

TEST REPORT

Reference No...... : WTS19S09068238W003
FCC ID : 2AEPIELEMENT4PLUS
Applicant..... : COLOMBIANA DE COMERCIO S.A.
Address..... : Car. 43E No 8-71, Medellin, Colombia
Manufacturer : The same as above
Address..... : The same as above
Product..... : SMARTPHONE
Model(s) : ELEMENT 4 PLUS
Brand Name : Kalley
Standards..... : FCC CFR47 Part 15.247:2018
Date of Receipt sample : 2019-10-30
Date of Test : 2019-10-31 to 2019-11-11
Date of Issue..... : 2019-11-12
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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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
5 TEST SUMMARY	7
6 EQUIPMENT USED DURING TEST	8
6.1 EQUIPMENTS LIST	8
6.2 DESCRIPTION OF SUPPORT UNITS	9
6.3 MEASUREMENT UNCERTAINTY	9
6.4 TEST EQUIPMENT CALIBRATION	9
7 CONDUCTED EMISSION	10
7.1 E.U.T. OPERATION	10
7.2 EUT SETUP	10
7.3 MEASUREMENT DESCRIPTION	10
7.4 CONDUCTED EMISSION TEST RESULT	11
8 RADIATED EMISSIONS.....	15
8.1 EUT OPERATION.....	15
8.2 TEST SETUP	16
8.3 SPECTRUM ANALYZER SETUP	17
8.4 TEST PROCEDURE	18
8.5 CORRECTED AMPLITUDE & MARGIN CALCULATION	18
8.6 SUMMARY OF TEST RESULTS	19
9 CONDUCTED SPURIOUS EMISSIONS.....	35
9.1 TEST PROCEDURE	35
9.2 TEST RESULT	36
10 BAND EDGE MEASUREMENT	52
10.1 TEST PROCEDURE	52
10.2 TEST RESULT	53
11 6 DB BANDWIDTH AND 99% BANDWIDTH MEASUREMENT	58
11.1 TEST PROCEDURE:.....	58
11.2 TEST RESULT:	58
12 MAXIMUM PEAK CONDUCTED OUTPUT POWER.....	67
12.1 TEST PROCEDURE:.....	67
12.2 TEST RESULT:	68
13 DUTY CYCLE.....	77
14 POWER SPECTRAL DENSITY	78
14.1 TEST PROCEDURE:.....	78
14.2 TEST RESULT:	78
15 ANTENNA REQUIREMENT	87
16 RF EXPOSURE.....	88
17 PHOTOGRAPHS OF TEST SETUP AND EUT.....	89

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS19S09068 238W003	2019-10-30	2019-10-31 to 2019-11- 11	2019-11-12	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	SMARTPHONE
Model(s):	ELEMENT 4 PLUS
Model Description:	N/A
GSM Band(s):	GSM 850/900/1800/1900MHz
GPRS Class:	12
WCDMA Band(s):	FDD Band II/V
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40
Bluetooth Version:	Bluetooth v4.0 with BLE
GPS:	Support
NFC:	N/A
Hardware Version:	V00
Software Version:	ELEMENT4PLUS_V1_20191015
Highest frequency (Exclude Radio):	1.3GHz
Storage Location:	Internal Storage
Note:	N/A

4.2 Details of E.U.T.

Operation Frequency:	WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz BLE:2402-2480MHz
Max. RF output power:	WiFi(2.4G): 20.08dBm BLE: 4.61dBm
Type of Modulation:	WiFi: CCK, OFDM BLE:GFSK
Antenna installation:	WiFi: internal permanent antenna BLE: internal permanent antenna
Antenna Gain:	WiFi(2.4G): -3.0dBi BLE: -3.0dBi
Ratings:	Battery DC 3.8V, 1500mAh DC 5V, 550mA, charging from adapter (Adapter Input: 100-240V~50/60Hz 0.15A)
Adapter:	Manufacturer: Dongguan Aohai Power Technology Co.,Ltd Model No.: A31A-050055U-US1

4.3 Channel List

WIFI

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

BT BLE

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

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
Power Spectral Density	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
6dB Bandwidth	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
Band Edge	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX
Transmitter Spurious Emissions	802.11b	1 Mbps	1/6/11	TX
	802.11g	6 Mbps	1/6/11	TX
	802.11n HT20	MCS0	1/6/11	TX
	802.11n HT40	MCS0	3/6/9	TX

Table 2 Tests Carried Out Under FCC part 15.247

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
6dB 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 .

5 Test Summary

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

Note: All test were performed that the device transmit continue of the 100% duty cycle.

6 Equipment Used during Test

6.1 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	2019-09-12	2020-09-11
2.	LISN	R&S	ENV216	101215	2019-09-12	2020-09-11
3.	Cable	Top	TYPE16(3.5M)	-	2019-09-12	2020-09-11
Conducted Emissions Test Site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMI Test Receiver	R&S	ESCI	101155	2019-09-12	2020-09-11
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2019-09-12	2020-09-11
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2019-09-12	2020-09-11
4.	Cable	LARGE	RF300	-	2019-09-12	2020-09-11
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Spectrum Analyzer	R&S	FSP	100091	2019-04-29	2020-04-28
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2019-04-09	2020-04-08
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2019-04-09	2020-04-08
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2019-09-12	2020-09-11
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2019-04-09	2020-04-08
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2019-04-09	2020-04-08
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2019-04-13	2020-04-12
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2019-04-13	2020-04-12
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1	Test Receiver	R&S	ESCI	101296	2019-04-13	2020-04-12
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-04-09	2020-04-08
3	Amplifier	Compliance direction systems inc	PAP-0203	22024	2019-04-13	2020-04-12
4	Cable	HUBER+SUHNER	CBL2	525178	2019-04-13	2020-04-12

RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2019-09-12	2020-09-11
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2019-09-12	2020-09-11
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2019-09-12	2020-09-11

6.2 Description of Support Units

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

6.3 Measurement Uncertainty

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

6.4 Test Equipment Calibration

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

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207
Test Method: ANSI C63.10:2013
Test Result: PASS
Frequency Range: 150kHz to 30MHz
Class/Severity: Class B
Limit:

Frequency (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

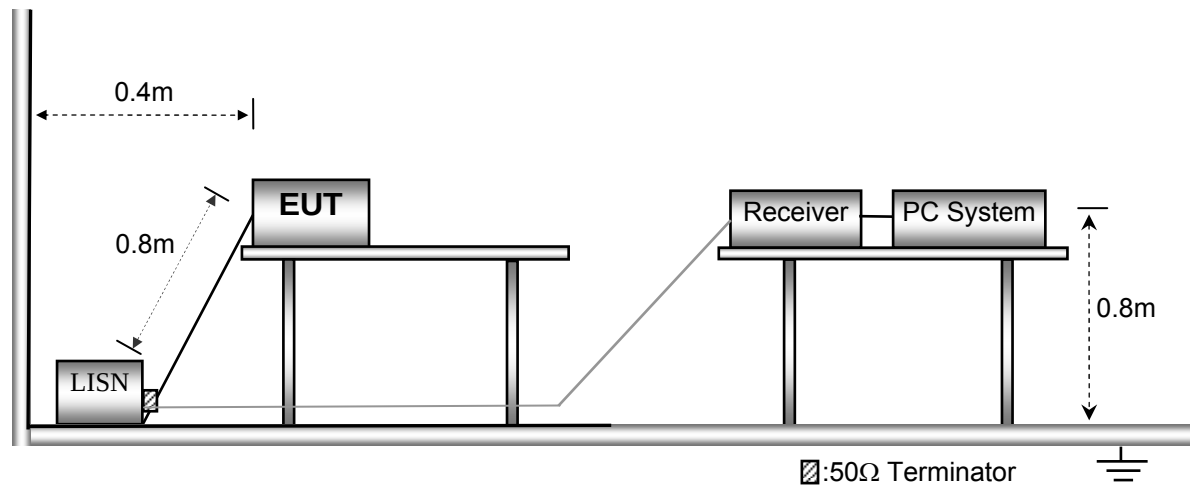
7.1 E.U.T. Operation

Operating Environment :
Temperature: 21.5 °C
Humidity: 51.9 % RH
Atmospheric Pressure: 101.2kPa

EUT Operation :
The test was performed in TX transmitting mode, the worst data 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

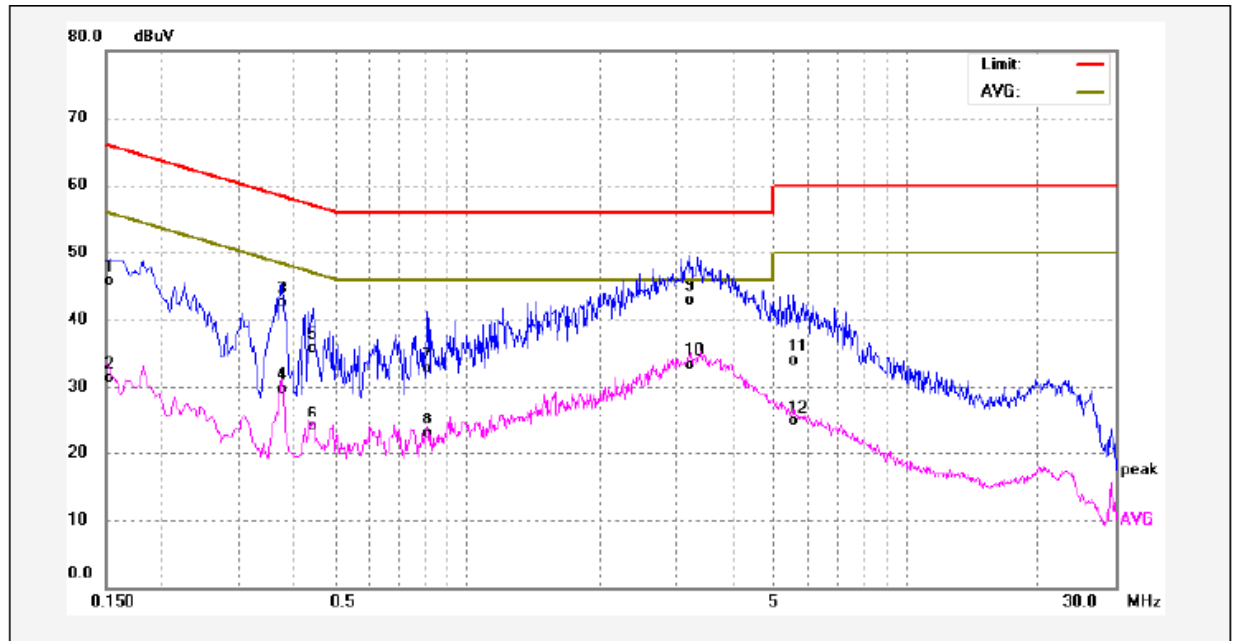
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

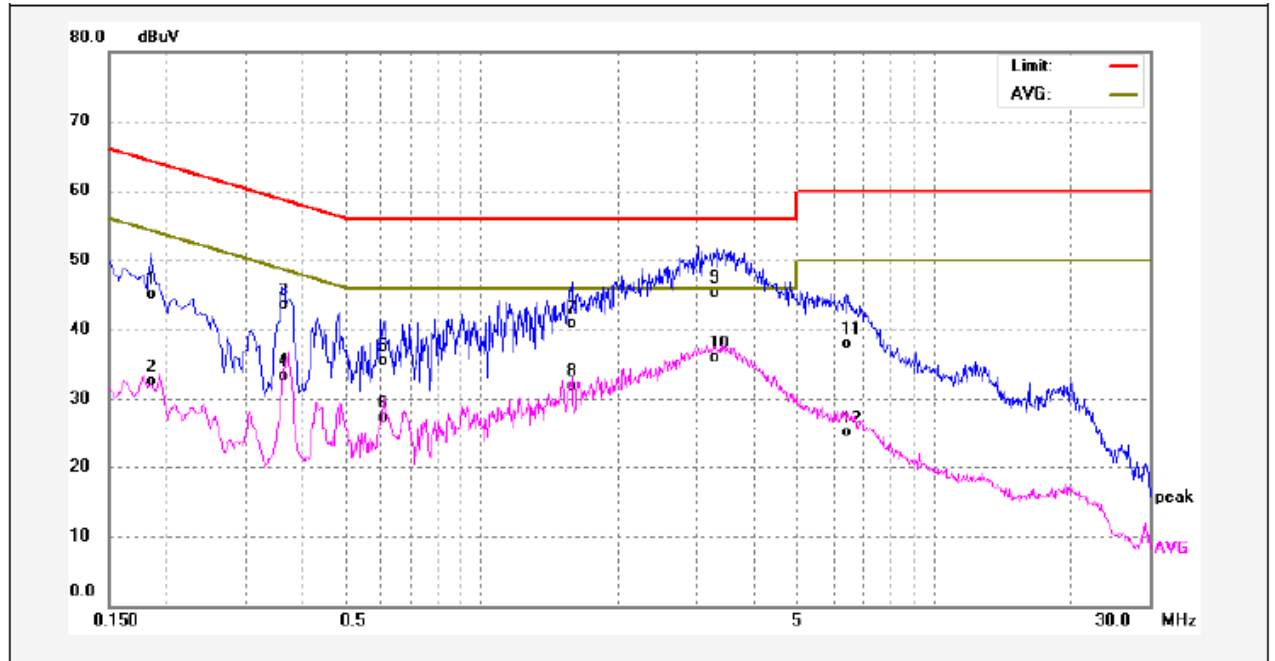
An initial pre-scan was performed on the live and neutral lines.

Worst Mode: WIFI mode (802.11b mode low channel)

Live line:



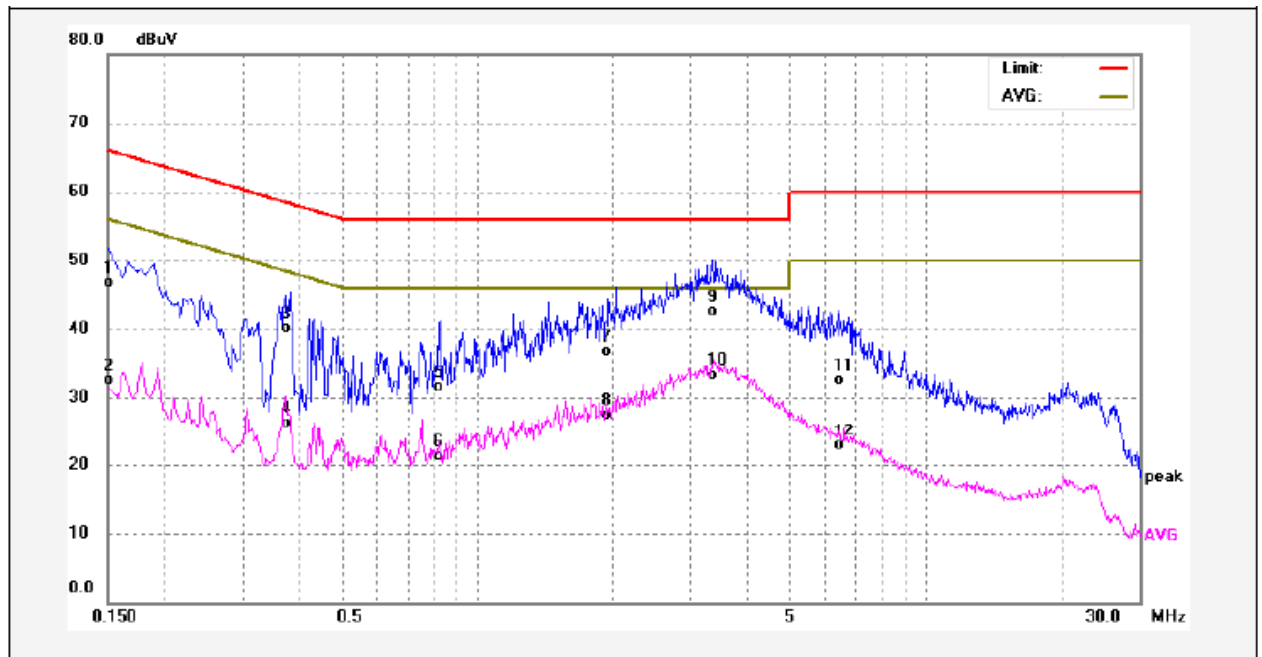
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1860	34.82	10.31	45.13	64.21	-19.08	QP	
2	0.1860	22.12	10.31	32.43	54.21	-21.78	AVG	
3	0.3620	33.12	10.42	43.54	58.68	-15.14	QP	
4	0.3620	22.83	10.42	33.25	48.68	-15.43	AVG	
5	0.5980	25.08	10.49	35.57	56.00	-20.43	QP	
6	0.5980	16.75	10.49	27.24	46.00	-18.76	AVG	
7	1.5780	30.43	10.49	40.92	56.00	-15.08	QP	
8	1.5780	21.36	10.49	31.85	46.00	-14.15	AVG	
9	3.3140	34.52	10.72	45.24	56.00	-10.76	QP	
10	3.3140	25.11	10.72	35.83	46.00	-10.17	AVG	
11	6.4060	26.97	10.95	37.92	60.00	-22.08	QP	
12	6.4060	14.17	10.95	25.12	50.00	-24.88	AVG	

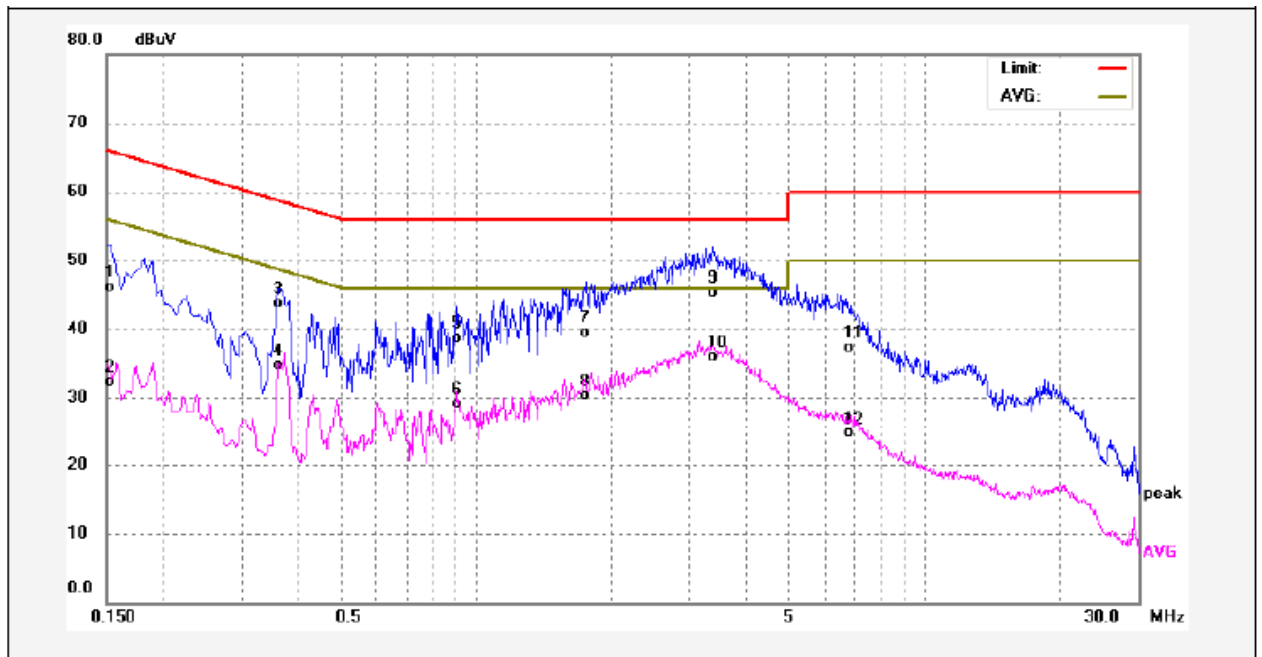
Worst Mode: BLE mode (low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	36.51	10.26	46.77	65.99	-19.22	QP	
2	0.1500	22.32	10.26	32.58	55.99	-23.41	AVG	
3	0.3820	29.60	10.42	40.02	58.23	-18.21	QP	
4	0.3820	15.83	10.42	26.25	48.23	-21.98	AVG	
5	0.8300	21.11	10.44	31.55	56.00	-24.45	QP	
6	0.8300	10.90	10.44	21.34	46.00	-24.66	AVG	
7	1.9620	26.13	10.55	36.68	56.00	-19.32	QP	
8	1.9620	16.90	10.55	27.45	46.00	-18.55	AVG	
9	3.3620	31.85	10.72	42.57	56.00	-13.43	QP	
10	3.3620	22.64	10.72	33.36	46.00	-12.64	AVG	
11	6.3980	21.61	10.95	32.56	60.00	-27.44	QP	
12	6.3980	12.05	10.95	23.00	50.00	-27.00	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector	Remark
1	0.1539	35.86	10.27	46.13	65.78	-19.65	QP	
2	0.1539	22.13	10.27	32.40	55.78	-23.38	AVG	
3	0.3660	33.26	10.42	43.68	58.59	-14.91	QP	
4	0.3660	24.29	10.42	34.71	48.59	-13.88	AVG	
5	0.9060	28.20	10.44	38.64	56.00	-17.36	QP	
6	0.9060	18.74	10.44	29.18	46.00	-16.82	AVG	
7	1.7660	28.89	10.52	39.41	56.00	-16.59	QP	
8	1.7660	19.71	10.52	30.23	46.00	-15.77	AVG	
9	3.3700	34.57	10.72	45.29	56.00	-10.71	QP	
10	3.3700	25.20	10.72	35.92	46.00	-10.08	AVG	
11	6.7420	26.39	10.98	37.37	60.00	-22.63	QP	
12	6.7420	13.72	10.98	24.70	50.00	-25.30	AVG	

8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;
ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

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

8.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

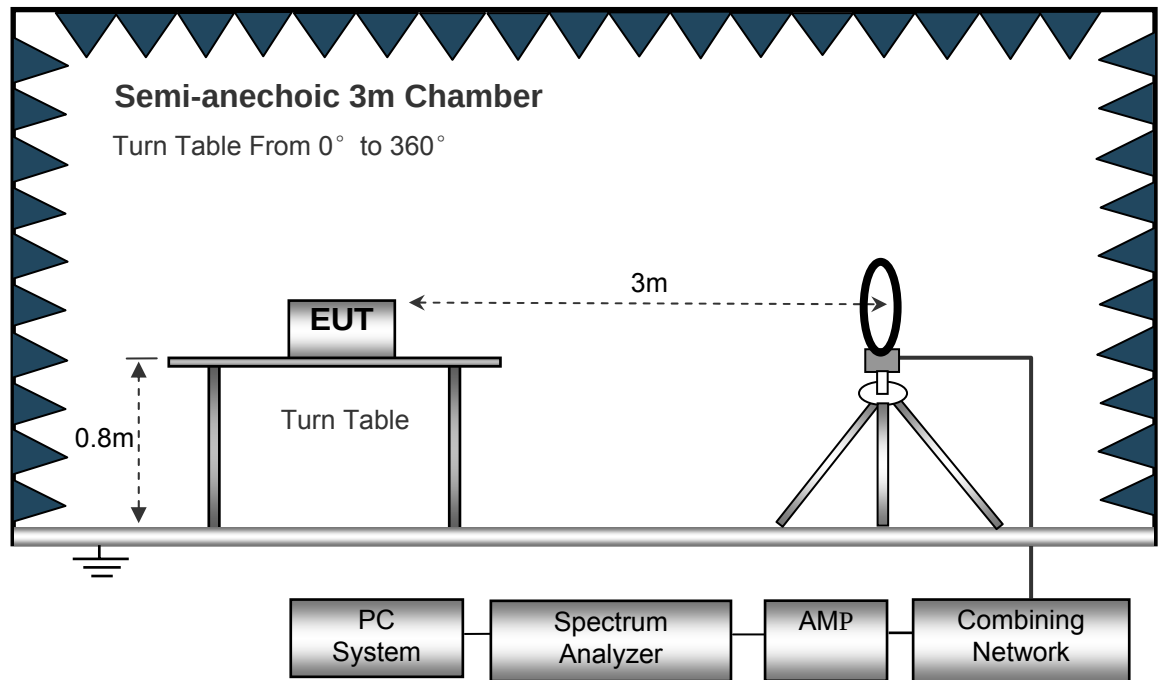
EUT Operation :

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

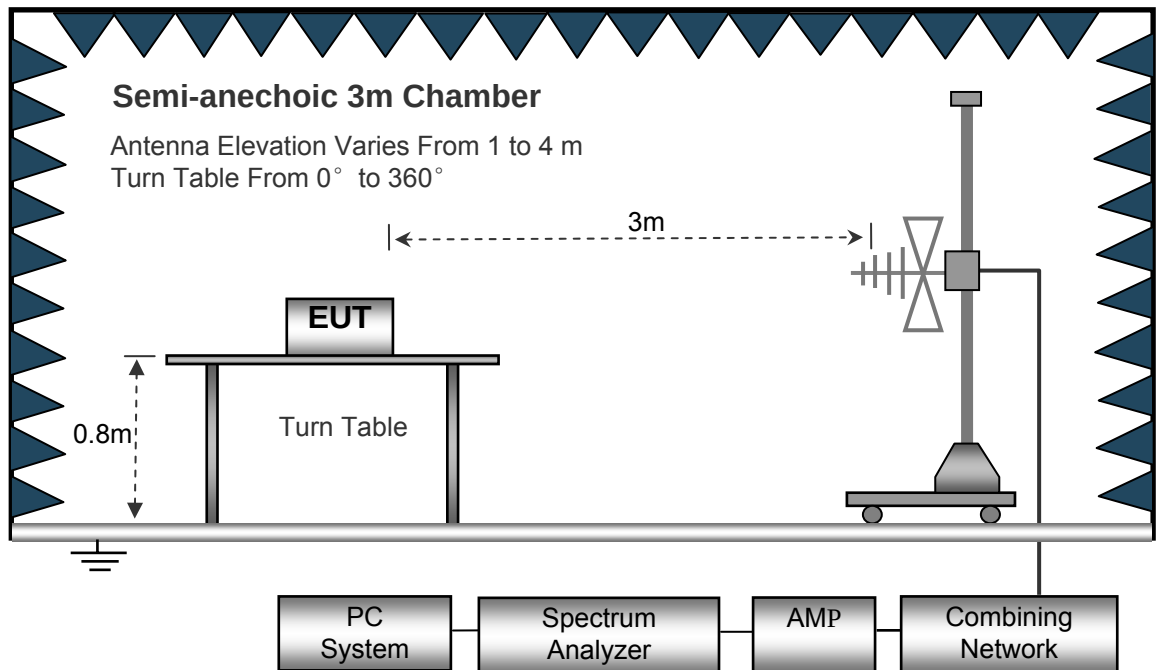
8.2 Test Setup

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

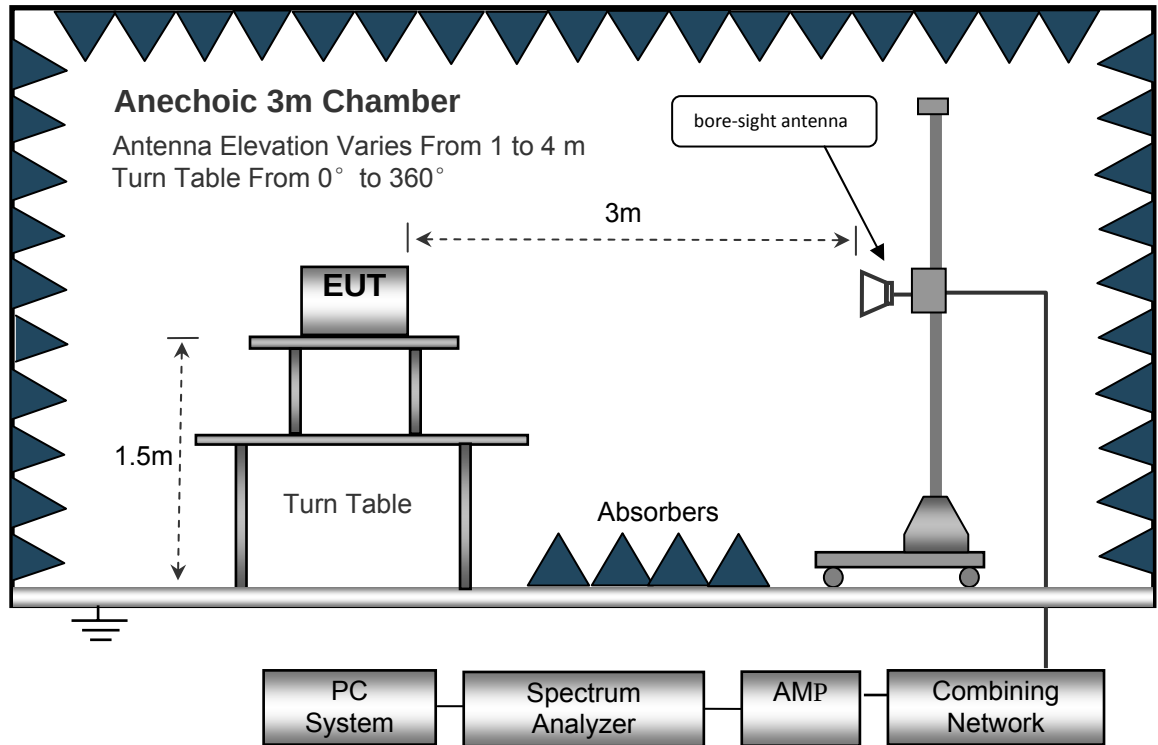
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

Sweep Speed Auto
 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, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used 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

Wifi:

Test Frequency: 9KHz~30MHz

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

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
802.11b							
6.021	25.33	QP	21.84	40.00	7.17	29.54	-22.37
15.730	24.75	QP	21.35	40.00	6.10	29.54	-23.44
25.680	25.10	QP	20.67	40.00	5.77	29.54	-23.77
802.11g							
6.021	25.37	QP	21.84	40.00	7.21	29.54	-22.33
15.730	24.61	QP	21.35	40.00	5.96	29.54	-23.58
25.680	25.25	QP	20.67	40.00	5.92	29.54	-23.62
802.11n(HT20)							
6.021	25.30	QP	21.84	40.00	7.14	29.54	-22.40
15.730	24.52	QP	21.35	40.00	5.87	29.54	-23.67
25.680	24.78	QP	20.67	40.00	5.45	29.54	-24.09
802.11n(HT40)							
6.021	25.11	QP	21.84	40.00	6.95	29.54	-22.59
15.730	24.89	QP	21.35	40.00	6.24	29.54	-23.30
25.680	24.73	QP	20.67	40.00	5.40	29.54	-24.14

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	40.04	QP	172	1.8	H	-11.62	28.42	46.00	-17.58
223.45	35.45	QP	155	1.5	V	-11.62	23.83	46.00	-22.17
4824.00	51.16	PK	3	2.0	V	-1.06	50.10	74.00	-23.90
4824.00	46.69	Ave	3	2.0	V	-1.06	45.63	54.00	-8.37
7236.00	41.43	PK	51	1.1	H	1.33	42.76	74.00	-31.24
7236.00	42.94	Ave	51	1.1	H	1.33	44.27	54.00	-9.73
2342.54	46.01	PK	356	1.6	V	-13.19	32.82	74.00	-41.18
2342.54	38.01	Ave	356	1.6	V	-13.19	24.82	54.00	-29.18
2352.78	44.95	PK	348	1.6	H	-13.14	31.81	74.00	-42.19
2352.78	37.51	Ave	348	1.6	H	-13.14	24.37	54.00	-29.63
2494.98	44.08	PK	31	1.6	V	-13.08	31.00	74.00	-43.00
2494.98	38.19	Ave	31	1.6	V	-13.08	25.11	54.00	-28.89

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	39.54	QP	64	1.3	H	-11.62	27.92	46.00	-18.08
223.45	35.60	QP	180	1.5	V	-11.62	23.98	46.00	-22.02
4874.00	50.38	PK	278	1.9	V	-0.62	49.76	74.00	-24.24
4874.00	46.03	Ave	278	1.9	V	-0.62	45.41	54.00	-8.59
7311.00	42.21	PK	115	1.9	H	2.21	44.42	74.00	-29.58
7311.00	43.05	Ave	115	1.9	H	2.21	45.26	54.00	-8.74
2323.60	46.31	PK	312	1.7	V	-13.19	33.12	74.00	-40.88
2323.60	39.97	Ave	312	1.7	V	-13.19	26.78	54.00	-27.22
2369.88	42.46	PK	110	1.3	H	-13.14	29.32	74.00	-44.68
2369.88	38.49	Ave	110	1.3	H	-13.14	25.35	54.00	-28.65
2488.50	44.52	PK	306	1.5	V	-13.08	31.44	74.00	-42.56
2488.50	38.59	Ave	306	1.5	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)
11b: High Channel 2462MHz									
223.45	39.40	QP	343	1.5	H	-11.62	27.78	46.00	-18.22
223.45	36.53	QP	217	1.5	V	-11.62	24.91	46.00	-21.09
4924.00	50.09	PK	115	1.9	V	-0.24	49.85	74.00	-24.15
4924.00	44.90	Ave	115	1.9	V	-0.24	44.66	54.00	-9.34
7386.00	40.85	PK	97	1.9	H	2.84	43.69	74.00	-30.31
7386.00	41.56	Ave	97	1.9	H	2.84	44.40	54.00	-9.60
2325.41	45.19	PK	36	1.1	V	-13.19	32.00	74.00	-42.00
2325.41	39.39	Ave	36	1.1	V	-13.19	26.20	54.00	-27.80
2371.88	42.45	PK	67	1.9	H	-13.14	29.31	74.00	-44.69
2371.88	38.71	Ave	67	1.9	H	-13.14	25.57	54.00	-28.43
2495.65	43.29	PK	142	1.4	V	-13.08	30.21	74.00	-43.79
2495.65	36.18	Ave	142	1.4	V	-13.08	23.10	54.00	-30.90

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
223.45	39.45	QP	291	1.5	H	-11.62	27.83	46.00	-18.17
223.45	35.85	QP	105	1.5	V	-11.62	24.23	46.00	-21.77
4824.00	49.01	PK	82	1.4	V	-1.06	47.95	74.00	-26.05
4824.00	45.66	Ave	82	1.4	V	-1.06	44.60	54.00	-9.40
7236.00	40.70	PK	9	1.3	H	1.33	42.03	74.00	-31.97
7236.00	41.28	Ave	9	1.3	H	1.33	42.61	54.00	-11.39
2330.85	46.76	PK	88	1.2	V	-13.19	33.57	74.00	-40.43
2330.85	39.86	Ave	88	1.2	V	-13.19	26.67	54.00	-27.33
2350.11	42.23	PK	3	1.9	H	-13.14	29.09	74.00	-44.91
2350.11	37.99	Ave	3	1.9	H	-13.14	24.85	54.00	-29.15
2493.29	44.05	PK	181	1.3	V	-13.08	30.97	74.00	-43.03
2493.29	36.27	Ave	181	1.3	V	-13.08	23.19	54.00	-30.81

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	40.51	QP	187	1.9	H	-11.62	28.89	46.00	-17.11
223.45	35.08	QP	335	1.8	V	-11.62	23.46	46.00	-22.54
4874.00	49.60	PK	89	1.6	V	-0.62	48.98	74.00	-25.02
4874.00	44.89	Ave	89	1.6	V	-0.62	44.27	54.00	-9.73
7311.00	39.21	PK	46	1.2	H	2.21	41.42	74.00	-32.58
7311.00	41.20	Ave	46	1.2	H	2.21	43.41	54.00	-10.59
2337.92	46.85	PK	214	1.3	V	-13.19	33.66	74.00	-40.34
2337.92	37.00	Ave	214	1.3	V	-13.19	23.81	54.00	-30.19
2350.53	42.29	PK	184	1.3	H	-13.14	29.15	74.00	-44.85
2350.53	38.10	Ave	184	1.3	H	-13.14	24.96	54.00	-29.04
2492.78	43.44	PK	66	2.0	V	-13.08	30.36	74.00	-43.64
2492.78	37.54	Ave	66	2.0	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)
11g: High Channel 2462MHz									
223.45	41.26	QP	149	1.2	H	-11.62	29.64	46.00	-16.36
223.45	34.78	QP	254	1.5	V	-11.62	23.16	46.00	-22.84
4924.00	48.40	PK	251	1.4	V	-0.24	48.16	74.00	-25.84
4924.00	44.04	Ave	251	1.4	V	-0.24	43.80	54.00	-10.20
7386.00	39.36	PK	260	2.0	H	2.84	42.20	74.00	-31.80
7386.00	41.37	Ave	260	2.0	H	2.84	44.21	54.00	-9.79
2311.96	45.32	PK	230	1.6	V	-13.19	32.13	74.00	-41.87
2311.96	39.60	Ave	230	1.6	V	-13.19	26.41	54.00	-27.59
2380.74	43.93	PK	120	1.6	H	-13.14	30.79	74.00	-43.21
2380.74	36.85	Ave	120	1.6	H	-13.14	23.71	54.00	-30.29
2497.37	42.09	PK	321	1.2	V	-13.08	29.01	74.00	-44.99
2497.37	38.76	Ave	321	1.2	V	-13.08	25.68	54.00	-28.32

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	42.37	QP	88	1.5	H	-11.62	30.75	46.00	-15.25
223.45	34.82	QP	170	1.6	V	-11.62	23.20	46.00	-22.80
4824.00	49.26	PK	197	1.9	V	-1.06	48.20	74.00	-25.80
4824.00	44.66	Ave	197	1.9	V	-1.06	43.60	54.00	-10.40
7236.00	38.83	PK	176	1.0	H	1.33	40.16	74.00	-33.84
7236.00	40.01	Ave	176	1.0	H	1.33	41.34	54.00	-12.66
2331.69	45.45	PK	130	1.3	V	-13.19	32.26	74.00	-41.74
2331.69	37.10	Ave	130	1.3	V	-13.19	23.91	54.00	-30.09
2356.70	43.09	PK	67	2.0	H	-13.14	29.95	74.00	-44.05
2356.70	36.38	Ave	67	2.0	H	-13.14	23.24	54.00	-30.76
2496.37	44.58	PK	8	1.8	V	-13.08	31.50	74.00	-42.50
2496.37	38.82	Ave	8	1.8	V	-13.08	25.74	54.00	-28.26

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	43.57	QP	195	1.5	H	-11.62	31.95	46.00	-14.05
223.45	34.00	QP	49	1.8	V	-11.62	22.38	46.00	-23.62
4874.00	50.30	PK	204	1.2	V	-0.62	49.68	74.00	-24.32
4874.00	43.29	Ave	204	1.2	V	-0.62	42.67	54.00	-11.33
7311.00	37.79	PK	35	1.8	H	2.21	40.00	74.00	-34.00
7311.00	38.86	Ave	35	1.8	H	2.21	41.07	54.00	-12.93
2323.00	46.86	PK	309	1.2	V	-13.19	33.67	74.00	-40.33
2323.00	37.19	Ave	309	1.2	V	-13.19	24.00	54.00	-30.00
2374.48	43.82	PK	41	1.7	H	-13.14	30.68	74.00	-43.32
2374.48	37.16	Ave	41	1.7	H	-13.14	24.02	54.00	-29.98
2496.20	42.05	PK	88	1.9	V	-13.08	28.97	74.00	-45.03
2496.20	38.32	Ave	88	1.9	V	-13.08	25.24	54.00	-28.76

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	42.13	QP	356	1.3	H	-11.62	30.51	46.00	-15.49
223.45	33.84	QP	262	1.5	V	-11.62	22.22	46.00	-23.78
4924.00	49.30	PK	162	1.5	V	-0.24	49.06	74.00	-24.94
4924.00	44.73	Ave	162	1.5	V	-0.24	44.49	54.00	-9.51
7386.00	38.03	PK	98	1.2	H	2.84	40.87	74.00	-33.13
7386.00	40.08	Ave	98	1.2	H	2.84	42.92	54.00	-11.08
2336.27	45.54	PK	289	1.2	V	-13.19	32.35	74.00	-41.65
2336.27	38.68	Ave	289	1.2	V	-13.19	25.49	54.00	-28.51
2379.47	44.12	PK	240	1.9	H	-13.14	30.98	74.00	-43.02
2379.47	36.02	Ave	240	1.9	H	-13.14	22.88	54.00	-31.12
2489.02	42.84	PK	110	1.4	V	-13.08	29.76	74.00	-44.24
2489.02	38.27	Ave	110	1.4	V	-13.08	25.19	54.00	-28.81

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	40.99	QP	330	1.8	H	-11.62	29.37	46.00	-16.63
223.45	32.95	QP	132	1.9	V	-11.62	21.33	46.00	-24.67
4844.00	47.41	PK	316	1.0	V	-1.06	46.35	74.00	-27.65
4844.00	41.74	Ave	316	1.0	V	-1.06	40.68	54.00	-13.32
7266.00	36.32	PK	334	1.0	H	1.33	37.65	74.00	-36.35
7266.00	38.57	Ave	334	1.0	H	1.33	39.90	54.00	-14.10
2336.75	46.65	PK	207	1.8	V	-13.19	33.46	74.00	-40.54
2336.75	39.86	Ave	207	1.8	V	-13.19	26.67	54.00	-27.33
2373.77	42.79	PK	99	1.1	H	-13.14	29.65	74.00	-44.35
2373.77	36.74	Ave	99	1.1	H	-13.14	23.60	54.00	-30.40
2489.87	44.30	PK	133	1.7	V	-13.08	31.22	74.00	-42.78
2489.87	36.16	Ave	133	1.7	V	-13.08	23.08	54.00	-30.92

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: Middle Channel 2437MHz									
223.45	40.63	QP	204	1.8	H	-11.62	29.01	46.00	-16.99
223.45	32.02	QP	83	1.9	V	-11.62	20.40	46.00	-25.60
4874.00	48.07	PK	336	1.5	V	-0.62	47.45	74.00	-26.55
4874.00	41.90	Ave	336	1.5	V	-0.62	41.28	54.00	-12.72
7311.00	36.62	PK	231	1.2	H	2.21	38.83	74.00	-35.17
7311.00	39.12	Ave	231	1.2	H	2.21	41.33	54.00	-12.67
2348.20	45.79	PK	204	1.5	V	-13.19	32.60	74.00	-41.40
2348.20	39.83	Ave	204	1.5	V	-13.19	26.64	54.00	-27.36
2375.24	43.70	PK	203	1.8	H	-13.14	30.56	74.00	-43.44
2375.24	37.03	Ave	203	1.8	H	-13.14	23.89	54.00	-30.11
2494.24	44.26	PK	292	1.6	V	-13.08	31.18	74.00	-42.82
2494.24	36.30	Ave	292	1.6	V	-13.08	23.22	54.00	-30.78

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: High Channel 2452MHz									
223.45	39.86	QP	16	1.4	H	-11.62	28.24	46.00	-17.76
223.45	31.87	QP	138	1.4	V	-11.62	20.25	46.00	-25.75
4904.00	48.96	PK	346	1.9	V	-0.24	48.72	74.00	-25.28
4904.00	41.28	Ave	346	1.9	V	-0.24	41.04	54.00	-12.96
7356.00	36.99	PK	249	1.7	H	2.84	39.83	74.00	-34.17
7356.00	38.69	Ave	249	1.7	H	2.84	41.53	54.00	-12.47
2320.16	45.37	PK	9	1.3	V	-13.19	32.18	74.00	-41.82
2320.16	39.59	Ave	9	1.3	V	-13.19	26.40	54.00	-27.60
2360.83	42.80	PK	22	1.1	H	-13.14	29.66	74.00	-44.34
2360.83	37.27	Ave	22	1.1	H	-13.14	24.13	54.00	-29.87
2490.46	44.95	PK	5	1.6	V	-13.08	31.87	74.00	-42.13
2490.46	38.10	Ave	5	1.6	V	-13.08	25.02	54.00	-28.98

Test Frequency: 18GHz~25GHz

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

BT BLE:**Test Frequency: 9KHz~26MHz**

Remark: only the worst data (GFSK modulation Low channel mode) were recorded.

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
6.021	25.30	QP	21.84	40.00	7.14	29.54	-22.40
15.730	24.33	QP	21.35	40.00	5.68	29.54	-23.86
25.680	23.85	QP	20.67	40.00	4.52	29.54	-25.02

Test Frequency : 26MHz ~ 30MHz

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									
269.33	34.57	QP	270	1.0	H	-13.35	21.22	46.00	-24.78
269.33	40.47	QP	68	1.2	V	-13.35	27.12	46.00	-18.88
4804.00	45.41	PK	242	1.4	V	-1.06	44.35	74.00	-29.65
4804.00	41.55	Ave	242	1.4	V	-1.06	40.49	54.00	-13.51
7206.00	45.47	PK	183	1.5	H	1.33	46.80	74.00	-27.20
7206.00	37.07	Ave	183	1.5	H	1.33	38.40	54.00	-15.60
2310.34	46.68	PK	246	1.1	V	-13.19	33.49	74.00	-40.51
2310.34	38.21	Ave	246	1.1	V	-13.19	25.02	54.00	-28.98
2382.79	44.91	PK	295	1.7	H	-13.14	31.77	74.00	-42.23
2382.79	38.97	Ave	295	1.7	H	-13.14	25.83	54.00	-28.17
2494.64	43.73	PK	27	1.6	V	-13.08	30.65	74.00	-43.35
2494.64	37.34	Ave	27	1.6	V	-13.08	24.26	54.00	-29.74

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									
269.33	34.17	QP	86	1.3	H	-13.35	20.82	46.00	-25.18
269.33	40.74	QP	278	2.0	V	-13.35	27.39	46.00	-18.61
4880.00	43.46	PK	201	1.2	V	-0.62	42.84	74.00	-31.16
4880.00	42.41	Ave	201	1.2	V	-0.62	41.79	54.00	-12.21
7320.00	46.47	PK	248	1.8	H	2.21	48.68	74.00	-25.32
7320.00	37.74	Ave	248	1.8	H	2.21	39.95	54.00	-14.05
2324.59	45.22	PK	196	1.4	V	-13.19	32.03	74.00	-41.97
2324.59	38.09	Ave	196	1.4	V	-13.19	24.90	54.00	-29.10
2382.15	42.31	PK	71	1.9	H	-13.14	29.17	74.00	-44.83
2382.15	36.68	Ave	71	1.9	H	-13.14	23.54	54.00	-30.46
2497.94	42.74	PK	122	1.9	V	-13.08	29.66	74.00	-44.34
2497.94	38.31	Ave	122	1.9	V	-13.08	25.23	54.00	-28.77

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									
269.33	34.54	QP	1	1.0	H	-13.35	21.19	46.00	-24.81
269.33	38.46	QP	285	1.7	V	-13.35	25.11	46.00	-20.89
4960.00	44.10	PK	238	1.6	V	-0.24	43.86	74.00	-30.14
4960.00	43.25	Ave	238	1.6	V	-0.24	43.01	54.00	-10.99
7440.00	47.36	PK	250	1.7	H	2.84	50.20	74.00	-23.80
7440.00	36.29	Ave	250	1.7	H	2.84	39.13	54.00	-14.87
2312.97	46.55	PK	80	2.0	V	-13.19	33.36	74.00	-40.64
2312.97	38.99	Ave	80	2.0	V	-13.19	25.80	54.00	-28.20
2384.68	42.72	PK	117	1.5	H	-13.14	29.58	74.00	-44.42
2384.68	36.20	Ave	117	1.5	H	-13.14	23.06	54.00	-30.94
2496.96	44.46	PK	307	1.5	V	-13.08	31.38	74.00	-42.62
2496.96	36.37	Ave	307	1.5	V	-13.08	23.29	54.00	-30.71

Test Frequency: 18GHz~25GHz

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

9 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;
ANSI C63.10:2013

Test Result: PASS

Limit:

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

9.1 Test Procedure

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

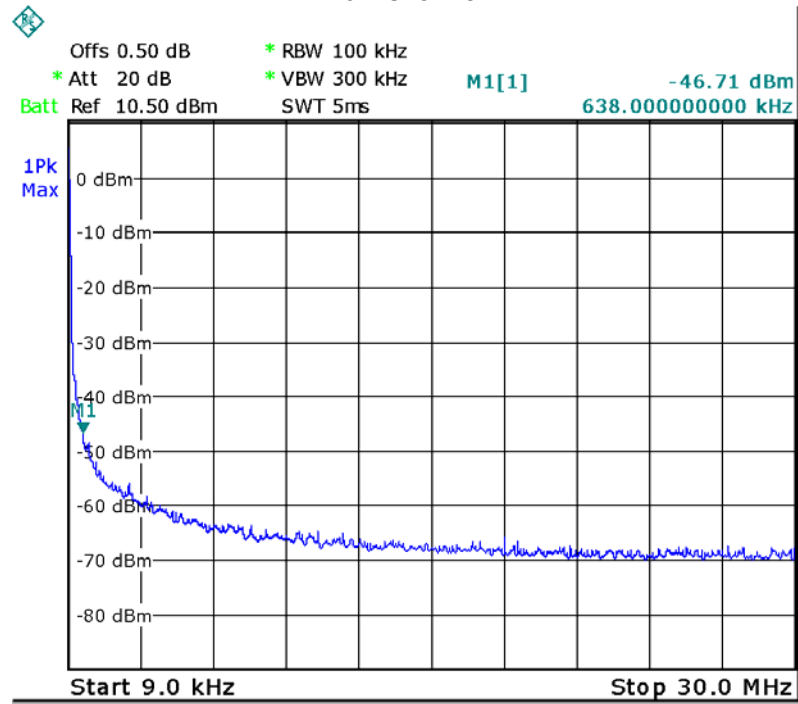
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

9.2 Test Result

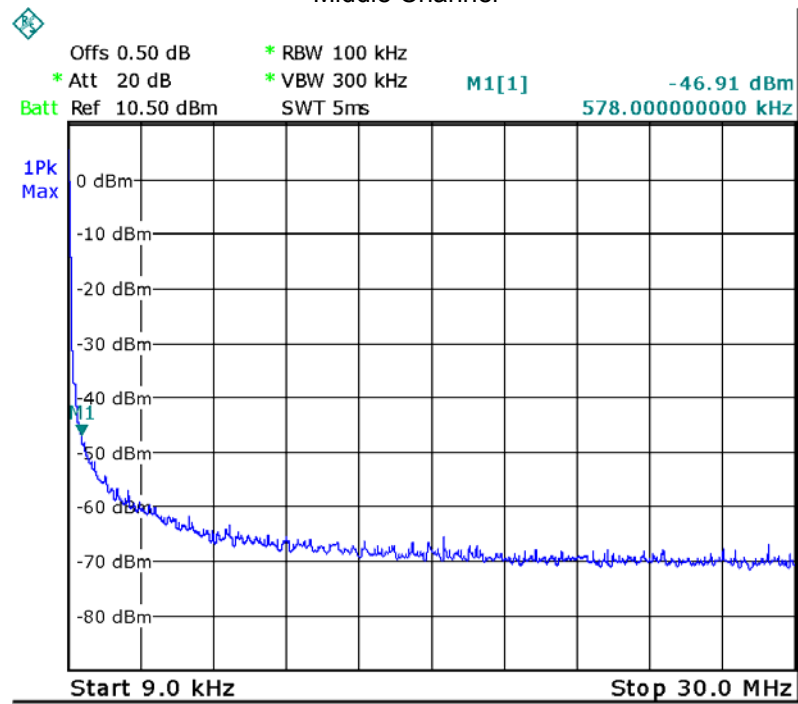
9KHz – 30MHz

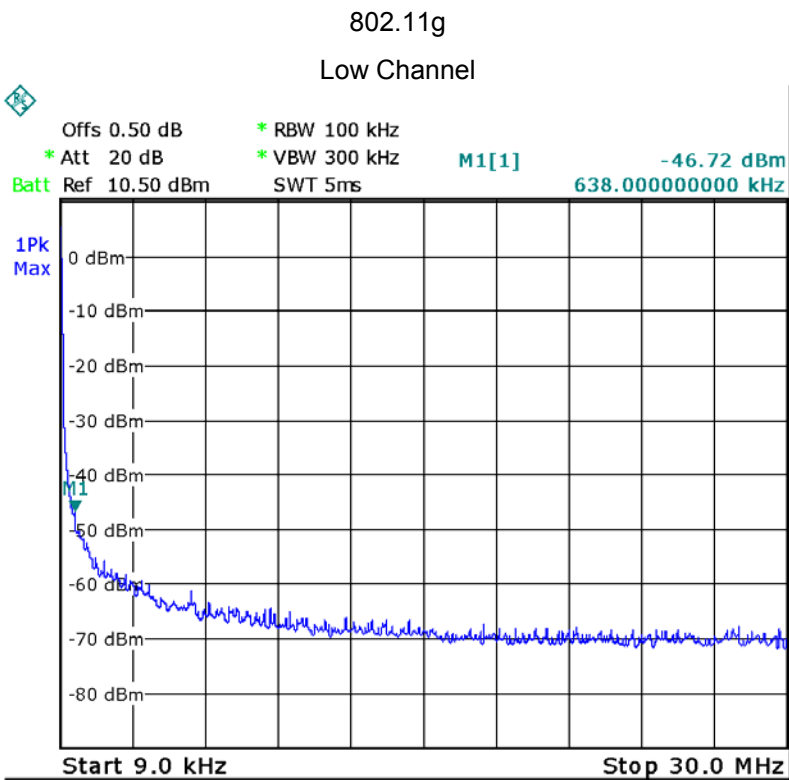
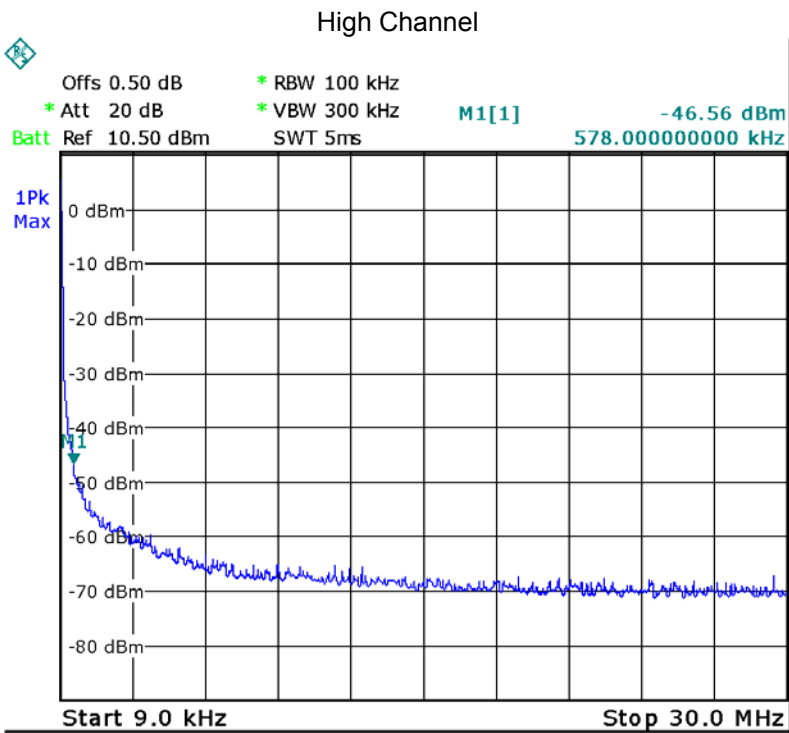
802.11b

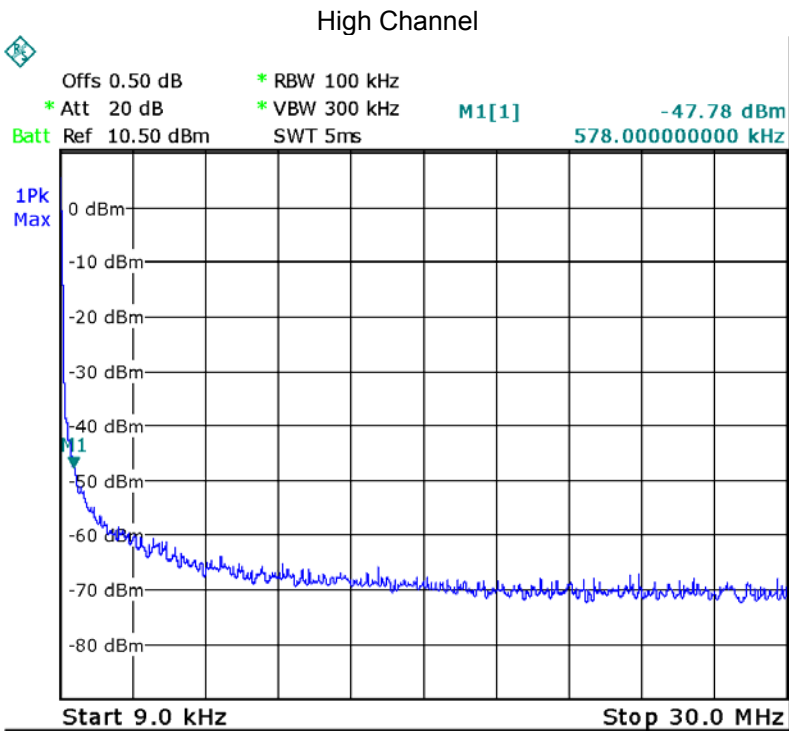
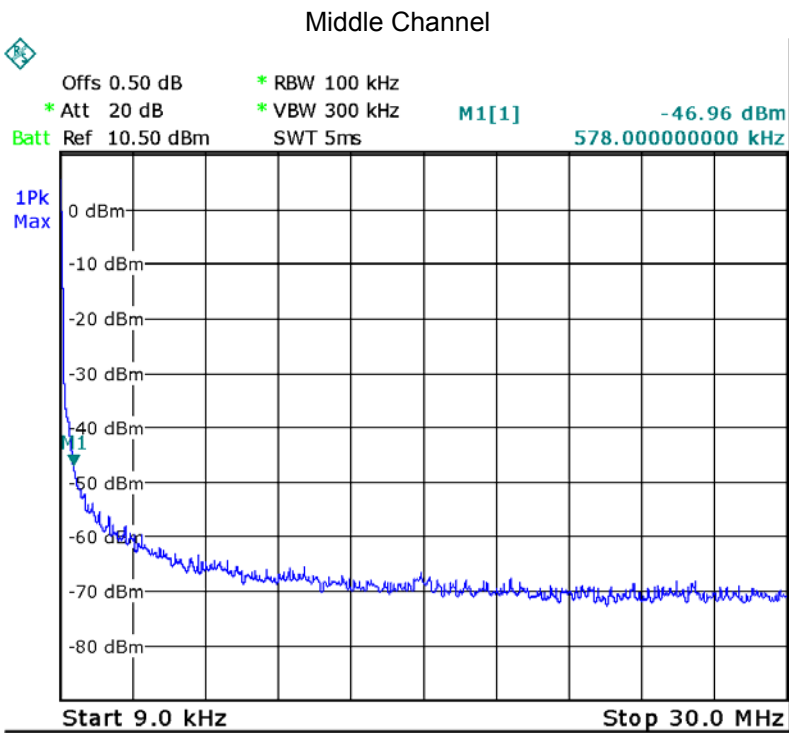
Low Channel



Middle Channel

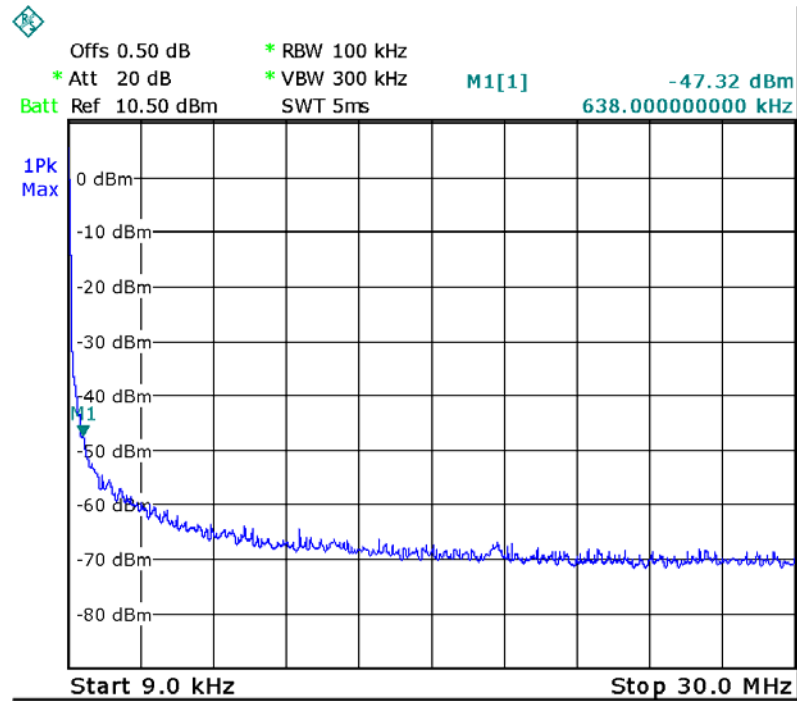




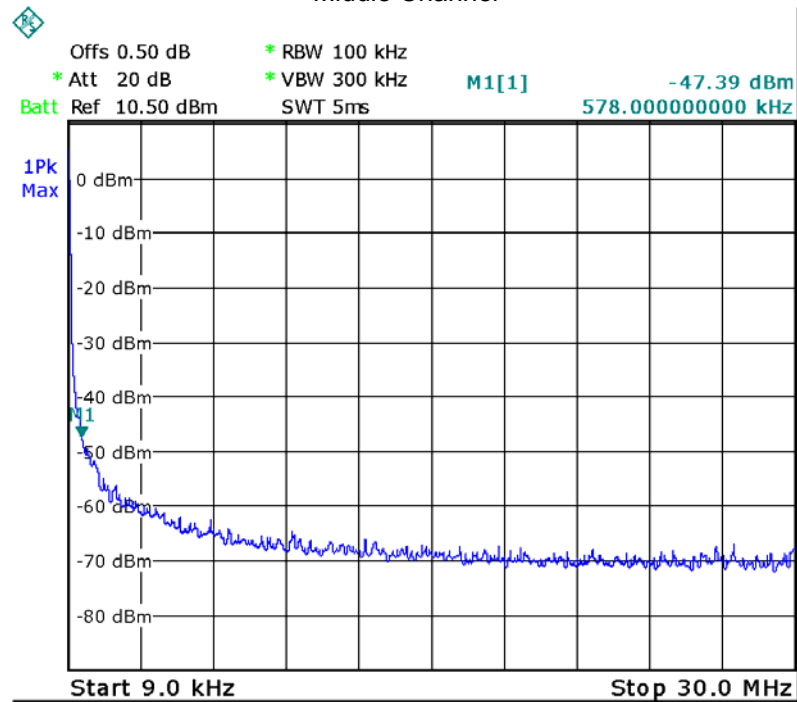


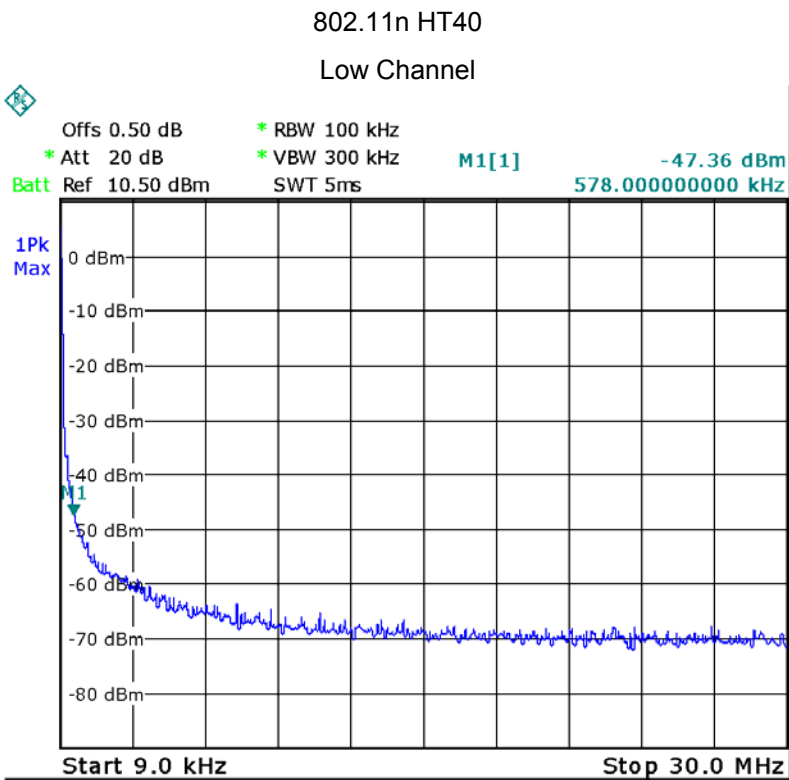
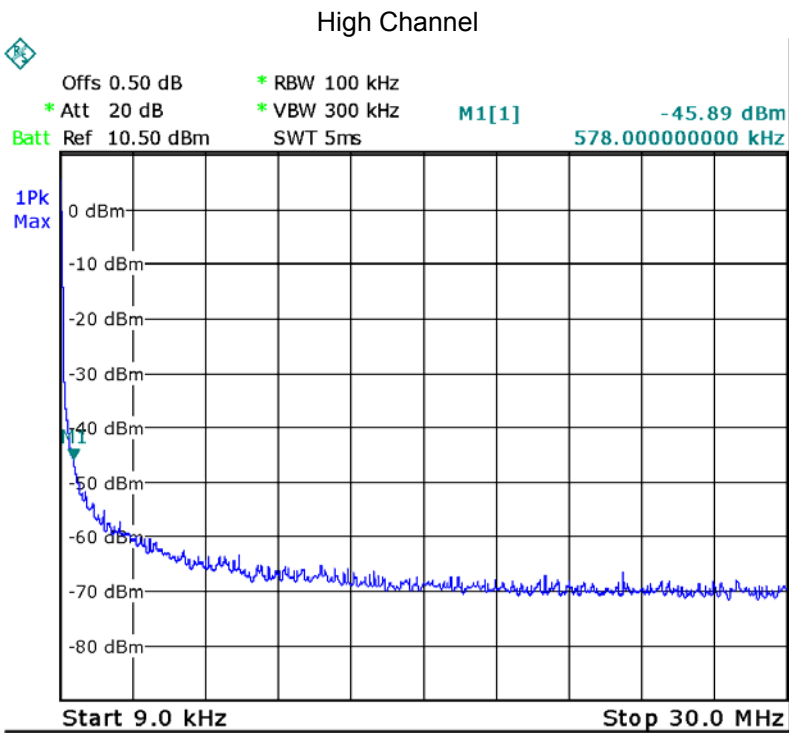
802.11n HT20

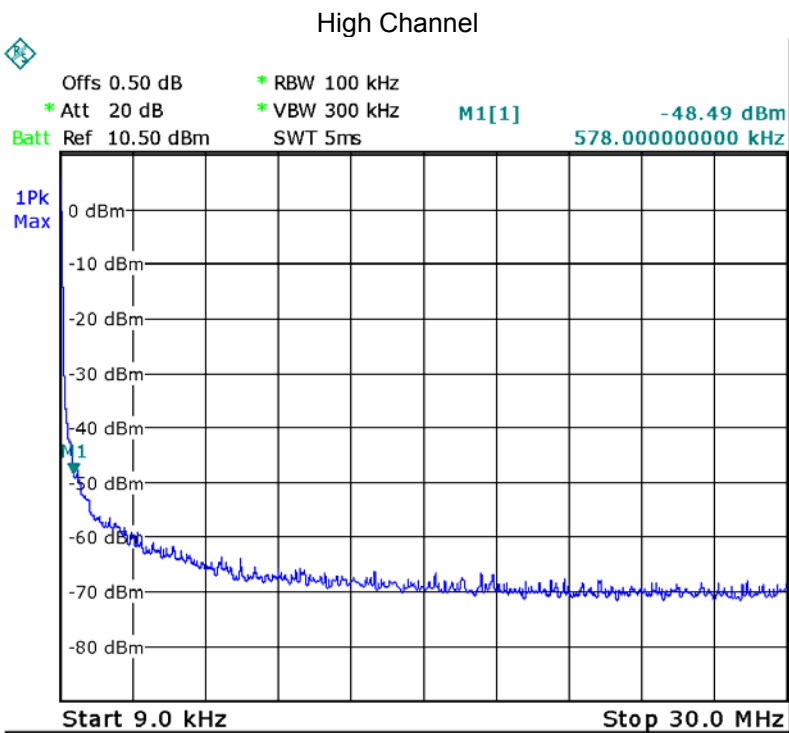
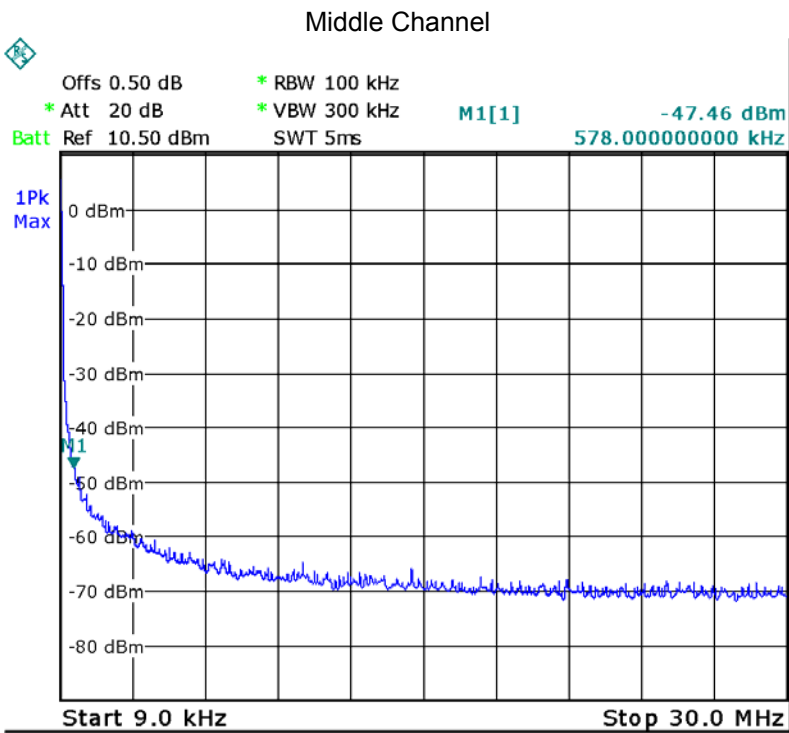
Low Channel



Middle Channel

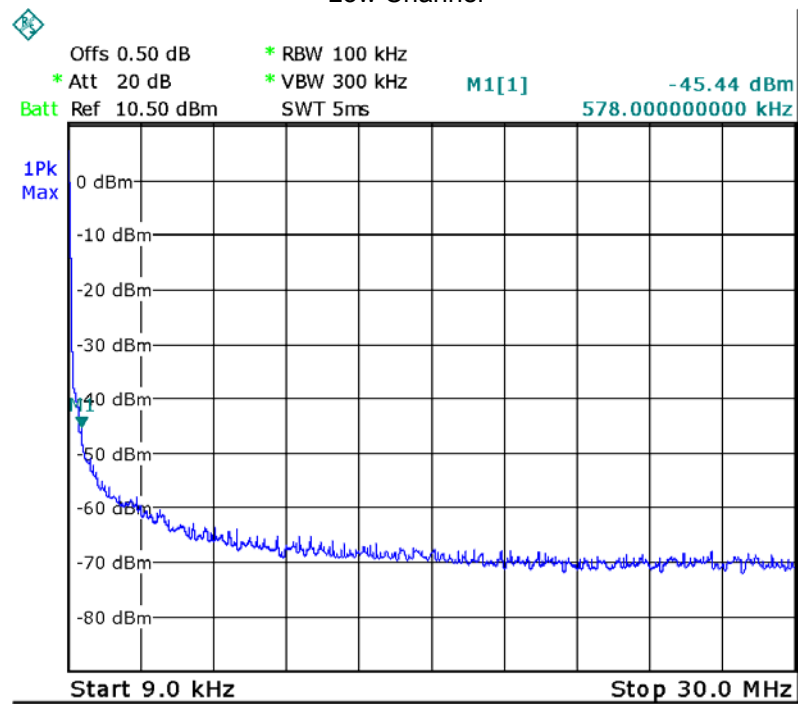




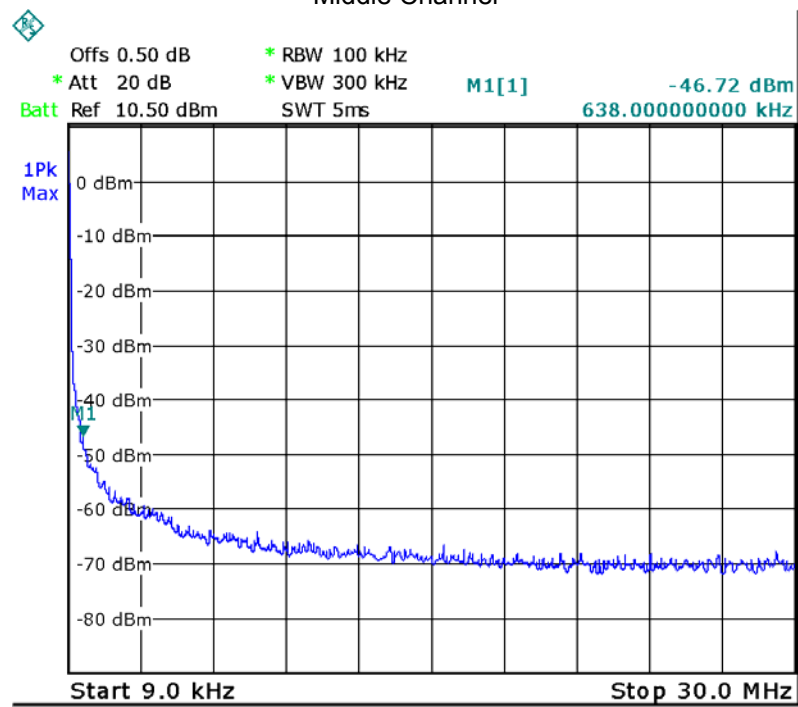


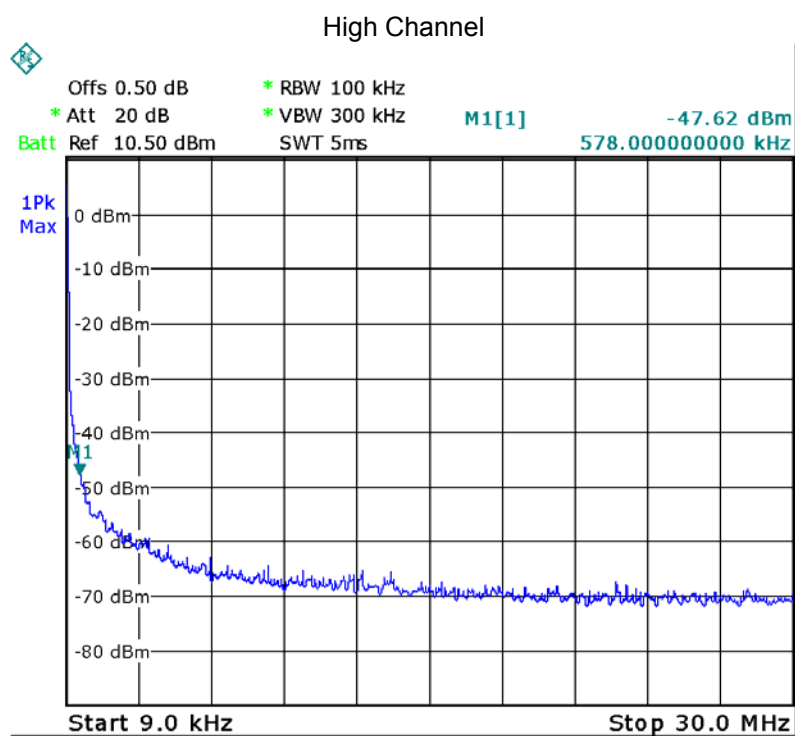
BLE

Low Channel



Middle Channel





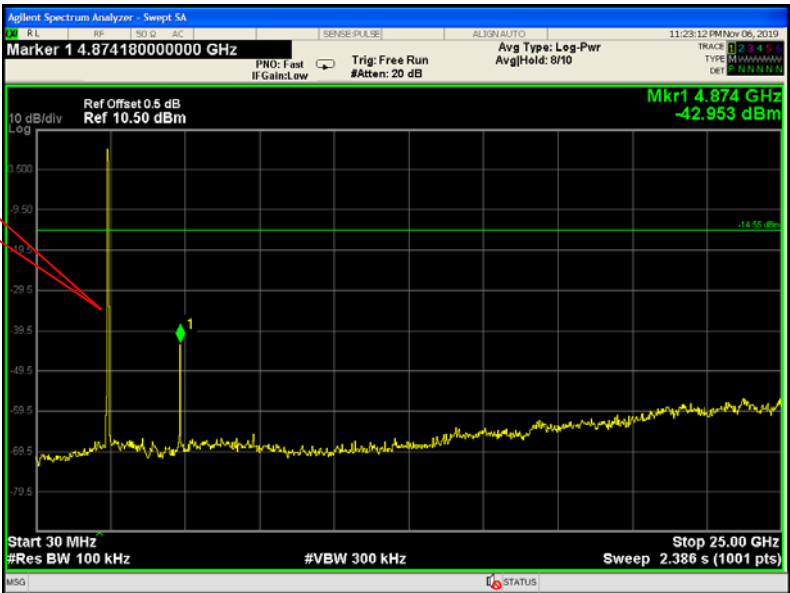
Above 30MHz
802.11b
Low Channel

Fundamental



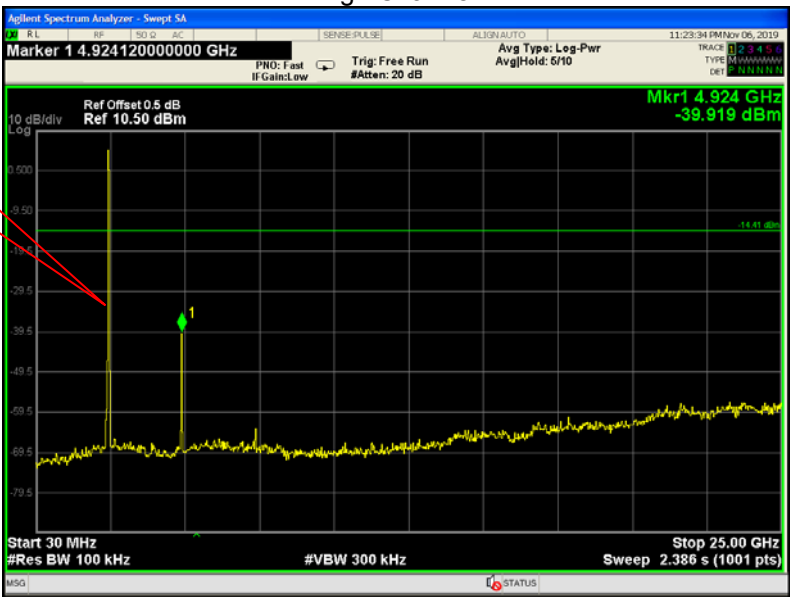
Middle Channel

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



802.11n HT40

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



BLE

Low Channel

Fundamental



Middle Channel

Fundamental



High Channel

Fundamental



10 Band Edge Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;
ANSI C63.10:2013

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

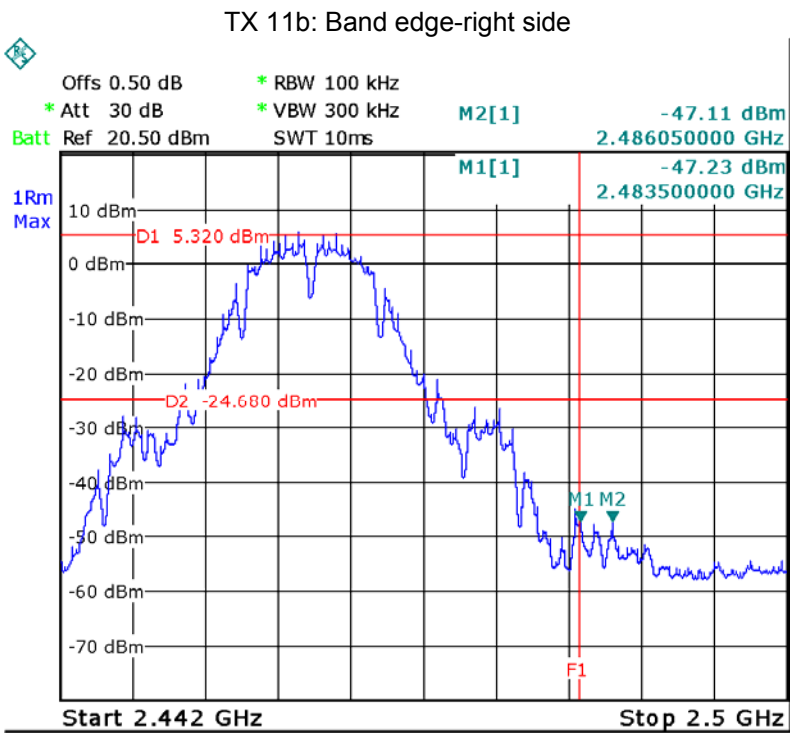
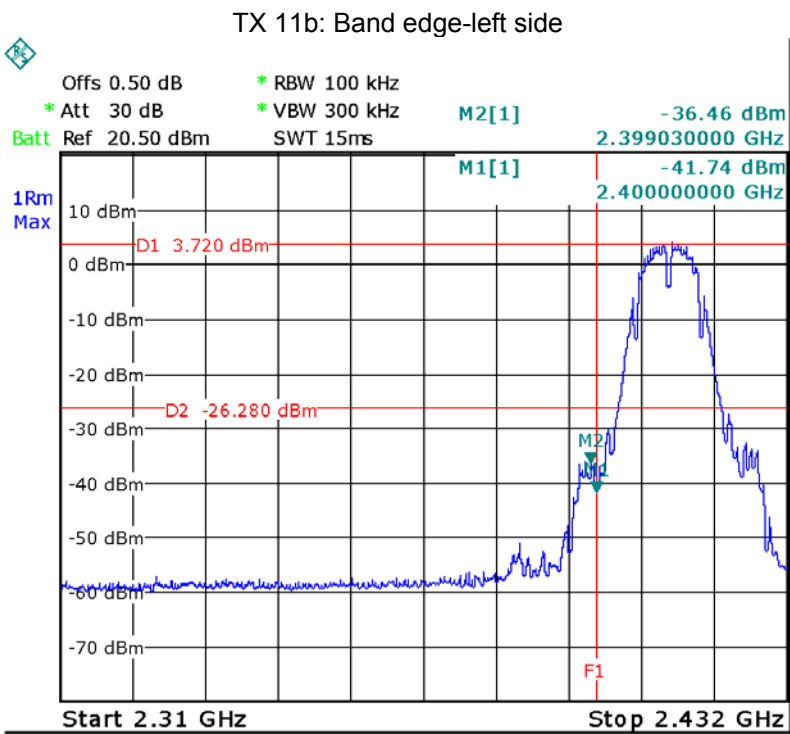
Test Mode: Transmitting

10.1 Test Produce

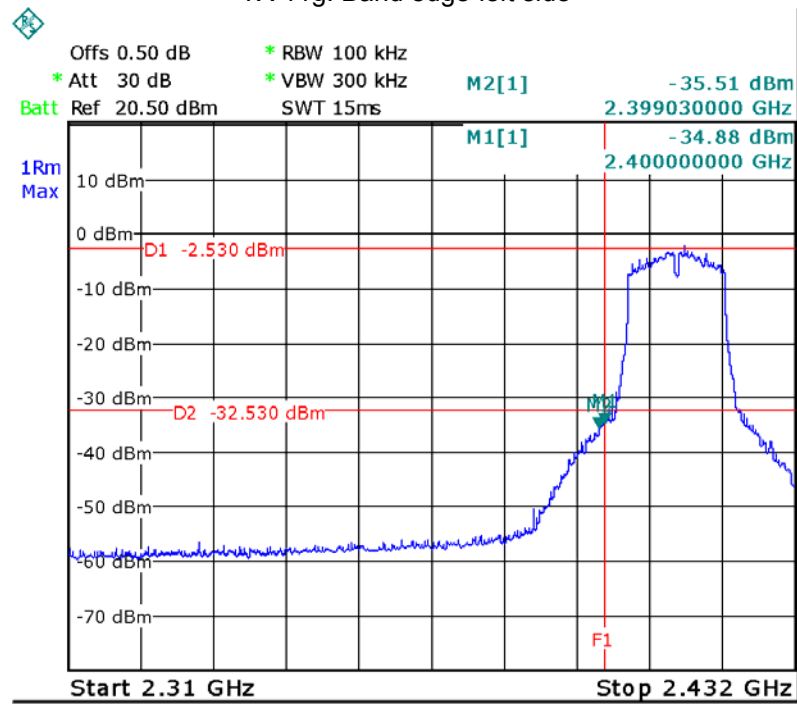
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

10.2 Test Result

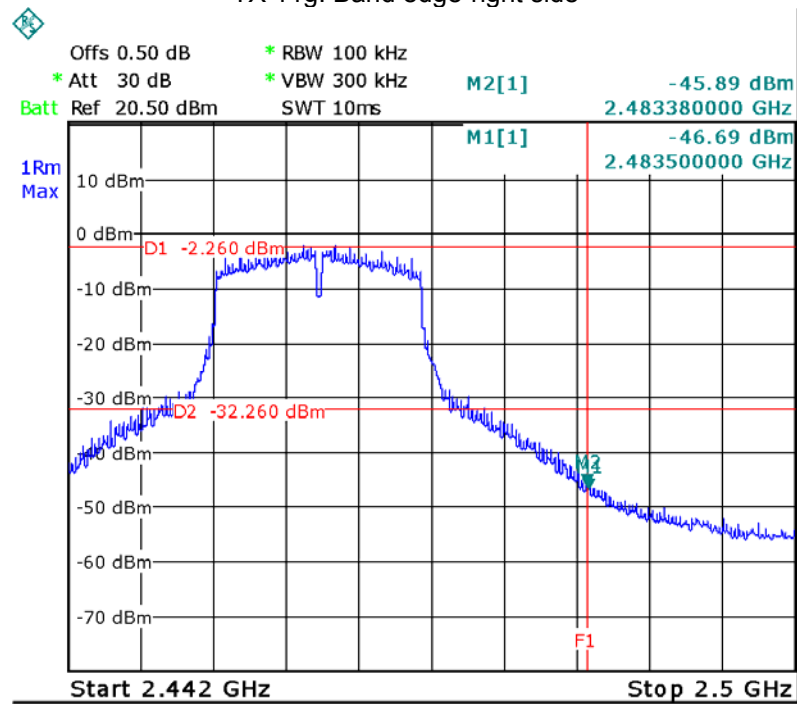
Test result plots shown as follows:

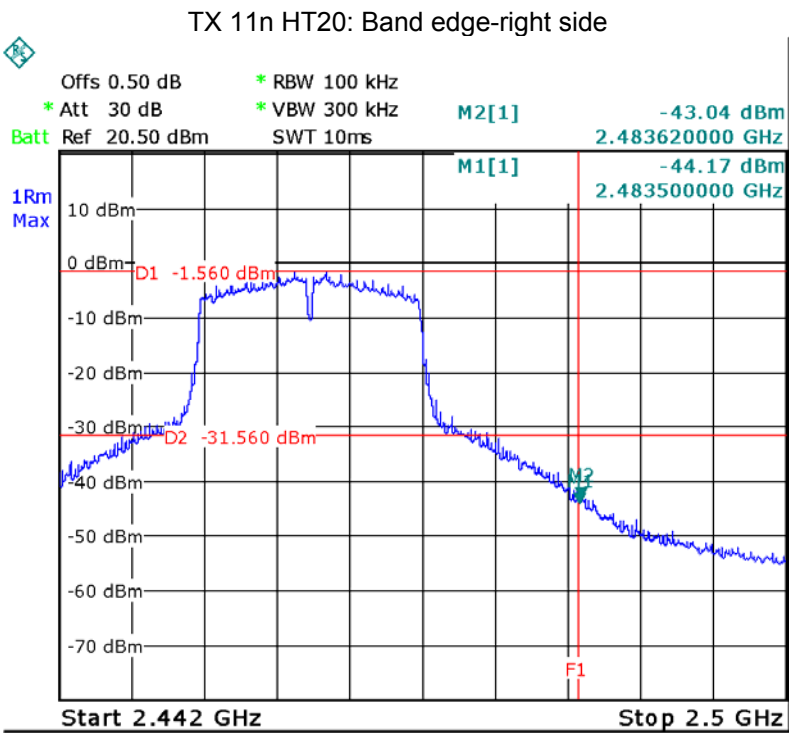
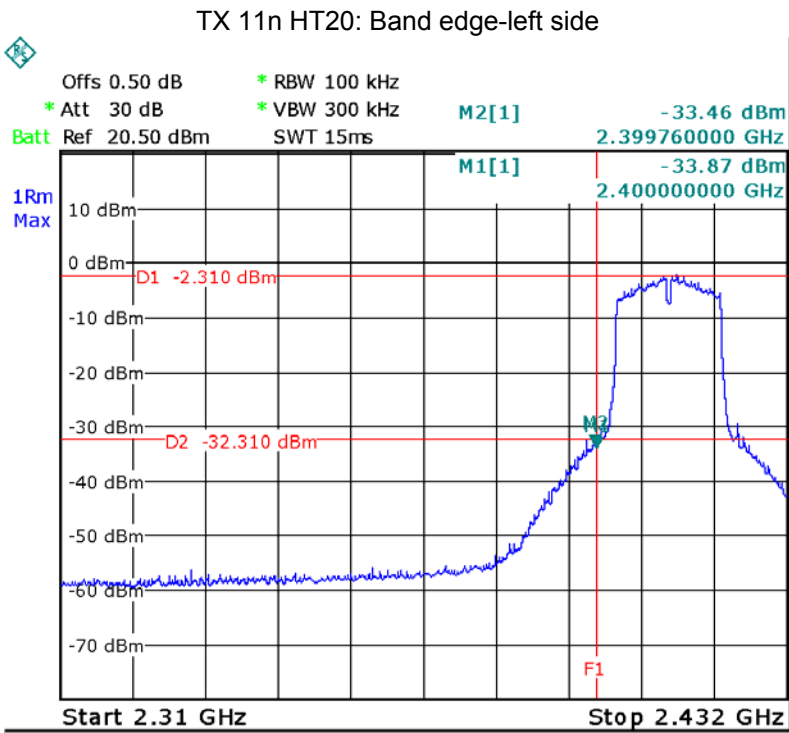


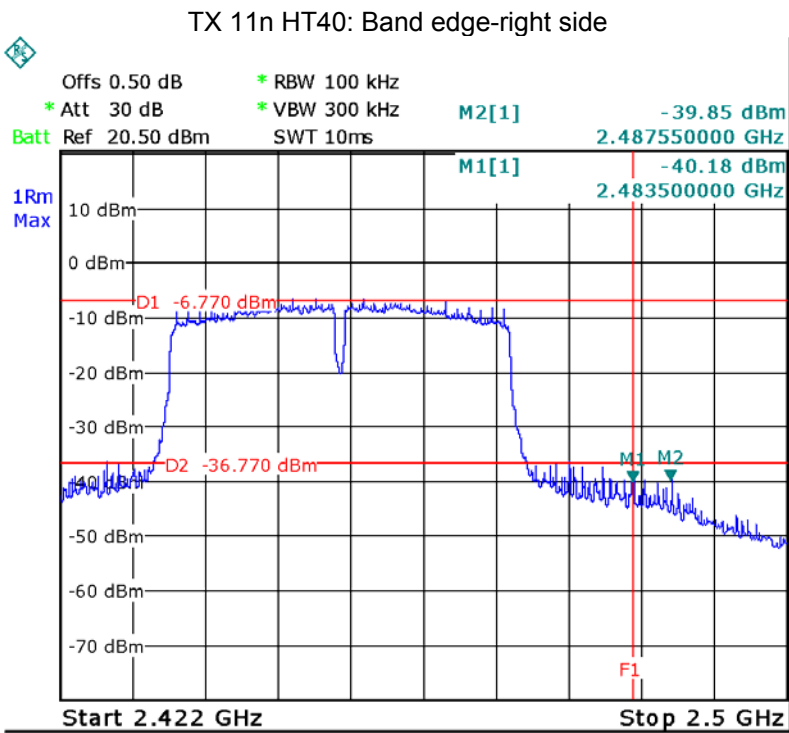
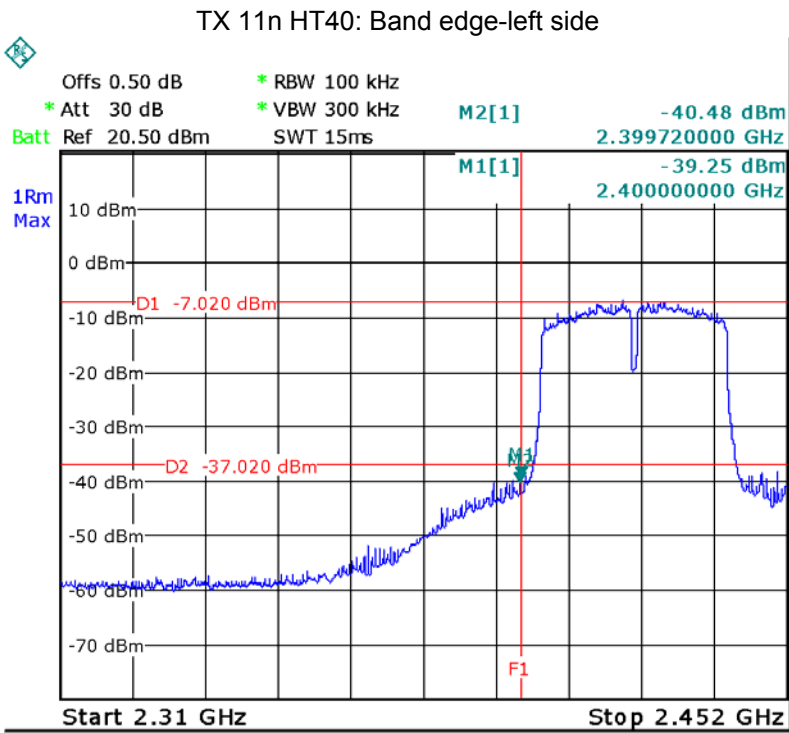
TX 11g: Band edge-left side



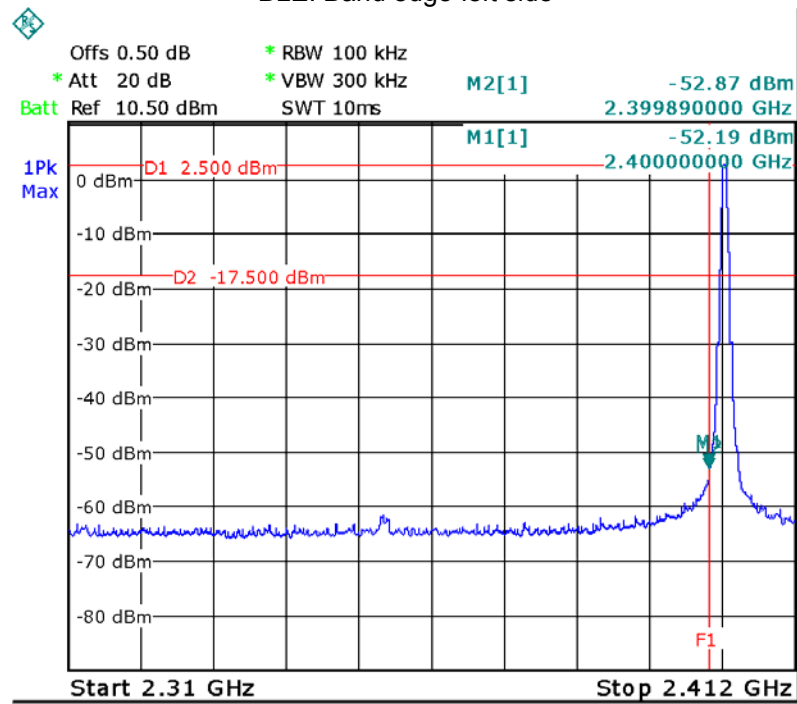
TX 11g: Band edge-right side



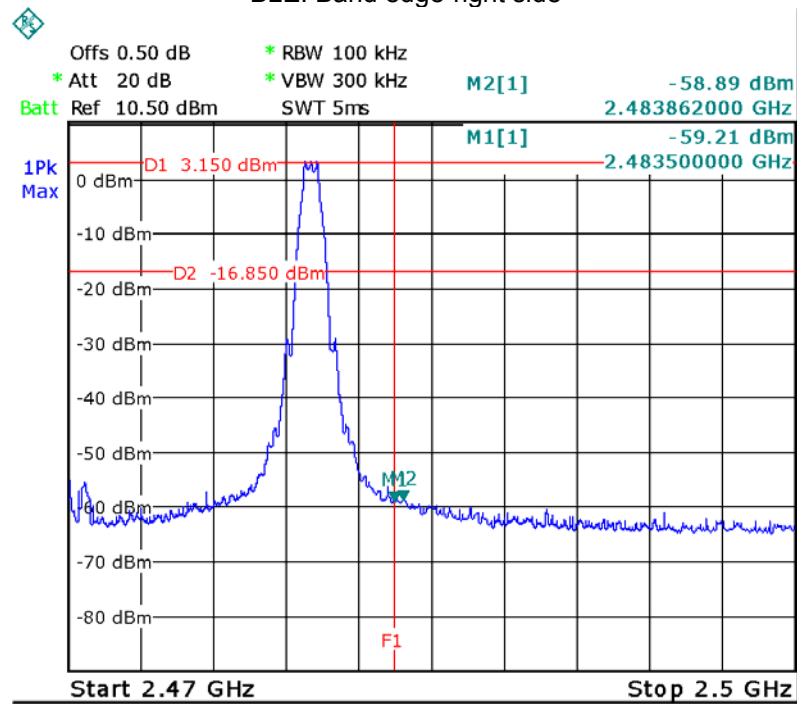




BLE: Band edge-left side



BLE: Band edge-right side



11 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;

ANSI C63.10:2013

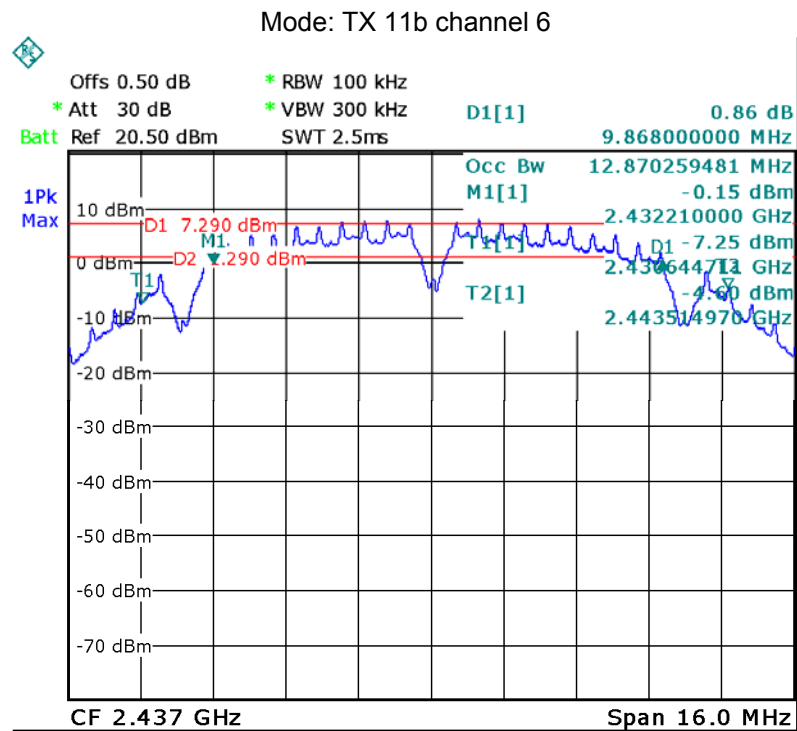
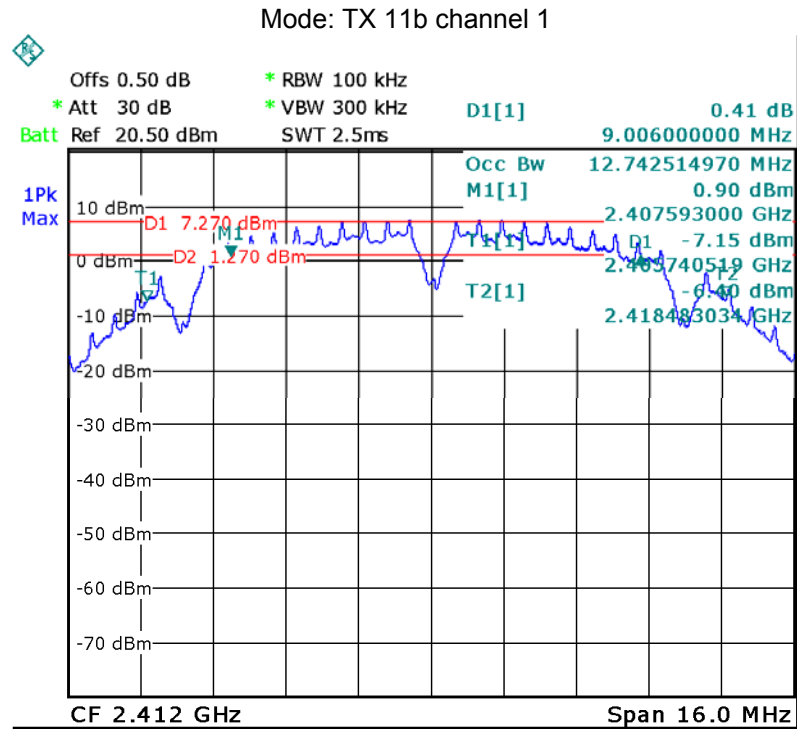
11.1 Test Procedure:

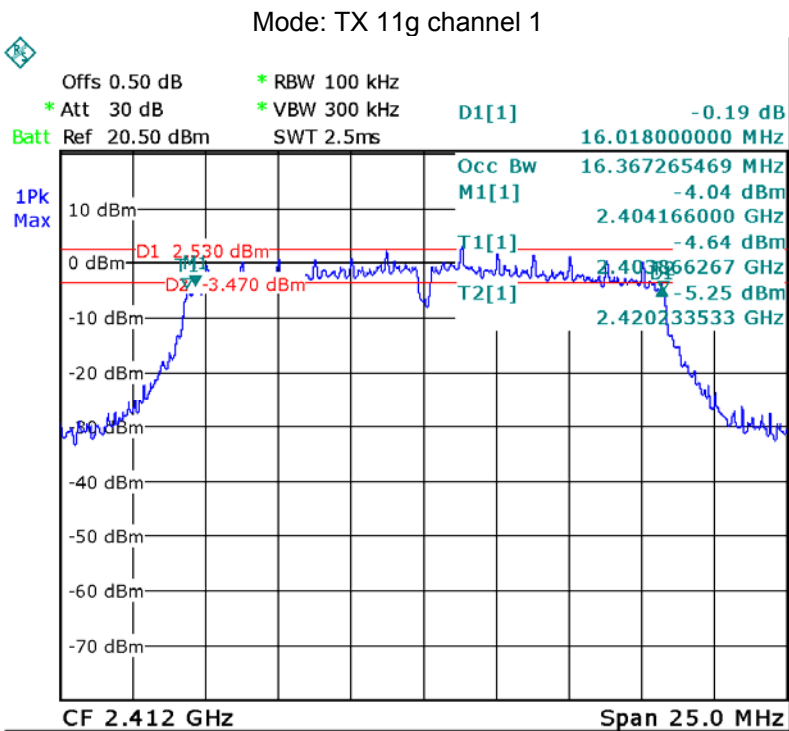
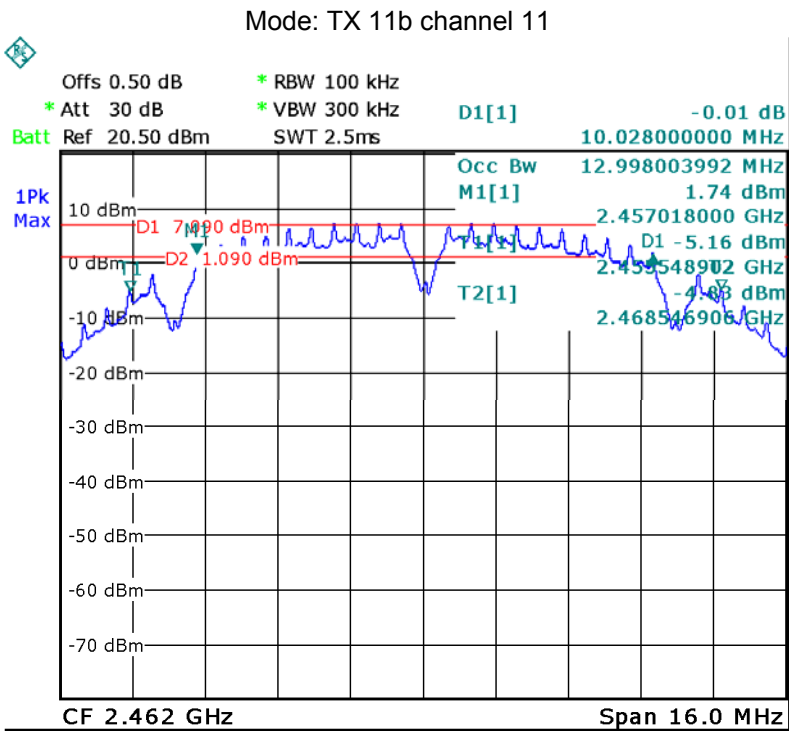
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

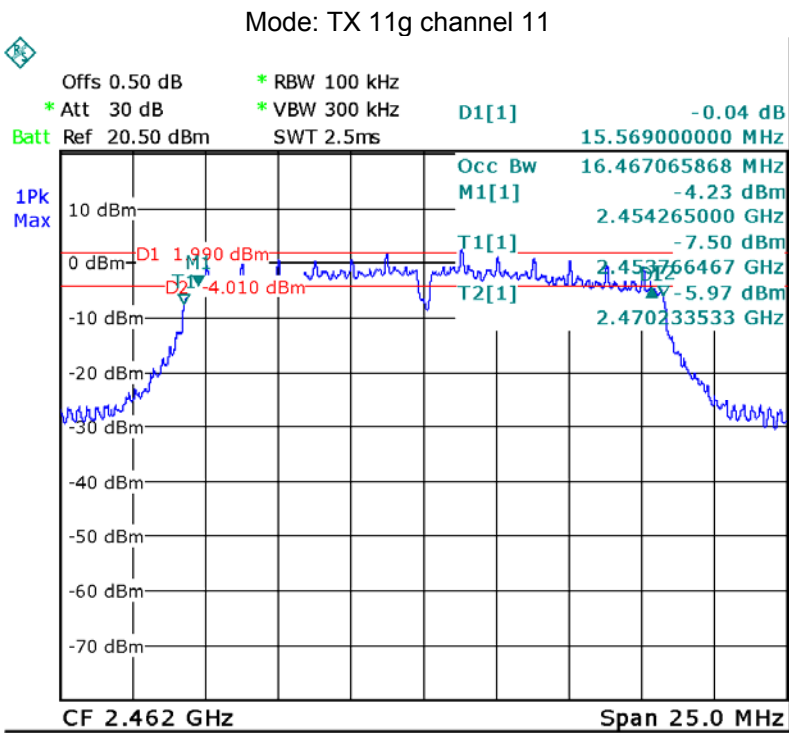
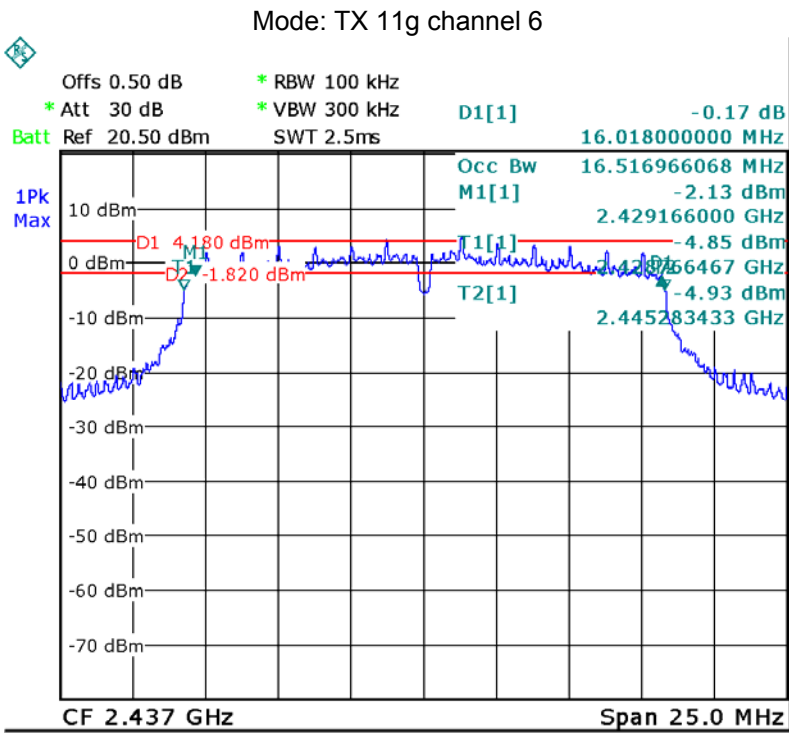
11.2 Test Result:

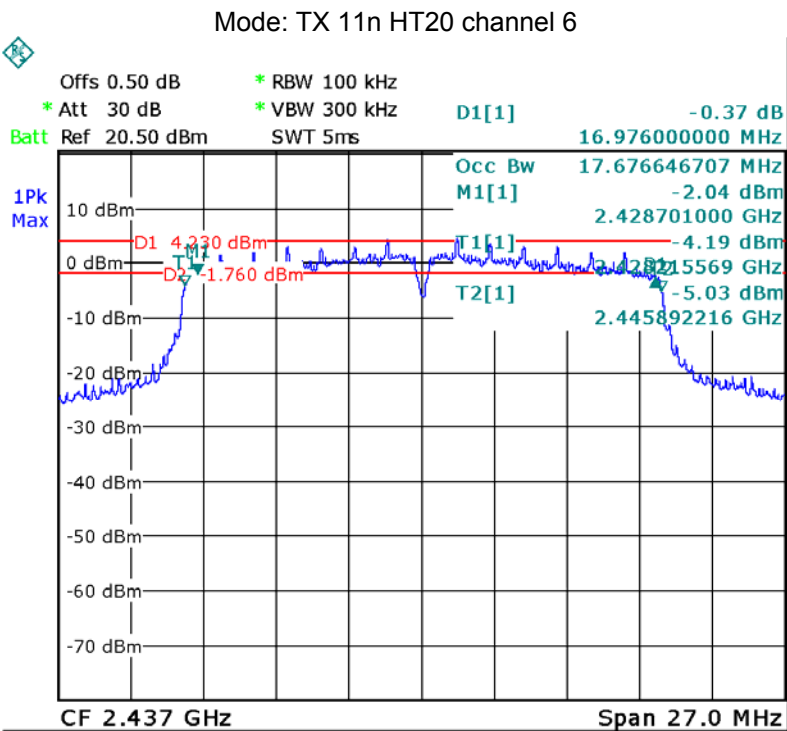
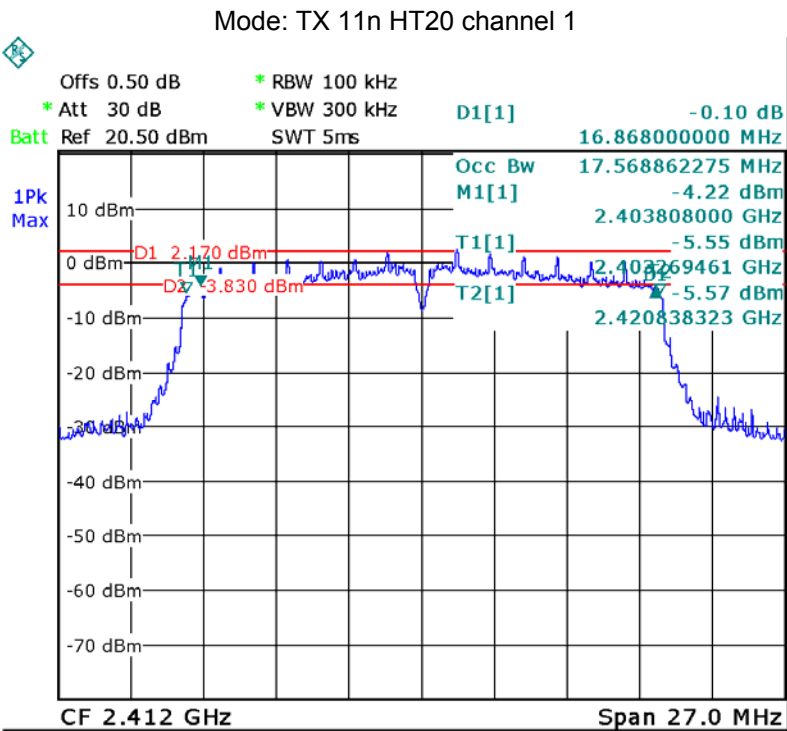
Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	9.006	12.743
	Channel 6	9.868	12.870
	Channel 11	10.028	12.998
TX 11g	Channel 1	16.018	16.367
	Channel 6	16.018	16.517
	Channel 11	15.569	16.467
TX 11n HT20	Channel 1	16.868	17.569
	Channel 6	16.976	17.677
	Channel 11	16.814	17.623
TX 11n HT40	Channel 3	35.240	35.788
	Channel 6	35.720	35.898
	Channel 9	34.660	35.789
BLE	Channel 0	0.707	1.090
	Channel 19	0.713	1.090
	Channel 39	0.713	1.090

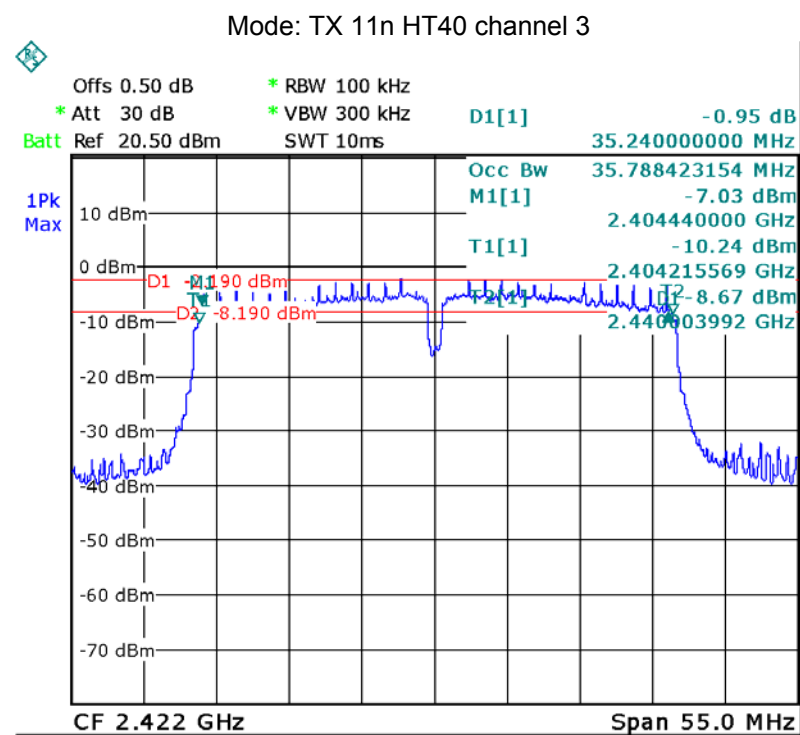
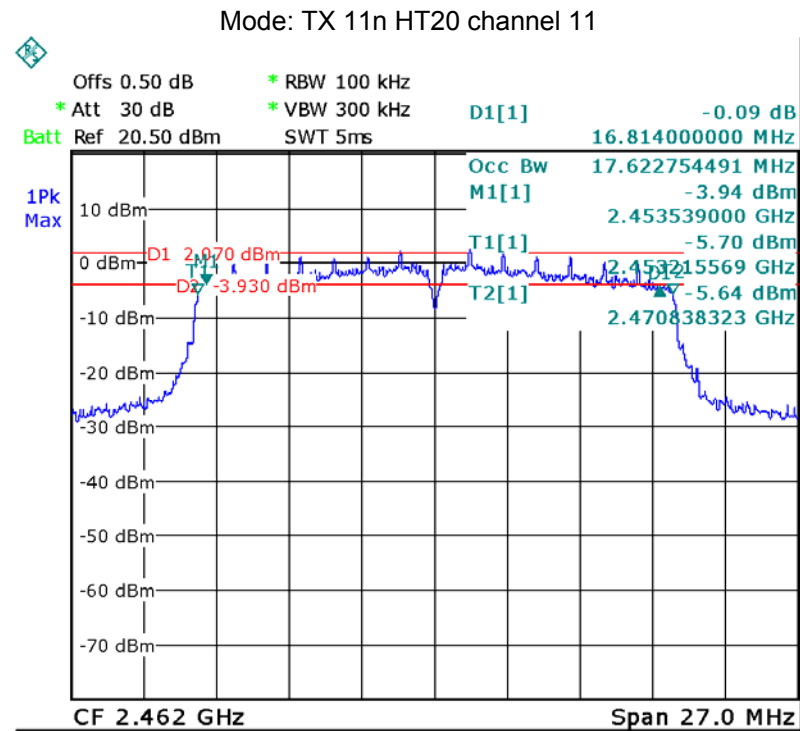
Test result plot:

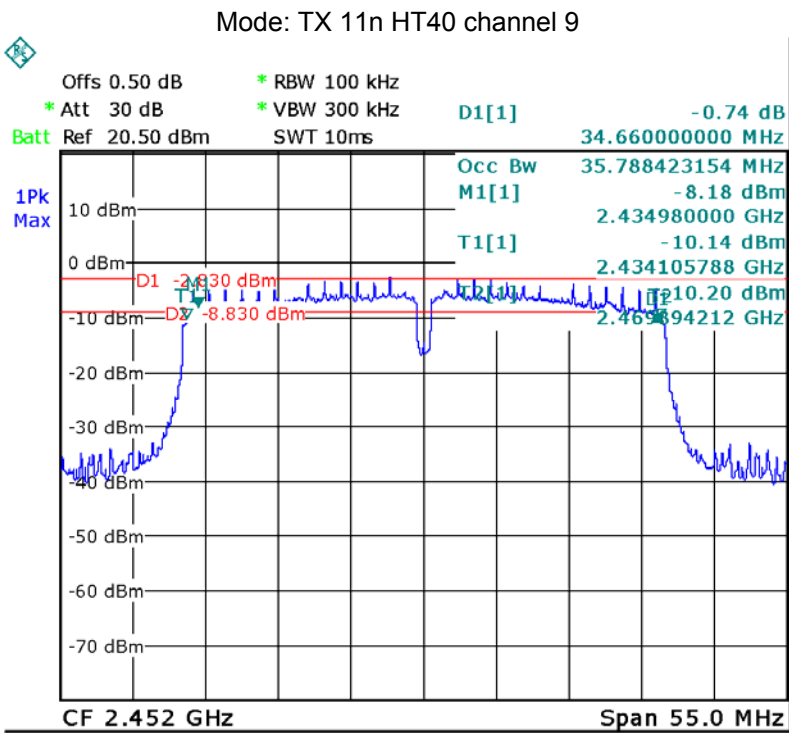
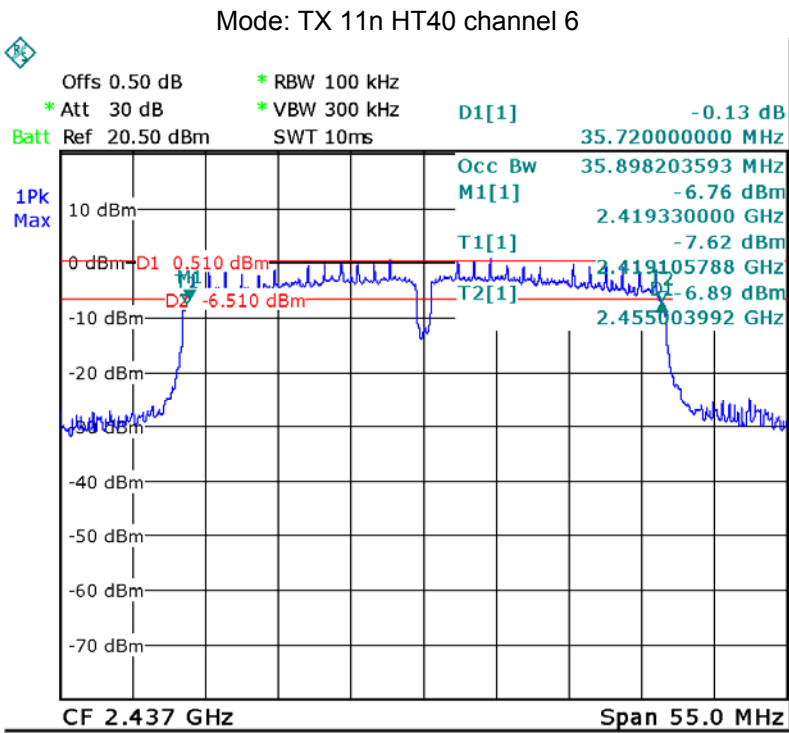


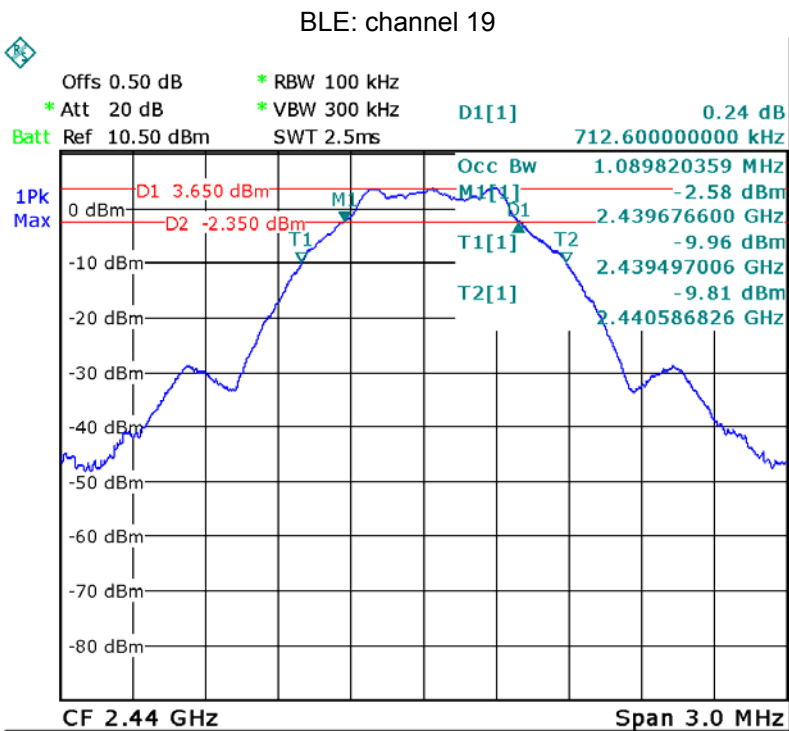
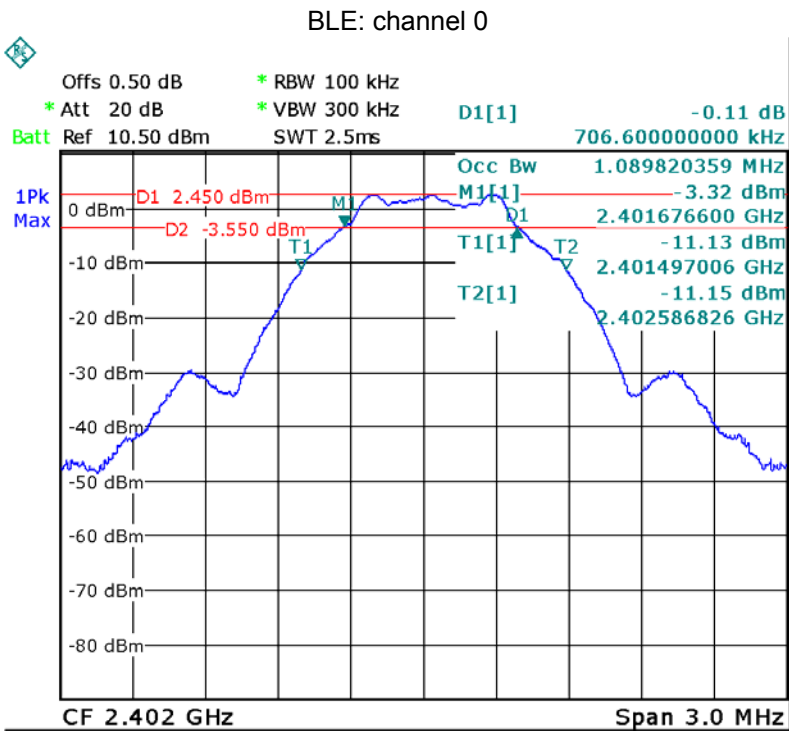


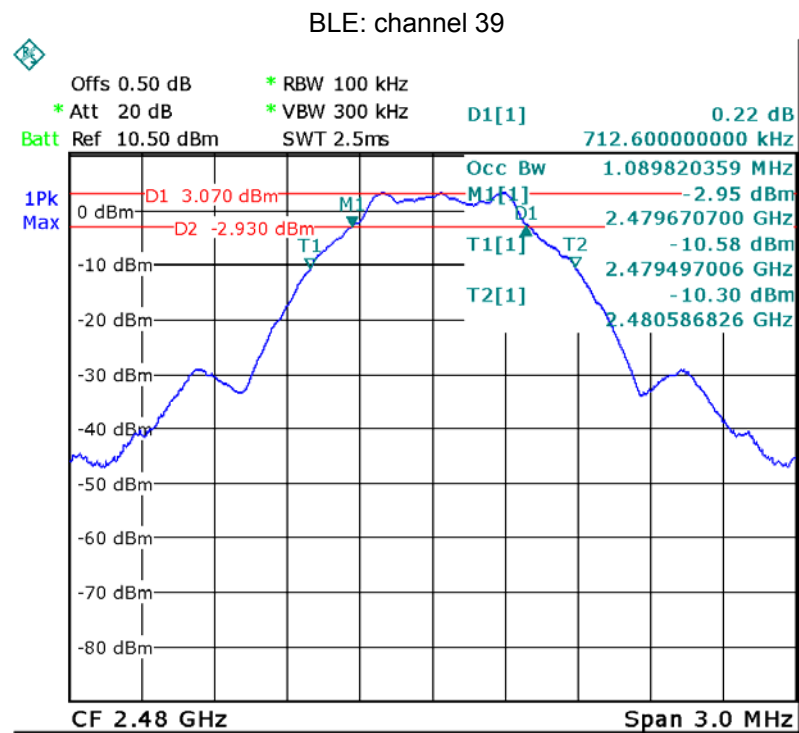












12 Maximum Peak conducted Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;
ANSI C63.10:2013

12.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

section 8.3.1.1 (For BLE)

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the $RBW \geq DTS$ bandwidth.
- b) Set $VBW \geq 3 \times RBW$.
- c) Set $span \geq 3 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

section 8.3.1.2 (For WIFI)

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

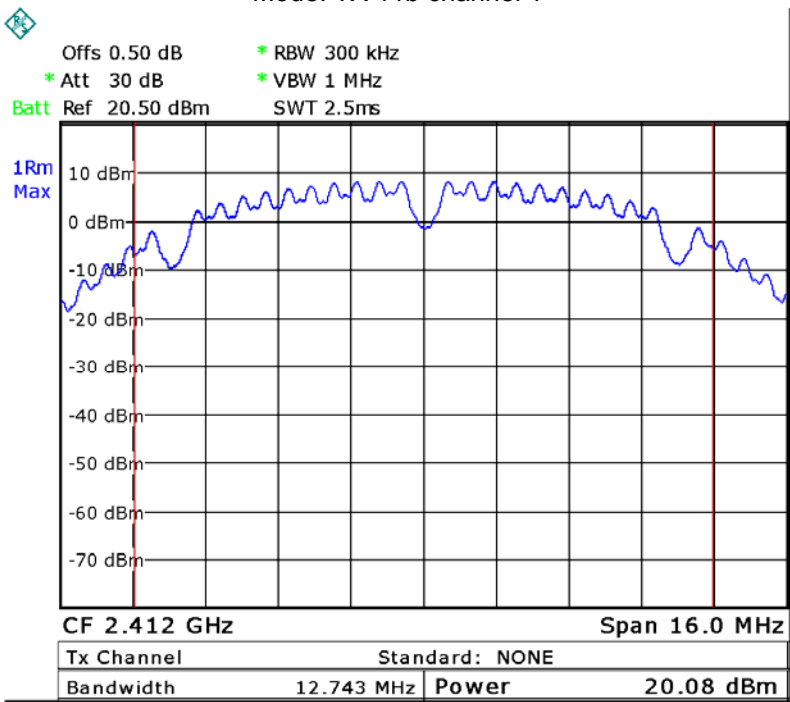
- a) Set the $RBW = 1\%$ to 5% of the OBW, not to exceed 1 MHz..
- b) Set the $VBW \geq 3 \times RBW$
- c) Set the $span \geq 1.5 \times OBW$.
- d) Detector = RMS.
- e) Sweep time = auto couple.
- f) trigger = free run..
- g) Number of points in sweep $\geq [2 \times span / RBW]$. (This gives bin-to-bin spacing $\geq RBW / 2$, so that narrowband signals are not lost between frequency bins.)
- h) Trace average at least 100 traces in power averaging (rms) mode.
- i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum..

12.2 Test Result:

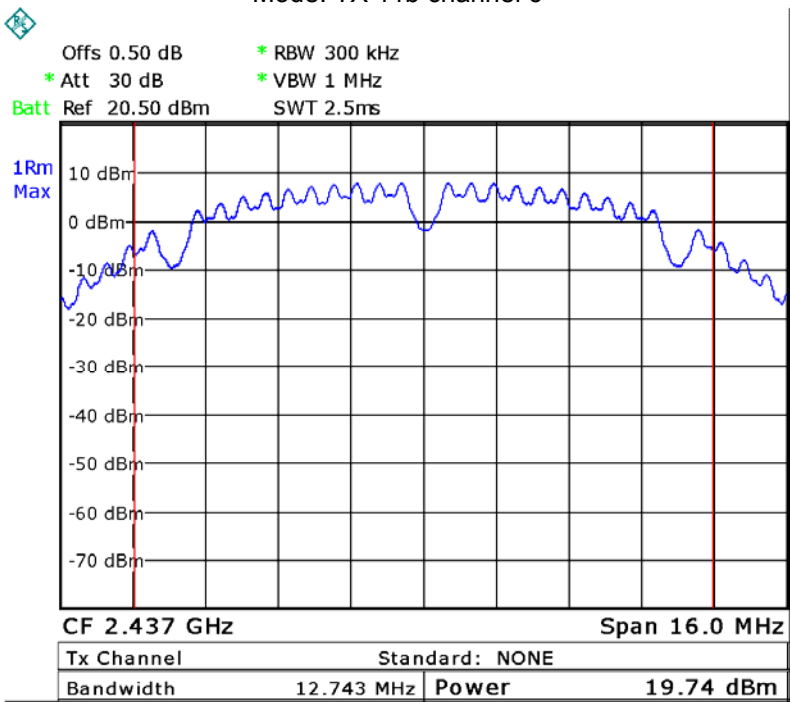
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	20.08	1W/30dBm
	Middle-2437	19.74	1W/30dBm
	High-2462	19.48	1W/30dBm
TX 11g	Low-2412	17.12	1W/30dBm
	Middle-2437	19.02	1W/30dBm
	High-2462	16.58	1W/30dBm
TX 11n HT20	Low-2412	16.69	1W/30dBm
	Middle-2437	19.18	1W/30dBm
	High-2462	17.06	1W/30dBm
TX 11n HT40	Low-2422	14.22	1W/30dBm
	Middle-2437	17.00	1W/30dBm
	High-2452	13.94	1W/30dBm
BLE	Low-2402	3.43	1W/30dBm
	Middle-2440	4.61	1W/30dBm
	High-2480	4.00	1W/30dBm

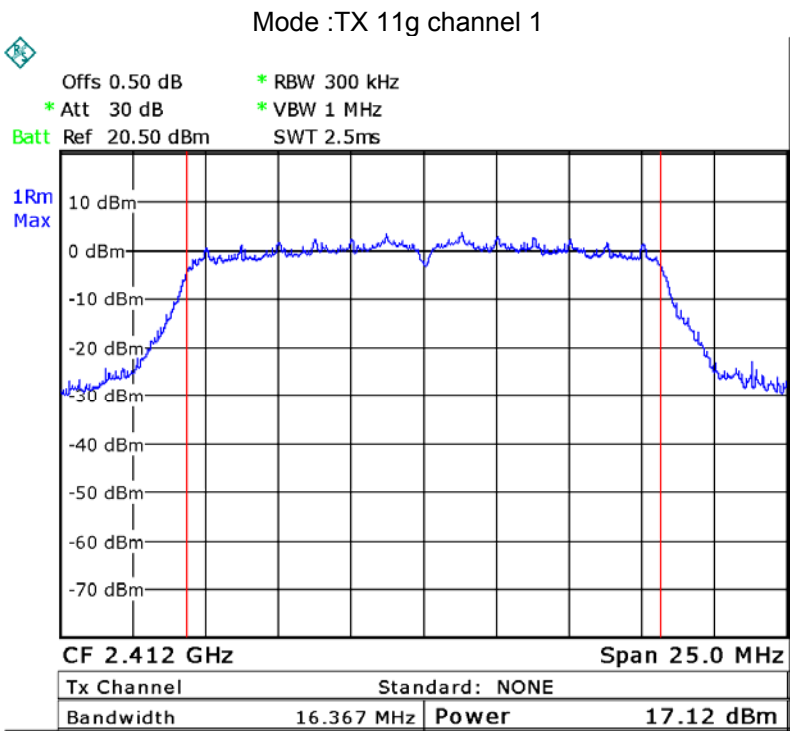
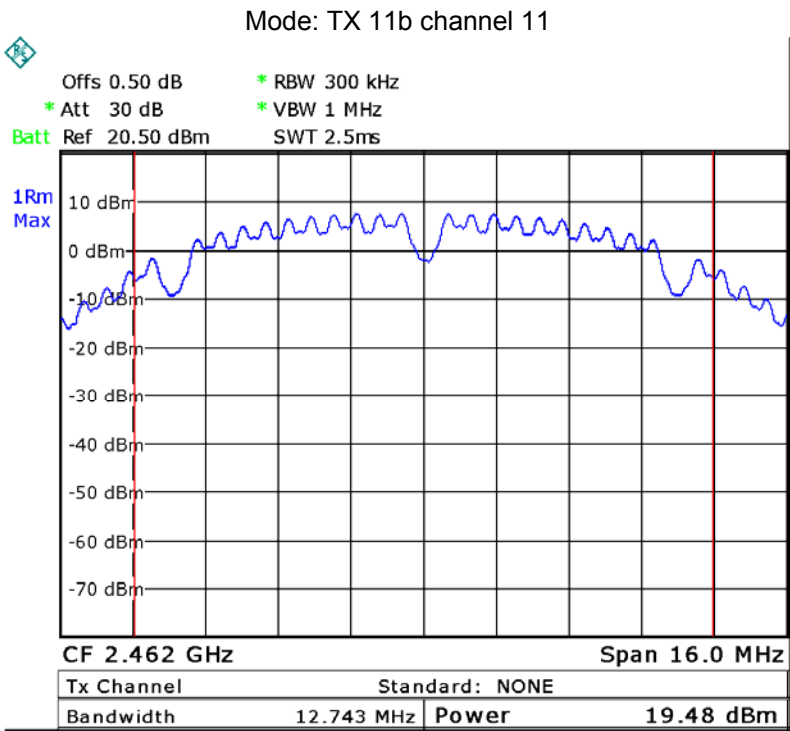
Test Plot

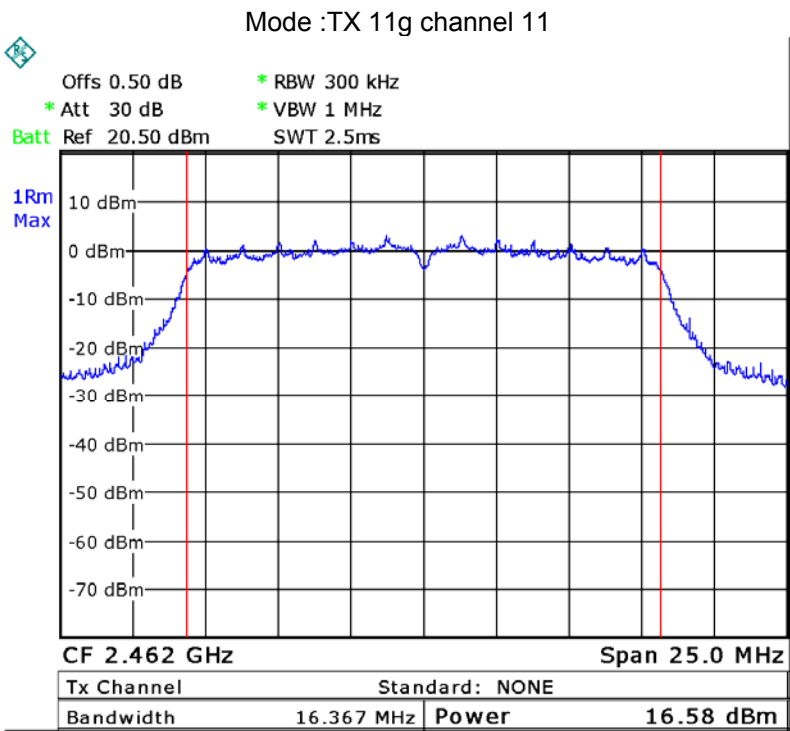
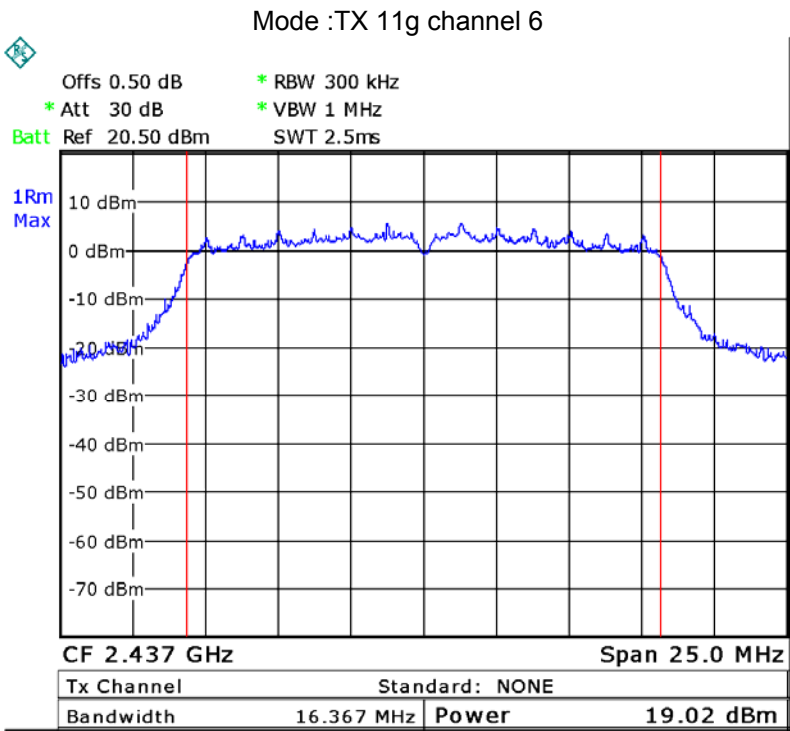
Mode: TX 11b channel 1

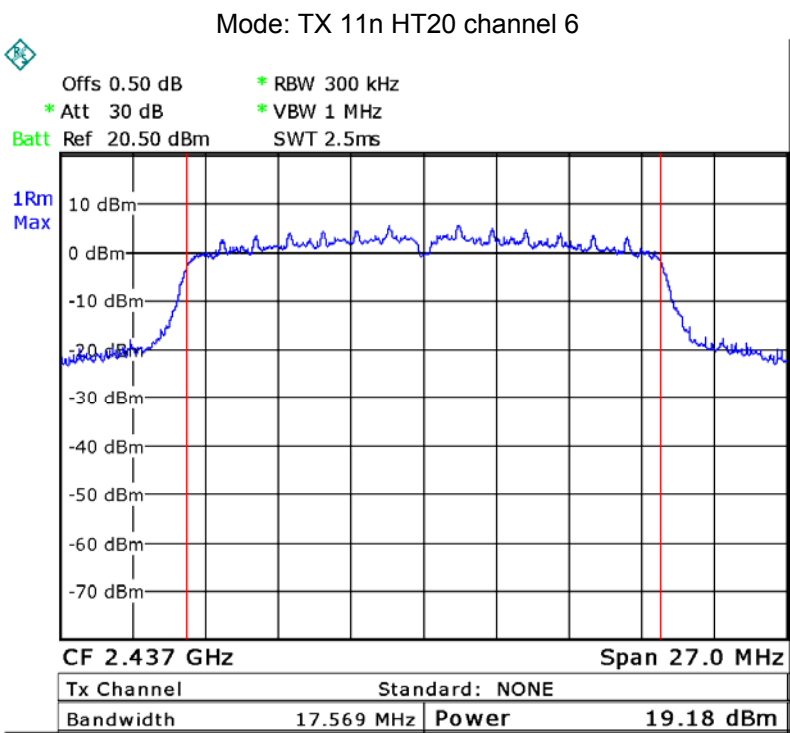
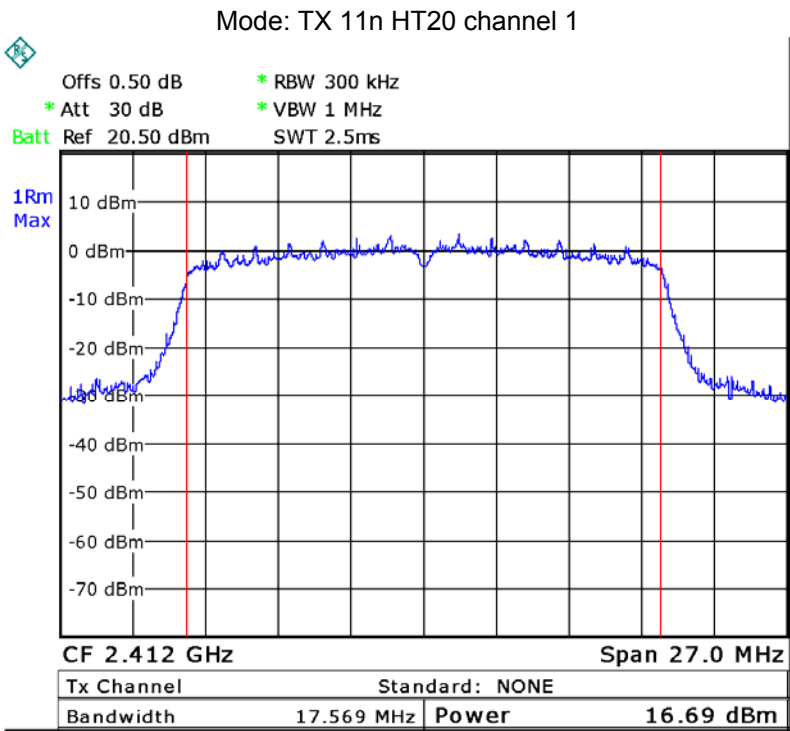


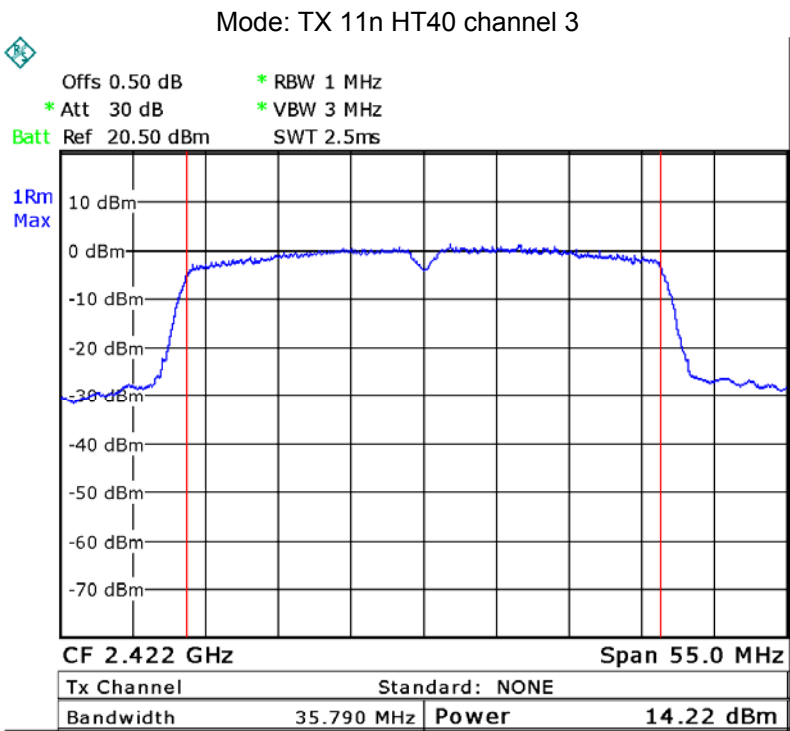
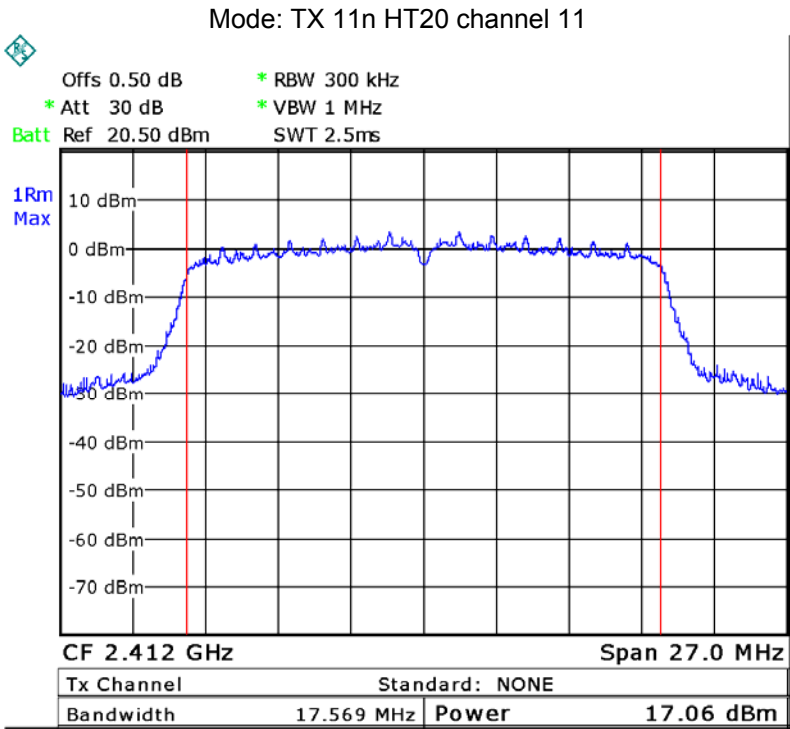
Mode: TX 11b channel 6

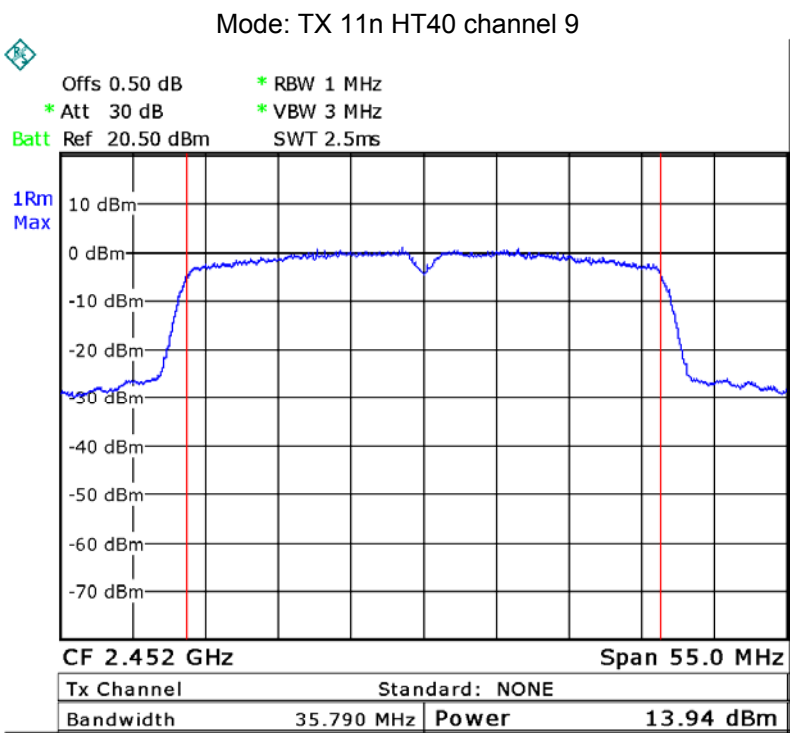
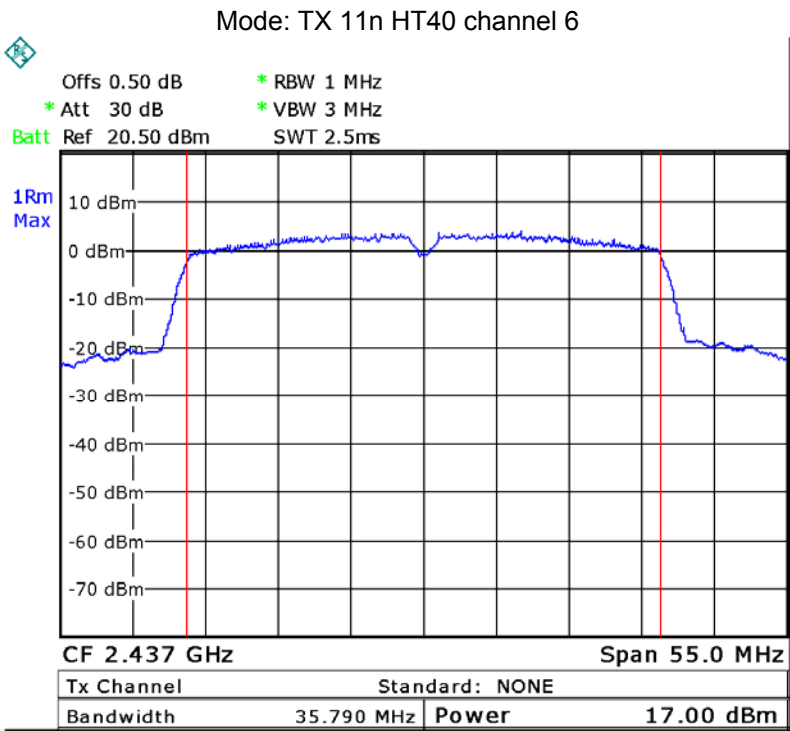


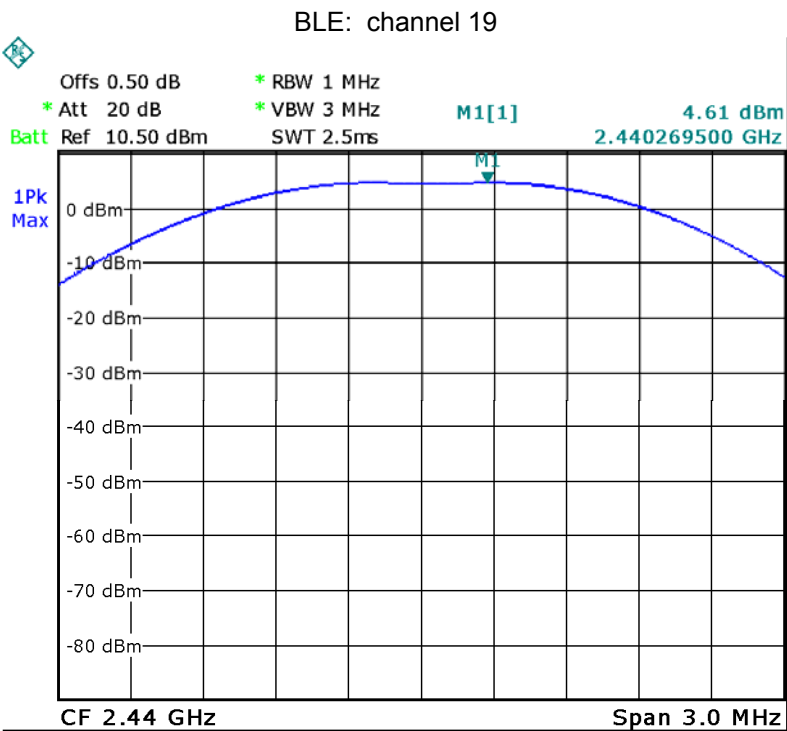
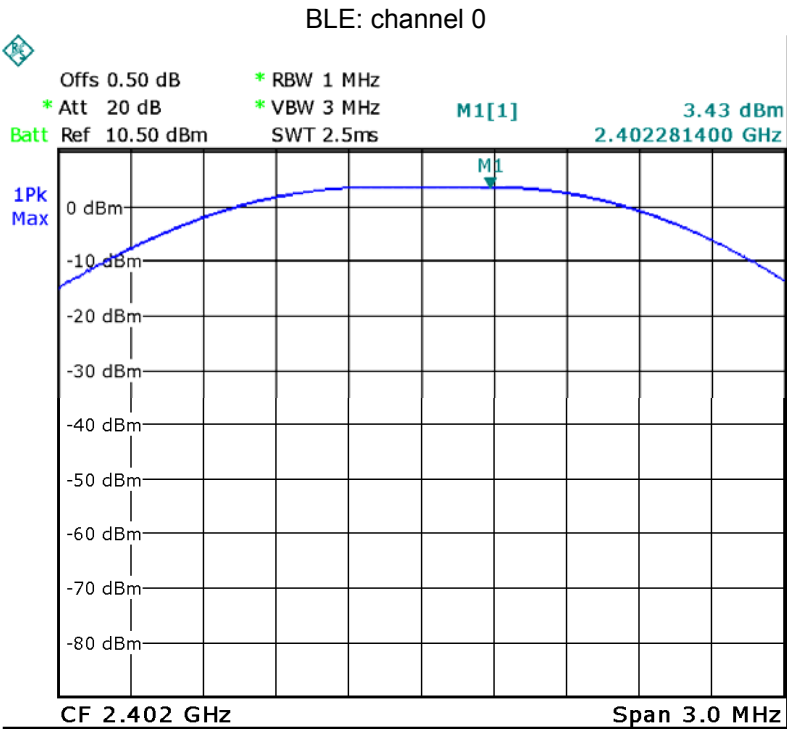


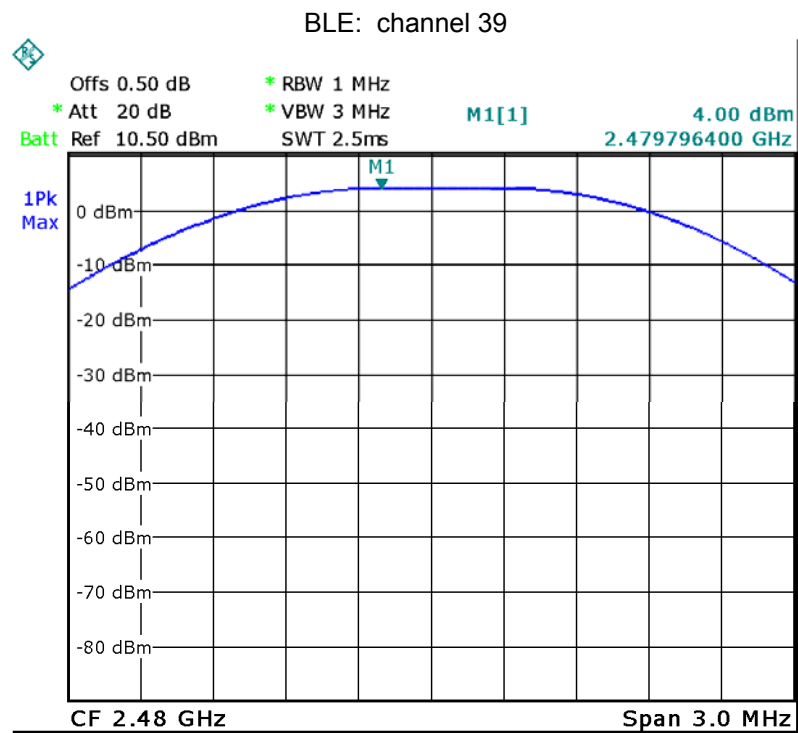












13 Duty cycle

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

14 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019;
ANSI C63.10:2013

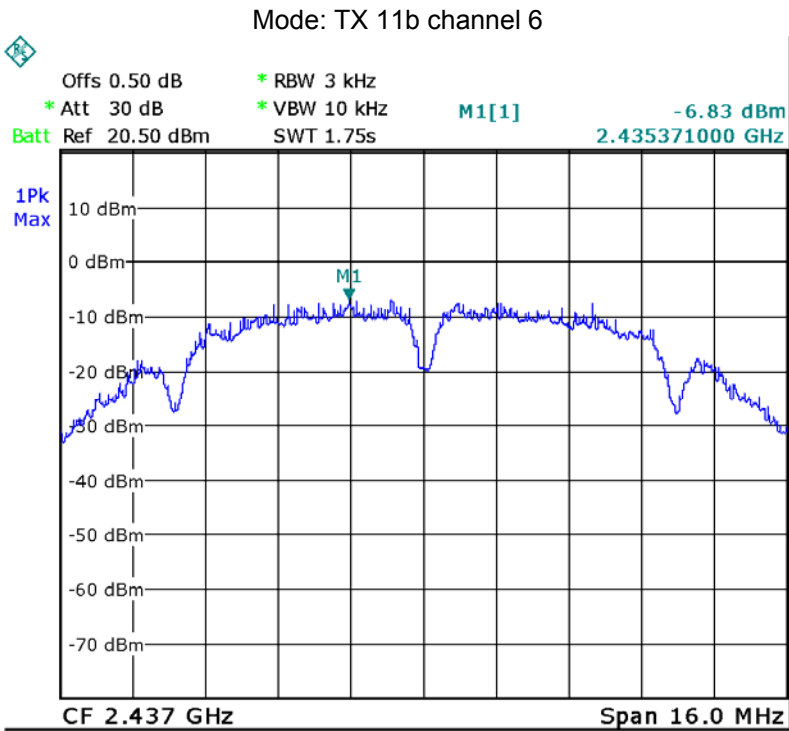
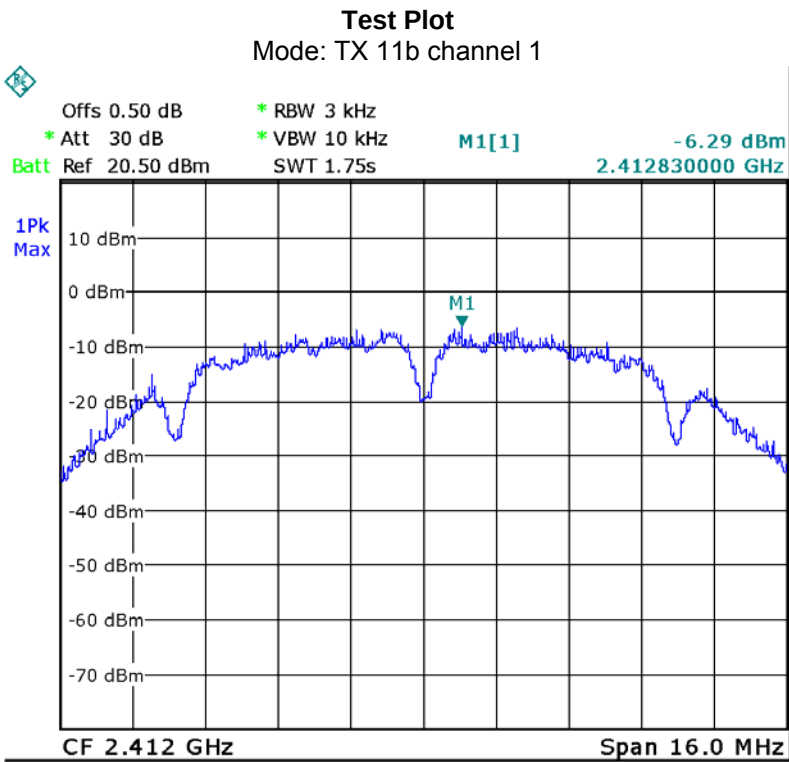
14.1 Test Procedure:

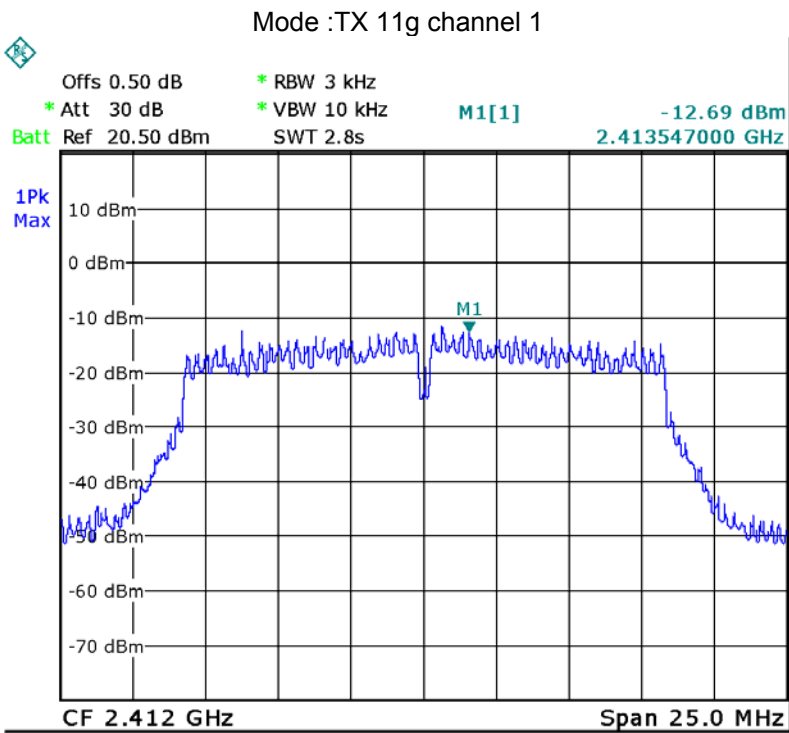
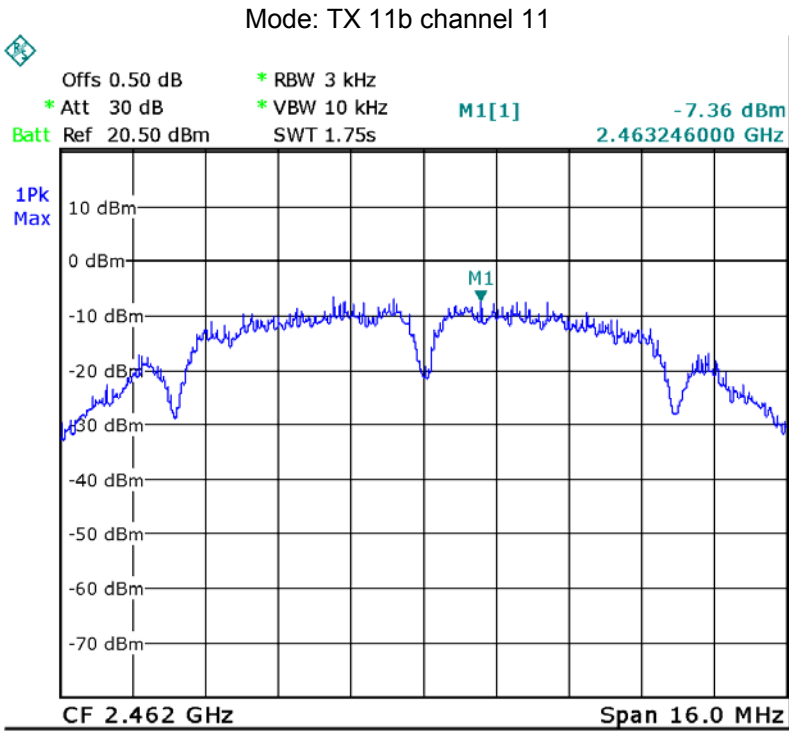
KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019 section 10.2

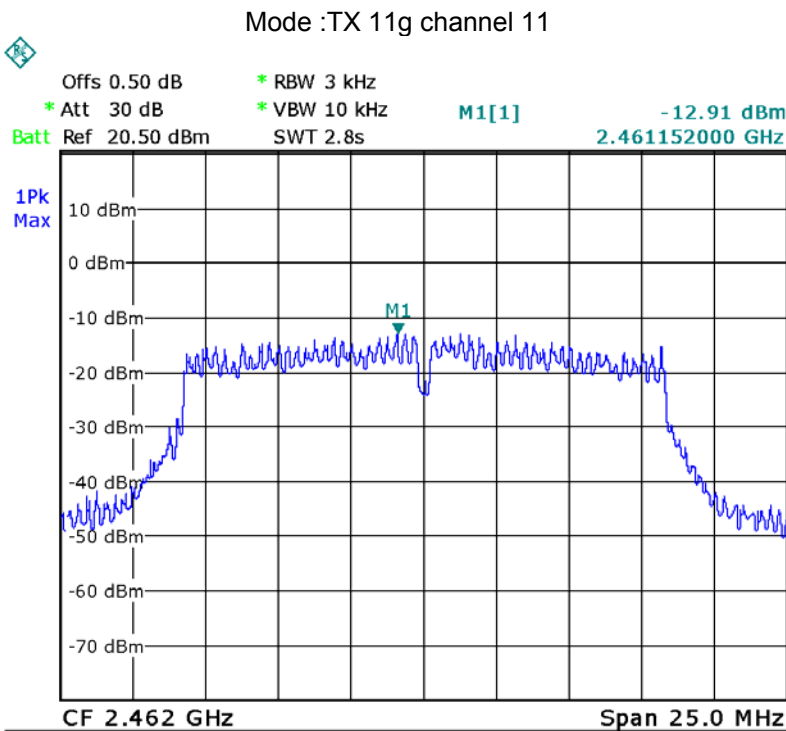
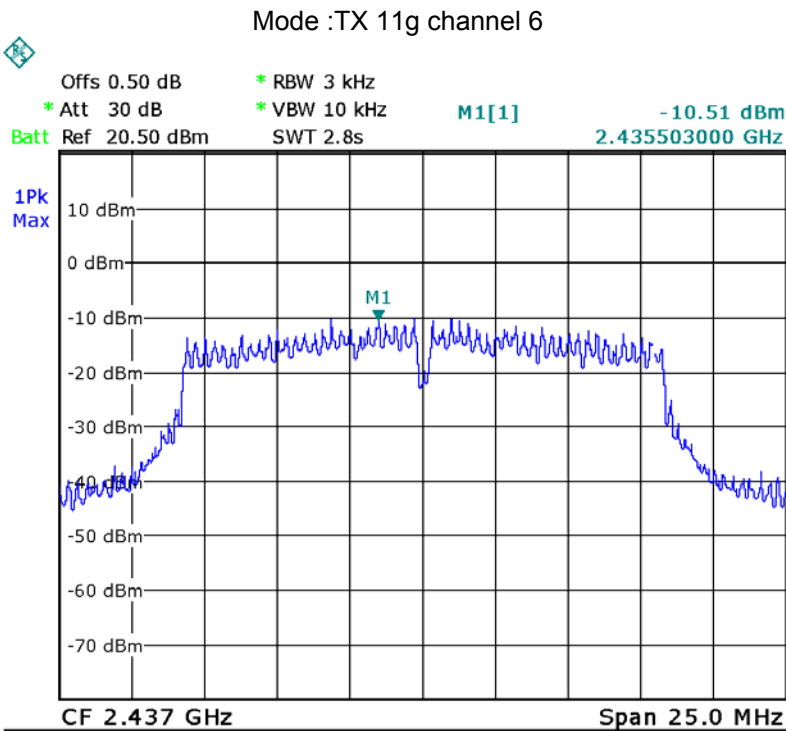
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

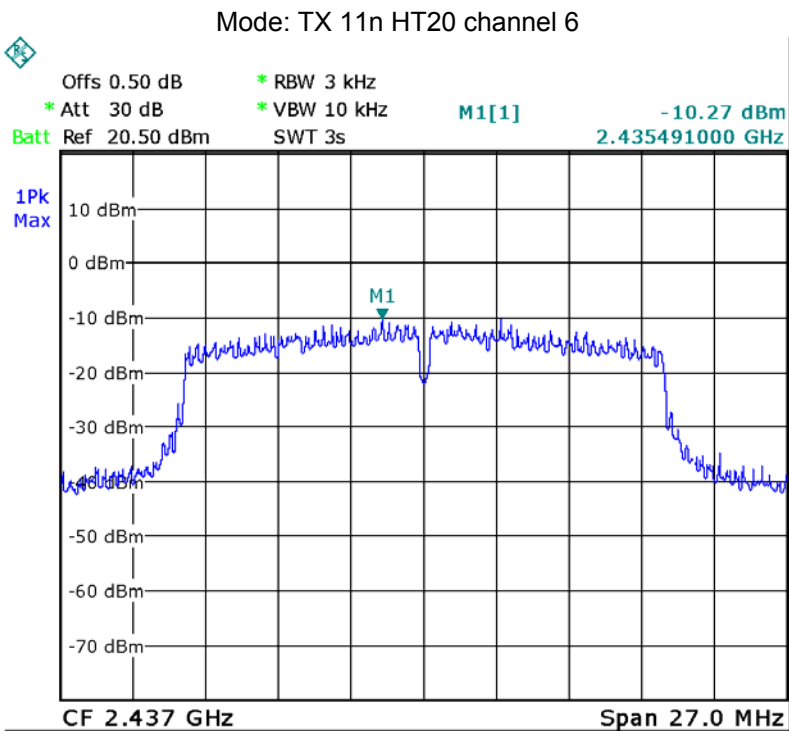
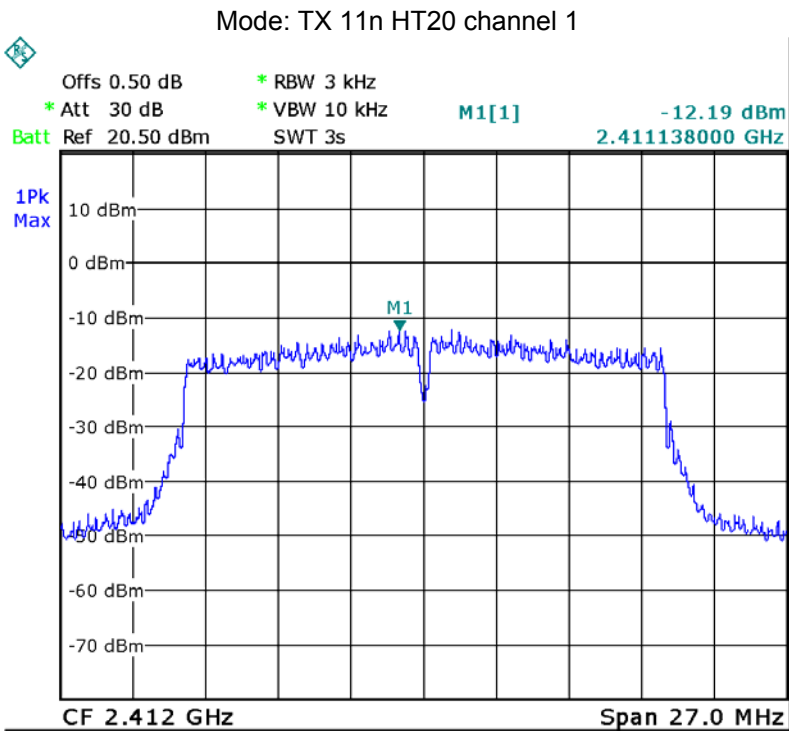
14.2 Test Result:

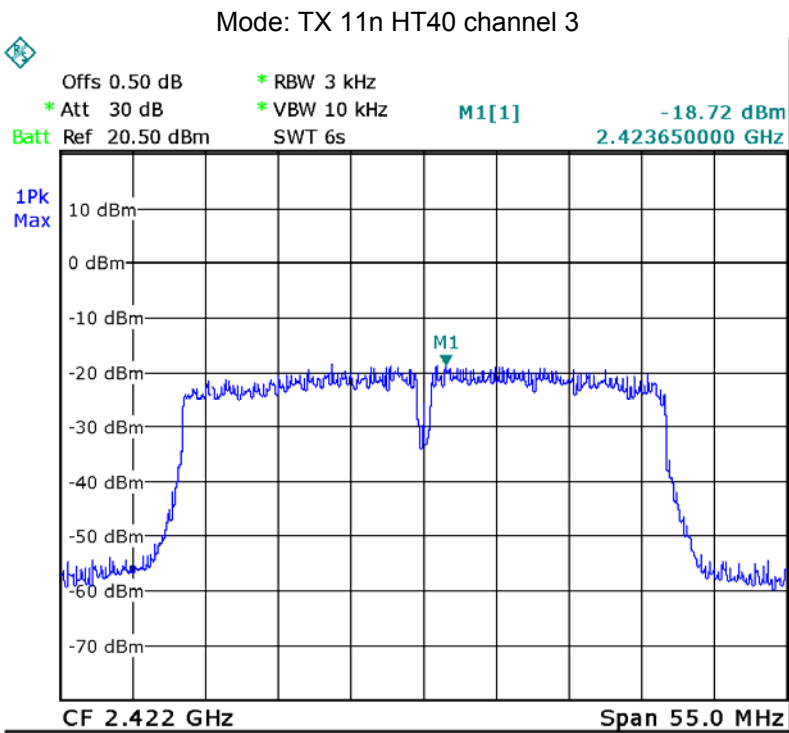
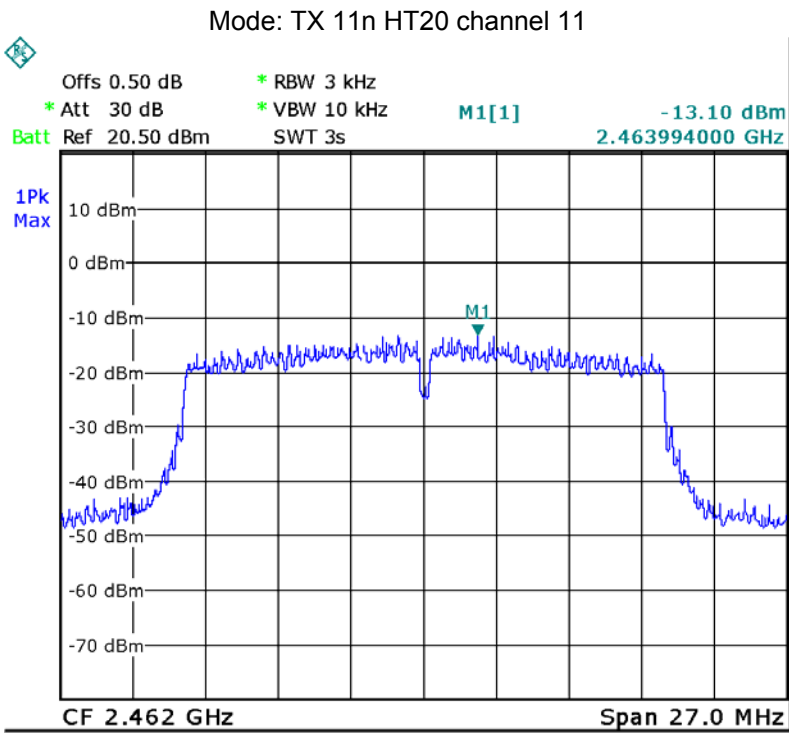
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-6.29	8dBm per 3kHz
	Middle-2437	-6.83	8dBm per 3kHz
	High-2462	-7.36	8dBm per 3kHz
TX 11g	Low-2412	-12.69	8dBm per 3kHz
	Middle-2437	-10.51	8dBm per 3kHz
	High-2462	-12.91	8dBm per 3kHz
TX 11n HT20	Low-2412	-12.19	8dBm per 3kHz
	Middle-2437	-10.27	8dBm per 3kHz
	High-2462	-13.10	8dBm per 3kHz
TX 11n HT40	Low-2422	-18.72	8dBm per 3kHz
	Middle-2437	-14.09	8dBm per 3kHz
	High-2452	-17.80	8dBm per 3kHz
BLE	Low-2402	-11.88	8dBm per 3kHz
	Middle-2440	-10.80	8dBm per 3kHz
	High-2480	-11.89	8dBm per 3kHz

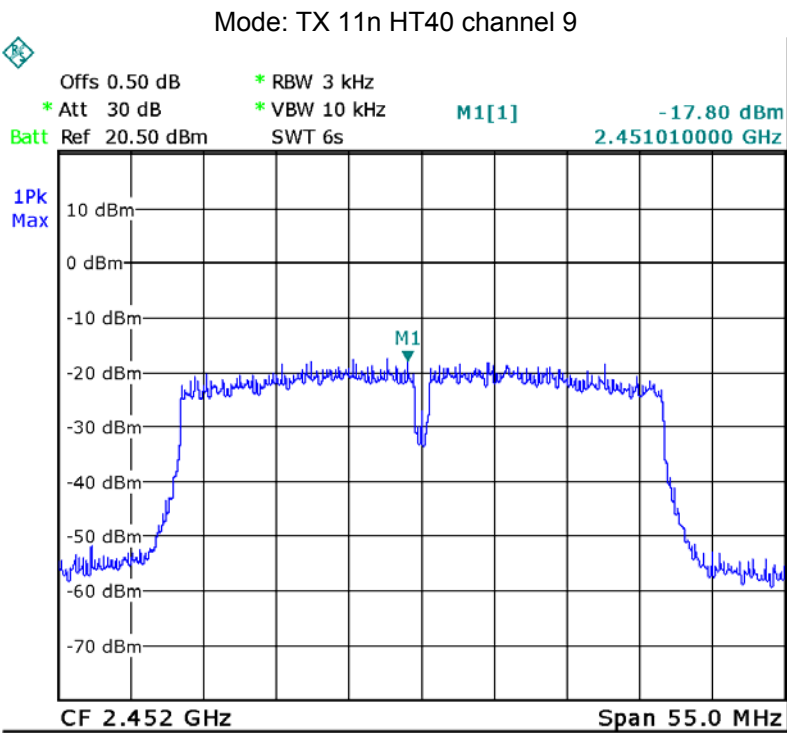
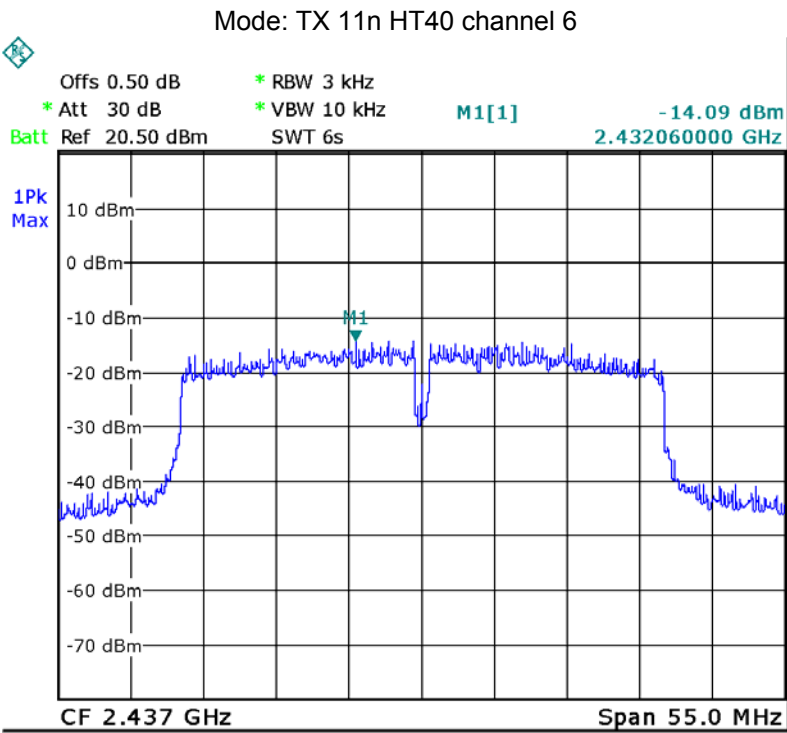


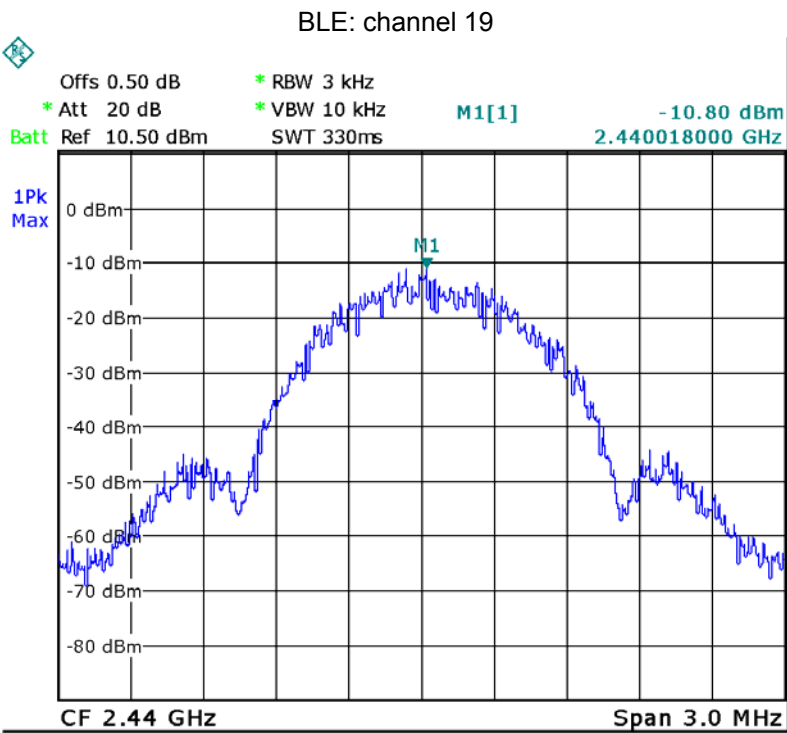
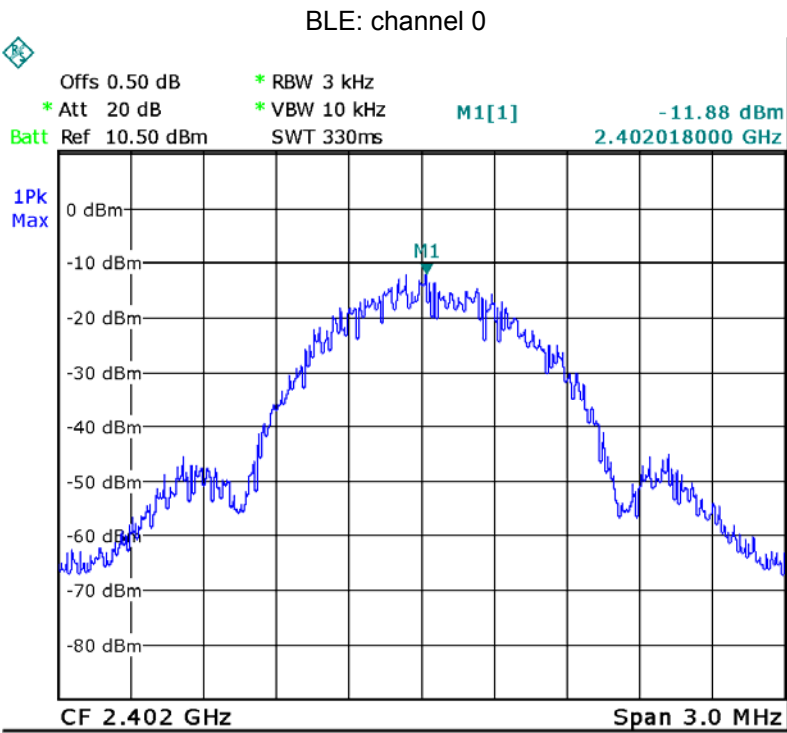


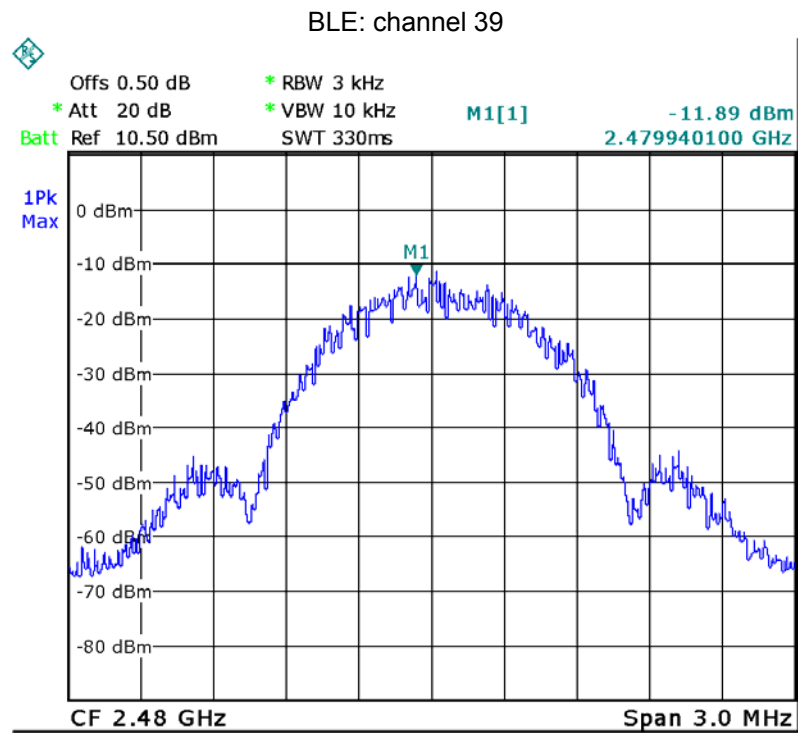












15 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. This product has an integrated antenna fulfill the requirement of this section.

16 RF Exposure

Remark: refer to SAR test report: WTS19S09068238W001.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-ELEMENT 4 PLUS-Photos.

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