Conducted Output Power (802.11a-CH 165) 12 Mbps

Conducted Output Power (802.11a-CH 165) 18 Mbps

Conducted Output Power (802.11a-CH 165) 24 Mbps

Conducted Output Power (802.11a-CH 165) 36 Mbps

Conducted Output Power (802.11a-CH 165) 48 Mbps

Conducted Output Power (802.11a-CH 165) 54 Mbps

20 MHz BW

(5745 MHz ~5825 MHz)

Conducted Output Power (802.11n-CH 149) 6.5 Mbps

Conducted Output Power (802.11n-CH 149) 13 Mbps

Conducted Output Power (802.11n-CH 149) 19.5 Mbps

Conducted Output Power (802.11n-CH 149) 26 Mbps

Conducted Output Power (802.11n-CH 149) 39 Mbps

Conducted Output Power (802.11n-CH 149) 52 Mbps

Conducted Output Power (802.11n-CH 149) 58.5 Mbps

Conducted Output Power (802.11n-CH 149) 65 Mbps

Conducted Output Power (802.11n-CH 157) 6.5 Mbps

Conducted Output Power (802.11n-CH 157) 13 Mbps

Conducted Output Power (802.11n-CH 157) 19.5 Mbps

Conducted Output Power (802.11n-CH 157) 26 Mbps

Conducted Output Power (802.11n-CH 157) 39 Mbps

Conducted Output Power (802.11n-CH 157) 52 Mbps

Conducted Output Power (802.11n-CH 157) 58.5 Mbps

Conducted Output Power (802.11n-CH 157) 65 Mbps

Conducted Output Power (802.11n-CH 165) 6.5 Mbps

Conducted Output Power (802.11n-CH 165) 13 Mbps

Conducted Output Power (802.11n-CH 165) 19.5 Mbps

Conducted Output Power (802.11n-CH 165) 26 Mbps

Conducted Output Power (802.11n-CH 165) 39 Mbps

Conducted Output Power (802.11n-CH 165) 52 Mbps

Conducted Output Power (802.11n-CH 165) 58.5 Mbps

Conducted Output Power (802.11n-CH 165) 65 Mbps

40 MHz BW

(5755 MHz ~5795 MHz)

Conducted Output Power (802.11n-CH 149) 13.5 Mbps

Conducted Output Power (802.11n-CH 149) 27 Mbps

Conducted Output Power (802.11n-CH 149) 40.5 Mbps

Conducted Output Power (802.11n-CH 149) 54 Mbps

Conducted Output Power (802.11n-CH 149) 81 Mbps

Conducted Output Power (802.11n-CH 149) 108 Mbps

Conducted Output Power (802.11n-CH 149) 121.5 Mbps

Conducted Output Power (802.11n-CH 149) 135 Mbps

Conducted Output Power (802.11n-CH 149) 13.5 Mbps

Conducted Output Power (802.11n-CH 149) 27 Mbps

Conducted Output Power (802.11n-CH 149) 40.5 Mbps

Conducted Output Power (802.11n-CH 149) 54 Mbps

Conducted Output Power (802.11n-CH 149) 81 Mbps

Conducted Output Power (802.11n-CH 149) 108 Mbps

Conducted Output Power (802.11n-CH 149) 121.5 Mbps

Conducted Output Power (802.11n-CH 149) 135 Mbps

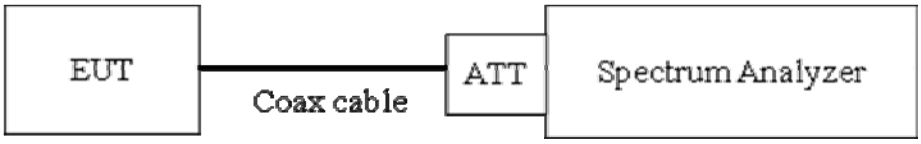
8.3 POWER SPECTRAL DENSITY (802.11a/b/g/n)

Test Requirements and limit, §15.247(e)

The peak power spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

Minimum Standard – the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

We tested according to ANSI 63.10 (issued 2009).

The spectrum analyzer is set to :

Span = 20 MHz(For devices with a nominal 40 MHz BW, 50 MHz span will be needed)

Reference level = 20 dBm

Attenuation = 0 dB (add internal attenuation, if necessary)

Sweep time = Auto Coupled

RBW = 3 kHz

VBW = 10 kHz

Detector = Peak

MKR = Center Frequency

Trace = Clear write

Set the TRACE to MAX HOLD, and after the trace stabilizes, the TRACE to VIEW.

SET the marker on the peak of the signal and then adjust the center frequency of the spectrum analyzer to the marker frequency.

After viewing the EUT waveform on the spectrum analyzer, perform the following spectrum analyzer functions to capture the trace

Span = 300 kHz

Sweep time = 100 s

Trace = Max hold

MKR = Peak Search

▣ Sample Calculation

PSD = Reading Value + ATT loss + Cable loss(1 ea)

= -5 dBm + 10 dB + 0.8 dB = 5.8 dBm

Where: BWCF(Bandwidth Correction Factor) = 10log(3 kHz/100 kHz) = -15.2 dB

Note :

1. Spectrum reading values are not plot data. The PSD results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz and 5.8 GHz range that was rounded off to the closest tenth dB. Actual value of loss for the attenuator and cable combination is below table.

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	10.11
	2437	10.10
	2462	10.12
5.8 GHz	5745	10.37
	5755	10.37
	5785	10.38
	5795	10.38
	5825	10.37

(Actual value of loss for the attenuator and cable combination)

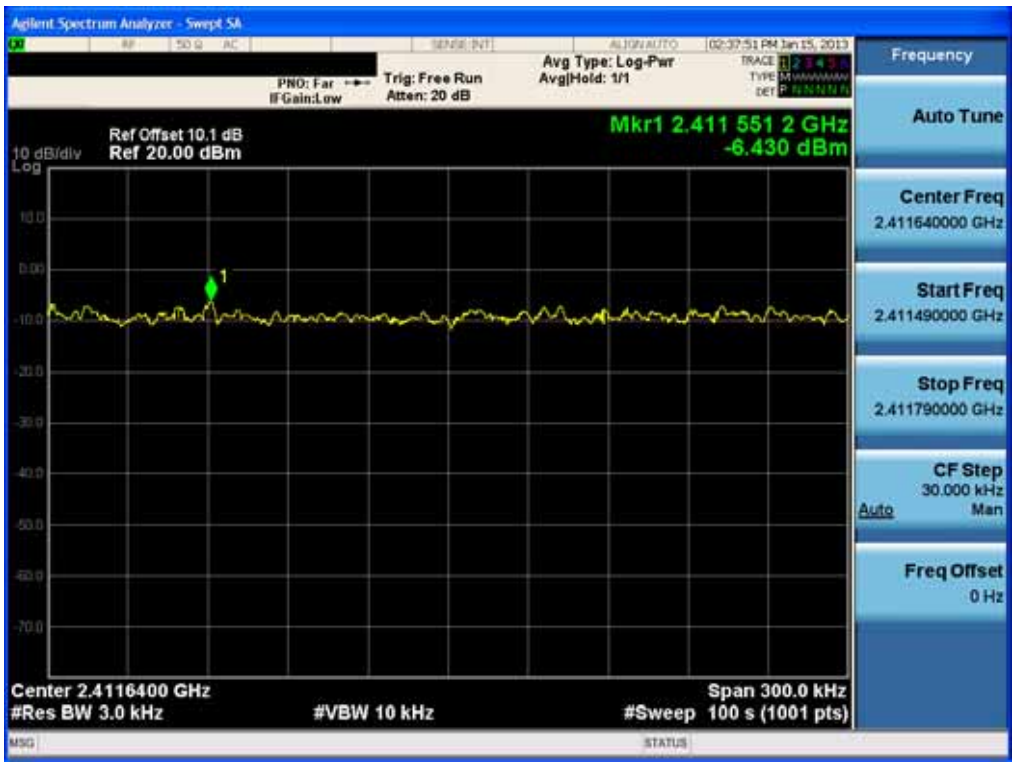
▣ TEST RESULTS

Conducted Power Density Measurements

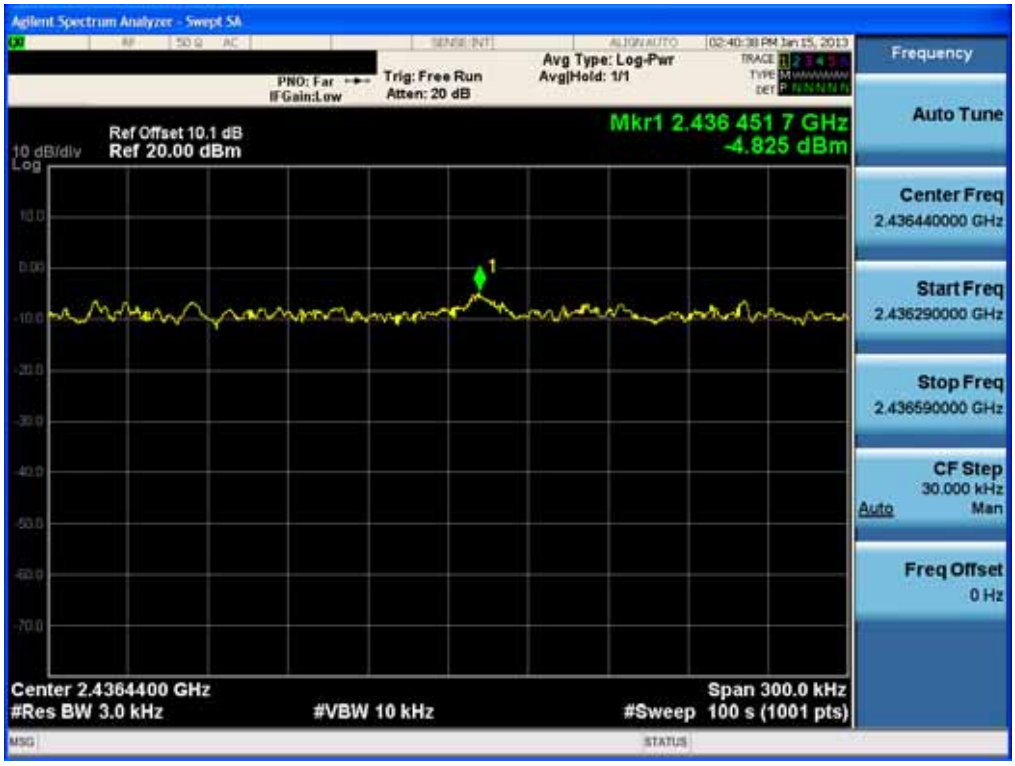
Frequency (MHz)	Channel No.	Mode	Test Result		
			PSD (dBm)	Limit (dBm)	Pass/Fail
2412	1	802.11b	-6.430	8	Pass
2437	6		-4.825	8	Pass
2462	11		-6.844	8	Pass
2412	1	802.11g	-10.734	8	Pass
2437	6		-10.158	8	Pass
2462	11		-9.765	8	Pass
2412	1	802.11n 2.4 GHz Band	-10.535	8	Pass
2437	6		-11.142	8	Pass
2462	11		-10.635	8	Pass
5745	149	802.11a	-10.777	8	Pass
5785	157		-11.276	8	Pass
5825	165		-10.920	8	Pass
5745	149	802.11n_20 MHz BW 5.8 GHz Band	-13.110	8	Pass
5785	157		-12.496	8	Pass
5825	165		-13.573	8	Pass
5755	151	802.11n_40 MHz BW 5.8 GHz Band	-16.931	8	Pass
5795	159		-17.065	8	Pass

▣ RESULT PLOTS

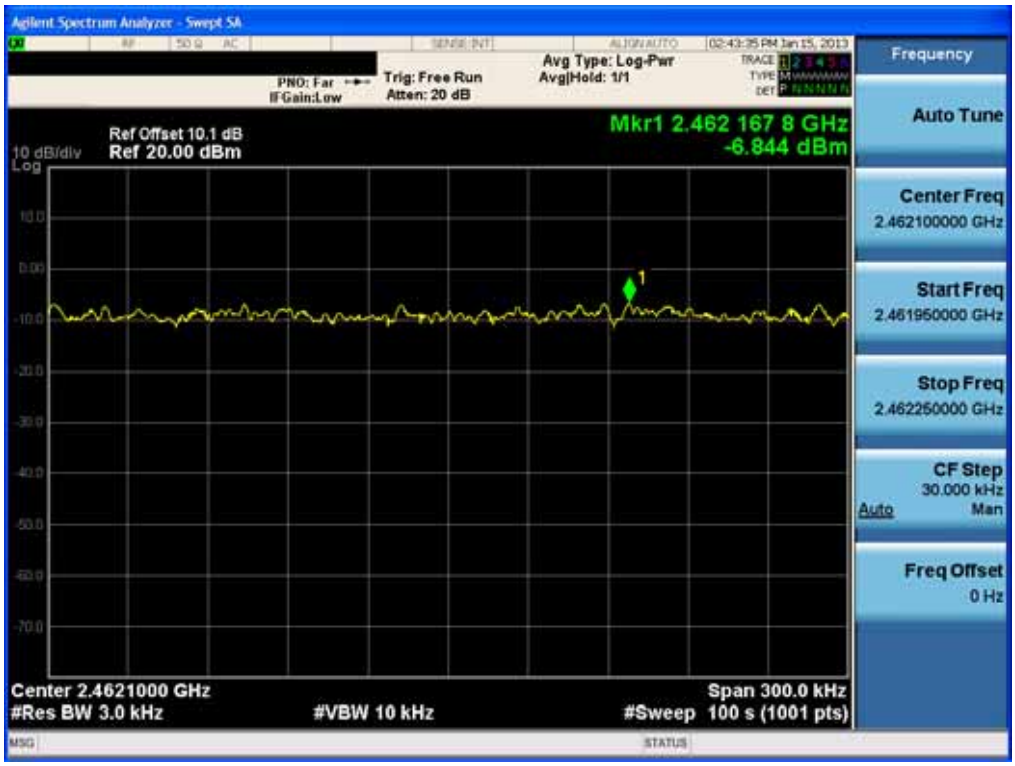
Power Spectral Density (802.11b-CH 1)



Power Spectral Density (802.11b-CH 6)



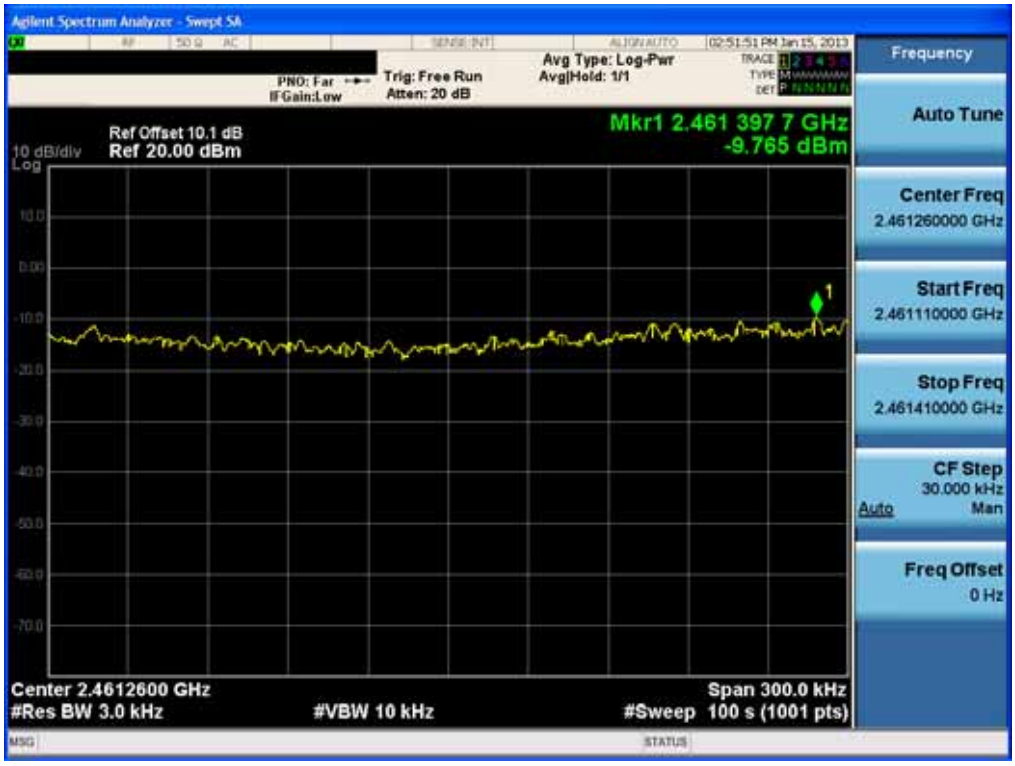
Power Spectral Density (802.11b-CH 11)



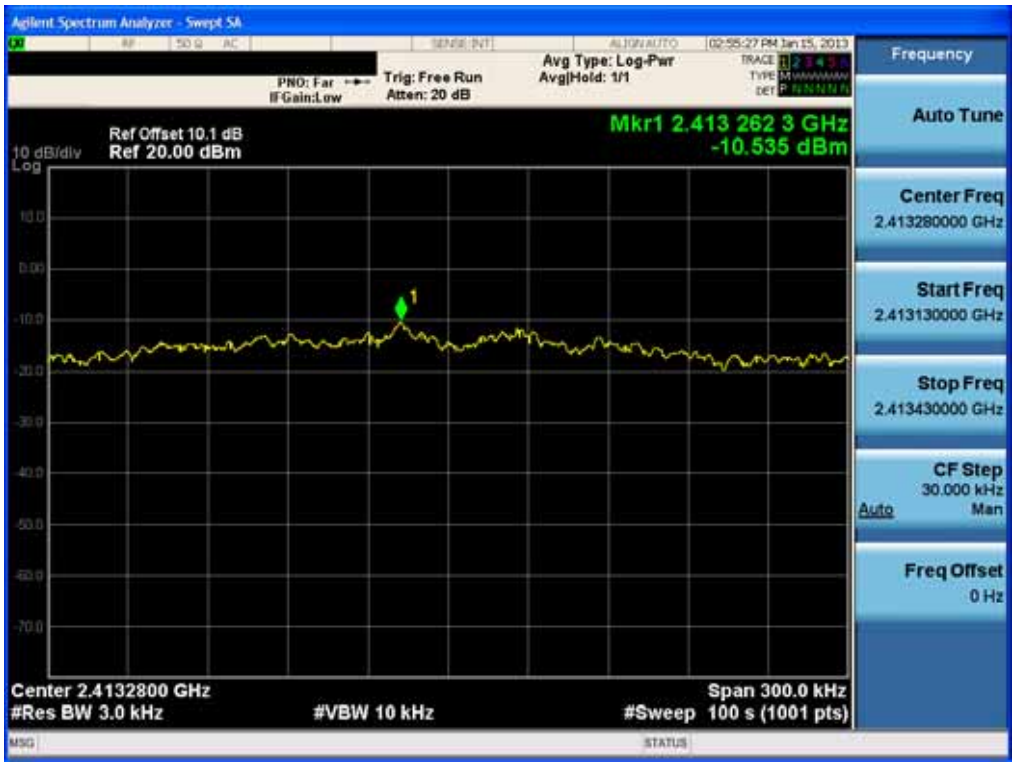
Power Spectral Density (802.11g-CH 1)

Power Spectral Density (802.11g-CH 6)

Power Spectral Density (802.11g-CH11)

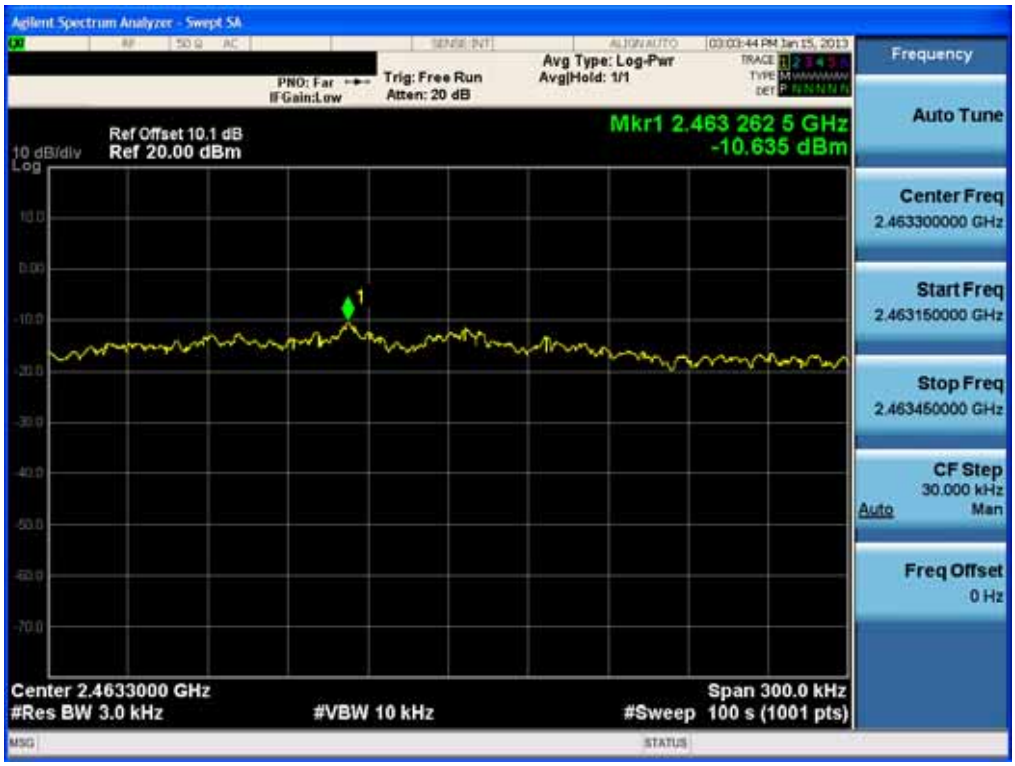


Power Spectral Density (802.11n-CH 1)

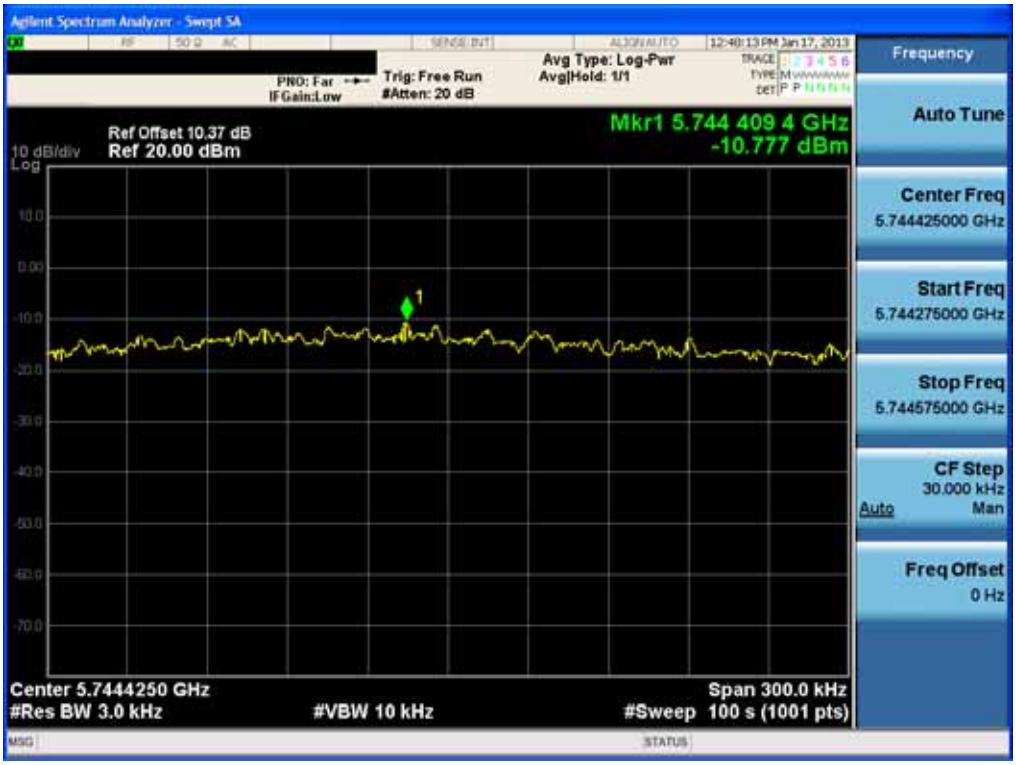


Power Spectral Density (802.11n-CH 6)

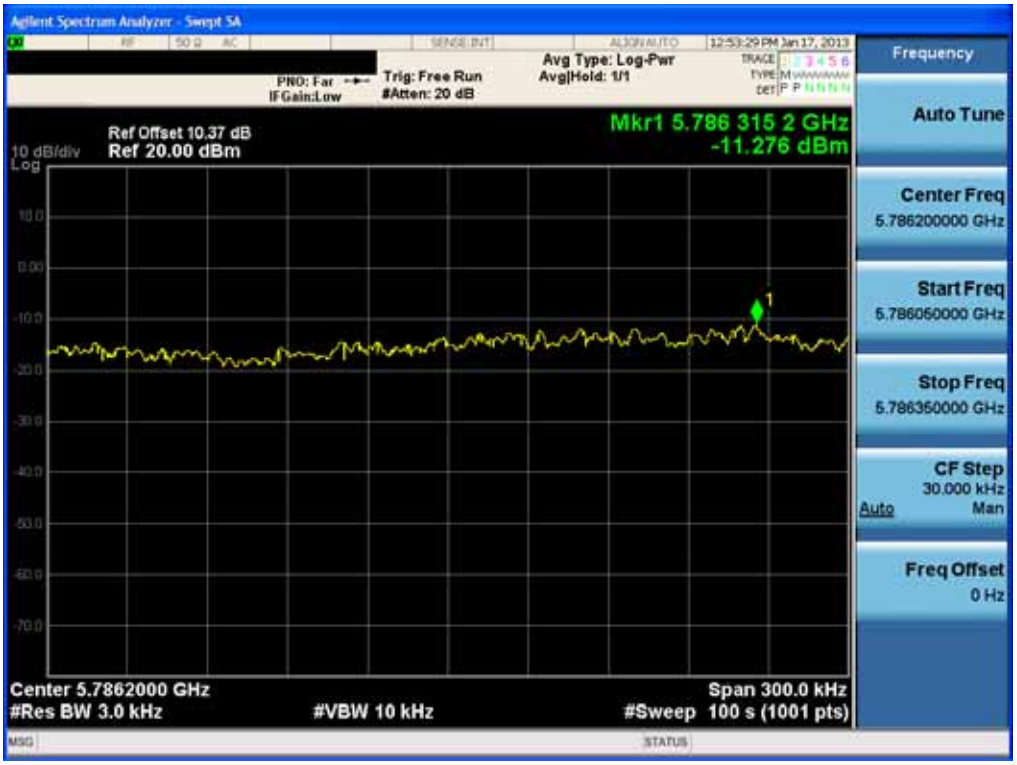
Power Spectral Density (802.11n-CH11)



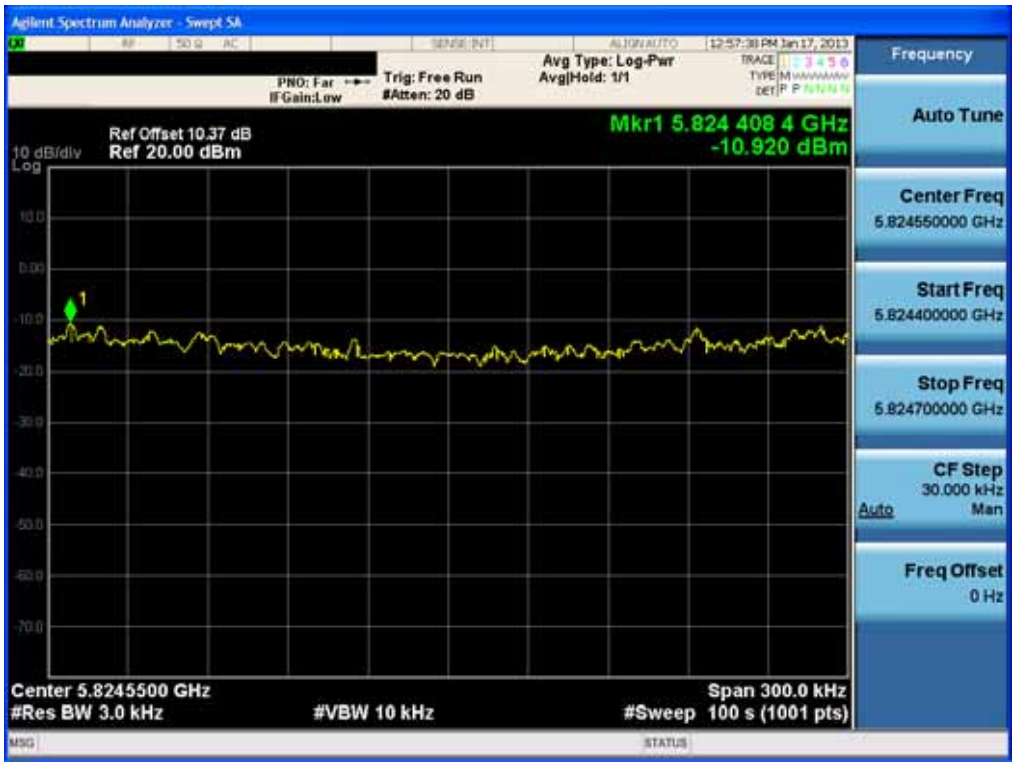
Power Spectral Density (802.11a-CH 149)



Power Spectral Density (802.11a-CH 157)



Power Spectral Density (802.11a-CH 165)



20 MHz BW

Power Spectral Density (802.11n-CH 149)

Power Spectral Density (802.11n-CH 157)

Power Spectral Density (802.11n-CH 165)

40 MHz BW

Power Spectral Density (802.11n-CH 151)

Power Spectral Density (802.11n-CH 159)

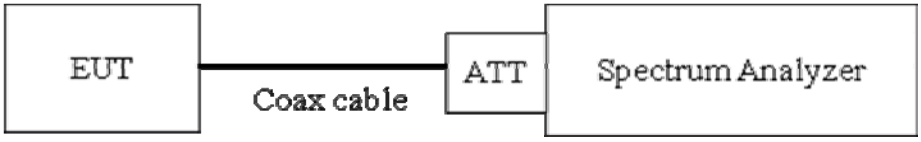
8.4 OUT OF BAND EMISSIONS AT THE BAND EDGE/ CONDUCTED SPURIOUS EMISSIONS

Test Requirements and limit, §15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Limit : 20 dBc

▣ TEST CONFIGURATION



▣ TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. (Procedure 7.7.10 in ANSI 63.10)
RBW = 100 kHz(Upon 1 GHz = 1 MHz)
VBW = 300 kHz(Upon 1 GHz = 1 MHz)
Set span to encompass the spectrum to be examined
Detector = Peak
Trace Mode = max hold
Sweep = auto couple

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

Note :

1. The band edge results in plot is already including the actual values of loss for the attenuator and cable combination.
2. Spectrum offset = Attenuator loss + Cable loss
3. We apply to the offset in the 2.4 GHz and 5.8 GHz range that was rounded off to the closest tenth dB. Actual value of loss for the attenuator and cable combination is below table.

Band	Frequency(MHz)	Loss(dB)
2.4 GHz	2412	10.11
	2437	10.10
	2462	10.12
5.8 GHz	5745	10.37
	5755	10.37
	5785	10.38
	5795	10.38
	5825	10.37

(Actual value of loss for the attenuator and cable combination)

4. In case of conducted spurious emissions test, please check factors blow table.

▣ FACTORS FOR FREQUENCY

Freq(MHz)	Factor(dB)
30	10.37
100	10.16
200	10.15
300	10.14
400	10.18
500	10.19
600	10.20
700	10.30
800	10.25
900	10.28
1000	10.29
2000	10.17
2400*	10.10
2500*	10.12
3000	10.26
4000	10.31
5000	9.85
5700*	10.40
5800*	10.38
6000	10.20
7000	10.60
8000	10.53
9000	10.23
10000	10.41

11000	10.65
12000	11.19
13000	10.97
14000	11.42
15000	12.01
16000	11.77
17000	10.78
18000	10.76
19000	11.15
20000	10.75
21000	10.82
22000	10.82
23000	11.26
24000	11.08
25000	11.18
26000	10.90
27000	11.32
28000	11.33
29000	11.77
30000	11.40
31000	11.82
32000	11.07
33000	13.05
34000	15.68
35000	14.08
36000	15.88
37000	17.32
38000	15.44
39000	14.48
40000	16.50

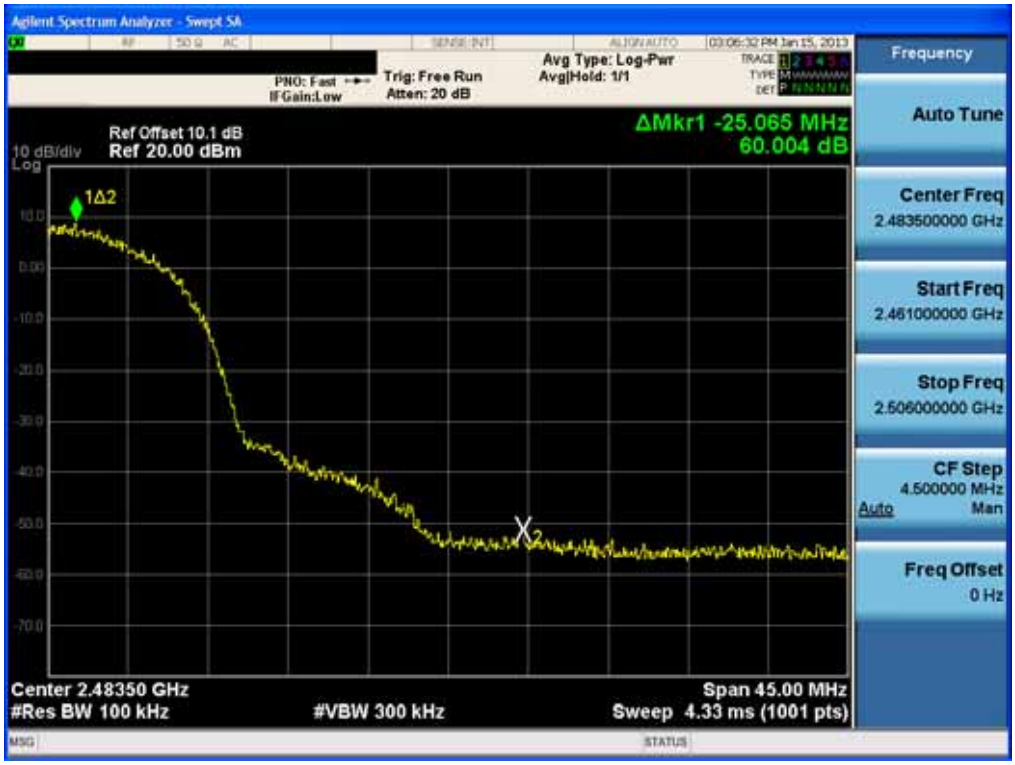
Note : 1. '*' is fundamental frequency range.

2. Factor = Cable loss + Attenuator loss

▣ RESULT PLOTS

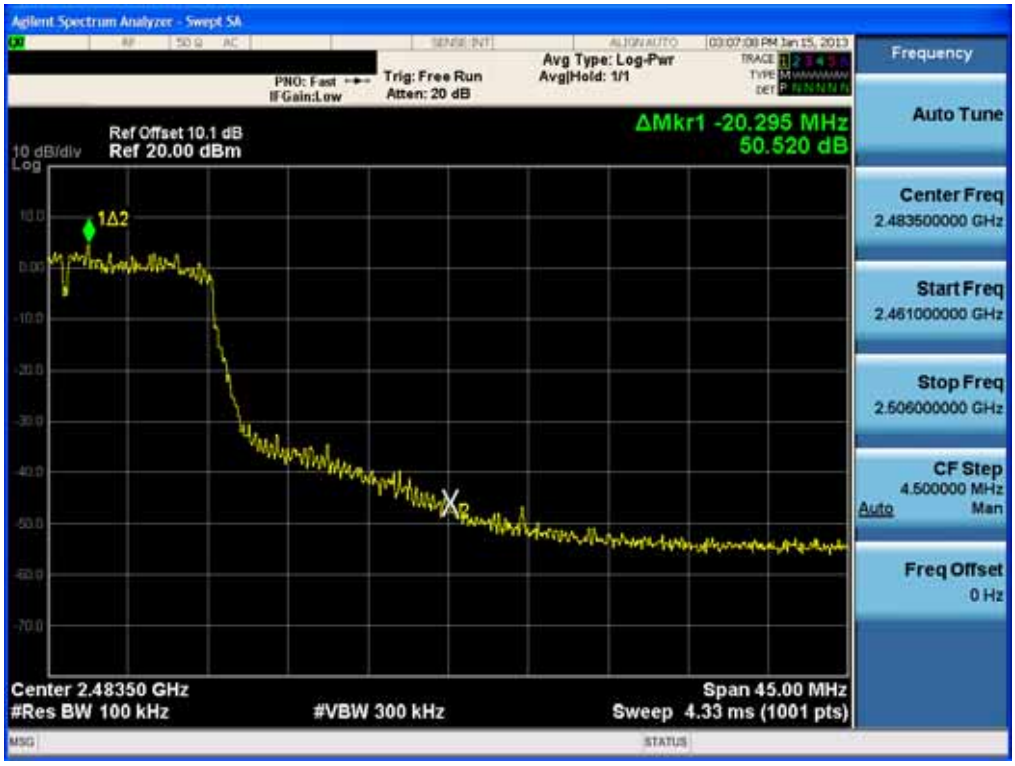
BandEdge (802.11b-CH1)

BandEdge (802.11b-CH11)

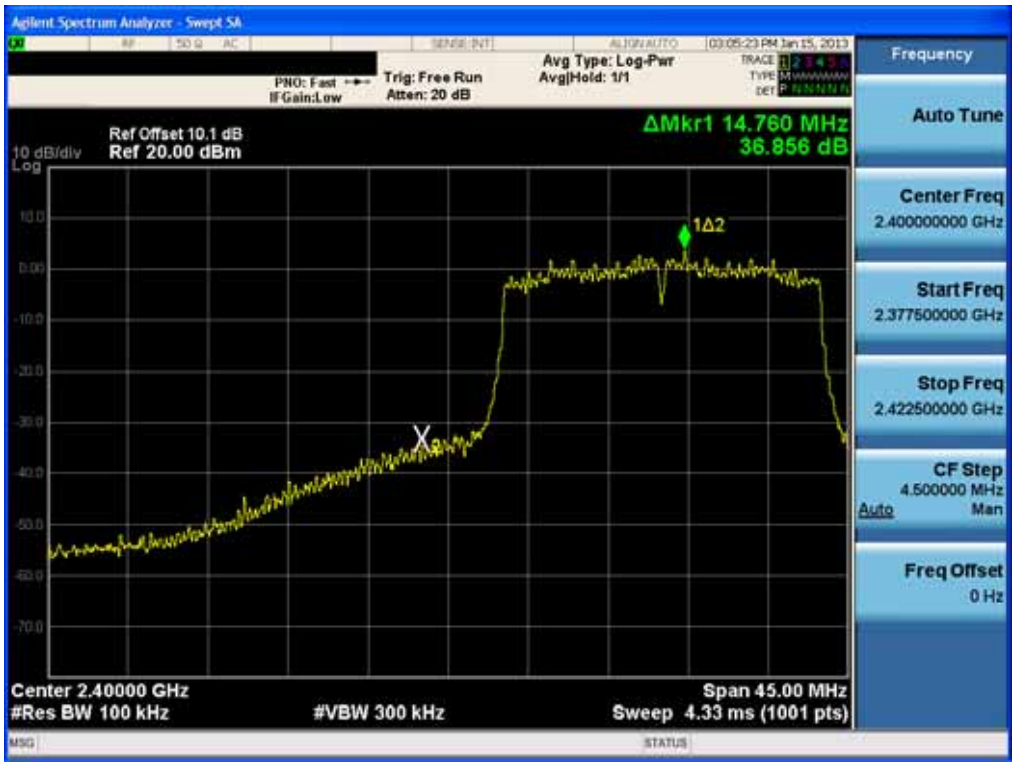


BandEdge (802.11g-CH1)

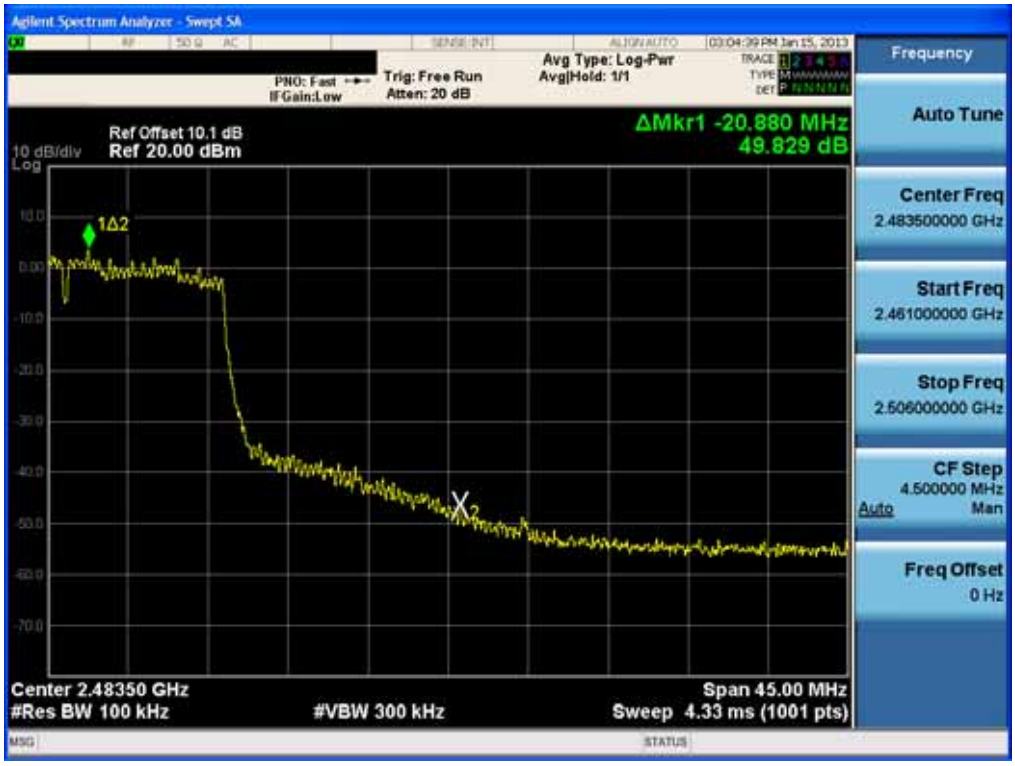
BandEdge (802.11g-CH11)



BandEdge (802.11n-CH1)

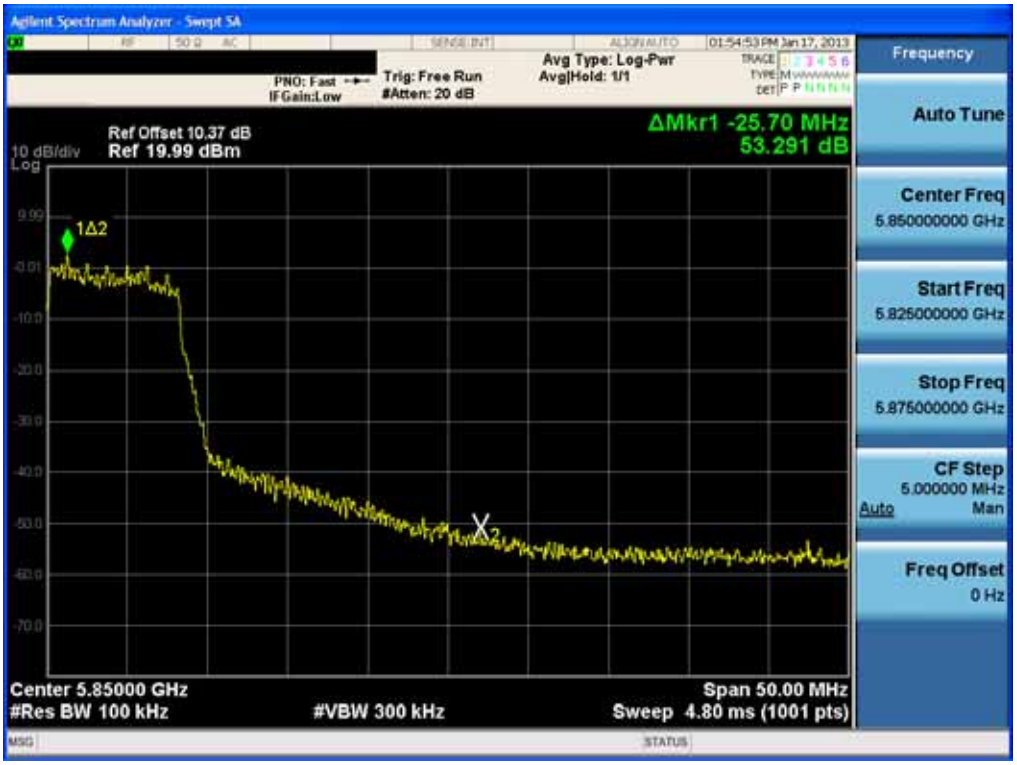


BandEdge (802.11n-CH11)



BandEdge (802.11a-CH 149)

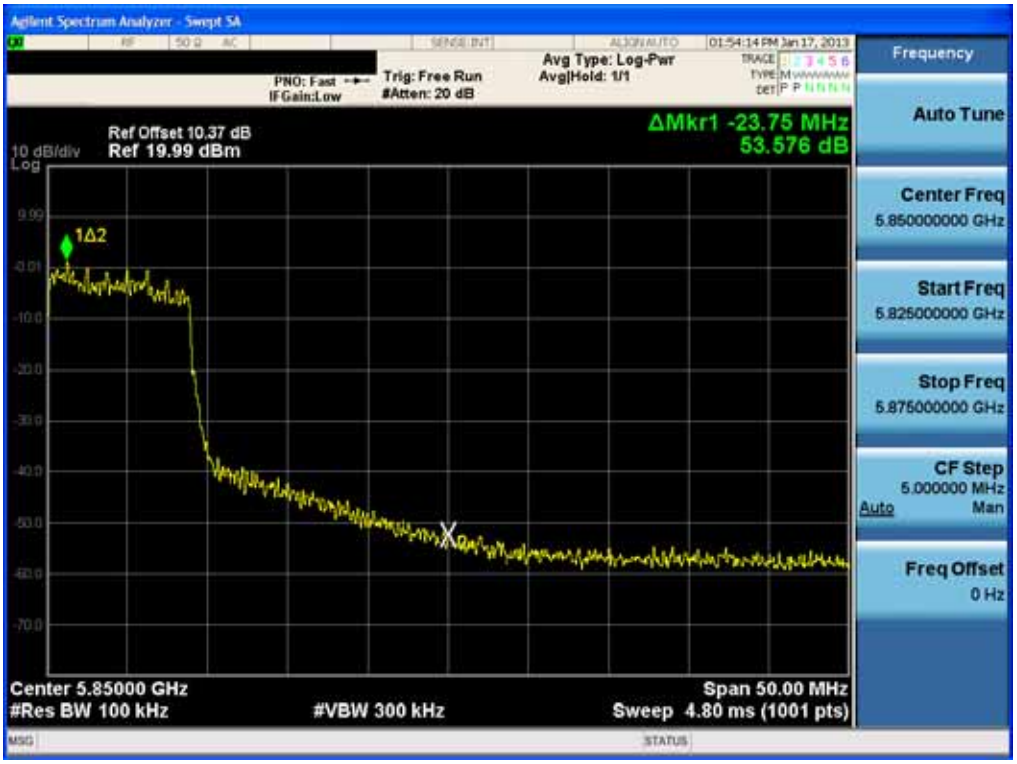
BandEdge (802.11a-CH 165)



20 MHz BW

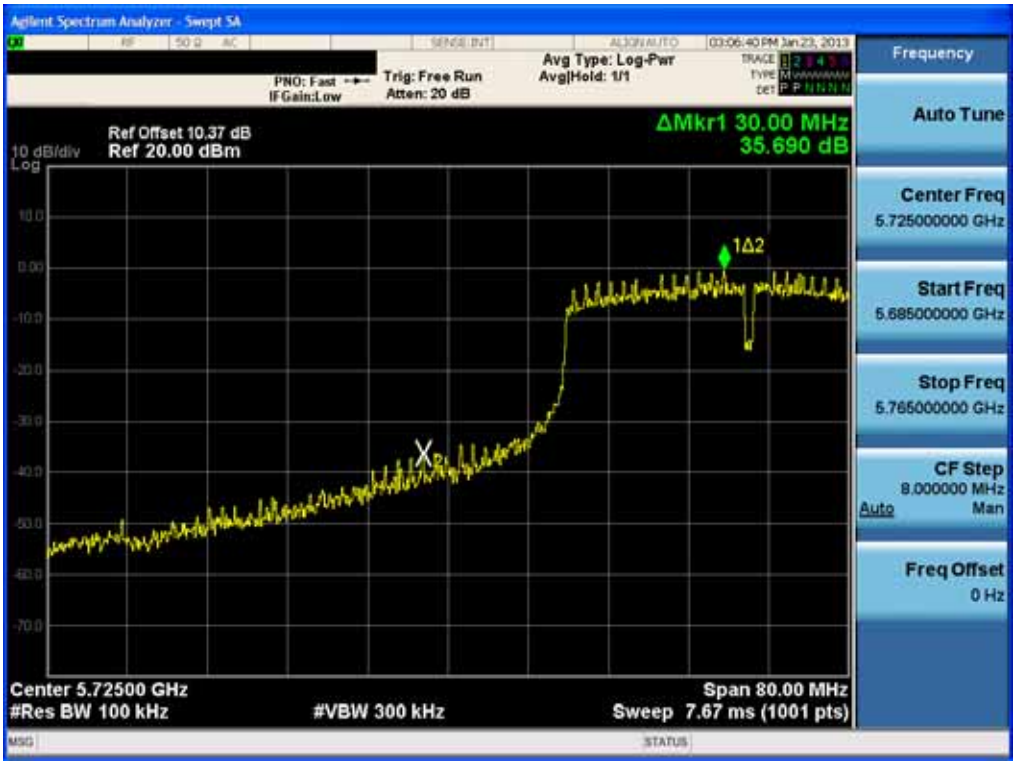
BandEdge (802.11n-CH 149)

BandEdge (802.11n-CH 165)

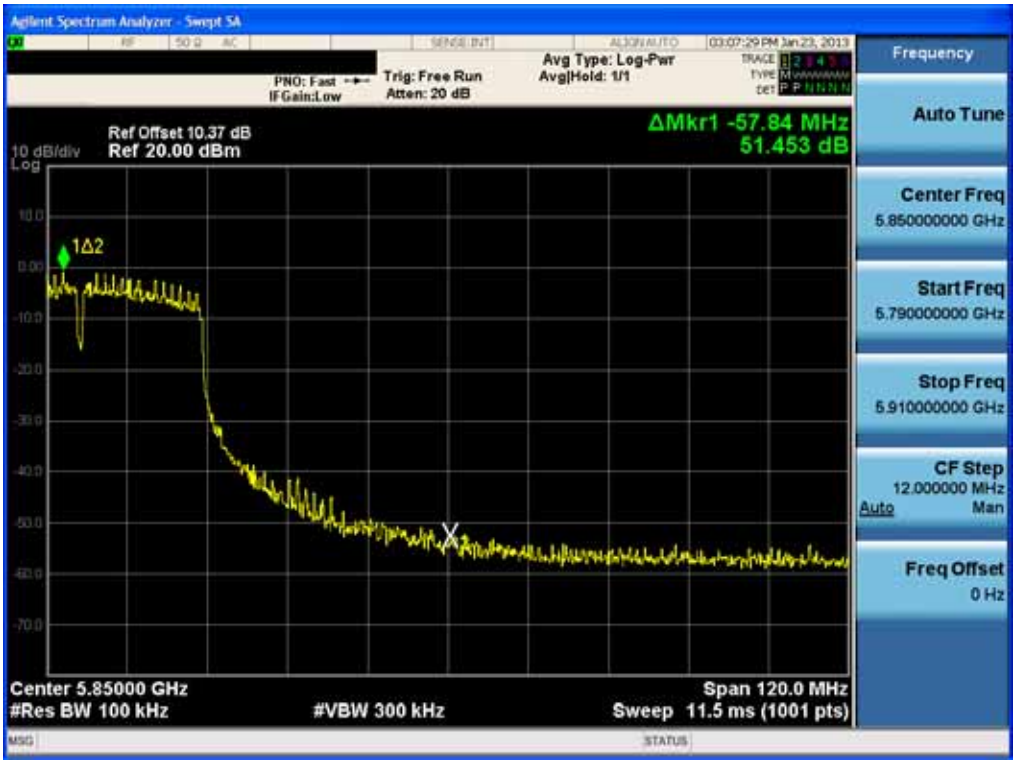


40 MHz BW

BandEdge (802.11n-CH 151)

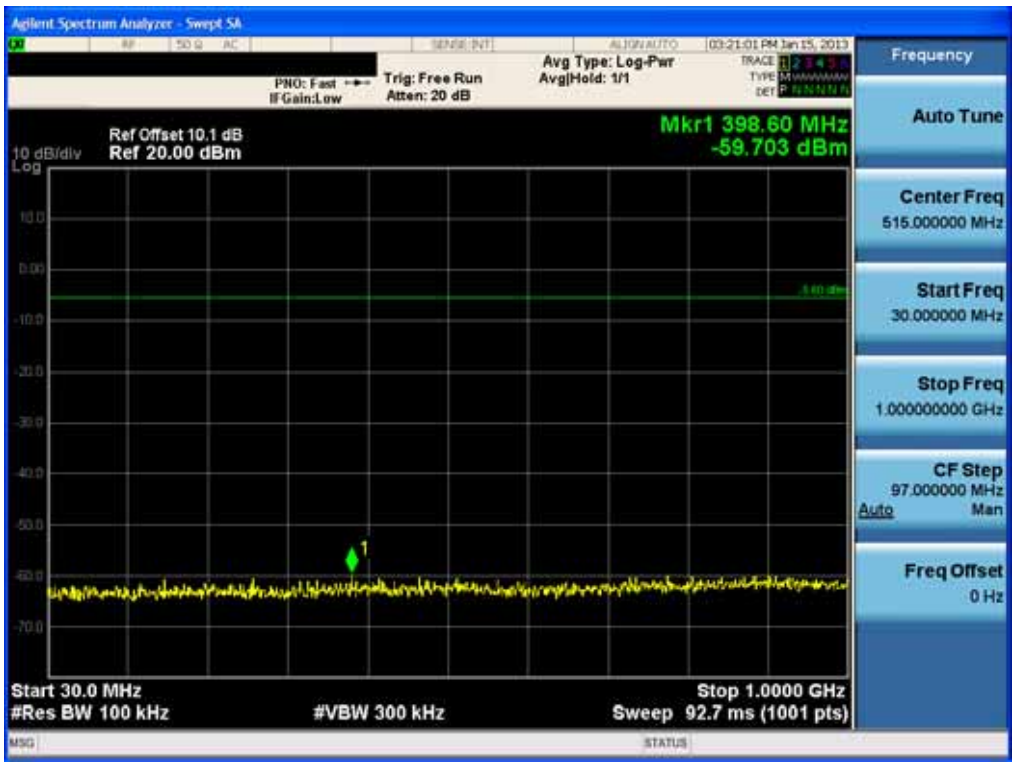


BandEdge (802.11n-CH 159)

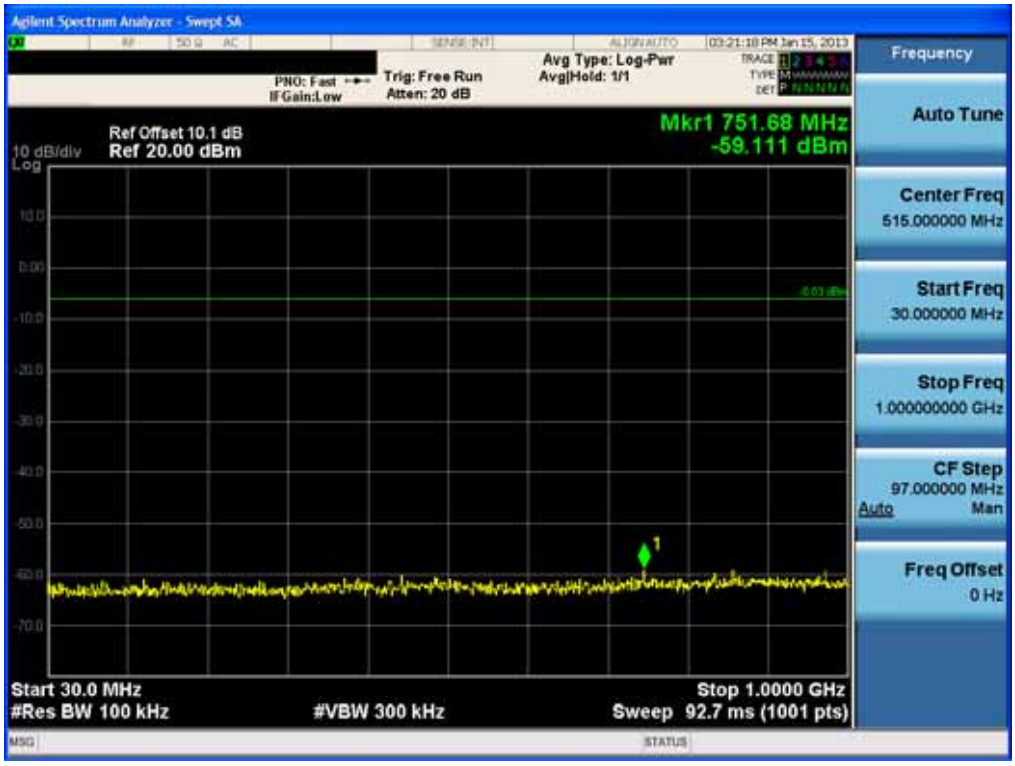


30 MHz ~ 1 GHz

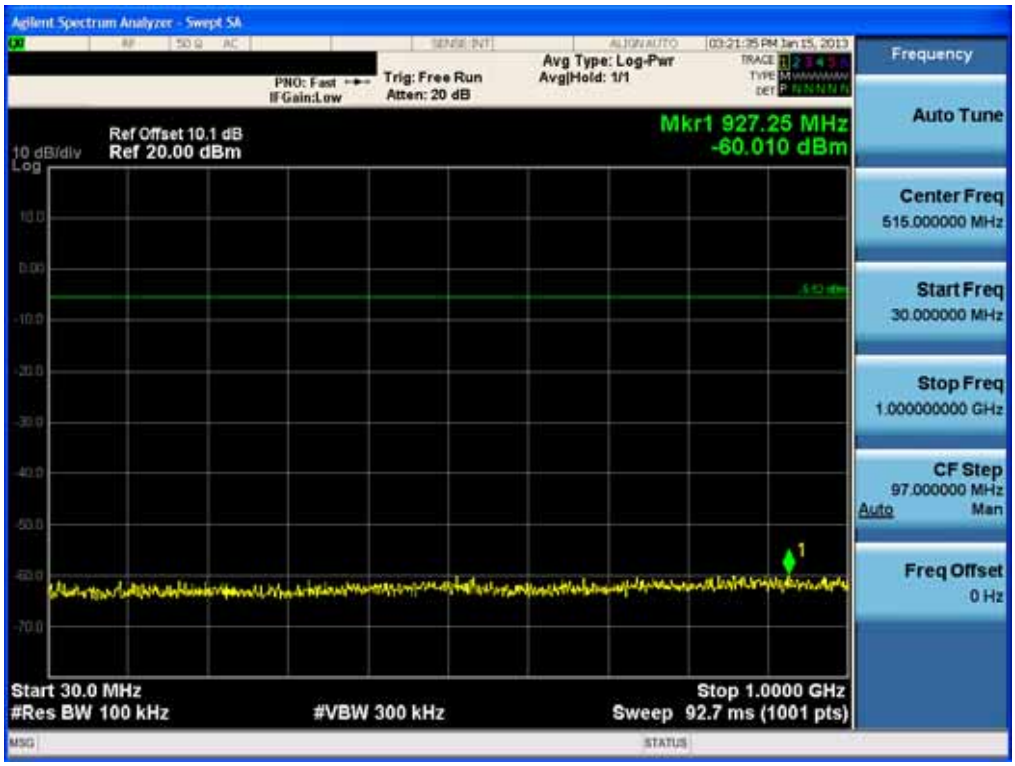
Conducted Spurious Emission (802.11b-CH1)



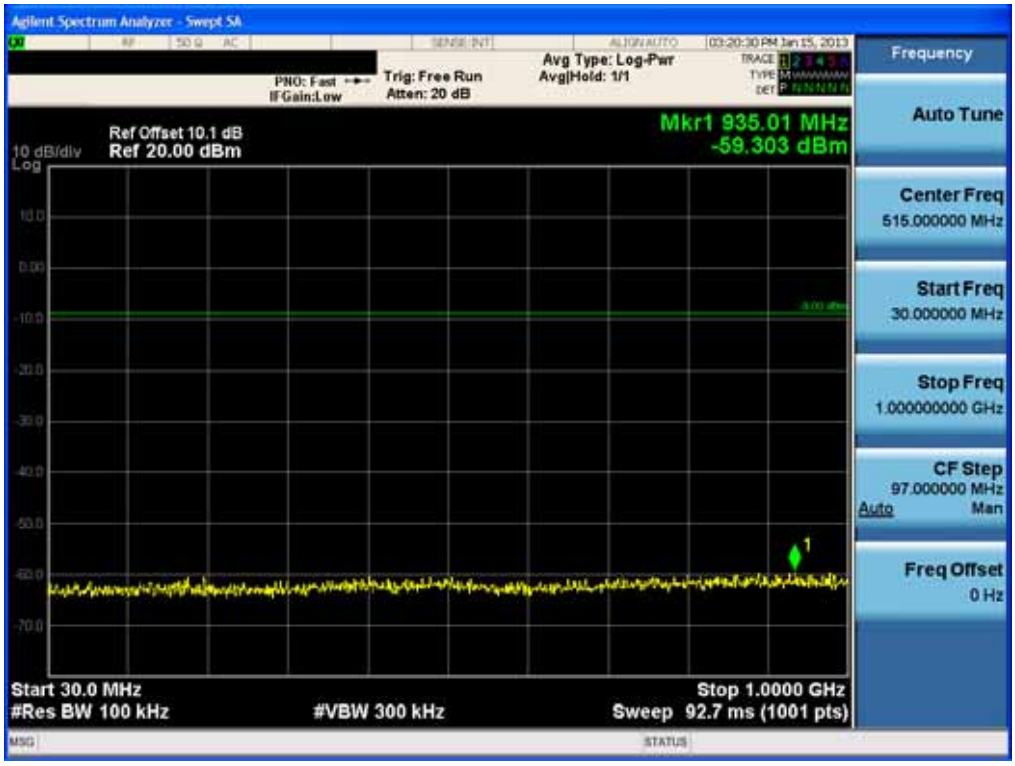
Conducted Spurious Emission (802.11b-CH6)



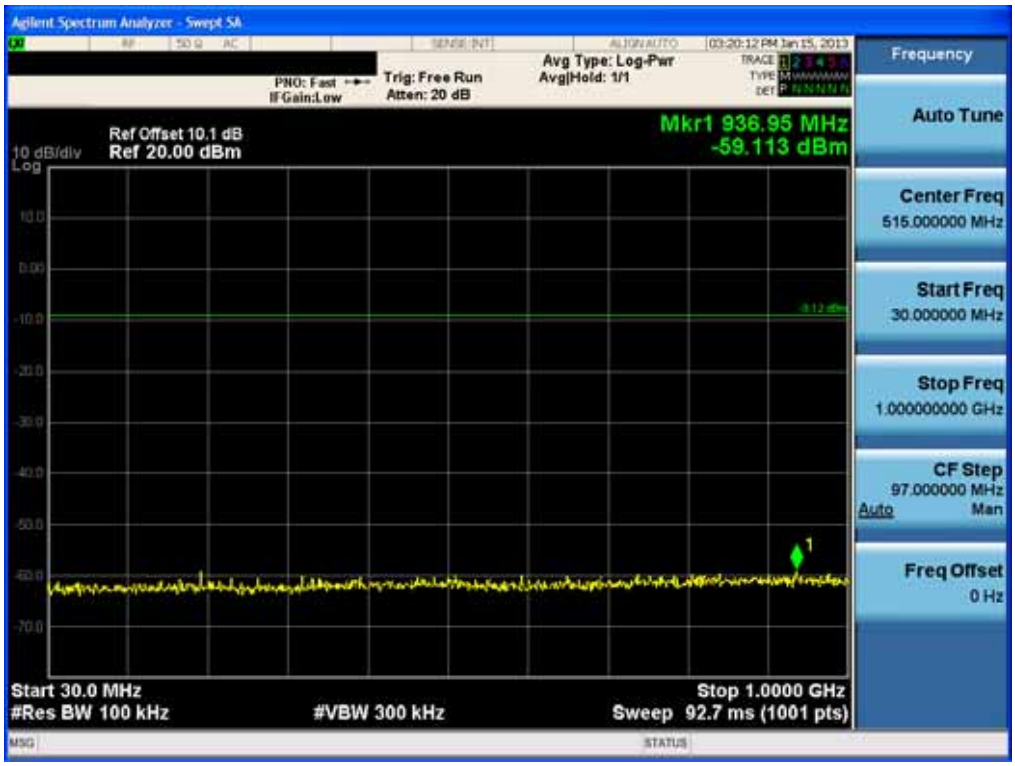
Conducted Spurious Emission (802.11b-CH11)



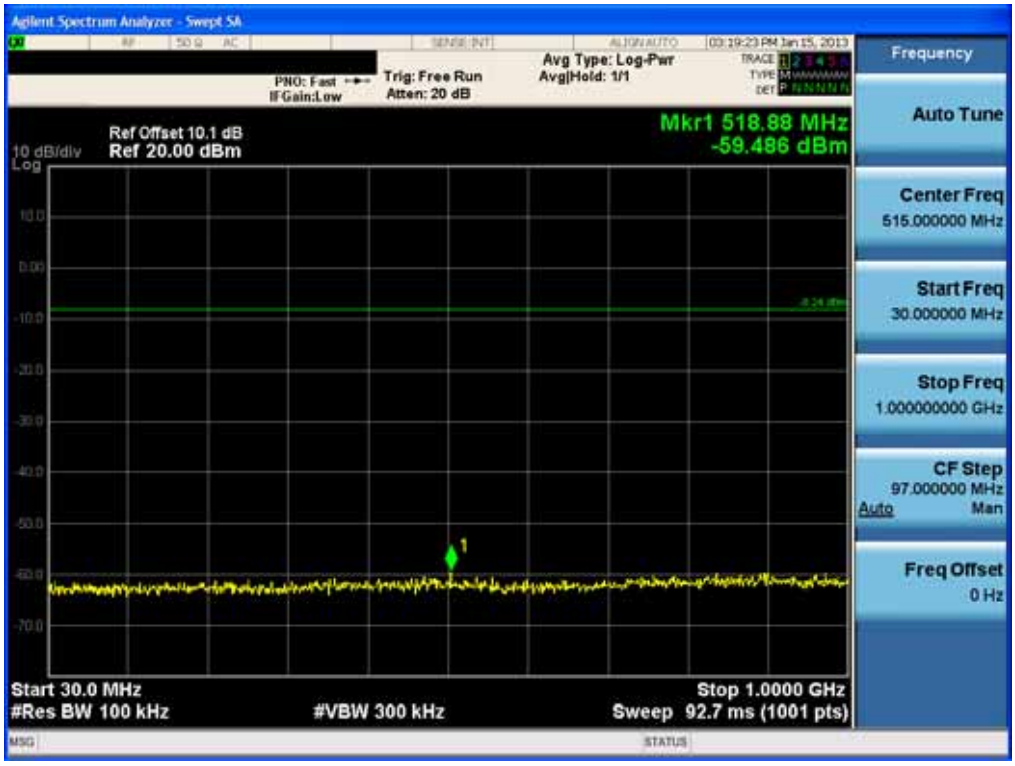
Conducted Spurious Emission (802.11g-CH1)



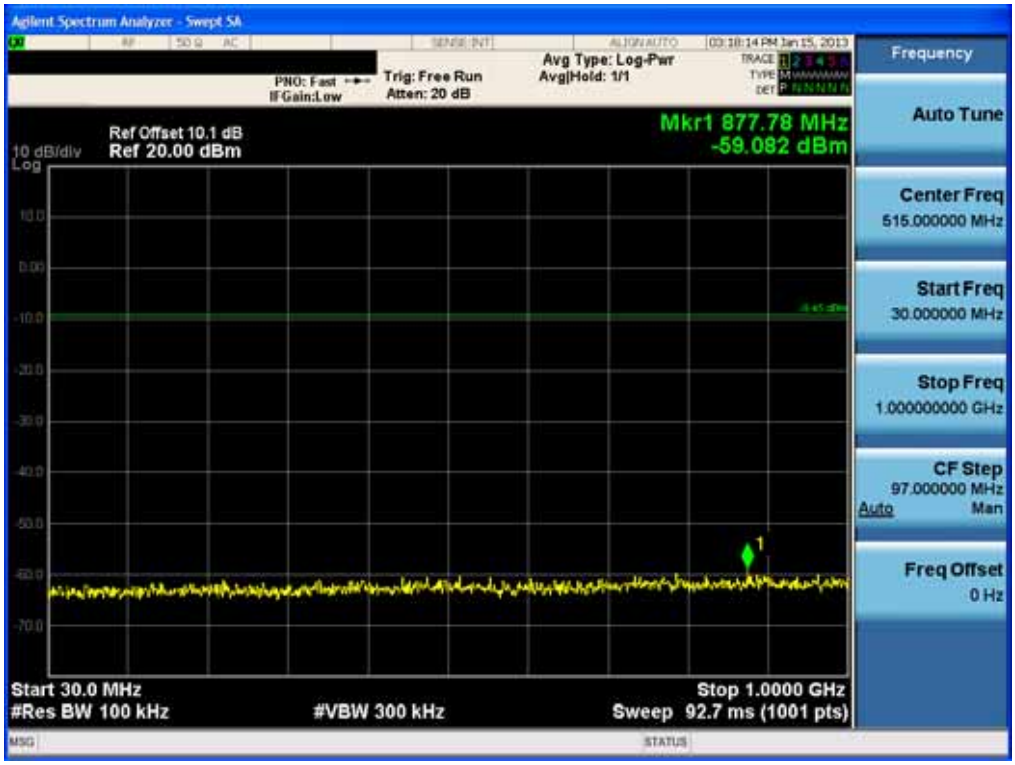
Conducted Spurious Emission (802.11g-CH6)



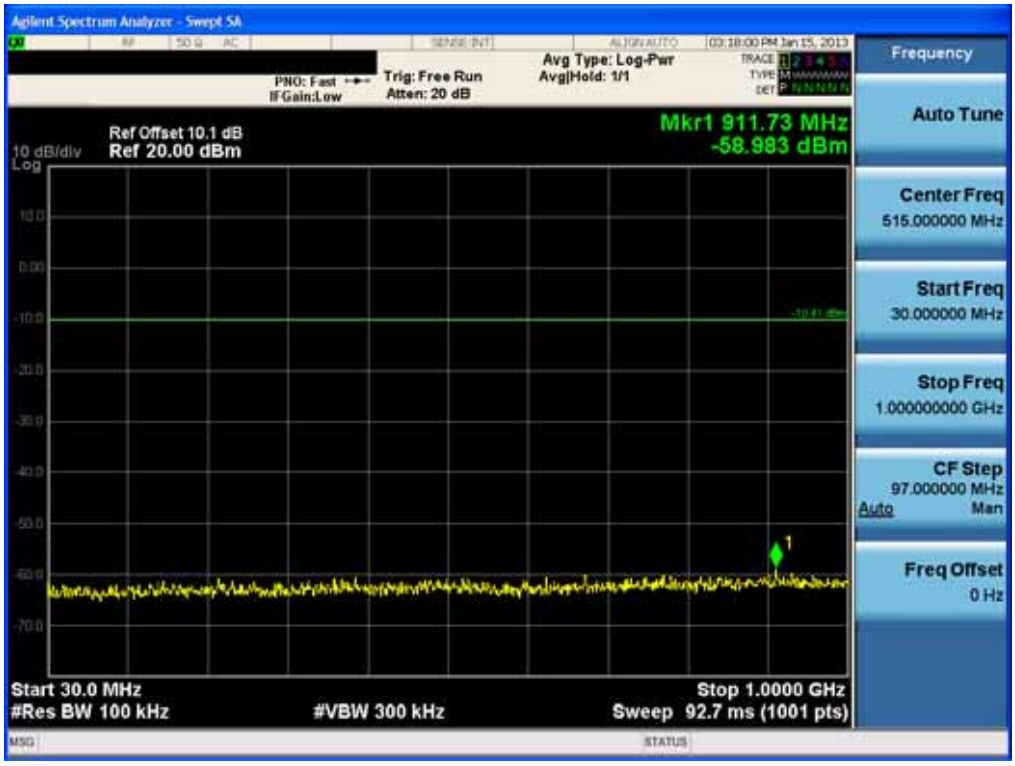
Conducted Spurious Emission (802.11g-CH11)



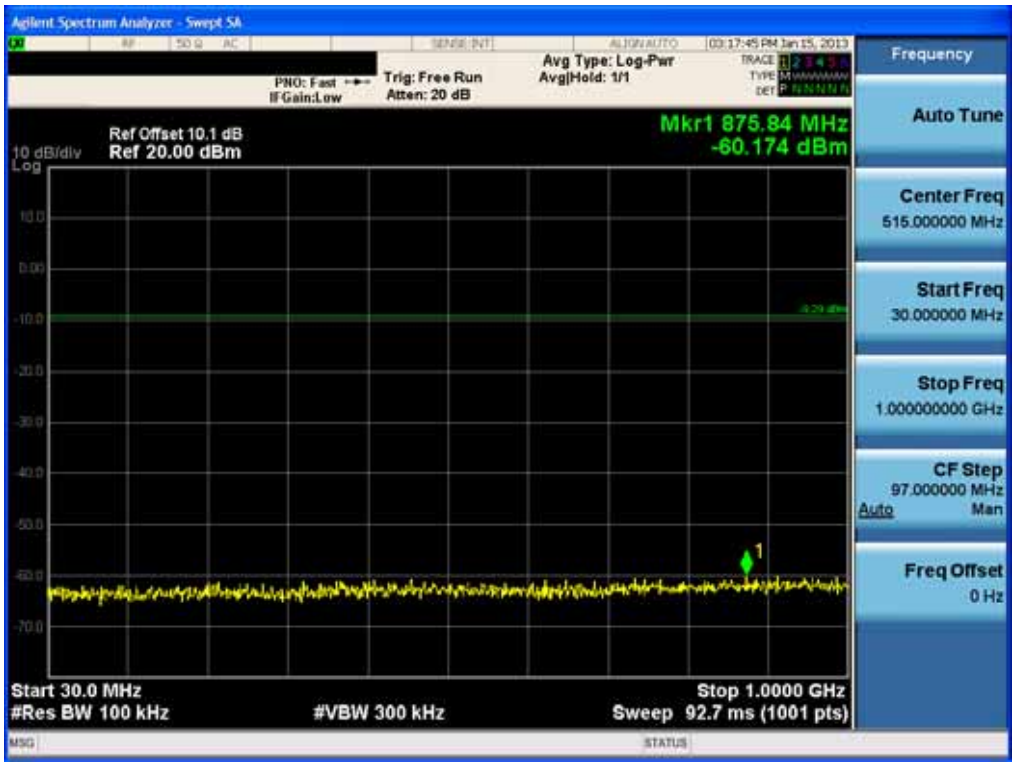
Conducted Spurious Emission (802.11n-CH1)



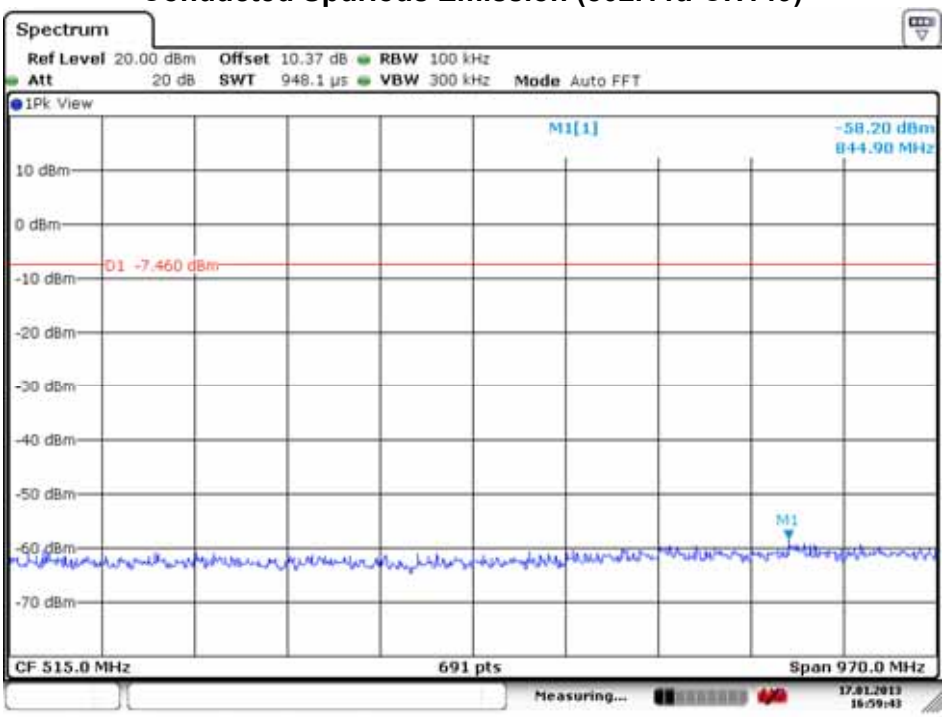
Conducted Spurious Emission (802.11n-CH6)



Conducted Spurious Emission (802.11n-CH11)

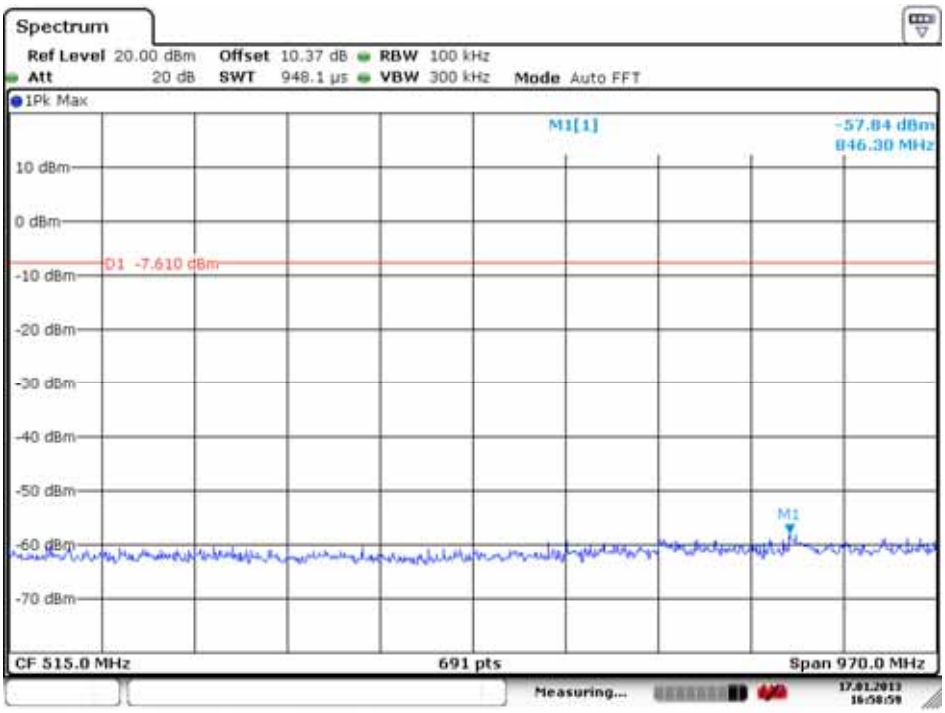


Conducted Spurious Emission (802.11a-CH149)



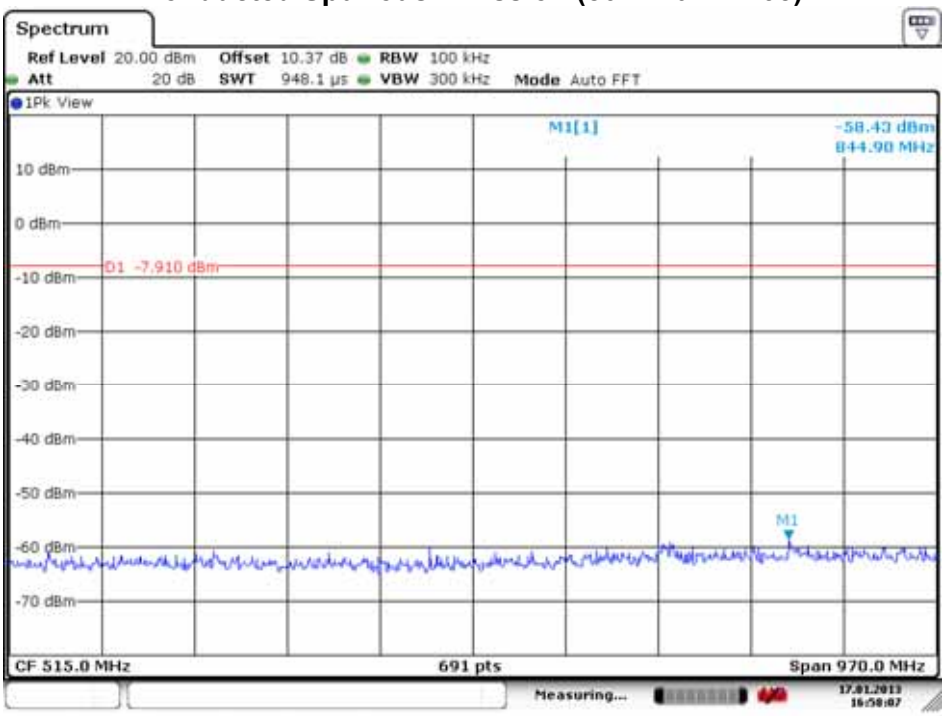
Date: 17.JAN.2013 16:59:43

Conducted Spurious Emission (802.11a-CH157)



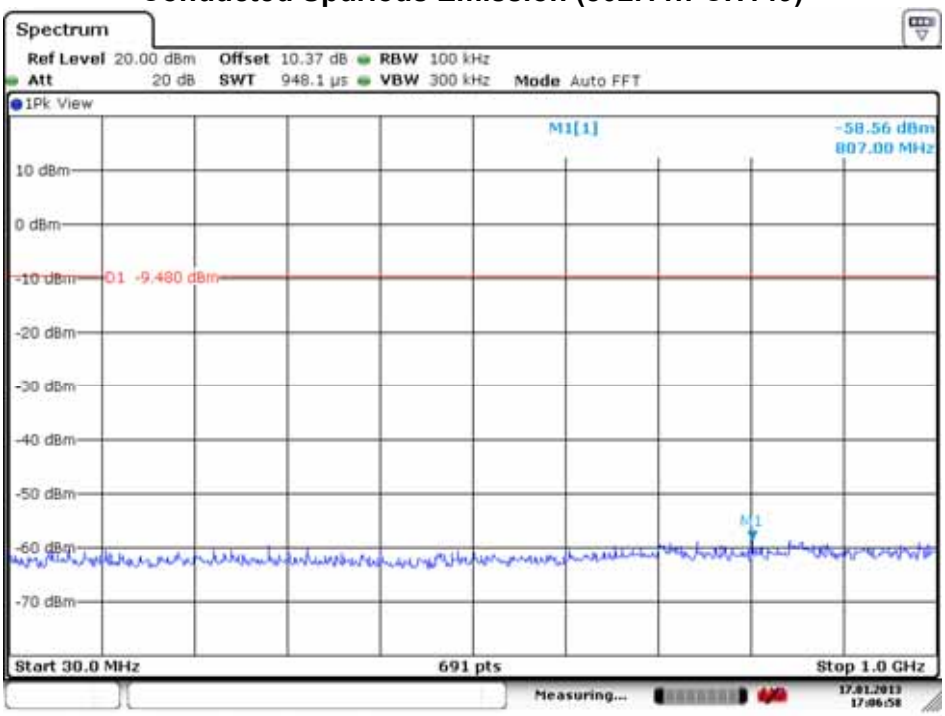
Date: 17.JAN.2013 16:58:59

Conducted Spurious Emission (802.11a-CH165)



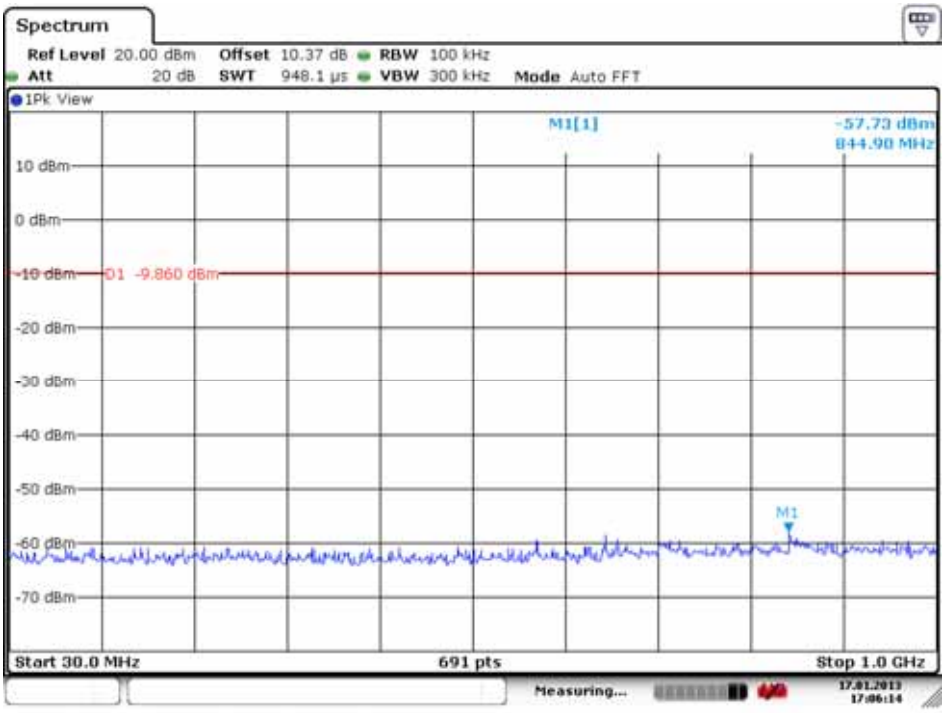
20 MHz BW

Conducted Spurious Emission (802.11n-CH149)



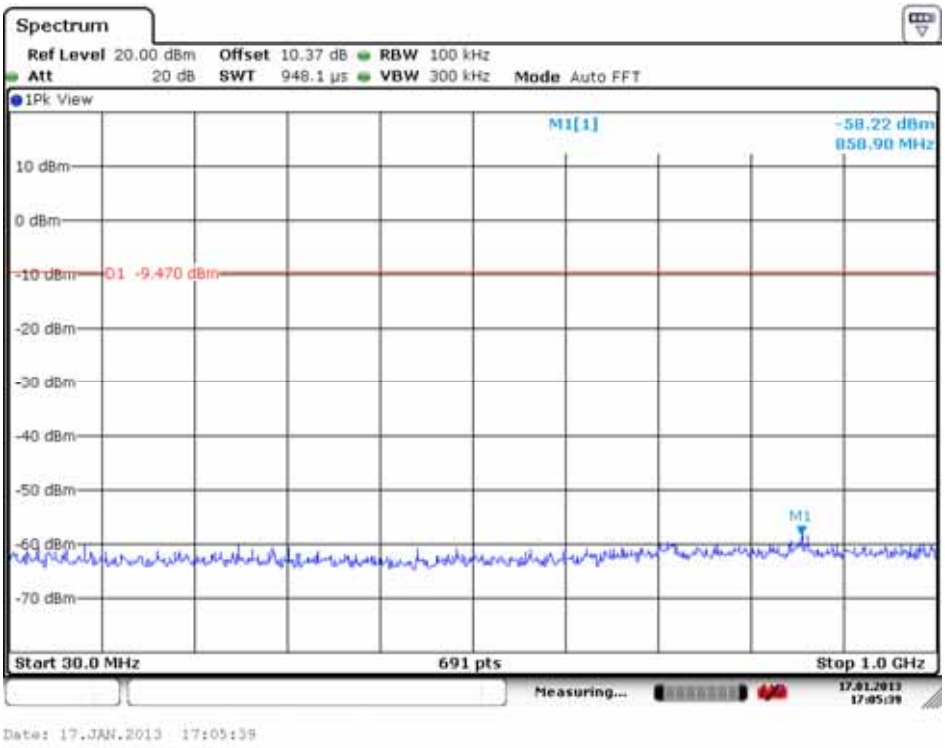
Date: 17.JAN.2013 17:06:58

Conducted Spurious Emission (802.11n-CH157)



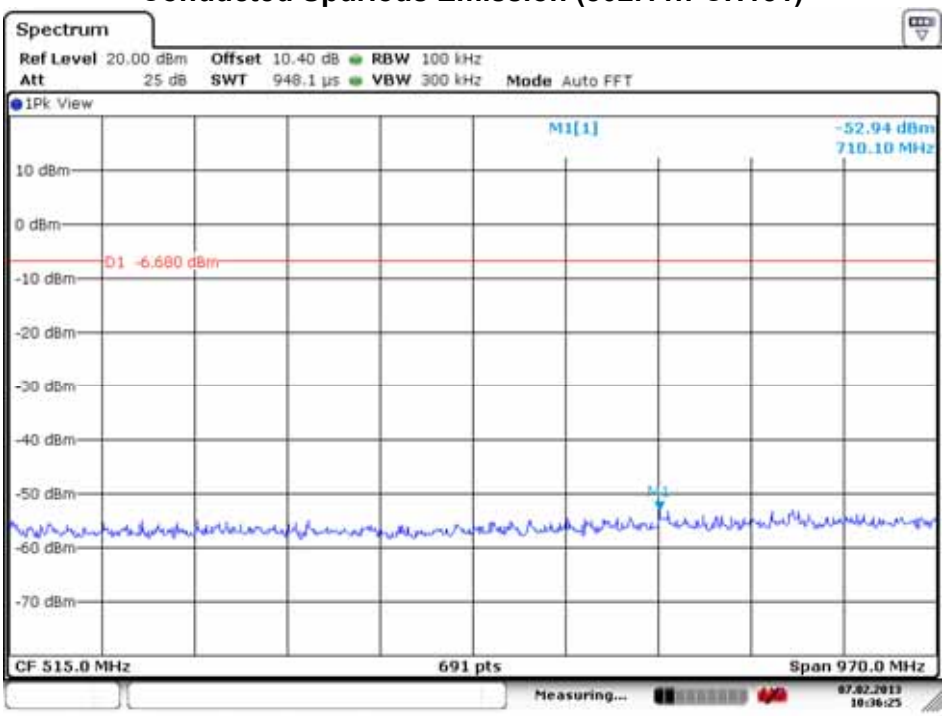
Date: 17.JAN.2013 17:06:14

Conducted Spurious Emission (802.11n-CH165)



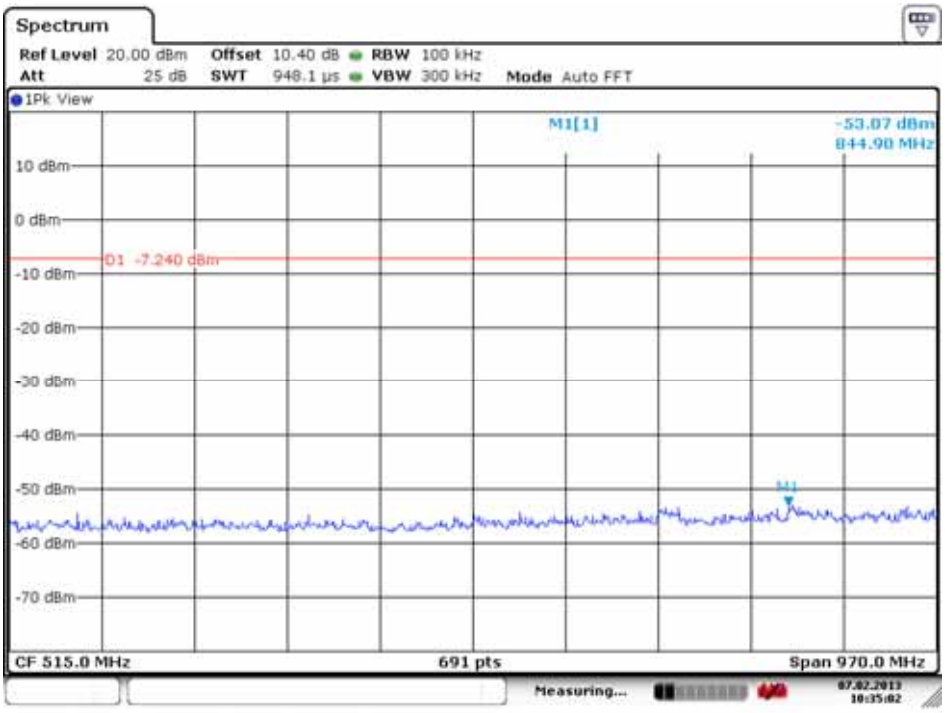
40 MHz BW

Conducted Spurious Emission (802.11n-CH151)



Date: 7.FEB.2013 10:36:24

Conducted Spurious Emission (802.11n-CH159)



Date: 7.FEB.2013 10:35:02

1 GHz ~ 26 GHz

Conducted Spurious Emission (802.11b-CH1)

Conducted Spurious Emission (802.11b-CH6)

Conducted Spurious Emission (802.11b-CH11)

Conducted Spurious Emission (802.11g-CH1)

Conducted Spurious Emission (802.11g-CH6)

Conducted Spurious Emission (802.11g-CH11)

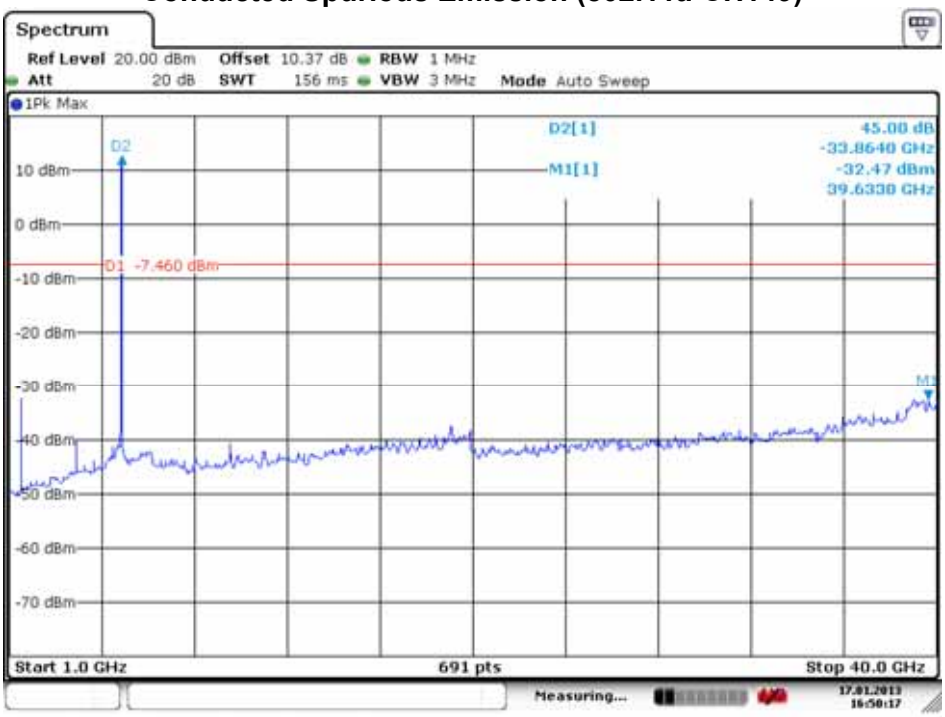
Conducted Spurious Emission (802.11n-CH1)

Conducted Spurious Emission (802.11n-CH6)

Conducted Spurious Emission (802.11n-CH11)

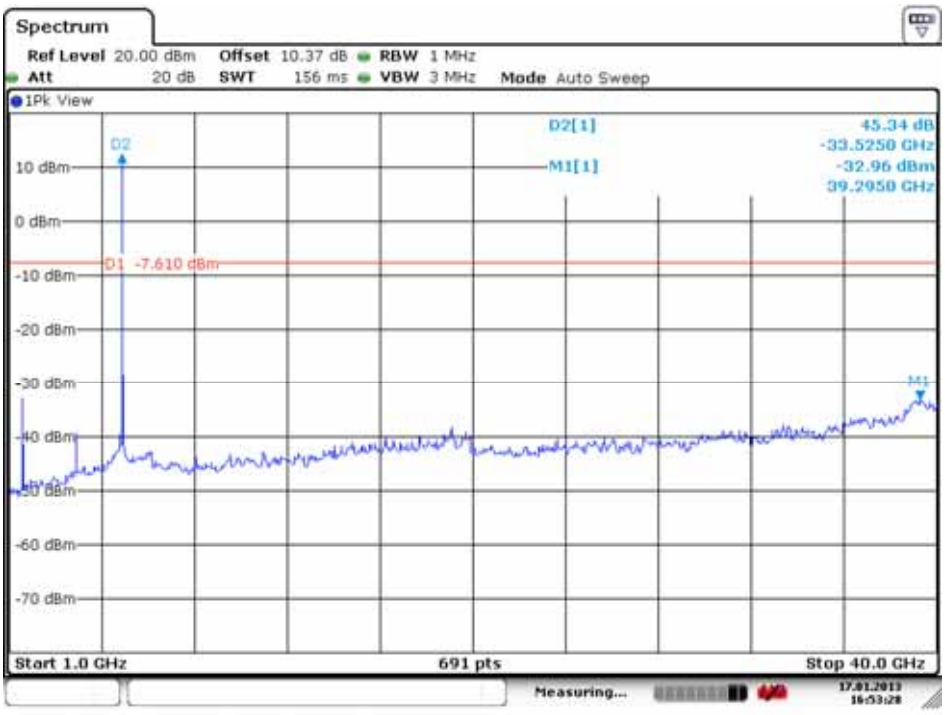
1 GHz ~ 40 GHz

Conducted Spurious Emission (802.11a-CH149)



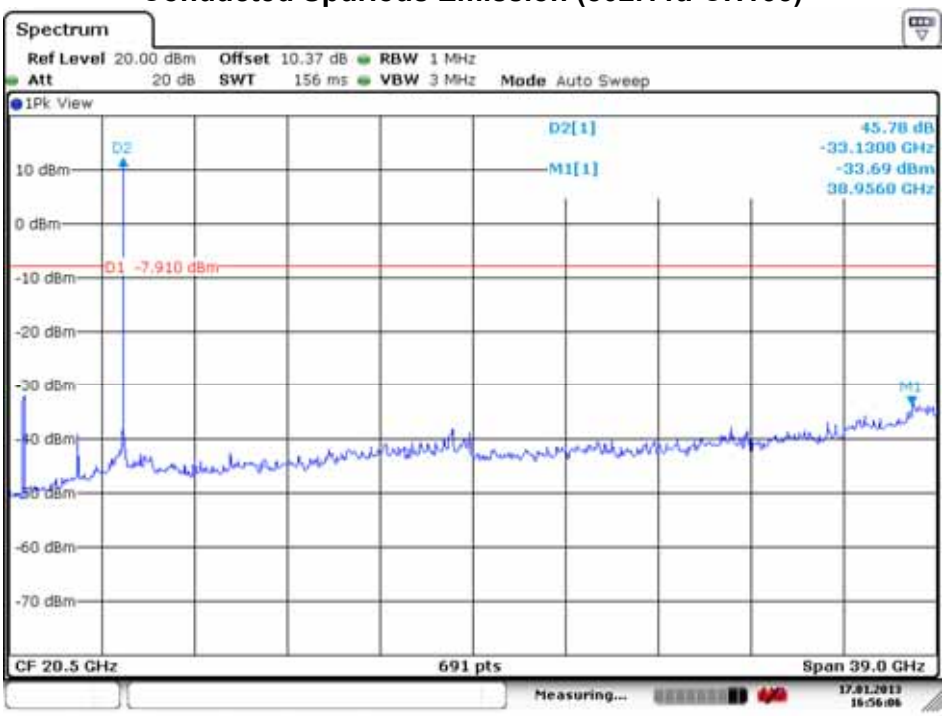
Date: 17.JAN.2013 16:50:17

Conducted Spurious Emission (802.11a-CH157)



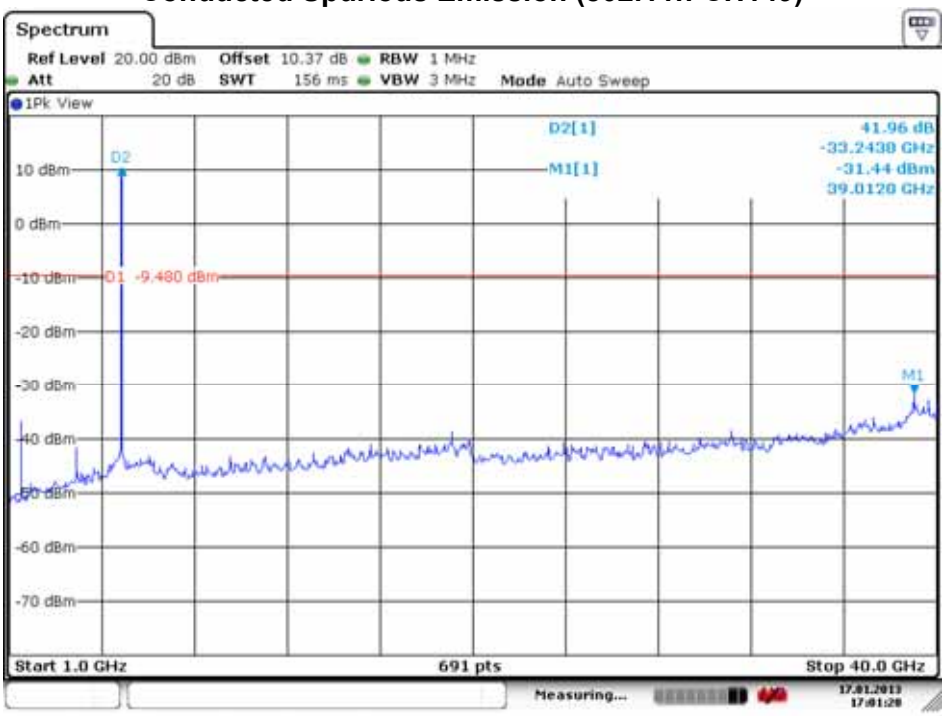
Date: 17.JAN.2013 16:53:29

Conducted Spurious Emission (802.11a-CH165)



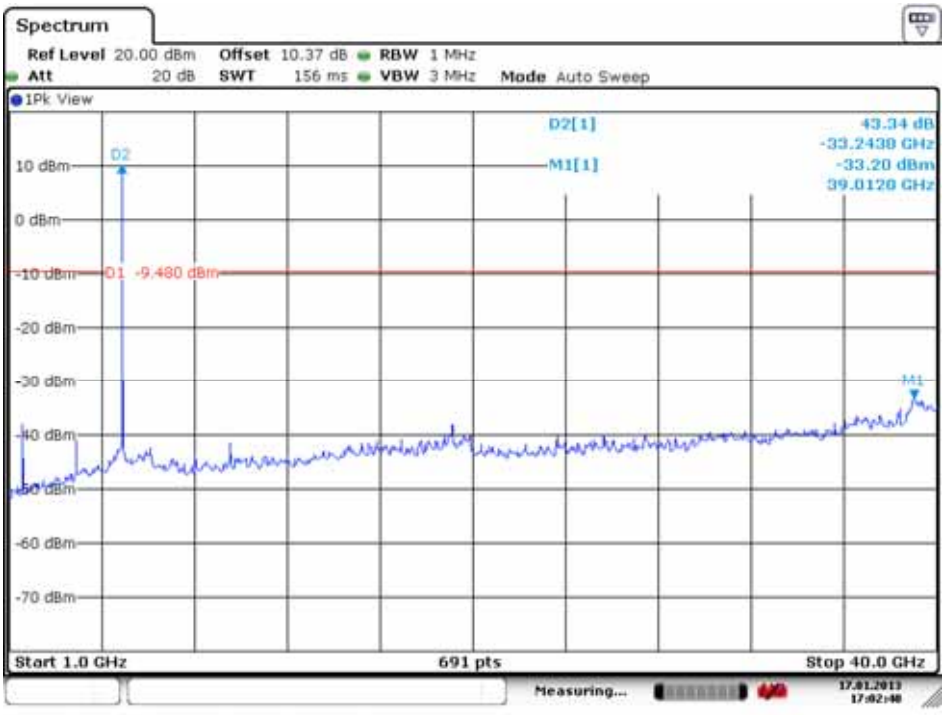
20 MHz BW

Conducted Spurious Emission (802.11n-CH149)



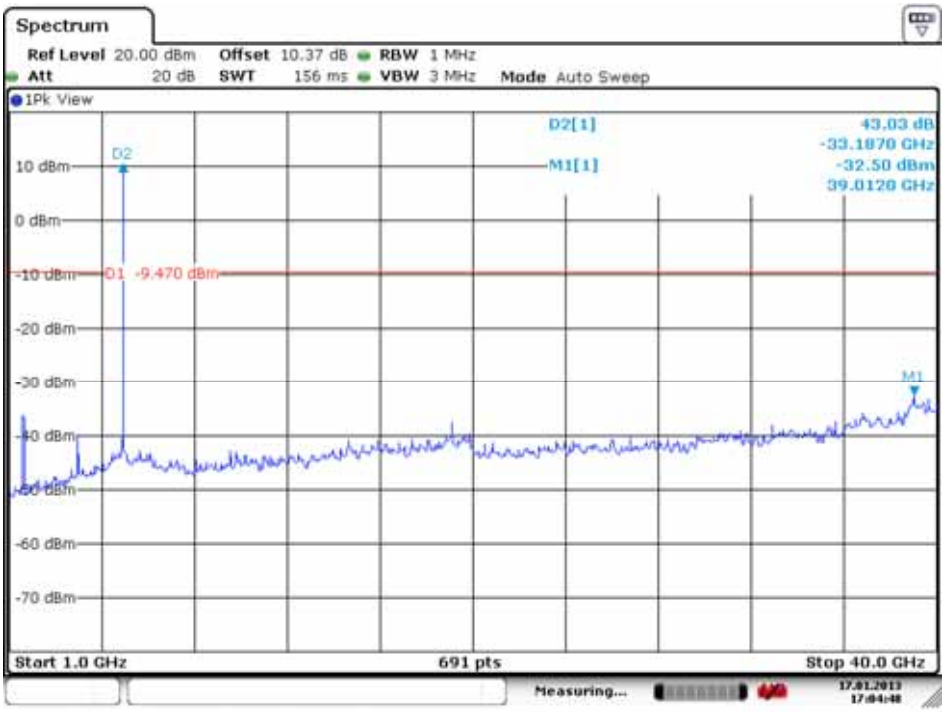
Date: 17.JAN.2013 17:01:21

Conducted Spurious Emission (802.11n-CH157)



Date: 17.JAN.2013 17:02:41

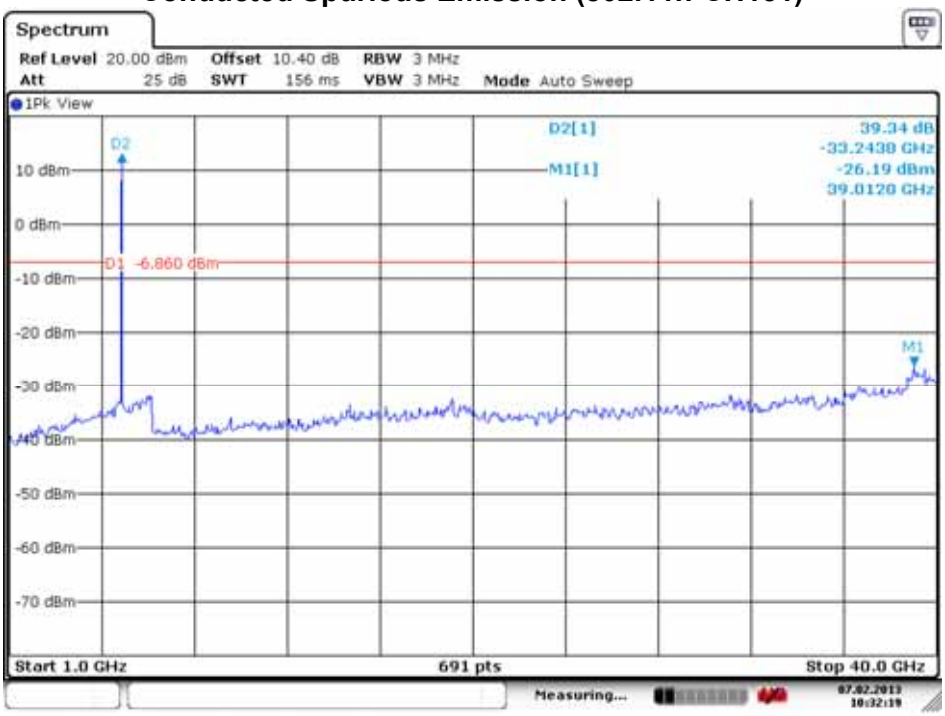
Conducted Spurious Emission (802.11n-CH165)



Date: 17.JAN.2013 17:04:48

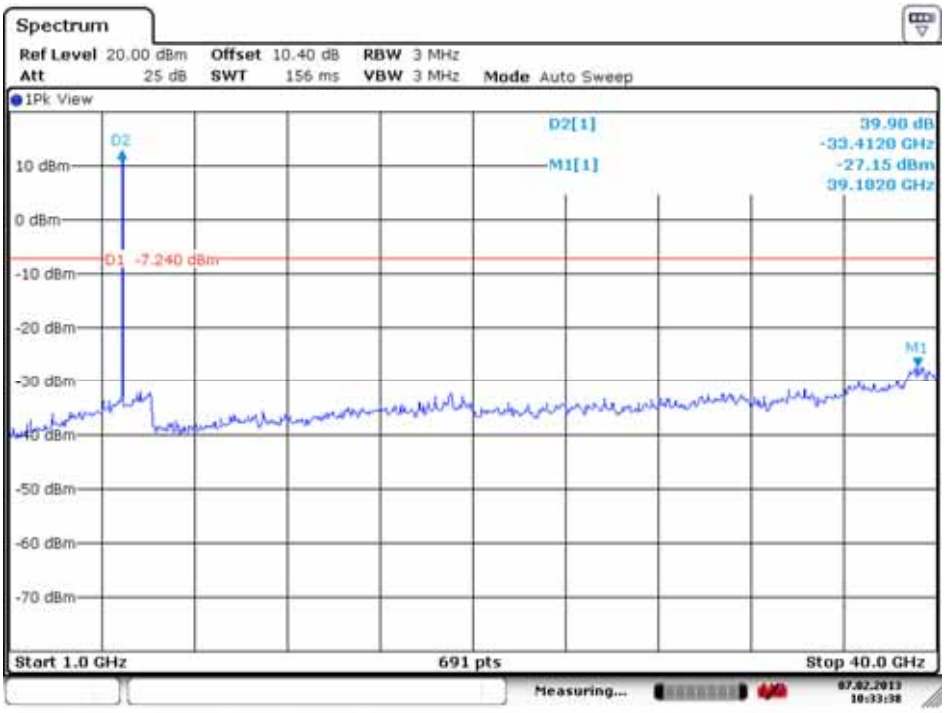
40 MHz BW

Conducted Spurious Emission (802.11n-CH151)



Date: 7.FEB.2013 10:32:18

Conducted Spurious Emission (802.11n-CH159)



Date: 7.FEB.2013 10:33:38

8.5 RADIATED MEASUREMENT.

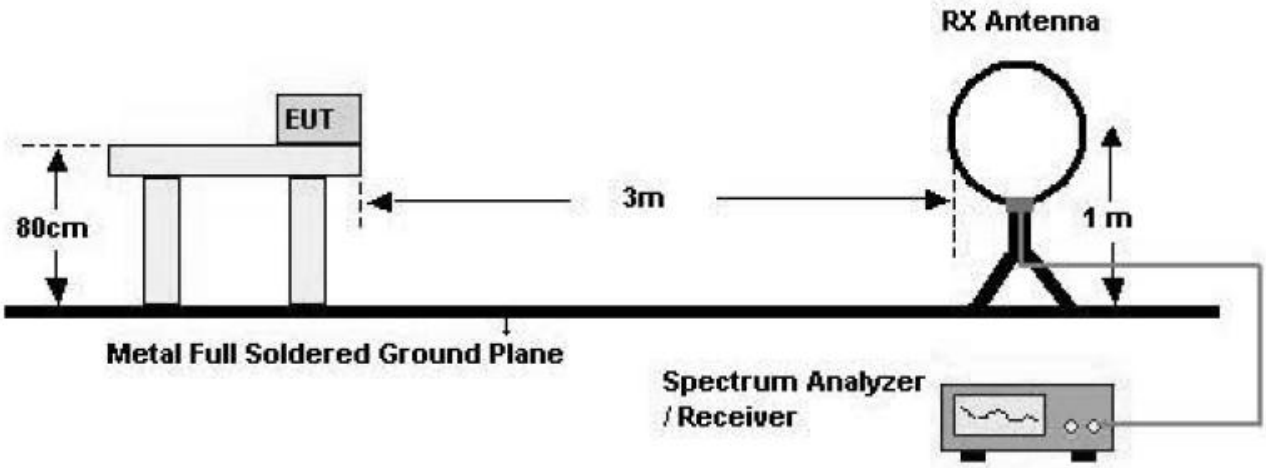
8.5.1 RADIATED SPURIOUS EMISSIONS.

Test Requirements and limit, §15.205, §15.209

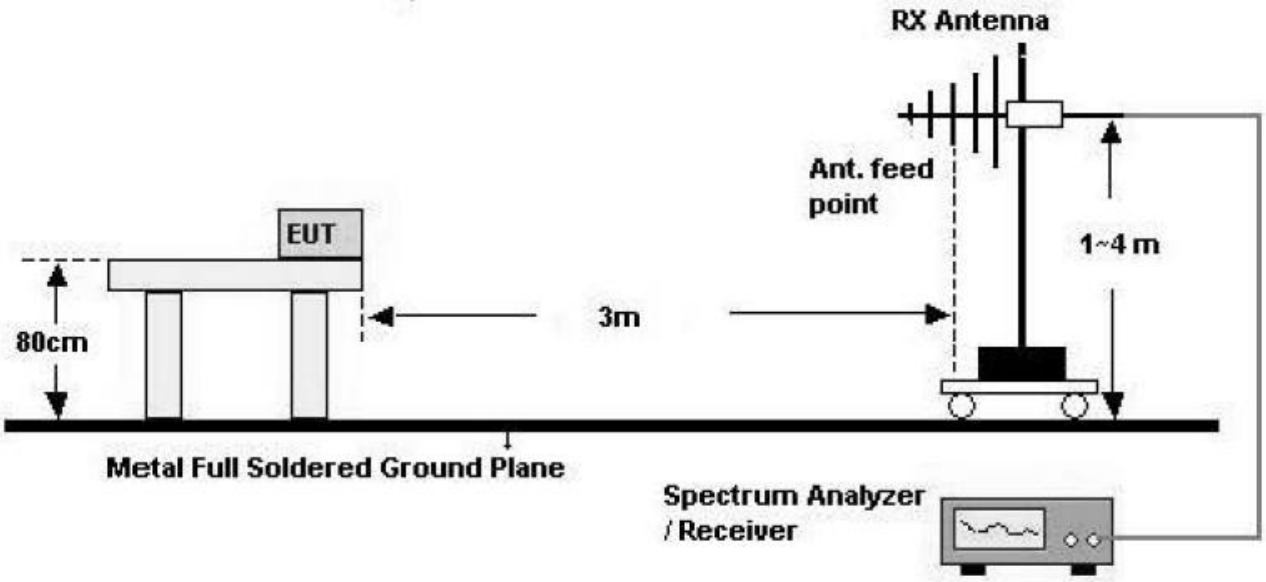
Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Test Configuration

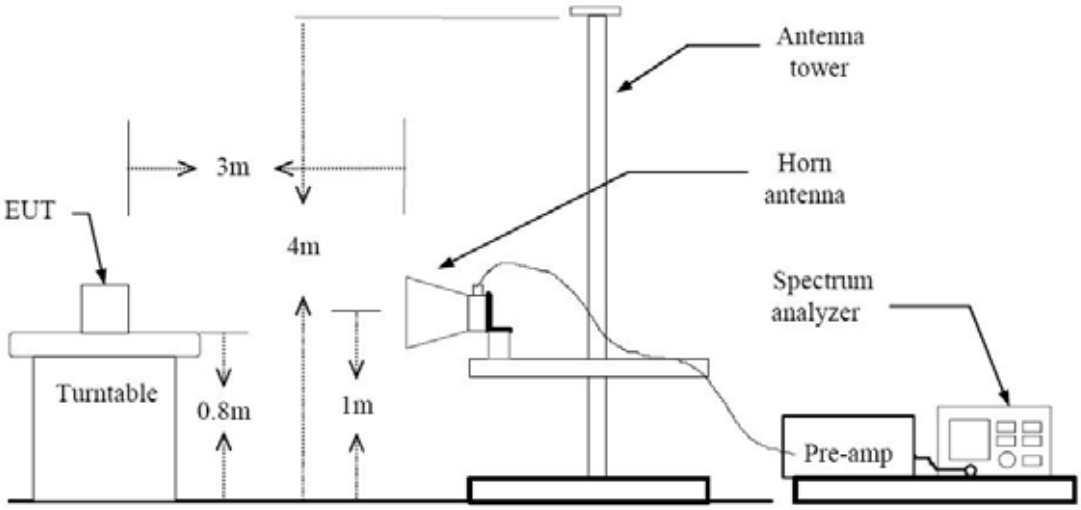
Below 30 MHz



30 MHz - 1 GHz



Above 1 GHz



TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

TEST RESULTS

9 kHz – 30MHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor
5. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

TEST RESULTS

Below 1 GHz

Operation Mode: Normal Mode

Frequency	Reading	Ant. factor	Cable loss	Ant. POL	Total	Limit	Margin
㎒	dB㎶	dB /m	dB	(H/V)	dB㎶/m	dB㎶/m	dB
No Critical peaks found							

Notes:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.
3. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Above 1 GHz

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2412
Channel No.	01 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4824	55.05	-0.79	V	54.26	74	19.74	PK
4824	47.88	-0.79	V	47.09	54	6.91	AV
7236	49.85	9.08	V	58.93	74	15.07	PK
7236	36.05	9.08	V	45.13	54	8.87	AV
4824	55.83	-0.79	H	55.04	74	18.96	PK
4824	49.71	-0.79	H	48.92	54	5.08	AV
7236	49.99	9.08	H	59.07	74	14.93	PK
7236	36.06	9.08	H	45.14	54	8.86	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

6. We have done 802.11b/g/n(2.4 GHz) mode test. Worst case of EUT is 1 Mbps in 802.11b.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2437
Channel No.	06 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4874	55.55	-0.37	V	55.18	74	18.82	PK
4874	48.64	-0.37	V	48.27	54	5.73	AV
7311	49.96	8.64	V	58.60	74	15.40	PK
7311	35.84	8.64	V	44.48	54	9.52	AV
4874	57.29	-0.37	H	56.92	74	17.08	PK
4874	51.37	-0.37	H	51.00	54	3.00	AV
7311	50.57	8.64	H	59.21	74	14.79	PK
7311	35.80	8.64	H	44.44	54	9.56	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

      Span = Zero

Detector Mode = Peak

Trace = Max hold

6. We have done 802.11b/g/n(2.4 GHz) mode test. Worst case of EUT is 1 Mbps in 802.11b.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Operation Mode:	802.11 b
Transfer Rate:	1 Mbps
Operating Frequency	2462
Channel No.	11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-AMP G [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4924	56.11	-0.15	V	55.96	74	18.04	PK
4924	49.93	-0.15	V	49.78	54	4.22	AV
7386	49.92	9.06	V	58.98	74	15.02	PK
7386	36.46	9.06	V	45.52	54	8.48	AV
4924	56.00	-0.15	H	55.85	74	18.15	PK
4924	50.11	-0.15	H	49.96	54	4.04	AV
7386	50.18	9.06	H	59.24	74	14.76	PK
7386	36.52	9.06	H	45.58	54	8.42	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:
   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)
      RBW = 1 MHz
      VBW = 3 MHz
      Detector = Peak
      Trace = Max hold
      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)
      RBW = 1 MH
      VBW = 10 Hz
      Span = Zero

Detector Mode = Peak

Trace = Max hold

6. We have done 802.11b/g/n(2.4 GHz) mode test. Worst case of EUT is 1 Mbps in 802.11b.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	5.8 GHz
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5745 MHz
Channel No.	149 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
11490	40.54	11.22	V	51.76	74	22.24	PK
11490	27.10	11.22	V	38.32	54	15.68	AV
17235	45.45	18.82	V	64.27	74	9.73	PK
17235	31.20	18.82	V	50.02	54	3.98	AV
11490	39.18	11.22	H	50.40	74	23.60	PK
11490	26.67	11.22	H	37.89	54	16.11	AV
17235	45.79	18.82	H	64.61	74	9.39	PK
17235	31.23	18.82	H	50.05	54	3.95	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

6. . We have done 802.11a/n_20 MHz BW(5.8 GHz) mode test. Worst case of EUT is 6 Mbps in 802.11a_5.8 GHz.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	5.8 GHz
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5785 MHz
Channel No.	157 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
11570	38.94	11.71	V	50.65	74	23.35	PK
11570	26.50	11.71	V	38.21	54	15.79	AV
17355	44.83	18.94	V	63.77	74	10.24	PK
17355	31.33	18.94	V	50.27	54	3.74	AV
11570	39.83	11.71	H	51.54	74	22.46	PK
11570	25.36	11.71	H	37.07	54	16.93	AV
17355	44.32	18.94	H	63.26	74	10.75	PK
17355	31.14	18.94	H	50.08	54	3.93	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

6. . We have done 802.11a/n_20 MHz BW(5.8 GHz) mode test. Worst case of EUT is 6 Mbps in 802.11a_5.8 GHz.
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	5.8 GHz
Operation Mode:	802.11 a
Transfer Rate:	6 Mbps
Operating Frequency	5825 MHz
Channel No.	165 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
11650	38.73	11.34	V	50.07	74	23.93	PK
11650	26.21	11.34	V	37.55	54	16.45	AV
17475	45.27	19.52	V	64.79	74	9.21	PK
17475	30.97	19.52	V	50.49	54	3.51	AV
11650	38.91	11.34	H	50.25	74	23.75	PK
11650	25.25	11.34	H	36.59	54	17.41	AV
17475	45.00	19.52	H	64.52	74	9.48	PK
17475	30.82	19.52	H	50.34	54	3.66	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

6. . We have done 802.11a/n_20 MHz BW(5.8 GHz) mode test. Worst case of EUT is 6 Mbps in 802.11a_5.8 GHz.

7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	5.8 GHz
Operation Mode:	802.11 n_40 MHz BW
Transfer Rate:	13.5 Mbps
Operating Frequency	5755 MHz
Channel No.	151 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
11510	39.12	11.53	V	50.65	74	23.35	PK
11510	25.72	11.53	V	37.25	54	16.75	AV
17265	45.12	18.46	V	63.58	74	10.42	PK
17265	31.40	18.46	V	49.86	54	4.14	AV
11510	38.81	11.53	H	50.34	74	23.66	PK
11510	25.71	11.53	H	37.24	54	16.76	AV
17265	45.38	18.46	H	63.84	74	10.16	PK
17265	31.43	18.46	H	49.89	54	4.11	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

6. . We have done test all data rate in 802.11n_40 MHz BW(5.8 GHz) mode. Worst case of EUT is 13.5 Mbps in 802.11n_40 MHz BW(5.8 GHz).
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

Band :	5.8 GHz
Operation Mode:	802.11 n_40 MHz BW
Transfer Rate:	13.5 Mbps
Operating Frequency	5795 MHz
Channel No.	159 Ch

Frequency [MHz]	Reading dBuV	AN.+CL-Amp G. [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
11590	38.01	11.64	V	49.65	74	24.35	PK
11590	25.08	11.64	V	36.72	54	17.28	AV
17385	45.17	18.91	V	64.08	74	9.93	PK
17385	30.99	18.91	V	49.90	54	4.11	AV
11590	38.46	11.64	H	50.10	74	23.90	PK
11590	25.07	11.64	H	36.71	54	17.29	AV
17385	44.22	18.91	H	63.13	74	10.88	PK
17385	30.97	18.91	H	49.88	54	4.13	AV

Notes:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain
5. Spectrum setting:

   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)

      RBW = 1 MHz

      VBW = 3 MHz

      Detector = Peak

      Trace = Max hold

      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

      RBW = 1 MH

      VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

6. . We have done test all data rate in 802.11n_40 MHz BW(5.8 GHz) mode. Worst case of EUT is 13.5 Mbps in 802.11n_40 MHz BW(5.8 GHz).
7. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

8.5.2 RADIATED RESTRICTED BAND EDGE MEASUREMENTS

Test Requirements and limit, §15.247(d) §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Operation Mode:	802.11g
Transfer Rate:	6 Mbps
Operating Frequency	2412 MHz, 2462 MHz
Channel No.	01 Ch, 11 Ch

Frequency [MHz]	Reading dBuV	AN.+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2390.0	32.60	33.90	H	66.50	74	7.50	PK
2390.0	15.07	33.90	H	48.97	54	5.03	AV
2390.0	27.07	33.90	V	60.97	74	13.03	PK
2390.0	12.60	33.90	V	46.50	54	7.50	AV
2483.5	35.15	33.99	H	69.14	74	4.86	PK
2483.5	16.58	33.99	H	50.57	54	3.43	AV
2483.5	32.67	33.99	V	66.66	74	7.34	PK
2483.5	14.36	33.99	V	48.35	54	5.65	AV

Notes:

1. Total = Reading Value + Antenna Factor + Cable Loss
2. Spectrum setting:
   a. Peak (Procedure 4.2.3.2.2 in ANSI 63.10)
      RBW = 1 MHz
      VBW = 3 MHz
      Detector = Peak
      Trace = Max hold
      Sweep = auto couple

   b. Average (Procedure 4.2.3.2.3 in ANSI 63.10)

RBW = 1 MH

VBW = 10 Hz

Span = Zero

Detector Mode = Peak

Trace = Max hold

3. We have done 802.11b/g/n mode test. . Worst case of EUT is 6 Mbps in 802.11g

8.6 POWERLINE CONDUCTED EMISSIONS

Test Requirements and limit, §15.207

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.
5. We are performed the AC Power Line Conducted Emission test for 18 Mbps, Ch.6 and 802.11g. Because 802.11g mode is worst case.

▣ RESULT PLOTS

Conducted Emissions (Line 1)

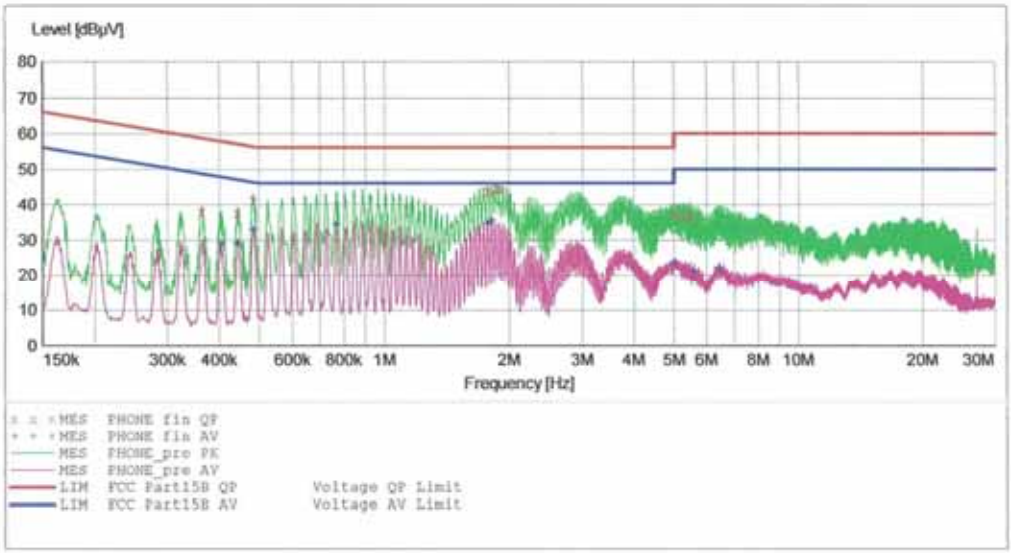
HCT

EMC

```
EUT:                  US780
Manufacturer:         LG
Operating Condition:  WLAN MODE
Test Site:            SHIELD ROOM
Operator:             JS LEE
Test Specification:   FCC PART 15 B
Comment:              H
```

SCAN TABLE: "FCC PART 15 B(H)"

```
Short Description:                FCC PART 15 CLASS B
Start      Stop       Step       Detector  Meas.     IF       Transducer
Frequency  Frequency  Width                Time      Bandw.
150.0 kHz  500.0 kHz  1.0 kHz    MaxPeak   10.0 ms   9 kHz    None
                                 Average
500.0 kHz  5.0 MHz    4.0 kHz    MaxPeak   10.0 ms   9 kHz    None
                                 Average
5.0 MHz    30.0 MHz   4.0 kHz    MaxPeak   10.0 ms   9 kHz    None
                                 Average
```



MEASUREMENT RESULT: "PHONE_fin QP"

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Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.363010	38.00	9.8	59	20.6	---	---
0.443010	37.80	9.8	57	19.2	---	---
0.485010	41.20	9.8	56	15.1	---	---
1.776000	43.80	9.9	56	12.2	---	---
1.856000	44.60	9.9	56	11.4	---	---
1.896000	44.30	9.9	56	11.7	---	---
5.000000	37.50	10.2	56	18.5	---	---
5.288000	36.70	10.2	60	23.3	---	---
5.488000	36.60	10.2	60	23.4	---	---

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MEASUREMENT RESULT: "PHONE_fin AV"

1/21/2013 8:59AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.404010	28.90	9.8	48	18.9	---	---
0.443010	29.00	9.8	47	18.0	---	---
0.485010	33.00	9.8	46	13.3	---	---
0.768000	34.30	9.8	46	11.7	---	---
1.776000	34.60	9.9	46	11.4	---	---
1.820000	35.40	9.9	46	10.6	---	---
5.000000	23.40	10.2	46	22.6	---	---
5.604000	21.20	10.2	50	28.8	---	---
6.456000	22.00	10.3	50	28.0	---	---

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Conducted Emissions (Line 2)

HCT

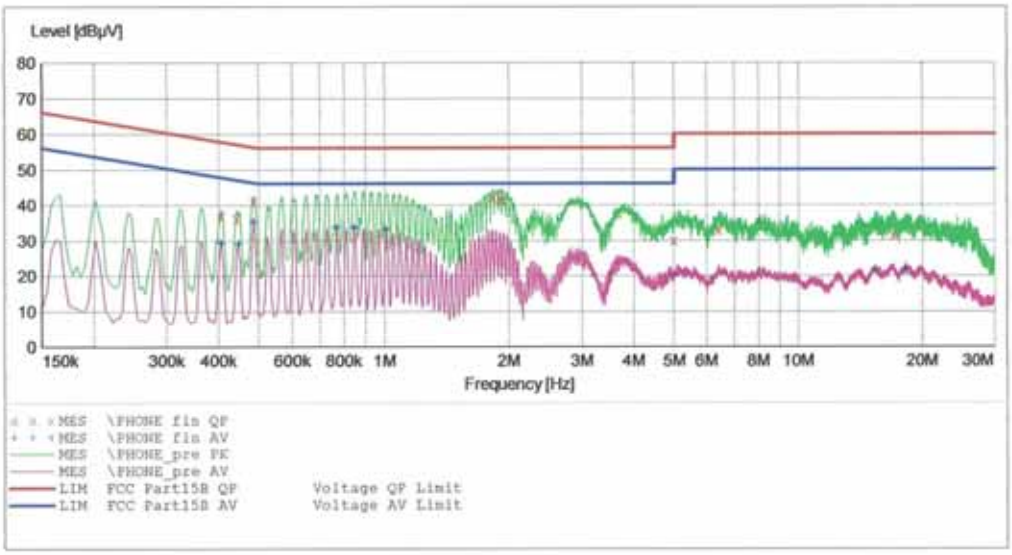
EMC

```
EUT:                  US780
Manufacturer:         LG
Operating Condition:  WLAN MODE
Test Site:            SHIELD ROOM
Operator:             JS LEE
Test Specification:   FCC PART 15 CLASS B
Comment:              N
```

SCAN TABLE: "FCC PART 15 B(N)"

Short Description: FCC PART 15 CLASS B

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak Average	10.0 ms	9 kHz	None



MEASUREMENT RESULT: "\PHONE_fin QP"

1/21/2013 8:55AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.406010	37.00	10.0	58	20.7	---	---
0.442010	36.30	10.0	57	20.7	---	---
0.486010	41.00	10.0	56	15.2	---	---
1.832000	42.10	10.1	56	13.9	---	---
1.912000	41.90	10.1	56	14.1	---	---
1.932000	41.30	10.1	56	14.7	---	---
5.000000	30.00	10.4	56	26.0	---	---
6.432000	33.10	10.5	60	26.9	---	---
16.968000	31.50	11.6	60	28.5	---	---

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MEASUREMENT RESULT: "\PHONE_fin AV"

1/21/2013 8:55AM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.406010	29.30	10.0	48	18.4	---	---
0.446010	29.00	10.0	47	18.0	---	---
0.486010	35.30	10.0	46	10.9	---	---
0.768000	33.60	10.0	46	12.4	---	---
0.848000	33.60	10.0	46	12.4	---	---
1.012000	33.10	10.0	46	12.9	---	---
5.000000	20.00	10.4	46	26.0	---	---
15.364000	21.80	11.3	50	28.2	---	---
18.168000	21.80	11.8	50	28.2	---	---

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9. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Rohde & Schwarz	ENV216/ LISN	Annual	02/09/2013	100073
Schwarzbeck	VULB 9168/ TRILOG Antenna	Biennial	02/09/2013	200
Rohde & Schwarz	ESI 40 / EMI TEST RECEIVER	Annual	05/03/2013	831564103
Agilent	E4440A/ Spectrum Analyzer	Annual	05/02/2013	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	Annual	07/31/2013	MY51110020
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	Annual	09/11/2013	10094
MITEQ	AMF-6B-180265-35-10P / POWER AMP	Annual	04/16/2013	667624
CERNEX	CBL26405040 / POWER AMP	Annual	04/16/2013	19660
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	10/17/2013	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	Biennial	10/30/2014	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	Annual	02/09/2013	839117/011
Agilent	E4416A /Power Meter	Annual	11/07/2013	GB41291412
Agilent	E9327A /POWER SENSOR	Annual	05/02/2013	MY4442009
Wainwright Instrument	WHF3.3/18G-10EF / High Pass Filter	Annual	05/02/2013	1
Wainwright Instrument	WHNX6.0/26.5G-6SS / High Pass Filter	Annual	05/02/2013	1
Wainwright Instrument	WHNX7.0/18G-8SS / High Pass Filter	Annual	05/02/2013	29
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	Annual	05/02/2013	1
Hewlett Packard	11636B/Power Divider	Annual	11/07/2013	11377
Hewlett Packard	11667B / Power Splitter	Annual	06/05/2013	05001
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	11/07/2013	3110117
ITECH	IT6720 / DC POWER SUPPLY	Annual	11/07/2013	010002156287001199
TESCOM	TC-3000C / BLUETOOTH TESTER	Annual	11/07/2013	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	Annual	05/02/2013	100422
EMCO	6502.LOOP ANTENNA	Biennial	01/11/2014	9009-2536
MITEQ	AMF-6D-001180-35-20P/ POWER AMP	Annual	07/30/2013	990893
Agilent	8493C / Attenuator(10 dB)	Annual	07/30/2013	76649
WEINSCHEL	2-3 / Attenuator(3 dB)	Annual	11/07/2013	BR0617
CERNEX	CBLU1183540 / POWER AMP	Annual	07/27/2013	21691