

TEST REPORT

Reference No. : WTD21D05044772W001
FCC ID : 2AZ6P-1166197
Applicant..... : AOB Products Company
Address..... : 1800 North Route Z, Suite A, Columbia, Missouri 65202, USA
Manufacturer : Winstars Technology Limited
Address..... : 1-5/F, NO.5, Taisong Industrial Zone, Dalang Community, Dalang Street, Longhua District, Shenzhen
Product..... : Wi-Fi Range Extender
Model(s). : 1166197
Brand Name..... : Lockdown
Standards..... : FCC CFR47 Part 15.247
Date of Receipt sample : 2021-05-11
Date of Test : 2021-05-11 to 2021-05-21
Date of Issue..... : 2021-05-21
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:

Waltek Testing Group Co., Ltd.

Address: No. 77, Houjie Section, Guantai Road, Houjie Town, Dongguan City, Guangdong, China

Tel: +86-769-2267 6998

Fax: +86-769-2267 6828

Compiled by:

Estel Qian

Estel Qian / Project Engineer

Approved by:



Daniel Liu

Daniel Liu / Designated Reviewer

2 Contents

	Page
1 COVER PAGE.....	1
2 CONTENTS	2
3 REVISION HISTORY	4
4 GENERAL INFORMATION.....	5
4.1 GENERAL DESCRIPTION OF E.U.T.	5
4.2 DETAILS OF E.U.T.	5
4.3 CHANNEL LIST.....	6
4.4 TEST MODE	7
4.5 TEST FACILITY.....	8
5 TEST SUMMARY	9
6 EQUIPMENT USED DURING TEST	10
6.1 EQUIPMENTS LIST	10
6.2 DESCRIPTION OF SUPPORT UNITS	11
6.3 MEASUREMENT UNCERTAINTY	11
6.4 TEST EQUIPMENT CALIBRATION	11
7 CONDUCTED EMISSION	12
7.1 E.U.T. OPERATION	12
7.2 EUT SETUP.....	12
7.3 MEASUREMENT DESCRIPTION	12
7.4 CONDUCTED EMISSION TEST RESULT	13
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 DUTY CYCLE.....	37
10 CONDUCTED SPURIOUS EMISSIONS.....	38
10.1 TEST PROCEDURE.....	38
10.2 TEST RESULT	39
11 BAND EDGE MEASUREMENT	63
11.1 TEST PROCEDURE	63
11.2 TEST RESULT	64
12 6 DB BANDWIDTH MEASUREMENT	72
12.1 TEST PROCEDURE:.....	72
12.2 TEST RESULT:	72
13 MAXIMUM PEAK OUTPUT POWER	86
13.1 TEST PROCEDURE:.....	86
13.2 TEST RESULT:	87
14 POWER SPECTRAL DENSITY	100
14.1 TEST PROCEDURE:.....	100
14.2 TEST RESULT:	100
15 ANTENNA REQUIREMENT	113

16 RF EXPOSURE..... 114

17 PHOTOGRAPHS OF TEST SETUP AND EUT..... 114

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD21D05044772 W001	2021-05-11	2021-05-11 to 2021-05-21	2021-05-21	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	Wi-Fi Range Extender
Model(s):	1166197
Model Description:	N/A
Wi-Fi Specification:	802.11b/g/n HT20/n HT40
Hardware Version:	WS-WN578N2-B
Software Version:	M78N_V1310_210409
Note:	N/A

4.2 Details of E.U.T.

Operation Frequency:	802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz
Max. RF output power:	ANT 0: 15.49dBm ANT 1: 15.53dBm SUM: 18.23dBm
Type of Modulation:	DSSS, CCK, OFDM
Antenna installation:	External antenna
Antenna Gain:	ANT 0: 3.0dBi ANT 1: 3.0dBi
Ratings:	100-240V a.c. 50/60Hz, 0.3A MAX

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	-

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

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)	N/A
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3),(4)	PASS
Power Spectral Density	15.247(e)	PASS
Band Edge	15.247(d)	PASS
Antenna Requirement	15.203	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

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	101215	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	8128-289	2020-07-30	2021-07-29
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2020-07-30	2021-07-29
4.	Cable	LARGE	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	FSP	100091	2021-04-19	2022-04-18
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2021-04-19	2022-04-18
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2020-08-22	2021-08-21
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2021-04-19	2022-04-18
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2021-04-24	2022-04-23
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2021-04-19	2022-04-18
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2021-04-19	2022-04-18
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2021-04-19	2022-04-18
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	2021-04-19	2022-04-18
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-04-24	2022-04-23
3	Amplifier	Compliance direction systems inc	PAP-0203	22024	2021-04-19	2022-04-18
4	Cable	HUBER+SUHNER	CBL2	525178	2021-04-19	2022-04-18

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	2021-04-19	2022-04-18
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2021-04-19	2022-04-18
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2021-04-19	2022-04-18

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	$\pm 1 \times 10^{-7}$ Hz
RF Power	± 0.42 dB
RF Power Density	± 0.7 dB
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:	66-56 dB μ V between 0.15MHz & 0.5MHz 56 dB μ V between 0.5MHz & 5MHz 60 dB μ V between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

7.1 E.U.T. Operation

Operating Environment :

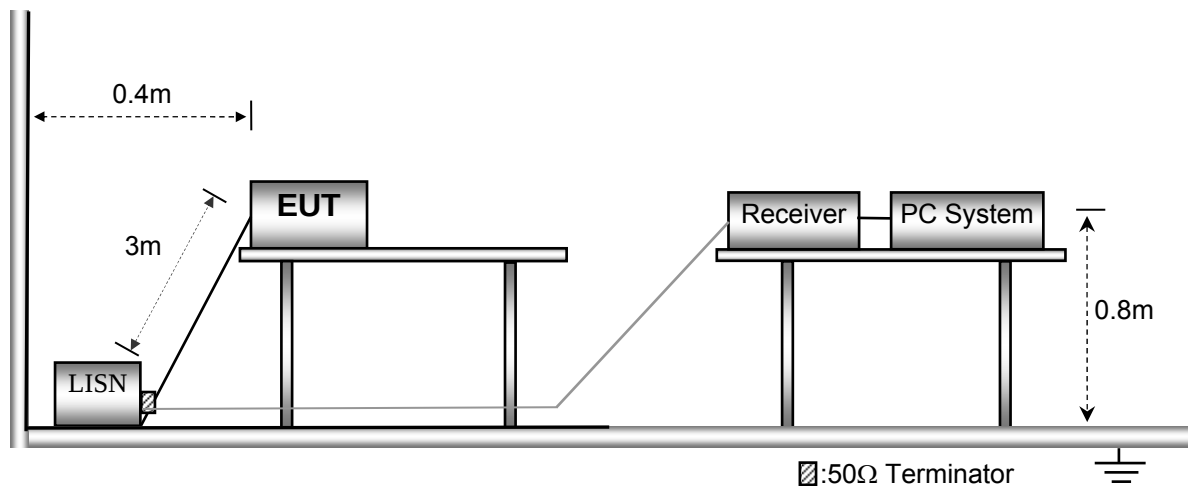
Temperature:	21.5 °C
Humidity:	51.9 % RH
Atmospheric Pressure:	101.2kPa

EUT Operation :

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

7.2 EUT Setup

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



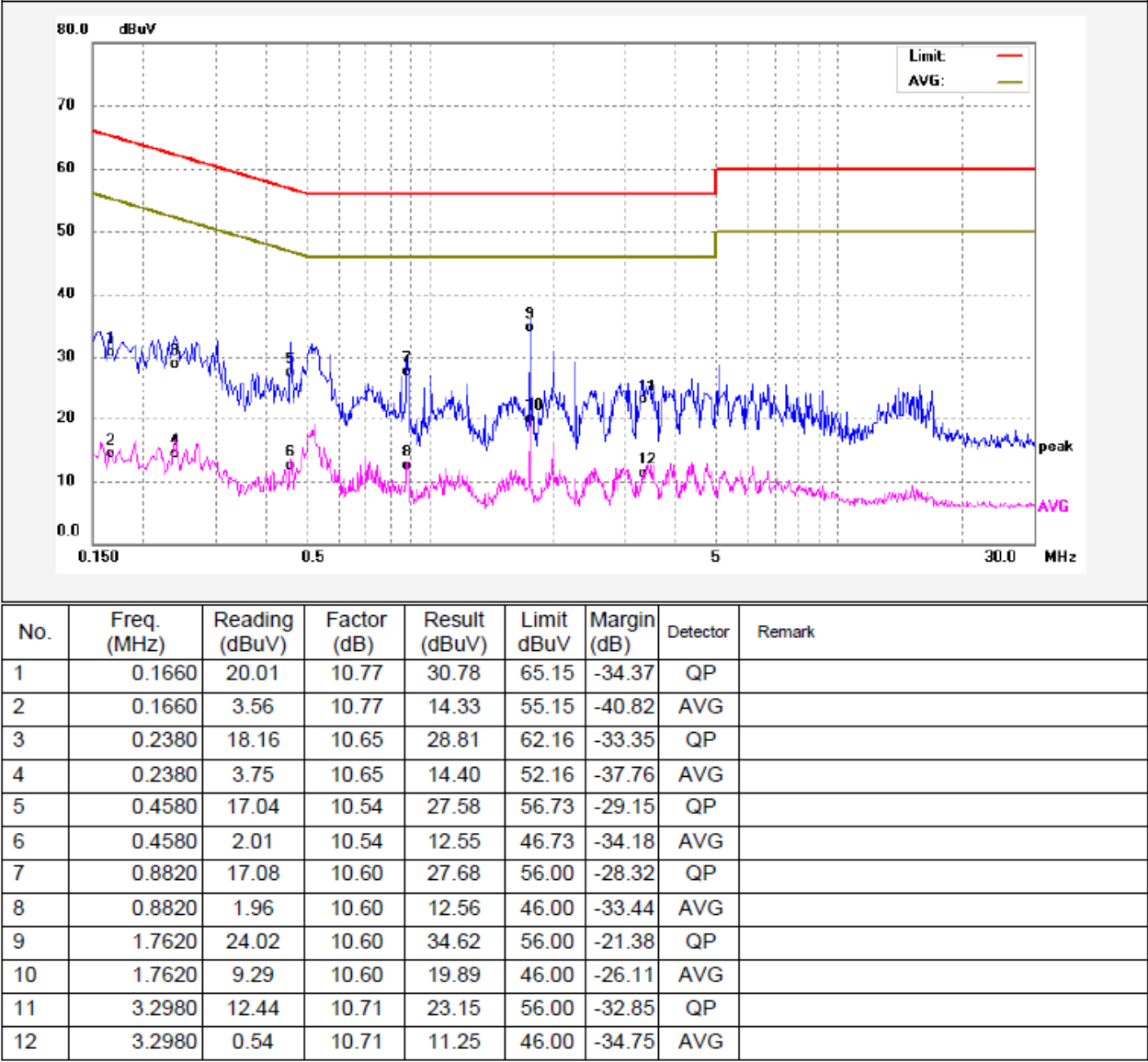
7.3 Measurement Description

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

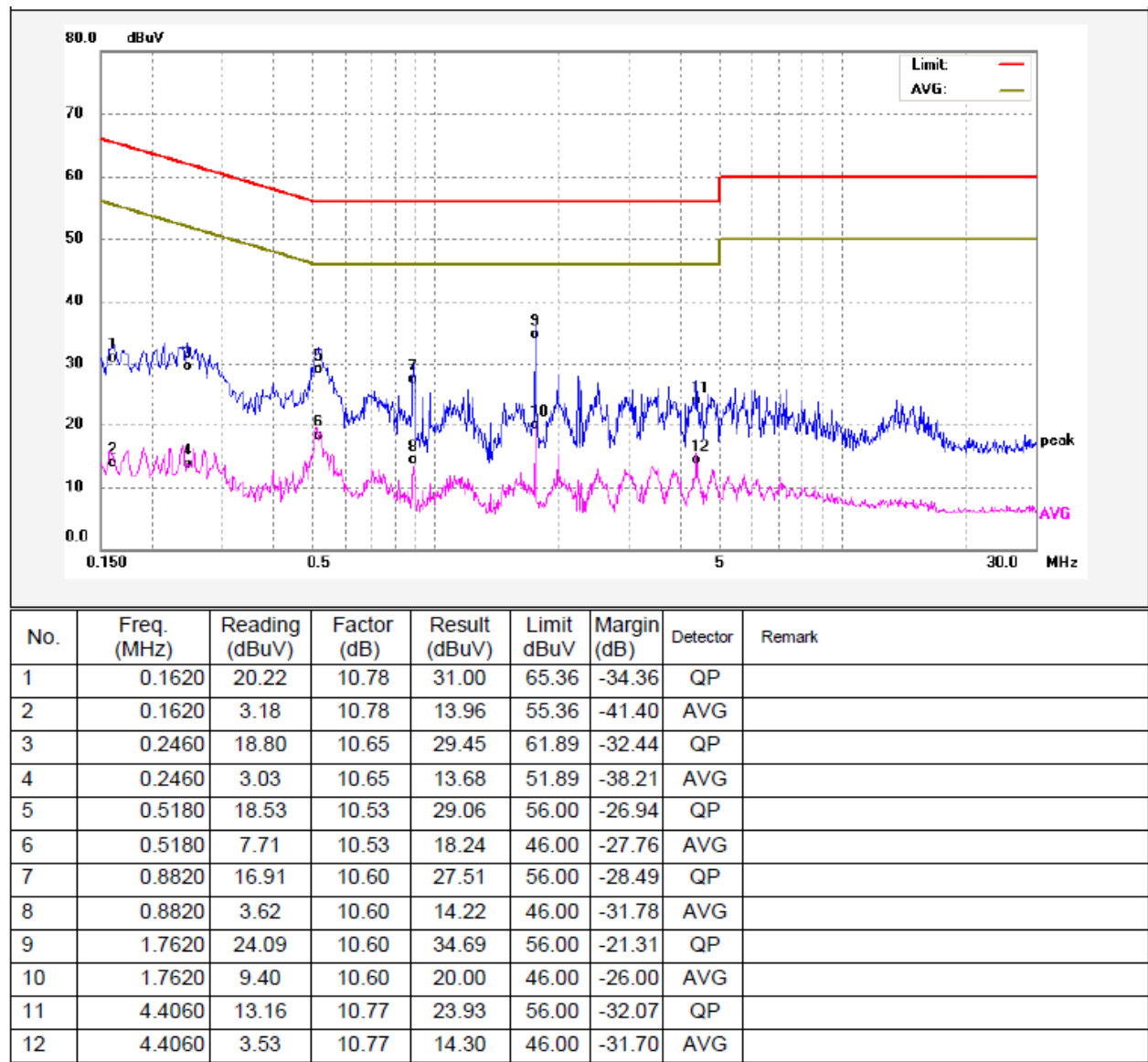
7.4 Conducted Emission Test Result

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

Live line:



Neutral line:



8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

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

8.1 EUT Operation

Operating Environment :

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

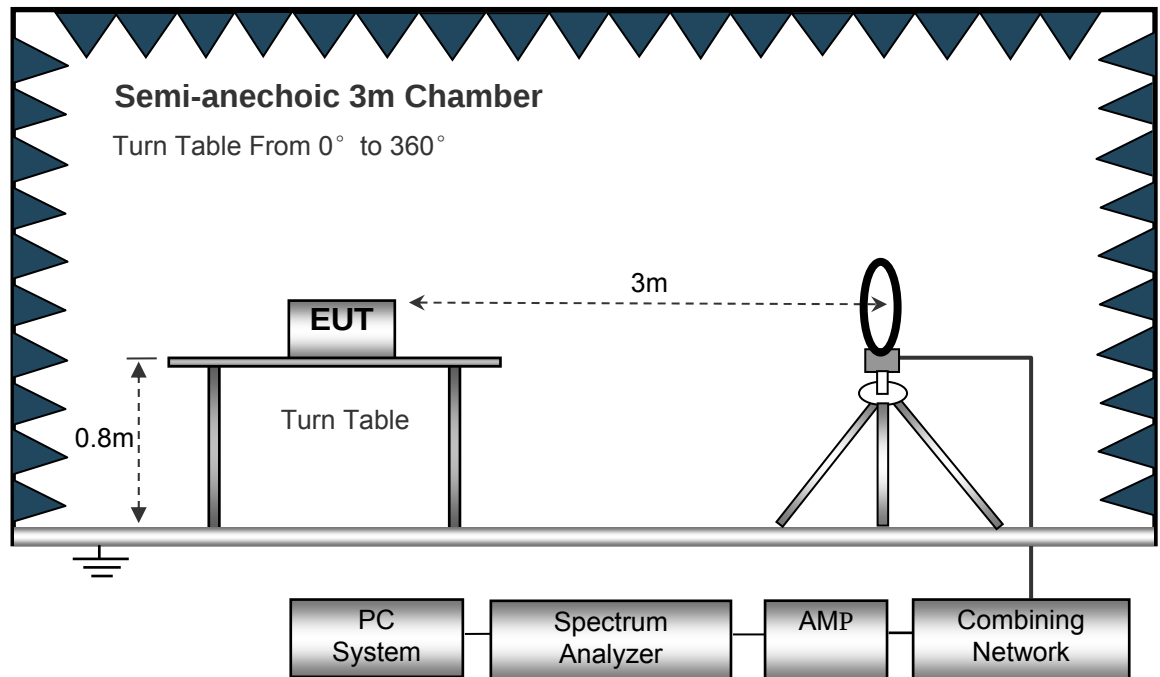
EUT Operation :

The test was performed in Working mode, the worst data were shown in the report.

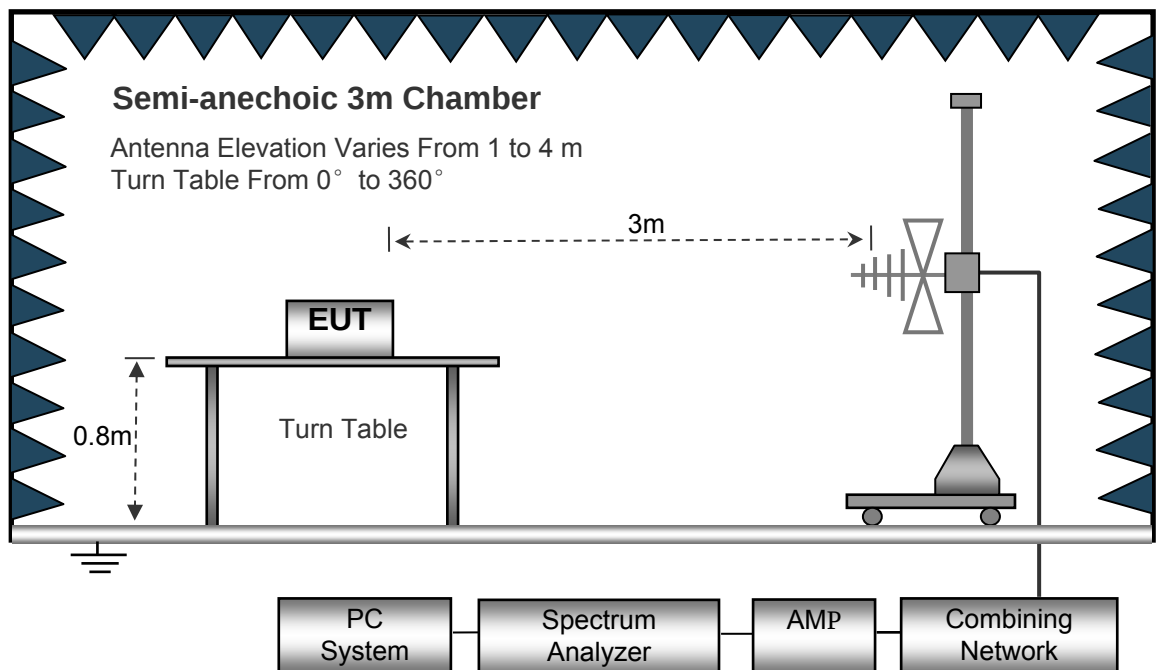
8.2 Test Setup

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

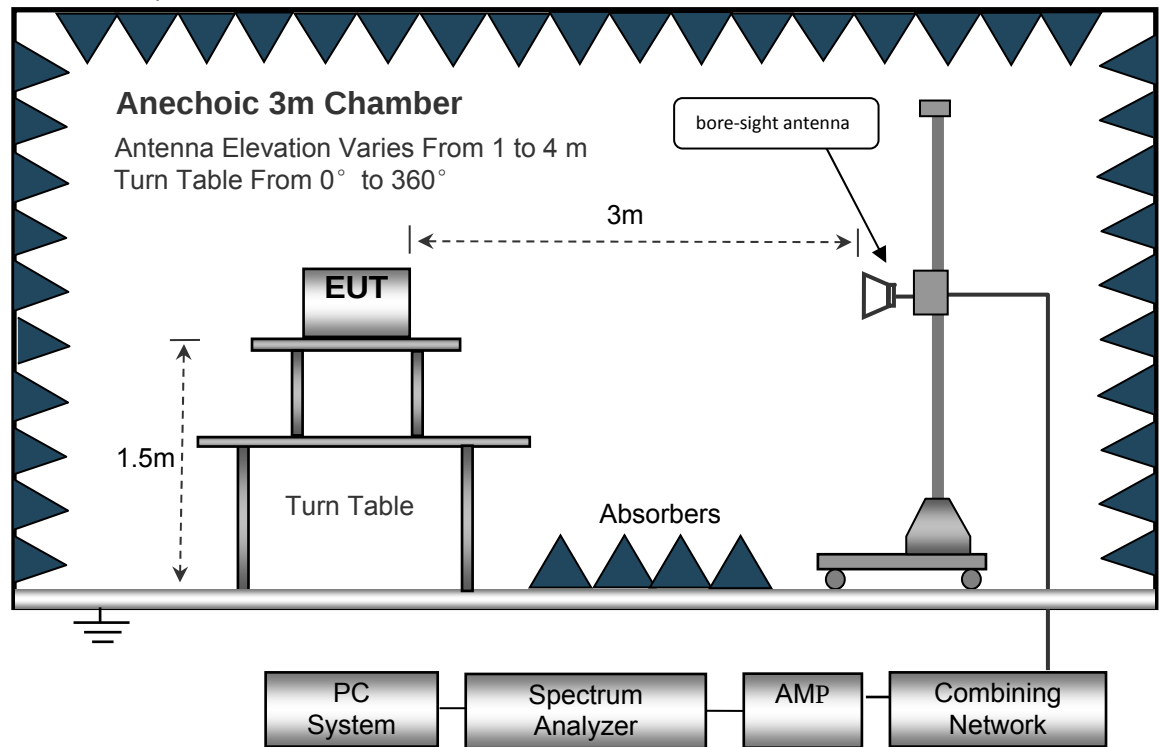
The test setup for emission measurement below 30MHz.



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

Note: Lowest frequency generated in the device is 40MHz, frequency range of measurement should be above 30MHz.

Test frequency: 30MHz ~ 18GHz

ANT0

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Low Channel 2412MHz									
223.45	39.52	QP	210	1.4	H	-11.62	27.90	46.00	-18.10
223.45	36.02	QP	146	1.0	V	-11.62	24.40	46.00	-21.60
4824.00	51.92	PK	63	1.9	V	-1.06	50.86	74.00	-23.14
4824.00	48.86	Ave	63	1.9	V	-1.06	47.80	54.00	-6.20
7236.00	44.98	PK	301	1.1	H	1.33	46.31	74.00	-27.69
7236.00	40.51	Ave	301	1.1	H	1.33	41.84	54.00	-12.16
2339.15	46.48	PK	306	1.5	V	-13.19	33.29	74.00	-40.71
2339.15	40.00	Ave	306	1.5	V	-13.19	26.81	54.00	-27.19
2367.28	44.85	PK	279	1.3	H	-13.14	31.71	74.00	-42.29
2367.28	37.35	Ave	279	1.3	H	-13.14	24.21	54.00	-29.79
2490.93	43.28	PK	212	2.0	V	-13.08	30.20	74.00	-43.80
2490.93	38.61	Ave	212	2.0	V	-13.08	25.53	54.00	-28.47

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Middle Channel 2437MHz									
223.45	38.89	QP	163	1.5	H	-11.62	27.27	46.00	-18.73
223.45	34.57	QP	334	1.0	V	-11.62	22.95	46.00	-23.05
4874.00	52.56	PK	11	2.0	V	-0.62	51.94	74.00	-22.06
4874.00	48.24	Ave	11	2.0	V	-0.62	47.62	54.00	-6.38
7311.00	45.59	PK	312	1.1	H	2.21	47.80	74.00	-26.20
7311.00	39.16	Ave	312	1.1	H	2.21	41.37	54.00	-12.63
2333.96	46.87	PK	293	1.8	V	-13.19	33.68	74.00	-40.32
2333.96	39.34	Ave	293	1.8	V	-13.19	26.15	54.00	-27.85
2374.14	42.82	PK	234	2.0	H	-13.14	29.68	74.00	-44.32
2374.14	37.46	Ave	234	2.0	H	-13.14	24.32	54.00	-29.68
2489.04	44.27	PK	204	1.8	V	-13.08	31.19	74.00	-42.81
2489.04	37.71	Ave	204	1.8	V	-13.08	24.63	54.00	-29.37

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	38.66	QP	47	1.0	H	-11.62	27.04	46.00	-18.96
223.45	33.53	QP	296	1.7	V	-11.62	21.91	46.00	-24.09
4924.00	53.39	PK	330	1.2	V	-0.24	53.15	74.00	-20.85
4924.00	49.23	Ave	330	1.2	V	-0.24	48.99	54.00	-5.01
7386.00	45.13	PK	181	2.0	H	2.84	47.97	74.00	-26.03
7386.00	38.41	Ave	181	2.0	H	2.84	41.25	54.00	-12.75
2311.72	45.85	PK	161	1.7	V	-13.19	32.66	74.00	-41.34
2311.72	37.17	Ave	161	1.7	V	-13.19	23.98	54.00	-30.02
2389.19	43.19	PK	178	1.0	H	-13.14	30.05	74.00	-43.95
2389.19	36.70	Ave	178	1.0	H	-13.14	23.56	54.00	-30.44
2496.06	44.92	PK	169	1.1	V	-13.08	31.84	74.00	-42.16
2496.06	37.21	Ave	169	1.1	V	-13.08	24.13	54.00	-29.87

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
223.45	37.31	QP	67	1.9	H	-11.62	25.69	46.00	-20.31
223.45	33.59	QP	25	1.1	V	-11.62	21.97	46.00	-24.03
4824.00	52.34	PK	324	1.7	V	-1.06	51.28	74.00	-22.72
4824.00	49.16	Ave	324	1.7	V	-1.06	48.10	54.00	-5.90
7236.00	44.95	PK	174	1.0	H	1.33	46.28	74.00	-27.72
7236.00	38.18	Ave	174	1.0	H	1.33	39.51	54.00	-14.49
2330.75	45.59	PK	138	1.7	V	-13.19	32.40	74.00	-41.60
2330.75	38.45	Ave	138	1.7	V	-13.19	25.26	54.00	-28.74
2380.99	43.34	PK	78	1.4	H	-13.14	30.20	74.00	-43.80
2380.99	36.37	Ave	78	1.4	H	-13.14	23.23	54.00	-30.77
2485.89	44.93	PK	118	1.3	V	-13.08	31.85	74.00	-42.15
2485.89	38.65	Ave	118	1.3	V	-13.08	25.57	54.00	-28.43

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	38.18	QP	8	1.9	H	-11.62	26.56	46.00	-19.44
223.45	32.64	QP	134	1.3	V	-11.62	21.02	46.00	-24.98
4874.00	52.09	PK	338	1.7	V	-0.62	51.47	74.00	-22.53
4874.00	48.05	Ave	338	1.7	V	-0.62	47.43	54.00	-6.57
7311.00	43.57	PK	102	1.9	H	2.21	45.78	74.00	-28.22
7311.00	39.48	Ave	102	1.9	H	2.21	41.69	54.00	-12.31
2337.61	46.21	PK	252	1.1	V	-13.19	33.02	74.00	-40.98
2337.61	39.86	Ave	252	1.1	V	-13.19	26.67	54.00	-27.33
2359.12	44.00	PK	196	1.5	H	-13.14	30.86	74.00	-43.14
2359.12	37.43	Ave	196	1.5	H	-13.14	24.29	54.00	-29.71
2489.25	44.52	PK	27	1.1	V	-13.08	31.44	74.00	-42.56
2489.25	38.58	Ave	27	1.1	V	-13.08	25.50	54.00	-28.50

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: High Channel 2462MHz									
223.45	38.30	QP	222	1.2	H	-11.62	26.68	46.00	-19.32
223.45	31.30	QP	54	1.4	V	-11.62	19.68	46.00	-26.32
4924.00	52.04	PK	285	1.6	V	-0.24	51.80	74.00	-22.20
4924.00	47.83	Ave	285	1.6	V	-0.24	47.59	54.00	-6.41
7386.00	44.44	PK	241	1.9	H	2.84	47.28	74.00	-26.72
7386.00	39.45	Ave	241	1.9	H	2.84	42.29	54.00	-11.71
2318.34	45.28	PK	25	1.8	V	-13.19	32.09	74.00	-41.91
2318.34	39.77	Ave	25	1.8	V	-13.19	26.58	54.00	-27.42
2350.88	43.17	PK	231	1.6	H	-13.14	30.03	74.00	-43.97
2350.88	36.57	Ave	231	1.6	H	-13.14	23.43	54.00	-30.57
2495.17	42.32	PK	333	1.2	V	-13.08	29.24	74.00	-44.76
2495.17	37.60	Ave	333	1.2	V	-13.08	24.52	54.00	-29.48

ANT1

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	38.91	QP	219	2.0	H	-11.62	27.29	46.00	-18.71
223.45	29.87	QP	119	1.9	V	-11.62	18.25	46.00	-27.75
4824.00	50.82	PK	209	1.5	V	-1.06	49.76	74.00	-24.24
4824.00	49.65	Ave	209	1.5	V	-1.06	48.59	54.00	-5.41
7236.00	45.56	PK	132	2.0	H	1.33	46.89	74.00	-27.11
7236.00	41.85	Ave	132	2.0	H	1.33	43.18	54.00	-10.82
2330.93	46.22	PK	183	1.8	V	-13.19	33.03	74.00	-40.97
2330.93	39.75	Ave	183	1.8	V	-13.19	26.56	54.00	-27.44
2383.29	44.30	PK	87	1.5	H	-13.14	31.16	74.00	-42.84
2383.29	36.12	Ave	87	1.5	H	-13.14	22.98	54.00	-31.02
2485.47	44.03	PK	52	1.8	V	-13.08	30.95	74.00	-43.05
2485.47	37.74	Ave	52	1.8	V	-13.08	24.66	54.00	-29.34

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Middle Channel 2437MHz									
223.45	39.40	QP	273	1.4	H	-11.62	27.78	46.00	-18.22
223.45	28.74	QP	290	1.8	V	-11.62	17.12	46.00	-28.88
4874.00	51.07	PK	269	1.9	V	-0.62	50.45	74.00	-23.55
4874.00	50.05	Ave	269	1.9	V	-0.62	49.43	54.00	-4.57
7311.00	44.31	PK	35	1.0	H	2.21	46.52	74.00	-27.48
7311.00	41.55	Ave	35	1.0	H	2.21	43.76	54.00	-10.24
2342.99	45.34	PK	170	1.7	V	-13.19	32.15	74.00	-41.85
2342.99	37.20	Ave	170	1.7	V	-13.19	24.01	54.00	-29.99
2383.60	44.81	PK	193	1.5	H	-13.14	31.67	74.00	-42.33
2383.60	36.85	Ave	193	1.5	H	-13.14	23.71	54.00	-30.29
2487.80	43.53	PK	241	1.9	V	-13.08	30.45	74.00	-43.55
2487.80	37.60	Ave	241	1.9	V	-13.08	24.52	54.00	-29.48

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	38.18	QP	335	1.5	H	-11.62	26.56	46.00	-19.44
223.45	30.22	QP	216	1.2	V	-11.62	18.60	46.00	-27.40
4924.00	51.57	PK	112	1.8	V	-0.24	51.33	74.00	-22.67
4924.00	49.17	Ave	112	1.8	V	-0.24	48.93	54.00	-5.07
7386.00	45.33	PK	338	1.9	H	2.84	48.17	74.00	-25.83
7386.00	41.09	Ave	338	1.9	H	2.84	43.93	54.00	-10.07
2320.92	45.62	PK	287	1.7	V	-13.19	32.43	74.00	-41.57
2320.92	37.13	Ave	287	1.7	V	-13.19	23.94	54.00	-30.06
2383.51	42.67	PK	89	1.3	H	-13.14	29.53	74.00	-44.47
2383.51	36.27	Ave	89	1.3	H	-13.14	23.13	54.00	-30.87
2490.28	43.40	PK	275	1.1	V	-13.08	30.32	74.00	-43.68
2490.28	37.00	Ave	275	1.1	V	-13.08	23.92	54.00	-30.08

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	38.17	QP	218	1.8	H	-11.62	26.55	46.00	-19.45
223.45	31.33	QP	147	1.5	V	-11.62	19.71	46.00	-26.29
4824.00	51.31	PK	298	1.9	V	-1.06	50.25	74.00	-23.75
4824.00	50.35	Ave	298	1.9	V	-1.06	49.29	54.00	-4.71
7236.00	43.90	PK	192	1.0	H	1.33	45.23	74.00	-28.77
7236.00	39.78	Ave	192	1.0	H	1.33	41.11	54.00	-12.89
2335.92	45.98	PK	42	1.8	V	-13.19	32.79	74.00	-41.21
2335.92	37.94	Ave	42	1.8	V	-13.19	24.75	54.00	-29.25
2379.52	43.34	PK	343	1.8	H	-13.14	30.20	74.00	-43.80
2379.52	38.65	Ave	343	1.8	H	-13.14	25.51	54.00	-28.49
2490.22	44.32	PK	2	1.7	V	-13.08	31.24	74.00	-42.76
2490.22	36.72	Ave	2	1.7	V	-13.08	23.64	54.00	-30.36

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Middle Channel 2437MHz									
223.45	39.63	QP	266	1.3	H	-11.62	28.01	46.00	-17.99
223.45	31.96	QP	95	1.2	V	-11.62	20.34	46.00	-25.66
4874.00	51.15	PK	214	1.9	V	-0.62	50.53	74.00	-23.47
4874.00	51.41	Ave	214	1.9	V	-0.62	50.79	54.00	-3.21
7311.00	44.37	PK	11	1.3	H	2.21	46.58	74.00	-27.42
7311.00	39.41	Ave	11	1.3	H	2.21	41.62	54.00	-12.38
2314.25	45.23	PK	227	1.2	V	-13.19	32.04	74.00	-41.96
2314.25	39.96	Ave	227	1.2	V	-13.19	26.77	54.00	-27.23
2381.66	43.85	PK	41	1.4	H	-13.14	30.71	74.00	-43.29
2381.66	38.03	Ave	41	1.4	H	-13.14	24.89	54.00	-29.11
2491.53	43.64	PK	324	1.4	V	-13.08	30.56	74.00	-43.44
2491.53	36.49	Ave	324	1.4	V	-13.08	23.41	54.00	-30.59

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	41.04	QP	280	1.4	H	-11.62	29.42	46.00	-16.58
223.45	31.94	QP	184	1.5	V	-11.62	20.32	46.00	-25.68
4924.00	51.47	PK	178	1.0	V	-0.24	51.23	74.00	-22.77
4924.00	50.91	Ave	178	1.0	V	-0.24	50.67	54.00	-3.33
7386.00	43.89	PK	24	1.7	H	2.84	46.73	74.00	-27.27
7386.00	38.85	Ave	24	1.7	H	2.84	41.69	54.00	-12.31
2339.82	46.19	PK	195	1.5	V	-13.19	33.00	74.00	-41.00
2339.82	37.76	Ave	195	1.5	V	-13.19	24.57	54.00	-29.43
2378.82	42.45	PK	247	1.8	H	-13.14	29.31	74.00	-44.69
2378.82	38.36	Ave	247	1.8	H	-13.14	25.22	54.00	-28.78
2490.33	42.64	PK	22	1.9	V	-13.08	29.56	74.00	-44.44
2490.33	37.16	Ave	22	1.9	V	-13.08	24.08	54.00	-29.92

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)
(ANT0+ANT1) 11n20: Low Channel 2412MHz									
223.45	40.66	QP	138	1.1	H	-11.62	29.04	46.00	-16.96
223.45	32.72	QP	355	1.7	V	-11.62	21.10	46.00	-24.90
4824.00	50.04	PK	18	1.8	V	-1.06	48.98	74.00	-25.02
4824.00	49.58	Ave	18	1.8	V	-1.06	48.52	54.00	-5.48
7236.00	44.76	PK	52	1.7	H	1.33	46.09	74.00	-27.91
7236.00	37.45	Ave	52	1.7	H	1.33	38.78	54.00	-15.22
2333.47	46.20	PK	173	1.5	V	-13.19	33.01	74.00	-40.99
2333.47	38.39	Ave	173	1.5	V	-13.19	25.20	54.00	-28.80
2364.63	44.47	PK	82	1.8	H	-13.14	31.33	74.00	-42.67
2364.63	37.61	Ave	82	1.8	H	-13.14	24.47	54.00	-29.53
2484.57	42.60	PK	35	1.9	V	-13.08	29.52	74.00	-44.48
2484.57	37.29	Ave	35	1.9	V	-13.08	24.21	54.00	-29.79

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)
(ANT0+ANT1) 11n20: Middle Channel 2437MHz									
223.45	39.50	QP	297	1.2	H	-11.62	27.88	46.00	-18.12
223.45	31.58	QP	62	1.8	V	-11.62	19.96	46.00	-26.04
4874.00	49.41	PK	263	1.6	V	-0.62	48.79	74.00	-25.21
4874.00	50.09	Ave	263	1.6	V	-0.62	49.47	54.00	-4.53
7311.00	44.88	PK	169	1.7	H	2.21	47.09	74.00	-26.91
7311.00	38.76	Ave	169	1.7	H	2.21	40.97	54.00	-13.03
2325.52	46.34	PK	120	1.9	V	-13.19	33.15	74.00	-40.85
2325.52	37.51	Ave	120	1.9	V	-13.19	24.32	54.00	-29.68
2353.05	43.39	PK	179	1.5	H	-13.14	30.25	74.00	-43.75
2353.05	36.74	Ave	179	1.5	H	-13.14	23.60	54.00	-30.40
2487.17	43.91	PK	134	1.9	V	-13.08	30.83	74.00	-43.17
2487.17	37.07	Ave	134	1.9	V	-13.08	23.99	54.00	-30.01

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
(ANT0+ANT1) 11n20: High Channel 2462MHz									
223.45	40.73	QP	303	1.4	H	-11.62	29.11	46.00	-16.89
223.45	32.70	QP	289	1.4	V	-11.62	21.08	46.00	-24.92
4924.00	48.50	PK	240	1.5	V	-0.24	48.26	74.00	-25.74
4924.00	49.21	Ave	240	1.5	V	-0.24	48.97	54.00	-5.03
7386.00	45.02	PK	259	1.1	H	2.84	47.86	74.00	-26.14
7386.00	37.56	Ave	259	1.1	H	2.84	40.40	54.00	-13.60
2333.44	45.93	PK	82	1.1	V	-13.19	32.74	74.00	-41.26
2333.44	38.04	Ave	82	1.1	V	-13.19	24.85	54.00	-29.15
2381.31	43.75	PK	3	1.7	H	-13.14	30.61	74.00	-43.39
2381.31	37.62	Ave	3	1.7	H	-13.14	24.48	54.00	-29.52
2496.13	43.90	PK	307	1.6	V	-13.08	30.82	74.00	-43.18
2496.13	38.94	Ave	307	1.6	V	-13.08	25.86	54.00	-28.14

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)
(ANT0+ANT1) 11n40: Low Channel 2422MHz									
223.45	41.20	QP	23	1.6	H	-11.62	29.58	46.00	-16.42
223.45	32.05	QP	143	1.5	V	-11.62	20.43	46.00	-25.57
4844.00	46.15	PK	132	1.1	V	-1.06	45.09	74.00	-28.91
4844.00	47.16	Ave	132	1.1	V	-1.06	46.10	54.00	-7.90
7266.00	42.88	PK	121	1.9	H	1.33	44.21	74.00	-29.79
7266.00	35.52	Ave	121	1.9	H	1.33	36.85	54.00	-17.15
2341.03	46.11	PK	320	1.4	V	-13.19	32.92	74.00	-41.08
2341.03	38.60	Ave	320	1.4	V	-13.19	25.41	54.00	-28.59
2372.42	44.70	PK	359	1.7	H	-13.14	31.56	74.00	-42.44
2372.42	37.36	Ave	359	1.7	H	-13.14	24.22	54.00	-29.78
2494.62	42.14	PK	212	1.5	V	-13.08	29.06	74.00	-44.94
2494.62	38.61	Ave	212	1.5	V	-13.08	25.53	54.00	-28.47

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
(ANT0+ANT1) 11n40: Middle Channel 2437MHz									
223.45	41.31	QP	194	1.9	H	-11.62	29.69	46.00	-16.31
223.45	31.58	QP	28	1.4	V	-11.62	19.96	46.00	-26.04
4874.00	46.93	PK	118	1.3	V	-0.62	46.31	74.00	-27.69
4874.00	46.74	Ave	118	1.3	V	-0.62	46.12	54.00	-7.88
7311.00	43.51	PK	275	1.4	H	2.21	45.72	74.00	-28.28
7311.00	35.05	Ave	275	1.4	H	2.21	37.26	54.00	-16.74
2317.18	46.51	PK	235	1.1	V	-13.19	33.32	74.00	-40.68
2317.18	38.86	Ave	235	1.1	V	-13.19	25.67	54.00	-28.33
2370.66	43.62	PK	244	1.2	H	-13.14	30.48	74.00	-43.52
2370.66	36.33	Ave	244	1.2	H	-13.14	23.19	54.00	-30.81
2492.58	44.04	PK	330	2.0	V	-13.08	30.96	74.00	-43.04
2492.58	37.03	Ave	330	2.0	V	-13.08	23.95	54.00	-30.05

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)
(ANT0+ANT1) 11n40: High Channel 2452MHz									
223.45	41.42	QP	202	1.4	H	-11.62	29.80	46.00	-16.20
223.45	30.71	QP	129	1.2	V	-11.62	19.09	46.00	-26.91
4904.00	47.74	PK	132	1.0	V	-0.24	47.50	74.00	-26.50
4904.00	45.91	Ave	132	1.0	V	-0.24	45.67	54.00	-8.33
7356.00	43.77	PK	306	1.2	H	2.84	46.61	74.00	-27.39
7356.00	35.40	Ave	306	1.2	H	2.84	38.24	54.00	-15.76
2341.77	45.84	PK	138	1.6	V	-13.19	32.65	74.00	-41.35
2341.77	38.60	Ave	138	1.6	V	-13.19	25.41	54.00	-28.59
2367.80	44.62	PK	203	1.5	H	-13.14	31.48	74.00	-42.52
2367.80	36.07	Ave	203	1.5	H	-13.14	22.93	54.00	-31.07
2492.76	42.79	PK	140	1.1	V	-13.08	29.71	74.00	-44.29
2492.76	38.10	Ave	140	1.1	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.

9 Duty cycle

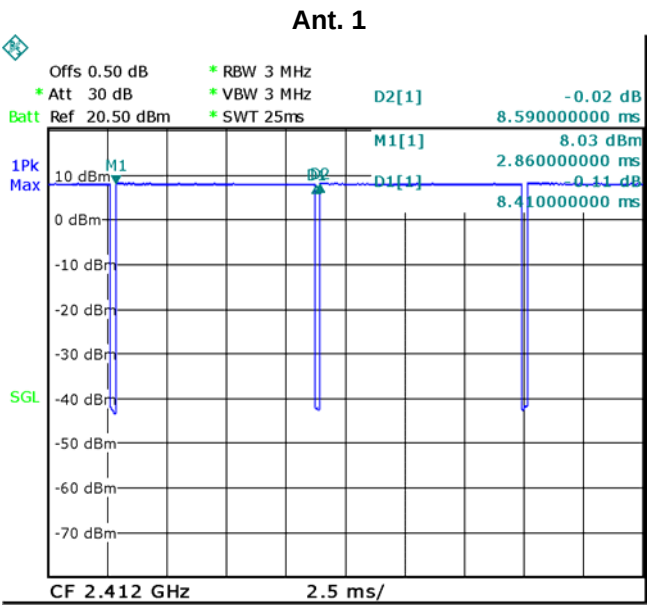
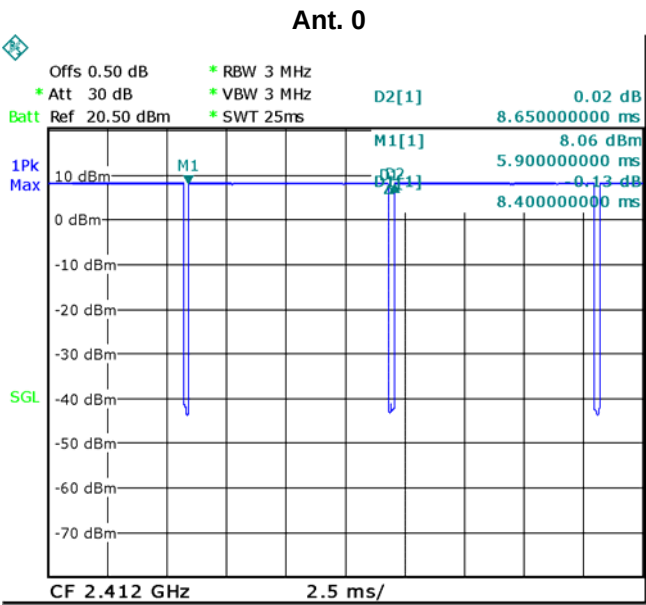
Ant.	Type of Modulation	On time ms	Period ms	Duty Cycle linear	Duty Cycle %	Duty Cycle Factor(dB)	Average Factor(dB)
Ant. 0	802.11b	8.40	8.65	0.97	97.11	0.13	-0.25
Ant. 1	802.11b	8.41	8.59	0.98	97.90	0.09	-0.18

Remark:

Duty cycle=On Time/period;

Duty cycle factor=10*log(1/Duty cycle);

Average factor=20log₁₀Duty cycle



10 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 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.

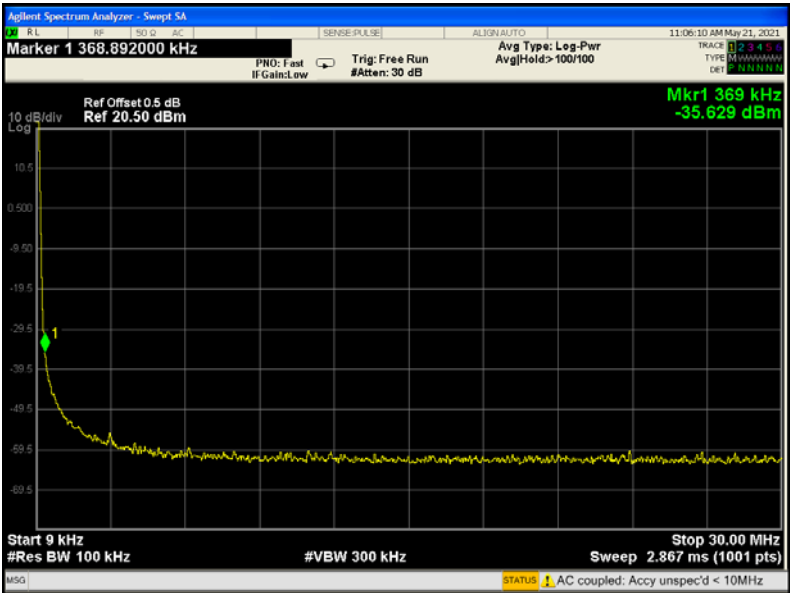
10.2 Test Result

Antenna 0

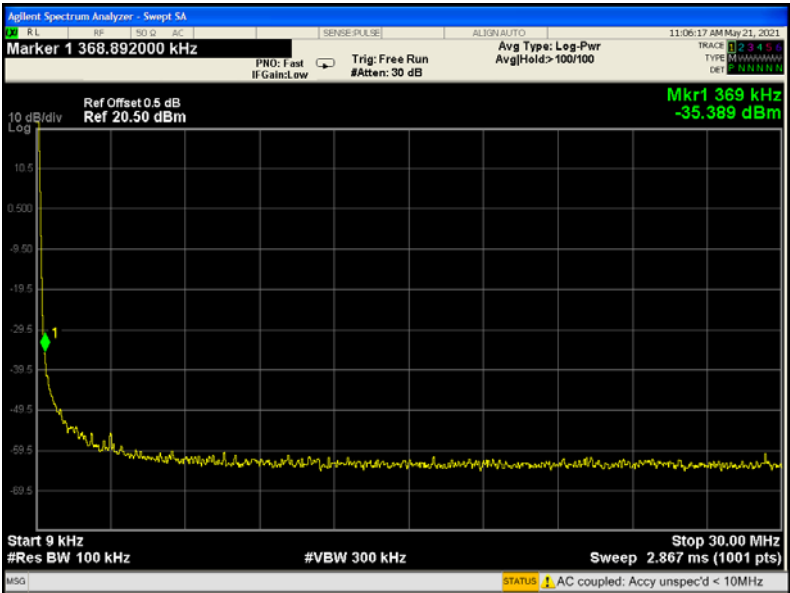
9KHz – 30MHz

802.11b

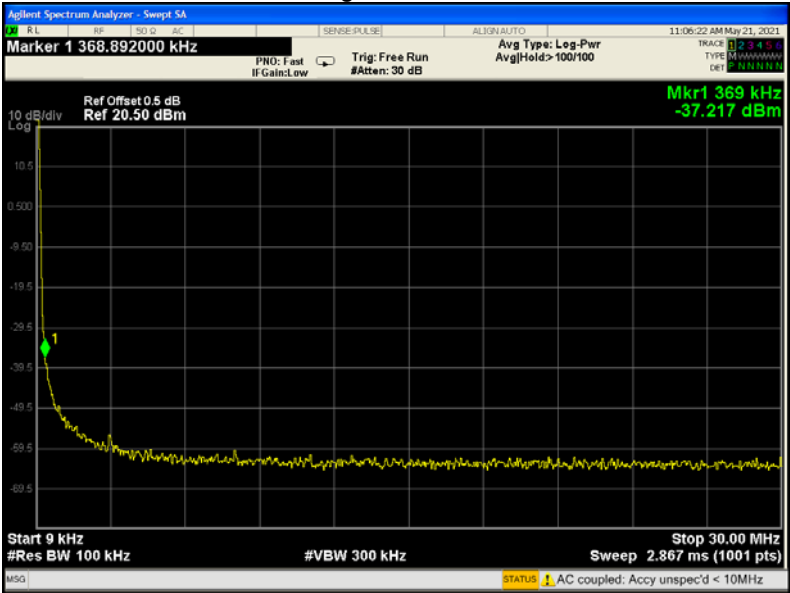
Low Channel



Middle Channel

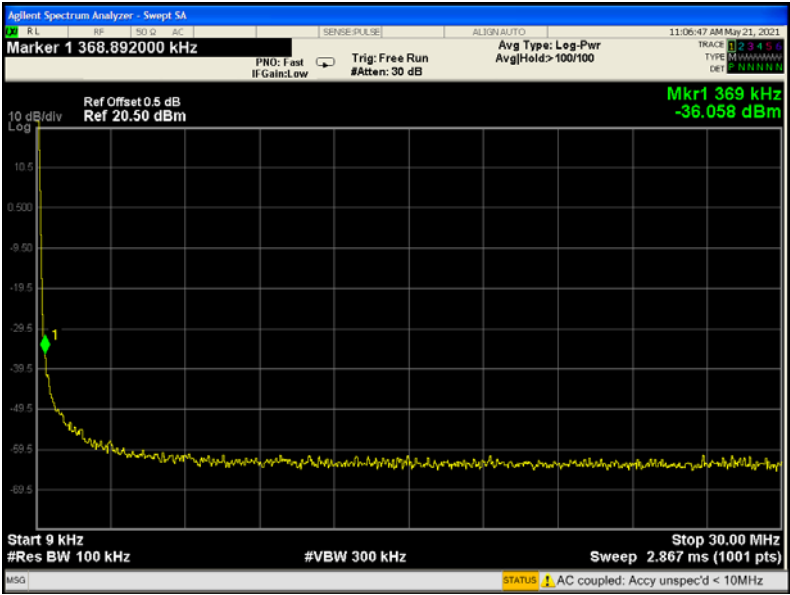


High Channel

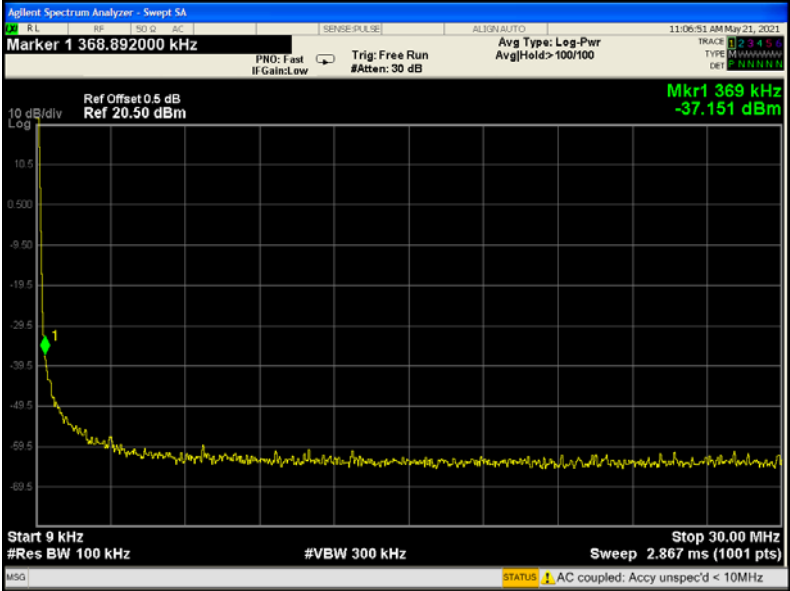


802.11g

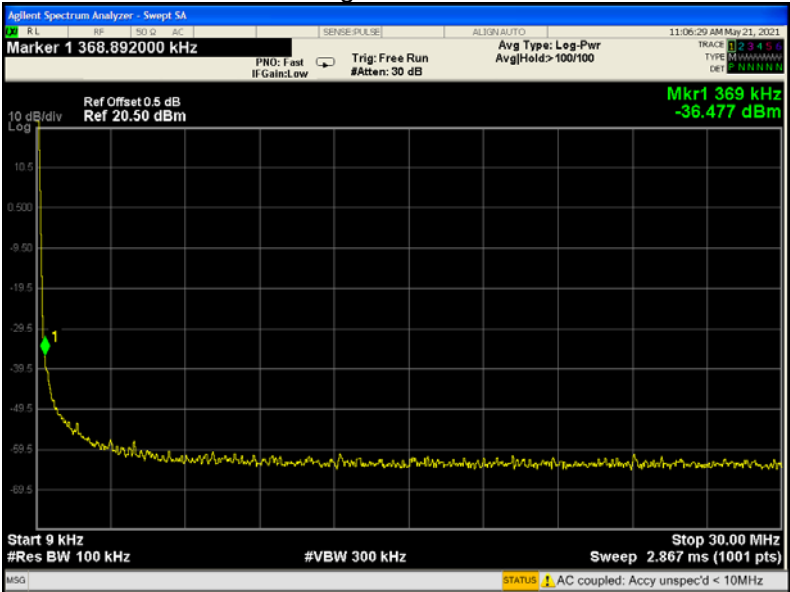
Low Channel



Middle Channel

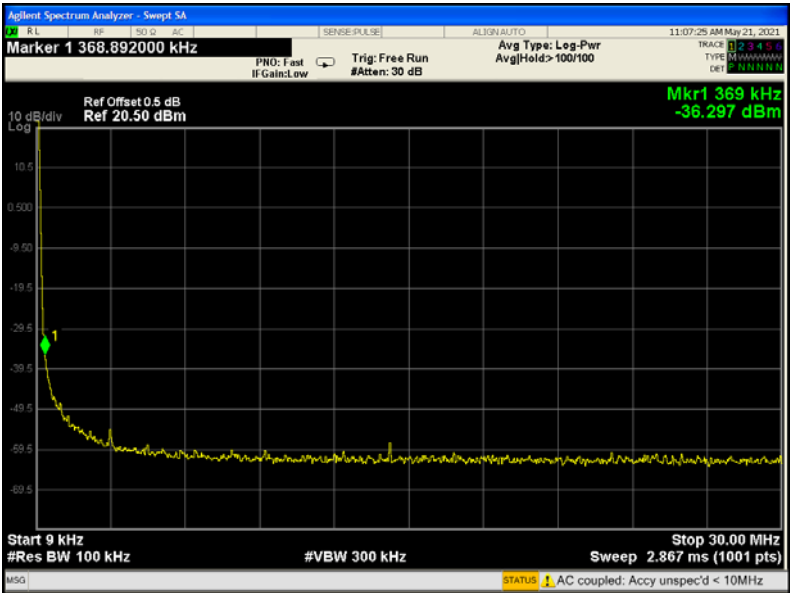


High Channel

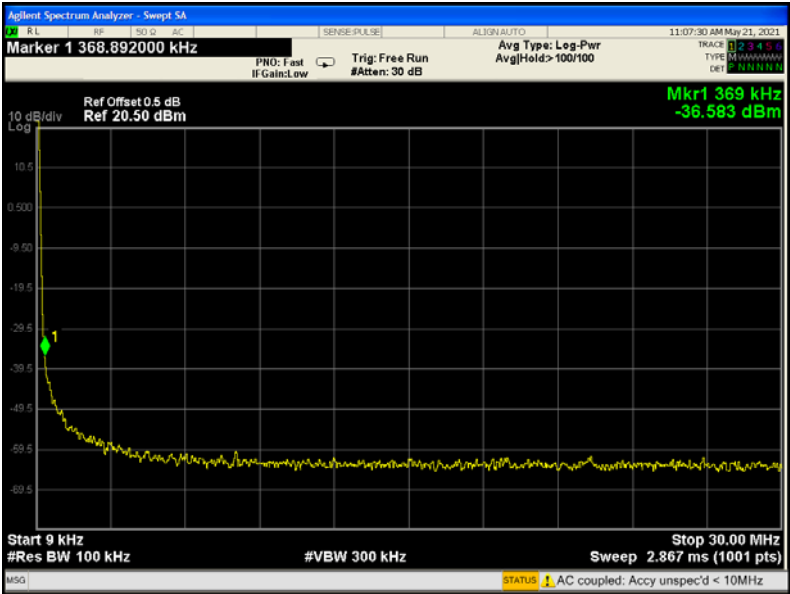


802.11n HT20

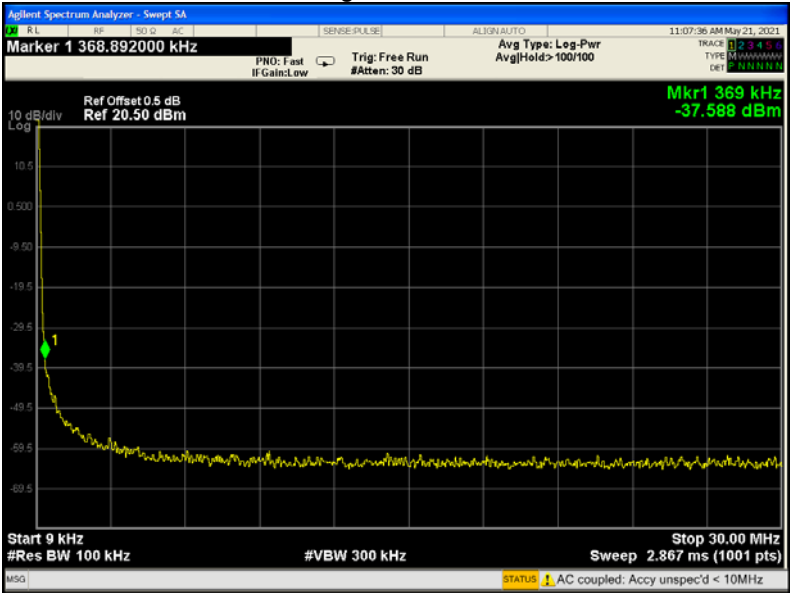
Low Channel



Middle Channel

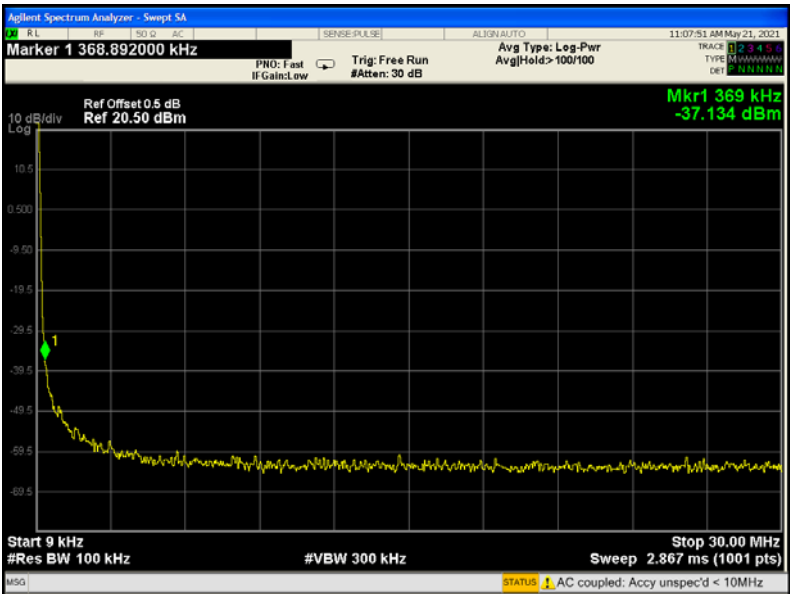


High Channel

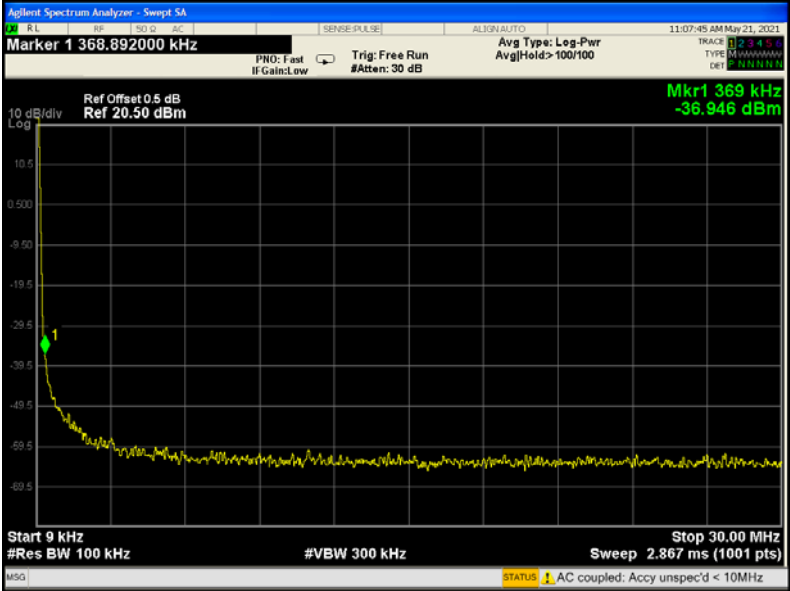


802.11n HT40

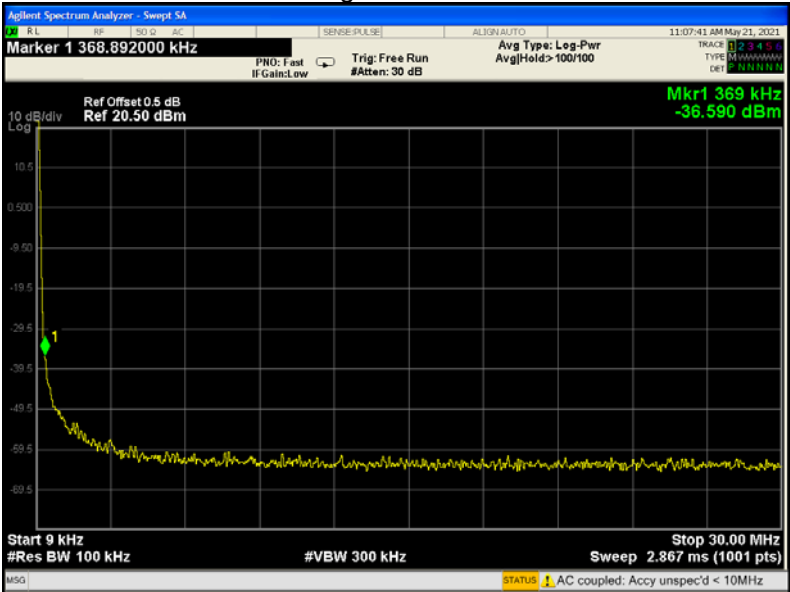
Low Channel



Middle Channel

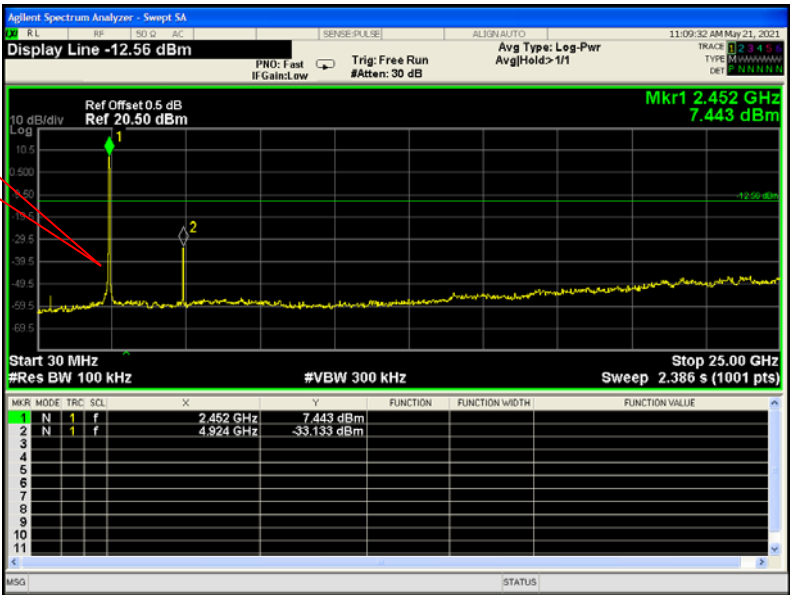


High Channel



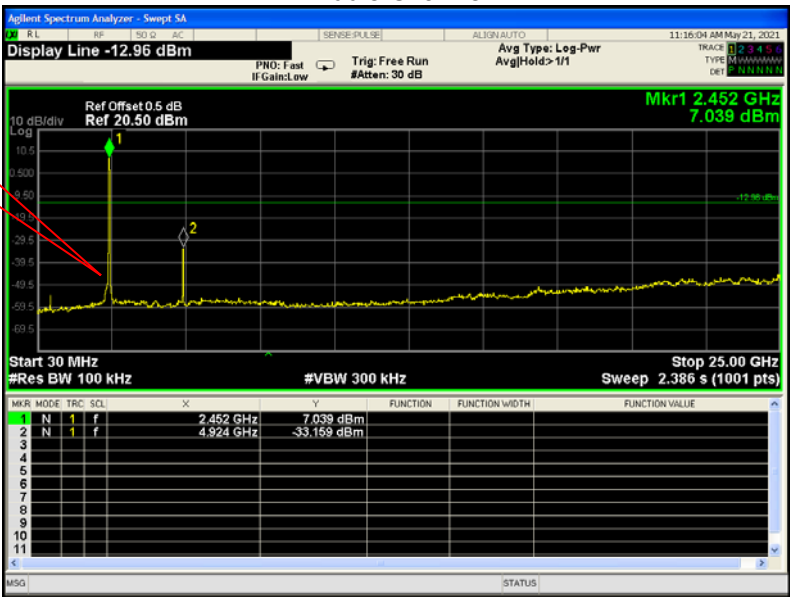
Above 30MHz
802.11b
Low Channel

Fundamental



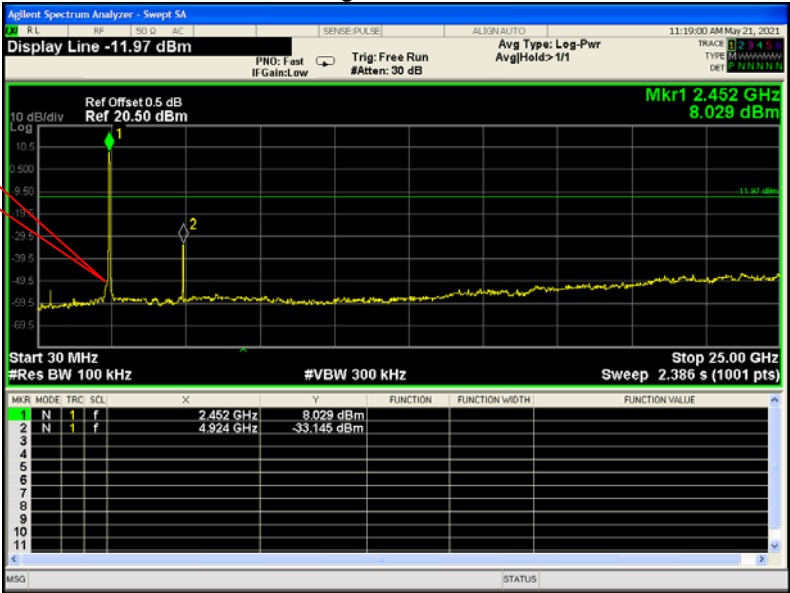
Middle Channel

Fundamental



High Channel

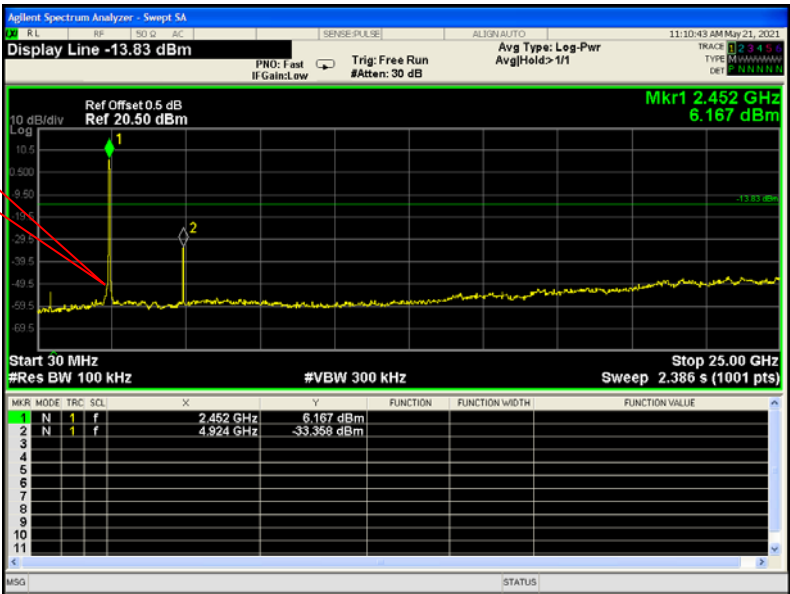
Fundamental



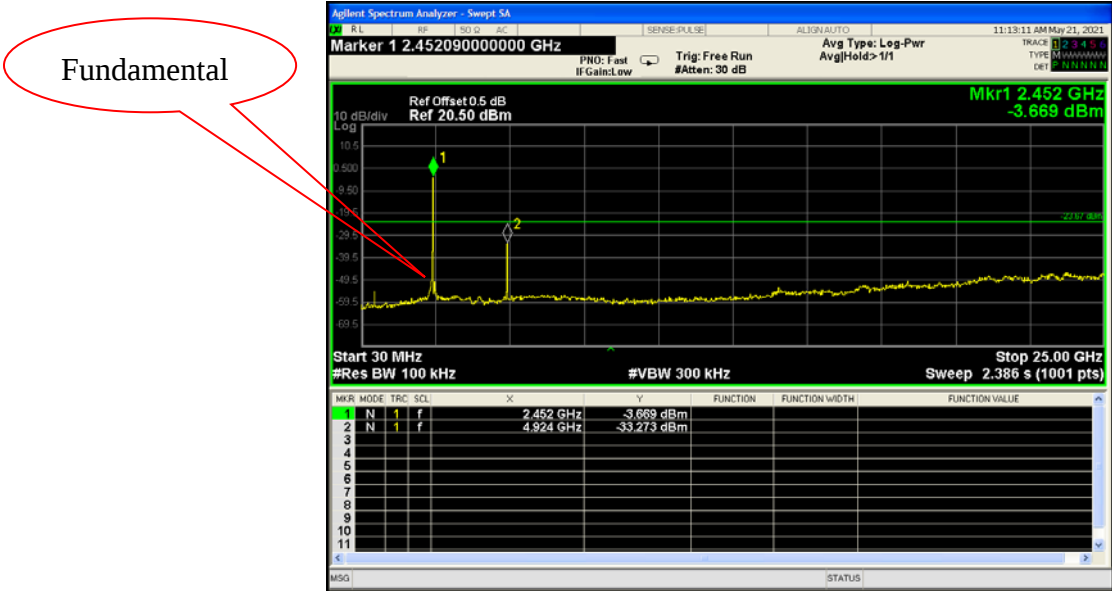
802.11g

Low Channel

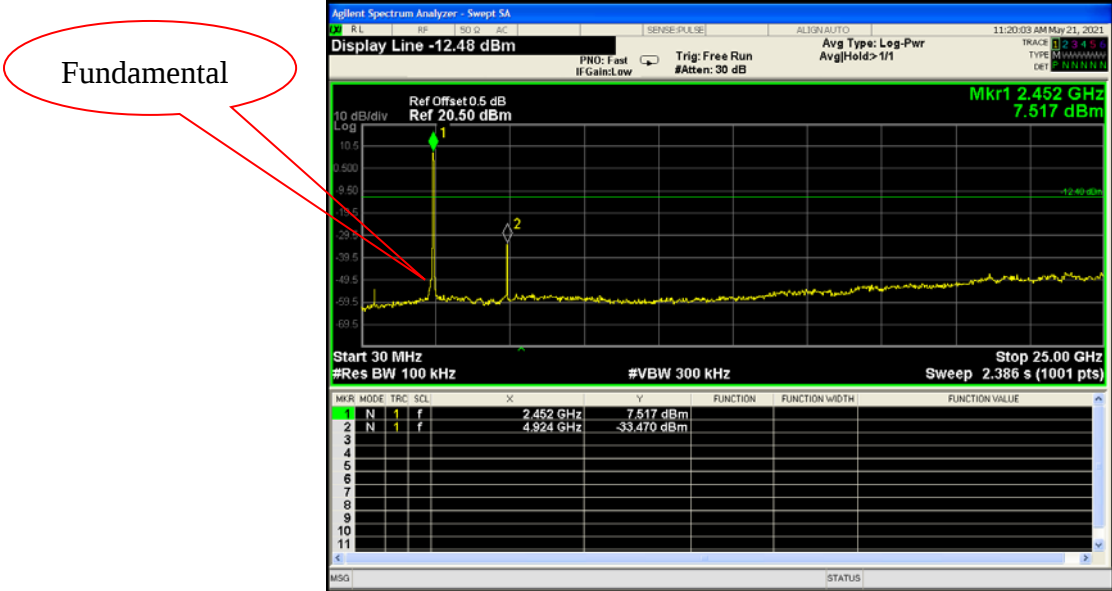
Fundamental



Middle Channel



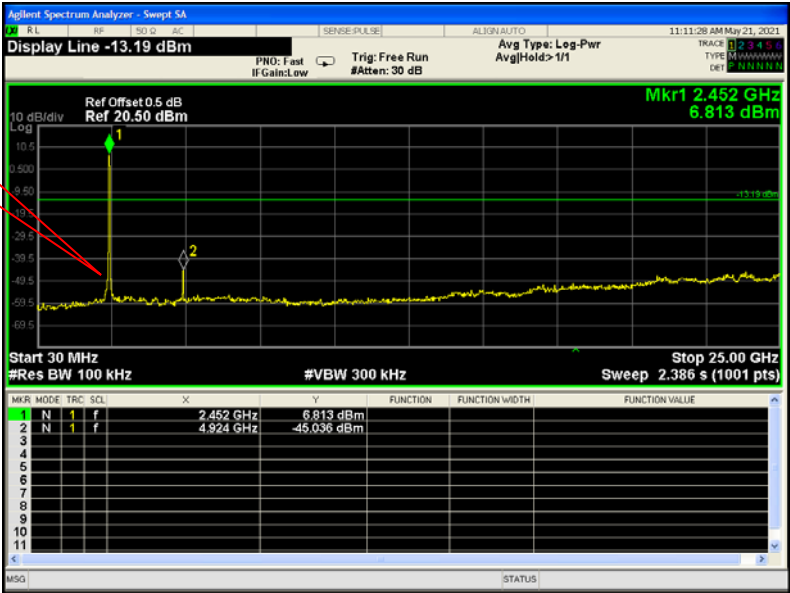
High Channel



802.11n HT20

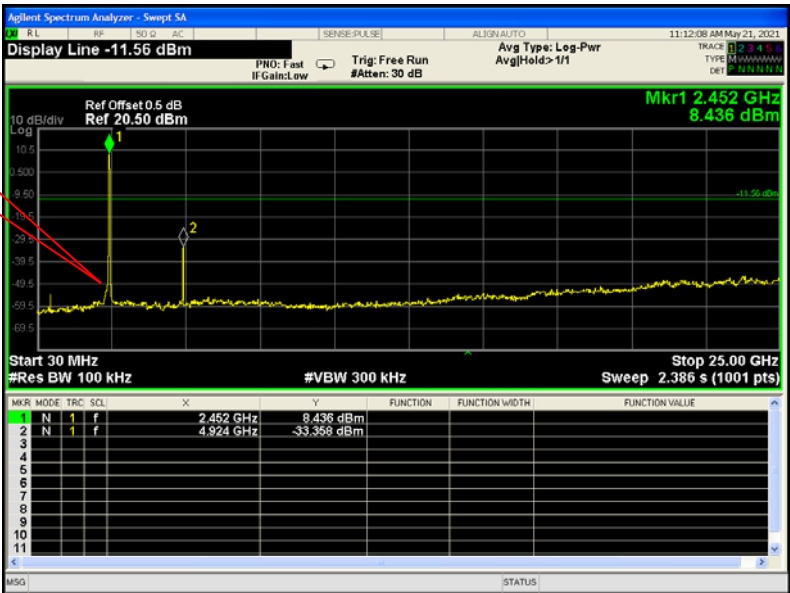
Low Channel

Fundamental



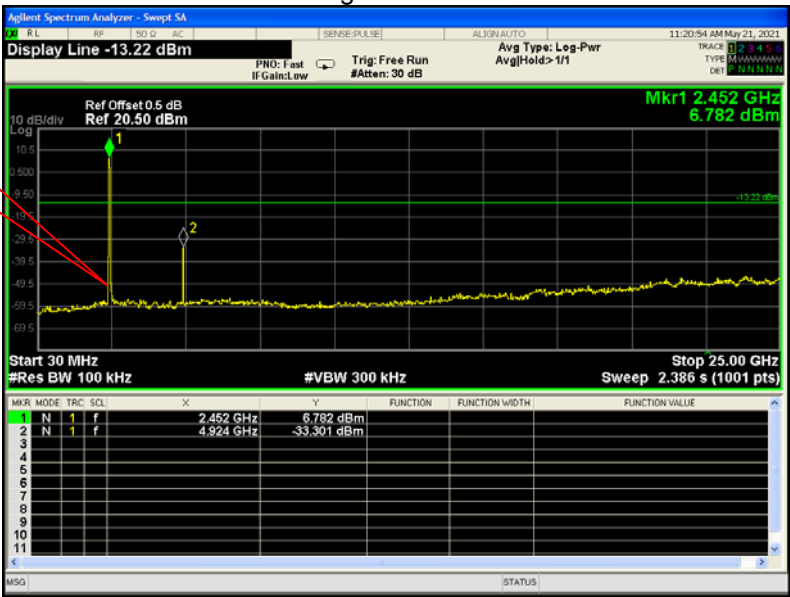
Middle Channel

Fundamental



High Channel

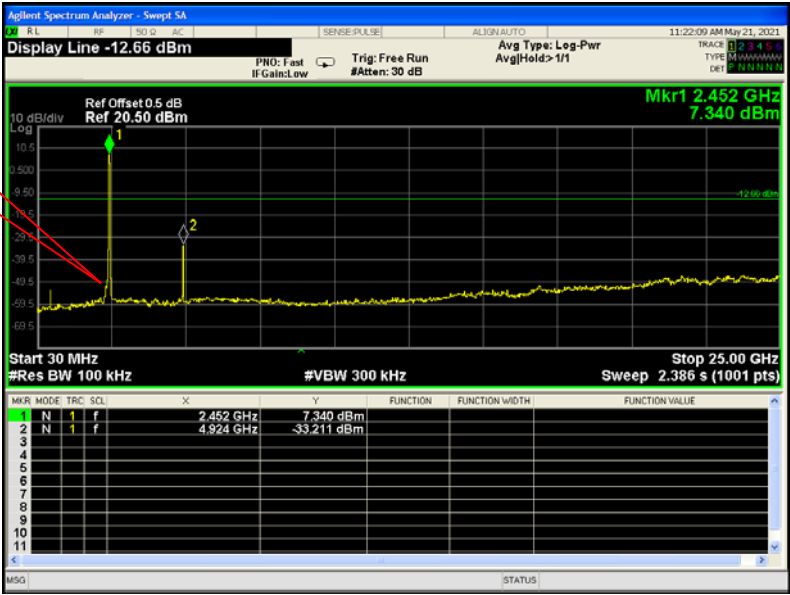
Fundamental



802.11n HT40

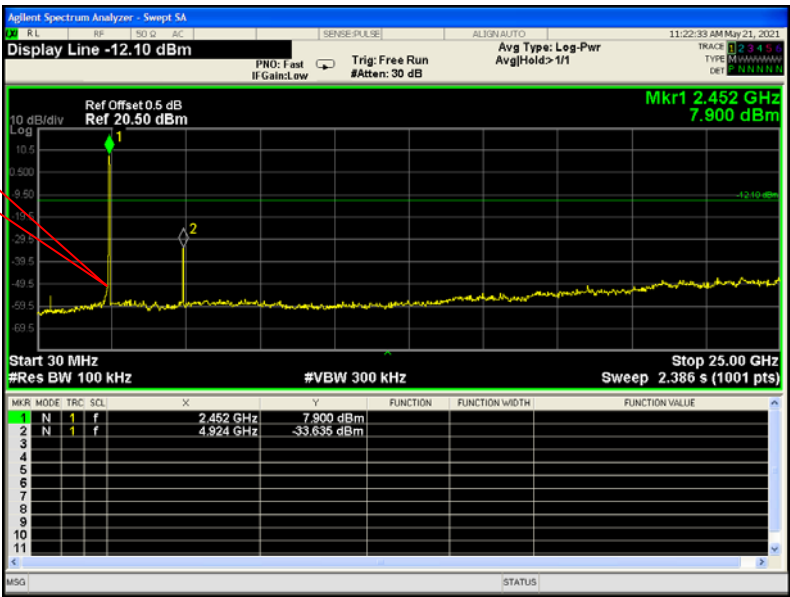
Low Channel

Fundamental



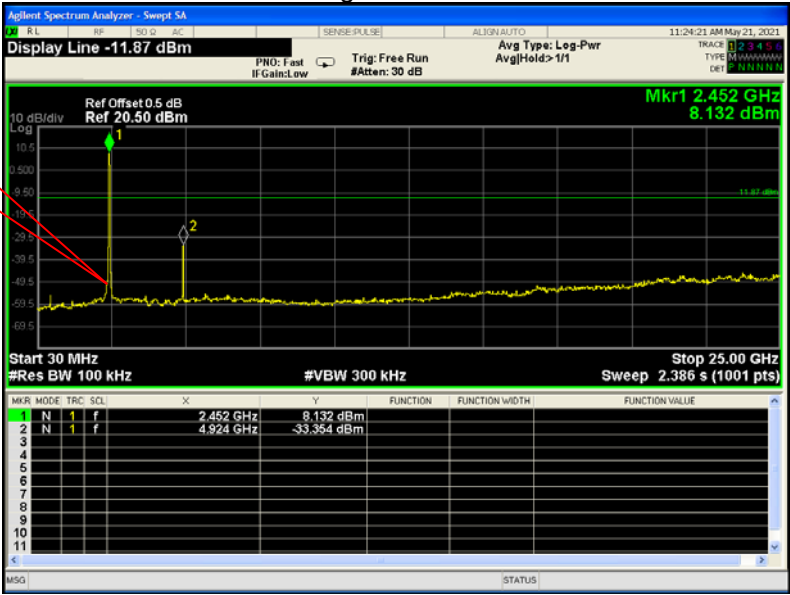
Middle Channel

Fundamental

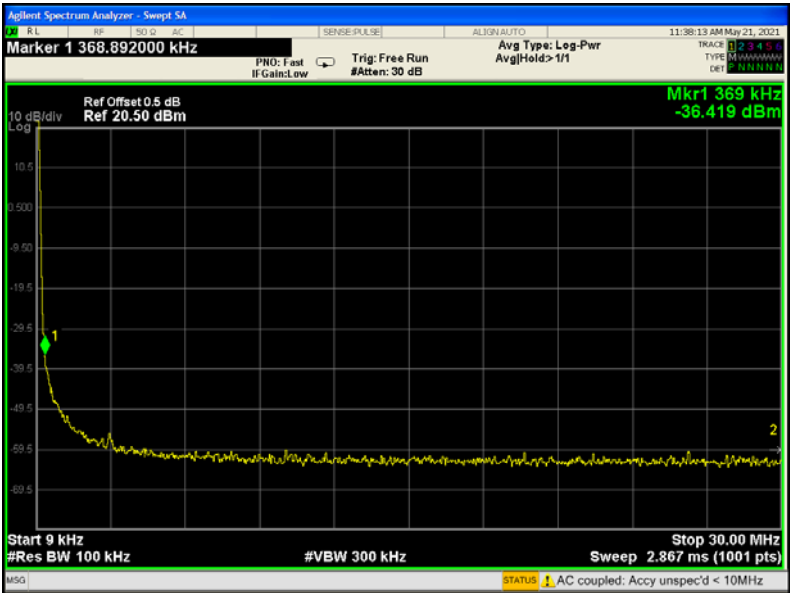


High Channel

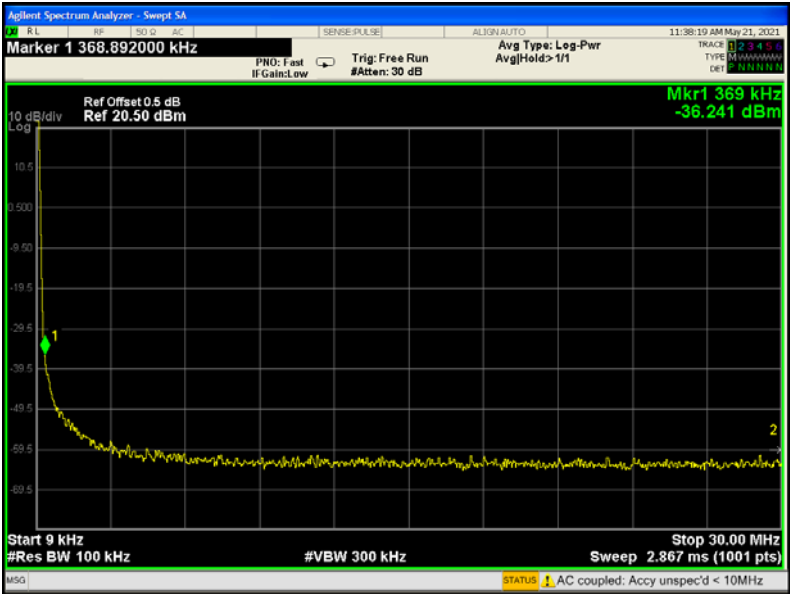
Fundamental



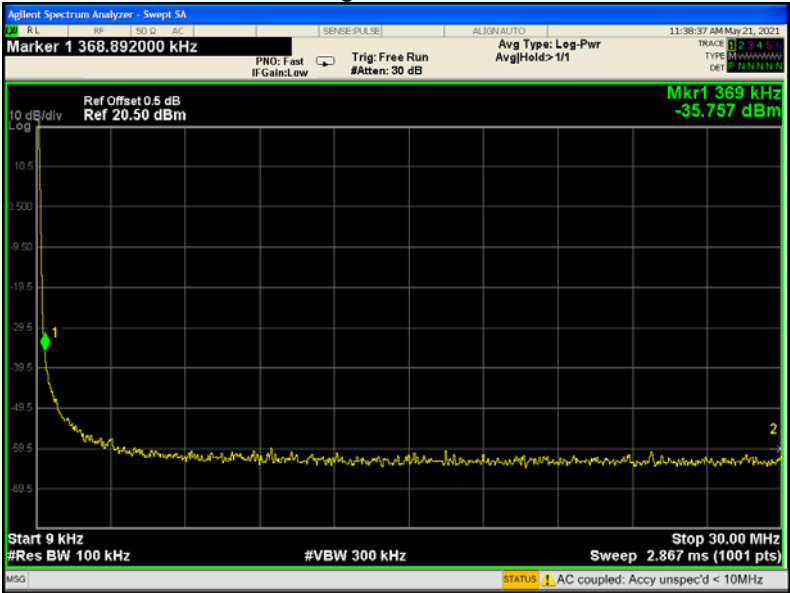
Antenna 1
9KHz – 30MHz
802.11b
Low Channel



Middle Channel

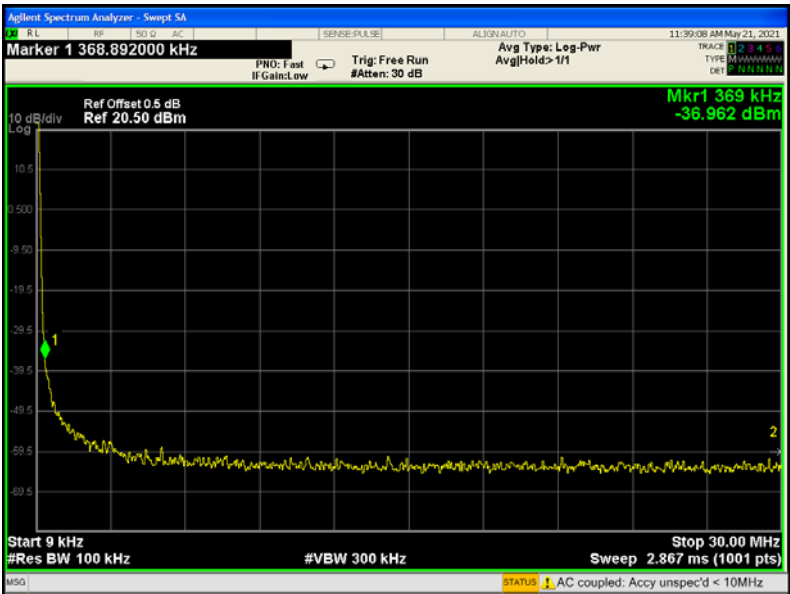


High Channel

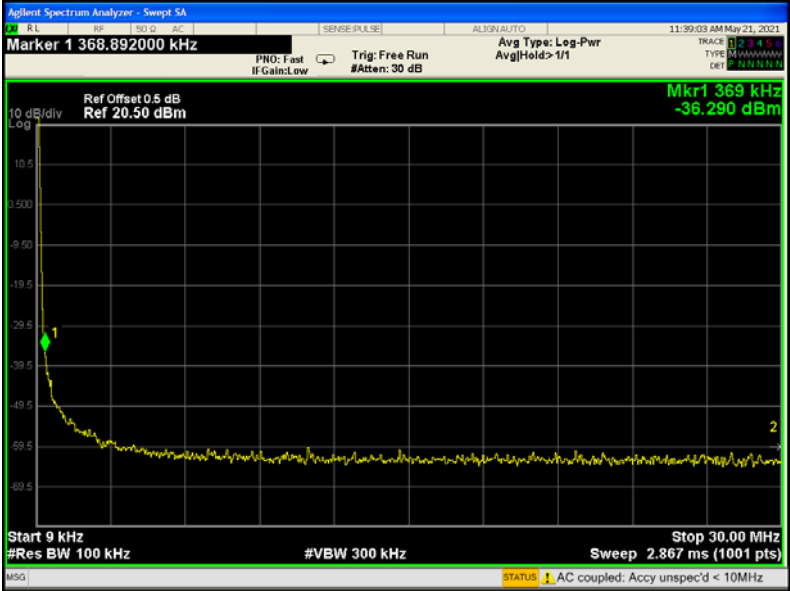


802.11g

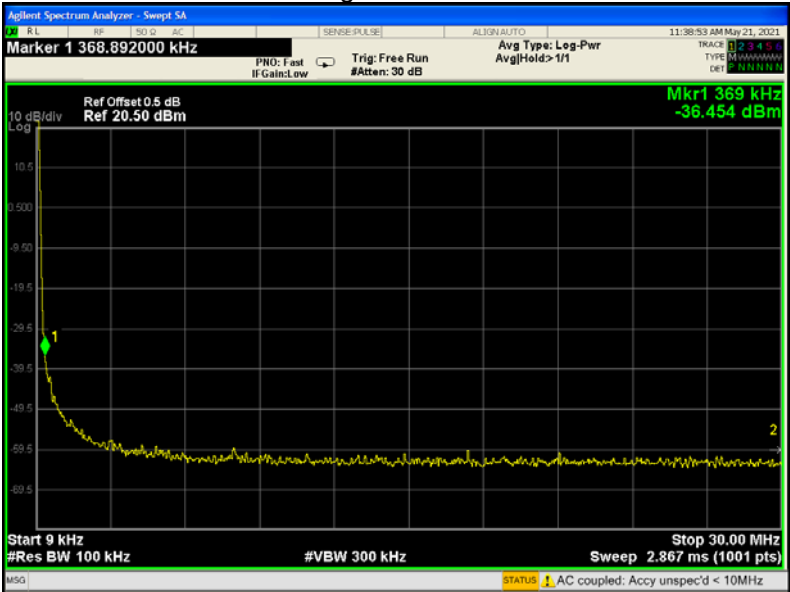
Low Channel



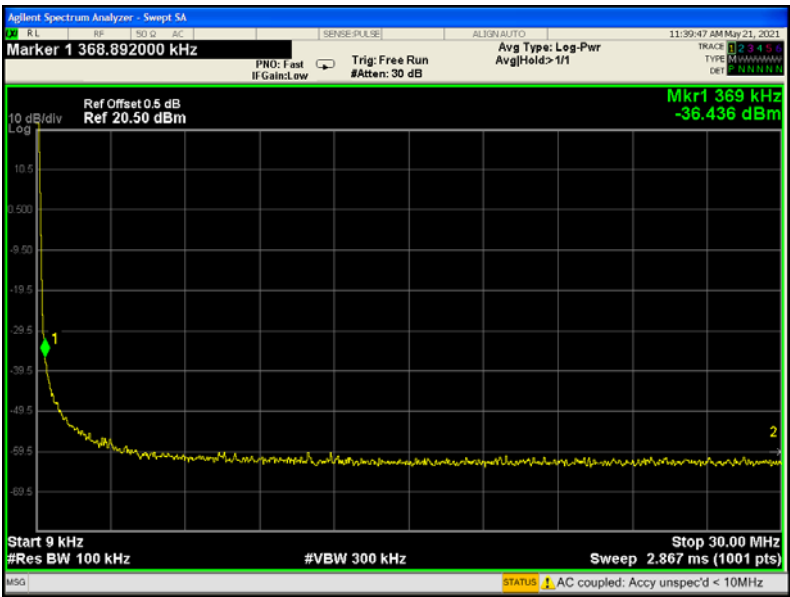
Middle Channel



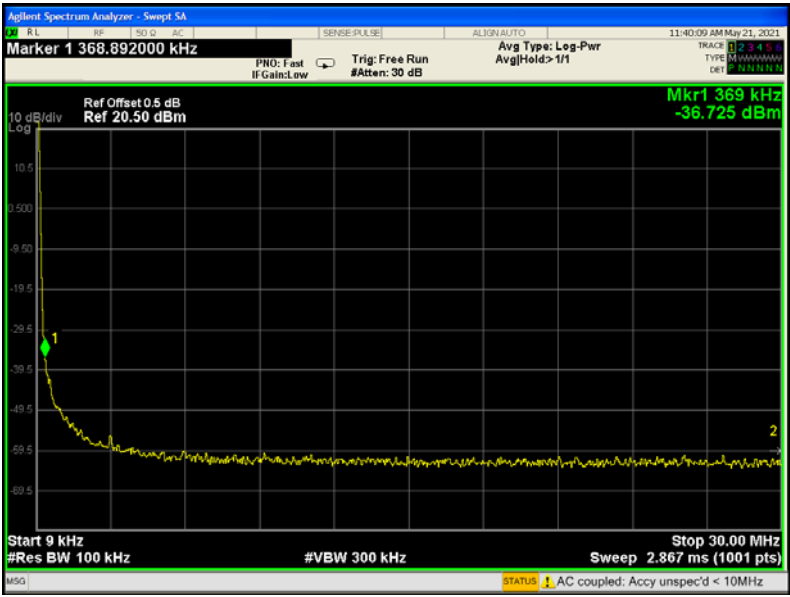
High Channel



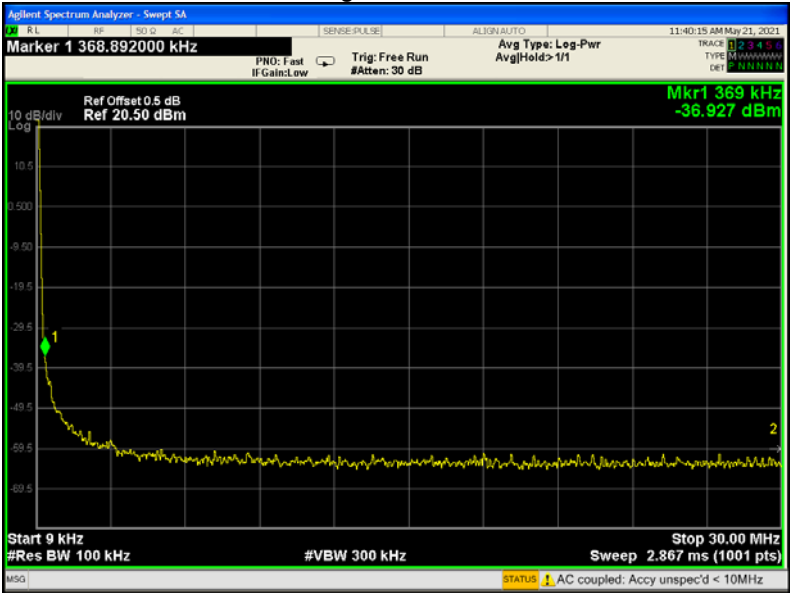
802.11n HT20
Low Channel



Middle Channel

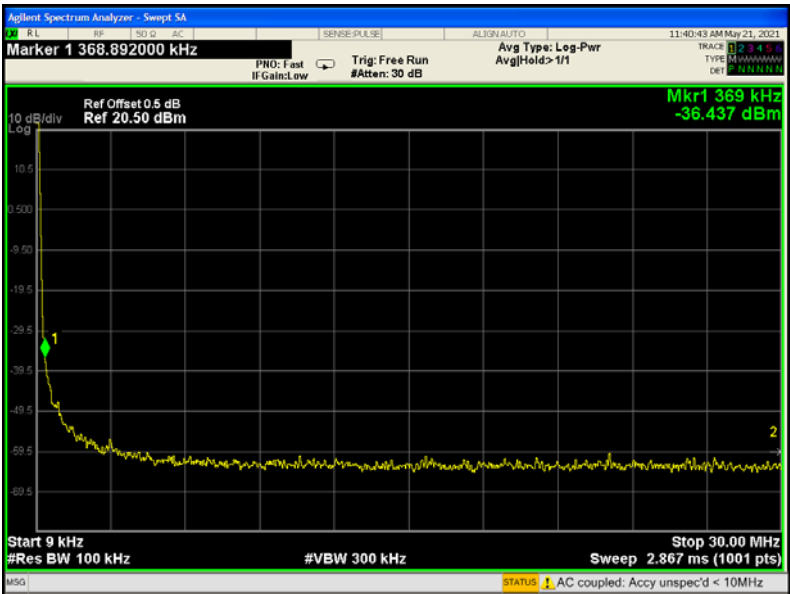


High Channel

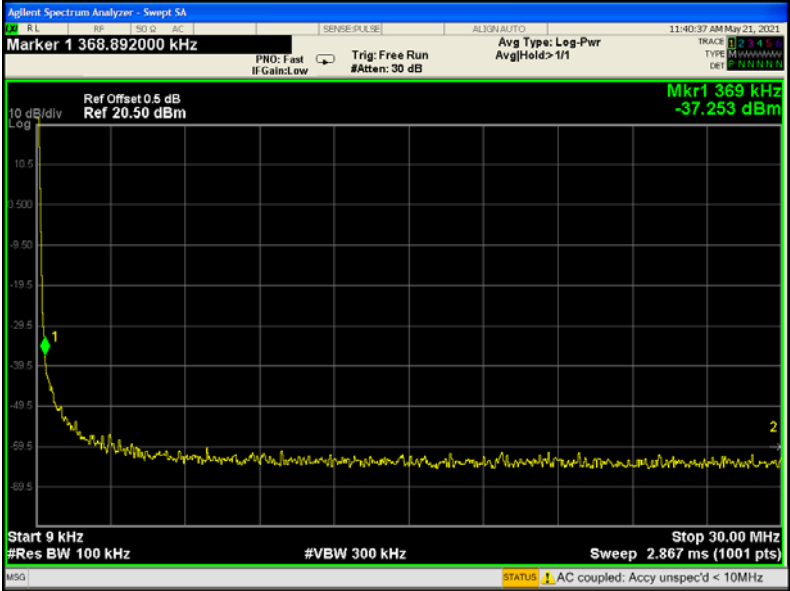


802.11n HT40

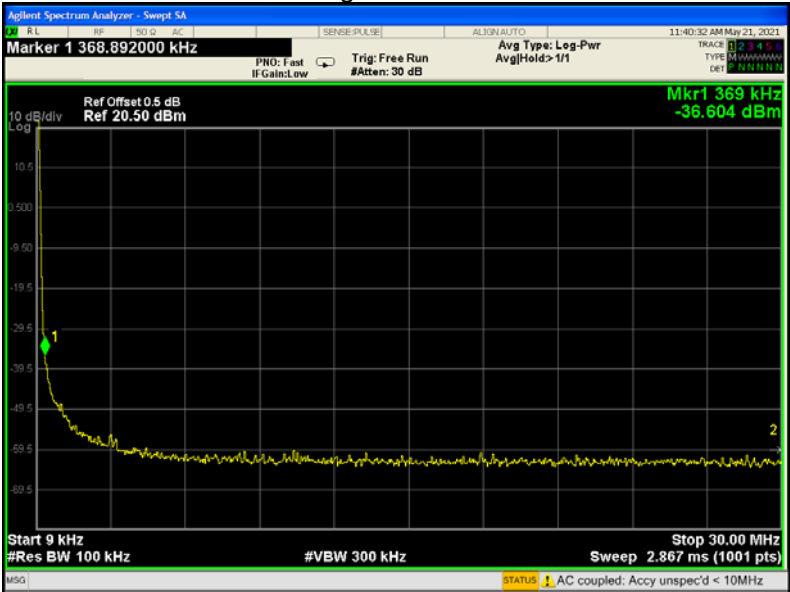
Low Channel



Middle Channel

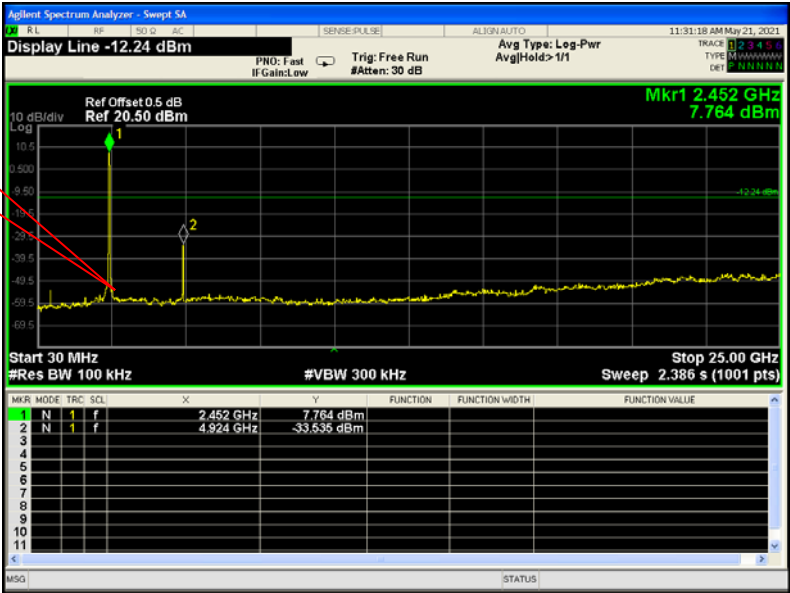


High Channel



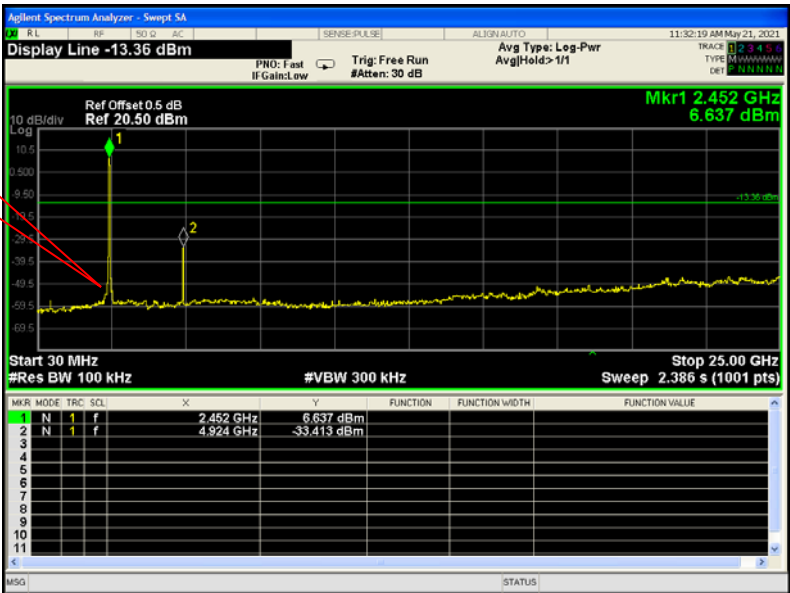
Above 30MHz
802.11b
Low Channel

Fundamental



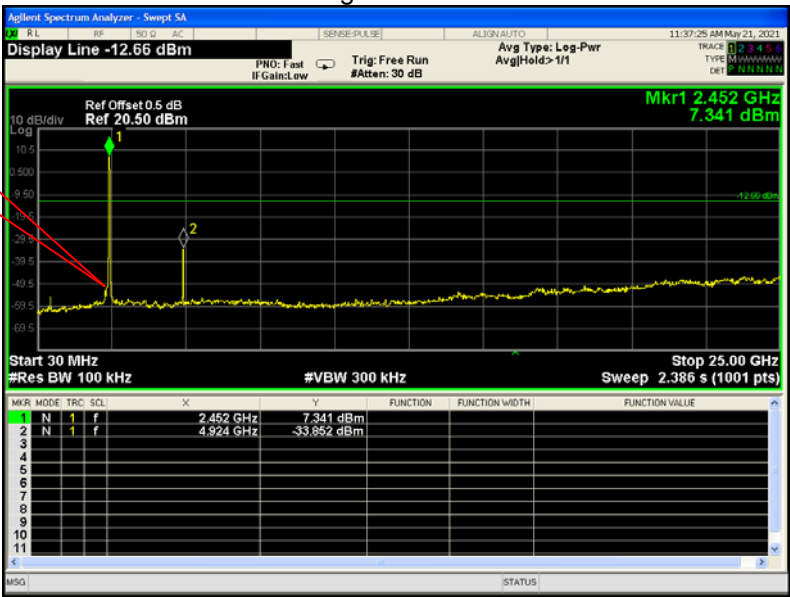
Middle Channel

Fundamental



High Channel

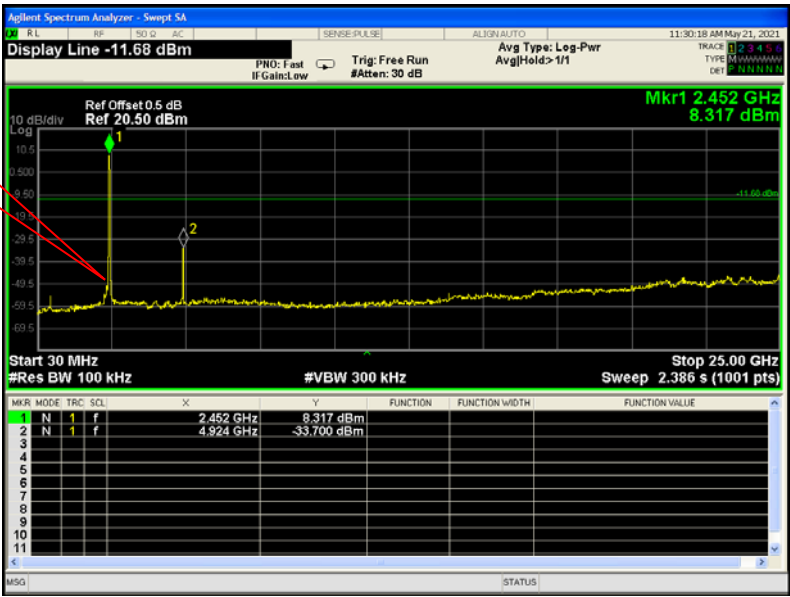
Fundamental



802.11g

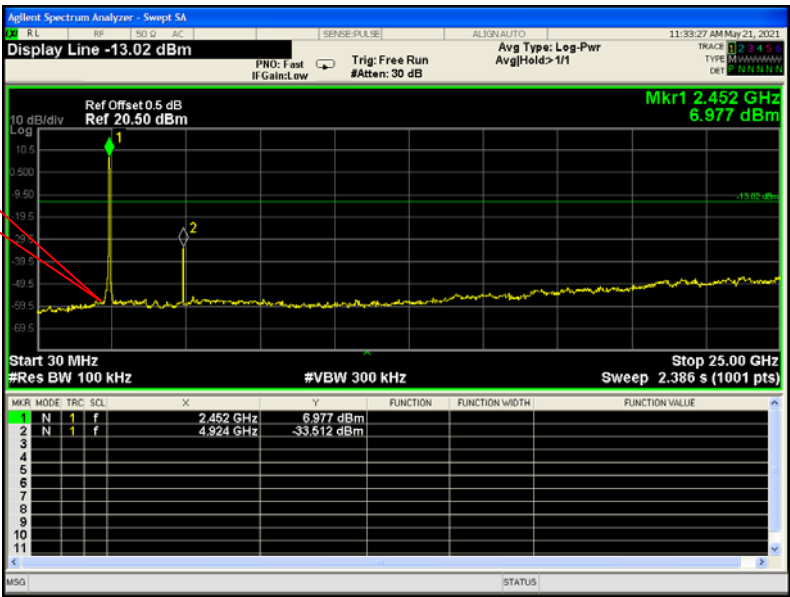
Low Channel

Fundamental



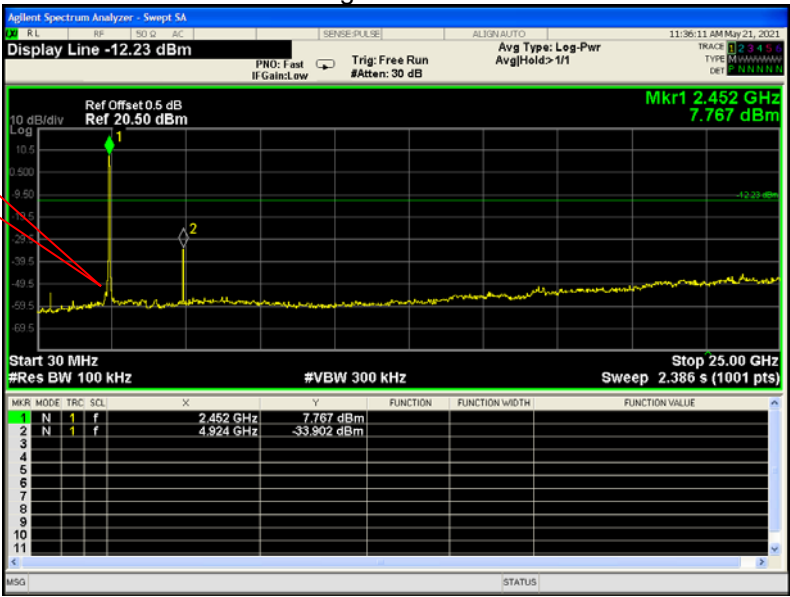
Middle Channel

Fundamental



High Channel

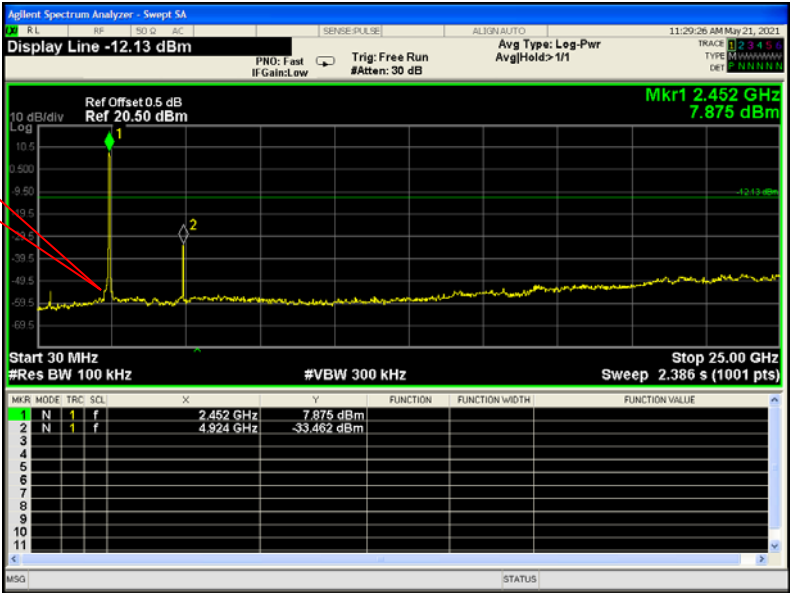
Fundamental



802.11n HT20

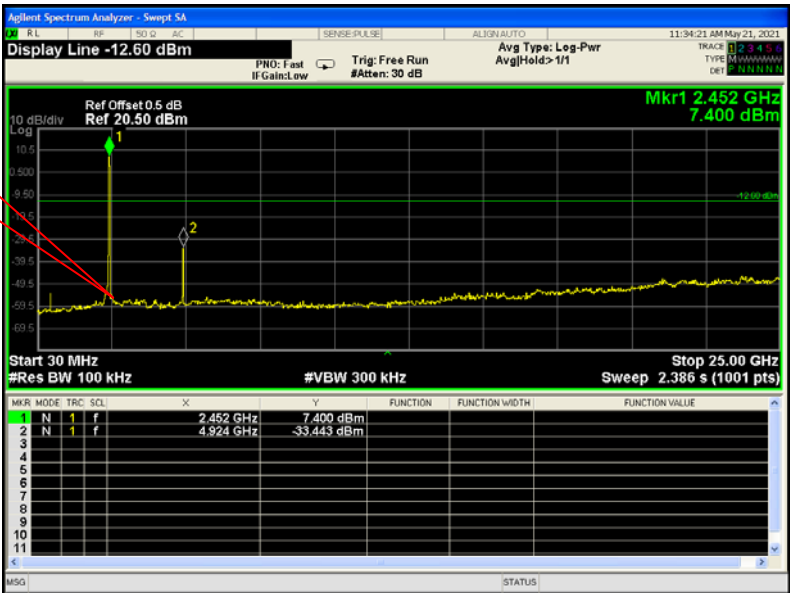
Low Channel

Fundamental



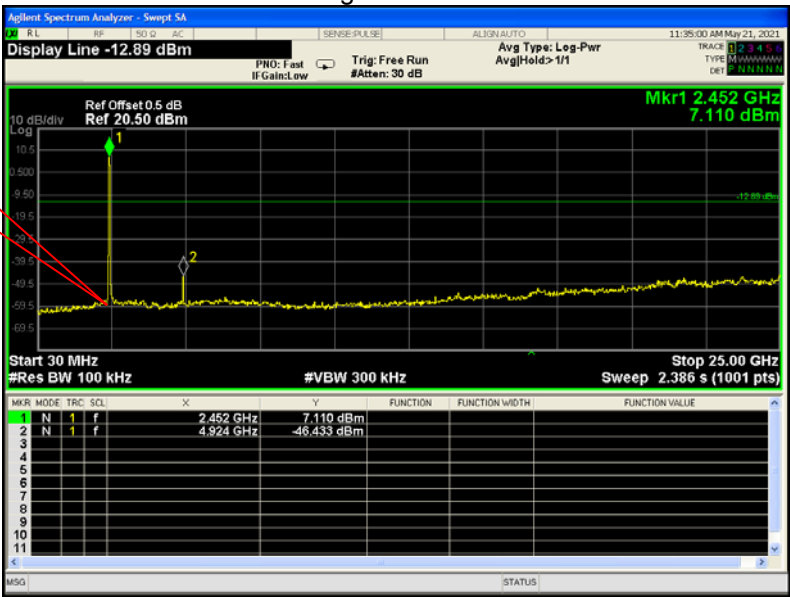
Middle Channel

Fundamental



High Channel

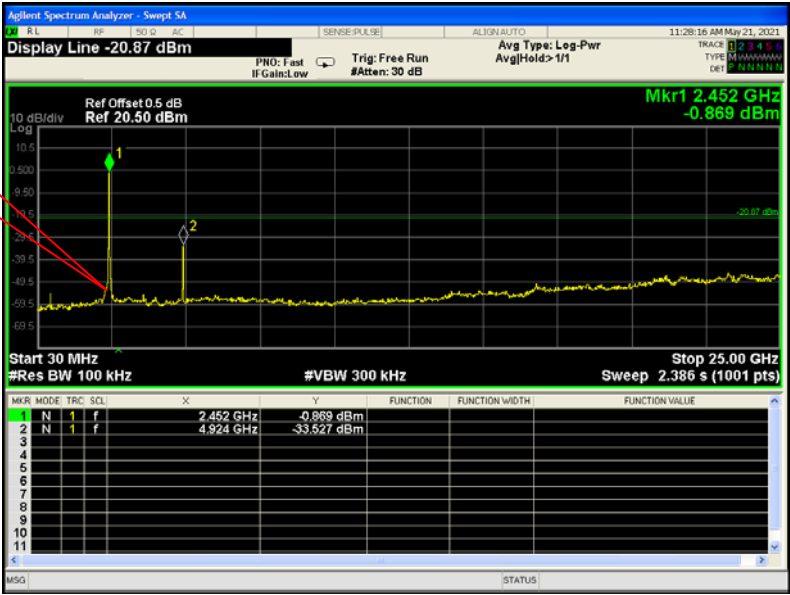
Fundamental



802.11n HT40

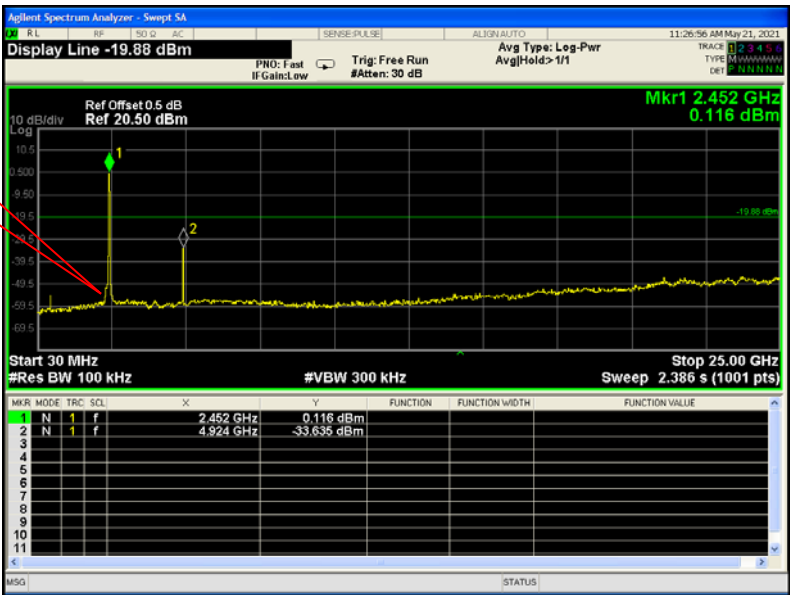
Low Channel

Fundamental



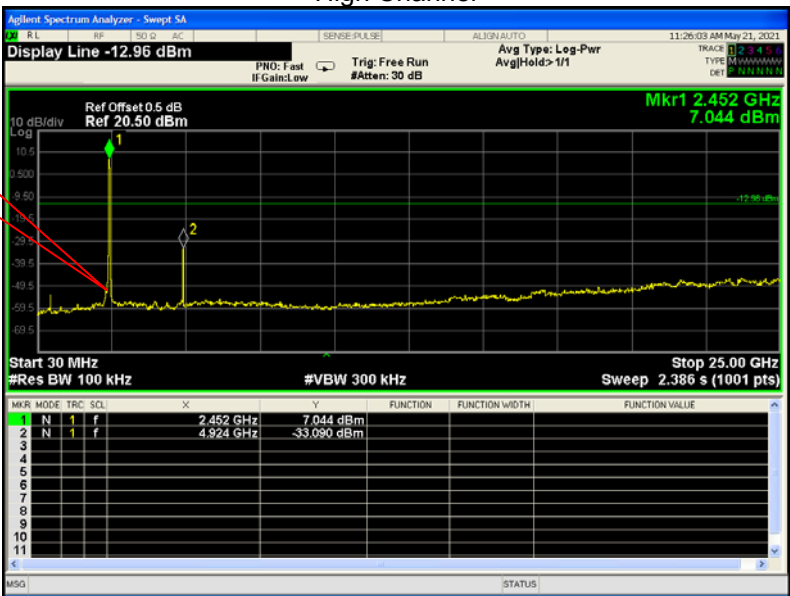
Middle Channel

Fundamental



High Channel

Fundamental



11 Band Edge Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 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 Produce

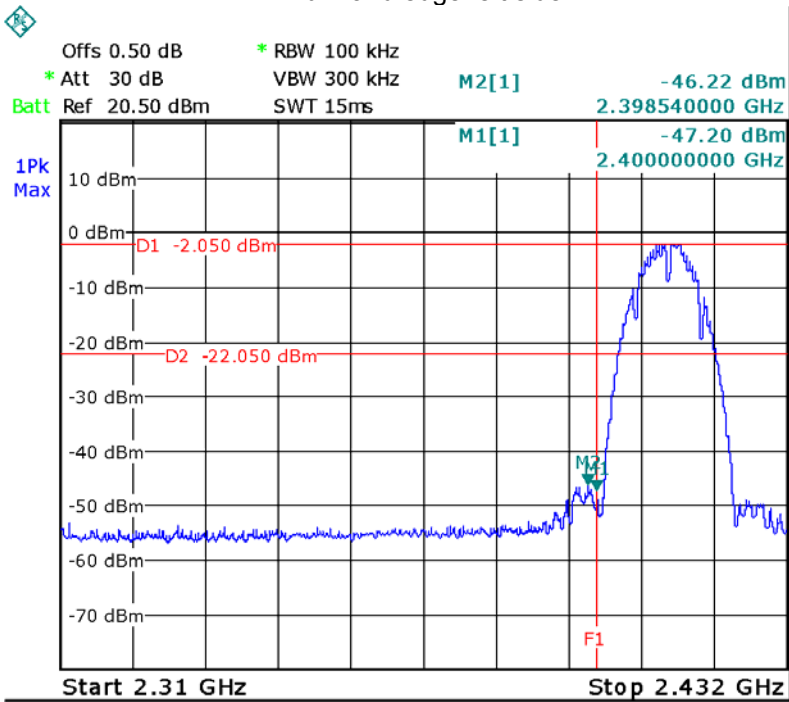
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

11.2 Test Result

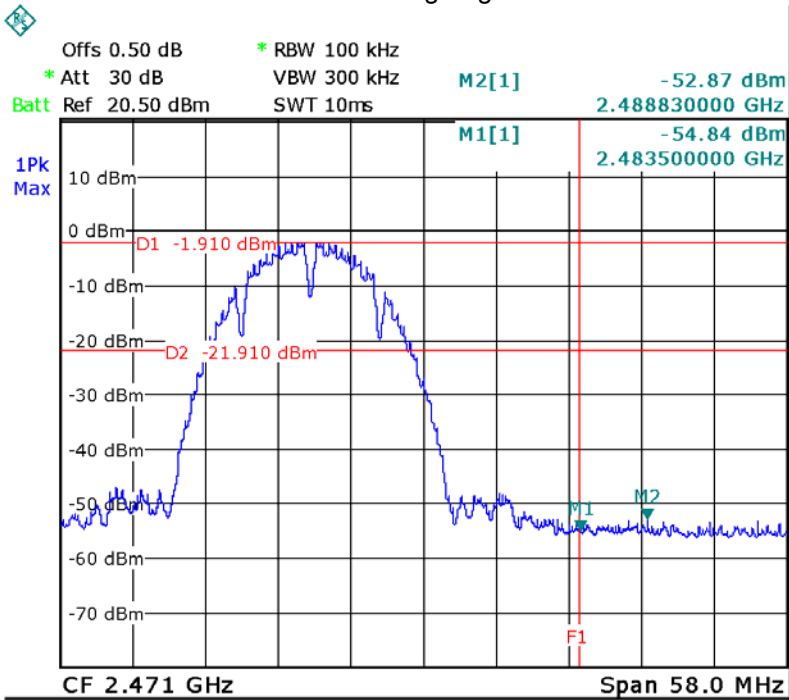
Test result plots shown as follows:

Antenna 0

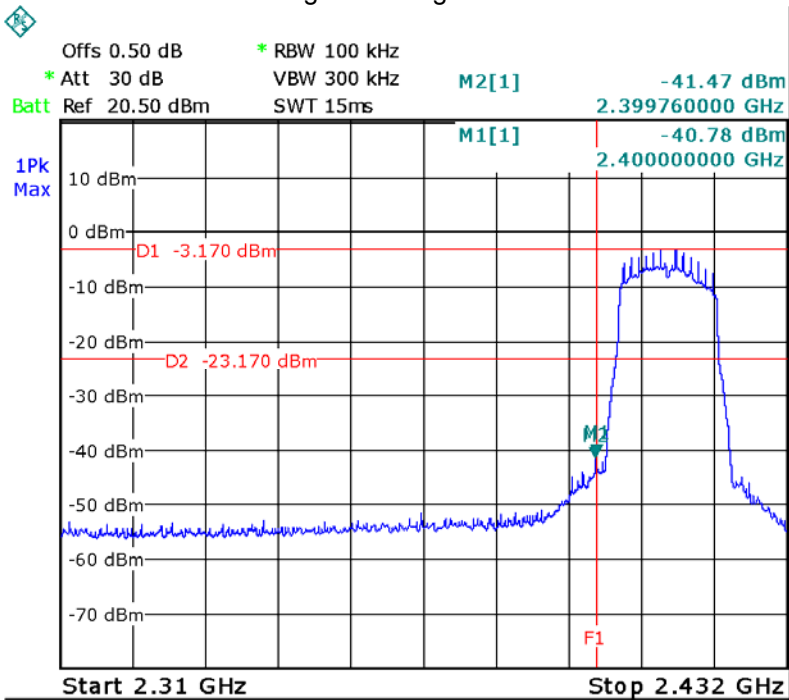
TX 11b: Band edge-left side



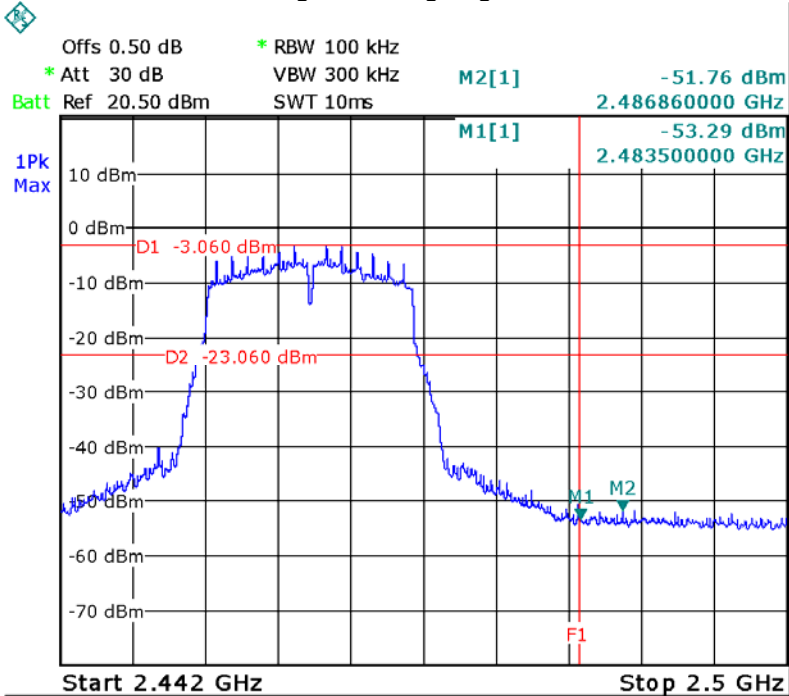
TX 11b: Band edge-right side

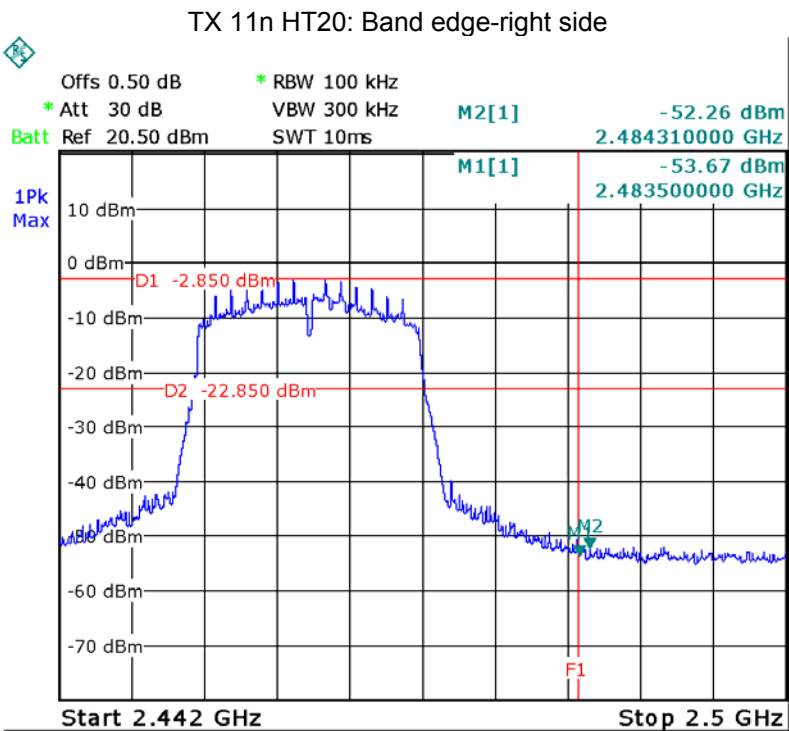
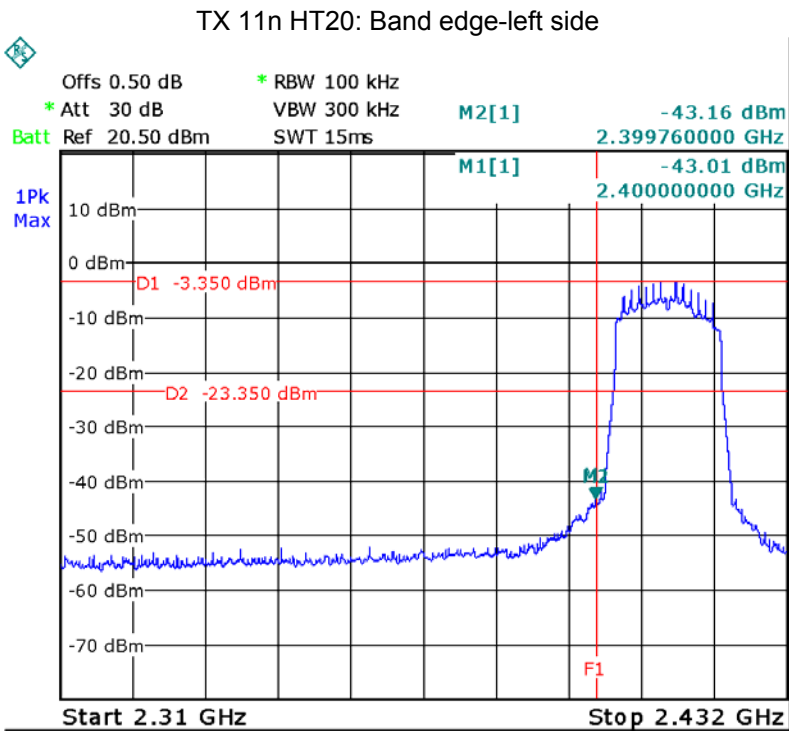


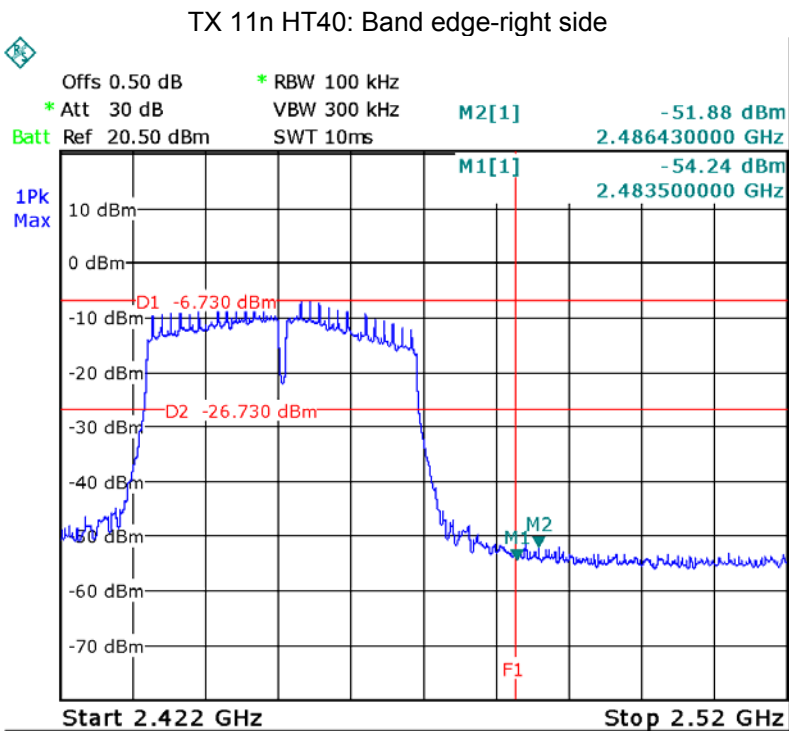
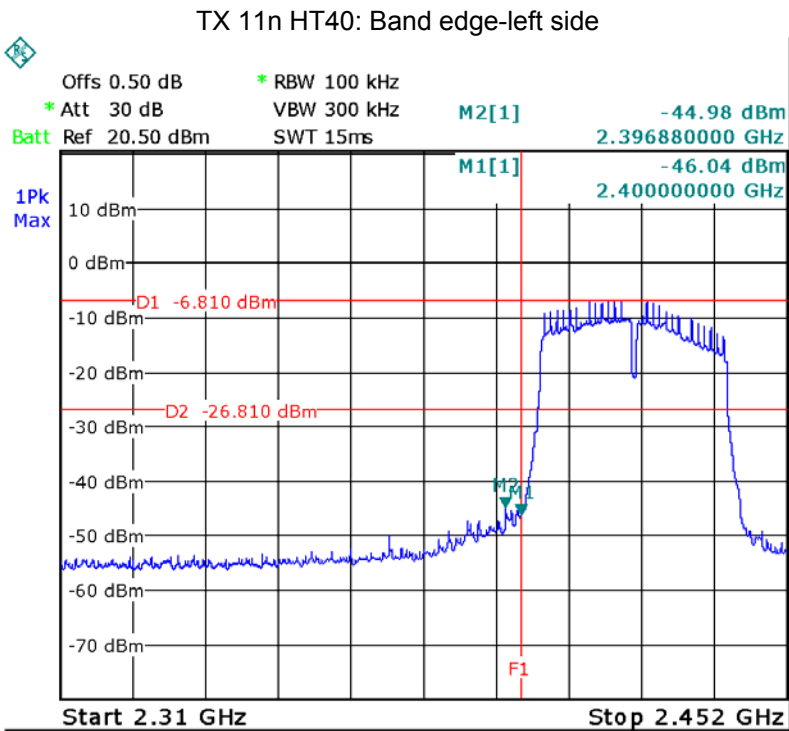
TX 11g: Band edge-left side



TX 11g: Band edge-right side

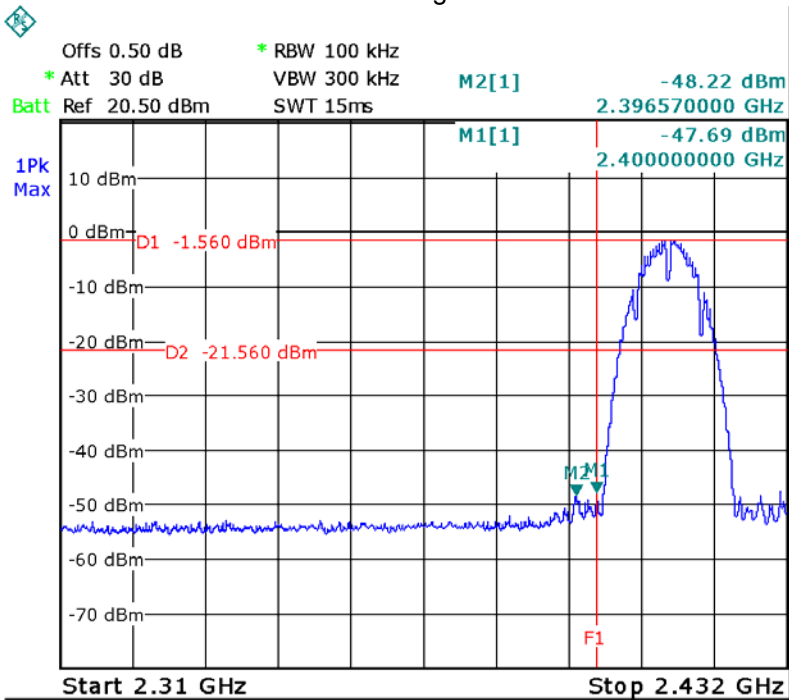




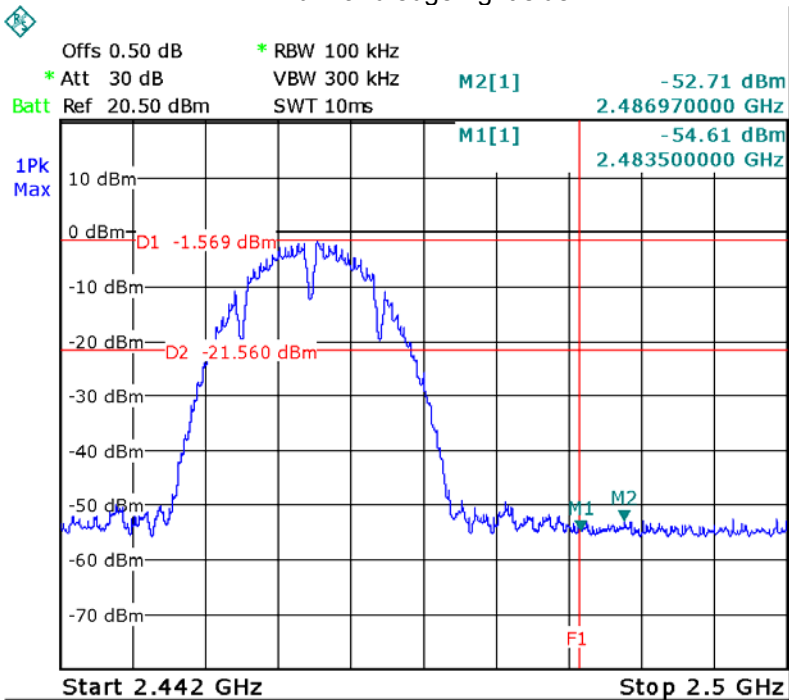


Antenna 1

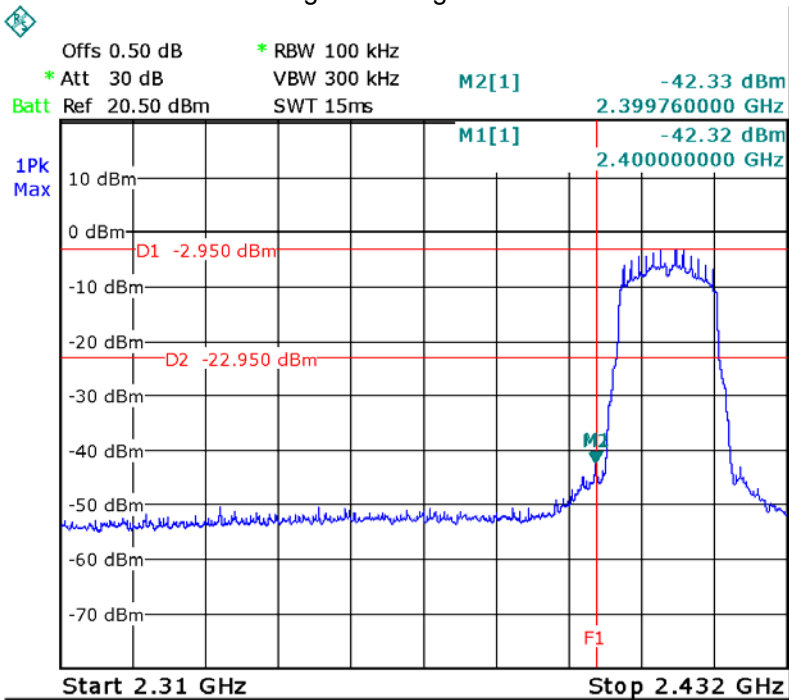
TX 11b: Band edge-left side



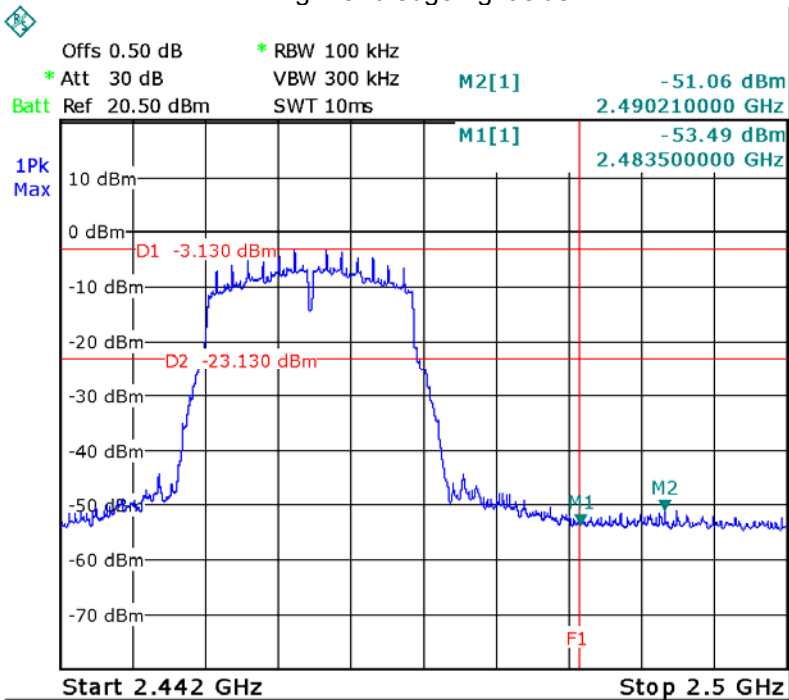
TX 11b: Band edge-right side

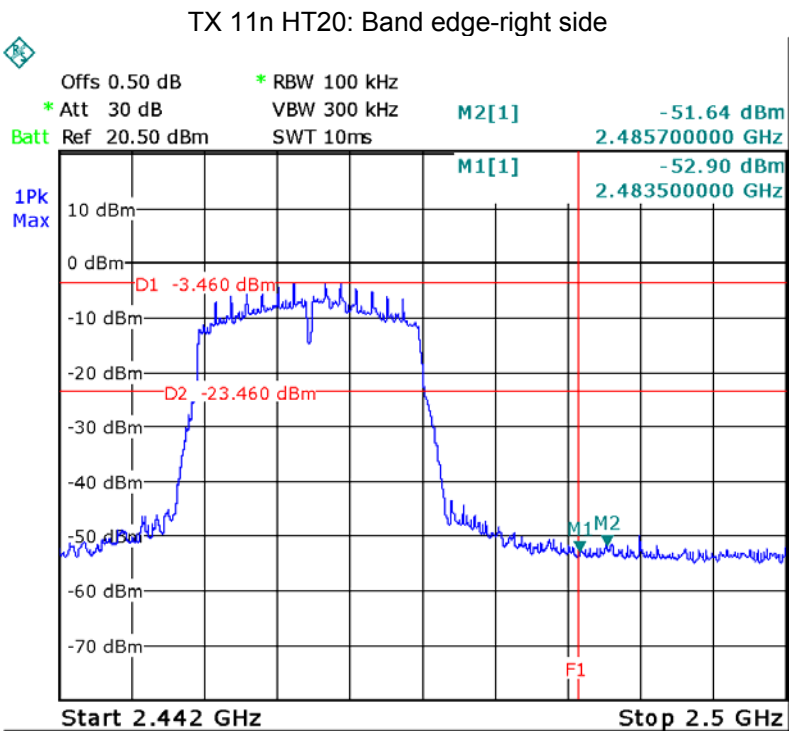
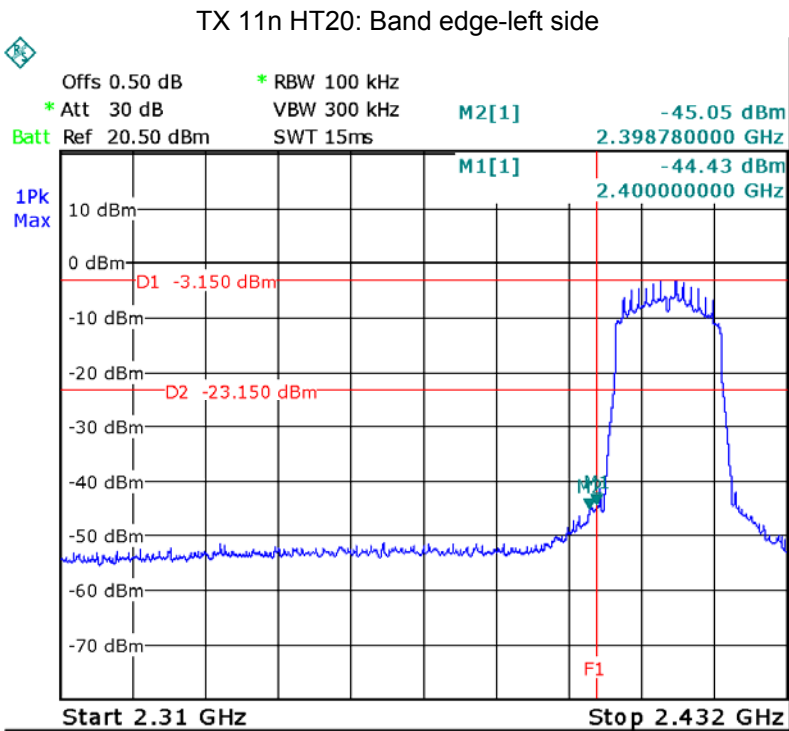


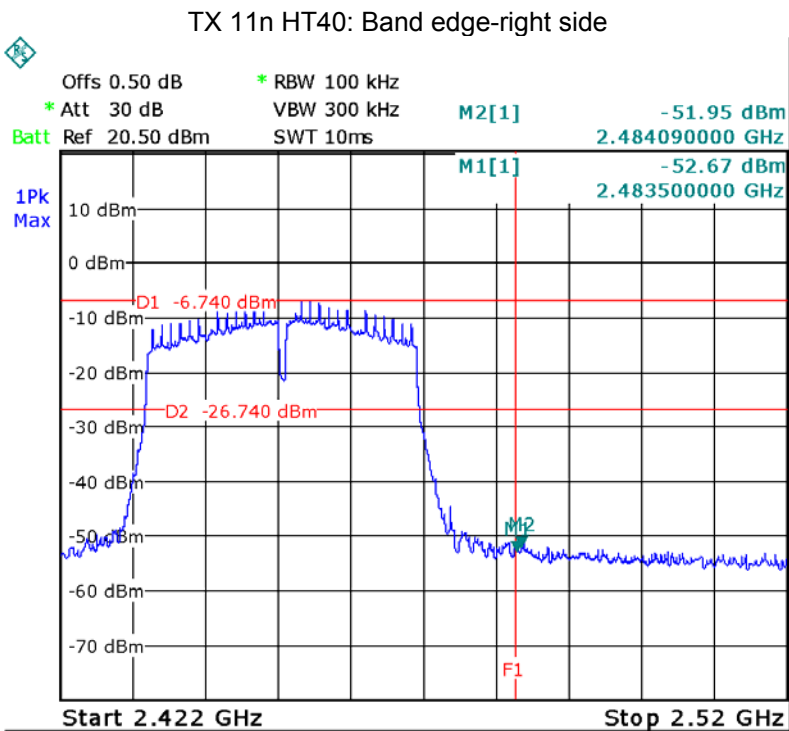
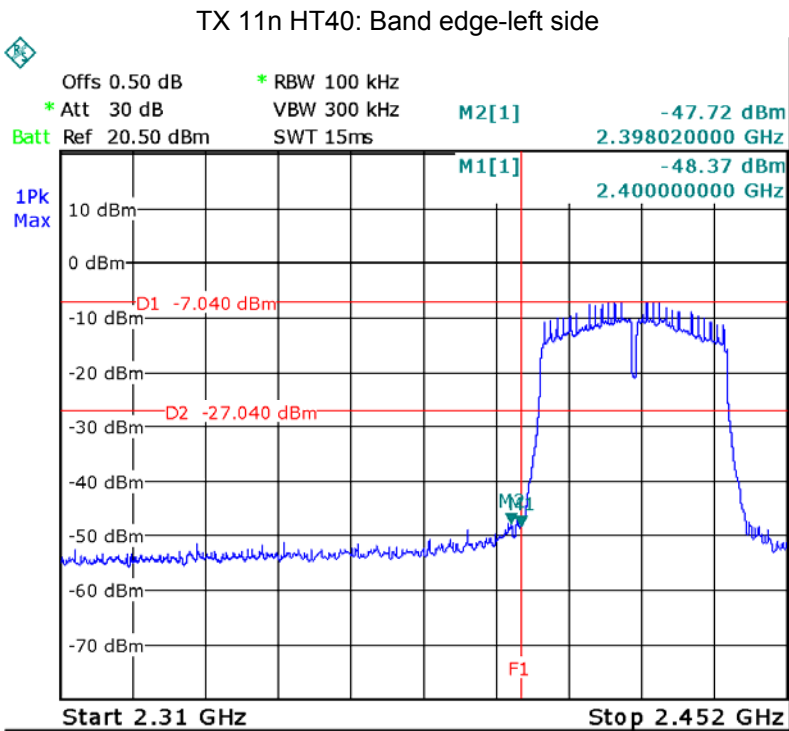
TX 11g: Band edge-left side



TX 11g: Band edge-right side







12 6 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

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

12.2 Test Result:

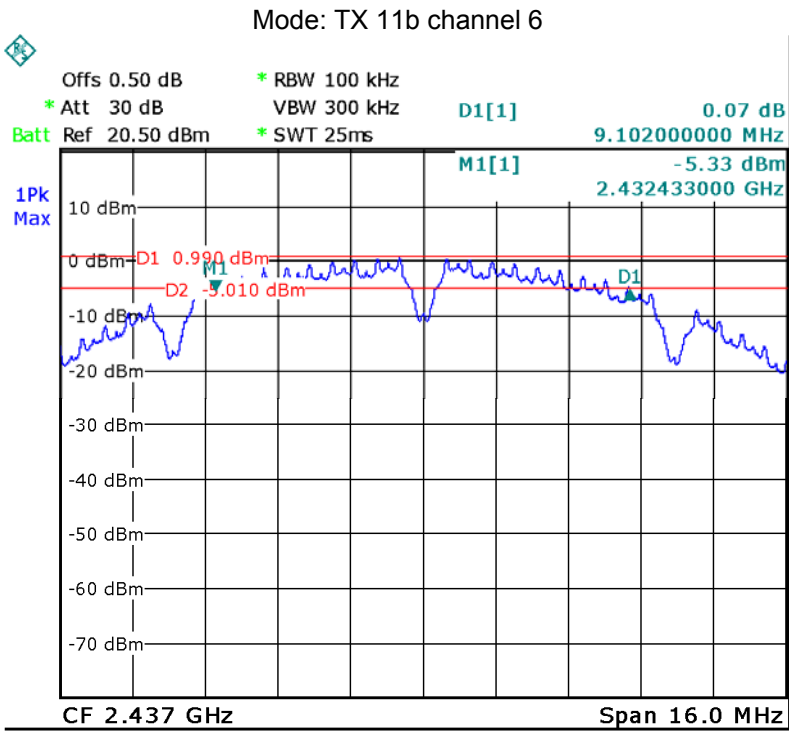
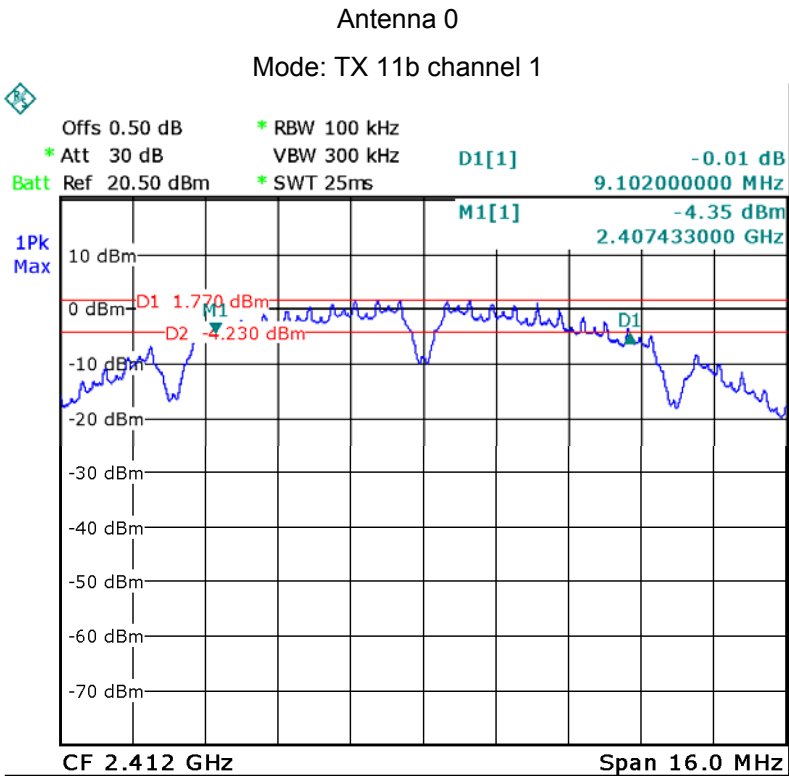
Antenna 0

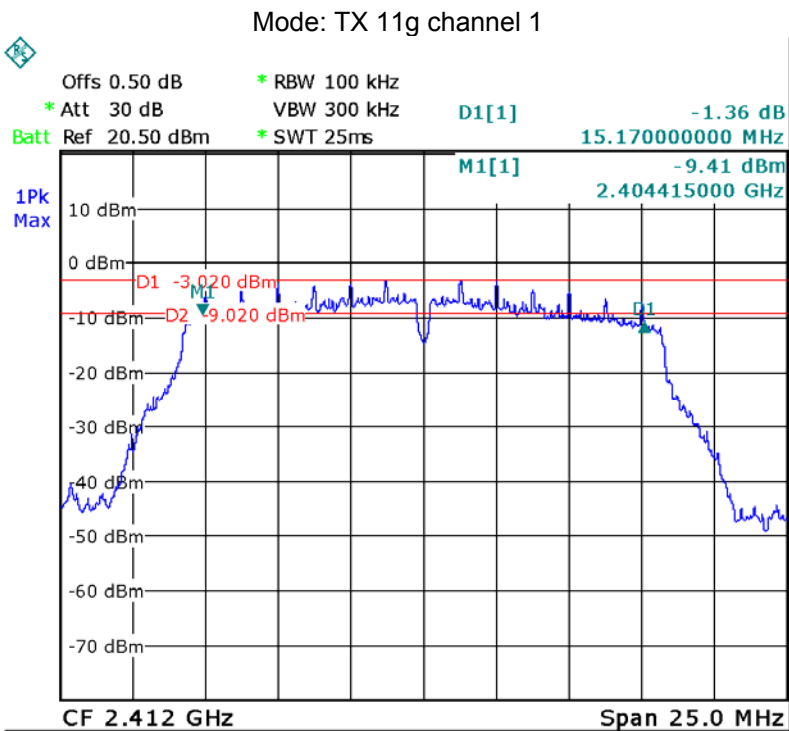
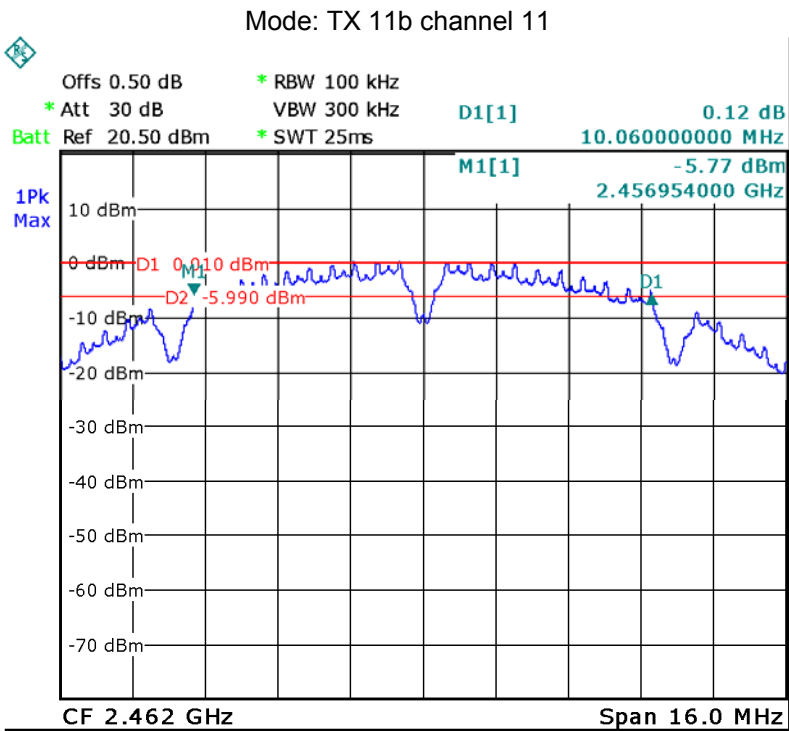
Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	9.102	13.797
	Channel 6	9.102	13.828
	Channel 11	10.06	13.892
TX 11g	Channel 1	15.17	16.717
	Channel 6	15.17	16.717
	Channel 11	15.17	16.717
TX 11n HT20	Channel 1	15.199	17.623
	Channel 6	15.199	17.623
	Channel 11	15.199	17.623
TX 11n HT40	Channel 3	35.82	36.008
	Channel 6	35.24	36.118
	Channel 9	35.35	36.118

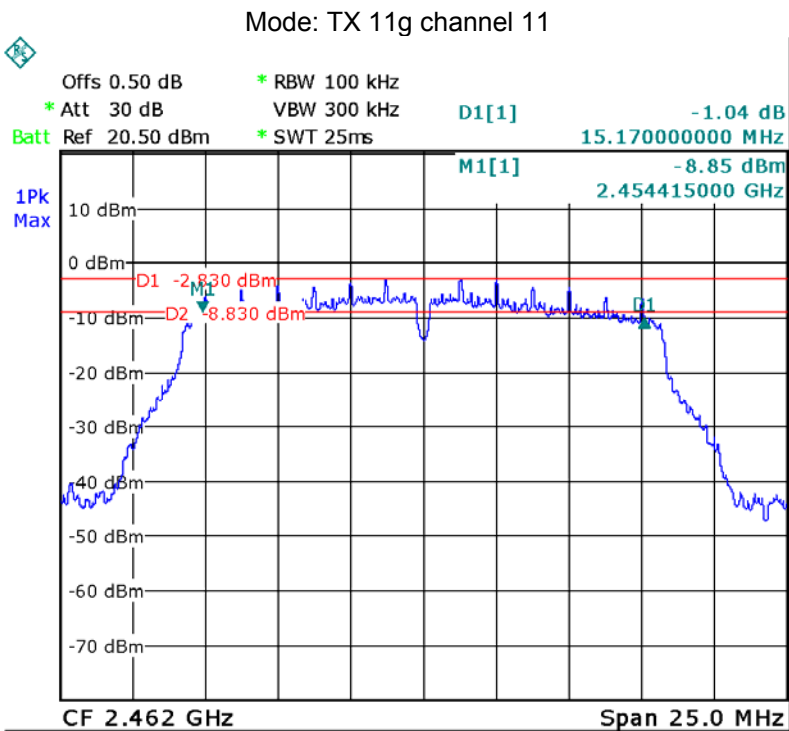
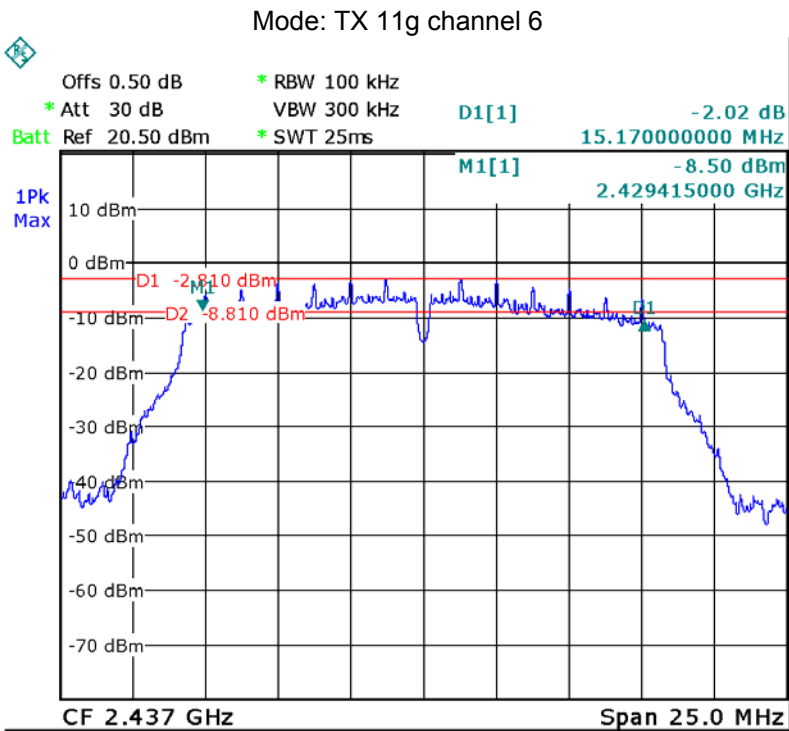
Antenna 1

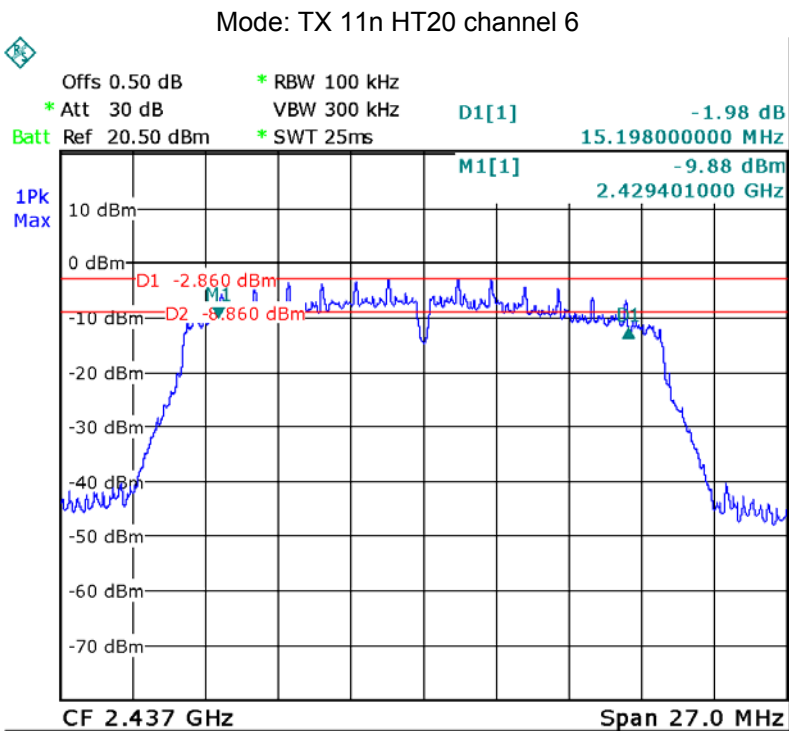
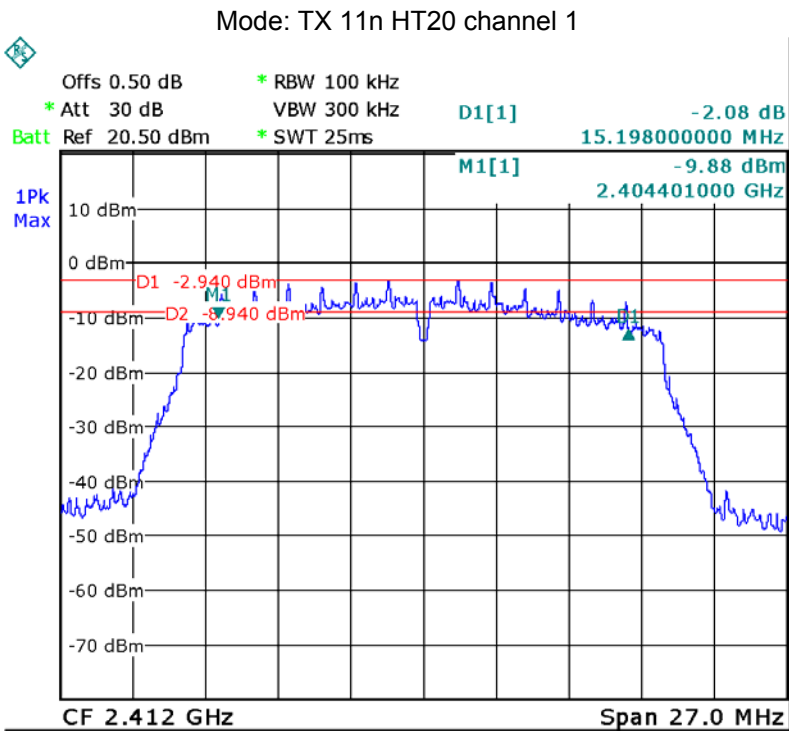
Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	9.485	13.828
	Channel 6	9.134	13.828
	Channel 11	9.134	13.828
TX 11g	Channel 1	15.17	16.667
	Channel 6	15.17	16.828
	Channel 11	15.17	16.828
TX 11n HT20	Channel 1	15.251	17.623
	Channel 6	15.305	17.569
	Channel 11	15.359	17.569
TX 11n HT40	Channel 3	33.92	36.118
	Channel 6	33.92	36.118
	Channel 9	35.13	36.118

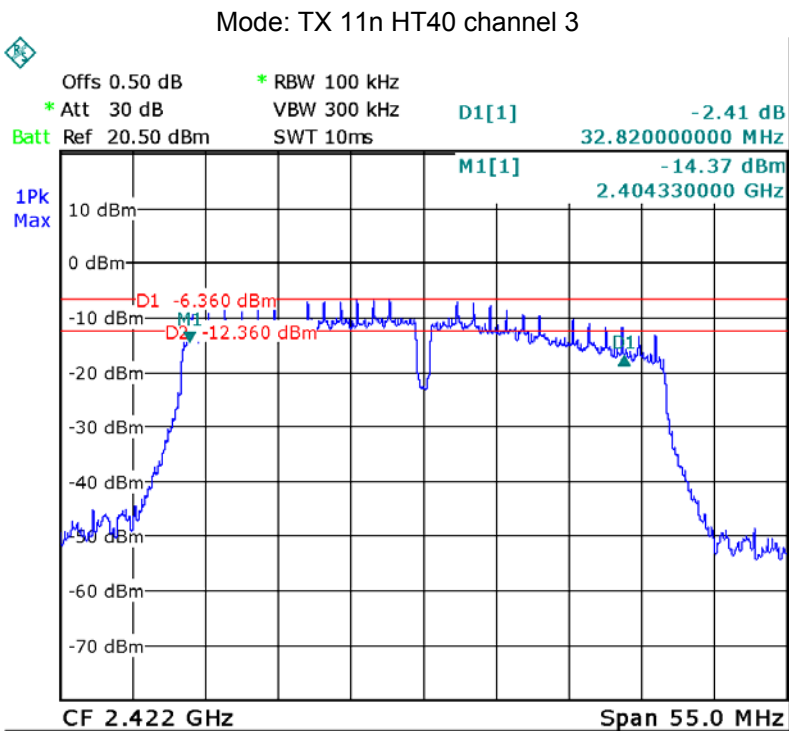
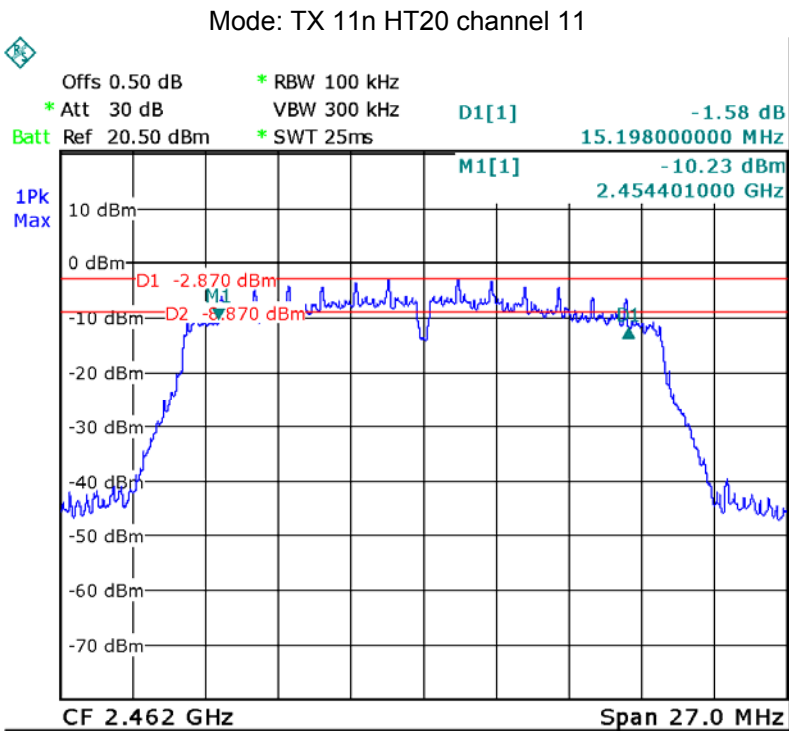
Test result plot:

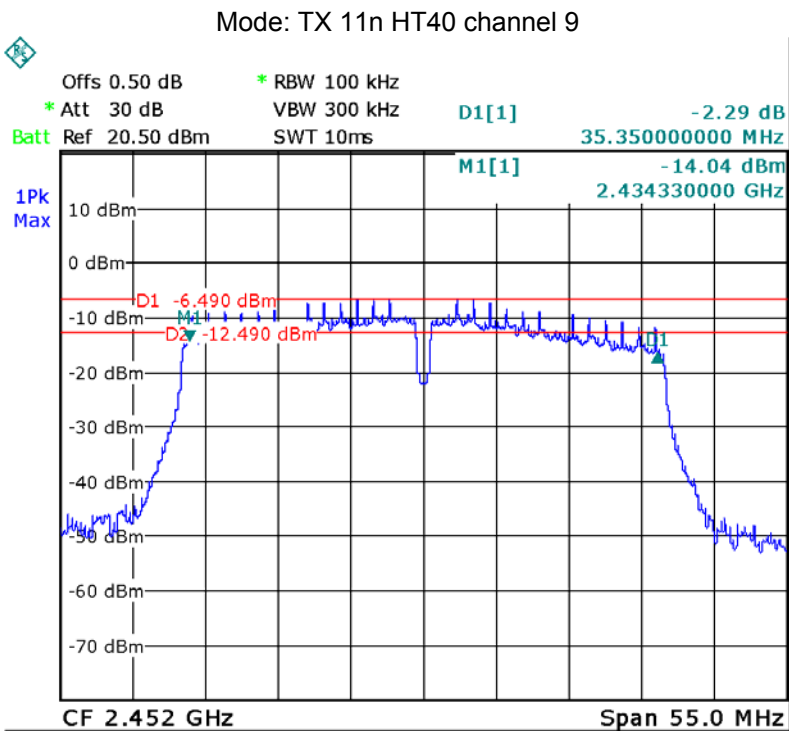
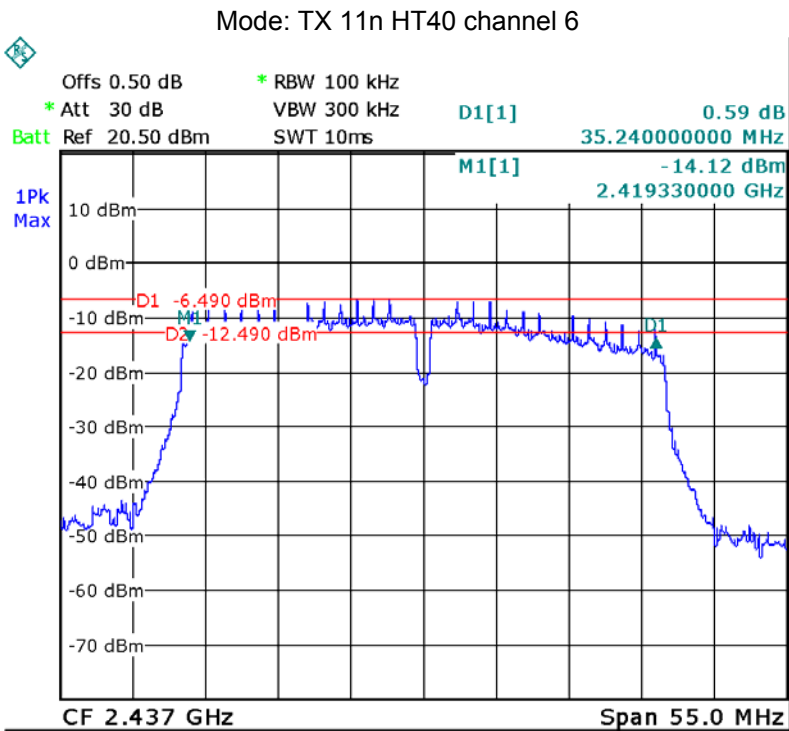






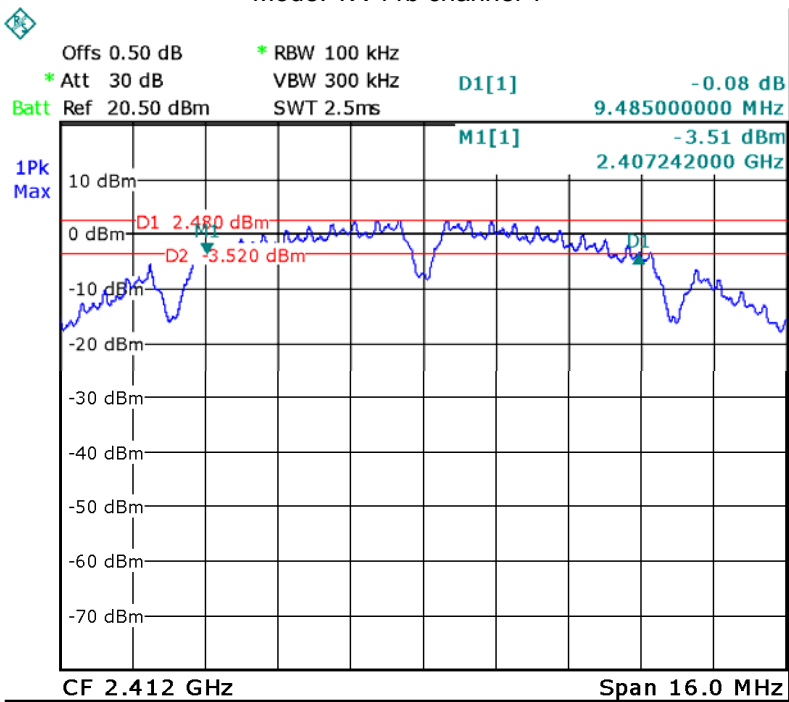




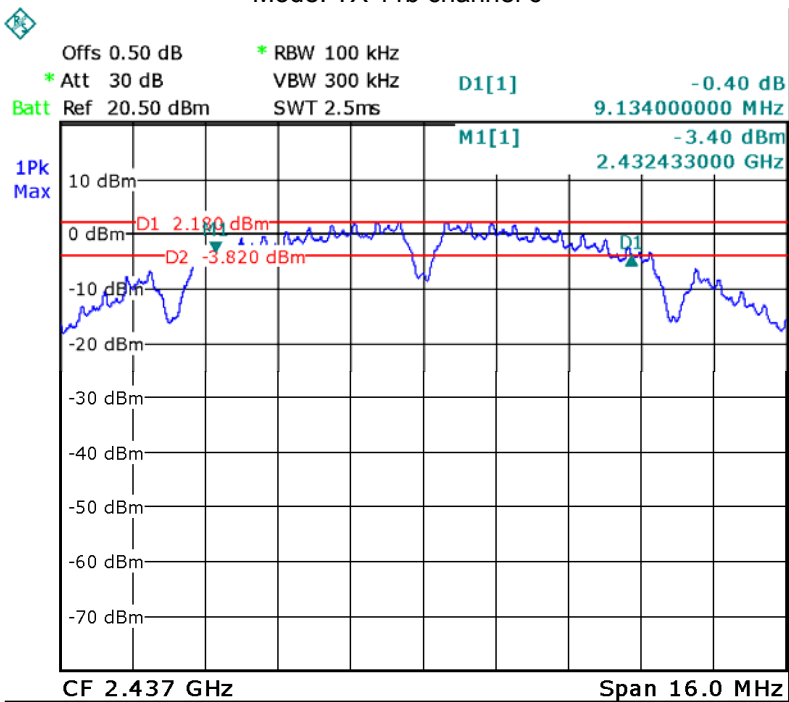


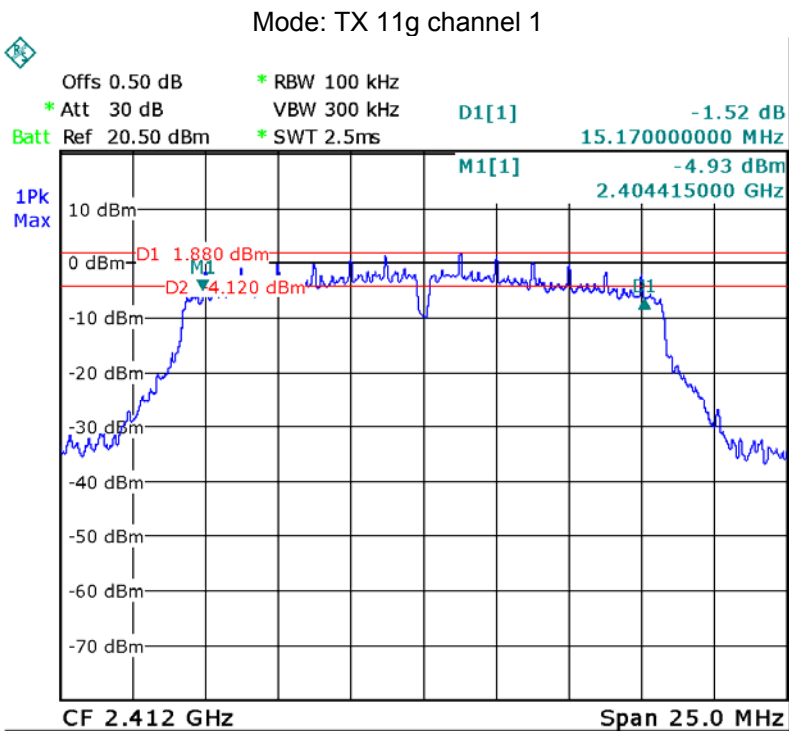
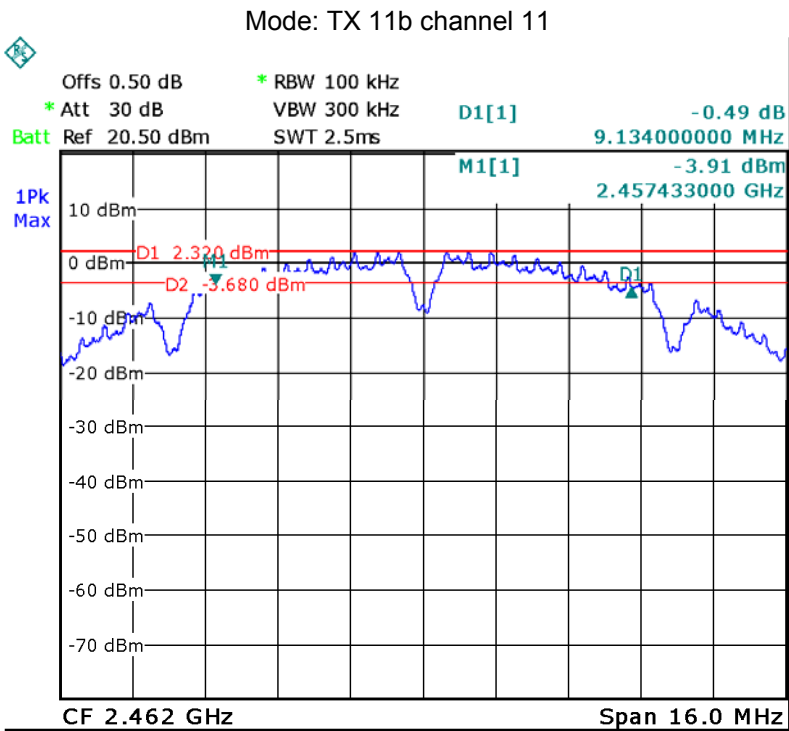
Antenna 1

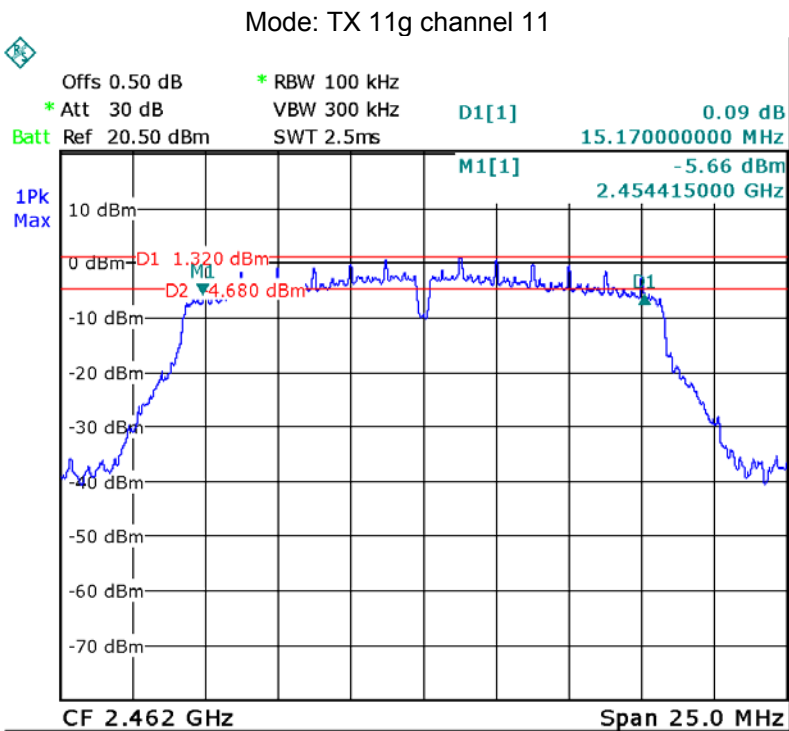
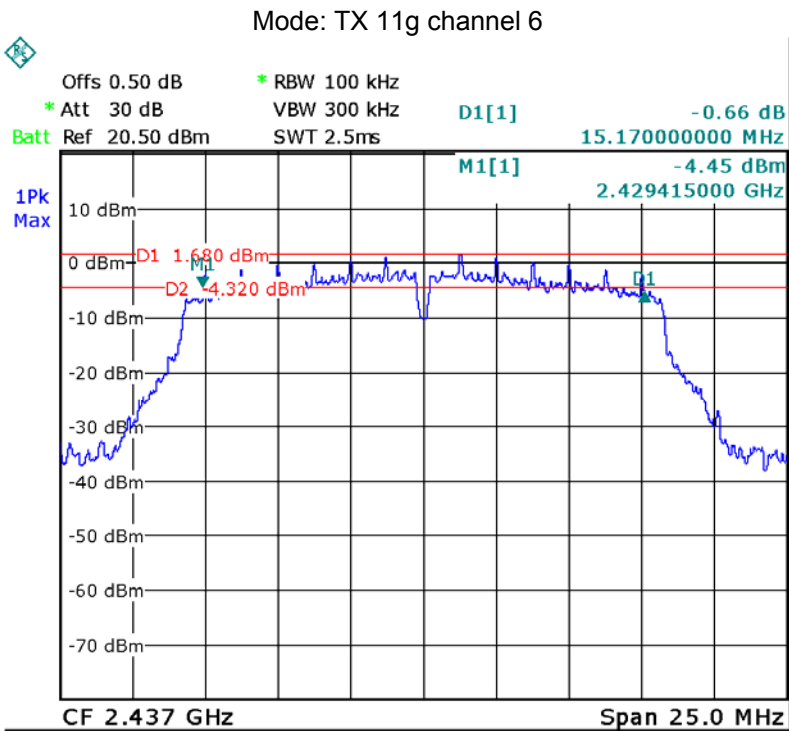
Mode: TX 11b channel 1

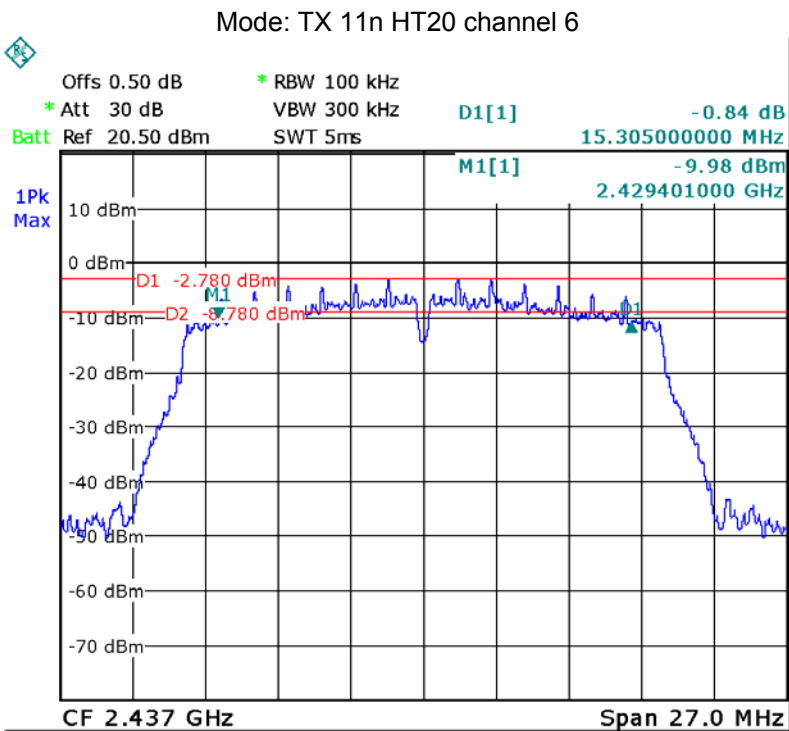
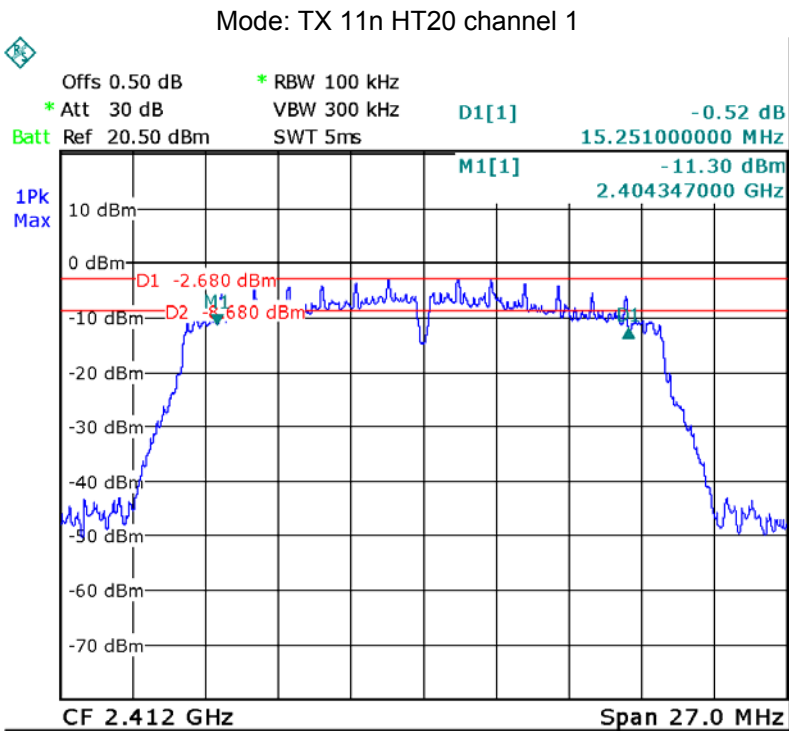


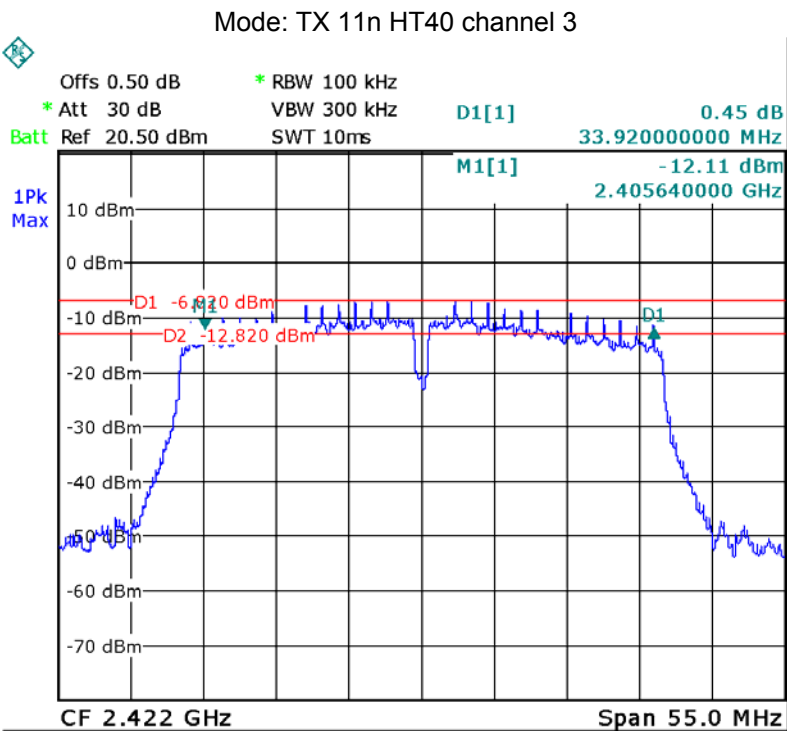
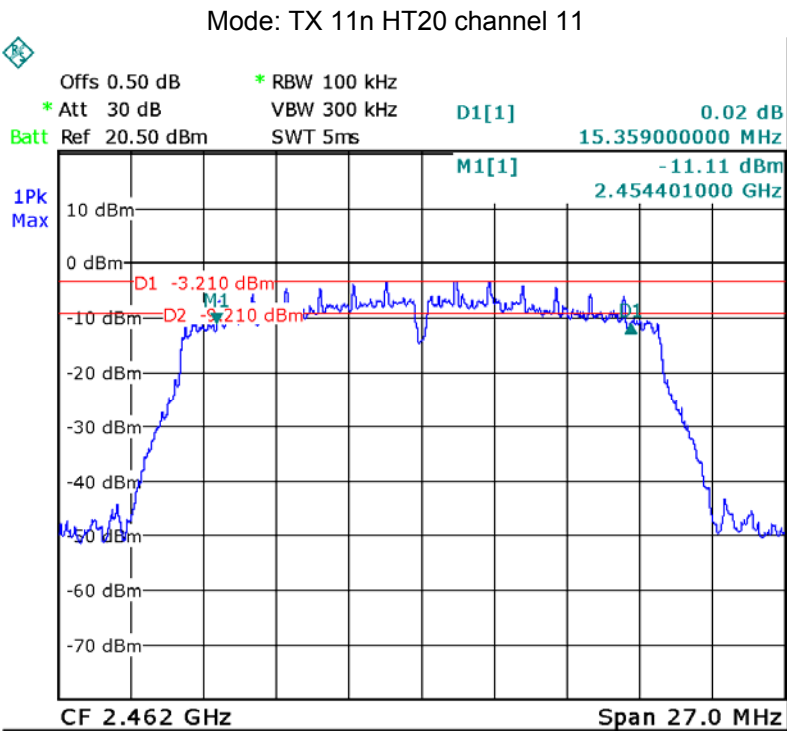
Mode: TX 11b channel 6

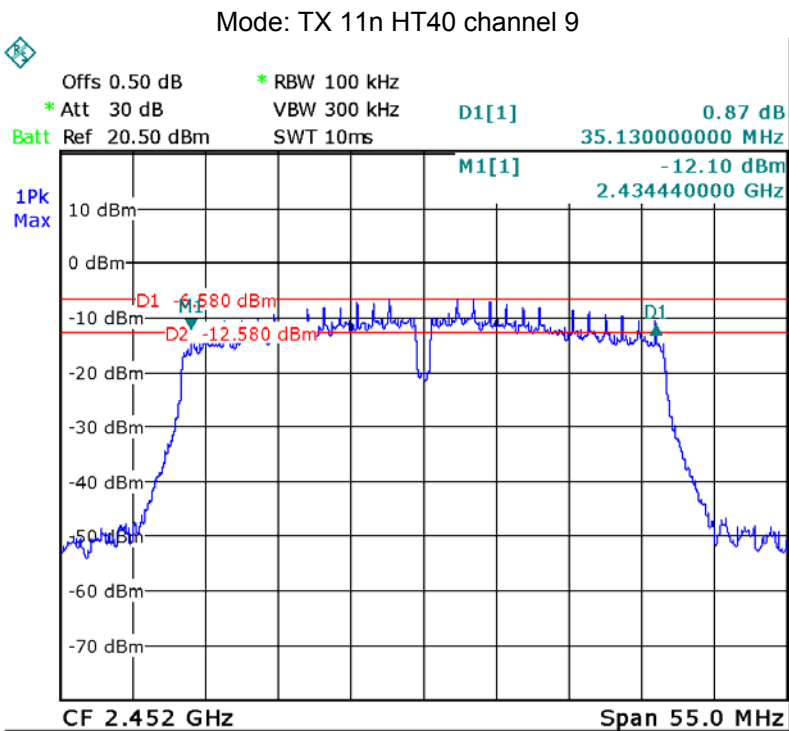
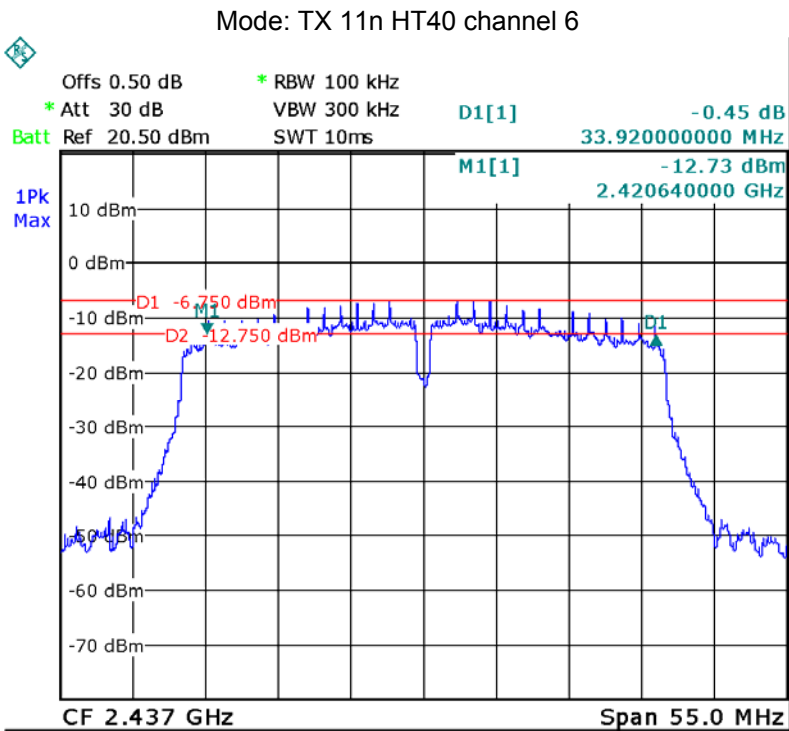












13 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10:2013

13.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018

section 8.3.1.2 (For WIFI)

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

a) Set the RBW = 1% to 5% of the OBW, not to exceed 1MHz.

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 $\leq \text{RBW} / 2$, 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..

13.2 Test Result:

Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)		
		ANT0	ANT1	SUM
TX 11b	Low-2412	14.24	15.26	/
	Middle-2437	13.08	15.15	/
	High-2462	12.96	14.75	/
TX 11g	Low-2412	15.17	15.53	/
	Middle-2437	15.49	15.47	/
	High-2462	15.48	15.30	/
TX 11n HT20	Low-2412	14.86	15.45	18.18
	Middle-2437	15.17	15.27	18.23
	High-2462	15.05	15.03	18.05
TX 11n HT40	Low-2422	14.25	14.18	17.23
	Middle-2437	14.56	14.27	17.43
	High-2452	14.54	14.04	17.31
Directional gain=antenna gain + 10log(N)=3 + 10log2= 6.01dBi				
N is number of array elements or staves				

Note: according to ANSI C63.10 clause 11.7,

For those cases where it is specified that the conducted output power be reduced by the amount in dB that the directional gain of the transmitting antenna exceeds 6dBi, the output power effective limit shall be calculated as follows in Equation:

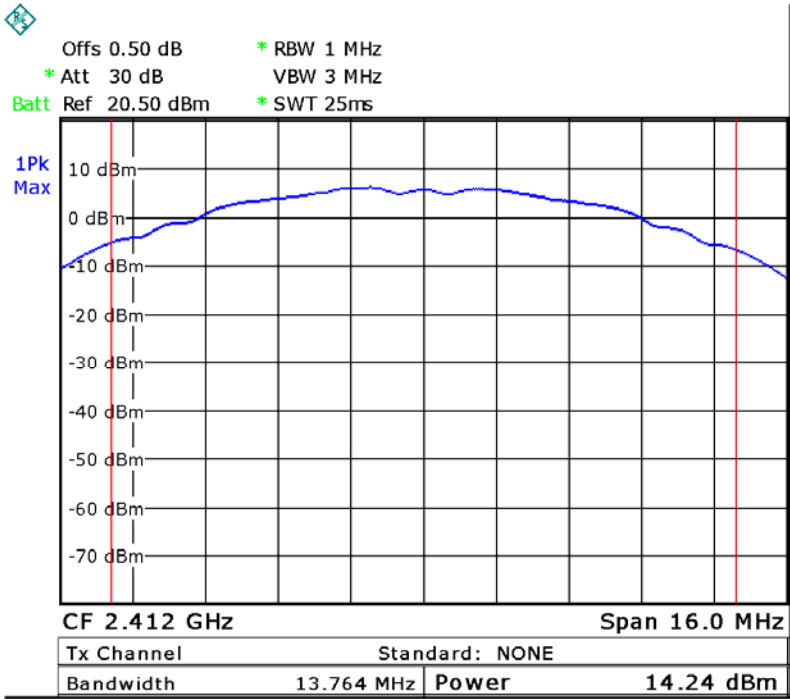
$$P_{out} = P_{Limit} - (G_{TX} - 6)$$

Limit of power(SUM) is 29.99dBm.

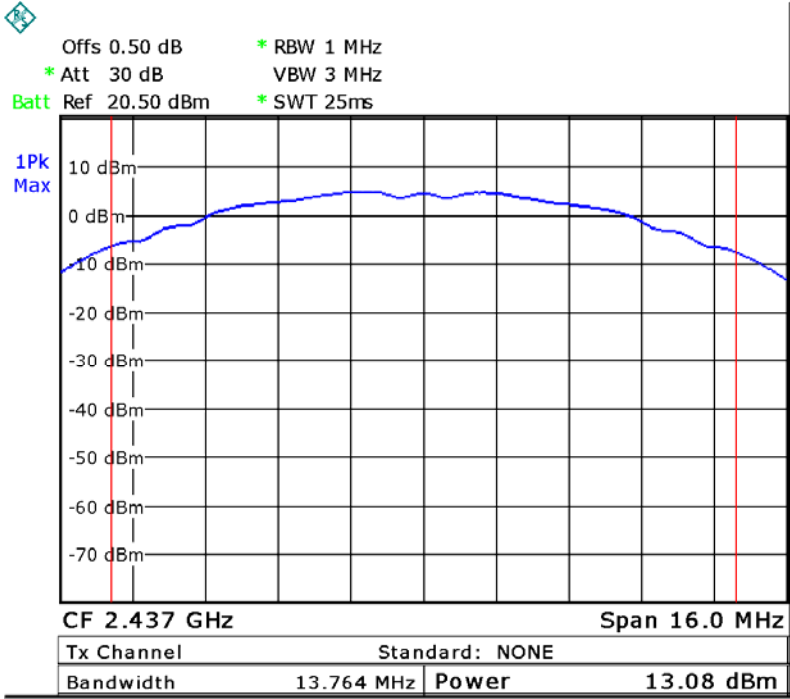
Test Plot

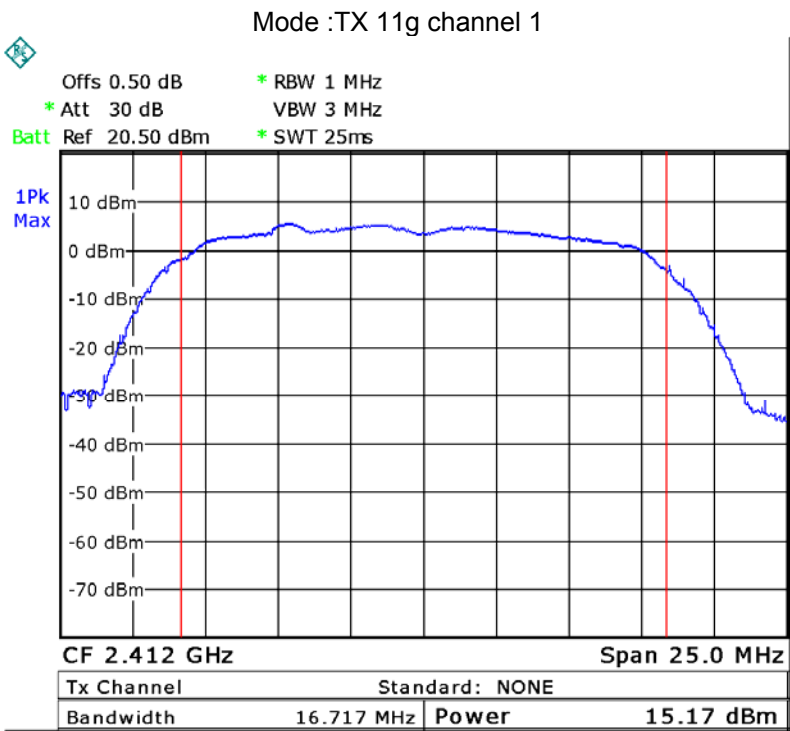
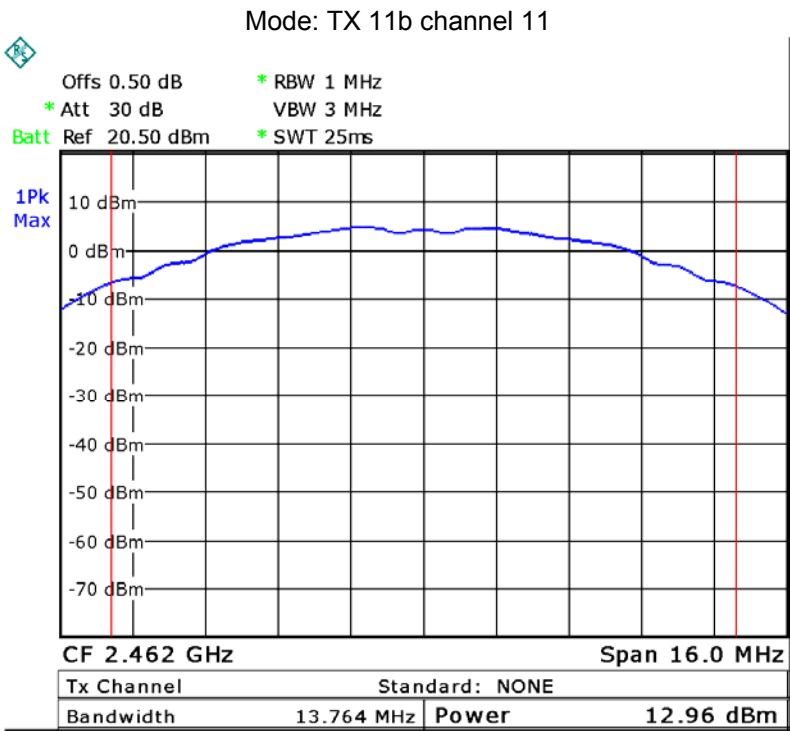
Antenna 0

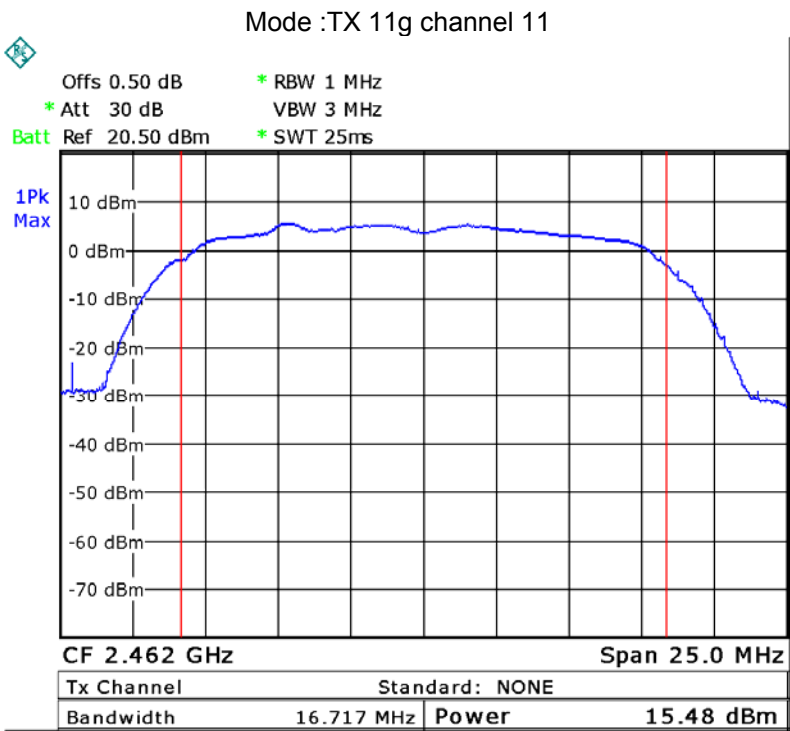
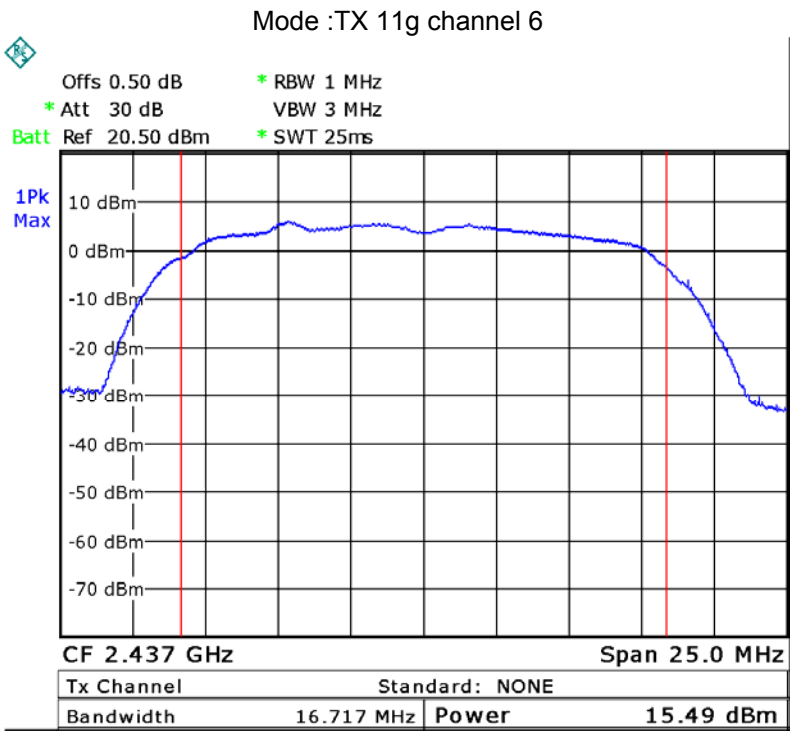
Mode: TX 11b channel 1

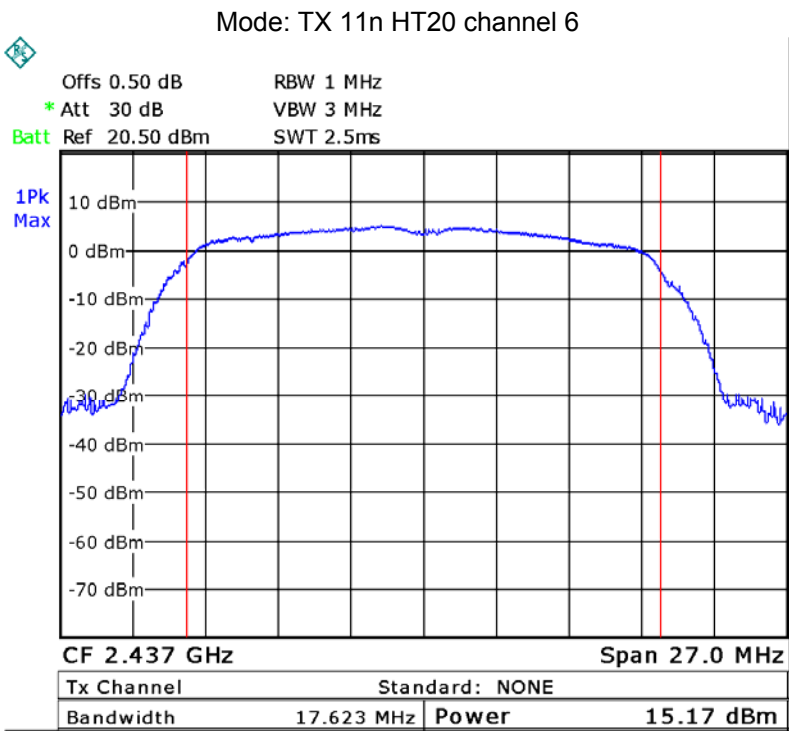
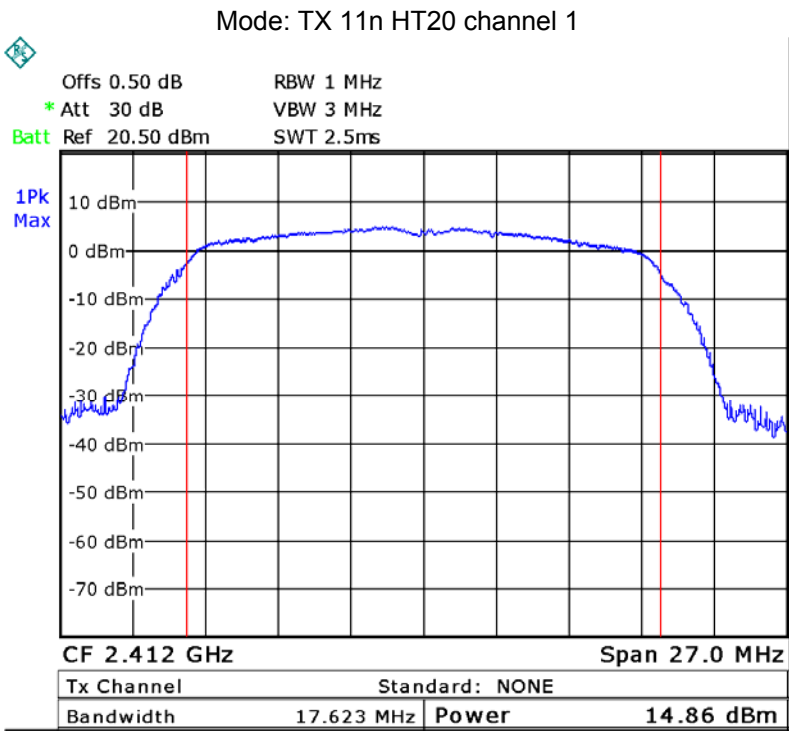


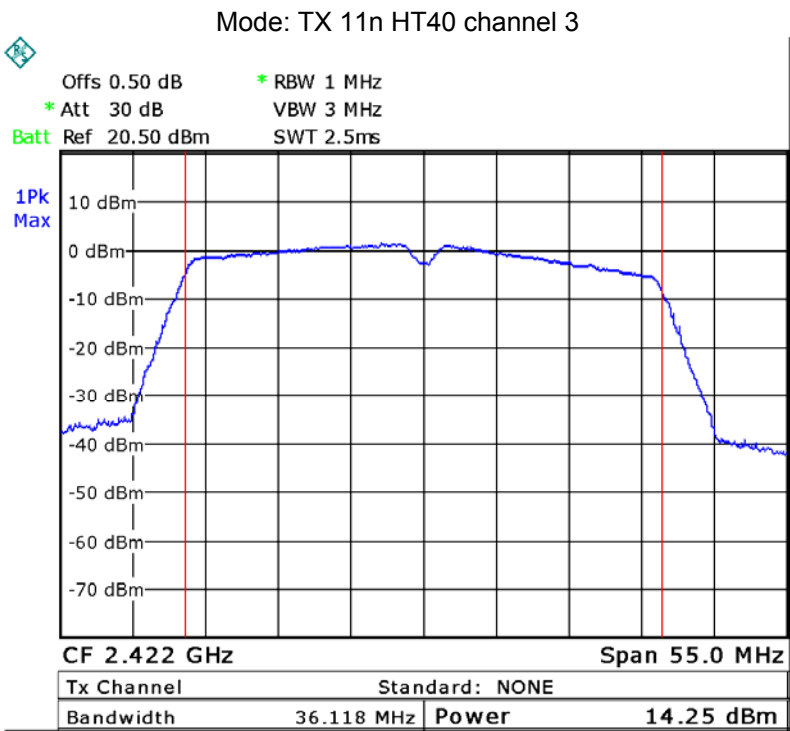
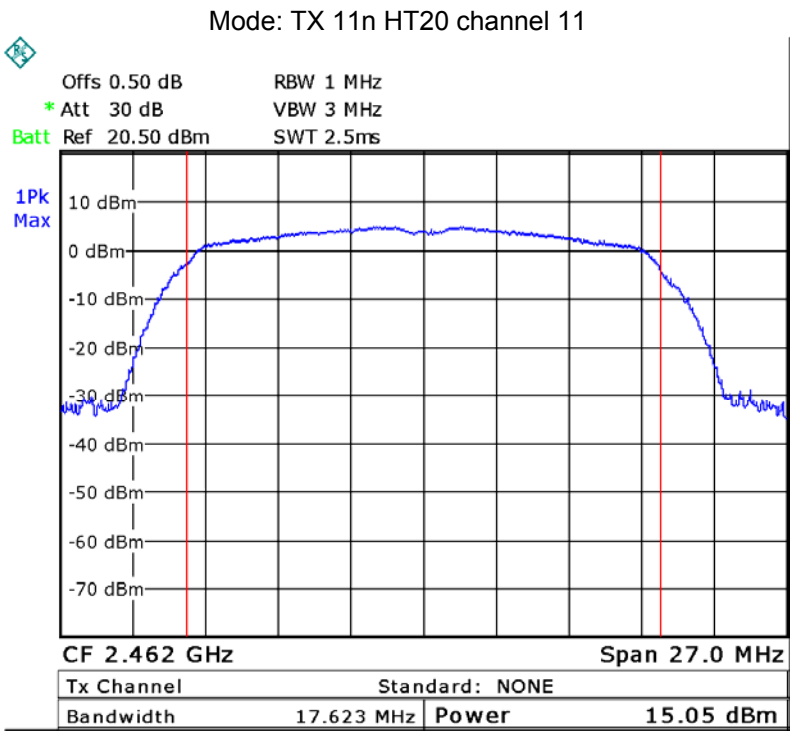
Mode: TX 11b channel 6

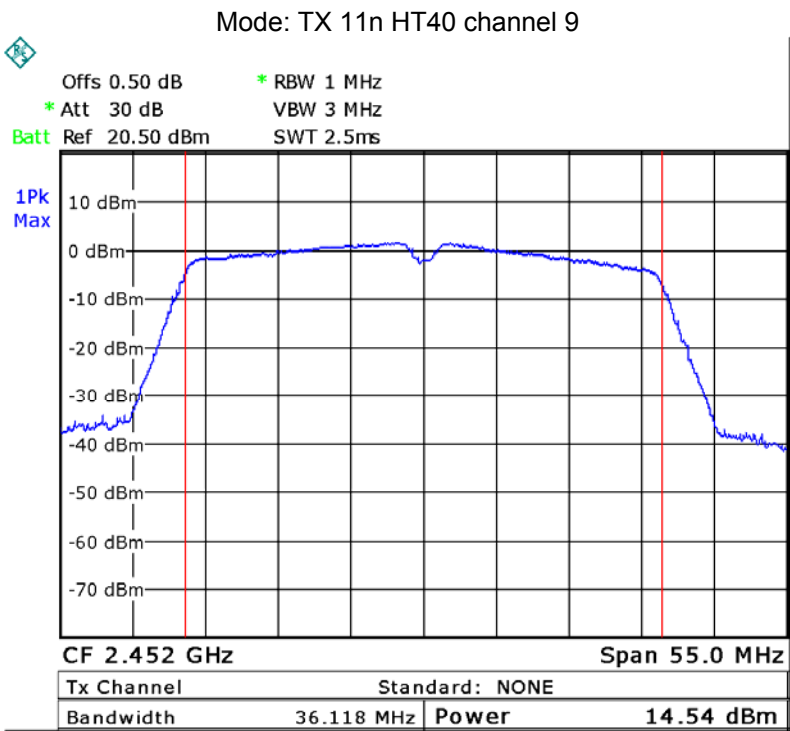
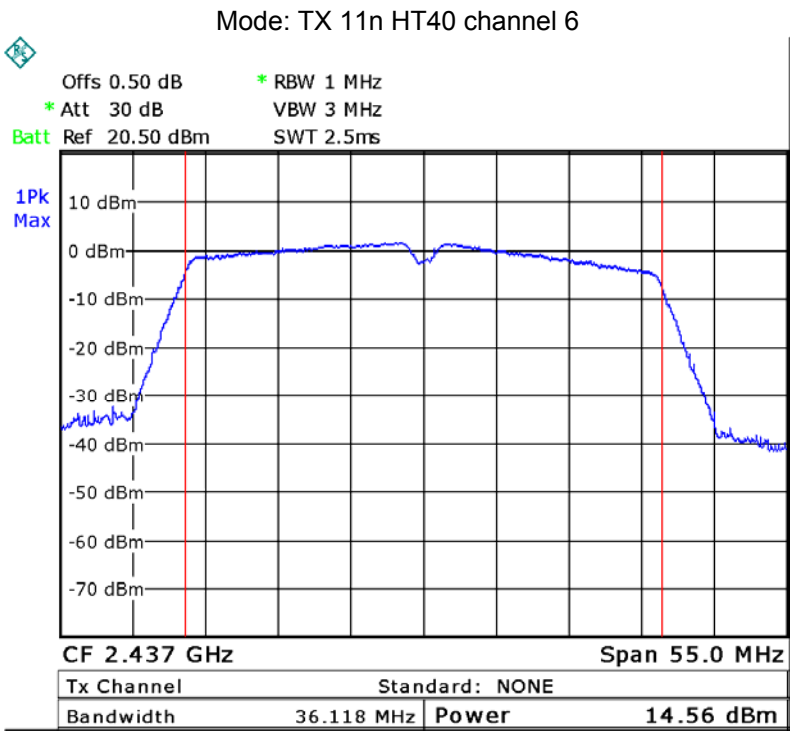






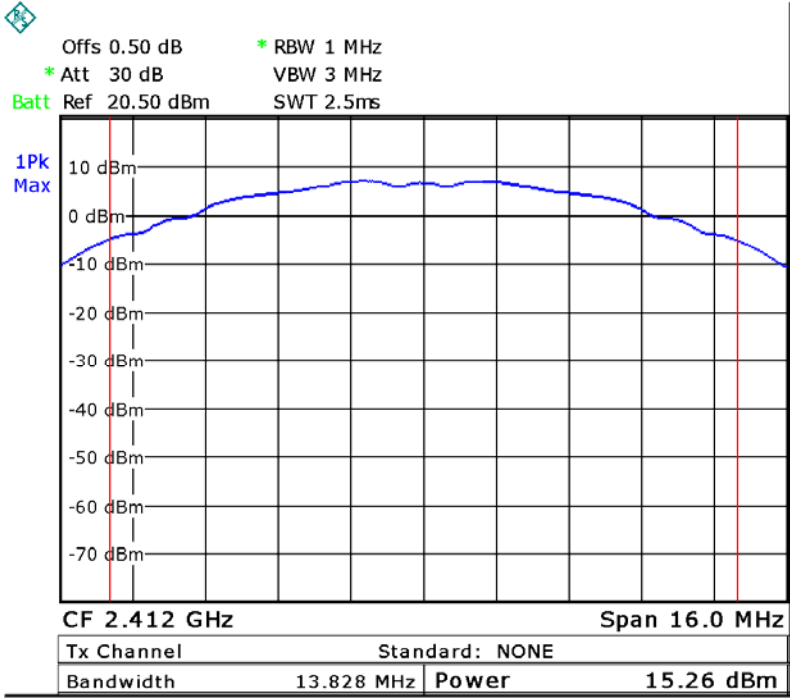




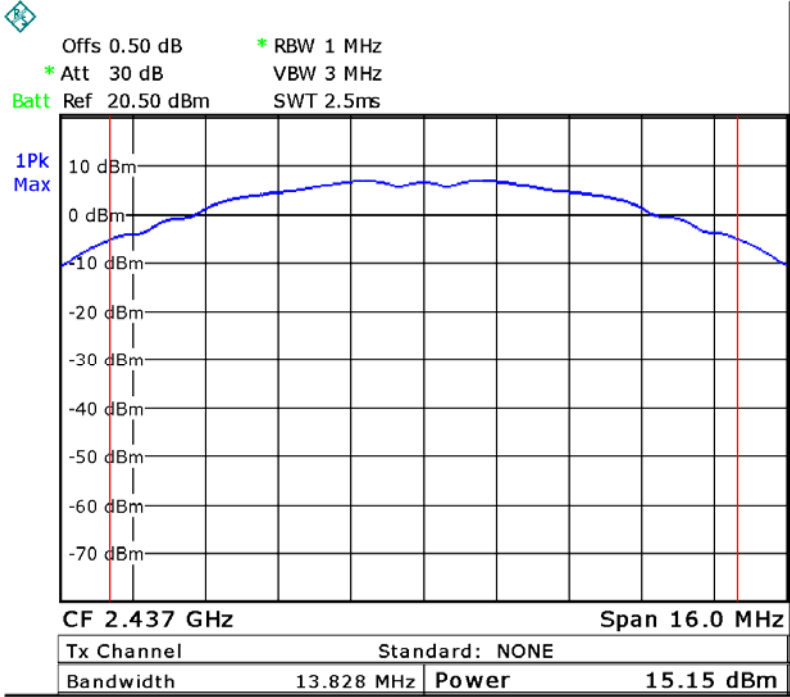


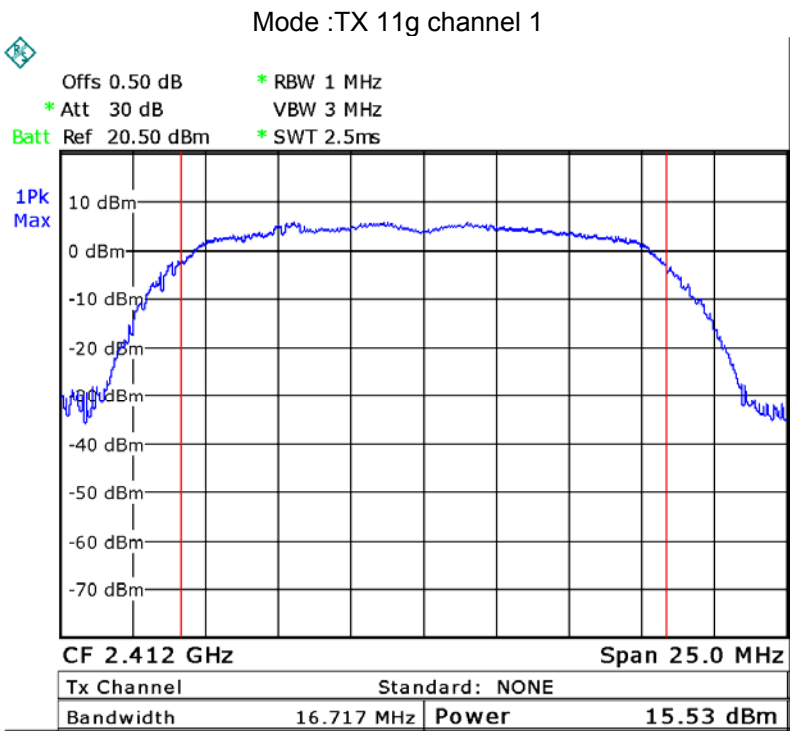
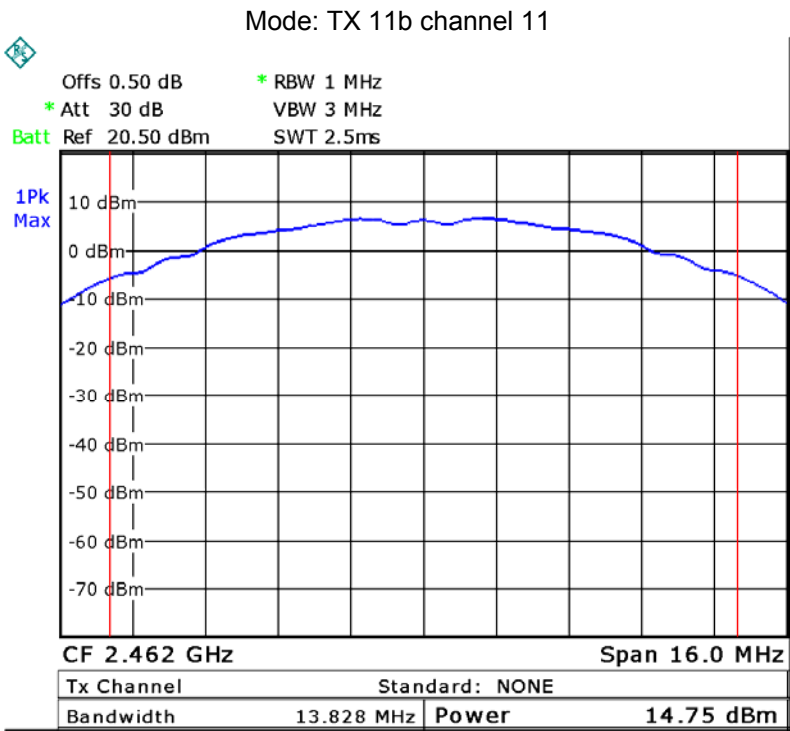
Antenna 1

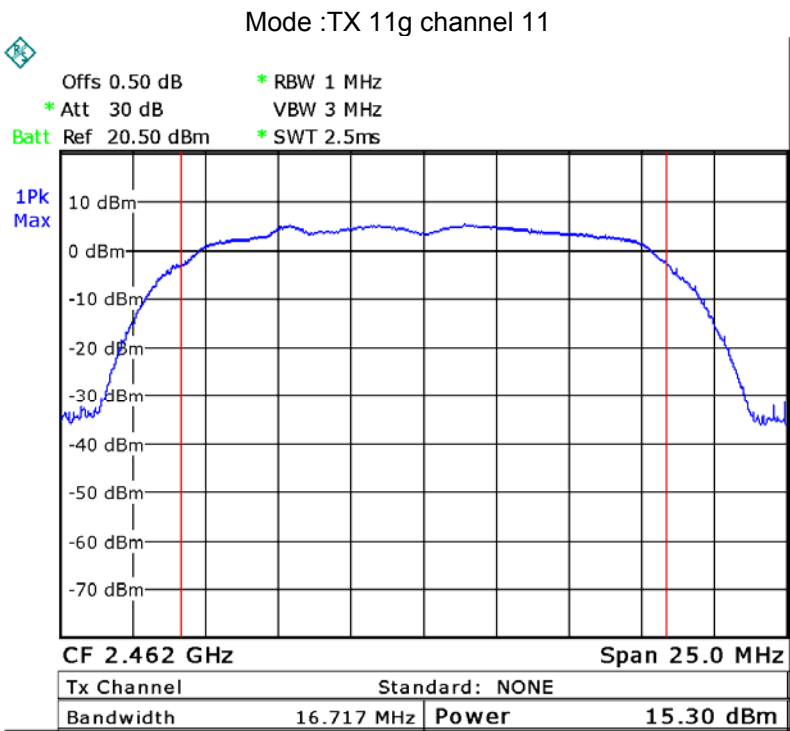
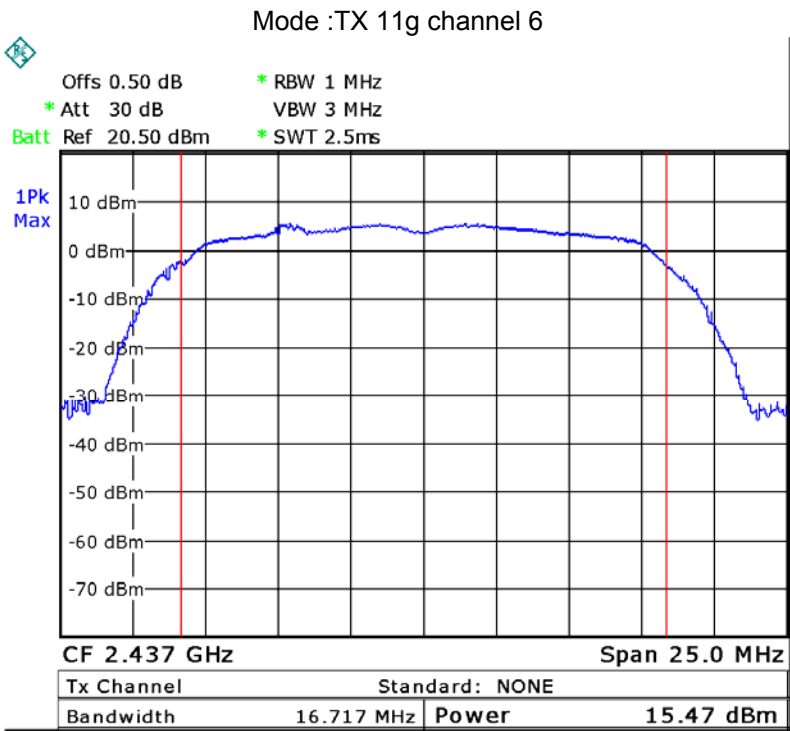
Mode: TX 11b channel 1

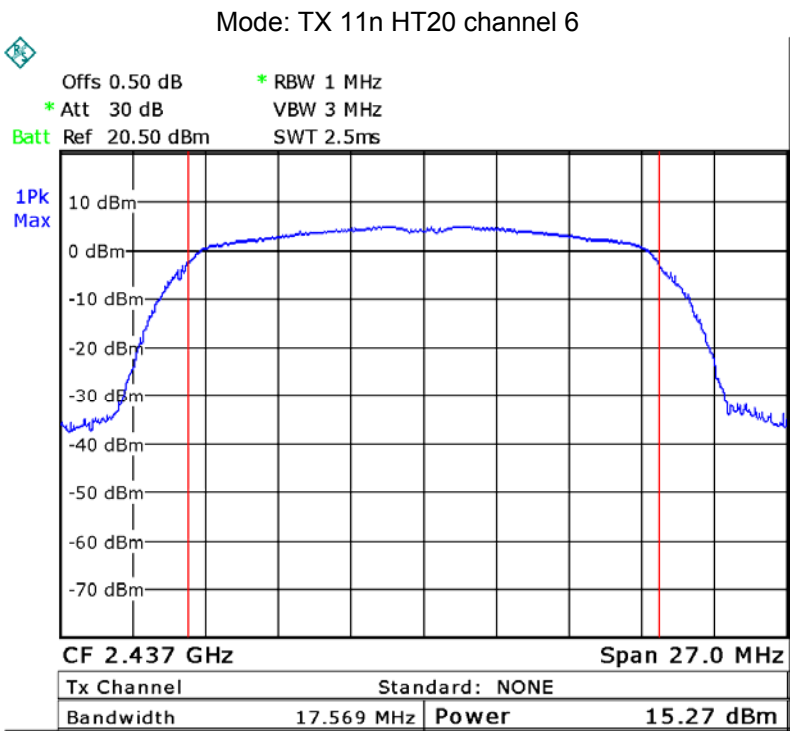
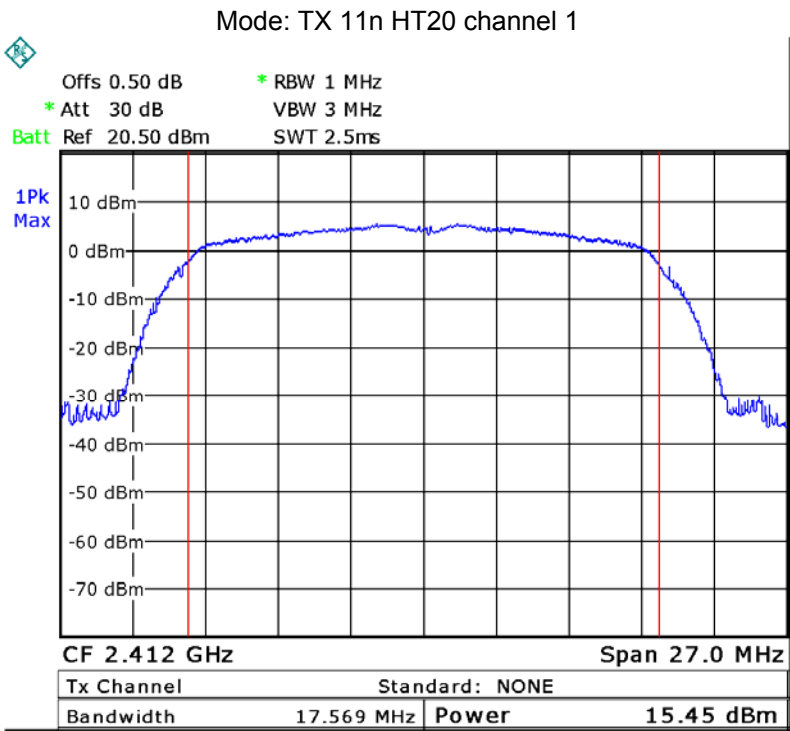


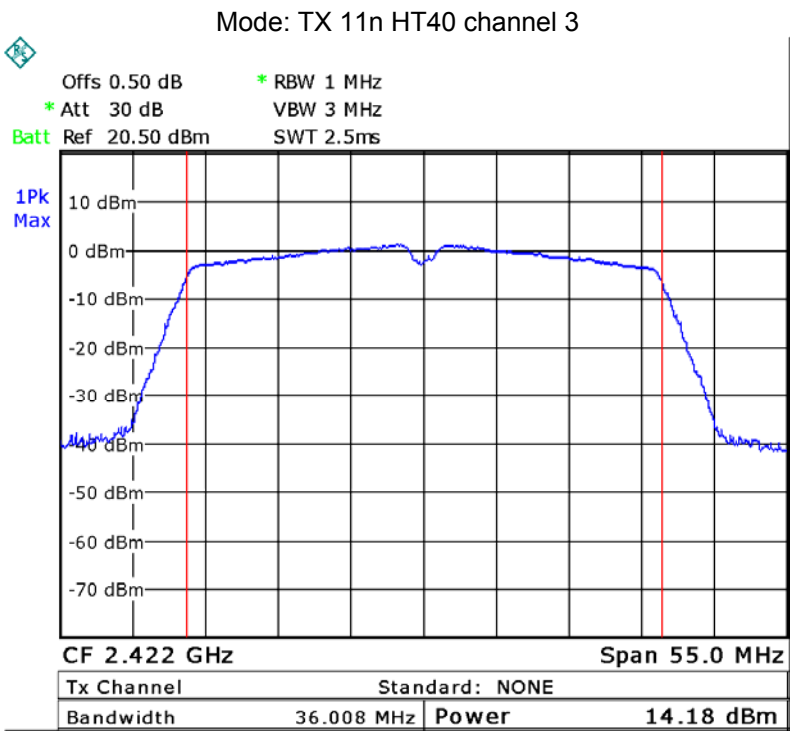
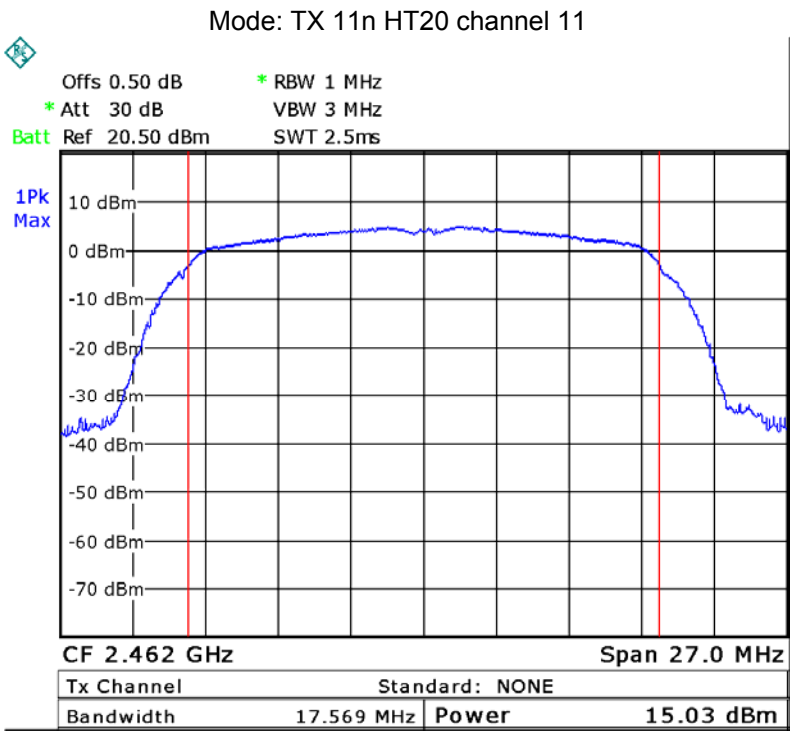
Mode: TX 11b channel 6

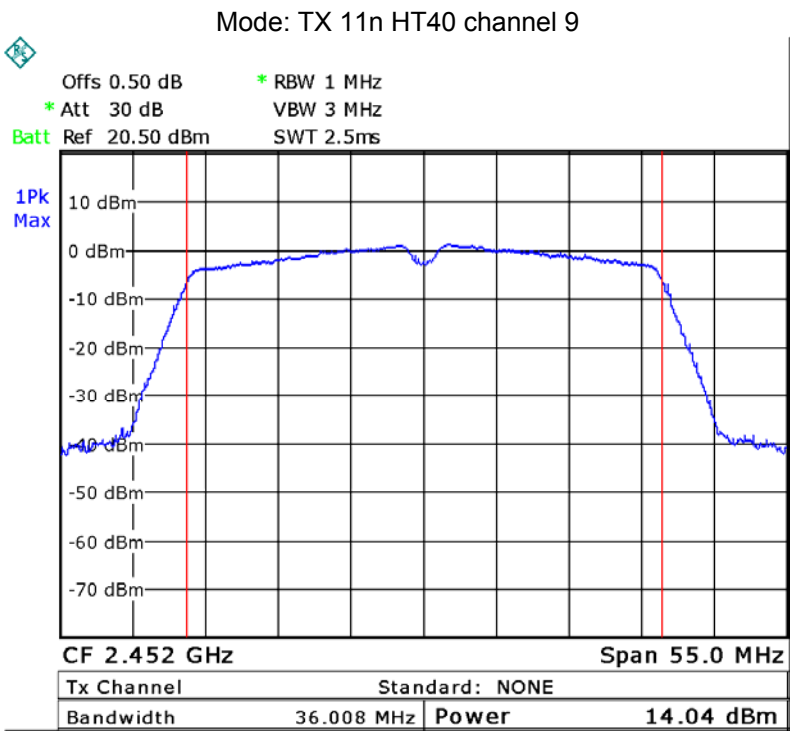
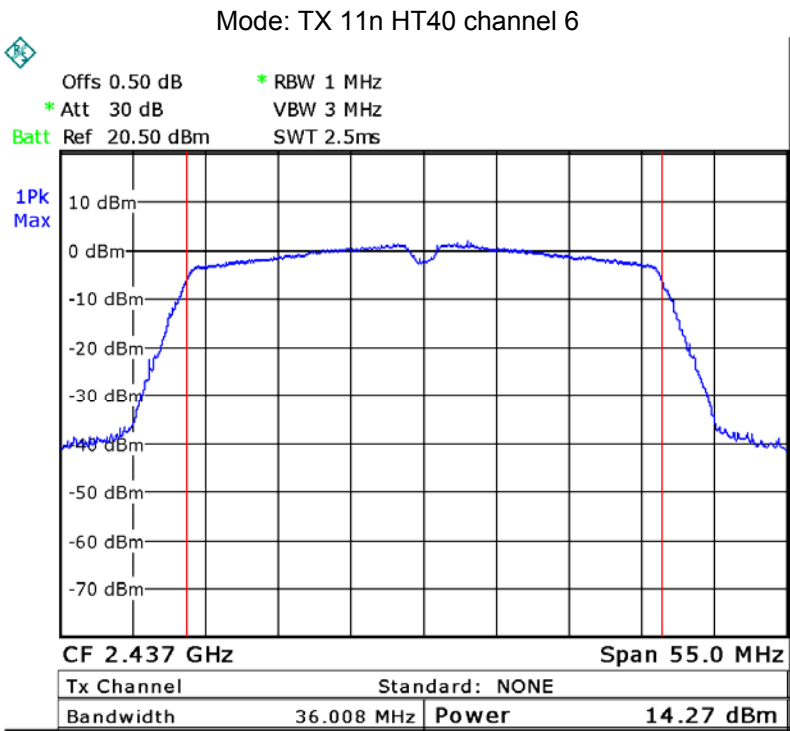












14 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: ANSI C63.10:2013

14.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018 section 10.2

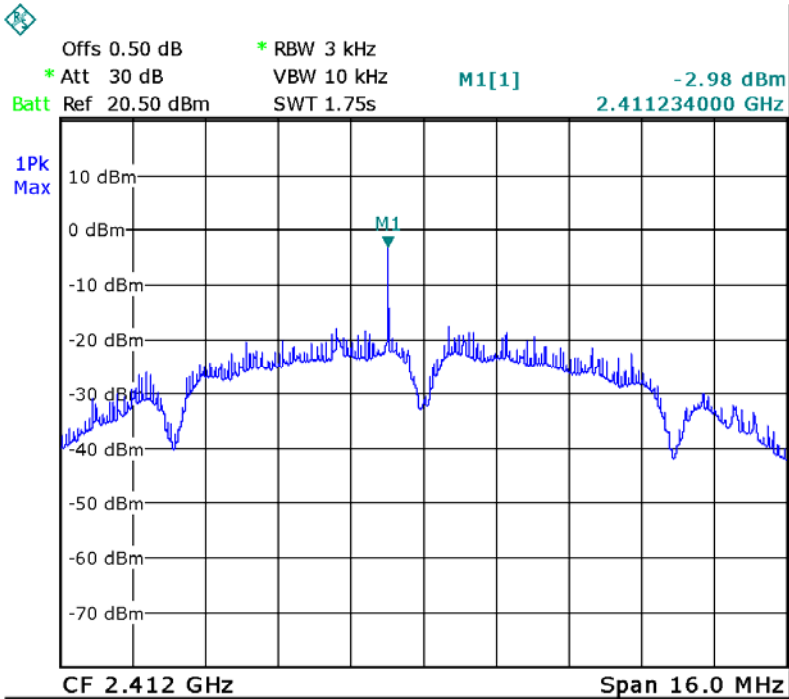
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to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

14.2 Test Result:

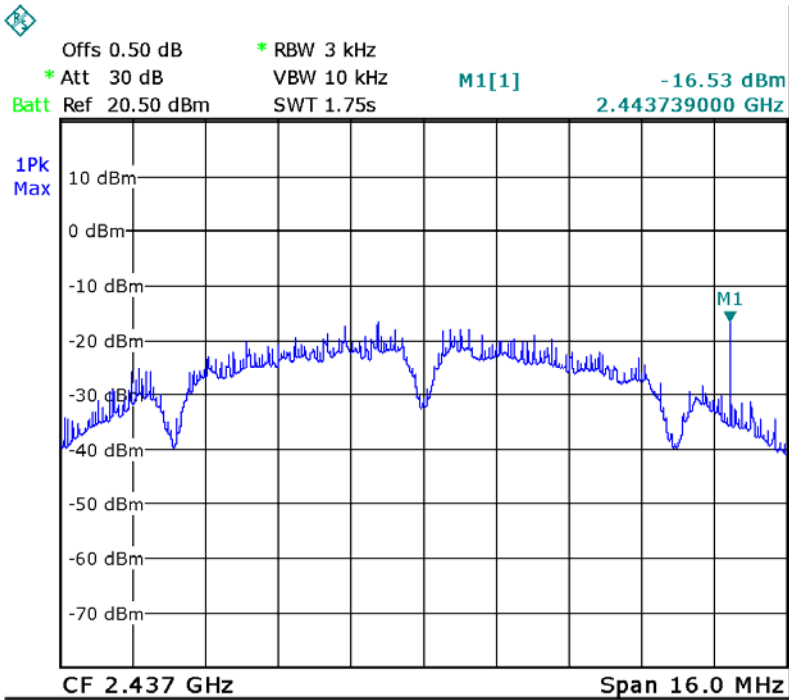
Operation mode	Channel Frequency (MHz)	Power Spectral density (dBm)		
		ANT0	ANT1	SUM
TX 11b	Low-2412	-2.98	-4.61	/
	Middle-2437	-16.53	-9.69	/
	High-2462	-6.49	-5.26	/
TX 11g	Low-2412	-20.30	-19.91	/
	Middle-2437	-19.93	-19.77	/
	High-2462	-19.33	-20.36	/
TX 11n HT20	Low-2412	-20.43	-19.98	-17.19
	Middle-2437	-17.16	-20.57	-15.53
	High-2462	-19.87	-20.00	-16.92
TX 11n HT40	Low-2422	-23.20	-23.72	-20.44
	Middle-2437	-23.74	-23.18	-20.44
	High-2452	-23.12	-23.55	-20.32
Directional gain=antenna gain + 10log(N)=3 + 10log2= 6.01dBi N is number of array elements or staves				

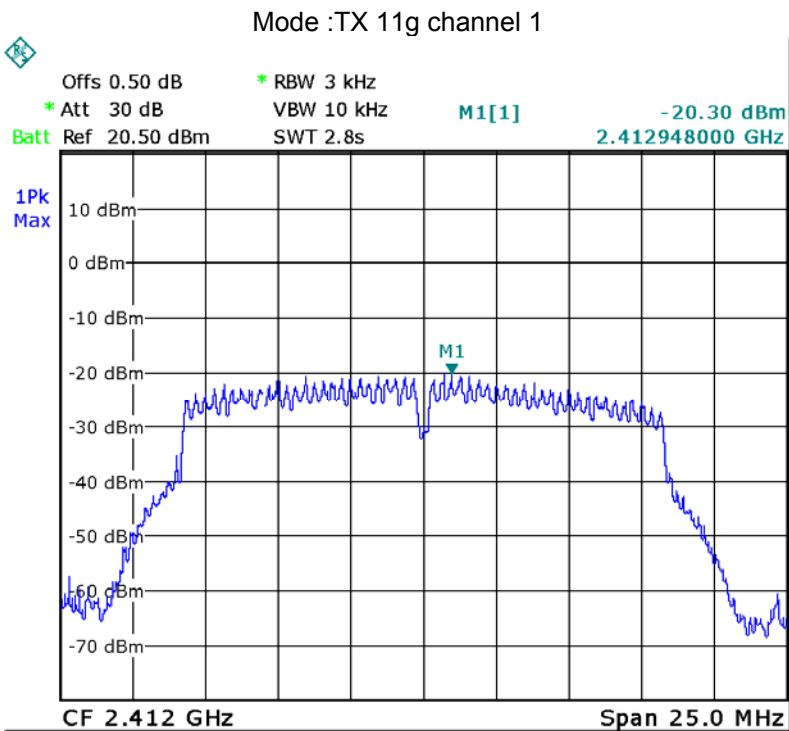
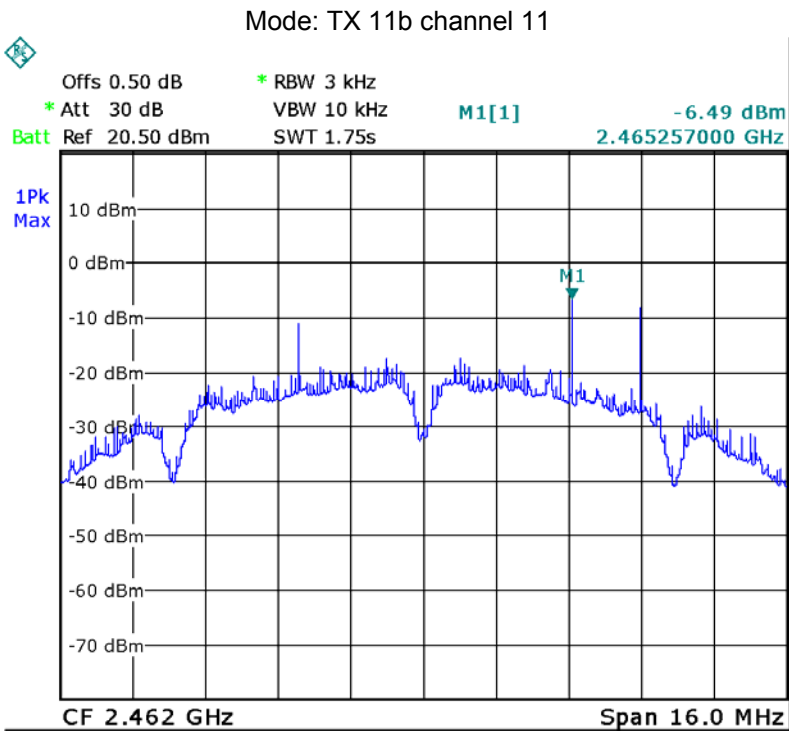
Test Plot

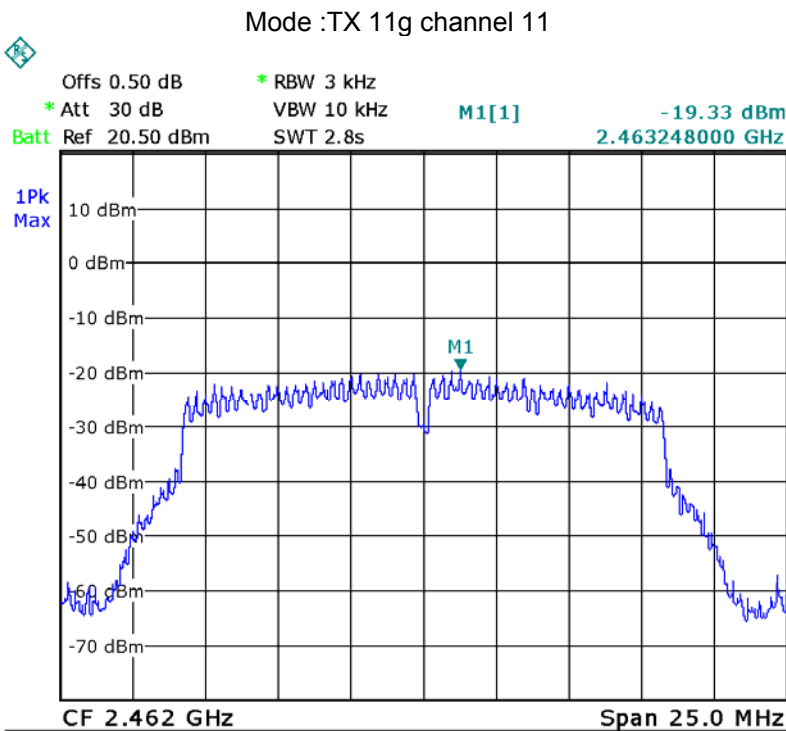
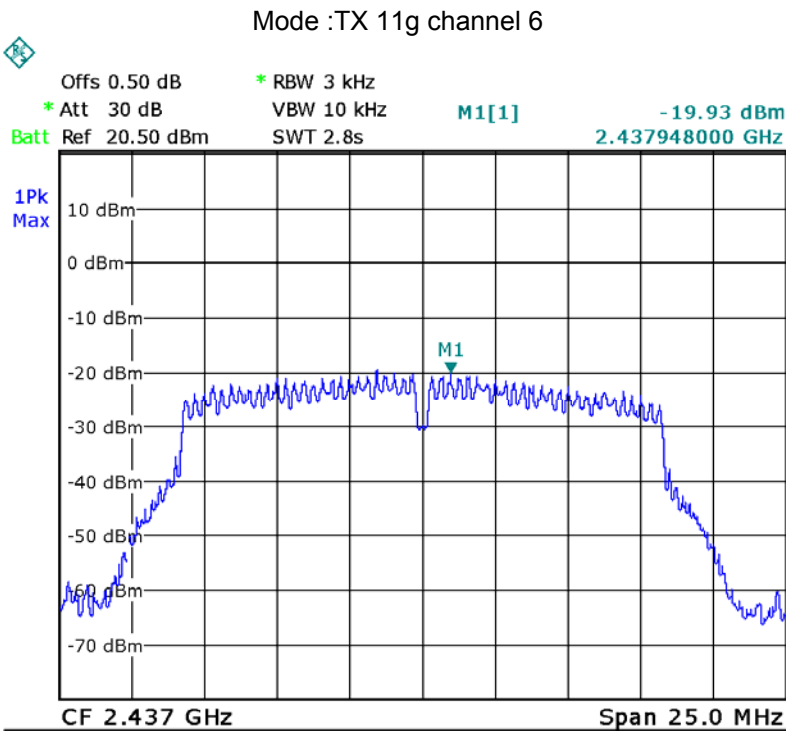
Antenna 0
Mode: TX 11b channel 1

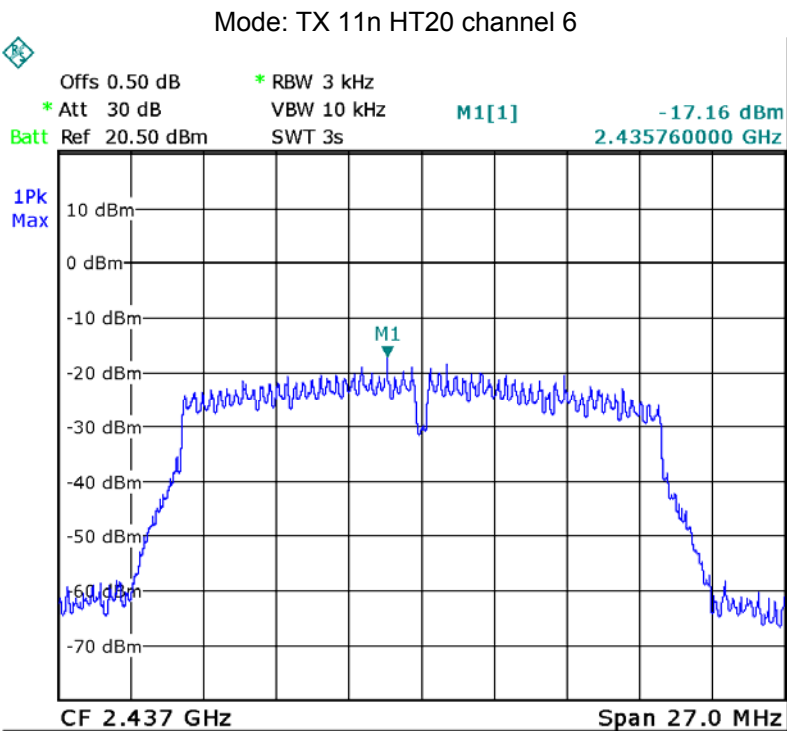
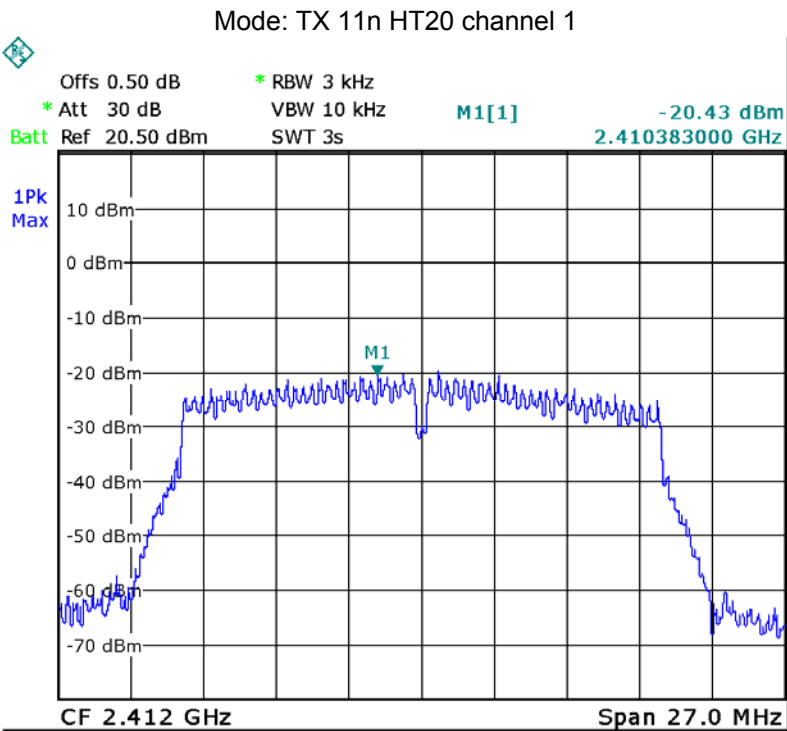


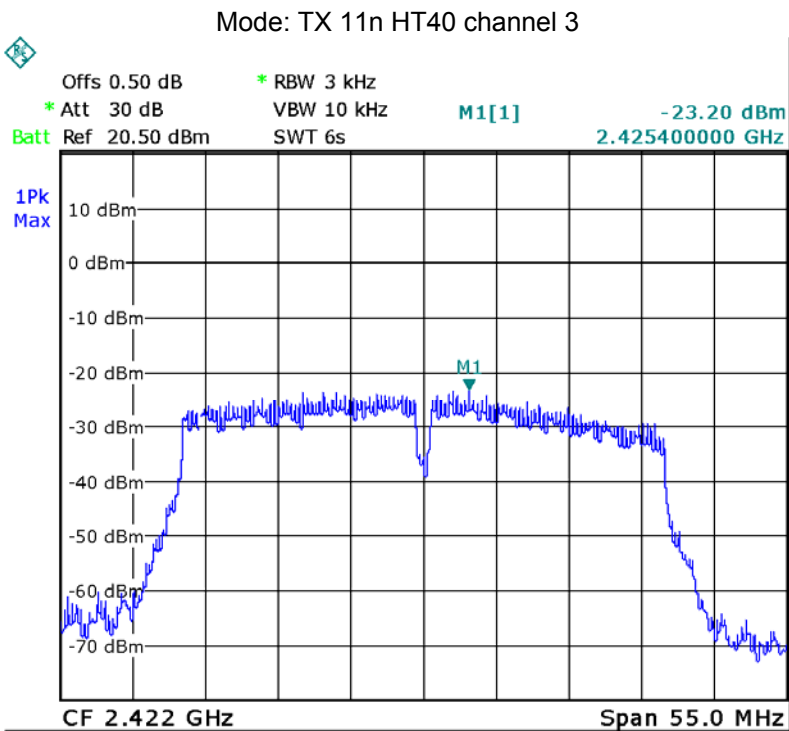
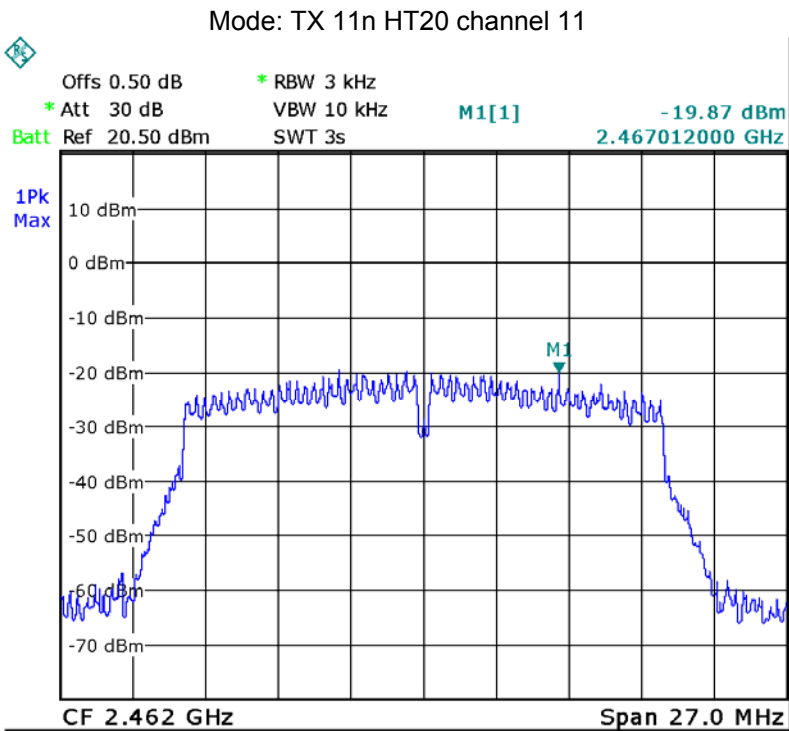
Mode: TX 11b channel 6

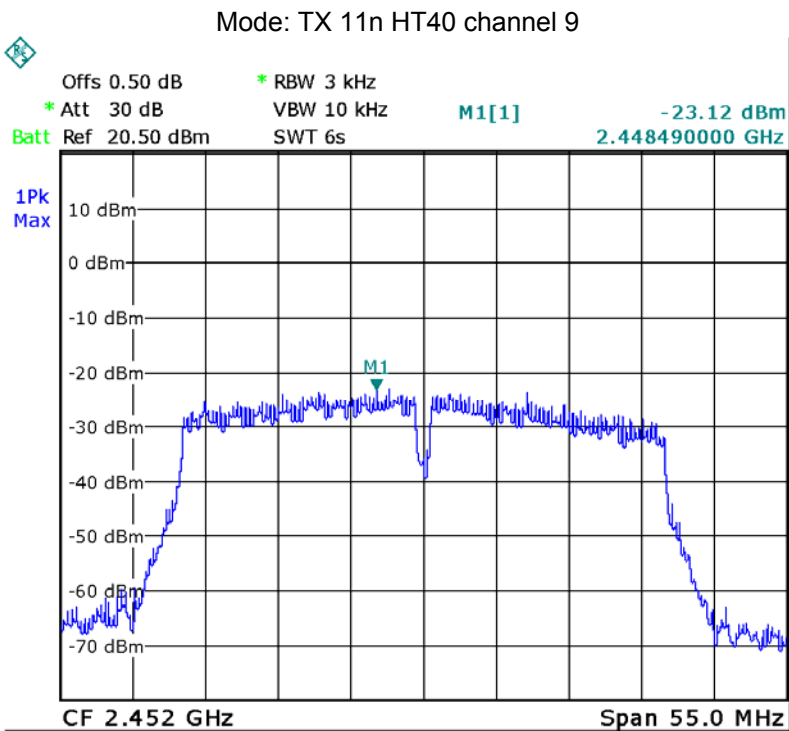
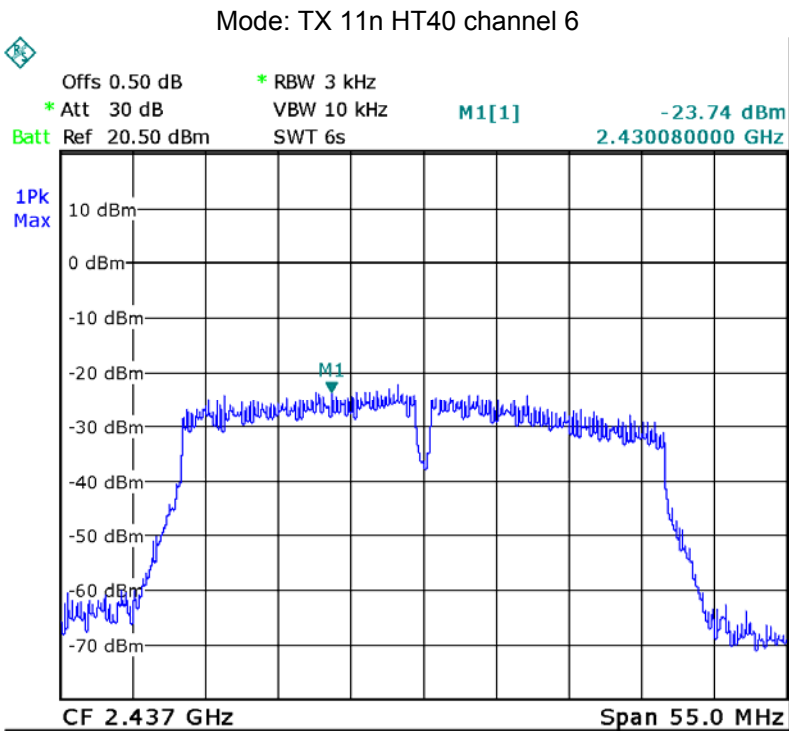


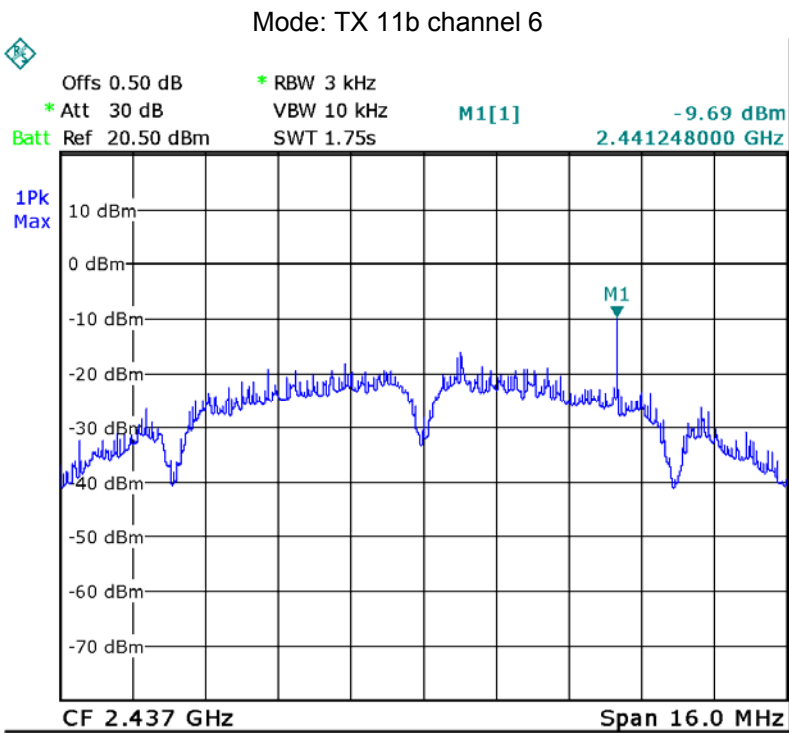
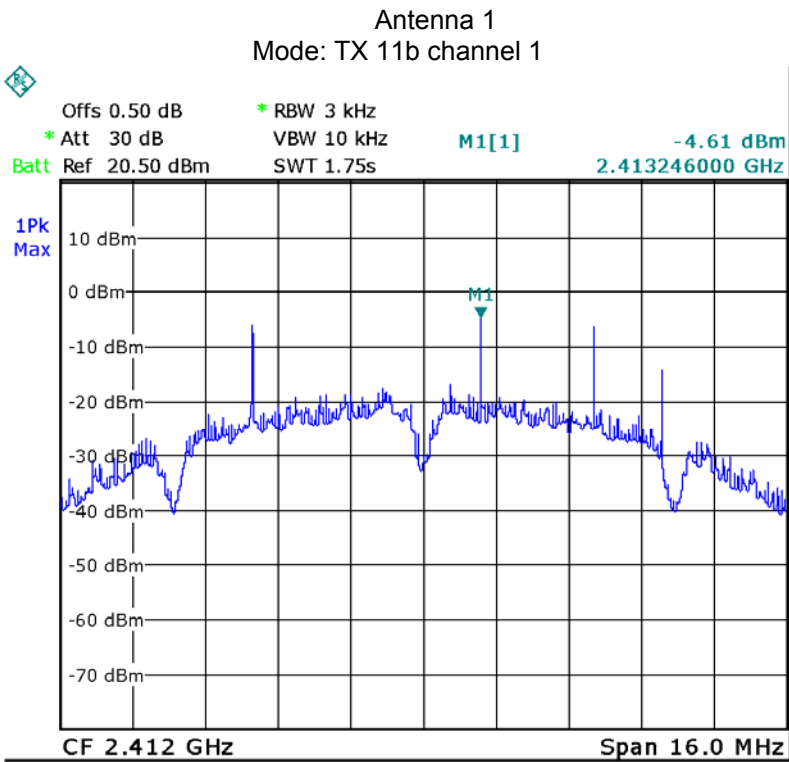


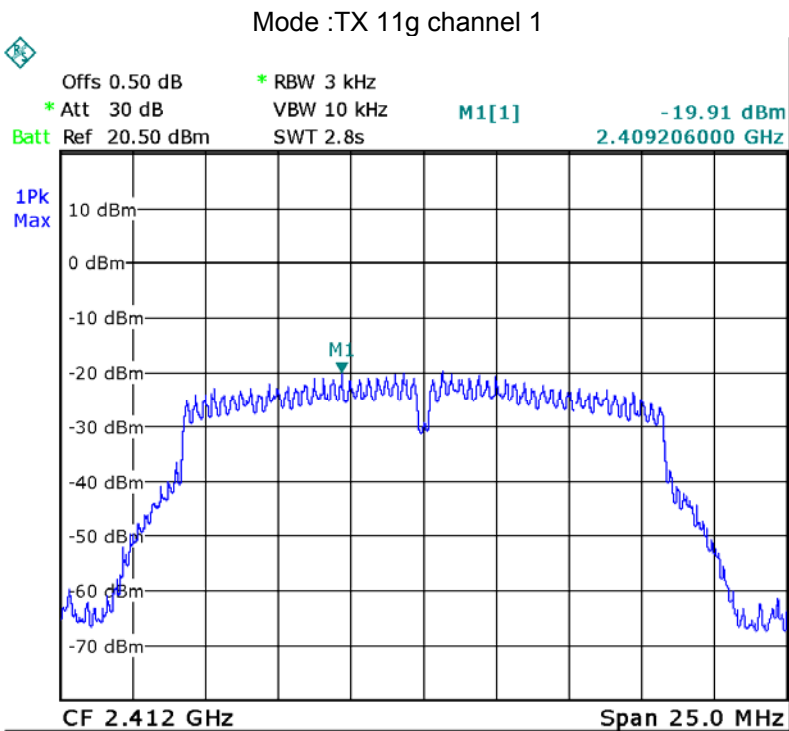
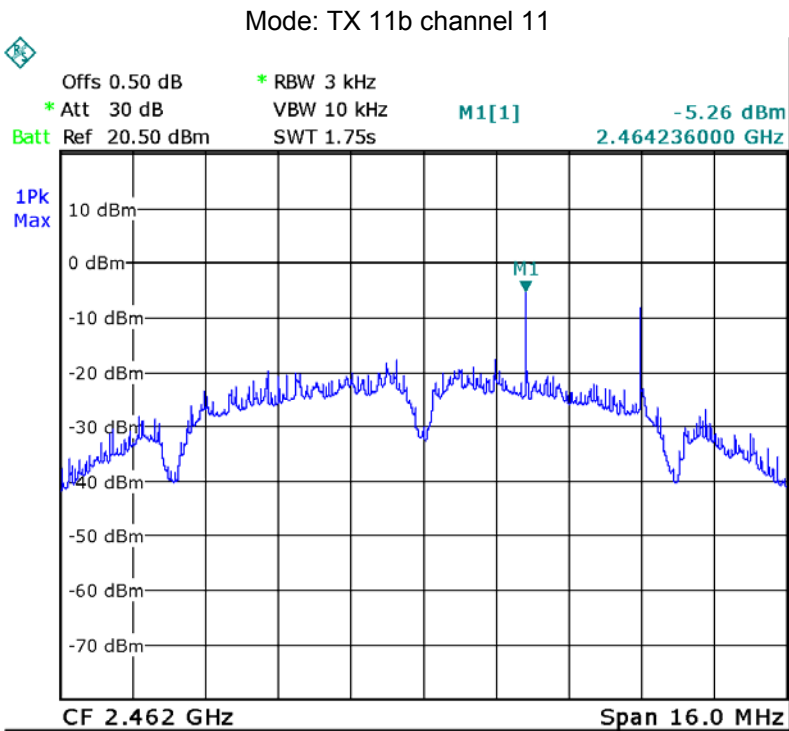


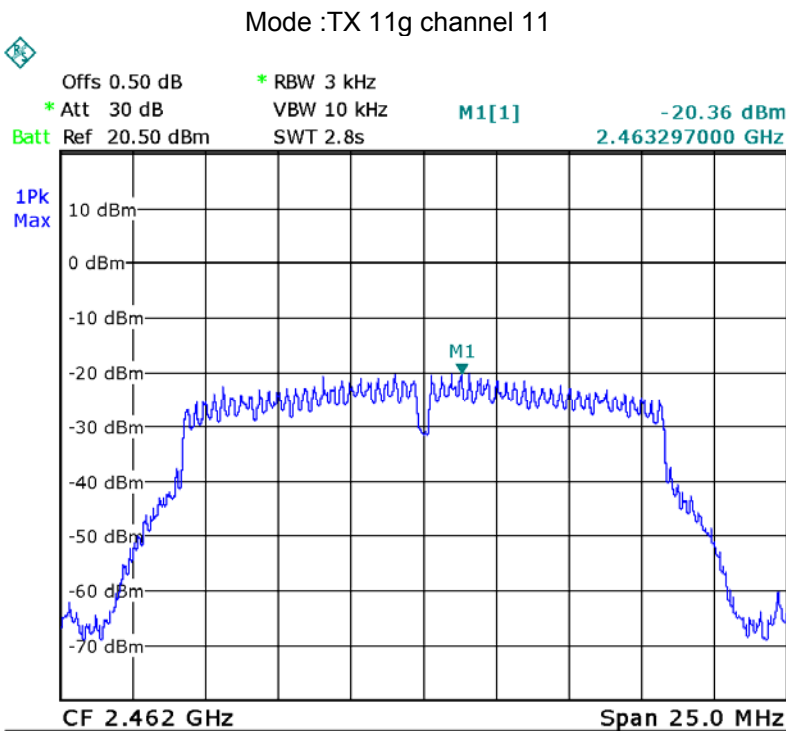
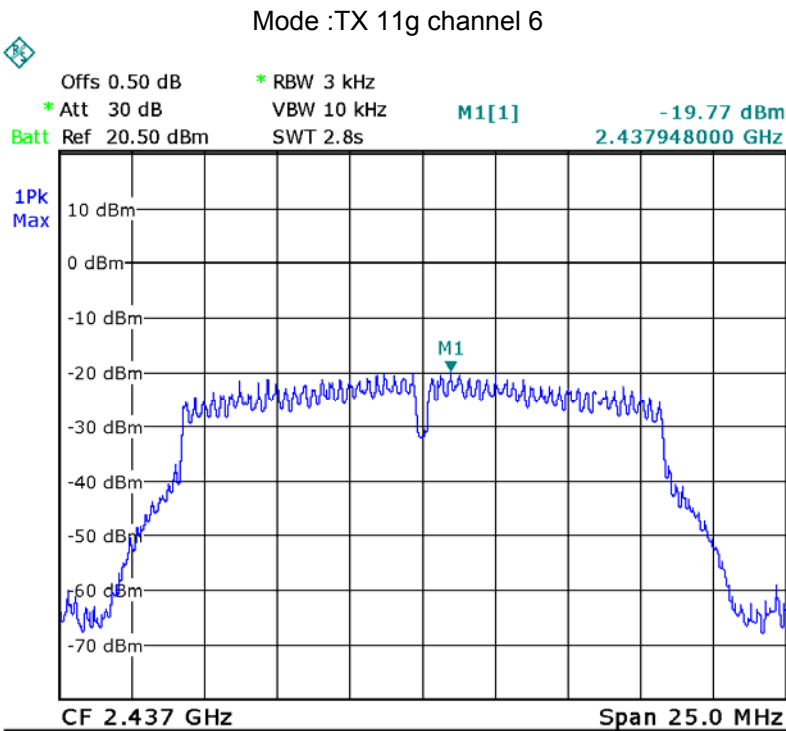


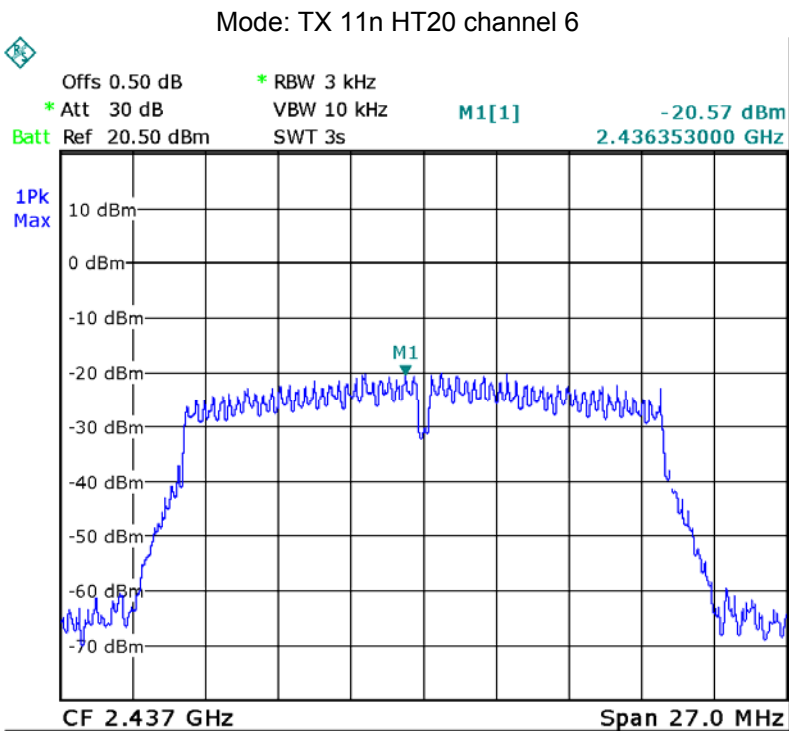
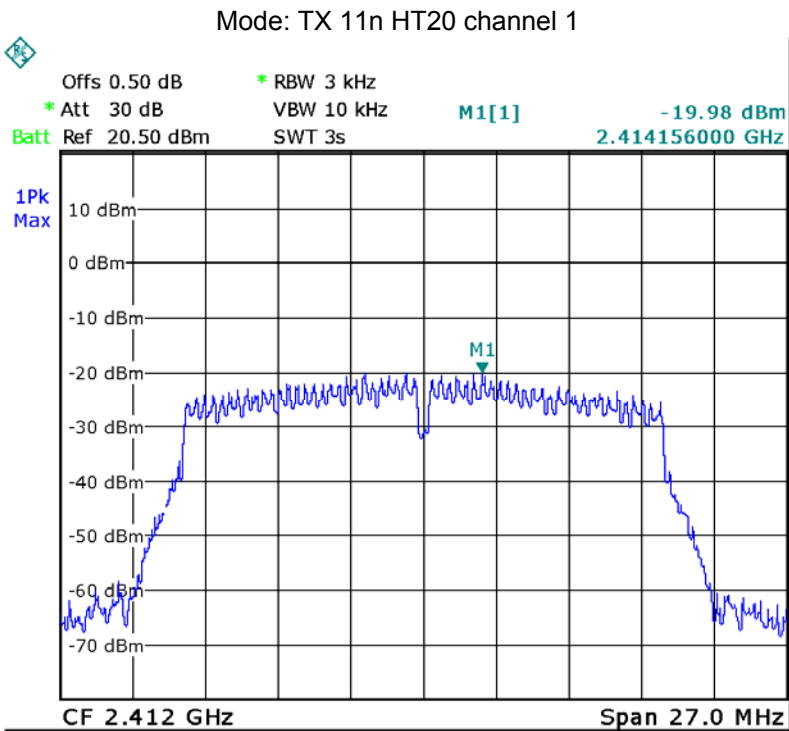


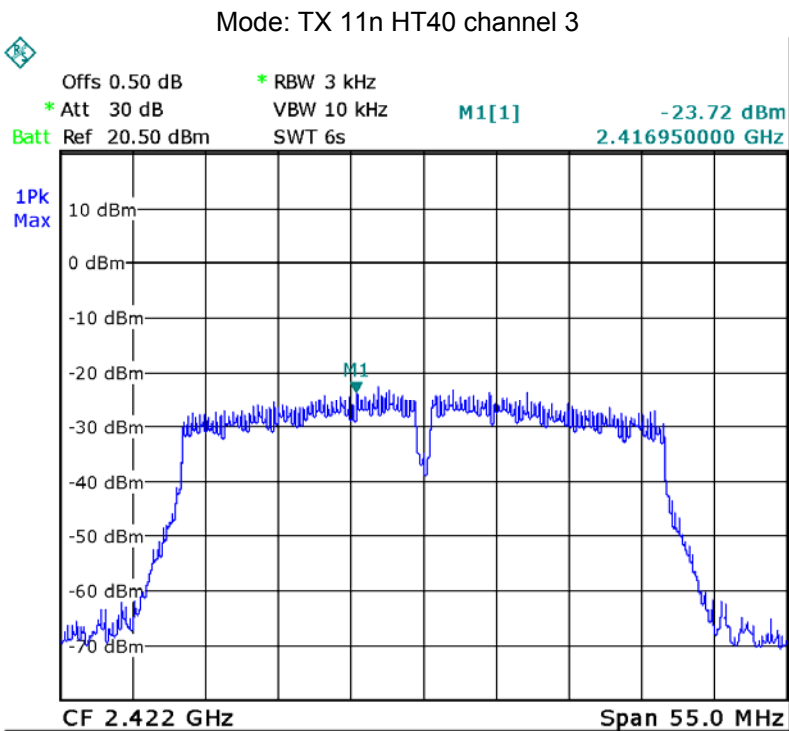
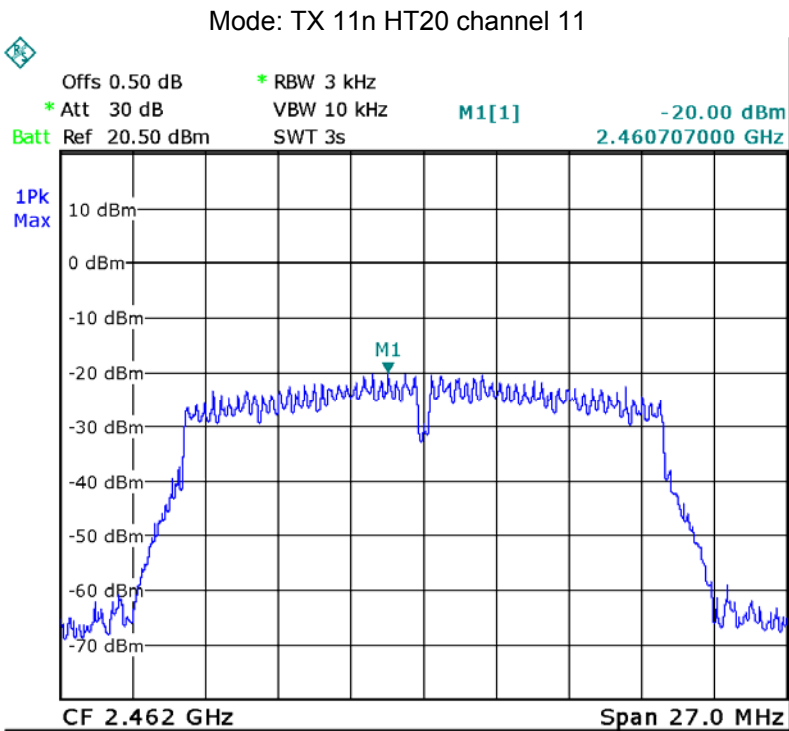


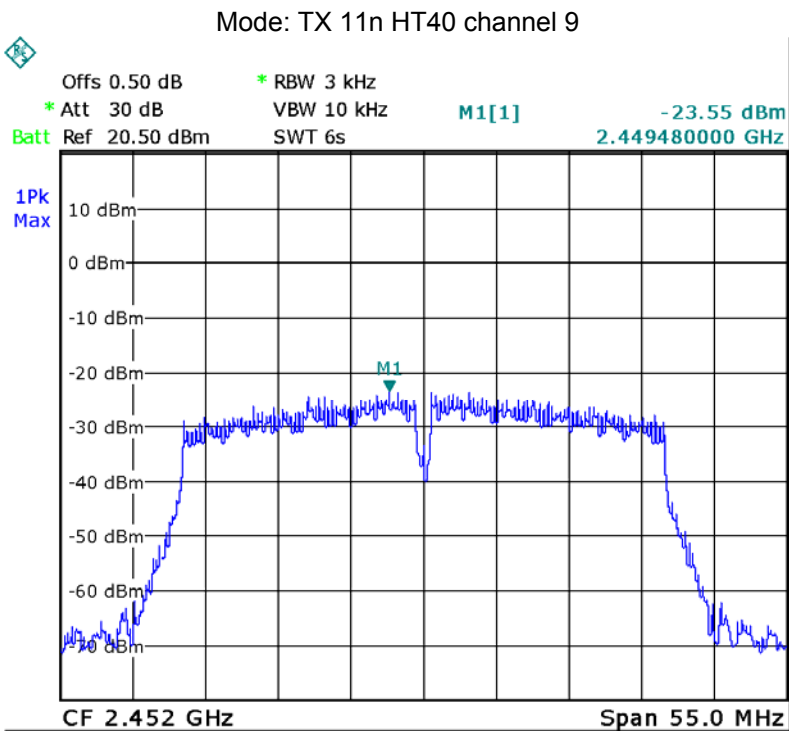
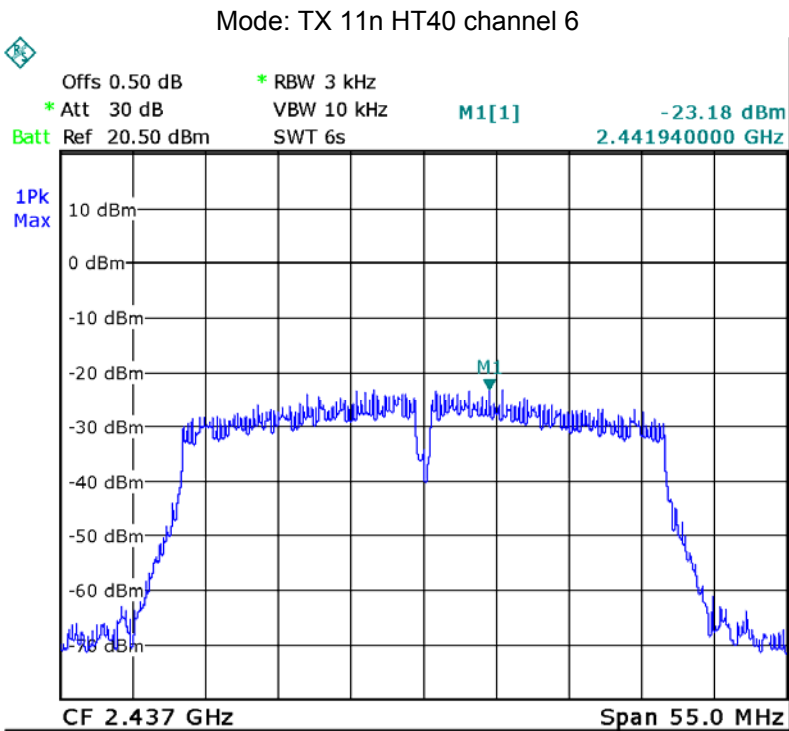






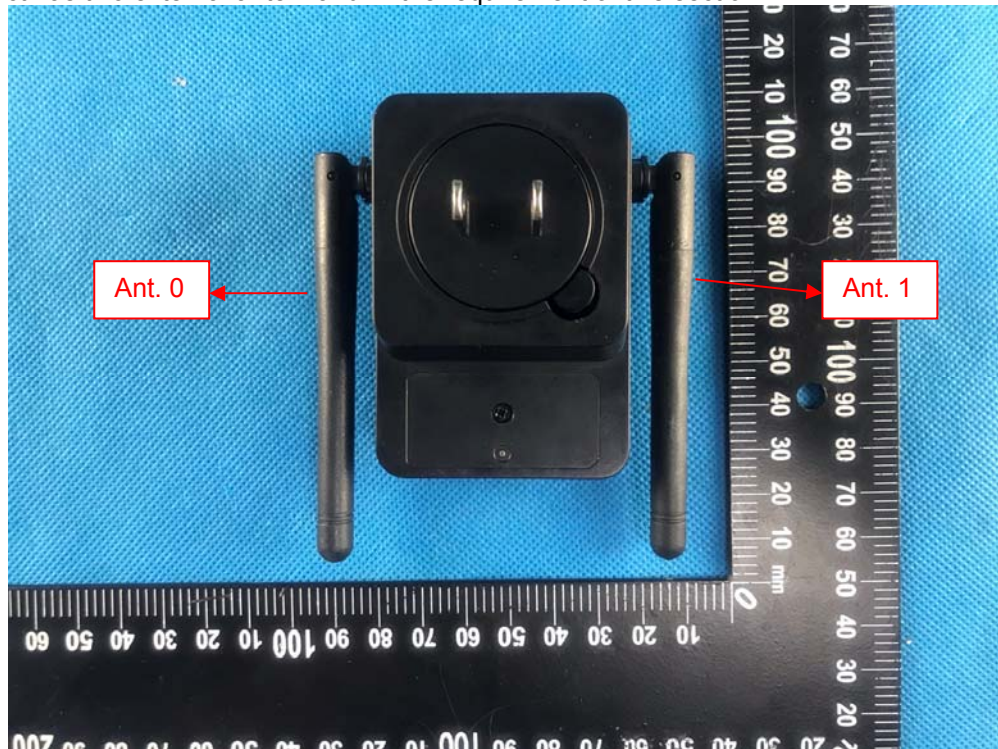






15 Antenna Requirement

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 two external antenna fulfill the requirement of this section.



16 RF Exposure

Note: Please refer to MPE report: WTD21D05044772W002.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-1166197_Photos.

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