

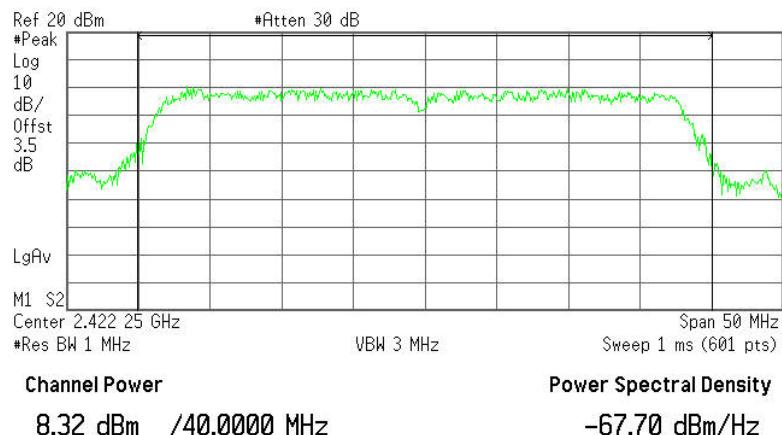


IEEE 802.11n HT40 MHz mode(Antenna 0)

Peak power (CH Low)

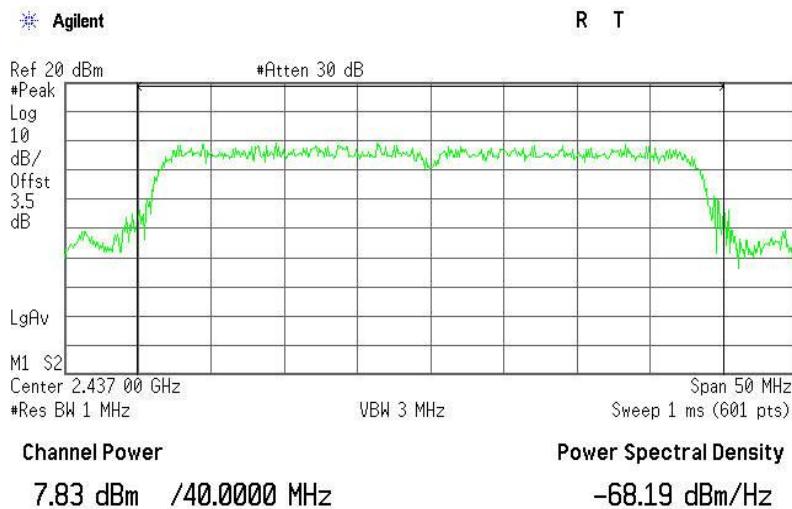
Agilent

R T

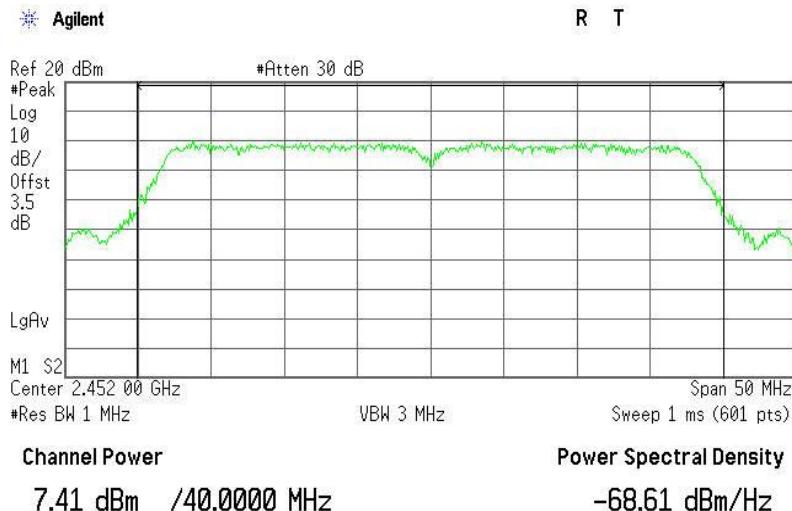




Peak power (CH Mid)



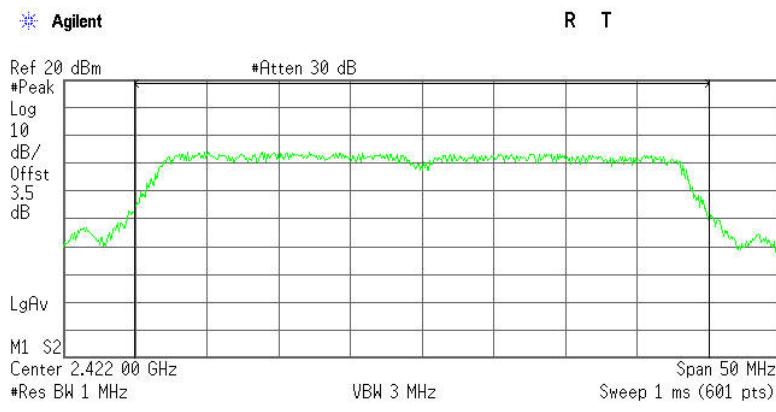
Peak power (CH High)





IEEE 802.11n HT40 MHz mode(Antenna 1)

Peak power (CH Low)

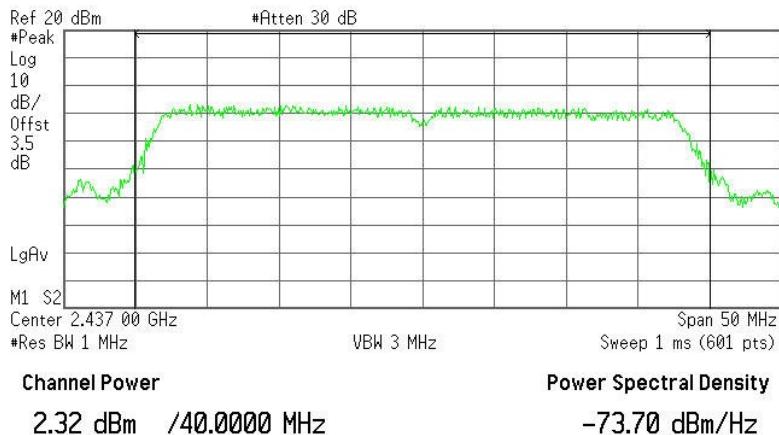




Peak power (CH Mid)

Agilent

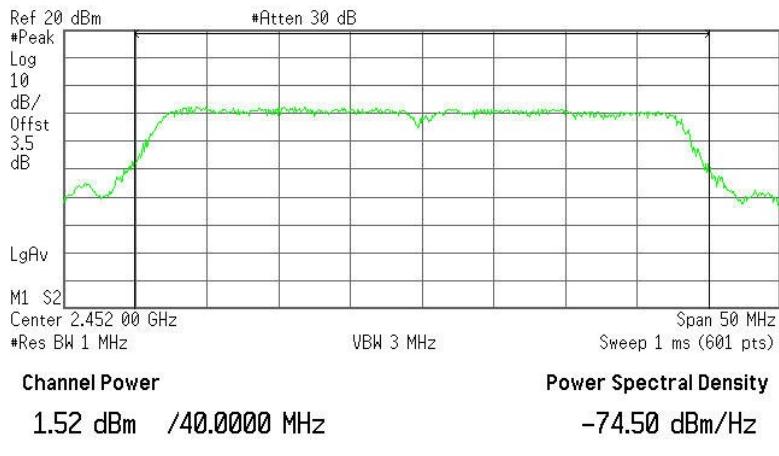
R T



Peak power (CH High)

Agilent

R T





7.5. BAND EDGES MEASUREMENT

7.5.1. LIMITS

According to §15.247(d), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum 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. 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 Section 15.205(c)).

7.5.2. TEST INSTRUMENTS

Radiated Emission Test Site 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	E4446A	US44300399	03/19/2012	03/19/2013
ESCI EMI TEST RECEIVER.ESCI	ROHDE&SCHWARZ	ESCI	100783	03/17/2012	03/17/2013
Amplifier	MITEQ	AM-1604-3000	1123808	03/18/2012	03/18/2013
Turn Table	EMCO	2081-1.21	N/A	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
High Noise Amplifier	Agilent	8449B	3008A01838	03/18/2012	03/18/2013
Bilog Antenna	SCHAFFNER	CBL6143	5082	03/17/2012	03/17/2013
Horn Antenna	SCHWARZBECK	BBHA9120	D286	03/17/2012	03/17/2013
Loop Antenna	A, R, A	PLA-1030/B	1029	03/23/2012	03/23/2013
Temp. / Humidity Meter	VICTOR	VC230	N/A	03/19/2012	03/19/2013
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

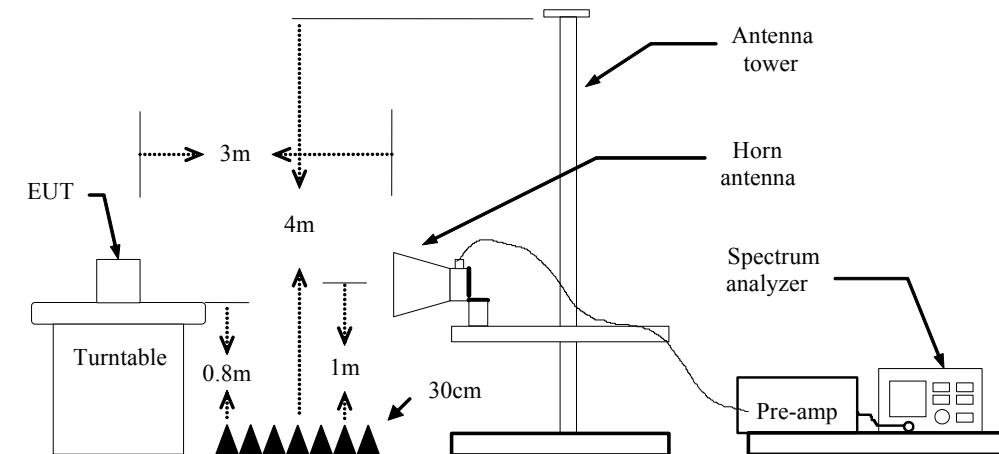
NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The FCC Site Registration number is 101879.
3. N.C.R = No Calibration Required.



7.5.3. TEST PROCEDURES (please refer to measurement standard)

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
 - (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are

7.5.4. TEST SETUP





7.5.5. TEST RESULTS

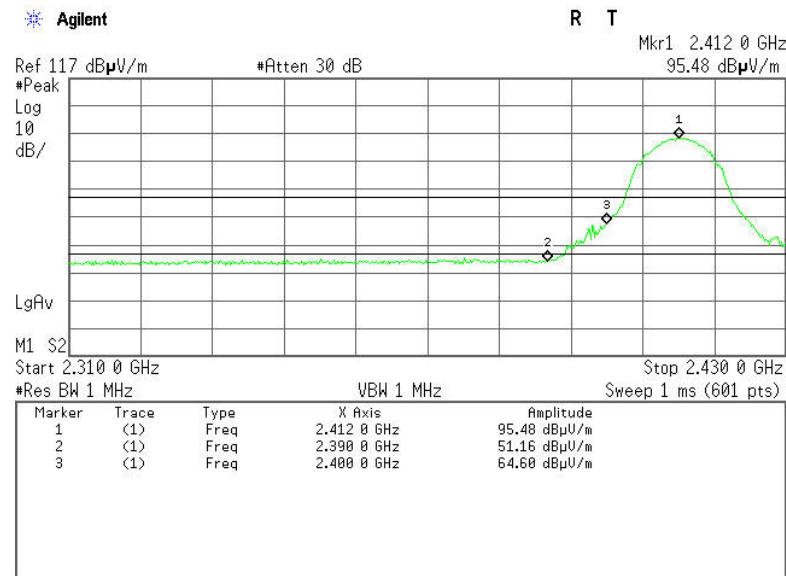
Test Plot

IEEE 802.11b mode(Antenna 1)

Band Edges (CH Low)

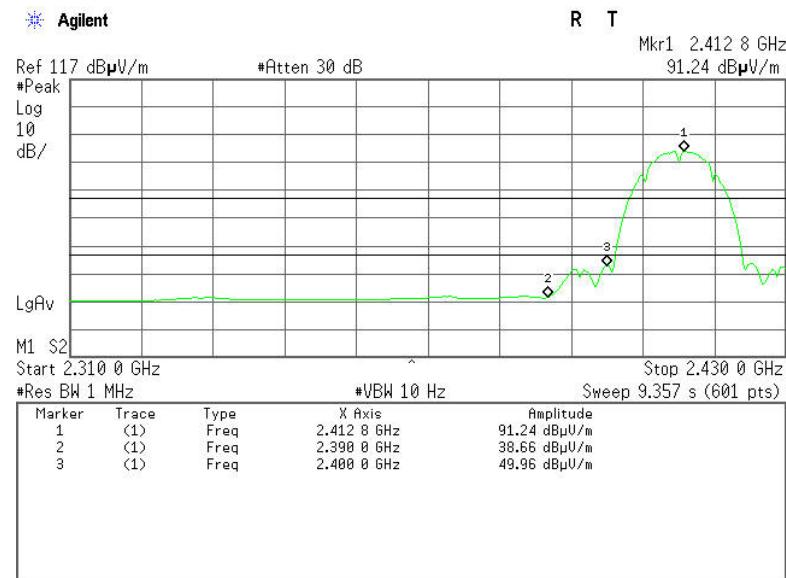
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

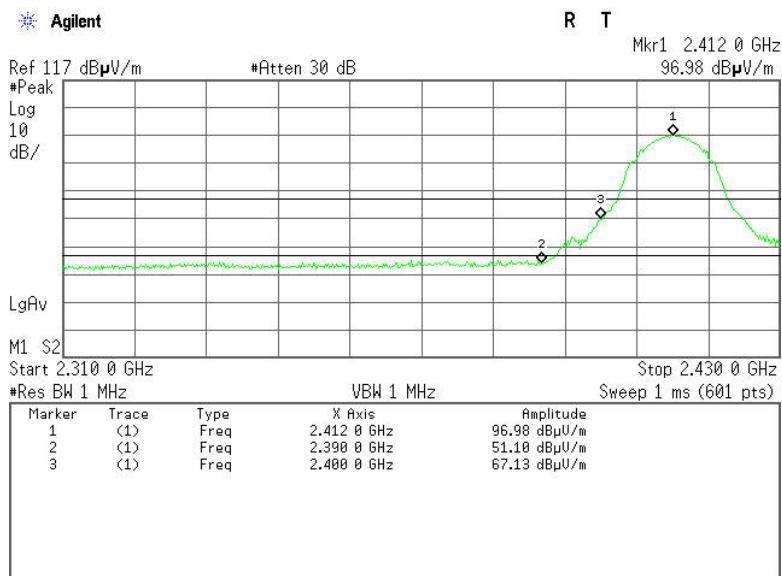
Polarity: Vertical





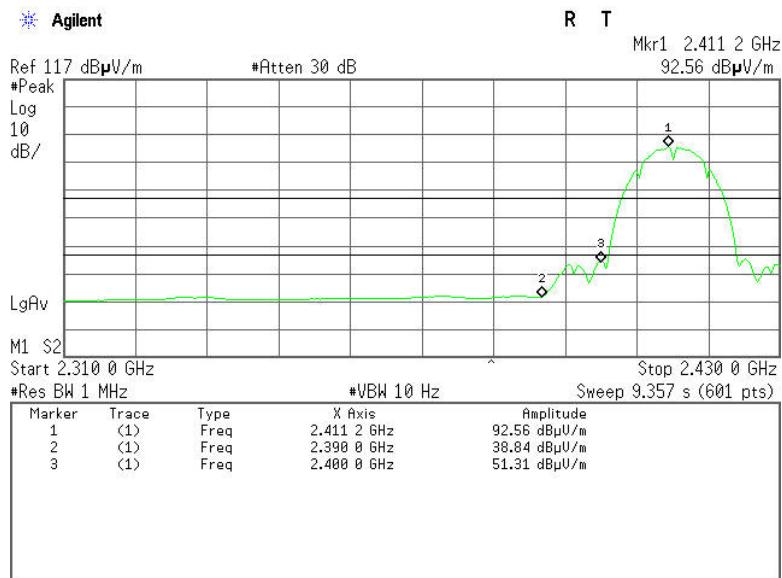
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

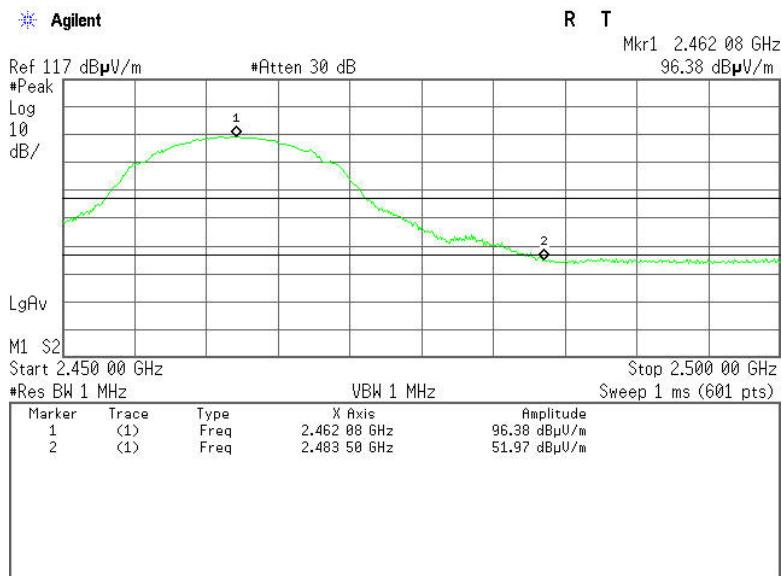




Band Edges (CH High)

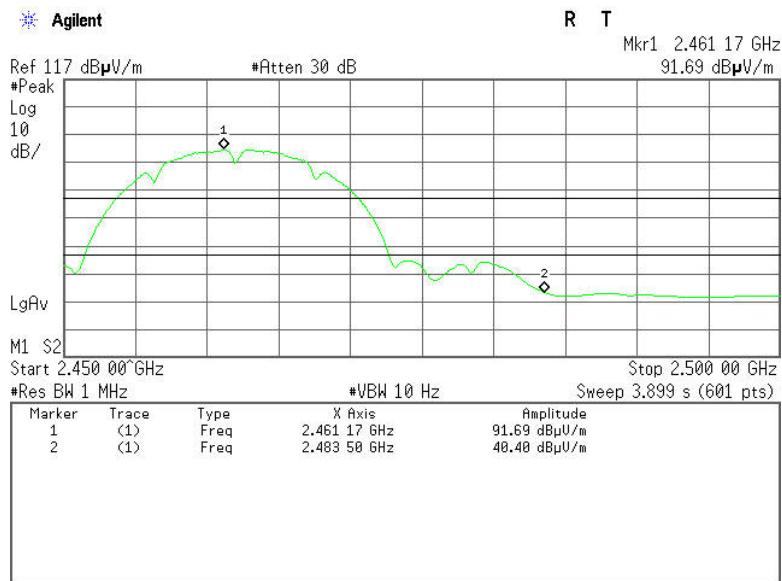
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical





Detector mode: Peak

* Agilent

Ref 117 dB μ V/m

#Peak

Log 10

dB/

LgAv

M1 S2

Start 2.450 00 GHz

#Res BW 1 MHz

#Atten 30 dB

Polarity: Horizontal

R T

Mkr1 2.462 17 GHz

98.59 dB μ V/m

Stop 2.500 00 GHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.462 17 GHz	98.59 dB μ V/m
2	(1)	Freq	2.483 50 GHz	52.64 dB μ V/m

Detector mode: Average

* Agilent

Ref 117 dB μ V/m

#Peak

Log 10

dB/

LgAv

M1 S2

Start 2.450 00 GHz

#Res BW 1 MHz

#Atten 30 dB

Polarity: Horizontal

R T

Mkr1 2.461 25 GHz

94.54 dB μ V/m

Stop 2.500 00 GHz

Sweep 3.899 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.461 25 GHz	94.54 dB μ V/m
2	(1)	Freq	2.483 50 GHz	41.33 dB μ V/m

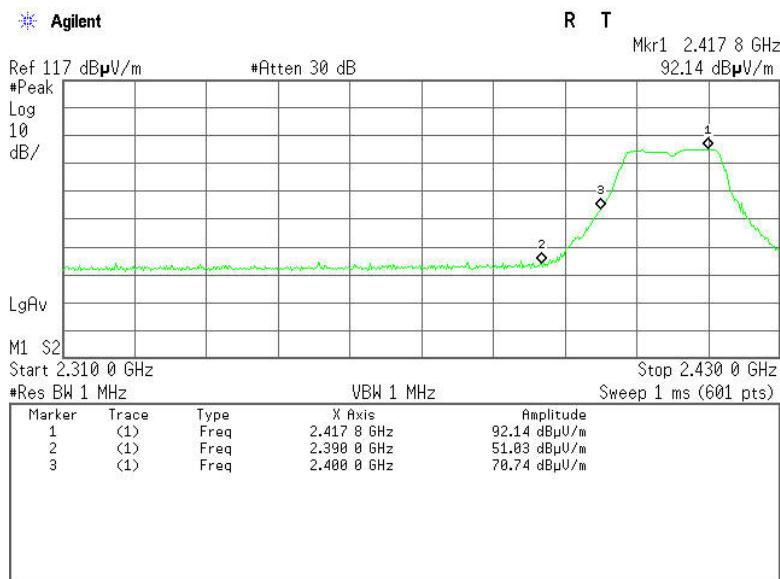


IEEE 802.11g mode(Antenna 1)

Band Edges (CH Low)

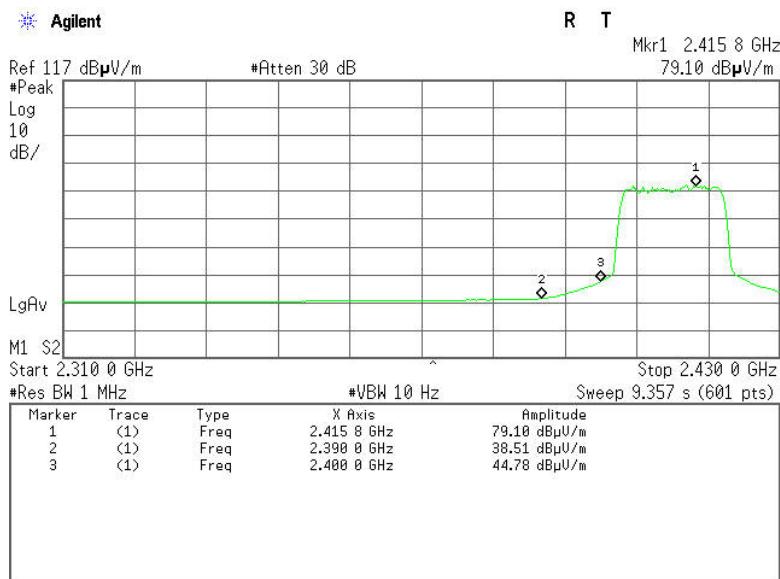
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical





Detector mode: Peak

Polarity: Horizontal

* Agilent

Ref 117 dB μ V/m

#Atten 30 dB

R T
Mkr1 2.407 0 GHz
95.76 dB μ V/m

#Peak

Log

10

dB/

LgAv

M1 S2

Start 2.310 0 GHz

Stop 2.430 0 GHz

#Res BW 1 MHz

VBW 1 MHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.407 0 GHz	95.76 dB μ V/m
2	(1)	Freq	2.398 0 GHz	51.96 dB μ V/m
3	(1)	Freq	2.400 0 GHz	74.29 dB μ V/m

Detector mode: Average

Polarity: Horizontal

* Agilent

Ref 117 dB μ V/m

#Atten 30 dB

R T
Mkr1 2.407 4 GHz
82.20 dB μ V/m

#Peak

Log

10

dB/

LgAv

M1 S2

Start 2.310 0 GHz

Stop 2.430 0 GHz

#Res BW 1 MHz

#VBW 10 Hz

Sweep 9.357 s (601 pts)

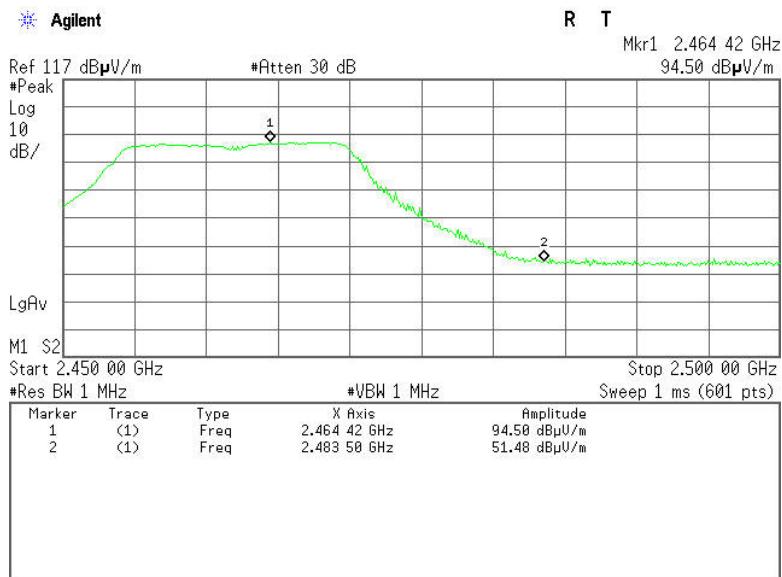
Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.407 4 GHz	82.20 dB μ V/m
2	(1)	Freq	2.398 0 GHz	39.17 dB μ V/m
3	(1)	Freq	2.400 0 GHz	47.75 dB μ V/m



Band Edges (CH High)

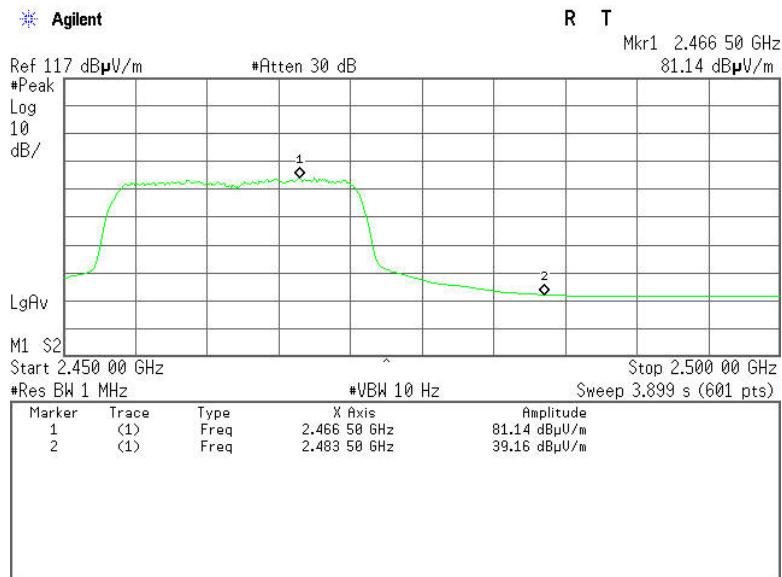
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

Polarity: Vertical





Detector mode: Peak

* Agilent

Ref 117 dB μ V/m

#Peak

Log

10

dB/

#Atten 30 dB

Polarity: Horizontal

R T

Mkr1 2.456 92 GHz

95.46 dB μ V/m

LgAv

M1 S2

Start 2.450 00 GHz

#Res BW 1 MHz

VBW 1 MHz

Stop 2.500 00 GHz

Sweep 1 ms (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.456 92 GHz	95.46 dB μ V/m
2	(1)	Freq	2.483 50 GHz	53.28 dB μ V/m

Detector mode: Average

* Agilent

Ref 117 dB μ V/m

#Peak

Log

10

dB/

Polarity: Horizontal

R T

Mkr1 2.464 50 GHz

82.38 dB μ V/m

LgAv

M1 S2

Start 2.450 00 GHz

#Res BW 1 MHz

#VBW 10 Hz

Stop 2.500 00 GHz

Sweep 3.899 s (601 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(1)	Freq	2.464 50 GHz	82.38 dB μ V/m
2	(1)	Freq	2.483 50 GHz	48.21 dB μ V/m

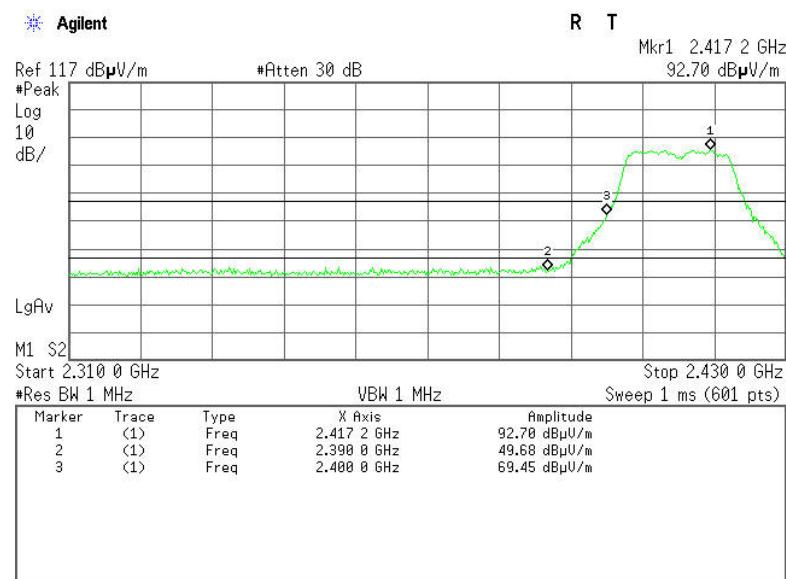


IEEE 802.11n HT20 MHz mode(Combine with Antenna 0 and Antenna 1)

Band Edges (CH Low)

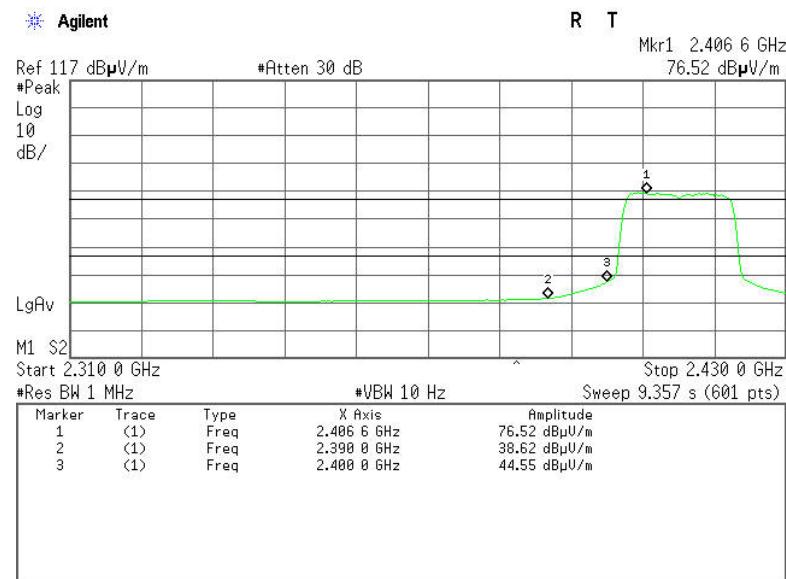
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

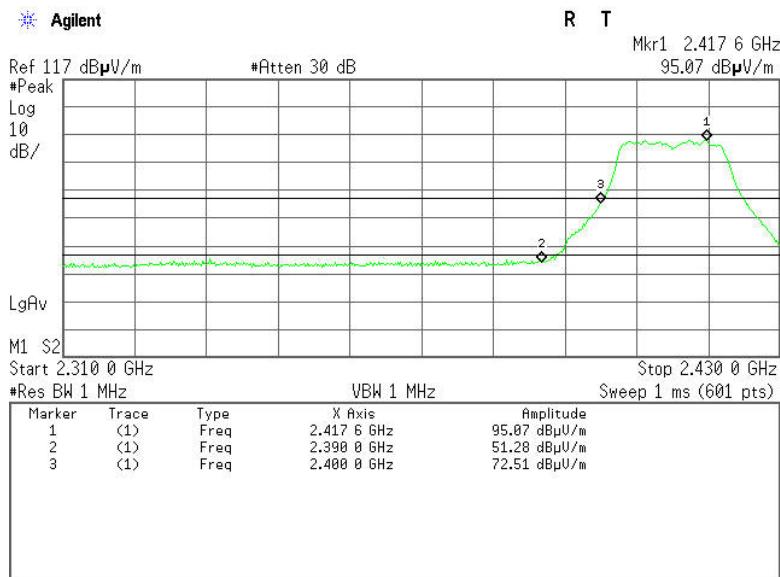
Polarity: Vertical





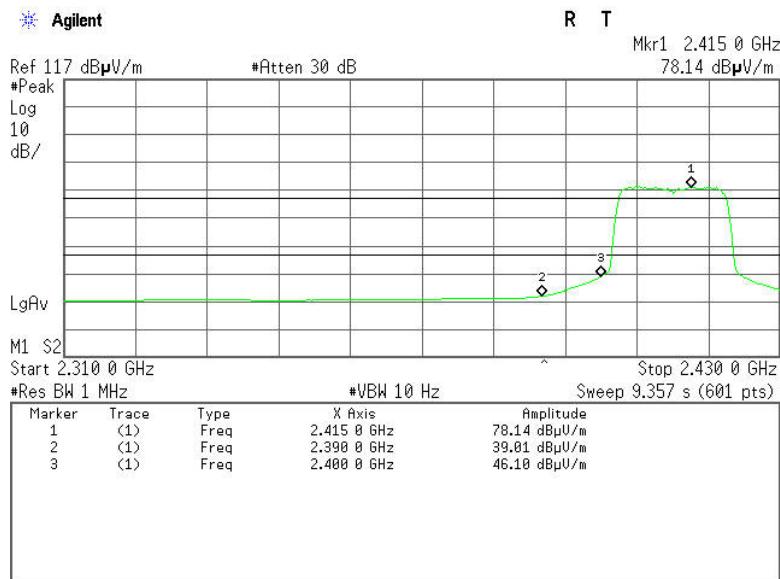
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal

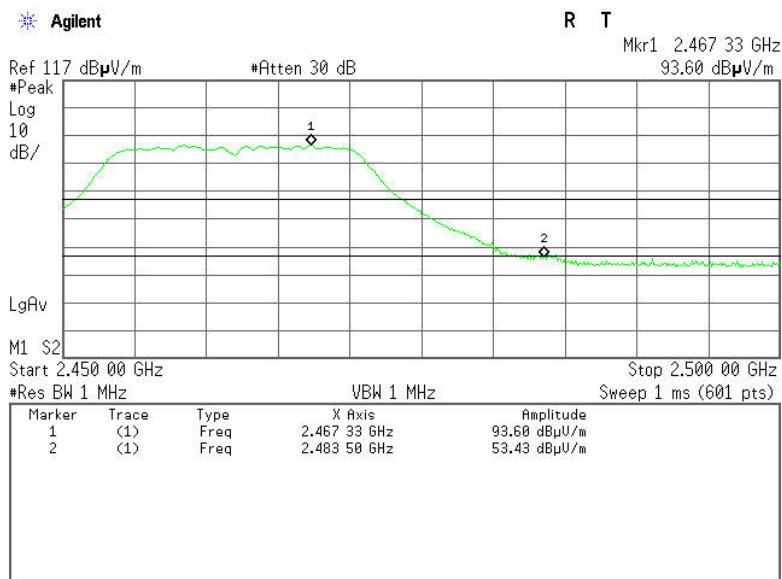




Band Edges (CH High)

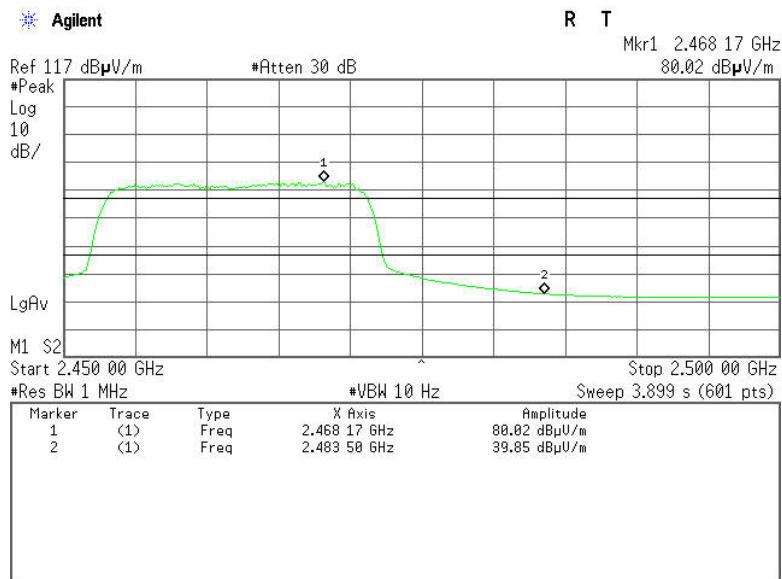
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

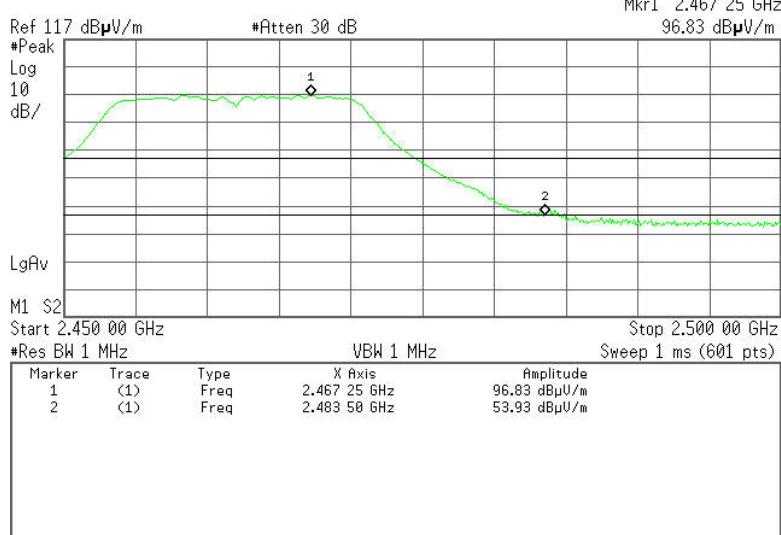
Polarity: Vertical





Detector mode: Peak

 Agilent



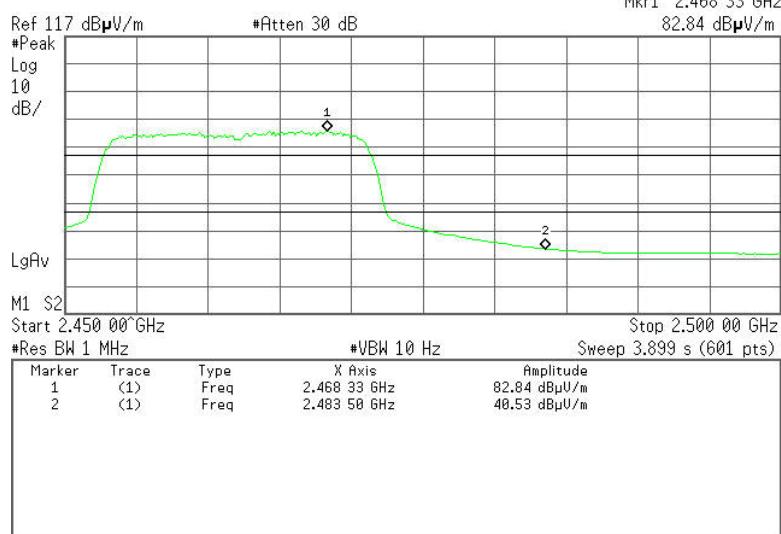
Polarity: Horizontal

R T

Mkr1 2.467 25 GHz
96.83 dB μ V/m

Detector mode: Average

Agilent



Polarity: Horizontal

R T

Mkr1 2.468 33 GHz
82.84 dBuV/m

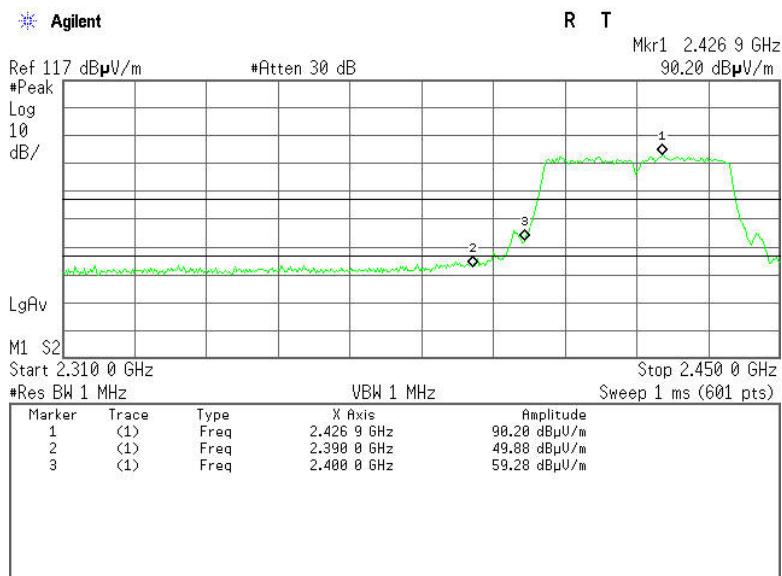


IEEE 802.11n HT40 MHz mode(Combine with Antenna 0 and Antenna 1)

Band Edges (CH Low)

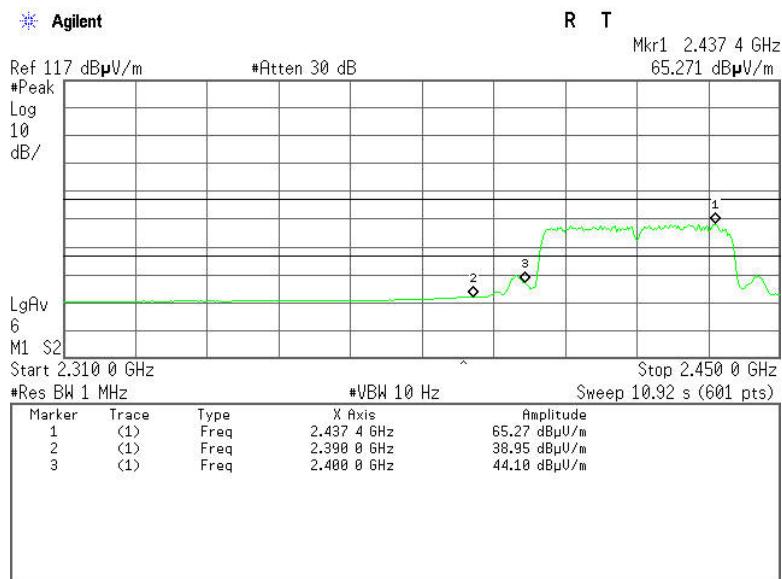
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

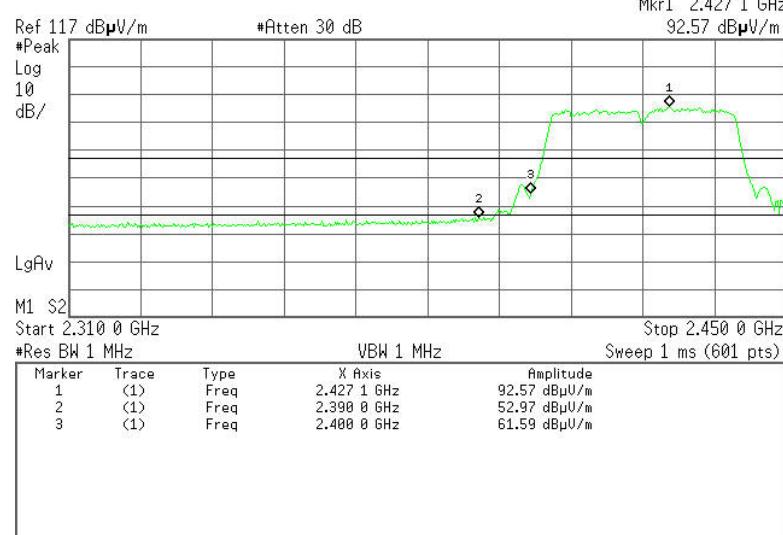
Polarity: Vertical





Detector mode: Peak

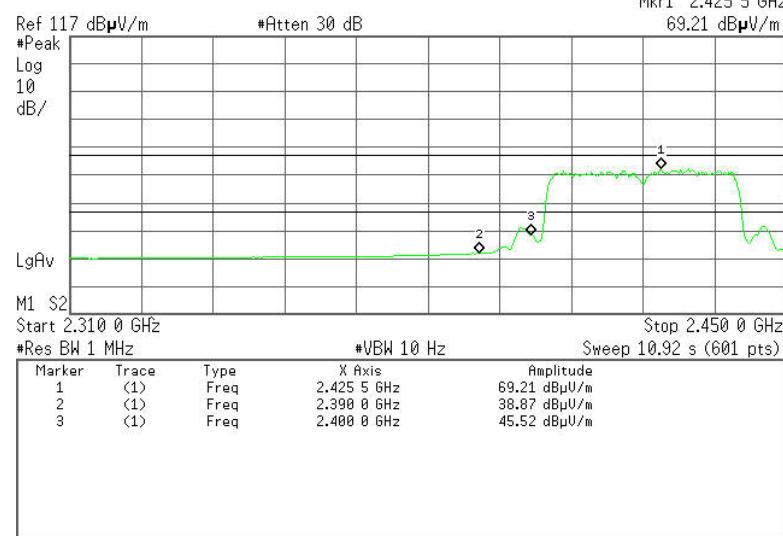
* Agilent



Polarity: Horizontal

Detector mode: Average

* Agilent



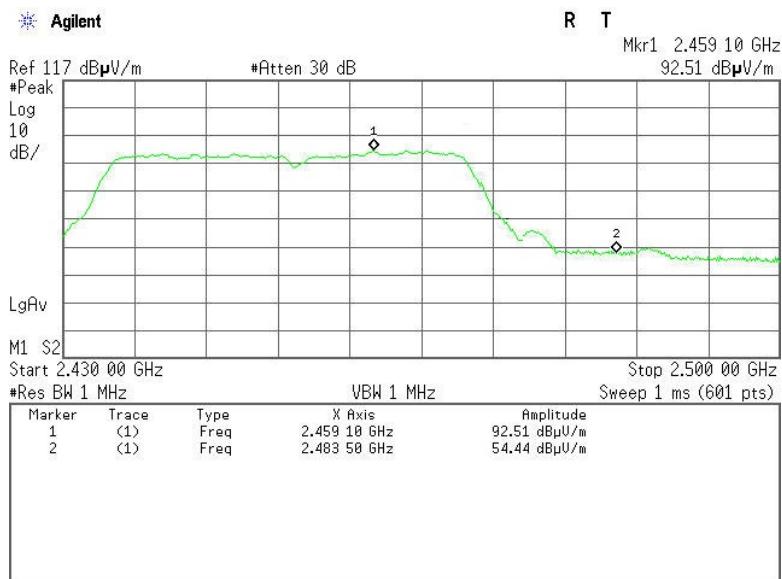
Polarity: Horizontal



Band Edges (CH High)

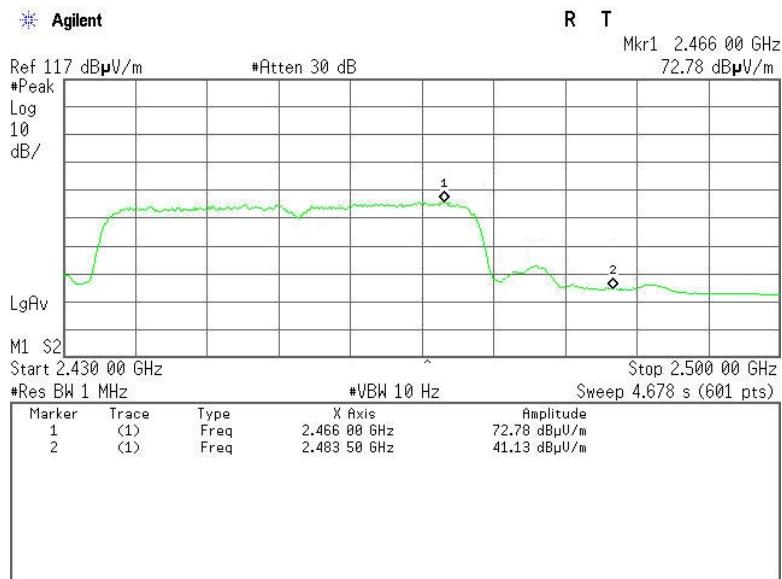
Detector mode: Peak

Polarity: Vertical



Detector mode: Average

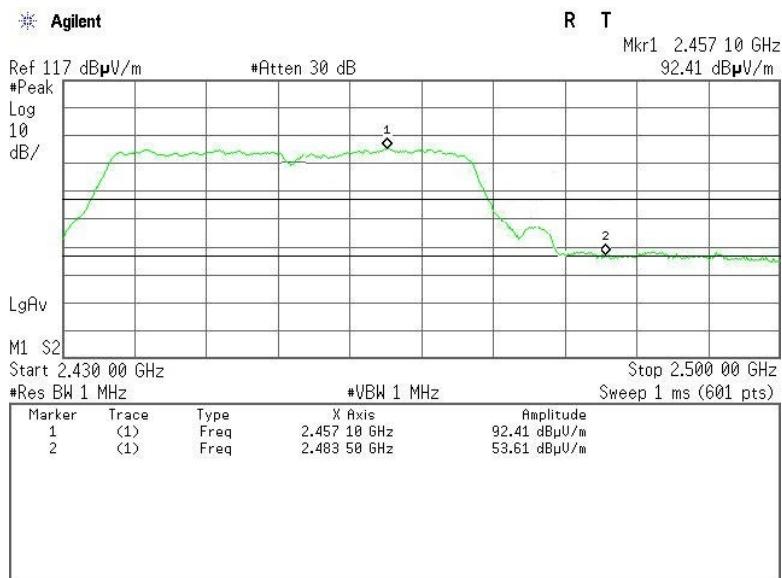
Polarity: Vertical





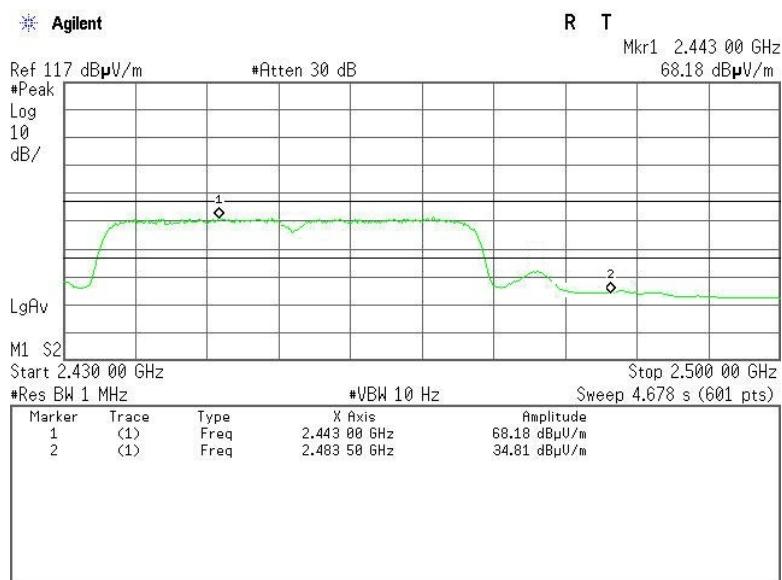
Detector mode: Peak

Polarity: Horizontal



Detector mode: Average

Polarity: Horizontal





7.6. PEAK POWER SPECTRAL DENSITY MEASUREMENT

7.6.1. LIMITS

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

According to §15.247(f), the digital modulation operation of the hybrid system, with the frequency hopping turned off, shall comply with the power density requirements of paragraph (d) of this section.

7.6.2. TEST INSTRUMENTS

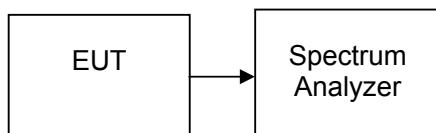
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	E4446A	US44300399	03/19/2012	03/19/2013

7.6.3. TEST PROCEDURES (please refer to measurement standard)

§15.247(e) specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission. The same method as used to determine the conducted output power shall be used to determine the power spectral density (i.e., if peak-detected fundamental power was measured then use the peak PSD procedure and if average fundamental power was measured then use the average PSD procedure).

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW ≥ 3 kHz.
4. Set the VBW $\geq 3 \times$ RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.6.4. TEST SETUP





7.6.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b(Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-15.31	8	PASS
Mid	2437	-12.23		PASS
High	2462	-12.69		PASS

Test mode: IEEE 802.11g(Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-21.58	8	PASS
Mid	2437	-22.44		PASS
High	2462	-22.98		PASS

Test mode: IEEE 802.11n HT20 MHz(Combine with Antenna 0 and Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		(Chain 0)	(Chain 1)	(Total)		
Low	2412	-20.05	-25.72	-19.01	8	PASS
Mid	2437	-20.35	-25.17	-19.11		PASS
High	2462	-24.47	-25.64	-22.01		PASS

Test mode: IEEE 802.11n HT40 MHz(Combine with Antenna 0 and Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		(Chain 0)	(Chain 1)	(Total)		
Low	2422	-23.57	-27.95	-22.22	8	PASS
Mid	2437	-24.96	-27.60	-23.07		PASS
High	2452	-24.32	-28.43	-22.90		PASS

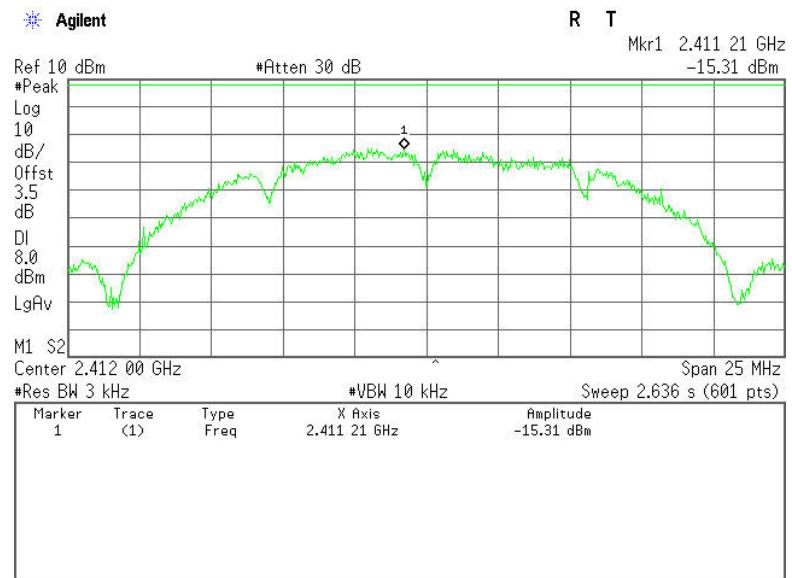
Note : Combine Power Calculation :

$$\text{Total PPSD(dBm)} = \log_{10} \left(10^{(\text{chain 0 PPSD}/10)} + 10^{(\text{chain 1 PPSD}/10)} \right) * 10$$

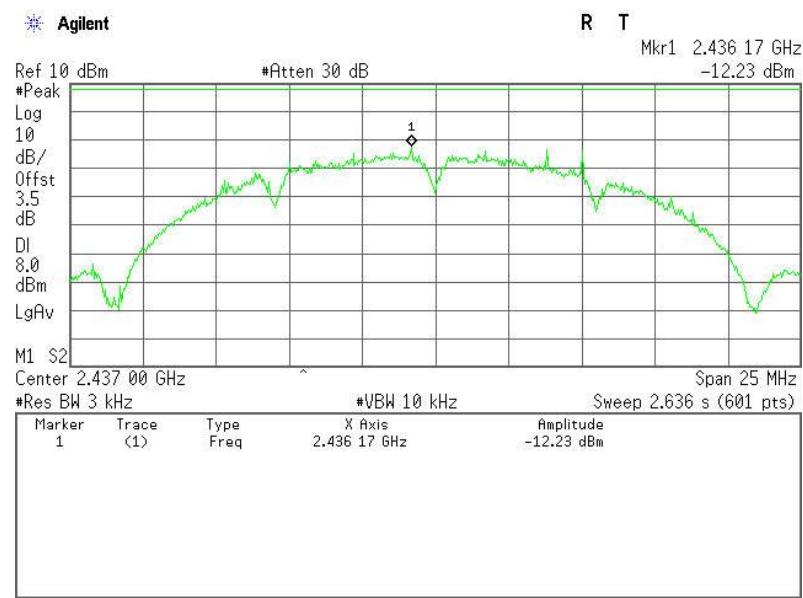


Test Plot IEEE 802.11b mode(Antenna 1)

PPSD (CH Low)

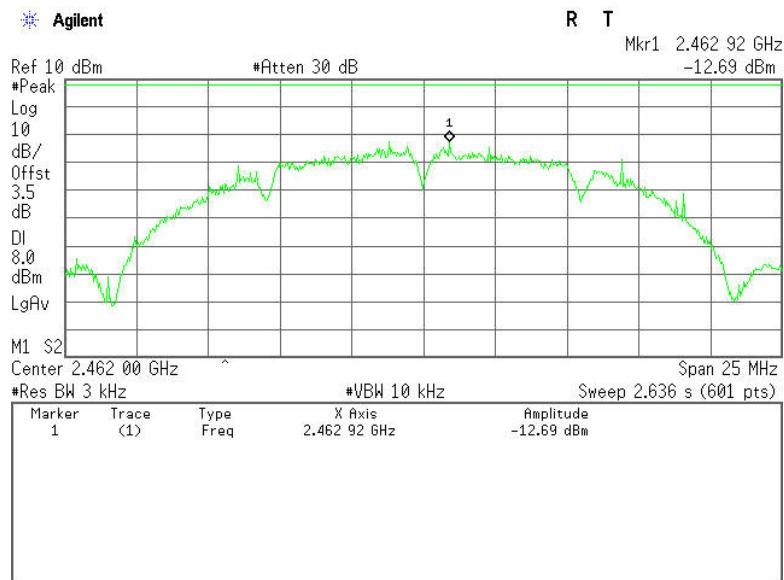


PPSD (CH Mid)



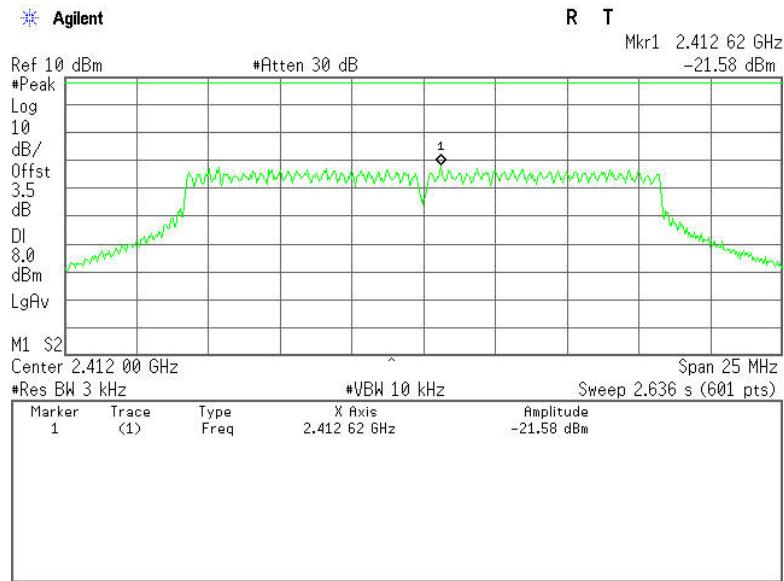


PPSD (CH High)



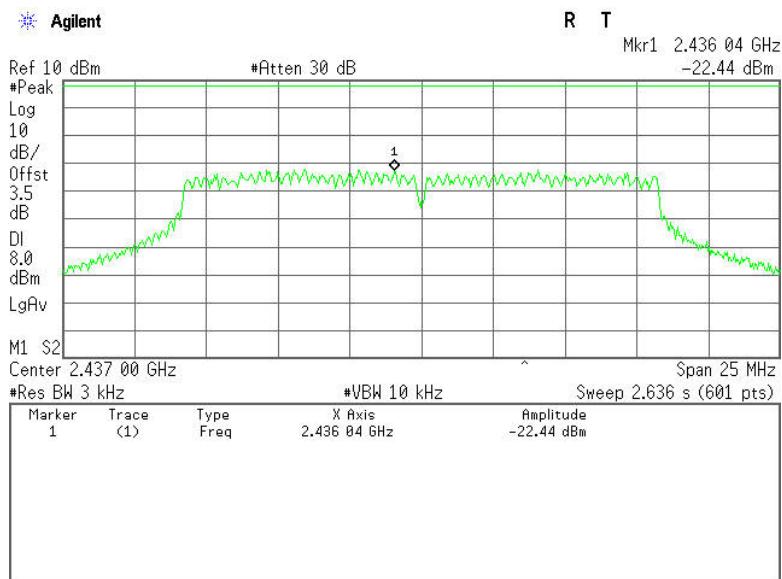
IEEE 802.11g mode(Antenna 1)

PPSD (CH Low)

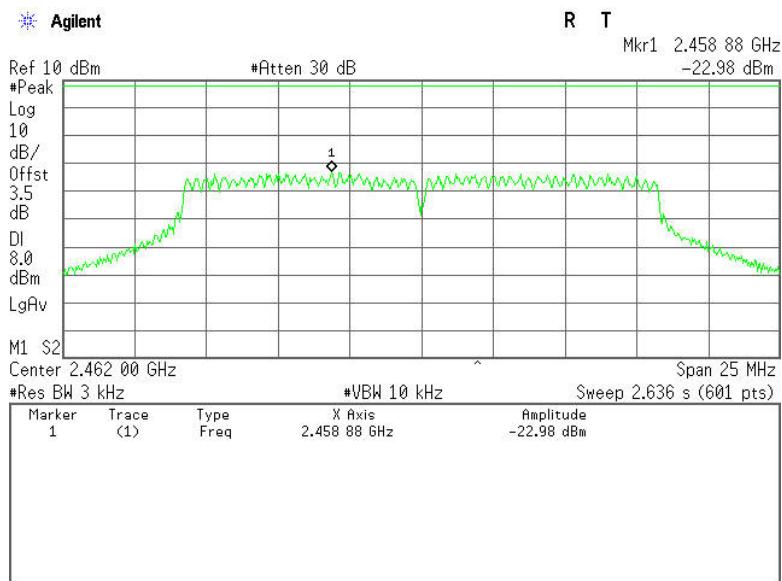




PPSD (CH Mid)



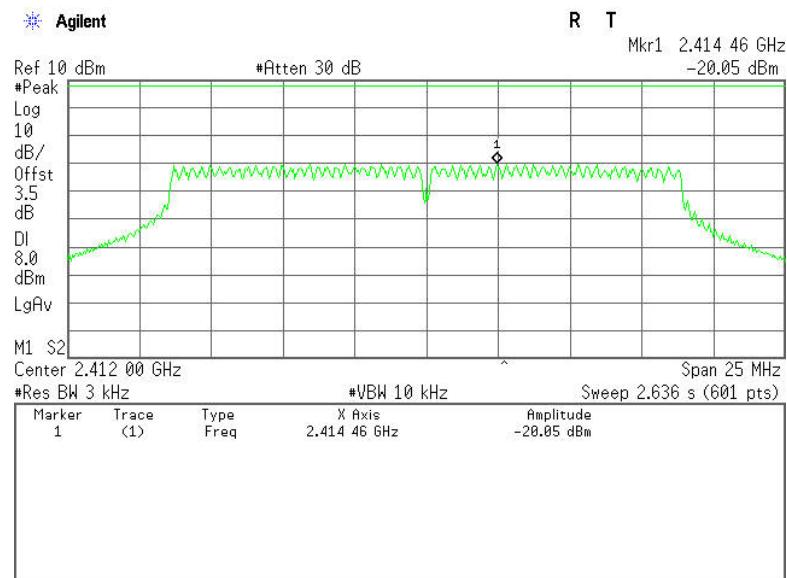
PPSD (CH High)



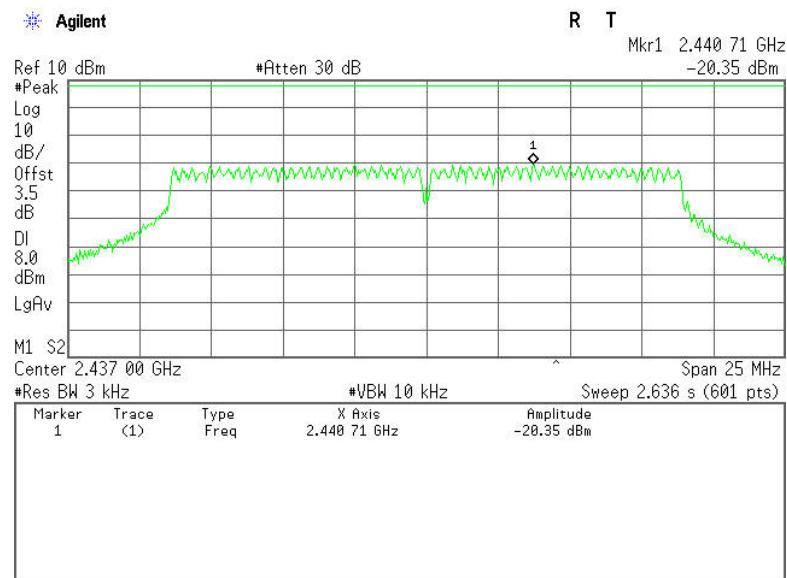


IEEE 802.11n HT20 MHz mode(Antenna 0)

PPSD (CH Low)

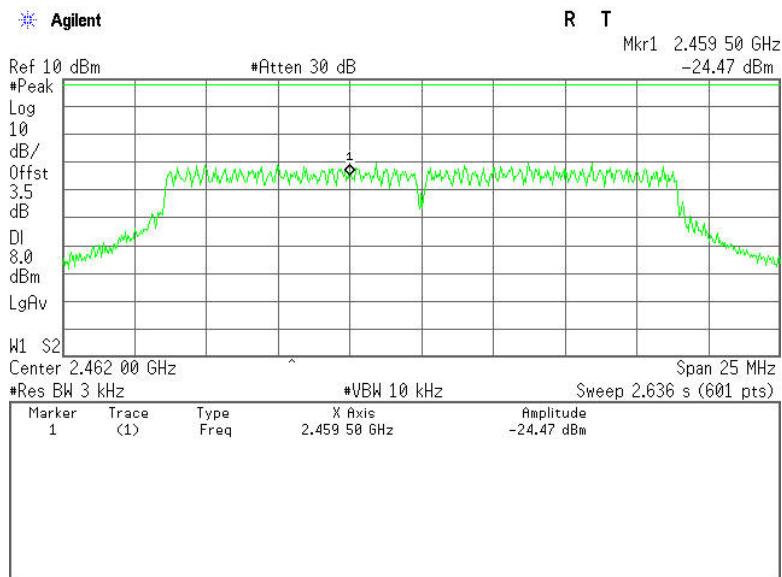


PPSD (CH Mid)



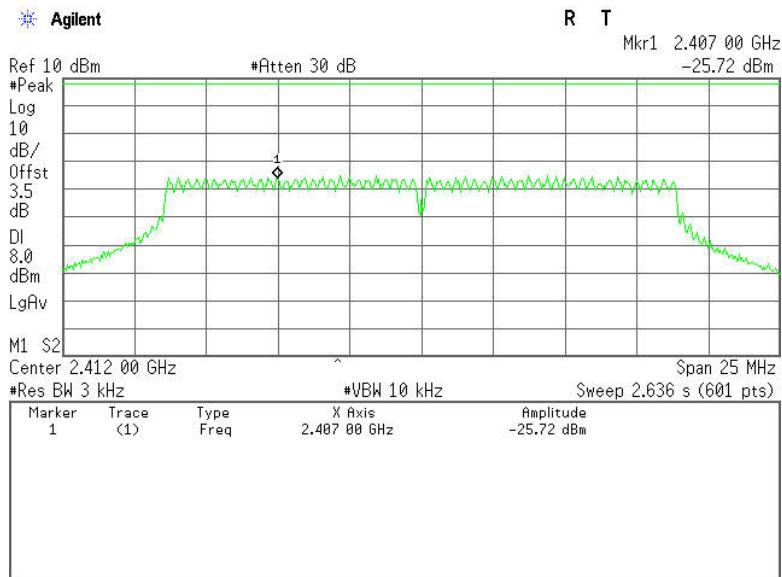


PPSD (CH High)



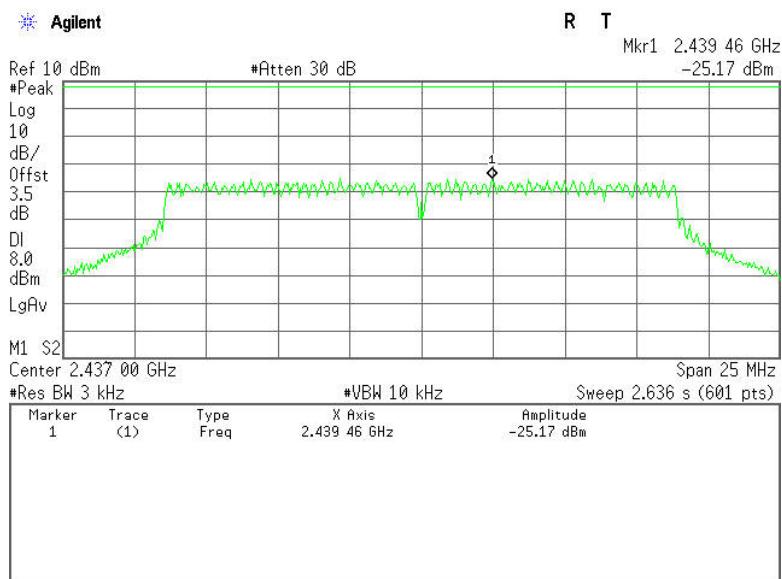
IEEE 802.11n HT20 MHz mode(Antenna 1)

PPSD (CH Low)

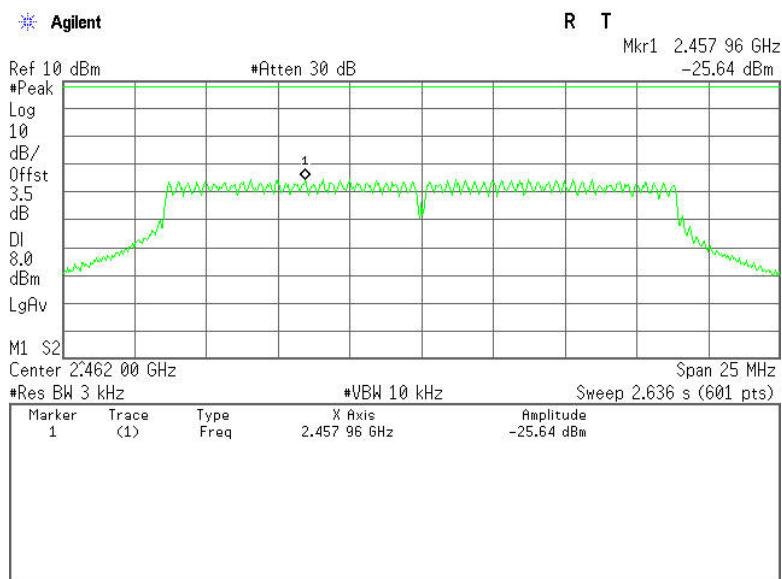




PPSD (CH Mid)



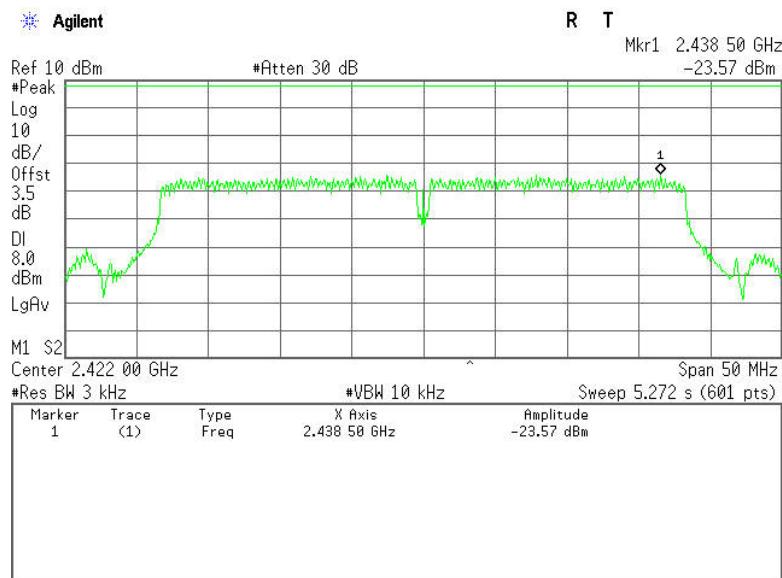
PPSD (CH High)



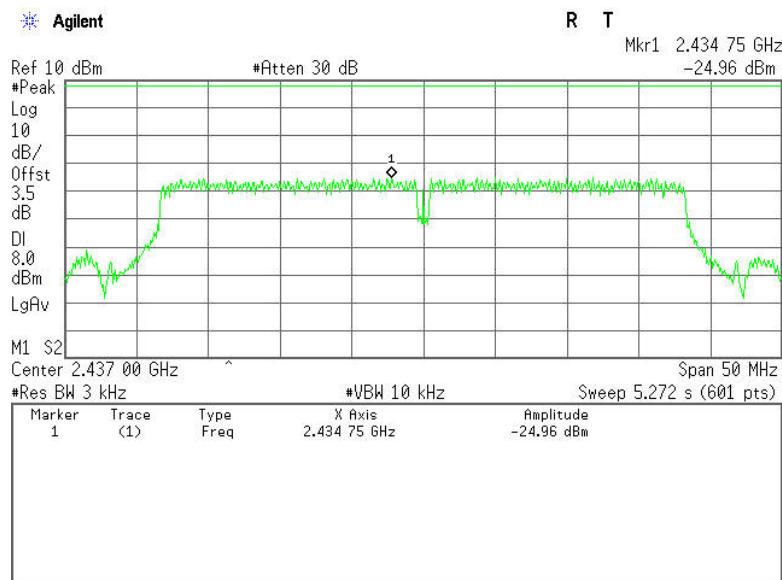


IEEE 802.11n HT40 MHz mode(Antenna 0)

PPSD (CH Low)

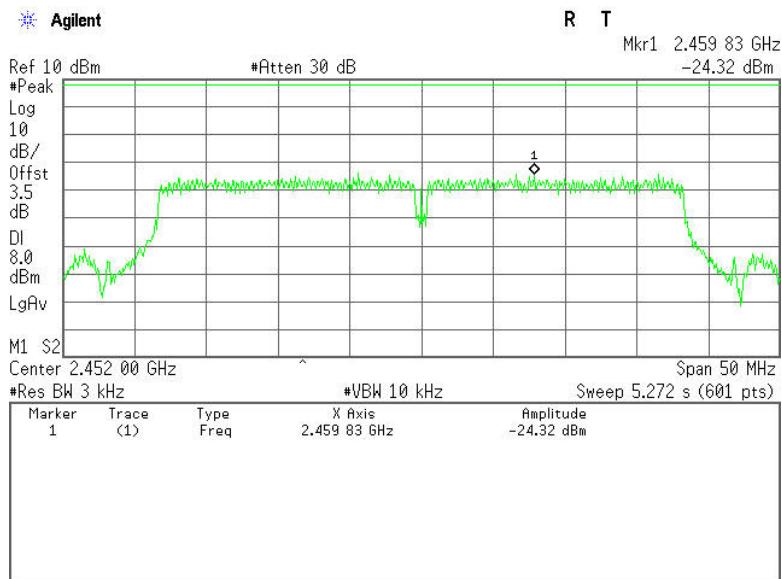


PPSD (CH Mid)



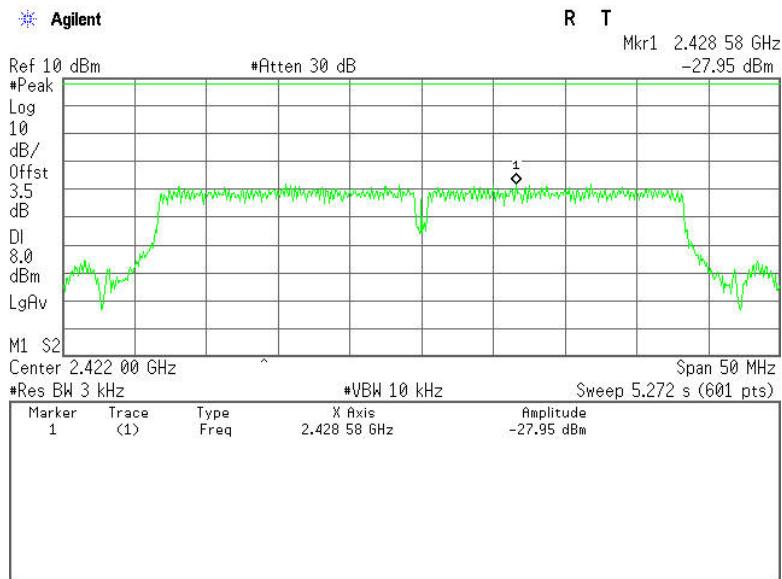


PPSD (CH High)



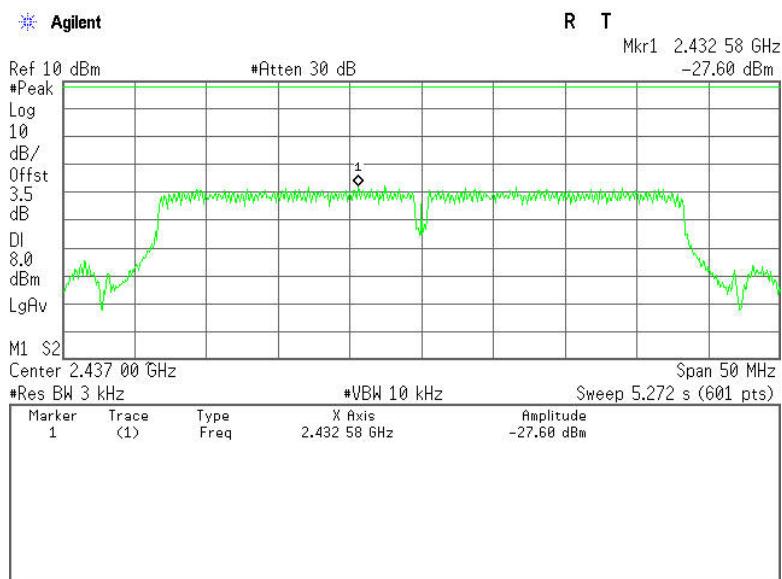
IEEE 802.11n HT40 MHz mode(Antenna 1)

PPSD (CH Low)





PPSD (CH Mid)



PPSD (CH High)

