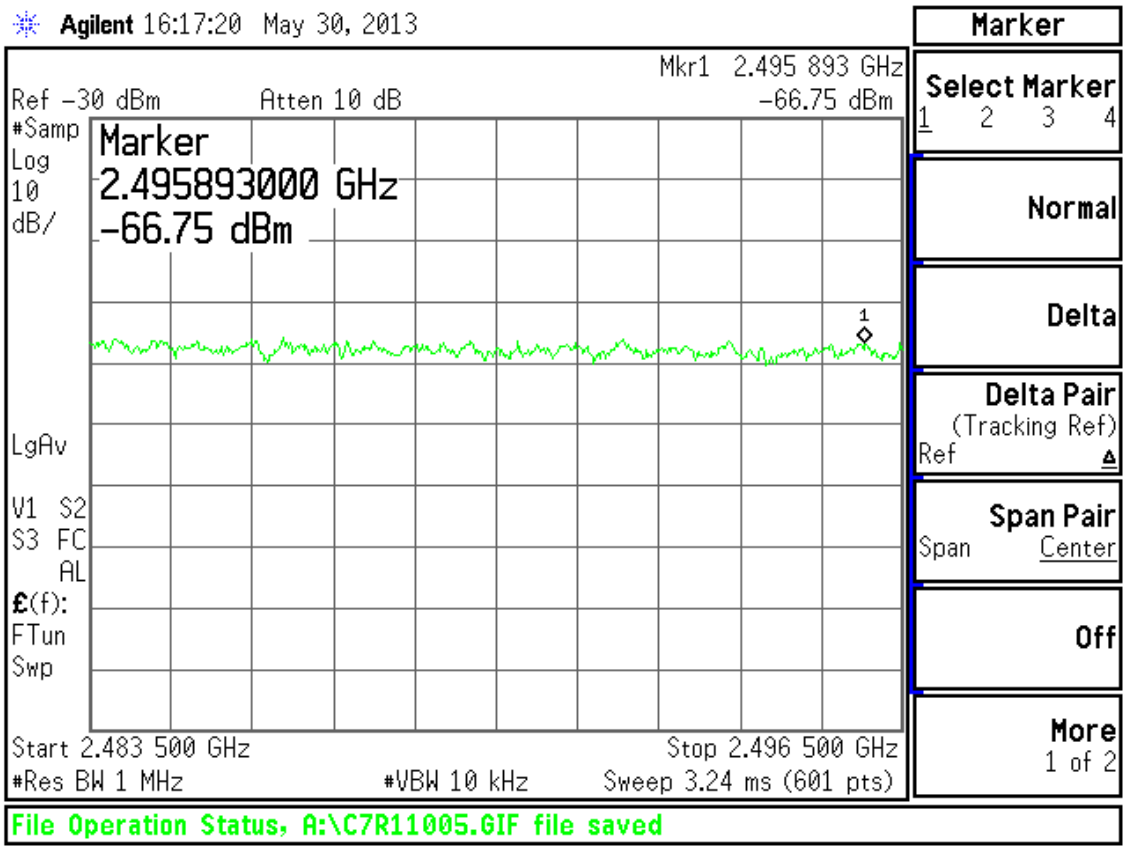
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



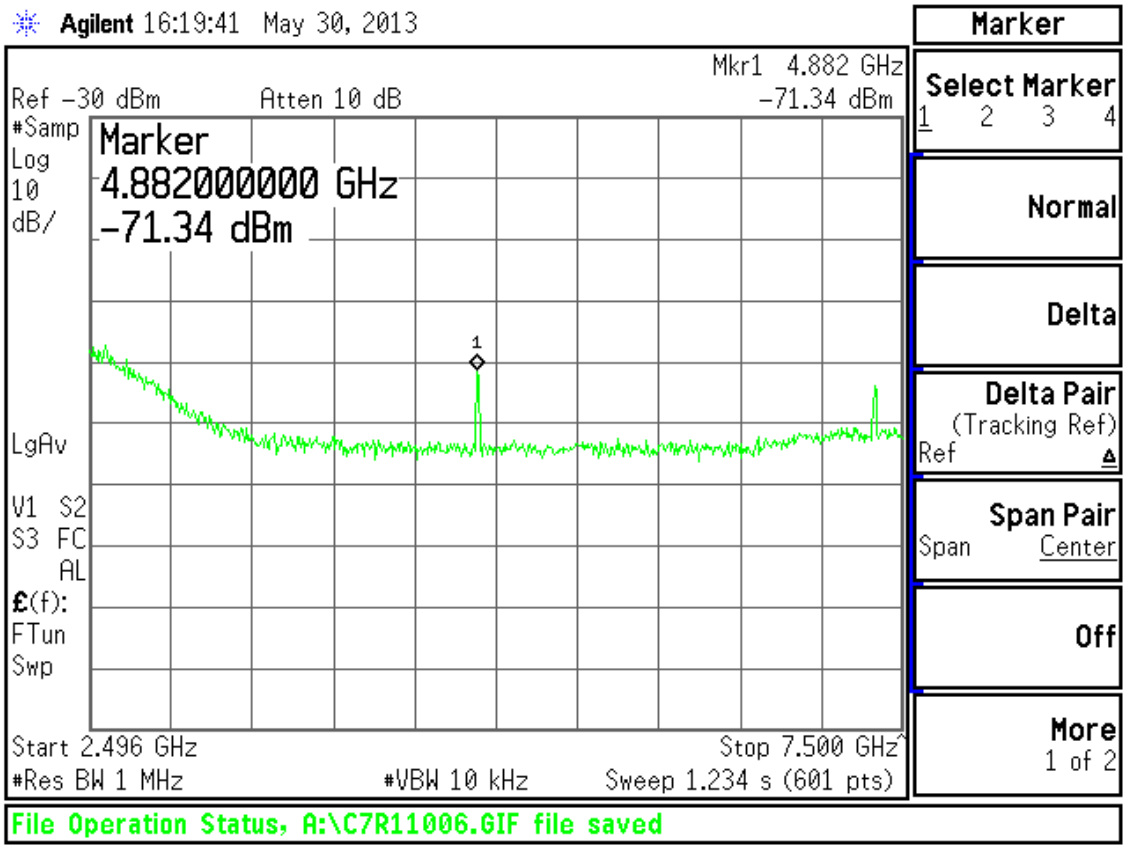
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



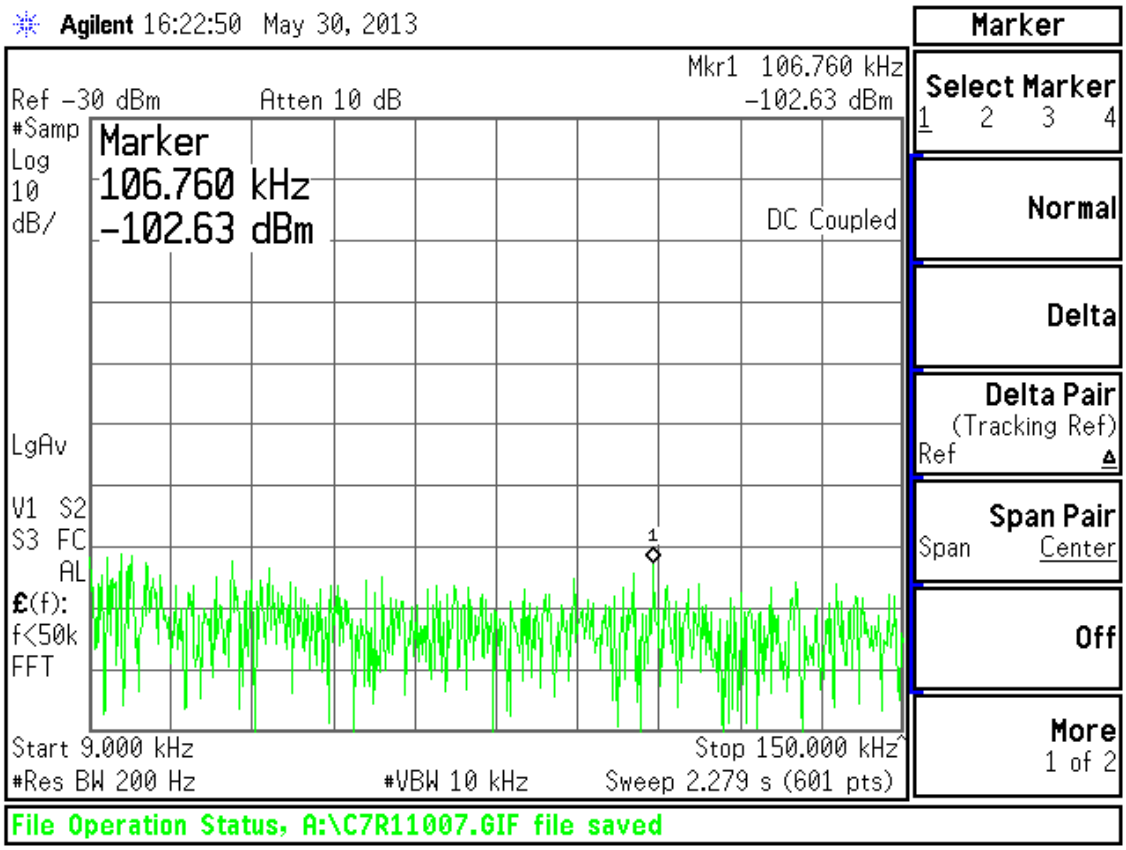
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



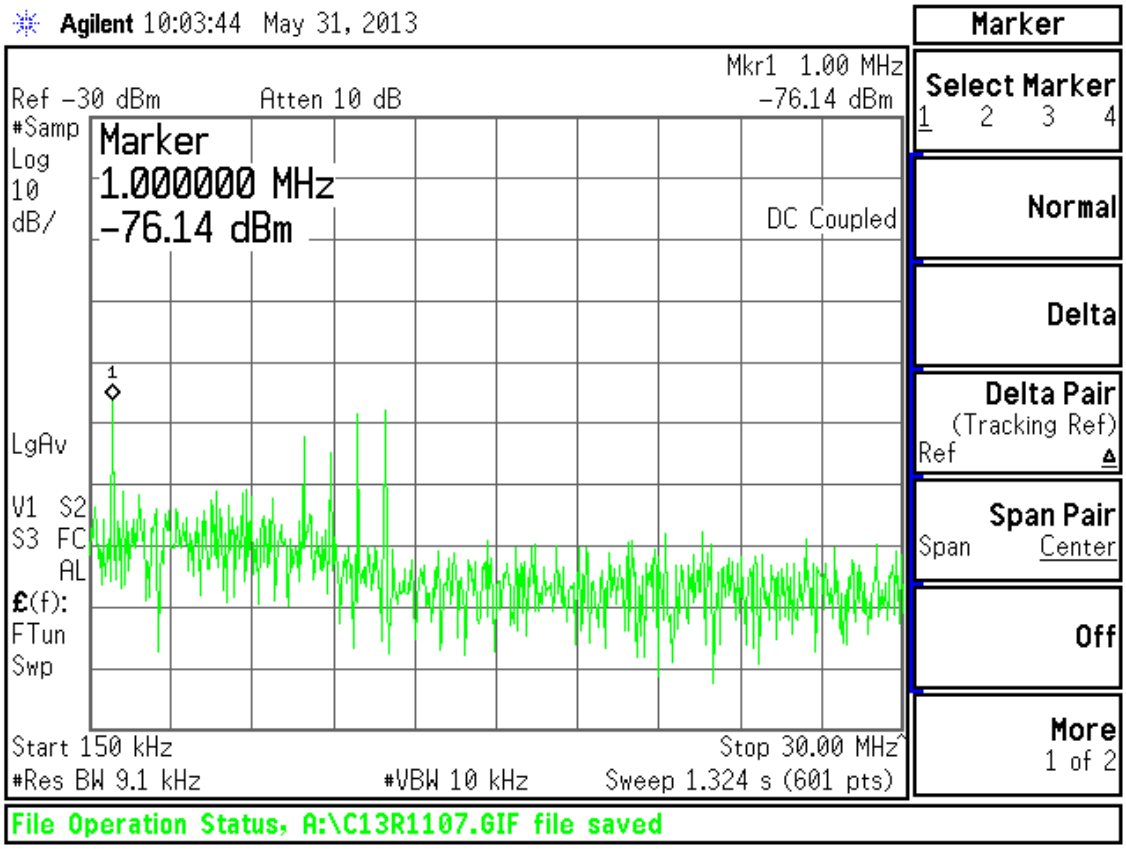
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



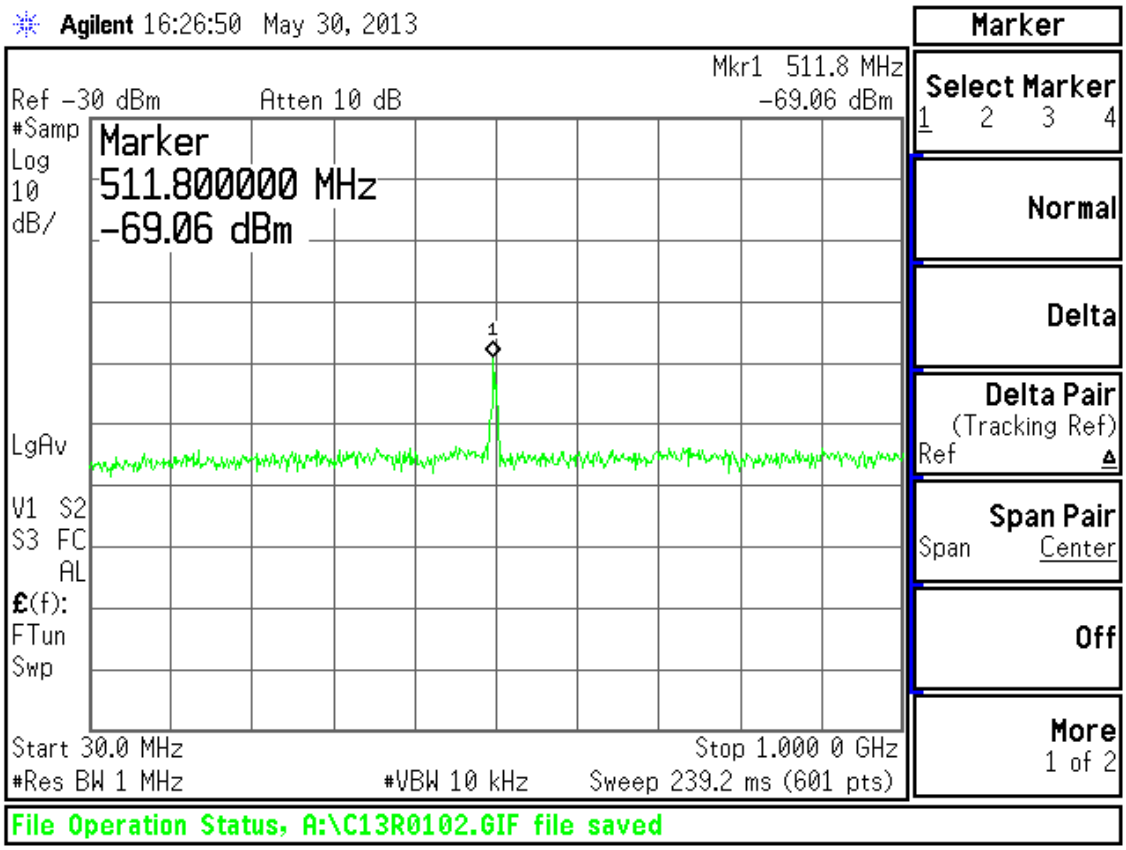
CH 7 802.11b Tx Conducted Emissions @ 11Mbps



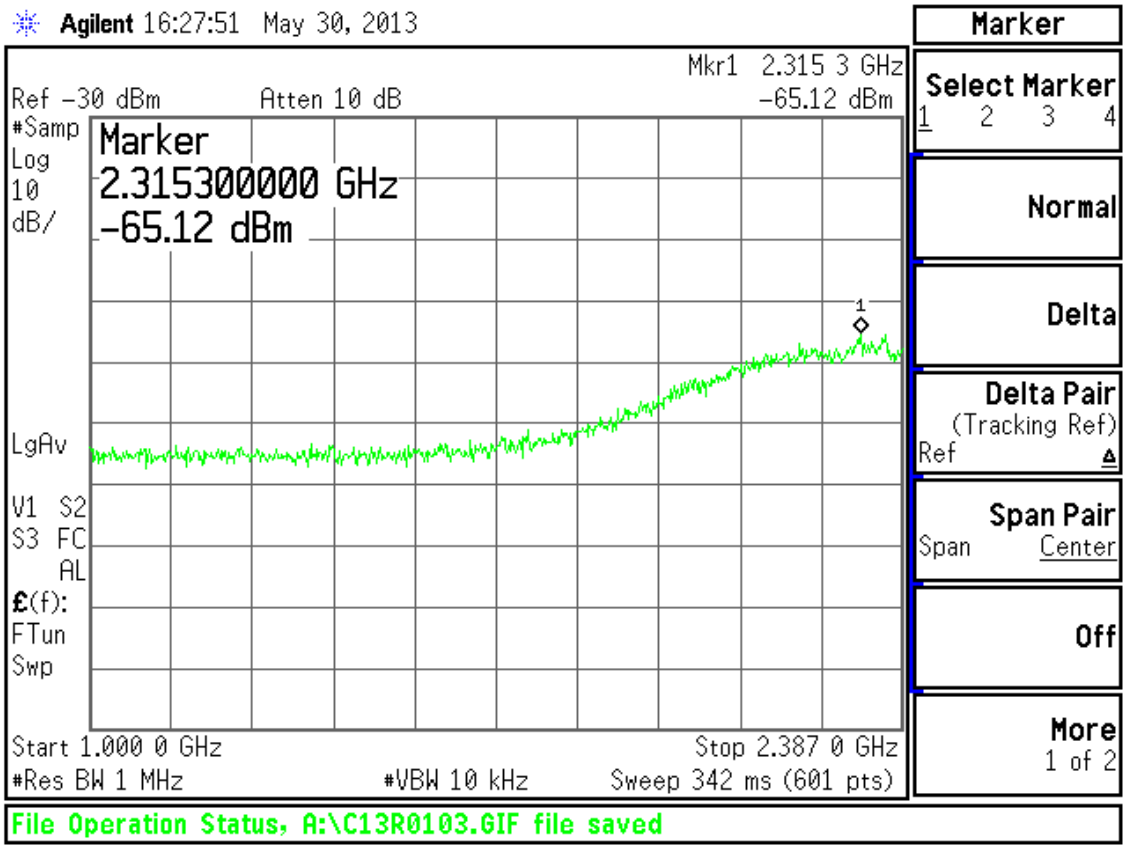
CH 13 802.11b Tx Conducted Emissions @ 1Mbps



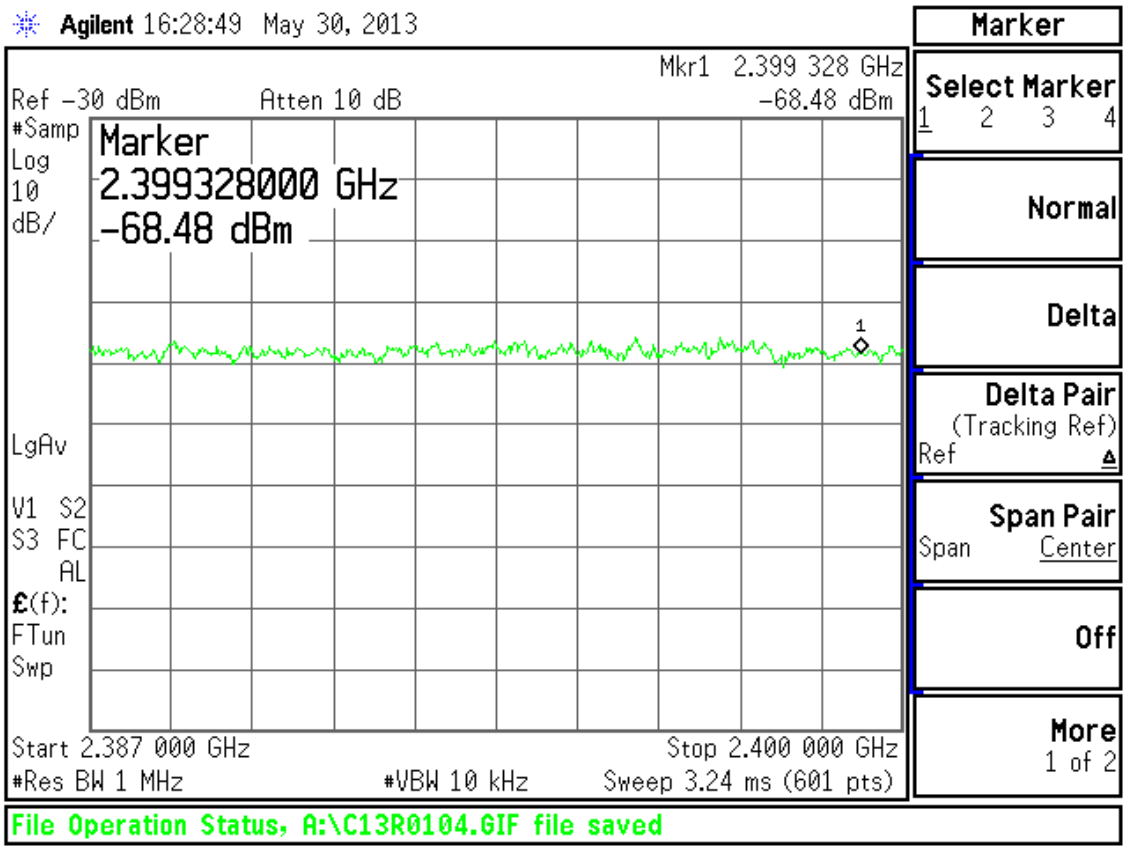
CH 13 802.11b Tx Conducted Emissions @ 1Mbps



CH 13 802.11b Tx Conducted Emissions @ 1Mbps



CH 13 802.11b Tx Conducted Emissions @ 1Mbps



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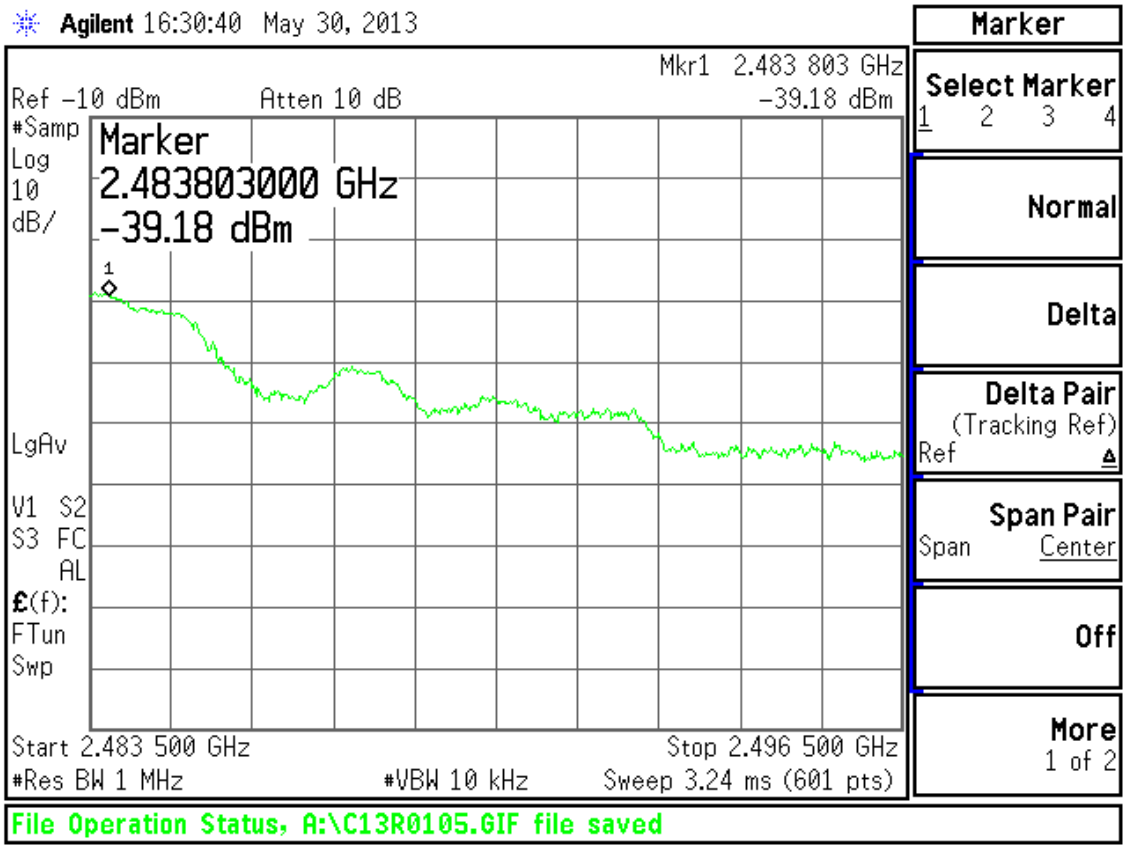

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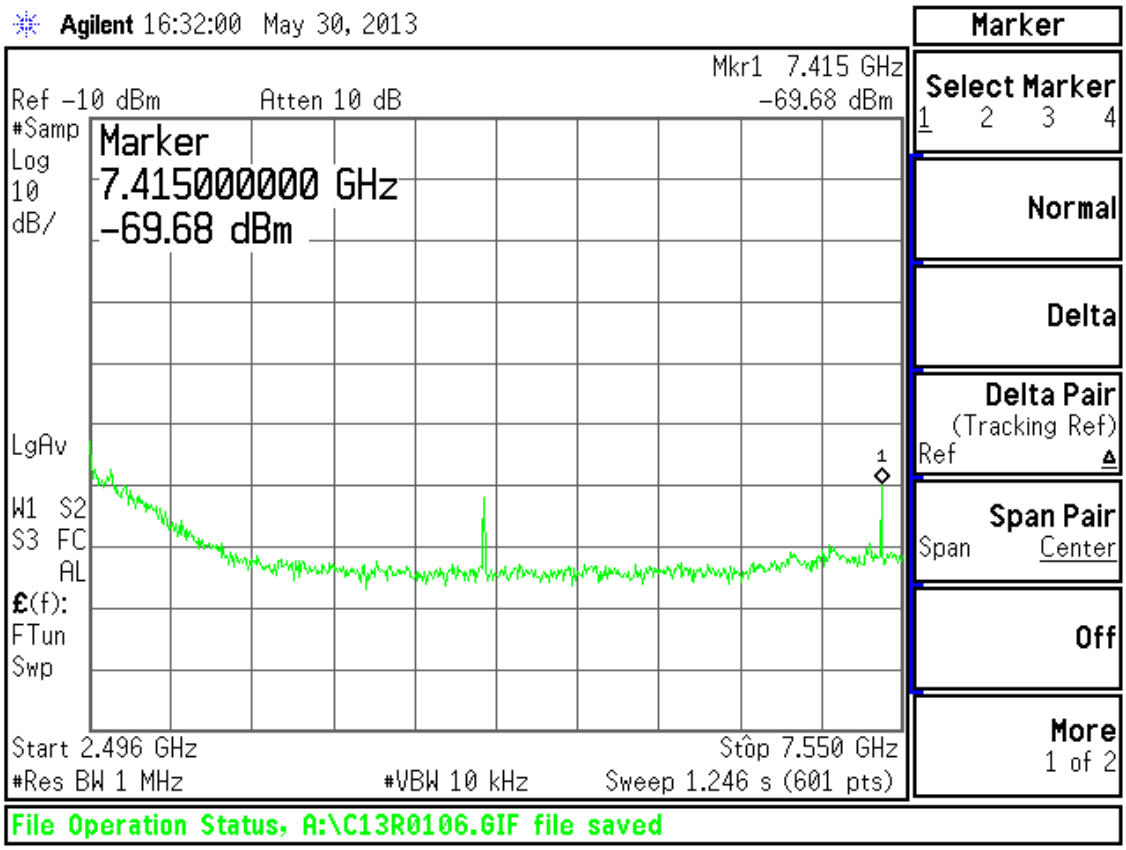

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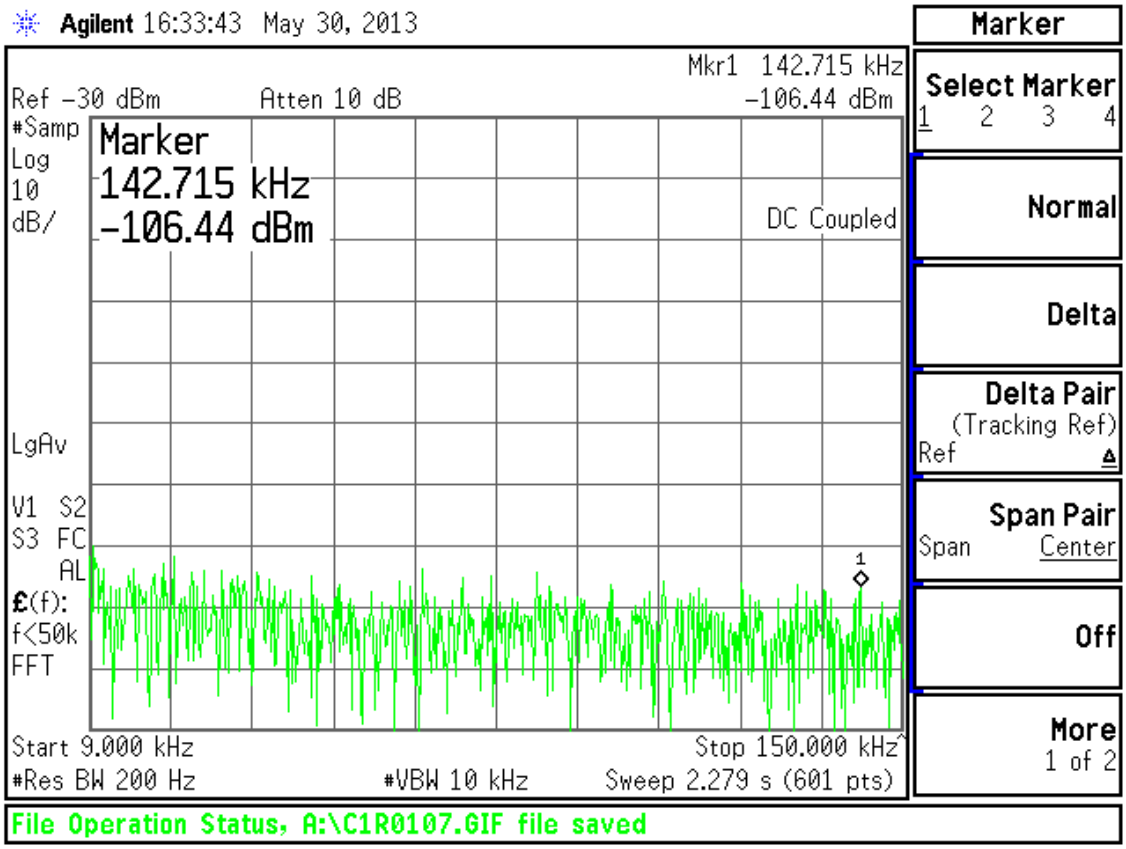
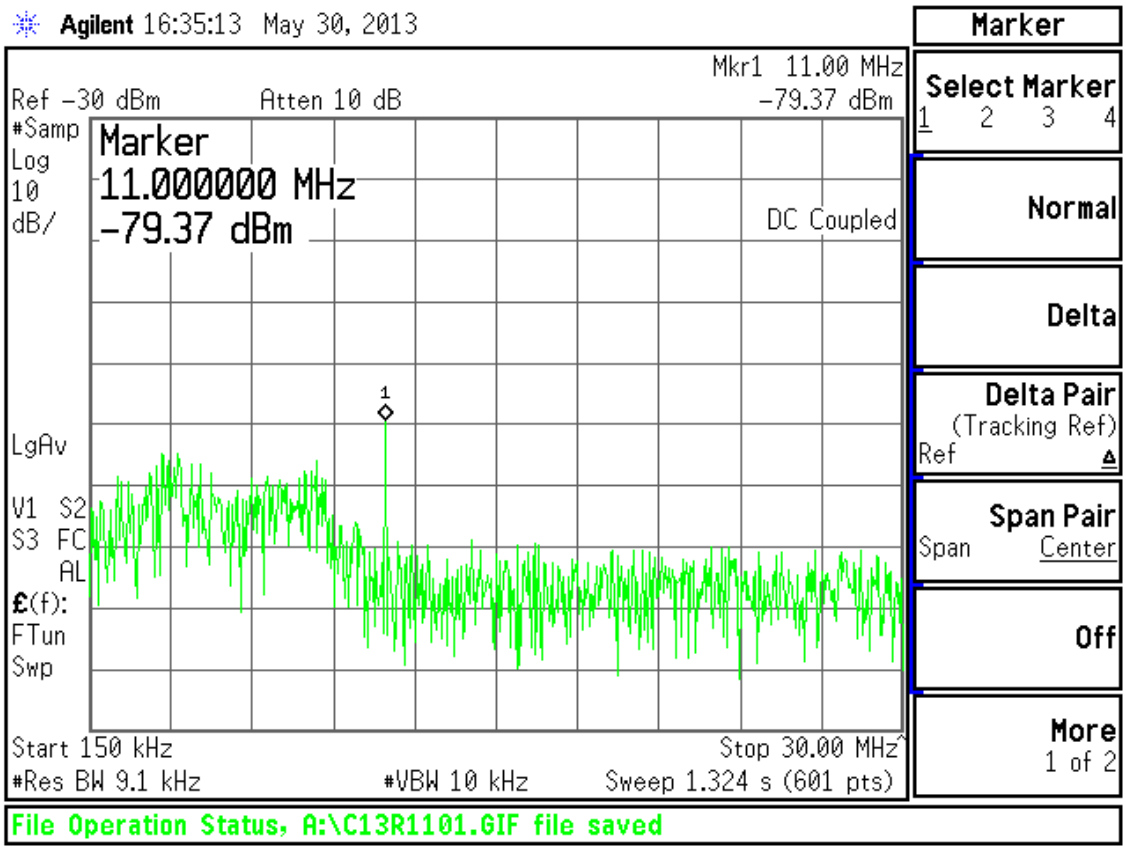
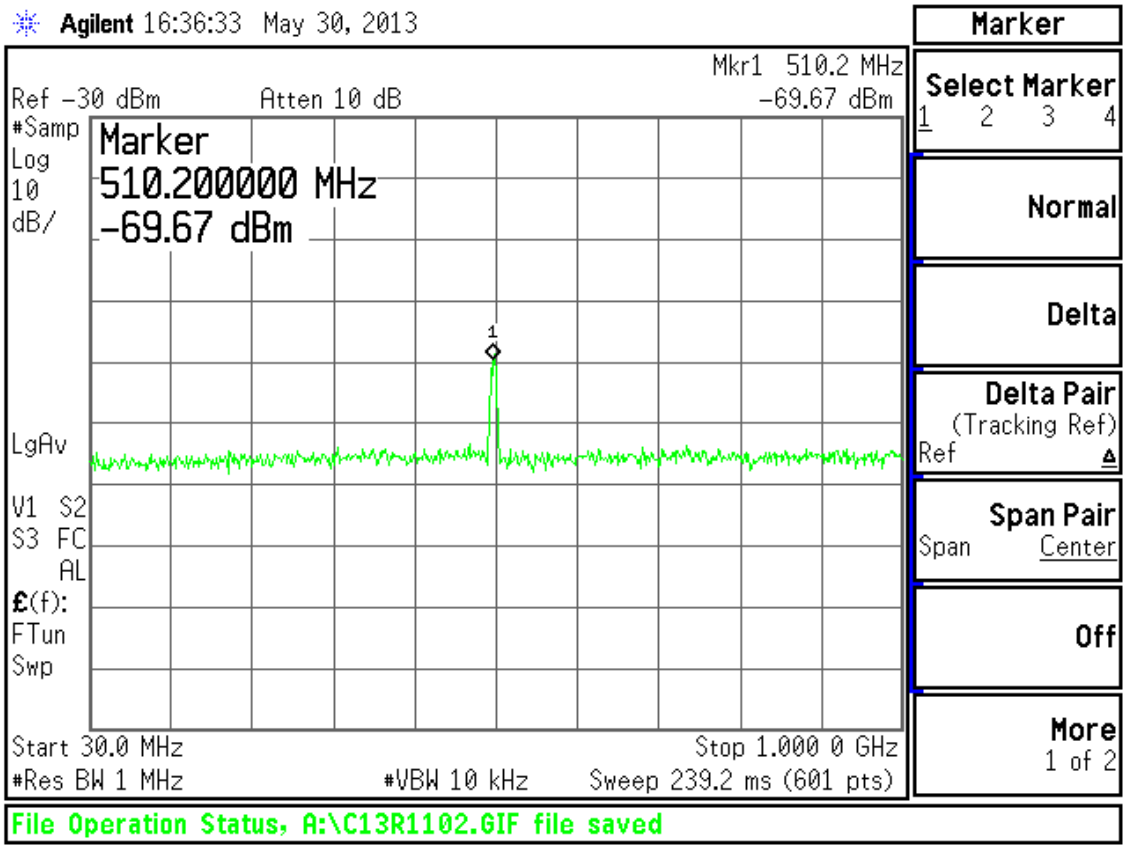


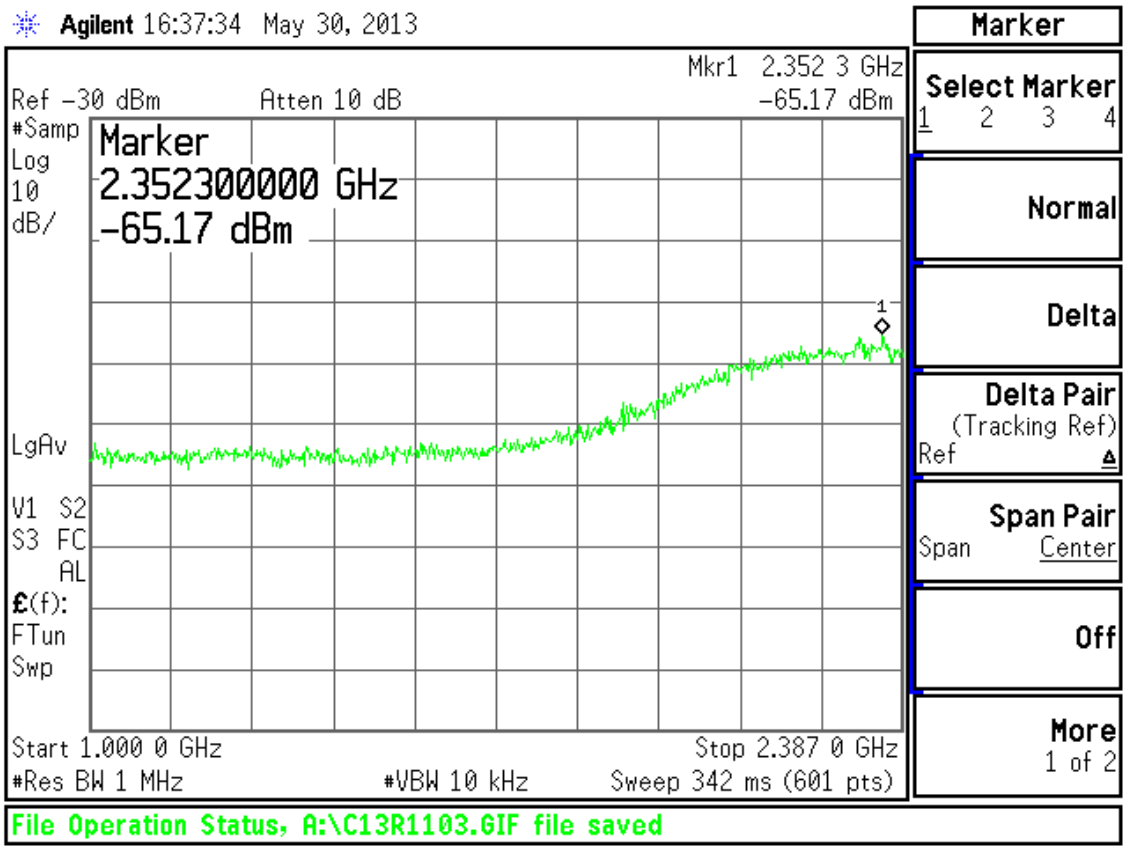
CH 13 802.11b Tx Conducted Emissions @ 11Mbps



CH 13 802.11b Tx Conducted Emissions @ 11Mbps



CH 13 802.11b Tx Conducted Emissions @ 11Mbps



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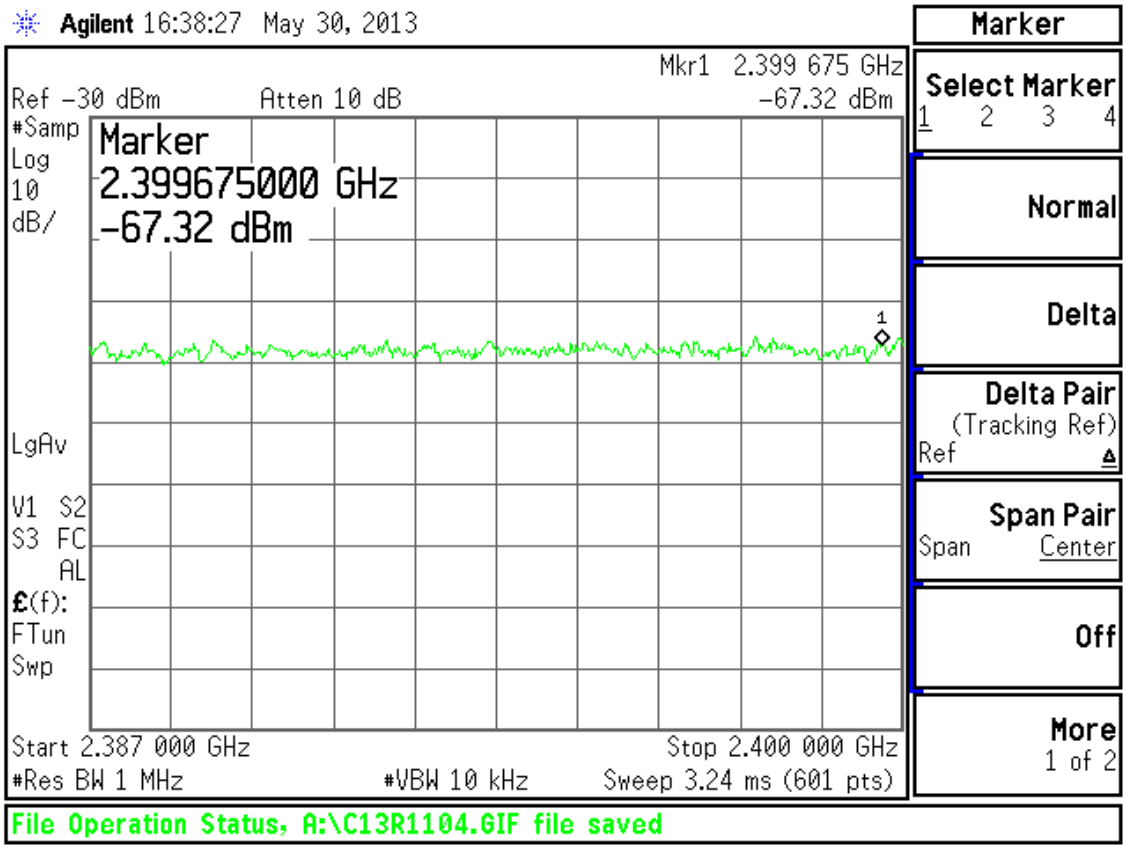
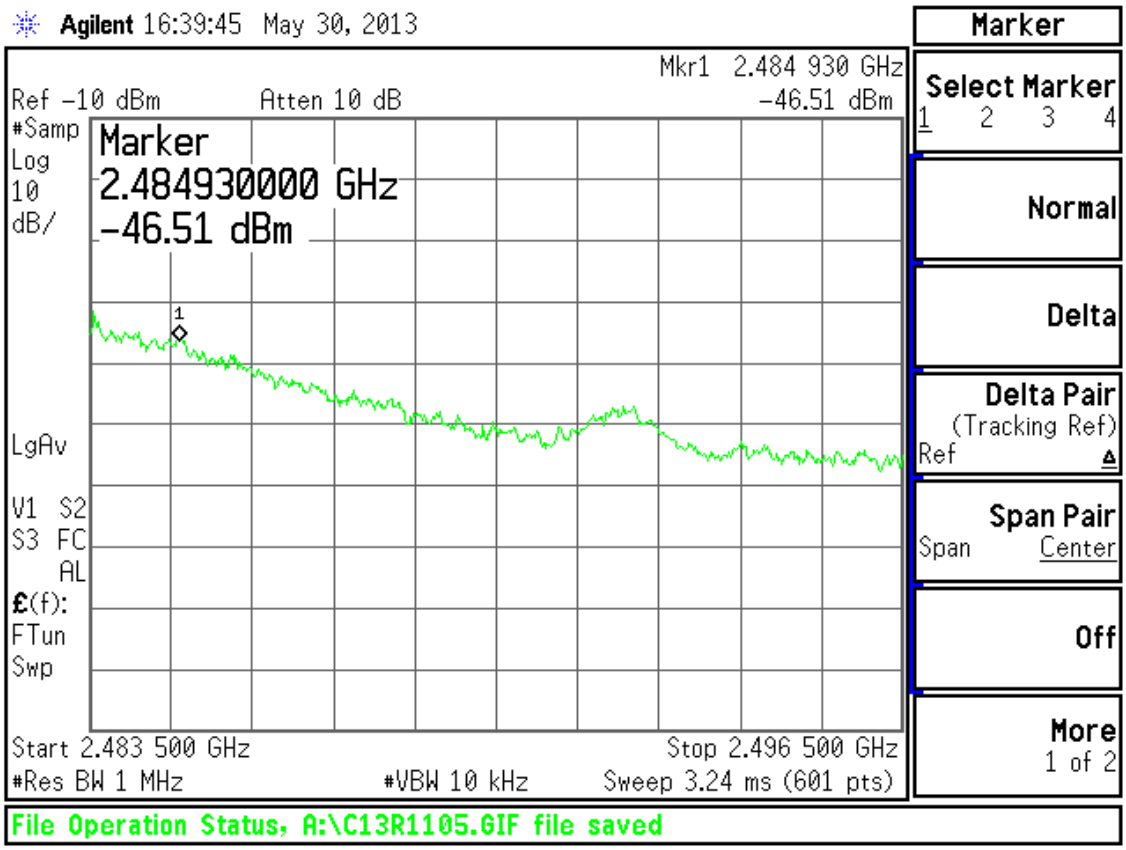
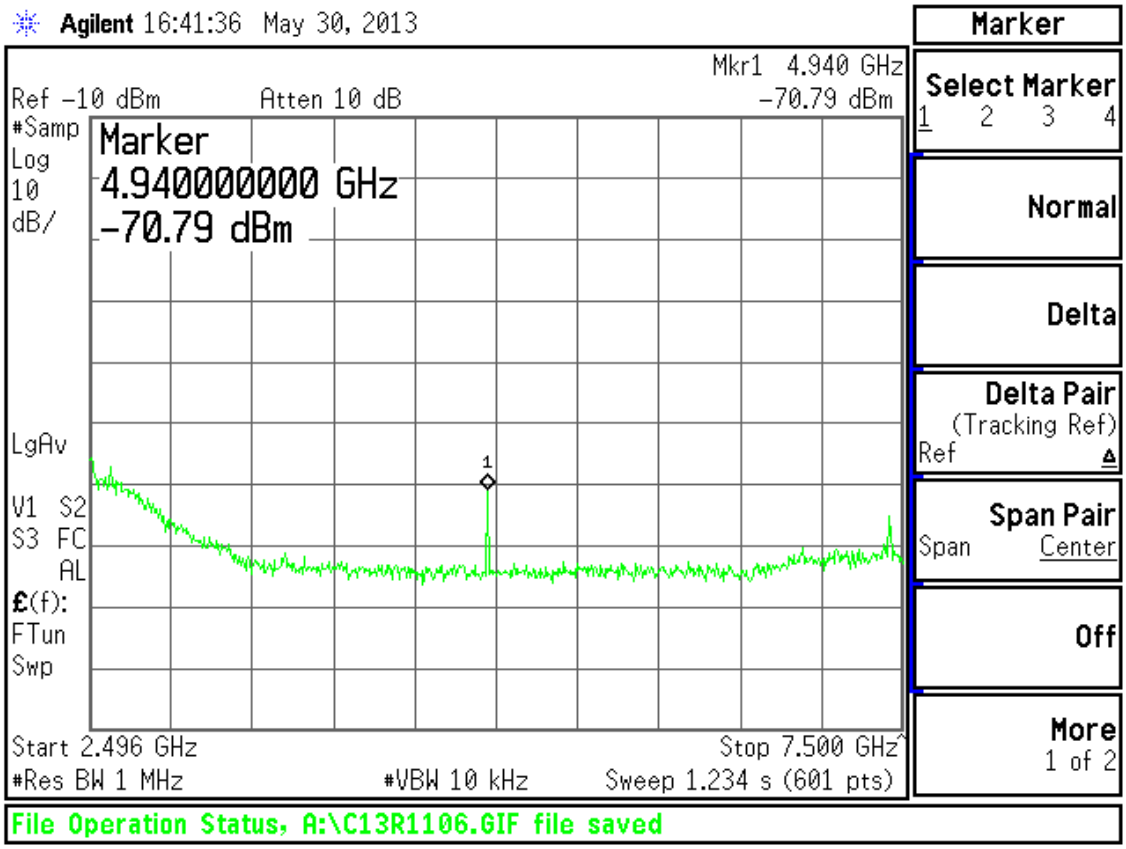


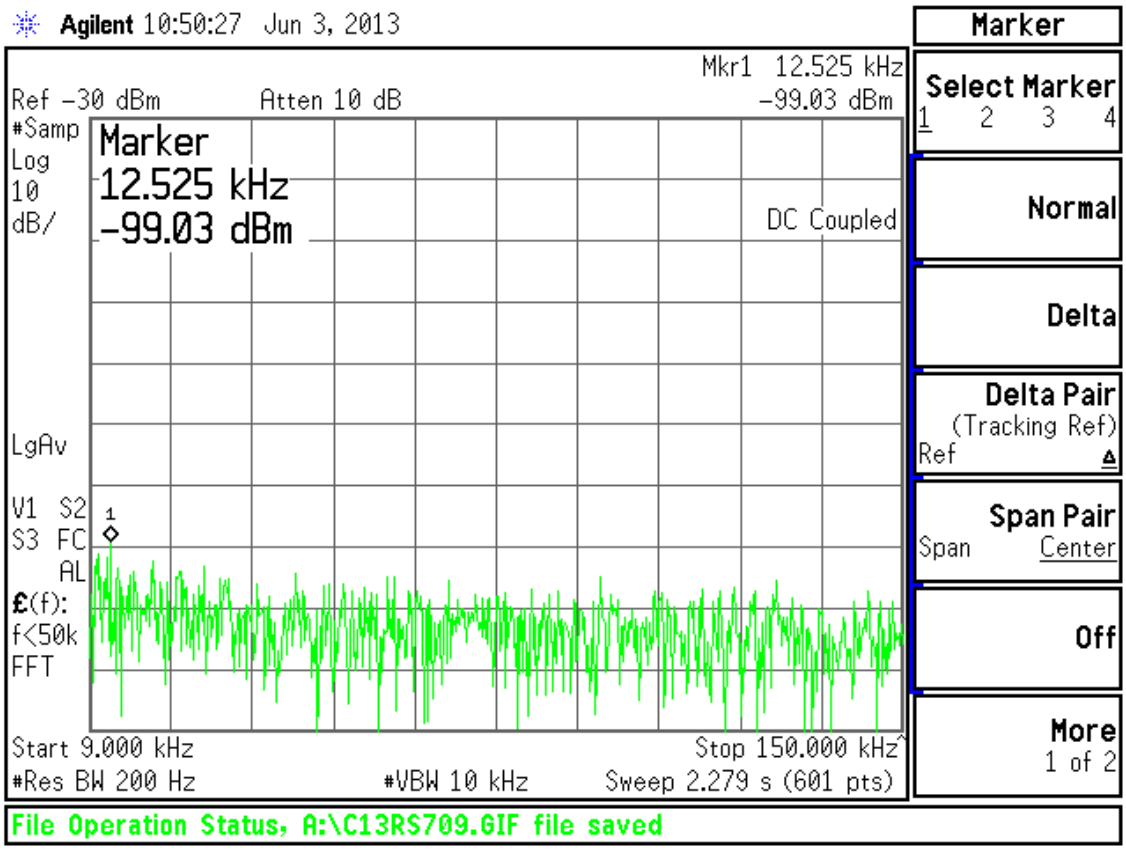
CH 13 802.11b Tx Conducted Emissions @ 11Mbps



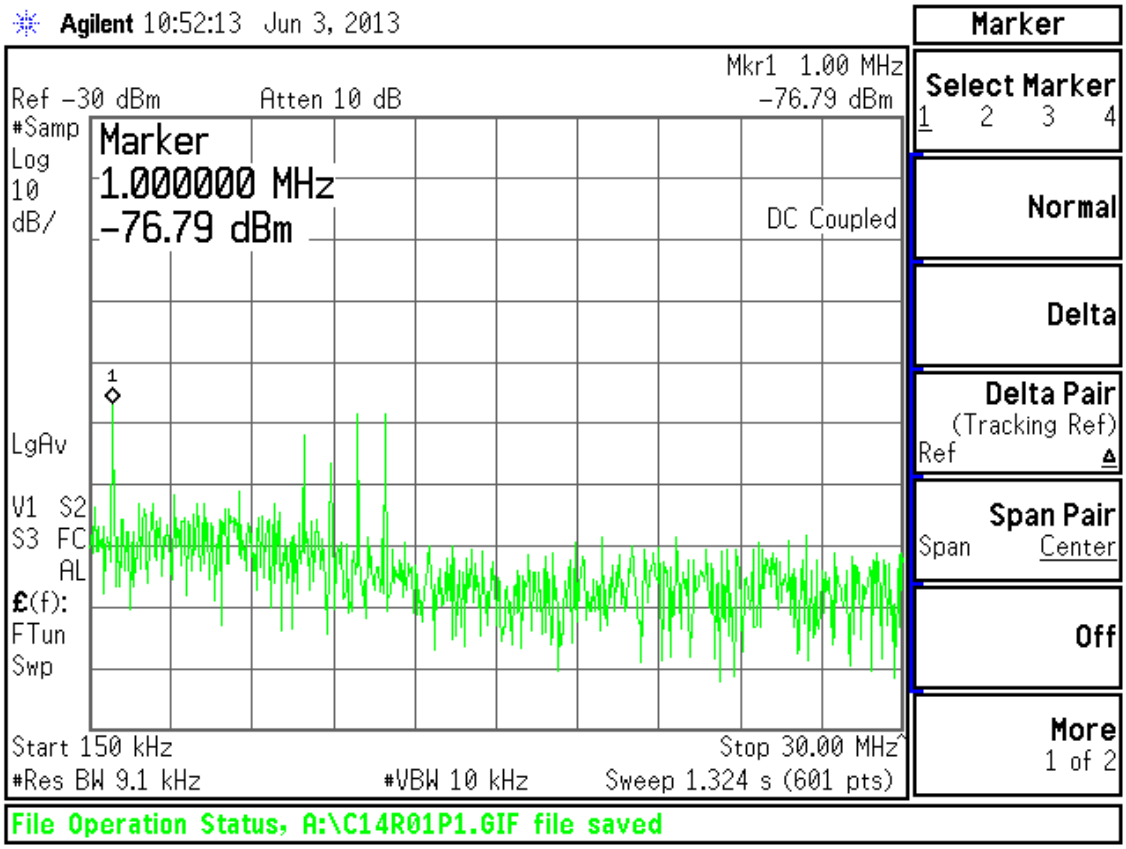
CH 13 802.11b Tx Conducted Emissions @ 11Mbps



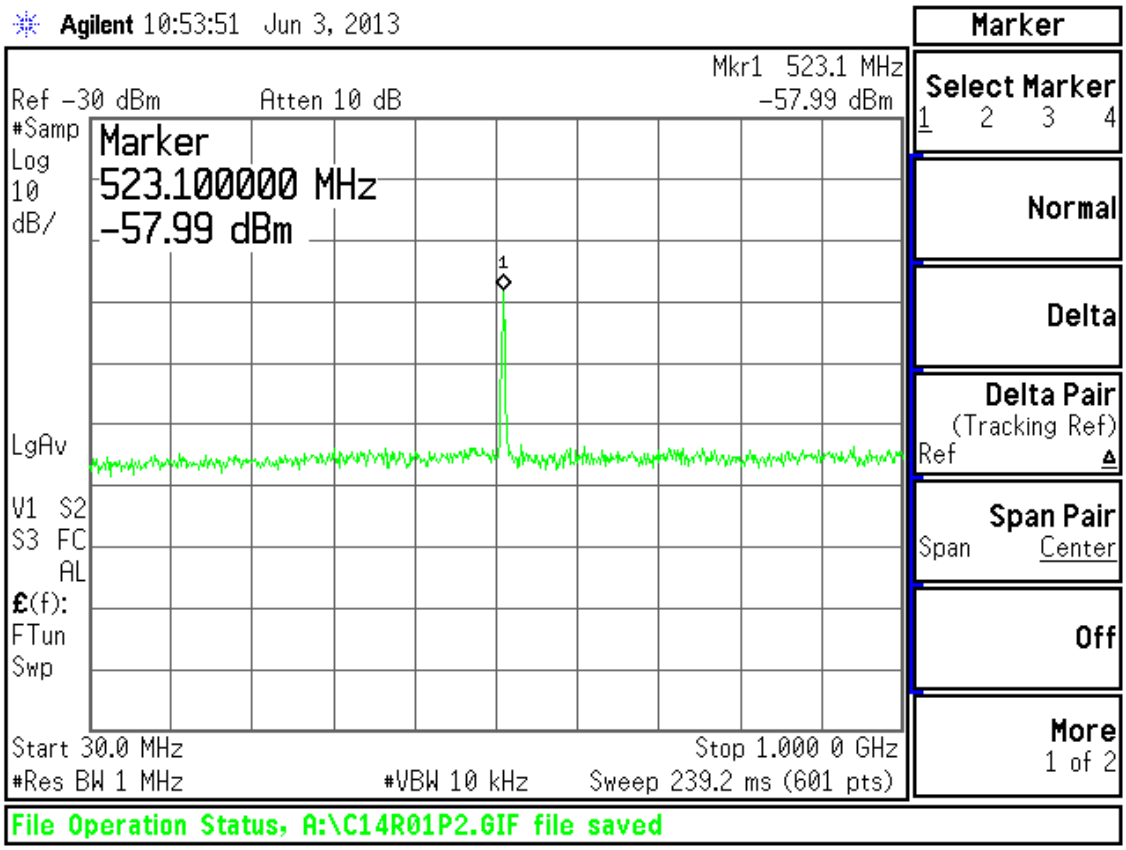
CH 13 802.11b Tx Conducted Emissions @ 11Mbps



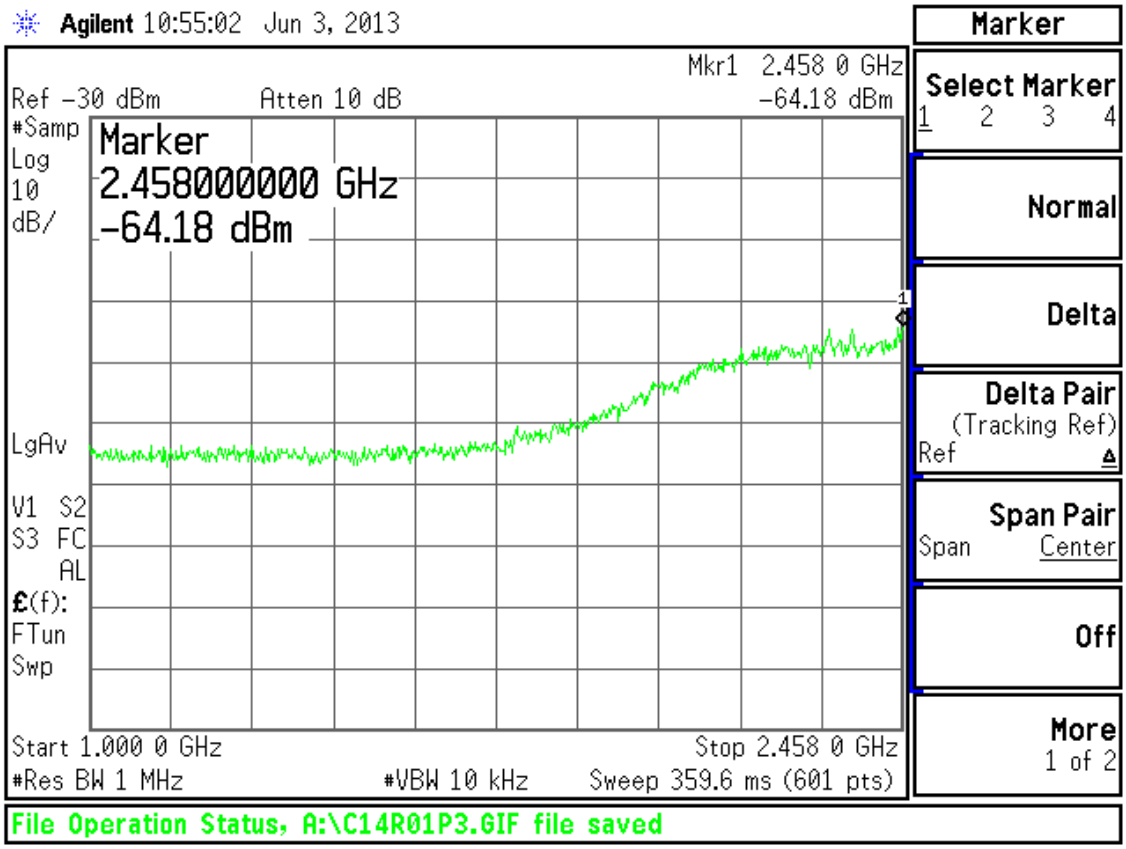
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



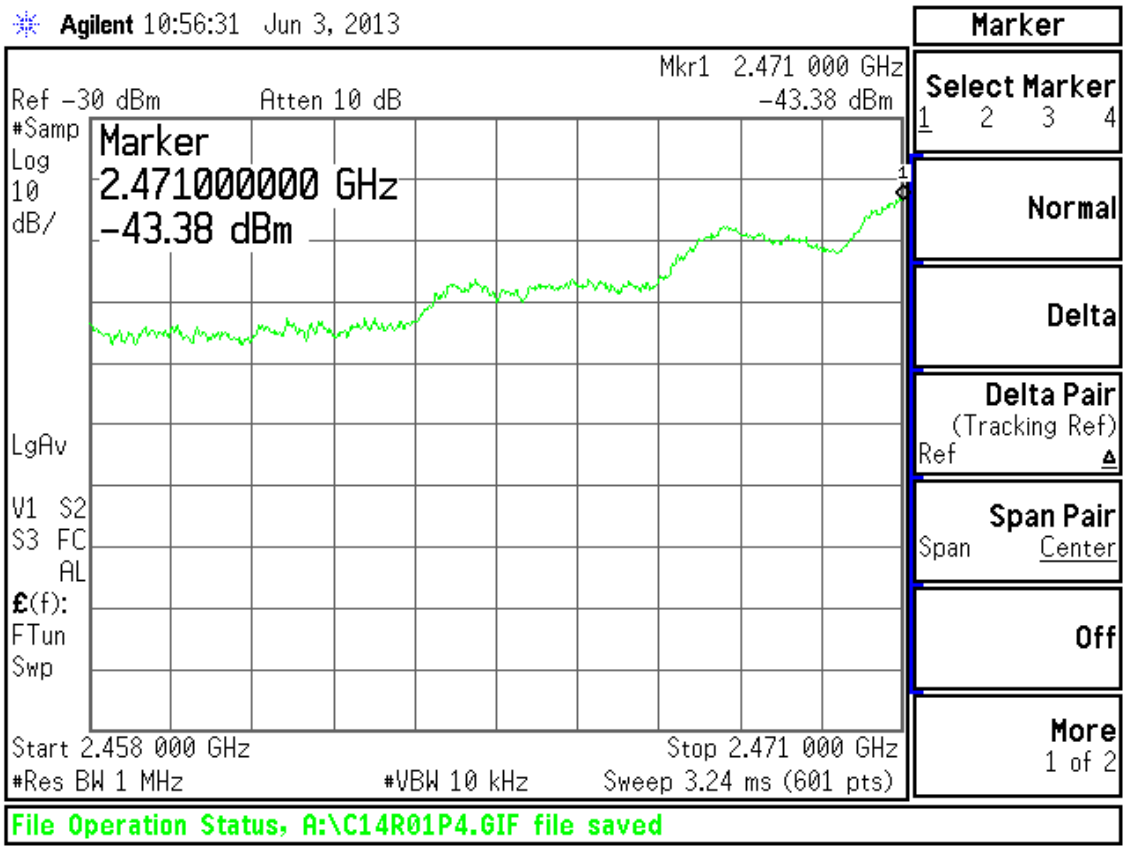
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



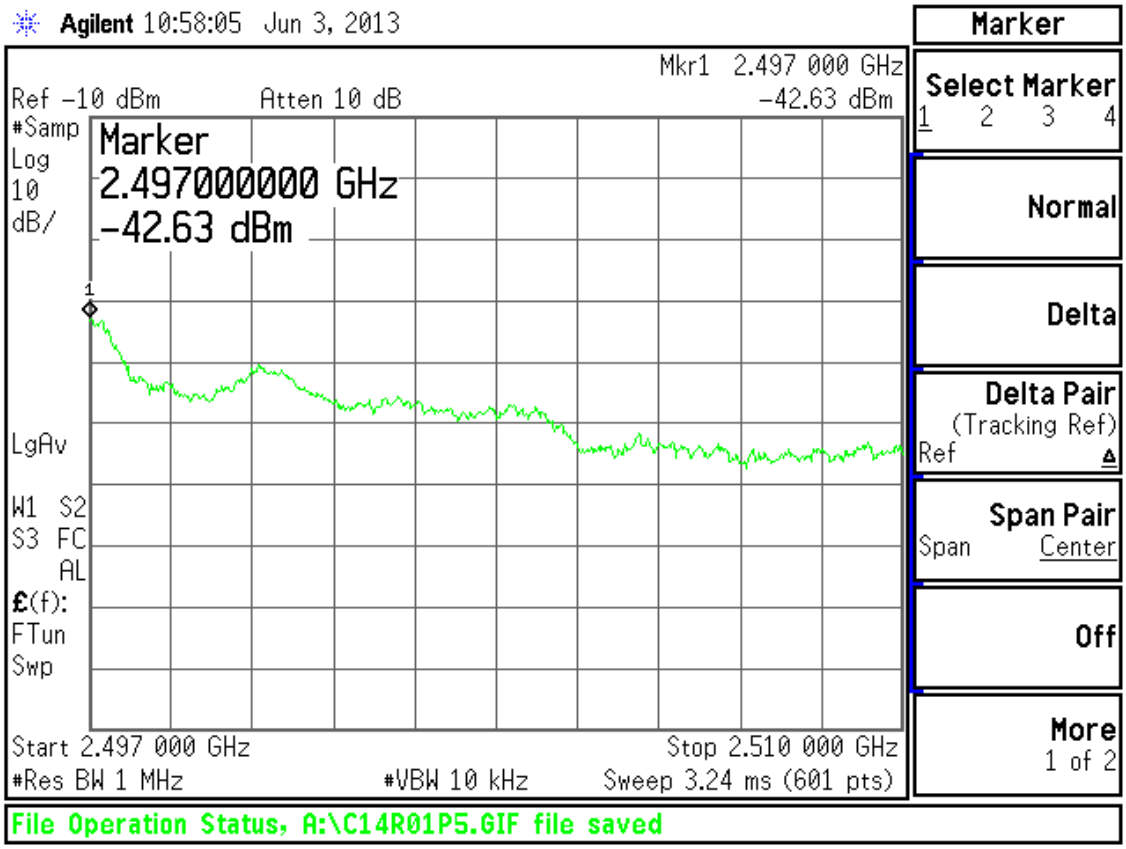
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



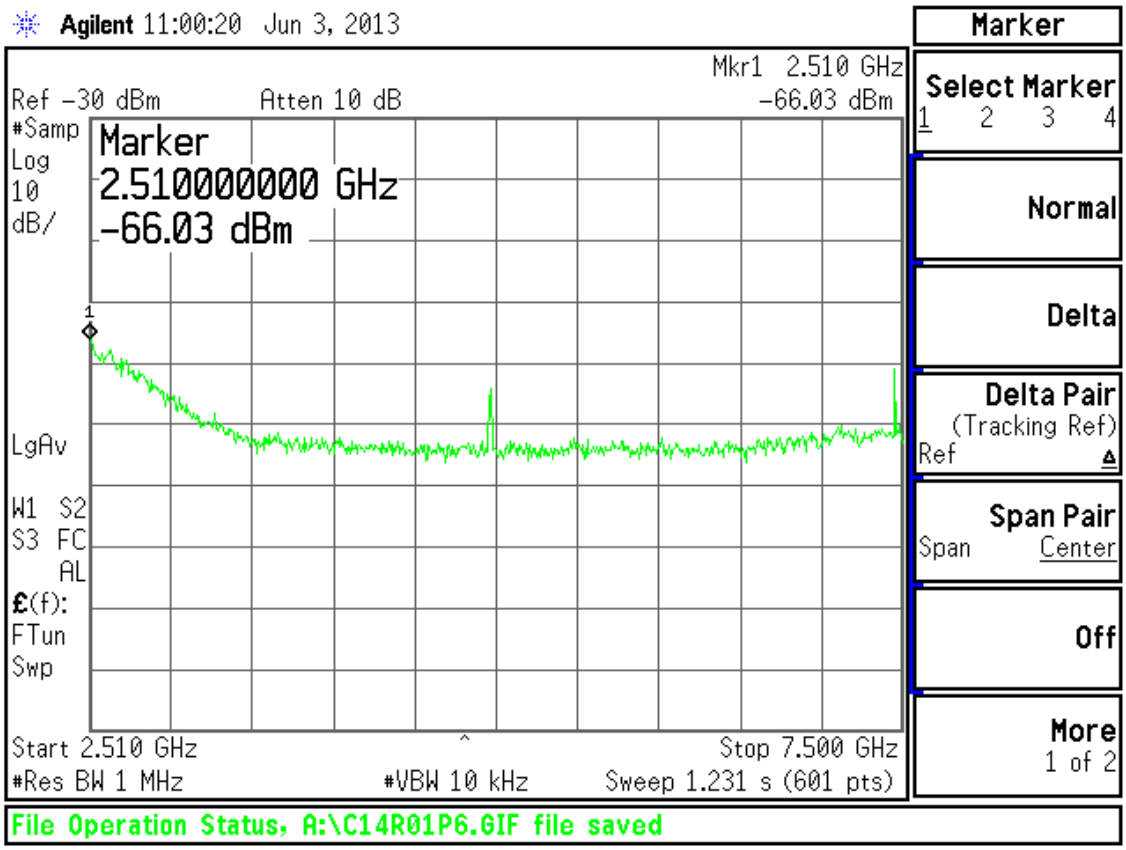
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



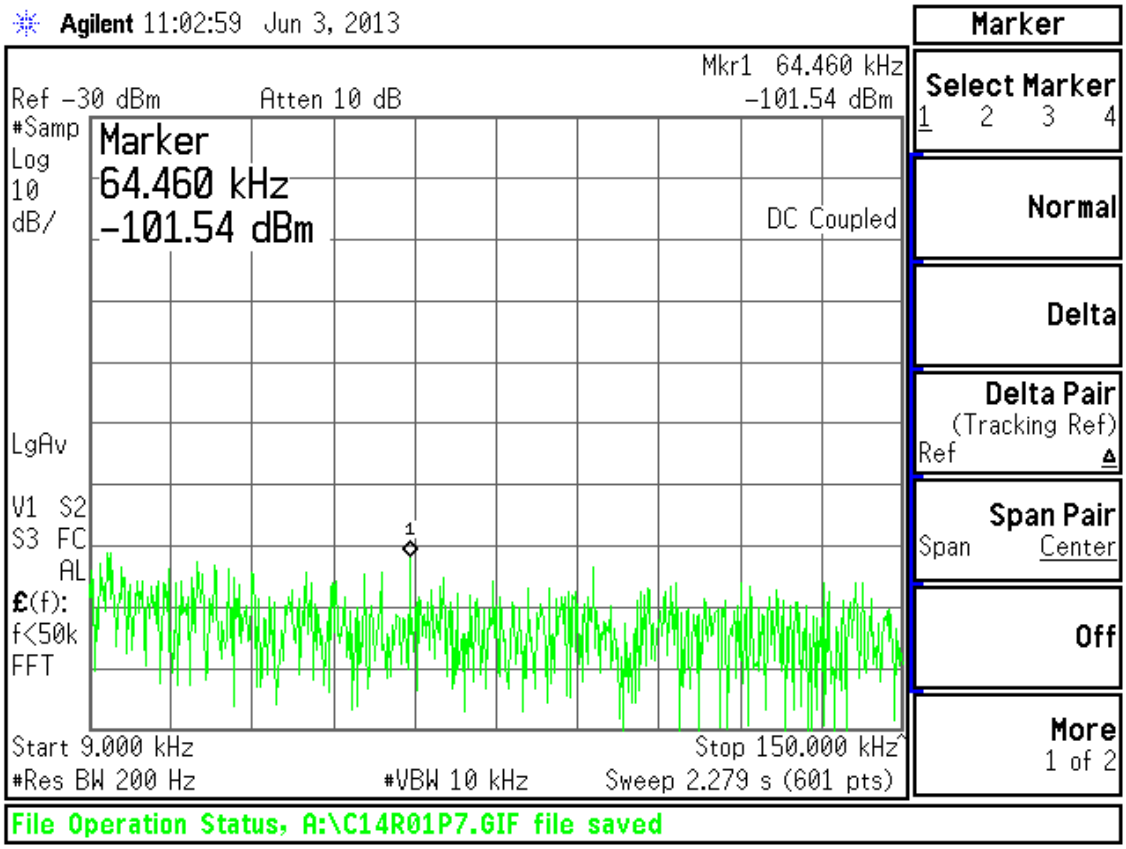
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



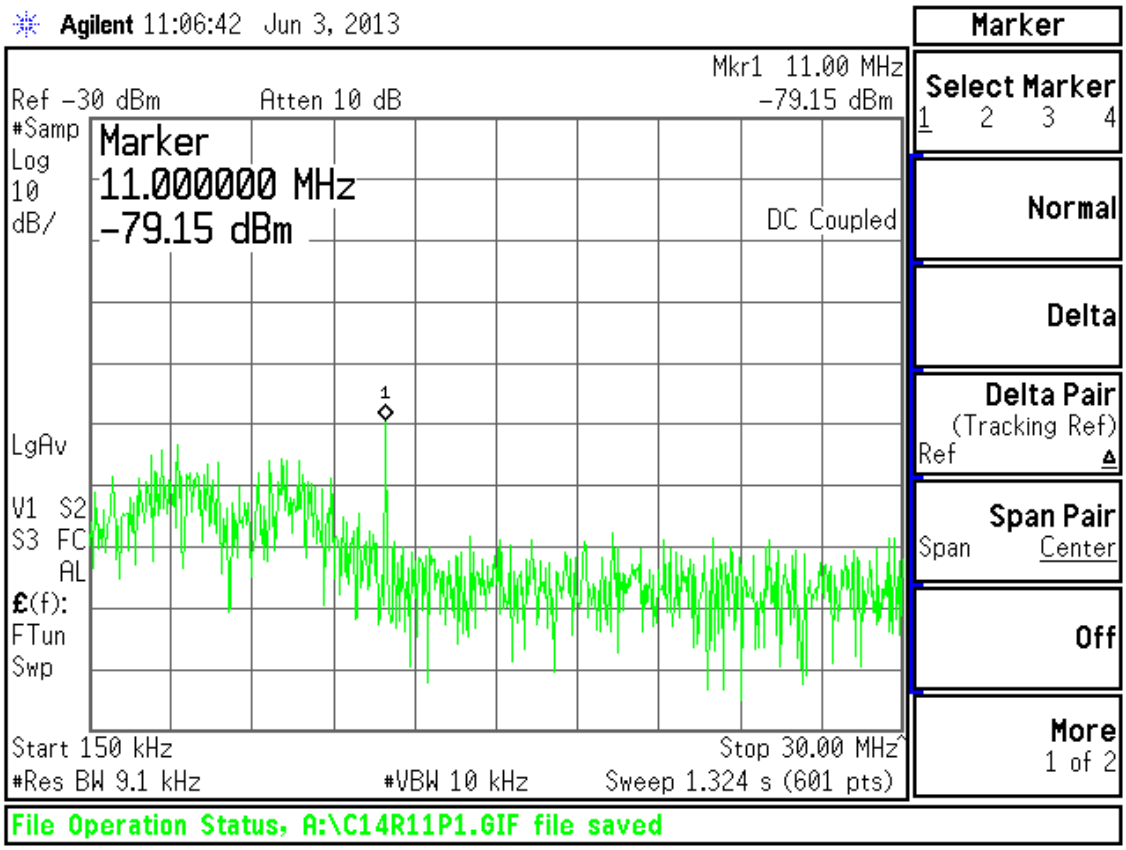
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



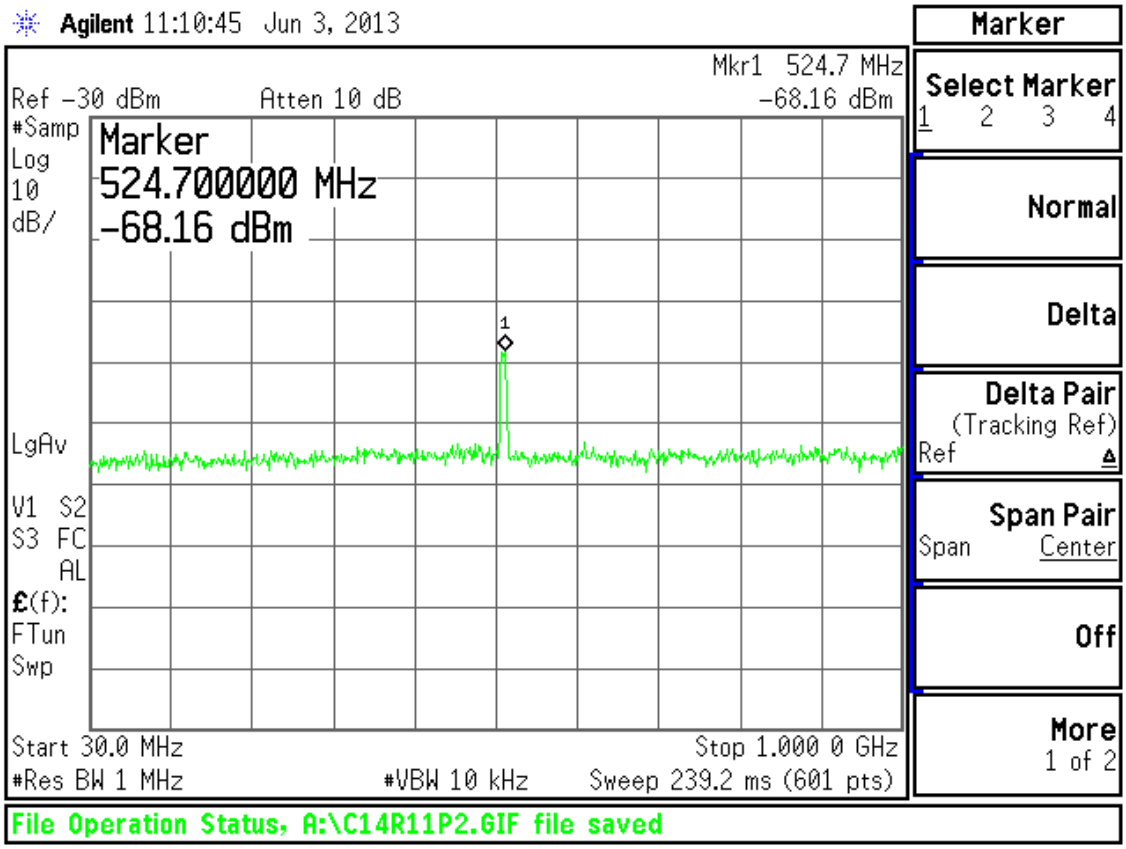
CH 14 802.11b Tx Conducted Emissions @ 1Mbps



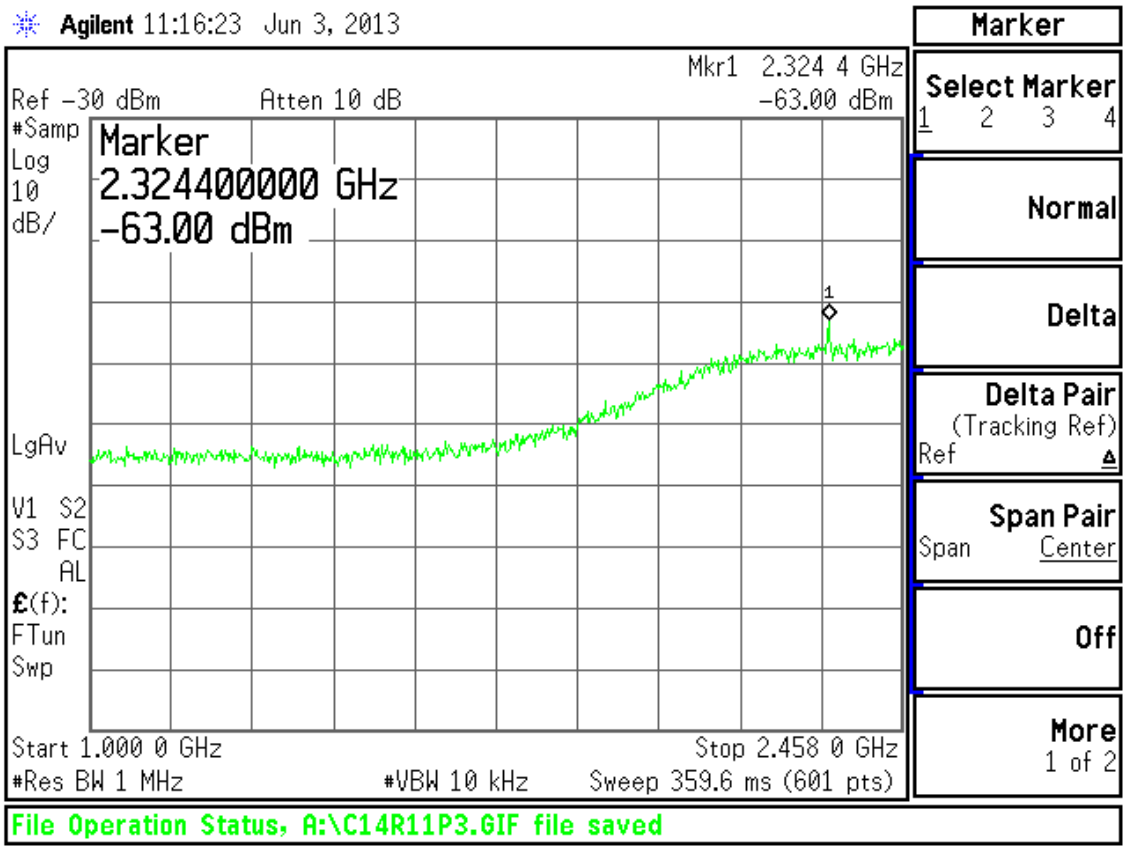
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



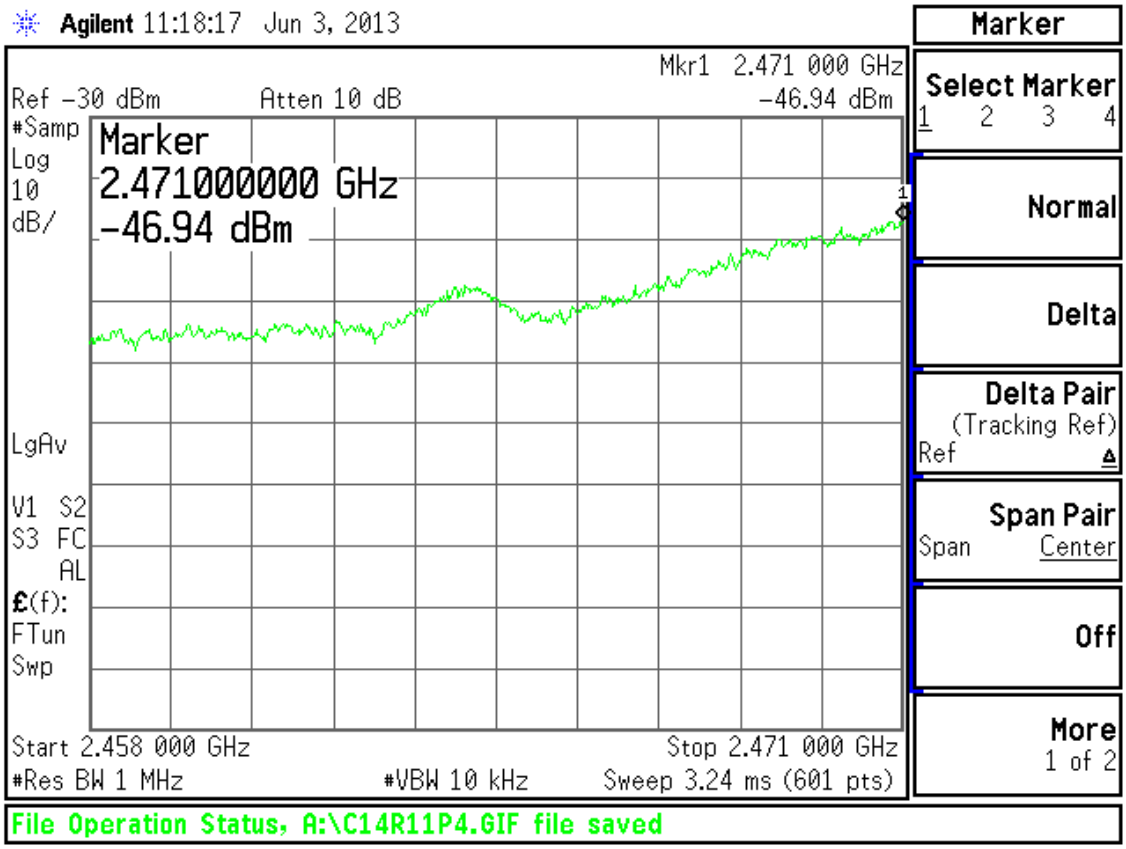
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



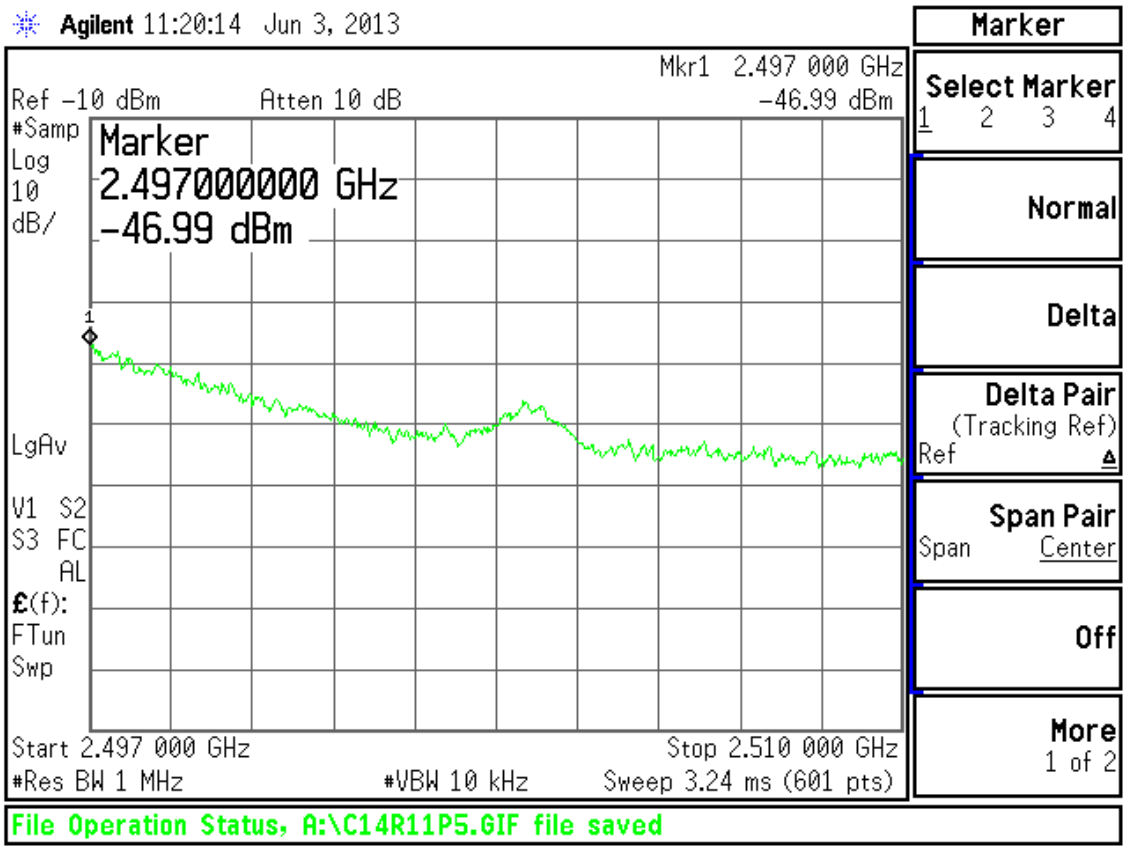
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



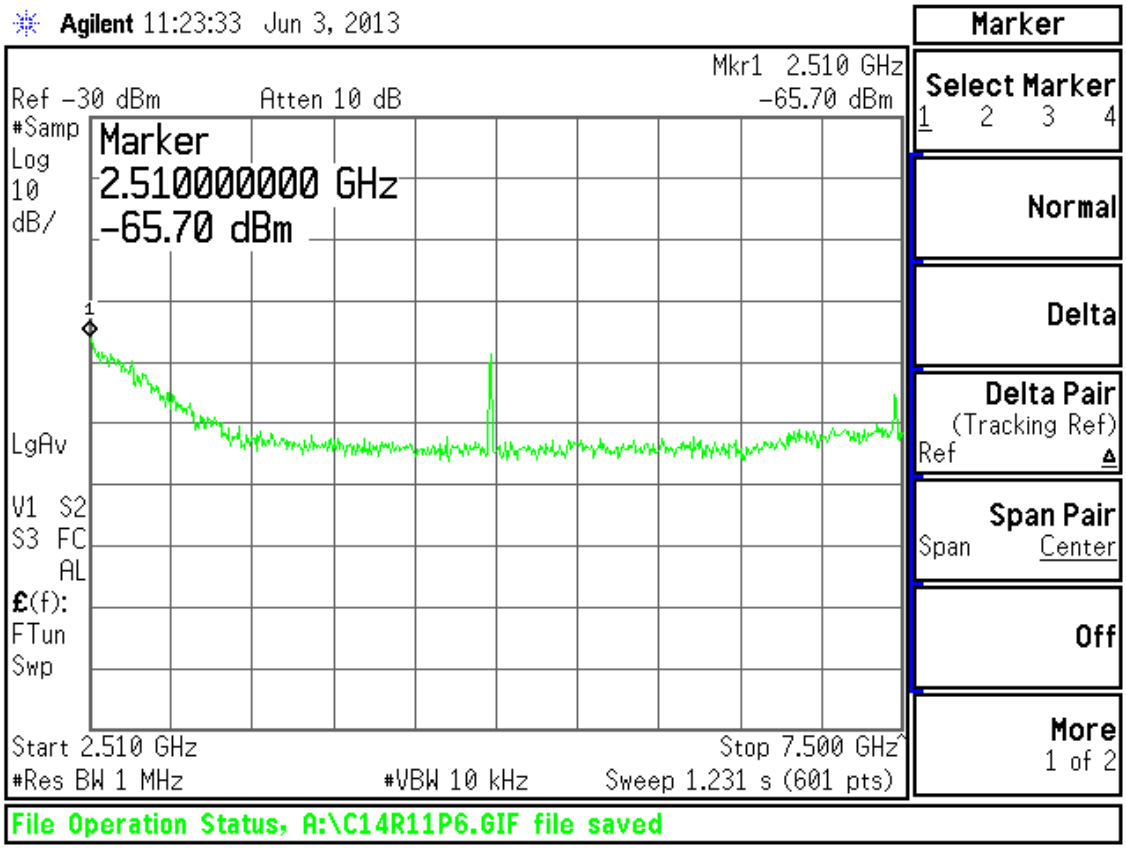
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



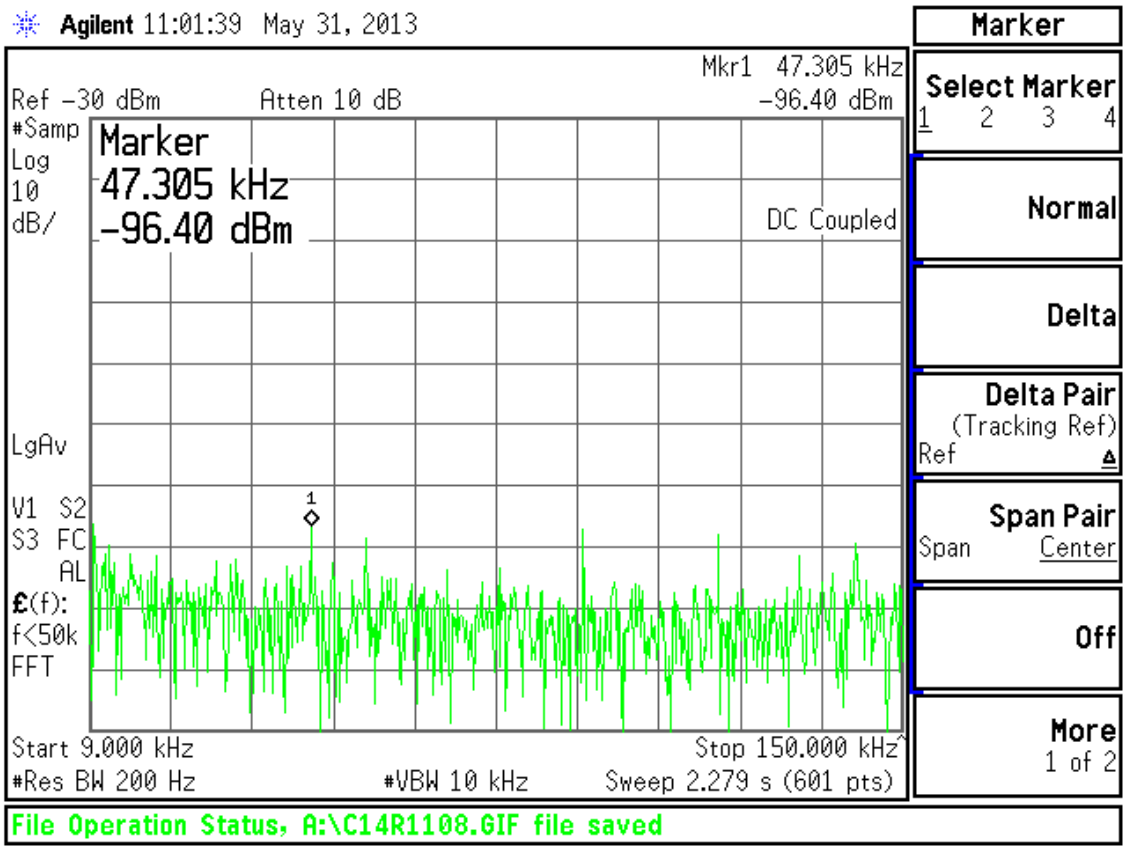
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



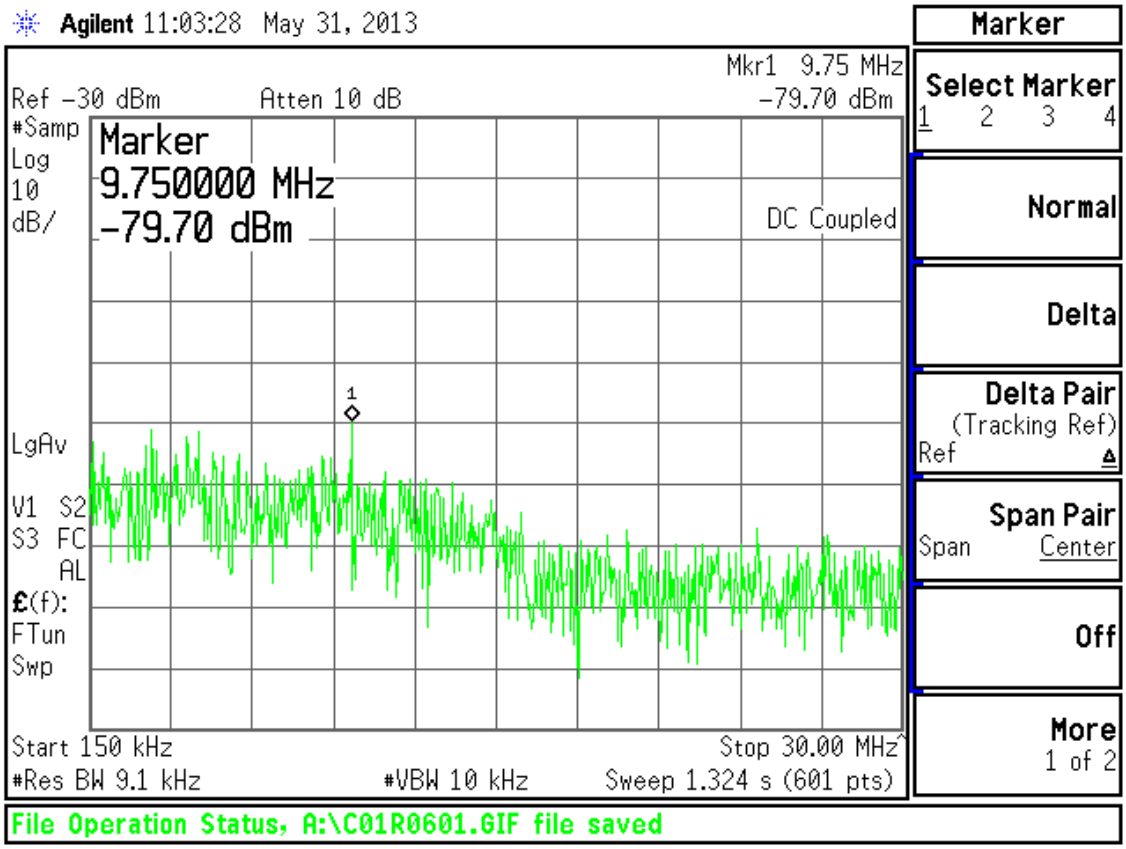
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



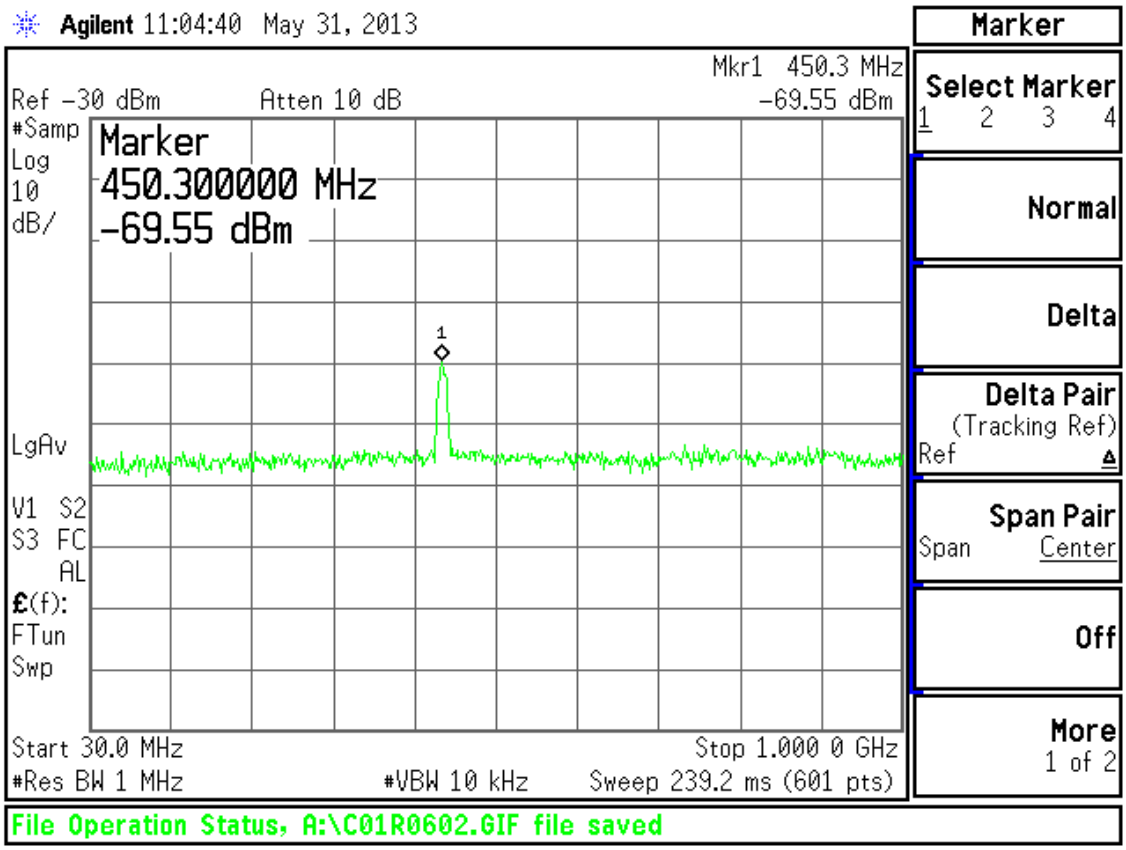
CH 14 802.11b Tx Conducted Emissions @ 11Mbps



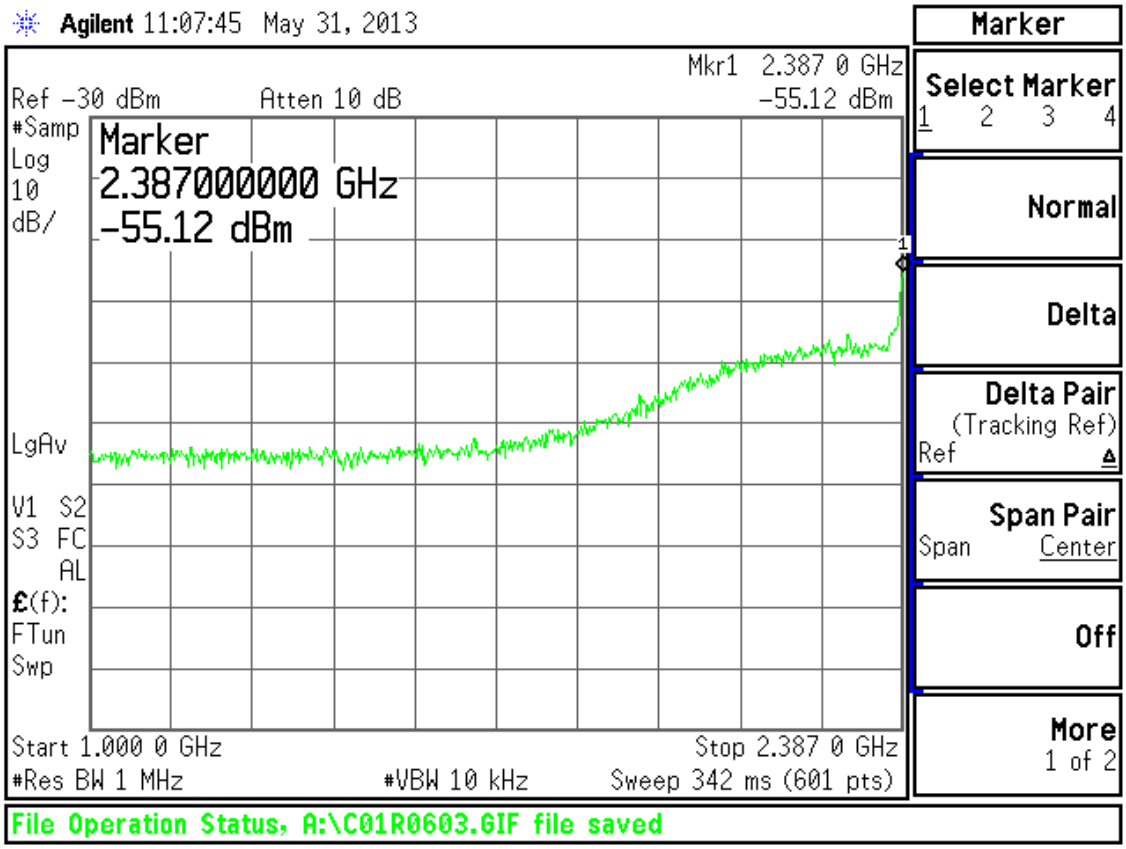
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



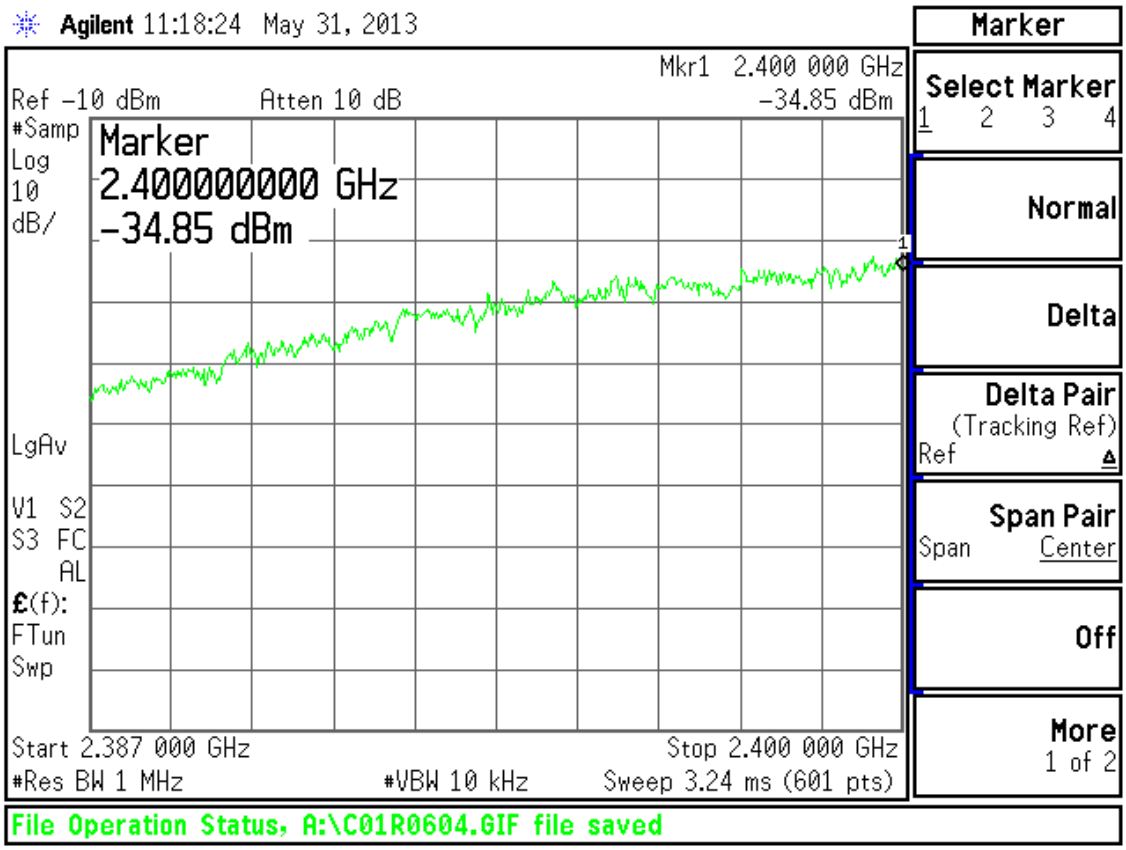
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



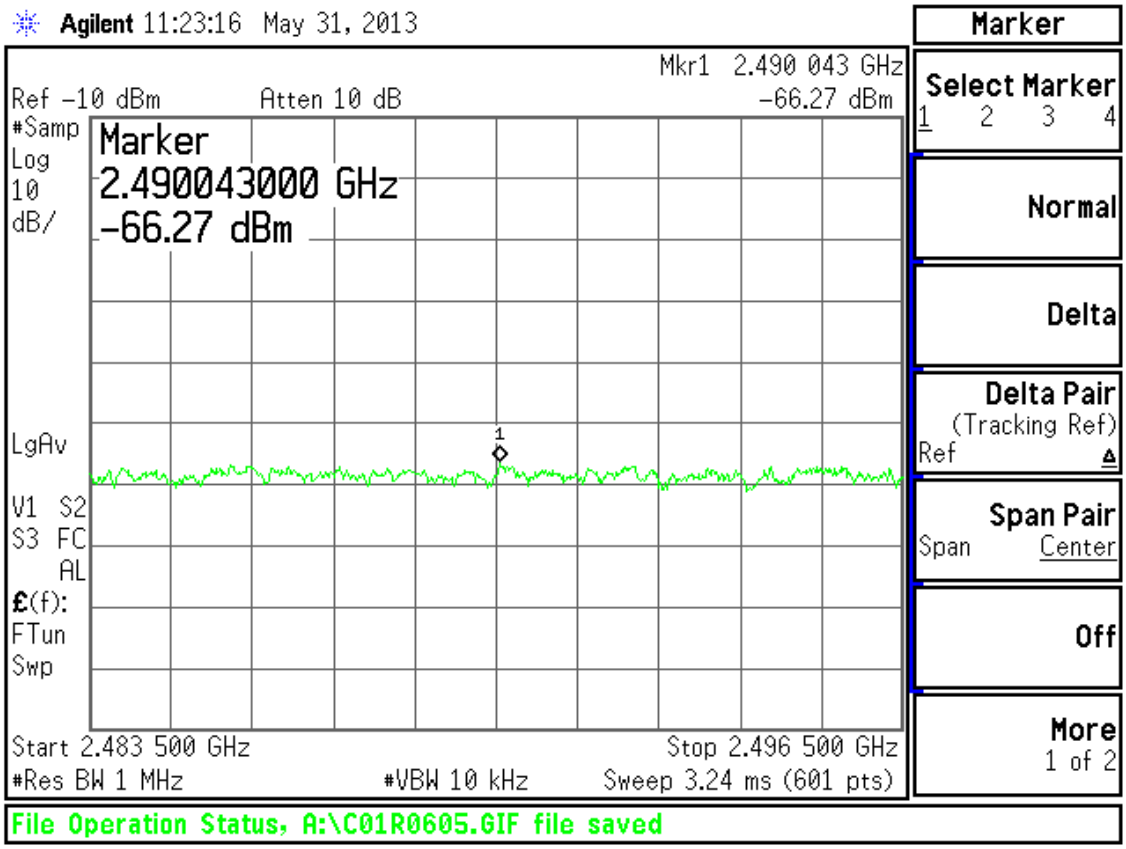
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



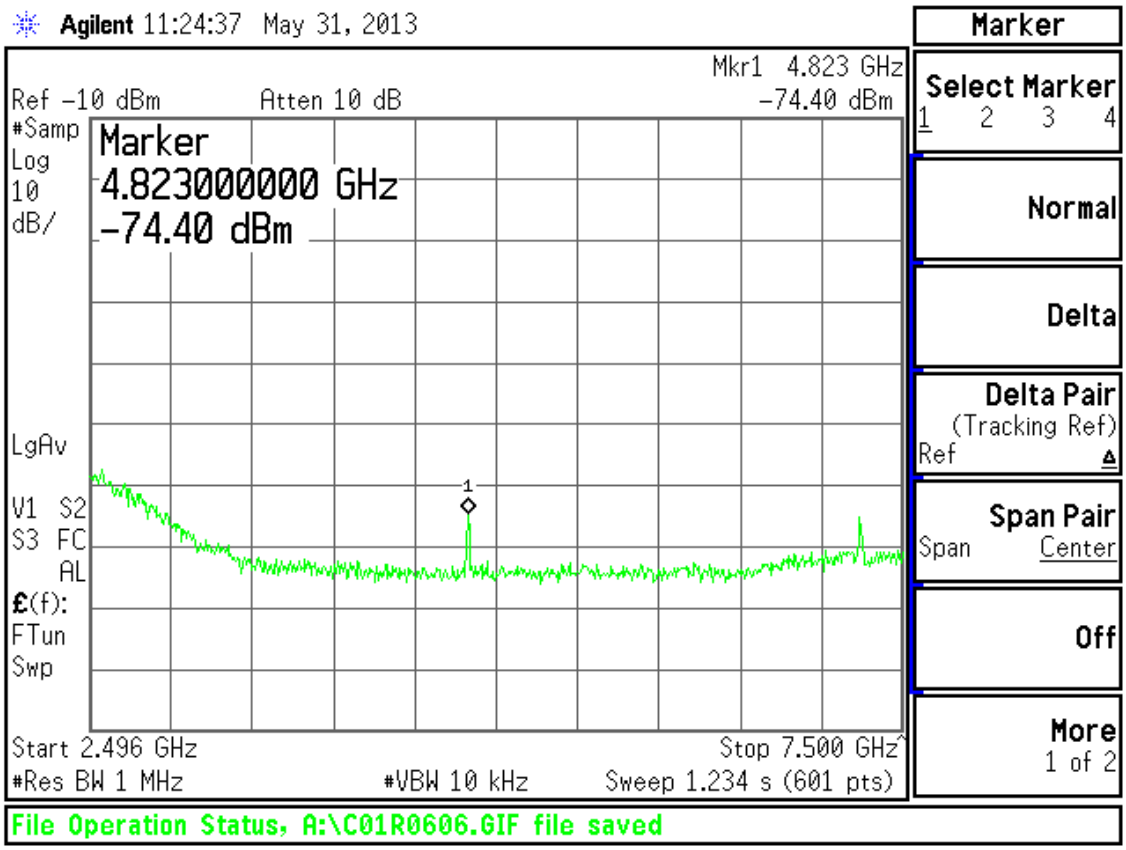
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



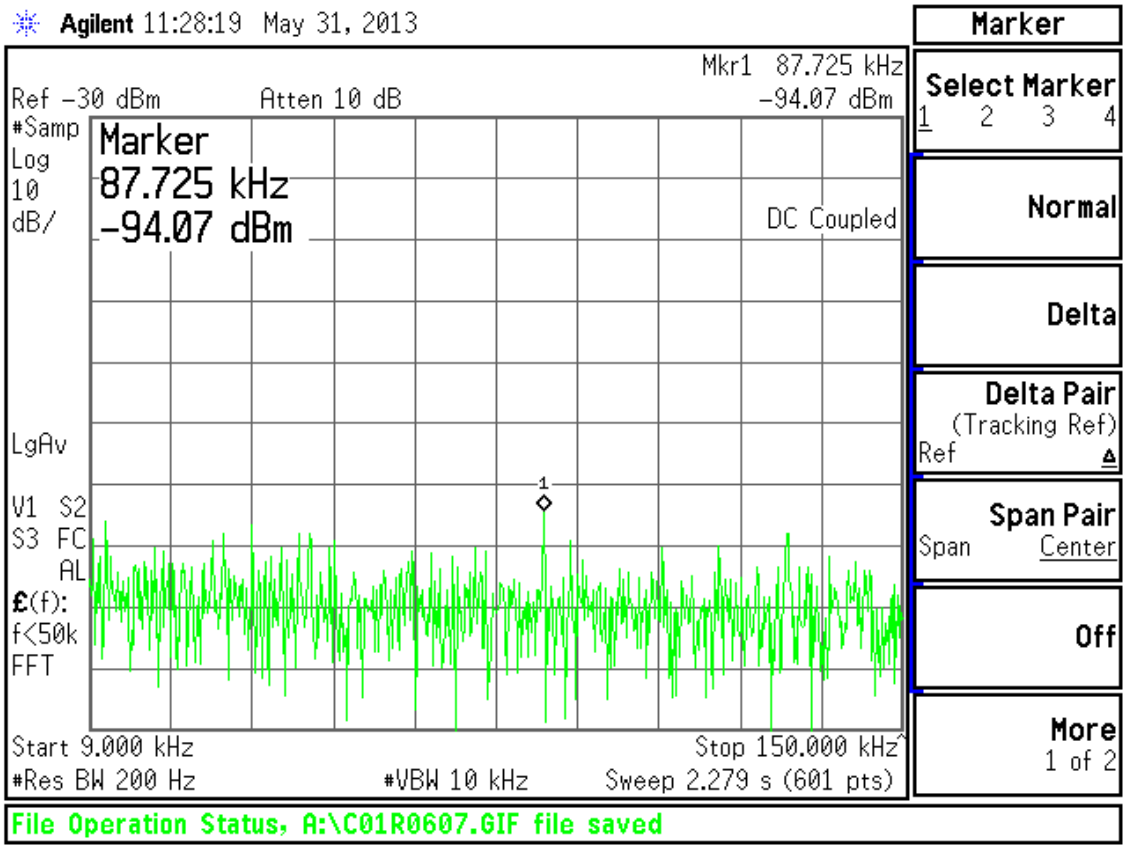
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



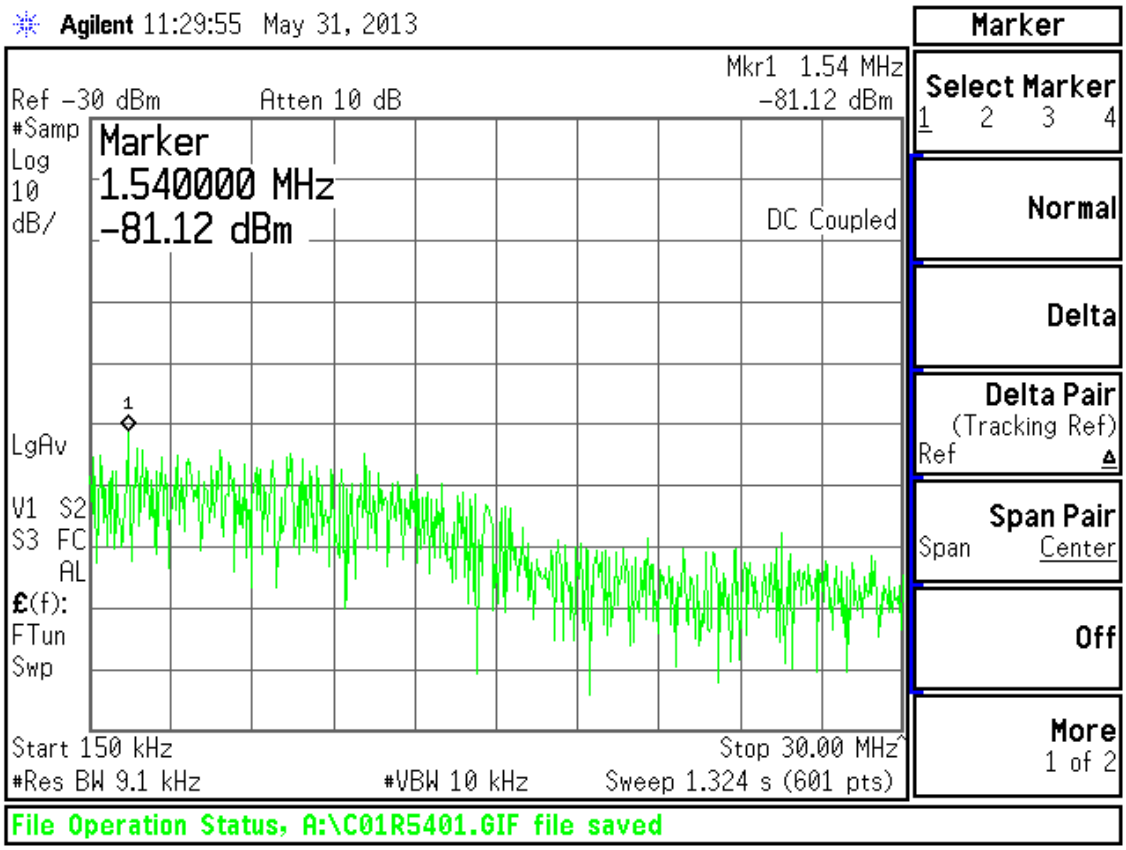
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



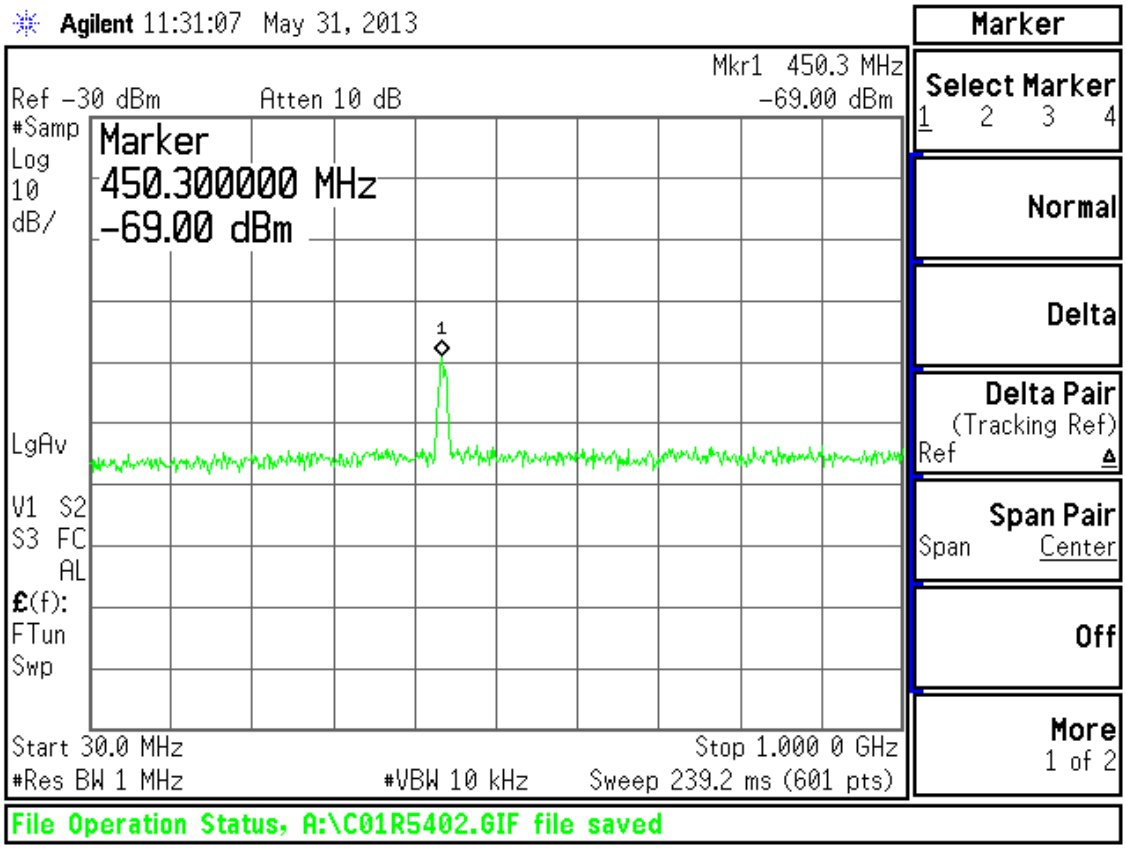
CH 1 802.11g Tx Conducted Emissions @ 6Mbps



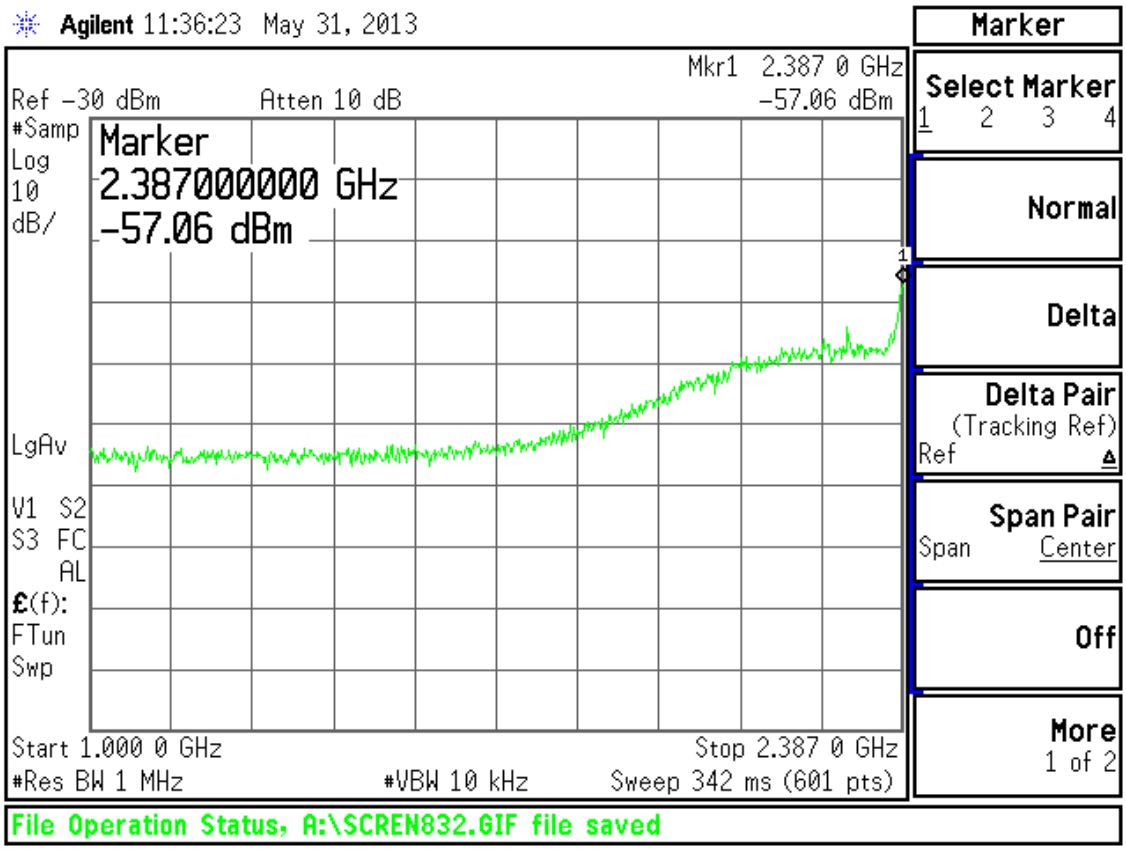
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



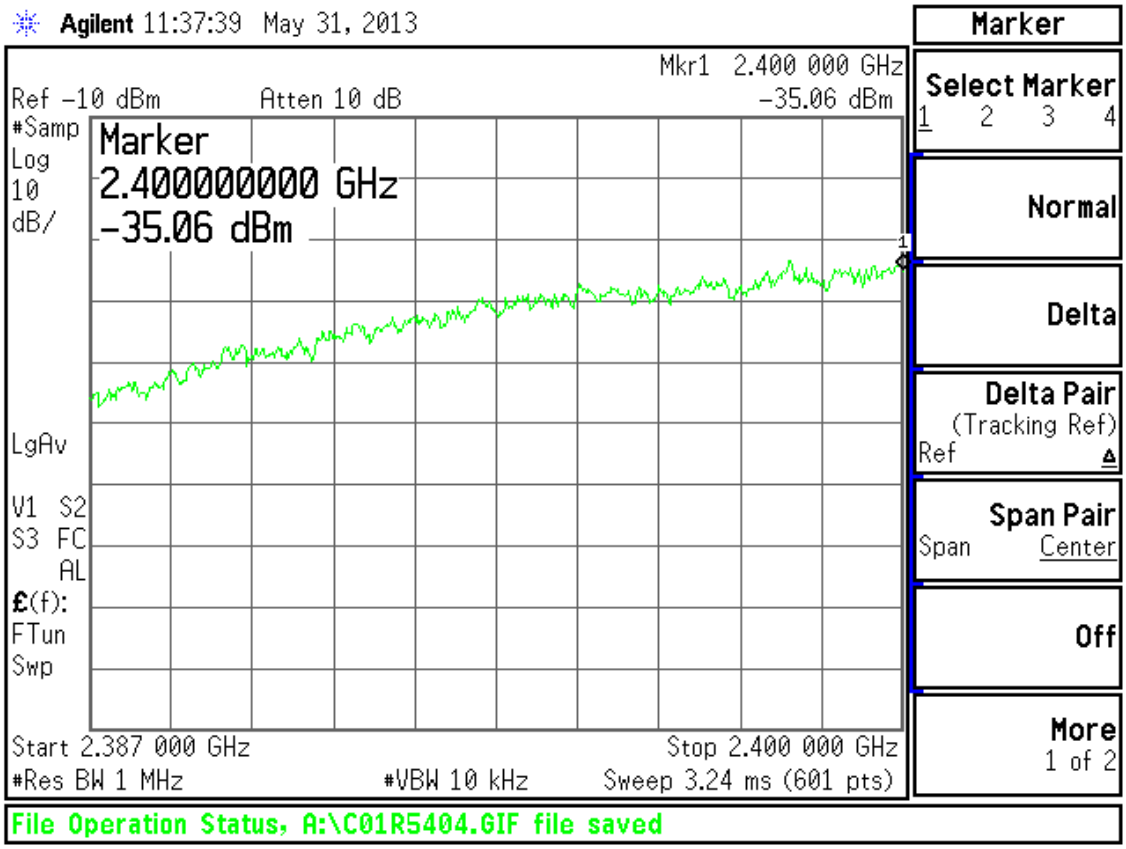
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



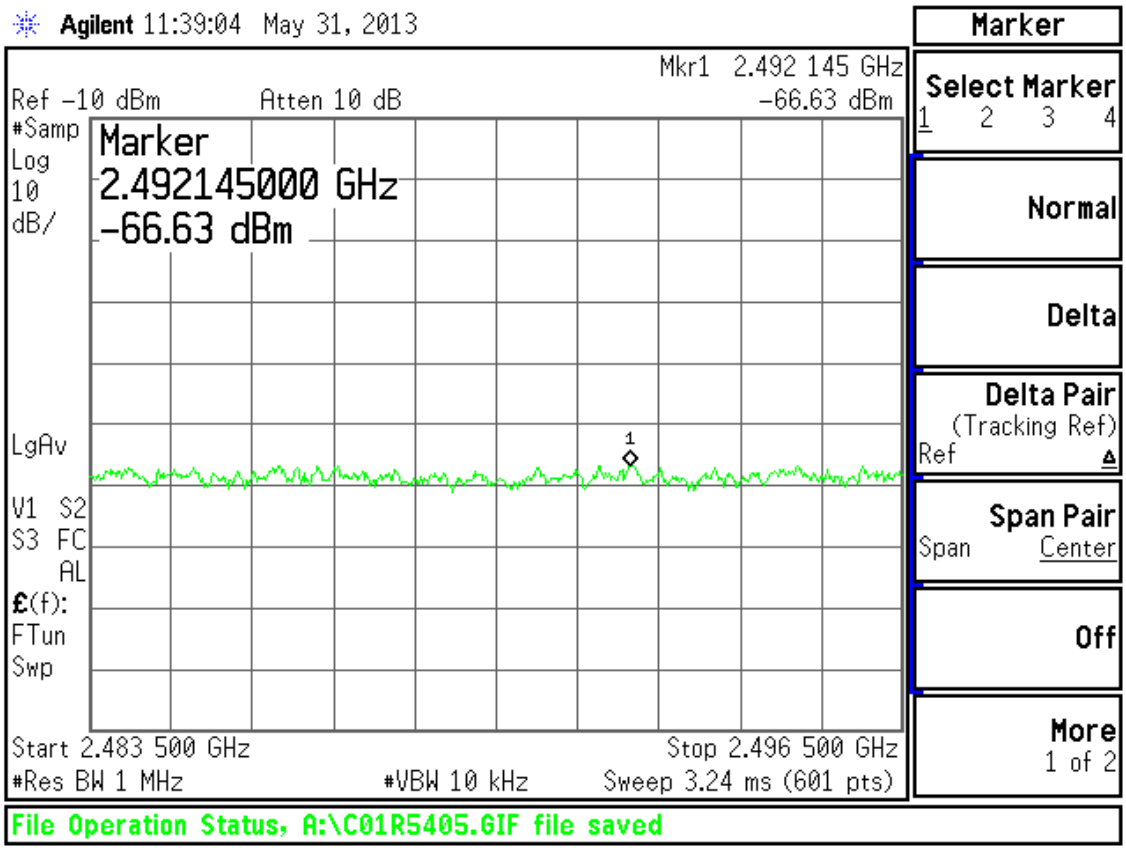
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



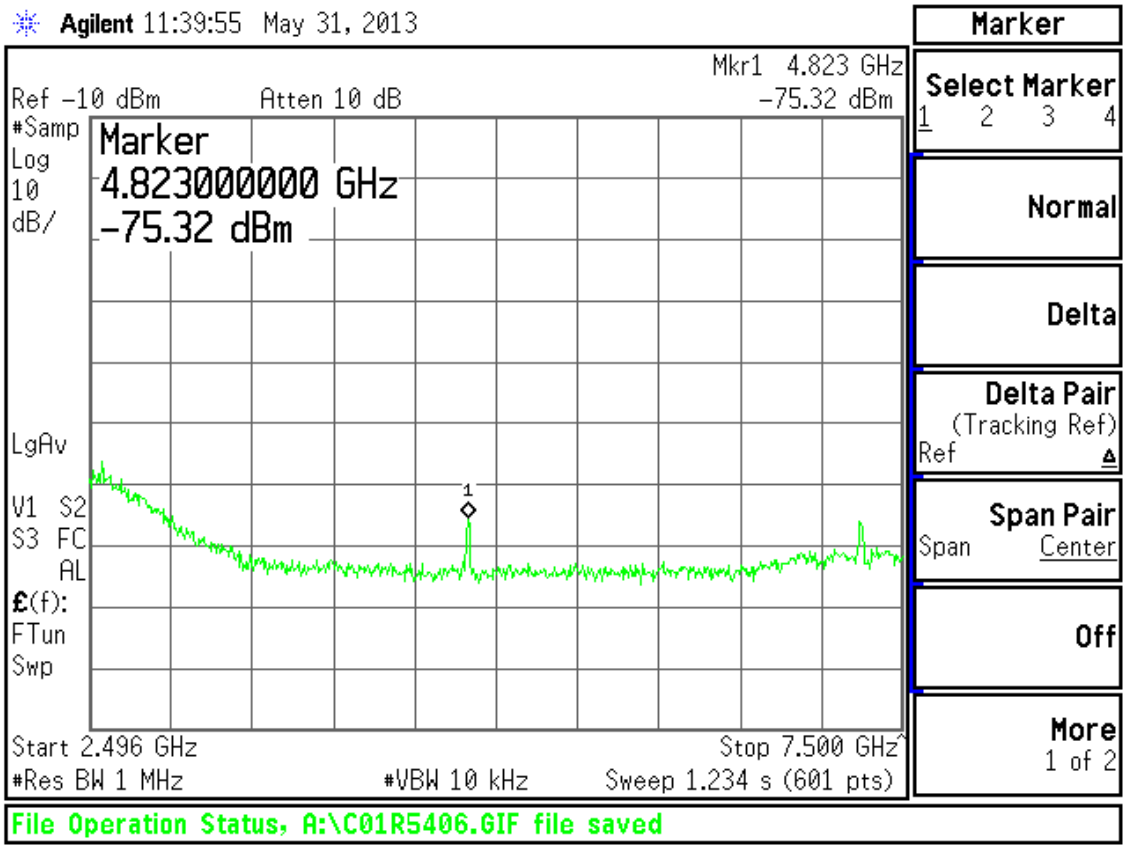
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



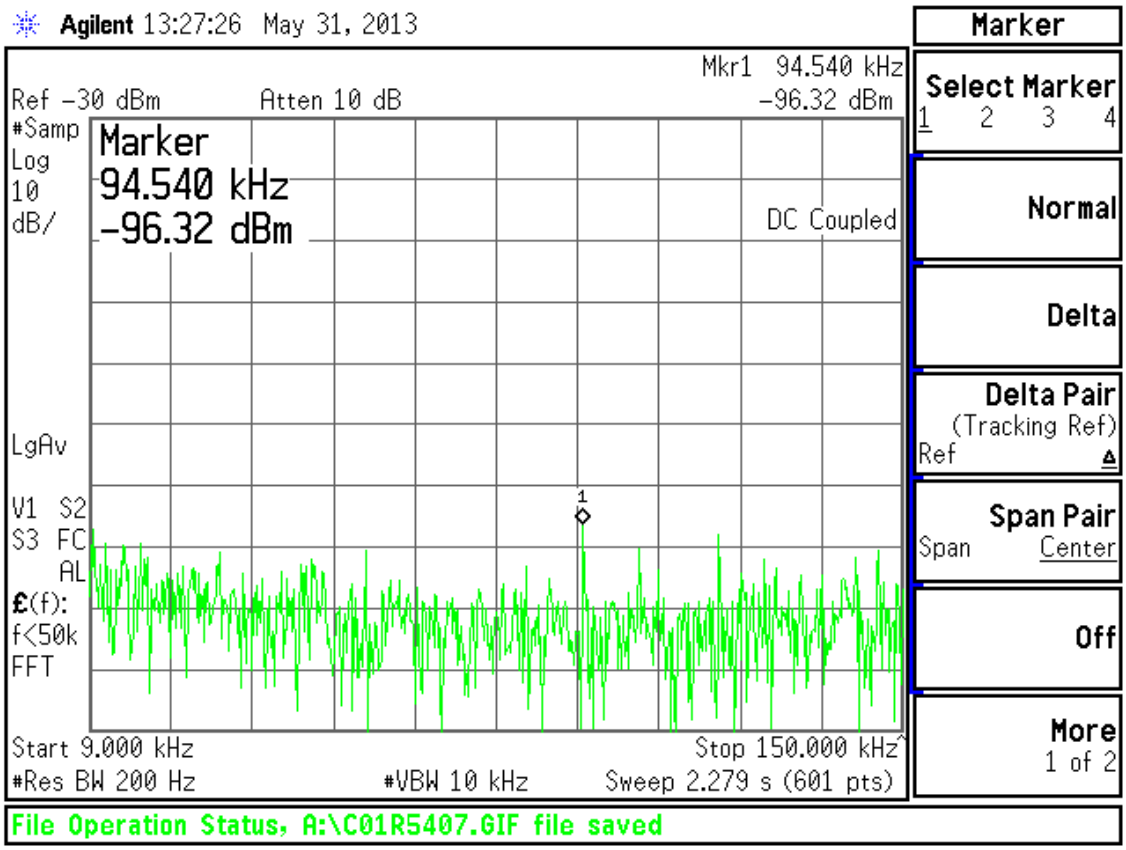
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



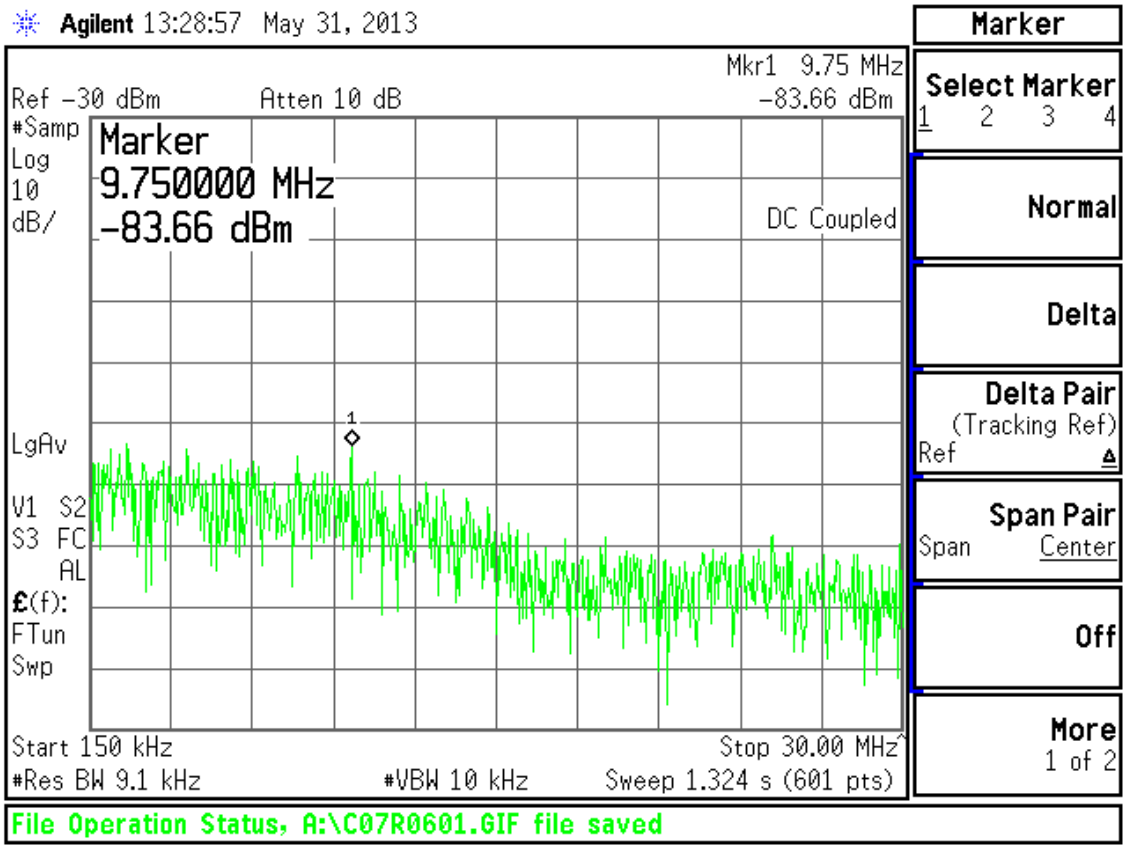
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



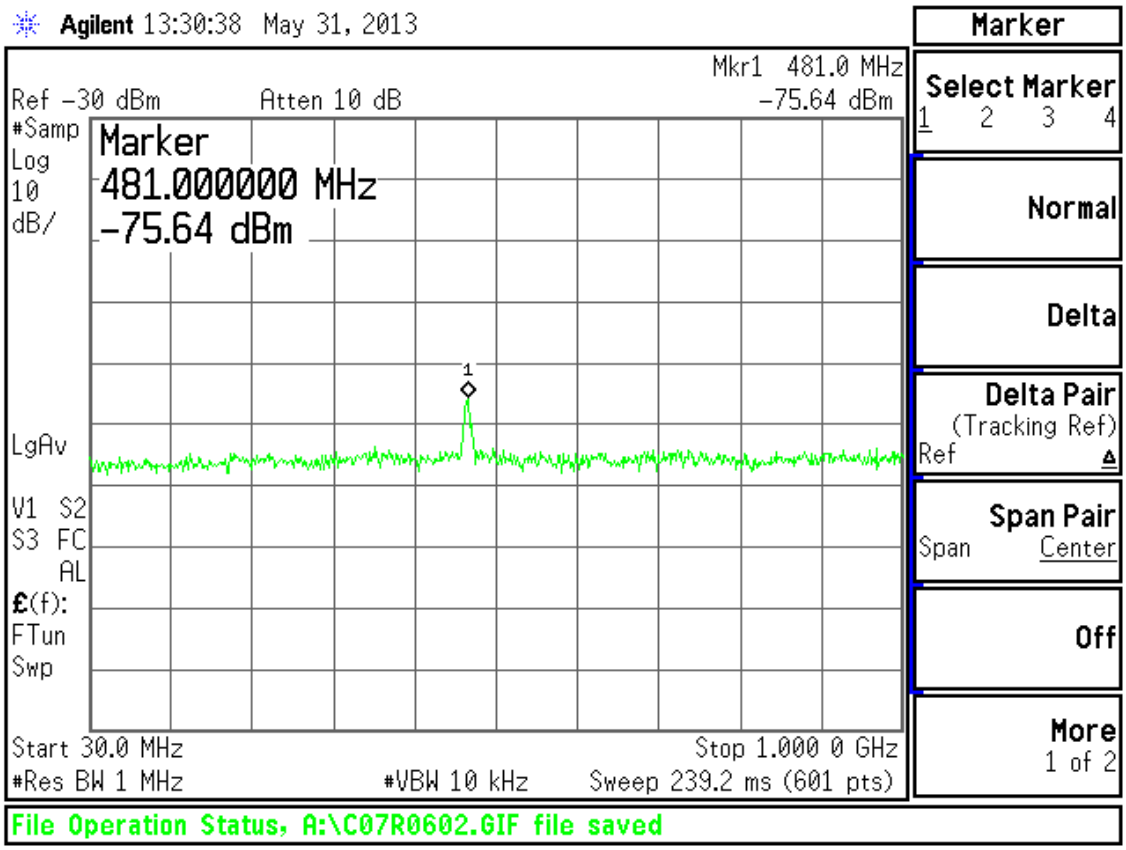
CH 1 802.11g Tx Conducted Emissions @ 54Mbps



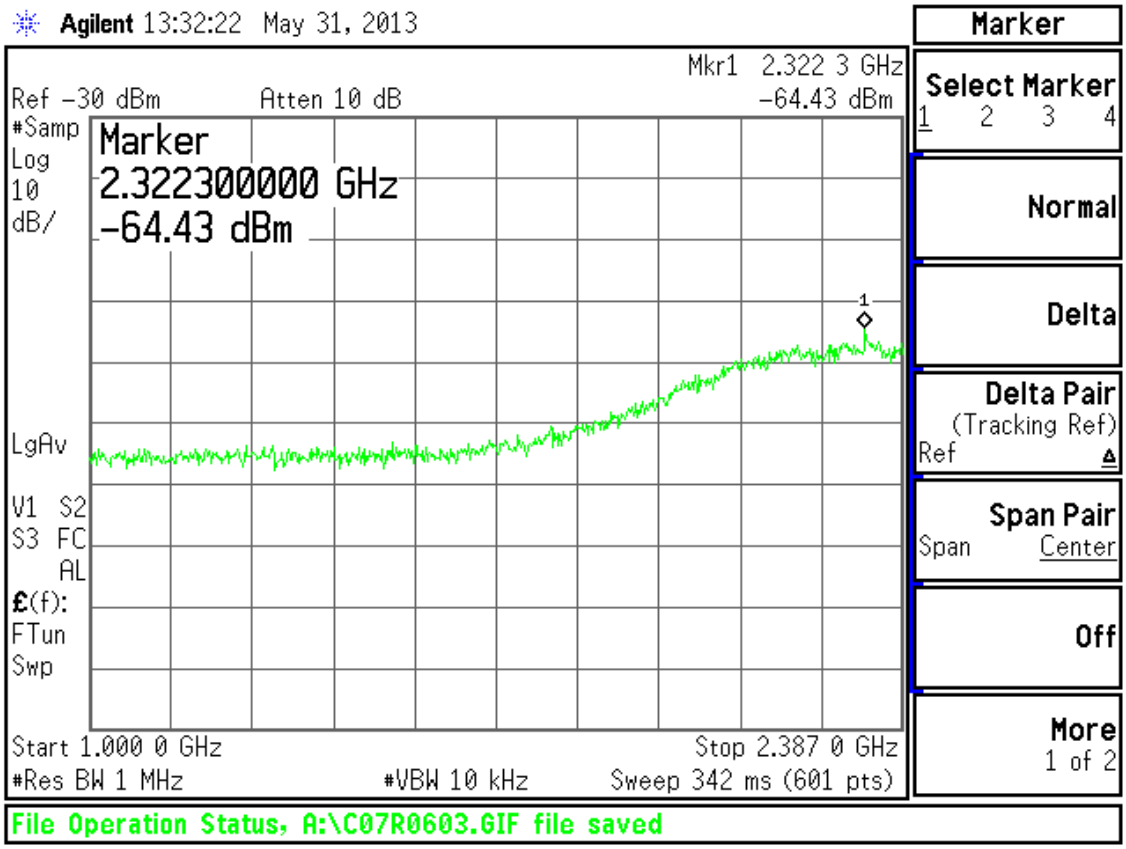
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



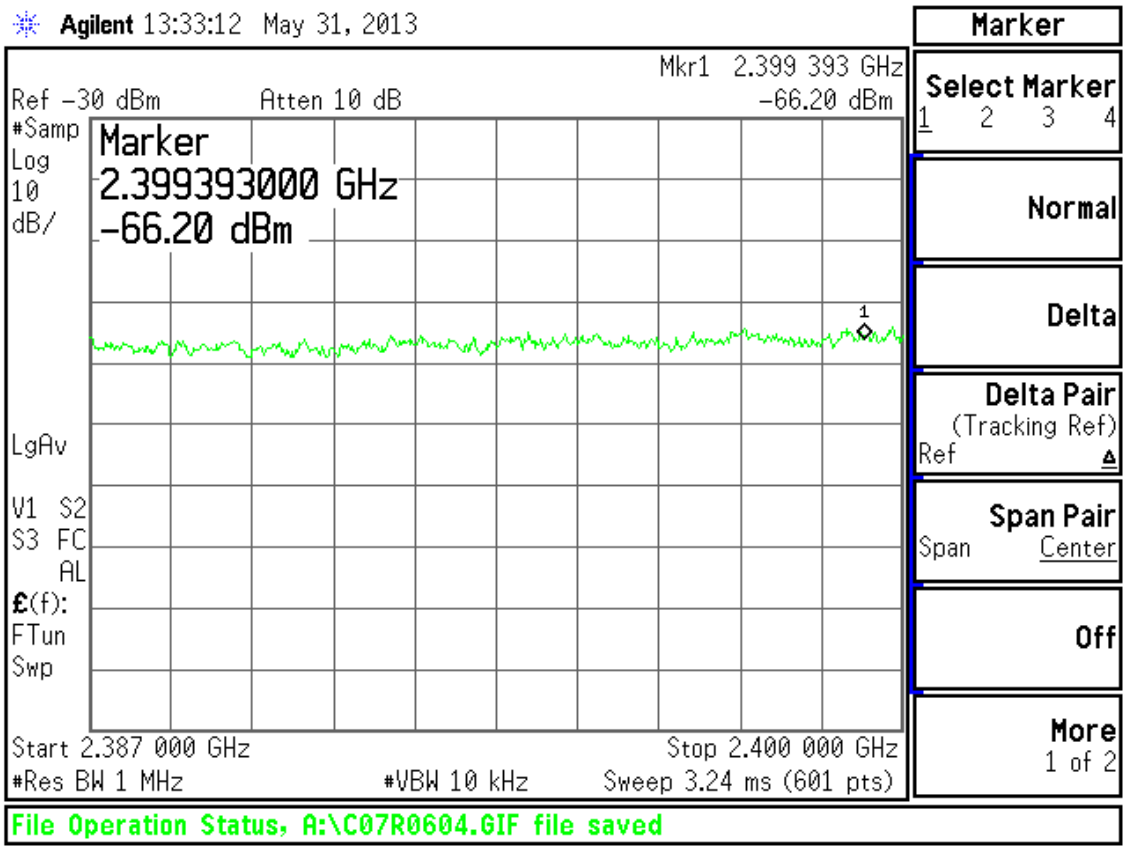
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



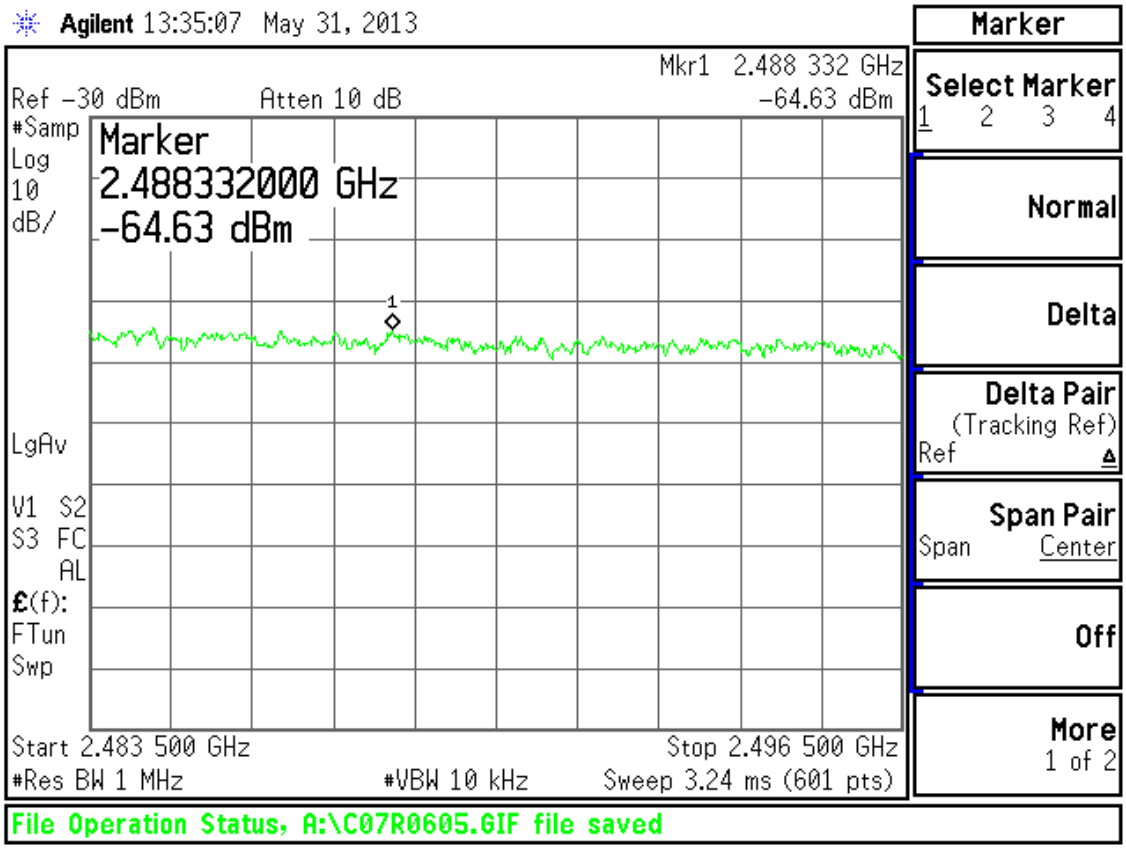
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



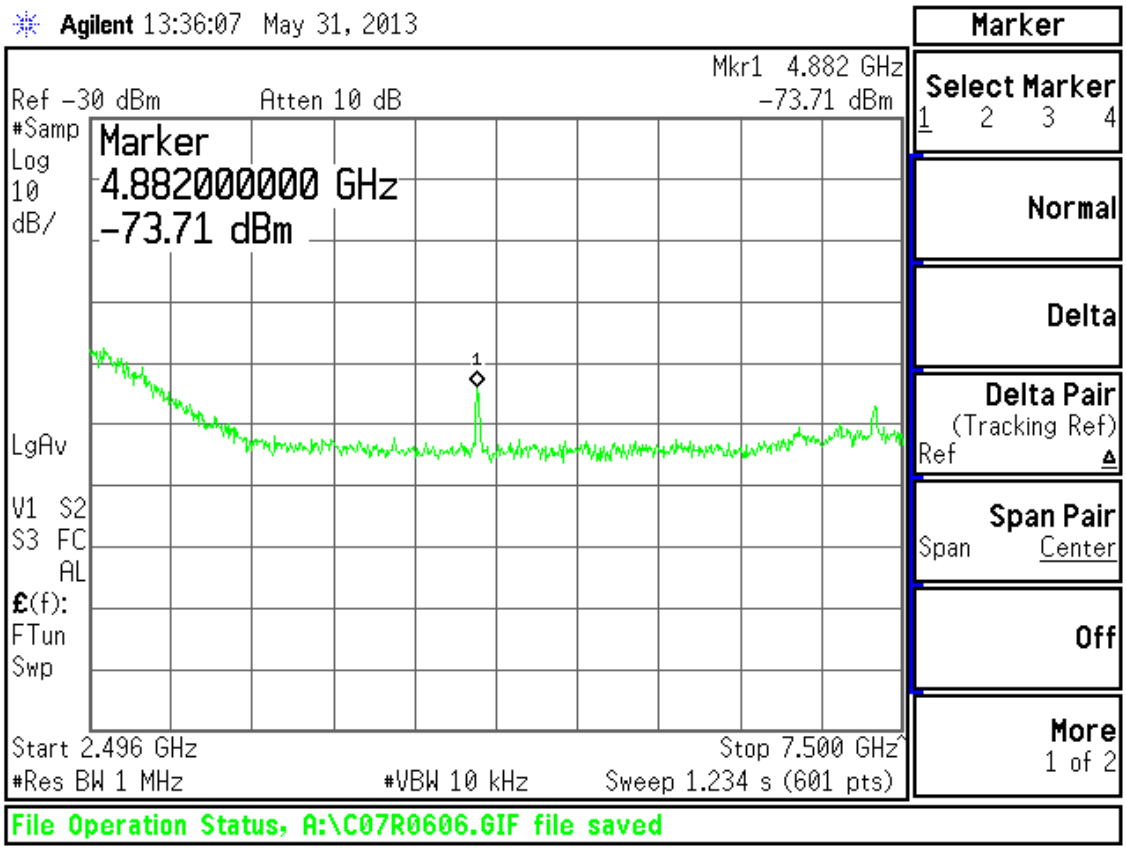
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



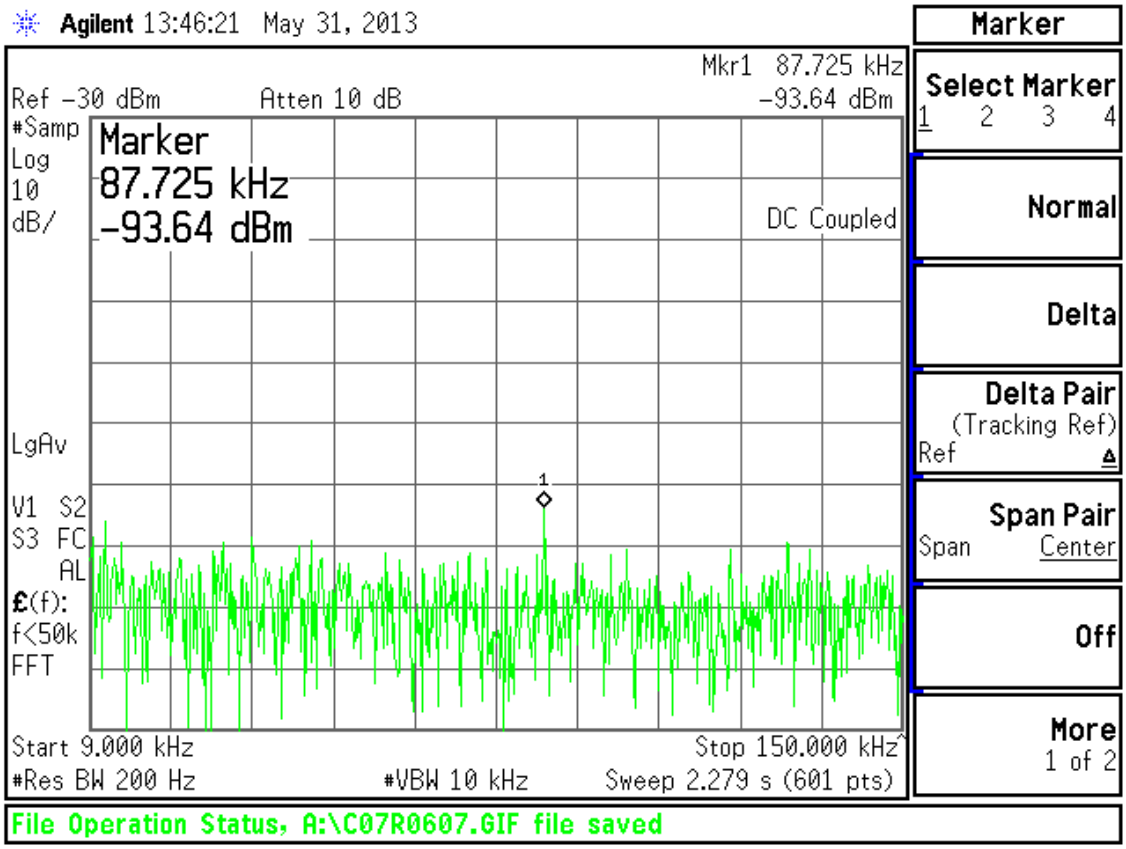
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



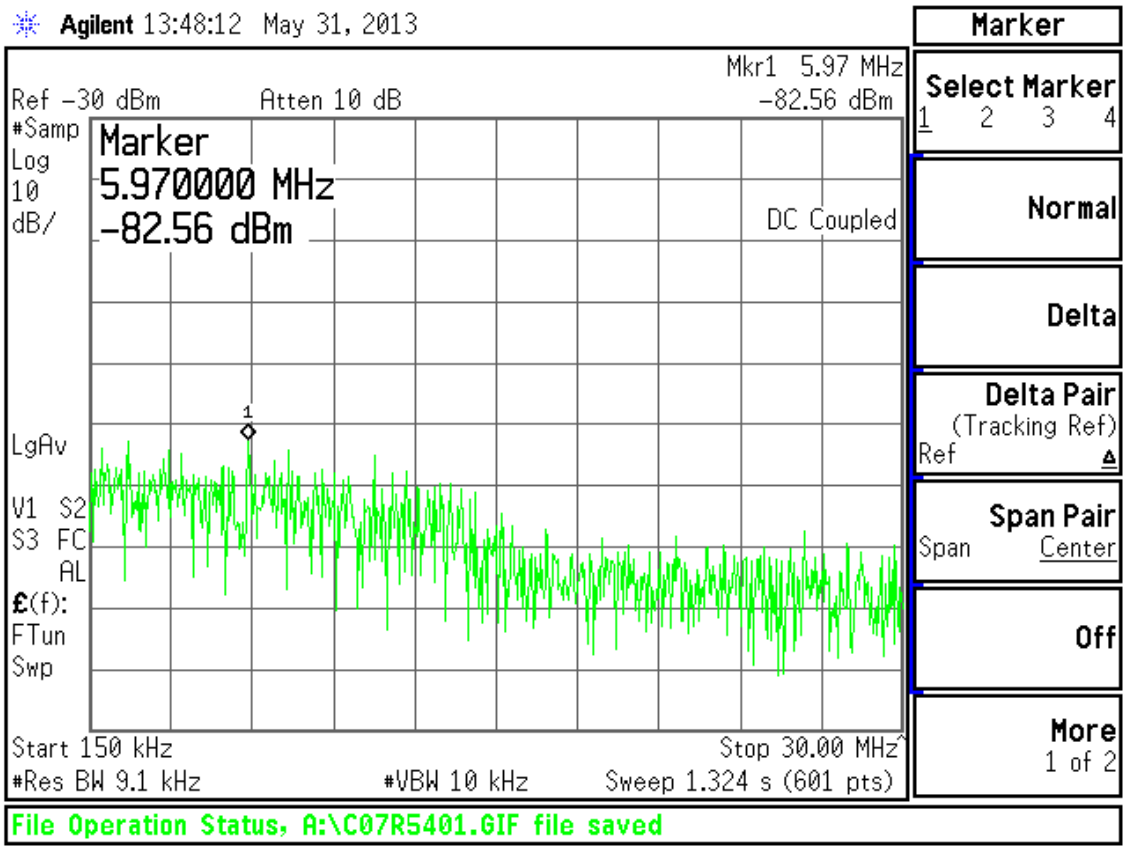
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



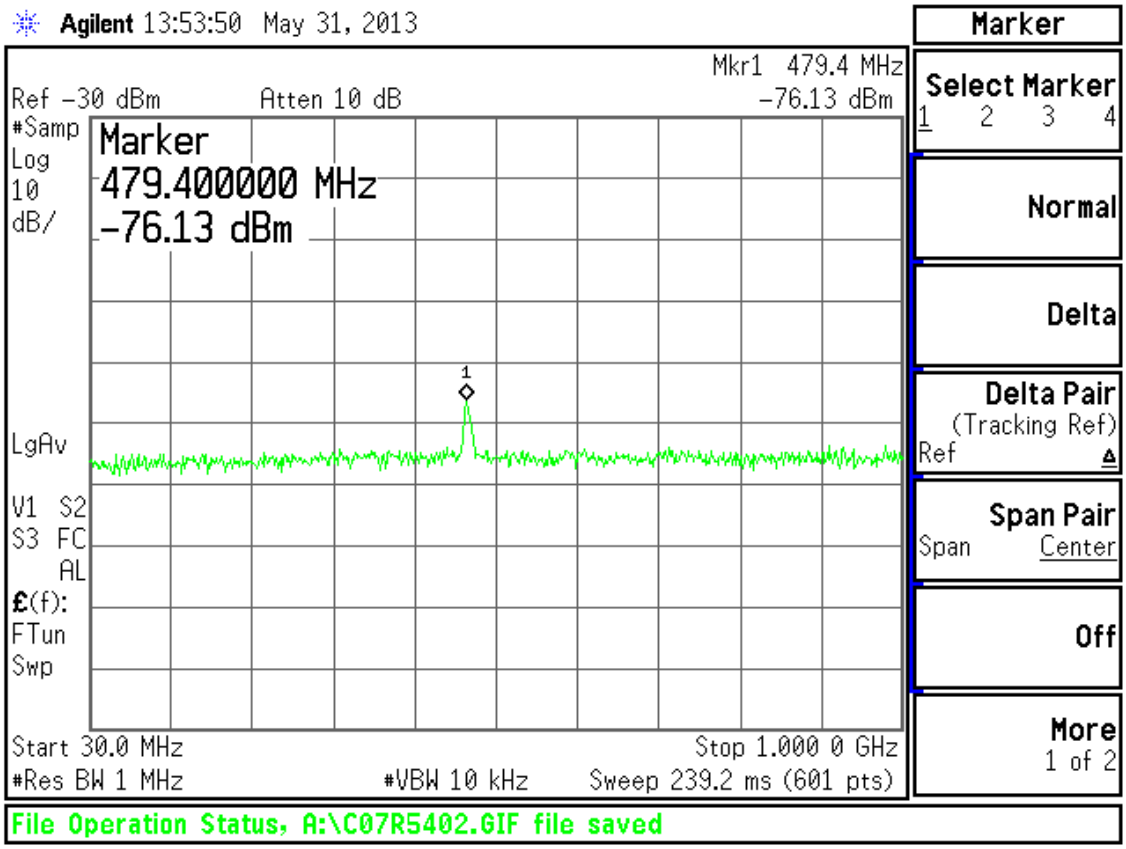
CH 7 802.11g Tx Conducted Emissions @ 6Mbps



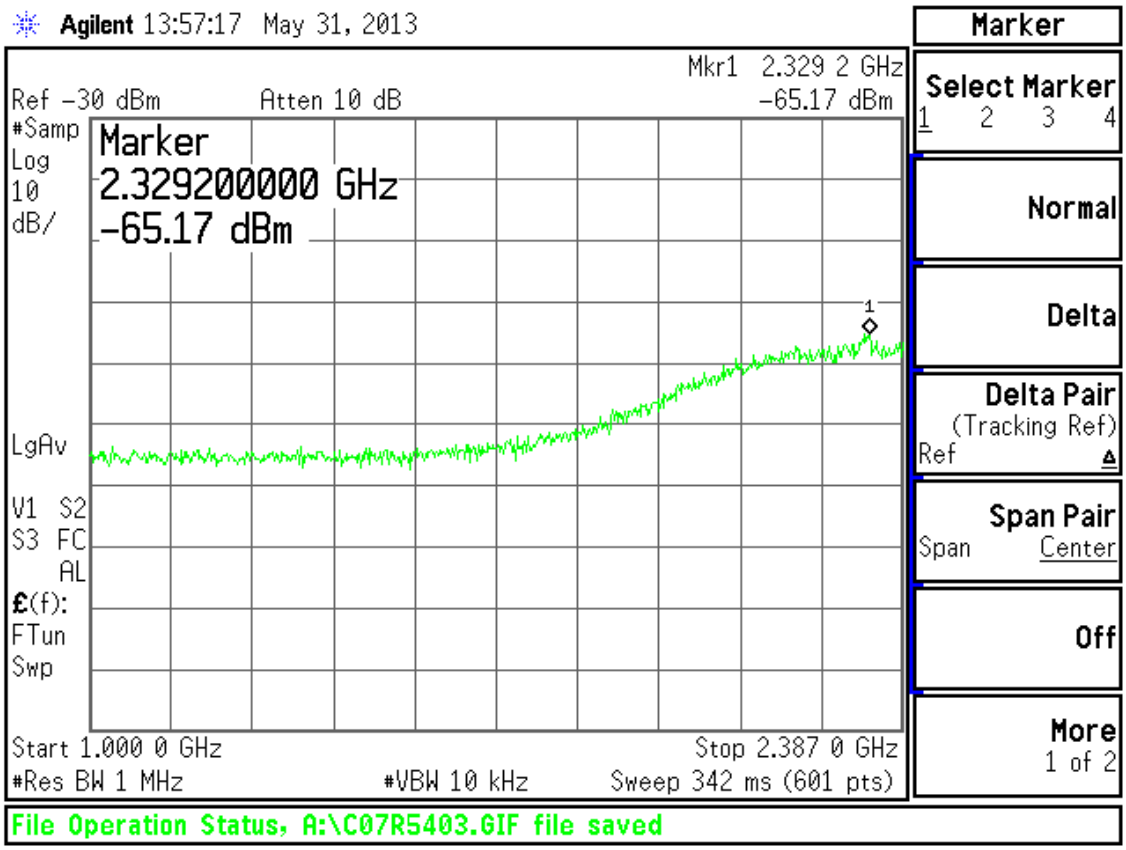
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



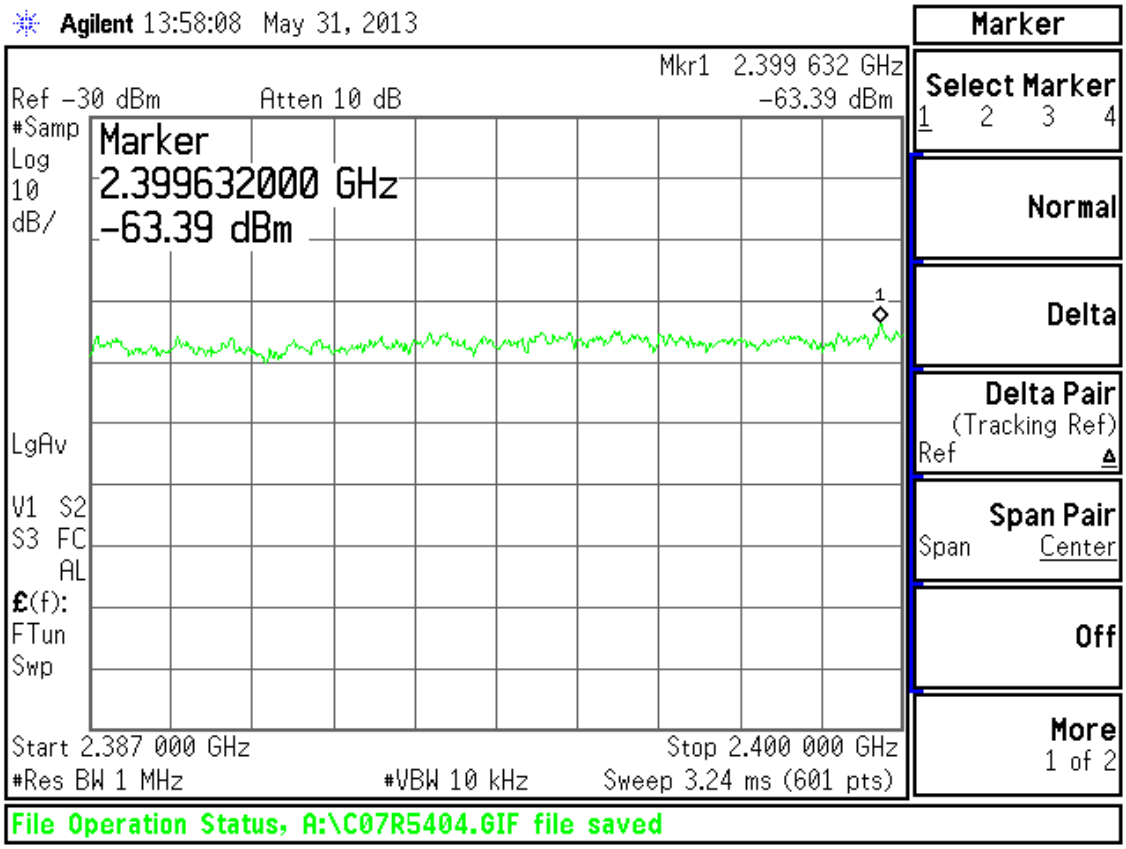
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



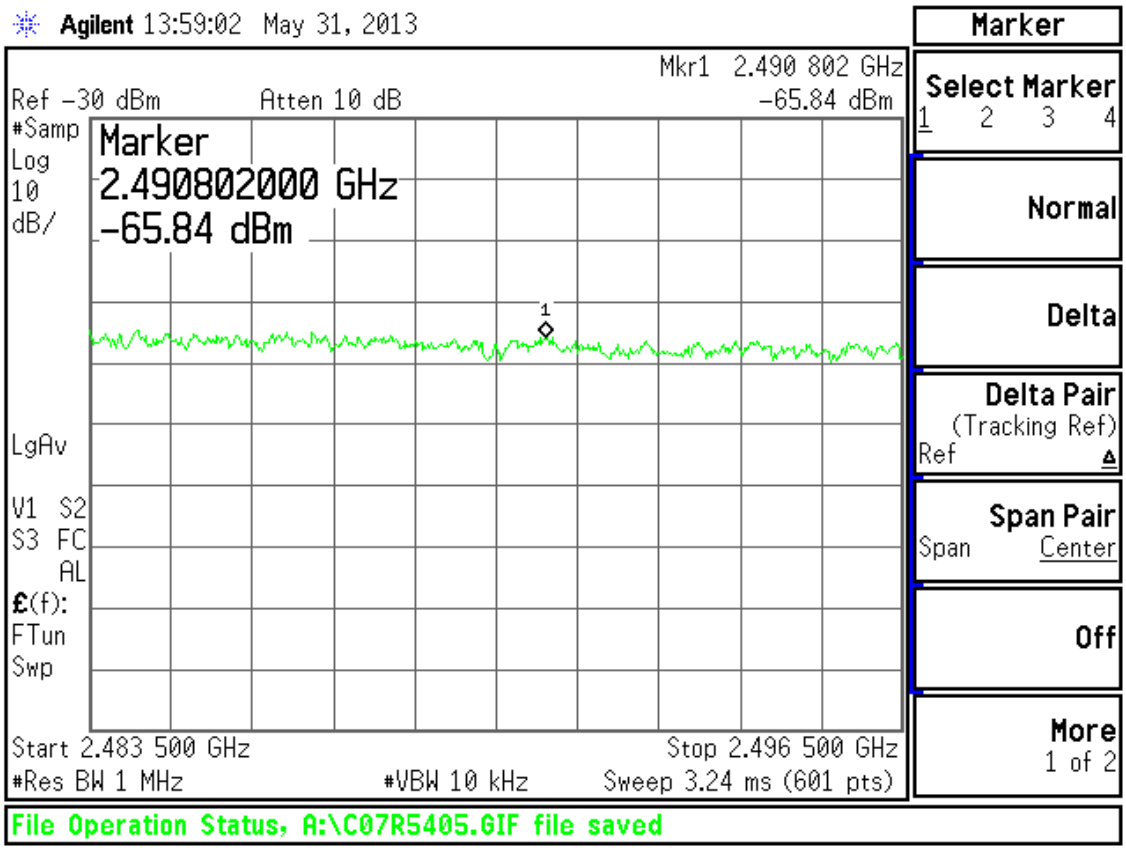
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



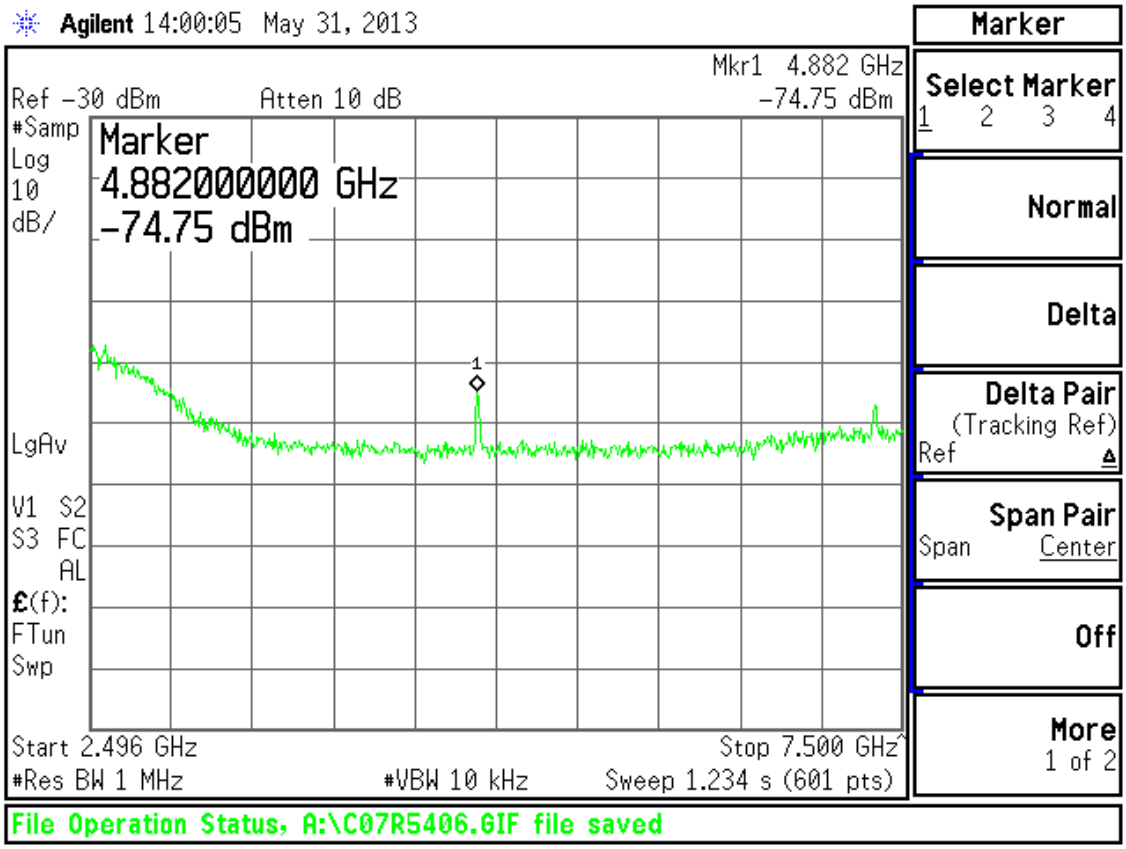
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



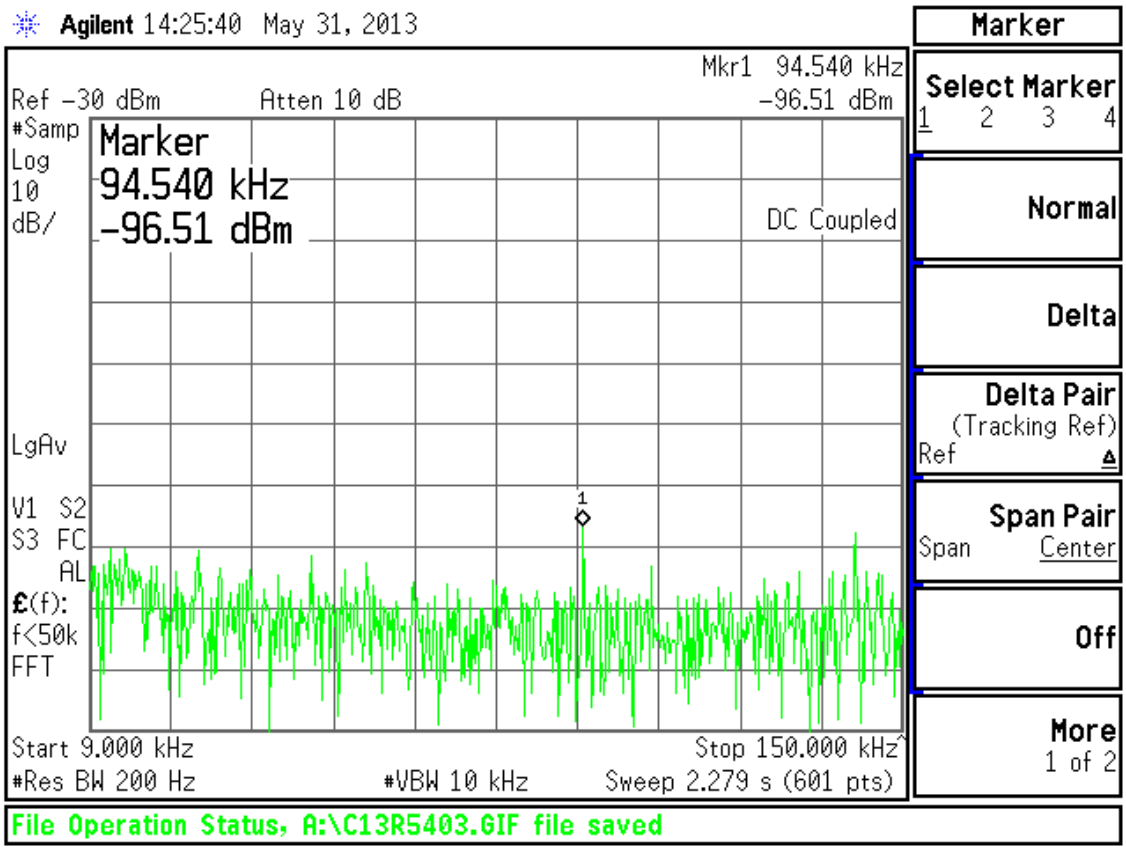
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



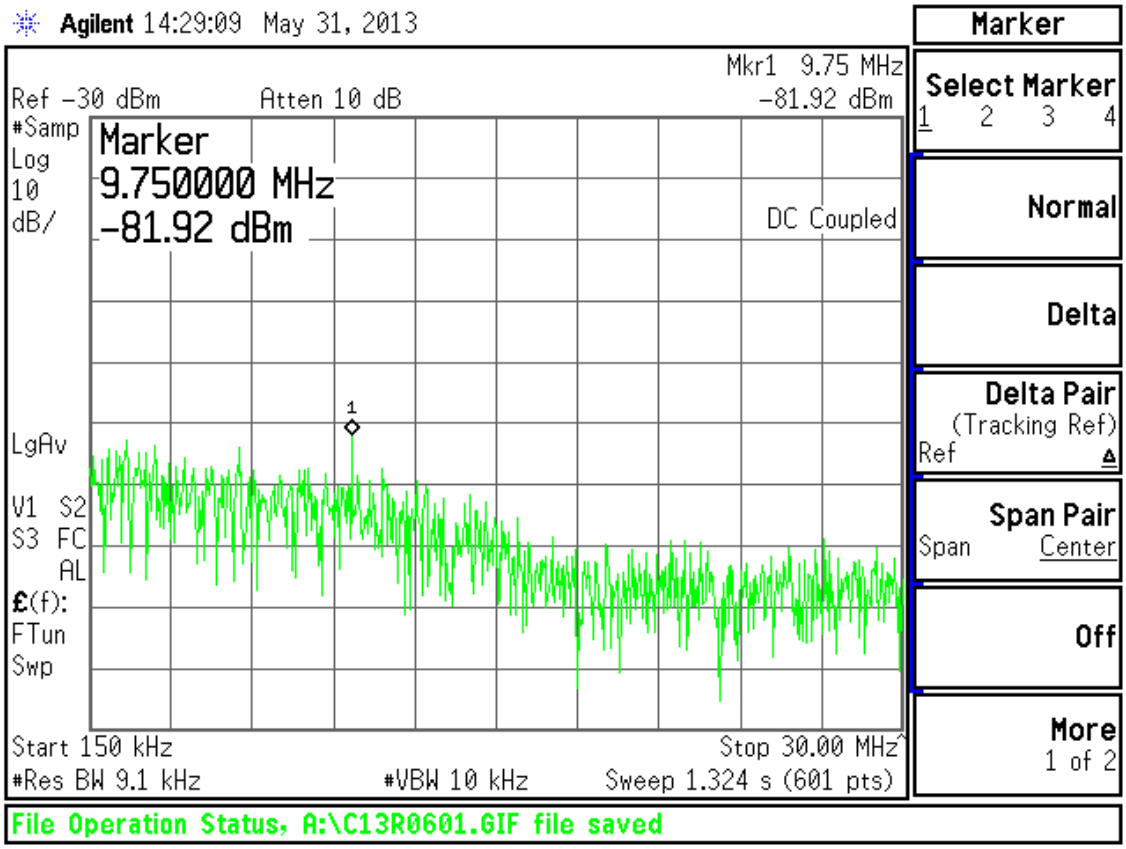
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



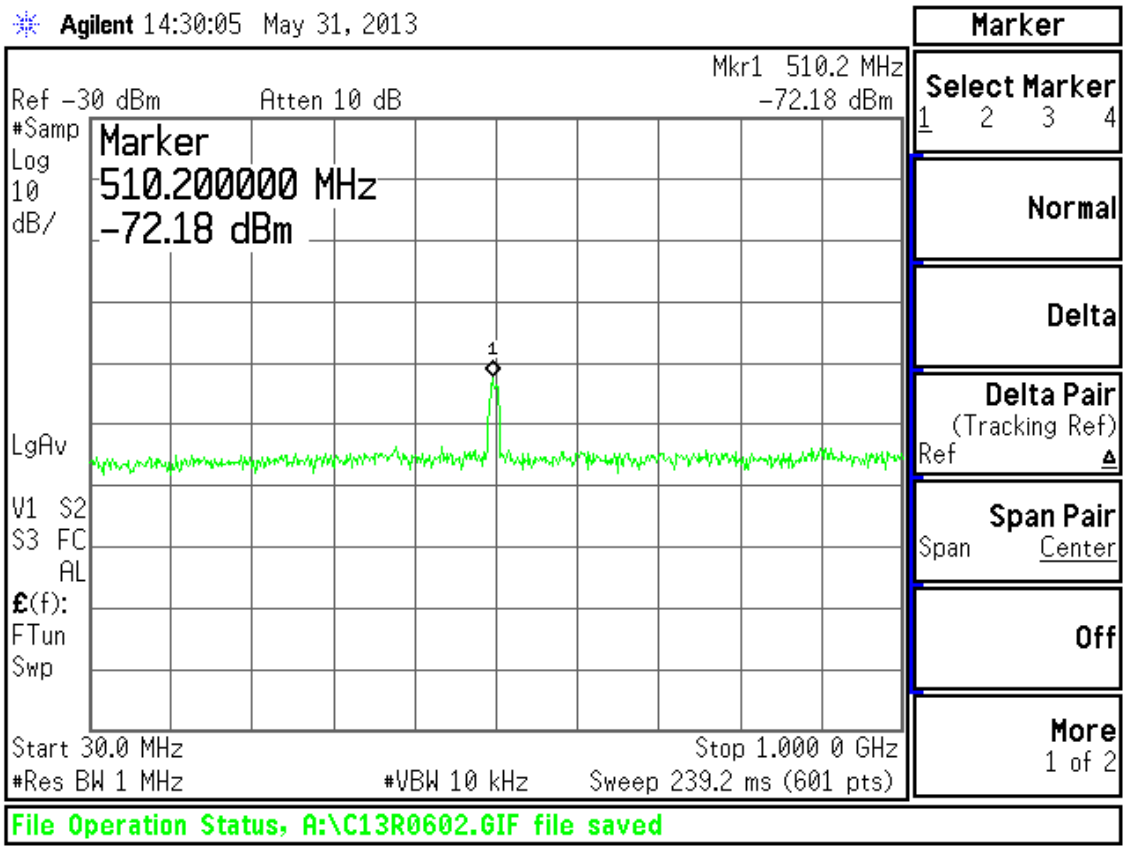
CH 7 802.11g Tx Conducted Emissions @ 54Mbps



CH 13 802.11g Tx Conducted Emissions @ 6Mbps



CH 13 802.11g Tx Conducted Emissions @ 6Mbps



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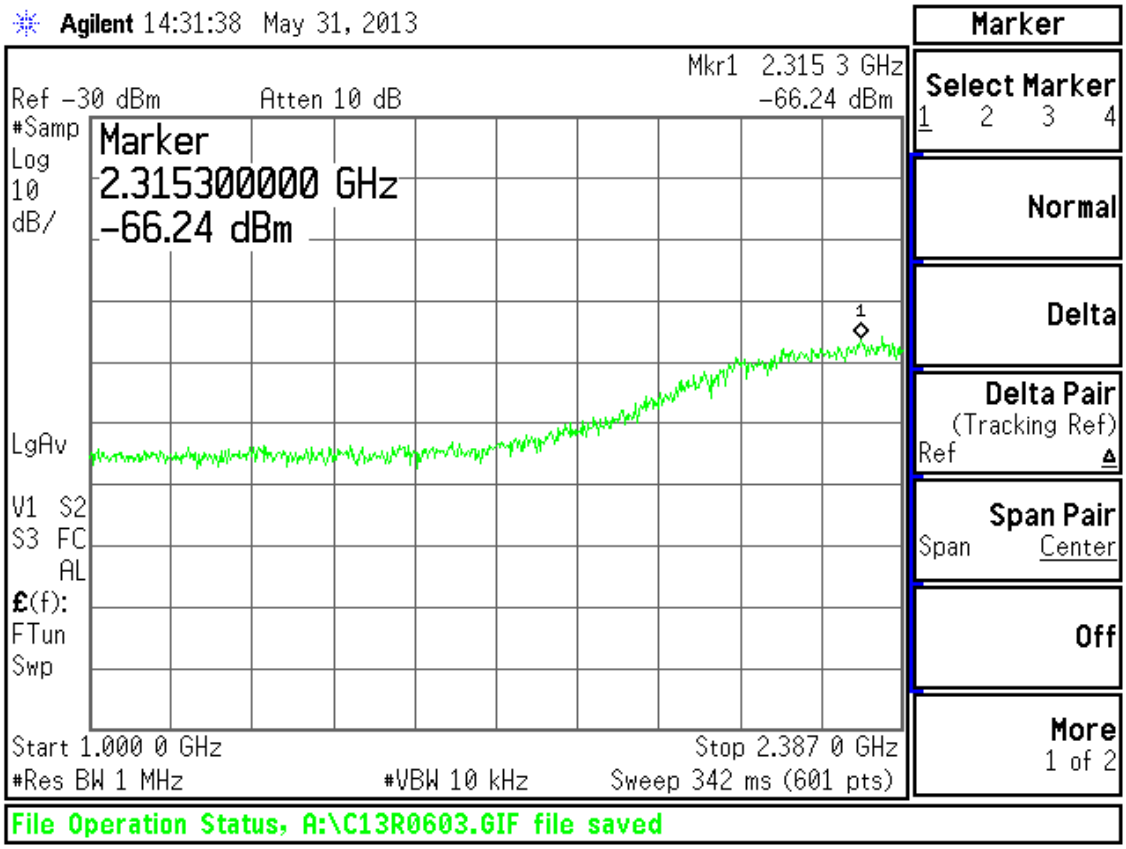

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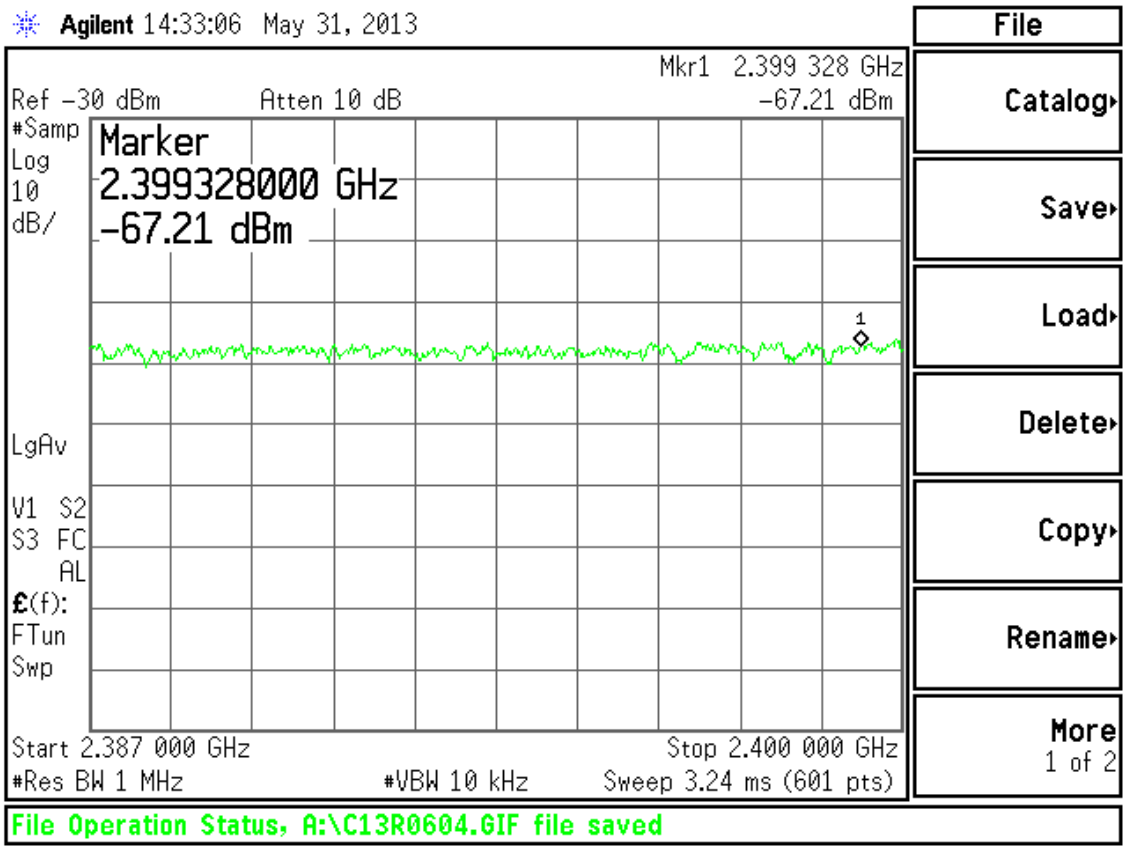
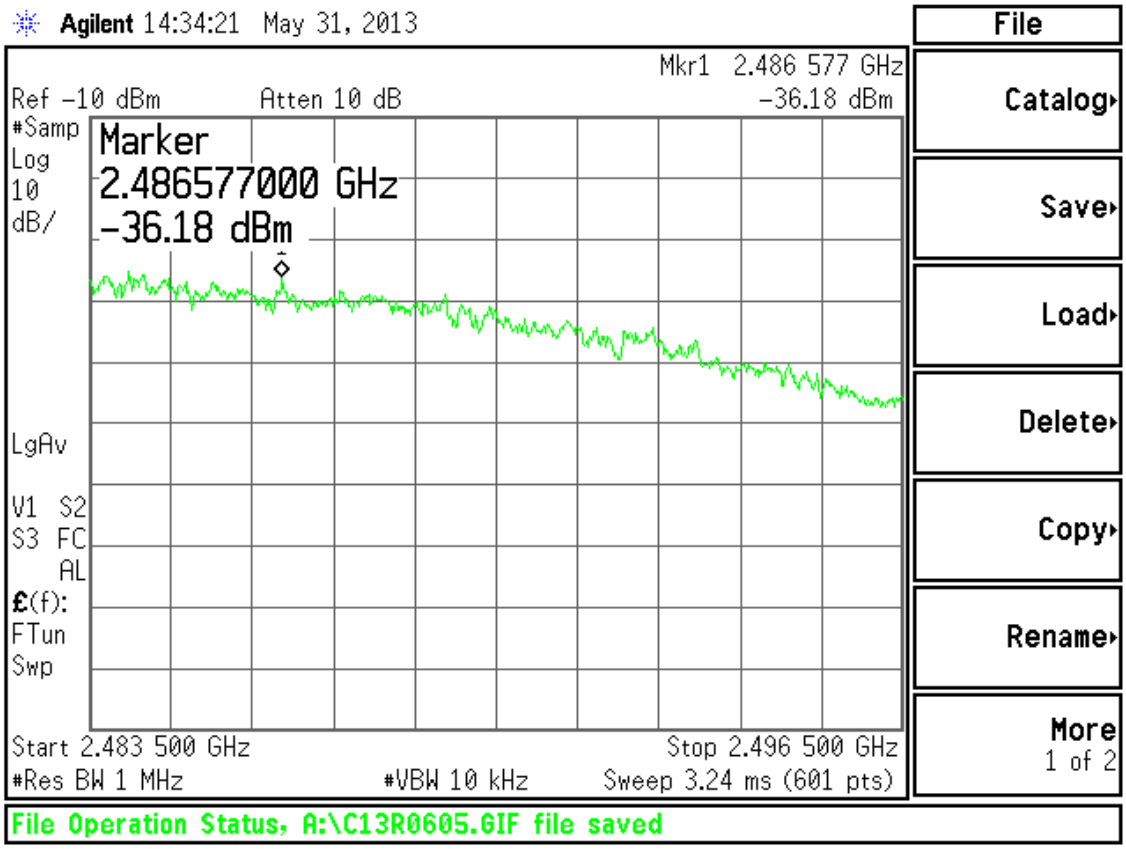
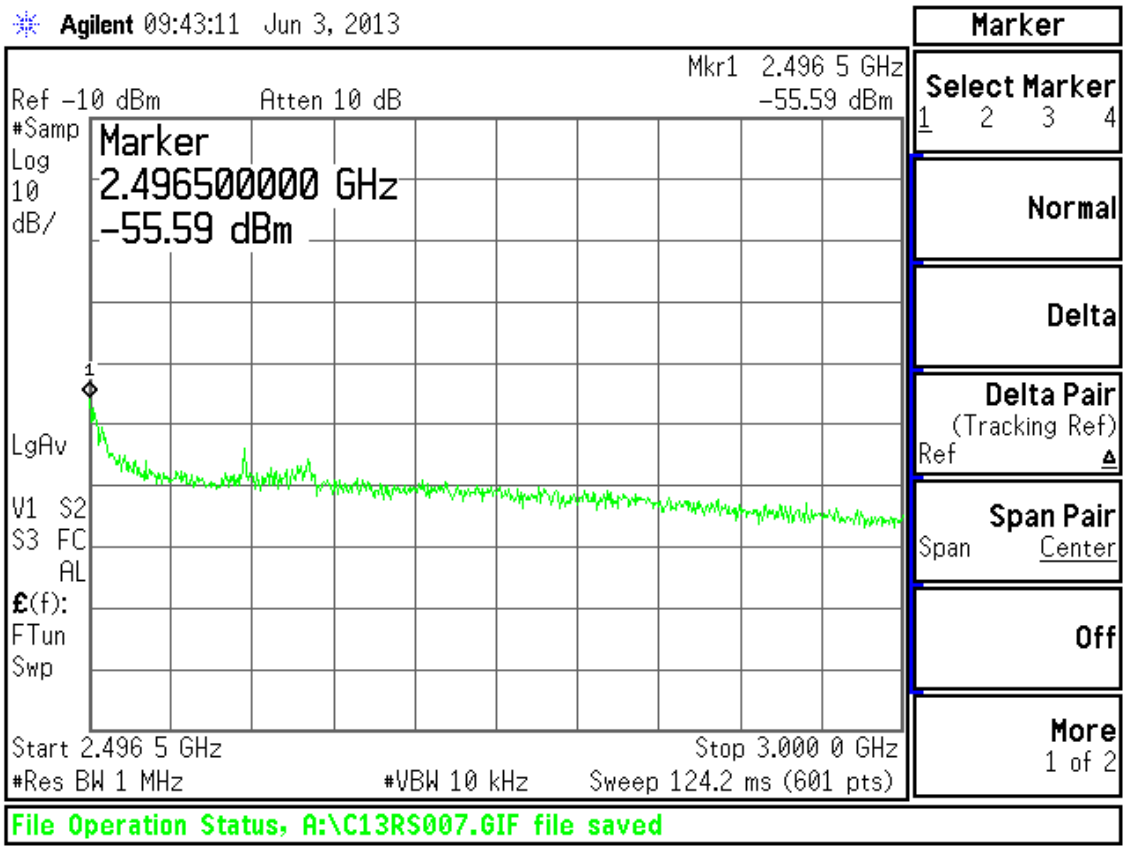


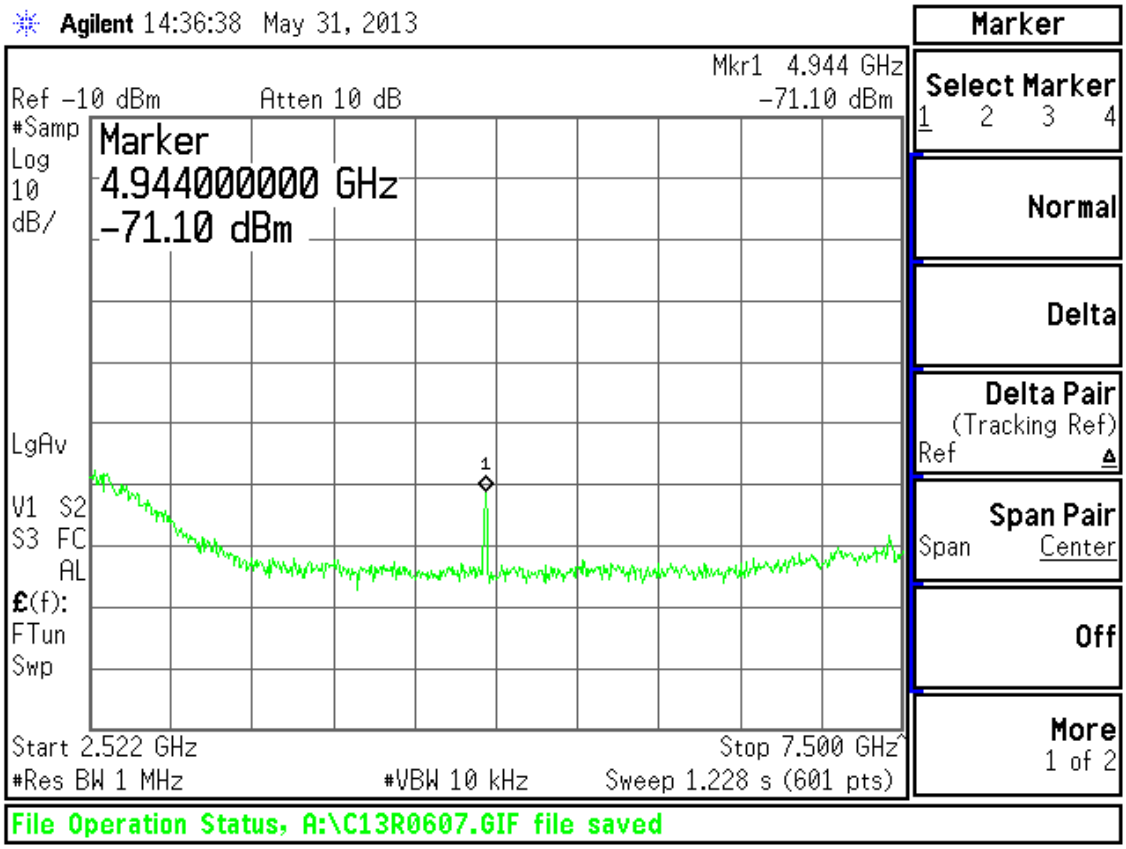
CH 13 802.11g Tx Conducted Emissions @ 6Mbps



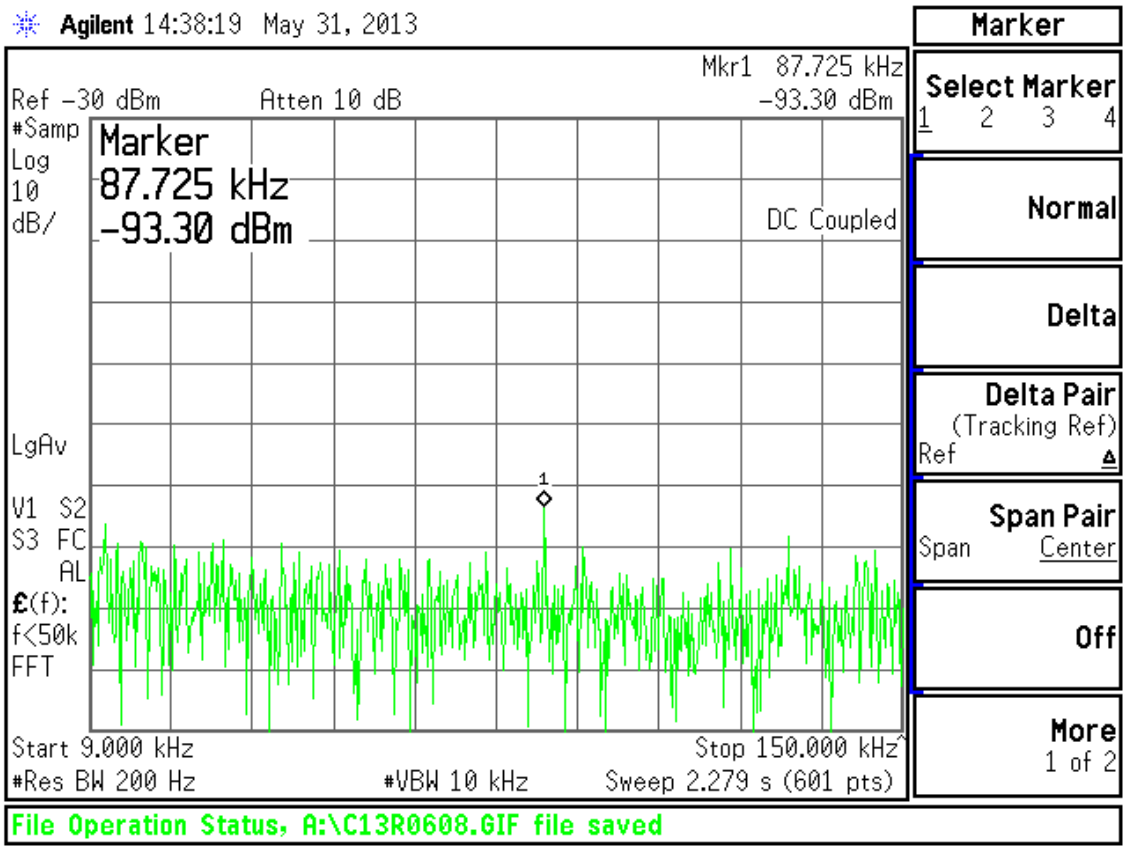
CH 13 802.11g Tx Conducted Emissions @ 6Mbps



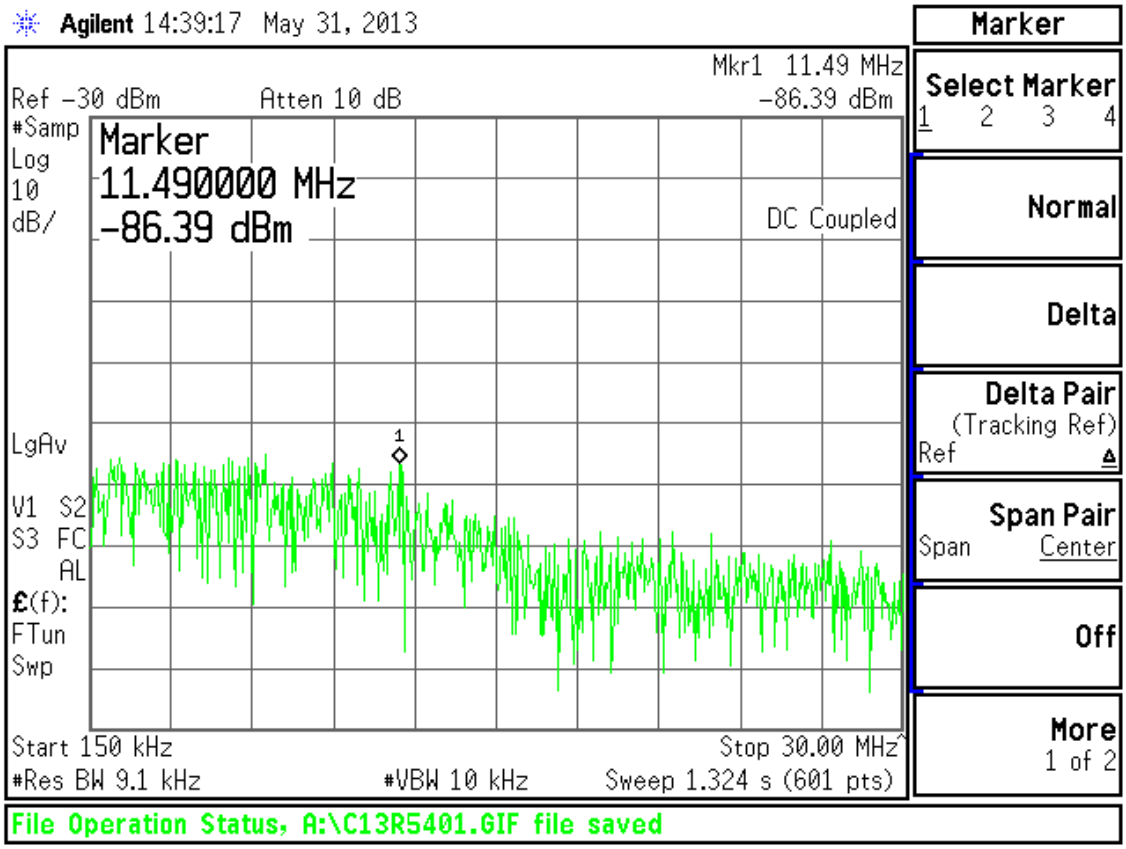
CH 13 802.11g Tx Conducted Emissions @ 6Mbps



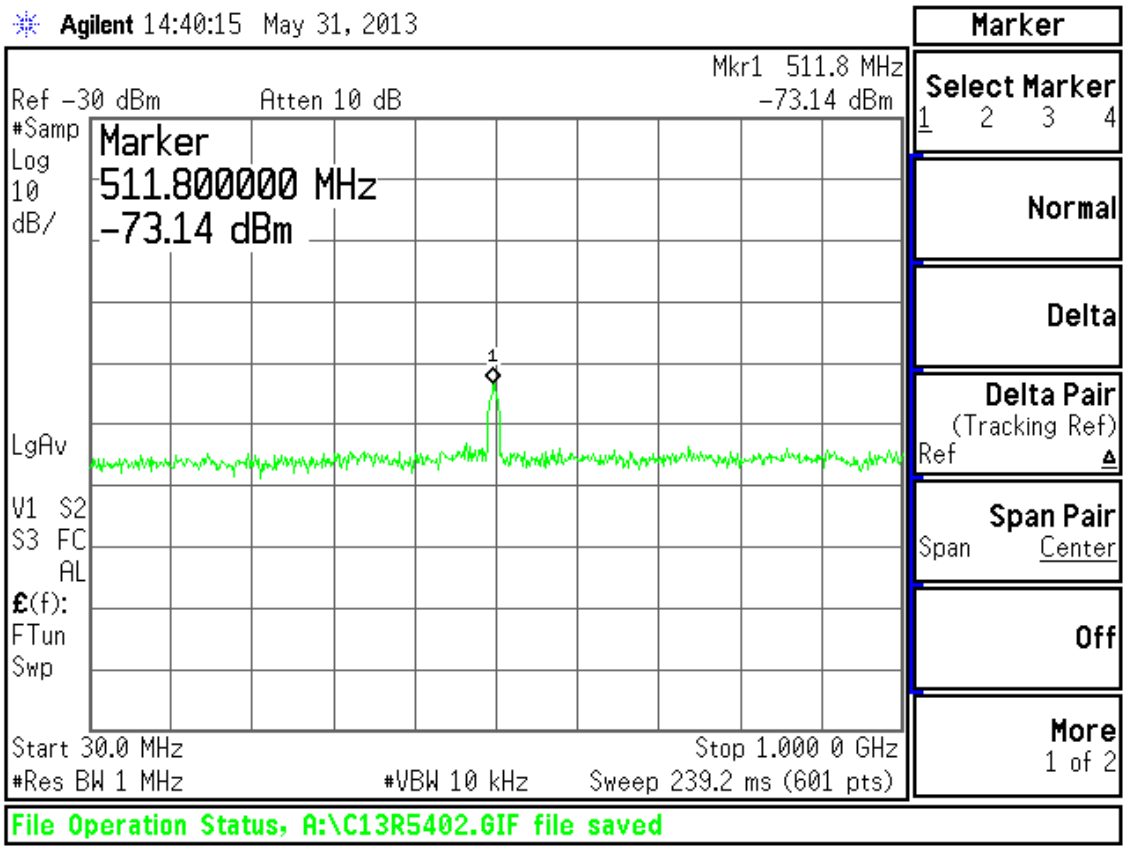
CH 13 802.11g Tx Conducted Emissions @ 6Mbps



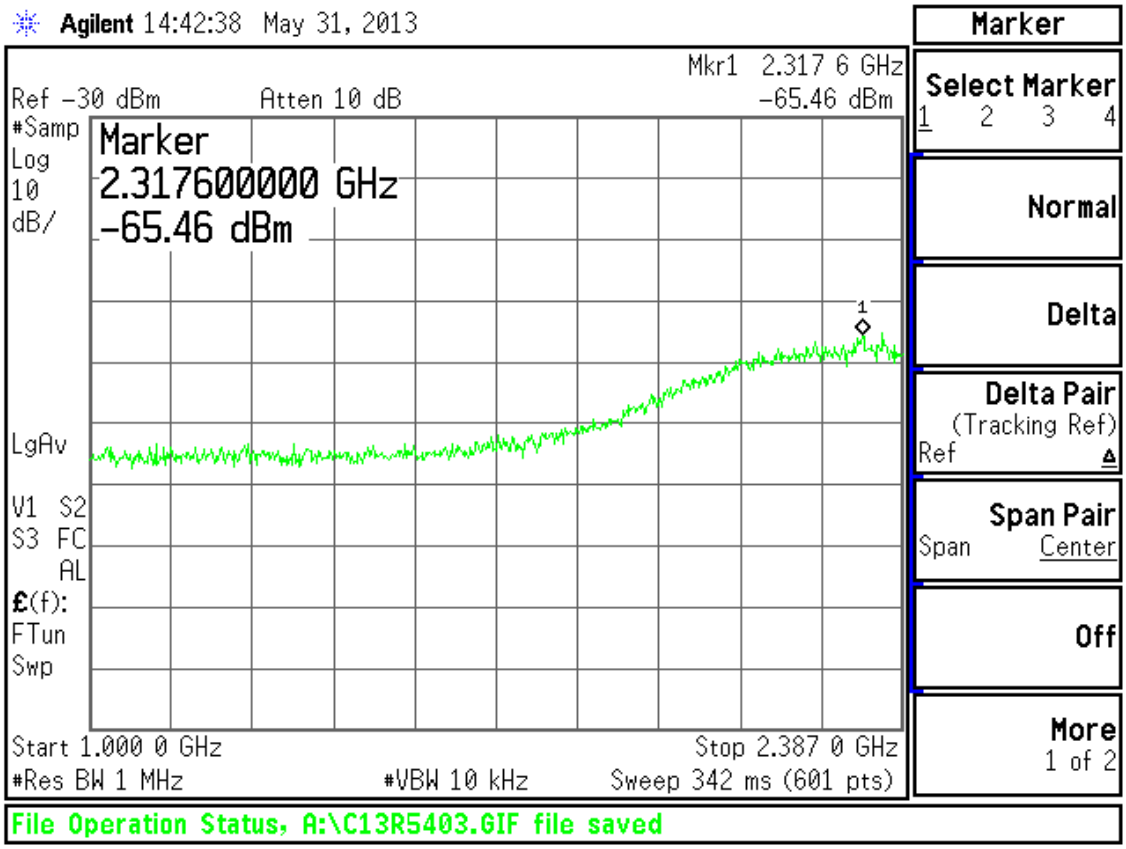
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



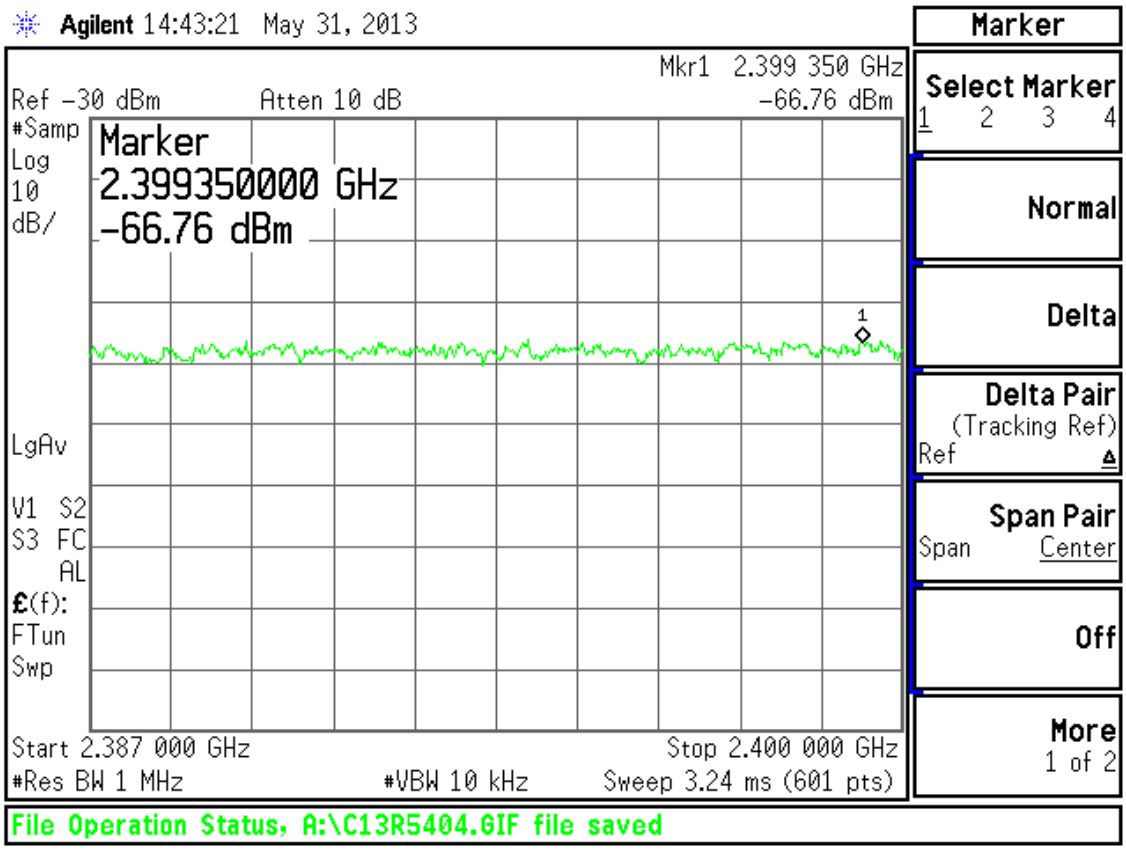
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



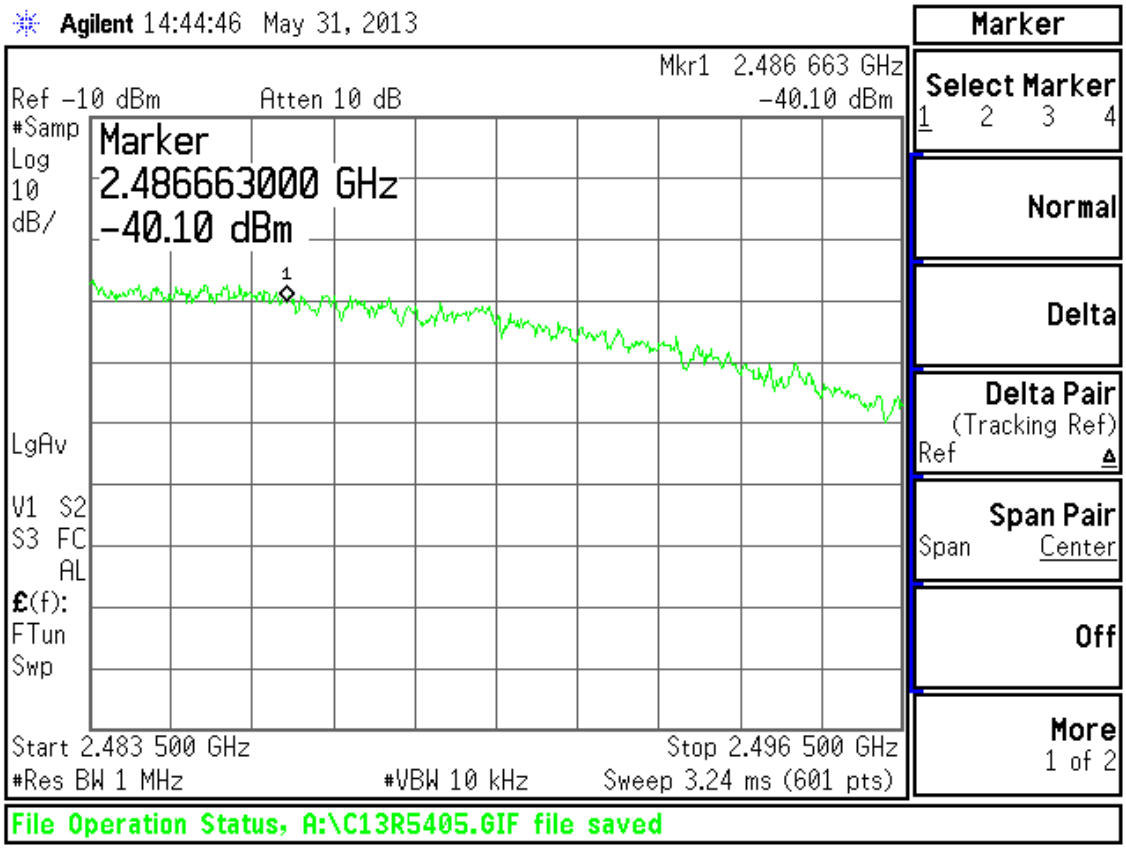
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



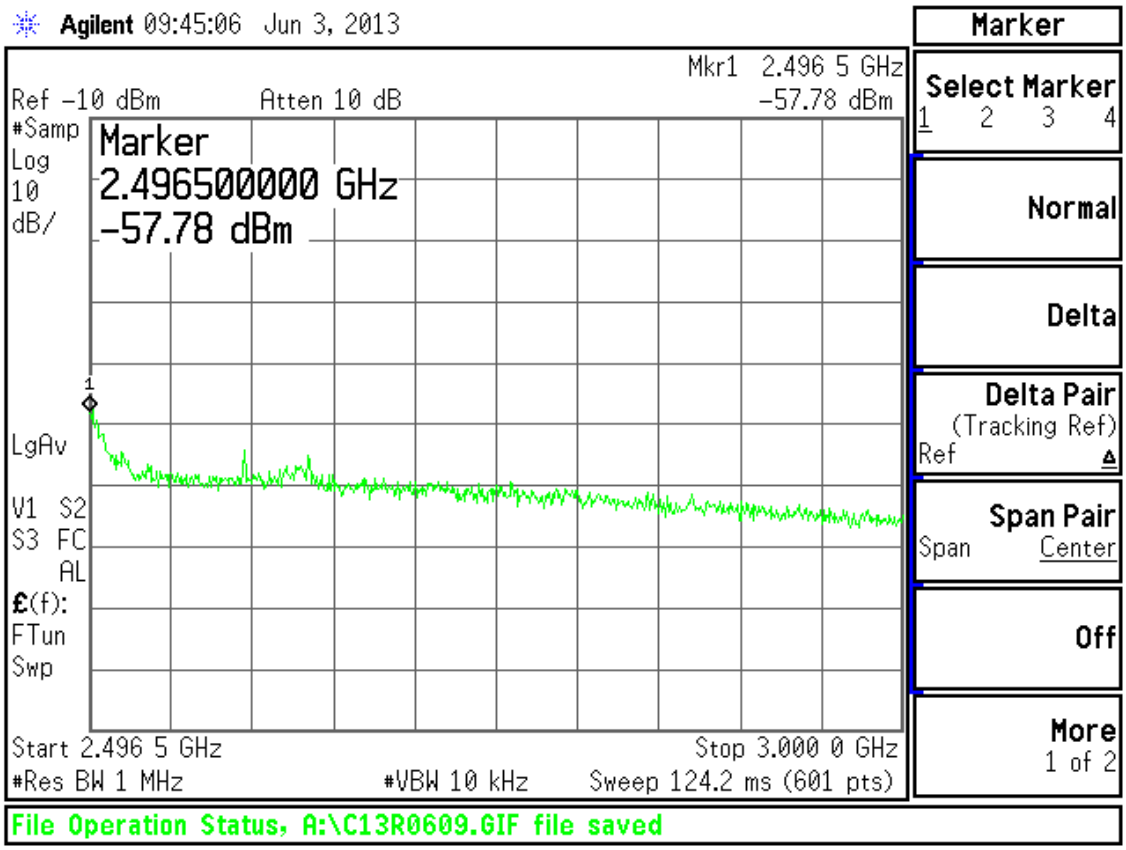
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



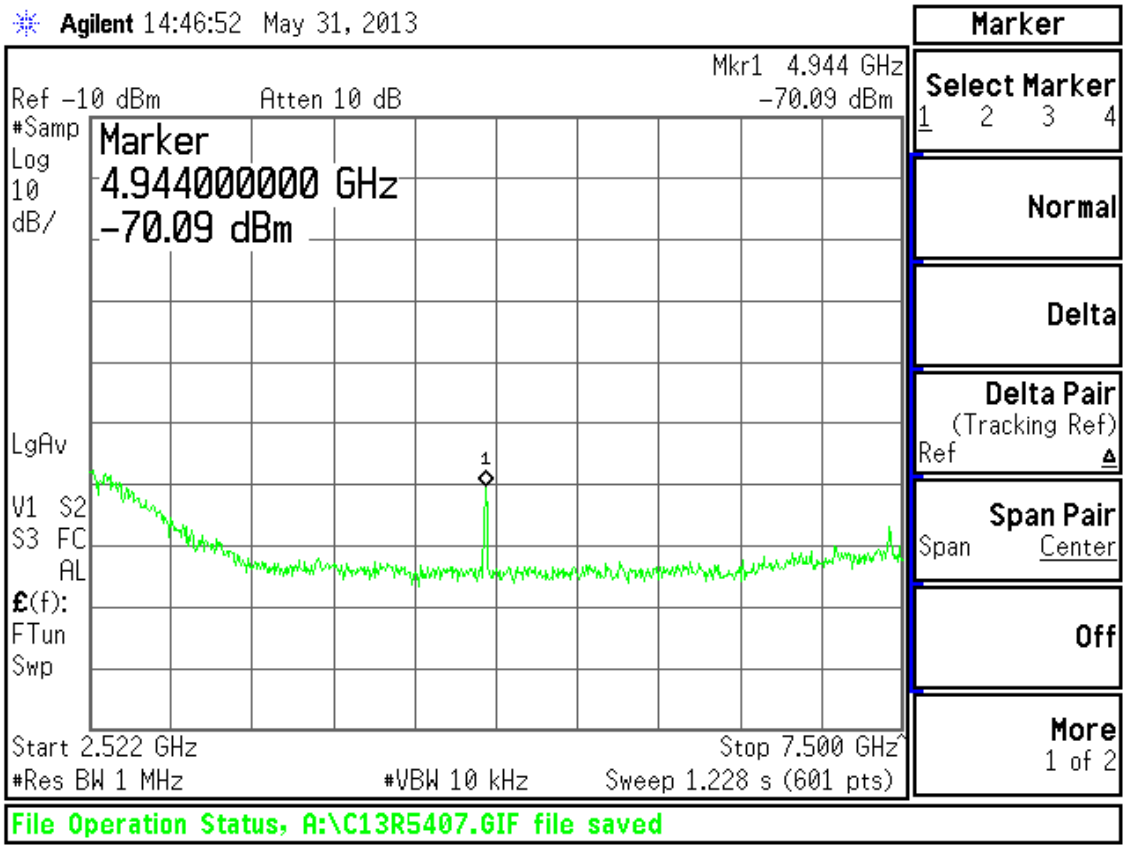
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



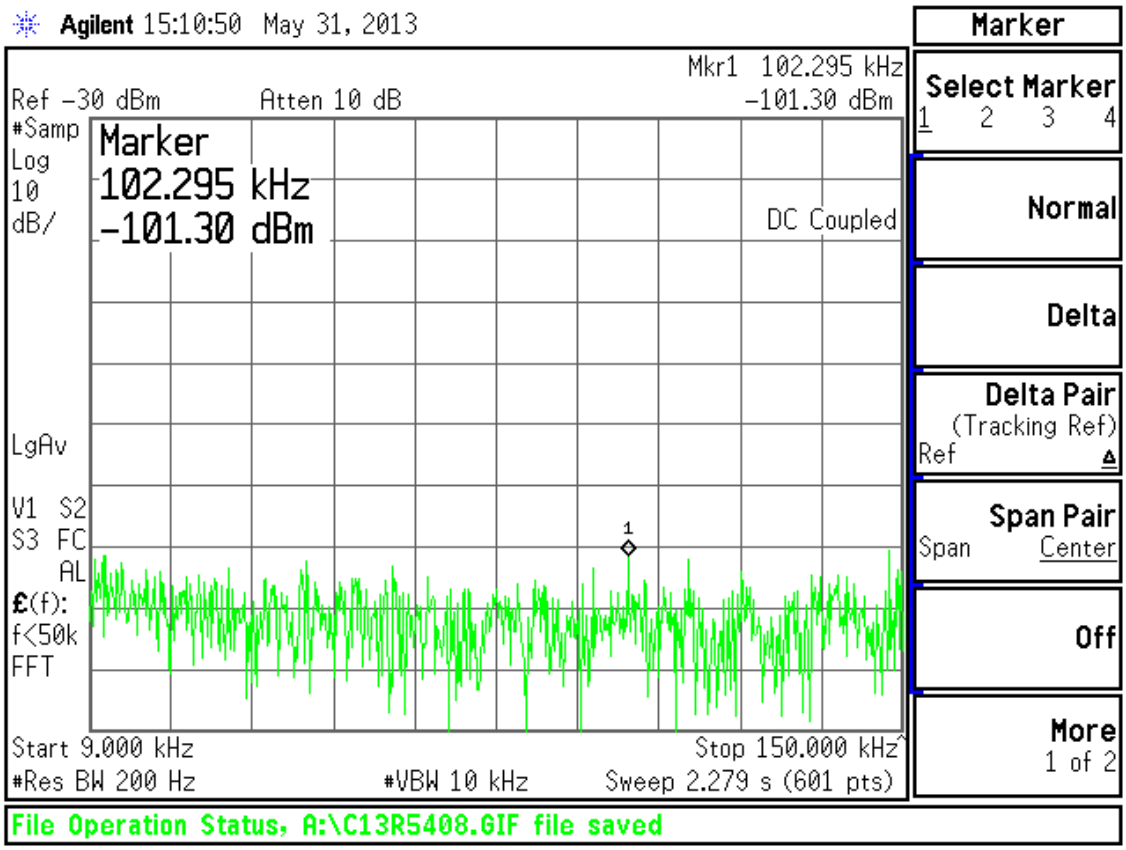
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



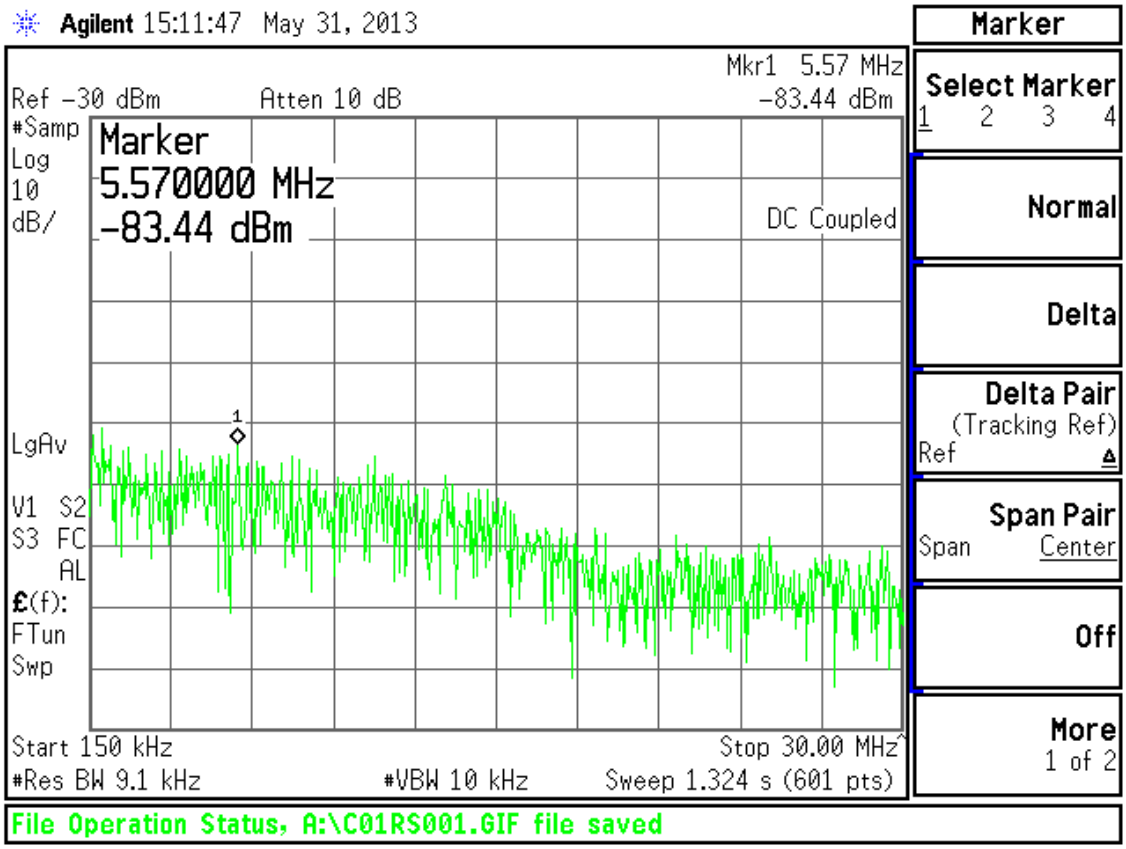
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



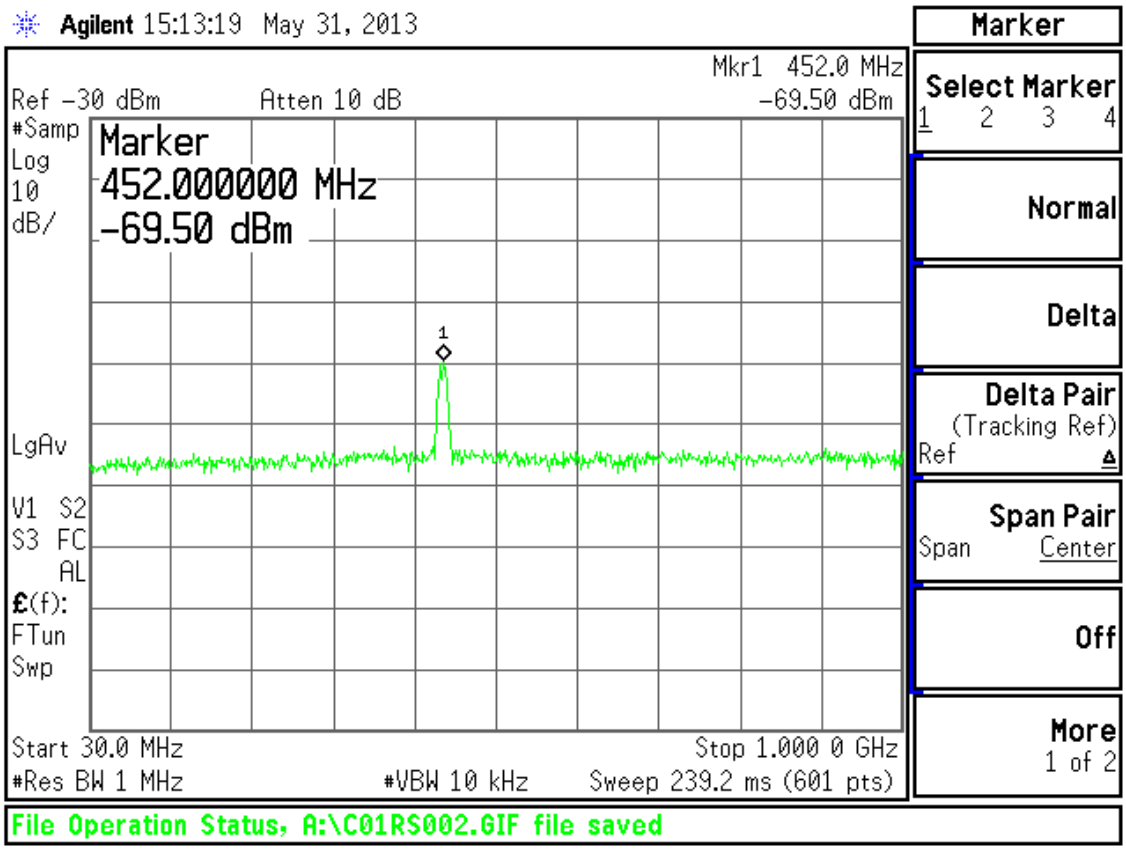
CH 13 802.11g Tx Conducted Emissions @ 54Mbps



CH 1 802.11n Tx Conducted Emissions (MCS0)



CH 1 802.11n Tx Conducted Emissions (MCS0)



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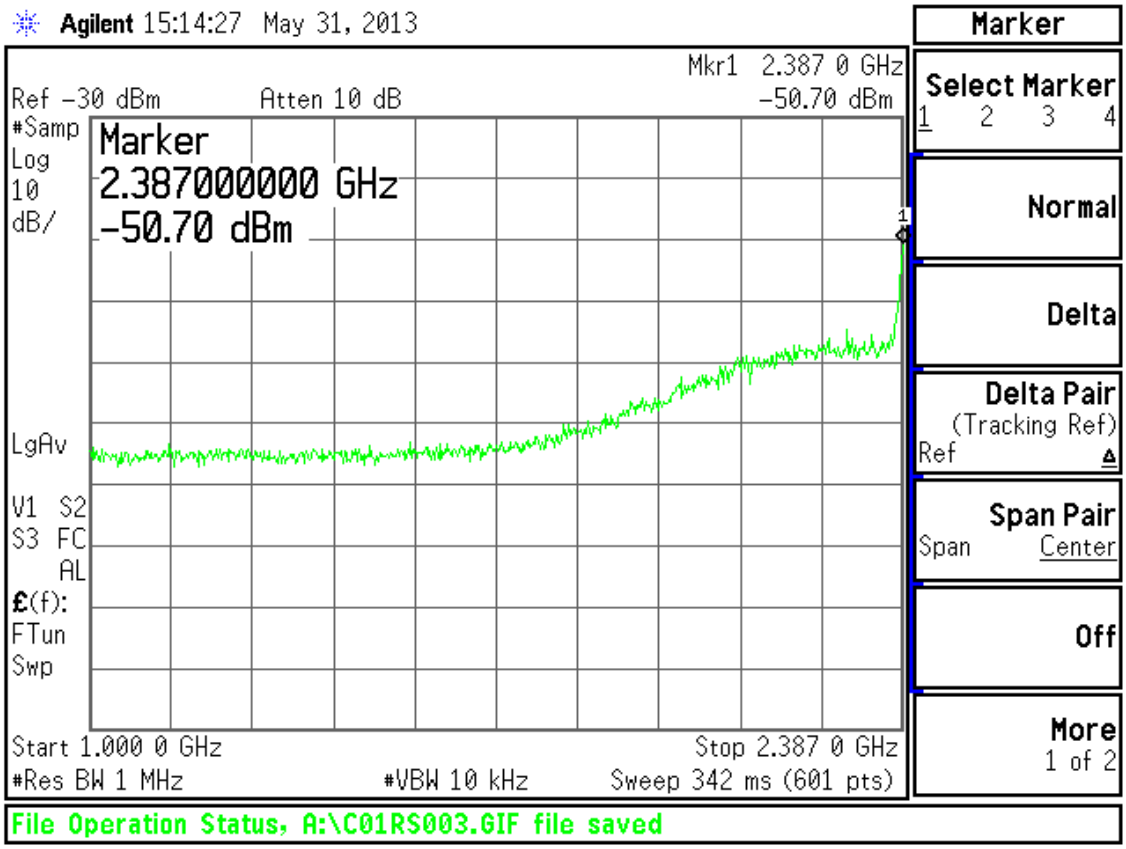

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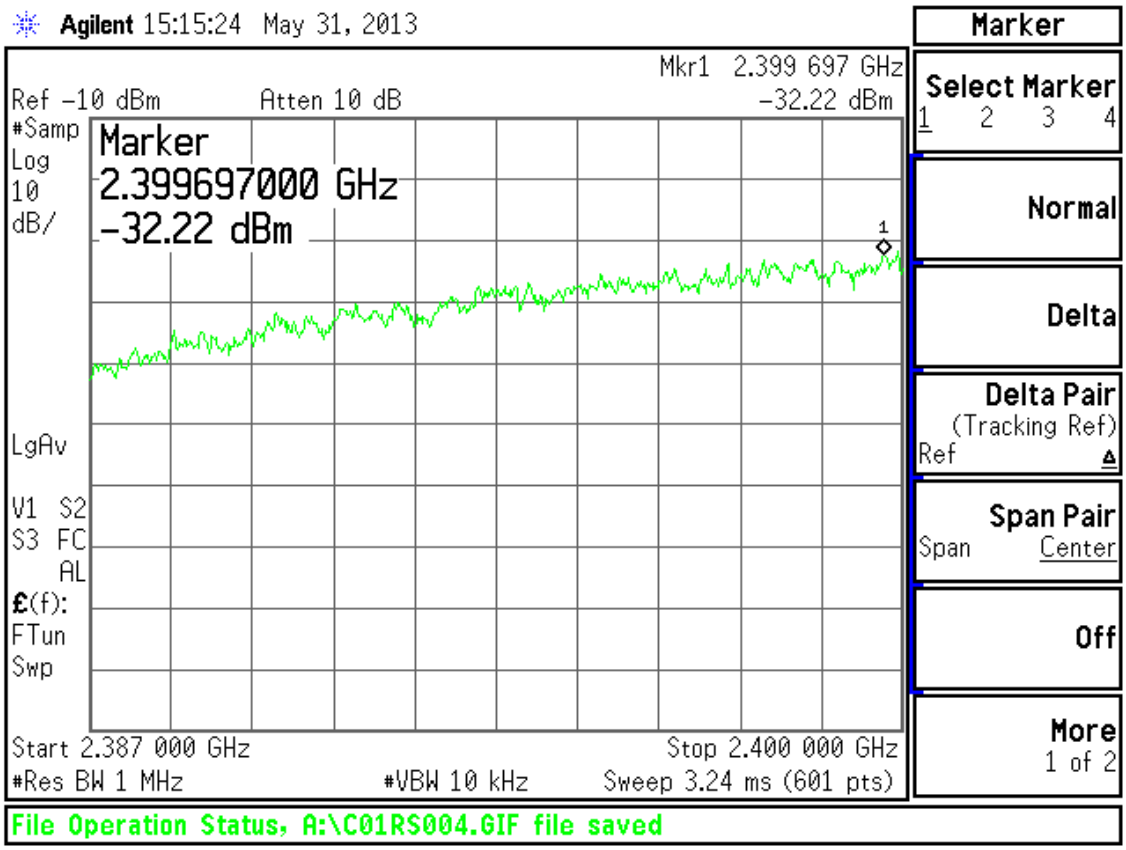

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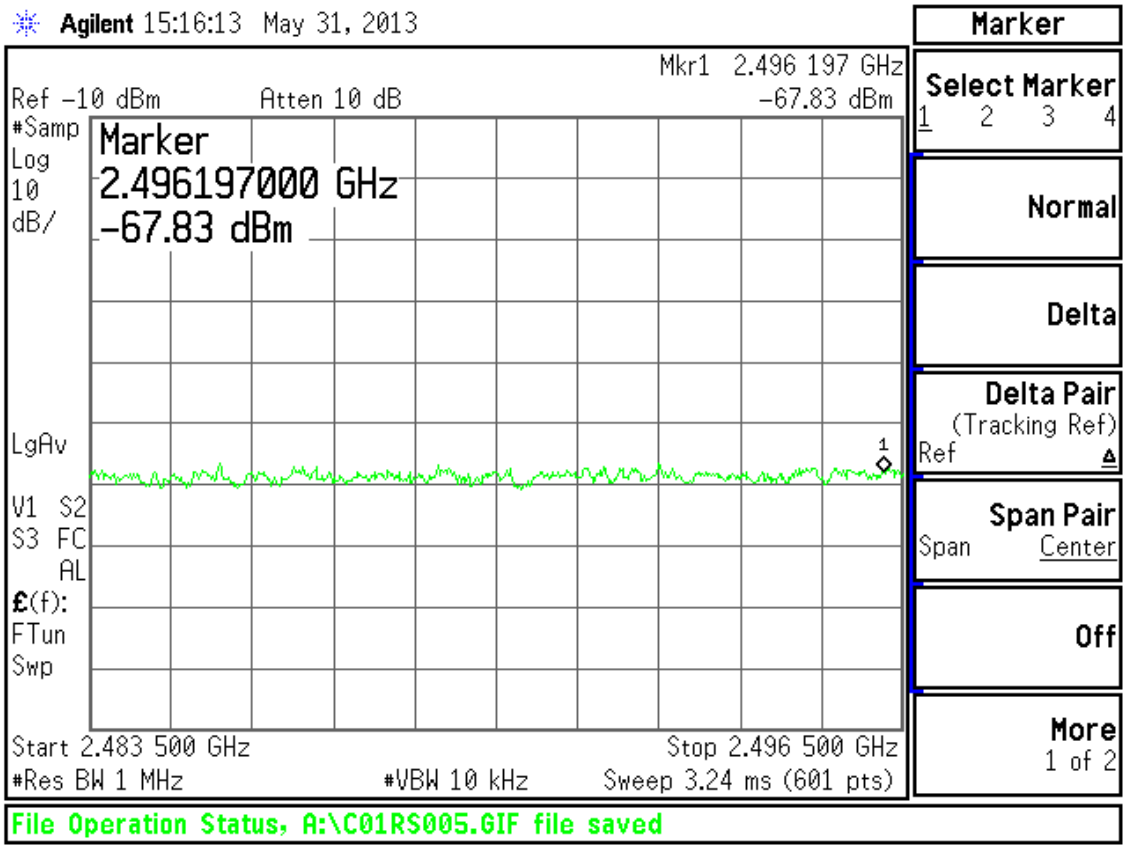

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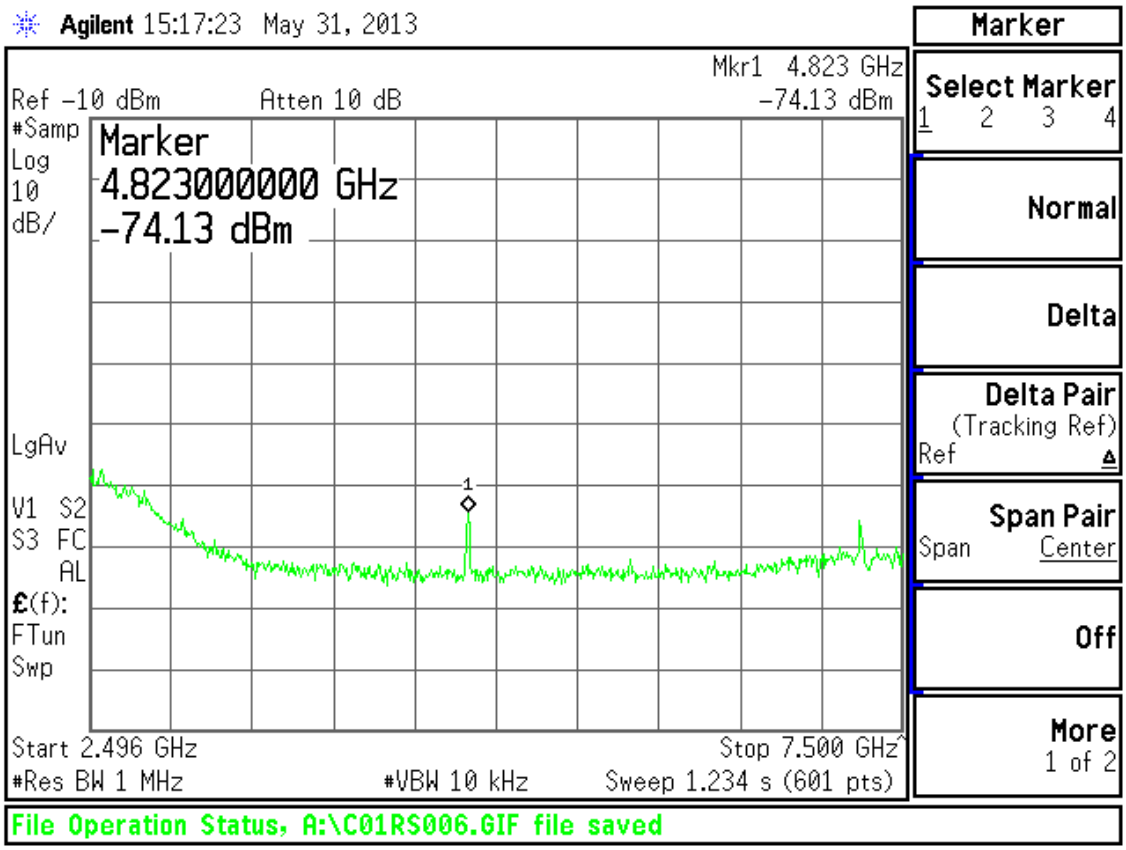

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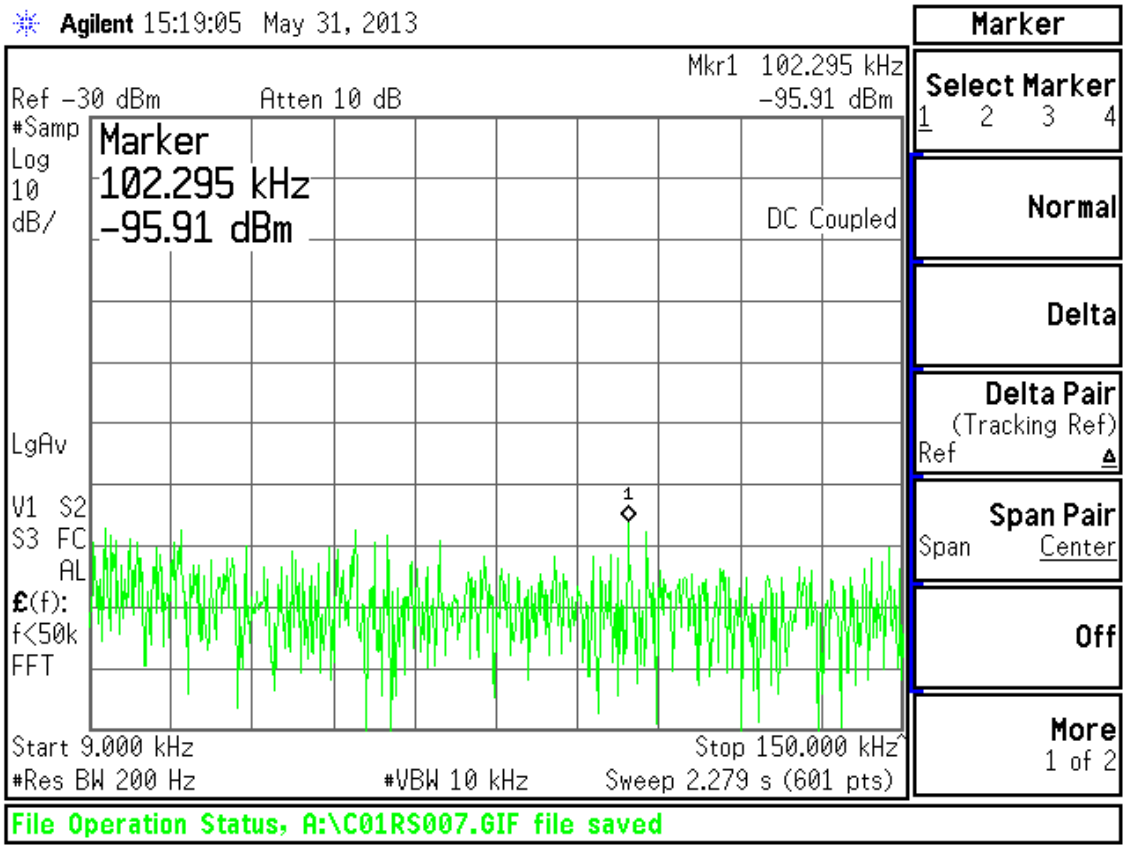
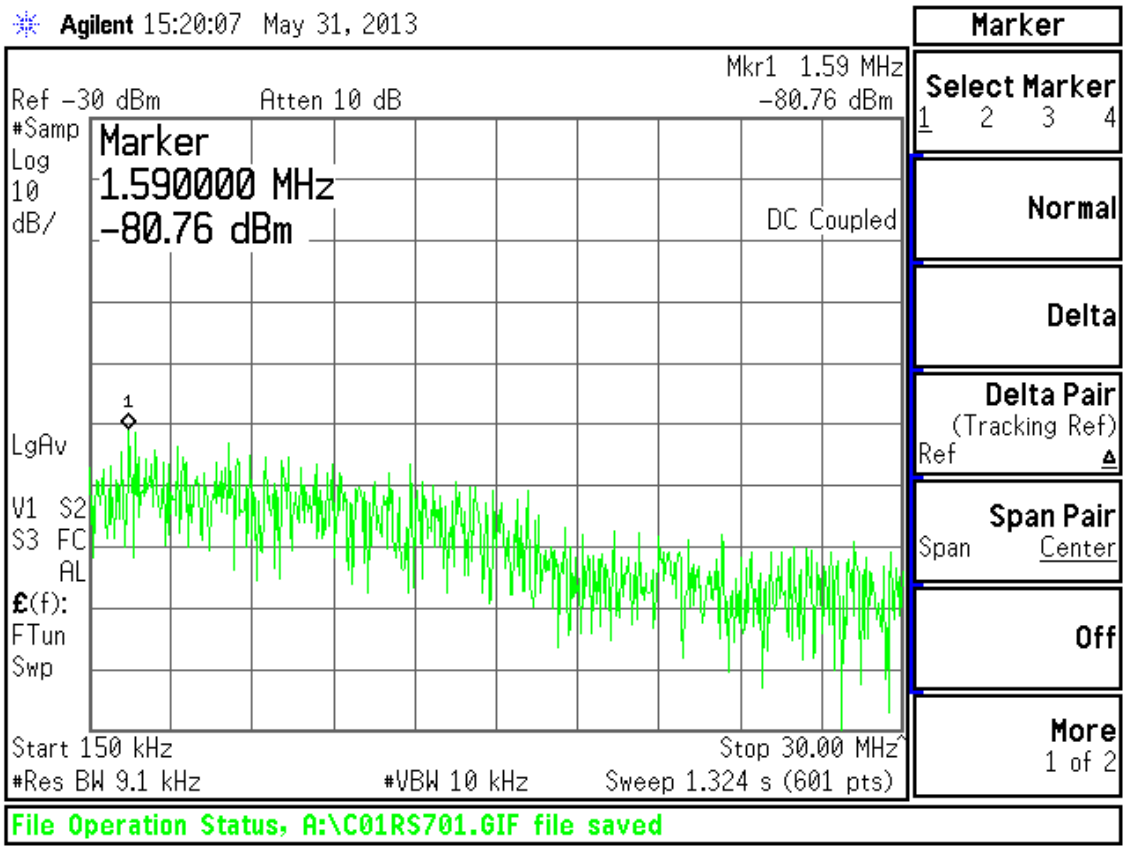


CH 1 802.11n Tx Conducted Emissions (MCS7)



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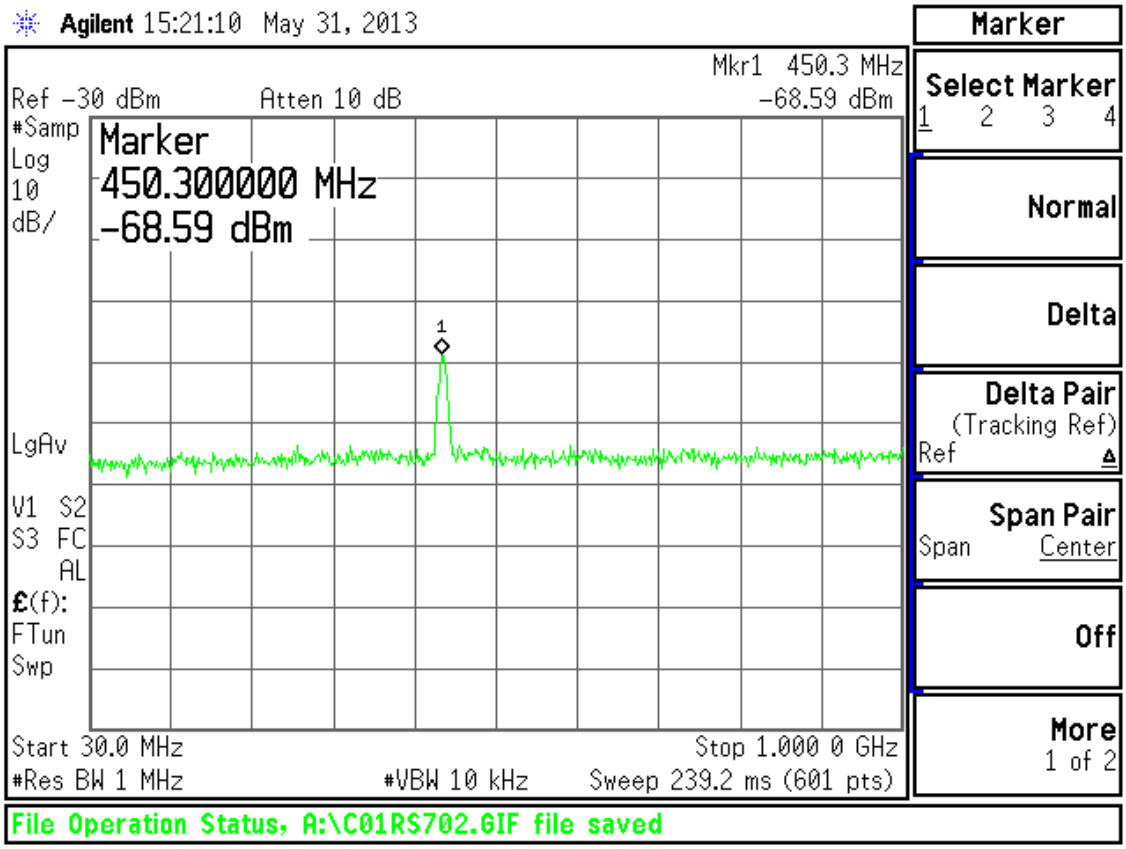

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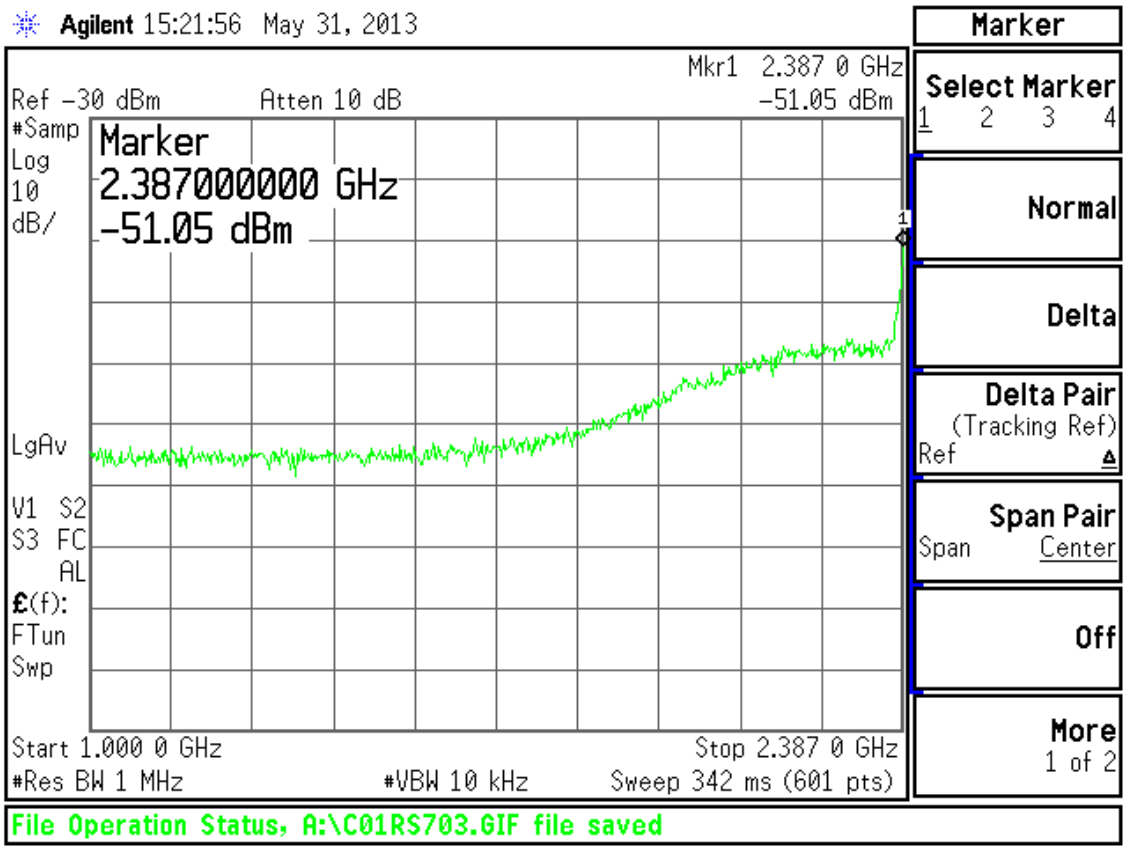

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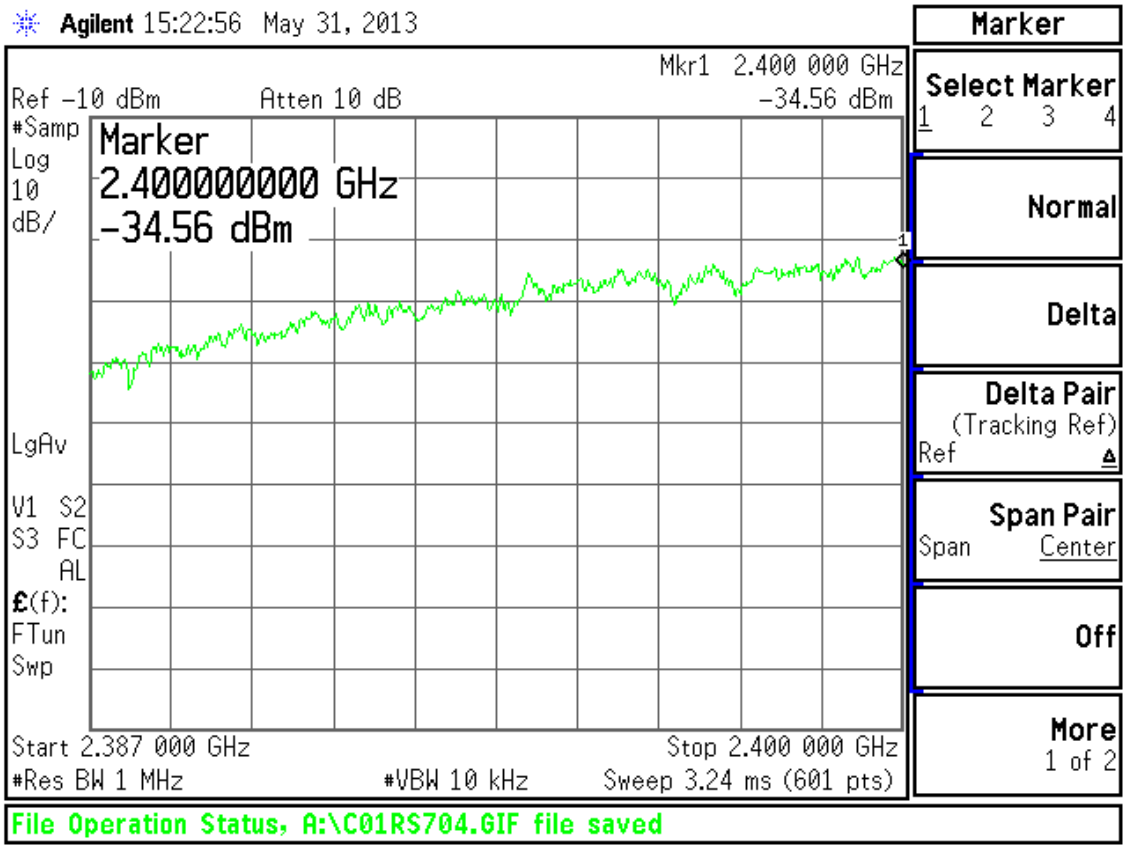

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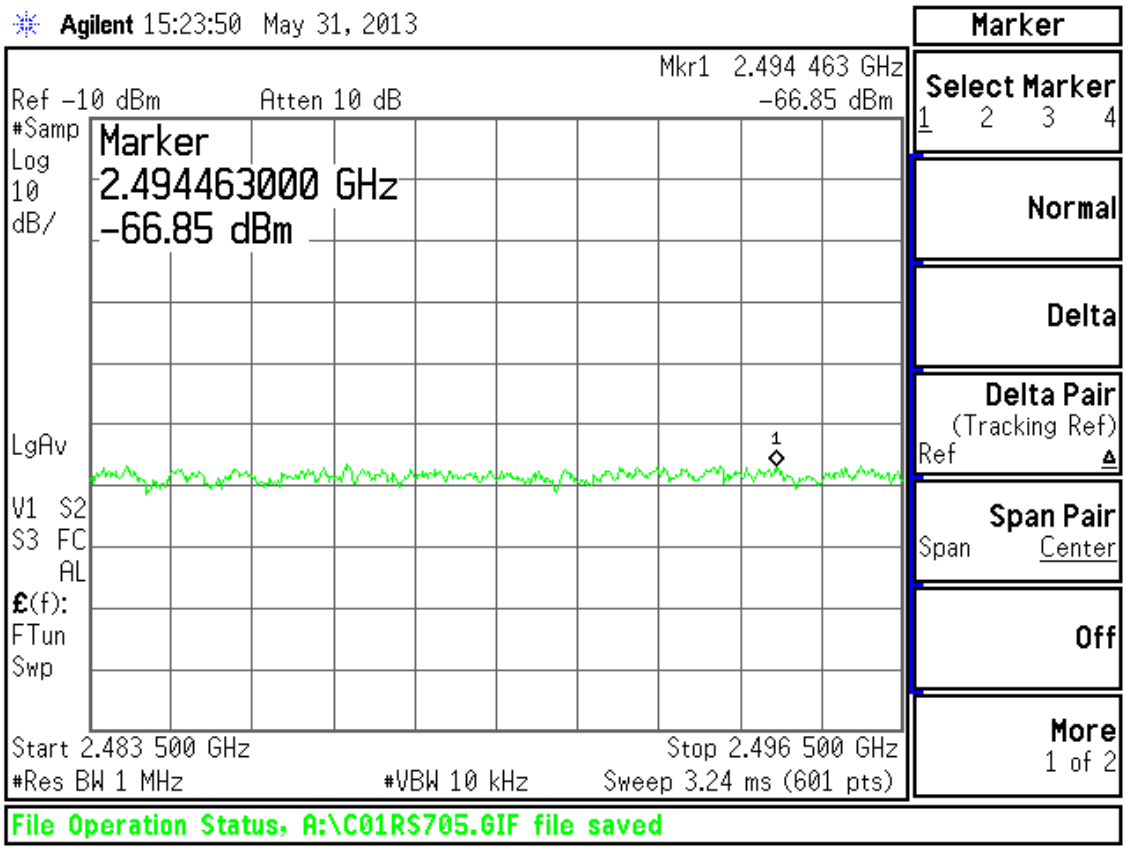

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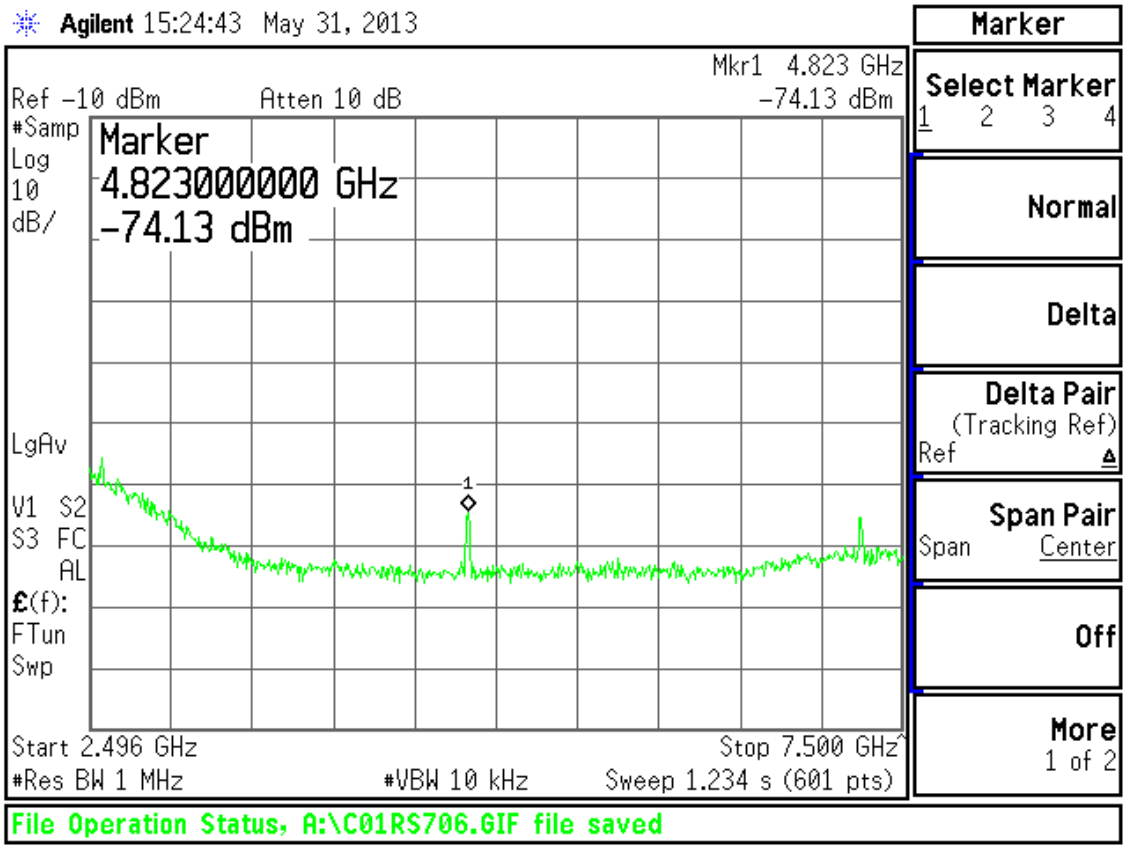
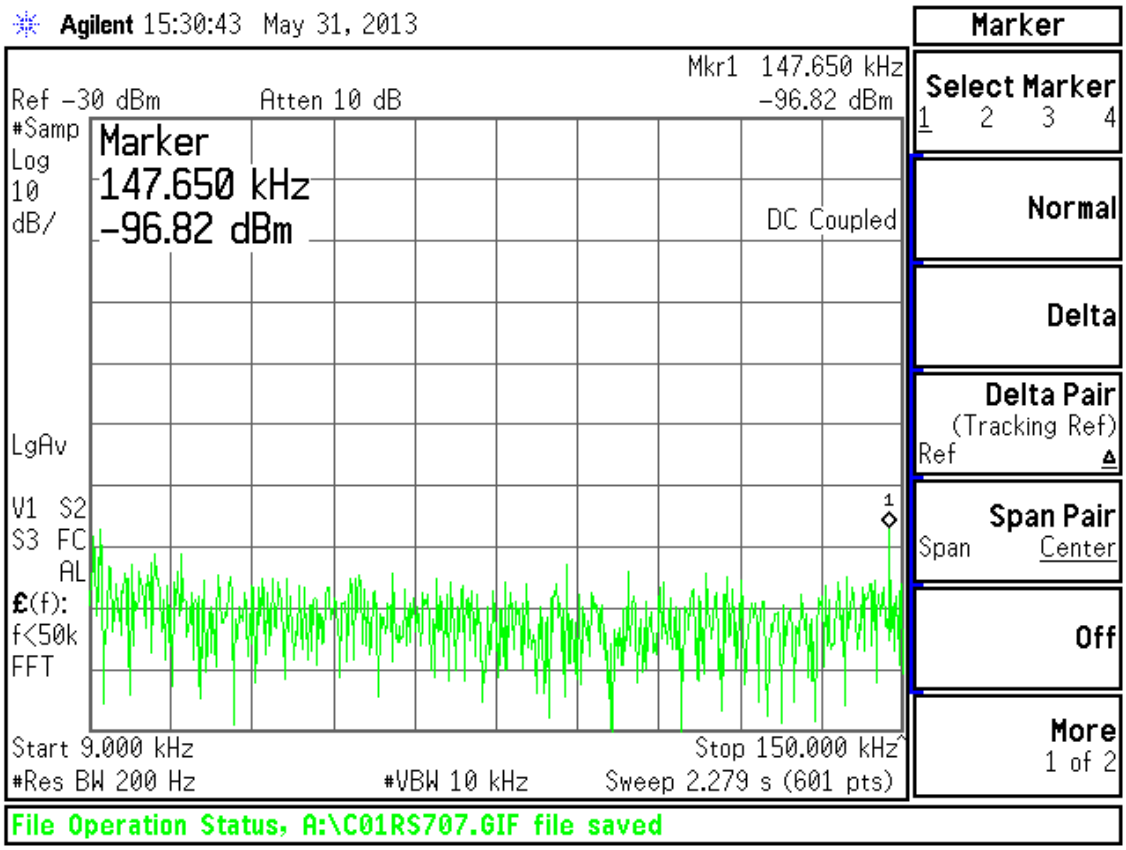
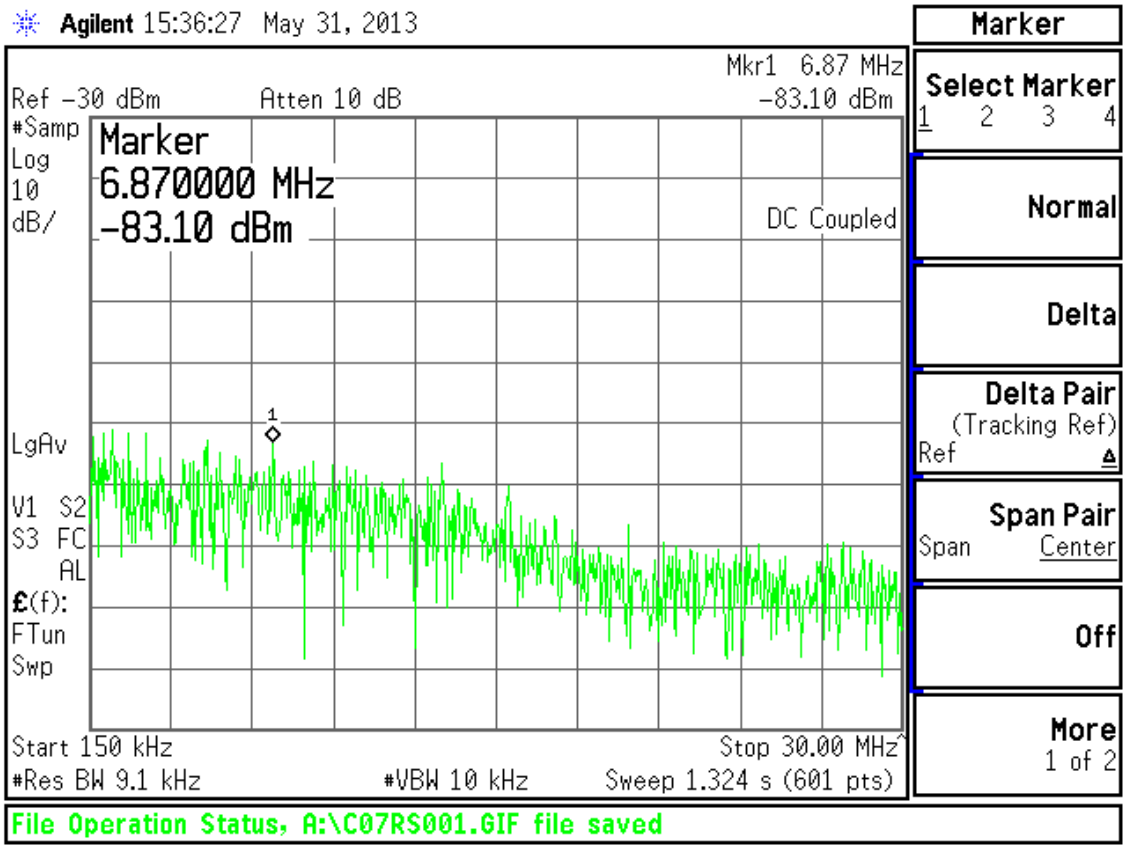


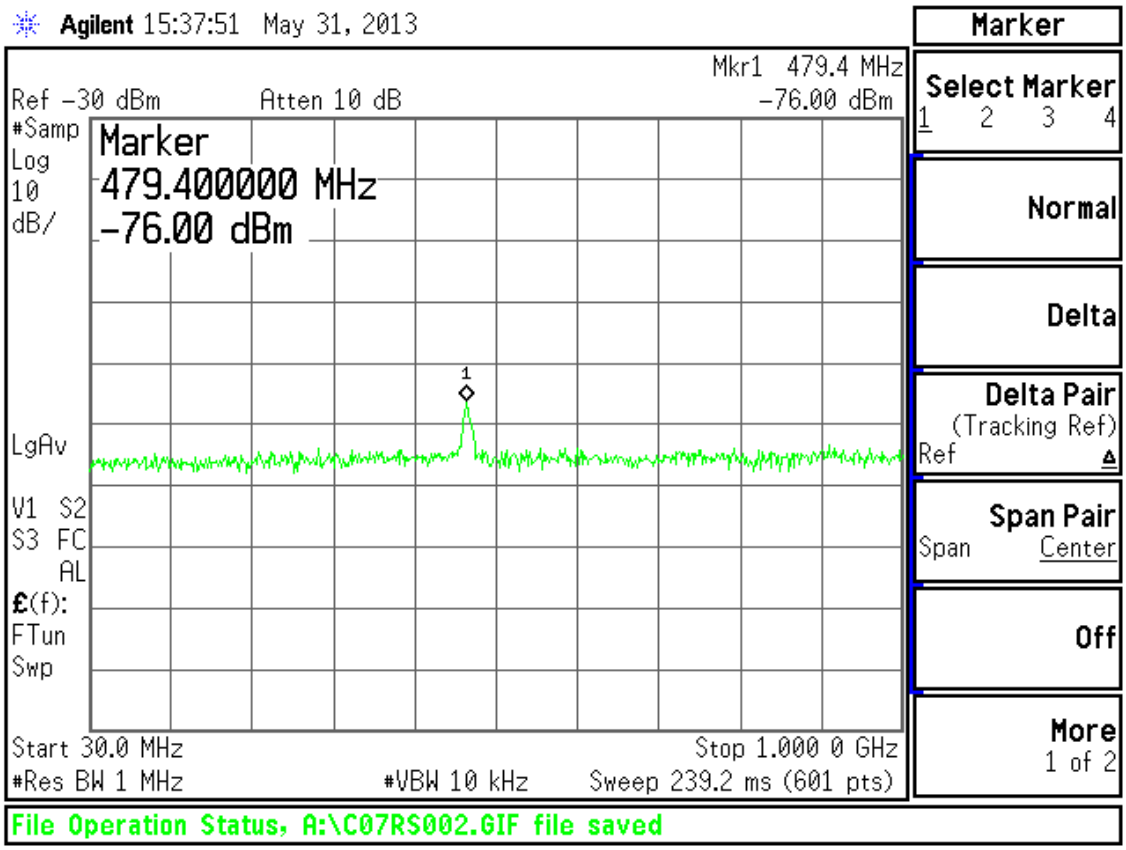
CH 1 802.11n Tx Conducted Emissions (MCS7)



CH 7 802.11n Tx Conducted Emissions (MCS0)



CH 7 802.11n Tx Conducted Emissions (MCS0)



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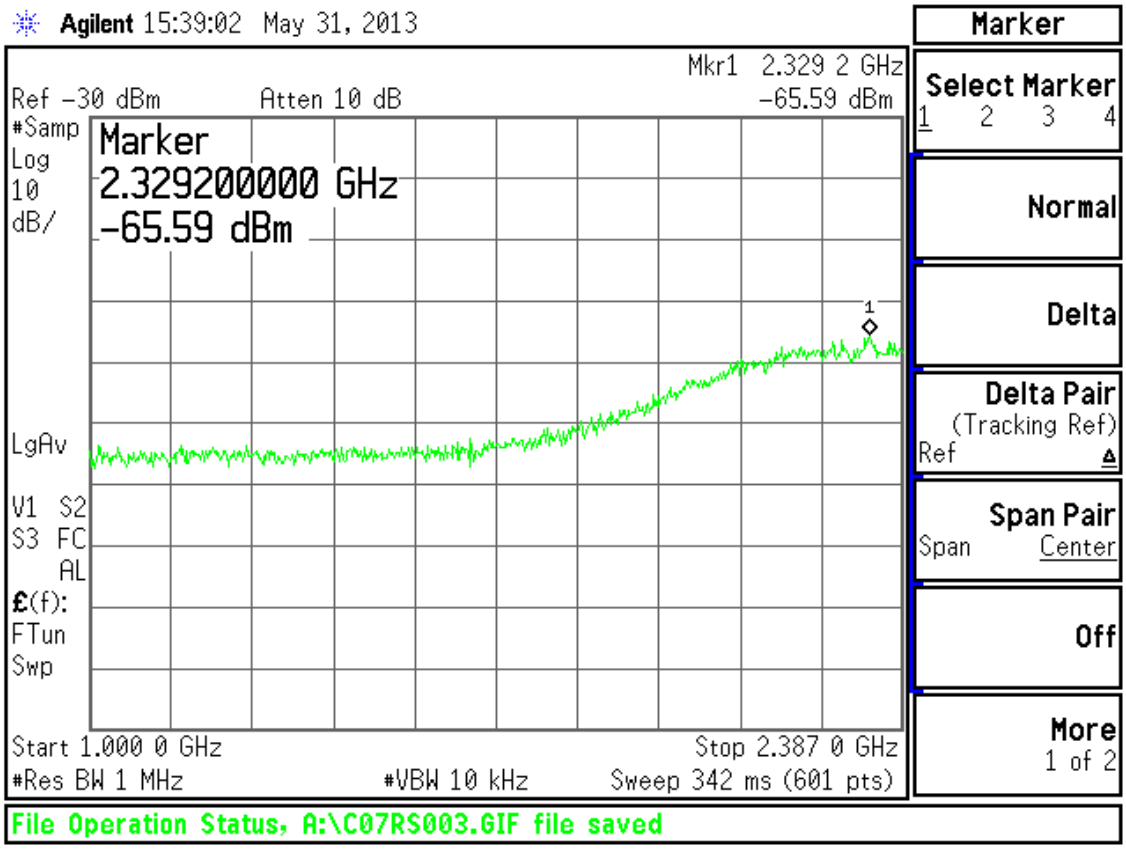

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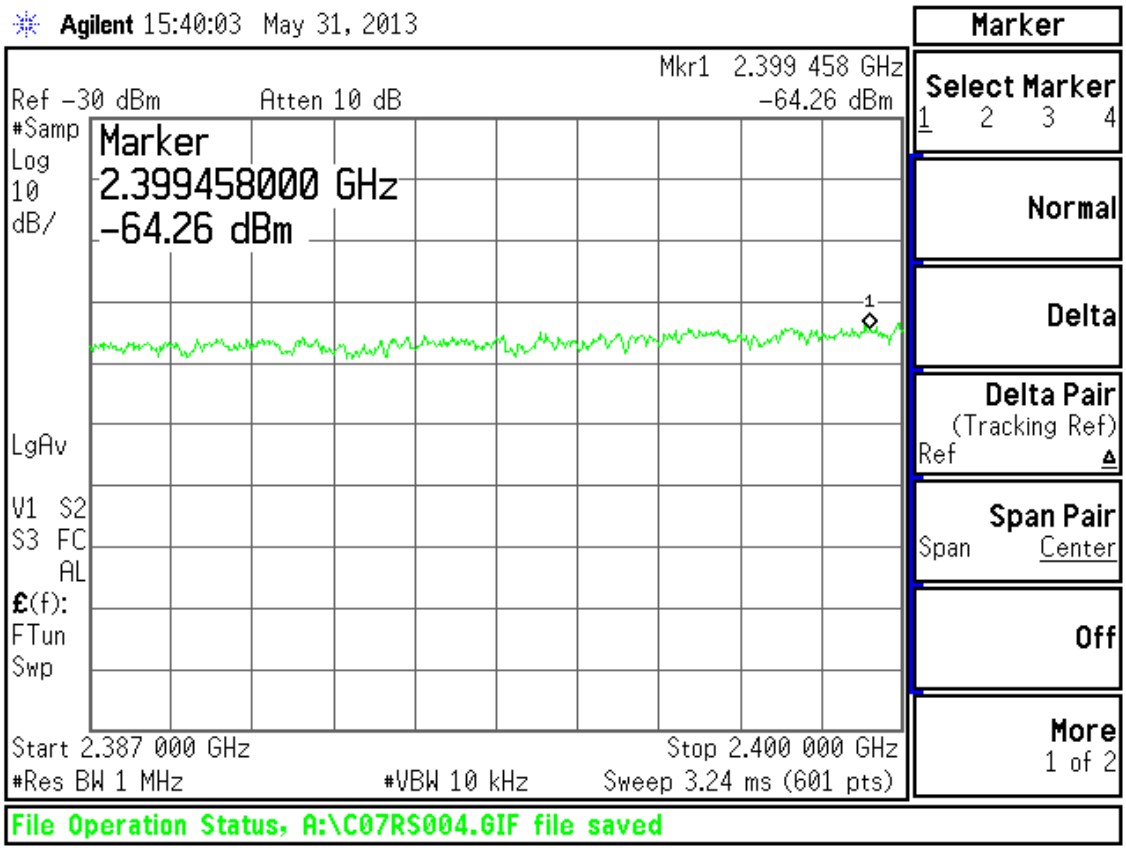

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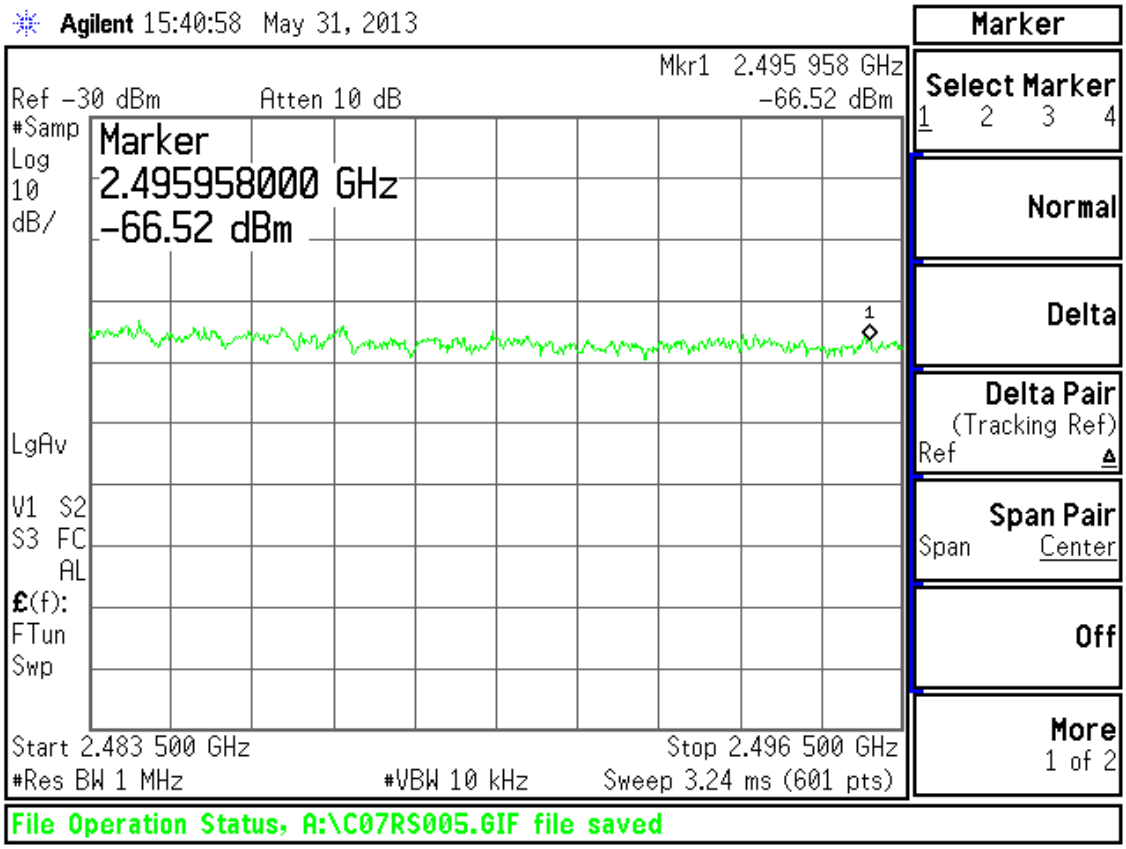
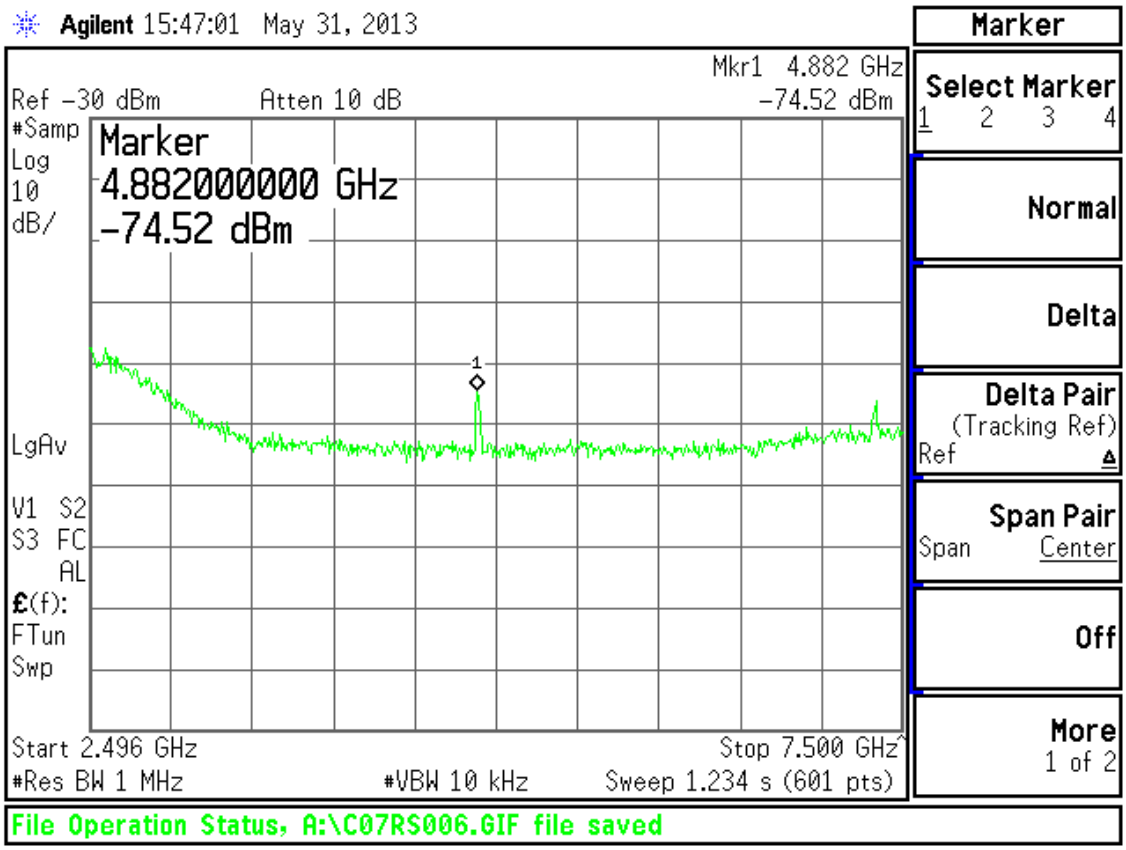
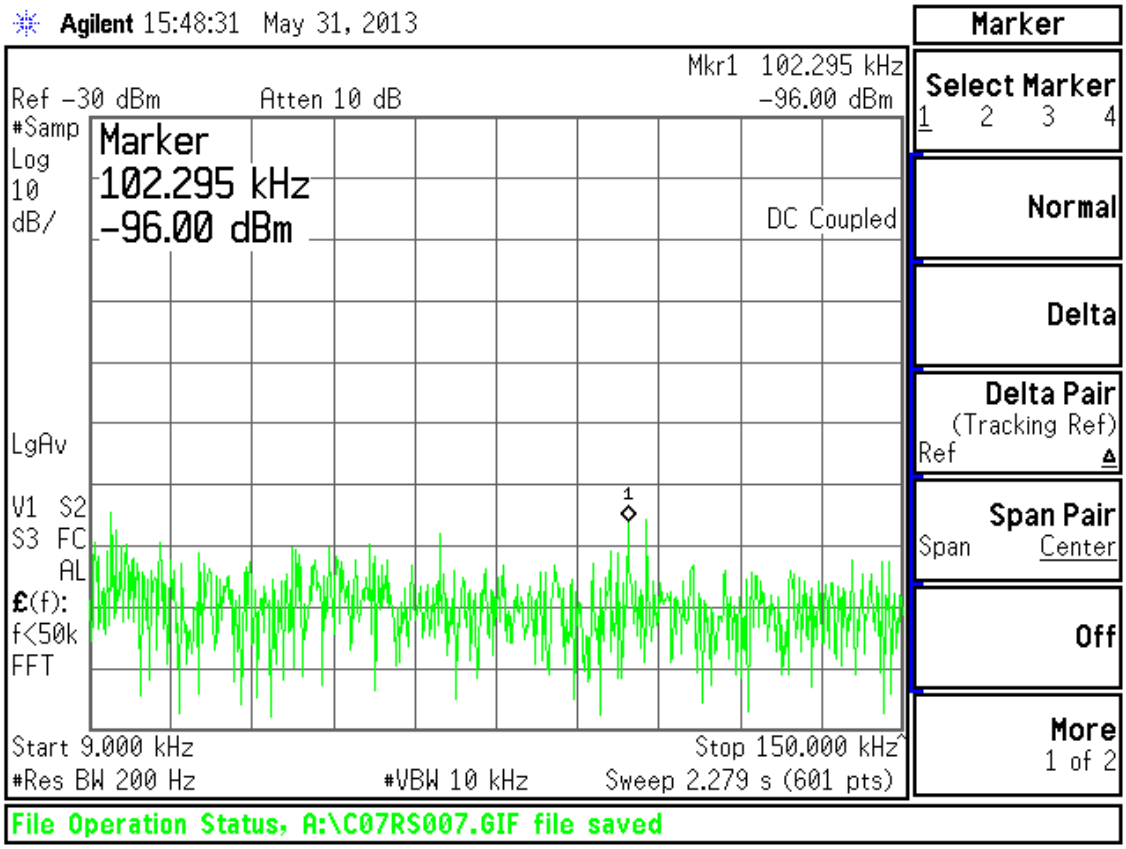


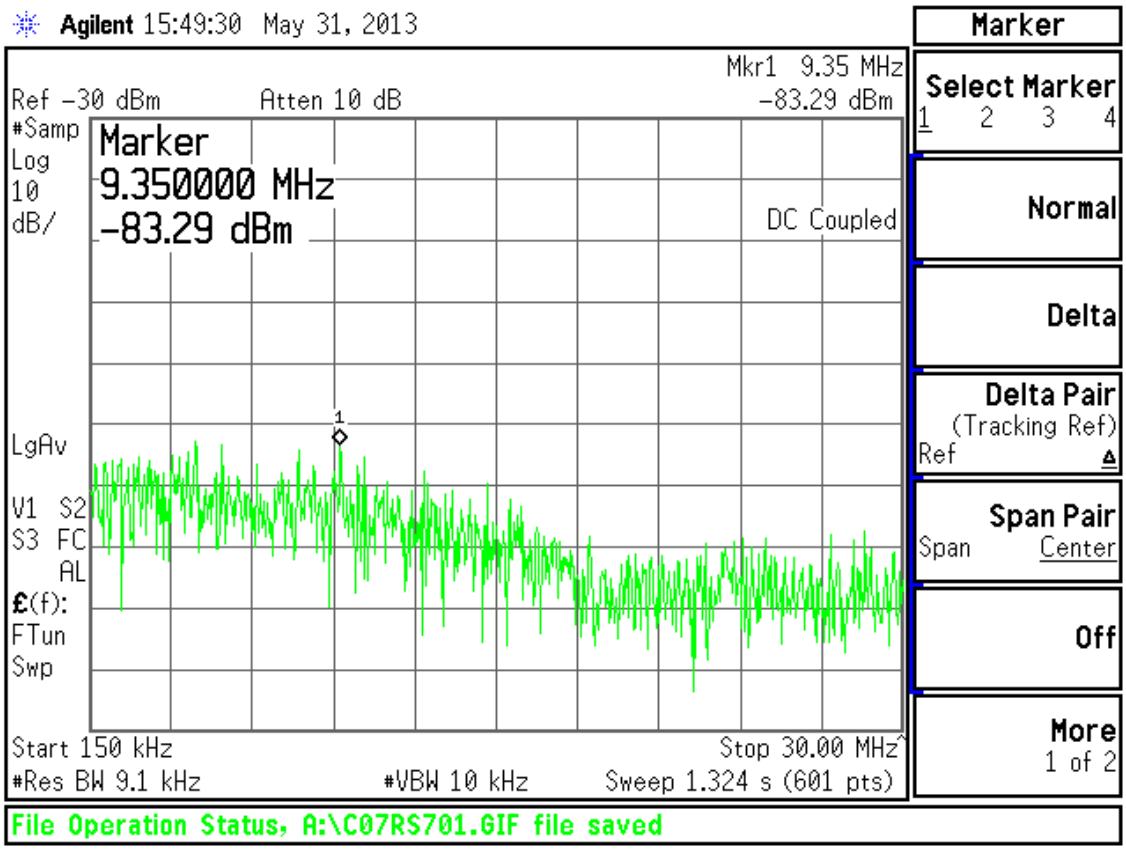
CH 7 802.11n Tx Conducted Emissions (MCS0)



CH 7 802.11n Tx Conducted Emissions (MCS0)



CH 7 802.11n Tx Conducted Emissions (MCS7)



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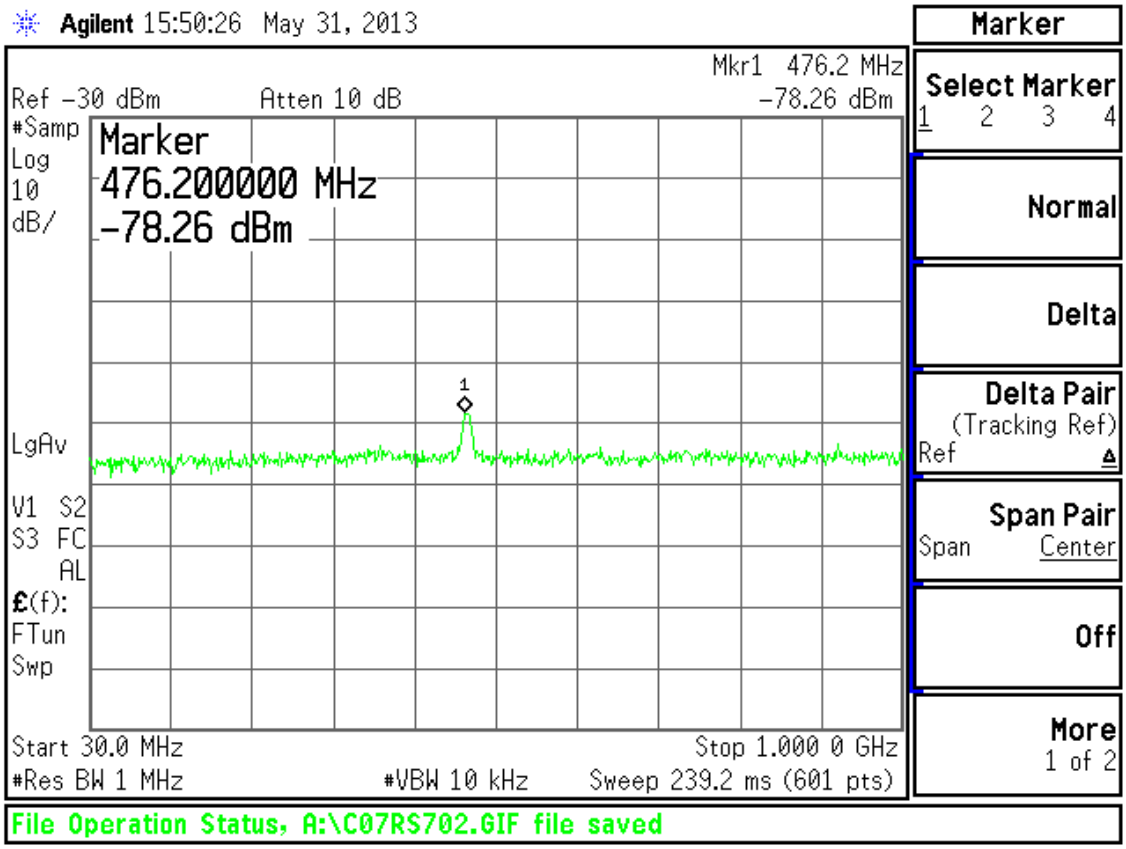

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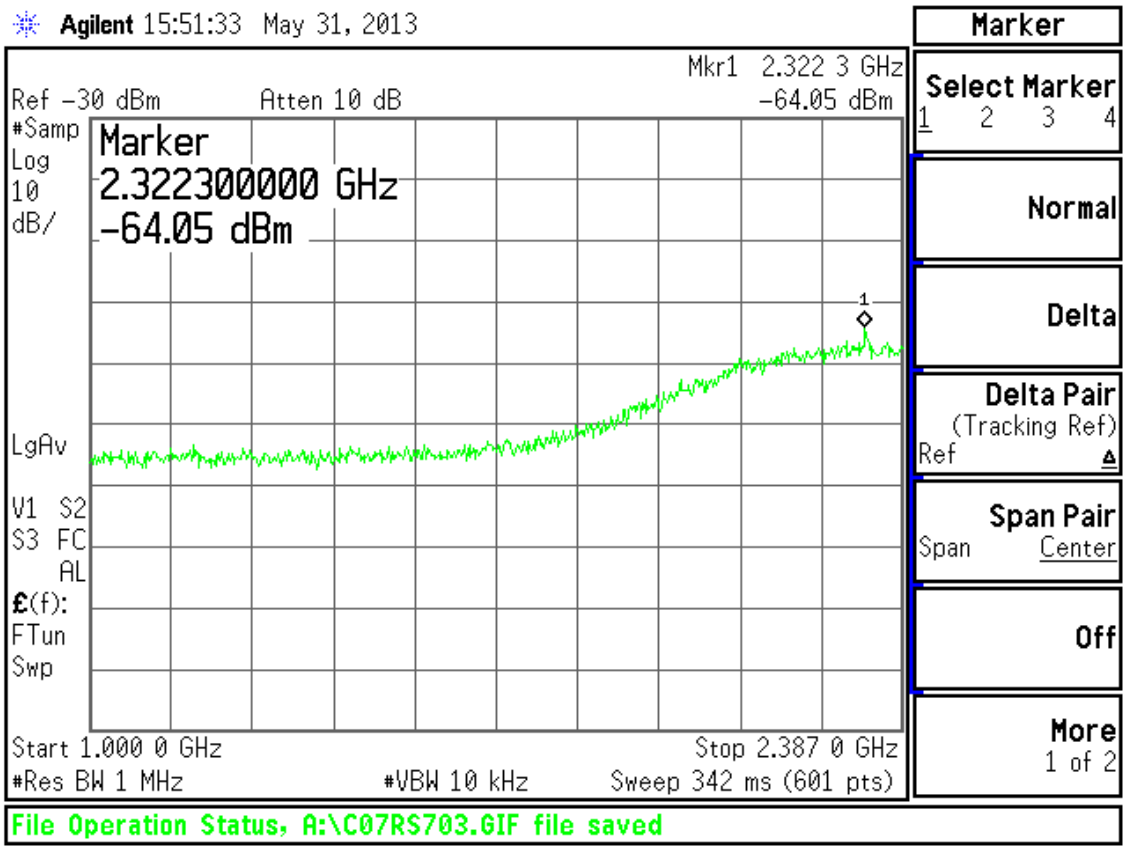

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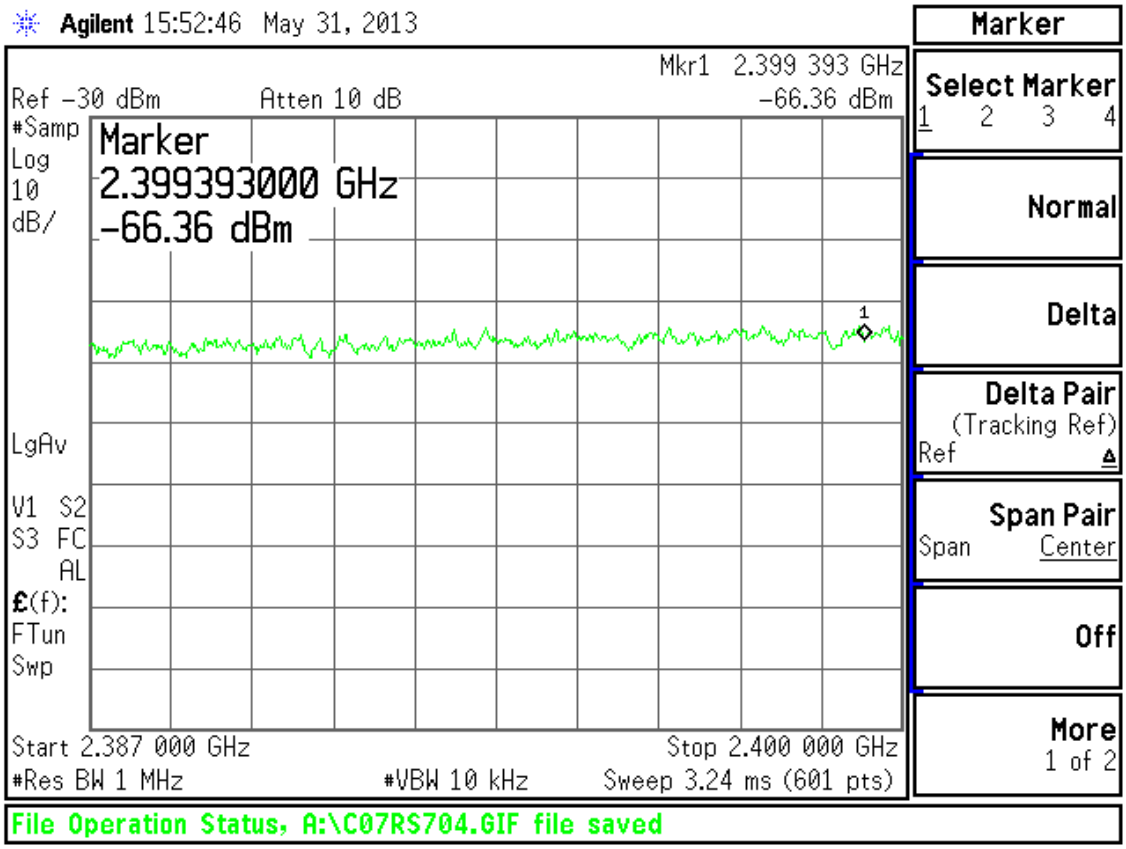

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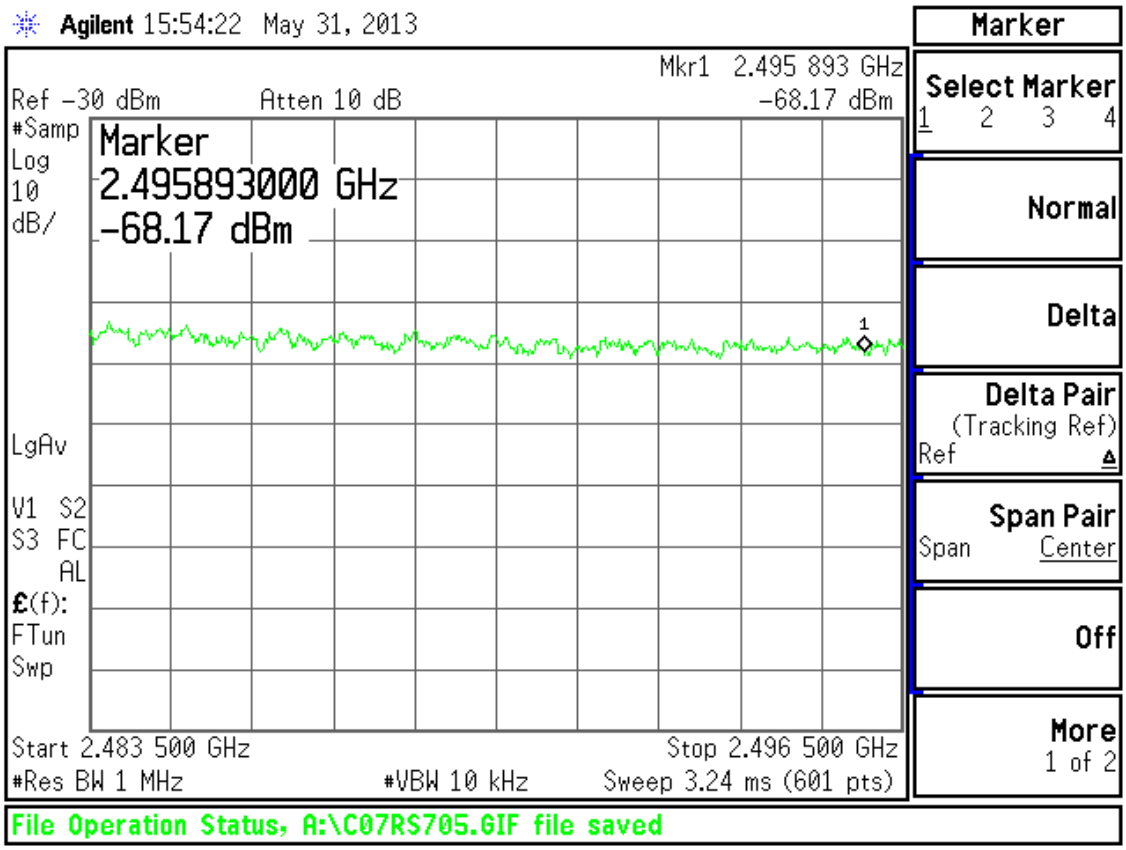
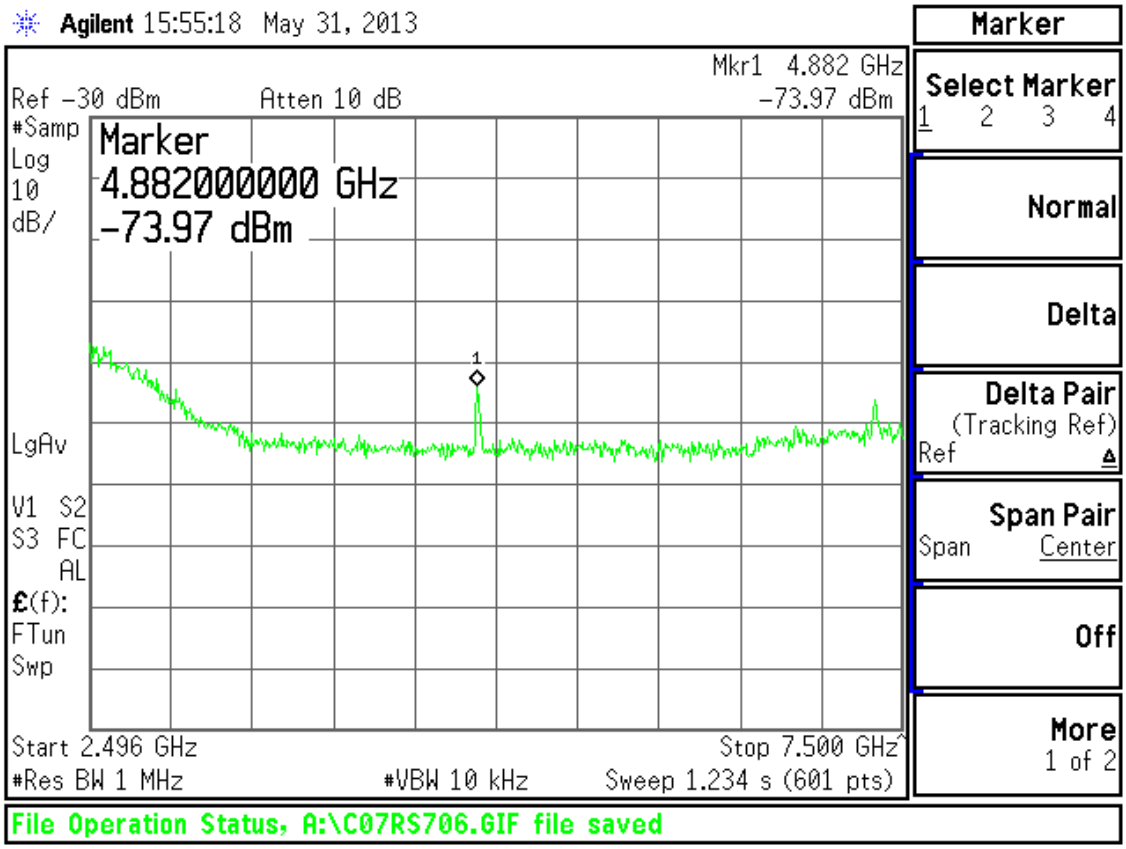


CH 7 802.11n Tx Conducted Emissions (MCS7)



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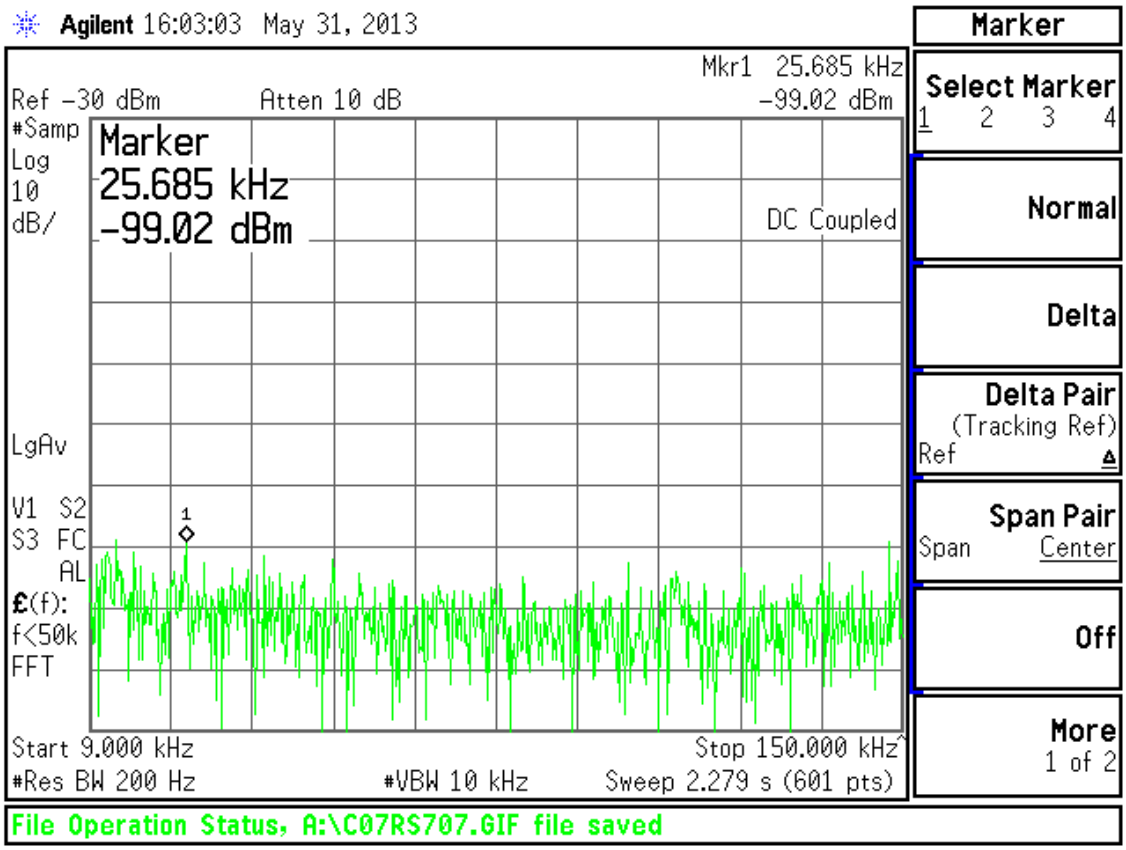
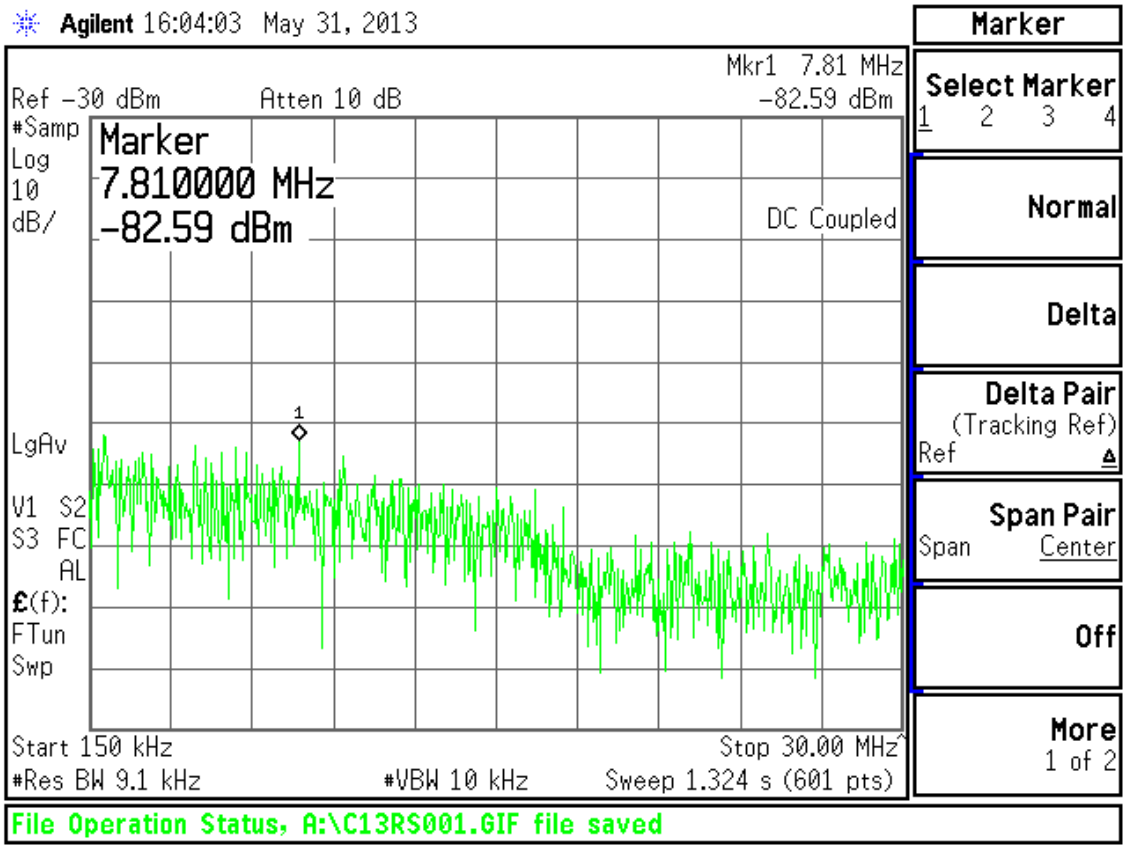


CH 13 802.11n Tx Conducted Emissions (MCS0)



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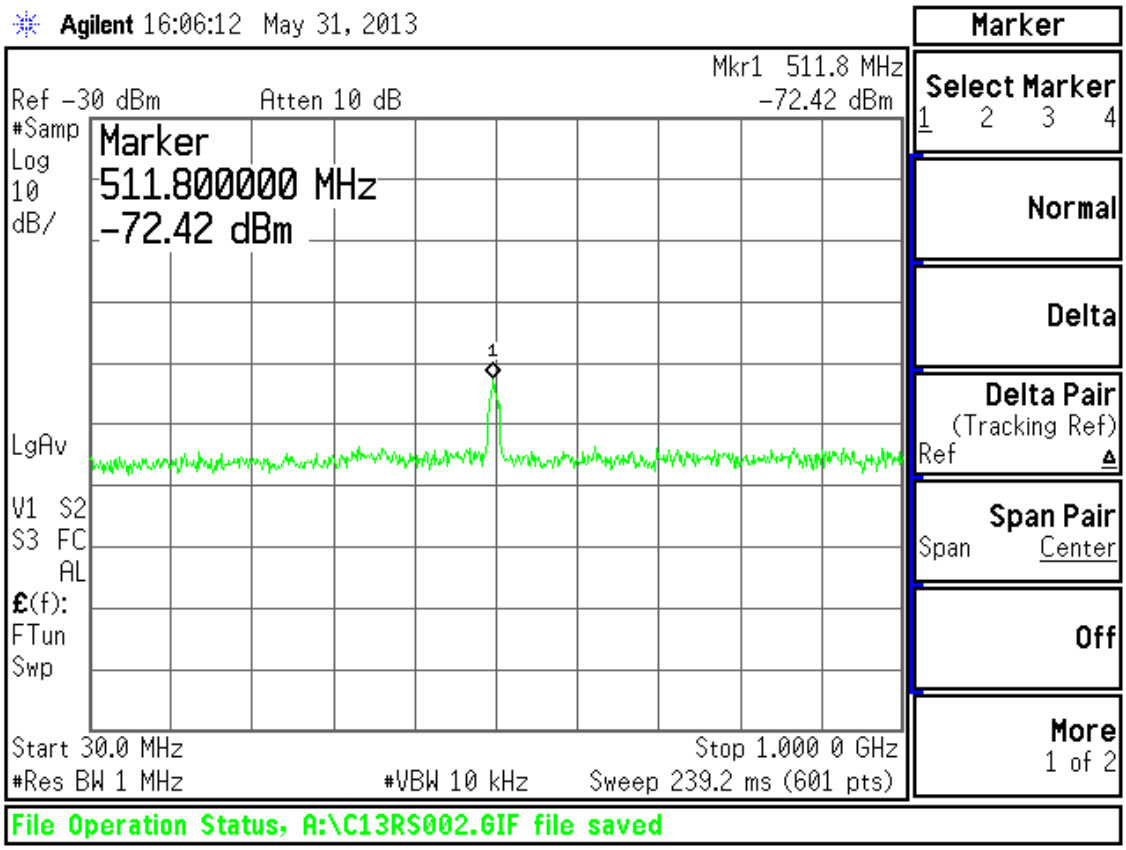

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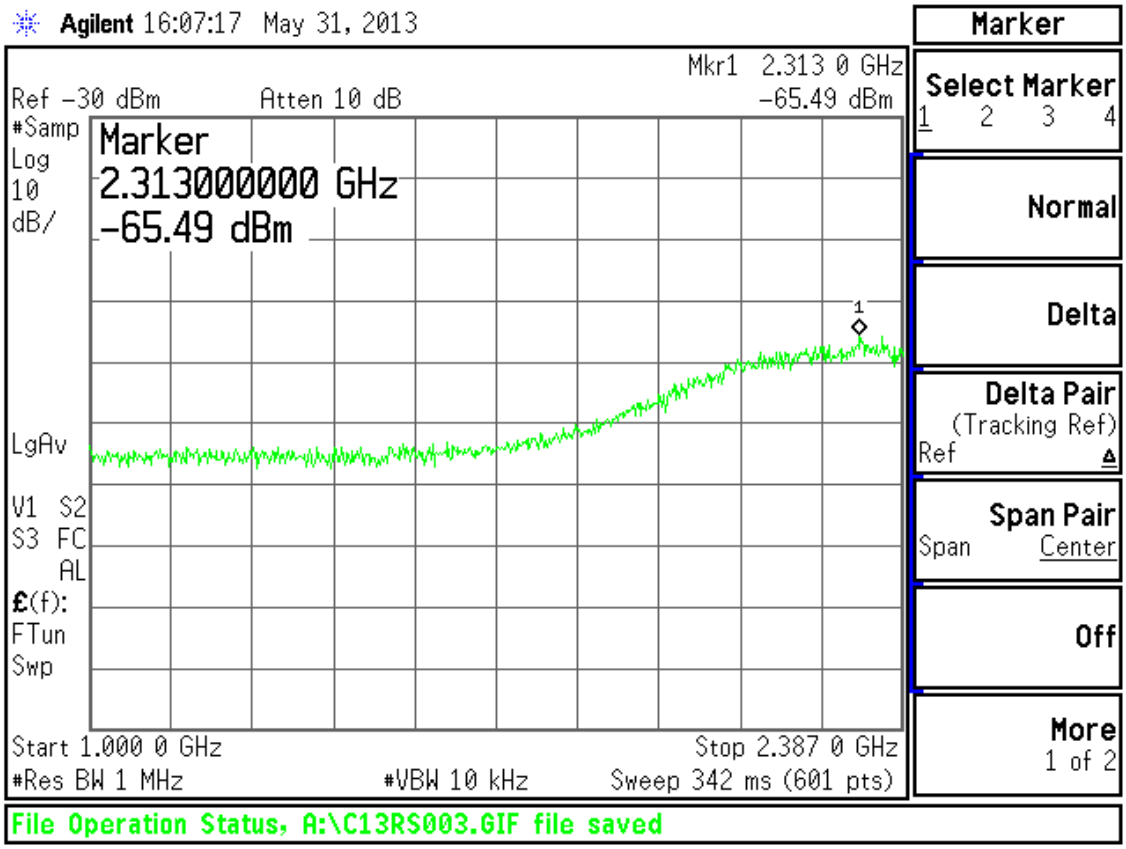

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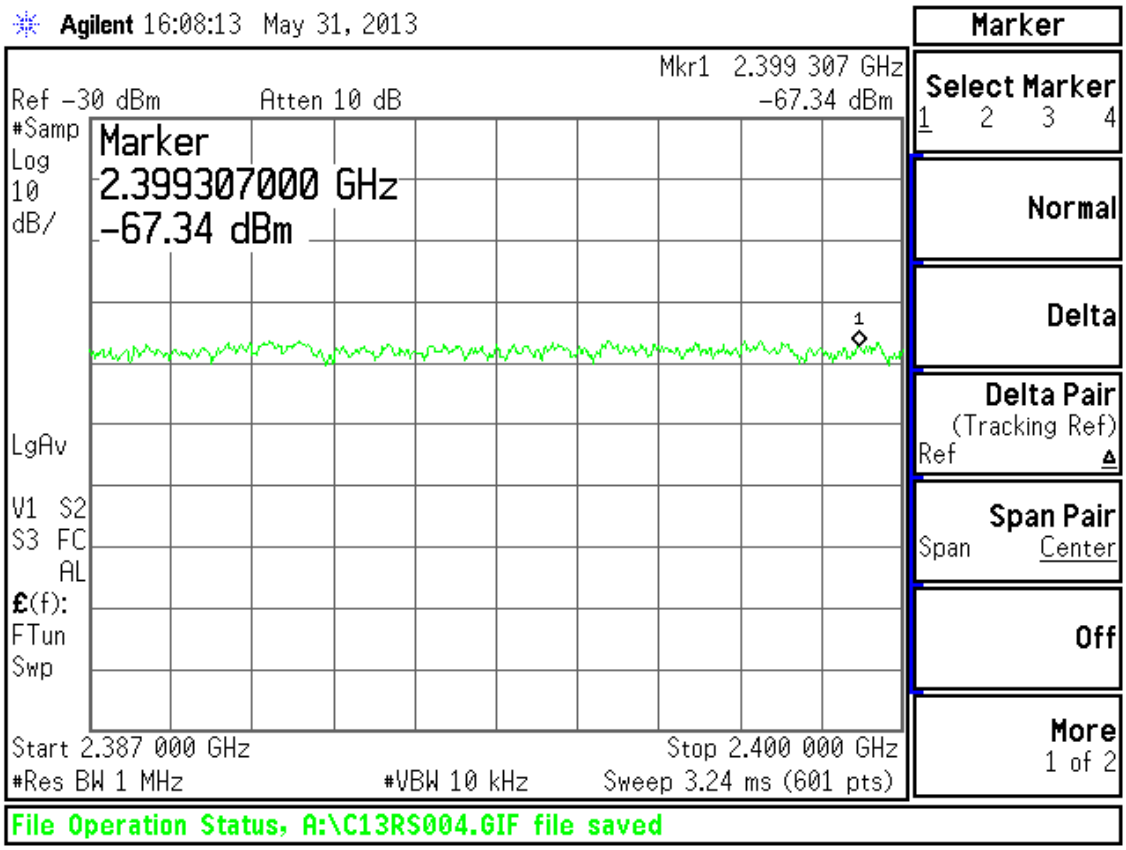

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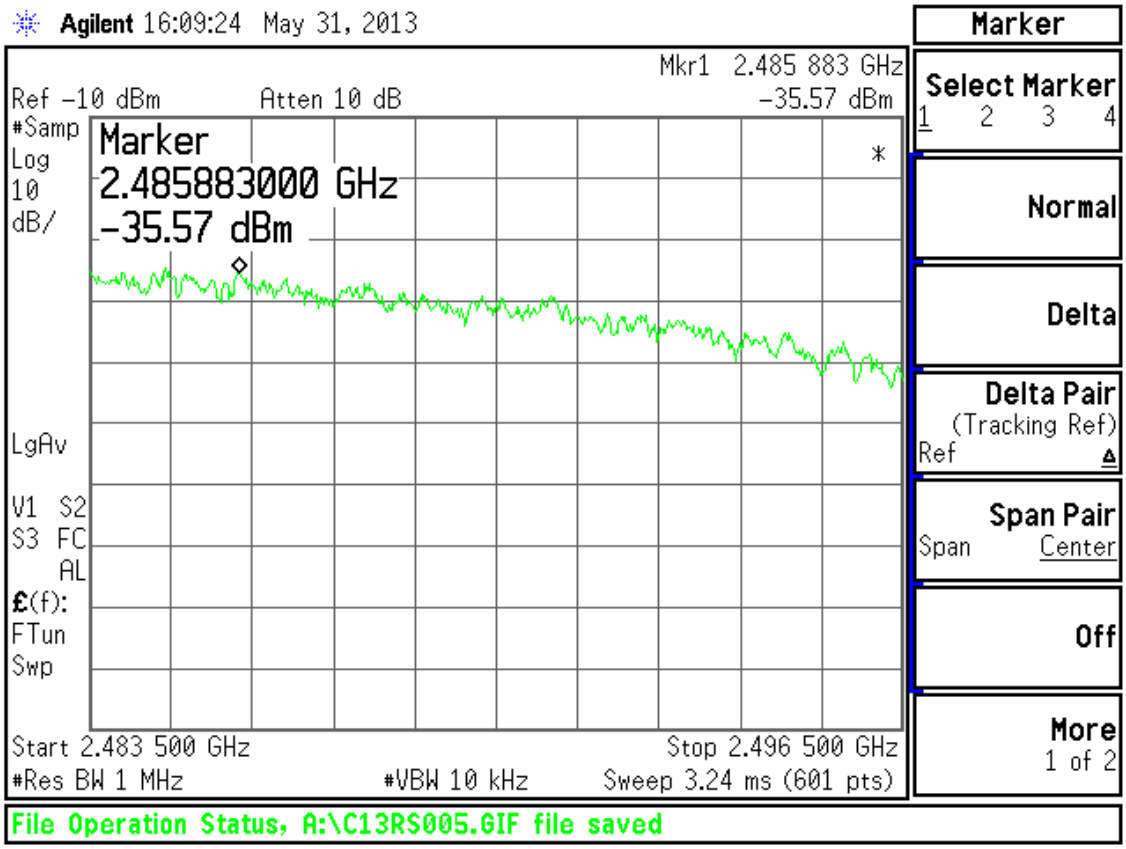

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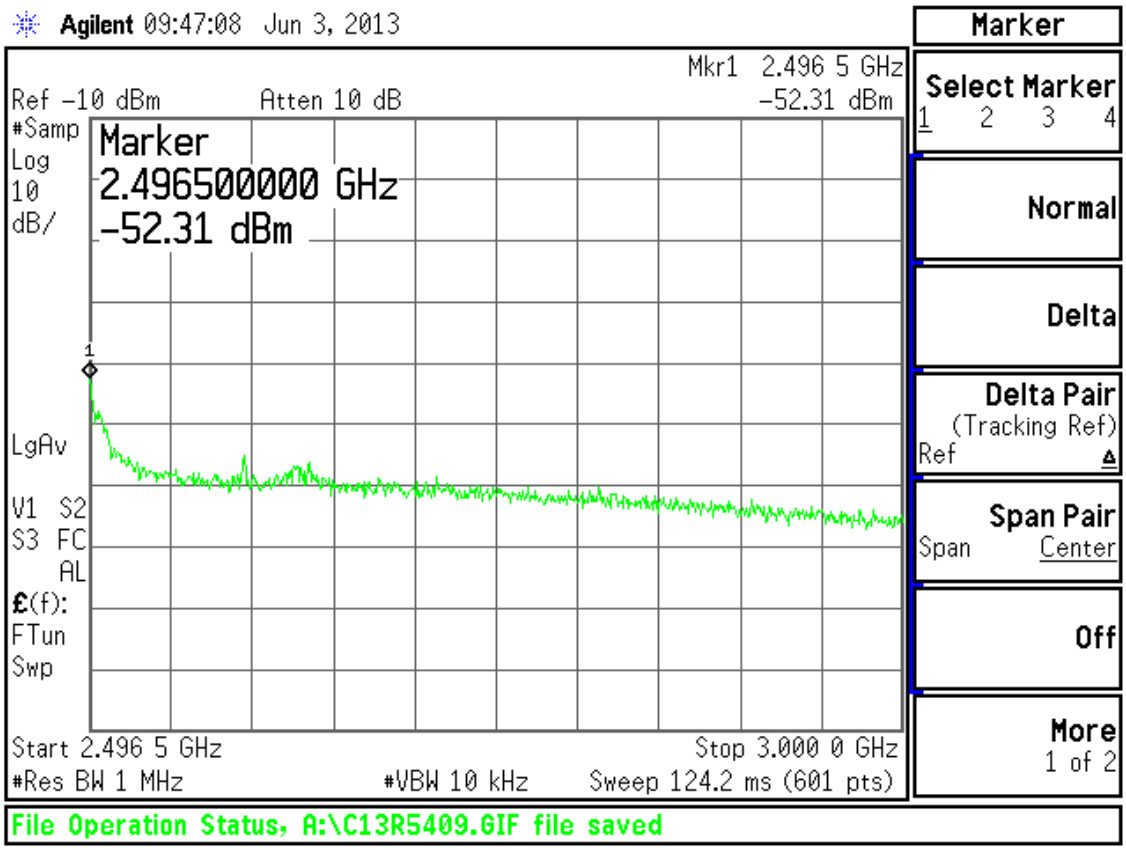

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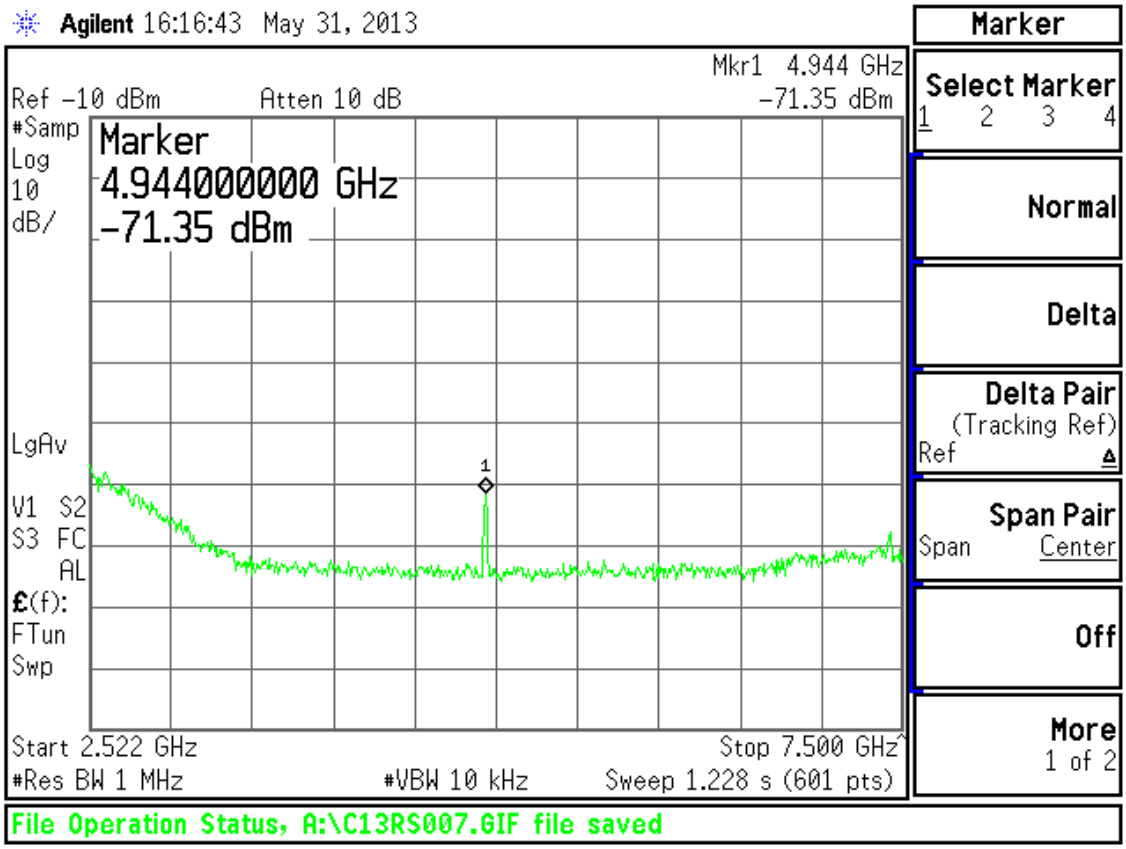

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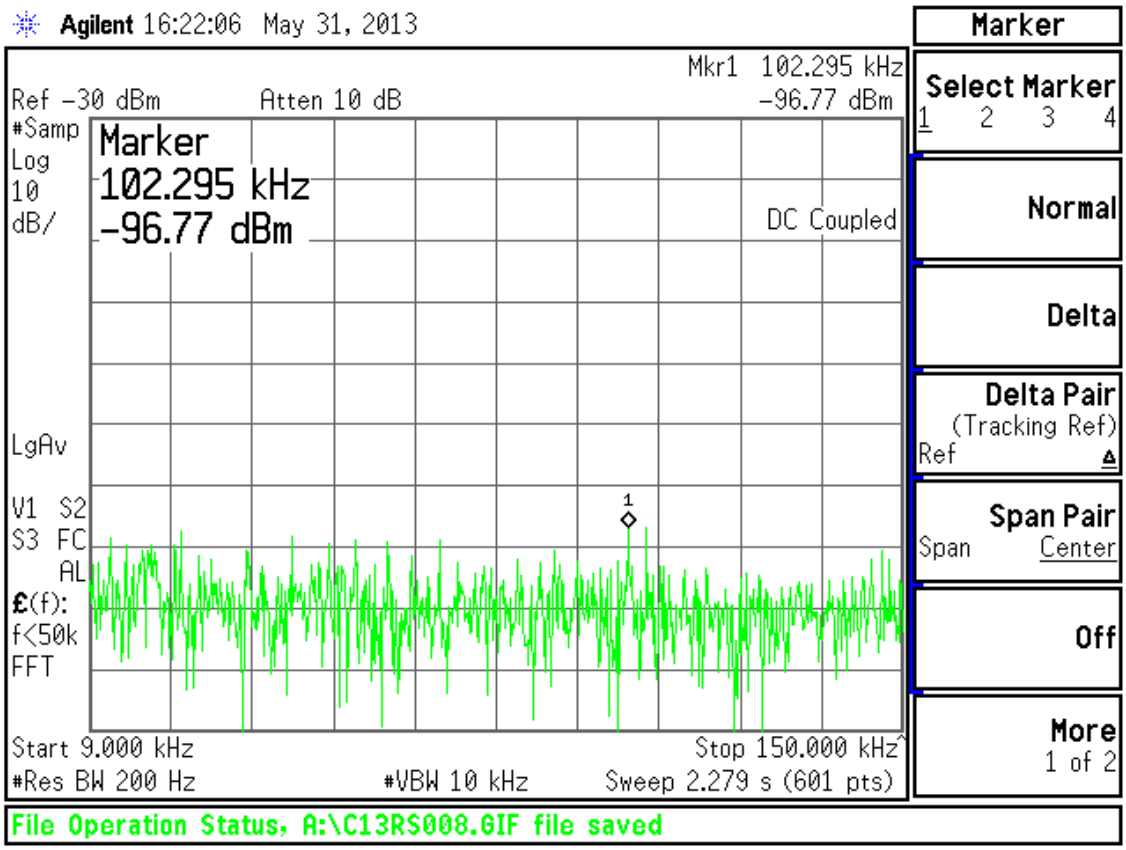

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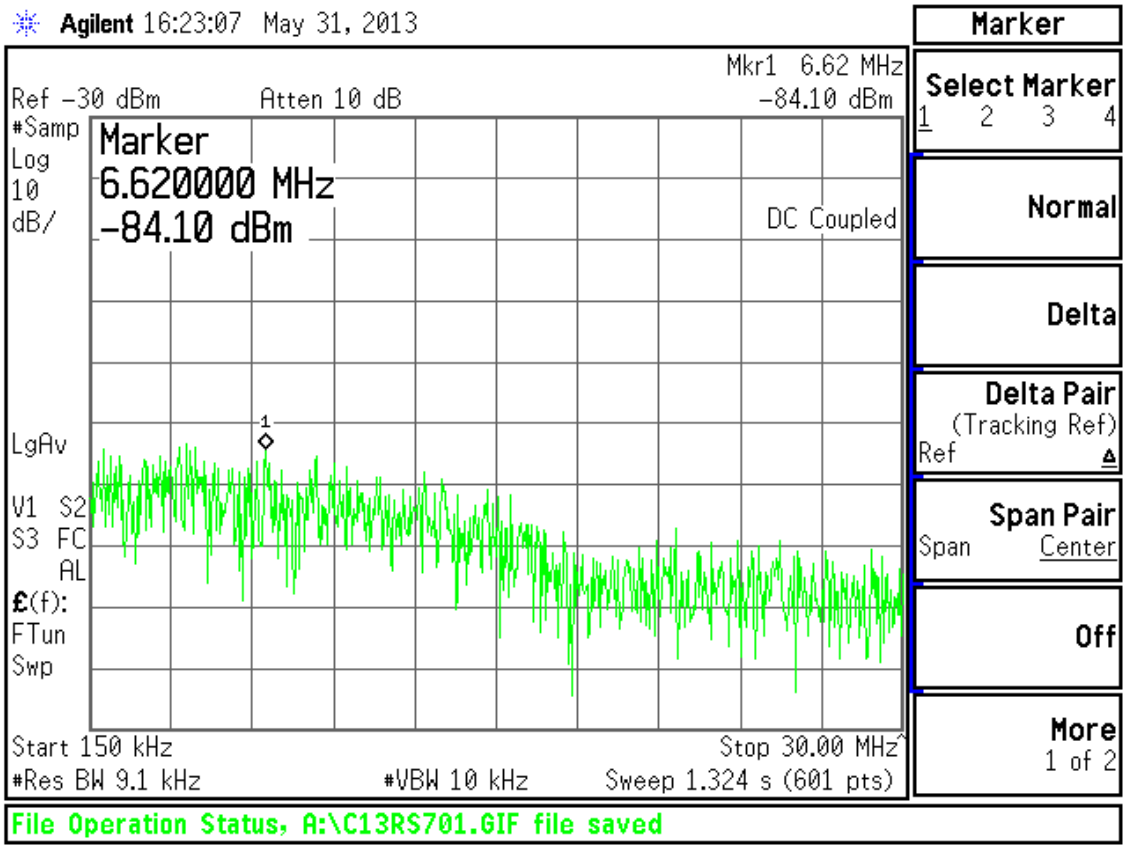

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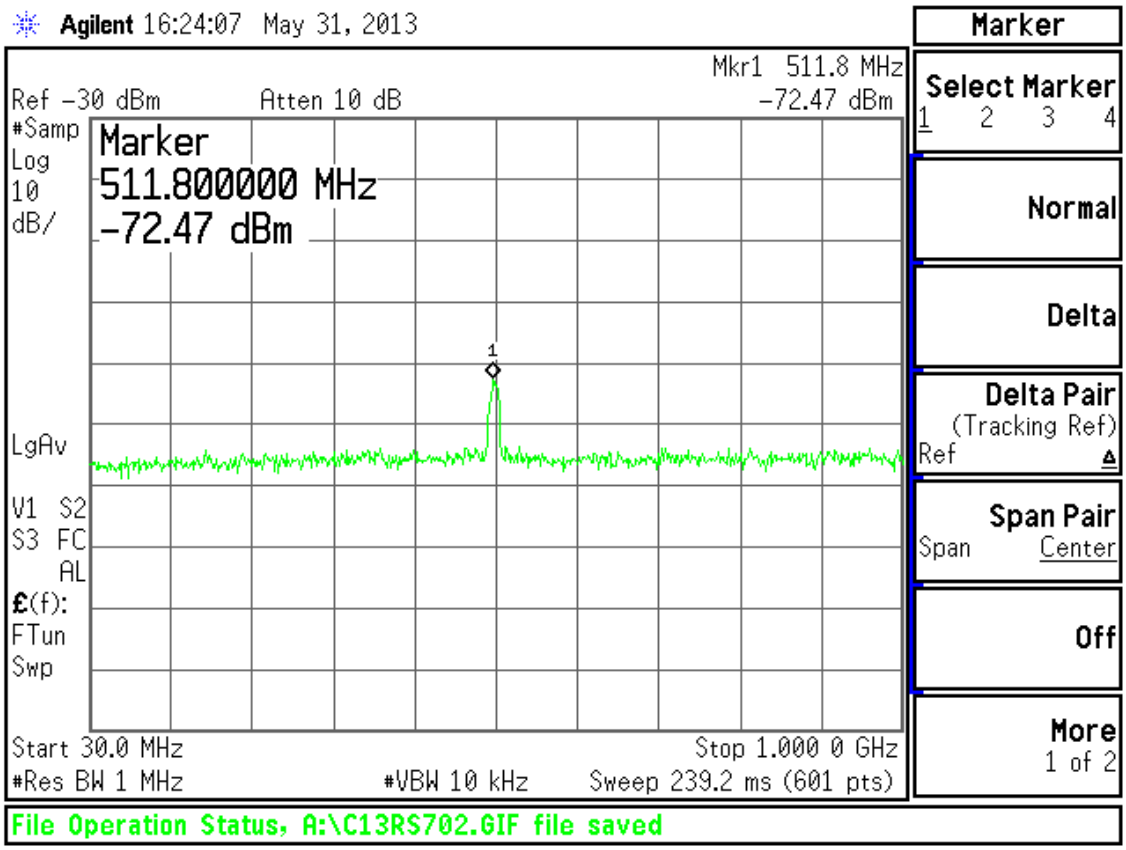

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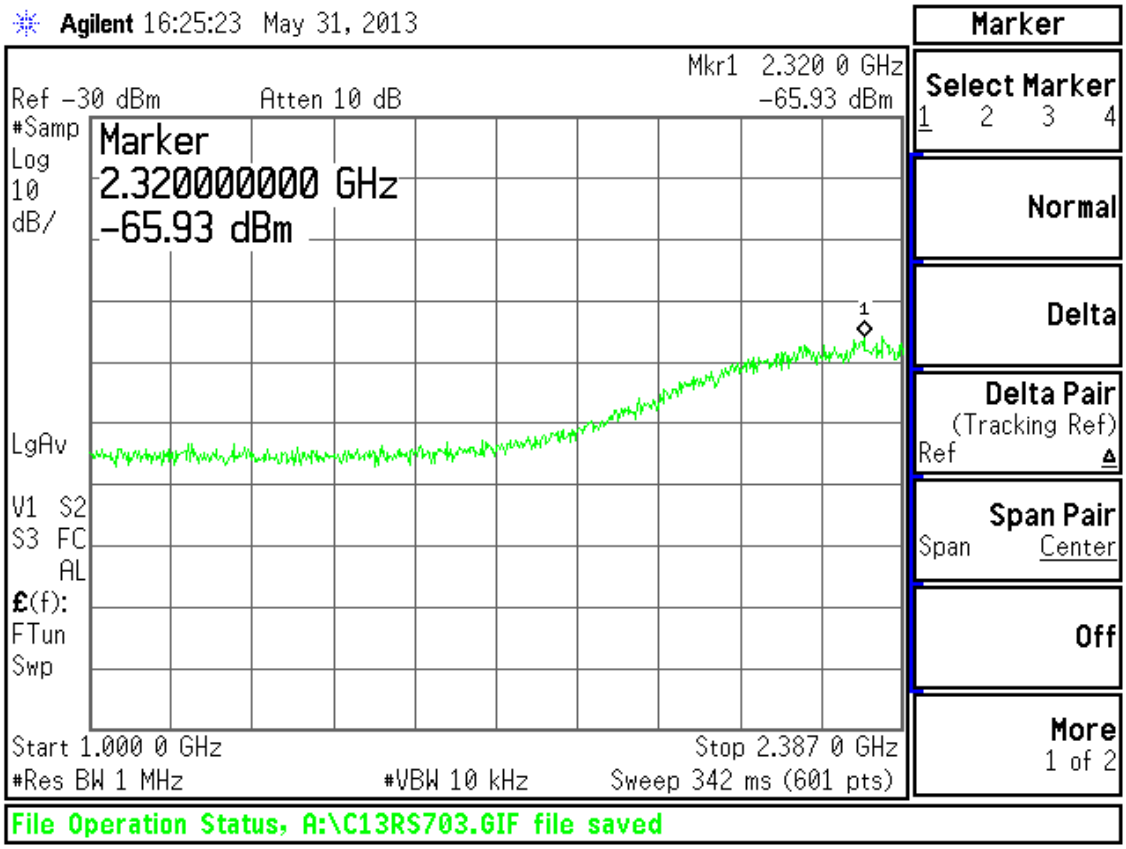

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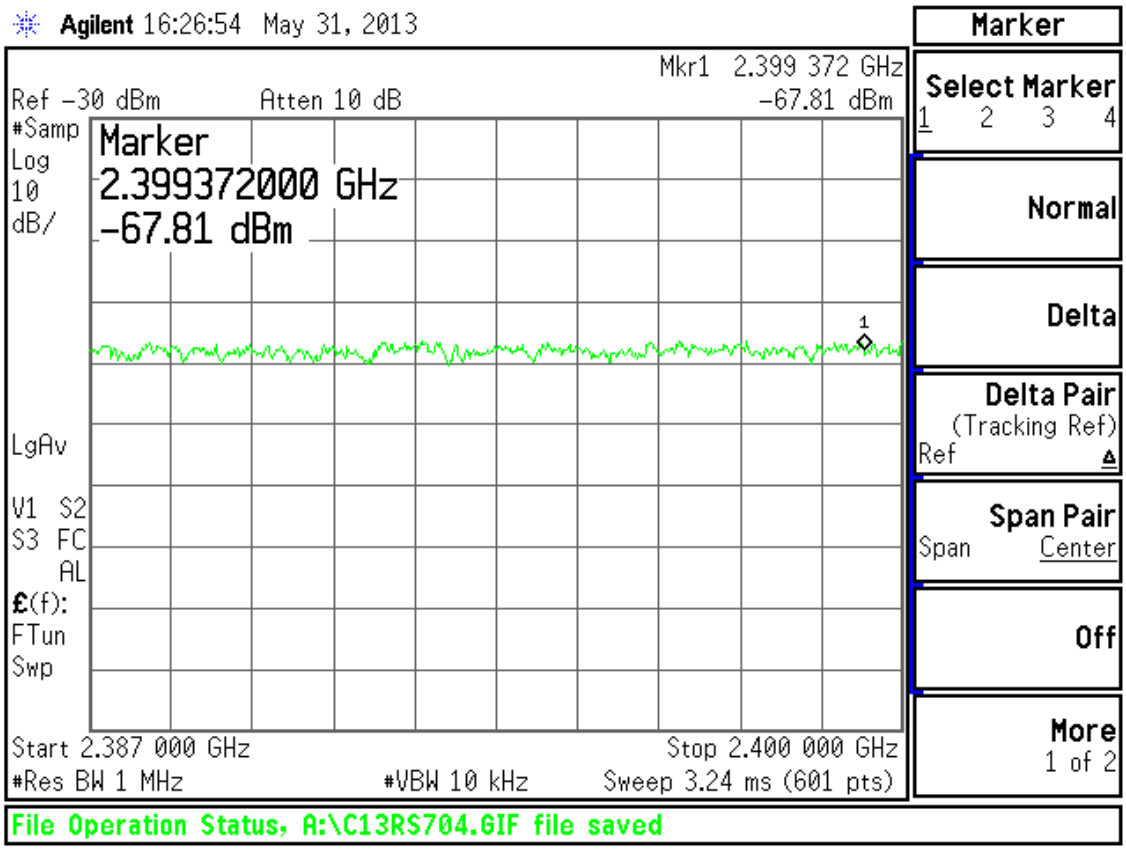

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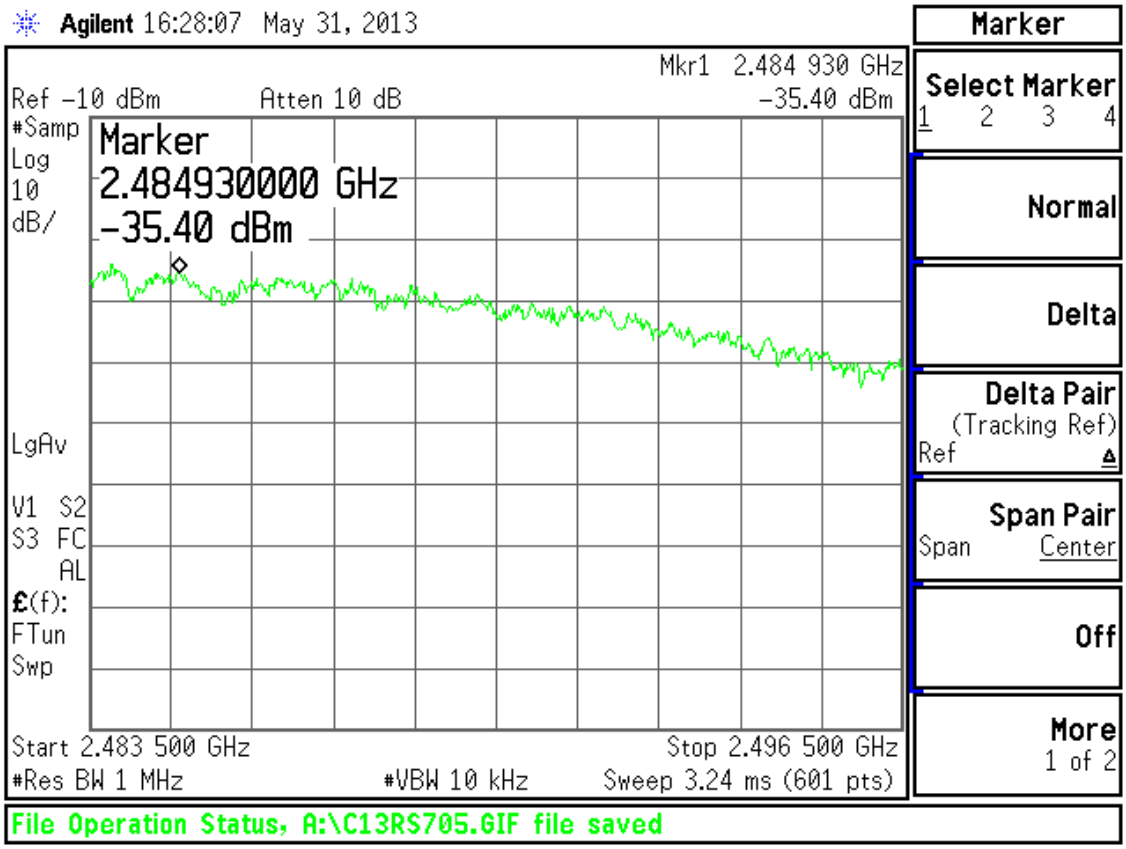

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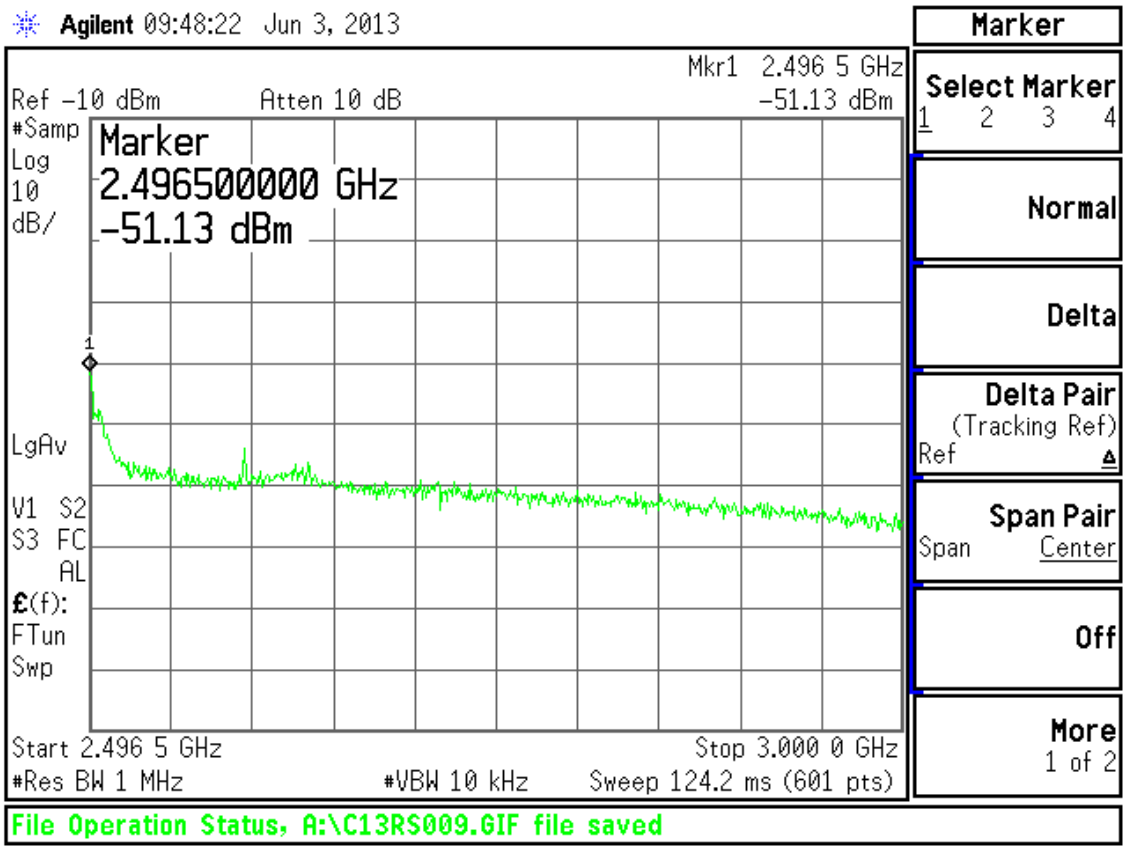

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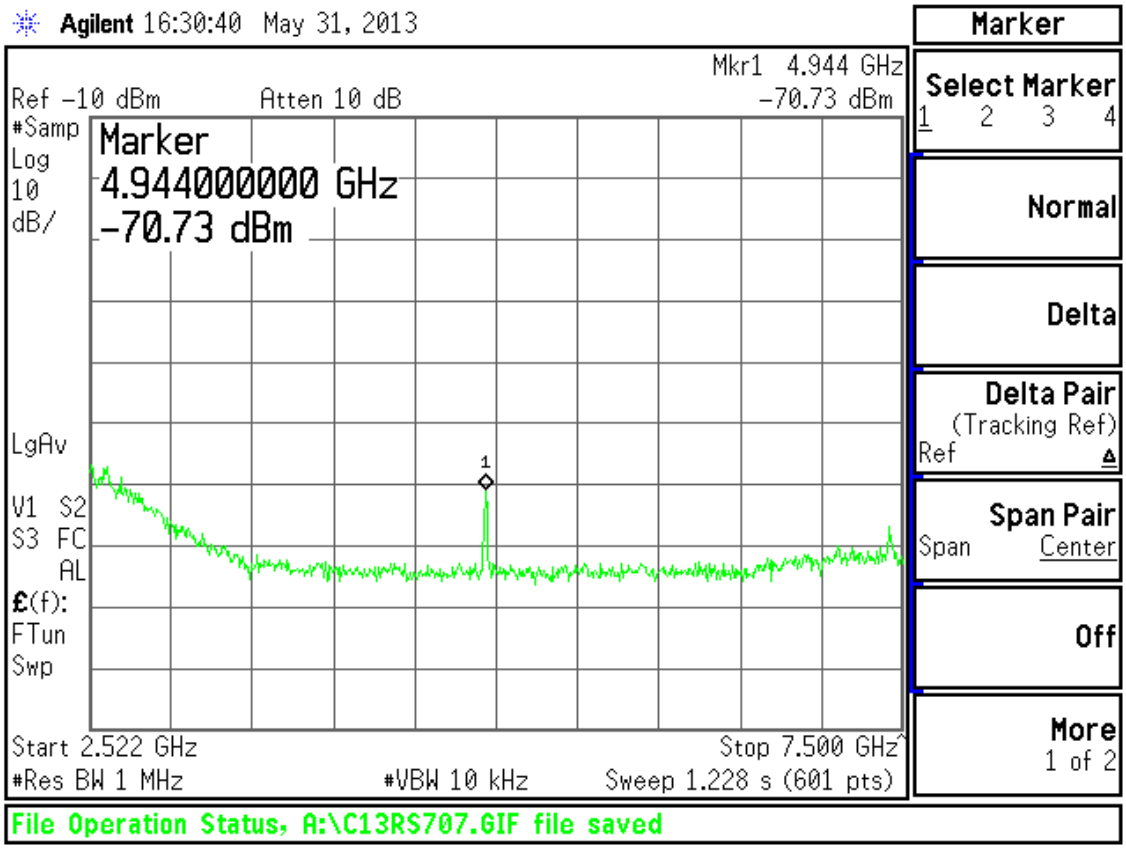
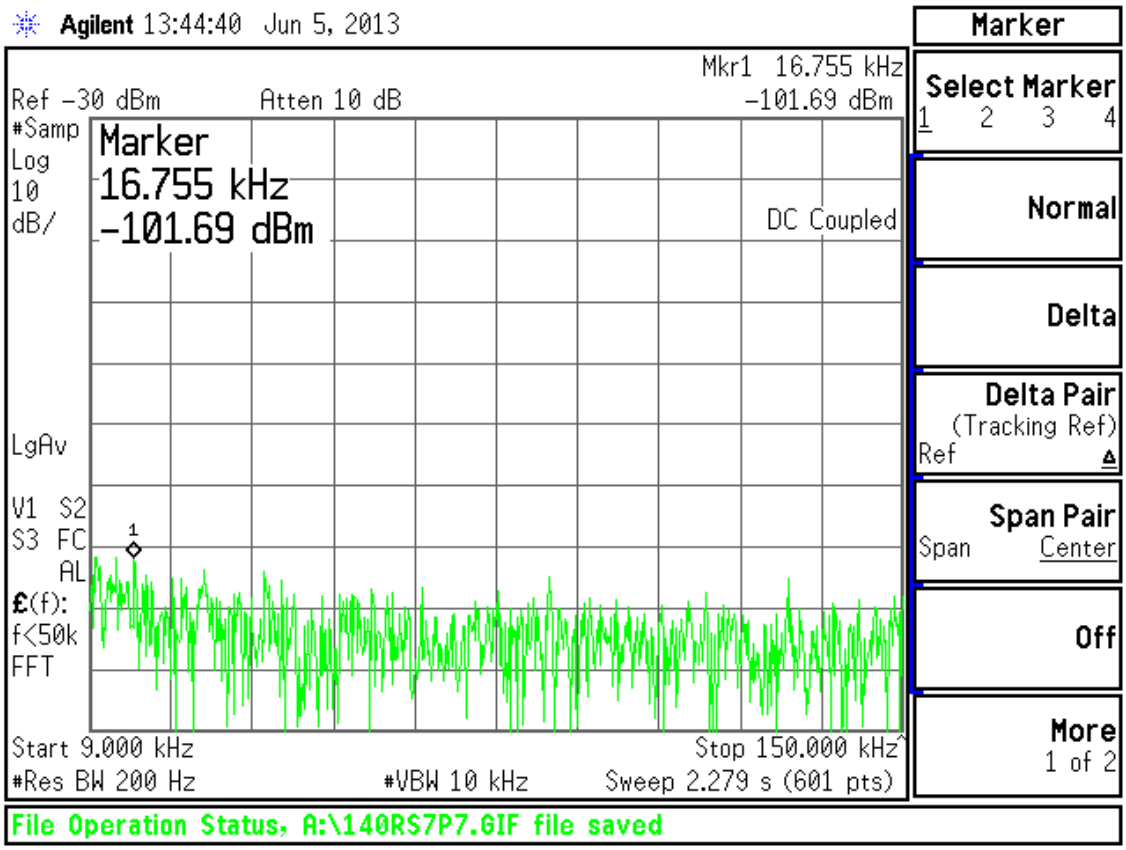
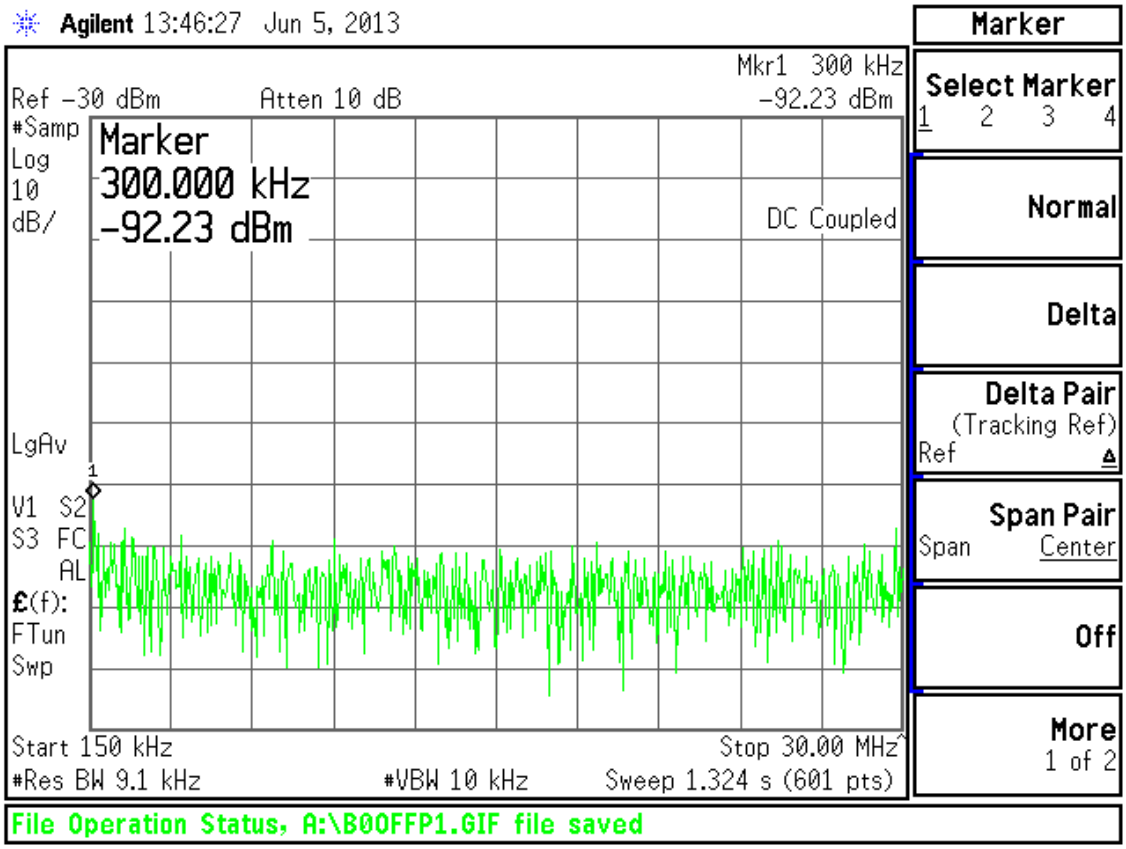


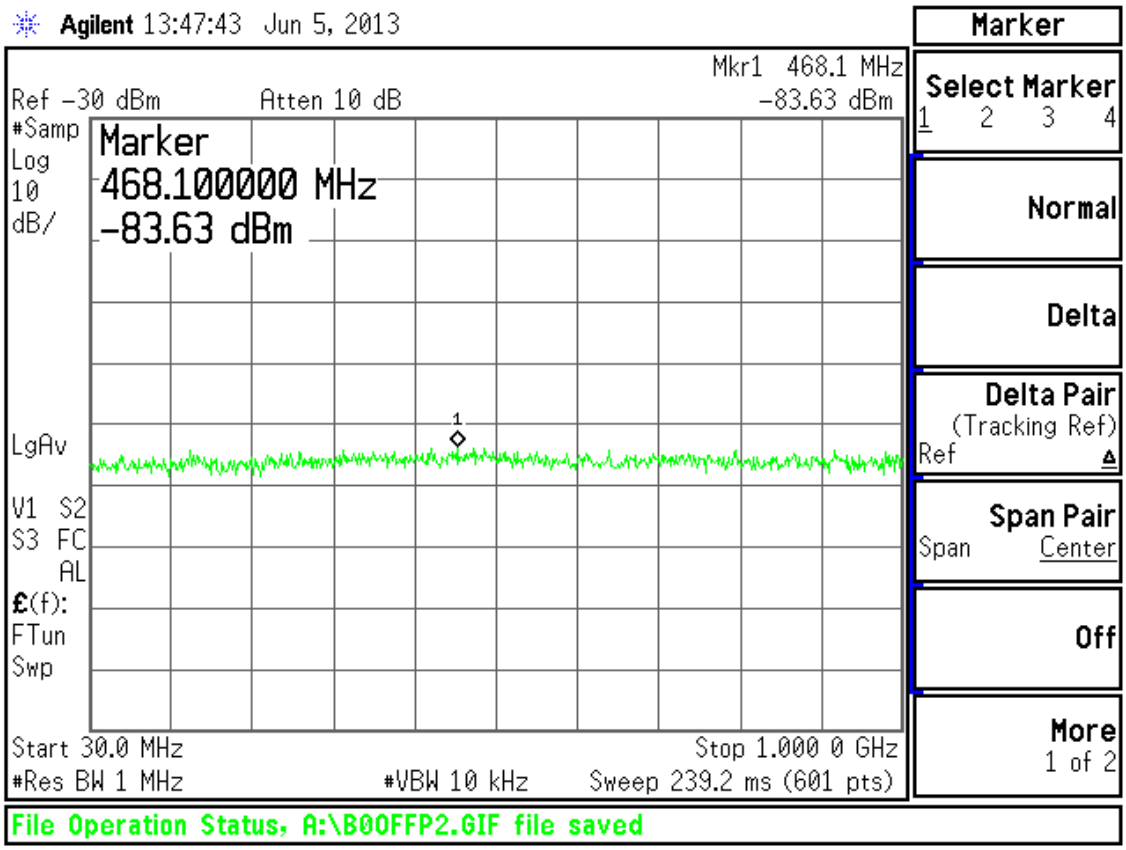
CH 13 802.11n Tx Conducted Emissions (MCS7)



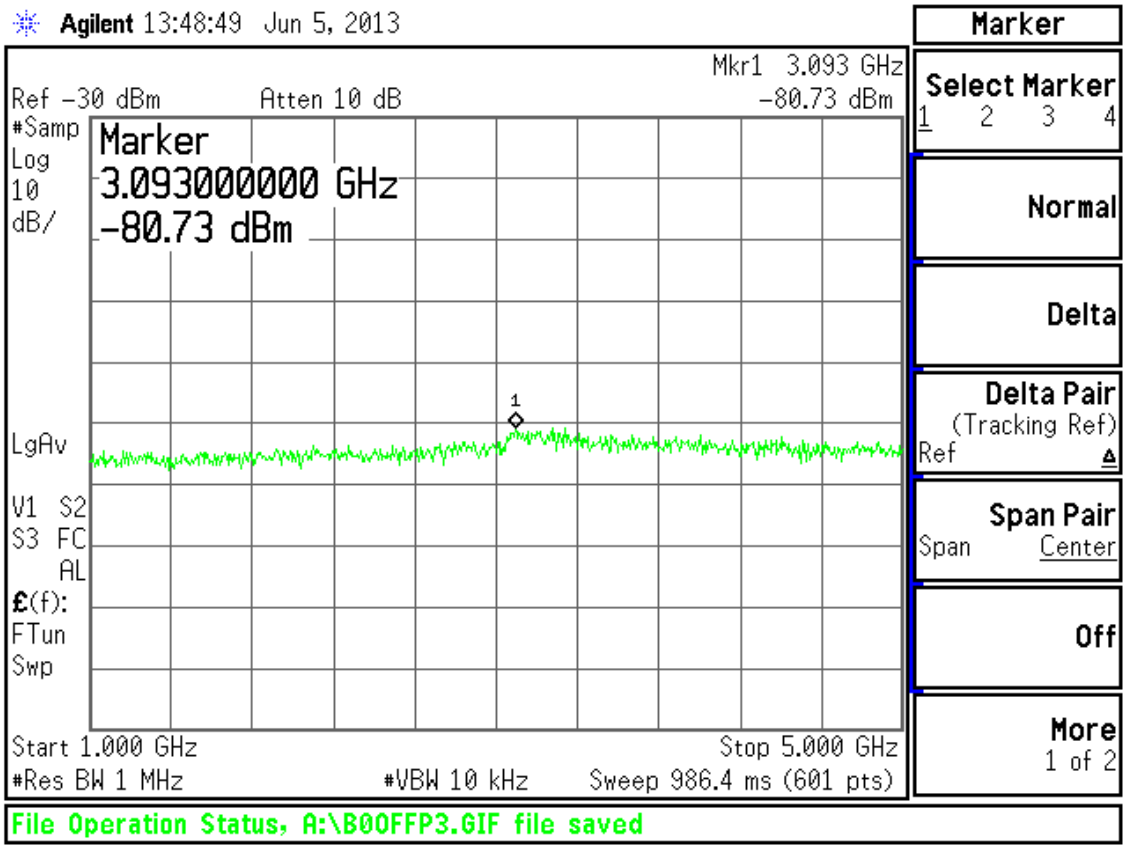
Rx Conducted Emissions



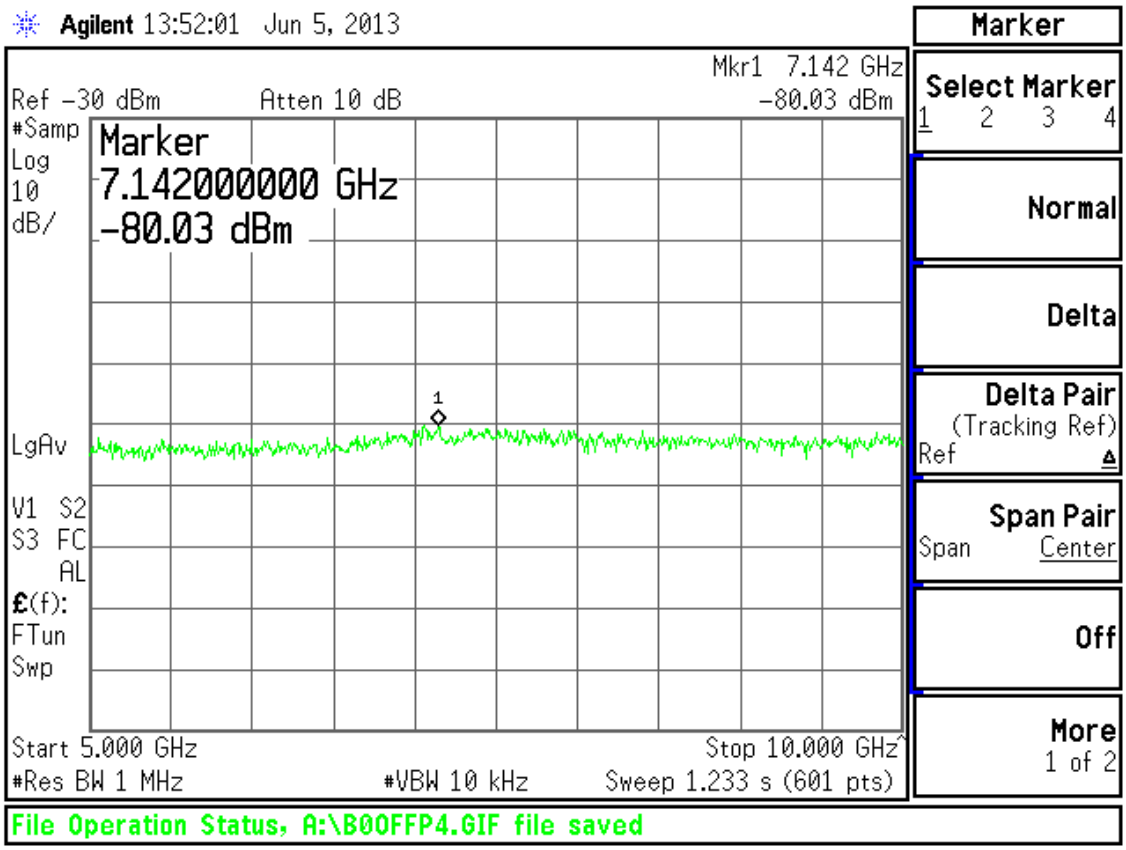
Rx Conducted Emissions



Rx Conducted Emissions



Rx Conducted Emissions



Rx Conducted Emissions

Appendix C: Additional Test and Sample Details

This appendix contains details of:

1. The samples submitted for testing.
2. Details of EUT operating mode(s)
3. Details of EUT configuration(s) (see below).
4. EUT arrangement (see below).

Throughout testing, the following numbering system is used to identify the sample and it's modification state:

Sample No: Sxx Mod w

where:

xx = sample number eg. S01
w = modification number eg. Mod 2

The following terminology is used throughout the test report:

Support Equipment (SE) is any additional equipment required to exercise the EUT in the applicable operating mode. Where relevant SE is divided into two categories:

SE in test environment: The SE is positioned in the test environment and is not isolated from the EUT (e.g. on the table top during REFE testing).

SE isolated from the EUT: The SE is isolated via filtering from the EUT. (e.g. equipment placed externally to the ALSR during REFE testing).

EUT configuration refers to the internal set-up of the EUT. It may include for example:

Positioning of cards in a chassis.
Setting of any internal switches.
Circuit board jumper settings.
Alternative internal power supplies.

Where no change in EUT configuration is **possible**, the configuration is described as “single possible configuration”.

EUT arrangement refers to the termination of EUT ports / connection of support equipment, and where relevant, the relative positioning of samples (EUT and SE) in the test environment.

For further details of the test procedures and general test set ups used during testing please refer to the related document "EMC Test Methods - An Overview", which can be supplied by TRaC telecoms & Radio upon request.

C1) Test samples

The following samples of the apparatus were submitted by the client for testing :

Sample No.	Description	Identification
TRA-007055S17	Wi-i.MX53	55001661-01
TRA-007055S18	Bec In-Line PSU	AP1212-1 01 Rev.B

The following samples of apparatus were supplied by TRaC Telecoms & Radio as support or drive equipment (auxiliary equipment):

Identification	Description
REF1270	Variac

C2) EUT Operating Mode During Testing.

During testing, the EUT was exercised as described in the following tables :

Test	Description of Operating Mode
All tests detailed in this report excluding: RX emissions	EUT was transmitting on software power setting 53, 100% duty cycle using the following operating modes : **Operating band: 2.4 to 2.4835GHz** 802.11b (DSSS): Channels 1, 7 and 13 with data rates: 1Mbps and 11MBps 802.11b (DSSS): Channel 14 with data rates: 1Mbps and 11Mbps 802.11g (OFDM): Channels 1, 7 and 13 with data rates: 6Mbps and 54Mbps 802.11n (20MHz): (OFDM):Channels 1, 7 and 13 using a single spatial stream with a modulation and coding scheme (MCS) 0 and 7 802.11n (40MHz) (OFDM): Channels 3, 7 and 11 using a single spatial stream with a modulation and coding scheme (MCS) 0 and 7
RX emissions	The EUT was in continuous Receive mode

C3) EUT Configuration Information.

The EUT was submitted for testing in one single possible configuration.

C4) List of EUT Ports.

Sample : TRA-007055S17
Tests : All tests listed within this test report.

Port	Description of Cable Attached	Cable length	Equipment Connected
Power, control and signals	None	N/A	None
dc power port	2 core unscreened	1m	PSU
Ethernet 1	None	N/A	None
Ethernet 2	Cat 5e UTP	>3m	Laptop
USB	None	N/A	None
Serial	None	N/A	None
BAT IN	None	N/A	None

The only active interface that is used by the EUT under normal operation is the Ethernet port. The other interfaces are only used to set up the support board, which is not EUT.

C5) Details of Equipment Used.

TRAC Ref	Type	Description	Manufacturer	Date Calibrated.
RFG031/032/171	436A/8482A/8481D	Power Meter/Head	HP	04/10/10
REF845	E8257D	PSG Signal generator	Agilent	19/02/10
REF837	E4440A	PSA Spectrum Analyser	Agilent	10/05/13
REF847	ESU	EMI Test Receiver (Spectrum analyser)	Rhode & Schwarz	14/06/10
RFG454	SMA	HF cable (SMA to SMA)	Utiflex	04/05/10
REF887	34405A	Digital Multi-meter	Agilent	25/08/10
REF1270	N/A	VARIAC	TRaC	CAL date N/A

Appendix D: Additional Information

Manufacturer's data sheet detailing the maximum gain used by the EUT.

Tri-band
2.45/5.2/5.8GHz
Hi-Gain Dipole **WPANTE3 Series**

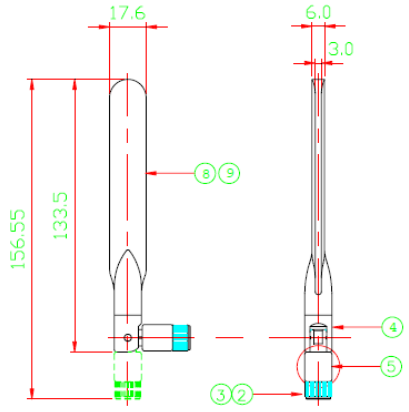
Explanation of Part Number

WPANT E3
(1) (2)

(1) Product type: Antenna
(2) Appearance Series: E3

Electrical Properties

Item	Property
Frequency Range	2.4~2.4835 GHz / 5.15~5.35/5.725~5.85GHz
Impedance	50Ω
VSWR (see Fig. 1)	2.0 max
Return Loss (see Fig 2)	-10 dB max
Gain (see Fig 3,Fig 4)	5 dBi (Typ.)
Polarization	Linear
Radiation Pattern	Near omni-directional in the horizontal plane
Admitted Power	1 W
Electrical	1/2 λ Dipole



Application

This tri-band high-gain dipole antenna is an ideal solution for dual or tri-band WLAN access points operating in the ISM 2.45GHz or UNII/III 5.2/5.8GHz bands.
Two antennas may be deployed for diversity antenna applications/requirements.
These antennas are available in a variety of standard coaxial terminations or optionally as a "snap-in" mounted version.
Please contact wireless@worldproducts.com with your specific requirements.

Figure 1. Return Loss (2.4GHz)

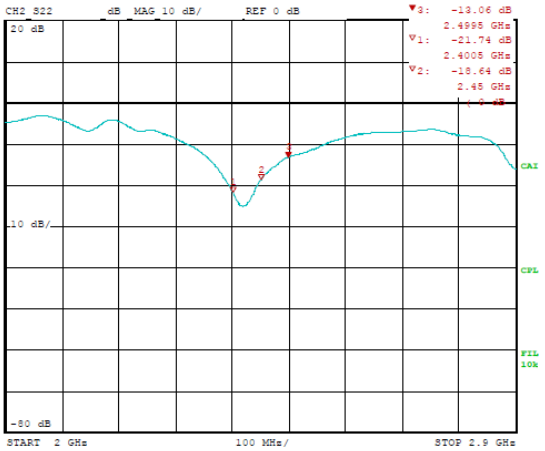


Figure 2. V.S.W.R (2.4GHz)

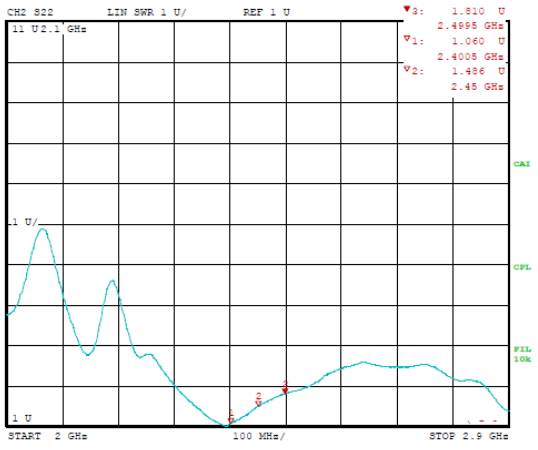


Figure 3. Return Loss (5.0GHz)

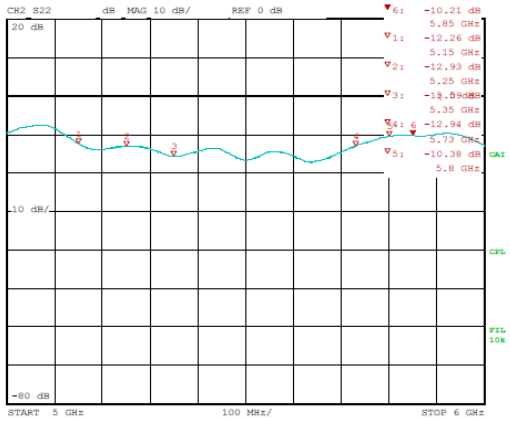


Figure 4. V.S.W.R (5.0GHz)

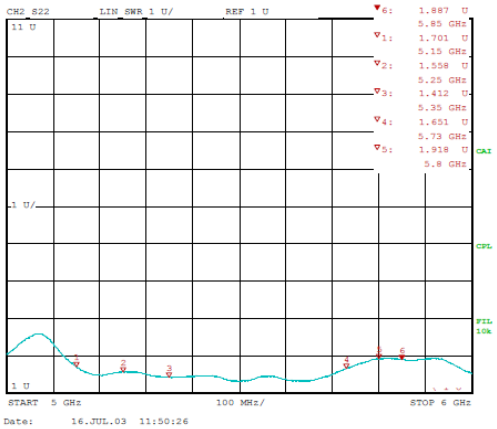


Figure 5. Return Loss (2.0 & 5.0GHz)

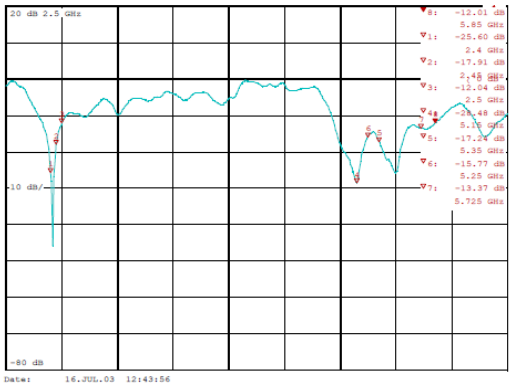
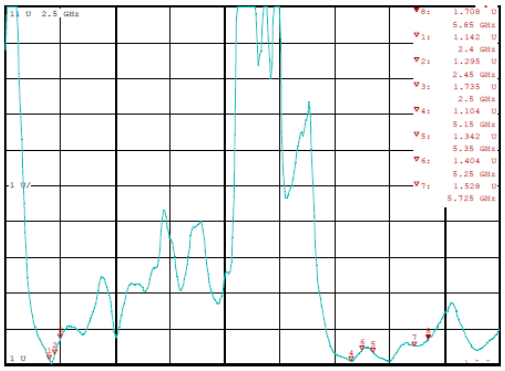


Figure 6. V.S.W.R (2.0 & 5.0GHz)



Measurement Set Up

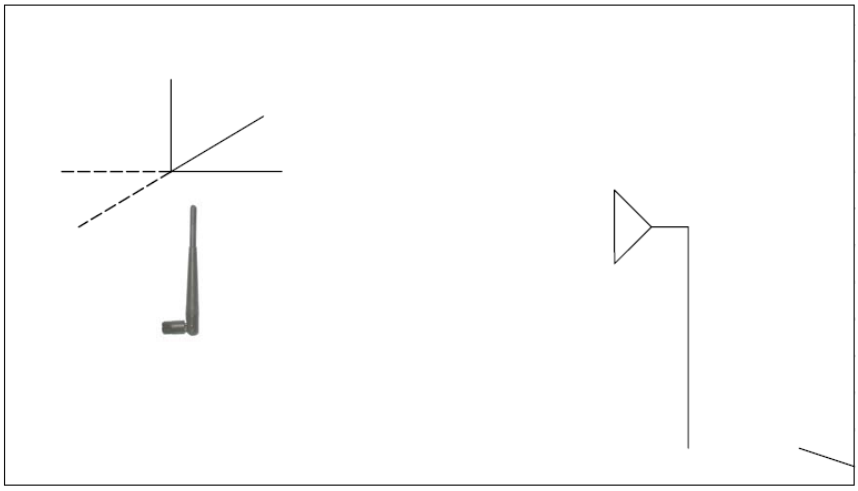


Figure 7. H-Plane (2.0GHz)

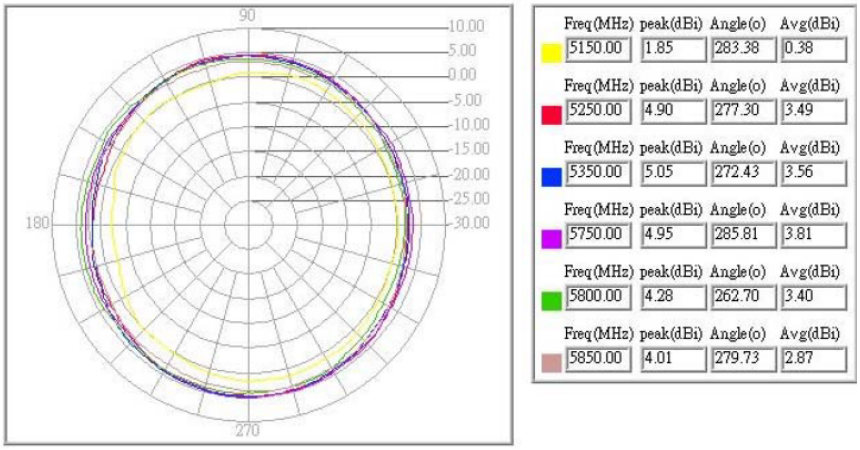
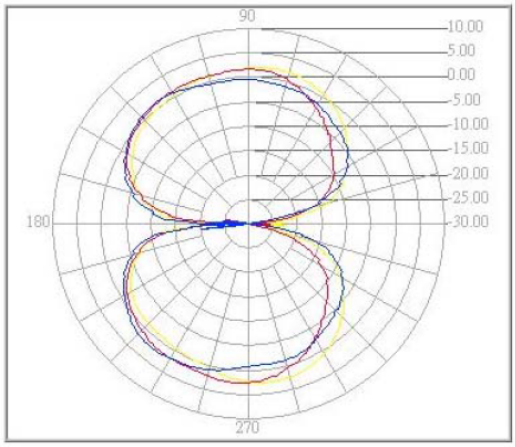
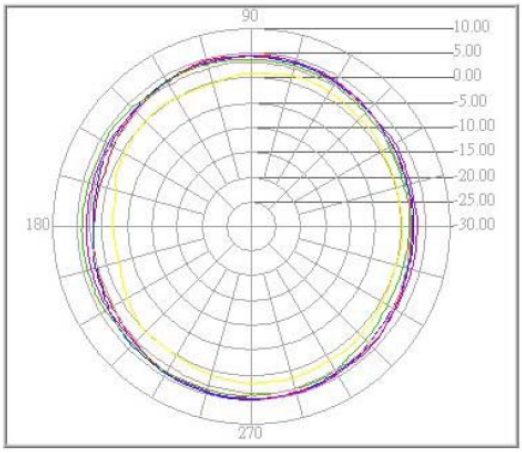


Figure 8. E-Plane (2.0GHz)



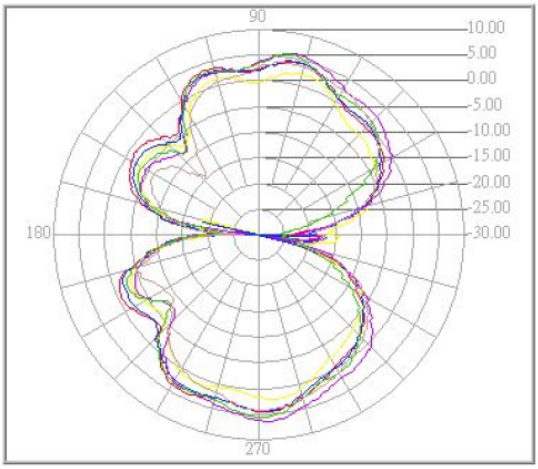
Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
2400.00	2.72	277.79	-1.18
2450.00	2.71	264.08	-1.39
2490.00	2.17	232.94	-1.82

Figure 9. H-Plane (5.0GHz)



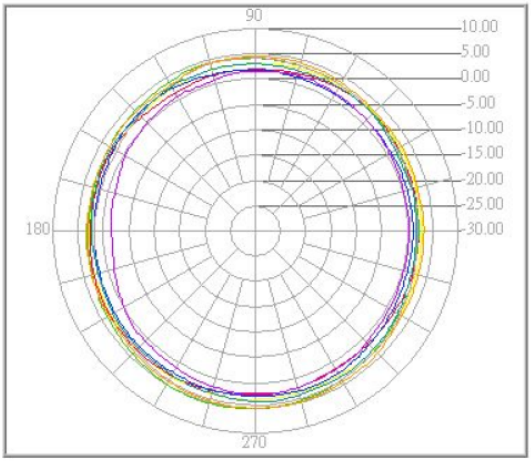
Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
5150.00	1.85	283.38	0.38
5250.00	4.90	277.30	3.49
5350.00	5.05	272.43	3.56
5750.00	4.95	285.81	3.81
5800.00	4.28	262.70	3.40
5850.00	4.01	279.73	2.87

Figure 10. E-Plane (5.0GHz)



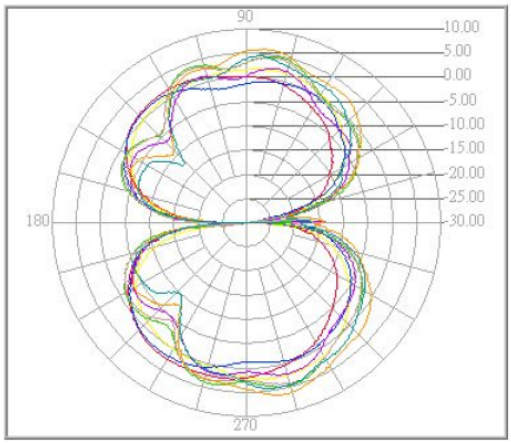
Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
5150.00	2.44	72.25	-2.01
5250.00	4.53	272.80	0.11
5350.00	4.51	75.99	-0.15
5750.00	6.42	274.05	0.96
5800.00	5.79	79.72	0.26
5850.00	4.20	271.56	-0.75

Figure 11. H-Plane (2.0 & 5.0GHz)



Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
2400.00	3.39	257.68	2.98
2450.00	3.17	214.74	2.37
2500.00	2.79	288.00	1.96
5150.00	2.25	280.42	0.82
5200.00	5.23	252.63	3.71
5250.00	4.51	272.84	3.16
5750.00	5.03	267.79	3.88
5850.00	3.83	276.63	2.74

Figure 12. E-Plane (2.0 & 5.0GHz)



Freq(MHz)	peak(dBi)	Angle(o)	Avg(dBi)
2400.00	2.60	283.22	-1.10
2450.00	2.57	240.42	-1.36
2500.00	1.92	237.27	-1.78
5150.00	2.37	78.67	-1.91
5200.00	4.80	79.30	0.32
5250.00	4.49	79.93	-0.01
5750.00	6.34	283.85	1.08
5850.00	4.67	283.22	-0.46

Mechanical Properties

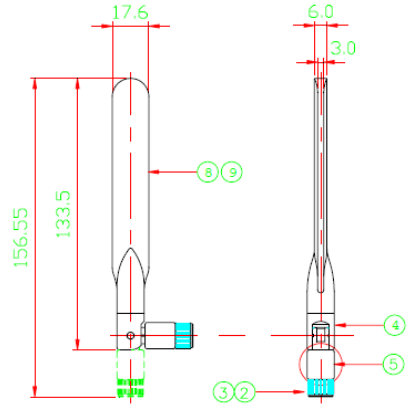
Item	Property
Color	Black/Gray
Coaxial-Cable	RG-178
Plastic Cover	TPU
Antenna Base	PC
Connector	SMA/TNC/BNC

Operation Temperature : -20~+65ºC
Storage Temperature : -20~+65ºC

Environmental Characteristics

Item	Test Condition	Specification
High Temperature/Humidity Operating test	1. Temperature: +60 ± 2ºC 2. Humidity: 90~95%RH 3. Time: 24hrs	1. Normal function. Test must be satisfied after the test. 2. No material deformation is allowed.
Low Temperature/Humidity Operating test	1. Temperature: +20 ± 2ºC 2. Humidity: 0%RH 3. Time: 24hrs	
High Temperature/Humidity Storage	1. Temperature: +65 ± 2ºC 2. Humidity: 90~95%RH 3. Time: 72hrs	
Low Temperature/Humidity Storage	1. Temperature: +20 ± 2ºC 2. Humidity: 0%RH 3. Time: 24hrs	
Temperature Cycle Operating Test	1. Temperature: -40~+75ºC 2. Duration: ▪ 88 Hours ▪ 45min./dwelling@-40ºC ▪ 10ºC per min./transition from 40~75ºC ▪ 45min./dwelling@ 75ºC	
Temperature Shock Test	1. Temperature: -40~+85ºC 2. TIME: 30min./dwelling, 5minutes/transition, 24 cycles	

Physical Dimensions



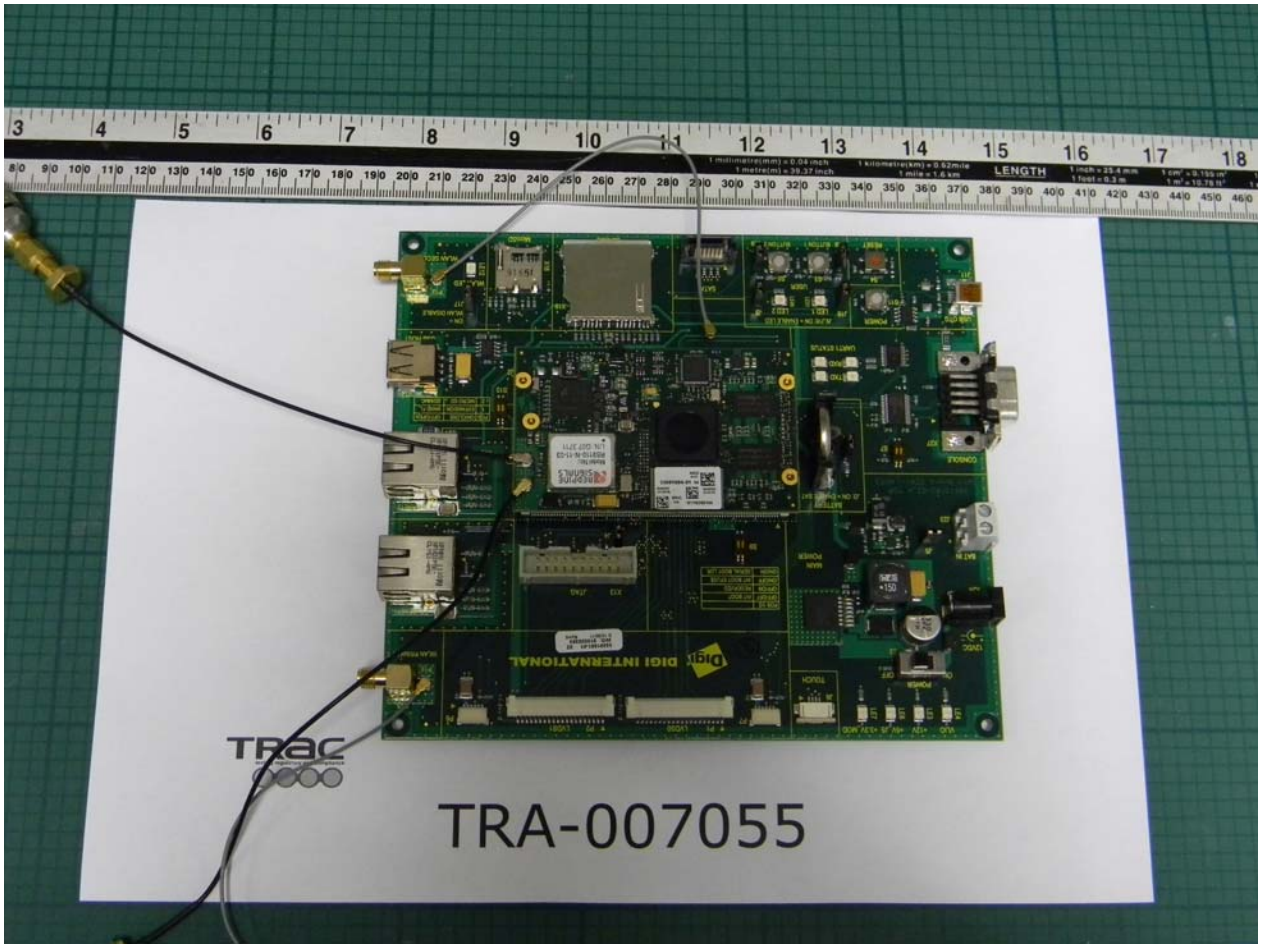
Software settings used for both modes of modulation to determine the maximum power used by the device. Antenna port A and B was assed for the highest output power to determine the software settings within this test report.

Antenna Port A/B: Operating mode 802.11b		
Software Output Power settings		
Mode 802.11b	Declared operating frequency (MHz)	Software Output Power settings
CH1	2412MHz	53
CH7	2442MHz	53
CH13	2472MHz	53
CH14	2484MHz	53

Antenna Port A/B: Operating mode 802.11g		
Software Output Power settings		
Mode 802.11g	Declared operating frequency (MHz)	Software Output Power settings
CH1	2412MHz	53
CH7	2442MHz	53
CH13	2472MHz	53

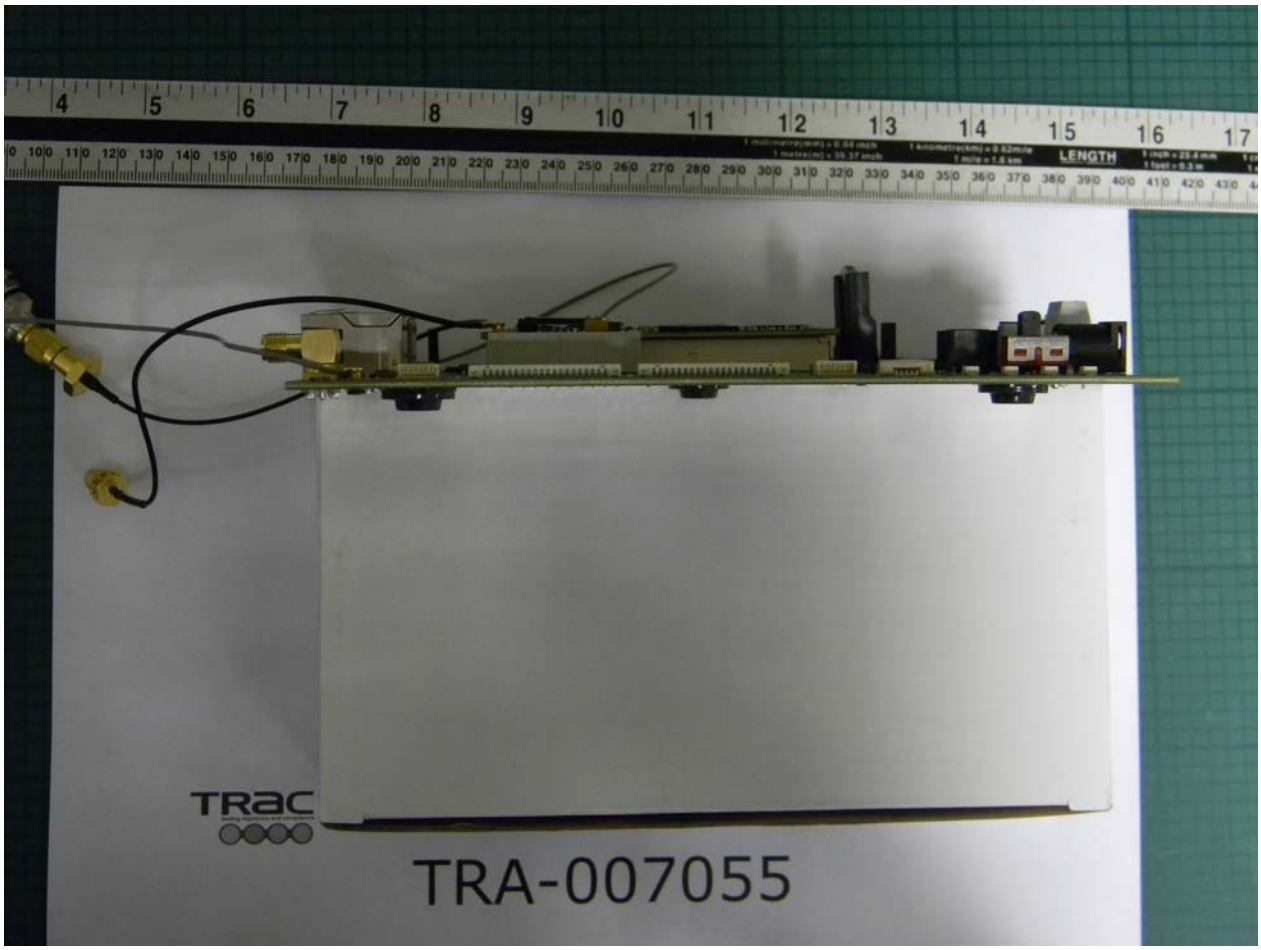
Appendix E: Photographs and Figures

1. Photo of the EUT Front view -length dimension
2. Photo of the DUT Rear view
3. Photo of the DUT Side view
4. Photo of the EUT Front view - width dimension

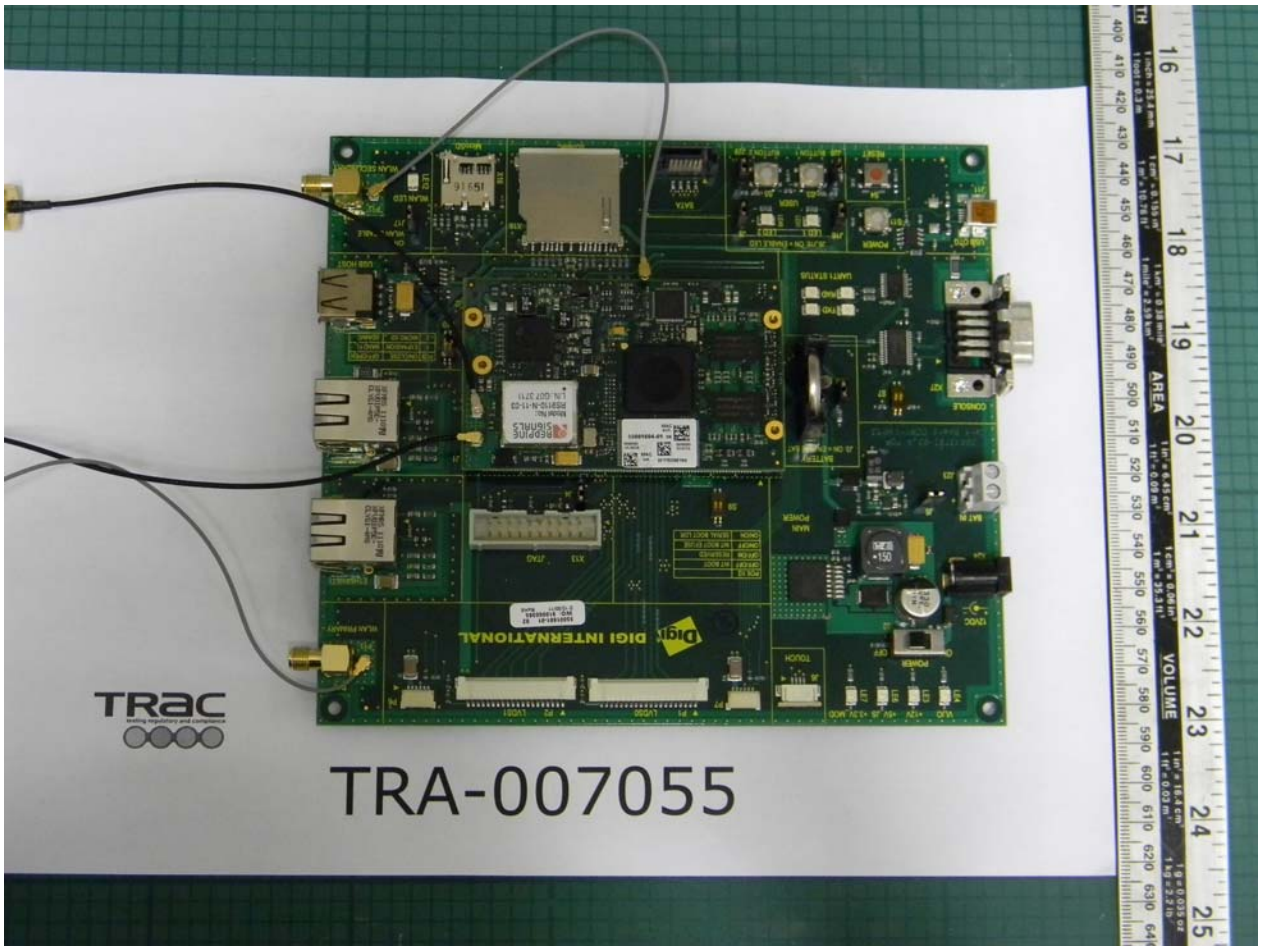


Photograph 1

Photograph 2



Photograph 3



Photograph 4

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