TEST REPORT

Reference No.	:	WTS18S10126788-1W
FCC ID	:	2AAV8VP-K
Applicant	:	SHENZHEN QIAOHUA INDUSTRIES LIMITED
Address	:	Room 301, No.building, Qiaohua Industrial Park, Luotian forestry center, Yanchuan, Yanluo town, Bao An, Shenzhen, China
Manufacturer	:	The same as above
Address	:	The same as above
Product	:	Video Doorbell
Model(s)	:	VP-K, VP-K1, VP-K2, VP-W1, VP-W1
Brand Name	:	QUHWA
Standards	:	FCC CFR47 Part 15.247:2017
Date of Receipt sample	:	2018-10-22
Date of Test	:	2018-10-23 to 2018-11-14
Date of Issue	:	2018-11-15
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:
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2 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China. Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC (The Federal Communications Commission), CEC (California energy efficiency), ISED (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek (ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.

Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. Electro Magnetic Compatibility (EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

Test Facility:

A. Accreditations for Conformity Assessment (International)

Country/Region	Scope Covered By	Scope	Note
USA	ISO/IEC 17025	FCC ID \ DOC \ VOC	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand		NTC	-
Singapore		IDA	-
Note: 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. 2. ISED CAB identifier: CN0013			

B. TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of …	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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4 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS18S10126788-1W	2018-10-22	2018-10-23 to 2018-11-14	2018-11-15	original	-	Valid

5 General Information

5.1 General Description of E.U.T.

Product:	Video Doorbell
Model No.	VP-K, VP-K1, VP-K2, VP-W1, VP-W1
Model Difference	Only different for the model names.
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40
Hardware Version:	VP_T10_V1.01
Software Version:	68.3.21.16
Storage Location:	Internal Storage
Note:	N/A

5.2 Details of E.U.T.

Operation Frequency:	WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz
Max. RF output power:	WiFi(2.4G): 20.96dBm
Type of Modulation:	WiFi: CCK, OFDM
Antenna installation:	WiFi: internal permanent antenna
Antenna Gain:	WiFi(2.4G): 2.5dBi
Ratings:	DC 9V/1A～24V/0.5A AC 8V/1A～16V/1A

5.3 Channel List

WIFI

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	-

5.4 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	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
Power Spectral Density	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
6dB Bandwidth	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
Band Edge	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
Transmitter Spurious Emissions	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	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 .

6 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)	N/A
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

7 Equipment Used during Test

7.1 Equipments List

Conducted Emissions Test Site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2018-09-12	2019-09-11
2.	LISN	R&S	ENV216	101215	2018-09-12	2019-09-11
3.	Cable	Top	TYPE16(3.5M)	-	2018-09-12	2019-09-11
Conducted Emissions Test Site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	2018-09-12	2019-09-11
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2018-09-12	2019-09-11
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2018-09-12	2019-09-11
4.	Cable	LARGE	RF300	-	2018-09-12	2019-09-11
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP	100091	2018-04-29	2019-04-28
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2018-04-09	2019-04-08
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2018-04-09	2019-04-08
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2018-09-12	2019-09-11
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2018-04-09	2019-04-08
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2018-04-09	2019-04-08
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2018-04-13	2019-04-12
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2018-04-13	2019-04-12
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2018-04-13	2019-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2018-04-09	2019-04-08
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	2018-04-13	2019-04-12
4	Cable	HUBER+SUHNER	CBL2	525178	2018-04-13	2019-04-12

RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2018-09-12	2019-09-11
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2018-09-12	2019-09-11
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2018-09-12	2019-09-11

7.2 Description of Support Units

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

7.3 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission	± 3.64 dB(AC mains 150KHz~30MHz)
Radiated Spurious Emissions	± 5.08 dB (Bilog antenna 30M~1000MHz)
	± 5.47 dB (Horn antenna 1000M~25000MHz)
Radio Frequency	± 1 x 10^{-7}Hz
RF Power	± 0.42 dB
RF Power Density	± 0.7dB
Conducted Spurious Emissions	± 2.76 dB (9kHz~26500MHz)
Confidence interval：95%. Confidence factor:k=2	

7.4 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.

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

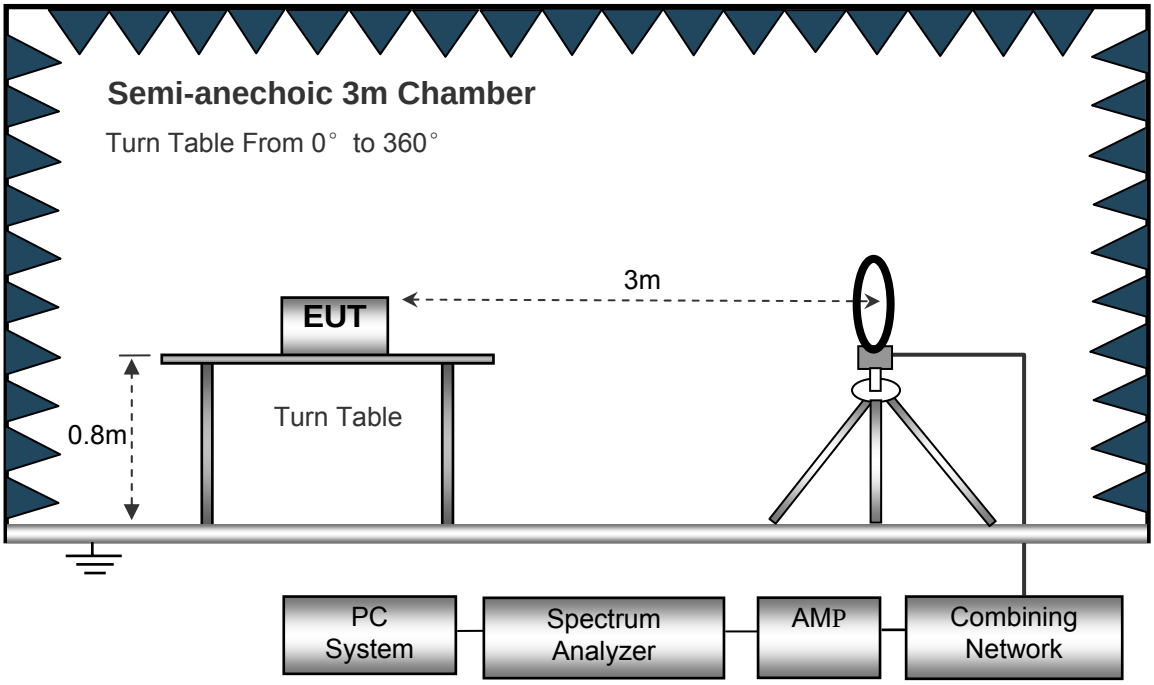
EUT Operation **:**

The test was performed in TX transmitting mode, the test data were shown in the report.

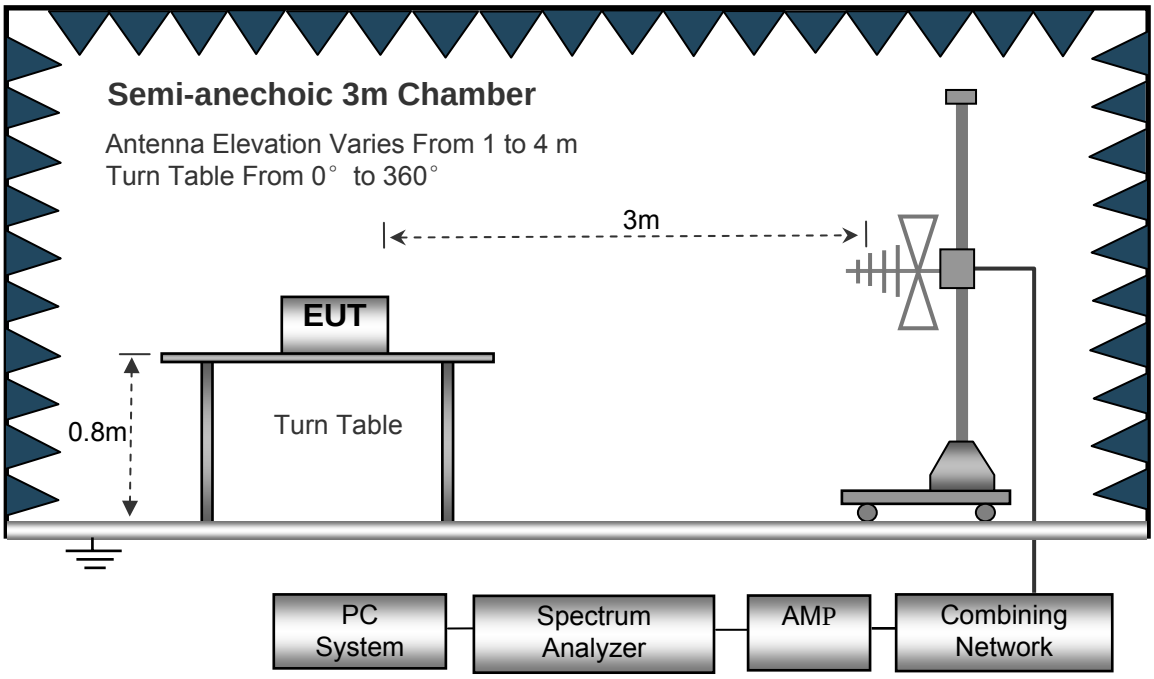
8.2 Test Setup

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

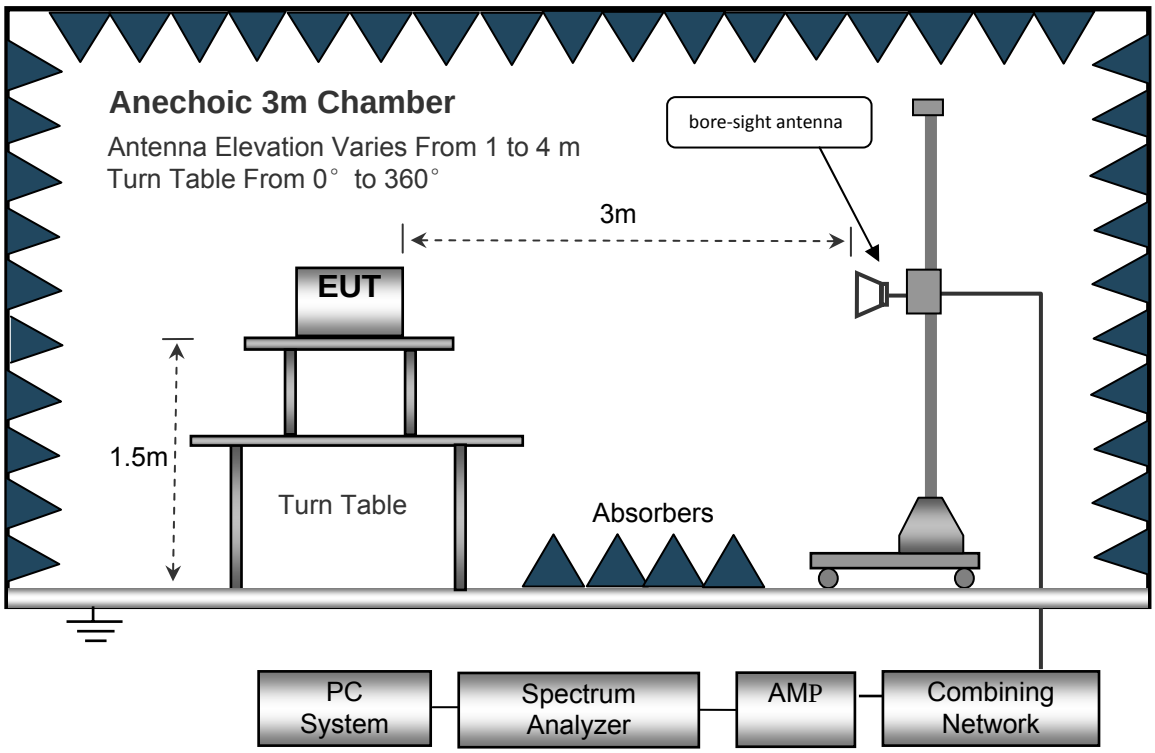
The test setup for emission measurement below 30MHz.



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

Wifi:
Test Frequency: 9KHz~30MHz

Remark: only the worst data (802.11b/g/n Low channel mode) were recorded.

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
802.11b							
6.032	25.46	QP	21.84	40.00	7.30	29.54	-22.24
15.730	25.32	QP	21.35	40.00	6.67	29.54	-22.87
25.215	25.17	QP	20.67	40.00	5.84	29.54	-23.70
802.11g							
6.032	25.43	QP	21.84	40.00	7.27	29.54	-22.27
15.730	25.70	QP	21.35	40.00	7.05	29.54	-22.49
25.215	25.12	QP	20.67	40.00	5.79	29.54	-23.75
802.11n(HT20)							
6.032	25.31	QP	21.84	40.00	7.15	29.54	-22.39
15.730	25.18	QP	21.35	40.00	6.53	29.54	-23.01
25.215	25.22	QP	20.67	40.00	5.89	29.54	-23.65
802.11n(HT40)							
6.032	25.80	QP	21.84	40.00	7.64	29.54	-21.90
15.730	25.15	QP	21.35	40.00	6.50	29.54	-23.04
25.215	25.30	QP	20.67	40.00	5.97	29.54	-23.57

Test Frequency : 30MHz ~ 18GHz

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	39.14	QP	9	1.5	H	-11.62	27.52	46.00	-18.48
223.45	35.42	QP	18	1.0	V	-11.62	23.80	46.00	-22.20
4824.00	50.07	PK	280	1.9	V	-1.06	49.01	74.00	-24.99
4824.00	45.86	Ave	280	1.9	V	-1.06	44.80	54.00	-9.20
7236.00	39.10	PK	175	1.7	H	1.33	40.43	74.00	-33.57
7236.00	42.79	Ave	175	1.7	H	1.33	44.12	54.00	-9.88
2325.63	46.31	PK	48	1.7	V	-13.19	33.12	74.00	-40.88
2325.63	37.61	Ave	48	1.7	V	-13.19	24.42	54.00	-29.58
2385.74	43.93	PK	353	1.4	H	-13.14	30.79	74.00	-43.21
2385.74	37.32	Ave	353	1.4	H	-13.14	24.18	54.00	-29.82
2491.80	42.75	PK	356	1.6	V	-13.08	29.67	74.00	-44.33
2491.80	37.88	Ave	356	1.6	V	-13.08	24.80	54.00	-29.20

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	38.01	QP	69	1.3	H	-11.62	26.39	46.00	-19.61
223.45	34.51	QP	39	2.0	V	-11.62	22.89	46.00	-23.11
4874.00	48.51	PK	28	1.5	V	-0.62	47.89	74.00	-26.11
4874.00	44.05	Ave	28	1.5	V	-0.62	43.43	54.00	-10.57
7311.00	39.27	PK	342	1.8	H	2.21	41.48	74.00	-32.52
7311.00	43.85	Ave	342	1.8	H	2.21	46.06	54.00	-7.94
2344.21	45.60	PK	78	1.8	V	-13.19	32.41	74.00	-41.59
2344.21	38.92	Ave	78	1.8	V	-13.19	25.73	54.00	-28.27
2358.19	43.83	PK	303	1.4	H	-13.14	30.69	74.00	-43.31
2358.19	38.46	Ave	303	1.4	H	-13.14	25.32	54.00	-28.68
2487.22	43.10	PK	6	1.0	V	-13.08	30.02	74.00	-43.98
2487.22	37.90	Ave	6	1.0	V	-13.08	24.82	54.00	-29.18

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)
11b: High Channel 2462MHz									
223.45	40.54	QP	261	1.5	H	-11.62	28.92	46.00	-17.08
223.45	36.31	QP	109	1.3	V	-11.62	24.69	46.00	-21.31
4924.00	49.58	PK	316	1.9	V	-0.24	49.34	74.00	-24.66
4924.00	45.41	Ave	316	1.9	V	-0.24	45.17	54.00	-8.83
7386.00	37.90	PK	328	2.0	H	2.84	40.74	74.00	-33.26
7386.00	42.47	Ave	328	2.0	H	2.84	45.31	54.00	-8.69
2348.52	46.94	PK	32	1.8	V	-13.19	33.75	74.00	-40.25
2348.52	37.08	Ave	32	1.8	V	-13.19	23.89	54.00	-30.11
2387.30	44.74	PK	225	2.0	H	-13.14	31.60	74.00	-42.40
2387.30	38.31	Ave	225	2.0	H	-13.14	25.17	54.00	-28.83
2497.57	43.81	PK	206	1.9	V	-13.08	30.73	74.00	-43.27
2497.57	36.64	Ave	206	1.9	V	-13.08	23.56	54.00	-30.44

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	40.52	QP	346	1.5	H	-11.62	28.90	46.00	-17.10
223.45	36.24	QP	218	1.5	V	-11.62	24.62	46.00	-21.38
4824.00	51.85	PK	263	1.6	V	-1.06	50.79	74.00	-23.21
4824.00	44.83	Ave	263	1.6	V	-1.06	43.77	54.00	-10.23
7236.00	38.09	PK	248	1.6	H	1.33	39.42	74.00	-34.58
7236.00	44.50	Ave	248	1.6	H	1.33	45.83	54.00	-8.17
2318.08	45.04	PK	257	1.5	V	-13.19	31.85	74.00	-42.15
2318.08	37.85	Ave	257	1.5	V	-13.19	24.66	54.00	-29.34
2363.96	42.26	PK	293	1.3	H	-13.14	29.12	74.00	-44.88
2363.96	37.72	Ave	293	1.3	H	-13.14	24.58	54.00	-29.42
2496.18	42.76	PK	182	1.2	V	-13.08	29.68	74.00	-44.32
2496.18	36.74	Ave	182	1.2	V	-13.08	23.66	54.00	-30.34

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	39.24	QP	112	1.9	H	-11.62	27.62	46.00	-18.38
223.45	34.58	QP	112	1.2	V	-11.62	22.96	46.00	-23.04
4874.00	50.47	PK	256	1.4	V	-0.62	49.85	74.00	-24.15
4874.00	47.04	Ave	256	1.4	V	-0.62	46.42	54.00	-7.58
7311.00	38.58	PK	41	1.1	H	2.21	40.79	74.00	-33.21
7311.00	44.51	Ave	41	1.1	H	2.21	46.72	54.00	-7.28
2337.41	46.82	PK	177	1.2	V	-13.19	33.63	74.00	-40.37
2337.41	39.08	Ave	177	1.2	V	-13.19	25.89	54.00	-28.11
2382.03	43.95	PK	292	1.9	H	-13.14	30.81	74.00	-43.19
2382.03	36.34	Ave	292	1.9	H	-13.14	23.20	54.00	-30.80
2495.55	42.31	PK	175	1.8	V	-13.08	29.23	74.00	-44.77
2495.55	36.55	Ave	175	1.8	V	-13.08	23.47	54.00	-30.53

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	38.66	QP	177	1.0	H	-11.62	27.04	46.00	-18.96
223.45	36.75	QP	59	1.0	V	-11.62	25.13	46.00	-20.87
4924.00	49.32	PK	273	1.1	V	-0.24	49.08	74.00	-24.92
4924.00	46.96	Ave	273	1.1	V	-0.24	46.72	54.00	-7.28
7386.00	37.60	PK	46	1.2	H	2.84	40.44	74.00	-33.56
7386.00	42.46	Ave	46	1.2	H	2.84	45.30	54.00	-8.70
2336.68	46.06	PK	132	1.7	V	-13.19	32.87	74.00	-41.13
2336.68	38.41	Ave	132	1.7	V	-13.19	25.22	54.00	-28.78
2384.02	43.00	PK	230	1.8	H	-13.14	29.86	74.00	-44.14
2384.02	37.26	Ave	230	1.8	H	-13.14	24.12	54.00	-29.88
2486.24	43.70	PK	193	1.2	V	-13.08	30.62	74.00	-43.38
2486.24	37.07	Ave	193	1.2	V	-13.08	23.99	54.00	-30.01

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	37.95	QP	224	1.4	H	-11.62	26.33	46.00	-19.67
223.45	36.93	QP	13	2.0	V	-11.62	25.31	46.00	-20.69
4824.00	48.71	PK	38	1.0	V	-1.06	47.65	74.00	-26.35
4824.00	45.81	Ave	38	1.0	V	-1.06	44.75	54.00	-9.25
7236.00	37.17	PK	345	1.4	H	1.33	38.50	74.00	-35.50
7236.00	41.17	Ave	345	1.4	H	1.33	42.50	54.00	-11.50
2325.99	46.22	PK	112	1.4	V	-13.19	33.03	74.00	-40.97
2325.99	39.75	Ave	112	1.4	V	-13.19	26.56	54.00	-27.44
2387.85	44.00	PK	1	1.3	H	-13.14	30.86	74.00	-43.14
2387.85	37.15	Ave	1	1.3	H	-13.14	24.01	54.00	-29.99
2488.22	43.64	PK	292	1.3	V	-13.08	30.56	74.00	-43.44
2488.22	37.89	Ave	292	1.3	V	-13.08	24.81	54.00	-29.19

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	39.18	QP	245	1.1	H	-11.62	27.56	46.00	-18.44
223.45	36.96	QP	306	1.8	V	-11.62	25.34	46.00	-20.66
4874.00	48.57	PK	9	1.2	V	-0.62	47.95	74.00	-26.05
4874.00	44.07	Ave	9	1.2	V	-0.62	43.45	54.00	-10.55
7311.00	38.94	PK	36	1.8	H	2.21	41.15	74.00	-32.85
7311.00	41.36	Ave	36	1.8	H	2.21	43.57	54.00	-10.43
2324.59	46.59	PK	71	1.9	V	-13.19	33.40	74.00	-40.60
2324.59	37.67	Ave	71	1.9	V	-13.19	24.48	54.00	-29.52
2367.68	42.52	PK	134	1.1	H	-13.14	29.38	74.00	-44.62
2367.68	38.83	Ave	134	1.1	H	-13.14	25.69	54.00	-28.31
2491.66	44.96	PK	128	1.3	V	-13.08	31.88	74.00	-42.12
2491.66	36.01	Ave	128	1.3	V	-13.08	22.93	54.00	-31.07

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	38.99	QP	244	2.0	H	-11.62	27.37	46.00	-18.63
223.45	36.05	QP	28	2.0	V	-11.62	24.43	46.00	-21.57
4924.00	52.05	PK	69	1.7	V	-0.24	51.81	74.00	-22.19
4924.00	47.70	Ave	69	1.7	V	-0.24	47.46	54.00	-6.54
7386.00	37.54	PK	223	1.8	H	2.84	40.38	74.00	-33.62
7386.00	44.65	Ave	223	1.8	H	2.84	47.49	54.00	-6.51
2331.39	46.76	PK	138	1.3	V	-13.19	33.57	74.00	-40.43
2331.39	38.69	Ave	138	1.3	V	-13.19	25.50	54.00	-28.50
2359.04	44.27	PK	329	2.0	H	-13.14	31.13	74.00	-42.87
2359.04	36.06	Ave	329	2.0	H	-13.14	22.92	54.00	-31.08
2494.07	42.90	PK	168	1.7	V	-13.08	29.82	74.00	-44.18
2494.07	38.74	Ave	168	1.7	V	-13.08	25.66	54.00	-28.34

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	39.39	QP	51	1.8	H	-11.62	27.77	46.00	-18.23
223.45	33.95	QP	355	1.2	V	-11.62	22.33	46.00	-23.67
4844.00	49.13	PK	168	1.4	V	-1.06	48.07	74.00	-25.93
4844.00	46.36	Ave	168	1.4	V	-1.06	45.30	54.00	-8.70
7266.00	37.80	PK	83	1.9	H	1.33	39.13	74.00	-34.87
7266.00	43.84	Ave	83	1.9	H	1.33	45.17	54.00	-8.83
2346.57	46.98	PK	222	1.9	V	-13.19	33.79	74.00	-40.21
2346.57	37.89	Ave	222	1.9	V	-13.19	24.70	54.00	-29.30
2364.60	43.81	PK	86	1.9	H	-13.14	30.67	74.00	-43.33
2364.60	37.35	Ave	86	1.9	H	-13.14	24.21	54.00	-29.79
2493.11	44.83	PK	338	1.3	V	-13.08	31.75	74.00	-42.25
2493.11	36.61	Ave	338	1.3	V	-13.08	23.53	54.00	-30.47

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	40.09	QP	14	1.5	H	-11.62	28.47	46.00	-17.53
223.45	33.77	QP	324	1.4	V	-11.62	22.15	46.00	-23.85
4874.00	48.47	PK	264	1.5	V	-0.62	47.85	74.00	-26.15
4874.00	46.48	Ave	264	1.5	V	-0.62	45.86	54.00	-8.14
7311.00	38.74	PK	293	1.9	H	2.21	40.95	74.00	-33.05
7311.00	42.96	Ave	293	1.9	H	2.21	45.17	54.00	-8.83
2337.86	45.78	PK	5	1.4	V	-13.19	32.59	74.00	-41.41
2337.86	37.26	Ave	5	1.4	V	-13.19	24.07	54.00	-29.93
2355.68	42.41	PK	197	1.5	H	-13.14	29.27	74.00	-44.73
2355.68	36.79	Ave	197	1.5	H	-13.14	23.65	54.00	-30.35
2498.31	43.74	PK	340	1.6	V	-13.08	30.66	74.00	-43.34
2498.31	37.34	Ave	340	1.6	V	-13.08	24.26	54.00	-29.74

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	39.89	QP	23	1.9	H	-11.62	28.27	46.00	-17.73
223.45	36.02	QP	168	1.5	V	-11.62	24.40	46.00	-21.60
4904.00	52.05	PK	68	1.8	V	-0.24	51.81	74.00	-22.19
4904.00	47.48	Ave	68	1.8	V	-0.24	47.24	54.00	-6.76
7356.00	40.60	PK	190	1.1	H	2.84	43.44	74.00	-30.56
7356.00	41.80	Ave	190	1.1	H	2.84	44.64	54.00	-9.36
2310.01	45.45	PK	104	1.4	V	-13.19	32.26	74.00	-41.74
2310.01	37.04	Ave	104	1.4	V	-13.19	23.85	54.00	-30.15
2374.25	42.47	PK	225	1.6	H	-13.14	29.33	74.00	-44.67
2374.25	37.01	Ave	225	1.6	H	-13.14	23.87	54.00	-30.13
2495.91	44.19	PK	337	1.1	V	-13.08	31.11	74.00	-42.89
2495.91	37.58	Ave	337	1.1	V	-13.08	24.50	54.00	-29.50

Test Frequency: 18GHz~25GHz

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

9 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)).

9.1 Test Procedure

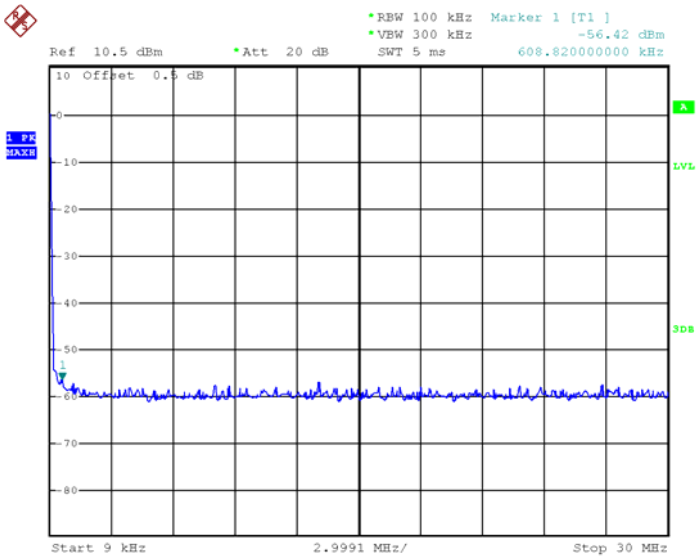
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
   a) Set instrument center frequency to DTS channel center frequency.
   b) Set the span to _ 1.5 times the DTS bandwidth.
   c) Set the RBW = 100 kHz.
   d) Set the 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.

9.2 Test Result

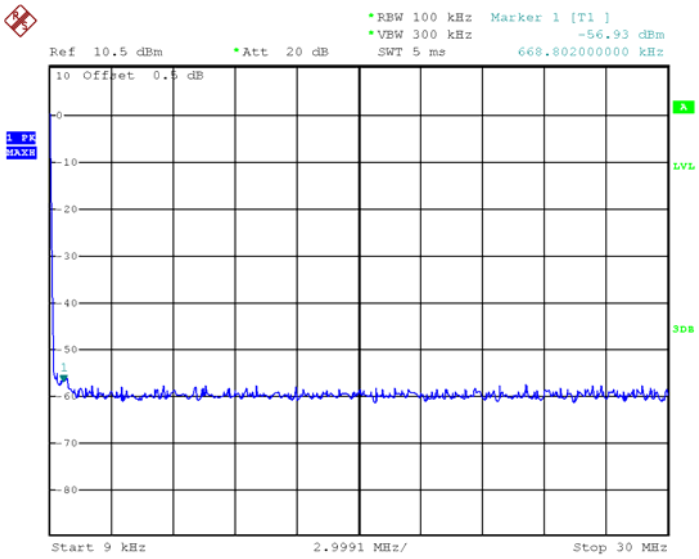
9KHz – 30MHz

802.11b

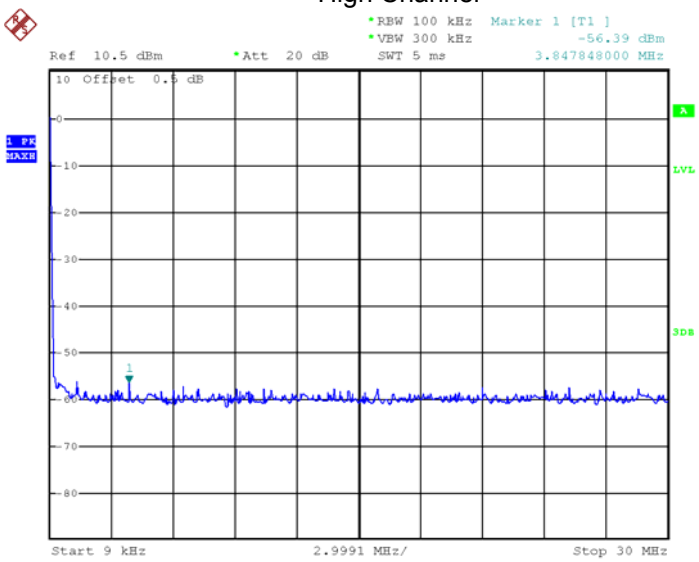
Low Channel



Middle Channel

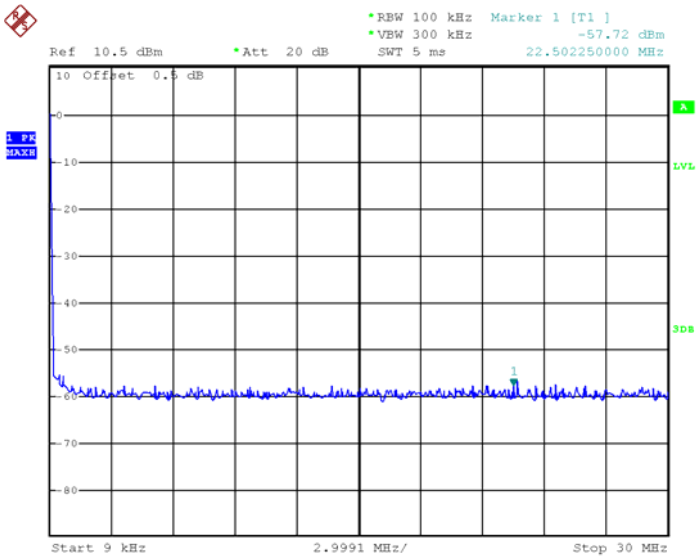


High Channel

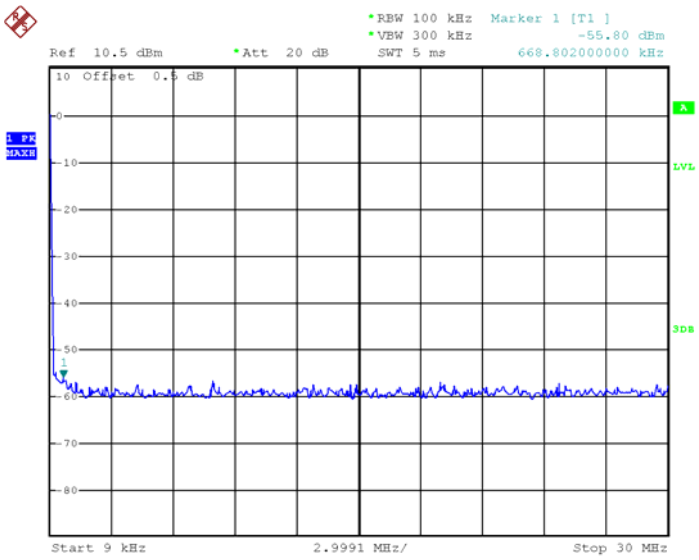


802.11g

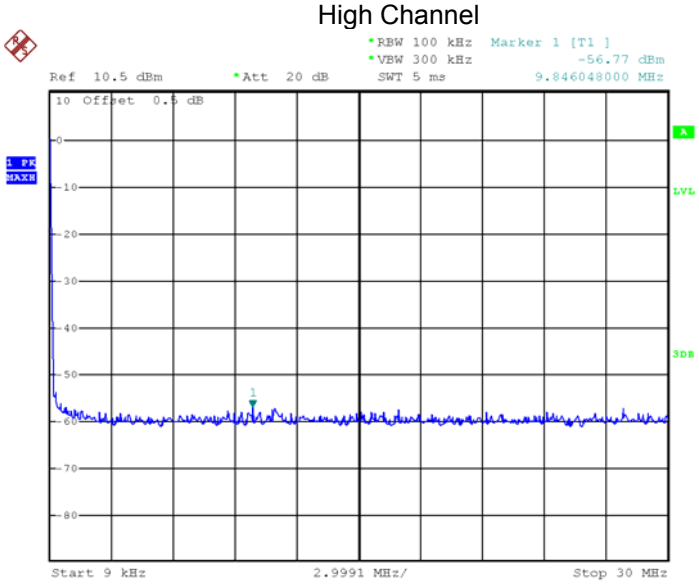
Low Channel



Middle Channel

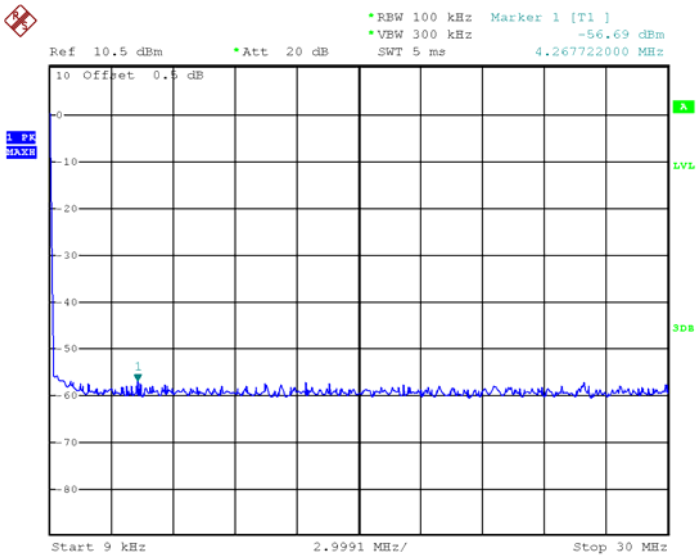


High Channel

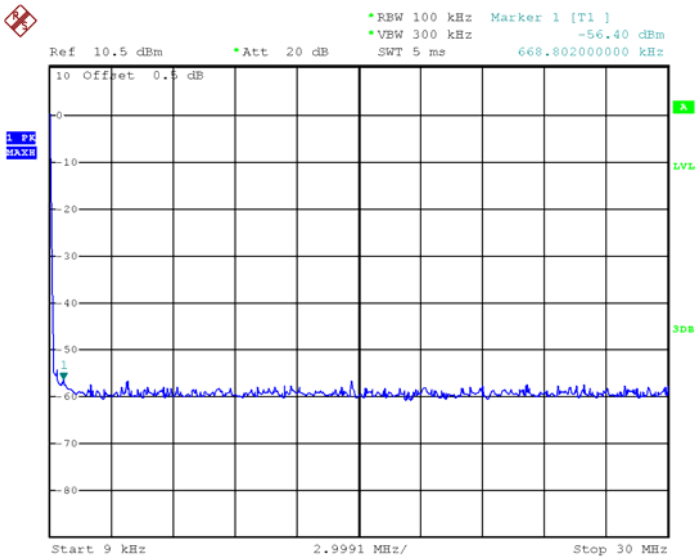


802.11n HT20

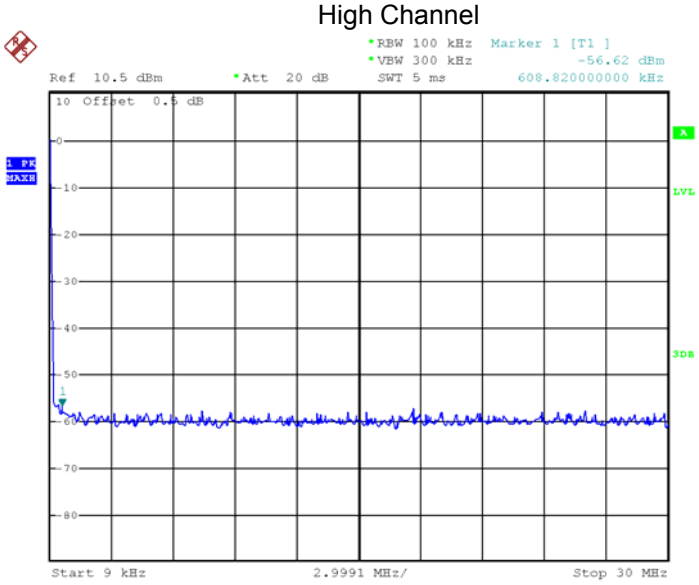
Low Channel



Middle Channel

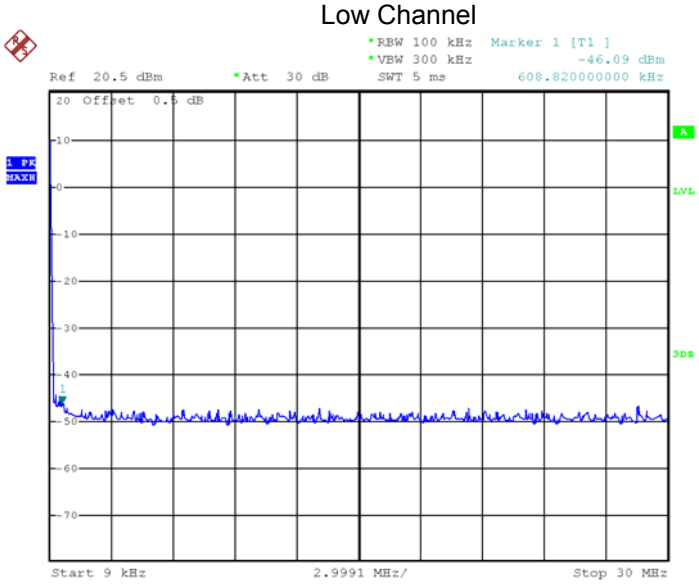


High Channel

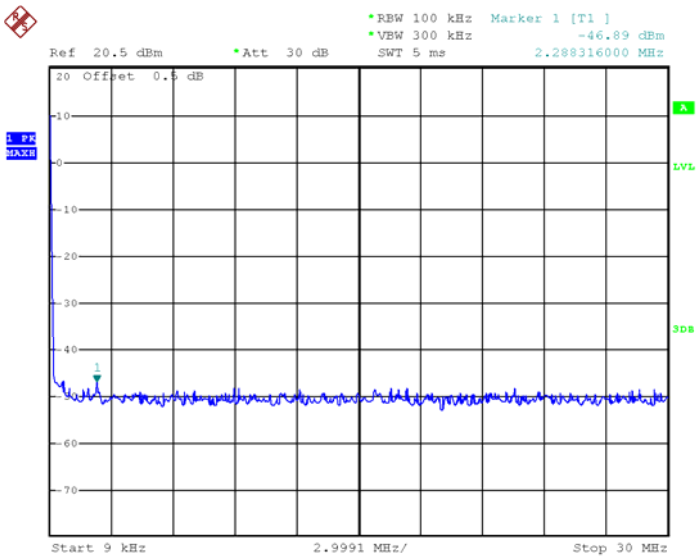


802.11n HT40

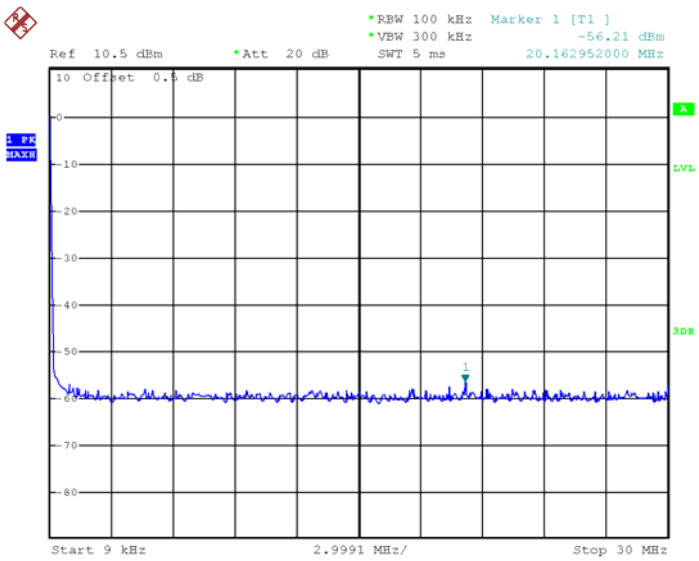
Low Channel



Middle Channel



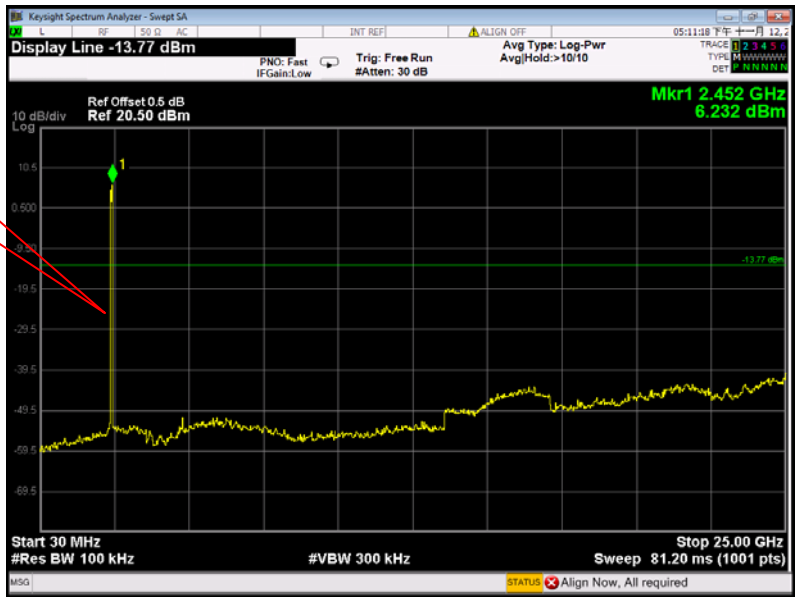
High Channel



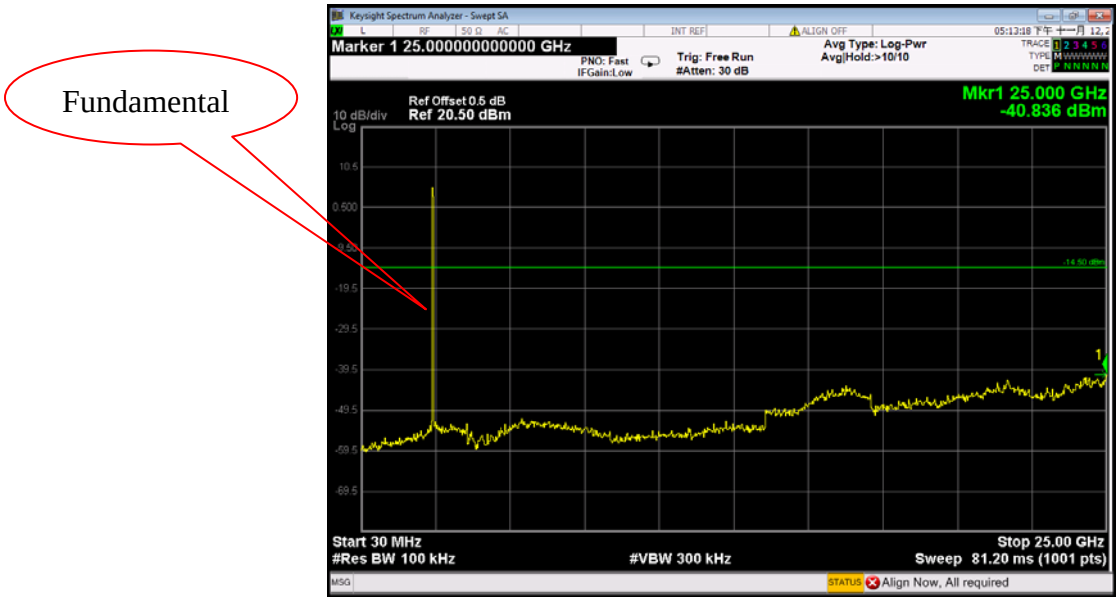
Above 30MHz

802.11b

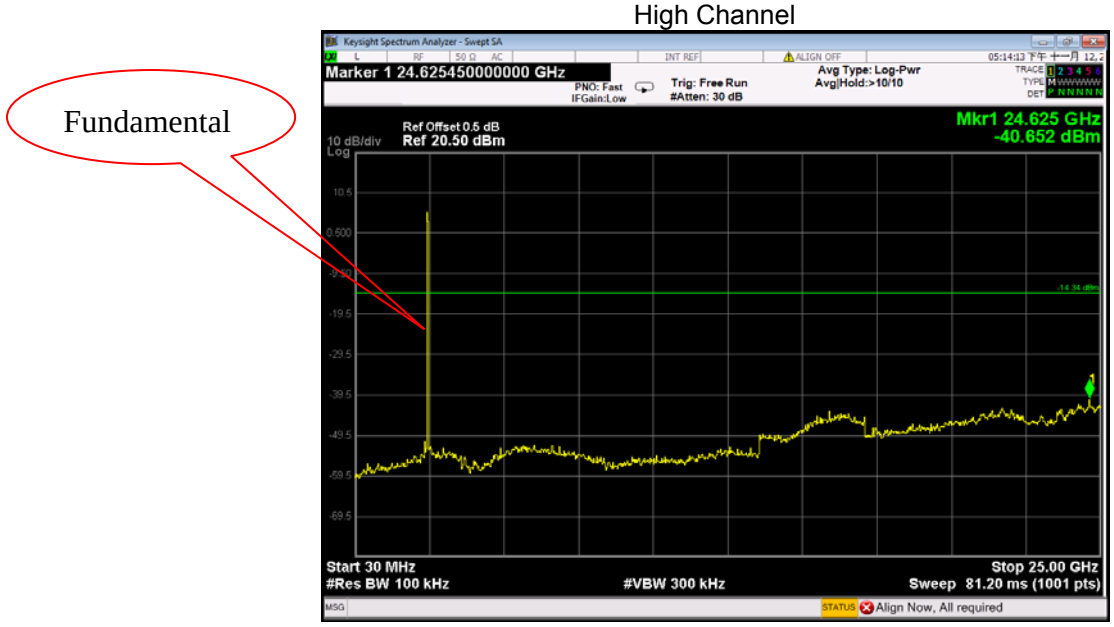
Low Channel



Middle Channel

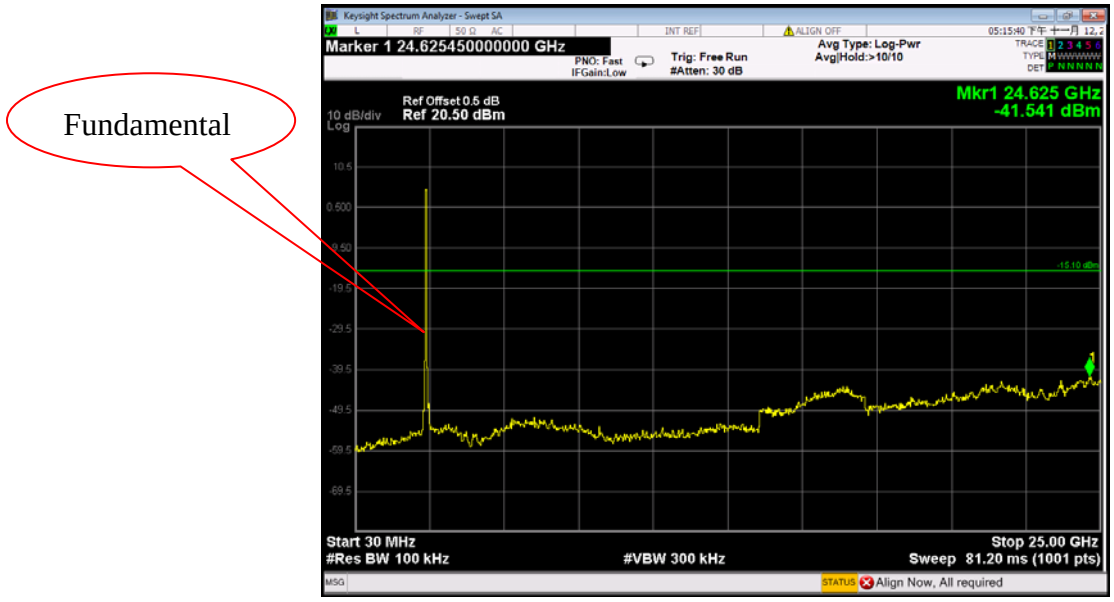


High Channel



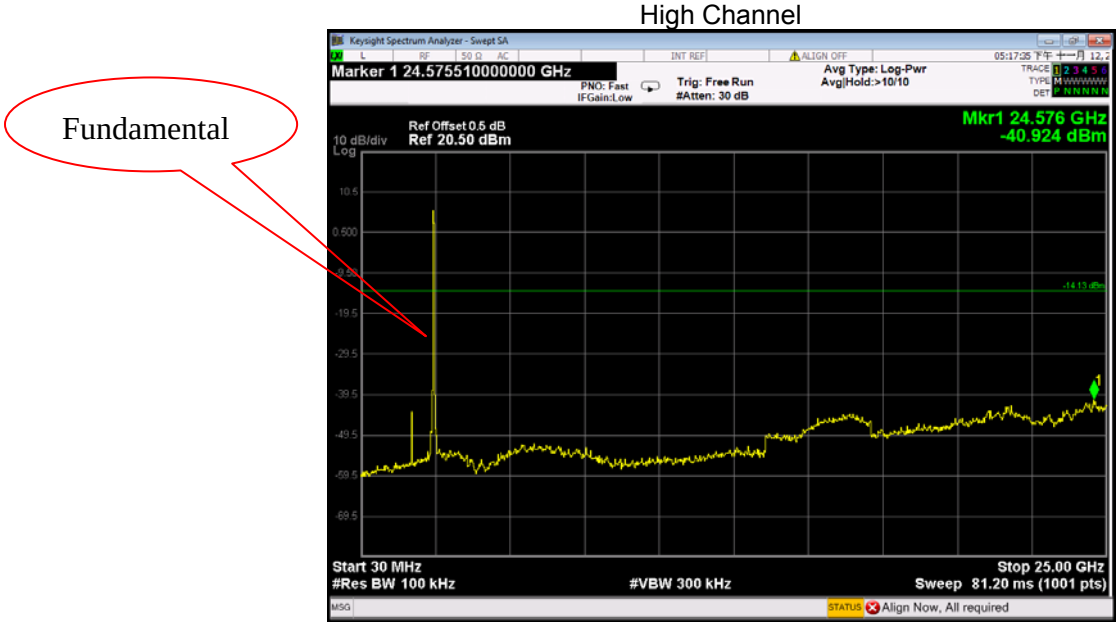
802.11g

Low Channel



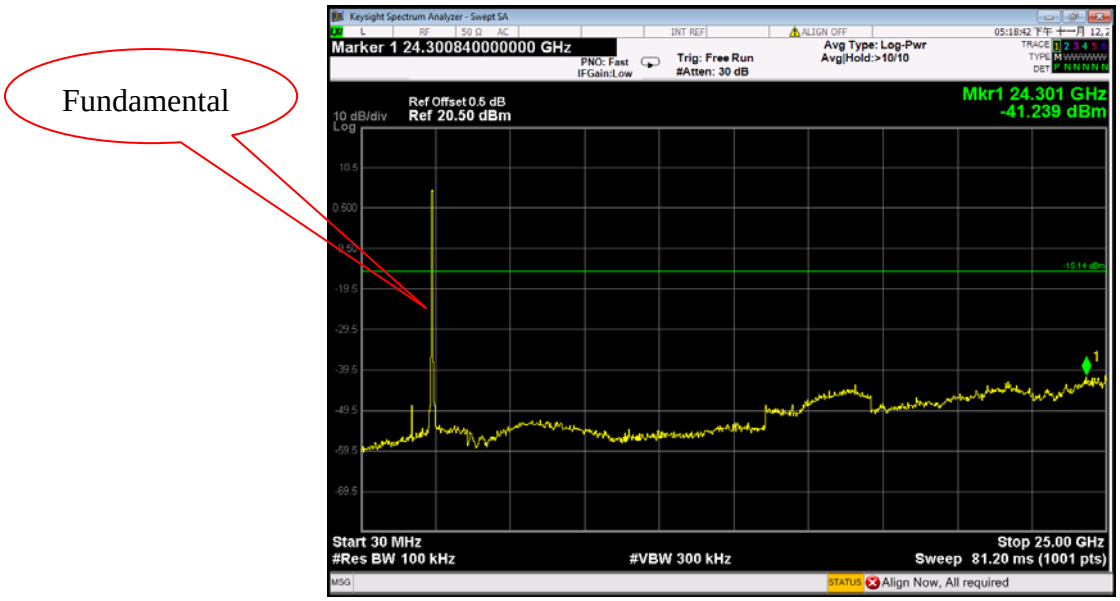
Middle Channel

High Channel

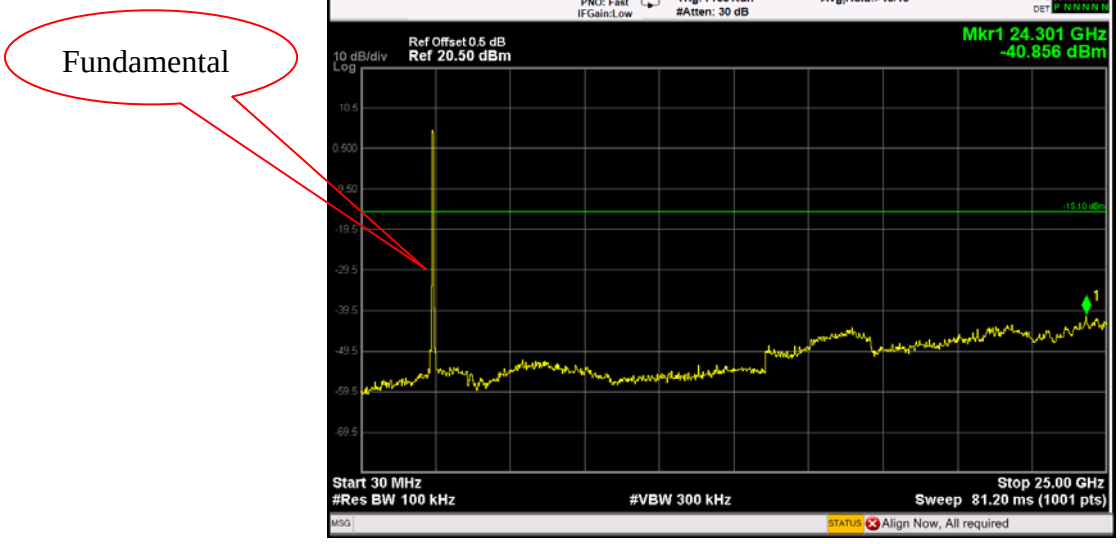


802.11n HT20

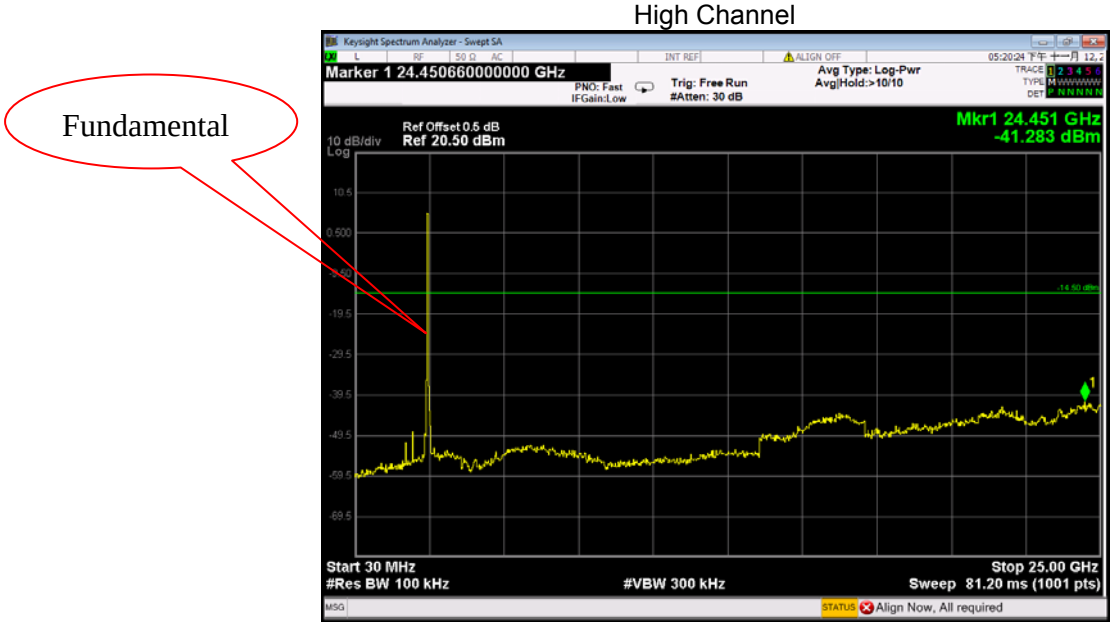
Low Channel



Middle Channel

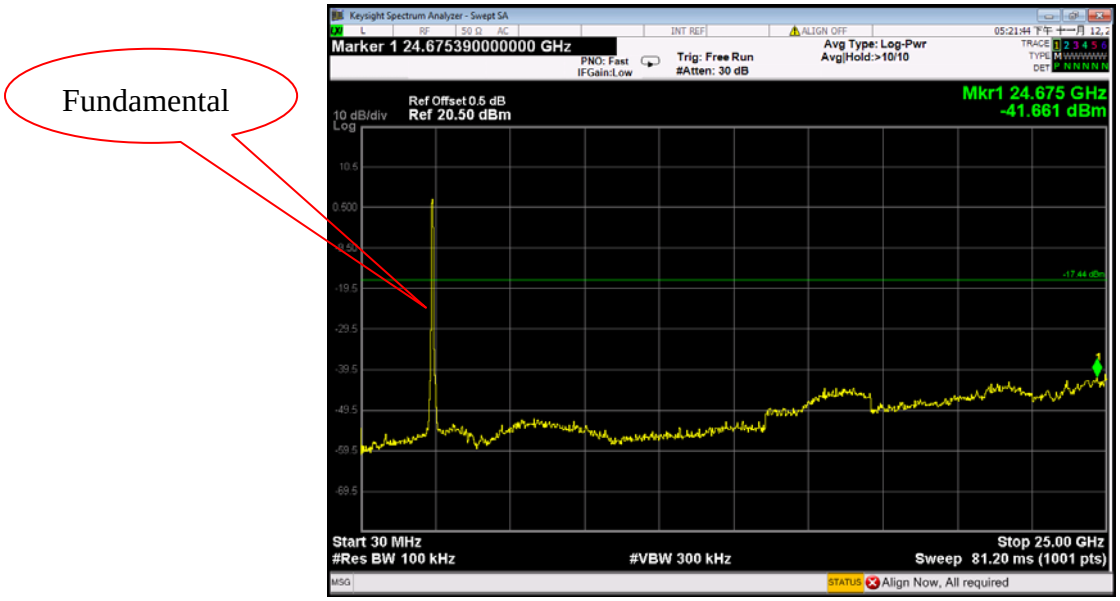


High Channel

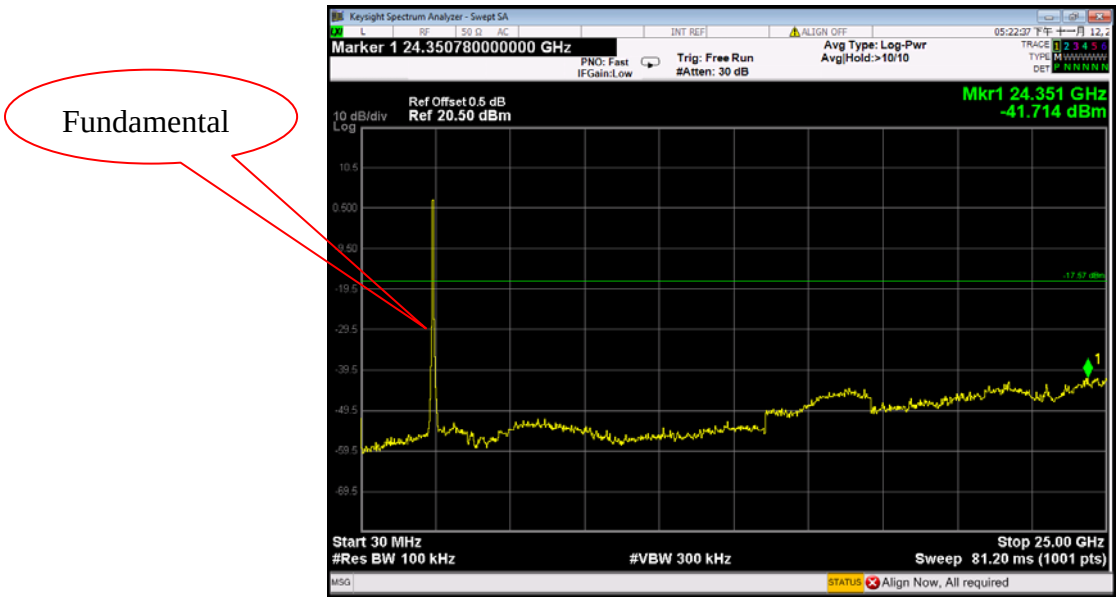


802.11n HT40

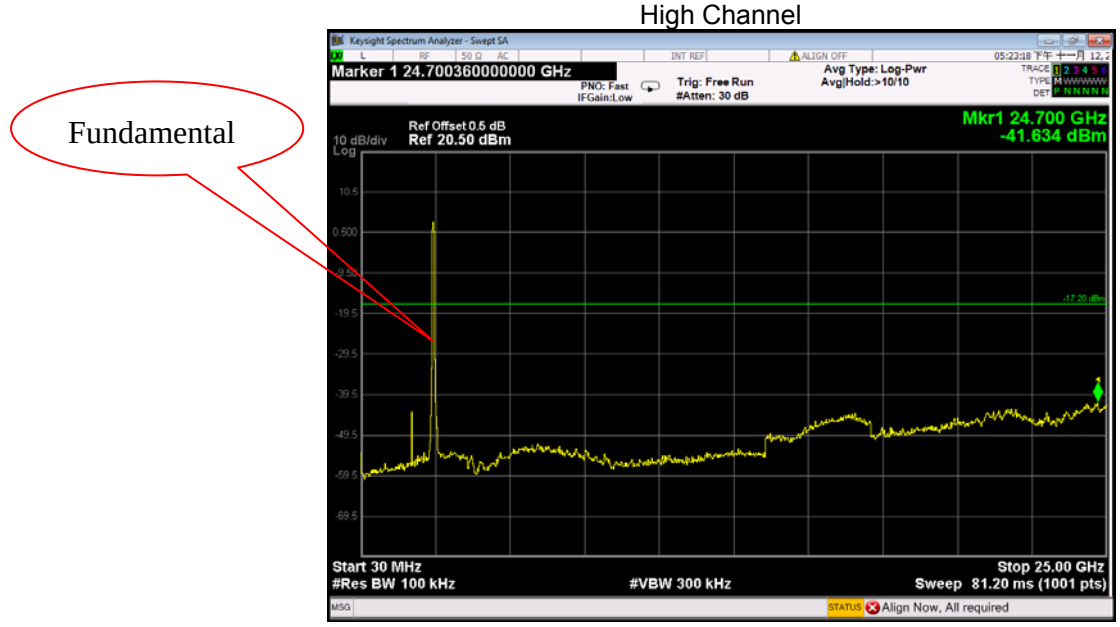
Low Channel



Middle Channel



High Channel



10 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

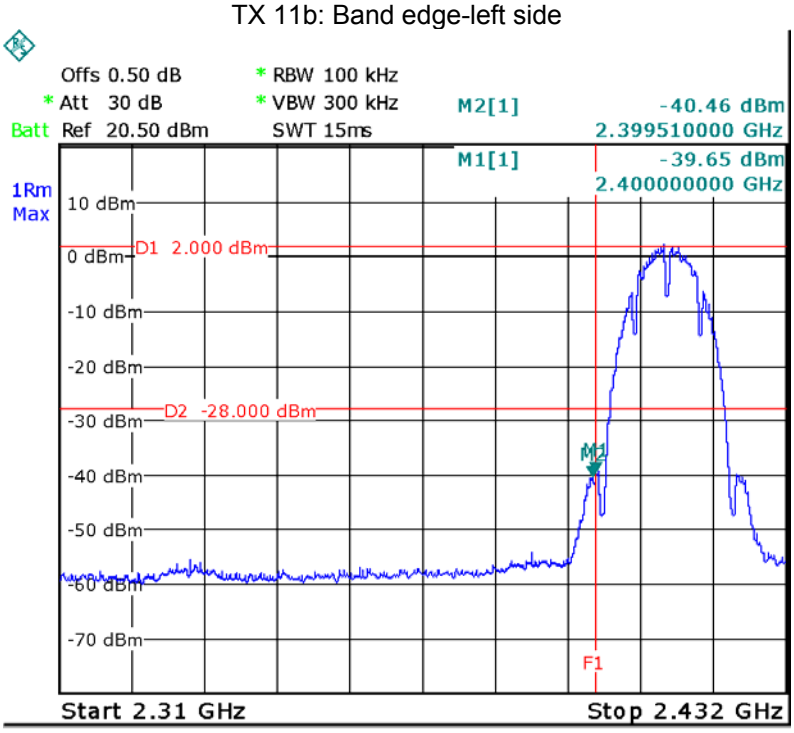
10.1 Test Produce

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.

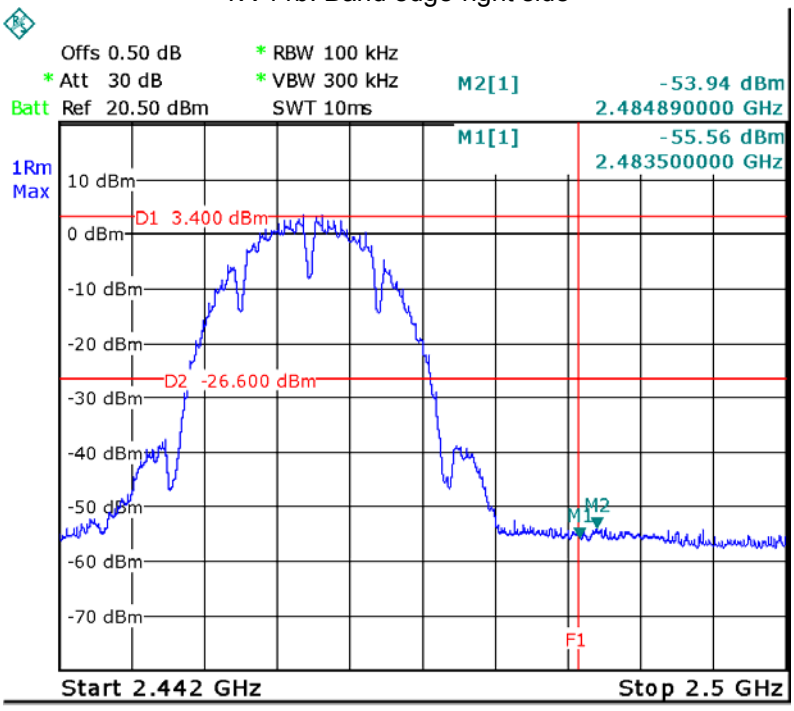
10.2 Test Result

Test result plots shown as follows:

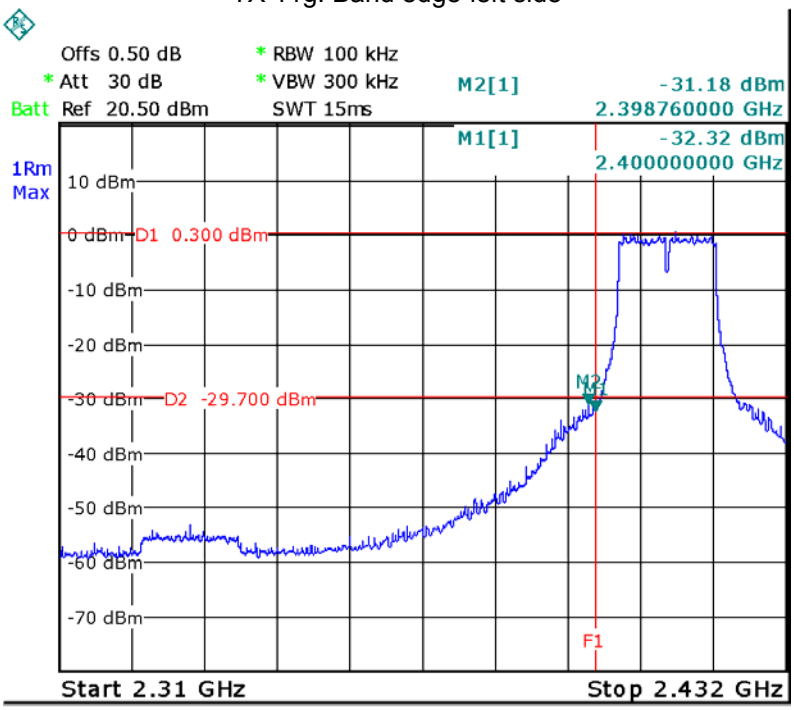
TX 11b: Band edge-left side



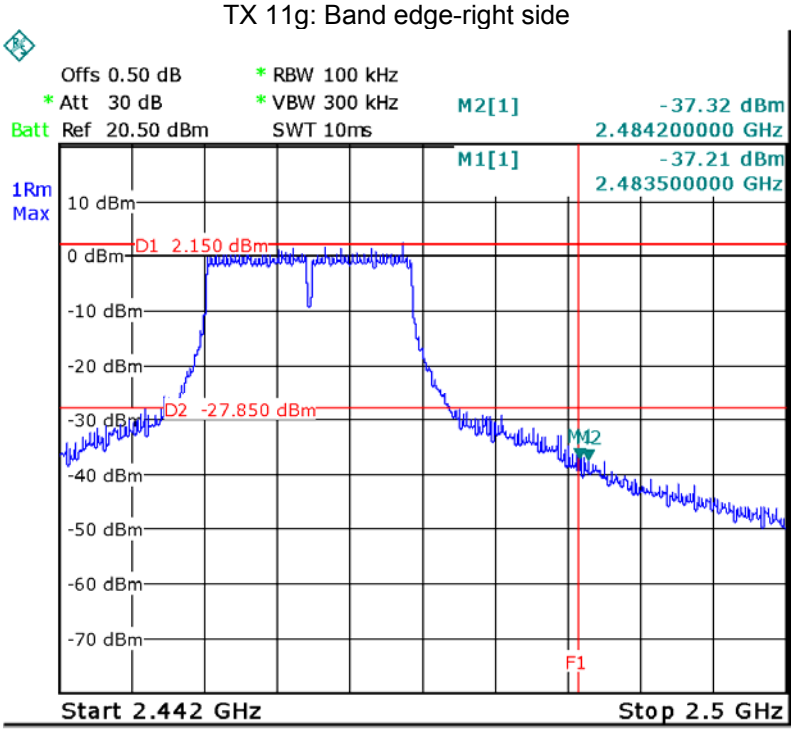
TX 11b: Band edge-right side



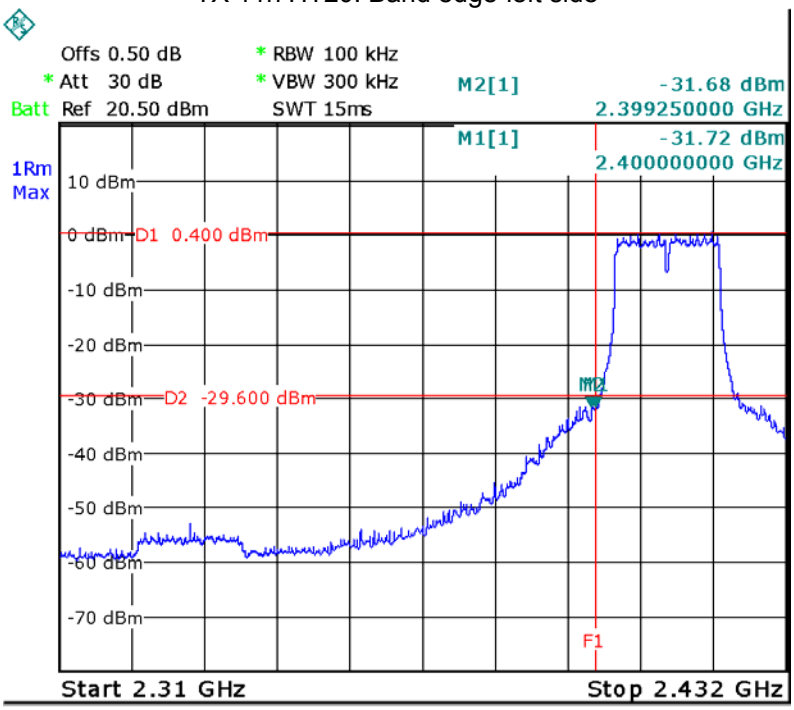
TX 11g: Band edge-left side



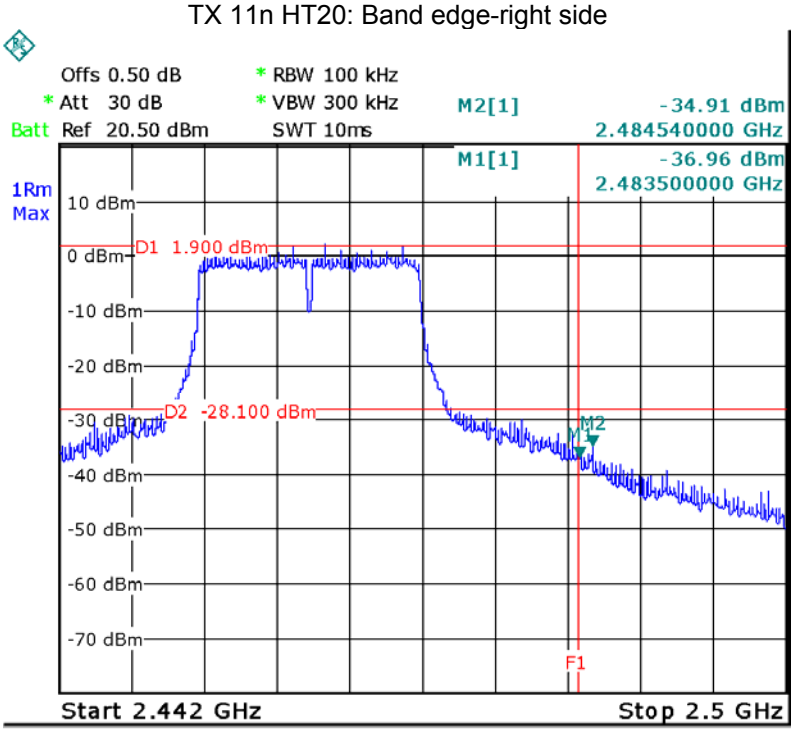
TX 11g: Band edge-right side



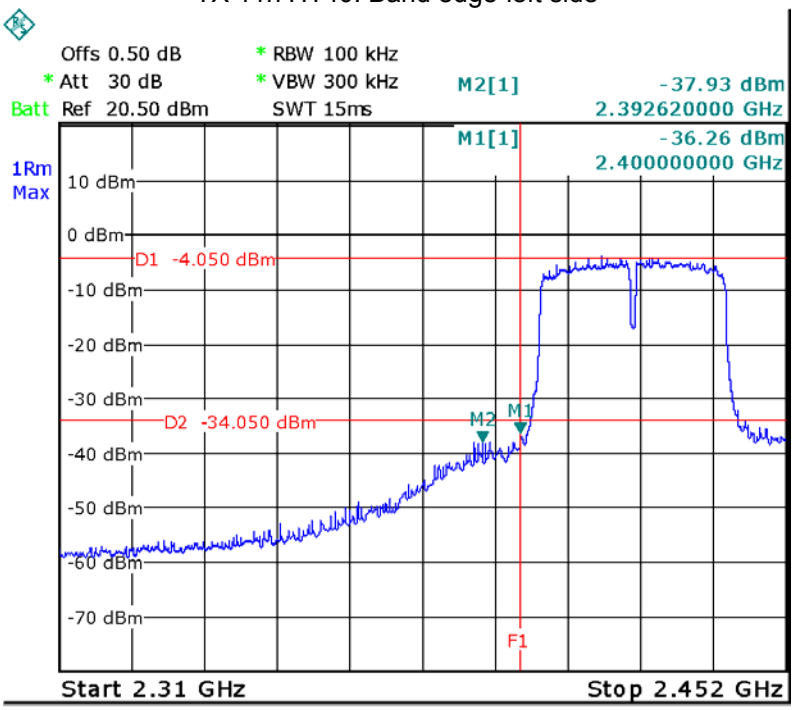
TX 11n HT20: Band edge-left side



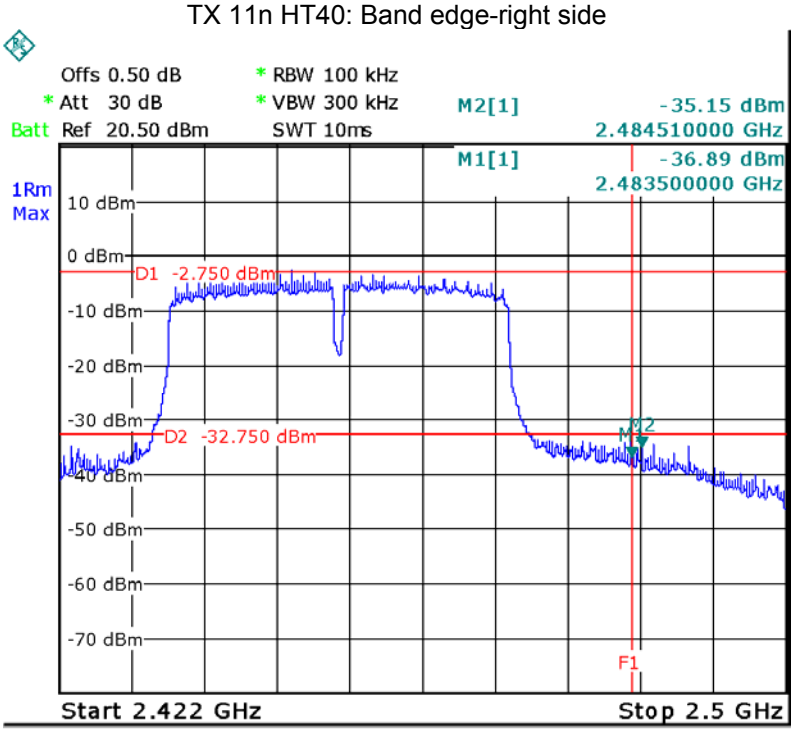
TX 11n HT20: Band edge-right side



TX 11n HT40: Band edge-left side



TX 11n HT40: Band edge-right side



11 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

11.1 Test Procedure:

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

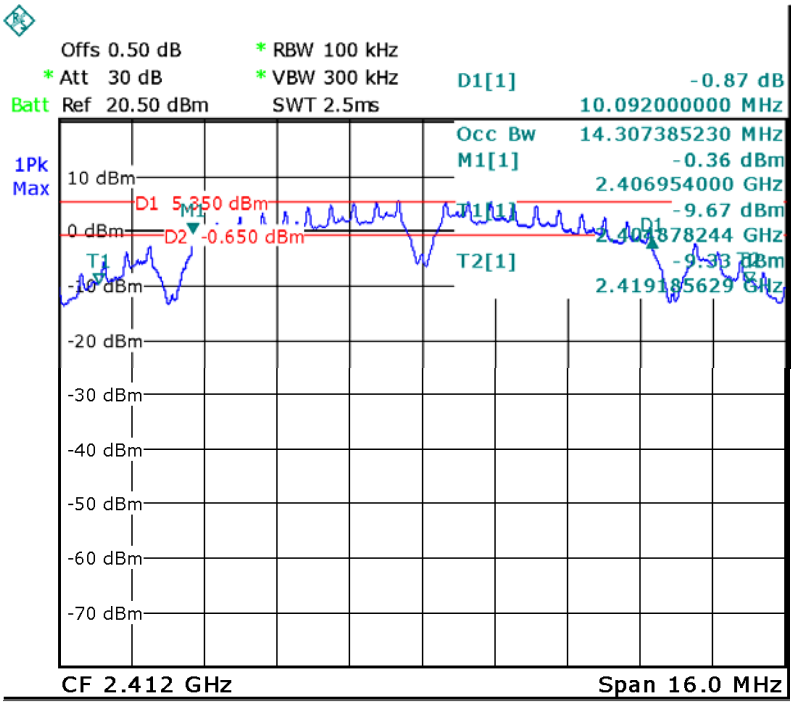
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

11.2 Test Result:

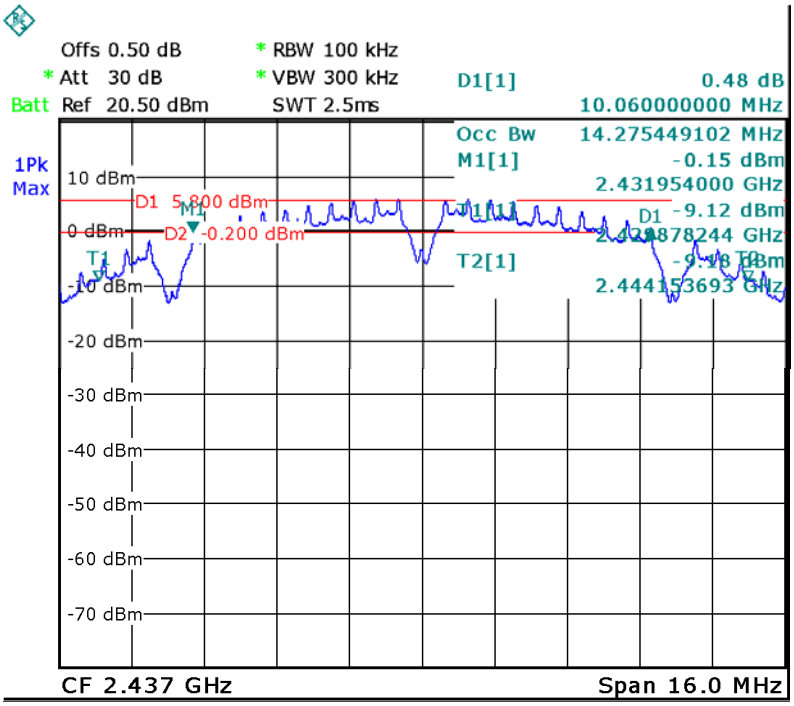
Operation mode	Test Channel	99% Bandwidth (MHz)	6dB Bandwidth (MHz)
TX 11b	Channel 1	14.307	10.092
	Channel 6	14.275	10.060
	Channel 11	14.275	10.060
TX 11g	Channel 1	16.467	16.417
	Channel 6	16.517	16.417
	Channel 11	16.517	16.417
TX 11n HT20	Channel 1	17.677	17.623
	Channel 6	17.677	17.623
	Channel 11	17.677	17.623
TX 11n HT40	Channel 3	35.784	35.570
	Channel 6	35.892	35.570
	Channel 9	35.784	35.570

Test result plot:

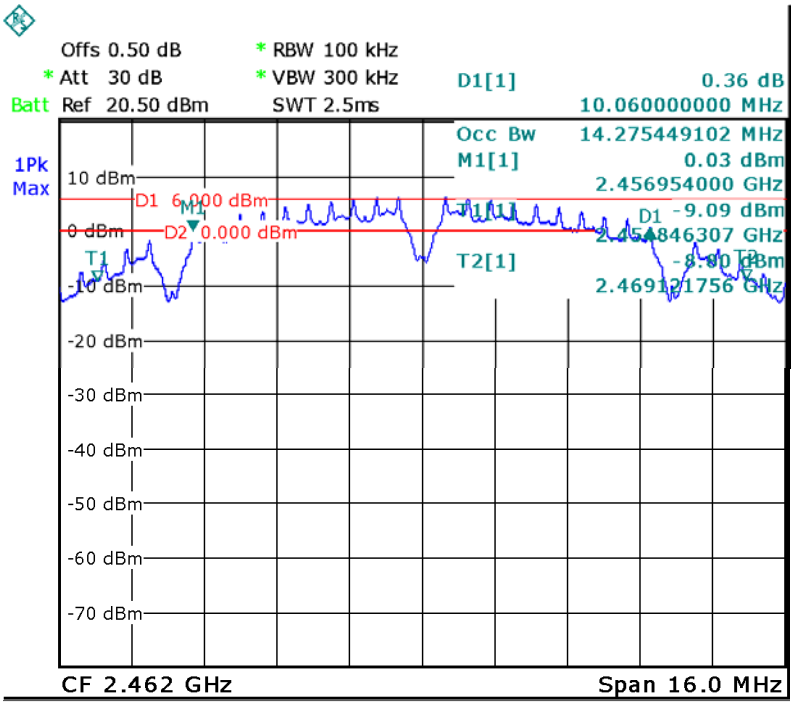
Mode: TX 11b channel 1



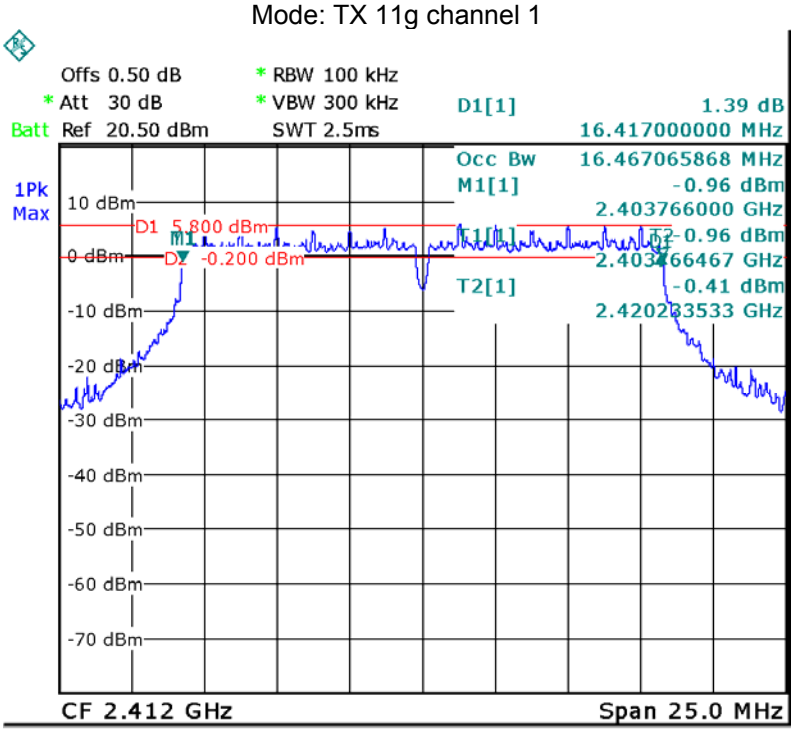
Mode: TX 11b channel 6



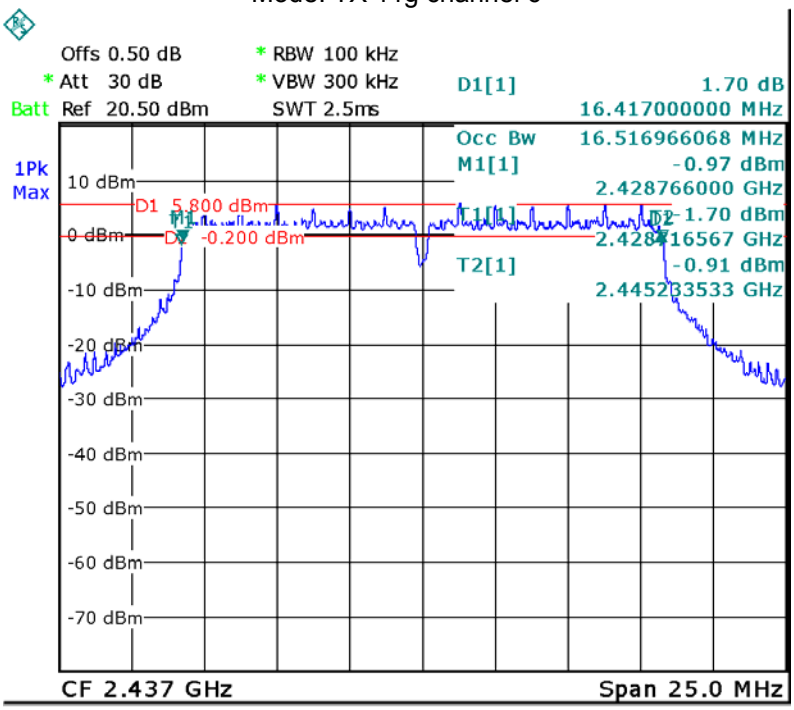
Mode: TX 11b channel 11



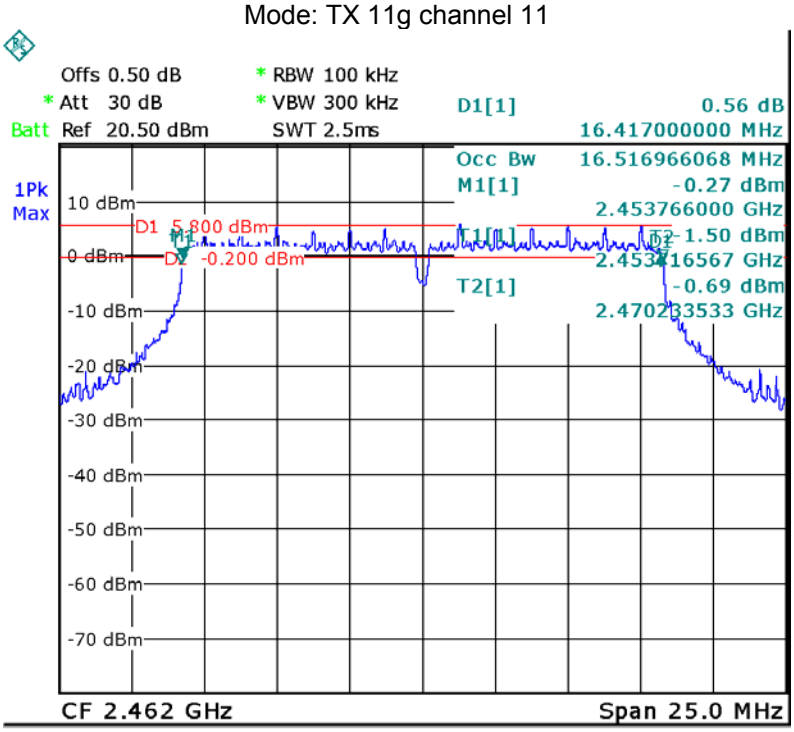
Mode: TX 11g channel 1



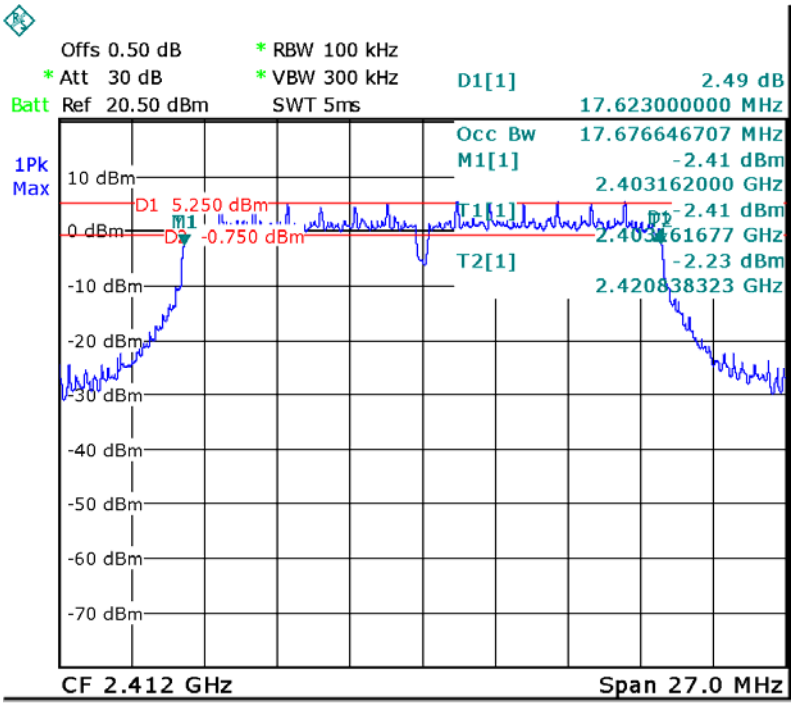
Mode: TX 11g channel 6



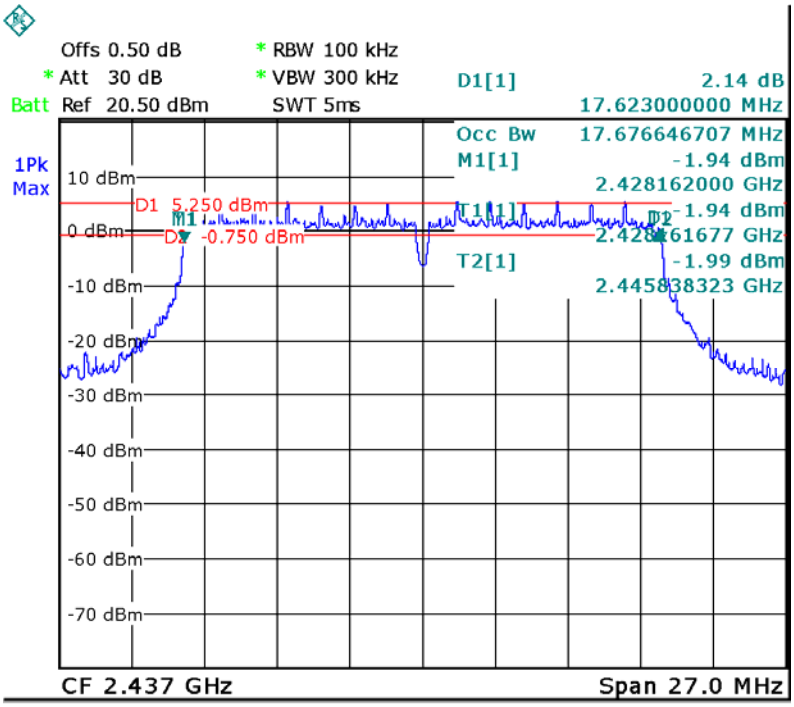
Mode: TX 11g channel 11



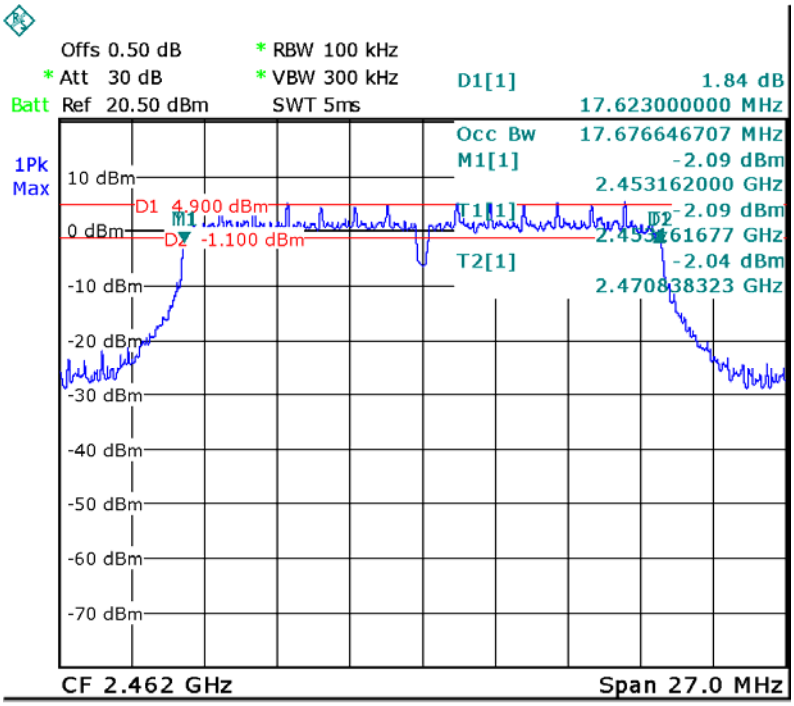
Mode: TX 11n HT20 channel 1



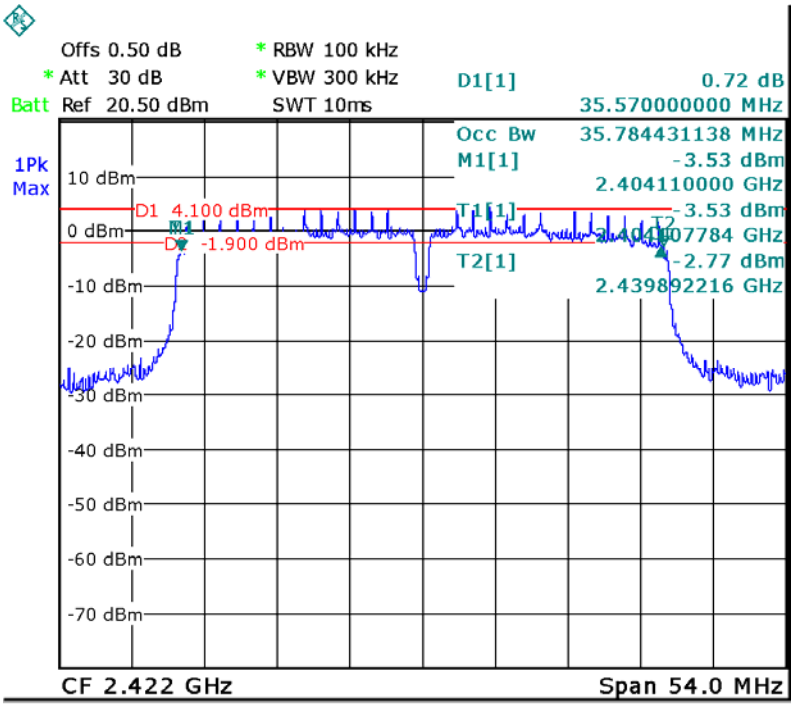
Mode: TX 11n HT20 channel 6



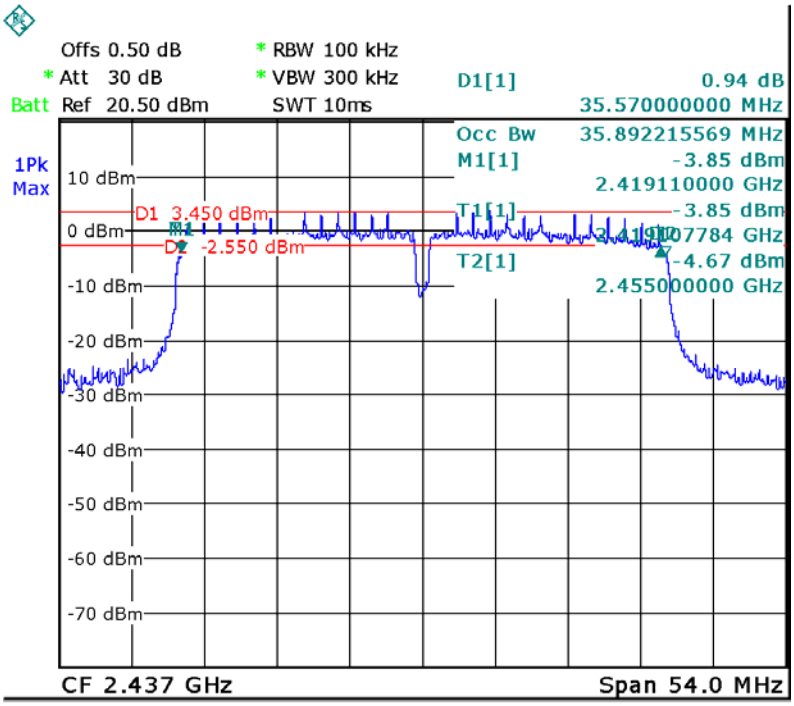
Mode: TX 11n HT20 channel 11



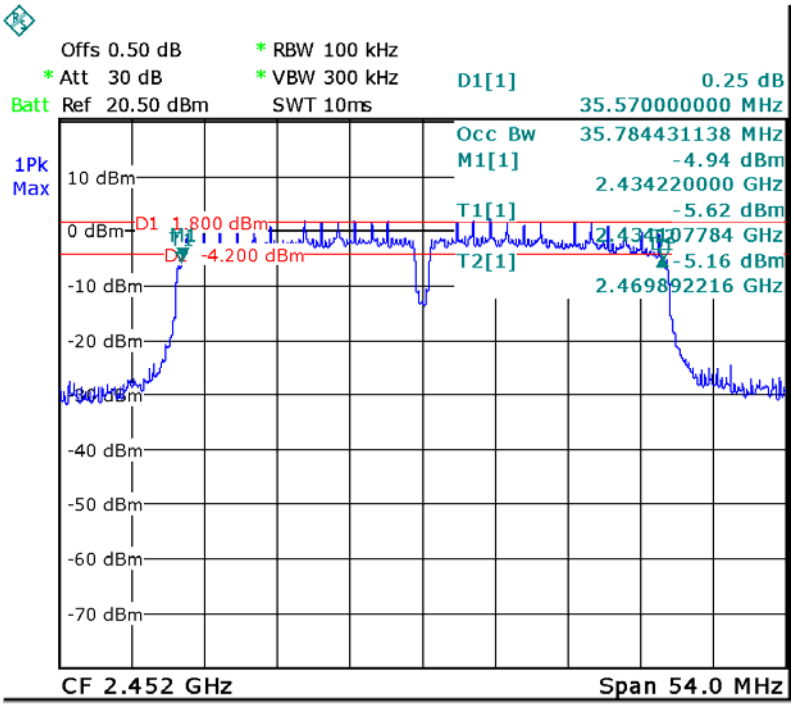
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6



Mode: TX 11n HT40 channel 9



12 Maximum Peak conducted 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

12.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018

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.

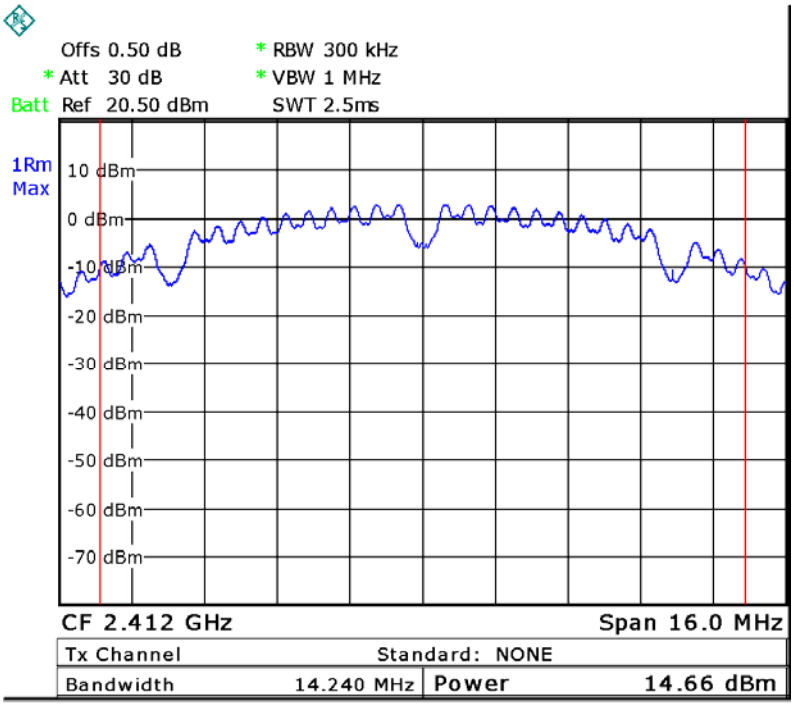
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the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

12.2 Test Result:

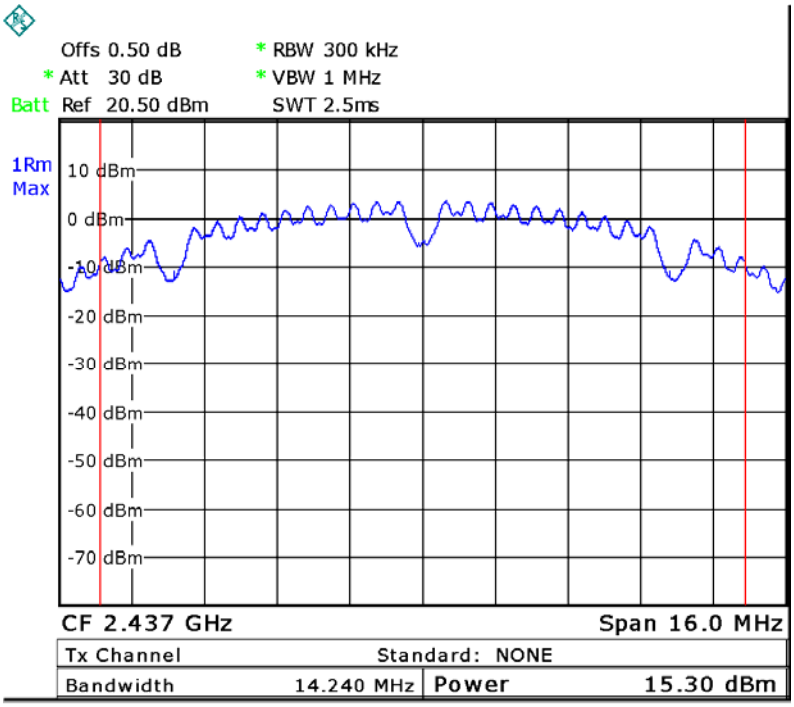
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	14.66	1W/30dBm
	Middle-2437	15.30	1W/30dBm
	High-2462	15.25	1W/30dBm
TX 11g	Low-2412	18.54	1W/30dBm
	Middle-2437	19.10	1W/30dBm
	High-2462	18.98	1W/30dBm
TX 11n HT20	Low-2412	20.39	1W/30dBm
	Middle-2437	20.96	1W/30dBm
	High-2462	20.51	1W/30dBm
TX 11n HT40	Low-2422	20.14	1W/30dBm
	Middle-2437	20.79	1W/30dBm
	High-2452	20.84	1W/30dBm

Test Plot

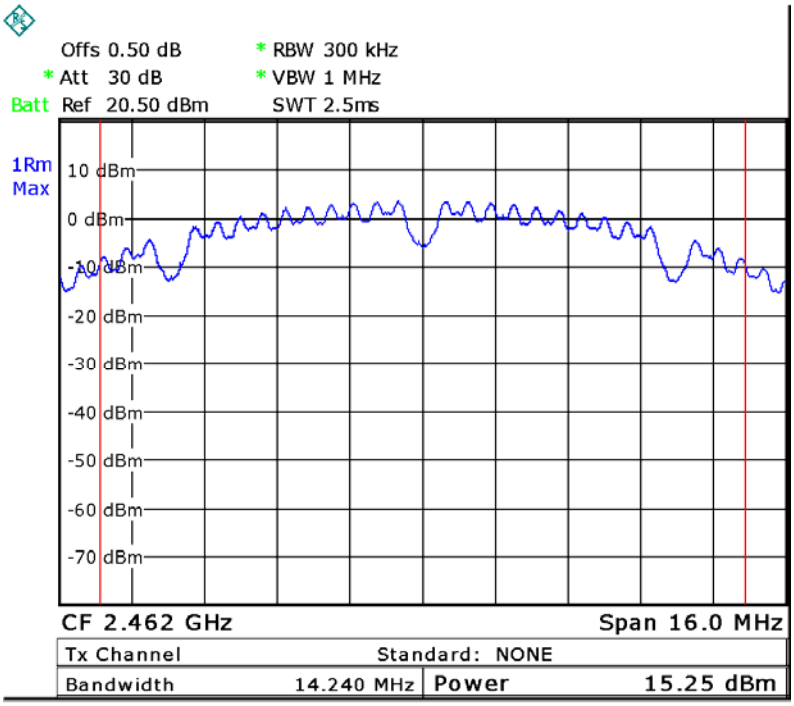
Mode: TX 11b channel 1



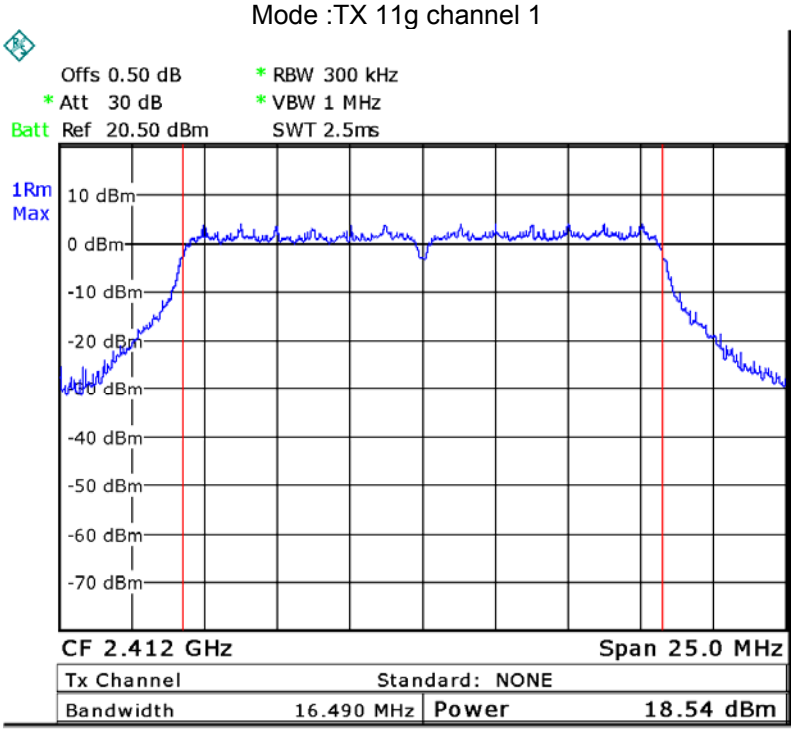
Mode: TX 11b channel 6



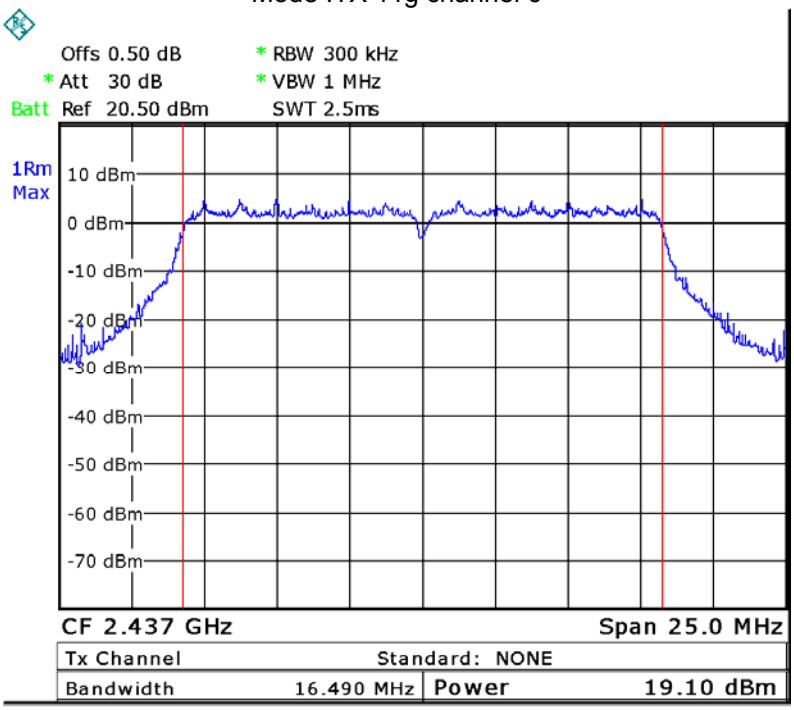
Mode: TX 11b channel 11



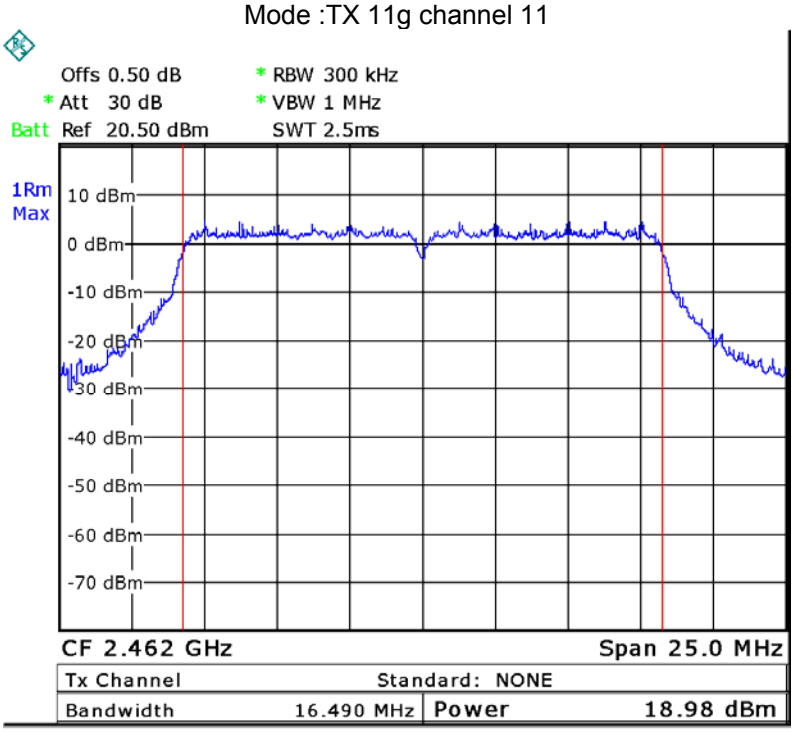
Mode :TX 11g channel 1



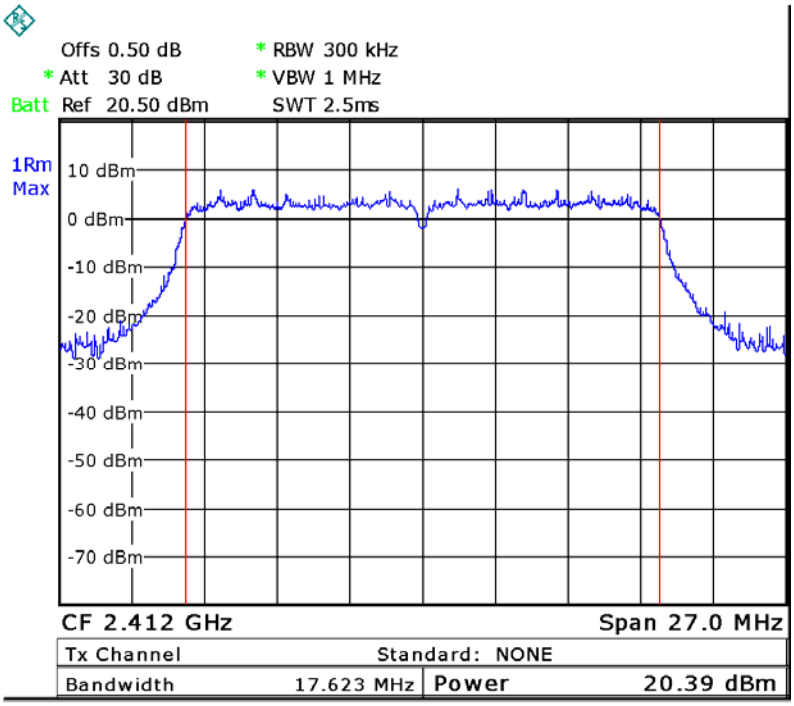
Mode :TX 11g channel 6



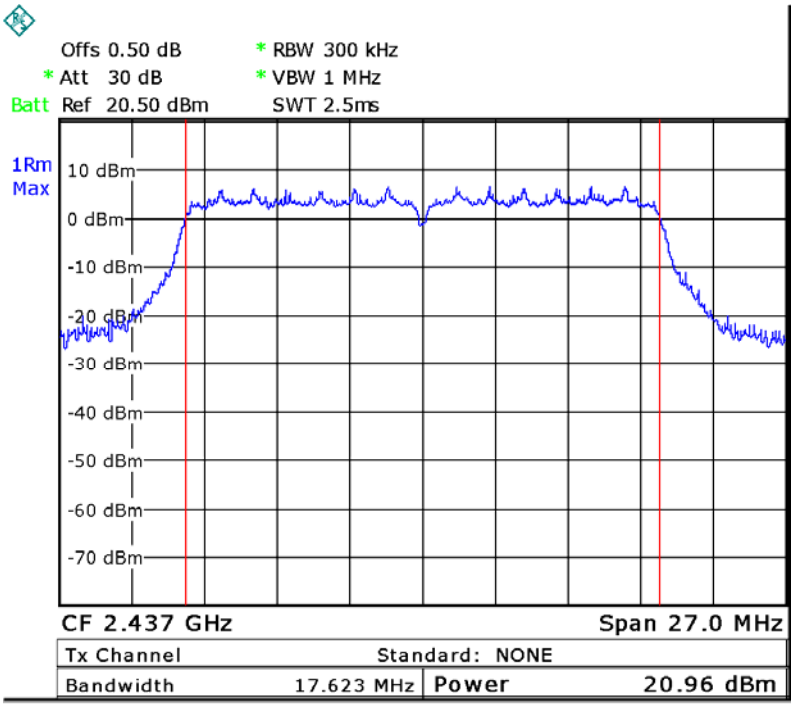
Mode :TX 11g channel 11



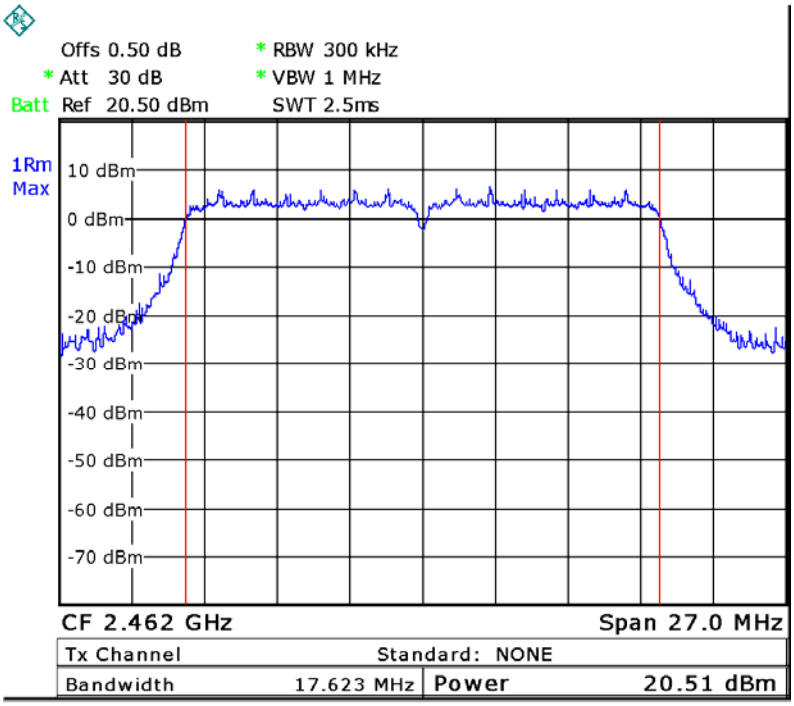
Mode: TX 11n HT20 channel 1



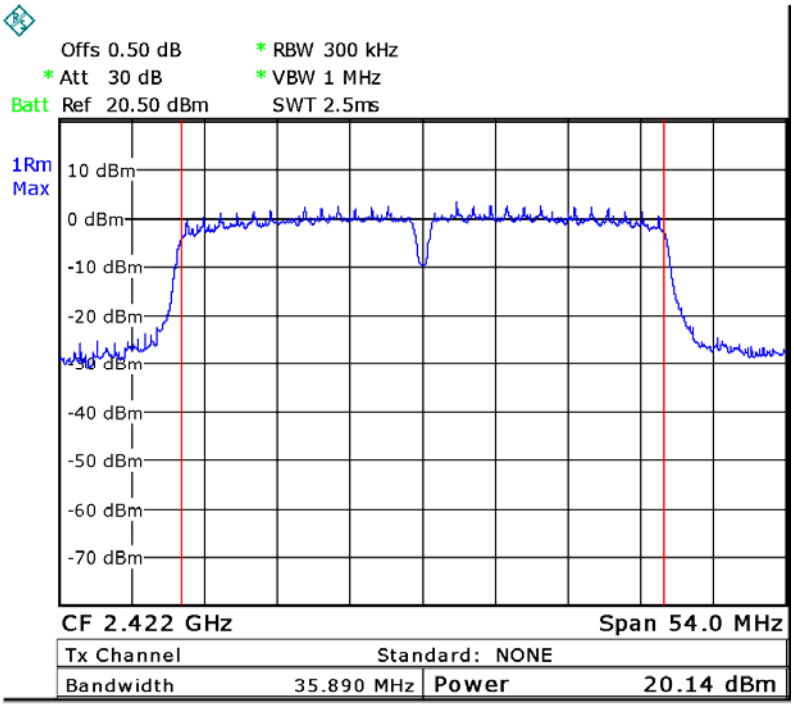
Mode: TX 11n HT20 channel 6



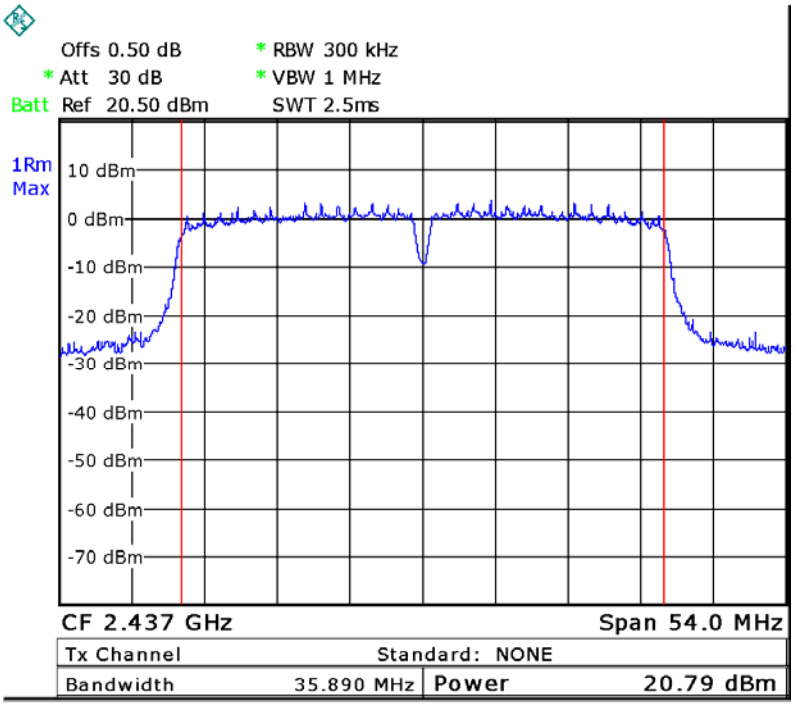
Mode: TX 11n HT20 channel 11



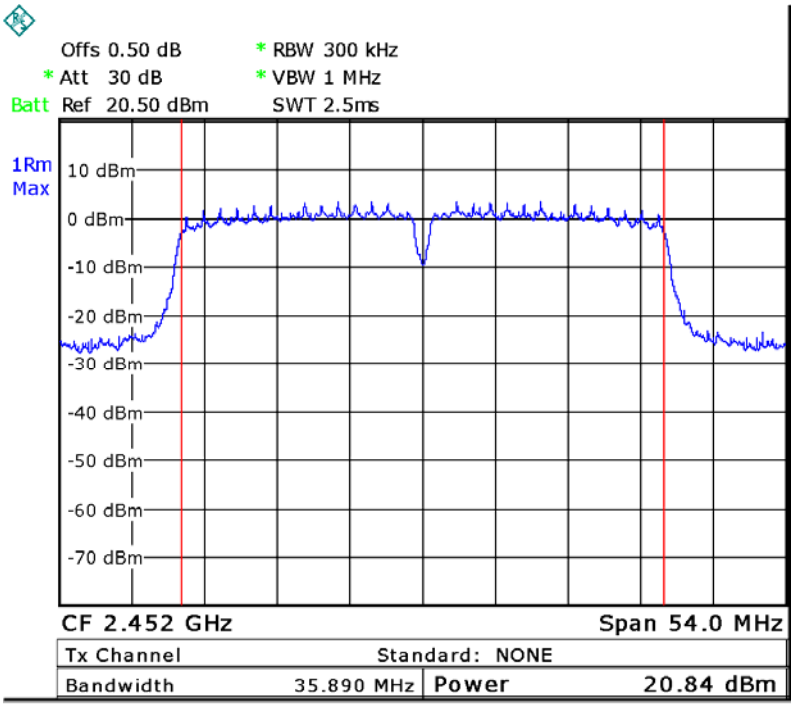
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6



Mode: TX 11n HT40 channel 9



13 Duty cycle

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	ANSI C63.10: 2013
Test Limit:	N/A
Test Result:	PASS
Remark:	EUT transmitting continuously

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 15.247 Meas Guidance v05 August 24, 2018 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.

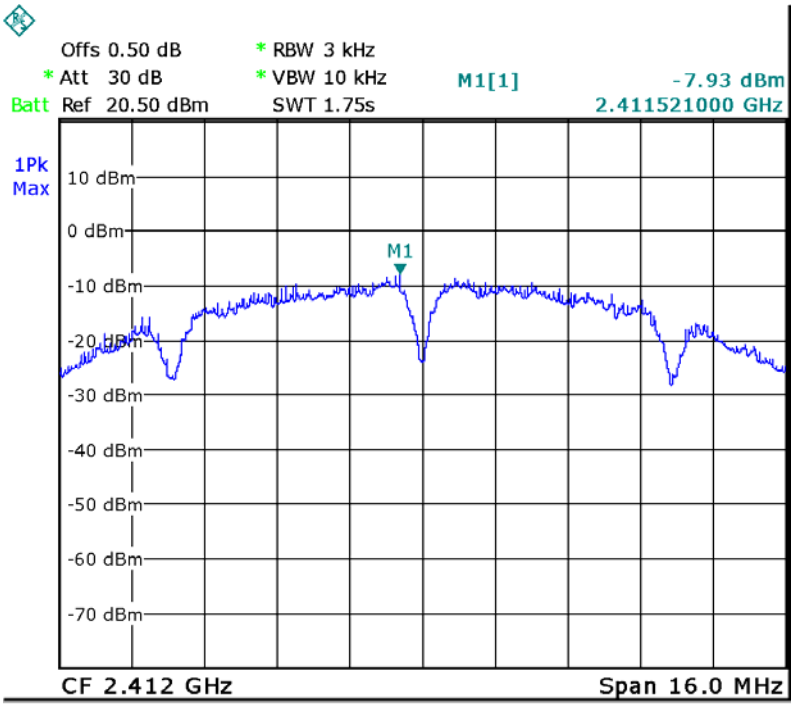
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

14.2 Test Result:

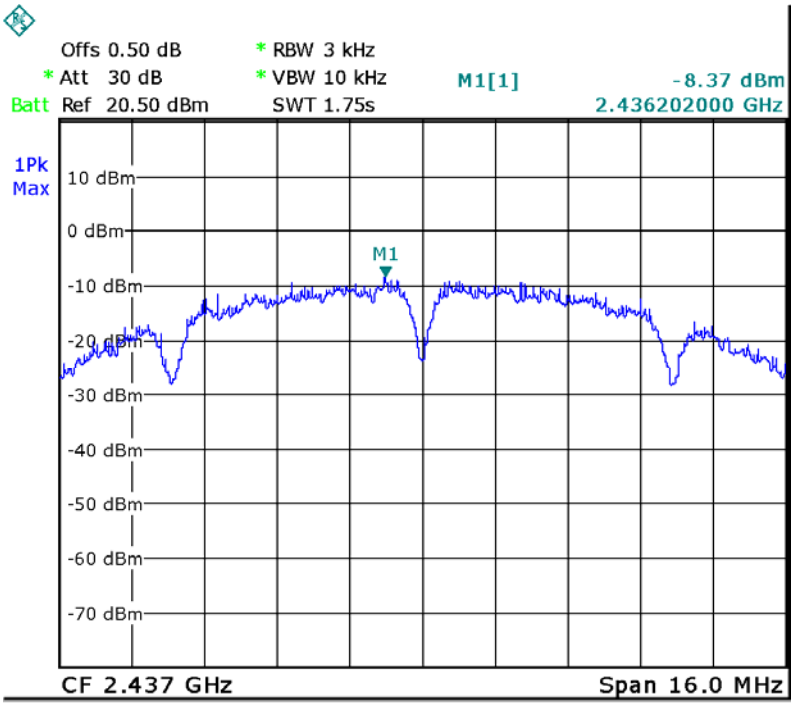
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-7.93	8dBm per 3kHz
	Middle-2437	-8.37	8dBm per 3kHz
	High-2462	-8.36	8dBm per 3kHz
TX 11g	Low-2412	-8.95	8dBm per 3kHz
	Middle-2437	-8.50	8dBm per 3kHz
	High-2462	-9.06	8dBm per 3kHz
TX 11n HT20	Low-2412	-8.73	8dBm per 3kHz
	Middle-2437	-8.90	8dBm per 3kHz
	High-2462	-8.20	8dBm per 3kHz
TX 11n HT40	Low-2422	-10.31	8dBm per 3kHz
	Middle-2437	-10.91	8dBm per 3kHz
	High-2452	-13.04	8dBm per 3kHz

Test Plot

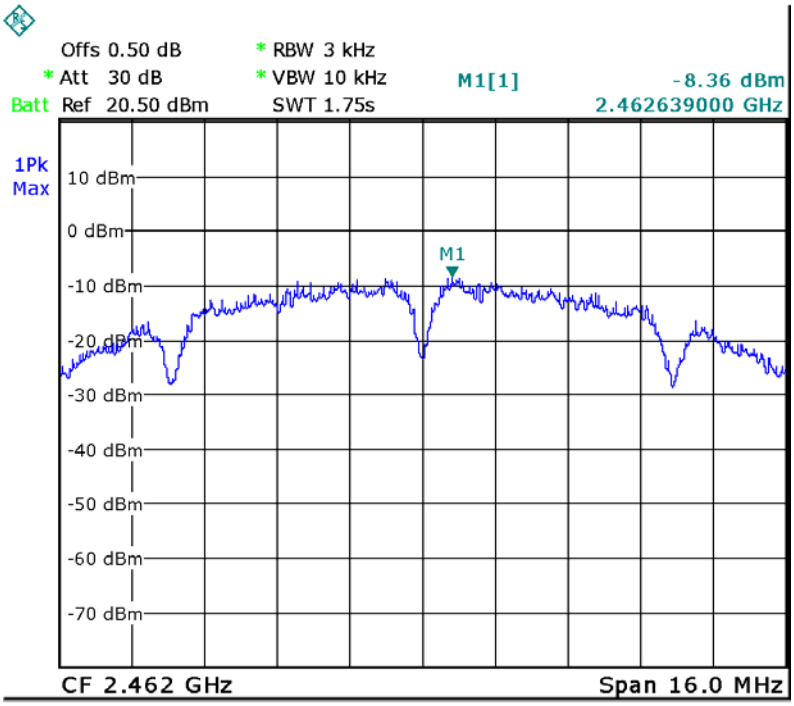
Mode: TX 11b channel 1



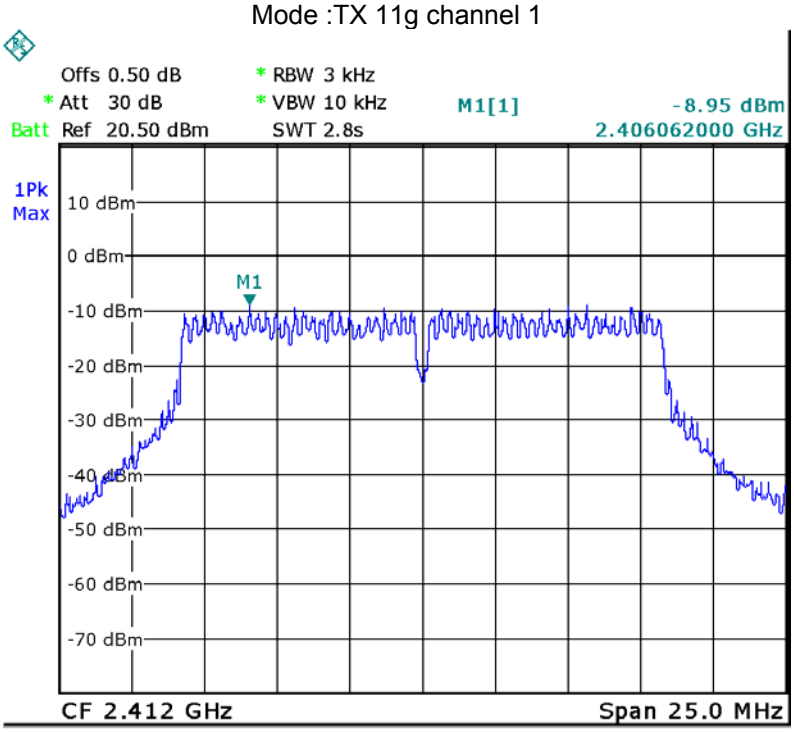
Mode: TX 11b channel 6



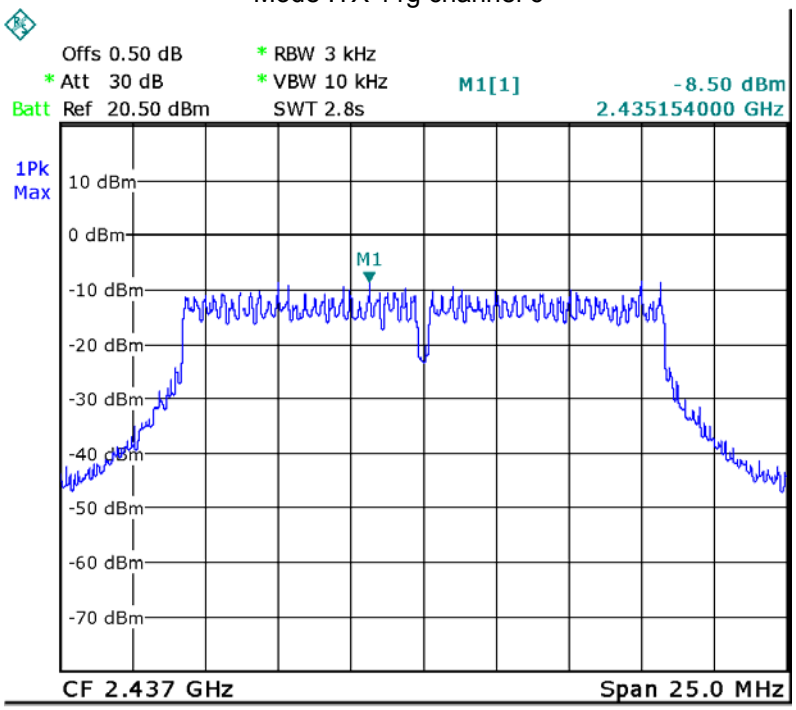
Mode: TX 11b channel 11



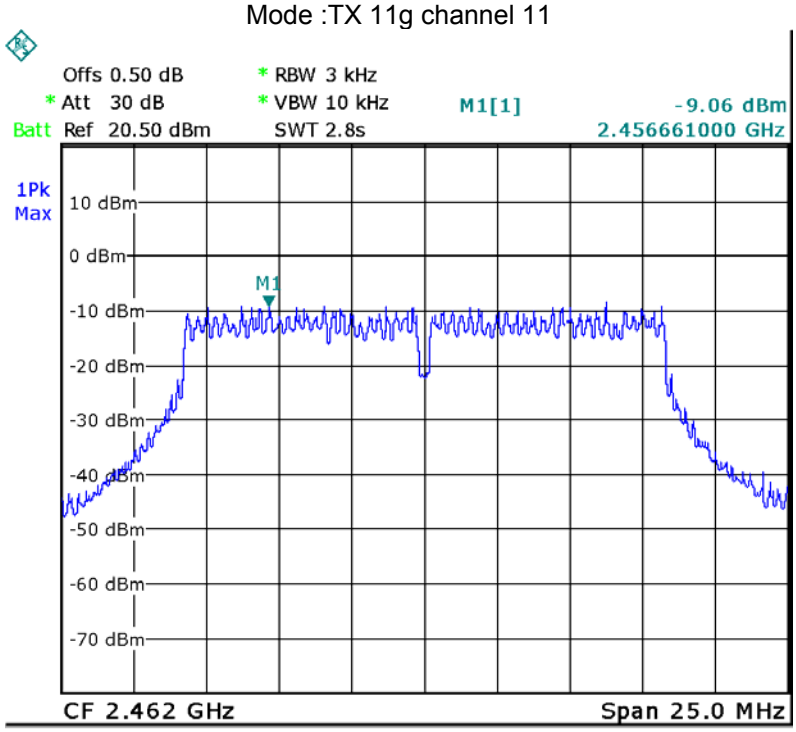
Mode :TX 11g channel 1



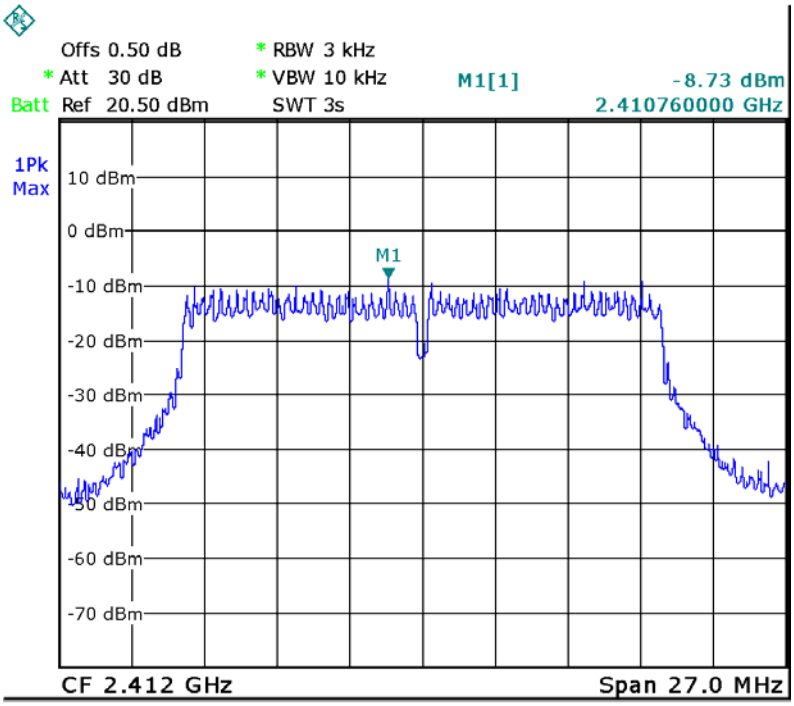
Mode :TX 11g channel 6



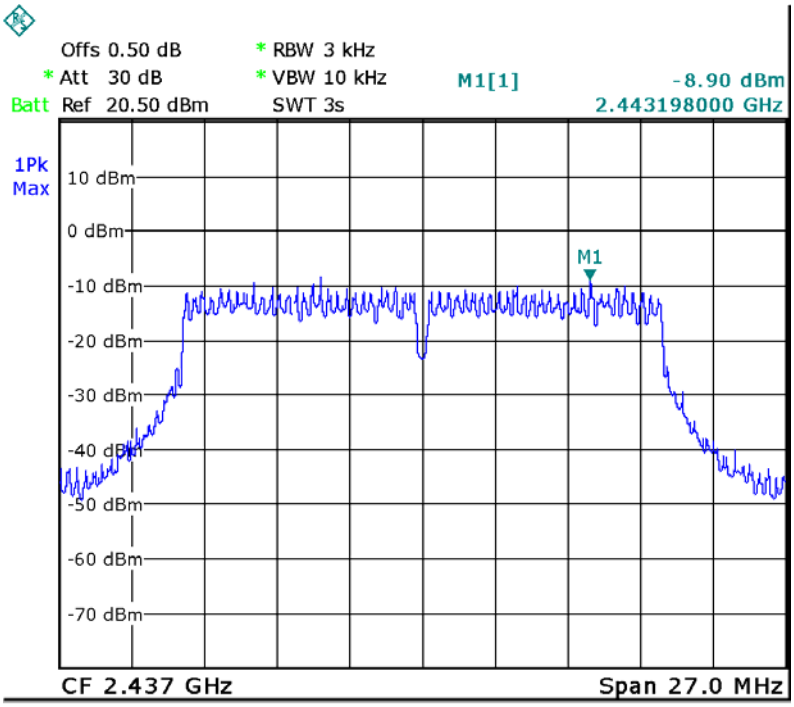
Mode :TX 11g channel 11



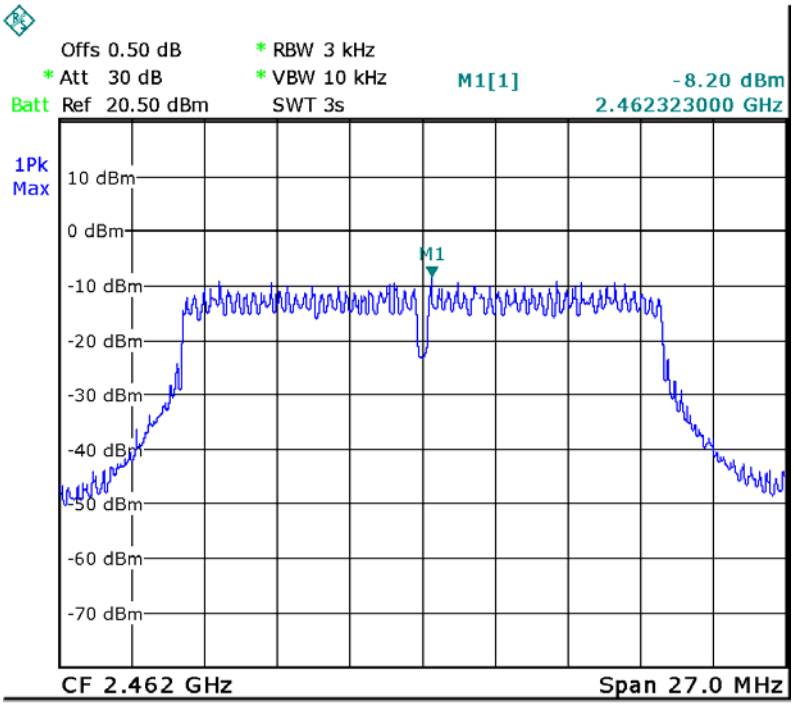
Mode: TX 11n HT20 channel 1



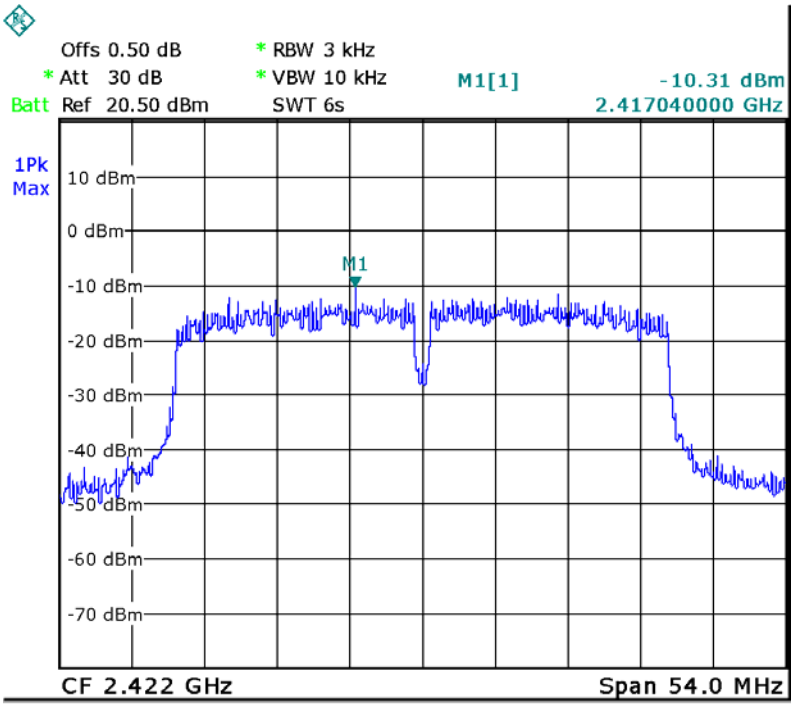
Mode: TX 11n HT20 channel 6



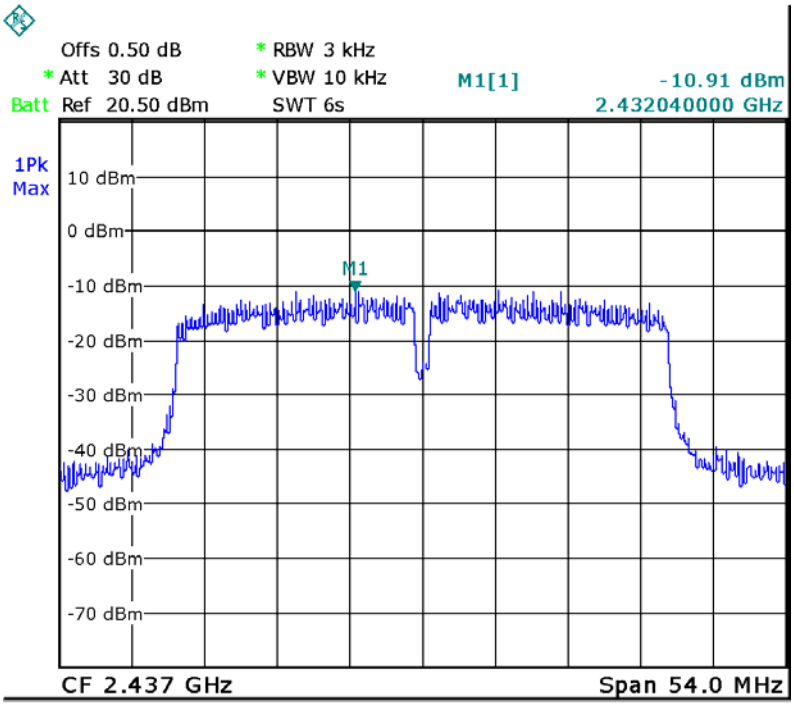
Mode: TX 11n HT20 channel 11



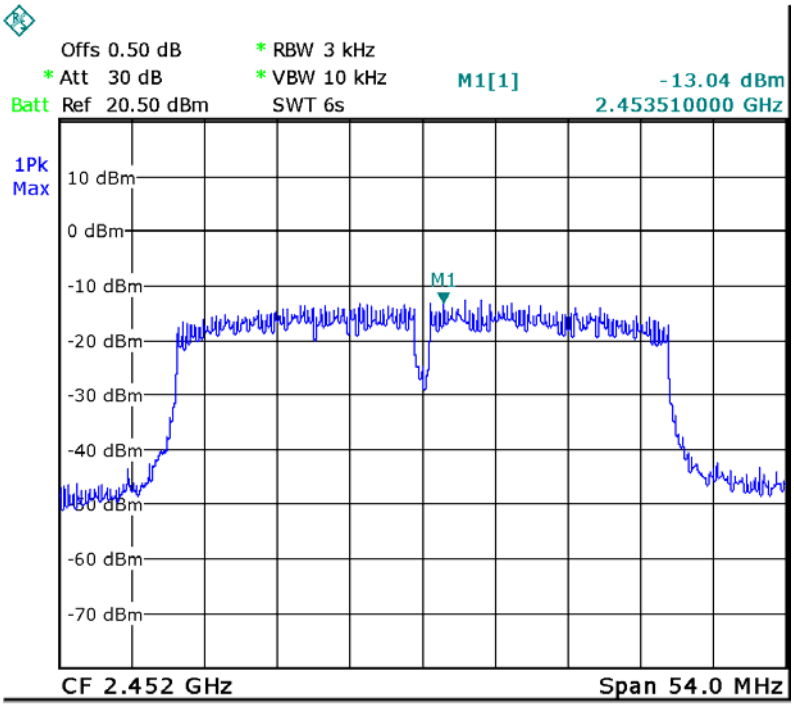
Mode: TX 11n HT40 channel 3



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.

16 Photographs of test setup and EUT.

Note: Please refer to appendix: WTS18S10126788W_Photo.

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