TEST REPORT

Reference No.	:	WTD22D03053479W004
FCC ID	:	2AEPIBLACKX
Applicant	:	COLOMBIANA DE COMERCIO S.A.
Address	:	Car. 43E No 8-71, Medellin, Colombia
Manufacturer	:	COOSEA GROUP (HK) COMPANY LIMITED LIMITED
Address	:	UNIT 5-6,16F.,MULTIFIELD PLAZA 3-7A PRAT AVENUE TSIM SHA TSUI KL, HONG KONG
Product	:	CELLPHONE
Model(s)	:	Black X
Brand Name	:	Kalley
Standards	:	FCC CFR47 Part 15.247
Date of Receipt sample	:	2022-03-25
Date of Test	:	2022-03-25 to 2022-04-19
Date of Issue	:	2022-05-30
Test Result	:	**Pass**

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

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Approved by:

Daniel Liu / Designated Reviewer

2 Contents

3 Revision History

Test report No.	Date of Receipt sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTD22D03053479W004	2022-03-25	2022-03-25 to 2022-04-19	2022-05-30	original	-	Valid

4 General Information

4.1 General Description of E.U.T.

Product:	CELLPHONE
Model(s):	Black X
Model Description:	N/A
GSM Band(s):	GSM 850/900/1800/1900MHz
GPRS/EGPRS Class:	12
WCDMA Band(s):	FDD Band II/V
LTE Band(s):	FDD Band 4/7
Wi-Fi Specification:	2.4G-802.11b/g/n HT20/n HT40 5G-802.11a/ n(HT20/40)/ac(HT20/40/80)
Bluetooth Version:	Bluetooth v5.0 with BLE
GPS:	Support
NFC:	N/A
Hardware Version:	KF8F01
Software Version:	Kalley_BLACK_X_V01_20220401
Highest frequency (Exclude Radio):	1.8GHz
Storage Location:	Internal Storage
Note:	N/A

4.2 Details of E.U.T.

Operation Frequency:	WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422~2452MHz BLE:2402-2480MHz
Max. RF output power:	WiFi(2.4G): 16.54dBm BLE: 6.20dBm
Type of Modulation:	WiFi: CCK, OFDM BLE:GFSK
Antenna installation:	WiFi: internal permanent antenna BLE: internal permanent antenna
Antenna Gain:	WiFi(2.4G): 1.2dBi BLE: 1.2dBi
Ratings:	Battery DC 3.87V, 4900mAh DC 5.0V⎓3.0A 15.0W charging from adapter (Adapter Input: 100-240V~50/60Hz 0.50A)

Adapter: Manufacturer: Guangdong Beicom Electronics Co.,Ltd
Model No.: UF22F1A050300

4.3 Channel List

WIFI

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462	12	-

BT 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	BT BLE	1 Mbps	0/19/39	TX
Power Spectral Density	BT BLE	1 Mbps	0/19/39	TX
6dB Bandwidth	BT BLE	1 Mbps	0/19/39	TX
Band Edge	BT BLE	1 Mbps	0/19/39	TX
Transmitter Spurious Emissions	BT 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

Conducted Emissions Test Site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	100947	2021-07-30	2022-07-29
2.	LISN	R&S	ENV216	100115	2021-07-30	2022-07-29
3.	Cable	Top	TYPE16(3.5M)	-	2021-07-30	2022-07-29
Conducted Emissions Test Site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMI Test Receiver	R&S	ESCI	101155	2021-07-30	2022-07-29
2.	LISN	SCHWARZBECK	NSLK 8128	8128-259	2021-07-30	2022-07-29
3.	Limiter	CYBERTEK	EM5010	261115-001-0024	2021-07-30	2022-07-29
4.	Cable	**Laplace**	RF300	-	2021-07-30	2022-07-29
3m Semi-anechoic Chamber for Radiation Emissions Test site 1#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP30	100091	2021-04-20	2022-04-19
2	Amplifier	Agilent	8447D	2944A10178	2021-04-20	2022-04-19
3	Trilog Broadband Antenna	SCHWARZBECK	VULB9163	336	2021-08-22	2022-08-21
4	Coaxial Cable (below 1GHz)	Top	TYPE16(13M)	-	2021-04-20	2022-04-19
5	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	667	2021-04-25	2022-04-24
6	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	335	2021-04-20	2022-04-19
7	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2021-04-20	2022-04-19
8	Coaxial Cable (above 1GHz)	ZT26-NJ-NJ-8M/FA	1GHz-18GHz	NA	2021-04-20	2022-04-19
3m Semi-anechoic Chamber for Radiation Emissions Test site 2#						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2021-04-20	2022-04-19
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2021-04-25	2022-04-24
3	Active Loop Antenna	Com-Power Corp.	AL-130R	10160007	2021-05-06 2021-04-29	2022-05-05 2022-04-28
4	Amplifier	ANRITSU	MH648A	M43381	2021-04-20	2022-04-19

5	Cable	HUBER+SUHNER	CBL2	525178	2021-04-20	2022-04-19
RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1.	EMC Analyzer (9k~26.5GHz)	Agilent	E7405A	MY45114943	2021-04-20	2022-04-19
2.	Spectrum Analyzer	R&S	FSP30	100091	2021-04-20	2022-04-19
3.	EXA Signal Analyzer	Malaysia Keysight	N9010A	MY50520207	2021-04-20	2022-04-19

6.2 Description of Support Units

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

6.3 Measurement Uncertainty

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

6.4 Test Equipment Calibration

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

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit:

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

7.1 E.U.T. Operation

Operating Environment **:**

Temperature: 21.5 °C

Humidity: 51.9 % RH

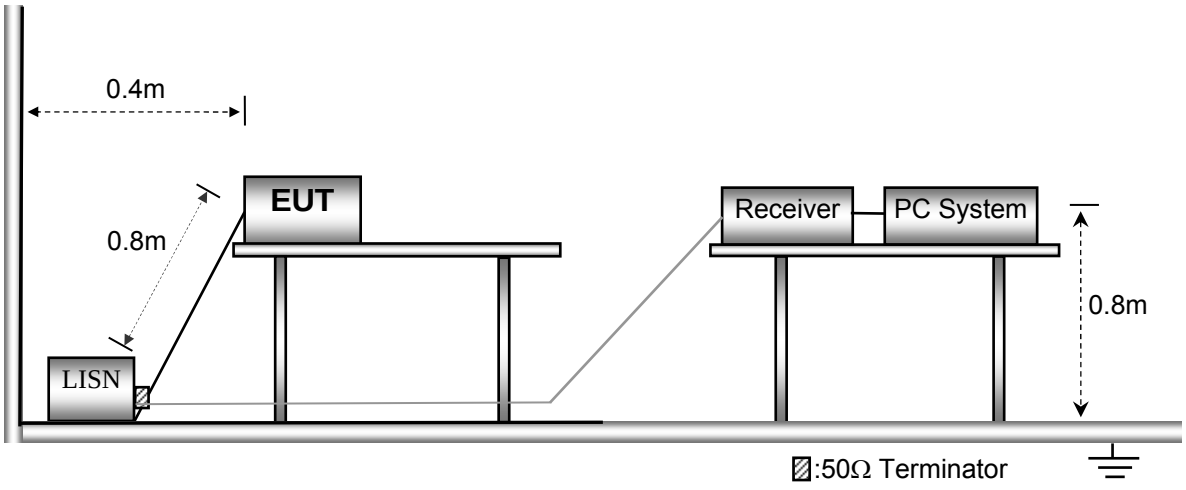
Atmospheric Pressure: 101.2kPa

EUT Operation **:**

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

7.2 EUT Setup

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



7.3 Measurement Description

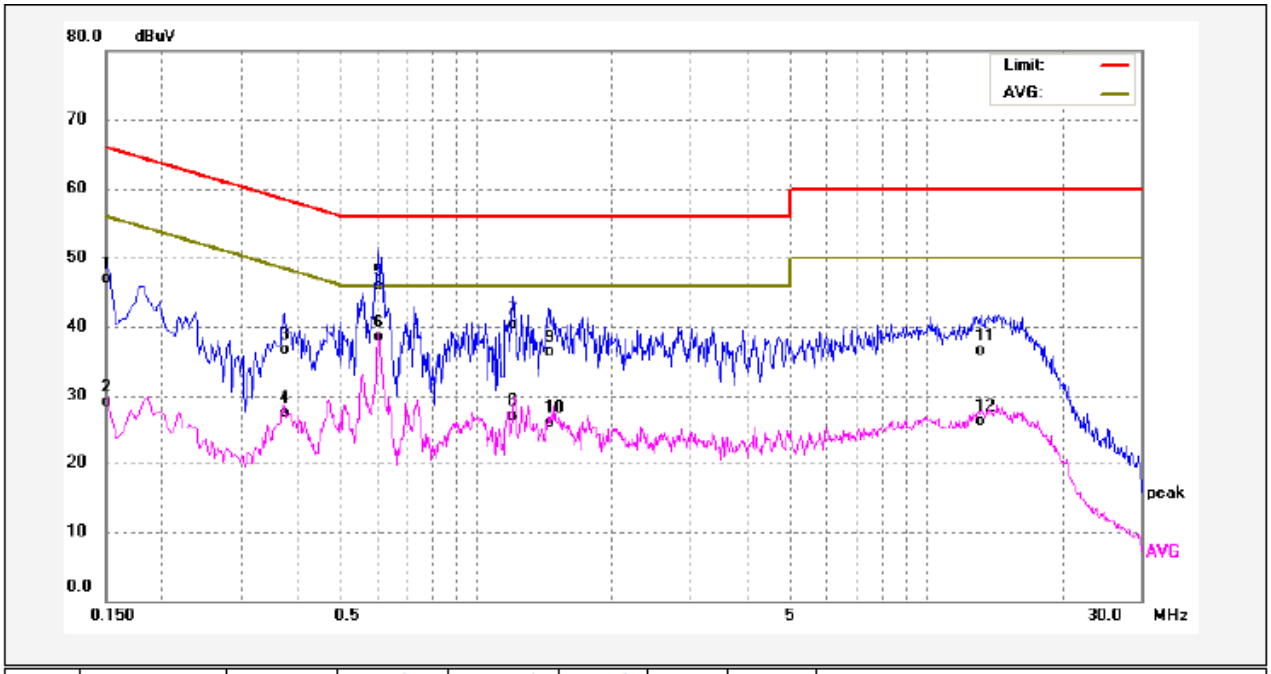
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

7.4 Conducted Emission Test Result

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

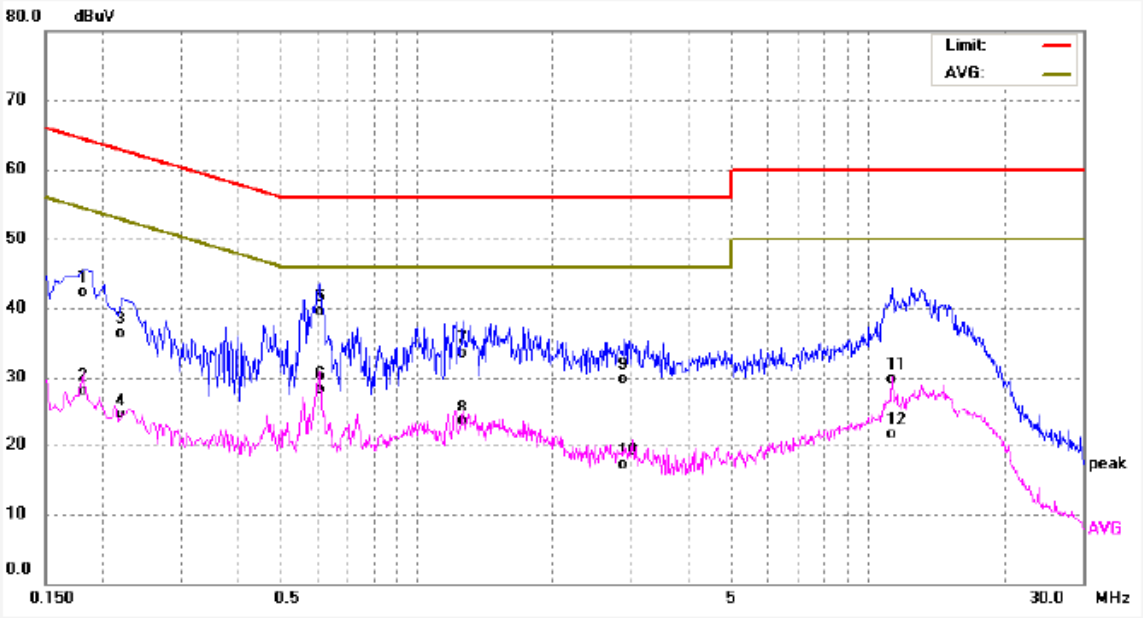
Worst Mode: WIFI mode (802.11b mode low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	36.95	9.94	46.89	65.99	-19.10	QP	
2	0.1500	19.16	9.94	29.10	55.99	-26.89	AVG	
3	0.3740	26.76	9.89	36.65	58.41	-21.76	QP	
4	0.3740	17.66	9.89	27.55	48.41	-20.86	AVG	
5	0.6060	36.07	9.88	45.95	56.00	-10.05	QP	
6	0.6060	28.53	9.88	38.41	46.00	-7.59	AVG	
7	1.2020	30.34	9.89	40.23	56.00	-15.77	QP	
8	1.2020	17.30	9.89	27.19	46.00	-18.81	AVG	
9	1.4460	26.35	9.91	36.26	56.00	-19.74	QP	
10	1.4460	16.14	9.91	26.05	46.00	-19.95	AVG	
11	13.1940	25.87	10.60	36.47	60.00	-23.53	QP	
12	13.1940	15.75	10.60	26.35	50.00	-23.65	AVG	

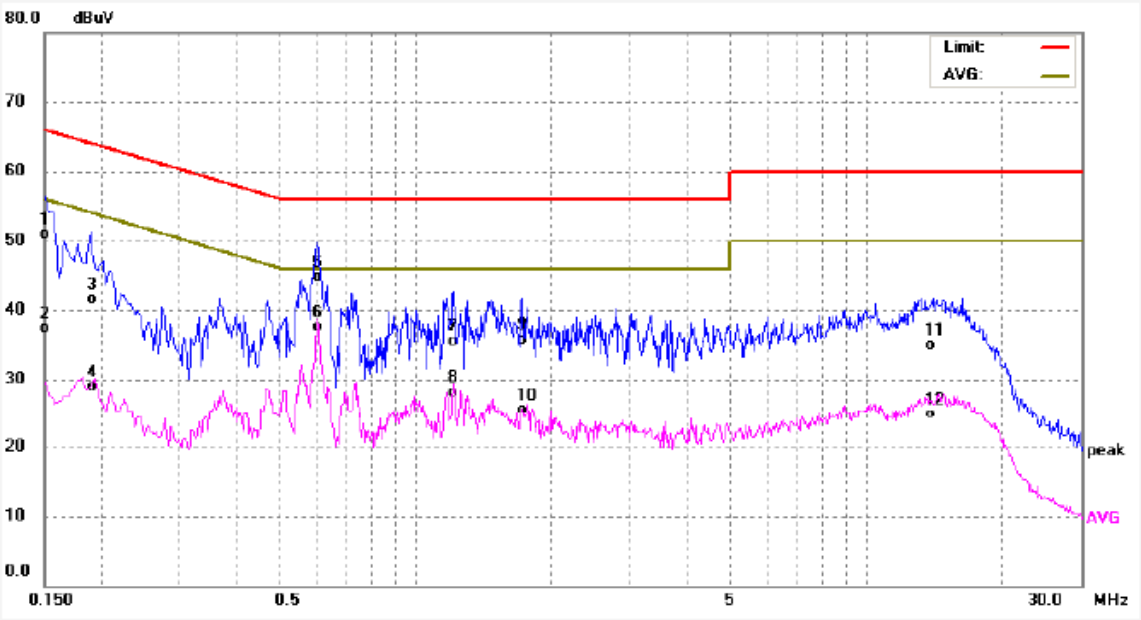
Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1819	32.25	9.98	42.23	64.39	-22.16	QP	
2	0.1819	18.11	9.98	28.09	54.39	-26.30	AVG	
3	0.2220	26.34	9.96	36.30	62.74	-26.44	QP	
4	0.2220	14.58	9.96	24.54	52.74	-28.20	AVG	
5	0.6100	29.47	9.96	39.43	56.00	-16.57	QP	
6	0.6100	18.39	9.96	28.35	46.00	-17.65	AVG	
7	1.2660	23.43	9.98	33.41	56.00	-22.59	QP	
8	1.2660	13.51	9.98	23.49	46.00	-22.51	AVG	
9	2.8940	19.67	10.05	29.72	56.00	-26.28	QP	
10	2.8940	7.11	10.05	17.16	46.00	-28.84	AVG	
11	11.2780	19.13	10.66	29.79	60.00	-30.21	QP	
12	11.2780	10.91	10.66	21.57	50.00	-28.43	AVG	

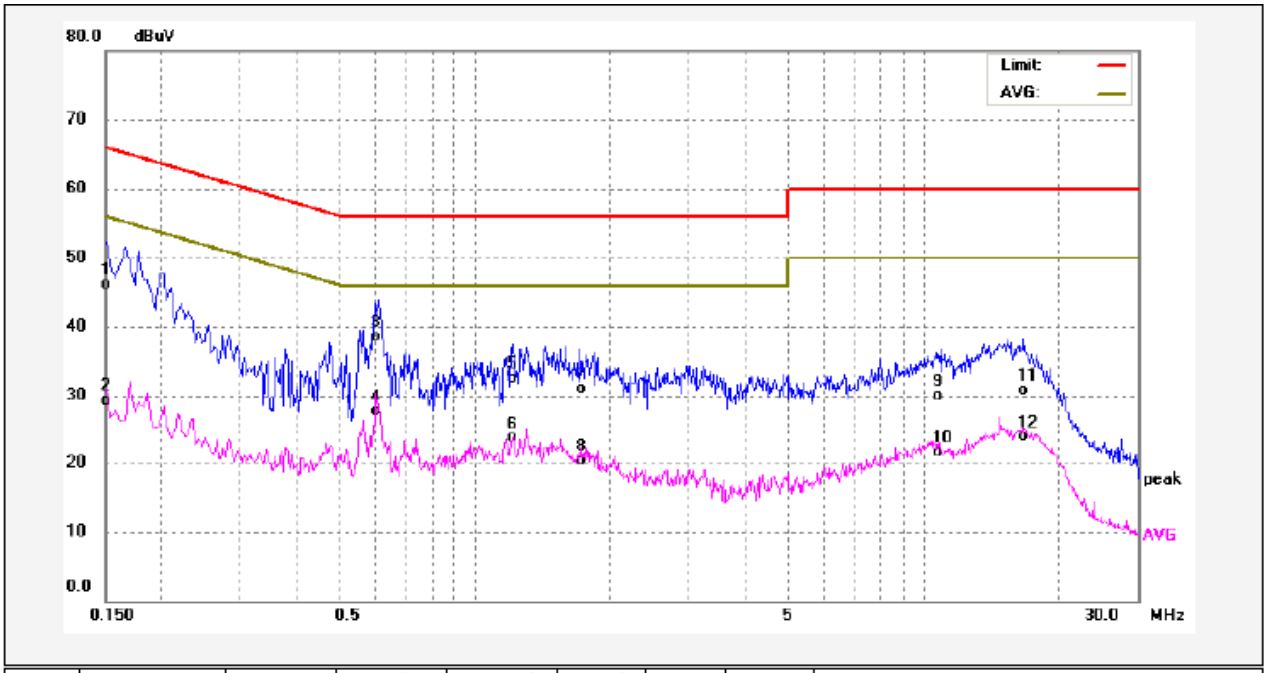
Worst Mode: BLE mode (low channel)

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1499	40.97	9.94	50.91	66.00	-15.09	QP	
2	0.1499	27.32	9.94	37.26	56.00	-18.74	AVG	
3	0.1900	31.63	9.88	41.51	64.03	-22.52	QP	
4	0.1900	18.95	9.88	28.83	54.03	-25.20	AVG	
5	0.6060	34.90	9.88	44.78	56.00	-11.22	QP	
6	0.6060	27.64	9.88	37.52	46.00	-8.48	AVG	
7	1.2140	25.58	9.89	35.47	56.00	-20.53	QP	
8	1.2140	18.27	9.89	28.16	46.00	-17.84	AVG	
9	1.7220	25.75	9.91	35.66	56.00	-20.34	QP	
10	1.7220	15.59	9.91	25.50	46.00	-20.50	AVG	
11	14.0059	24.21	10.67	34.88	60.00	-25.12	QP	
12	14.0059	14.25	10.67	24.92	50.00	-25.08	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	36.15	10.02	46.17	65.99	-19.82	QP	
2	0.1500	19.28	10.02	29.30	55.99	-26.69	AVG	
3	0.6100	28.50	9.96	38.46	56.00	-17.54	QP	
4	0.6100	17.76	9.96	27.72	46.00	-18.28	AVG	
5	1.2100	22.44	9.97	32.41	56.00	-23.59	QP	
6	1.2100	13.70	9.97	23.67	46.00	-22.33	AVG	
7	1.7140	20.86	10.00	30.86	56.00	-25.14	QP	
8	1.7140	10.29	10.00	20.29	46.00	-25.71	AVG	
9	10.8860	19.28	10.63	29.91	60.00	-30.09	QP	
10	10.8860	10.90	10.63	21.53	50.00	-28.47	AVG	
11	16.7380	19.50	11.12	30.62	60.00	-29.38	QP	
12	16.7380	12.70	11.12	23.82	50.00	-26.18	AVG	

8 Radiated Emissions

Test Requirement: FCC CFR47 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: 23.5 °C

Humidity: 52.1 % RH

Atmospheric Pressure: 101.2kPa

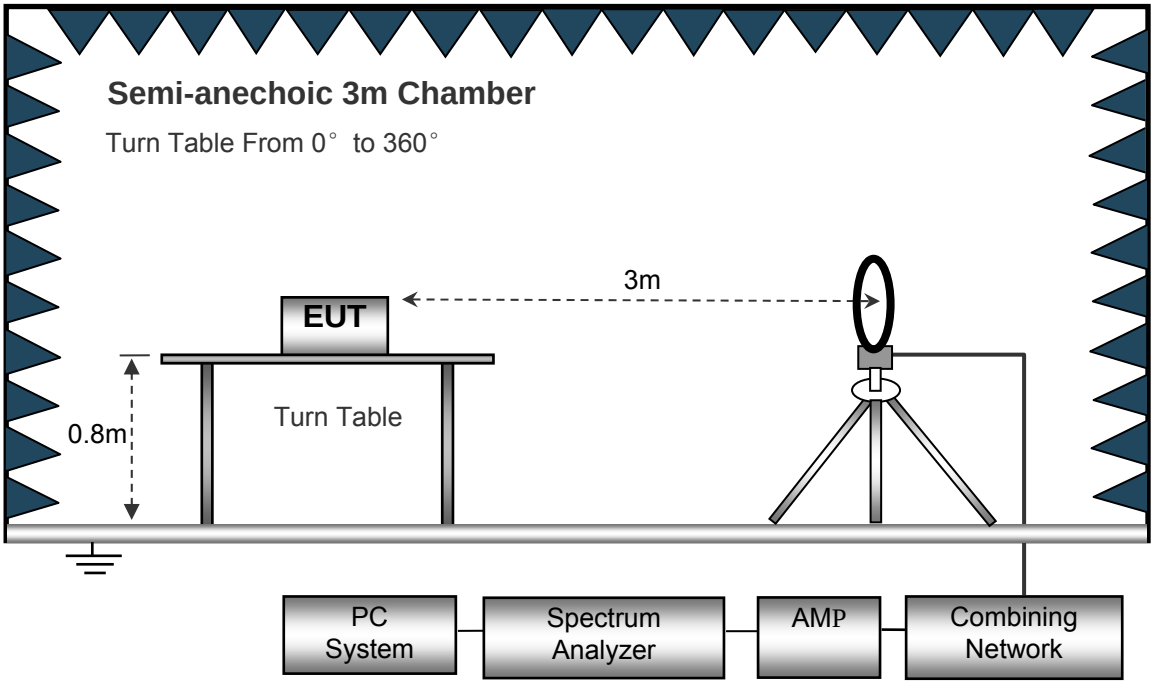
EUT Operation **:**

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

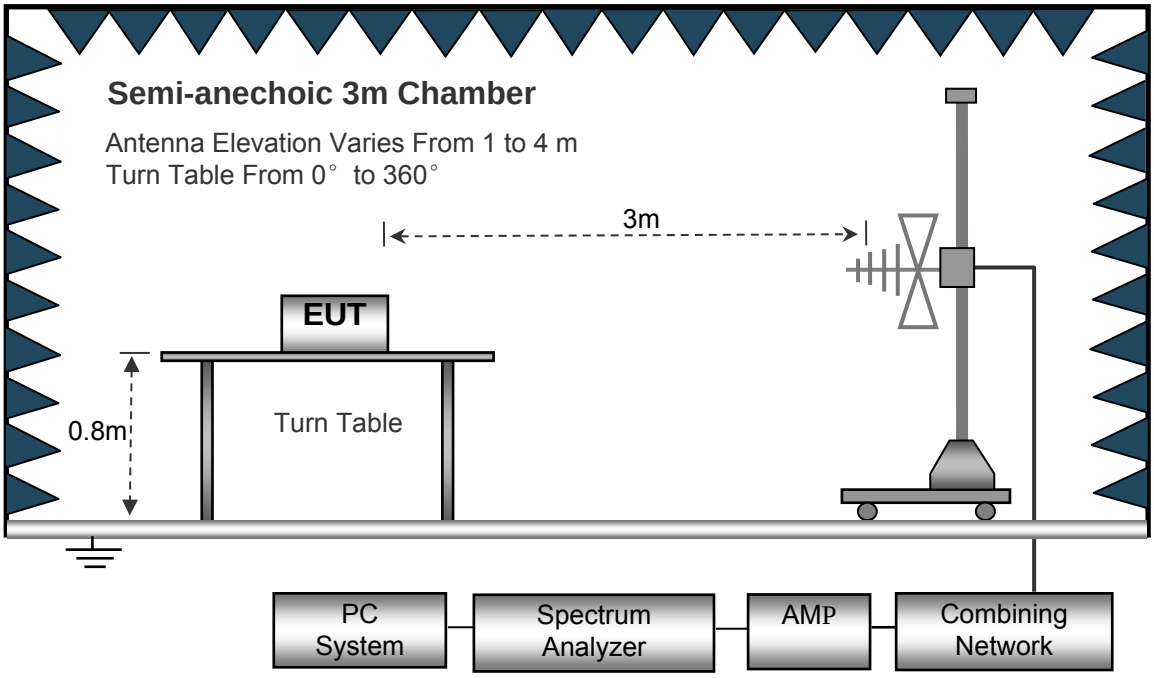
8.2 Test Setup

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

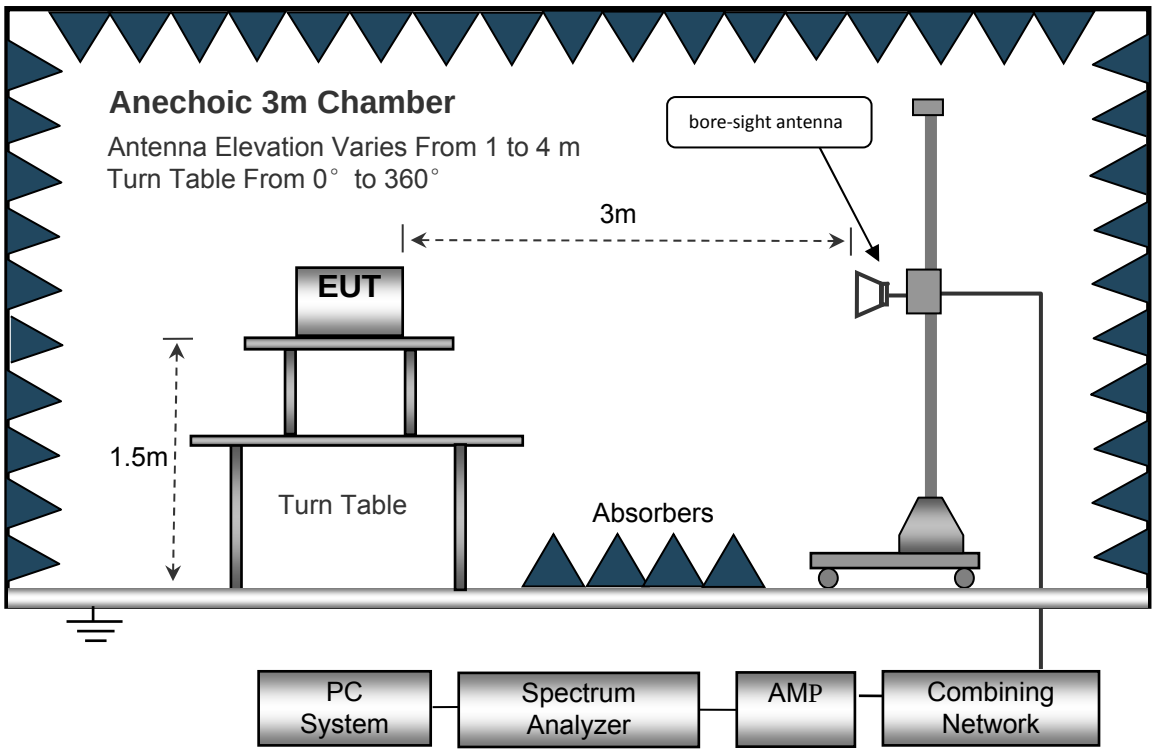
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

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

Above 1GHz

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

8.4 Test Procedure

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

8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

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

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

Margin = Corr. Ampl. – Limit

8.6 Summary of Test Results

Wifi:
Test Frequency: 9KHz~30MHz

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

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
802.11b							
6.023	25.10	QP	21.84	40.00	6.94	29.54	-22.60
15.447	24.85	QP	21.35	40.00	6.20	29.54	-23.34
25.221	24.73	QP	20.67	40.00	5.40	29.54	-24.14
802.11g							
6.023	24.85	QP	21.84	40.00	6.69	29.54	-22.85
15.447	25.17	QP	21.35	40.00	6.52	29.54	-23.02
25.221	24.63	QP	20.67	40.00	5.30	29.54	-24.24
802.11n(HT20)							
6.023	23.56	QP	21.84	40.00	5.40	29.54	-24.14
15.447	24.16	QP	21.35	40.00	5.51	29.54	-24.03
25.221	25.22	QP	20.67	40.00	5.89	29.54	-23.65
802.11n(HT40)							
6.023	24.52	QP	21.84	40.00	6.36	29.54	-23.18
15.447	25.33	QP	21.35	40.00	6.68	29.54	-22.86
25.221	24.58	QP	20.67	40.00	5.25	29.54	-24.29

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									
223.45	37.86	QP	19	1.1	H	-11.62	26.24	46.00	-19.76
223.45	28.03	QP	346	1.4	V	-11.62	16.41	46.00	-29.59
4824.00	51.85	PK	345	1.2	V	-1.06	50.79	74.00	-23.21
4824.00	50.50	Ave	345	1.2	V	-1.06	49.44	54.00	-4.56
7236.00	43.83	PK	261	1.4	H	1.33	45.16	74.00	-28.84
7236.00	43.06	Ave	261	1.4	H	1.33	44.39	54.00	-9.61
2346.03	46.22	PK	41	1.4	V	-13.19	33.03	74.00	-40.97
2346.03	39.75	Ave	41	1.4	V	-13.19	26.56	54.00	-27.44
2374.10	44.30	PK	195	1.5	H	-13.14	31.16	74.00	-42.84
2374.10	36.12	Ave	195	1.5	H	-13.14	22.98	54.00	-31.02
2487.96	44.03	PK	349	1.9	V	-13.08	30.95	74.00	-43.05
2487.96	37.74	Ave	349	1.9	V	-13.08	24.66	54.00	-29.34

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11b: Middle Channel 2437MHz									
223.45	38.82	QP	292	1.8	H	-11.62	27.20	46.00	-18.80
223.45	26.67	QP	184	1.8	V	-11.62	15.05	46.00	-30.95
4874.00	50.52	PK	111	1.2	V	-0.62	49.90	74.00	-24.10
4874.00	50.31	Ave	111	1.2	V	-0.62	49.69	54.00	-4.31
7311.00	44.34	PK	213	1.7	H	2.21	46.55	74.00	-27.45
7311.00	42.53	Ave	213	1.7	H	2.21	44.74	54.00	-9.26
2329.75	46.68	PK	41	1.4	V	-13.19	33.49	74.00	-40.51
2329.75	38.95	Ave	41	1.4	V	-13.19	25.76	54.00	-28.24
2368.08	42.46	PK	117	1.9	H	-13.14	29.32	74.00	-44.68
2368.08	38.02	Ave	117	1.9	H	-13.14	24.88	54.00	-29.12
2488.45	43.55	PK	25	1.3	V	-13.08	30.47	74.00	-43.53
2488.45	37.32	Ave	25	1.3	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)
11b: High Channel 2462MHz									
223.45	38.24	QP	140	1.4	H	-11.62	26.62	46.00	-19.38
223.45	26.66	QP	160	1.1	V	-11.62	15.04	46.00	-30.96
4924.00	51.94	PK	222	1.4	V	-0.24	51.70	74.00	-22.30
4924.00	50.90	Ave	222	1.4	V	-0.24	50.66	54.00	-3.34
7386.00	44.54	PK	306	1.4	H	2.84	47.38	74.00	-26.62
7386.00	44.01	Ave	306	1.4	H	2.84	46.85	54.00	-7.15
2314.15	46.59	PK	114	1.1	V	-13.19	33.40	74.00	-40.60
2314.15	38.27	Ave	114	1.1	V	-13.19	25.08	54.00	-28.92
2381.80	42.99	PK	11	1.5	H	-13.14	29.85	74.00	-44.15
2381.80	38.36	Ave	11	1.5	H	-13.14	25.22	54.00	-28.78
2486.27	43.48	PK	16	1.7	V	-13.08	30.40	74.00	-43.60
2486.27	36.97	Ave	16	1.7	V	-13.08	23.89	54.00	-30.11

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Low Channel 2412MHz									
223.45	38.77	QP	192	1.6	H	-11.62	27.15	46.00	-18.85
223.45	26.75	QP	338	1.4	V	-11.62	15.13	46.00	-30.87
4824.00	52.73	PK	334	1.5	V	-1.06	51.67	74.00	-22.33
4824.00	51.57	Ave	334	1.5	V	-1.06	50.51	54.00	-3.49
7236.00	45.76	PK	285	1.4	H	1.33	47.09	74.00	-26.91
7236.00	43.05	Ave	285	1.4	H	1.33	44.38	54.00	-9.62
2316.76	45.32	PK	3	1.1	V	-13.19	32.13	74.00	-41.87
2316.76	37.27	Ave	3	1.1	V	-13.19	24.08	54.00	-29.92
2376.07	43.29	PK	237	1.7	H	-13.14	30.15	74.00	-43.85
2376.07	38.51	Ave	237	1.7	H	-13.14	25.37	54.00	-28.63
2493.42	43.52	PK	74	1.2	V	-13.08	30.44	74.00	-43.56
2493.42	38.95	Ave	74	1.2	V	-13.08	25.87	54.00	-28.13

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: Middle Channel 2437MHz									
223.45	38.68	QP	194	1.1	H	-11.62	27.06	46.00	-18.94
223.45	26.69	QP	116	1.2	V	-11.62	15.07	46.00	-30.93
4874.00	53.11	PK	261	1.9	V	-0.62	52.49	74.00	-21.51
4874.00	51.83	Ave	261	1.9	V	-0.62	51.21	54.00	-2.79
7311.00	46.35	PK	38	1.5	H	2.21	48.56	74.00	-25.44
7311.00	42.94	Ave	38	1.5	H	2.21	45.15	54.00	-8.85
2328.09	45.27	PK	227	1.8	V	-13.19	32.08	74.00	-41.92
2328.09	39.63	Ave	227	1.8	V	-13.19	26.44	54.00	-27.56
2376.11	42.52	PK	86	1.4	H	-13.14	29.38	74.00	-44.62
2376.11	37.31	Ave	86	1.4	H	-13.14	24.17	54.00	-29.83
2492.26	43.80	PK	297	1.3	V	-13.08	30.72	74.00	-43.28
2492.26	36.25	Ave	297	1.3	V	-13.08	23.17	54.00	-30.83

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11g: High Channel 2462MHz									
223.45	37.29	QP	333	1.3	H	-11.62	25.67	46.00	-20.33
223.45	28.00	QP	210	1.1	V	-11.62	16.38	46.00	-29.62
4924.00	53.54	PK	90	1.0	V	-0.24	53.30	74.00	-20.70
4924.00	51.60	Ave	90	1.0	V	-0.24	51.36	54.00	-2.64
7386.00	44.98	PK	225	1.3	H	2.84	47.82	74.00	-26.18
7386.00	41.46	Ave	225	1.3	H	2.84	44.30	54.00	-9.70
2321.01	45.53	PK	167	1.4	V	-13.19	32.34	74.00	-41.66
2321.01	39.85	Ave	167	1.4	V	-13.19	26.66	54.00	-27.34
2368.90	44.28	PK	69	1.9	H	-13.14	31.14	74.00	-42.86
2368.90	37.84	Ave	69	1.9	H	-13.14	24.70	54.00	-29.30
2486.10	44.47	PK	324	1.5	V	-13.08	31.39	74.00	-42.61
2486.10	37.24	Ave	324	1.5	V	-13.08	24.16	54.00	-29.84

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									
223.45	35.83	QP	212	1.1	H	-11.62	24.21	46.00	-21.79
223.45	27.62	QP	109	1.4	V	-11.62	16.00	46.00	-30.00
4824.00	54.45	PK	166	1.2	V	-1.06	53.39	74.00	-20.61
4824.00	52.04	Ave	166	1.2	V	-1.06	50.98	54.00	-3.02
7236.00	44.48	PK	249	1.8	H	1.33	45.81	74.00	-28.19
7236.00	40.94	Ave	249	1.8	H	1.33	42.27	54.00	-11.73
2314.92	46.84	PK	27	1.4	V	-13.19	33.65	74.00	-40.35
2314.92	38.06	Ave	27	1.4	V	-13.19	24.87	54.00	-29.13
2373.93	42.14	PK	181	1.1	H	-13.14	29.00	74.00	-45.00
2373.93	36.54	Ave	181	1.1	H	-13.14	23.40	54.00	-30.60
2498.37	42.62	PK	88	1.8	V	-13.08	29.54	74.00	-44.46
2498.37	36.03	Ave	88	1.8	V	-13.08	22.95	54.00	-31.05

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: Middle Channel 2437MHz									
223.45	35.60	QP	16	1.5	H	-11.62	23.98	46.00	-22.02
223.45	27.42	QP	210	1.3	V	-11.62	15.80	46.00	-30.20
4874.00	55.21	PK	272	1.5	V	-0.62	54.59	74.00	-19.41
4874.00	51.37	Ave	272	1.5	V	-0.62	50.75	54.00	-3.25
7311.00	43.68	PK	168	1.8	H	2.21	45.89	74.00	-28.11
7311.00	40.20	Ave	168	1.8	H	2.21	42.41	54.00	-11.59
2337.68	46.21	PK	208	2.0	V	-13.19	33.02	74.00	-40.98
2337.68	39.29	Ave	208	2.0	V	-13.19	26.10	54.00	-27.90
2355.67	43.82	PK	269	1.2	H	-13.14	30.68	74.00	-43.32
2355.67	38.20	Ave	269	1.2	H	-13.14	25.06	54.00	-28.94
2495.52	43.97	PK	85	1.3	V	-13.08	30.89	74.00	-43.11
2495.52	37.74	Ave	85	1.3	V	-13.08	24.66	54.00	-29.34

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n20: High Channel 2462MHz									
223.45	36.60	QP	321	1.0	H	-11.62	24.98	46.00	-21.02
223.45	26.83	QP	180	2.0	V	-11.62	15.21	46.00	-30.79
4924.00	55.97	PK	237	1.0	V	-0.24	55.73	74.00	-18.27
4924.00	51.34	Ave	237	1.0	V	-0.24	51.10	54.00	-2.90
7386.00	43.89	PK	136	1.2	H	2.84	46.73	74.00	-27.27
7386.00	38.74	Ave	136	1.2	H	2.84	41.58	54.00	-12.42
2340.07	46.89	PK	322	1.6	V	-13.19	33.70	74.00	-40.30
2340.07	39.36	Ave	322	1.6	V	-13.19	26.17	54.00	-27.83
2357.98	44.51	PK	320	1.8	H	-13.14	31.37	74.00	-42.63
2357.98	37.19	Ave	320	1.8	H	-13.14	24.05	54.00	-29.95
2485.74	43.70	PK	293	1.8	V	-13.08	30.62	74.00	-43.38
2485.74	38.30	Ave	293	1.8	V	-13.08	25.22	54.00	-28.78

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: Low Channel 2422MHz									
223.45	38.02	QP	228	1.7	H	-11.62	26.40	46.00	-19.60
223.45	27.71	QP	23	1.7	V	-11.62	16.09	46.00	-29.91
4844.00	54.56	PK	140	1.7	V	-1.06	53.50	74.00	-20.50
4844.00	49.29	Ave	140	1.7	V	-1.06	48.23	54.00	-5.77
7266.00	41.59	PK	179	1.7	H	1.33	42.92	74.00	-31.08
7266.00	36.67	Ave	179	1.7	H	1.33	38.00	54.00	-16.00
2348.55	46.20	PK	320	1.7	V	-13.19	33.01	74.00	-40.99
2348.55	37.00	Ave	320	1.7	V	-13.19	23.81	54.00	-30.19
2386.06	43.06	PK	104	1.1	H	-13.14	29.92	74.00	-44.08
2386.06	38.47	Ave	104	1.1	H	-13.14	25.33	54.00	-28.67
2495.96	44.82	PK	155	1.9	V	-13.08	31.74	74.00	-42.26
2495.96	38.29	Ave	155	1.9	V	-13.08	25.21	54.00	-28.79

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
11n40: Middle Channel 2437MHz									
223.45	37.32	QP	113	1.5	H	-11.62	25.70	46.00	-20.30
223.45	27.46	QP	5	1.2	V	-11.62	15.84	46.00	-30.16
4874.00	53.65	PK	120	1.4	V	-0.62	53.03	74.00	-20.97
4874.00	50.00	Ave	120	1.4	V	-0.62	49.38	54.00	-4.62
7311.00	40.98	PK	34	1.2	H	2.21	43.19	74.00	-30.81
7311.00	35.78	Ave	34	1.2	H	2.21	37.99	54.00	-16.01
2314.18	46.29	PK	14	1.3	V	-13.19	33.10	74.00	-40.90
2314.18	38.35	Ave	14	1.3	V	-13.19	25.16	54.00	-28.84
2374.31	44.48	PK	205	1.7	H	-13.14	31.34	74.00	-42.66
2374.31	36.46	Ave	205	1.7	H	-13.14	23.32	54.00	-30.68
2499.49	43.86	PK	169	1.9	V	-13.08	30.78	74.00	-43.22
2499.49	37.14	Ave	169	1.9	V	-13.08	24.06	54.00	-29.94

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									
223.45	37.08	QP	104	1.6	H	-11.62	25.46	46.00	-20.54
223.45	28.23	QP	40	1.6	V	-11.62	16.61	46.00	-29.39
4904.00	54.55	PK	53	1.4	V	-0.24	54.31	74.00	-19.69
4904.00	49.33	Ave	53	1.4	V	-0.24	49.09	54.00	-4.91
7356.00	40.70	PK	133	1.6	H	2.84	43.54	74.00	-30.46
7356.00	34.95	Ave	133	1.6	H	2.84	37.79	54.00	-16.21
2346.42	46.76	PK	324	1.4	V	-13.19	33.57	74.00	-40.43
2346.42	38.56	Ave	324	1.4	V	-13.19	25.37	54.00	-28.63
2376.11	44.00	PK	351	1.5	H	-13.14	30.86	74.00	-43.14
2376.11	38.00	Ave	351	1.5	H	-13.14	24.86	54.00	-29.14
2492.86	43.93	PK	244	1.8	V	-13.08	30.85	74.00	-43.15
2492.86	38.51	Ave	244	1.8	V	-13.08	25.43	54.00	-28.57

Test Frequency: 8GHz~25GHz

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

BT BLE:

Test Frequency: 9KHz~26MHz

Remark: only the worst data (GFSK modulation Low channel mode) were recorded.

Frequency	Measurement results dBμV @3m	Detector PK/QP	Correct factor dB/m	Extrapolation factor dB	Measurement results (calculated) dBμV/m @30m	Limits dBμV/m @30m	Margin dB
(MHz)	Measurement results	Detector	Correct factor	Extrapolation factor	Measurement results (calculated)	Limits	Margin
6.023	24.33	QP	21.84	40.00	6.17	29.54	-23.37
15.447	25.17	QP	21.35	40.00	6.52	29.54	-23.02
25.221	24.66	QP	20.67	40.00	5.33	29.54	-24.21

Test Frequency : 26MHz ~ 30MHz

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

Test Frequency : 30MHz ~ 18GHz

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	Limit	Margin
				Height	Polar				
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
GFSK Low Channel 2402MHz									
269.33	33.76	QP	156	1.4	H	-13.35	20.41	46.00	-25.59
269.33	39.29	QP	216	1.3	V	-13.35	25.94	46.00	-20.06
4804.00	46.04	PK	173	1.6	V	-1.06	44.98	74.00	-29.02
4804.00	42.00	Ave	173	1.6	V	-1.06	40.94	54.00	-13.06
7206.00	45.64	PK	234	1.1	H	1.33	46.97	74.00	-27.03
7206.00	37.51	Ave	234	1.1	H	1.33	38.84	54.00	-15.16
2326.07	46.86	PK	226	2.0	V	-13.19	33.67	74.00	-40.33
2326.07	39.90	Ave	226	2.0	V	-13.19	26.71	54.00	-27.29
2354.66	42.27	PK	348	1.5	H	-13.14	29.13	74.00	-44.87
2354.66	38.31	Ave	348	1.5	H	-13.14	25.17	54.00	-28.83
2491.15	43.51	PK	288	1.6	V	-13.08	30.43	74.00	-43.57
2491.15	36.79	Ave	288	1.6	V	-13.08	23.71	54.00	-30.29

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)
GFSK Middle Channel 2440MHz									
269.33	33.72	QP	138	1.7	H	-13.35	20.37	46.00	-25.63
269.33	38.37	QP	10	1.3	V	-13.35	25.02	46.00	-20.98
4880.00	43.46	PK	76	1.6	V	-0.62	42.84	74.00	-31.16
4880.00	41.68	Ave	76	1.6	V	-0.62	41.06	54.00	-12.94
7320.00	45.96	PK	140	1.9	H	2.21	48.17	74.00	-25.83
7320.00	37.51	Ave	140	1.9	H	2.21	39.72	54.00	-14.28
2326.16	45.20	PK	344	1.3	V	-13.19	32.01	74.00	-41.99
2326.16	37.97	Ave	344	1.3	V	-13.19	24.78	54.00	-29.22
2369.38	42.73	PK	0	1.7	H	-13.14	29.59	74.00	-44.41
2369.38	38.71	Ave	0	1.7	H	-13.14	25.57	54.00	-28.43
2489.27	43.71	PK	76	1.3	V	-13.08	30.63	74.00	-43.37
2489.27	38.10	Ave	76	1.3	V	-13.08	25.02	54.00	-28.98

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									
269.33	34.14	QP	0	1.2	H	-13.35	20.79	46.00	-25.21
269.33	38.46	QP	265	1.6	V	-13.35	25.11	46.00	-20.89
4960.00	42.68	PK	118	1.8	V	-0.24	42.44	74.00	-31.56
4960.00	40.88	Ave	118	1.8	V	-0.24	40.64	54.00	-13.36
7440.00	45.82	PK	49	1.4	H	2.84	48.66	74.00	-25.34
7440.00	36.29	Ave	49	1.4	H	2.84	39.13	54.00	-14.87
2341.88	45.43	PK	118	1.2	V	-13.19	32.24	74.00	-41.76
2341.88	38.76	Ave	118	1.2	V	-13.19	25.57	54.00	-28.43
2351.10	43.90	PK	88	1.1	H	-13.14	30.76	74.00	-43.24
2351.10	37.93	Ave	88	1.1	H	-13.14	24.79	54.00	-29.21
2493.88	44.20	PK	214	1.6	V	-13.08	31.12	74.00	-42.88
2493.88	36.78	Ave	214	1.6	V	-13.08	23.70	54.00	-30.30

Test Frequency: 18GHz~25GHz

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

9 Duty Cycle

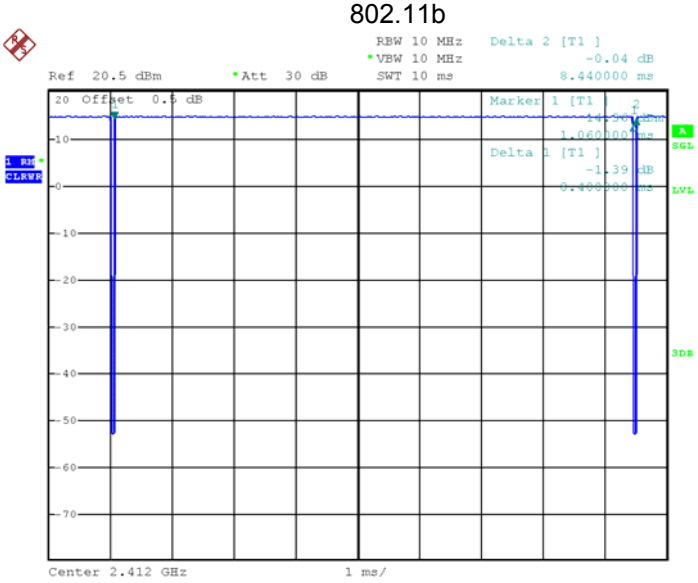
Modulation	On time(ms)	Period(ms)	Duty Cycle(%)	Duty Cycle Factor(dB)	Average Factor(dB)
802.11b	8.400	8.440	99.53	0.02	-0.04
802.11g	1.395	1.430	97.55	0.11	-0.22
802.11n20	1.305	1.350	96.67	0.15	-0.29
802.11n40	0.655	0.965	67.88	1.68	-3.37

Remark:

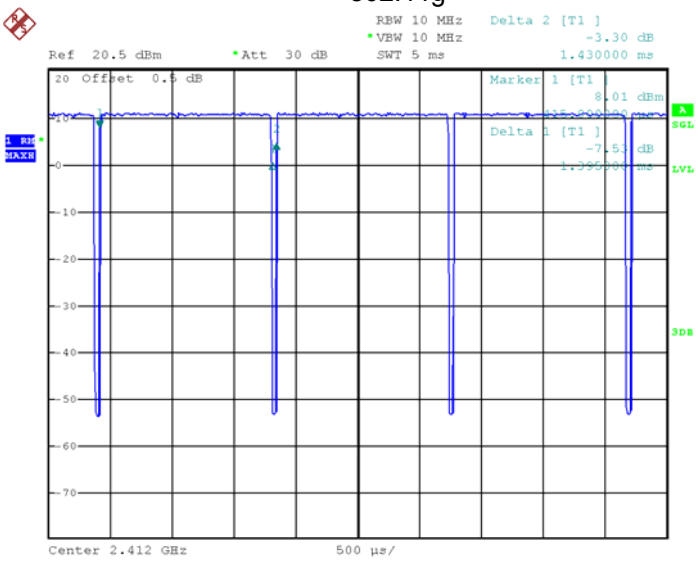
1) Duty Cycle=On Time/Period
2) Duty Cycle Factor=10*log(1/Duty cycle)
3) Average Factor=20 $\log_{10}$ Duty Cycle

Test Plot

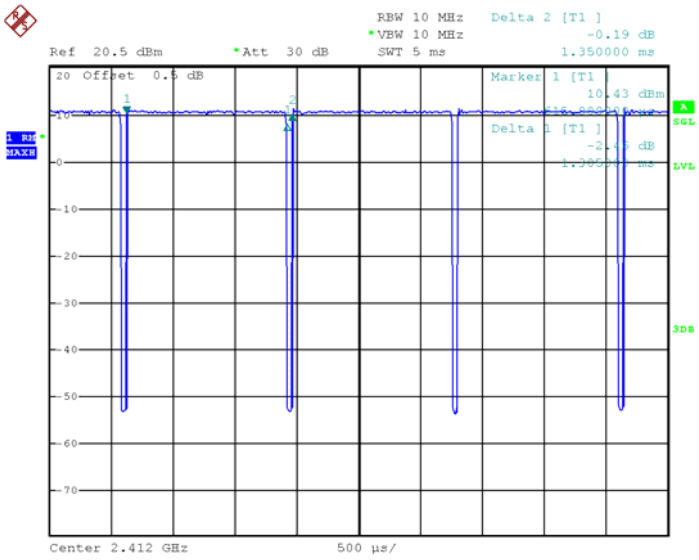
802.11b



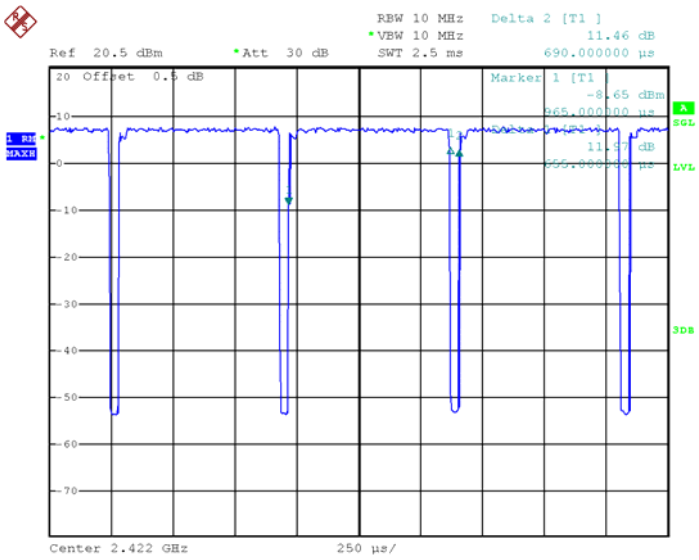
802.11g



802.11n20



802.11n40



10 Conducted Spurious Emissions

Test Requirement: FCC 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

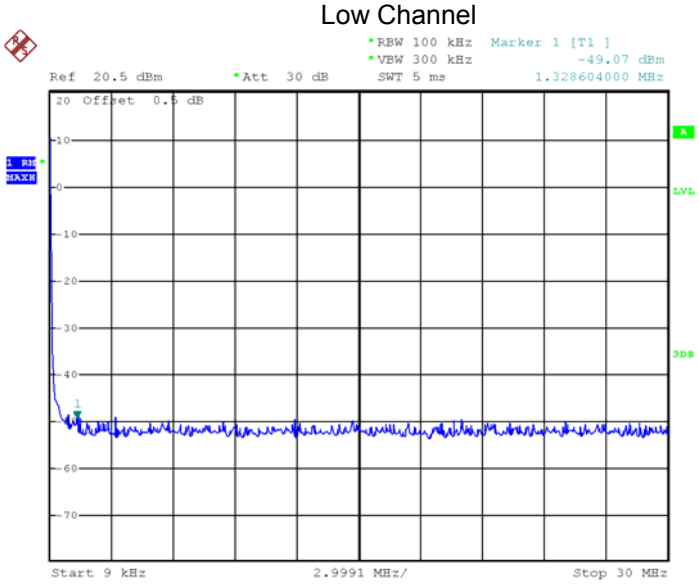
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
   a) Set instrument center frequency to DTS channel center frequency.
   b) Set the span to _ 1.5 times the DTS bandwidth.
   c) Set the RBW = 100 kHz.
   d) Set the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

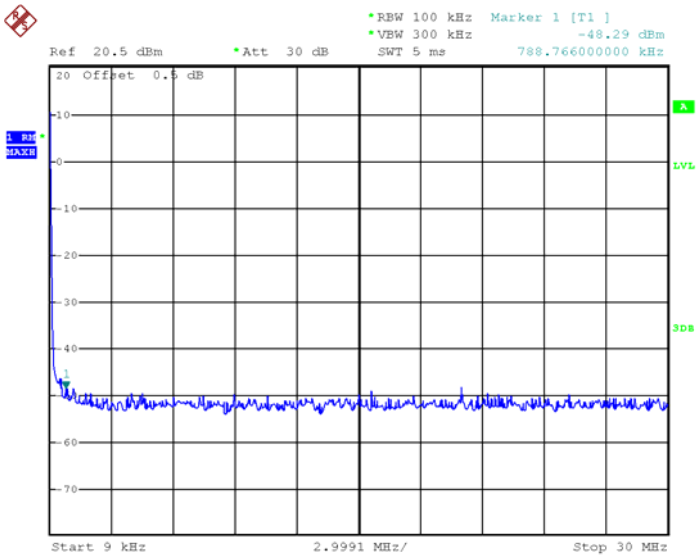
9KHz – 30MHz

802.11b

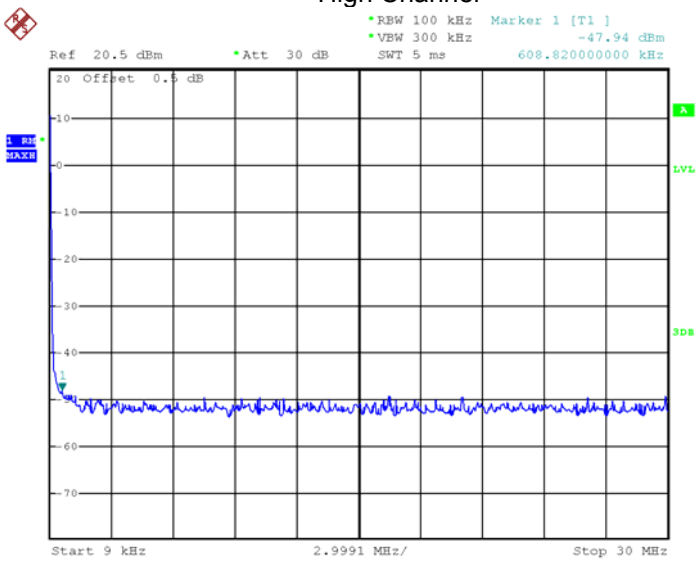
Low Channel



Middle Channel

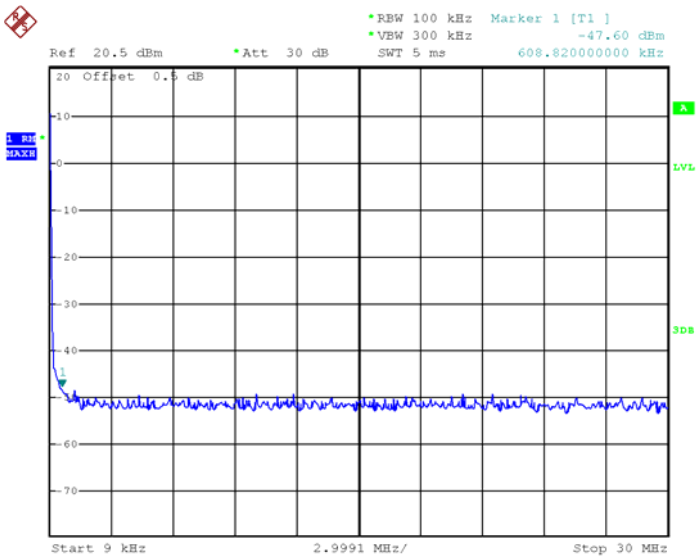


High Channel

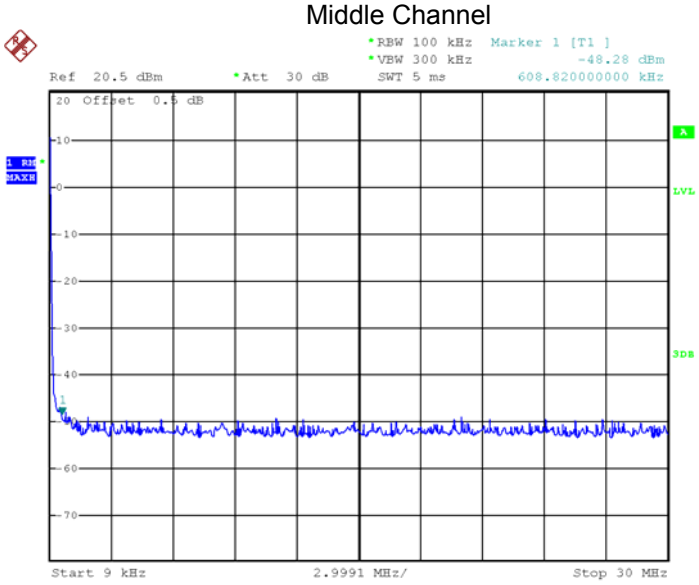


802.11g

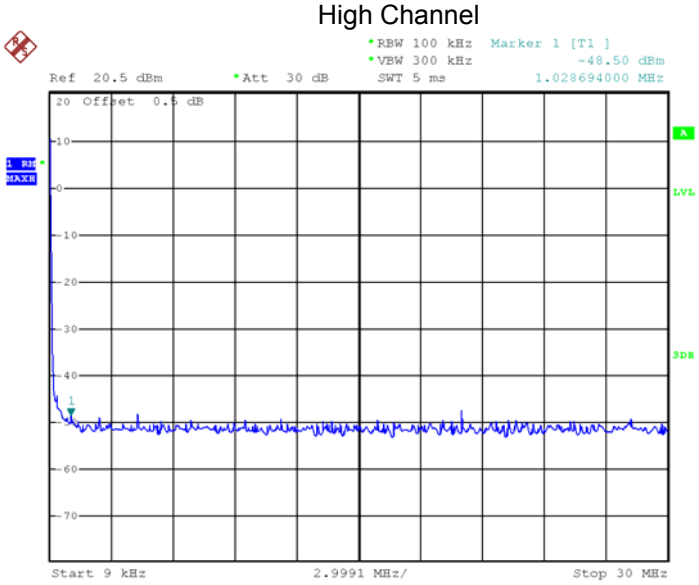
Low Channel



Middle Channel

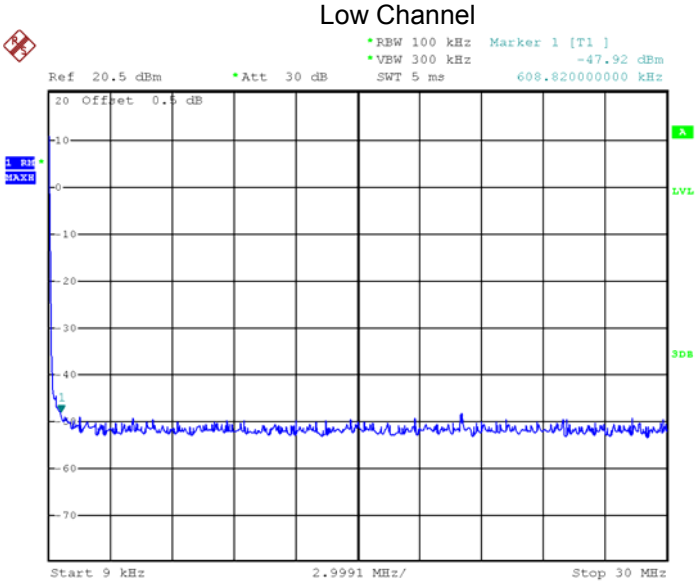


High Channel

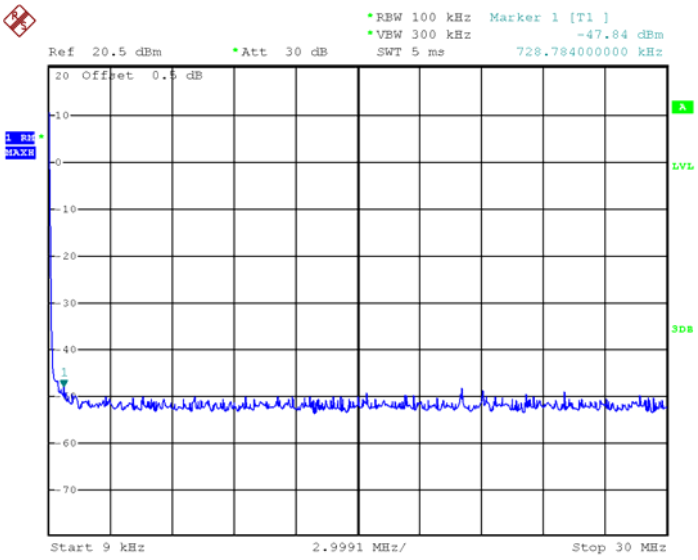


802.11n HT20

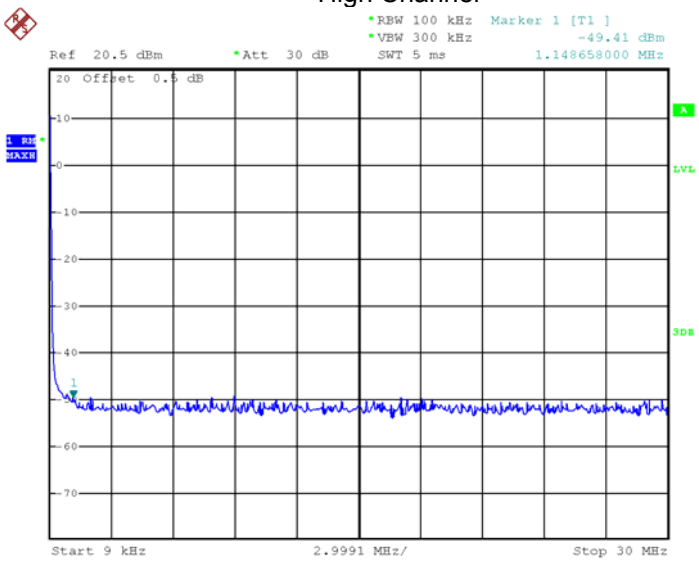
Low Channel



Middle Channel

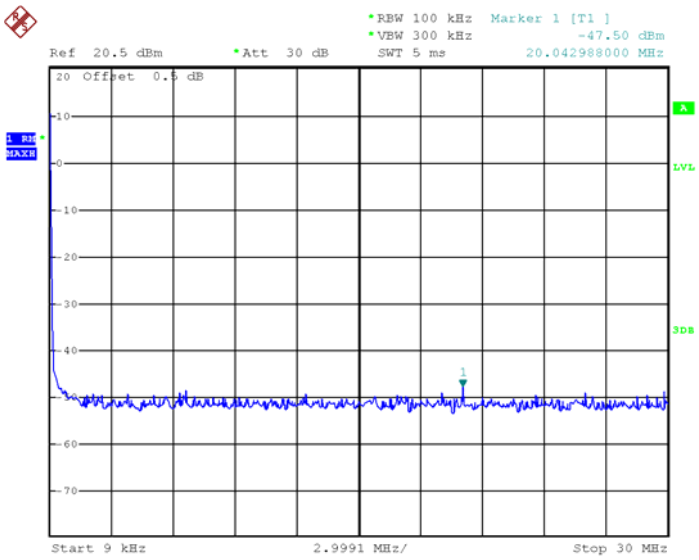


High Channel

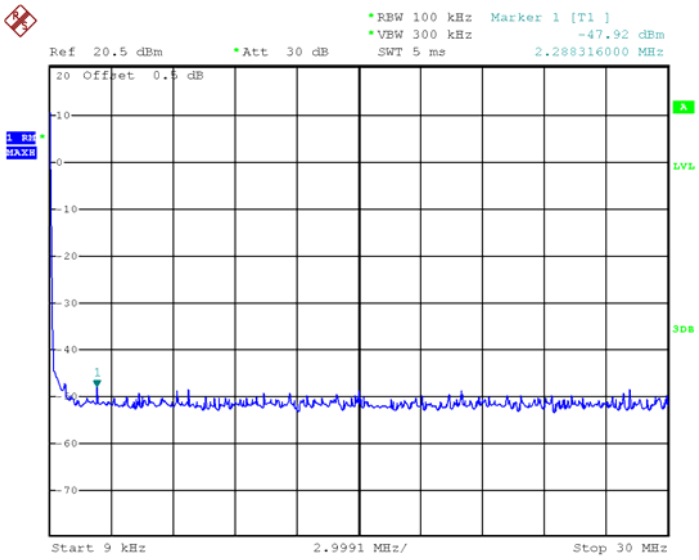


802.11n HT40

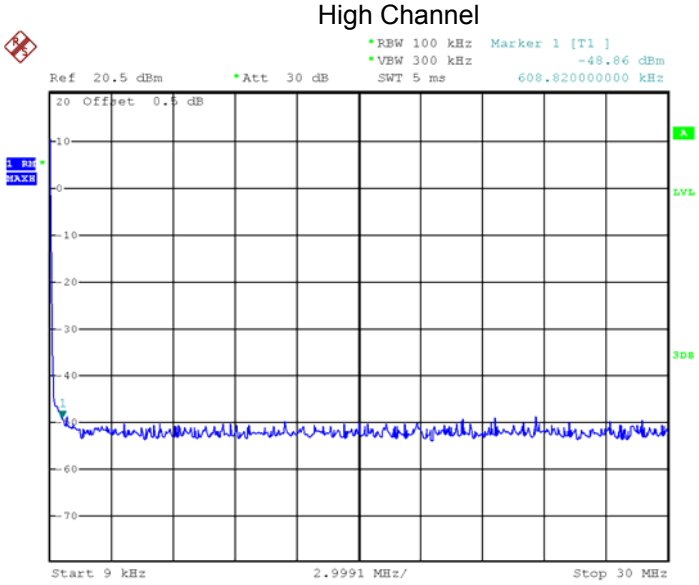
Low Channel



Middle Channel

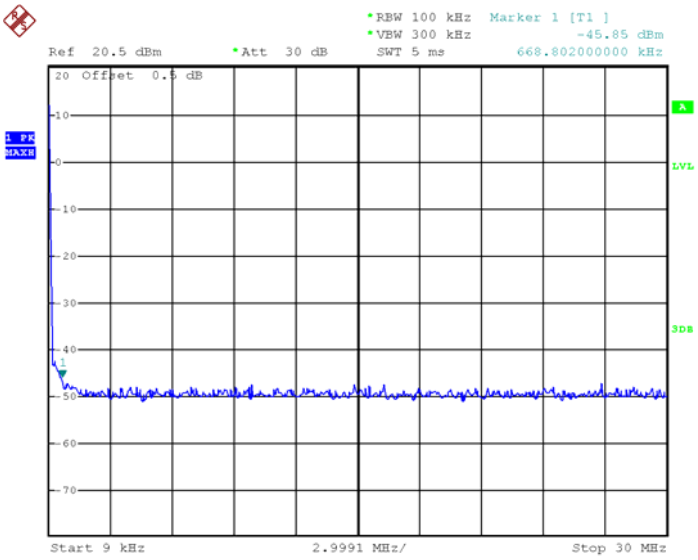


High Channel

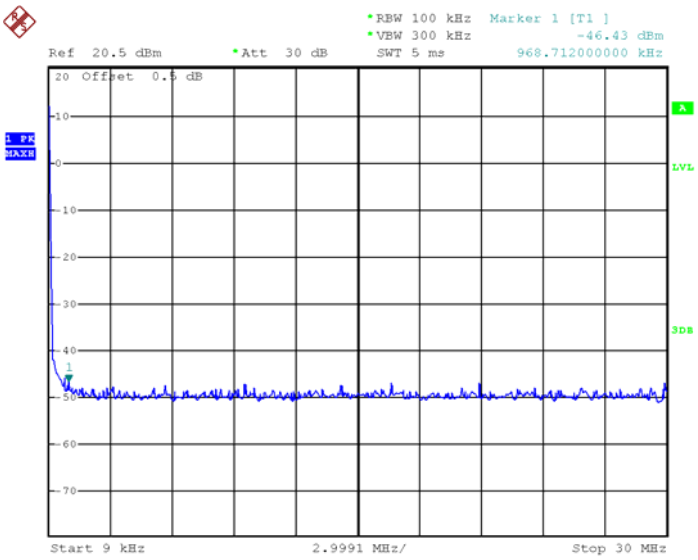


BLE

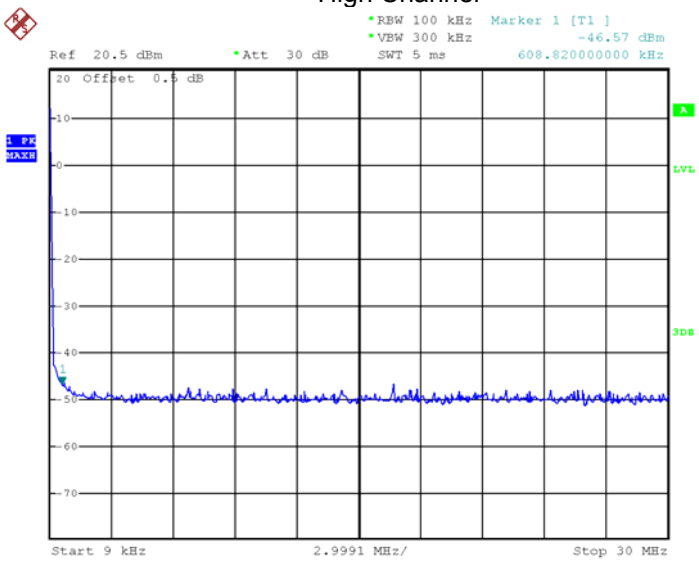
Low Channel



Middle Channel



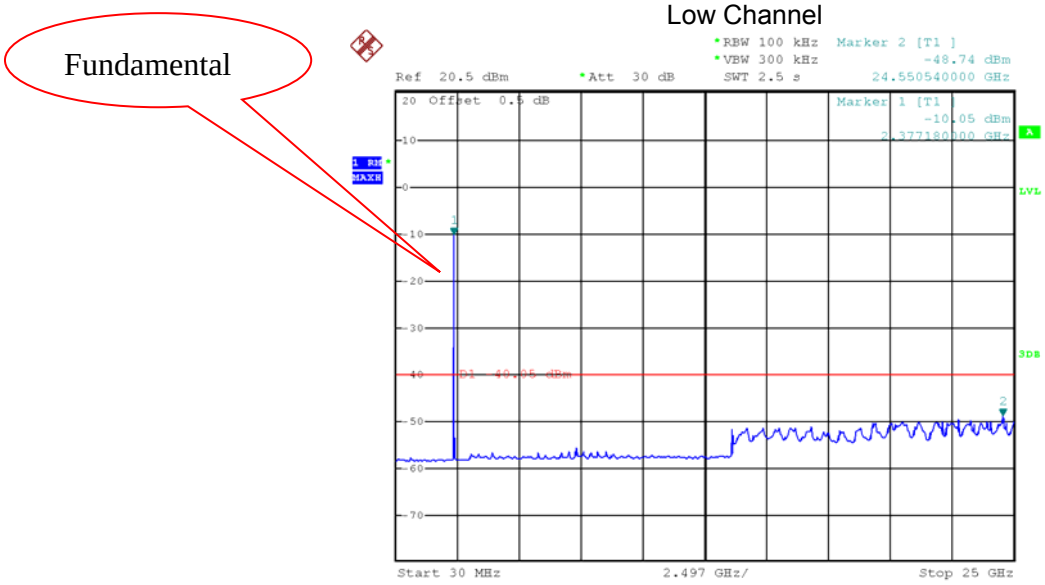
High Channel



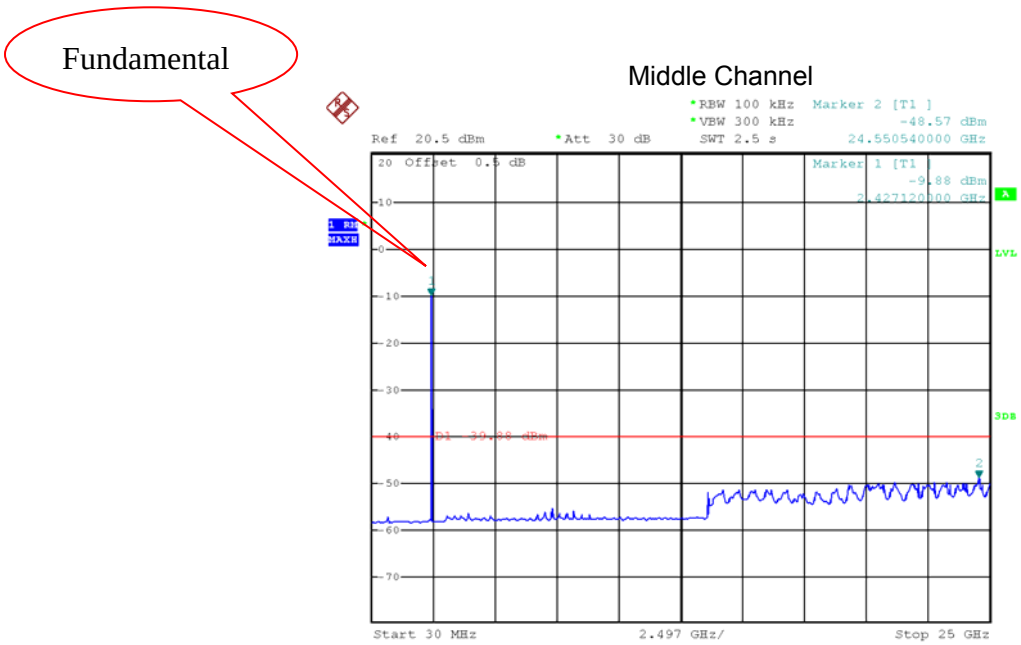
Above 30MHz

802.11b

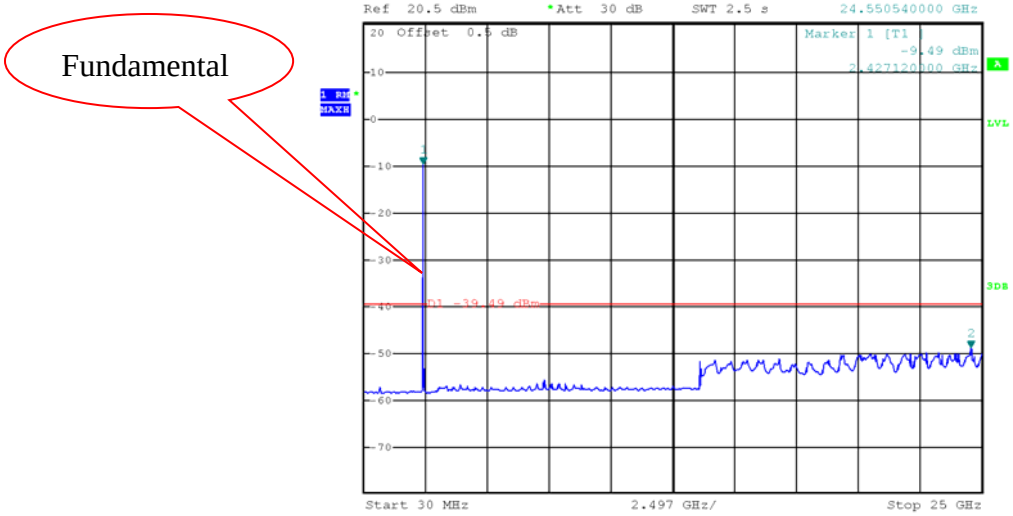
Low Channel



Middle Channel

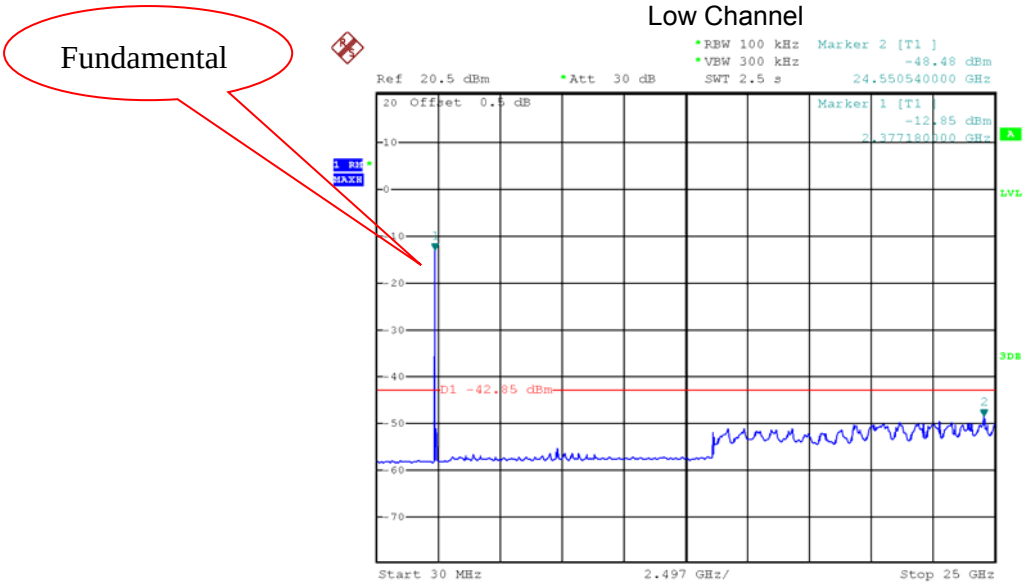


High Channel

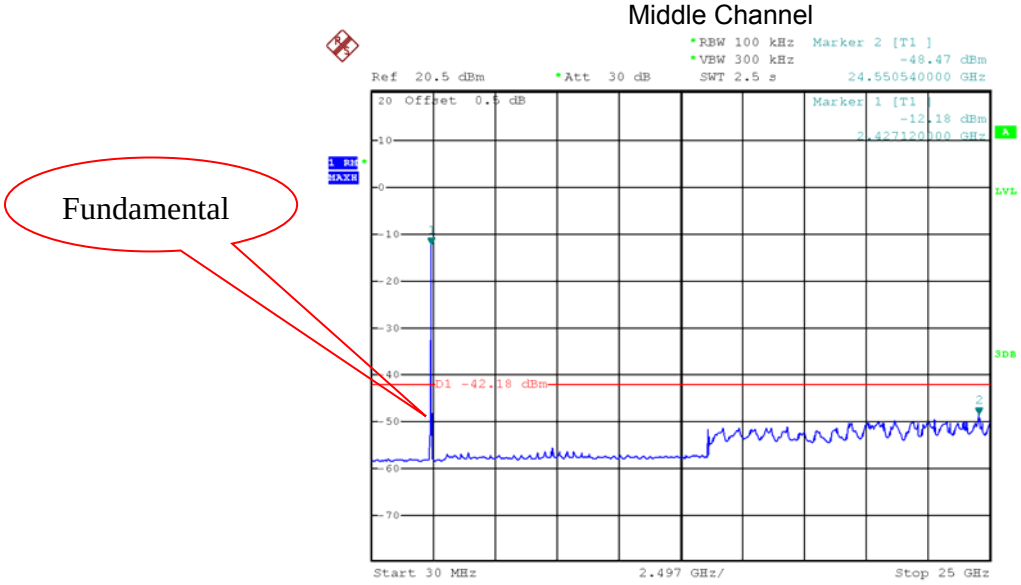


802.11g

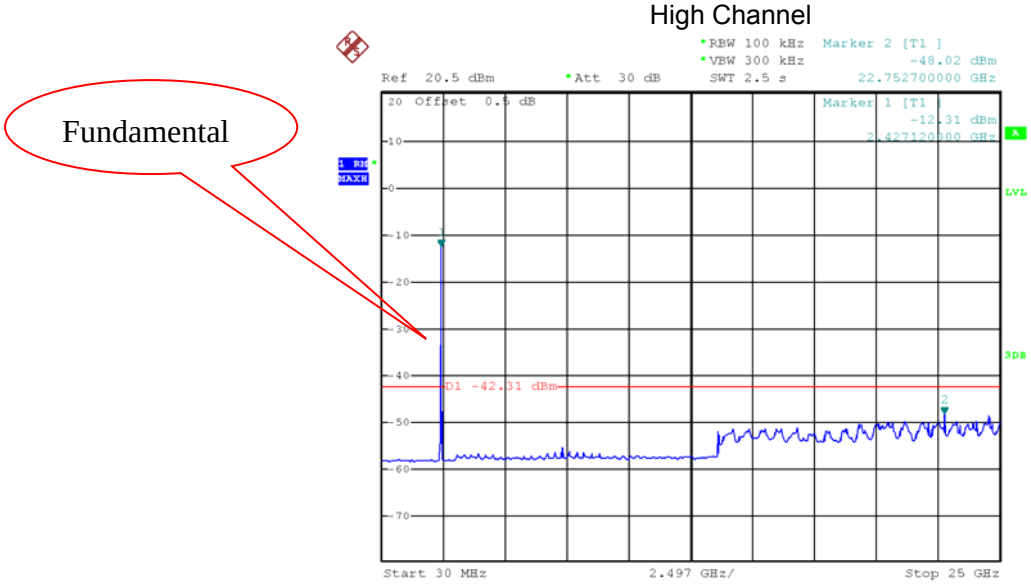
Low Channel



Middle Channel

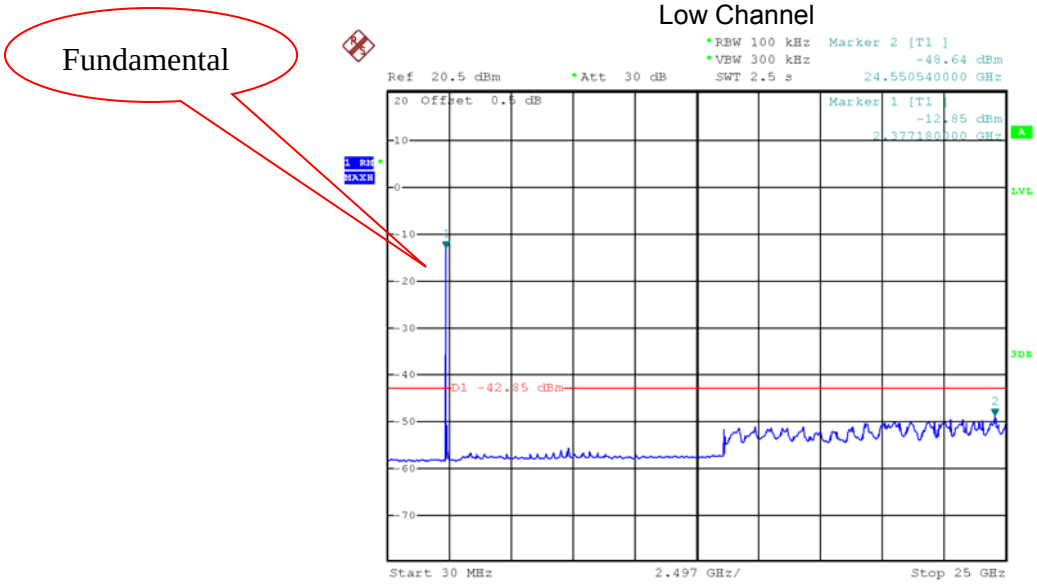


High Channel

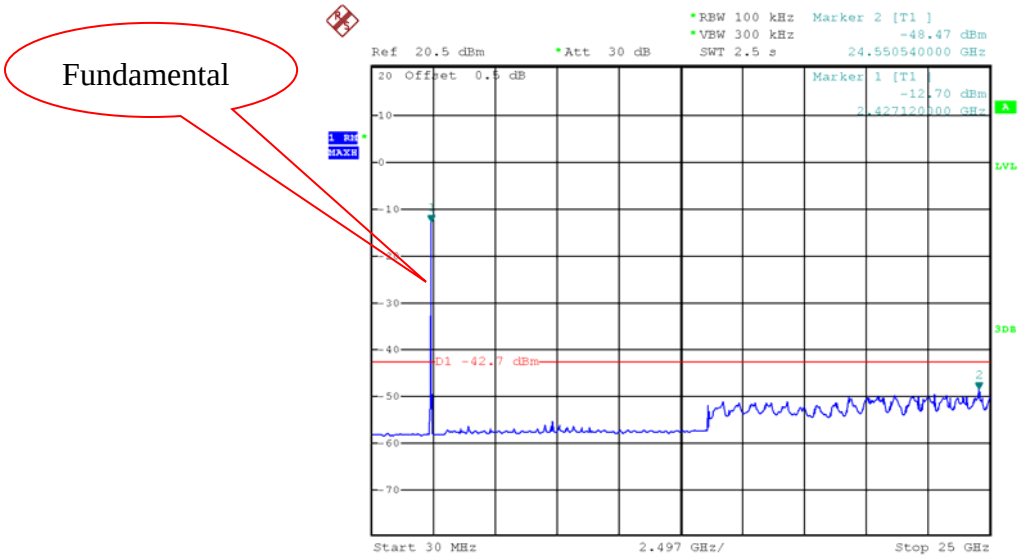


802.11n HT20

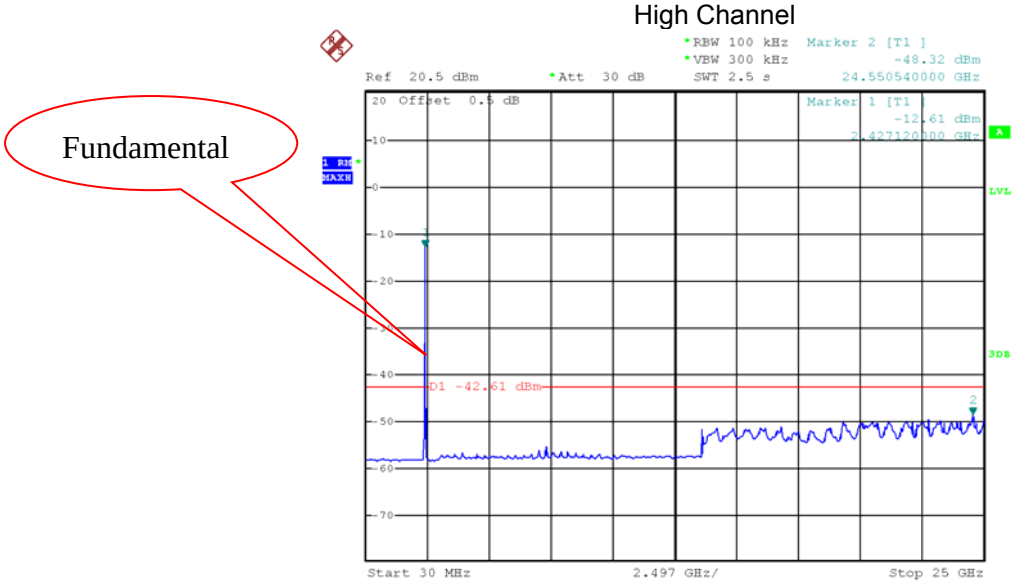
Low Channel



Middle Channel

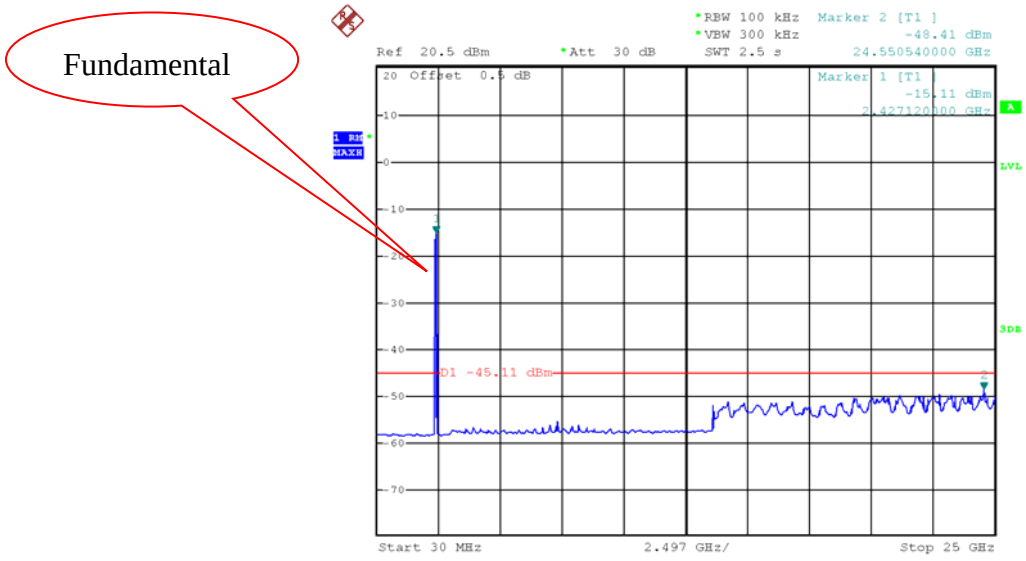


High Channel

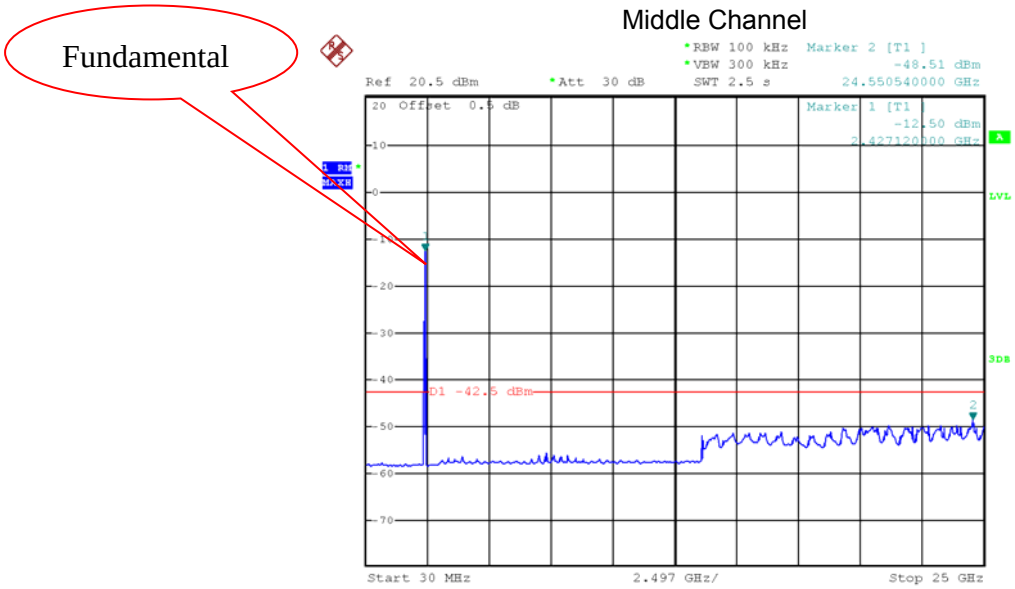


802.11n HT40

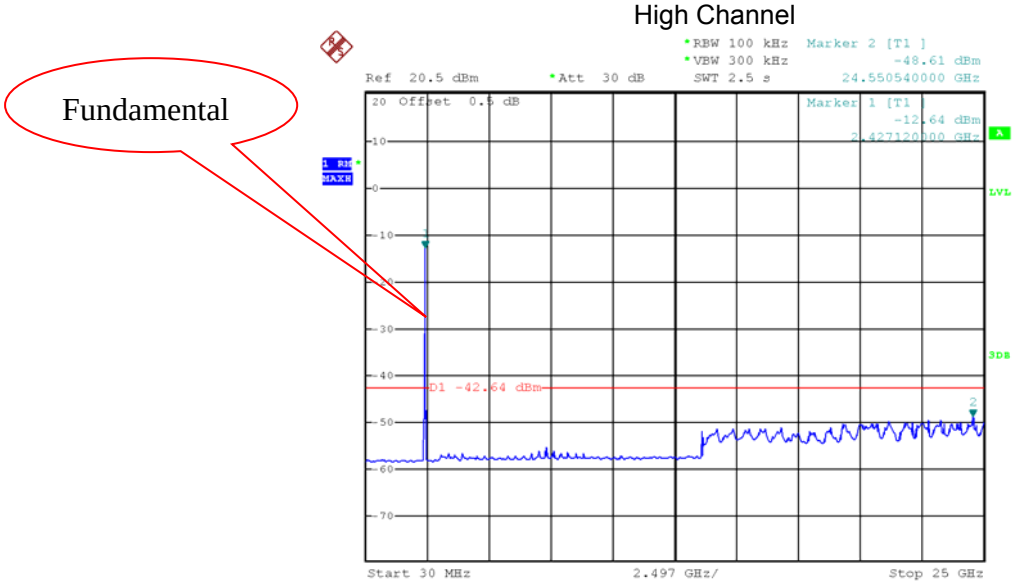
Low Channel



Middle Channel

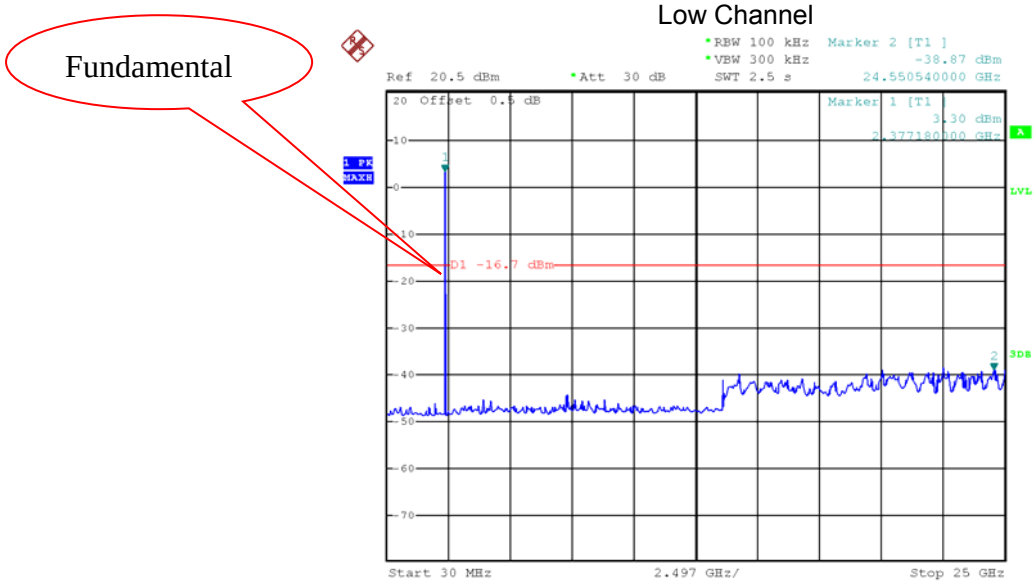


High Channel

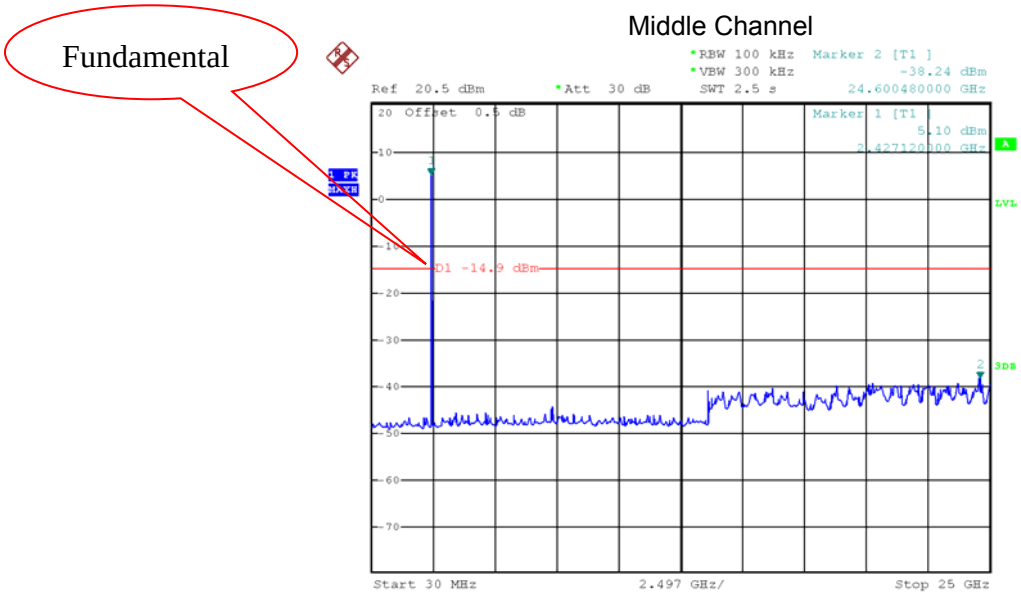


BLE

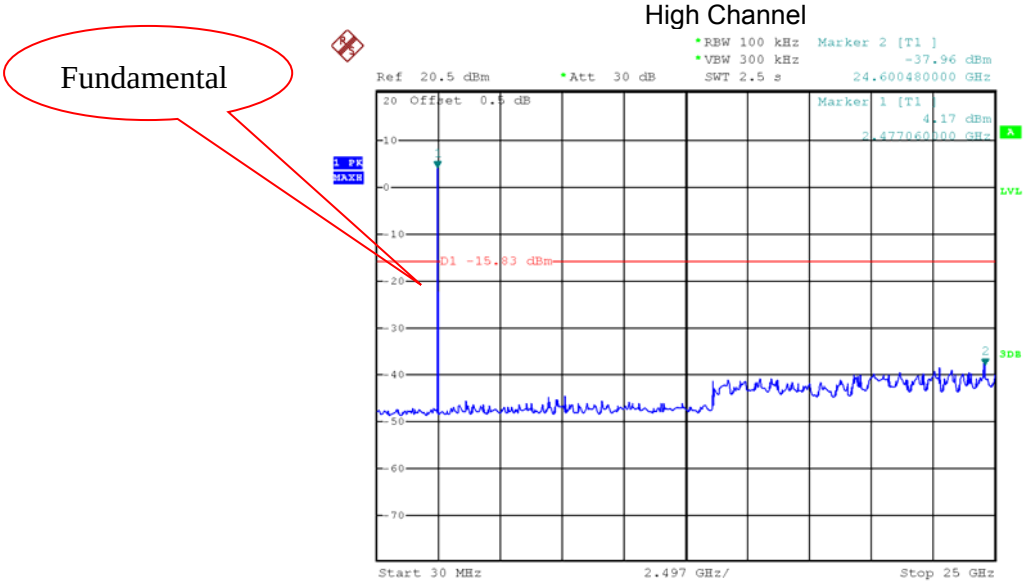
Low Channel



Middle Channel



High Channel



11 Band Edge Measurement

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 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

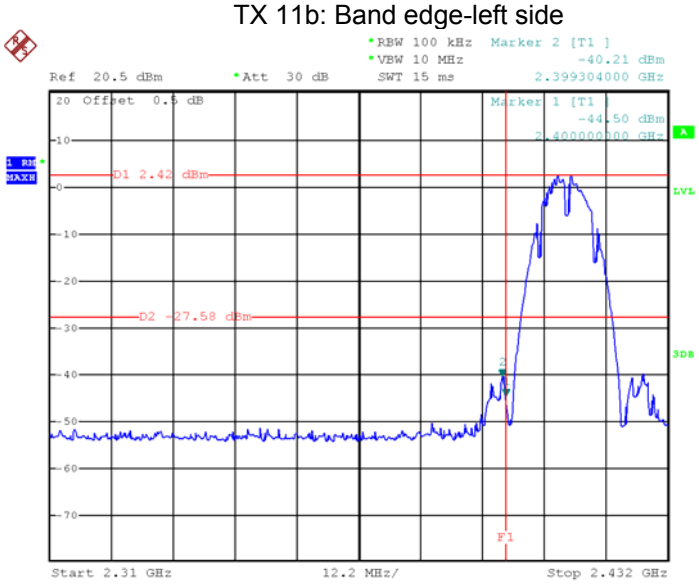
11.1 Test Produce

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.

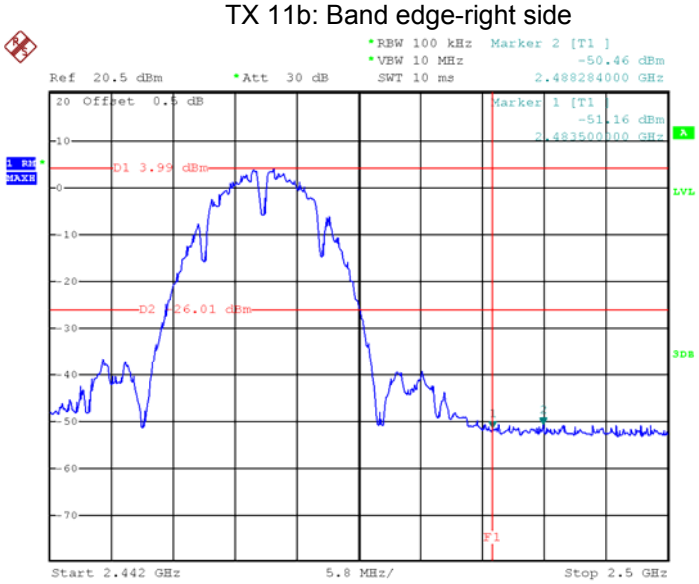
11.2 Test Result

Test result plots shown as follows:

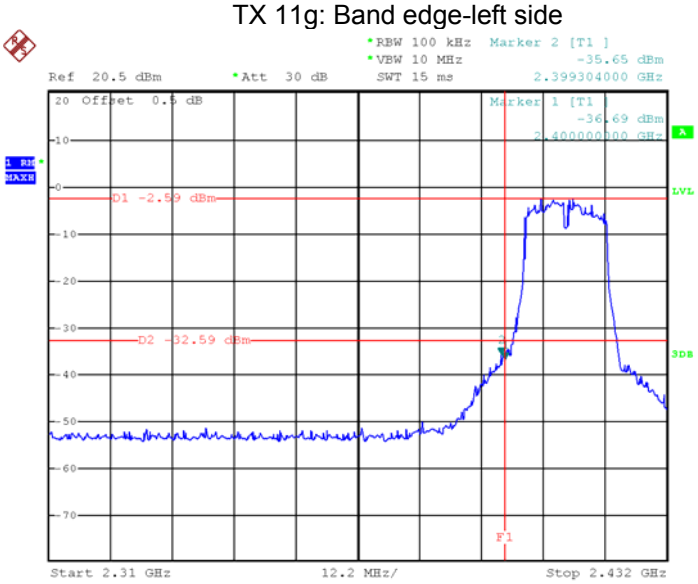
TX 11b: Band edge-left side



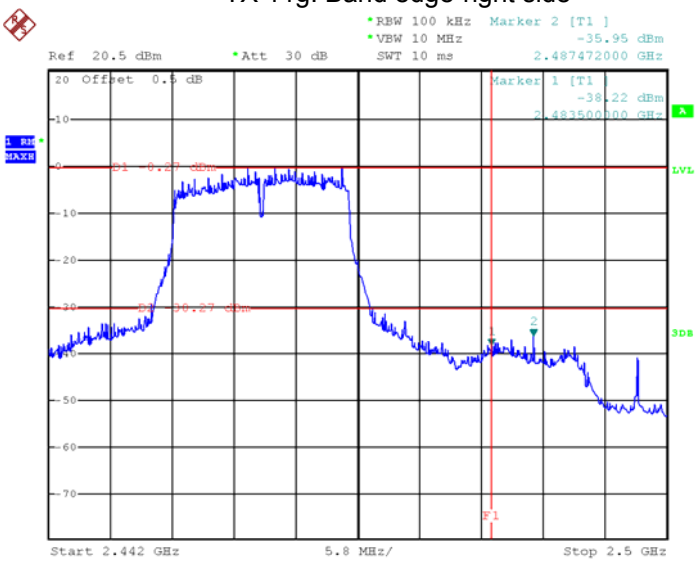
TX 11b: Band edge-right side



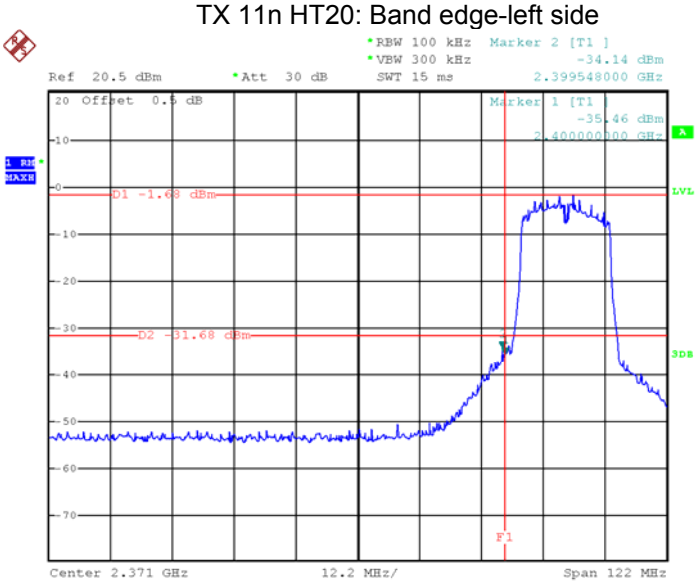
TX 11g: Band edge-left side



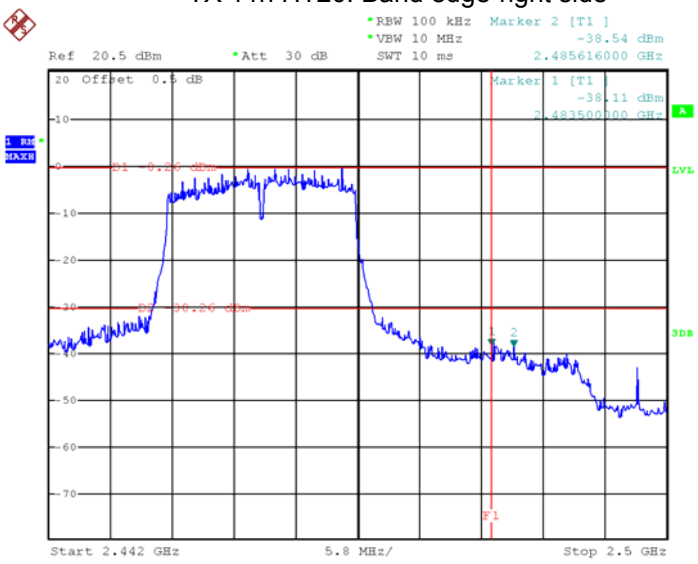
TX 11g: Band edge-right side



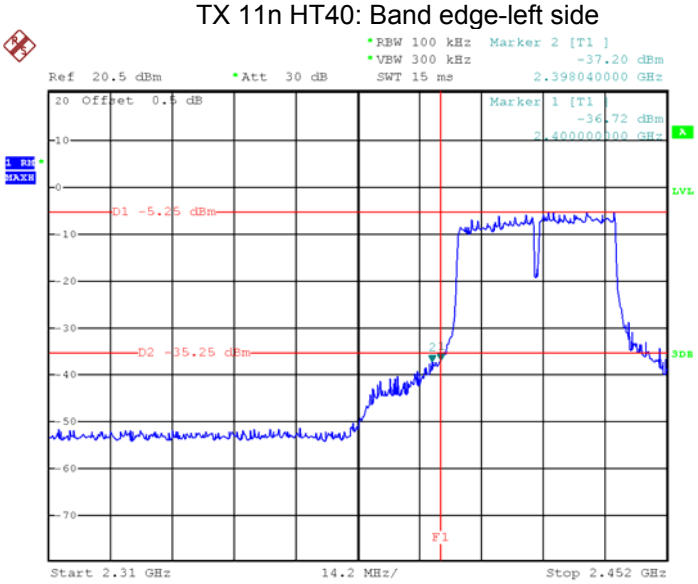
TX 11n HT20: Band edge-left side



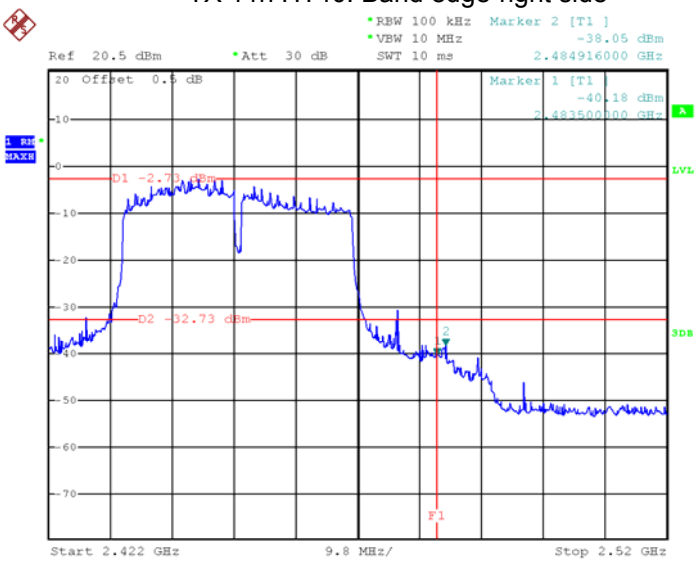
TX 11n HT20: Band edge-right side



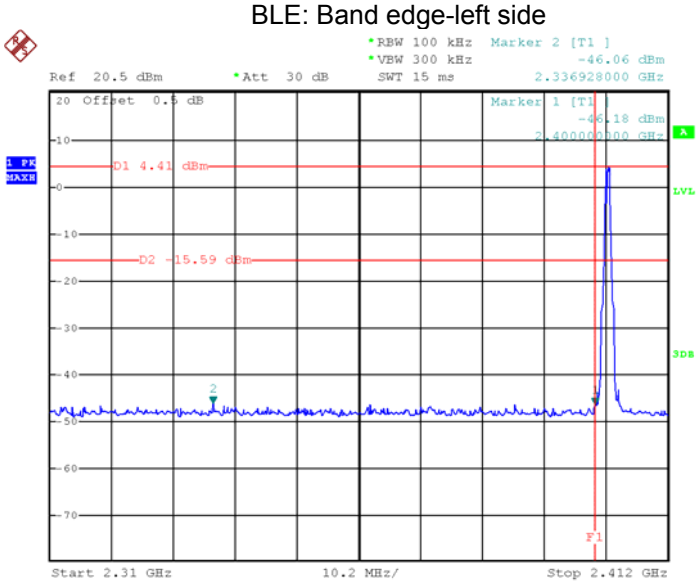
TX 11n HT40: Band edge-left side



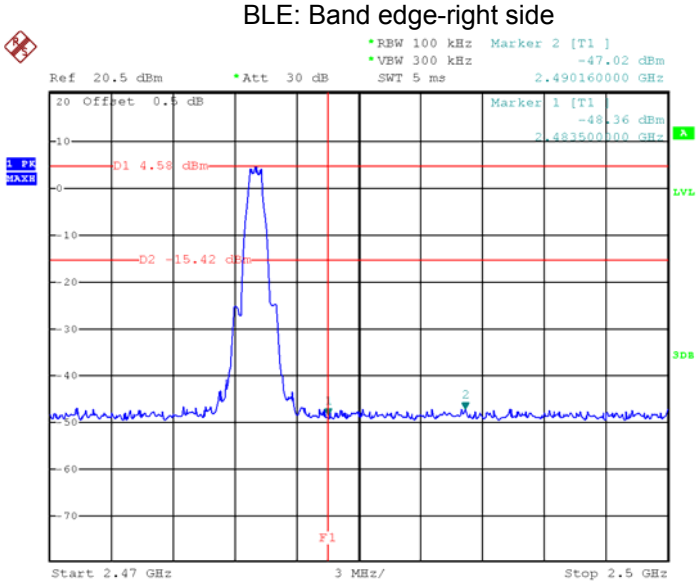
TX 11n HT40: Band edge-right side



BLE: Band edge-left side



BLE: Band edge-right side



12 6 dB Bandwidth and 99% Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: KDB 558074 D01 15.247 Meas Guidance 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

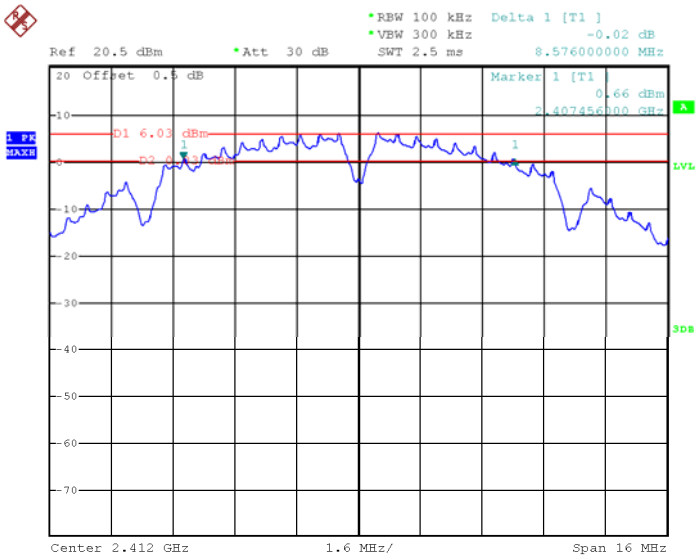
12.2 Test Result:

13 Operation mode	Test Channel	6dB Bandwidth (MHz)	99% Bandwidth (MHz)
TX 11b	Channel 1	8.576	13.152
	Channel 6	8.544	12.576
	Channel 11	9.536	13.024
TX 11g	Channel 1	16.000	16.950
	Channel 6	15.600	16.600
	Channel 11	16.350	16.950
TX 11n HT20	Channel 1	16.740	17.874
	Channel 6	15.876	17.550
	Channel 11	16.092	17.766
TX 11n HT40	Channel 3	35.880	36.410
	Channel 6	26.270	35.530
	Channel 9	35.200	36.080
BLE	Channel 0	0.690	1.032
	Channel 19	0.684	1.038
	Channel 39	0.690	1.038

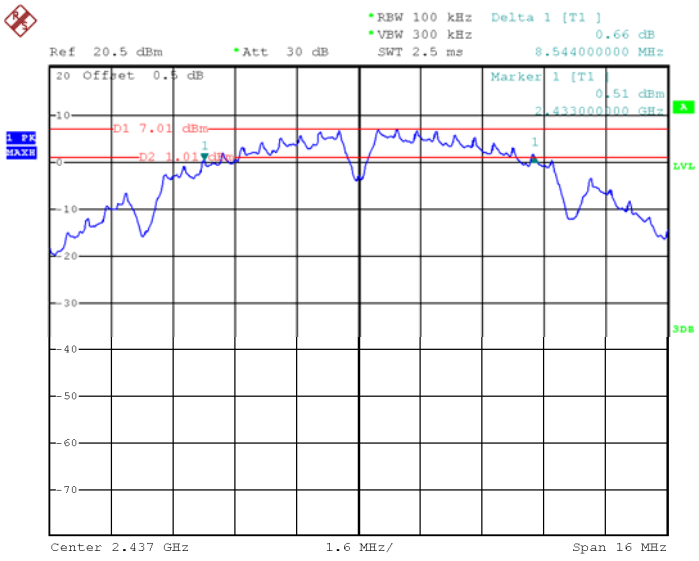
Test result plot:

6dB Bandwidth

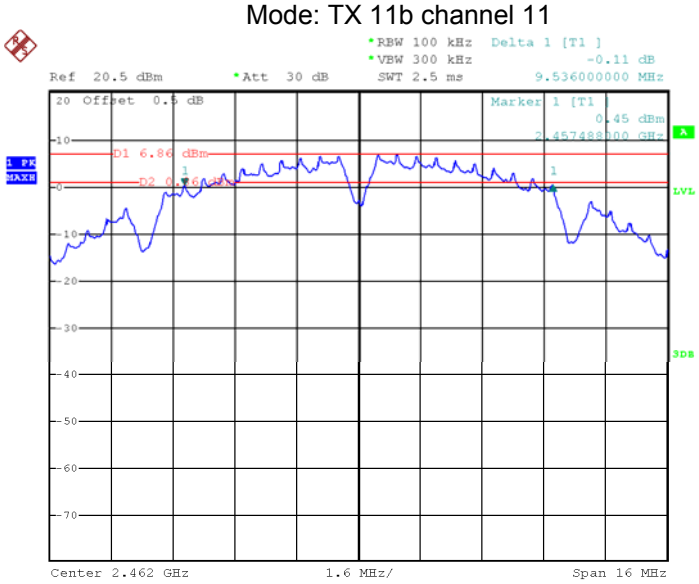
Mode: TX 11b channel 1



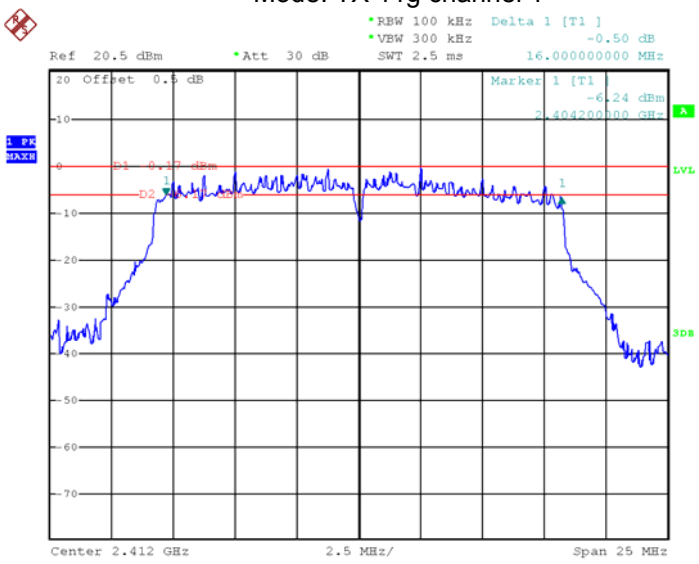
Mode: TX 11b channel 6



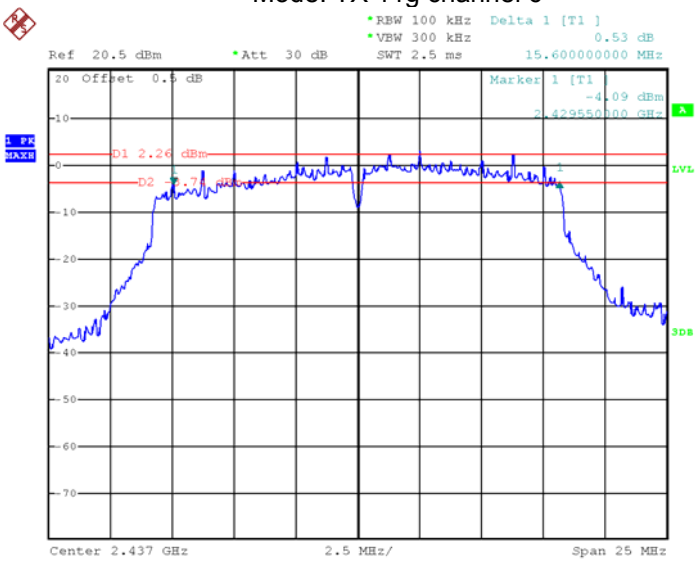
Mode: TX 11b channel 11



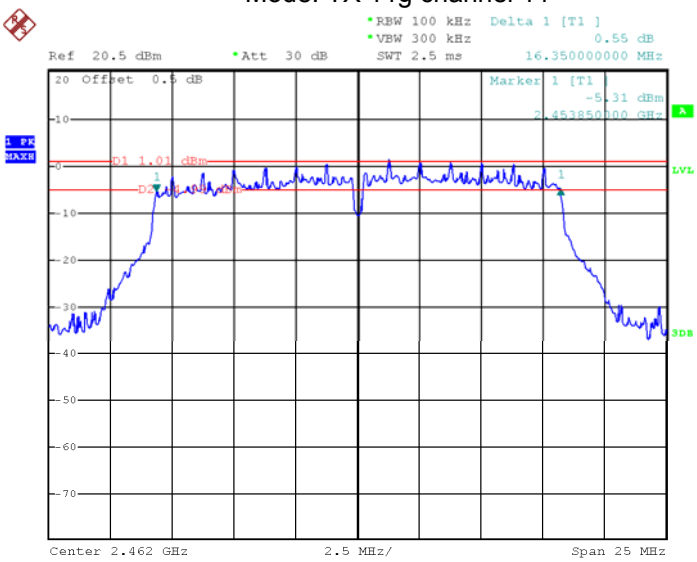
Mode: TX 11g channel 1



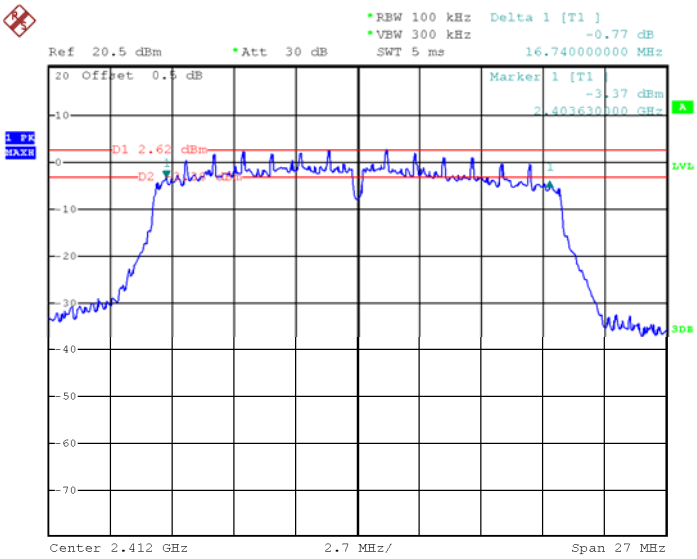
Mode: TX 11g channel 6



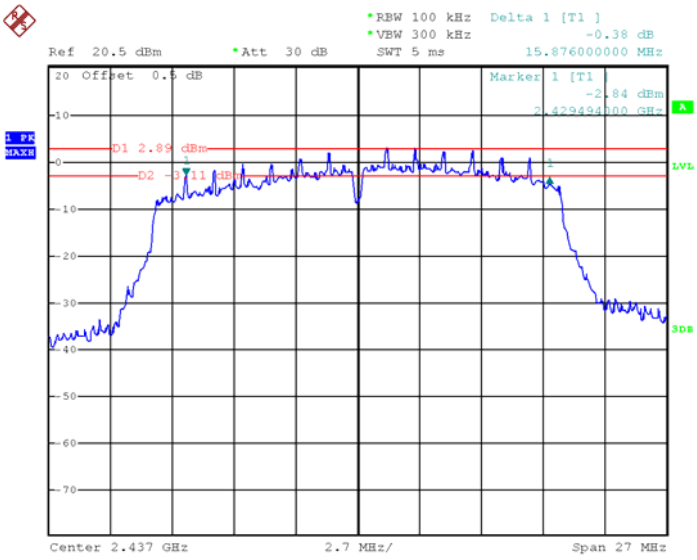
Mode: TX 11g channel 11



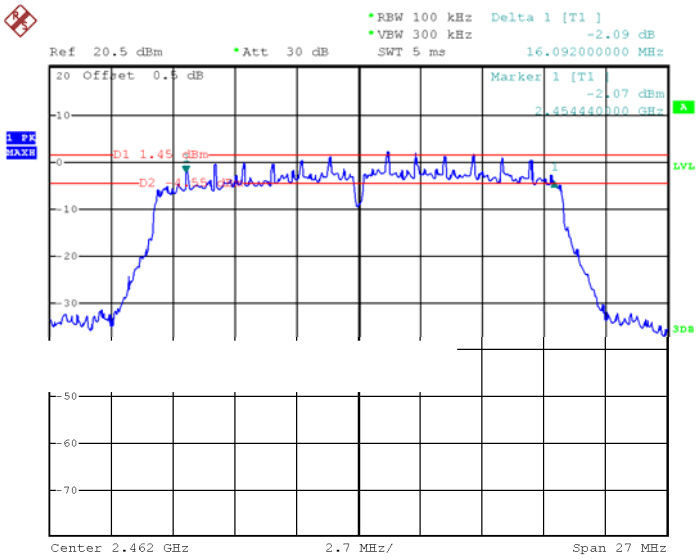
Mode: TX 11n HT20 channel 1



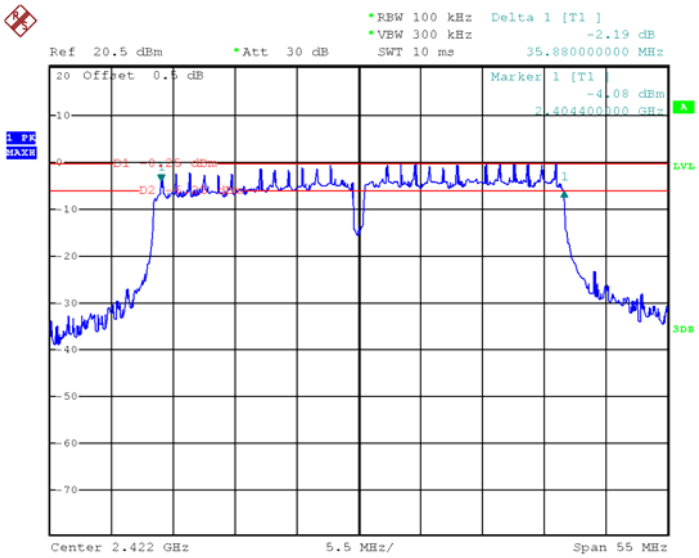
Mode: TX 11n HT20 channel 6



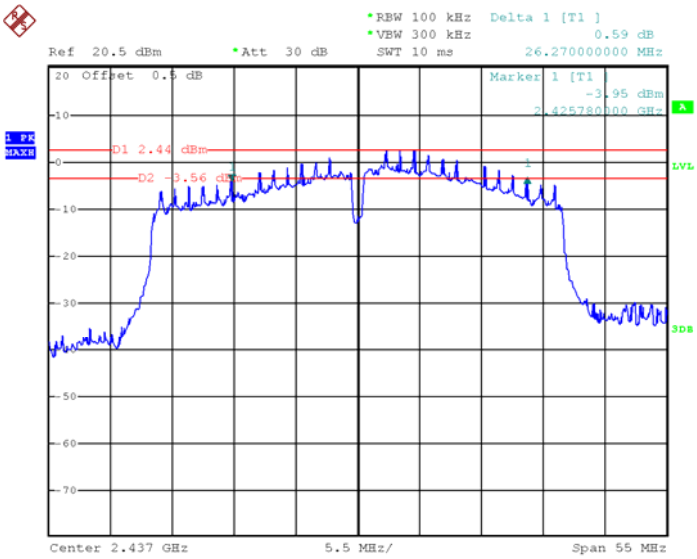
Mode: TX 11n HT20 channel 11



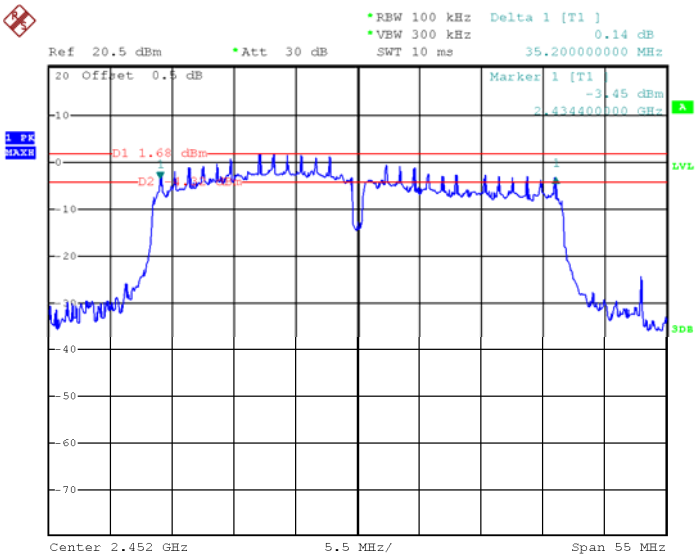
Mode: TX 11n HT40 channel 3



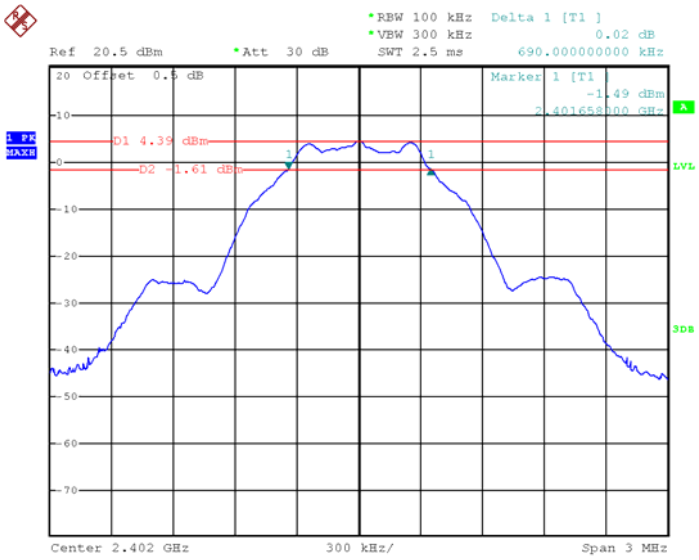
Mode: TX 11n HT40 channel 6



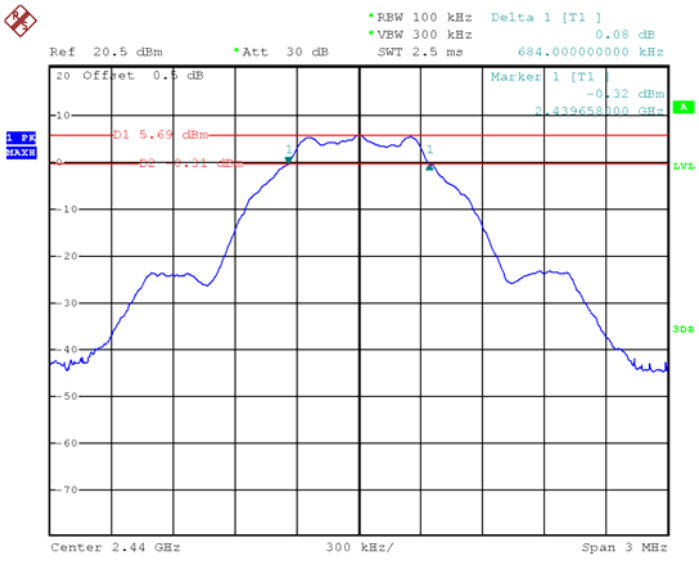
Mode: TX 11n HT40 channel 9



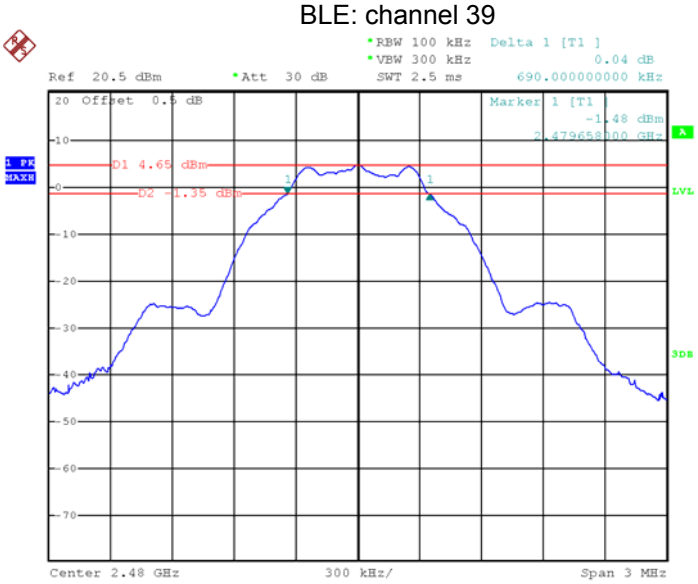
BLE: channel 0



BLE: channel 19

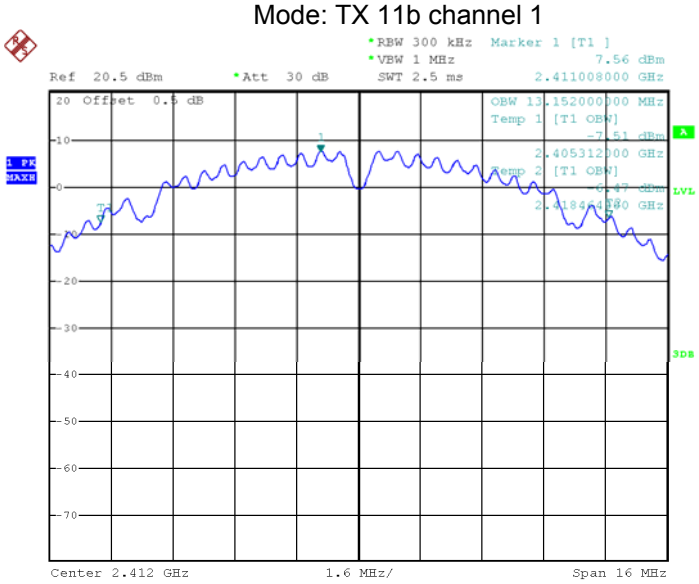


BLE: channel 39

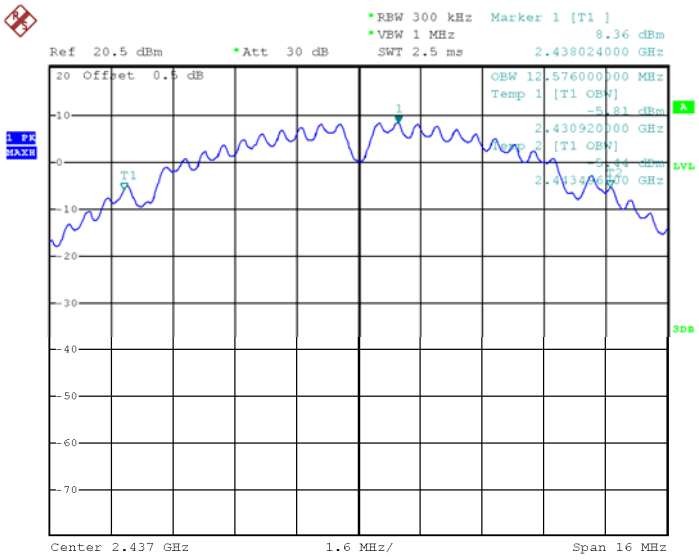


99% Bandwidth

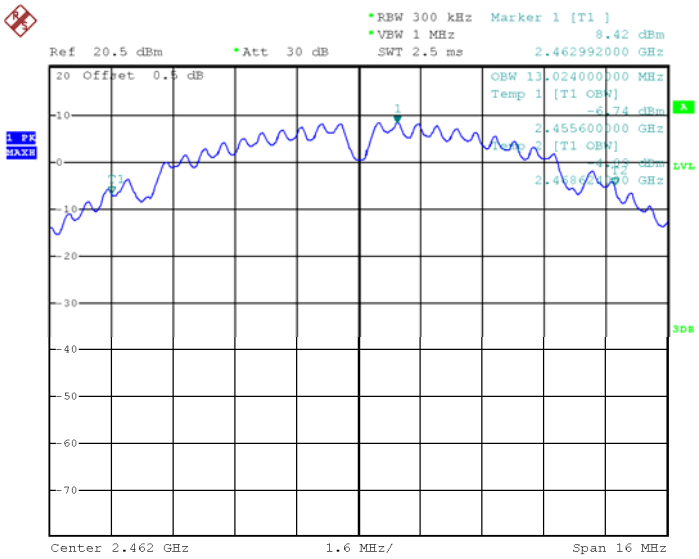
Mode: TX 11b channel 1



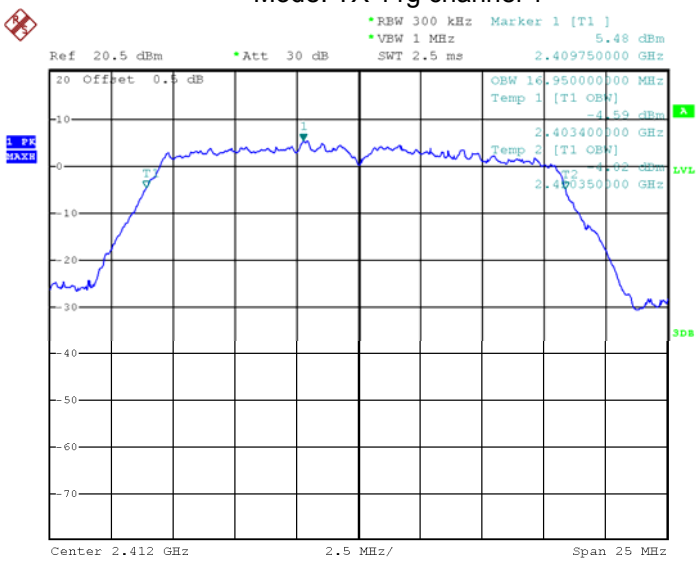
Mode: TX 11b channel 6



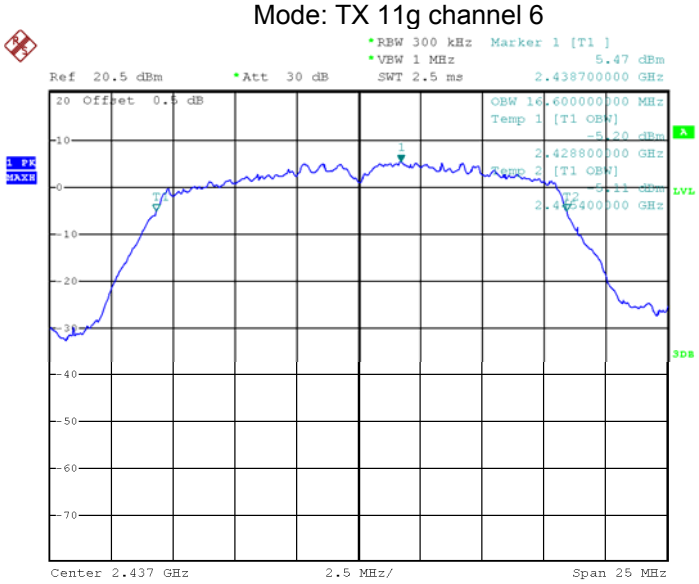
Mode: TX 11b channel 11



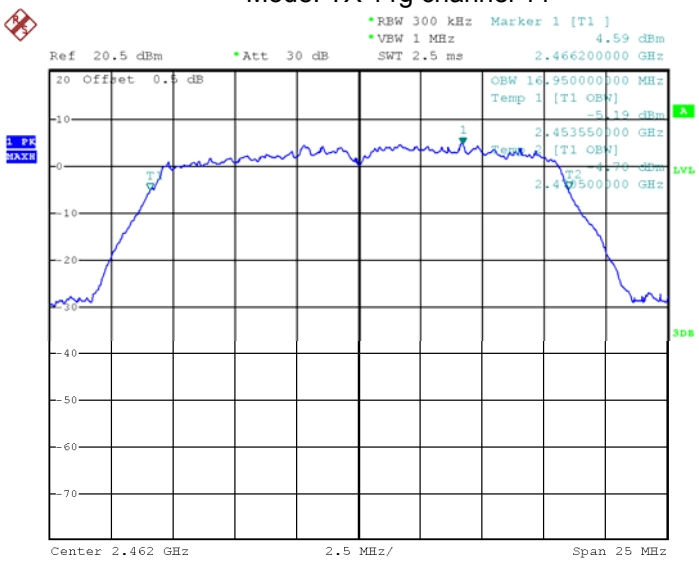
Mode: TX 11g channel 1



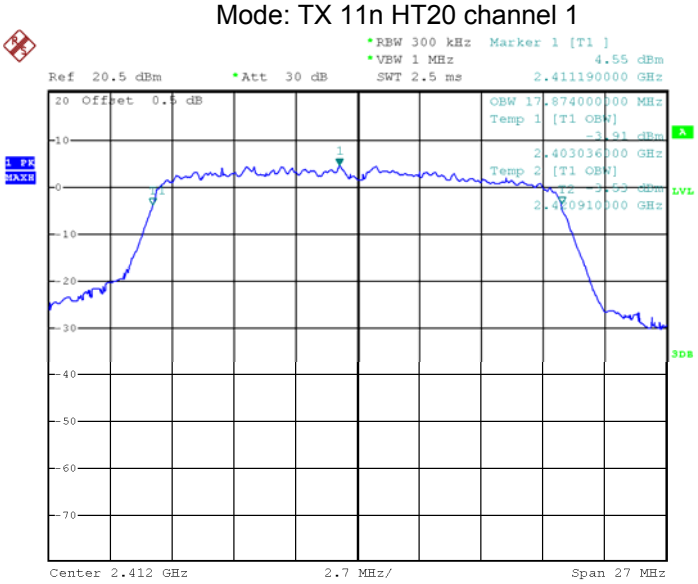
Mode: TX 11g channel 6



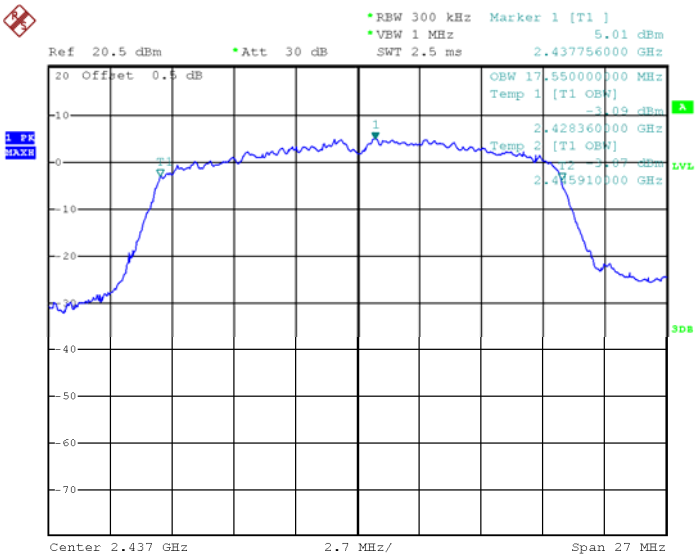
Mode: TX 11g channel 11



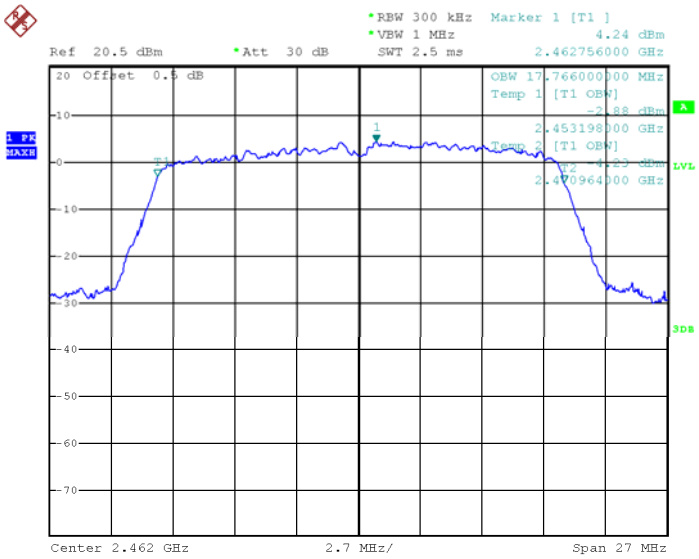
Mode: TX 11n HT20 channel 1



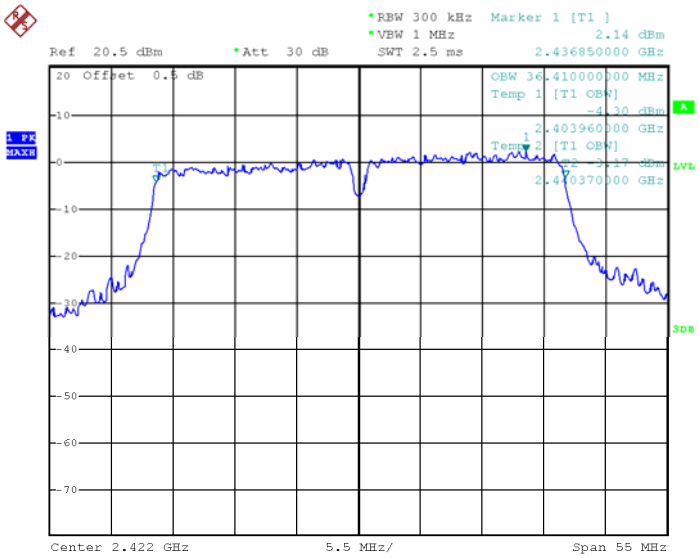
Mode: TX 11n HT20 channel 6



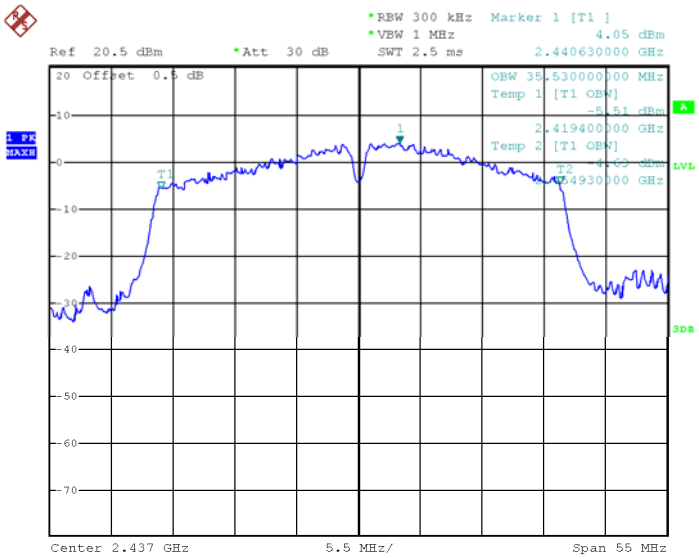
Mode: TX 11n HT20 channel 11



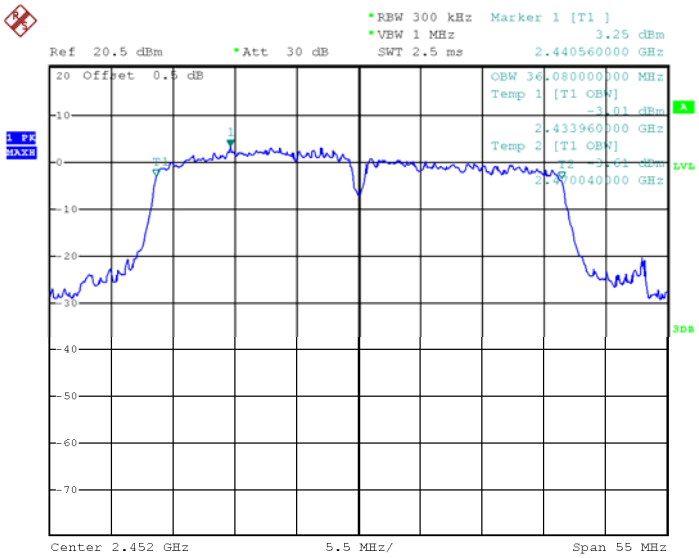
Mode: TX 11n HT40 channel 3



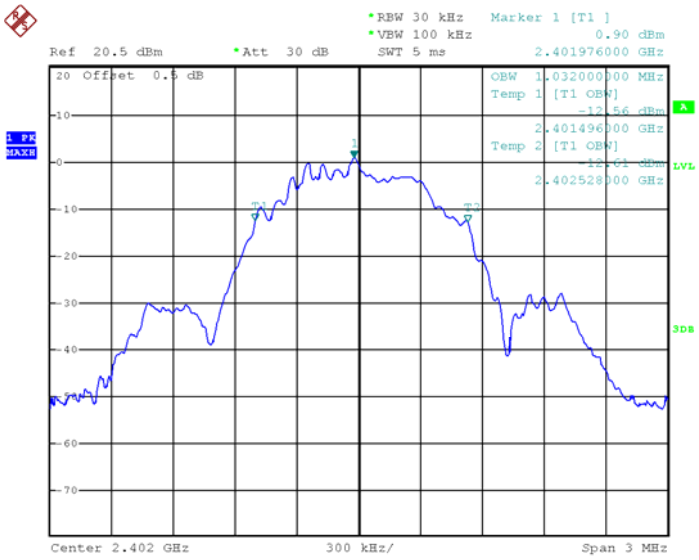
Mode: TX 11n HT40 channel 6



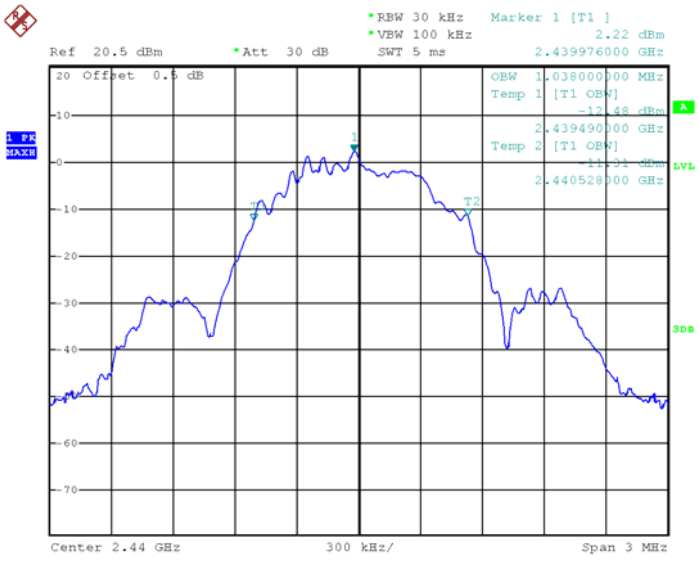
Mode: TX 11n HT40 channel 9



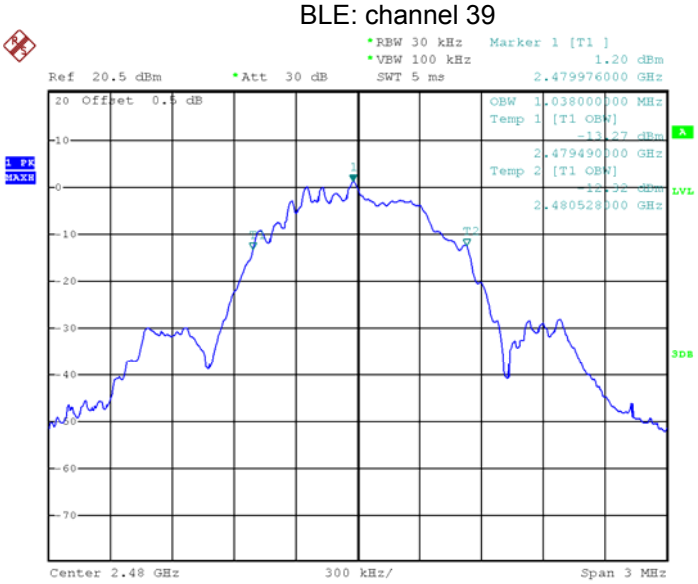
BLE: channel 0



BLE: channel 19



BLE: channel 39



14 Maximum Peak conducted Output Power

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

14.1 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.

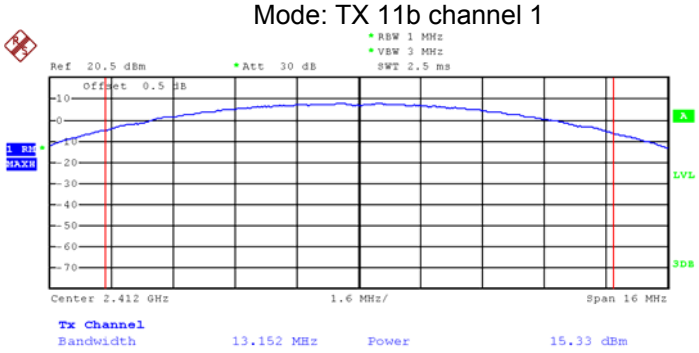
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the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

14.2 Test Result:

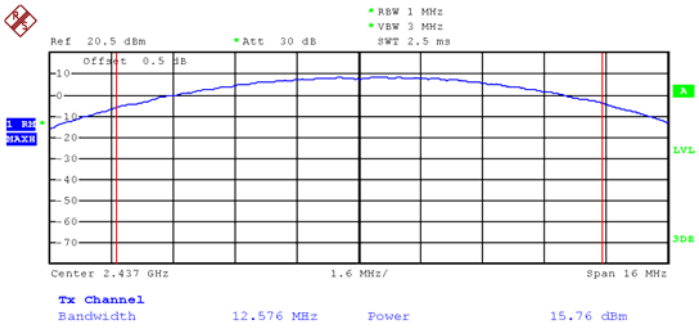
Operation mode	Channel Frequency (MHz)	Maximum Peak Output Power (dBm)	Limit
TX 11b	Low-2412	15.33	1W/30dBm
	Middle-2437	15.76	1W/30dBm
	High-2462	16.29	1W/30dBm
TX 11g	Low-2412	14.29	1W/30dBm
	Middle-2437	14.31	1W/30dBm
	High-2462	14.28	1W/30dBm
TX 11n HT20	Low-2412	14.18	1W/30dBm
	Middle-2437	14.34	1W/30dBm
	High-2462	14.32	1W/30dBm
TX 11n HT40	Low-2422	16.12	1W/30dBm
	Middle-2437	**16.54**	1W/30dBm
	High-2452	16.45	1W/30dBm
BLE	Low-2402	4.82	1W/30dBm
	Middle-2440	**6.20**	1W/30dBm
	High-2480	5.07	1W/30dBm

Test Plot

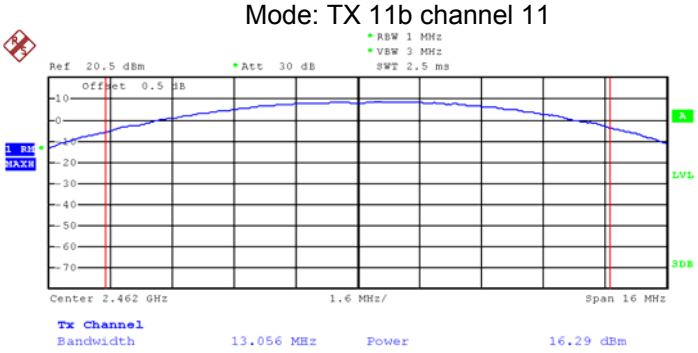
Mode: TX 11b channel 1



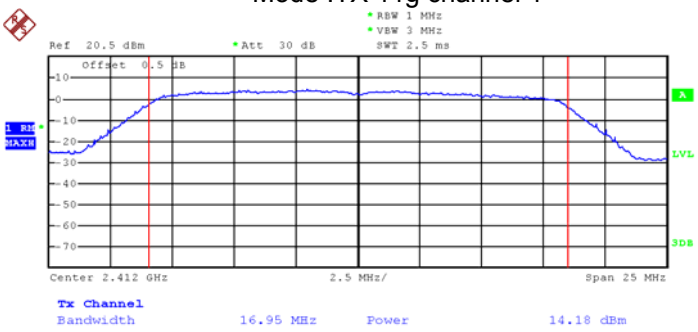
Mode: TX 11b channel 6



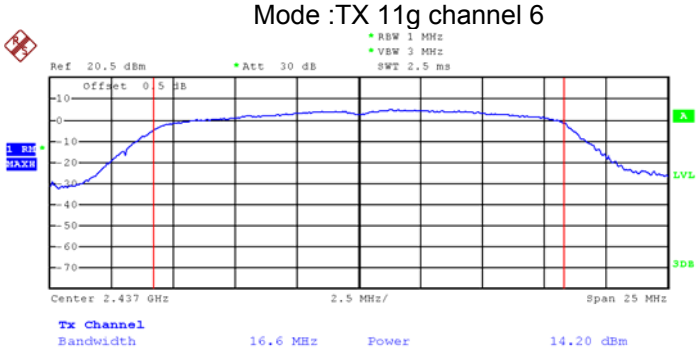
Mode: TX 11b channel 11



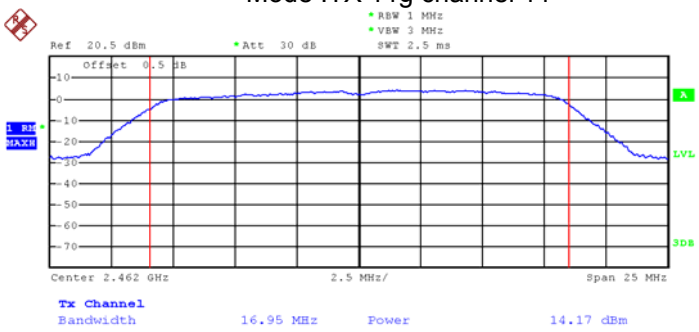
Mode :TX 11g channel 1



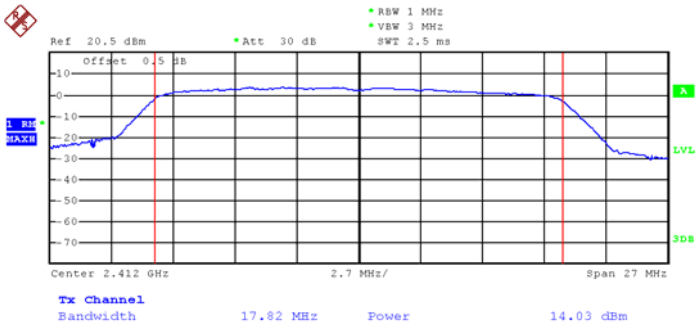
Mode :TX 11g channel 6



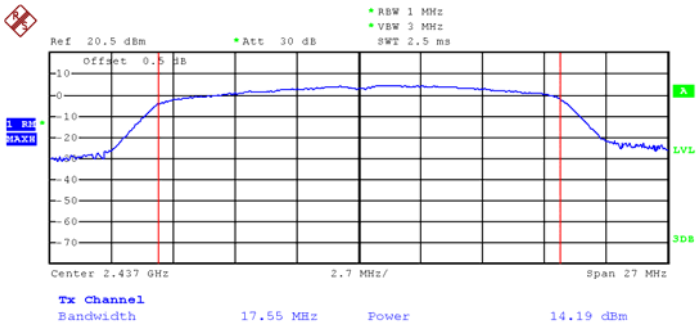
Mode :TX 11g channel 11



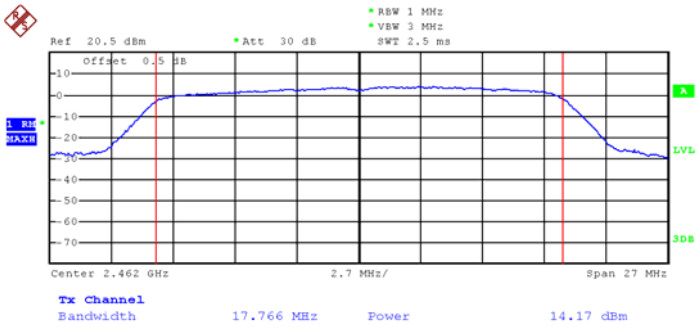
Mode: TX 11n HT20 channel 1



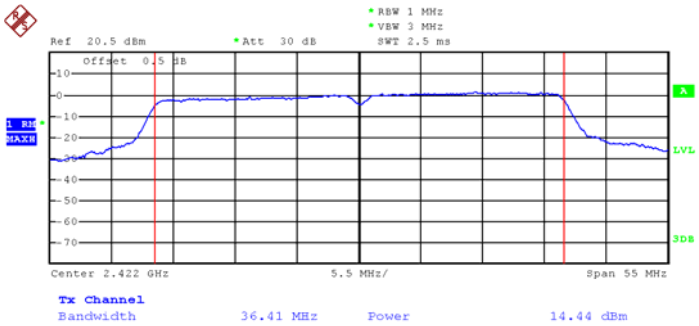
Mode: TX 11n HT20 channel 6



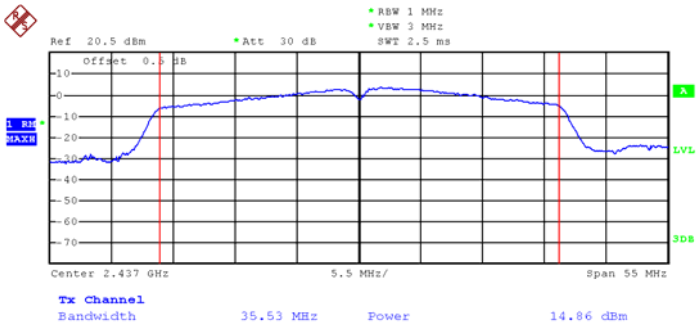
Mode: TX 11n HT20 channel 11



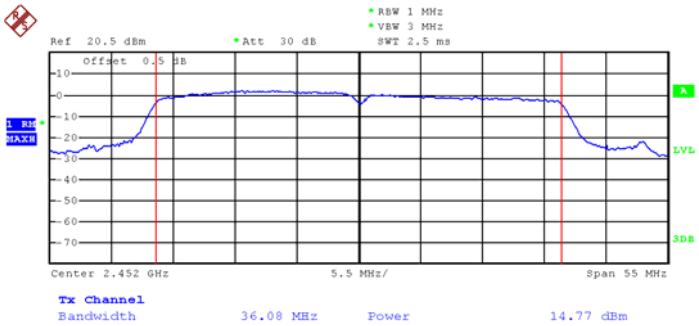
Mode: TX 11n HT40 channel 3



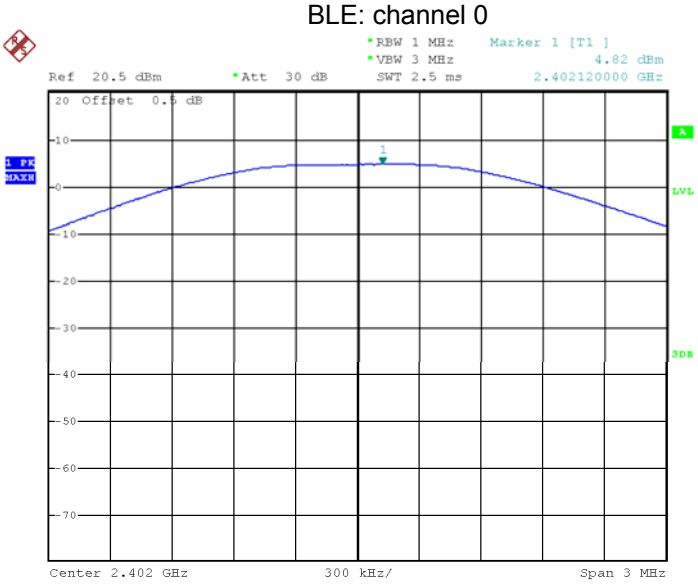
Mode: TX 11n HT40 channel 6



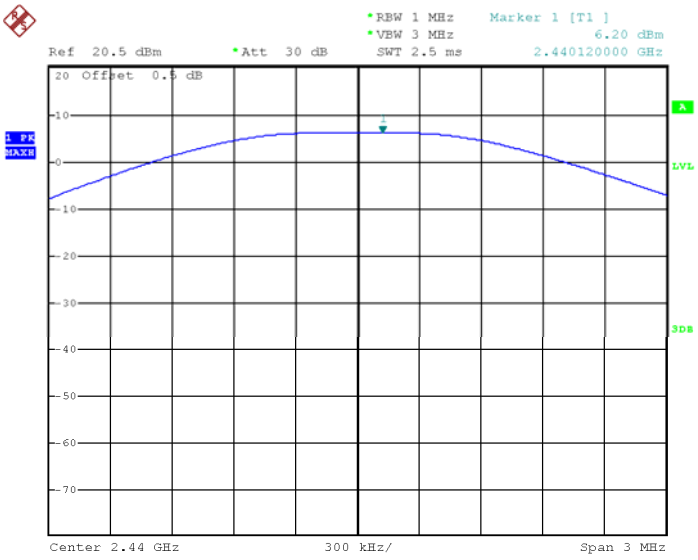
Mode: TX 11n HT40 channel 9



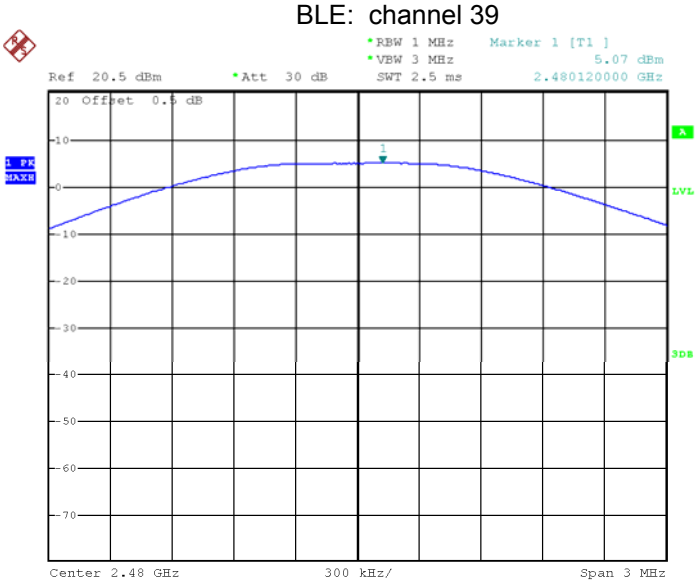
BLE: channel 0



BLE: channel 19



BLE: channel 39



15 Power Spectral density

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

15.1 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.

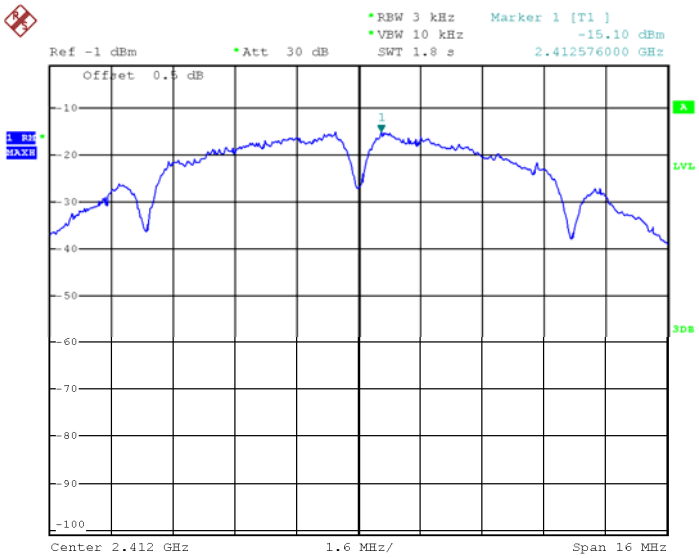
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

15.2 Test Result:

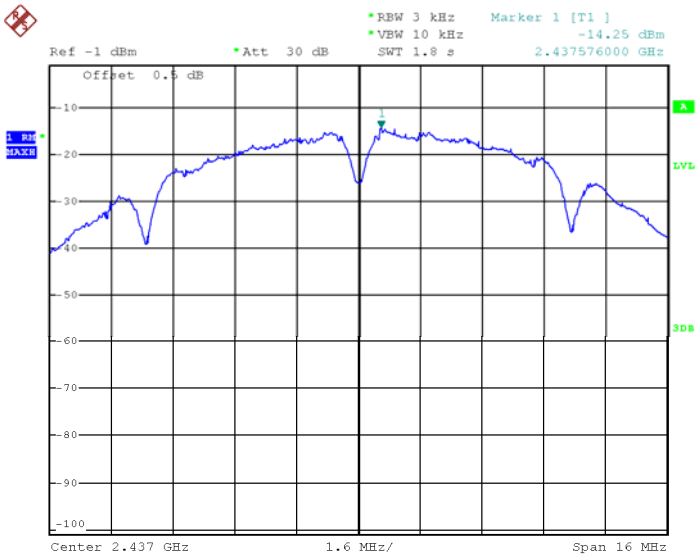
Operation mode	Channel Frequency (MHz)	Power Spectral (dBm per 3kHz)	Limit
TX 11b	Low-2412	-15.10	8dBm per 3kHz
	Middle-2437	-14.25	8dBm per 3kHz
	High-2462	-13.95	8dBm per 3kHz
TX 11g	Low-2412	-19.54	8dBm per 3kHz
	Middle-2437	-18.87	8dBm per 3kHz
	High-2462	-18.99	8dBm per 3kHz
TX 11n HT20	Low-2412	-19.75	8dBm per 3kHz
	Middle-2437	-18.43	8dBm per 3kHz
	High-2462	-19.48	8dBm per 3kHz
TX 11n HT40	Low-2422	-21.80	8dBm per 3kHz
	Middle-2437	-19.24	8dBm per 3kHz
	High-2452	-20.74	8dBm per 3kHz
BLE	Low-2402	-10.05	8dBm per 3kHz
	Middle-2440	-8.79	8dBm per 3kHz
	High-2480	-9.89	8dBm per 3kHz

Test Plot

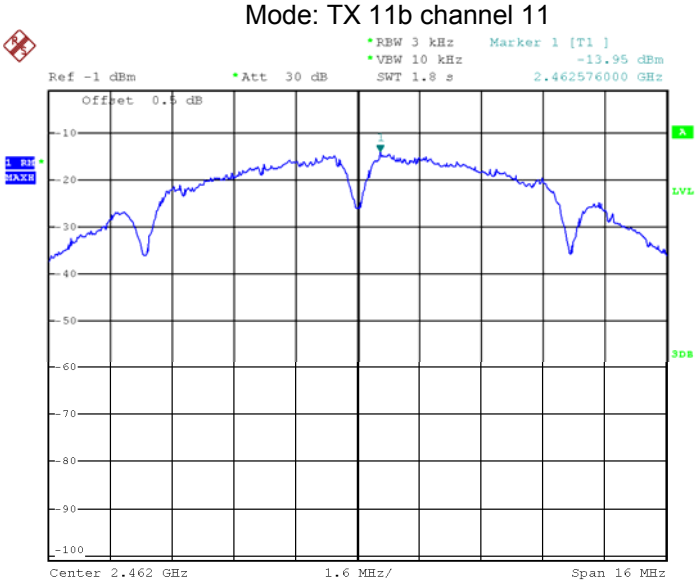
Mode: TX 11b channel 1



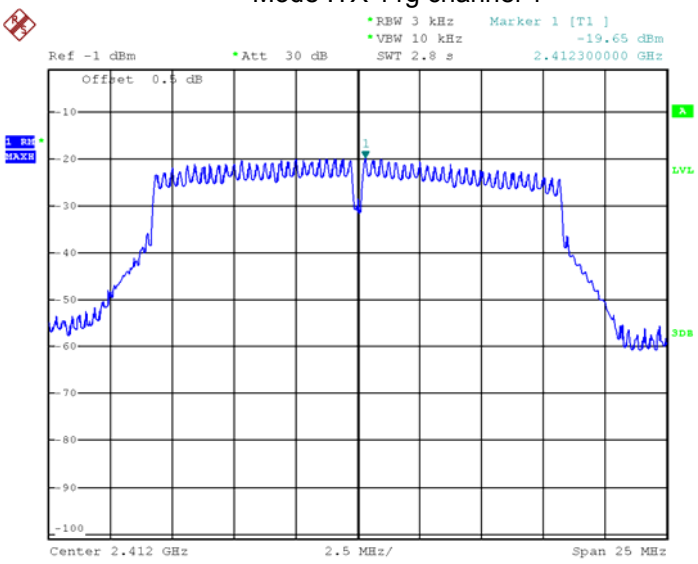
Mode: TX 11b channel 6



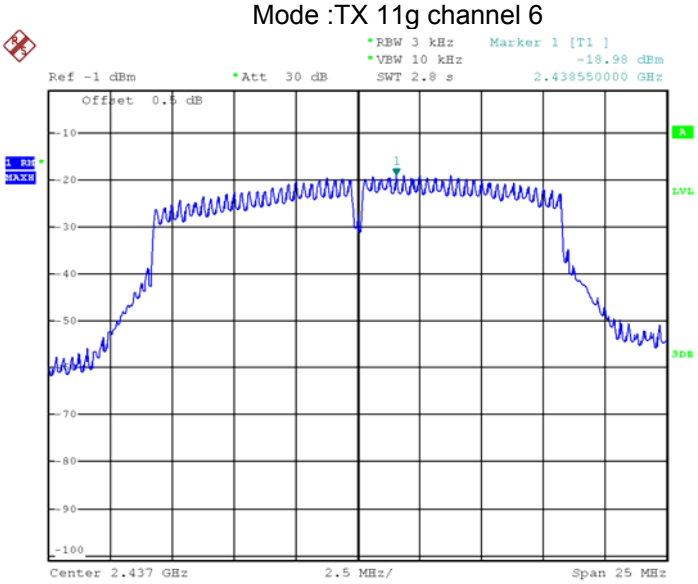
Mode: TX 11b channel 11



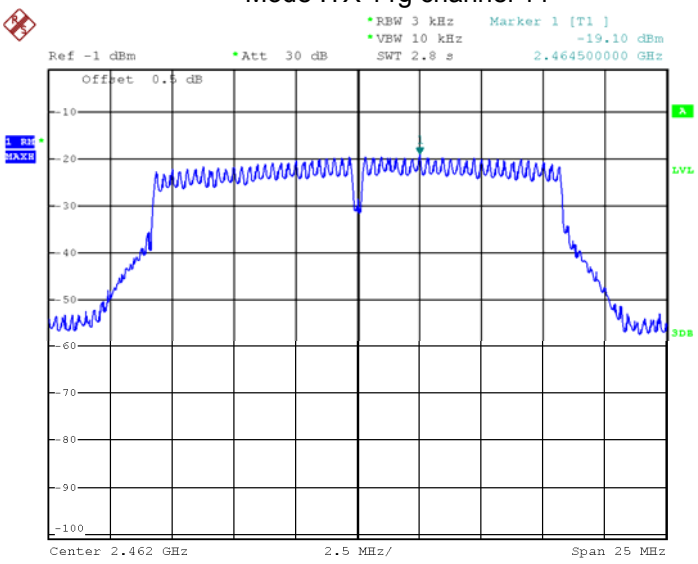
Mode :TX 11g channel 1



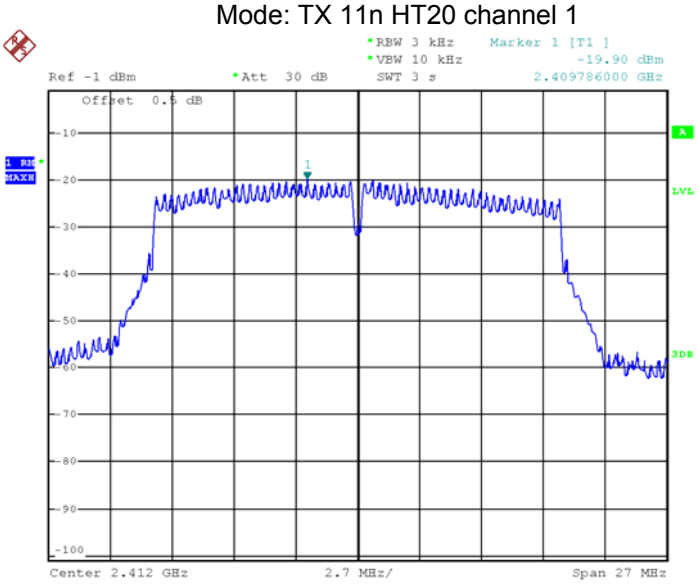
Mode :TX 11g channel 6



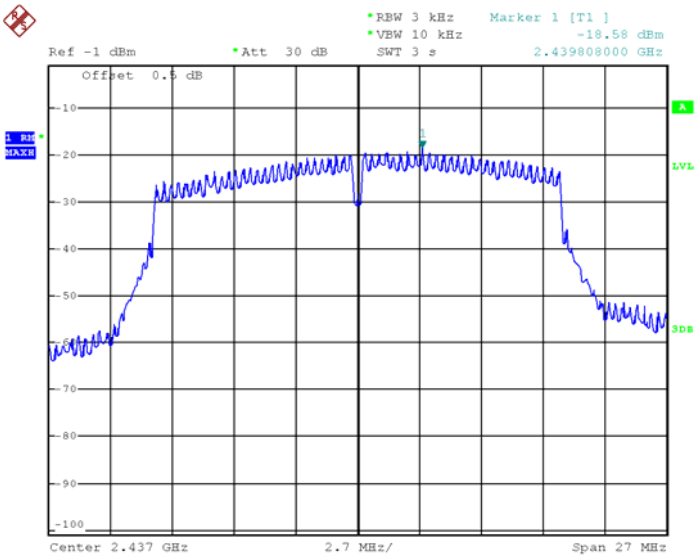
Mode :TX 11g channel 11



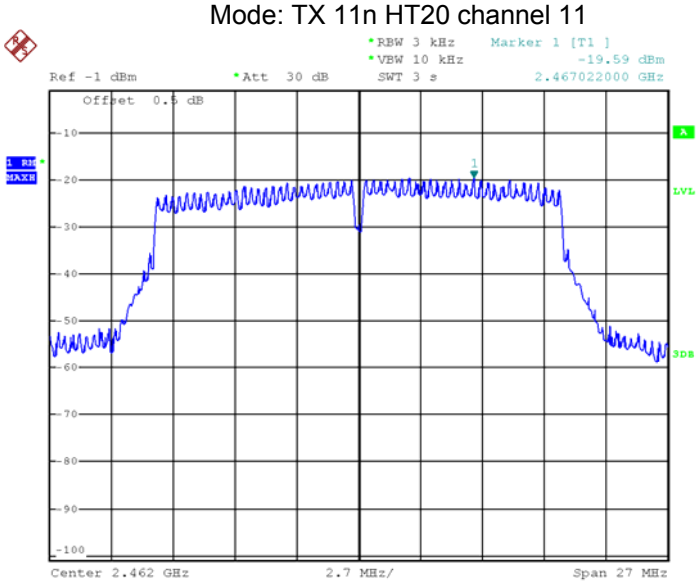
Mode: TX 11n HT20 channel 1



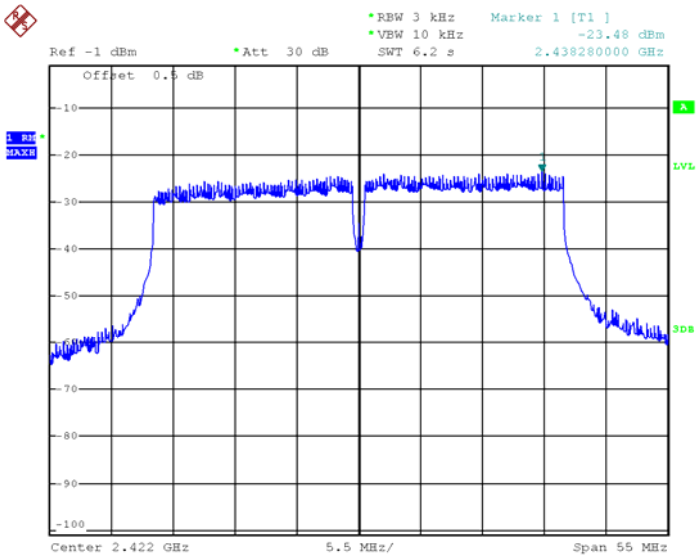
Mode: TX 11n HT20 channel 6



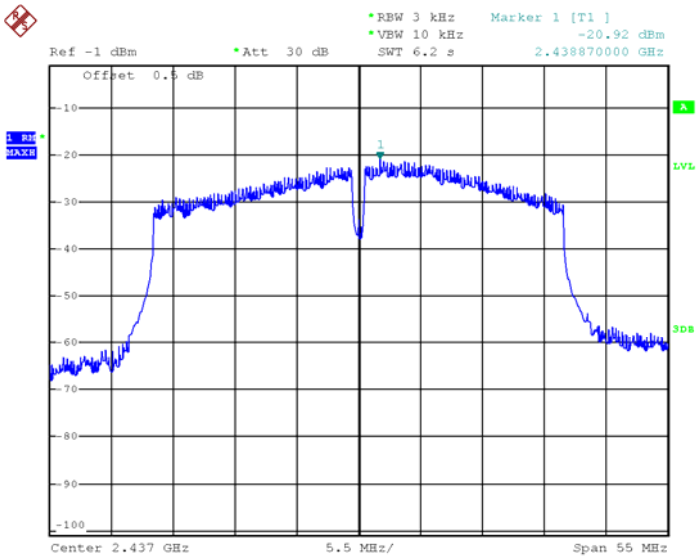
Mode: TX 11n HT20 channel 11



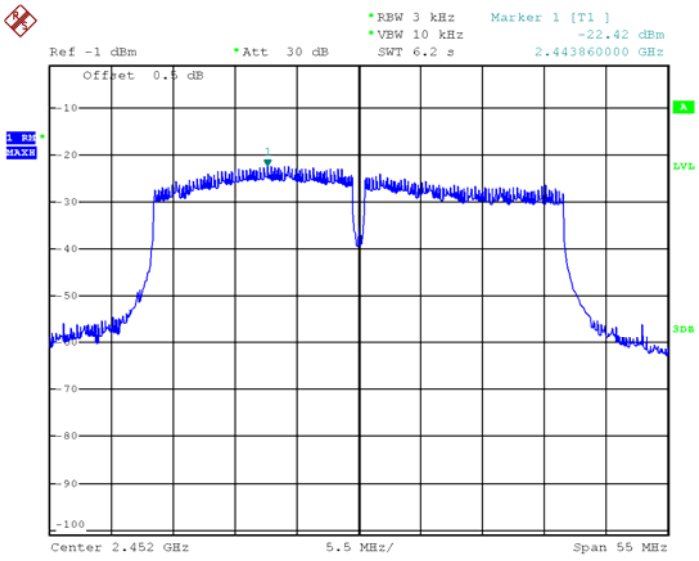
Mode: TX 11n HT40 channel 3



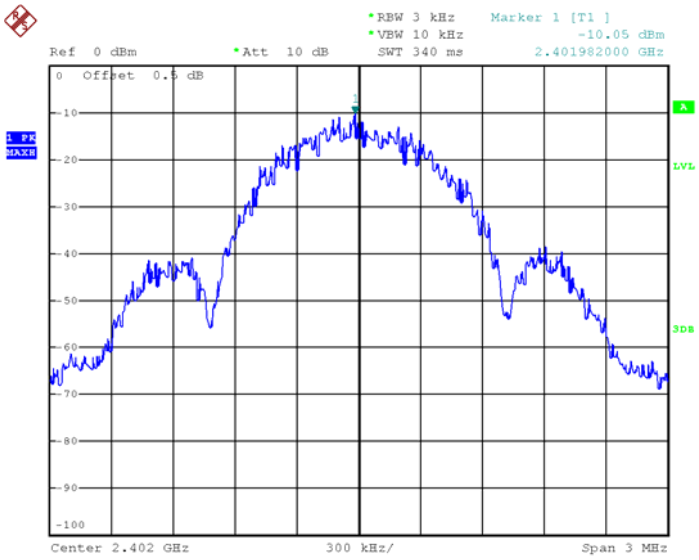
Mode: TX 11n HT40 channel 6



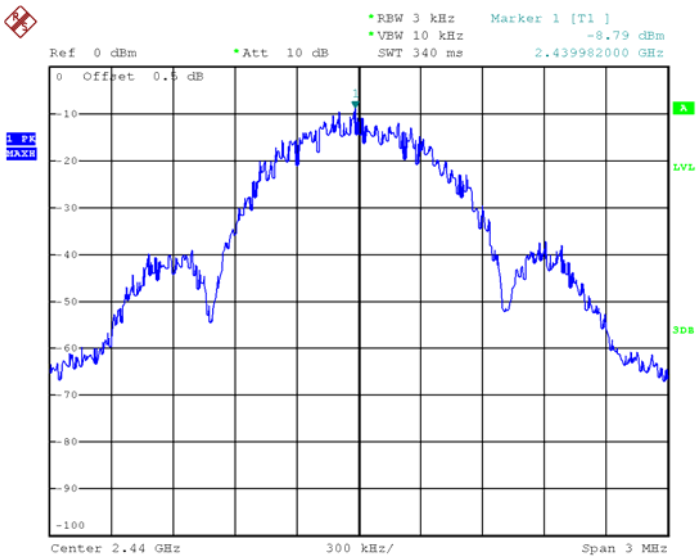
Mode: TX 11n HT40 channel 9



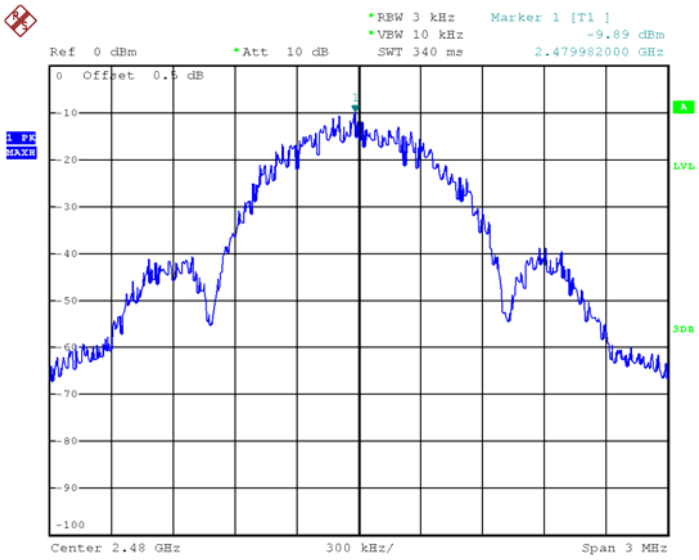
BLE: channel 0



BLE: channel 19



BLE: channel 39



16 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.

17 RF Exposure

Remark: refer to SAR test report: WTD22D03053479W001.

18 Photographs of test setup and EUT.

Note: Please refer to appendix: Appendix-Black X-Photos.

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