TEST REPORT

Reference No.	:	WTS18S05112396-1W
FCC ID	:	2AP2U-SN3R
Applicant	:	IoT Defense Inc.
Address	:	1600 Spring Hill Rd., Suite 200, Vienna, VA 22182 USA
Manufacturer	:	Winstars Technology Limited
Address	:	Block 4, TaiSong Industrial Park, DaLang Street, LongHua Town, Bao'an district,Shenzhen, China
Product	:	SimpliNET-2 AC2100 Mesh WiFi Router
Model(s).....	:	SN3R
Brand name.....	:	SimpliNET
Standards.....	:	FCC CFR47 Part 15 C Section 15.247: 2018
Date of Receipt sample.....	:	2018-05-22
Date of Test.....	:	2018-05-23 to2018-06-05
Date of Issue	:	2018-06-09
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 Services (Shenzhen) Co., Ltd.
Address: 1/F., Fukangtai Building, West Baima Road, Songgang Street, Baoan District, Shenzhen, Guangdong, China
Tel :+86-755-83551033
Fax:+86-755-83552400

Tested by:

Frank Yin

Frank Yin / Test Engineer

Approved by:

Philo zhong

Philo Zhong / Manager

2 Laboratories Introduction

Waltek Services (Shenzhen) Co., Ltd is a professional third-party testing and certification laboratory with multi-year product testing and certification experience, established strictly in accordance with ISO/IEC 17025 requirements, and accredited by ILAC (International Laboratory Accreditation Cooperation) member. A2LA (American Association for Laboratory Accreditation, the certification number is 4243.01) of USA, CNAS (China National Accreditation Service for Conformity Assessment, the registration number is L3110) of China.Meanwhile, Waltek has got recognition as registration and accreditation laboratory from EMSD (Electrical and Mechanical Services Department), and American Energy star, FCC(The Federal Communications Commission), CEC(California energy efficiency), ISED Canada (Innovation, Science and Economic Development Canada). It's the strategic partner and data recognition laboratory of international authoritative organizations, such as Intertek(ETL-SEMKO), TÜV Rheinland, TÜV SÜD, etc.

Waltek Services (Shenzhen) Co., Ltd is one of the largest and the most comprehensive third party testing laboratory in China. Our test capability covered four large fields: safety test. ElectroMagnetic Compatibility(EMC), and energy performance, wireless radio. As a professional, comprehensive, justice international test organization, we still keep the scientific and rigorous work attitude to help each client satisfy the international standards and assist their product enter into globe market smoothly.

2.1 Test Facility

A. Accreditations for Conformity Assessment (International)

Country/Region	Scope Covered By	Scope	Note
USA	ISO/IEC 17025	FCC ID \ SDoC(VOC/DOC)	1
Canada		IC ID \ VOC	2
Japan		MIC-T \ MIC-R	-
Europe		EMCD \ RED	-
Taiwan		NCC	-
Hong Kong		OFCA	-
Australia		RCM	-
India		WPC	-
Thailand		NTC	-
Singapore		IDA	-

Note:

1. FCC Designation No.: CN1201. Test Firm Registration No.: 523476.
2. ISED Canada Registration No.: 7760A

B.TCBs and Notify Bodies Recognized Testing Laboratory.

Recognized Testing Laboratory of …	Notify body number
TUV Rheinland	Optional.
Intertek	
TUV SUD	
SGS	
Phoenix Testlab GmbH	0700
Element Materials Technology Warwick Ltd.	0891
Timco Engineering, Inc.	1177
Eurofins Product Service GmbH	0681

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2. Revision History

Test report #	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS18S05112396-1W	2018-05-22	2018-05-23 to 2018-06-05	2018-06-09	Original	-	Valid

4 General Information

4.1 General Description of E.U.T

Product:	SimpliNET-2 AC2100 Mesh WiFi Router
Model(s).:	SN3R
Operation Frequency:	802.11b/g/n HT20: 2412MHz ~ 2462MHz 802.11n HT40: 2422MHz~2452MHz
Antenna installation:	Integrated Antenna
Antenna Gain:	3.0dBi
Type of modulation:	IEEE 802.11b (CCK/QPSK/BPSK,11Mbps max.) IEEE 802.11g (BPSK/QPSK/16QAM/64QAM,54Mbps max.) IEEE 802.11n (BPSK/QPSK/16QAM/64QAM,HT20:72Mbps max., HT40:150Mbps max.)

4.2 Details of E.U.T

Ratings	Input: AC 100~240V, 50/60Hz, 0.6A Output: 5V, 3A
Adapter	Model: P05W3000U

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	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Frequency Range	802.11b	11 Mbps	1/11	TX
	802.11g	54 Mbps	1/11	TX
	802.11n HT20	108 Mbps	1/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	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.

5 Equipment Used during Test

5.1 Equipments List

Conducted Emissions Test Site						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2017-09-15	2018-09-14
2.	LISN	R&S	ENV216	101215	2017-09-15	2018-09-14
3.	Cable	Top	TYPE16(3.5M)	-	2017-09-15	2018-09-14
3m Semi-anechoic Chamber for Radiation Emissions Test site						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP30	100091	2018-04-20	2019-04-19
2	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2018-05-18	2019-05-17
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2018-04-07	2019-04-06
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2018-04-07	2019-04-06
5	Spectrum Analyzer	R&S	FSP40	100501	2017-10-20	2018-10-19
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2017-09-14	2018-09-13
7	Microwave Broadband Preamplifier	SCHWARZBECK	BBV 9721	100472	2017-10-25	2018-10-24
8	Cable	Top	18GHz-40GHz	-	2017-10-25	2018-10-24
3m Semi-anechoic Chamber for Radiation Emissions Test site						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2018-04-20	2019-04-19
2	Ative Loop Antenna	Beijing Dazhi	ZN30900A	-	2018-04-17	2019-04-16
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2018-04-19	2019-04-18
4	Amplifier	ANRITSU	MH648A	M43381	2018-04-20	2019-04-19
5	Cable	HUBER+SUHNER	CBL2	525178	2018-04-20	2019-04-19
6	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2017-09-12	2018-09-11
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	Spectrum Analyzer	Agilent	N9020A	MY49100060	2017-09-15	2018-09-14
2.	Spectrum Analyzer	R&S	FSP40	100501	2017-10-20	2018-10-19
3.	Coaxial Cable	Top	10Hz-30GHz	-	2017-09-12	2018-09-11

4	DC Block	Gwave	GDCB-3G-N-SMA	140307001	2017-09-12	2018-09-11
5.	Humidity Chamber	GF	GTH-225-40-1P	IAA061213	2017-09-15	2018-09-14
6.	Antenna Connector*	/	/	/	2017-09-12	2018-09-11

"*": The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

5.2 Measurement Uncertainty

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

5.3 Test Equipment Calibration

All the test equipments used are valid and calibrated by GUANG ZHOU GRG METROLOGY & TEST CO., LTD. address is No.163, Pingyun Rd. West of Huangpu Ave,Tianhe District, Guangzhou, Guang dong, China.

6 Test Summary

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

7 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.10:2013
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class/Severity:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz
	56 dBμV between 0.5MHz & 5MHz
	60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth)

7.1 E.U.T. Operation

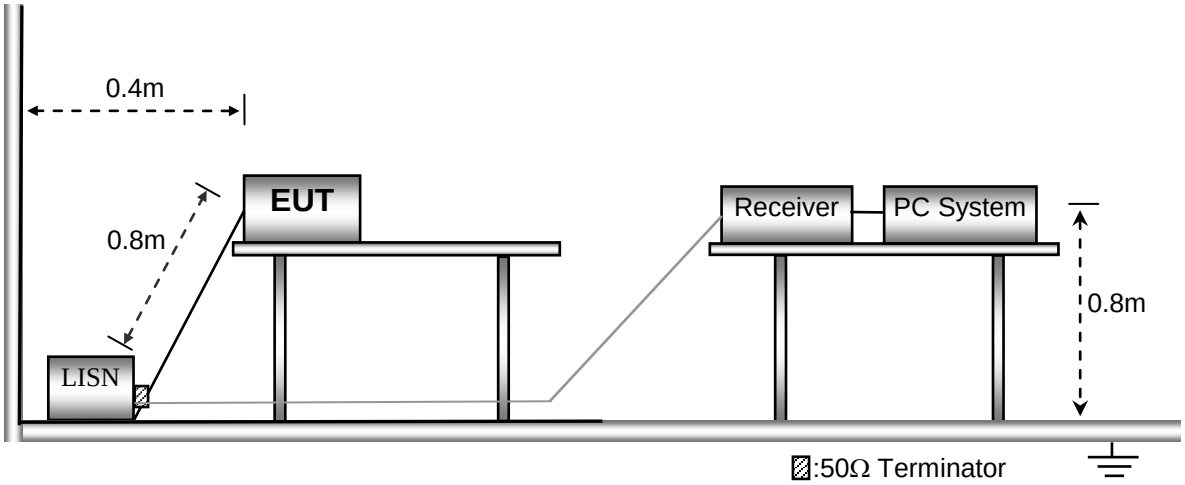
Operating Environment **:**

Temperature:	21.5 °C
Humidity:	51.9 % RH
Atmospheric Pressure:	101.2kPa
EUT Operation **:**	Transmitting mode

The test was performed in Transmitting mode(For WIFI), Only the worst case 802.11b mode were record in the report.

7.2 EUT Setup

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



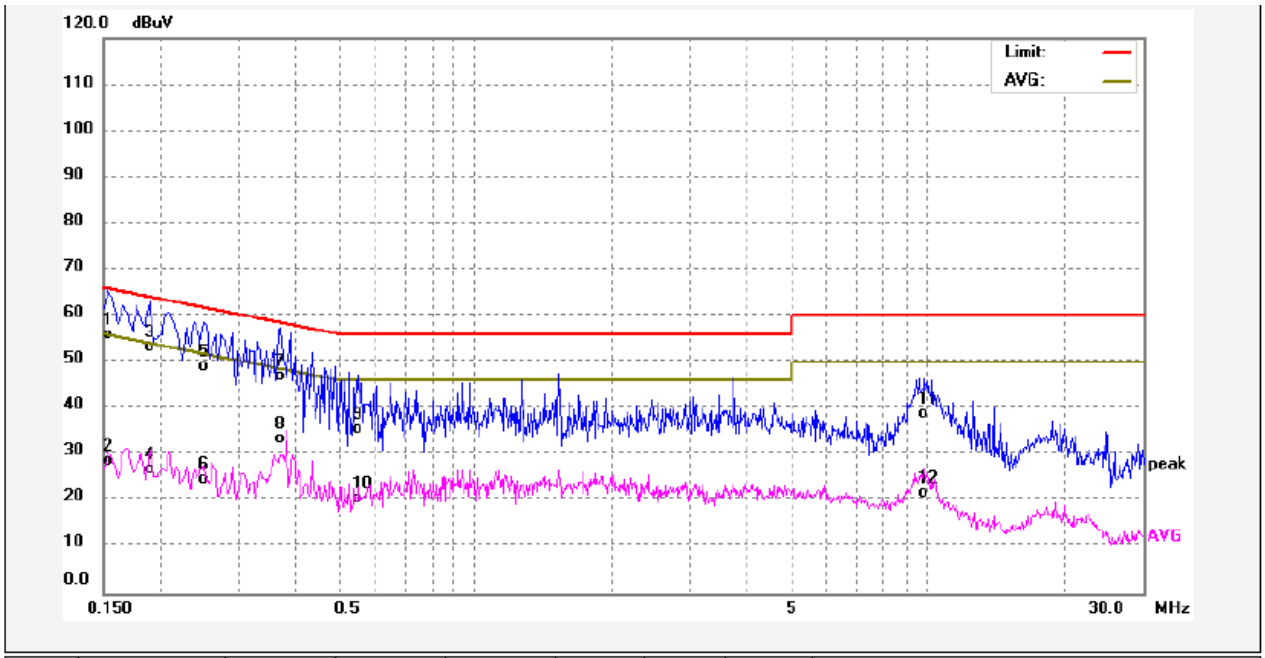
7.3 Measurement Description

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

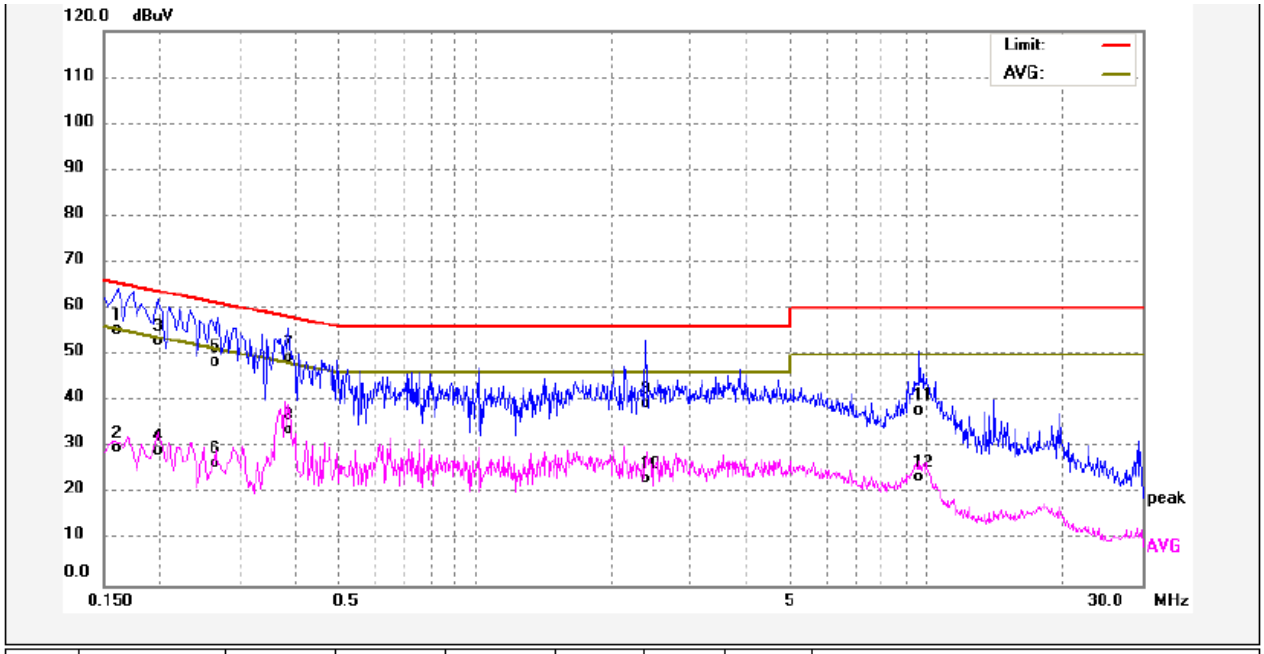
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	45.89	10.02	55.91	65.78	-9.87	QP	
2	0.1539	18.73	10.02	28.75	55.78	-27.03	AVG	
3	0.1900	43.37	9.90	53.27	64.03	-10.76	QP	
4	0.1900	16.93	9.90	26.83	54.03	-27.20	AVG	
5	0.2500	39.18	10.01	49.19	61.75	-12.56	QP	
6	0.2500	14.85	10.01	24.86	51.75	-26.89	AVG	
7	0.3700	36.83	10.05	46.88	58.50	-11.62	QP	
8	0.3700	23.36	10.05	33.41	48.50	-15.09	AVG	
9	0.5500	25.39	10.07	35.46	56.00	-20.54	QP	
10	0.5500	10.44	10.07	20.51	46.00	-25.49	AVG	
11	9.8420	28.64	10.36	39.00	60.00	-21.00	QP	
12	9.8420	11.51	10.36	21.87	50.00	-28.13	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1620	45.50	9.94	55.44	65.36	-9.92	QP	
2	0.1620	19.97	9.94	29.91	55.36	-25.45	AVG	
3	0.1980	43.12	9.91	53.03	63.69	-10.66	QP	
4	0.1980	19.29	9.91	29.20	53.69	-24.49	AVG	
5	0.2700	38.35	10.00	48.35	61.12	-12.77	QP	
6	0.2700	16.67	10.00	26.67	51.12	-24.45	AVG	
7	0.3860	39.18	10.04	49.22	58.15	-8.93	QP	
8	0.3860	23.61	10.04	33.65	48.15	-14.50	AVG	
9	2.3900	29.29	10.22	39.51	56.00	-16.49	QP	
10	2.3900	12.99	10.22	23.21	46.00	-22.79	AVG	
11	9.6220	27.73	10.36	38.09	60.00	-21.91	QP	
12	9.6220	13.24	10.36	23.60	50.00	-26.40	AVG	

8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

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

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

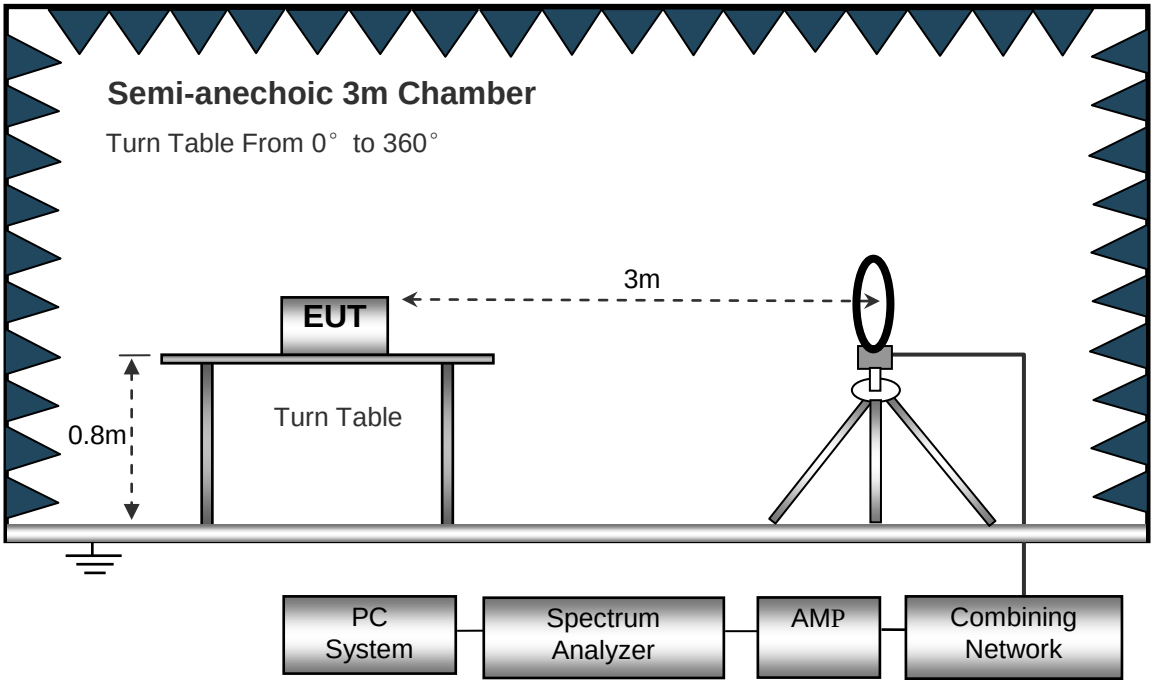
EUT Operation **:**

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

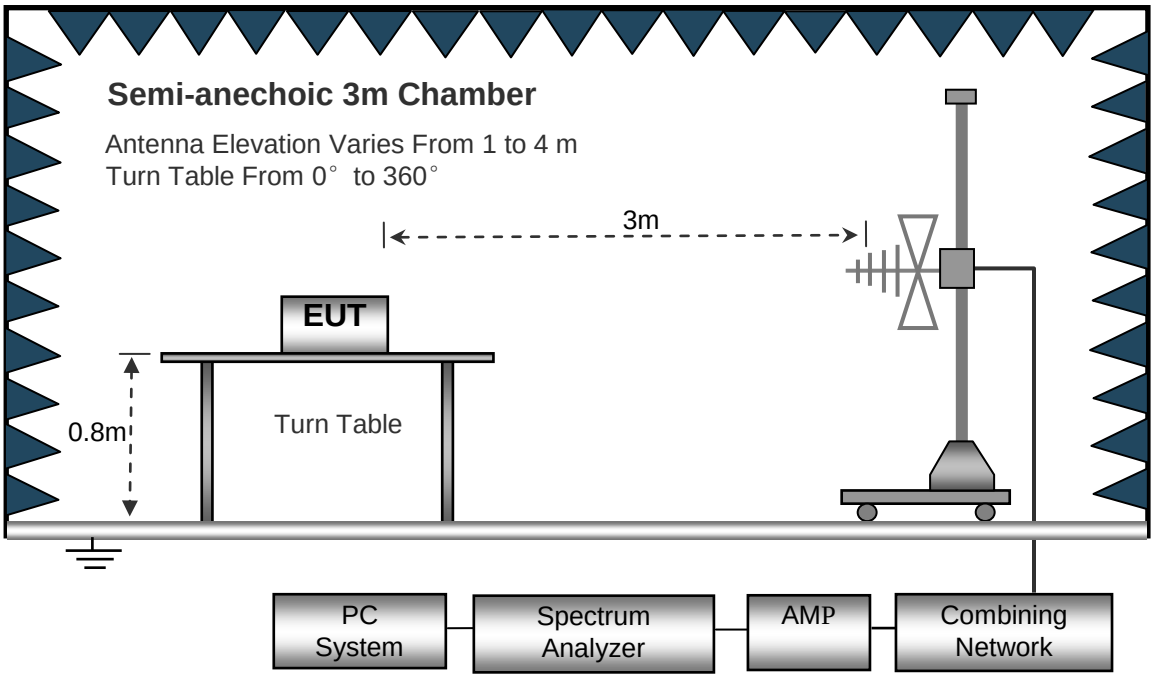
8.2 Test Setup

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

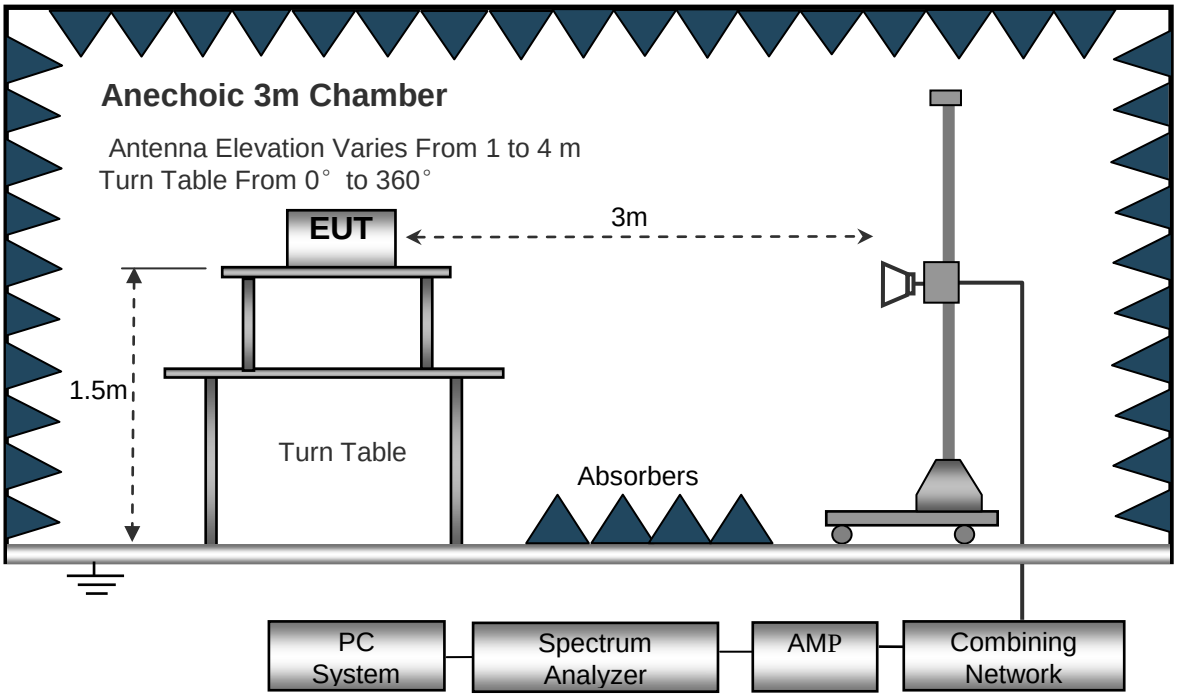
The test setup for emission measurement below 30MHz.



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. For below 1GHz, the EUT is 0.8m above ground plane; For above1GHz, the EUT is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X,Y and Z axis positioning(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand),the worst condition was tested putting the eut in X axis,so the worst data were shown as follow.
8. A 2.4GHz high –pass filter is used druing 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:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

8.6 Summary of Test Results

Test Frequency: 9 kHz ~ 30 MHz

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

Test Frequency : 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	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									
601.43	45.66	QP	291	1.4	H	-7.75	37.91	46.00	-8.09
601.43	47.99	QP	68	1.0	V	-7.75	40.24	46.00	-5.76
4824.00	54.69	PK	140	1.4	V	-1.05	53.64	74.00	-20.36
4824.00	41.39	Ave	140	1.4	V	-1.05	40.34	54.00	-13.66
7236.00	50.42	PK	148	1.5	H	1.34	51.76	74.00	-22.24
7236.00	38.17	Ave	148	1.5	H	1.34	39.51	54.00	-14.49
2333.04	46.23	PK	348	1.5	V	-13.19	33.04	74.00	-40.96
2333.04	38.86	Ave	348	1.5	V	-13.19	25.67	54.00	-28.33
2360.24	42.38	PK	184	1.5	H	-13.15	29.23	74.00	-44.77
2360.24	36.36	Ave	184	1.5	H	-13.15	23.21	54.00	-30.79
2493.79	43.05	PK	244	1.1	V	-13.08	29.97	74.00	-44.03
2493.79	38.90	Ave	244	1.1	V	-13.08	25.82	54.00	-28.18

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									
601.43	45.75	QP	190	1.5	H	-7.75	38.00	46.00	-8.00
601.43	48.86	QP	69	1.7	V	-7.75	41.11	46.00	-4.89
4874.00	50.70	PK	197	1.9	V	-0.63	50.07	74.00	-23.93
4874.00	42.92	Ave	197	1.9	V	-0.63	42.29	54.00	-11.71
7311.00	43.06	PK	132	1.3	H	2.21	45.27	74.00	-28.73
7311.00	41.96	Ave	132	1.3	H	2.21	44.17	54.00	-9.83
2321.77	45.03	PK	47	1.0	V	-13.19	31.84	74.00	-42.16
2321.77	37.09	Ave	47	1.0	V	-13.19	23.90	54.00	-30.10
2388.97	42.29	PK	352	1.3	H	-13.14	29.15	74.00	-44.85
2388.97	38.14	Ave	352	1.3	H	-13.14	25.00	54.00	-29.00
2489.18	43.63	PK	347	1.4	V	-13.09	30.54	74.00	-43.46
2489.18	38.71	Ave	347	1.4	V	-13.09	25.62	54.00	-28.38

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: High Channel 2462MHz									
601.43	46.66	QP	260	1.1	H	-7.75	38.91	46.00	-7.09
601.43	48.12	QP	165	1.1	V	-7.75	40.37	46.00	-5.63
4924.00	49.38	PK	52	1.0	V	-0.25	49.13	74.00	-24.87
4924.00	43.77	Ave	52	1.0	V	-0.25	43.52	54.00	-10.48
7386.00	46.67	PK	14	1.2	H	2.85	49.52	74.00	-24.48
7386.00	41.95	Ave	14	1.2	H	2.85	44.80	54.00	-9.20
2330.16	45.03	PK	20	1.5	V	-13.19	31.84	74.00	-42.16
2330.16	39.91	Ave	20	1.5	V	-13.19	26.72	54.00	-27.28
2373.61	44.94	PK	92	1.5	H	-13.14	31.80	74.00	-42.20
2373.61	38.29	Ave	92	1.5	H	-13.14	25.15	54.00	-28.85
2491.05	43.75	PK	7	1.8	V	-13.09	30.66	74.00	-43.34
2491.05	36.24	Ave	7	1.8	V	-13.09	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)
11g: Low Channel 2412MHz									
601.43	46.06	QP	258	1.3	H	-7.75	38.31	46.00	-7.69
601.43	47.69	QP	164	1.4	V	-7.75	39.94	46.00	-6.06
4824.00	47.04	PK	166	1.4	V	-1.06	45.98	74.00	-28.02
4824.00	42.39	Ave	166	1.4	V	-1.06	41.33	54.00	-12.67
7236.00	47.42	PK	176	1.9	H	1.35	48.77	74.00	-25.23
7236.00	45.18	Ave	176	1.9	H	1.35	46.53	54.00	-7.47
2329.19	46.00	PK	36	1.4	V	-13.19	32.81	74.00	-41.19
2329.19	38.97	Ave	36	1.4	V	-13.19	25.78	54.00	-28.22
2368.18	42.28	PK	359	1.3	H	-13.14	29.14	74.00	-44.86
2368.18	37.02	Ave	359	1.3	H	-13.14	23.88	54.00	-30.12
2494.55	43.78	PK	319	1.1	V	-13.08	30.70	74.00	-43.30
2494.55	37.39	Ave	319	1.1	V	-13.08	24.31	54.00	-29.69

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									
601.43	46.36	QP	147	1.8	H	-7.75	38.61	46.00	-7.39
601.43	49.40	QP	248	1.9	V	-7.75	41.65	46.00	-4.35
4874.00	50.25	PK	0	1.9	V	-0.62	49.63	74.00	-24.37
4874.00	46.40	Ave	0	1.9	V	-0.62	45.78	54.00	-8.22
7311.00	48.77	PK	238	1.7	H	2.20	50.97	74.00	-23.03
7311.00	47.03	Ave	238	1.7	H	2.20	49.23	54.00	-4.77
2328.46	45.54	PK	311	1.3	V	-13.19	32.35	74.00	-41.65
2328.46	38.75	Ave	311	1.3	V	-13.19	25.56	54.00	-28.44
2353.19	42.72	PK	49	1.0	H	-13.15	29.57	74.00	-44.43
2353.19	36.72	Ave	49	1.0	H	-13.15	23.57	54.00	-30.43
2492.49	43.73	PK	297	1.8	V	-13.09	30.64	74.00	-43.36
2492.49	38.90	Ave	297	1.8	V	-13.09	25.81	54.00	-28.19

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									
601.43	44.51	QP	113	1.7	H	-7.75	36.76	46.00	-9.24
601.43	47.99	QP	84	1.5	V	-7.75	40.24	46.00	-5.76
4924.00	52.86	PK	29	1.9	V	-0.25	52.61	74.00	-21.39
4924.00	44.88	Ave	29	1.9	V	-0.25	44.63	54.00	-9.37
7386.00	45.71	PK	321	1.0	H	2.86	48.57	74.00	-25.43
7386.00	42.05	Ave	321	1.0	H	2.86	44.91	54.00	-9.09
2327.39	45.17	PK	56	1.3	V	-13.19	31.98	74.00	-42.02
2327.39	38.41	Ave	56	1.3	V	-13.19	25.22	54.00	-28.78
2381.60	42.97	PK	240	2.0	H	-13.14	29.83	74.00	-44.17
2381.60	37.18	Ave	240	2.0	H	-13.14	24.04	54.00	-29.96
2487.03	42.72	PK	267	1.6	V	-13.08	29.64	74.00	-44.36
2487.03	38.94	Ave	267	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)
n20: Low Channel 2412MHz									
601.43	46.00	QP	220	1.2	H	-7.75	38.25	46.00	-7.75
601.43	47.38	QP	185	1.5	V	-7.75	39.63	46.00	-6.37
4824.00	47.57	PK	262	1.9	V	-1.06	46.51	74.00	-27.49
4824.00	41.13	Ave	262	1.9	V	-1.06	40.07	54.00	-13.93
7236.00	47.27	PK	228	1.8	H	1.34	48.61	74.00	-25.39
7236.00	46.57	Ave	228	1.8	H	1.34	47.91	54.00	-6.09
2344.22	46.77	PK	311	2.0	V	-13.19	33.58	74.00	-40.42
2344.22	37.06	Ave	311	2.0	V	-13.19	23.87	54.00	-30.13
2354.14	44.07	PK	247	1.3	H	-13.14	30.93	74.00	-43.07
2354.14	37.94	Ave	247	1.3	H	-13.14	24.80	54.00	-29.20
2499.27	44.88	PK	282	1.5	V	-13.08	31.80	74.00	-42.20
2499.27	36.37	Ave	282	1.5	V	-13.08	23.29	54.00	-30.71

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)
n20: Middle Channel 2437MHz									
601.43	45.65	QP	154	1.2	H	-7.75	37.90	46.00	-8.10
601.43	49.17	QP	336	1.3	V	-7.75	41.42	46.00	-4.58
4874.00	50.27	PK	152	1.5	V	-0.61	49.66	74.00	-24.34
4874.00	41.76	Ave	152	1.5	V	-0.61	41.15	54.00	-12.85
7311.00	47.18	PK	343	1.0	H	2.21	49.39	74.00	-24.61
7311.00	39.65	Ave	343	1.0	H	2.21	41.86	54.00	-12.14
2321.56	45.18	PK	156	1.1	V	-13.19	31.99	74.00	-42.01
2321.56	38.39	Ave	156	1.1	V	-13.19	25.20	54.00	-28.80
2362.68	42.96	PK	134	1.6	H	-13.14	29.82	74.00	-44.18
2362.68	38.94	Ave	134	1.6	H	-13.14	25.80	54.00	-28.20
2496.42	42.60	PK	204	1.3	V	-13.09	29.51	74.00	-44.49
2496.42	36.61	Ave	204	1.3	V	-13.09	23.52	54.00	-30.48

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)
n20: High Channel 2462MHz									
601.43	44.95	QP	94	1.2	H	-7.75	37.20	46.00	-8.80
601.43	47.16	QP	204	1.9	V	-7.75	39.41	46.00	-6.59
4924.00	51.59	PK	50	1.2	V	-0.24	51.35	74.00	-22.65
4924.00	42.37	Ave	50	1.2	V	-0.24	42.13	54.00	-11.87
7386.00	49.54	PK	315	1.2	H	2.83	52.37	74.00	-21.63
7386.00	45.44	Ave	315	1.2	H	2.83	48.27	54.00	-5.73
2330.45	46.02	PK	72	1.7	V	-13.19	32.83	74.00	-41.17
2330.45	37.07	Ave	72	1.7	V	-13.19	23.88	54.00	-30.12
2383.18	44.46	PK	144	1.8	H	-13.14	31.32	74.00	-42.68
2383.18	38.41	Ave	144	1.8	H	-13.14	25.27	54.00	-28.73
2497.23	44.80	PK	110	1.8	V	-13.08	31.72	74.00	-42.28
2497.23	38.95	Ave	110	1.8	V	-13.08	25.87	54.00	-28.13

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
n40: Low Channel 2422MHz									
601.43	44.52	QP	151	1.4	H	-7.75	36.77	46.00	-9.23
601.43	47.58	QP	307	1.6	V	-7.75	39.83	46.00	-6.17
4844.00	46.57	PK	143	1.4	V	-1.06	45.51	74.00	-28.49
4844.00	39.12	Ave	143	1.4	V	-1.06	38.06	54.00	-15.94
7266.00	46.28	PK	170	1.2	H	1.34	47.62	74.00	-26.38
7266.00	42.50	Ave	170	1.2	H	1.34	43.84	54.00	-10.16
2330.43	45.09	PK	65	1.1	V	-13.19	31.90	74.00	-42.10
2330.43	39.24	Ave	65	1.1	V	-13.19	26.05	54.00	-27.95
2371.35	44.20	PK	134	1.8	H	-13.14	31.06	74.00	-42.94
2371.35	38.79	Ave	134	1.8	H	-13.14	25.65	54.00	-28.35
2495.48	44.81	PK	224	1.5	V	-13.08	31.73	74.00	-42.27
2495.48	36.16	Ave	224	1.5	V	-13.08	23.08	54.00	-30.92

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
n40: Middle Channel 2437MHz									
601.43	44.21	QP	152	1.3	H	-7.75	36.46	46.00	-9.54
601.43	47.69	QP	318	1.6	V	-7.75	39.94	46.00	-6.06
4874.00	46.30	PK	58	1.3	V	-0.61	45.69	74.00	-28.31
4874.00	41.54	Ave	58	1.3	V	-0.61	40.93	54.00	-13.07
7311.00	37.62	PK	225	1.5	H	2.21	39.83	74.00	-34.17
7311.00	32.79	Ave	225	1.5	H	2.21	35.00	54.00	-19.00
2339.87	46.95	PK	196	1.7	V	-13.19	33.76	74.00	-40.24
2339.87	39.80	Ave	196	1.7	V	-13.19	26.61	54.00	-27.39
2352.95	44.46	PK	55	1.6	H	-13.14	31.32	74.00	-42.68
2352.95	37.05	Ave	55	1.6	H	-13.14	23.91	54.00	-30.09
2491.40	43.11	PK	170	1.1	V	-13.09	30.02	74.00	-43.98
2491.40	36.07	Ave	170	1.1	V	-13.09	22.98	54.00	-31.02

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)
n40: High Channel 2452MHz									
601.43	46.72	QP	197	1.1	H	-7.75	38.97	46.00	-7.03
601.43	47.79	QP	190	1.2	V	-7.75	40.04	46.00	-5.96
4904.00	48.44	PK	323	2.0	V	-0.24	48.20	74.00	-25.80
4904.00	41.75	Ave	323	2.0	V	-0.24	41.51	54.00	-12.49
7356.00	36.27	PK	302	1.2	H	2.83	39.10	74.00	-34.90
7356.00	32.32	Ave	302	1.2	H	2.83	35.15	54.00	-18.85
2334.33	46.87	PK	18	1.1	V	-13.19	33.68	74.00	-40.32
2334.33	37.85	Ave	18	1.1	V	-13.19	24.66	54.00	-29.34
2367.40	42.44	PK	54	1.7	H	-13.14	29.30	74.00	-44.70
2367.40	37.22	Ave	54	1.7	H	-13.14	24.08	54.00	-29.92
2497.75	44.94	PK	76	1.8	V	-13.08	31.86	74.00	-42.14
2497.75	36.82	Ave	76	1.8	V	-13.08	23.74	54.00	-30.26

Test Frequency: 18GHz~25GHz

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

9 Band Edge Measurement

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	558074 D01 15.247 Meas Guidance v05
Test Limit:	Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

9.1 Test Produce

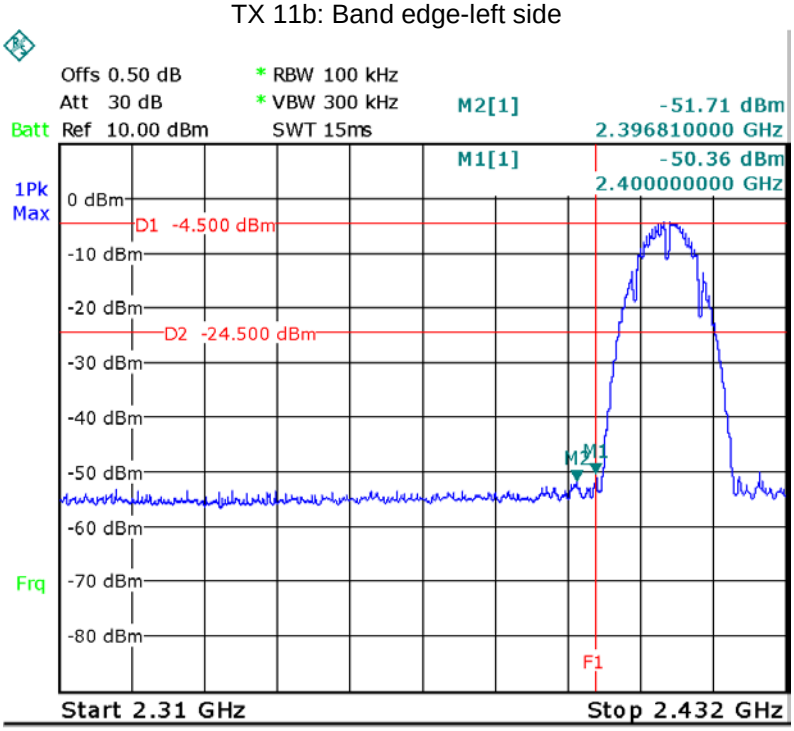
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

9.2 Test Result

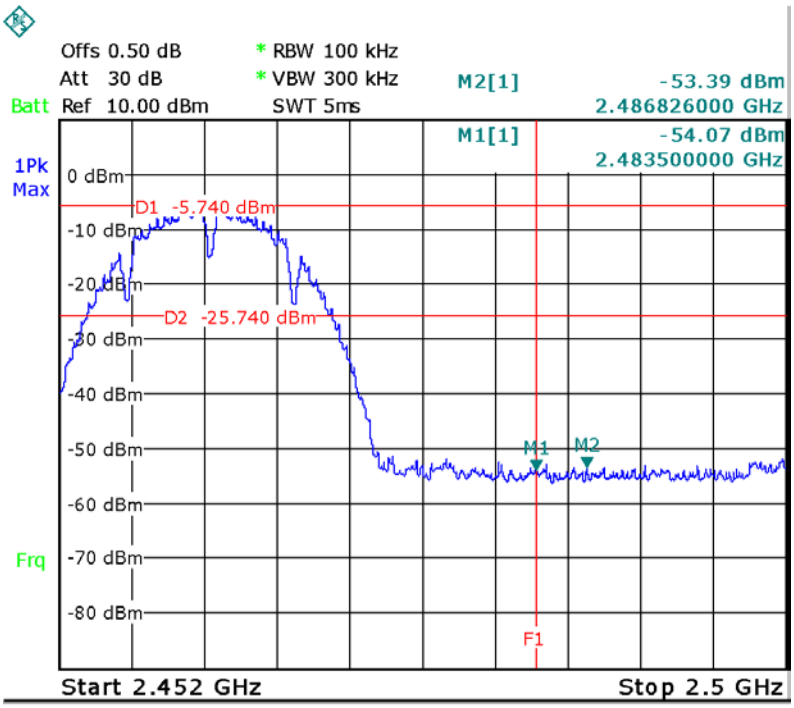
Test result plots shown as follows:

ANT1:

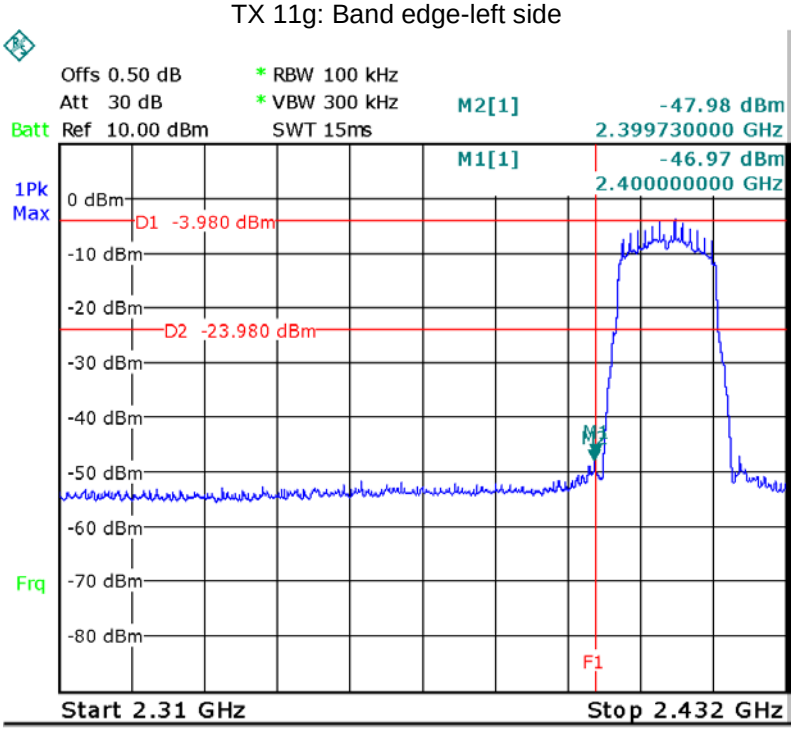
TX 11b: Band edge-left side



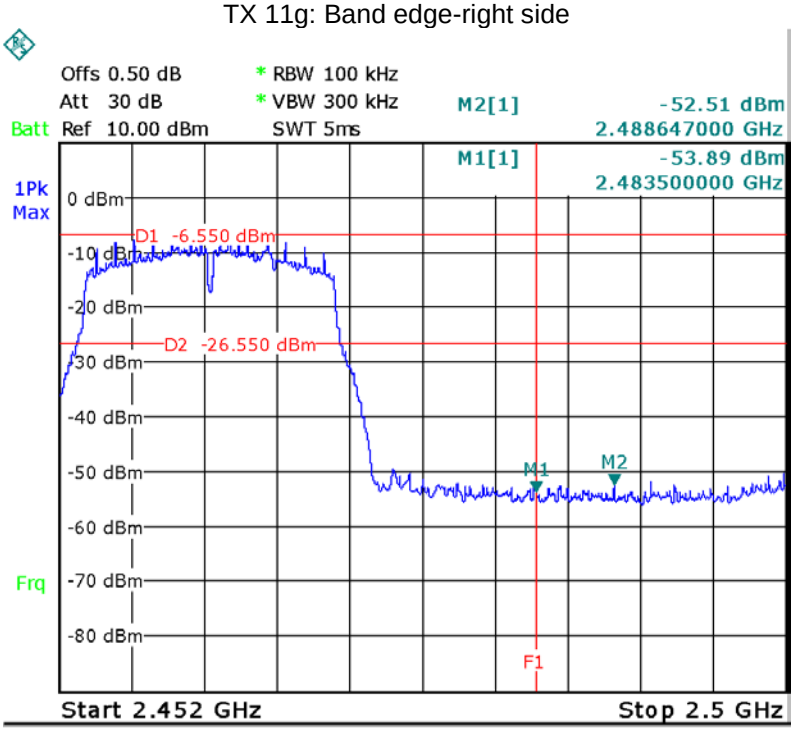
TX 11b: Band edge-right side



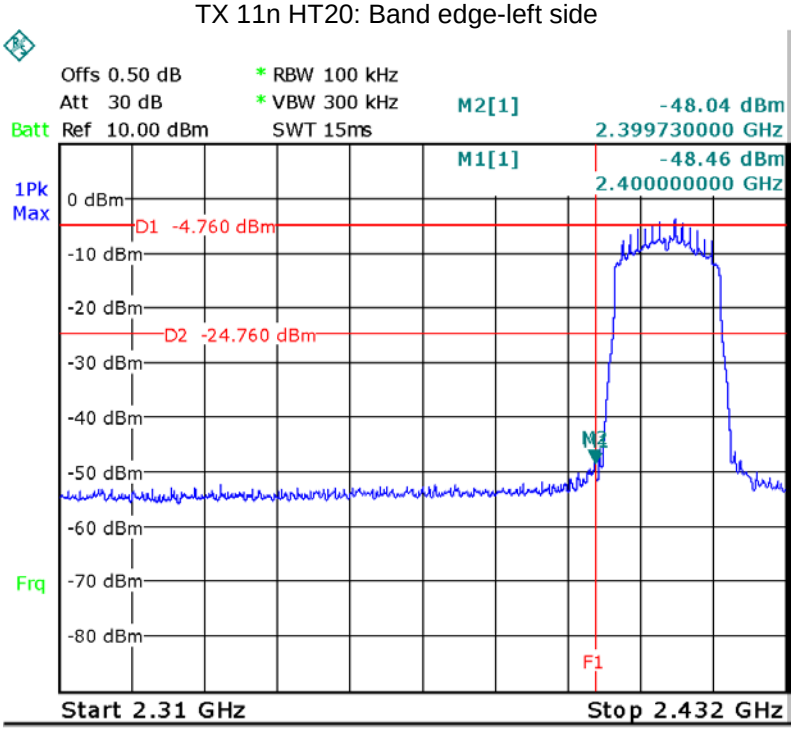
TX 11g: Band edge-left side



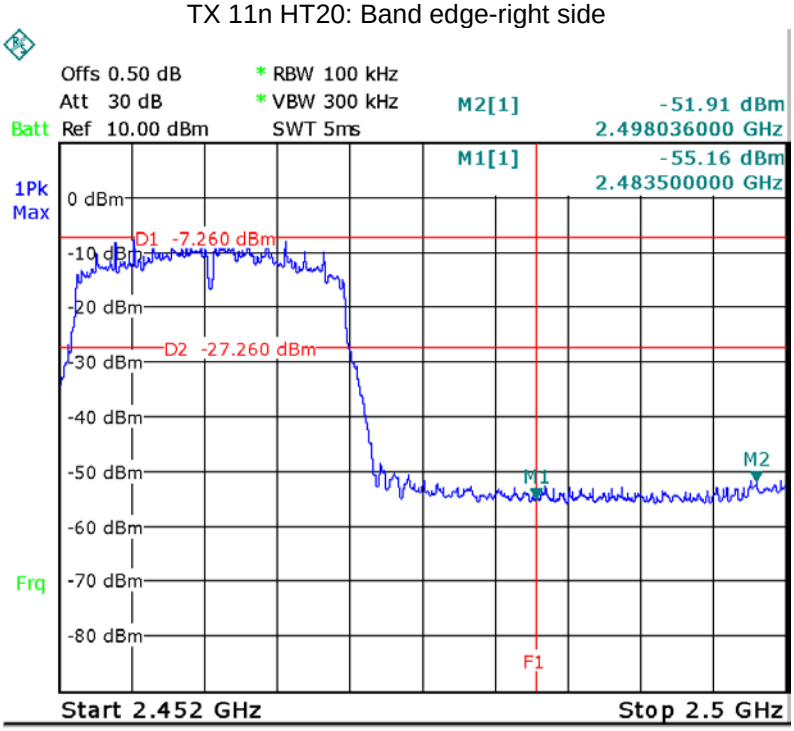
TX 11g: Band edge-right side



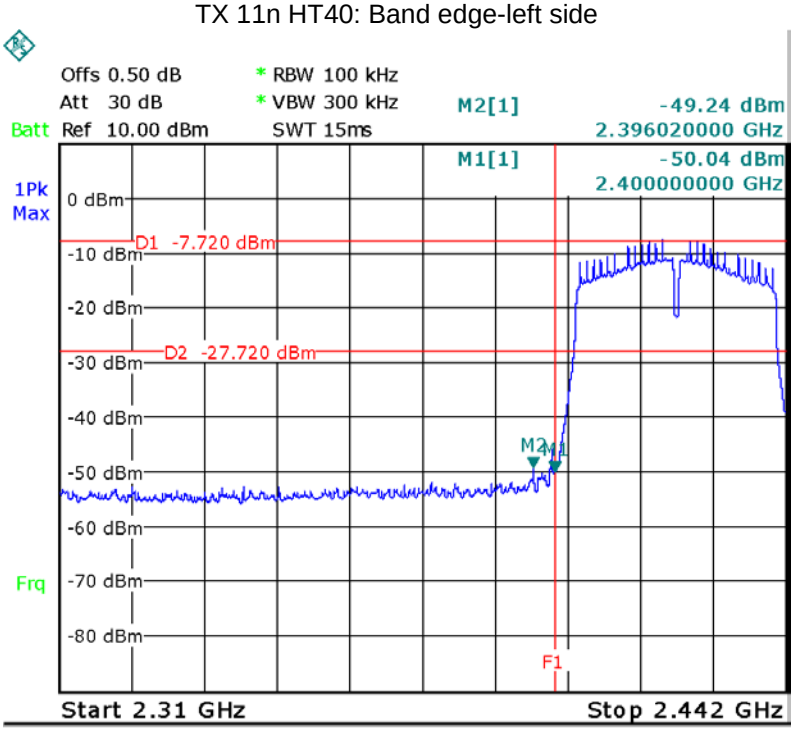
TX 11n HT20: Band edge-left side



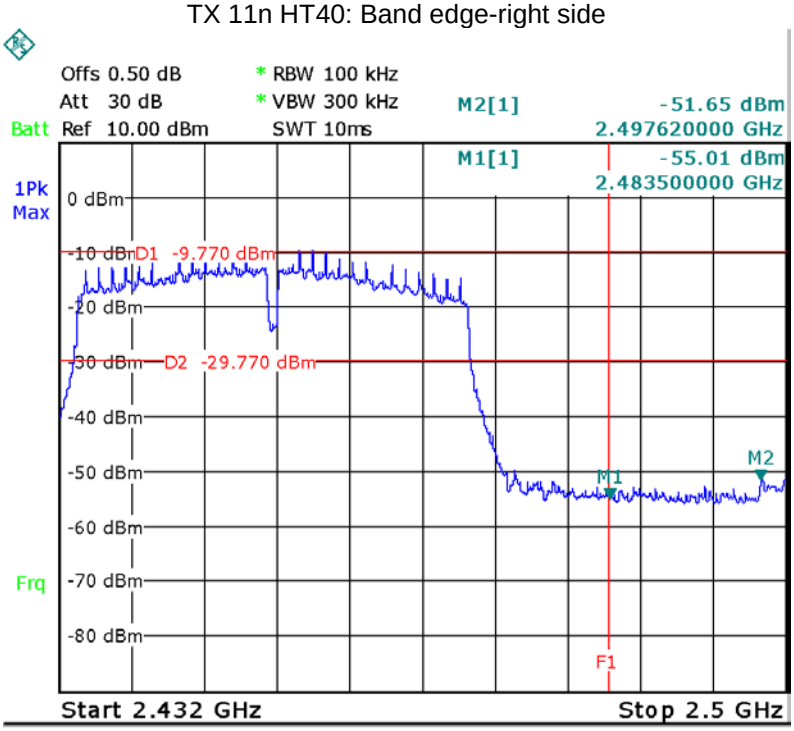
TX 11n HT20: Band edge-right side



TX 11n HT40: Band edge-left side

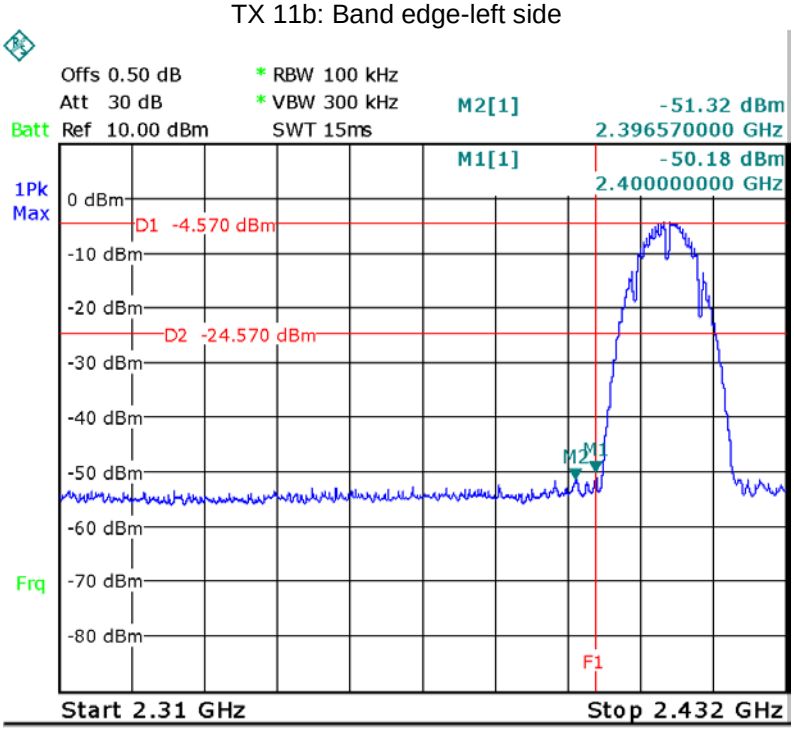


TX 11n HT40: Band edge-right side

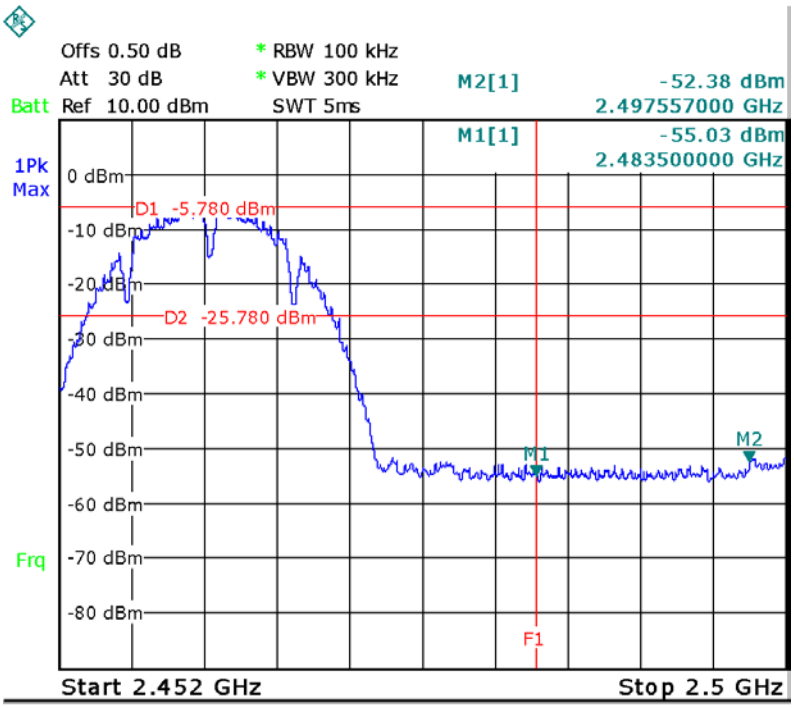


ANT2:

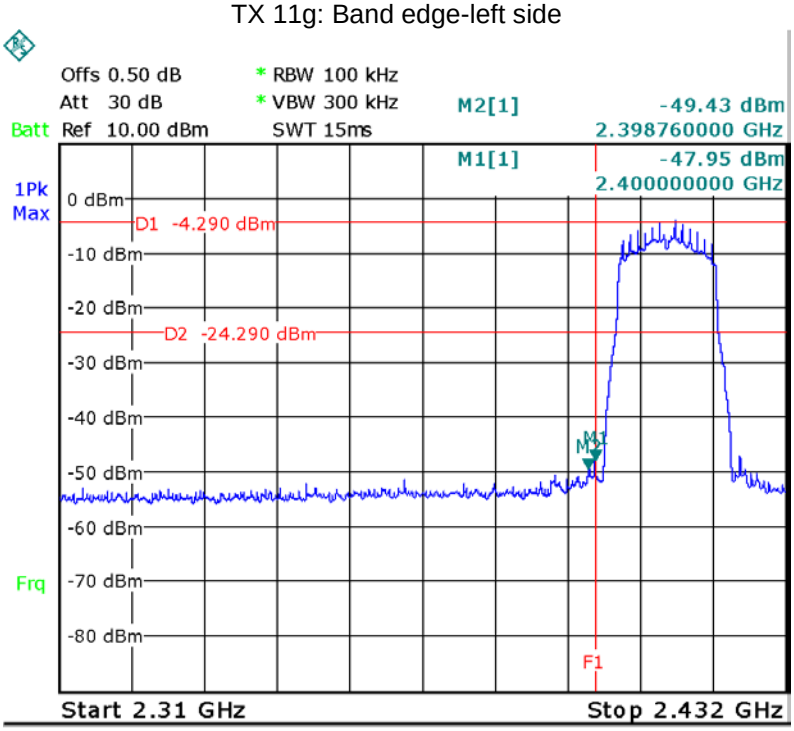
TX 11b: Band edge-left side



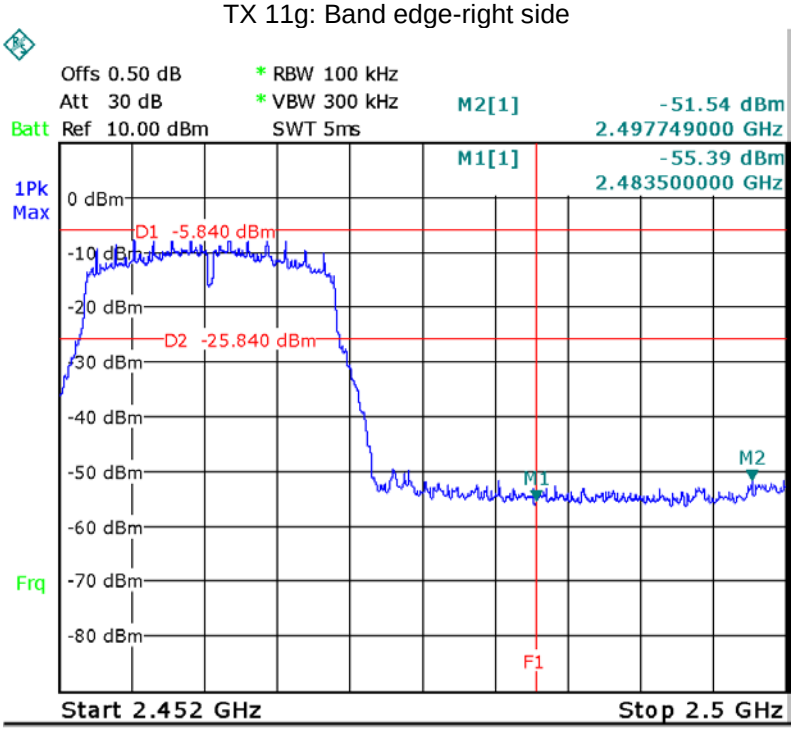
TX 11b: Band edge-right side



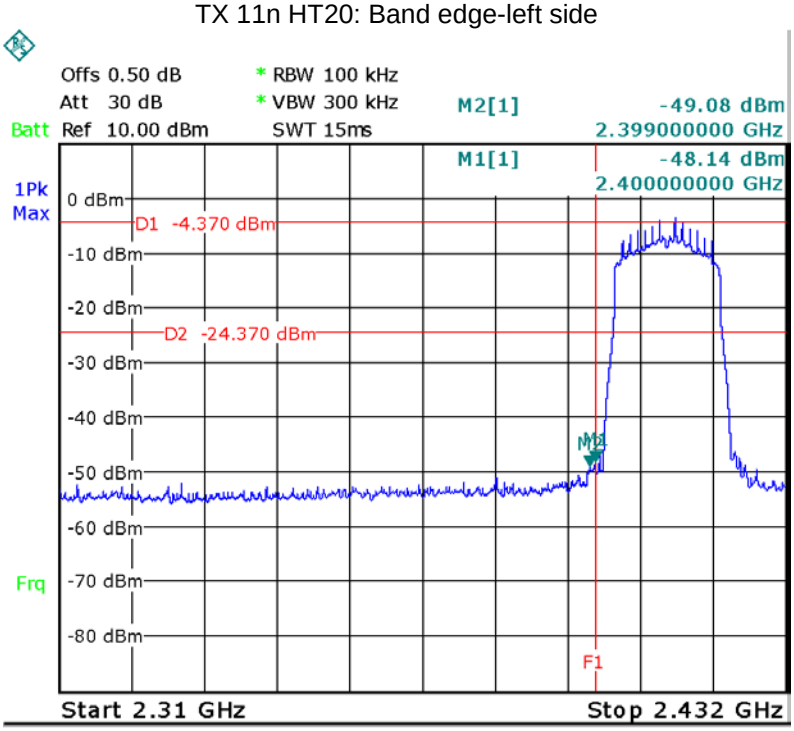
TX 11g: Band edge-left side



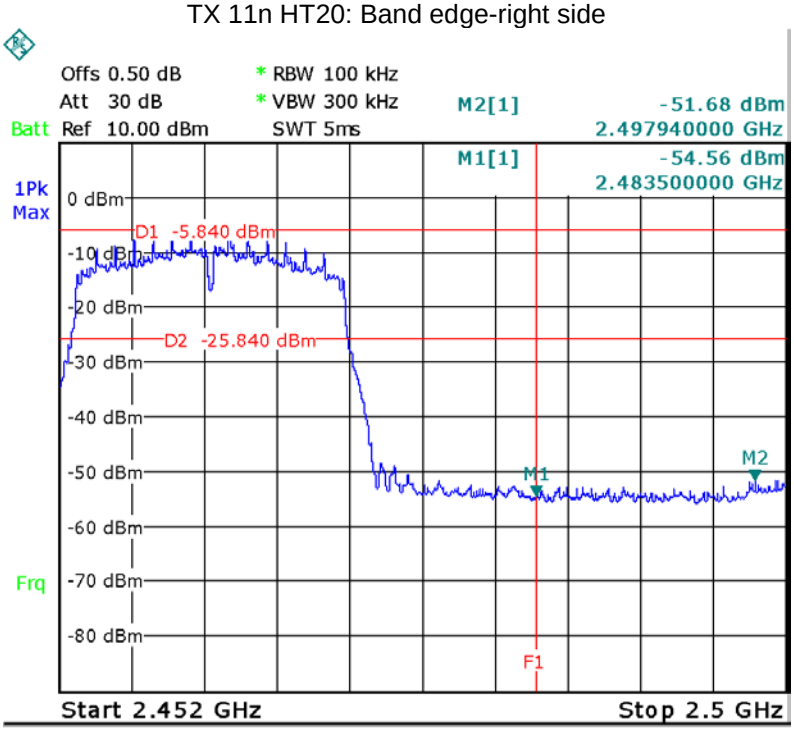
TX 11g: Band edge-right side



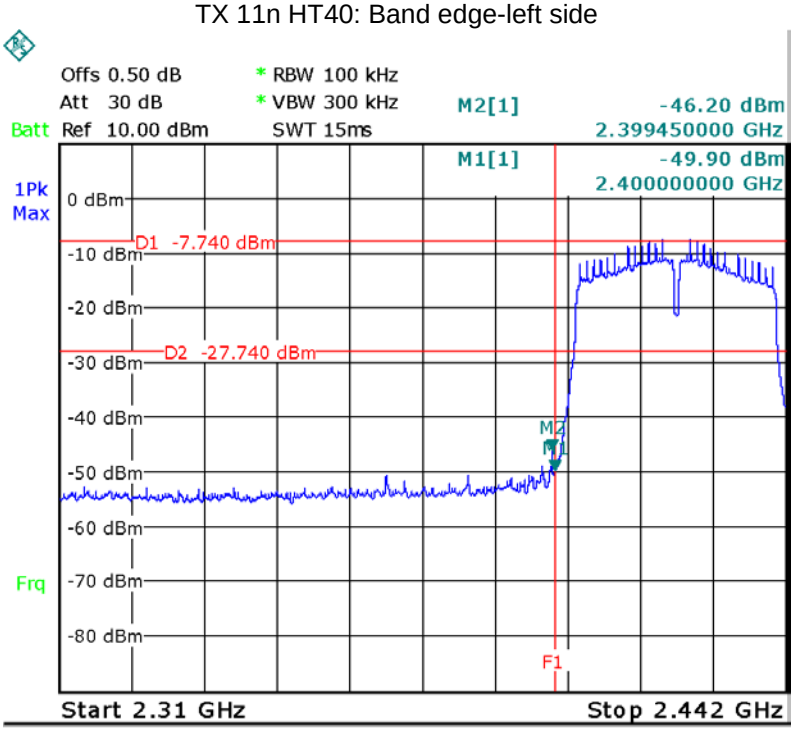
TX 11n HT20: Band edge-left side



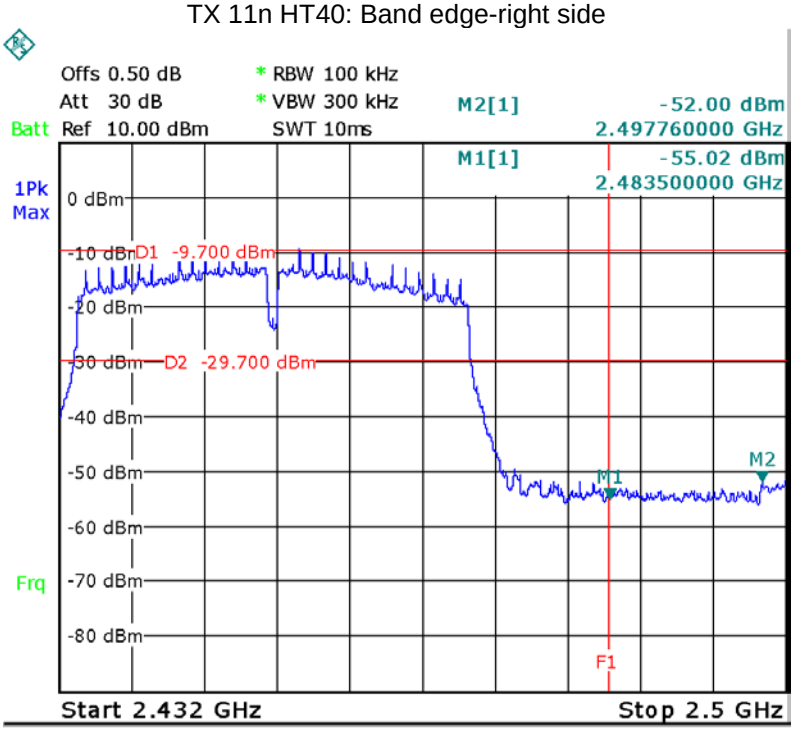
TX 11n HT20: Band edge-right side



TX 11n HT40: Band edge-left side



TX 11n HT40: Band edge-right side



10 Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05

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: RBW = 100kHz, VBW = 300kHz

10.2 Test Result:

ANT1:

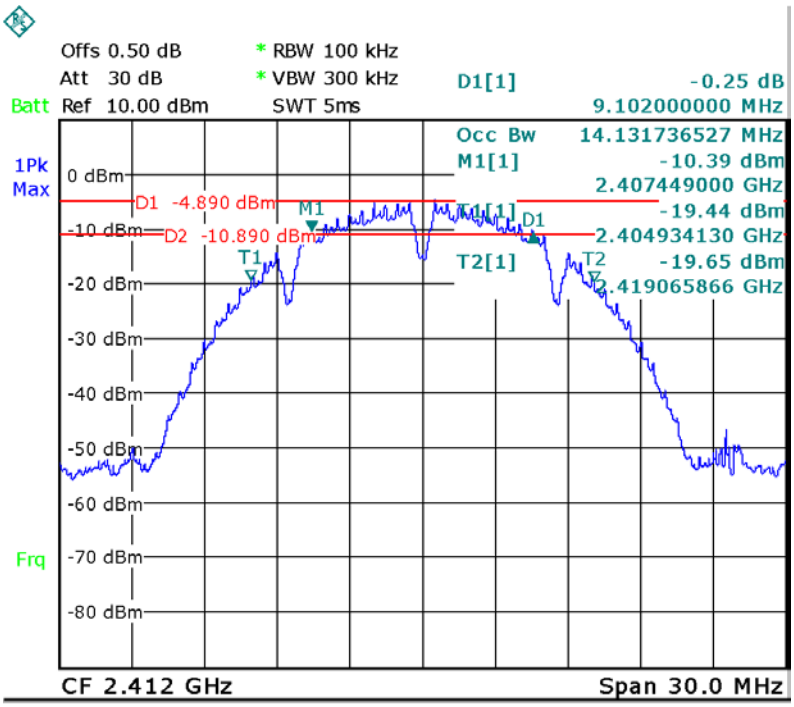
Operation mode	6dB Bandwidth (MHz)			99% Bandwidth (MHz)		
TX 11b	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	9.102	9.581	9.581	14.132	14.132	14.132
TX 11g	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	15.269	15.090	15.090	16.287	16.287	16.347
TX 11n HT20	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	15.150	15.150	15.210	17.485	17.485	17.485
TX 11n HT40	Channel 3	Channel 6	Channel 9	Channel 3	Channel 6	Channel 9
	32.960	35.090	35.060	35.689	35.808	35.808

ANT2:

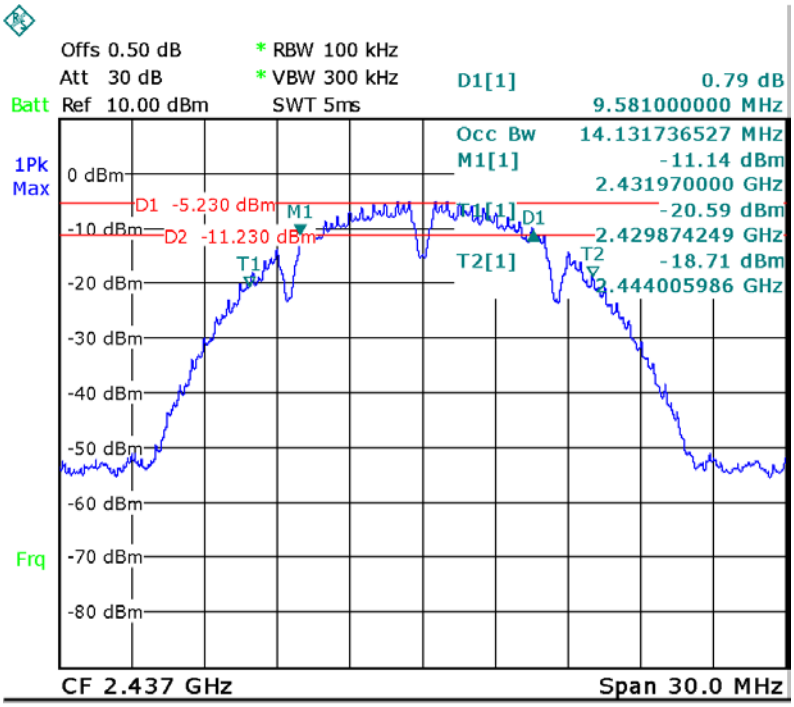
Operation mode	6dB Bandwidth (MHz)			99% Bandwidth (MHz)		
TX 11b	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	9.521	10.060	9.341	14.072	14.072	14.132
TX 11g	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	15.090	15.090	15.090	16.287	16.287	16.347
TX 11n HT20	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
	15.150	15.210	15.210	17.485	17.485	17.485
TX 11n HT40	Channel 3	Channel 6	Channel 9	Channel 3	Channel 6	Channel 9
	33.920	35.090	35.060	35.689	35.808	35.808

ANT1

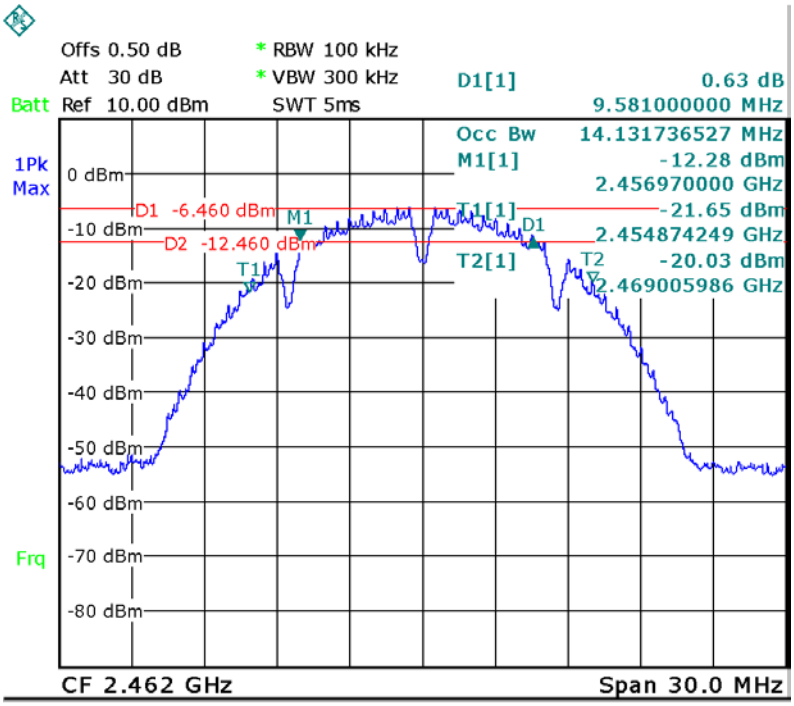
Mode: TX 11b channel 1



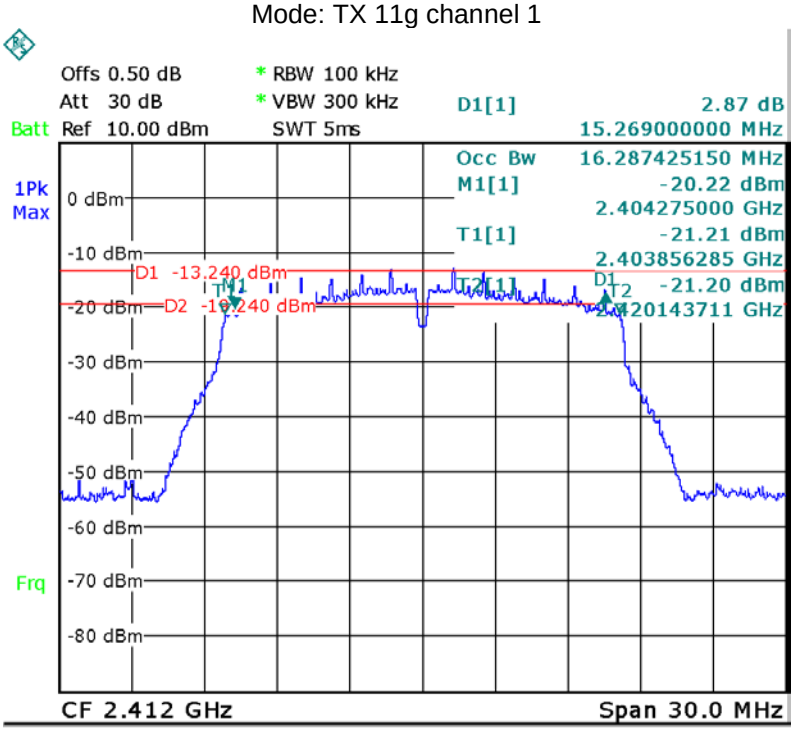
Mode: TX 11b channel 6



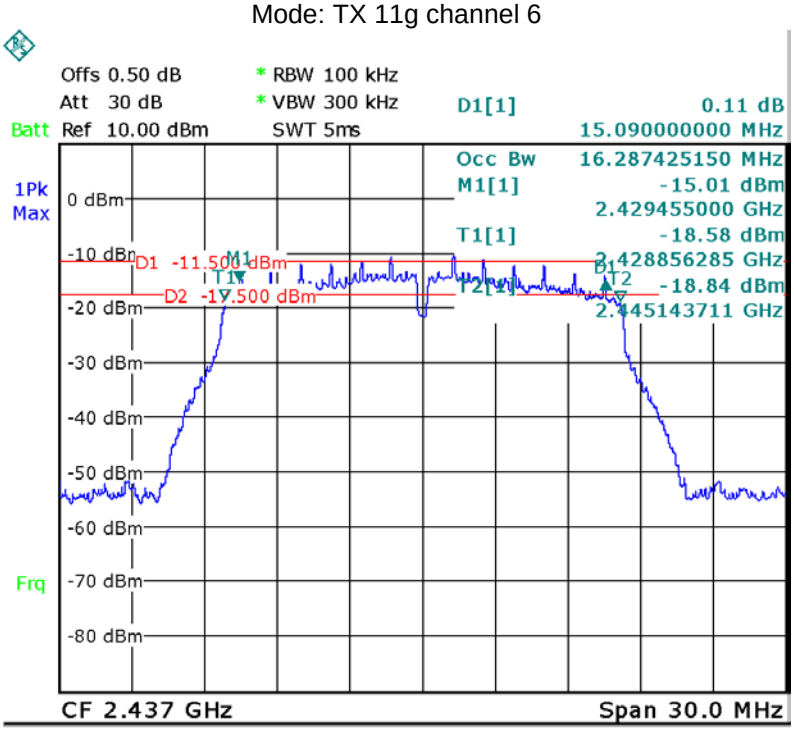
Mode: TX 11b channel 11



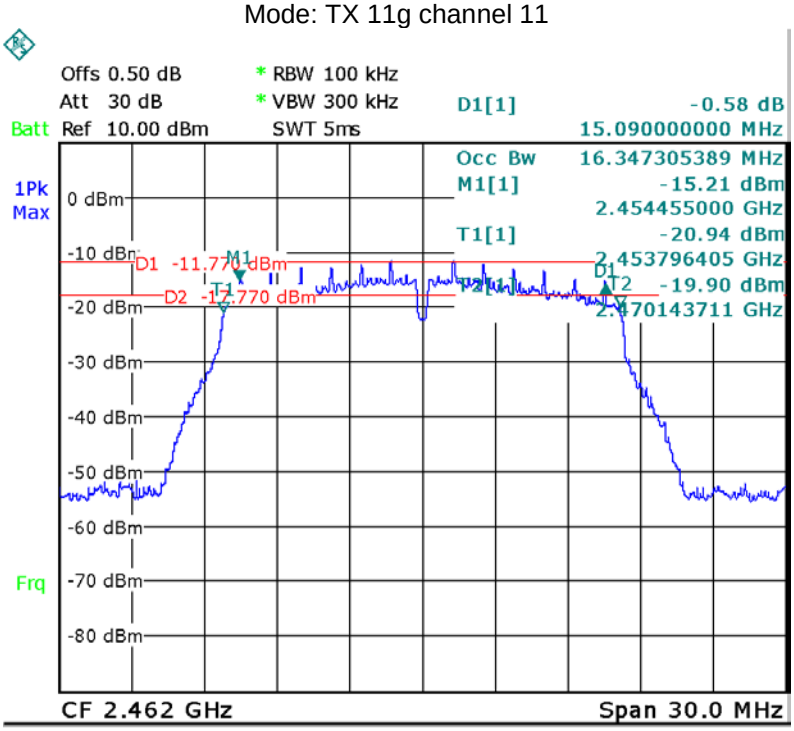
Mode: TX 11g channel 1



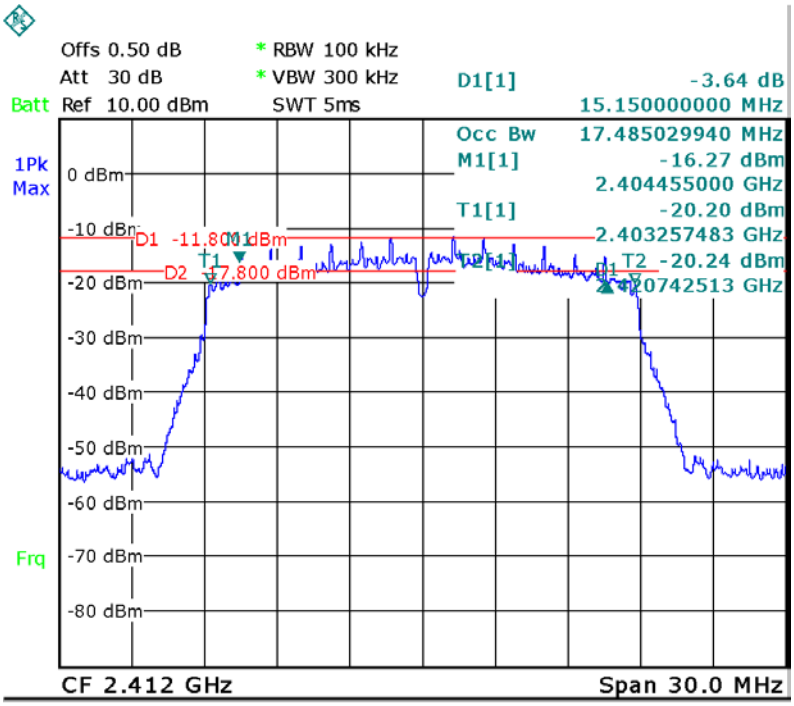
Mode: TX 11g channel 6



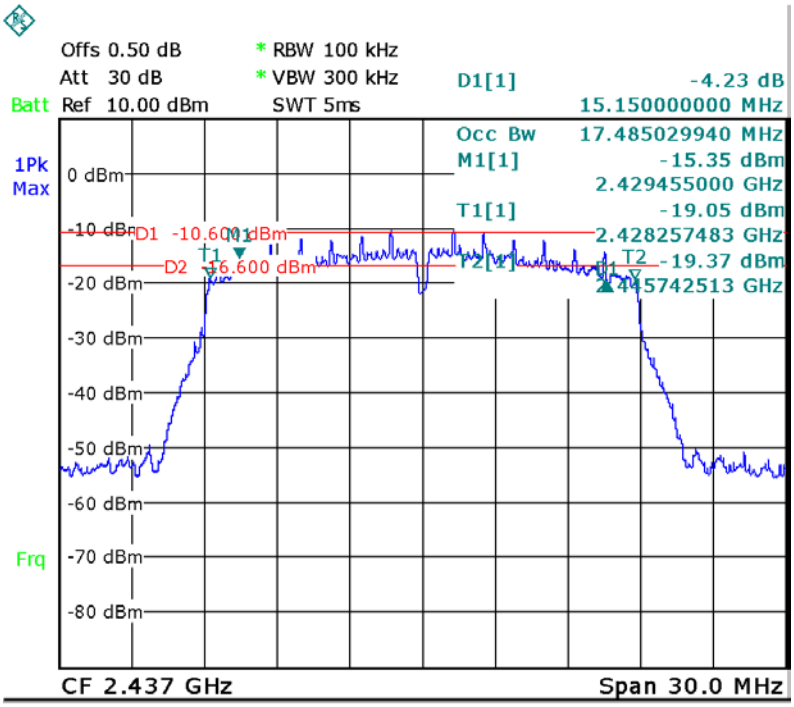
Mode: TX 11g channel 11



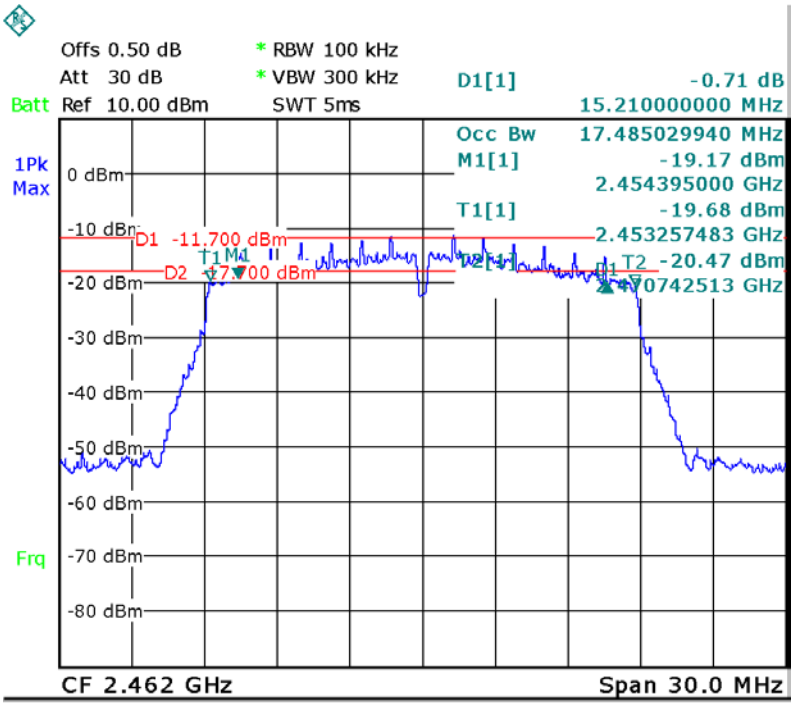
Mode: TX 11n HT20 channel 1



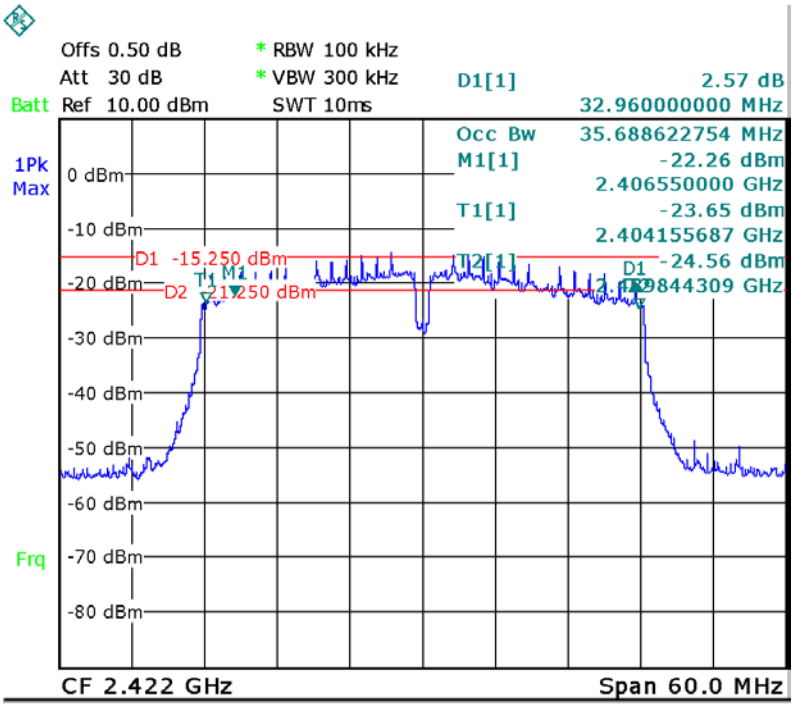
Mode: TX 11n HT20 channel 6



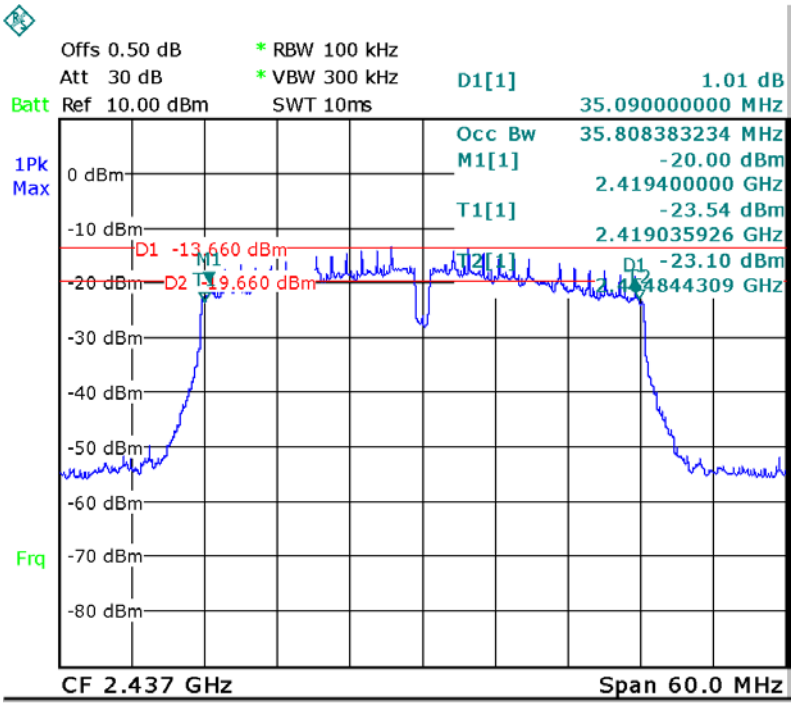
Mode: TX 11n HT20 channel 11



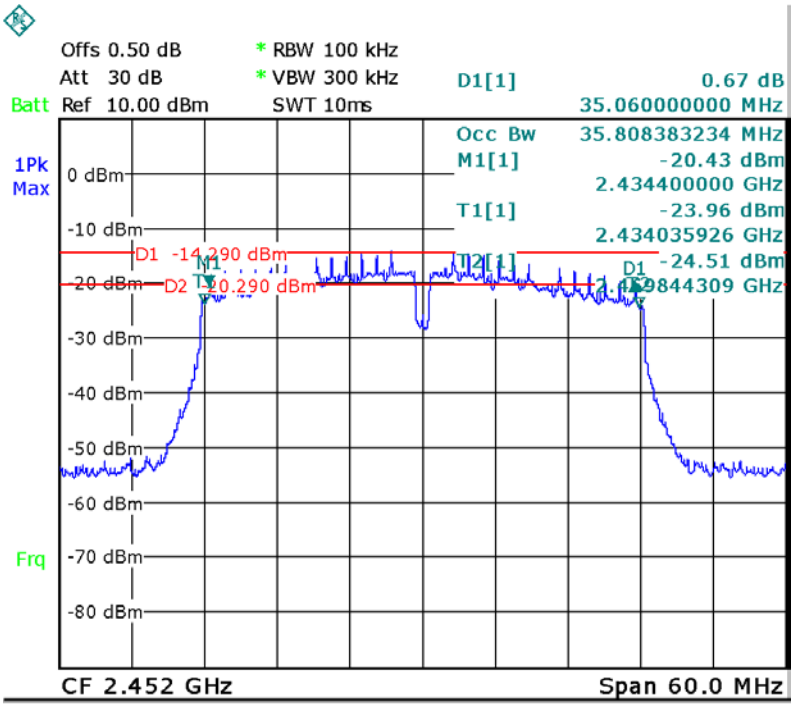
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

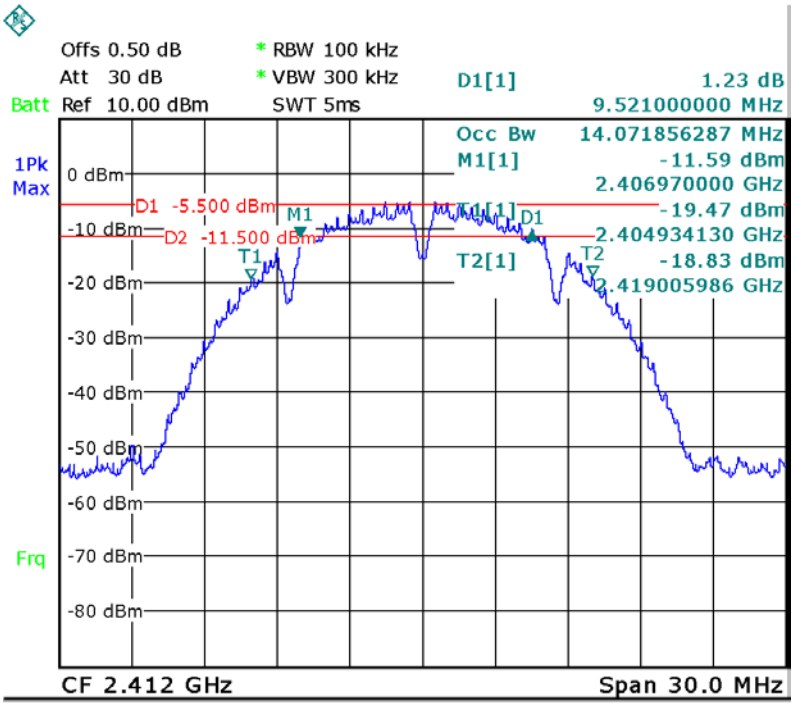


Mode: TX 11n HT40 channel 9

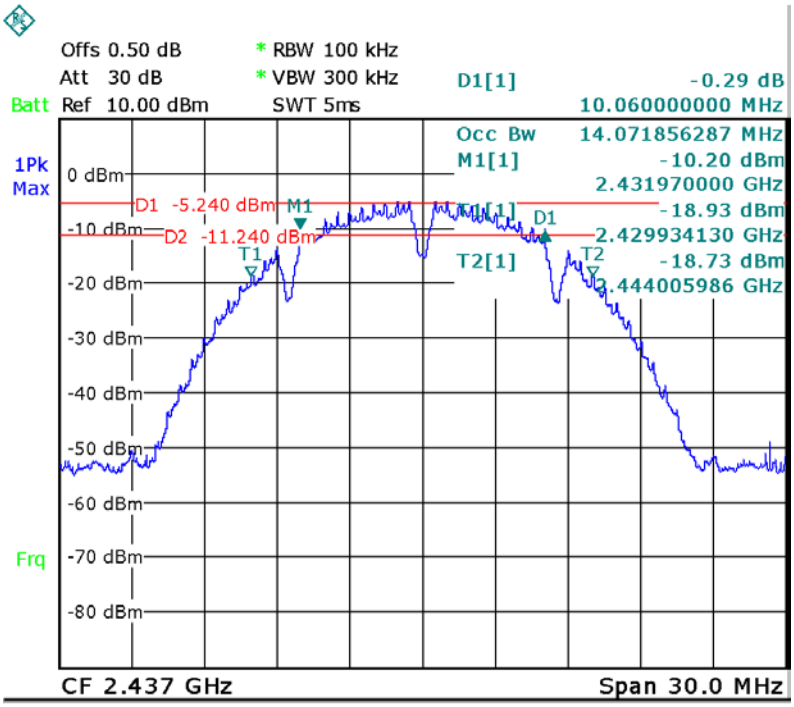


ANT2

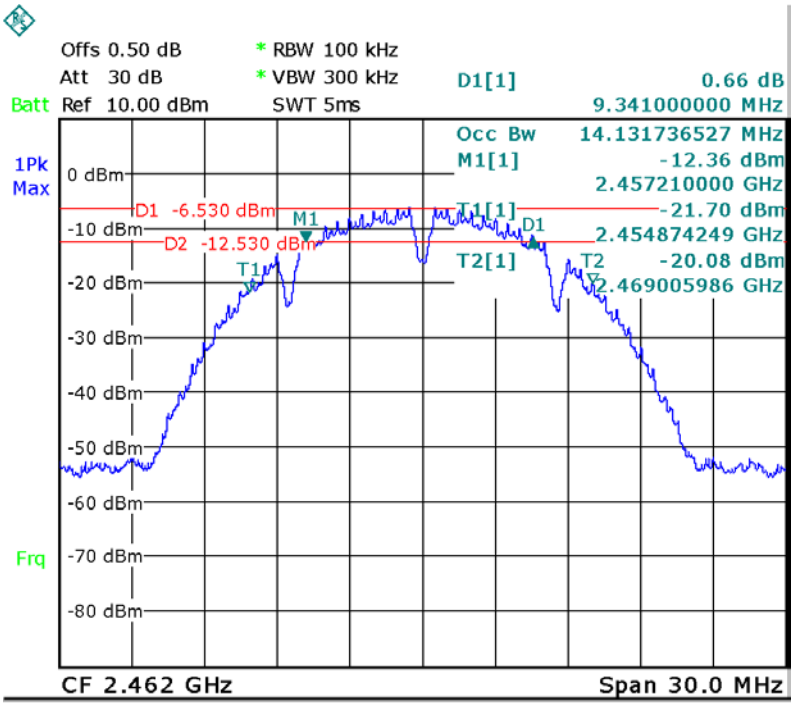
Mode: TX 11b channel 1



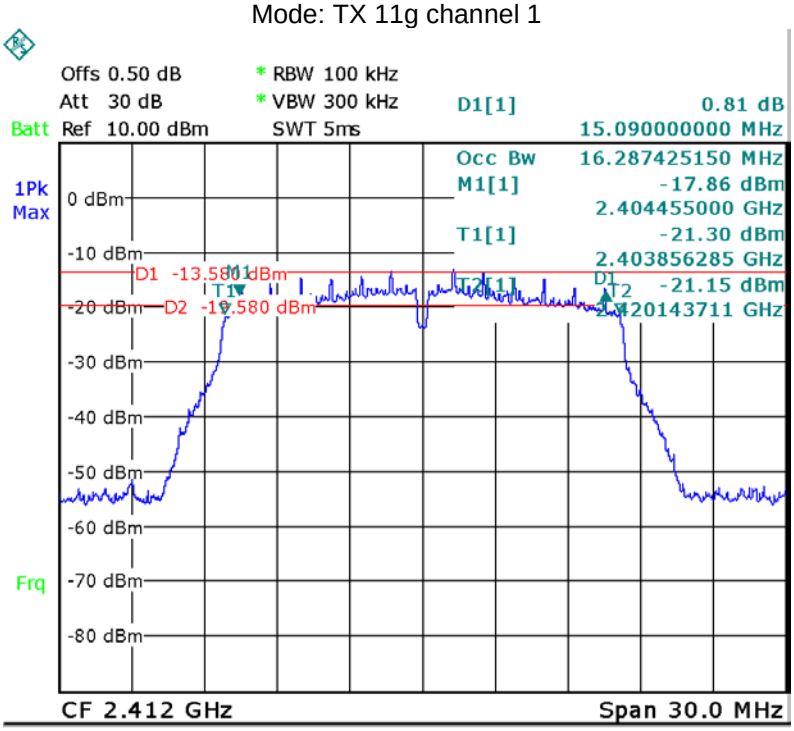
Mode: TX 11b channel 6



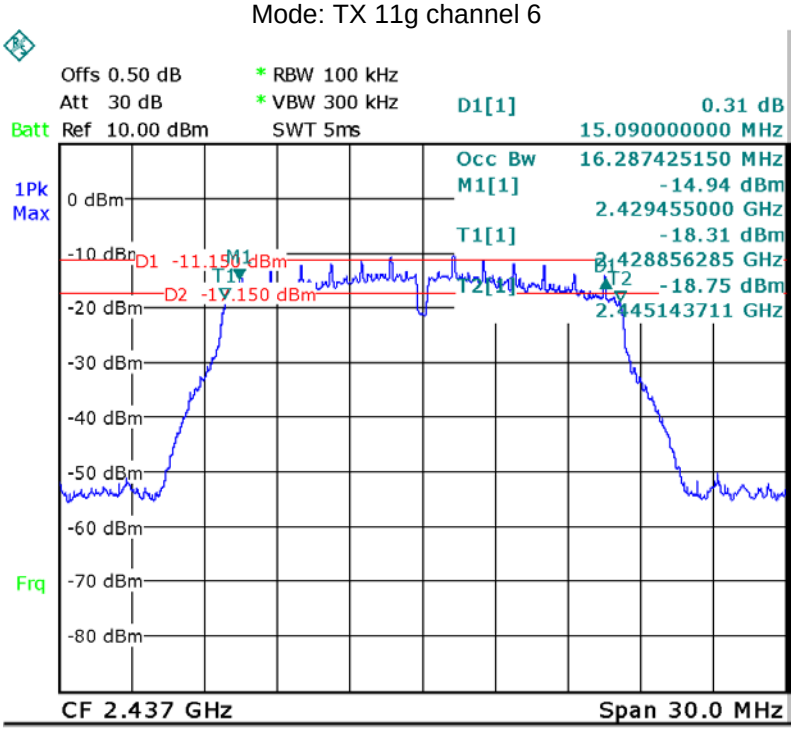
Mode: TX 11b channel 11



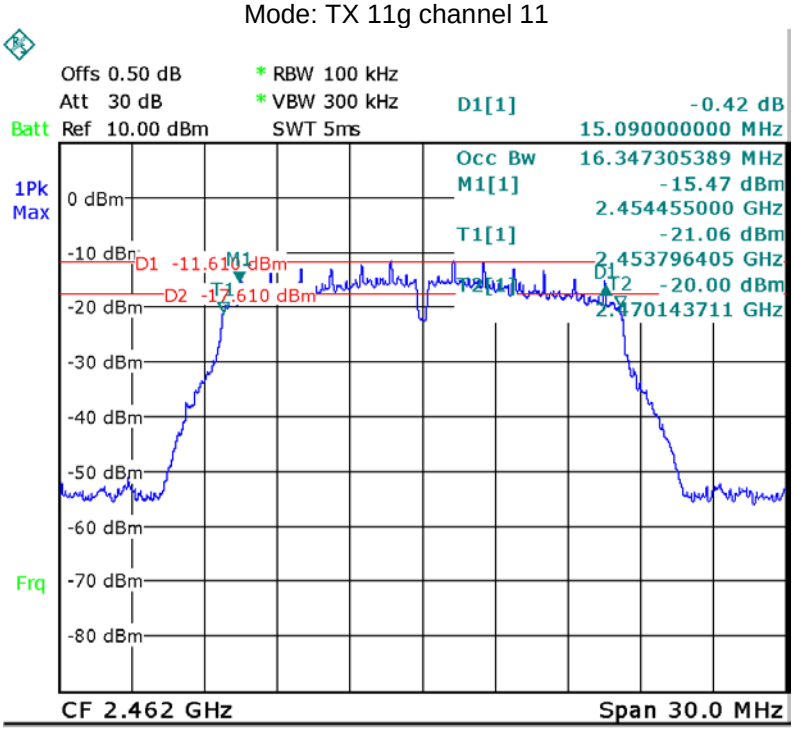
Mode: TX 11g channel 1



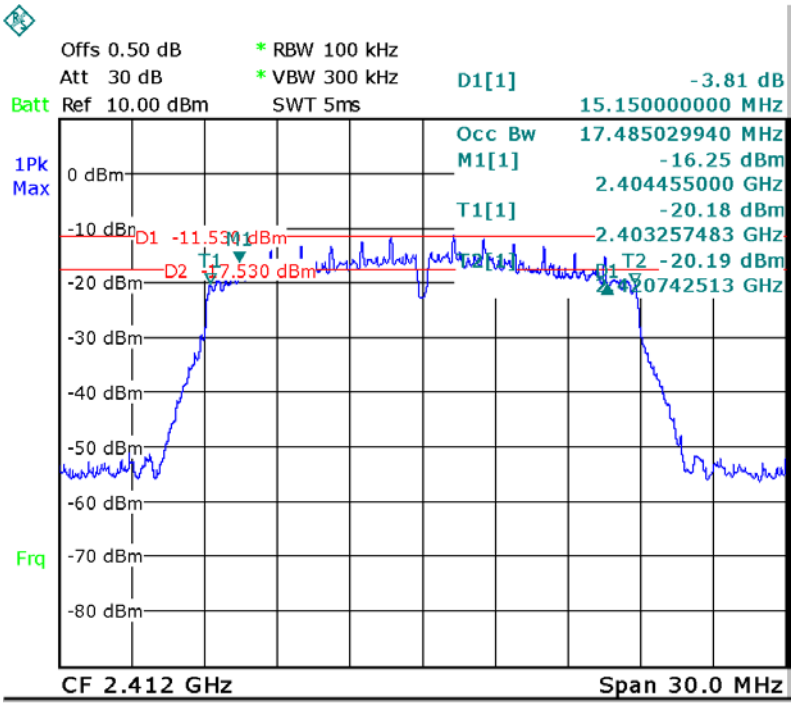
Mode: TX 11g channel 6



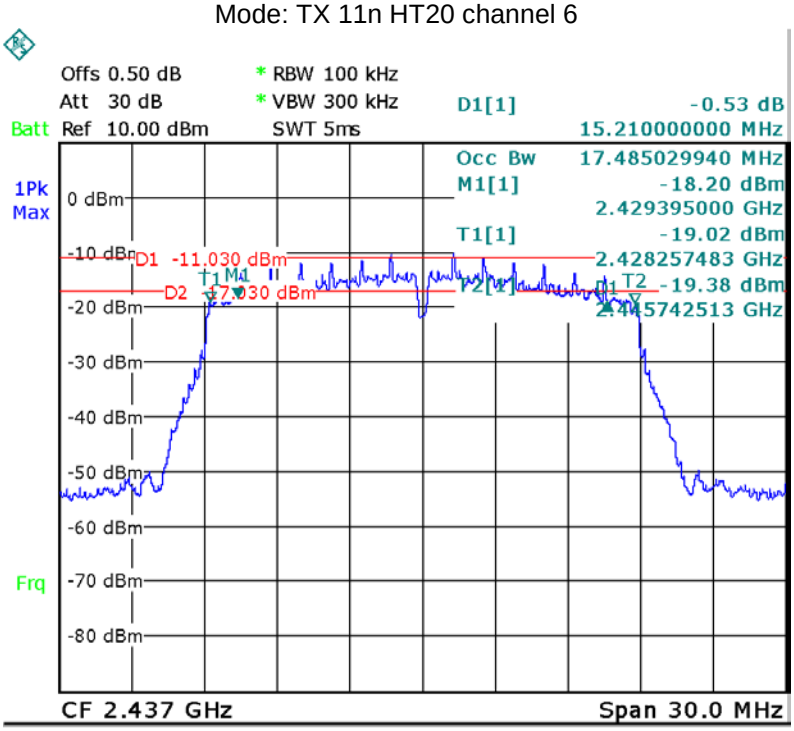
Mode: TX 11g channel 11



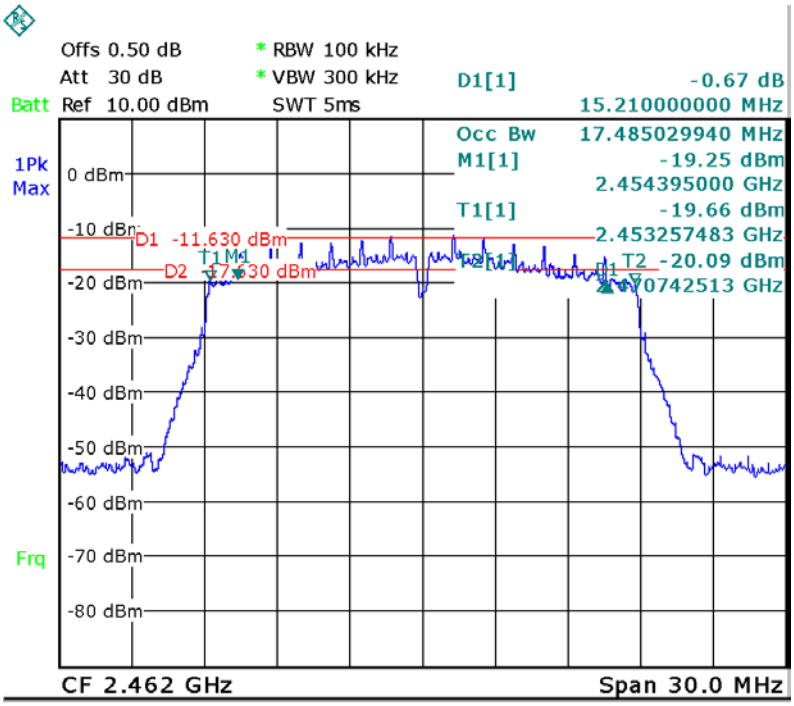
Mode: TX 11n HT20 channel 1



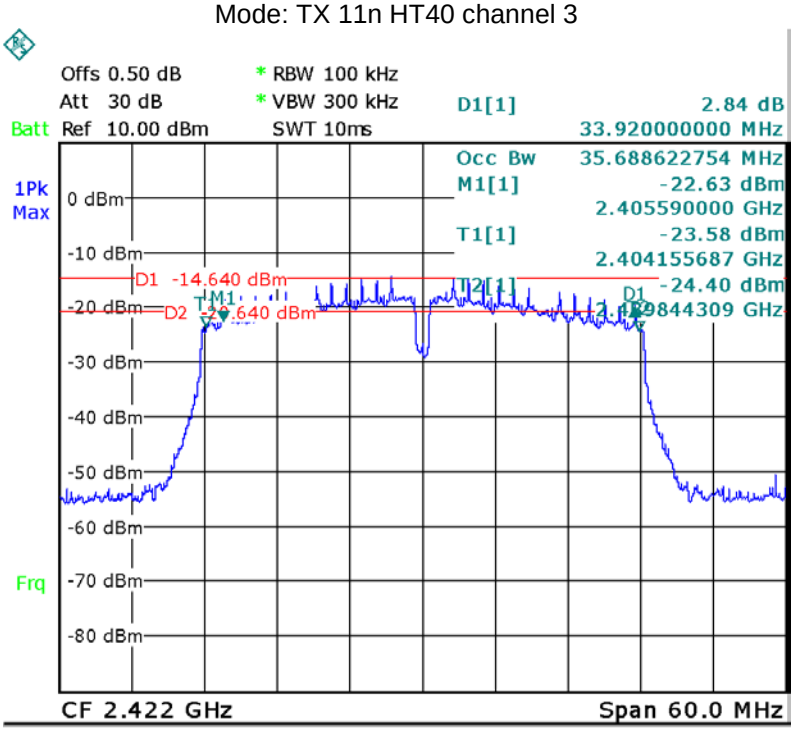
Mode: TX 11n HT20 channel 6



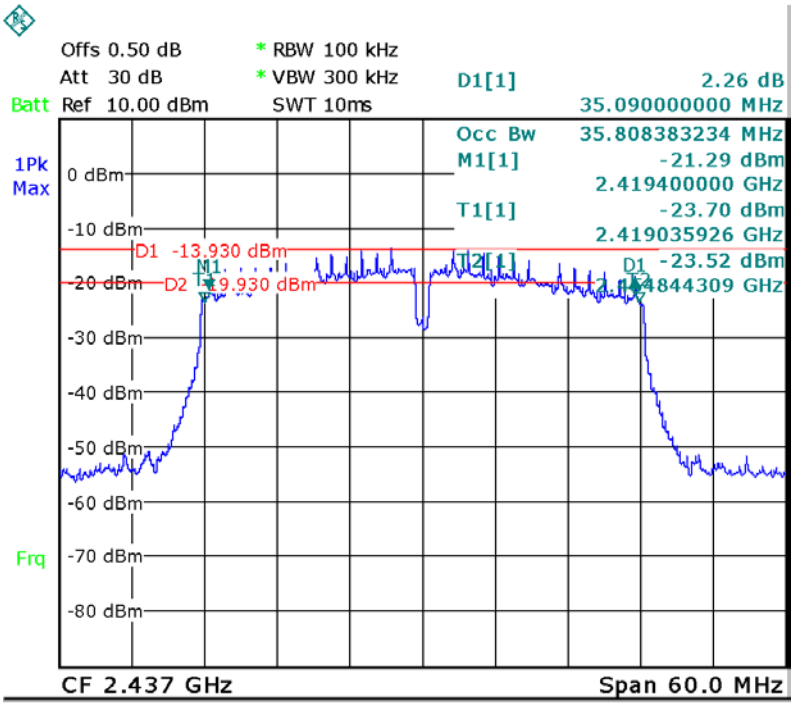
Mode: TX 11n HT20 channel 11



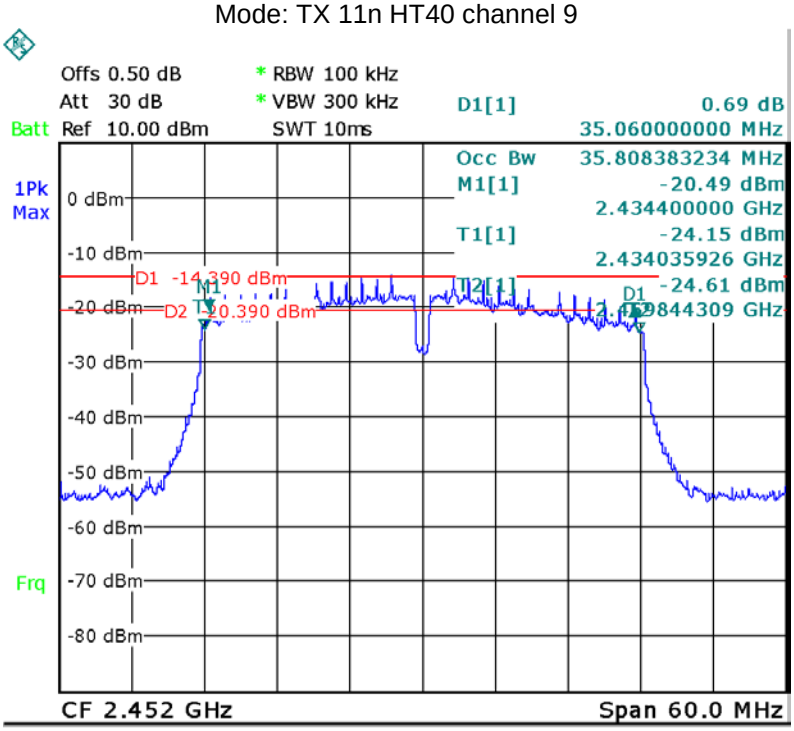
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6



Mode: TX 11n HT40 channel 9



11 Maximum Peak Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05

11.1 Test Procedure:

558074 D01 15.247 Meas Guidance v05

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = Peak, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

11.2 Test Result:

ANT1:

Test mode :TX 11b		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
10.38	10.44	10.58
Limit: 1W/30dBm		
Test mode :TX 11g		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
10.30	10.36	10.29
Limit: 1W/30dBm		
Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
10.25	10.31	10.24
Limit: 1W/30dBm		
Test mode :TX 11n HT40		
Maximum Peak Output Power (dBm)		
2422MHz	2437MHz	2452MHz
9.82	9.87	9.92
Limit: 1W/30dBm		

ANT2:

Test mode :TX 11b		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
10.49	10.50	10.66
Limit: 1W/30dBm		
Test mode :TX 11g		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
10.24	10.28	10.31
Limit: 1W/30dBm		
Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
10.25	10.33	10.26
Limit: 1W/30dBm		
Test mode :TX 11n HT40		
Maximum Peak Output Power (dBm)		
2422MHz	2437MHz	2452MHz
9.92	9.83	9.82
Limit: 1W/30dBm		

ANT1+ANT2:

Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
13.26	13.33	13.26
Limit: 1W/30dBm		
Test mode :TX 11n HT40		
Maximum Peak Output Power (dBm)		
2422MHz	2437MHz	2452MHz
12.88	12.86	12.88
Limit: 1W/30dBm		

12 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05

12.1 Test Procedure:

558074 D01 15.247 Meas Guidance v05

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.

12.2 Test Result:

ANT1:

Test mode :TX 11b		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-19.37	-8.03	-10.59
Limit: 8dBm per 3kHz		
Test mode :TX 11g		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-21.04	-21.36	-22.72
Limit: 8dBm per 3kHz		
Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-20.71	-21.96	-23.00
Limit: 8dBm per 3kHz		
Test mode :TX 11n HT40		
Power Spectral (dBm per 3kHz)		
2422MHz	2437MHz	2452MHz
-24.63	-24.47	-25.72
Limit: 8dBm per 3kHz		

ANT2:

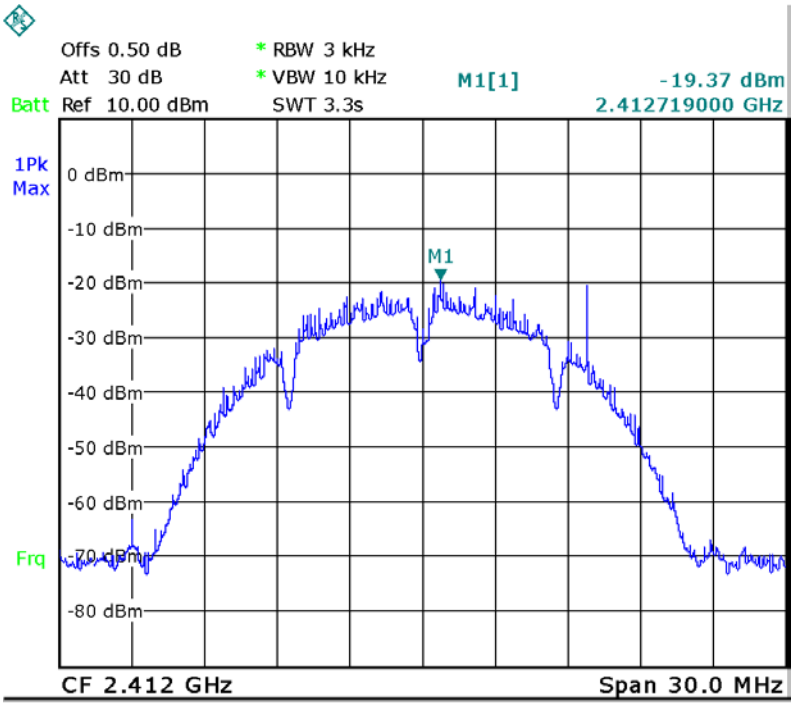
Test mode :TX 11b		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-18.91	-16.80	-8.96
Limit: 8dBm per 3kHz		
Test mode :TX 11g		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-20.96	-21.53	-22.94
Limit: 8dBm per 3kHz		
Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-20.84	-21.82	-22.74
Limit: 8dBm per 3kHz		
Test mode :TX 11n HT40		
Power Spectral (dBm per 3kHz)		
2422MHz	2437MHz	2452MHz
-23.96	-25.82	-26.39
Limit: 8dBm per 3kHz		

ANT1+ANT2:

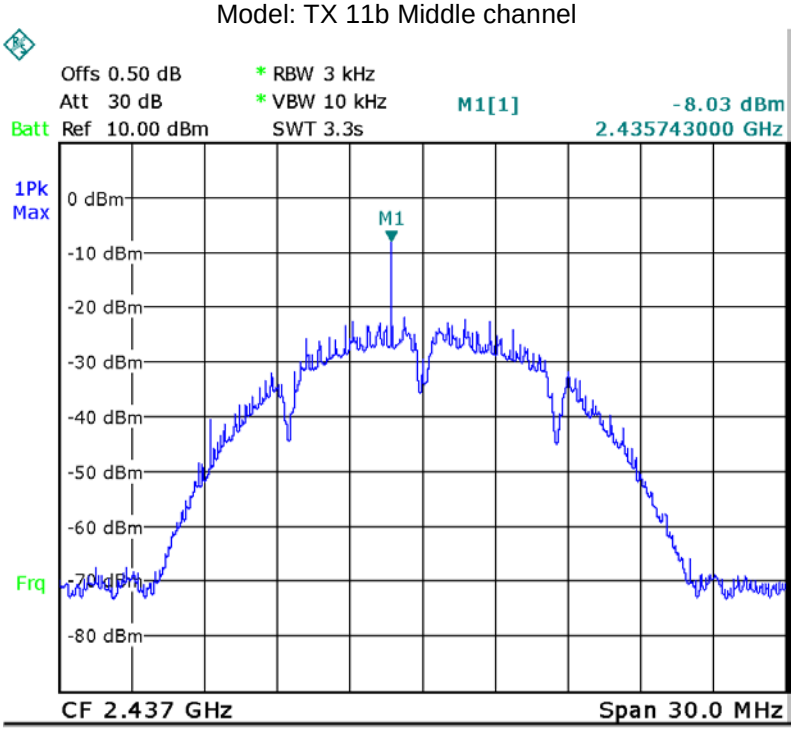
Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-17.76	-18.88	-19.86
Limit: 8dBm per 3kHz		
Test mode :TX 11n HT40		
Power Spectral (dBm per 3kHz)		
2422MHz	2437MHz	2452MHz
-21.27	-22.08	-23.03
Limit: 8dBm per 3kHz		

ANT1:

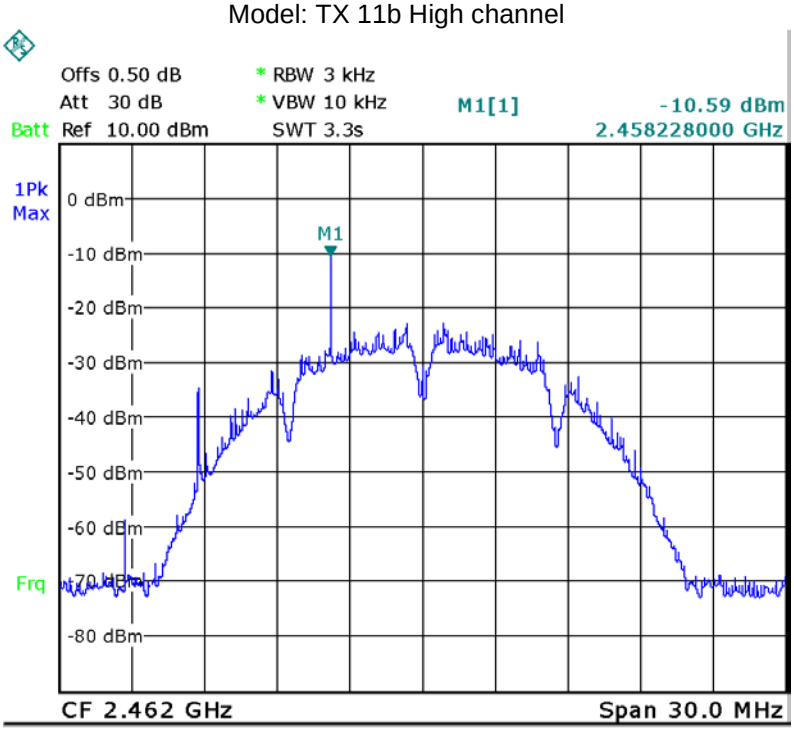
Model: TX 11b Low Channel



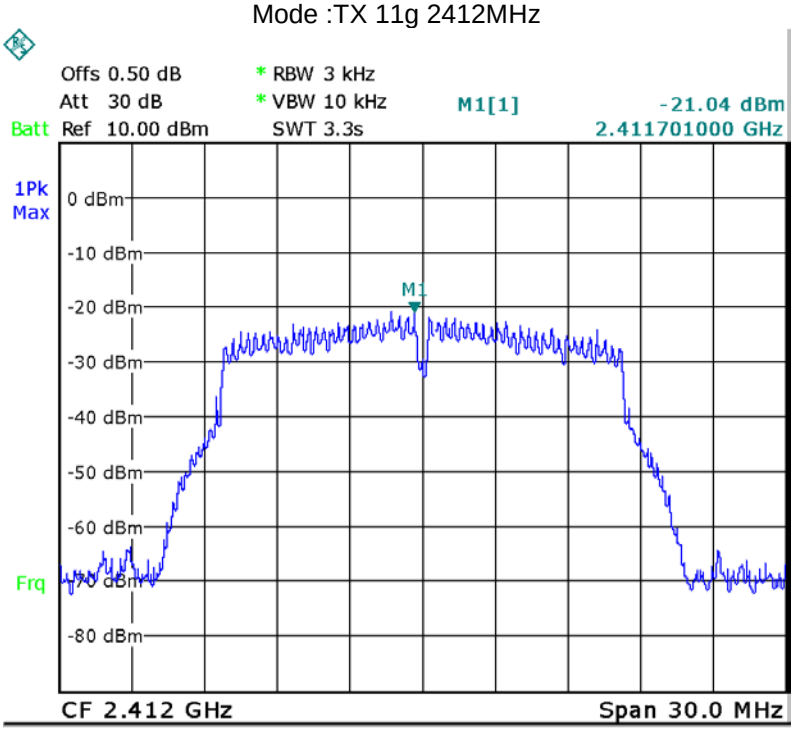
Model: TX 11b Middle channel



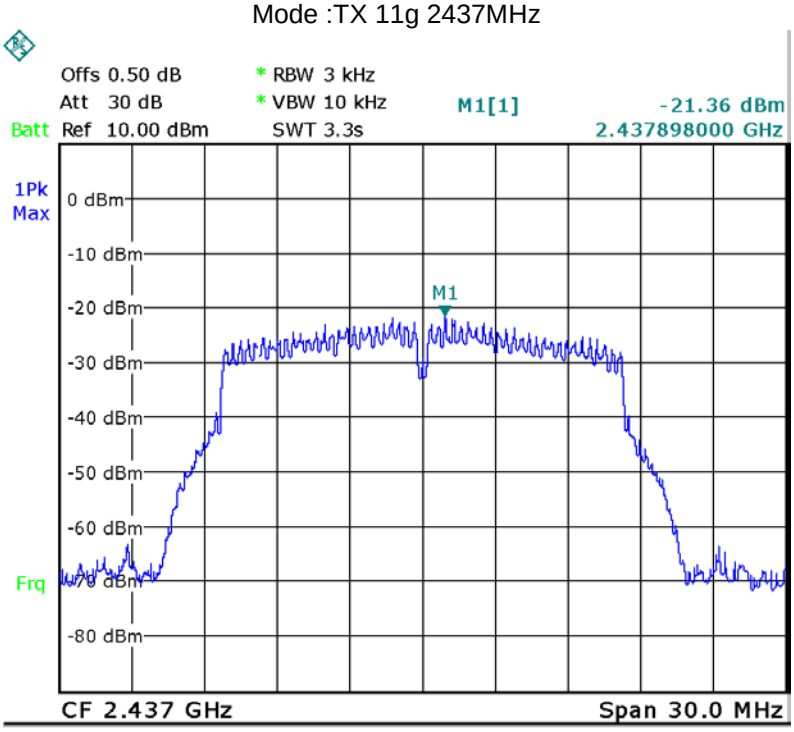
Model: TX 11b High channel



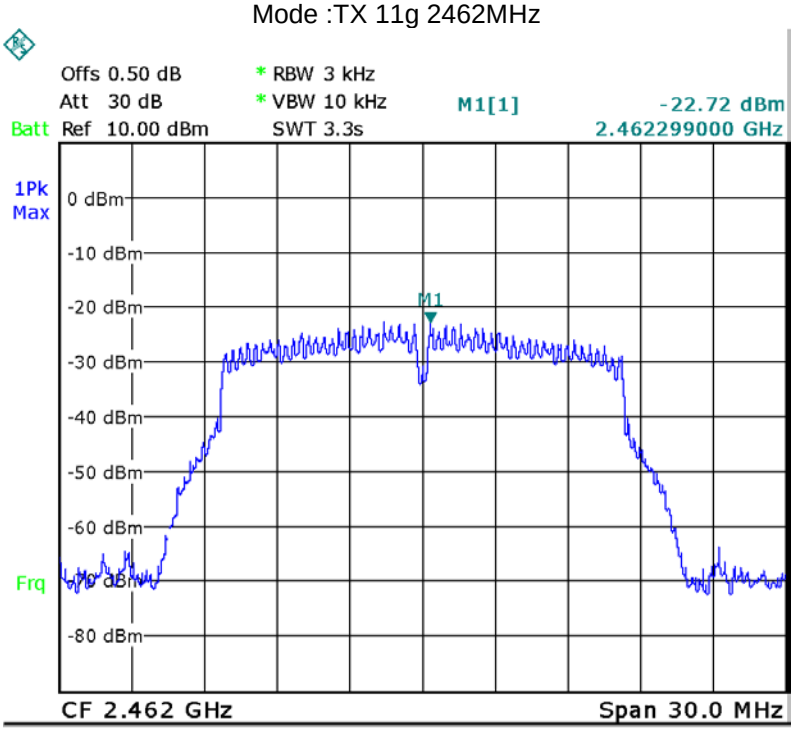
Mode :TX 11g 2412MHz



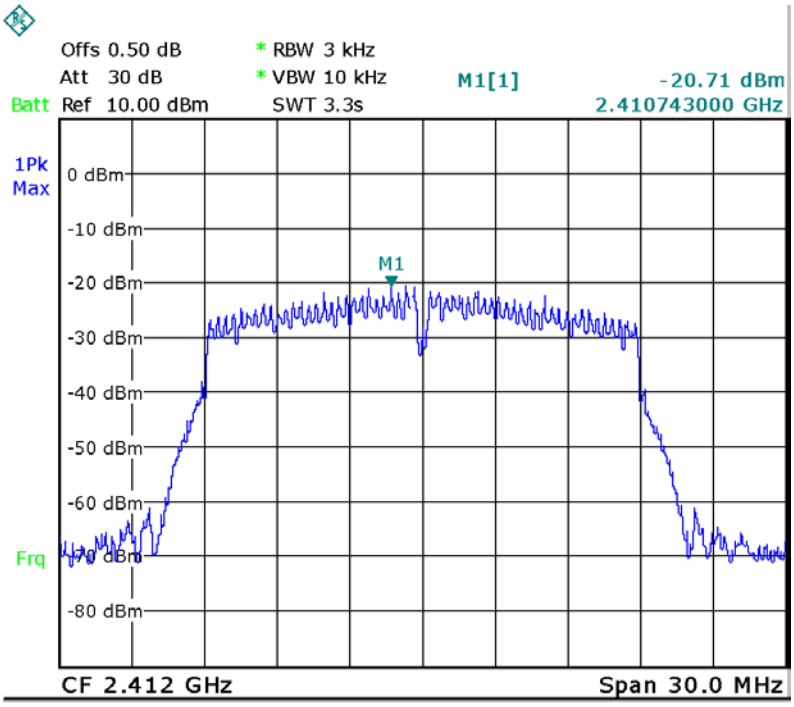
Mode :TX 11g 2437MHz



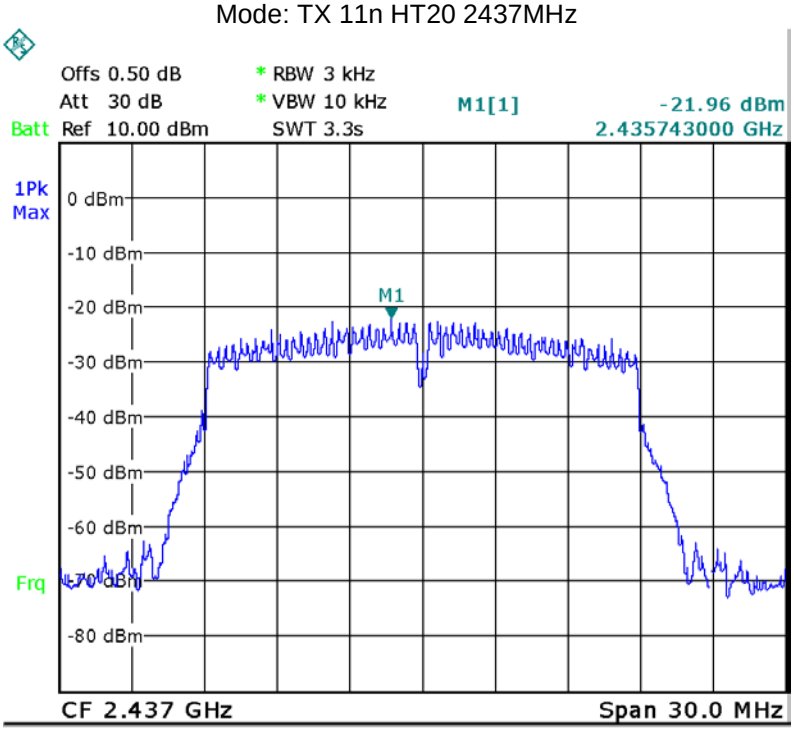
Mode :TX 11g 2462MHz



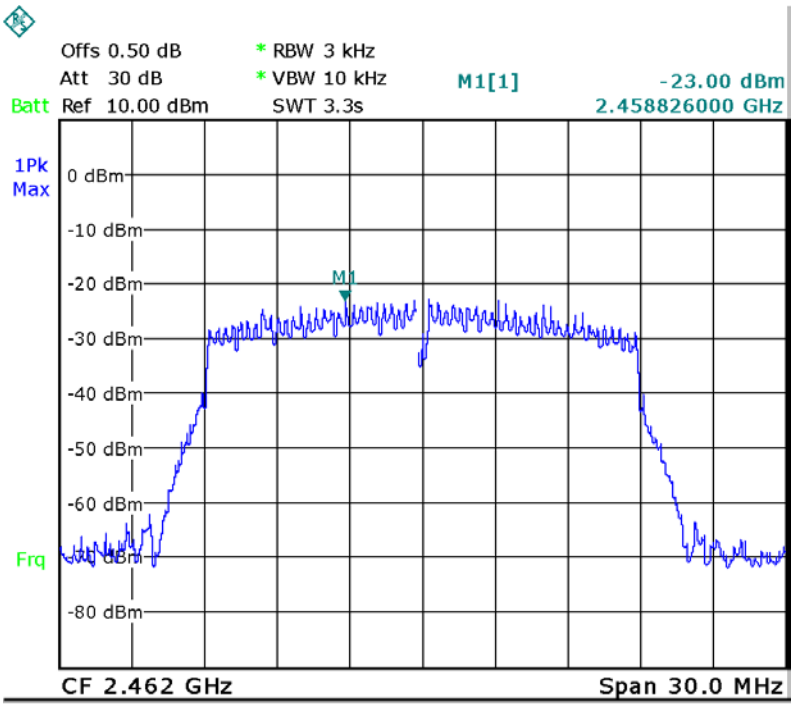
Mode: TX 11n HT20 2412MHz



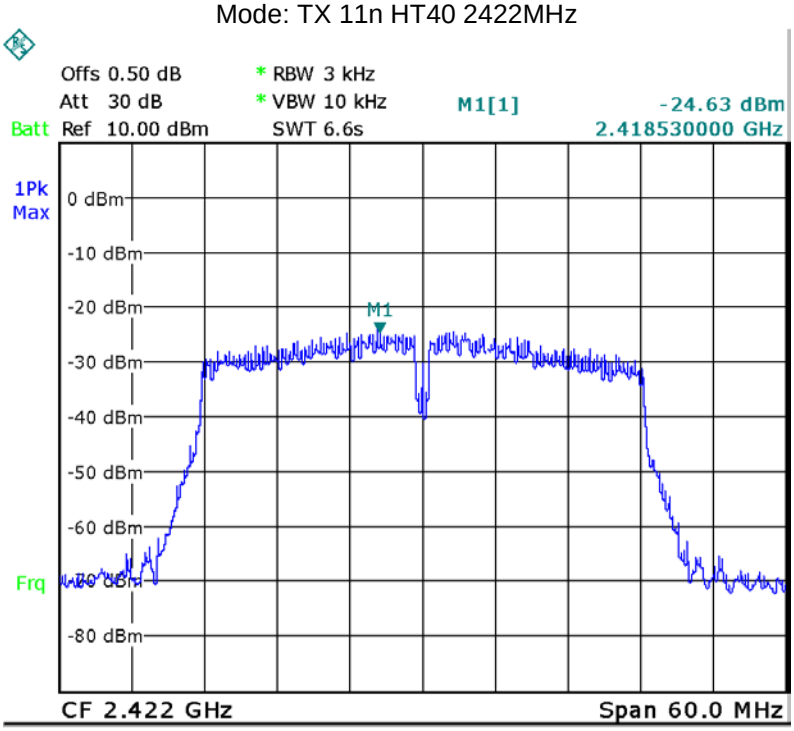
Mode: TX 11n HT20 2437MHz



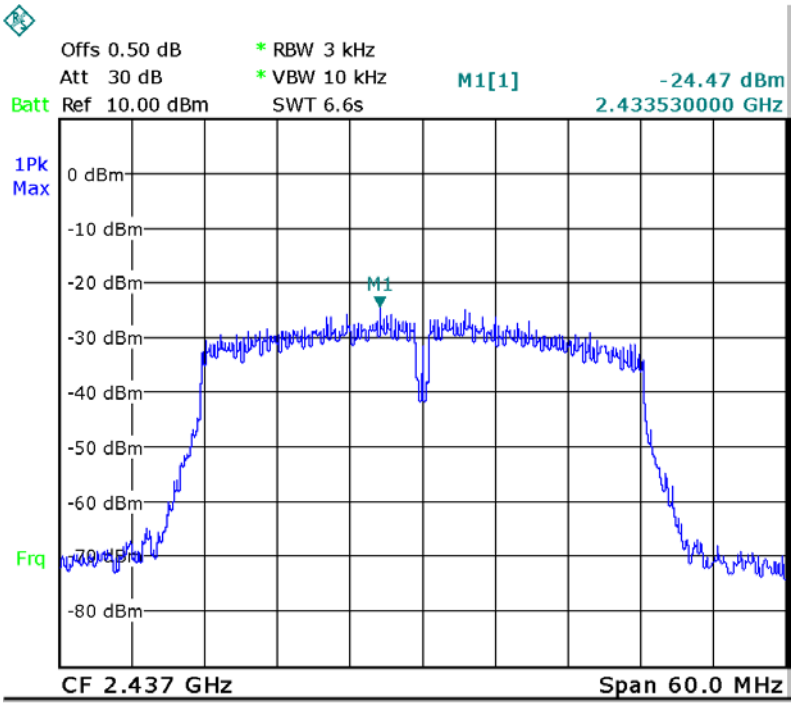
Mode: TX 11n HT20 2462MHz



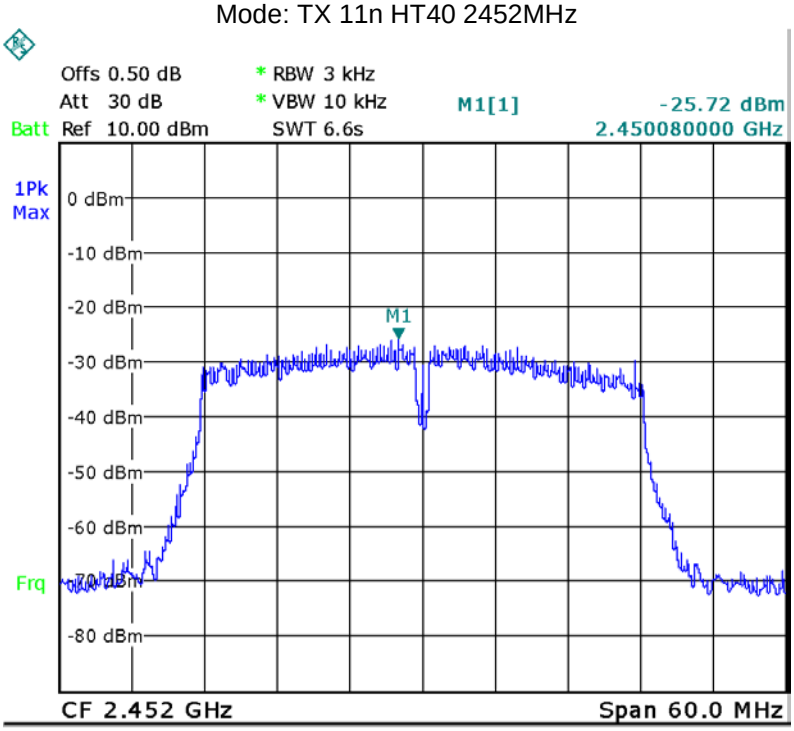
Mode: TX 11n HT40 2422MHz



Mode: TX 11n HT40 2437MHz

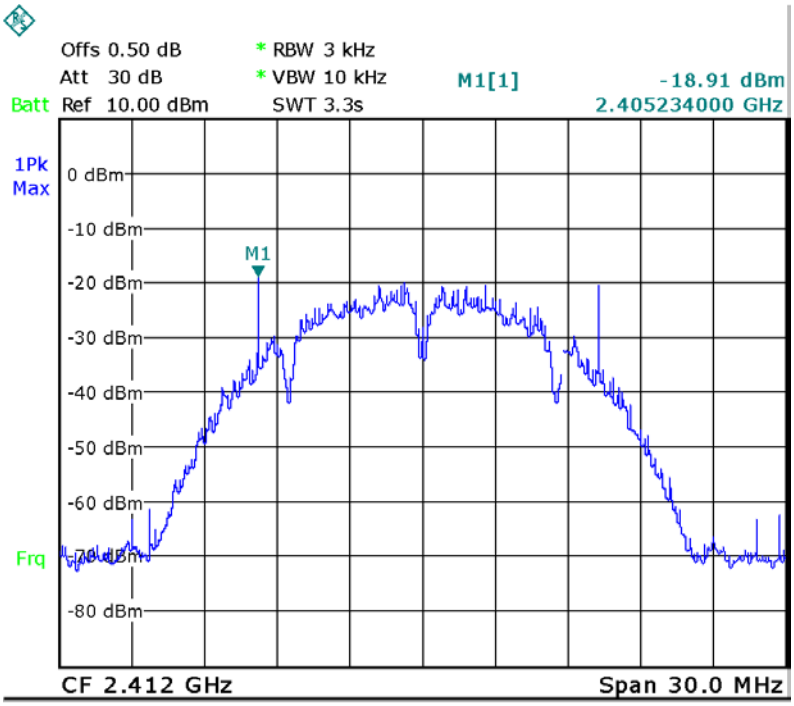


Mode: TX 11n HT40 2452MHz

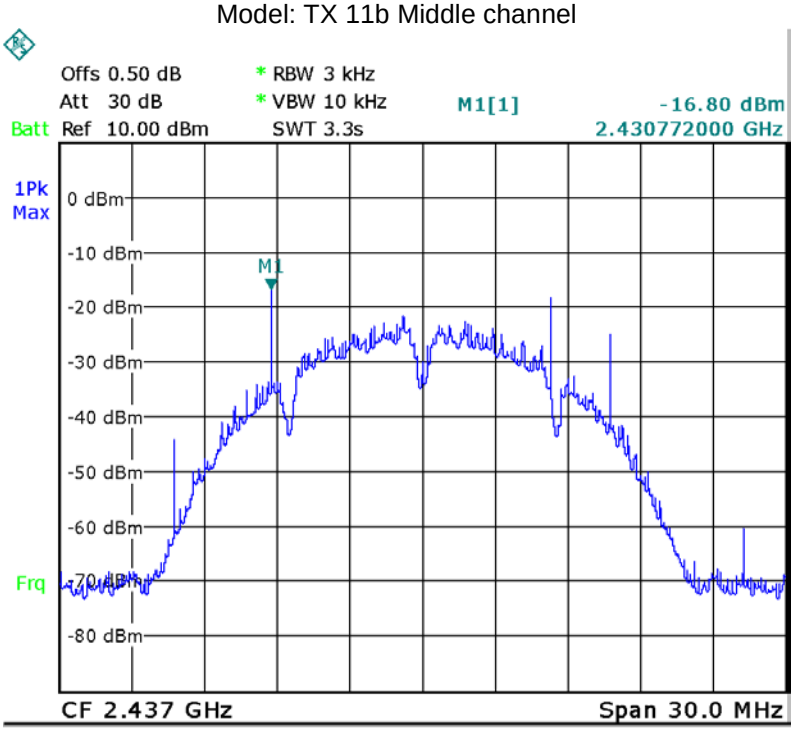


ANT2:

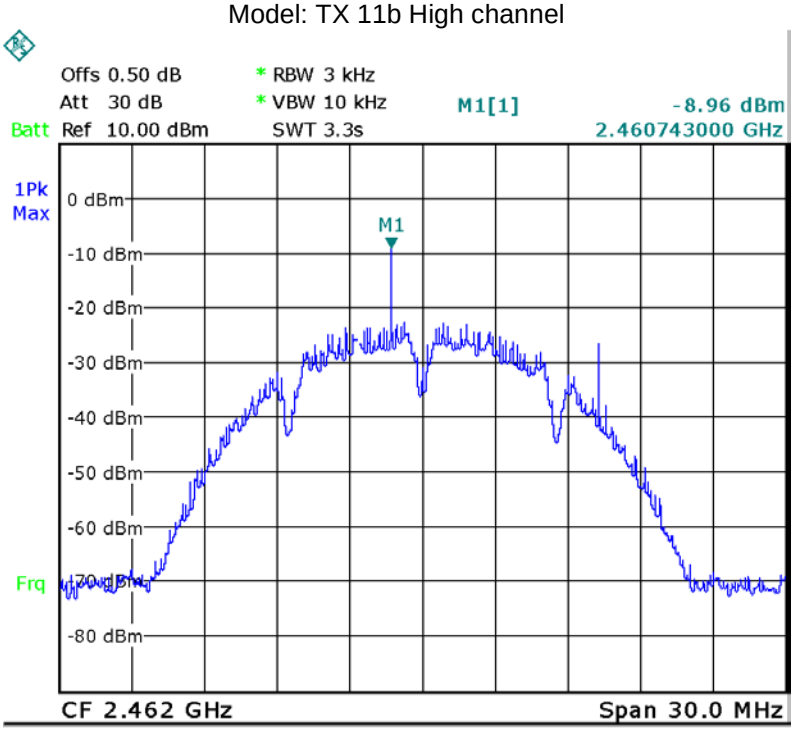
Model: TX 11b Low Channel



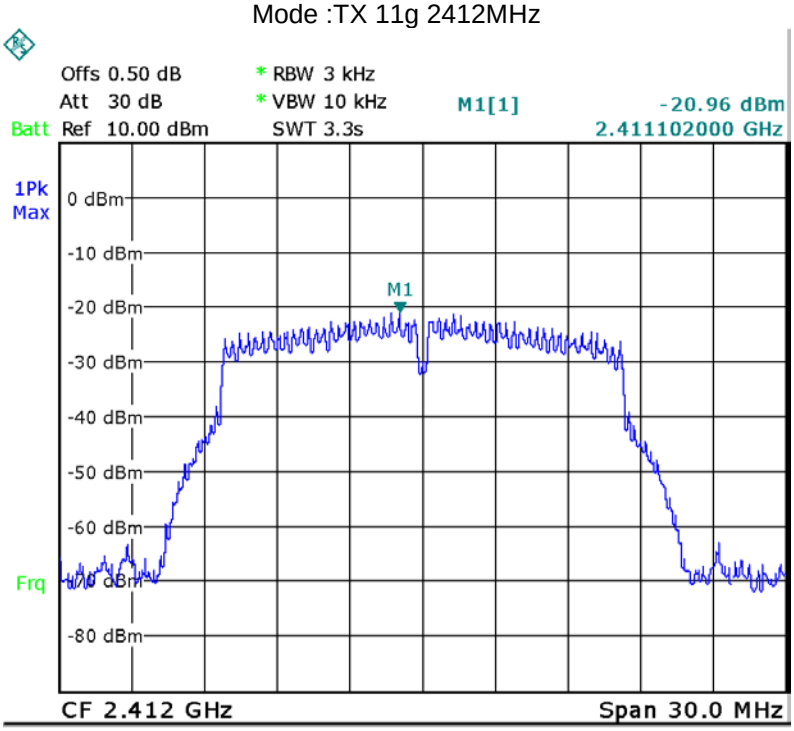
Model: TX 11b Middle channel



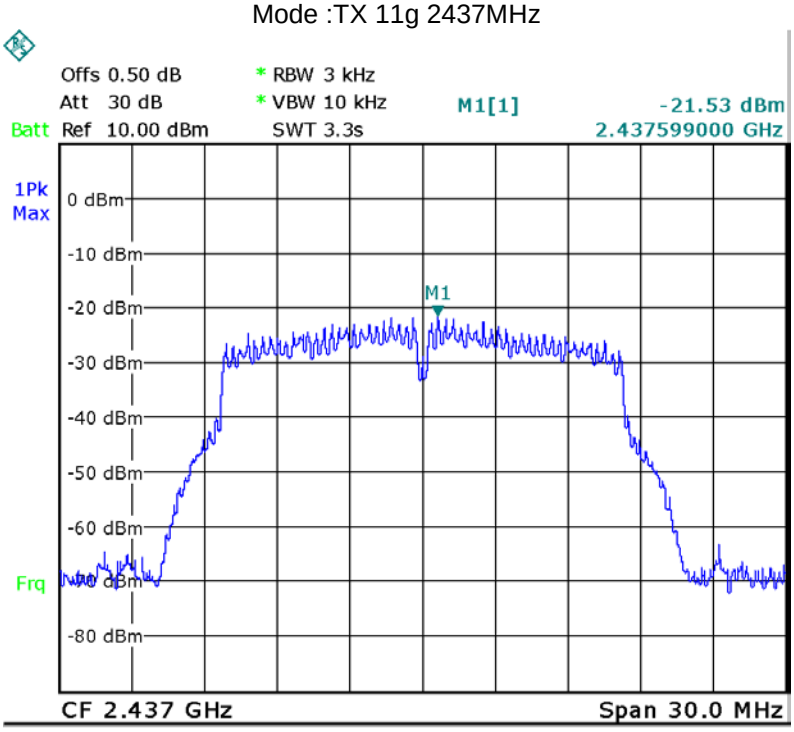
Model: TX 11b High channel



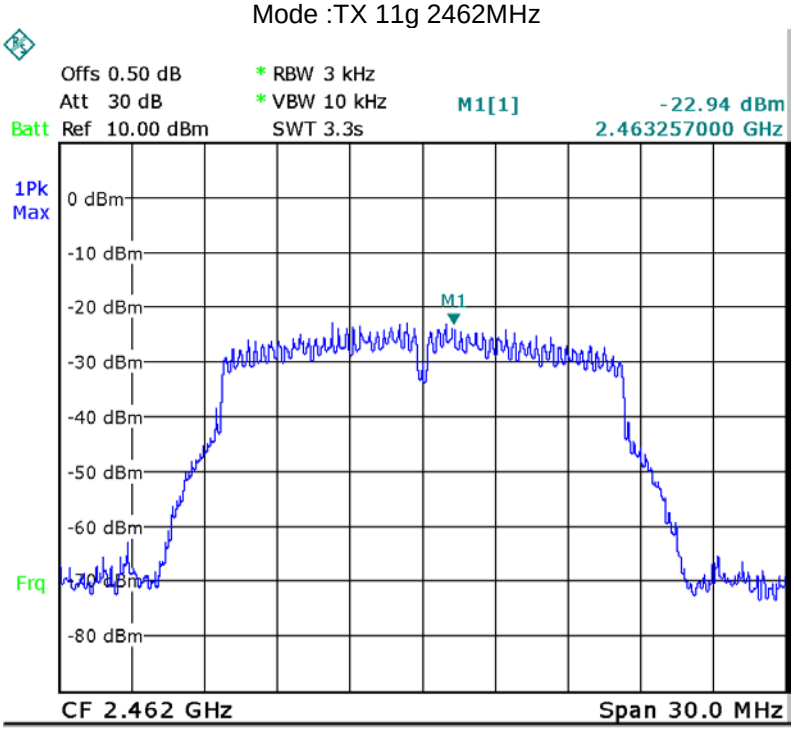
Mode :TX 11g 2412MHz



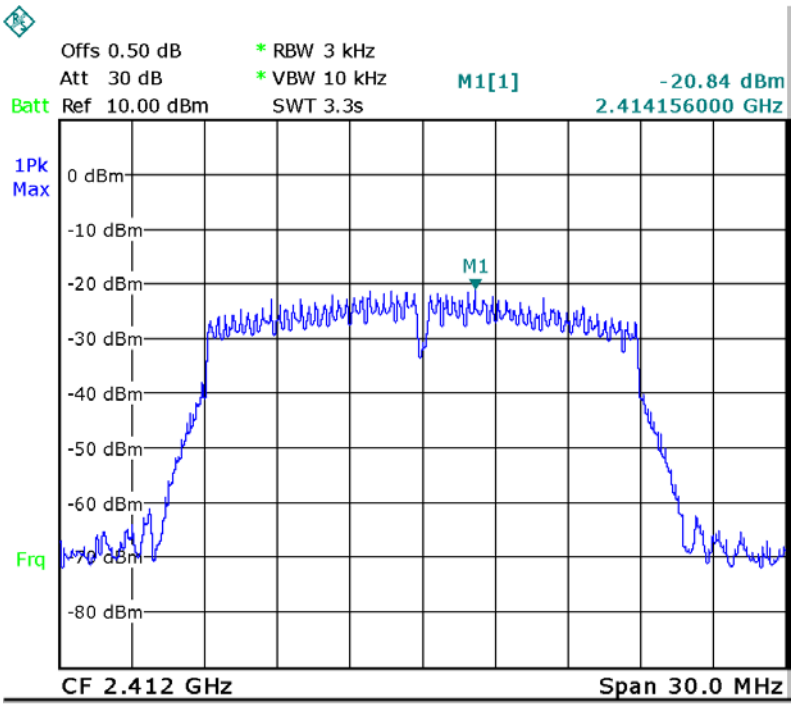
Mode :TX 11g 2437MHz



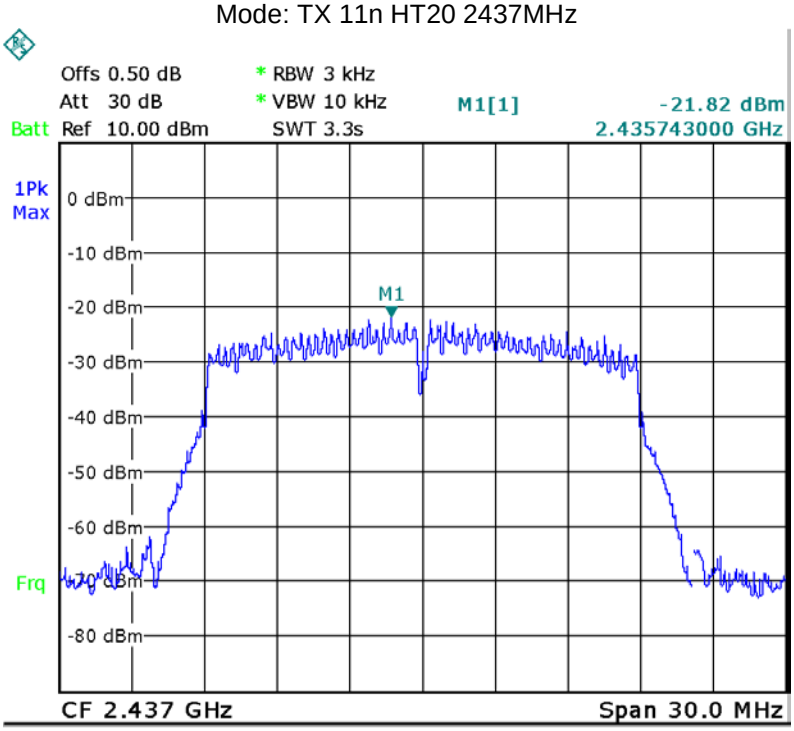
Mode :TX 11g 2462MHz



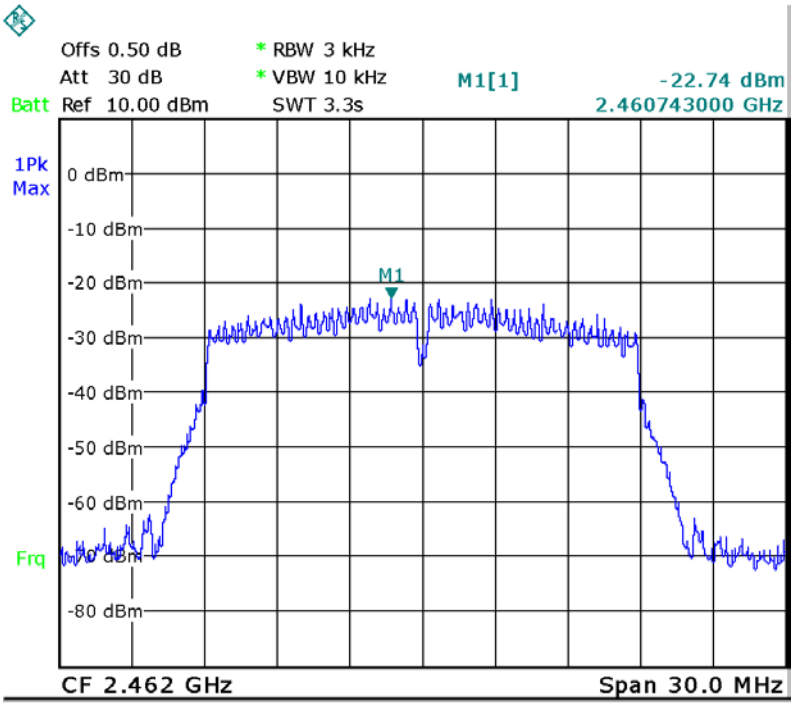
Mode: TX 11n HT20 2412MHz



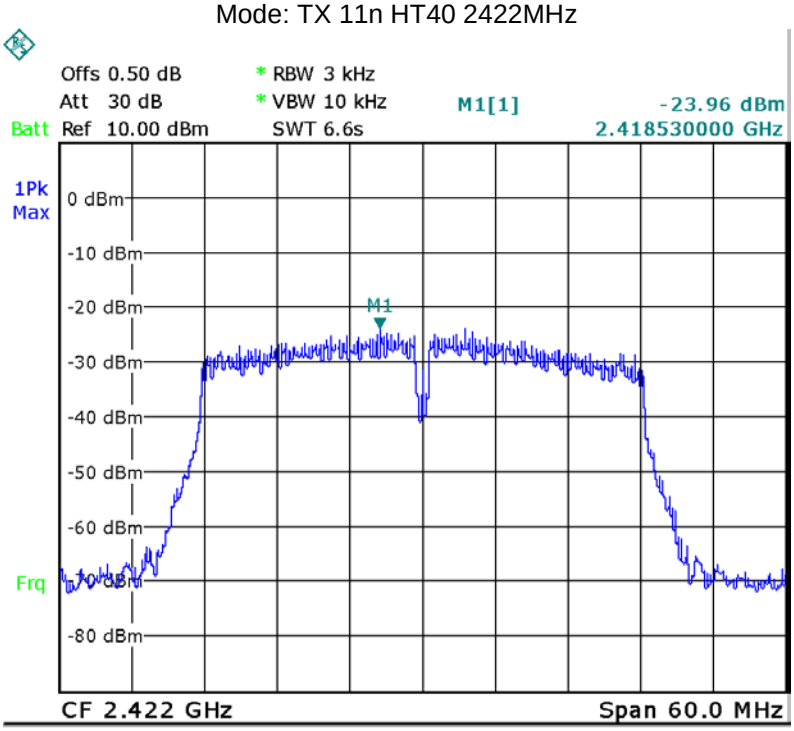
Mode: TX 11n HT20 2437MHz



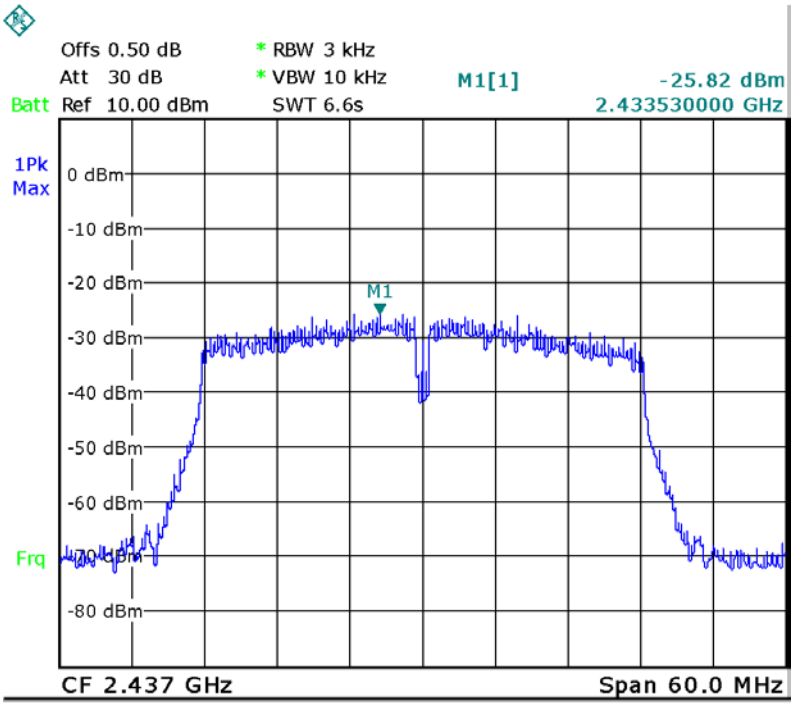
Mode: TX 11n HT20 2462MHz



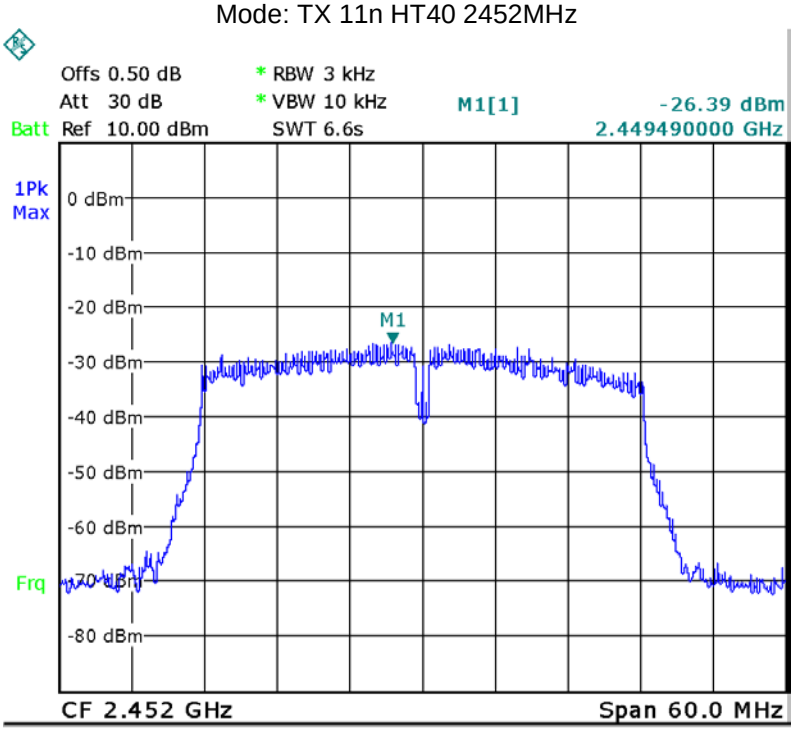
Mode: TX 11n HT40 2422MHz



Mode: TX 11n HT40 2437MHz



Mode: TX 11n HT40 2452MHz



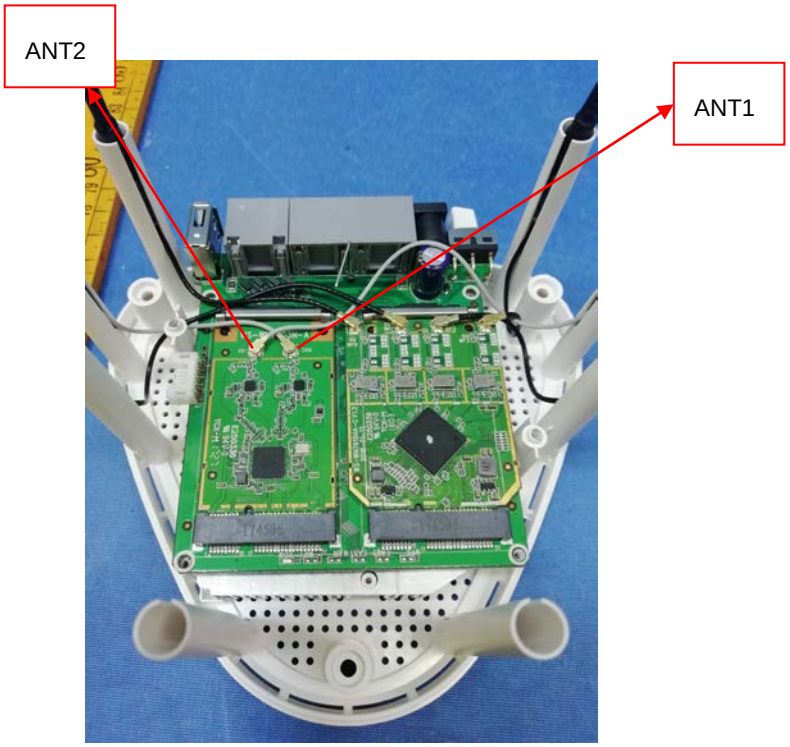
13 Antenna Requirement

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

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

Result:

The EUT have two Integrated Antenna for 2.4G WiFi Antenna, meets the requirements of FCC 15.203.



14 FCC ID: 2AP2U-SN3R RF Exposure Report

Note: Please refer to RF Exposure Report: WTS18S05112396-3W.

15 Photographs – Test Setup Photos

Note: Please refer to Photos: WTS18S05112396-4W.

16 Photographs - Constructional Details

16.1 External Photos

Note: Please refer to Photos: WTS18S05112396-4W.

16.2 Internal Photos

Note: Please refer to Photos: WTS18S05112396-4W.

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