TEST REPORT

Reference No.	:	WTD21D04030232W001
FCC ID	:	2AZLG-AHD01R
Applicant	:	KAVE Industries LLC
Address	:	8605 Santa Monica.Blvd #53476, Los Angeles, CA 90069
Manufacturer	:	A-oneTech Limited
Address	:	Unit B, 6/F, Valiant Industrial Center, 2-12 Au Pui Wan Street, Fo Tan, N.T., Hong Kong
Product	:	airKAVE Room
Model(s)	:	AHD01, AHD02, AHD03
Standards	:	FCC CFR47 Part 15.247
Date of Receipt sample	:	2021-04-08
Date of Test	:	2021-04-08 to 2021-04-26
Date of Issue	:	2021-04-26
Test Result	:	**Pass**

Remarks:
The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:
Waltek Testing Group Co., Ltd.
Address: No. 77, Houjie Section, Guantai Road, Houjie Town, Dongguan City, Guangdong, China
Tel: +86-769-2267 6998
Fax: +86-769-2267 6828

Compiled by:

Estel Qian / Project Engineer

Approved by:

Daniel Liu / Designated Reviewer

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D04030232 W001	2021-04-08	2021-04-08 to 2021-04-26	2021-04-26	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	airKAVE Room
Model(s):	AHD01, AHD02, AHD03
Model Description:	Only the model name are difference.
Wi-Fi Specification:	802.11b/g/n HT20/n HT40
Hardware Version:	2.1
Software Version:	6.85
Note:	N/A

4.2 Details of E.U.T.

Operation Frequency:	802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz
Max. RF output power:	16.97dBm
Type of Modulation:	BPSK, DQPSK, CCK, OFDM
Antenna installation:	internal permanent antenna
Antenna Gain:	2.0dBi
Ratings:	12.0V ⎓ 5.0A
Adapter:	Model: DSS65-1205000 Input: 100-240V ~2.0A 50/60Hz Output: 12.0V ⎓ 5.0A

4.3 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

4.4 Test Facility

The test facility has a test site registered with the following organizations:

ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.

Waltek Testing Group Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

4.5 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
6dB Bandwidth	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Band Edge	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX

Note :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

5 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.247(d) 15.205(a) 15.209(a)	PASS
Conducted Spurious Emissions	15.247(d)	PASS
Conducted Emissions	15.207(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

6 Equipment Used during Test

6.1 Equipments List

Conducted Emissions Test Site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal. Date**	**Cal. Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2020-07-30	2021-07-29
2.	LISN	R&S	ENV216	101215	2020-07-30	2021-07-29
3.	Cable	Top	TYPE16(3.5M)	-	2020-07-30	2021-07-29
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal. Date**	**Cal. Due Date**
1	Spectrum Analyzer	R&S	FSP30	100091	2020-04-20 2021-04-19	2021-04-19 2022-04-18
2	Amplifier	Agilent	8447D	2944A10178	2020-04-20 2021-04-19	2021-04-19 2022-04-18
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2020-08-22	2021-08-21
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2020-04-20 2021-04-19	2021-04-19 2022-04-18
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2020-04-25 2021-04-24	2021-04-24 2022-04-23
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2020-04-20 2021-04-19	2021-04-19 2022-04-18
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2020-04-20 2021-04-19	2021-04-19 2022-04-18
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2020-04-20 2021-04-19	2021-04-19 2022-04-18
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Cal. Date**	**Cal. Due Date**
1	Test Receiver	R&S	ESCI	101296	2020-04-20 2021-04-19	2021-04-19 2022-04-18
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2020-04-25 2021-04-24	2021-04-24 2022-04-23
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2020-05-06	2021-05-05
4	Amplifier	ANRITSU	MH648A	M43381	2020-04-20 2021-04-19	2021-04-19 2022-04-18
5	Cable	HUBER+SUHNER	CBL2	525178	2020-04-20 2021-04-19	2021-04-19 2022-04-18
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Cal. Date**	**Cal. Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2020-04-20 2021-04-19	2021-04-19 2022-04-18
2.	Spectrum Analyzer	R&S	FSP30	100091	2020-04-20 2021-04-19	2021-04-19 2022-04-18
3.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2020-04-20 2021-04-19	2021-04-19 2022-04-18

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
/	/	/	/

6.3 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-6}
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Conducted Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)
Conducted Spurious Emissions test	± 3.12 dB (9kHz~30MHz)
	± 4.21 dB (30M~1000MHz)
	± 5.14 dB (1000M~26500MHz)

6.4 Test Equipment Calibration

All the test equipments used are valid and calibrated by CEPREI Certification Body that address is No.110 Dongguan Zhuang RD. Guangzhou, P.R.China.

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5.0	56	46
5.0 to 30	60	50
*Decreases with the logarithm of the frequency.		

7.1 E.U.T. Operation

Operating Environment:

Temperature: 22.4 °C

Humidity: 53.7 % RH

Atmospheric Pressure: 101.8kPa

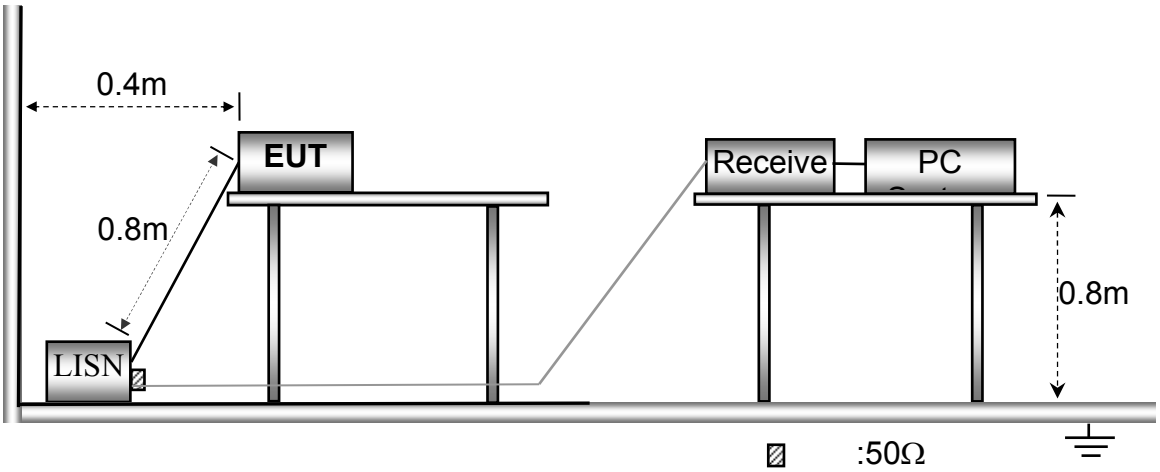
Test Voltage: AC 120V, 60Hz

EUT Operation:

The test was performed in Transmitting mode, the worst test data (802.11b mode low channel) were shown in the report.

7.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013.

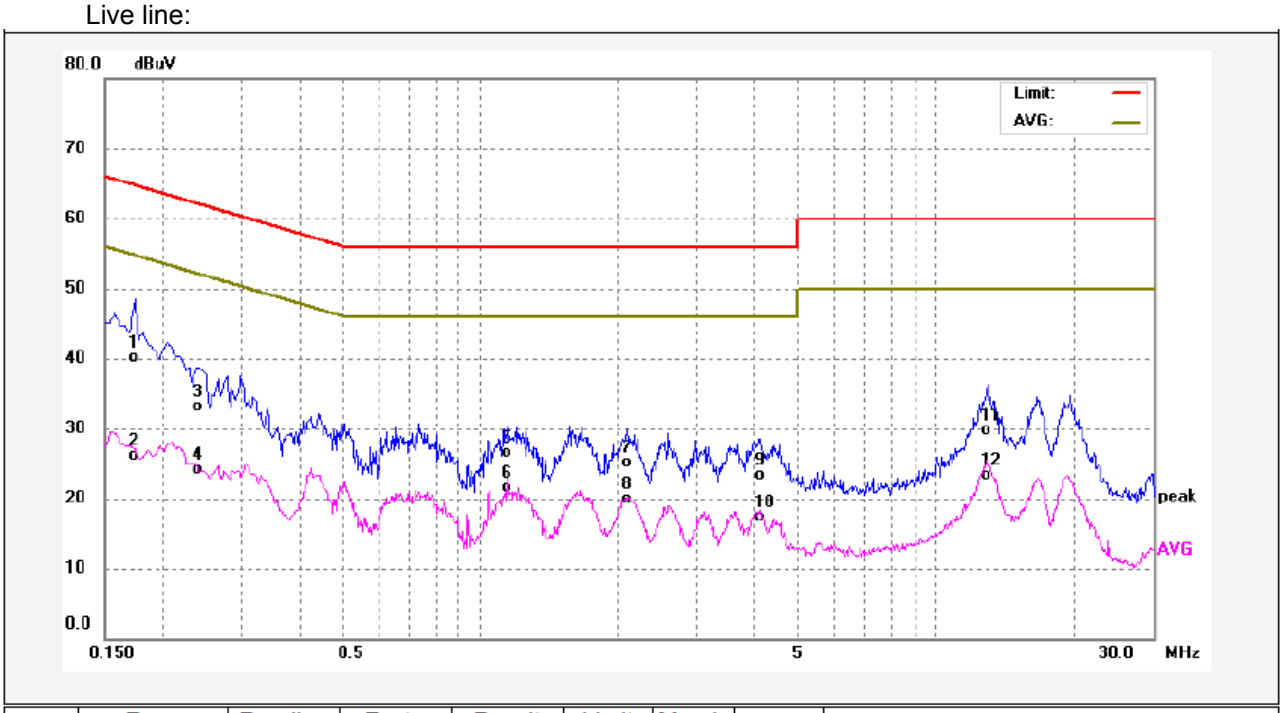


7.3 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

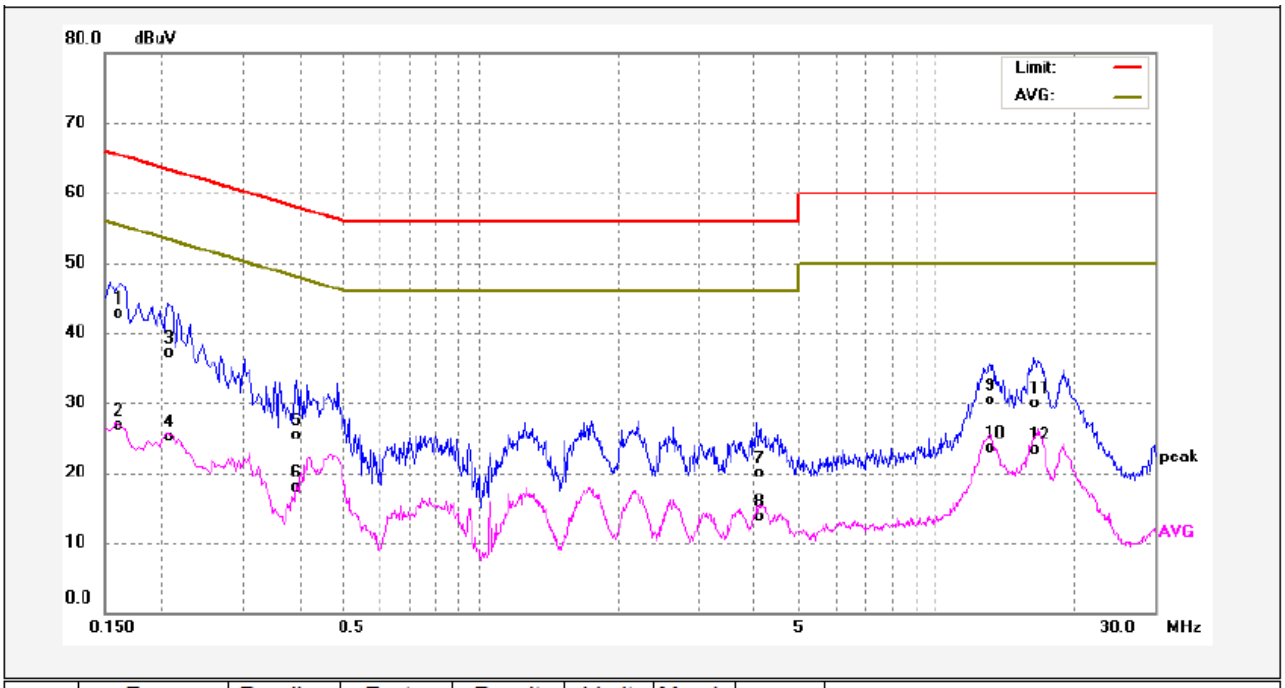
7.4 Conducted Emission Test Result

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1740	29.39	10.75	40.14	64.76	-24.62	QP	
2	0.1740	15.45	10.75	26.20	54.76	-28.56	AVG	
3	0.2420	22.47	10.65	33.12	62.02	-28.90	QP	
4	0.2420	13.44	10.65	24.09	52.02	-27.93	AVG	
5	1.1500	15.83	10.60	26.43	56.00	-29.57	QP	
6	1.1500	10.96	10.60	21.56	46.00	-24.44	AVG	
7	2.1060	14.50	10.61	25.11	56.00	-30.89	QP	
8	2.1060	9.27	10.61	19.88	46.00	-26.12	AVG	
9	4.1060	12.51	10.76	23.27	56.00	-32.73	QP	
10	4.1060	6.52	10.76	17.28	46.00	-28.72	AVG	
11	13.0100	18.89	10.80	29.69	60.00	-30.31	QP	
12	13.0100	12.60	10.80	23.40	50.00	-26.60	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	31.98	10.78	42.76	65.36	-22.60	QP	
2	0.1620	15.83	10.78	26.61	55.36	-28.75	AVG	
3	0.2100	26.44	10.66	37.10	63.20	-26.10	QP	
4	0.2100	14.38	10.66	25.04	53.20	-28.16	AVG	
5	0.3940	14.82	10.57	25.39	57.98	-32.59	QP	
6	0.3940	7.27	10.57	17.84	47.98	-30.14	AVG	
7	4.0420	9.23	10.75	19.98	56.00	-36.02	QP	
8	4.0420	2.86	10.75	13.61	46.00	-32.39	AVG	
9	13.0020	19.50	10.80	30.30	60.00	-29.70	QP	
10	13.0020	12.66	10.80	23.46	50.00	-26.54	AVG	
11	16.3700	19.21	10.78	29.99	60.00	-30.01	QP	
12	16.3700	12.47	10.78	23.25	50.00	-26.75	AVG	

8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

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

Test Result: PASS

Measurement Distance: 3m

Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

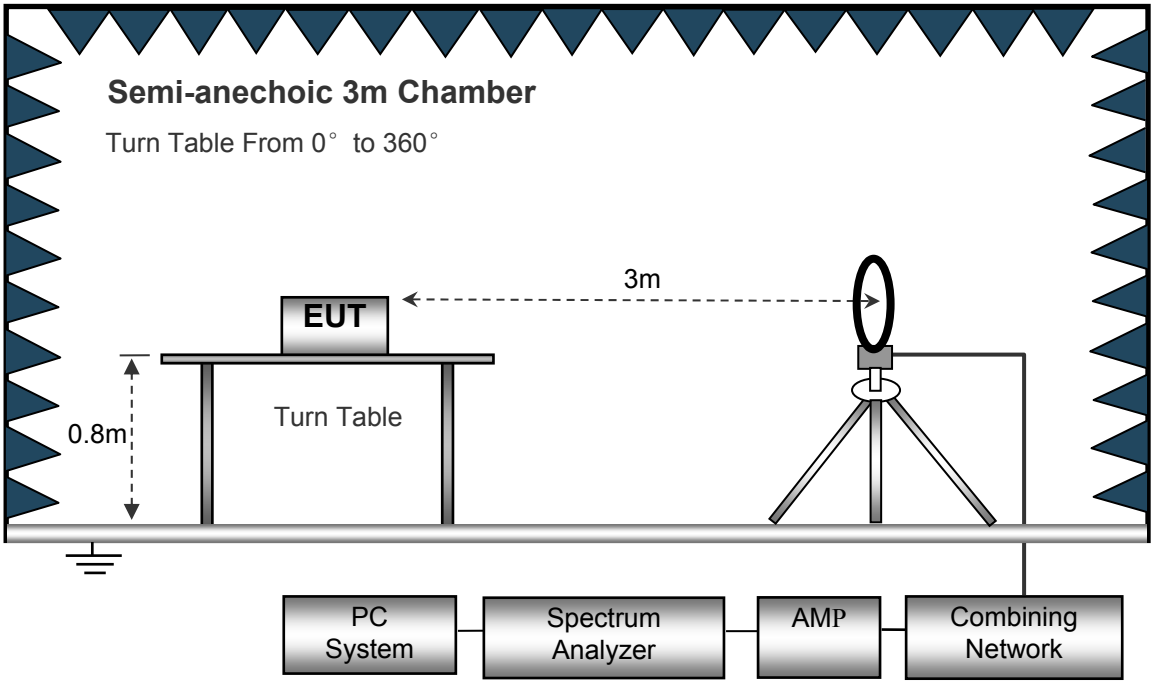
EUT Operation **:**

The test was performed in WIFI link mode, the test data were shown in the report.

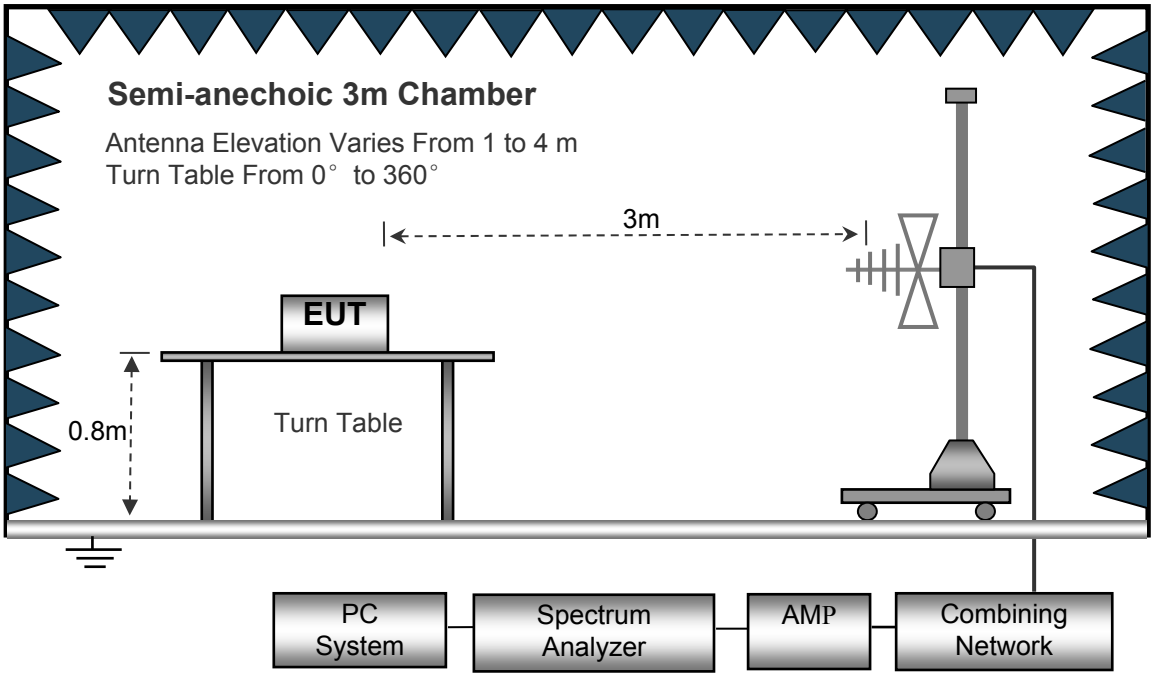
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10.

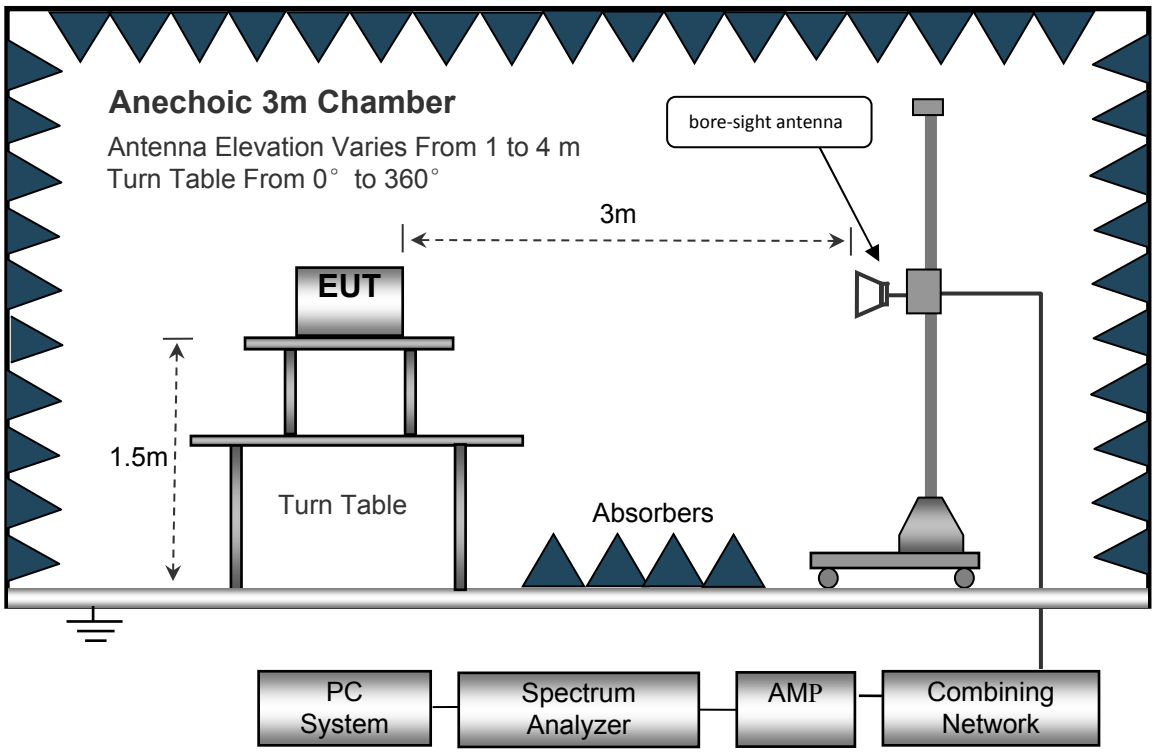
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

Sweep Speed ..... Auto
IF Bandwidth..... 10kHz
Video Bandwidth..... 10kHz
Resolution Bandwidth..... 10kHz

30MHz ~ 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 100kHz
Video Bandwidth..... 300kHz

Above 1GHz

Sweep Speed ..... Auto
Detector ..... PK
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 3MHz
Detector ..... Ave.
Resolution Bandwidth..... 1MHz
Video Bandwidth..... 10Hz

8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
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 moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used druing radiated emissions above 1GHz measurement.

8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

8.6 Summary of Test Results

Test Frequency: 9KHz~30MHz

The measurements were more than 20 dB below the limit and not reported.

Test Frequency : 30MHz ~8GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Low Channel 2412MHz									
223.45	39.92	QP	165	2.0	H	-11.62	28.30	46.00	-17.70
223.45	37.80	QP	46	1.3	V	-11.62	26.18	46.00	-19.82
4824.00	51.64	PK	20	1.4	V	-1.06	50.58	74.00	-23.42
4824.00	43.64	Ave	20	1.4	V	-1.06	42.58	54.00	-11.42
7236.00	42.26	PK	266	1.8	H	1.33	43.59	74.00	-30.41
7236.00	41.29	Ave	266	1.8	H	1.33	42.62	54.00	-11.38
2321.55	45.96	PK	188	1.7	V	-13.19	32.77	74.00	-41.23
2321.55	38.86	Ave	188	1.7	V	-13.19	25.67	54.00	-28.33
2368.68	44.80	PK	210	1.3	H	-13.14	31.66	74.00	-42.34
2368.68	38.30	Ave	210	1.3	H	-13.14	25.16	54.00	-28.84
2485.07	43.94	PK	219	1.8	V	-13.08	30.86	74.00	-43.14
2485.07	37.94	Ave	219	1.8	V	-13.08	24.86	54.00	-29.14

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Middle Channel 2437MHz									
223.45	40.31	QP	338	1.7	H	-11.62	28.69	46.00	-17.31
223.45	38.16	QP	146	1.6	V	-11.62	26.54	46.00	-19.46
4874.00	52.96	PK	92	1.7	V	-0.62	52.34	74.00	-21.66
4874.00	43.81	Ave	92	1.7	V	-0.62	43.19	54.00	-10.81
7311.00	41.48	PK	242	1.8	H	2.21	43.69	74.00	-30.31
7311.00	41.18	Ave	242	1.8	H	2.21	43.39	54.00	-10.61
2344.81	46.58	PK	307	1.4	V	-13.19	33.39	74.00	-40.61
2344.81	38.51	Ave	307	1.4	V	-13.19	25.32	54.00	-28.68
2363.75	42.43	PK	296	1.3	H	-13.14	29.29	74.00	-44.71
2363.75	36.06	Ave	296	1.3	H	-13.14	22.92	54.00	-31.08
2495.34	44.26	PK	174	1.1	V	-13.08	31.18	74.00	-42.82
2495.34	36.80	Ave	174	1.1	V	-13.08	23.72	54.00	-30.28

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: High Channel 2462MHz									
223.45	39.44	QP	275	1.6	H	-11.62	27.82	46.00	-18.18
223.45	38.58	QP	339	1.1	V	-11.62	26.96	46.00	-19.04
4924.00	52.74	PK	229	1.6	V	-0.24	52.50	74.00	-21.50
4924.00	42.73	Ave	229	1.6	V	-0.24	42.49	54.00	-11.51
7386.00	41.12	PK	177	1.3	H	2.84	43.96	74.00	-30.04
7386.00	42.03	Ave	177	1.3	H	2.84	44.87	54.00	-9.13
2323.06	45.81	PK	21	1.4	V	-13.19	32.62	74.00	-41.38
2323.06	37.16	Ave	21	1.4	V	-13.19	23.97	54.00	-30.03
2370.88	44.99	PK	153	1.6	H	-13.14	31.85	74.00	-42.15
2370.88	37.95	Ave	153	1.6	H	-13.14	24.81	54.00	-29.19
2487.29	44.82	PK	335	1.5	V	-13.08	31.74	74.00	-42.26
2487.29	37.78	Ave	335	1.5	V	-13.08	24.70	54.00	-29.30

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
223.45	39.28	QP	116	1.3	H	-11.62	27.66	46.00	-18.34
223.45	38.46	QP	182	1.4	V	-11.62	26.84	46.00	-19.16
4824.00	51.37	PK	143	1.2	V	-1.06	50.31	74.00	-23.69
4824.00	41.37	Ave	143	1.2	V	-1.06	40.31	54.00	-13.69
7236.00	41.37	PK	10	1.1	H	1.33	42.70	74.00	-31.30
7236.00	41.58	Ave	10	1.1	H	1.33	42.91	54.00	-11.09
2338.04	46.63	PK	198	1.8	V	-13.19	33.44	74.00	-40.56
2338.04	37.25	Ave	198	1.8	V	-13.19	24.06	54.00	-29.94
2351.25	43.28	PK	249	1.3	H	-13.14	30.14	74.00	-43.86
2351.25	38.90	Ave	249	1.3	H	-13.14	25.76	54.00	-28.24
2488.30	44.85	PK	265	1.4	V	-13.08	31.77	74.00	-42.23
2488.30	38.43	Ave	265	1.4	V	-13.08	25.35	54.00	-28.65

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Middle Channel 2437MHz									
223.45	39.21	QP	136	1.6	H	-11.62	27.59	46.00	-18.41
223.45	39.46	QP	123	1.2	V	-11.62	27.84	46.00	-18.16
4874.00	50.19	PK	13	1.1	V	-0.62	49.57	74.00	-24.43
4874.00	42.20	Ave	13	1.1	V	-0.62	41.58	54.00	-12.42
7311.00	40.92	PK	356	1.8	H	2.21	43.13	74.00	-30.87
7311.00	41.46	Ave	356	1.8	H	2.21	43.67	54.00	-10.33
2336.28	46.83	PK	23	1.8	V	-13.19	33.64	74.00	-40.36
2336.28	39.60	Ave	23	1.8	V	-13.19	26.41	54.00	-27.59
2381.61	43.32	PK	3	1.9	H	-13.14	30.18	74.00	-43.82
2381.61	37.99	Ave	3	1.9	H	-13.14	24.85	54.00	-29.15
2489.90	44.02	PK	319	1.0	V	-13.08	30.94	74.00	-43.06
2489.90	38.58	Ave	319	1.0	V	-13.08	25.50	54.00	-28.50

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: High Channel 2462MHz									
223.45	37.83	QP	355	1.5	H	-11.62	26.21	46.00	-19.79
223.45	40.67	QP	219	1.1	V	-11.62	29.05	46.00	-16.95
4924.00	51.47	PK	63	1.3	V	-0.24	51.23	74.00	-22.77
4924.00	41.59	Ave	63	1.3	V	-0.24	41.35	54.00	-12.65
7386.00	39.59	PK	102	1.7	H	2.84	42.43	74.00	-31.57
7386.00	41.73	Ave	102	1.7	H	2.84	44.57	54.00	-9.43
2311.79	46.37	PK	183	1.9	V	-13.19	33.18	74.00	-40.82
2311.79	39.16	Ave	183	1.9	V	-13.19	25.97	54.00	-28.03
2354.50	42.44	PK	157	1.5	H	-13.14	29.30	74.00	-44.70
2354.50	36.59	Ave	157	1.5	H	-13.14	23.45	54.00	-30.55
2488.69	43.86	PK	335	1.6	V	-13.08	30.78	74.00	-43.22
2488.69	38.98	Ave	335	1.6	V	-13.08	25.90	54.00	-28.10

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Low Channel 2412MHz									
223.45	39.05	QP	10	1.7	H	-11.62	27.43	46.00	-18.57
223.45	40.58	QP	299	1.5	V	-11.62	28.96	46.00	-17.04
4824.00	50.60	PK	59	1.8	V	-1.06	49.54	74.00	-24.46
4824.00	43.06	Ave	59	1.8	V	-1.06	42.00	54.00	-12.00
7236.00	40.27	PK	54	1.9	H	1.33	41.60	74.00	-32.40
7236.00	41.94	Ave	54	1.9	H	1.33	43.27	54.00	-10.73
2349.25	45.85	PK	95	1.9	V	-13.19	32.66	74.00	-41.34
2349.25	39.20	Ave	95	1.9	V	-13.19	26.01	54.00	-27.99
2375.36	43.92	PK	313	1.3	H	-13.14	30.78	74.00	-43.22
2375.36	36.57	Ave	313	1.3	H	-13.14	23.43	54.00	-30.57
2486.16	42.68	PK	202	1.7	V	-13.08	29.60	74.00	-44.40
2486.16	36.54	Ave	202	1.7	V	-13.08	23.46	54.00	-30.54

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Middle Channel 2437MHz									
223.45	40.10	QP	117	1.9	H	-11.62	28.48	46.00	-17.52
223.45	40.08	QP	115	1.8	V	-11.62	28.46	46.00	-17.54
4874.00	49.49	PK	354	1.9	V	-0.62	48.87	74.00	-25.13
4874.00	42.45	Ave	354	1.9	V	-0.62	41.83	54.00	-12.17
7311.00	41.35	PK	232	1.5	H	2.21	43.56	74.00	-30.44
7311.00	42.47	Ave	232	1.5	H	2.21	44.68	54.00	-9.32
2326.93	45.19	PK	165	1.9	V	-13.19	32.00	74.00	-42.00
2326.93	39.25	Ave	165	1.9	V	-13.19	26.06	54.00	-27.94
2375.59	43.66	PK	55	1.3	H	-13.14	30.52	74.00	-43.48
2375.59	36.89	Ave	55	1.3	H	-13.14	23.75	54.00	-30.25
2489.80	42.12	PK	50	1.6	V	-13.08	29.04	74.00	-44.96
2489.80	36.90	Ave	50	1.6	V	-13.08	23.82	54.00	-30.18

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: High Channel 2462MHz									
223.45	39.93	QP	208	1.3	H	-11.62	28.31	46.00	-17.69
223.45	39.44	QP	99	1.2	V	-11.62	27.82	46.00	-18.18
4924.00	50.22	PK	21	1.4	V	-0.24	49.98	74.00	-24.02
4924.00	43.83	Ave	21	1.4	V	-0.24	43.59	54.00	-10.41
7386.00	41.39	PK	269	1.8	H	2.84	44.23	74.00	-29.77
7386.00	41.86	Ave	269	1.8	H	2.84	44.70	54.00	-9.30
2346.81	46.30	PK	15	1.0	V	-13.19	33.11	74.00	-40.89
2346.81	38.96	Ave	15	1.0	V	-13.19	25.77	54.00	-28.23
2350.81	44.32	PK	74	1.2	H	-13.14	31.18	74.00	-42.82
2350.81	39.00	Ave	74	1.2	H	-13.14	25.86	54.00	-28.14
2483.69	43.21	PK	137	1.4	V	-13.08	30.13	74.00	-43.87
2483.69	38.17	Ave	137	1.4	V	-13.08	25.09	54.00	-28.91

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: Low Channel 2422MHz									
223.45	38.45	QP	55	1.0	H	-11.62	26.83	46.00	-19.17
223.45	39.76	QP	269	1.6	V	-11.62	28.14	46.00	-17.86
4844.00	49.01	PK	297	1.5	V	-1.06	47.95	74.00	-26.05
4844.00	41.73	Ave	297	1.5	V	-1.06	40.67	54.00	-13.33
7266.00	39.01	PK	84	1.1	H	1.33	40.34	74.00	-33.66
7266.00	39.66	Ave	84	1.1	H	1.33	40.99	54.00	-13.01
2336.75	45.65	PK	186	1.9	V	-13.19	32.46	74.00	-41.54
2336.75	39.24	Ave	186	1.9	V	-13.19	26.05	54.00	-27.95
2354.03	43.49	PK	310	2.0	H	-13.14	30.35	74.00	-43.65
2354.03	38.24	Ave	310	2.0	H	-13.14	25.10	54.00	-28.90
2497.46	42.26	PK	162	1.8	V	-13.08	29.18	74.00	-44.82
2497.46	38.86	Ave	162	1.8	V	-13.08	25.78	54.00	-28.22

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: Middle Channel 2437MHz									
223.45	39.08	QP	230	1.5	H	-11.62	27.46	46.00	-18.54
223.45	40.12	QP	205	1.4	V	-11.62	28.50	46.00	-17.50
4874.00	48.30	PK	91	1.8	V	-0.62	47.68	74.00	-26.32
4874.00	42.30	Ave	91	1.8	V	-0.62	41.68	54.00	-12.32
7311.00	39.61	PK	206	1.2	H	2.21	41.82	74.00	-32.18
7311.00	39.12	Ave	206	1.2	H	2.21	41.33	54.00	-12.67
2310.40	46.31	PK	258	1.4	V	-13.19	33.12	74.00	-40.88
2310.40	39.86	Ave	258	1.4	V	-13.19	26.67	54.00	-27.33
2355.19	42.52	PK	341	1.8	H	-13.14	29.38	74.00	-44.62
2355.19	38.02	Ave	341	1.8	H	-13.14	24.88	54.00	-29.12
2492.39	44.07	PK	184	1.7	V	-13.08	30.99	74.00	-43.01
2492.39	36.16	Ave	184	1.7	V	-13.08	23.08	54.00	-30.92

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: High Channel 2452MHz									
223.45	39.52	QP	208	1.4	H	-11.62	27.90	46.00	-18.10
223.45	40.40	QP	241	1.0	V	-11.62	28.78	46.00	-17.22
4904.00	48.38	PK	84	1.7	V	-0.24	48.14	74.00	-25.86
4904.00	42.52	Ave	84	1.7	V	-0.24	42.28	54.00	-11.72
7356.00	40.18	PK	194	1.2	H	2.84	43.02	74.00	-30.98
7356.00	38.16	Ave	194	1.2	H	2.84	41.00	54.00	-13.00
2344.33	46.75	PK	186	1.3	V	-13.19	33.56	74.00	-40.44
2344.33	37.03	Ave	186	1.3	V	-13.19	23.84	54.00	-30.16
2378.40	42.75	PK	119	1.7	H	-13.14	29.61	74.00	-44.39
2378.40	36.40	Ave	119	1.7	H	-13.14	23.26	54.00	-30.74
2499.16	42.23	PK	51	1.5	V	-13.08	29.15	74.00	-44.85
2499.16	38.35	Ave	51	1.5	V	-13.08	25.27	54.00	-28.73

Test Frequency: 8GHz~25GHz

The measurements were more than 20 dB below the limit and not reported.

9 Duty Cycle

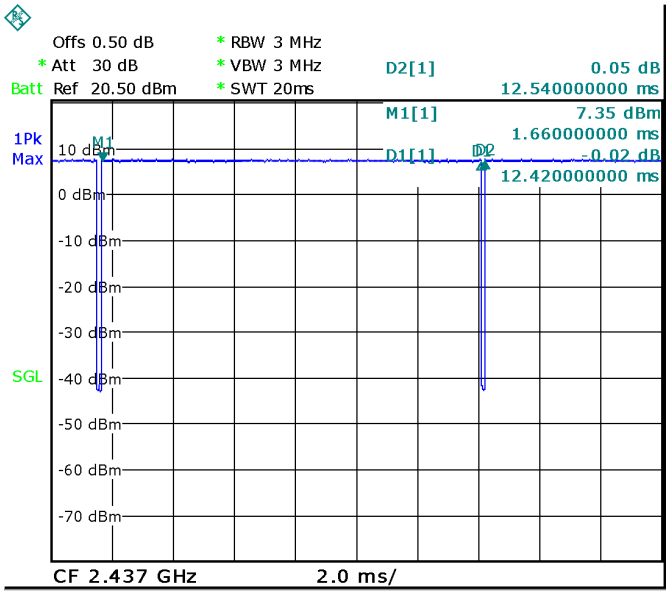
Type of Modulation	On time ms	Period ms	Duty Cycle linear	Duty Cycle %	Duty Cycle Factor(dB)	Average Factor(dB)
802.11b	12.4200	12.5400	0.99	99.04	0.04	-0.08
-						

Remark:

Duty cycle=On Time/period;

Duty cycle factor=10*log(1/Duty cycle);

Average factor=20log$_{10}$Duty cycle



10 Conducted Spurious Emissions

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

Test Result: PASS

Limit:

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

10.1 Test Procedure

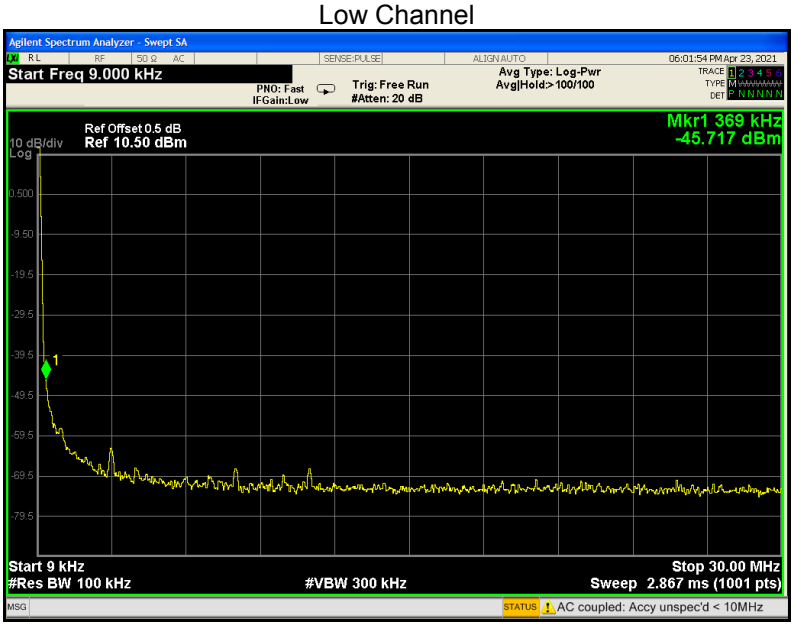
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
   a) Set instrument center frequency to DTS channel center frequency.
   b) Set the span to _ 1.5 times the DTS bandwidth.
   c) Set the RBW = 100 kHz.
   d) Set the VBW _ [3 × RBW].
   e) Detector = peak.
   f) Sweep time = auto couple.
   g) Trace mode = max hold.
   h) Allow trace to fully stabilize.
   i) Use the peak marker function to determine the maximum PSD level.
   Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

10.2 Test Result

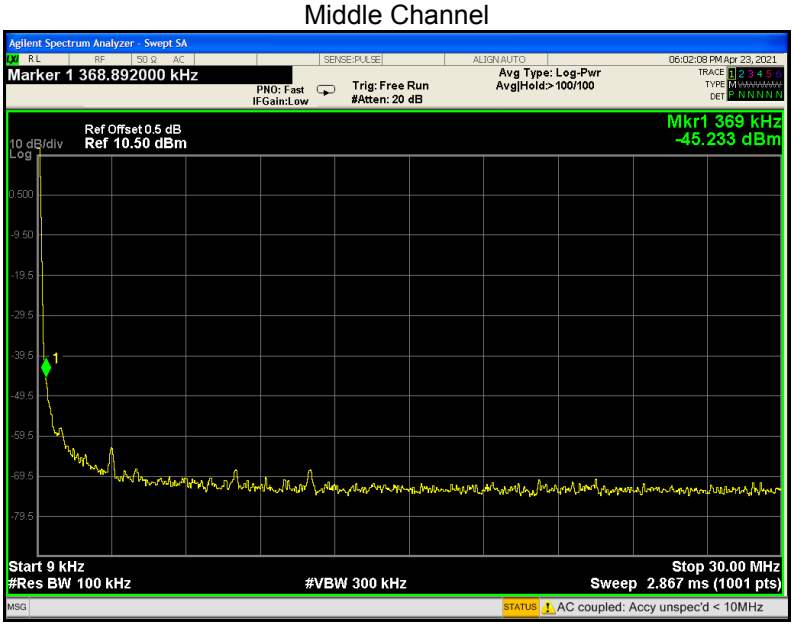
9KHz – 30MHz

802.11b

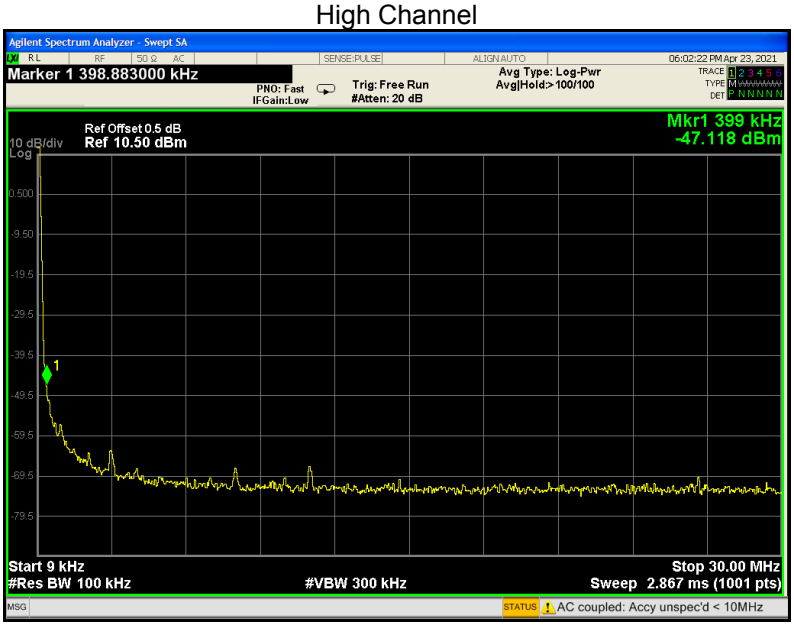
Low Channel



Middle Channel

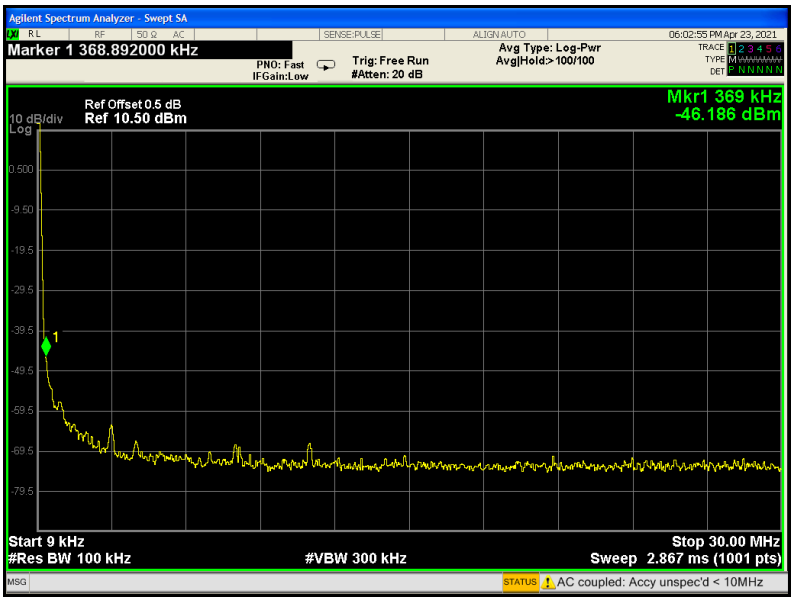


High Channel

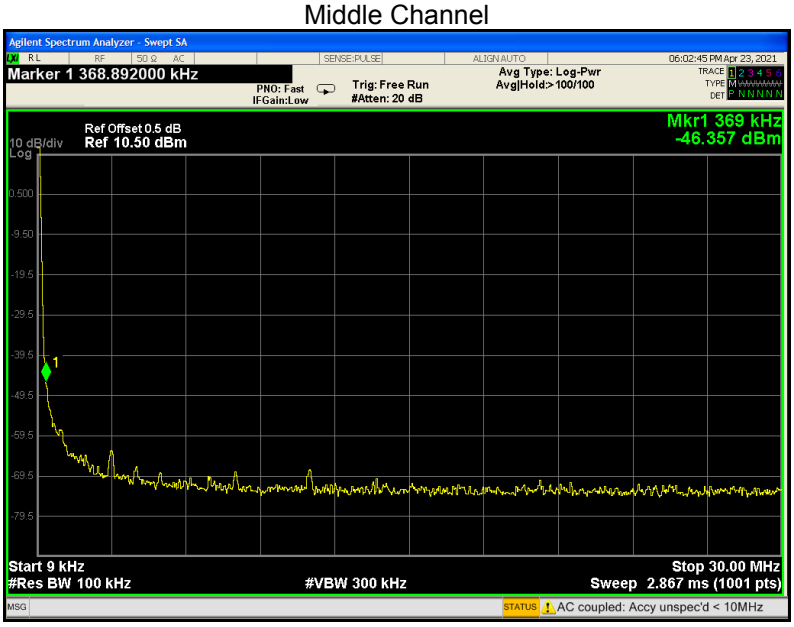


802.11g

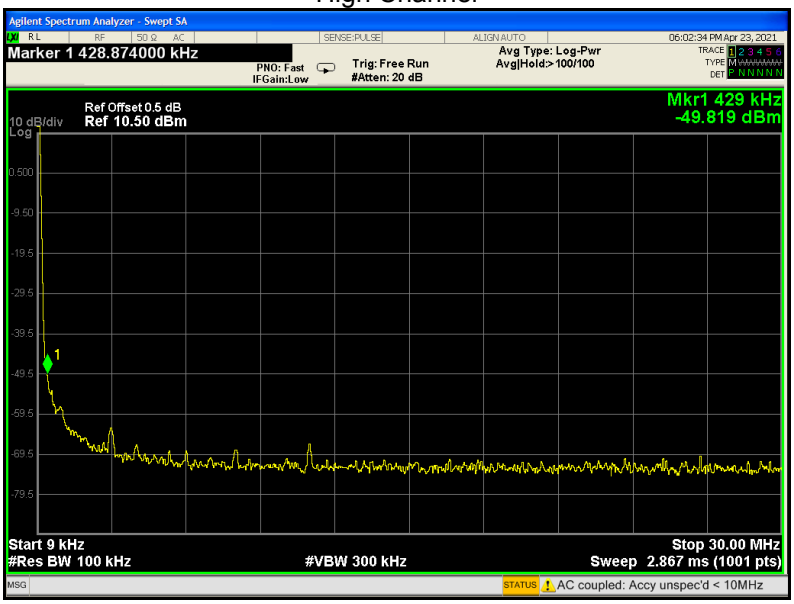
Low Channel



Middle Channel

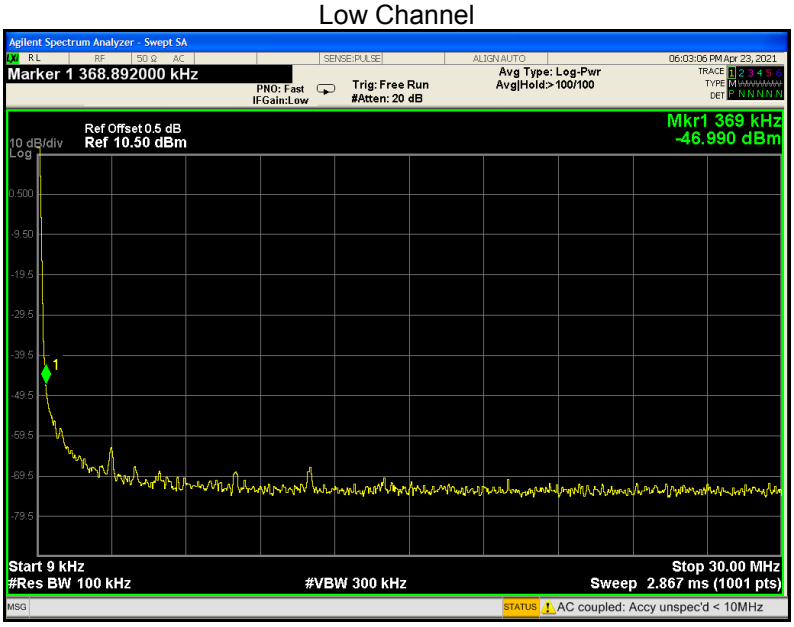


High Channel

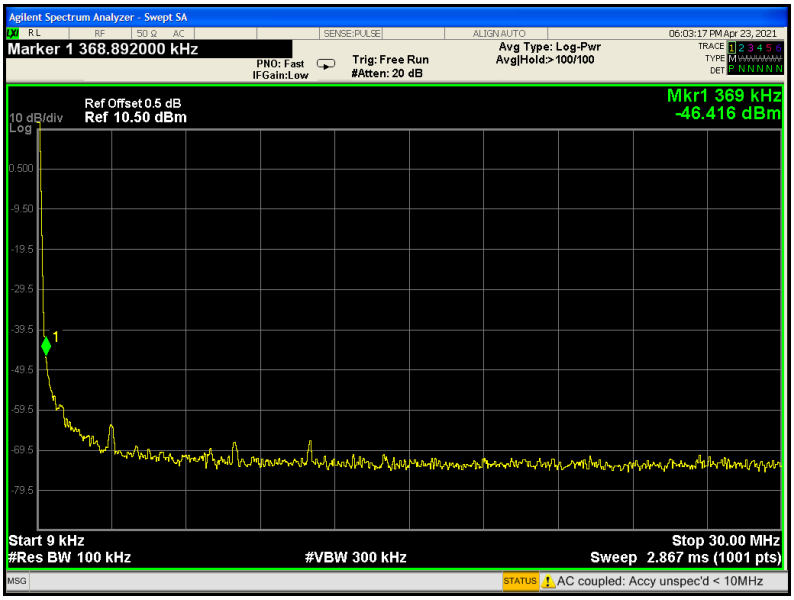


802.11n HT20

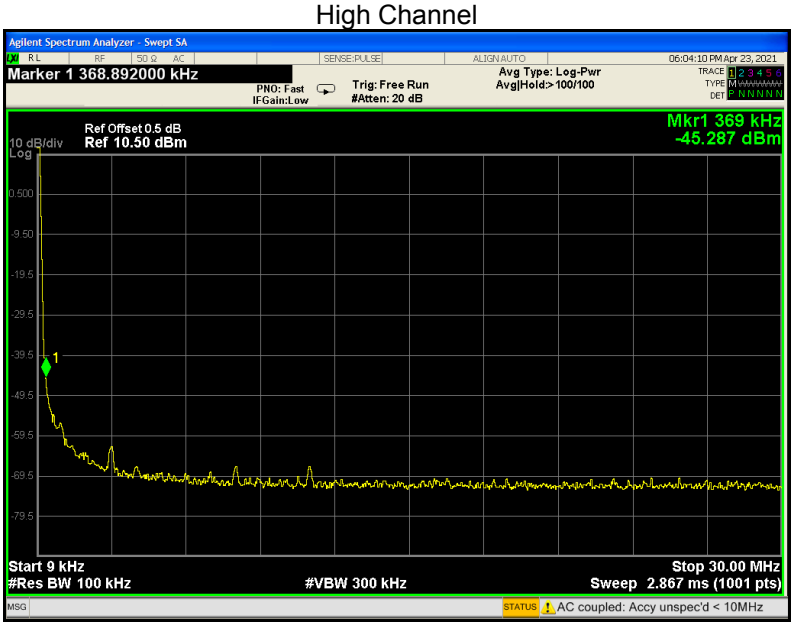
Low Channel



Middle Channel

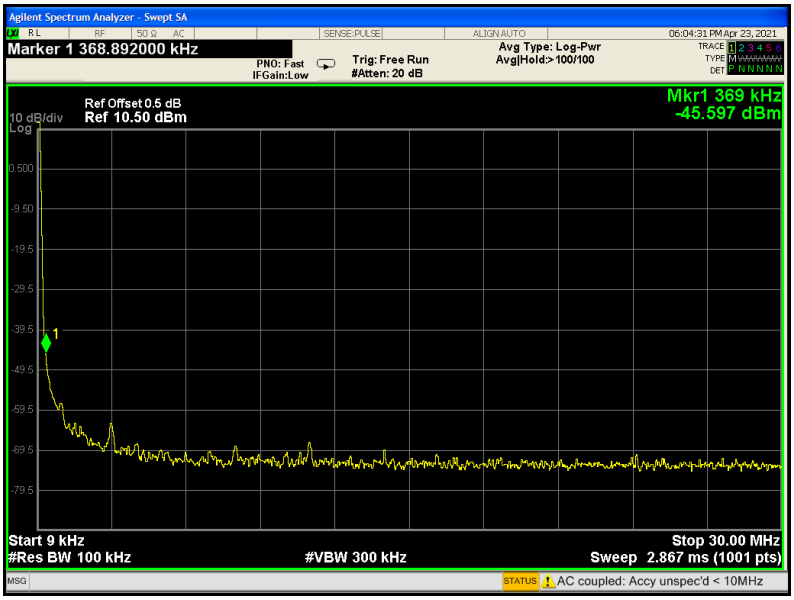


High Channel

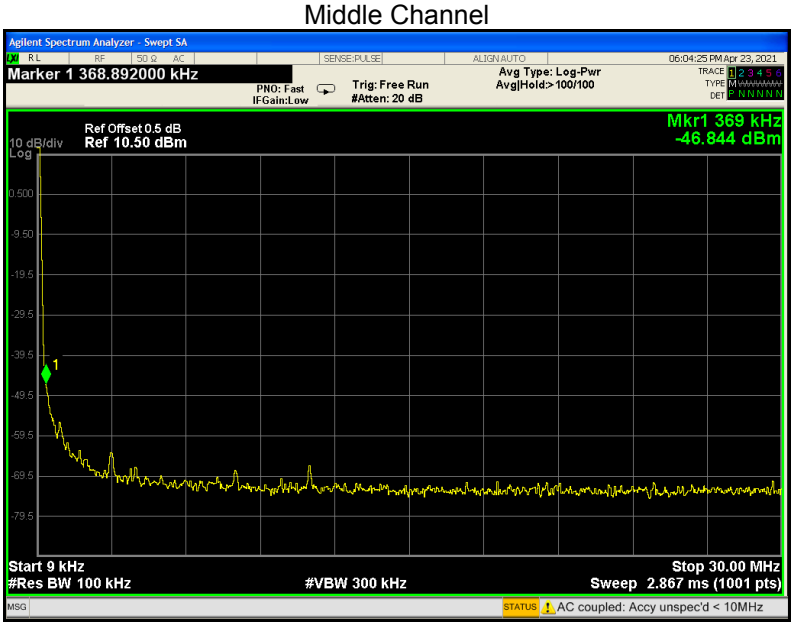


802.11n HT40

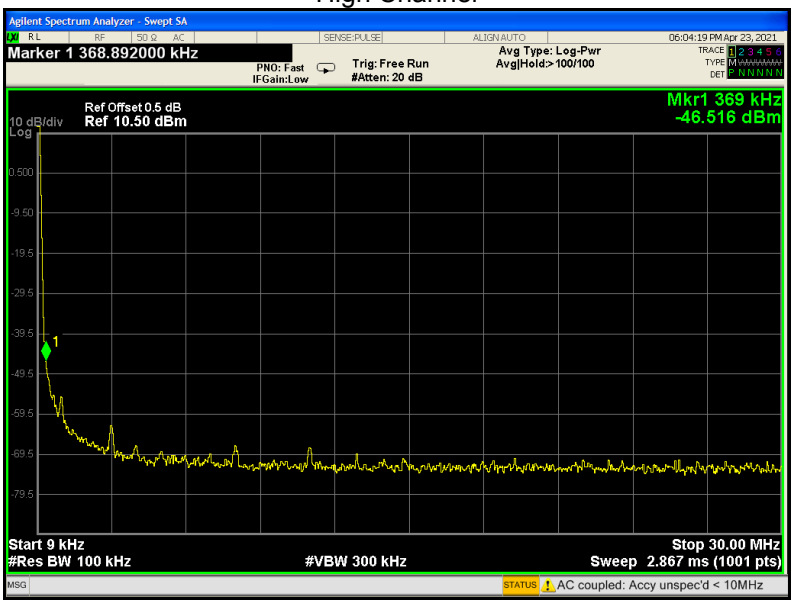
Low Channel



Middle Channel



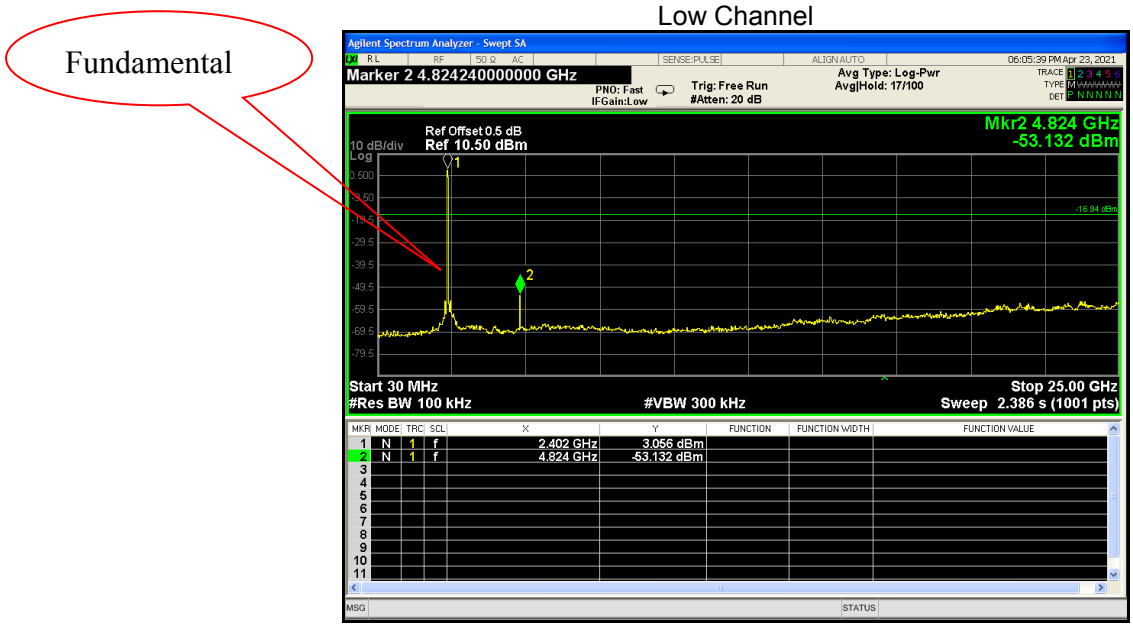
High Channel



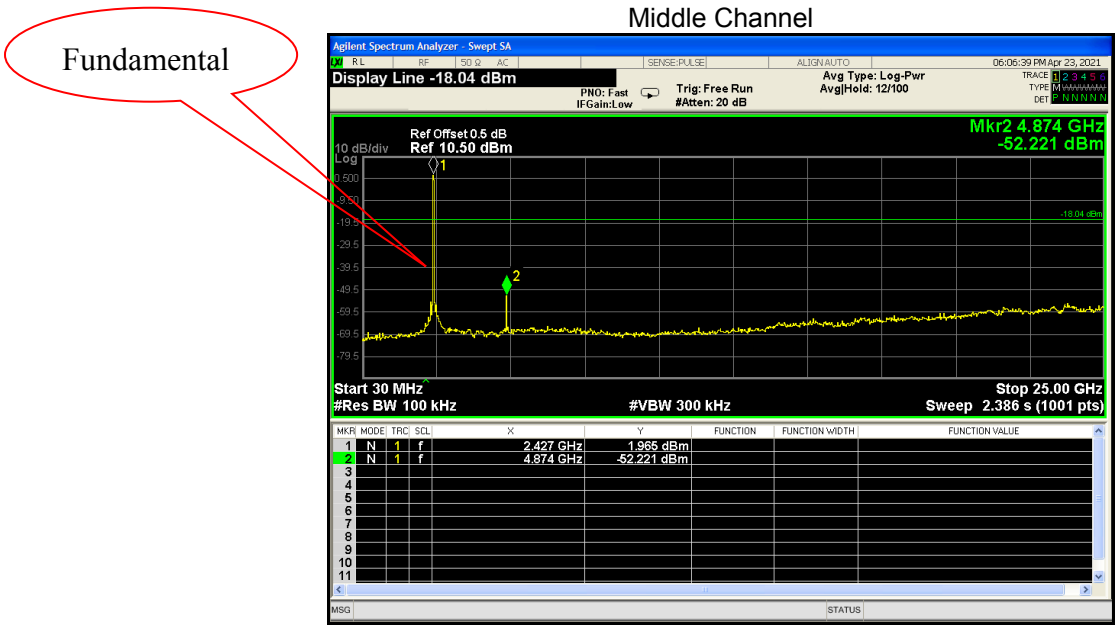
Above 30MHz

802.11b

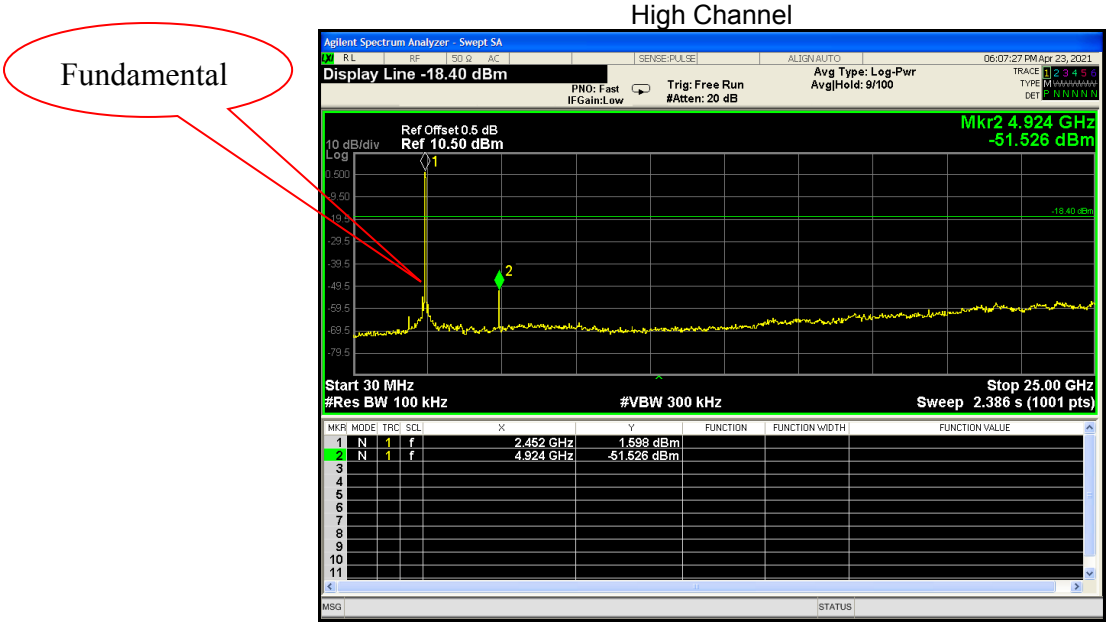
Low Channel



Middle Channel

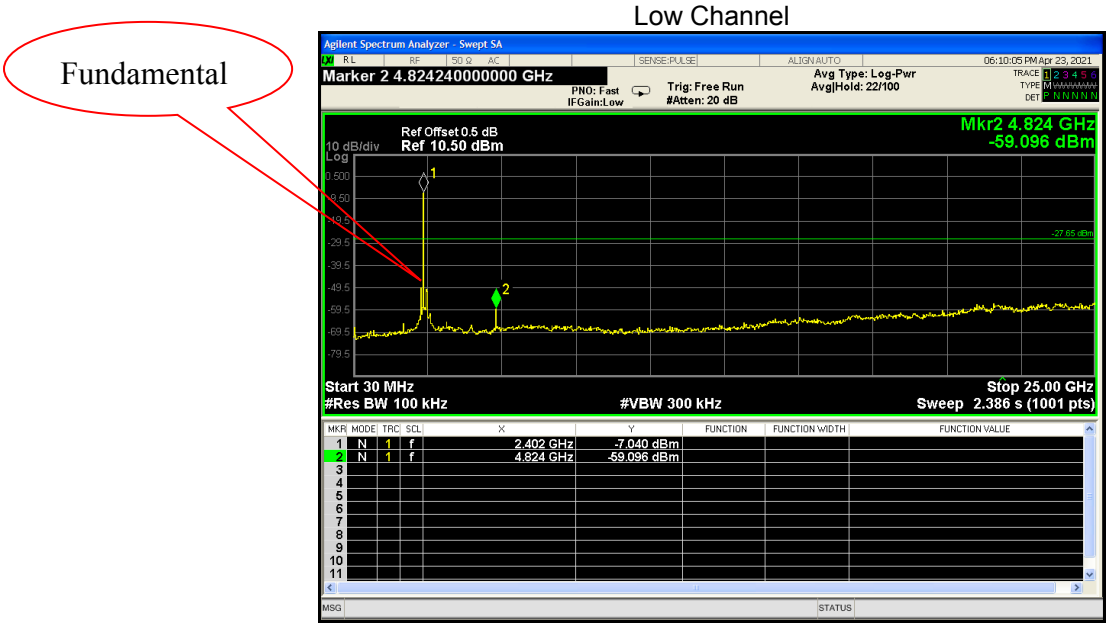


High Channel

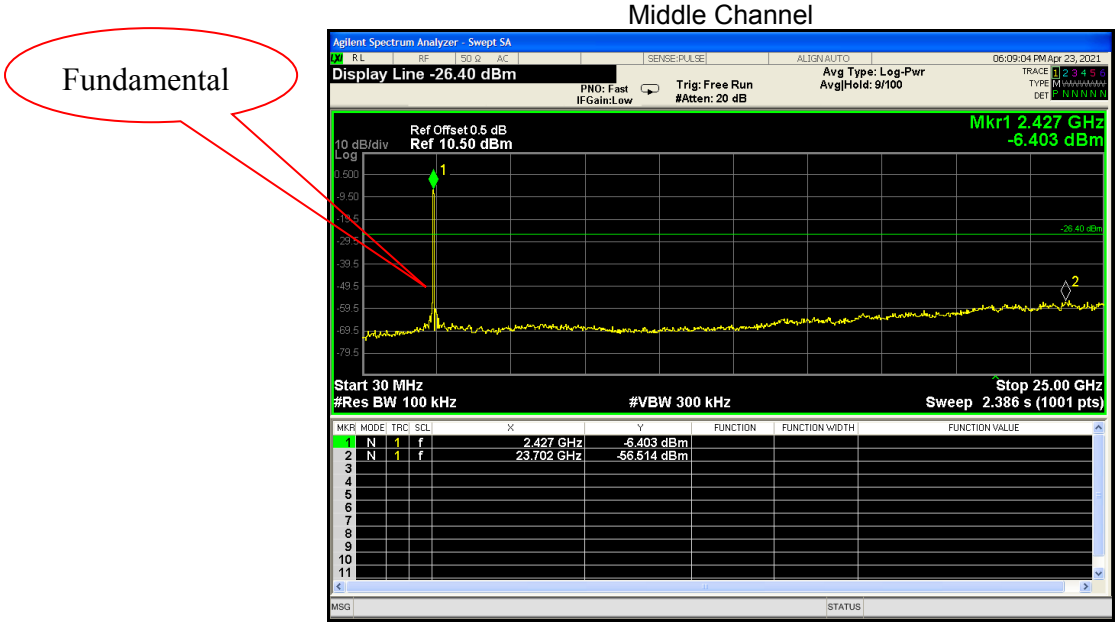


802.11g

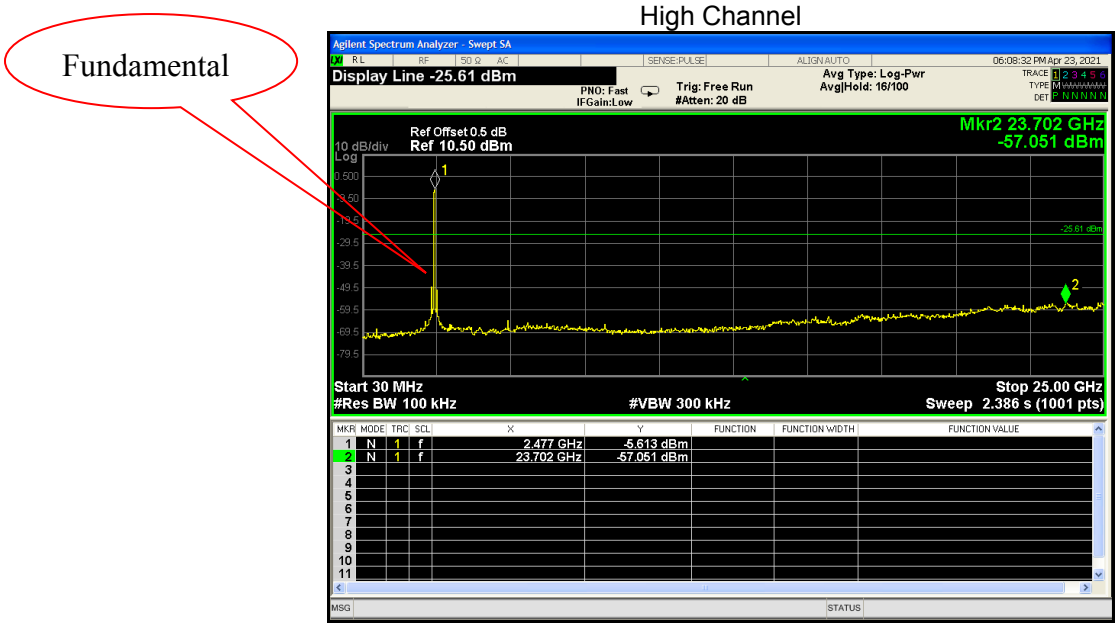
Low Channel



Middle Channel

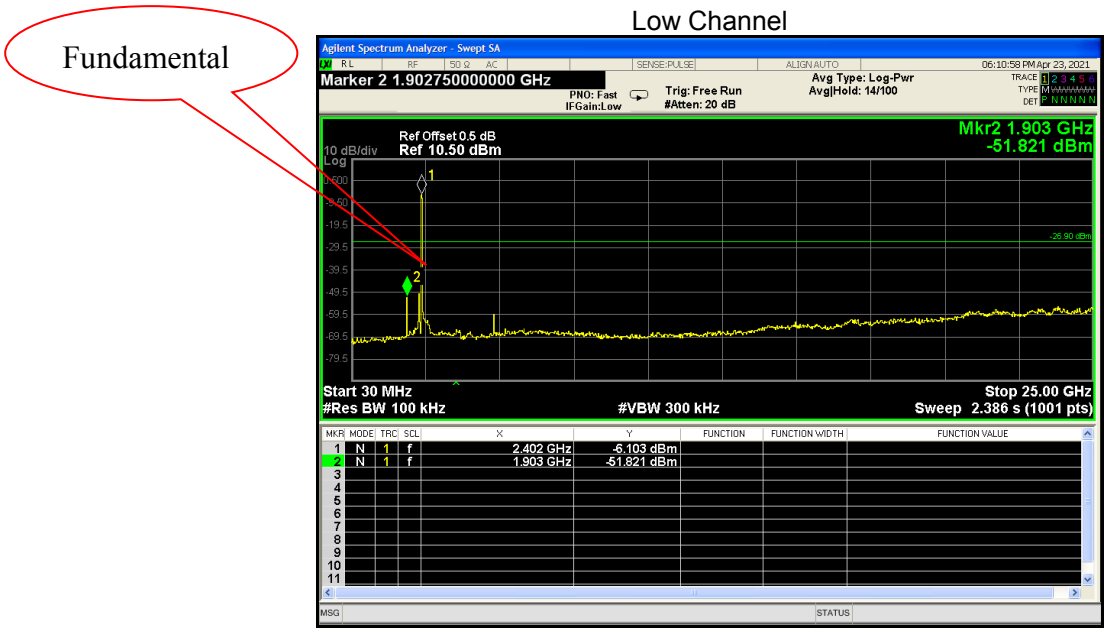


High Channel

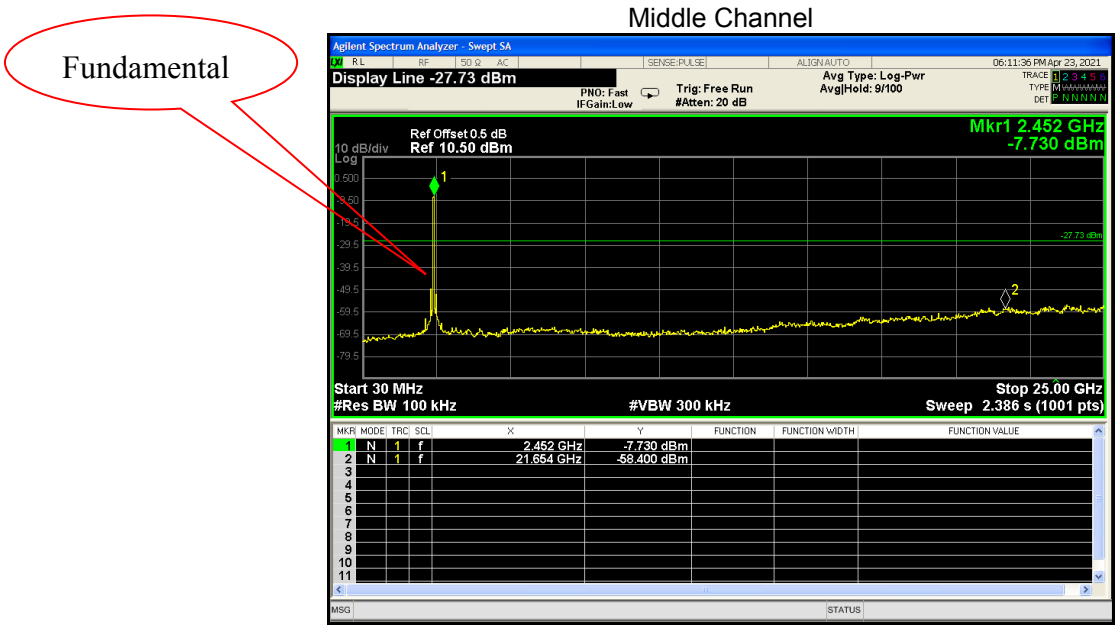


802.11n HT20

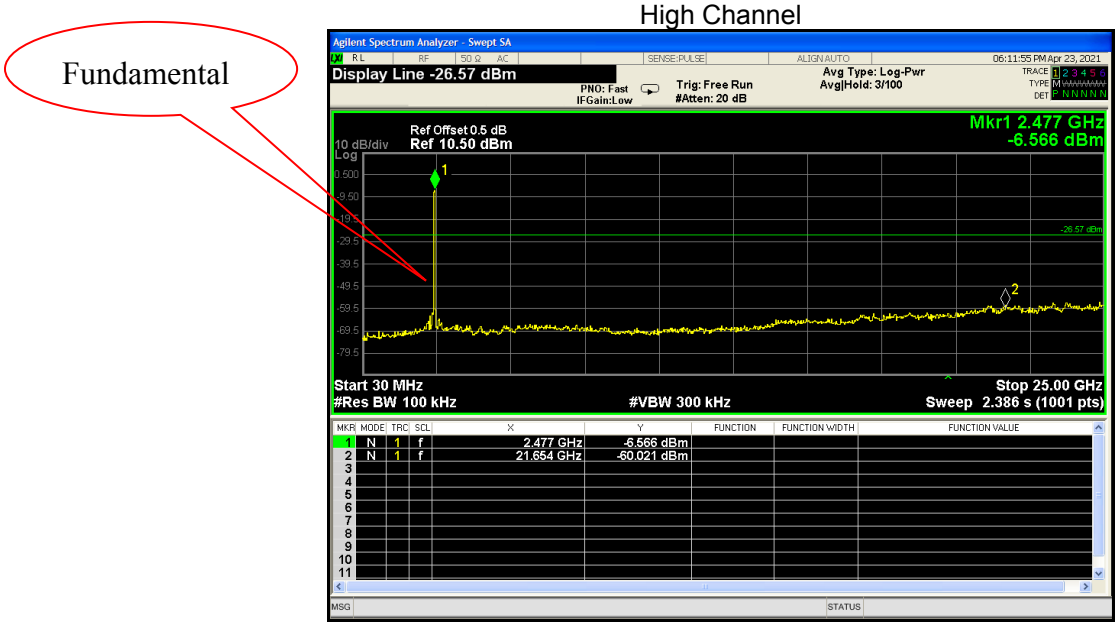
Low Channel



Middle Channel

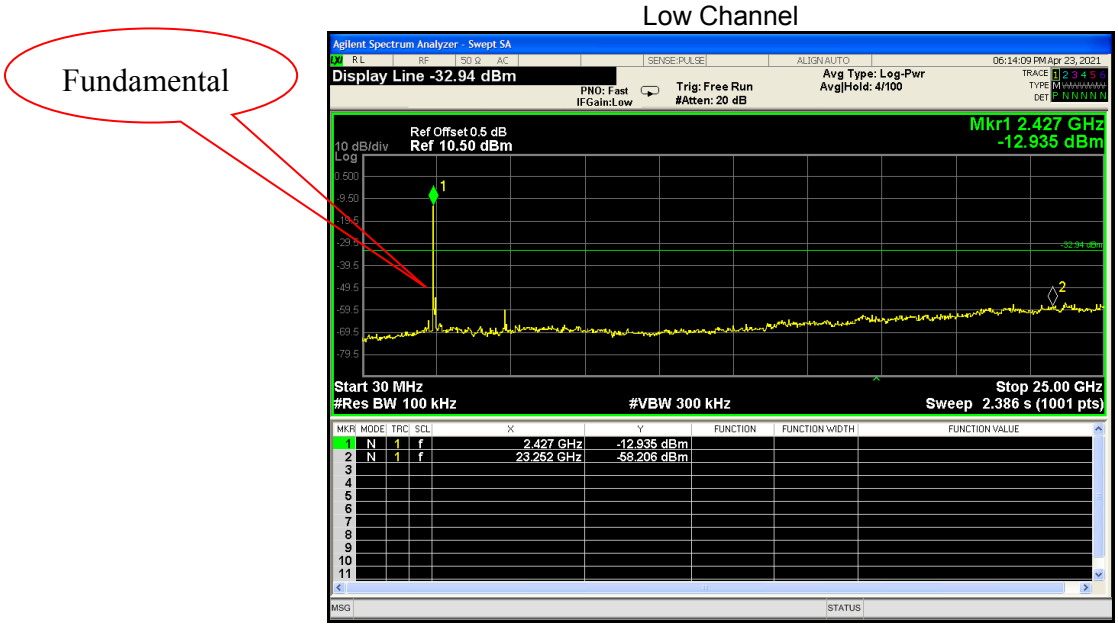


High Channel

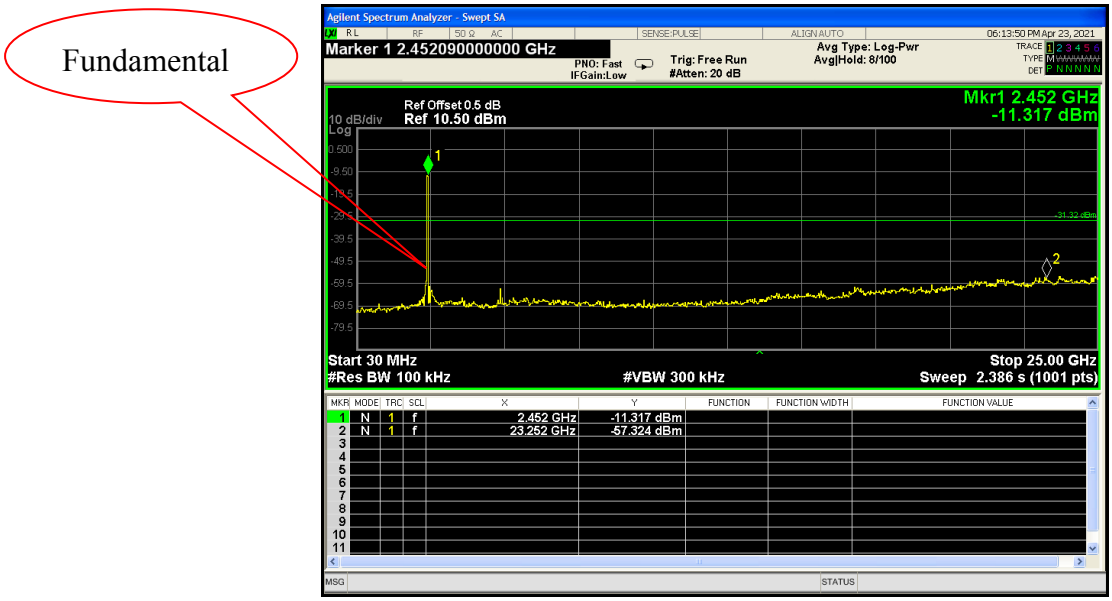


802.11n HT40

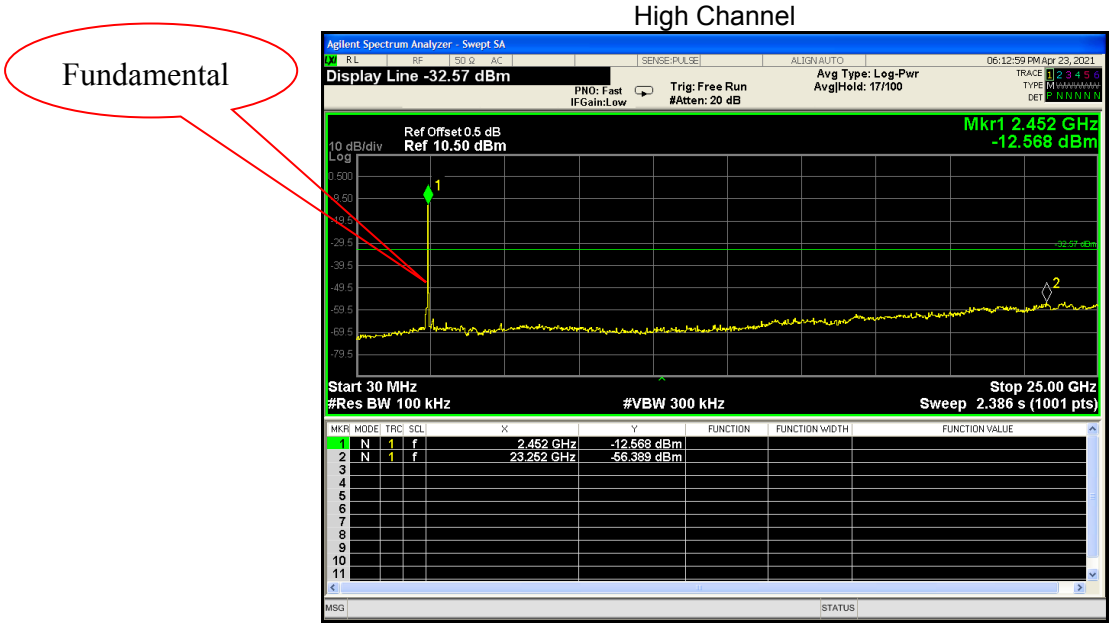
Low Channel



Middle Channel



High Channel



11 Band Edge 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

Test Limit: Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Mode: Transmitting

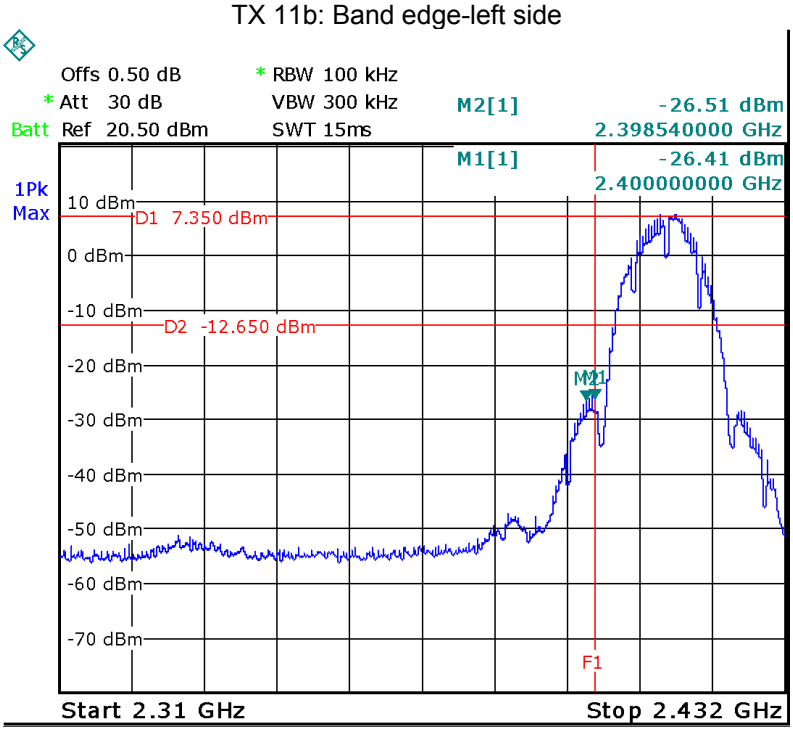
11.1 Test Produce

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

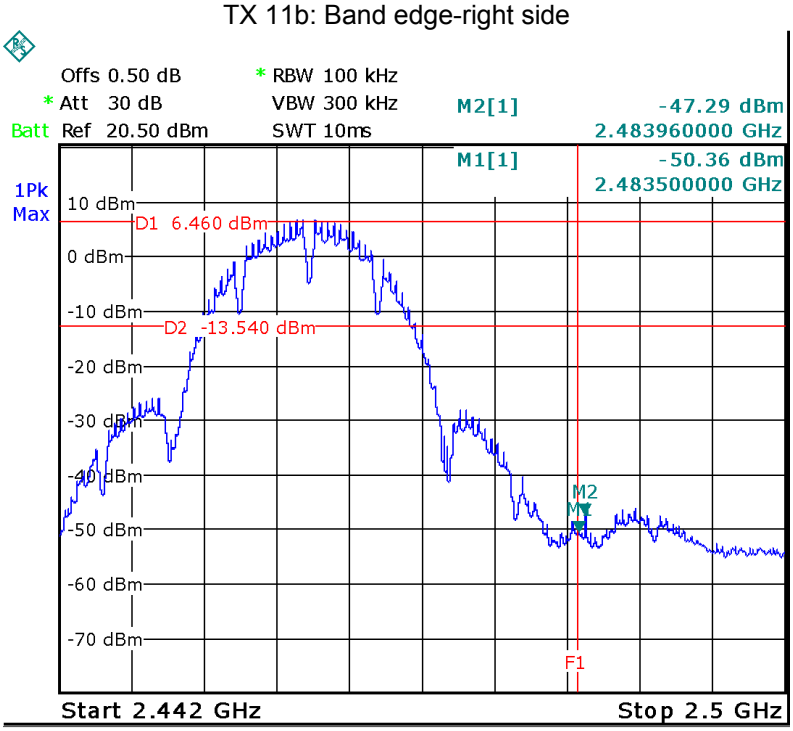
11.2 Test Result

Test result plots shown as follows:

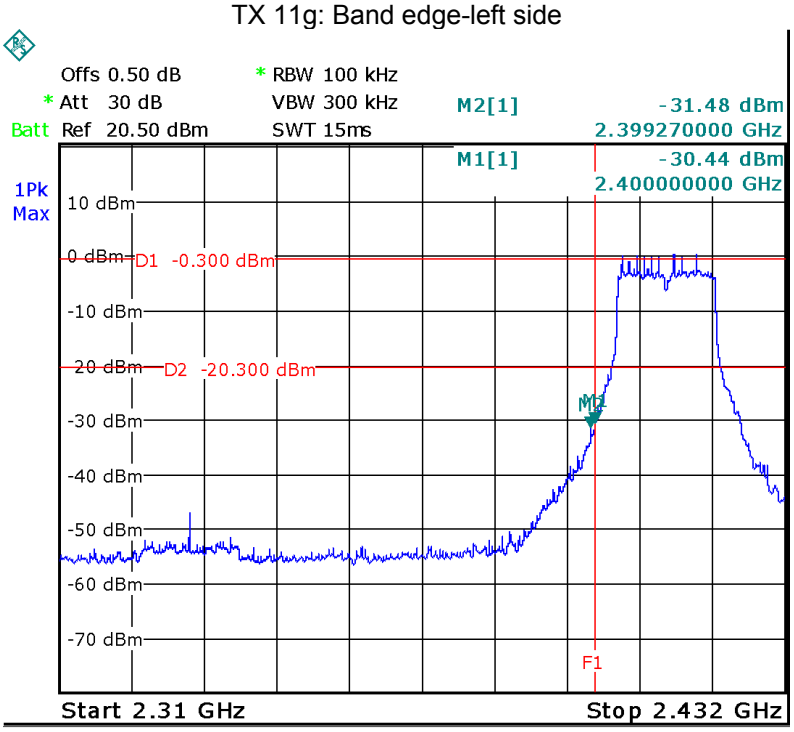
TX 11b: Band edge-left side



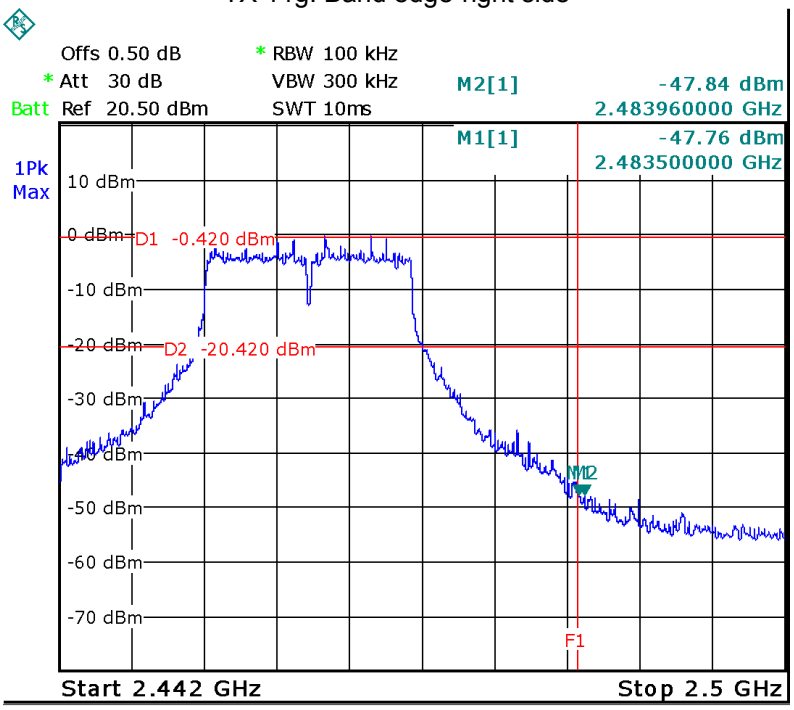
TX 11b: Band edge-right side



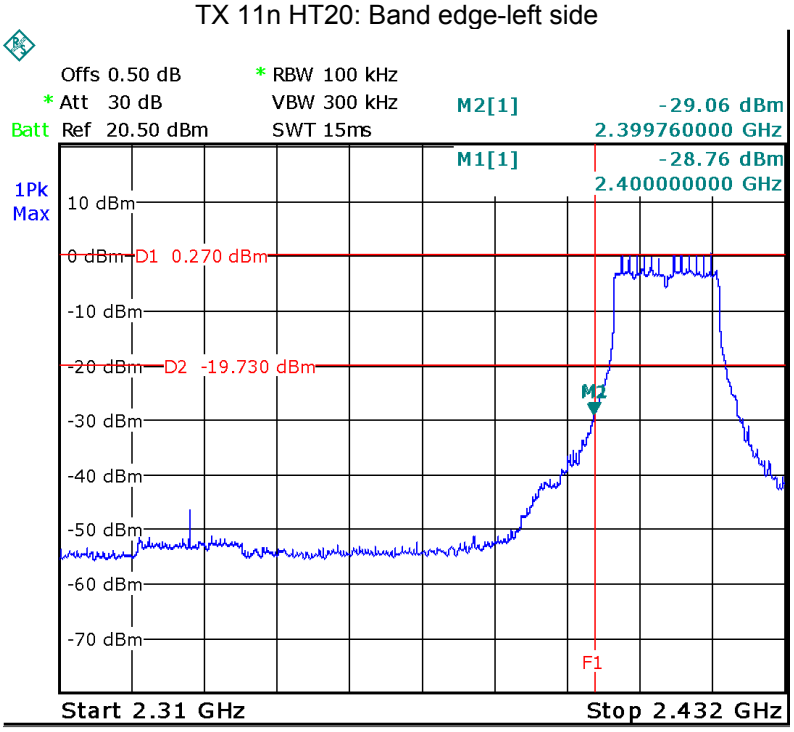
TX 11g: Band edge-left side



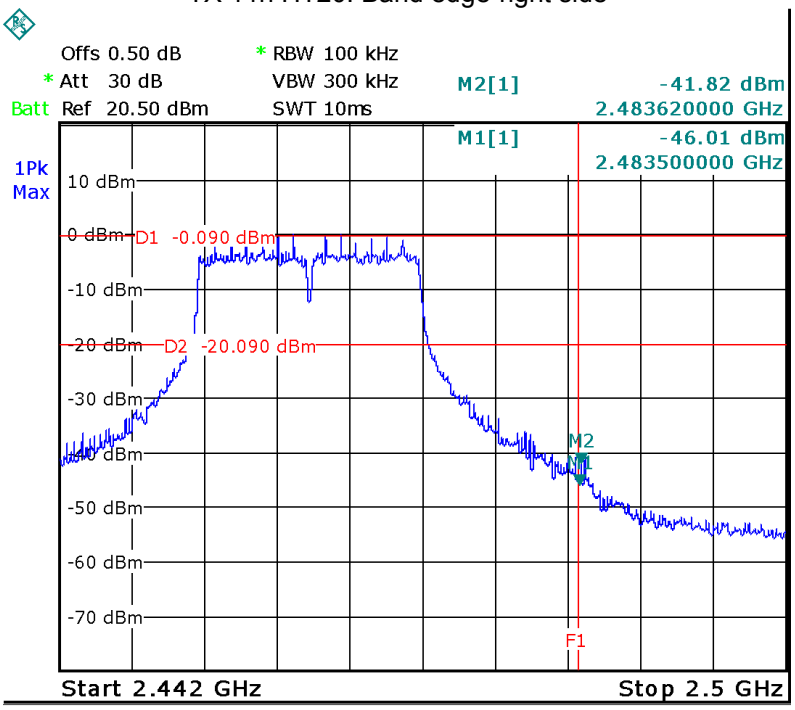
TX 11g: Band edge-right side



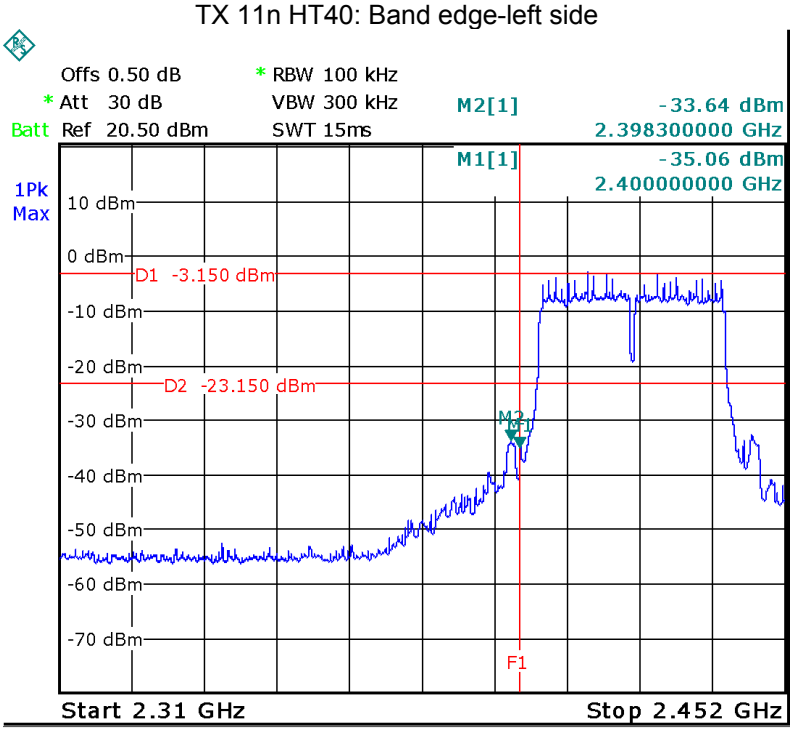
TX 11n HT20: Band edge-left side



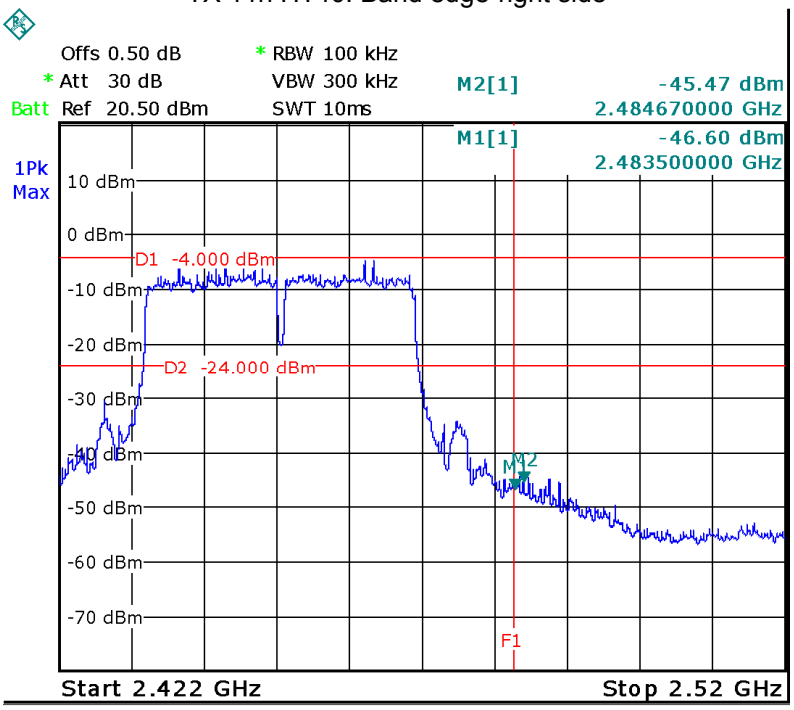
TX 11n HT20: Band edge-right side



TX 11n HT40: Band edge-left side



TX 11n HT40: Band edge-right side



12 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

12.1 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

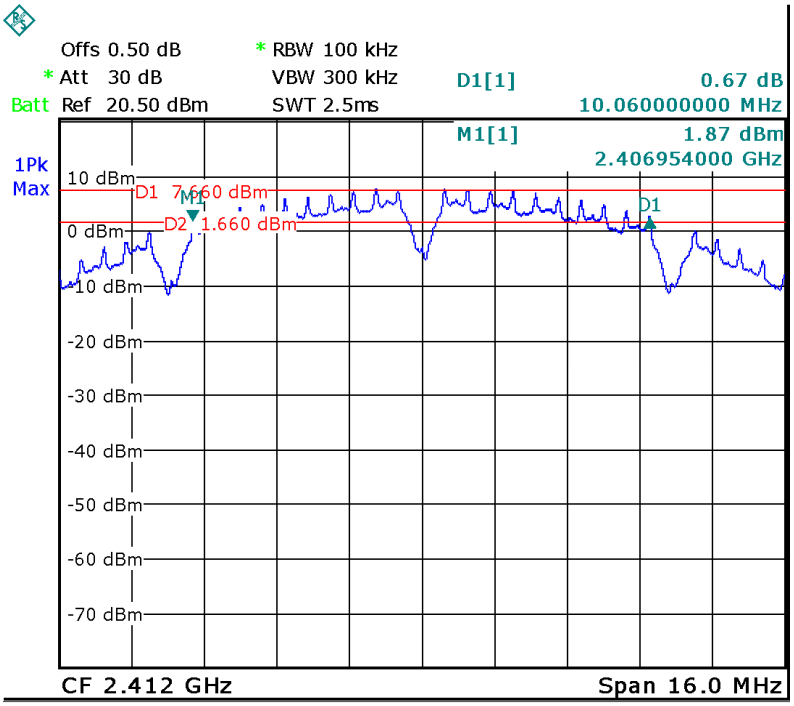
12.2 Test Result:

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.060	14.371
	Channel 6	9.964	14.435
	Channel 11	10.028	14.435
TX 11g	Channel 1	16.467	17.066
	Channel 6	16.467	17.166
	Channel 11	16.267	17.265
TX 11n HT20	Channel 1	17.677	18.266
	Channel 6	17.407	18.323
	Channel 11	17.677	18.216
TX 11n HT40	Channel 3	35.680	36.557
	Channel 6	35.680	36.447
	Channel 9	35.010	36.447

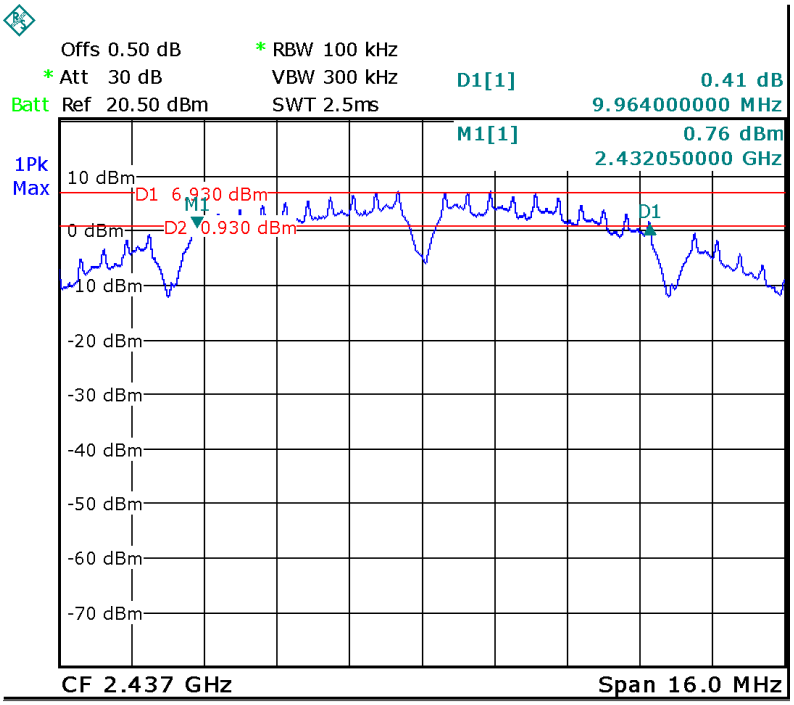
Test result plot:

6dB Bandwidth

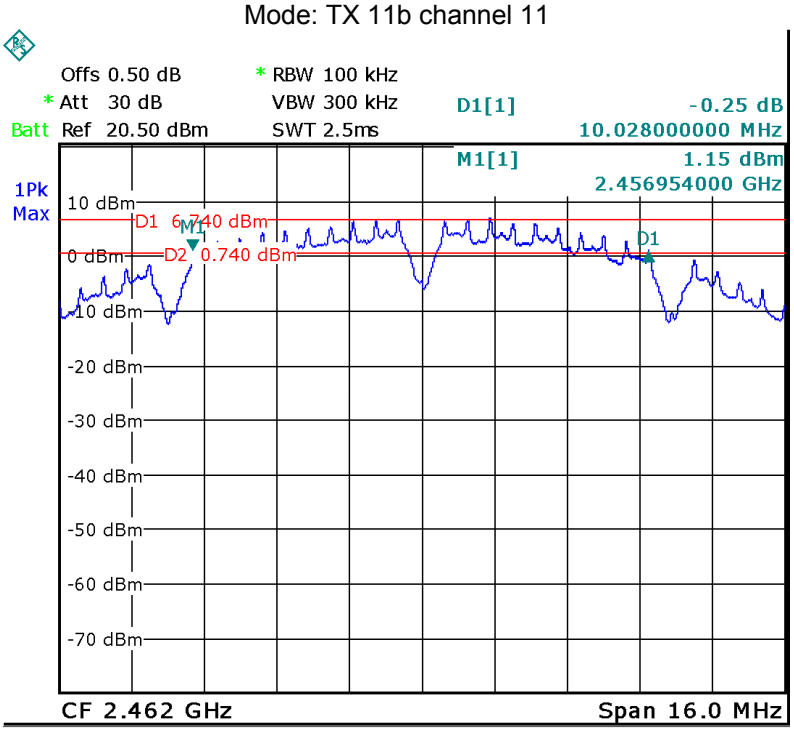
Mode: TX 11b channel 1



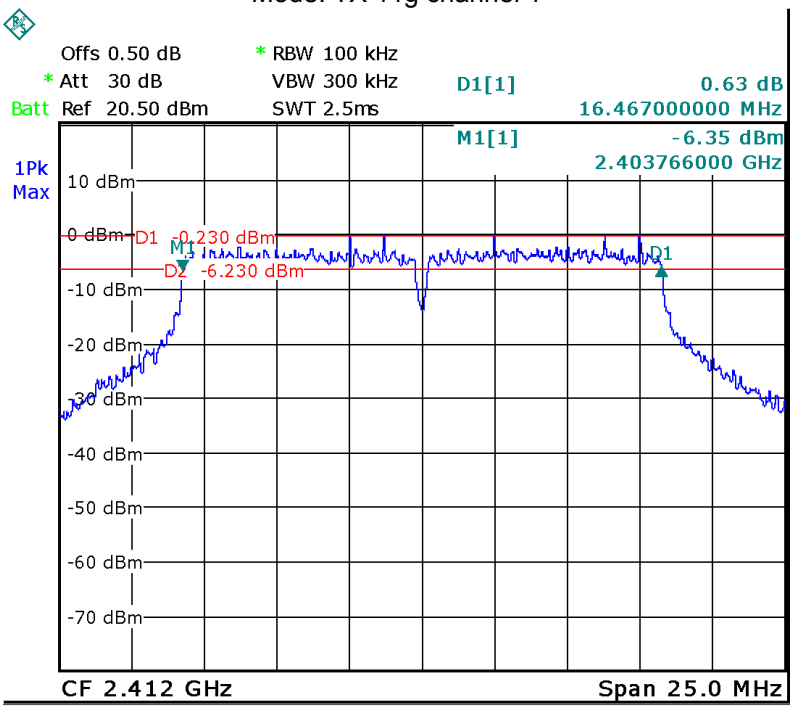
Mode: TX 11b channel 6



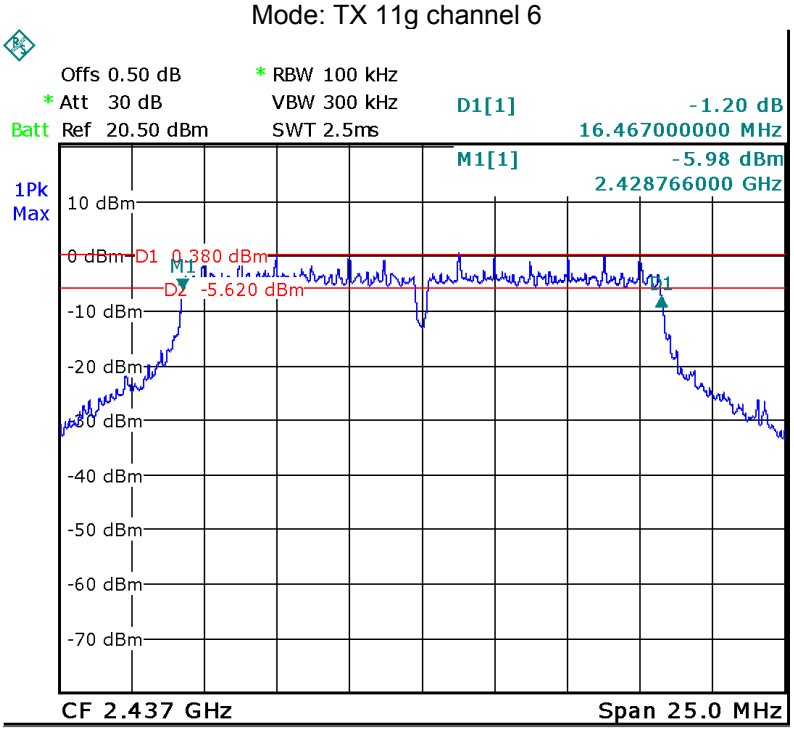
Mode: TX 11b channel 11



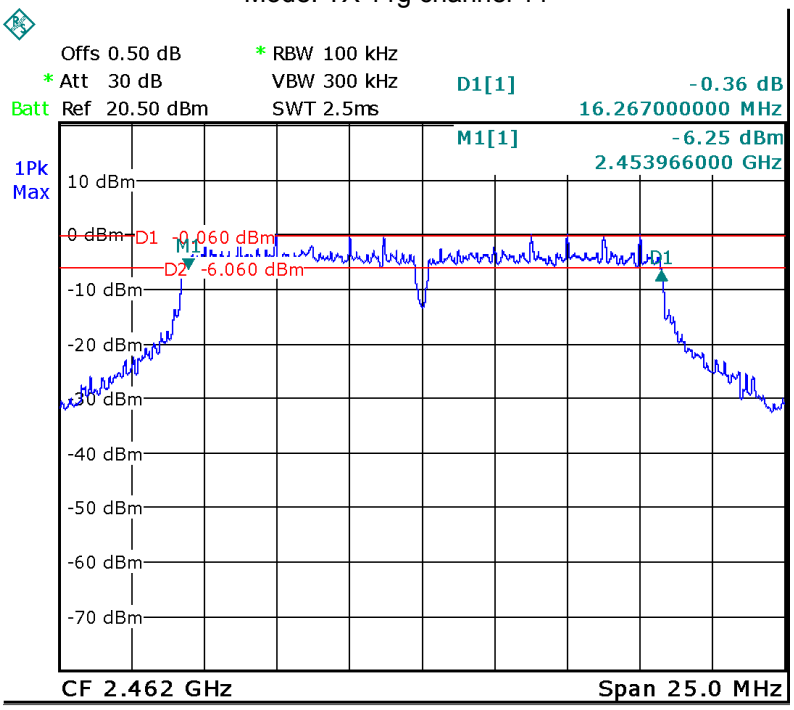
Mode: TX 11g channel 1



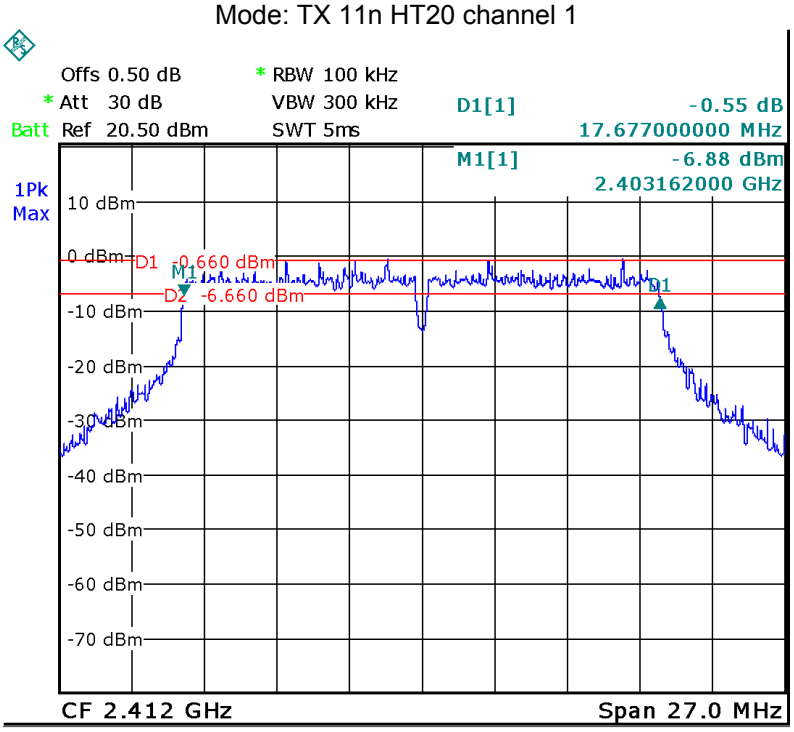
Mode: TX 11g channel 6



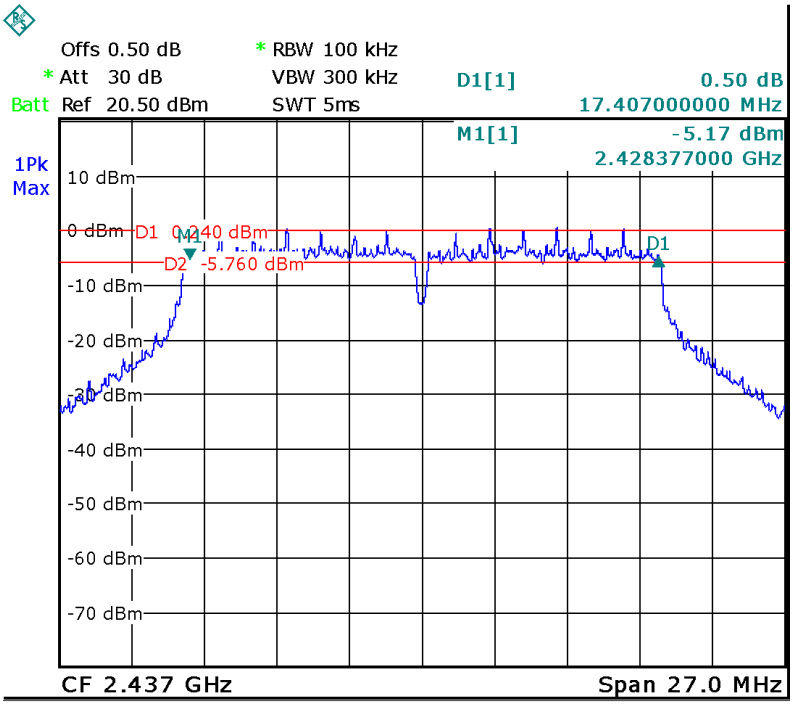
Mode: TX 11g channel 11



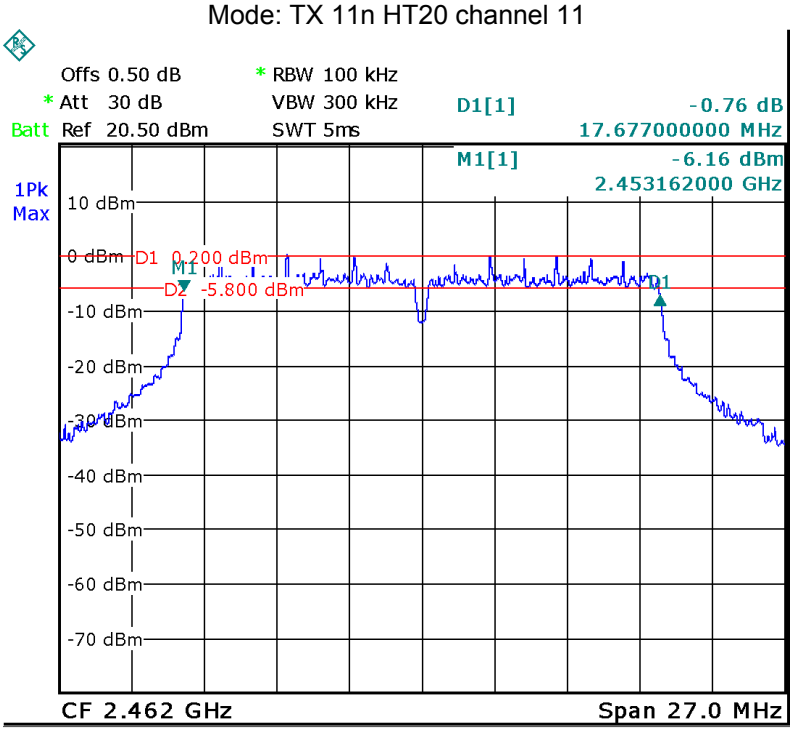
Mode: TX 11n HT20 channel 1



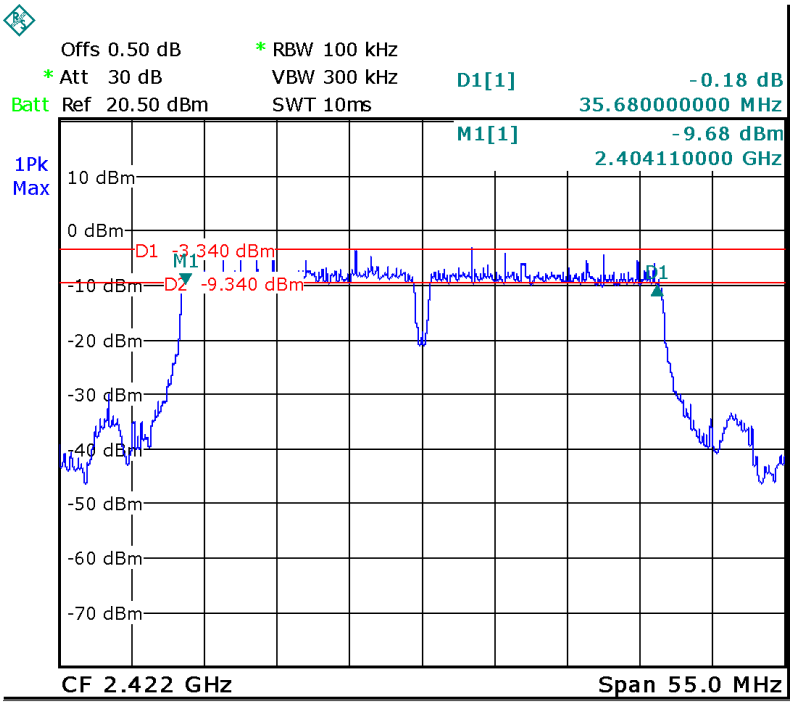
Mode: TX 11n HT20 channel 6



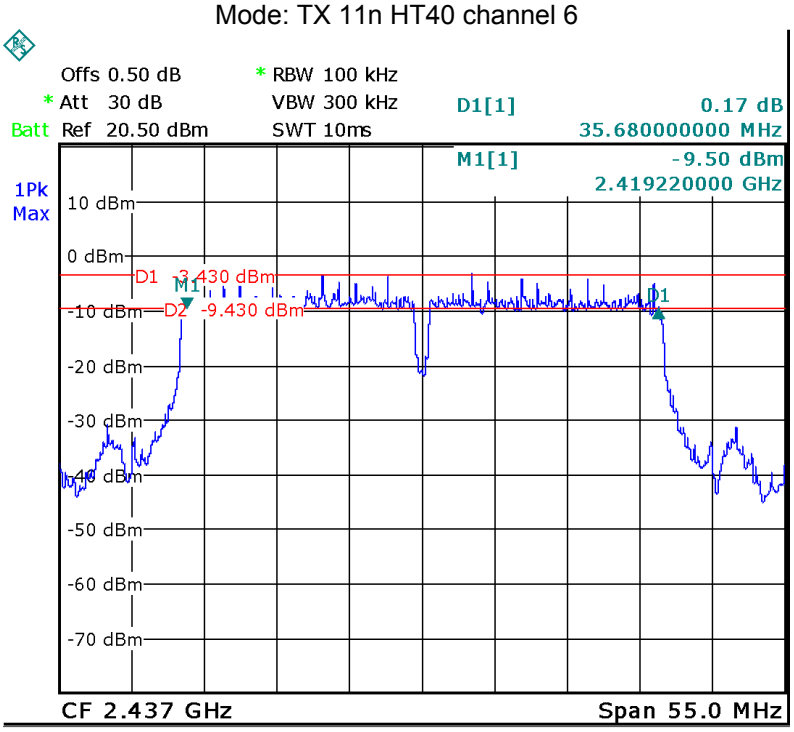
Mode: TX 11n HT20 channel 11



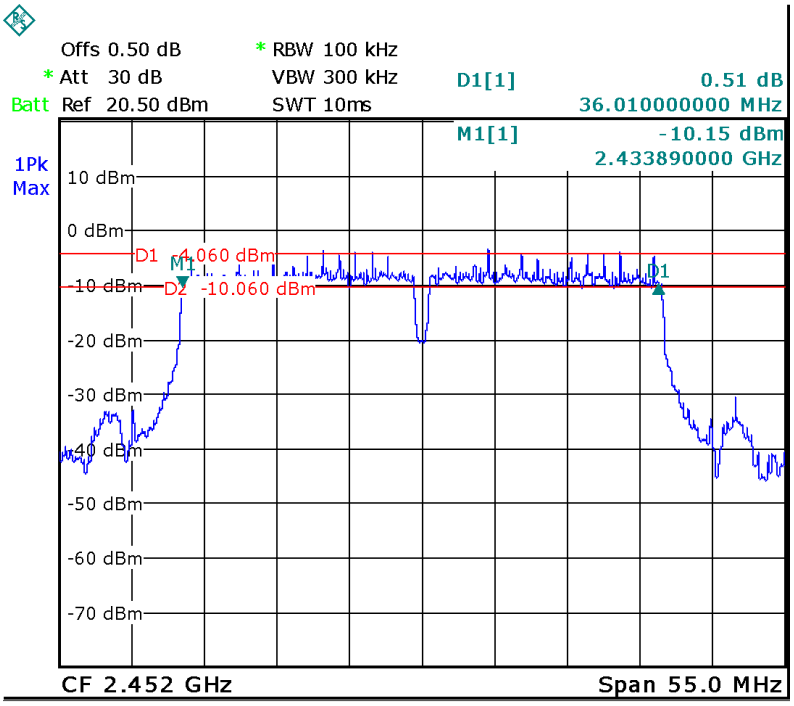
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

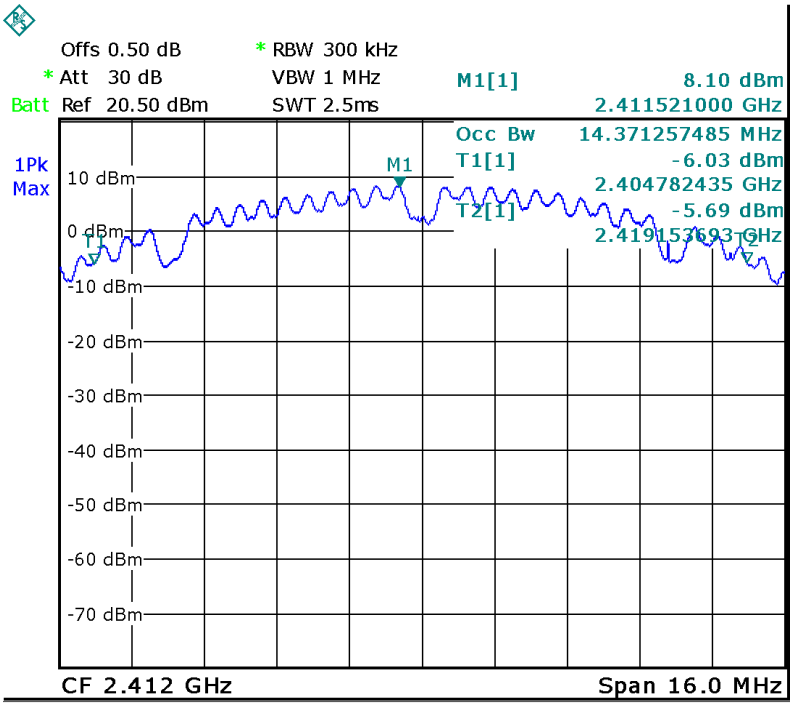


Mode: TX 11n HT40 channel 9

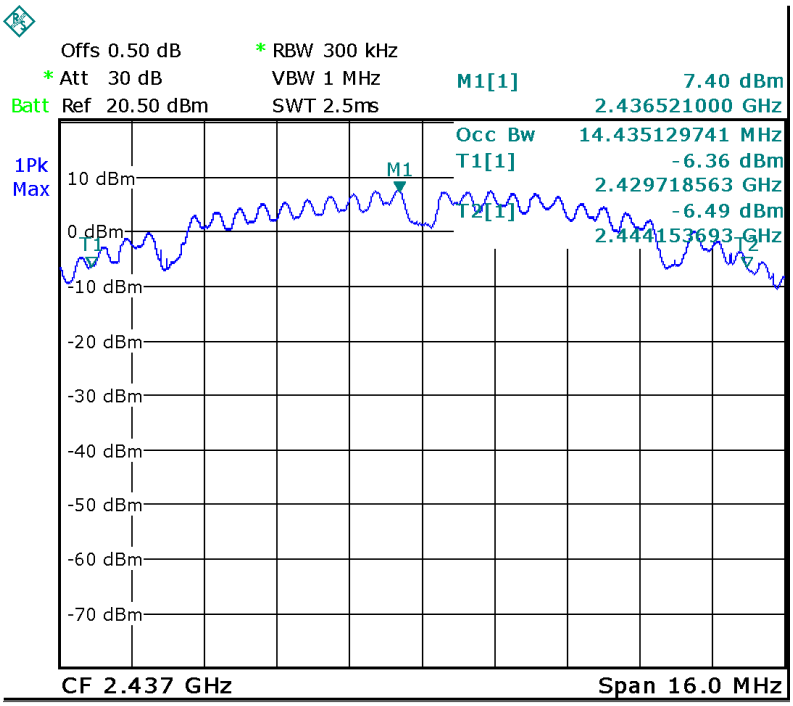


99% Bandwidth

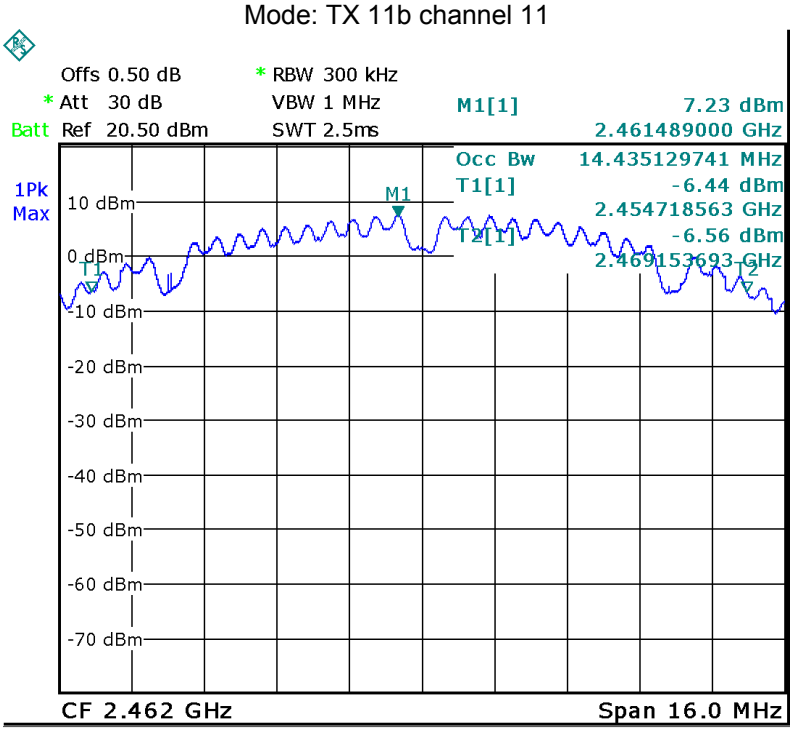
Mode: TX 11b channel 1



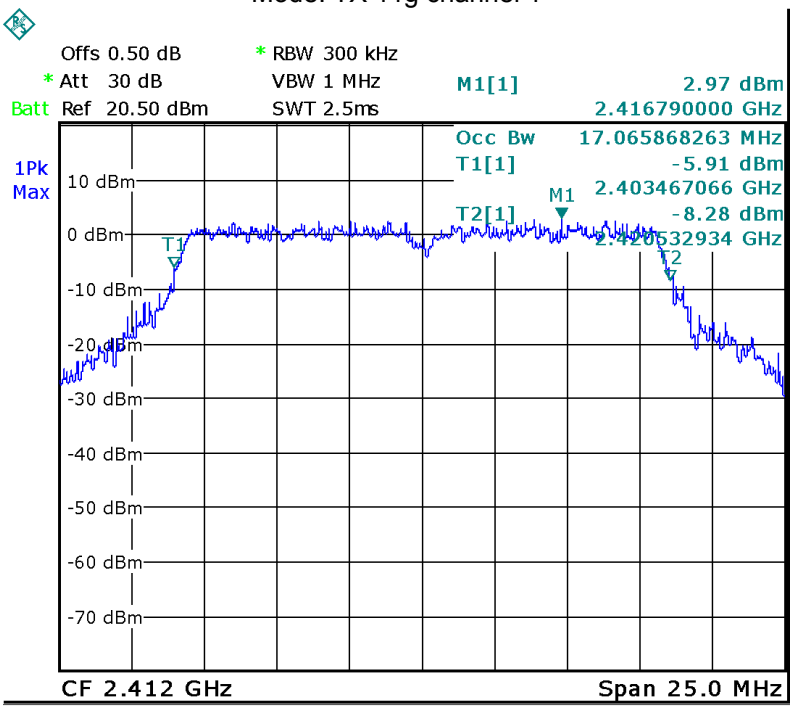
Mode: TX 11b channel 6



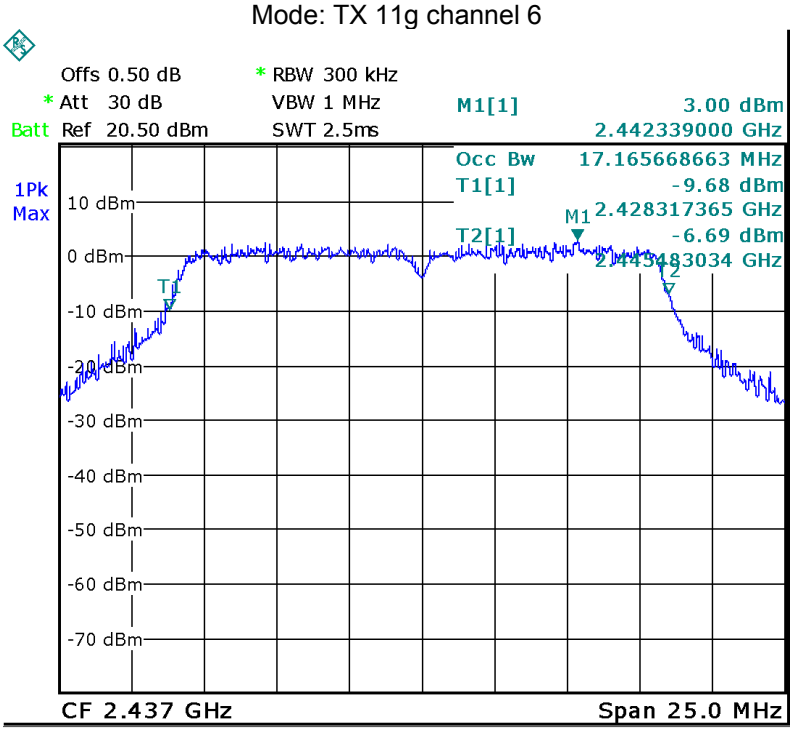
Mode: TX 11b channel 11



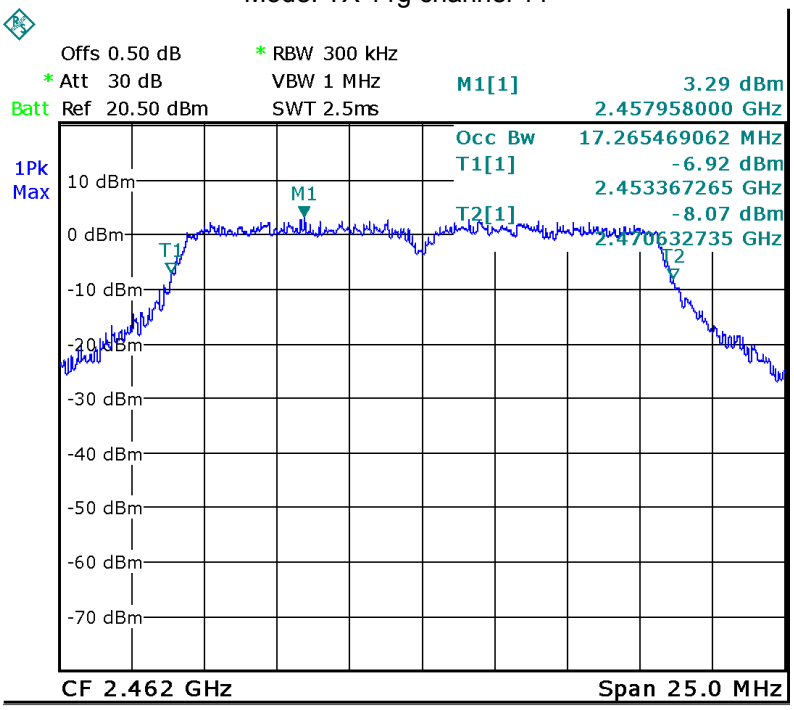
Mode: TX 11g channel 1



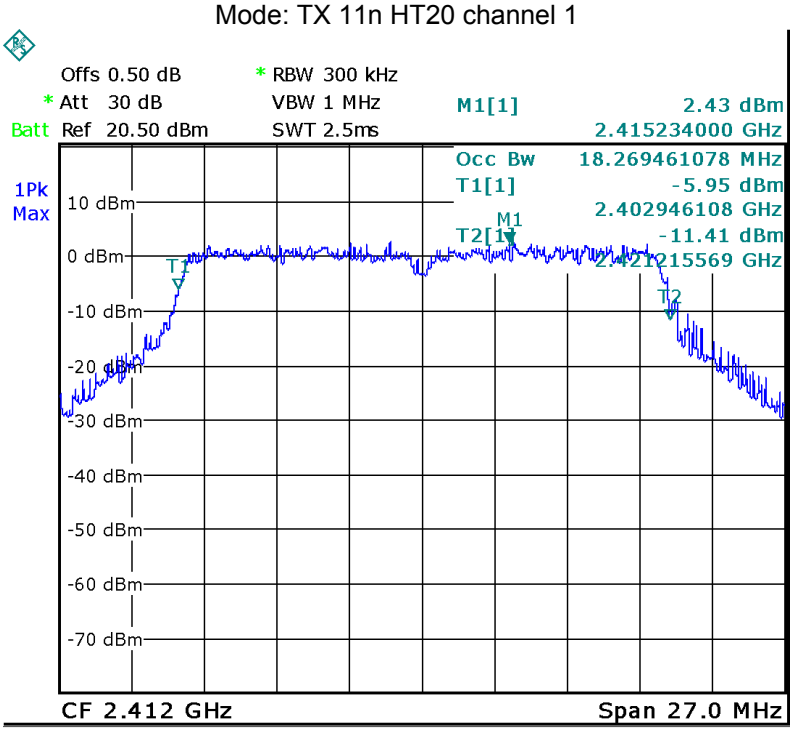
Mode: TX 11g channel 6



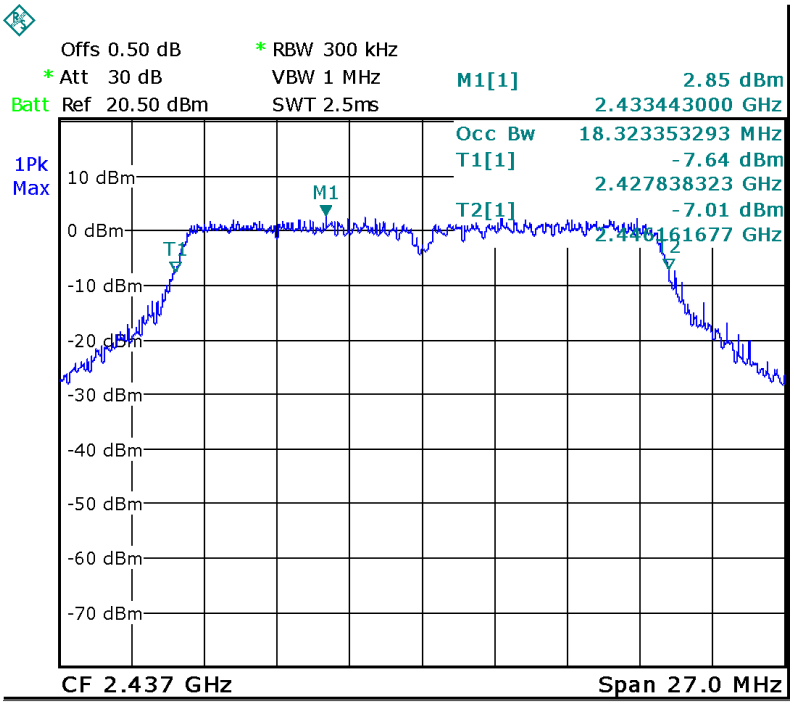
Mode: TX 11g channel 11



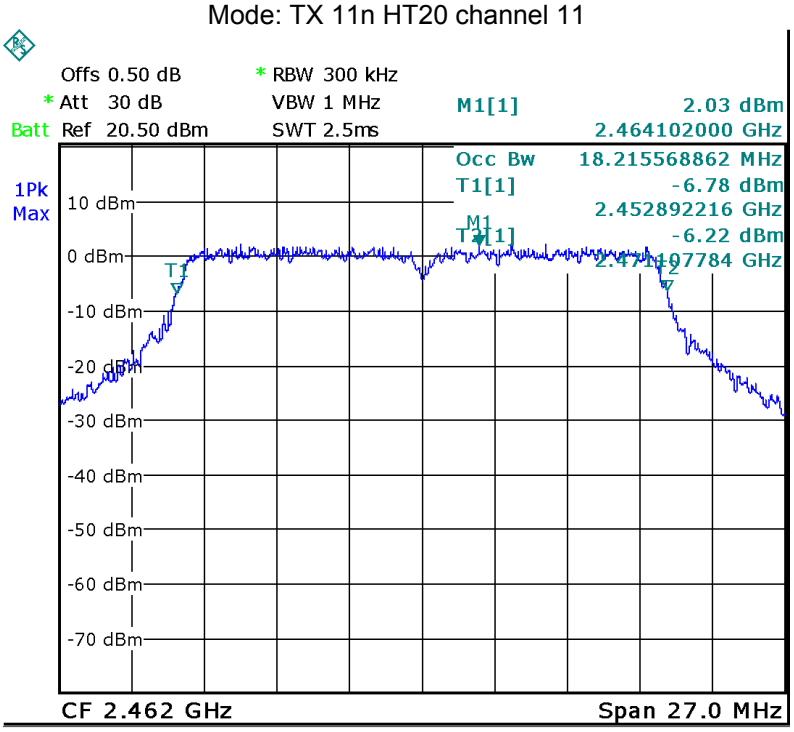
Mode: TX 11n HT20 channel 1



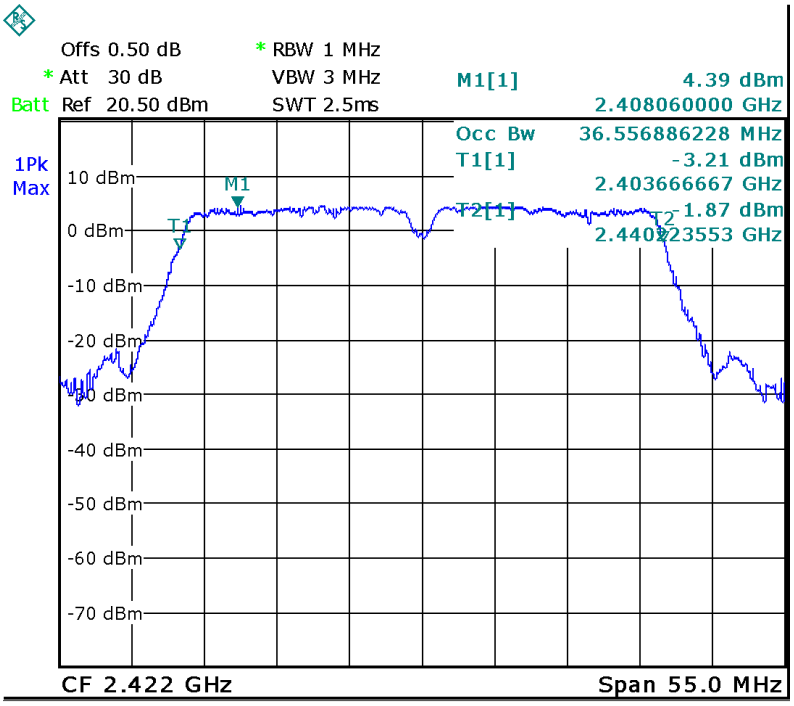
Mode: TX 11n HT20 channel 6



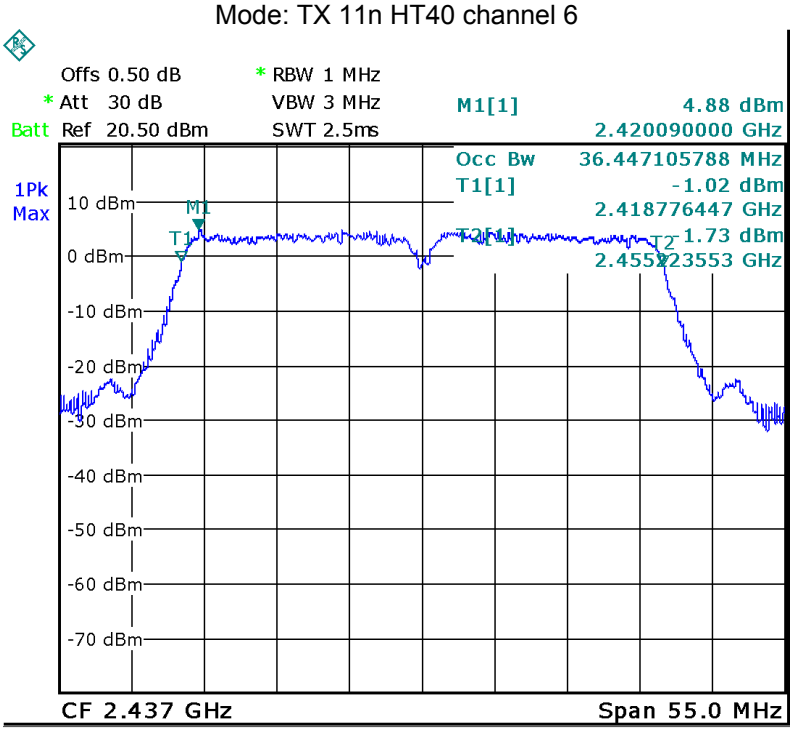
Mode: TX 11n HT20 channel 11



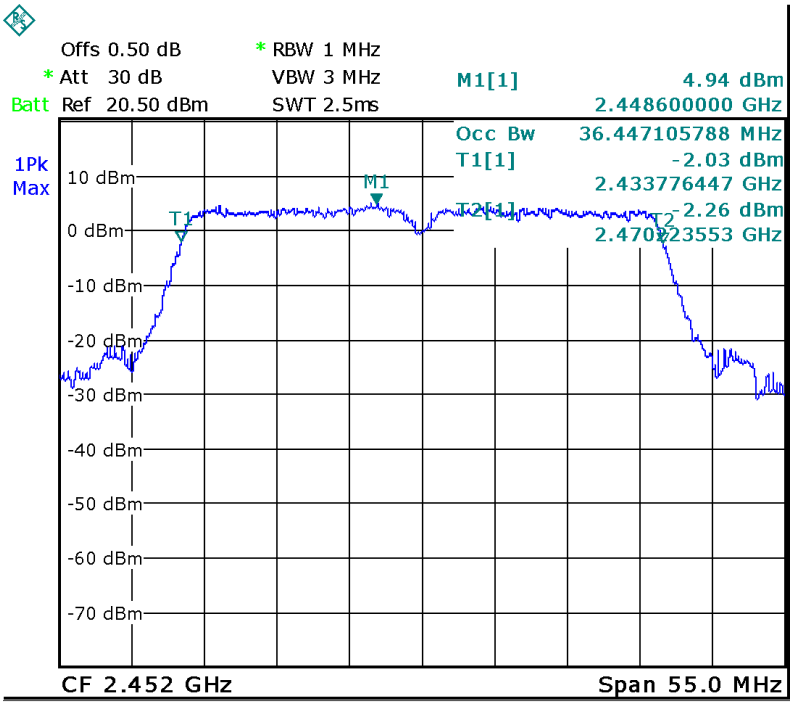
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6



Mode: TX 11n HT40 channel 9



13 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

13.1 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.

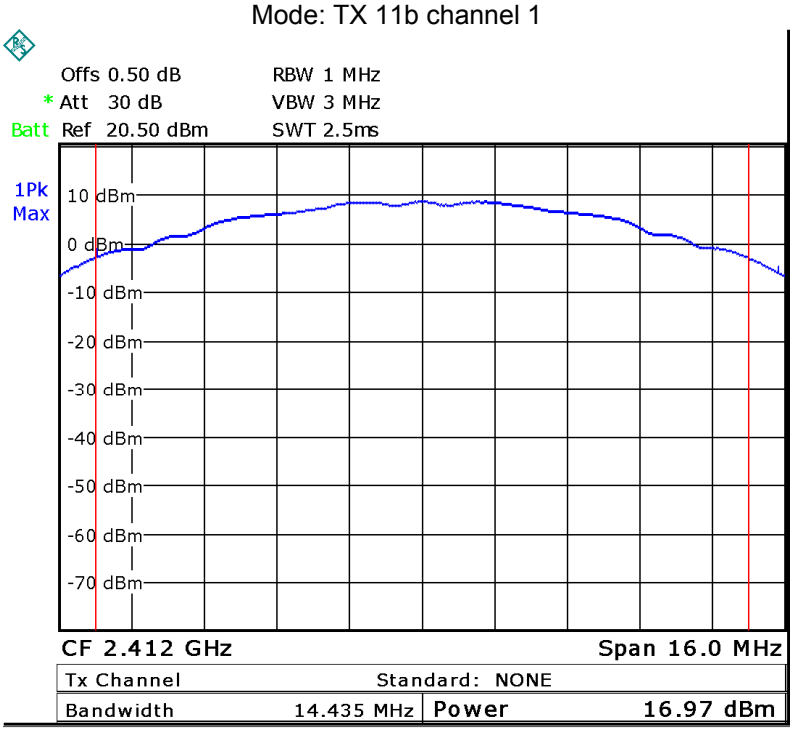
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the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

13.2 Test Result:

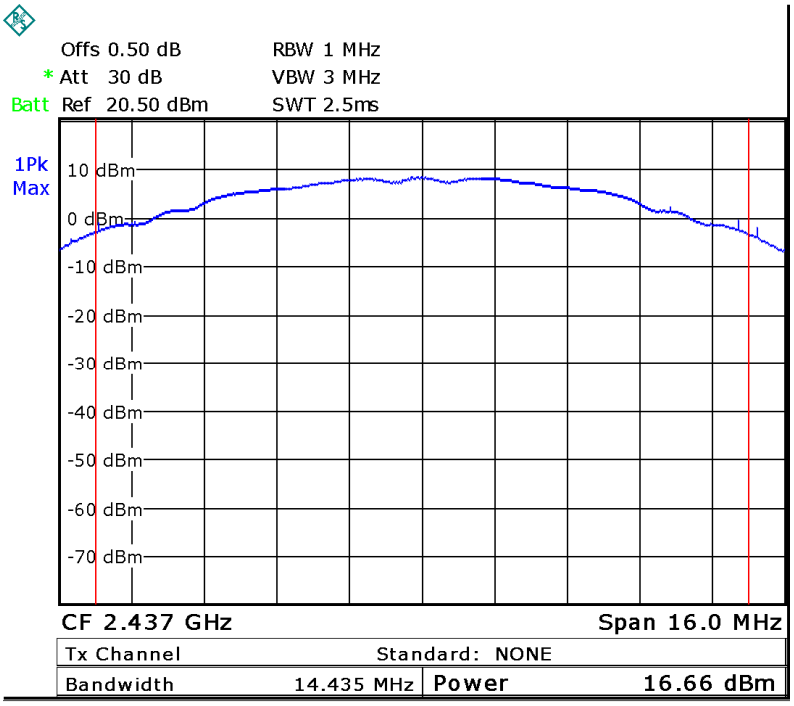
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	**16.97**	1W/30dBm
	Middle-2437	16.66	1W/30dBm
	High-2462	16.46	1W/30dBm
TX 11g	Low-2412	16.13	1W/30dBm
	Middle-2437	16.23	1W/30dBm
	High-2462	16.17	1W/30dBm
TX 11n HT20	Low-2412	16.72	1W/30dBm
	Middle-2437	16.66	1W/30dBm
	High-2462	16.33	1W/30dBm
TX 11n HT40	Low-2422	14.93	1W/30dBm
	Middle-2437	14.64	1W/30dBm
	High-2452	14.37	1W/30dBm

Test Plot

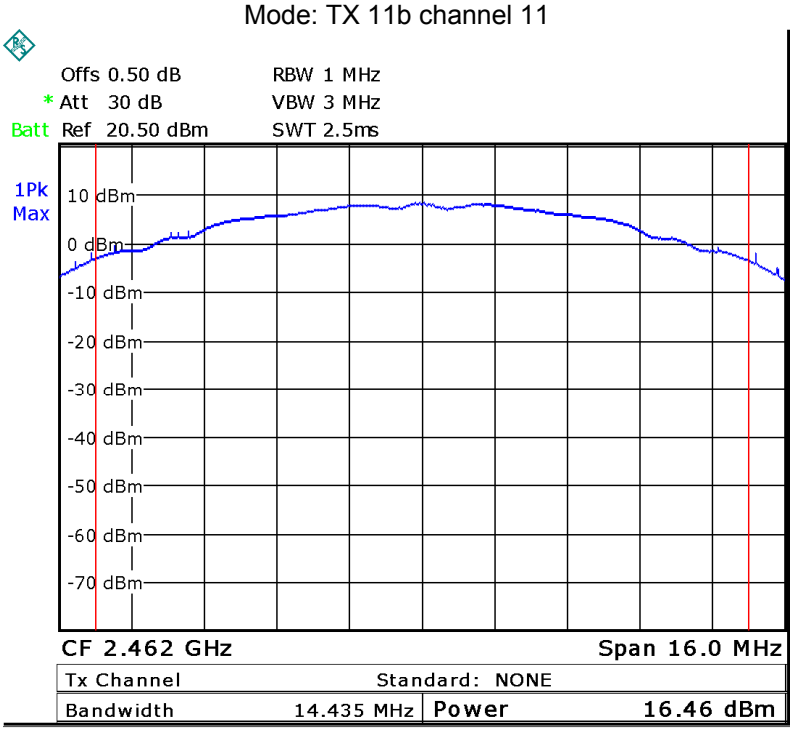
Mode: TX 11b channel 1



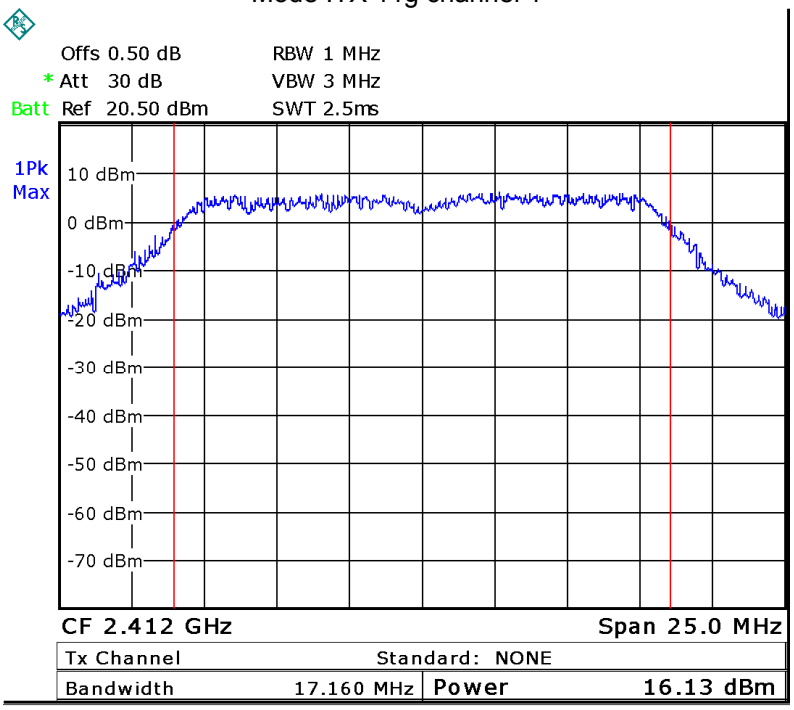
Mode: TX 11b channel 6



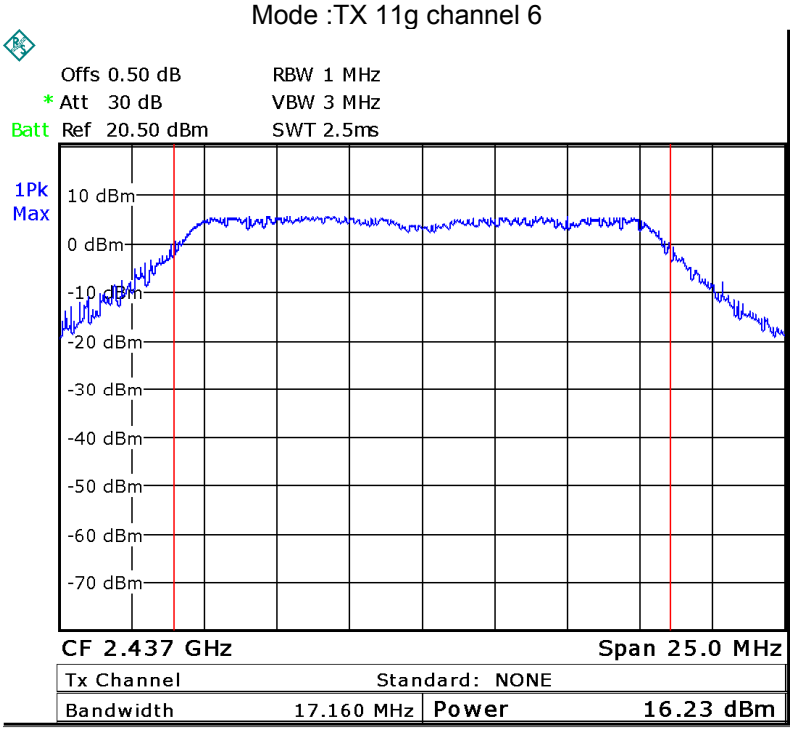
Mode: TX 11b channel 11



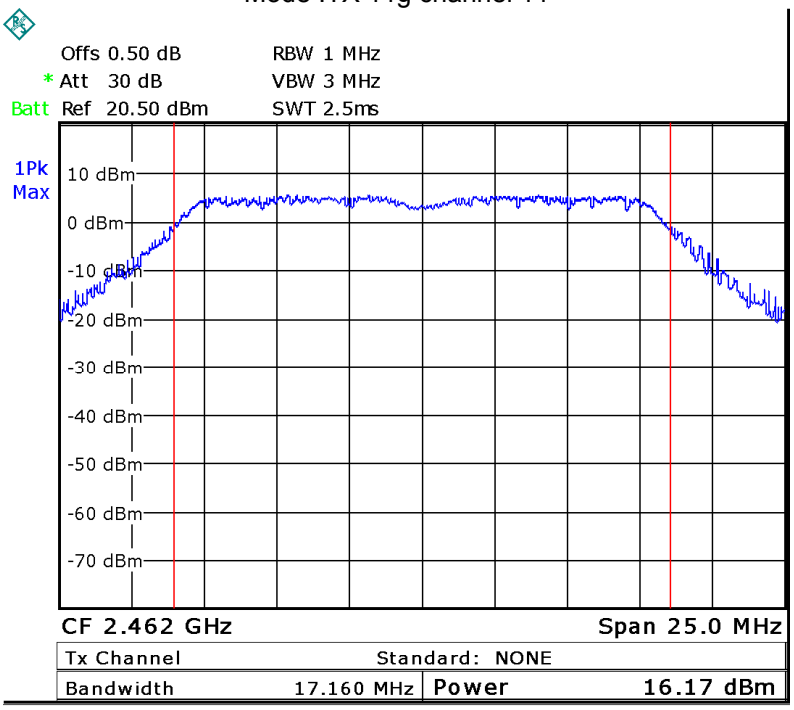
Mode :TX 11g channel 1



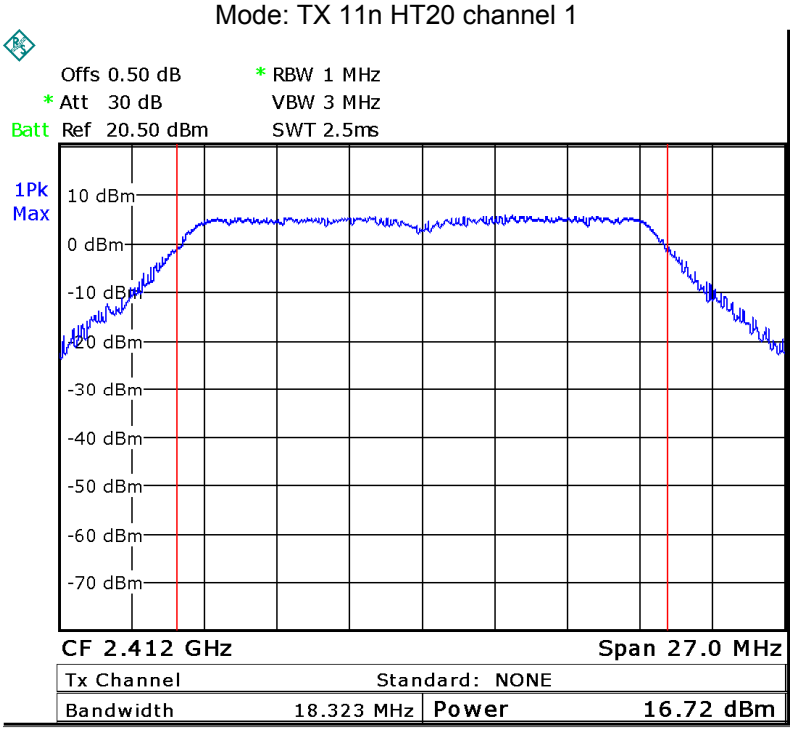
Mode :TX 11g channel 6



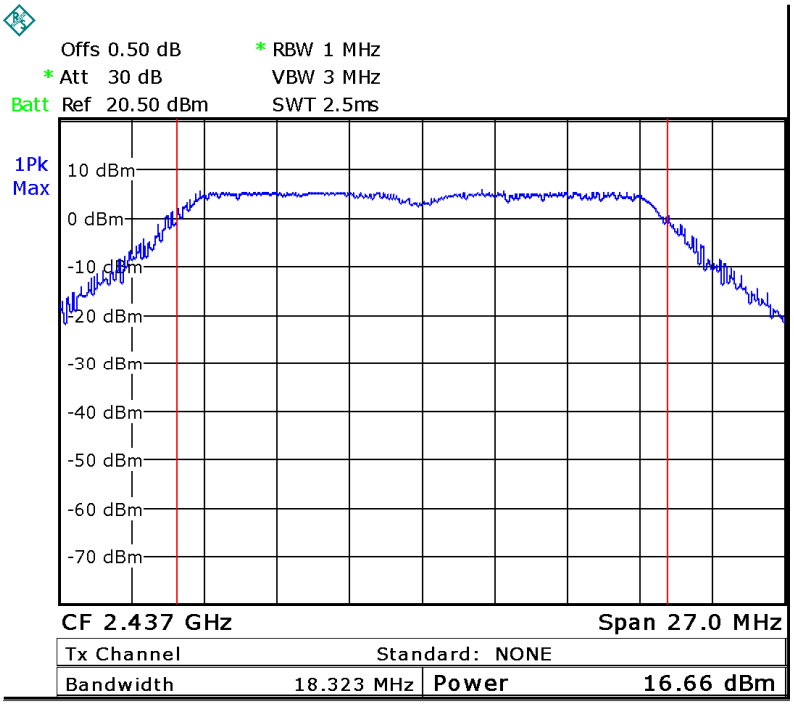
Mode :TX 11g channel 11



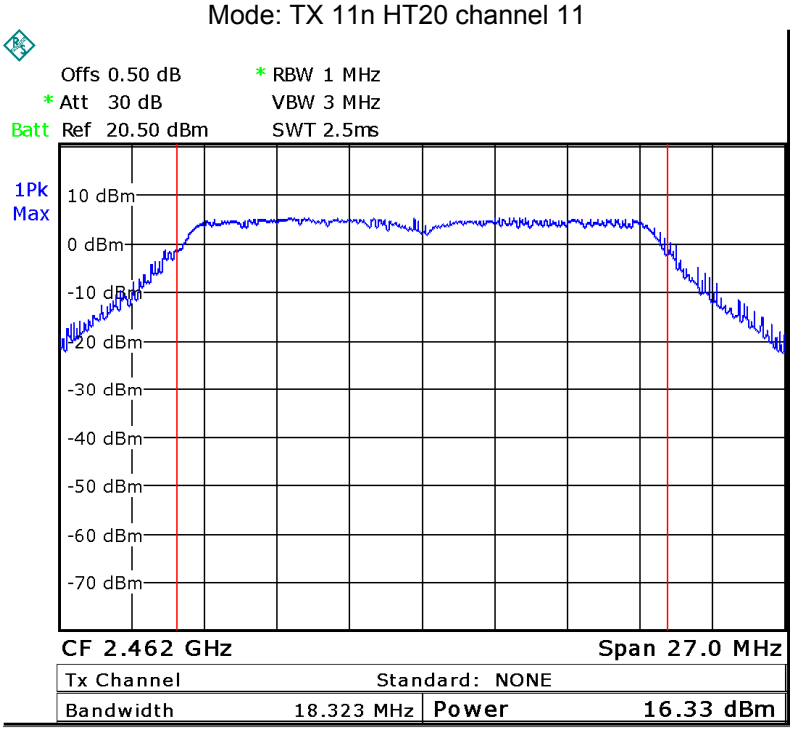
Mode: TX 11n HT20 channel 1



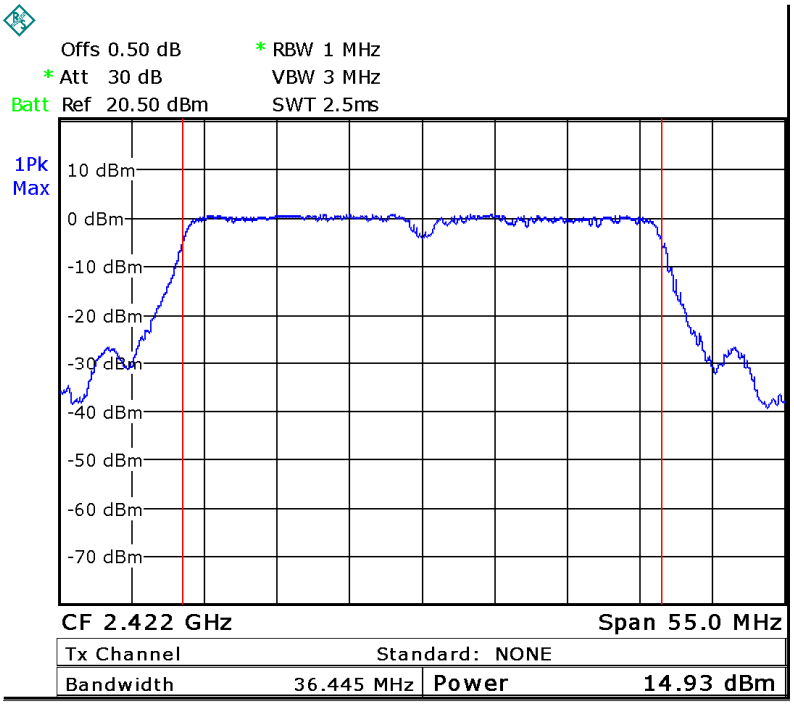
Mode: TX 11n HT20 channel 6



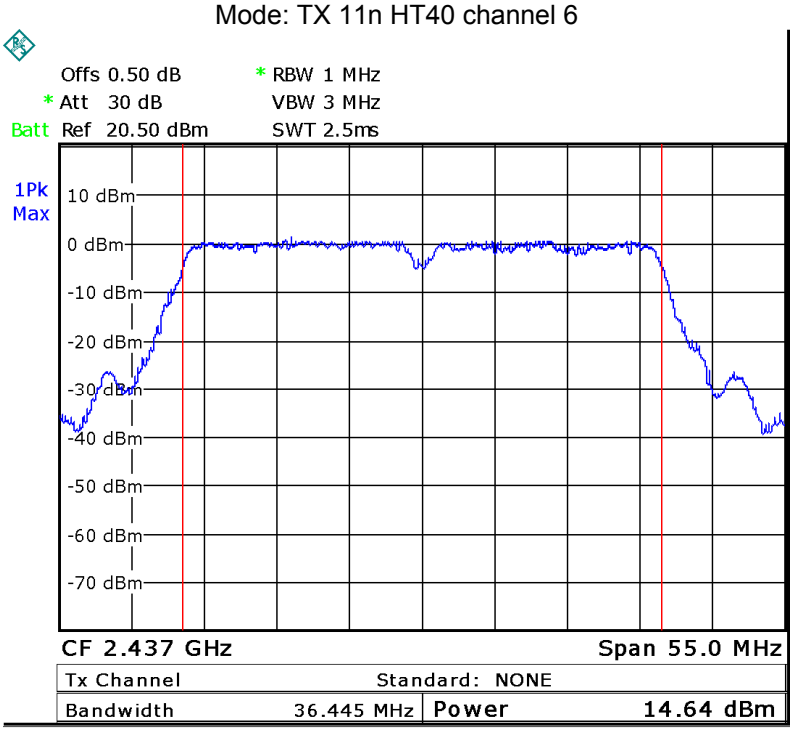
Mode: TX 11n HT20 channel 11



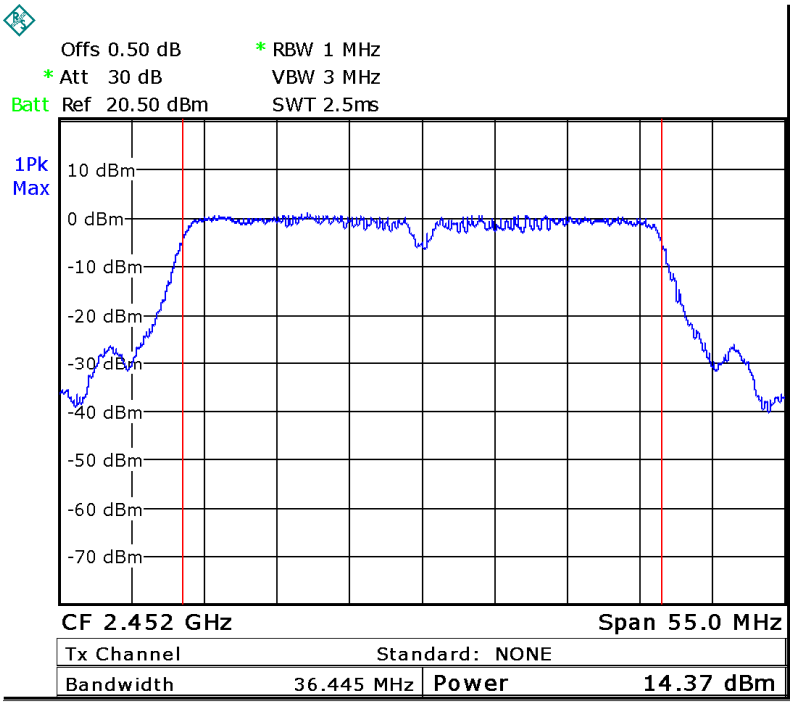
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6



Mode: TX 11n HT40 channel 9



14 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

14.1 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.

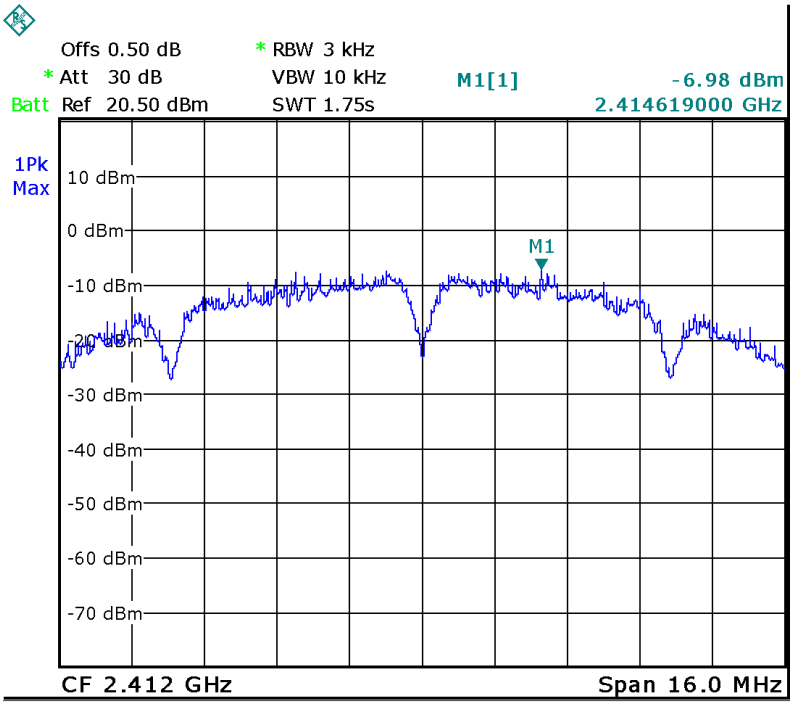
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

14.2 Test Result:

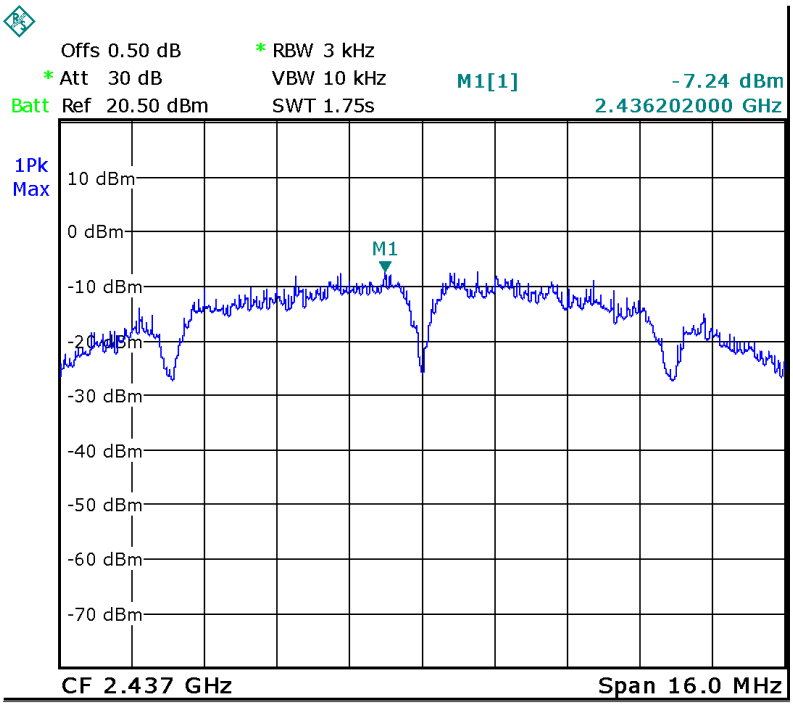
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-6.98	8dBm per 3kHz
	Middle-2437	-7.24	8dBm per 3kHz
	High-2462	-7.98	8dBm per 3kHz
TX 11g	Low-2412	-14.34	8dBm per 3kHz
	Middle-2437	-14.66	8dBm per 3kHz
	High-2462	-12.90	8dBm per 3kHz
TX 11n HT20	Low-2412	-14.43	8dBm per 3kHz
	Middle-2437	-14.50	8dBm per 3kHz
	High-2462	-13.26	8dBm per 3kHz
TX 11n HT40	Low-2422	-19.58	8dBm per 3kHz
	Middle-2437	-18.73	8dBm per 3kHz
	High-2452	-18.76	8dBm per 3kHz

Test Plot

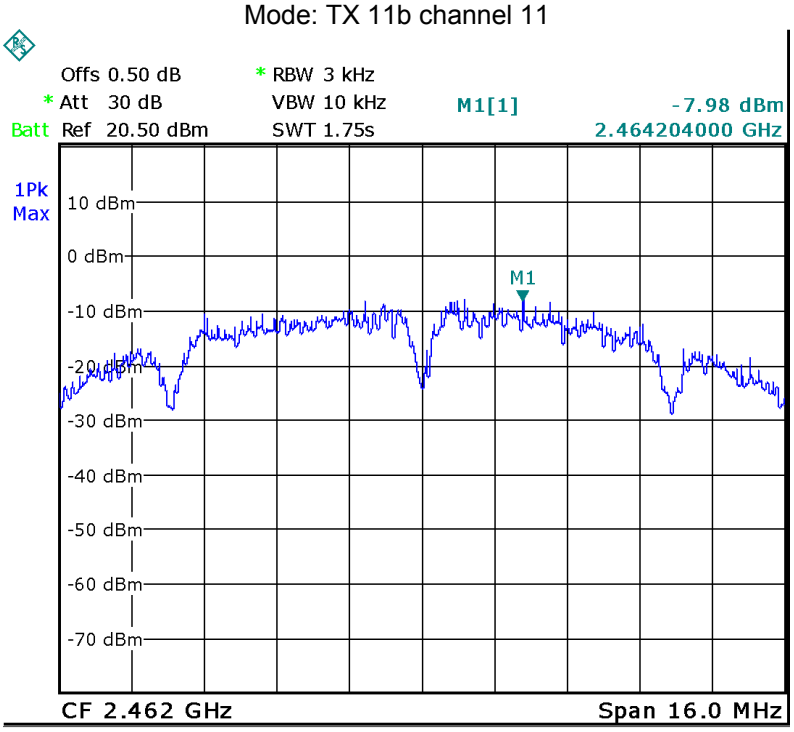
Mode: TX 11b channel 1



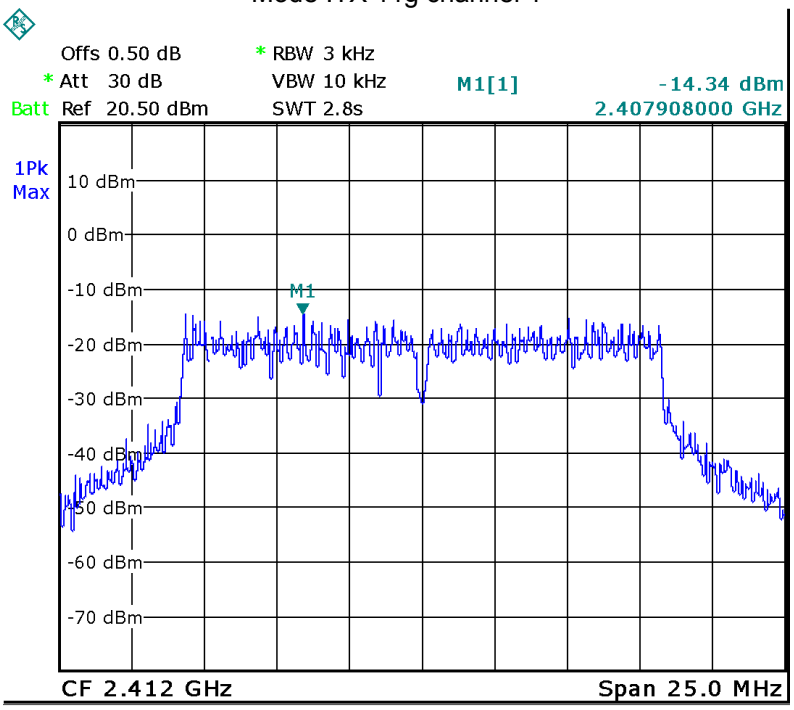
Mode: TX 11b channel 6



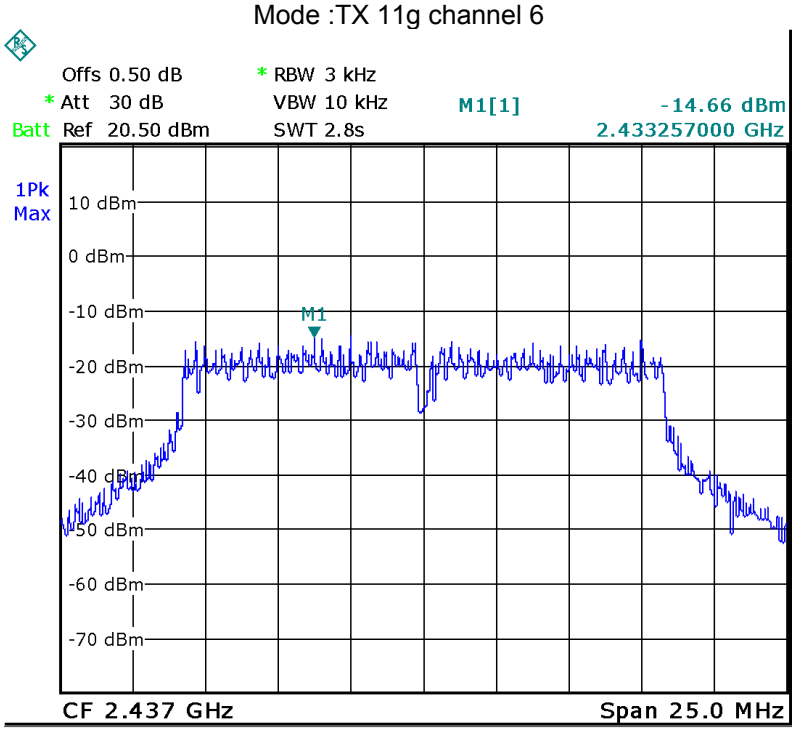
Mode: TX 11b channel 11



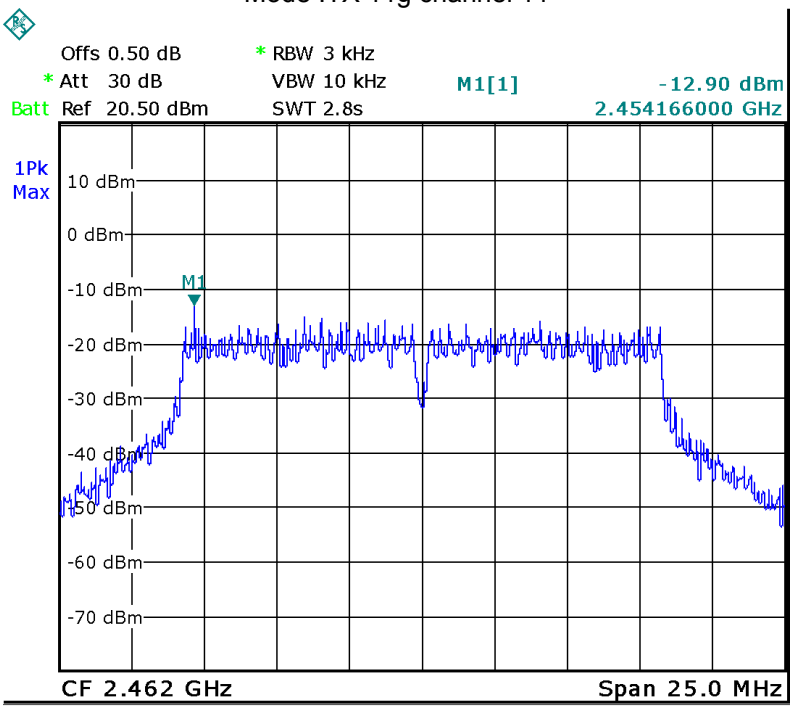
Mode :TX 11g channel 1



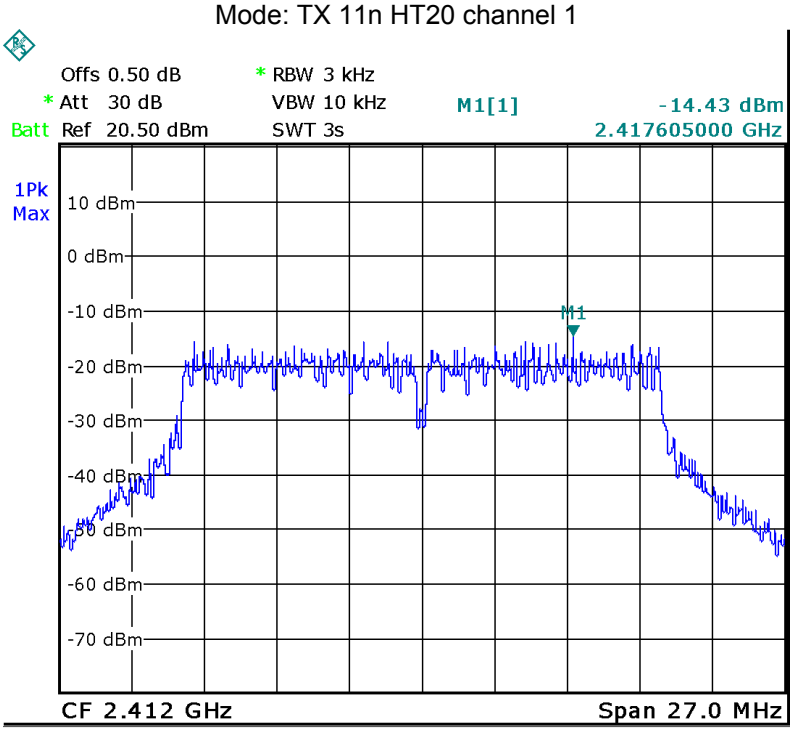
Mode :TX 11g channel 6



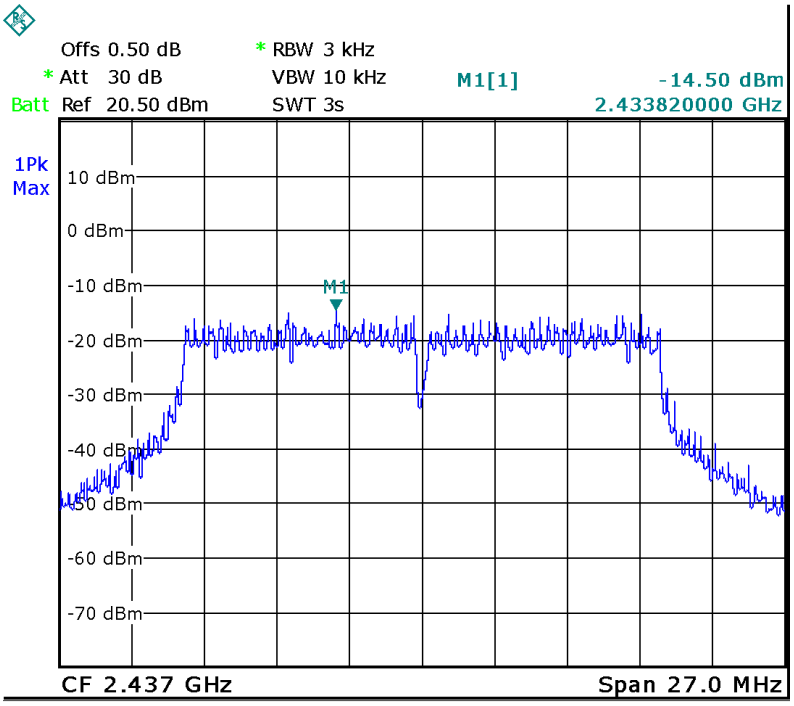
Mode :TX 11g channel 11



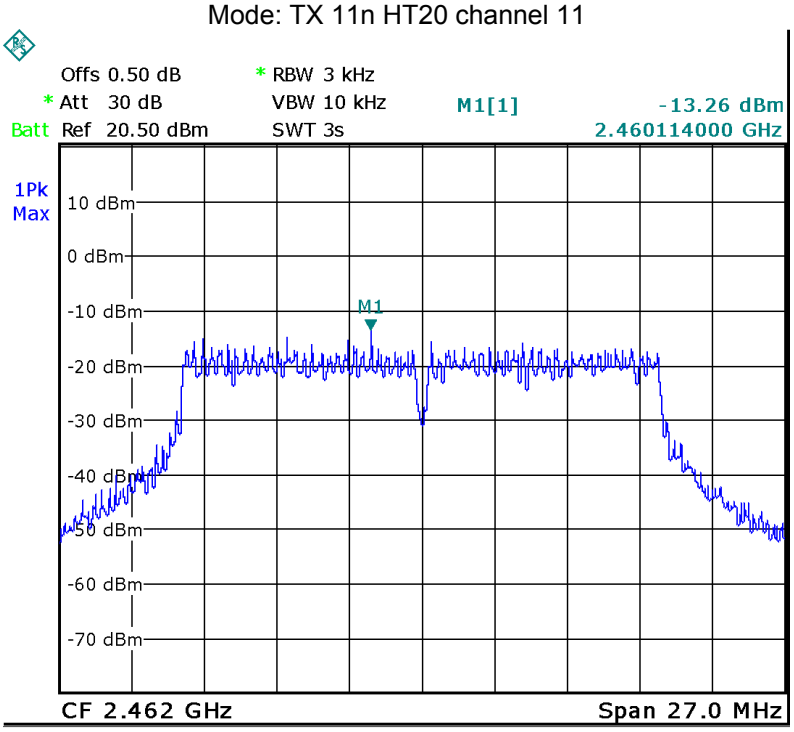
Mode: TX 11n HT20 channel 1



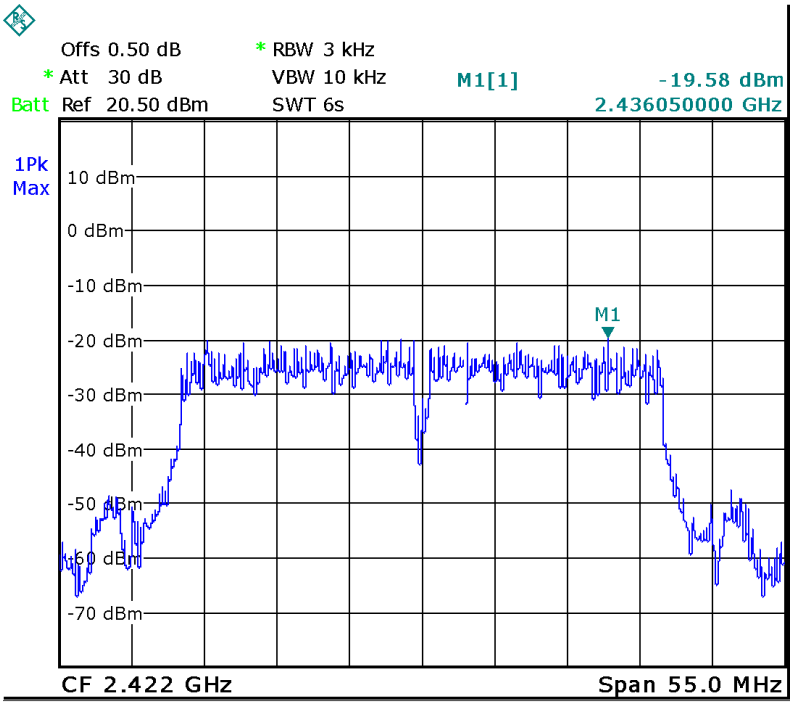
Mode: TX 11n HT20 channel 6



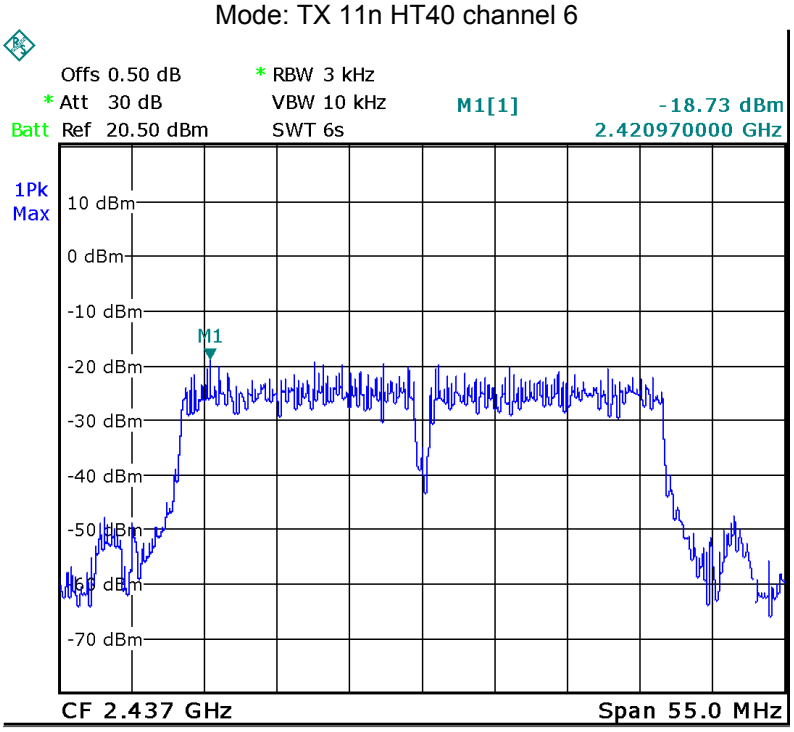
Mode: TX 11n HT20 channel 11



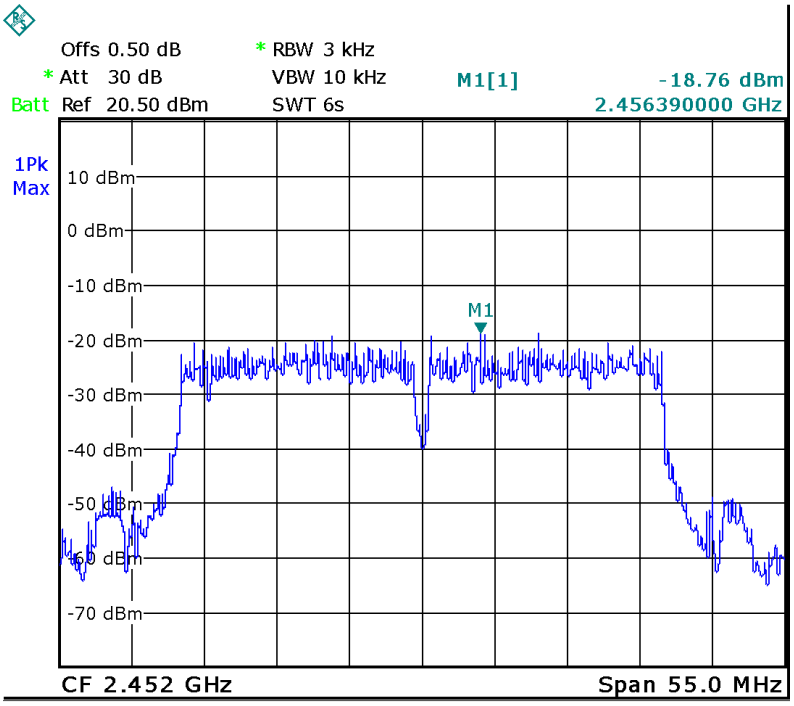
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6



Mode: TX 11n HT40 channel 9



15 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.

Note: Please refer to EUT photos for more details.

16 RF Exposure

Remark: refer to MPE test report: WTD21D04030232W002.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix- AHD01-Photos.

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