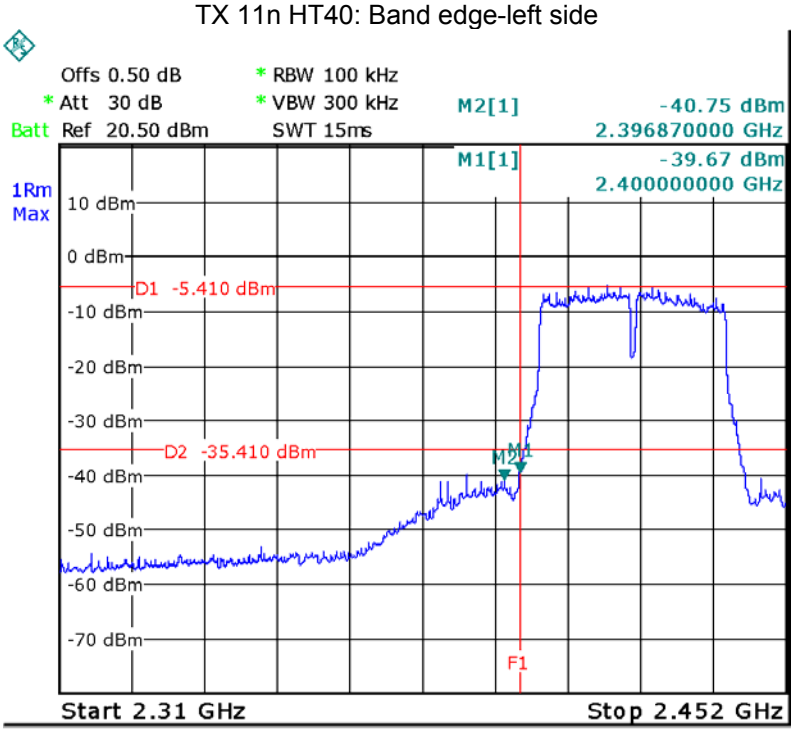
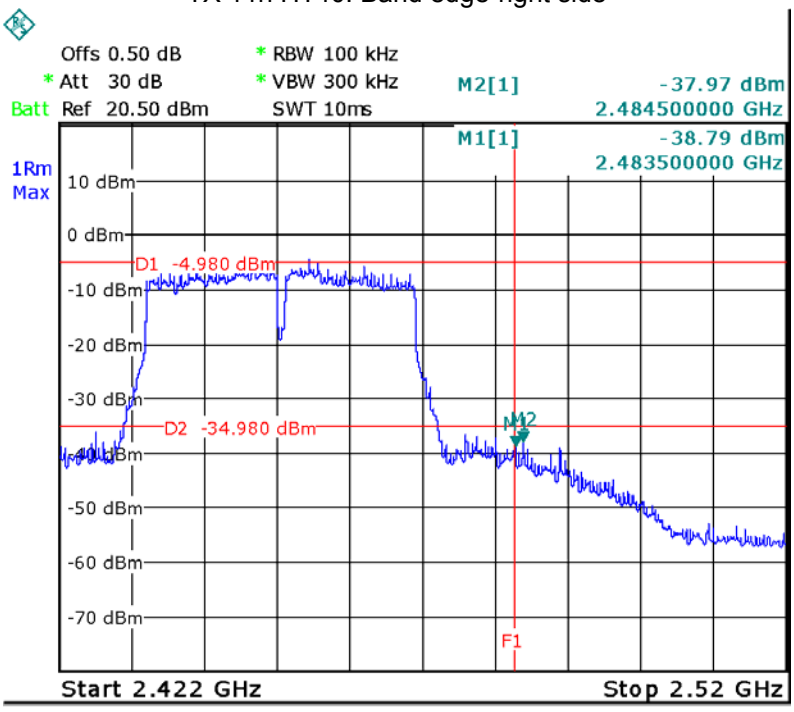
TX 11n HT40: Band edge-left side

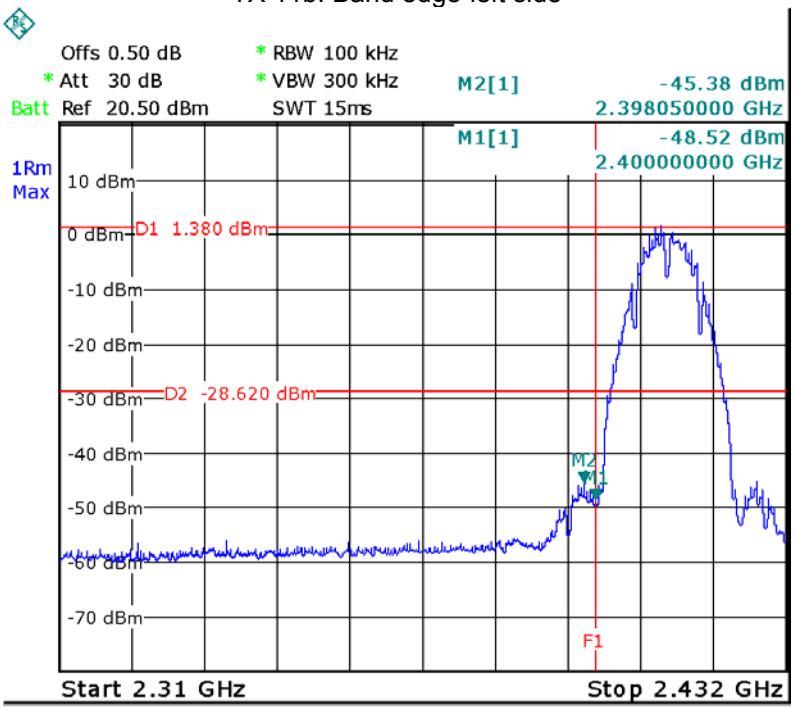


TX 11n HT40: Band edge-right side

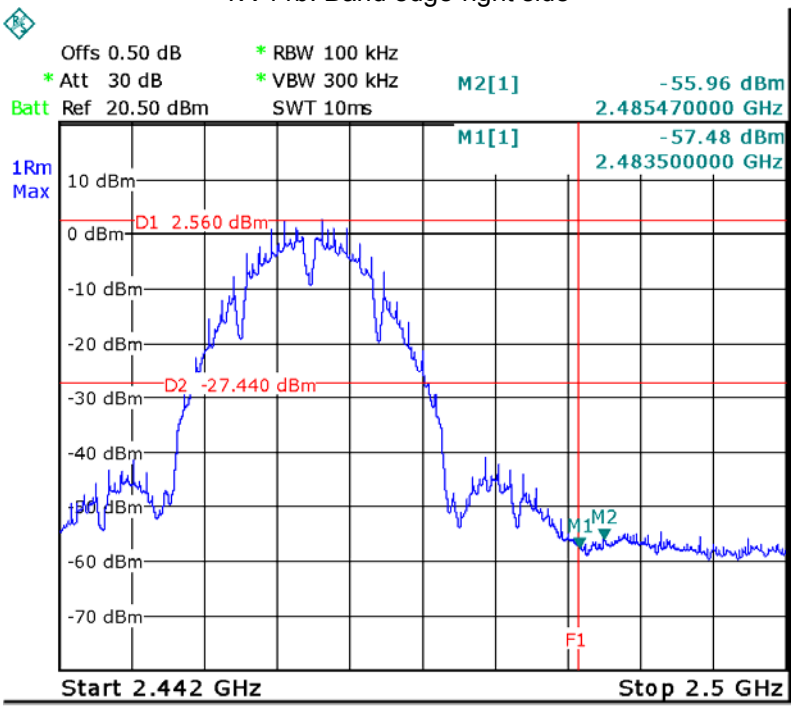


Antenna 1

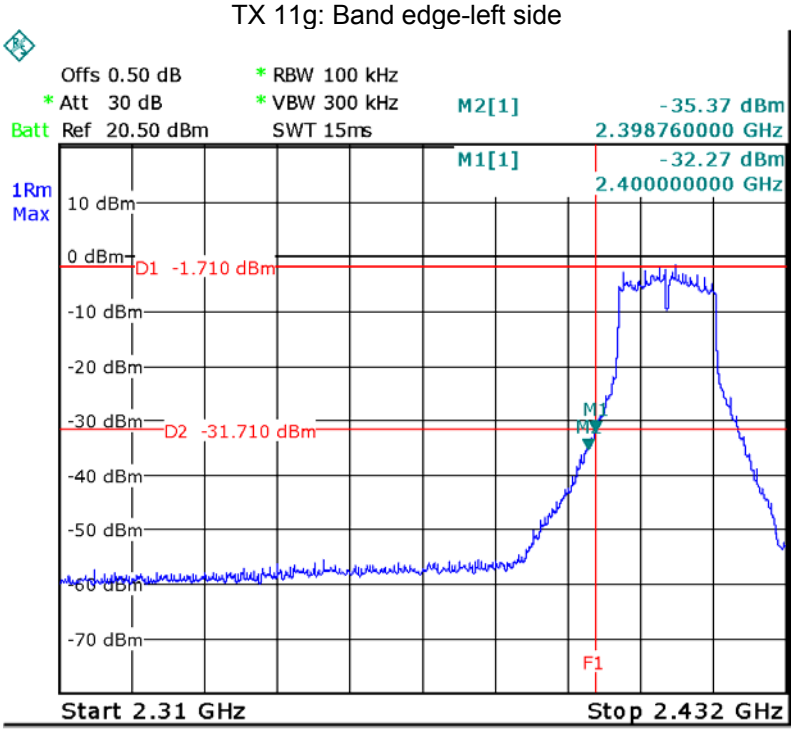
TX 11b: Band edge-left side



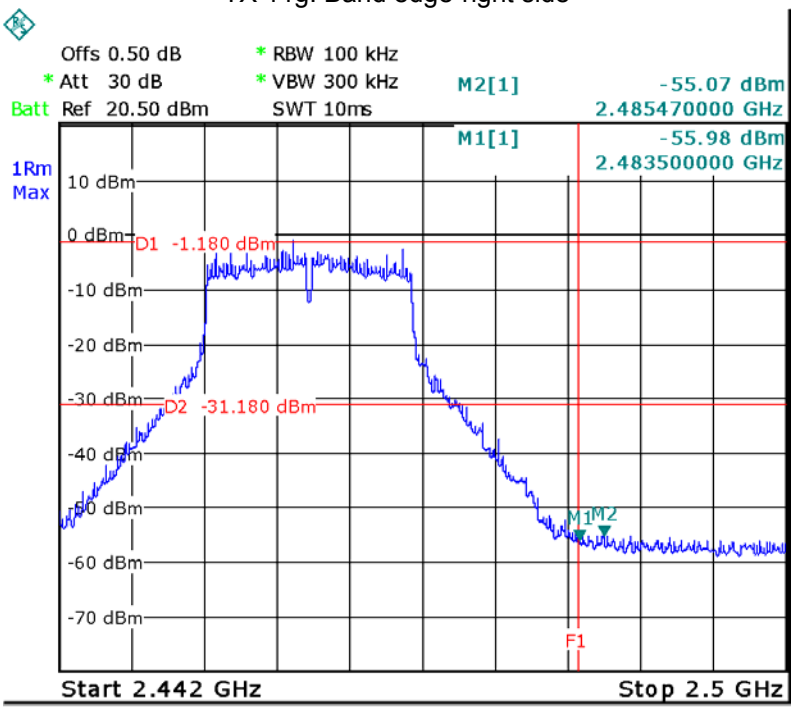
TX 11b: Band edge-right side



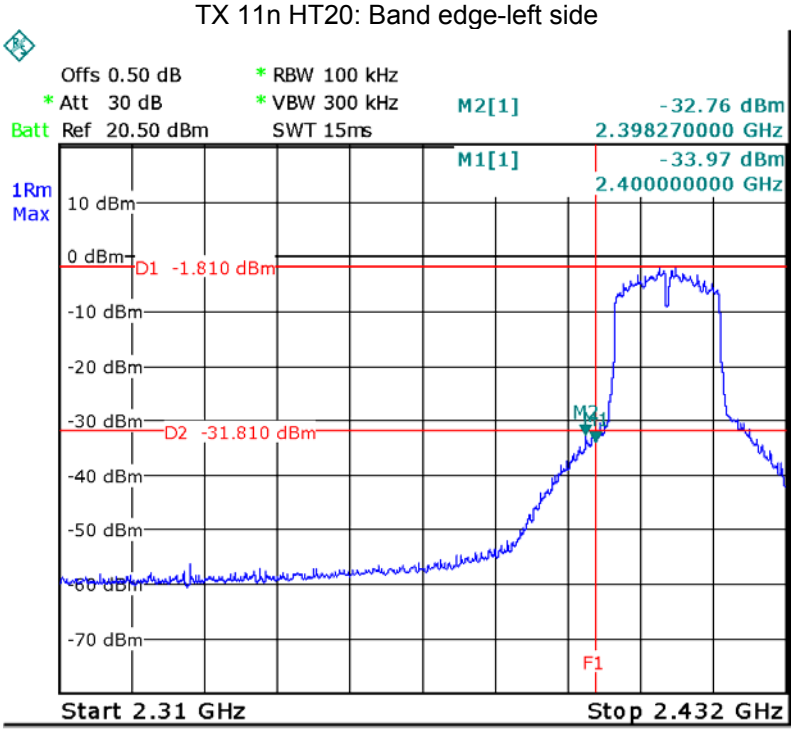
TX 11g: Band edge-left side



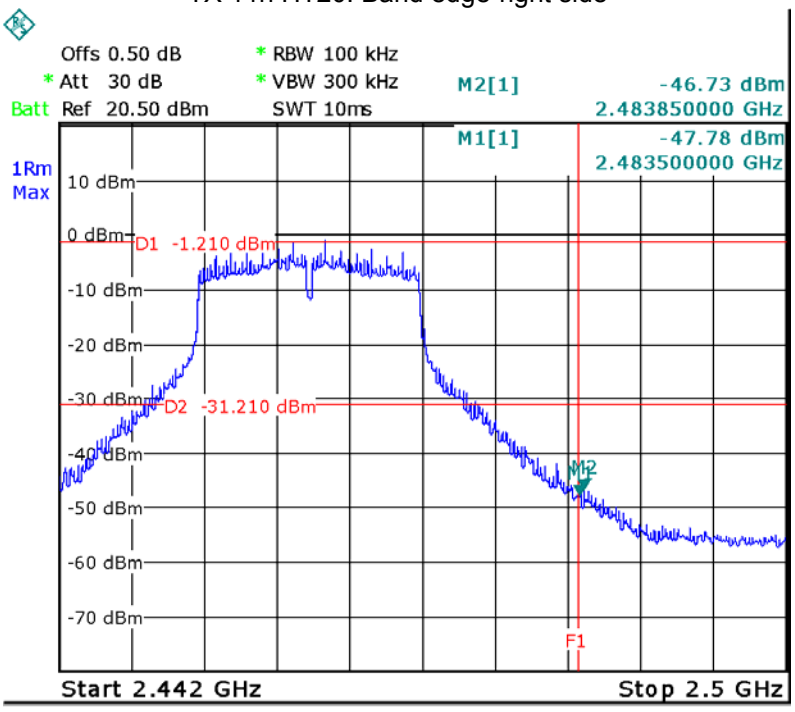
TX 11g: Band edge-right side



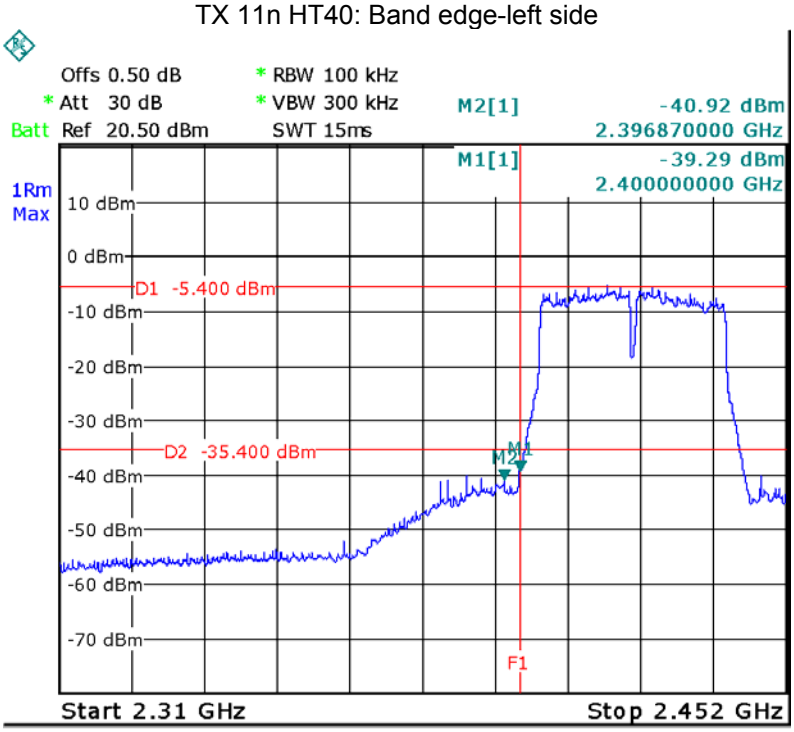
TX 11n HT20: Band edge-left side



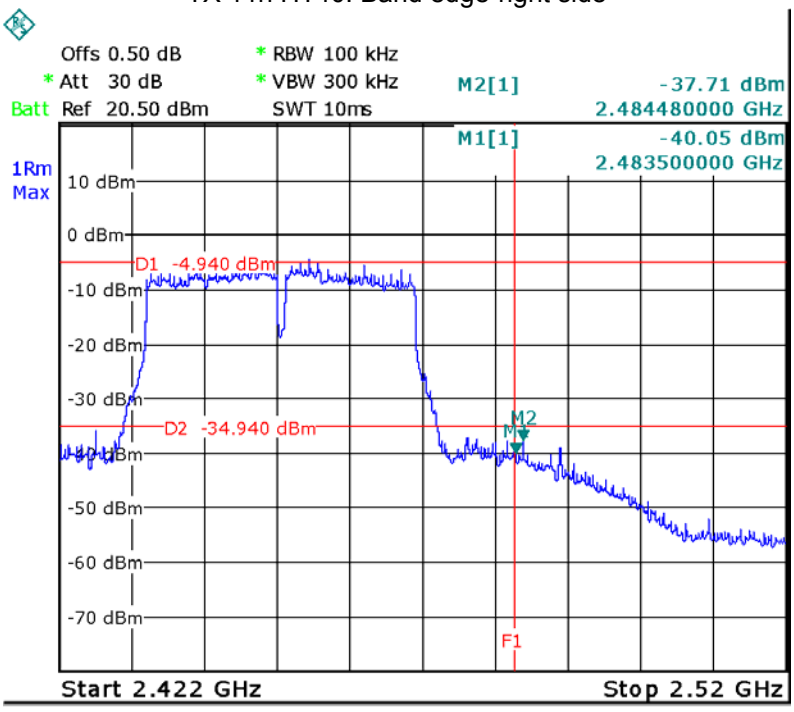
TX 11n HT20: Band edge-right side



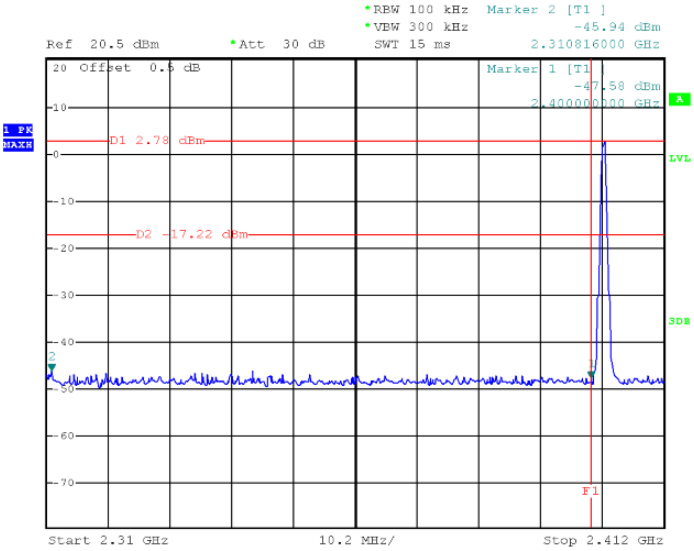
TX 11n HT40: Band edge-left side



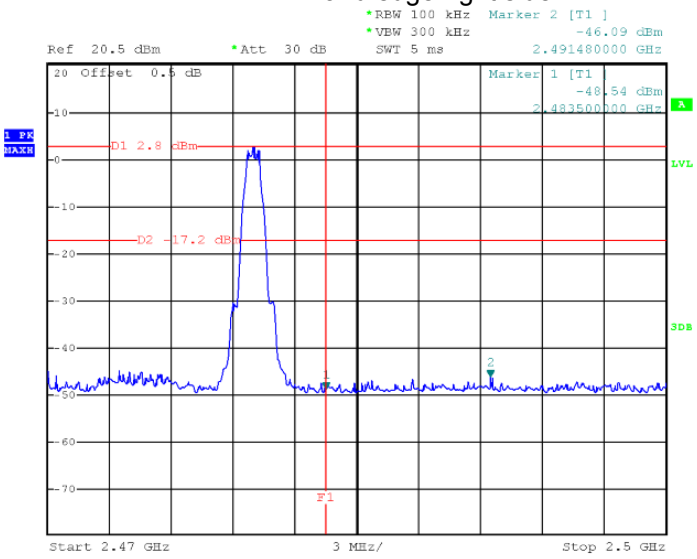
TX 11n HT40: Band edge-right side



BLE: Band edge-left side



BLE: Band edge-right side



10 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

10.2 Test Result:

Table 1: Antenna 0

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.03	13.29
	Channel 6	9.996	13.32
	Channel 11	9.992	13.32
TX 11g	Channel 1	16.12	16.67
	Channel 6	16.02	16.67
	Channel 11	15.82	16.67
TX 11n HT20	Channel 1	16.22	17.89
	Channel 6	16.28	17.95
	Channel 11	16.49	17.89
TX 11n HT40	Channel 3	35.79	36.56
	Channel 6	35.72	36.67
	Channel 9	35.98	36.67

Table 2: Antenna 1

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.06	13.29
	Channel 6	9.996	13.32
	Channel 11	9.992	13.32
TX 11g	Channel 1	15.47	16.67
	Channel 6	15.37	16.67
	Channel 11	15.42	16.72
TX 11n HT20	Channel 1	16.87	17.89
	Channel 6	16.28	17.89
	Channel 11	16.76	17.89
TX 11n HT40	Channel 3	35.57	36.67
	Channel 6	35.61	36.67
	Channel 9	36.65	36.57

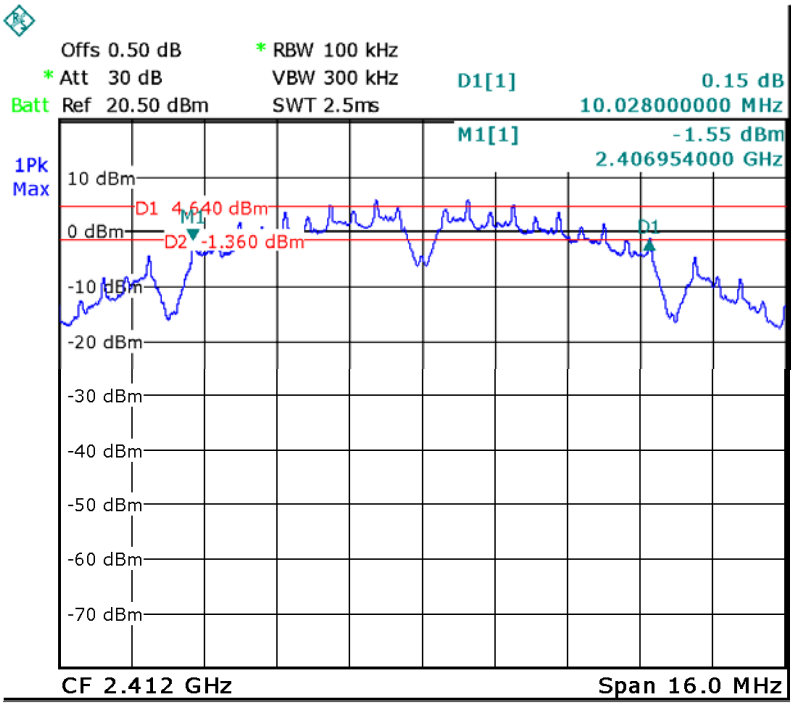
Table 3:

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
BLE	Channel 0	0.672	1.038
	Channel 19	0.666	1.038
	Channel 39	0.666	1.038

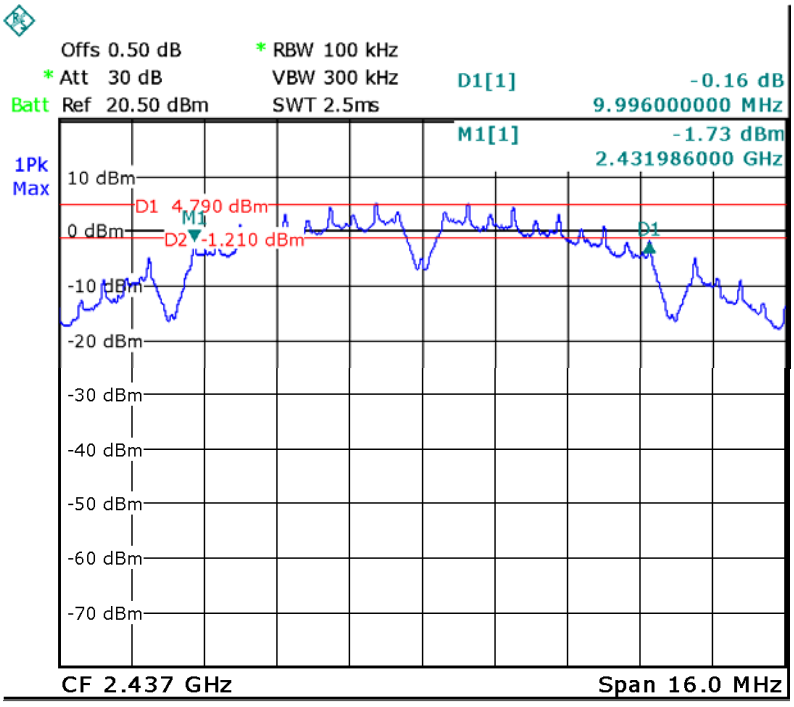
Test result plot:

6dB Bandwidth (Antenna 0)

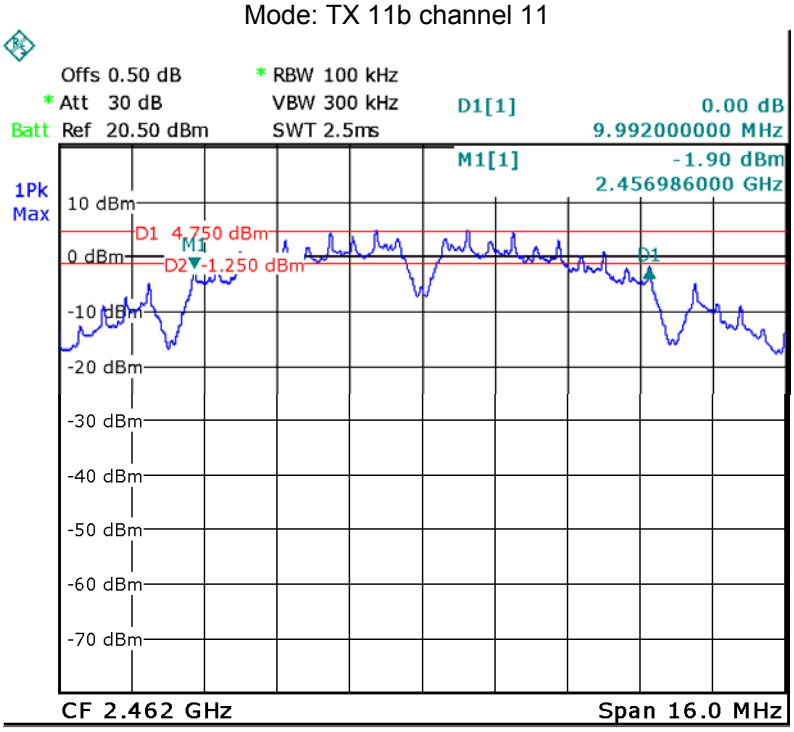
Mode: TX 11b channel 1



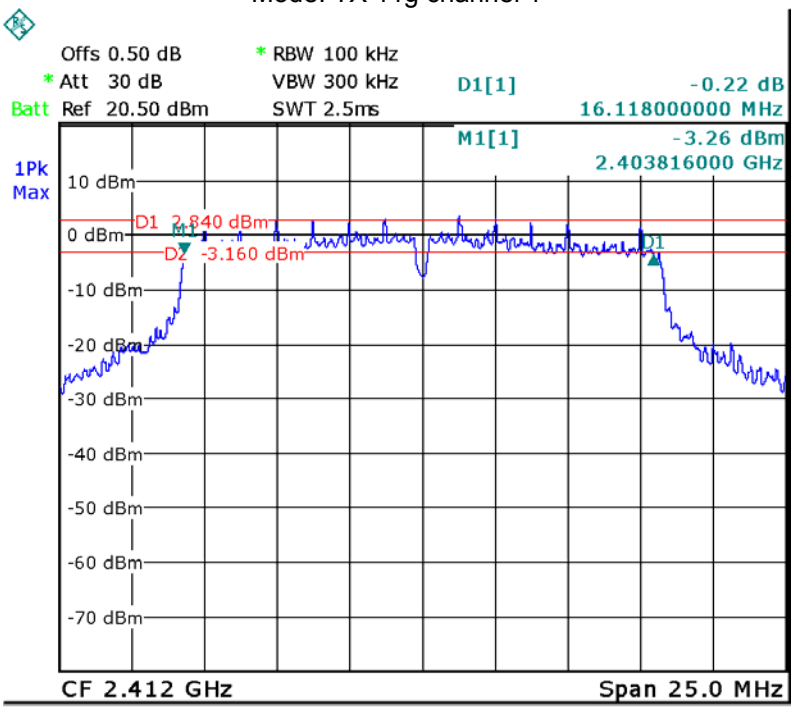
Mode: TX 11b channel 6



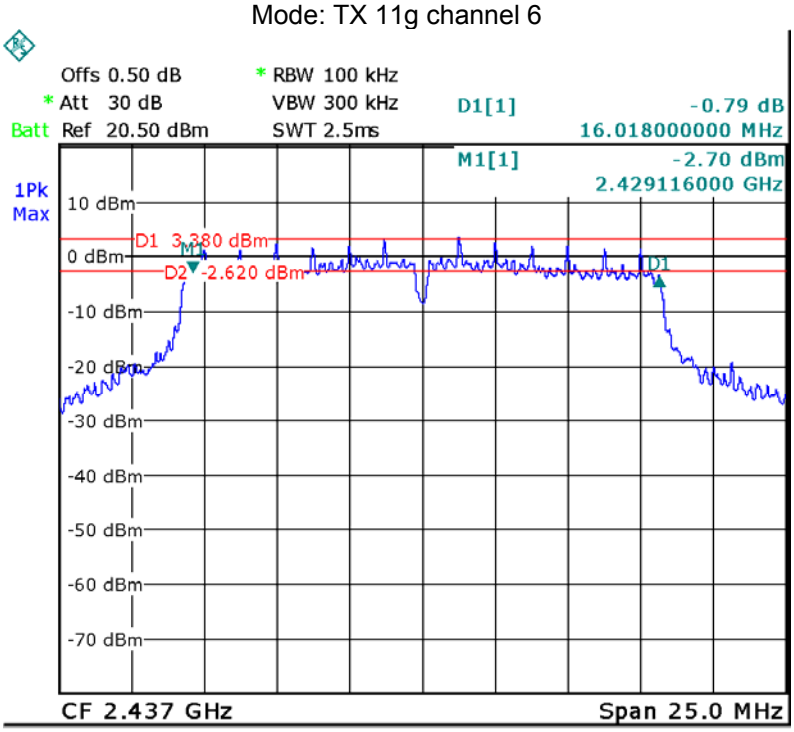
Mode: TX 11b channel 11



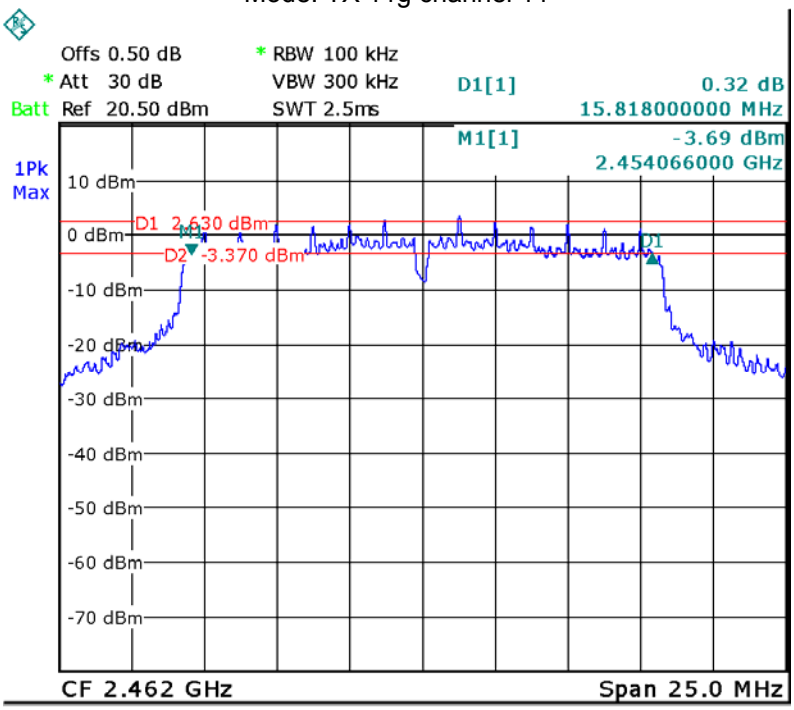
Mode: TX 11g channel 1



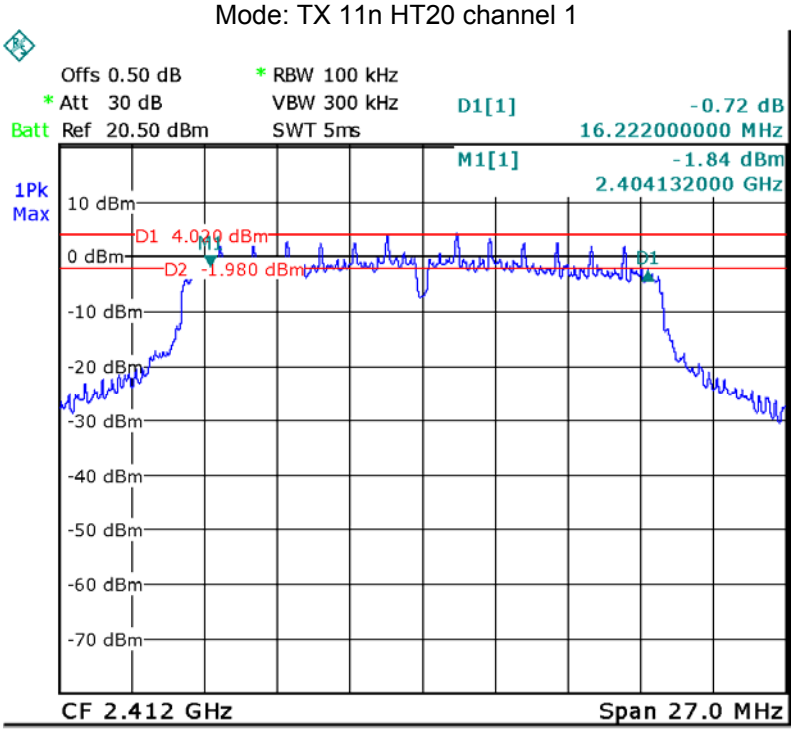
Mode: TX 11g channel 6



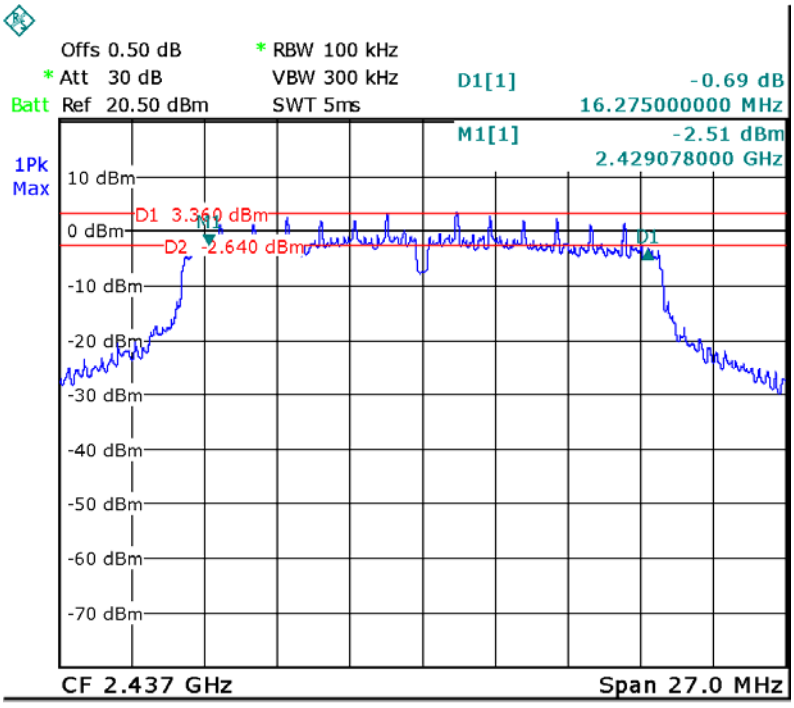
Mode: TX 11g channel 11



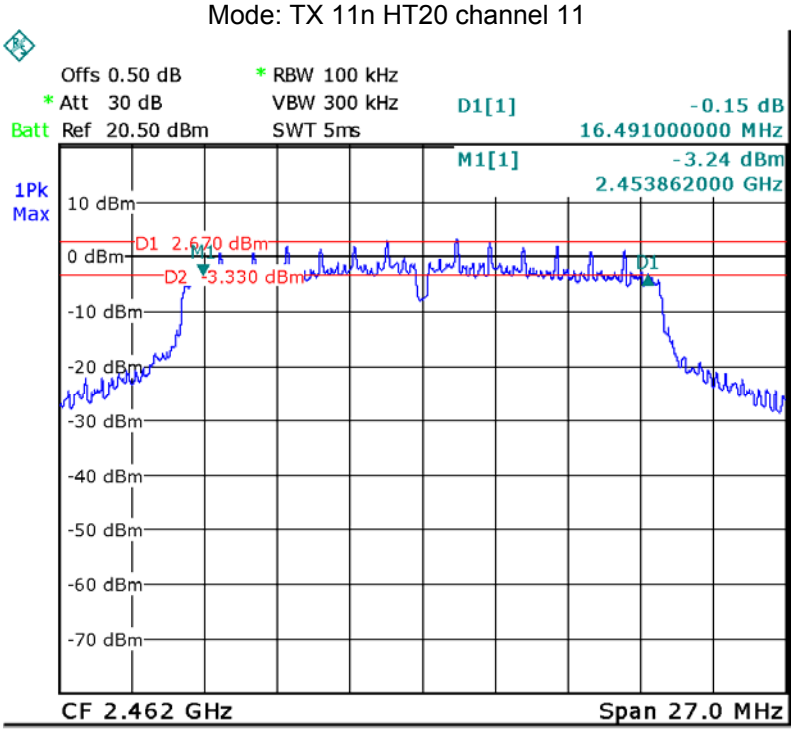
Mode: TX 11n HT20 channel 1



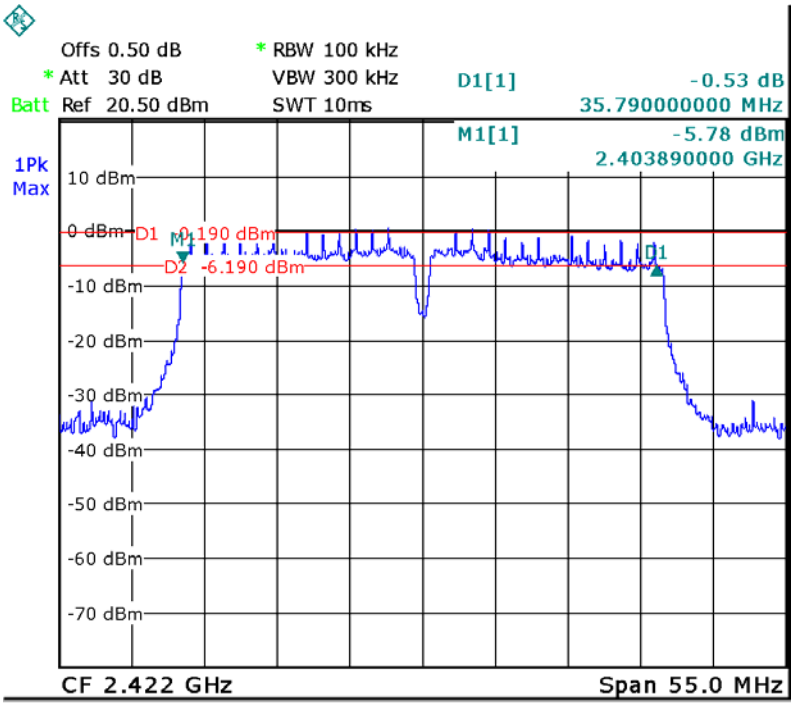
Mode: TX 11n HT20 channel 6



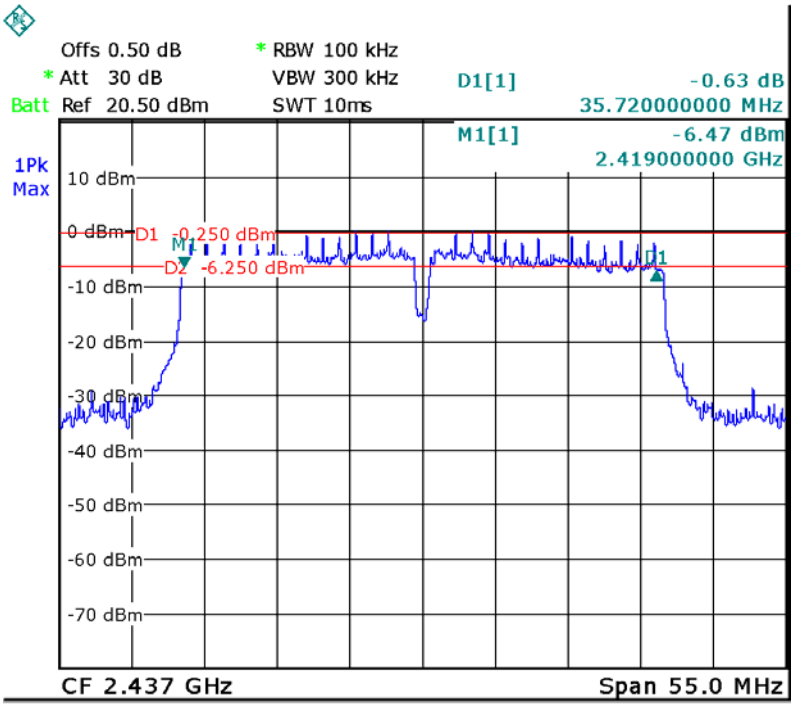
Mode: TX 11n HT20 channel 11



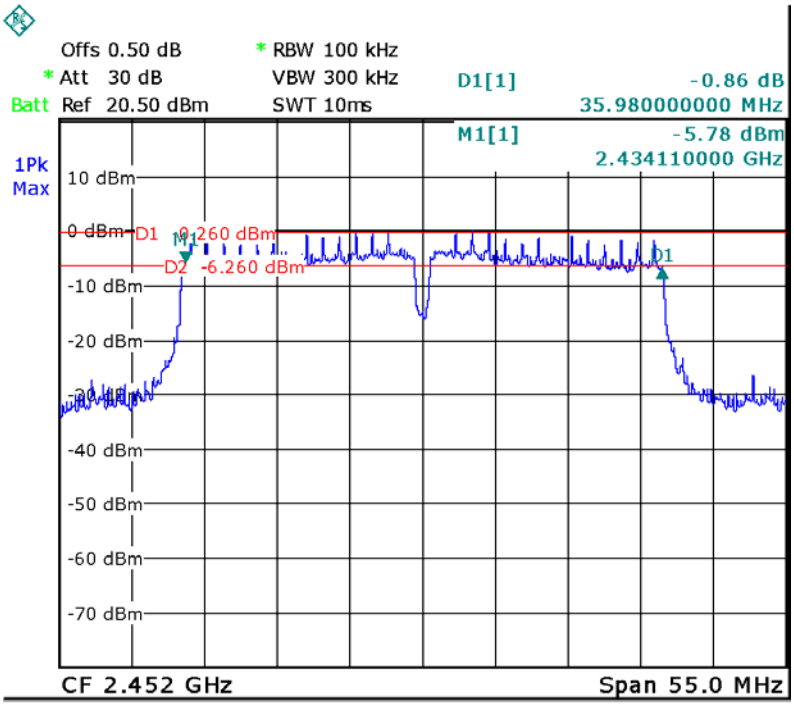
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

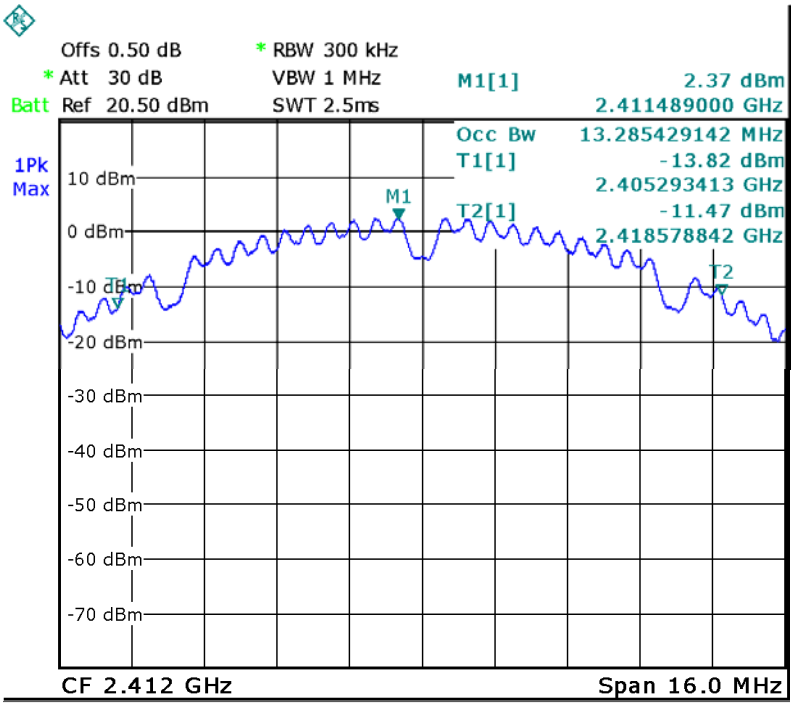


Mode: TX 11n HT40 channel 9

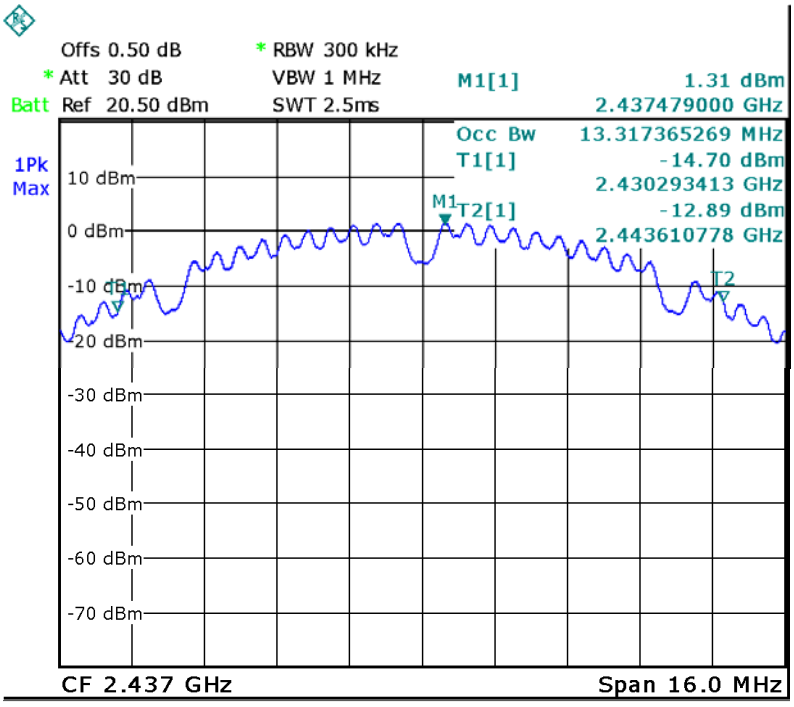


99% Bandwidth(Antenna 0)

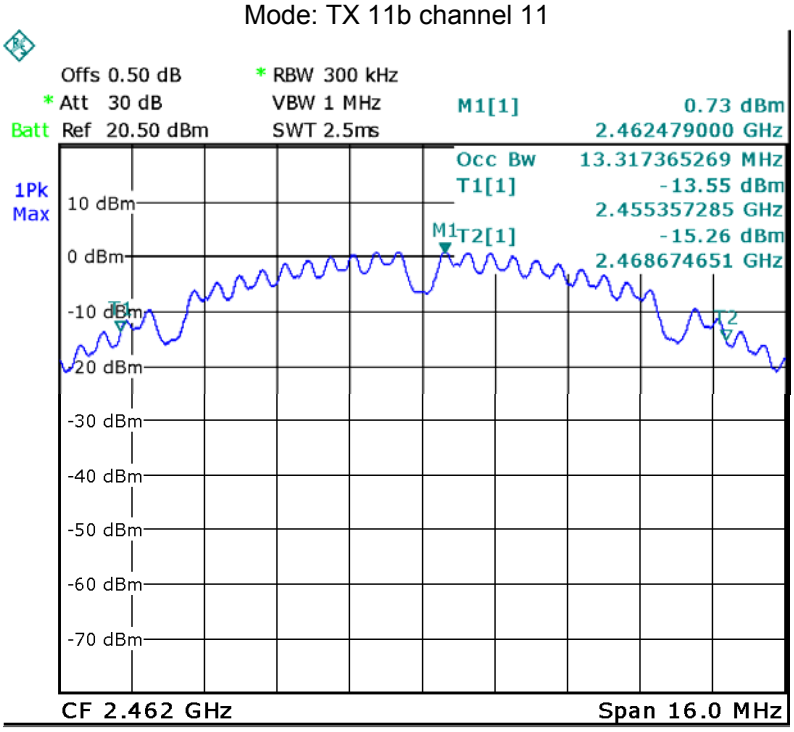
Mode: TX 11b channel 1



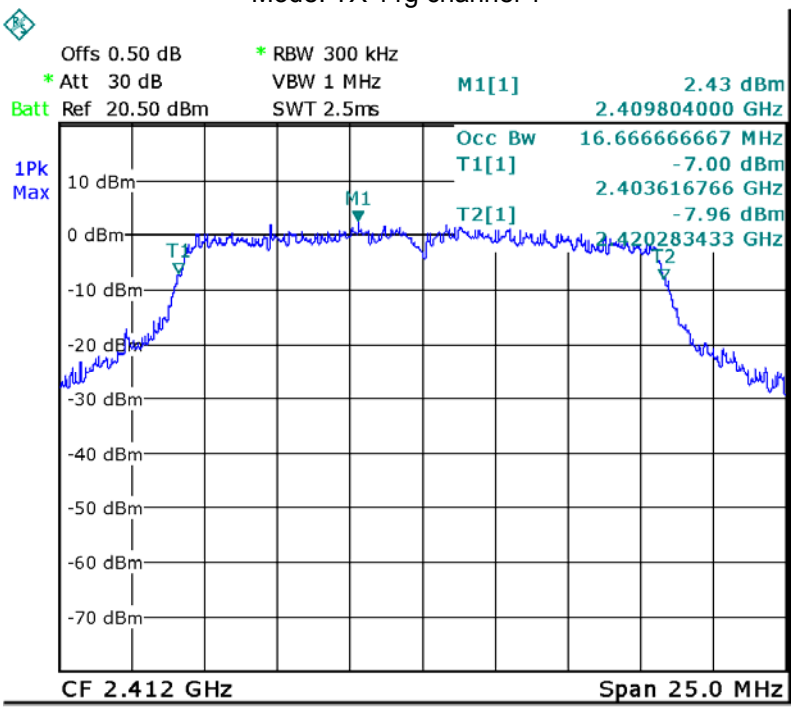
Mode: TX 11b channel 6



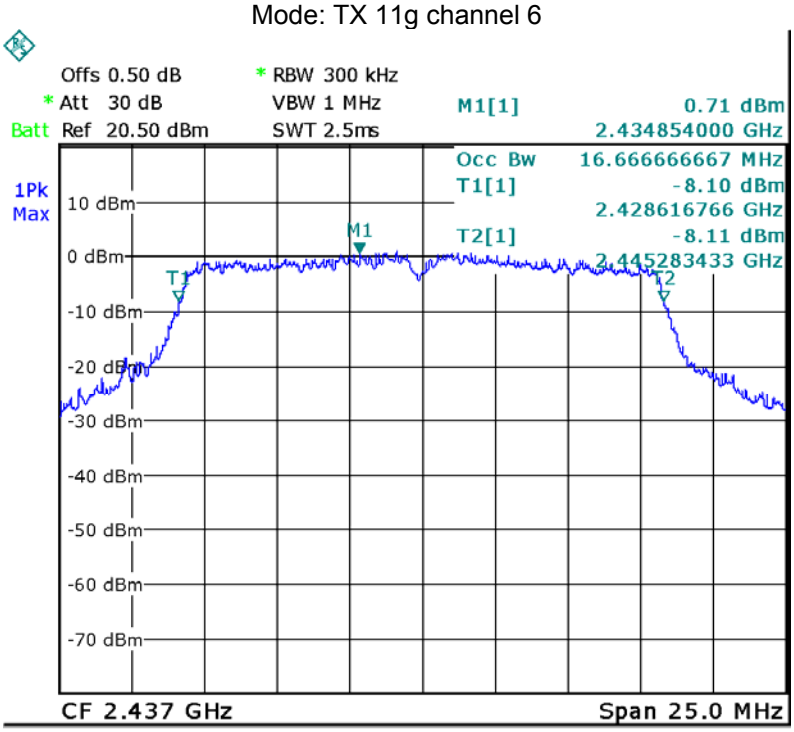
Mode: TX 11b channel 11



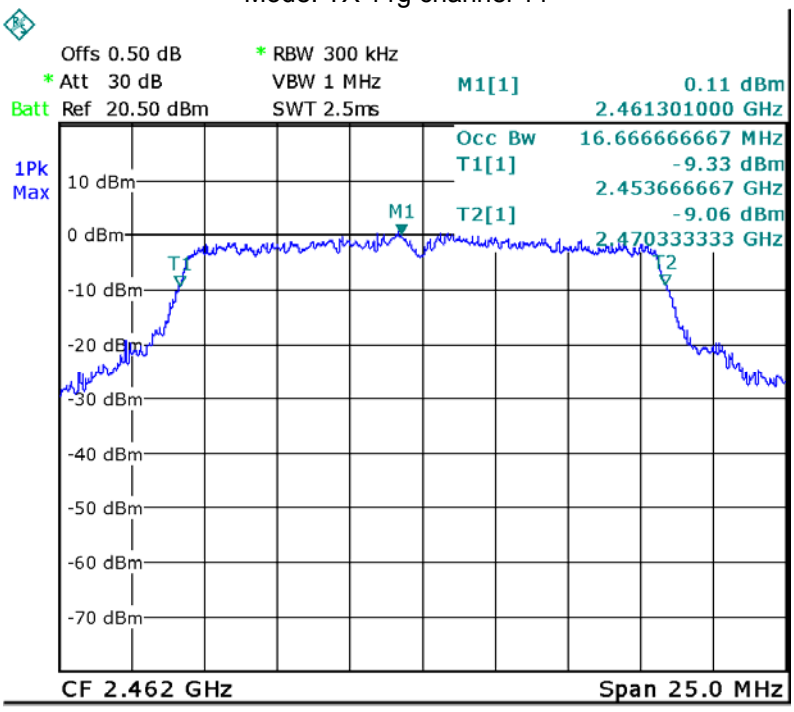
Mode: TX 11g channel 1



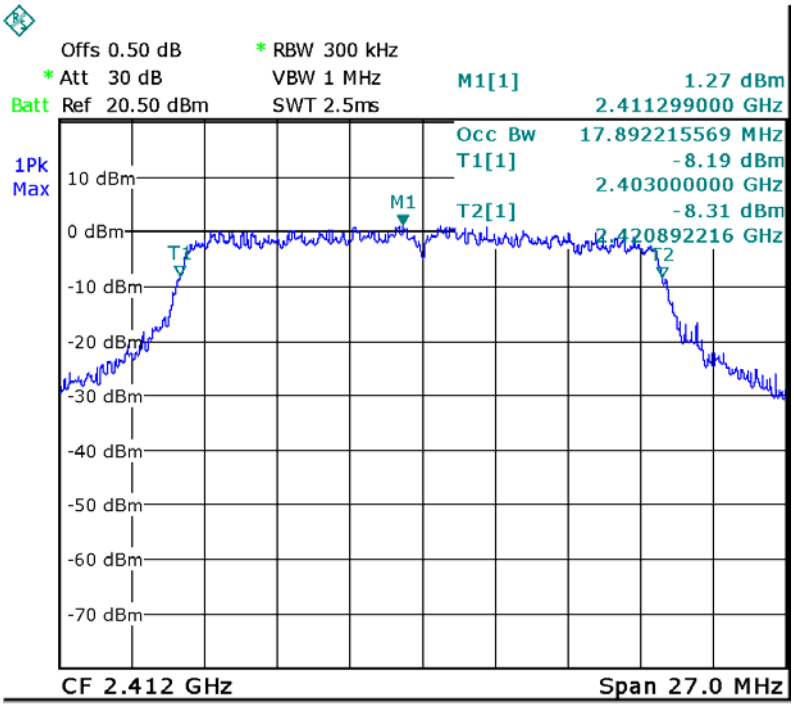
Mode: TX 11g channel 6



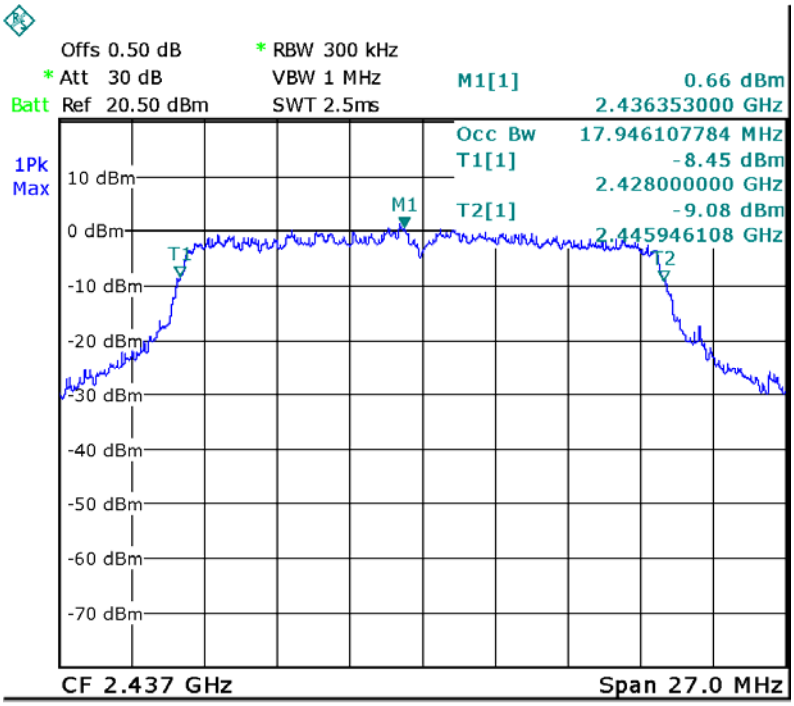
Mode: TX 11g channel 11



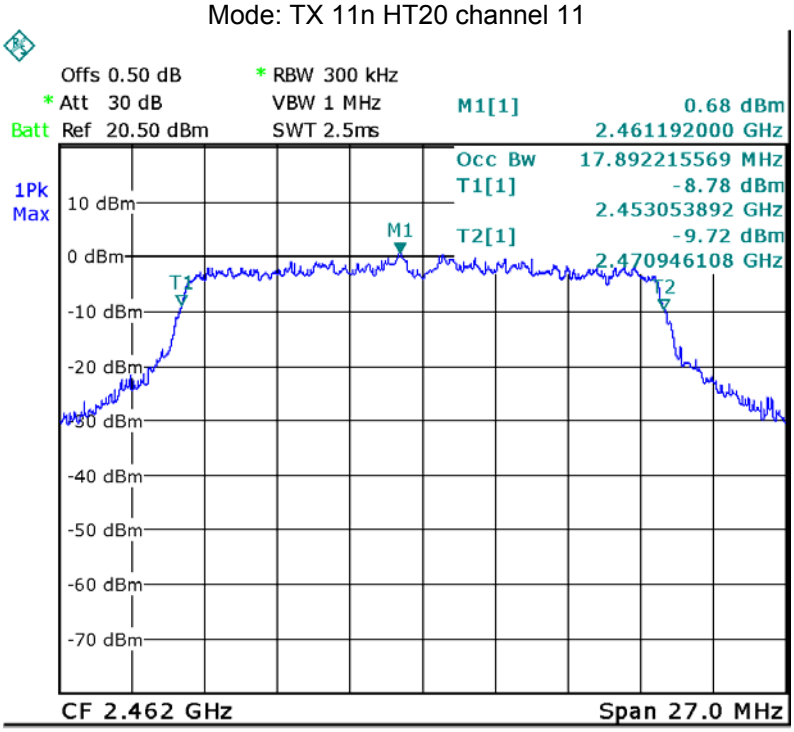
Mode: TX 11n HT20 channel 1



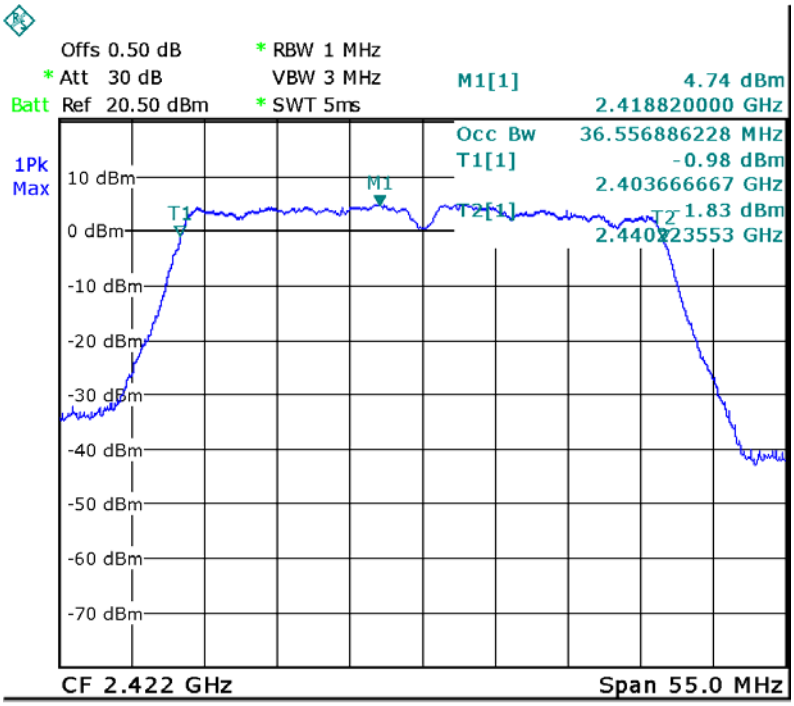
Mode: TX 11n HT20 channel 6



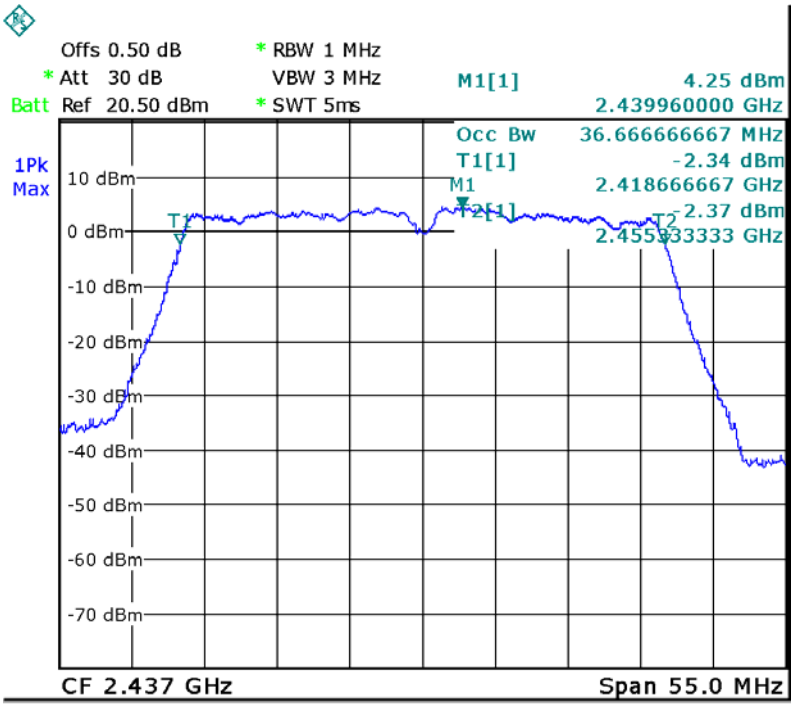
Mode: TX 11n HT20 channel 11



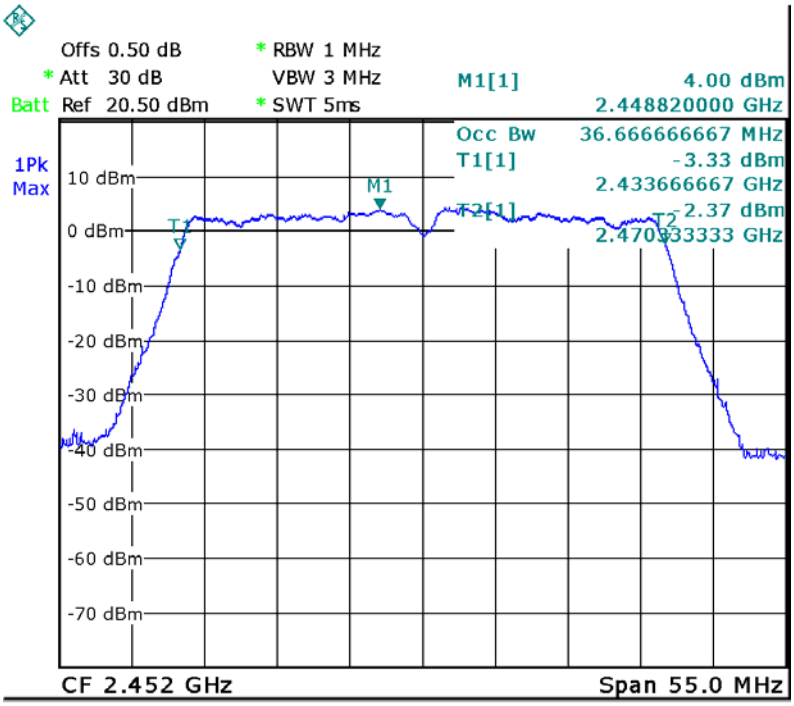
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

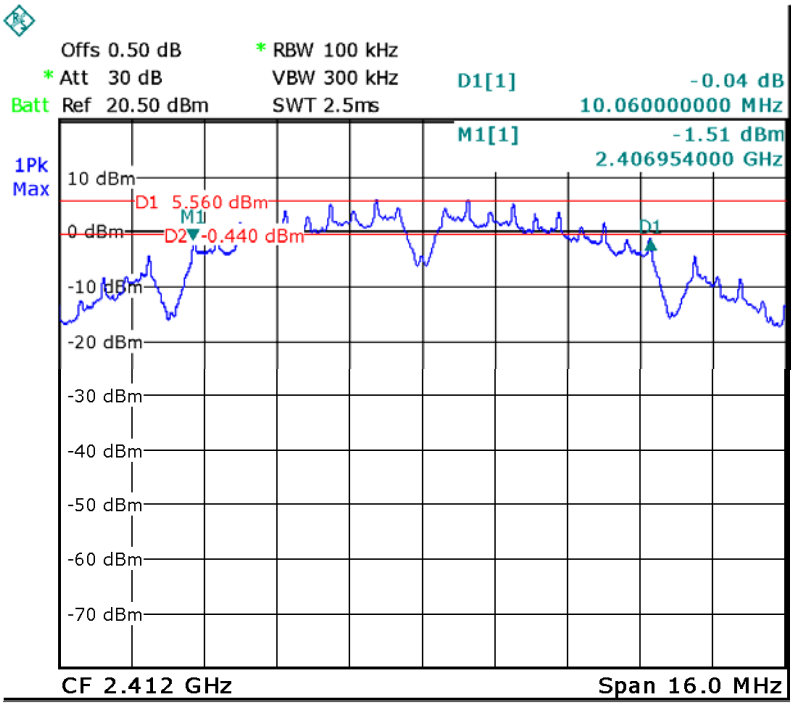


Mode: TX 11n HT40 channel 9

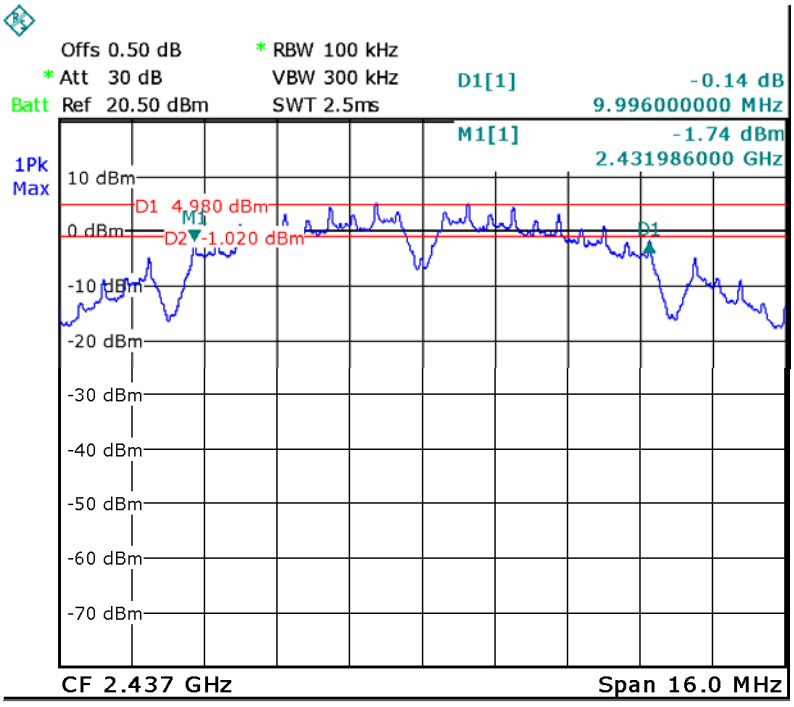


6dB Bandwidth (Antenna 1)

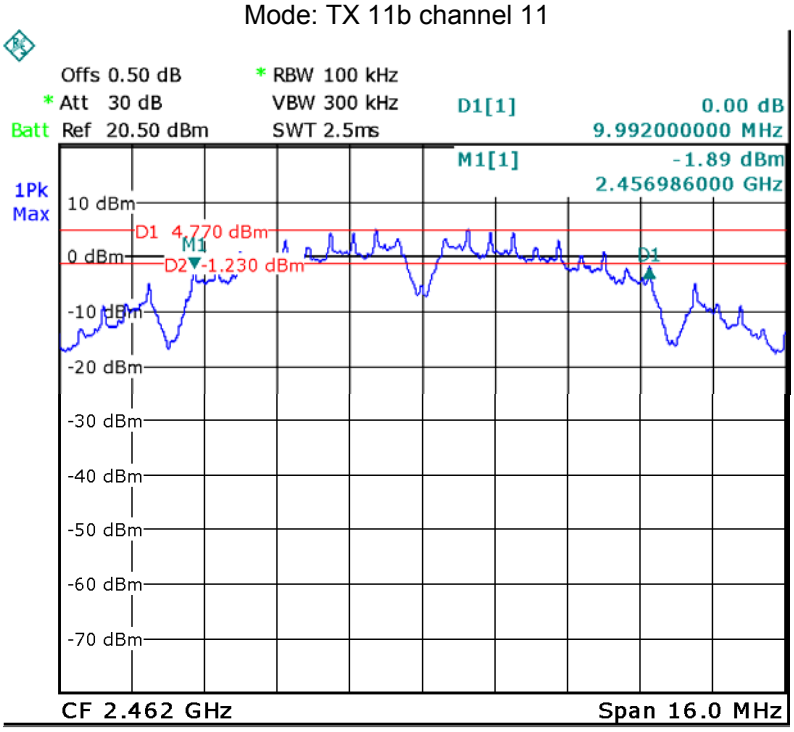
Mode: TX 11b channel 1



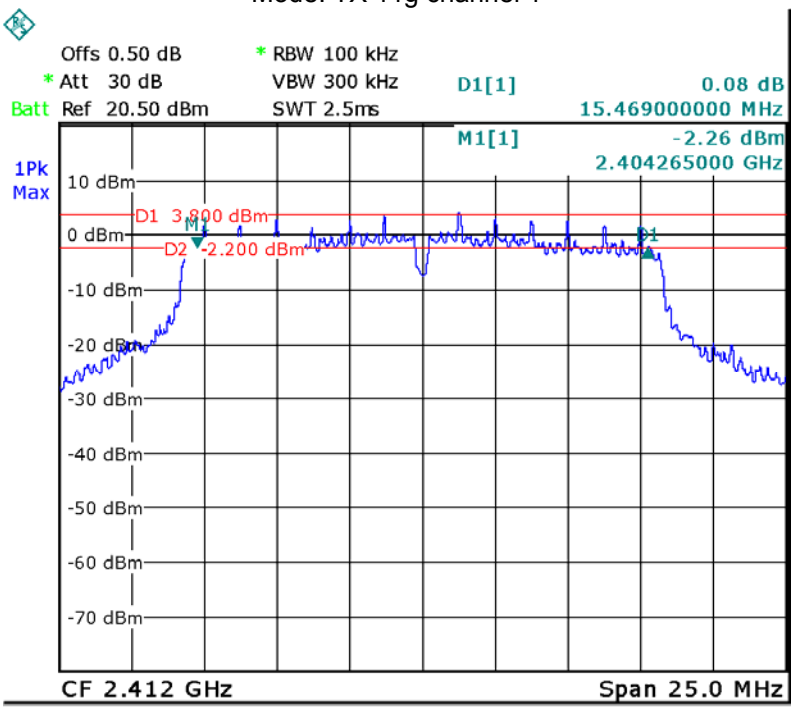
Mode: TX 11b channel 6



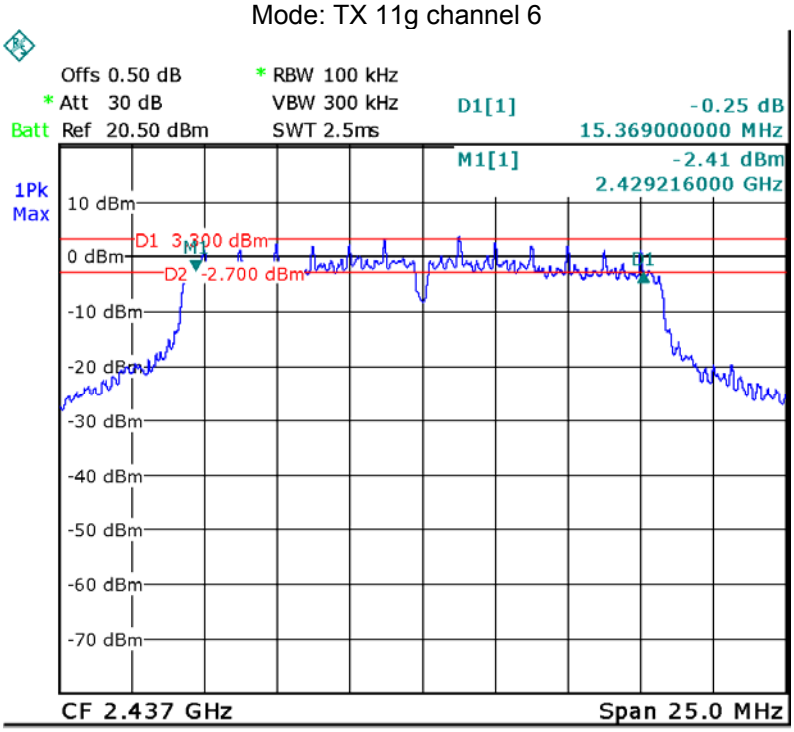
Mode: TX 11b channel 11



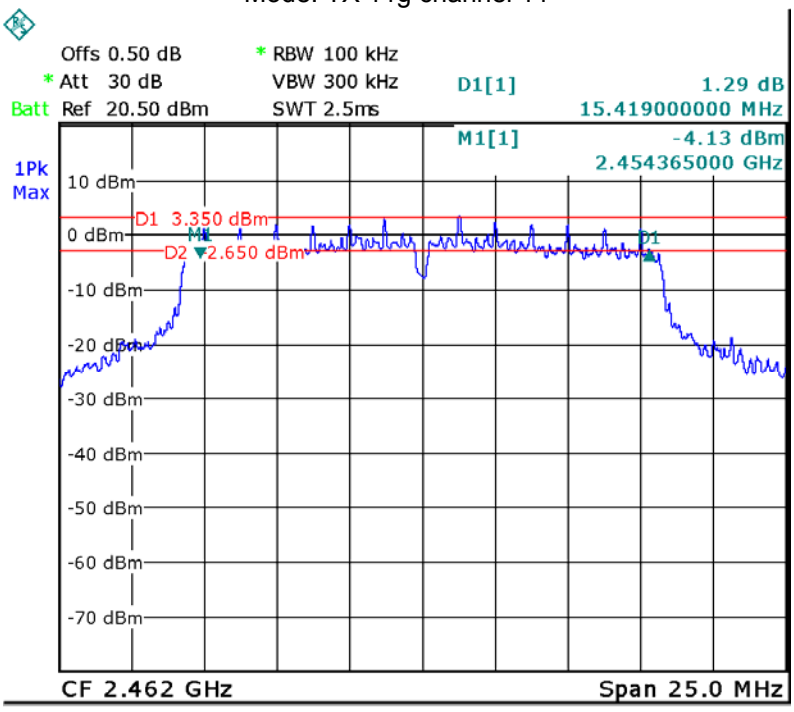
Mode: TX 11g channel 1



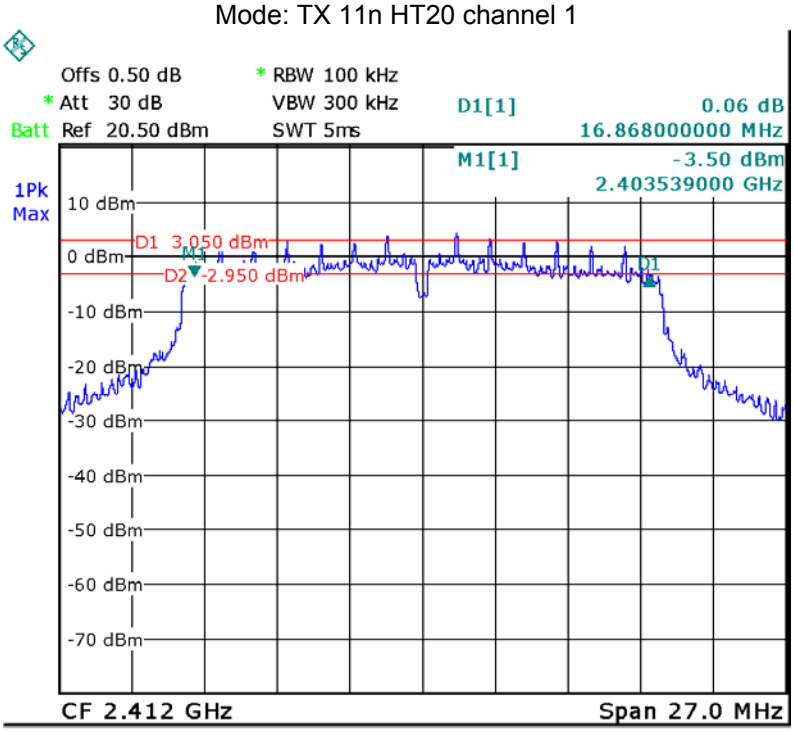
Mode: TX 11g channel 6



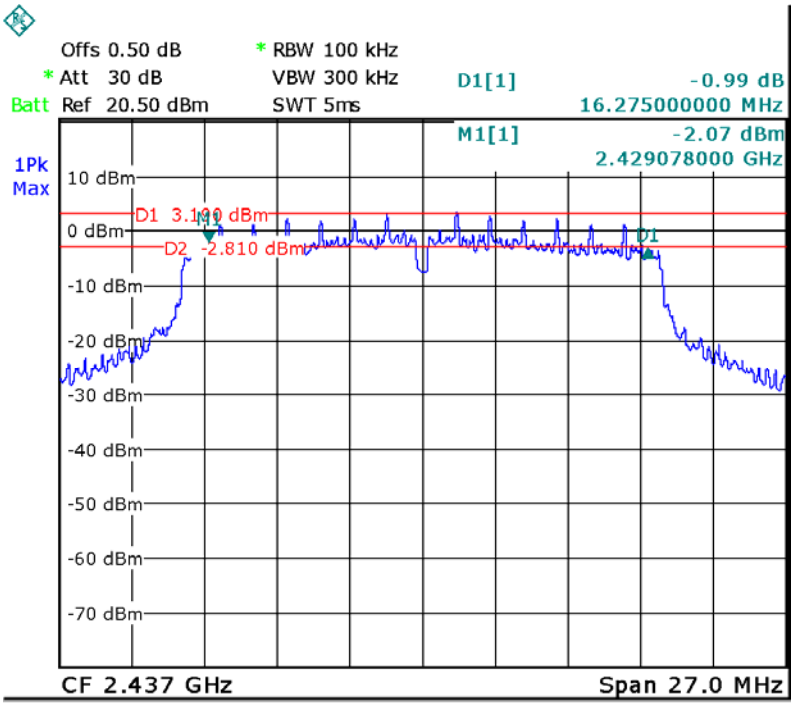
Mode: TX 11g channel 11



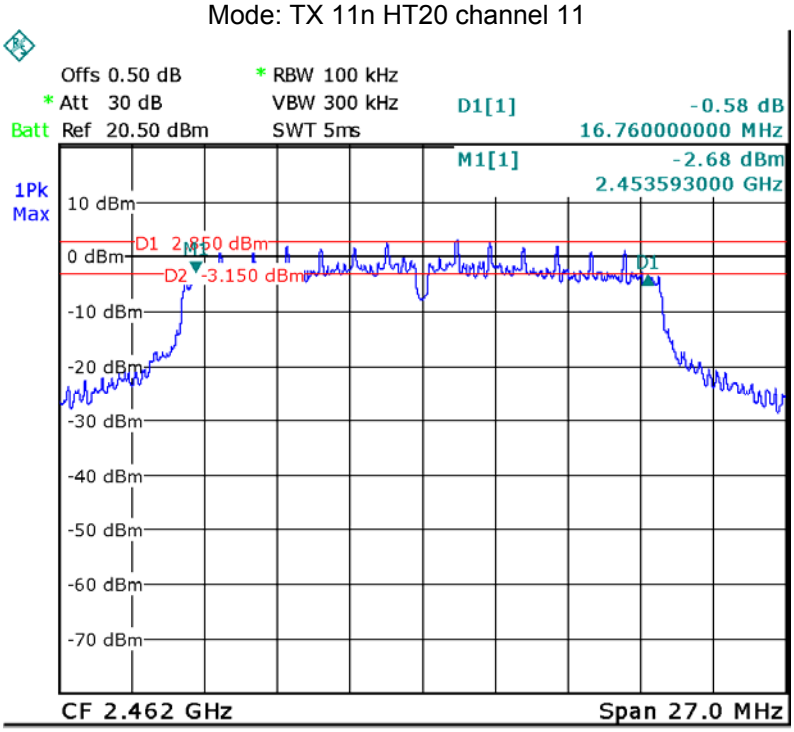
Mode: TX 11n HT20 channel 1



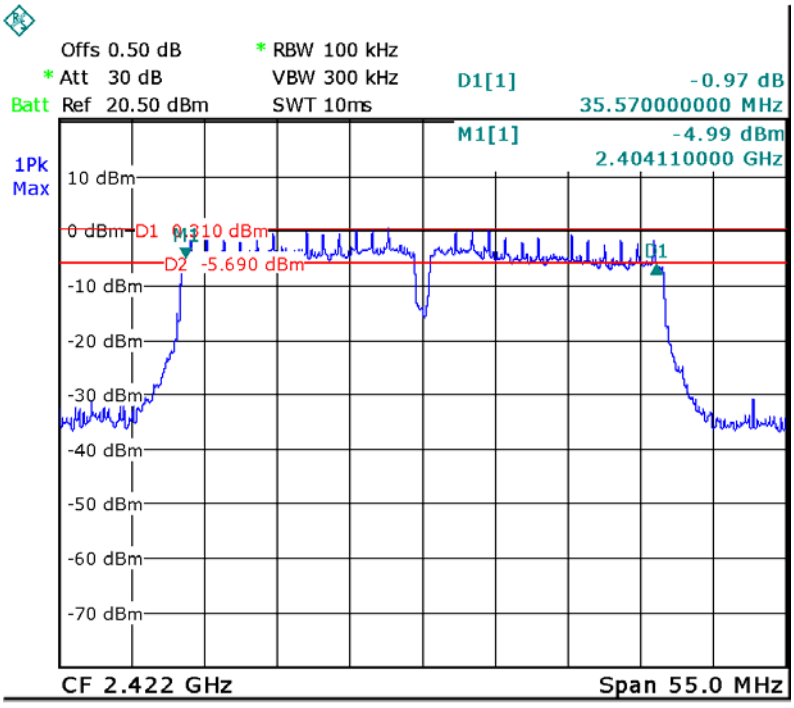
Mode: TX 11n HT20 channel 6



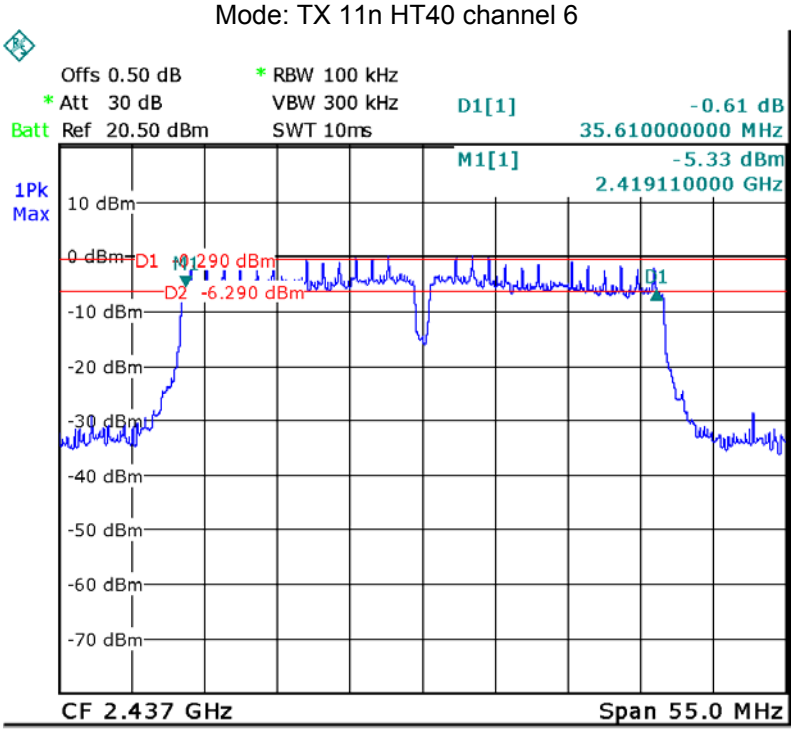
Mode: TX 11n HT20 channel 11



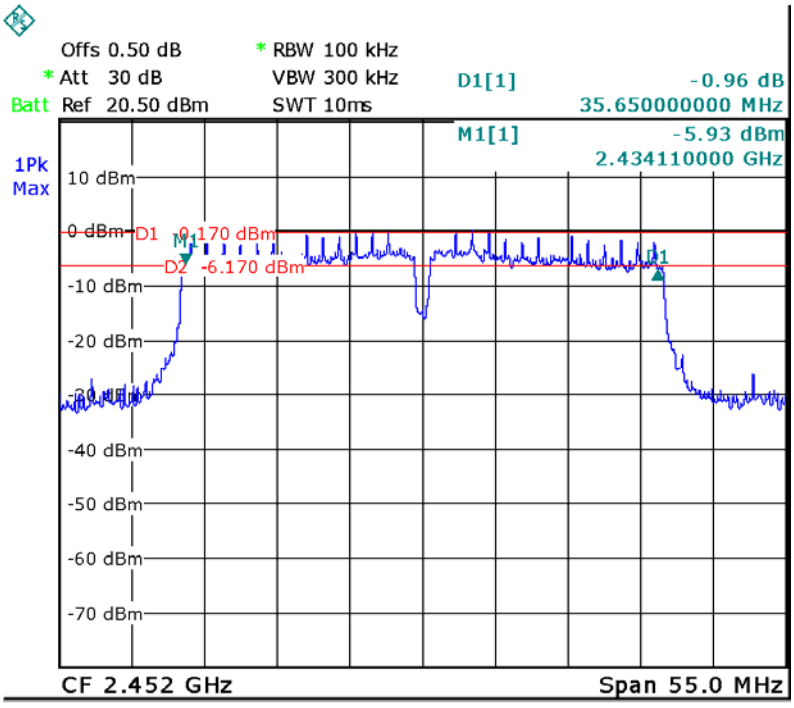
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

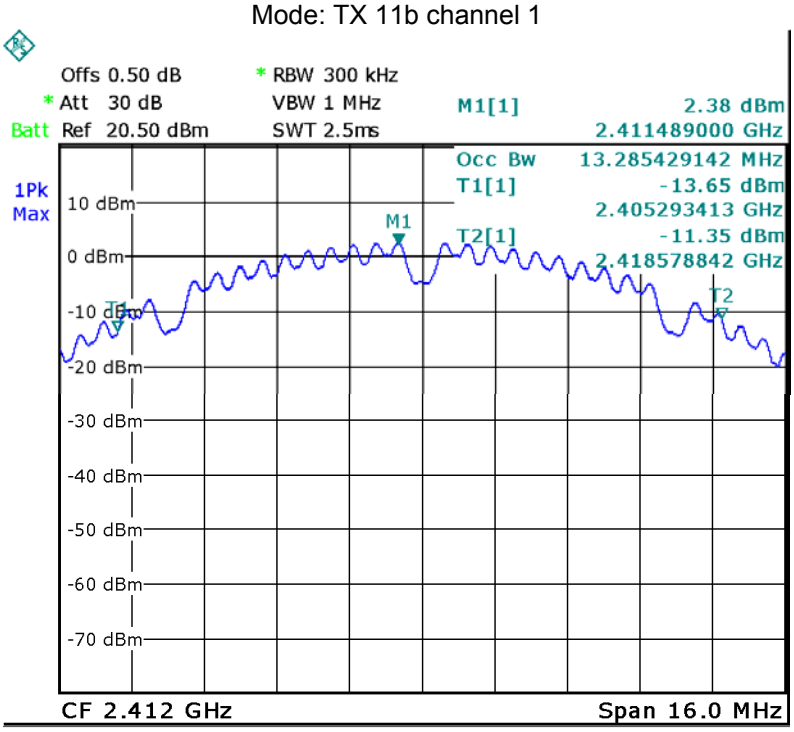


Mode: TX 11n HT40 channel 9

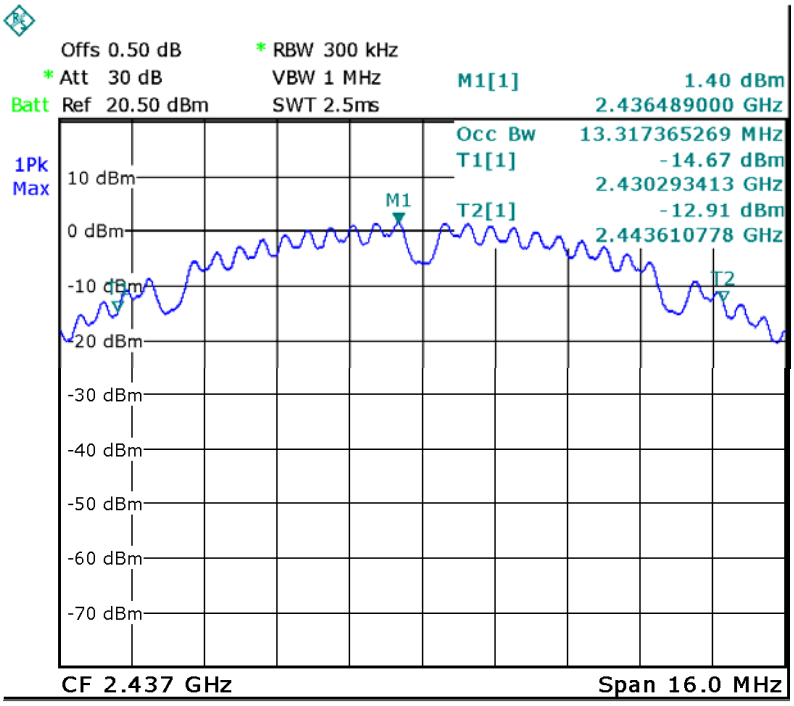


99% Bandwidth (Antenna 1)

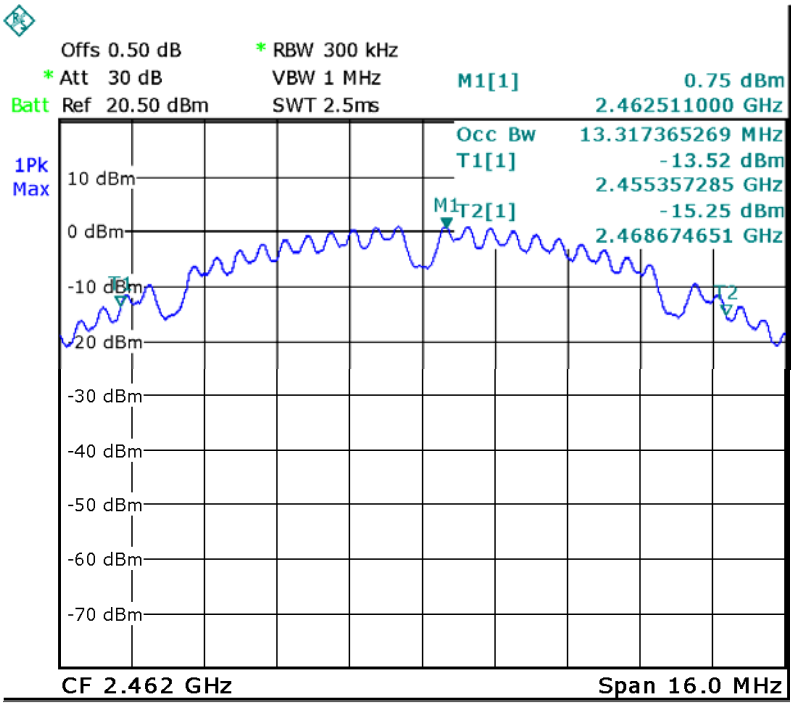
Mode: TX 11b channel 1



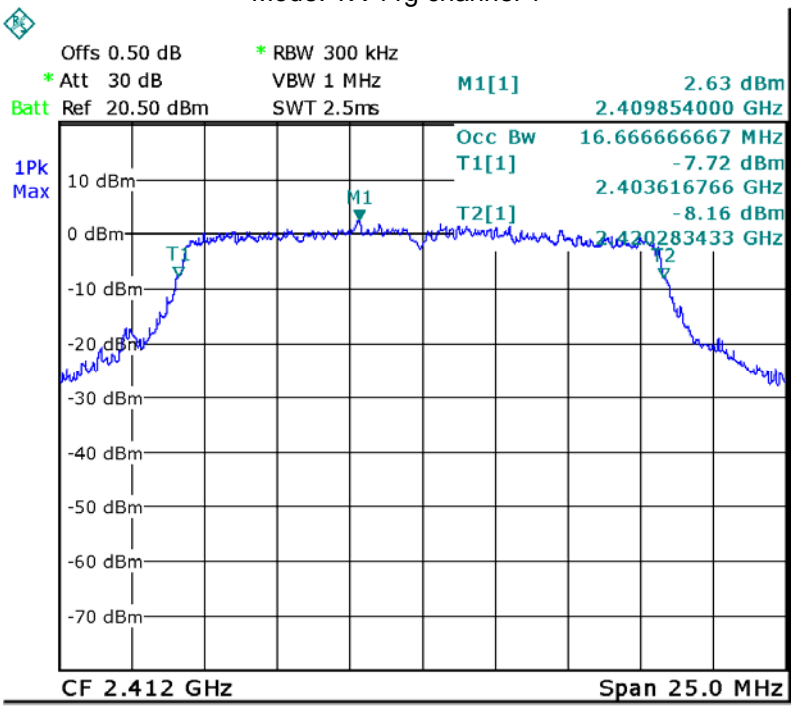
Mode: TX 11b channel 6



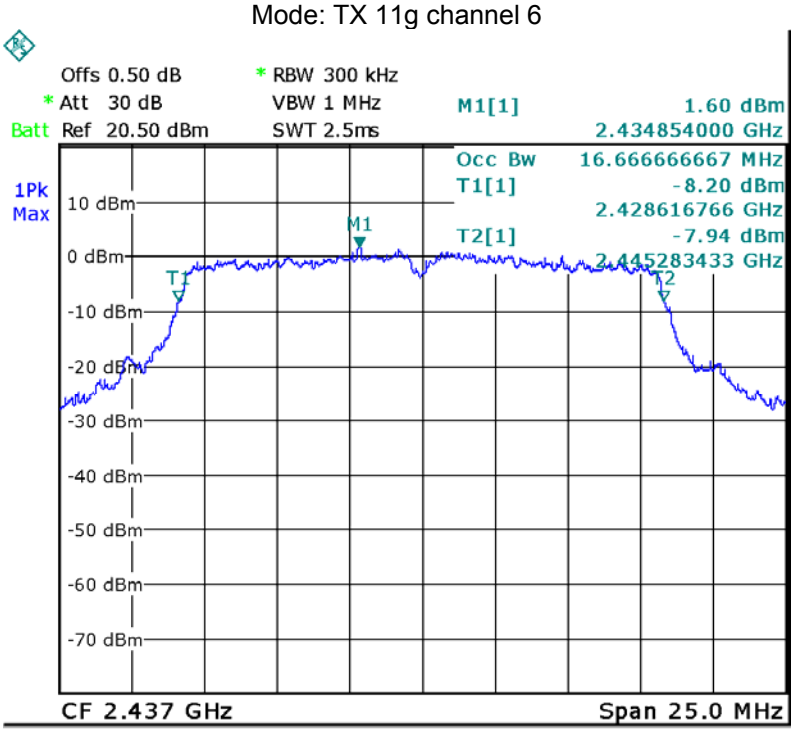
Mode: TX 11b channel 11



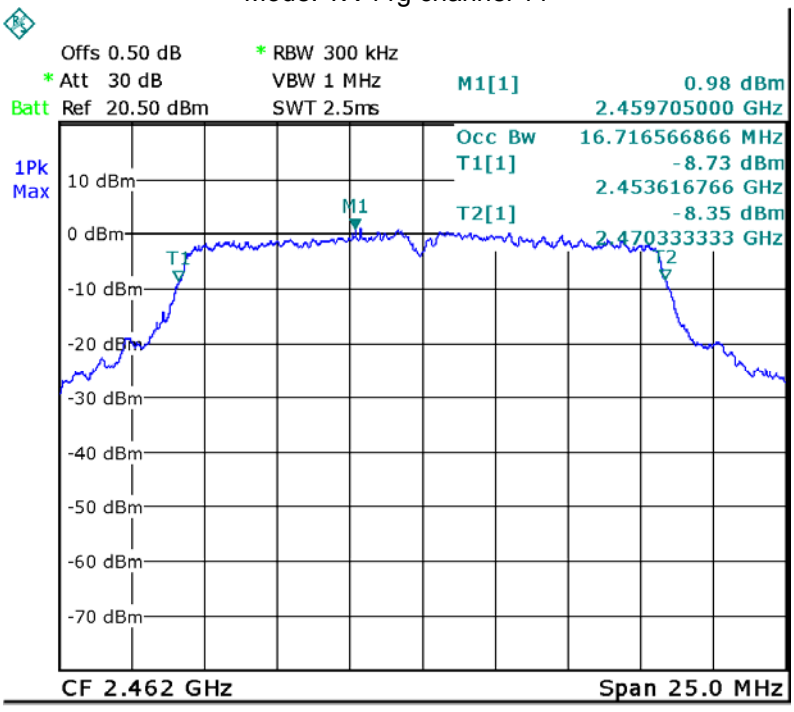
Mode: TX 11g channel 1



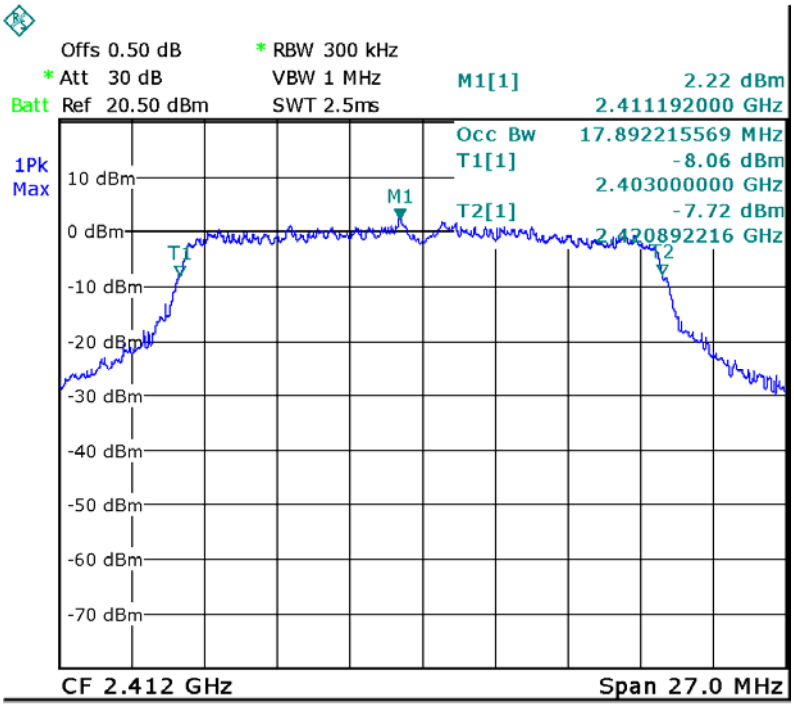
Mode: TX 11g channel 6



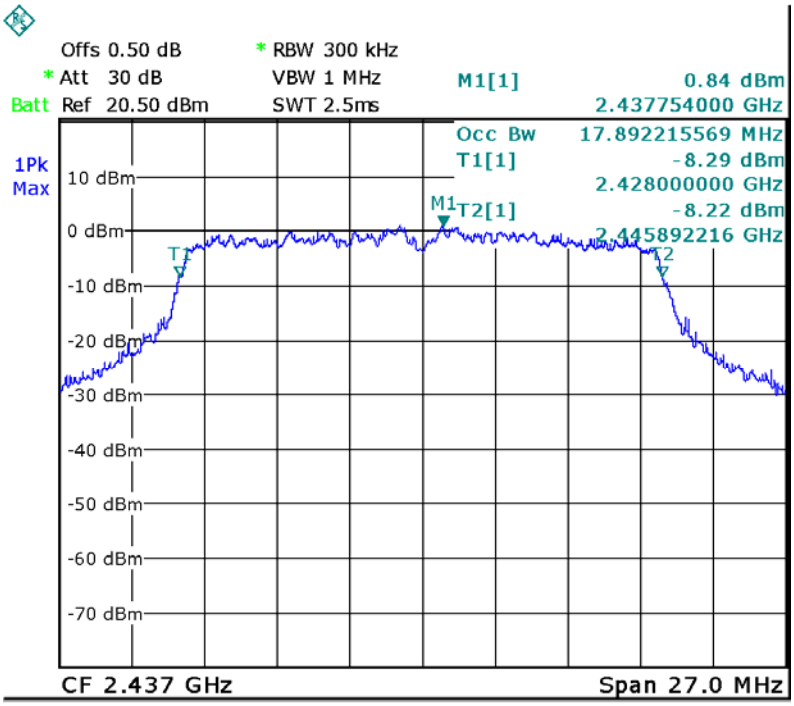
Mode: TX 11g channel 11



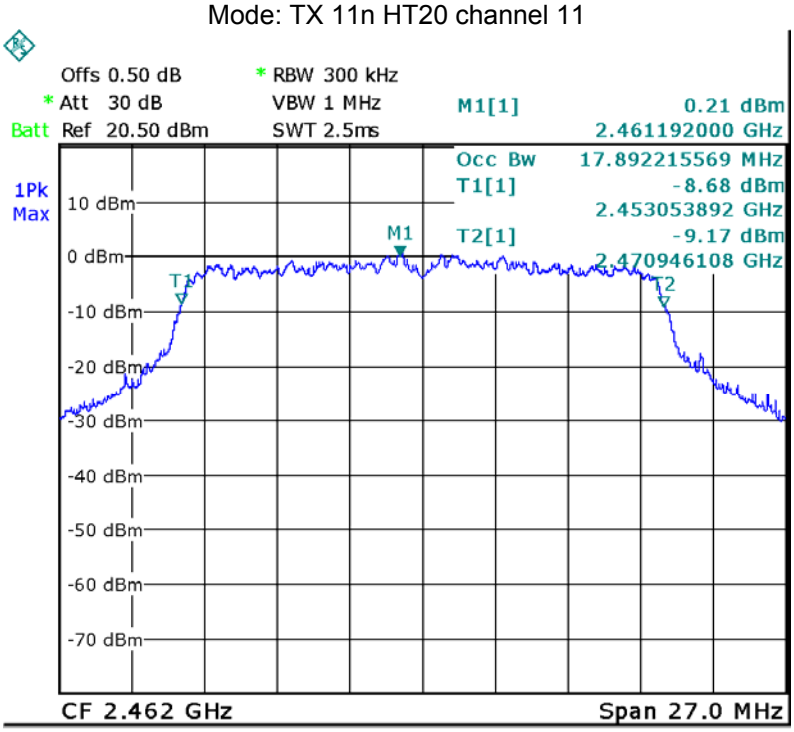
Mode: TX 11n HT20 channel 1



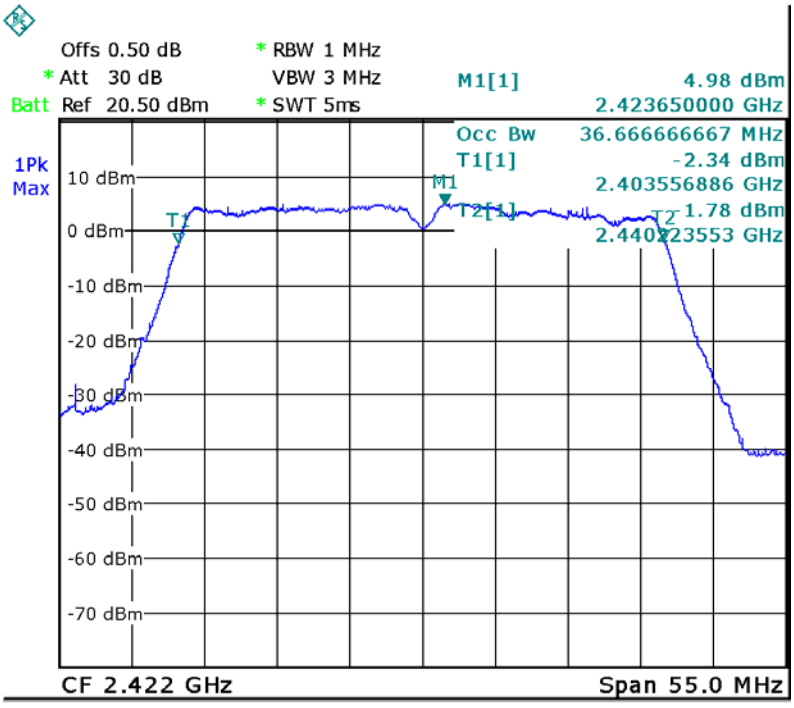
Mode: TX 11n HT20 channel 6



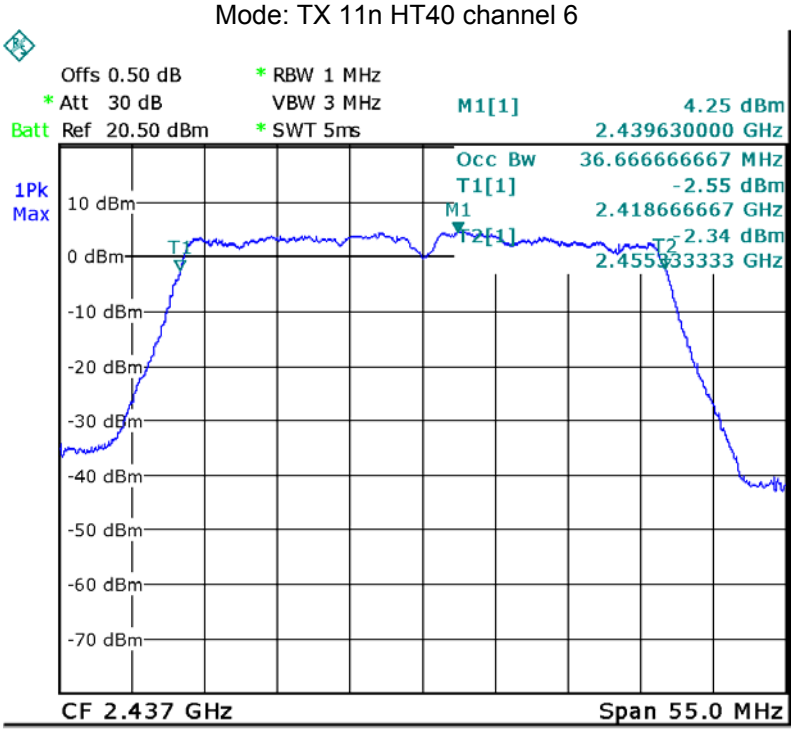
Mode: TX 11n HT20 channel 11



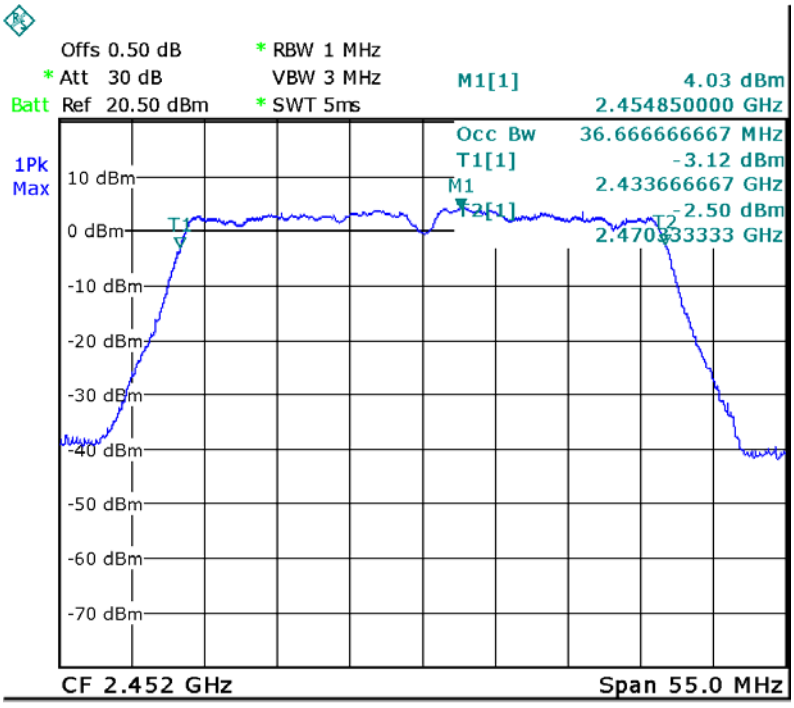
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

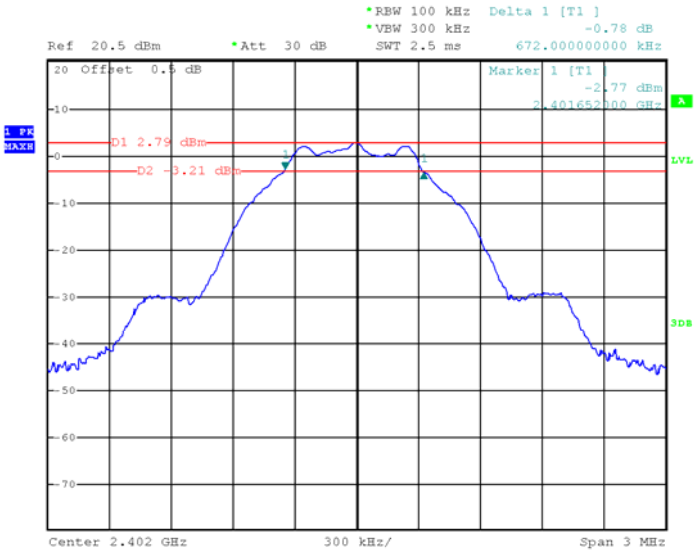


Mode: TX 11n HT40 channel 9

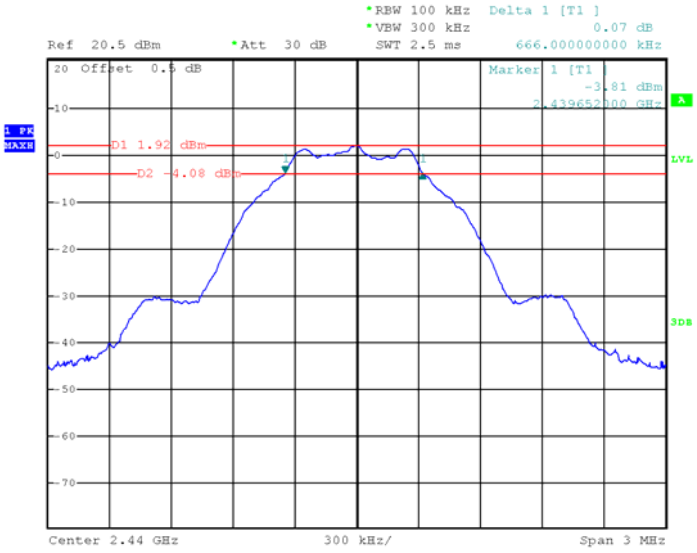


6dB Bandwidth

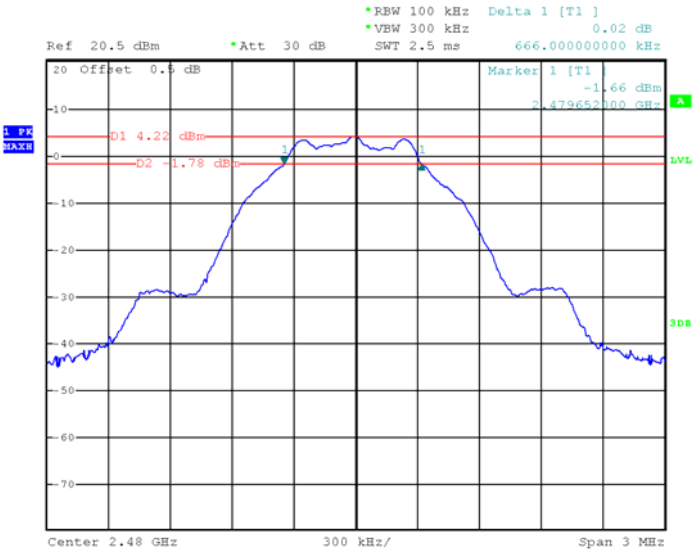
BLE: channel 0



BLE: channel 19

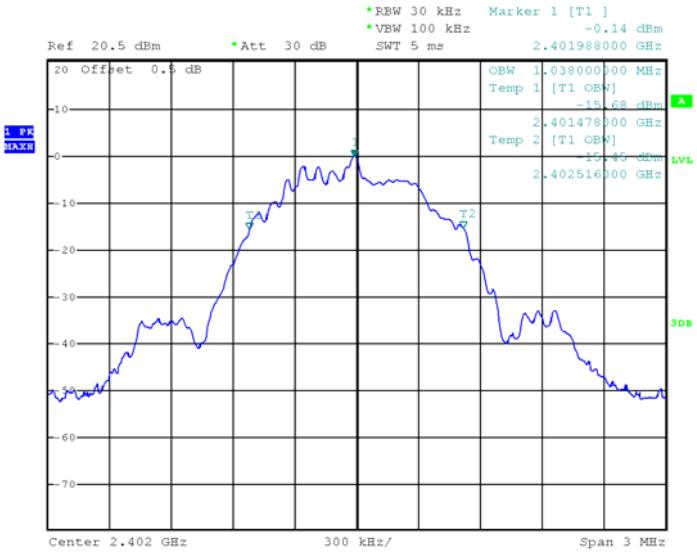


BLE: channel 39

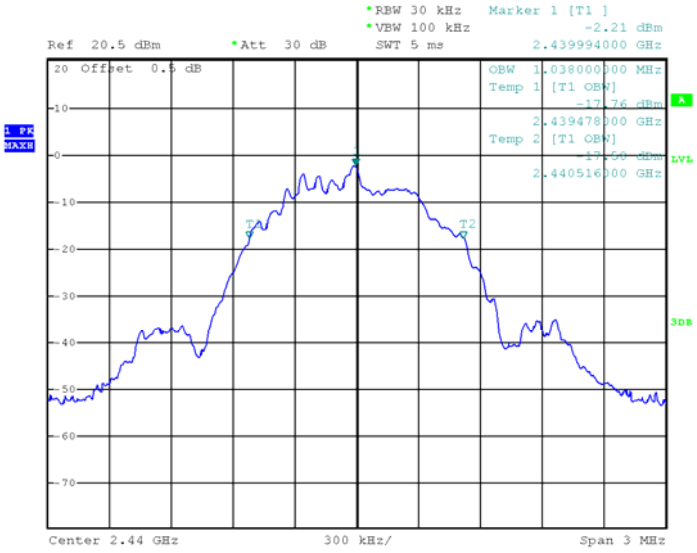


99% Bandwidth

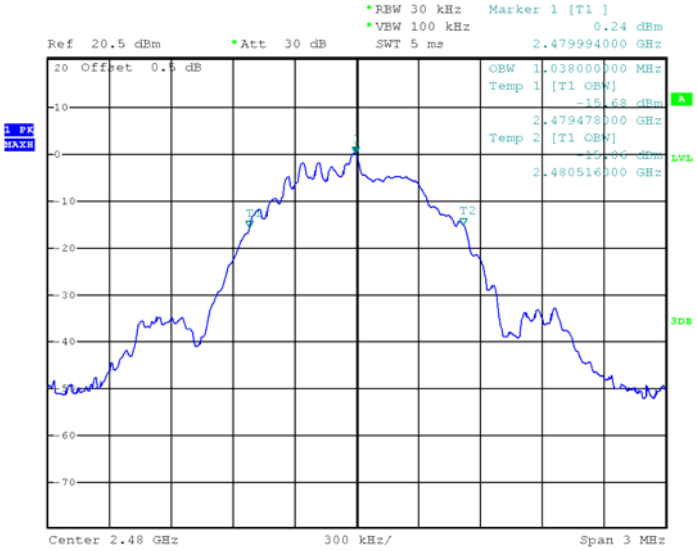
BLE: channel 0



BLE: channel 19



BLE: channel 39



11 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

11.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018

section 8.3.1.1 (For BLE)

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 ≥ DTS bandwidth.

b)Set VBW ≥ 3 RBW.

c)Set span ≥ 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.

section 8.3.1.2 (For WIFI)

This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.

a)Set the RBW = 1% to 5% of the OBW, not to exceed 1 MHz..

b)Set the VBW ≥ 3 x RBW

c)Set the span ≥ 1.5 x OBW.

d)Detector = RMS.

e)Sweep time = auto couple.

f) trigger = free run..

g) Number of points in sweep _ [2 × span / RBW]. (This gives bin-to-bin spacing _ RBW / 2, so that narrowband signals are not lost between frequency bins.)

h) Trace average at least 100 traces in power averaging (rms) mode.

i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum..

11.2 Test Result:

Table 1:

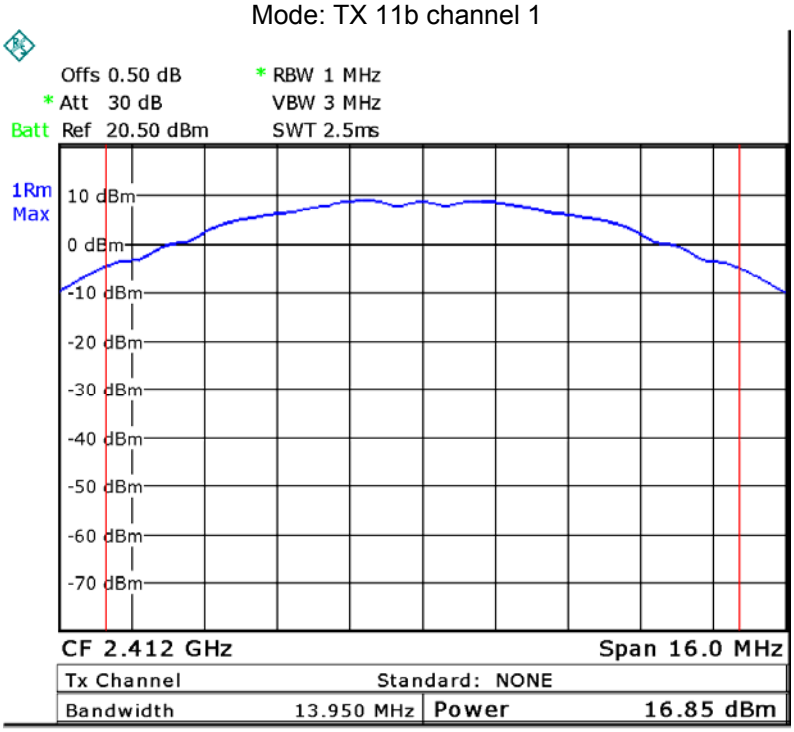
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)		
		ANT0	ANT1	Total
TX 11b	Low-2412	16.85	16.87	/
	Middle-2437	16.19	16.21	/
	High-2462	16.01	16.02	/
TX 11g	Low-2412	17.51	17.98	/
	Middle-2437	17.20	17.63	/
	High-2462	17.01	17.50	/
TX 11n HT20	Low-2412	17.15	**18.05**	20.63
	Middle-2437	16.95	17.43	20.21
	High-2462	16.83	17.24	20.05
TX 11n HT40	Low-2422	**17.97**	18.04	21.02
	Middle-2437	17.28	17.67	20.49
	High-2452	17.35	17.63	20.50
Limit: 1W/30dBm * All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.				

Table 2:

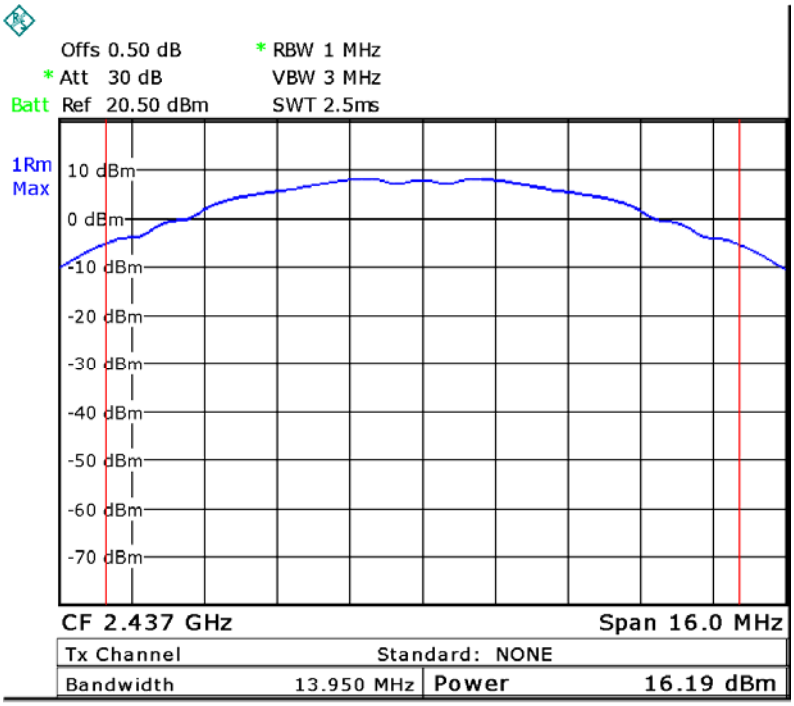
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
BLE	Low-2402	3.77	1W/30dBm
	Middle-2440	3.21	1W/30dBm
	High-2480	4.43	1W/30dBm

Test Plot(antenna 0)

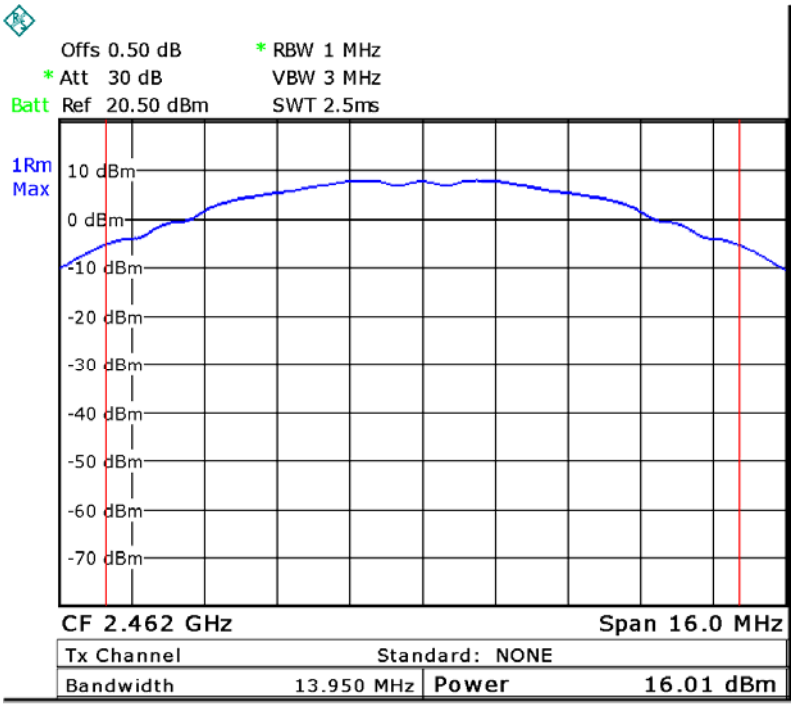
Mode: TX 11b channel 1



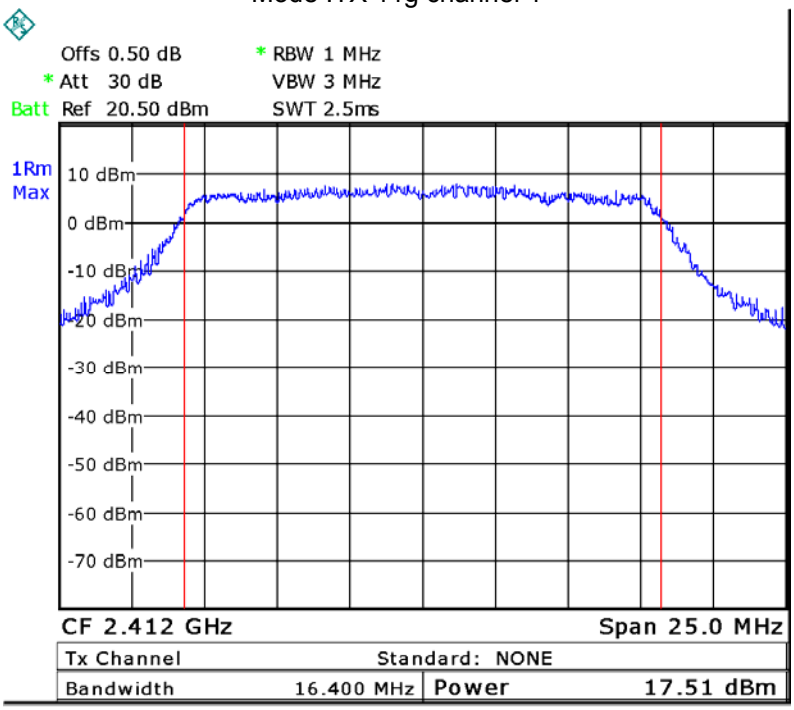
Mode: TX 11b channel 6



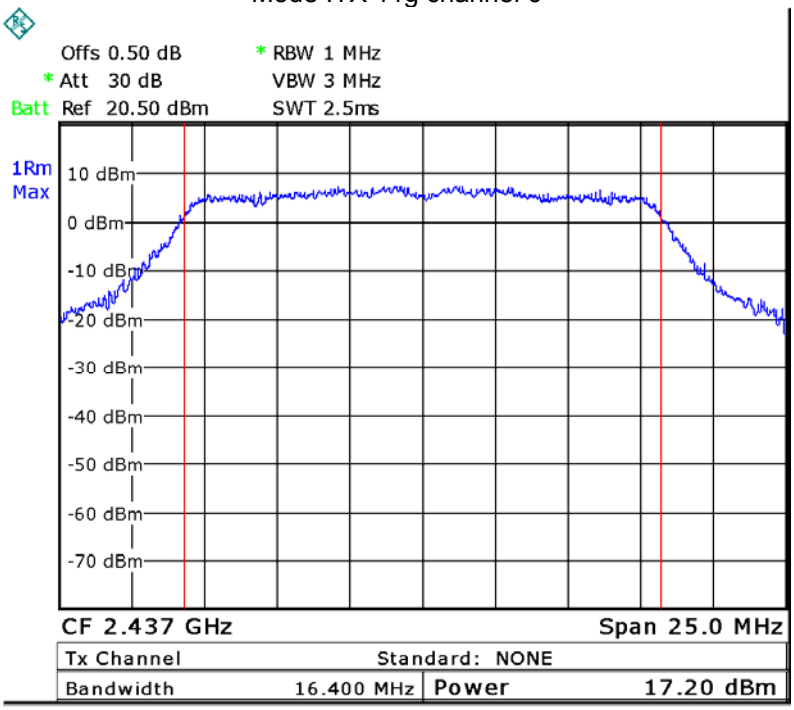
Mode: TX 11b channel 11



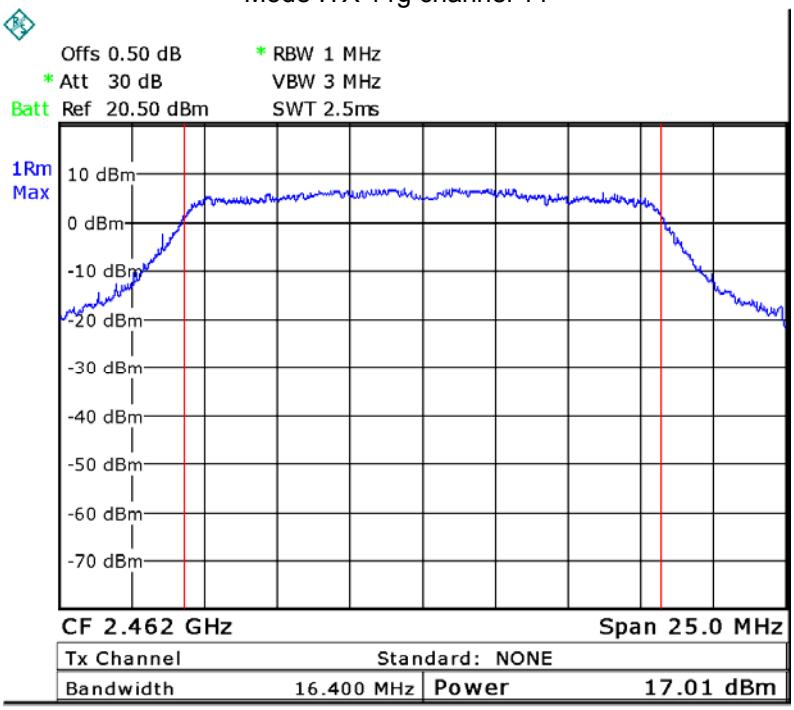
Mode :TX 11g channel 1



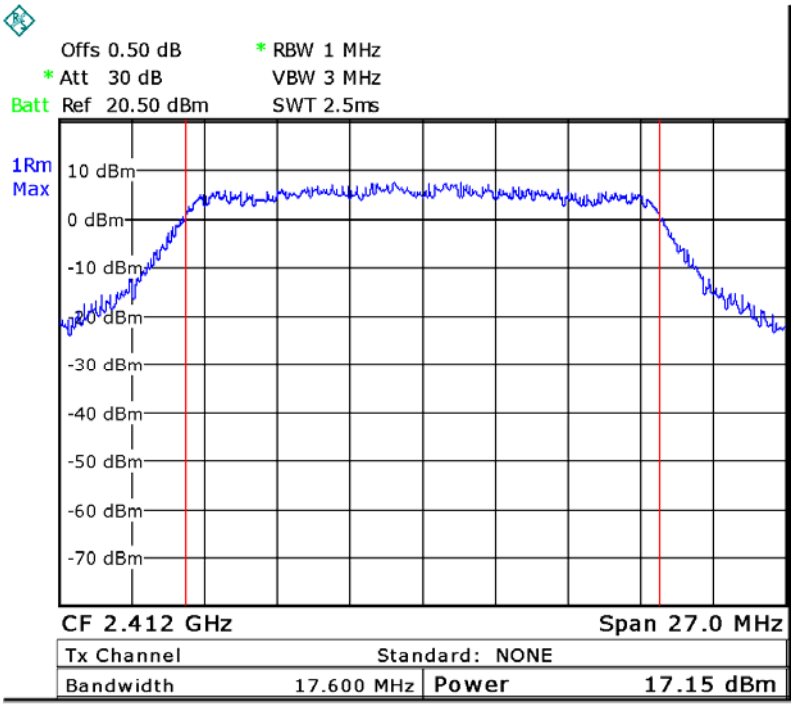
Mode :TX 11g channel 6



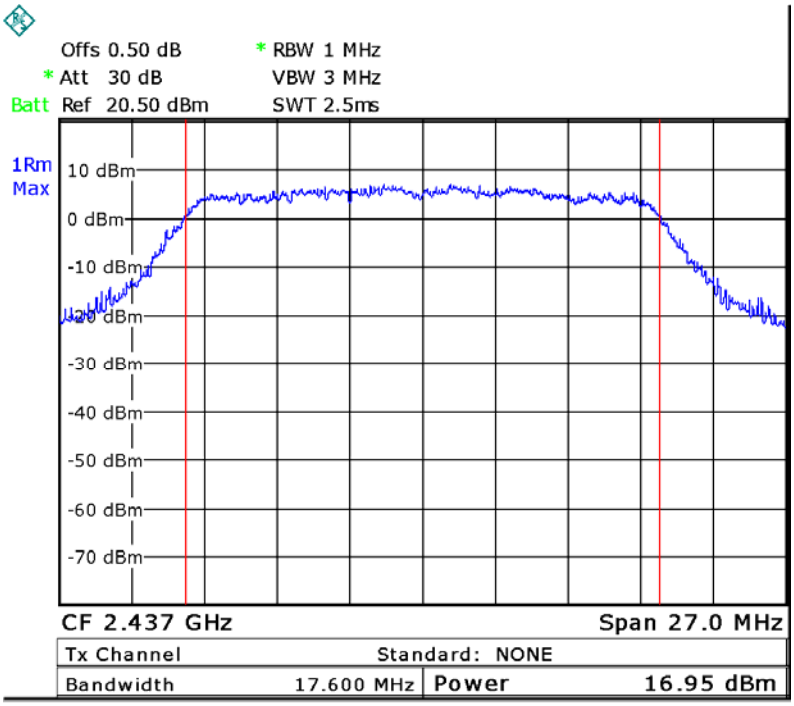
Mode :TX 11g channel 11



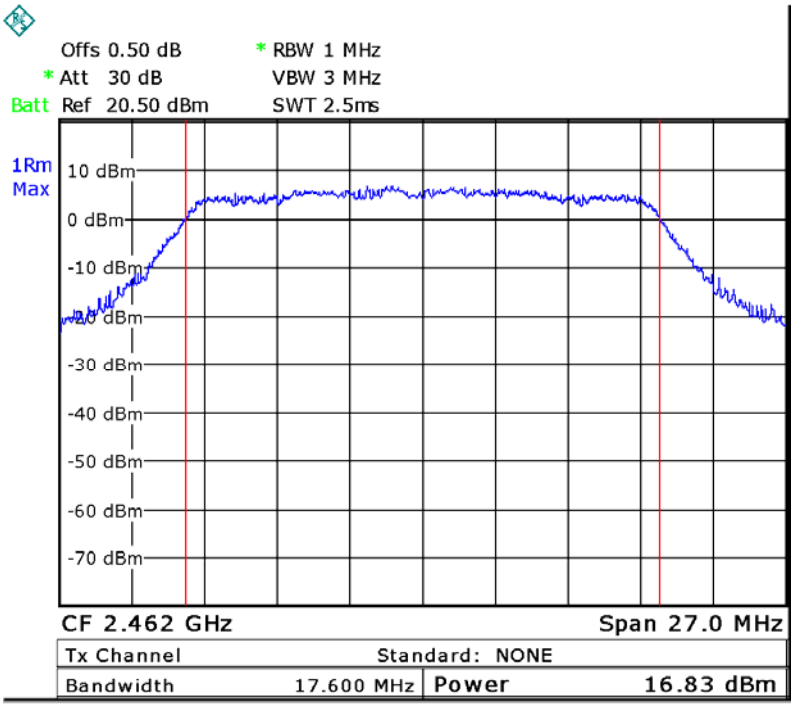
Mode: TX 11n HT20 channel 1



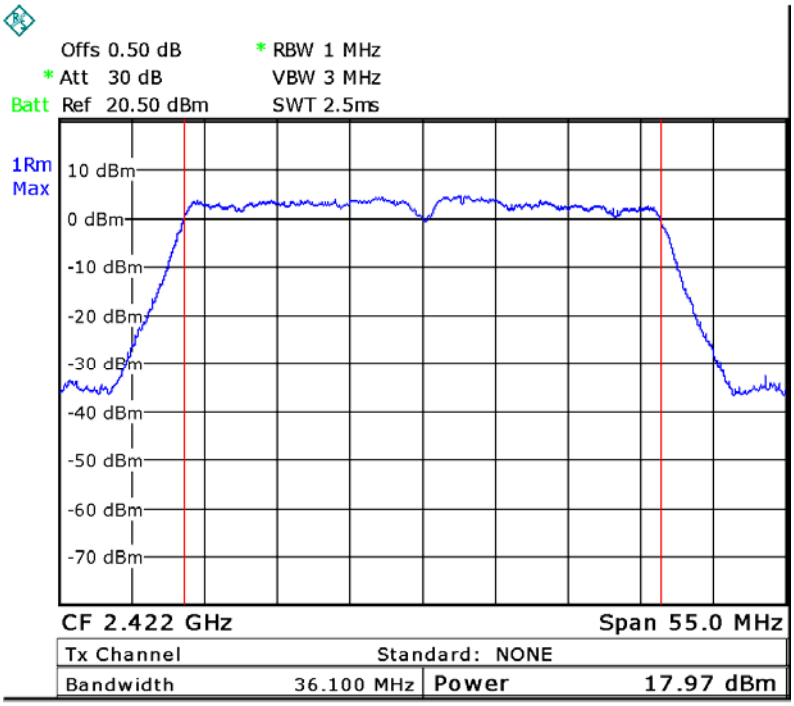
Mode: TX 11n HT20 channel 6



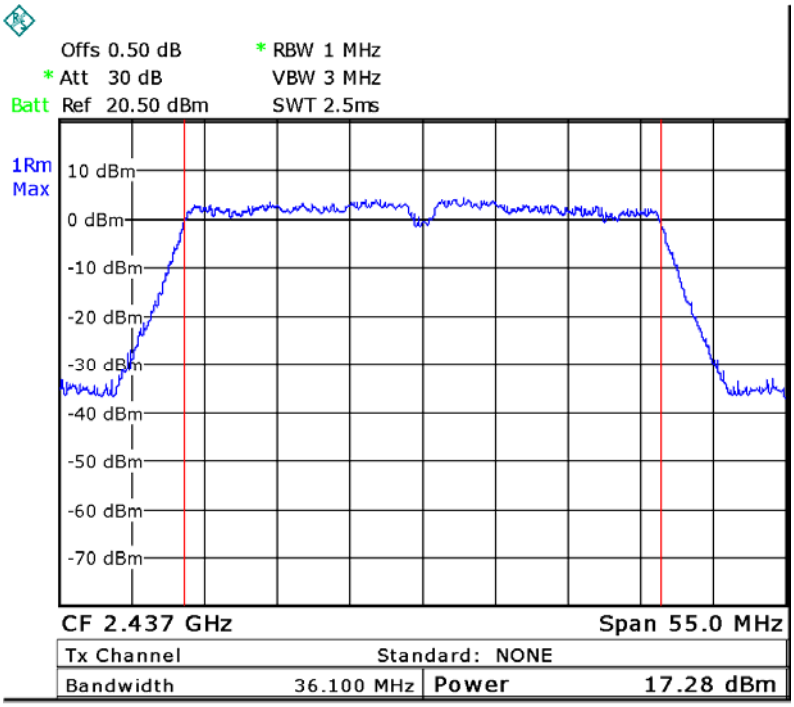
Mode: TX 11n HT20 channel 11



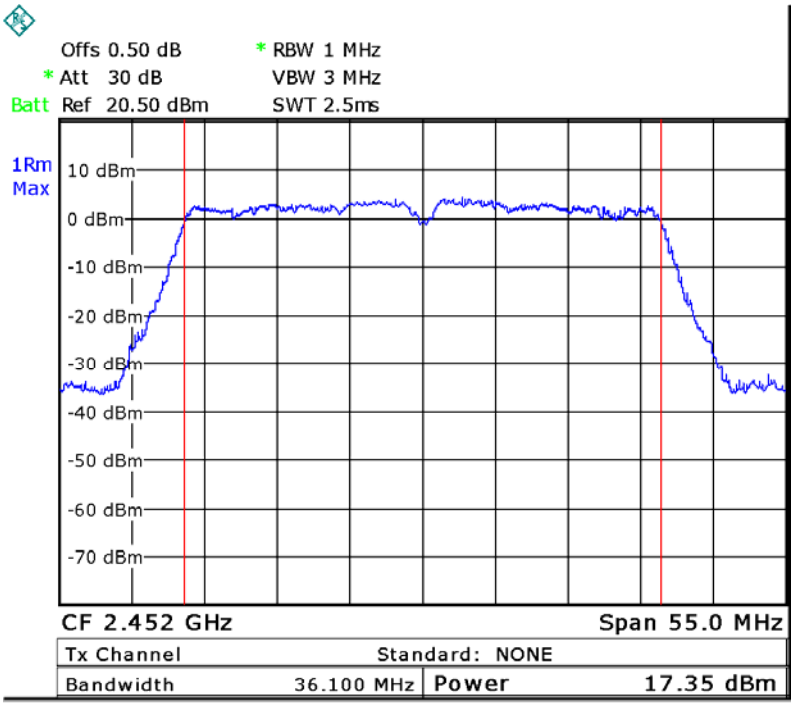
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

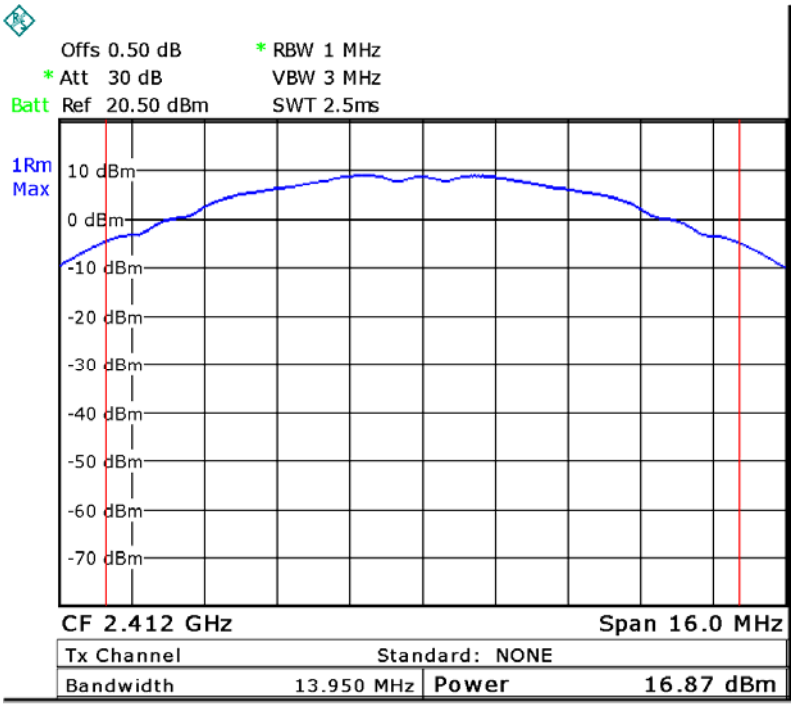


Mode: TX 11n HT40 channel 9

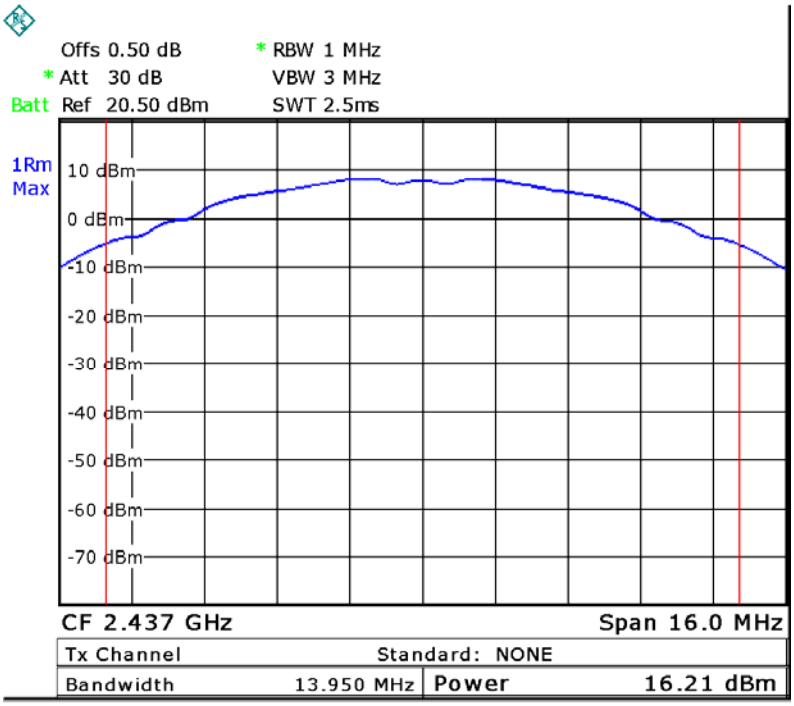


Test Plot(antenna 1)

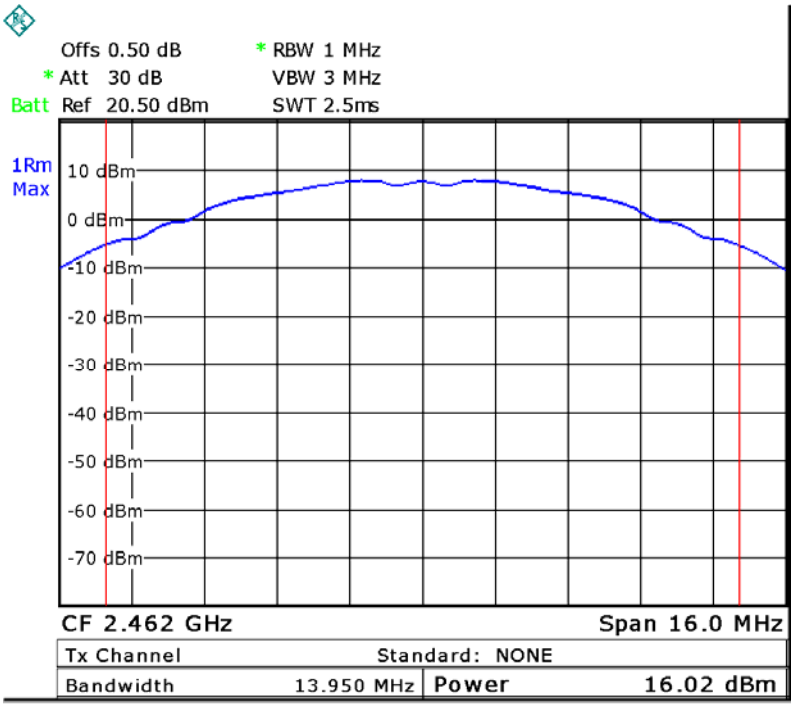
Mode: TX 11b channel 1



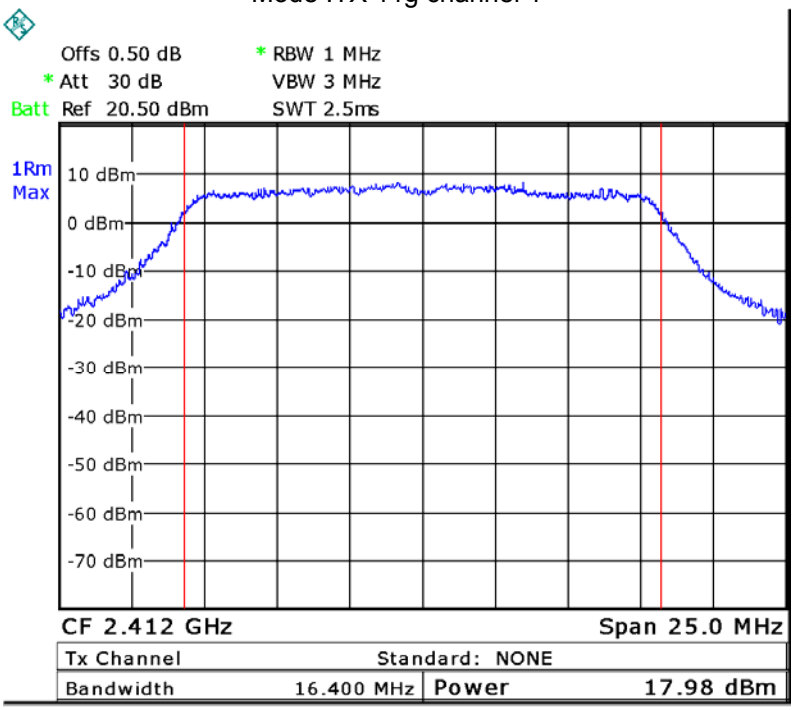
Mode: TX 11b channel 6



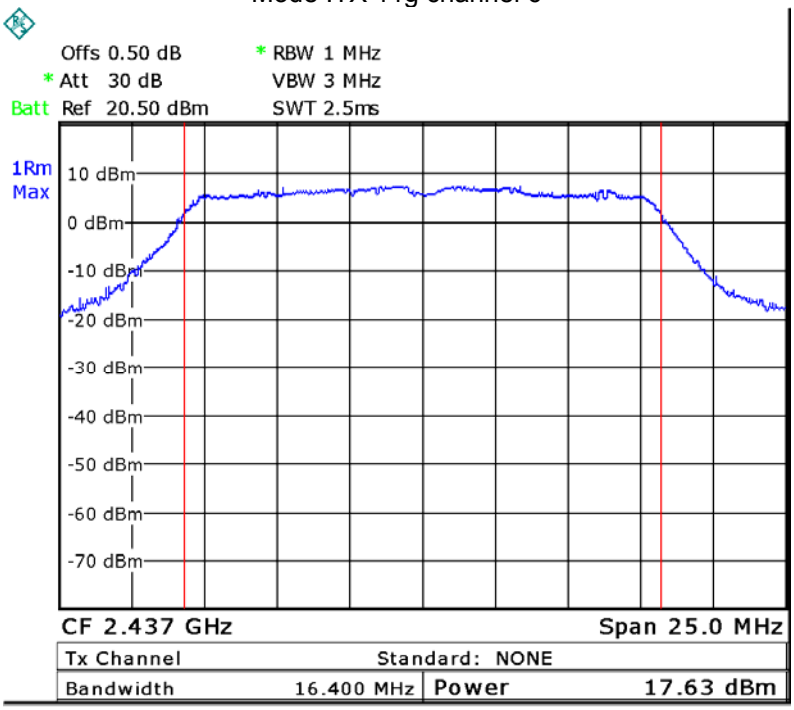
Mode: TX 11b channel 11



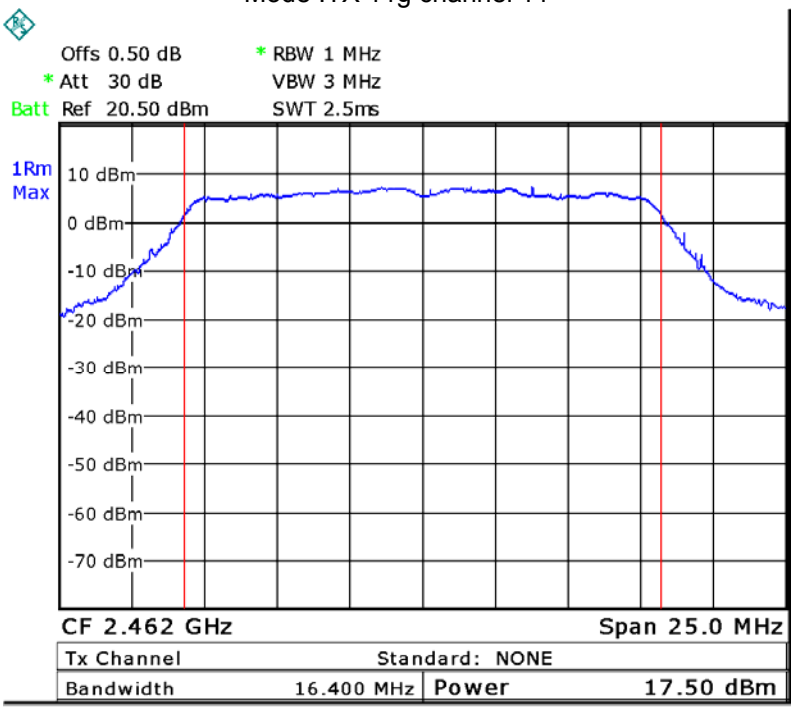
Mode :TX 11g channel 1



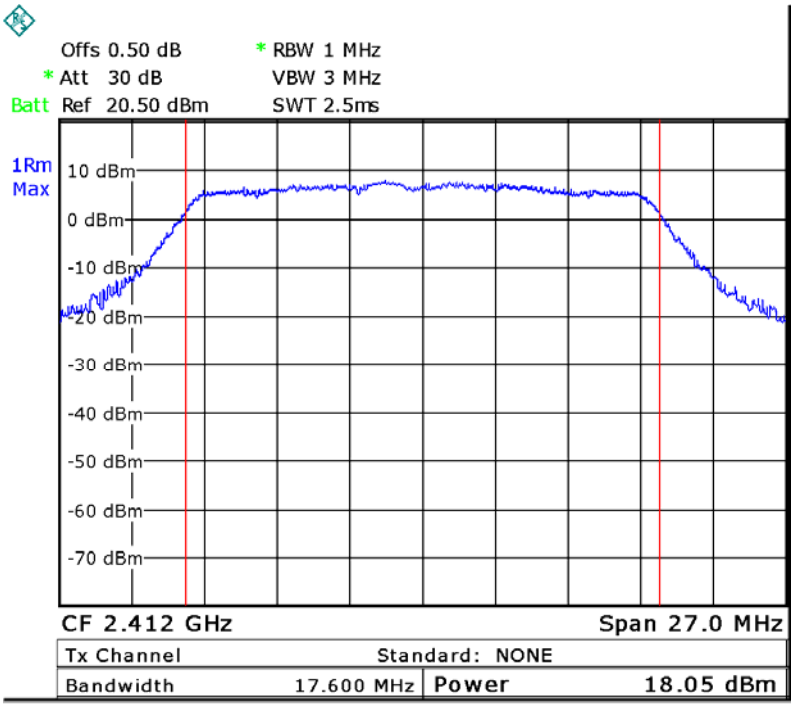
Mode :TX 11g channel 6



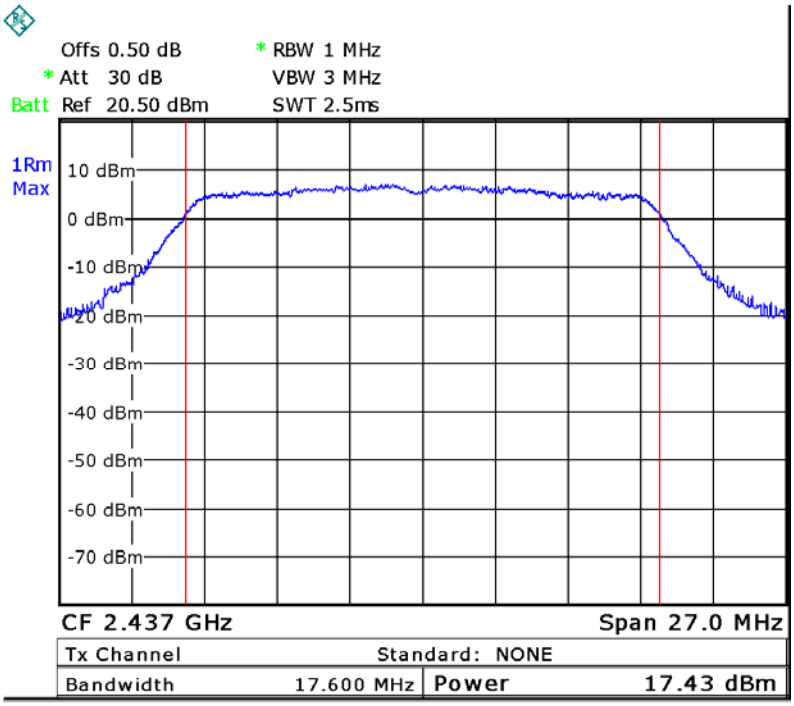
Mode :TX 11g channel 11



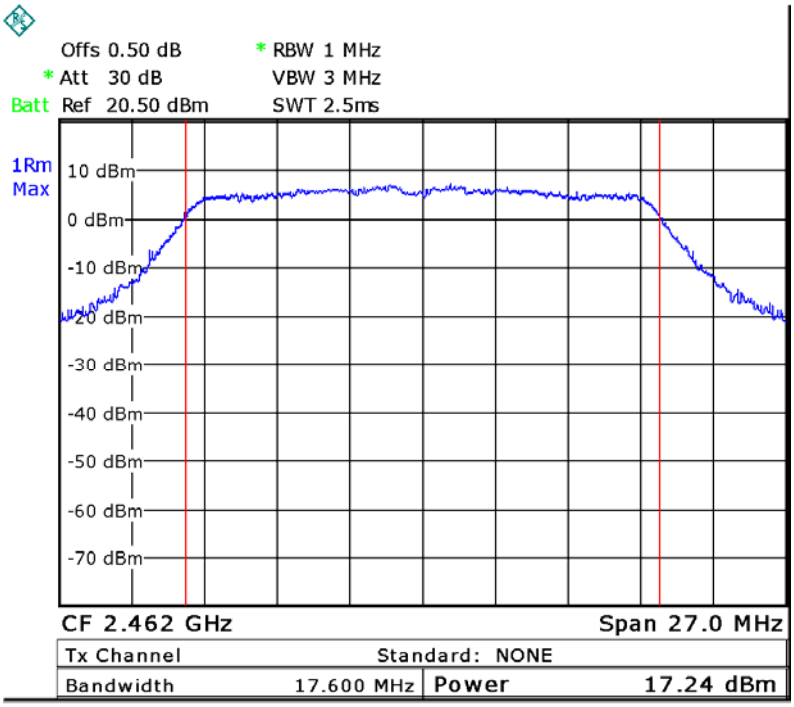
Mode: TX 11n HT20 channel 1



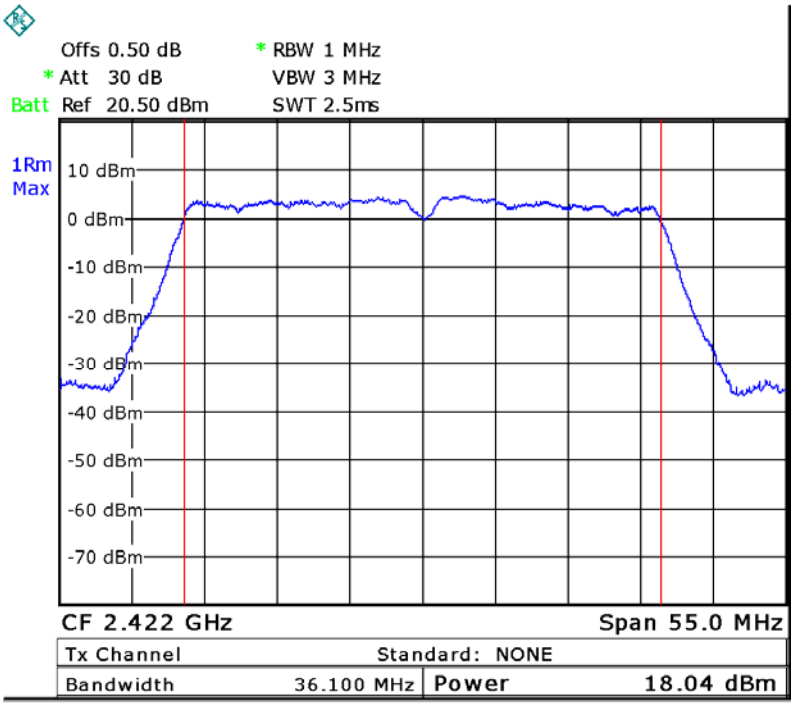
Mode: TX 11n HT20 channel 6



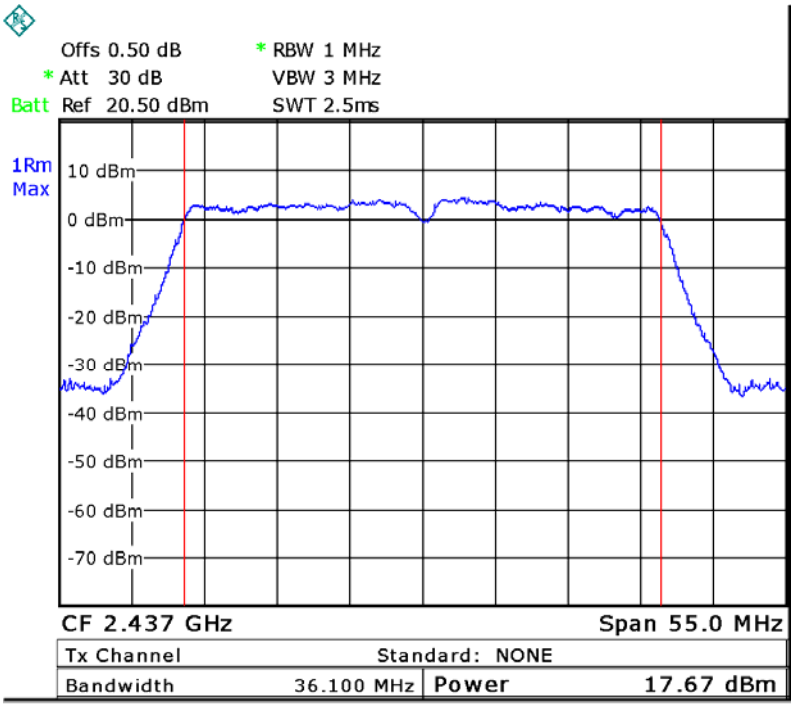
Mode: TX 11n HT20 channel 11



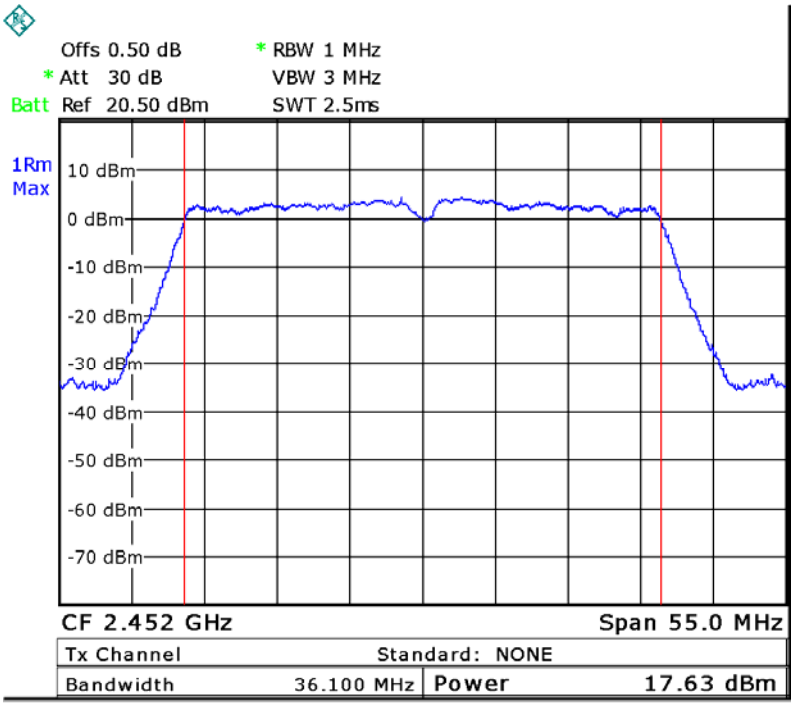
Mode: TX 11n HT40 channel 3



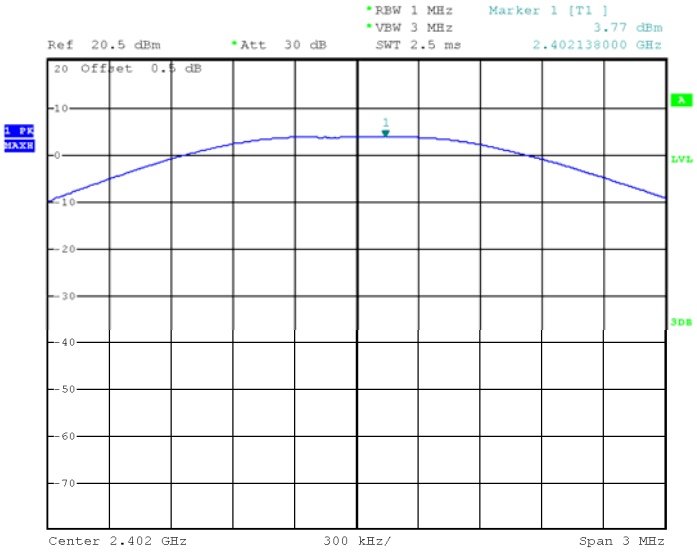
Mode: TX 11n HT40 channel 6



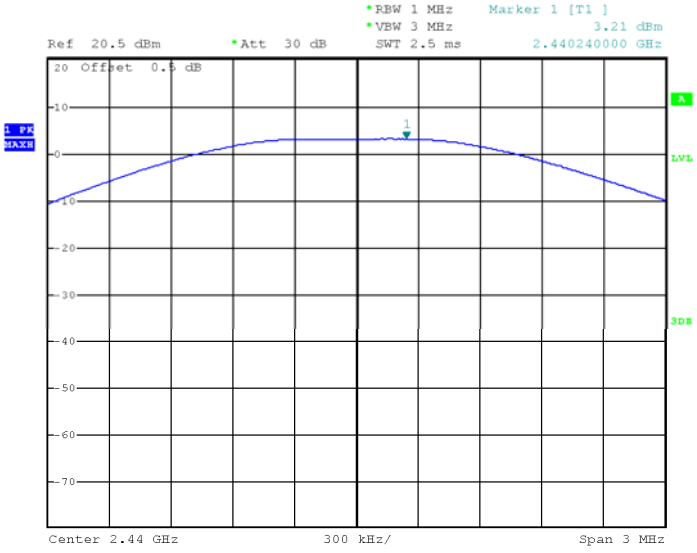
Mode: TX 11n HT40 channel 9



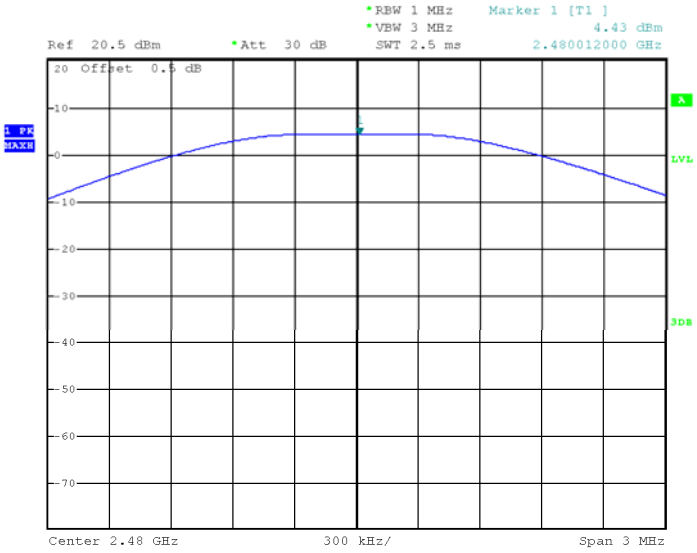
BLE: channel 0



BLE: channel 19



BLE: channel 39



12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

12.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v04 April 5, 2017 section 10.2

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

12.2 Test Result:

Table 1:

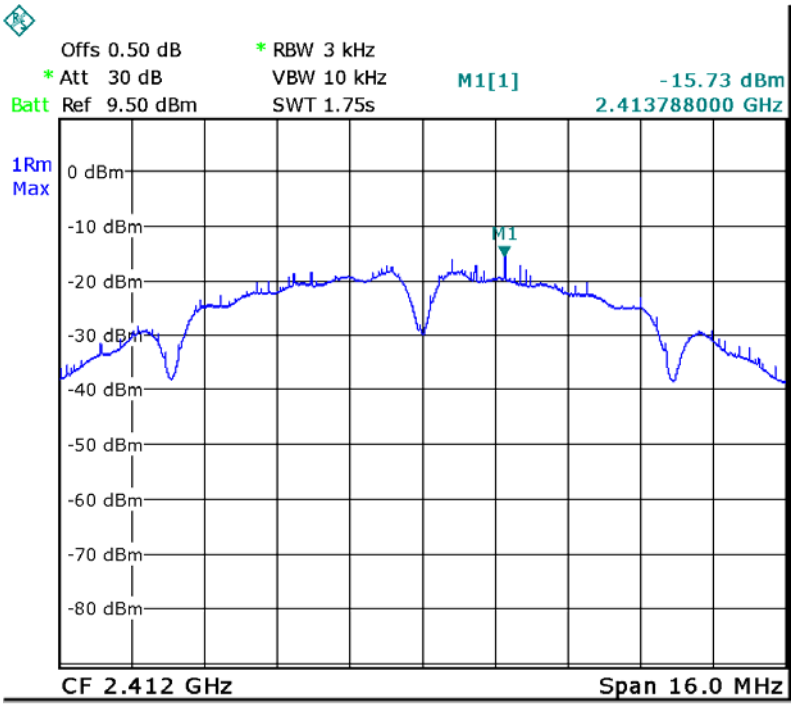
Operation mode	Channel Frequency (MHz)	Power Spectral density (dBm)		
		ANT0	ANT1	Total
TX 11b	Low-2412	-15.73	-9.05	/
	Middle-2437	-10.30	-14.96	/
	High-2462	0.32	0.52	/
TX 11g	Low-2412	-17.24	-18.40	/
	Middle-2437	-18.94	-18.65	/
	High-2462	-19.28	-19.31	/
TX 11n HT20	Low-2412	-18.69	-18.12	-15.39
	Middle-2437	-19.11	-18.65	-15.86
	High-2462	-18.78	-19.91	-16.30
TX 11n HT40	Low-2422	-19.92	-22.08	-17.86
	Middle-2437	-19.40	-20.03	-16.69
	High-2452	-19.52	-20.20	-16.84
Limit: 8dBm per 3kHz * All transmit signals are completely uncorrelated with each other, Directional gain = G_{ANT} which is less than 6dBi. So the limit does not be reduced.				

Table 2:

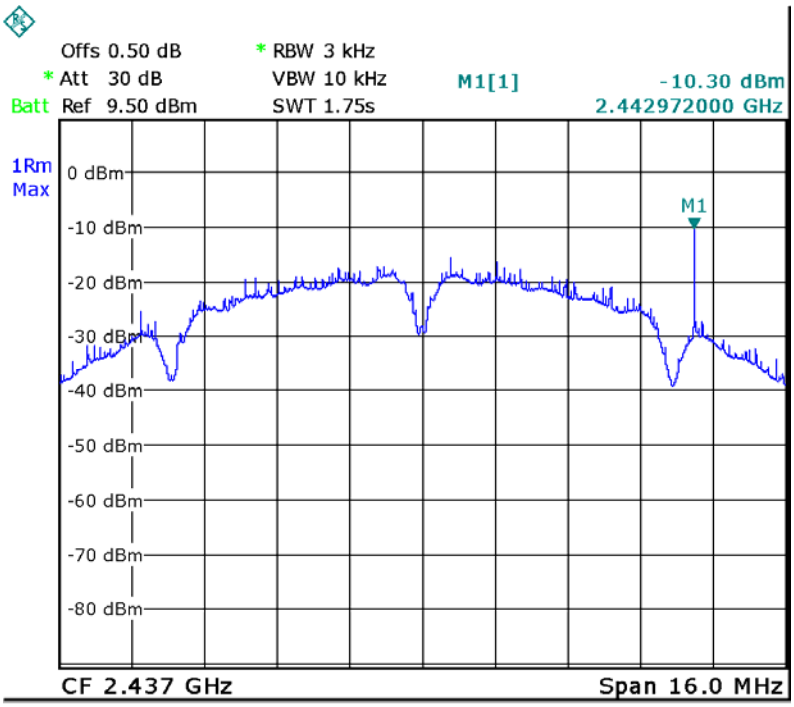
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
BLE	Low-2402	-11.86	8dBm per 3kHz
	Middle-2440	-13.75	8dBm per 3kHz
	High-2480	-11.42	8dBm per 3kHz

Test Plot(antenna 0)

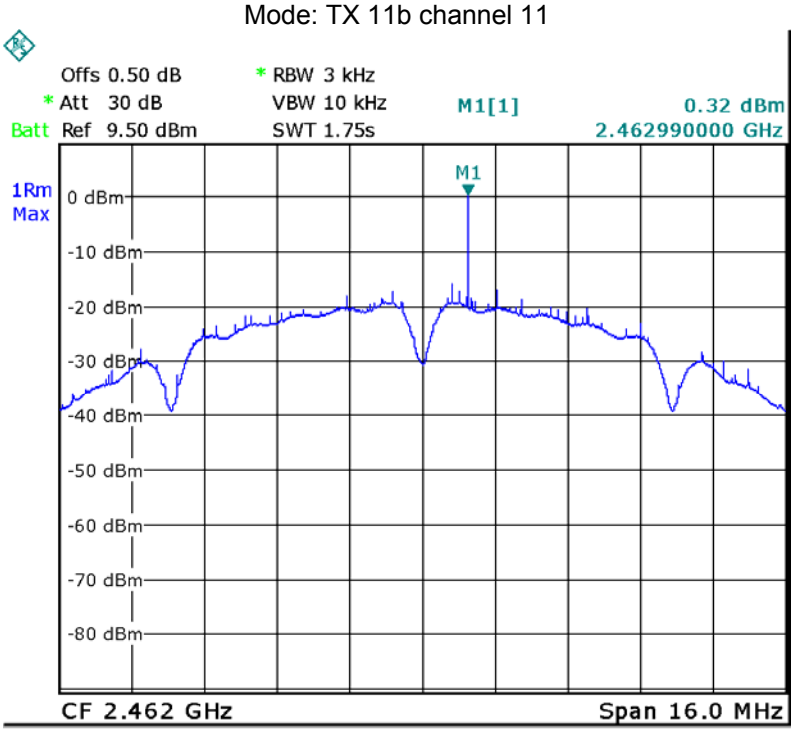
Mode: TX 11b channel 1



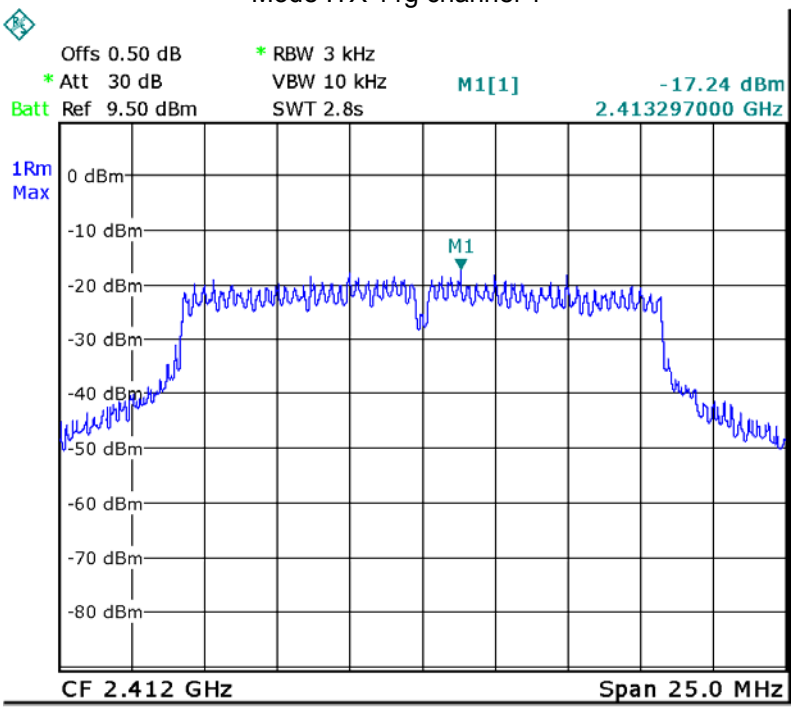
Mode: TX 11b channel 6



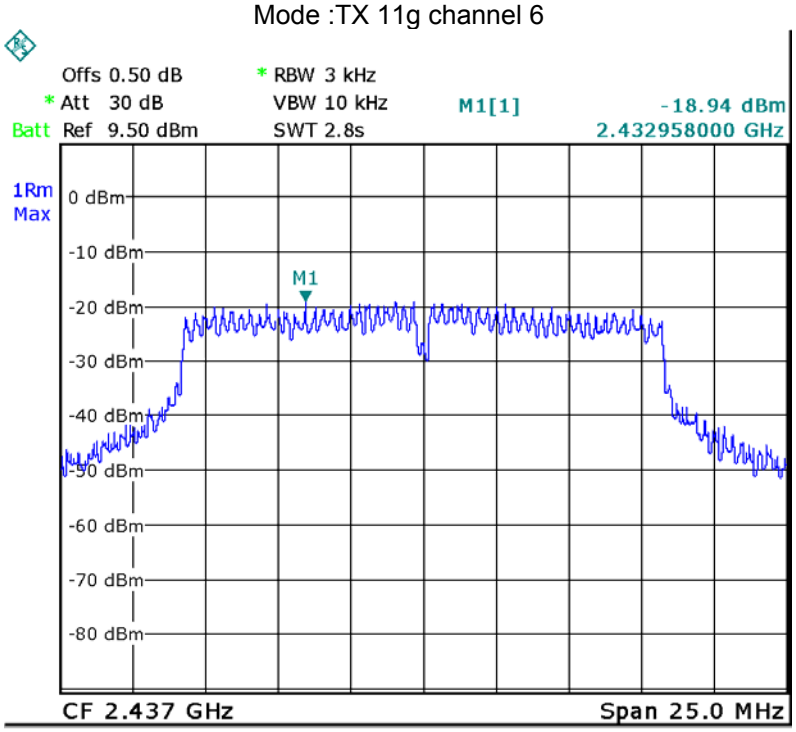
Mode: TX 11b channel 11



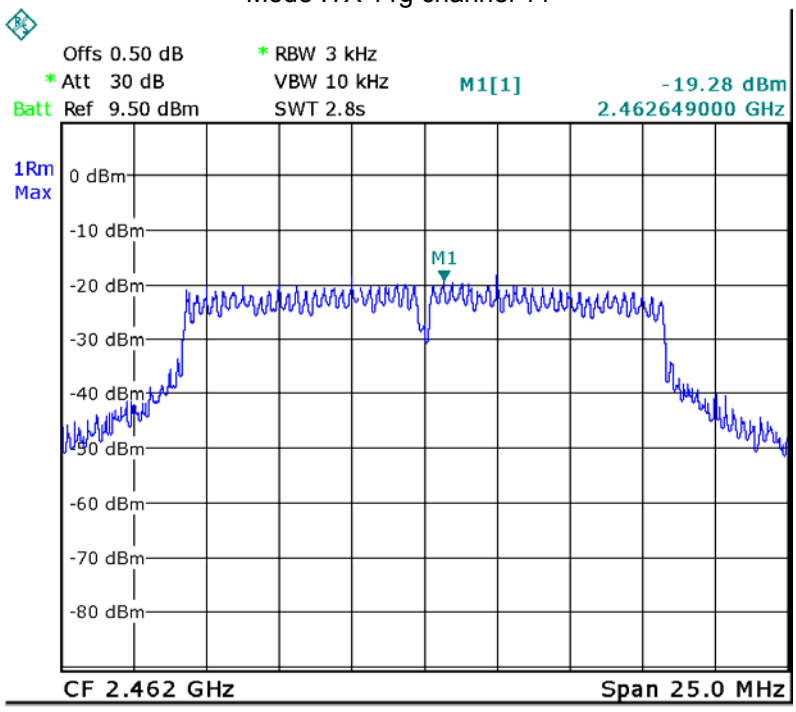
Mode :TX 11g channel 1



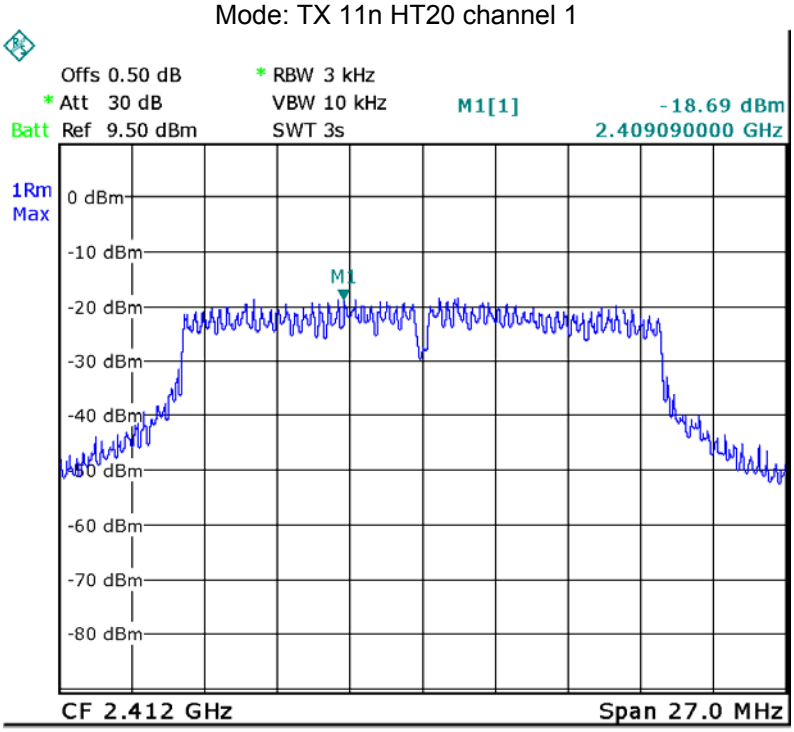
Mode :TX 11g channel 6



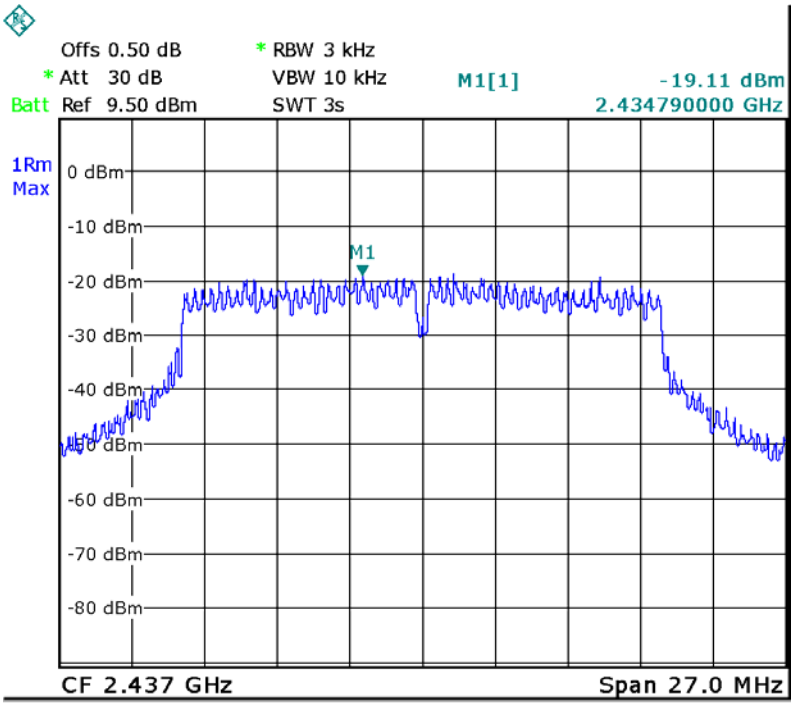
Mode :TX 11g channel 11



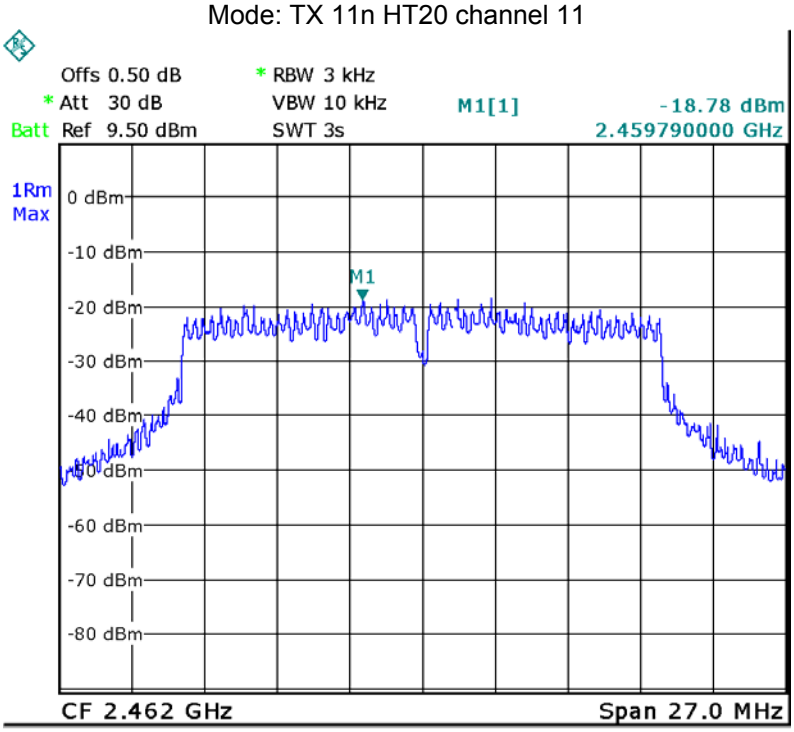
Mode: TX 11n HT20 channel 1



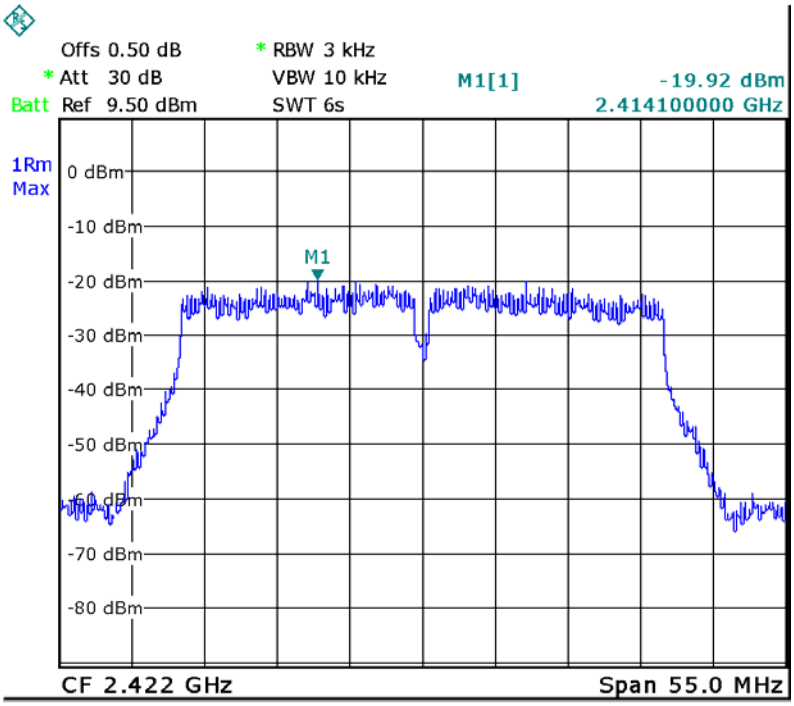
Mode: TX 11n HT20 channel 6



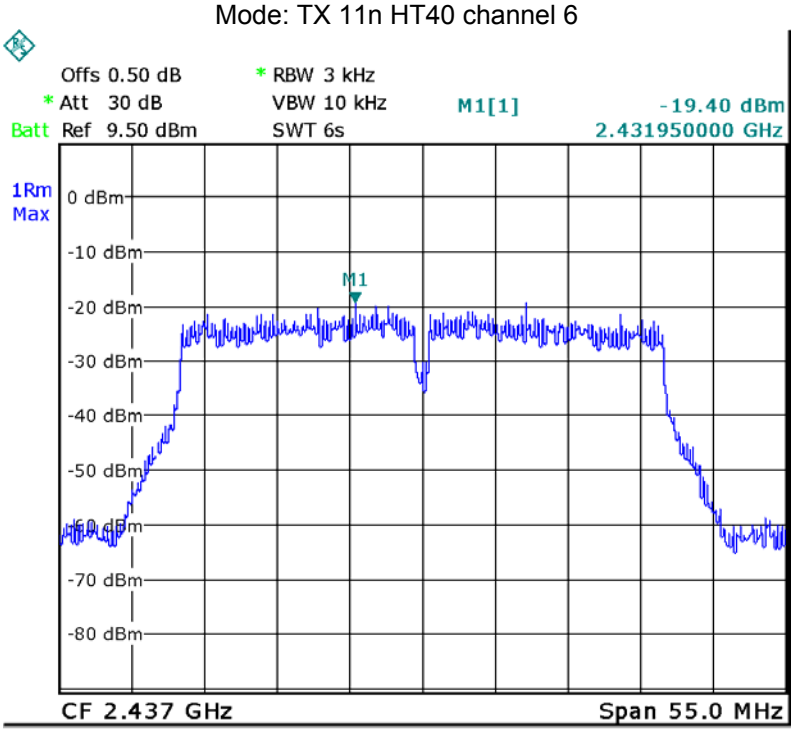
Mode: TX 11n HT20 channel 11



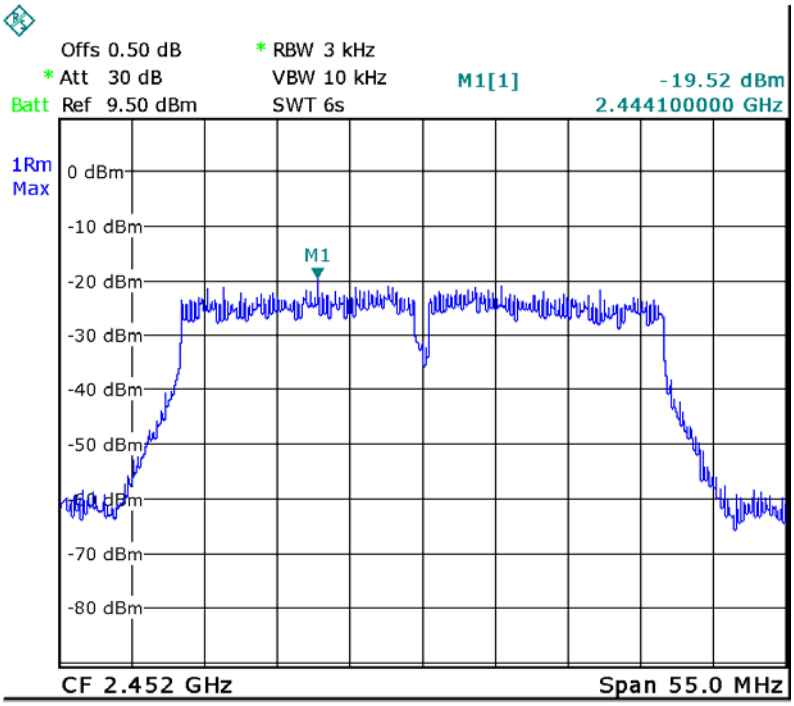
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

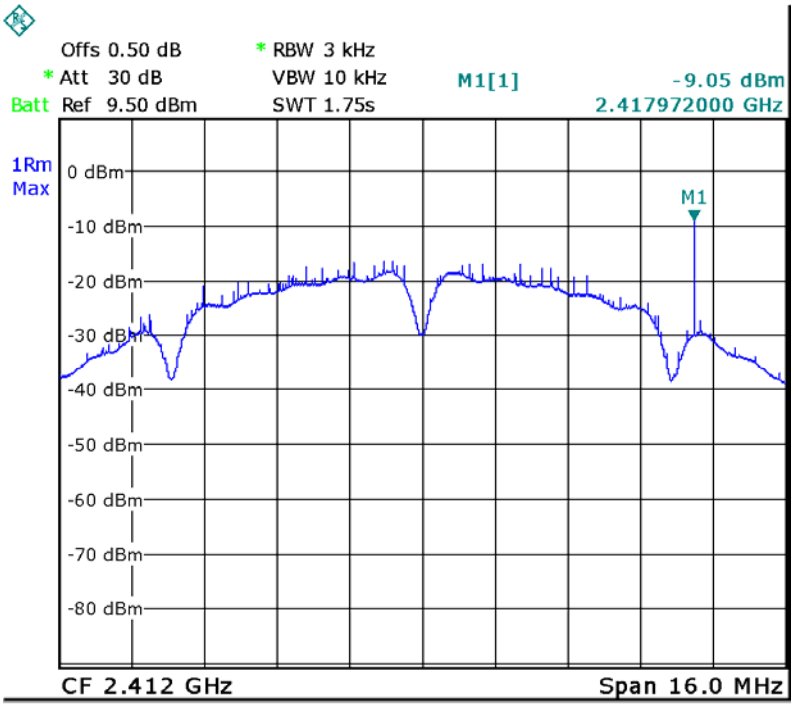


Mode: TX 11n HT40 channel 9

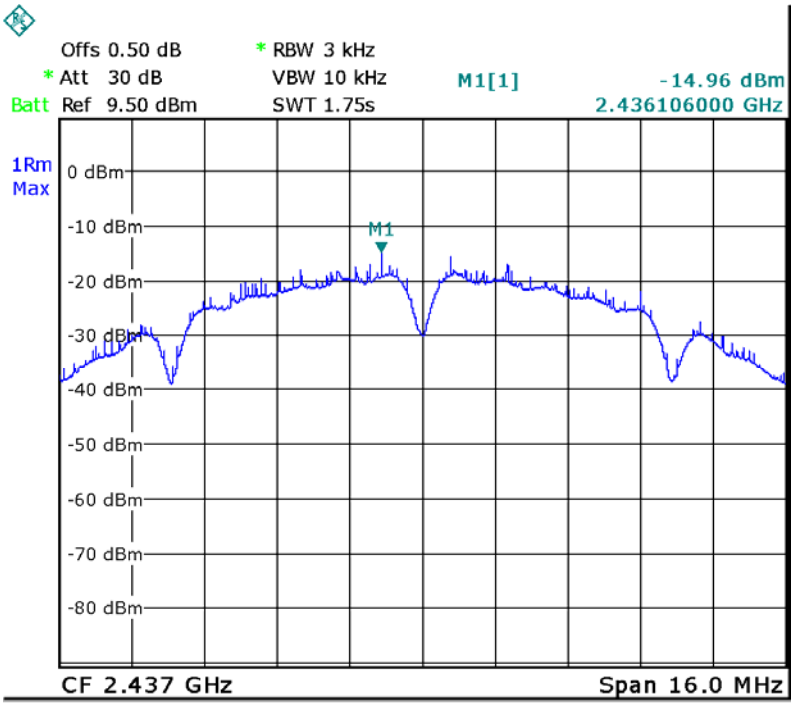


Test Plot(antenna 1)

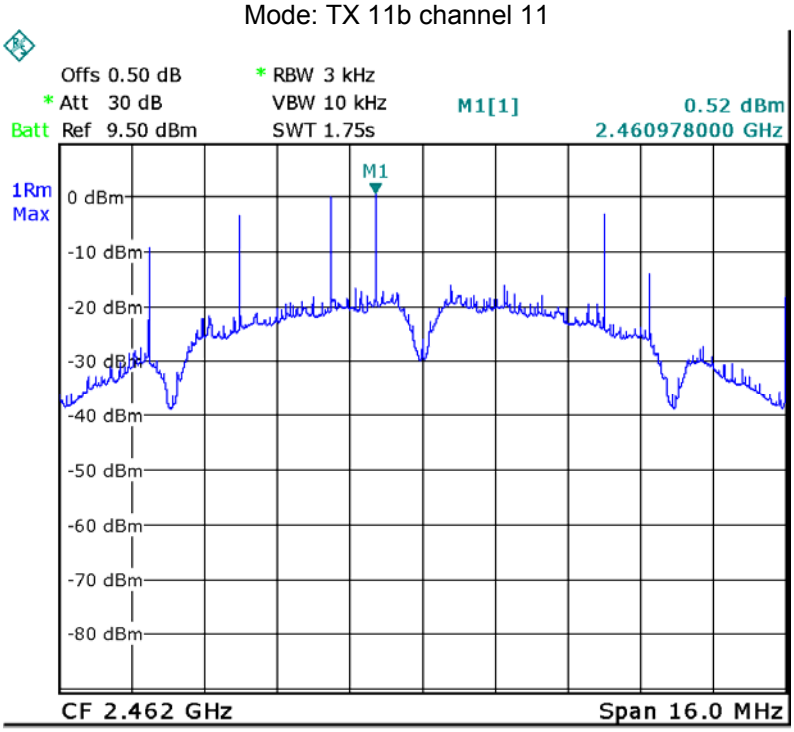
Mode: TX 11b channel 1



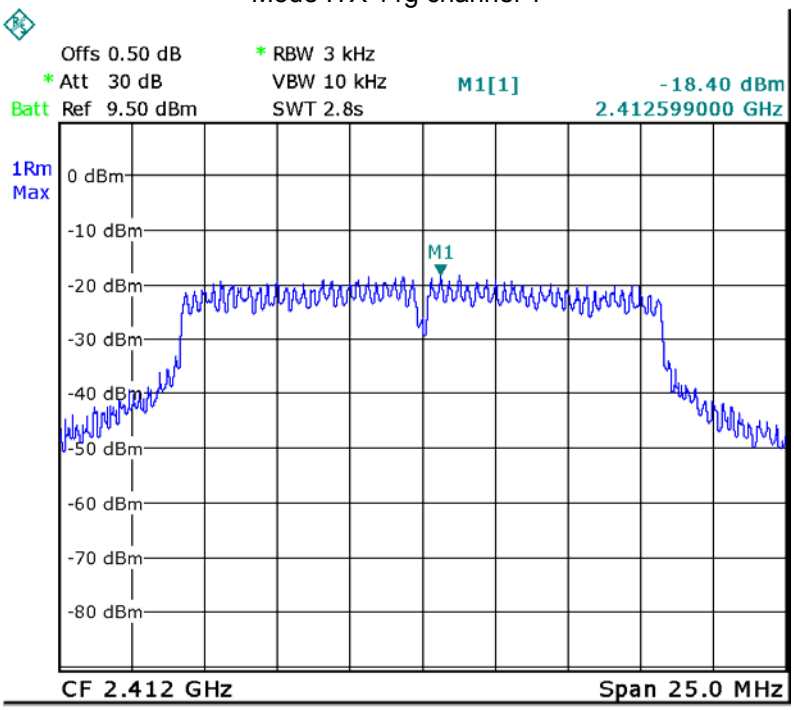
Mode: TX 11b channel 6



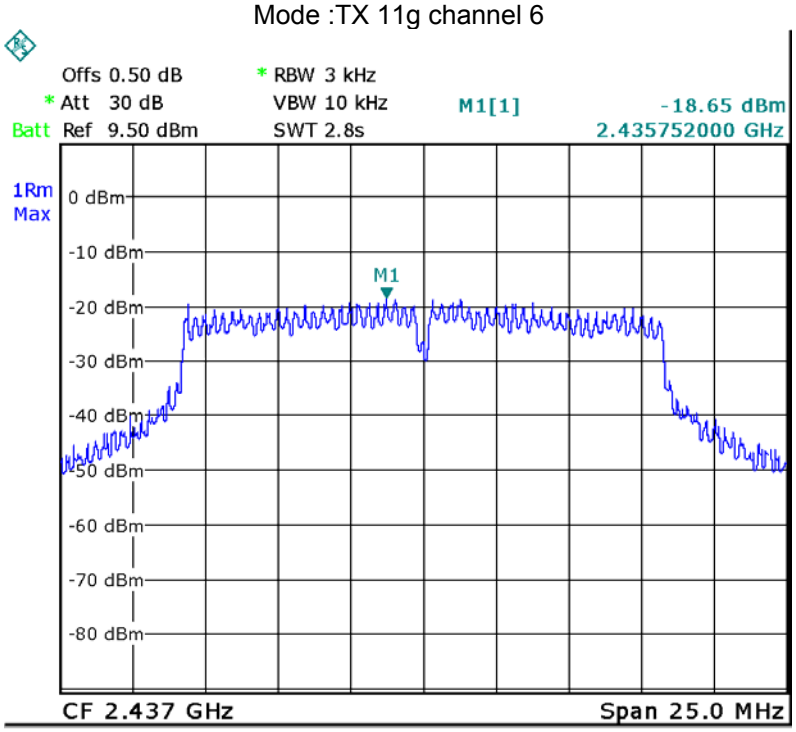
Mode: TX 11b channel 11



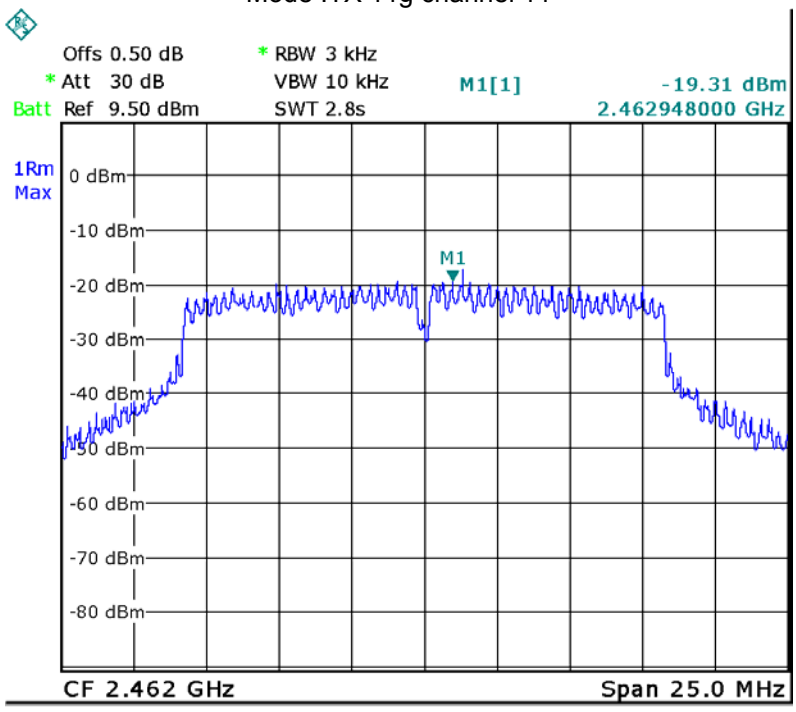
Mode :TX 11g channel 1



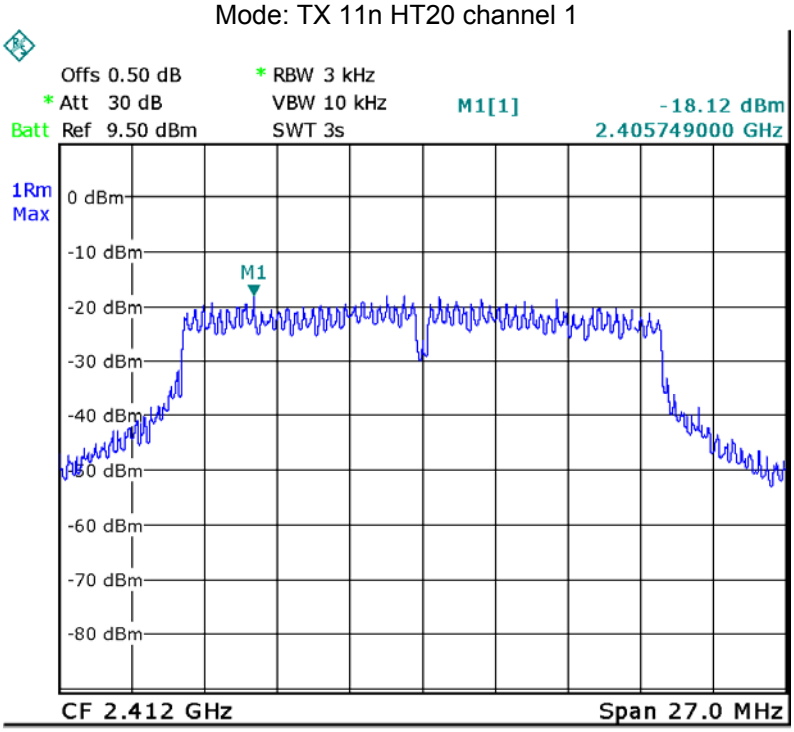
Mode :TX 11g channel 6



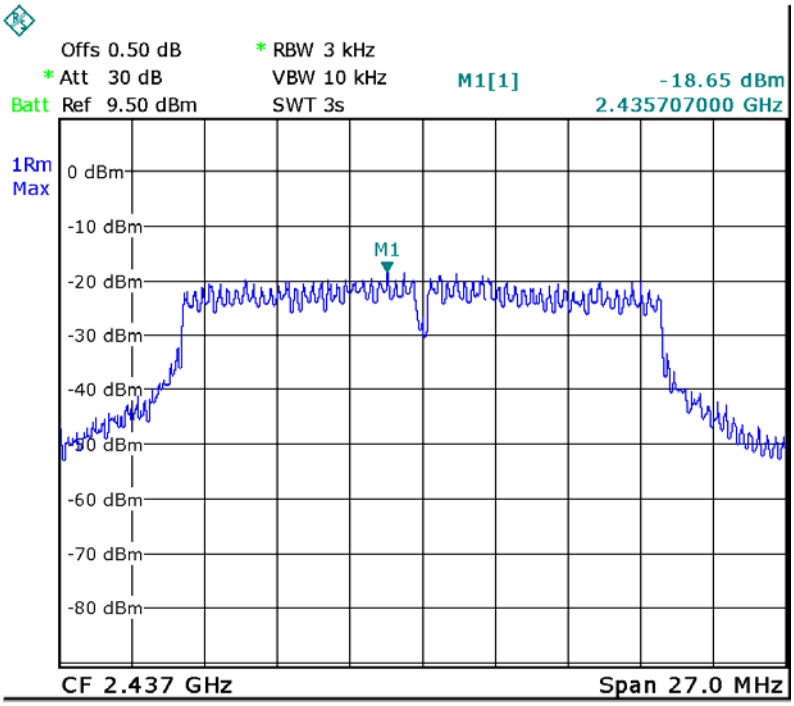
Mode :TX 11g channel 11



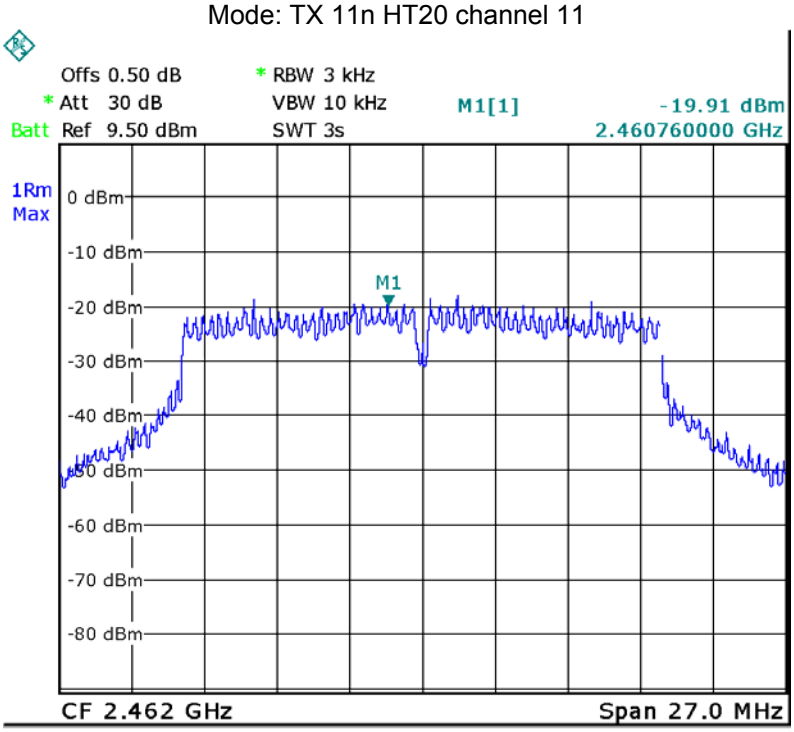
Mode: TX 11n HT20 channel 1



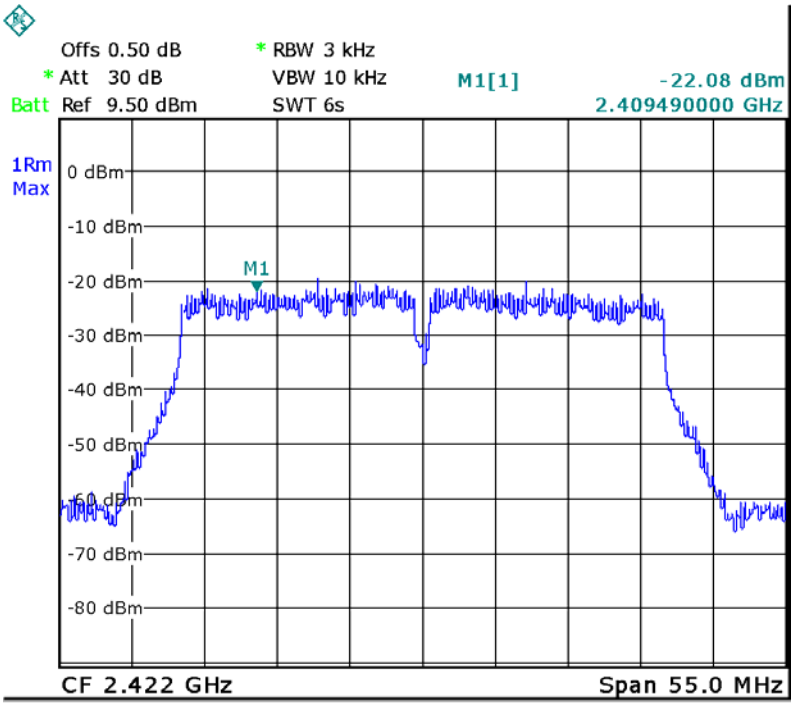
Mode: TX 11n HT20 channel 6



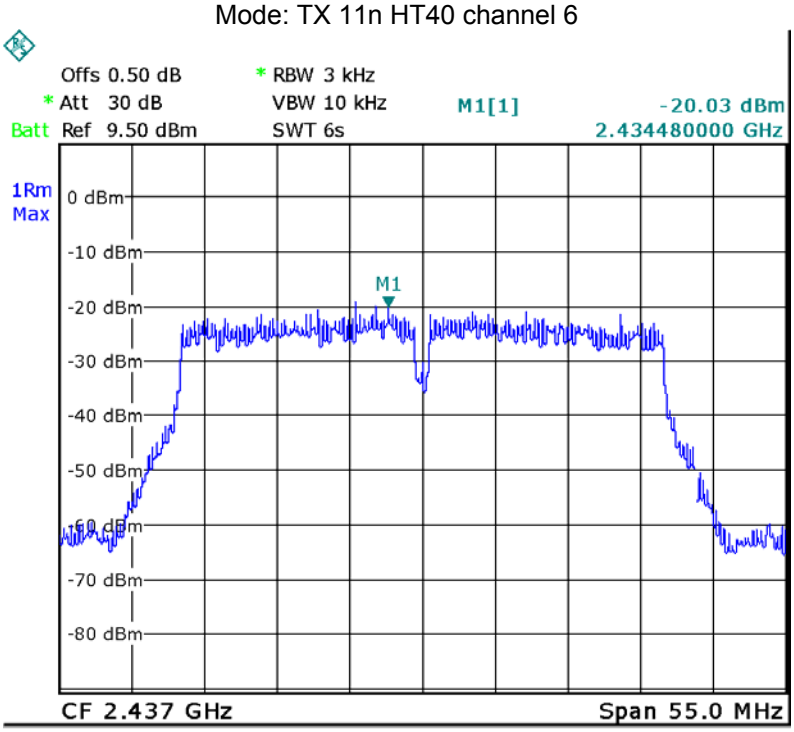
Mode: TX 11n HT20 channel 11



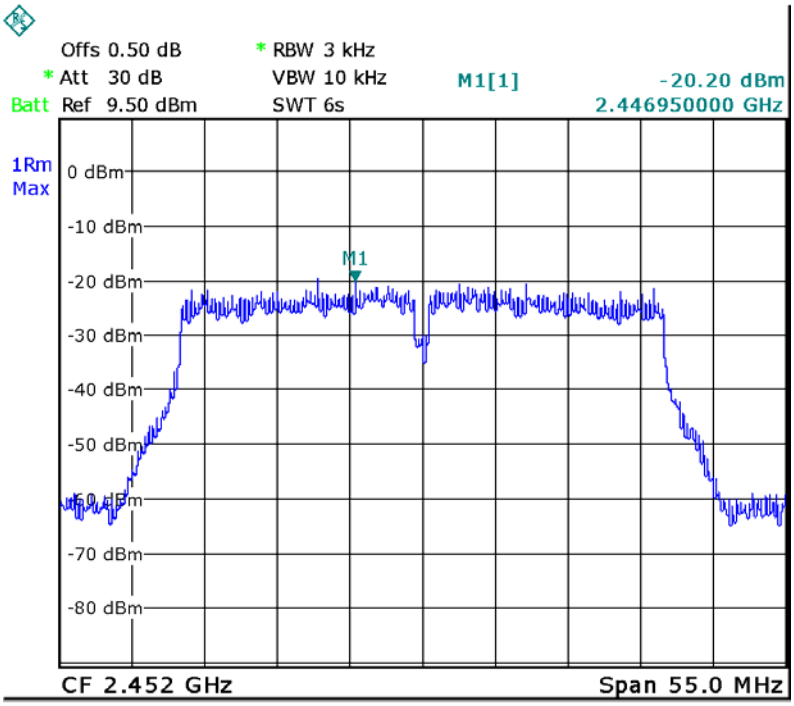
Mode: TX 11n HT40 channel 3



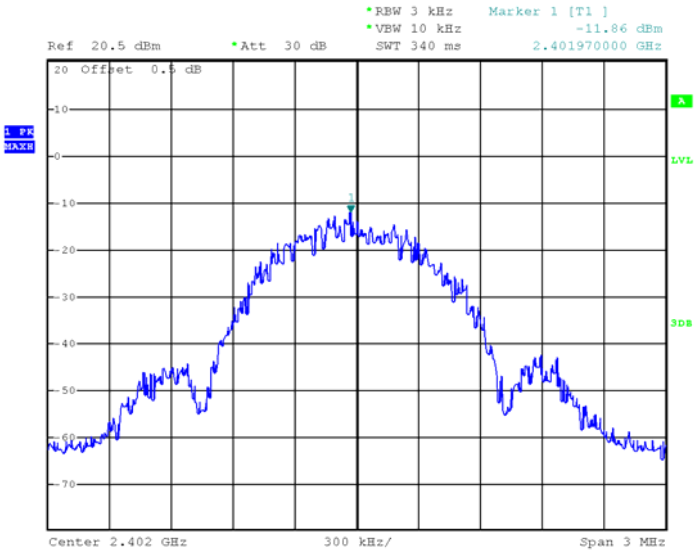
Mode: TX 11n HT40 channel 6



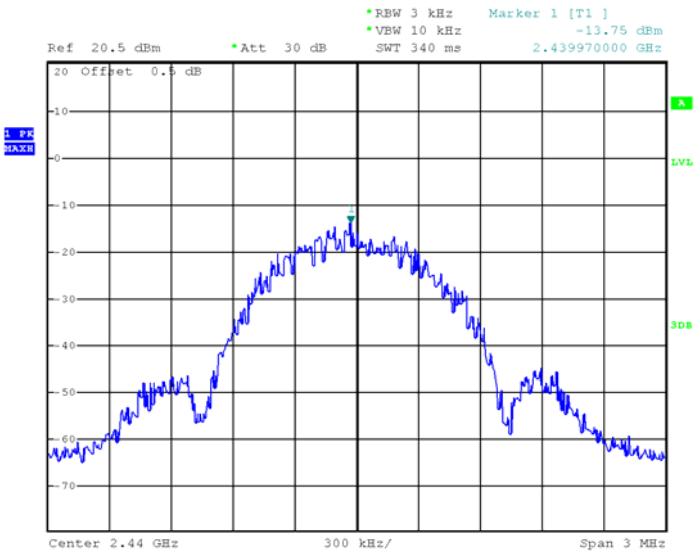
Mode: TX 11n HT40 channel 9



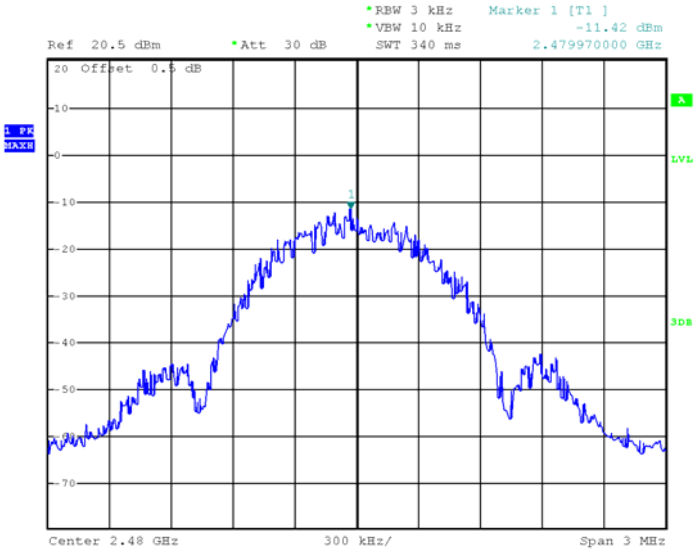
BLE: channel 0



BLE: channel 19



BLE: channel 39



13 Antenna Requirement

According to the FCC Part 15 Paragraph 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. This product has an integrated antenna fulfill the requirement of this section.

14 RF Exposure

Remark: refer to MPE test report: WTD21D09098668W005.

15 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix- IFC67X1 -Photos.

======End of Report======