

TEST REPORT

Reference No...... : WTD21D04040628W003
FCC ID : 2AEPBLACKG
Applicant..... : COLOMBIANA DE COMERCIO S.A.
Address..... : Car. 43E No 8-71, Medellin, Colombia
Manufacturer : COOSEA GROUP (HK) COMPANY LIMITED LIMITED
Address..... : UNIT 5-6,16F.,MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIM SHA TSUI KL, HONG KONG
Product..... : Smartphone
Model(s) : Black G
Brand Name..... : Kalley
Standards..... : FCC CFR47 Part 15.247
Date of Receipt sample : 2021-04-29
Date of Test : 2021-04-30 to 2021-06-01
Date of Issue..... : 2021-06-02
Test Result..... : **Pass**

Remarks:

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

Prepared By:

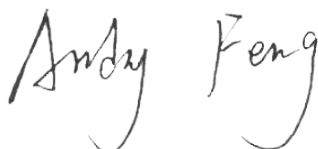
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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D04040 628W003	2021-04-29	2021-04-30 to 2021-06-01	2021-06-02	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	Smartphone
Model(s):	Black G
Model Description:	N/A
GSM Band(s):	GSM 850/900/1800/1900MHz
GPRS/EGPRS Class:	12
WCDMA Band(s):	FDD Band II/V
LTE Band(s):	FDD Band 4/7
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/ n(HT20/40)/ac(HT20/40/80)
Bluetooth Version:	Bluetooth v5.0 with BLE
GPS:	Support
NFC:	N/A
Hardware Version:	V01A
Software Version:	Kally_BLACK_G_V01_20210407
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): 16.44dBm BLE: -4.64dBm
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 3.87V, 4900mAh DC 5V, 2.0A, charging from adapter (Adapter Input: 100-240V~50/60Hz 0.35A)

Adapter:

Manufacturer: Guangdong Beicom Electronics Co.,Ltd

Model No.: U282F0A050200

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 .

4.5 Test Facility

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

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

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

Registration number 7760A, October 15, 2016.

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

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

Registration number 523476, September 10, 2019.

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	2020-07-30	2021-07-29
2.	LISN	R&S	ENV216	100115	2020-07-30	2021-07-29
3.	Cable	Top	TYPE16(3.5M)	-	2020-07-30	2021-07-29
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	2020-07-30	2021-07-29
2.	LISN	SCHWARZBECK	NSLK 8128	8128-259	2020-07-30	2021-07-29
3.	Limiter	CYBERTEK	EM5010	261115-001-0024	2020-07-30	2021-07-29
4.	Cable	Laplace	RF300	-	2020-07-30	2021-07-29
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	FSP30	100091	2021-04-20	2022-04-19
2	Amplifier	Agilent	8447D	2944A10178	2021-04-20	2022-04-19
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2020-08-22	2021-08-21
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2021-04-20	2022-04-19
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2021-04-20	2022-04-19
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2021-04-20	2022-04-19
7	Broadband Pre-amplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2021-04-20	2022-04-19
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2021-04-20	2022-04-19
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	2021-04-20	2022-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-04-25	2022-04-24
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2020-05-06 2021-04-29	2021-05-05 2022-04-28
4	Amplifier	ANRITSU	MH648A	M43381	2021-04-20	2022-04-19

5	Cable	HUBER+SUHNER	CBL2	525178	2021-04-20	2022-04-19
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	2021-04-20	2022-04-19
2.	Spectrum Analyzer	R&S	FSP30	100091	2021-04-20	2022-04-19
3.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2021-04-20	2022-04-19

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 (dB μ V)	
	Quasi-peak	Average
0.15 to 0.5	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 :

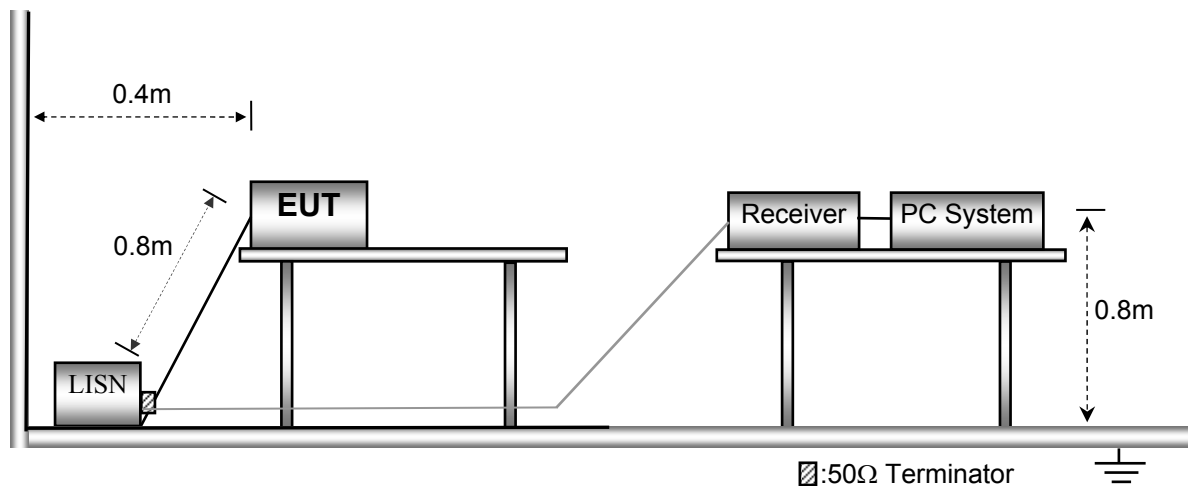
Temperature:	21.5 °C
Humidity:	51.9 % RH
Atmospheric Pressure:	101.2kPa

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

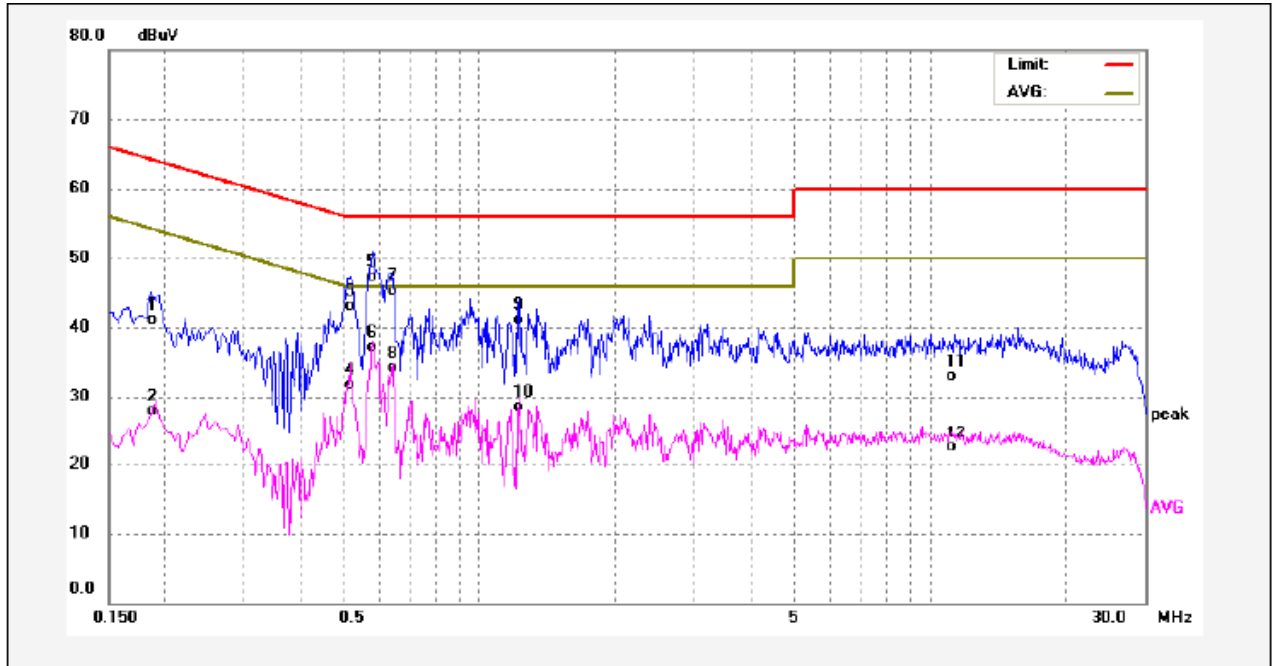
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

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

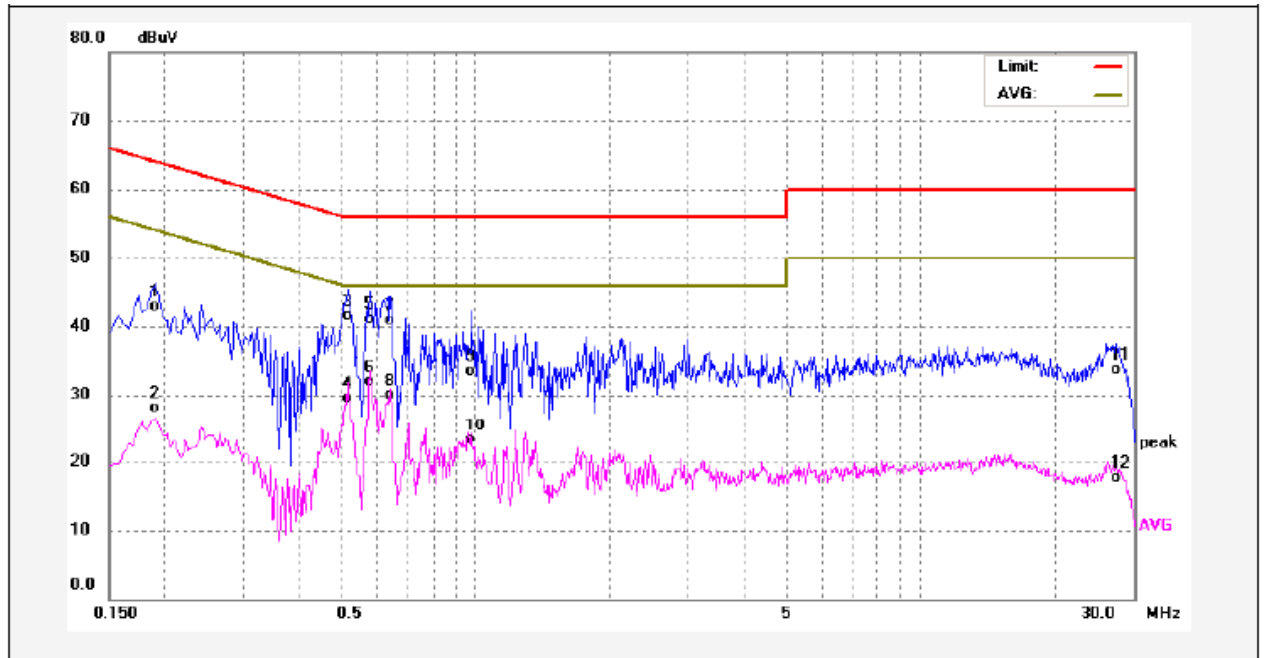
Worst Mode: WIFI mode (802.11b mode low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1860	30.35	10.71	41.06	64.21	-23.15	QP	
2	0.1860	17.26	10.71	27.97	54.21	-26.24	AVG	
3	0.5180	32.55	10.53	43.08	56.00	-12.92	QP	
4	0.5180	21.25	10.53	31.78	46.00	-14.22	AVG	
5	0.5740	36.70	10.55	47.25	56.00	-8.75	QP	
6	0.5740	26.63	10.55	37.18	46.00	-8.82	AVG	
7	0.6340	34.66	10.57	45.23	56.00	-10.77	QP	
8	0.6340	23.47	10.57	34.04	46.00	-11.96	AVG	
9	1.2220	30.57	10.60	41.17	56.00	-14.83	QP	
10	1.2220	17.97	10.60	28.57	46.00	-17.43	AVG	
11	11.3060	22.19	10.80	32.99	60.00	-27.01	QP	
12	11.3060	11.72	10.80	22.52	50.00	-27.48	AVG	

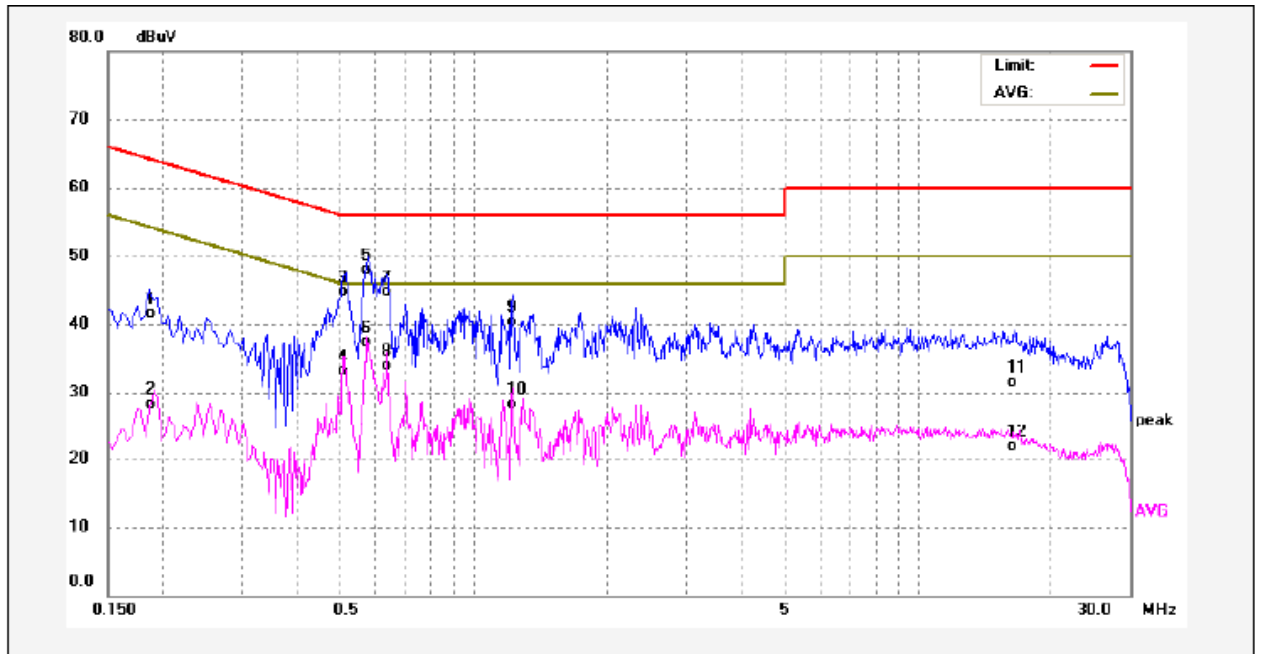
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1900	32.13	10.70	42.83	64.03	-21.20	QP	
2	0.1900	17.46	10.70	28.16	54.03	-25.87	AVG	
3	0.5180	30.94	10.53	41.47	56.00	-14.53	QP	
4	0.5180	19.07	10.53	29.60	46.00	-16.40	AVG	
5	0.5780	30.51	10.55	41.06	56.00	-14.94	QP	
6	0.5780	21.39	10.55	31.94	46.00	-14.06	AVG	
7	0.6340	30.30	10.57	40.87	56.00	-15.13	QP	
8	0.6340	19.32	10.57	29.89	46.00	-16.11	AVG	
9	0.9780	22.85	10.60	33.45	56.00	-22.55	QP	
10	0.9780	12.61	10.60	23.21	46.00	-22.79	AVG	
11	27.4100	22.85	10.85	33.70	60.00	-26.30	QP	
12	27.4100	6.95	10.85	17.80	50.00	-32.20	AVG	

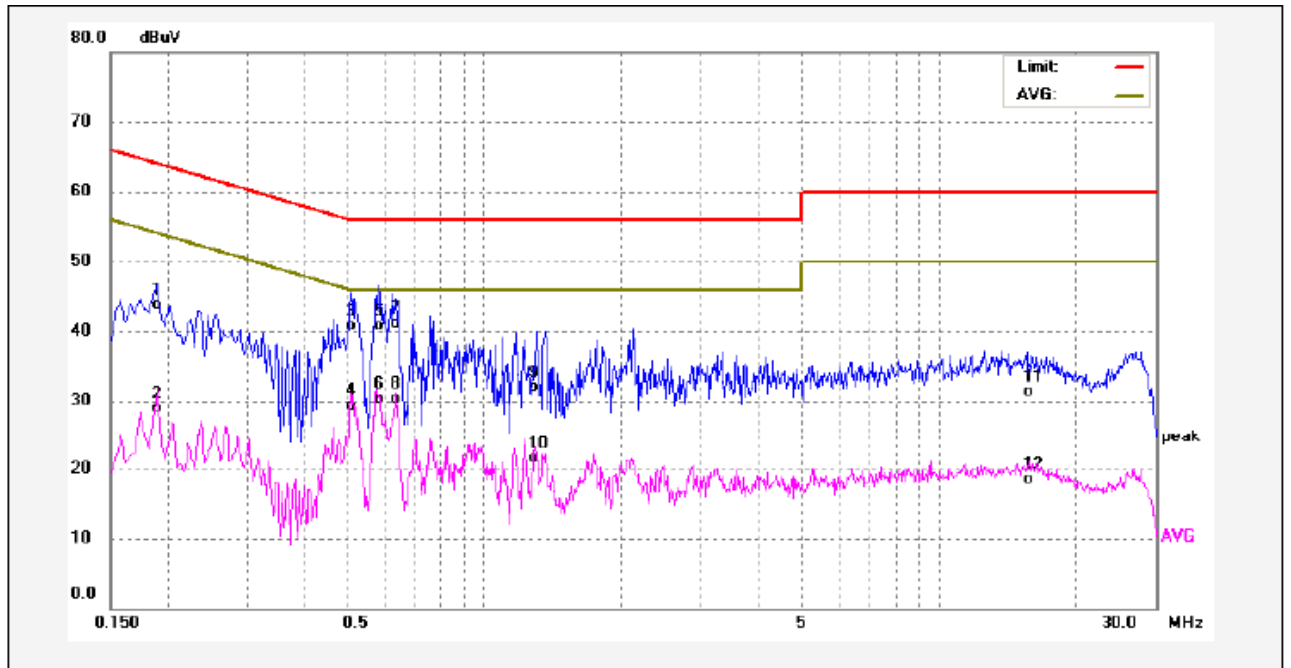
Worst Mode: BLE mode (low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1860	30.85	10.71	41.56	64.21	-22.65	QP	
2	0.1860	17.63	10.71	28.34	54.21	-25.87	AVG	
3	0.5140	34.25	10.53	44.78	56.00	-11.22	QP	
4	0.5140	22.54	10.53	33.07	46.00	-12.93	AVG	
5	0.5780	37.45	10.55	48.00	56.00	-8.00	QP	
6	0.5780	26.74	10.55	37.29	46.00	-8.71	AVG	
7	0.6380	34.19	10.58	44.77	56.00	-11.23	QP	
8	0.6380	23.28	10.58	33.86	46.00	-12.14	AVG	
9	1.2260	29.65	10.60	40.25	56.00	-15.75	QP	
10	1.2260	17.72	10.60	28.32	46.00	-17.68	AVG	
11	16.4020	20.73	10.78	31.51	60.00	-28.49	QP	
12	16.4020	11.03	10.78	21.81	50.00	-28.19	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1900	32.98	10.70	43.68	64.03	-20.35	QP	
2	0.1900	18.13	10.70	28.83	54.03	-25.20	AVG	
3	0.5100	30.19	10.52	40.71	56.00	-15.29	QP	
4	0.5100	18.85	10.52	29.37	46.00	-16.63	AVG	
5	0.5860	30.08	10.55	40.63	56.00	-15.37	QP	
6	0.5860	19.69	10.55	30.24	46.00	-15.76	AVG	
7	0.6380	30.62	10.58	41.20	56.00	-14.80	QP	
8	0.6380	19.80	10.58	30.38	46.00	-15.62	AVG	
9	1.2980	21.32	10.60	31.92	56.00	-24.08	QP	
10	1.2980	10.95	10.60	21.55	46.00	-24.45	AVG	
11	15.5620	20.56	10.79	31.35	60.00	-28.65	QP	
12	15.5620	7.67	10.79	18.46	50.00	-31.54	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)	20log ^{(2400/F(kHz))} + 80
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	20log ^{(24000/F(kHz))} + 40
1.705 ~ 30	30	30	100 * 30	20log ⁽³⁰⁾ + 40
30 ~ 88	100	3	100	20log ⁽¹⁰⁰⁾
88 ~ 216	150	3	150	20log ⁽¹⁵⁰⁾
216 ~ 960	200	3	200	20log ⁽²⁰⁰⁾
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾

8.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

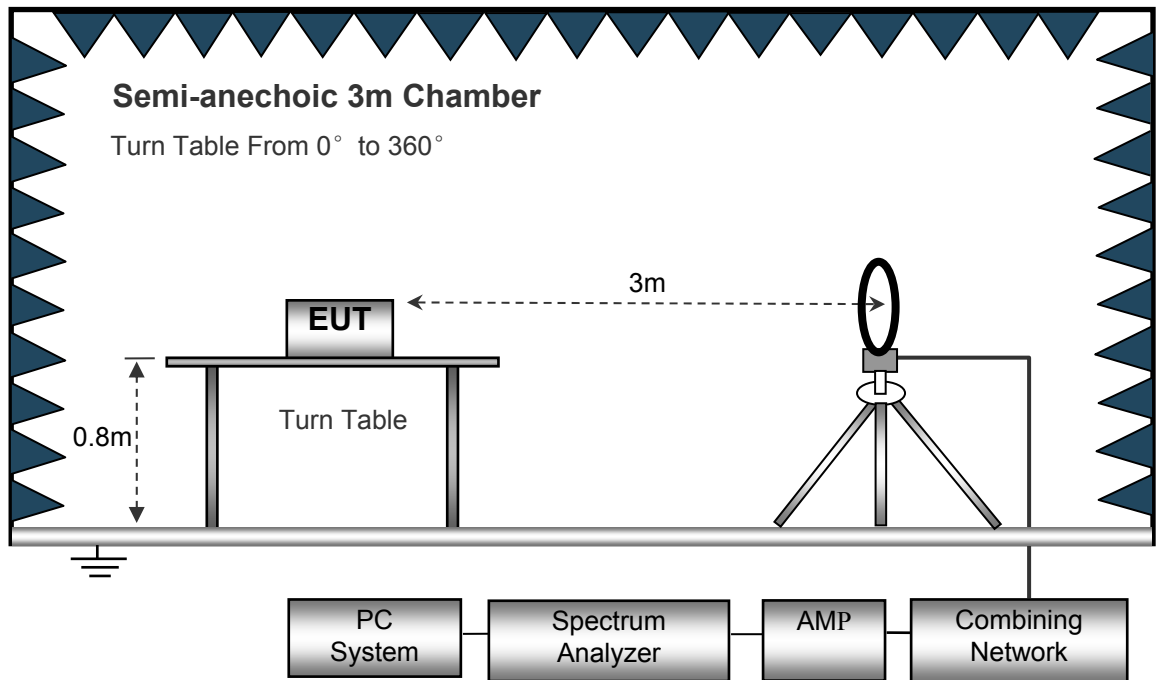
EUT Operation :

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

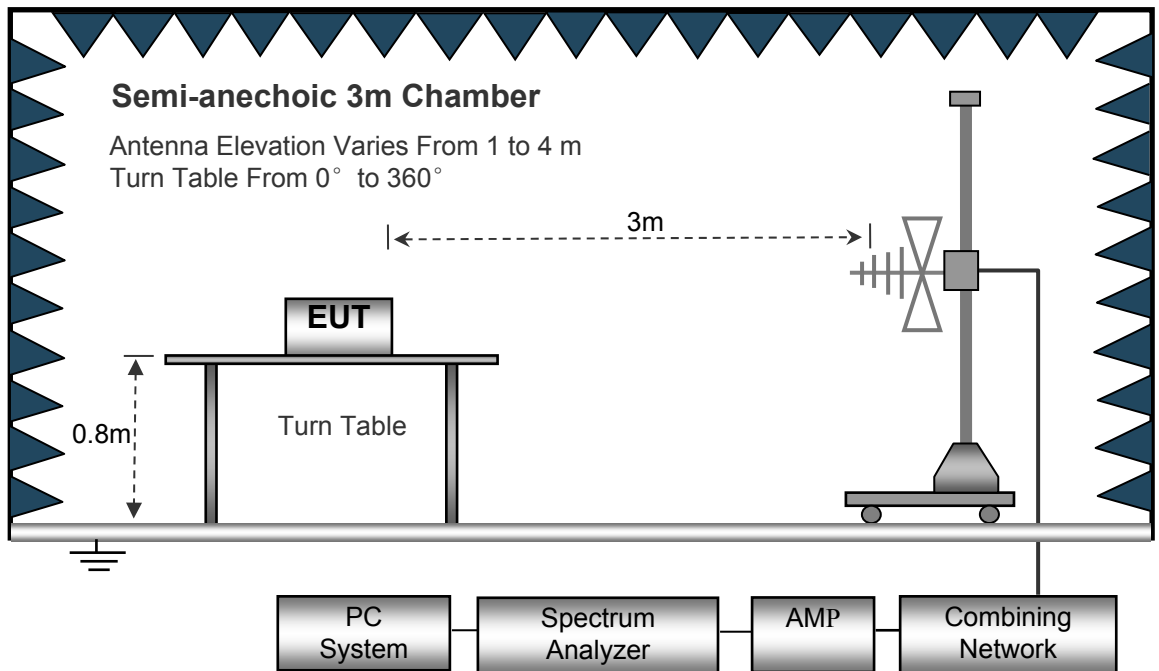
8.2 Test Setup

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

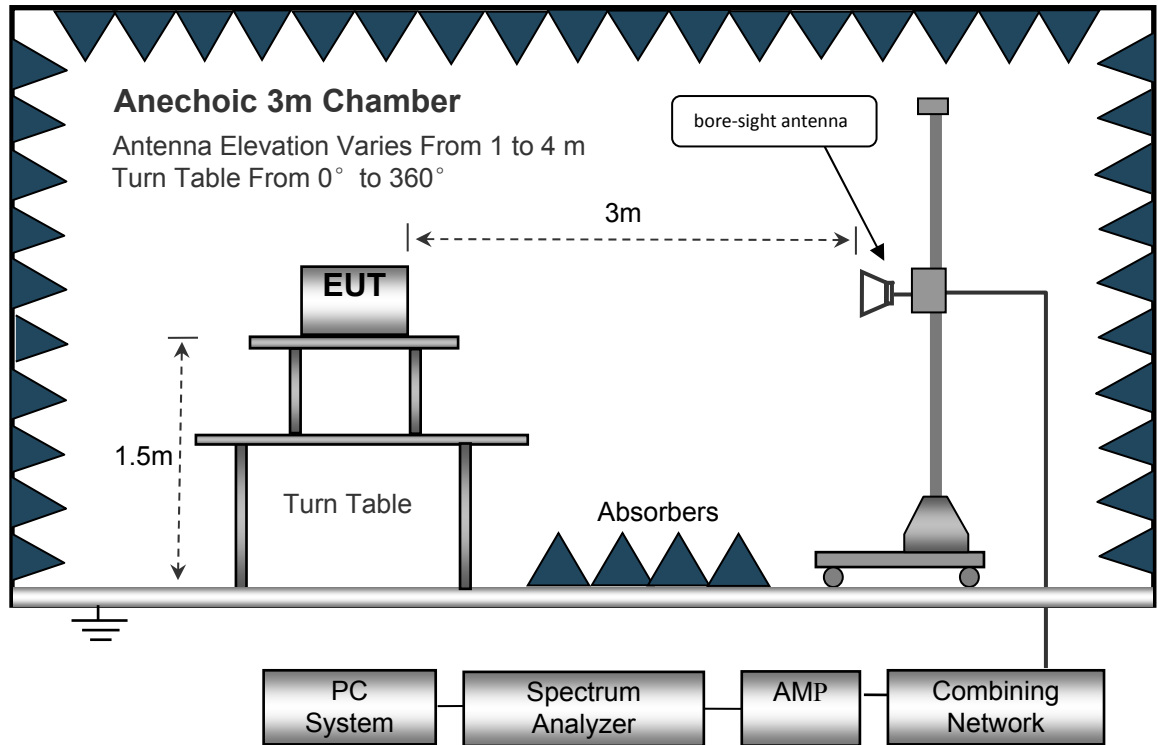
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

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

Above 1GHz

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

8.4 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane for below 1GHz and 1.5m for above 1GHz.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in Z axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used 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 dB μ V @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dB μ V/m @30m	Limits dB μ V/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
802.11b							
6.032	25.17	QP	21.84	40.00	7.01	29.54	-22.53
15.730	24.65	QP	21.35	40.00	6.00	29.54	-23.54
25.680	25.13	QP	20.67	40.00	5.80	29.54	-23.74
802.11g							
6.032	24.53	QP	21.84	40.00	6.37	29.54	-23.17
8.051	24.71	QP	21.02	40.00	5.73	29.54	-23.81
26.215	25.06	QP	20.55	40.00	5.61	29.54	-23.93
802.11n(HT20)							
6.032	25.17	QP	21.84	40.00	7.01	29.54	-22.53
8.051	25.03	QP	21.02	40.00	6.05	29.54	-23.49
26.215	24.42	QP	20.55	40.00	4.97	29.54	-24.57
802.11n(HT40)							
6.032	25.11	QP	21.84	40.00	6.95	29.54	-22.59
8.051	25.23	QP	21.02	40.00	6.25	29.54	-23.29
26.215	24.57	QP	20.55	40.00	5.12	29.54	-24.42

Test Frequency : 30MHz ~ 8GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11b: Low Channel 2412MHz									
223.45	41.38	QP	87	1.8	H	-11.62	29.76	46.00	-16.24
223.45	37.64	QP	31	1.7	V	-11.62	26.02	46.00	-19.98
4824.00	48.48	PK	50	1.4	V	-1.06	47.42	74.00	-26.58
4824.00	44.60	Ave	50	1.4	V	-1.06	43.54	54.00	-10.46
7236.00	41.73	PK	288	1.5	H	1.33	43.06	74.00	-30.94
7236.00	40.84	Ave	288	1.5	H	1.33	42.17	54.00	-11.83
2323.36	46.60	PK	195	1.9	V	-13.19	33.41	74.00	-40.59
2323.36	39.24	Ave	195	1.9	V	-13.19	26.05	54.00	-27.95
2359.85	42.74	PK	290	1.5	H	-13.14	29.60	74.00	-44.40
2359.85	38.58	Ave	290	1.5	H	-13.14	25.44	54.00	-28.56
2497.89	42.39	PK	176	1.2	V	-13.08	29.31	74.00	-44.69
2497.89	36.28	Ave	176	1.2	V	-13.08	23.20	54.00	-30.80

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11b: Middle Channel 2437MHz									
223.45	40.52	QP	61	2.0	H	-11.62	28.90	46.00	-17.10
223.45	37.34	QP	251	1.1	V	-11.62	25.72	46.00	-20.28
4874.00	49.96	PK	190	1.8	V	-0.62	49.34	74.00	-24.66
4874.00	44.28	Ave	190	1.8	V	-0.62	43.66	54.00	-10.34
7311.00	41.49	PK	208	1.2	H	2.21	43.70	74.00	-30.30
7311.00	39.58	Ave	208	1.2	H	2.21	41.79	54.00	-12.21
2321.87	45.05	PK	109	1.7	V	-13.19	31.86	74.00	-42.14
2321.87	39.52	Ave	109	1.7	V	-13.19	26.33	54.00	-27.67
2365.06	43.73	PK	30	1.7	H	-13.14	30.59	74.00	-43.41
2365.06	38.02	Ave	30	1.7	H	-13.14	24.88	54.00	-29.12
2484.04	42.01	PK	149	1.0	V	-13.08	28.93	74.00	-45.07
2484.04	36.73	Ave	149	1.0	V	-13.08	23.65	54.00	-30.35

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11b: High Channel 2462MHz									
223.45	41.80	QP	120	1.3	H	-11.62	30.18	46.00	-15.82
223.45	36.77	QP	139	1.2	V	-11.62	25.15	46.00	-20.85
4924.00	50.07	PK	129	1.4	V	-0.24	49.83	74.00	-24.17
4924.00	43.52	Ave	129	1.4	V	-0.24	43.28	54.00	-10.72
7386.00	40.01	PK	20	1.7	H	2.84	42.85	74.00	-31.15
7386.00	39.70	Ave	20	1.7	H	2.84	42.54	54.00	-11.46
2338.03	46.29	PK	52	2.0	V	-13.19	33.10	74.00	-40.90
2338.03	38.78	Ave	52	2.0	V	-13.19	25.59	54.00	-28.41
2363.89	42.12	PK	0	1.6	H	-13.14	28.98	74.00	-45.02
2363.89	37.65	Ave	0	1.6	H	-13.14	24.51	54.00	-29.49
2490.90	42.16	PK	202	1.6	V	-13.08	29.08	74.00	-44.92
2490.90	36.99	Ave	202	1.6	V	-13.08	23.91	54.00	-30.09

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11g: Low Channel 2412MHz									
223.45	41.23	QP	206	1.4	H	-11.62	29.61	46.00	-16.39
223.45	36.94	QP	111	1.4	V	-11.62	25.32	46.00	-20.68
4824.00	50.29	PK	62	1.3	V	-1.06	49.23	74.00	-24.77
4824.00	43.49	Ave	62	1.3	V	-1.06	42.43	54.00	-11.57
7236.00	38.68	PK	208	1.7	H	1.33	40.01	74.00	-33.99
7236.00	38.23	Ave	208	1.7	H	1.33	39.56	54.00	-14.44
2324.08	45.35	PK	2	1.9	V	-13.19	32.16	74.00	-41.84
2324.08	38.40	Ave	2	1.9	V	-13.19	25.21	54.00	-28.79
2362.38	43.53	PK	232	1.5	H	-13.14	30.39	74.00	-43.61
2362.38	37.64	Ave	232	1.5	H	-13.14	24.50	54.00	-29.50
2491.62	44.00	PK	83	1.8	V	-13.08	30.92	74.00	-43.08
2491.62	36.64	Ave	83	1.8	V	-13.08	23.56	54.00	-30.44

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11g: Middle Channel 2437MHz									
223.45	41.92	QP	119	1.0	H	-11.62	30.30	46.00	-15.70
223.45	37.30	QP	304	1.4	V	-11.62	25.68	46.00	-20.32
4874.00	50.47	PK	43	1.2	V	-0.62	49.85	74.00	-24.15
4874.00	44.00	Ave	43	1.2	V	-0.62	43.38	54.00	-10.62
7311.00	39.70	PK	112	1.6	H	2.21	41.91	74.00	-32.09
7311.00	38.16	Ave	112	1.6	H	2.21	40.37	54.00	-13.63
2344.92	46.67	PK	235	1.1	V	-13.19	33.48	74.00	-40.52
2344.92	38.60	Ave	235	1.1	V	-13.19	25.41	54.00	-28.59
2370.54	42.70	PK	70	1.7	H	-13.14	29.56	74.00	-44.44
2370.54	37.04	Ave	70	1.7	H	-13.14	23.90	54.00	-30.10
2490.87	44.02	PK	95	1.5	V	-13.08	30.94	74.00	-43.06
2490.87	37.34	Ave	95	1.5	V	-13.08	24.26	54.00	-29.74

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11g: High Channel 2462MHz									
223.45	43.39	QP	195	1.7	H	-11.62	31.77	46.00	-14.23
223.45	37.90	QP	273	1.8	V	-11.62	26.28	46.00	-19.72
4924.00	50.30	PK	190	1.8	V	-0.24	50.06	74.00	-23.94
4924.00	43.52	Ave	190	1.8	V	-0.24	43.28	54.00	-10.72
7386.00	39.24	PK	194	1.8	H	2.84	42.08	74.00	-31.92
7386.00	37.66	Ave	194	1.8	H	2.84	40.50	54.00	-13.50
2325.00	45.45	PK	119	1.3	V	-13.19	32.26	74.00	-41.74
2325.00	39.72	Ave	119	1.3	V	-13.19	26.53	54.00	-27.47
2383.49	43.41	PK	345	1.5	H	-13.14	30.27	74.00	-43.73
2383.49	36.08	Ave	345	1.5	H	-13.14	22.94	54.00	-31.06
2499.76	42.97	PK	221	1.0	V	-13.08	29.89	74.00	-44.11
2499.76	36.11	Ave	221	1.0	V	-13.08	23.03	54.00	-30.97

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11n20: Low Channel 2412MHz									
223.45	43.82	QP	245	1.5	H	-11.62	32.20	46.00	-13.80
223.45	37.25	QP	190	1.2	V	-11.62	25.63	46.00	-20.37
4824.00	50.75	PK	23	2.0	V	-1.06	49.69	74.00	-24.31
4824.00	42.41	Ave	23	2.0	V	-1.06	41.35	54.00	-12.65
7236.00	39.91	PK	306	1.1	H	1.33	41.24	74.00	-32.76
7236.00	37.41	Ave	306	1.1	H	1.33	38.74	54.00	-15.26
2310.70	45.90	PK	178	2.0	V	-13.19	32.71	74.00	-41.29
2310.70	37.43	Ave	178	2.0	V	-13.19	24.24	54.00	-29.76
2379.45	42.92	PK	220	1.6	H	-13.14	29.78	74.00	-44.22
2379.45	36.65	Ave	220	1.6	H	-13.14	23.51	54.00	-30.49
2494.24	43.68	PK	156	1.3	V	-13.08	30.60	74.00	-43.40
2494.24	38.09	Ave	156	1.3	V	-13.08	25.01	54.00	-28.99

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11n20: Middle Channel 2437MHz									
223.45	44.02	QP	248	1.1	H	-11.62	32.40	46.00	-13.60
223.45	36.23	QP	192	1.8	V	-11.62	24.61	46.00	-21.39
4874.00	52.19	PK	327	1.6	V	-0.62	51.57	74.00	-22.43
4874.00	43.35	Ave	327	1.6	V	-0.62	42.73	54.00	-11.27
7311.00	38.65	PK	181	1.5	H	2.21	40.86	74.00	-33.14
7311.00	38.15	Ave	181	1.5	H	2.21	40.36	54.00	-13.64
2314.36	45.20	PK	194	1.3	V	-13.19	32.01	74.00	-41.99
2314.36	39.60	Ave	194	1.3	V	-13.19	26.41	54.00	-27.59
2356.49	42.24	PK	165	2.0	H	-13.14	29.10	74.00	-44.90
2356.49	37.13	Ave	165	2.0	H	-13.14	23.99	54.00	-30.01
2497.22	42.14	PK	332	1.4	V	-13.08	29.06	74.00	-44.94
2497.22	36.70	Ave	332	1.4	V	-13.08	23.62	54.00	-30.38

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11n20: High Channel 2462MHz									
223.45	43.20	QP	141	1.4	H	-11.62	31.58	46.00	-14.42
223.45	35.72	QP	187	1.0	V	-11.62	24.10	46.00	-21.90
4924.00	53.50	PK	149	1.4	V	-0.24	53.26	74.00	-20.74
4924.00	44.31	Ave	149	1.4	V	-0.24	44.07	54.00	-9.93
7386.00	38.94	PK	163	1.8	H	2.84	41.78	74.00	-32.22
7386.00	38.43	Ave	163	1.8	H	2.84	41.27	54.00	-12.73
2322.25	46.62	PK	325	1.2	V	-13.19	33.43	74.00	-40.57
2322.25	37.65	Ave	325	1.2	V	-13.19	24.46	54.00	-29.54
2356.13	43.94	PK	38	1.9	H	-13.14	30.80	74.00	-43.20
2356.13	37.98	Ave	38	1.9	H	-13.14	24.84	54.00	-29.16
2485.80	42.16	PK	248	1.4	V	-13.08	29.08	74.00	-44.92
2485.80	38.86	Ave	248	1.4	V	-13.08	25.78	54.00	-28.22

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11n40: Low Channel 2422MHz									
223.45	42.70	QP	291	1.2	H	-11.62	31.08	46.00	-14.92
223.45	34.88	QP	64	1.6	V	-11.62	23.26	46.00	-22.74
4844.00	50.88	PK	218	1.2	V	-1.06	49.82	74.00	-24.18
4844.00	42.57	Ave	218	1.2	V	-1.06	41.51	54.00	-12.49
7266.00	37.58	PK	227	1.2	H	1.33	38.91	74.00	-35.09
7266.00	35.73	Ave	227	1.2	H	1.33	37.06	54.00	-16.94
2342.74	46.30	PK	4	1.5	V	-13.19	33.11	74.00	-40.89
2342.74	38.07	Ave	4	1.5	V	-13.19	24.88	54.00	-29.12
2385.66	42.84	PK	337	1.3	H	-13.14	29.70	74.00	-44.30
2385.66	38.17	Ave	337	1.3	H	-13.14	25.03	54.00	-28.97
2485.61	42.00	PK	249	1.3	V	-13.08	28.92	74.00	-45.08
2485.61	38.32	Ave	249	1.3	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)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
11n40: Middle Channel 2437MHz									
223.45	42.55	QP	125	1.2	H	-11.62	30.93	46.00	-15.07
223.45	34.00	QP	311	1.1	V	-11.62	22.38	46.00	-23.62
4874.00	51.68	PK	272	1.8	V	-0.62	51.06	74.00	-22.94
4874.00	42.37	Ave	272	1.8	V	-0.62	41.75	54.00	-12.25
7311.00	37.30	PK	124	1.4	H	2.21	39.51	74.00	-34.49
7311.00	34.75	Ave	124	1.4	H	2.21	36.96	54.00	-17.04
2348.13	45.84	PK	201	2.0	V	-13.19	32.65	74.00	-41.35
2348.13	37.86	Ave	201	2.0	V	-13.19	24.67	54.00	-29.33
2388.42	43.72	PK	205	1.2	H	-13.14	30.58	74.00	-43.42
2388.42	38.88	Ave	205	1.2	H	-13.14	25.74	54.00	-28.26
2485.54	44.62	PK	127	1.1	V	-13.08	31.54	74.00	-42.46
2485.54	36.23	Ave	127	1.1	V	-13.08	23.15	54.00	-30.85

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	41.92	QP	359	1.6	H	-11.62	30.30	46.00	-15.70
223.45	33.63	QP	32	1.5	V	-11.62	22.01	46.00	-23.99
4904.00	50.69	PK	46	1.4	V	-0.24	50.45	74.00	-23.55
4904.00	43.13	Ave	46	1.4	V	-0.24	42.89	54.00	-11.11
7356.00	36.73	PK	146	1.8	H	2.84	39.57	74.00	-34.43
7356.00	35.74	Ave	146	1.8	H	2.84	38.58	54.00	-15.42
2329.61	45.62	PK	223	1.8	V	-13.19	32.43	74.00	-41.57
2329.61	38.97	Ave	223	1.8	V	-13.19	25.78	54.00	-28.22
2378.67	44.93	PK	293	1.4	H	-13.14	31.79	74.00	-42.21
2378.67	38.44	Ave	293	1.4	H	-13.14	25.30	54.00	-28.70
2492.62	43.37	PK	324	1.4	V	-13.08	30.29	74.00	-43.71
2492.62	38.64	Ave	324	1.4	V	-13.08	25.56	54.00	-28.44

Test Frequency: 8GHz~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 dB μ V @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dB μ V/m @30m	Limits dB μ V/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
6.032	24.03	QP	21.84	40.00	5.87	29.54	-23.67
8.051	25.62	QP	21.02	40.00	6.64	29.54	-22.90
26.215	24.27	QP	20.55	40.00	4.82	29.54	-24.72

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)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK Low Channel 2402MHz									
269.33	33.43	QP	308	1.3	H	-13.35	20.08	46.00	-25.92
269.33	39.52	QP	215	1.2	V	-13.35	26.17	46.00	-19.83
4804.00	45.92	PK	211	1.9	V	-1.06	44.86	74.00	-29.14
4804.00	42.54	Ave	211	1.9	V	-1.06	41.48	54.00	-12.52
7206.00	45.65	PK	233	1.8	H	1.33	46.98	74.00	-27.02
7206.00	37.28	Ave	233	1.8	H	1.33	38.61	54.00	-15.39
2321.63	46.57	PK	263	1.1	V	-13.19	33.38	74.00	-40.62
2321.63	39.91	Ave	263	1.1	V	-13.19	26.72	54.00	-27.28
2387.04	43.37	PK	321	1.9	H	-13.14	30.23	74.00	-43.77
2387.04	38.48	Ave	321	1.9	H	-13.14	25.34	54.00	-28.66
2483.65	42.23	PK	176	1.4	V	-13.08	29.15	74.00	-44.85
2483.65	37.00	Ave	176	1.4	V	-13.08	23.92	54.00	-30.08

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK Middle Channel 2440MHz									
269.33	33.14	QP	176	1.2	H	-13.35	19.79	46.00	-26.21
269.33	39.45	QP	58	1.6	V	-13.35	26.10	46.00	-19.90
4880.00	43.46	PK	304	1.5	V	-0.62	42.84	74.00	-31.16
4880.00	42.09	Ave	304	1.5	V	-0.62	41.47	54.00	-12.53
7320.00	46.64	PK	28	1.7	H	2.21	48.85	74.00	-25.15
7320.00	37.78	Ave	28	1.7	H	2.21	39.99	54.00	-14.01
2342.04	45.79	PK	19	1.4	V	-13.19	32.60	74.00	-41.40
2342.04	38.43	Ave	19	1.4	V	-13.19	25.24	54.00	-28.76
2351.16	43.27	PK	25	1.4	H	-13.14	30.13	74.00	-43.87
2351.16	37.86	Ave	25	1.4	H	-13.14	24.72	54.00	-29.28
2495.14	44.88	PK	290	1.3	V	-13.08	31.80	74.00	-42.20
2495.14	37.41	Ave	290	1.3	V	-13.08	24.33	54.00	-29.67

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dB μ V)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
GFSK High Channel 2480MHz									
269.33	33.76	QP	258	1.2	H	-13.35	20.41	46.00	-25.59
269.33	38.46	QP	253	1.9	V	-13.35	25.11	46.00	-20.89
4960.00	43.53	PK	67	1.8	V	-0.24	43.29	74.00	-30.71
4960.00	40.67	Ave	67	1.8	V	-0.24	40.43	54.00	-13.57
7440.00	45.76	PK	84	1.3	H	2.84	48.60	74.00	-25.40
7440.00	36.29	Ave	84	1.3	H	2.84	39.13	54.00	-14.87
2316.15	46.78	PK	345	1.5	V	-13.19	33.59	74.00	-40.41
2316.15	38.15	Ave	345	1.5	V	-13.19	24.96	54.00	-29.04
2377.46	42.32	PK	291	1.1	H	-13.14	29.18	74.00	-44.82
2377.46	36.80	Ave	291	1.1	H	-13.14	23.66	54.00	-30.34
2496.48	42.53	PK	59	1.1	V	-13.08	29.45	74.00	-44.55
2496.48	36.29	Ave	59	1.1	V	-13.08	23.21	54.00	-30.79

Test Frequency: 18GHz~25GHz

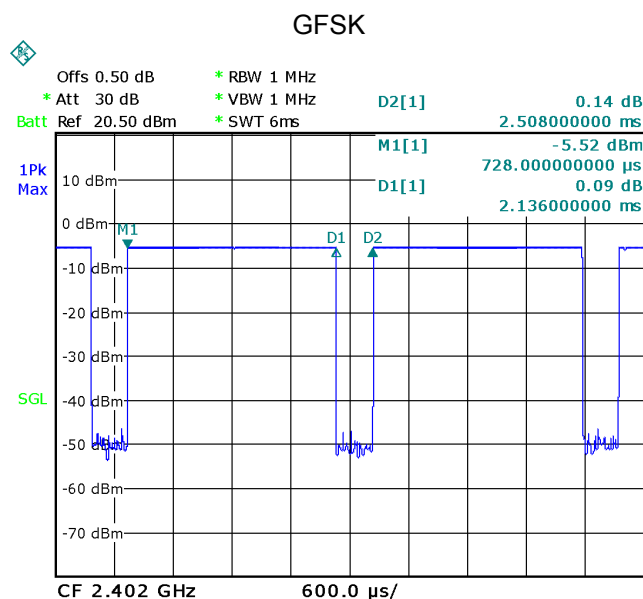
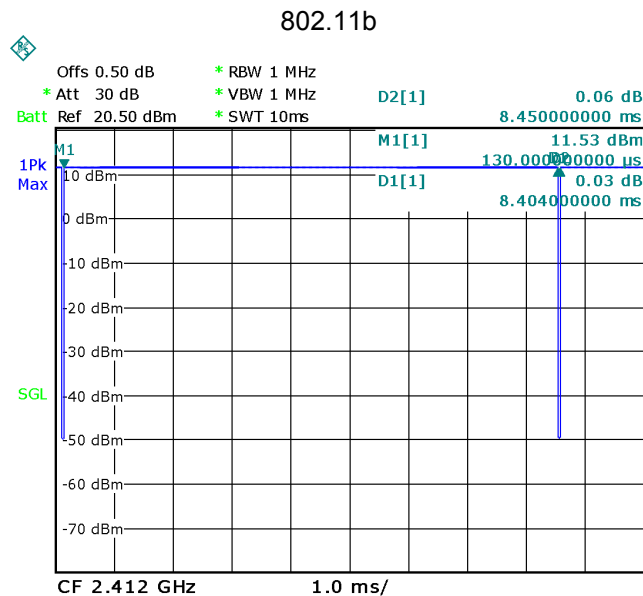
The measurements were more than 20 dB below the limit and not reported.

9 Duty Cycle

Modulation	On time(ms)	Period(ms)	Duty Cycle(%)	Duty Cycle Factor(dB)	Average Factor(dB)
802.11b	8.404	8.450	99.46	0.024	-0.047
GFSK	2.136	2.508	85.17	0.697	-1.394

Remark:

- 1) Duty Cycle=On Time/Period
- 2) Duty Cycle Factor= $10 \cdot \log(1/\text{Duty cycle})$
- 3) Average Factor= $20 \log_{10} \text{Duty Cycle}$



10 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)).

10.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
 - a) Set instrument center frequency to DTS channel center frequency.
 - b) Set the span to ≈ 1.5 times the DTS bandwidth.
 - c) Set the RBW = 100 kHz.
 - d) Set the VBW $\approx [3 \times \text{RBW}]$.
 - 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.

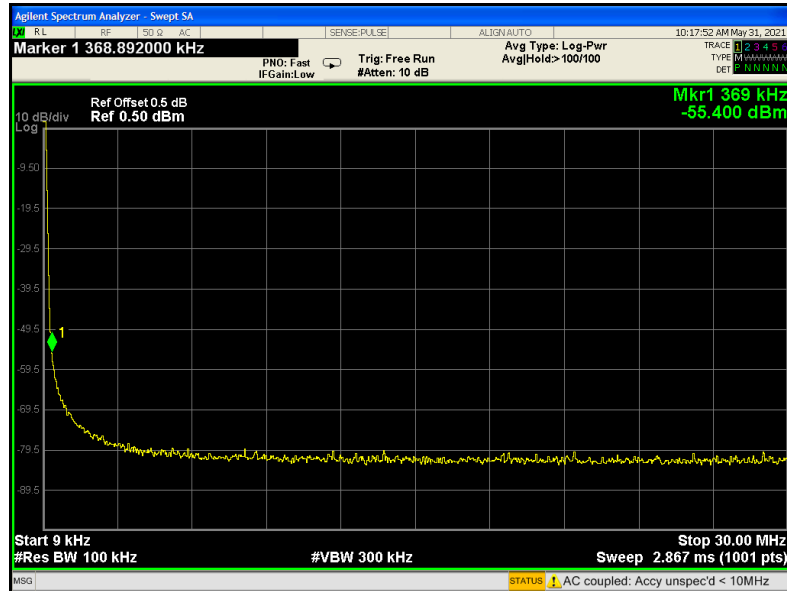
Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

10.2 Test Result

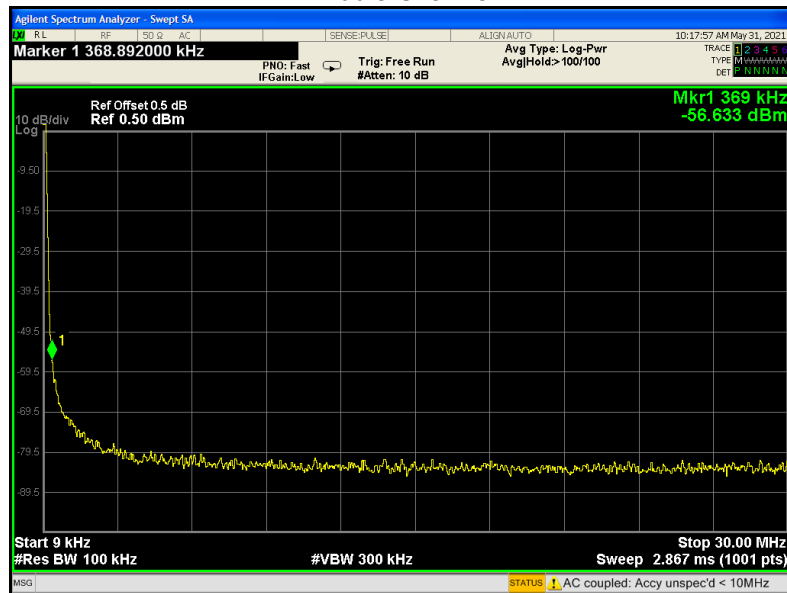
9KHz – 30MHz

802.11b

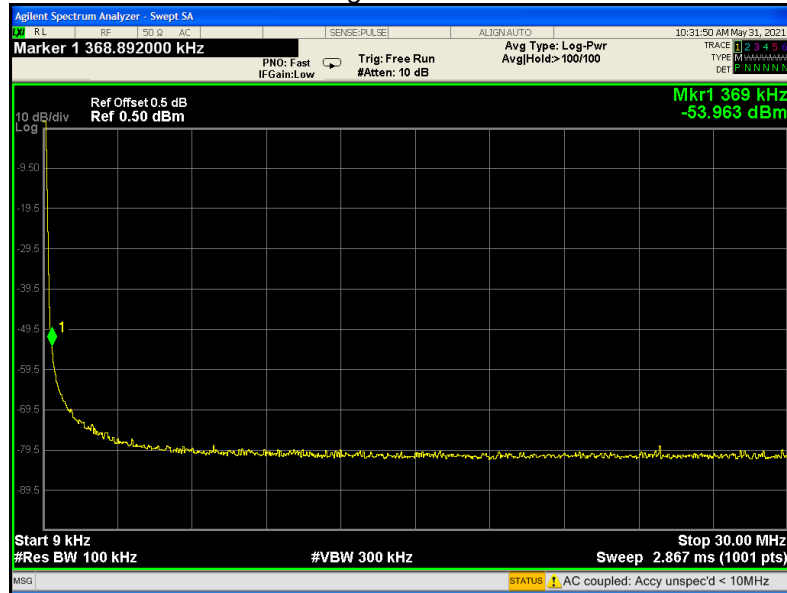
Low Channel



Middle Channel

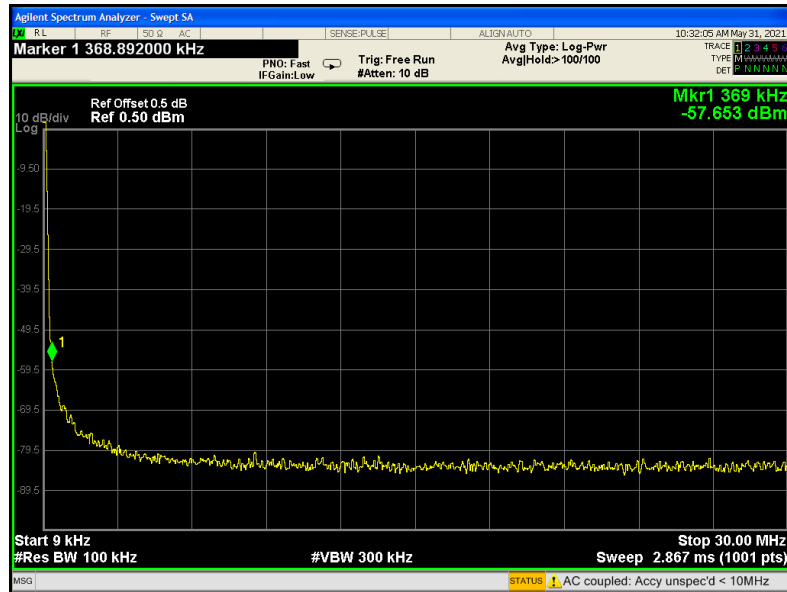


High Channel

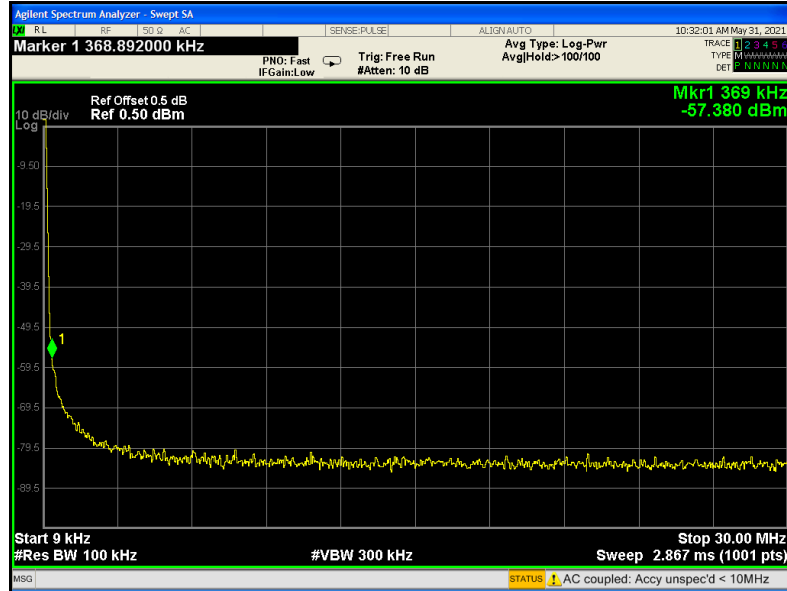


802.11g

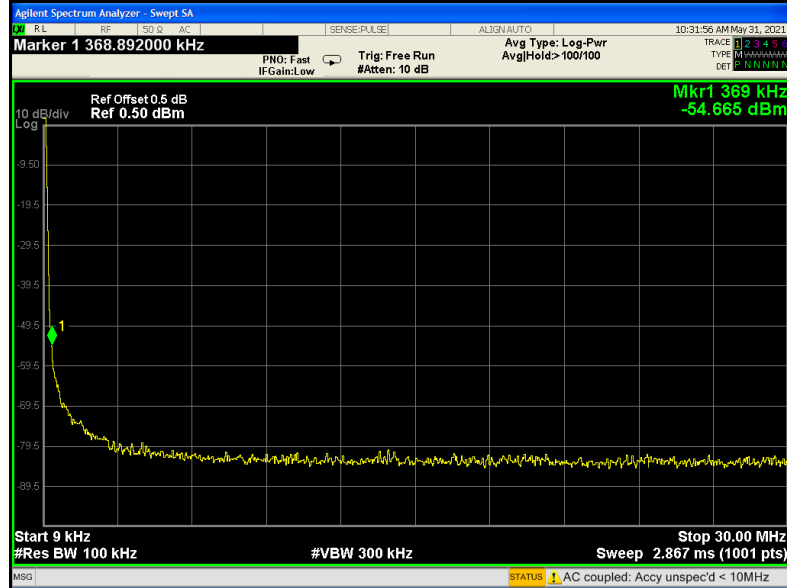
Low Channel



Middle Channel

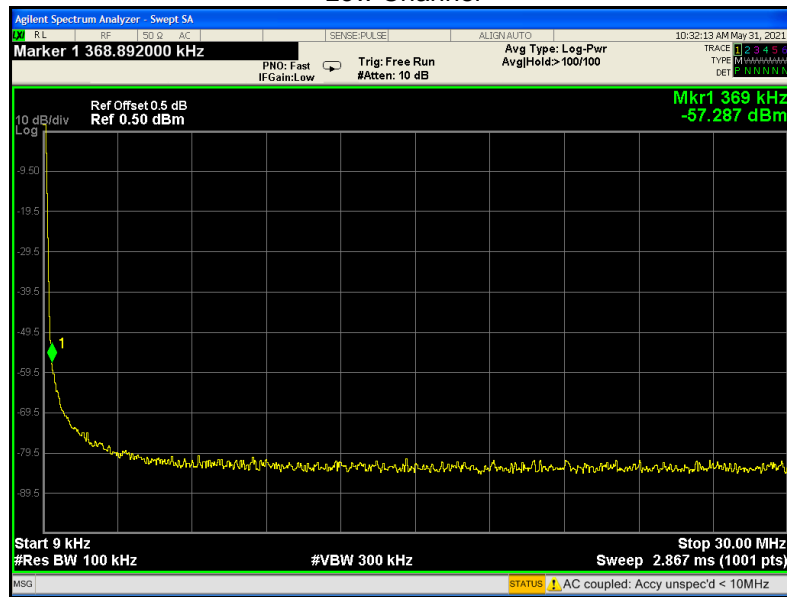


High Channel

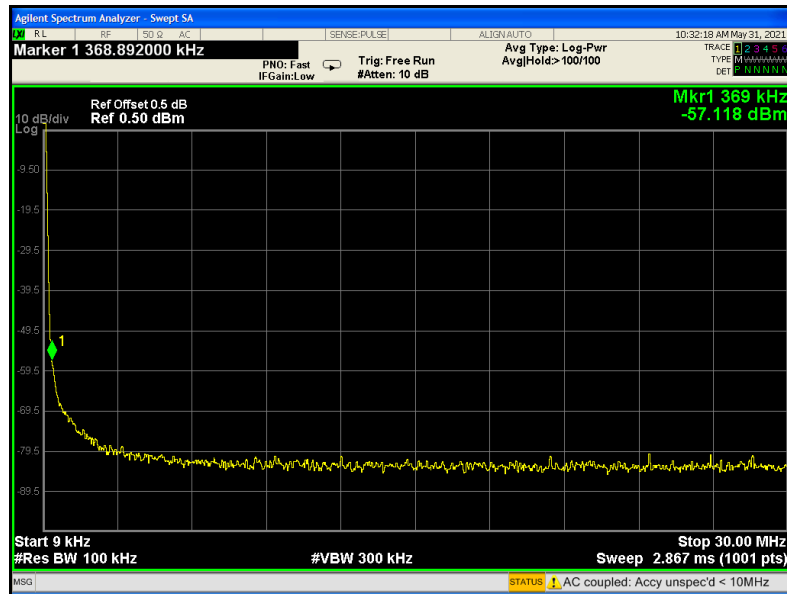


802.11n HT20

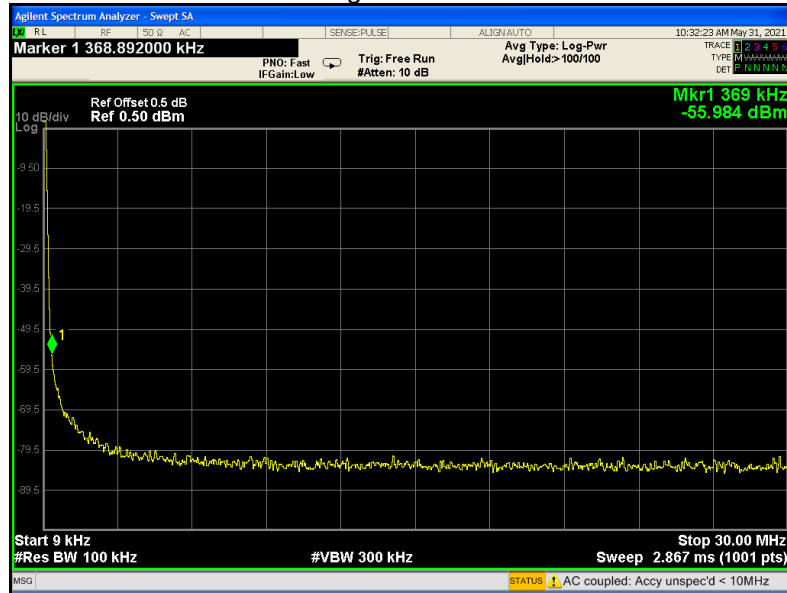
Low Channel



Middle Channel

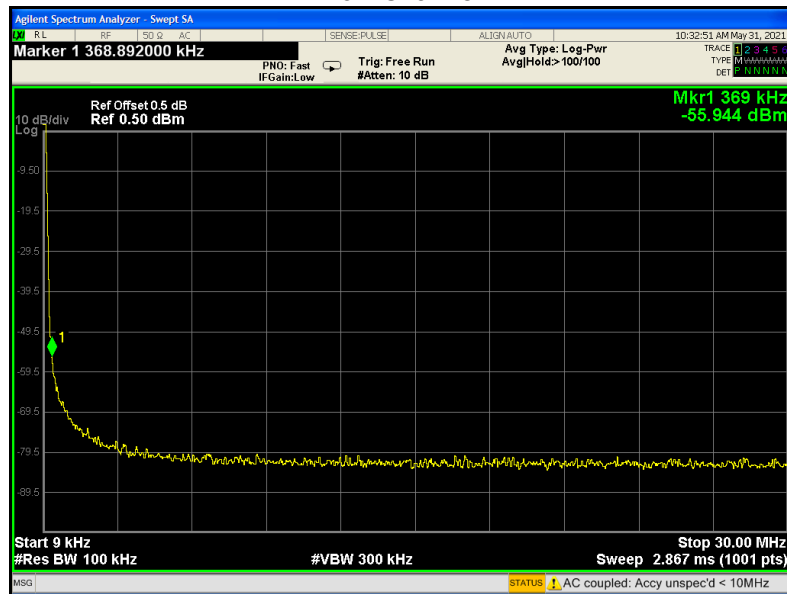


High Channel

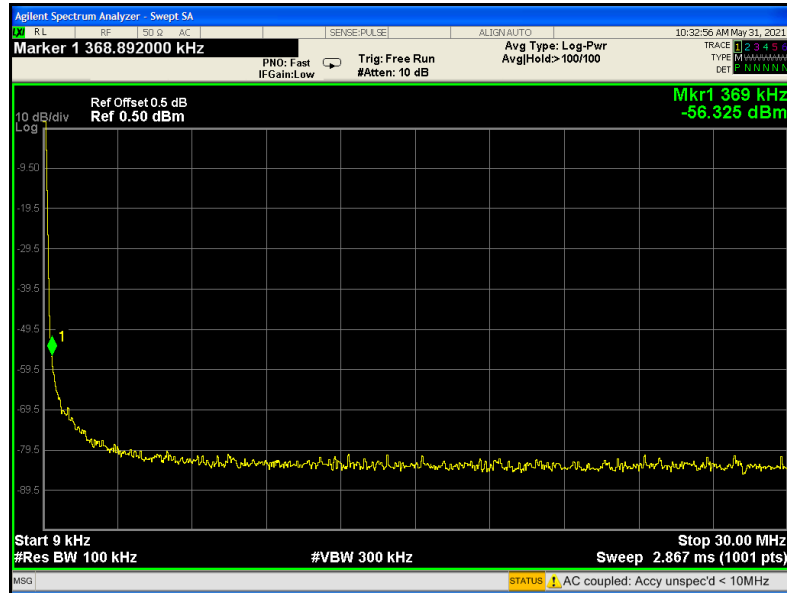


802.11n HT40

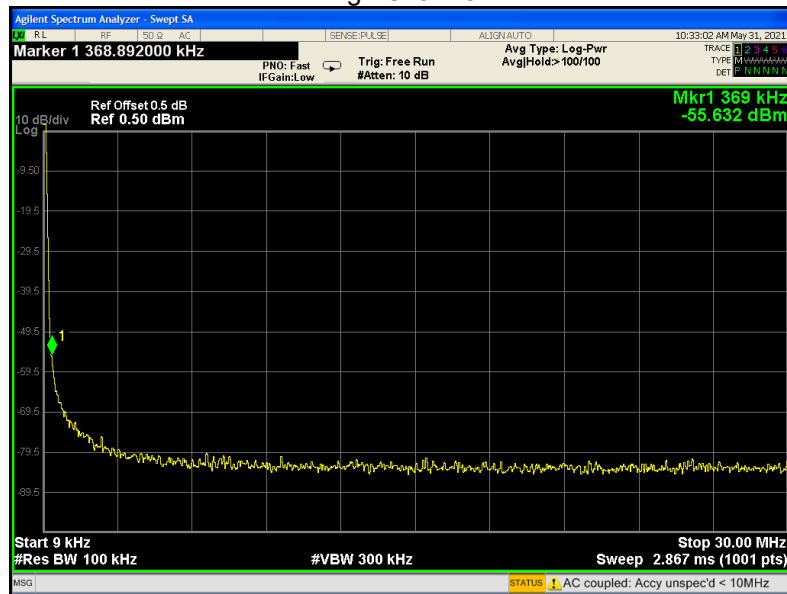
Low Channel



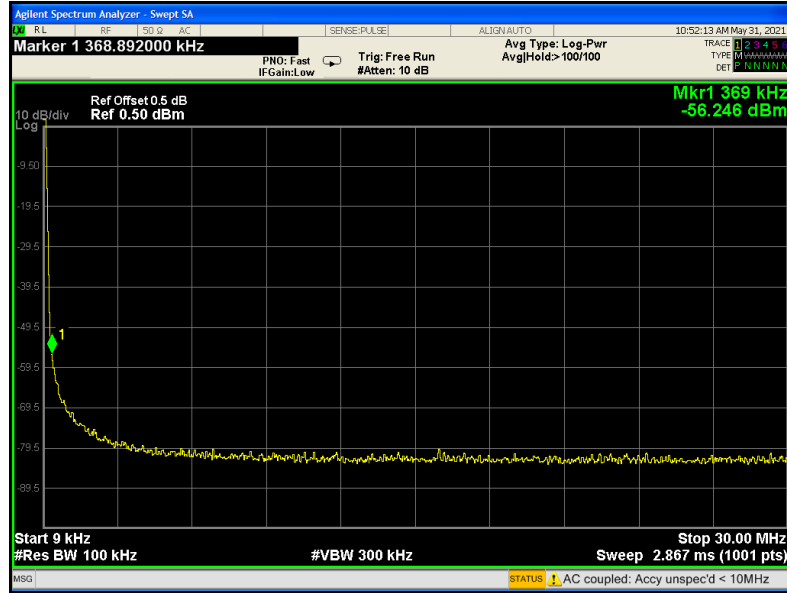
Middle Channel



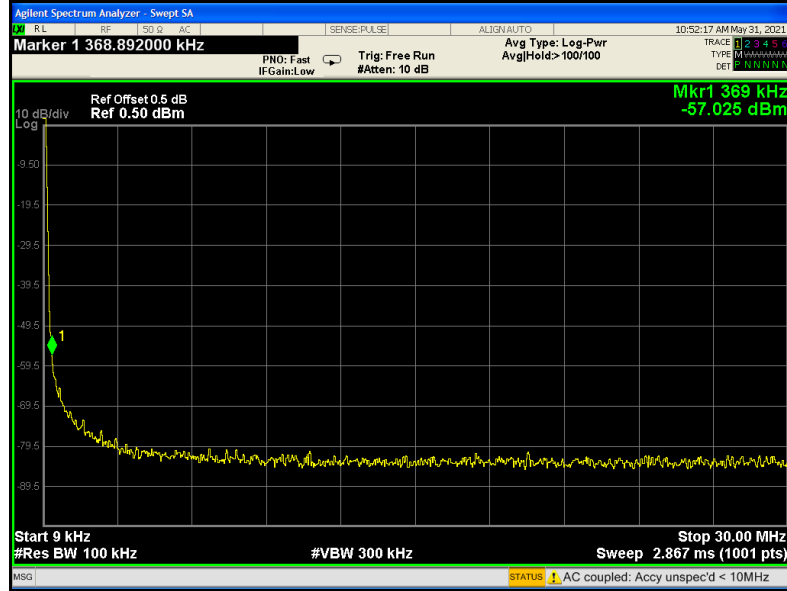
High Channel



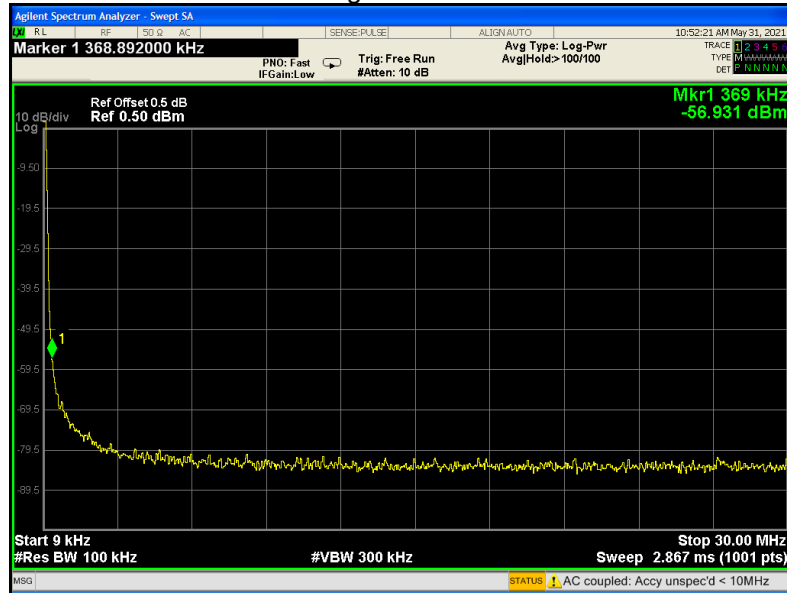
BLE Low Channel



Middle Channel



High Channel

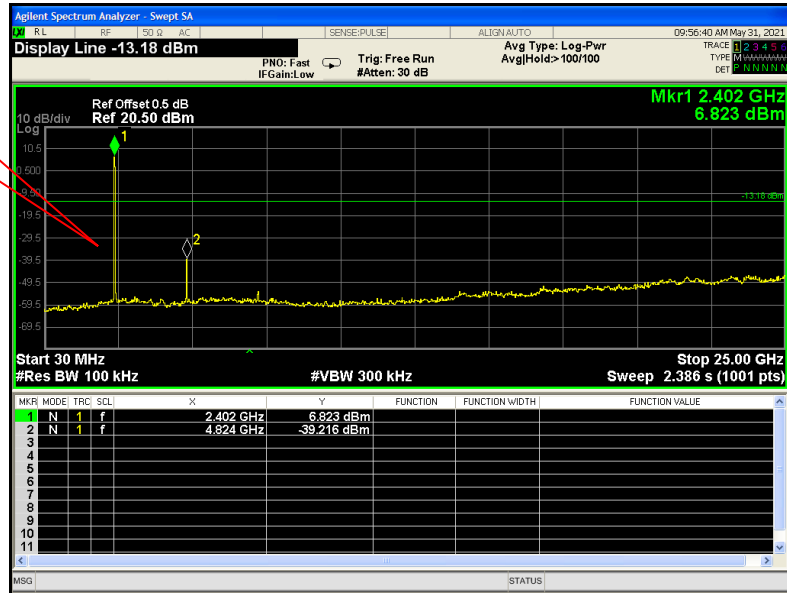


Above 30MHz

802.11b

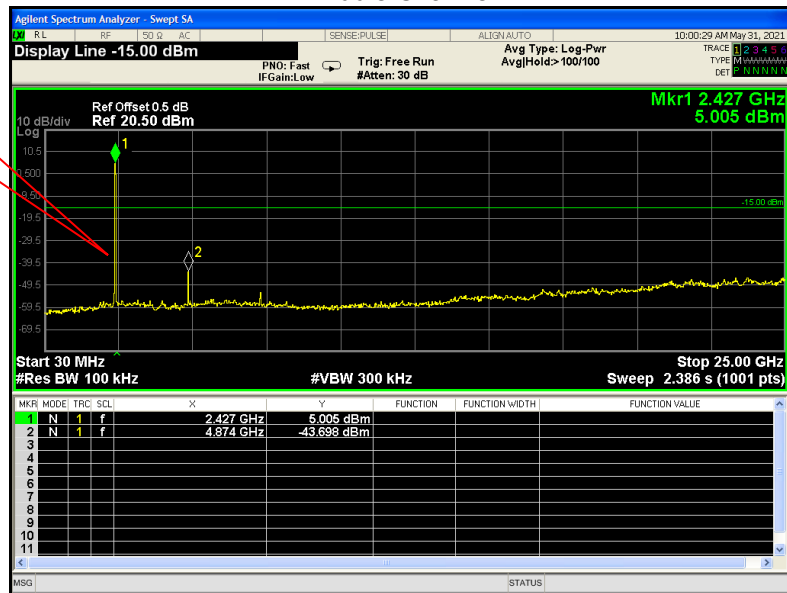
Low Channel

Fundamental



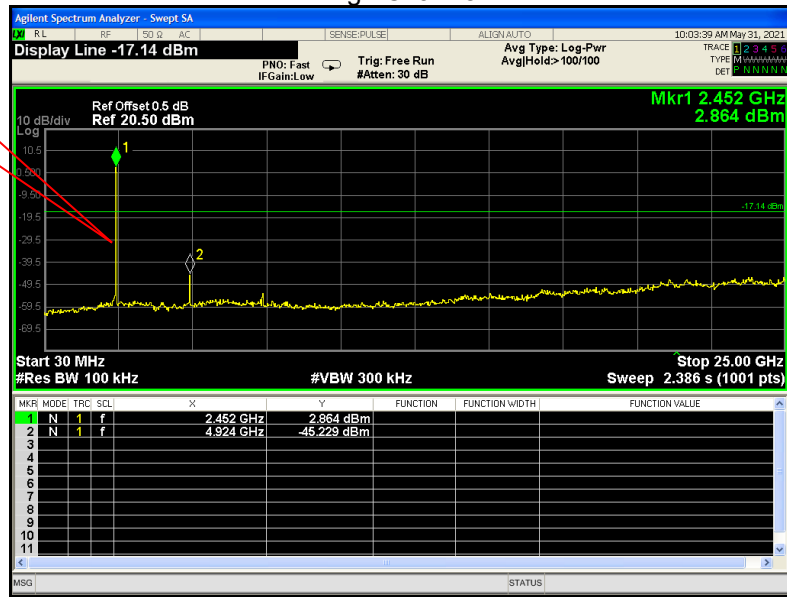
Middle Channel

Fundamental



High Channel

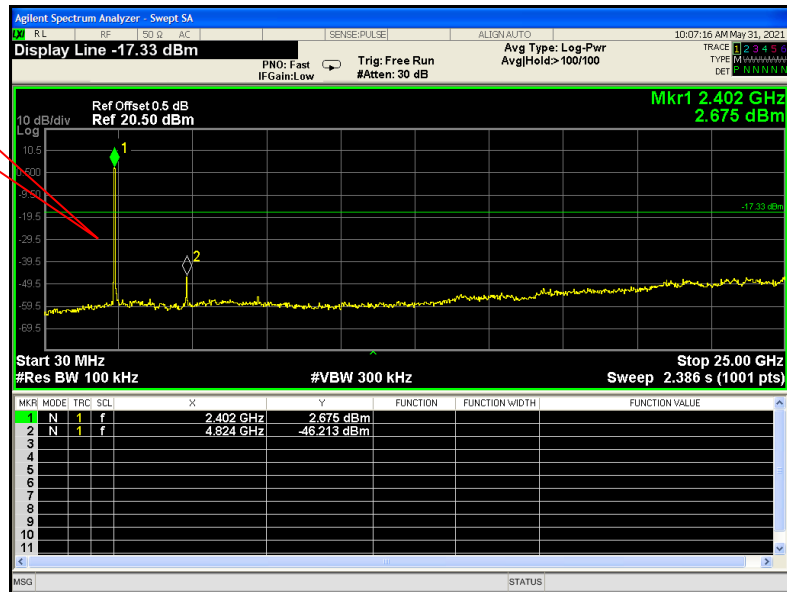
Fundamental



802.11g

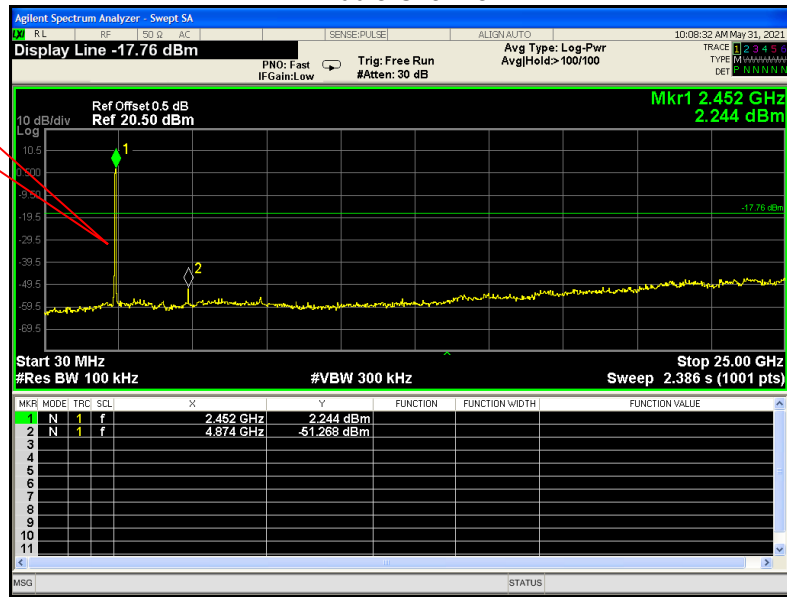
Low Channel

Fundamental



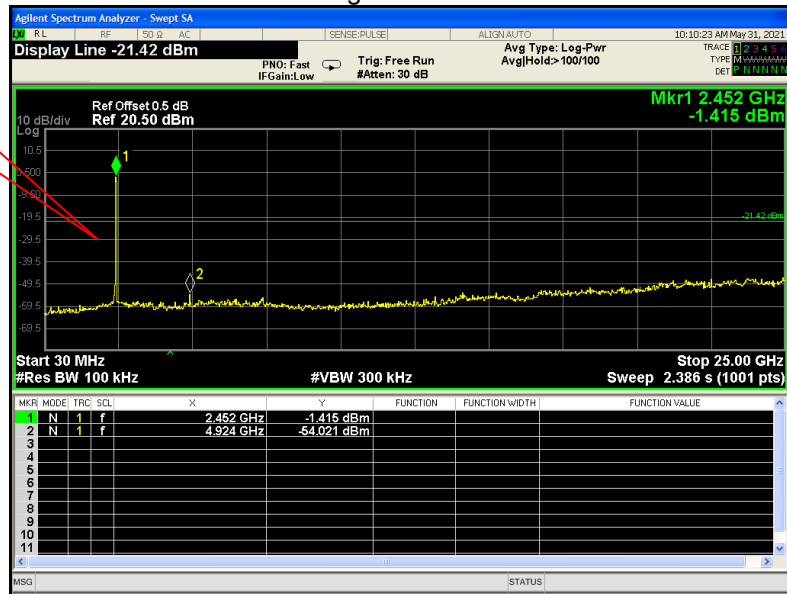
Middle Channel

Fundamental



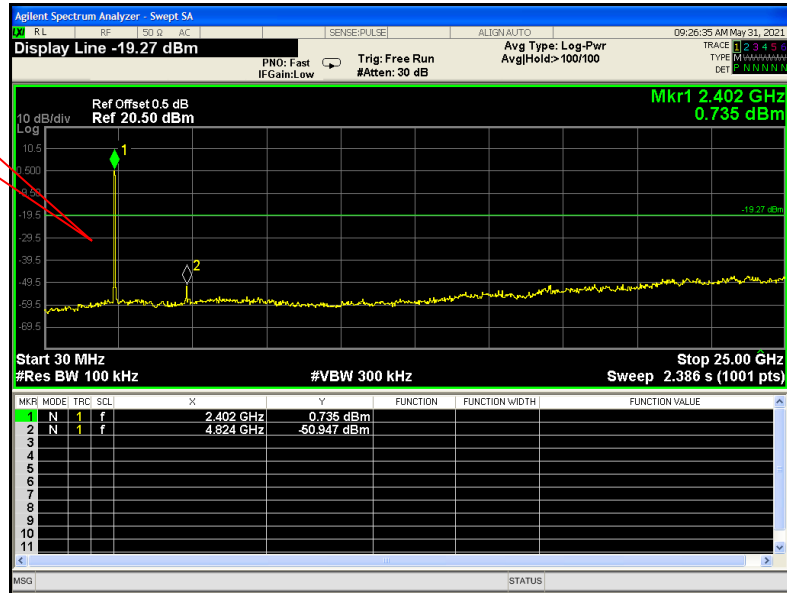
High Channel

Fundamental



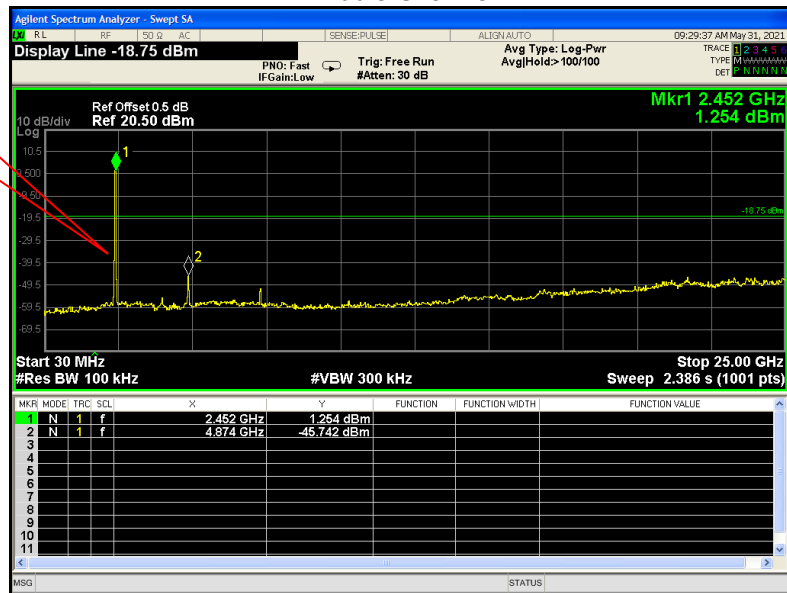
802.11n HT20
Low Channel

Fundamental



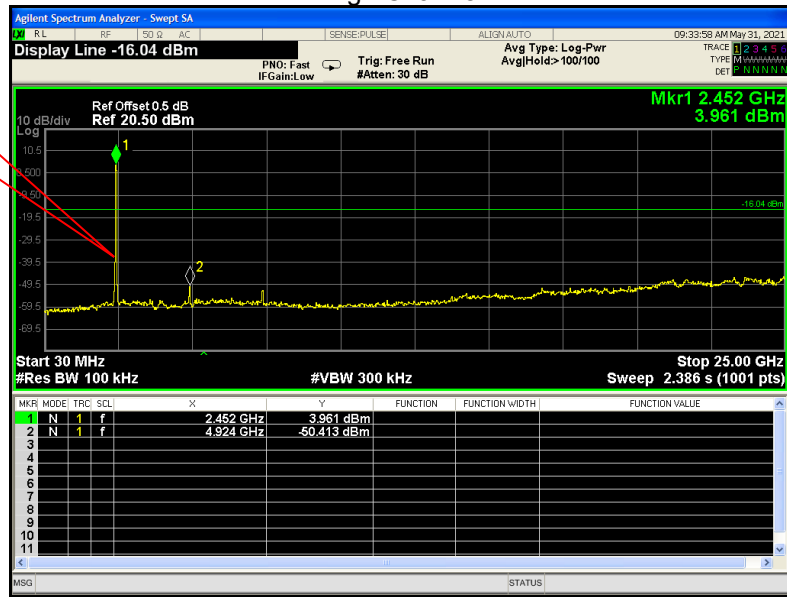
Middle Channel

Fundamental



High Channel

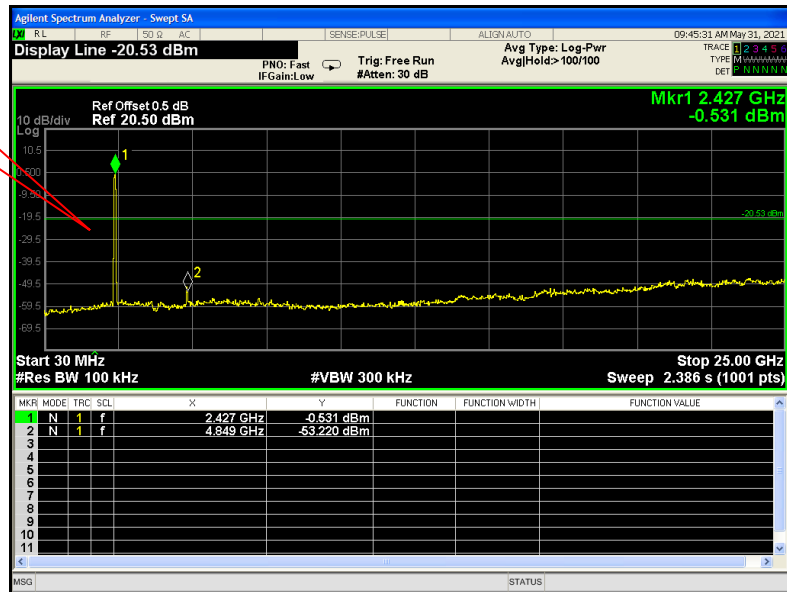
Fundamental



802.11n HT40

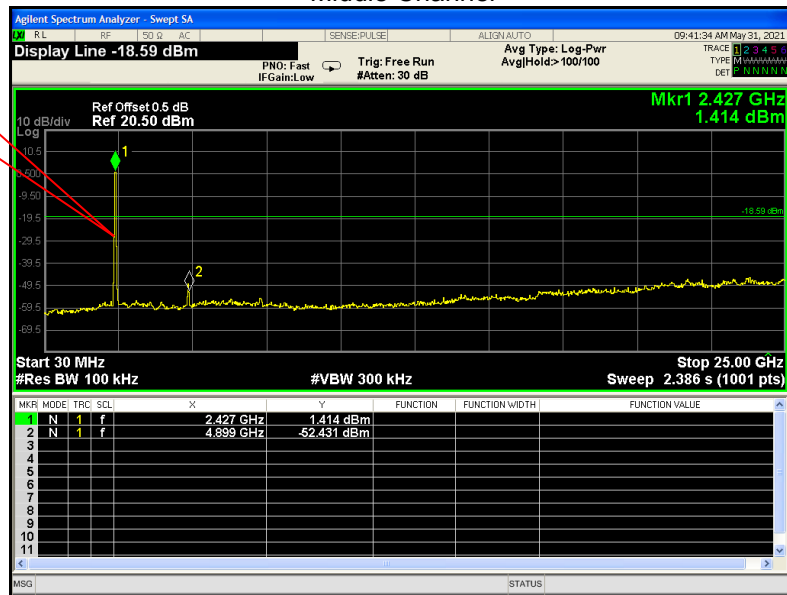
Low Channel

Fundamental



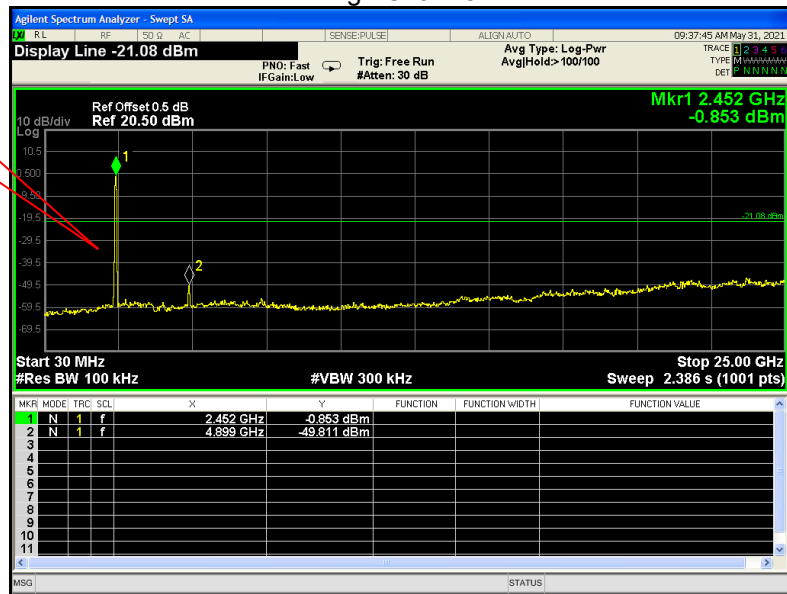
Middle Channel

Fundamental



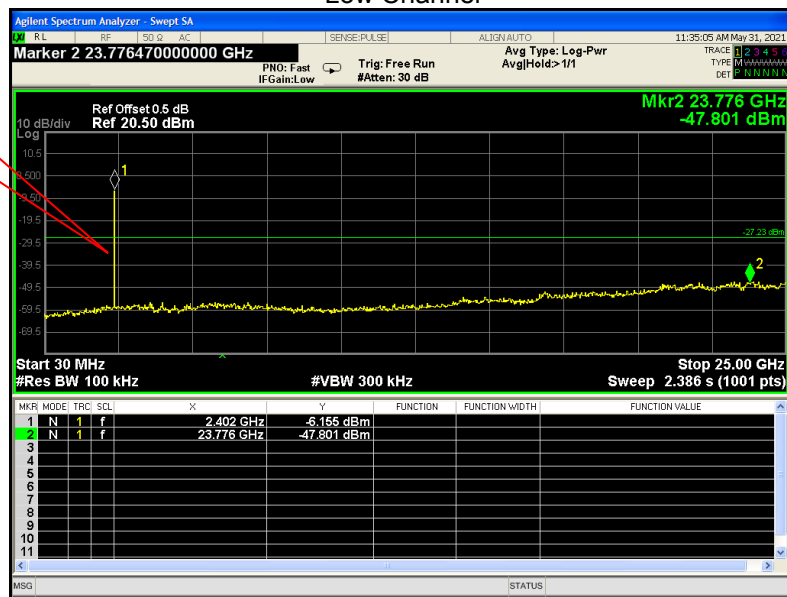
High Channel

Fundamental



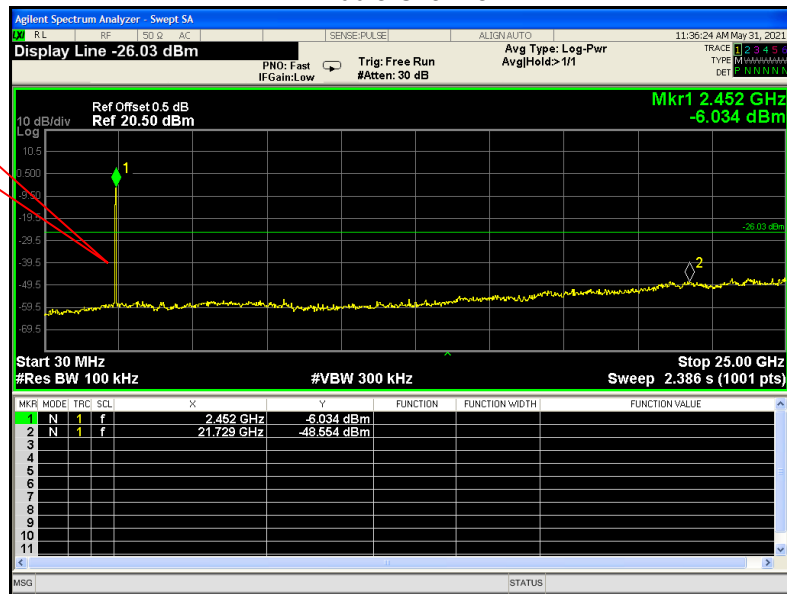
BLE
Low Channel

Fundamental



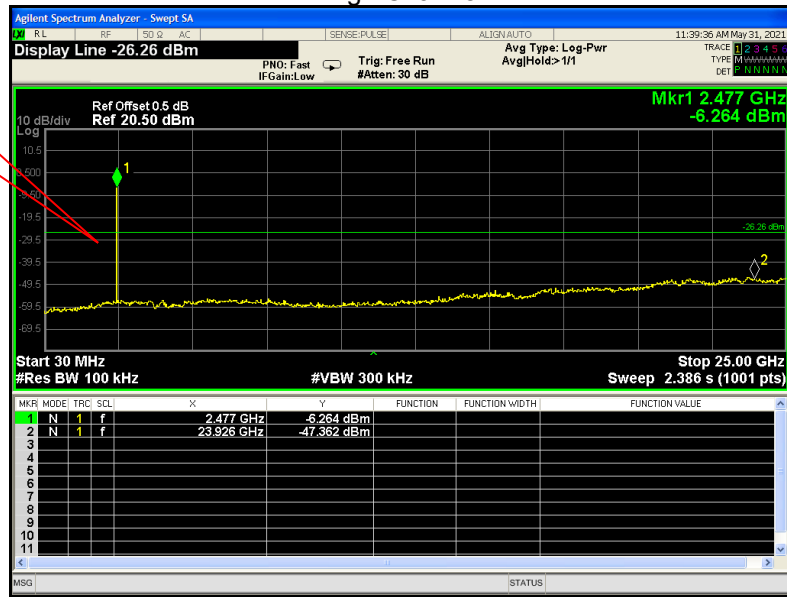
Middle Channel

Fundamental



High Channel

Fundamental



11 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)).

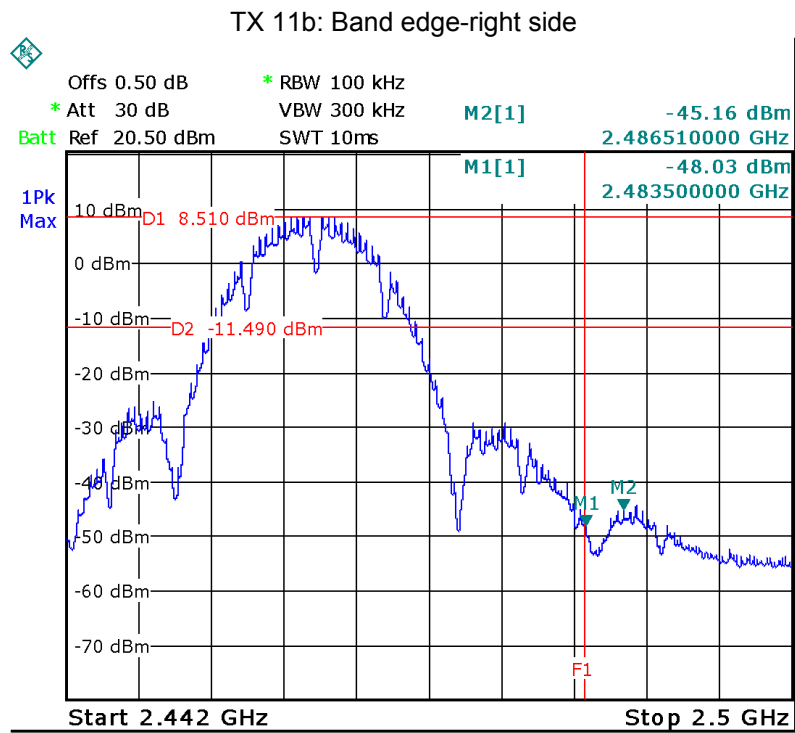
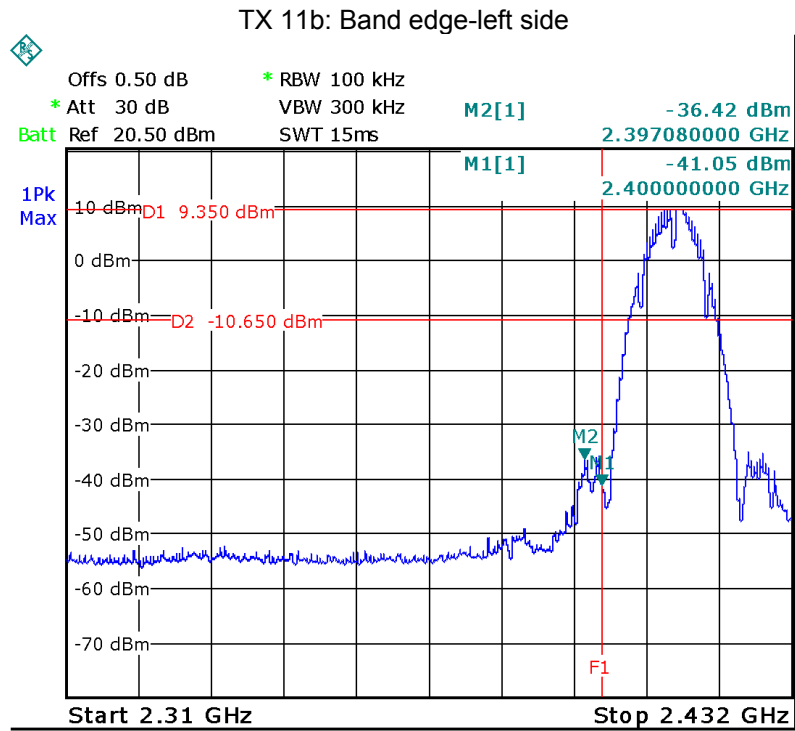
Test Mode: Transmitting

11.1 Test Procedure

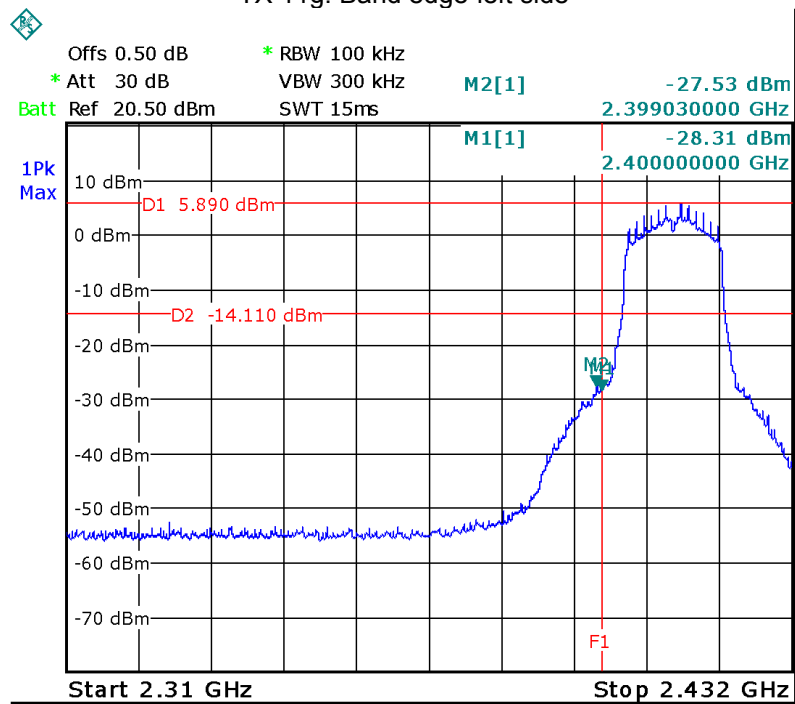
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

11.2 Test Result

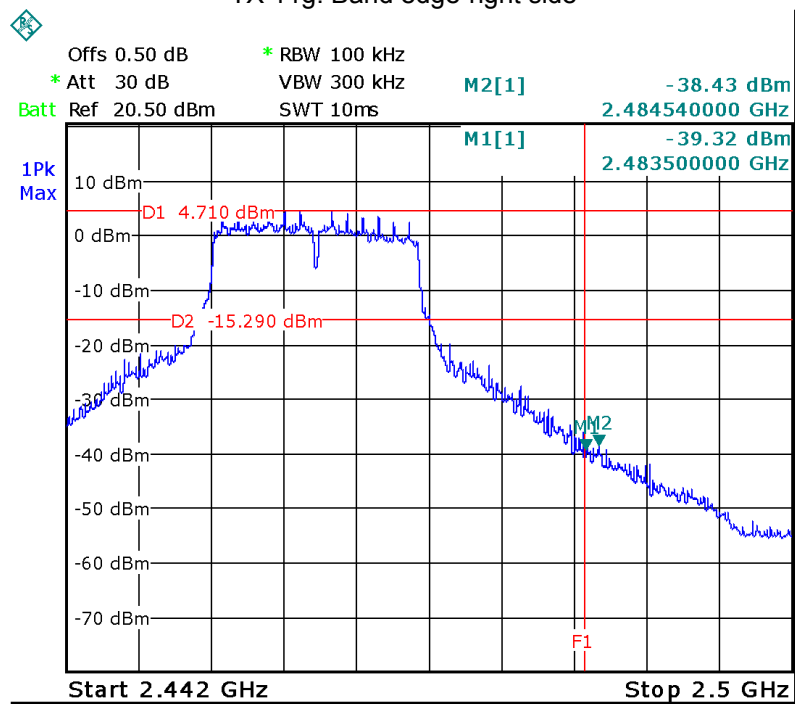
Test result plots shown as follows:



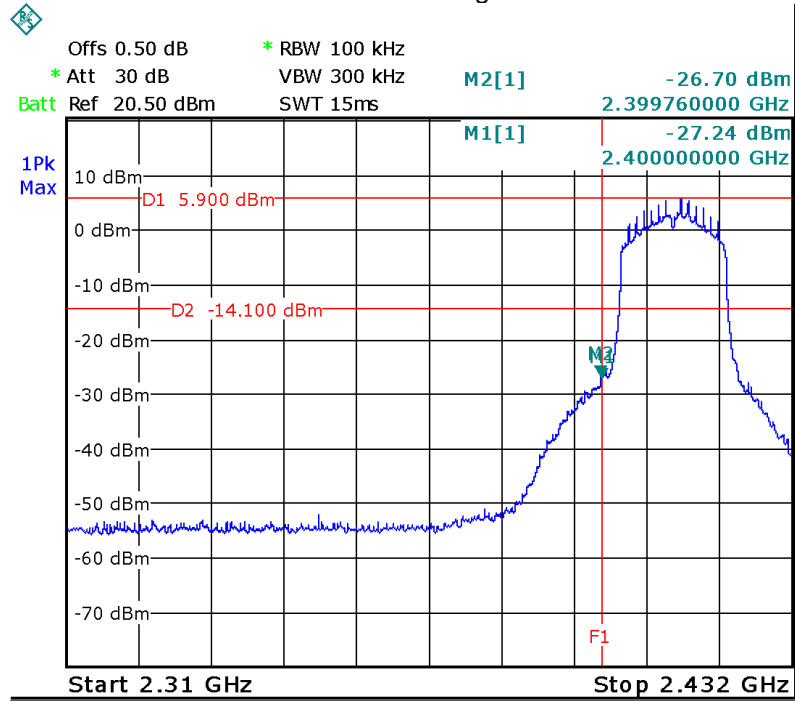
TX 11g: Band edge-left side



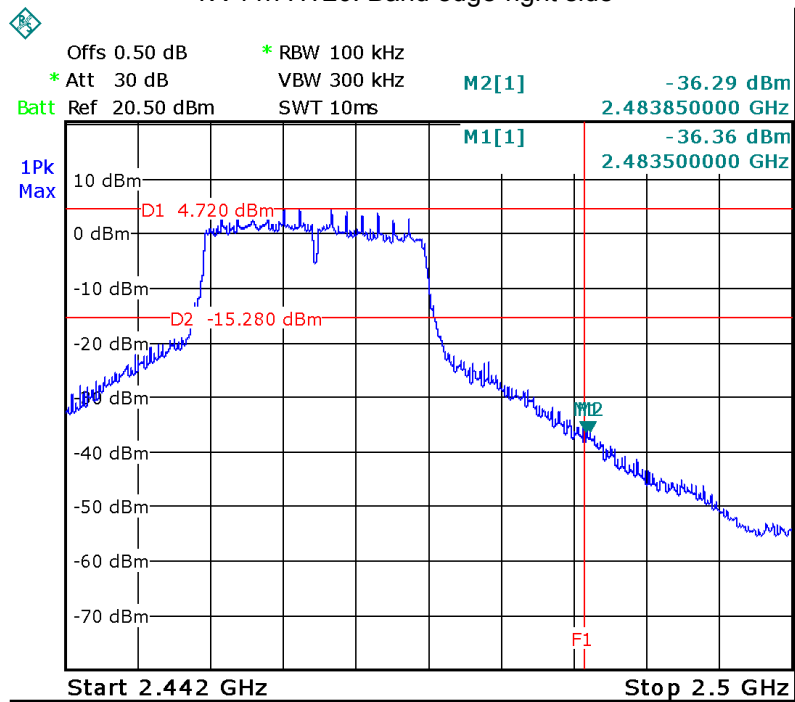
TX 11g: Band edge-right side



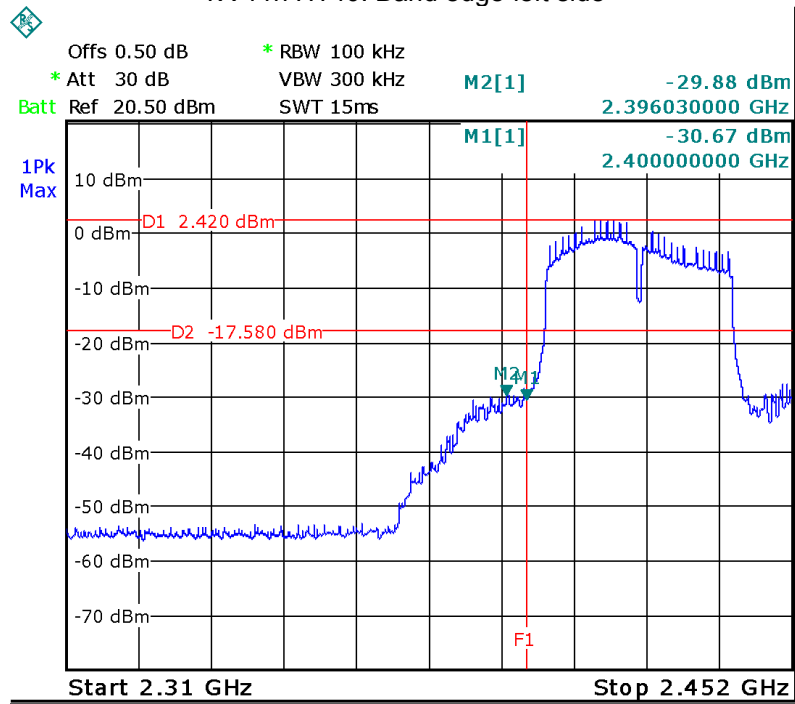
TX 11n HT20: Band edge-left side



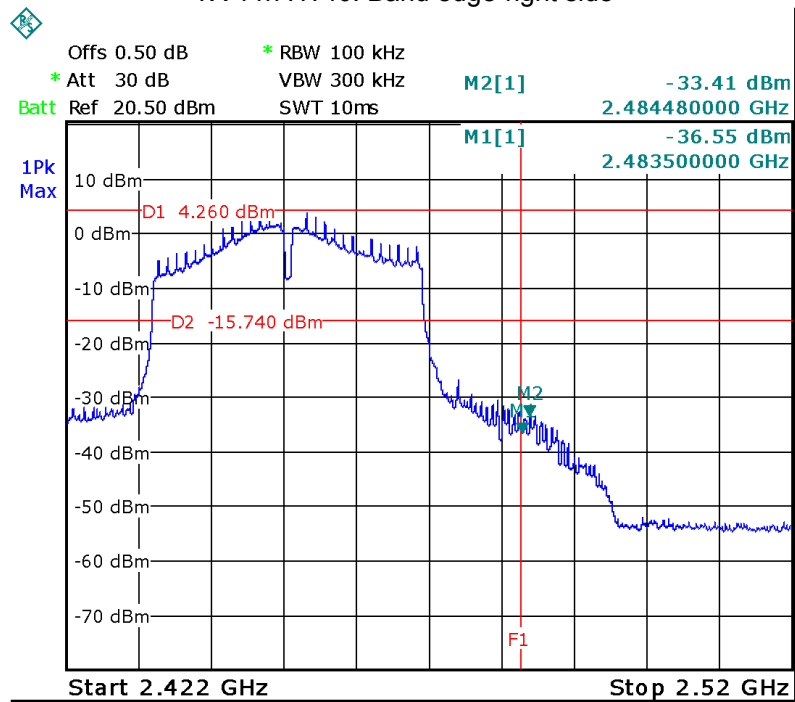
TX 11n HT20: Band edge-right side



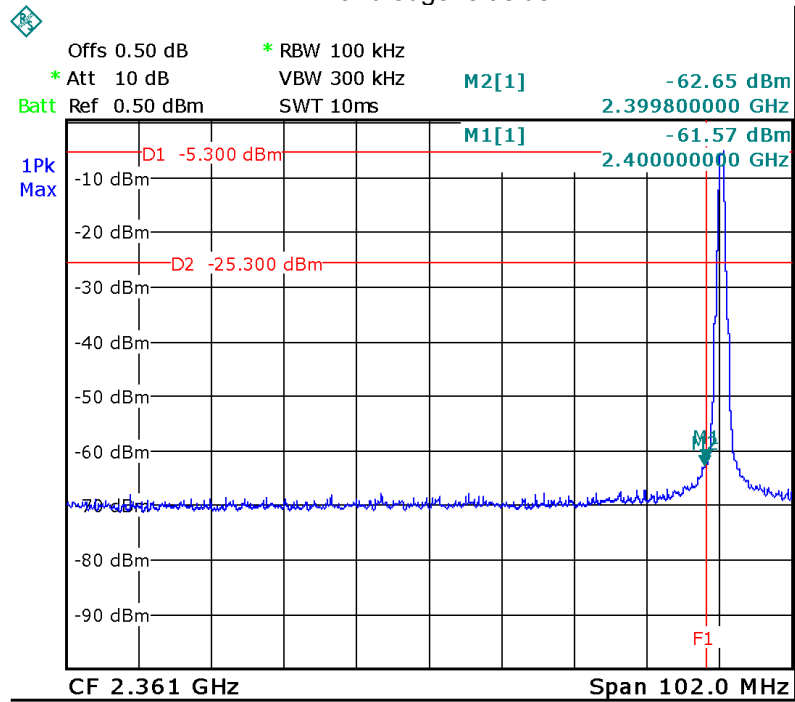
TX 11n HT40: Band edge-left side



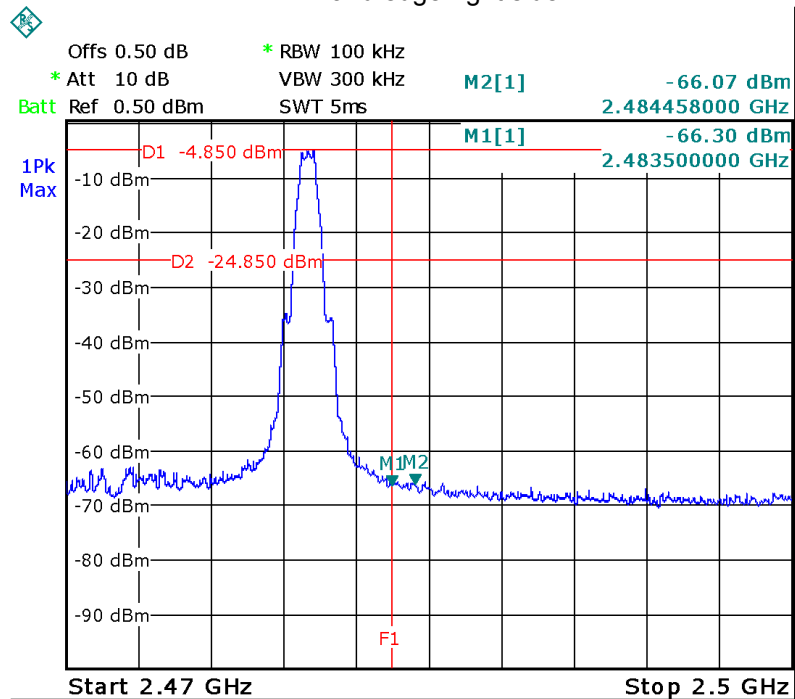
TX 11n HT40: Band edge-right side



BLE: Band edge-left side



BLE: Band edge-right side



12 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

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

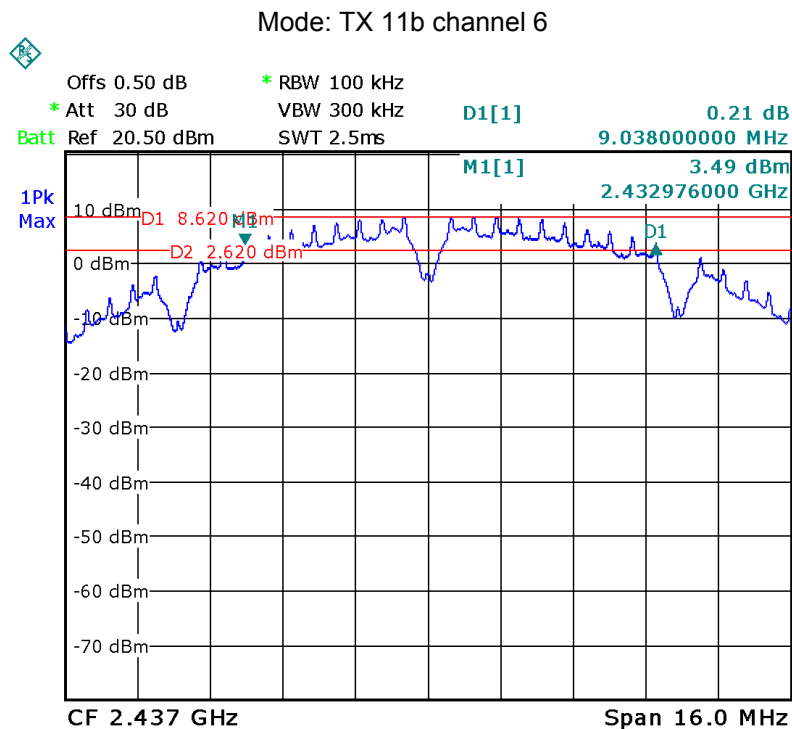
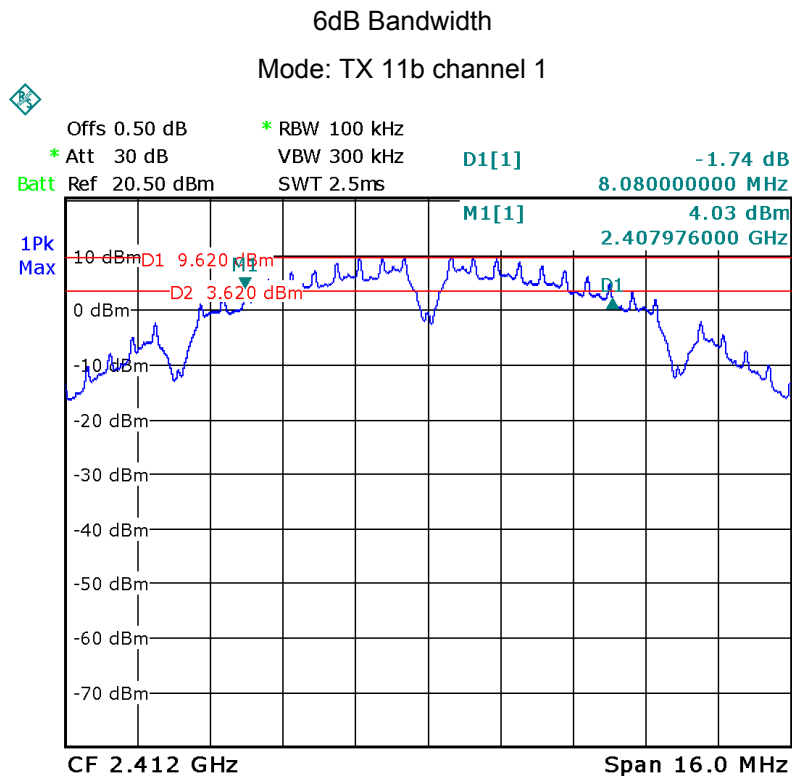
12.1 Test Procedure:

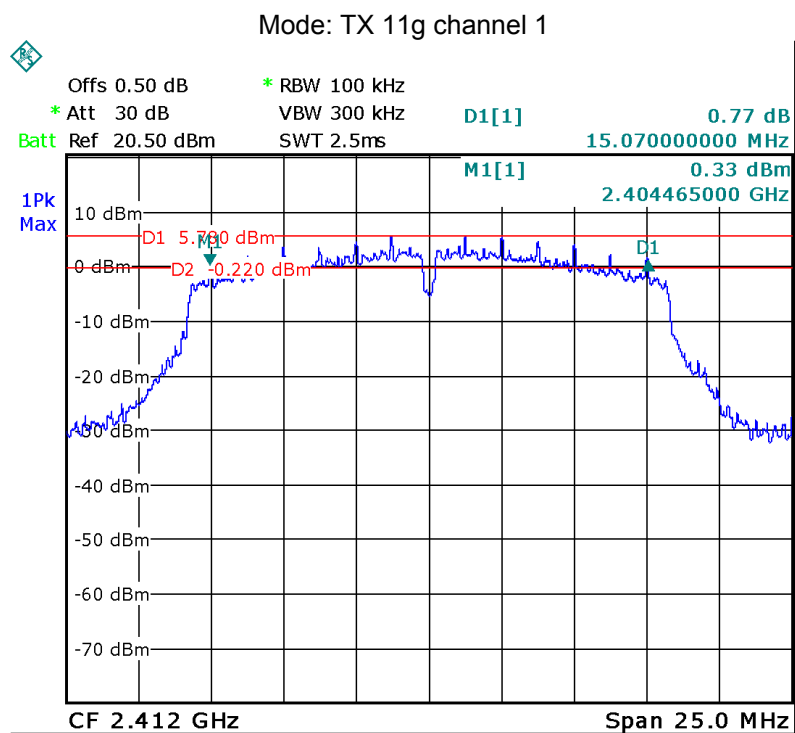
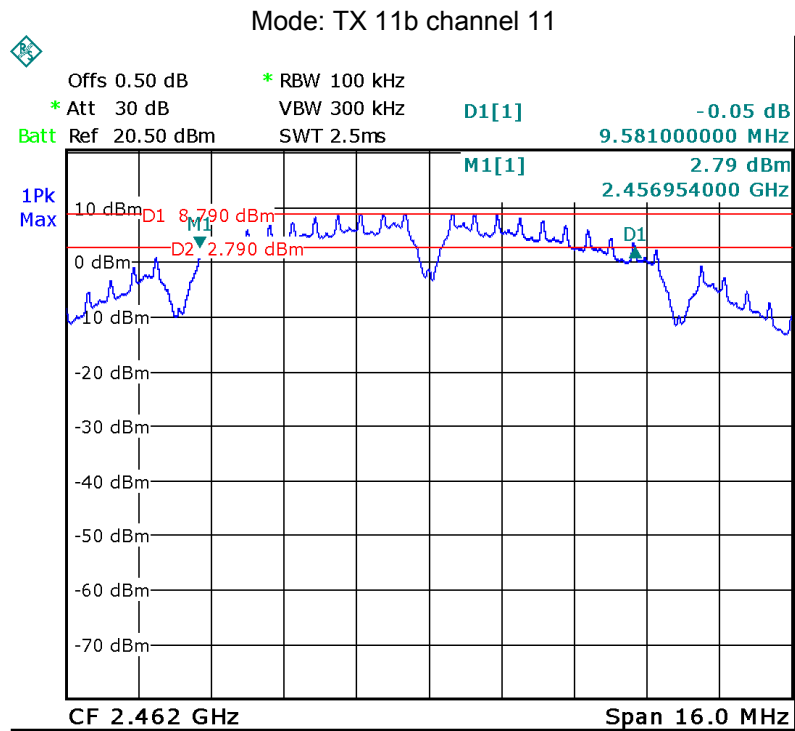
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. 6dB Bandwidth Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz
99% Bandwidth Set the spectrum analyzer : RBW = 1~5% DTS OBW, VBW = 3 RBW

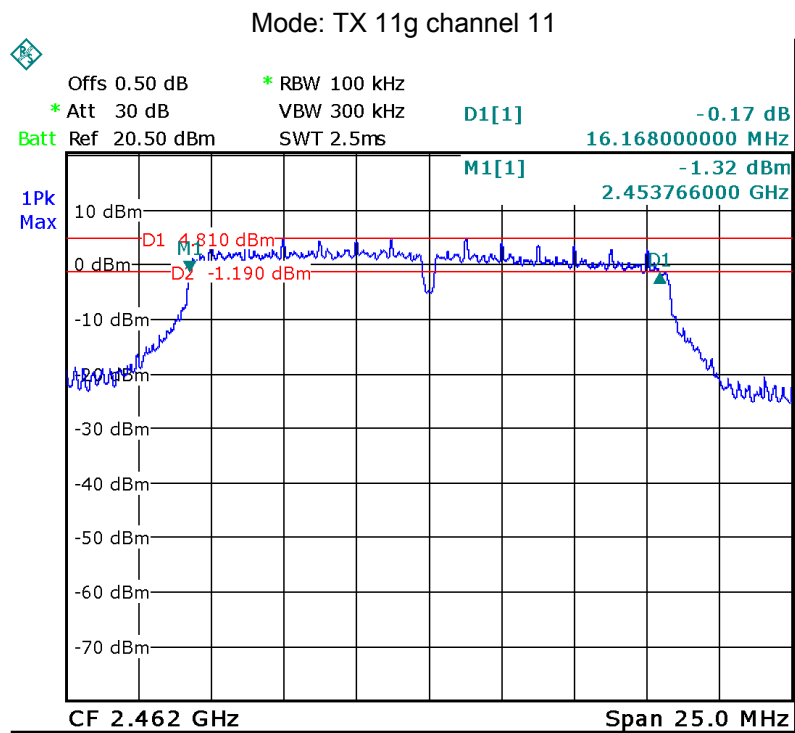
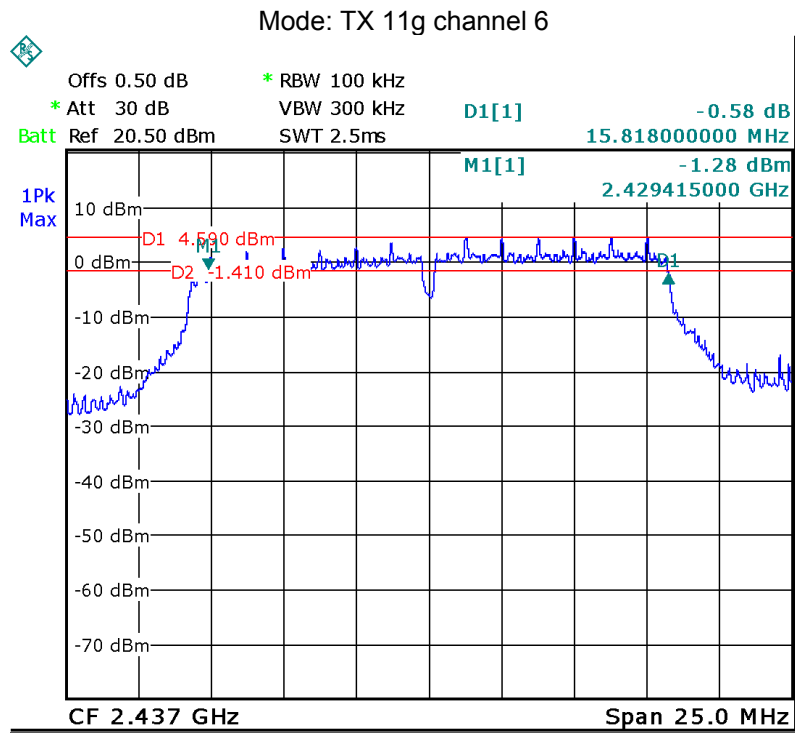
12.2 Test Result:

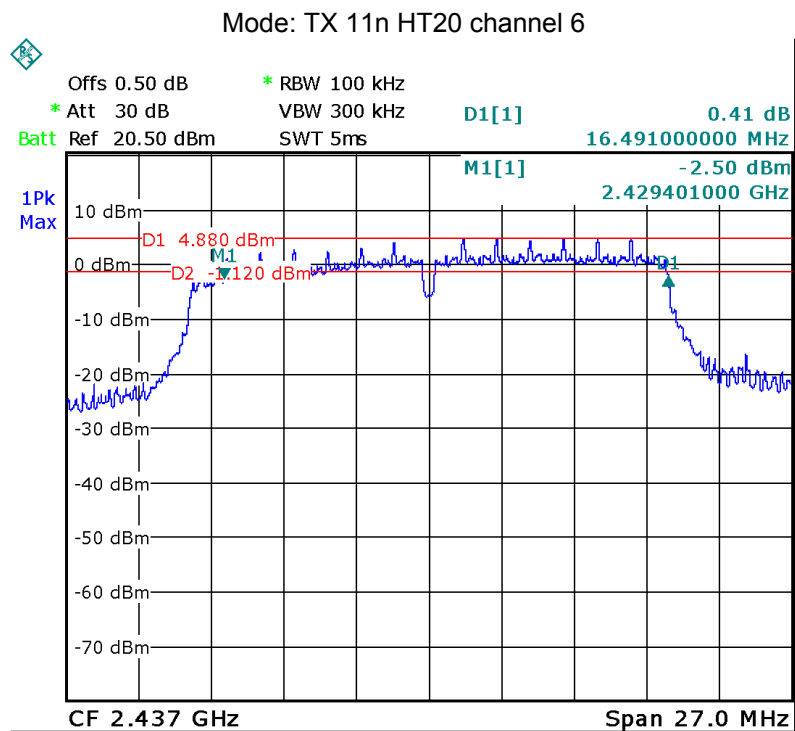
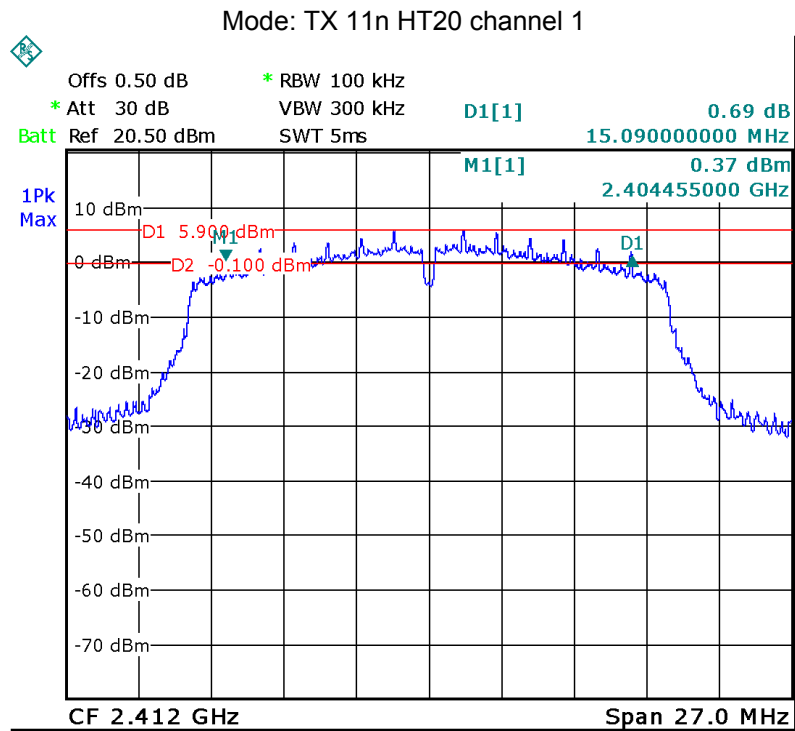
13	Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b		Channel 1	8.08	12.68
		Channel 6	9.04	13.67
		Channel 11	9.58	13.70
TX 11g		Channel 1	15.07	16.42
		Channel 6	15.82	17.12
		Channel 11	16.17	17.17
TX 11n HT20		Channel 1	15.09	17.51
		Channel 6	16.49	18.16
		Channel 11	16.81	18.22
TX 11n HT40		Channel 3	35.02	36.78
		Channel 6	35.24	37.22
		Channel 9	23.82	36.01
BLE		Channel 0	0.665	1.036
		Channel 19	0.671	1.036
		Channel 39	0.677	1.042

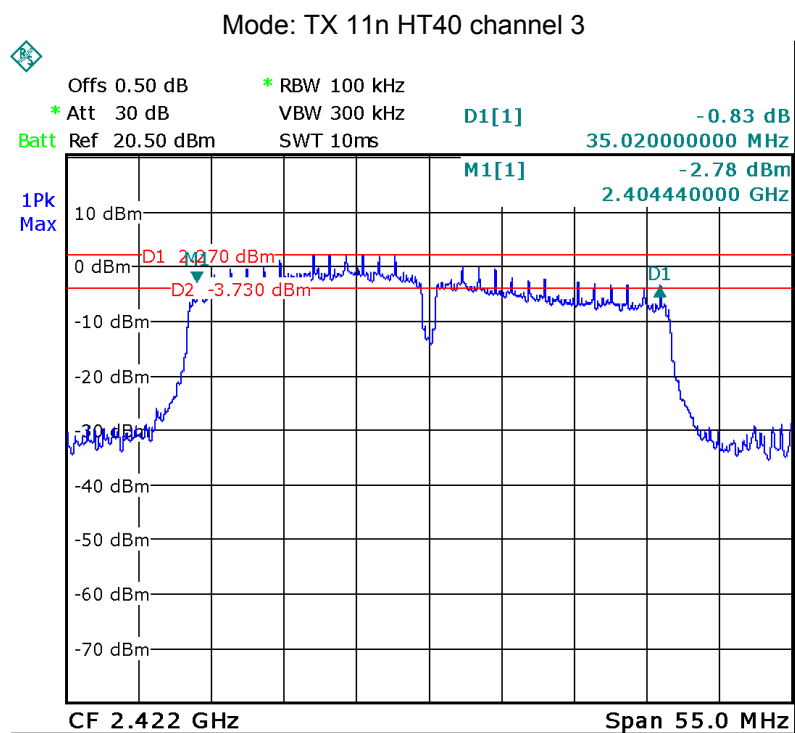
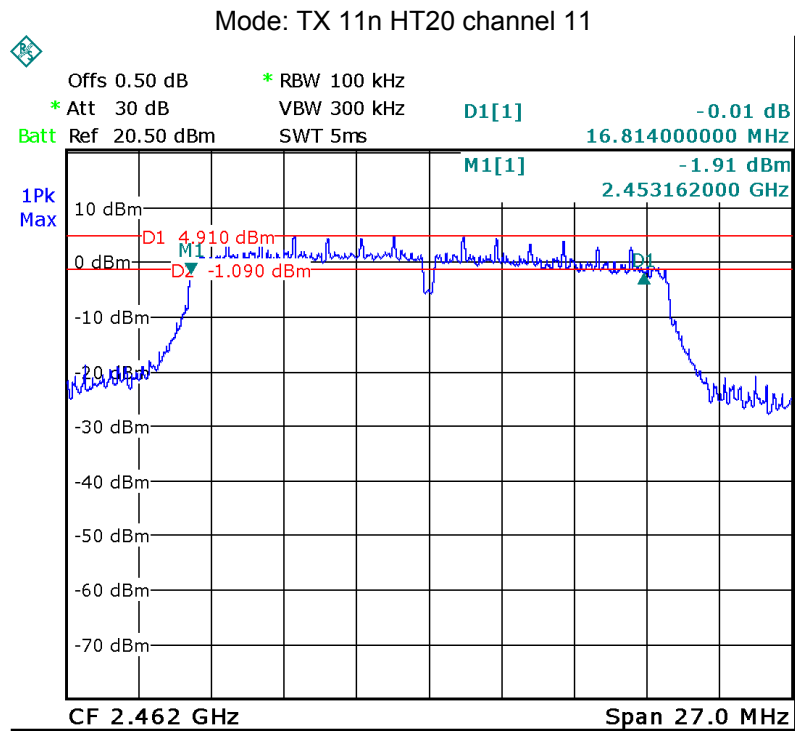
Test result plot:

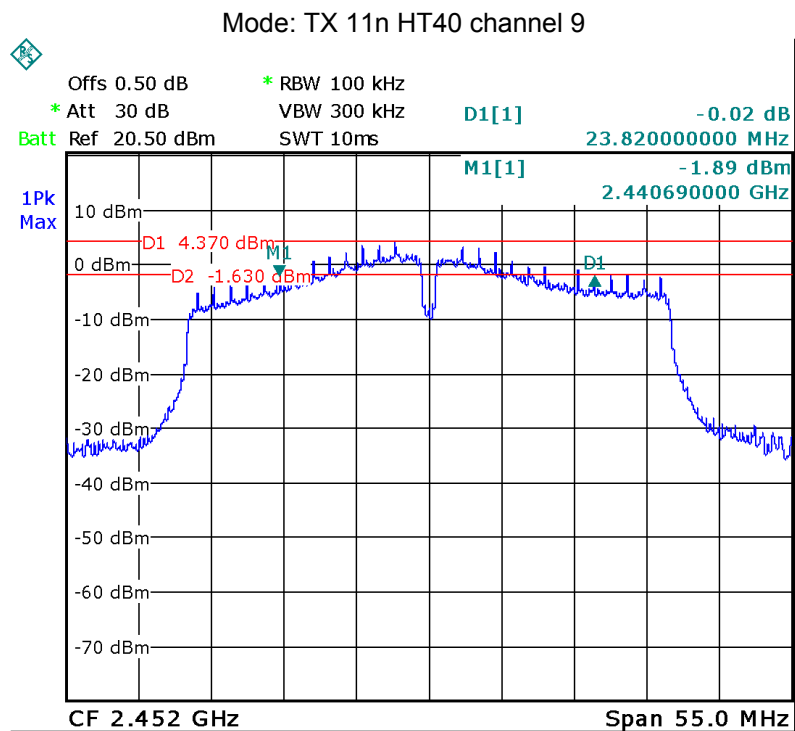
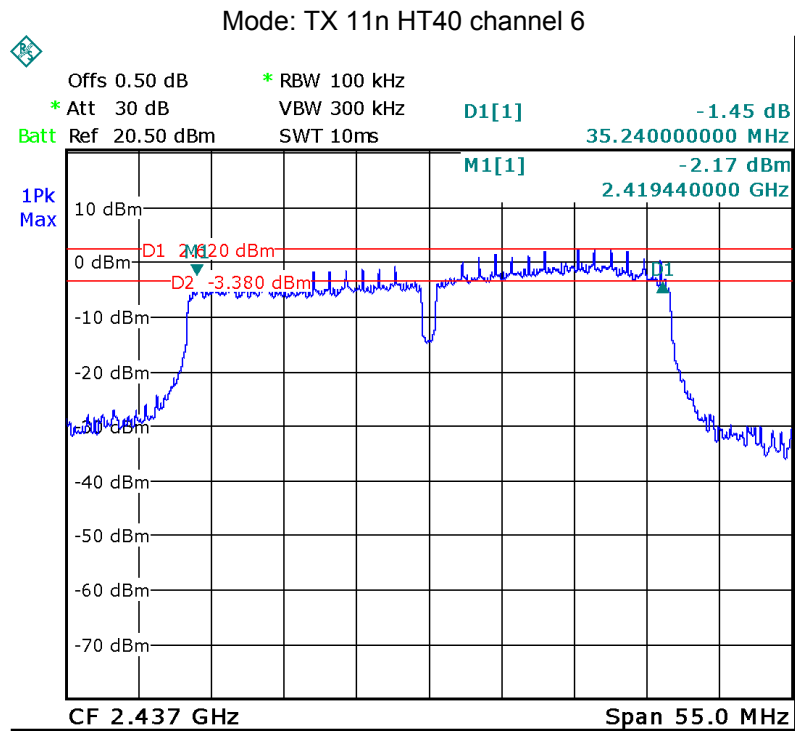


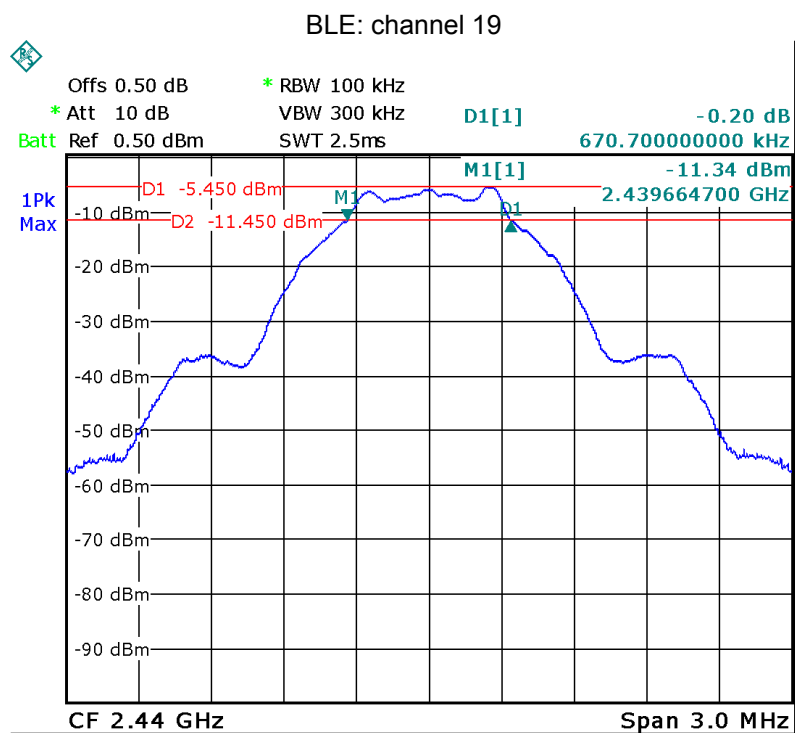
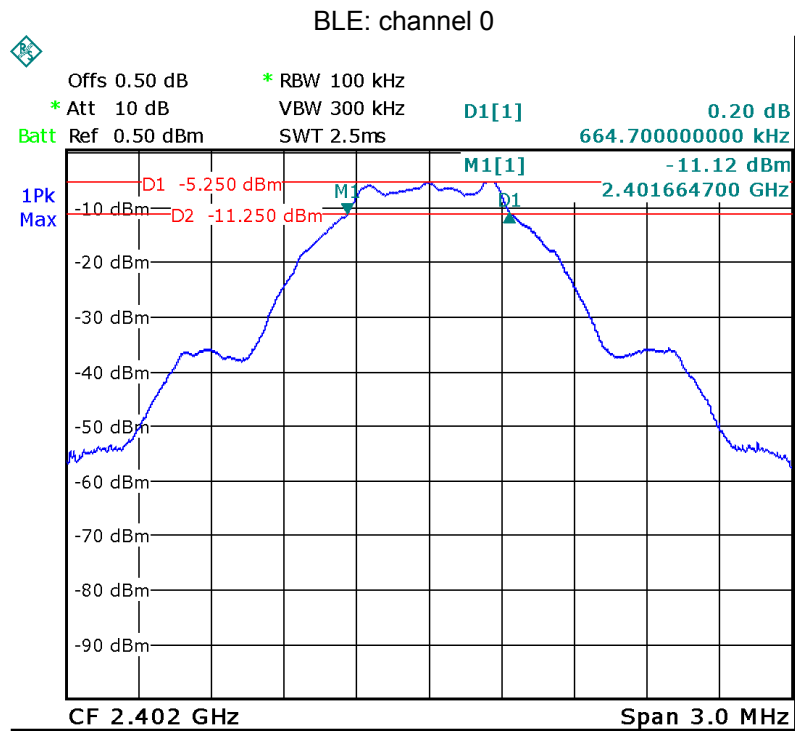


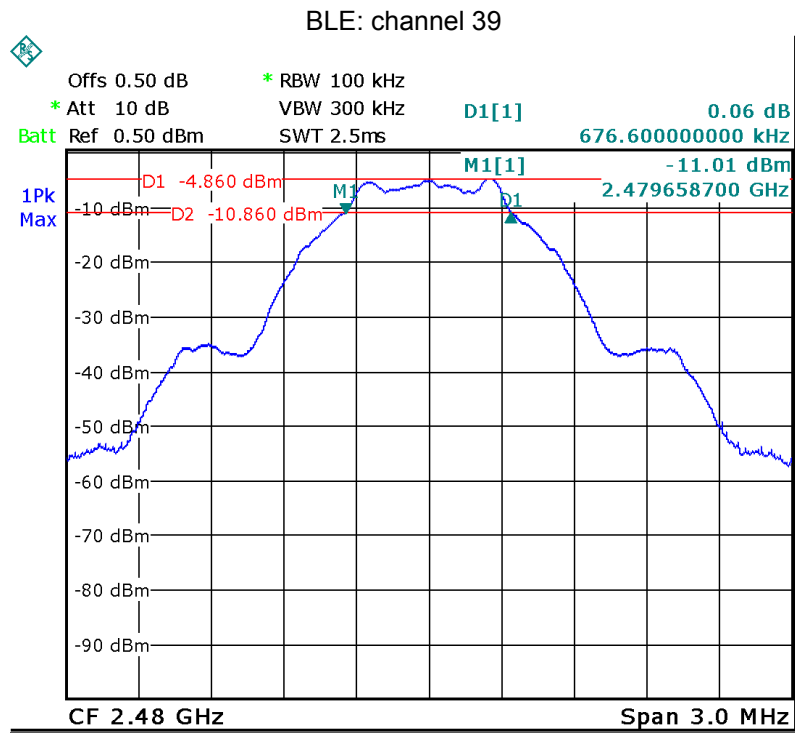






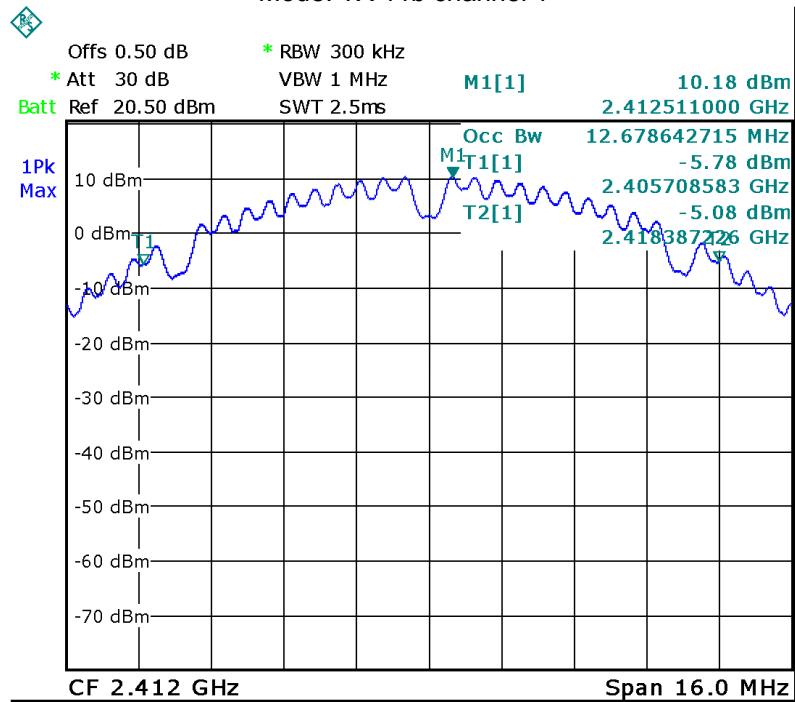




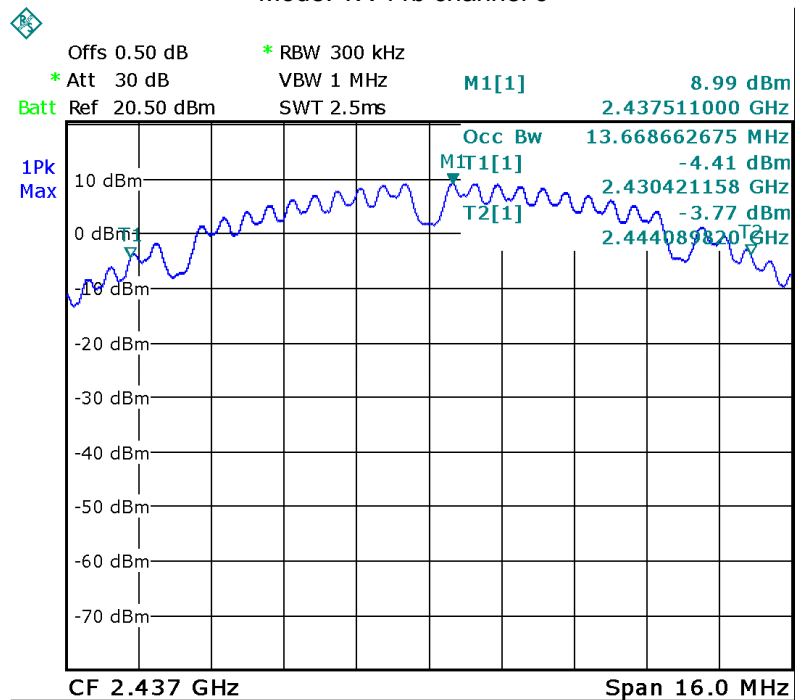


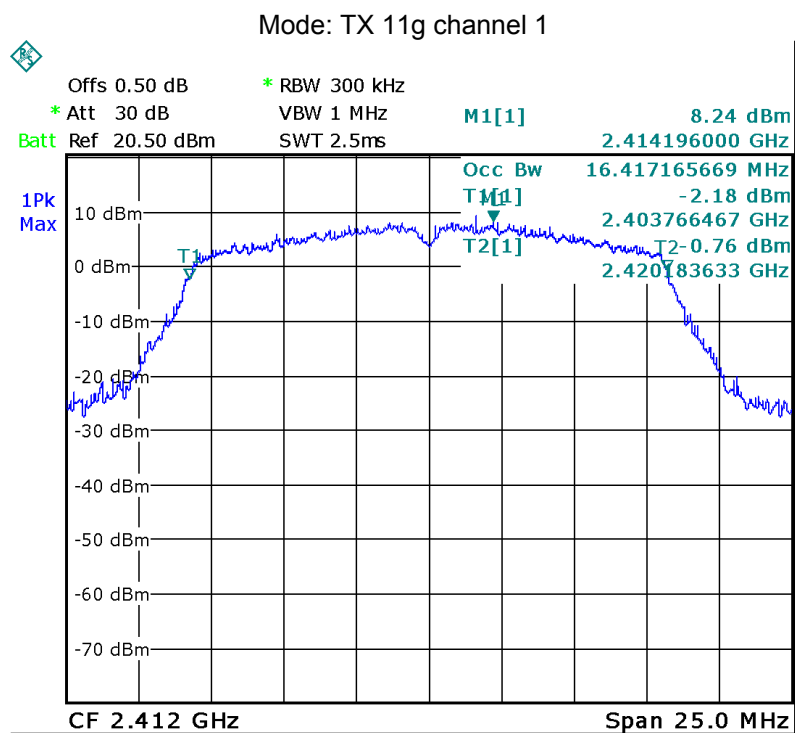
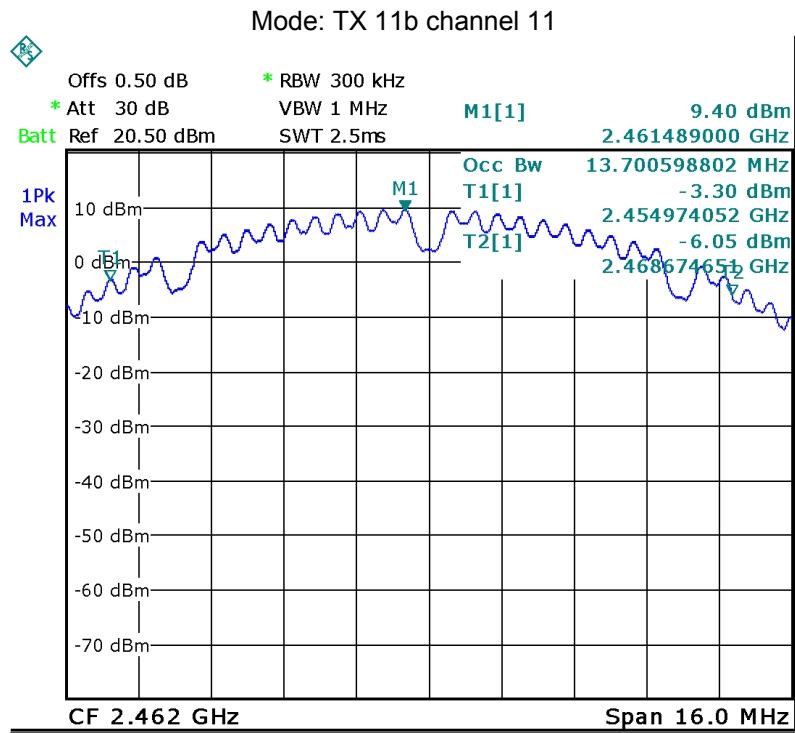
99% Bandwidth

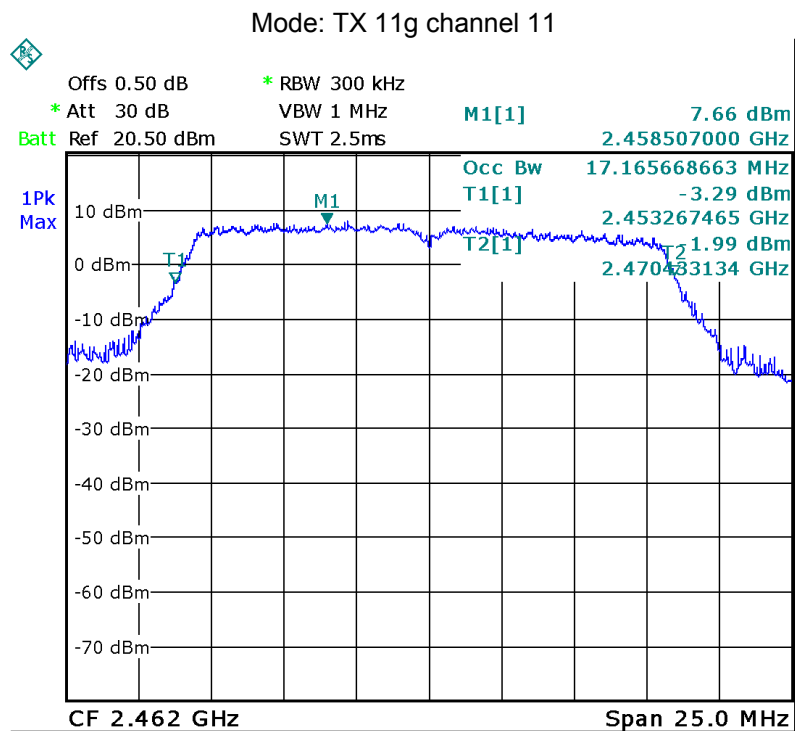
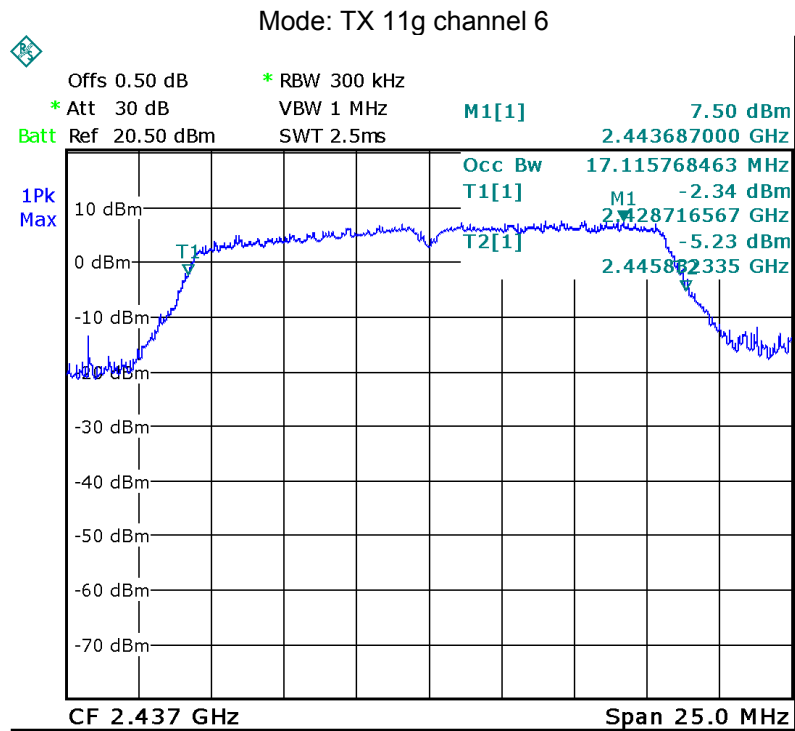
Mode: TX 11b channel 1



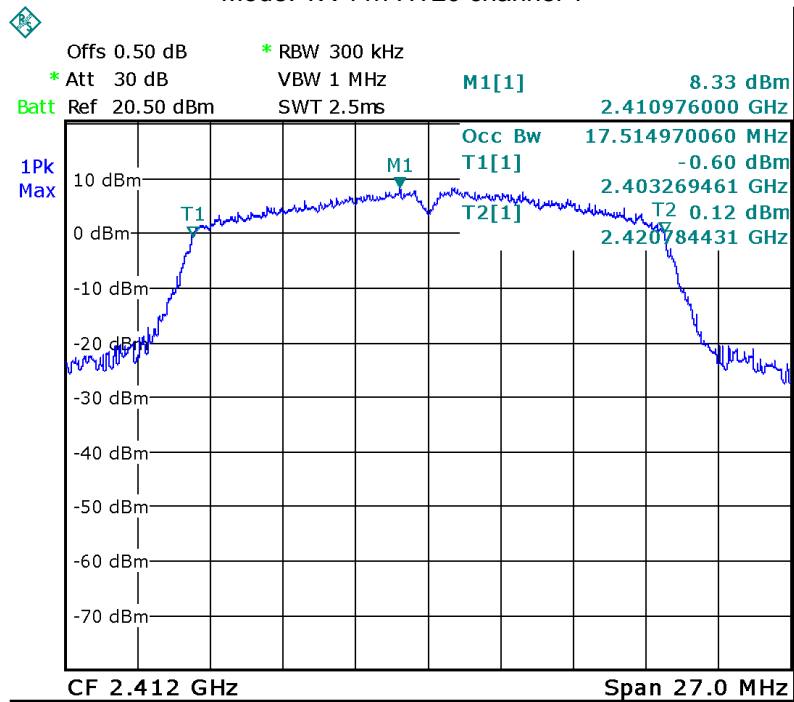
Mode: TX 11b channel 6



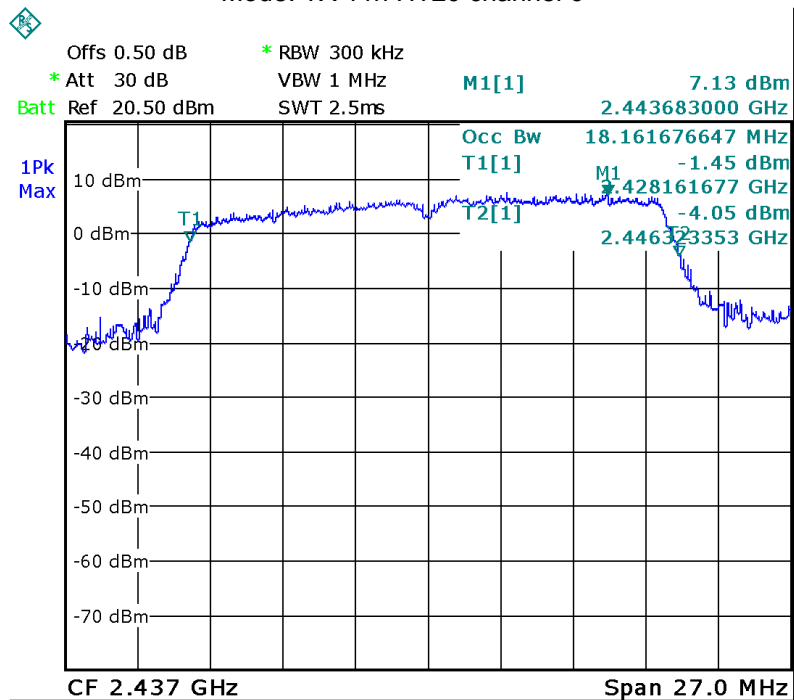




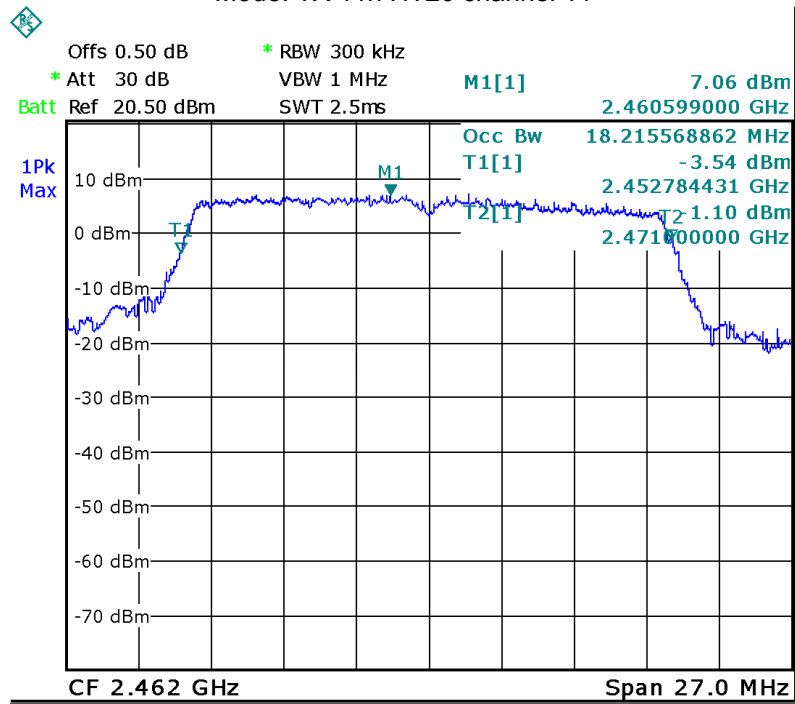
Mode: TX 11n HT20 channel 1



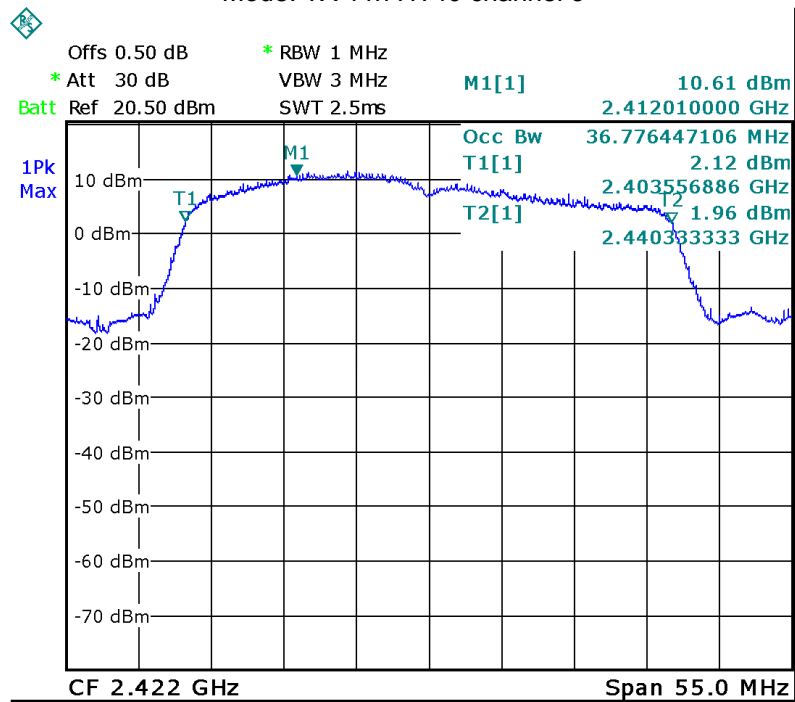
Mode: TX 11n HT20 channel 6



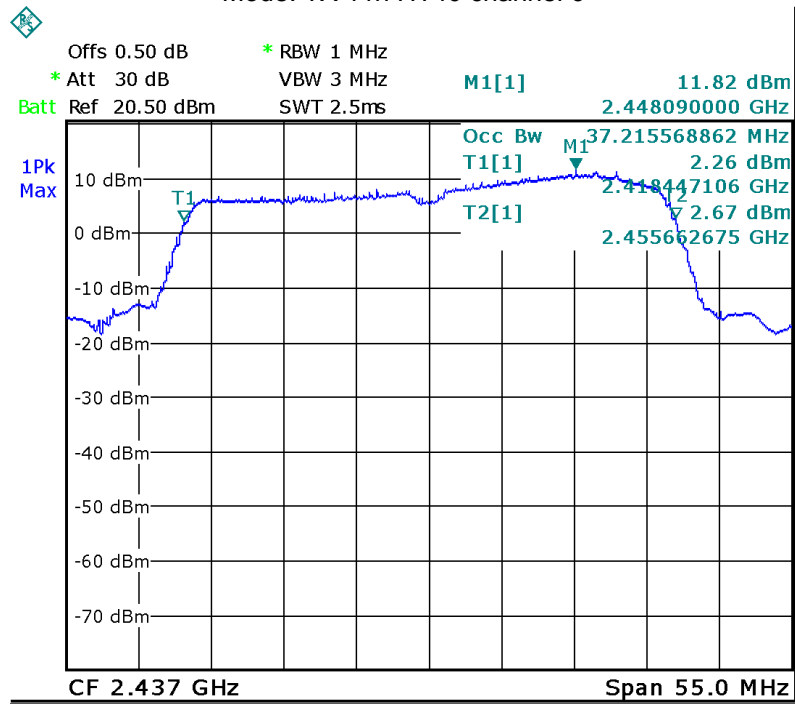
Mode: TX 11n HT20 channel 11



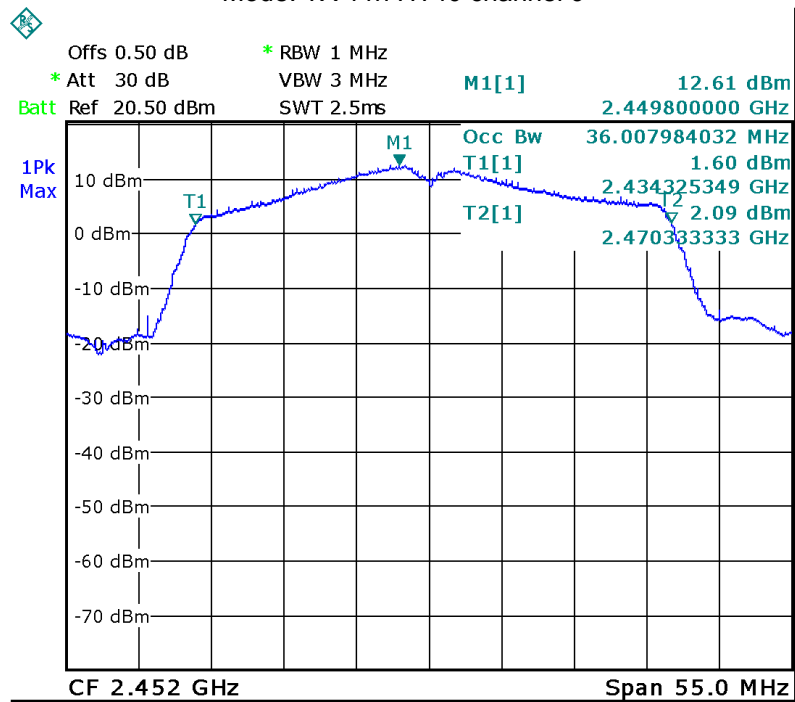
Mode: TX 11n HT40 channel 3



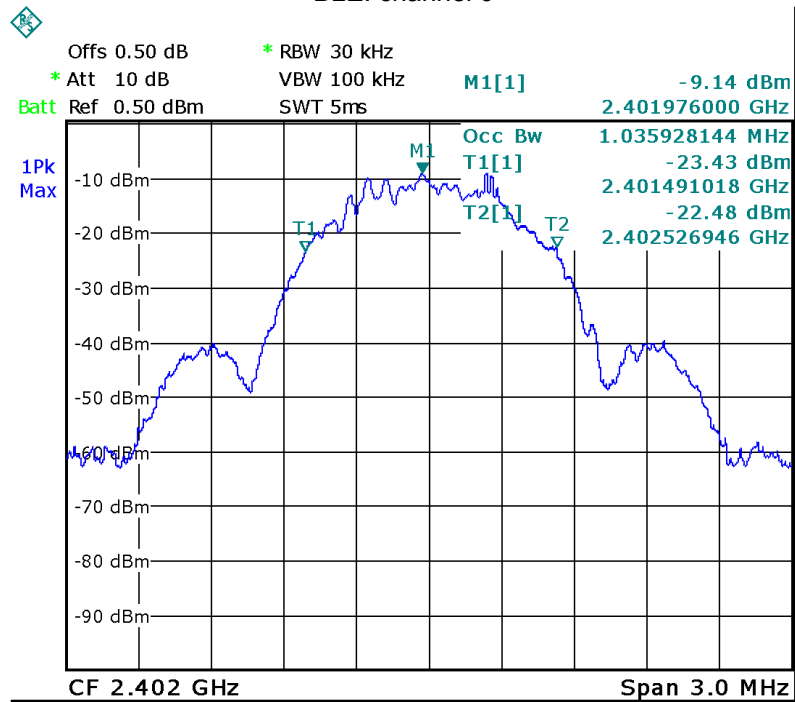
Mode: TX 11n HT40 channel 6



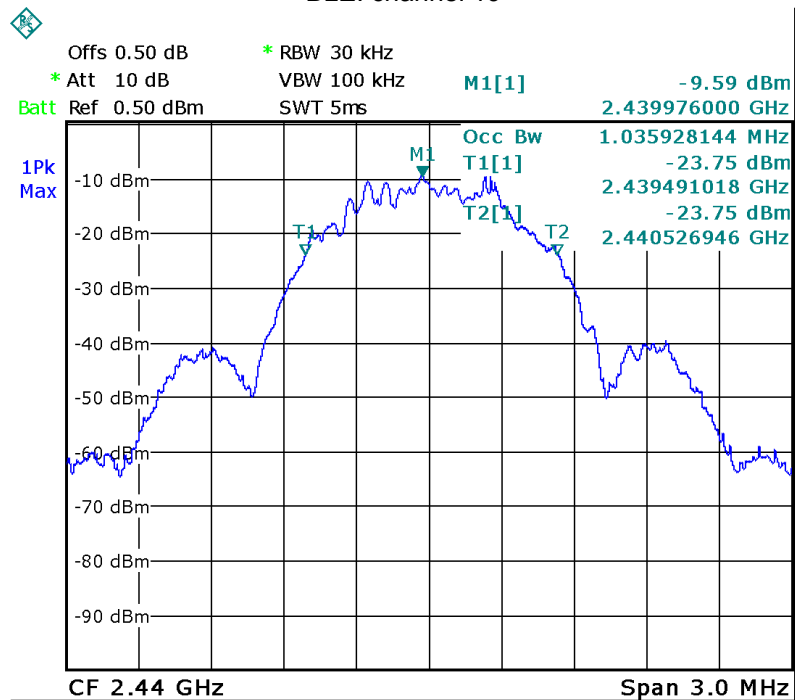
Mode: TX 11n HT40 channel 9

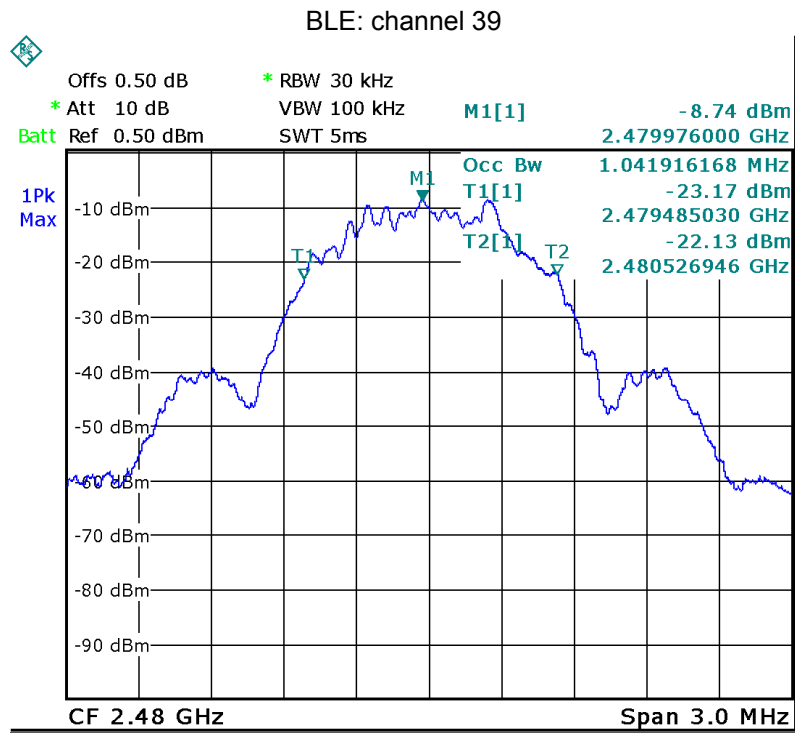


BLE: channel 0



BLE: channel 19





14 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

14.1 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 ≥ 3 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.

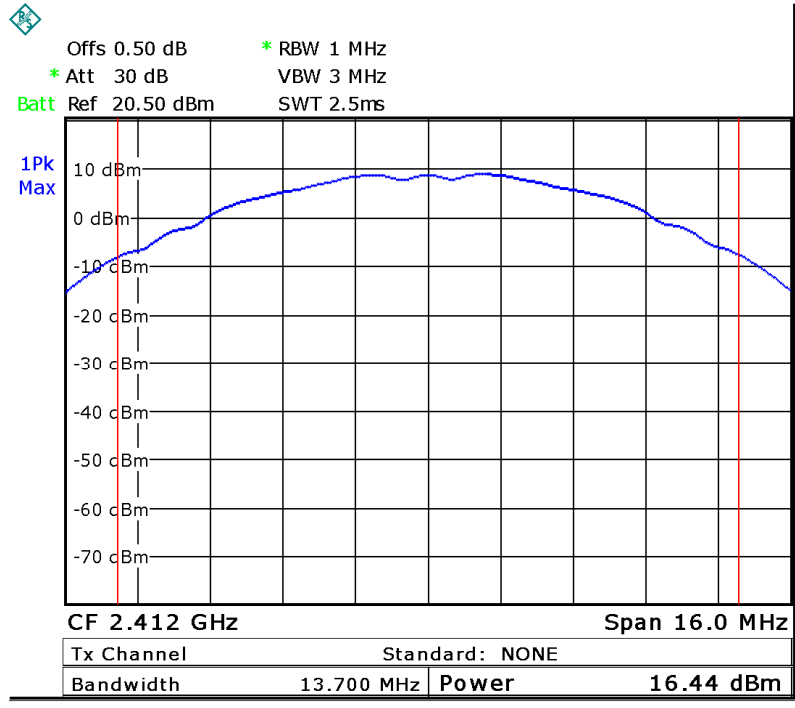
- a) Set the RBW = 1% to 5% of the OBW, not to exceed 1 MHz..
- b) Set the VBW $\geq 3 \times$ RBW
- c) Set the span $\geq 1.5 \times$ OBW.
- d) Detector = RMS.
- e) Sweep time = auto couple.
- f) trigger = free run..
- g) Number of points in sweep $\geq [2 \times \text{span} / \text{RBW}]$. (This gives bin-to-bin spacing $\geq \text{RBW} / 2$, 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..

14.2 Test Result:

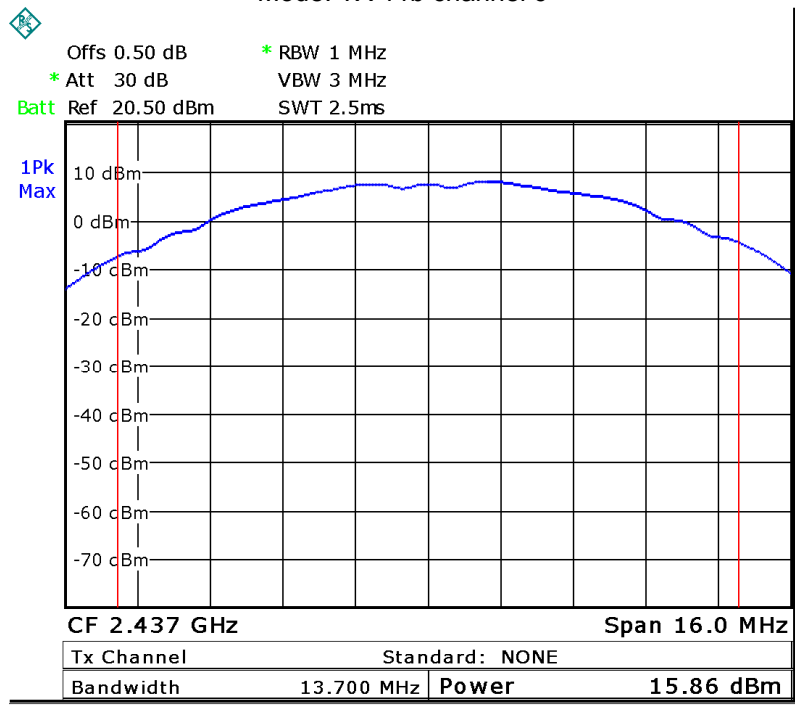
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	16.44	1W/30dBm
	Middle-2437	15.86	1W/30dBm
	High-2462	16.28	1W/30dBm
TX 11g	Low-2412	15.41	1W/30dBm
	Middle-2437	15.06	1W/30dBm
	High-2462	15.43	1W/30dBm
TX 11n HT20	Low-2412	15.35	1W/30dBm
	Middle-2437	15.22	1W/30dBm
	High-2462	15.54	1W/30dBm
TX 11n HT40	Low-2422	14.81	1W/30dBm
	Middle-2437	15.02	1W/30dBm
	High-2452	15.74	1W/30dBm
BLE	Low-2402	-5.14	1W/30dBm
	Middle-2440	-5.36	1W/30dBm
	High-2480	-4.64	1W/30dBm

Test Plot

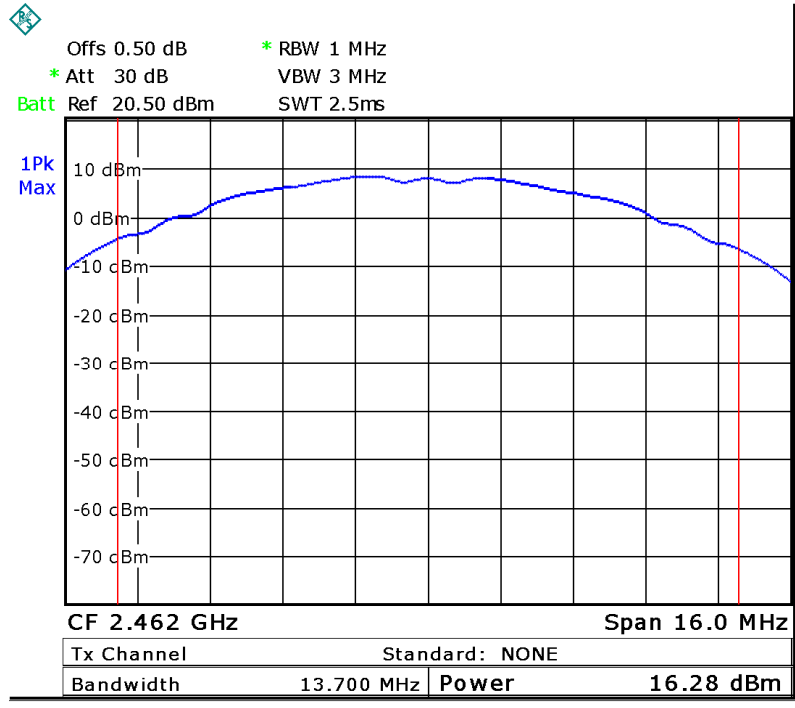
Mode: TX 11b channel 1



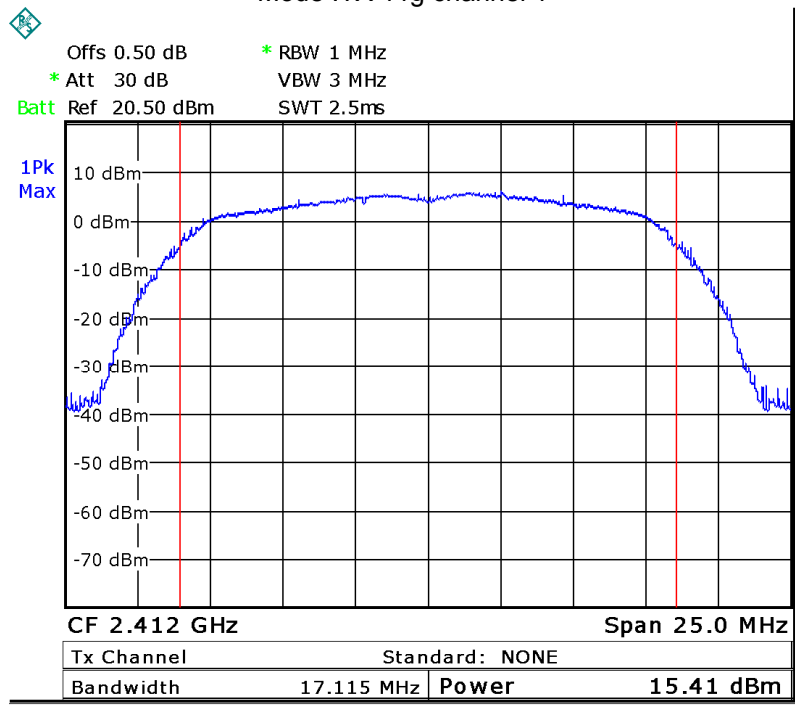
Mode: TX 11b channel 6



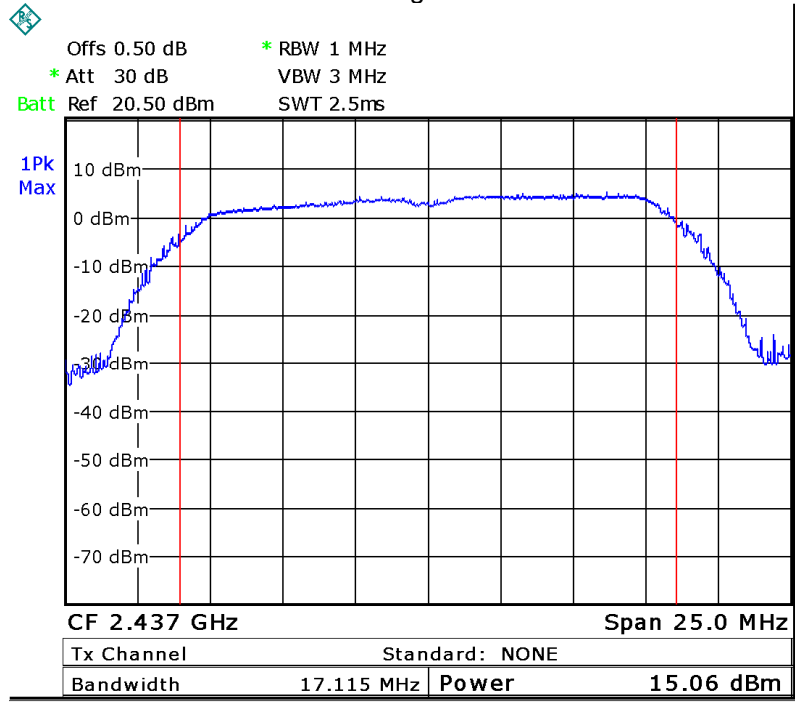
Mode: TX 11b channel 11



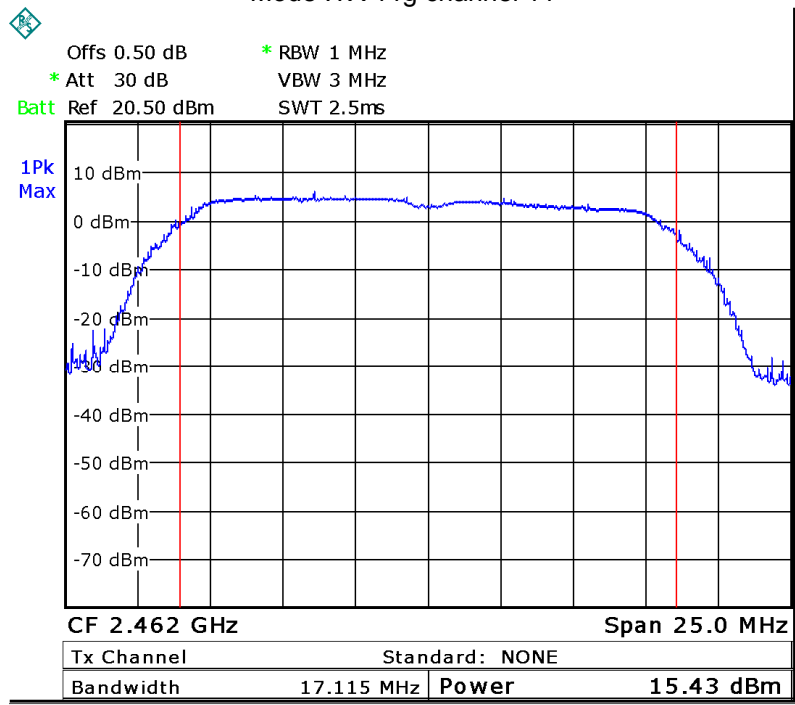
Mode :TX 11g channel 1



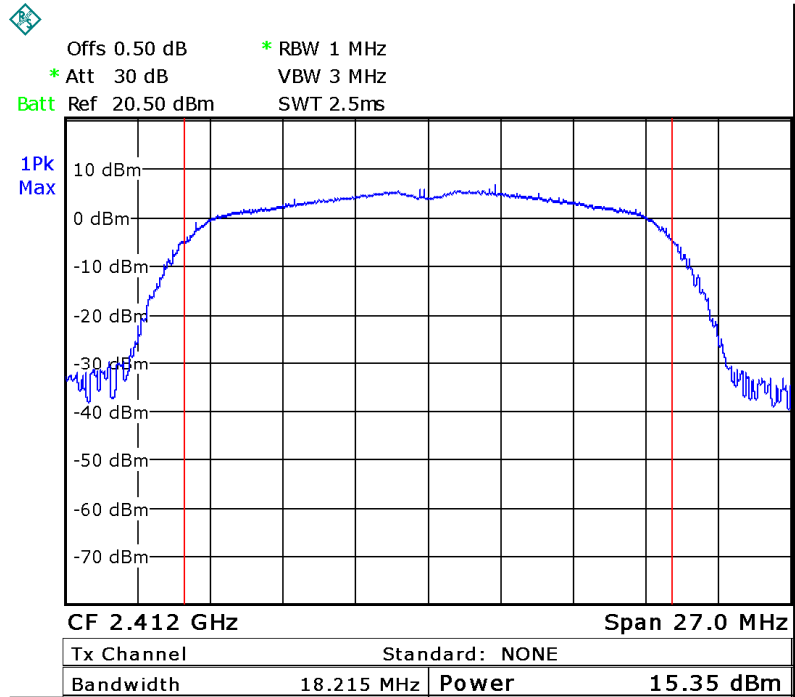
Mode :TX 11g channel 6



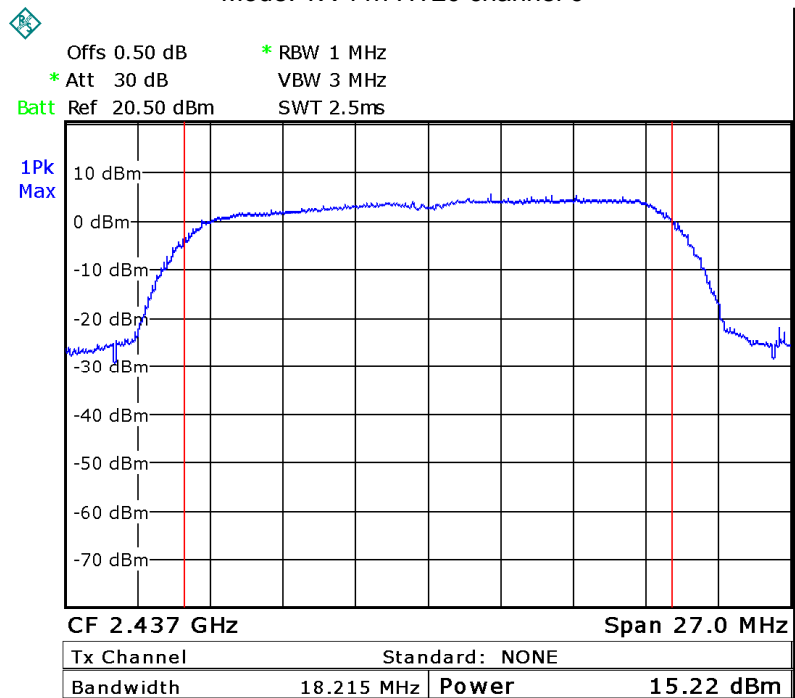
Mode :TX 11g channel 11



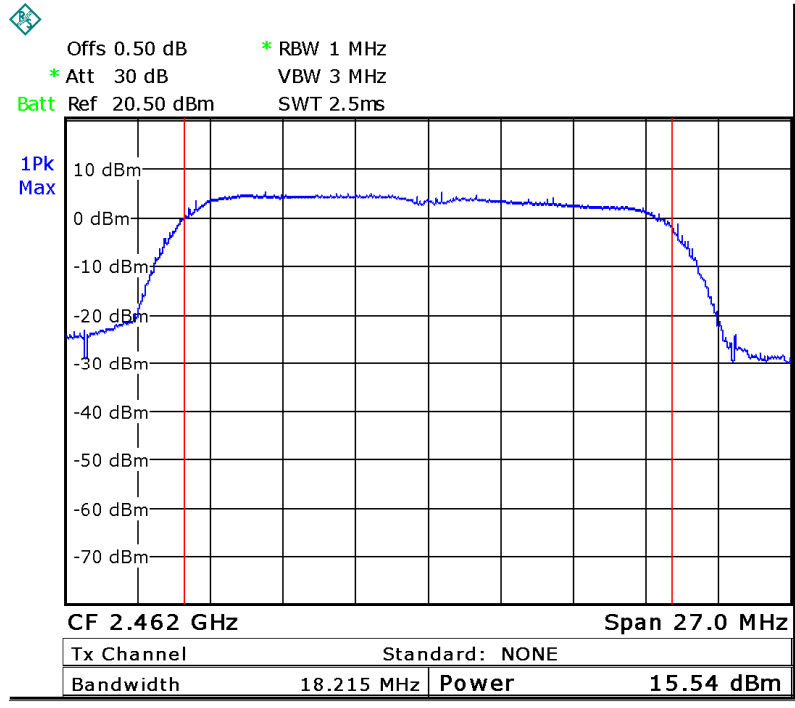
Mode: TX 11n HT20 channel 1



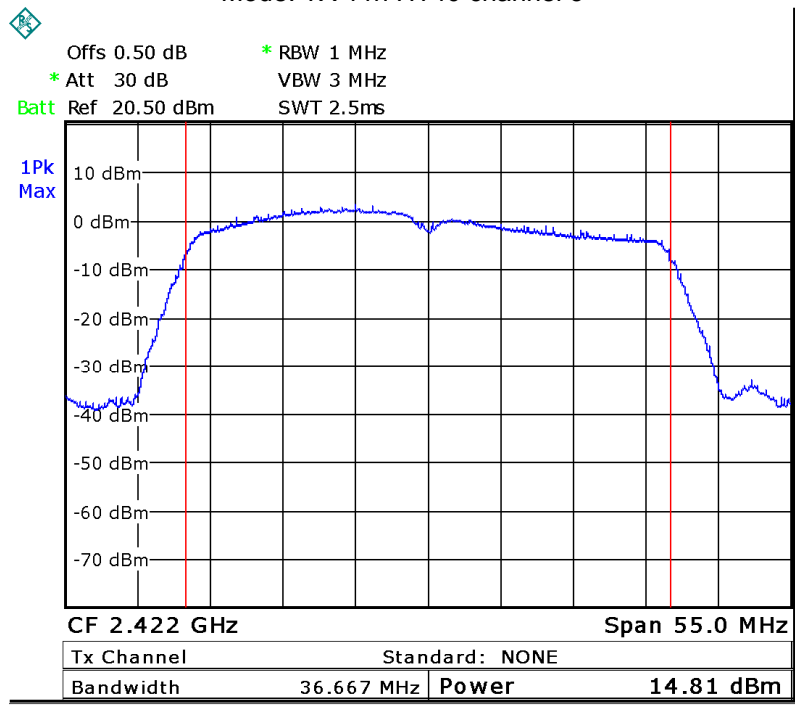
Mode: TX 11n HT20 channel 6



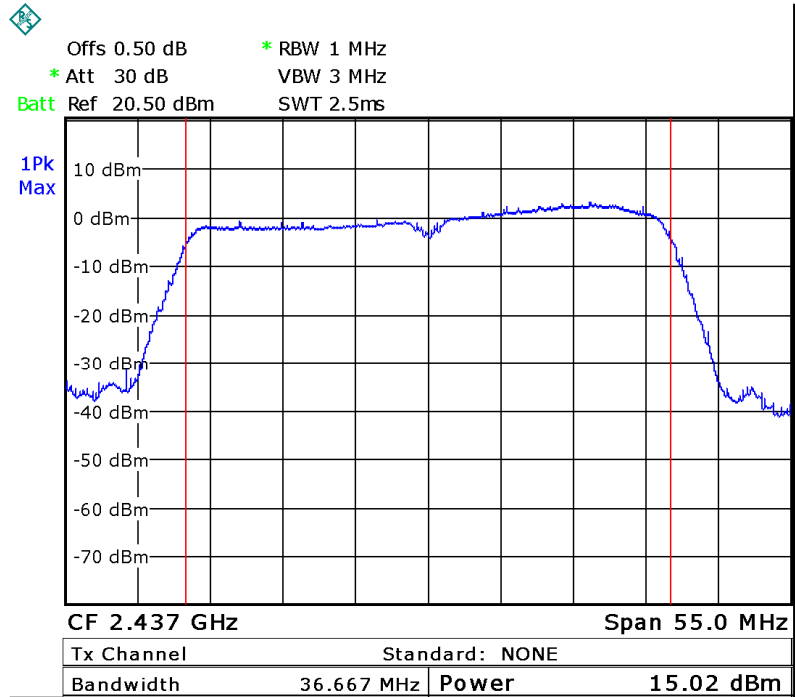
Mode: TX 11n HT20 channel 11



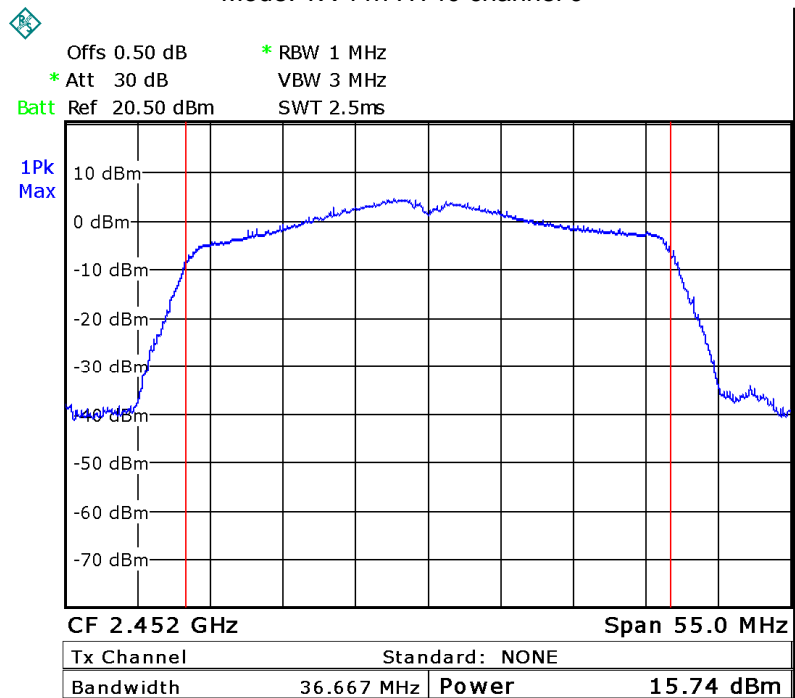
Mode: TX 11n HT40 channel 3

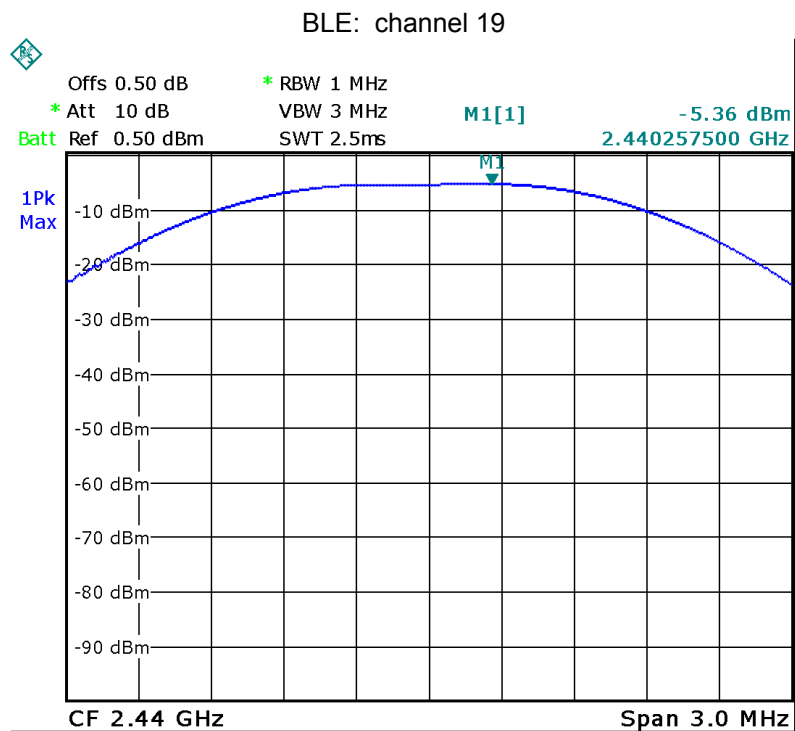
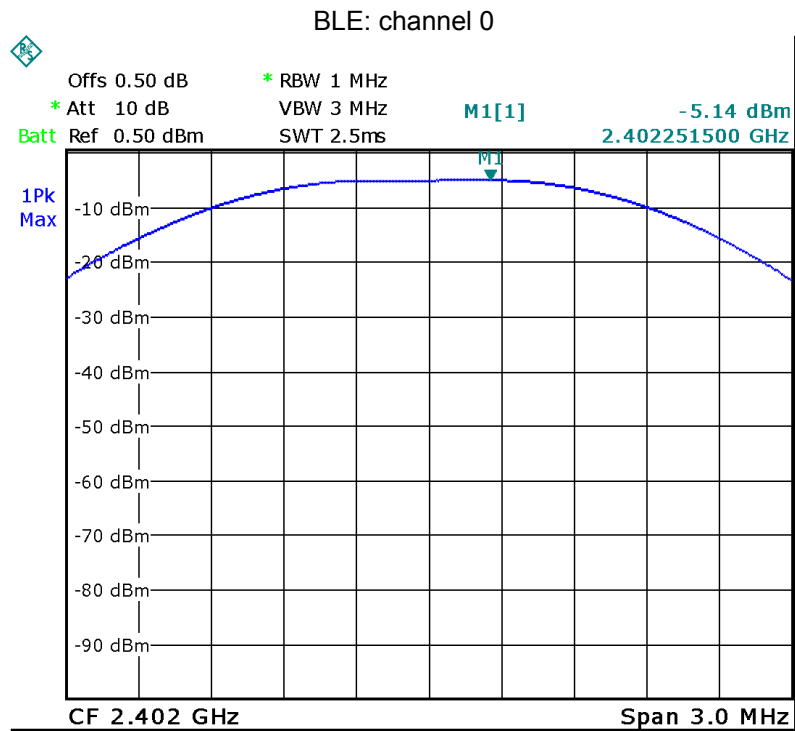


Mode: TX 11n HT40 channel 6

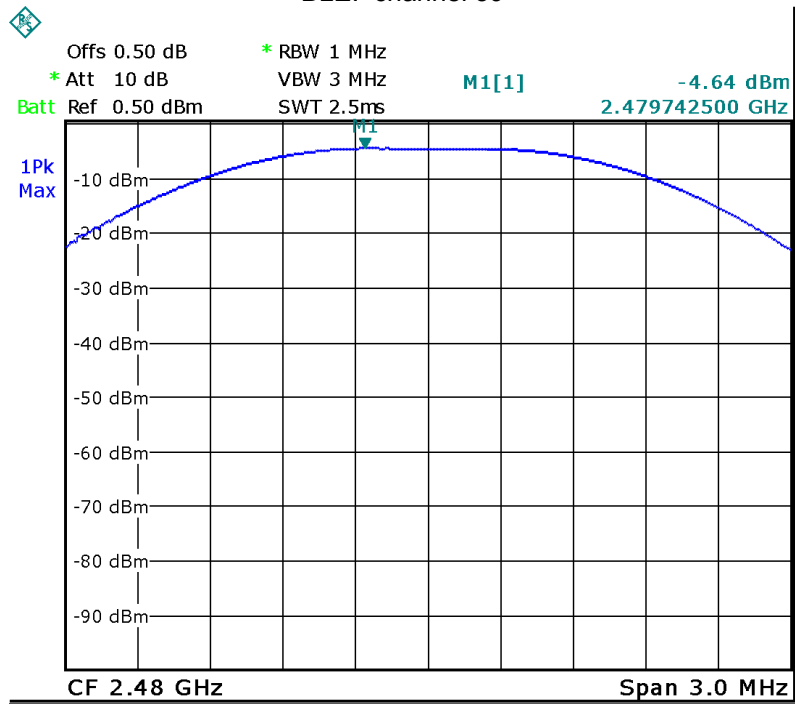


Mode: TX 11n HT40 channel 9





BLE: channel 39



15 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

16 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

16.1 Test Procedure:

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

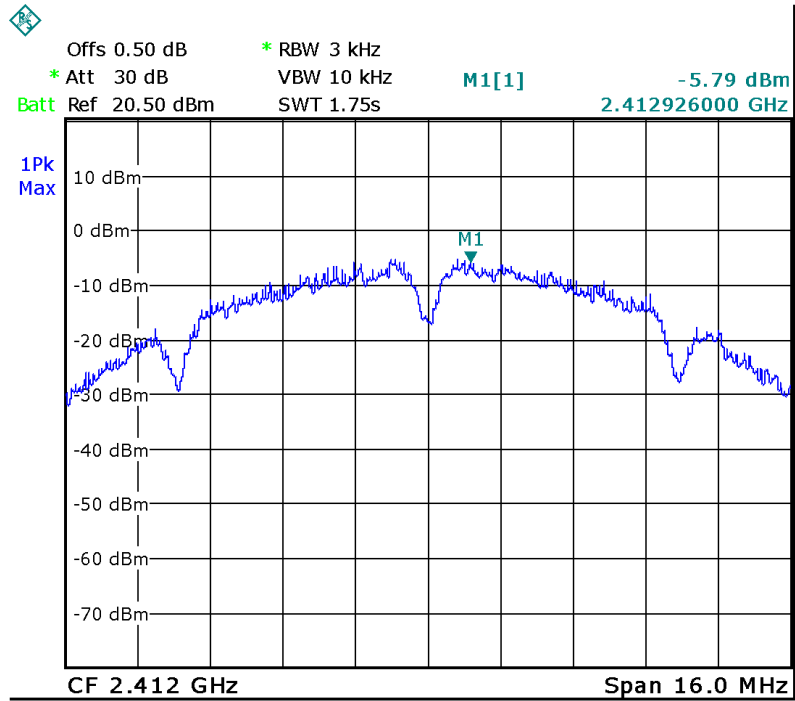
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to 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.

16.2 Test Result:

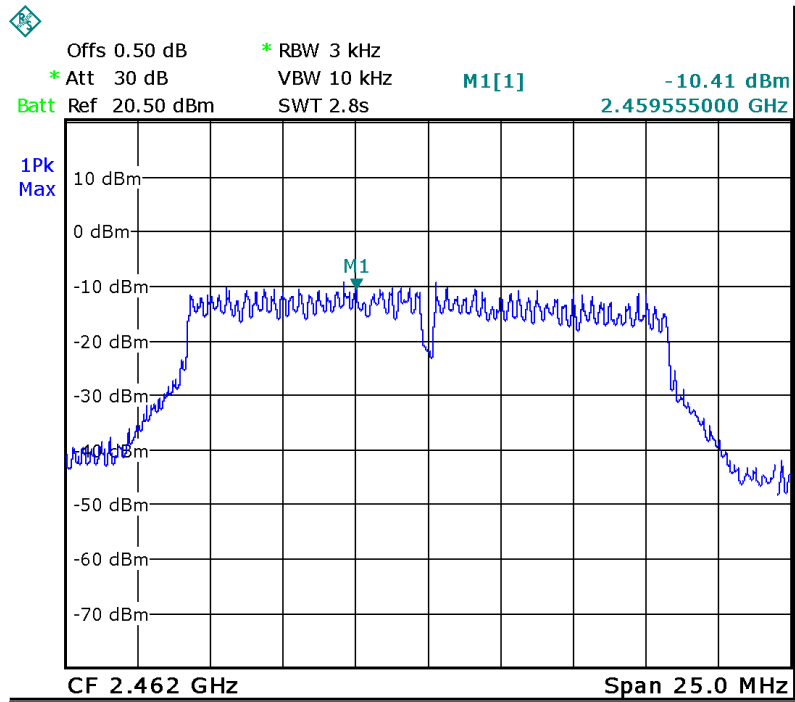
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-5.79	8dBm per 3kHz
	Middle-2437	-4.71	8dBm per 3kHz
	High-2462	-4.28	8dBm per 3kHz
TX 11g	Low-2412	-9.04	8dBm per 3kHz
	Middle-2437	-9.17	8dBm per 3kHz
	High-2462	-10.41	8dBm per 3kHz
TX 11n HT20	Low-2412	-8.06	8dBm per 3kHz
	Middle-2437	-9.46	8dBm per 3kHz
	High-2462	-10.38	8dBm per 3kHz
TX 11n HT40	Low-2422	-13.77	8dBm per 3kHz
	Middle-2437	-12.61	8dBm per 3kHz
	High-2452	-9.94	8dBm per 3kHz
BLE	Low-2402	-21.68	8dBm per 3kHz
	Middle-2440	-22.11	8dBm per 3kHz
	High-2480	-21.40	8dBm per 3kHz

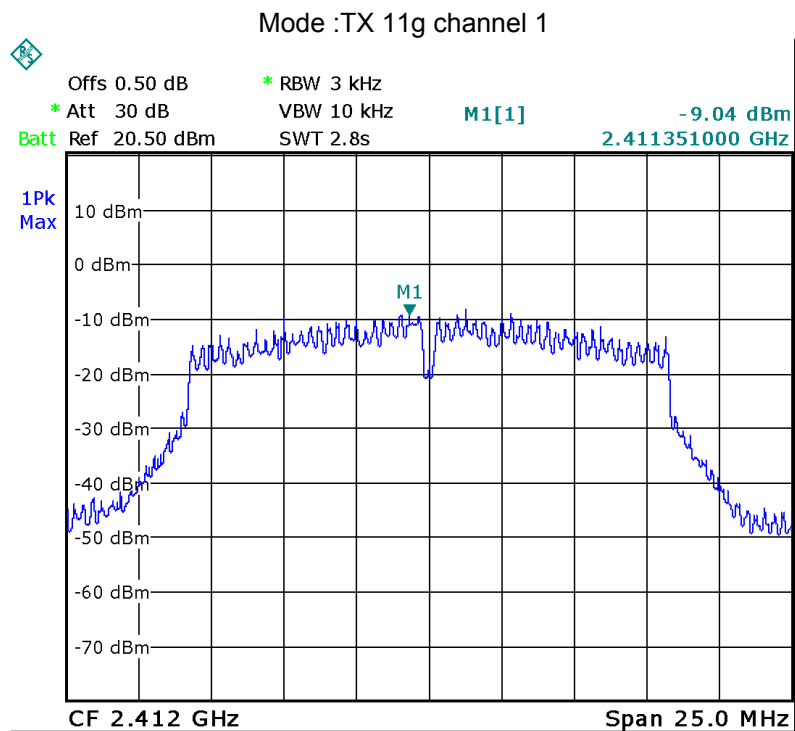
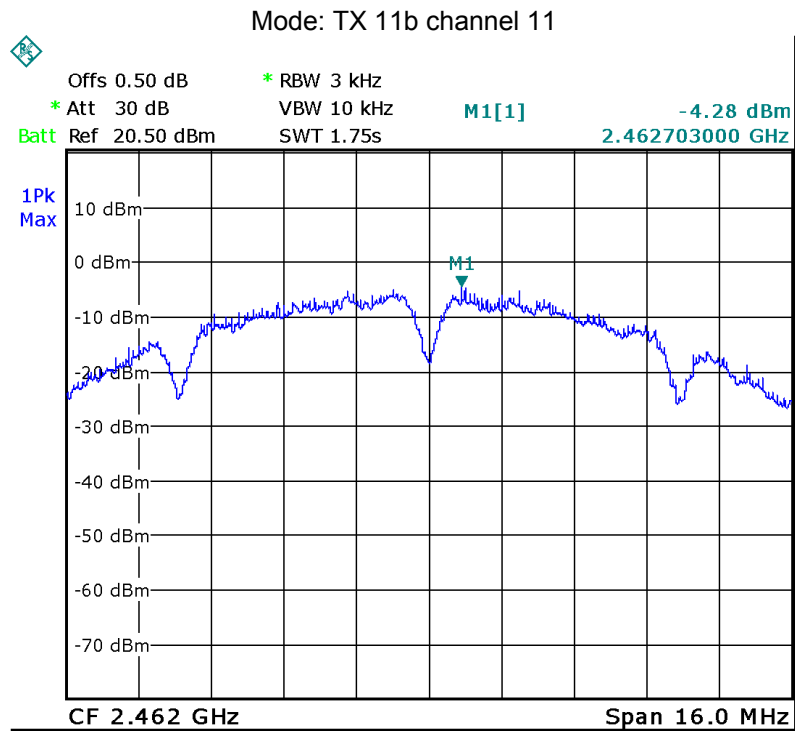
Test Plot

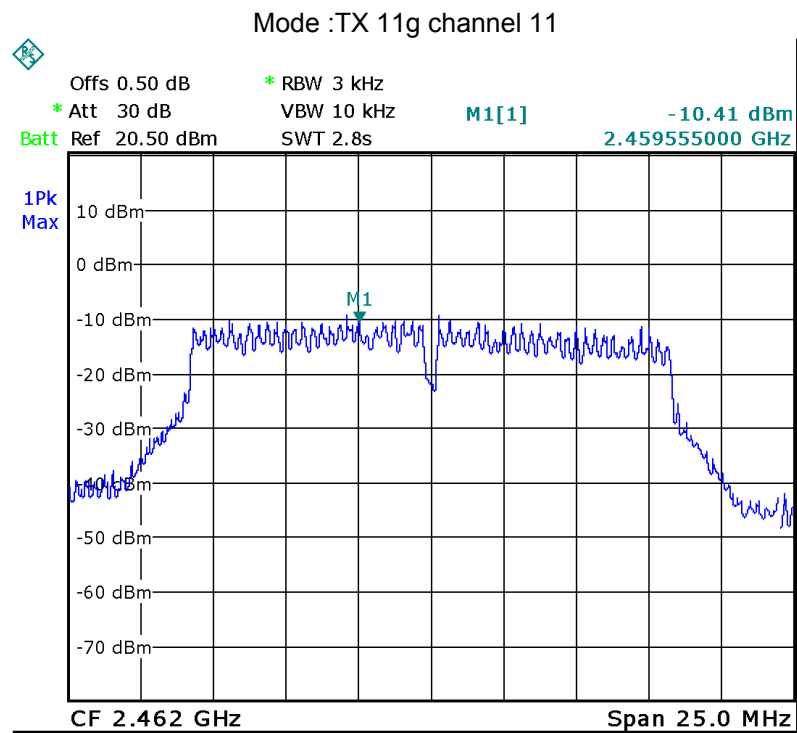
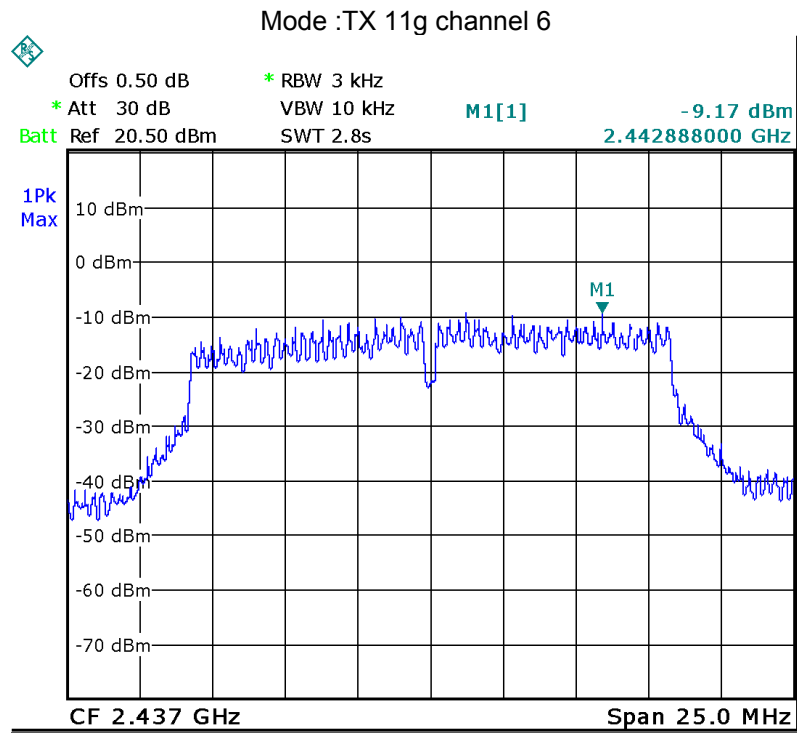
Mode: TX 11b channel 1



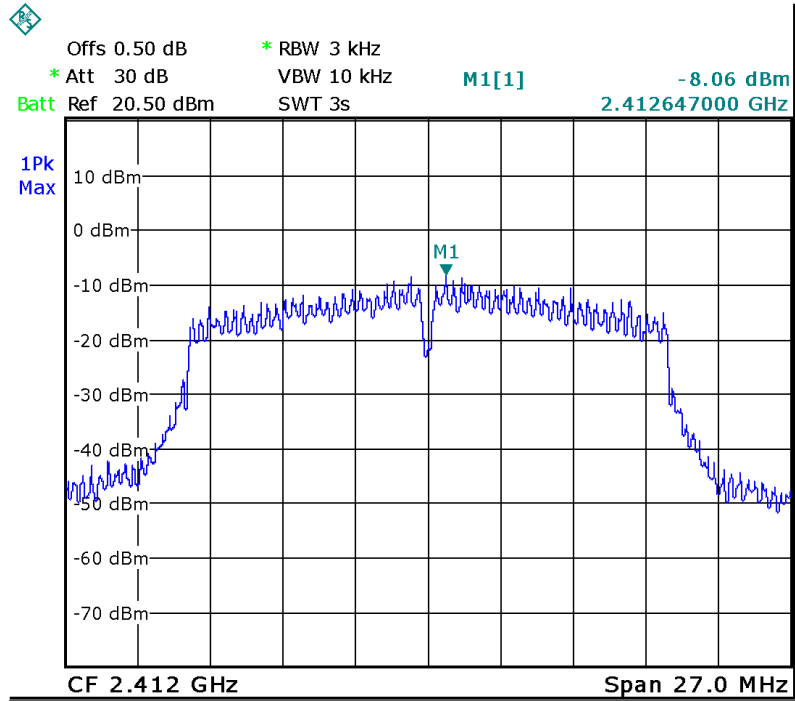
Mode: TX 11b channel 6



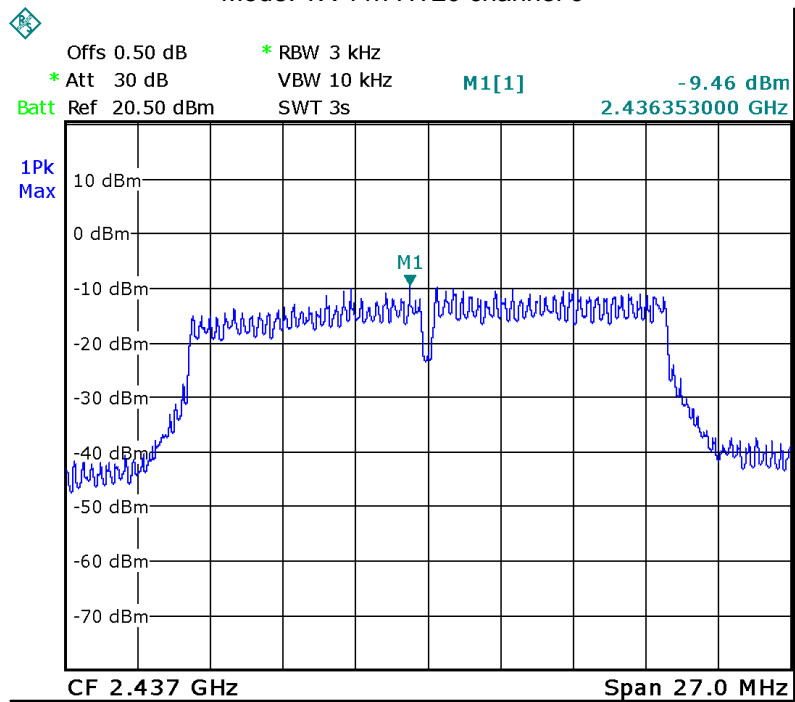




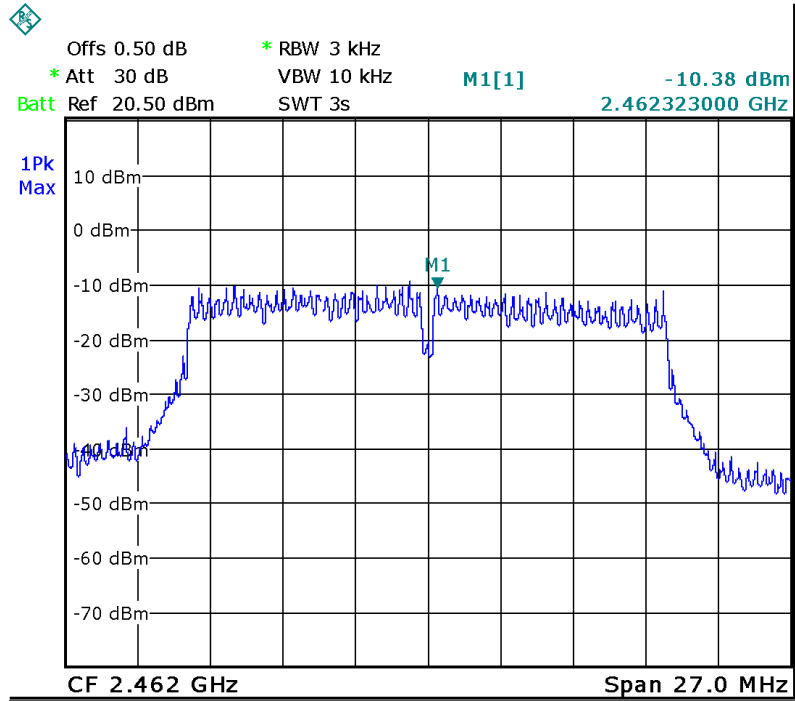
Mode: TX 11n HT20 channel 1



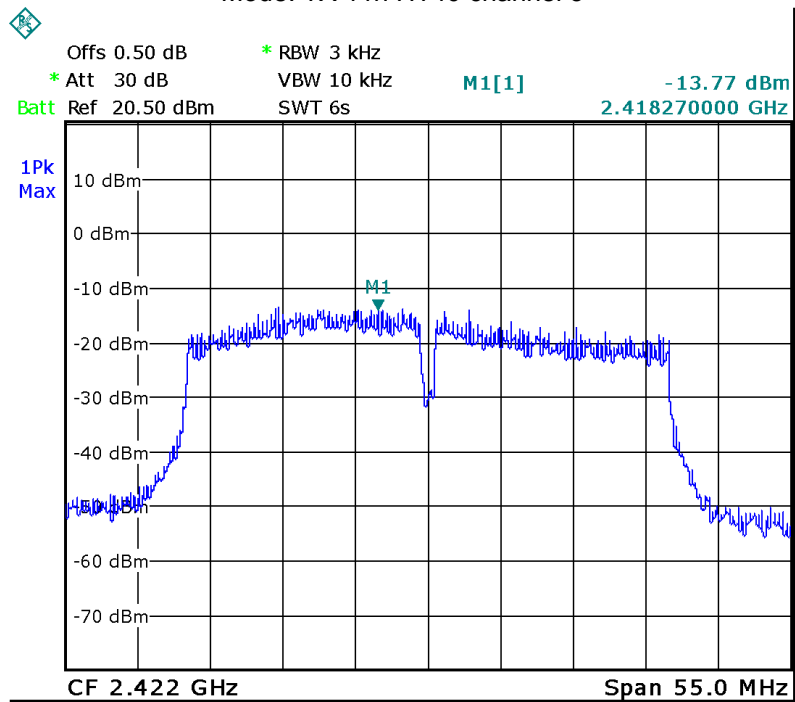
Mode: TX 11n HT20 channel 6



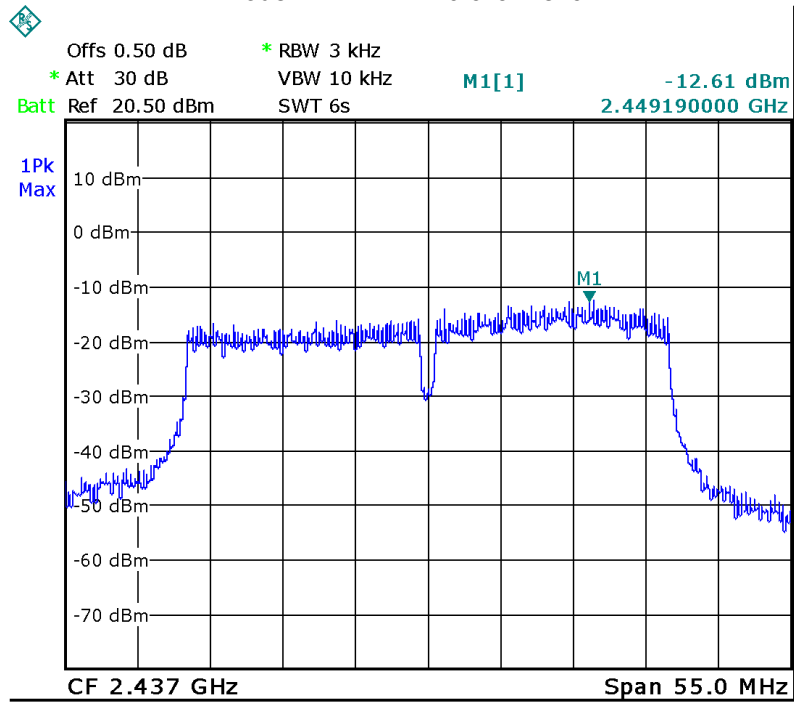
Mode: TX 11n HT20 channel 11



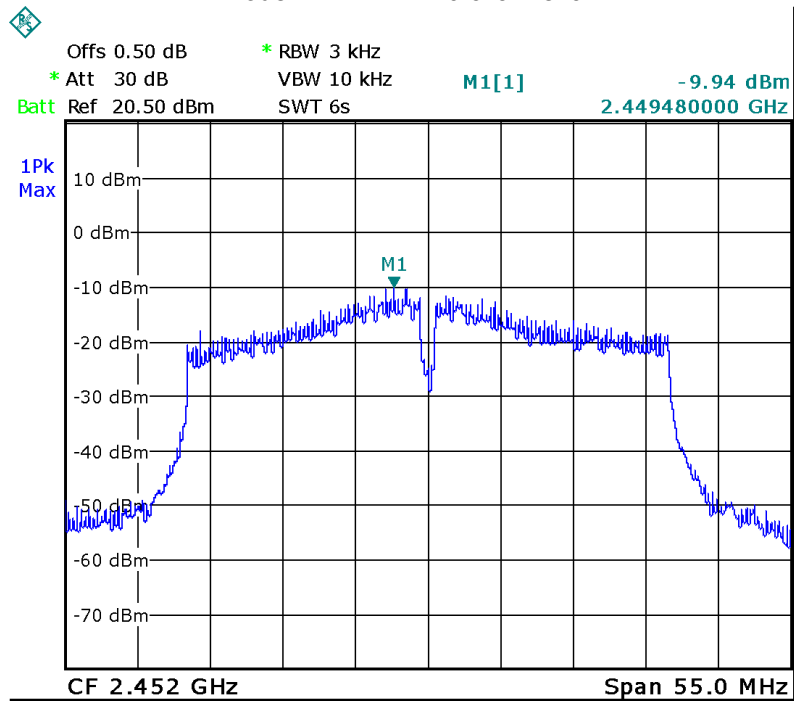
Mode: TX 11n HT40 channel 3



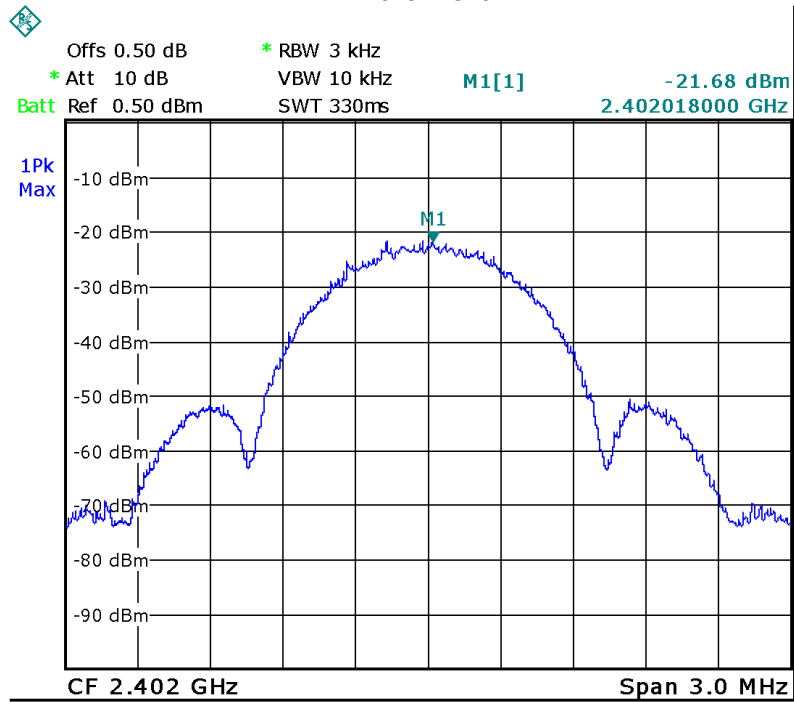
Mode: TX 11n HT40 channel 6



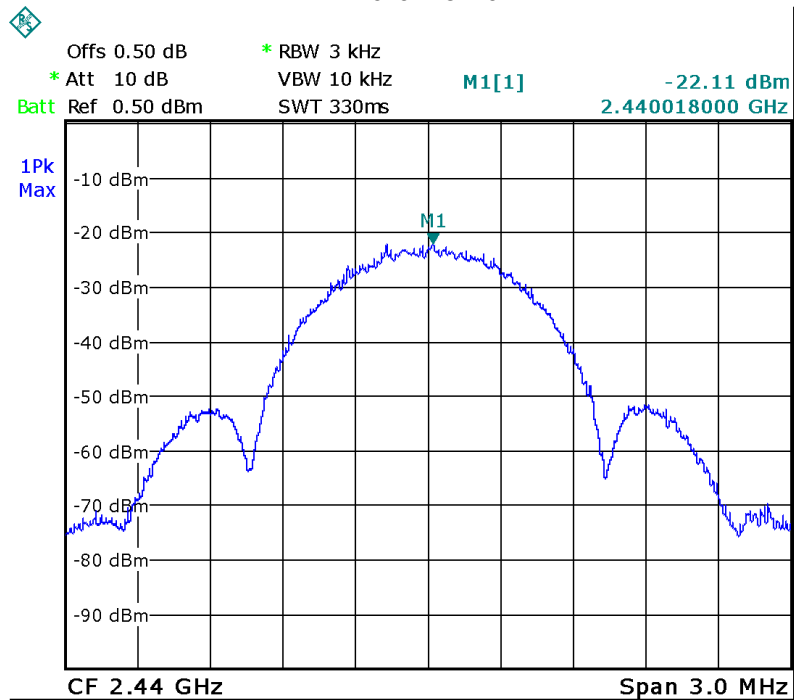
Mode: TX 11n HT40 channel 9



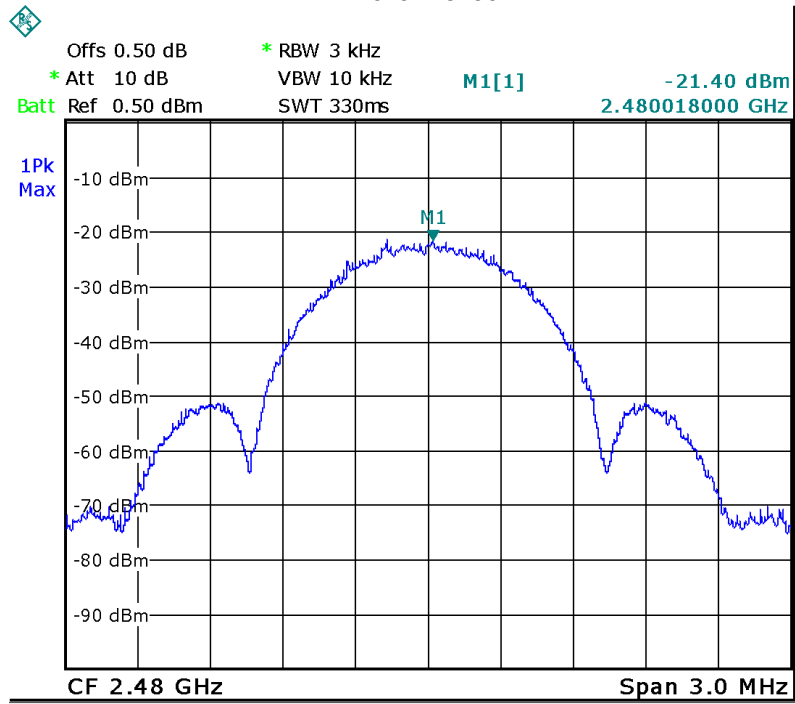
BLE: channel 0



BLE: channel 19



BLE: channel 39



17 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.

18 RF Exposure

Remark: refer to SAR test report: WTD21D04040628W001.

19 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-Black G-Photos.

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