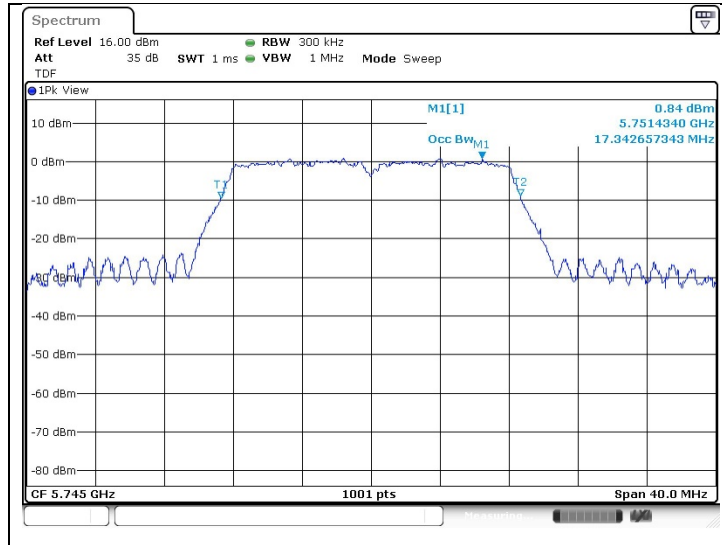
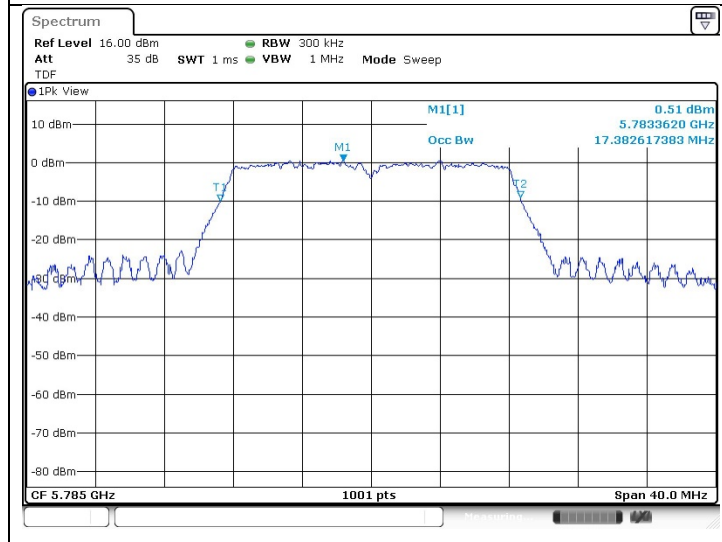


802.11a (Band 3)

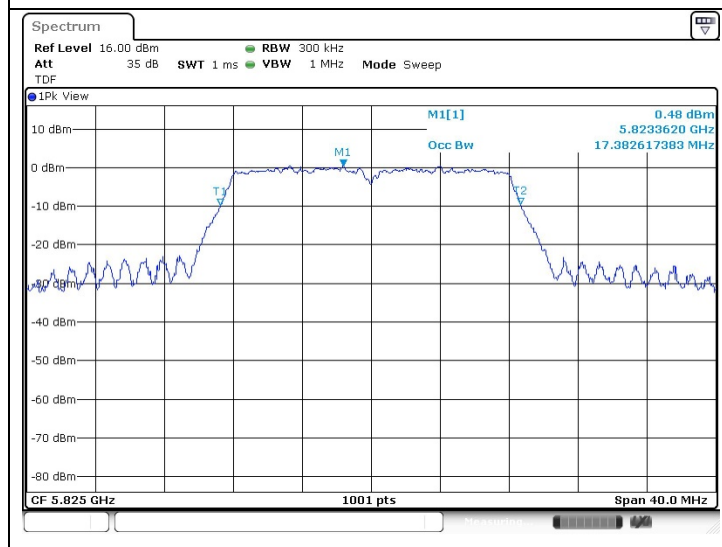
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)



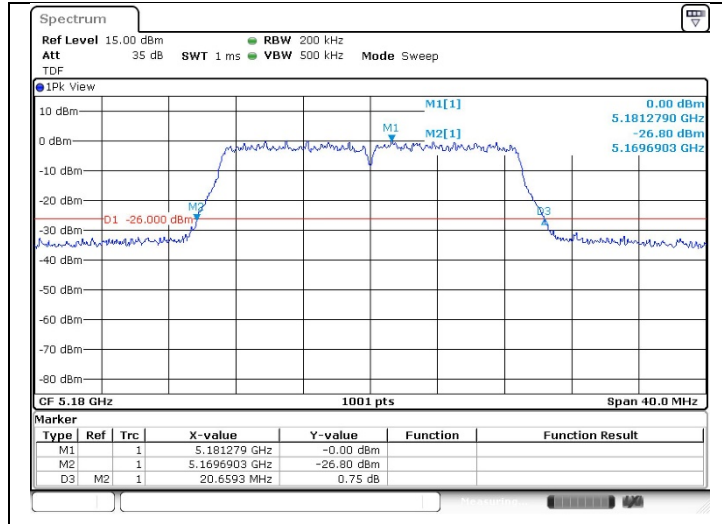
High Channel
(5 825 MHz)



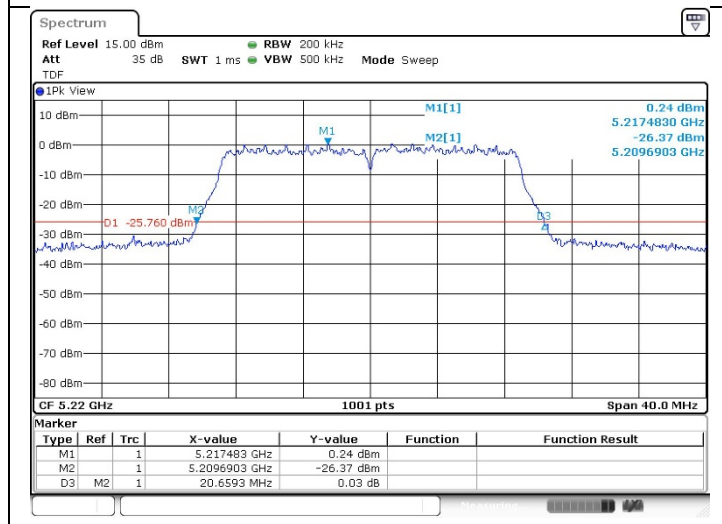
26 dB Bandwidth

802.11n_HT20 (Band 1)

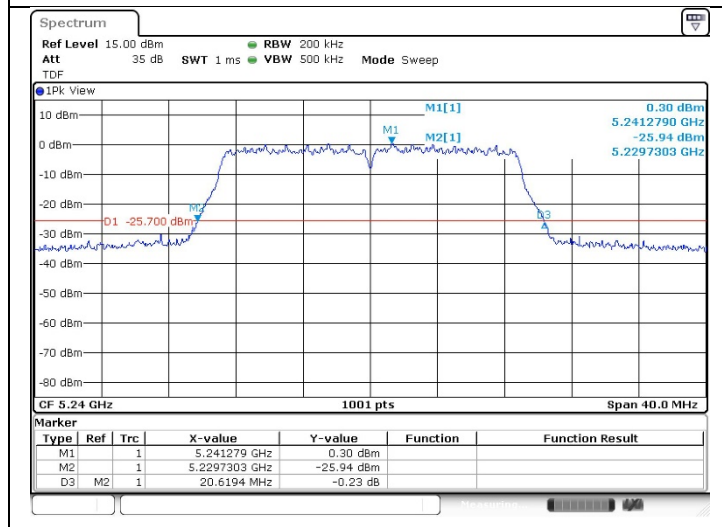
Low Channel
 (5 180 MHz)



Middle Channel
 (5 220 MHz)

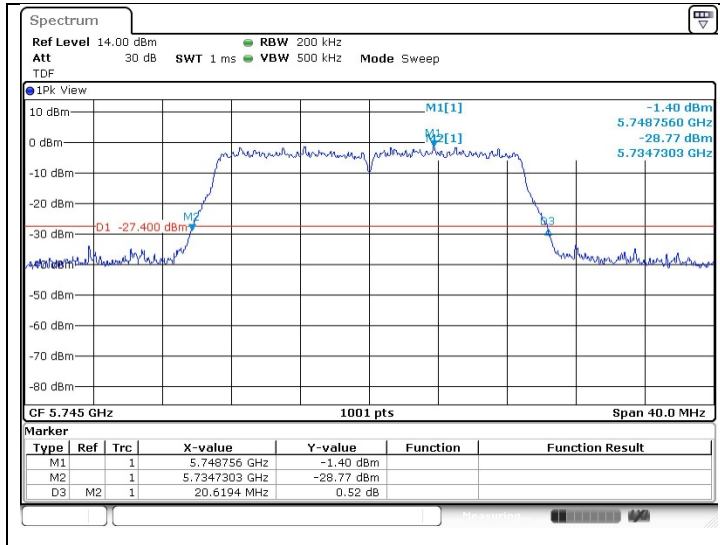


High Channel
 (5 240 MHz)

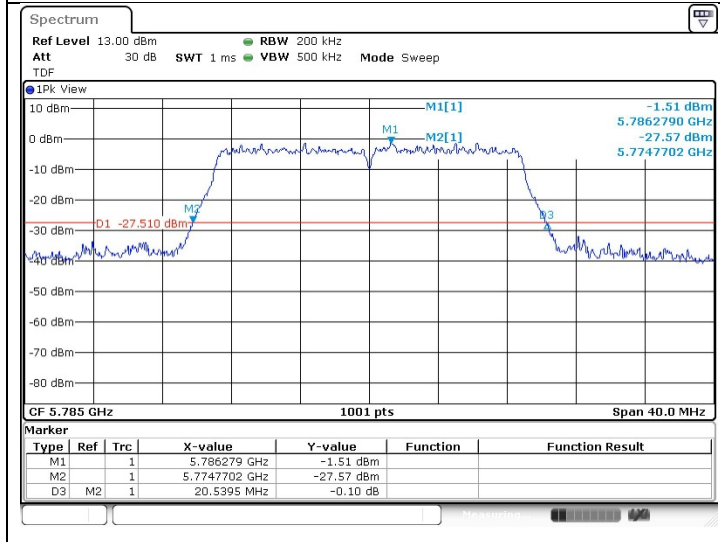


802.11n_HT20 (Band 3)

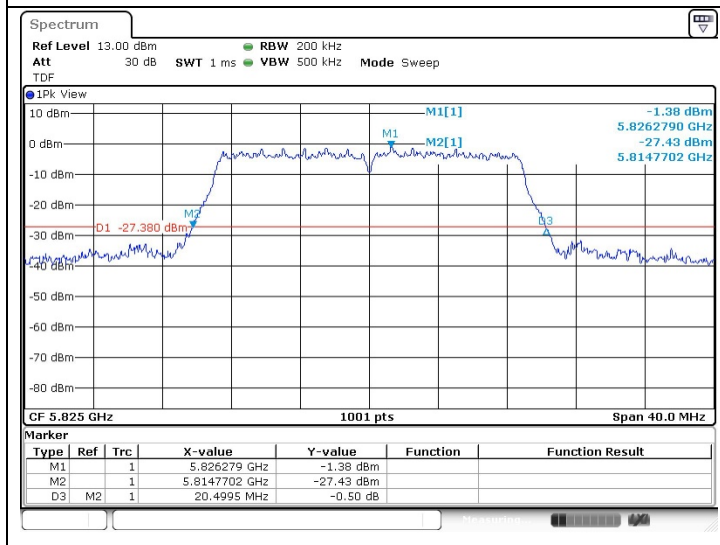
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)



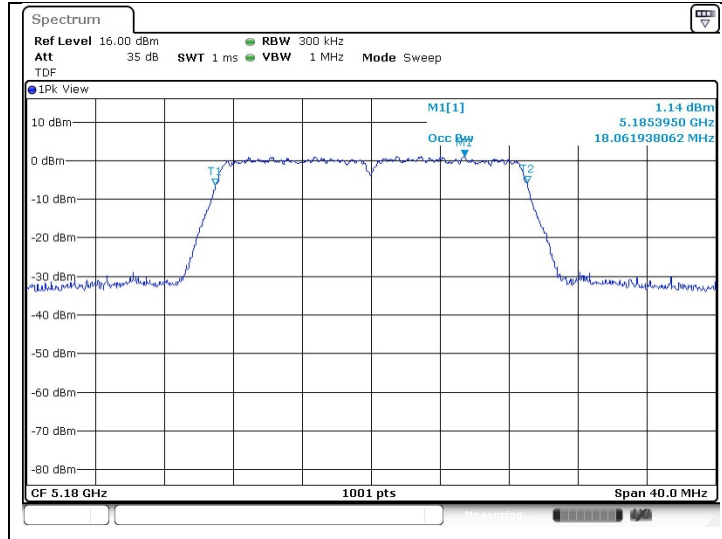
High Channel
(5 825 MHz)



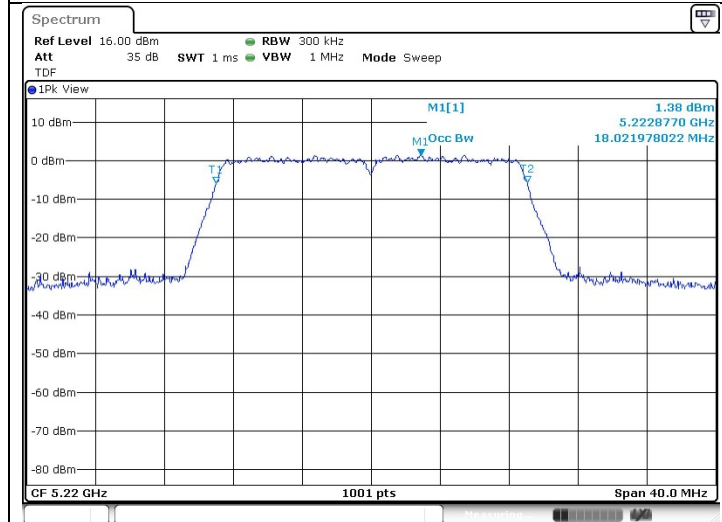
99 % Bandwidth

802.11n_HT20 (Band 1)

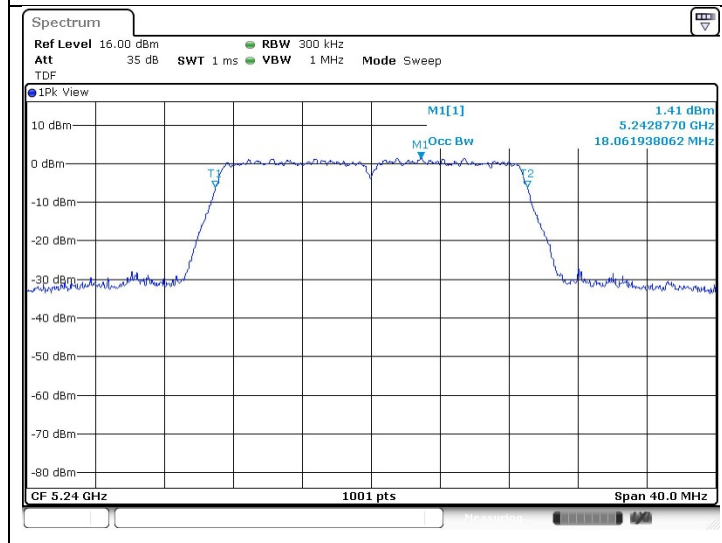
Low Channel
 (5 180 MHz)



Middle Channel
 (5 220 MHz)

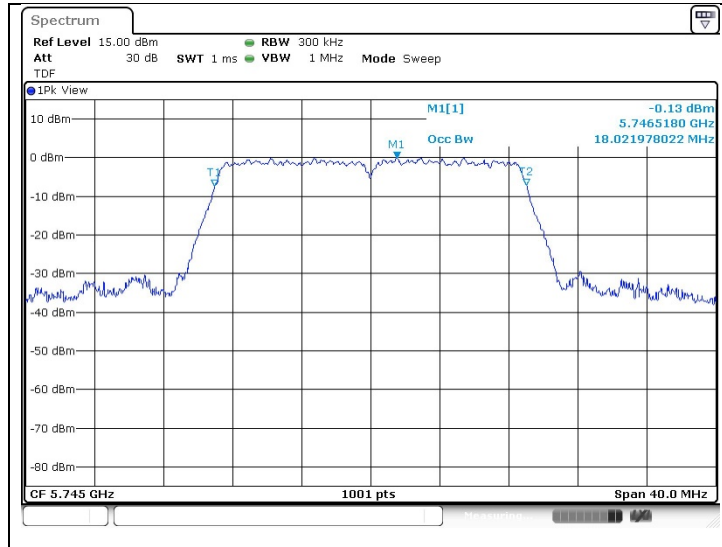


High Channel
 (5 240 MHz)

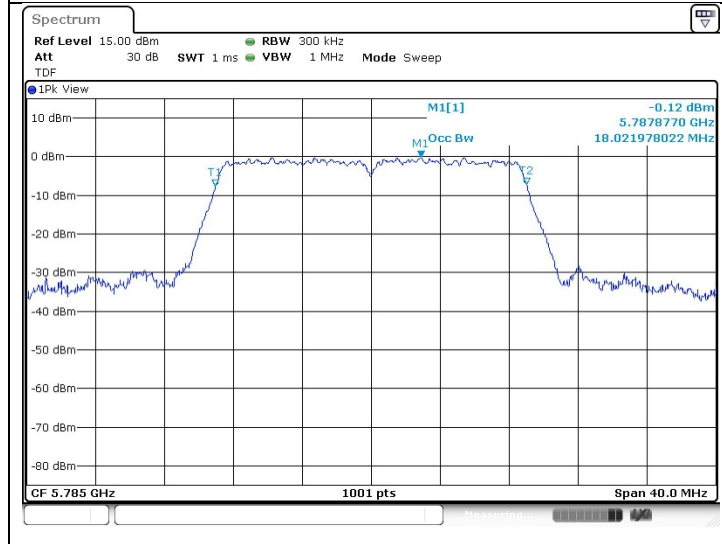


802.11n_HT20 (Band 3)

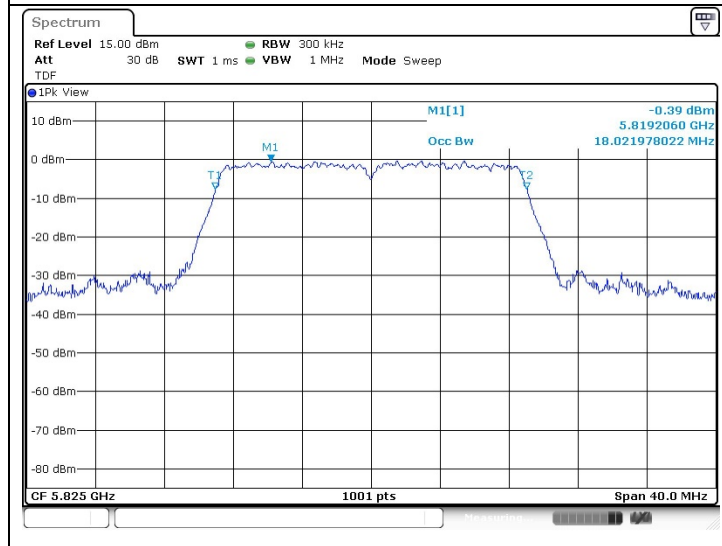
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)

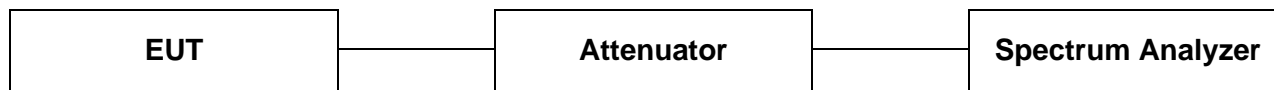


High Channel
(5 825 MHz)



4. 6 dB Bandwidth

4.1. Test Setup



4.2. Limit

According to §15.407(e), within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

4.3. Test Procedure

1. This measurement settings are specified in section II.C.2 of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Set RBW = 100 kHz.
3. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
4. Detector = Peak.
5. Trace mode = max hold.
6. Sweep = auto couple.
7. Allow the trace to stabilize.
8. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.4. Test Result

Ambient temperature : (23 ± 1) °C

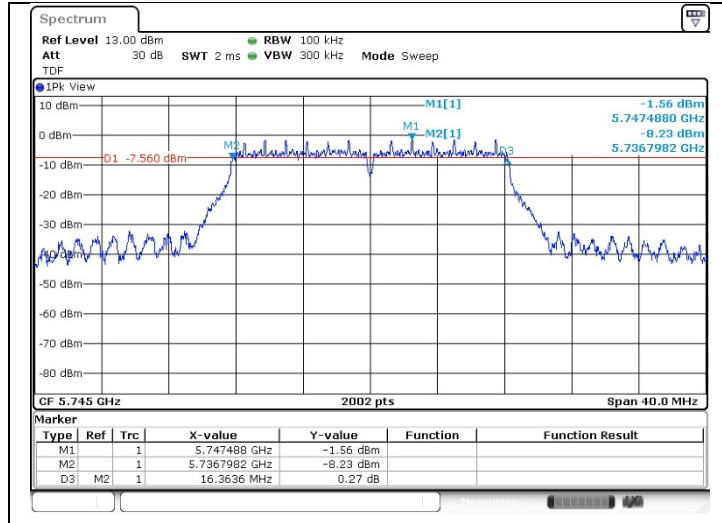
Relative humidity : 47 % R.H.

Band	Mode	Frequency (MHz)	Ch.	Data Rate (Mbps)	6 dB Bandwidth (MHz)	Minimum Bandwidth (kHz)
U-NII 3	11a	5 745	149	6	16.364	500
		5 785	157		16.384	
		5 825	165		16.364	
	11n_HT20	5 745	149	MCS0	17.602	
		5 785	157		17.622	
		5 825	165		17.602	

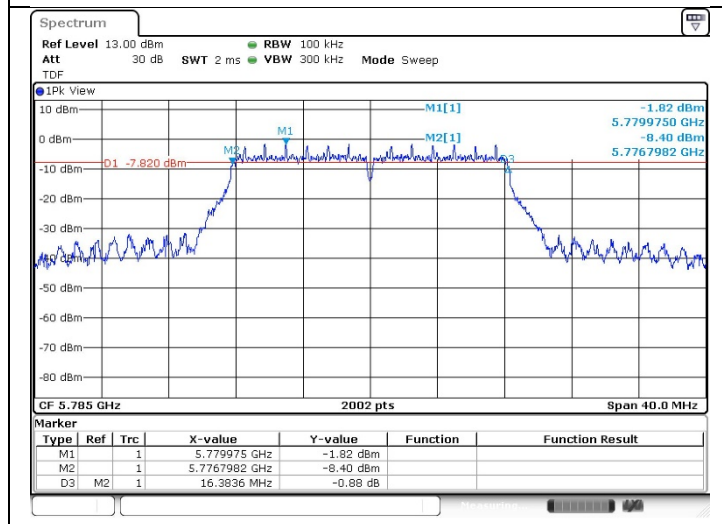
- Test plots

802.11a (Band 3)

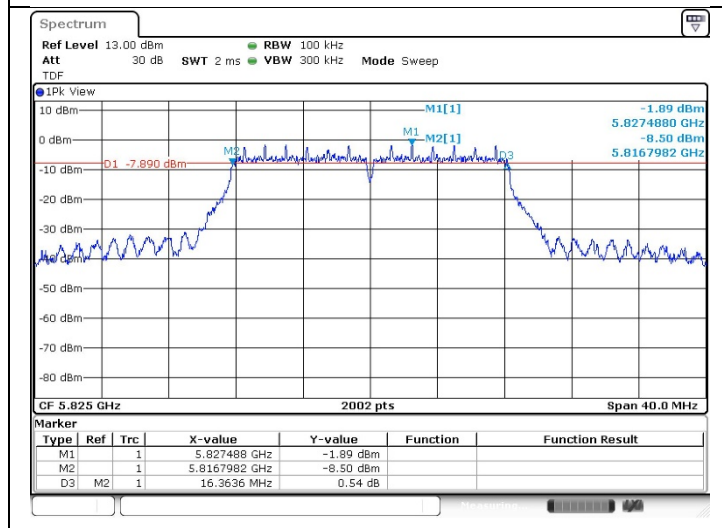
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)

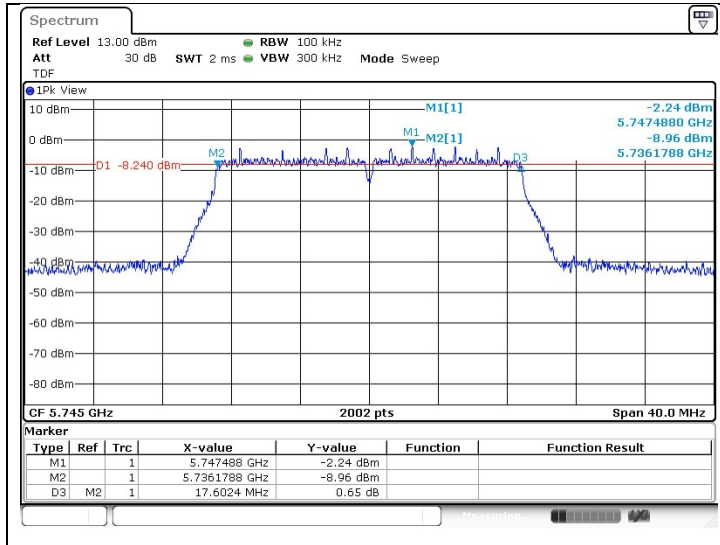


High Channel
(5 825 MHz)

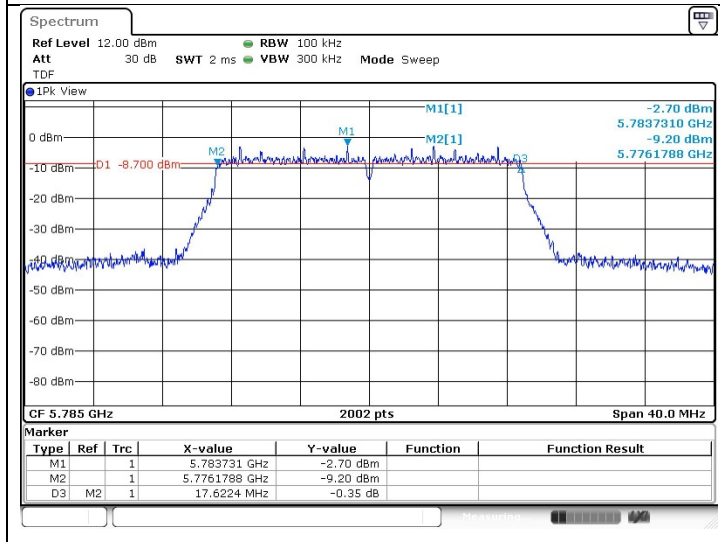


802.11n_HT20 (Band 3)

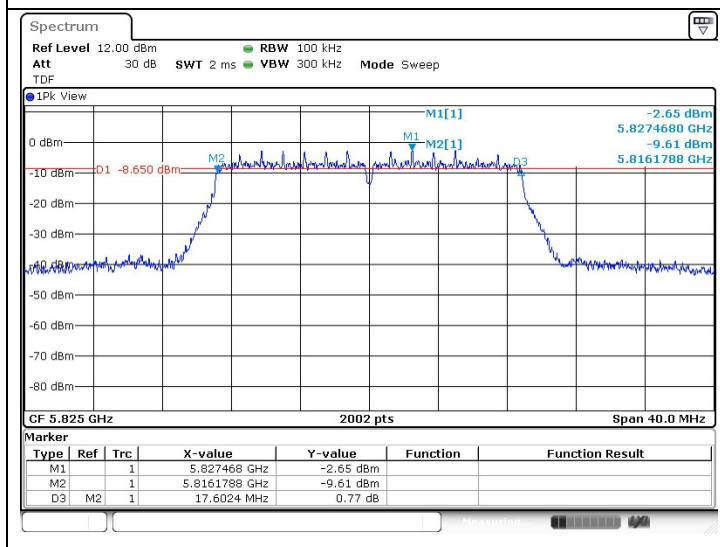
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)

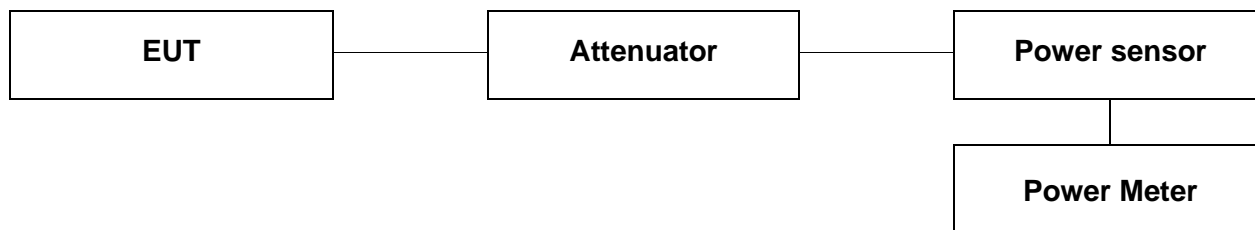


High Channel
(5 825 MHz)



5. Maximum Conducted Output Power

5.1. Test Setup



5.2. Limit

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dB i. In addition, the maximum power spectral density shall not exceed 11 dB m in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i.

According to 15.407(a)(3)(i)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dB m in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dB i are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB i. However, fixed point-to point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dB i without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple colocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

5.3. Test Procedure

1. This measurement settings are specified in section II.E.3.a of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
 - The EUT is configured to transmit continuously or to transmit with a consistent duty cycle.
 - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
 - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
3. If the transmitter does not transmit continuously, measure the duty cycle, x , of the transmitter output signal as described in section II.B.
4. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
5. Adjust the measurement in dBm by adding $10 \log (1/x)$ where x is the duty cycle (e.g., $10 \log (1/0.25)$ if the duty cycle is 25 %).

5.4. Test Result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Test mode: 11a

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	6	12.16	0.34	12.50
	5 220		12.06		12.40
	5 240		12.08		12.42
U-NII 3	5 745		10.74		11.08
	5 785		10.66		11.00
	5 825		10.41		10.75

Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			3.61	23.98
	5 220					
	5 240					
U-NII 3	5 745	30			3.77	30
	5 785					
	5 825					

Test mode: 11n_HT20

Band	Frequency (MHz)	Data Rate (Mbps)	Average Power (dB m)	Duty Cycle Correction Factor (dB)	Average Power Result (dB m)
U-NII 1	5 180	MCS0	11.38	-	11.38
	5 220		11.45		11.45
	5 240		11.48		11.48
U-NII 3	5 745		10.12		10.12
	5 785		10.05		10.05
	5 825		9.83		9.83

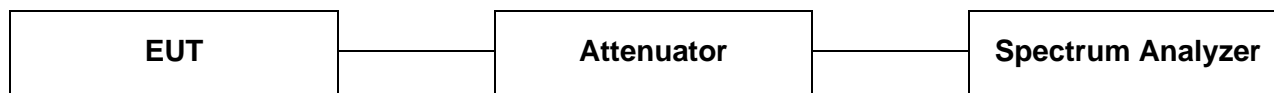
Band	Limit					
	Frequency (MHz)	Fixed Limit (dB m)	26 dB BW (MHz)	11+10LogB (dB m)	Antenna Gain (dB i)	Limit (dB m)
U-NII 1	5 180	23.98			3.61	23.98
	5 220					
	5 240					
U-NII 3	5 745	30			3.77	30
	5 785					
	5 825					

Remark;

- Average Power Result (dB m) = Average Power (dB m) + Duty Cycle Correction Factor (dB)

6. Peak Power Spectral Density

6.1. Test Setup



6.2. Limit

According to 15.407(a)(1)(iv)

For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to 15.407(a)(3)(i)

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

6.3. Test Procedure

1. This measurement settings are specified in section II.F of KDB 789033 D02 General UNII Test Procedures New Rules v02r01.
2. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power...". (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
3. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
4. Make the following adjustments to the peak value of the spectrum, if applicable:
 - a) **If Method SA-2 or SA-2 Alternative was used, add $10 \log(1/x)$, where x is the duty cycle, to the peak of the spectrum.**
 - b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
5. The result is the Maximum PSD over 1 MHz reference bandwidth.
6. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (*i.e.*, 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth ($< 1 \text{ MHz}$, or $< 500 \text{ kHz}$) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:
 - a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a).
 - b) Set $VBW \geq 3 \text{ RBW}$.
 - c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log(500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
 - d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log(1 \text{ MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
 - e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

6.4. Test Result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Test mode: 11a

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSP (dB m)	Duty Cycle Correction Factor (dB)	Final PPSP (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 180	36	6	0.21	0.34	0.55	11
	5 220	44		0.05		0.39	
	5 240	48		0		0.34	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSP (dB m)	Duty Cycle Correction Factor (dB)	Final PPSP (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 745	149	6	-3.85	0.34	-3.51	30
	5 785	157		-3.76		-3.42	
	5 825	165		-4.06		-3.72	

Test mode: 11n_HT20

Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSP (dB m)	Duty Cycle Correction Factor (dB)	Final PPSP (dB m)	Limit (dB m/1 MHz)
U-NII 1	5 180	36	MCS0	-0.91	-	-0.91	11
	5 220	44		-0.82		-0.82	
	5 240	48		-0.84		-0.84	
Band	Frequency (MHz)	Ch.	Data Rate (Mbps)	Measured PPSP (dB m)	Duty Cycle Correction Factor (dB)	Final PPSP (dB m)	Limit (dB m/500 kHz)
U-NII 3	5 745	149	MCS0	-4.46	-	-4.46	30
	5 785	157		-4.58		-4.58	
	5 825	165		-4.81		-4.81	

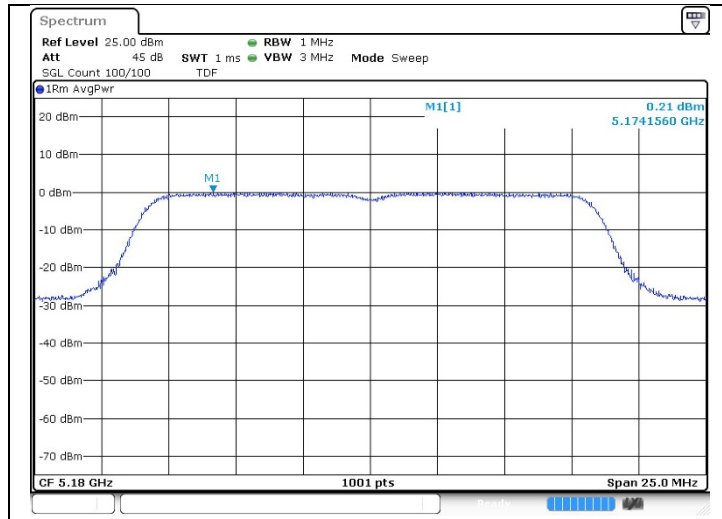
Remark;

- Final PPSP (dB m) = Measured PPSP (dB m) + Duty Cycle Correction Factor (dB)

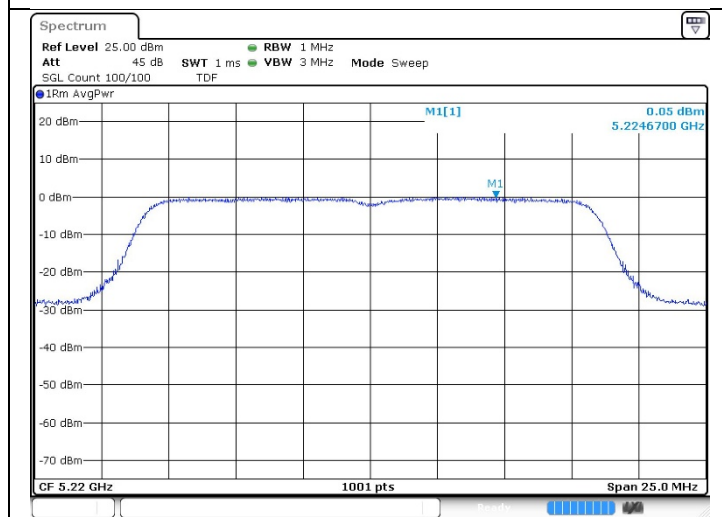
- Test plots

802.11a (Band 1)

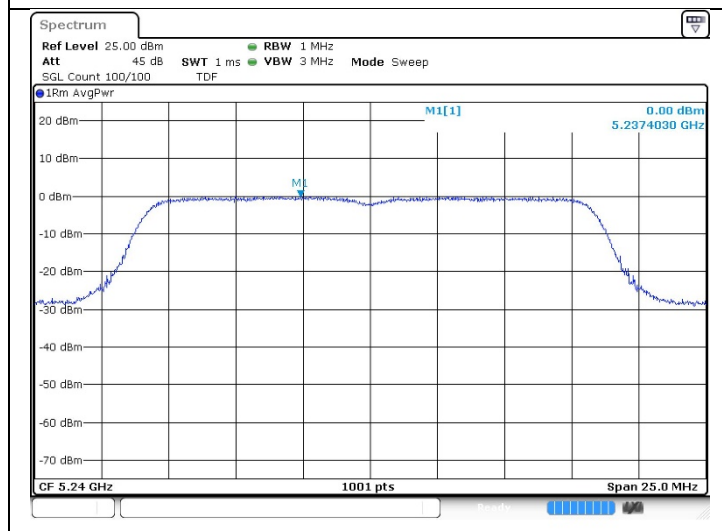
Low Channel
(5 180 MHz)



Middle Channel
(5 220 MHz)

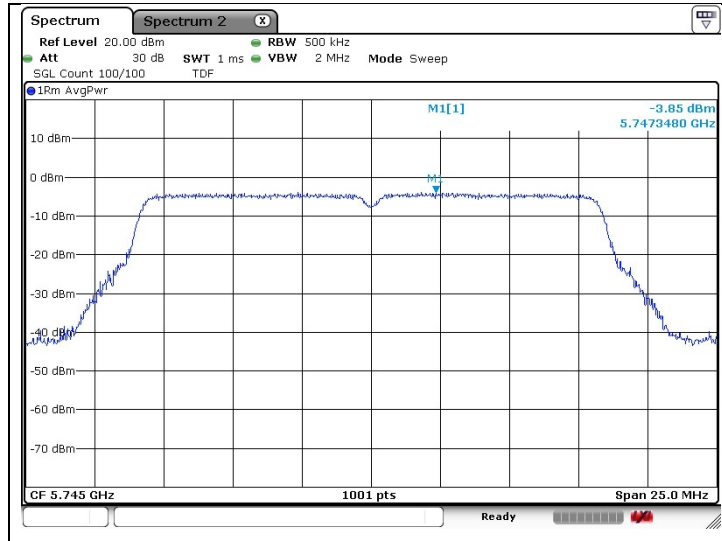


High Channel
(5 240 MHz)

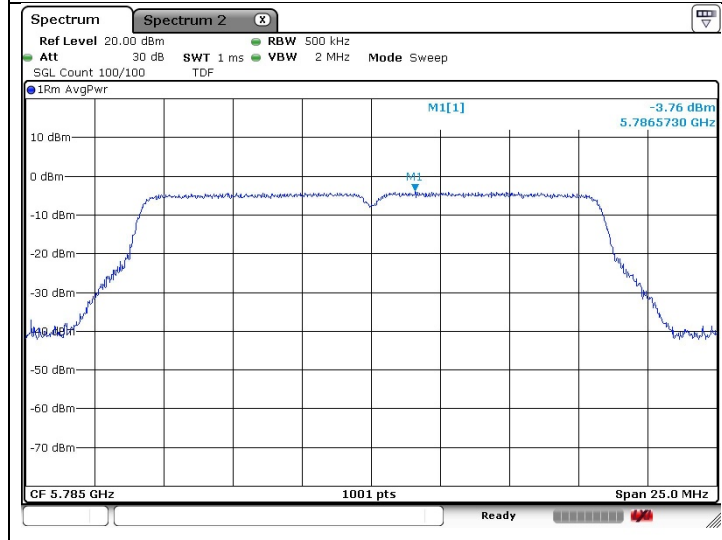


802.11a (Band 3)

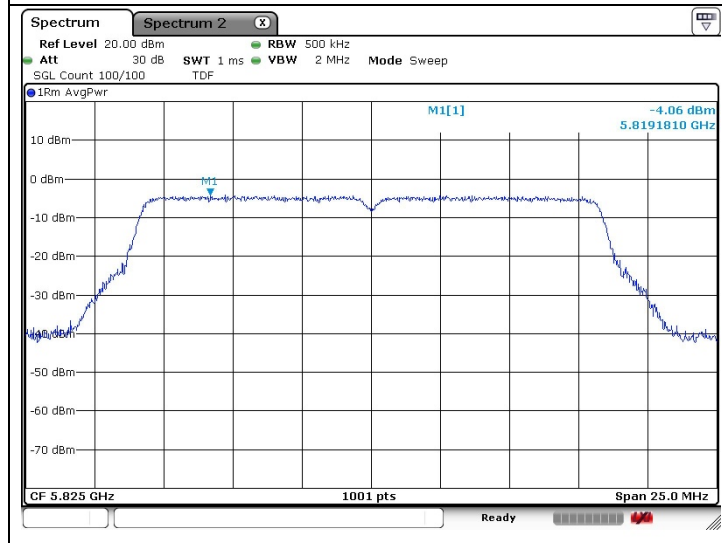
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)

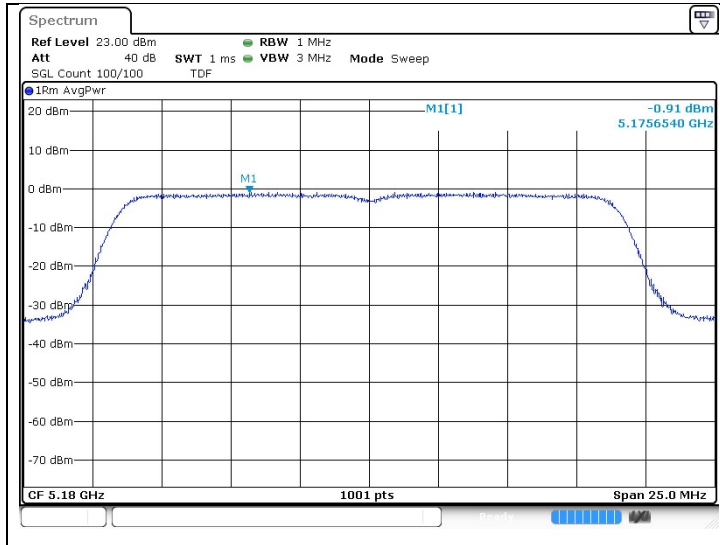


High Channel
(5 825 MHz)

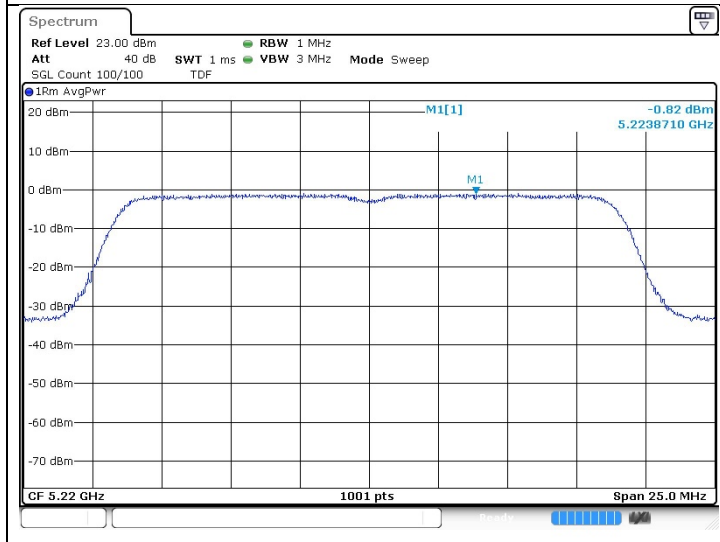


802.11n_HT20 (Band 1)

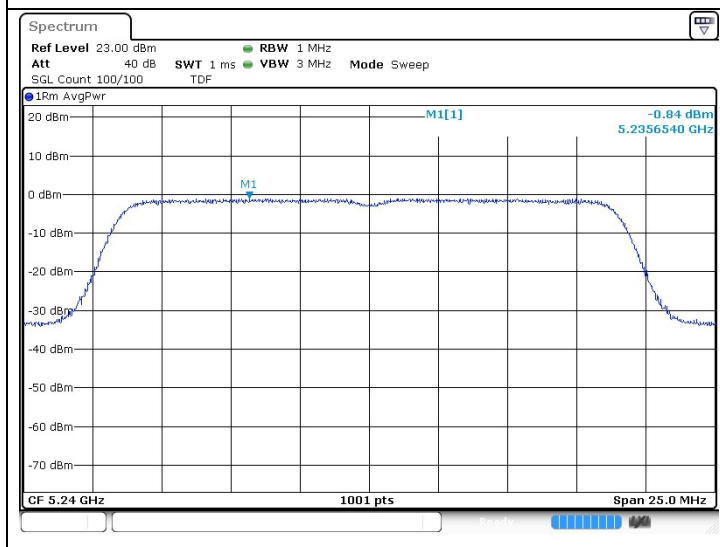
Low Channel
(5 180 MHz)



Middle Channel
(5 220 MHz)

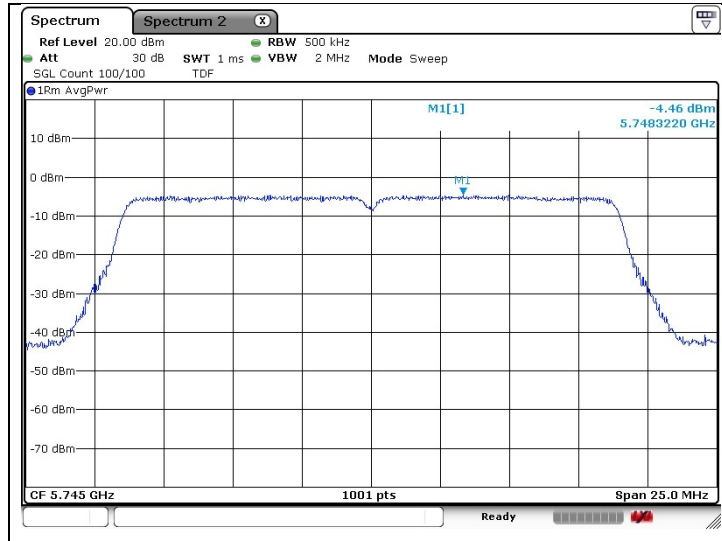


High Channel
(5 240 MHz)

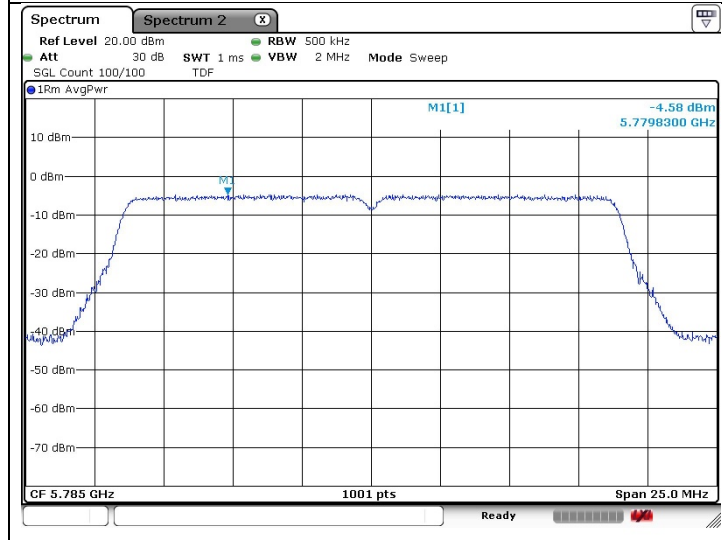


802.11n_HT20 (Band 3)

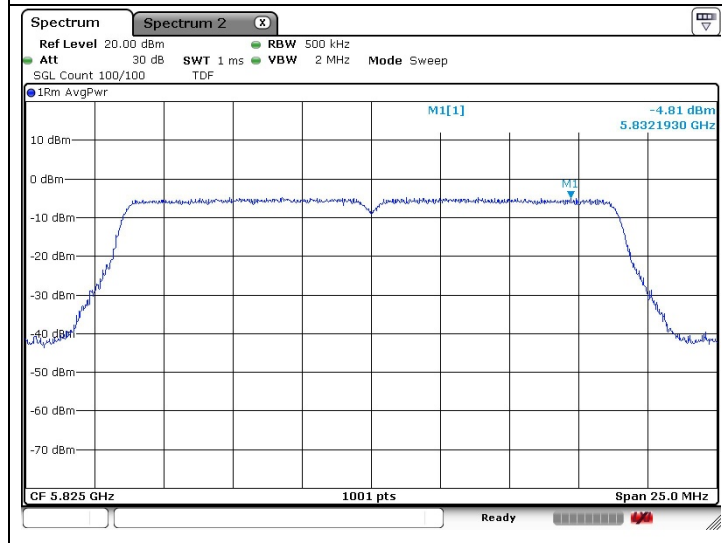
Low Channel
(5 745 MHz)



Middle Channel
(5 785 MHz)

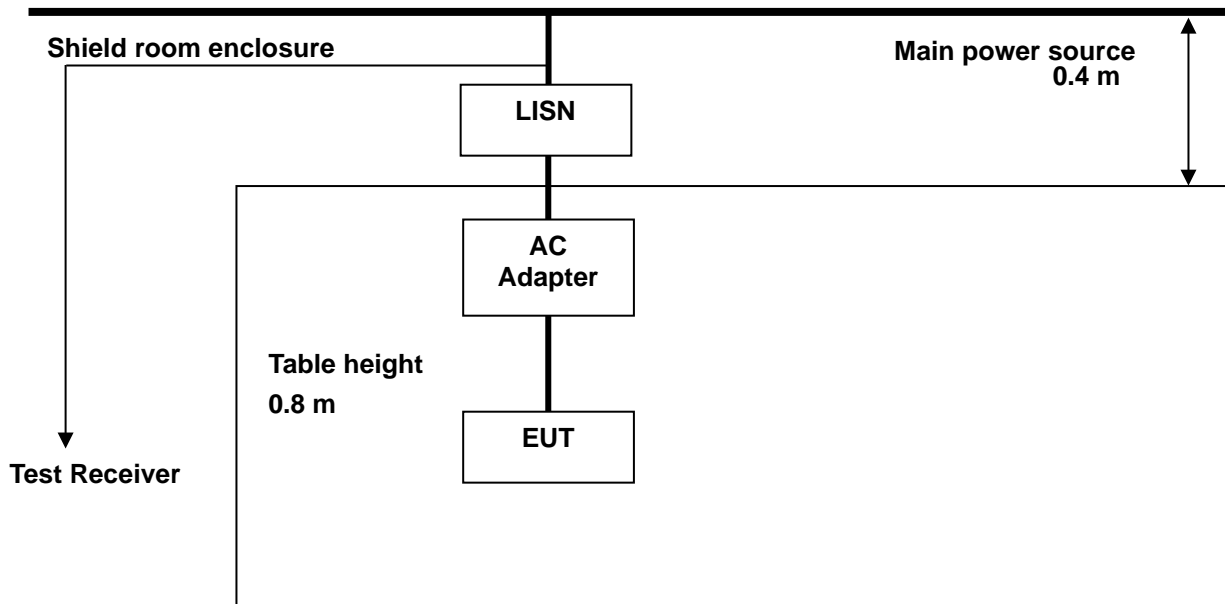


High Channel
(5 825 MHz)



7. AC Power Line Conducted Emission

7.1. Test Setup



7.2. Limit

According to §15.207(a), for an intentional radiator that 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 the limits in the following table, as measured using a 50 μ H / 50 ohms line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

7.3. Test Procedures

AC conducted emissions from the EUT were measured according to the dictates of ANSI C63.10-2013.

1. The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

7.4. Test Results

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

Frequency range : 0.15 MHz - 30 MHz
Measured Bandwidth : 9 kHz

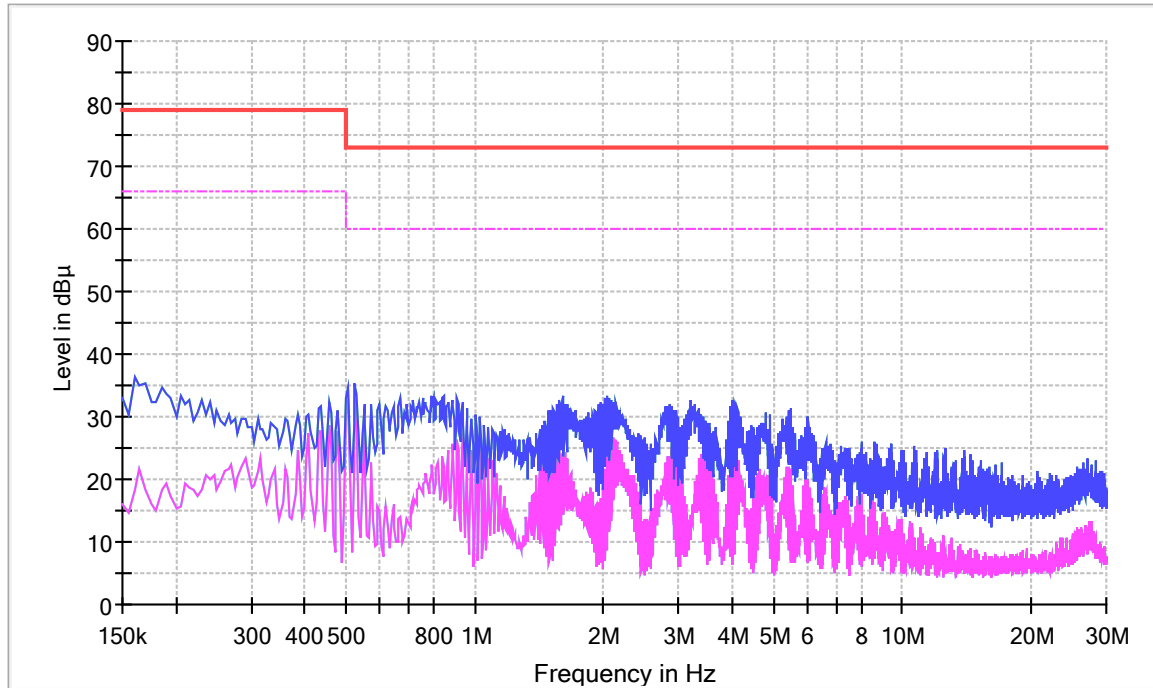
Freq. (MHz)	Level (dBμV)		Line	Limit (dBμV)		Margin (dB)	
	Quasi-peak	Average		Quasi-peak	Average	Quasi-peak	Average
2.10	37.90	30.00	H	56.00	46.00	18.10	16.00
2.83	35.60	26.50	H	56.00	46.00	20.40	19.50
3.38	34.70	26.30	H	56.00	46.00	21.30	19.70
4.07	35.00	24.70	H	56.00	46.00	21.00	21.30
5.41	36.30	28.00	H	60.00	50.00	23.70	22.00
6.01	34.40	25.40	H	60.00	50.00	25.60	24.60
0.53	34.60	33.80	N	56.00	46.00	21.40	12.20
1.61	27.30	21.70	N	56.00	46.00	28.70	24.30
2.06	31.40	26.10	N	56.00	46.00	24.60	19.90
2.83	28.50	21.80	N	56.00	46.00	27.50	24.20
4.07	30.00	24.90	N	56.00	46.00	26.00	21.10
5.51	24.60	21.30	N	60.00	50.00	35.40	28.70

Remark;

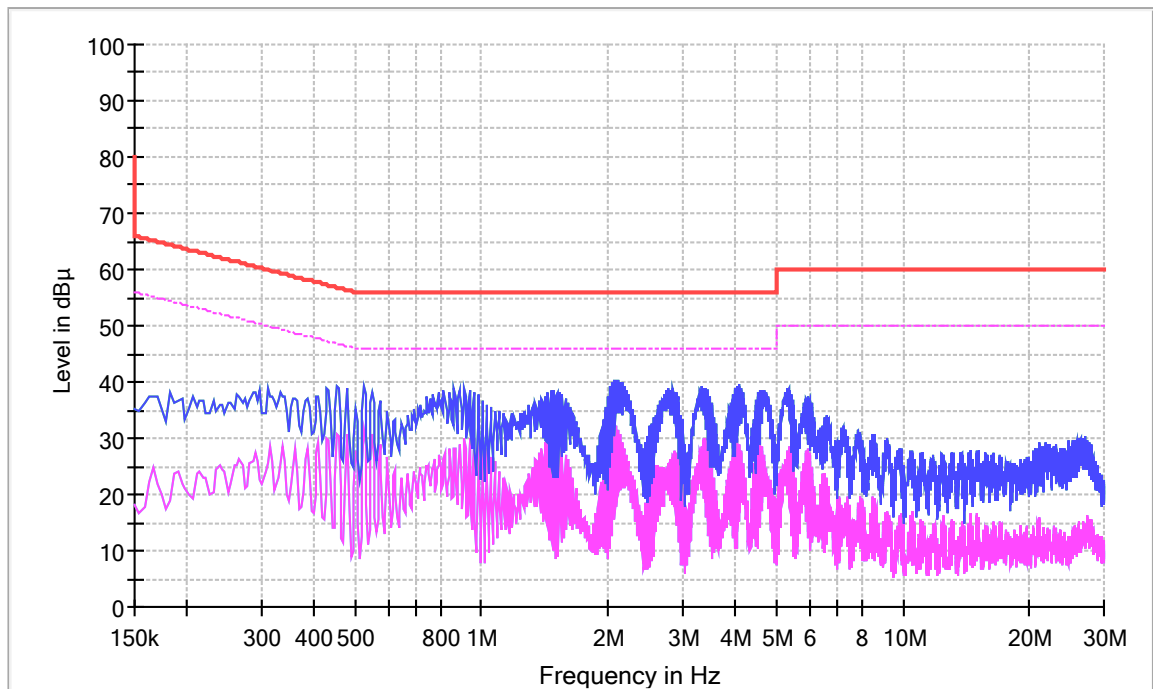
1. Line (H): Hot, Line (N): Neutral.
2. All modes and channels were investigated and the worst-case emissions were reported using **11a (Band 1) / 6Mbps / Low channel.**
3. The limit for Class B device(s) from 150 kHz to 30 MHz are specified in Section of the Title 47 CFR.
4. Traces shown in plot were made by using a Quasi-peak detector and average detector.
5. Deviations to the Specifications: None.

- Test plots

Test mode: (Neutral)



Test mode: (Hot)



8. Antenna Requirement

8.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. And according to FCC 47 CFR Section §15.407(a) if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

8.2. Antenna Connected Construction

Antenna used in this product is PCB pattern antenna with following gain.

Frequency range	Antenna gain
5 150 MHz ~ 5 250 MHz	3.61 dBi
5 725 MHz ~ 5 850 MHz	3.77 dBi

- End of the Test Report -