TEST REPORT

Reference No.	:	WTH23D10215115W002
FCC ID	:	VMIAS4KCAM
Applicant	:	Swann Communications U.S.A. Inc.
Address	:	12636 Clark Street, Santa Fe Springs, California, United States
Manufacturer	:	Swann Communications Pty Ltd.
Address	:	Unit 5B, 706 Lorimer Street Port Melbourne, Victoria 3207, Australia
Product	:	WIRELESS NETWORK CAMERA
Model(s)	:	NVW-AS4KCAM
Standards	:	FCC 47CFR Part 15.247
Date of Receipt sample	:	2023-10-11
Date of Test	:	2023-10-11 to 2023-10-27
Date of Issue	:	2023-11-17
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.

Prepared By:
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Compiled by:

Ford Wang

Ford Wang / Project Engineer

Approved by:

Deval Qin

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
WTH23D10215115W002	2023-10-11	2023-10-11 to 2023-10-27	2023-11-17	Original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	WIRELESS NETWORK CAMERA
Model(s):	NVW-AS4KCAM
Wi-Fi Specification:	802.11b/g/n
Hardware Version:	CMW-003A
Software Version:	Station/AP/Station+AP

4.2 Details of E.U.T.

Operation Frequency:	802.11b/g/n HT20: 2412~2462MHz
Max. RF output power:	22.49dBm
Type of Modulation:	DSSS, OFDM
Antenna installation:	External Antenna
Antenna Gain:	1.82dBi

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:	Input: 5V⎓2000mA charging by adapter
Battery:	DC 3.7V, 8700mAh, 32.19Wh

4.3 Channel List

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	-	-

4.4 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.

4.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

☐ Yes ☒ No

If Yes, list the related test items and lab information:

Test Lab: N/A

Lab address: N/A

Test items: N/A

4.6 Abnormalities from Standard Conditions

None.

4.7 Test Mode

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.

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

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	2023-07-27	2024-07-26
2	LISN	R&S	ENV216	100115	2023-07-27	2024-07-26
3	Cable	Top	TYPE16(3.5M)	-	2023-07-27	2024-07-26
3m Semi-anechoic Chamber for Radiation Emissions 1#						
1	Spectrum Analyzer	R&S	FSP30	100091	2023-04-24	2024-04-23
2	Amplifier	Agilent	8447D	2944A10178	2023-07-27	2024-07-26
3	Tri-log Broadband Antenna	SCHWARZBECK	VULB9163	336	2023-08-07	2024-08-06
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	2023-07-27	2024-07-26
7	Broadband Preamplifier	COMPLIANCE	PAP-1G18	2004	2023-08-08	2024-08-07
8	Coaxial Cable	Top	ZT26-NJ-NJ-8M/FA	-	2023-02-02	2024-02-01
9	Microwave Amplifier	SCHWARZBECK	BBV 9721	100472	2023-07-27	2024-07-26
10	Coaxial Cable	Top	ZT40-2.92J-2.92J-2.0M	17100919	2023-04-24	2024-04-23
3m Semi-anechoic Chamber for Radiation Emissions 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
RF Conducted Testing						
1	Spectrum Analyzer	R&S	FSP40	100501	2023-07-27	2024-07-26
2	Spectrum Analyzer	Agilent	N9020A	MY49100060	2023-07-27	2024-07-26

Test Software:

Test Item	Software name	Software version
Conduction disturbance Radiated Emission(3m)	EZ-EMC	EZ-EMC(RA-03A1-1)

6.2 Description of Support Units

Equipment	Manufacturer	Model No.	Series No.
Adapter	SHENZHEN FUJIA APPLIANCE CO.,LTD.	FJ-SW266B50502000U	/

6.3 Measurement Uncertainty

Parameter	Uncertainty
Conducted Emission	± 3.64dB (AC mains 150KHz~30MHz)
Radiated Spurious Emissions	± 5.08dB (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 Duty Cycle

Type of Modulation	On time ms	Period ms	Duty Cycle linear	Duty Cycle %	Duty Cycle Factor(dB)	Average Factor(dB)
802.11b	4.260	5.380	0.79	79.18	1.01	-2.03
802.11g	0.700	1.820	0.38	38.46	4.15	-8.30
802.11n-HT20	0.660	1.770	0.37	37.29	4.28	-8.57

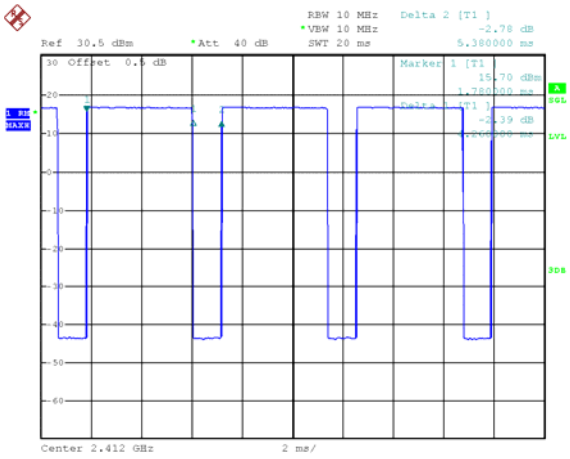
Remark:

Duty cycle=On Time/period;

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

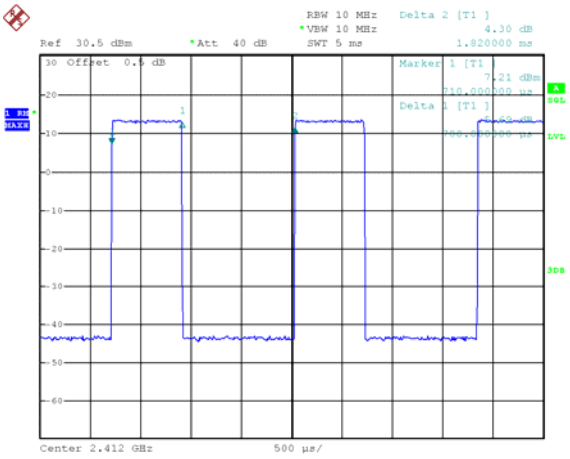
Average factor=$20\log_{10}$Duty cycle

Wi-Fi 802.11b



Date: 23.OCT.2023 16:24:45

Wi-Fi 802.11g



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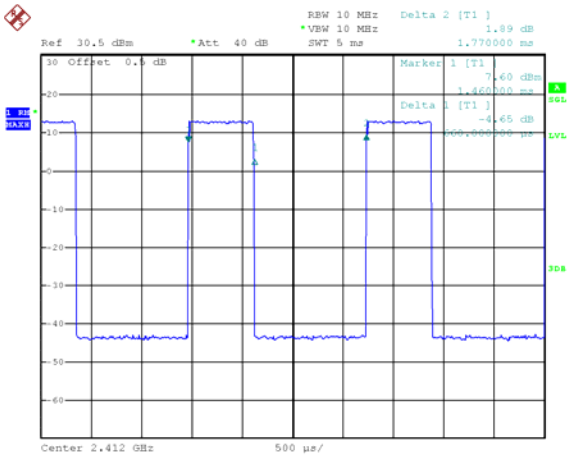
Wi-Fi 802.11n-HT20



Date: 23.OCT.2023 16:29:00

8 Conducted Emission

Test Requirement: 47CFR FCC Part15 Subpart C §15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0. 5 to 0.5	66 to 56*	56 to 46*
0.5 to 5.0	56	46
5.0 to 30	60	50
*Decreases with the logarithm of the frequency.		

8.1 E.U.T. Operation

Operating Environment:

Temperature: 25.6°C

Humidity: 50.2 % RH

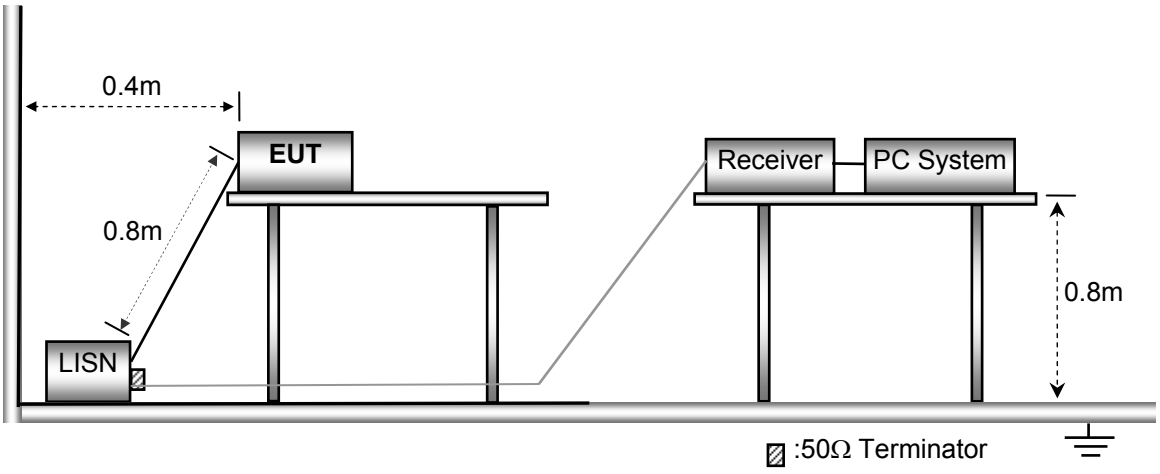
Atmospheric Pressure: 101.3kPa

EUT Operation:

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

8.2 EUT Setup

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



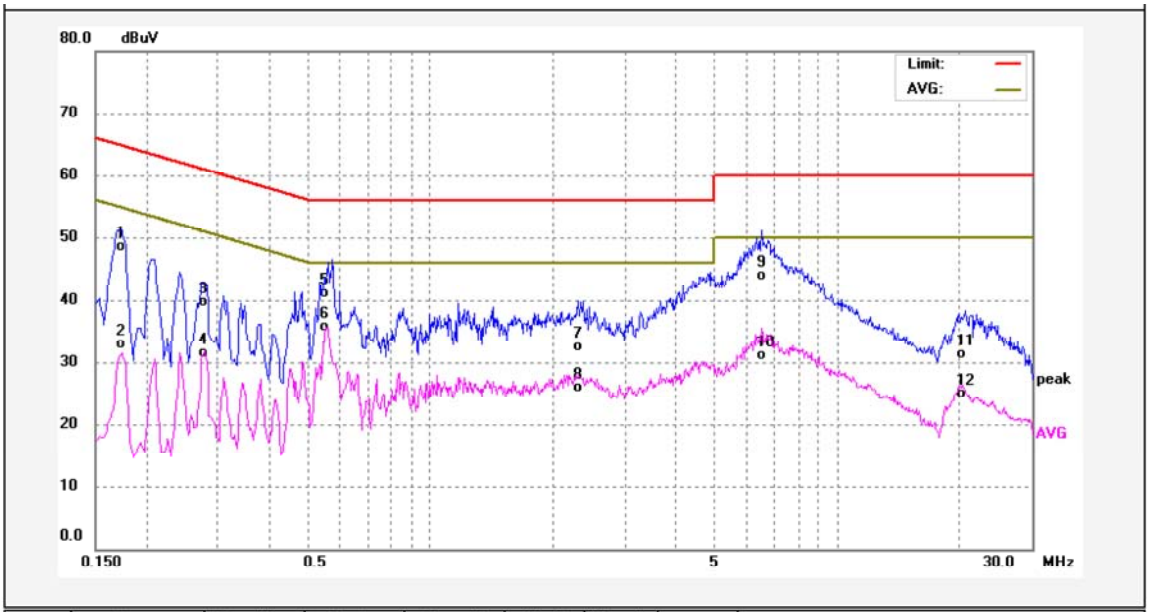
8.3 Measurement Description

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.

8.4 Conducted Emission Test Result

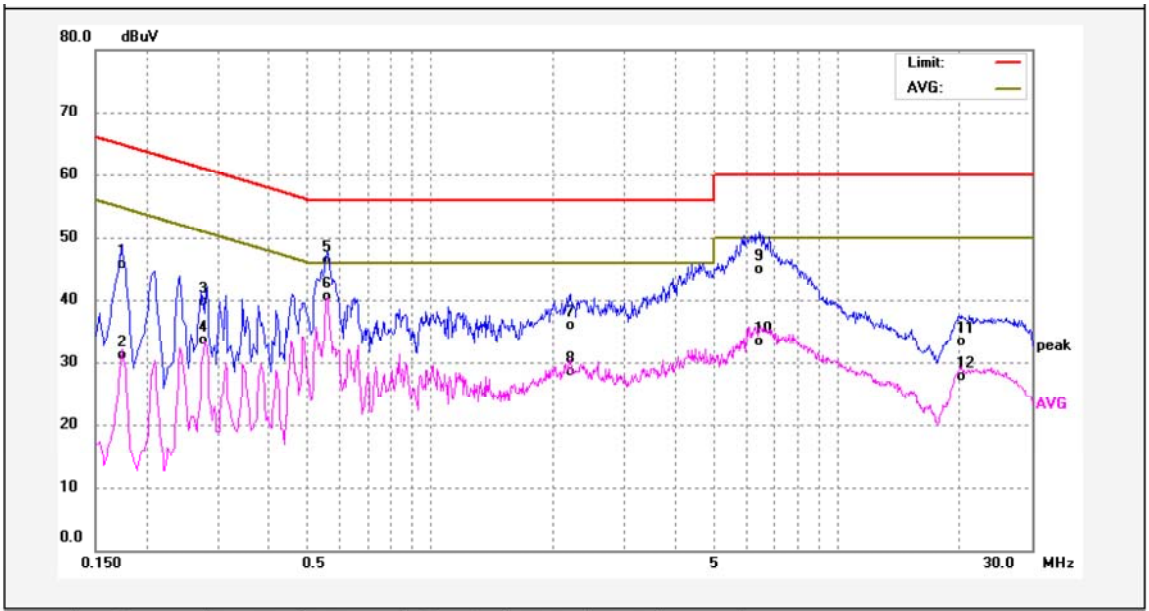
Remark: only the worst data (TX 11b mode High channel mode) were reported

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1740	37.65	10.92	48.57	64.76	-16.19	QP	
2	0.1740	21.98	10.92	32.90	54.76	-21.86	AVG	
3	0.2779	28.81	10.96	39.77	60.88	-21.11	QP	
4	0.2779	20.53	10.96	31.49	50.88	-19.39	AVG	
5	0.5540	30.19	10.99	41.18	56.00	-14.82	QP	
6	0.5540	24.64	10.99	35.63	46.00	-10.37	AVG	
7	2.3020	21.49	11.10	32.59	56.00	-23.41	QP	
8	2.3020	14.79	11.10	25.89	46.00	-20.11	AVG	
9	6.4980	32.54	11.34	43.88	60.00	-16.12	QP	
10	6.4980	19.81	11.34	31.15	50.00	-18.85	AVG	
11	20.2860	19.57	11.71	31.28	60.00	-28.72	QP	
12	20.2860	13.13	11.71	24.84	50.00	-25.16	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1740	34.80	10.95	45.75	64.76	-19.01	QP	
2	0.1740	20.18	10.95	31.13	54.76	-23.63	AVG	
3	0.2779	28.75	10.98	39.73	60.88	-21.15	QP	
4	0.2779	22.60	10.98	33.58	50.88	-17.30	AVG	
5	0.5580	35.39	11.00	46.39	56.00	-9.61	QP	
6	0.5580	29.42	11.00	40.42	46.00	-5.58	AVG	
7	2.2100	24.82	11.08	35.90	56.00	-20.10	QP	
8	2.2100	17.38	11.08	28.46	46.00	-17.54	AVG	
9	6.4740	33.58	11.34	44.92	60.00	-15.08	QP	
10	6.4740	22.00	11.34	33.34	50.00	-16.66	AVG	
11	20.1060	21.58	11.69	33.27	60.00	-26.73	QP	
12	20.1060	15.95	11.69	27.64	50.00	-22.36	AVG	

9 Radiated Emissions

Test Requirement: 47CFR FCC Part15 Subpart C §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	$20\log^{(500)}$

9.1 EUT Operation

Operating Environment:

Temperature: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

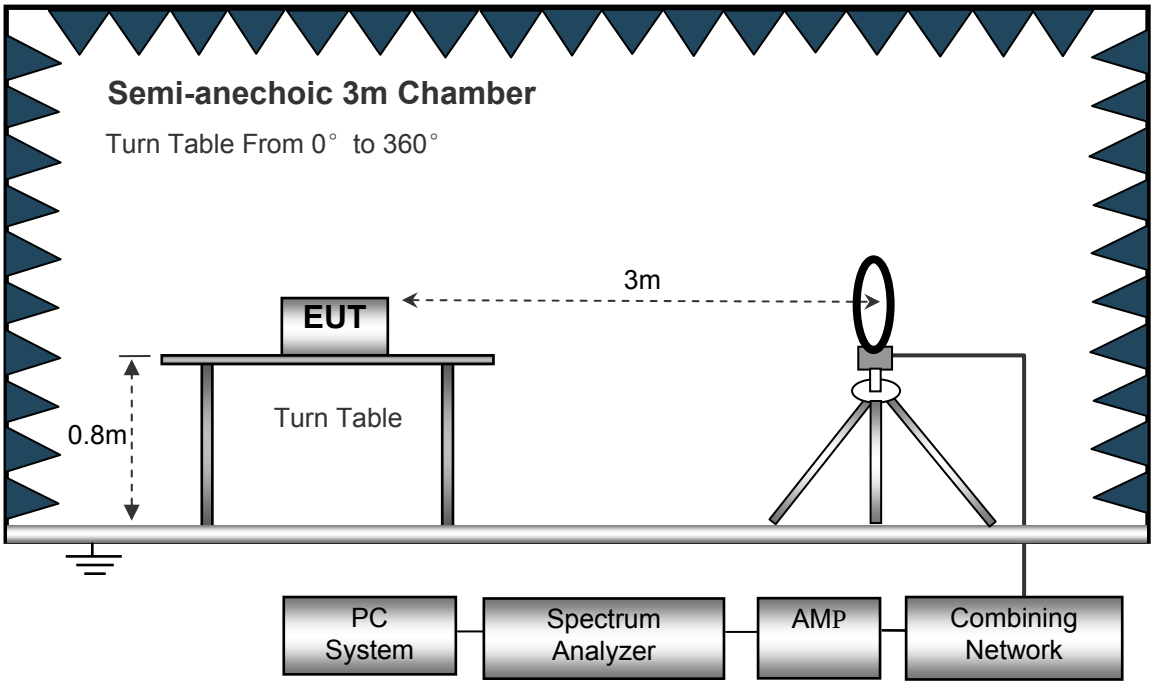
EUT Operation:

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

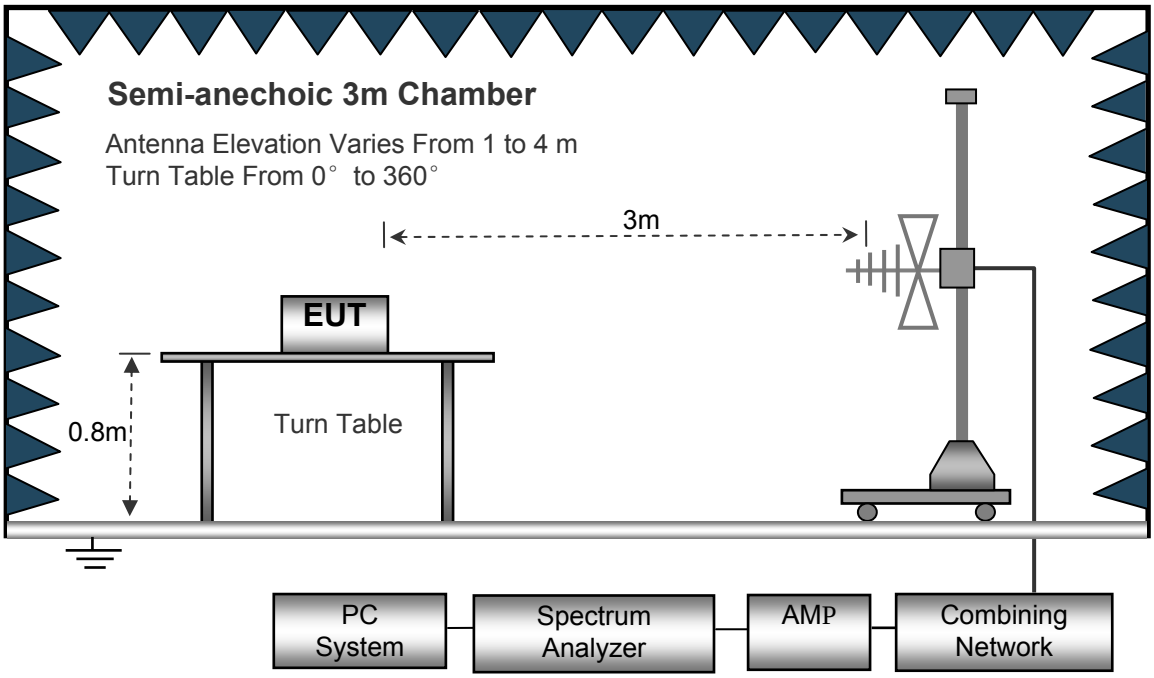
9.2 Test Setup

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

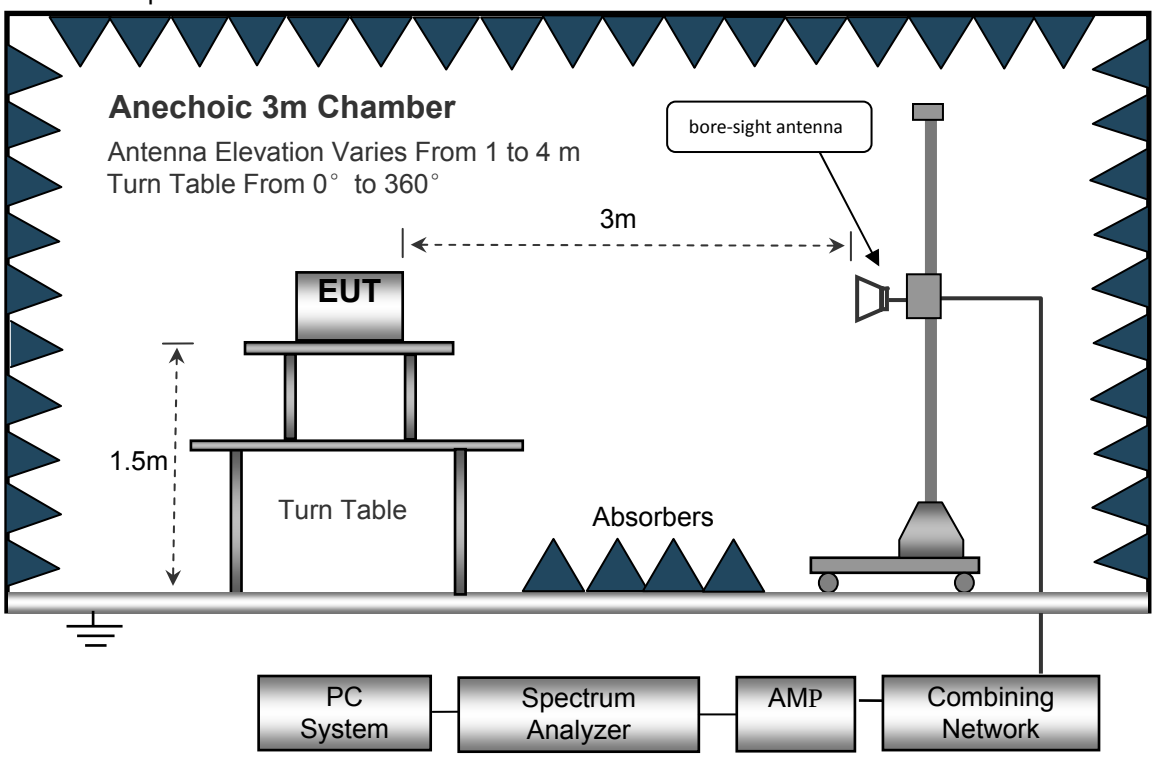
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



9.3 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

9.4 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.

9.5 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

9.6 Summary of Test Results

Test Frequency: 9kHz ~ 30MHz

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

Test Frequency: 30MHz ~ 8GHz

Note: Only the worst-case 11b mode were record in the report.

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)
11b: Low Channel 2412MHz									
311.94	40.71	QP	99	1.4	H	-13.21	27.50	46.00	-18.50
311.94	46.85	QP	181	1.4	V	-13.21	33.64	46.00	-12.36
4824.00	53.43	PK	141	1.3	V	-1.06	52.37	74.00	-21.63
4824.00	40.77	Ave	141	1.3	V	-1.06	39.71	54.00	-14.29
7236.00	49.62	PK	276	1.5	H	1.33	50.95	74.00	-23.05
7236.00	38.98	Ave	276	1.5	H	1.33	40.31	54.00	-13.69
2326.38	48.03	PK	314	1.3	V	-13.19	34.84	74.00	-39.16
2326.38	38.30	Ave	314	1.3	V	-13.19	25.11	54.00	-28.89
2354.71	42.93	PK	115	1.1	H	-13.14	29.79	74.00	-44.21
2354.71	37.46	Ave	115	1.1	H	-13.14	24.32	54.00	-29.68
2493.12	42.08	PK	62	1.2	V	-13.08	29.00	74.00	-45.00
2493.12	37.63	Ave	62	1.2	V	-13.08	24.55	54.00	-29.45

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)
11b: Middle Channel 2437MHz									
311.94	41.23	QP	88	1.7	H	-13.21	28.02	46.00	-17.98
311.94	48.29	QP	246	1.7	V	-13.21	35.08	46.00	-10.92
4874.00	53.41	PK	353	1.3	V	-0.62	52.79	74.00	-21.21
4874.00	40.49	Ave	353	1.3	V	-0.62	39.87	54.00	-14.13
7311.00	50.47	PK	347	1.5	H	2.21	52.68	74.00	-21.32
7311.00	39.43	Ave	347	1.5	H	2.21	41.64	54.00	-12.36
2313.69	46.38	PK	329	1.6	V	-13.19	33.19	74.00	-40.81
2313.69	38.20	Ave	329	1.6	V	-13.19	25.01	54.00	-28.99
2368.52	42.47	PK	233	1.2	H	-13.14	29.33	74.00	-44.67
2368.52	36.45	Ave	233	1.2	H	-13.14	23.31	54.00	-30.69
2483.61	44.27	PK	60	1.3	V	-13.08	31.19	74.00	-42.81
2483.61	37.79	Ave	60	1.3	V	-13.08	24.71	54.00	-29.29

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)
11b: High Channel 2462MHz									
311.94	40.20	QP	341	1.9	H	-13.21	26.99	46.00	-19.01
311.94	48.64	QP	66	1.4	V	-13.21	35.43	46.00	-10.57
4924.00	53.70	PK	259	1.3	V	-0.24	53.46	74.00	-20.54
4924.00	40.30	Ave	259	1.3	V	-0.24	40.06	54.00	-13.94
7386.00	49.61	PK	327	1.9	H	2.84	52.45	74.00	-21.55
7386.00	40.88	Ave	327	1.9	H	2.84	43.72	54.00	-10.28
2315.65	45.86	PK	38	1.5	V	-13.19	32.67	74.00	-41.33
2315.65	37.67	Ave	38	1.5	V	-13.19	24.48	54.00	-29.52
2361.30	44.37	PK	24	1.8	H	-13.14	31.23	74.00	-42.77
2361.30	38.16	Ave	24	1.8	H	-13.14	25.02	54.00	-28.98
2495.79	42.80	PK	105	2.0	V	-13.08	29.72	74.00	-44.28
2495.79	38.48	Ave	105	2.0	V	-13.08	25.40	54.00	-28.60

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	RSS-Gen	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
311.94	39.20	QP	173	1.3	H	-13.21	25.99	46.00	-20.01
311.94	45.74	QP	116	1.0	V	-13.21	32.53	46.00	-13.47
4824.00	53.49	PK	44	1.8	V	-1.06	52.43	74.00	-21.57
4824.00	40.18	Ave	44	1.8	V	-1.06	39.12	54.00	-14.88
7236.00	47.42	PK	227	1.7	H	1.33	48.75	74.00	-25.25
7236.00	38.59	Ave	227	1.7	H	1.33	39.92	54.00	-14.08
2324.41	45.91	PK	155	1.4	V	-13.19	32.72	74.00	-41.28
2324.41	37.41	Ave	155	1.4	V	-13.19	24.22	54.00	-29.78
2388.84	42.60	PK	50	1.8	H	-13.14	29.46	74.00	-44.54
2388.84	38.39	Ave	50	1.8	H	-13.14	25.25	54.00	-28.75
2490.12	43.53	PK	7	1.7	V	-13.08	30.45	74.00	-43.55
2490.12	37.86	Ave	7	1.7	V	-13.08	24.78	54.00	-29.22

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	RSS-Gen	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Middle Channel 2437MHz									
311.94	39.80	QP	4	1.1	H	-13.21	26.59	46.00	-19.41
311.94	46.41	QP	138	1.4	V	-13.21	33.20	46.00	-12.80
4874.00	50.51	PK	110	1.3	V	-0.62	49.89	74.00	-24.11
4874.00	36.38	Ave	110	1.3	V	-0.62	35.76	54.00	-18.24
7311.00	49.59	PK	89	1.7	H	2.21	51.80	74.00	-22.20
7311.00	38.59	Ave	89	1.7	H	2.21	40.80	54.00	-13.20
2332.66	46.97	PK	53	1.3	V	-13.19	33.78	74.00	-40.22
2332.66	37.59	Ave	53	1.3	V	-13.19	24.40	54.00	-29.60
2366.29	43.27	PK	262	1.6	H	-13.14	30.13	74.00	-43.87
2366.29	36.31	Ave	262	1.6	H	-13.14	23.17	54.00	-30.83
2485.34	44.57	PK	82	1.6	V	-13.08	31.49	74.00	-42.51
2485.34	37.70	Ave	82	1.6	V	-13.08	24.62	54.00	-29.38

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	RSS-Gen	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: High Channel 2462MHz									
311.94	38.93	QP	267	1.8	H	-13.21	25.72	46.00	-20.28
311.94	45.90	QP	172	1.1	V	-13.21	32.69	46.00	-13.31
4924.00	49.37	PK	338	1.6	V	-0.24	49.13	74.00	-24.87
4924.00	37.32	Ave	338	1.6	V	-0.24	37.08	54.00	-16.92
7386.00	49.87	PK	248	1.8	H	2.84	52.71	74.00	-21.29
7386.00	38.41	Ave	248	1.8	H	2.84	41.25	54.00	-12.75
2334.00	46.72	PK	35	1.2	V	-13.19	33.53	74.00	-40.47
2334.00	39.23	Ave	35	1.2	V	-13.19	26.04	54.00	-27.96
2378.94	42.56	PK	244	1.4	H	-13.14	29.42	74.00	-44.58
2378.94	38.92	Ave	244	1.4	H	-13.14	25.78	54.00	-28.22
2499.18	43.87	PK	219	1.1	V	-13.08	30.79	74.00	-43.21
2499.18	36.34	Ave	219	1.1	V	-13.08	23.26	54.00	-30.74

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	RSS-Gen	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Low Channel 2412MHz									
311.94	40.12	QP	348	1.8	H	-13.21	26.91	46.00	-19.09
311.94	45.67	QP	163	1.8	V	-13.21	32.46	46.00	-13.54
4824.00	53.41	PK	202	1.9	V	-1.06	52.35	74.00	-21.65
4824.00	42.81	Ave	202	1.9	V	-1.06	41.75	54.00	-12.25
7236.00	49.17	PK	263	1.7	H	1.33	50.50	74.00	-23.50
7236.00	38.46	Ave	263	1.7	H	1.33	39.79	54.00	-14.21
2339.08	45.91	PK	317	1.3	V	-13.19	32.72	74.00	-41.28
2339.08	37.18	Ave	317	1.3	V	-13.19	23.99	54.00	-30.01
2374.37	44.68	PK	277	2.0	H	-13.14	31.54	74.00	-42.46
2374.37	36.25	Ave	277	2.0	H	-13.14	23.11	54.00	-30.89
2487.13	43.17	PK	182	1.9	V	-13.08	30.09	74.00	-43.91
2487.13	36.06	Ave	182	1.9	V	-13.08	22.98	54.00	-31.02

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	RSS-Gen	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Middle Channel 2437MHz									
311.94	41.10	QP	43	1.3	H	-13.21	27.89	46.00	-18.11
311.94	45.54	QP	155	1.7	V	-13.21	32.33	46.00	-13.67
4874.00	54.06	PK	246	1.3	V	-0.62	53.44	74.00	-20.56
4874.00	39.87	Ave	246	1.3	V	-0.62	39.25	54.00	-14.75
7311.00	49.25	PK	177	1.7	H	2.21	51.46	74.00	-22.54
7311.00	41.12	Ave	177	1.7	H	2.21	43.33	54.00	-10.67
2340.46	45.48	PK	219	1.0	V	-13.19	32.29	74.00	-41.71
2340.46	39.90	Ave	219	1.0	V	-13.19	26.71	54.00	-27.29
2372.16	43.70	PK	260	1.2	H	-13.14	30.56	74.00	-43.44
2372.16	36.97	Ave	260	1.2	H	-13.14	23.83	54.00	-30.17
2488.01	42.05	PK	125	1.6	V	-13.08	28.97	74.00	-45.03
2488.01	38.51	Ave	125	1.6	V	-13.08	25.43	54.00	-28.57

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	RSS-Gen	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: High Channel 2462MHz									
311.94	37.47	QP	243	1.8	H	-13.21	24.26	46.00	-21.74
311.94	43.65	QP	17	1.6	V	-13.21	30.44	46.00	-15.56
4924.00	45.90	PK	231	1.2	V	-0.24	45.66	74.00	-28.34
4924.00	38.99	Ave	231	1.2	V	-0.24	38.75	54.00	-15.25
7386.00	48.16	PK	351	1.8	H	2.84	51.00	74.00	-23.00
7386.00	34.28	Ave	351	1.8	H	2.84	37.12	54.00	-16.88
2336.91	45.64	PK	81	1.0	V	-13.19	32.45	74.00	-41.55
2336.91	39.39	Ave	81	1.0	V	-13.19	26.20	54.00	-27.80
2359.26	43.63	PK	141	1.1	H	-13.14	30.49	74.00	-43.51
2359.26	36.13	Ave	141	1.1	H	-13.14	22.99	54.00	-31.01
2486.98	44.80	PK	88	1.5	V	-13.08	31.72	74.00	-42.28
2486.98	37.10	Ave	88	1.5	V	-13.08	24.02	54.00	-29.98

Test Frequency: 8GHz~25GHz

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

10 Conducted Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.247

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

Test Result: PASS

Limit:

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

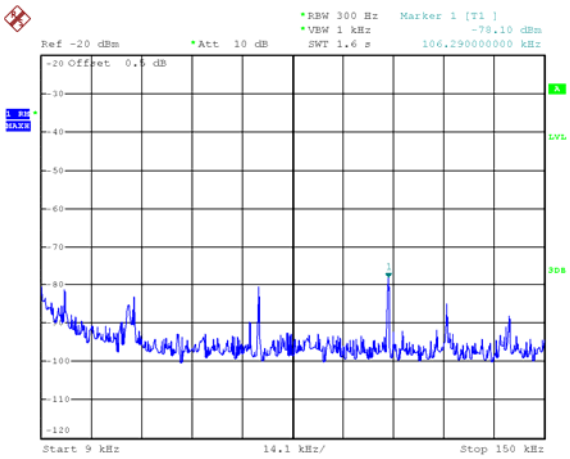
10.1 Test Procedure

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

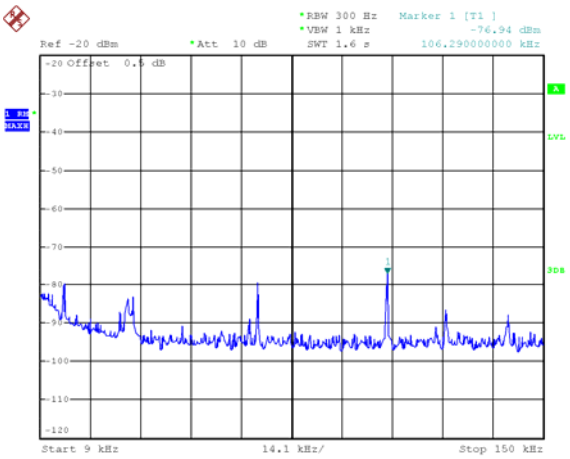
9kHz – 150kHz

Mode: TX 11b channel 1



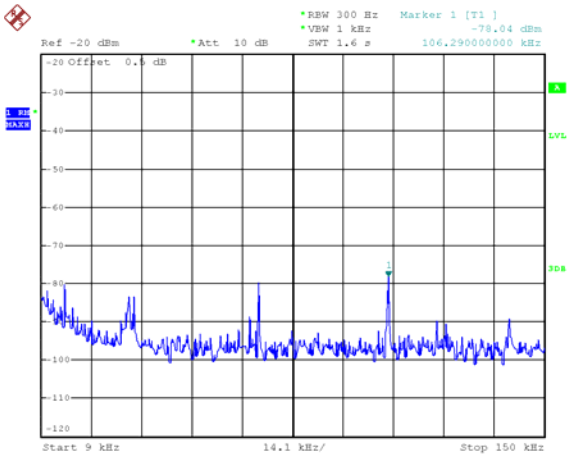
Date: 24.OCT.2023 09:52:18

Mode: TX 11b channel 6



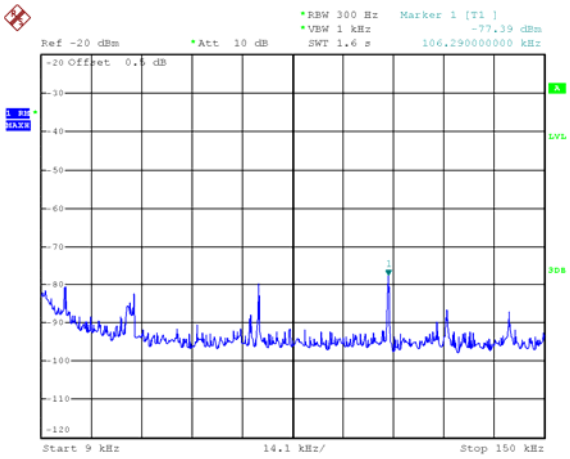
Date: 24.OCT.2023 09:55:19

Mode: TX 11b channel 11



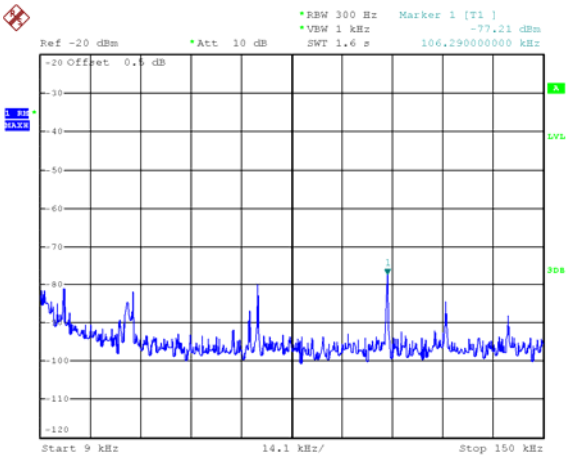
Date: 24.OCT.2023 09:51:52

Mode: TX 11g channel 1



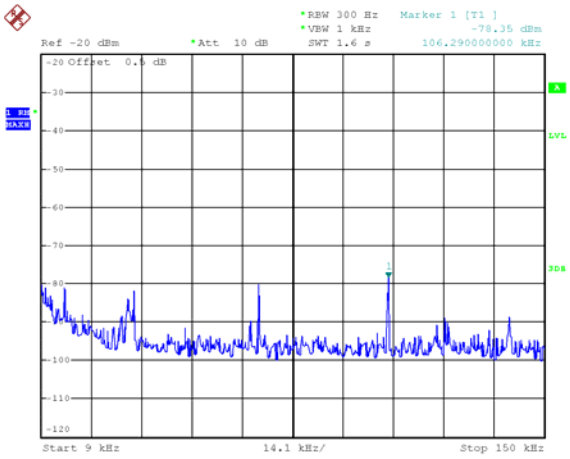
Date: 24.OCT.2023 09:50:37

Mode: TX 11g channel 6



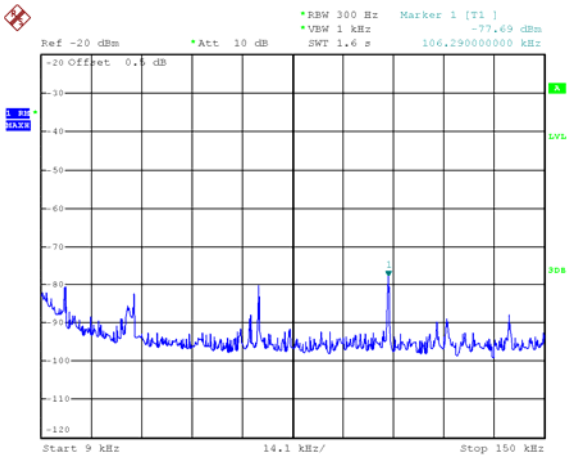
Date: 24.OCT.2023 09:51:05

Mode: TX 11g channel 11

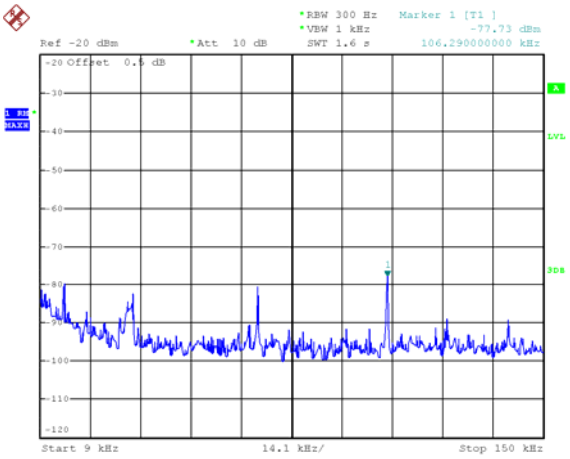


Date: 24.OCT.2023 09:51:29

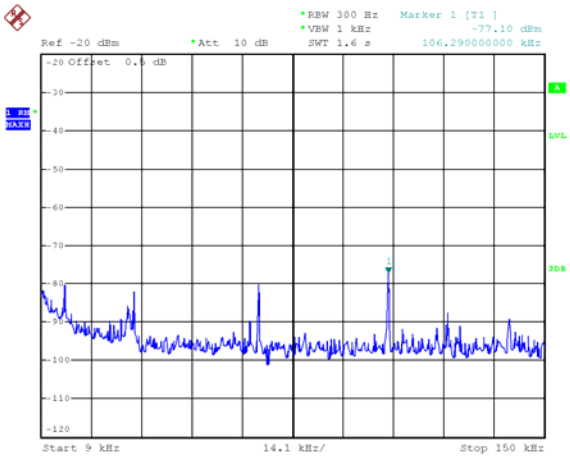
Mode: TX 11n HT20 channel 1



Mode: TX 11 n HT20 channel 6

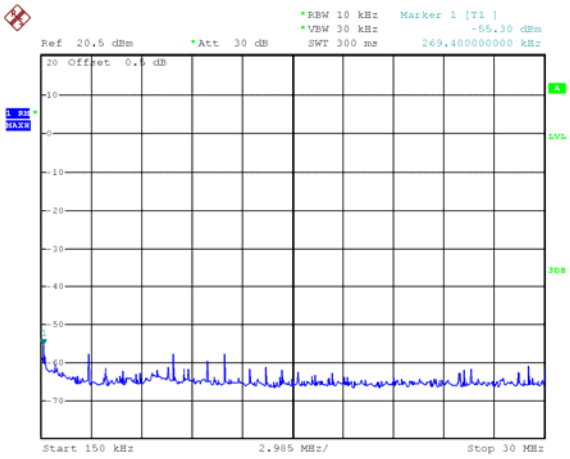


Mode: TX 11 n HT20 channel 11



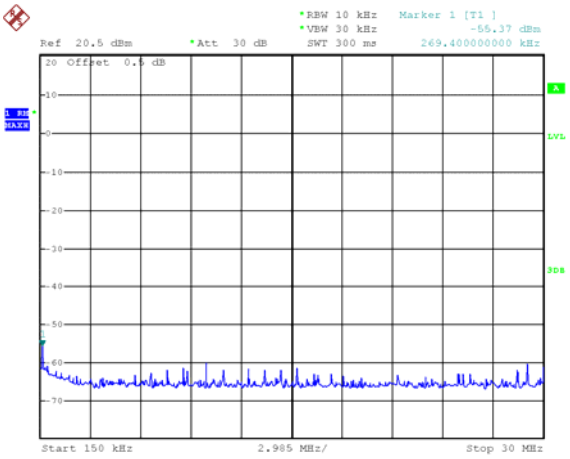
150kHz – 30MHz

Mode: TX 11b channel 1



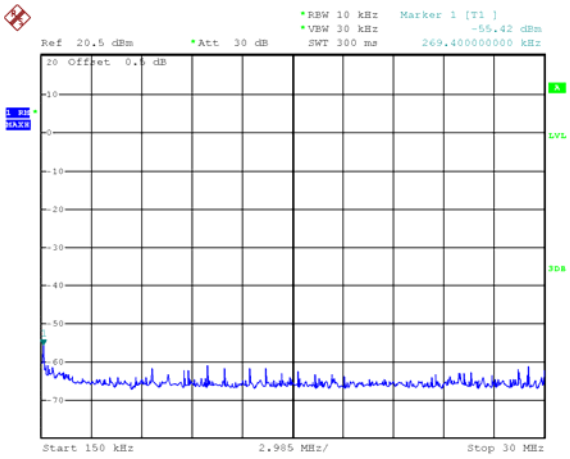
Date: 23.OCT.2023 17:42:55

Mode: TX 11b channel 6



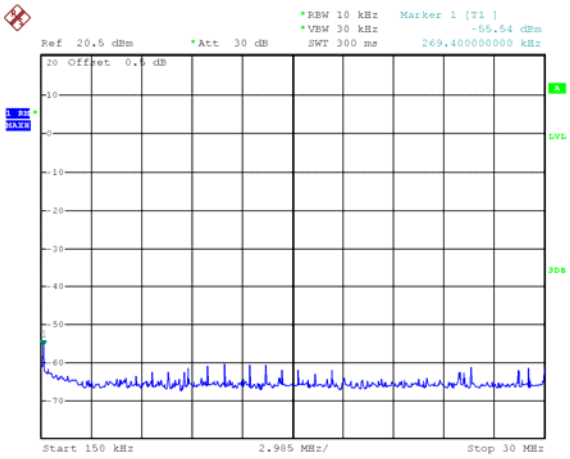
Date: 24.OCT.2023 09:45:35

Mode: TX 11b channel 11



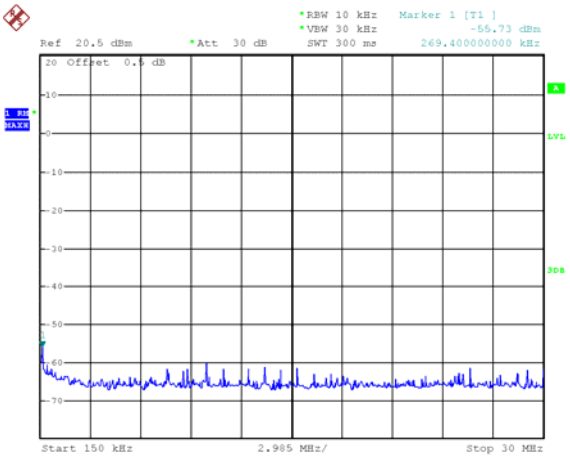
Date: 24.OCT.2023 09:45:57

Mode: TX 11g channel 1



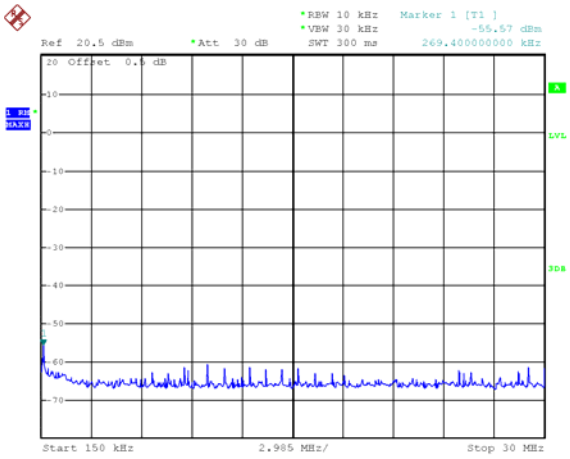
Date: 24.OCT.2023 09:47:00

Mode: TX 11g channel 6



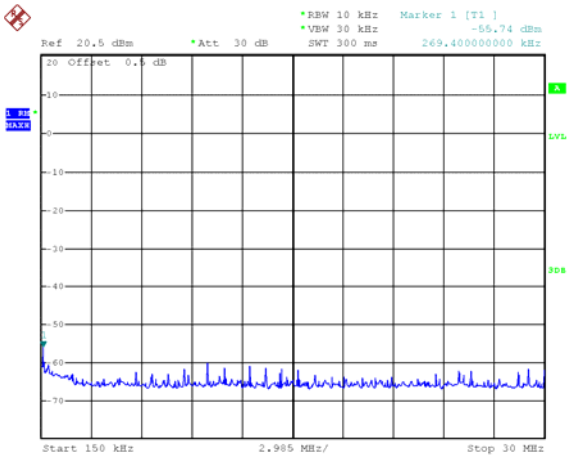
Date: 24.OCT.2023 09:46:40

Mode: TX 11g channel 11



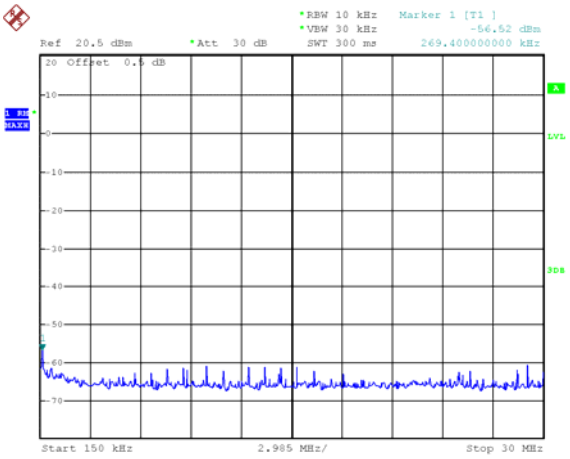
Date: 24.OCT.2023 09:46:18

Mode: TX 11n HT20 channel 1



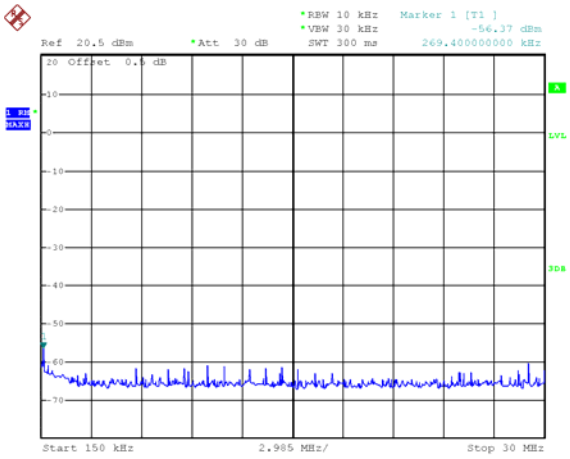
Date: 24.OCT.2023 09:47:23

Mode: TX 11 n HT20 channel 6



Date: 24.OCT.2023 09:47:42

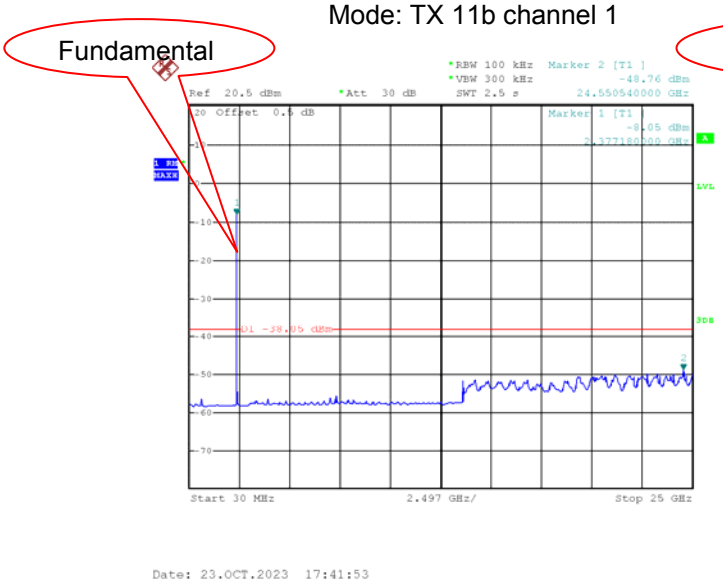
Mode: TX 11 n HT20 channel 11



Date: 24.OCT.2023 09:48:02

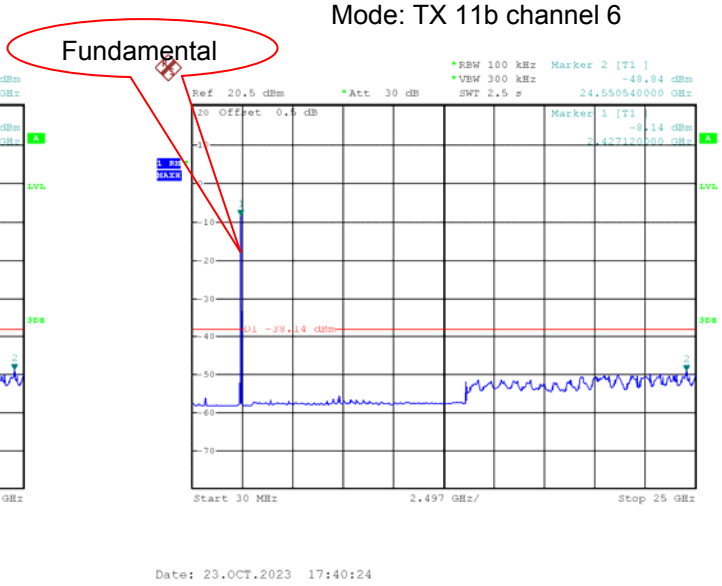
Above 30MHz

Mode: TX 11b channel 1



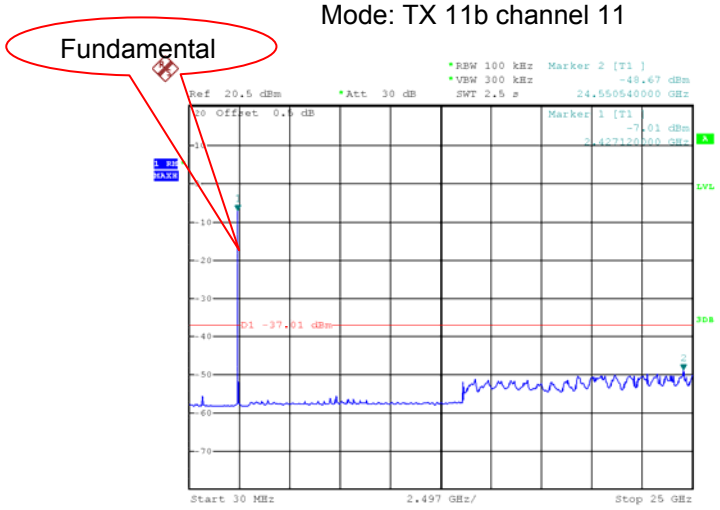
Date: 23.OCT.2023 17:41:53

Mode: TX 11b channel 6



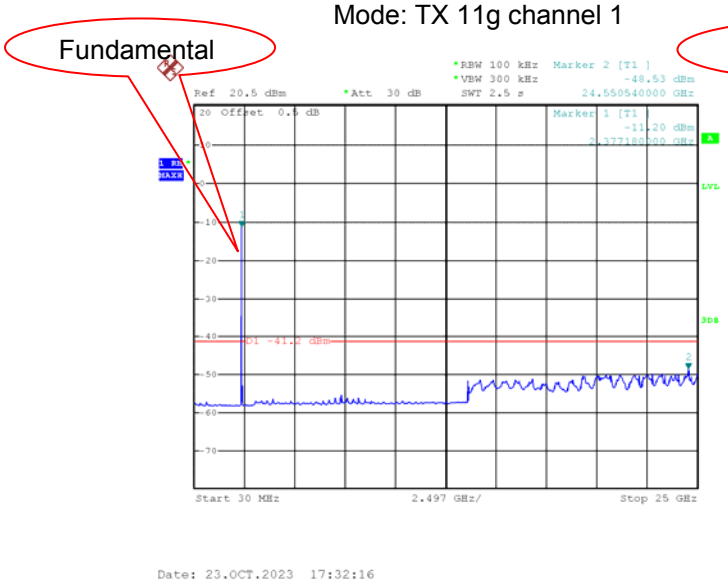
Date: 23.OCT.2023 17:40:24

Mode: TX 11b channel 11



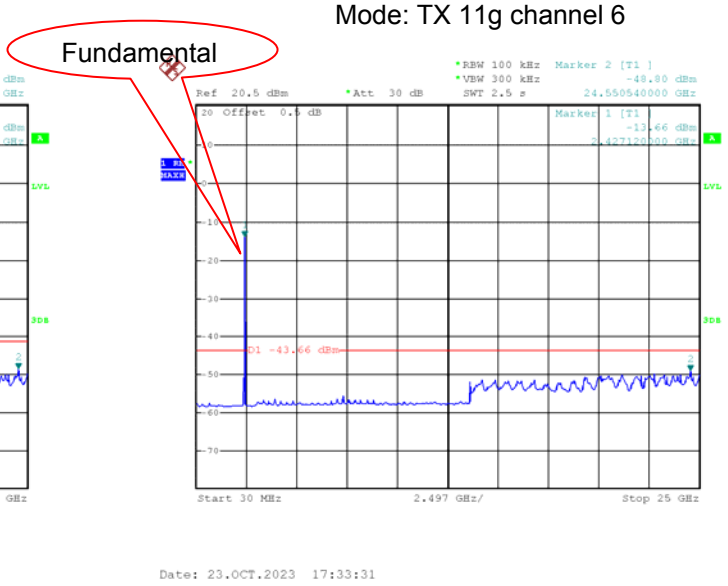
Date: 23.OCT.2023 17:38:27

Mode: TX 11g channel 1



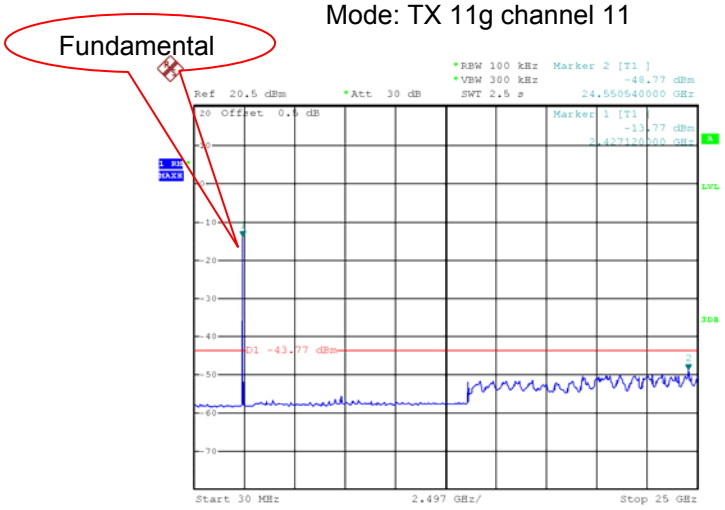
Date: 23.OCT.2023 17:32:16

Mode: TX 11g channel 6



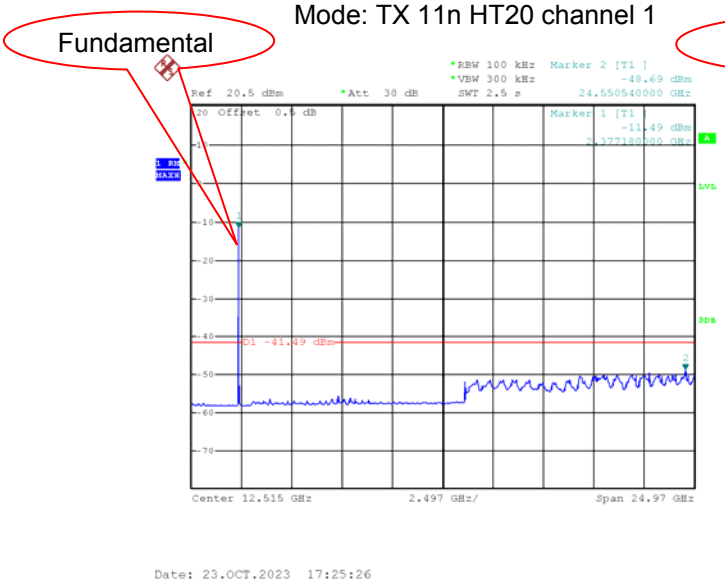
Date: 23.OCT.2023 17:33:31

Mode: TX 11g channel 11



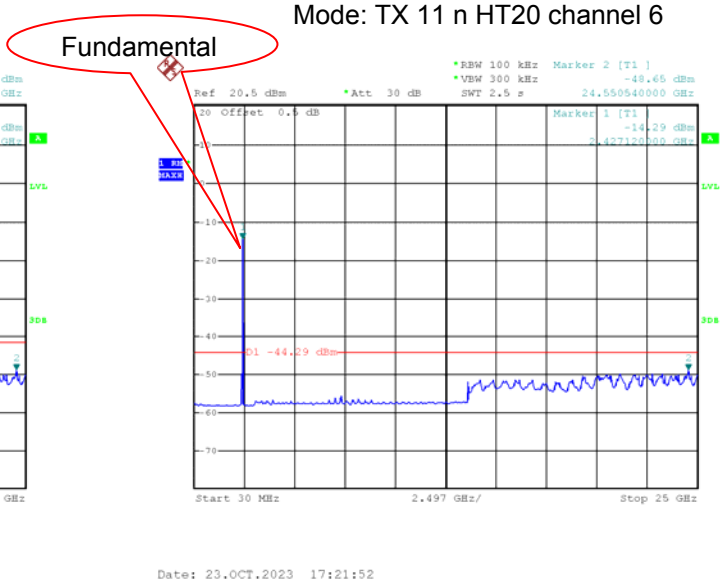
Date: 23.OCT.2023 17:34:49

Mode: TX 11n HT20 channel 1



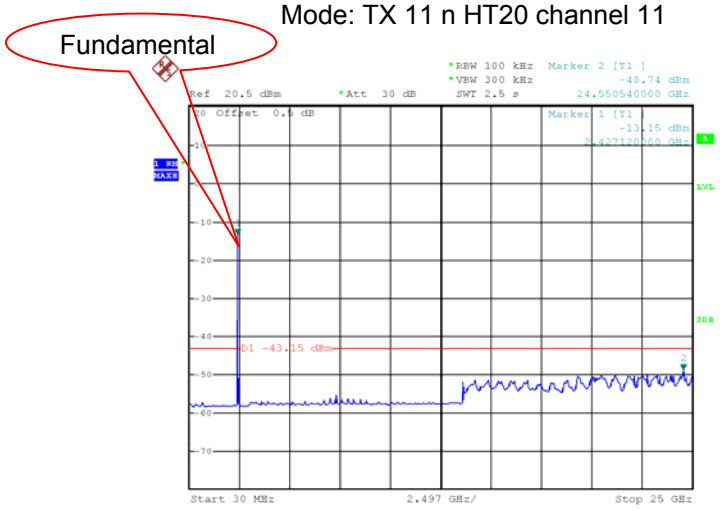
Date: 23.OCT.2023 17:25:26

Mode: TX 11 n HT20 channel 6



Date: 23.OCT.2023 17:21:52

Mode: TX 11 n HT20 channel 11



Date: 23.OCT.2023 17:16:27

11 Band Edge Measurement

Test Requirement:	47CFR FCC Part15 Subpart C §15.247
Test Method:	KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
Test Limit:	Regulation 15.247 (d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

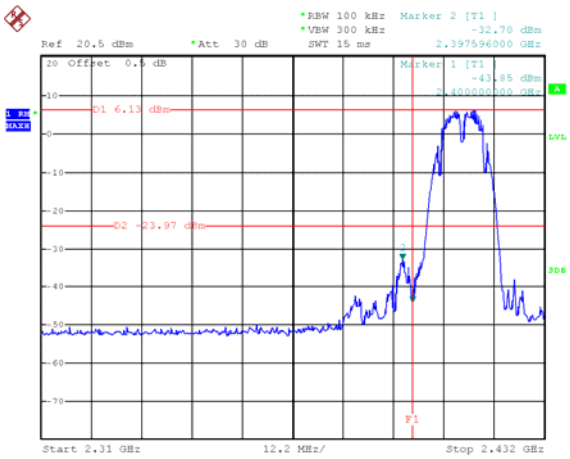
11.1 Test Produce

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

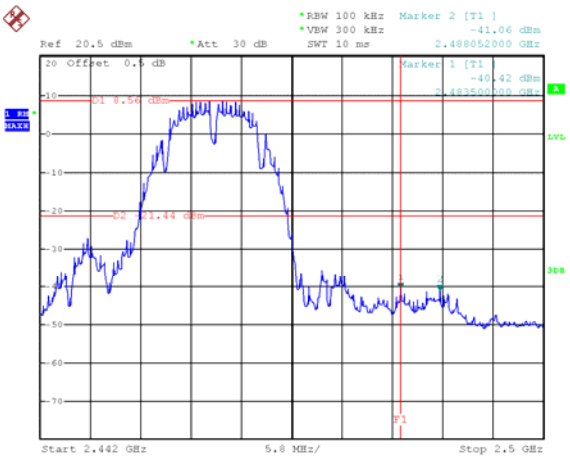
Test result plots shown as follows:

TX 11b: Band edge-left side



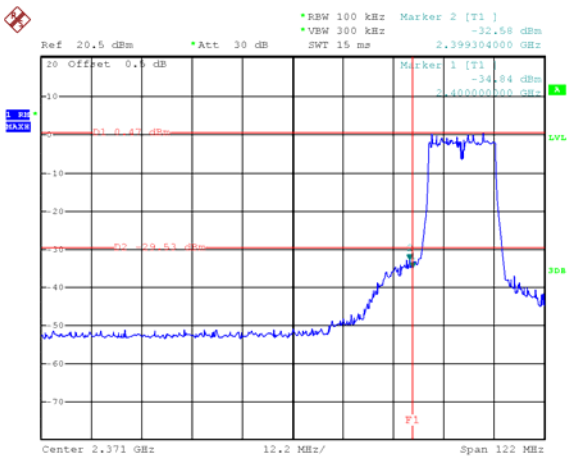
Date: 23.OCT.2023 16:55:46

TX 11b: Band edge-right side



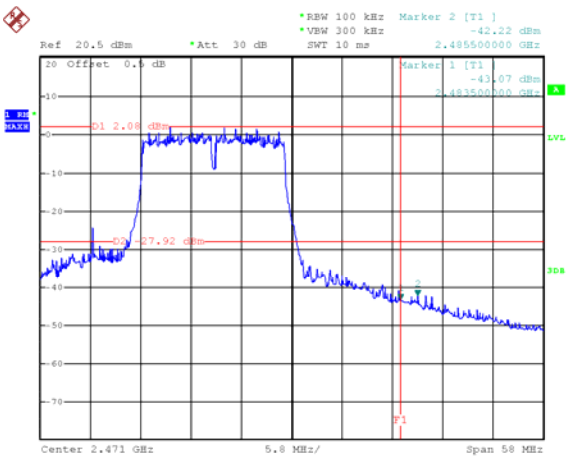
Date: 23.OCT.2023 17:00:06

TX 11g: Band edge-left side



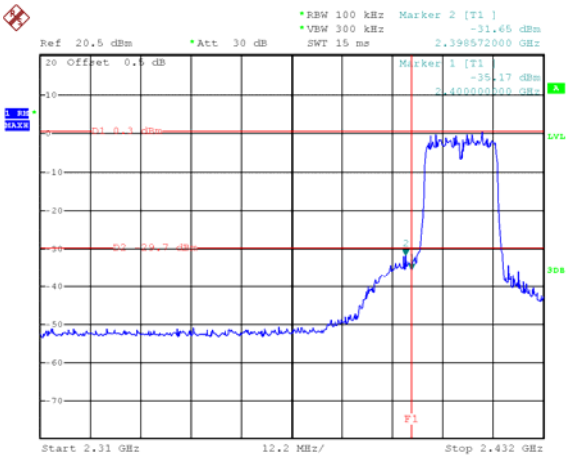
Date: 23.OCT.2023 16:42:09

TX 11g: Band edge-right side



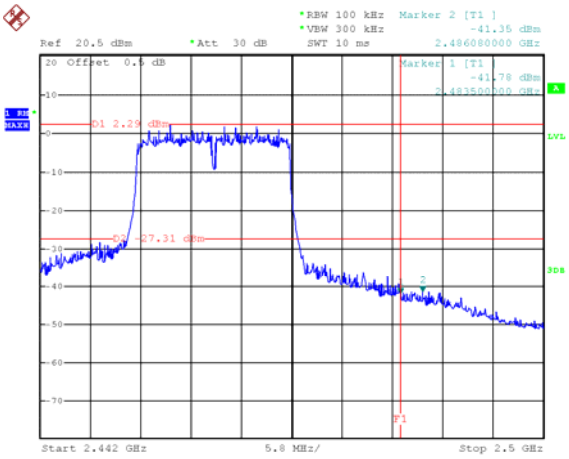
Date: 23.OCT.2023 17:06:10

TX 11n HT20: Band edge-left side



Date: 23.OCT.2023 16:35:07

TX 11n HT20: Band edge-right side



Date: 23.OCT.2023 17:09:26

12 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement:	47CFR FCC Part15 Subpart C §15.247
Test Method:	ANSI C63.10:2013 KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
Test Limit:	§15.247(a)(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Mode:	Transmitting

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: 1~5% of the OBW, VBW = 3 times the RBW

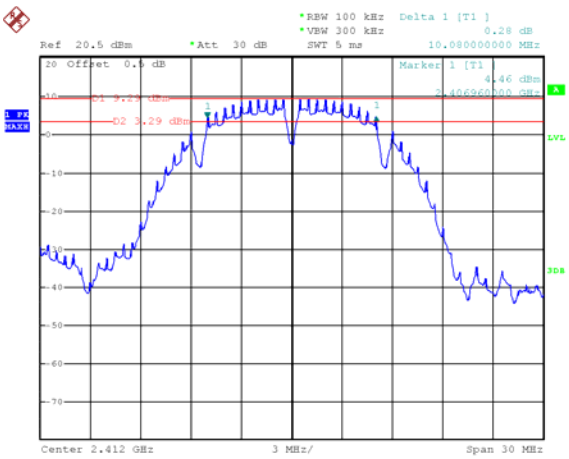
12.2 Test Result

Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	10.080	13.320
	Channel 6	10.080	13.320
	Channel 11	10.080	13.320
TX 11g	Channel 1	16.440	16.800
	Channel 6	16.440	16.800
	Channel 11	16.320	16.860
TX 11n HT20	Channel 1	17.040	17.640
	Channel 6	17.220	17.640
	Channel 11	17.040	17.640

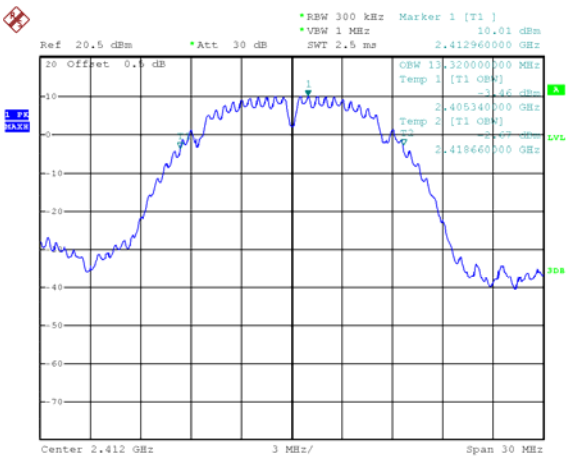
Test result plot:

6 dB Bandwidth 99% Bandwidth

Mode: TX 11b channel 1

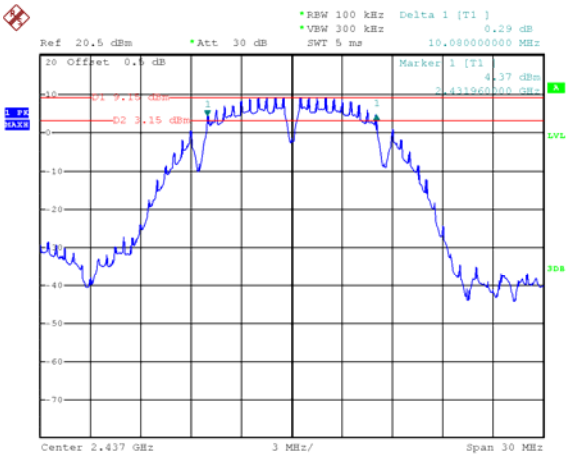


Date: 23.OCT.2023 15:53:26

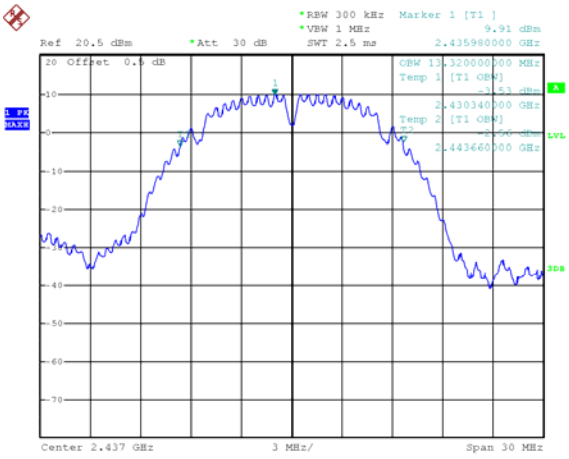


Date: 23.OCT.2023 15:08:44

Mode: TX 11b channel 6



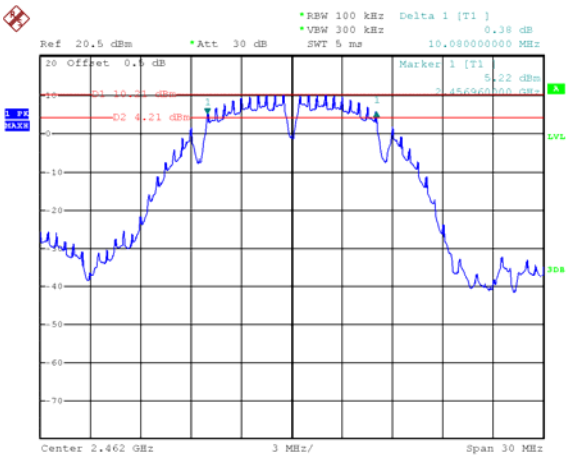
Date: 23.OCT.2023 15:49:44



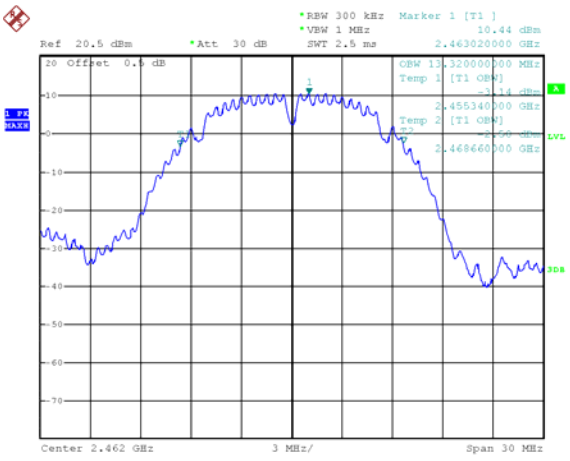
Date: 23.OCT.2023 15:10:49

6 dB Bandwidth 99% Bandwidth

Mode: TX 11b channel 11

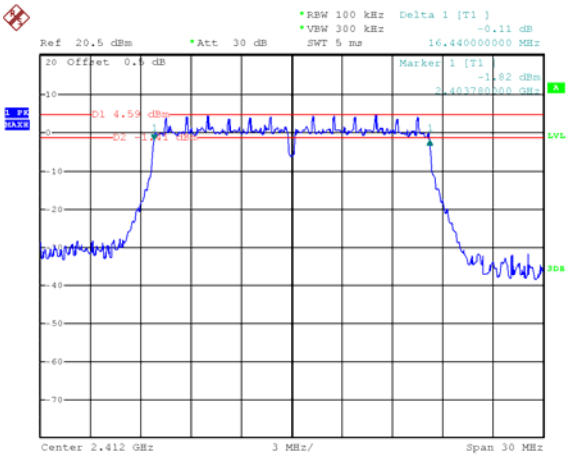


Date: 23.OCT.2023 15:48:35

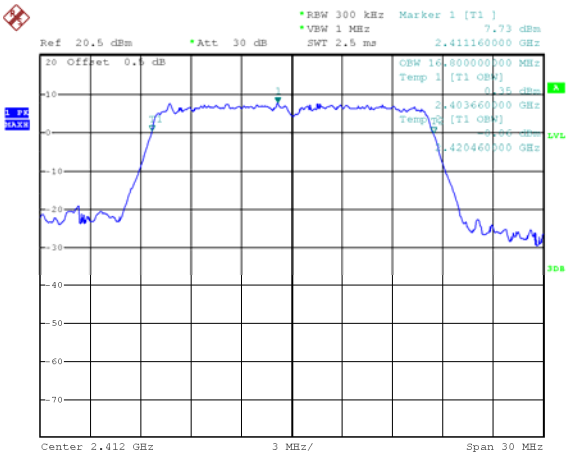


Date: 23.OCT.2023 15:12:22

Mode: TX 11g channel 1



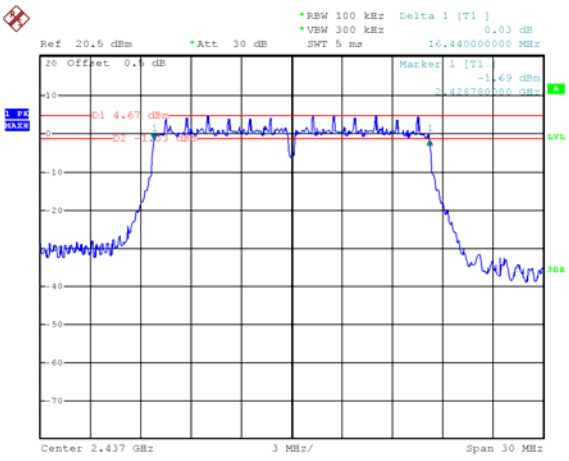
Date: 23.OCT.2023 15:33:49



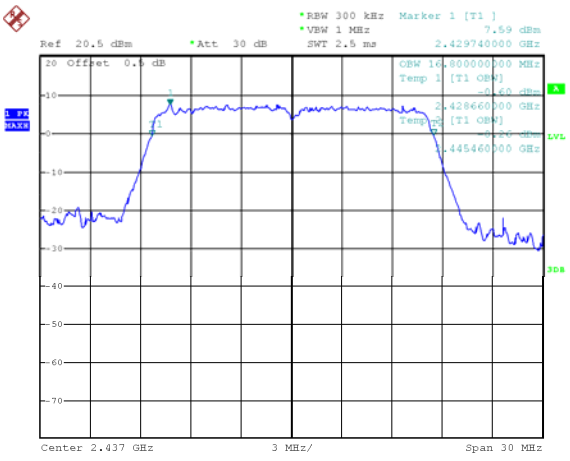
Date: 23.OCT.2023 15:16:12

6 dB Bandwidth 99% Bandwidth

Mode: TX 11g channel 6

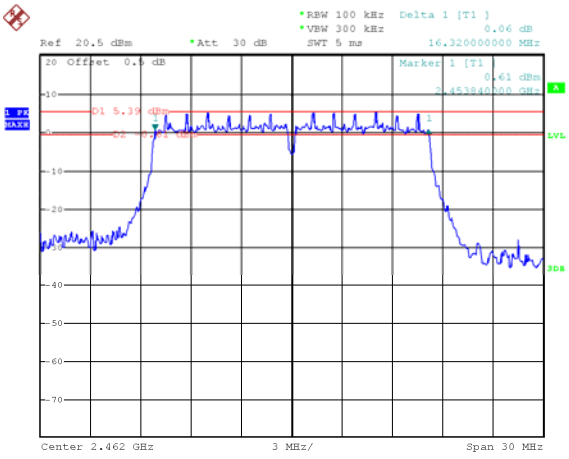


Date: 23.OCT.2023 15:36:23

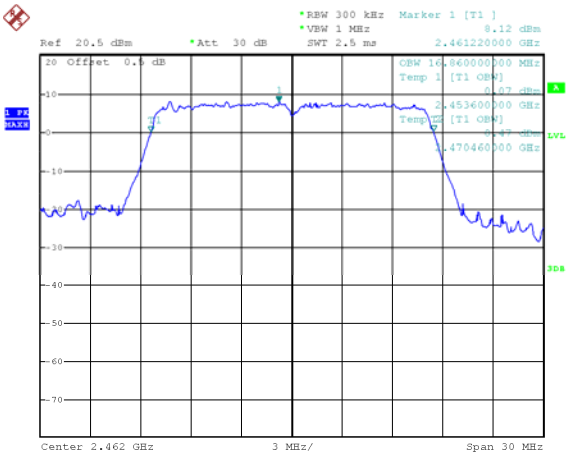


Date: 23.OCT.2023 15:14:31

Mode: TX 11g channel 11



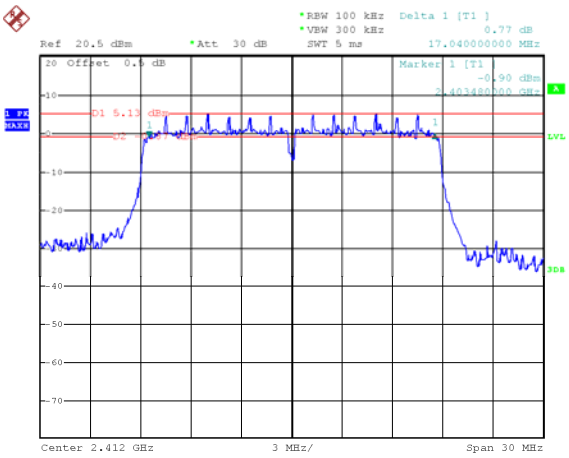
Date: 23.OCT.2023 15:39:22



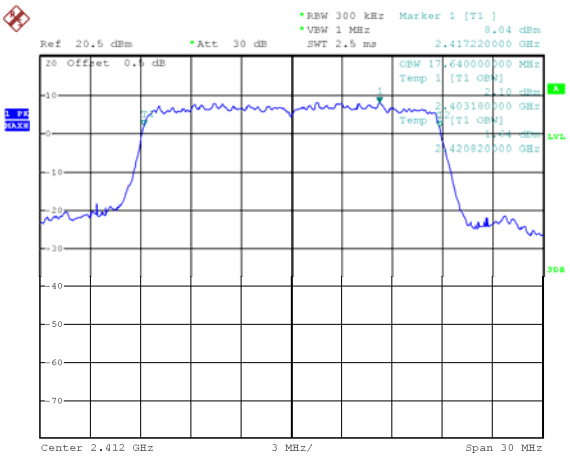
Date: 23.OCT.2023 15:13:23

6 dB Bandwidth 99% Bandwidth

Mode: TX 11n HT20 channel 1

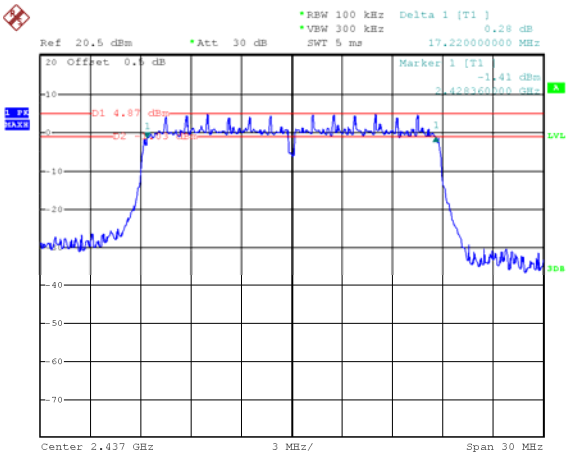


Date: 23.OCT.2023 15:31:02

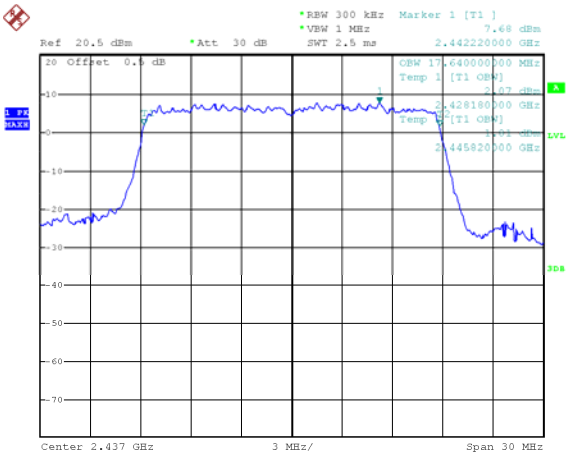


Date: 23.OCT.2023 15:17:53

Mode: TX 11n HT20 channel 6



Date: 23.OCT.2023 15:28:06

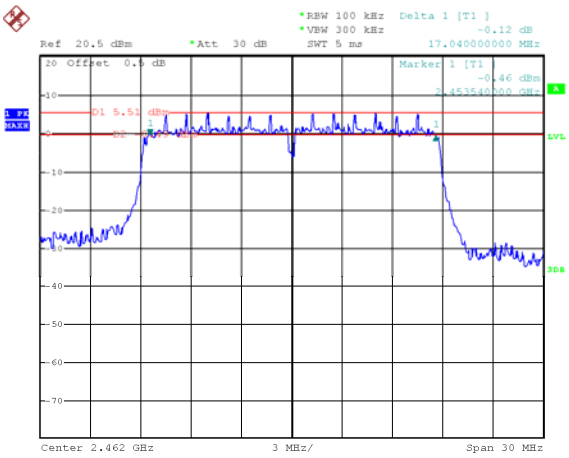


Date: 23.OCT.2023 15:18:59

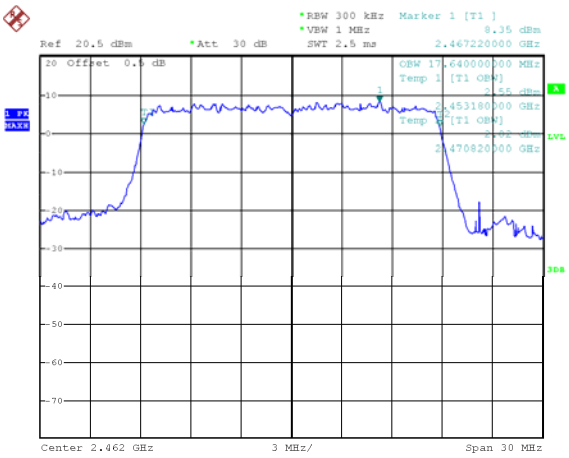
6 dB Bandwidth

99% Bandwidth

Mode: TX 11n HT20 channel 11



Date: 23.OCT.2023 15:24:35



Date: 23.OCT.2023 15:23:07

13 Maximum Peak conducted Output Power

Test Requirement:	47CFR FCC Part15 Subpart C §15.247
Test Method:	ANSI C63.10:2013 KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
Test Limit:	§15.247(b) The maximum peak conducted output power of the intentional radiator shall not exceed 1W.
Test Mode:	Transmitting

13.1 Test Procedure

According to KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019

Section 8.3.1.1 RBW ≥ DTS bandwidth

Subclause 11.9.1.1 of ANSI C63.10 is applicable.

Section 8.3.1.2 Integrated band power method

For measuring the output power of a device transmitting a wide-band noise-like signal where the peak power amplitude is a statistical parameter, the preferred methodology is to use an integrated average power measurement, as described in 8.3.2. The peak integrated band power method of 11.9.1 in ANSI C63.10 is not applicable.

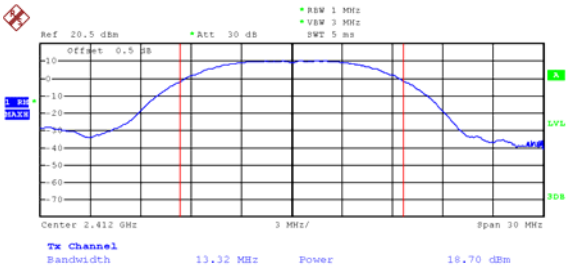
Subclause 11.9.2 of ANSI C63.10 is applicable.

13.2 Test Result

Operation mode	Channel Frequency (MHz)	Measurements (dBm)	Duty Cycle Factor (dB)	Conducted Output Power (dBm)	Limit
TX 11b	Low-2412	18.70	1.01	19.71	1W/30dBm
	Middle-2437	18.70		19.71	1W/30dBm
	High-2462	19.48		20.49	1W/30dBm
TX 11g	Low-2412	17.46	4.15	21.61	1W/30dBm
	Middle-2437	17.65		21.80	1W/30dBm
	High-2462	18.17		22.32	1W/30dBm
TX 11n HT20	Low-2412	17.54	4.28	21.82	1W/30dBm
	Middle-2437	17.39		21.67	1W/30dBm
	High-2462	18.21		**22.49**	1W/30dBm

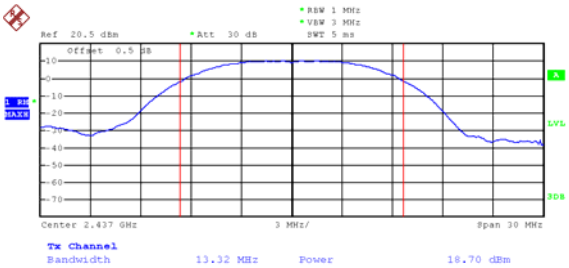
Test Plot:

Mode: TX 11b channel 1



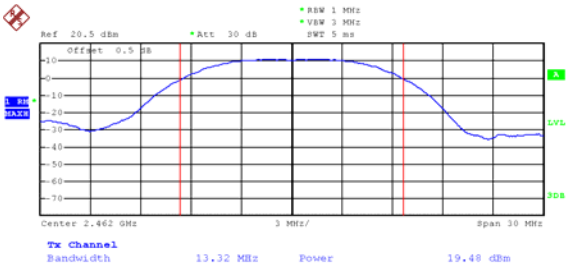
Date: 23.OCT.2023 15:58:41

Mode: TX 11b channel 6



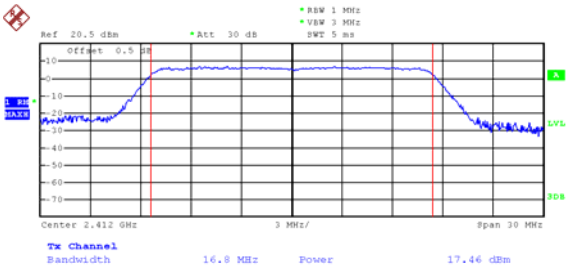
Date: 23.OCT.2023 16:01:34

Mode: TX 11b channel 11



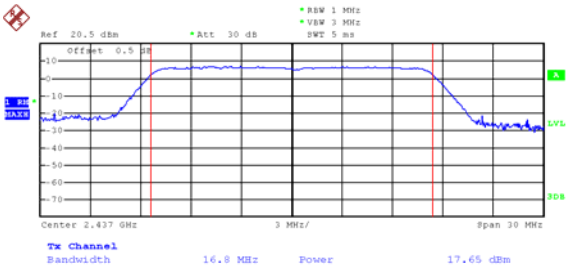
Date: 23.OCT.2023 16:00:44

Mode: TX 11g channel 1



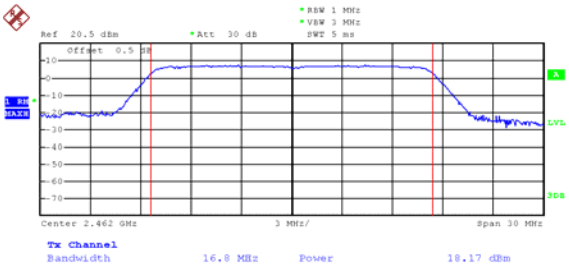
Date: 23.OCT.2023 16:04:36

Mode: TX 11g channel 6



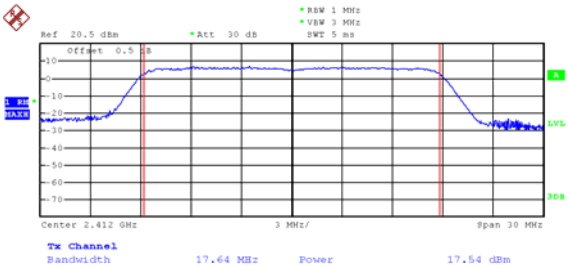
Date: 23.OCT.2023 16:04:01

Mode: TX 11g channel 11



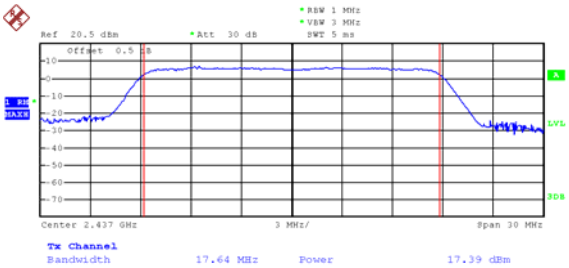
Date: 23.OCT.2023 16:05:27

Mode: TX 11n HT20 channel 1



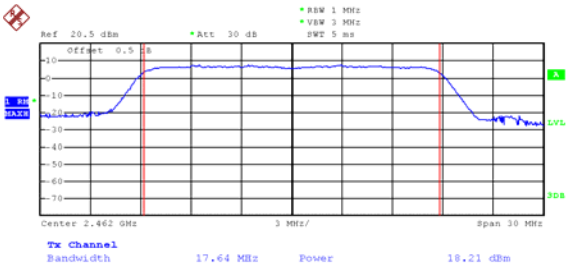
Date: 23.OCT.2023 16:08:41

Mode: TX 11n HT20 channel 6



Date: 23.OCT.2023 16:07:33

Mode: TX 11n HT20 channel 11



Date: 23.OCT.2023 16:06:40

14 Power Spectral density

Test Requirement:	47CFR FCC Part15 Subpart C §15.247
Test Method:	ANSI C63.10:2013 KDB 558074 D01 15.247 Meas Guidance v05r02, April 2, 2019
Test Limit:	§15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
Test Mode:	Transmitting

14.1 Test Procedure

According to KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019 section 8.4

Subclause 11.10 of ANSI C63.10 is applicable.

Choose the test procedure according to the product type

Peak PSD

Subclause 11.10.2 of ANSI C63.10 is applicable.

AVG PSD

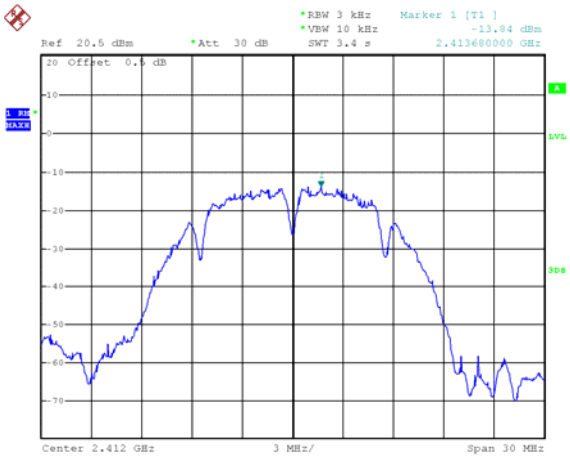
Subclause 11.10.3/4/5/6/7/8 of ANSI C63.10 is applicable.

14.2 Test Result

Operation mode	Channel Frequency (MHz)	Measurements (dBm per 3kHz)	Duty Cycle Factor (dB)	Power Spectral density (dBm per 3kHz)	Limit
TX 11b	Low-2412	-13.84	1.01	-12.83	8dBm per 3kHz
	Middle-2437	-14.07		-13.06	8dBm per 3kHz
	High-2462	-13.42		**-12.41**	8dBm per 3kHz
TX 11g	Low-2412	-20.47	4.15	-16.32	8dBm per 3kHz
	Middle-2437	-20.98		-16.83	8dBm per 3kHz
	High-2462	-19.88		-15.73	8dBm per 3kHz
TX 11n HT20	Low-2412	-20.91	4.28	-16.63	8dBm per 3kHz
	Middle-2437	-21.88		-17.60	8dBm per 3kHz
	High-2462	-20.85		-16.57	8dBm per 3kHz

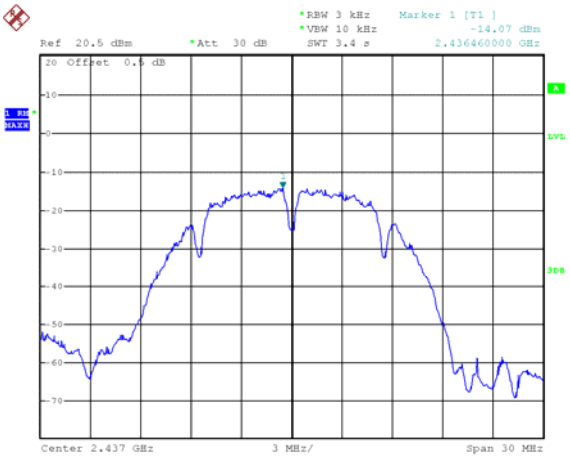
Test Plot:

Mode: TX 11b channel 1



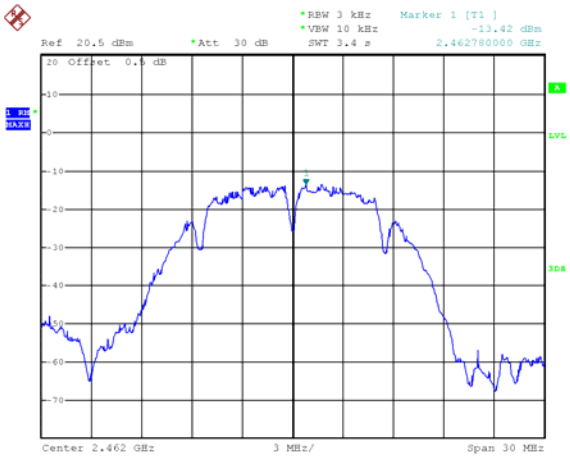
Date: 23.OCT.2023 16:20:04

Mode: TX 11b channel 6



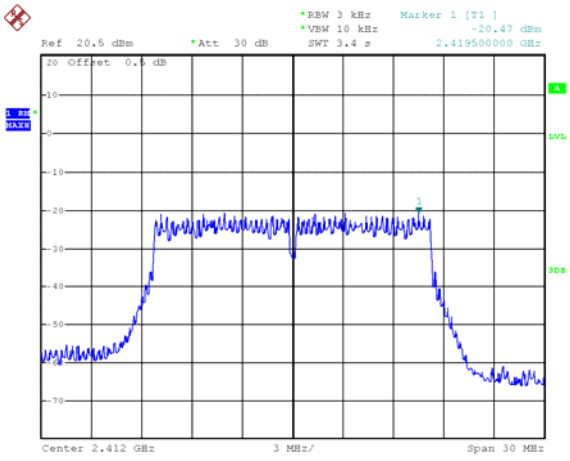
Date: 23.OCT.2023 16:21:21

Mode: TX 11b channel 11



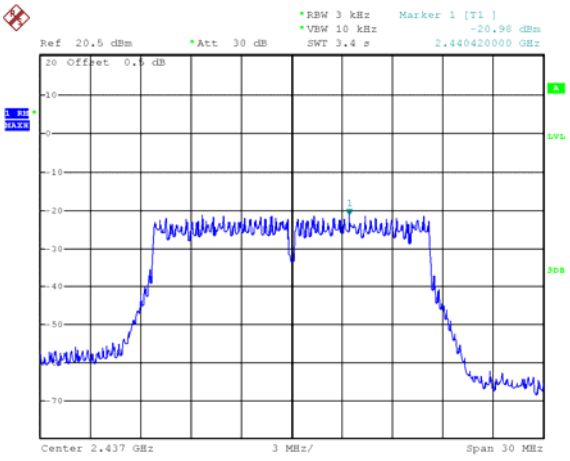
Date: 23.OCT.2023 16:22:15

Mode: TX 11g channel 1



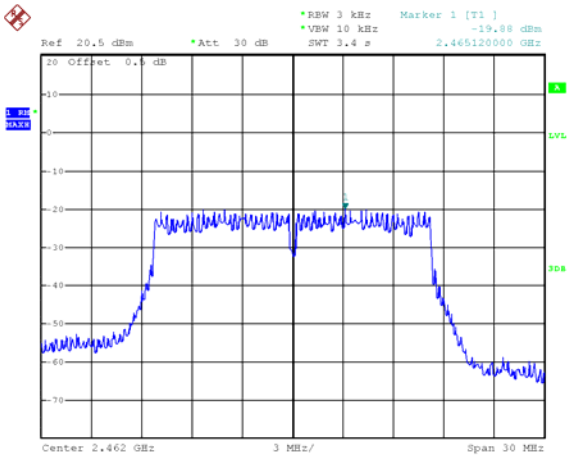
Date: 23.OCT.2023 16:19:09

Mode: TX 11g channel 6



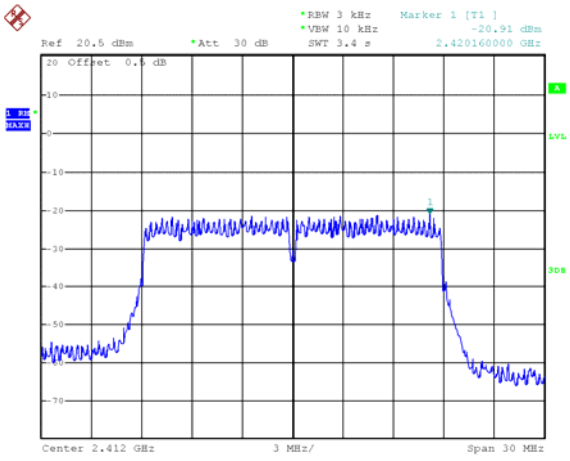
Date: 23.OCT.2023 16:18:02

Mode: TX 11g channel 11



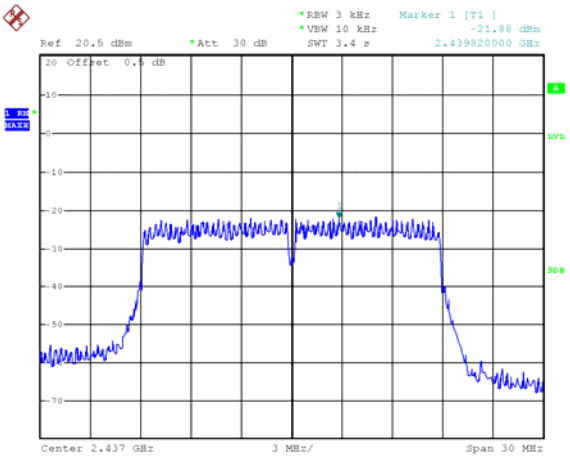
Date: 23.OCT.2023 16:16:57

Mode: TX 11n HT20 channel 1



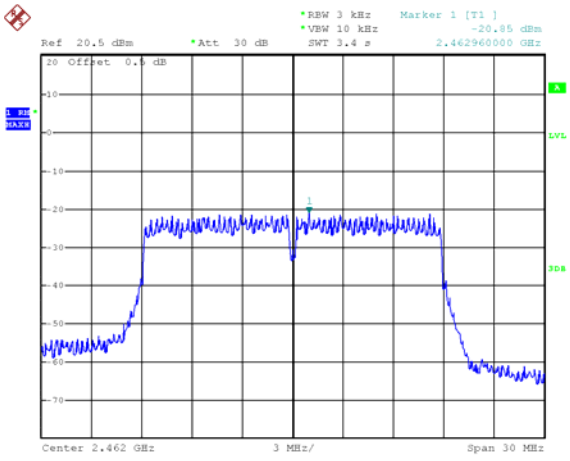
Date: 23.OCT.2023 16:09:50

Mode: TX 11n HT20 channel 6



Date: 23.OCT.2023 16:13:51

Mode: TX 11n HT20 channel 11



Date: 23.OCT.2023 16:15:16

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 external antenna fulfil the requirement of this section.

Note: Please refer to EUT photos for more details.

16 RF Exposure

Note: Please refer to RF Exposure Report: WTH23D10215115W003.

17 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-NVW-AS4KCAM-Photos

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