TEST REPORT

Reference No.	:	WTF20S05031693W001
FCC ID	:	2AWKO-IE1200M
Applicant	:	Innovative Energy Systems and Technology Pte Ltd
Address	:	102F Pasir Panjang Road. #03-03. Citilink Warehouse, Singapore 118530
Manufacturer	:	Shenzhen Leadingplus Electronic Co.,Ltd.
Address	:	NO. 337-339, B Block, JieMeiKang Creative Industry Park, Donghuan Road, Longhua New District, Shenzhen, Guangdong, China
Product	:	WiFi-AC Booster
Model(s)	:	IE-1200M
Brand Name	:	Innovative Energy
Standards	:	FCC CFR47 Part 15.247:2017
Date of Receipt sample	:	2020-05-27
Date of Test	:	2020-05-28 to 2020-06-16
Date of Issue	:	2020-06-17
Test Result	:	Pass

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

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3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTF20S05031693W001	2020-05-27	2020-05-28 to 2020-06-16	2020-06-17	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	WiFi-AC Booster
Model(s):	IE-1200M
Model Description:	N/A
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/n/ac HT20 /n/ac HT40 /ac HT80
Hardware Version:	V1.0
Software Version:	V1.0

4.2 Details of E.U.T.

Operation Frequency:	WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz
Max. RF output power:	WiFi(2.4G): 20.64dBm
Type of Modulation:	WiFi: CCK, OFDM
Antenna installation:	WiFi: internal permanent antenna
Antenna Gain:	WiFi(2.4G): 0.5dBi
Ratings:	Input: AC 100-240V~50/60Hz

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 Services(Shenzhen) 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 Services(Shenzhen) 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	2019-09-17	2020-09-16
2.	LISN	R&S	ENV216	101215	2019-09-17	2020-09-16
3.	Cable	Top	TYPE16(3.5M)	-	2019-09-17	2020-09-16
Conducted Emissions Test Site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	2019-09-17	2020-09-16
2.	LISN	SCHWARZBECK	NSLK 8128	8128-289	2019-09-17	2020-09-16
3.	Limiter	York	MTS-IMP-136	261115-001-0024	2019-09-17	2020-09-16
4.	Cable	LARGE	RF300	-	2019-09-17	2020-09-16
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	2020-04-20	2021-04-19
2	Active Loop Antenna	Beijing Dazhi	ZN30900A	-	2020-04-20	2021-04-19
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2019-08-11	2020-08-10
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2019-09-17	2020-09-16
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2020-04-19	2021-04-18
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2020-04-20	2021-04-19
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2020-04-20	2021-04-19
8	Coaxial Cable (above 1GHz)	Top	1GHz-25GHz	EW02014-7	2020-04-20	2021-04-19
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2020-04-20	2021-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2020-04-25	2021-04-24
3	Amplifier	Compliance pirection systems inc	PAP-0203	22024	2020-04-20	2021-04-19
4	Cable	HUBER+SUHNER	CBL2	525178	2020-04-20	2021-04-19

RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2019-09-17	2020-09-16
2.	Spectrum Analyzer (9k-6GHz)	R&S	FSL6	100959	2019-09-17	2020-09-16
3.	Signal Analyzer (9k~26.5GHz)	Agilent	N9010A	MY50520207	2019-09-17	2020-09-16

6.2 Description of Support Units

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

6.3 Measurement Uncertainty

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

6.4 Test Equipment Calibration

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

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit:

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

7.1 E.U.T. Operation

Operating Environment **:**

Temperature: 21.5 °C

Humidity: 51.9 % RH

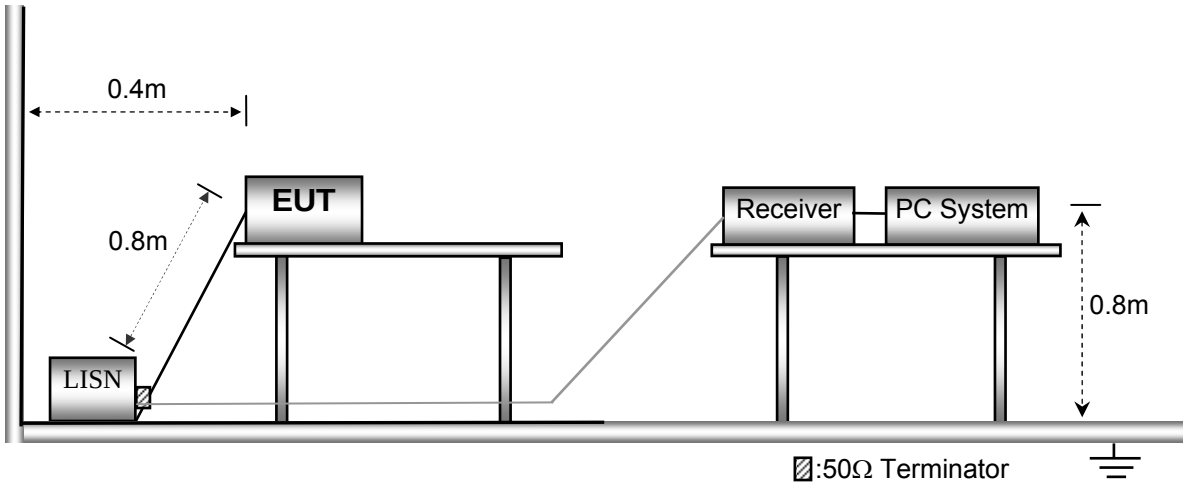
Atmospheric Pressure: 101.2kPa

EUT Operation **:**

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

7.2 EUT Setup

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



7.3 Measurement Description

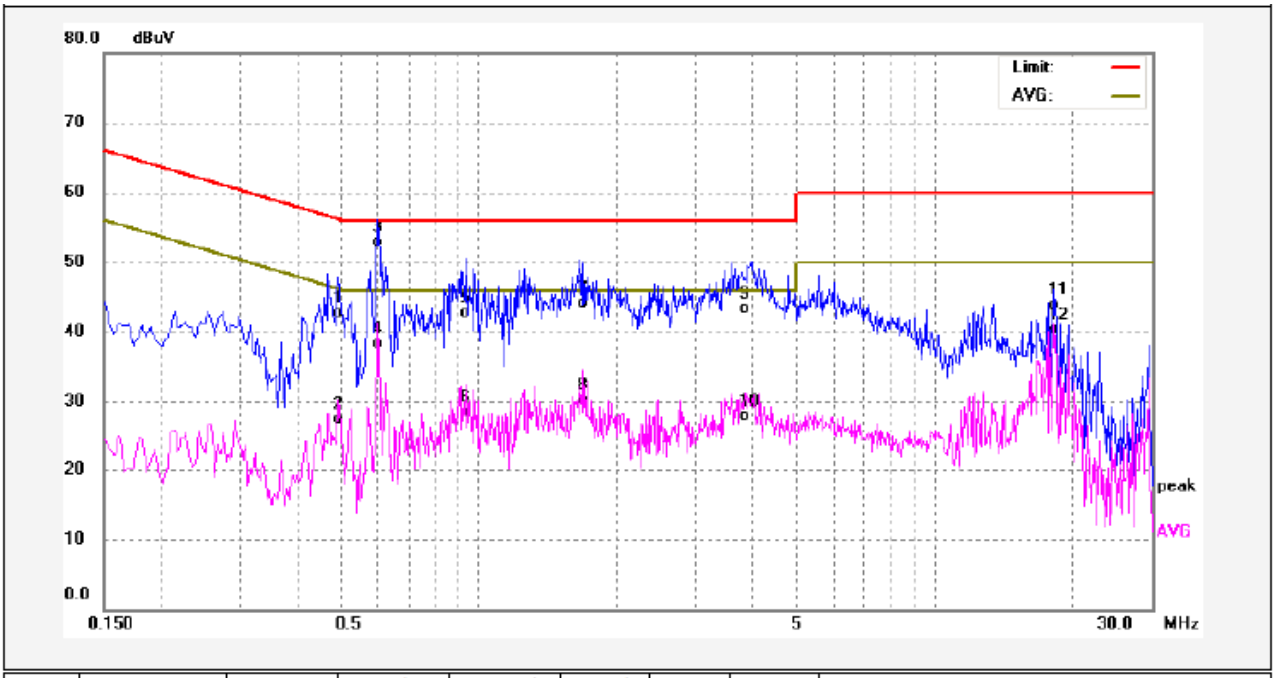
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

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

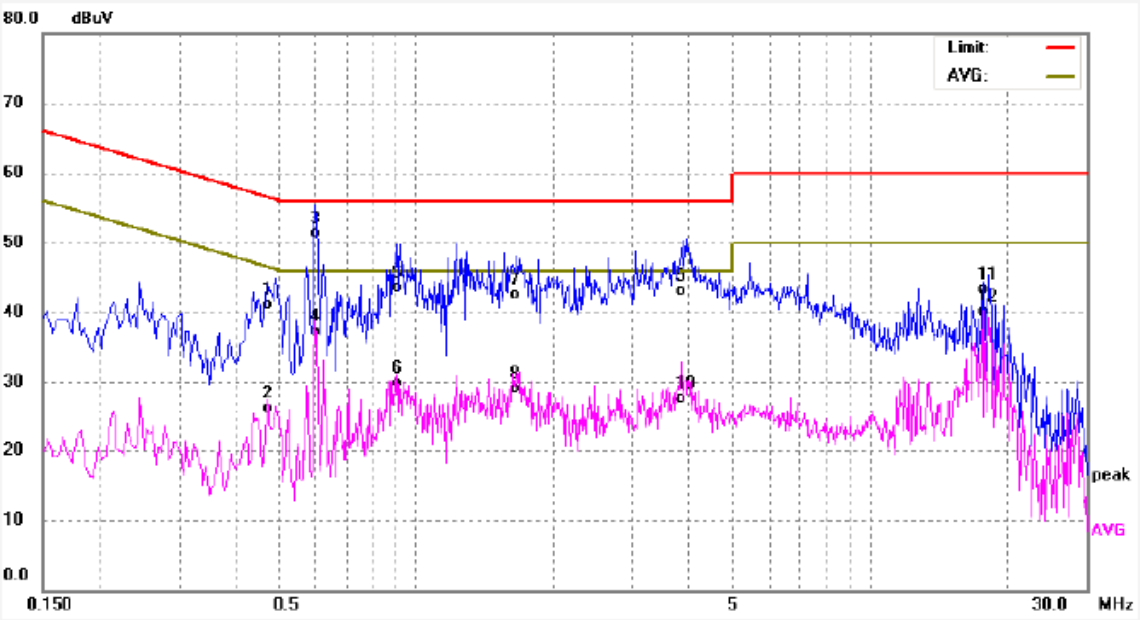
Worst Mode: 2.4G WIFI mode (802.11b mode low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.4900	32.88	9.81	42.69	56.17	-13.48	QP	
2	0.4900	17.64	9.81	27.45	46.17	-18.72	AVG	
3	0.5980	43.16	9.84	53.00	56.00	-3.00	QP	
4	0.5980	28.37	9.84	38.21	46.00	-7.79	AVG	
5	0.9420	32.78	9.87	42.65	56.00	-13.35	QP	
6	0.9420	18.59	9.87	28.46	46.00	-17.54	AVG	
7	1.6900	34.28	9.92	44.20	56.00	-11.80	QP	
8	1.6900	20.45	9.92	30.37	46.00	-15.63	AVG	
9	3.8220	33.38	9.94	43.32	56.00	-12.68	QP	
10	3.8220	18.03	9.94	27.97	46.00	-18.03	AVG	
11	18.2420	33.69	10.24	43.93	60.00	-16.07	QP	
12	18.2420	30.09	10.24	40.33	50.00	-9.67	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.4700	31.32	9.82	41.14	56.51	-15.37	QP	
2	0.4700	16.53	9.82	26.35	46.51	-20.16	AVG	
3	0.5980	41.46	9.84	51.30	56.00	-4.70	QP	
4	0.5980	27.51	9.84	37.35	46.00	-8.65	AVG	
5	0.9060	33.65	9.87	43.52	56.00	-12.48	QP	
6	0.9060	19.99	9.87	29.86	46.00	-16.14	AVG	
7	1.6620	32.64	9.92	42.56	56.00	-13.44	QP	
8	1.6620	19.21	9.92	29.13	46.00	-16.87	AVG	
9	3.8260	33.20	9.94	43.14	56.00	-12.86	QP	
10	3.8260	17.78	9.94	27.72	46.00	-18.28	AVG	
11	17.6940	33.16	10.22	43.38	60.00	-16.62	QP	
12	17.6940	29.82	10.22	40.04	50.00	-9.96	AVG	

8 Radiated Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018; ANSI C63.10:2013

Test Result: PASS

Measurement Distance: 3m

Limit:

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

8.1 EUT Operation

Operating Environment **:**

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

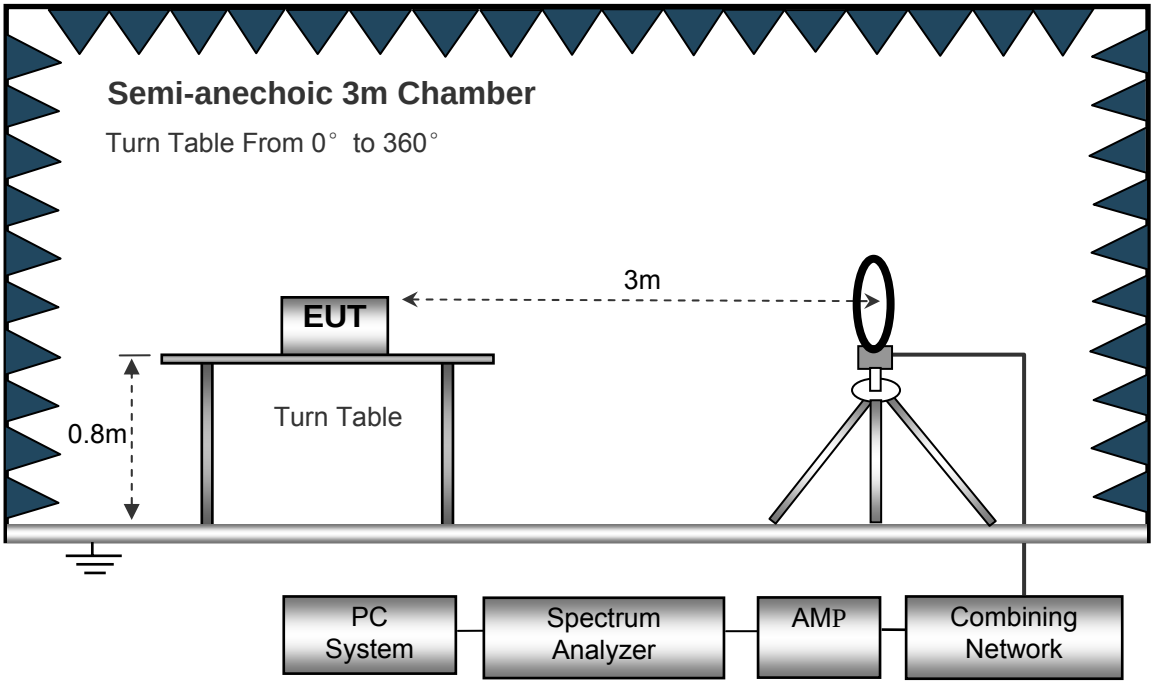
EUT Operation **:**

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

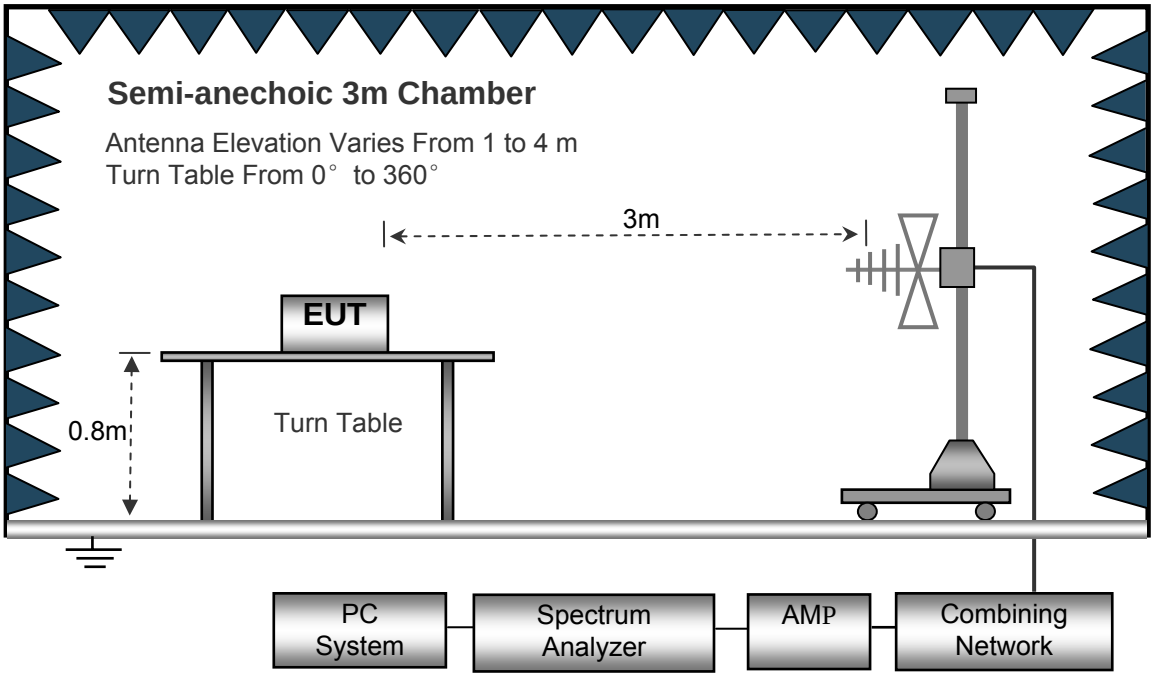
8.2 Test Setup

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

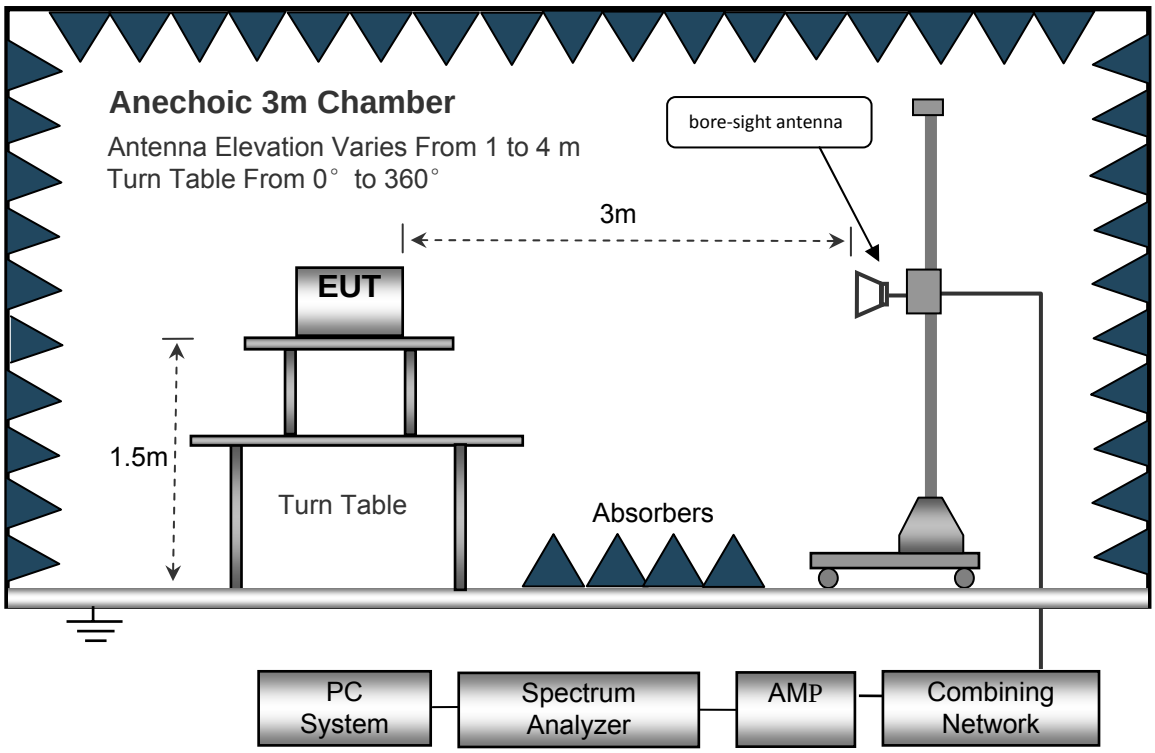
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

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

Above 1GHz

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

8.4 Test Procedure

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

Wifi:
Test Frequency: 9KHz~30MHz

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

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
ANT1+ANT2 802.11b							
6.021	25.34	QP	21.84	40.00	7.18	29.54	-22.36
15.730	25.36	QP	21.35	40.00	6.71	29.54	-22.83
25.680	25.18	QP	20.67	40.00	5.85	29.54	-23.69
ANT1+ANT2 802.11g							
6.021	25.11	QP	21.84	40.00	6.95	29.54	-22.59
15.730	24.63	QP	21.35	40.00	5.98	29.54	-23.56
25.680	25.05	QP	20.67	40.00	5.72	29.54	-23.82
ANT1+ANT2 802.11n(HT20)							
6.021	25.01	QP	21.84	40.00	6.85	29.54	-22.69
15.730	24.75	QP	21.35	40.00	6.10	29.54	-23.44
25.680	25.33	QP	20.67	40.00	6.00	29.54	-23.54
ANT1+ANT2 802.11n(HT40)							
6.021	25.11	QP	21.84	40.00	6.95	29.54	-22.59
15.730	24.86	QP	21.35	40.00	6.21	29.54	-23.33
25.680	27.53	QP	20.67	40.00	8.20	29.54	-21.34

Test Frequency : 30MHz ~ 8GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 11b: Low Channel 2412MHz									
223.45	41.46	QP	94	1.2	H	-11.62	29.84	46.00	-16.16
223.45	35.17	QP	140	1.2	V	-11.62	23.55	46.00	-22.45
4824.00	50.11	PK	83	1.8	V	-1.06	49.05	74.00	-24.95
4824.00	45.89	Ave	83	1.8	V	-1.06	44.83	54.00	-9.17
7236.00	42.46	PK	156	1.9	H	1.33	43.79	74.00	-30.21
7236.00	41.22	Ave	156	1.9	H	1.33	42.55	54.00	-11.45
2334.44	45.80	PK	198	1.9	V	-13.19	32.61	74.00	-41.39
2334.44	37.47	Ave	198	1.9	V	-13.19	24.28	54.00	-29.72
2388.10	42.17	PK	179	1.5	H	-13.14	29.03	74.00	-44.97
2388.10	38.91	Ave	179	1.5	H	-13.14	25.77	54.00	-28.23
2495.39	43.51	PK	313	1.6	V	-13.08	30.43	74.00	-43.57
2495.39	38.92	Ave	313	1.6	V	-13.08	25.84	54.00	-28.16

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)
ANT1+ANT2 11b: Middle Channel 2437MHz									
223.45	40.13	QP	279	1.4	H	-11.62	28.51	46.00	-17.49
223.45	35.31	QP	28	1.7	V	-11.62	23.69	46.00	-22.31
4874.00	50.84	PK	173	1.6	V	-0.62	50.22	74.00	-23.78
4874.00	44.85	Ave	173	1.6	V	-0.62	44.23	54.00	-9.77
7311.00	43.80	PK	165	1.0	H	2.21	46.01	74.00	-27.99
7311.00	42.39	Ave	165	1.0	H	2.21	44.60	54.00	-9.40
2319.96	46.59	PK	309	1.0	V	-13.19	33.40	74.00	-40.60
2319.96	37.04	Ave	309	1.0	V	-13.19	23.85	54.00	-30.15
2374.40	42.92	PK	155	1.8	H	-13.14	29.78	74.00	-44.22
2374.40	38.79	Ave	155	1.8	H	-13.14	25.65	54.00	-28.35
2488.99	44.94	PK	171	1.3	V	-13.08	31.86	74.00	-42.14
2488.99	38.68	Ave	171	1.3	V	-13.08	25.60	54.00	-28.40

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)
ANT1+ANT2 11b: High Channel 2462MHz									
223.45	40.53	QP	227	1.6	H	-11.62	28.91	46.00	-17.09
223.45	33.86	QP	226	1.8	V	-11.62	22.24	46.00	-23.76
4924.00	49.97	PK	258	1.7	V	-0.24	49.73	74.00	-24.27
4924.00	44.18	Ave	258	1.7	V	-0.24	43.94	54.00	-10.06
7386.00	43.48	PK	85	1.4	H	2.84	46.32	74.00	-27.68
7386.00	40.99	Ave	85	1.4	H	2.84	43.83	54.00	-10.17
2336.77	46.31	PK	42	1.0	V	-13.19	33.12	74.00	-40.88
2336.77	37.75	Ave	42	1.0	V	-13.19	24.56	54.00	-29.44
2377.68	43.31	PK	200	1.9	H	-13.14	30.17	74.00	-43.83
2377.68	38.63	Ave	200	1.9	H	-13.14	25.49	54.00	-28.51
2488.21	42.94	PK	274	1.4	V	-13.08	29.86	74.00	-44.14
2488.21	37.30	Ave	274	1.4	V	-13.08	24.22	54.00	-29.78

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 11g: Low Channel 2412MHz									
223.45	41.95	QP	35	1.4	H	-11.62	30.33	46.00	-15.67
223.45	33.15	QP	1	1.6	V	-11.62	21.53	46.00	-24.47
4824.00	50.02	PK	188	1.9	V	-1.06	48.96	74.00	-25.04
4824.00	44.21	Ave	188	1.9	V	-1.06	43.15	54.00	-10.85
7236.00	42.50	PK	167	2.0	H	1.33	43.83	74.00	-30.17
7236.00	42.17	Ave	167	2.0	H	1.33	43.50	54.00	-10.50
2338.32	46.41	PK	216	1.5	V	-13.19	33.22	74.00	-40.78
2338.32	37.30	Ave	216	1.5	V	-13.19	24.11	54.00	-29.89
2369.92	42.37	PK	181	1.5	H	-13.14	29.23	74.00	-44.77
2369.92	37.17	Ave	181	1.5	H	-13.14	24.03	54.00	-29.97
2486.13	44.54	PK	81	1.3	V	-13.08	31.46	74.00	-42.54
2486.13	36.27	Ave	81	1.3	V	-13.08	23.19	54.00	-30.81

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 11g: Middle Channel 2437MHz									
223.45	42.28	QP	31	1.3	H	-11.62	30.66	46.00	-15.34
223.45	33.78	QP	36	1.2	V	-11.62	22.16	46.00	-23.84
4874.00	49.53	PK	263	1.3	V	-0.62	48.91	74.00	-25.09
4874.00	44.33	Ave	263	1.3	V	-0.62	43.71	54.00	-10.29
7311.00	41.65	PK	216	1.6	H	2.21	43.86	74.00	-30.14
7311.00	43.30	Ave	216	1.6	H	2.21	45.51	54.00	-8.49
2333.80	45.75	PK	352	1.9	V	-13.19	32.56	74.00	-41.44
2333.80	38.06	Ave	352	1.9	V	-13.19	24.87	54.00	-29.13
2370.26	43.65	PK	130	1.1	H	-13.14	30.51	74.00	-43.49
2370.26	37.92	Ave	130	1.1	H	-13.14	24.78	54.00	-29.22
2499.06	43.74	PK	29	1.6	V	-13.08	30.66	74.00	-43.34
2499.06	36.99	Ave	29	1.6	V	-13.08	23.91	54.00	-30.09

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 11g: High Channel 2462MHz									
223.45	43.08	QP	70	1.2	H	-11.62	31.46	46.00	-14.54
223.45	32.79	QP	157	1.5	V	-11.62	21.17	46.00	-24.83
4924.00	48.61	PK	214	1.5	V	-0.24	48.37	74.00	-25.63
4924.00	44.51	Ave	214	1.5	V	-0.24	44.27	54.00	-9.73
7386.00	40.71	PK	56	1.9	H	2.84	43.55	74.00	-30.45
7386.00	42.93	Ave	56	1.9	H	2.84	45.77	54.00	-8.23
2322.66	46.46	PK	60	1.7	V	-13.19	33.27	74.00	-40.73
2322.66	38.36	Ave	60	1.7	V	-13.19	25.17	54.00	-28.83
2374.33	42.21	PK	209	1.7	H	-13.14	29.07	74.00	-44.93
2374.33	36.14	Ave	209	1.7	H	-13.14	23.00	54.00	-31.00
2494.51	42.20	PK	149	1.6	V	-13.08	29.12	74.00	-44.88
2494.51	36.87	Ave	149	1.6	V	-13.08	23.79	54.00	-30.21

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)
ANT1+ANT2 11n20: Low Channel 2412MHz									
223.45	43.56	QP	295	1.1	H	-11.62	31.94	46.00	-14.06
223.45	32.44	QP	102	1.6	V	-11.62	20.82	46.00	-25.18
4824.00	49.29	PK	320	1.2	V	-1.06	48.23	74.00	-25.77
4824.00	43.50	Ave	320	1.2	V	-1.06	42.44	54.00	-11.56
7236.00	41.80	PK	90	1.3	H	1.33	43.13	74.00	-30.87
7236.00	41.78	Ave	90	1.3	H	1.33	43.11	54.00	-10.89
2319.88	46.69	PK	326	1.5	V	-13.19	33.50	74.00	-40.50
2319.88	37.54	Ave	326	1.5	V	-13.19	24.35	54.00	-29.65
2361.79	44.68	PK	28	1.7	H	-13.14	31.54	74.00	-42.46
2361.79	38.16	Ave	28	1.7	H	-13.14	25.02	54.00	-28.98
2485.21	42.24	PK	94	1.6	V	-13.08	29.16	74.00	-44.84
2485.21	36.56	Ave	94	1.6	V	-13.08	23.48	54.00	-30.52

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)
ANT1+ANT2 11n20: Middle Channel 2437MHz									
223.45	42.77	QP	342	1.8	H	-11.62	31.15	46.00	-14.85
223.45	31.49	QP	10	1.1	V	-11.62	19.87	46.00	-26.13
4874.00	50.77	PK	36	1.1	V	-0.62	50.15	74.00	-23.85
4874.00	42.88	Ave	36	1.1	V	-0.62	42.26	54.00	-11.74
7311.00	40.68	PK	282	1.9	H	2.21	42.89	74.00	-31.11
7311.00	40.37	Ave	282	1.9	H	2.21	42.58	54.00	-11.42
2341.23	45.53	PK	296	1.6	V	-13.19	32.34	74.00	-41.66
2341.23	39.18	Ave	296	1.6	V	-13.19	25.99	54.00	-28.01
2381.43	42.99	PK	268	1.2	H	-13.14	29.85	74.00	-44.15
2381.43	38.65	Ave	268	1.2	H	-13.14	25.51	54.00	-28.49
2492.59	44.27	PK	71	1.8	V	-13.08	31.19	74.00	-42.81
2492.59	38.23	Ave	71	1.8	V	-13.08	25.15	54.00	-28.85

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)
ANT1+ANT2 11n20: High Channel 2462MHz									
223.45	44.07	QP	266	2.0	H	-11.62	32.45	46.00	-13.55
223.45	32.27	QP	159	1.5	V	-11.62	20.65	46.00	-25.35
4924.00	51.32	PK	78	1.1	V	-0.24	51.08	74.00	-22.92
4924.00	41.43	Ave	78	1.1	V	-0.24	41.19	54.00	-12.81
7386.00	40.17	PK	287	1.4	H	2.84	43.01	74.00	-30.99
7386.00	39.44	Ave	287	1.4	H	2.84	42.28	54.00	-11.72
2311.26	46.65	PK	152	1.4	V	-13.19	33.46	74.00	-40.54
2311.26	38.73	Ave	152	1.4	V	-13.19	25.54	54.00	-28.46
2373.36	43.54	PK	353	1.8	H	-13.14	30.40	74.00	-43.60
2373.36	38.85	Ave	353	1.8	H	-13.14	25.71	54.00	-28.29
2485.29	44.73	PK	12	1.2	V	-13.08	31.65	74.00	-42.35
2485.29	38.56	Ave	12	1.2	V	-13.08	25.48	54.00	-28.52

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)
ANT1+ANT2 11n40: Low Channel 2422MHz									
223.45	45.39	QP	205	1.9	H	-11.62	33.77	46.00	-12.23
223.45	33.56	QP	356	1.0	V	-11.62	21.94	46.00	-24.06
4844.00	49.48	PK	289	1.4	V	-1.06	48.42	74.00	-25.58
4844.00	39.27	Ave	289	1.4	V	-1.06	38.21	54.00	-15.79
7266.00	37.19	PK	48	2.0	H	1.33	38.52	74.00	-35.48
7266.00	37.02	Ave	48	2.0	H	1.33	38.35	54.00	-15.65
2325.91	46.20	PK	71	1.8	V	-13.19	33.01	74.00	-40.99
2325.91	37.80	Ave	71	1.8	V	-13.19	24.61	54.00	-29.39
2377.67	43.96	PK	50	2.0	H	-13.14	30.82	74.00	-43.18
2377.67	38.63	Ave	50	2.0	H	-13.14	25.49	54.00	-28.51
2499.58	43.33	PK	2	1.4	V	-13.08	30.25	74.00	-43.75
2499.58	38.18	Ave	2	1.4	V	-13.08	25.10	54.00	-28.90

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 11n40: Middle Channel 2437MHz									
223.45	45.01	QP	57	1.1	H	-11.62	33.39	46.00	-12.61
223.45	32.77	QP	227	1.1	V	-11.62	21.15	46.00	-24.85
4874.00	49.46	PK	111	1.5	V	-0.62	48.84	74.00	-25.16
4874.00	39.58	Ave	111	1.5	V	-0.62	38.96	54.00	-15.04
7311.00	36.93	PK	22	1.5	H	2.21	39.14	74.00	-34.86
7311.00	37.25	Ave	22	1.5	H	2.21	39.46	54.00	-14.54
2315.08	46.87	PK	61	1.5	V	-13.19	33.68	74.00	-40.32
2315.08	39.13	Ave	61	1.5	V	-13.19	25.94	54.00	-28.06
2389.00	42.74	PK	281	2.0	H	-13.14	29.60	74.00	-44.40
2389.00	37.21	Ave	281	2.0	H	-13.14	24.07	54.00	-29.93
2498.66	44.38	PK	135	1.8	V	-13.08	31.30	74.00	-42.70
2498.66	38.92	Ave	135	1.8	V	-13.08	25.84	54.00	-28.16

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)
ANT1+ANT2 11n40: High Channel 2452MHz									
223.45	44.47	QP	247	1.6	H	-11.62	32.85	46.00	-13.15
223.45	32.53	QP	29	1.8	V	-11.62	20.91	46.00	-25.09
4904.00	49.80	PK	233	1.3	V	-0.24	49.56	74.00	-24.44
4904.00	39.49	Ave	233	1.3	V	-0.24	39.25	54.00	-14.75
7356.00	37.32	PK	50	1.3	H	2.84	40.16	74.00	-33.84
7356.00	36.82	Ave	50	1.3	H	2.84	39.66	54.00	-14.34
2319.60	45.09	PK	11	1.5	V	-13.19	31.90	74.00	-42.10
2319.60	39.96	Ave	11	1.5	V	-13.19	26.77	54.00	-27.23
2360.53	42.07	PK	248	1.5	H	-13.14	28.93	74.00	-45.07
2360.53	36.99	Ave	248	1.5	H	-13.14	23.85	54.00	-30.15
2486.08	42.51	PK	349	1.5	V	-13.08	29.43	74.00	-44.57
2486.08	37.28	Ave	349	1.5	V	-13.08	24.20	54.00	-29.80

Test Frequency: 8GHz~25GHz

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

9 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

Test Result: PASS

Limit:

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

9.1 Test Procedure

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

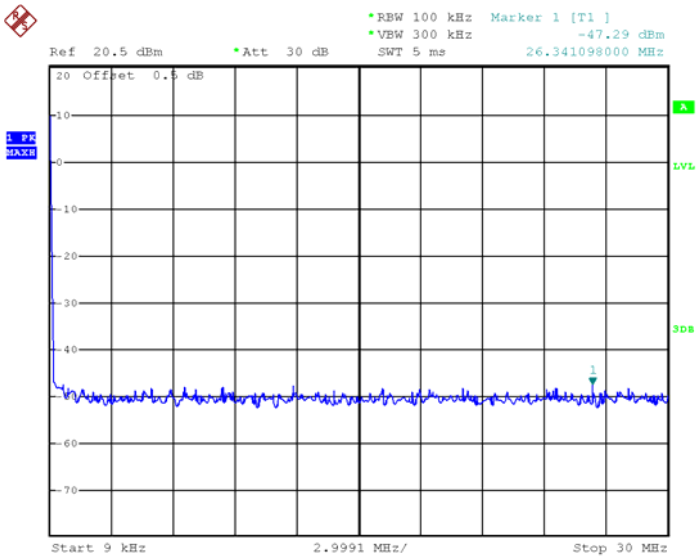
9.2 Test Result

9KHz – 30MHz

ANT 1

802.11b

Low Channel



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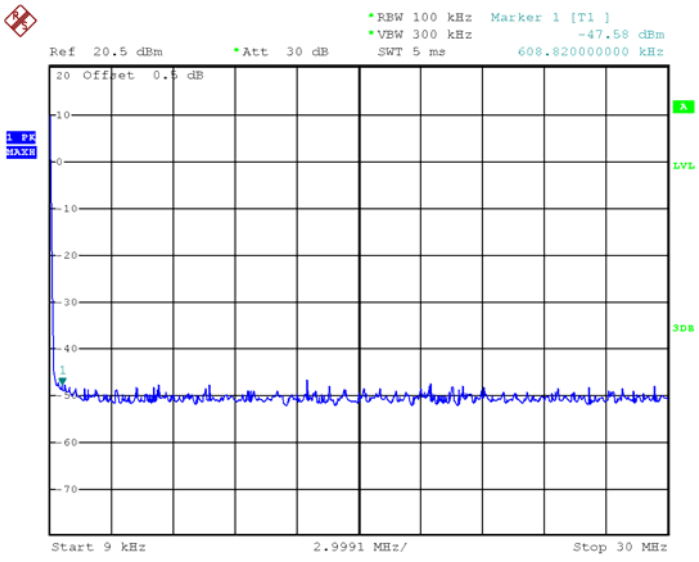
Middle Channel



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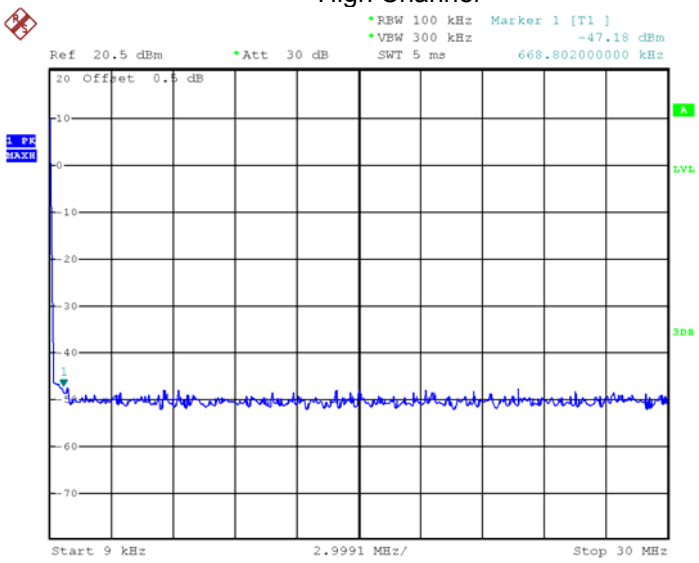
High Channel



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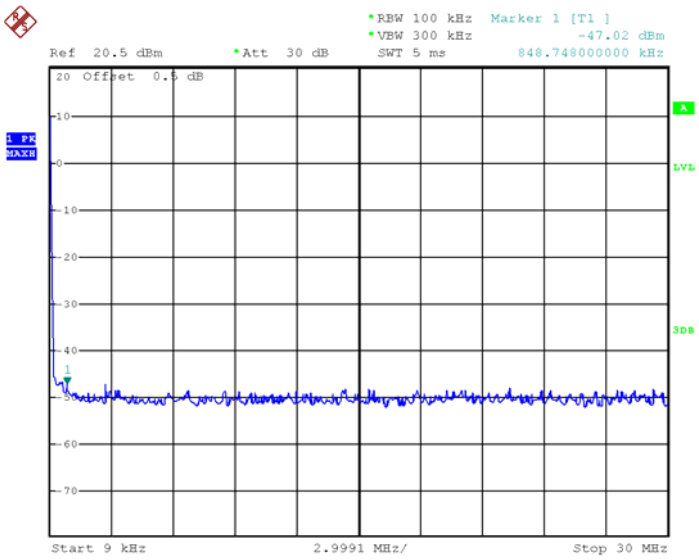
802.11g

Low Channel



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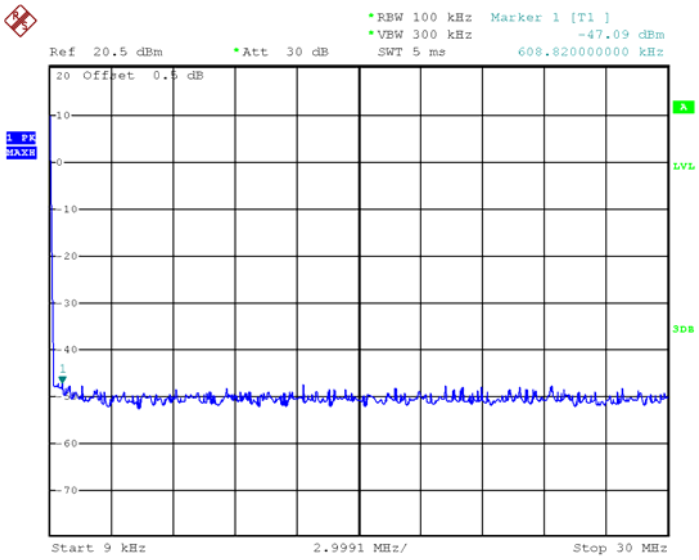
Middle Channel



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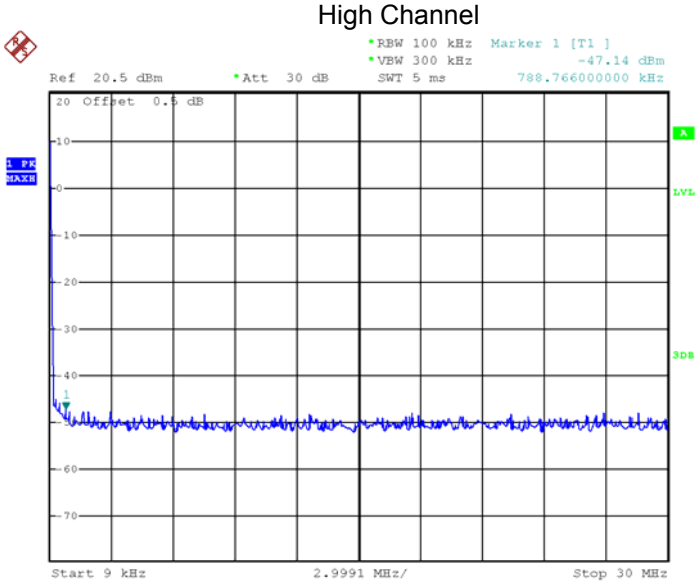
High Channel



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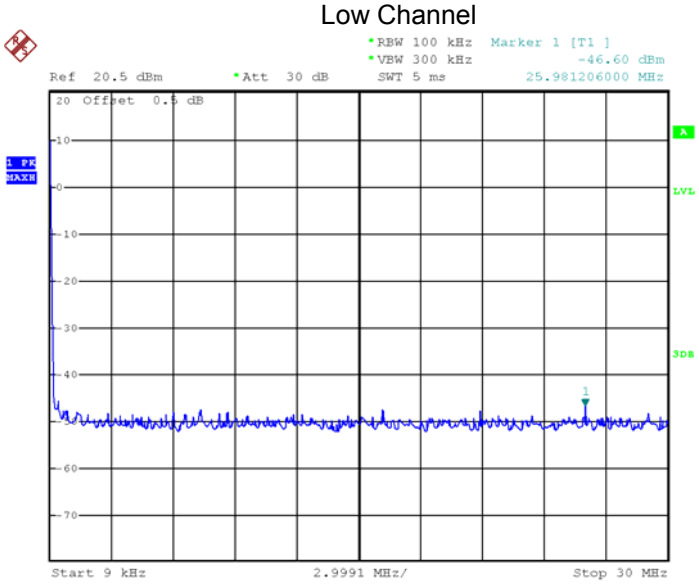
802.11n HT20

Low Channel



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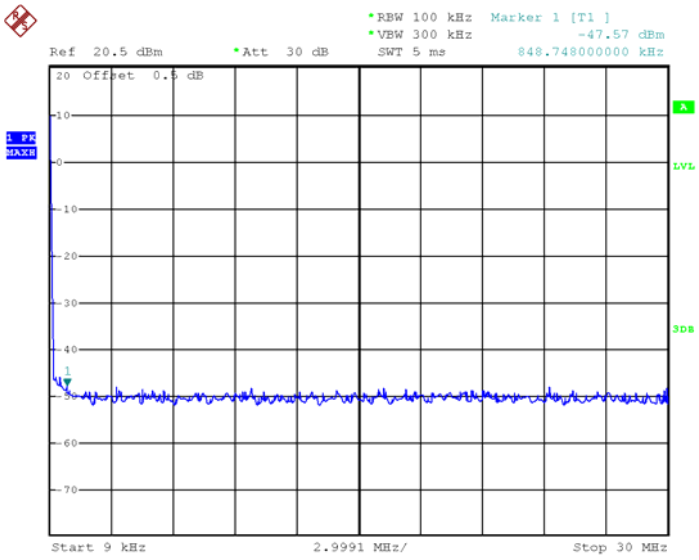
Middle Channel



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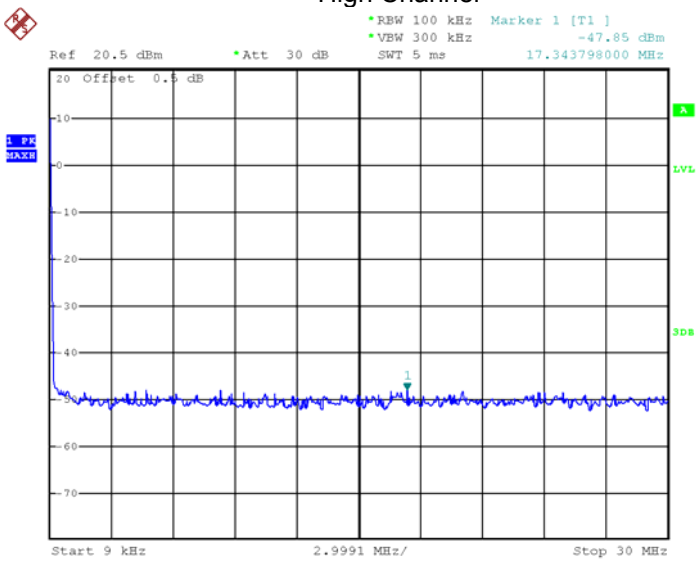
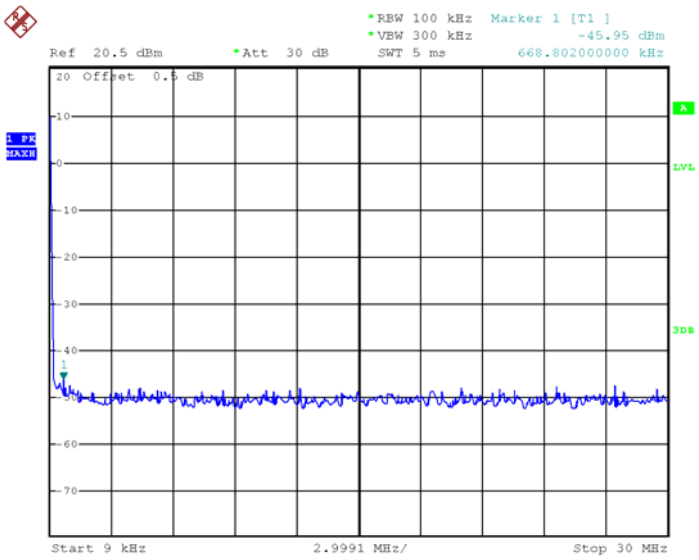
High Channel



Date: 10.JUN.2020 00:55:03

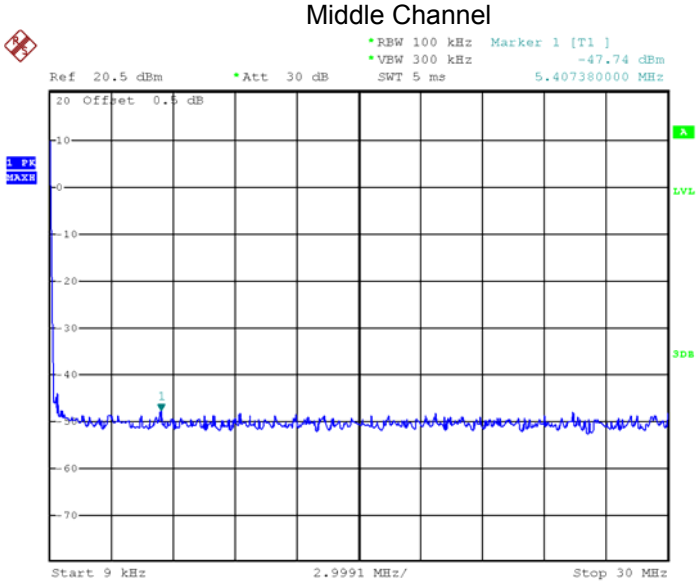
802.11n HT40

Low Channel



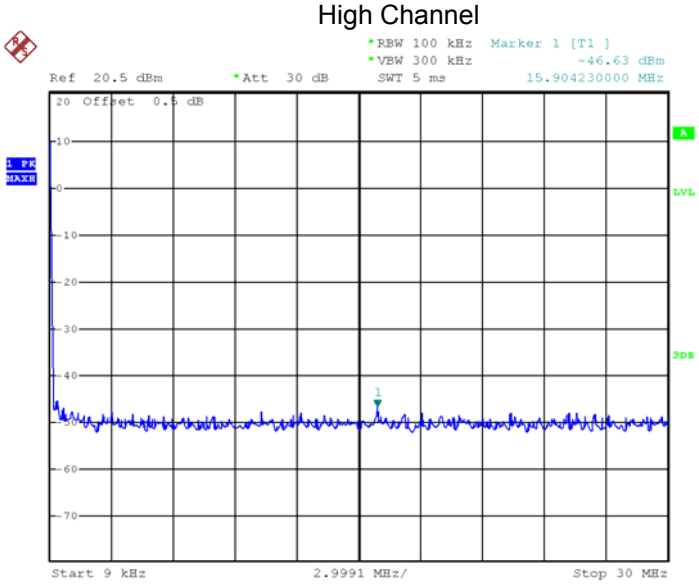
Date: 10.JUN.2020 00:55:12

Middle Channel



Date: 10.JUN.2020 00:55:22

High Channel

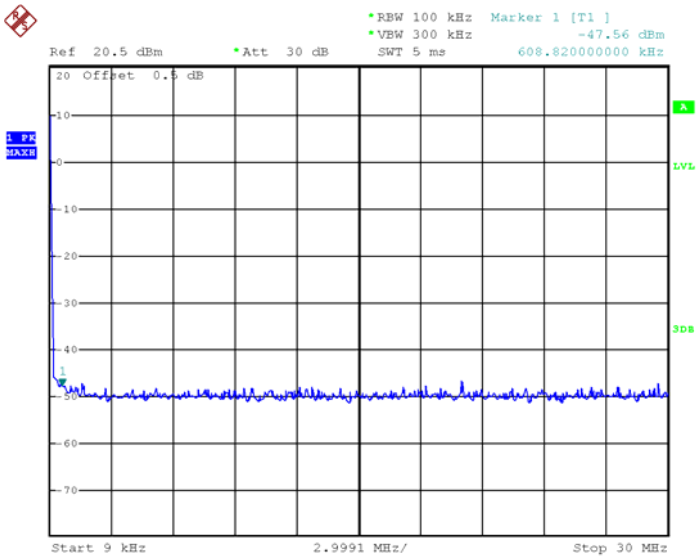


Date: 10.JUN.2020 00:55:33

ANT 2

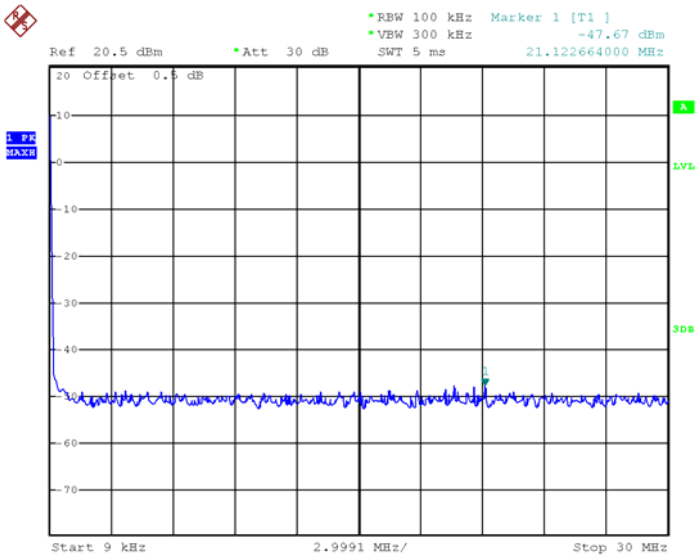
802.11b

Low Channel



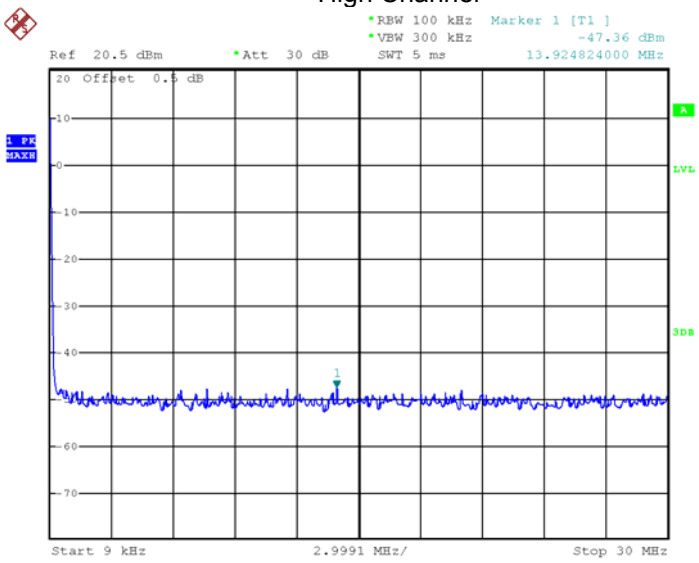
Date: 10.JUN.2020 00:51:42

Middle Channel



Date: 10.JUN.2020 00:51:49

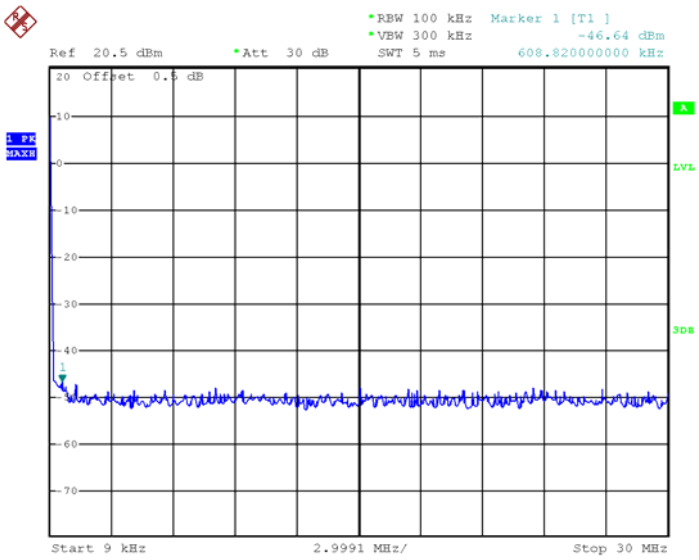
High Channel



Date: 10.JUN.2020 00:51:59

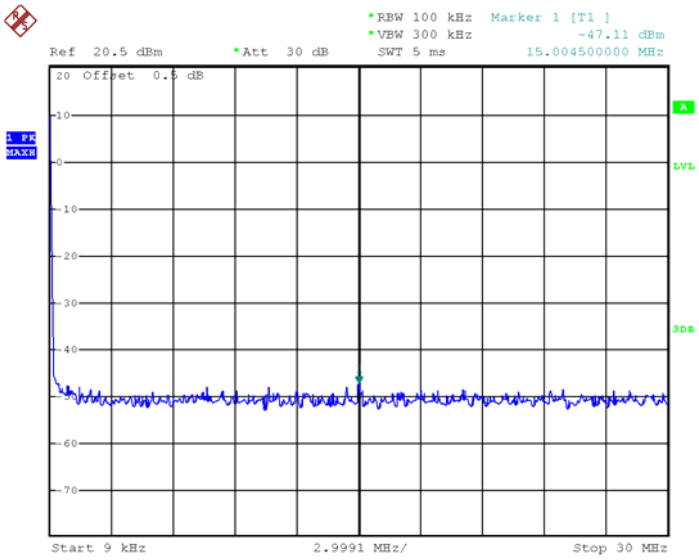
802.11g

Low Channel



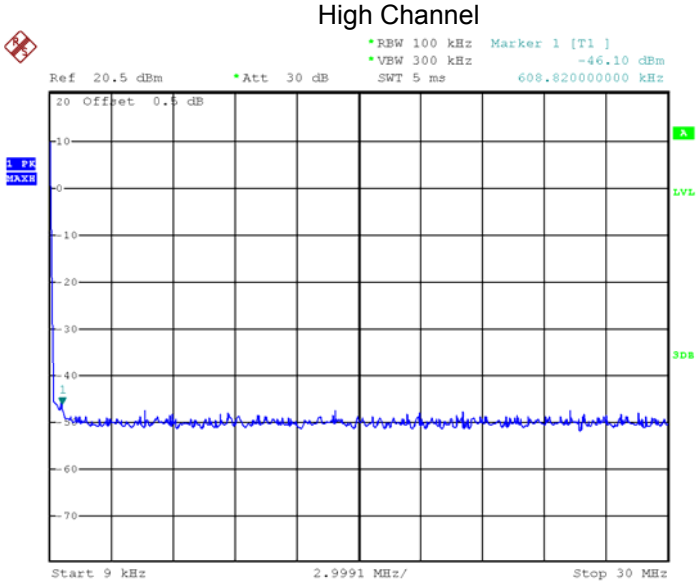
Date: 10.JUN.2020 00:52:07

Middle Channel



Date: 10.JUN.2020 00:52:15

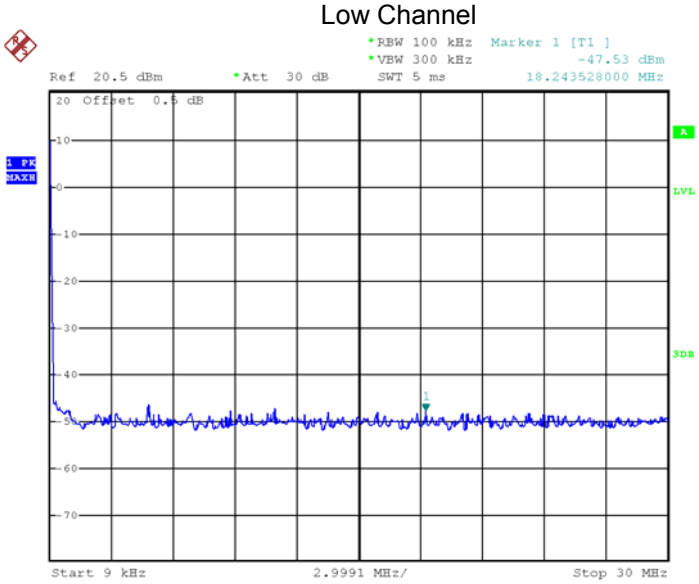
High Channel



Date: 10.JUN.2020 00:52:27

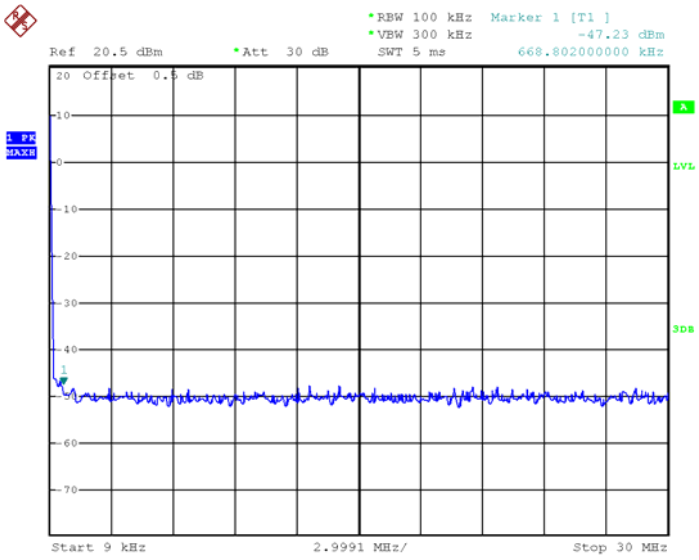
802.11n HT20

Low Channel



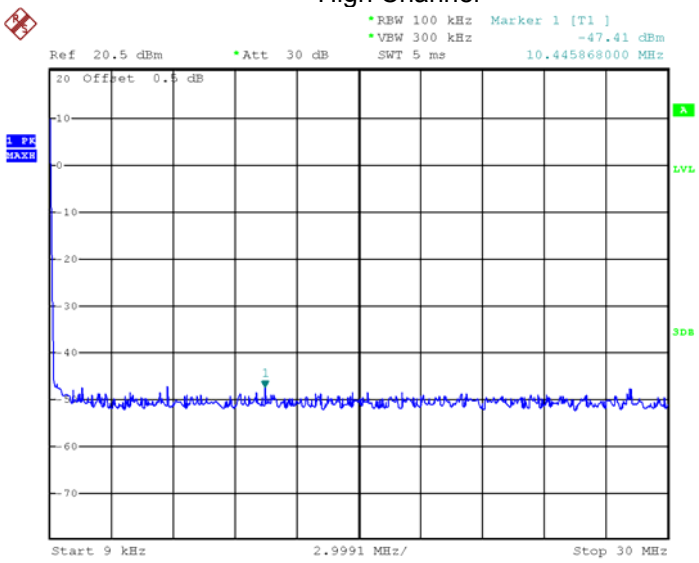
Date: 10.JUN.2020 00:52:38

Middle Channel



Date: 10.JUN.2020 00:52:49

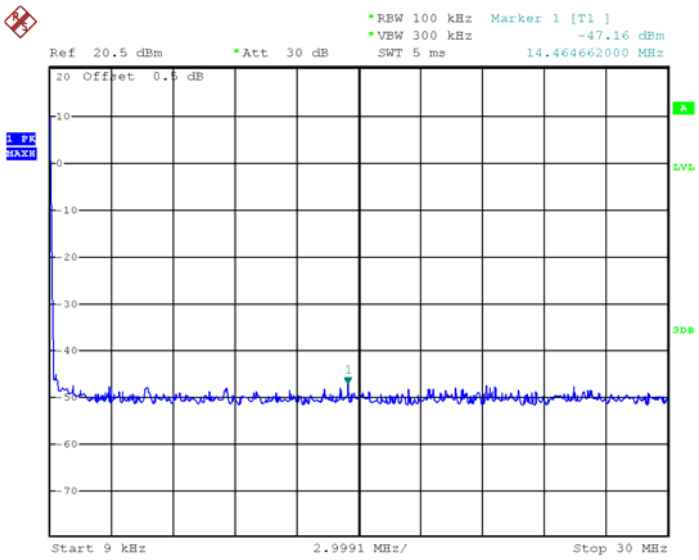
High Channel



Date: 10.JUN.2020 00:52:59

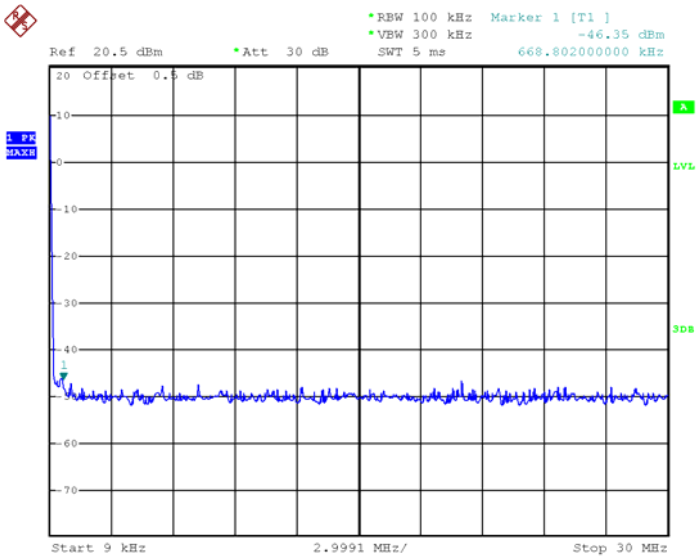
802.11n HT40

Low Channel



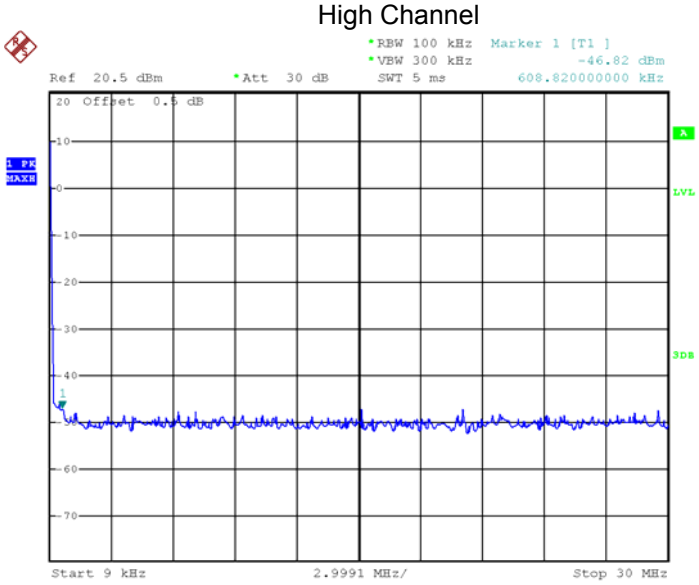
Date: 10.JUN.2020 00:53:10

Middle Channel



Date: 10.JUN.2020 00:53:22

High Channel



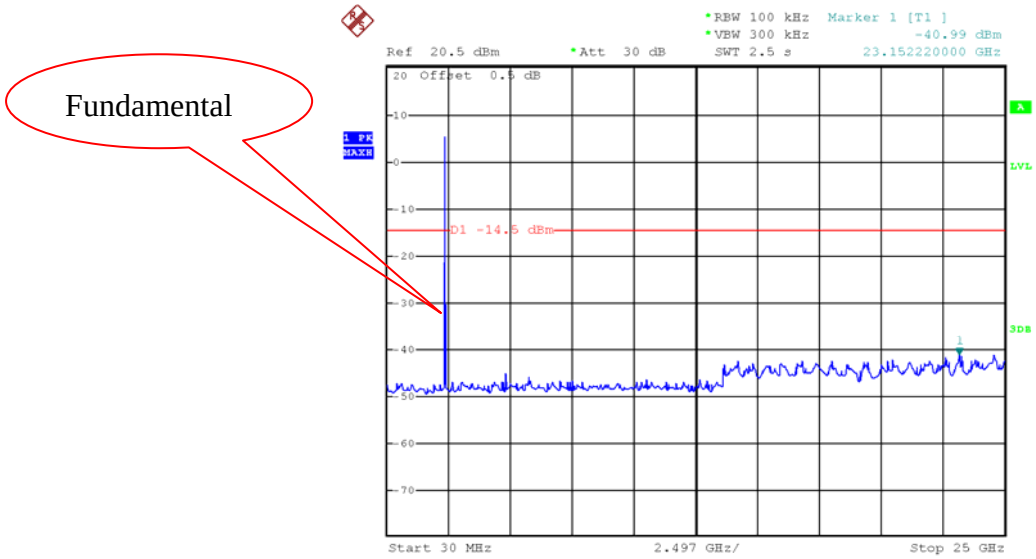
Date: 10.JUN.2020 00:53:32

Above 30MHz

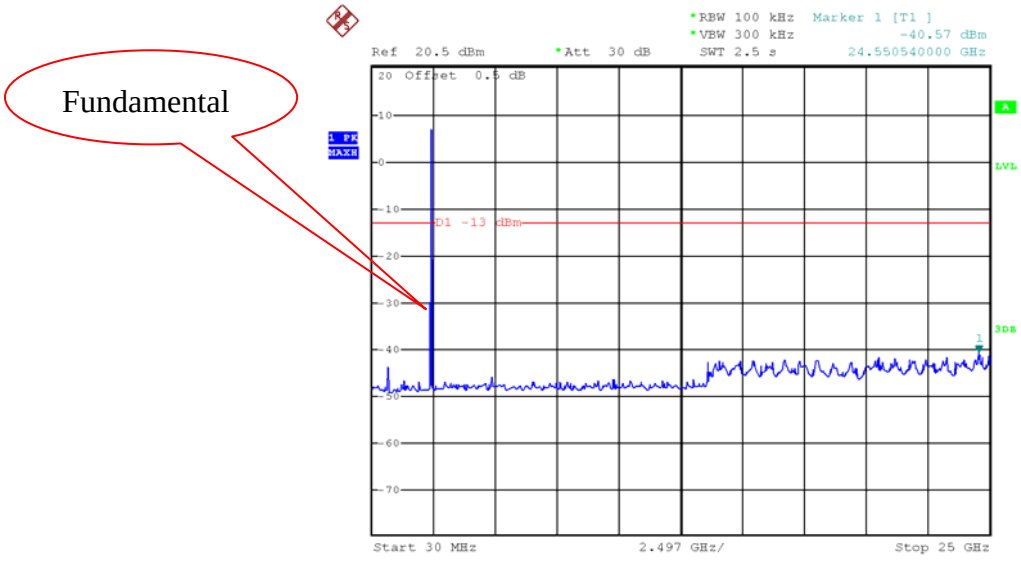
ANT 1

802.11b

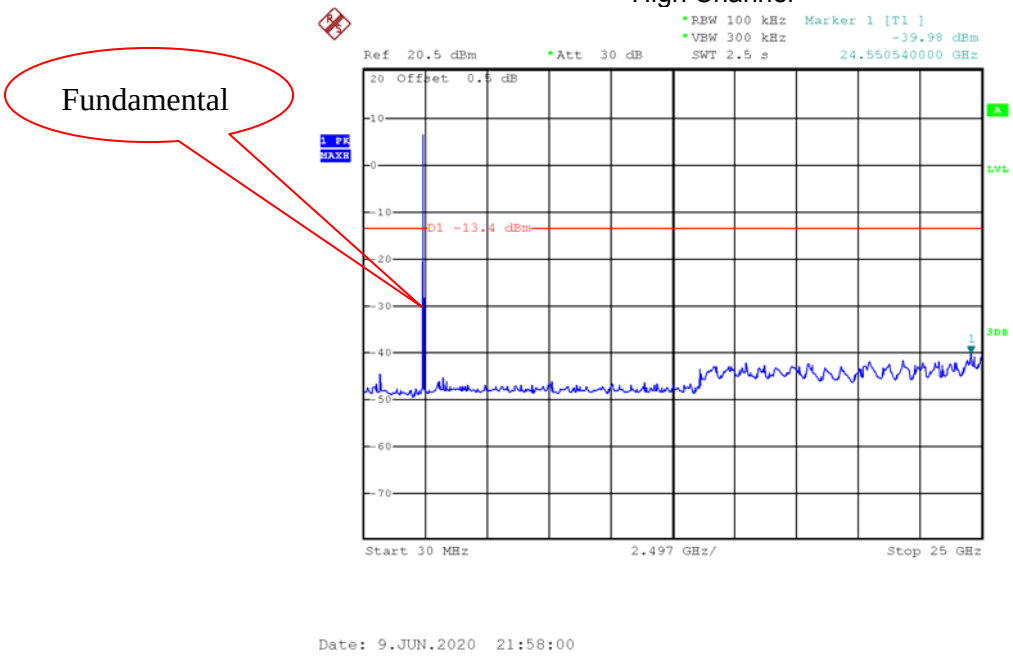
Low Channel



Middle Channel

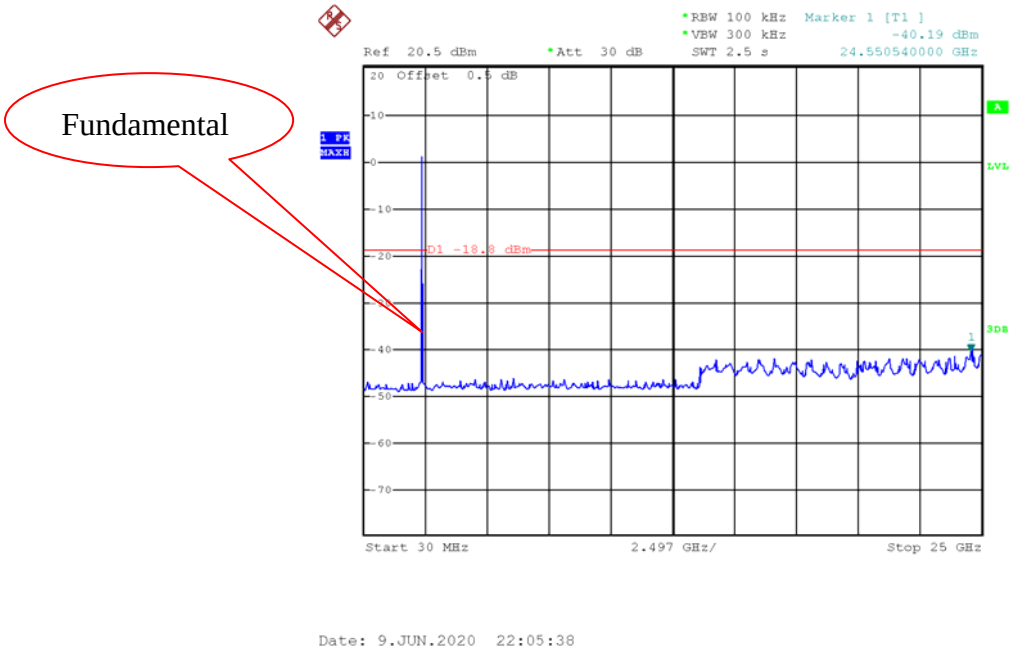


High Channel

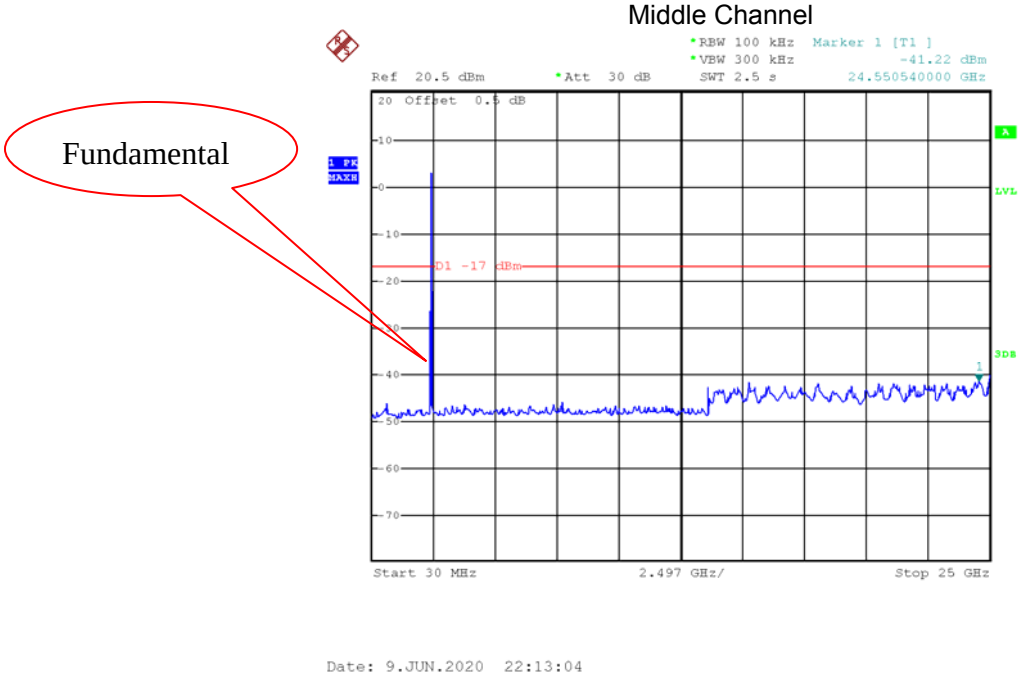


802.11g

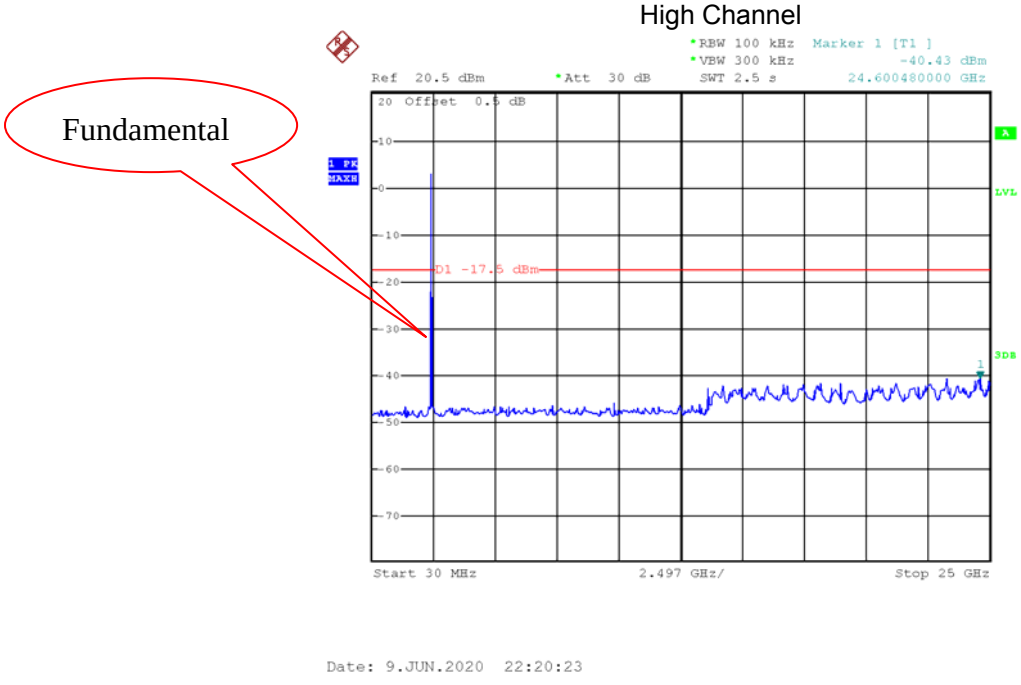
Low Channel



Middle Channel

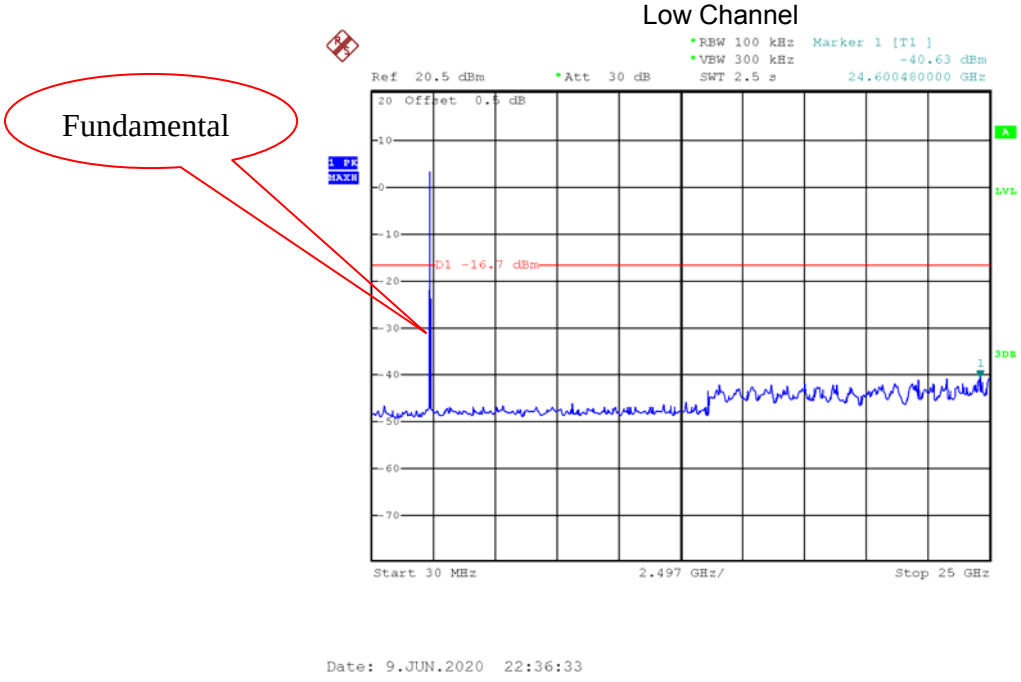


High Channel

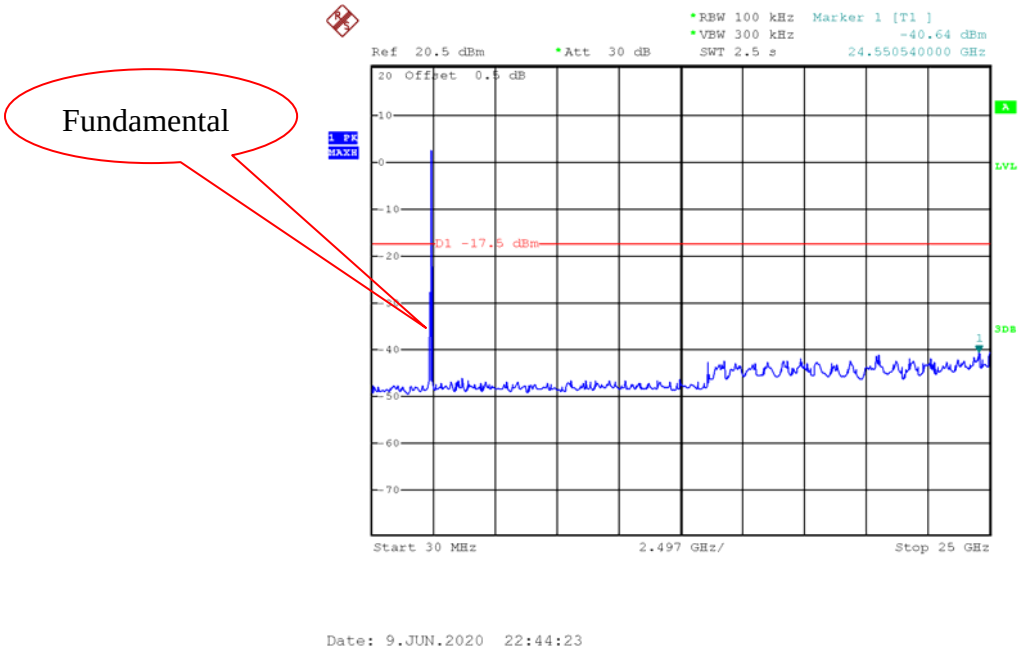


802.11n HT20

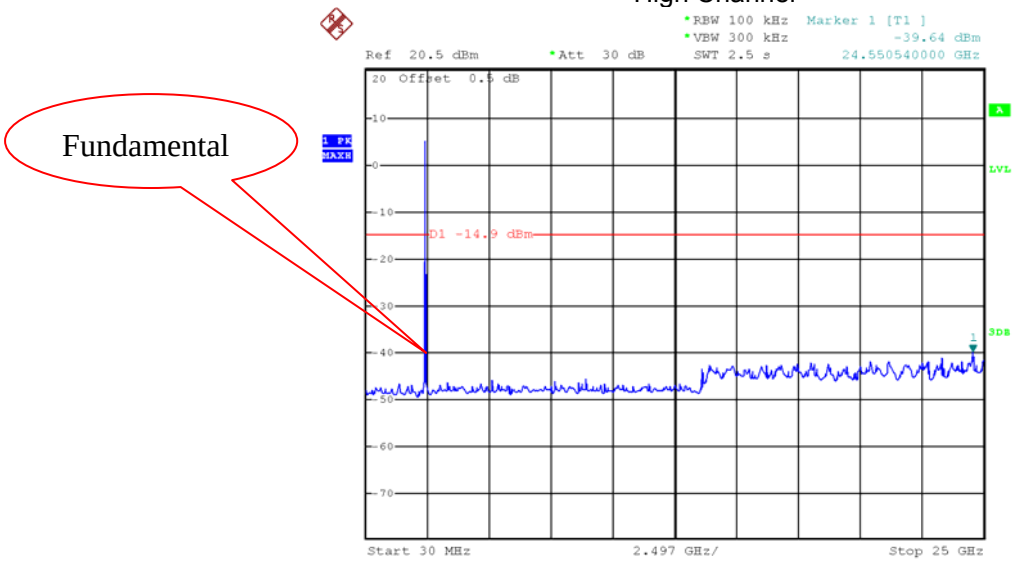
Low Channel



Middle Channel



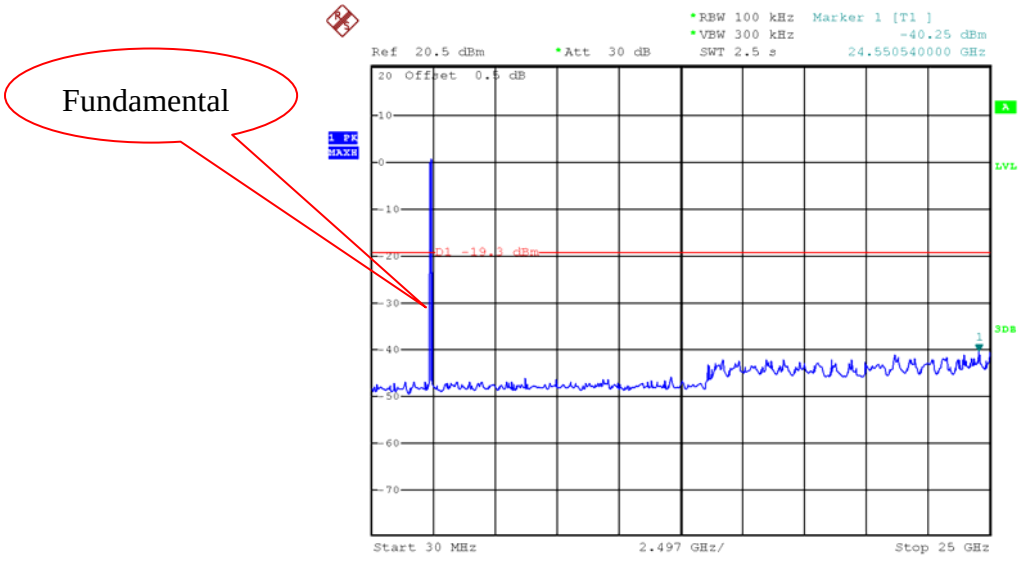
High Channel



Date: 9.JUN.2020 22:49:01

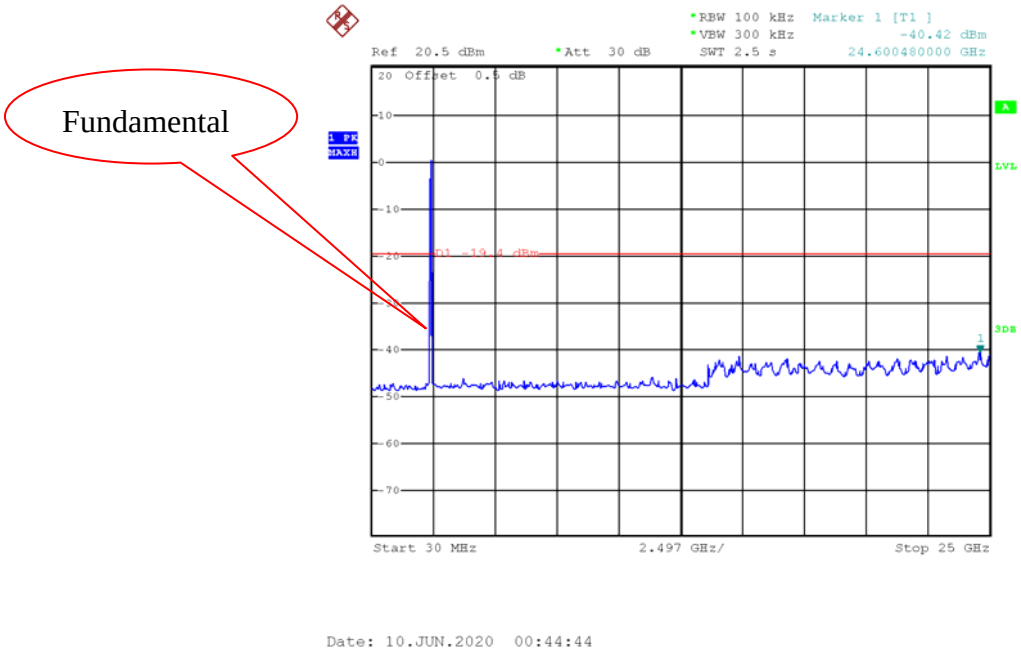
802.11n HT40

Low Channel

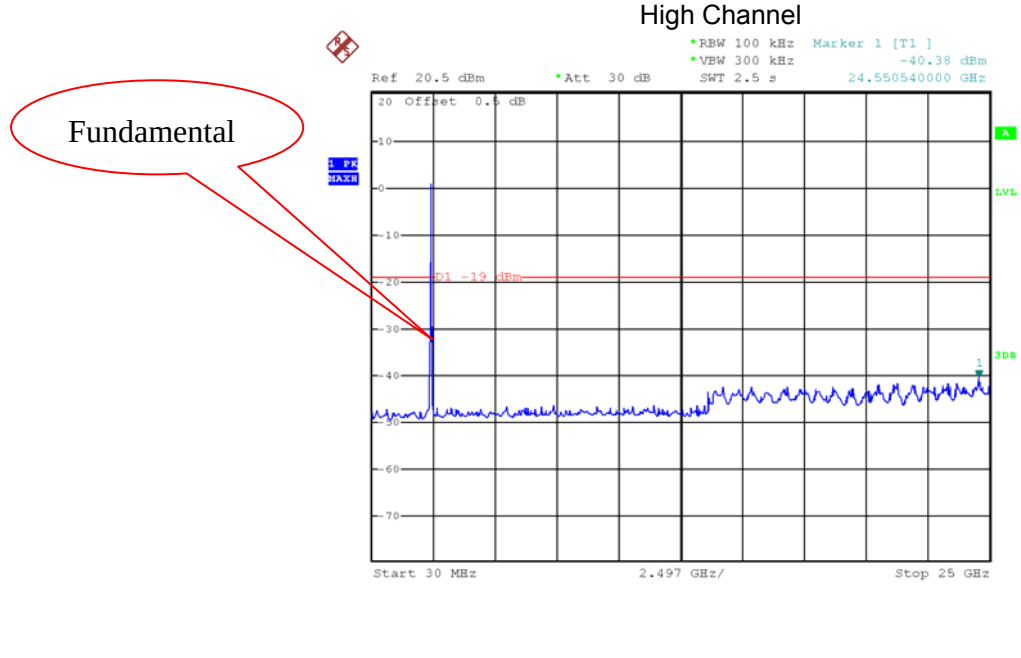


Date: 10.JUN.2020 00:37:59

Middle Channel



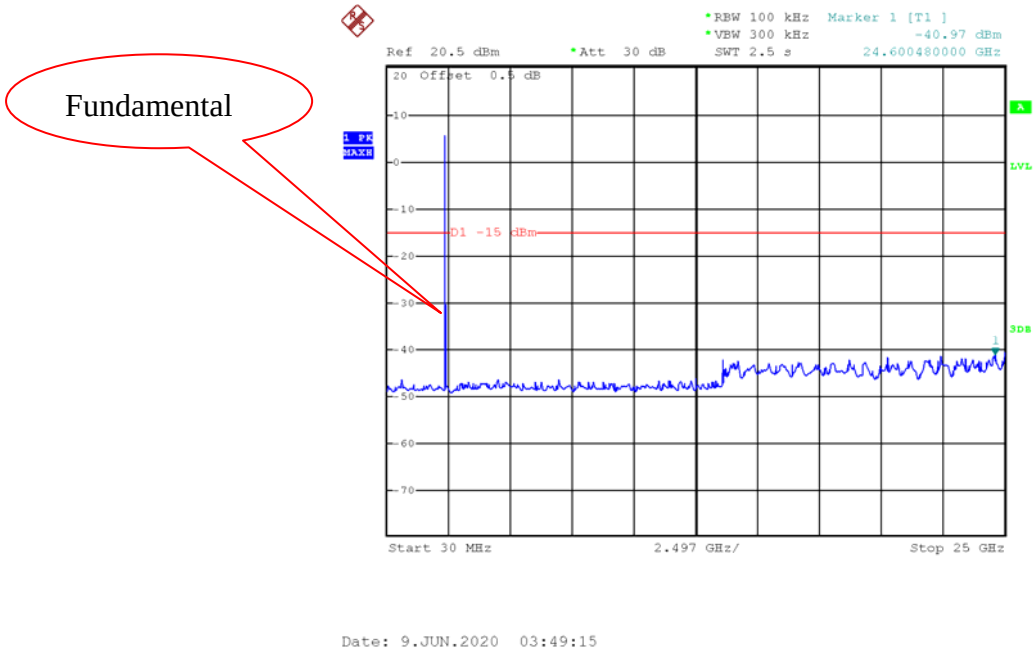
High Channel



ANT 2

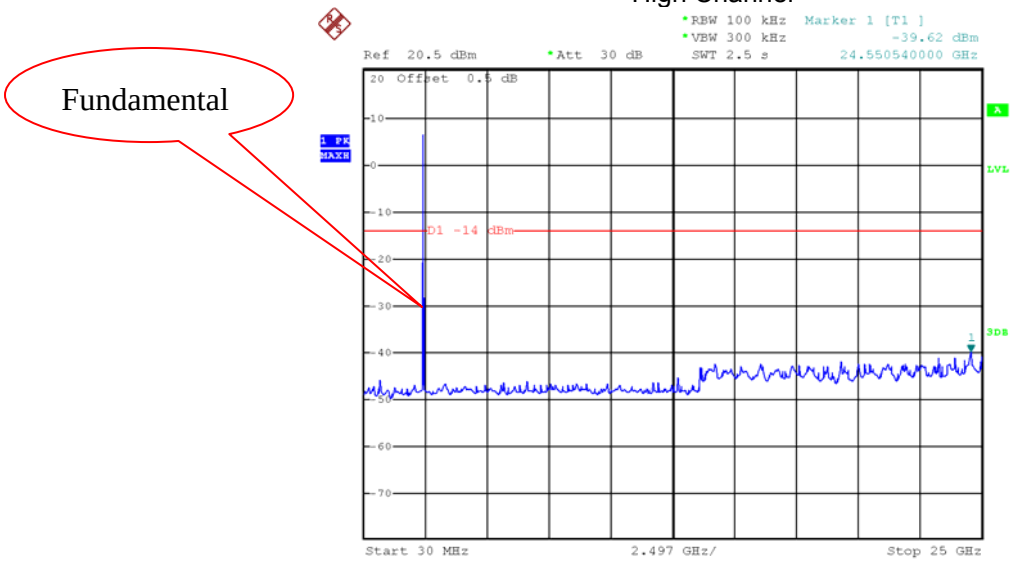
802.11b

Low Channel



Middle Channel

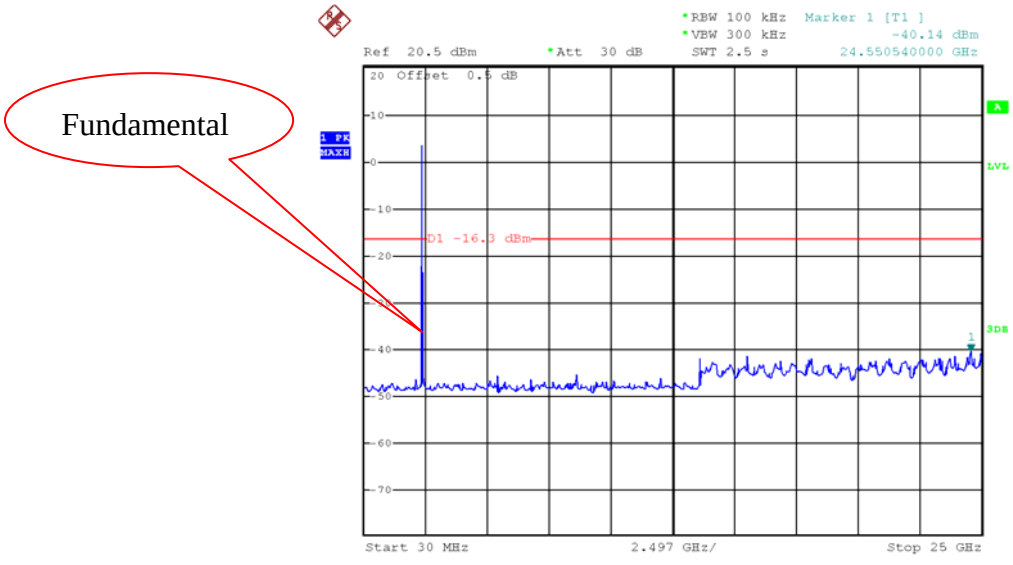
High Channel



Date: 9.JUN.2020 04:03:11

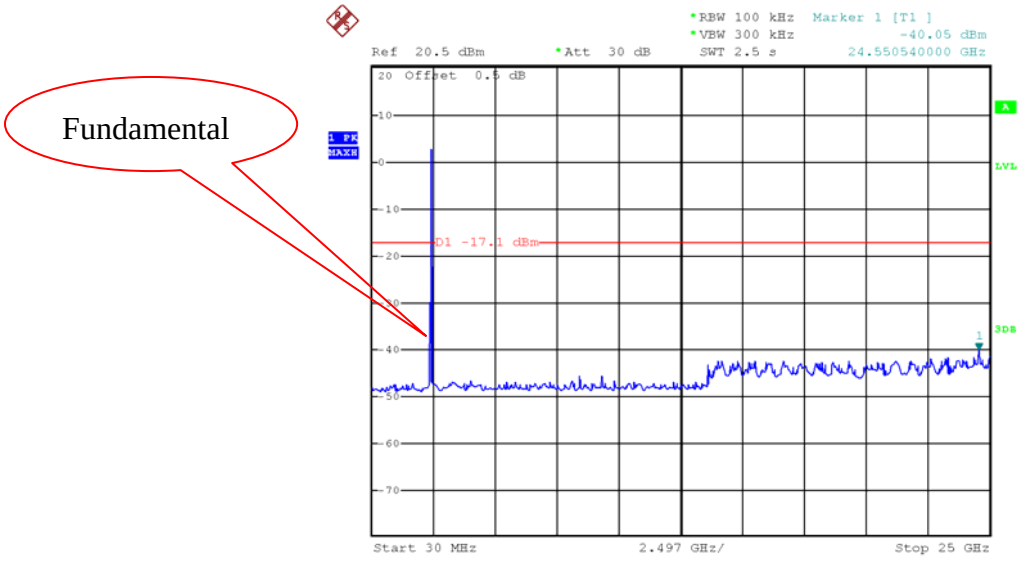
802.11g

Low Channel



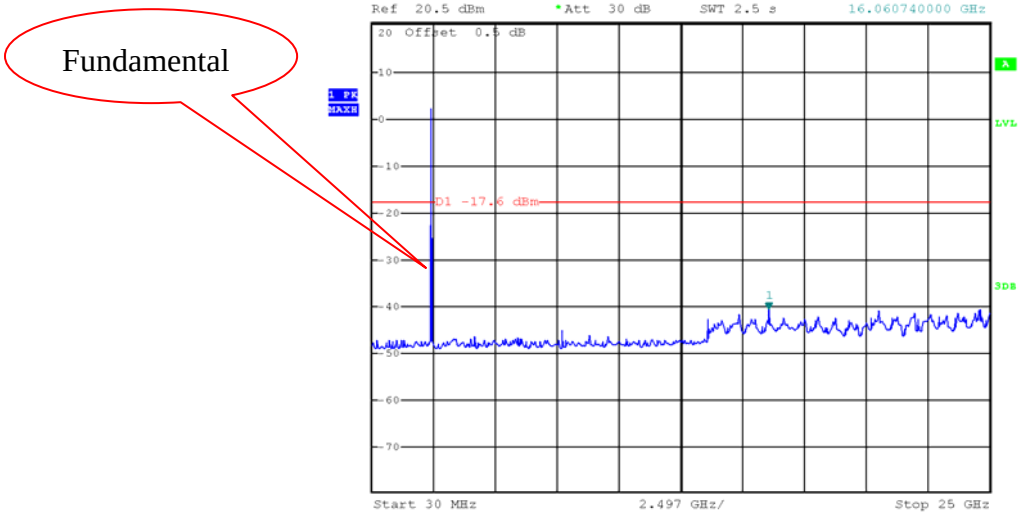
Date: 9.JUN.2020 20:14:30

Middle Channel



Date: 9.JUN.2020 20:18:43

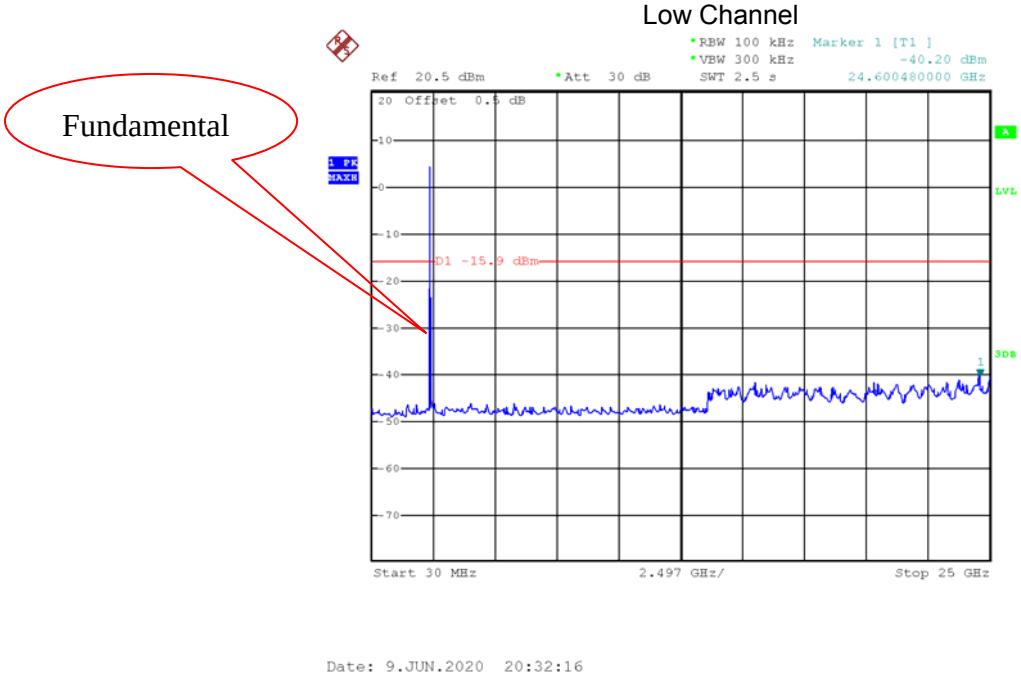
High Channel



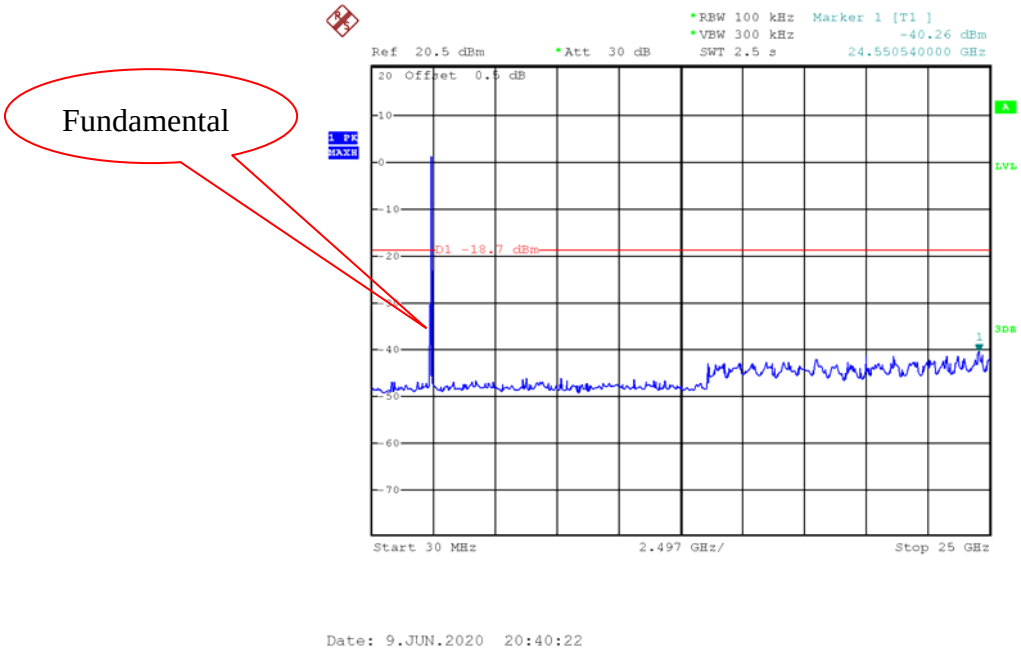
Date: 9.JUN.2020 20:23:48

802.11n HT20

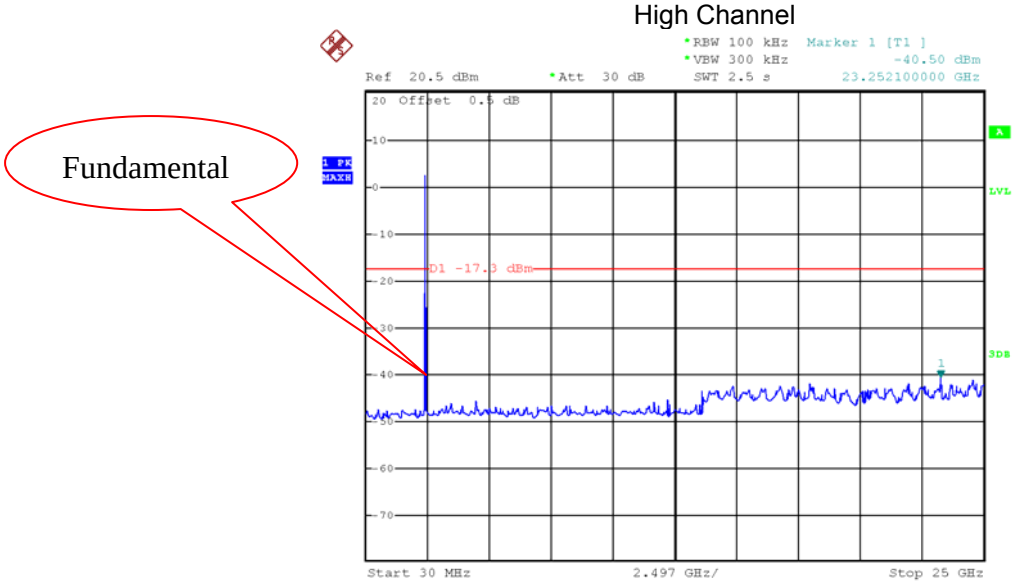
Low Channel



Middle Channel



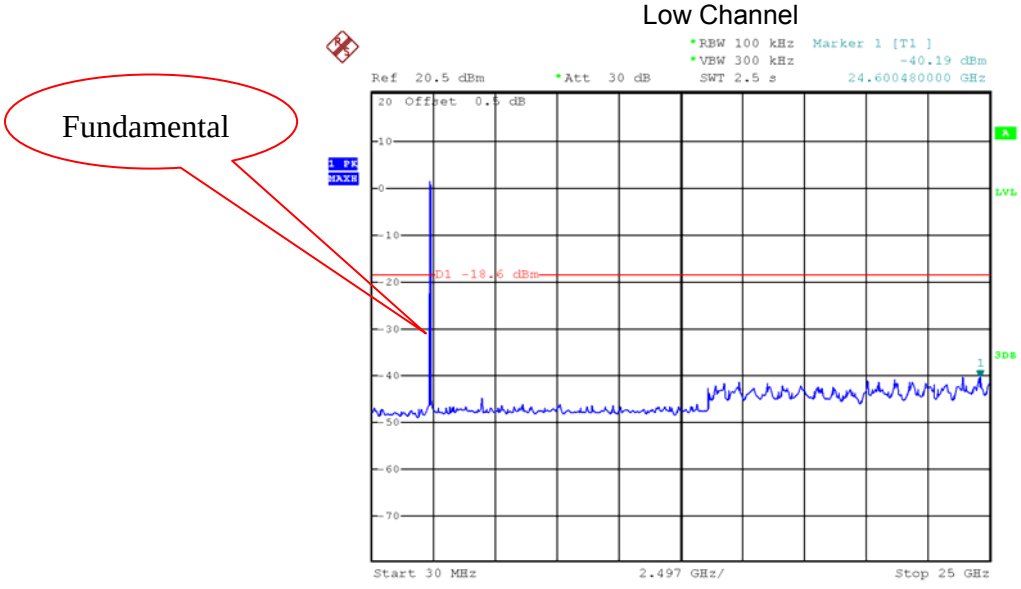
High Channel



Date: 9.JUN.2020 20:59:32

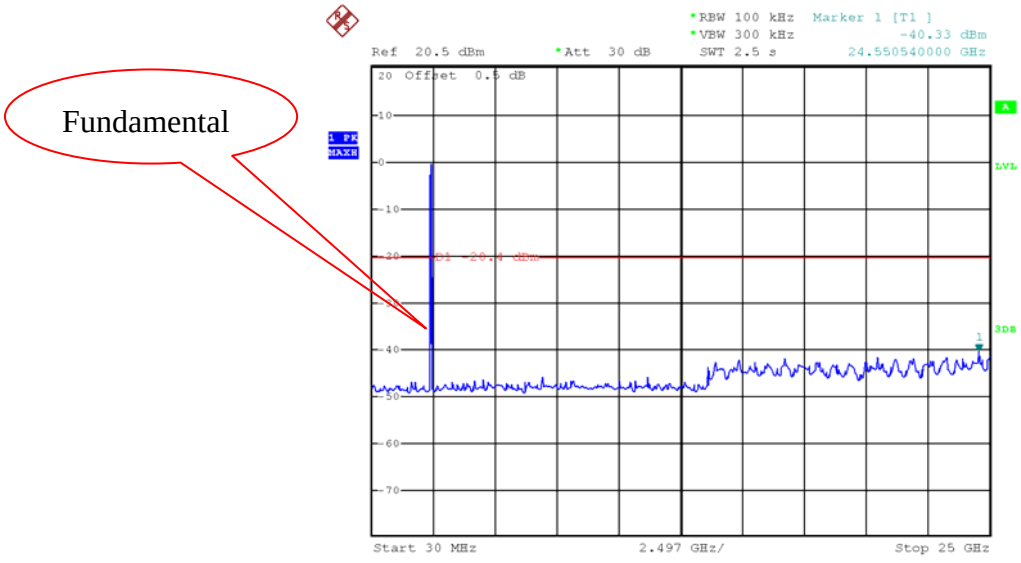
802.11n HT40

Low Channel

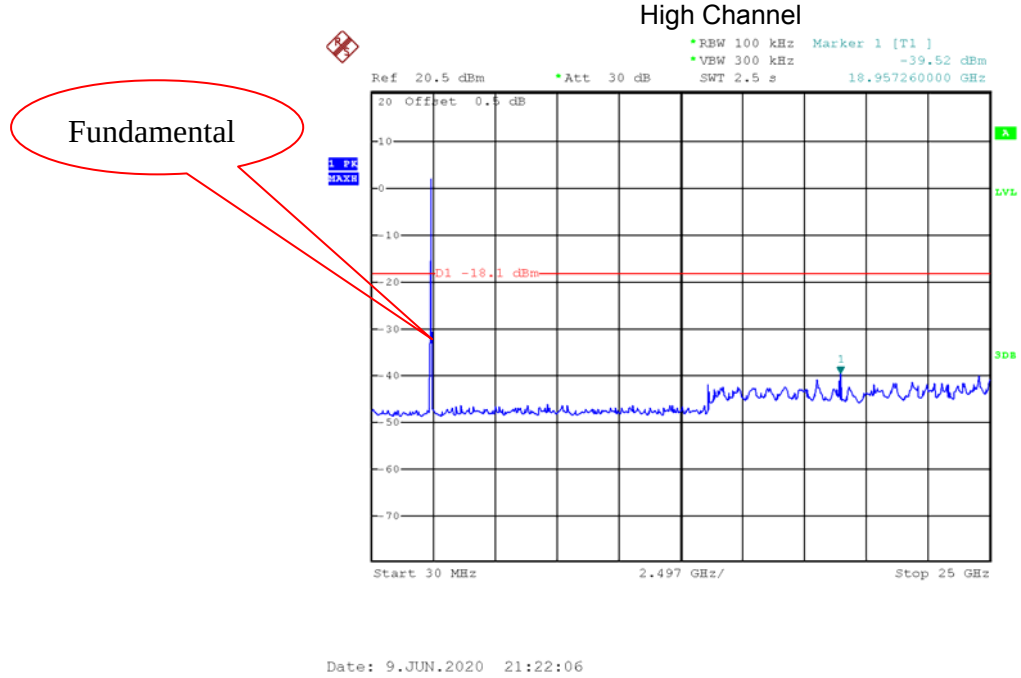


Date: 9.JUN.2020 21:09:12

Middle Channel



High Channel



10 Band Edge Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

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

Test Mode: Transmitting

10.1 Test Produce

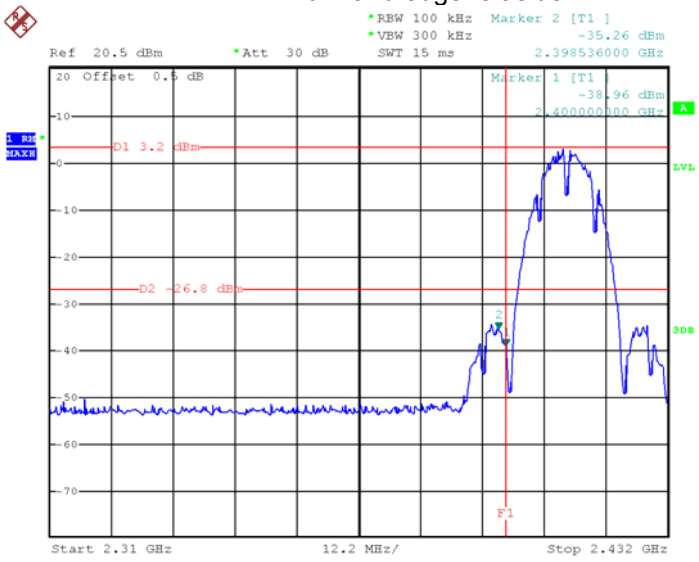
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then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

10.2 Test Result

Test result plots shown as follows:

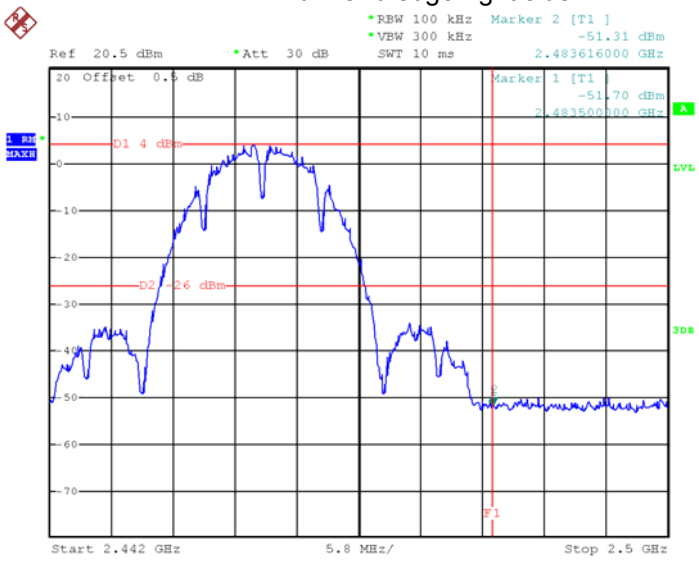
ANT 1

TX 11b: Band edge-left side



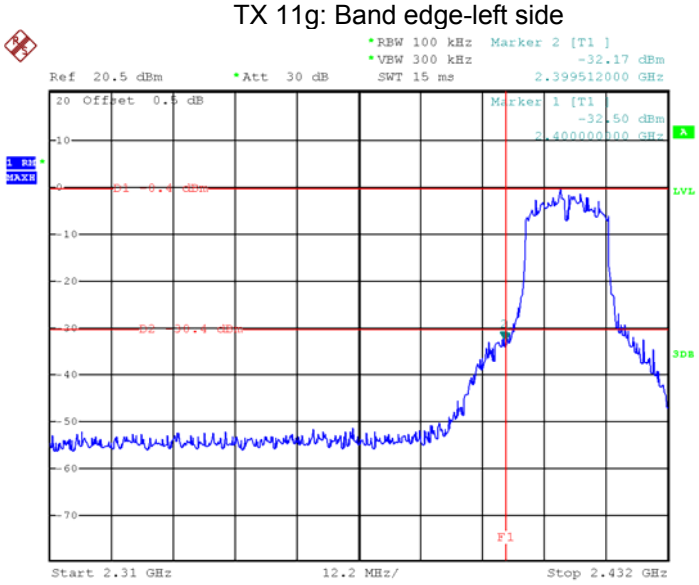
Date: 9.JUN.2020 21:48:25

TX 11b: Band edge-right side



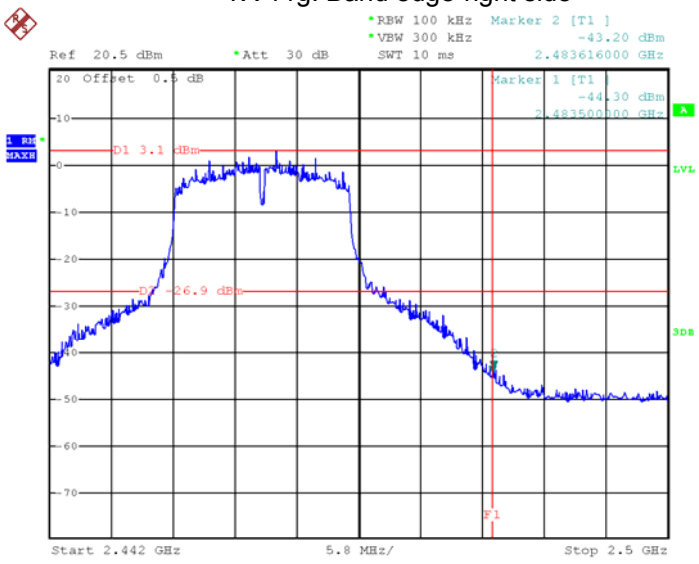
Date: 9.JUN.2020 21:59:47

TX 11g: Band edge-left side



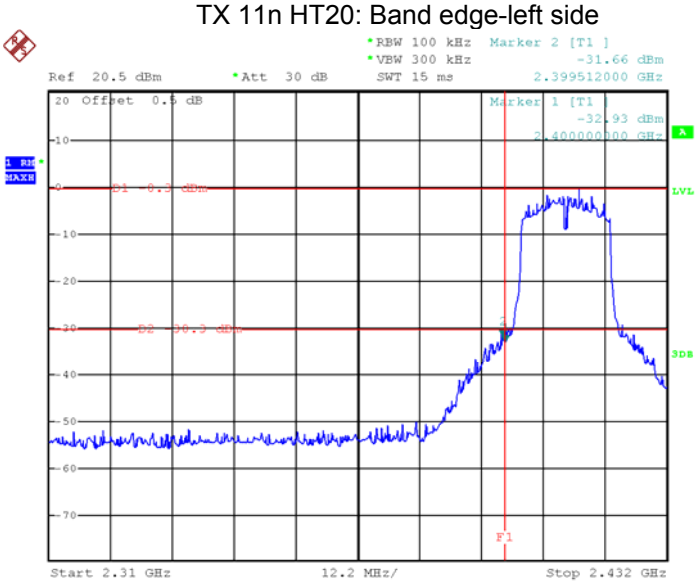
Date: 9.JUN.2020 22:09:00

TX 11g: Band edge-right side



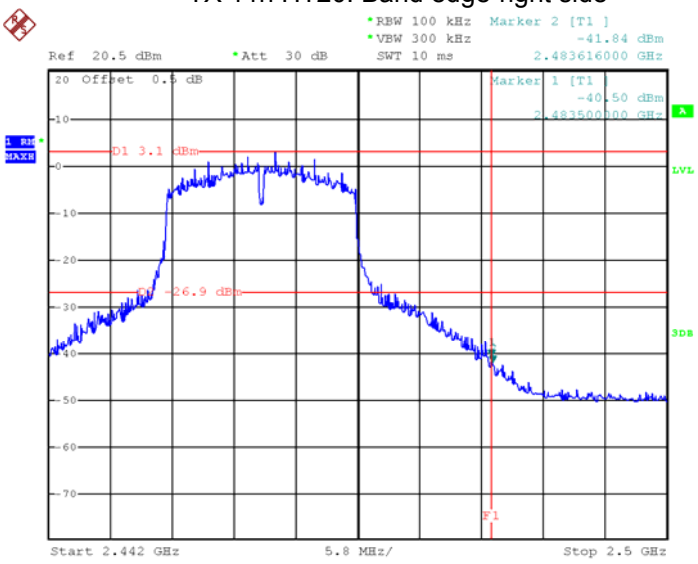
Date: 9.JUN.2020 22:22:39

TX 11n HT20: Band edge-left side



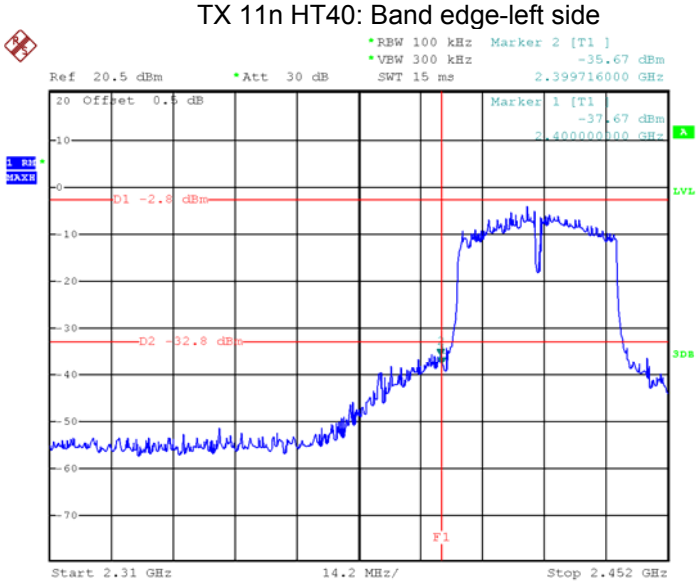
Date: 9.JUN.2020 22:40:18

TX 11n HT20: Band edge-right side



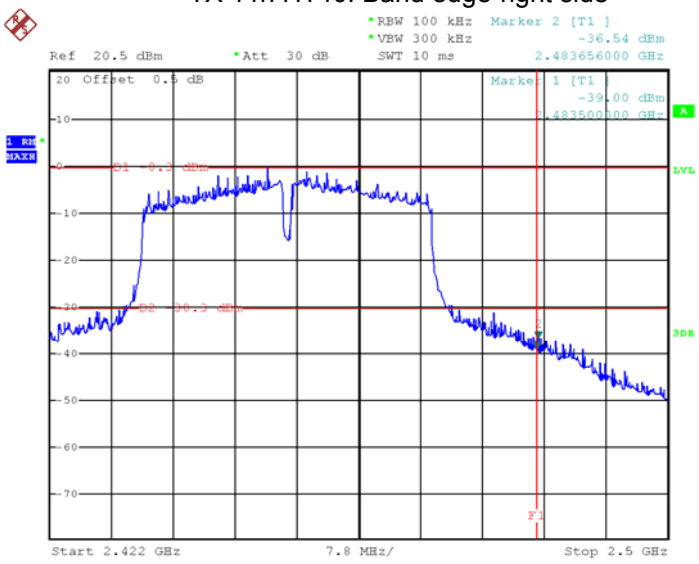
Date: 9.JUN.2020 22:51:26

TX 11n HT40: Band edge-left side



Date: 10.JUN.2020 00:40:25

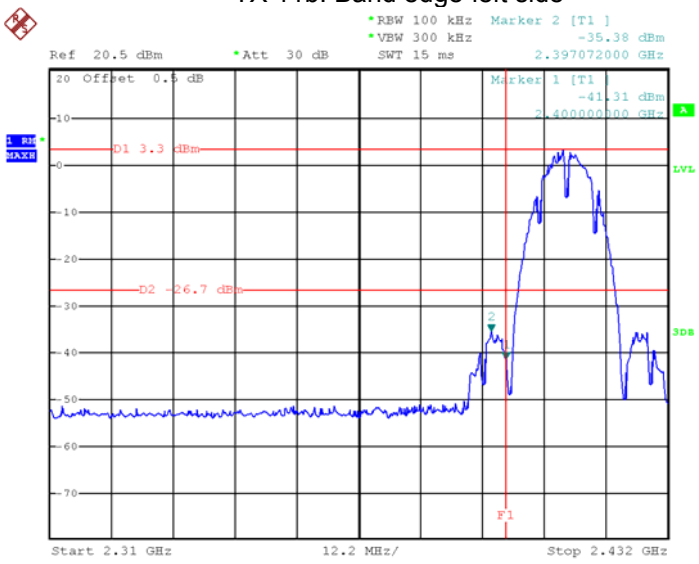
TX 11n HT40: Band edge-right side



Date: 10.JUN.2020 00:50:48

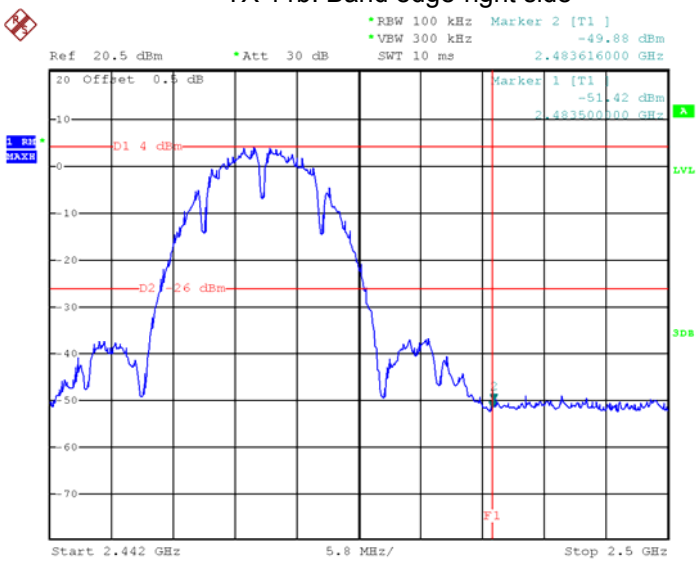
ANT 2

TX 11b: Band edge-left side



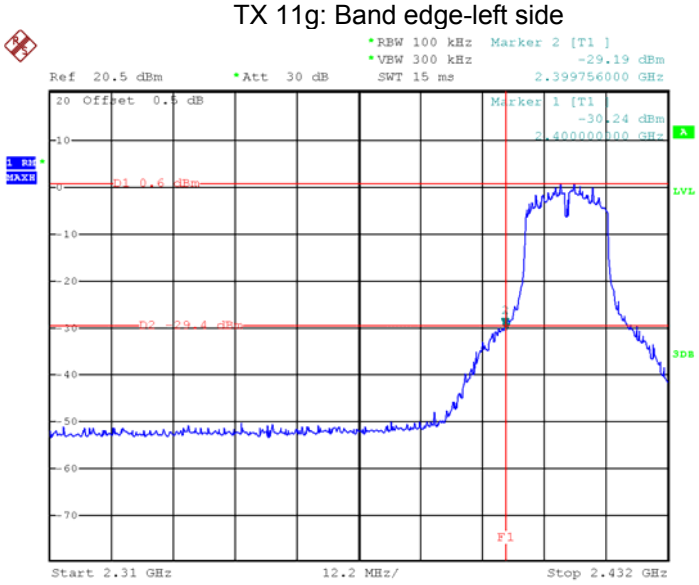
Date: 9.JUN.2020 03:51:03

TX 11b: Band edge-right side



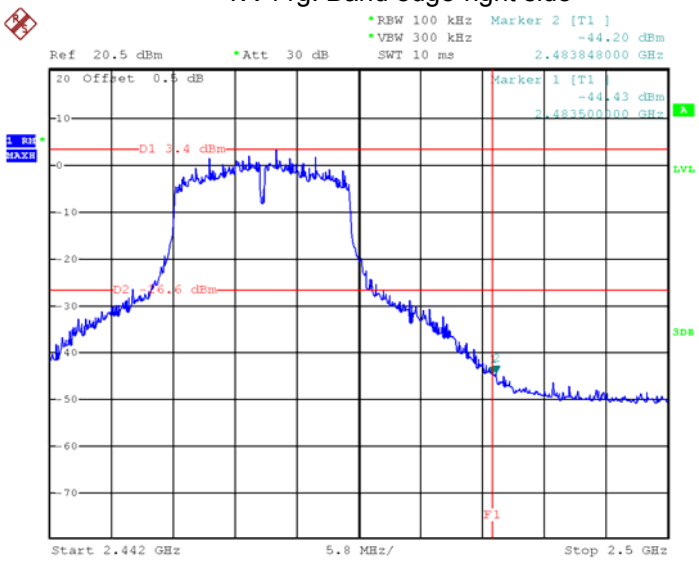
Date: 9.JUN.2020 04:05:08

TX 11g: Band edge-left side



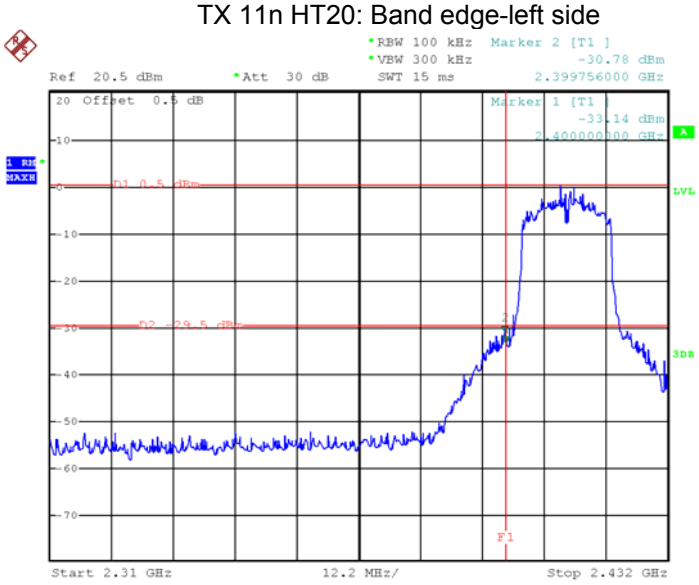
Date: 9.JUN.2020 20:13:33

TX 11g: Band edge-right side



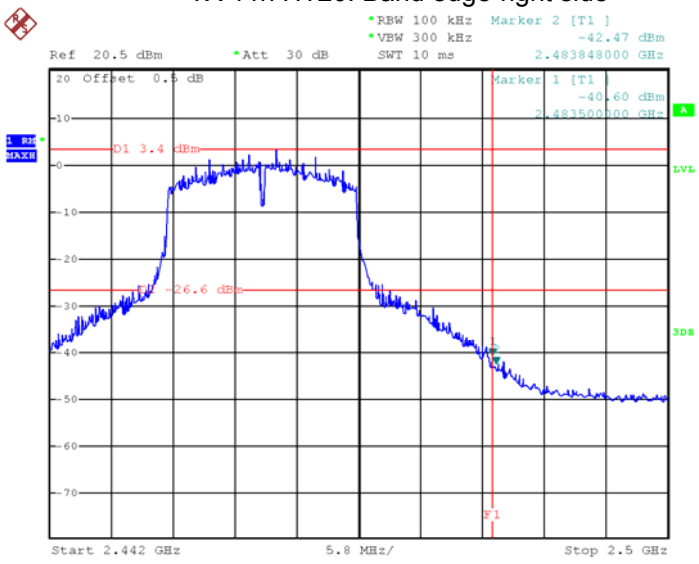
Date: 9.JUN.2020 20:26:03

TX 11n HT20: Band edge-left side



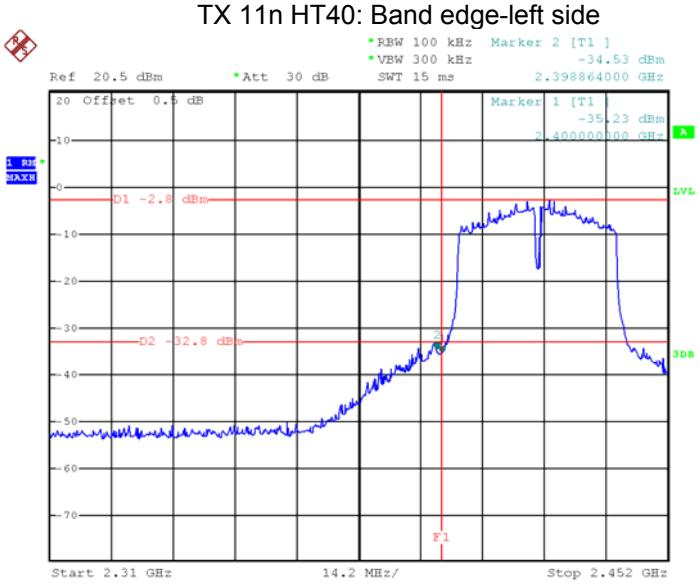
Date: 9.JUN.2020 20:35:31

TX 11n HT20: Band edge-right side



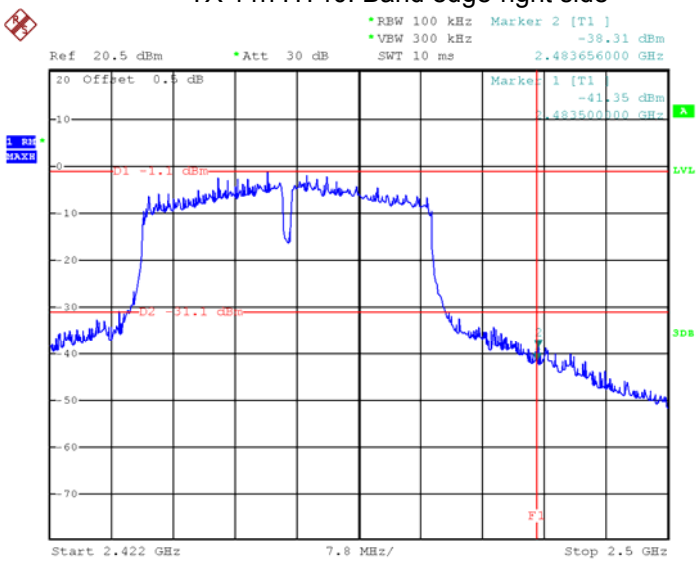
Date: 9.JUN.2020 20:43:56

TX 11n HT40: Band edge-left side



Date: 9.JUN.2020 21:11:14

TX 11n HT40: Band edge-right side



Date: 9.JUN.2020 21:24:21

11 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

11.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2. Set the spectrum analyzer:

6dB bandwidth:

RBW = 100kHz, VBW = 300kHz

99% bandwidth:

RBW = 1~5% OBW, VBW ≥ 3OBW

11.2 Test Result:

ANT 1

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.080	14.640
	Channel 6	10.120	14.640
	Channel 11	10.080	14.520
TX 11g	Channel 1	15.150	16.950
	Channel 6	15.150	16.950
	Channel 11	15.200	16.950
TX 11n HT20	Channel 1	15.174	17.820
	Channel 6	15.174	17.820
	Channel 11	15.174	17.820
TX 11n HT40	Channel 3	35.200	36.300
	Channel 6	35.200	36.300
	Channel 9	35.200	36.300

ANT 2

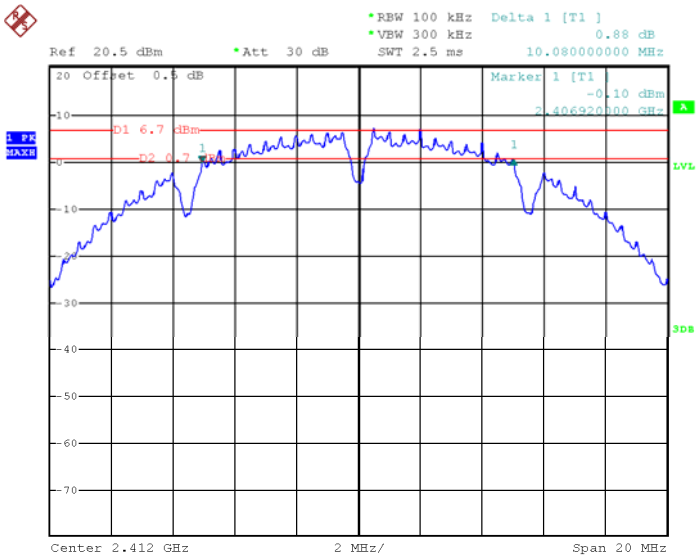
Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.080	14.480
	Channel 6	10.080	14.400
	Channel 11	10.080	14.400
TX 11g	Channel 1	15.200	16.950
	Channel 6	15.150	16.900
	Channel 11	15.200	16.900
TX 11n HT20	Channel 1	15.174	17.820
	Channel 6	15.174	17.766
	Channel 11	15.174	17.766
TX 11n HT40	Channel 3	35.200	36.300
	Channel 6	35.200	36.300
	Channel 9	35.200	36.190

Test result plot:

ANT 1

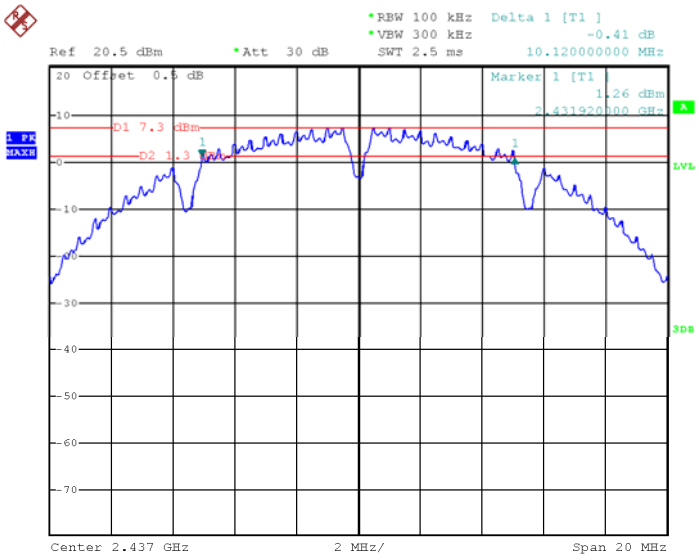
6dB Bandwidth

Mode: TX 11b channel 1



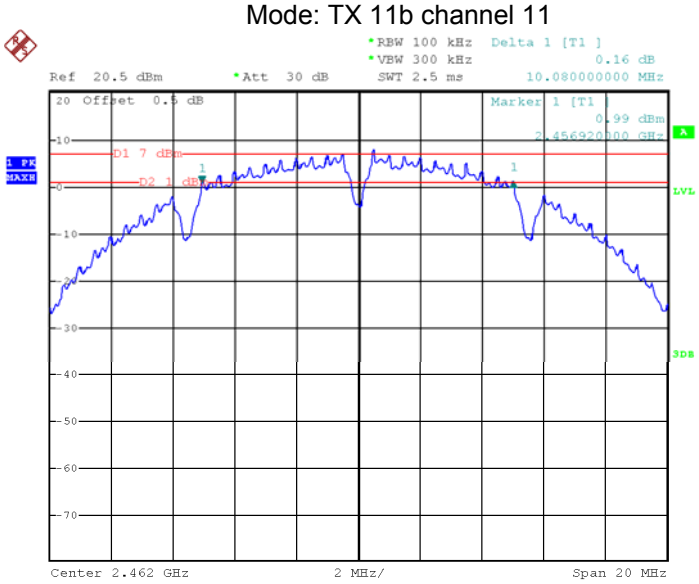
Date: 9.JUN.2020 21:45:13

Mode: TX 11b channel 6



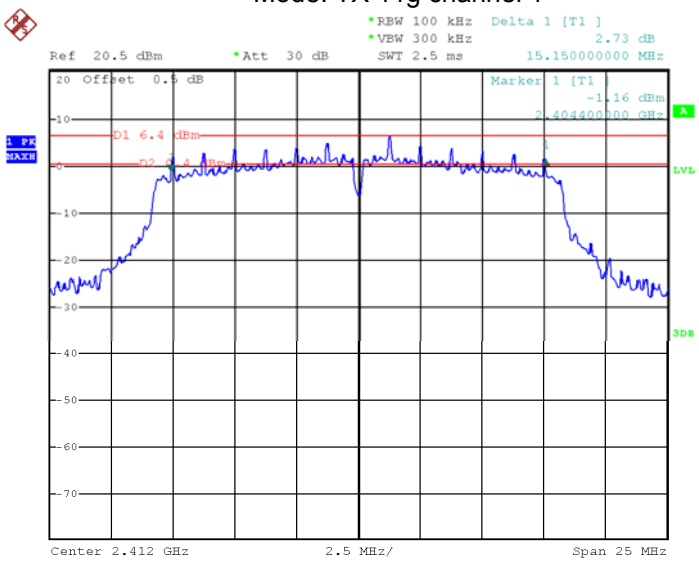
Date: 9.JUN.2020 21:50:23

Mode: TX 11b channel 11



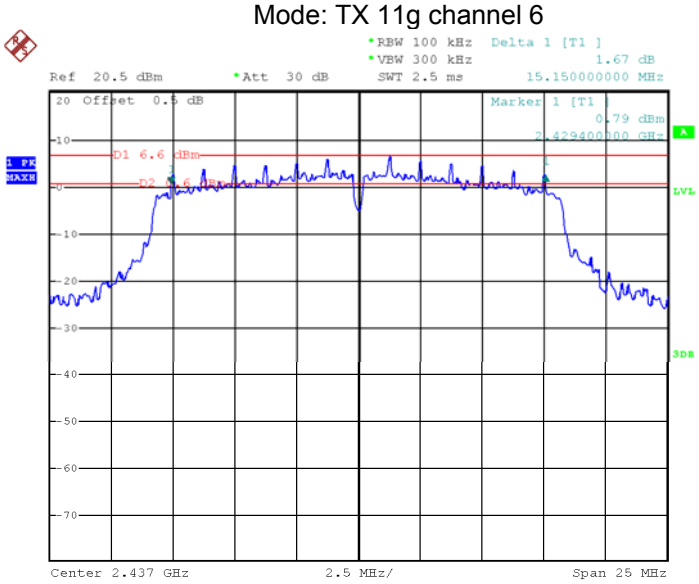
Date: 9.JUN.2020 21:56:26

Mode: TX 11g channel 1



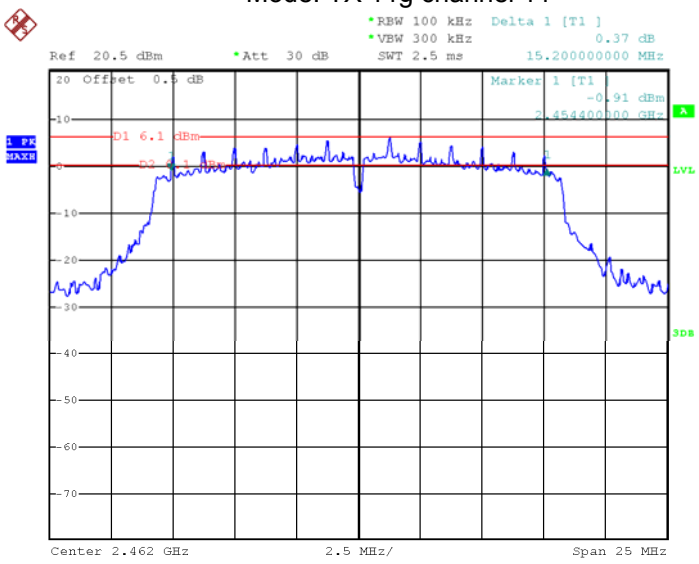
Date: 9.JUN.2020 22:03:57

Mode: TX 11g channel 6



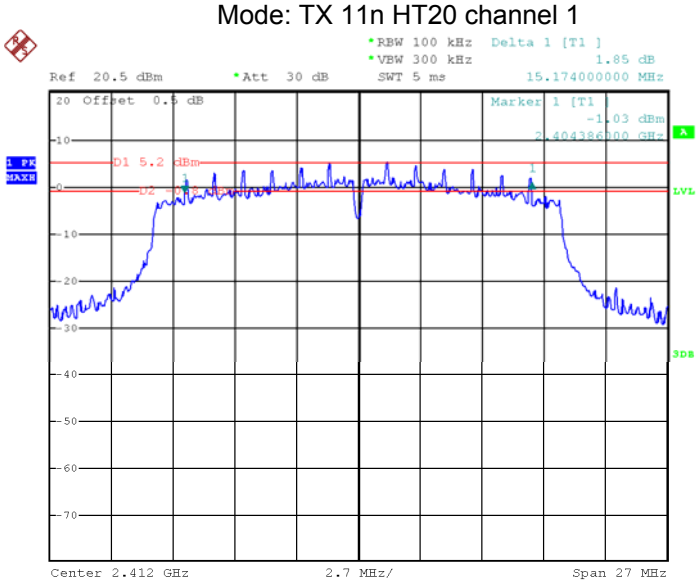
Date: 9.JUN.2020 22:11:24

Mode: TX 11g channel 11



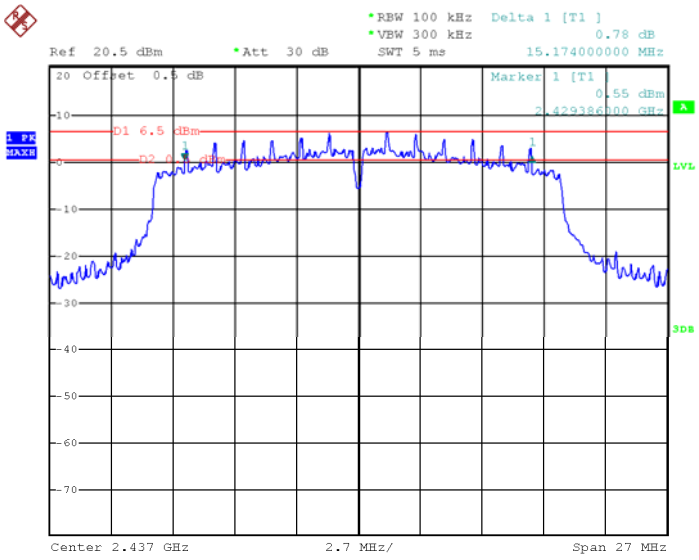
Date: 9.JUN.2020 22:17:29

Mode: TX 11n HT20 channel 1



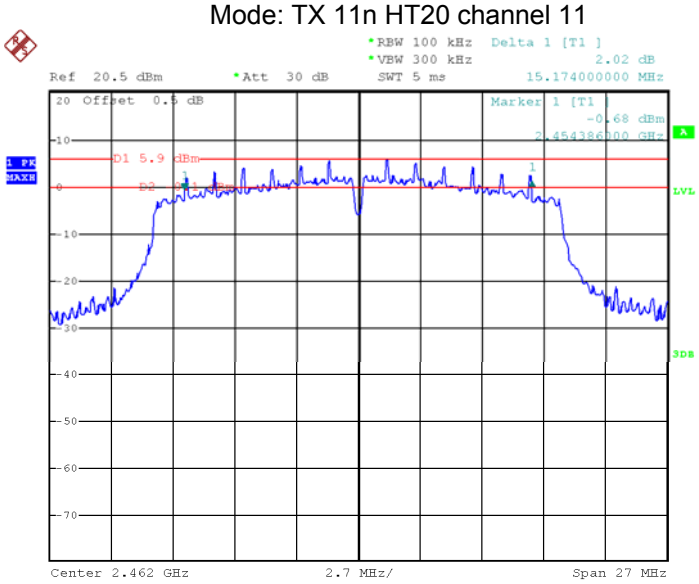
Date: 9.JUN.2020 22:34:45

Mode: TX 11n HT20 channel 6



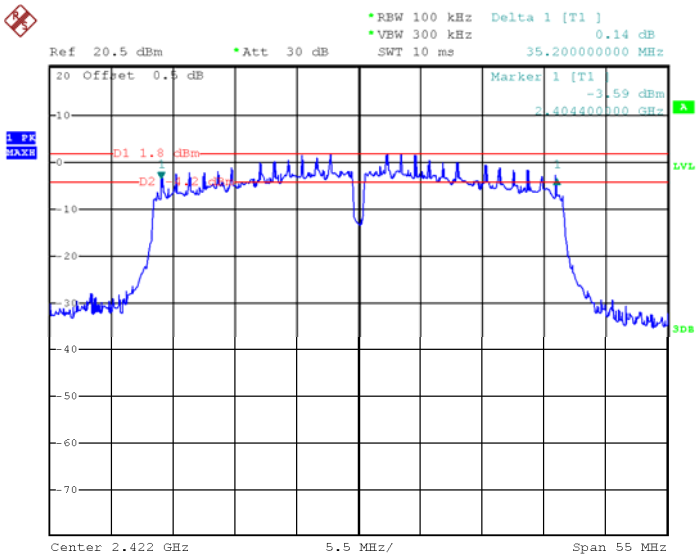
Date: 9.JUN.2020 22:43:00

Mode: TX 11n HT20 channel 11



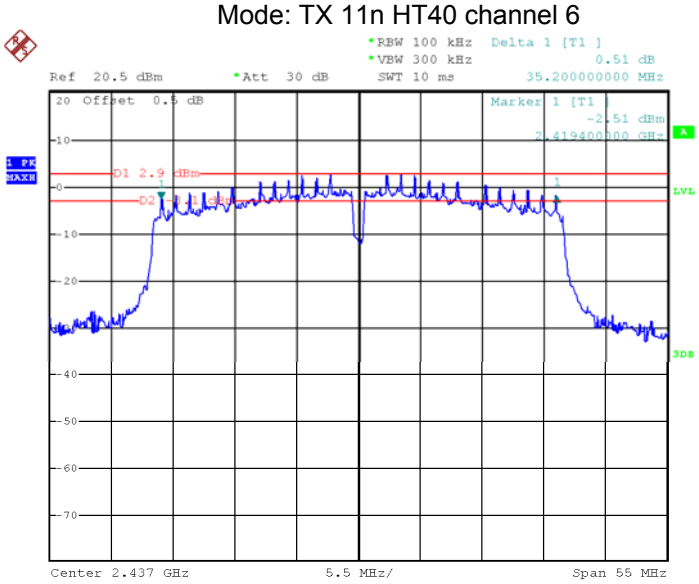
Date: 9.JUN.2020 22:47:47

Mode: TX 11n HT40 channel 3



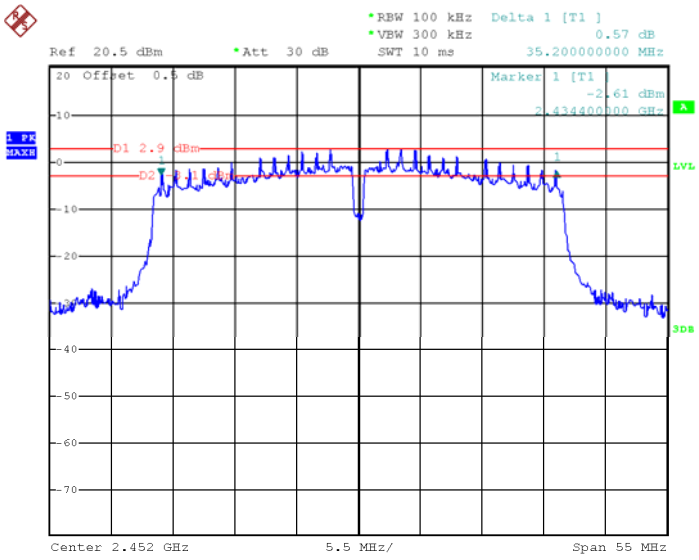
Date: 10.JUN.2020 00:36:35

Mode: TX 11n HT40 channel 6



Date: 10.JUN.2020 00:42:46

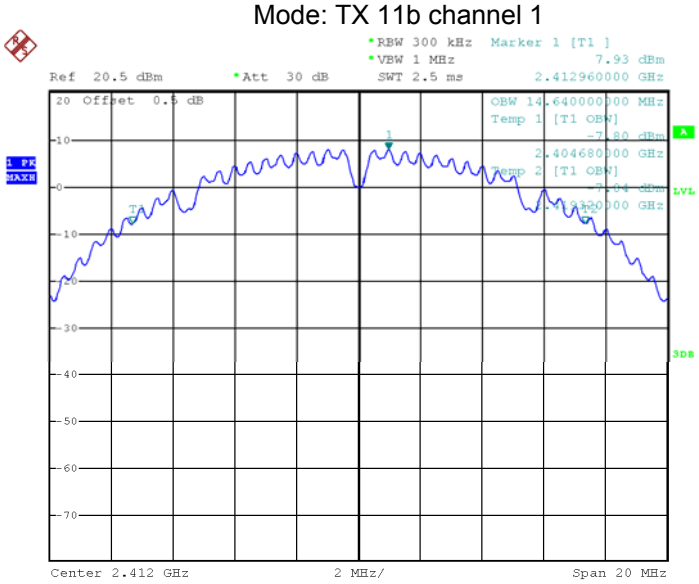
Mode: TX 11n HT40 channel 9



Date: 10.JUN.2020 00:47:36

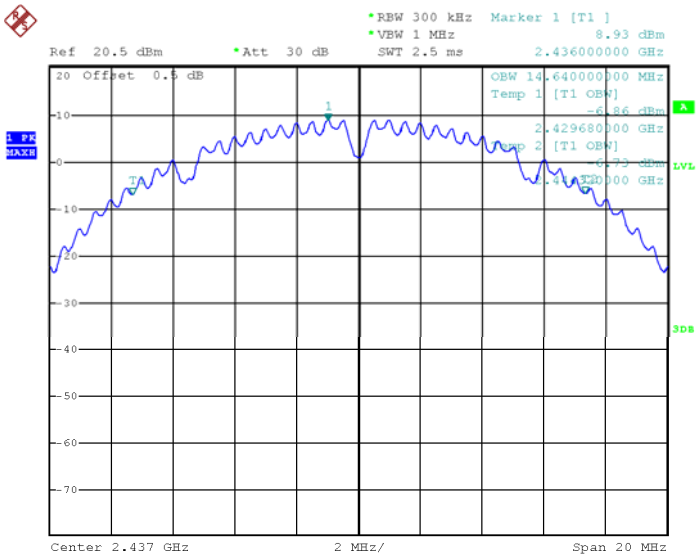
99% Bandwidth

Mode: TX 11b channel 1



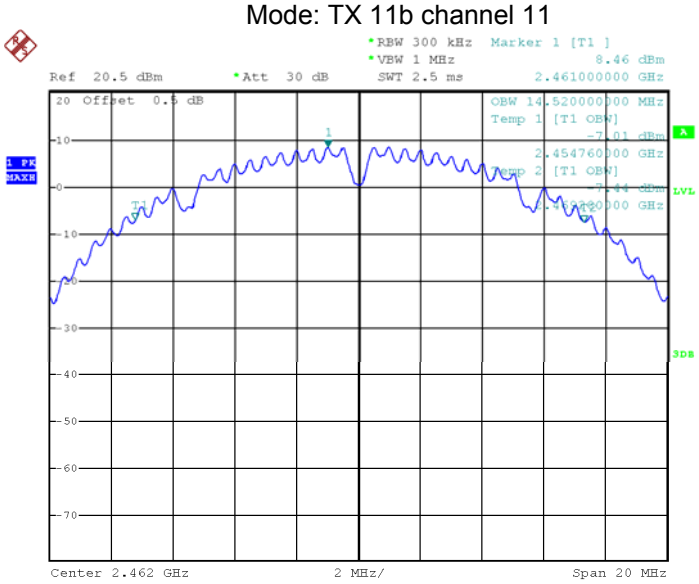
Date: 9.JUN.2020 21:43:36

Mode: TX 11b channel 6



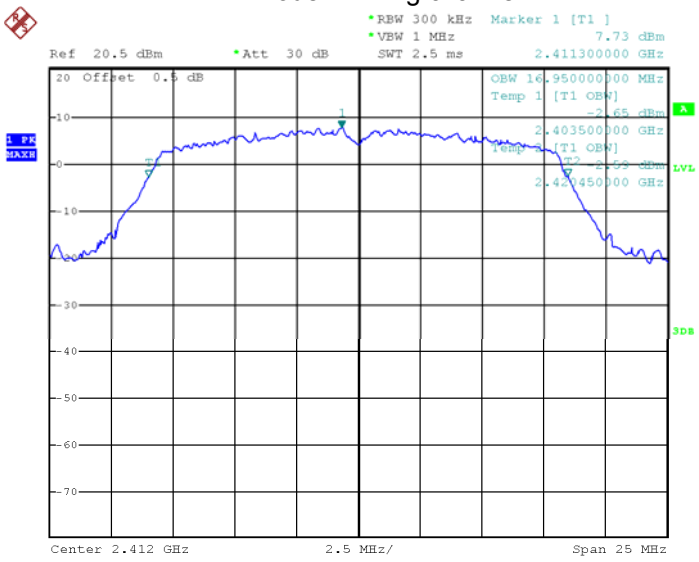
Date: 9.JUN.2020 21:49:33

Mode: TX 11b channel 11



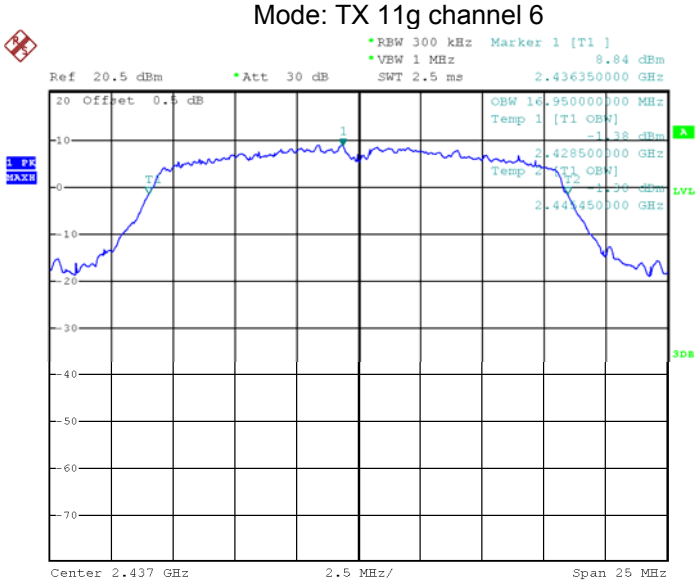
Date: 9.JUN.2020 21:55:33

Mode: TX 11g channel 1



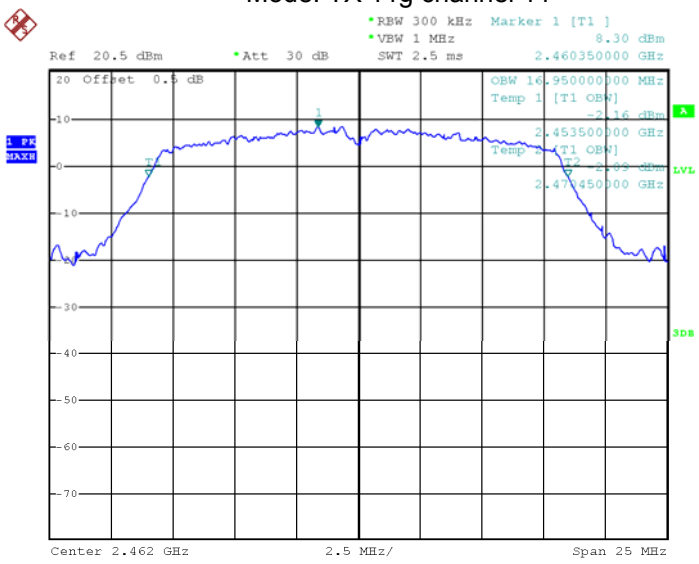
Date: 9.JUN.2020 22:02:48

Mode: TX 11g channel 6



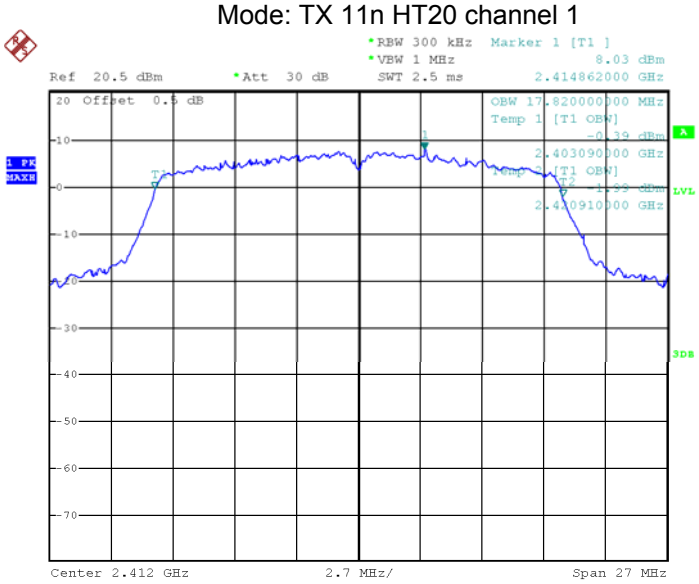
Date: 9.JUN.2020 22:10:24

Mode: TX 11g channel 11



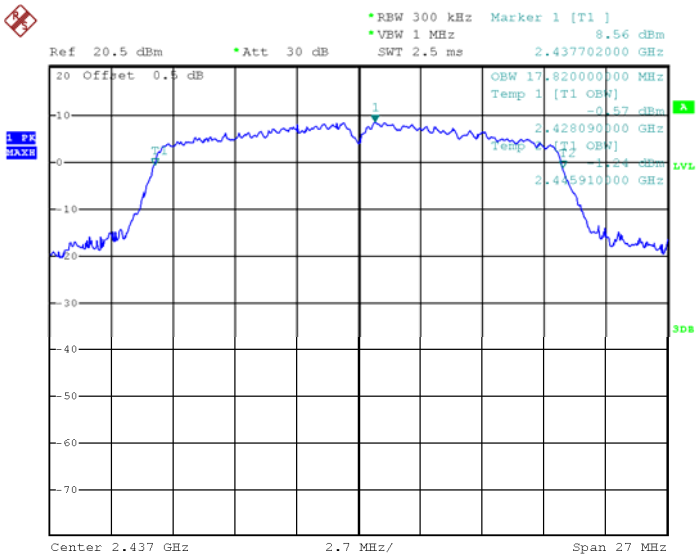
Date: 9.JUN.2020 22:16:27

Mode: TX 11n HT20 channel 1



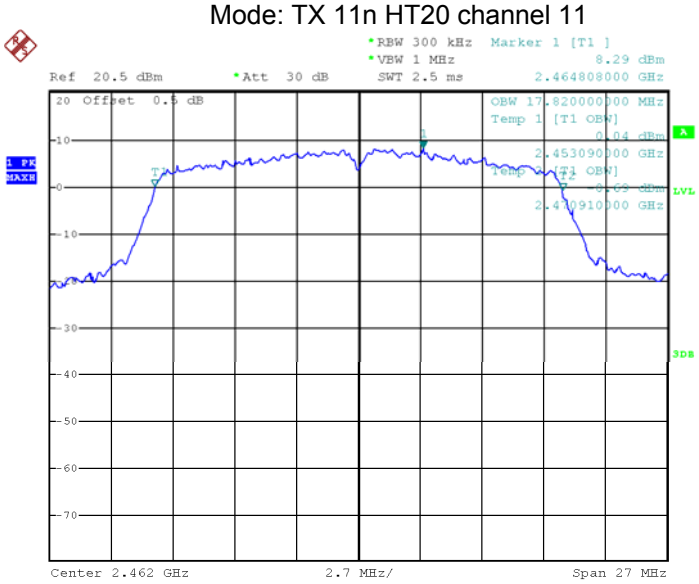
Date: 9.JUN.2020 22:33:28

Mode: TX 11n HT20 channel 6



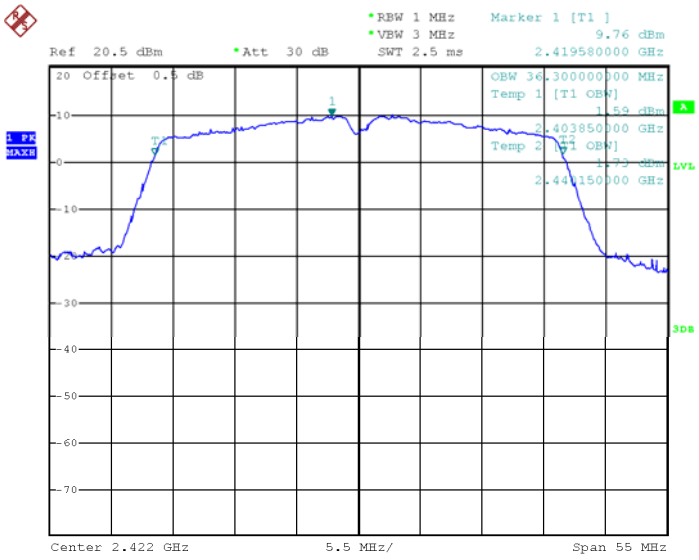
Date: 9.JUN.2020 22:42:06

Mode: TX 11n HT20 channel 11



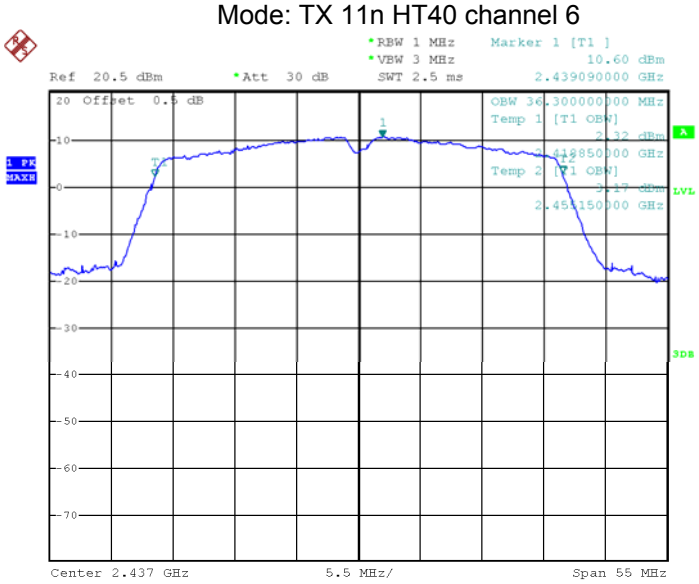
Date: 9.JUN.2020 22:46:50

Mode: TX 11n HT40 channel 3



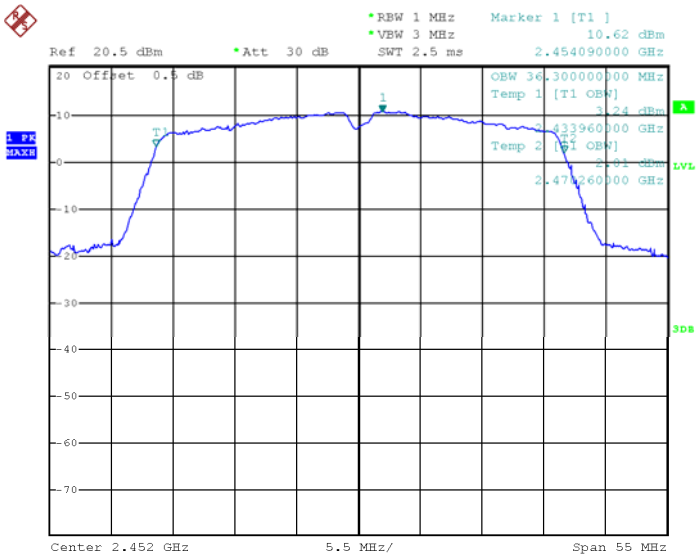
Date: 10.JUN.2020 00:35:35

Mode: TX 11n HT40 channel 6



Date: 10.JUN.2020 00:41:46

Mode: TX 11n HT40 channel 9

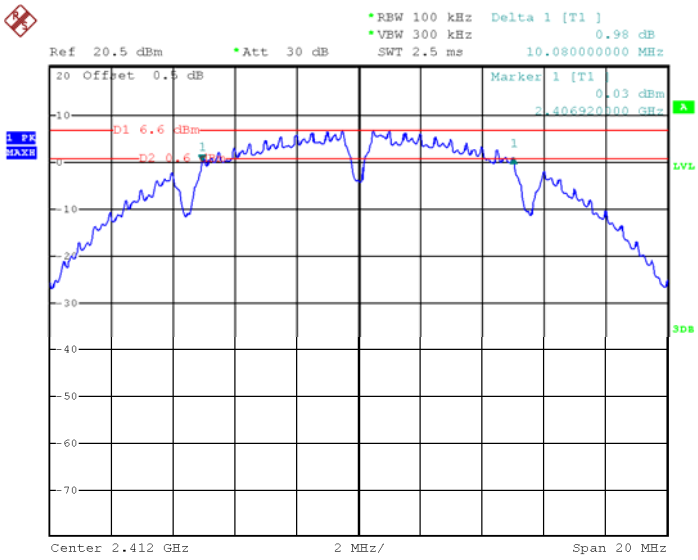


Date: 10.JUN.2020 00:46:45

ANT 2

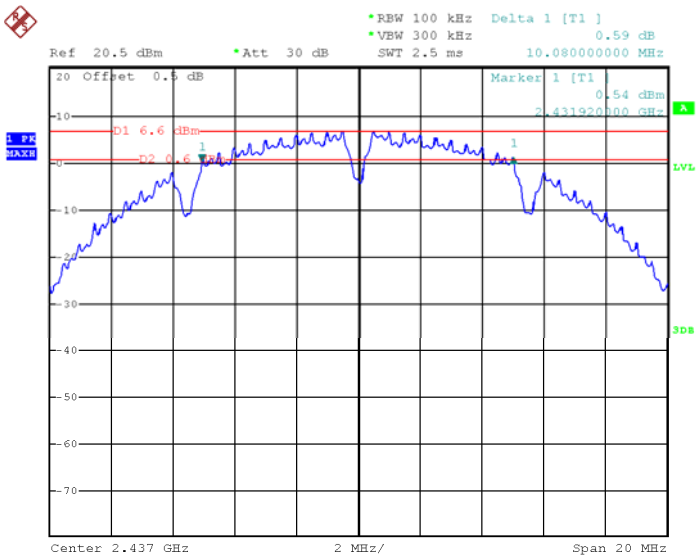
6dB Bandwidth

Mode: TX 11b channel 1



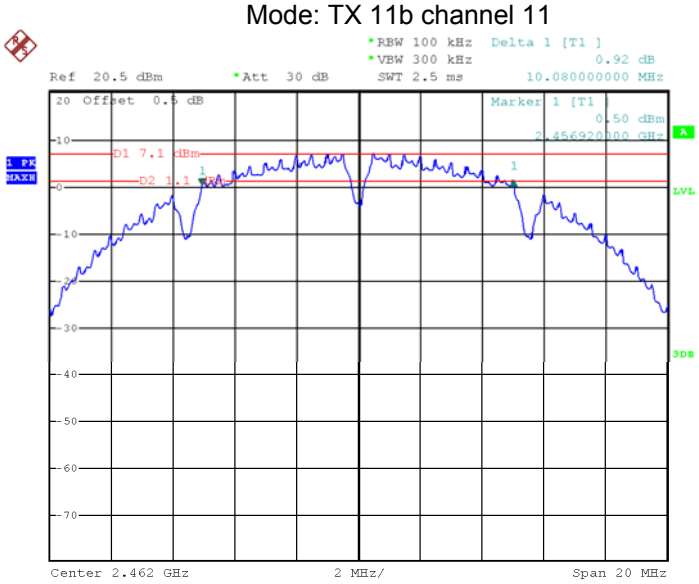
Date: 9.JUN.2020 19:50:51

Mode: TX 11b channel 6



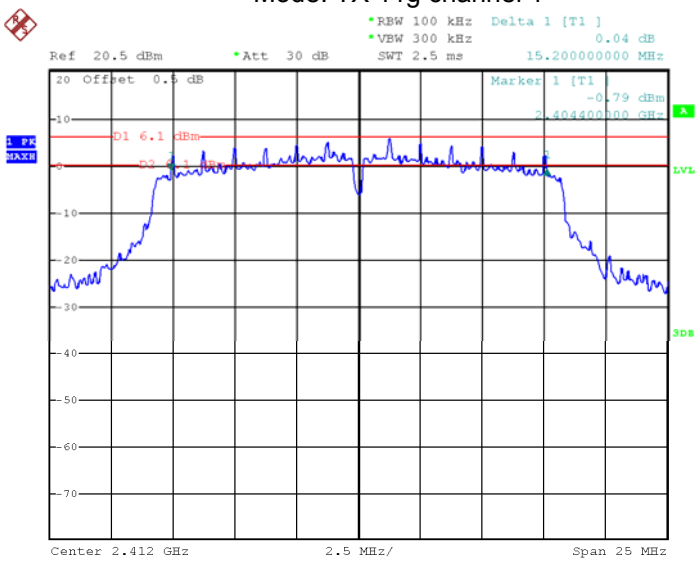
Date: 9.JUN.2020 19:54:54

Mode: TX 11b channel 11



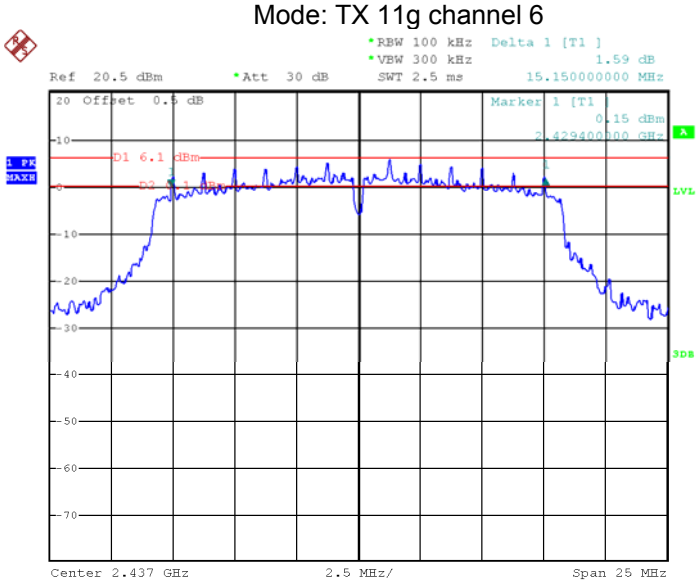
Date: 9.JUN.2020 19:57:49

Mode: TX 11g channel 1



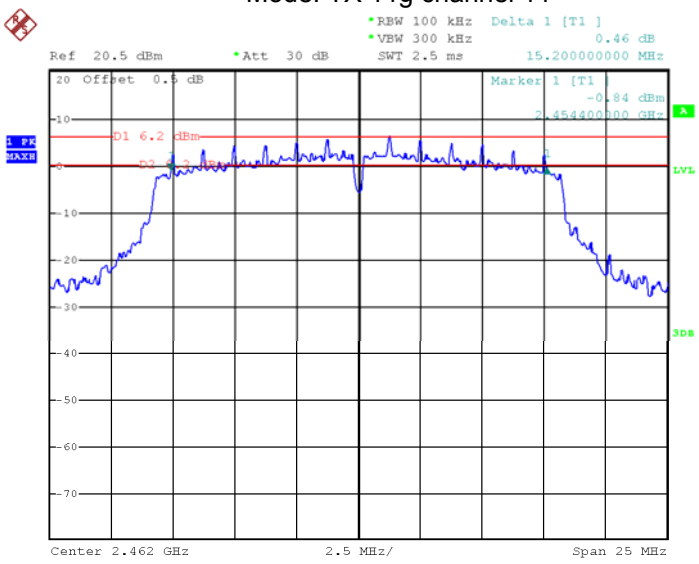
Date: 9.JUN.2020 20:11:08

Mode: TX 11g channel 6



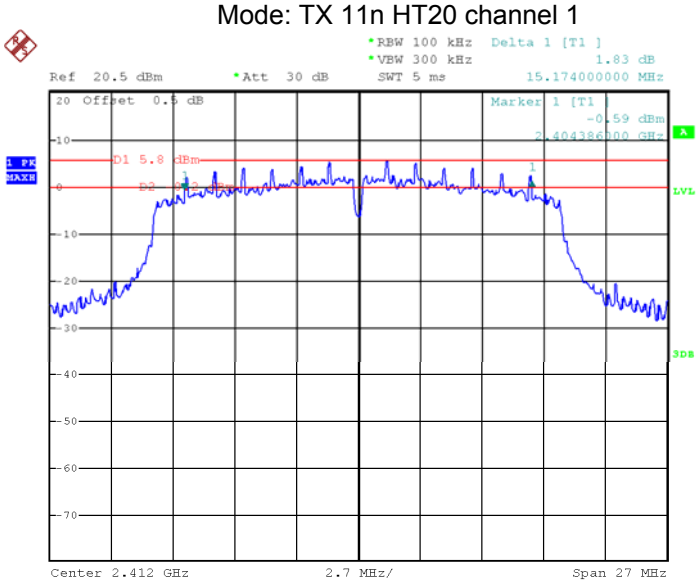
Date: 9.JUN.2020 20:17:19

Mode: TX 11g channel 11



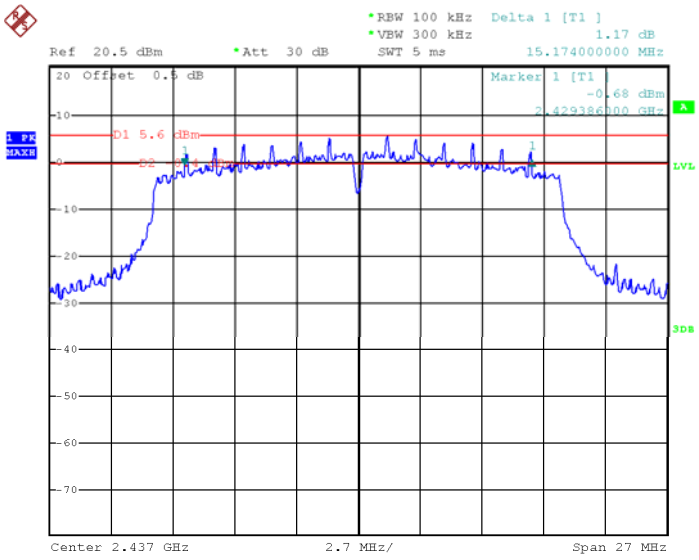
Date: 9.JUN.2020 20:22:12

Mode: TX 11n HT20 channel 1



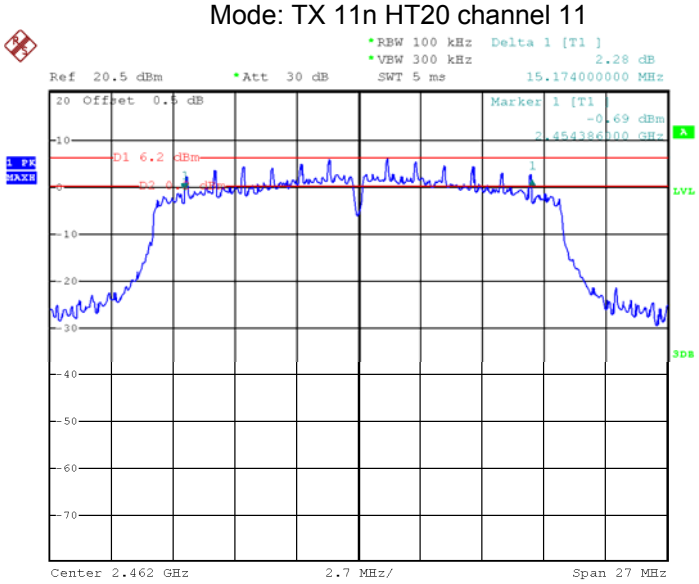
Date: 9.JUN.2020 20:30:18

Mode: TX 11n HT20 channel 6



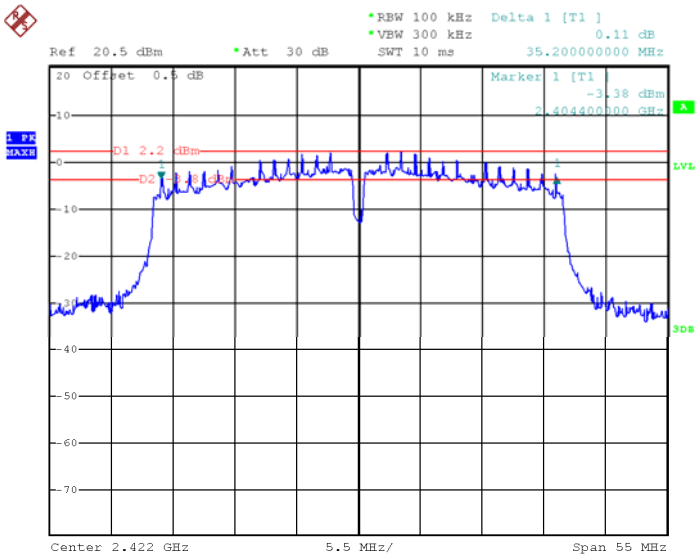
Date: 9.JUN.2020 20:39:02

Mode: TX 11n HT20 channel 11



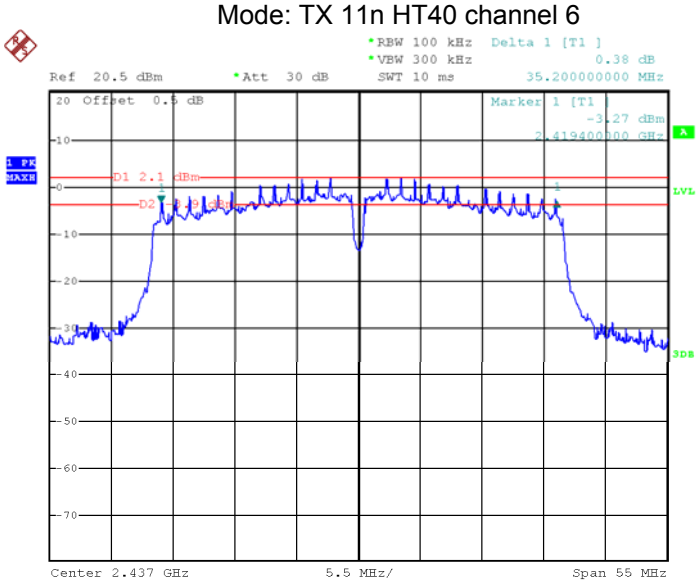
Date: 9.JUN.2020 20:58:17

Mode: TX 11n HT40 channel 3



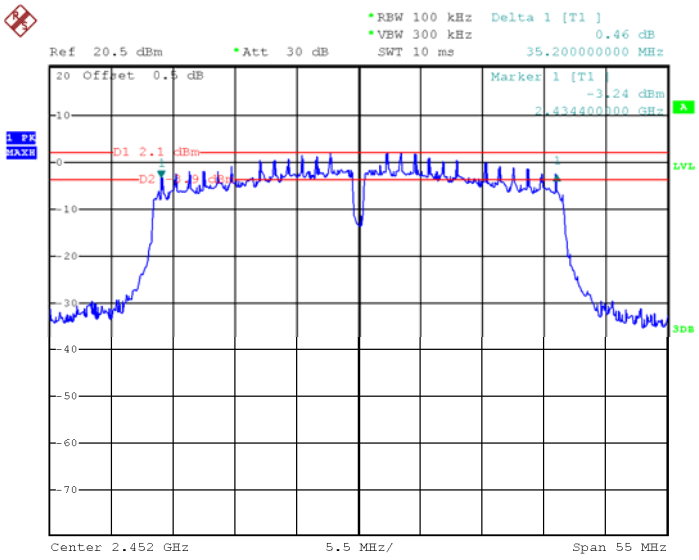
Date: 9.JUN.2020 21:06:18

Mode: TX 11n HT40 channel 6



Date: 9.JUN.2020 21:14:36

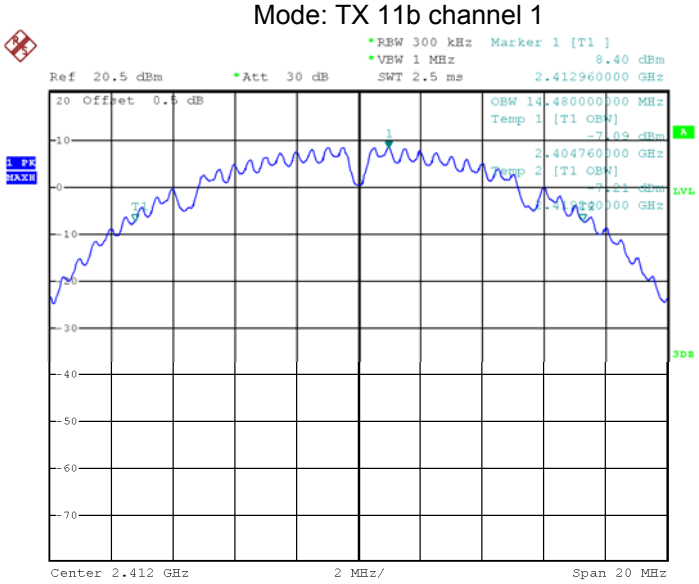
Mode: TX 11n HT40 channel 9



Date: 9.JUN.2020 21:19:47

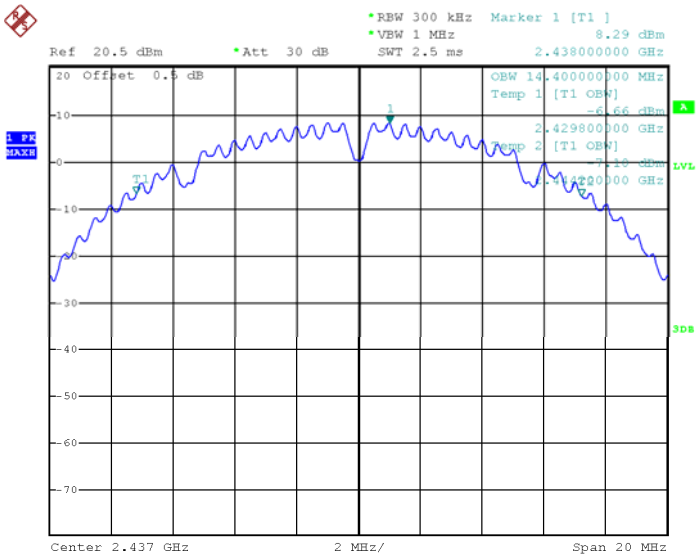
99% Bandwidth

Mode: TX 11b channel 1



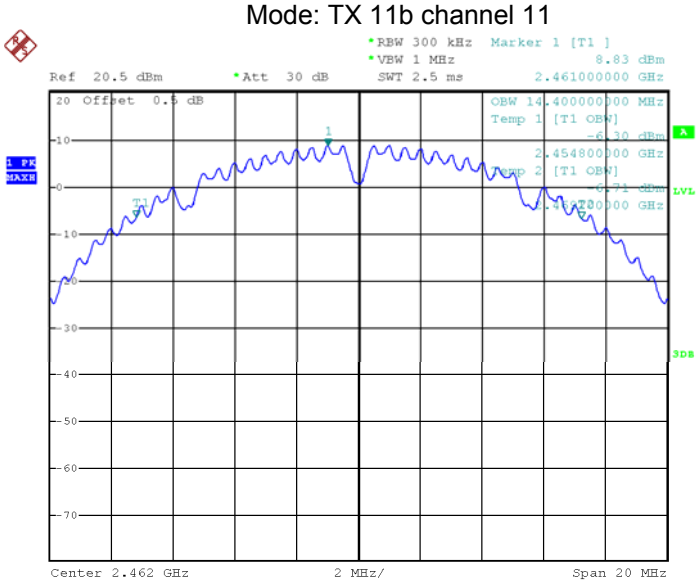
Date: 9.JUN.2020 19:49:59

Mode: TX 11b channel 6



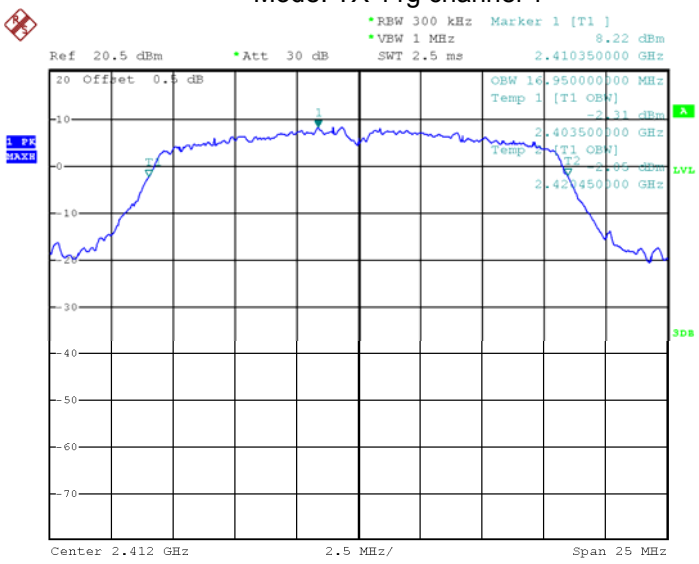
Date: 9.JUN.2020 19:54:10

Mode: TX 11b channel 11



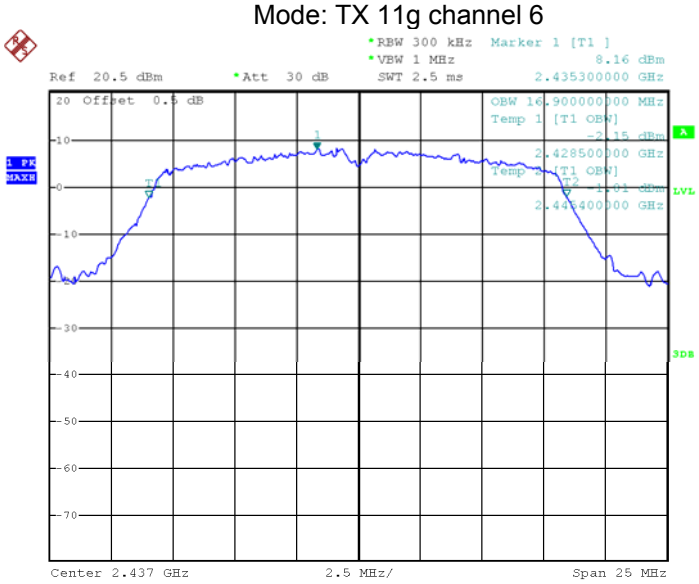
Date: 9.JUN.2020 19:56:58

Mode: TX 11g channel 1



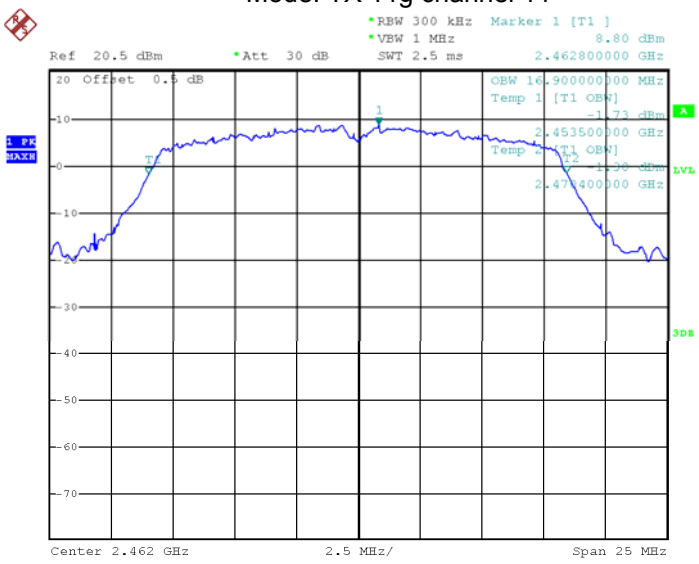
Date: 9.JUN.2020 20:09:40

Mode: TX 11g channel 6



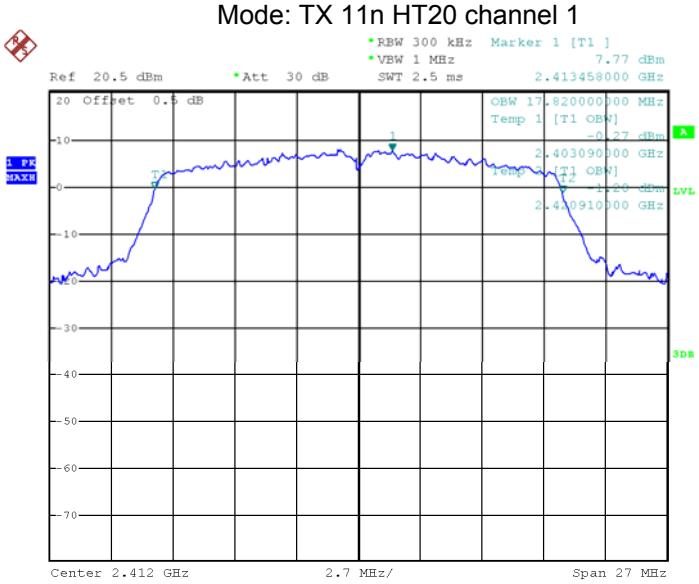
Date: 9.JUN.2020 20:16:09

Mode: TX 11g channel 11



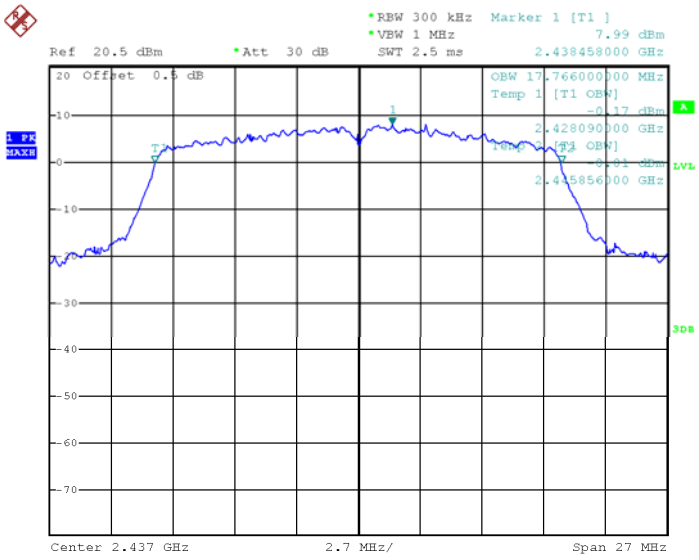
Date: 9.JUN.2020 20:21:15

Mode: TX 11n HT20 channel 1



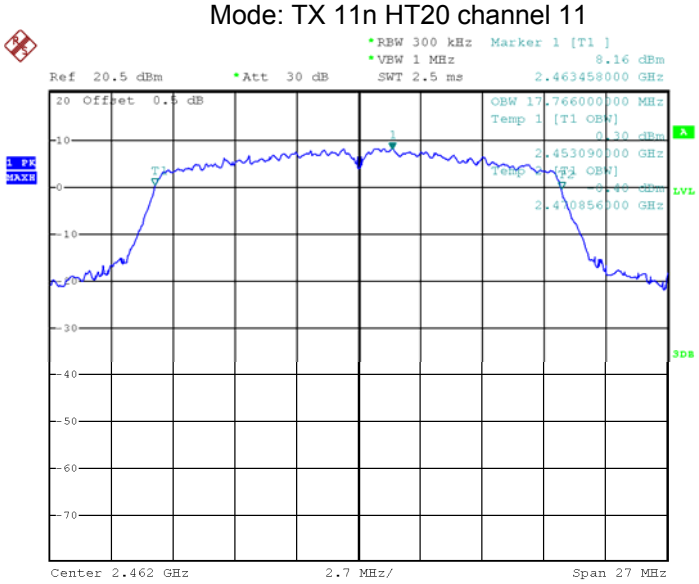
Date: 9.JUN.2020 20:28:36

Mode: TX 11n HT20 channel 6



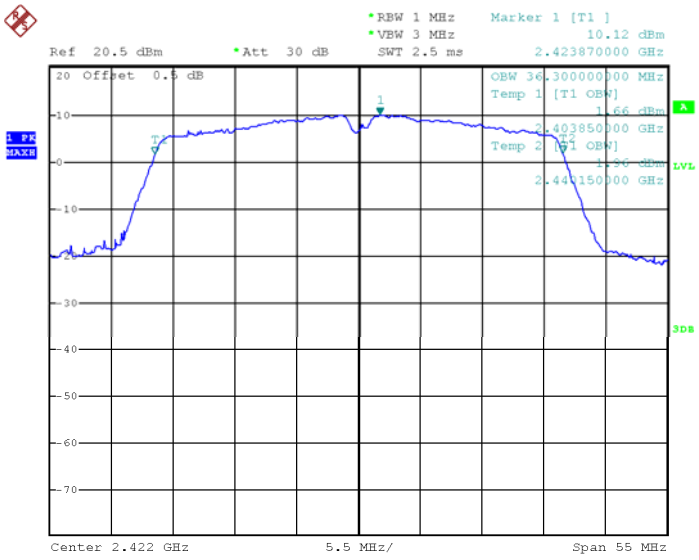
Date: 9.JUN.2020 20:38:10

Mode: TX 11n HT20 channel 11



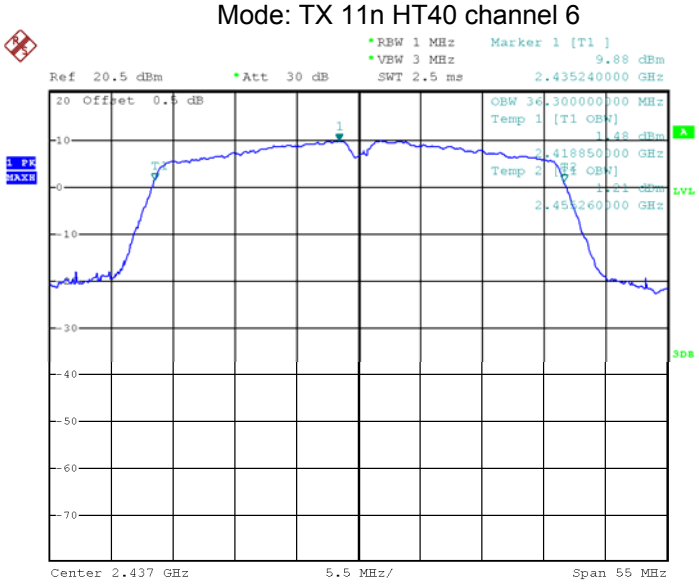
Date: 9.JUN.2020 20:57:10

Mode: TX 11n HT40 channel 3



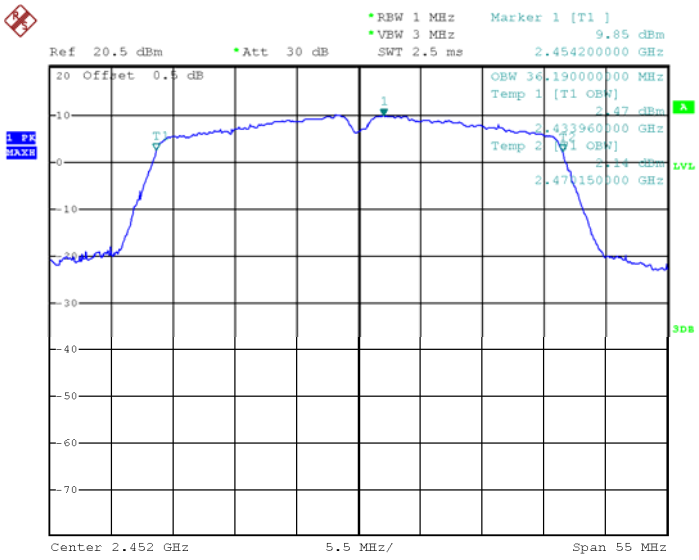
Date: 9.JUN.2020 21:04:33

Mode: TX 11n HT40 channel 6



Date: 9.JUN.2020 21:12:41

Mode: TX 11n HT40 channel 9



Date: 9.JUN.2020 21:19:04

12 Maximum Peak conducted Output Power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
ANSI C63.10:2013

12.1 Test Procedure:

KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018

section 8.3.1.1 (For BLE)

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

a)Set the RBW ≥ DTS bandwidth.

b)Set VBW ≥ 3 RBW.

c)Set span ≥ 3 x RBW

d)Sweep time = auto couple.

e)Detector = peak.

f)Trace mode = max hold.

g)Allow trace to fully stabilize.

h)Use peak marker function to determine the peak amplitude level.

section 8.3.1.2 (For WIFI)

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

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

b)Set the VBW ≥ 3 x RBW

c)Set the span ≥ 1.5 x OBW.

d)Detector = RMS.

e)Sweep time = auto couple.

f) trigger = free run..

g) Number of points in sweep _ [2 × span / RBW]. (This gives bin-to-bin spacing _ RBW / 2, so that narrowband signals are not lost between frequency bins.)

h) Trace average at least 100 traces in power averaging (rms) mode.

i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum..

12.2 Test Result:

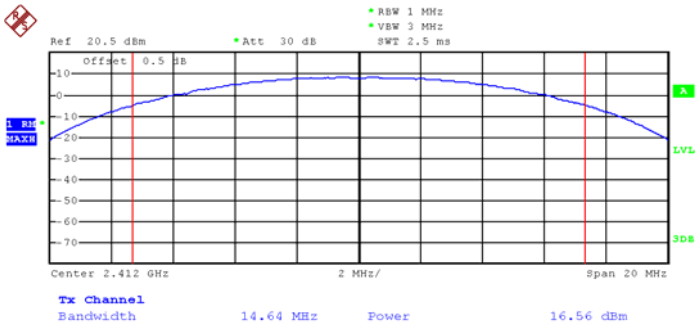
ANT 1+ ANT 2

Operation mode	Channel Frequency (MHz)	ANT1 (dBm)	ANT2 (dBm)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	16.56	17.07	19.83	1W/30dBm
	Middle-2437	17.59	16.93	20.28	1W/30dBm
	High-2462	16.99	17.47	20.25	1W/30dBm
TX 11g	Low-2412	17.02	17.31	20.18	1W/30dBm
	Middle-2437	17.96	17.27	**20.64**	1W/30dBm
	High-2462	17.39	17.67	20.54	1W/30dBm
TX 11n HT20	Low-2412	16.80	17.20	20.01	1W/30dBm
	Middle-2437	17.89	17.20	20.57	1W/30dBm
	High-2462	17.37	17.75	20.57	1W/30dBm
TX 11n HT40	Low-2422	16.19	16.37	19.29	1W/30dBm
	Middle-2437	17.13	16.34	19.76	1W/30dBm
	High-2452	17.12	16.37	19.77	1W/30dBm

Test Plot

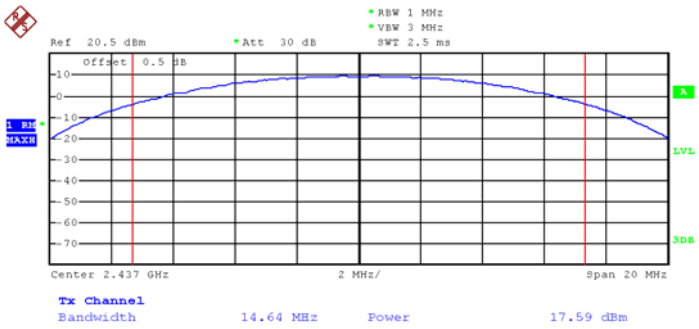
ANT 1

Mode: TX 11b channel 1



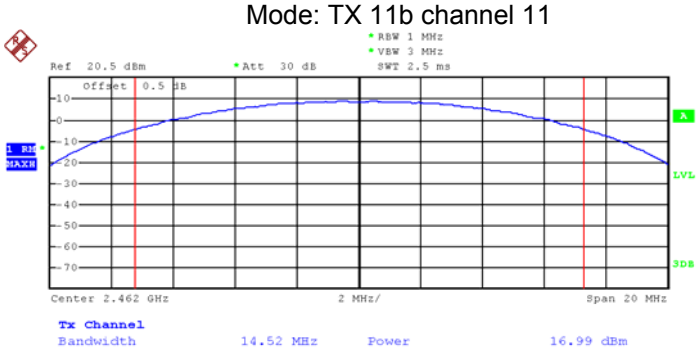
Date: 9.JUN.2020 21:47:02

Mode: TX 11b channel 6



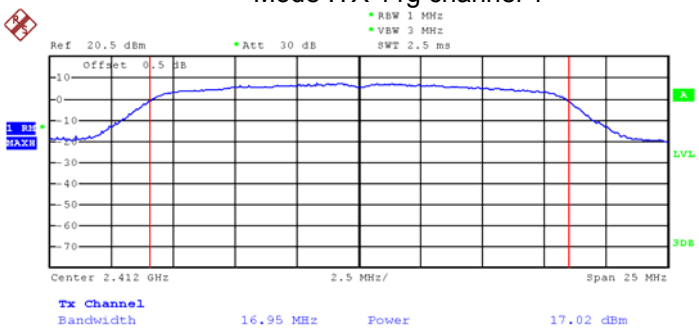
Date: 9.JUN.2020 21:53:21

Mode: TX 11b channel 11



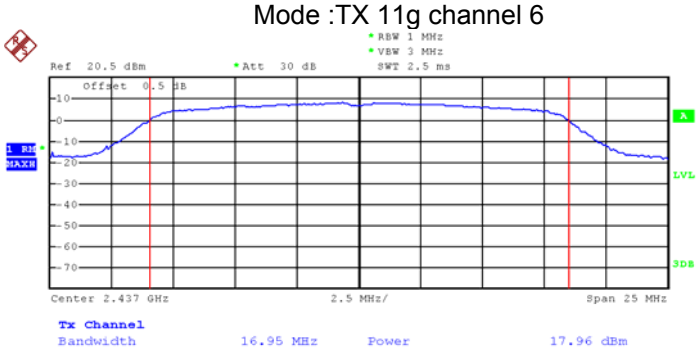
Date: 9.JUN.2020 21:58:49

Mode :TX 11g channel 1



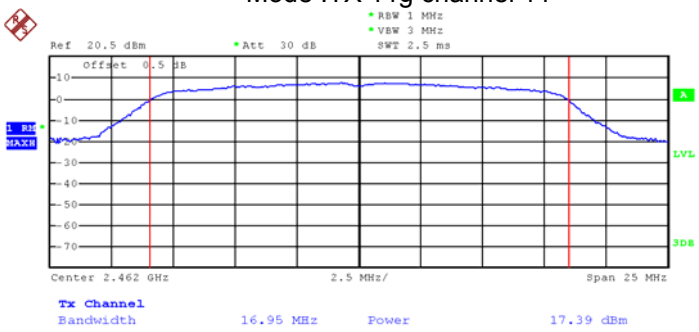
Date: 9.JUN.2020 22:06:42

Mode :TX 11g channel 6



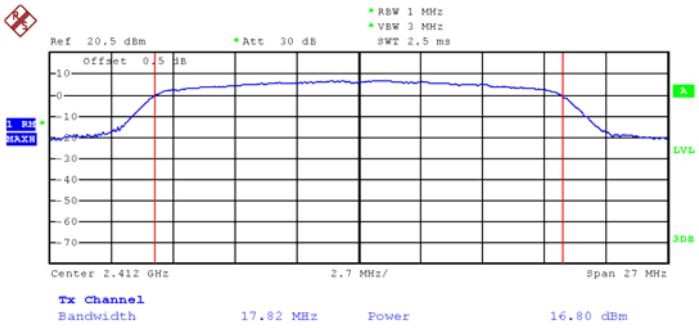
Date: 9.JUN.2020 22:13:46

Mode :TX 11g channel 11



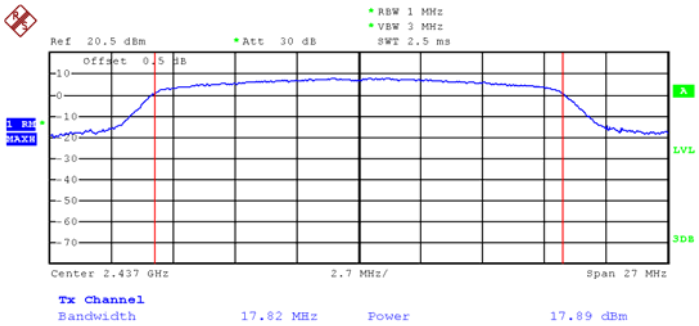
Date: 9.JUN.2020 22:21:24

Mode: TX 11n HT20 channel 1



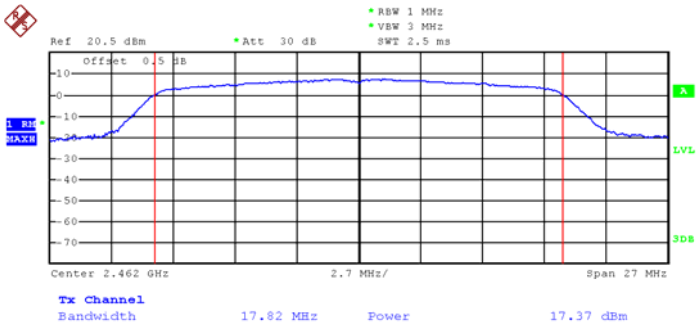
Date: 9.JUN.2020 22:38:30

Mode: TX 11n HT20 channel 6



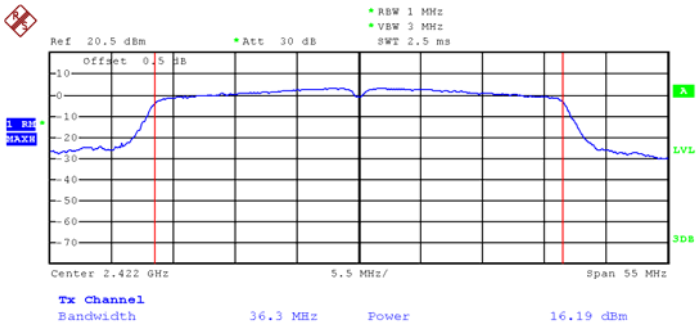
Date: 9.JUN.2020 22:45:13

Mode: TX 11n HT20 channel 11



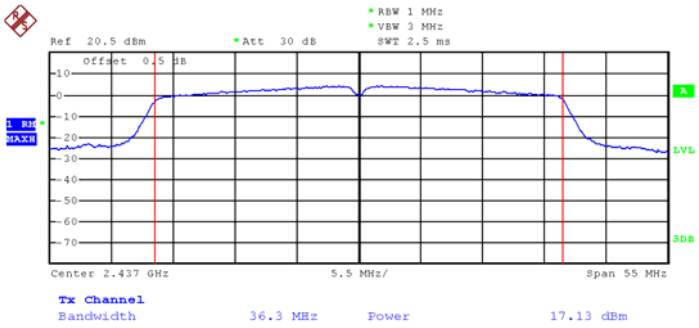
Date: 9.JUN.2020 22:49:47

Mode: TX 11n HT40 channel 3



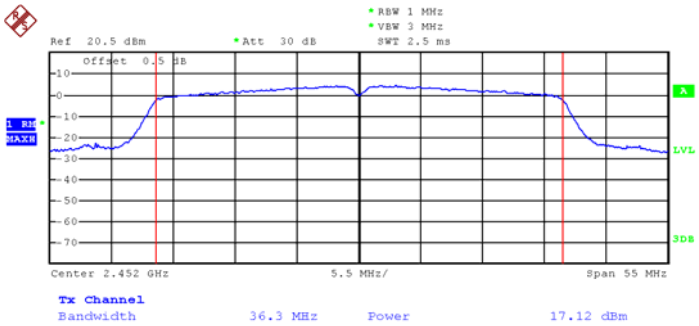
Date: 10.JUN.2020 00:38:38

Mode: TX 11n HT40 channel 6



Date: 10.JUN.2020 00:45:30

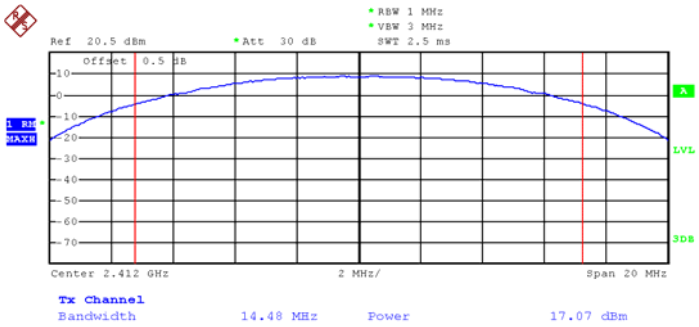
Mode: TX 11n HT40 channel 9



Date: 10.JUN.2020 00:49:30

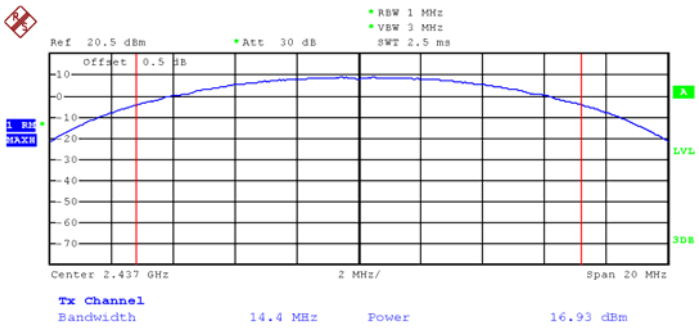
ANT 2

Mode: TX 11b channel 1



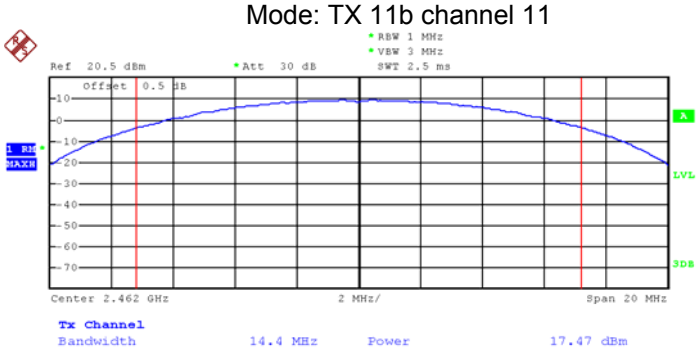
Date: 9.JUN.2020 19:52:47

Mode: TX 11b channel 6



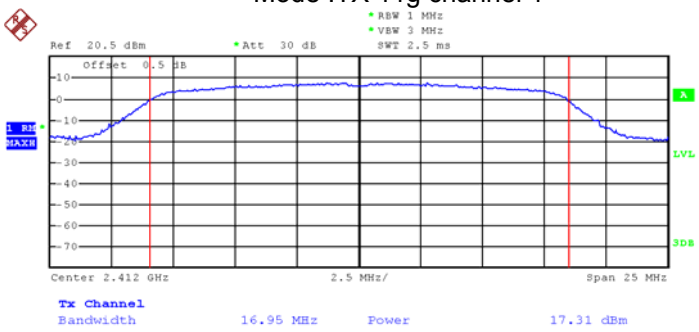
Date: 9.JUN.2020 19:55:52

Mode: TX 11b channel 11



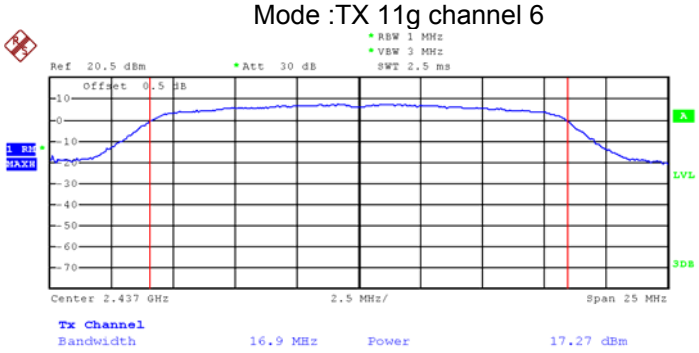
Date: 9.JUN.2020 20:01:35

Mode :TX 11g channel 1



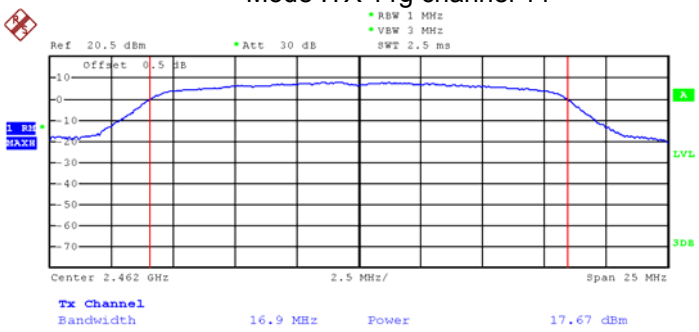
Date: 9.JUN.2020 20:12:10

Mode :TX 11g channel 6



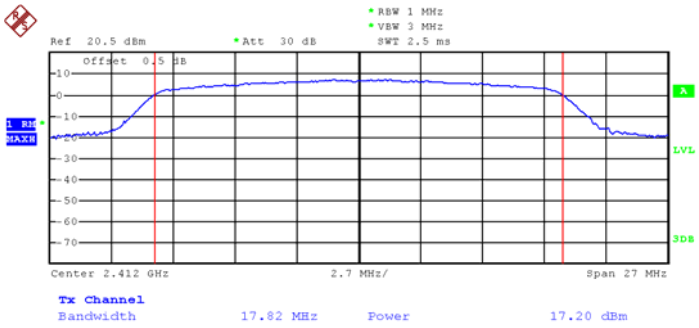
Date: 9.JUN.2020 20:19:27

Mode :TX 11g channel 11



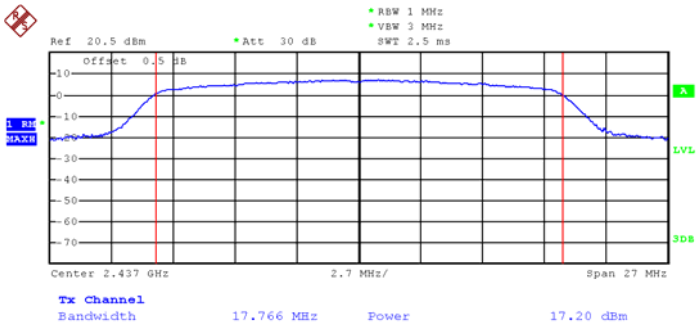
Date: 9.JUN.2020 20:24:26

Mode: TX 11n HT20 channel 1



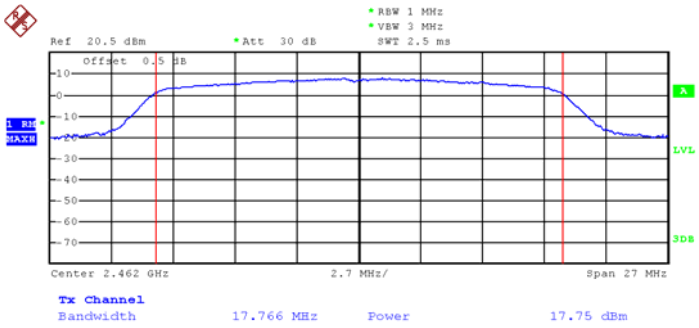
Date: 9.JUN.2020 20:33:07

Mode: TX 11n HT20 channel 6



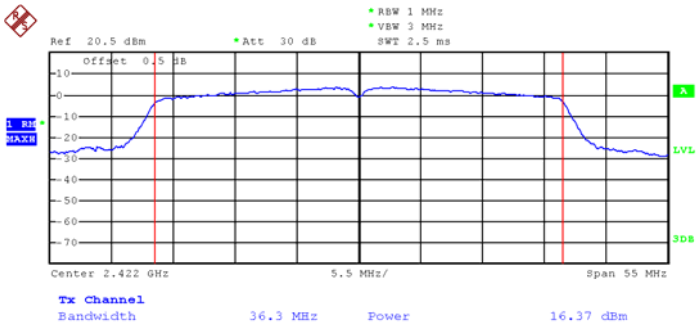
Date: 9.JUN.2020 20:41:04

Mode: TX 11n HT20 channel 11



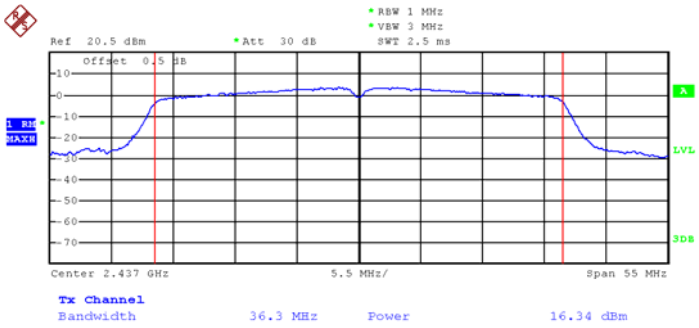
Date: 9.JUN.2020 21:00:19

Mode: TX 11n HT40 channel 3



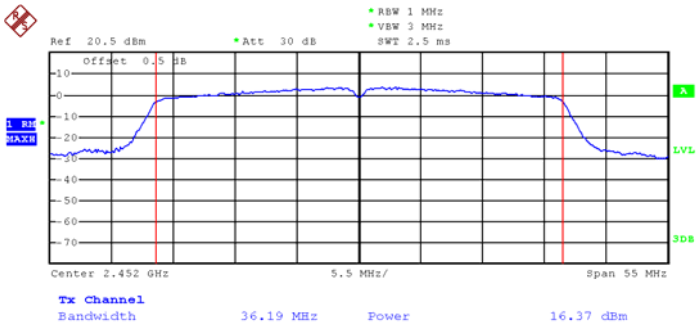
Date: 9.JUN.2020 21:09:53

Mode: TX 11n HT40 channel 6



Date: 9.JUN.2020 21:17:23

Mode: TX 11n HT40 channel 9



Date: 9.JUN.2020 21:22:50

13 Duty cycle

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

14 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance v05 August 24, 2018;
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:

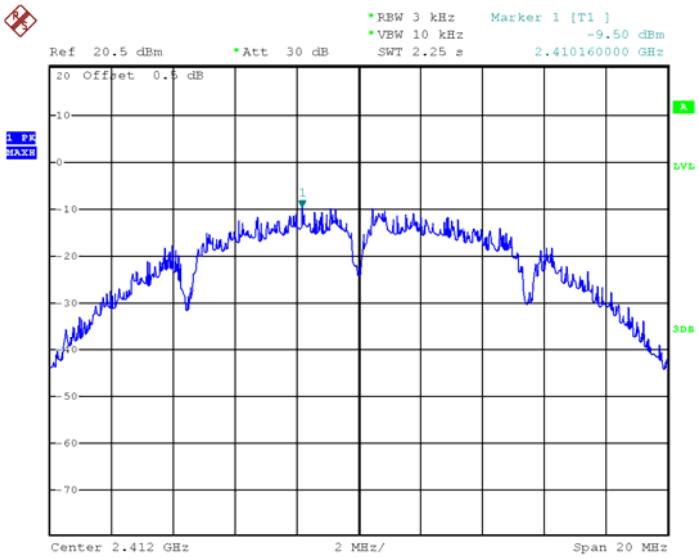
ANT 1+ ANT 2

Operation mode	Channel Frequency (MHz)	ANT1 (dBm/3kHz)	ANT2 (dBm/3kHz)	Power Spectral (dBm/3kHz)	Limit
TX 11b	Low-2412	-9.50	-9.81	-6.64	8dBm/3kHz
	Middle-2437	-8.74	-7.69	-5.17	8dBm/3kHz
	High-2462	-8.33	-9.36	-5.80	8dBm/3kHz
TX 11g	Low-2412	-11.78	-11.49	-8.62	8dBm/3kHz
	Middle-2437	-10.25	-11.06	-7.63	8dBm/3kHz
	High-2462	-10.37	-9.96	-7.15	8dBm/3kHz
TX 11n HT20	Low-2412	-10.87	-11.19	-8.02	8dBm/3kHz
	Middle-2437	-11.08	-11.87	-8.45	8dBm/3kHz
	High-2462	-9.39	-10.63	-6.96	8dBm/3kHz
TX 11n HT40	Low-2422	-15.93	-15.33	-12.61	8dBm/3kHz
	Middle-2437	-14.25	-14.39	-11.31	8dBm/3kHz
	High-2452	-12.63	-14.38	-10.41	8dBm/3kHz

Test Plot

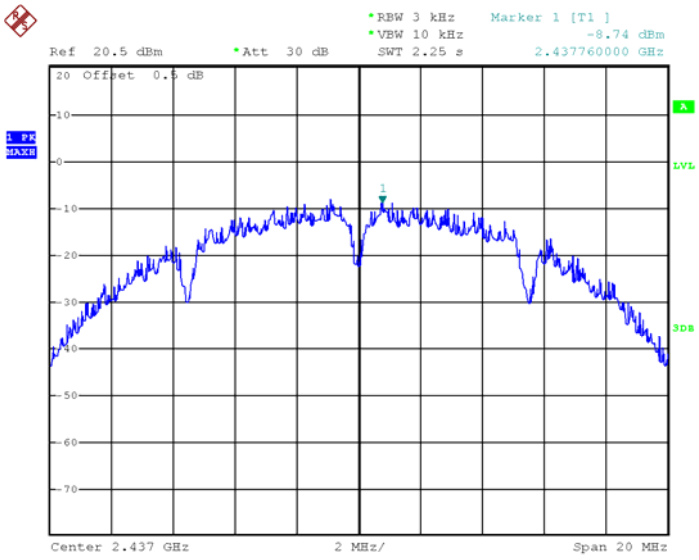
ANT 1

Mode: TX 11b channel 1



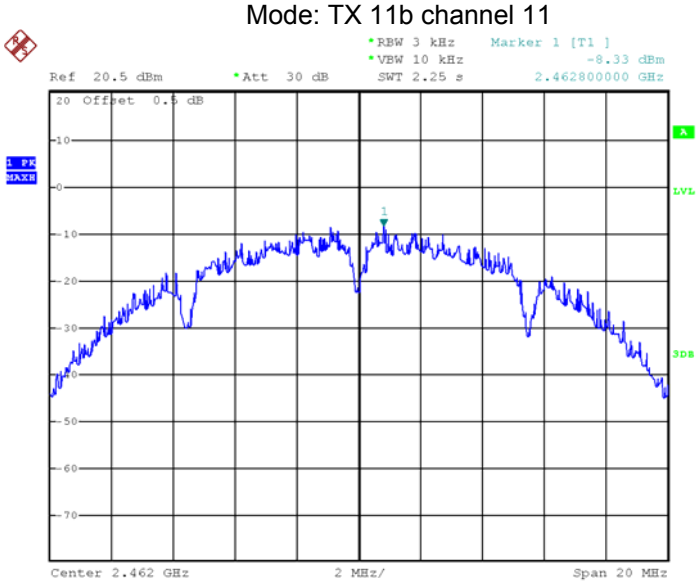
Date: 9.JUN.2020 21:45:35

Mode: TX 11b channel 6



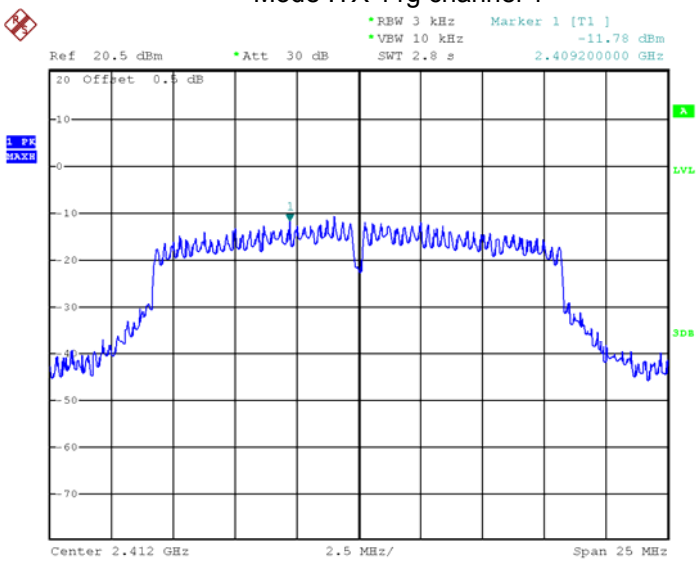
Date: 9.JUN.2020 21:50:54

Mode: TX 11b channel 11



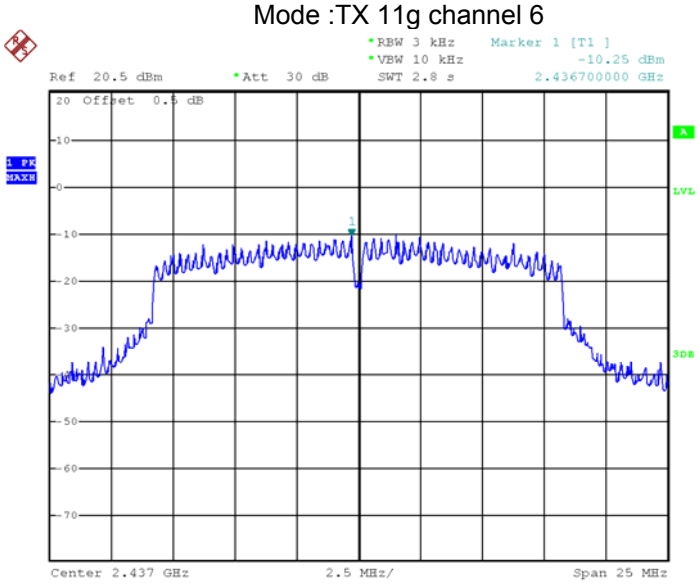
Date: 9.JUN.2020 21:56:50

Mode :TX 11g channel 1



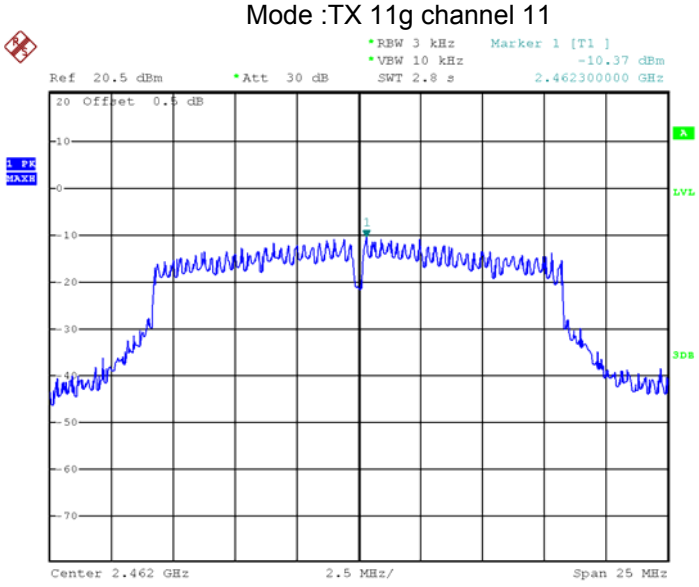
Date: 9.JUN.2020 22:04:28

Mode :TX 11g channel 6



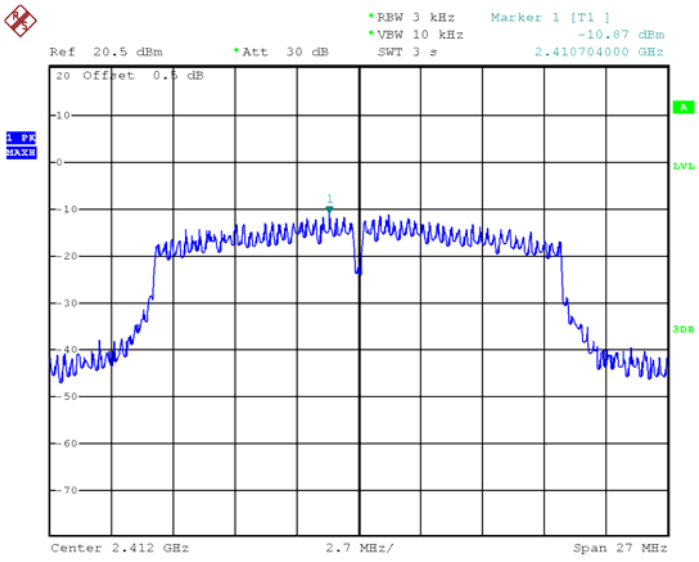
Date: 9.JUN.2020 22:11:57

Mode :TX 11g channel 11



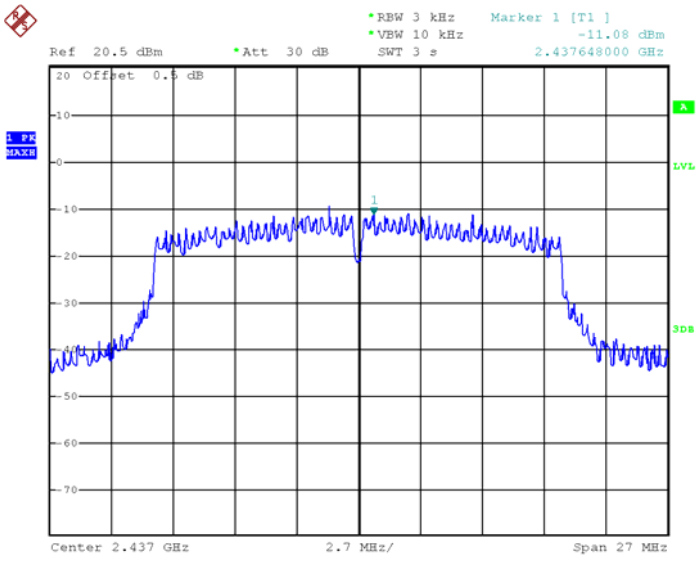
Date: 9.JUN.2020 22:18:57

Mode: TX 11n HT20 channel 1



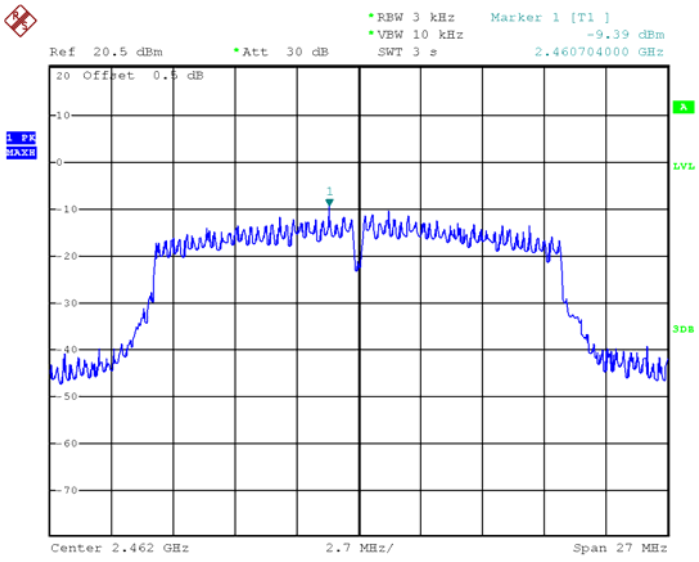
Date: 9.JUN.2020 22:35:34

Mode: TX 11n HT20 channel 6



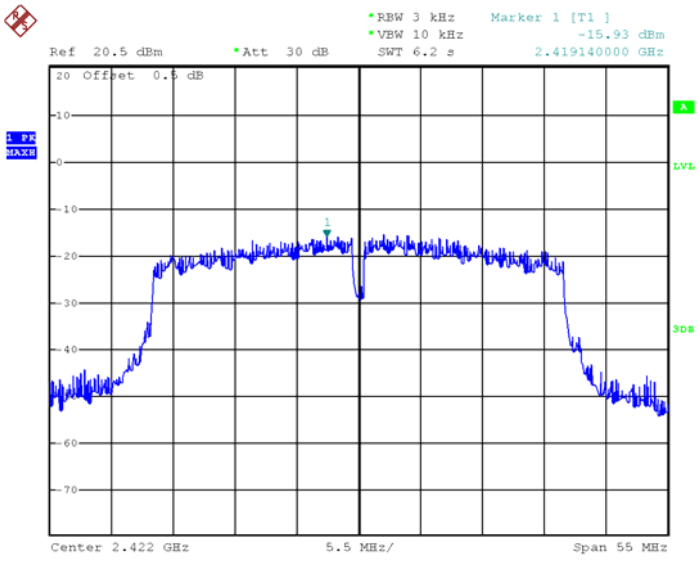
Date: 9.JUN.2020 22:43:31

Mode: TX 11n HT20 channel 11



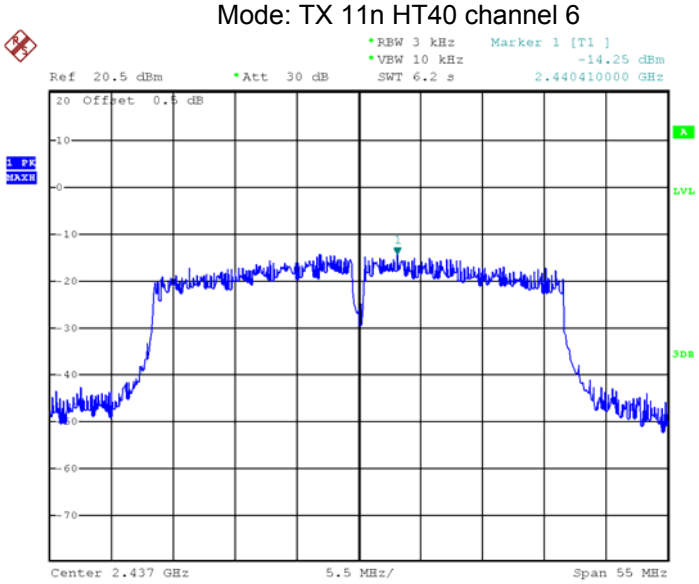
Date: 9.JUN.2020 22:48:11

Mode: TX 11n HT40 channel 3



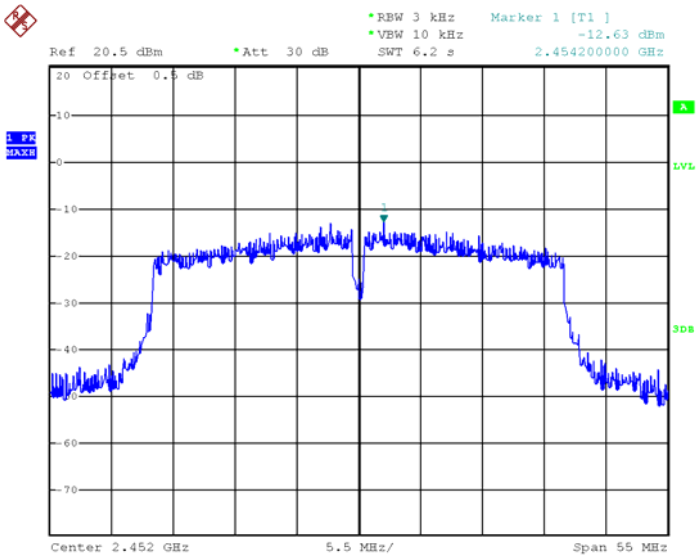
Date: 10.JUN.2020 00:37:00

Mode: TX 11n HT40 channel 6



Date: 10.JUN.2020 00:43:13

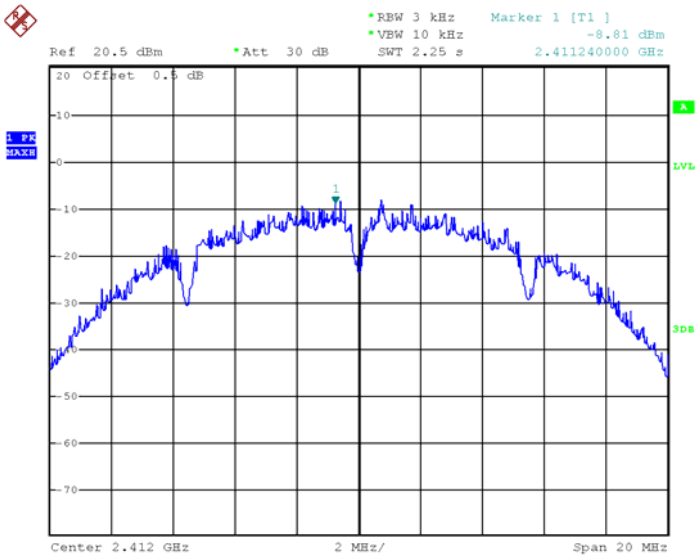
Mode: TX 11n HT40 channel 9



Date: 10.JUN.2020 00:48:04

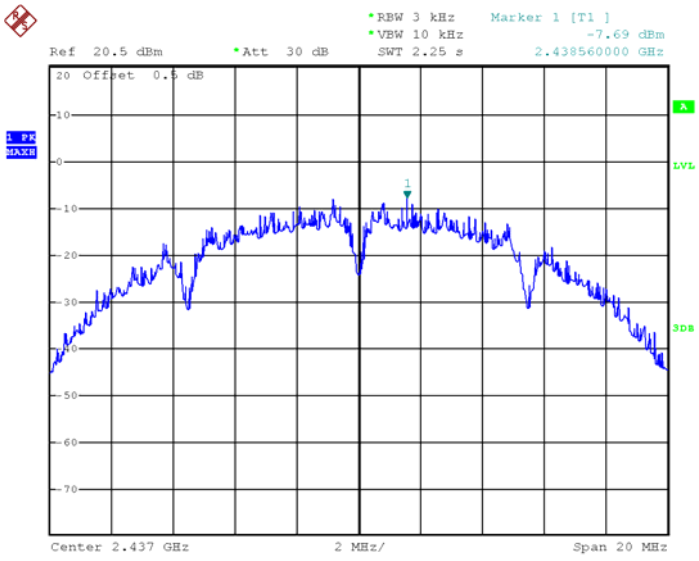
ANT 2

Mode: TX 11b channel 1



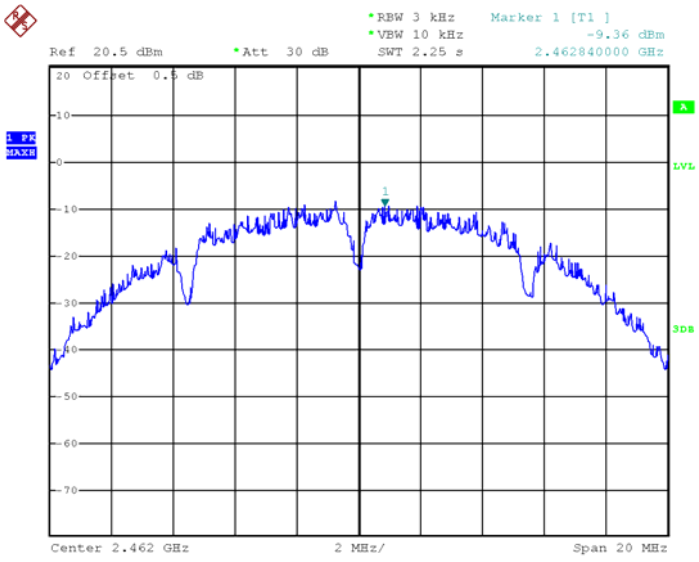
Date: 9.JUN.2020 19:52:15

Mode: TX 11b channel 6



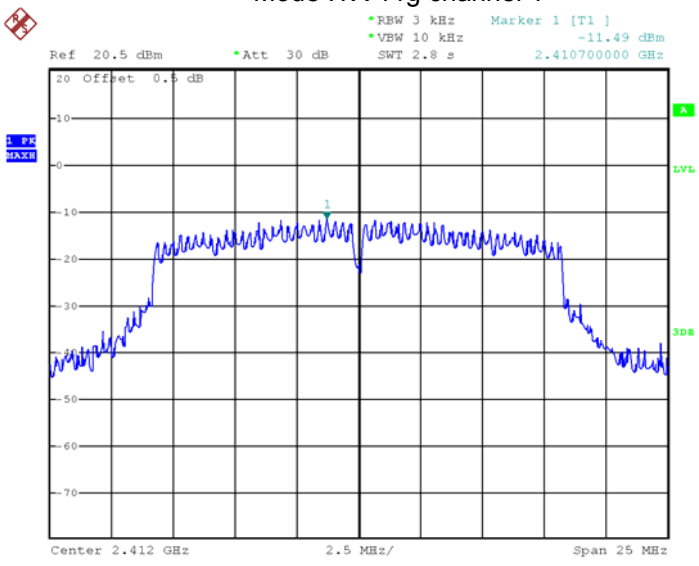
Date: 9.JUN.2020 19:55:21

Mode: TX 11b channel 11



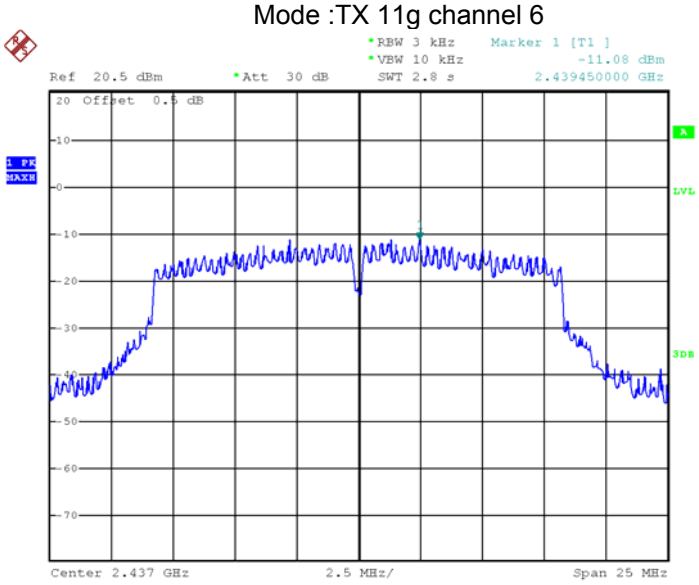
Date: 9.JUN.2020 19:58:24

Mode :TX 11g channel 1



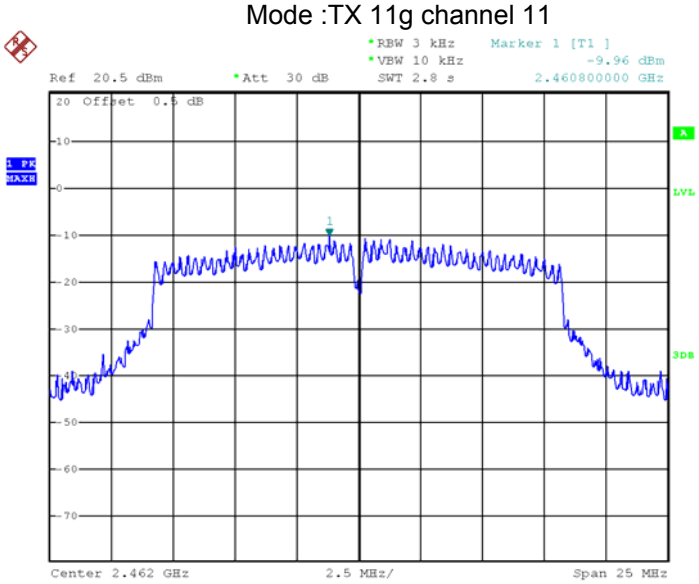
Date: 9.JUN.2020 20:11:35

Mode :TX 11g channel 6



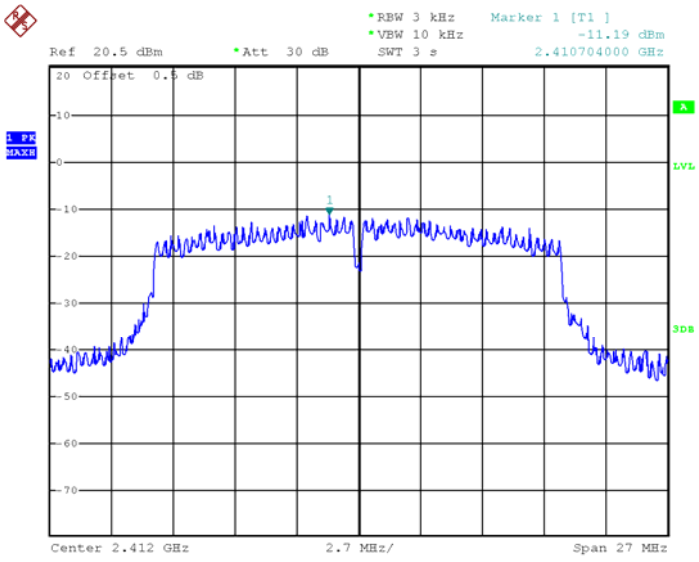
Date: 9.JUN.2020 20:17:50

Mode :TX 11g channel 11



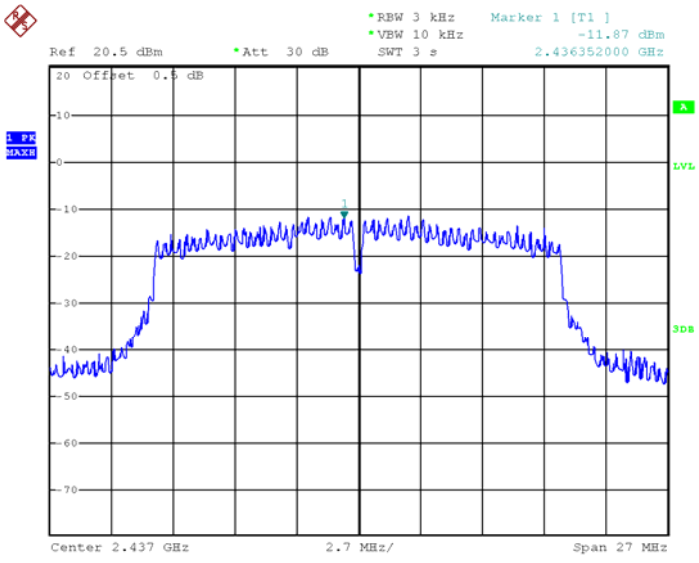
Date: 9.JUN.2020 20:22:49

Mode: TX 11n HT20 channel 1



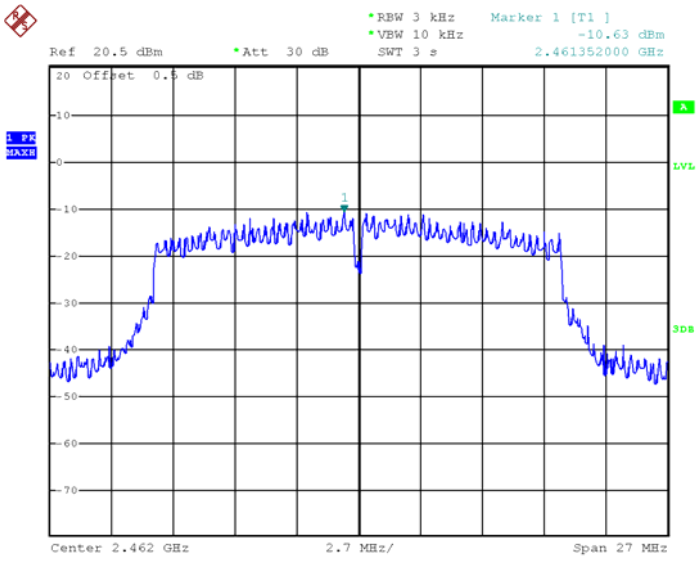
Date: 9.JUN.2020 20:30:57

Mode: TX 11n HT20 channel 6



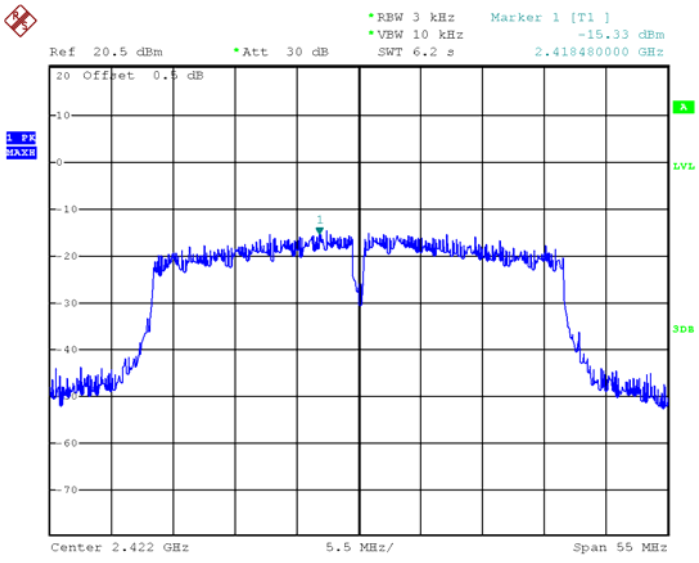
Date: 9.JUN.2020 20:39:30

Mode: TX 11n HT20 channel 11



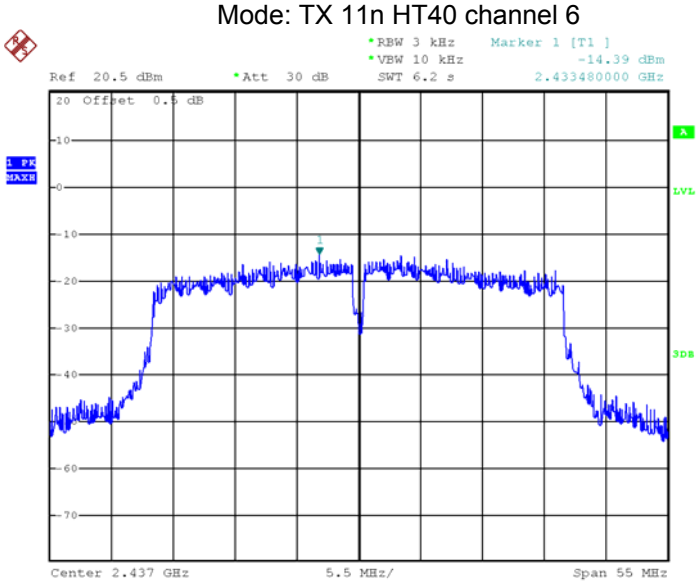
Date: 9.JUN.2020 20:58:47

Mode: TX 11n HT40 channel 3



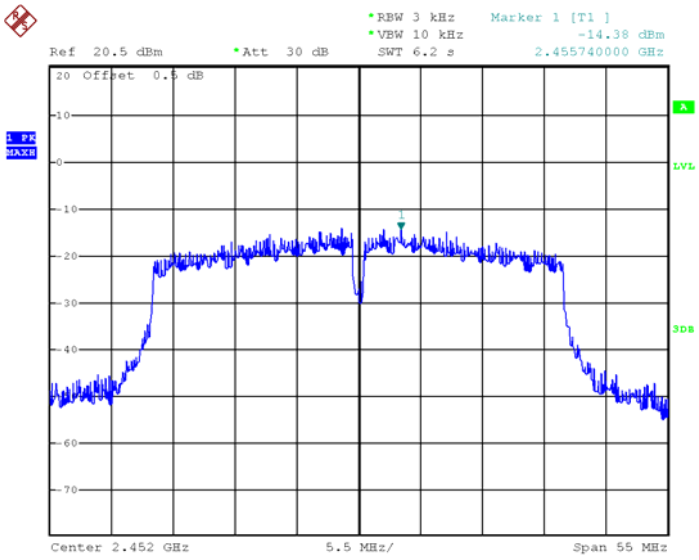
Date: 9.JUN.2020 21:07:10

Mode: TX 11n HT40 channel 6



Date: 9.JUN.2020 21:15:09

Mode: TX 11n HT40 channel 9



Date: 9.JUN.2020 21:20:25

15 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.

This device uses an anti-helix interface antenna to the intentional radiator. Antenna connectors complied with the requirement.

16 RF Exposure

Remark: refer to MPE test report: WTF20S05031693W003.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-IE-1200M-Photos.

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