

TEST REPORT

Reference No. : WTF17S1092243-1E
FCC ID..... : BRWIX12
Applicant..... : Horizon Hobby, LLC
Address : 4105 Fieldstone Road, Champaign, Illinois 61821, United States
Manufacturer : Horizon Hobby, LLC
Address : 4105 Fieldstone Road, Champaign, Illinois 61821, United States
Product..... : iX12
Model(s)..... : iX12
Standards..... : FCC CFR47 Part 15 C Section 15.247:2017
Date of Receipt sample..... : 2017-10-12
Date of Test..... : 2017-10-13 to 2018-01-04
Date of Issue : 2018-01-06
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.

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1 Laboratories Introduction

Waltek Services Test Group Ltd. is one of the largest and the most comprehensive third party testing organizations in China, our headquarter located in Shenzhen (CNAS Registration No. L3110, A2LA Certificate Number: 4243.01) and have branches in Foshan (CNAS Registration No. L6478), Dongguan (CNAS Registration No. L9950), Zhongshan, Suzhou (CNAS Registration No. L7754), Ningbo and Hong Kong, Our test capability covered four large fields: safety test. Electronic Magnetic Compatibility(EMC), reliability and energy performance, Chemical test. 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), CPSC(Consumer Product Safety Commission), CEC(California energy efficiency), IC(Industry Canada) and ELI(Efficient Lighting Initiative). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as UL, Intertek(ETL-SEMKO), CSA, TÜV Rheinland, TÜV SÜD, etc. 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.

Waltek Services (Shenzhen) Co., Ltd.

A. Accreditations for Conformity Assessment (International)

Country/Region	Accreditation Body	Scope	Note
USA	CNAS (Registration No.: L3110) A2LA (Certificate No.: 4243.01)	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		International Services	WPC
Thailand	NTC		-
Singapore	IDA		-
Note: 1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476. 2. IC Canada Registration No.: 7760A			

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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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF17S1092243-1E	2017-10-12	2017-10-13 to 2018-01-04	2018-01-06	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product	: iX12
Model(s)	: iX12
Model Description	: N/A
Hardware Version	: SOM - UH1-SOM-DX12-REV03
Software Version	: v1.00.03

4.2 Details of E.U.T.

Bluetooth LE	
Operation Frequency:	2402-2480MHz
Type of Modulation:	GFSK
Wi-Fi	
Operation Frequency:	2412-2462MHz
Type of Modulation:	IEEE 802.11b (CCK/QPSK/BPSK, 11Mbps max.) IEEE 802.11g (BPSK/QPSK/16QAM/64QAM, 54Mbps max.) IEEE 802.11n (BPSK/QPSK/16QAM/64QAM, HT20:72Mbps max.)
2.4G Transmitter Module:	Contains FCC ID: BRWDAMTX12
2.4G Receiver Module:	Contains FCC ID: BRWDASRX20
Antenna installation:	Internal Integral Antenna for Bluetooth LE and Wi-Fi
Antenna Gain:	1.5dBi for Bluetooth LE and Wi-Fi
Ratings:	DC 3.7V by Transmitter Battery Pack 6000mAh, 22.2Wh Input: 5.0V  , 2A (Powered by Travel charger, Input: 100-240V~, 50/60Hz, 0.4A; Output: 5.0V  , 2A)

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	N/A

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

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
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

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum conducted (average) output power	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	BLE	1 Mbps	0/19/39	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	BLE	1 Mbps	0/19/39	TX
Band Edge	802.11b	11 Mbps	1/11	TX
	802.11g	54 Mbps	1/11	TX
	802.11n HT20	108 Mbps	1/11	TX
	BLE	1 Mbps	0/39	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	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.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	EMI Test Receiver	R&S	ESCI	100947	2017-09-12	2018-09-11
2	LISN	R&S	ENV216	100115	2017-09-12	2018-09-11
3	Cable	Top	TYPE16(3.5M)	-	2017-09-12	2018-09-11
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP30	100091	2017-04-29	2018-04-28
2	Broad-band Horn Antenna(1-18GHz)	SCHWARZBECK	BBHA 9120 D	667	2017-04-09	2018-04-08
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2017-04-13	2018-04-12
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2017-04-13	2018-04-12
5	Spectrum Analyzer	R&S	FSP40	100501	2017-10-20	2018-10-19
6	Broad-band Horn Antenna(18-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170651	2017-10-25	2018-10-24
7	Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	100472	2017-10-25	2018-10-24
8	Cable	Top	18-40GHz	-	2017-10-25	2018-10-24
3m Semi-anechoic Chamber for Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2017-04-13	2018-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2017-04-13	2018-04-12
3	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2017-04-09	2018-04-08
4	Amplifier	ANRITSU	MH648A	M43381	2017-04-13	2018-04-12
5	Cable	HUBER+SUHNER	CBL2	525178	2017-04-13	2018-04-12
6	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11

RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2017-09-12	2018-09-11
2	Spectrum Analyzer	R&S	FSL6	100959	2017-09-12	2018-09-11

5.2 Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-6}$
RF Power	± 1.0 dB
RF Power Density	± 2.2 dB
Radiated Spurious Emissions test	± 5.03 dB (30M~1000MHz)
	± 5.47 dB (1000M~25000MHz)
Conducted Spurious Emissions test	± 3.64 dB (AC mains 150KHz~30MHz)

6 Test Summary

Test Items	Test Requirement	Result
Radiated Emissions	15.247 15.205(a) 15.209(a)	Pass
Conducted Spurious emissions	15.247(d)	Pass
Conducted Emissions	15.207(a)	Pass
Bandwidth	15.247(a)(2)	Pass
Maximum conducted (average) 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
RF Exposure	1.1307(b)(1)	Pass
Note: Pass=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 (dB μ V)	
	Qsi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	50	60
5 to 30	60	50

7.1 E.U.T. Operation

Operating Environment :

Temperature: 21.5 °C

Humidity: 51.9 % RH

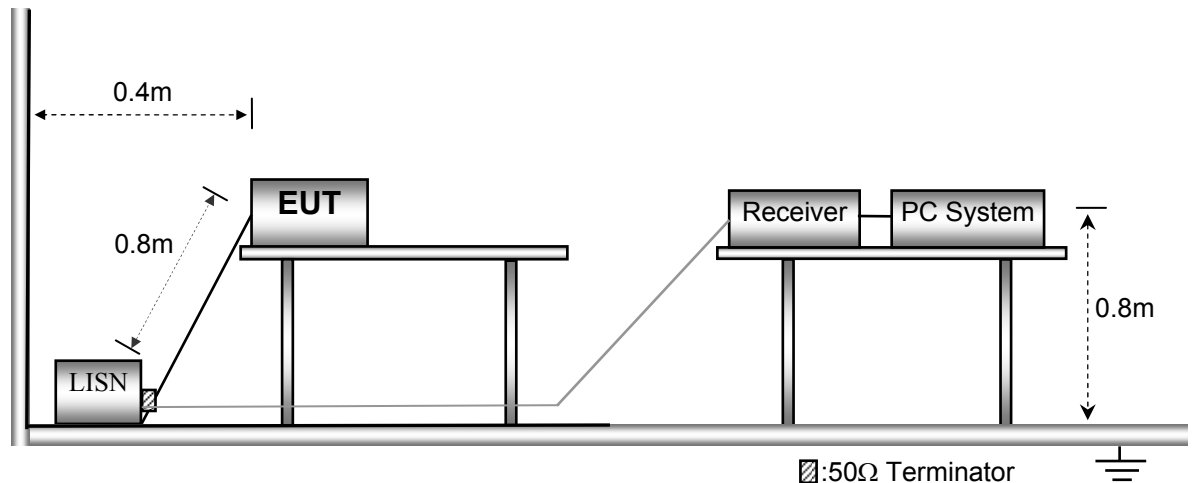
Atmospheric Pressure: 101.2kPa

EUT Operation :

The test was performed in Charging + Transmitting mode, the worst test data (11b Modulation Low Channel and GFSK modulation Low channel) were shown in the report.

7.2 EUT Setup

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



7.3 Measurement Description

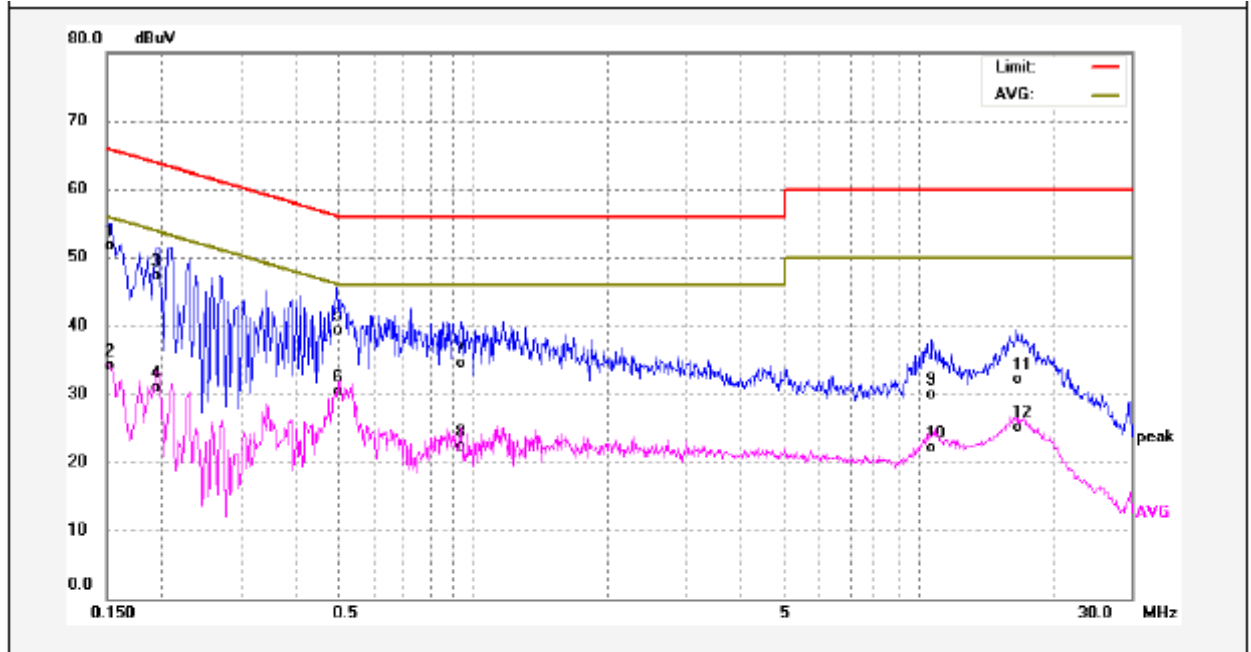
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

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

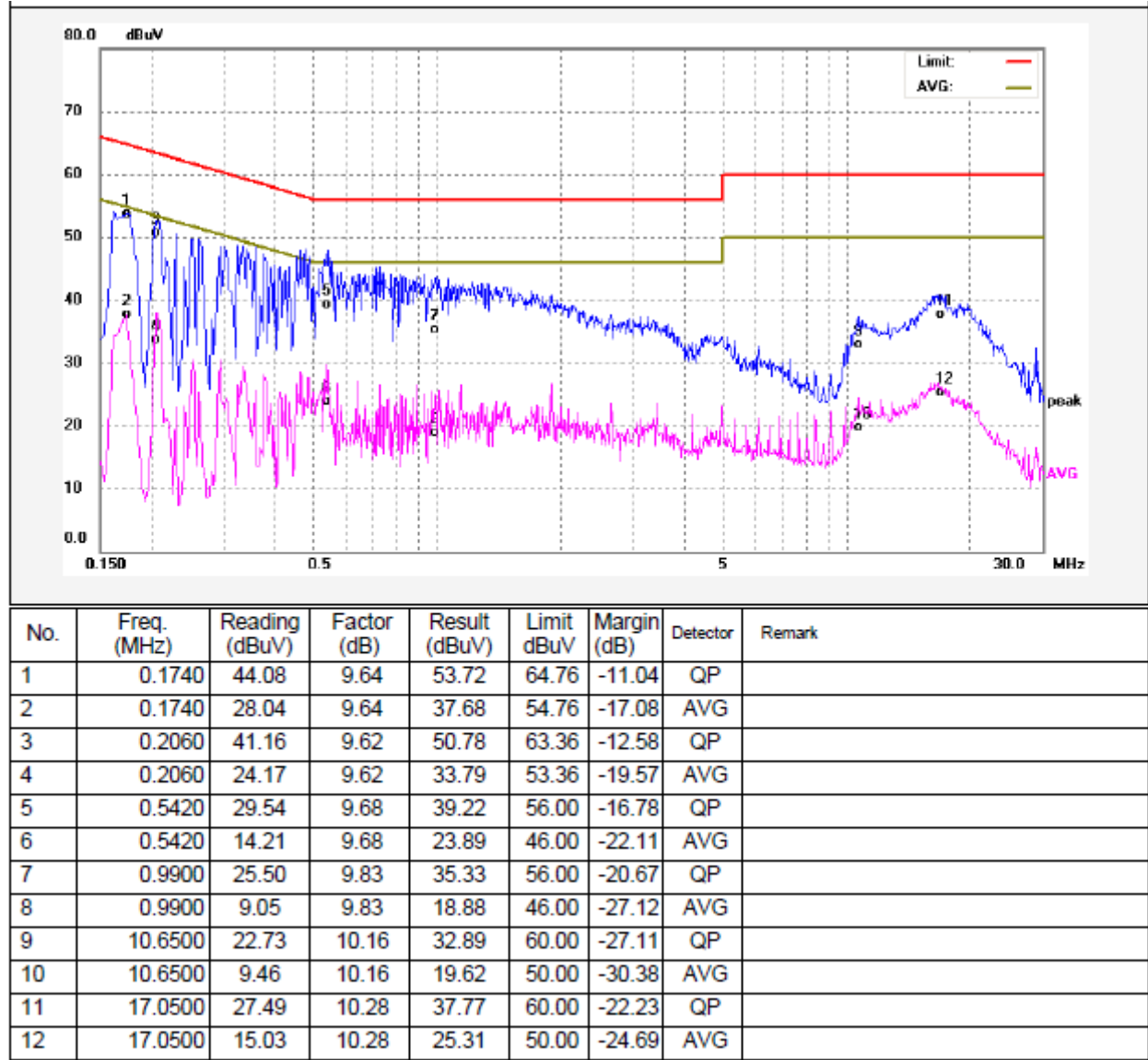
the worst test data 11b Modulation Low Channel

Live line:



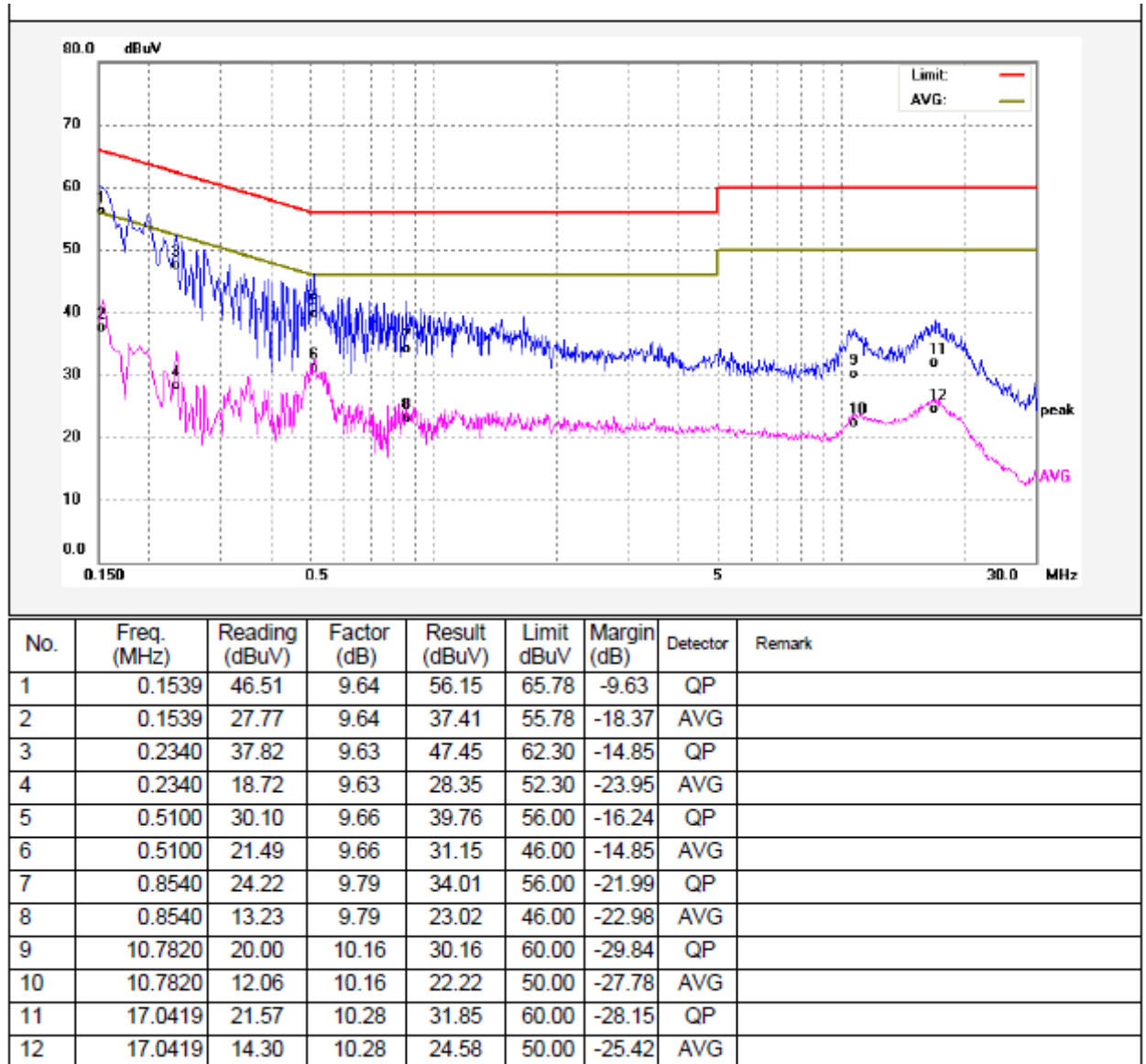
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	42.00	9.64	51.64	65.78	-14.14	QP	
2	0.1539	24.38	9.64	34.02	55.78	-21.76	AVG	
3	0.1940	37.69	9.62	47.31	63.86	-16.55	QP	
4	0.1940	21.29	9.62	30.91	53.86	-22.95	AVG	
5	0.4940	29.68	9.65	39.33	56.10	-16.77	QP	
6	0.4940	20.65	9.65	30.30	46.10	-15.80	AVG	
7	0.9420	24.76	9.81	34.57	56.00	-21.43	QP	
8	0.9420	12.50	9.81	22.31	46.00	-23.69	AVG	
9	10.6980	19.80	10.16	29.96	60.00	-30.04	QP	
10	10.6980	11.87	10.16	22.03	50.00	-27.97	AVG	
11	16.5580	21.85	10.27	32.12	60.00	-27.88	QP	
12	16.5580	14.80	10.27	25.07	50.00	-24.93	AVG	

Neutral line:

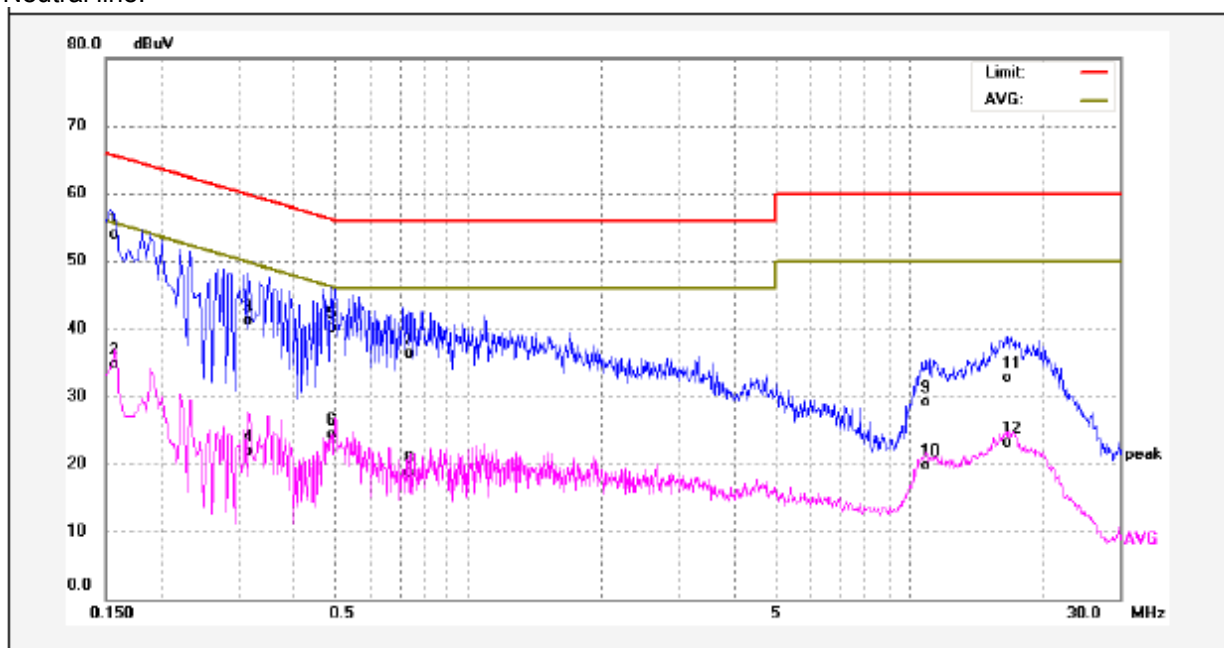


the worst test data GFSK Modulation Low Channel

Live line:



Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	0.1582	44.22	9.64	53.86	65.55	-11.69	QP	
2	0.1582	25.10	9.64	34.74	55.55	-20.81	AVG	
3	0.3180	31.55	9.64	41.19	59.76	-18.57	QP	
4	0.3180	12.19	9.64	21.83	49.76	-27.93	AVG	
5	0.4900	30.40	9.65	40.05	56.17	-16.12	QP	
6	0.4900	14.60	9.65	24.25	46.17	-21.92	AVG	
7	0.7340	26.56	9.74	36.30	56.00	-19.70	QP	
8	0.7340	8.95	9.74	18.69	46.00	-27.31	AVG	
9	10.9620	18.91	10.17	29.08	60.00	-30.92	QP	
10	10.9620	9.47	10.17	19.64	50.00	-30.36	AVG	
11	16.5780	22.34	10.27	32.61	60.00	-27.39	QP	
12	16.5780	12.79	10.27	23.06	50.00	-26.94	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	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
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

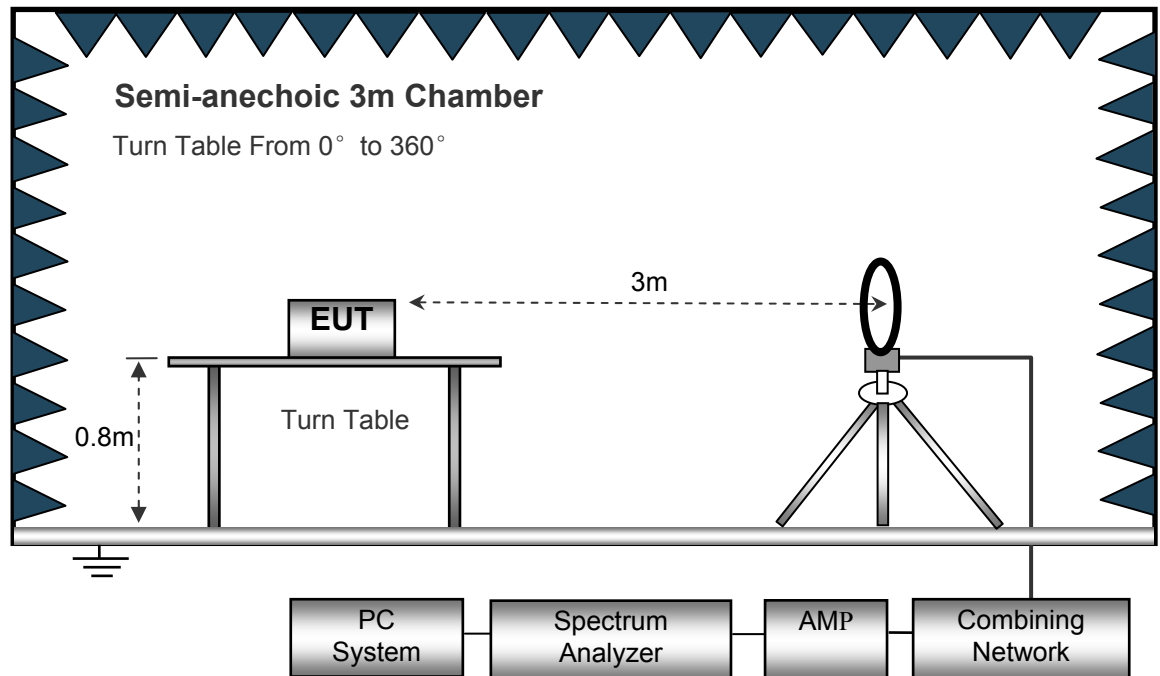
EUT Operation :

The test was performed in Charging + Transmitting mode, the test data were shown in the report.

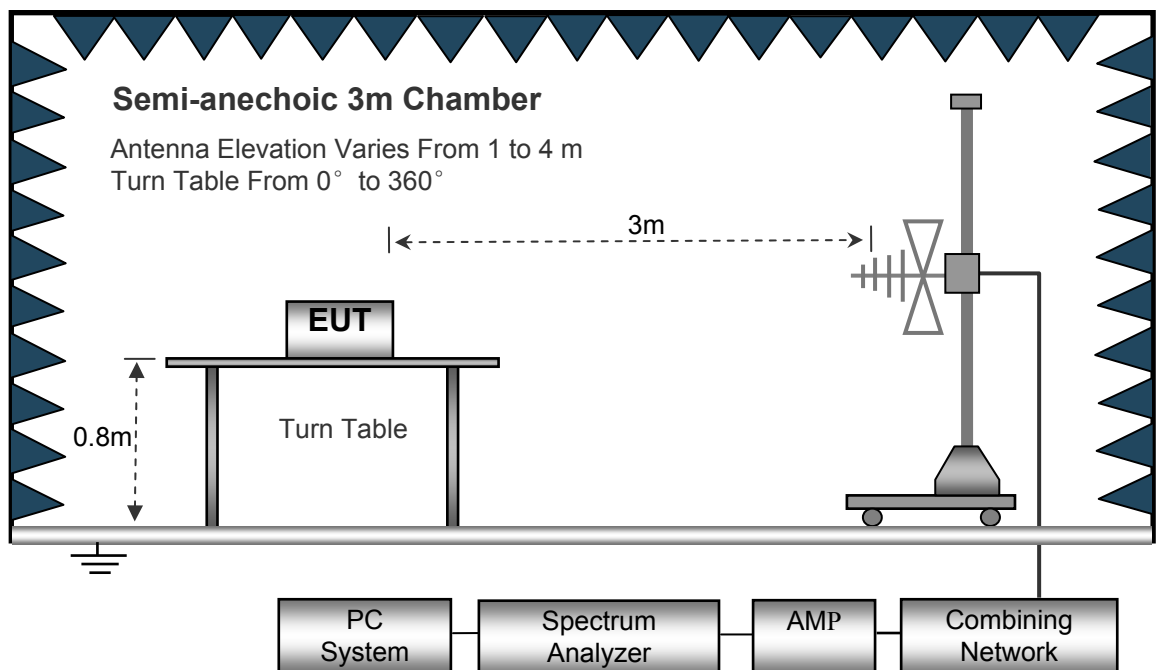
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

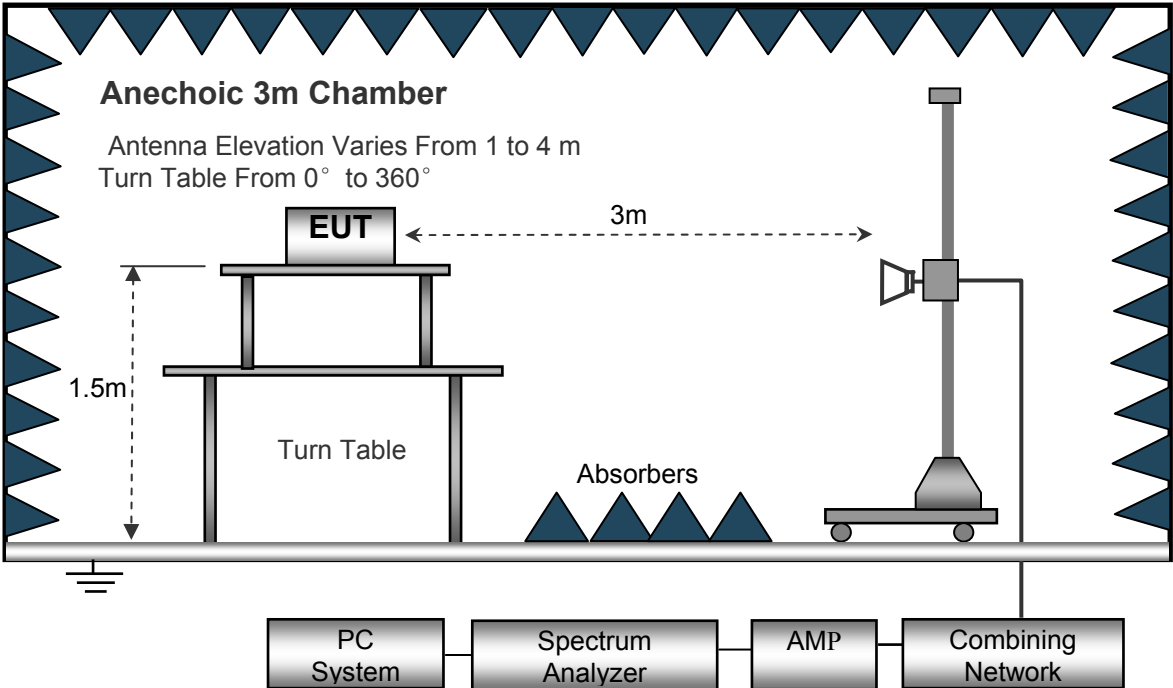
The test setup for emission measurement below 30MHz.



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
DetectorPK
Resolution Bandwidth.....100kHz
Video Bandwidth.....300kHz

Above 1GHz

Sweep Speed Auto
DetectorPK
Resolution Bandwidth.....1MHz
Video Bandwidth.....3MHz
DetectorAve.
Resolution Bandwidth.....1MHz
Video Bandwidth.....10Hz

8.4 Test Procedure

1. The EUT is placed on a turntable. For below 1GHz, the EUT is 0.8m above ground plane;
For above 1GHz, the EUT is 1.5m above ground plane.
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 X axis,so the worst data were shown as follow.
8. A 2.4GHz high -pass filter is used during 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

8.6 Summary of Test Results

Test Frequency : 9 kHz ~ 30 MHz

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

Test Frequency : 30MHz ~ 18GHz

Wi-Fi:

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									
36.51	39.65	QP	121	1.7	H	-11.62	28.03	40.00	-11.97
36.51	48.21	QP	90	2.0	V	-11.62	36.59	40.00	-3.41
4824.00	45.07	PK	181	1.5	V	-1.06	44.01	74.00	-29.99
4824.00	40.17	Ave	181	1.5	V	-1.06	39.11	54.00	-14.89
7236.00	44.35	PK	295	1.8	H	1.33	45.68	74.00	-28.32
7236.00	38.61	Ave	295	1.8	H	1.33	39.94	54.00	-14.06
2315.16	45.15	PK	148	1.0	V	-13.19	31.96	74.00	-42.04
2315.16	39.07	Ave	148	1.0	V	-13.19	25.88	54.00	-28.12
2357.27	42.93	PK	54	1.7	H	-13.14	29.79	74.00	-44.21
2357.27	36.39	Ave	54	1.7	H	-13.14	23.25	54.00	-30.75
2498.80	44.20	PK	91	1.5	V	-13.08	31.12	74.00	-42.88
2498.80	36.35	Ave	91	1.5	V	-13.08	23.27	54.00	-30.73

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									
36.51	39.78	QP	284	1.7	H	-11.62	28.16	40.00	-11.84
36.51	48.08	QP	55	1.5	V	-11.62	36.46	40.00	-3.54
4874.00	45.34	PK	224	1.7	V	-0.62	44.72	74.00	-29.28
4874.00	40.24	Ave	224	1.7	V	-0.62	39.62	54.00	-14.38
7311.00	43.28	PK	93	1.4	H	2.21	45.49	74.00	-28.51
7311.00	39.62	Ave	93	1.4	H	2.21	41.83	54.00	-12.17
2312.53	46.90	PK	85	1.2	V	-13.19	33.71	74.00	-40.29
2312.53	39.13	Ave	85	1.2	V	-13.19	25.94	54.00	-28.06
2385.78	43.79	PK	298	1.2	H	-13.14	30.65	74.00	-43.35
2385.78	36.50	Ave	298	1.2	H	-13.14	23.36	54.00	-30.64
2497.10	42.95	PK	133	1.1	V	-13.08	29.87	74.00	-44.13
2497.10	37.26	Ave	133	1.1	V	-13.08	24.18	54.00	-29.82

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									
36.51	39.77	QP	193	1.5	H	-11.62	28.15	40.00	-11.85
36.51	46.72	QP	4	1.9	V	-11.62	35.10	40.00	-4.90
4924.00	44.01	PK	90	1.4	V	-0.24	43.77	74.00	-30.23
4924.00	41.38	Ave	90	1.4	V	-0.24	41.14	54.00	-12.86
7386.00	43.90	PK	266	1.1	H	2.84	46.74	74.00	-27.26
7386.00	40.35	Ave	266	1.1	H	2.84	43.19	54.00	-10.81
2328.47	46.86	PK	305	1.6	V	-13.19	33.67	74.00	-40.33
2328.47	37.67	Ave	305	1.6	V	-13.19	24.48	54.00	-29.52
2358.13	42.95	PK	354	1.9	H	-13.14	29.81	74.00	-44.19
2358.13	38.19	Ave	354	1.9	H	-13.14	25.05	54.00	-28.95
2493.59	44.06	PK	85	1.1	V	-13.08	30.98	74.00	-43.02
2493.59	38.16	Ave	85	1.1	V	-13.08	25.08	54.00	-28.92

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
36.51	38.35	QP	116	1.9	H	-11.62	26.73	40.00	-13.27
36.51	47.91	QP	335	1.8	V	-11.62	36.29	40.00	-3.71
4824.00	43.24	PK	270	1.7	V	-1.06	42.18	74.00	-31.82
4824.00	40.17	Ave	270	1.7	V	-1.06	39.11	54.00	-14.89
7236.00	44.75	PK	4	1.2	H	1.33	46.08	74.00	-27.92
7236.00	39.85	Ave	4	1.2	H	1.33	41.18	54.00	-12.82
2334.78	46.49	PK	100	1.7	V	-13.19	33.30	74.00	-40.70
2334.78	38.09	Ave	100	1.7	V	-13.19	24.90	54.00	-29.10
2353.64	42.43	PK	4	1.2	H	-13.14	29.29	74.00	-44.71
2353.64	36.89	Ave	4	1.2	H	-13.14	23.75	54.00	-30.25
2492.42	44.27	PK	60	1.8	V	-13.08	31.19	74.00	-42.81
2492.42	37.95	Ave	60	1.8	V	-13.08	24.87	54.00	-29.13

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									
36.51	35.29	QP	63	1.2	H	-11.62	23.67	40.00	-16.33
36.51	47.21	QP	97	2.0	V	-11.62	35.59	40.00	-4.41
4874.00	43.53	PK	340	1.6	V	-0.62	42.91	74.00	-31.09
4874.00	45.18	Ave	340	1.6	V	-0.62	44.56	54.00	-9.44
7311.00	43.83	PK	69	1.4	H	2.21	46.04	74.00	-27.96
7311.00	38.31	Ave	69	1.4	H	2.21	40.52	54.00	-13.48
2348.63	46.74	PK	282	1.5	V	-13.19	33.55	74.00	-40.45
2348.63	37.25	Ave	282	1.5	V	-13.19	24.06	54.00	-29.94
2367.13	42.99	PK	277	2.0	H	-13.14	29.85	74.00	-44.15
2367.13	37.66	Ave	277	2.0	H	-13.14	24.52	54.00	-29.48
2485.28	44.56	PK	256	1.4	V	-13.08	31.48	74.00	-42.52
2485.28	36.78	Ave	256	1.4	V	-13.08	23.70	54.00	-30.30

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: High Channel 2462MHz									
36.51	35.16	QP	218	1.3	H	-11.62	23.54	40.00	-16.46
36.51	48.61	QP	305	1.6	V	-11.62	36.99	40.00	-3.01
4924.00	42.47	PK	55	1.7	V	-0.24	42.23	74.00	-31.77
4924.00	44.14	Ave	55	1.7	V	-0.24	43.90	54.00	-10.10
7386.00	42.97	PK	243	1.7	H	2.84	45.81	74.00	-28.19
7386.00	37.48	Ave	243	1.7	H	2.84	40.32	54.00	-13.68
2311.66	45.58	PK	47	1.9	V	-13.19	32.39	74.00	-41.61
2311.66	38.50	Ave	47	1.9	V	-13.19	25.31	54.00	-28.69
2385.97	42.21	PK	62	2.0	H	-13.14	29.07	74.00	-44.93
2385.97	37.30	Ave	62	2.0	H	-13.14	24.16	54.00	-29.84
2495.50	44.65	PK	116	1.7	V	-13.08	31.57	74.00	-42.43
2495.50	37.48	Ave	116	1.7	V	-13.08	24.40	54.00	-29.60

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									
36.51	39.45	QP	5	1.3	H	-11.62	27.83	40.00	-12.17
36.51	46.31	QP	285	1.6	V	-11.62	34.69	40.00	-5.31
4824.00	43.85	PK	13	1.5	V	-1.06	42.79	74.00	-31.21
4824.00	38.89	Ave	13	1.5	V	-1.06	37.83	54.00	-16.17
7236.00	45.25	PK	224	1.5	H	1.33	46.58	74.00	-27.42
7236.00	39.30	Ave	224	1.5	H	1.33	40.63	54.00	-13.37
2335.77	46.36	PK	309	1.1	V	-13.19	33.17	74.00	-40.83
2335.77	39.03	Ave	309	1.1	V	-13.19	25.84	54.00	-28.16
2375.58	42.93	PK	84	1.0	H	-13.14	29.79	74.00	-44.21
2375.58	37.96	Ave	84	1.0	H	-13.14	24.82	54.00	-29.18
2495.15	43.87	PK	271	1.9	V	-13.08	30.79	74.00	-43.21
2495.15	38.59	Ave	271	1.9	V	-13.08	25.51	54.00	-28.49

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									
36.51	40.32	QP	277	1.0	H	-11.62	28.70	40.00	-11.30
36.51	47.77	QP	180	1.1	V	-11.62	36.15	40.00	-3.85
4874.00	43.05	PK	257	1.1	V	-0.62	42.43	74.00	-31.57
4874.00	39.88	Ave	257	1.1	V	-0.62	39.26	54.00	-14.74
7311.00	46.11	PK	72	1.6	H	2.21	48.32	74.00	-25.68
7311.00	37.83	Ave	72	1.6	H	2.21	40.04	54.00	-13.96
2335.01	45.78	PK	285	1.1	V	-13.19	32.59	74.00	-41.41
2335.01	38.70	Ave	285	1.1	V	-13.19	25.51	54.00	-28.49
2352.45	44.14	PK	40	1.6	H	-13.14	31.00	74.00	-43.00
2352.45	37.50	Ave	40	1.6	H	-13.14	24.36	54.00	-29.64
2485.25	43.56	PK	220	1.3	V	-13.08	30.48	74.00	-43.52
2485.25	38.16	Ave	220	1.3	V	-13.08	25.08	54.00	-28.92

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: High Channel 2462MHz									
36.51	40.49	QP	71	1.2	H	-11.62	28.87	40.00	-11.13
36.51	47.93	QP	353	1.1	V	-11.62	36.31	40.00	-3.69
4924.00	42.40	PK	190	1.3	V	-0.24	42.16	74.00	-31.84
4924.00	40.74	Ave	190	1.3	V	-0.24	40.50	54.00	-13.50
7386.00	44.84	PK	84	1.5	H	2.84	47.68	74.00	-26.32
7386.00	38.15	Ave	84	1.5	H	2.84	40.99	54.00	-13.01
2316.58	46.21	PK	108	1.4	V	-13.19	33.02	74.00	-40.98
2316.58	38.62	Ave	108	1.4	V	-13.19	25.43	54.00	-28.57
2382.66	44.12	PK	39	1.8	H	-13.14	30.98	74.00	-43.02
2382.66	37.38	Ave	39	1.8	H	-13.14	24.24	54.00	-29.76
2494.49	44.94	PK	17	1.6	V	-13.08	31.86	74.00	-42.14
2494.49	38.85	Ave	17	1.6	V	-13.08	25.77	54.00	-28.23

Bluetooth LE:

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)
GFSK Low Channel 2402MHz									
36.51	38.61	QP	191	1.3	H	-11.62	26.99	40.00	-13.01
36.51	47.36	QP	267	1.5	V	-11.62	35.74	40.00	-4.26
4804.00	46.15	PK	135	1.4	V	-1.06	45.09	74.00	-28.91
4804.00	43.52	Ave	135	1.4	V	-1.06	42.46	54.00	-11.54
7206.00	40.62	PK	119	1.9	H	1.33	41.95	74.00	-32.05
7206.00	35.37	Ave	119	1.9	H	1.33	36.70	54.00	-17.30
2344.59	46.88	PK	80	1.3	V	-13.19	33.69	74.00	-40.31
2344.59	37.20	Ave	80	1.3	V	-13.19	24.01	54.00	-29.99
2368.56	44.03	PK	130	1.6	H	-13.14	30.89	74.00	-43.11
2368.56	37.68	Ave	130	1.6	H	-13.14	24.54	54.00	-29.46
2491.12	44.46	PK	108	1.3	V	-13.08	31.38	74.00	-42.62
2491.12	36.14	Ave	108	1.3	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)
GFSK Middle Channel 2440MHz									
36.51	37.92	QP	126	1.4	H	-11.62	26.30	40.00	-13.70
36.51	46.07	QP	237	1.8	V	-11.62	34.45	40.00	-5.55
4880.00	45.07	PK	91	1.2	V	-0.62	44.45	74.00	-29.55
4880.00	44.05	Ave	91	1.2	V	-0.62	43.43	54.00	-10.57
7320.00	41.35	PK	24	1.4	H	2.21	43.56	74.00	-30.44
7320.00	34.49	Ave	24	1.4	H	2.21	36.70	54.00	-17.30
2347.29	45.61	PK	288	1.9	V	-13.19	32.42	74.00	-41.58
2347.29	39.59	Ave	288	1.9	V	-13.19	26.40	54.00	-27.60
2382.98	42.82	PK	352	1.7	H	-13.14	29.68	74.00	-44.32
2382.98	36.31	Ave	352	1.7	H	-13.14	23.17	54.00	-30.83
2485.21	44.37	PK	276	1.3	V	-13.08	31.29	74.00	-42.71
2485.21	36.74	Ave	276	1.3	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)
GFSK High Channel 2480MHz									
36.51	38.66	QP	102	1.9	H	-11.62	27.04	40.00	-12.96
36.51	46.66	QP	224	1.9	V	-11.62	35.04	40.00	-4.96
4960.00	45.18	PK	157	1.0	V	-0.24	44.94	74.00	-29.06
4960.00	43.89	Ave	157	1.0	V	-0.24	43.65	54.00	-10.35
7440.00	42.74	PK	171	1.7	H	2.84	45.58	74.00	-28.42
7440.00	35.23	Ave	171	1.7	H	2.84	38.07	54.00	-15.93
2316.77	45.49	PK	357	1.0	V	-13.19	32.30	74.00	-41.70
2316.77	39.85	Ave	357	1.0	V	-13.19	26.66	54.00	-27.34
2373.49	45.00	PK	314	1.3	H	-13.14	31.86	74.00	-42.14
2373.49	38.46	Ave	314	1.3	H	-13.14	25.32	54.00	-28.68
2494.79	42.74	PK	323	1.6	V	-13.08	29.66	74.00	-44.34
2494.79	37.09	Ave	323	1.6	V	-13.08	24.01	54.00	-29.99

Test Frequency: 18GHz~25GHz

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

9 Conducted Spurious Emissions

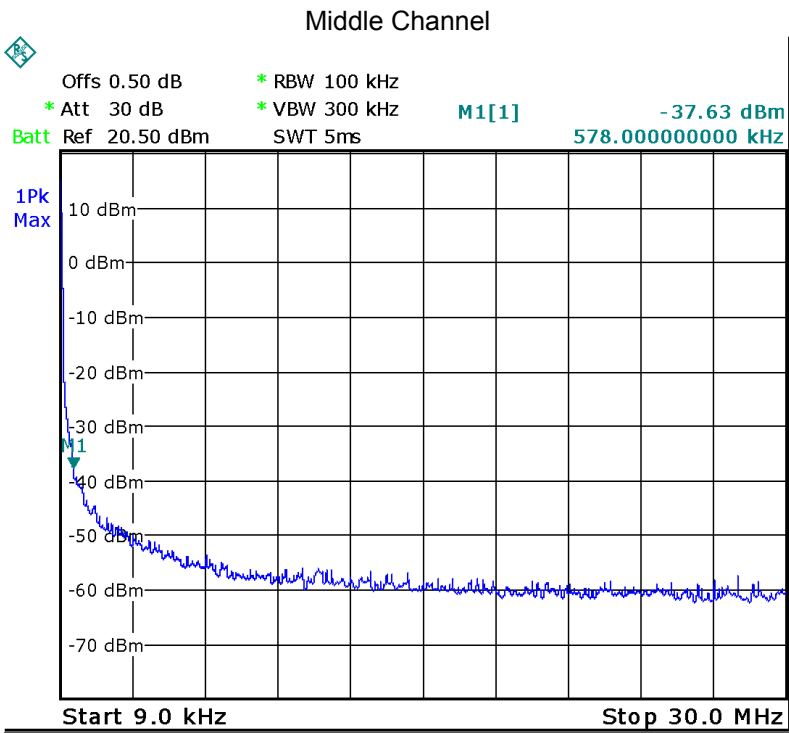
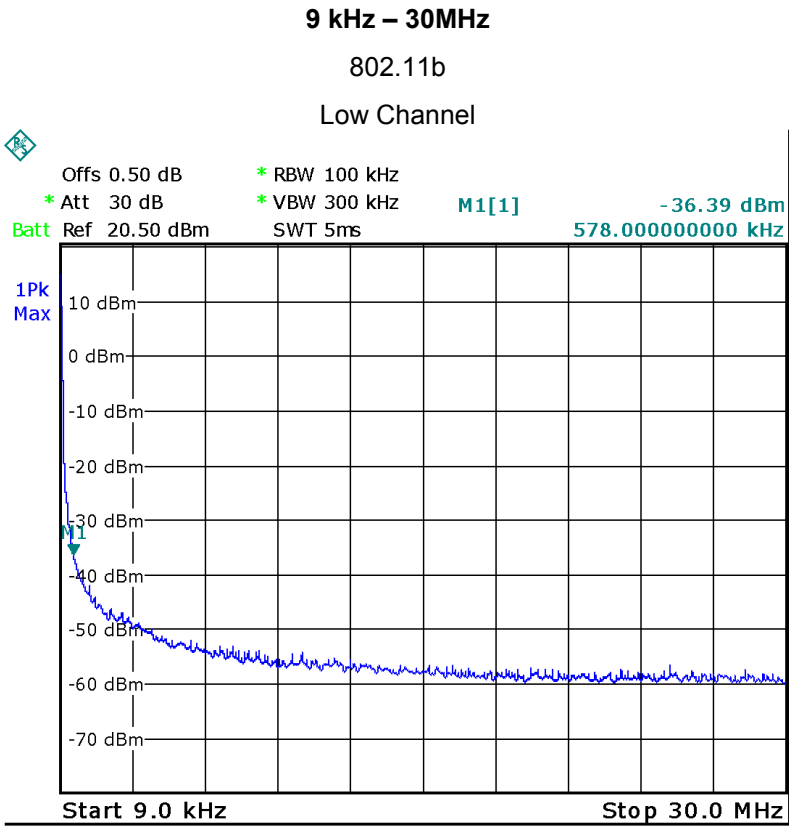
Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: KDB 558074 D01 DTS Meas Guidance v04
Test Result: PASS
Limit:

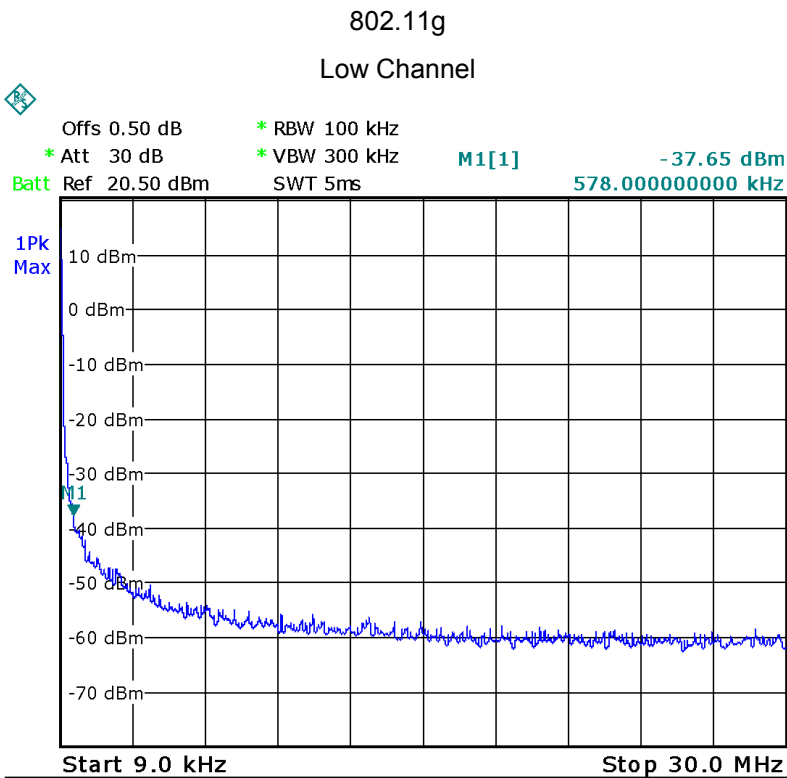
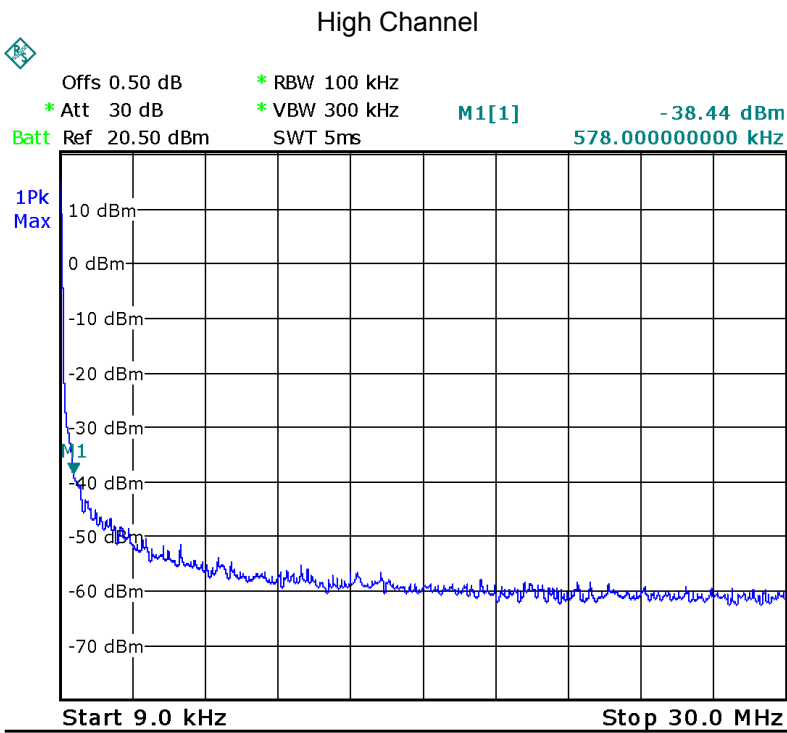
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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)).

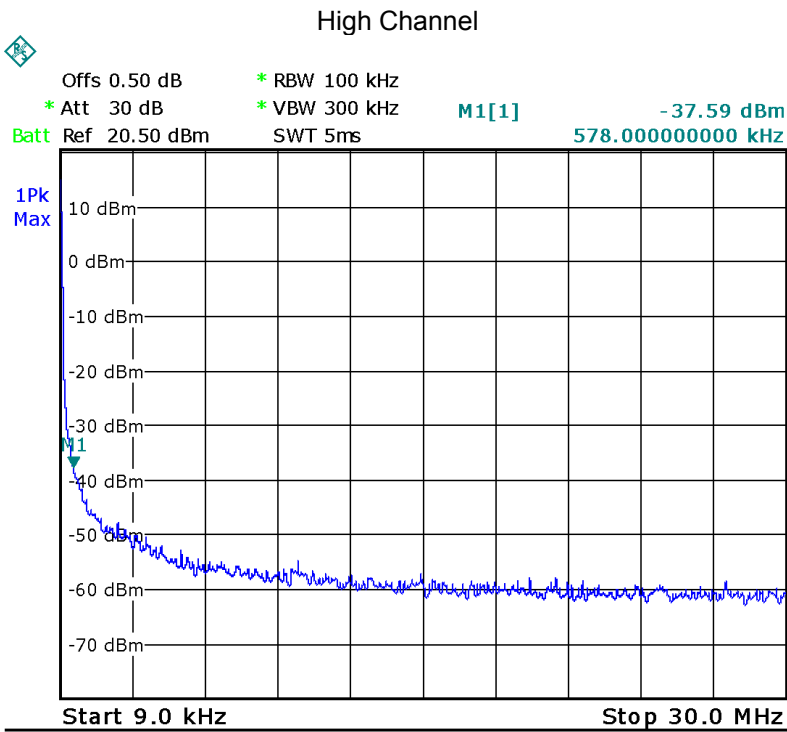
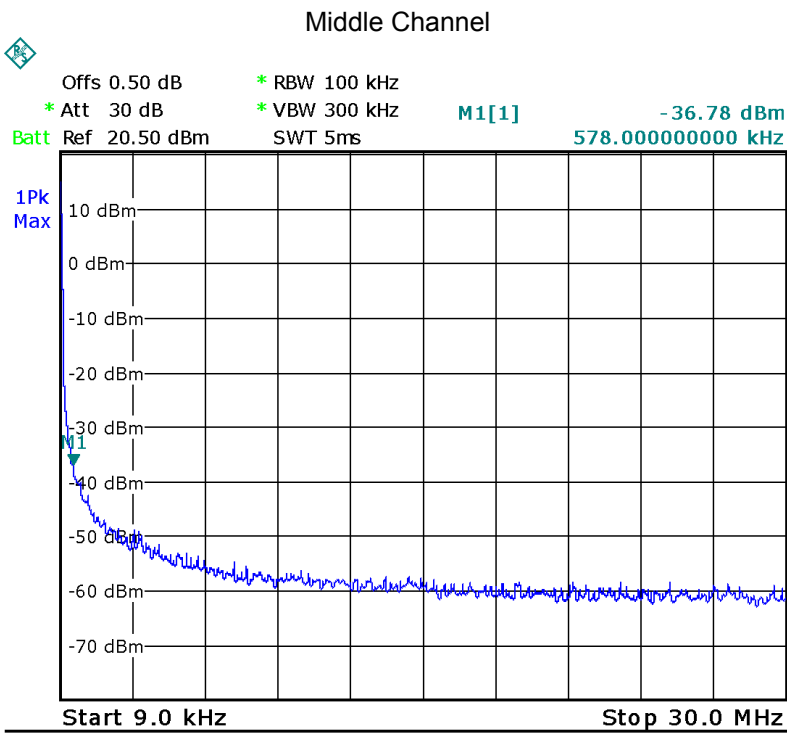
9.1 Test Procedure

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

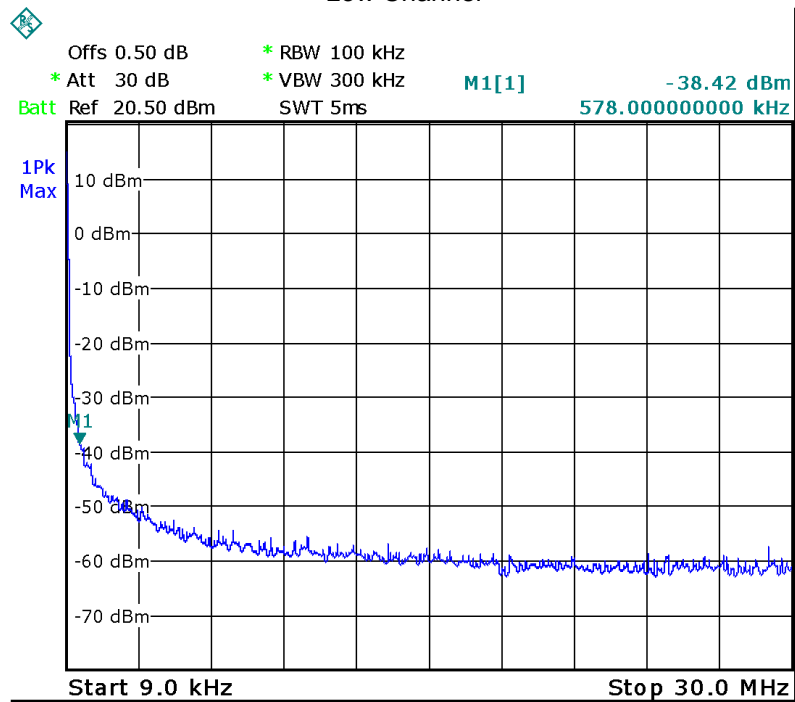




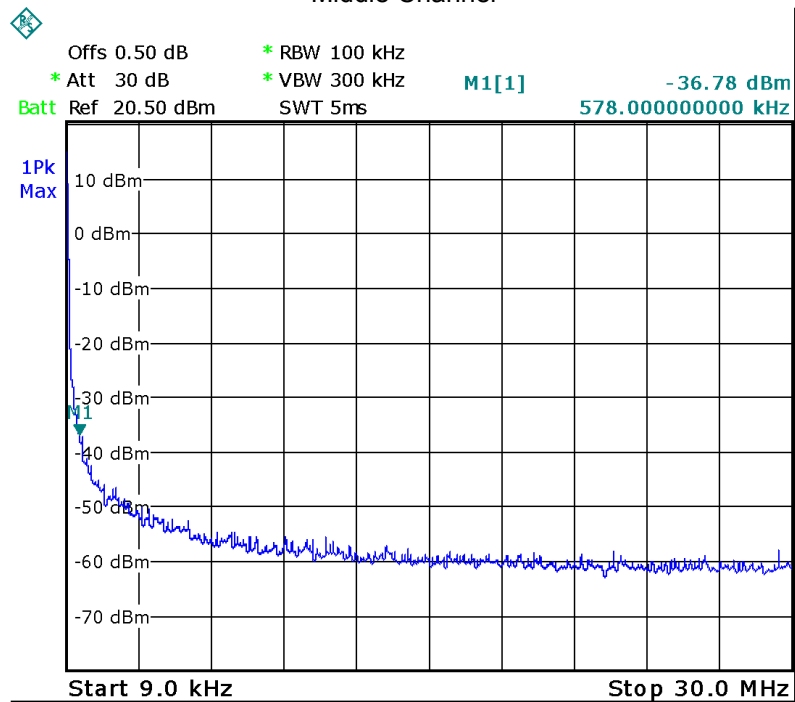


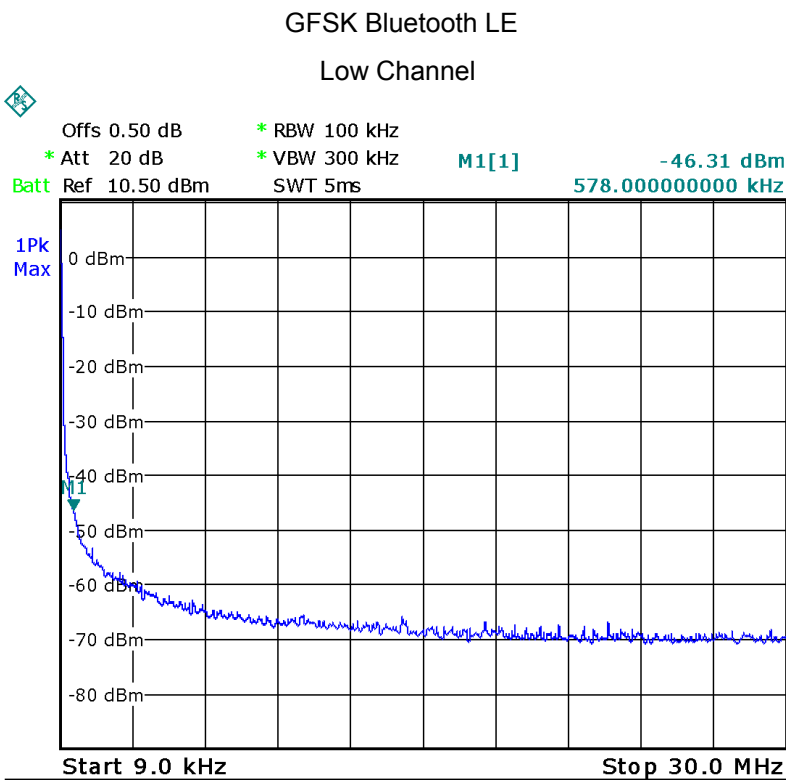
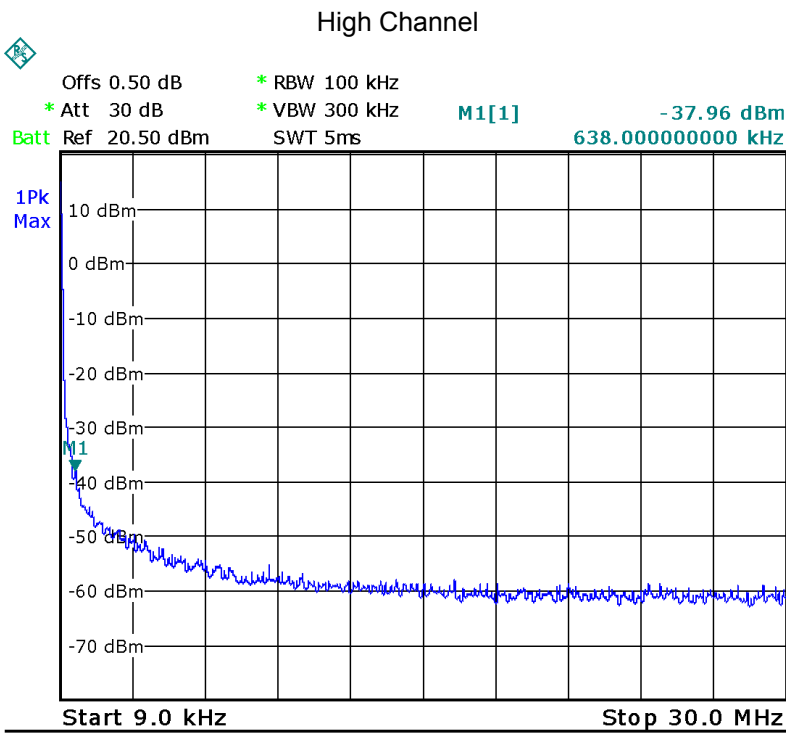
802.11n HT20

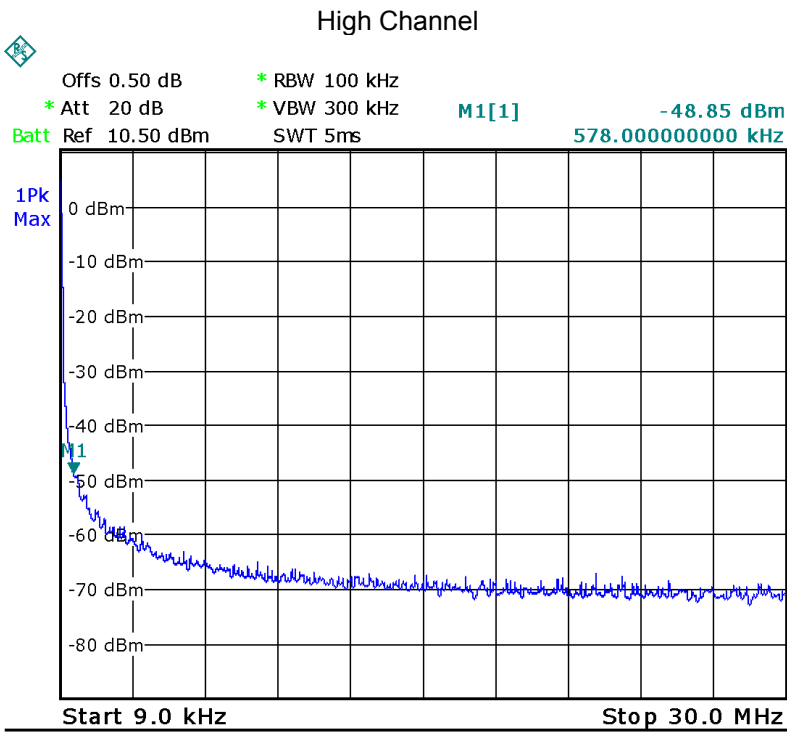
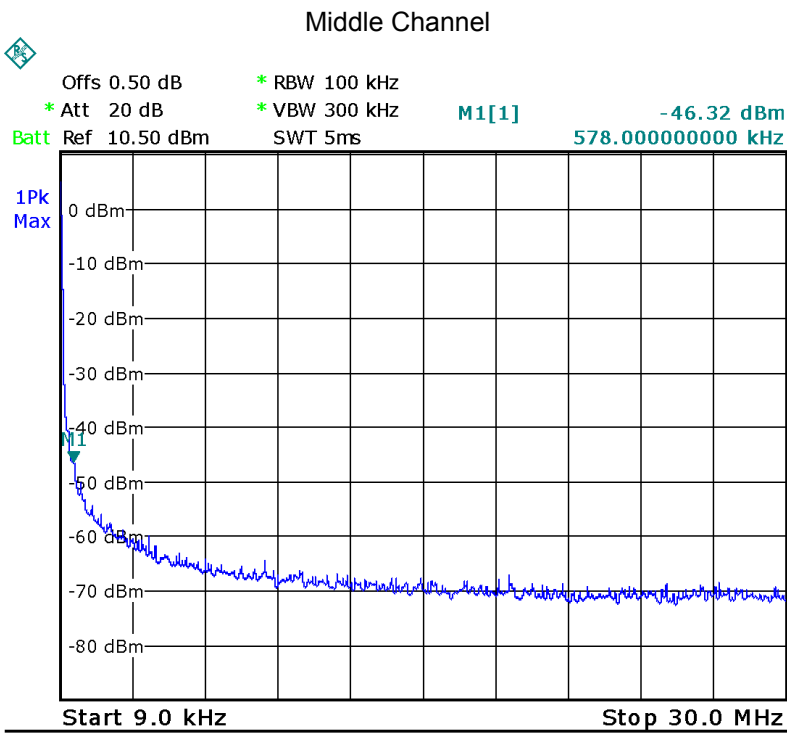
Low Channel



Middle Channel

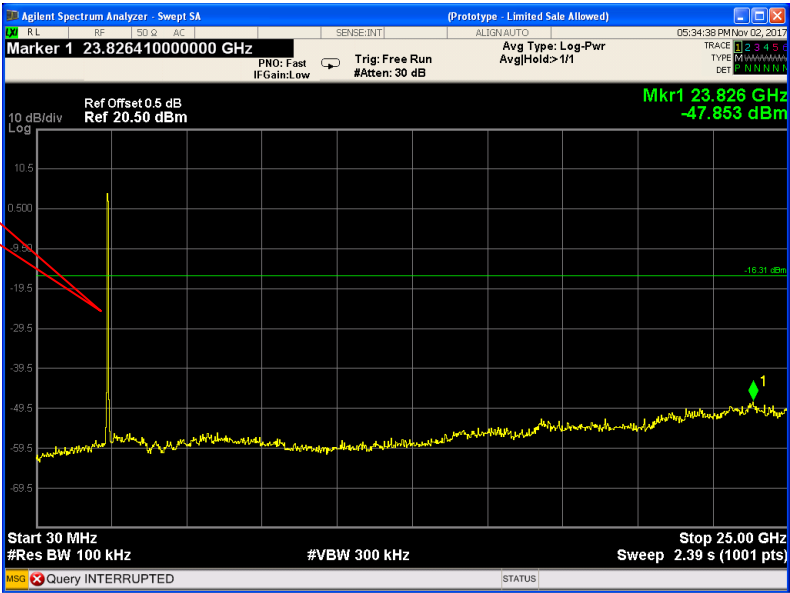






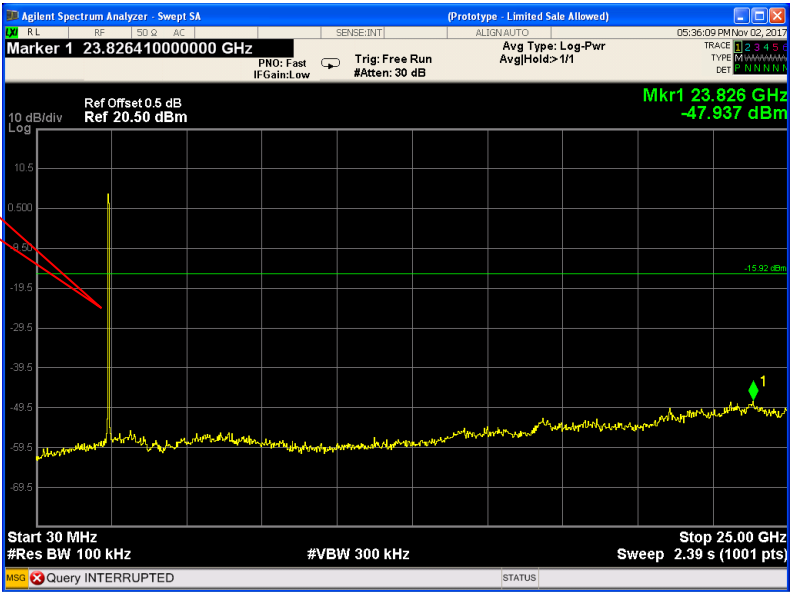
Above 30MHz
802.11b
Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



802.11g

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



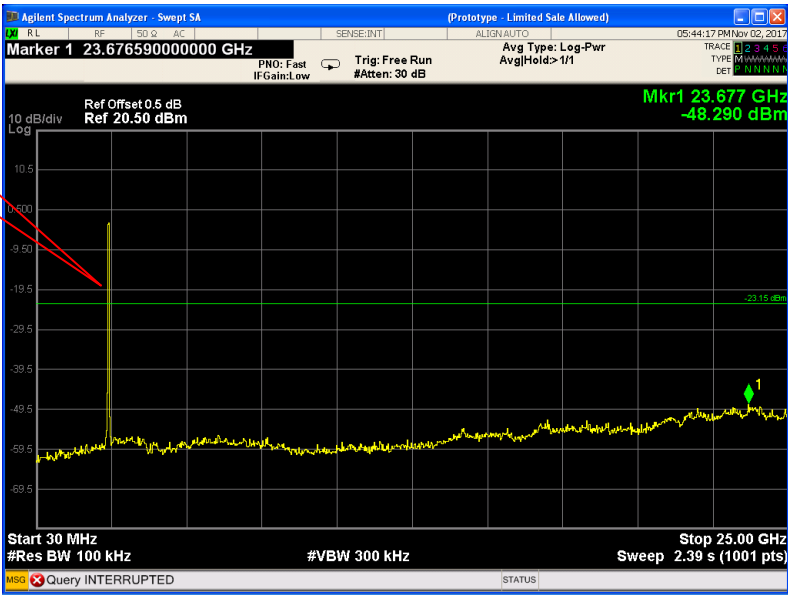
802.11n HT20
Low Channel

Fundamental



Middle Channel

Fundamental



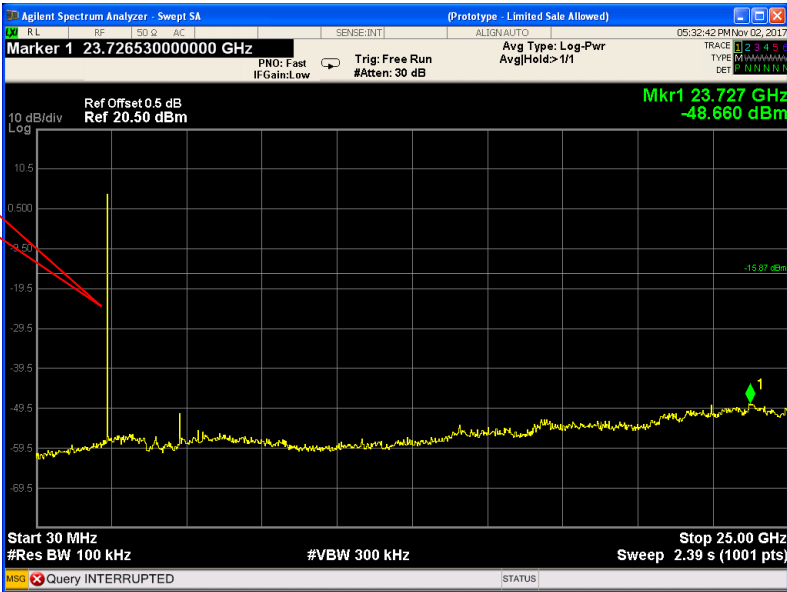
High Channel

Fundamental



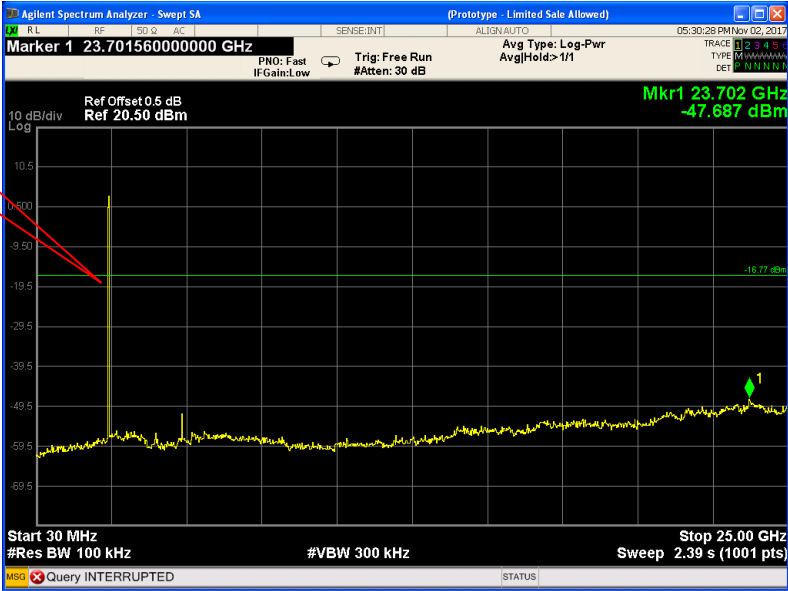
GFSK Bluetooth LE
Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



10 Band Edge Measurement

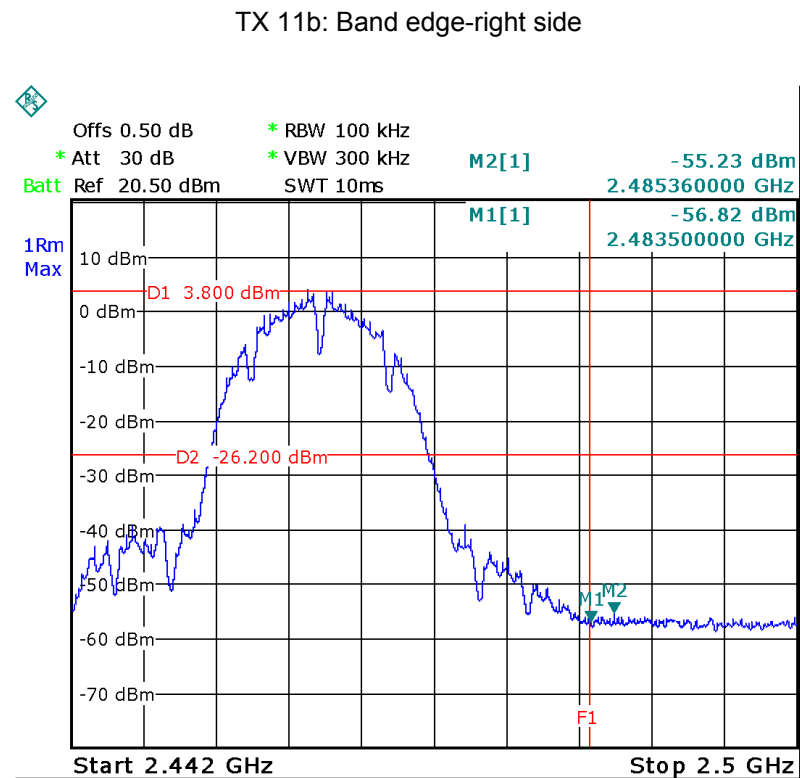
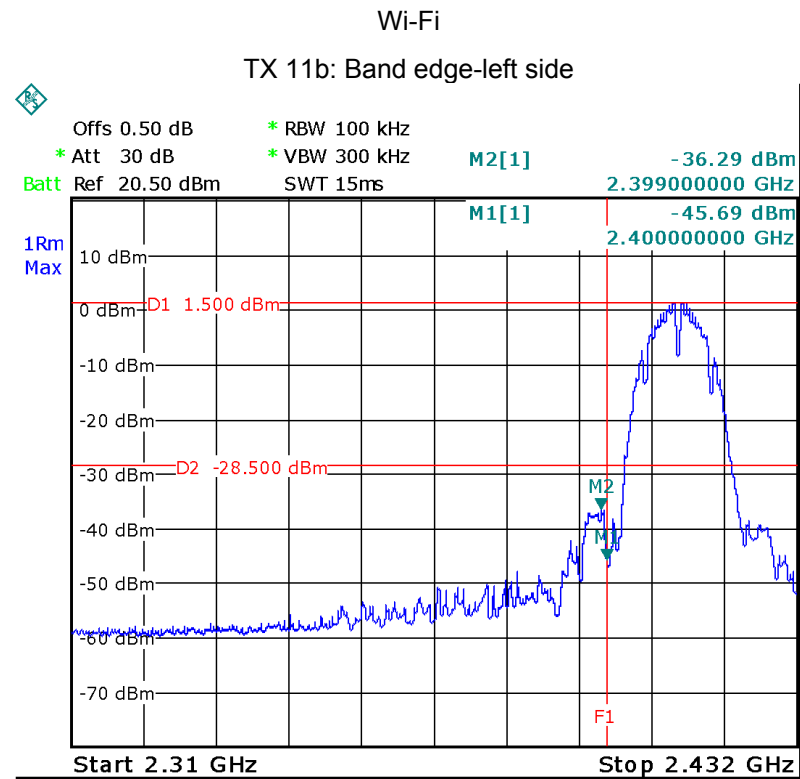
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	558074 D01 DTS Meas Guidance v04
Test Limit:	Regulation 15.247 (d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that 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

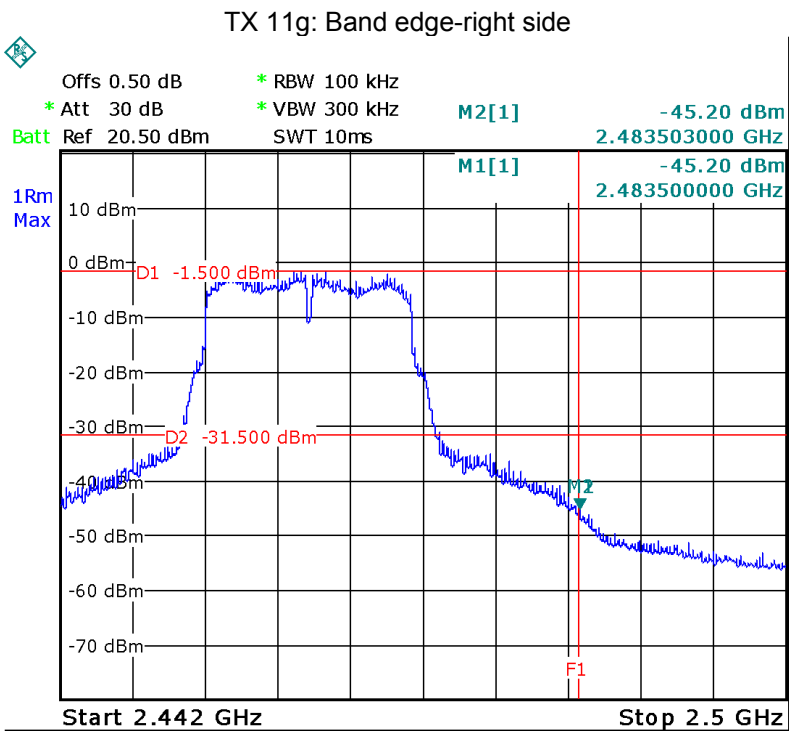
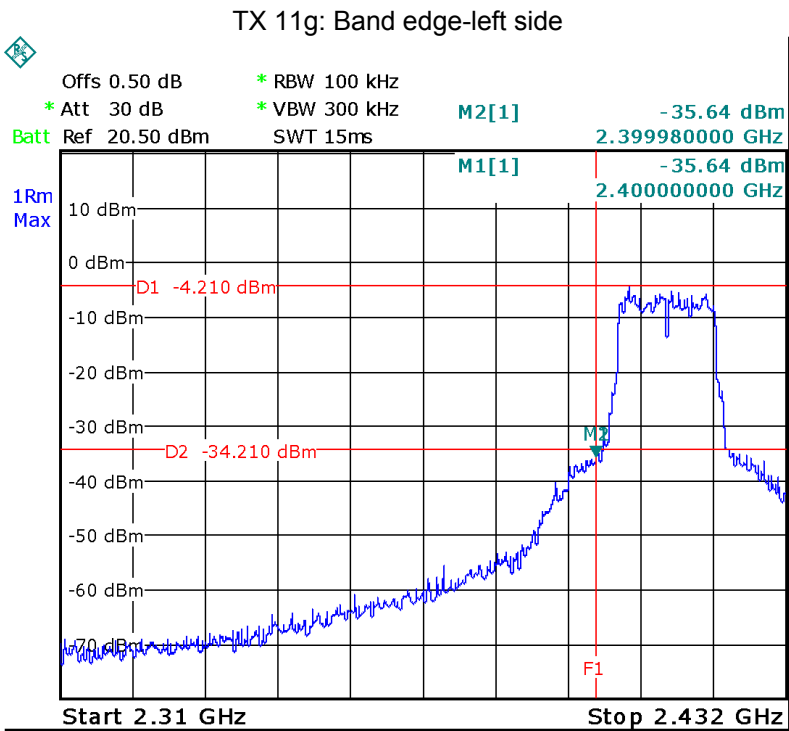
10.1 Test Produce

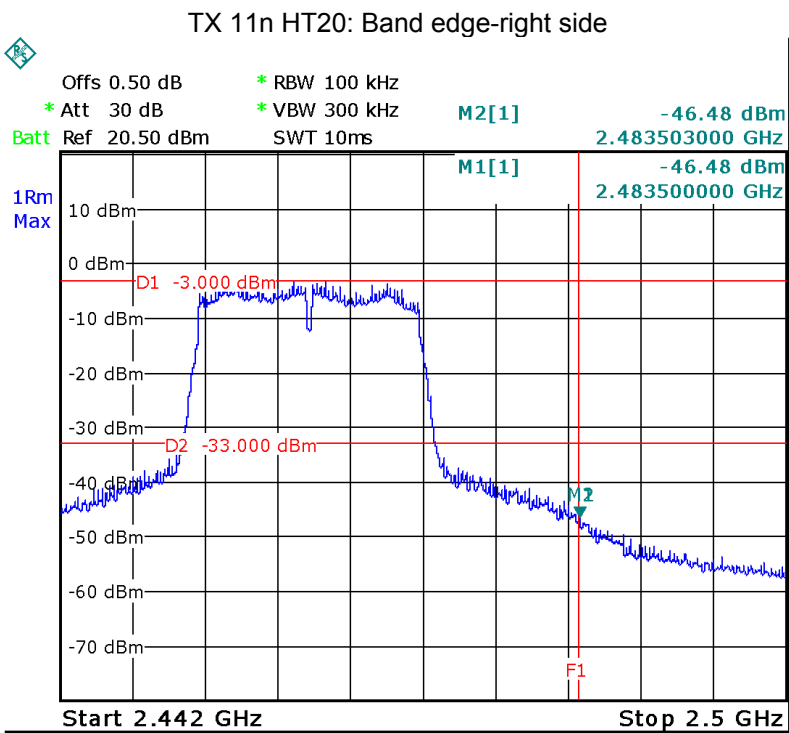
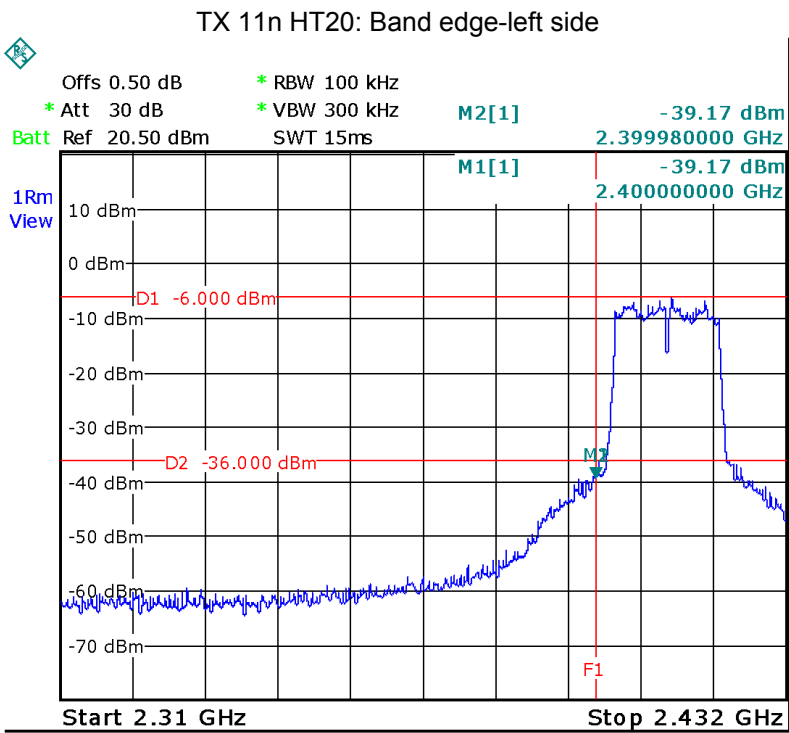
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then 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

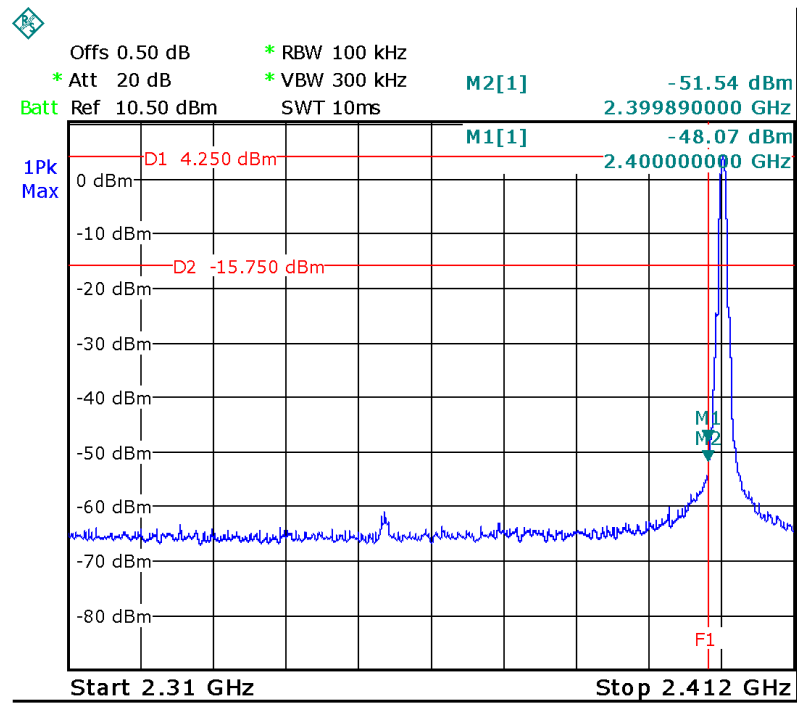
Test result plots shown as follows:



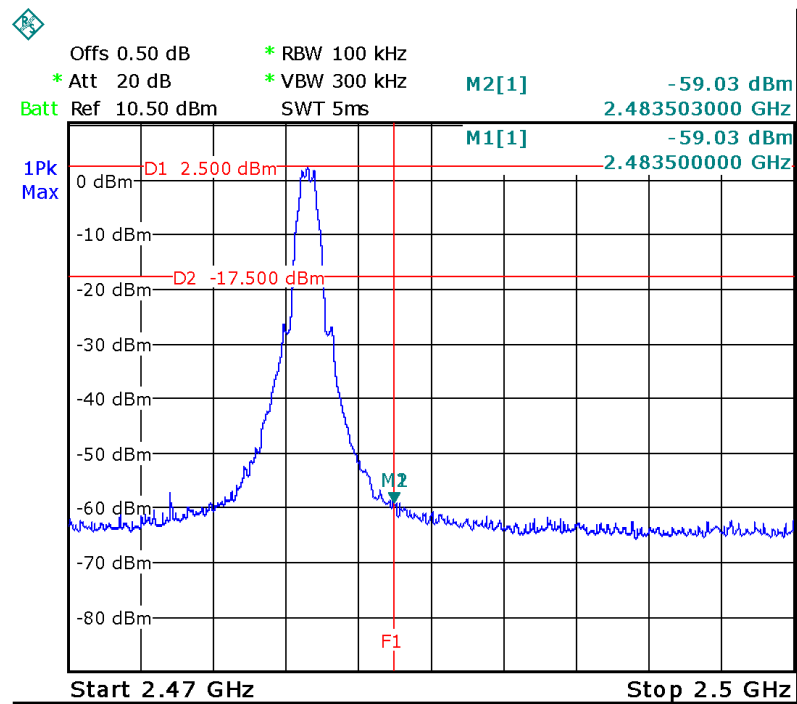




Bluetooth LE
GFSK Band edge-left side



GFSK Band edge-right side



11 Bandwidth Measurement

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance V04

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:

Wi-Fi:

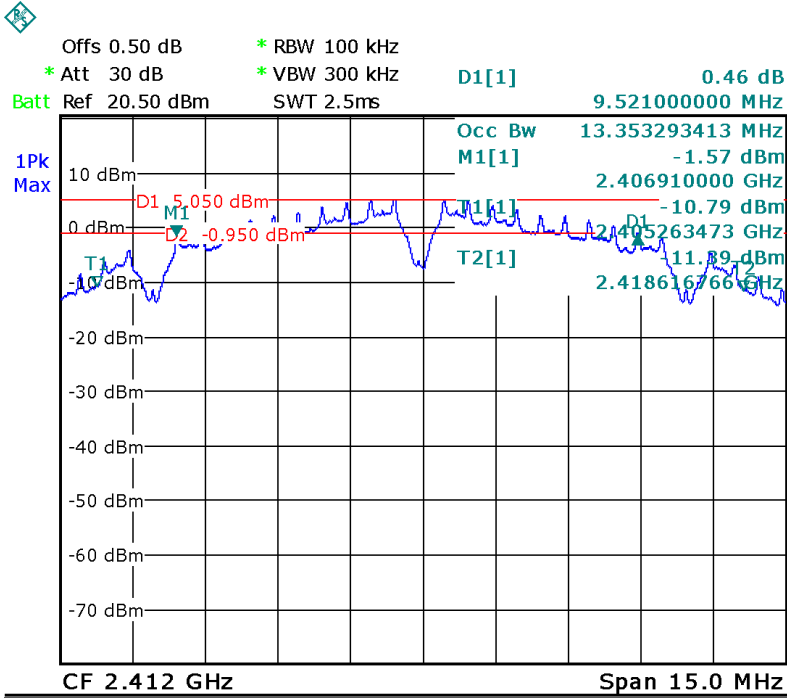
Operation mode	6dB Bandwidth (MHz)			99% Bandwidth (MHz)		
TX 11b	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	9.521	9.521	9.521	13.353	13.473	13.353
TX 11g	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	16.068	16.068	16.068	16.517	16.517	16.467
TX 11n HT20	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	17.515	17.515	17.515	17.731	17.731	17.677

Bluetooth LE:

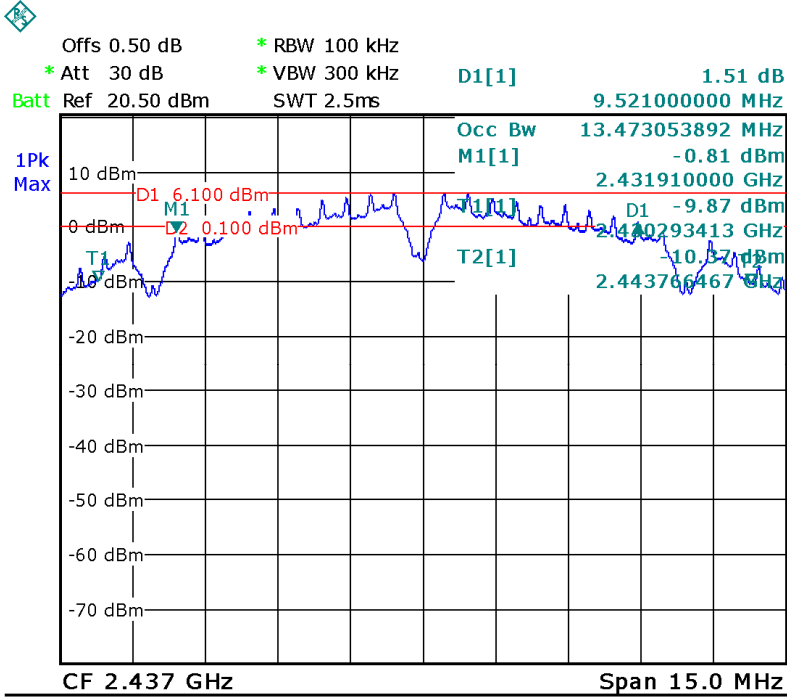
Operation mode	6dB Bandwidth (MHz)			99% Bandwidth (MHz)		
GFSK	Low channel	Middle channel	High channel	Low channel	Middle channel	High channel
	0.719	0.701	0.695	1.090	1.090	1.090

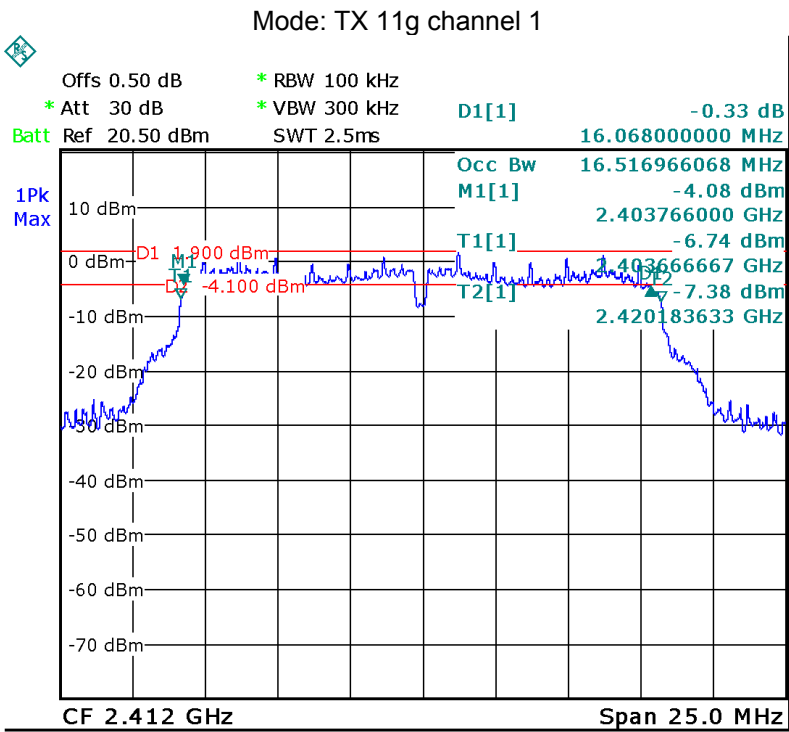
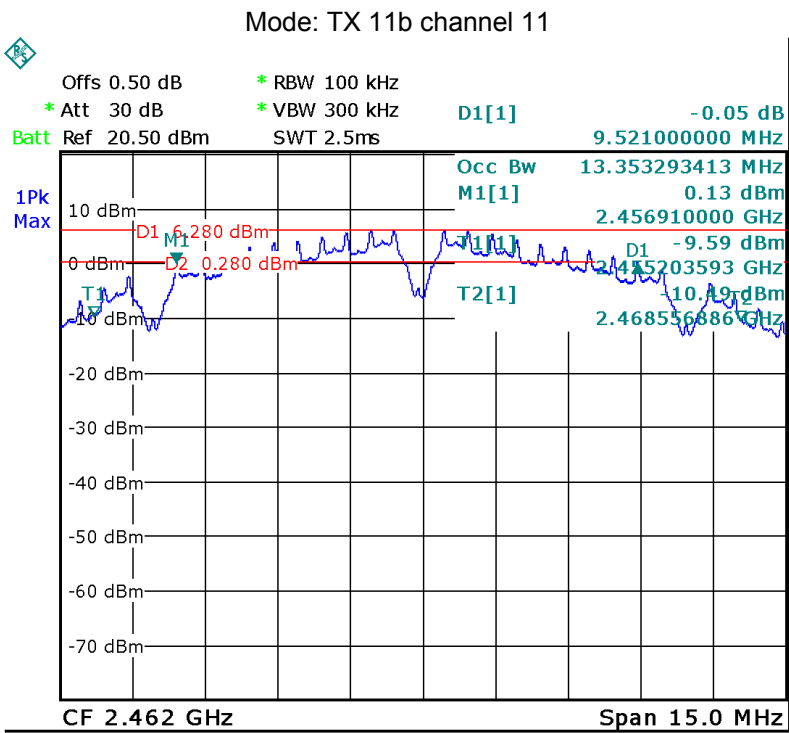
Wi-Fi: Test result plot as follows:

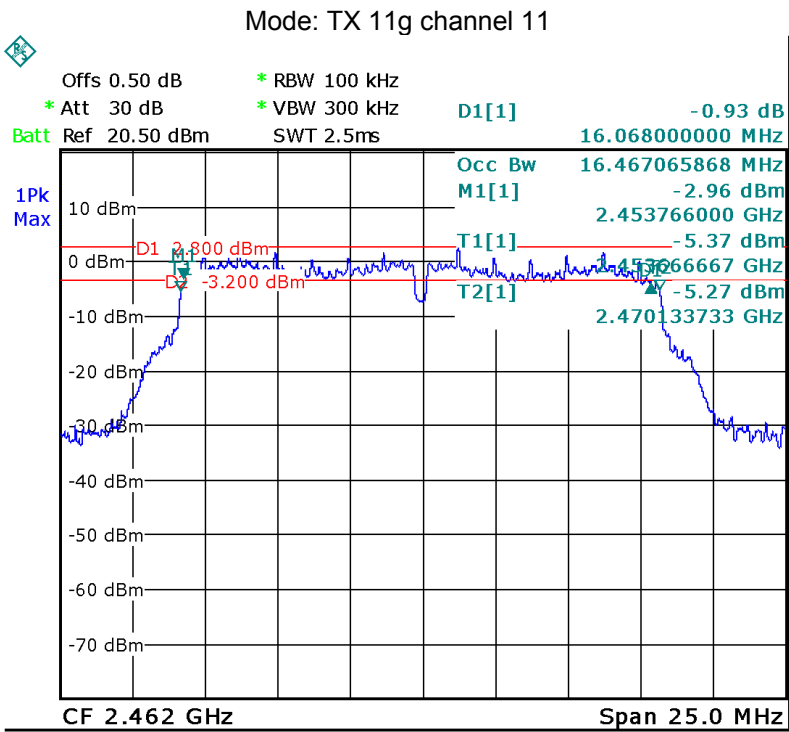
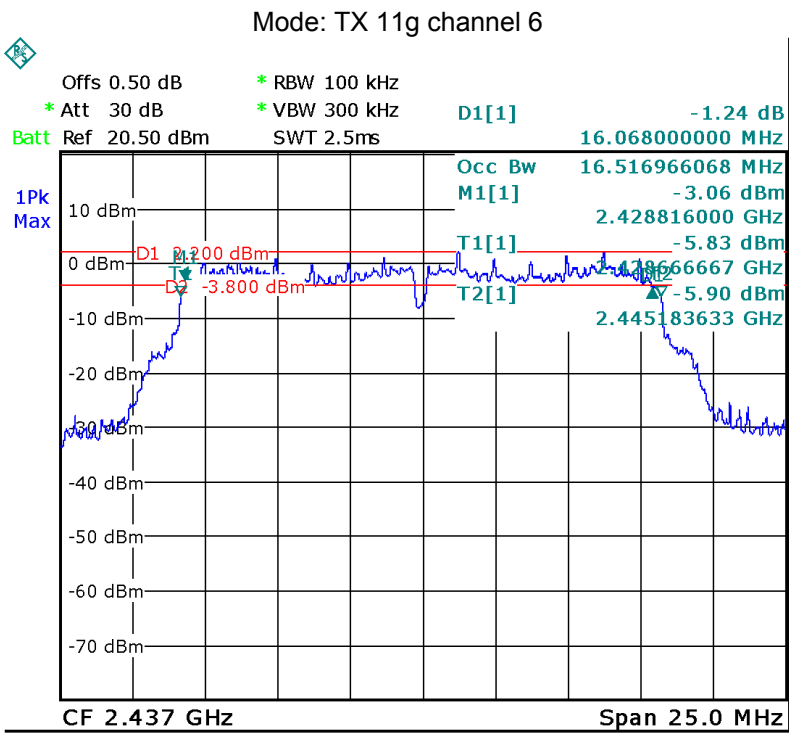
Mode: TX 11b channel 1

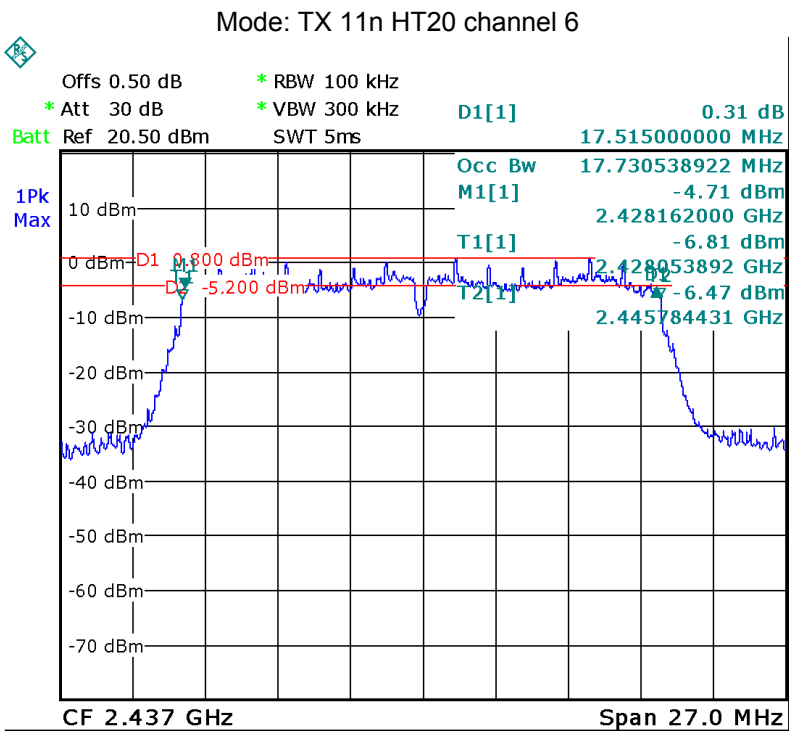
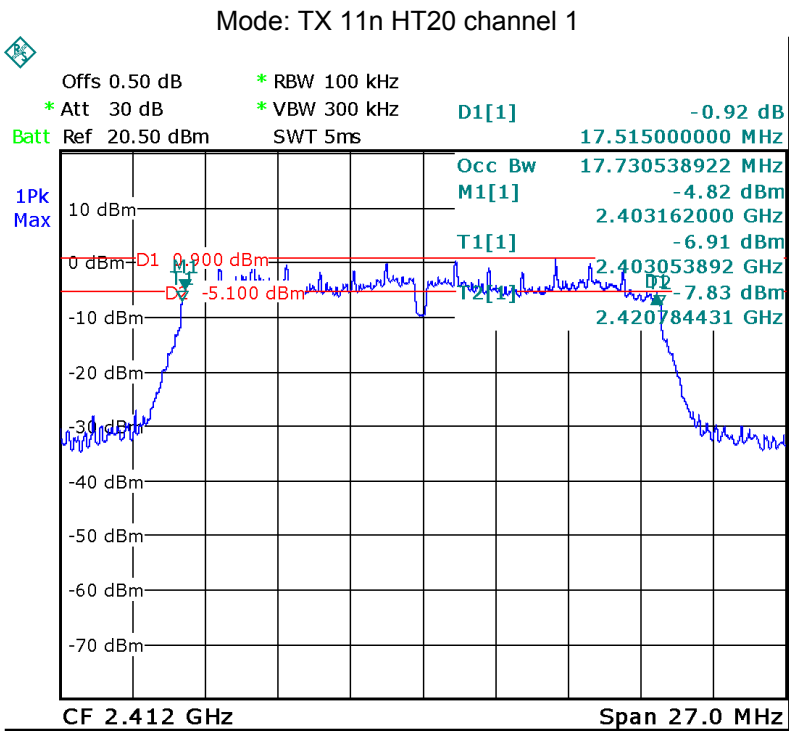


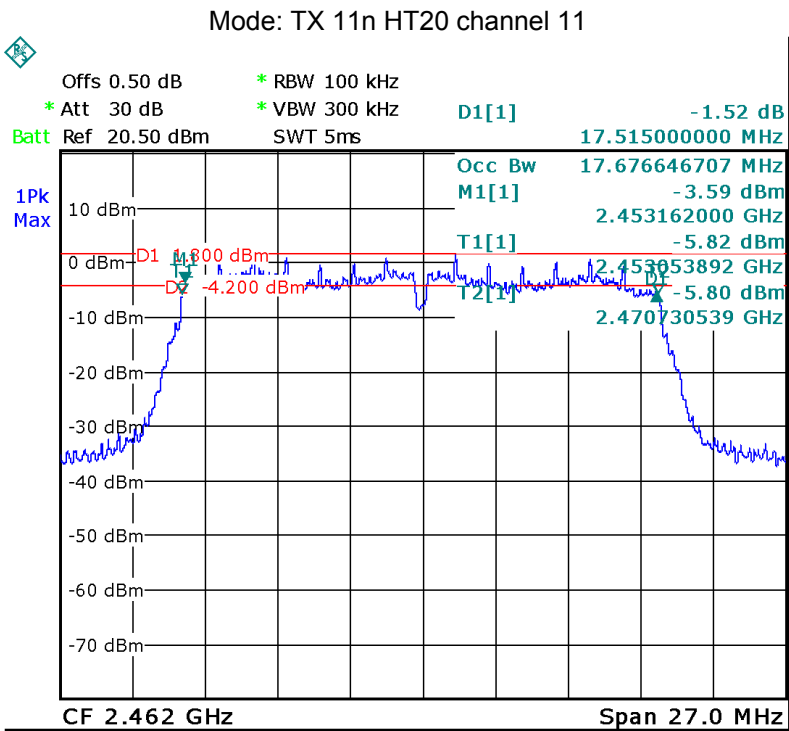
Mode: TX 11b channel 6





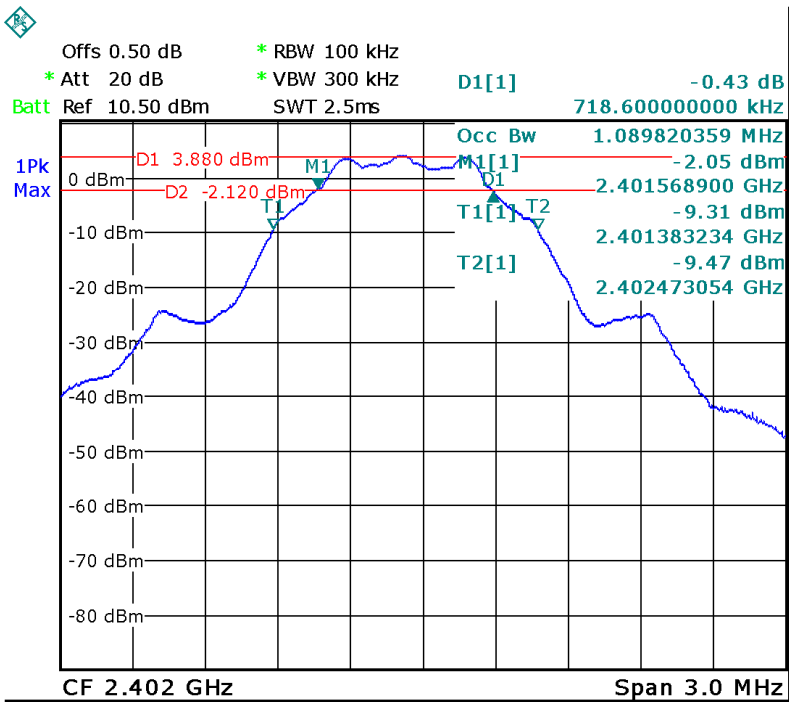




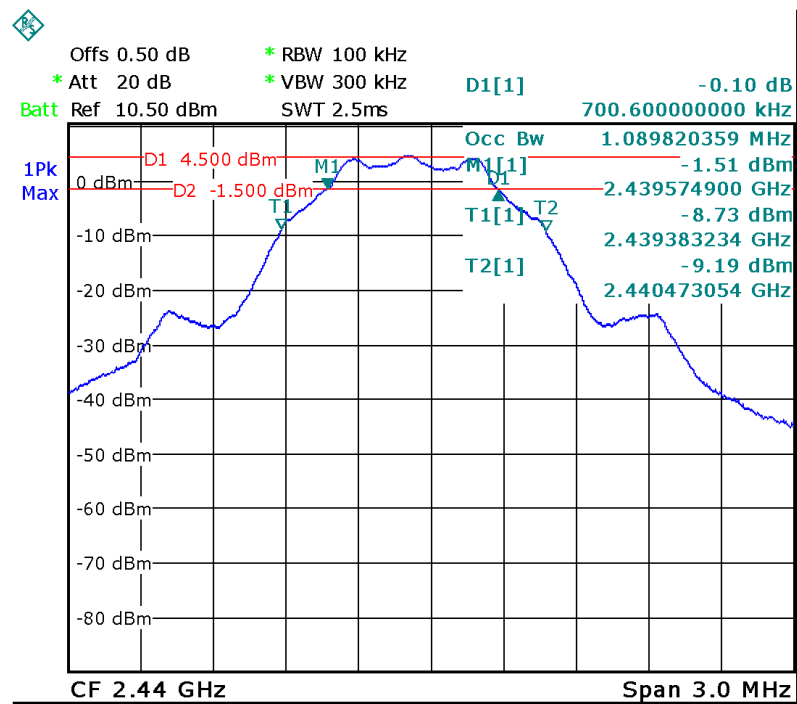


GFSK Bluetooth LE:

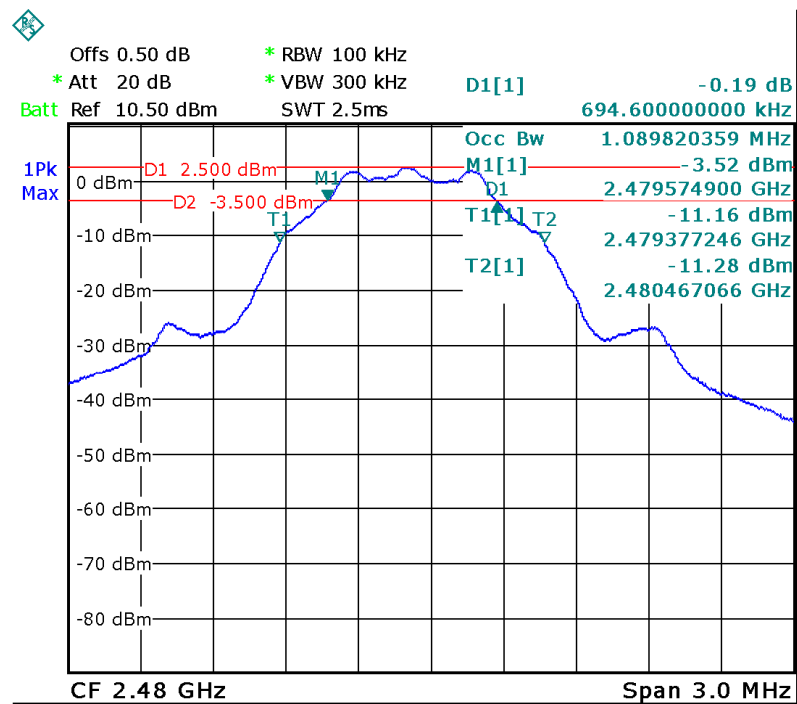
Mode: Low channel



Mode: Middle channel



Mode: High channel



12 Maximum conducted (average) output power

Test Requirement:

FCC CFR47 Part 15 Section 15.247

Test Method:

558074 D01 DTS Meas Guidance v04

12.1 Test Procedure:

558074 D01 DTS Meas Guidance v04

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 = 1 MHz . VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

12.2 Test Result:

Wi-Fi:

Test mode :TX 11b		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
13.35	14.84	14.09
Limit: 1W/30dBm		

Test mode :TX 11g		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
14.05	14.95	15.08
Limit: 1W/30dBm		

Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
12.95	13.63	13.81
Limit: 1W/30dBm		

Bluetooth LE:

Test mode :GFSK		
Maximum Peak Output Power (dBm)		
Low channel	Middle channel	High channel
4.47	5.23	3.18
Limit: 1W/30dBm		

13 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 DTS Meas Guidance v04

13.1 Test Procedure:

558074 D01 DTS Meas Guidance v04

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:

Wi-Fi:

Test mode :TX 11b		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-8.33	-9.12	-8.29
Limit: 8dBm per 3kHz		

Test mode :TX 11g		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-13.55	-12.10	-12.26
Limit: 8dBm per 3kHz		

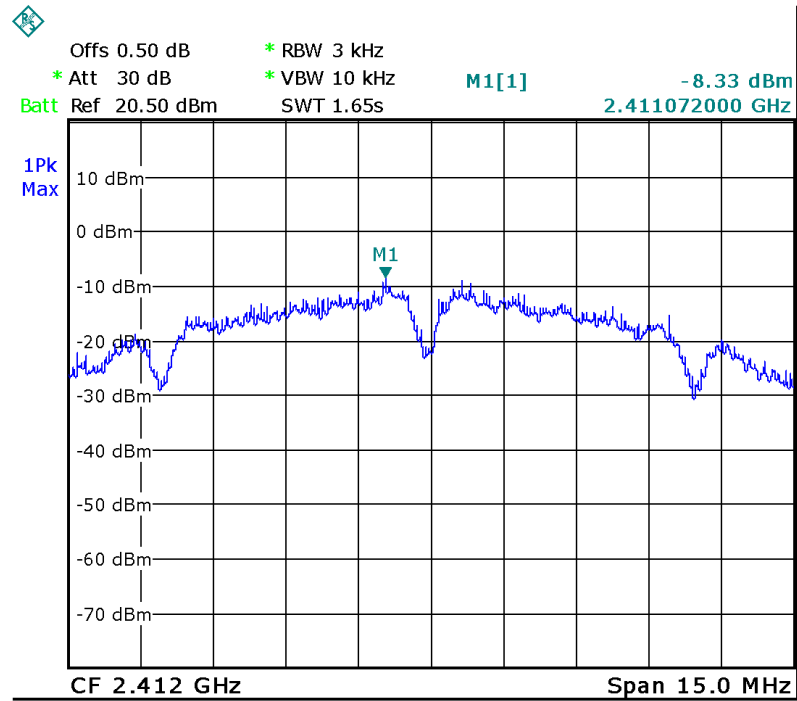
Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-15.35	-14.74	-12.92
Limit: 8dBm per 3kHz		

Bluetooth LE:

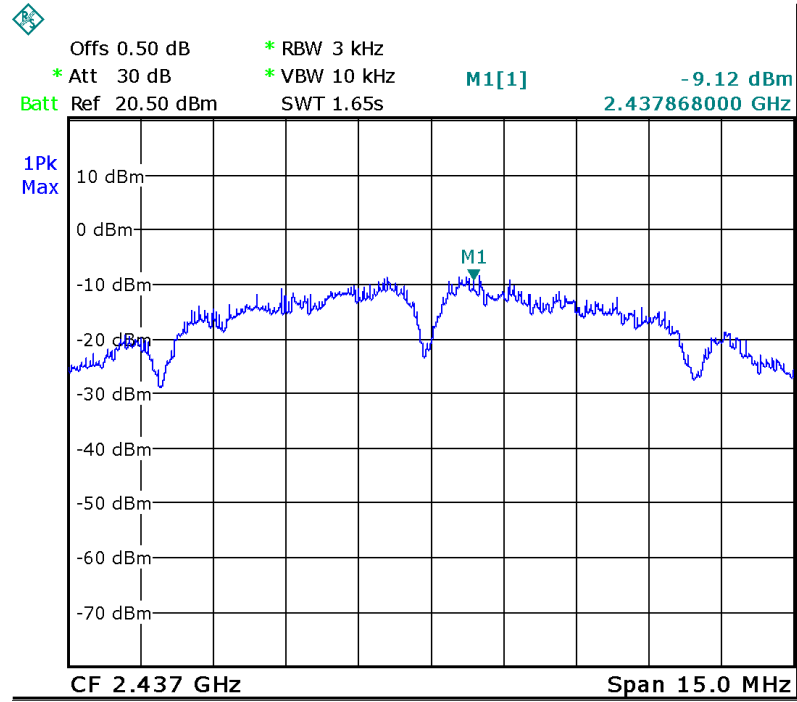
Test mode :TX GFSK		
Power Spectral Density(dBm)		
Low channel	Middle channel	High channel
-9.50	-9.46	-11.62
Limit: 8dBm per 3kHz		

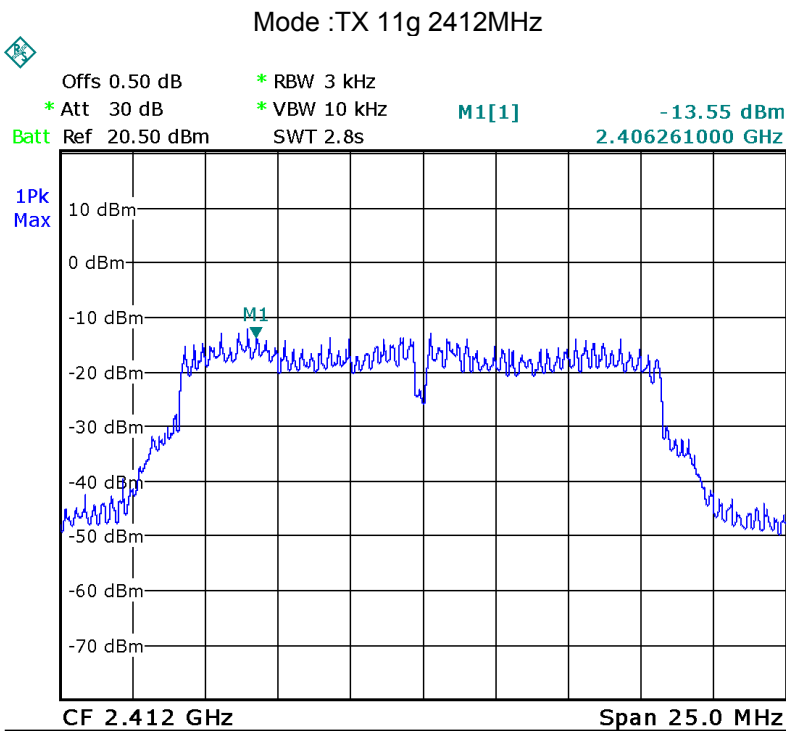
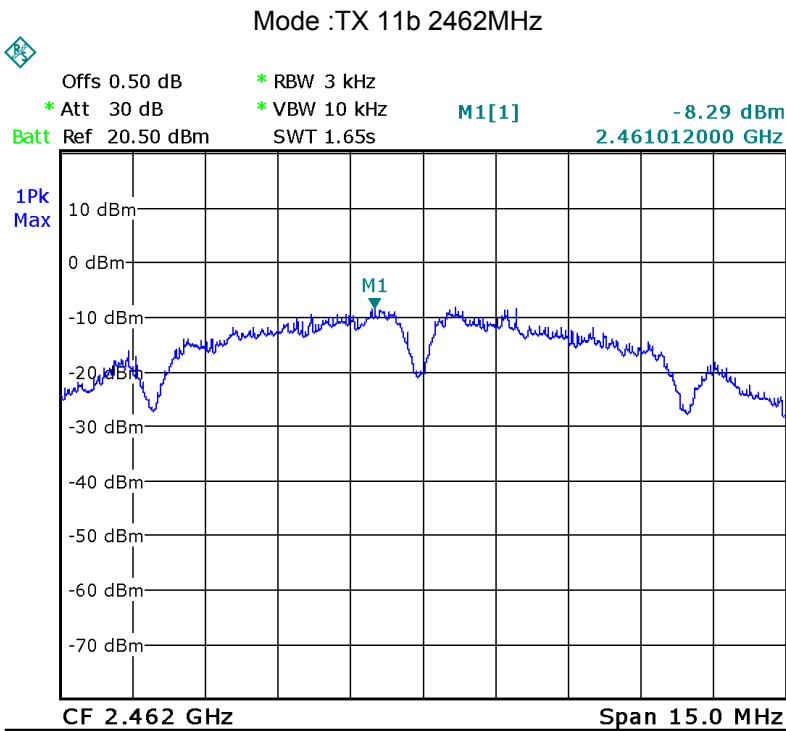
Wi-Fi:

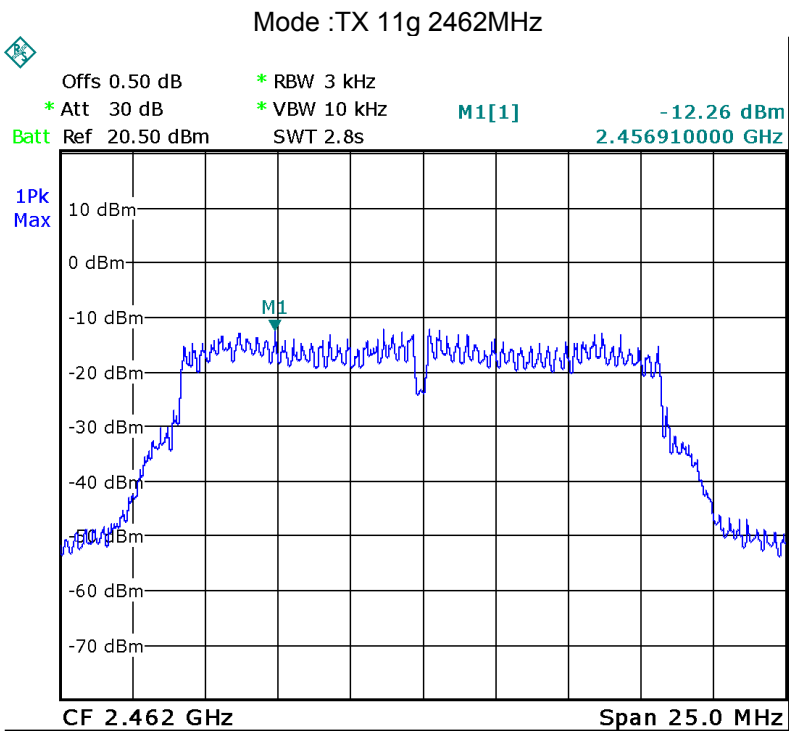
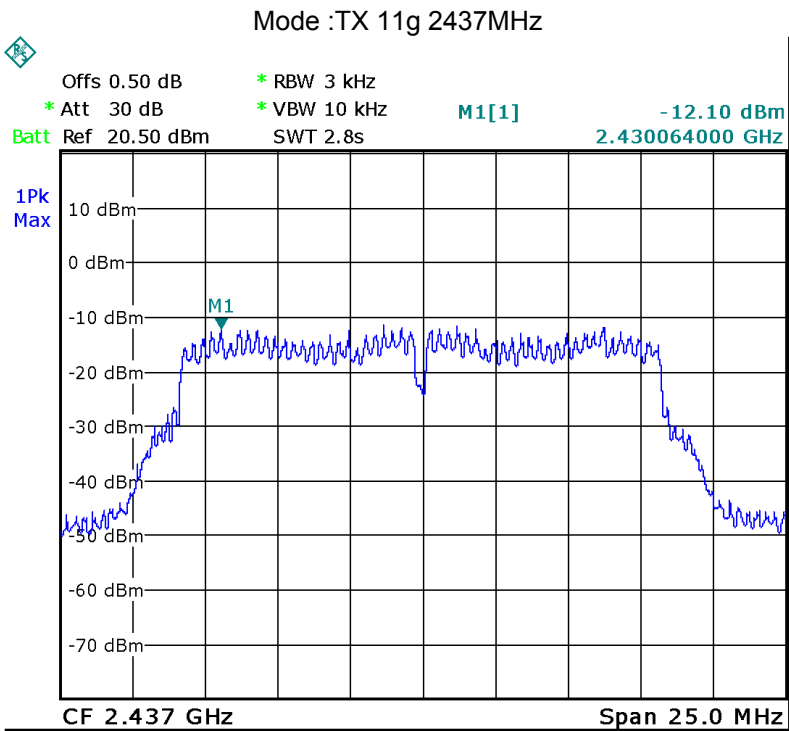
Mode :TX 11b 2412MHz

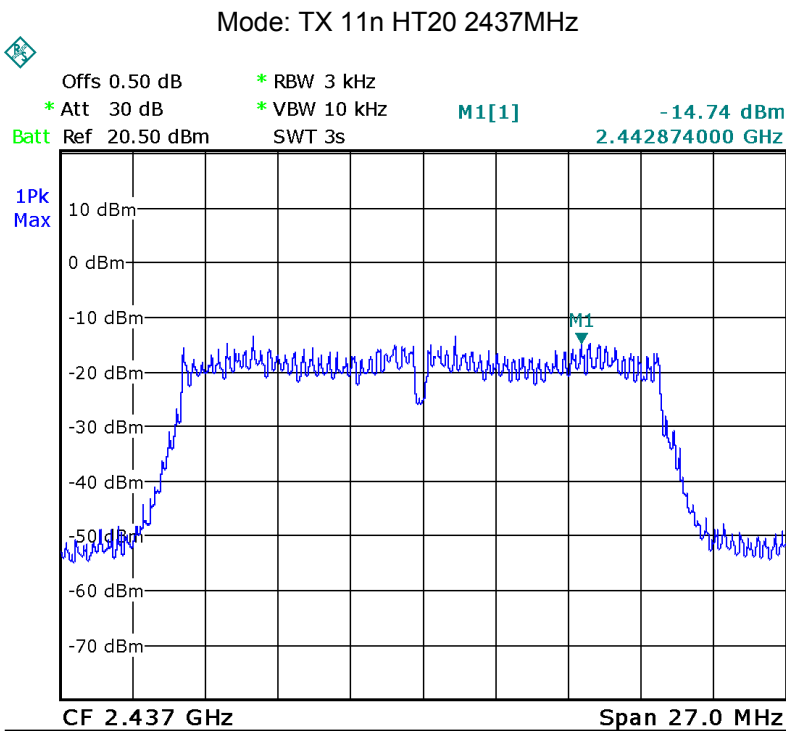
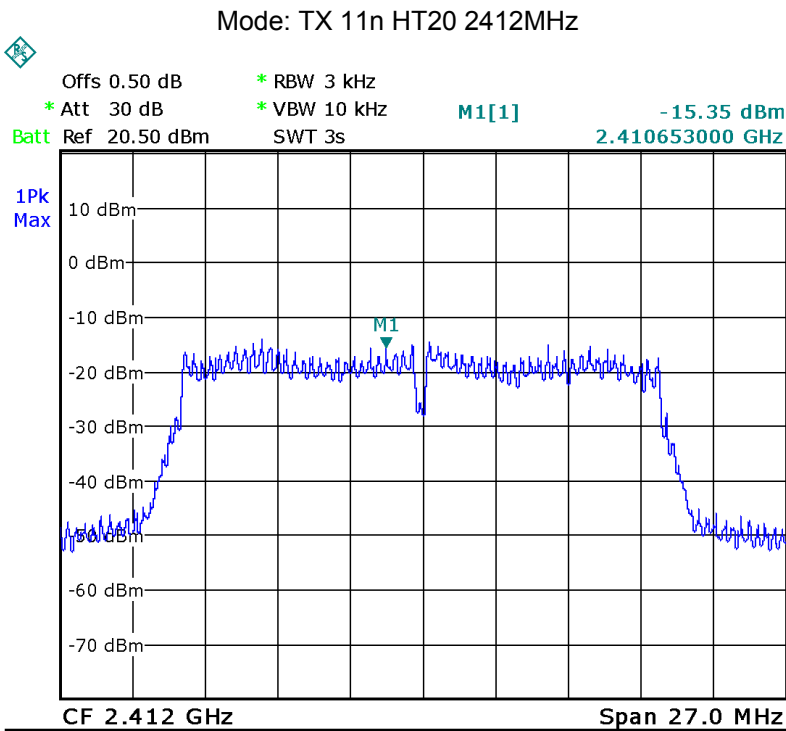


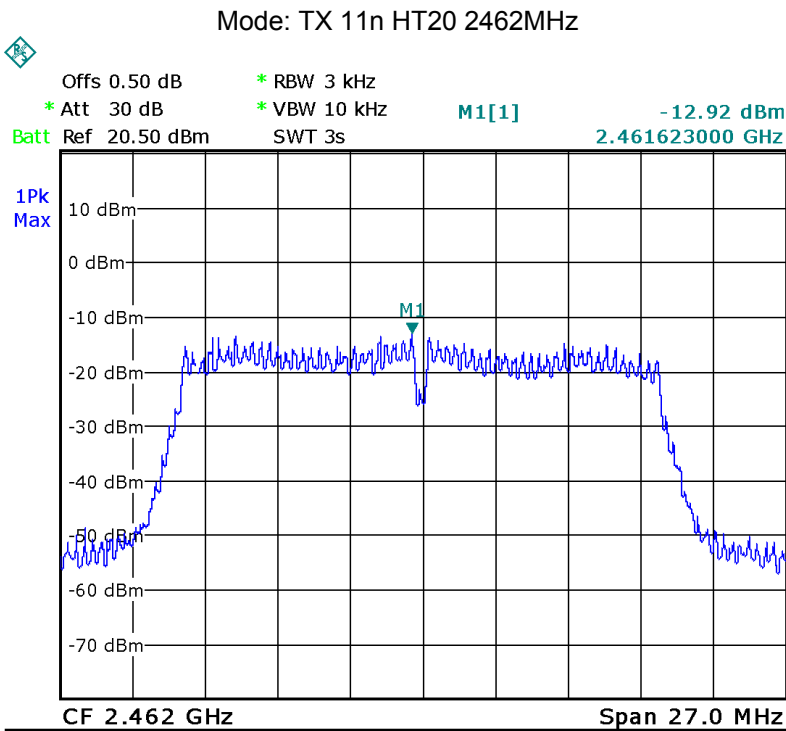
Mode :TX 11b 2437MHz





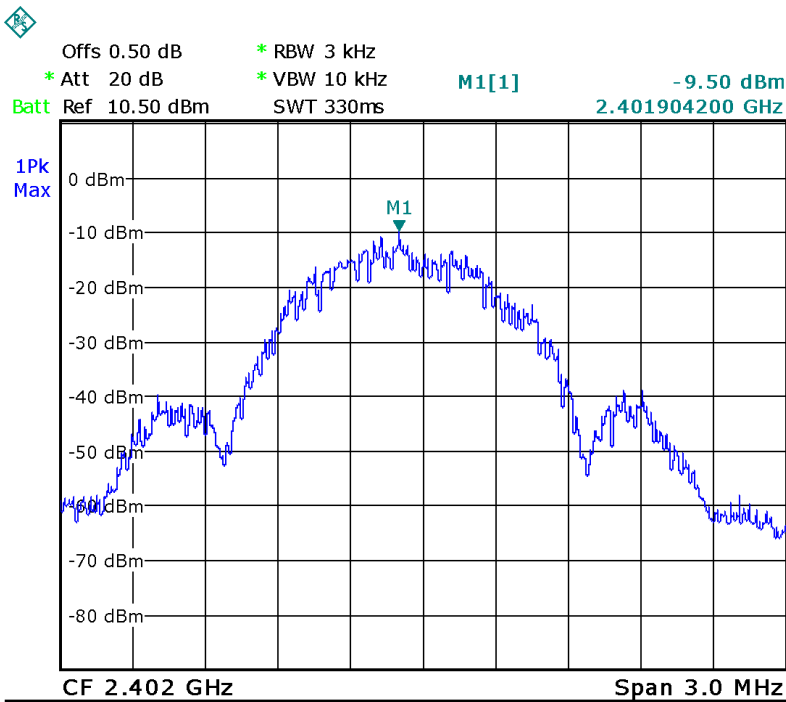




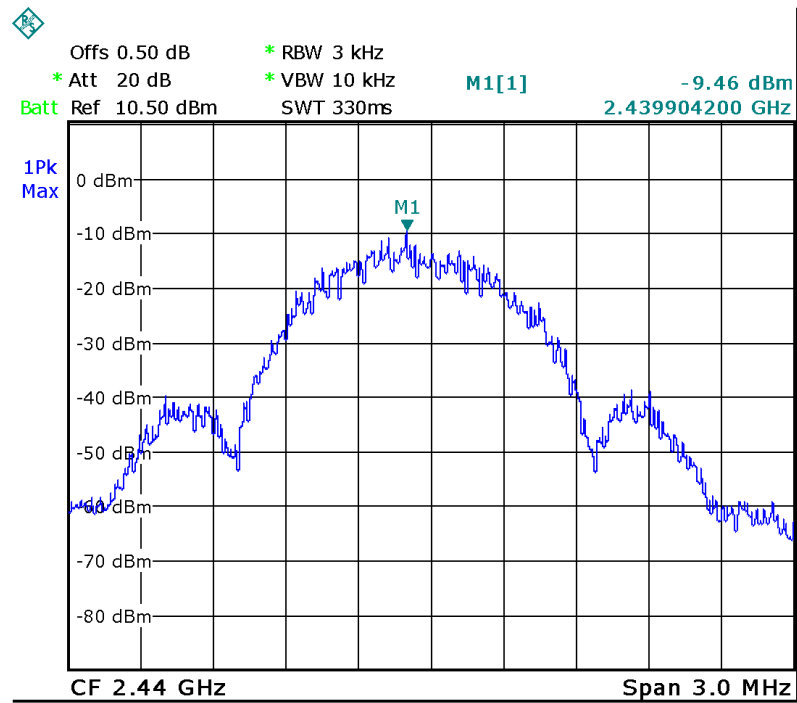


Bluetooth LE:

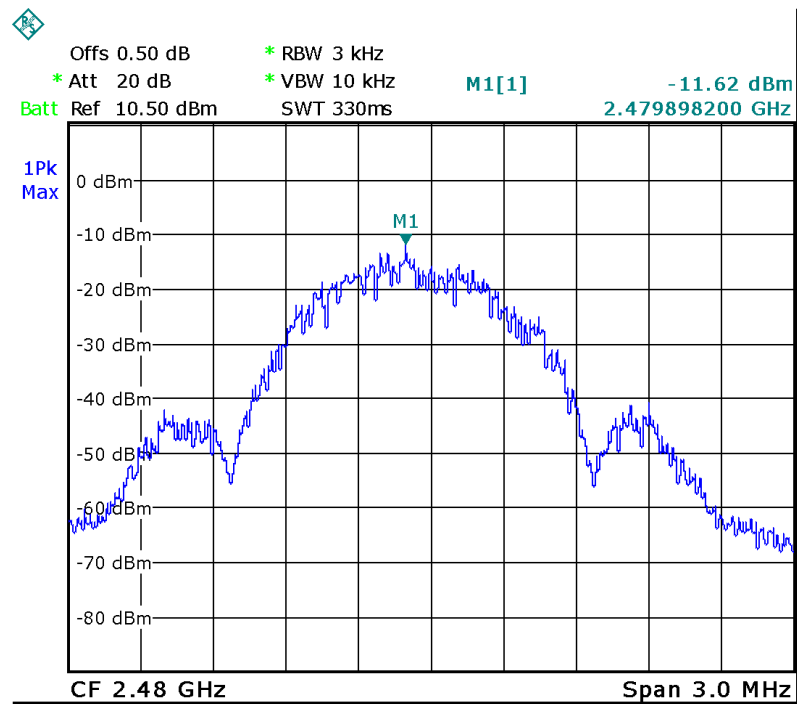
Test mode: GFSK Low channel



Test mode: Middle channel



Test mode: High channel



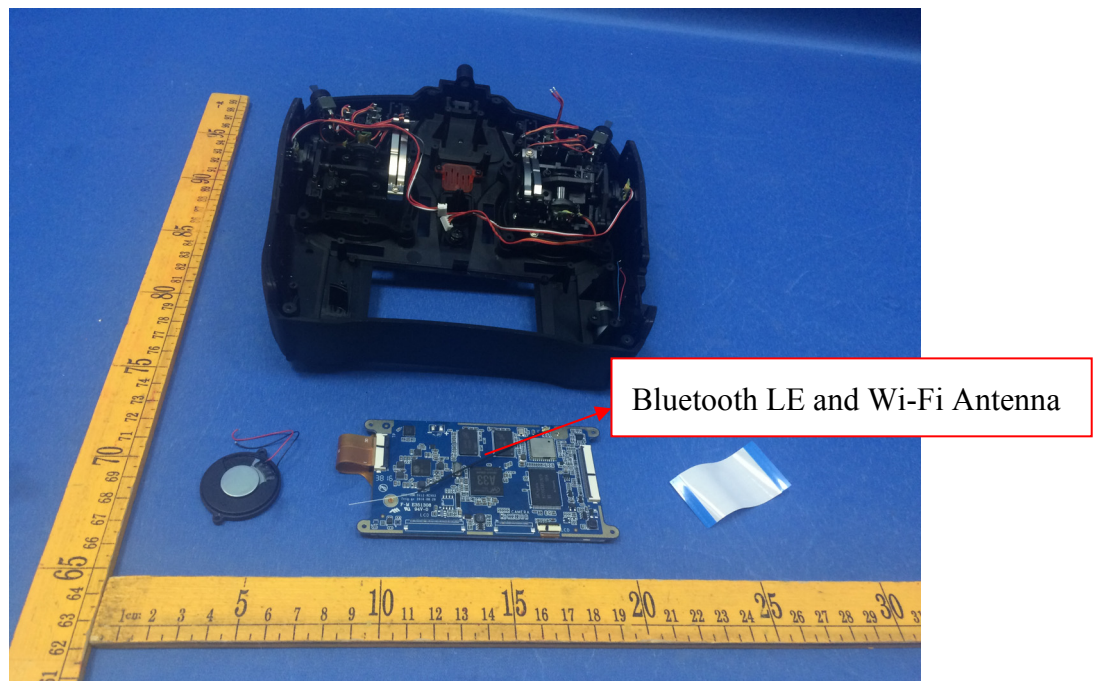
14 Antenna Requirement

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 an Internal Integral Antenna for Bluetooth LE and Wi-Fi, Antenna Gain is 1.5dBi, meets the requirements of FCC 15.203.



15 RF Exposure

Note: Please refer to SAR Test Report: WTF17S1092181E.

16 Photographs – Model iX12 Test Setup Photos

Note: Please refer to Photos: WTF17S1092243-3E.

17 Photographs - Constructional Details

17.1 Model iX12–External Photos

Note: Please refer to Photos: WTF17S1092243-3E

17.2 Model iX12–Internal Photos

Note: Please refer to Photos: WTF17S1092243-3E

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