TEST REPORT

Reference No.	:	WTD23D06139174W003
FCC ID	:	2AENW-37500
Applicant	:	GOAL ZERO LLC
Address	:	287 WEST 12300 SOUTH DRAPER, UT 84020, USA
Manufacturer	:	DONGGUAN PROTRONIC ELECTRONICS LTD.
Address	:	No.1 Gongye Blvd, Shipai Town, Dongguan, Guangdong Province, P.R. China
Product	:	Portable Power Station
Model(s)	:	Yeti PRO 4000
Brand Name	:	GOAL ZERO
Standards	:	FCC 47CFR Part 15.247
Date of Receipt sample	:	2023-06-27
Date of Test	:	2023-06-27 to 2023-07-12
Date of Issue	:	2023-08-16
Test Result	:	**Pass**

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

Prepared By:
Waltek Testing Group Co., Ltd.
Address: No. 77, Houjie Section, Guantai Road, Houjie Town, Dongguan City, Guangdong, China
Tel: +86-769-2267 6998
Fax: +86-769-2267 6828

Compiled by:

James Cheng / Project Engineer

Approved by:

Deval Qin / Designated Reviewer

2 Contents

3 Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD23D06139174W003	2023-06-27	2023-06-27 to 2023-07-12	2023-08-16	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	Portable Power Station
Model(s):	Yeti PRO 4000
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40
Bluetooth Version:	Bluetooth v5.0 with BLE
Hardware Version:	SGM040-CNTRL-V12
Software Version:	SGM040-PCU-V5.4.6

4.2 Details of E.U.T.

Operation Frequency:	2.4G Wi-Fi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz BLE: 2402-2480MHz
Max. RF output power:	2.4G Wi-Fi: 19.71dBm BLE: 9.453dBm
Type of Modulation:	2.4G Wi-Fi: CCK, OFDM BLE:GFSK
Antenna installation:	2.4G Wi-Fi/BLE: PCB printed antenna
Antenna Gain:	2.4G Wi-Fi/BLE: 3.76dBi

Note:
#: The antenna gain is provided by the applicant, and the applicant should be responsible for its authenticity, WALTEK lab has not verified the authenticity of its information.

Ratings:

Tech Specifications:	
Battery:	Rechargable Lithium Iron-Phosphate Battery
Capacity:	3993.6Wh (51.2V, 78Ah)
Inputs:	
Low Voltage DC:	13.3-28V DC, up to 10A (275W max)
High Voltage DC:	13.3-145V DC, up to 40A (3000W max)
AC Input:	120V AC 60Hz, up to 15A (1800W)
Outputs:	
AC Outlet:	(4x) 120V AC 60Hz pure sine wave, 30A (2400W per port, 3600W continuous, 7200W surge)
TT-30R AC Outlet:	120V AC 60Hz, 30A (3600W max)
6mm Port (x2):	13.5V DC, 10A continuous, 40A Surge (135W max)
12V Car Port:	13.5V DC, 12A continuous, 40A surge (162W max)
High Power Port:	13.5V DC, 30A continuous, 40A surge (405W max)
USB-A :	(3x) 5-12V DC, up to 3A (18W max)
USB-C 100W:	5V-20V DC, up to 5A (100W max)
USB-C 30W:	(2x) 5V-20V DC, up to 3A (30W each)
Input/Outputs:	
Power+ Port:	Input: 120V AC, 60Hz, up to 15A (1800W)/ 240V AC 60Hz, up to 13A (3000W max) Output: 120V AC 60Hz, up to 30A (3600W AC)
Expansion Port:	To be used with Goal Zero Expansion Modules: up to 56V DC, 100A
Charging Temperature:	32° to 104° F (0° to 40° C)
Discharging Temperature:	-4° to 104° F (-20° to 40° C)

4.3 Channel List

2.4G Wi-Fi

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	-

BLE

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
0	2402	1	2404	2	2406	3	2408
4	2410	5	2412	6	2414	7	2416
8	2418	9	2420	10	2422	11	2424
12	2426	13	2428	14	2430	15	2432
16	2434	17	2436	18	2438	19	2440
20	2442	21	2444	22	2446	23	2448
24	2450	25	2452	26	2454	27	2456
28	2458	29	2460	30	2462	31	2464
32	2466	33	2468	34	2470	35	2472
36	2474	37	2476	38	2478	39	2480

4.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

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

Table 2 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	BLE	1 Mbps	0/19/39	TX
Power Spectral Density	BLE	1 Mbps	0/19/39	TX
6dB Bandwidth	BLE	1 Mbps	0/19/39	TX
Band Edge	BLE	1 Mbps	0/19/39	TX
Transmitter Spurious Emissions	BLE	1 Mbps	0/19/39	TX

Note :Parameters set by test software during channel & power tests, the software provided by the customer was used to set the operating channels as well as the output power level. The RF output power set is the power expected by the manufacturer and is going to be fixed on the firmware of the final product .

4.5 Test Facility

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

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

Waltek Testing Group Co., Ltd. Has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration number 7760A, October 15, 2016.

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

Waltek Testing Group Co., Ltd. EMC Laboratory `has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration number 523476, September 10, 2019.

5 Test Summary

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

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

6 Equipment Used during Test

6.1 Equipments List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date	Calibration Due Date
Conducted Emissions 1#						
1	EMI Test Receiver	R&S	ESCI	100947	2022-08-01	2023-07-31
2	LISN	R&S	ENV216	100115	2022-08-01	2023-07-31
3	Cable	Top	TYPE16(3.5M)	-	2022-08-01	2023-07-31
4	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A
3m Semi-anechoic Chamber for Radiation Emissions (SAEMC) 1#						
1	Spectrum Analyzer	R&S	FSP30	100091	2023-04-24	2024-04-23
2	Amplifier	Agilent	8447D	2944A10178	2022-08-01	2023-07-31
3	Tri-log Broadband Antenna	SCHWARZBECK	VULB9163	336	2022-08-07	2023-08-06
4	Coaxial Cable	Top	TYPE16(13M)	-	2023-04-24	2024-04-23
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120D	667	2023-02-02	2024-02-01
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2022-07-29	2023-07-28
7	Broadband Preamplifier	COMPLIANCE	PAP-1G18	2004	2022-08-08	2023-08-07
8	Coaxial Cable	Top	ZT26-NJ-NJ-8M/FA	-	2023-02-02	2024-02-01
9	Microwave Amplifier	SCHWARZBECK	BBV 9721	100472	2022-07-29	2023-07-28
10	Coaxial Cable	Top	ZT40-2.92J-2.92J-2.0M	17100919	2023-04-24	2024-04-23
11	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A
3m Semi-anechoic Chamber for Radiation Emissions (TDK) 2#						
1	Test Receiver	R&S	ESCI	101296	2023-04-24	2024-04-23
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2022-10-31	2023-10-30
3	Active Loop Antenna	Com-Power	AL-130R	10160007	2023-05-07	2024-05-06
4	Amplifier	ANRITSU	MH648A	M43381	2023-04-24	2024-04-23
5	Cable	HUBER+SUHNER	CBL2	525178	2023-04-24	2024-04-23
6	Test software	EZ-EMC	RA-03A1-1	-	N/A	N/A
RF Conducting						
1	Spectrum Analyzer	R&S	FSP40	100501	2022-08-01	2023-07-31
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2022-08-01	2023-07-31

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	

7 Conducted Emission

Test Requirement: FCC 47CFR 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 0.5	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: 25.5 °C

Humidity: 49.2 % RH

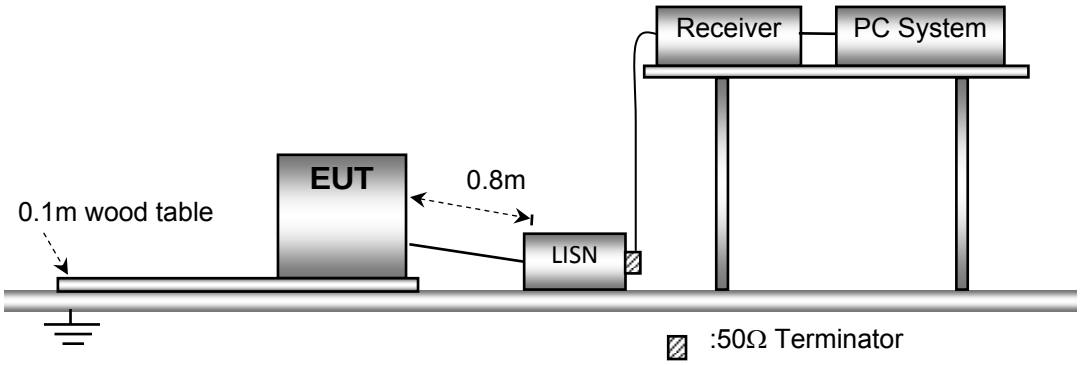
Atmospheric Pressure: 101.2kPa

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

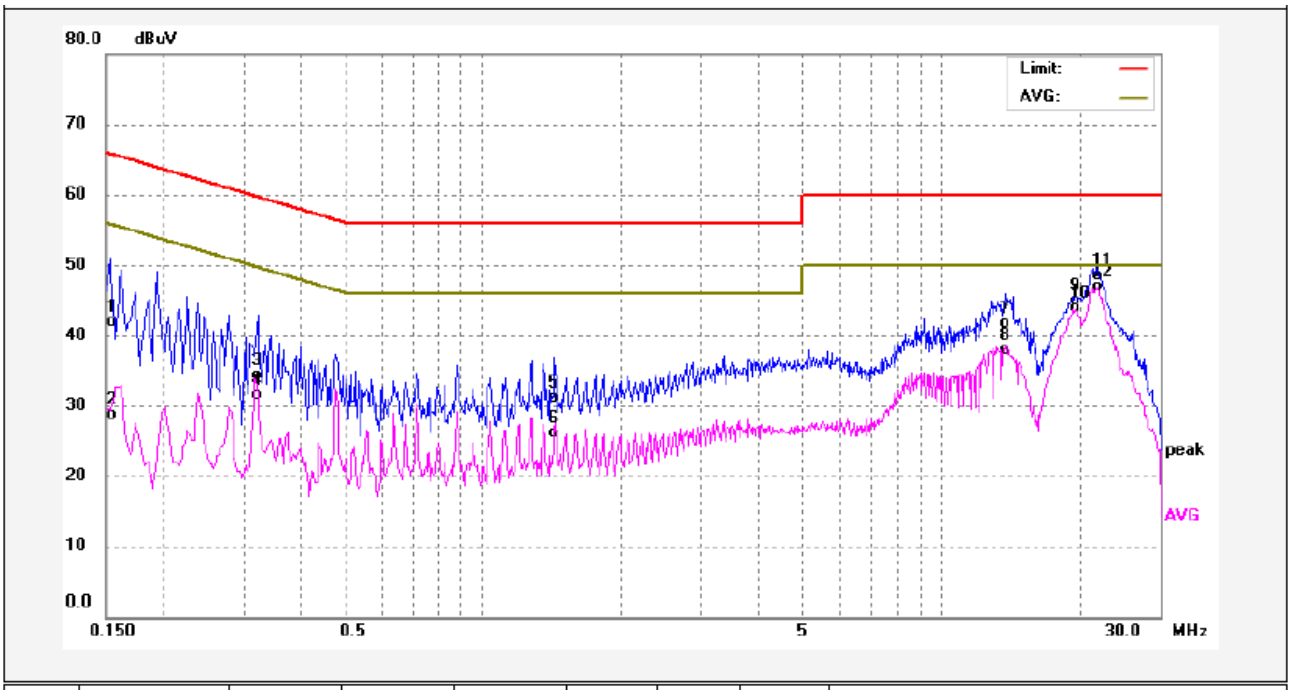
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

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

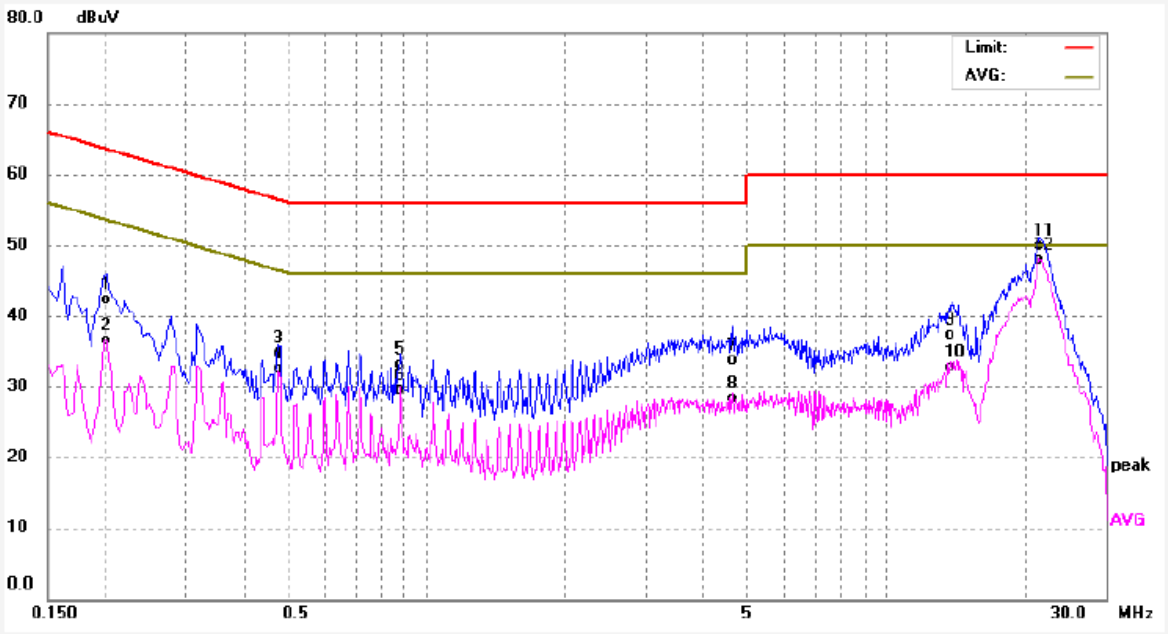
Worst Mode: Wi-Fi mode (802.11b mode low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	32.32	9.62	41.94	65.78	-23.84	QP	
2	0.1539	19.11	9.62	28.73	55.78	-27.05	AVG	
3	0.3220	24.71	9.65	34.36	59.65	-25.29	QP	
4	0.3220	21.78	9.65	31.43	49.65	-18.22	AVG	
5	1.4299	21.41	9.70	31.11	56.00	-24.89	QP	
6	1.4299	16.37	9.70	26.07	46.00	-19.93	AVG	
7	13.8740	31.61	10.01	41.62	60.00	-18.38	QP	
8	13.8740	27.89	10.01	37.90	50.00	-12.10	AVG	
9	19.5500	34.77	10.06	44.83	60.00	-15.17	QP	
10	19.5500	33.79	10.06	43.85	50.00	-6.15	AVG	
11	21.9900	37.80	10.75	48.55	60.00	-11.45	QP	
12	21.9900	36.12	10.75	46.87	50.00	-3.13	AVG	

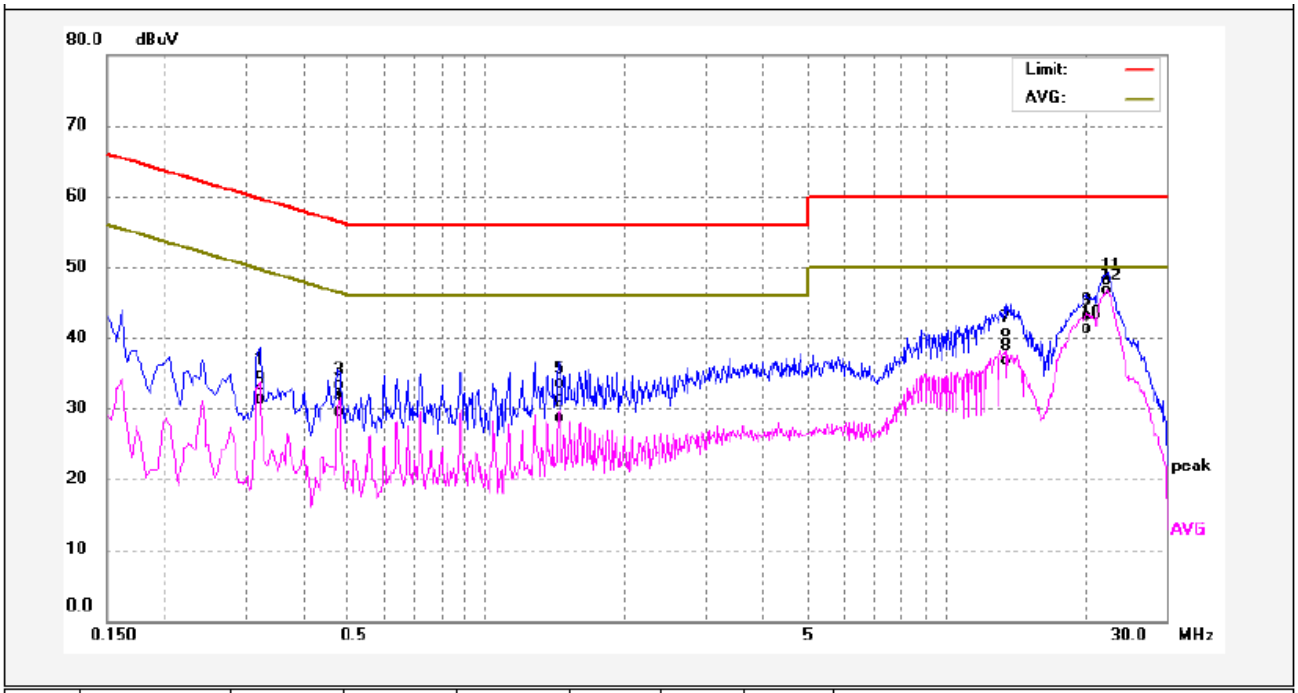
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2020	32.62	9.65	42.27	63.52	-21.25	QP	
2	0.2020	26.84	9.65	36.49	53.52	-17.03	AVG	
3	0.4780	24.94	9.67	34.61	56.37	-21.76	QP	
4	0.4780	22.76	9.67	32.43	46.37	-13.94	AVG	
5	0.8780	23.27	9.83	33.10	56.00	-22.90	QP	
6	0.8780	19.71	9.83	29.54	46.00	-16.46	AVG	
7	4.6380	23.80	9.81	33.61	56.00	-22.39	QP	
8	4.6380	18.55	9.81	28.36	46.00	-17.64	AVG	
9	13.8740	27.28	10.03	37.31	60.00	-22.69	QP	
10	13.8740	22.76	10.03	32.79	50.00	-17.21	AVG	
11	21.5900	39.25	10.64	49.89	60.00	-10.11	QP	
12	21.5900	37.27	10.64	47.91	50.00	-2.09	AVG	

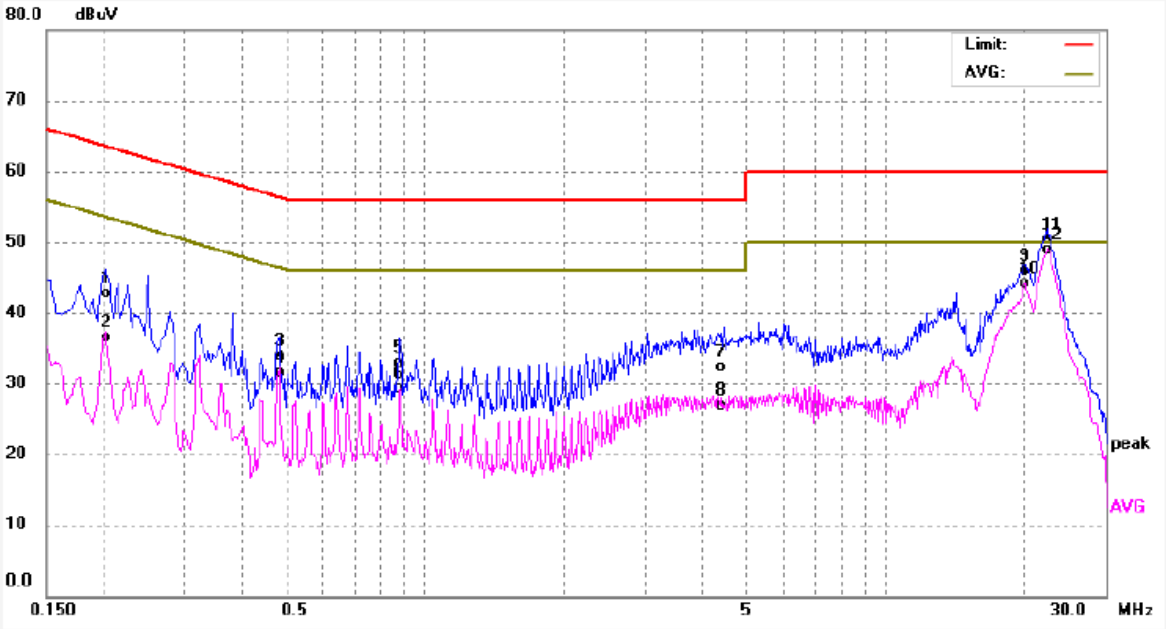
Worst Mode: BLE mode (low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.3220	25.11	9.65	34.76	59.65	-24.89	QP	
2	0.3220	21.70	9.65	31.35	49.65	-18.30	AVG	
3	0.4820	23.70	9.66	33.36	56.30	-22.94	QP	
4	0.4820	19.85	9.66	29.51	46.30	-16.79	AVG	
5	1.4420	23.76	9.70	33.46	56.00	-22.54	QP	
6	1.4420	19.06	9.70	28.76	46.00	-17.24	AVG	
7	13.4740	30.74	10.01	40.75	60.00	-19.25	QP	
8	13.4740	26.78	10.01	36.79	50.00	-13.21	AVG	
9	20.2300	33.04	10.14	43.18	60.00	-16.82	QP	
10	20.2300	31.15	10.14	41.29	50.00	-8.71	AVG	
11	22.2700	37.32	10.84	48.16	60.00	-11.84	QP	
12	22.2700	35.88	10.84	46.72	50.00	-3.28	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2020	32.96	9.65	42.61	63.52	-20.91	QP	
2	0.2020	26.88	9.65	36.53	53.52	-16.99	AVG	
3	0.4820	24.14	9.67	33.81	56.30	-22.49	QP	
4	0.4820	21.93	9.67	31.60	46.30	-14.70	AVG	
5	0.8820	23.06	9.83	32.89	56.00	-23.11	QP	
6	0.8820	19.39	9.83	29.22	46.00	-16.78	AVG	
7	4.4380	22.59	9.80	32.39	56.00	-23.61	QP	
8	4.4380	17.10	9.80	26.90	46.00	-19.10	AVG	
9	20.0700	35.70	10.11	45.81	60.00	-14.19	QP	
10	20.0700	33.93	10.11	44.04	50.00	-5.96	AVG	
11	22.5100	39.33	10.97	50.30	60.00	-9.70	QP	
12	22.5100	37.98	10.97	48.95	50.00	-1.05	AVG	

8 Radiated Emissions

Test Requirement: FCC 47CFR Part 15 Section 15.209 & 15.247

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

Test Result: PASS

Measurement Distance: 3m

Limit:

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

8.1 EUT Operation

Operating Environment **:**

Temperature: 25.7 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

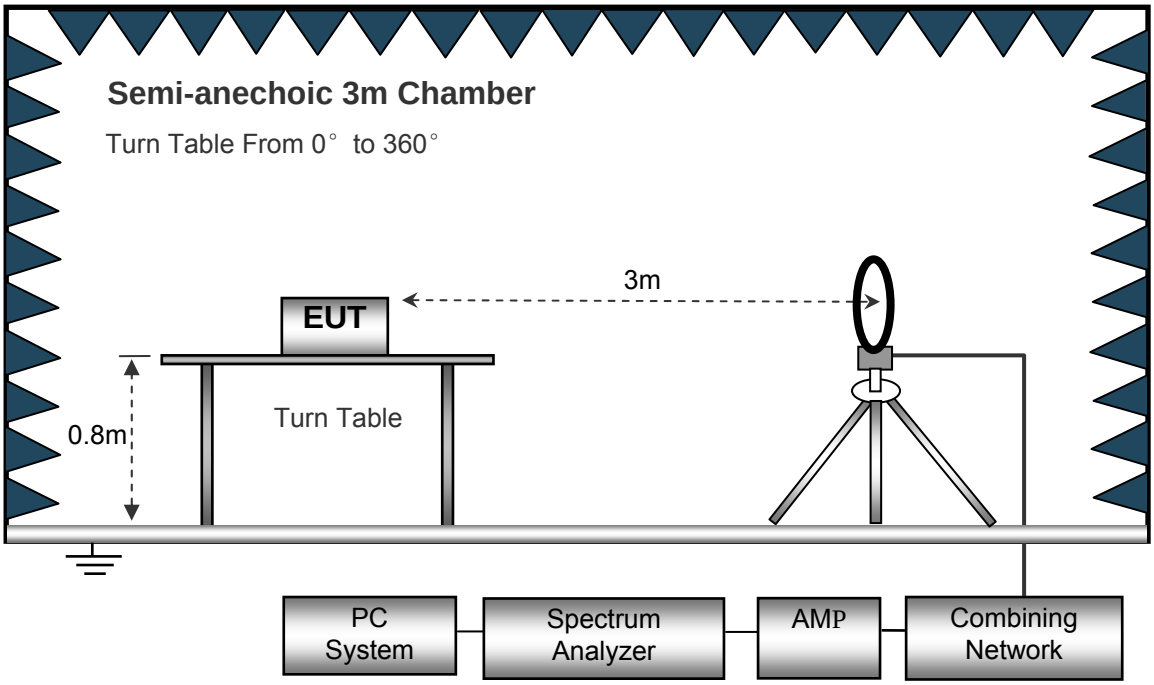
EUT Operation :

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

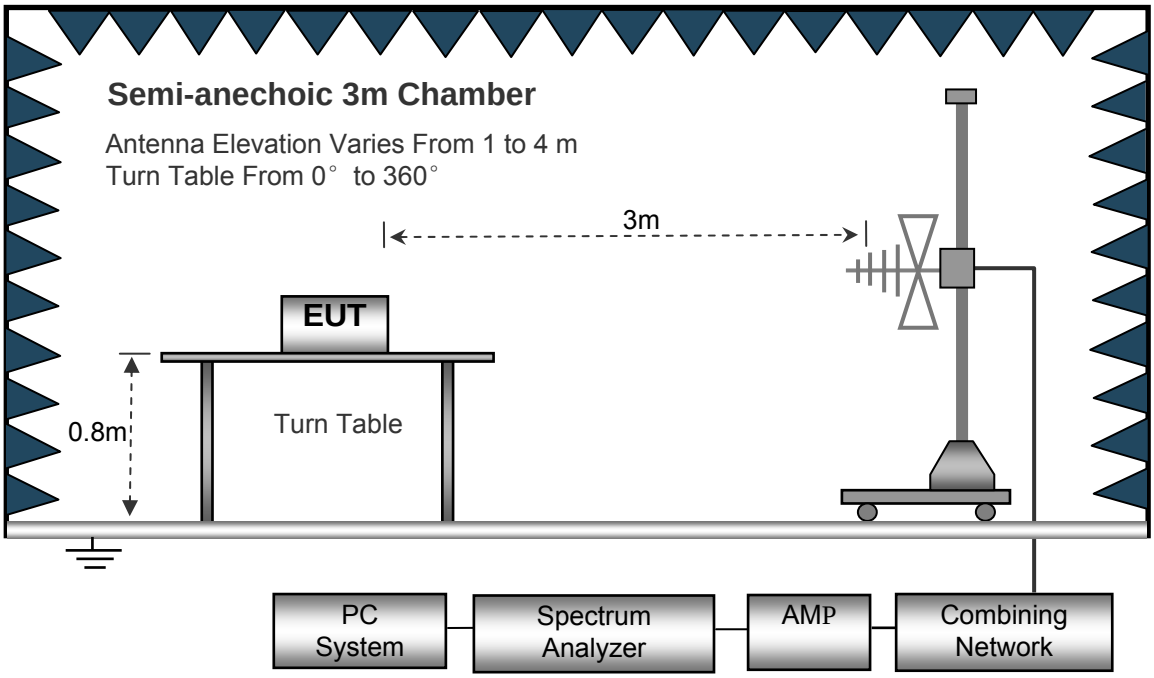
8.2 Test Setup

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

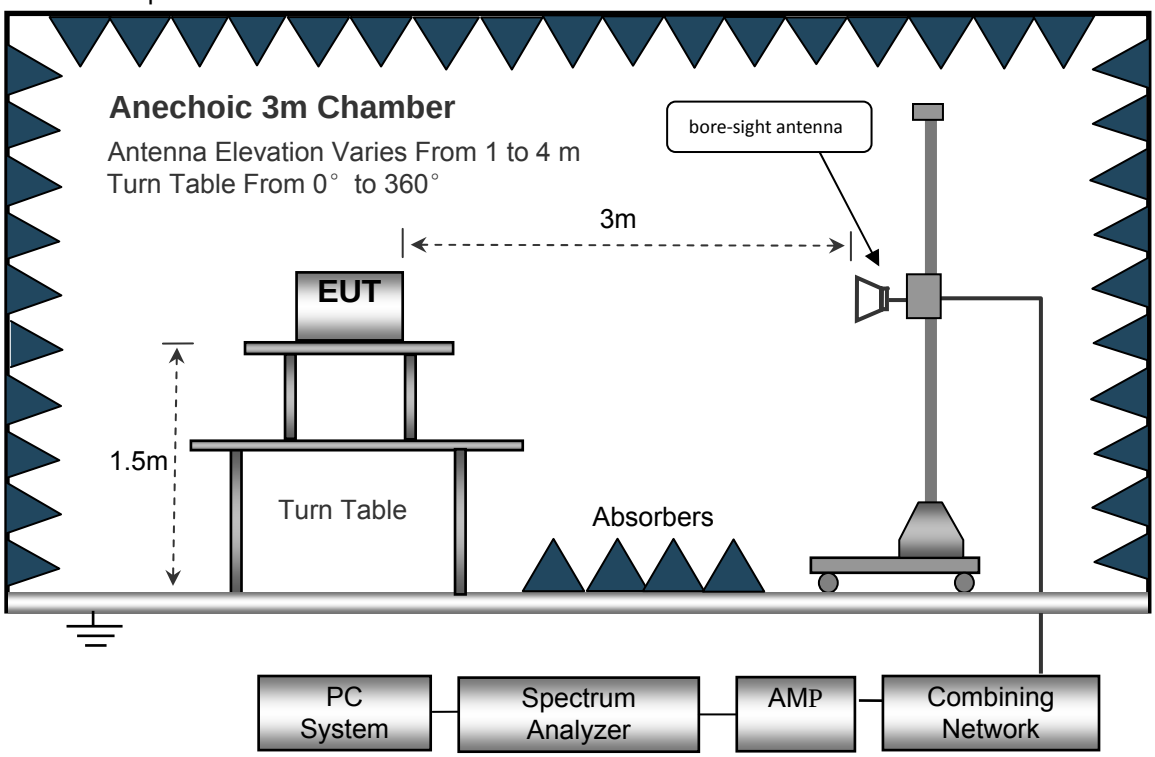
The test setup for emission measurement below 30MHz.



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

Wi-Fi:
Test Frequency: 9KHz~30MHz

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

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)
11b: Low Channel 2412MHz									
310.97	41.49	QP	187	1.5	H	-13.21	28.28	46.00	-17.72
310.97	46.68	QP	134	1.1	V	-13.21	33.47	46.00	-12.53
4824.00	51.01	PK	118	1.3	V	-1.06	49.95	74.00	-24.05
4824.00	41.10	Ave	118	1.3	V	-1.06	40.04	54.00	-13.96
7236.00	49.77	PK	15	1.8	H	1.33	51.10	74.00	-22.90
7236.00	38.97	Ave	15	1.8	H	1.33	40.30	54.00	-13.70
2347.07	48.85	PK	306	1.7	V	-13.19	35.66	74.00	-38.34
2347.07	37.59	Ave	306	1.7	V	-13.19	24.40	54.00	-29.60
2386.90	43.36	PK	189	1.9	H	-13.14	30.22	74.00	-43.78
2386.90	38.54	Ave	189	1.9	H	-13.14	25.40	54.00	-28.60
2493.26	43.17	PK	27	1.5	V	-13.08	30.09	74.00	-43.91
2493.26	36.98	Ave	27	1.5	V	-13.08	23.90	54.00	-30.10

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									
310.97	42.86	QP	96	1.3	H	-13.21	29.65	46.00	-16.35
310.97	45.82	QP	91	1.0	V	-13.21	32.61	46.00	-13.39
4874.00	51.30	PK	226	1.6	V	-0.62	50.68	74.00	-23.32
4874.00	41.97	Ave	226	1.6	V	-0.62	41.35	54.00	-12.65
7311.00	51.03	PK	327	1.3	H	2.21	53.24	74.00	-20.76
7311.00	39.68	Ave	327	1.3	H	2.21	41.89	54.00	-12.11
2345.46	45.20	PK	270	1.3	V	-13.19	32.01	74.00	-41.99
2345.46	39.27	Ave	270	1.3	V	-13.19	26.08	54.00	-27.92
2388.20	44.40	PK	23	1.2	H	-13.14	31.26	74.00	-42.74
2388.20	36.41	Ave	23	1.2	H	-13.14	23.27	54.00	-30.73
2491.51	43.40	PK	78	1.5	V	-13.08	30.32	74.00	-43.68
2491.51	36.35	Ave	78	1.5	V	-13.08	23.27	54.00	-30.73

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									
310.97	40.80	QP	246	1.6	H	-13.21	27.59	46.00	-18.41
310.97	46.36	QP	118	1.0	V	-13.21	33.15	46.00	-12.85
4924.00	49.43	PK	185	1.3	V	-0.24	49.19	74.00	-24.81
4924.00	40.44	Ave	185	1.3	V	-0.24	40.20	54.00	-13.80
7386.00	49.91	PK	54	1.3	H	2.84	52.75	74.00	-21.25
7386.00	38.67	Ave	54	1.3	H	2.84	41.51	54.00	-12.49
2347.93	45.02	PK	262	1.4	V	-13.19	31.83	74.00	-42.17
2347.93	38.96	Ave	262	1.4	V	-13.19	25.77	54.00	-28.23
2388.37	43.85	PK	341	1.5	H	-13.14	30.71	74.00	-43.29
2388.37	38.26	Ave	341	1.5	H	-13.14	25.12	54.00	-28.88
2483.84	43.33	PK	353	1.8	V	-13.08	30.25	74.00	-43.75
2483.84	36.88	Ave	353	1.8	V	-13.08	23.80	54.00	-30.20

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									
310.97	41.06	QP	352	1.9	H	-13.21	27.85	46.00	-18.15
310.97	47.44	QP	9	1.6	V	-13.21	34.23	46.00	-11.77
4824.00	49.94	PK	122	1.8	V	-1.06	48.88	74.00	-25.12
4824.00	41.13	Ave	122	1.8	V	-1.06	40.07	54.00	-13.93
7236.00	48.45	PK	40	1.4	H	1.33	49.78	74.00	-24.22
7236.00	37.60	Ave	40	1.4	H	1.33	38.93	54.00	-15.07
2342.98	46.37	PK	148	1.4	V	-13.19	33.18	74.00	-40.82
2342.98	38.06	Ave	148	1.4	V	-13.19	24.87	54.00	-29.13
2384.91	42.98	PK	46	1.6	H	-13.14	29.84	74.00	-44.16
2384.91	38.22	Ave	46	1.6	H	-13.14	25.08	54.00	-28.92
2499.91	44.53	PK	40	1.5	V	-13.08	31.45	74.00	-42.55
2499.91	36.62	Ave	40	1.5	V	-13.08	23.54	54.00	-30.46

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									
310.97	39.41	QP	123	1.0	H	-13.21	26.20	46.00	-19.80
310.97	47.95	QP	182	1.4	V	-13.21	34.74	46.00	-11.26
4874.00	47.39	PK	266	1.2	V	-0.62	46.77	74.00	-27.23
4874.00	42.27	Ave	266	1.2	V	-0.62	41.65	54.00	-12.35
7311.00	52.91	PK	246	1.4	H	2.21	55.12	74.00	-18.88
7311.00	37.21	Ave	246	1.4	H	2.21	39.42	54.00	-14.58
2318.36	46.60	PK	153	1.9	V	-13.19	33.41	74.00	-40.59
2318.36	37.58	Ave	153	1.9	V	-13.19	24.39	54.00	-29.61
2351.06	44.94	PK	332	1.8	H	-13.14	31.80	74.00	-42.20
2351.06	37.74	Ave	332	1.8	H	-13.14	24.60	54.00	-29.40
2498.57	43.88	PK	65	1.7	V	-13.08	30.80	74.00	-43.20
2498.57	36.93	Ave	65	1.7	V	-13.08	23.85	54.00	-30.15

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									
310.97	40.28	QP	160	1.7	H	-13.21	27.07	46.00	-18.93
310.97	44.30	QP	37	1.3	V	-13.21	31.09	46.00	-14.91
4924.00	50.57	PK	10	1.1	V	-0.24	50.33	74.00	-23.67
4924.00	42.13	Ave	10	1.1	V	-0.24	41.89	54.00	-12.11
7386.00	49.16	PK	354	1.5	H	2.84	52.00	74.00	-22.00
7386.00	40.37	Ave	354	1.5	H	2.84	43.21	54.00	-10.79
2314.10	46.89	PK	149	1.8	V	-13.19	33.70	74.00	-40.30
2314.10	39.74	Ave	149	1.8	V	-13.19	26.55	54.00	-27.45
2360.60	42.69	PK	80	1.6	H	-13.14	29.55	74.00	-44.45
2360.60	36.95	Ave	80	1.6	H	-13.14	23.81	54.00	-30.19
2494.73	43.84	PK	166	1.9	V	-13.08	30.76	74.00	-43.24
2494.73	38.20	Ave	166	1.9	V	-13.08	25.12	54.00	-28.88

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Low Channel 2412MHz									
310.97	40.85	QP	30	1.5	H	-13.21	27.64	46.00	-18.36
310.97	47.54	QP	256	1.5	V	-13.21	34.33	46.00	-11.67
4824.00	49.92	PK	56	2.0	V	-1.06	48.86	74.00	-25.14
4824.00	39.13	Ave	56	2.0	V	-1.06	38.07	54.00	-15.93
7236.00	49.23	PK	92	1.6	H	1.33	50.56	74.00	-23.44
7236.00	36.73	Ave	92	1.6	H	1.33	38.06	54.00	-15.94
2343.86	45.49	PK	241	1.5	V	-13.19	32.30	74.00	-41.70
2343.86	38.76	Ave	241	1.5	V	-13.19	25.57	54.00	-28.43
2389.34	42.40	PK	179	1.9	H	-13.14	29.26	74.00	-44.74
2389.34	37.47	Ave	179	1.9	H	-13.14	24.33	54.00	-29.67
2492.47	42.69	PK	91	1.0	V	-13.08	29.61	74.00	-44.39
2492.47	37.32	Ave	91	1.0	V	-13.08	24.24	54.00	-29.76

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Middle Channel 2437MHz									
310.97	40.96	QP	17	1.6	H	-13.21	27.75	46.00	-18.25
310.97	47.83	QP	13	1.1	V	-13.21	34.62	46.00	-11.38
4874.00	49.09	PK	293	1.7	V	-0.62	48.47	74.00	-25.53
4874.00	38.60	Ave	293	1.7	V	-0.62	37.98	54.00	-16.02
7311.00	50.57	PK	81	1.0	H	2.21	52.78	74.00	-21.22
7311.00	37.92	Ave	81	1.0	H	2.21	40.13	54.00	-13.87
2327.18	45.40	PK	124	1.7	V	-13.19	32.21	74.00	-41.79
2327.18	39.72	Ave	124	1.7	V	-13.19	26.53	54.00	-27.47
2369.48	43.89	PK	208	1.4	H	-13.14	30.75	74.00	-43.25
2369.48	37.97	Ave	208	1.4	H	-13.14	24.83	54.00	-29.17
2495.29	43.20	PK	196	1.1	V	-13.08	30.12	74.00	-43.88
2495.29	38.80	Ave	196	1.1	V	-13.08	25.72	54.00	-28.28

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: High Channel 2462MHz									
310.97	41.32	QP	121	1.1	H	-13.21	28.11	46.00	-17.89
310.97	47.72	QP	203	1.9	V	-13.21	34.51	46.00	-11.49
4924.00	48.15	PK	166	1.2	V	-0.24	47.91	74.00	-26.09
4924.00	37.98	Ave	166	1.2	V	-0.24	37.74	54.00	-16.26
7386.00	49.84	PK	17	1.4	H	2.84	52.68	74.00	-21.32
7386.00	37.08	Ave	17	1.4	H	2.84	39.92	54.00	-14.08
2318.01	46.90	PK	288	1.6	V	-13.19	33.71	74.00	-40.29
2318.01	38.72	Ave	288	1.6	V	-13.19	25.53	54.00	-28.47
2350.56	44.90	PK	151	1.9	H	-13.14	31.76	74.00	-42.24
2350.56	37.61	Ave	151	1.9	H	-13.14	24.47	54.00	-29.53
2483.55	42.43	PK	250	1.4	V	-13.08	29.35	74.00	-44.65
2483.55	36.17	Ave	250	1.4	V	-13.08	23.09	54.00	-30.91

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: Low Channel 2422MHz									
310.97	41.22	QP	98	1.9	H	-13.21	28.01	46.00	-17.99
310.97	47.84	QP	191	1.4	V	-13.21	34.63	46.00	-11.37
4844.00	48.32	PK	230	1.9	V	-1.06	47.26	74.00	-26.74
4844.00	42.69	Ave	230	1.9	V	-1.06	41.63	54.00	-12.37
7266.00	50.12	PK	254	1.4	H	1.33	51.45	74.00	-22.55
7266.00	36.24	Ave	254	1.4	H	1.33	37.57	54.00	-16.43
2318.69	45.12	PK	202	1.9	V	-13.19	31.93	74.00	-42.07
2318.69	37.20	Ave	202	1.9	V	-13.19	24.01	54.00	-29.99
2383.39	44.84	PK	182	1.7	H	-13.14	31.70	74.00	-42.30
2383.39	38.38	Ave	182	1.7	H	-13.14	25.24	54.00	-28.76
2497.95	44.99	PK	272	1.6	V	-13.08	31.91	74.00	-42.09
2497.95	38.94	Ave	272	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)
11n40: Middle Channel 2437MHz									
310.97	40.35	QP	355	1.9	H	-13.21	27.14	46.00	-18.86
310.97	47.58	QP	173	1.2	V	-13.21	34.37	46.00	-11.63
4874.00	47.33	PK	205	1.5	V	-0.62	46.71	74.00	-27.29
4874.00	43.29	Ave	205	1.5	V	-0.62	42.67	54.00	-11.33
7311.00	49.30	PK	66	1.7	H	2.21	51.51	74.00	-22.49
7311.00	37.23	Ave	66	1.7	H	2.21	39.44	54.00	-14.56
2323.53	45.80	PK	156	1.6	V	-13.19	32.61	74.00	-41.39
2323.53	38.06	Ave	156	1.6	V	-13.19	24.87	54.00	-29.13
2379.66	42.98	PK	147	1.5	H	-13.14	29.84	74.00	-44.16
2379.66	37.89	Ave	147	1.5	H	-13.14	24.75	54.00	-29.25
2497.26	43.18	PK	128	1.5	V	-13.08	30.10	74.00	-43.90
2497.26	37.40	Ave	128	1.5	V	-13.08	24.32	54.00	-29.68

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: High Channel 2452MHz									
310.97	39.78	QP	32	1.6	H	-13.21	26.57	46.00	-19.43
310.97	46.70	QP	116	1.7	V	-13.21	33.49	46.00	-12.51
4904.00	47.72	PK	94	1.3	V	-0.24	47.48	74.00	-26.52
4904.00	43.03	Ave	94	1.3	V	-0.24	42.79	54.00	-11.21
7356.00	49.56	PK	151	1.8	H	2.84	52.40	74.00	-21.60
7356.00	38.07	Ave	151	1.8	H	2.84	40.91	54.00	-13.09
2312.86	45.75	PK	88	2.0	V	-13.19	32.56	74.00	-41.44
2312.86	37.46	Ave	88	2.0	V	-13.19	24.27	54.00	-29.73
2383.68	43.70	PK	253	1.4	H	-13.14	30.56	74.00	-43.44
2383.68	36.91	Ave	253	1.4	H	-13.14	23.77	54.00	-30.23
2499.22	44.75	PK	62	1.6	V	-13.08	31.67	74.00	-42.33
2499.22	36.92	Ave	62	1.6	V	-13.08	23.84	54.00	-30.16

Test Frequency: 8GHz~25GHz

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

BLE:

Test Frequency: 9KHz~30MHz

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

Test Frequency : 30MHz ~ 8GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel 2402MHz									
314.58	38.92	QP	11	1.8	H	-11.88	27.04	46.00	-18.96
314.58	45.95	QP	41	1.8	V	-11.88	34.07	46.00	-11.93
4804.00	51.26	PK	63	1.7	V	-1.06	50.20	74.00	-23.80
4804.00	38.82	Ave	63	1.7	V	-1.06	37.76	54.00	-16.24
7206.00	44.28	PK	341	1.6	H	1.33	45.61	74.00	-28.39
7206.00	35.38	Ave	341	1.6	H	1.33	36.71	54.00	-17.29
2312.42	45.83	PK	274	1.7	V	-13.19	32.64	74.00	-41.36
2312.42	37.24	Ave	274	1.7	V	-13.19	24.05	54.00	-29.95
2367.42	44.46	PK	84	1.8	H	-13.14	31.32	74.00	-42.68
2367.42	38.62	Ave	84	1.8	H	-13.14	25.48	54.00	-28.52
2487.29	44.44	PK	94	1.4	V	-13.08	31.36	74.00	-42.64
2487.29	36.07	Ave	94	1.4	V	-13.08	22.99	54.00	-31.01

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Middle Channel 2440MHz									
314.58	39.69	QP	85	1.2	H	-13.35	26.34	46.00	-19.66
314.58	46.44	QP	335	1.9	V	-13.35	33.09	46.00	-12.91
4880.00	50.25	PK	71	1.9	V	-0.62	49.63	74.00	-24.37
4880.00	37.75	Ave	71	1.9	V	-0.62	37.13	54.00	-16.87
7320.00	44.21	PK	240	2.0	H	2.21	46.42	74.00	-27.58
7320.00	35.96	Ave	240	2.0	H	2.21	38.17	54.00	-15.83
2346.62	45.04	PK	281	1.3	V	-13.19	31.85	74.00	-42.15
2346.62	37.09	Ave	281	1.3	V	-13.19	23.90	54.00	-30.10
2372.02	43.69	PK	239	1.4	H	-13.14	30.55	74.00	-43.45
2372.02	38.66	Ave	239	1.4	H	-13.14	25.52	54.00	-28.48
2486.43	44.75	PK	274	1.6	V	-13.08	31.67	74.00	-42.33
2486.43	36.51	Ave	274	1.6	V	-13.08	23.43	54.00	-30.57

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK High Channel 2480MHz									
314.58	39.10	QP	43	1.6	H	-13.35	25.75	46.00	-20.25
314.58	38.46	QP	331	1.8	V	-13.35	25.11	46.00	-20.89
4960.00	51.31	PK	348	1.9	V	-0.24	51.07	74.00	-22.93
4960.00	39.20	Ave	348	1.9	V	-0.24	38.96	54.00	-15.04
7440.00	43.98	PK	333	1.9	H	2.84	46.82	74.00	-27.18
7440.00	35.45	Ave	333	1.9	H	2.84	38.29	54.00	-15.71
2341.14	45.87	PK	129	1.6	V	-13.19	32.68	74.00	-41.32
2341.14	37.83	Ave	129	1.6	V	-13.19	24.64	54.00	-29.36
2352.28	42.67	PK	274	1.8	H	-13.14	29.53	74.00	-44.47
2352.28	38.72	Ave	274	1.8	H	-13.14	25.58	54.00	-28.42
2499.08	44.35	PK	279	1.5	V	-13.08	31.27	74.00	-42.73
2499.08	37.52	Ave	279	1.5	V	-13.08	24.44	54.00	-29.56

Test Frequency: 8GHz~25GHz

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

9 Duty Cycle

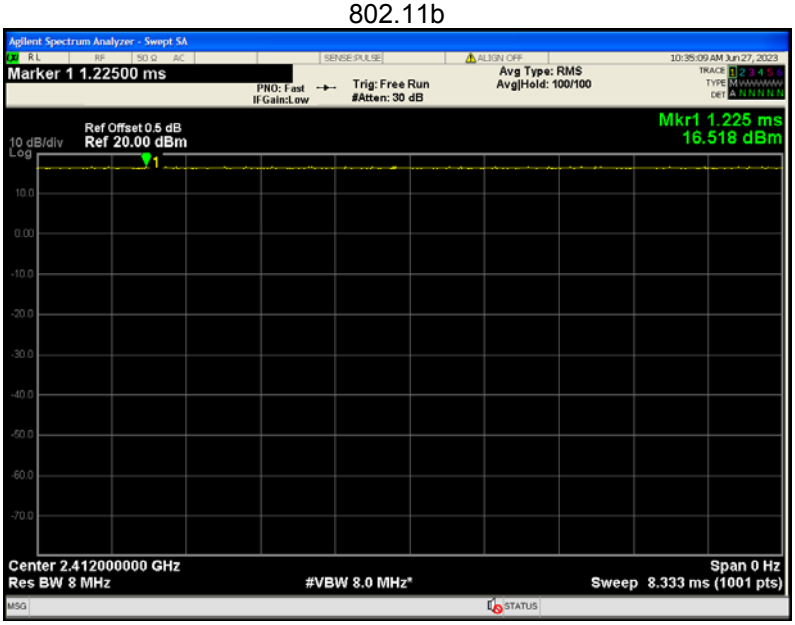
Modulation	On time(ms)	Period(ms)	Duty Cycle(%)	Duty Cycle Factor(dB)	Average Factor(dB)
802.11b	8.333	8.333	100	0	0
802.11g	8.333	8.333	100	0	0
802.11n20	8.333	8.333	100	0	0
802.11n40	8.333	8.333	100	0	0

Remark:

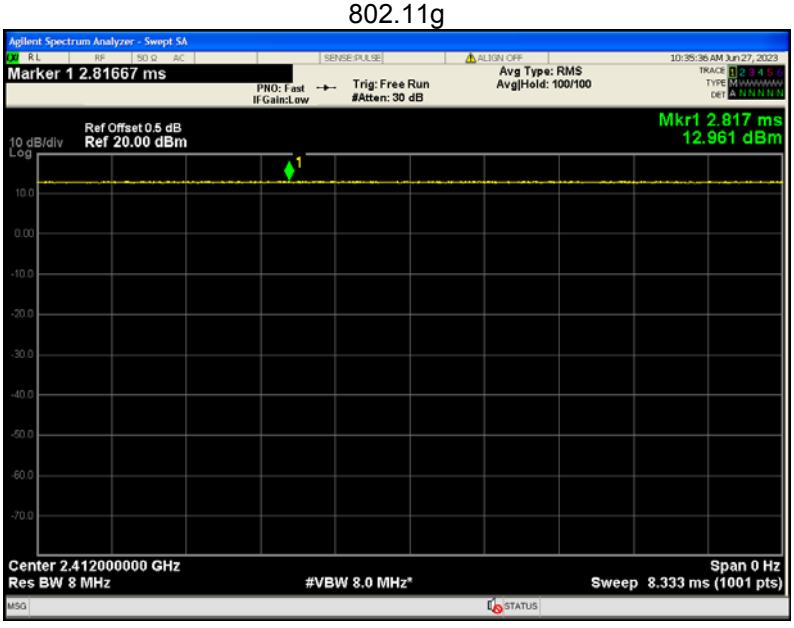
1) Duty Cycle=On Time/Period
2) Duty Cycle Factor=10*log(1/Duty cycle)
3) Average Factor=20 $\log_{10}$ Duty Cycle

Test Plot

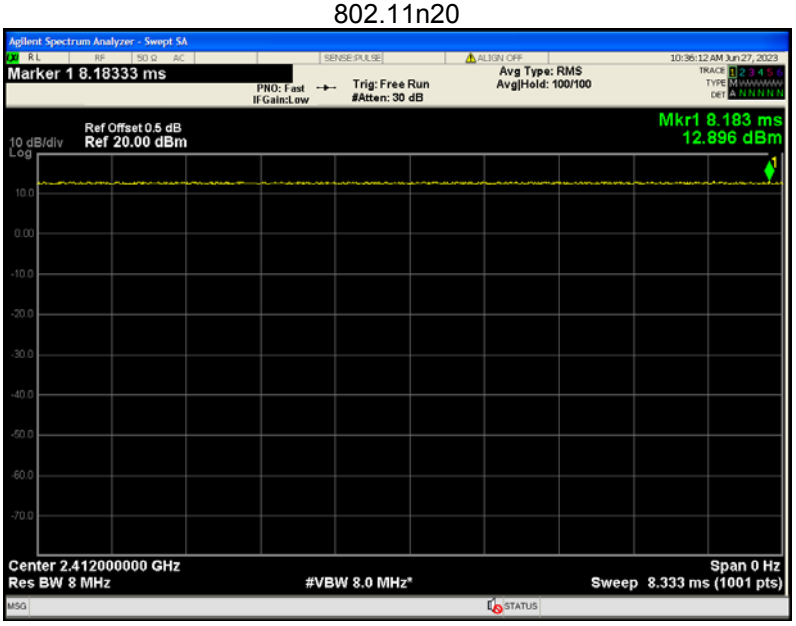
802.11b



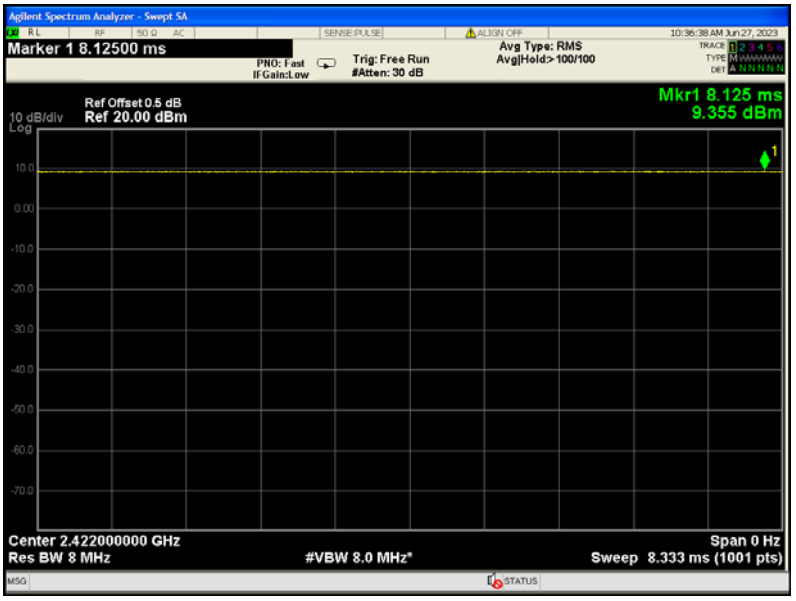
802.11g



802.11n20



802.11n40



10 Conducted Spurious Emissions

Test Requirement: FCC 47CFR Part 15 Section 15.247

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

Test Result: PASS

Limit:

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

10.1 Test Procedure

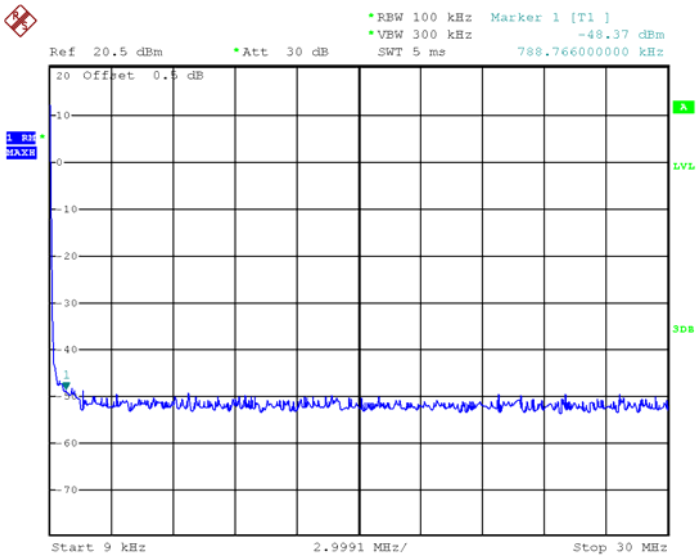
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
   a) Set instrument center frequency to DTS channel center frequency.
   b) Set the span to _ 1.5 times the DTS bandwidth.
   c) Set the RBW = 100 kHz.
   d) Set the VBW _ [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.

10.2 Test Result

9KHz – 30MHz

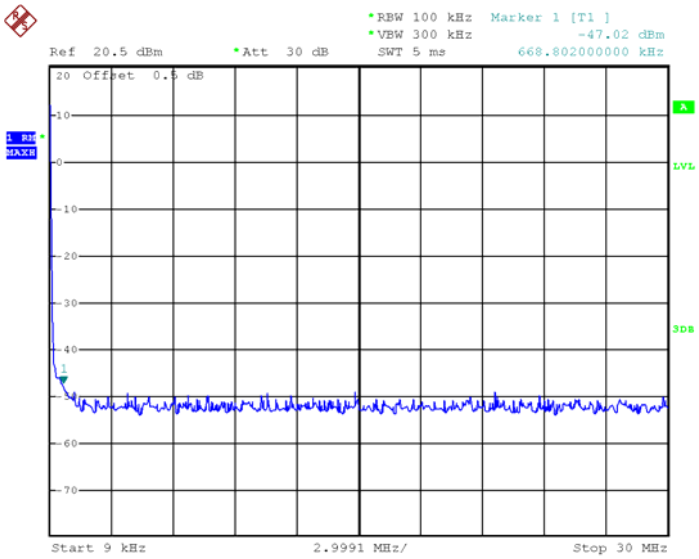
802.11b

Low Channel



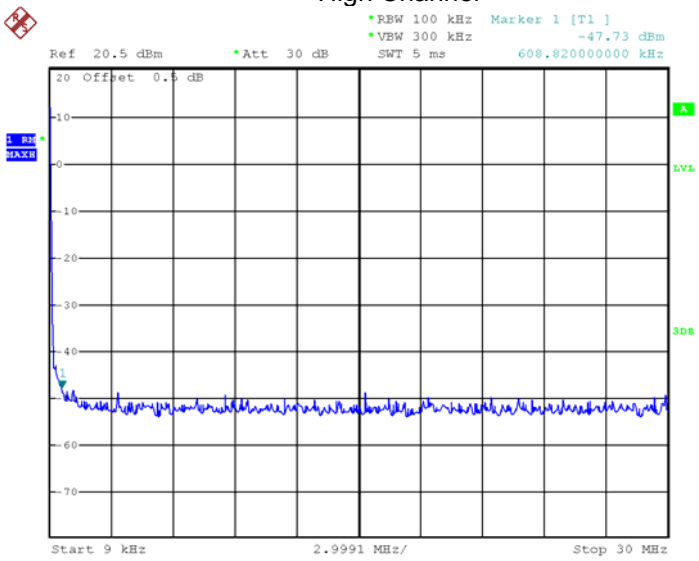
Date: 27.JUN.2023 17:00:44

Middle Channel



Date: 27.JUN.2023 17:01:01

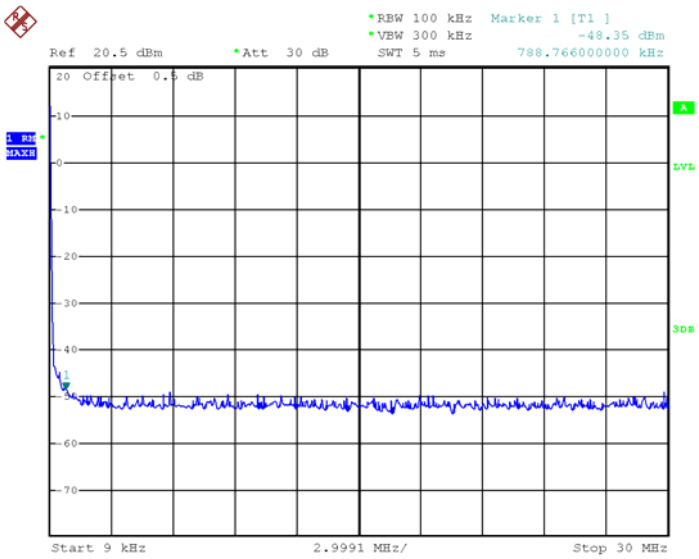
High Channel



Date: 27.JUN.2023 17:01:22

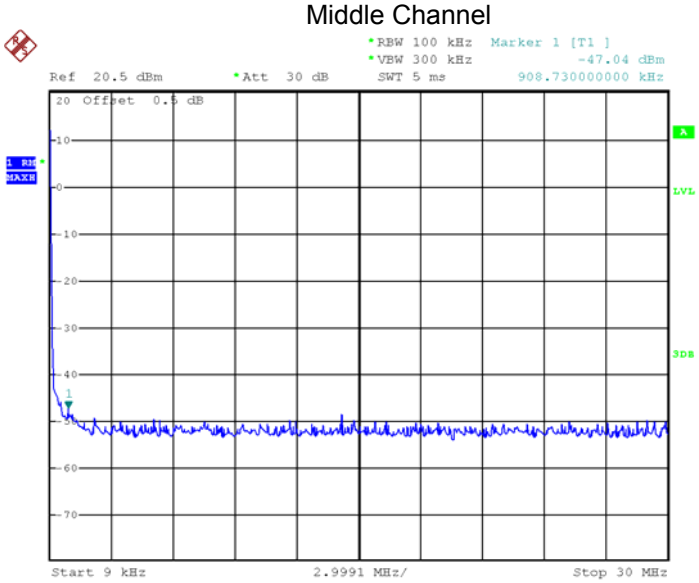
802.11g

Low Channel



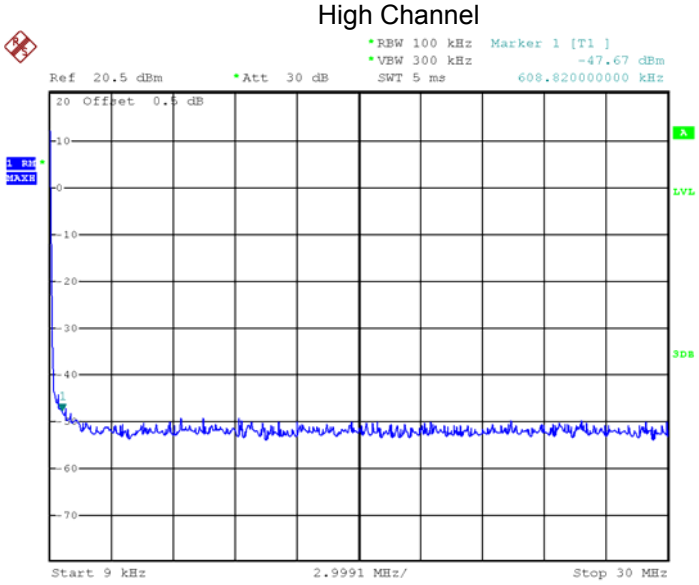
Date: 27.JUN.2023 17:01:49

Middle Channel



Date: 27.JUN.2023 17:02:07

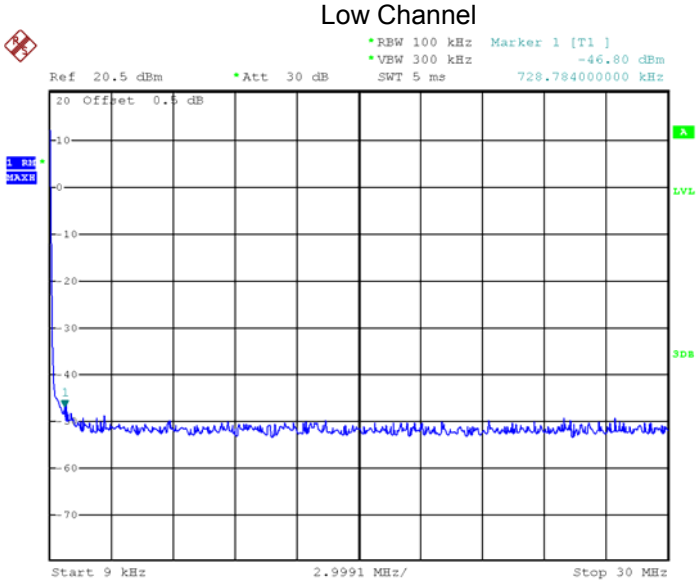
High Channel



Date: 27.JUN.2023 17:02:28

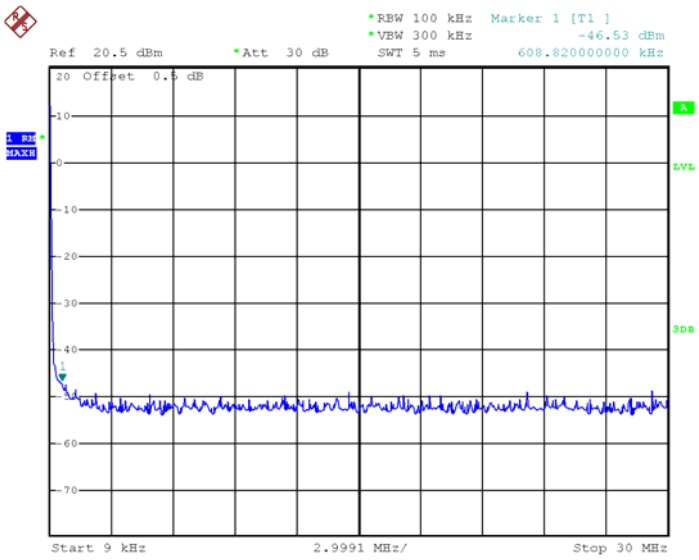
802.11n HT20

Low Channel



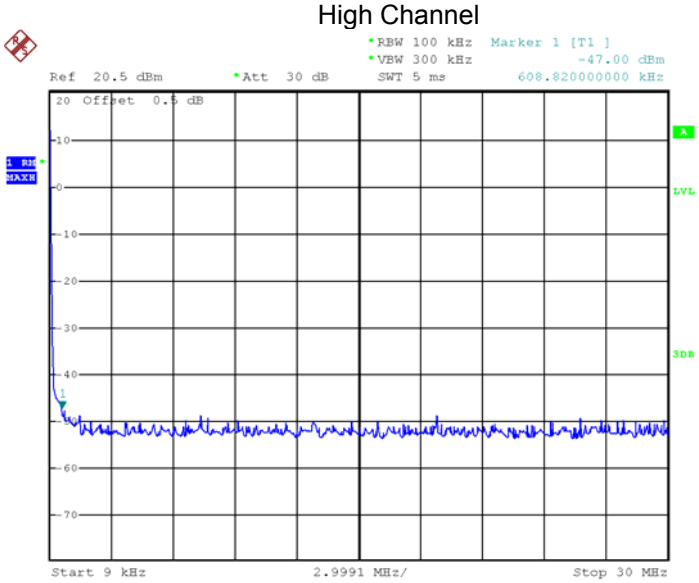
Date: 27.JUN.2023 17:02:53

Middle Channel



Date: 27.JUN.2023 17:03:08

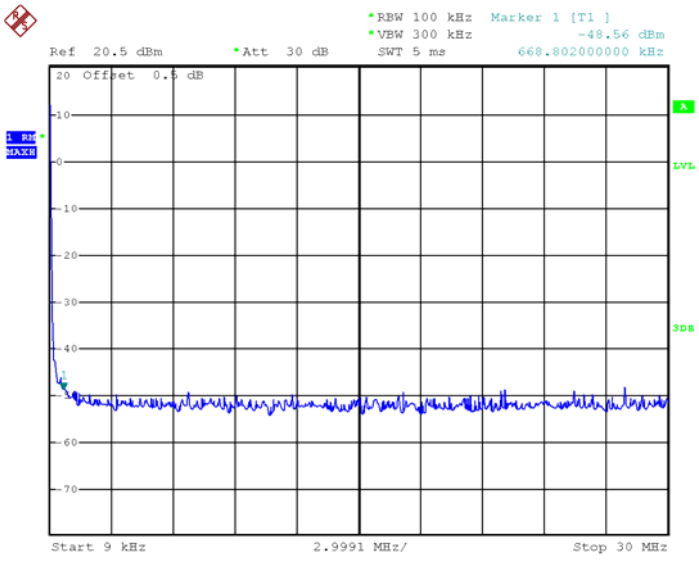
High Channel



Date: 27.JUN.2023 17:03:24

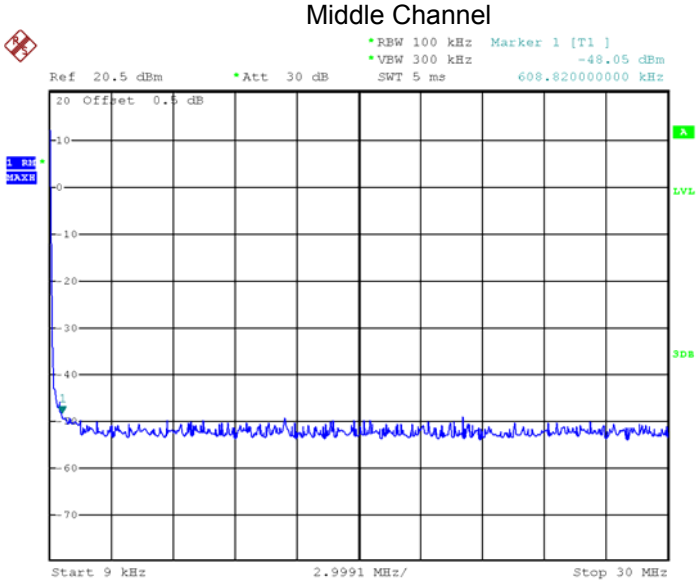
802.11n HT40

Low Channel



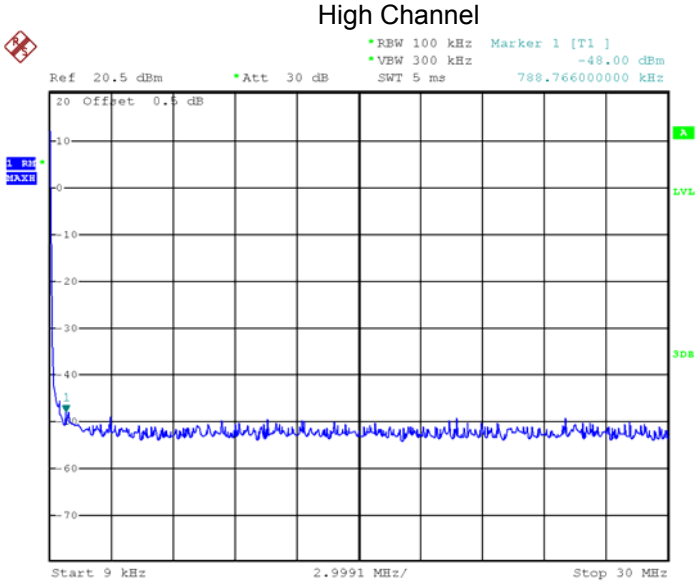
Date: 27.JUN.2023 17:03:43

Middle Channel



Date: 27.JUN.2023 17:04:00

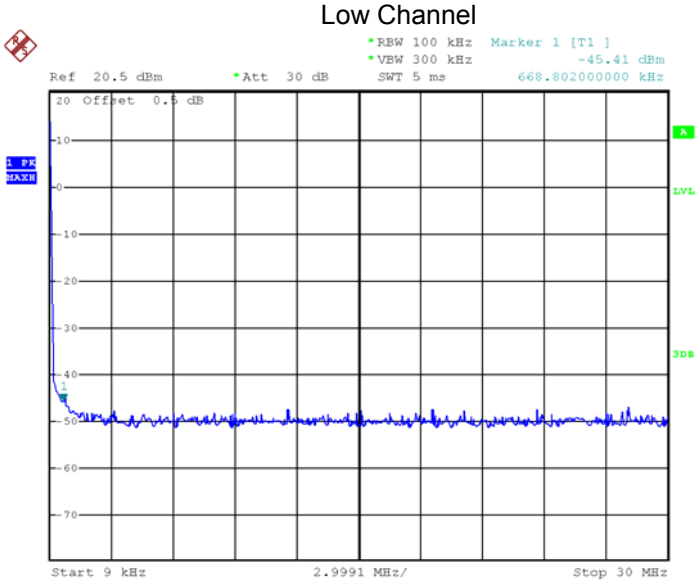
High Channel



Date: 27.JUN.2023 17:04:13

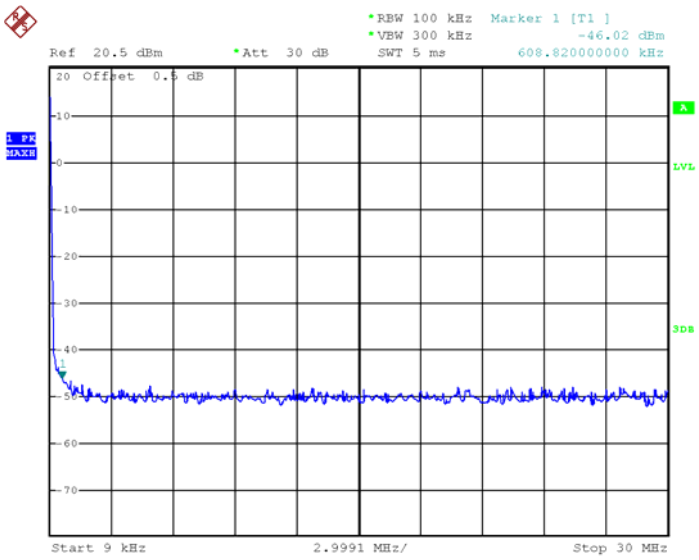
BLE

Low Channel



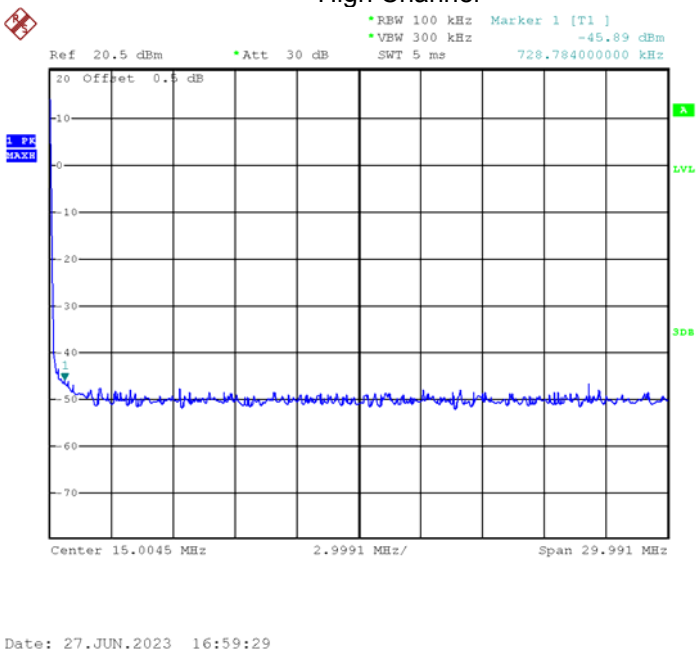
Date: 27.JUN.2023 16:59:00

Middle Channel



Date: 27.JUN.2023 16:59:14

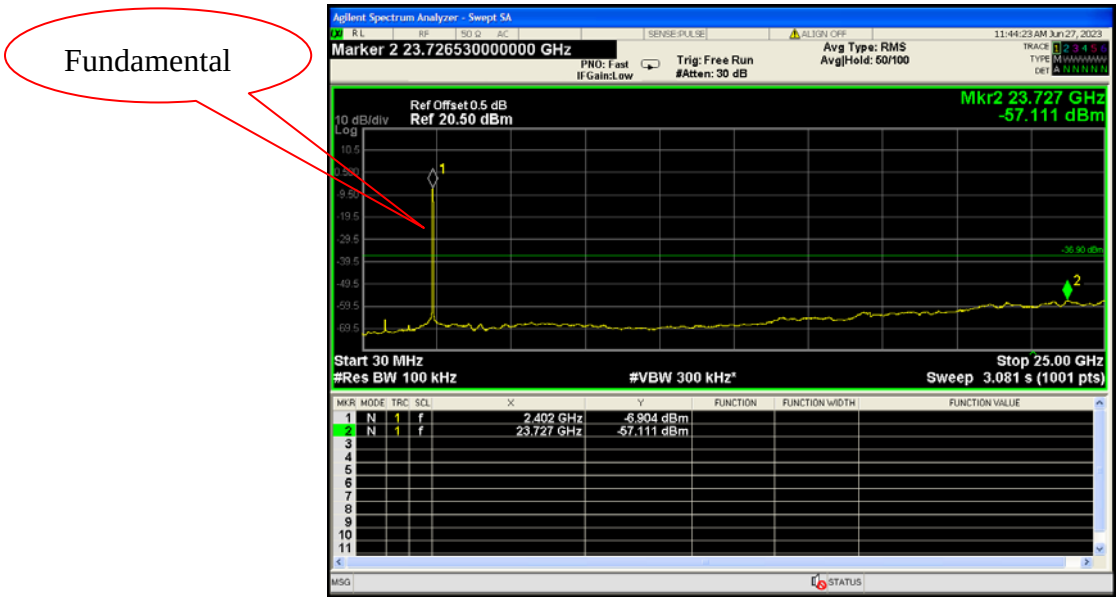
High Channel



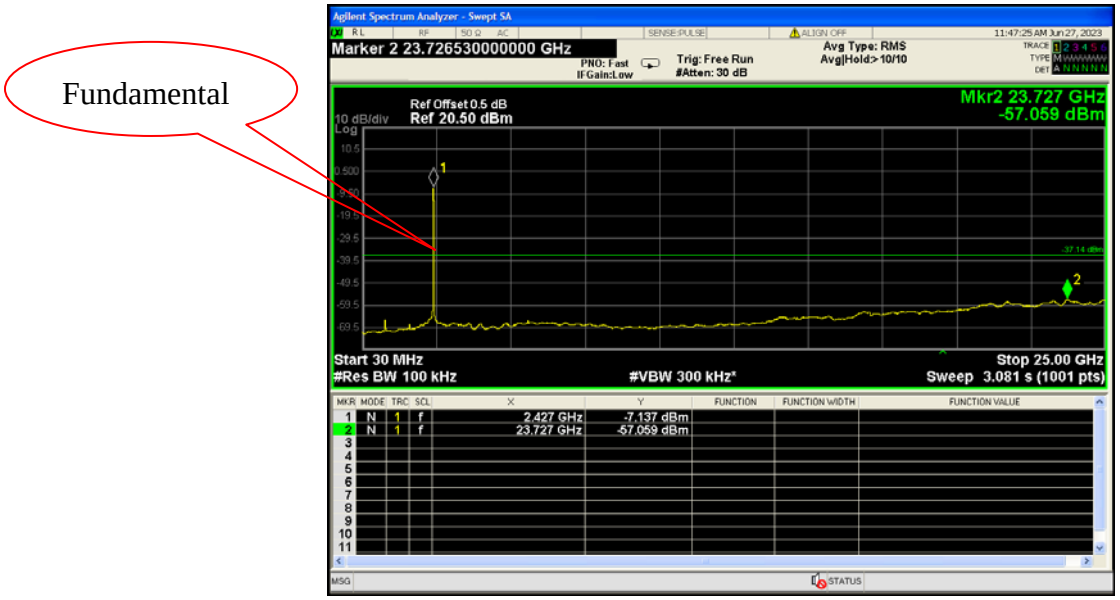
Above 30MHz

802.11b

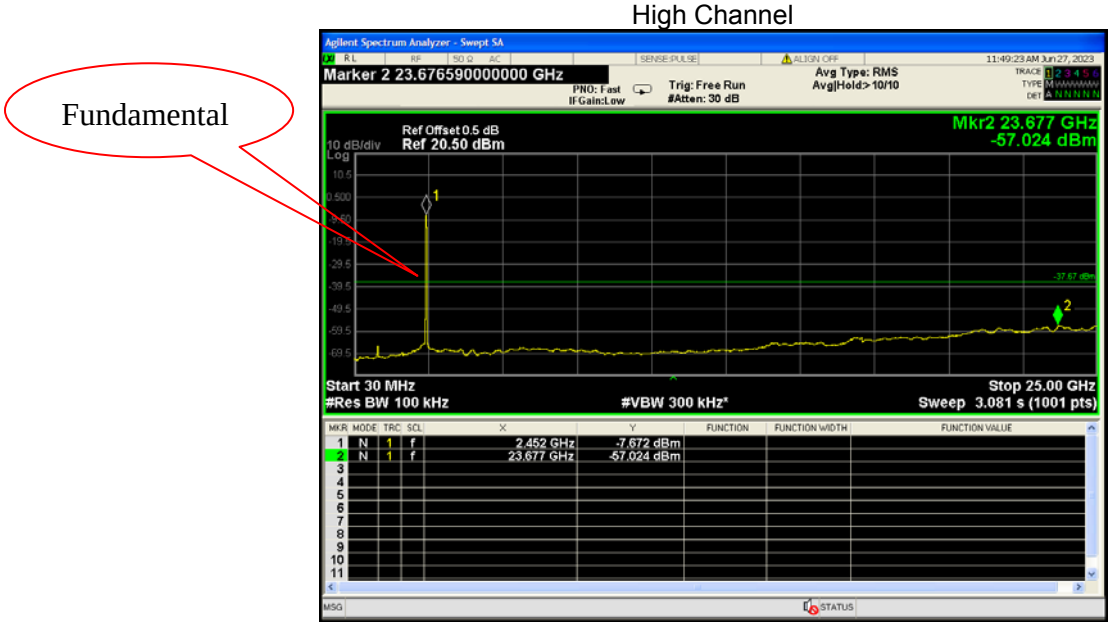
Low Channel



Middle Channel

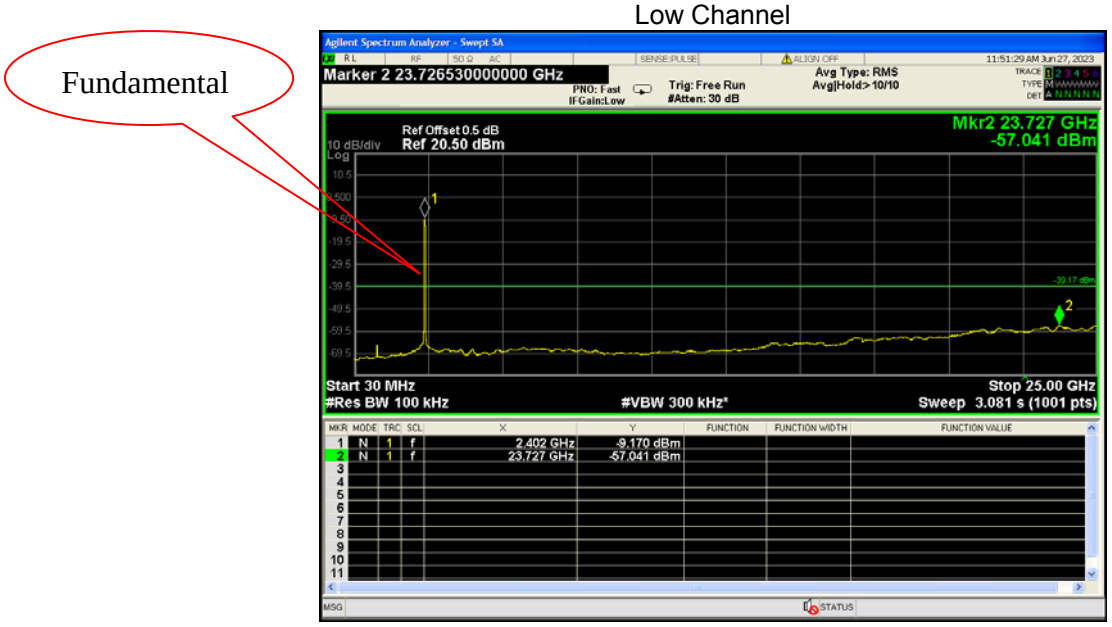


High Channel

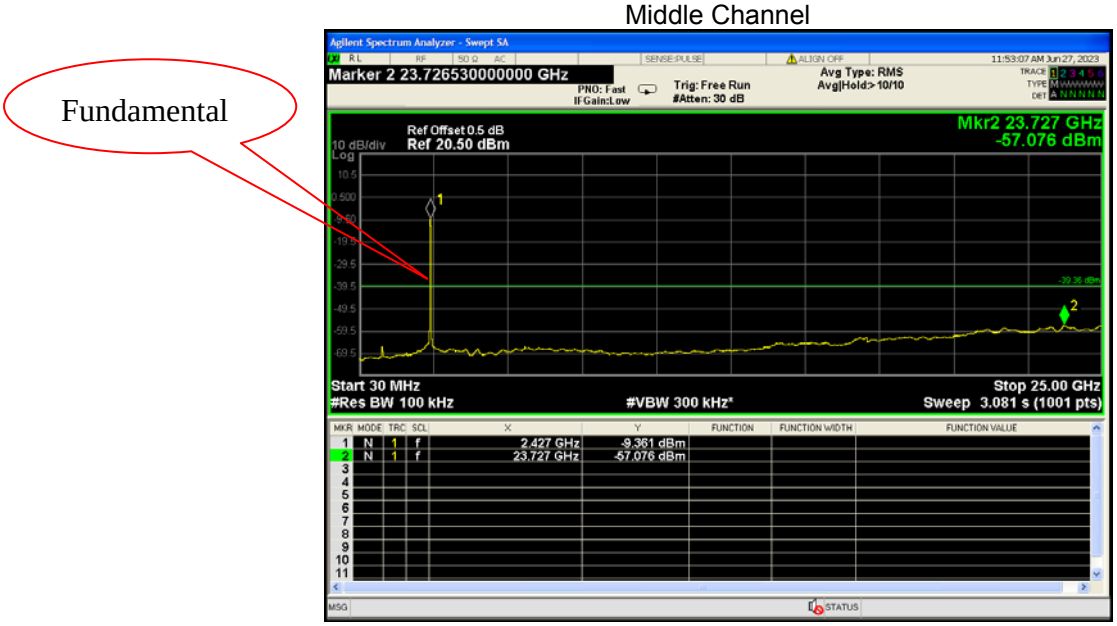


802.11g

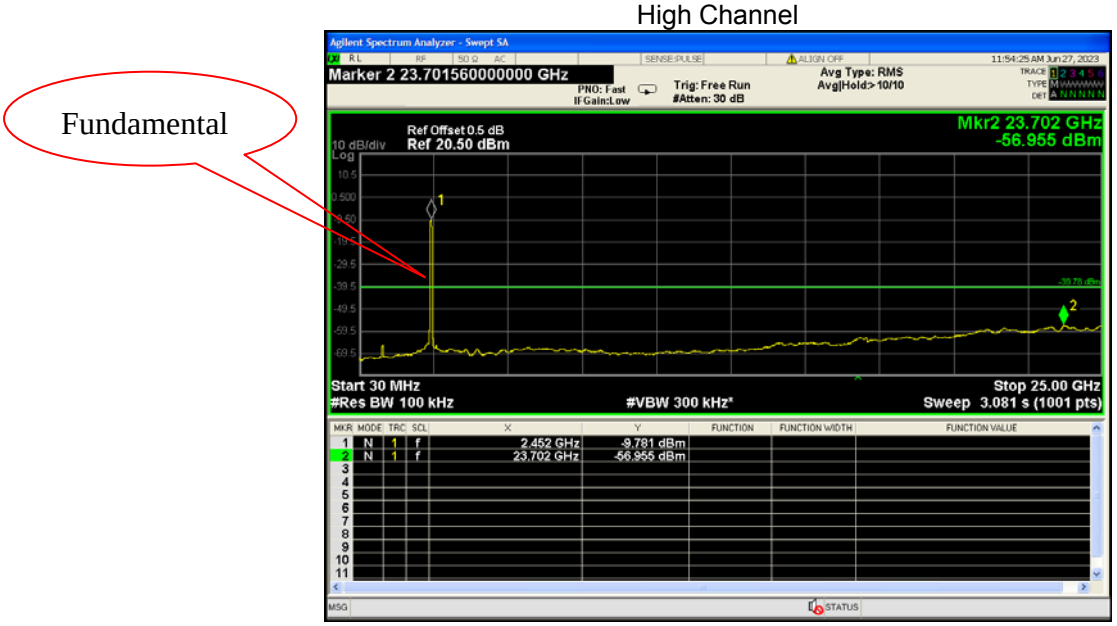
Low Channel



Middle Channel

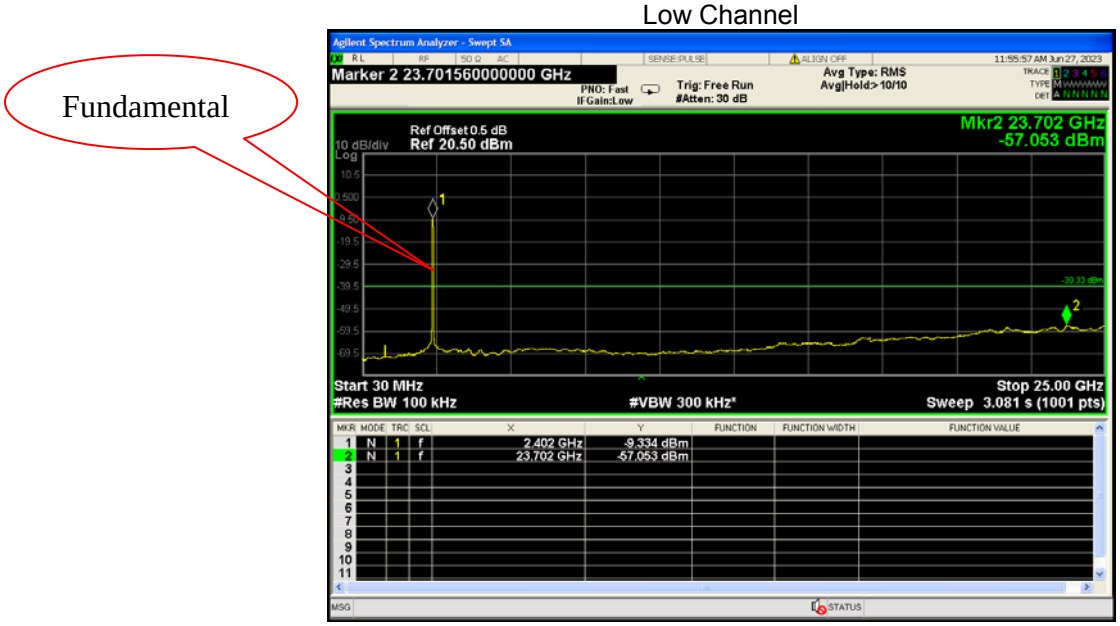


High Channel

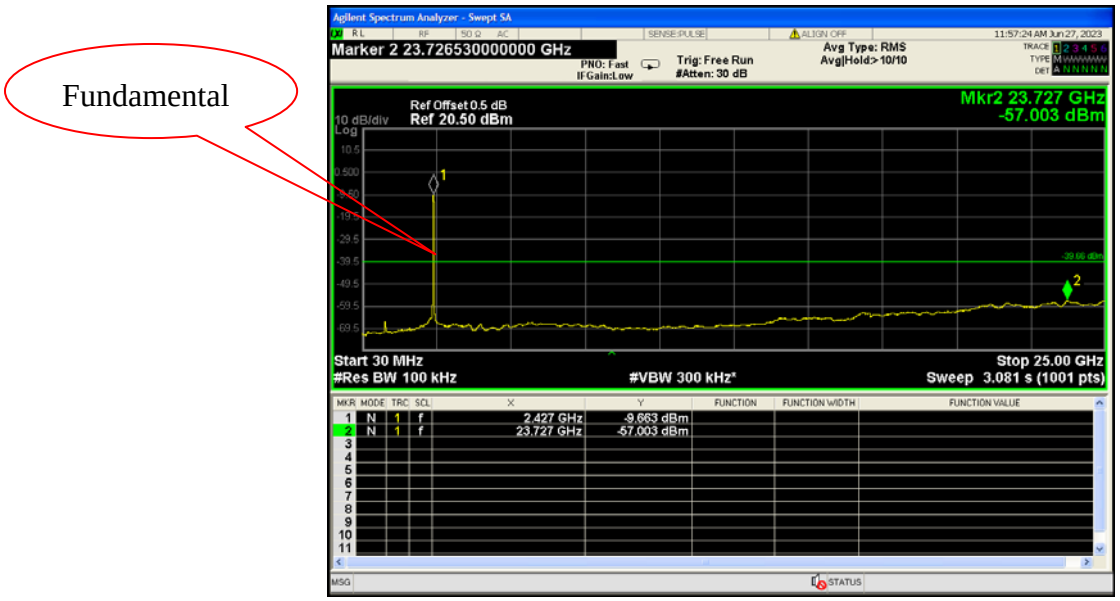


802.11n HT20

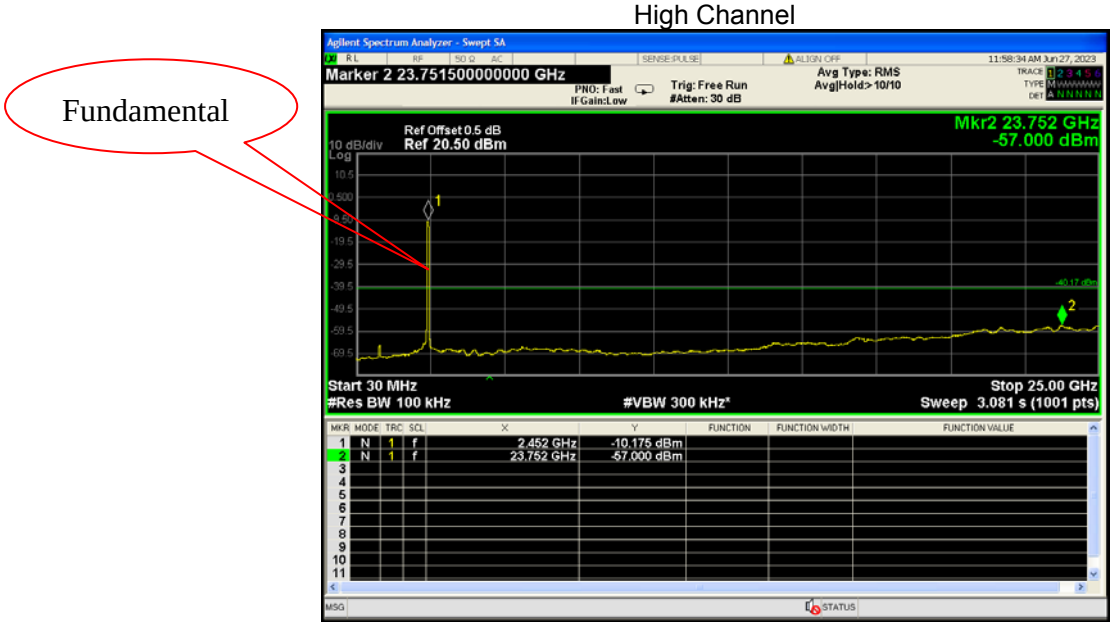
Low Channel



Middle Channel

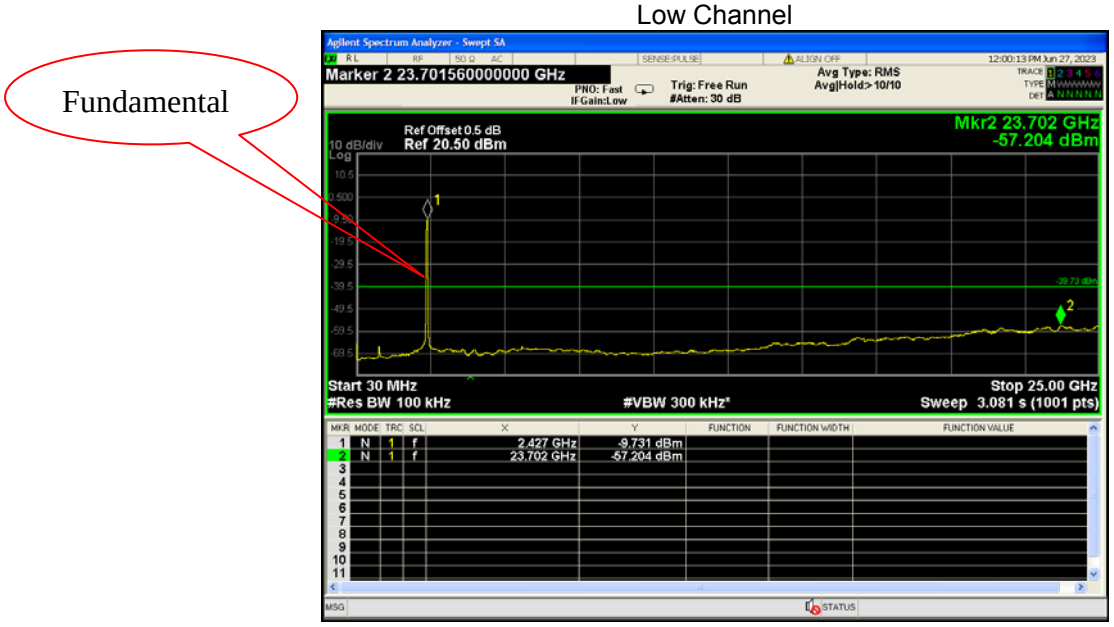


High Channel

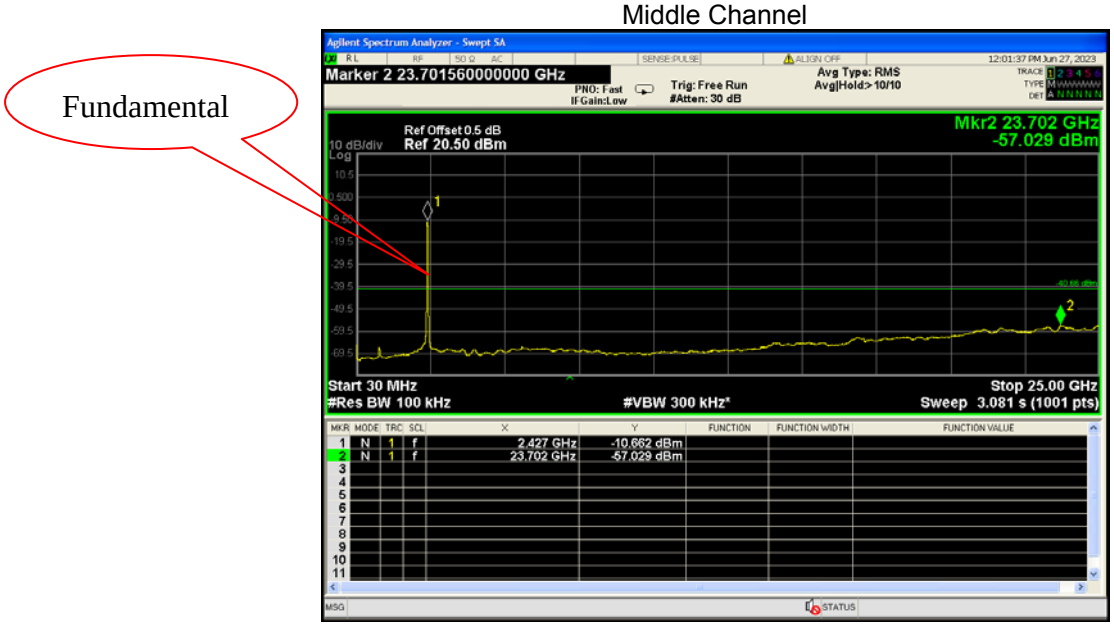


802.11n HT40

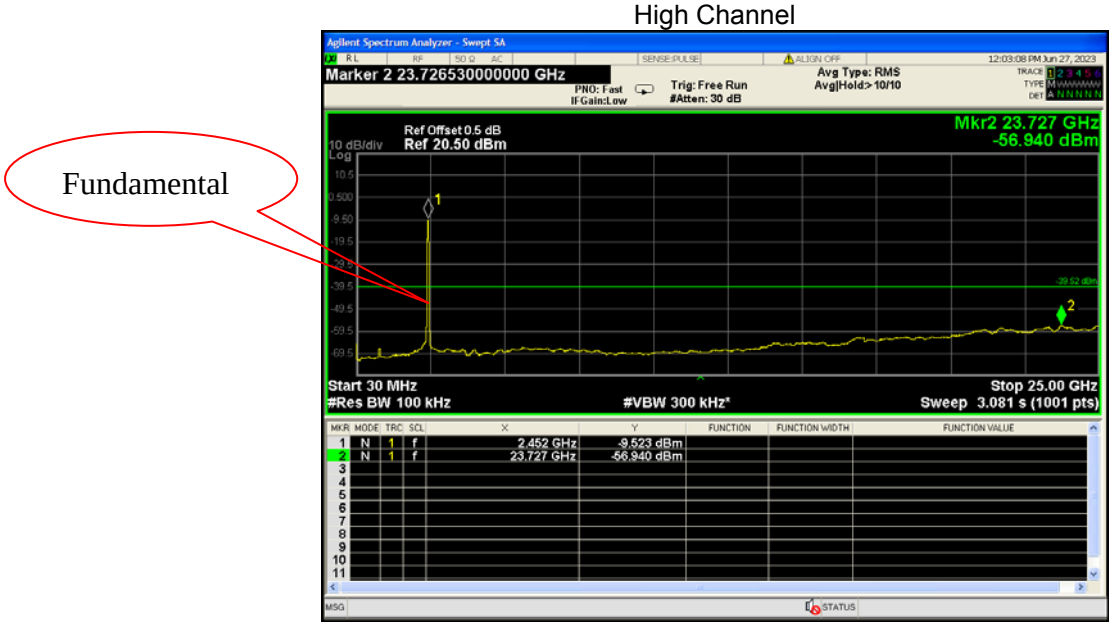
Low Channel



Middle Channel

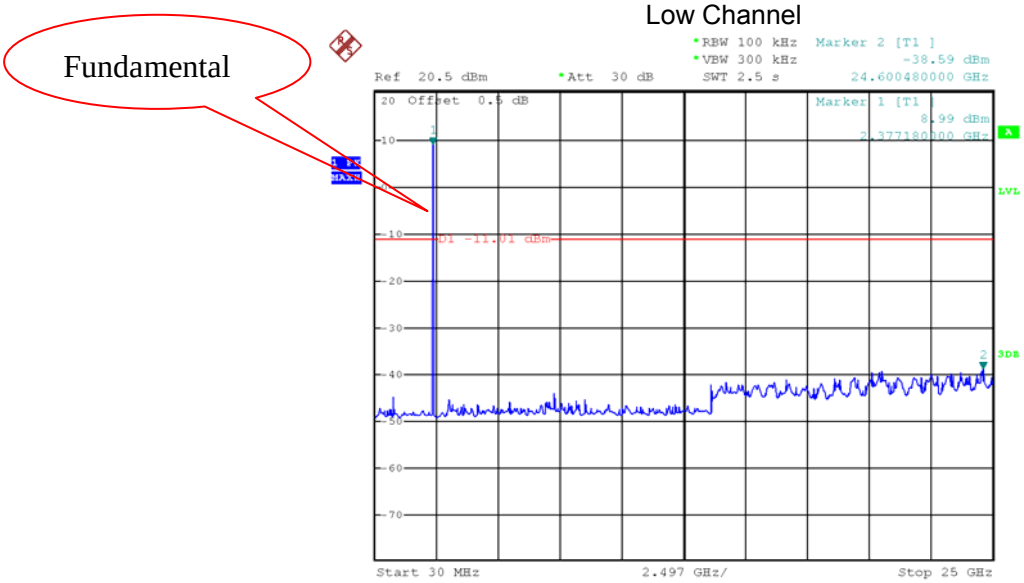


High Channel

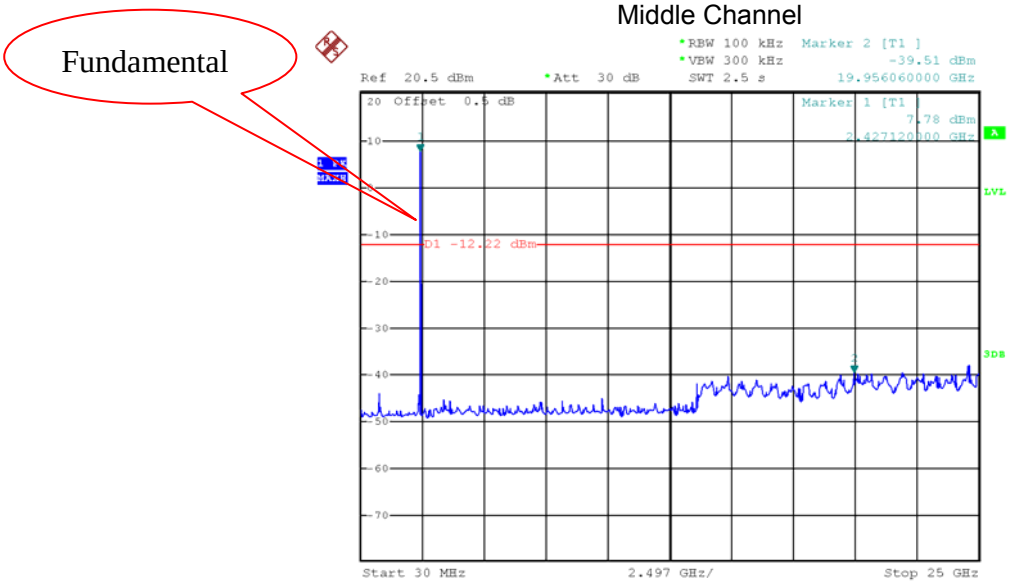


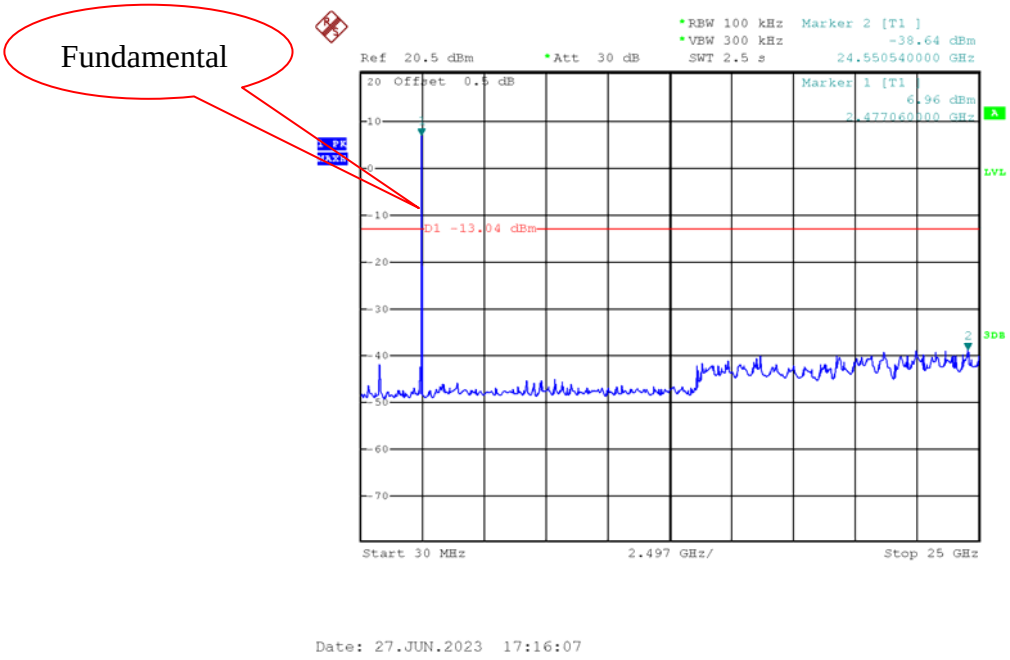
BLE

Low Channel



Middle Channel




Fundamental
RBW 100 kHz
VBW 300 kHz
SWT 2.5 s
Marker 2 [T1]
-38.64 dBm
24.550540000 GHz
Ref 20.5 dBm
Att 30 dB
20 Offset 0.5 dB
Marker 1 [T1]
6.96 dBm
2.477060000 GHz
D1 -13.04 dBm
LVL
3DB
Start 30 MHz
2.497 GHz/
Stop 25 GHz
Date: 27.JUN.2023 17:16:07

11 Band Edge Measurement

Test Requirement: FCC 47CFR Part 15 Section 15.247

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

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

Test Mode: Transmitting

11.1 Test Produce

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

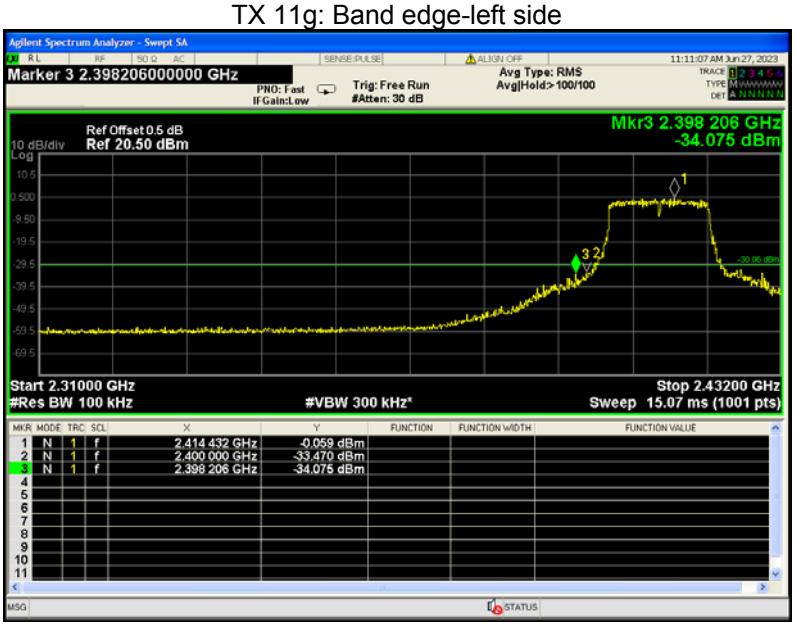
11.2 Test Result

Test result plots shown as follows:

TX 11b: Band edge-left side

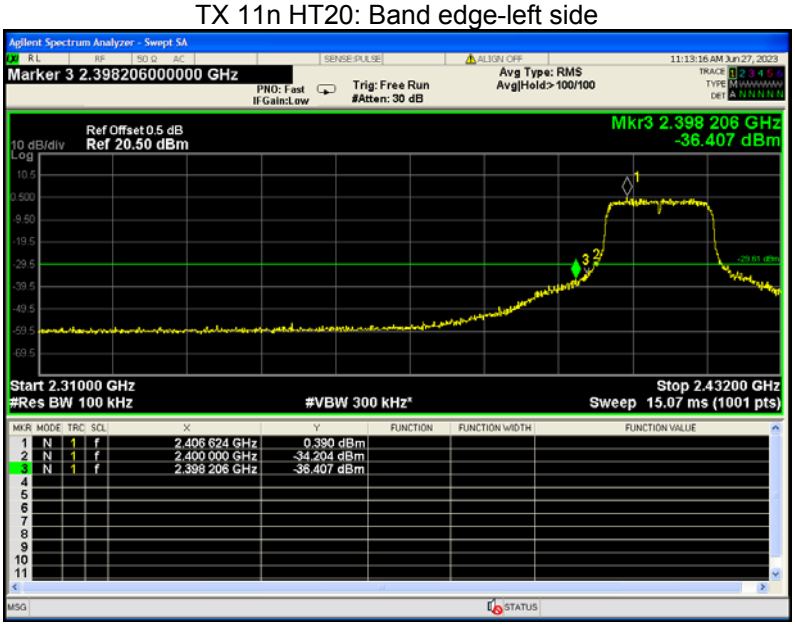
TX 11b: Band edge-right side

TX 11g: Band edge-left side

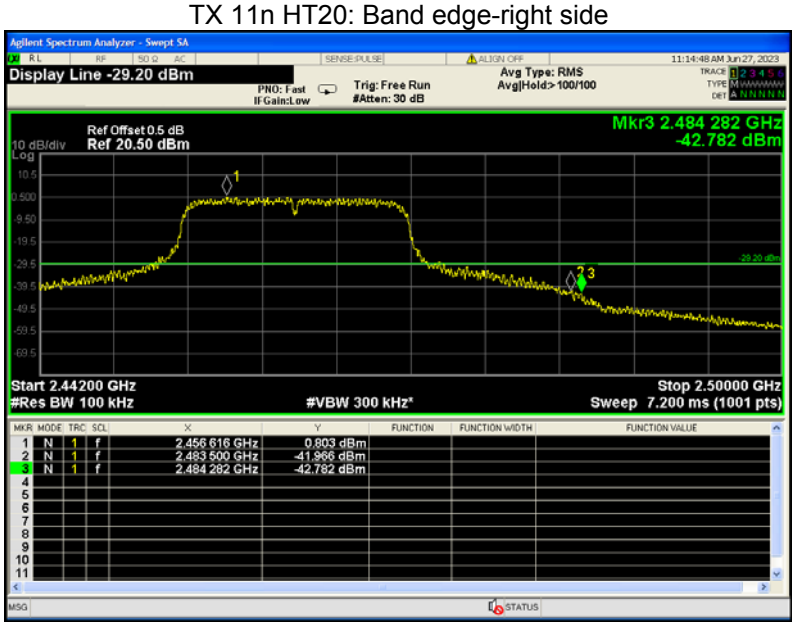


TX 11g: Band edge-right side

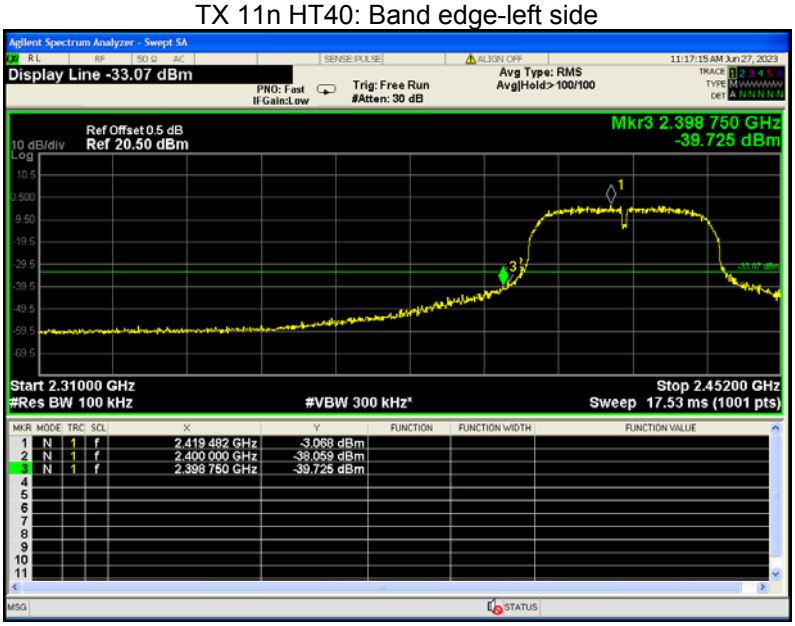
TX 11n HT20: Band edge-left side



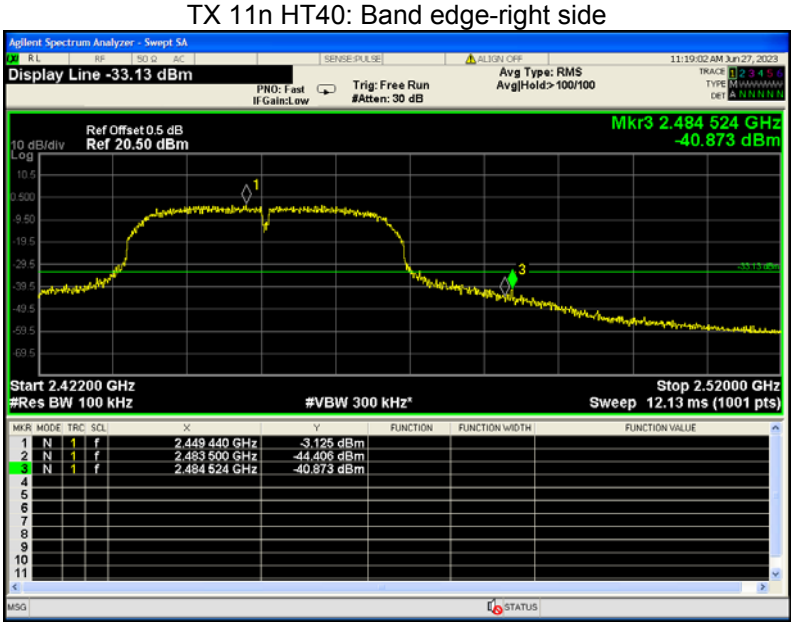
TX 11n HT20: Band edge-right side



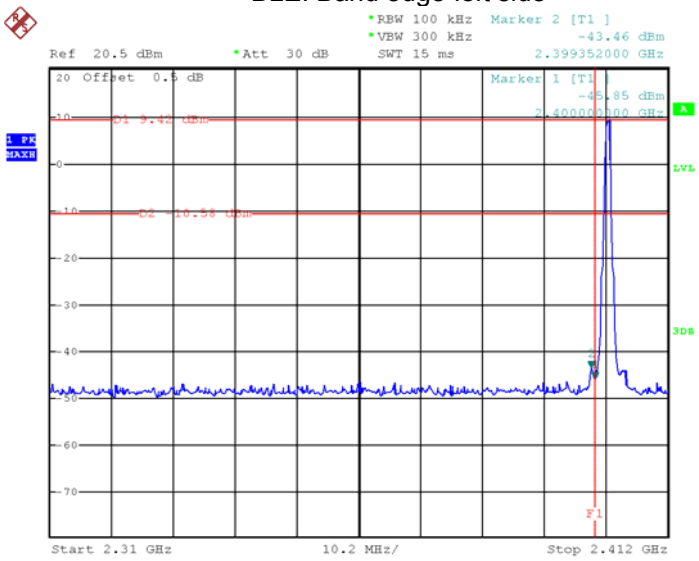
TX 11n HT40: Band edge-left side



TX 11n HT40: Band edge-right side

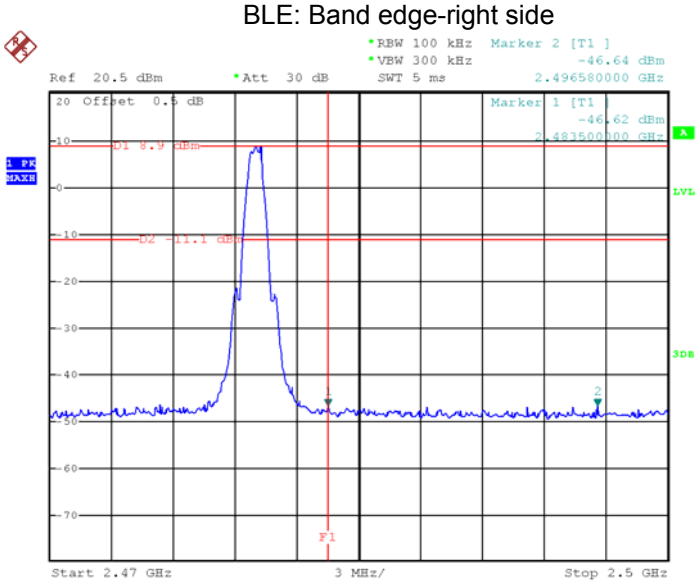


BLE: Band edge-left side



Date: 27.JUN.2023 16:39:13

BLE: Band edge-right side



Date: 27.JUN.2023 16:38:09

12 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC 47CFR Part 15 Section 15.247

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

12.1 Test Procedure

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

2. 6dB Bandwidth Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz

99% Bandwidth Set the spectrum analyzer : RBW = 1~5% DTS OBW, VBW = 3 RBW

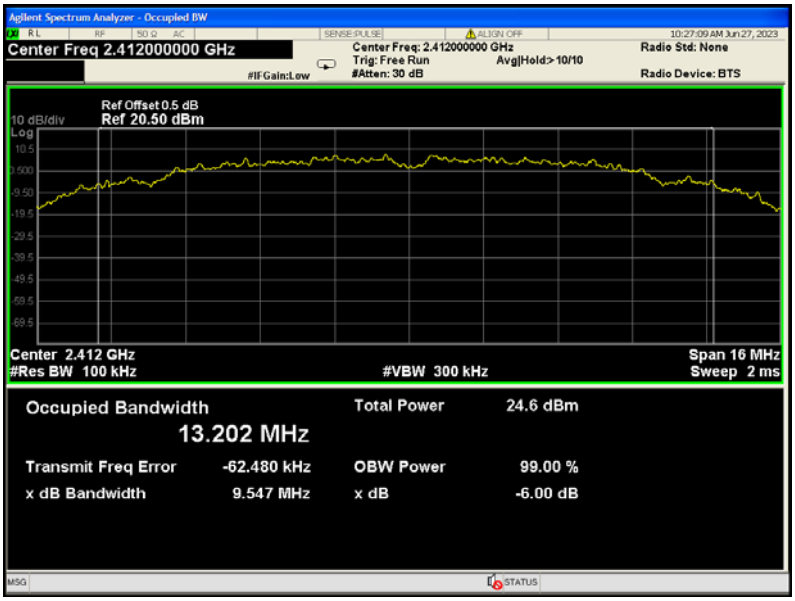
12.2 Test Result

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	9.547	13.376
	Channel 6	9.546	13.216
	Channel 11	9.544	13.216
TX 11g	Channel 1	16.360	16.450
	Channel 6	16.360	16.450
	Channel 11	16.360	16.450
TX 11n HT20	Channel 1	16.880	17.226
	Channel 6	16.960	17.172
	Channel 11	16.990	17.226
TX 11n HT40	Channel 3	31.860	33.990
	Channel 6	31.560	33.990
	Channel 9	31.870	33.990
BLE	Channel 0	0.649	1.016
	Channel 19	0.648	1.017
	Channel 39	0.645	1.019

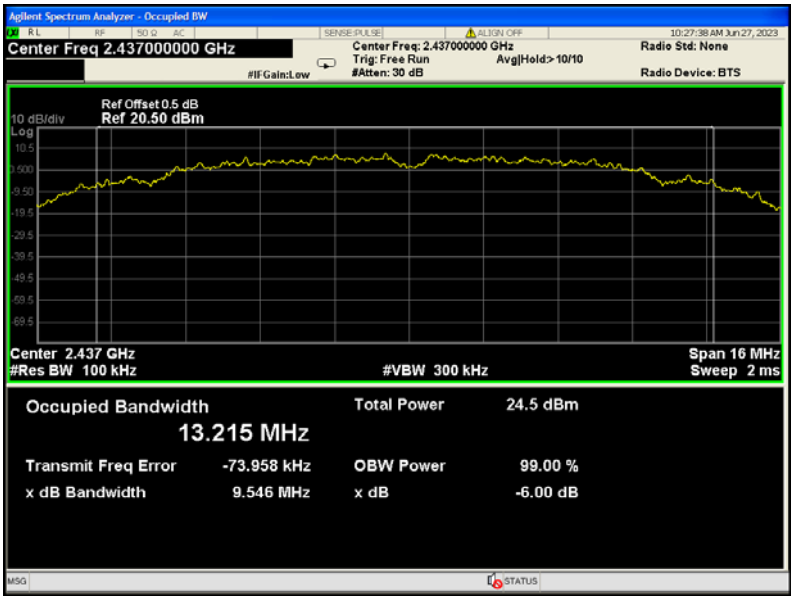
Test result plot:

6dB Bandwidth

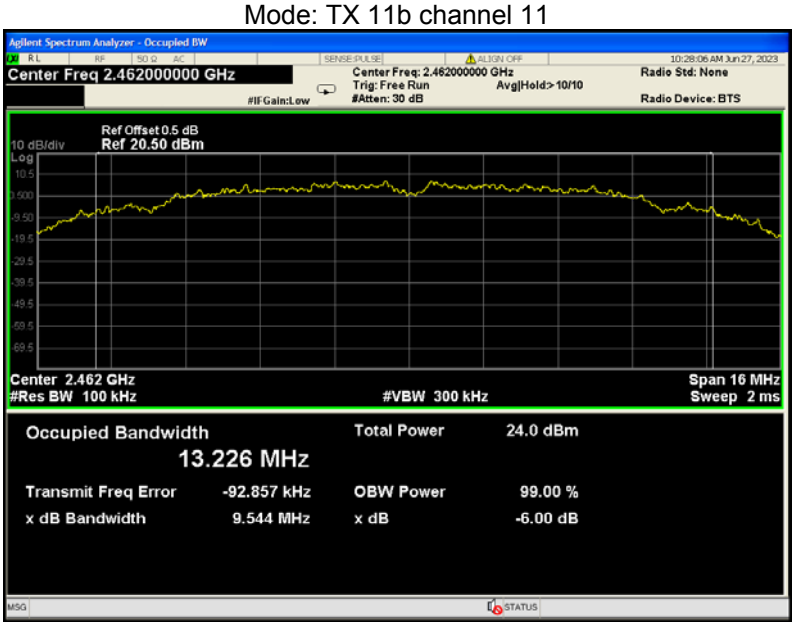
Mode: TX 11b channel 1



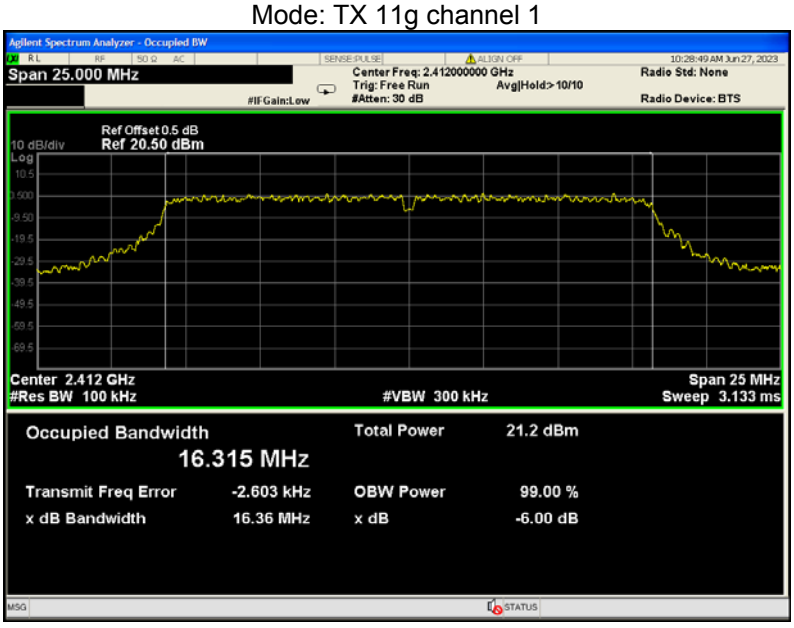
Mode: TX 11b channel 6



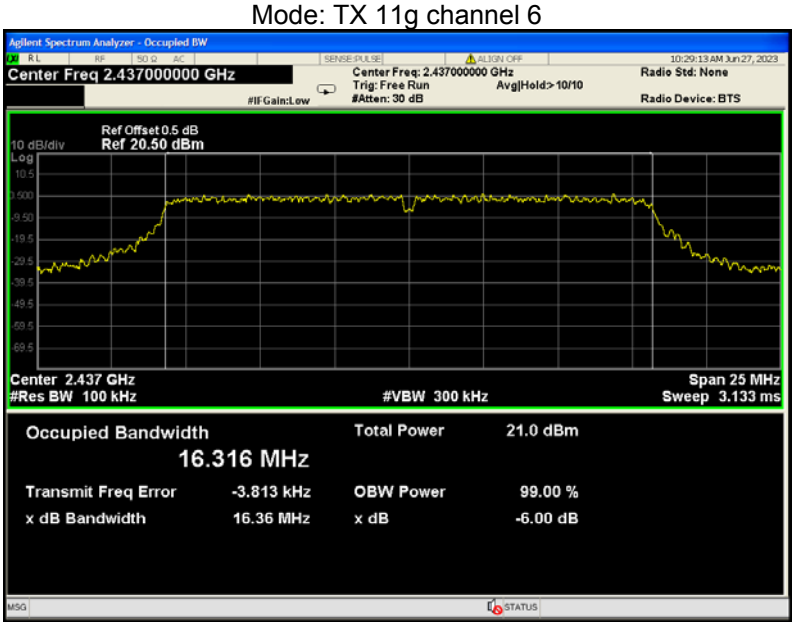
Mode: TX 11b channel 11



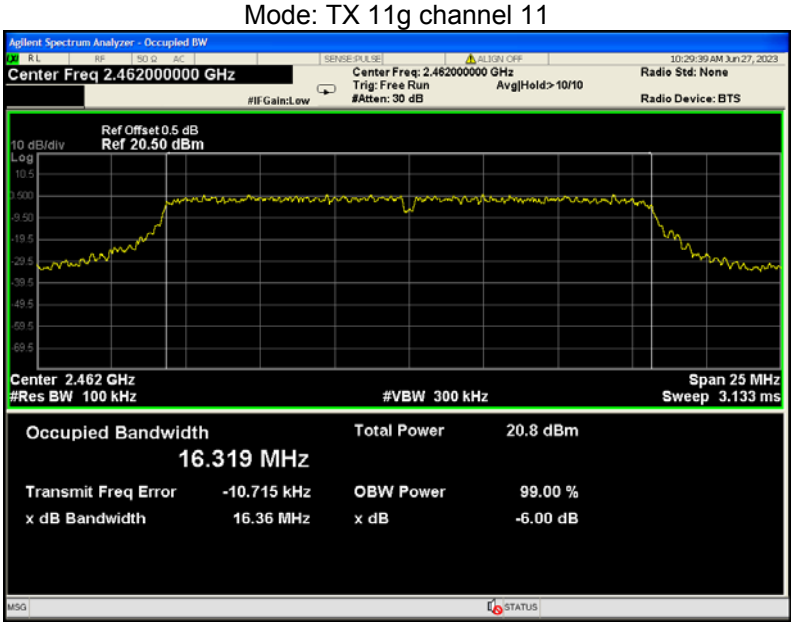
Mode: TX 11g channel 1



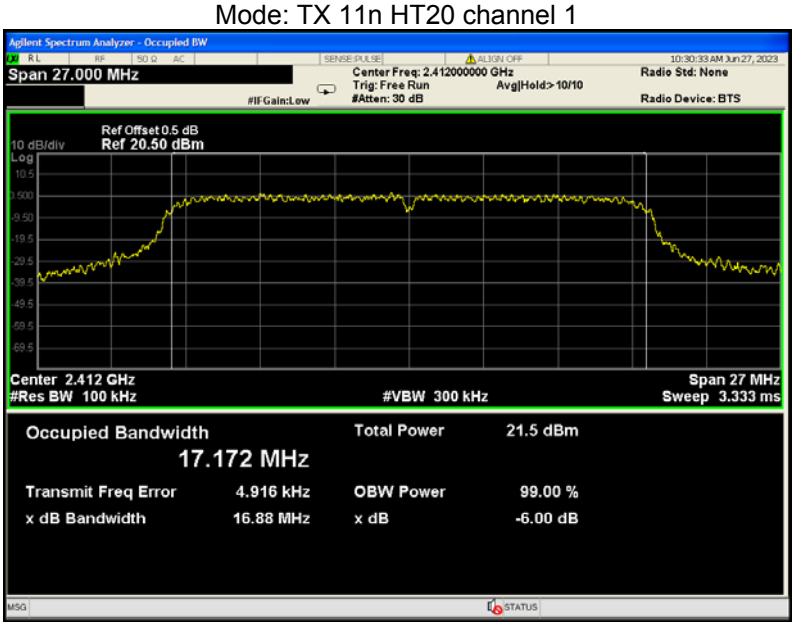
Mode: TX 11g channel 6



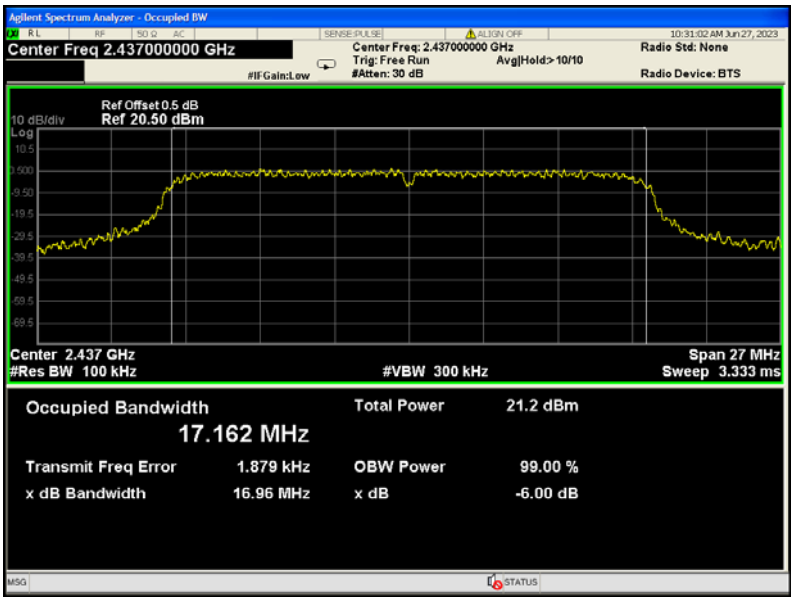
Mode: TX 11g channel 11



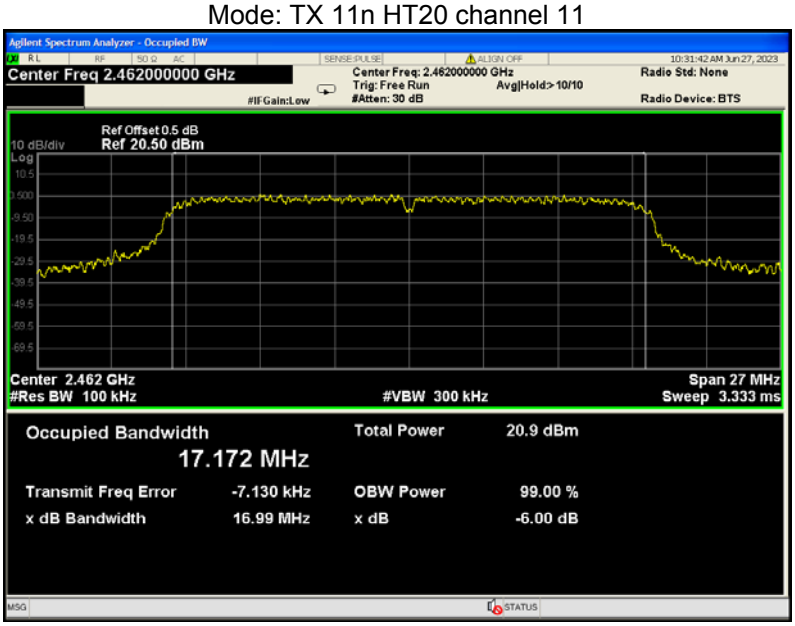
Mode: TX 11n HT20 channel 1



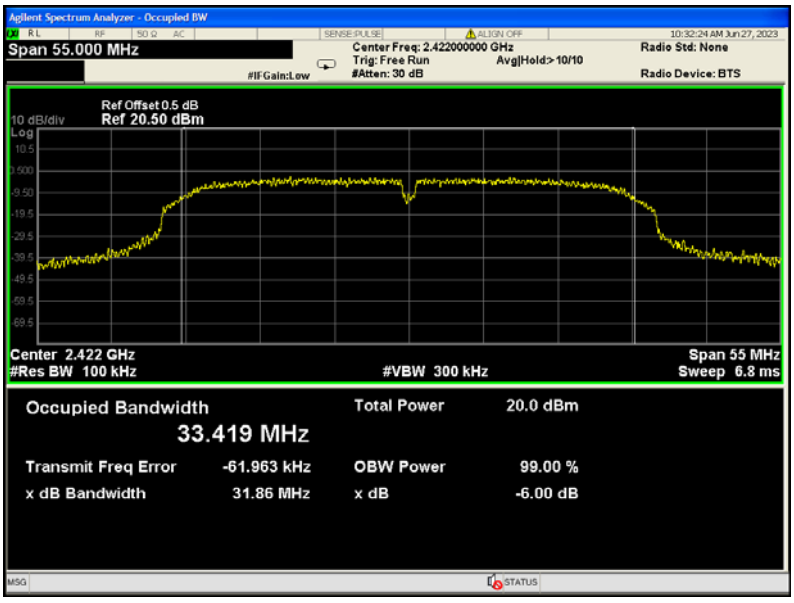
Mode: TX 11n HT20 channel 6



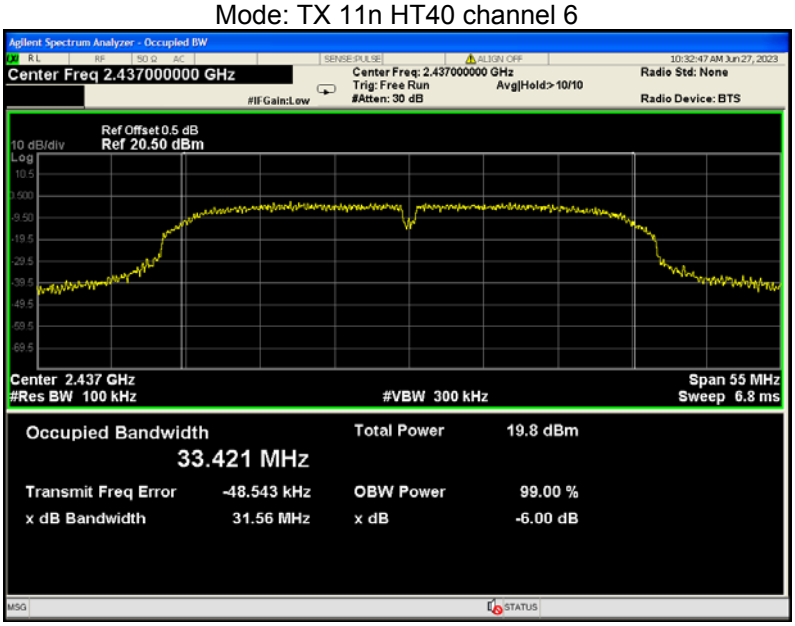
Mode: TX 11n HT20 channel 11



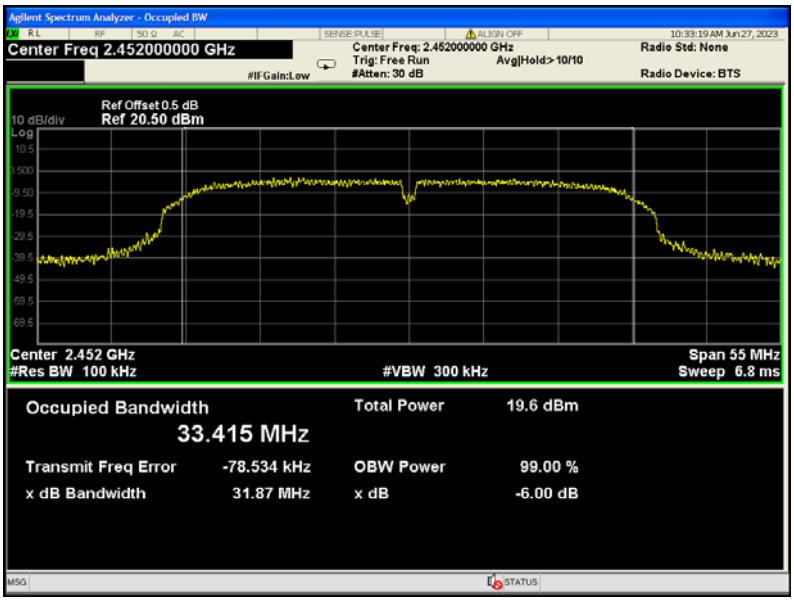
Mode: TX 11n HT40 channel 3



Mode: TX 11n HT40 channel 6

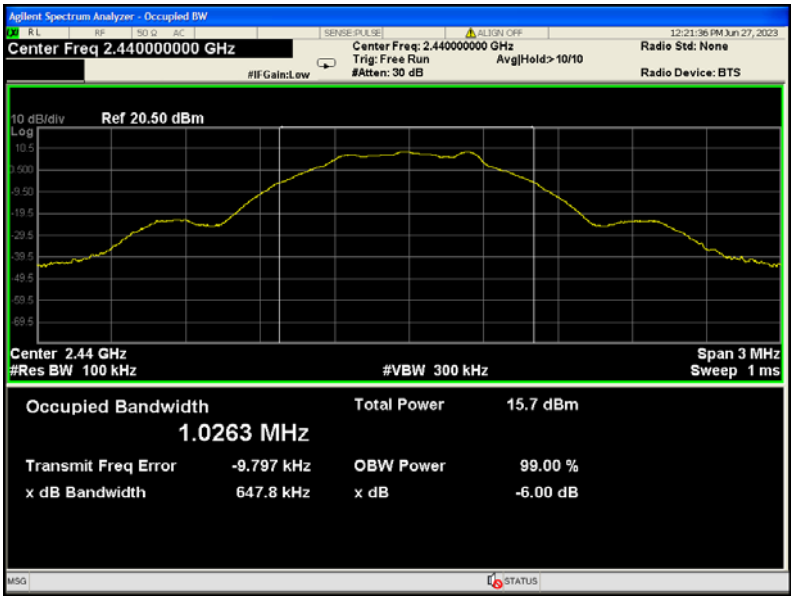


Mode: TX 11n HT40 channel 9

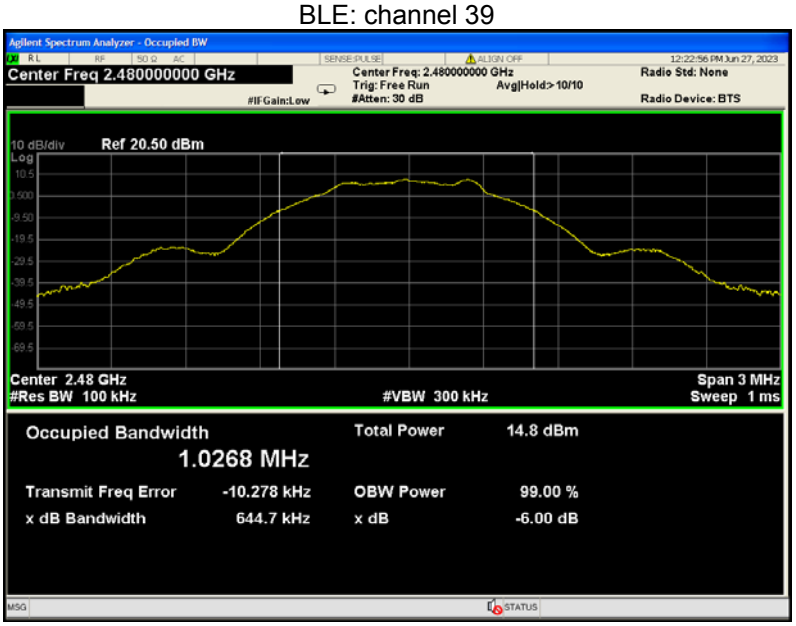


BLE: channel 0

BLE: channel 19

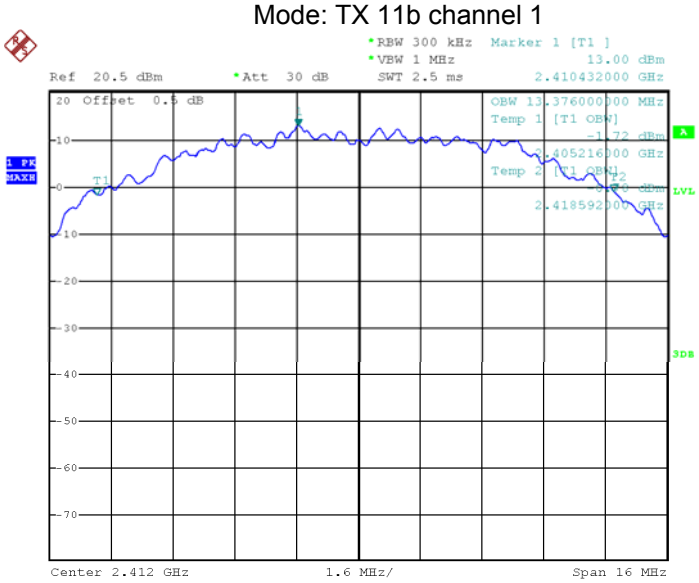


BLE: channel 39



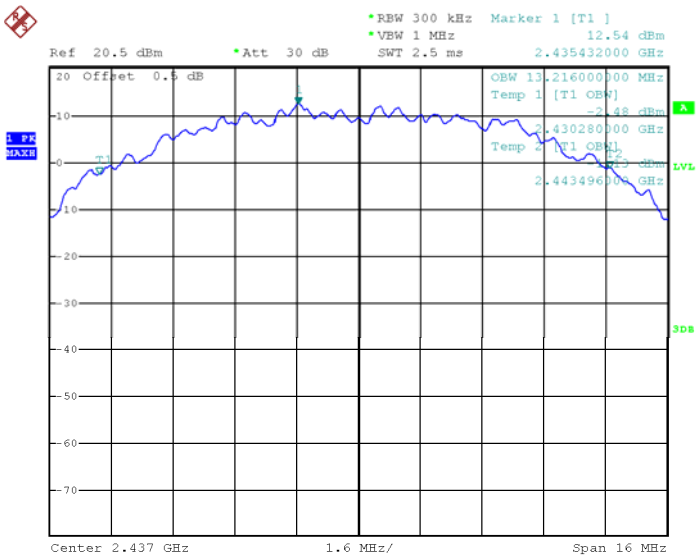
99% Bandwidth

Mode: TX 11b channel 1



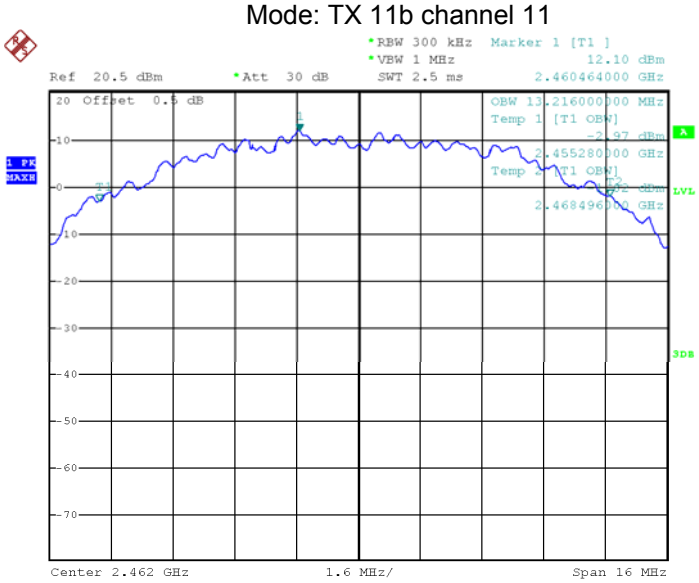
Date: 27.JUN.2023 09:39:25

Mode: TX 11b channel 6



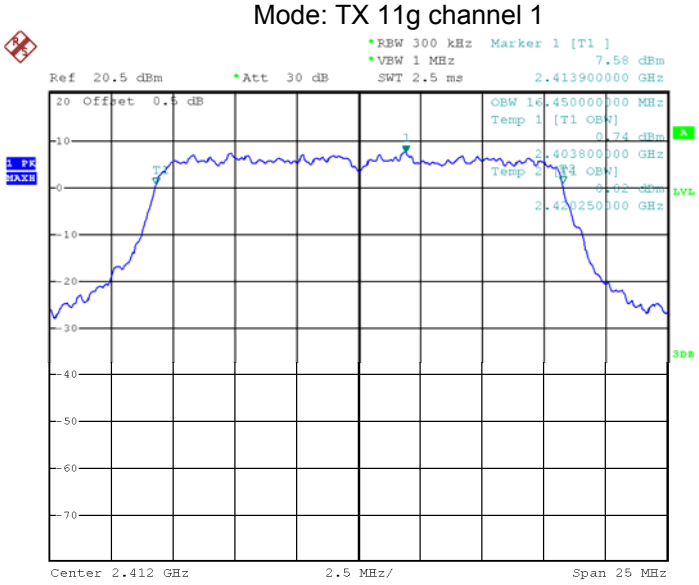
Date: 27.JUN.2023 09:40:07

Mode: TX 11b channel 11



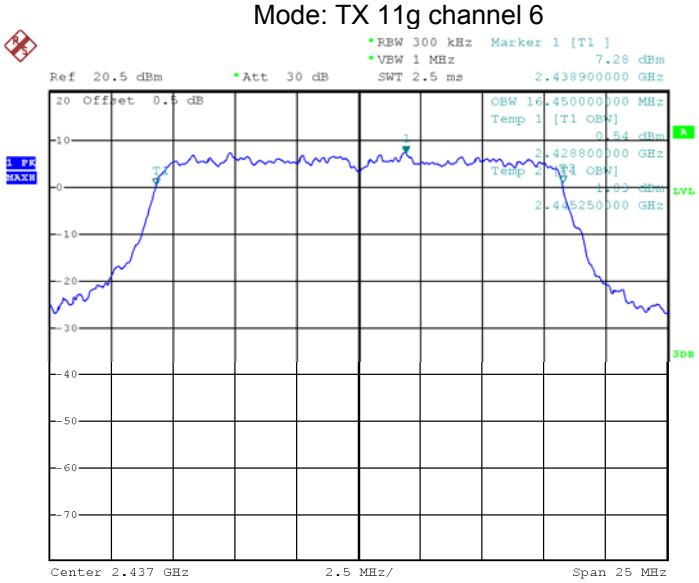
Date: 27.JUN.2023 09:40:46

Mode: TX 11g channel 1



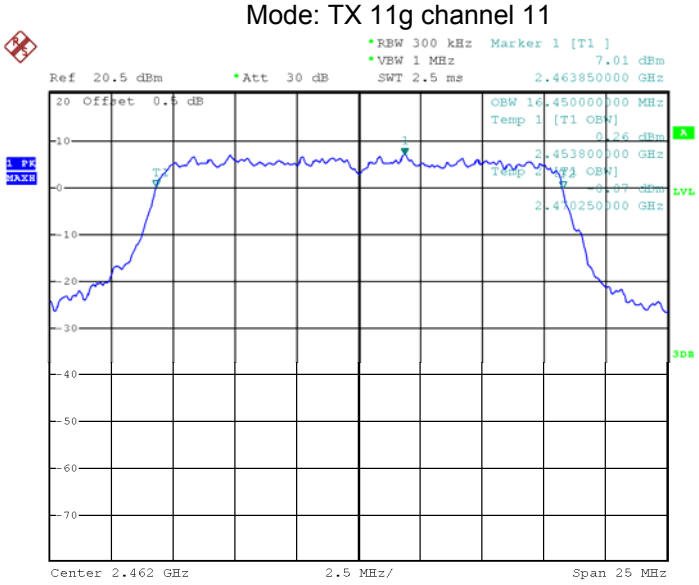
Date: 27.JUN.2023 09:43:04

Mode: TX 11g channel 6



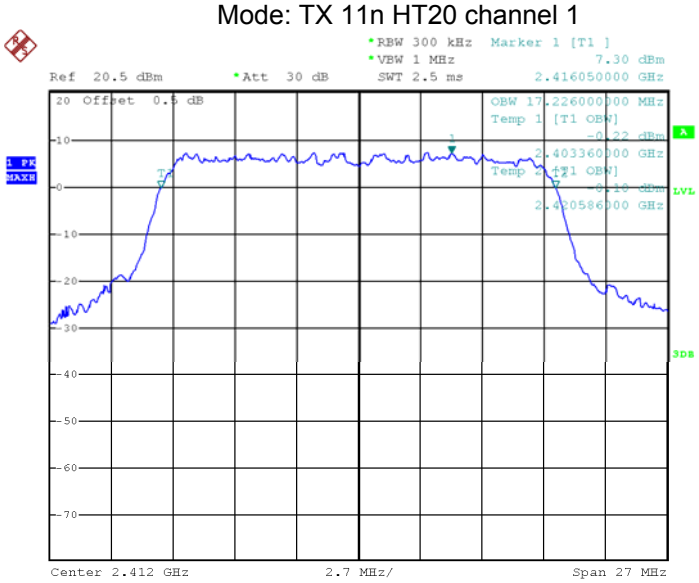
Date: 27.JUN.2023 09:43:39

Mode: TX 11g channel 11



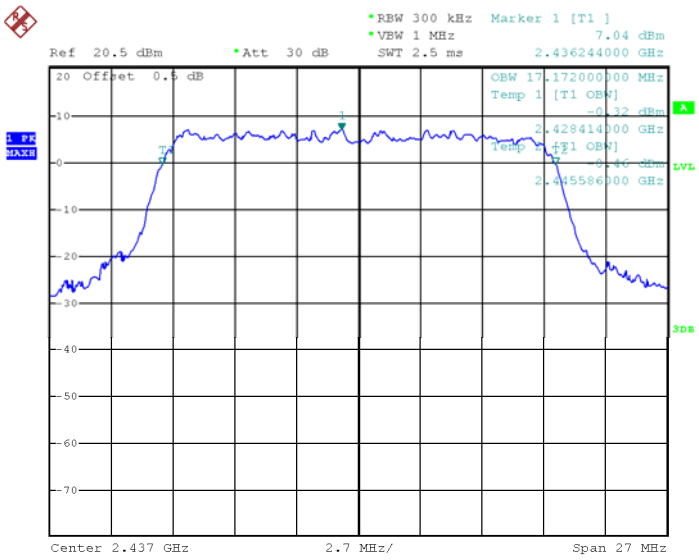
Date: 27.JUN.2023 09:44:14

Mode: TX 11n HT20 channel 1



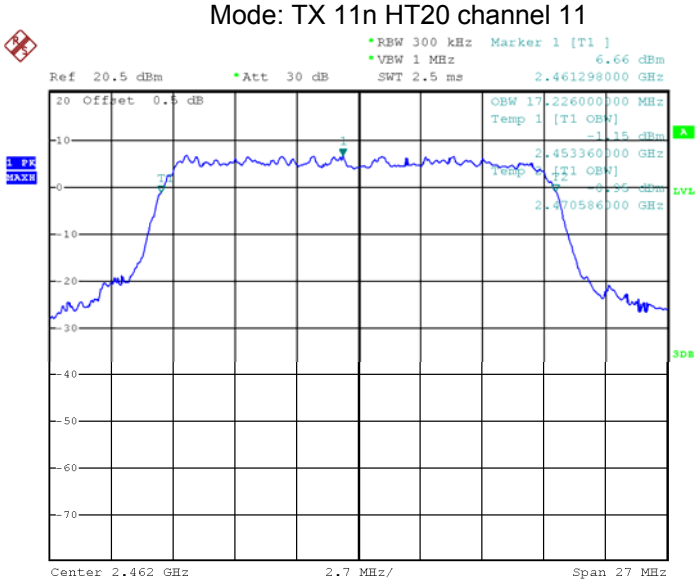
Date: 27.JUN.2023 09:45:02

Mode: TX 11n HT20 channel 6



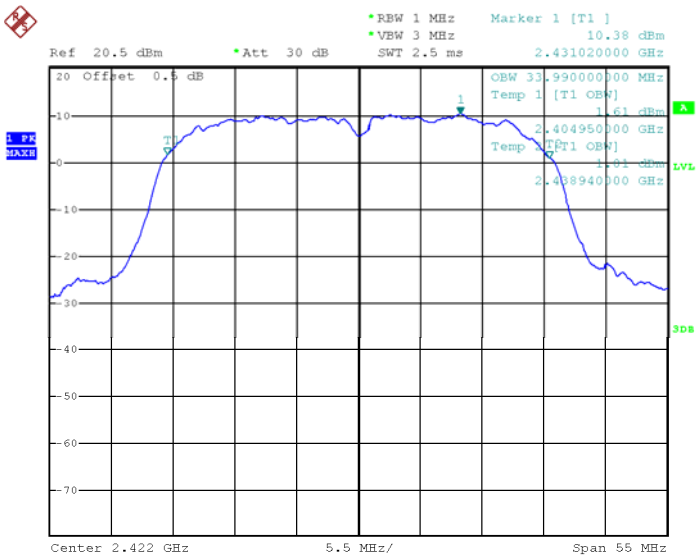
Date: 27.JUN.2023 09:45:44

Mode: TX 11n HT20 channel 11



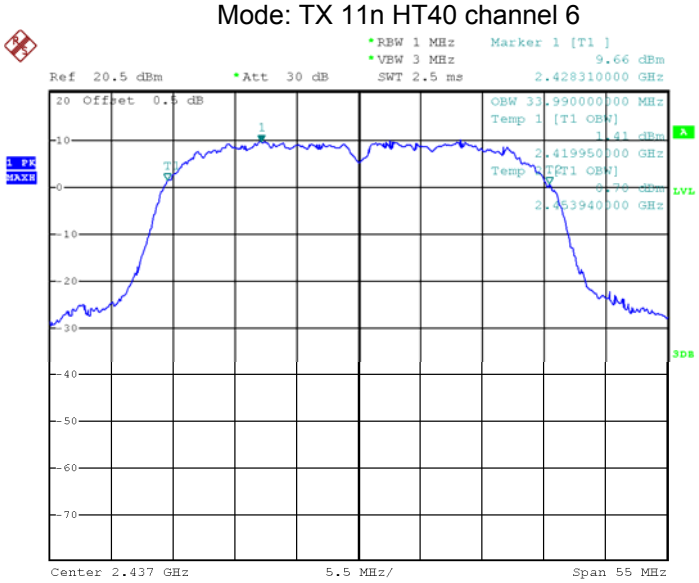
Date: 27.JUN.2023 09:46:35

Mode: TX 11n HT40 channel 3



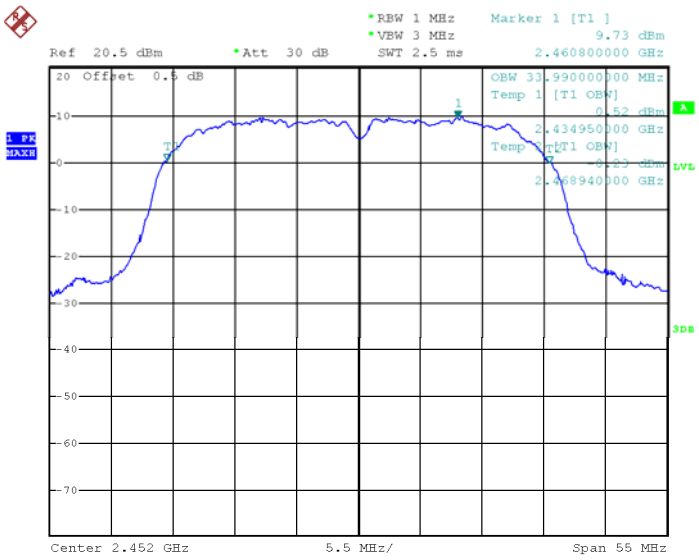
Date: 27.JUN.2023 09:47:58

Mode: TX 11n HT40 channel 6



Date: 27.JUN.2023 09:48:45

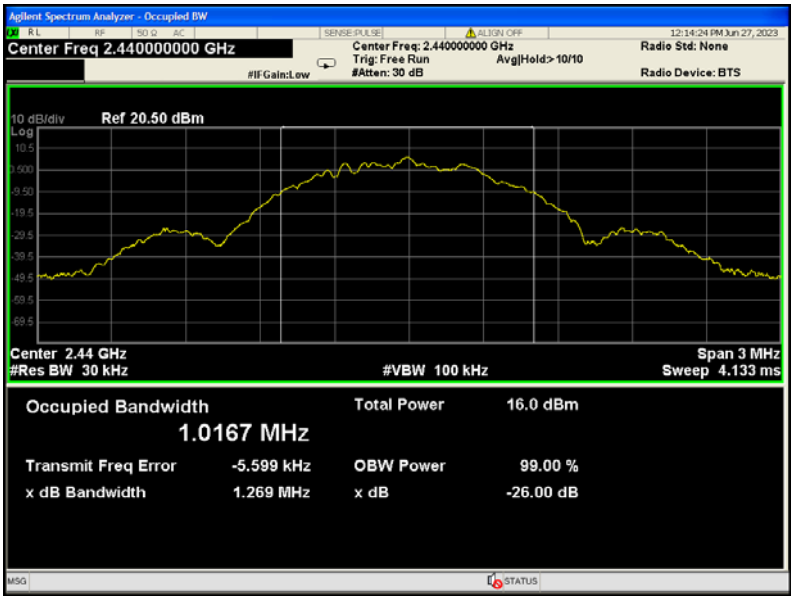
Mode: TX 11n HT40 channel 9



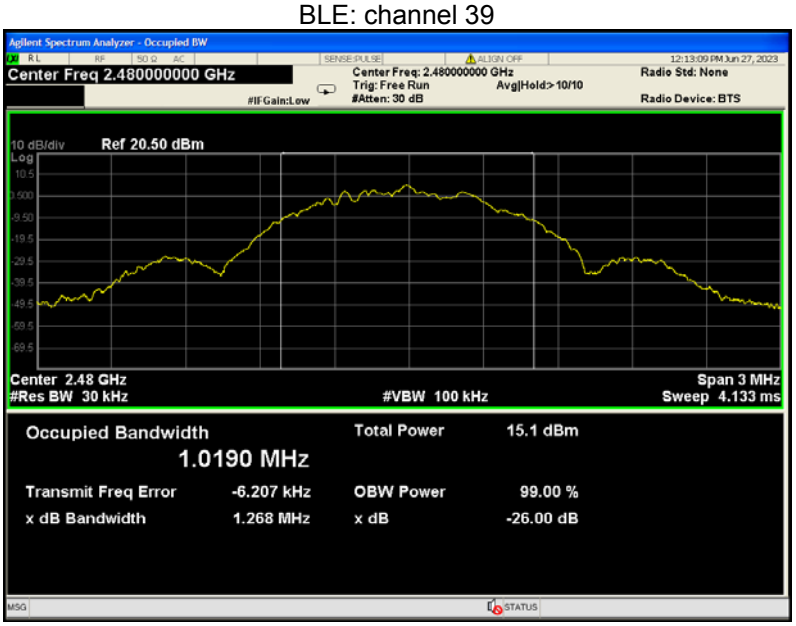
Date: 27.JUN.2023 09:49:19

BLE: channel 0

BLE: channel 19



BLE: channel 39



13 Maximum Peak conducted Output Power

Test Requirement: FCC 47CFR Part 15 Section 15.247

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

13.1 Test Procedure

KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019

section 8.3.1.1 (For BLE)

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

a)Set the RBW ≥ 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.

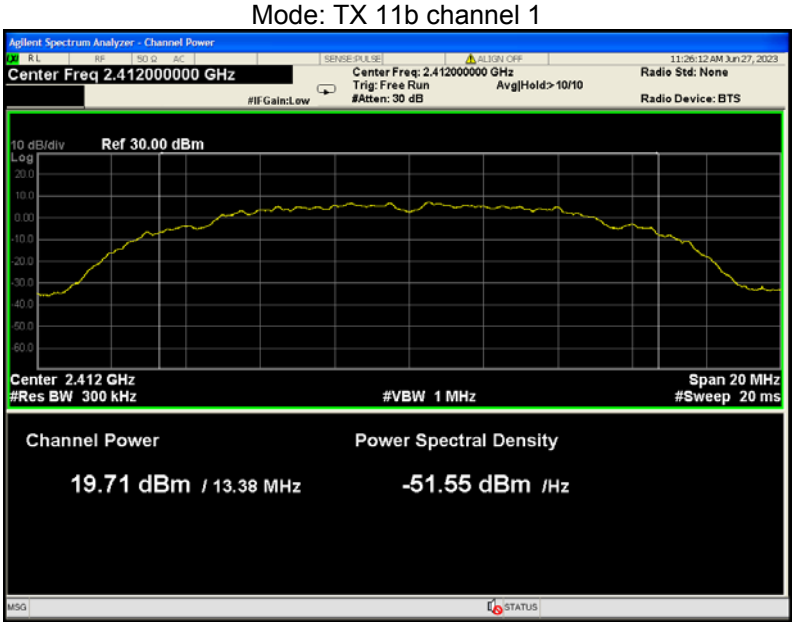
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the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

13.2 Test Result

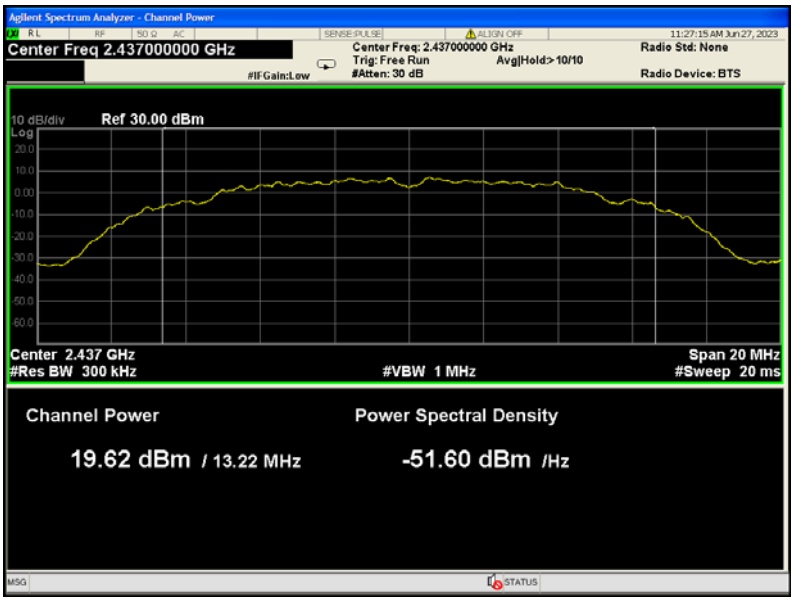
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	**19.71**	1W/30dBm
	Middle-2437	19.62	1W/30dBm
	High-2462	19.08	1W/30dBm
TX 11g	Low-2412	17.38	1W/30dBm
	Middle-2437	17.18	1W/30dBm
	High-2462	16.92	1W/30dBm
TX 11n HT20	Low-2412	17.60	1W/30dBm
	Middle-2437	17.31	1W/30dBm
	High-2462	16.97	1W/30dBm
TX 11n HT40	Low-2422	15.79	1W/30dBm
	Middle-2437	15.64	1W/30dBm
	High-2452	15.42	1W/30dBm
BLE	Low-2402	**9.453**	1W/30dBm
	Middle-2440	9.289	1W/30dBm
	High-2480	8.310	1W/30dBm

Test Plot

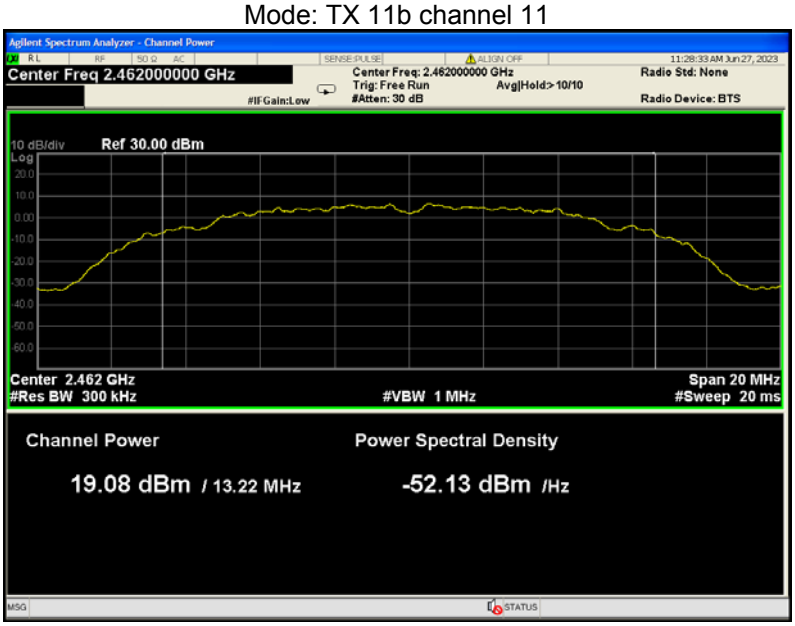
Mode: TX 11b channel 1



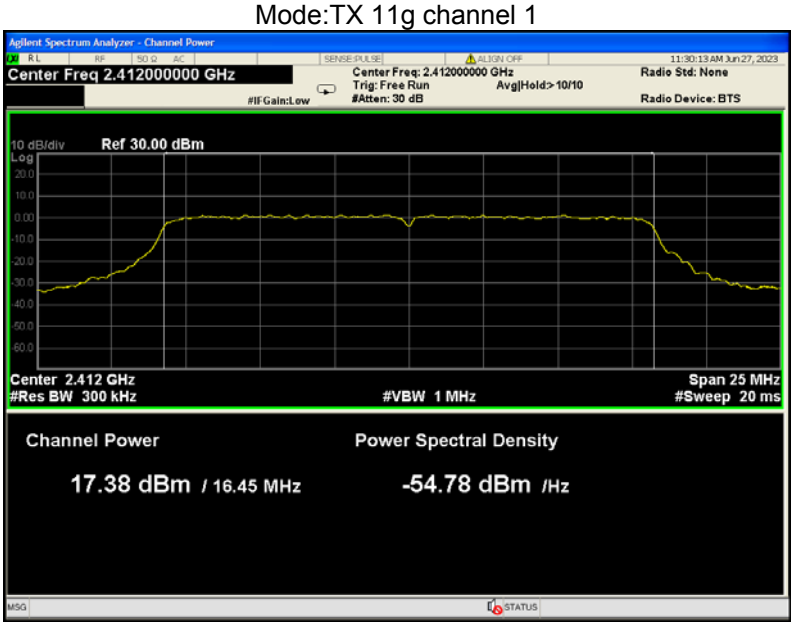
Mode: TX 11b channel 6



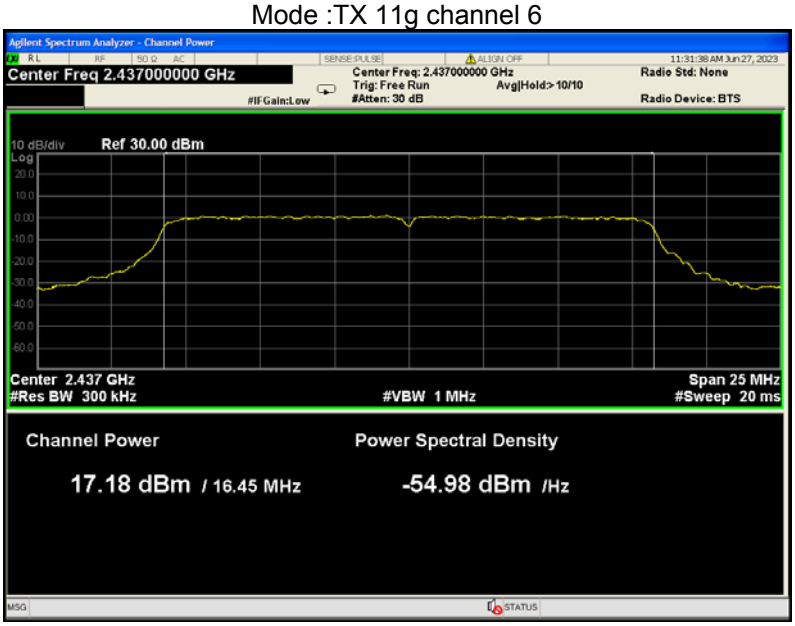
Mode: TX 11b channel 11



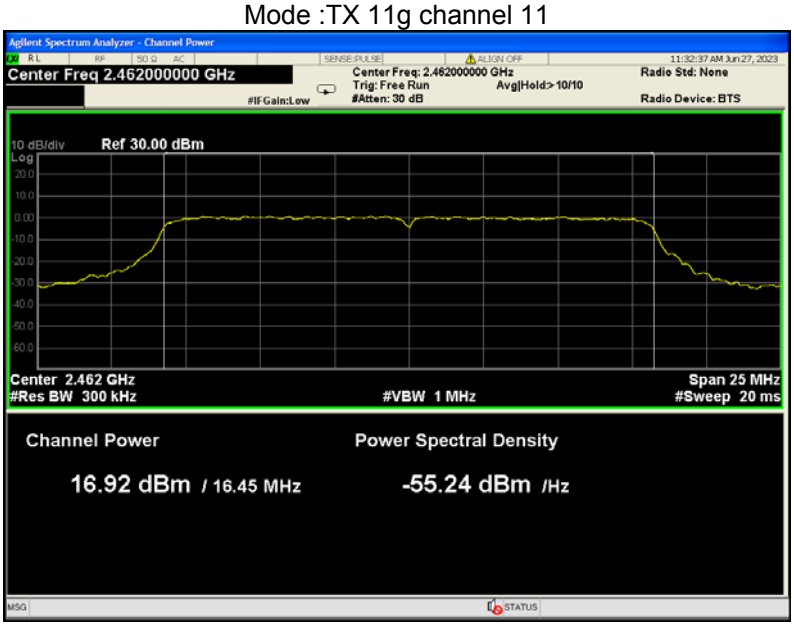
Mode:TX 11g channel 1



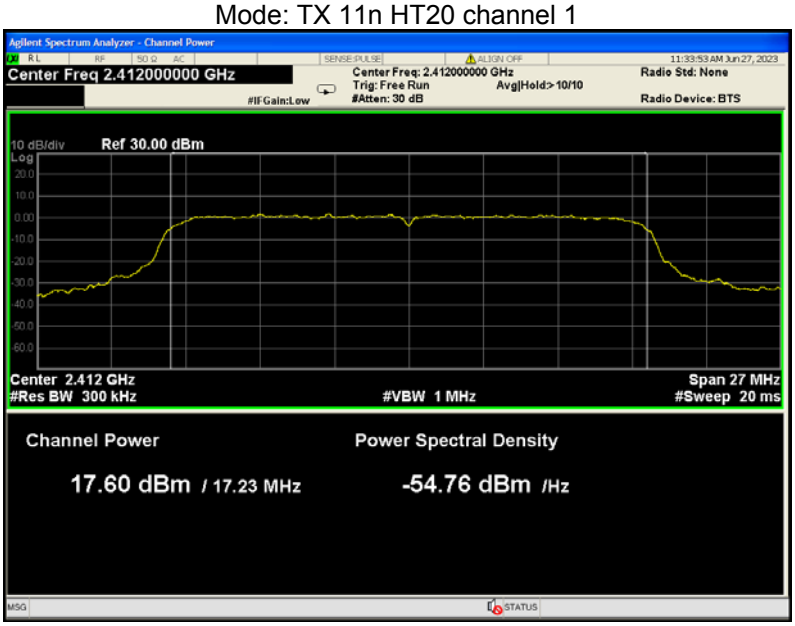
Mode :TX 11g channel 6



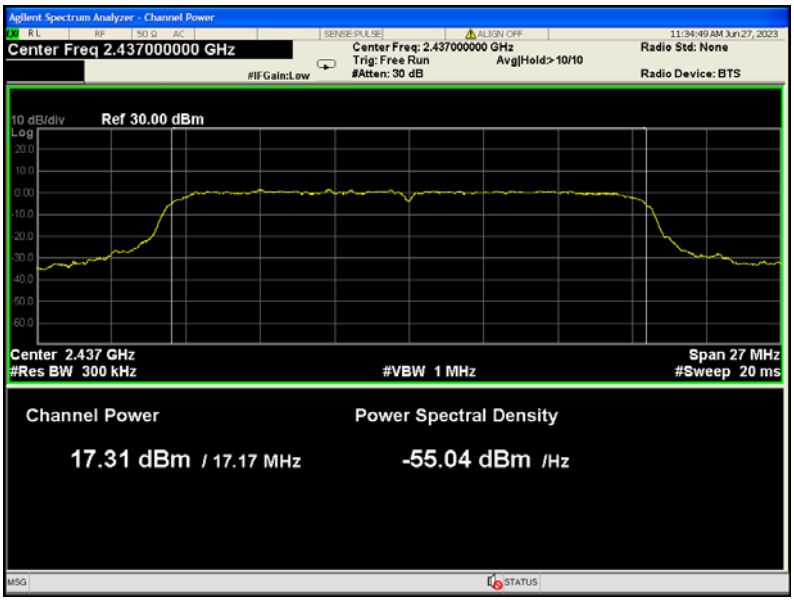
Mode :TX 11g channel 11



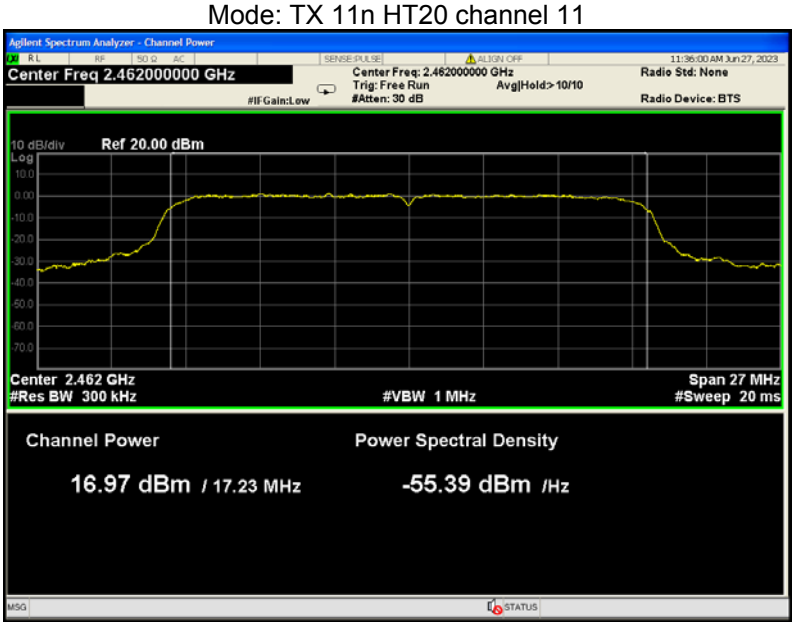
Mode: TX 11n HT20 channel 1



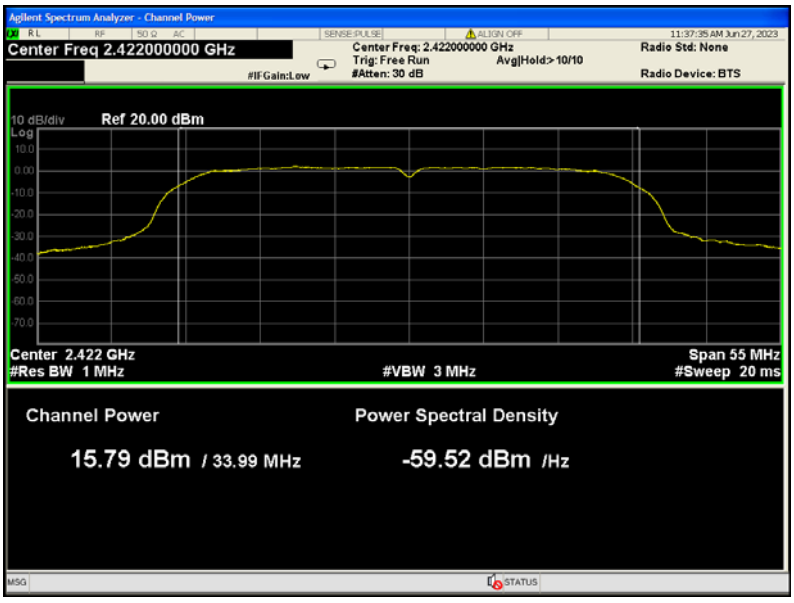
Mode: TX 11n HT20 channel 6



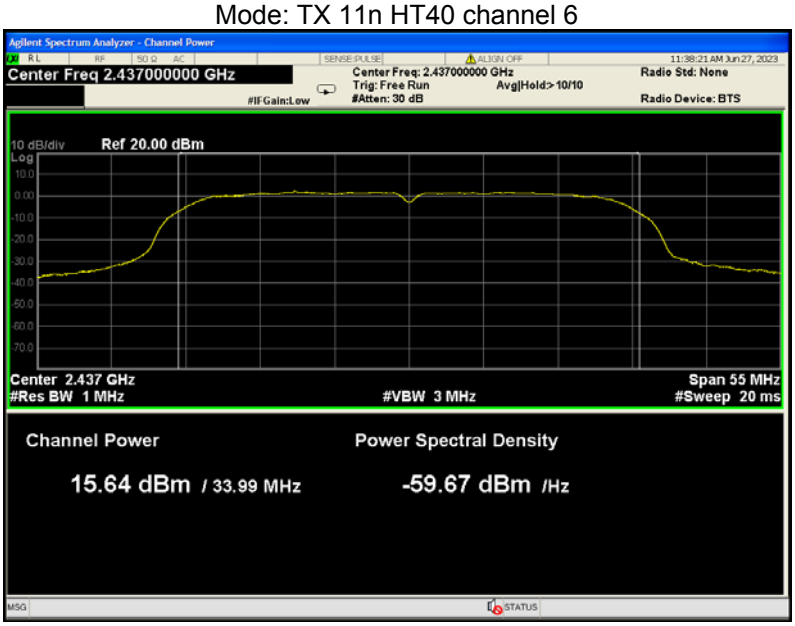
Mode: TX 11n HT20 channel 11



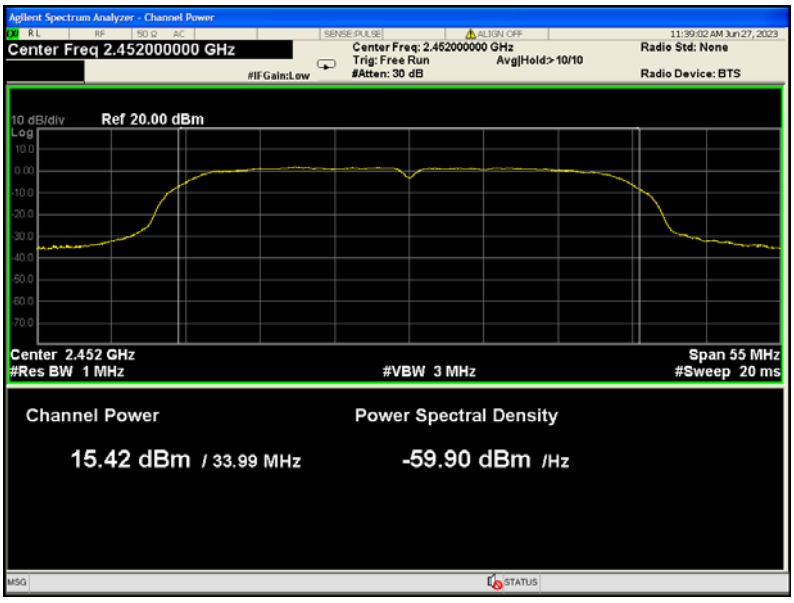
Mode: TX 11n HT40 channel 3



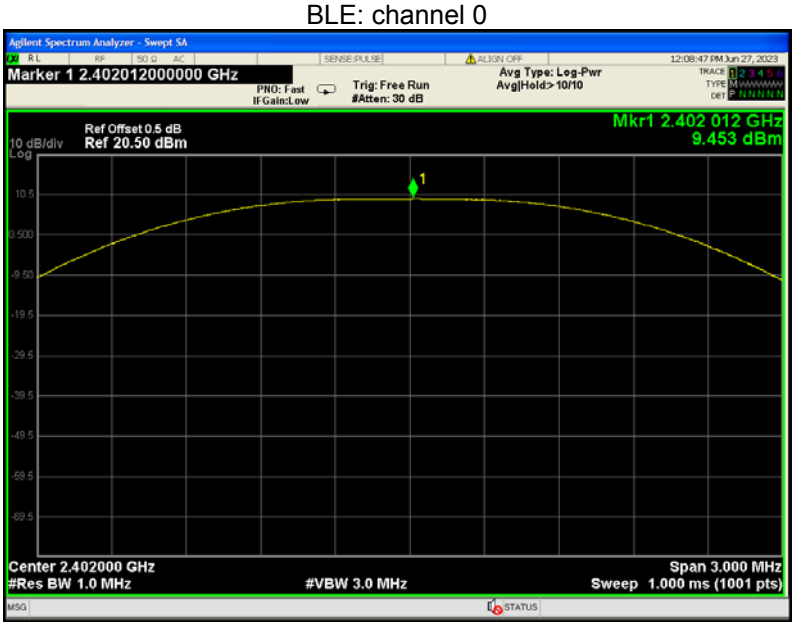
Mode: TX 11n HT40 channel 6



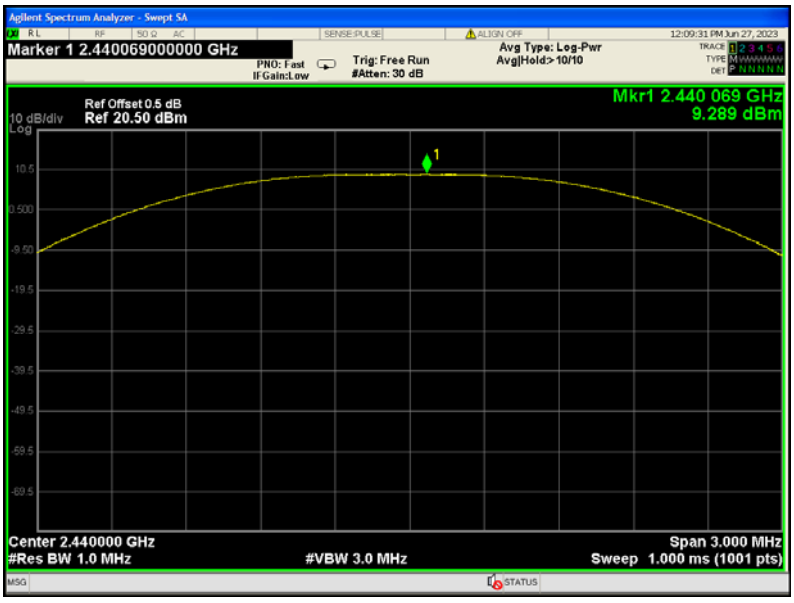
Mode: TX 11n HT40 channel 9



BLE: channel 0



BLE: channel 19



BLE: channel 39

14 Power Spectral density

Test Requirement: FCC 47CFR Part 15 Section 15.247

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

14.1 Test Procedure

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

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

2. Set the spectrum analyzer: RBW = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.

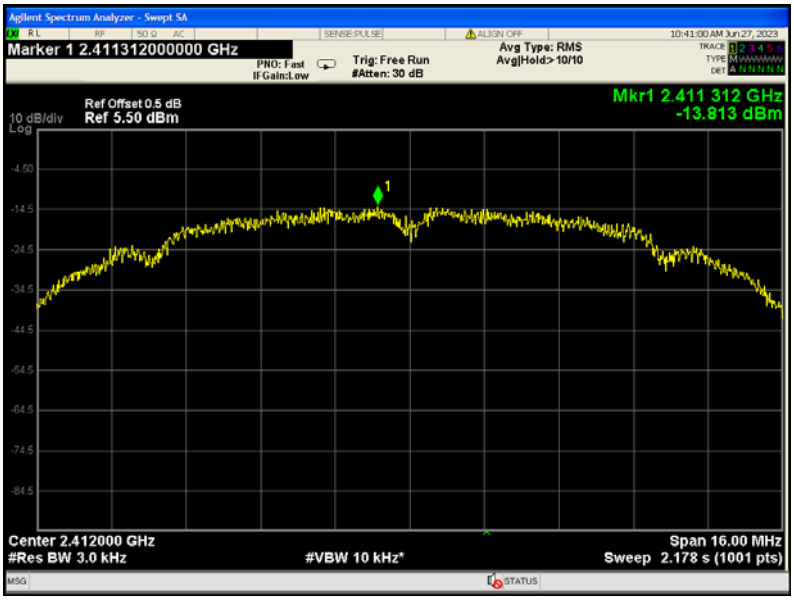
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

14.2 Test Result

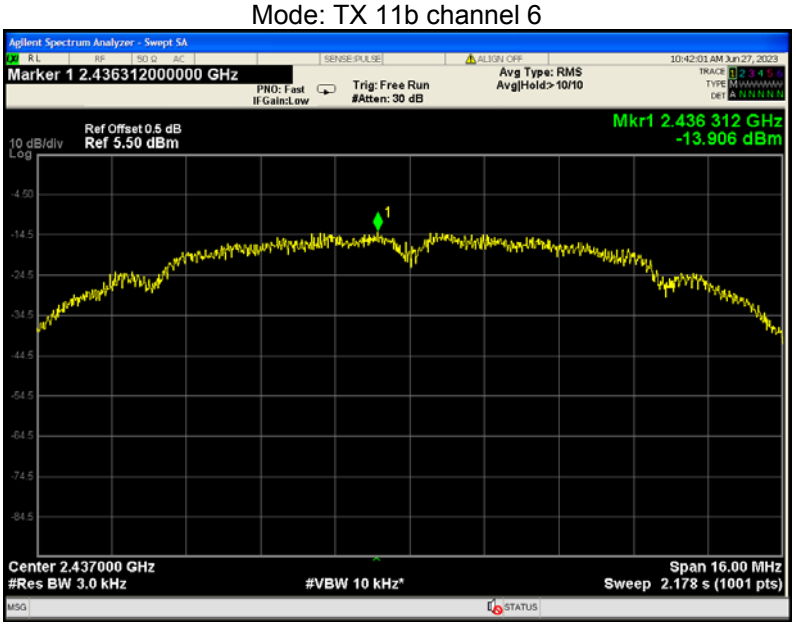
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-13.813	8dBm per 3kHz
	Middle-2437	-13.906	8dBm per 3kHz
	High-2462	-14.563	8dBm per 3kHz
TX 11g	Low-2412	-18.760	8dBm per 3kHz
	Middle-2437	-18.873	8dBm per 3kHz
	High-2462	-19.079	8dBm per 3kHz
TX 11n HT20	Low-2412	-18.383	8dBm per 3kHz
	Middle-2437	-18.590	8dBm per 3kHz
	High-2462	-18.717	8dBm per 3kHz
TX 11n HT40	Low-2422	-22.360	8dBm per 3kHz
	Middle-2437	-22.066	8dBm per 3kHz
	High-2452	-22.343	8dBm per 3kHz
BLE	Low-2402	-6.366	8dBm per 3kHz
	Middle-2440	-6.132	8dBm per 3kHz
	High-2480	-7.047	8dBm per 3kHz

Test Plot

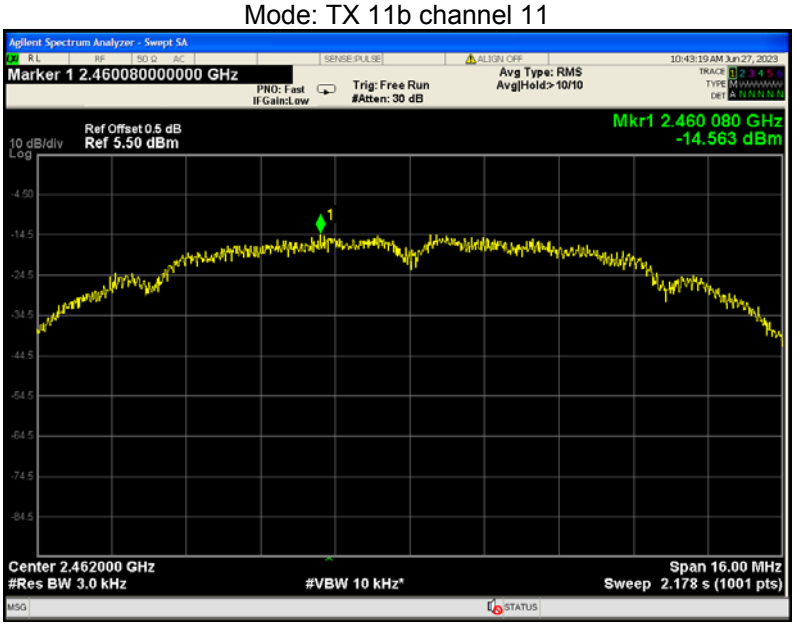
Mode: TX 11b channel 1



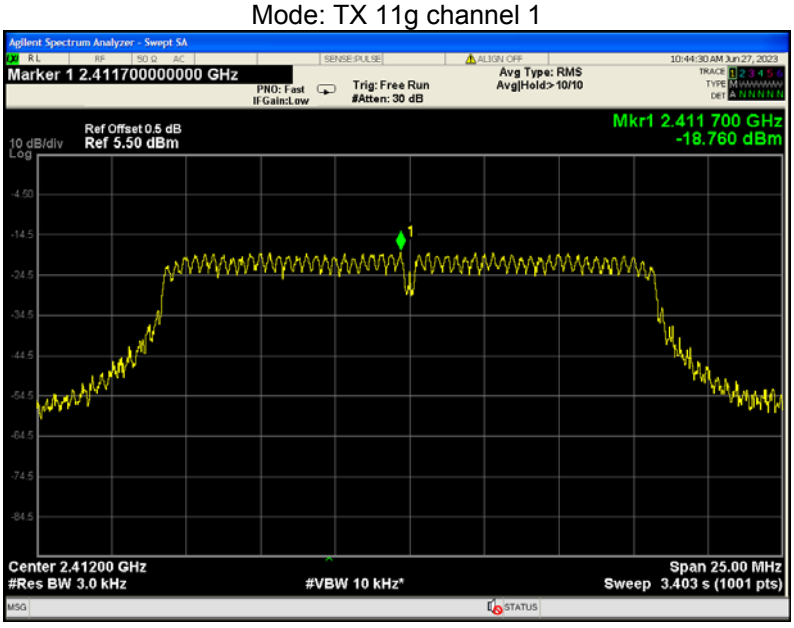
Mode: TX 11b channel 6



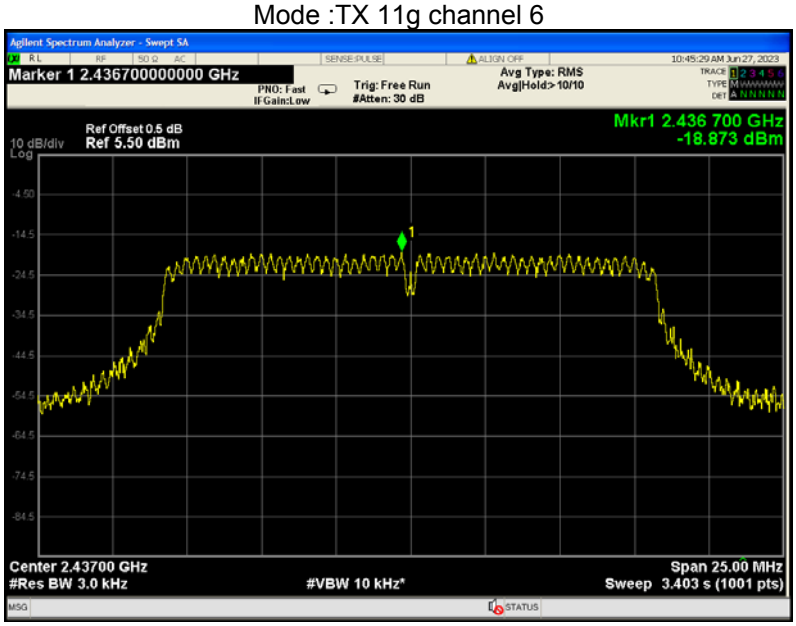
Mode: TX 11b channel 11



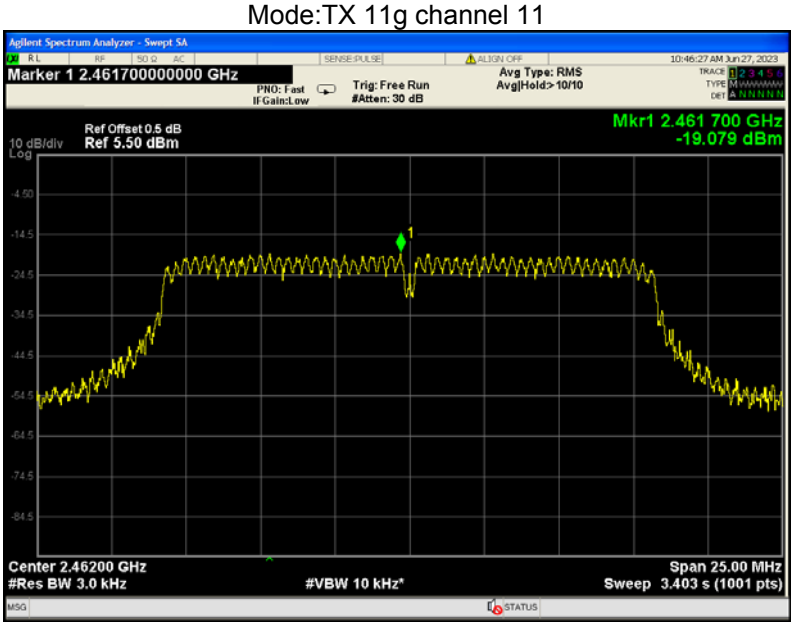
Mode: TX 11g channel 1



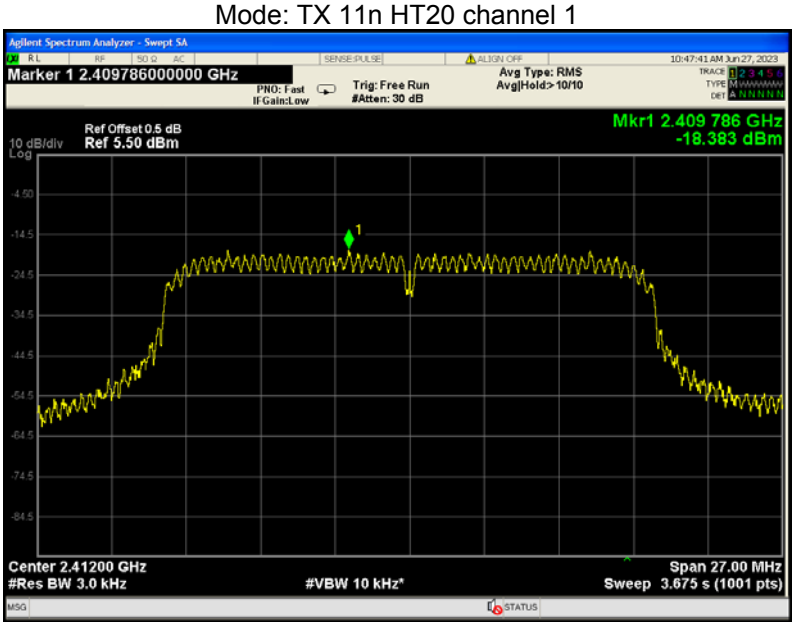
Mode :TX 11g channel 6



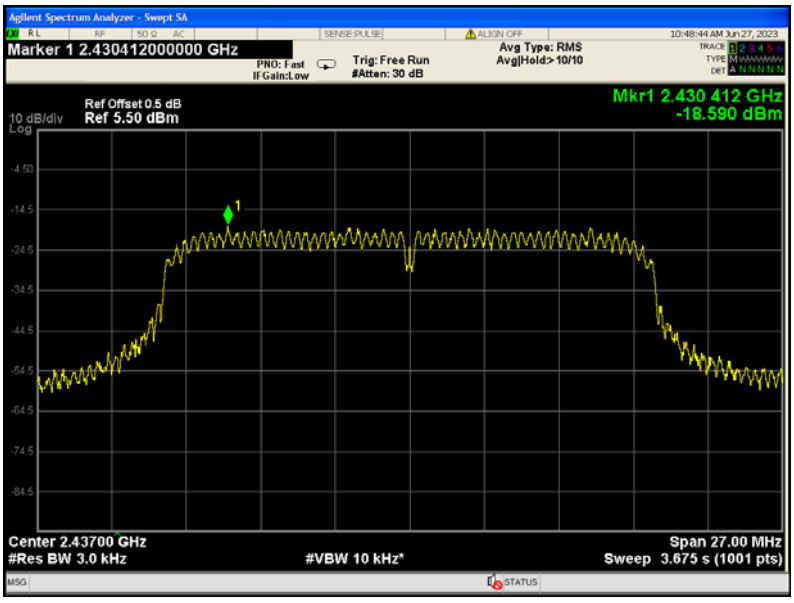
Mode:TX 11g channel 11



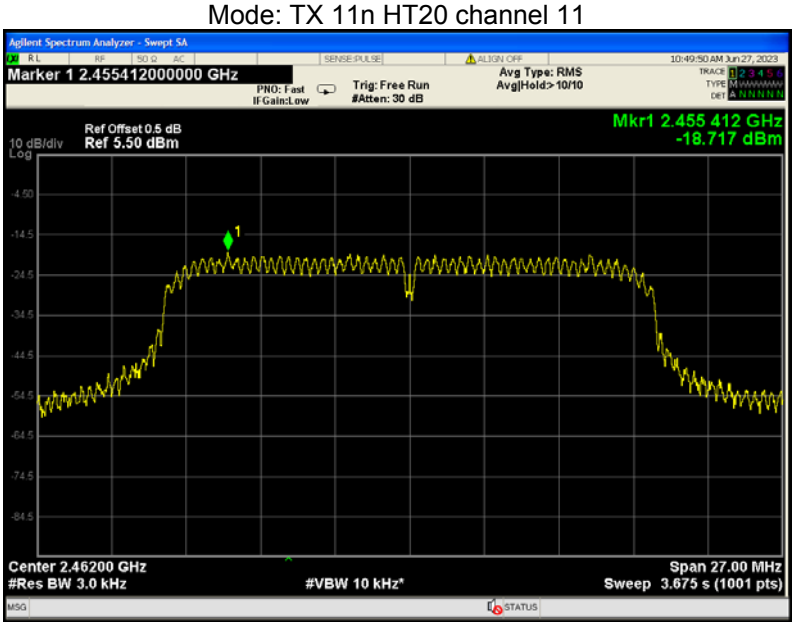
Mode: TX 11n HT20 channel 1



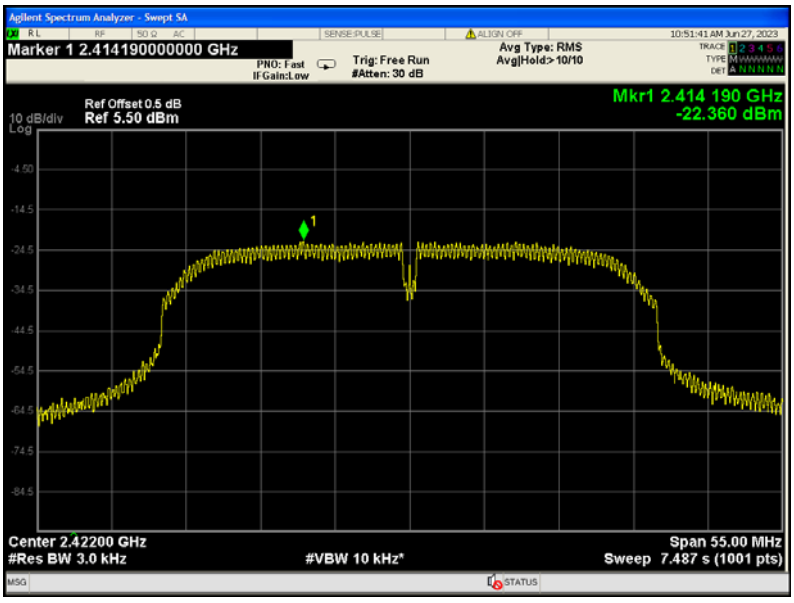
Mode: TX 11n HT20 channel 6



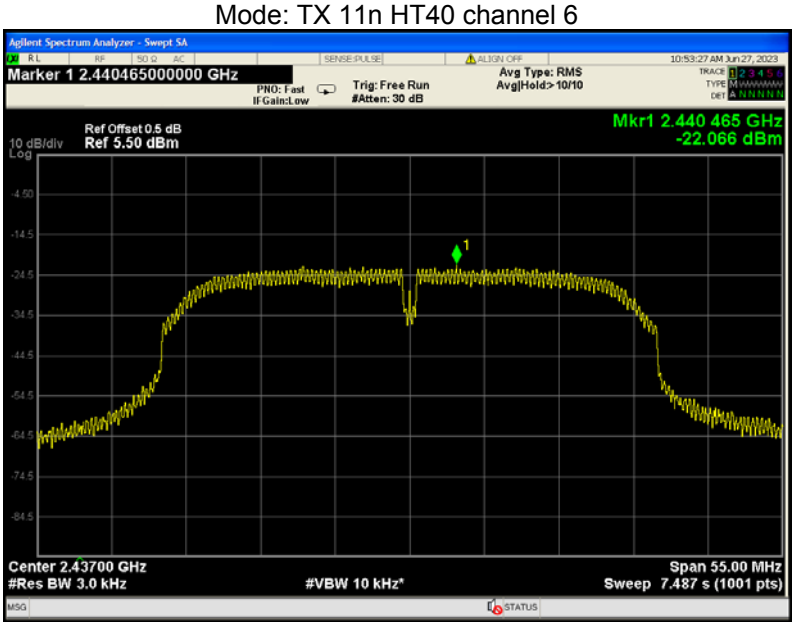
Mode: TX 11n HT20 channel 11



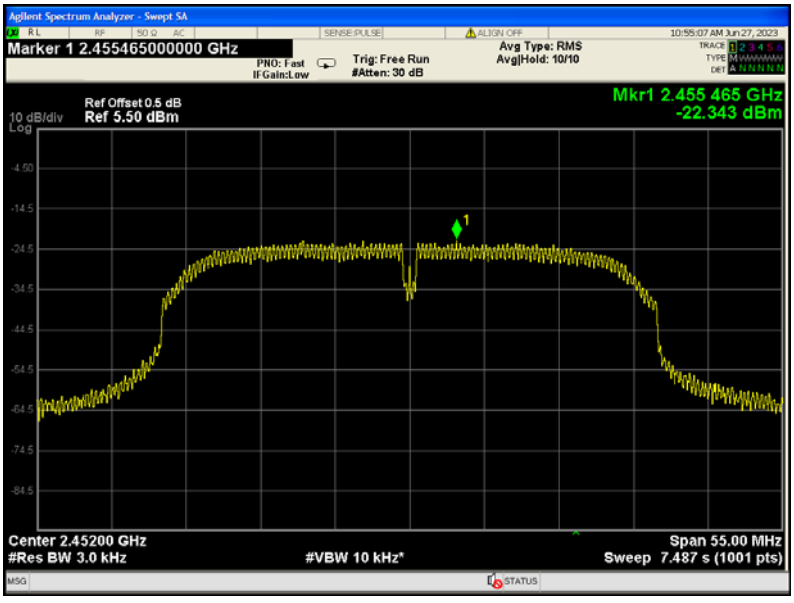
Mode: TX 11n HT40 channel 3



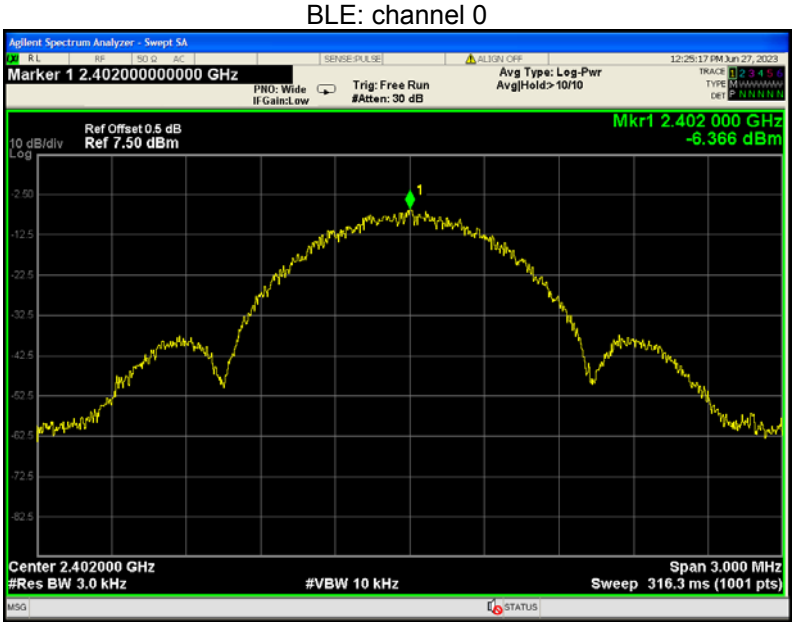
Mode: TX 11n HT40 channel 6



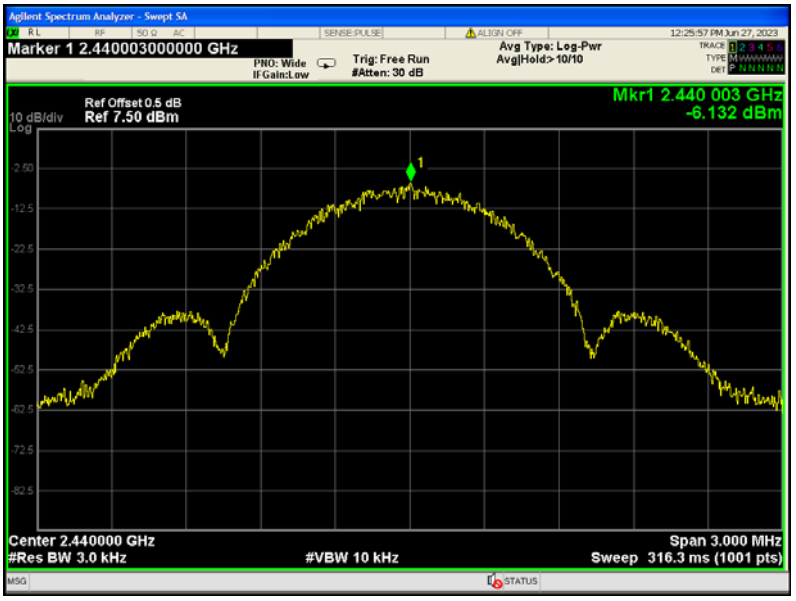
Mode: TX 11n HT40 channel 9



BLE: channel 0



BLE: channel 19



BLE: channel 39

15 Antenna Requirement

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

16 RF Exposure

Remark: refer to MPE test report: WTD23D06139174W004.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix- Yeti PRO 4000-Photos.

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