TEST REPORT

Reference No.	:	WTS16S1165060-3E
FCC ID	:	2AKHBF101
Applicant.....	:	Fantem Technologies (Shenzhen) Co., Ltd
Address.....	:	5th Floor, Yingtang Building, South 5th Road, HI-tech Park, Nanshan District, Shenzhen, Guangdong, China
Manufacturer	:	Fantem Technologies (Shenzhen) Co.,Ltd
Address.....	:	5th Floor, Yingtang Building, South 5th Road, HI-tech Park, Nanshan District, Shenzhen, Guangdong, China
Factory	:	Fantem Technologies (Shenzhen) Co., Ltd
Address.....	:	North, 3/F, Yitoa Technology Industrial Park, Baihua Yuan Rd., The Second Industrial Area, Guangming Sub-districtOffice, Guangming New District, Shenzhen, Guangdong, China
Product Name.....	:	Cube
Model No.	:	FT101-A
Brand.....	:	Fantem
Standards.....	:	FCC CFR47 Part 15.247:2016
Date of Receipt sample	:	Nov. 11, 2016
Date of Test	:	Nov. 11 – 30, 2016
Date of Issue.....	:	Dec. 23, 2016
Test Result.....	:	**Pass**
Note	:	This report is for Wi-Fi and Bluetooth LE Function

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 Services (Shenzhen) Co., Ltd.
Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China
Tel :+86-755-83551033
Fax:+86-755-83552400

Compiled by:

Zero Zhou / Test Engineer

Approved by:

Philo Zhong / Manager

2 Contents

Page

1 COVER PAGE 1
2 CONTENTS 2
3 REVISION HISTORY 3
4 GENERAL INFORMATION 4
4.1 GENERAL DESCRIPTION OF E.U.T. 4
4.2 DETAILS OF E.U.T. 4
4.3 CHANNEL LIST 5
4.4 TEST MODE 6
4.5 TEST FACILITY 7
5 EQUIPMENT USED DURING TEST 8
5.1 EQUIPMENTS LIST 8
5.2 MEASUREMENT UNCERTAINTY 9
5.3 TEST EQUIPMENT CALIBRATION 9
6 TEST SUMMARY 10
7 CONDUCTED EMISSION 11
7.1 E.U.T. OPERATION 11
7.2 EUT SETUP 11
7.3 MEASUREMENT DESCRIPTION 11
7.4 CONDUCTED EMISSION TEST RESULT 12
8 RADIATED EMISSIONS 16
8.1 EUT OPERATION 16
8.2 TEST SETUP 17
8.3 SPECTRUM ANALYZER SETUP 18
8.4 TEST PROCEDURE 19
8.5 CORRECTED AMPLITUDE & MARGIN CALCULATION 19
8.6 SUMMARY OF TEST RESULTS 20
9 CONDUCTED SPURIOUS EMISSIONS 35
9.1 TEST PROCEDURE 35
9.2 TEST RESULT 36
10 BAND EDGE MEASUREMENT 52
10.1 TEST PRODUCE 52
10.2 TEST RESULT 53
11 BANDWIDTH MEASUREMENT 58
11.1 TEST PROCEDURE: 58
11.2 TEST RESULT: 58
12 MAXIMUM PEAK OUTPUT POWER 67
12.1 TEST PROCEDURE: 67
12.2 TEST RESULT: 68
13 POWER SPECTRAL DENSITY 77
13.1 TEST PROCEDURE: 77
13.2 TEST RESULT: 77
14 ANTENNA REQUIREMENT 86
15 RF EXPOSURE 87
16 PHOTOGRAPHS OF TEST SETUP AND EUT 88

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS16S1165060-3E	Nov. 11, 2016	Nov. 12 – 30, 2016	Dec. 09, 2016	original	-	replaced
WTS16S1165060-3E	Nov. 11, 2016	Nov. 12 – 30, 2016	Dec. 23, 2016	revision1	updated test report	vaild

4 General Information

4.1 General Description of E.U.T.

Product Name	: Cube
Model No.	: FT101-A
Model Description	: N/A
Wi-Fi Specification	: 2.4G: 802.11b/g/n HT20/n HT40
Bluetooth Version	: Bluetooth v4.0 Containing Classic and LE mode
Z-wave	: Support
NFC	: Support, working on passive mode.
Hardware Version	: AA
Software Version	: 1.0.0.1

4.2 Details of E.U.T.

Operation Frequency	: Wi-Fi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422-2452MHz Bluetooth: 2402~2480MHz Z-wave: 908.40MHz,908.42MHz
Max. RF output power	:Wi-Fi(2.4G): 9.40dBm Bluetooth: 8.30dBm Z-wave: 99.87dBuV@3m
Type of Modulation	: Wi-Fi: CCK, OFDM Bluetooth: GFSK, Pi/4 DQPSK,8DPSK Z-wave: FSK NFC: ASK/2ASK
Antenna installation	: Wi-Fi/Bluetooth: internal permanent antenna Z-wave: internal permanent antenna NFC: Frame antenna
Antenna Gain	: Wi-Fi: 1.5dBi Bluetooth: 1.5dBi Z-wave: -3dBi
Technical Data	: DC 5V, 2A powered by adapter (Adapter Input: 100-240V~, 50-60Hz, 0.25A)
Adapter	: Manufacturer: ME TECHNOLOGY Co., LTD Model No.: G101U-050200B-1

4.3 Channel List

Wi-Fi

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	-

Bluetooth LE

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

4.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Wi-Fi 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
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

Table 2 Tests Carried Out Under FCC part 15.247

Bluetooth LE Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	BT BLE	1 Mbps	0/19/39	TX
Power Spectral Density	BT BLE	1 Mbps	0/19/39	TX
Bandwidth	BT BLE	1 Mbps	0/19/39	TX
Band Edge	BT BLE	1 Mbps	0/19/39	TX
Transmitter Spurious Emissions	BT BLE	1 Mbps	0/19/39	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 .

4.5 Test Facility

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

- **IC – Registration No.: 7760A**

  Waltek Services(Shenzhen) 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, 2015.

- **FCC Test Site 1#– Registration No.: 880581**

  Waltek Services(Shenzhen) 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 880581, April 29, 2014.

- **FCC Test Site 2#– Registration No.: 328995**

  Waltek Services(Shenzhen) 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 328995, December 3, 2014.

5 Equipment Used during Test

5.1 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	Sep.12,2016	Sep.11,2017
2.	LISN	R&S	ENV216	101215	Sep.12,2016	Sep.11,2017
3.	Cable	Top	TYPE16(3.5M)	-	Sep.12,2016	Sep.11,2017
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	Sep.12,2016	Sep.11,2017
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	Sep.12,2016	Sep.11,2017
3.	Limiter	York	MTS-IMP-136	261115-001-0024	Sep.12,2016	Sep.11,2017
4.	Cable	LARGE	RF300	-	Sep.12,2016	Sep.11,2017
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	Apr.29, 2016	Apr.28, 2017
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	Apr.09,2016	Apr.08,2017
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	Apr.09,2016	Apr.08,2017
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	Sep.12,2016	Sep.11,2017
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	Apr.09,2016	Apr.08,2017
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	Apr.09,2016	Apr.08,2017
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	Apr.13,2016	Apr.12,2017
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	Apr.13,2016	Apr.12,2017
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	Apr.13,2016	Apr.12,2017
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	Apr.09,2016	Apr.08,2017
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	Apr.13,2016	Apr.12,2017
4	Cable	HUBER+SUHNER	CBL2	525178	Apr.13,2016	Apr.12,2017

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	Sep.12,2016	Sep.11,2017
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	Sep.12,2016	Sep.11,2017
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	Sep.12,2016	Sep.11,2017

5.2 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)
Confidence interval：95%. Confidence factor:k=2	

5.3 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.

6 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.247(d) 15.205(a) 15.209(a)	C
Conducted Spurious Emissions	15.247(d)	C
Conducted Emissions	15.207(a)	C
Bandwidth	15.247(a)(2)	C
Maximum Peak Output Power	15.247(b)(3),(4)	C
Power Spectral Density	15.247(e)	C
Band Edge	15.247(d)	C
Antenna Requirement	15.203	C
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	C
Note: C=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

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

Class/Severity: Class B

Limit:

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	60
5 o 30	60	50

7.1 E.U.T. Operation

Operating Environment **:**

Temperature: 21.5 °C

Humidity: 51.9 % RH

Atmospheric Pressure: 101.2kPa

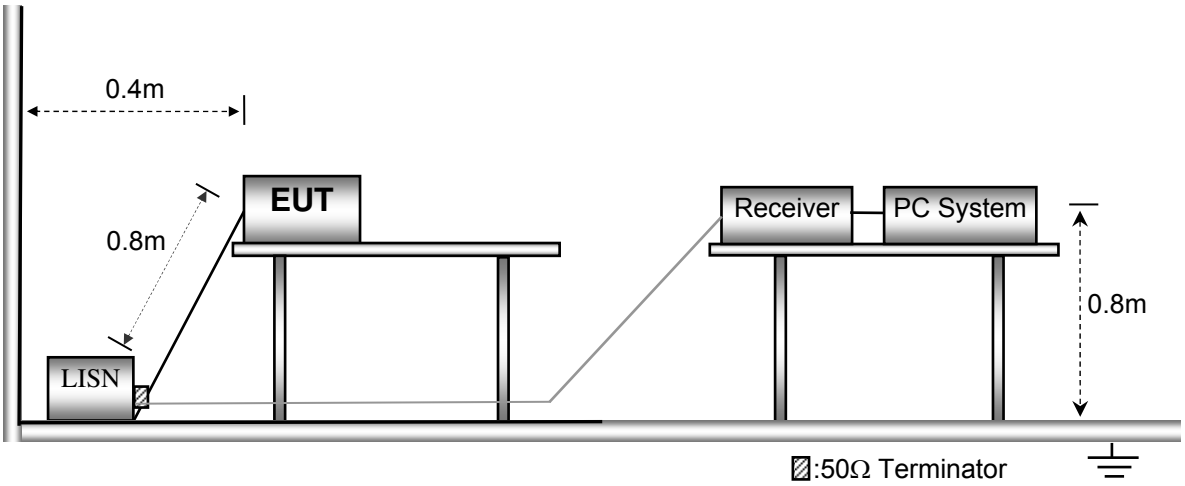
EUT Operation **:**

The test was performed inTransmitting mode, the worst data (Wi-Fi b mode low channel and Bluetooth LE 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.



7.3 Measurement Description

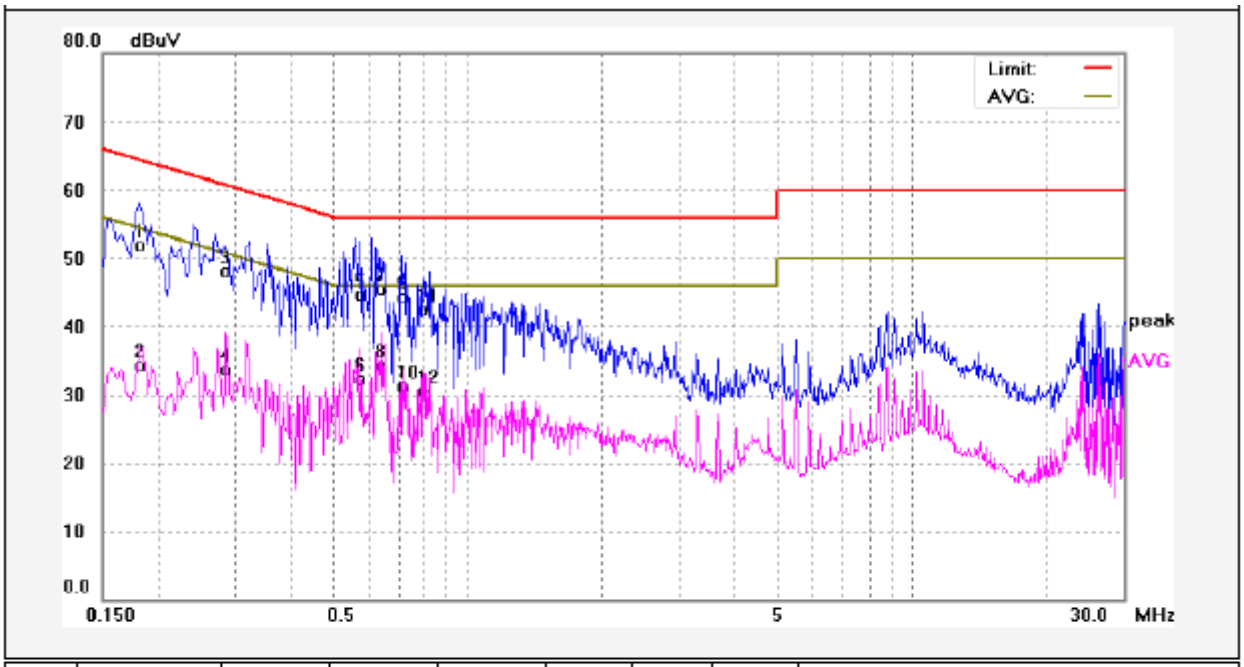
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

An initial pre-scan was performed on the live and neutral lines.

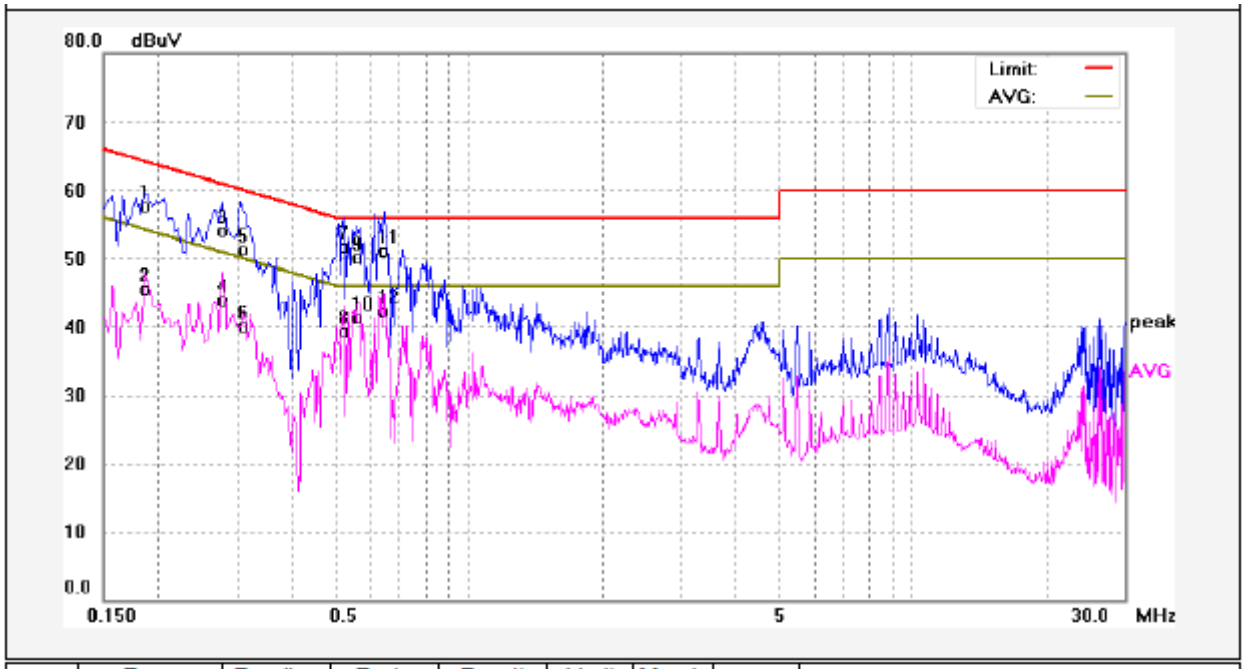
Worst Mode: Wi-Fi mode

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1819	42.09	9.75	51.84	64.39	-12.55	QP	
2	0.1819	24.58	9.75	34.33	54.39	-20.06	AVG	
3	0.2860	38.39	9.75	48.14	60.64	-12.50	QP	
4	0.2860	23.91	9.75	33.66	50.64	-16.98	AVG	
5	0.5740	34.97	9.76	44.73	56.00	-11.27	QP	
6	0.5740	22.48	9.76	32.24	46.00	-13.76	AVG	
7	0.6380	35.78	9.76	45.54	56.00	-10.46	QP	
8	0.6380	24.62	9.76	34.38	46.00	-11.62	AVG	
9	0.7140	34.62	9.77	44.39	56.00	-11.61	QP	
10	0.7140	21.61	9.77	31.38	46.00	-14.62	AVG	
11	0.7940	32.73	9.79	42.52	56.00	-13.48	QP	
12	0.7940	20.64	9.79	30.43	46.00	-15.57	AVG	

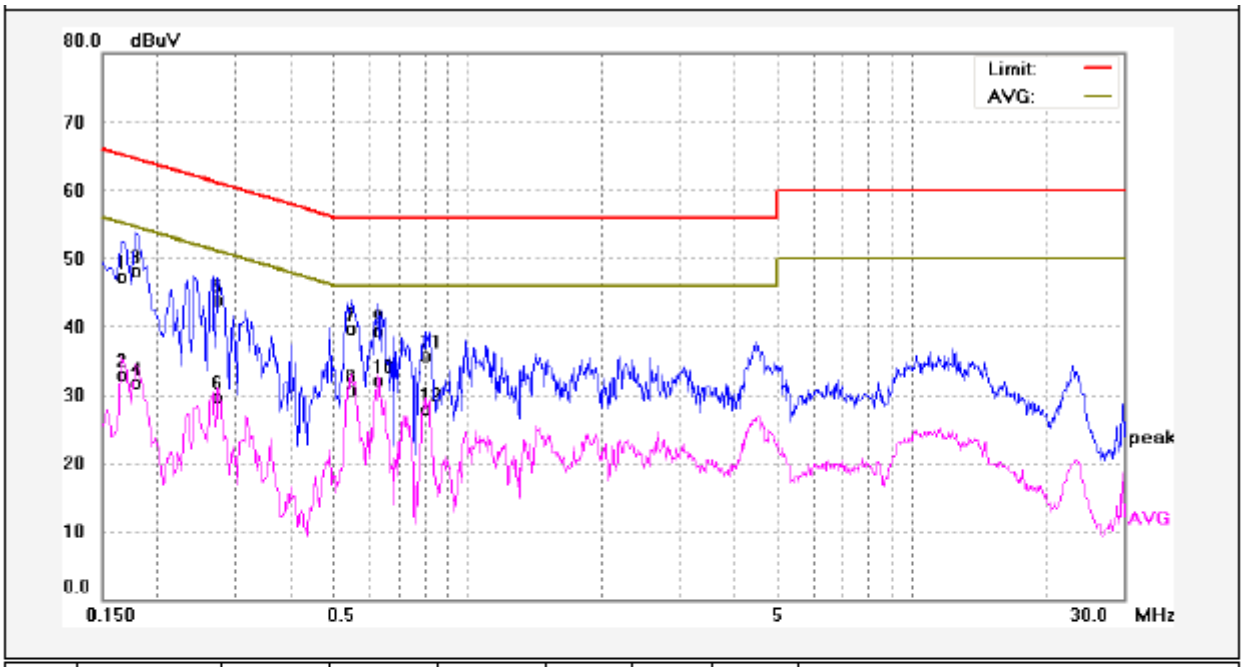
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1860	47.90	9.75	57.65	64.21	-6.56	QP	
2	0.1860	35.75	9.75	45.50	54.21	-8.71	AVG	
3	0.2779	44.45	9.75	54.20	60.88	-6.68	QP	
4	0.2779	34.23	9.75	43.98	50.88	-6.90	AVG	
5	0.3060	41.55	9.75	51.30	60.08	-8.78	QP	
6	0.3060	30.31	9.75	40.06	50.08	-10.02	AVG	
7	0.5220	41.96	9.76	51.72	56.00	-4.28	QP	
8	0.5220	29.59	9.76	39.35	46.00	-6.65	AVG	
9	0.5660	40.41	9.76	50.17	56.00	-5.83	QP	
10	0.5660	31.50	9.76	41.26	46.00	-4.74	AVG	
11	0.6419	41.35	9.76	51.11	56.00	-4.89	QP	
12	0.6419	32.47	9.76	42.23	46.00	-3.77	AVG	

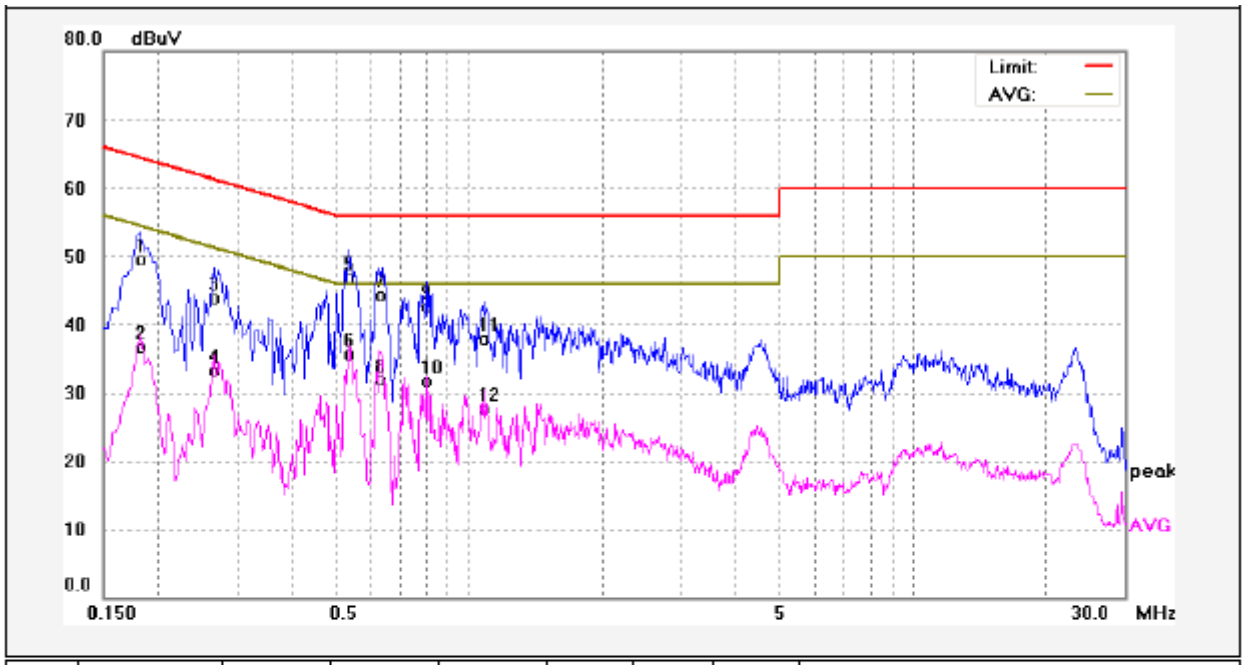
Worst Mode: Bluetooth LE mode

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1660	37.57	9.74	47.31	65.15	-17.84	QP	
2	0.1660	23.09	9.74	32.83	55.15	-22.32	AVG	
3	0.1780	38.29	9.75	48.04	64.57	-16.53	QP	
4	0.1780	21.99	9.75	31.74	54.57	-22.83	AVG	
5	0.2740	34.13	9.74	43.87	60.99	-17.12	QP	
6	0.2740	19.96	9.74	29.70	50.99	-21.29	AVG	
7	0.5460	29.86	9.76	39.62	56.00	-16.38	QP	
8	0.5460	21.01	9.76	30.77	46.00	-15.23	AVG	
9	0.6300	29.54	9.76	39.30	56.00	-16.70	QP	
10	0.6300	22.25	9.76	32.01	46.00	-13.99	AVG	
11	0.8020	25.91	9.79	35.70	56.00	-20.30	QP	
12	0.8020	18.05	9.79	27.84	46.00	-18.16	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1819	39.66	9.75	49.41	64.39	-14.98	QP	
2	0.1819	26.87	9.75	36.62	54.39	-17.77	AVG	
3	0.2660	34.20	9.74	43.94	61.24	-17.30	QP	
4	0.2660	23.53	9.74	33.27	51.24	-17.97	AVG	
5	0.5380	37.05	9.76	46.81	56.00	-9.19	QP	
6	0.5380	26.02	9.76	35.78	46.00	-10.22	AVG	
7	0.6419	34.52	9.76	44.28	56.00	-11.72	QP	
8	0.6419	22.08	9.76	31.84	46.00	-14.16	AVG	
9	0.8059	32.83	9.79	42.62	56.00	-13.38	QP	
10	0.8059	21.86	9.79	31.65	46.00	-14.35	AVG	
11	1.0780	28.14	9.81	37.95	56.00	-18.05	QP	
12	1.0780	17.88	9.81	27.69	46.00	-18.31	AVG	

8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: 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

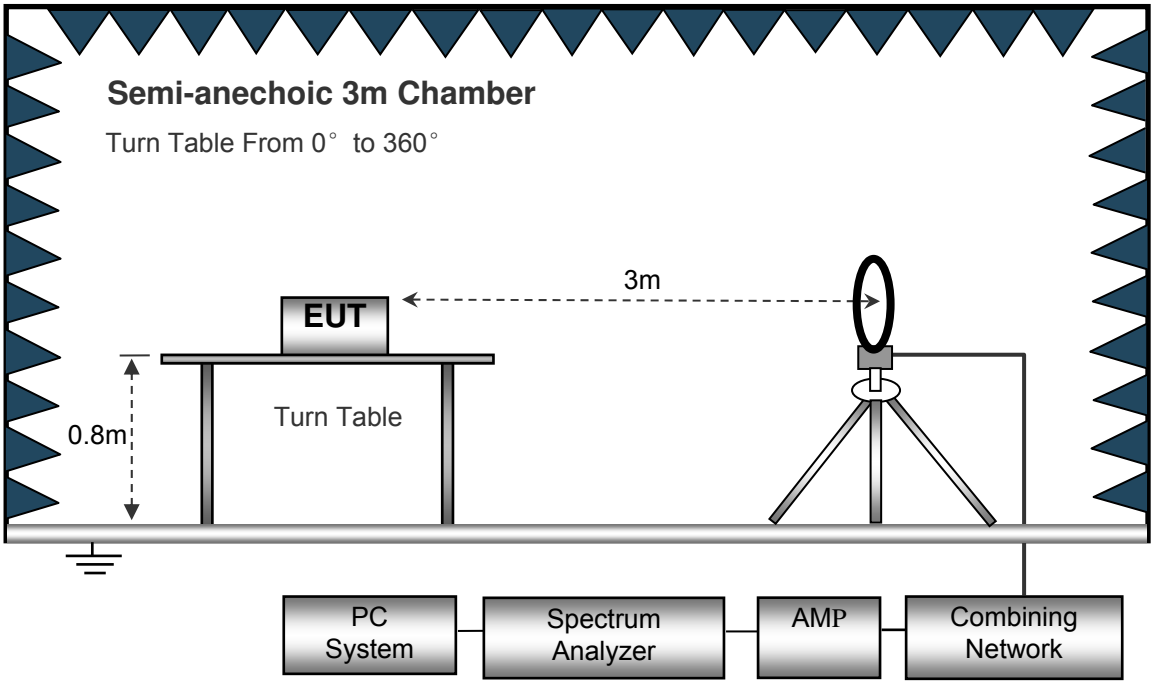
EUT Operation **:**

The test was performed in Transmitting mode (Wi-Fi /Bluetooth LE), the test data were shown in the report.

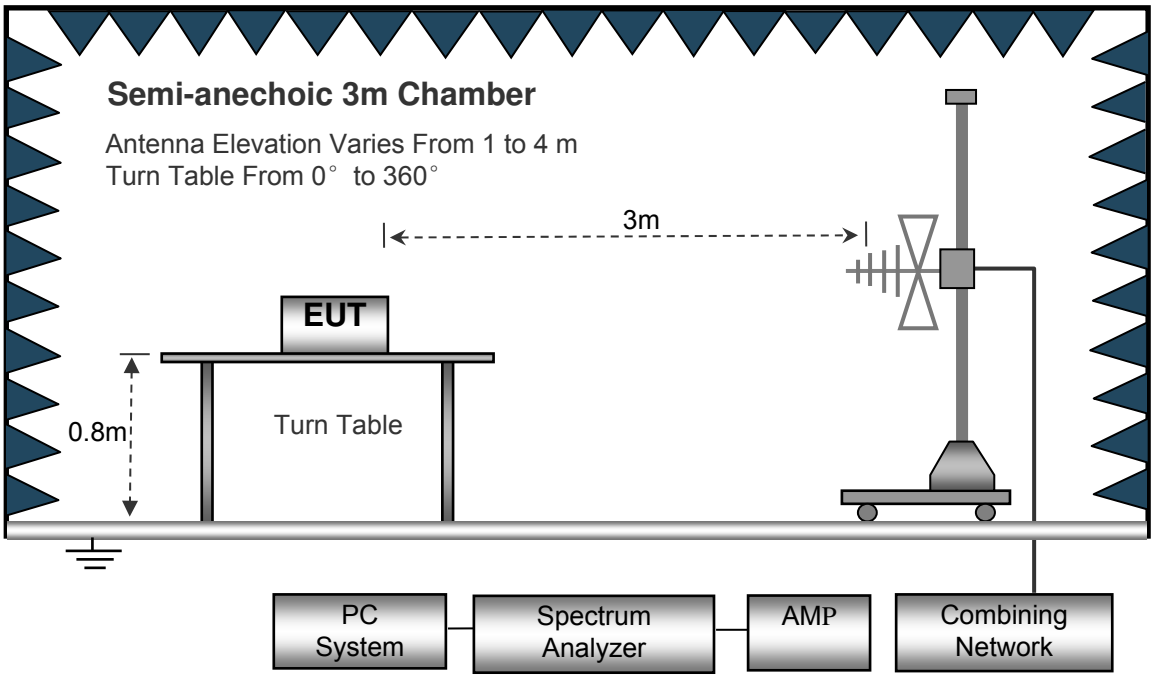
8.2 Test Setup

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

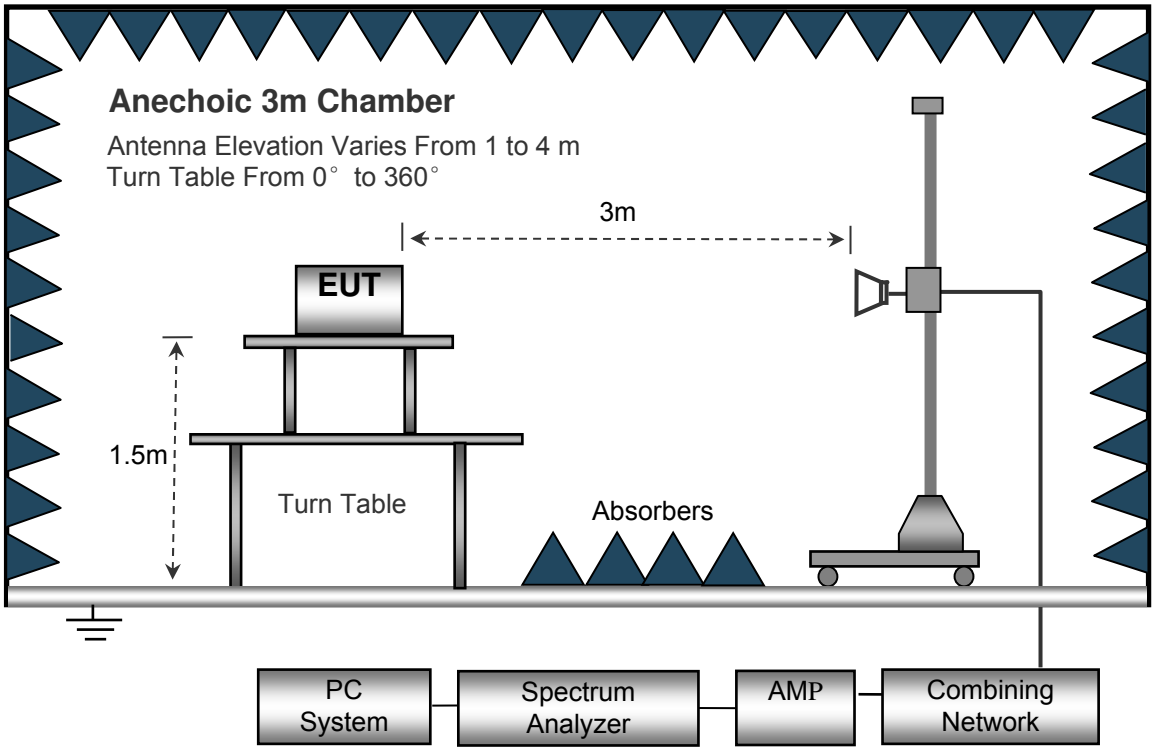
The test setup for emission measurement below 30MHz.



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.

8.5 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

Wi-Fi:

Test Frequency: 9 KHz ~ 30M Hz

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

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	40.26	QP	274.27	1.54	H	11.62	28.64	46.00	-17.36
223.45	35.23	QP	322.50	1.88	V	11.62	23.61	46.00	-22.39
4824.00	51.42	PK	123.38	1.67	V	1.06	50.36	74.00	-23.64
4824.00	42.23	Ave	123.38	1.67	V	1.06	41.17	54.00	-12.83
7236.00	38.45	PK	189.50	1.72	H	1.33	39.78	74.00	-34.22
7236.00	40.78	Ave	189.50	1.72	H	1.33	42.11	54.00	-11.89
2344.49	47.00	PK	350.61	1.14	V	13.19	33.81	74.00	-40.19
2344.49	37.82	Ave	350.61	1.14	V	13.19	24.63	54.00	-29.37
2365.87	43.51	PK	128.28	1.35	H	13.14	30.37	74.00	-43.63
2365.87	38.47	Ave	128.28	1.35	H	13.14	25.33	54.00	-28.67
2492.47	44.88	PK	170.32	1.90	V	13.08	31.80	74.00	-42.20
2492.47	38.46	Ave	170.32	1.90	V	13.08	25.38	54.00	-28.62

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	41.48	QP	70.83	1.19	H	11.62	29.86	46.00	-16.14
223.45	35.46	QP	318.51	1.21	V	11.62	23.84	46.00	-22.16
4874.00	52.40	PK	81.05	1.83	V	0.62	51.78	74.00	-22.22
4874.00	40.92	Ave	81.05	1.83	V	0.62	40.30	54.00	-13.70
7311.00	37.10	PK	359.45	1.49	H	2.21	39.31	74.00	-34.69
7311.00	41.08	Ave	359.45	1.49	H	2.21	43.29	54.00	-10.71
2319.98	46.68	PK	50.68	1.72	V	13.19	33.49	74.00	-40.51
2319.98	38.79	Ave	50.68	1.72	V	13.19	25.60	54.00	-28.40
2372.20	44.52	PK	293.11	1.21	H	13.14	31.38	74.00	-42.62
2372.20	38.26	Ave	293.11	1.21	H	13.14	25.12	54.00	-28.88
2490.54	44.39	PK	341.02	1.61	V	13.08	31.31	74.00	-42.69
2490.54	36.40	Ave	341.02	1.61	V	13.08	23.32	54.00	-30.68

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	42.79	QP	100.36	1.07	H	11.62	31.17	46.00	-14.83
223.45	36.21	QP	239.68	1.19	V	11.62	24.59	46.00	-21.41
4924.00	52.07	PK	286.60	1.26	V	0.24	51.83	74.00	-22.17
4924.00	41.96	Ave	286.60	1.26	V	0.24	41.72	54.00	-12.28
7386.00	37.23	PK	78.09	1.86	H	2.84	40.07	74.00	-33.93
7386.00	40.53	Ave	78.09	1.86	H	2.84	43.37	54.00	-10.63
2338.19	46.18	PK	84.36	1.66	V	13.19	32.99	74.00	-41.01
2338.19	39.84	Ave	84.36	1.66	V	13.19	26.65	54.00	-27.35
2379.83	44.16	PK	24.45	1.85	H	13.14	31.02	74.00	-42.98
2379.83	37.82	Ave	24.45	1.85	H	13.14	24.68	54.00	-29.32
2485.68	42.60	PK	238.31	1.17	V	13.08	29.52	74.00	-44.48
2485.68	36.46	Ave	238.31	1.17	V	13.08	23.38	54.00	-30.62

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	42.57	QP	188.06	1.62	H	11.62	30.95	46.00	-15.05
223.45	36.14	QP	104.91	1.57	V	11.62	24.52	46.00	-21.48
4824.00	51.24	PK	288.72	1.42	V	1.06	50.18	74.00	-23.82
4824.00	42.65	Ave	288.72	1.42	V	1.06	41.59	54.00	-12.41
7236.00	37.13	PK	222.24	1.15	H	1.33	38.46	74.00	-35.54
7236.00	39.87	Ave	222.24	1.15	H	1.33	41.20	54.00	-12.80
2331.47	45.57	PK	71.00	1.05	V	13.19	32.38	74.00	-41.62
2331.47	37.96	Ave	71.00	1.05	V	13.19	24.77	54.00	-29.23
2387.15	43.17	PK	53.27	1.77	H	13.14	30.03	74.00	-43.97
2387.15	36.74	Ave	53.27	1.77	H	13.14	23.60	54.00	-30.40
2488.42	42.63	PK	50.07	1.78	V	13.08	29.55	74.00	-44.45
2488.42	36.54	Ave	50.07	1.78	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)
11g: Middle Channel 2437MHz									
223.45	42.11	QP	143.27	1.90	H	11.62	30.49	46.00	-15.51
223.45	35.53	QP	114.18	1.53	V	11.62	23.91	46.00	-22.09
4874.00	51.98	PK	261.23	1.27	V	0.62	51.36	74.00	-22.64
4874.00	41.29	Ave	261.23	1.27	V	0.62	40.67	54.00	-13.33
7311.00	37.64	PK	184.12	1.82	H	2.21	39.85	74.00	-34.15
7311.00	41.36	Ave	184.12	1.82	H	2.21	43.57	54.00	-10.43
2344.20	46.92	PK	349.86	1.80	V	13.19	33.73	74.00	-40.27
2344.20	37.73	Ave	349.86	1.80	V	13.19	24.54	54.00	-29.46
2368.73	42.65	PK	45.85	1.67	H	13.14	29.51	74.00	-44.49
2368.73	36.47	Ave	45.85	1.67	H	13.14	23.33	54.00	-30.67
2487.66	42.27	PK	22.93	1.21	V	13.08	29.19	74.00	-44.81
2487.66	38.57	Ave	22.93	1.21	V	13.08	25.49	54.00	-28.51

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	43.17	QP	34.24	1.42	H	11.62	31.55	46.00	-14.45
223.45	35.81	QP	227.29	1.81	V	11.62	24.19	46.00	-21.81
4924.00	52.79	PK	305.62	1.02	V	0.24	52.55	74.00	-21.45
4924.00	40.06	Ave	305.62	1.02	V	0.24	39.82	54.00	-14.18
7386.00	36.68	PK	206.68	1.70	H	2.84	39.52	74.00	-34.48
7386.00	41.13	Ave	206.68	1.70	H	2.84	43.97	54.00	-10.03
2326.09	45.36	PK	28.74	1.20	V	13.19	32.17	74.00	-41.83
2326.09	38.75	Ave	28.74	1.20	V	13.19	25.56	54.00	-28.44
2370.31	44.42	PK	102.06	1.93	H	13.14	31.28	74.00	-42.72
2370.31	37.45	Ave	102.06	1.93	H	13.14	24.31	54.00	-29.69
2495.51	42.84	PK	215.78	1.01	V	13.08	29.76	74.00	-44.24
2495.51	36.43	Ave	215.78	1.01	V	13.08	23.35	54.00	-30.65

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)
11n20: Low Channel 2412MHz									
223.45	43.62	QP	14.22	1.51	H	11.62	32.00	46.00	-14.00
223.45	36.37	QP	307.31	1.04	V	11.62	24.75	46.00	-21.25
4824.00	54.25	PK	103.02	1.56	V	1.06	53.19	74.00	-20.81
4824.00	41.28	Ave	103.02	1.56	V	1.06	40.22	54.00	-13.78
7236.00	36.52	PK	39.20	1.24	H	1.33	37.85	74.00	-36.15
7236.00	40.55	Ave	39.20	1.24	H	1.33	41.88	54.00	-12.12
2331.06	46.43	PK	171.30	1.60	V	13.19	33.24	74.00	-40.76
2331.06	38.18	Ave	171.30	1.60	V	13.19	24.99	54.00	-29.01
2388.52	42.77	PK	126.78	1.94	H	13.14	29.63	74.00	-44.37
2388.52	36.61	Ave	126.78	1.94	H	13.14	23.47	54.00	-30.53
2484.31	42.13	PK	316.80	1.89	V	13.08	29.05	74.00	-44.95
2484.31	37.21	Ave	316.80	1.89	V	13.08	24.13	54.00	-29.87

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	44.58	QP	65.75	1.39	H	11.62	32.96	46.00	-13.04
223.45	37.78	QP	309.03	1.23	V	11.62	26.16	46.00	-19.84
4874.00	54.06	PK	142.92	1.12	V	0.62	53.44	74.00	-20.56
4874.00	42.12	Ave	142.92	1.12	V	0.62	41.50	54.00	-12.50
7311.00	37.80	PK	95.80	1.21	H	2.21	40.01	74.00	-33.99
7311.00	40.41	Ave	95.80	1.21	H	2.21	42.62	54.00	-11.38
2345.27	45.80	PK	257.69	1.55	V	13.19	32.61	74.00	-41.39
2345.27	39.65	Ave	257.69	1.55	V	13.19	26.46	54.00	-27.54
2351.87	42.68	PK	134.74	1.46	H	13.14	29.54	74.00	-44.46
2351.87	36.31	Ave	134.74	1.46	H	13.14	23.17	54.00	-30.83
2484.02	42.66	PK	253.97	1.28	V	13.08	29.58	74.00	-44.42
2484.02	36.14	Ave	253.97	1.28	V	13.08	23.06	54.00	-30.94

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	44.53	QP	272.22	1.25	H	11.62	32.91	46.00	-13.09
223.45	36.94	QP	259.42	1.44	V	11.62	25.32	46.00	-20.68
4924.00	54.09	PK	245.34	1.14	V	0.24	53.85	74.00	-20.15
4924.00	40.73	Ave	245.34	1.14	V	0.24	40.49	54.00	-13.51
7386.00	36.36	PK	174.21	1.28	H	2.84	39.20	74.00	-34.80
7386.00	40.74	Ave	174.21	1.28	H	2.84	43.58	54.00	-10.42
2312.52	45.89	PK	53.53	1.28	V	13.19	32.70	74.00	-41.30
2312.52	39.03	Ave	53.53	1.28	V	13.19	25.84	54.00	-28.16
2362.14	43.35	PK	131.41	1.25	H	13.14	30.21	74.00	-43.79
2362.14	37.35	Ave	131.41	1.25	H	13.14	24.21	54.00	-29.79
2493.89	42.49	PK	165.65	1.49	V	13.08	29.41	74.00	-44.59
2493.89	37.54	Ave	165.65	1.49	V	13.08	24.46	54.00	-29.54

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)
11n40: Low Channel 2422MHz									
223.45	44.95	QP	94.48	1.10	H	11.62	33.33	46.00	-12.67
223.45	37.53	QP	265.30	1.36	V	11.62	25.91	46.00	-20.09
4844.00	52.55	PK	148.71	1.37	V	1.06	51.49	74.00	-22.51
4844.00	37.75	Ave	148.71	1.37	V	1.06	36.69	54.00	-17.31
7266.00	34.73	PK	24.20	1.92	H	1.33	36.06	74.00	-37.94
7266.00	38.82	Ave	24.20	1.92	H	1.33	40.15	54.00	-13.85
2331.96	45.79	PK	48.54	1.65	V	13.19	32.60	74.00	-41.40
2331.96	37.37	Ave	48.54	1.65	V	13.19	24.18	54.00	-29.82
2368.92	44.06	PK	169.31	1.08	H	13.14	30.92	74.00	-43.08
2368.92	37.58	Ave	169.31	1.08	H	13.14	24.44	54.00	-29.56
2495.99	44.58	PK	181.99	1.72	V	13.08	31.50	74.00	-42.50
2495.99	36.97	Ave	181.99	1.72	V	13.08	23.89	54.00	-30.11

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	45.15	QP	104.01	1.91	H	11.62	33.53	46.00	-12.47
223.45	38.28	QP	55.69	1.81	V	11.62	26.66	46.00	-19.34
4874.00	53.10	PK	286.85	1.89	V	0.62	52.48	74.00	-21.52
4874.00	37.44	Ave	286.85	1.89	V	0.62	36.82	54.00	-17.18
7311.00	34.42	PK	272.45	1.90	H	2.21	36.63	74.00	-37.37
7311.00	39.75	Ave	272.45	1.90	H	2.21	41.96	54.00	-12.04
2345.30	46.48	PK	191.27	1.89	V	13.19	33.29	74.00	-40.71
2345.30	38.71	Ave	191.27	1.89	V	13.19	25.52	54.00	-28.48
2386.33	42.67	PK	121.93	1.70	H	13.14	29.53	74.00	-44.47
2386.33	38.05	Ave	121.93	1.70	H	13.14	24.91	54.00	-29.09
2497.63	43.99	PK	125.39	1.55	V	13.08	30.91	74.00	-43.09
2497.63	37.78	Ave	125.39	1.55	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)
11n40: High Channel 2452MHz									
223.45	45.08	QP	207.64	1.44	H	11.62	33.46	46.00	-12.54
223.45	37.75	QP	92.72	1.96	V	11.62	26.13	46.00	-19.87
4904.00	53.79	PK	183.03	1.14	V	0.24	53.55	74.00	-20.45
4904.00	37.65	Ave	183.03	1.14	V	0.24	37.41	54.00	-16.59
7356.00	33.91	PK	30.88	1.57	H	2.84	36.75	74.00	-37.25
7356.00	40.45	Ave	30.88	1.57	H	2.84	43.29	54.00	-10.71
2343.91	45.18	PK	92.94	1.67	V	13.19	31.99	74.00	-42.01
2343.91	38.20	Ave	92.94	1.67	V	13.19	25.01	54.00	-28.99
2374.82	42.44	PK	236.88	1.76	H	13.14	29.30	74.00	-44.70
2374.82	38.90	Ave	236.88	1.76	H	13.14	25.76	54.00	-28.24
2499.36	44.88	PK	273.97	1.65	V	13.08	31.80	74.00	-42.20
2499.36	36.24	Ave	273.97	1.65	V	13.08	23.16	54.00	-30.84

Test Frequency: 18GHz~25GHz

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

Bluetooth LE:

Test Frequency: 9 KHz ~ 30 MHz

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

Test Frequency: 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel 2402MHz									
268.32	36.45	QP	43	1.5	H	-13.35	23.10	46.00	-22.90
268.32	40.26	QP	19	1.5	V	-13.35	26.91	46.00	-19.09
4804.00	42.33	PK	340	1.5	V	-1.06	41.27	74.00	-32.73
4804.00	41.58	Ave	340	1.5	V	-1.06	40.52	54.00	-13.48
7206.00	40.12	PK	305	1.6	H	1.33	41.45	74.00	-32.55
7206.00	35.21	Ave	305	1.6	H	1.33	36.54	54.00	-17.46
2336.45	45.29	PK	183	1.3	V	-13.19	32.10	74.00	-41.90
2336.45	37.07	Ave	183	1.3	V	-13.19	23.88	54.00	-30.12
2367.40	42.18	PK	11	1.9	H	-13.14	29.04	74.00	-44.96
2367.40	37.11	Ave	11	1.9	H	-13.14	23.97	54.00	-30.03
2487.25	42.89	PK	206	1.9	V	-13.08	29.81	74.00	-44.19
2487.25	37.15	Ave	206	1.9	V	-13.08	24.07	54.00	-29.93

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel 2440MHz									
268.32	37.20	QP	66	1.3	H	-13.35	23.85	46.00	-22.15
268.32	40.92	QP	141	1.6	V	-13.35	27.57	46.00	-18.43
4880.00	43.78	PK	26	1.8	V	-0.62	43.16	74.00	-30.84
4880.00	41.77	Ave	26	1.8	V	-0.62	41.15	54.00	-12.85
7320.00	41.53	PK	45	1.1	H	2.21	43.74	74.00	-30.26
7320.00	36.33	Ave	45	1.1	H	2.21	38.54	54.00	-15.46
2325.13	46.02	PK	16	1.3	V	-13.19	32.83	74.00	-41.17
2325.13	38.00	Ave	16	1.3	V	-13.19	24.81	54.00	-29.19
2357.08	44.07	PK	170	1.4	H	-13.14	30.93	74.00	-43.07
2357.08	36.20	Ave	170	1.4	H	-13.14	23.06	54.00	-30.94
2493.70	44.28	PK	157	1.6	V	-13.08	31.20	74.00	-42.80
2493.70	36.84	Ave	157	1.6	V	-13.08	23.76	54.00	-30.24

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel 2480MHz									
268.32	36.82	QP	85	1.4	H	-13.35	23.47	46.00	-22.53
268.32	42.23	QP	39	1.3	V	-13.35	28.88	46.00	-17.12
4960.00	44.36	PK	257	1.8	V	-0.24	44.12	74.00	-29.88
4960.00	42.71	Ave	257	1.8	V	-0.24	42.47	54.00	-11.53
7440.00	40.54	PK	107	1.9	H	2.84	43.38	74.00	-30.62
7440.00	37.45	Ave	107	1.9	H	2.84	40.29	54.00	-13.71
2321.13	45.21	PK	348	1.8	V	-13.19	32.02	74.00	-41.98
2321.13	37.79	Ave	348	1.8	V	-13.19	24.60	54.00	-29.40
2373.27	42.73	PK	9	1.1	H	-13.14	29.59	74.00	-44.41
2373.27	37.99	Ave	9	1.1	H	-13.14	24.85	54.00	-29.15
2490.38	42.33	PK	307	1.2	V	-13.08	29.25	74.00	-44.75
2490.38	38.54	Ave	307	1.2	V	-13.08	25.46	54.00	-28.54

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 DTS Meas Guidance v03r05 April 8, 2016

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

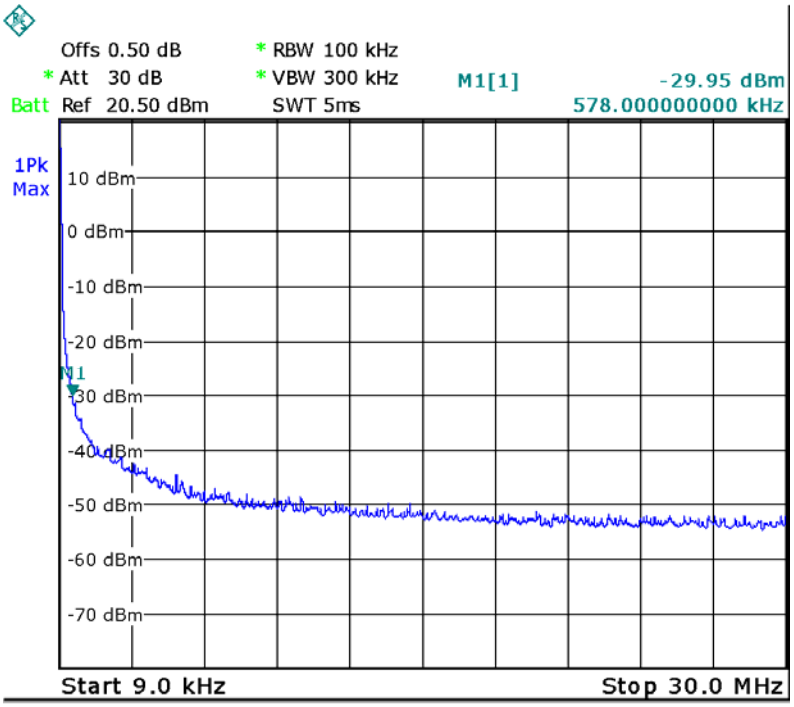
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
   RBW = 100kHz, VBW = 300kHz, Sweep = auto
   Detector function = peak, Trace = max hold

9.2 Test Result

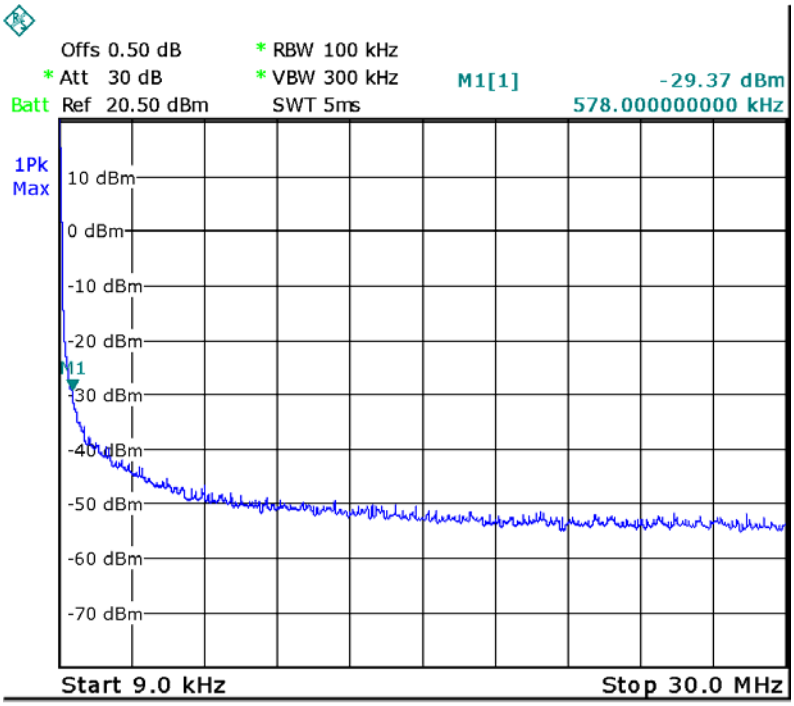
9 KHz – 30MHz

802.11b

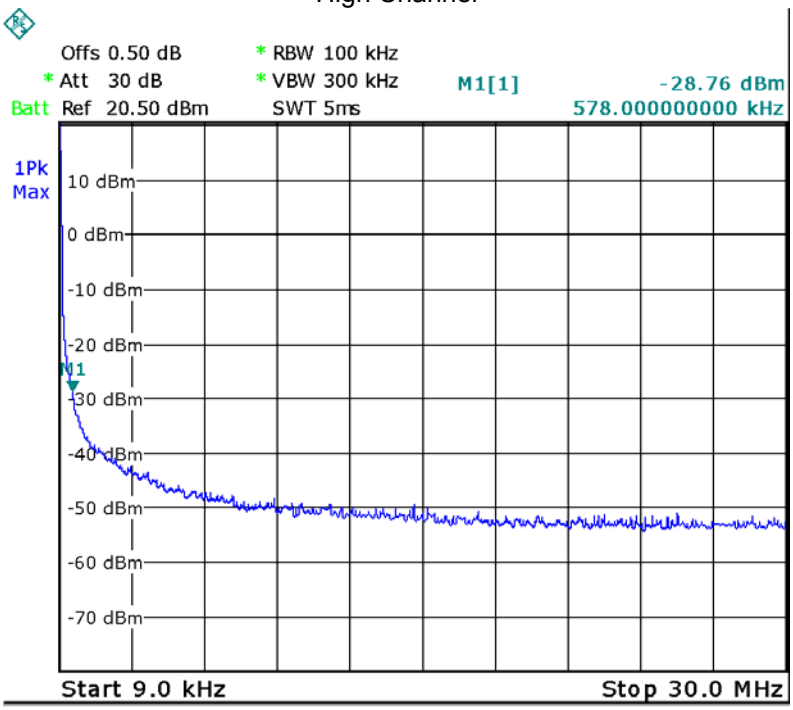
Low Channel



Middle Channel

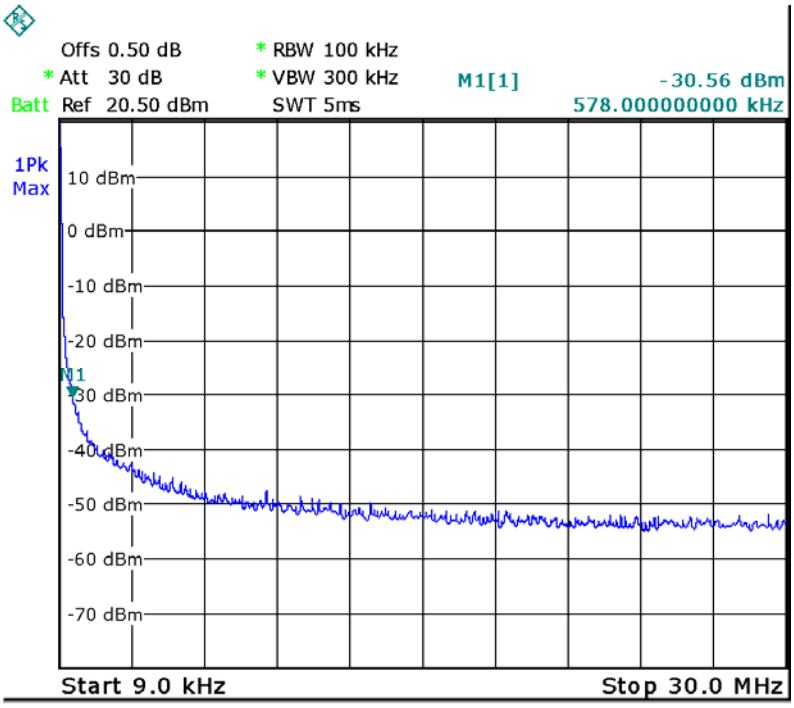


High Channel

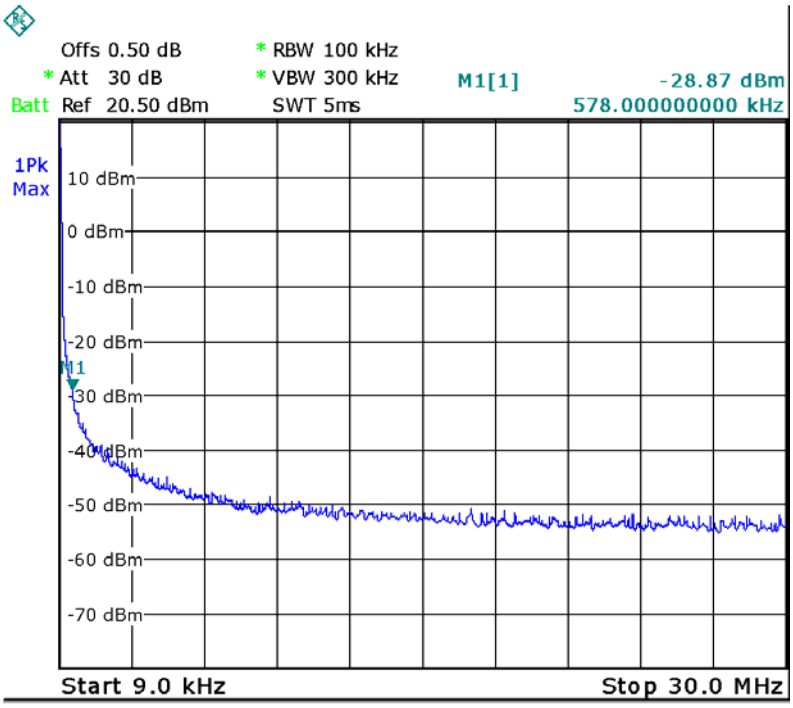


802.11g

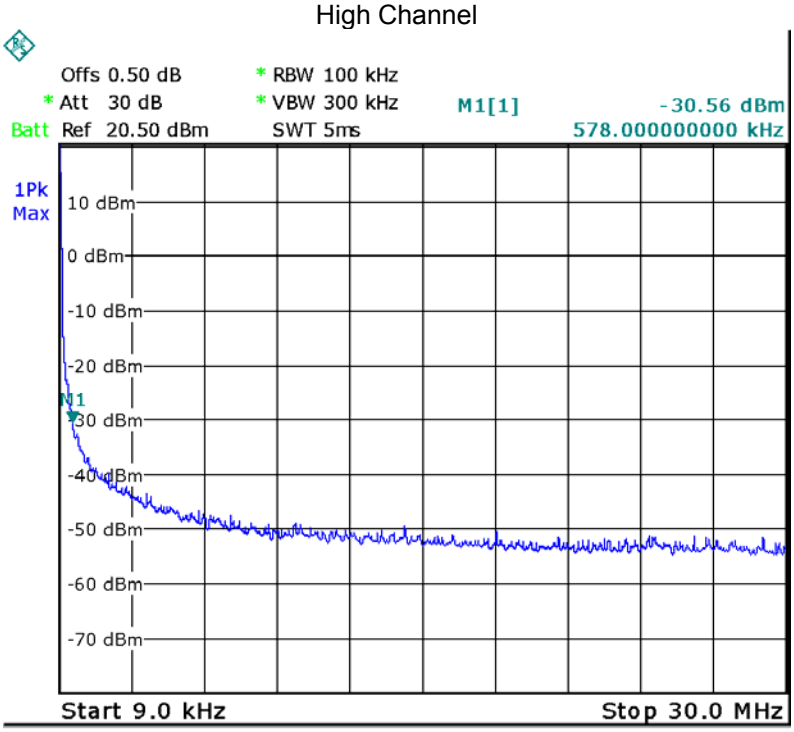
Low Channel



Middle Channel

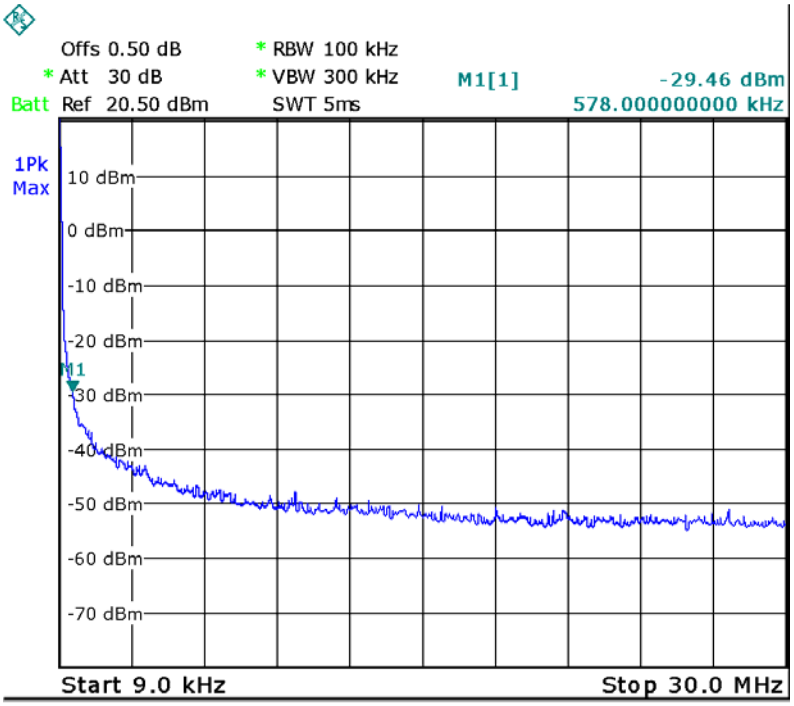


High Channel

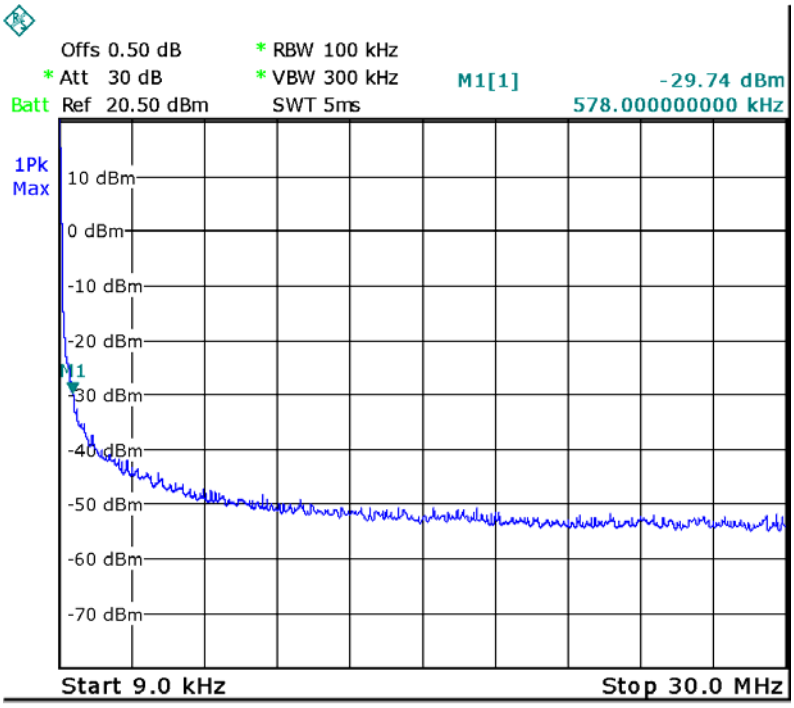


802.11n HT20

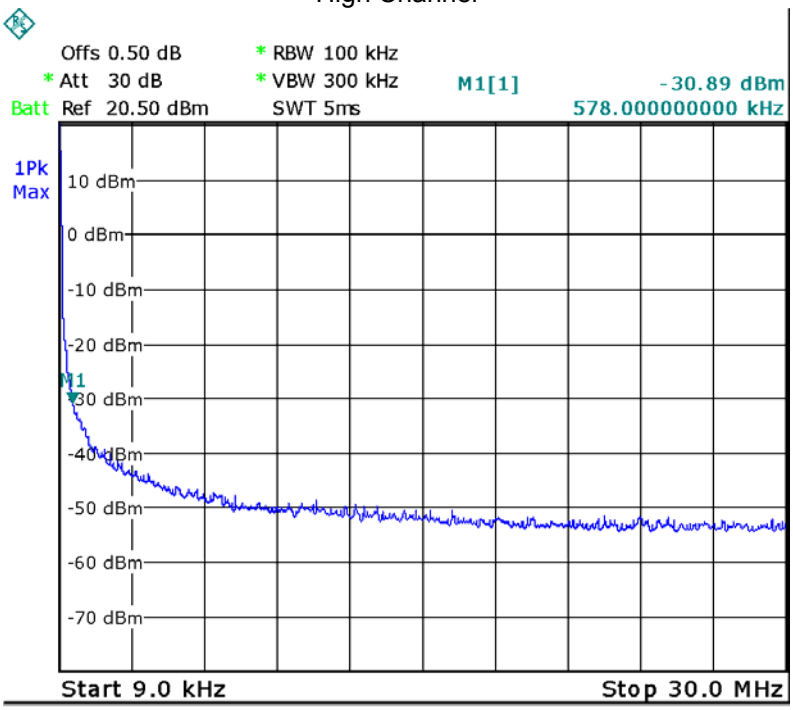
Low Channel



Middle Channel

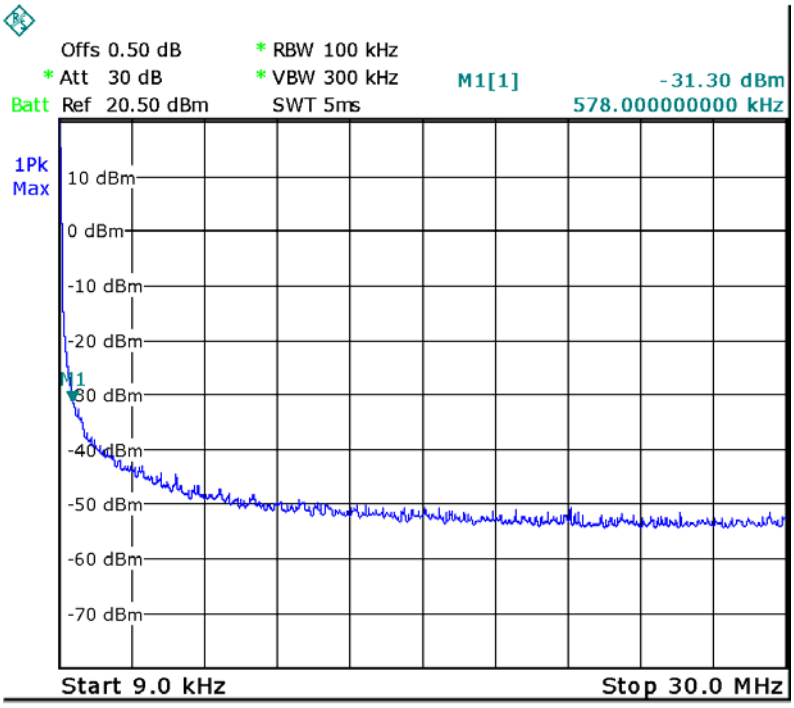


High Channel

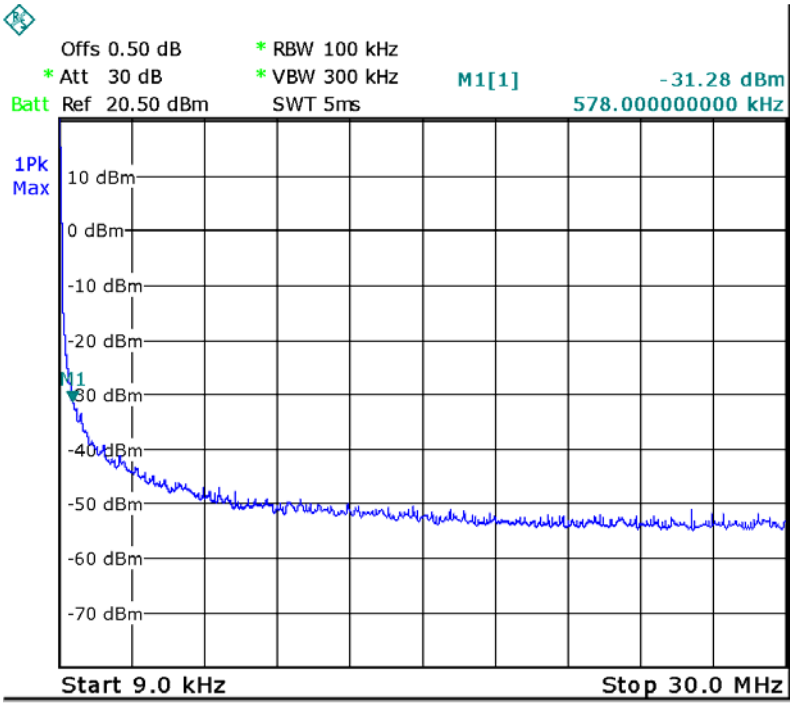


802.11n HT40

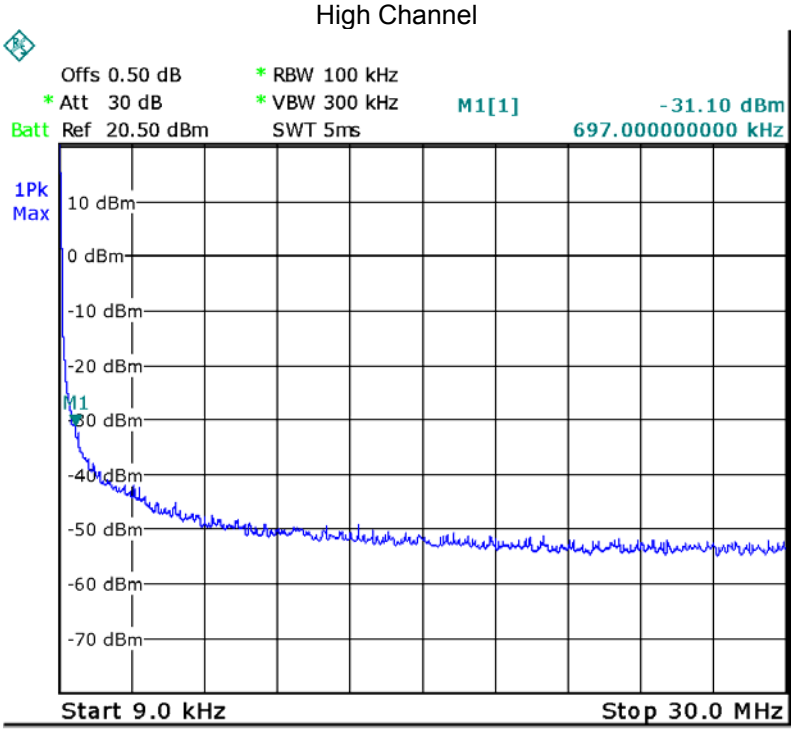
Low Channel



Middle Channel

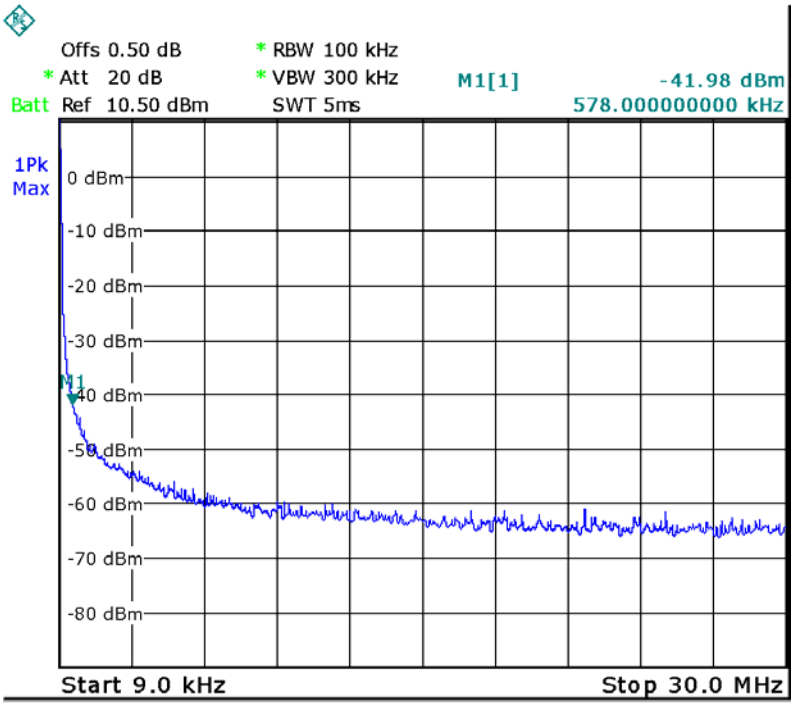


High Channel

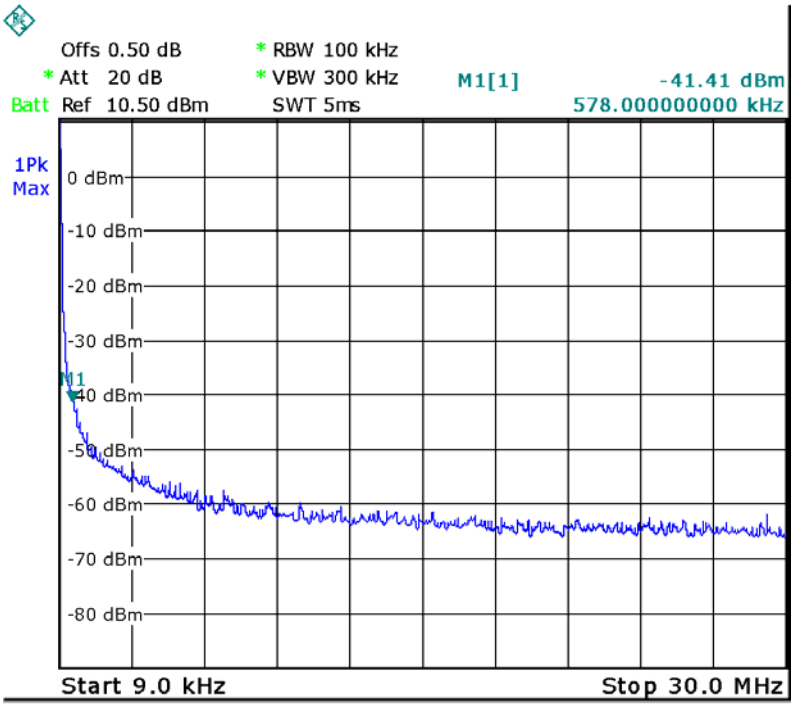


Bluetooth LE

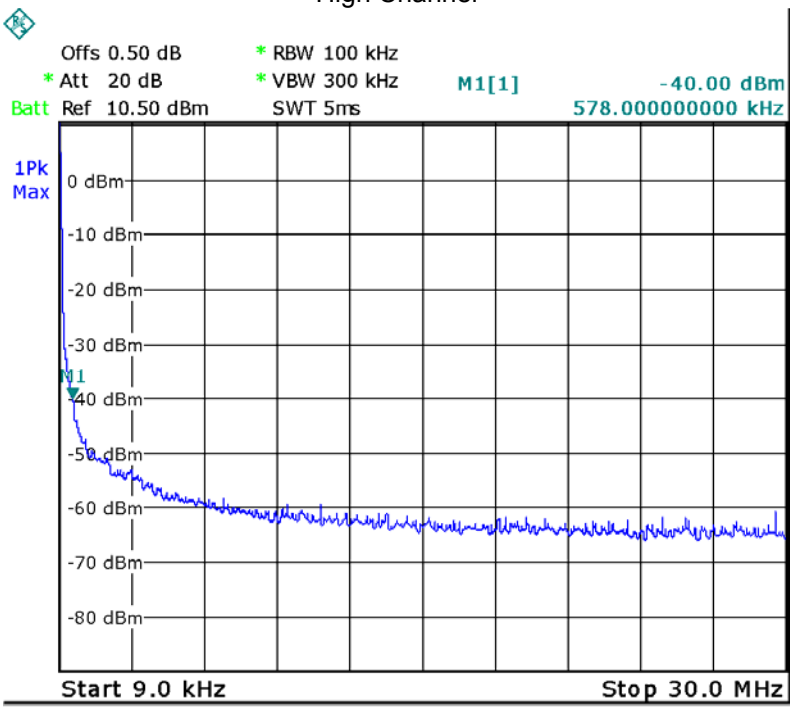
Low Channel



Middle Channel



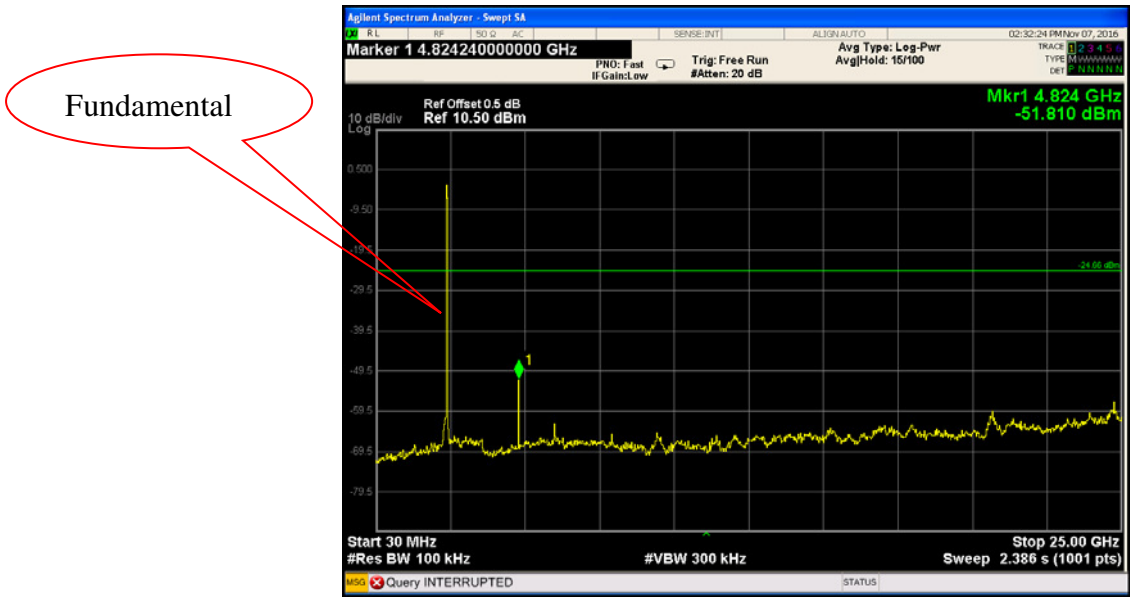
High Channel



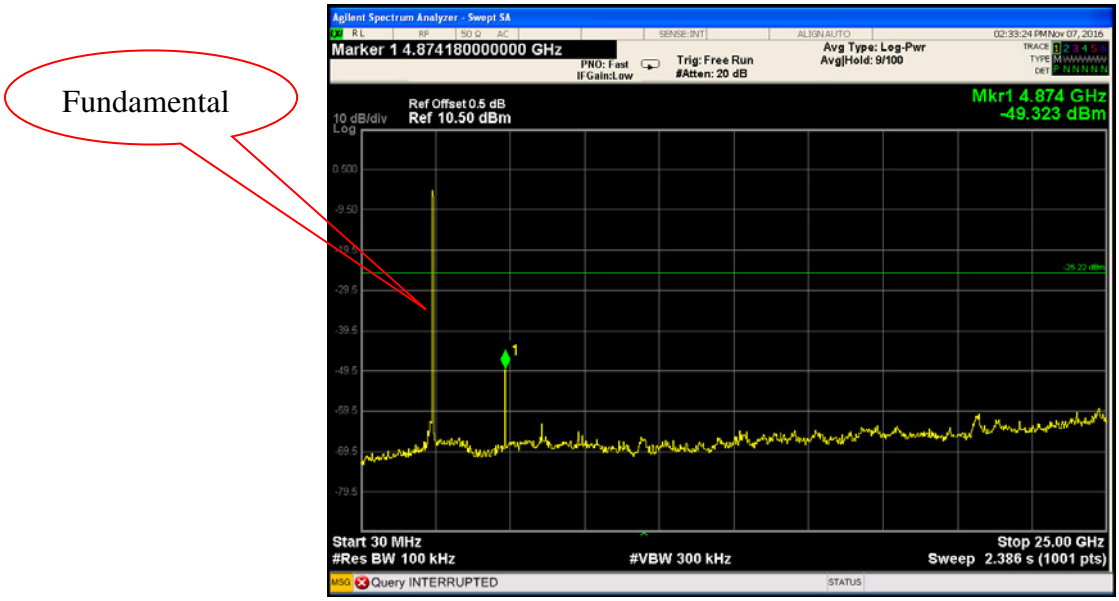
Above 30MHz

802.11b

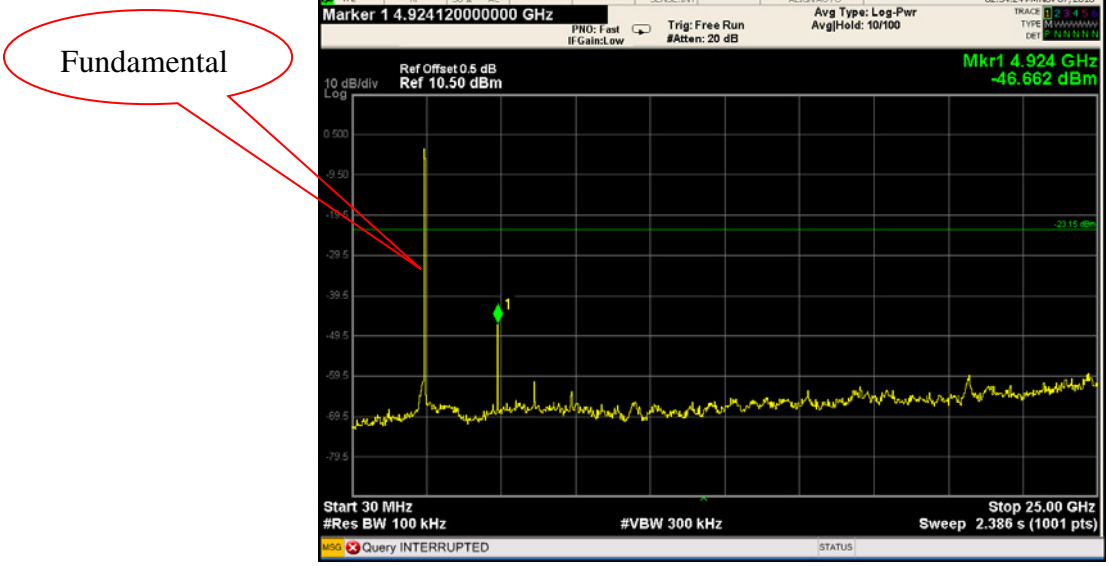
Low Channel



Middle Channel

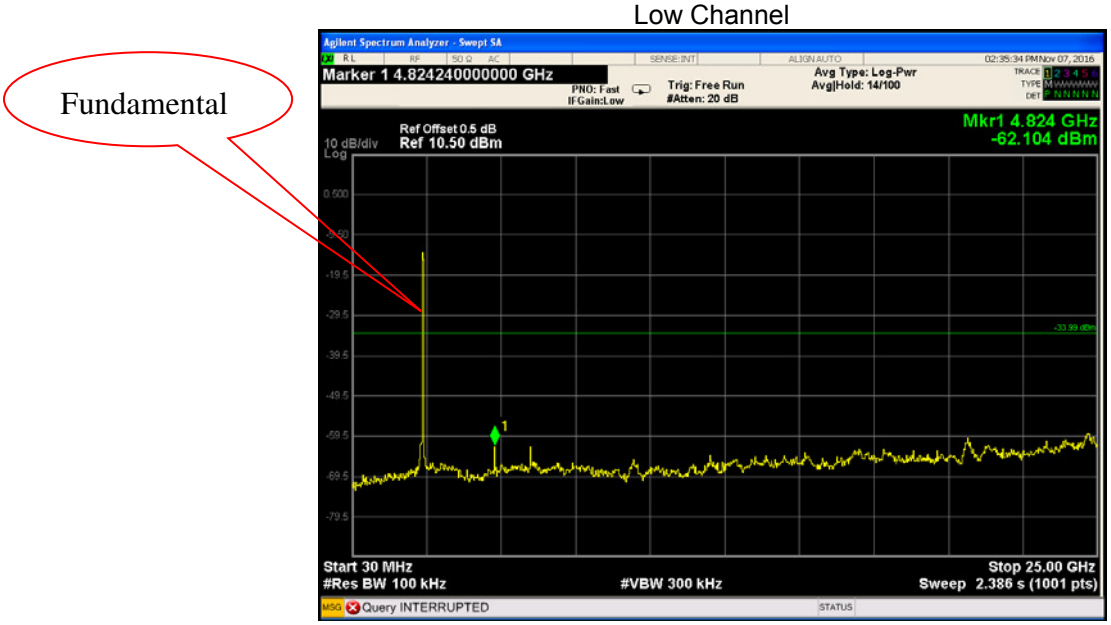


High Channel

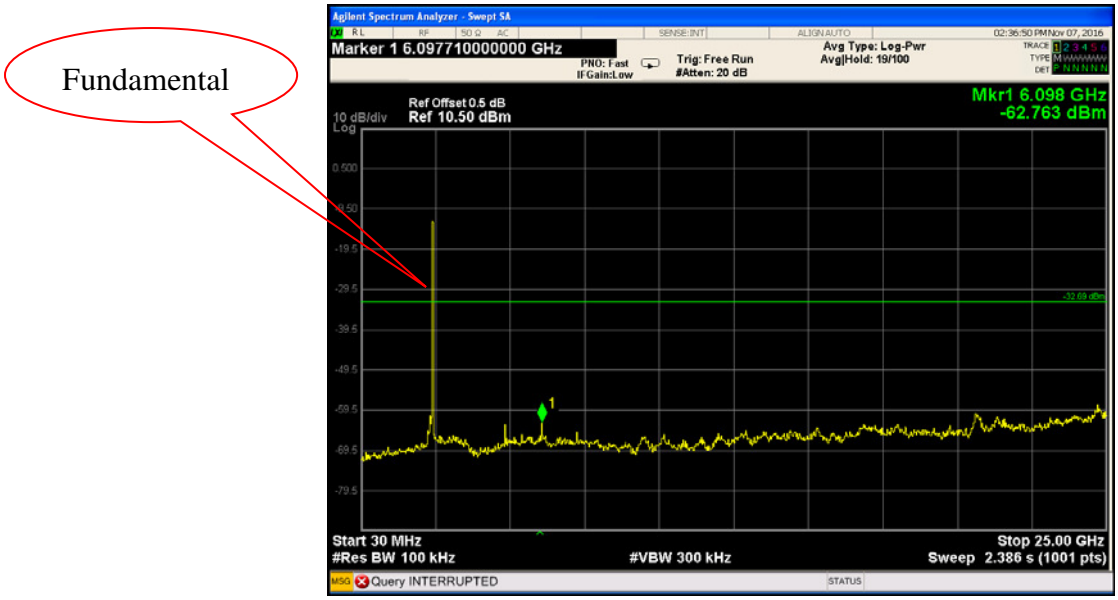


802.11g

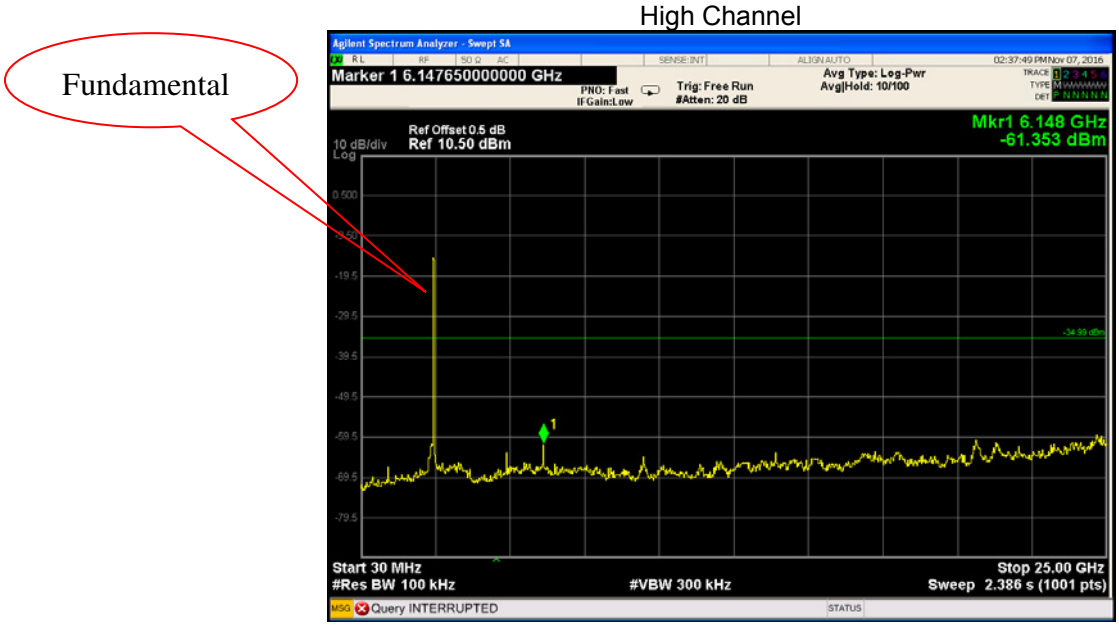
Low Channel



Middle Channel

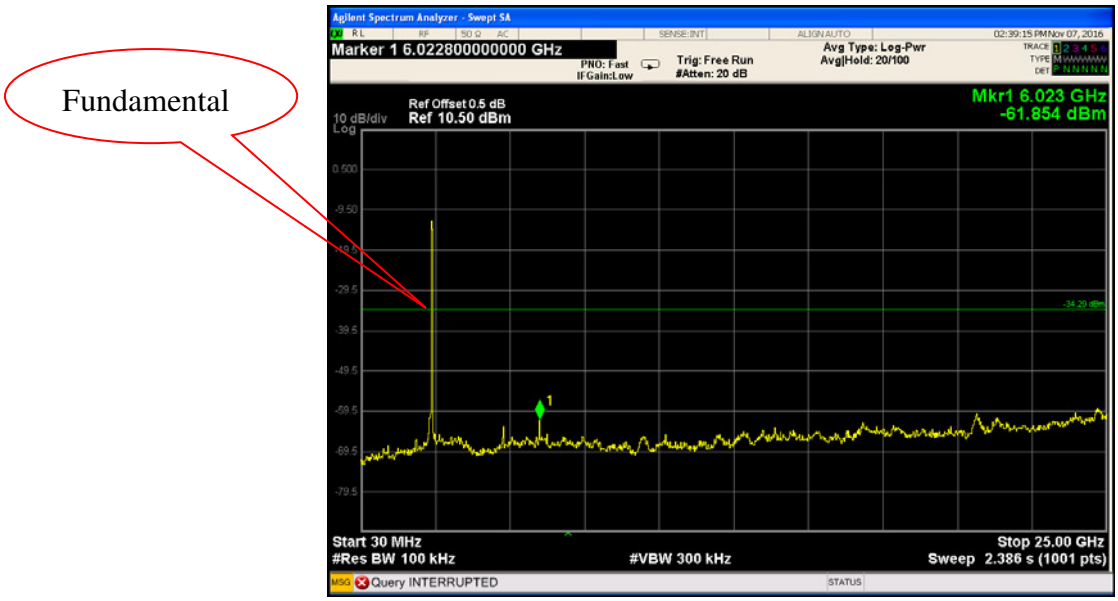


High Channel

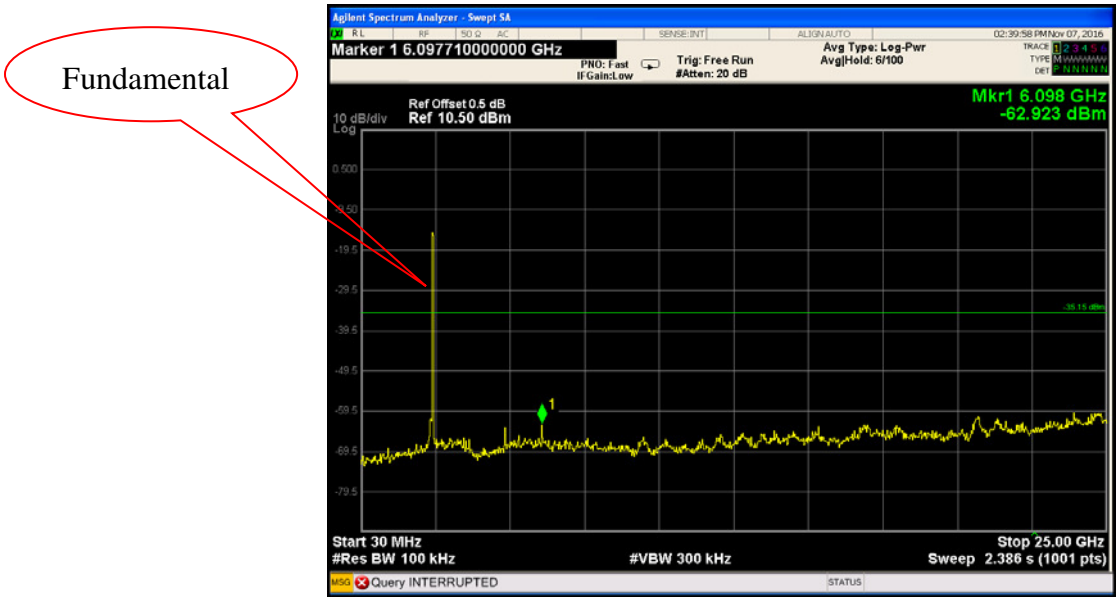


802.11n HT20

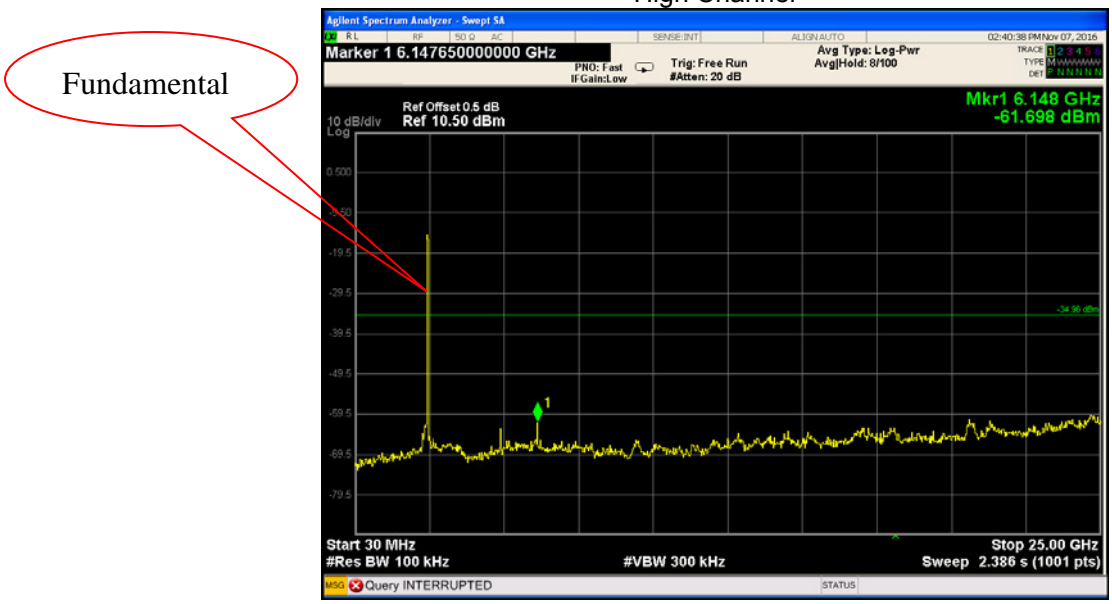
Low Channel



Middle Channel

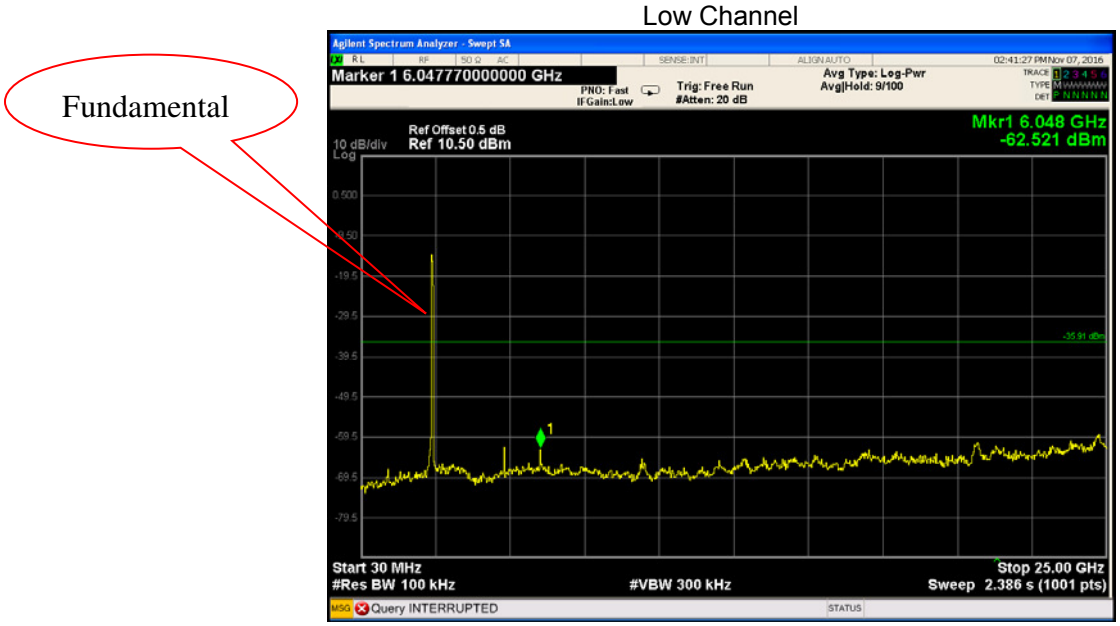


High Channel

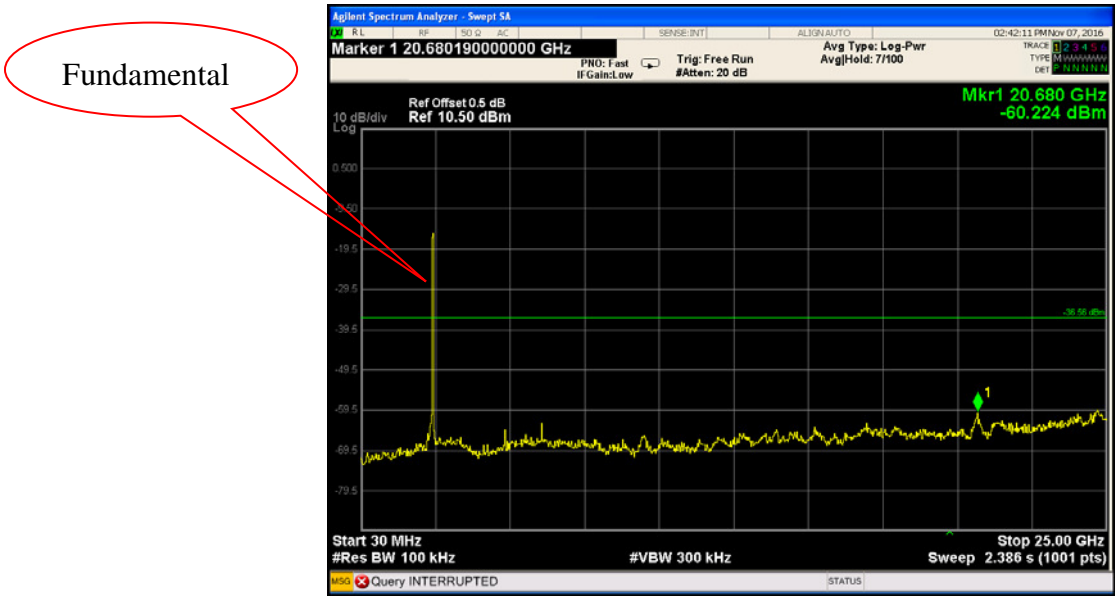


802.11n HT40

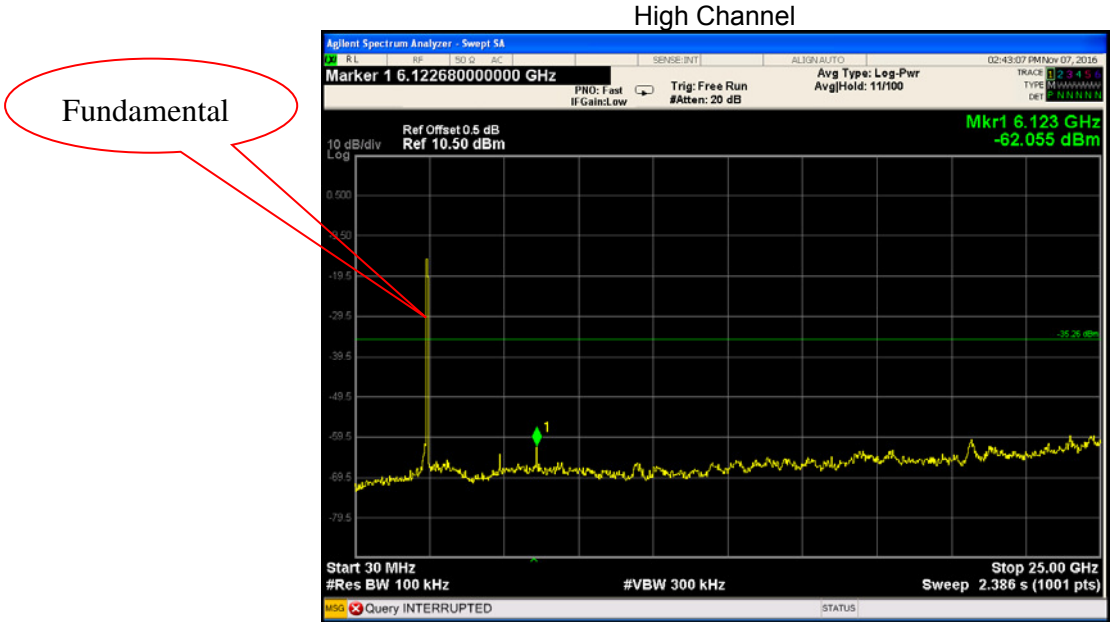
Low Channel



Middle Channel

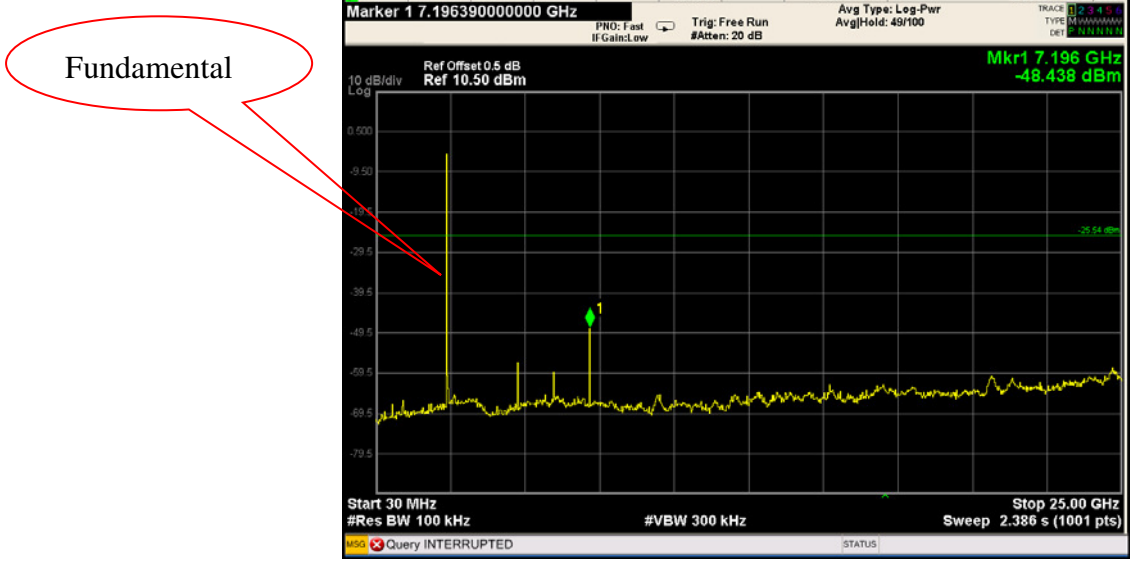


High Channel

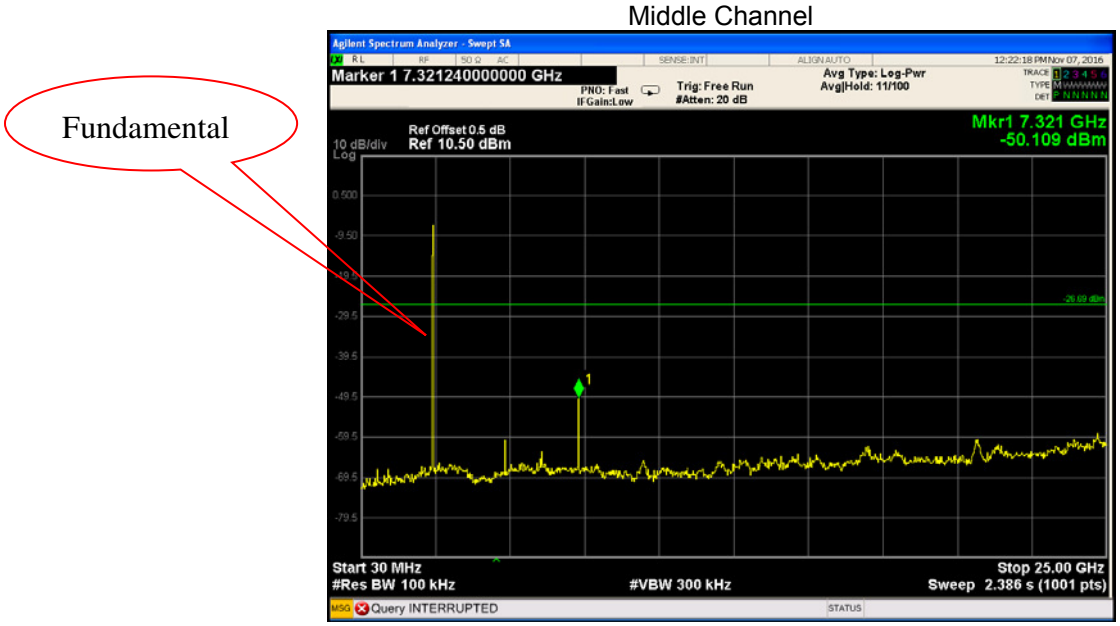


Bluetooth LE

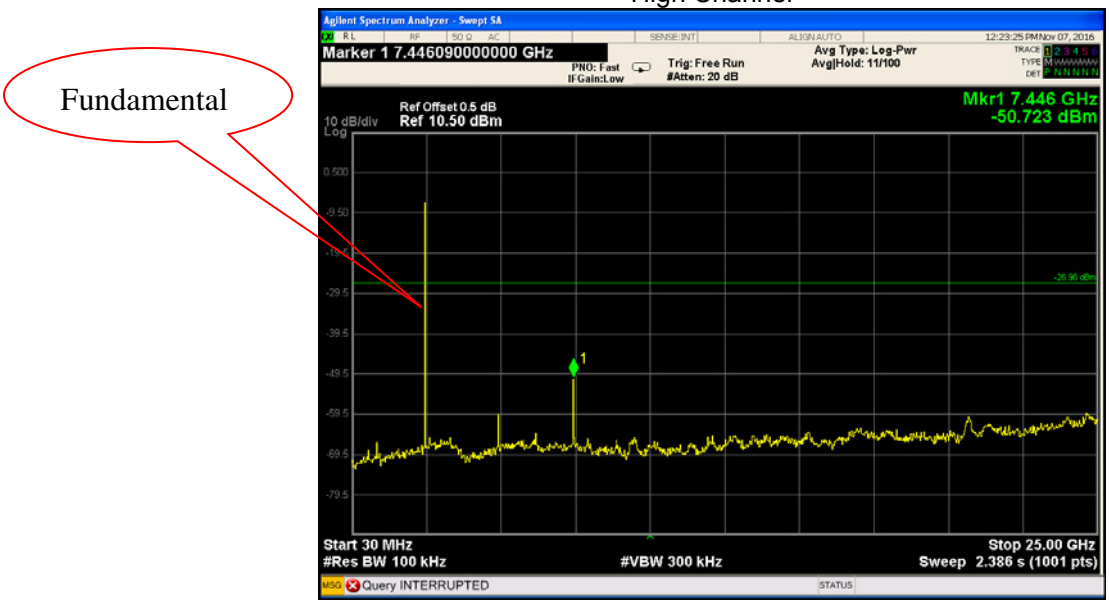
Low Channel



Middle Channel



High Channel



10 Band Edge Measurement

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016
Test Limit:	Regulation 15.247 (d),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 §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

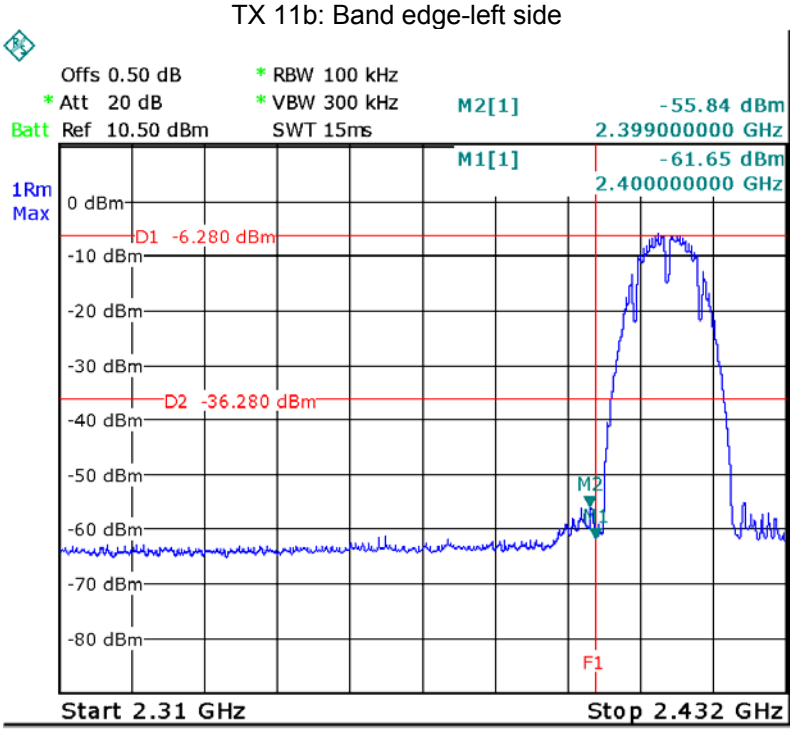
10.1 Test Produce

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.

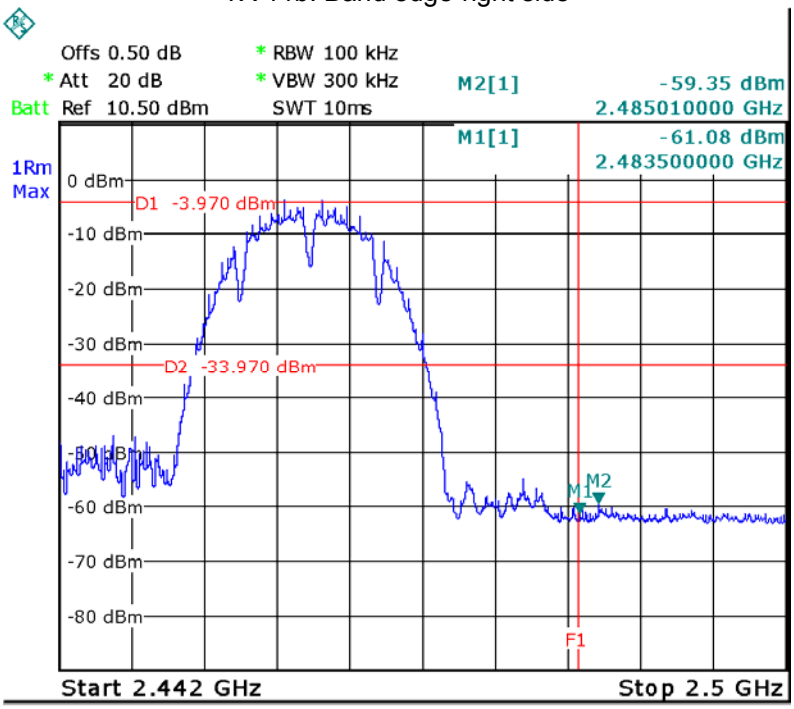
10.2 Test Result

Test result plots shown as follows:

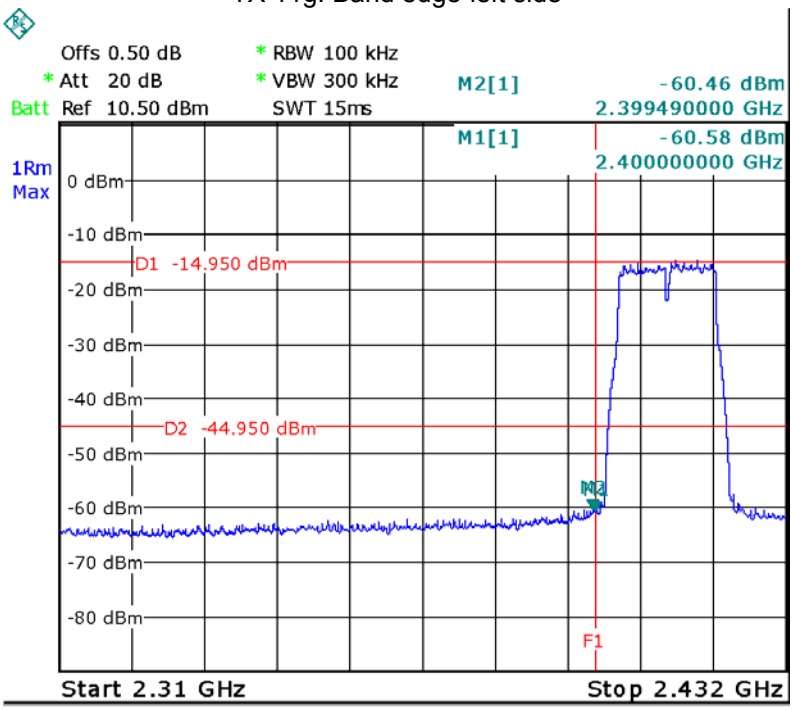
TX 11b: Band edge-left side



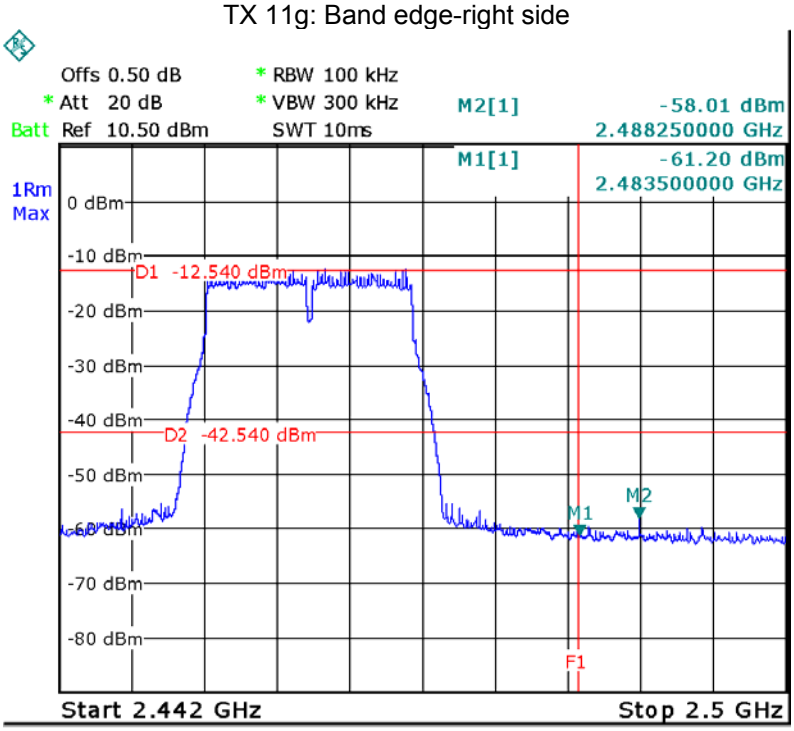
TX 11b: Band edge-right side



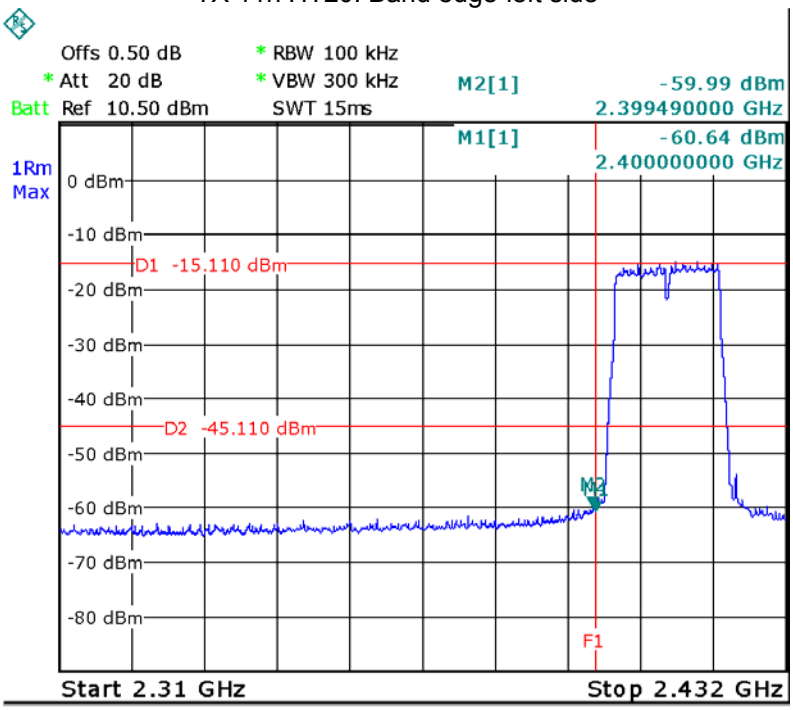
TX 11g: Band edge-left side



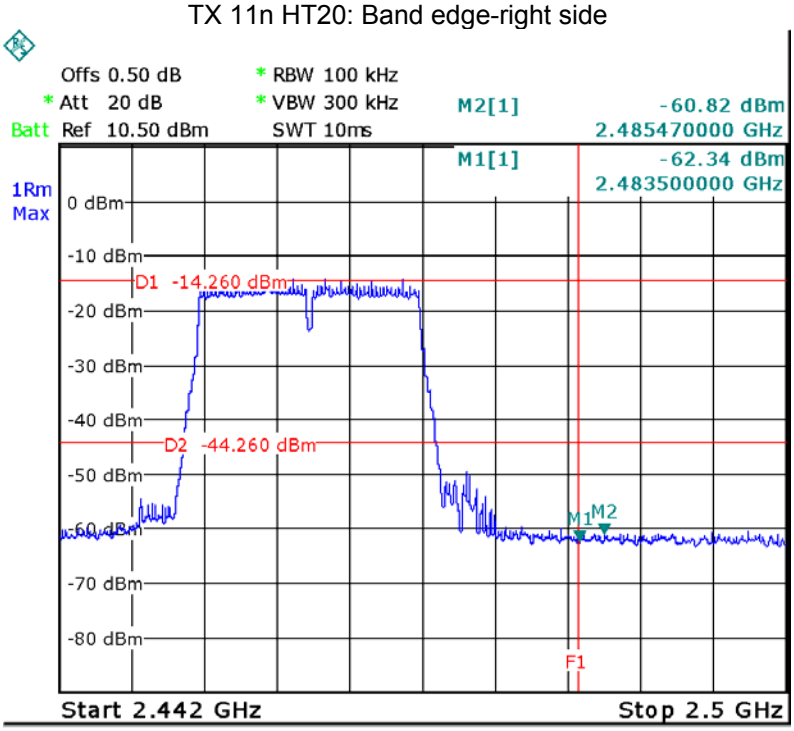
TX 11g: Band edge-right side



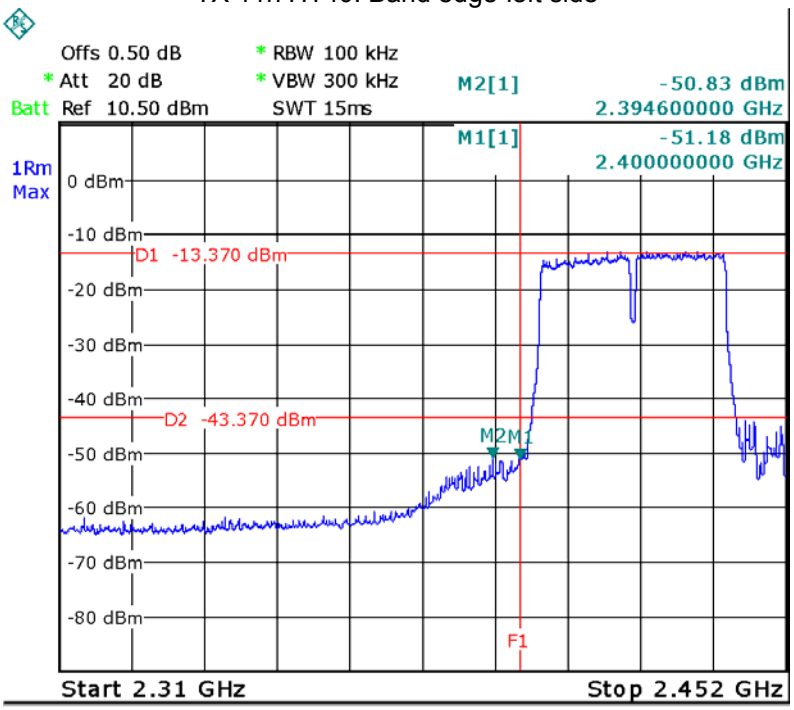
TX 11n HT20: Band edge-left side



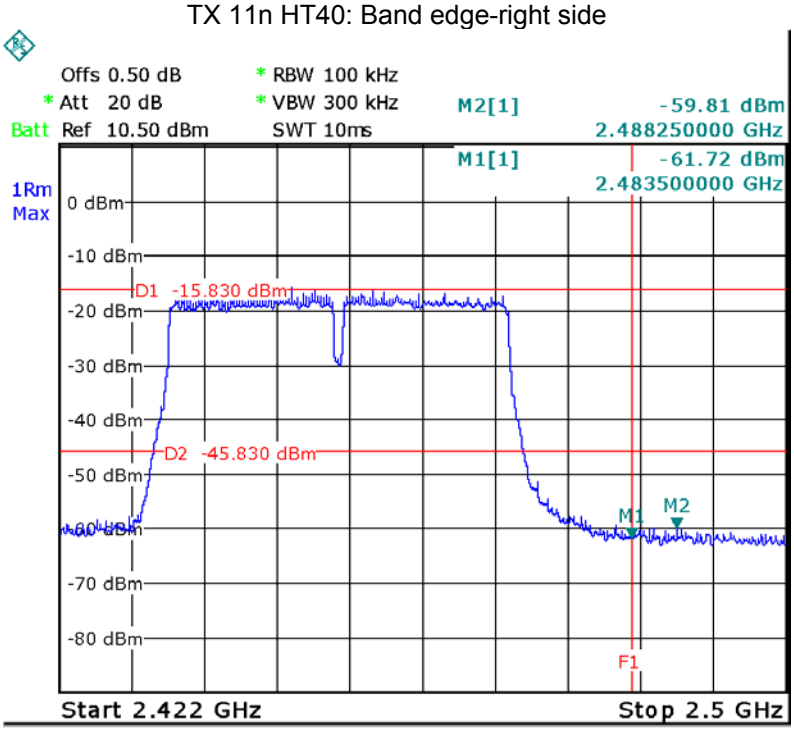
TX 11n HT20: Band edge-right side



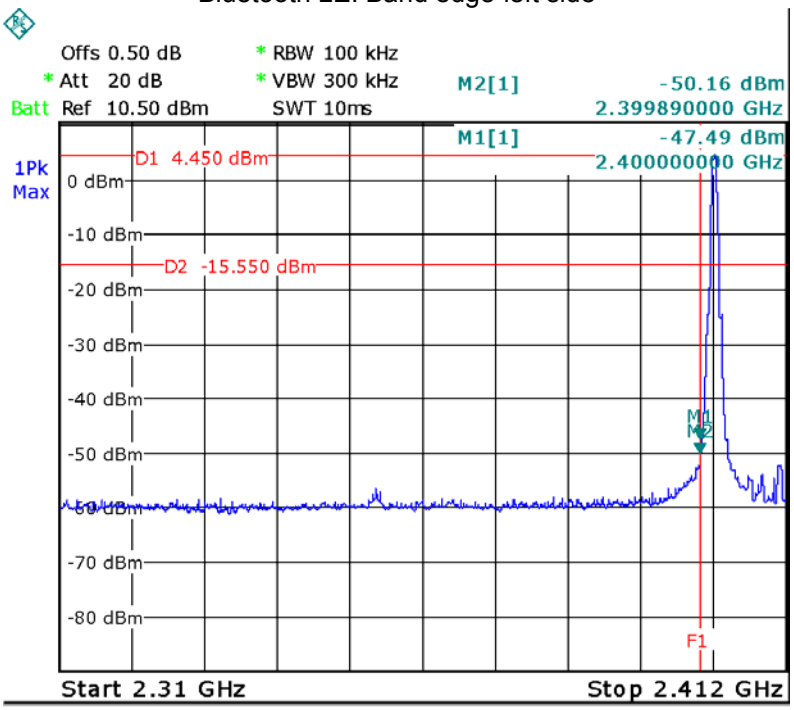
TX 11n HT40: Band edge-left side



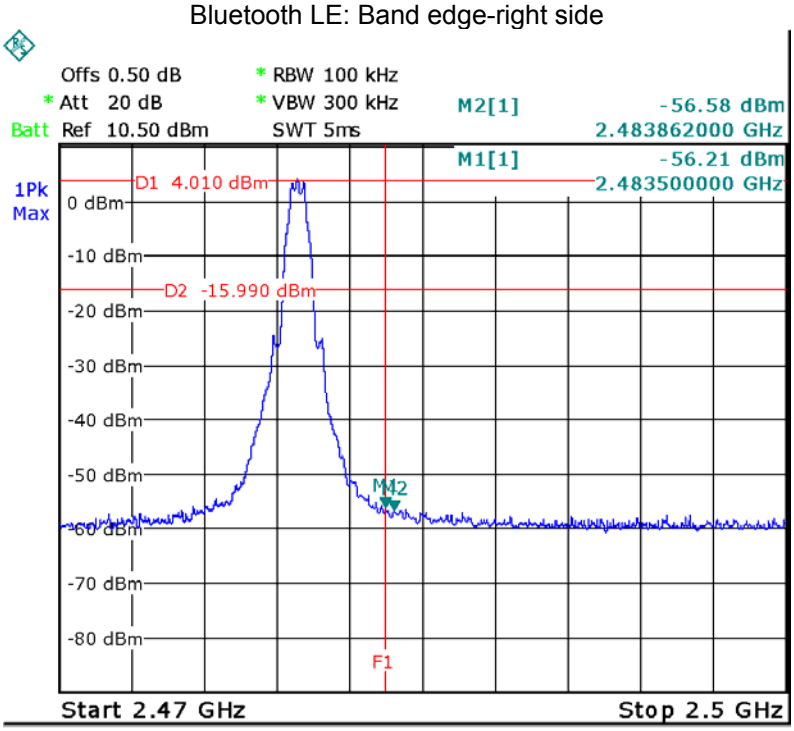
TX 11n HT40: Band edge-right side



Bluetooth LE: Band edge-left side



Bluetooth LE: Band edge-right side



11 Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016

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;

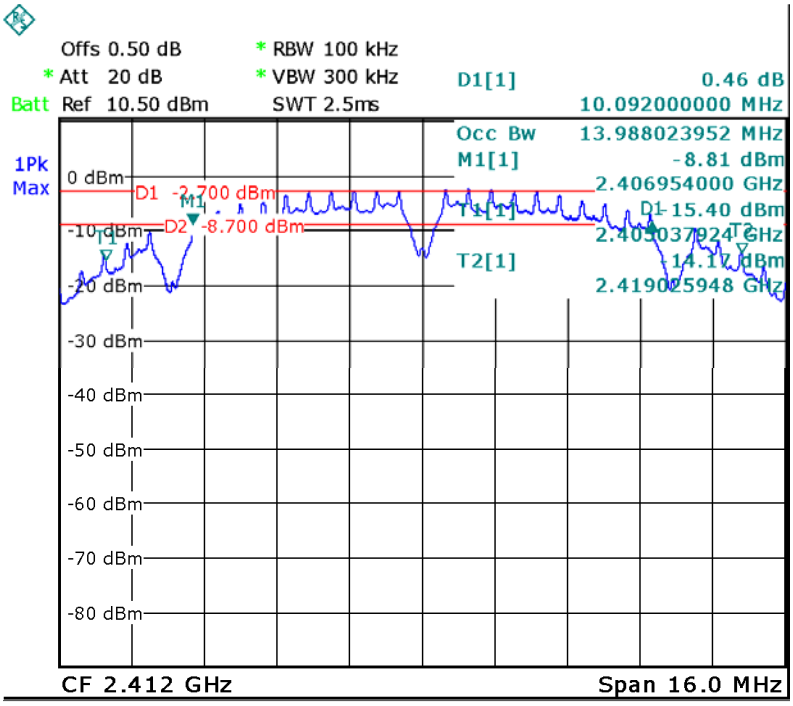
2. Set the spectrum analyzer: RBW = 100 kHz, VBW = 300 kHz

11.2 Test Result:

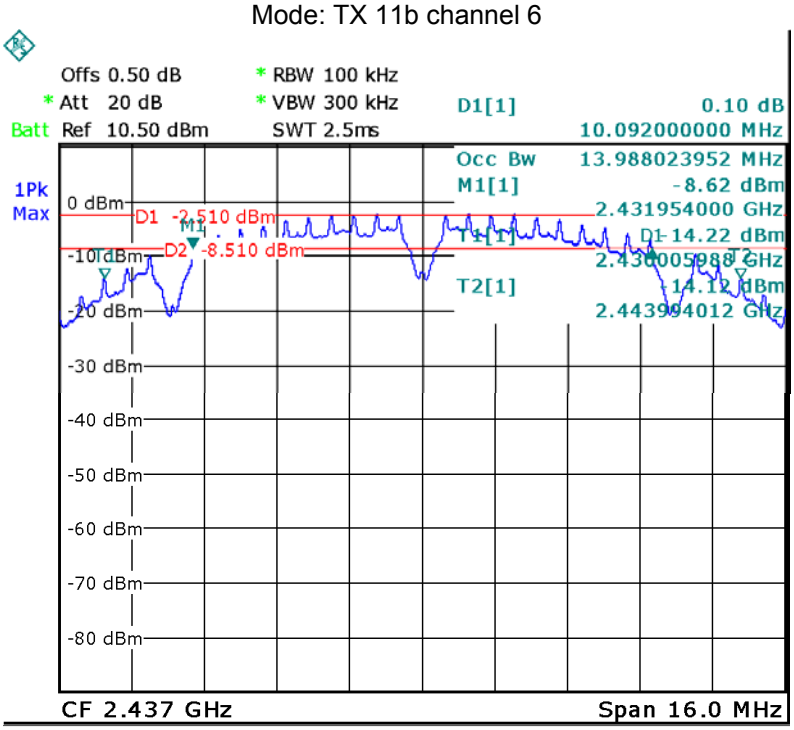
Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.092	13.988
	Channel 6	10.092	13.988
	Channel 11	10.092	13.988
TX 11g	Channel 1	16.417	16.517
	Channel 6	16.417	16.517
	Channel 11	16.417	16.517
TX 11n HT20	Channel 1	17.623	17.677
	Channel 6	17.623	17.677
	Channel 11	17.623	17.677
TX 11n HT40	Channel 3	36.120	36.118
	Channel 6	36.120	36.118
	Channel 9	36.120	36.118
Bluetooth LE	Channel 0	0.689	1.090
	Channel 19	0.689	1.090
	Channel 39	0.689	1.090

Test result plot:

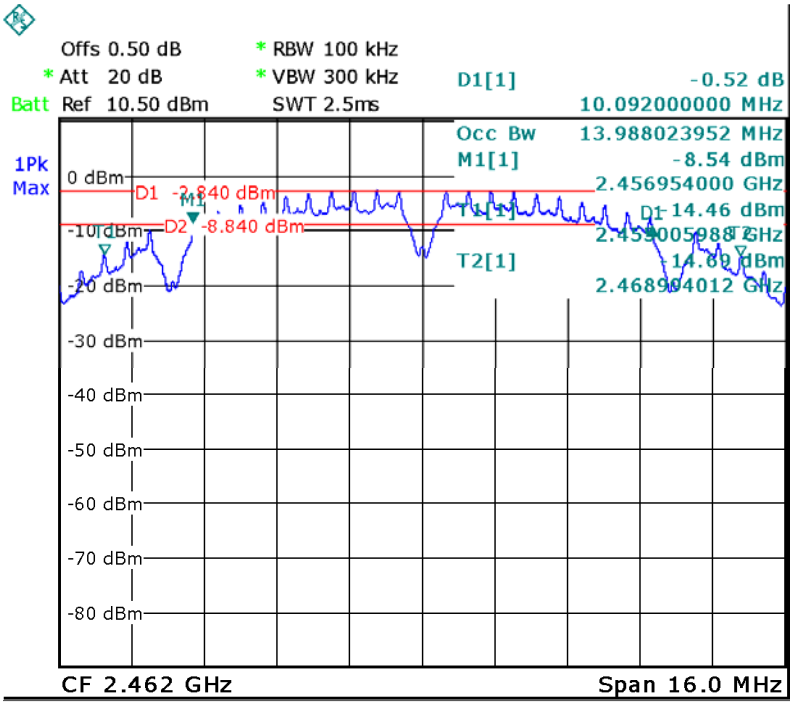
Mode: TX 11b channel 1



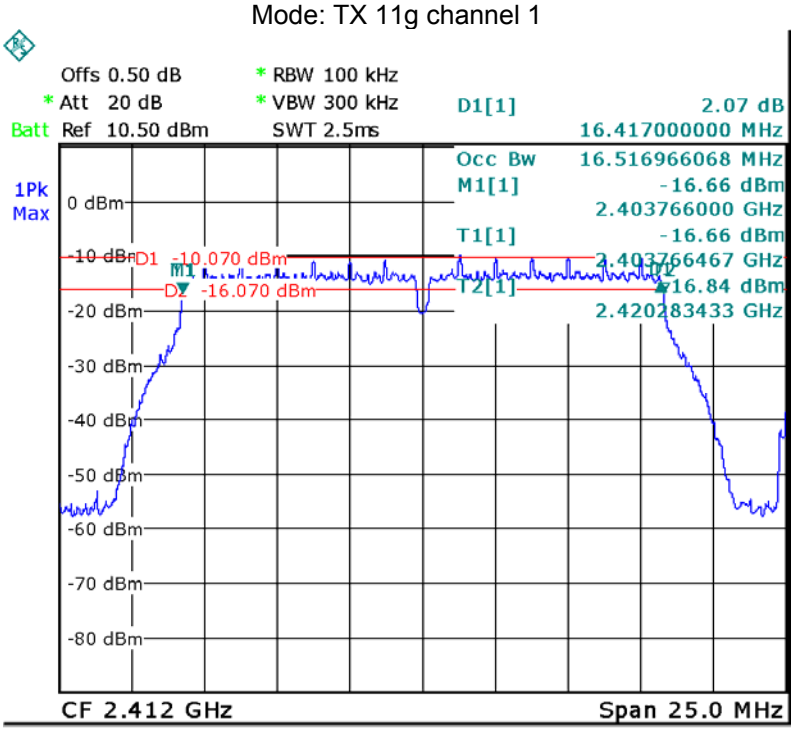
Mode: TX 11b channel 6



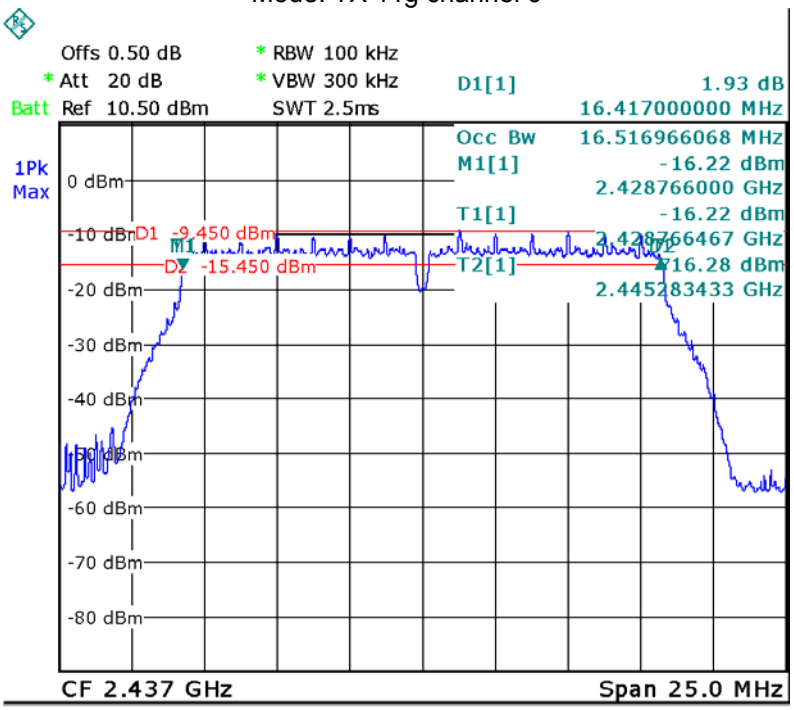
Mode: TX 11b channel 11



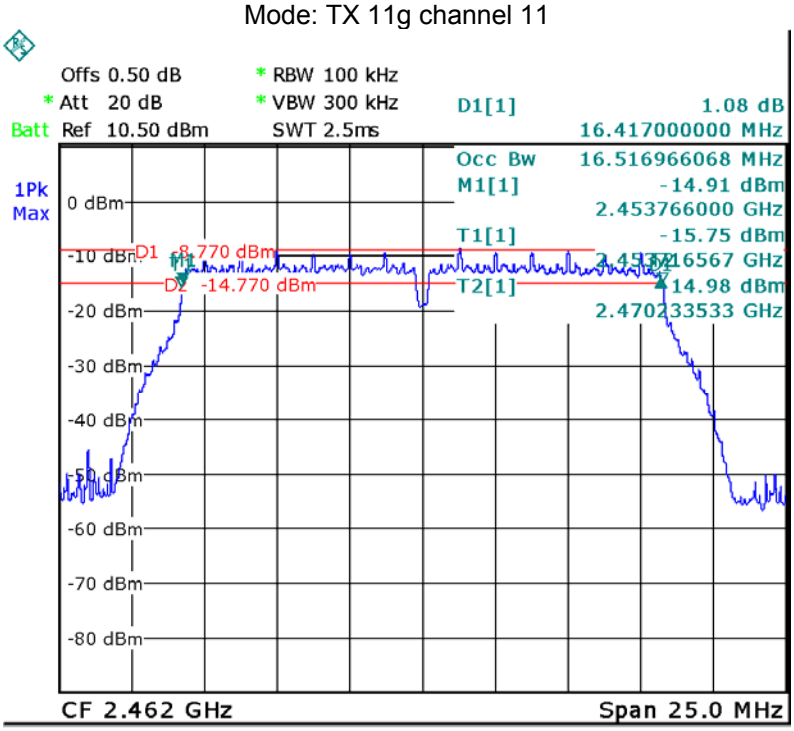
Mode: TX 11g channel 1



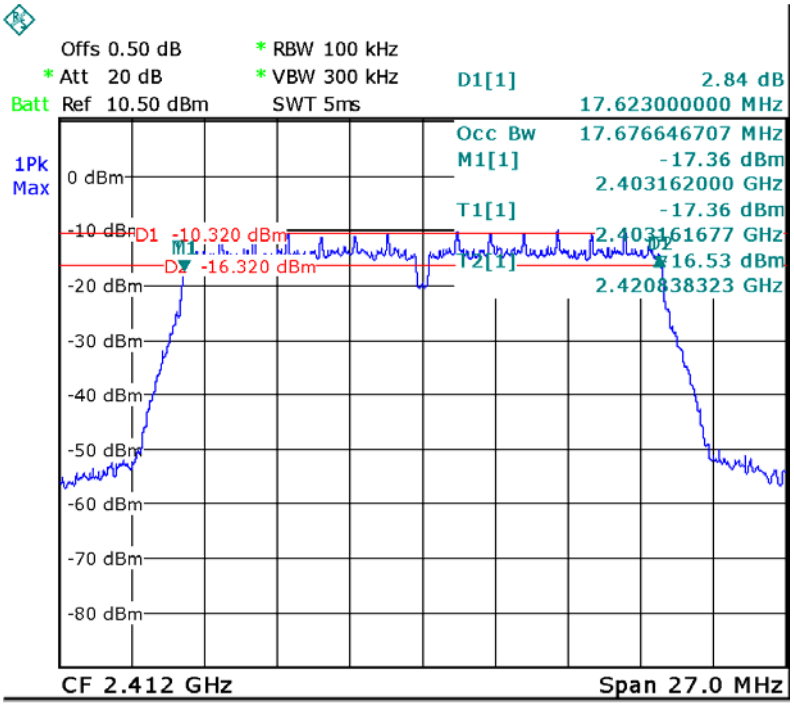
Mode: TX 11g channel 6



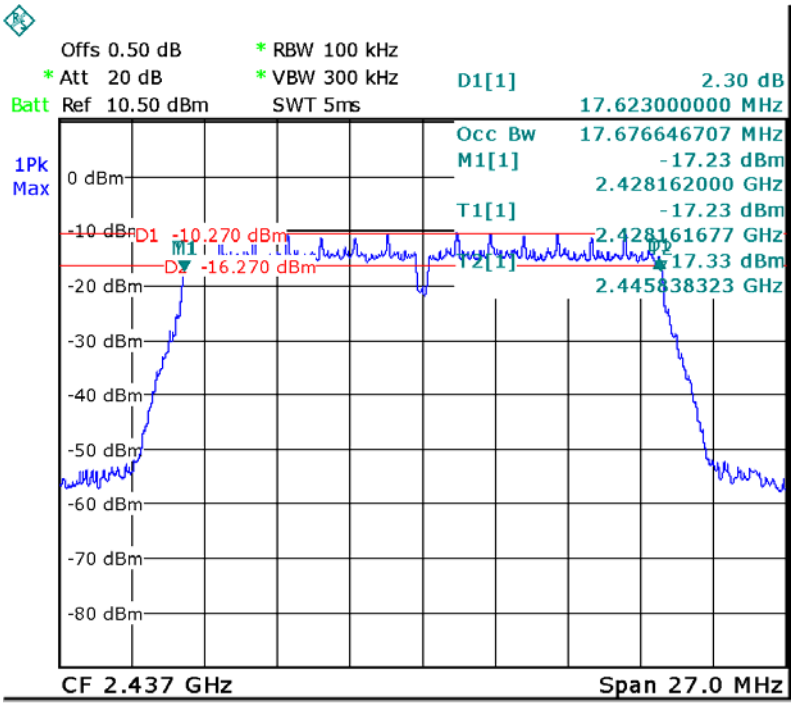
Mode: TX 11g channel 11



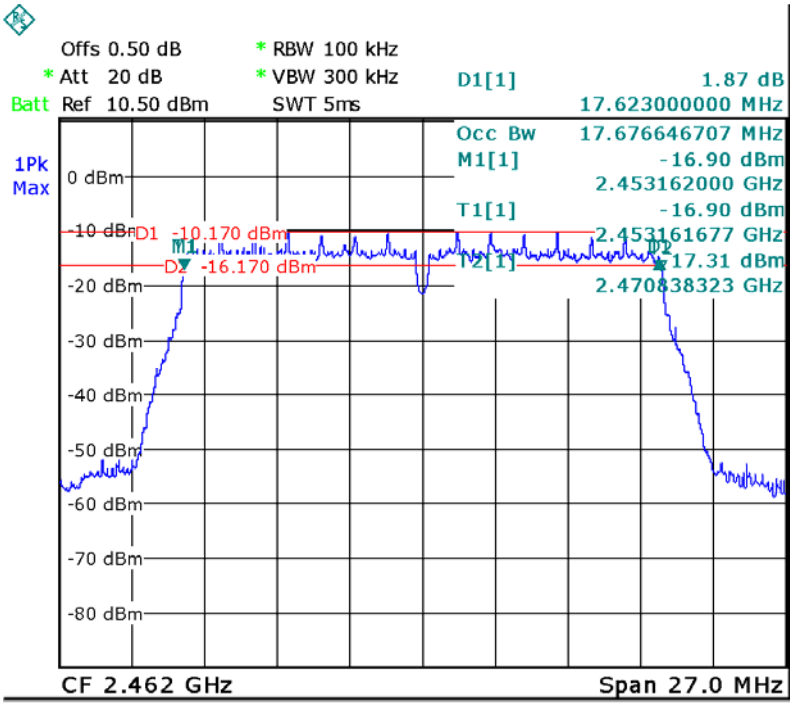
Mode: TX 11n HT20 channel 1



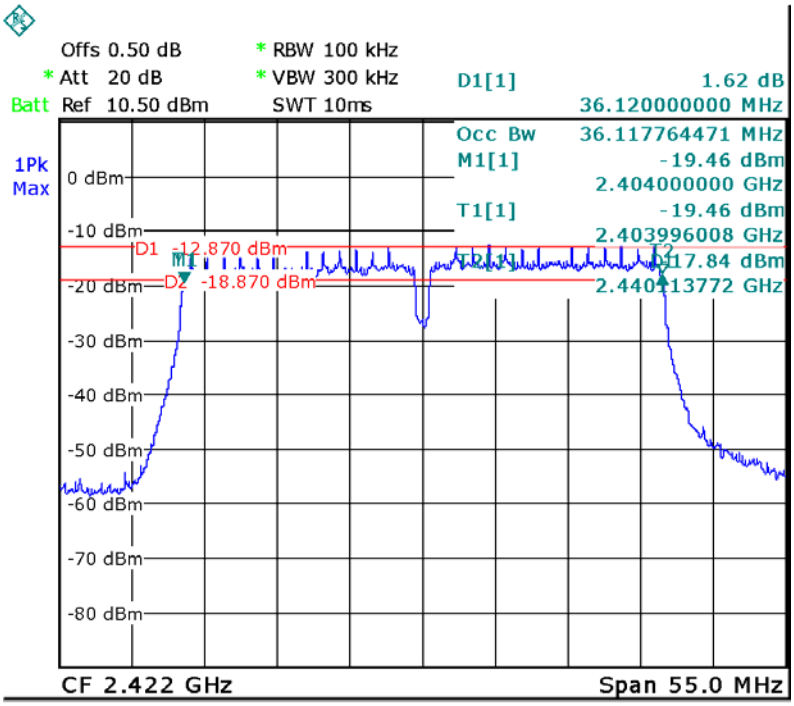
Mode: TX 11n HT20 channel 6



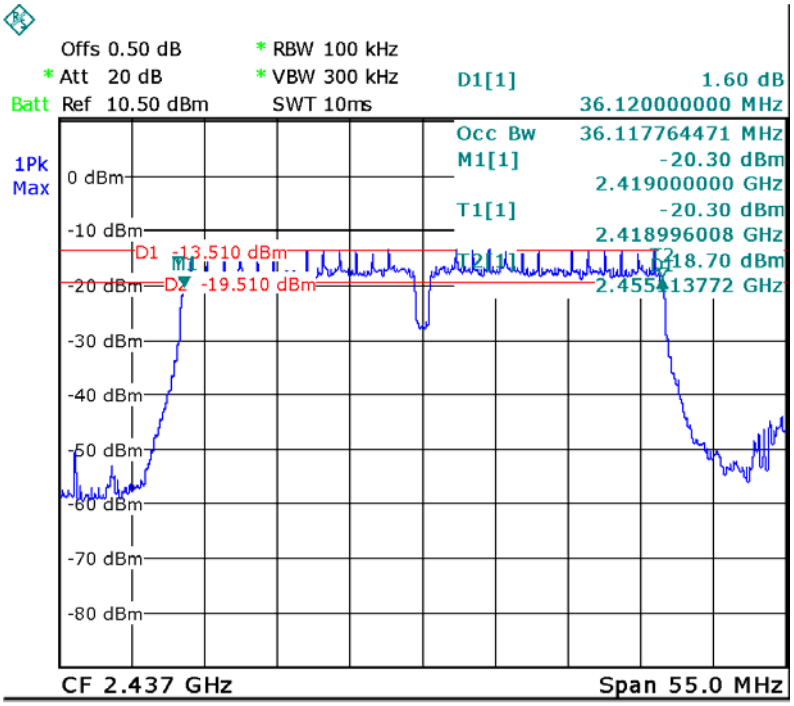
Mode: TX 11n HT20 channel 11



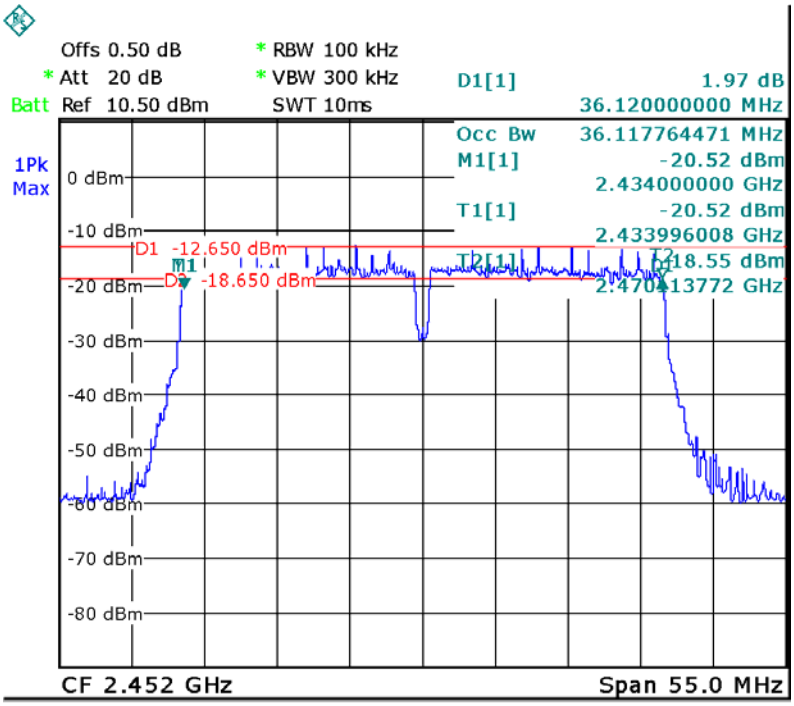
Mode: TX 11n HT40 channel 3



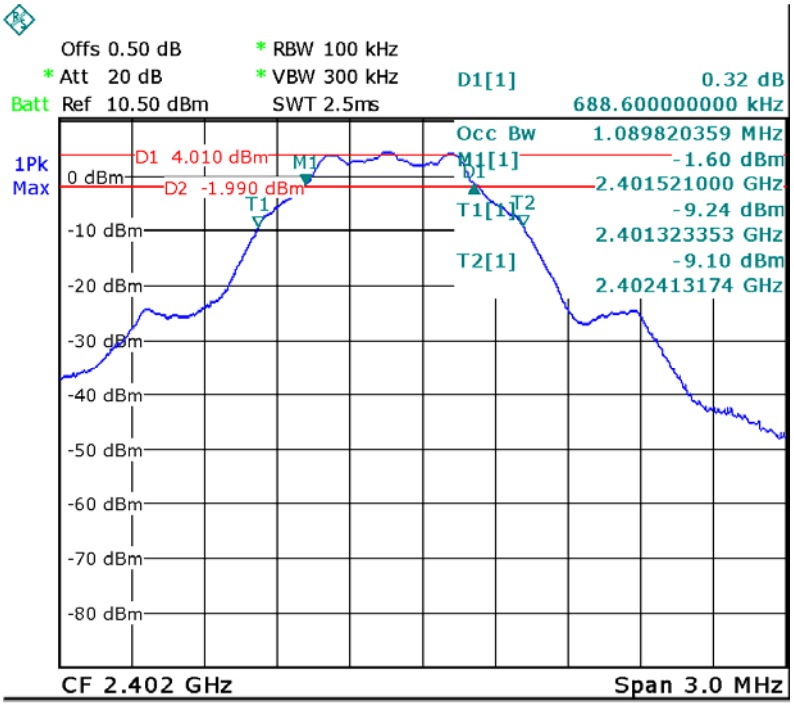
Mode: TX 11n HT40 channel 6



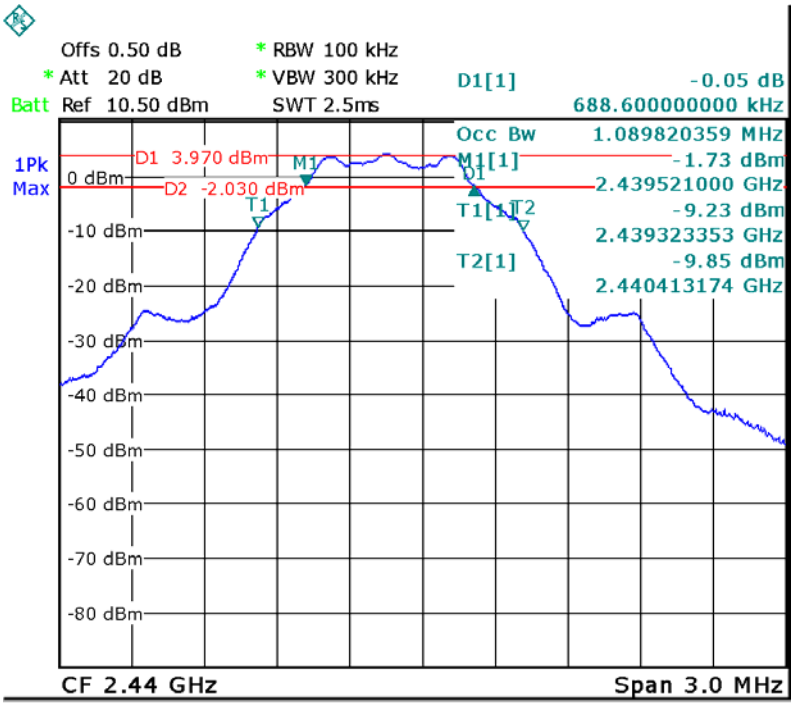
Mode: TX 11n HT40 channel 9



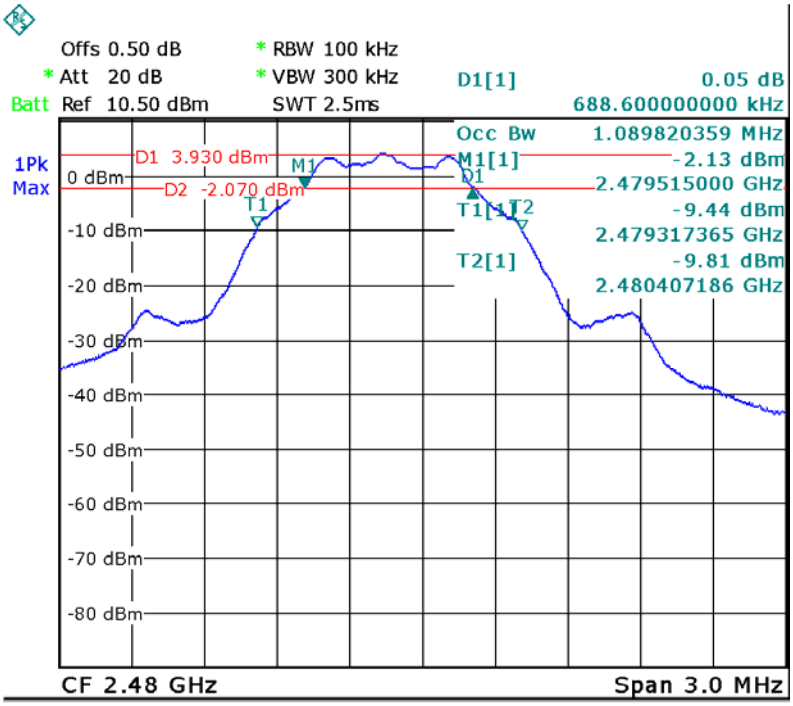
Bluetooth LE: channel 0



Bluetooth LE: channel 19



Bluetooth LE: channel 39



12 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016

12.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016

section 9.1.1 (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 9.1.2 (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 MHz.

b)Set the VBW ≥ 3 RBW

c)Set the span ≥ 1.5 x DTS bandwidth.

d)Detector = peak.

e)Sweep time = auto couple.

f)Trace mode = max hold.

g)Allow trace to fully stabilize.

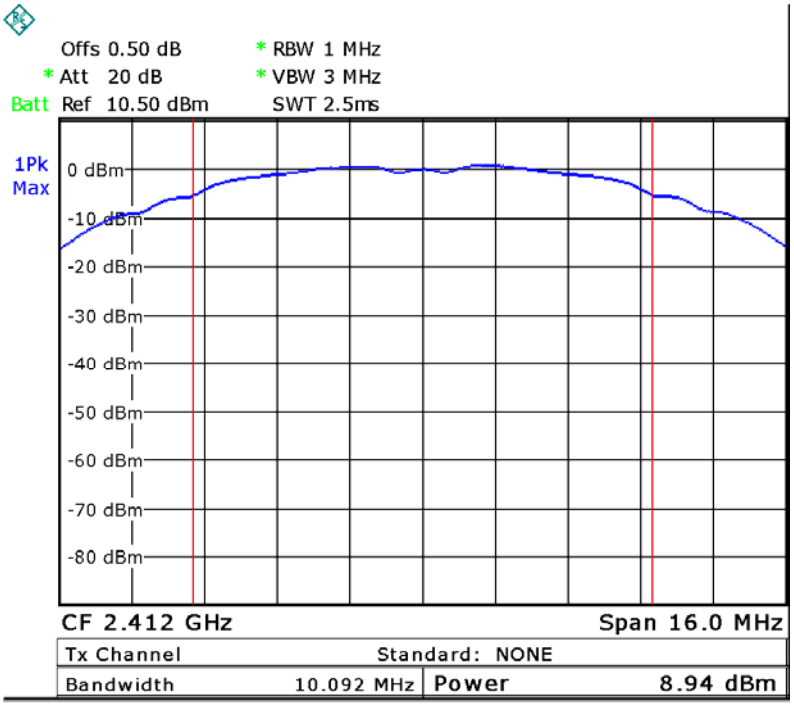
h)Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges (for some instruments, this may require a manual override to select peak detector). If the instrument does not have a band power function, sum the spectrum levels (in linear power units) at intervals equal to the RBW extending across the DTS bandwidth.

12.2 Test Result:

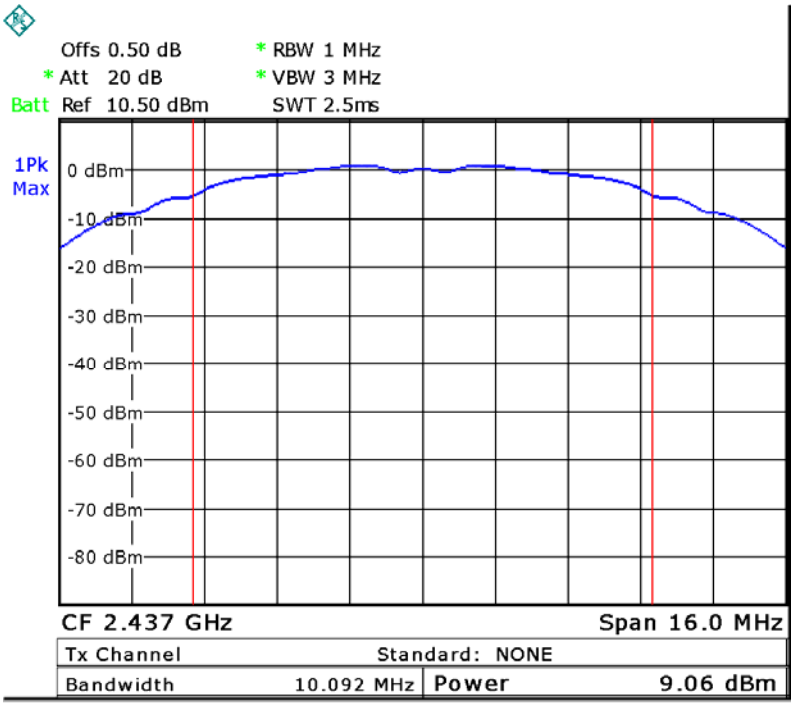
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	8.94	1W/30dBm
	Middle-2437	9.06	1W/30dBm
	High-2462	9.10	1W/30dBm
TX 11g	Low-2412	9.12	1W/30dBm
	Middle-2437	9.06	1W/30dBm
	High-2462	9.27	1W/30dBm
TX 11n HT20	Low-2412	9.23	1W/30dBm
	Middle-2437	9.19	1W/30dBm
	High-2462	9.40	1W/30dBm
TX 11n HT40	Low-2422	9.07	1W/30dBm
	Middle-2437	9.23	1W/30dBm
	High-2452	9.19	1W/30dBm
Bluetooth LE	Low-2402	4.30	1W/30dBm
	Middle-2440	4.65	1W/30dBm
	High-2480	4.30	1W/30dBm

Test Plot

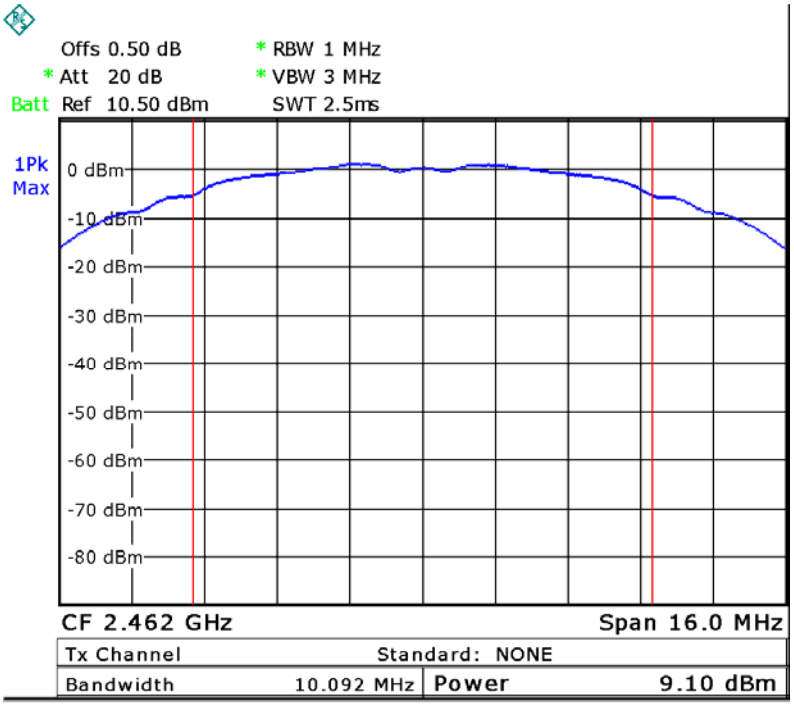
Mode: TX 11b channel 1



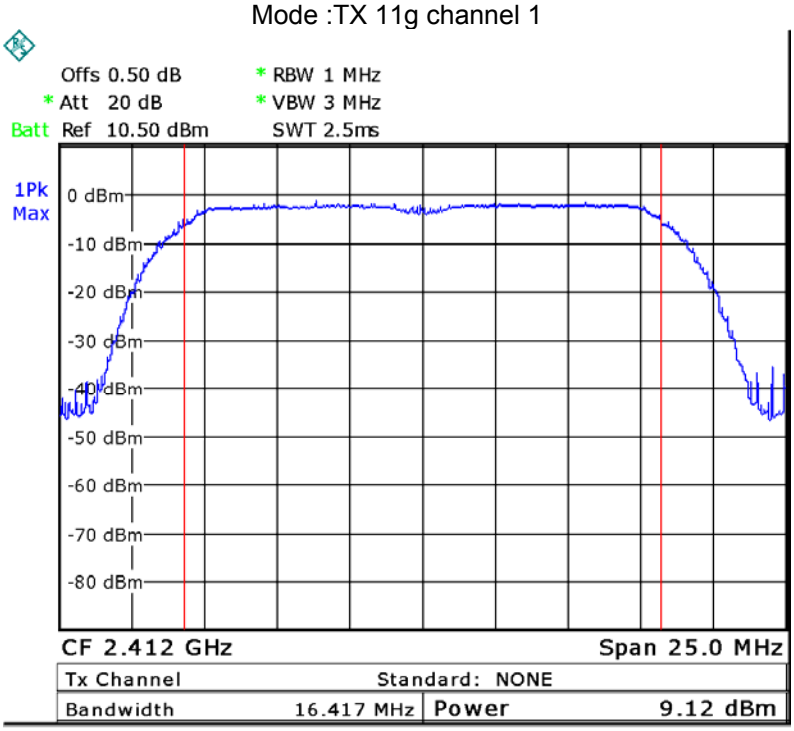
Mode: TX 11b channel 6



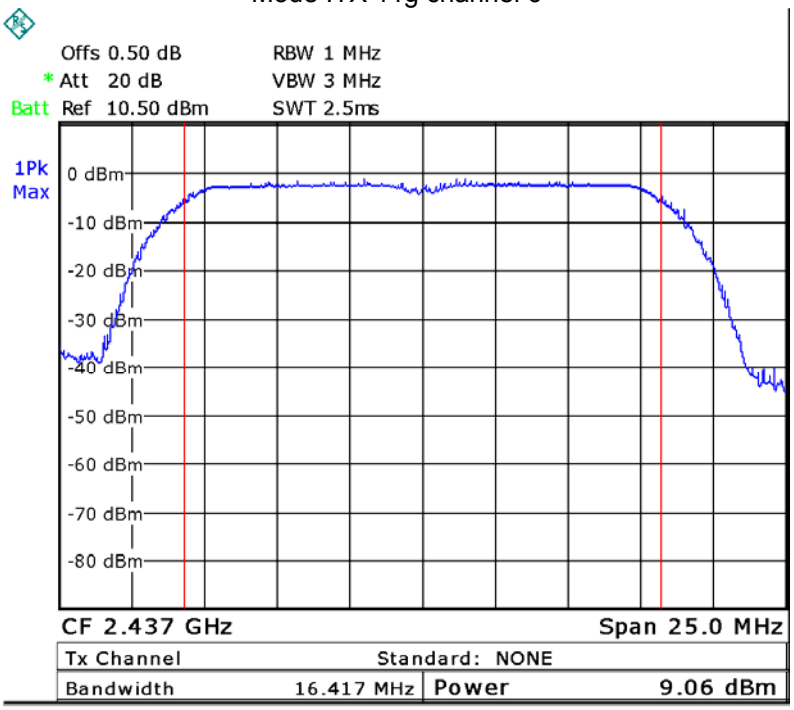
Mode: TX 11b channel 11



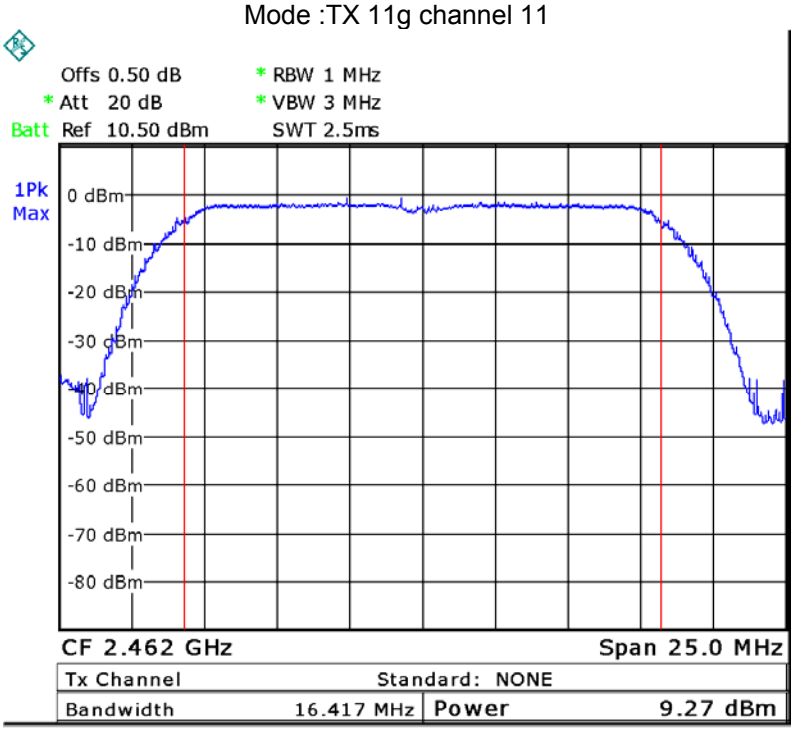
Mode :TX 11g channel 1



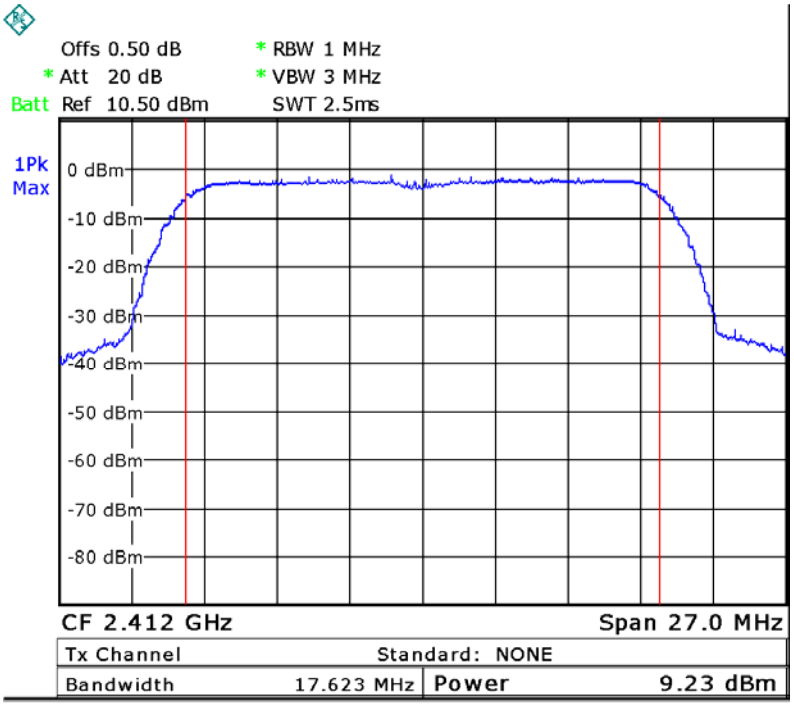
Mode :TX 11g channel 6



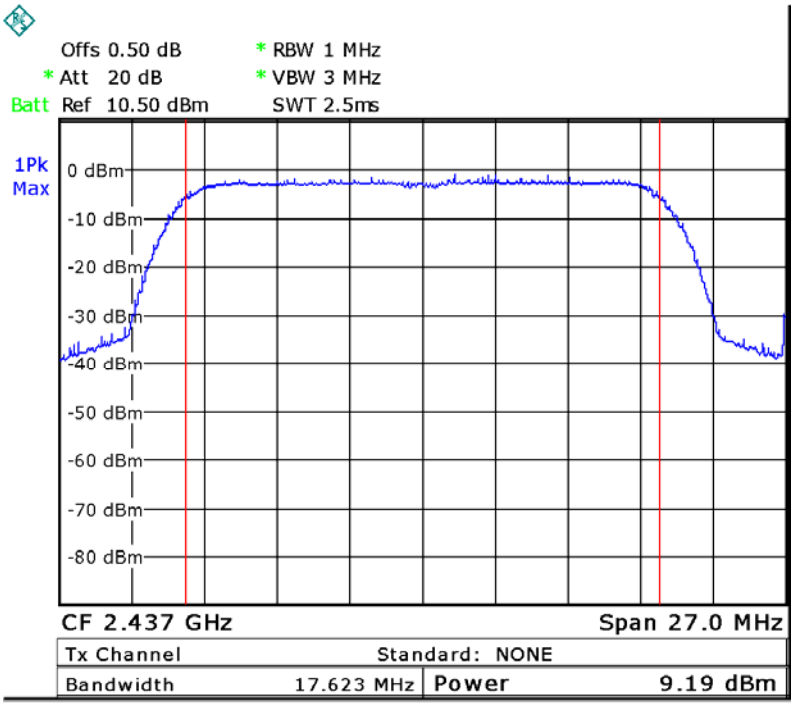
Mode :TX 11g channel 11



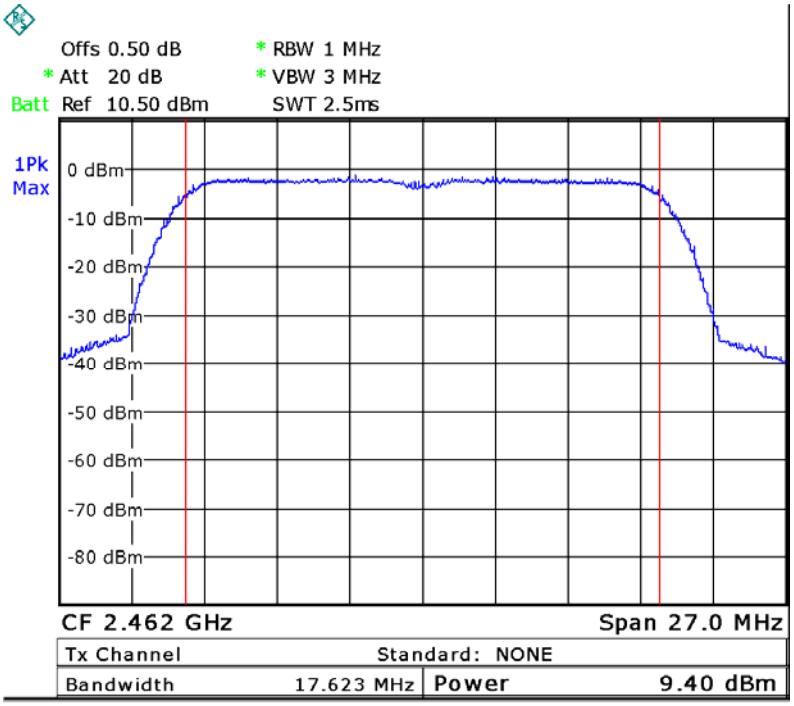
Mode: TX 11n HT20 channel 1



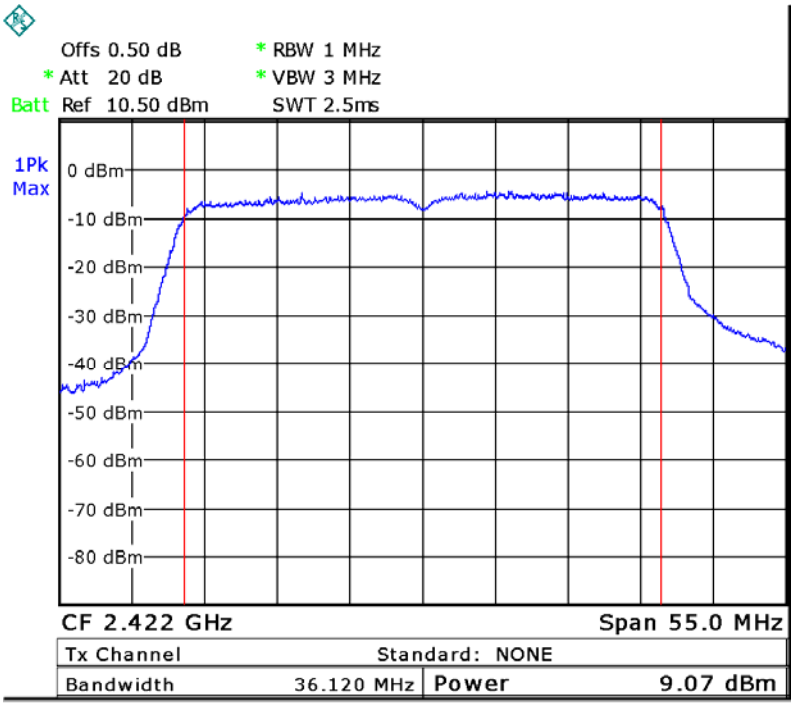
Mode: TX 11n HT20 channel 6



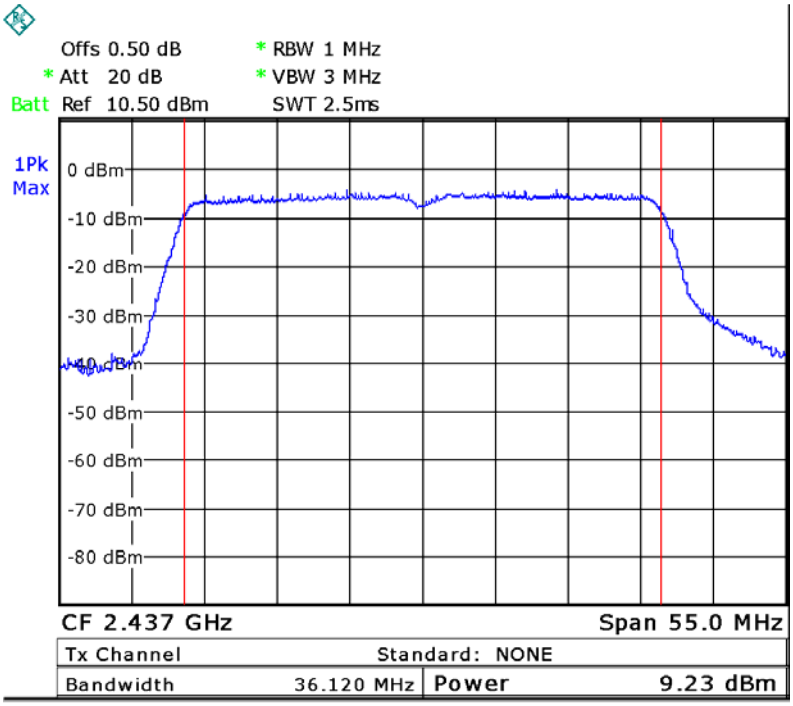
Mode: TX 11n HT20 channel 11



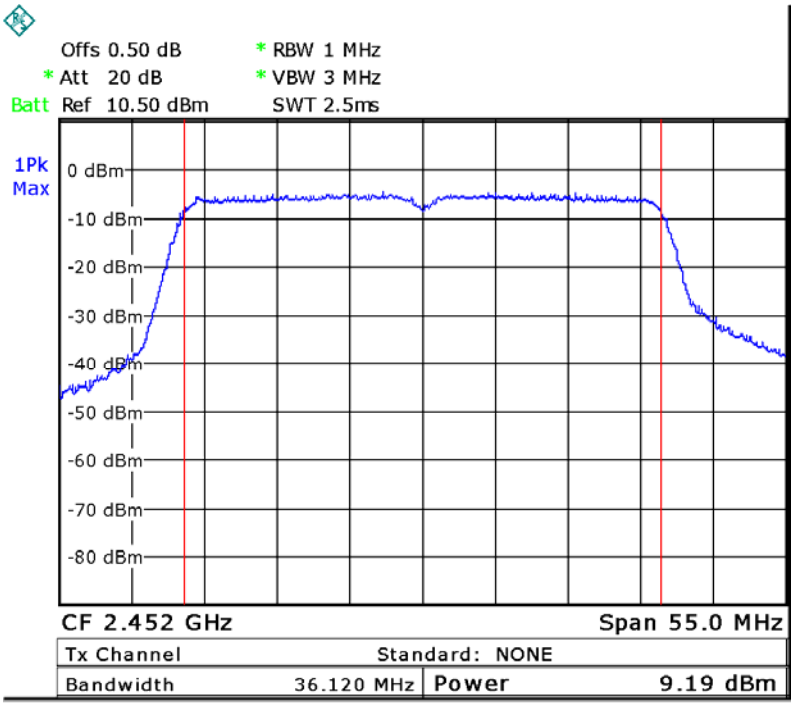
Mode: TX 11n HT40 channel 3



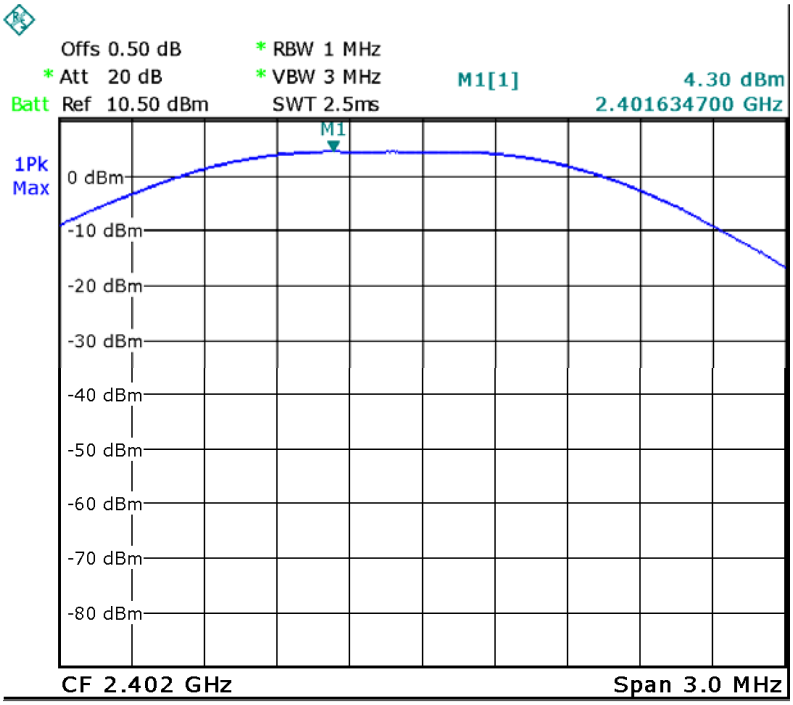
Mode: TX 11n HT40 channel 6



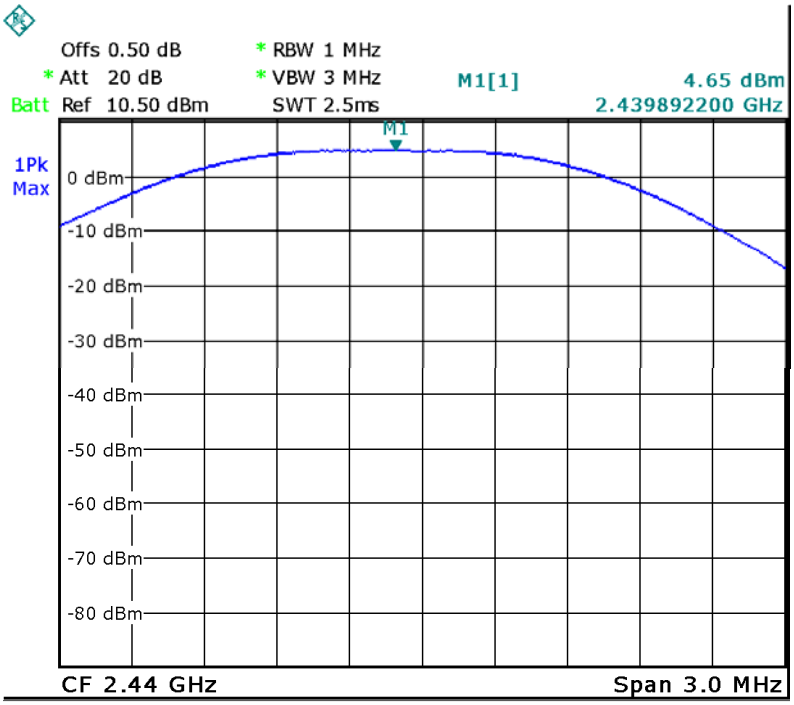
Mode: TX 11n HT40 channel 9



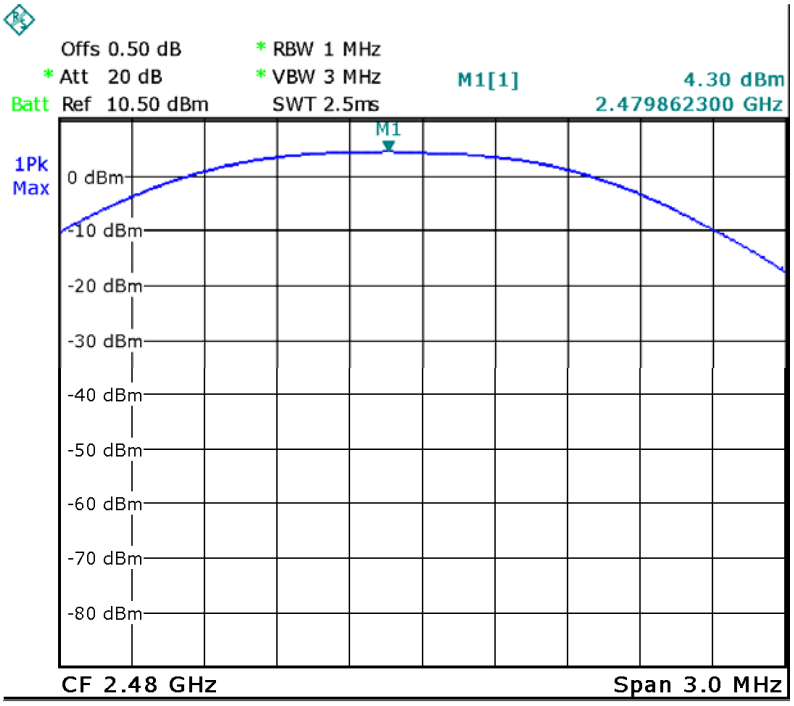
Bluetooth LE: channel 0



Bluetooth LE: channel 19



Bluetooth LE: channel 39



13 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016

13.1 Test Procedure:

KDB 558074 D01 DTS Meas Guidance v03r05 April 8, 2016 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.

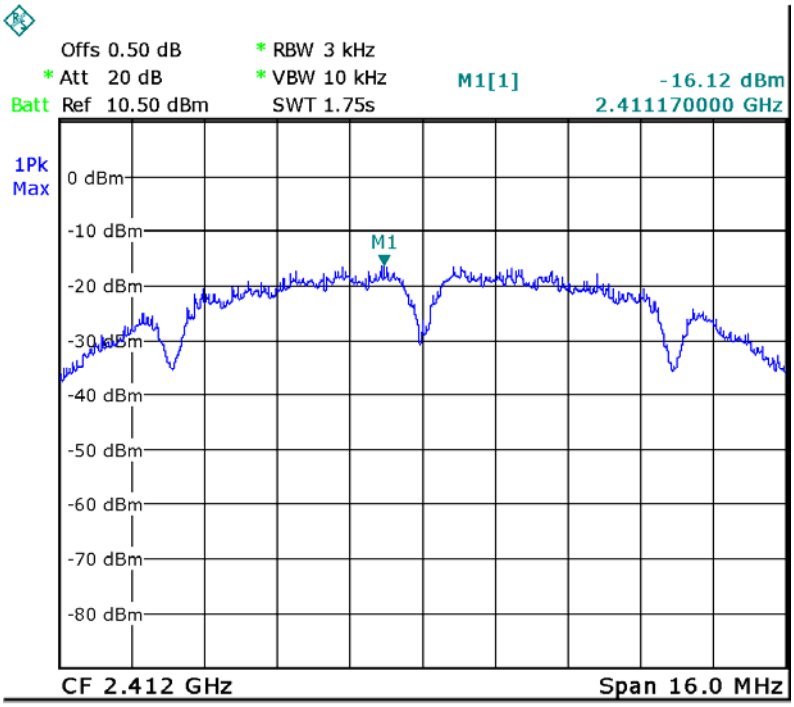
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

13.2 Test Result:

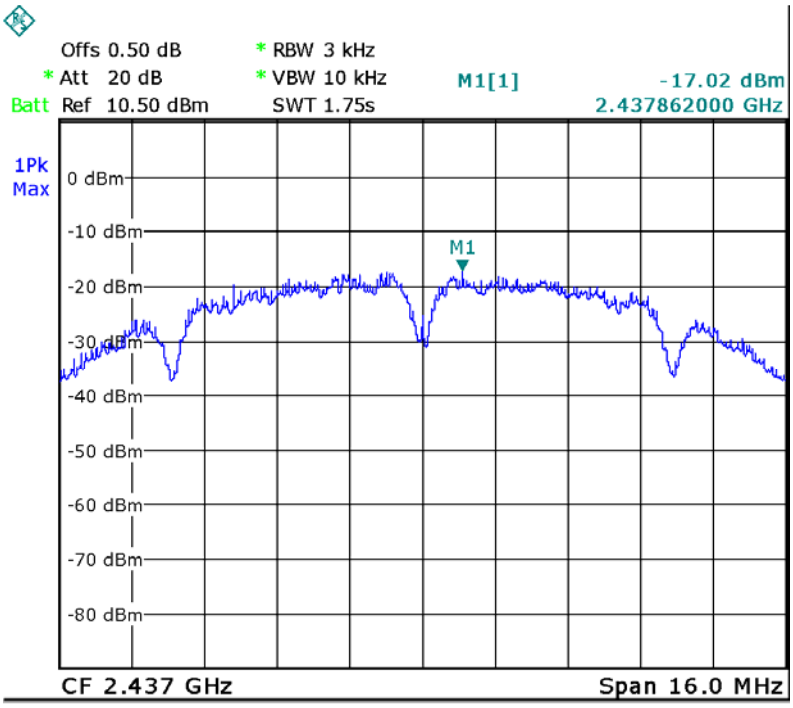
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-16.12	8dBm per 3kHz
	Middle-2437	-17.02	8dBm per 3kHz
	High-2462	-17.14	8dBm per 3kHz
TX 11g	Low-2412	-23.78	8dBm per 3kHz
	Middle-2437	-23.66	8dBm per 3kHz
	High-2462	-22.91	8dBm per 3kHz
TX 11n HT20	Low-2412	-23.94	8dBm per 3kHz
	Middle-2437	-24.70	8dBm per 3kHz
	High-2462	-24.78	8dBm per 3kHz
TX 11n HT40	Low-2422	-27.93	8dBm per 3kHz
	Middle-2437	-28.08	8dBm per 3kHz
	High-2452	-26.91	8dBm per 3kHz
Bluetooth LE	Low-2402	-10.22	8dBm per 3kHz
	Middle-2440	-9.85	8dBm per 3kHz
	High-2480	-10.47	8dBm per 3kHz

Test Plot

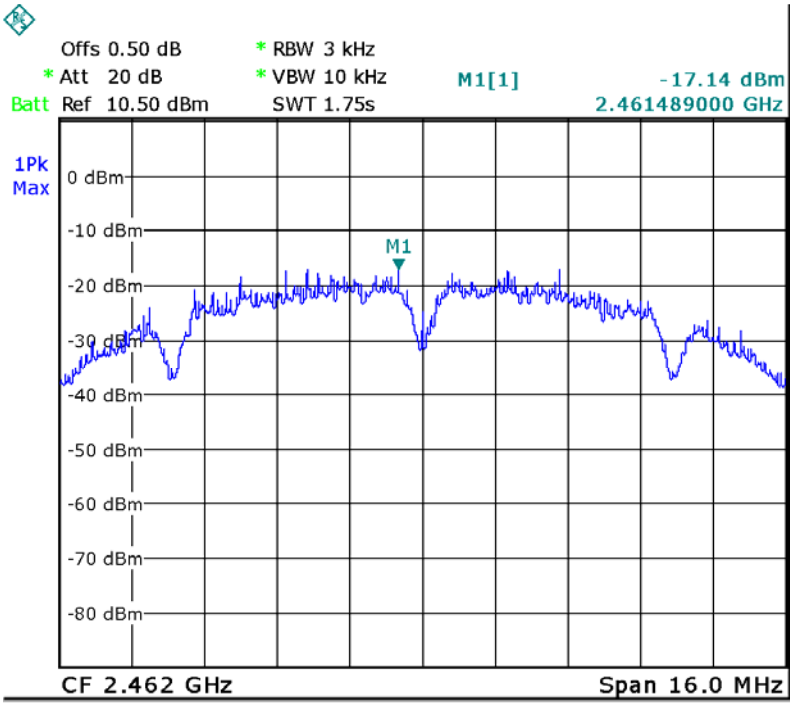
Mode: TX 11b channel 1



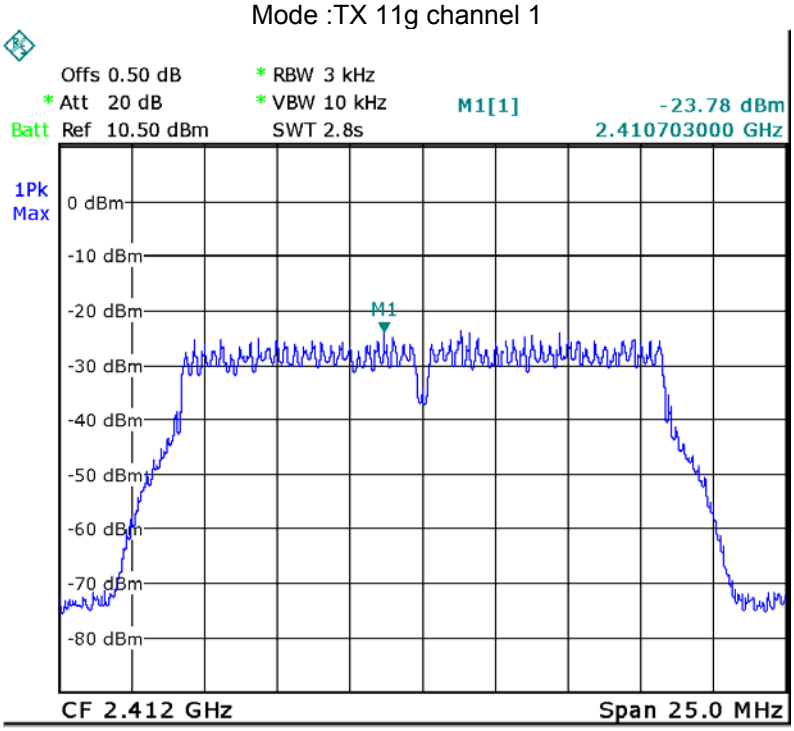
Mode: TX 11b channel 6



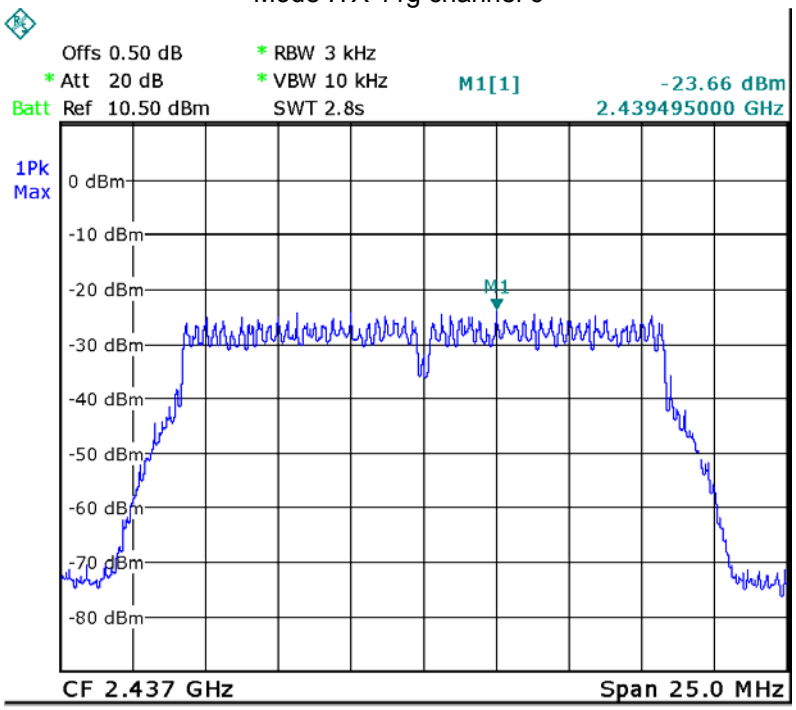
Mode: TX 11b channel 11



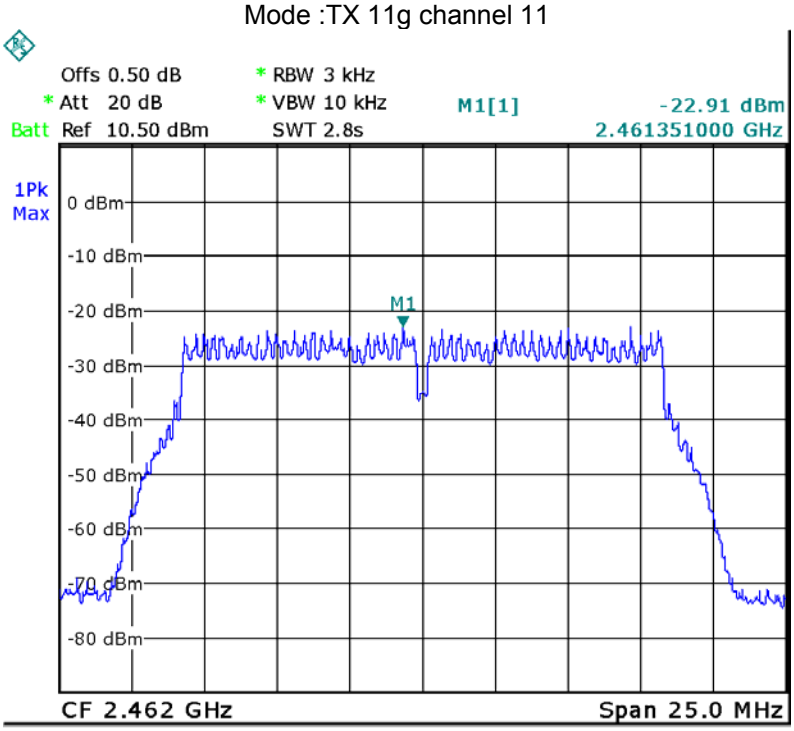
Mode :TX 11g channel 1



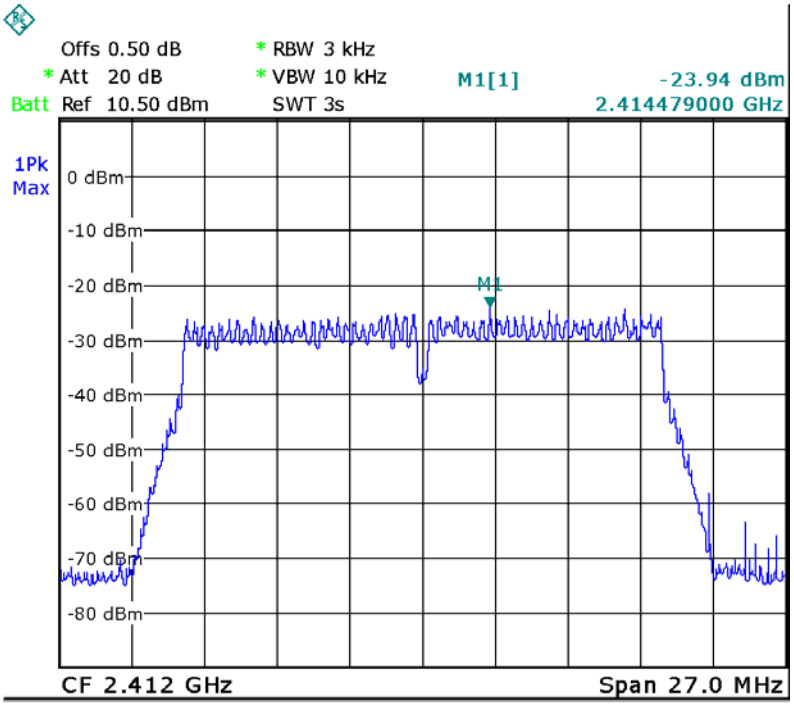
Mode :TX 11g channel 6



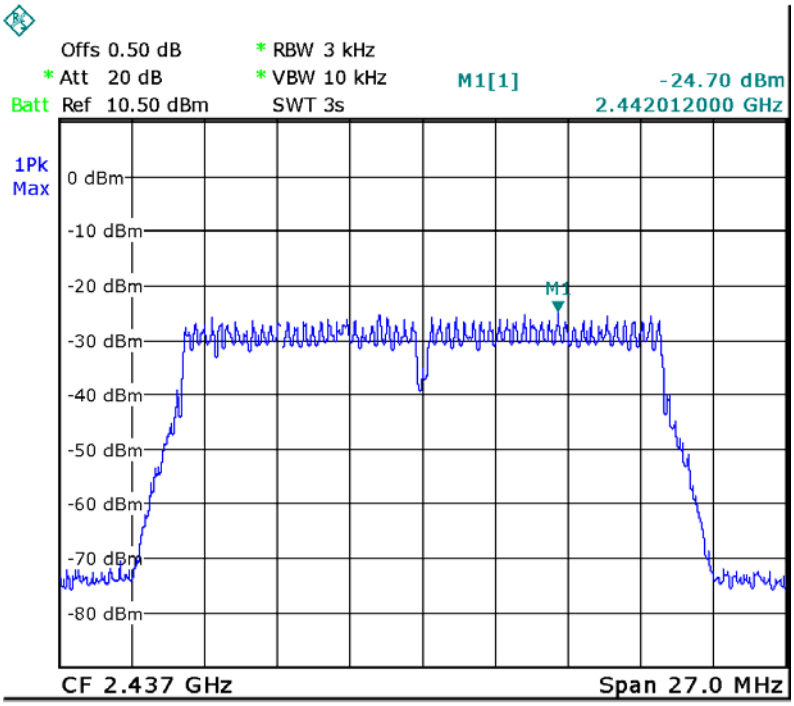
Mode :TX 11g channel 11



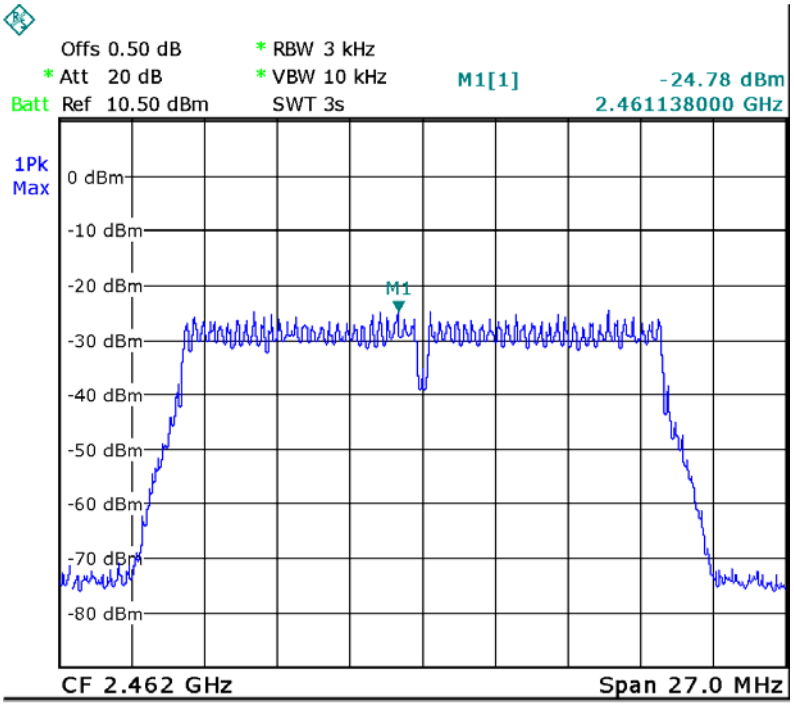
Mode: TX 11n HT20 channel 1



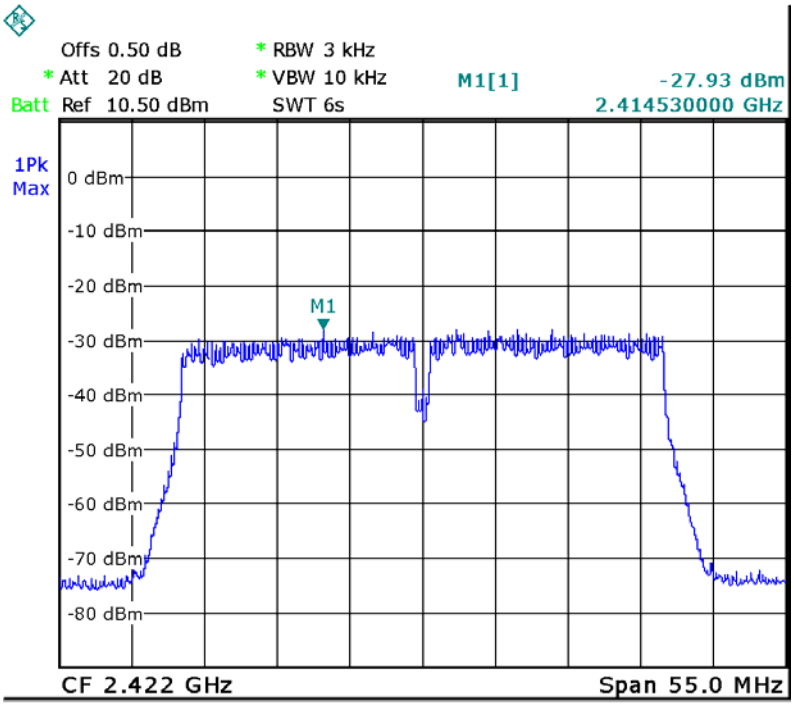
Mode: TX 11n HT20 channel 6



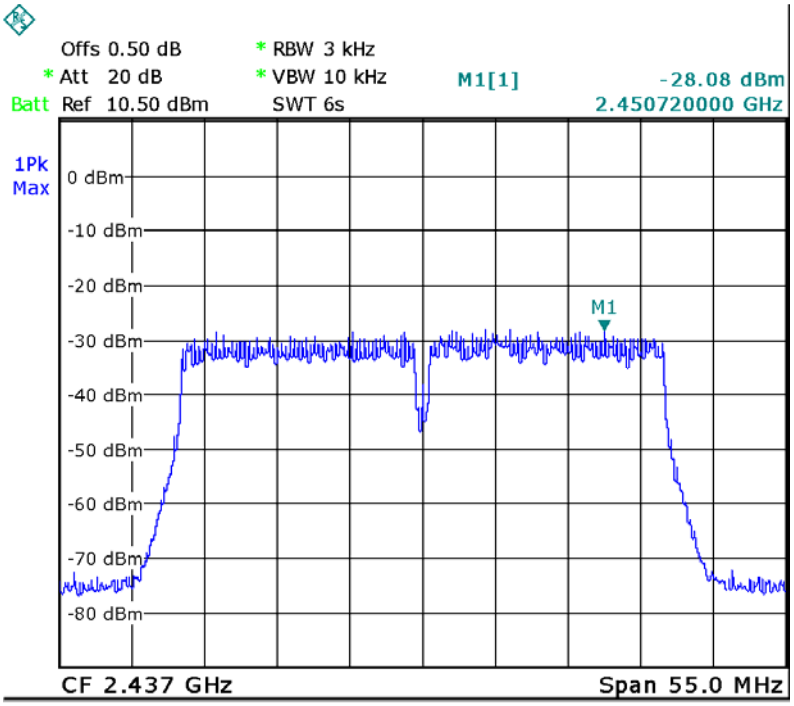
Mode: TX 11n HT20 channel 11



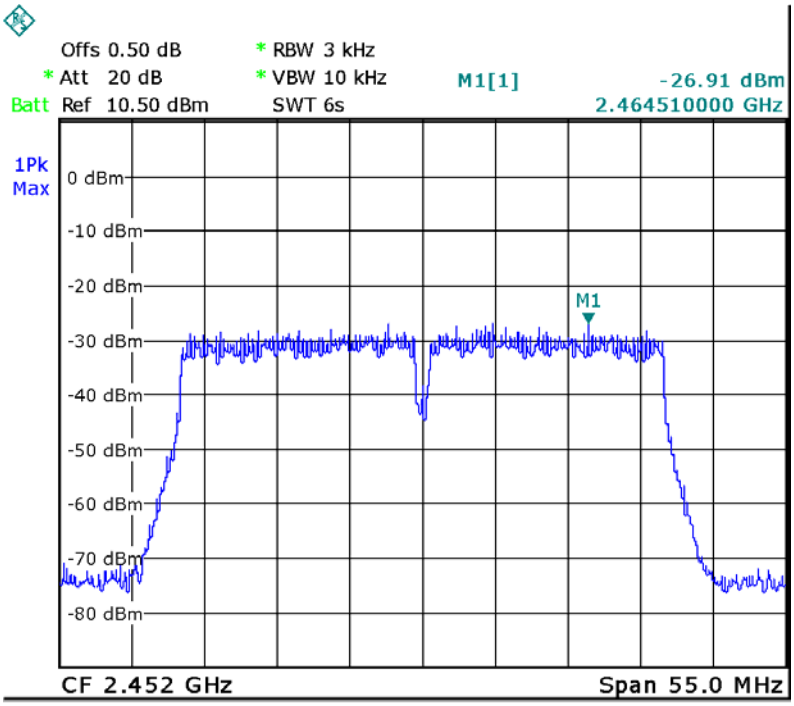
Mode: TX 11n HT40 channel 3



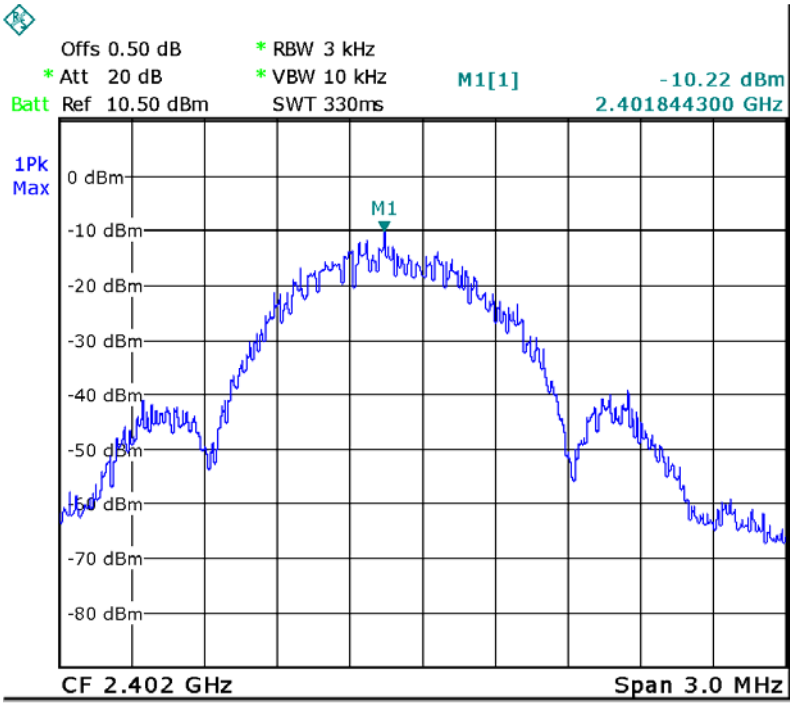
Mode: TX 11n HT40 channel 6



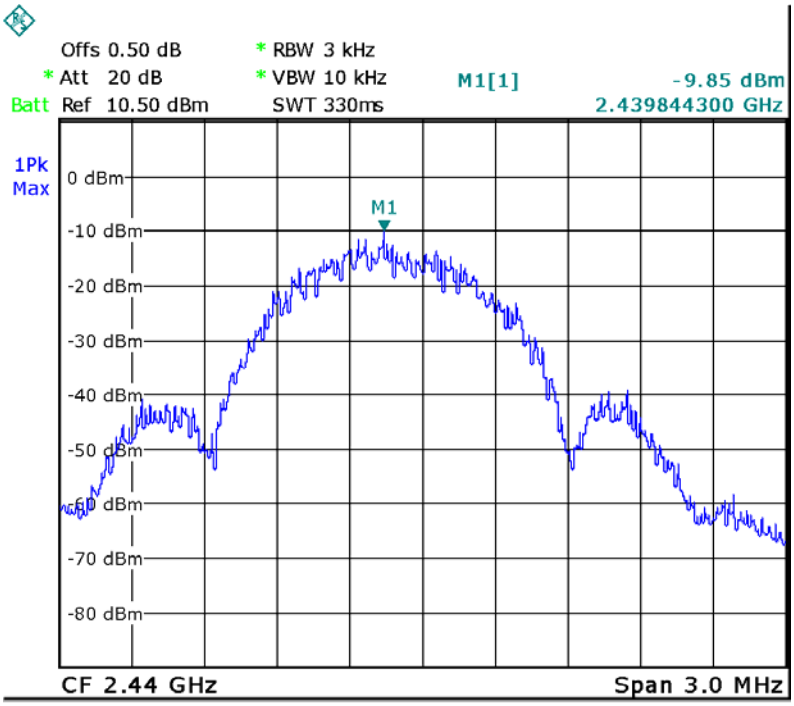
Mode: TX 11n HT40 channel 9



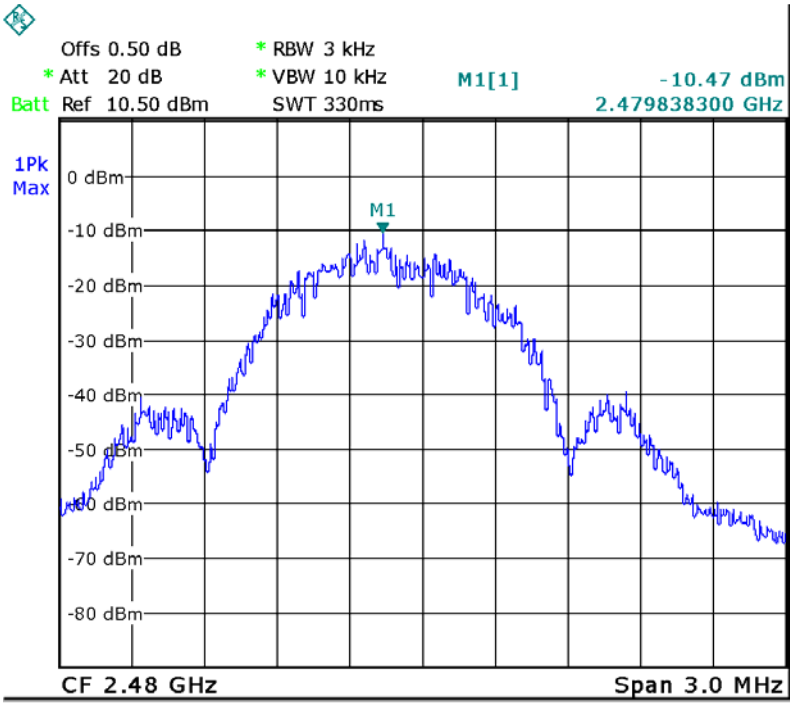
Bluetooth LE: channel 0



Bluetooth LE: channel 19



Bluetooth LE: channel 39



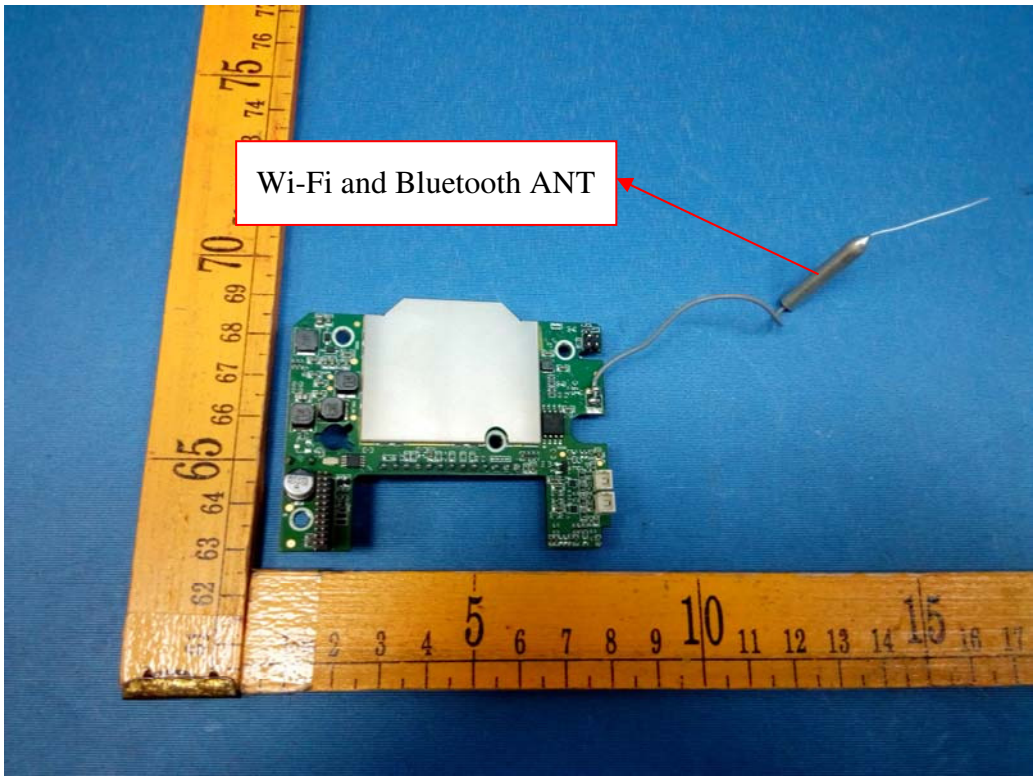
14 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Result:

The EUT has one Internal permanent antenna, the gain is 1.5dBi. meets the requirements of FCC 15.203.



15 RF Exposure

Note: Please refer to RF Exposure test report: WTS16S1165060-5E.

16 Photographs of test setup and EUT

Note: Please refer to appendix: WTS16S1165060E_Photo.

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