

**Test Mode:** TX / IEEE 802.11n HT20 MHz (CH Mid)**Tested by:** Fade Zhong**Ambient temperature:** 24°C **Relative humidity:** 52% RH**Date:** June 26, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1765.000	52.29	-6.35	45.94	74.00	-28.06	V	Peak
1954.000	56.61	-5.29	51.32	74.00	-22.68	V	Peak
1954.000	54.63	-5.29	49.34	54.00	-4.66	V	AVG
2548.000	45.26	-2.17	43.09	74.00	-30.91	V	Peak
3142.000	42.89	-1.12	41.77	74.00	-32.23	V	Peak
3565.000	42.19	-0.25	41.94	74.00	-32.06	V	Peak
4888.000	40.93	4.61	45.54	74.00	-28.46	V	Peak
1756.000	49.09	-6.36	42.73	74.00	-31.27	H	Peak
1954.000	57.54	-5.29	52.25	74.00	-21.75	H	Peak
1954.000	54.83	-5.29	49.54	54.00	-4.46	H	AVG
2584.000	44.70	-2.11	42.59	74.00	-31.41	H	Peak
3133.000	43.06	-1.14	41.92	74.00	-32.08	H	Peak
4843.000	39.83	4.47	44.30	74.00	-29.70	H	Peak
5653.000	39.15	5.93	45.08	74.00	-28.92	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / EEE 802.11n HT20 MHz (CH High)**Tested by:** Fade Zhong**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** June 26, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1756.000	53.11	-6.36	46.75	74.00	-27.25	V	Peak
1954.000	56.84	-5.29	51.55	74.00	-22.45	V	Peak
1954.000	52.67	-5.29	47.38	54.00	-6.62	V	AVG
2503.000	44.72	-2.25	42.47	74.00	-31.53	V	Peak
3790.000	40.68	0.70	41.38	74.00	-32.62	V	Peak
4402.000	40.65	3.01	43.66	74.00	-30.34	V	Peak
5617.000	39.91	5.92	45.83	74.00	-28.17	V	Peak
1954.000	57.62	-5.29	52.33	74.00	-21.67	H	Peak
1954.000	54.30	-5.29	49.01	54.00	-4.99	H	AVG
2557.000	44.47	-2.16	42.31	74.00	-31.69	H	Peak
3358.000	43.16	-0.76	42.40	74.00	-31.60	H	Peak
4375.000	41.85	2.91	44.76	74.00	-29.24	H	Peak
4636.000	41.61	3.79	45.40	74.00	-28.60	H	Peak
5644.000	40.04	5.93	45.97	74.00	-28.03	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Combine with Antenna 0 and Antenna 1****Test Mode:** TX/ IEEE 802.11n HT40 MHz (CH Low)**Tested by:** Fadie Zhong**Ambient temperature:** 24°C **Relative humidity:** 52% RH**Date:** June 26, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1756.000	59.66	-6.36	53.30	74.00	-20.70	V	Peak
1756.000	47.71	-6.36	41.35	54.00	-12.65	V	AVG
1954.000	56.64	-5.29	51.35	74.00	-22.65	V	Peak
1954.000	54.53	-5.29	49.24	54.00	-4.76	V	AVG
2539.000	45.42	-2.19	43.23	74.00	-30.77	V	Peak
3340.000	42.61	-0.79	41.82	74.00	-32.18	V	Peak
4528.000	39.29	3.44	42.73	74.00	-31.27	V	Peak
4933.000	40.43	4.76	45.19	74.00	-28.81	V	Peak
1720.000	57.52	-6.44	51.08	74.00	-22.92	H	Peak
1720.000	48.79	-6.44	42.35	54.00	-11.65	H	AVG
1954.000	55.54	-5.29	50.25	74.00	-23.75	H	Peak
1954.000	53.64	-5.29	48.35	54.00	-5.65	H	AVG
2575.000	44.46	-2.12	42.34	74.00	-31.66	H	Peak
3574.000	42.23	-0.21	42.02	74.00	-31.98	H	Peak
4618.000	39.97	3.73	43.70	74.00	-30.30	H	Peak
5392.000	40.70	5.68	46.38	74.00	-27.62	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX / IEEE 802.11n HT40 MHz (CH Mid)**Tested by:** Fade Zhong**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** June 26, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1954.000	56.51	-5.29	51.22	74.00	-22.78	V	Peak
1954.000	54.57	-5.29	49.28	54.00	-4.72	V	AVG
2548.000	44.88	-2.17	42.71	74.00	-31.29	V	Peak
3340.000	43.37	-0.79	42.58	74.00	-31.42	V	Peak
4546.000	40.16	3.50	43.66	74.00	-30.34	V	Peak
5005.000	39.37	4.99	44.36	74.00	-29.64	V	Peak
5869.000	39.99	6.02	46.01	74.00	-27.99	V	Peak
1729.000	53.41	-6.42	46.99	74.00	-27.01	H	Peak
1954.000	57.99	-5.29	52.70	74.00	-21.30	H	Peak
1954.000	54.56	-5.29	49.27	54.00	-4.73	H	AVG
2836.000	44.53	-1.66	42.87	74.00	-31.13	H	Peak
3952.000	39.80	1.39	41.19	74.00	-32.81	H	Peak
4618.000	39.95	3.73	43.68	74.00	-30.32	H	Peak
5860.000	40.01	6.02	46.03	74.00	-27.97	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).

**Test Mode:** TX/ IEEE 802.11n HT40 MHz (CH High)**Tested by:** Fadé Zhong**Ambient temperature:** 24°C **Relative humidity:** 52% RH**Date:** June 26, 2016

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1954.000	55.02	-5.29	49.73	74.00	-24.27	V	Peak
1954.000	52.50	-5.29	47.21	54.00	-6.79	V	AVG
2521.000	41.83	-2.22	39.61	74.00	-34.39	V	Peak
3106.000	40.56	-1.18	39.38	74.00	-34.62	V	Peak
4123.000	37.32	2.02	39.34	74.00	-34.66	V	Peak
5032.000	36.07	5.04	41.11	74.00	-32.89	V	Peak
6301.000	37.39	6.57	43.96	74.00	-30.04	V	Peak
1756.000	47.81	-6.36	41.45	74.00	-32.55	H	Peak
1954.000	57.25	-5.29	51.96	74.00	-22.04	H	Peak
1954.000	53.13	-5.29	47.84	54.00	-6.16	H	AVG
2575.000	44.94	-2.12	42.82	74.00	-31.18	H	Peak
3034.000	42.69	-1.30	41.39	74.00	-32.61	H	Peak
4564.000	40.13	3.56	43.69	74.00	-30.31	H	Peak
5176.000	39.42	5.29	44.71	74.00	-29.29	H	Peak

REMARKS:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Radiated emissions measured in frequency above 1000MHz were made with an instrument using peak/average detector mode.
3. Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
4. Data of measurement within this frequency range shown “---” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
5. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with “N/A” remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
6. Margin (dB) = Remark result (dBuV/m) – Average limit (dBuV/m).



7.3. 6dB BANDWIDTH MEASUREMENT

7.3.1. LIMITS

According to §15.247(a) (2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz. The minimum 6 dB bandwidth shall be at least 500 kHz.

7.3.2. TEST INSTRUMENTS

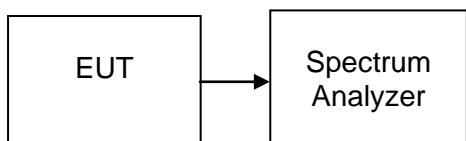
Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018

7.3.3. TEST PROCEDURES (please refer to measurement standard)

8.1 Option 2:

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW \geq 3 RBW, peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be \geq 6 dB.

7.3.4. TEST SETUP





7.3.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	7056	7062	>500	PASS
Mid	2437	7072	7057		PASS
High	2462	7051	7057		PASS

Test mode: IEEE 802.11g

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	15080	15080	>500	PASS
Mid	2437	15070	15050		PASS
High	2462	15080	15080		PASS

Test mode: IEEE 802.11n HT20 MHz

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2412	15090	15090	>500	PASS
Mid	2437	15080	15090		PASS
High	2462	15080	15070		PASS

Test mode: IEEE 802.11n HT40 MHz

Channel	Frequency (MHz)	Bandwidth (kHz)		Limit (kHz)	Test Result
		Antenna 0	Antenna 1		
Low	2422	31220	31300	>500	PASS
Mid	2437	30020	31300		PASS
High	2452	27570	30010		PASS



Test Plot

IEEE 802.11b mode (Antenna 0)

6dB Bandwidth (CH Low)



6dB Bandwidth (CH Mid)



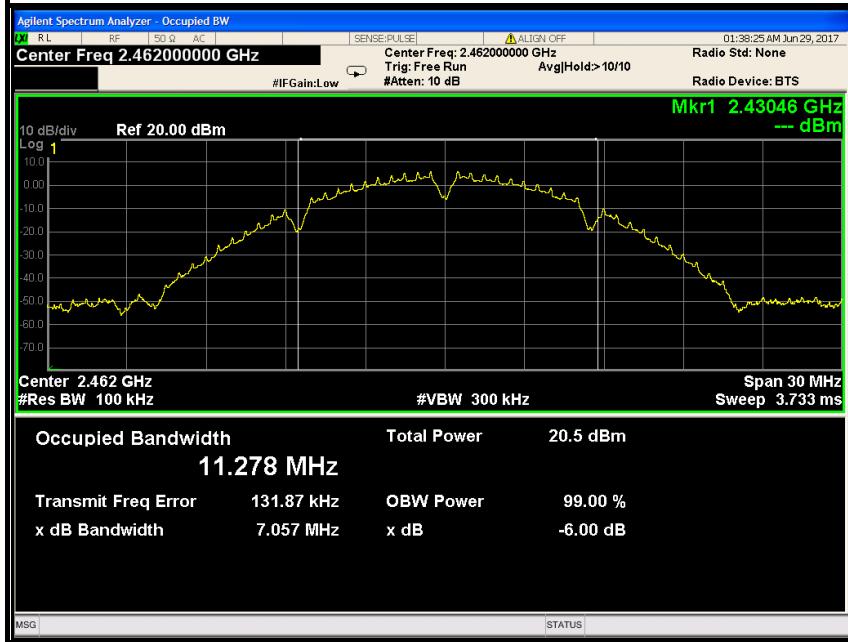
**6dB Bandwidth (CH High)****IEEE 802.11b mode (Antenna 1)****6dB Bandwidth (CH Low)**

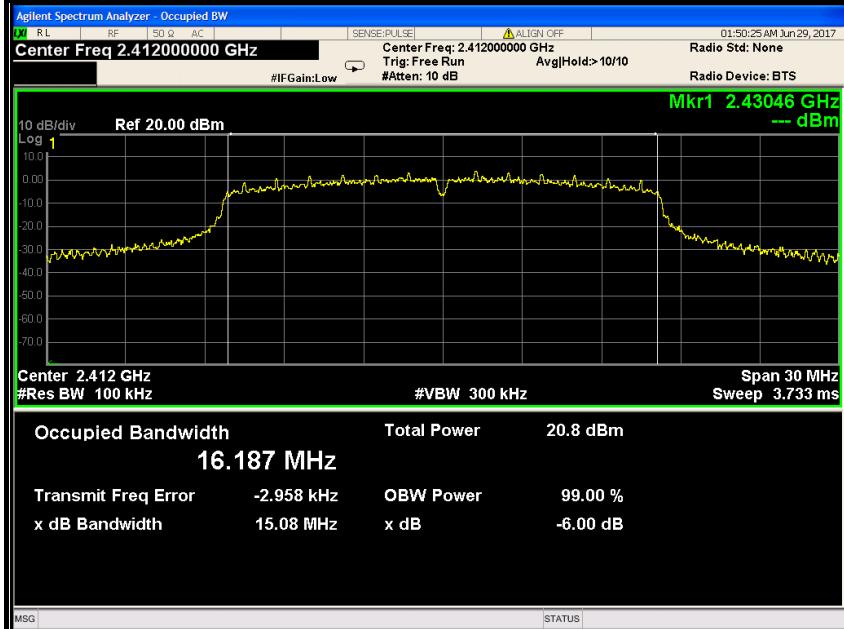
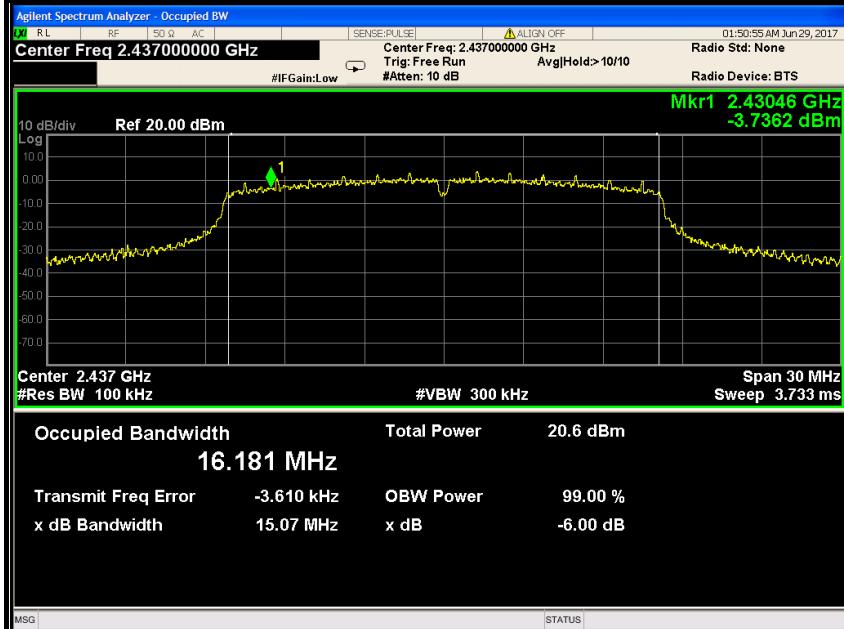


6dB Bandwidth (CH Mid)



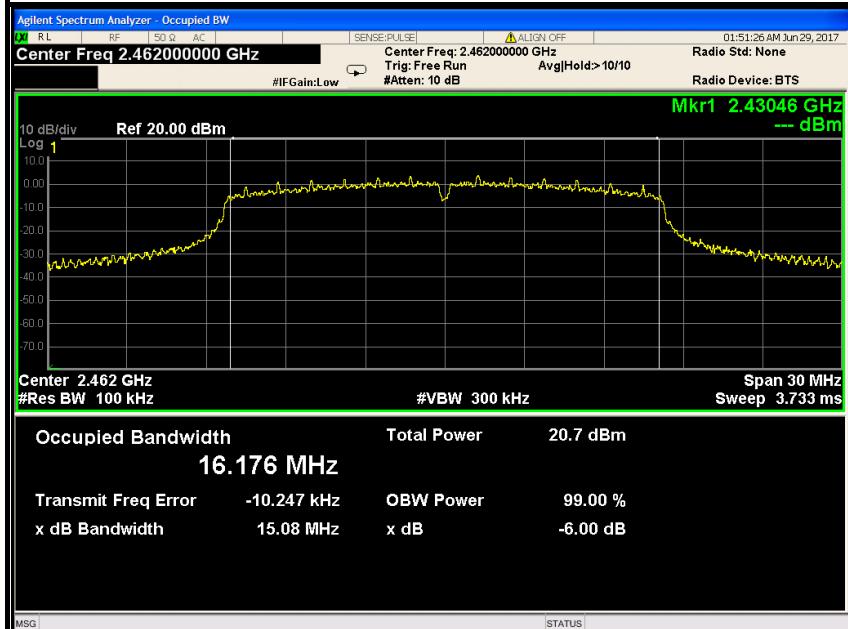
6dB Bandwidth (CH High)



**IEEE 802.11g mode (Antenna 0)****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

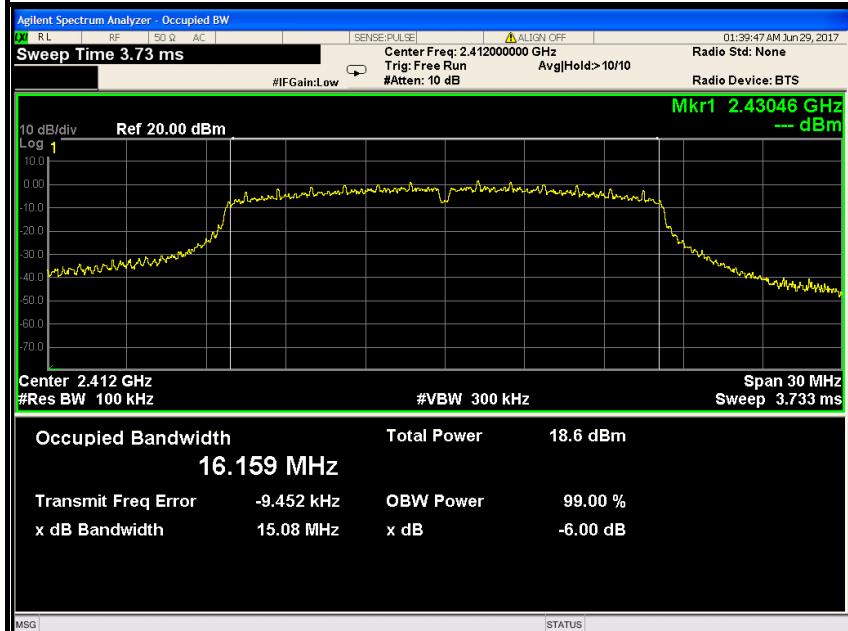


6dB Bandwidth (CH High)



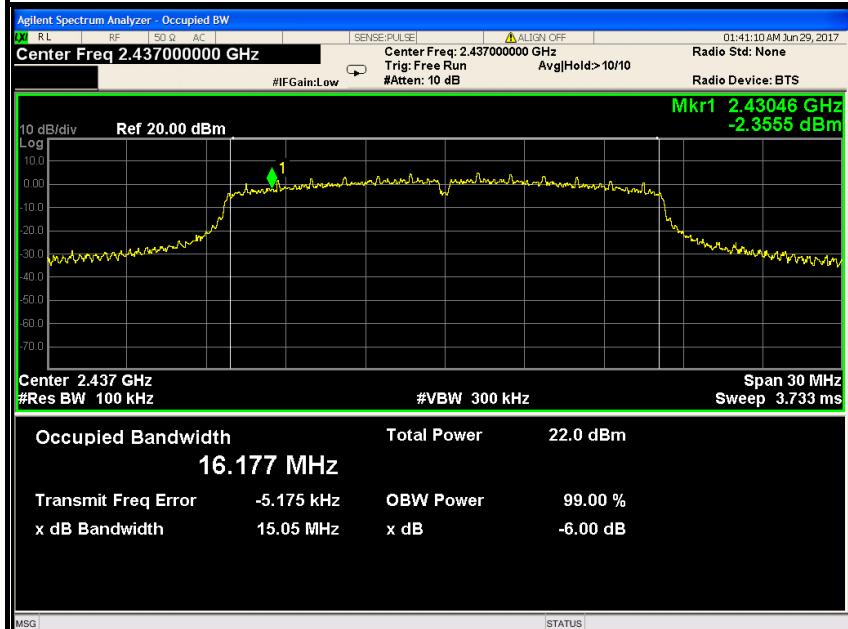
IEEE 802.11g mode (Antenna 1)

6dB Bandwidth (CH Low)

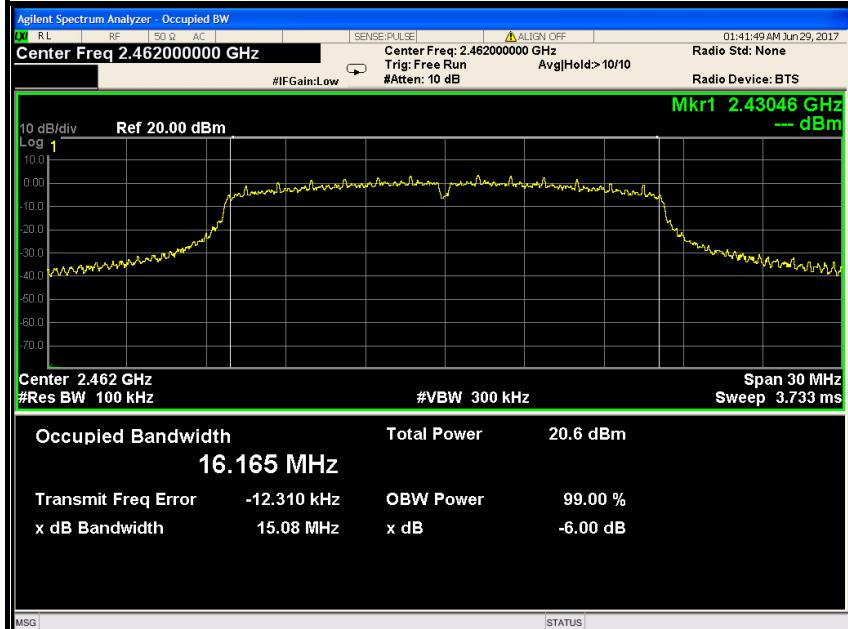


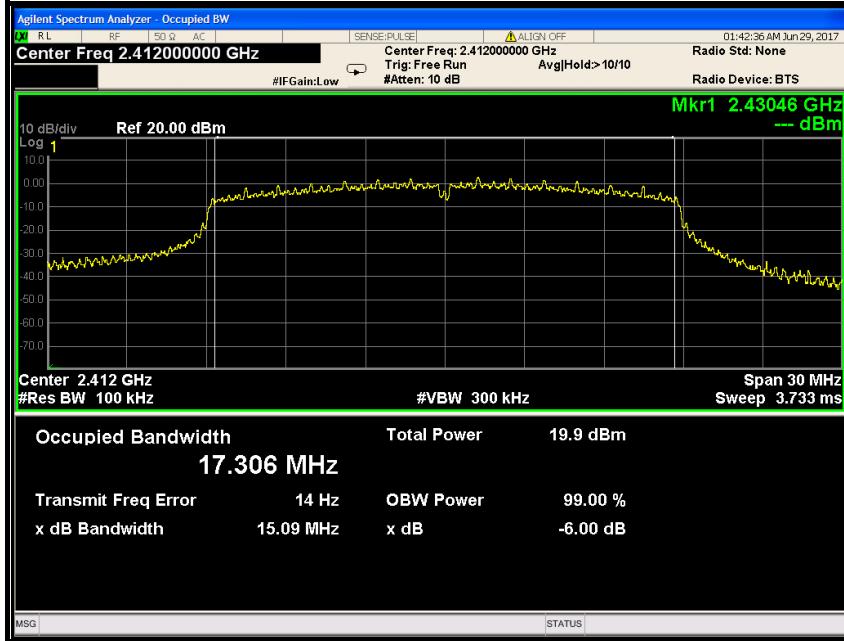
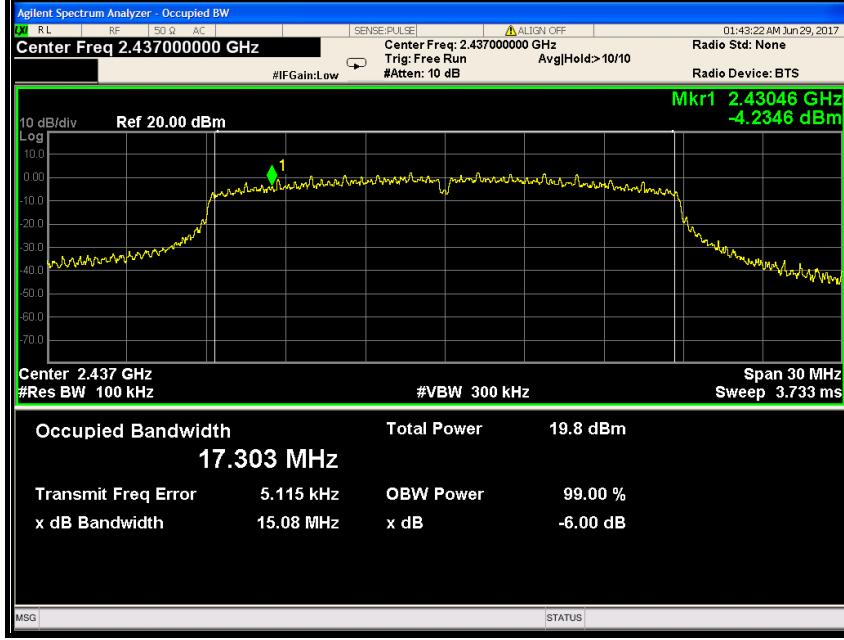


6dB Bandwidth (CH Mid)



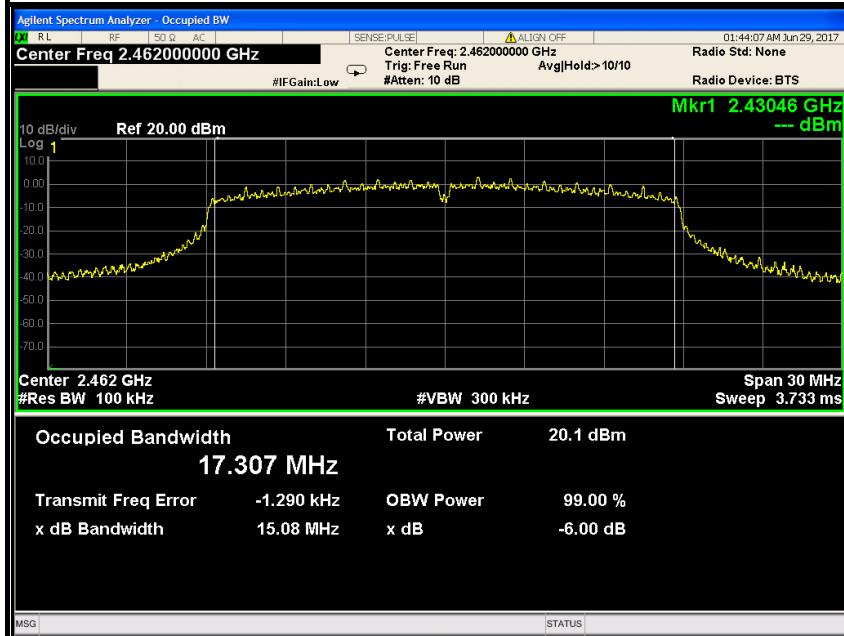
6dB Bandwidth (CH High)



**IEEE 802.11n HT20 MHz mode (Antenna 0)****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

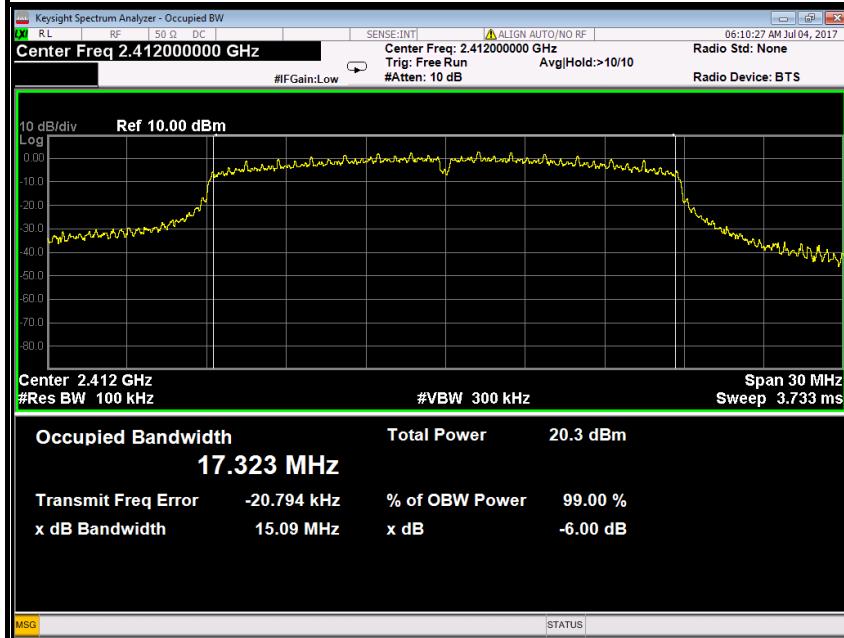


6dB Bandwidth (CH High)



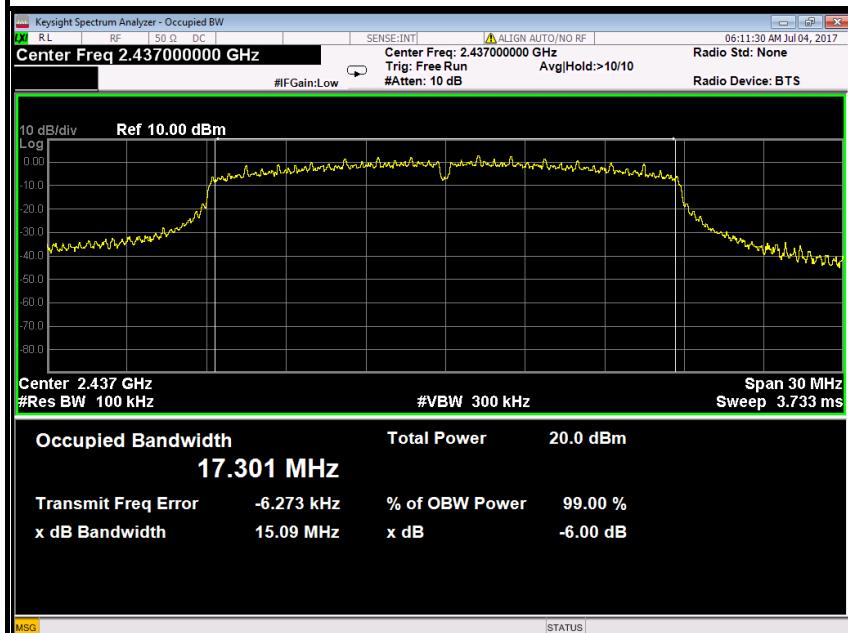
IEEE 802.11n HT20 MHz mode (Antenna 1)

6dB Bandwidth (CH Low)

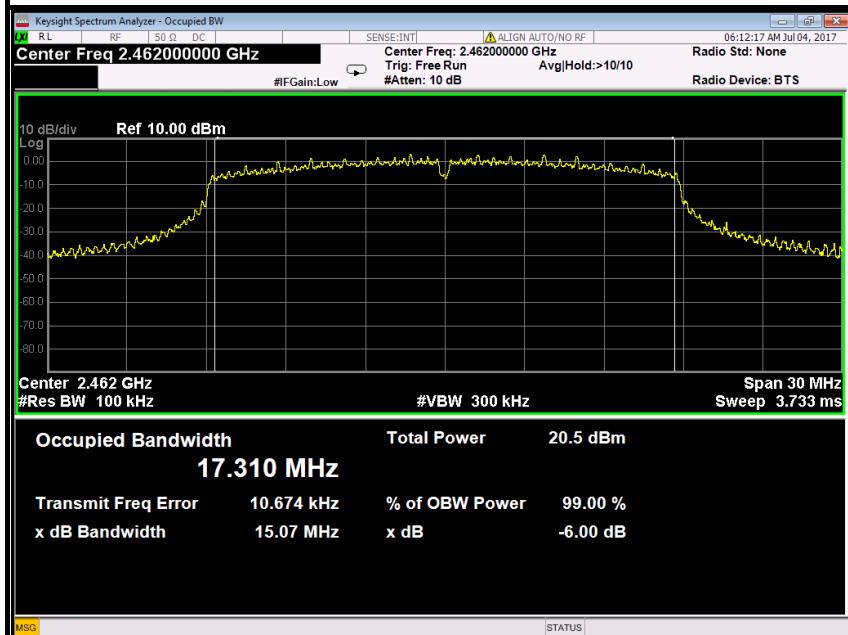


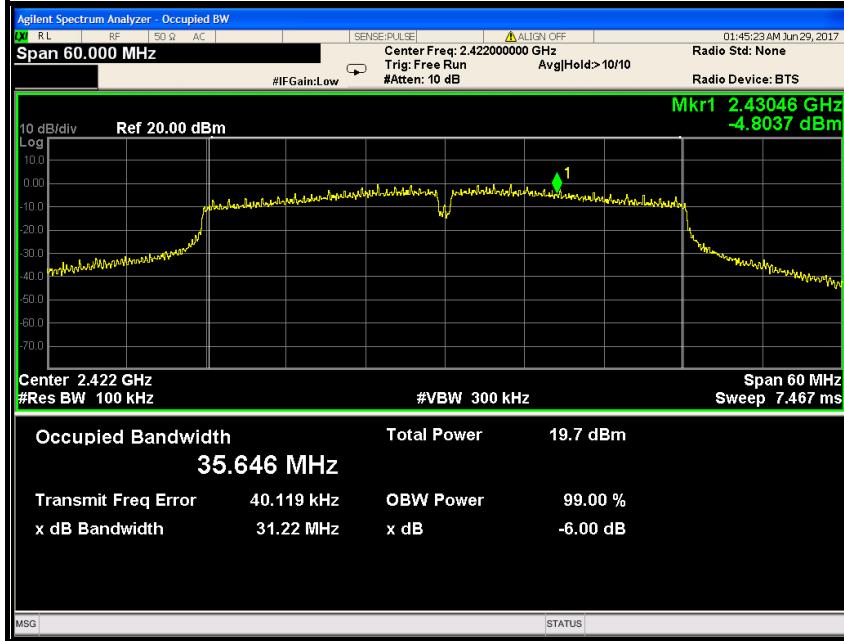
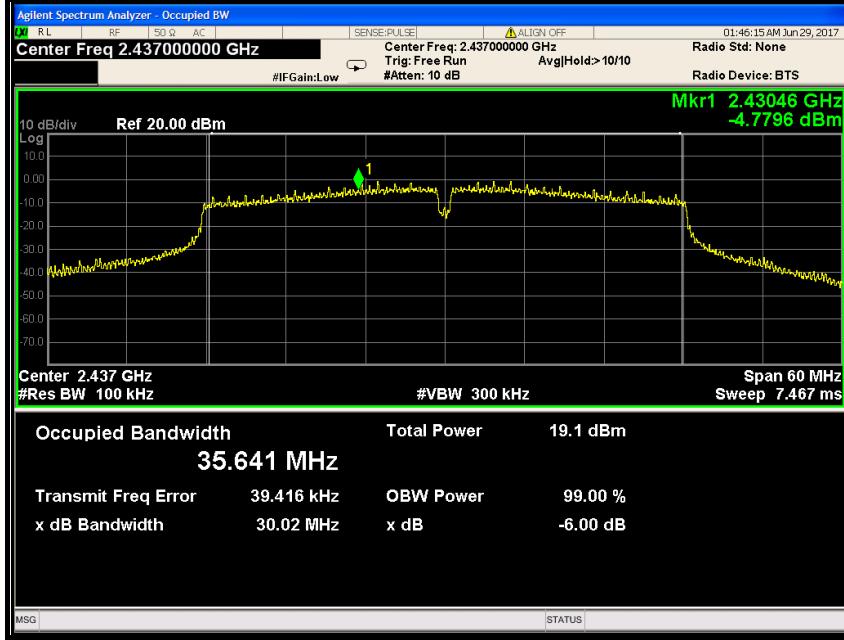


6dB Bandwidth (CH Mid)



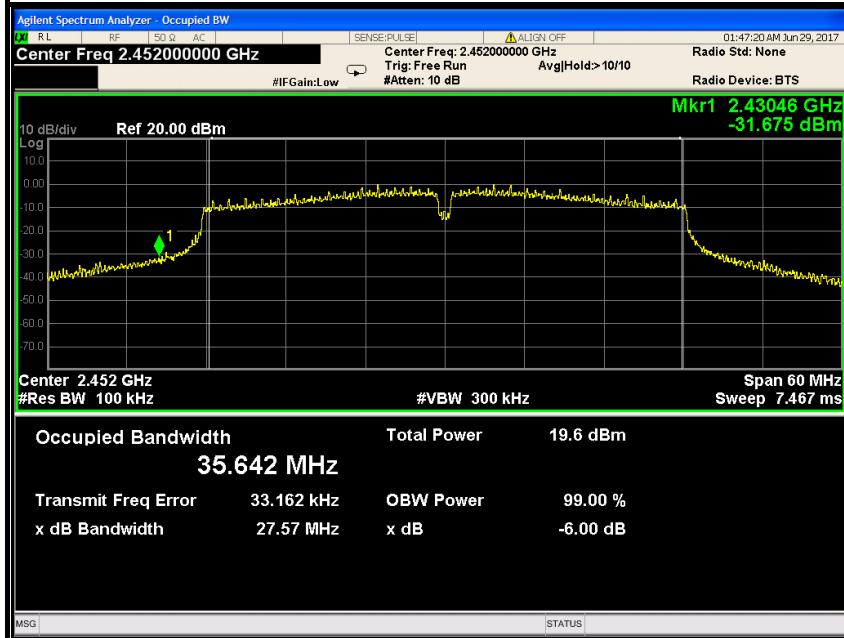
6dB Bandwidth (CH High)



**IEEE 802.11n HT40 MHz mode (Antenna 0)****6dB Bandwidth (CH Low)****6dB Bandwidth (CH Mid)**

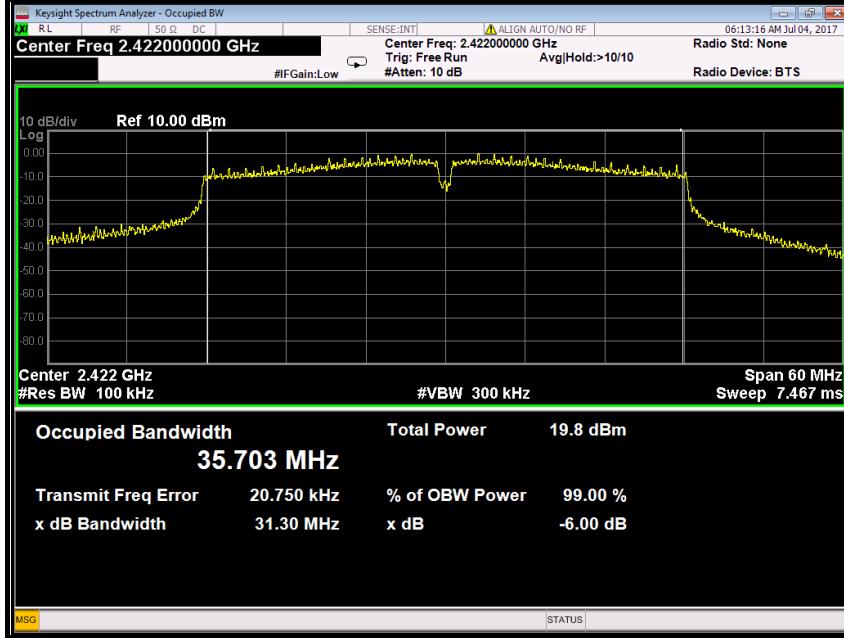


6dB Bandwidth (CH High)



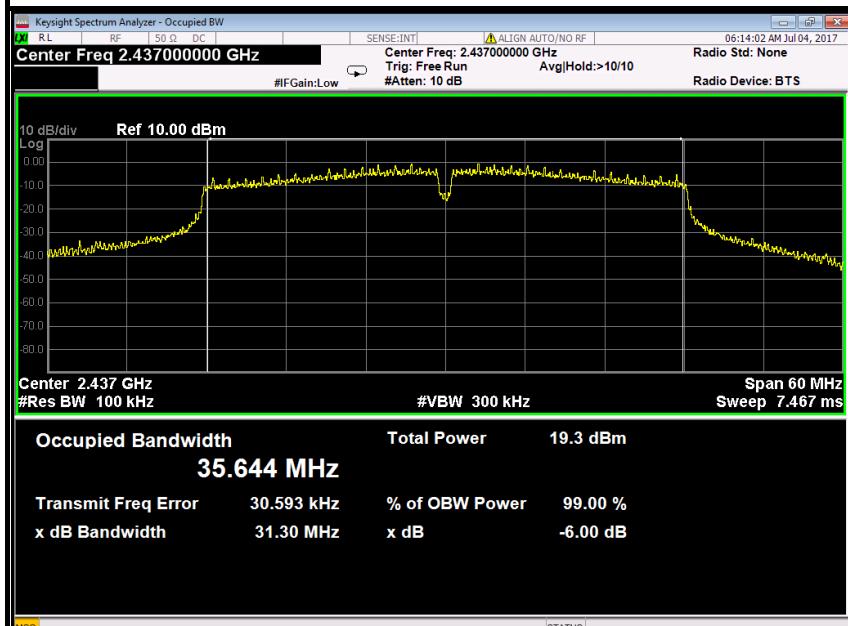
IEEE 802.11n HT40 MHz mode (Antenna 1)

6dB Bandwidth (CH Low)

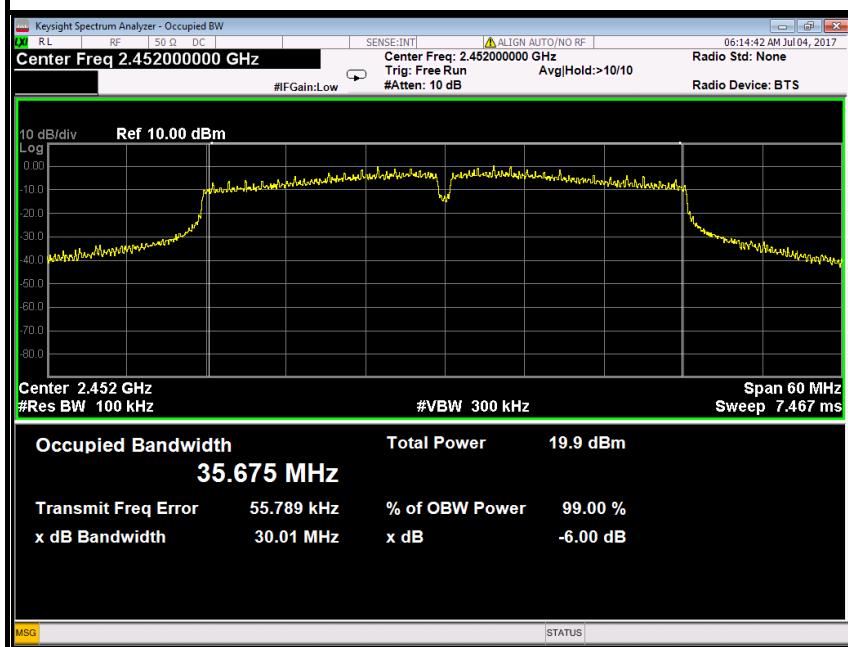




6dB Bandwidth (CH Mid)



6dB Bandwidth (CH High)





7.4. ANTENNA GAIN

MEASUREMENT

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For normal WLAN devices, the DSSS mode is used.

MEASUREMENT PARAMETERS

Measurement parameter	
Detector	Peak
Sweep time	Auto
Resolution bandwidth	3 MHz
Video bandwidth	3 MHz
Trace-Mode	Max hold

LIMITS

FCC	IC
Antenna Gain	
6 dBi	



TEST RESULTS

Antenna 0

T _{nom}	V _{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		6.82	7.18	7.10
Radiated power [dBm/MHz] Measured with DSSS modulation		9.14	9.87	9.93
Gain [dBi] Calculated		2.32	2.69	2.83
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)			

Antenna 1

T _{nom}	V _{nom}	Lowest channel 2412MHz	Middle channel 2437MHz	Highest channel 2462MHz
Conducted power [dBm/MHz] Measured with DSSS modulation		8.61	8.34	8.34
Radiated power [dBm/MHz] Measured with DSSS modulation		10.34	10.28	10.57
Gain [dBi] Calculated		1.73	1.94	2.24
Measurement uncertainty	± 1.5 dB (cond.) / ± 3 dB (rad.)			



7.5. PEAK OUTPUT POWER

7.5.1. LIMITS

The maximum peak output power of the intentional radiator shall not exceed the following:

1. According to §15.247(b)(3), for systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 Watt.
2. According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

7.5.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Power Meter	Anritsu	ML2495A	1204003	02/21/2017	02/20/2018
Power Sensor	Anritsu	MA2411B	1126150	02/21/2017	02/20/2018

7.5.3. TEST PROCEDURES (please refer to measurement standard)

9.1.1 RBW \geq DTS bandwidth

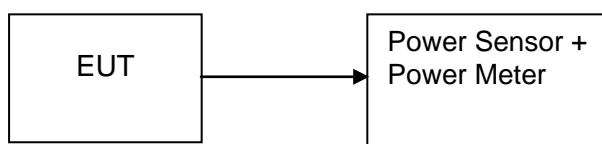
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the *DTS bandwidth*.

- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW \geq 3 RBW.
- c) Set span \geq 3 x RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

9.1.2 PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

7.5.4. TEST SETUP





7.5.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b (Antenna 0)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	17.42	0.05521	Peak	1	PASS
Mid	2437	17.79	0.06012			PASS
High	2462	17.74	0.05943			PASS
Low	2412	14.59	0.02877	AVG	1	PASS
Mid	2437	15.02	0.03177			PASS
High	2462	15.08	0.03221			PASS

Test mode: IEEE 802.11b (Antenna 1)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	19.02	0.07980	Peak	1	PASS
Mid	2437	18.75	0.07499			PASS
High	2462	18.86	0.07691			PASS
Low	2412	16.24	0.04207	AVG	1	PASS
Mid	2437	16.07	0.04046			PASS
High	2462	16.06	0.04036			PASS

Test mode: IEEE 802.11g (Antenna 0)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	21.12	0.12942	Peak	1	PASS
Mid	2437	21.11	0.12912			PASS
High	2462	21.12	0.12942			PASS
Low	2412	15.98	0.03963	AVG	1	PASS
Mid	2437	15.93	0.03917			PASS
High	2462	15.96	0.03945			PASS



Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Peak / AVG	Limit (W)	Result
Low	2412	21.10	0.12882	Peak	1	PASS
Mid	2437	21.14	0.13002			PASS
High	2462	21.12	0.12942			PASS
Low	2412	15.88	0.03873	AVG	1	PASS
Mid	2437	16.71	0.04688			PASS
High	2462	15.56	0.03597			PASS

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

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2412	20.83	21.09	23.97	0.24959	Peak	1	PASS
Mid	2437	20.97	21.08	24.04	0.25326			PASS
High	2462	20.73	21.23	24.00	0.25104			PASS
Low	2412	13.32	13.48	16.41	0.04376	AVG	1	PASS
Mid	2437	12.99	13.59	16.31	0.04276			PASS
High	2462	13.16	13.64	16.42	0.04382			PASS

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

Channel	Frequency (MHz)	Output Power (dBm)			Output Power (W)	Peak / AVG	Limit (W)	Result
		Antenna 0	Antenna 1	Total				
Low	2422	20.75	20.89	23.83	0.24159	Peak	1	PASS
Mid	2437	20.52	20.76	23.65	0.23184			PASS
High	2452	20.59	20.88	23.75	0.23701			PASS
Low	2422	13.69	13.52	16.62	0.04588	AVG	1	PASS
Mid	2437	13.25	13.48	16.38	0.04342			PASS
High	2452	13.18	13.34	16.27	0.04237			PASS



7.6. BAND EDGES MEASUREMENT

7.6.1. 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)).

7.6.2. 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	N9010A	MY52221469	02/21/2017	02/20/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018
Amplifier	EMEC	EM330	060661	03/18/2017	03/17/2018
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2017	02/20/2018
Loop Antenna	COM-POWER	AL-130	121044	09/25/2016	09/24/2017
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/27/2018	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/27/2018	02/27/2018
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2017	02/20/2018
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

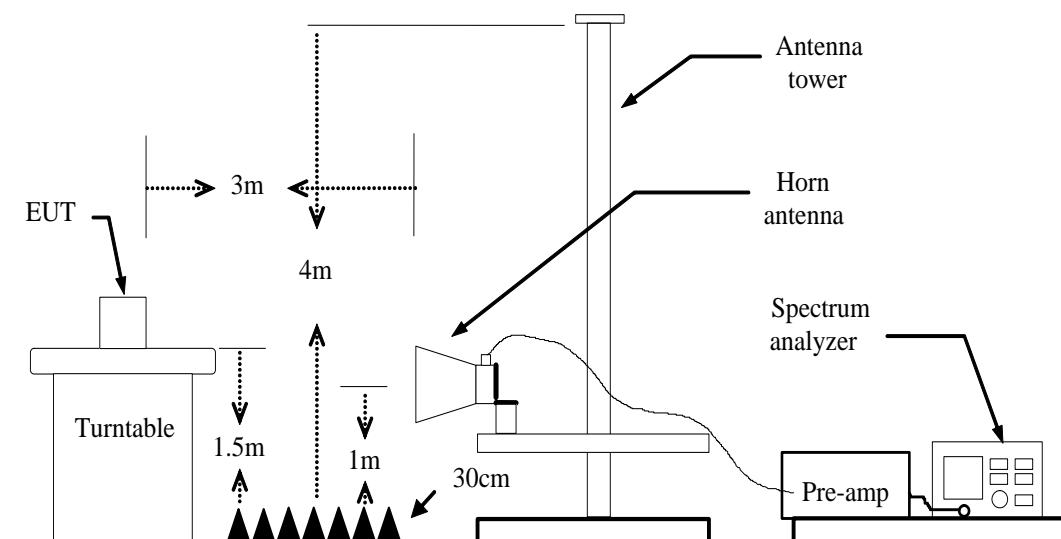
- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The FCC Site Registration number is 101879.
3. N.C.R = No Calibration Required.



7.6.3. TEST PROCEDURES (please refer to measurement standard)

1. The EUT is placed on a turntable, which is 1.5m 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=1MHz / VBW=3MHz / Sweep=AUTO
 - (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO / Detector=PEAK
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are

7.6.4. TEST SETUP



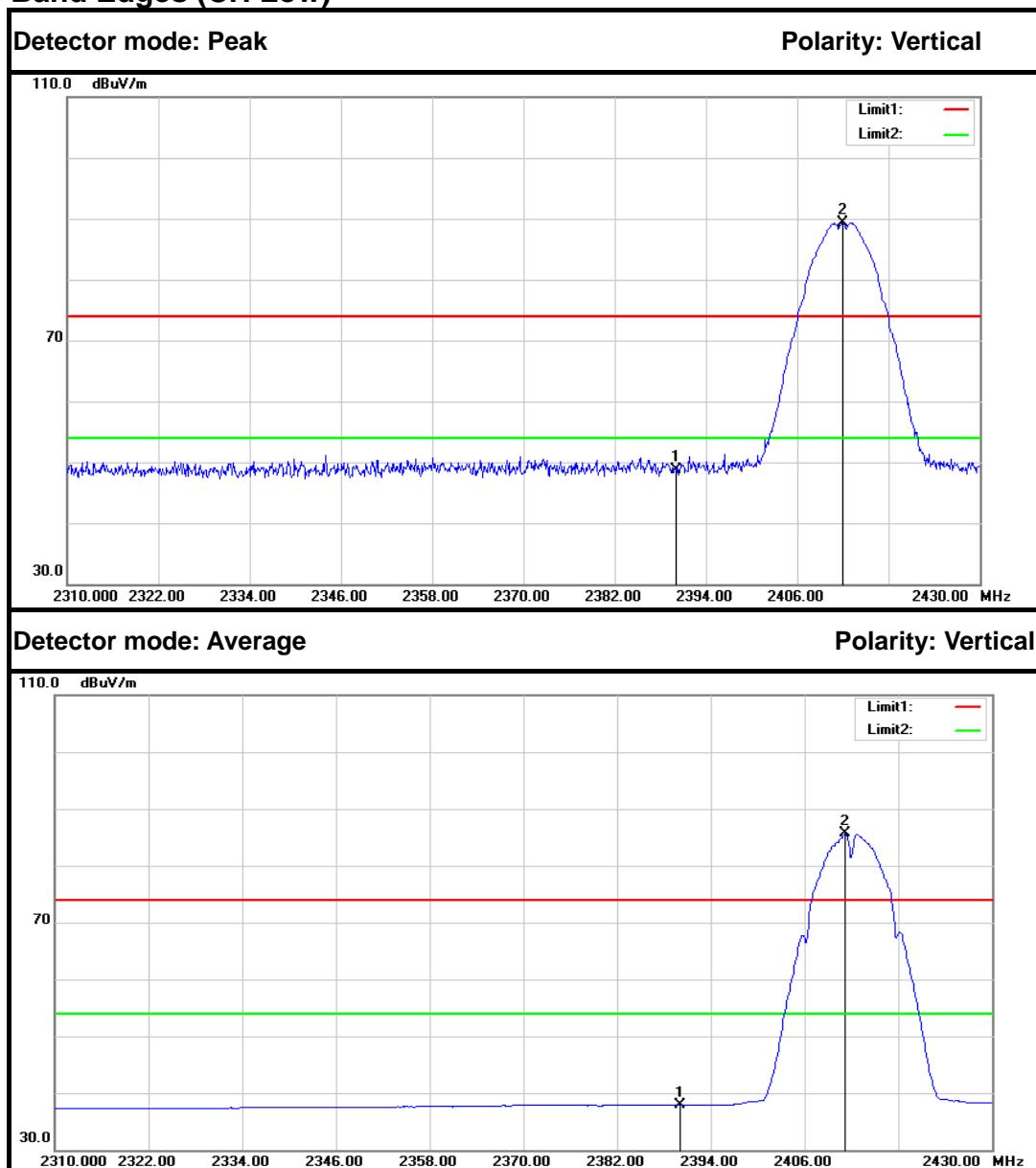


7.6.5. TEST RESULTS

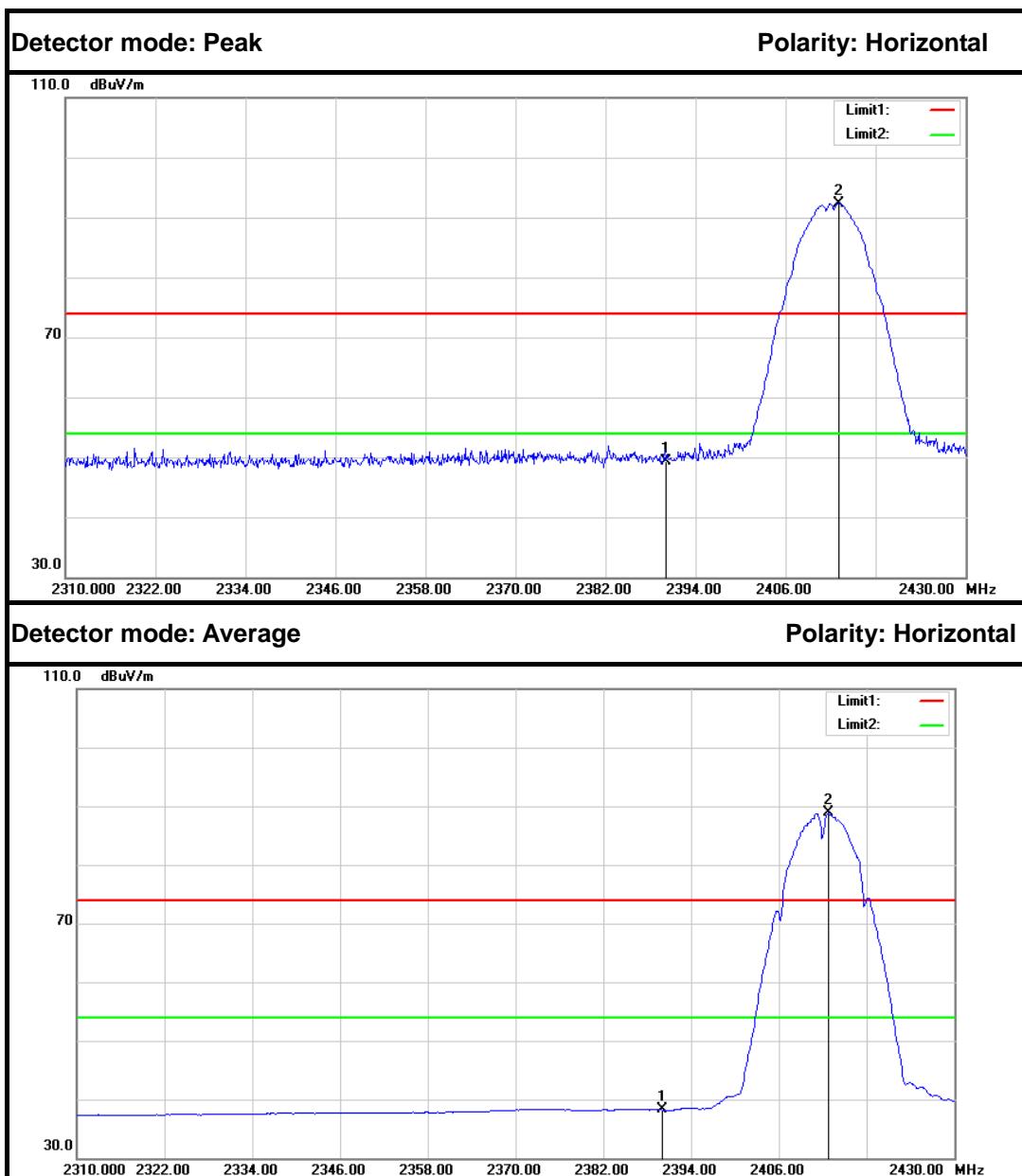
Test Plot

IEEE 802.11b mode (Antenna 0)

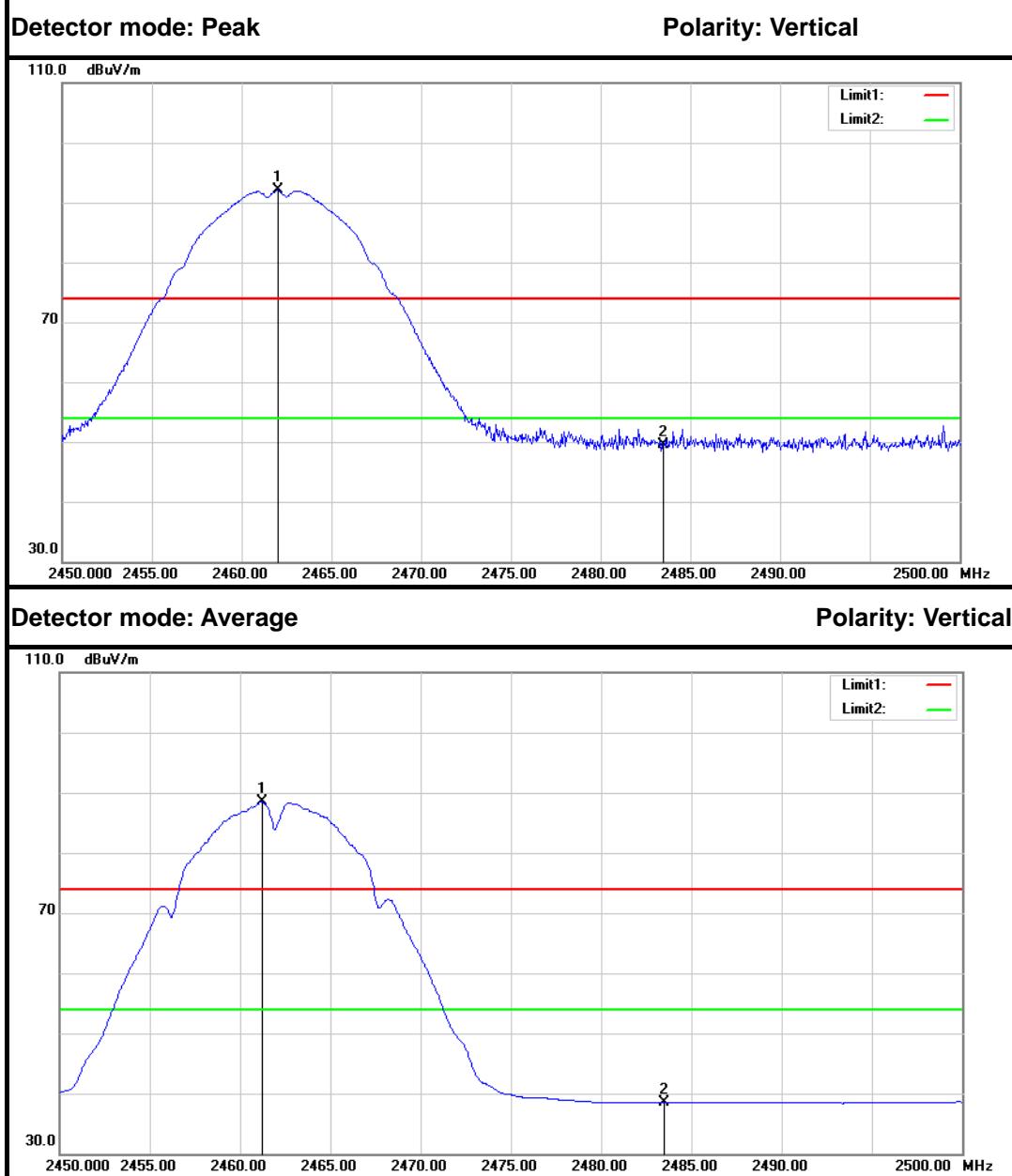
Band Edges (CH Low)



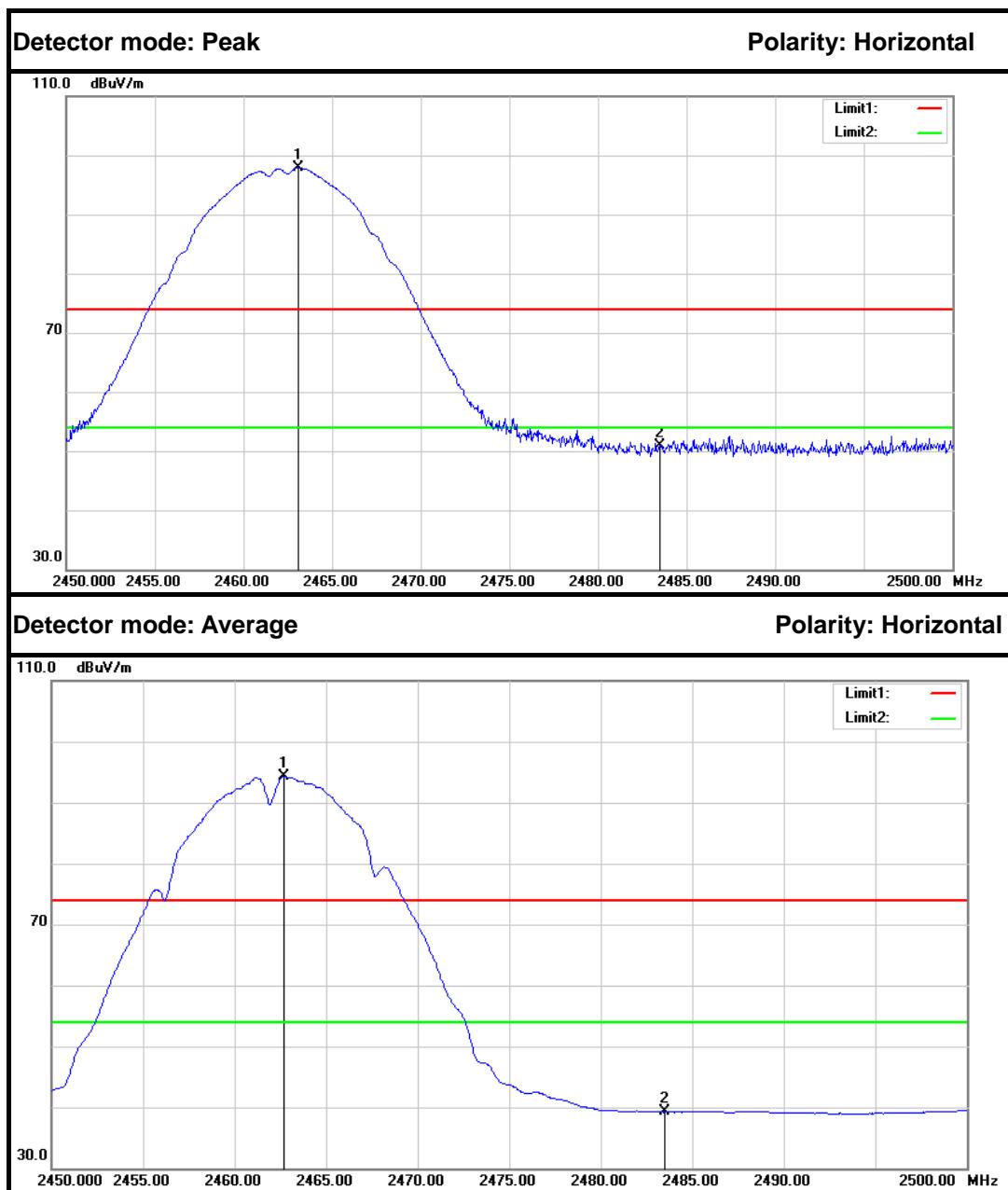
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	40.71	-2.86	37.85	54.00	-16.15	Peak	Vertical
2	2411.160	88.43	-2.75	85.68	---	---	Peak	Vertical
1	2390.000	51.64	-2.86	48.78	74.00	-25.22	Average	Vertical
2	2412.000	92.10	-2.74	89.36	---	---	Average	Vertical



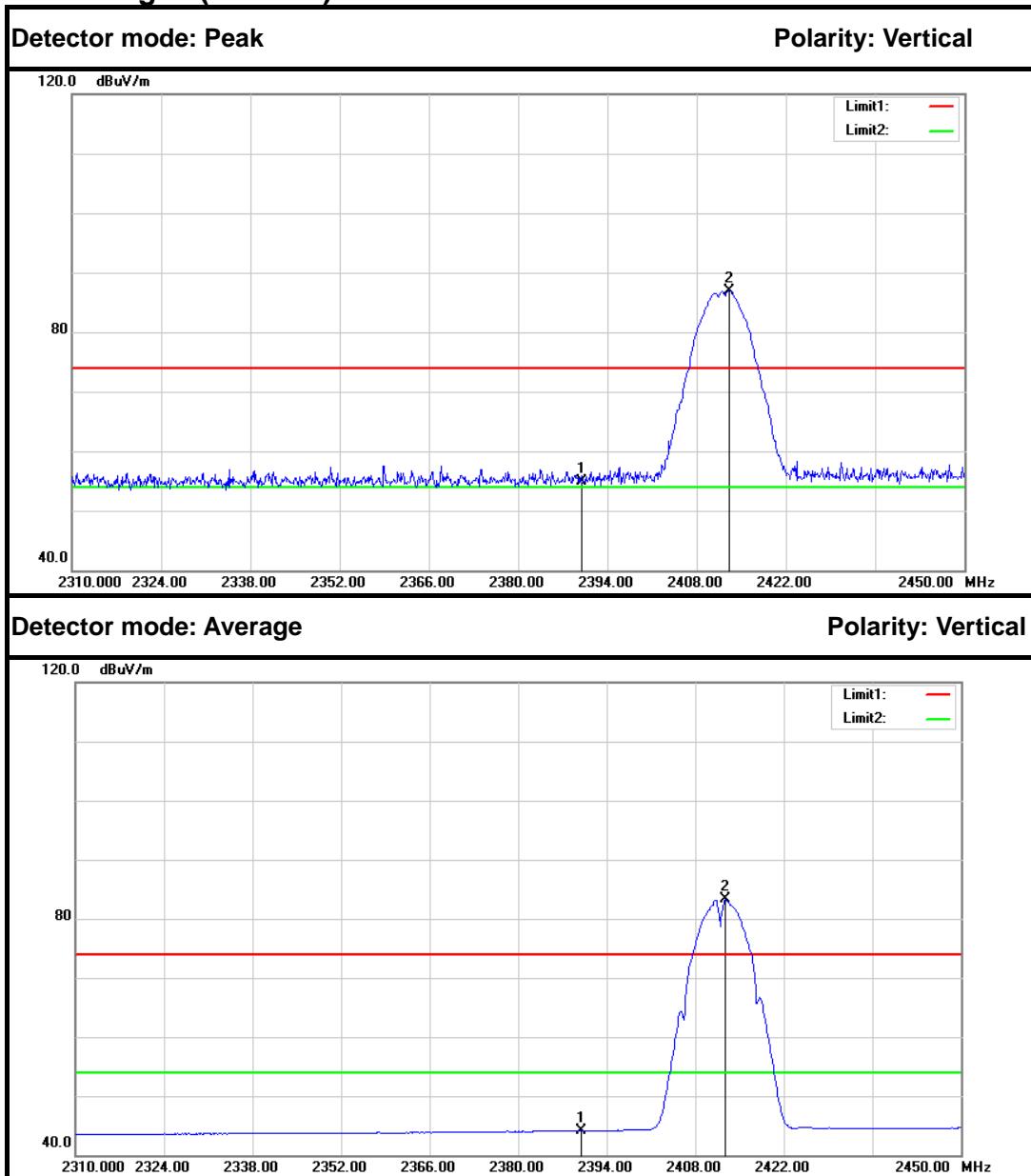
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	52.26	-2.86	49.40	74.00	-24.60	Peak	Horizontal
2	2413.080	95.14	-2.74	92.40	---	---	Peak	Horizontal
1	2390.000	41.06	-2.86	38.20	54.00	-15.80	Average	Horizontal
2	2412.720	91.55	-2.74	88.81	---	---	Average	Horizontal

**Band Edges (CH High)**

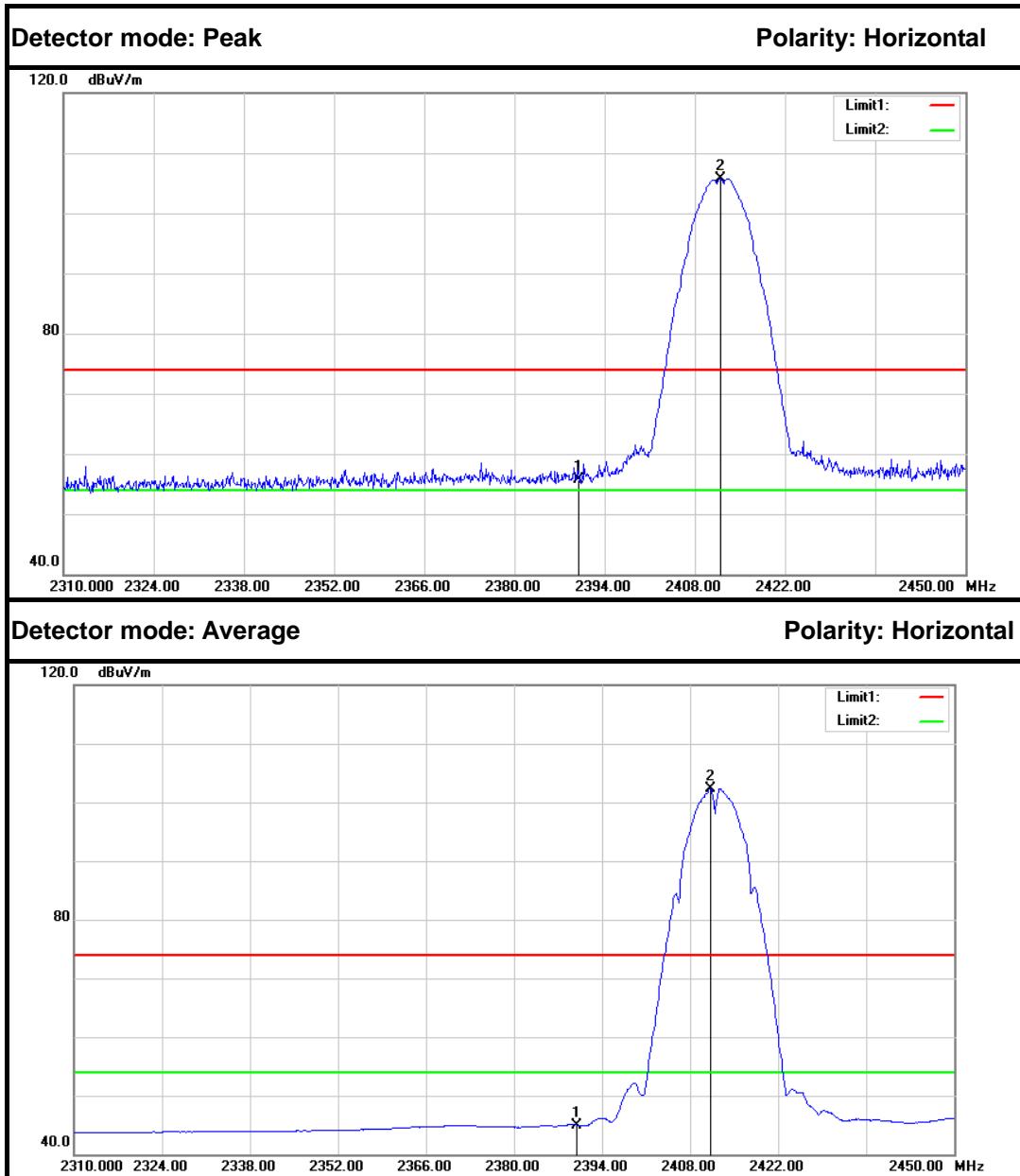
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.050	94.49	-2.47	92.02	----	---	Peak	Vertical
2	2483.500	51.79	-2.35	49.44	74.00	-24.56	Peak	Vertical
1	2461.250	90.96	-2.47	88.49	----	---	Average	Vertical
2	2483.500	40.83	-2.35	38.48	54.00	-15.52	Average	Vertical



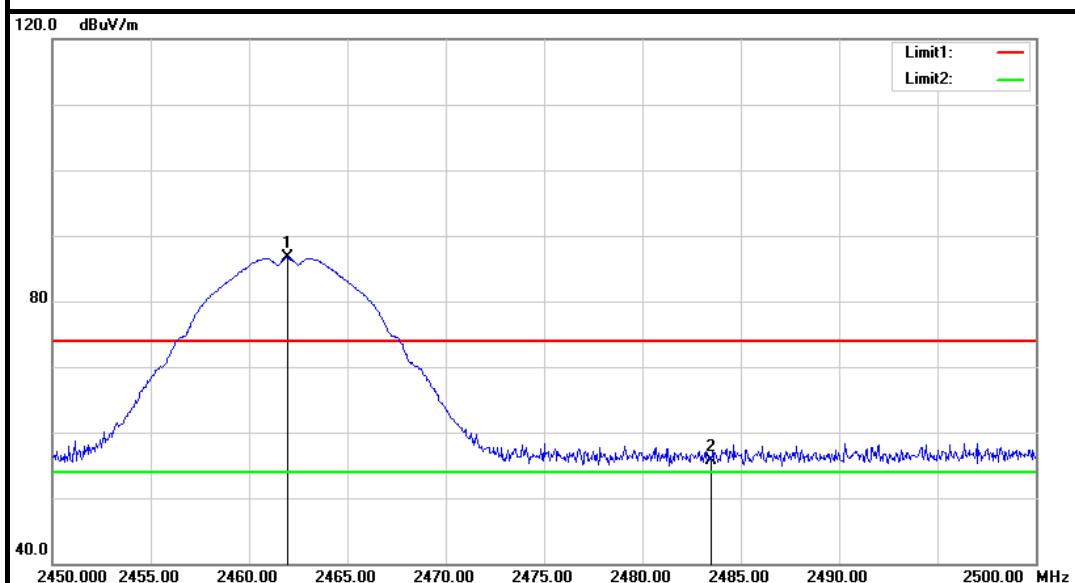
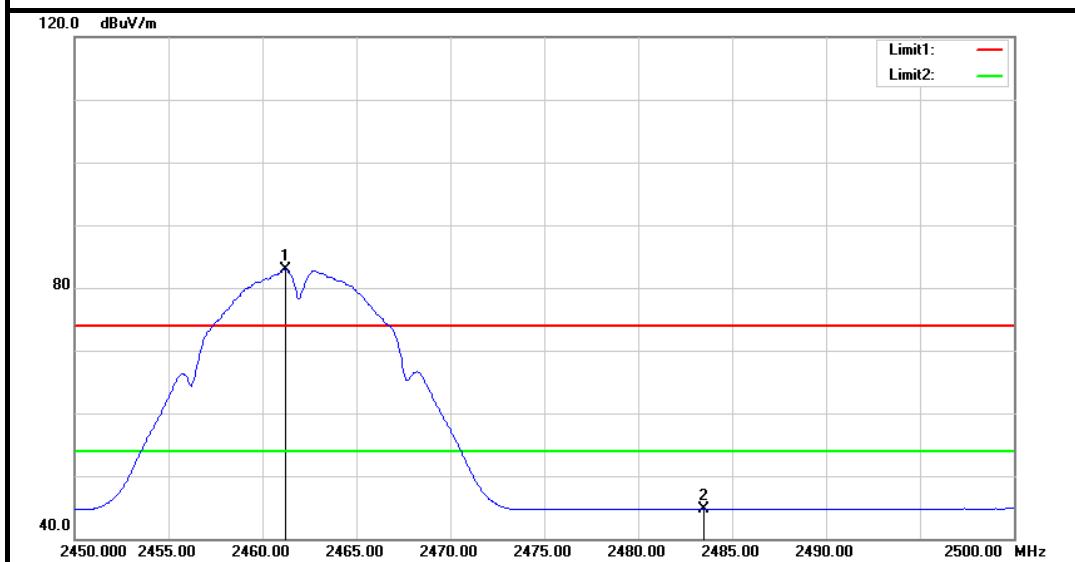
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2463.100	100.36	-2.46	97.90	----	---	Peak	Horizontal
2	2483.500	53.28	-2.35	50.93	74.00	-23.07	Peak	Horizontal
1	2462.700	96.83	-2.46	94.37	----	---	Average	Horizontal
2	2483.500	41.57	-2.35	39.22	54.00	-14.78	Average	Horizontal

**IEEE 802.11b mode (Antenna 1)
Band Edges (CH Low)**

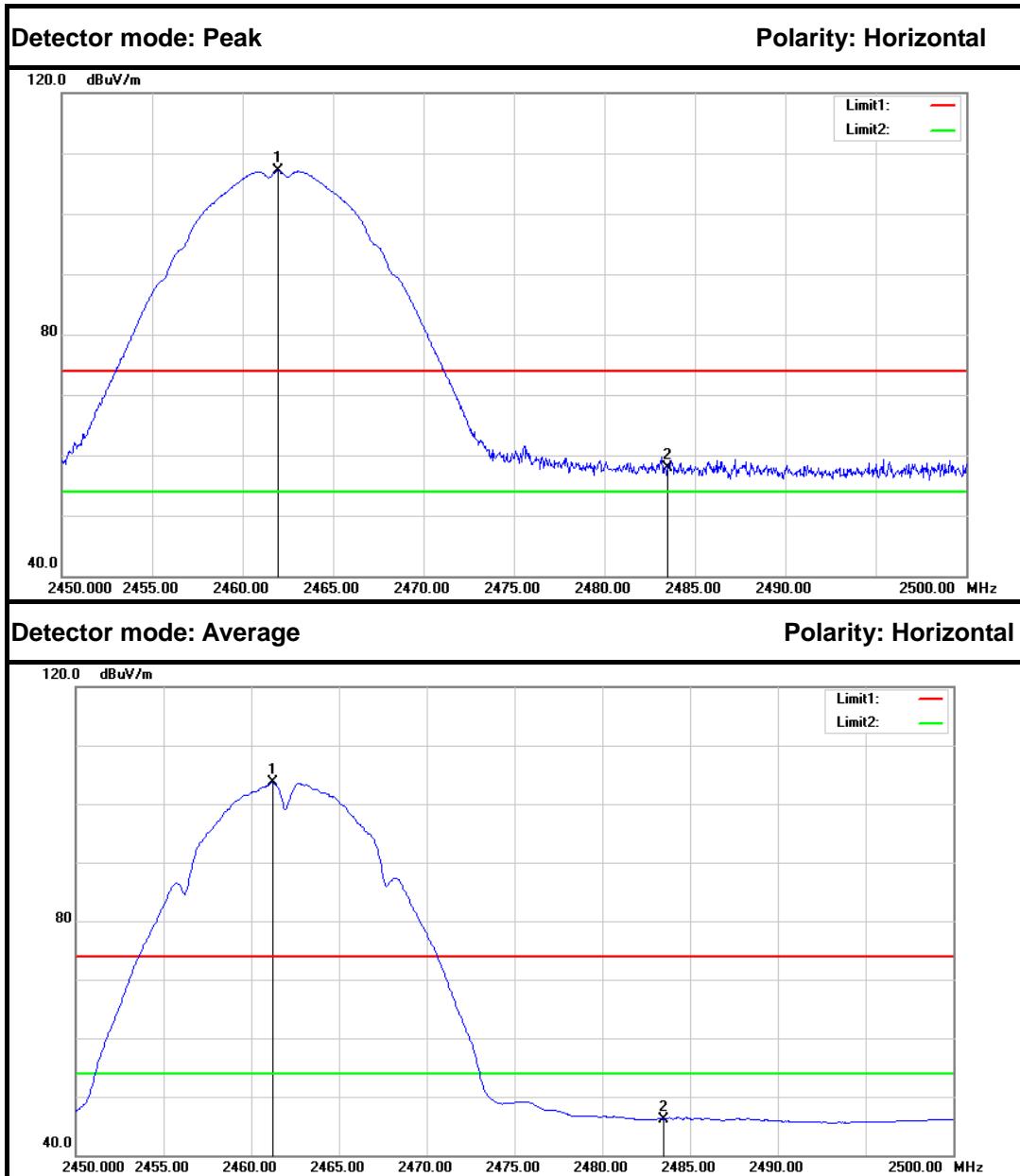
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	57.80	-2.86	54.94	74.00	-19.06	Peak	Vertical
2	2413.040	89.70	-2.74	86.96	---	---	Peak	Vertical
1	2390.000	46.97	-2.86	44.11	54.00	-9.89	Average	Vertical
2	2412.760	86.01	-2.74	83.27	---	---	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	58.53	-2.86	55.67	74.00	-18.33	Peak	Horizontal
2	2411.920	108.53	-2.74	105.79	---	---	Peak	Horizontal
1	2390.000	47.77	-2.86	44.91	54.00	-9.09	Average	Horizontal
2	2411.220	105.12	-2.75	102.37	---	---	Average	Horizontal

**Band Edges (CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

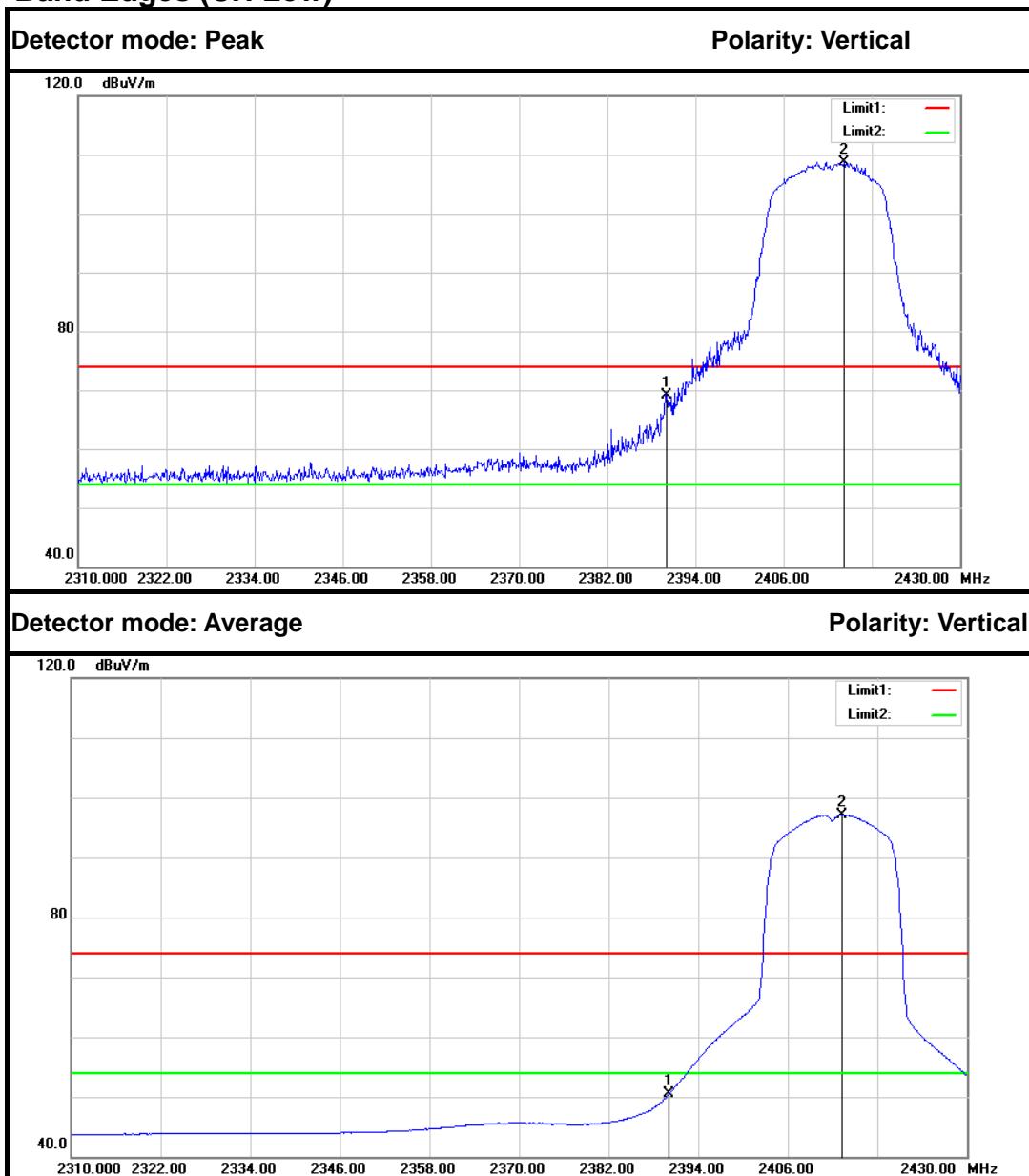
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.950	89.14	-2.47	86.67	---	---	Peak	Vertical
2	2483.500	58.02	-2.35	55.67	74.00	-18.33	Peak	Vertical
1	2461.250	85.36	-2.47	82.89	---	---	Average	Vertical
2	2483.500	47.01	-2.35	44.66	54.00	-9.34	Average	Vertical



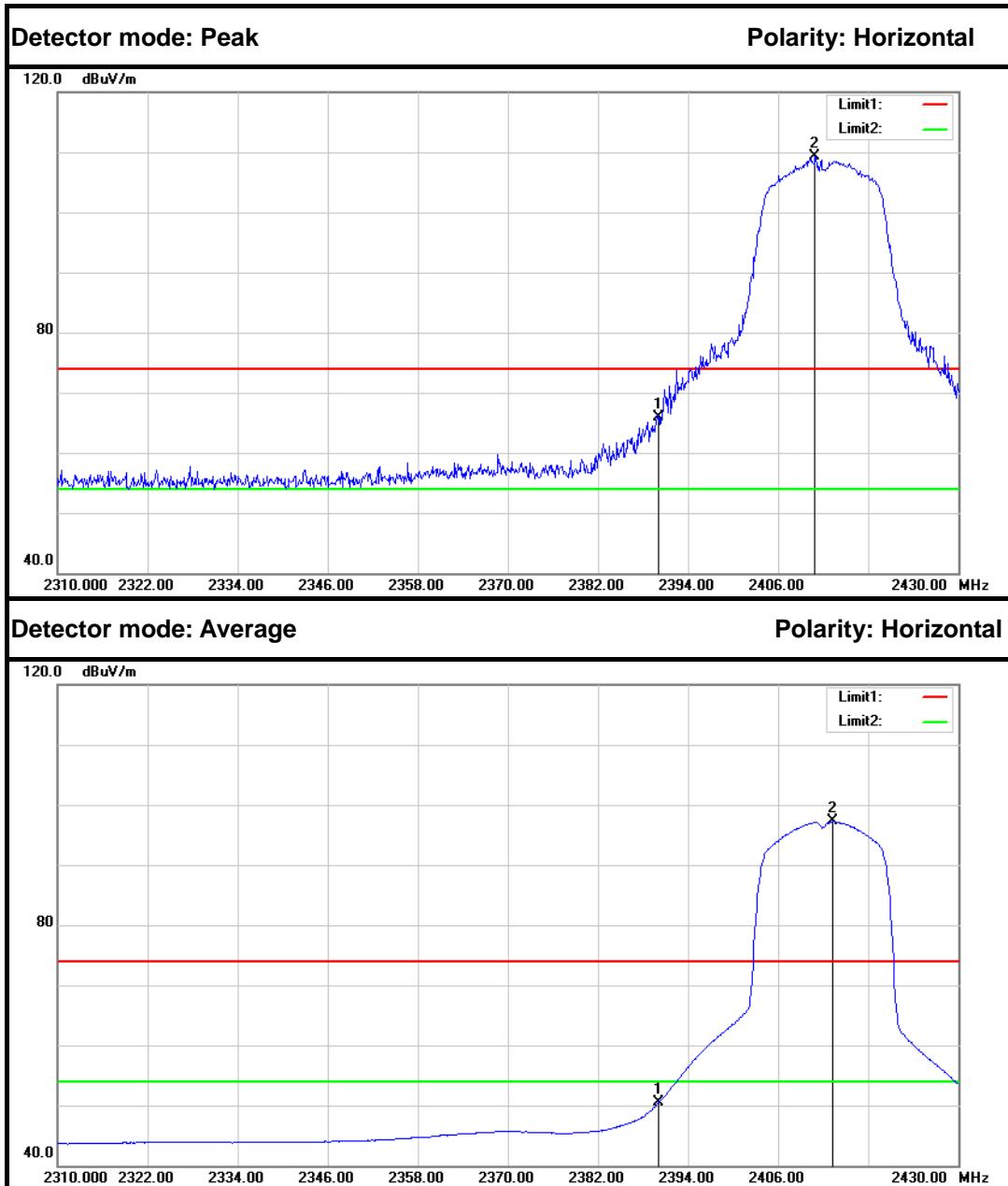
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2461.950	109.50	-2.47	107.03	---	---	Peak	Horizontal
2	2483.500	60.26	-2.35	57.91	74.00	-16.09	Peak	Horizontal
1	2461.250	106.15	-2.47	103.68	---	---	Average	Horizontal
2	2483.500	48.45	-2.35	46.10	54.00	-7.90	Average	Horizontal



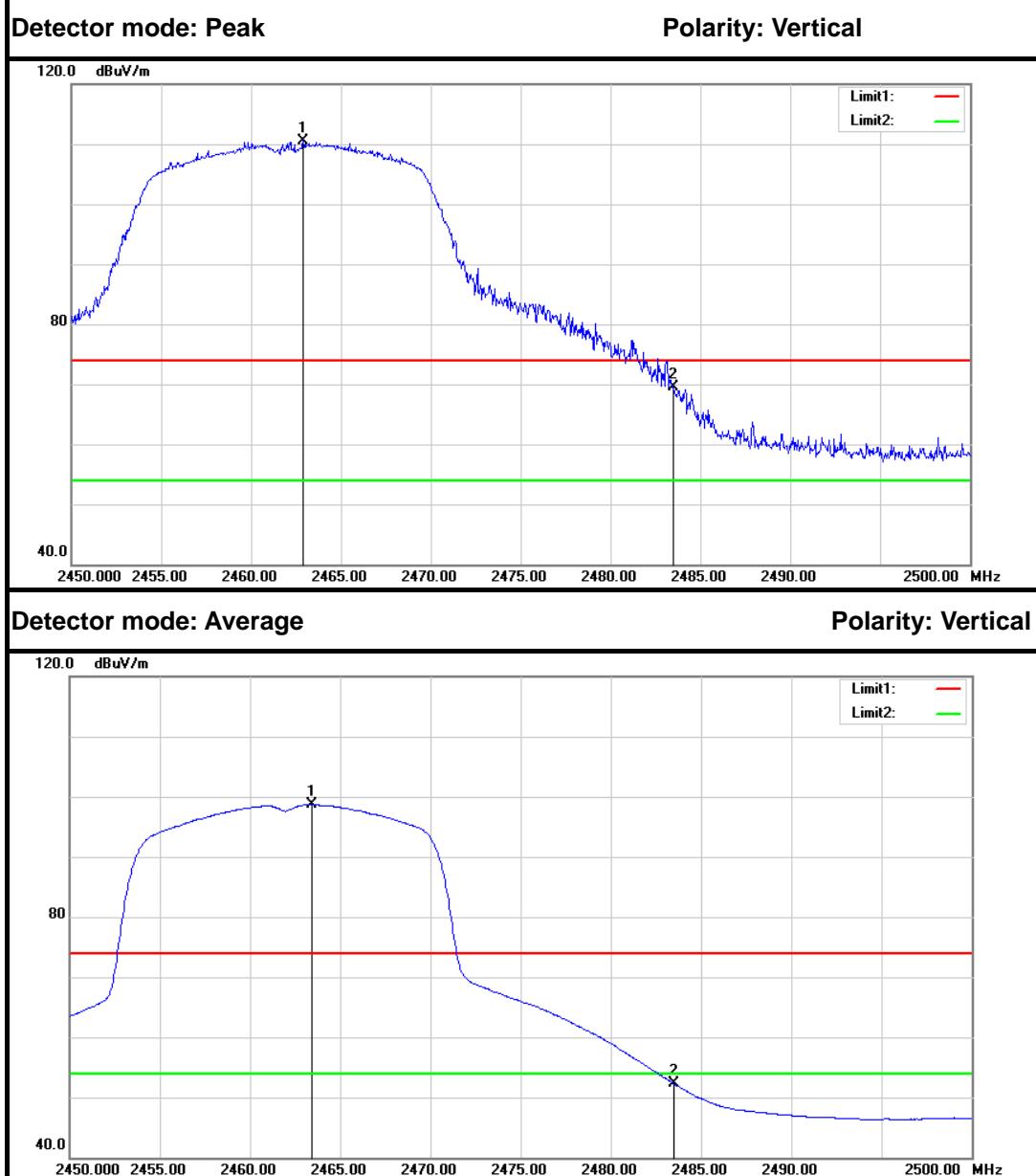
**IEEE 802.11g mode (Antenna 0)
Band Edges (CH Low)**



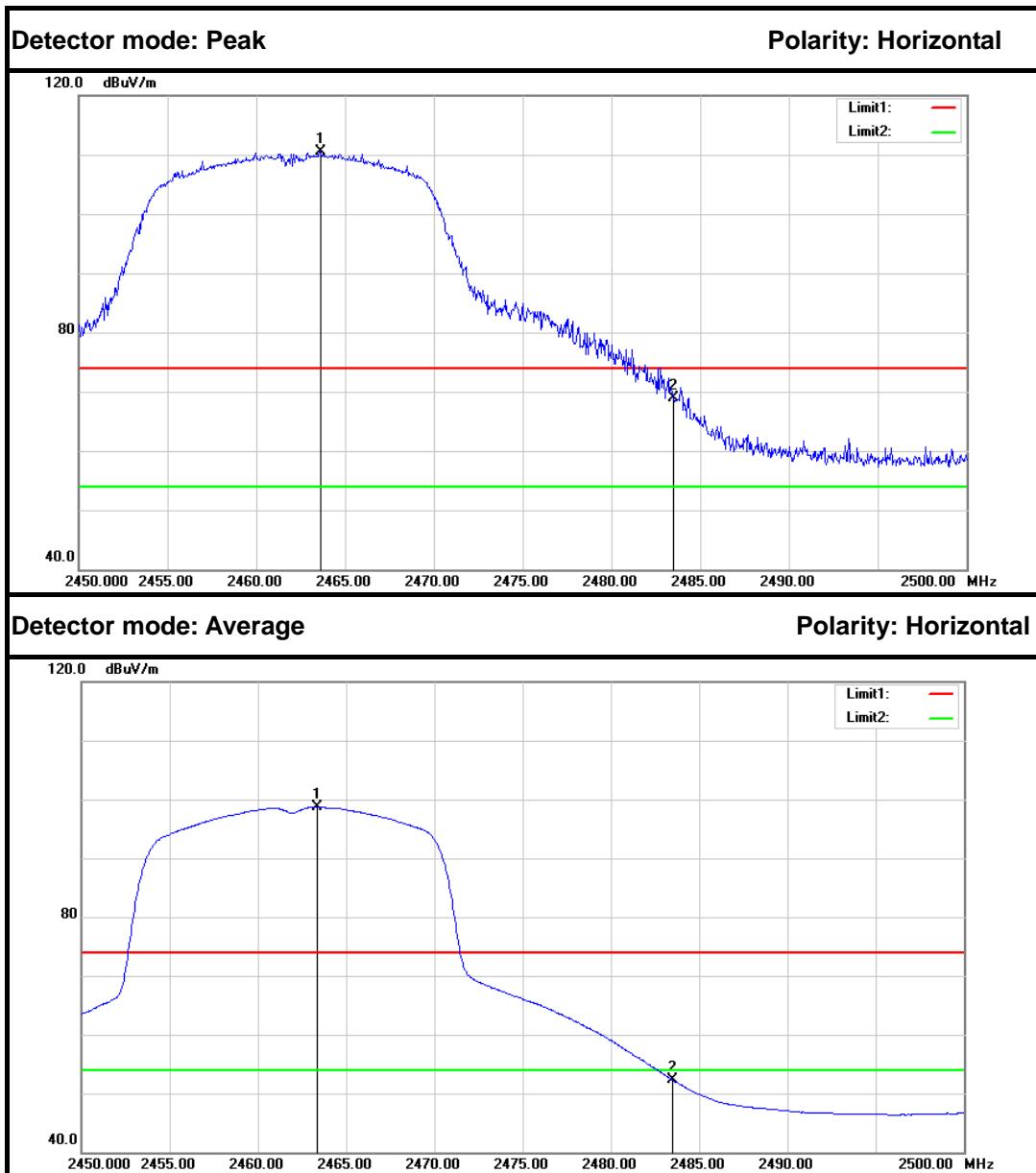
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	71.91	-2.86	69.05	74.00	-4.95	Peak	Vertical
2	2414.280	111.53	-2.73	108.80	---	---	Peak	Vertical
1	2390.000	53.29	-2.86	50.43	54.00	-3.57	Average	Vertical
2	2413.200	99.93	-2.74	97.19	---	---	Average	Vertical



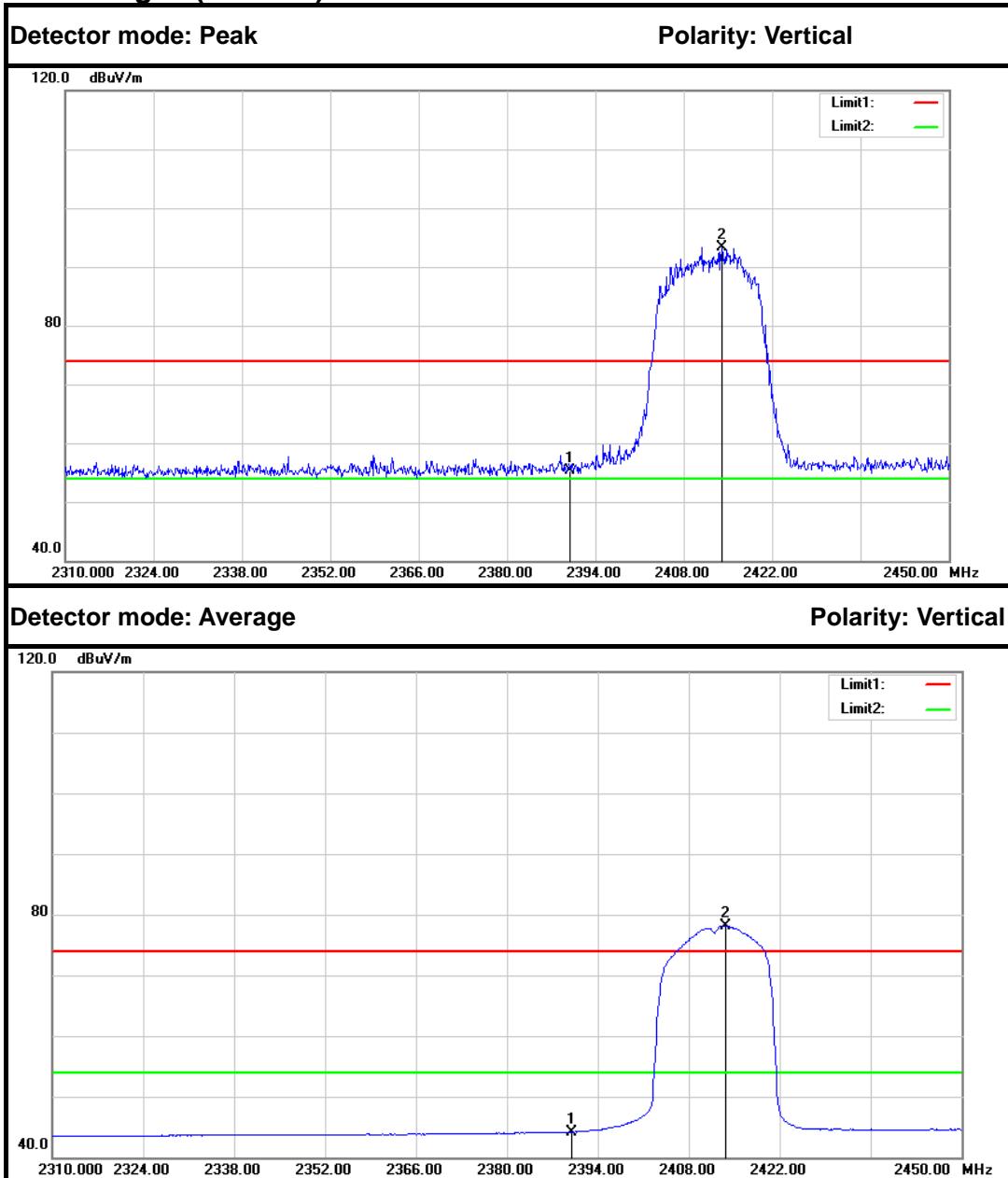
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	68.85	-2.86	65.99	74.00	-8.01	Peak	Horizontal
2	2410.920	112.03	-2.75	109.28	---	---	Peak	Horizontal
1	2390.000	53.33	-2.86	50.47	54.00	-3.53	Average	Horizontal
2	2413.320	99.96	-2.73	97.23	---	---	Average	Horizontal

**Band Edges (CH High)**

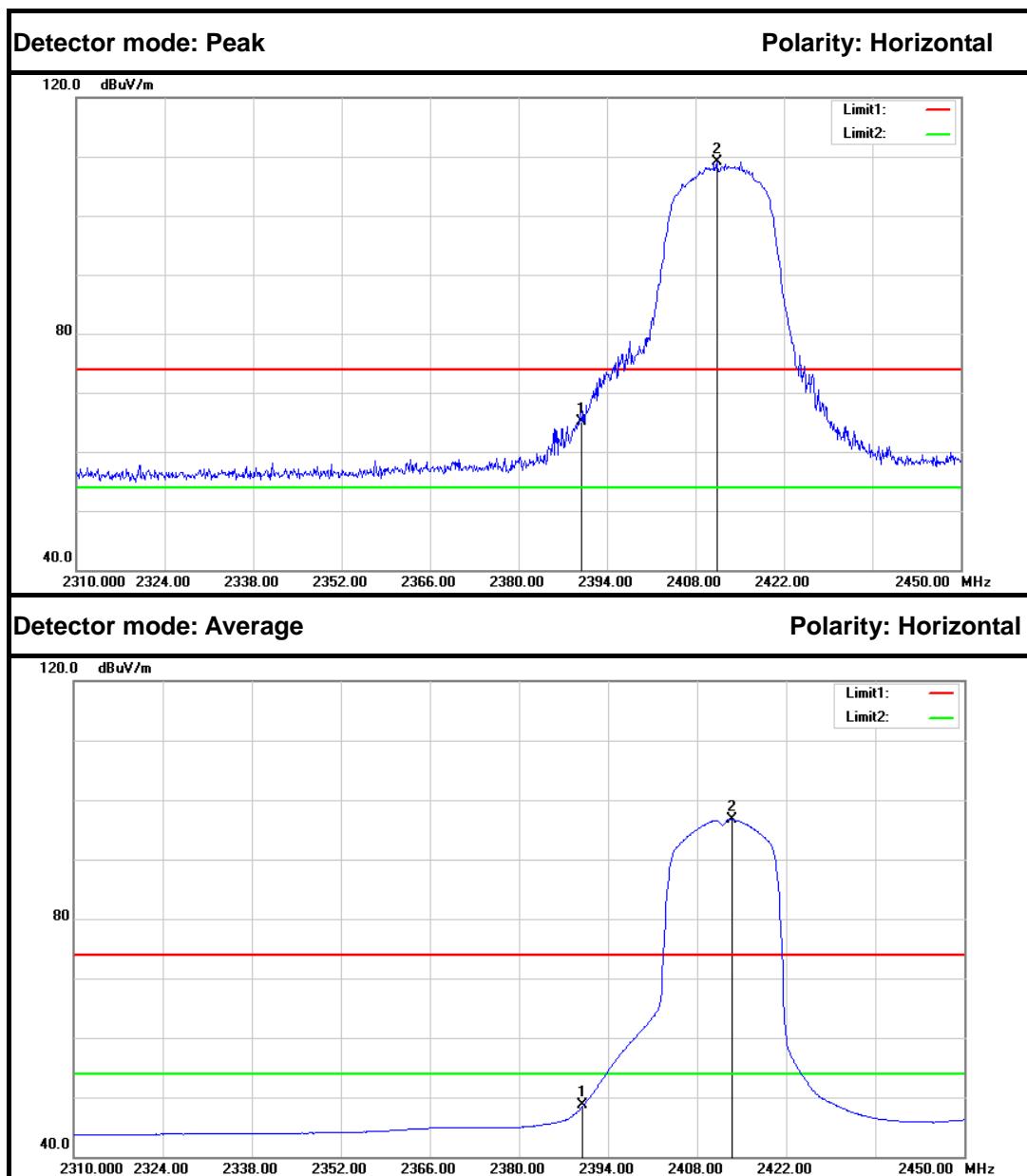
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2462.900	113.06	-2.46	110.60	----	----	Peak	Vertical
2	2483.500	71.88	-2.35	69.53	74.00	-4.47	Peak	Vertical
1	2463.450	101.19	-2.46	98.73	----	----	Average	Vertical
2	2483.500	54.62	-2.35	52.27	54.00	-1.73	Average	Vertical



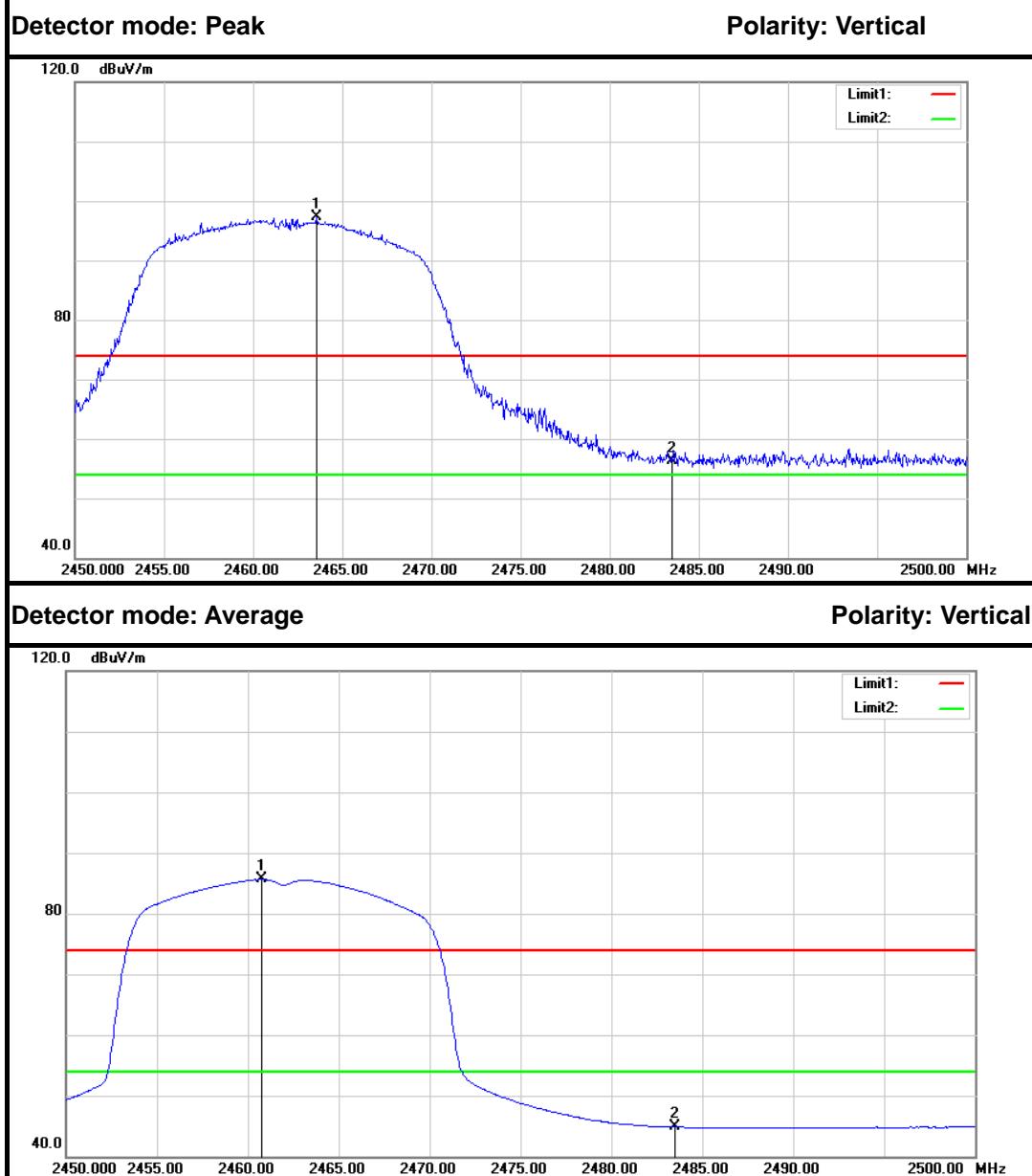
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2463.650	112.97	-2.46	110.51	---	---	Peak	Horizontal
2	2483.500	71.28	-2.35	68.93	74.00	-5.07	Peak	Horizontal
1	2463.350	101.14	-2.46	98.68	---	---	Average	Horizontal
2	2483.500	54.65	-2.35	52.30	54.00	-1.70	Average	Horizontal

**IEEE 802.11g mode (Antenna 1)
Band Edges (CH Low)**

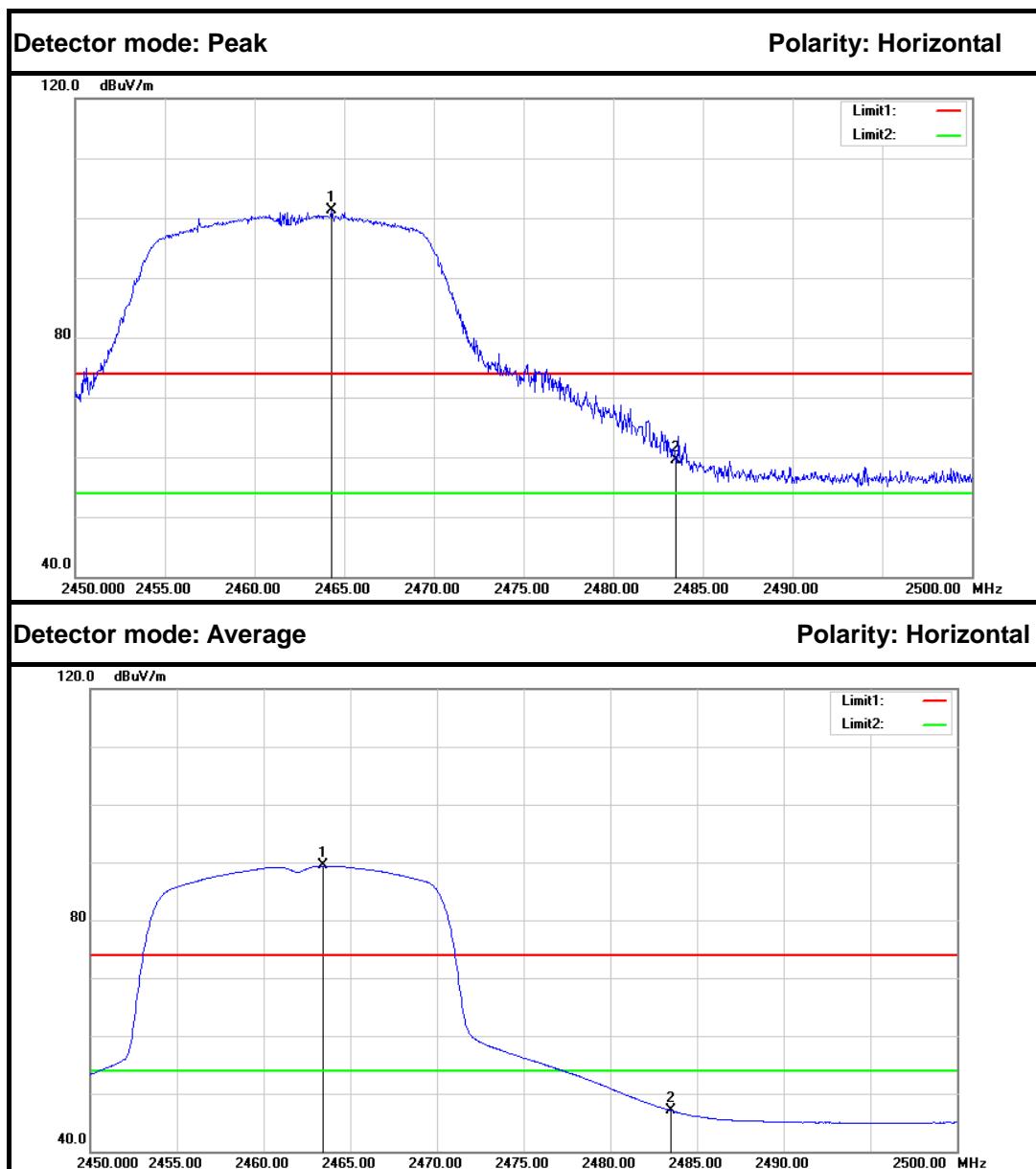
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	58.23	-2.86	55.37	74.00	-18.63	Peak	Vertical
2	2414.020	96.08	-2.73	93.35	---	---	Peak	Vertical
1	2390.000	47.05	-2.86	44.19	54.00	-9.81	Average	Vertical
2	2413.600	80.87	-2.73	78.14	---	---	Average	Vertical



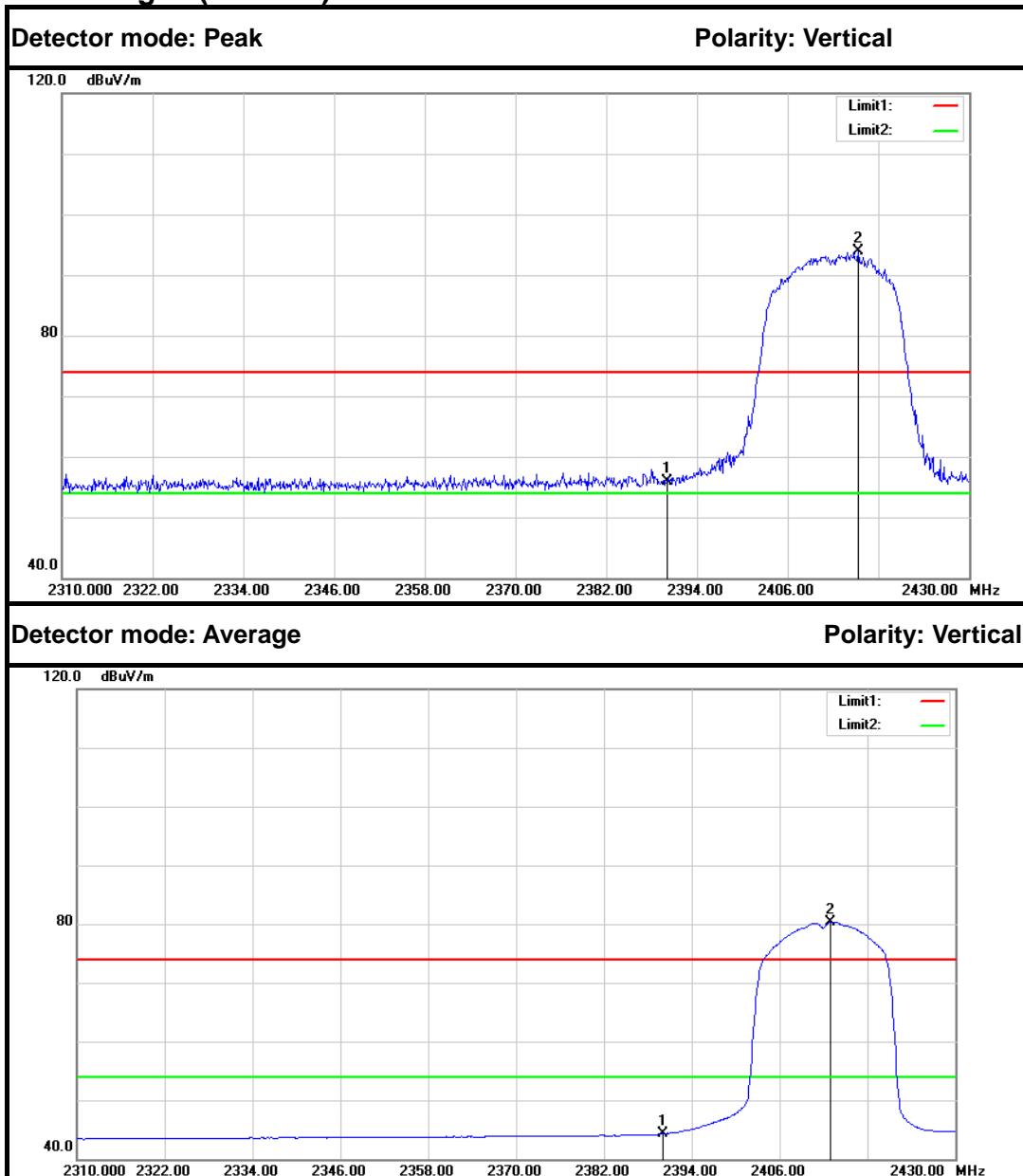
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	68.02	-2.86	65.16	74.00	-8.84	Peak	Horizontal
2	2411.360	111.79	-2.75	109.04	---	---	Peak	Horizontal
1	2390.000	51.47	-2.86	48.61	54.00	-5.39	Average	Horizontal
2	2413.460	99.43	-2.73	96.70	---	---	Average	Horizontal

**Band Edges (CH High)**

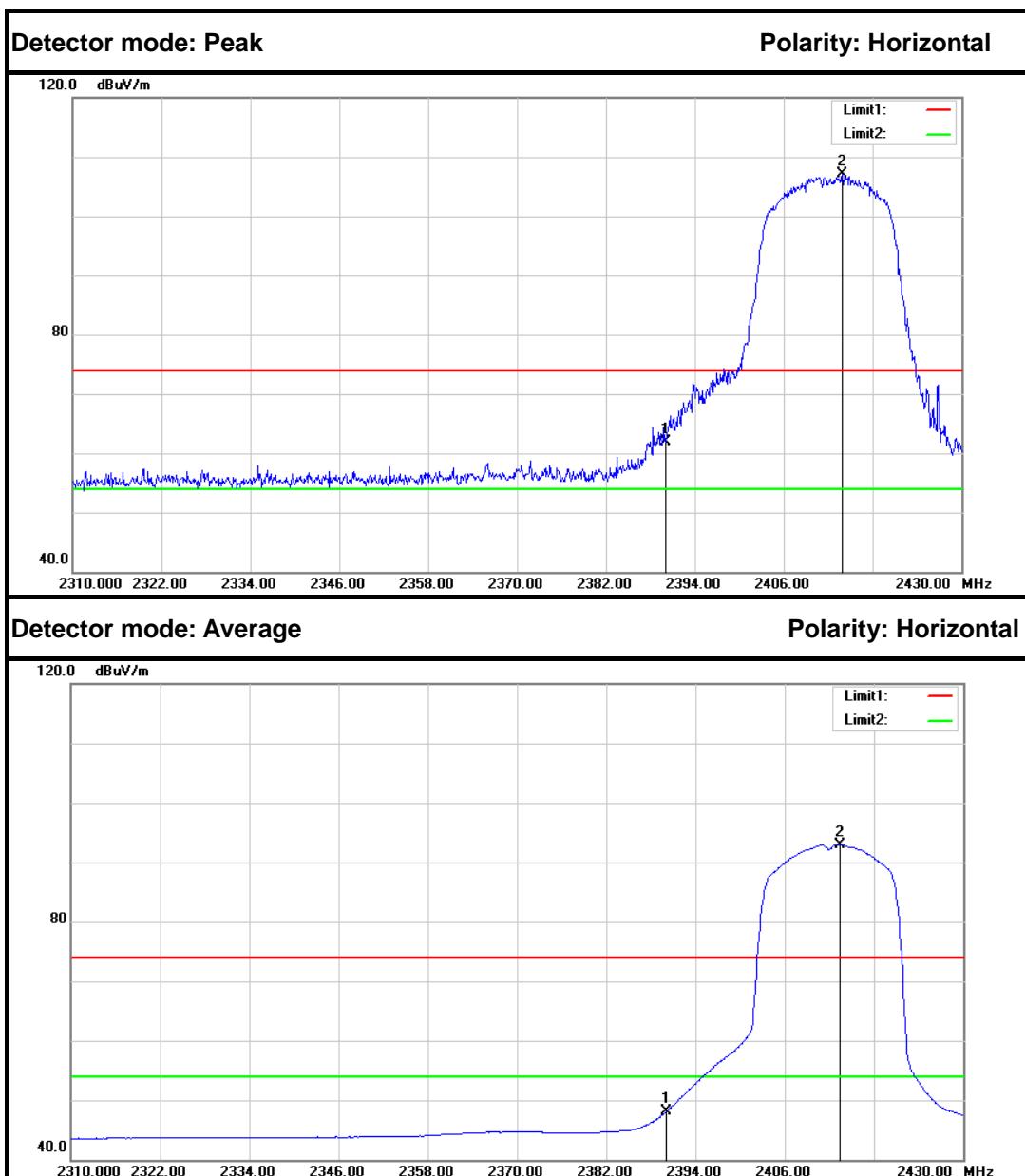
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2463.550	99.73	-2.46	97.27	----	----	Peak	Vertical
2	2483.500	58.55	-2.35	56.20	74.00	-17.80	Peak	Vertical
1	2460.750	88.12	-2.47	85.65	----	----	Average	Vertical
2	2483.500	47.16	-2.35	44.81	54.00	-9.19	Average	Vertical



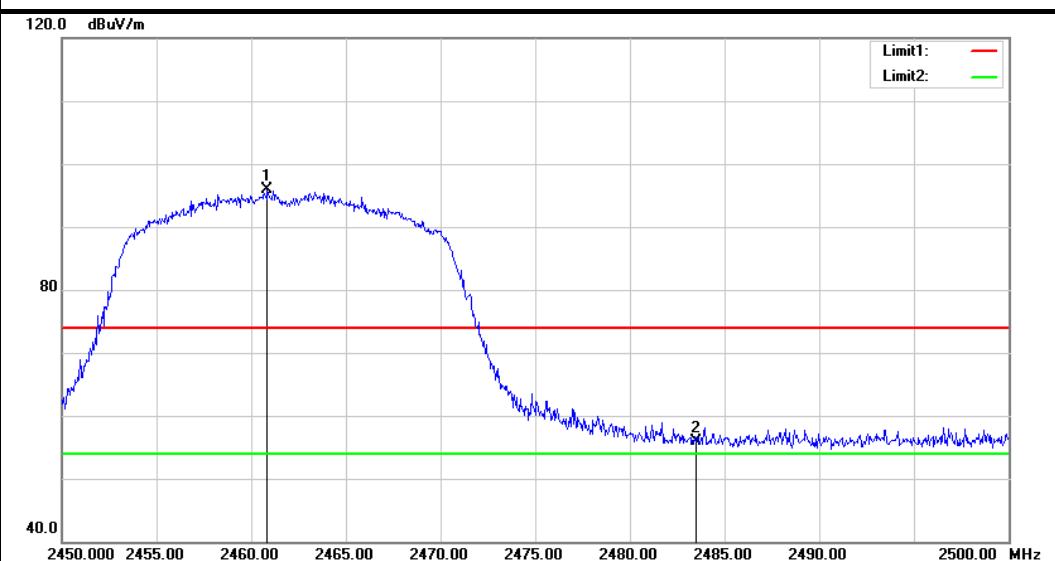
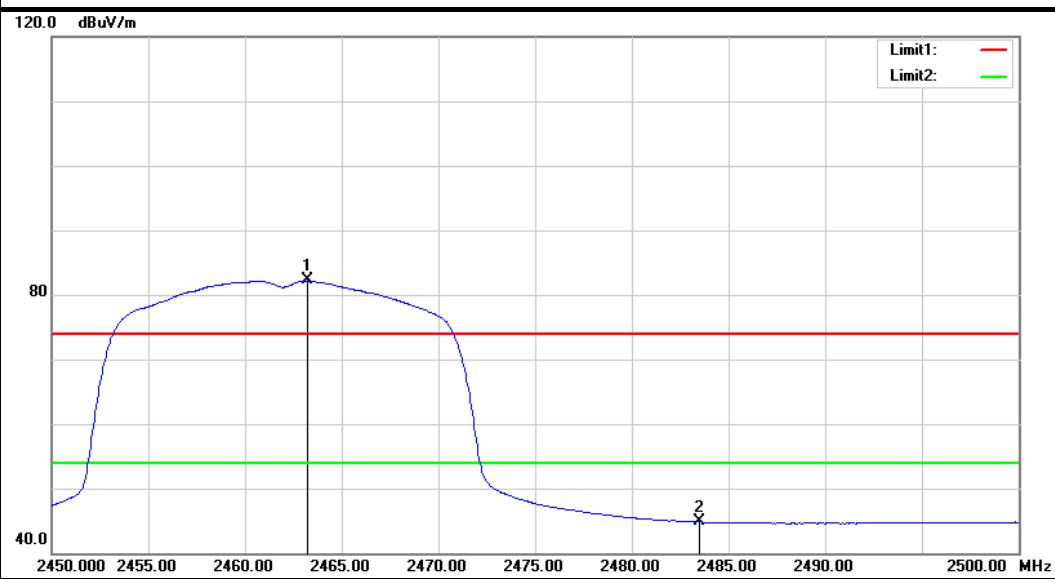
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2464.300	103.86	-2.46	101.40	---	---	Peak	Horizontal
2	2483.500	61.76	-2.35	59.41	74.00	-14.59	Peak	Horizontal
1	2463.450	91.86	-2.46	89.40	---	---	Average	Horizontal
2	2483.500	49.44	-2.35	47.09	54.00	-6.91	Average	Horizontal

**IEEE 802.11n HT20 MHz mode (Combine with Antenna 0 and Antenna 1)
Band Edges (CH Low)**

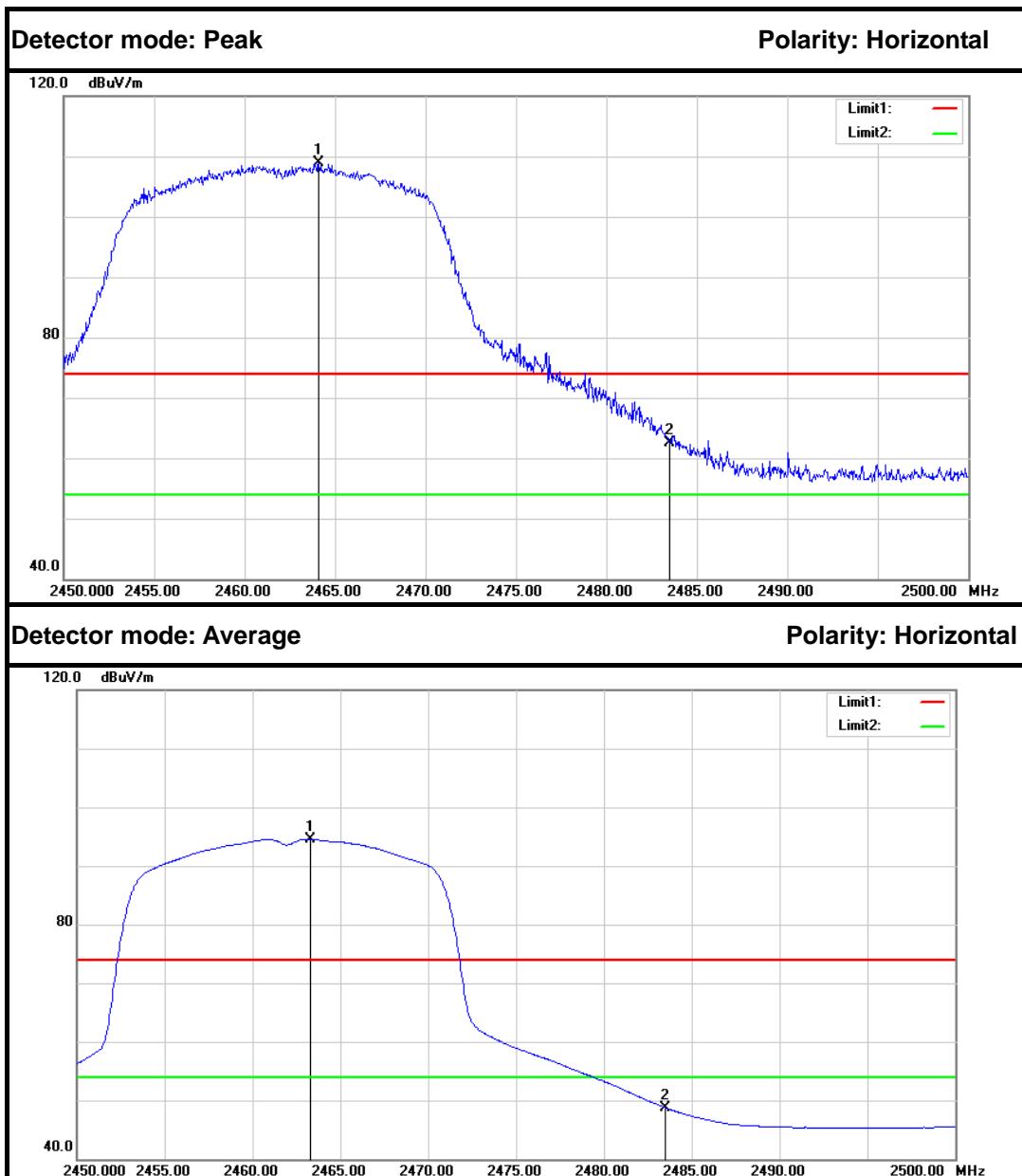
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	58.80	-2.86	55.94	74.00	-18.06	Peak	Vertical
2	2415.360	96.57	-2.72	93.85	----	----	Peak	Vertical
1	2390.000	47.16	-2.86	44.30	54.00	-9.70	Average	Vertical
2	2412.960	83.05	-2.74	80.31	----	----	Average	Vertical



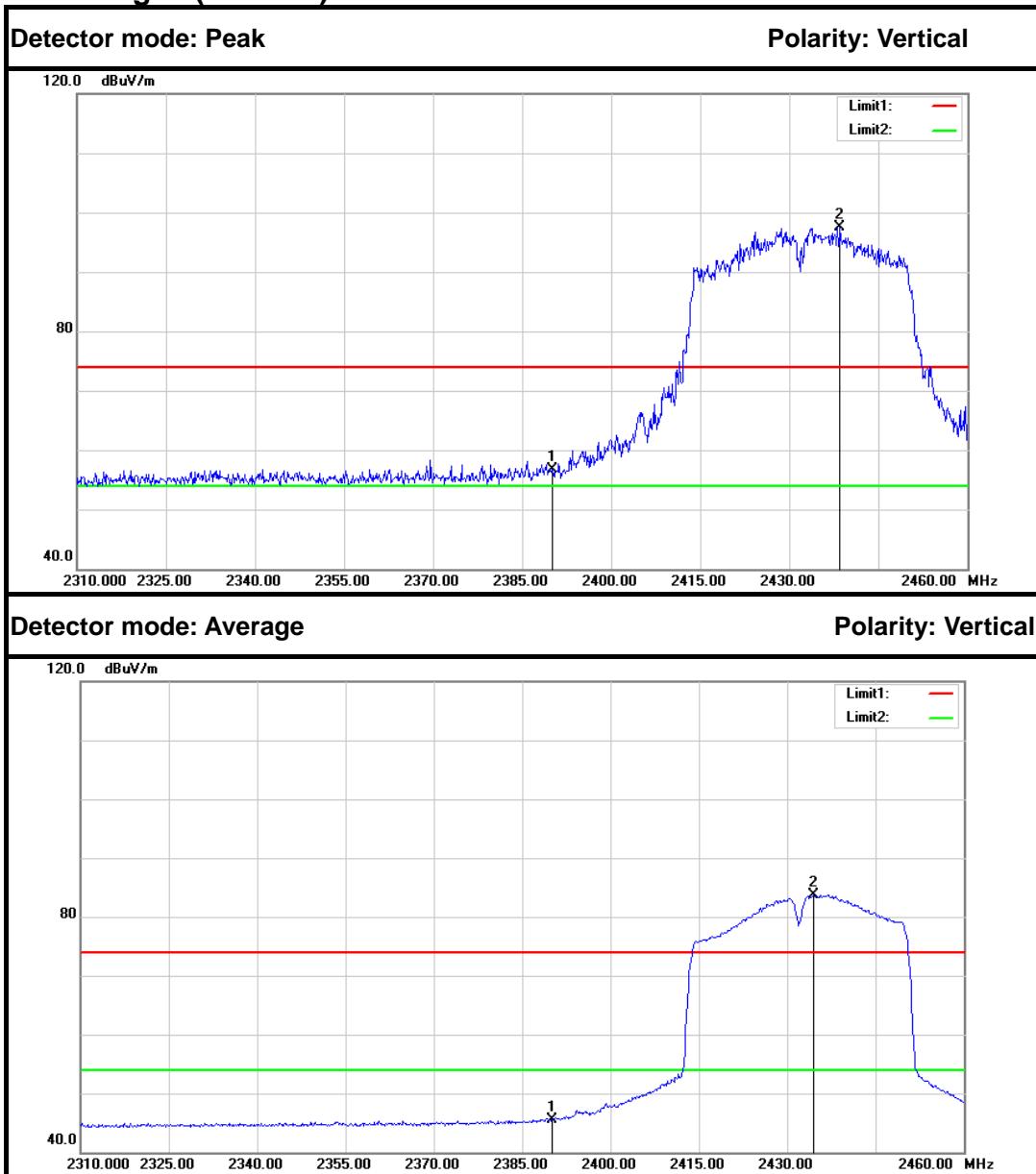
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	64.75	-2.86	61.89	74.00	-12.11	Peak	Horizontal
2	2413.920	109.80	-2.73	107.07	---	---	Peak	Horizontal
1	2390.000	50.90	-2.86	48.04	54.00	-5.96	Average	Horizontal
2	2413.440	95.72	-2.73	92.99	---	---	Average	Horizontal

**Band Edges (CH High)****Detector mode: Peak****Polarity: Vertical****Detector mode: Average****Polarity: Vertical**

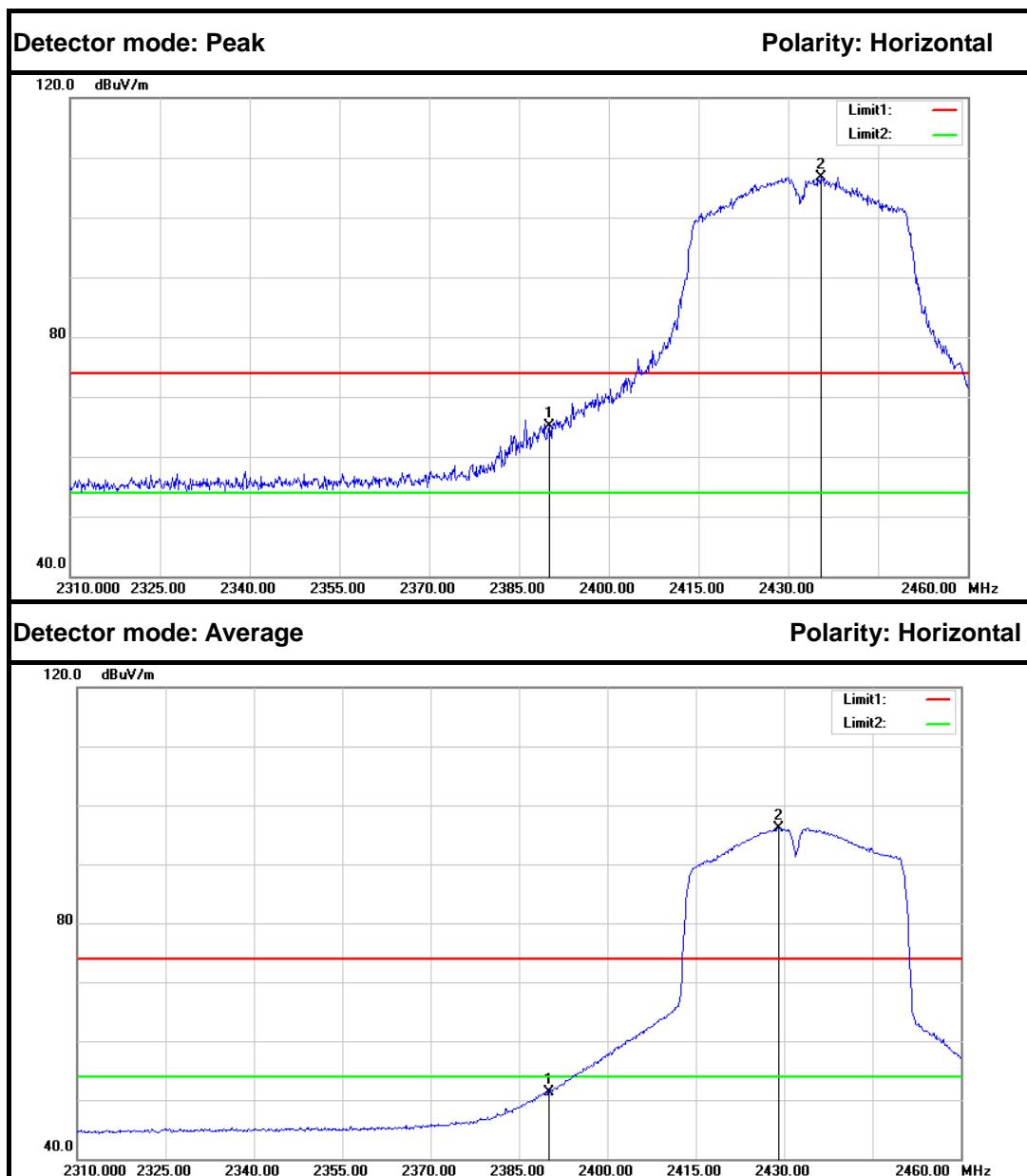
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2460.850	98.32	-2.47	95.85	----	----	Peak	Vertical
2	2483.500	58.22	-2.35	55.87	74.00	-18.13	Peak	Vertical
1	2463.250	84.67	-2.46	82.21	----	----	Average	Vertical
2	2483.500	47.19	-2.35	44.84	54.00	-9.16	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2464.100	111.27	-2.46	108.81	---	---	Peak	Horizontal
2	2483.500	64.93	-2.35	62.58	74.00	-11.42	Peak	Horizontal
1	2463.300	96.97	-2.46	94.51	---	---	Average	Horizontal
2	2483.500	51.15	-2.35	48.80	54.00	-5.20	Average	Horizontal

**IEEE 802.11n HT40 MHz mode (Combine with Antenna 0 and Antenna 1)
Band Edges (CH Low)**

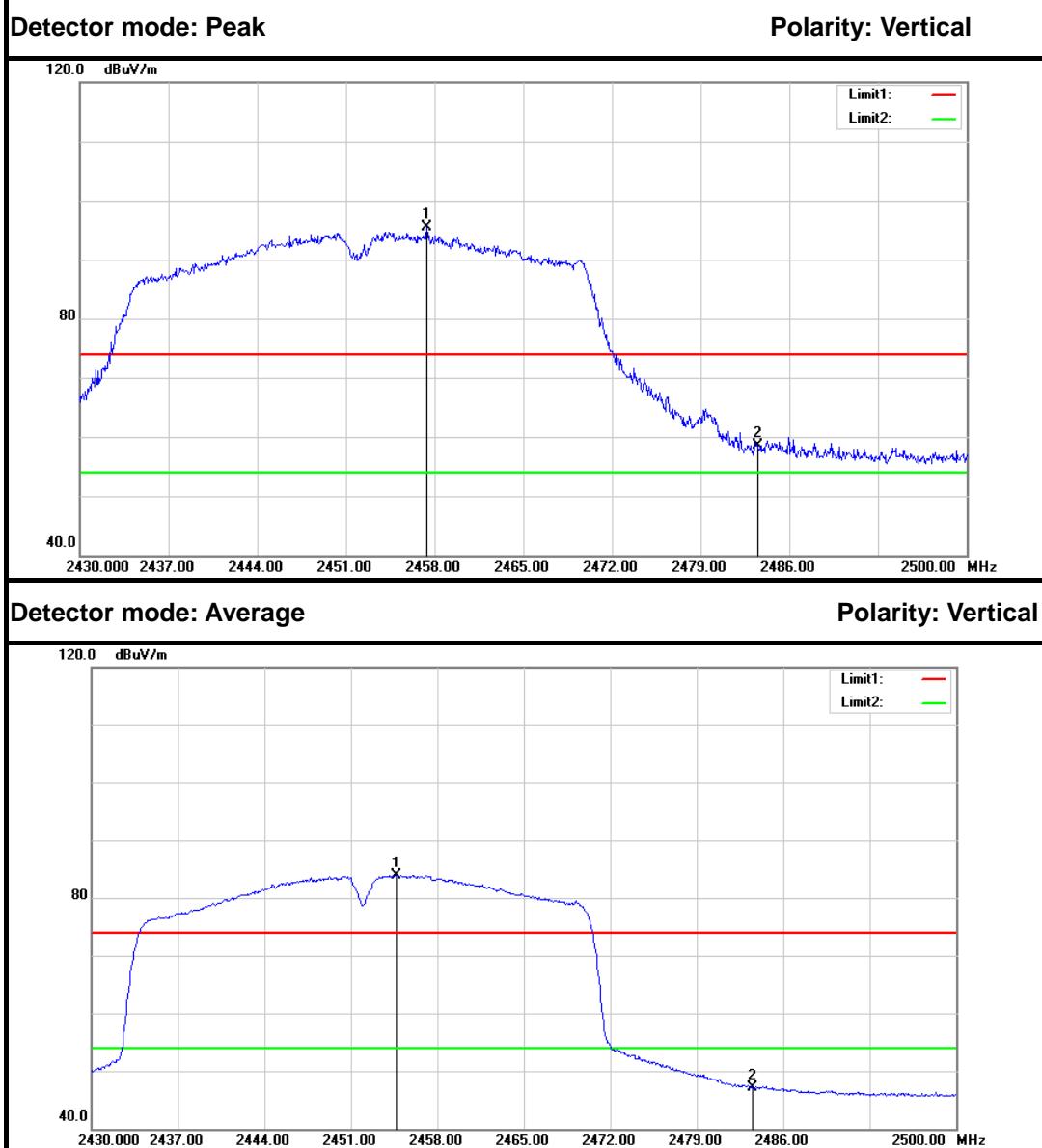
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	59.60	-2.86	56.74	74.00	-17.26	Peak	Vertical
2	2438.550	100.18	-2.60	97.58	---	---	Peak	Vertical
1	2390.000	48.38	-2.86	45.52	54.00	-8.48	Average	Vertical
2	2434.500	86.40	-2.62	83.78	---	---	Average	Vertical



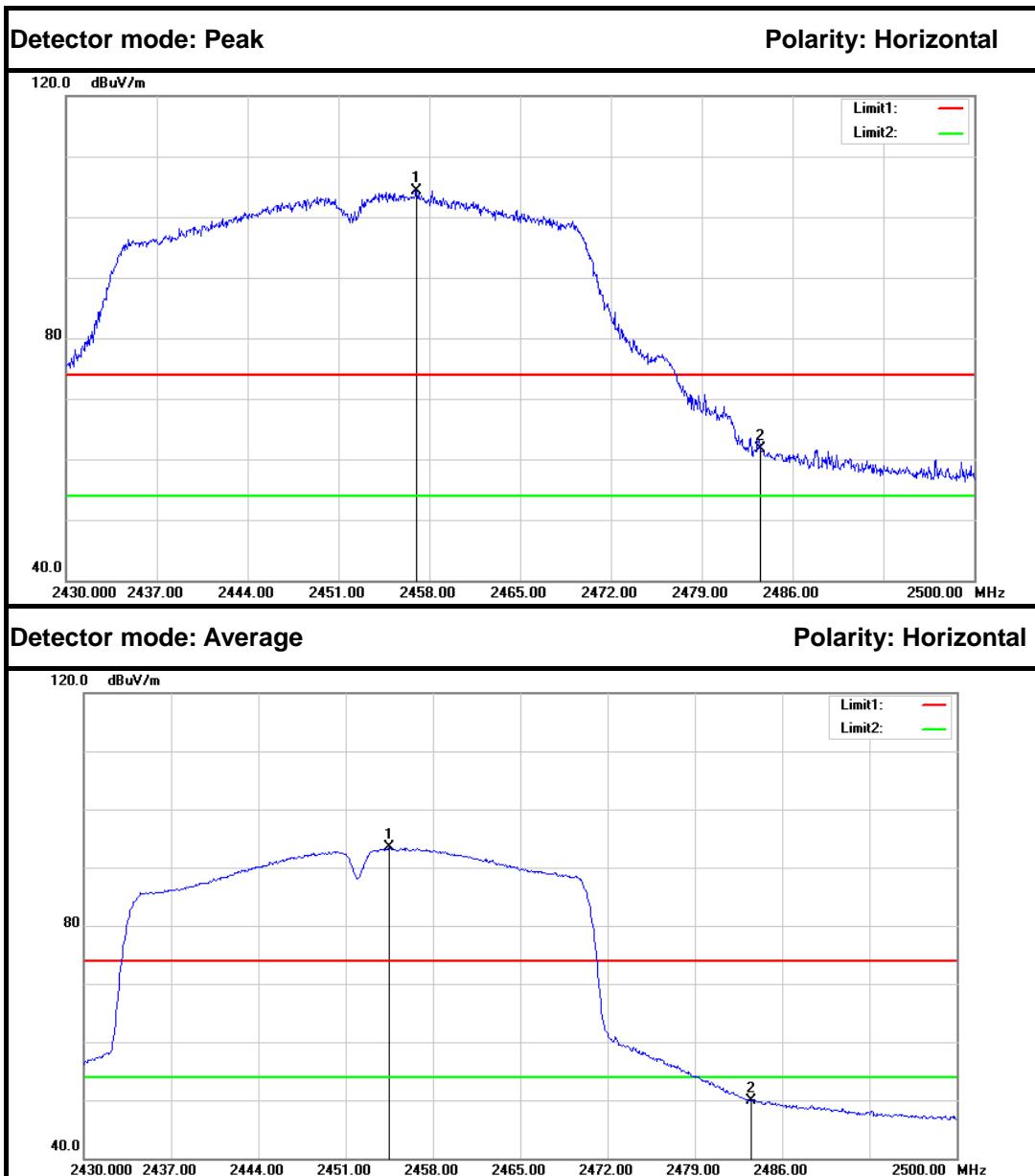
No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2390.000	68.01	-2.86	65.15	74.00	-8.85	Peak	Horizontal
2	2435.400	109.39	-2.61	106.78	----	----	Peak	Horizontal
1	2390.000	54.17	-2.86	51.31	54.00	-2.69	Average	Horizontal
2	2429.100	98.79	-2.65	96.14	----	----	Average	Horizontal



Band Edges (CH High)



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2457.370	97.93	-2.49	95.44	---	---	Peak	Vertical
2	2483.500	60.91	-2.35	58.56	74.00	-15.44	Peak	Vertical
1	2454.640	86.47	-2.51	83.96	---	---	Average	Vertical
2	2483.500	49.40	-2.35	47.05	54.00	-6.95	Average	Vertical



No.	Frequency (MHz)	Reading (dB)	Factor (dB/m)	Result (dB/m)	Limit (dB/m)	Margin (dB)	Remark	Antenna Polar
1	2457.020	106.80	-2.50	104.30	---	---	Peak	Horizontal
2	2483.500	64.08	-2.35	61.73	74.00	-12.27	Peak	Horizontal
1	2454.500	95.92	-2.51	93.41	---	---	Average	Horizontal
2	2483.500	52.17	-2.35	49.82	74.00	-24.18	Average	Horizontal



7.7. PEAK POWER SPECTRAL DENSITY MEASUREMENT

7.7.1. 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.

7.7.2. TEST INSTRUMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Last Calibration	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018

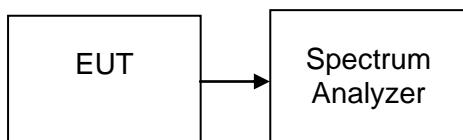
7.7.3. TEST PROCEDURES (please refer to measurement standard)

§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).

10.2 Method PKPSD (peak PSD)

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
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 within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

7.7.4. TEST SETUP





7.7.5. TEST RESULTS

No non-compliance noted

Test Data

Test mode: IEEE 802.11b (Antenna 0)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-8.827	8	PASS
Mid	2437	-9.968		PASS
High	2462	-9.693		PASS

Test mode: IEEE 802.11b (Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-7.469	8	PASS
Mid	2437	-9.529		PASS
High	2462	-6.982		PASS

Test mode: IEEE 802.11g (Antenna 0)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-11.111	8	PASS
Mid	2437	-11.615		PASS
High	2462	-9.819		PASS

Test mode: IEEE 802.11g (Antenna 1)

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Test Result
Low	2412	-10.072	8	PASS
Mid	2437	-10.791		PASS
High	2462	-10.394		PASS

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

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 0	Antenna 1	Total		
Low	2412	-12.669	-13.068	-9.854	8	PASS
Mid	2437	-12.740	-13.188	-9.948		PASS
High	2462	-12.915	-11.959	-9.400		PASS

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

Channel	Frequency (MHz)	PPSD (dBm)			Limit (dBm)	Test Result
		Antenna 0	Antenna 1	Total		
Low	2422	-17.181	-14.388	-12.553	8	PASS
Mid	2437	-17.718	-15.224	-13.284		PASS
High	2452	-15.826	-14.751	-12.245		PASS



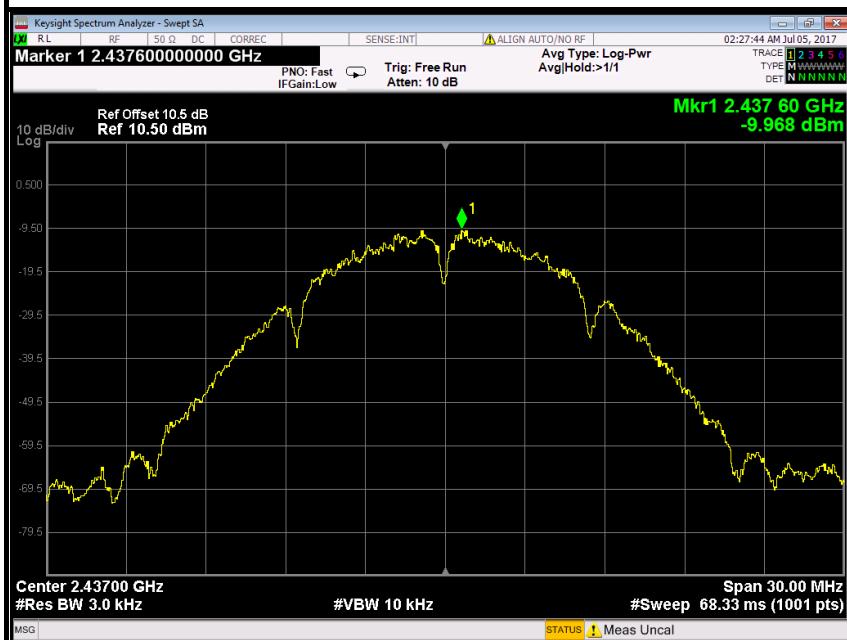
Test Plot

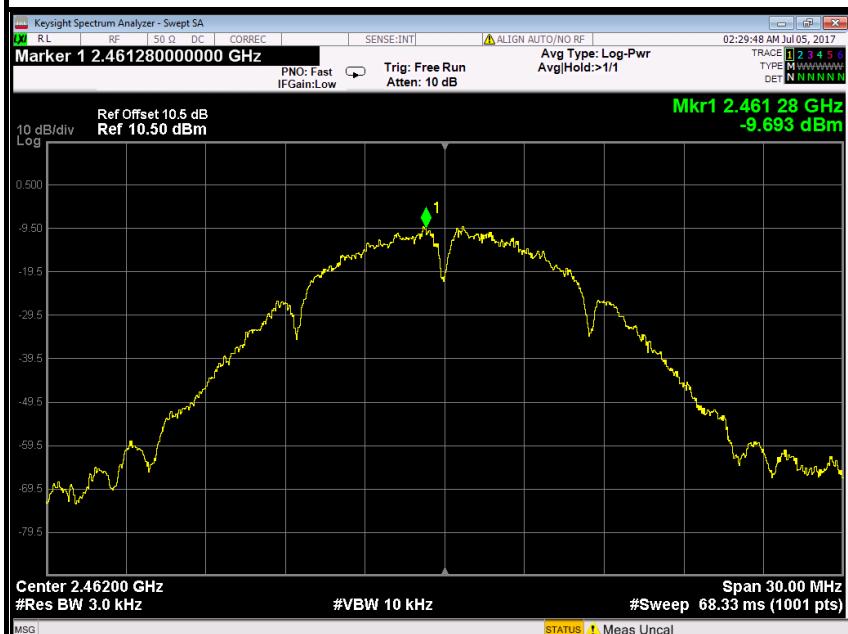
IEEE 802.11b mode (Antenna 0)

PPSD (CH Low)



PPSD (CH Mid)



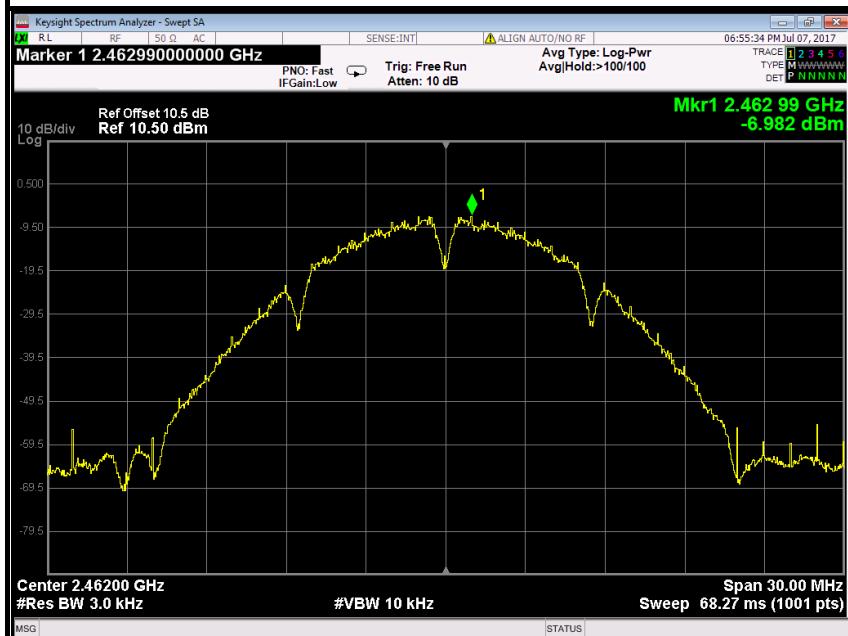
**PPSD (CH High)****IEEE 802.11b mode (Antenna 1)****PPSD (CH Low)**



PPSD (CH Mid)



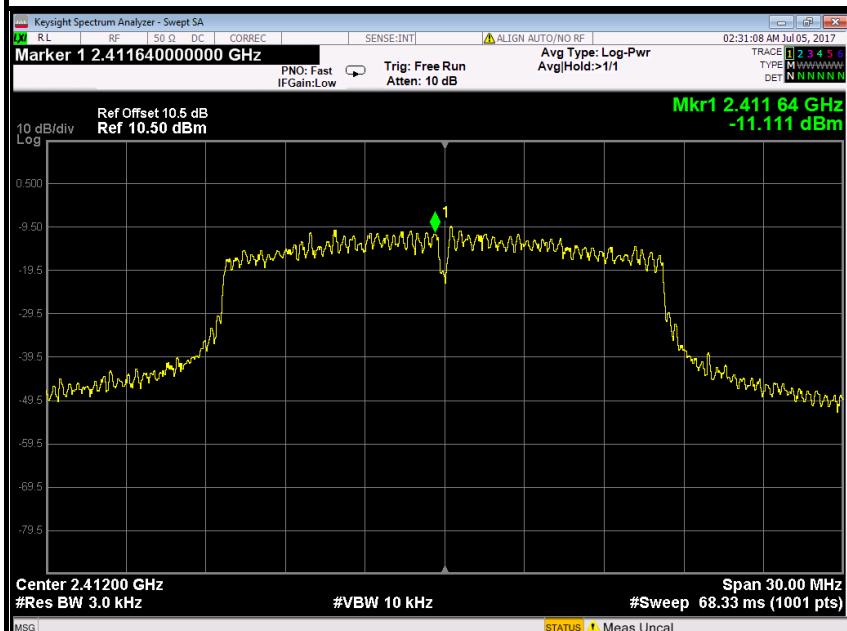
PPSD (CH High)



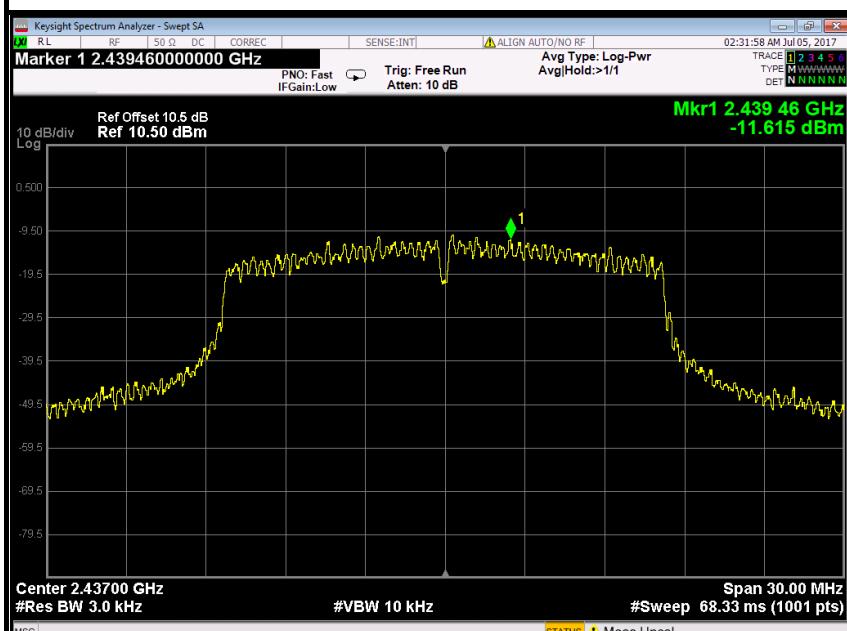


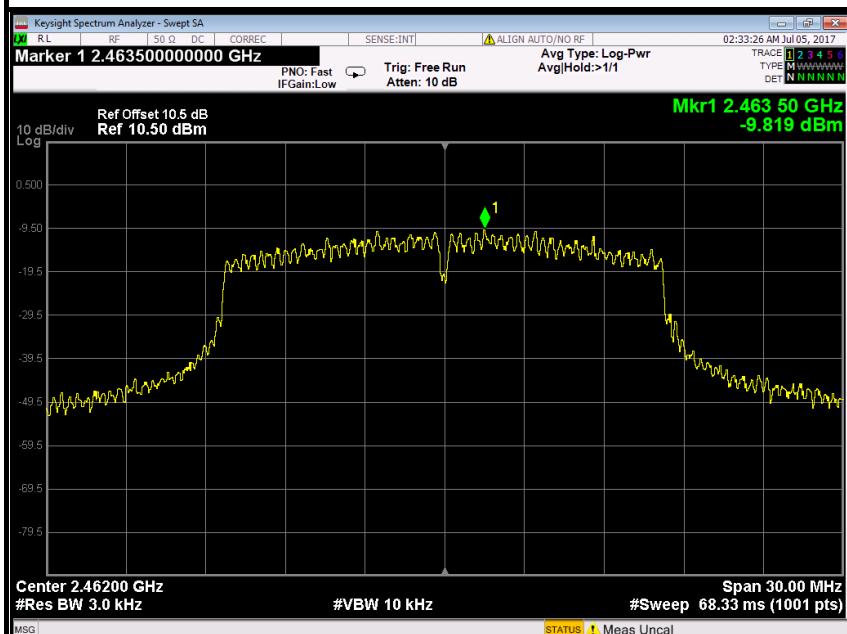
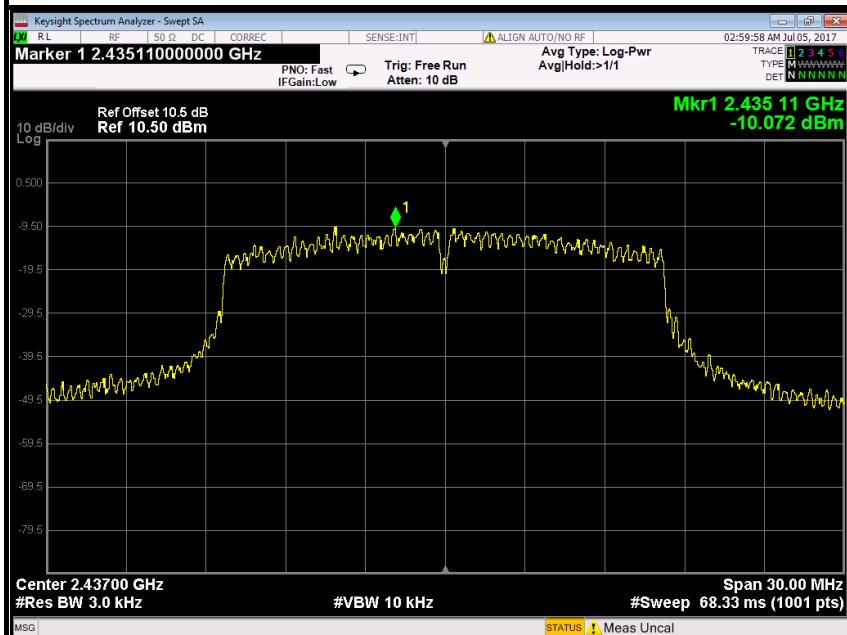
IEEE 802.11g mode (Antenna 0)

PPSD (CH Low)



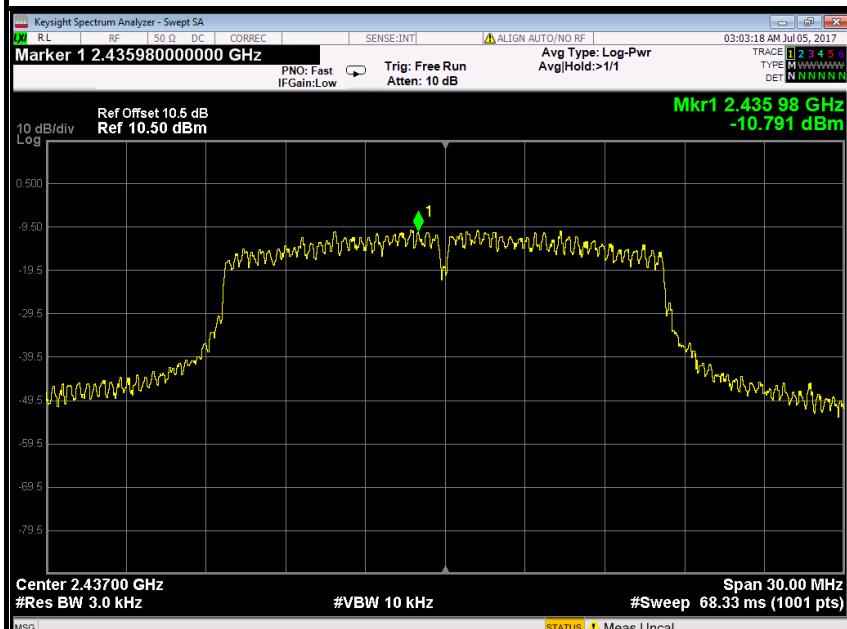
PPSD (CH Mid)



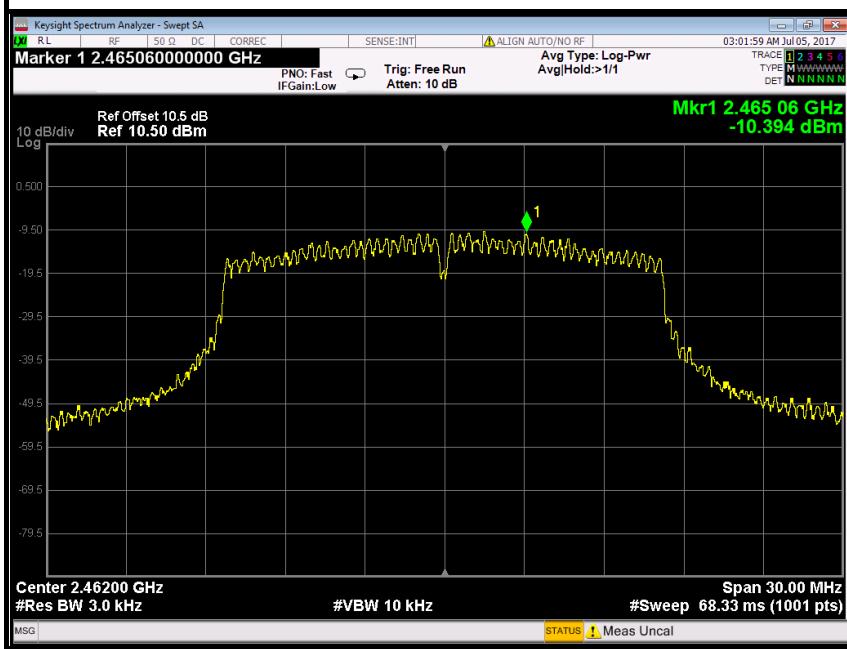
**PPSD (CH High)****IEEE 802.11g mode (Antenna 1)****PPSD (CH Low)**



PPSD (CH Mid)



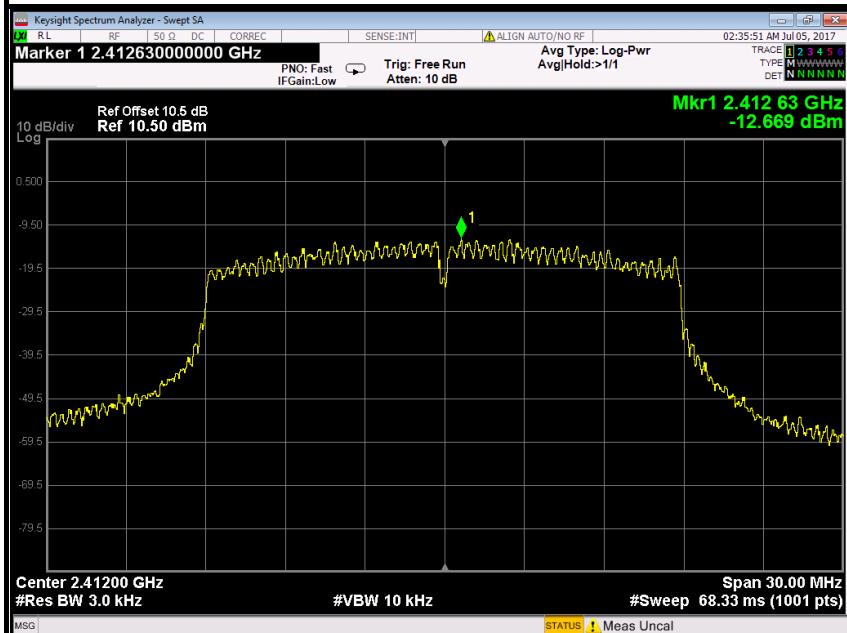
PPSD (CH High)



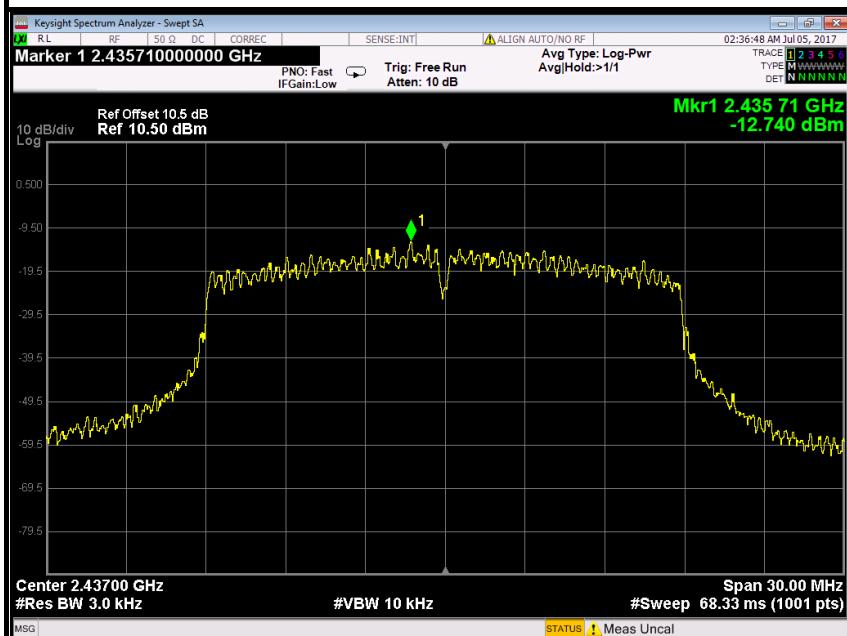


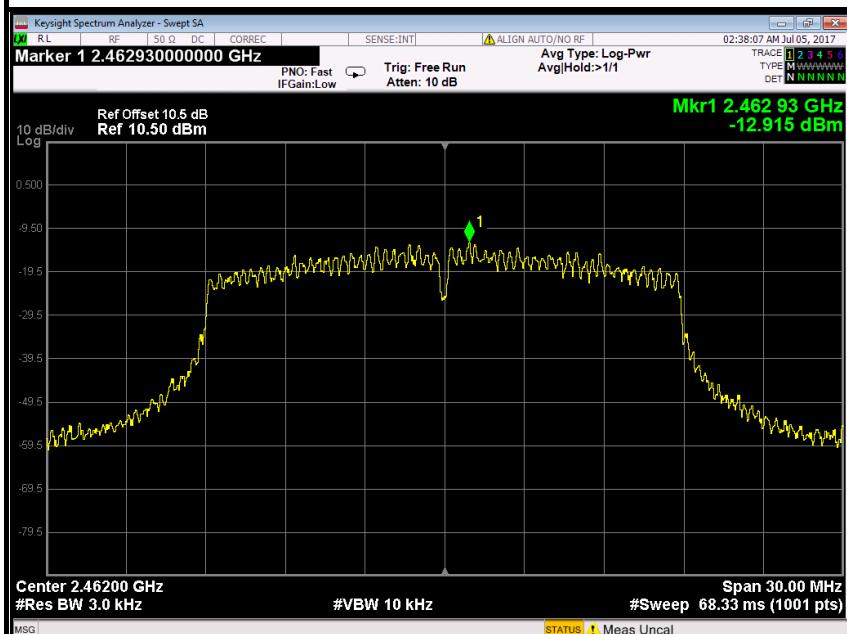
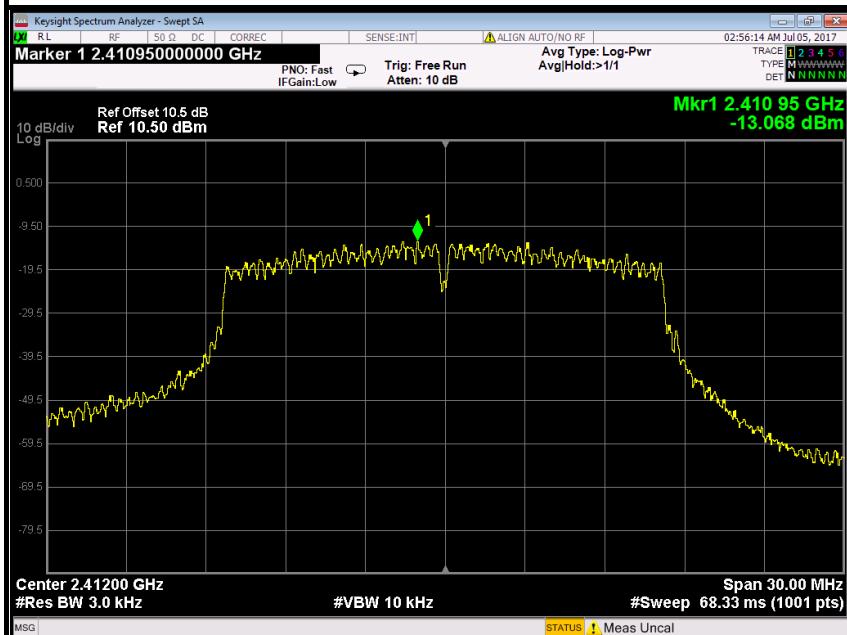
IEEE 802.11n HT20 MHz mode (Antenna 0)

PPSD (CH Low)



PPSD (CH Mid)



**PPSD (CH High)****IEEE 802.11n HT20 MHz mode (Antenna 1)****PPSD (CH Low)**



PPSD (CH Mid)



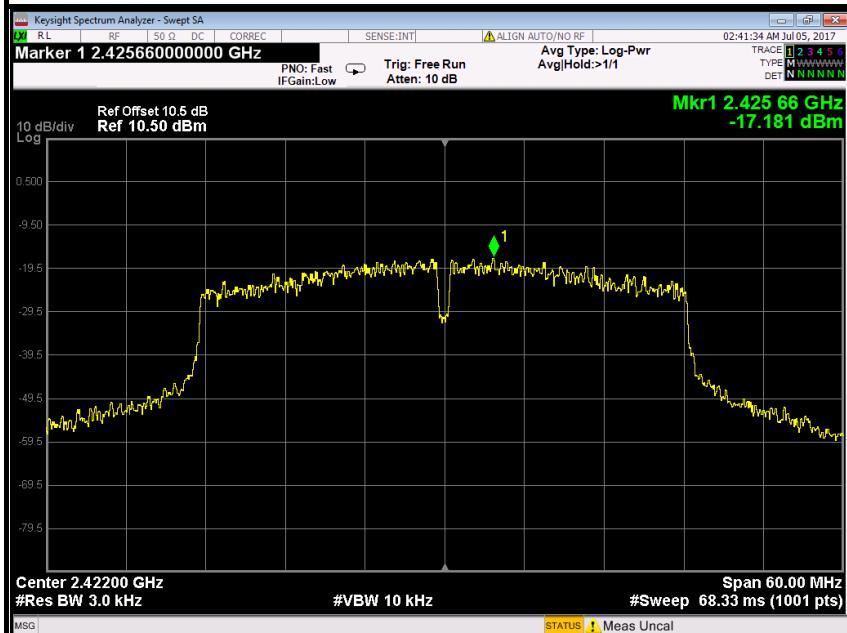
PPSD (CH High)



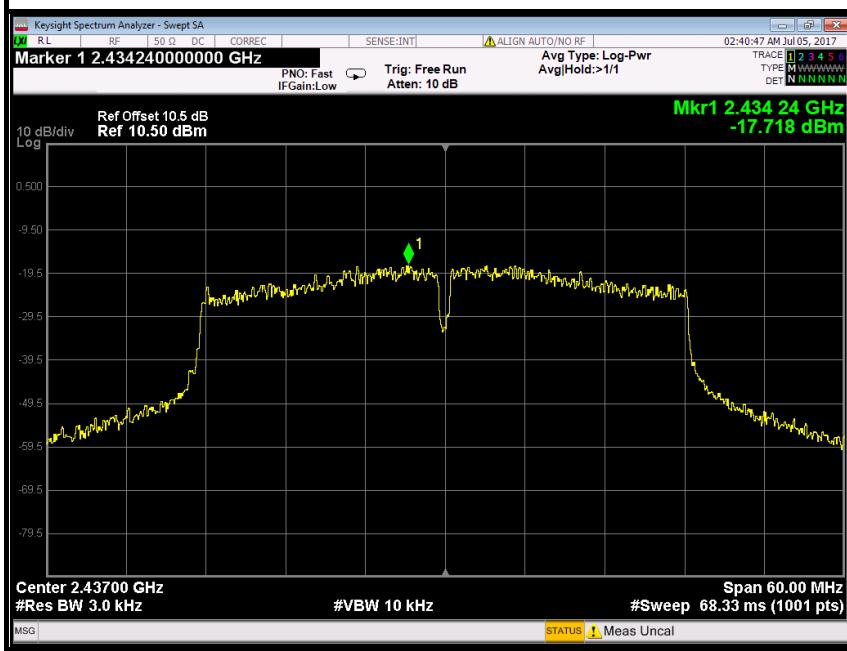


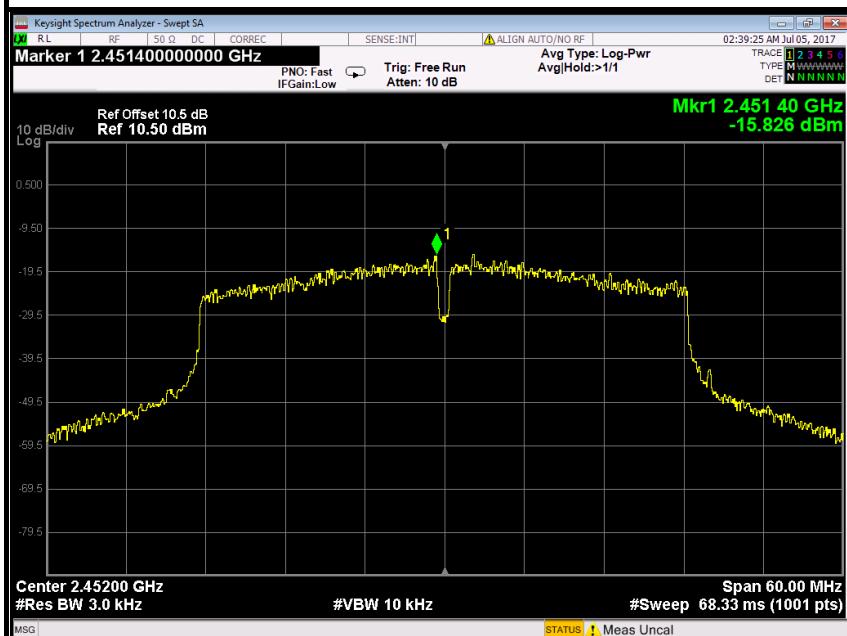
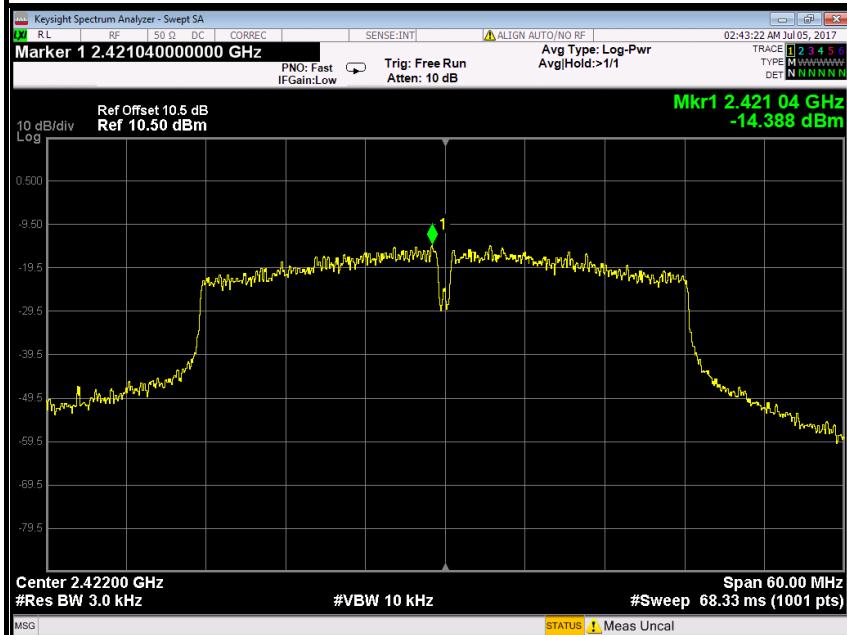
IEEE 802.11n HT40 MHz mode (Antenna 0)

PPSD (CH Low)



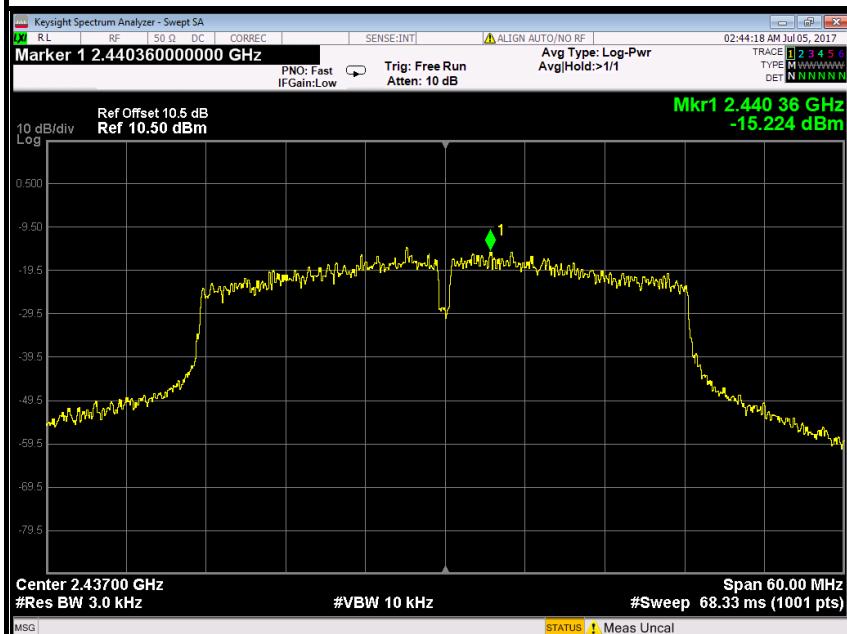
PPSD (CH Mid)



**PPSD (CH High)****IEEE 802.11n HT40 MHz mode (Antenna 1)****PPSD (CH Low)**



PPSD (CH Mid)



PPSD (CH High)

