TEST REPORT

Reference No.	:	WTS20S04018065W001
FCC ID.....	:	2AV6X-65T7U
Applicant	:	Makena Electronic(Shenzhen) Co.,Ltd
Address	:	Block B, New Sanyo Industrial Park, Nanhuan Rd, Shajing Town, Baoan District, Shenzhen 518104, China
Manufacturer	:	Makena Electronic(Shenzhen) Co.,Ltd
Address	:	Block B, New Sanyo Industrial Park, Nanhuan Rd, Shajing Town, Baoan District, Shenzhen 518104, China
Product.....	:	LED TV
Model(s).....	:	65T7U, FDUS65M7A
Brand Name(s).....	:	Polaroid, FURRION
Standards.....	:	FCC CFR47 Part 15 Section 15.247:2019
Date of Receipt sample..	:	2020-04-13
Date of Test.....	:	2020-04-20 to 2020-05-06
Date of Issue	:	2020-05-07
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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2 Revision History

Test Report No.	Date of Receipt Sample	Date of Test	Date of Issue	Purpose	Comment	Approved
WTS20S04018065W001	2020-04-13	2020-04-20 to 2020-05-06	2020-05-07	Original	-	Valid

3 General Information

3.1 General Description of E.U.T.

Product:	LED TV
Model(s):	65T7U, FDUS65M7A
Model Description:	Only the model names and brand names are different. The model 65T7U is the tested sample.
Operation Frequency:	802.11b/g/n HT20: 2412MHz ~ 2462MHz, 802.11n HT40: 2422MHz~2452MHz
Antenna installation:	Internal Integrated Antenna
Antenna Gain:	ANT1 2.4GHz Wi-Fi: 4.77 dBi ANT2 2.4GHz Wi-Fi: 4.77 dBi
Type of modulation:	IEEE 802.11b (CCK/QPSK/BPSK,11Mbps max.) IEEE 802.11g (BPSK/QPSK/16QAM/64QAM,54Mbps max.) IEEE 802.11n (BPSK/QPSK/16QAM/64QAM,HT20:72Mbps max., HT40:150Mbps max.)
Number of transmitter chains:	Wi-Fi:2T2R (MIMO)

The device supports MIMO 2T2R, and the MIMO works with STBC(Space-Time Block Coding).

The antenna is omnidirectional, does not support any directional gain in any modes.

TX power for MIMO rate, the Wi-Fi chip has a power/rate table that controls TX power from chipout, it's preset in nvram, FW don't need to calculate it again when MIMO rate is fixed. Of course the real radiation power is also related to antenna efficient. Two transmitter signals are not correlated with each other. Directional gain=G_{ANT}

MIMO is only supported for 802.11 n mode, and not supported for 802.11b and 802.11g mode.

3.2 Details of E.U.T

Ratings:	Input: AC 100-120V~, 50/60Hz, 198W

3.3 Channel List

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	-

3.4 Test Mode

Table 1 Tests Carried Out Under FCC part 15.247

Test Items	Mode	Data Rate	Channel	TX/RX
Maximum Peak Output Power	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Power Spectral Density	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Bandwidth	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX
Band Edge	802.11b	11 Mbps	1/11	TX
	802.11g	54 Mbps	1/11	TX
	802.11n HT20	108 Mbps	1/11	TX
	802.11n HT40	150 Mbps	3/9	TX
Transmitter Spurious Emissions	802.11b	11 Mbps	1/6/11	TX
	802.11g	54 Mbps	1/6/11	TX
	802.11n HT20	108 Mbps	1/6/11	TX
	802.11n HT40	150 Mbps	3/6/9	TX

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

4 Equipment Used during Test

4.1 Equipment's List

Conducted Emissions						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	EMI Test Receiver	R&S	ESCI	101155	2019-09-17	2020-09-16
2	LISN	SCHWARZBECK	NSLK 8128	8128-259	2019-09-17	2020-09-16
3	Limiter	CYBERTEK	EM5010	261115-001-0024	2019-09-17	2020-09-16
4	Cable	Laplace	RF300	-	2019-09-17	2020-09-16
3m Semi-anechoic Chamber for Radiation Emissions(SAEMC)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP30	100091	2020-04-19	2021-04-18
2	Broad-band Horn Antenna(1-18GHz)	SCHWARZBECK	BBHA 9120 D	667	2020-04-19	2021-04-18
3	Broadband Preamplifier	COMPLIANCE DIRECTION	PAP-1G18	2004	2020-04-19	2021-04-18
4	Coaxial Cable (above 1GHz)	Top	1GHz-18GHz	EW02014-7	2020-04-19	2021-04-18
5	Spectrum Analyzer	R&S	FSP40	100501	2019-09-17	2020-09-16
6	Broad-band Horn Antenna(18-40GHz)	SCHWARZBECK	BBHA 9170	335	2019-09-17	2020-09-16
7	Microwave Broadband Preamplifier (18-40GHz)	SCHWARZBECK	BBV 9721	100472	2019-09-17	2020-09-16
8	Cable	Top	18-40GHz	-	2019-09-17	2020-09-16
3m Semi-anechoic Chamber for Radiation Emissions(TDK)						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No**	**Last Calibration Date**	**Calibration Due Date**
1	Test Receiver	R&S	ESCI	101296	2020-04-19	2021-04-18
2	Trilog Broadband Antenna	SCHWARZBECK	VULB9160	9160-3325	2019-05-24	2020-05-23
3	Active Loop Antenna	Com-power	AL-130R	10160007	2020-04-18	2021-04-17
4	Amplifier	ANRITSU	MH648A	M43381	2020-04-19	2021-04-18
5	Cable	HUBER+SUHNER	CBL2	525178	2020-04-19	2021-04-18
6	Coaxial Cable (below 1GHz)	Top	TYPE16 (13M)	-	2019-09-12	2020-09-11

RF Conducted Testing						
Item	**Equipment**	**Manufacturer**	**Model No.**	**Serial No.**	**Last Calibration Date**	**Calibration Due Date**
1	Spectrum Analyzer	R&S	FSP40	100501	2019-09-17	2020-09-16
2	Coaxial Cable	Top	10Hz-30GHz	-	2019-09-12	2020-09-11
3	Antenna Connector*	Realacc	45RSm	-	2019-09-12	2020-09-11
4	DC Block	Gwave	GDCB-3G-N-SMA	140307001	2019-09-12	2020-09-11
"*": The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.						

4.2 Measurement Uncertainty

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

4.3 Test Equipment Calibration

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

5 Test Facility

FCC Designation No.: CN1201. Test Firm Registration No.: 523476.
ISED CAB identifier: CN0013. Test Firm Registration No.: 7760A.

6 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions	15.247 15.205(a) 15.209(a)	Pass
Conducted Emissions	15.207(a)	Pass
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
RF Exposure	1.1307(b)(1)	Pass
Note: Pass=Compliance; NC=Not Compliance; NT=Not Tested; N/A=Not Applicable.		

7 Conducted Emission

Test Requirement: FCC CFR 47 Part 15 Section 15.207

Test Method: ANSI C63.10:2013

Test Result: PASS

Frequency Range: 150kHz to 30MHz

Class/Severity: Class B

Limit:

Frequency (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 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.		

7.1 E.U.T. Operation

Operating Environment :

Temperature: 23.2 °C

Humidity: 53.7 % RH

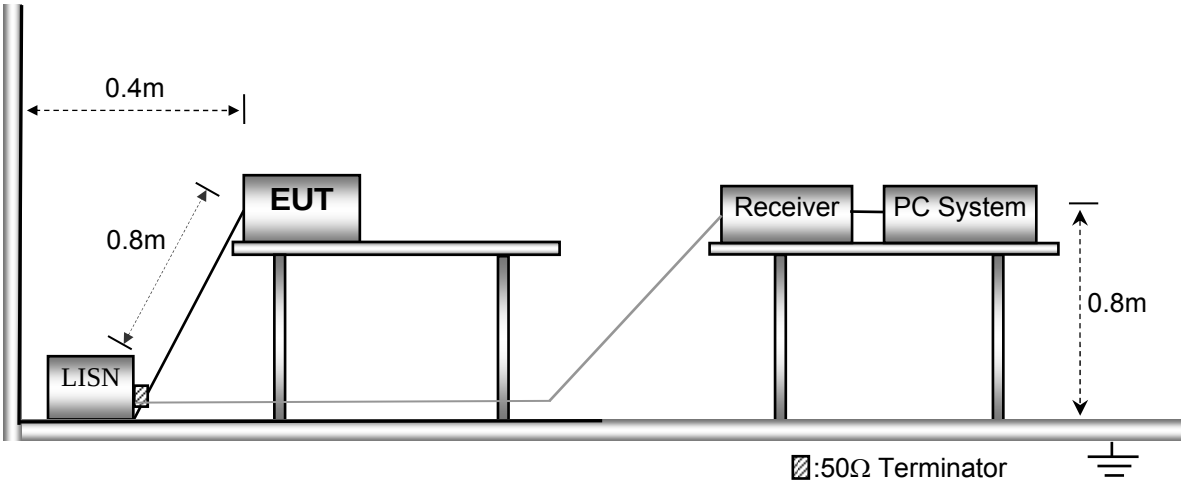
Atmospheric Pressure: 101.4kPa

EUT Operation :

The test was performed in Wi-Fi Transmitting mode, the worst test data (802.11b mode low channel for Antenna 1) were shown in the report.

7.2 Test Setup

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



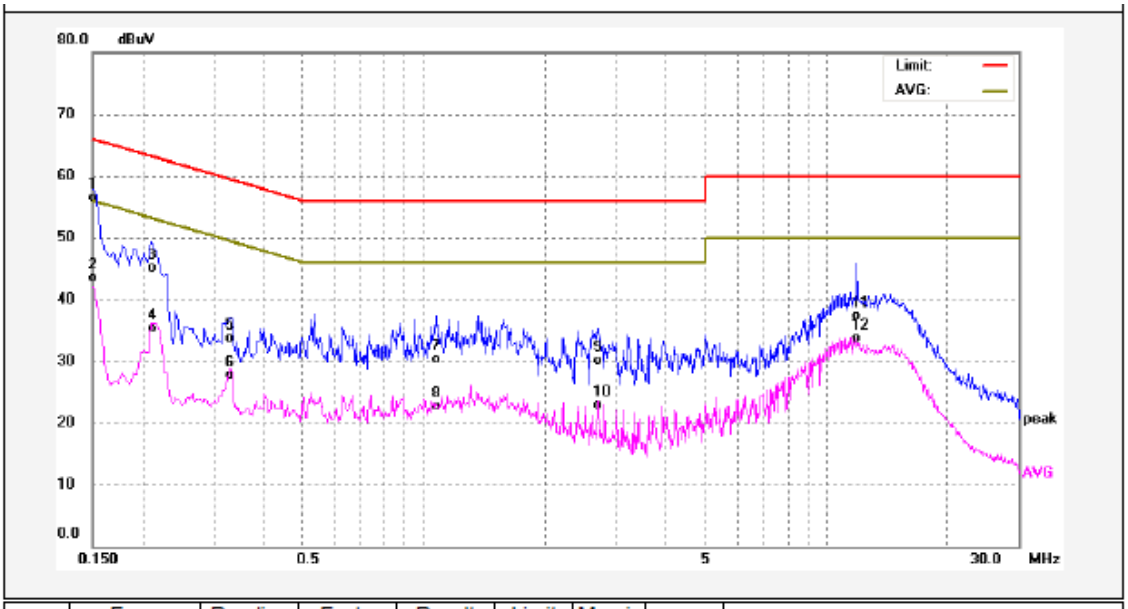
7.3 Measurement Description

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

7.4 Conducted Emission Test Result

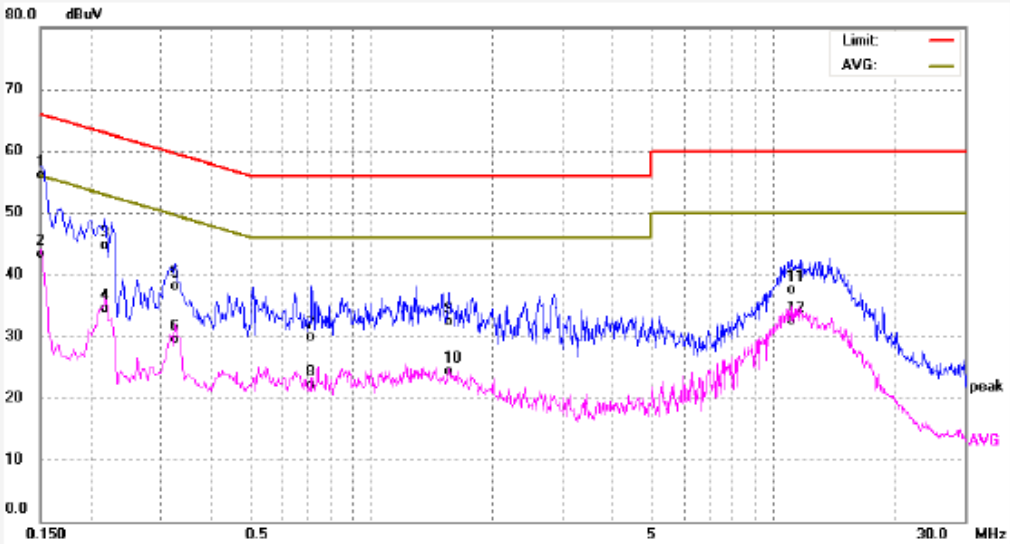
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	46.52	9.93	56.45	65.99	-9.54	QP	
2	0.1500	33.59	9.93	43.52	55.99	-12.47	AVG	
3	0.2100	35.14	9.90	45.04	63.20	-18.16	QP	
4	0.2100	25.31	9.90	35.21	53.20	-17.99	AVG	
5	0.3300	23.83	9.89	33.72	59.45	-25.73	QP	
6	0.3300	17.87	9.89	27.76	49.45	-21.69	AVG	
7	1.0740	20.24	10.00	30.24	56.00	-25.76	QP	
8	1.0740	12.78	10.00	22.78	46.00	-23.22	AVG	
9	2.7139	20.07	10.04	30.11	56.00	-25.89	QP	
10	2.7139	12.80	10.04	22.84	46.00	-23.16	AVG	
11	11.8700	27.01	10.29	37.30	60.00	-22.70	QP	
12	11.8700	23.41	10.29	33.70	50.00	-16.30	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	46.13	9.93	56.06	65.99	-9.93	QP	
2	0.1500	33.46	9.93	43.39	55.99	-12.60	AVG	
3	0.2180	34.82	9.89	44.71	62.89	-18.18	QP	
4	0.2180	24.66	9.89	34.55	52.89	-18.34	AVG	
5	0.3260	28.30	9.89	38.19	59.55	-21.36	QP	
6	0.3260	19.56	9.89	29.45	49.55	-20.10	AVG	
7	0.7100	19.97	9.93	29.90	56.00	-26.10	QP	
8	0.7100	12.20	9.93	22.13	46.00	-23.87	AVG	
9	1.5660	22.29	10.02	32.31	56.00	-23.69	QP	
10	1.5660	14.33	10.02	24.35	46.00	-21.65	AVG	
11	11.0860	27.25	10.28	37.53	60.00	-22.47	QP	
12	11.0860	22.23	10.28	32.51	50.00	-17.49	AVG	

8 Radiated Spurious Emissions

Test Requirement: FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05r02

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: 22.8 °C

Humidity: 54.1 % RH

Atmospheric Pressure: 101.3kPa

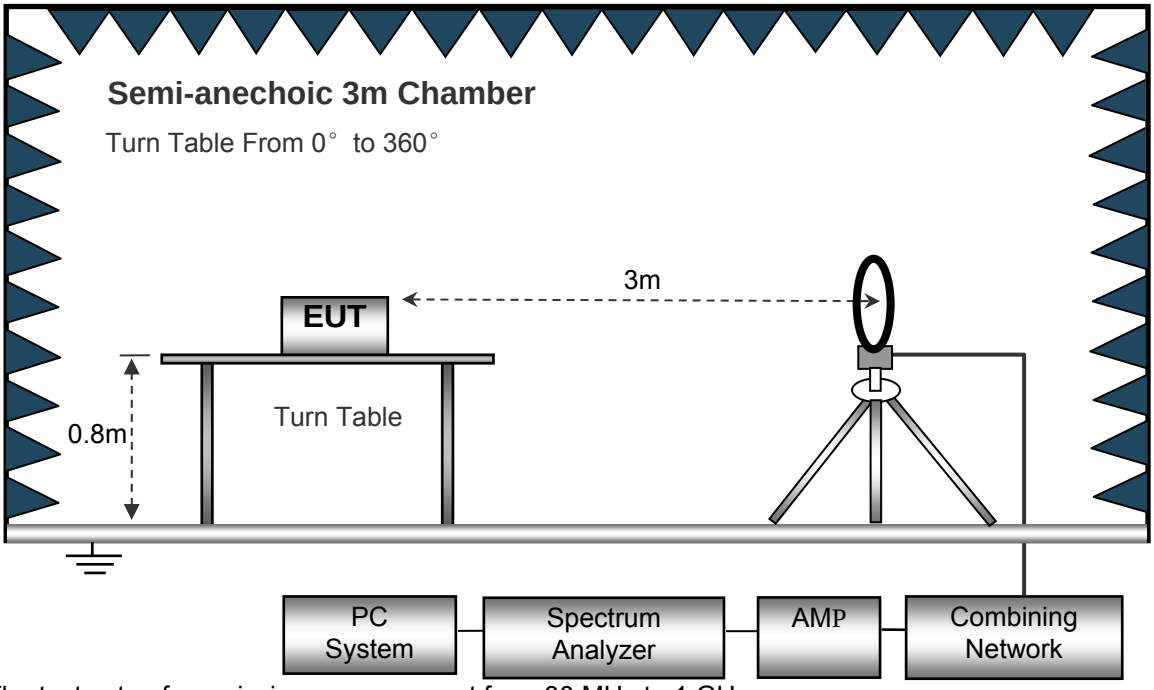
EUT Operation :

The test was performed in Wi-Fi Transmitting mode, the test data were shown in the report.

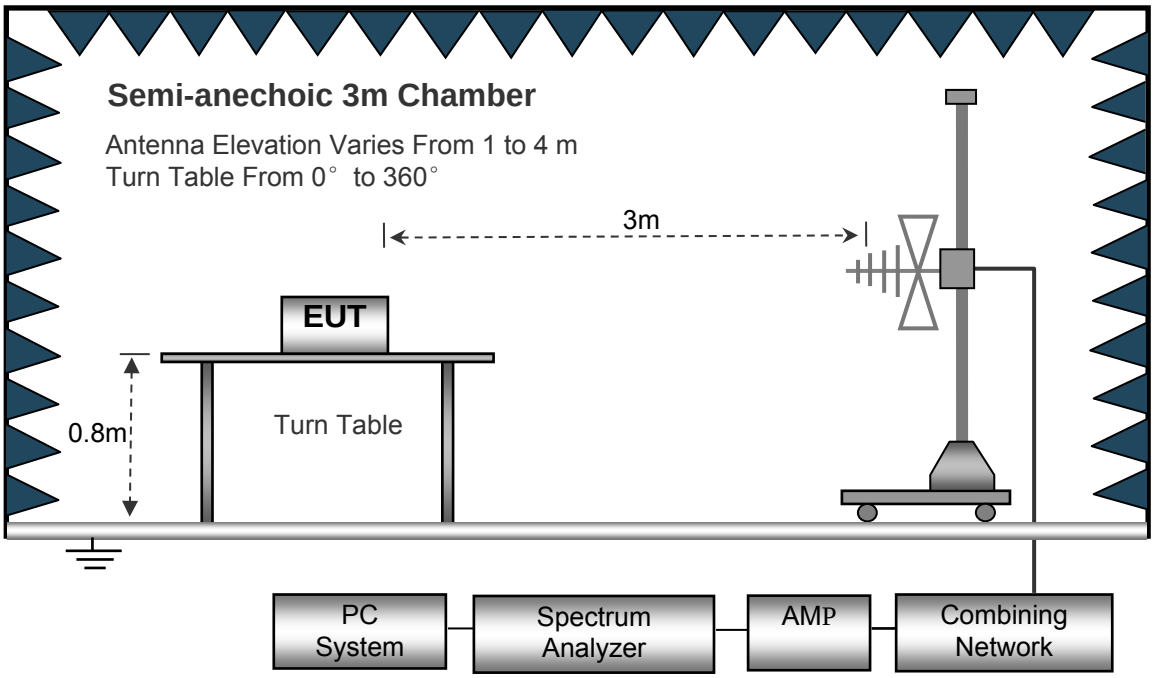
8.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.10:2013.

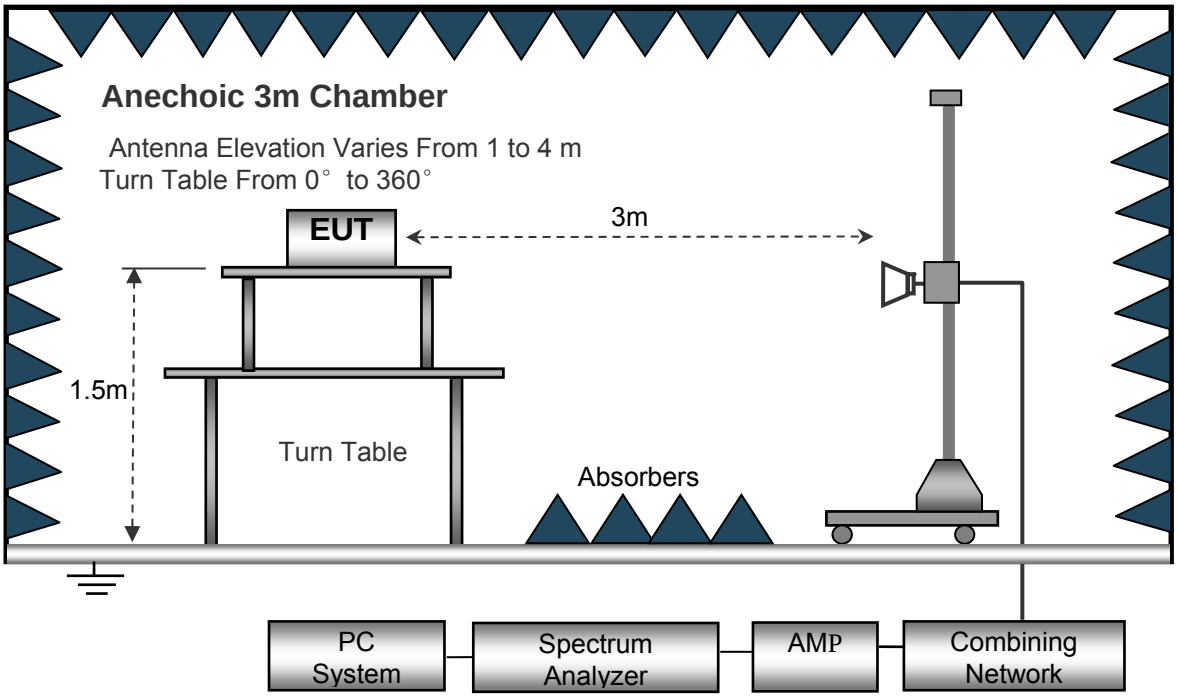
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1 GHz.



8.3 Spectrum Analyzer Setup

Below 30MHz

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

30MHz ~ 1GHz

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

Above 1GHz

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

8.4 Test Procedure

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

8.5 Corrected Amplitude & Margin Calculation

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

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

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

Margin = Corr. Ampl. – Limit

8.6 Summary of Test Results

Test Frequency: 9 kHz ~ 25 GHz

Only the worst case mode and the worst frequency test data were recorded in the report, other frequency are attenuated more than 20 dB below the permissible value and not reported.

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1 11b: Low Channel 2412MHz									
74.39	48.68	QP	270	1.3	H	-17.38	31.30	40.00	-8.70
74.39	49.04	QP	157	1.3	V	-17.38	31.66	40.00	-8.34
4824.00	48.32	PK	247	1.2	V	-1.06	47.26	74.00	-26.74
4824.00	44.96	Ave	247	1.2	V	-1.06	43.90	54.00	-10.10
7236.00	45.54	PK	139	1.7	H	1.33	46.87	74.00	-27.13
7236.00	41.25	Ave	139	1.7	H	1.33	42.58	54.00	-11.42
2325.13	46.26	PK	146	1.3	V	-13.19	33.07	74.00	-40.93
2325.13	37.17	Ave	146	1.3	V	-13.19	23.98	54.00	-30.02
2358.80	42.98	PK	317	1.7	H	-13.14	29.84	74.00	-44.16
2358.80	37.11	Ave	317	1.7	H	-13.14	23.97	54.00	-30.03
2485.80	43.25	PK	179	1.4	V	-13.08	30.17	74.00	-43.83
2485.80	38.51	Ave	179	1.4	V	-13.08	25.43	54.00	-28.57

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1 11b: Middle Channel 2437MHz									
74.39	48.51	QP	130	1.0	H	-17.38	31.13	40.00	-8.87
74.39	49.69	QP	19	1.5	V	-17.38	32.31	40.00	-7.69
4874.00	47.86	PK	199	1.1	V	-0.62	47.24	74.00	-26.76
4874.00	45.72	Ave	199	1.1	V	-0.62	45.10	54.00	-8.90
7311.00	45.77	PK	64	1.8	H	2.21	47.98	74.00	-26.02
7311.00	42.43	Ave	64	1.8	H	2.21	44.64	54.00	-9.36
2313.88	45.58	PK	146	1.5	V	-13.19	32.39	74.00	-41.61
2313.88	38.33	Ave	146	1.5	V	-13.19	25.14	54.00	-28.86
2352.40	42.15	PK	340	1.4	H	-13.14	29.01	74.00	-44.99
2352.40	37.92	Ave	340	1.4	H	-13.14	24.78	54.00	-29.22
2488.22	42.70	PK	154	1.6	V	-13.08	29.62	74.00	-44.38
2488.22	38.75	Ave	154	1.6	V	-13.08	25.67	54.00	-28.33

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1 11b: High Channel 2462MHz									
74.39	47.21	QP	163	1.1	H	-17.38	29.83	40.00	-10.17
74.39	49.32	QP	56	1.3	V	-17.38	31.94	40.00	-8.06
4924.00	47.40	PK	144	1.6	V	-0.24	47.16	74.00	-26.84
4924.00	45.39	Ave	144	1.6	V	-0.24	45.15	54.00	-8.85
7386.00	46.68	PK	278	1.1	H	2.84	49.52	74.00	-24.48
7386.00	43.84	Ave	278	1.1	H	2.84	46.68	54.00	-7.32
2338.29	46.39	PK	359	1.9	V	-13.19	33.20	74.00	-40.80
2338.29	37.22	Ave	359	1.9	V	-13.19	24.03	54.00	-29.97
2385.32	44.82	PK	79	1.4	H	-13.14	31.68	74.00	-42.32
2385.32	36.64	Ave	79	1.4	H	-13.14	23.50	54.00	-30.50
2484.20	44.94	PK	246	1.0	V	-13.08	31.86	74.00	-42.14
2484.20	36.56	Ave	246	1.0	V	-13.08	23.48	54.00	-30.52

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT2 11b: Low Channel 2412MHz									
74.39	48.31	QP	47	1.7	H	-17.38	30.93	40.00	-9.07
74.39	48.65	QP	222	1.3	V	-17.38	31.27	40.00	-8.73
4824.00	46.97	PK	172	1.6	V	-1.06	45.91	74.00	-28.09
4824.00	44.52	Ave	172	1.6	V	-1.06	43.46	54.00	-10.54
7236.00	41.28	PK	120	1.1	H	1.33	42.61	74.00	-31.39
7236.00	40.76	Ave	120	1.1	H	1.33	42.09	54.00	-11.91
2341.70	46.58	PK	286	1.8	V	-13.19	33.39	74.00	-40.61
2341.70	38.03	Ave	286	1.8	V	-13.19	24.84	54.00	-29.16
2371.65	42.90	PK	2	1.6	H	-13.14	29.76	74.00	-44.24
2371.65	38.02	Ave	2	1.6	H	-13.14	24.88	54.00	-29.12
2497.65	43.14	PK	286	1.7	V	-13.08	30.06	74.00	-43.94
2497.65	37.89	Ave	286	1.7	V	-13.08	24.81	54.00	-29.19

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT2 11b: Middle Channel 2437MHz									
74.39	46.90	QP	157	1.8	H	-17.38	29.52	40.00	-10.48
74.39	48.67	QP	138	1.3	V	-17.38	31.29	40.00	-8.71
4874.00	47.68	PK	79	1.6	V	-0.62	47.06	74.00	-26.94
4874.00	43.90	Ave	79	1.6	V	-0.62	43.28	54.00	-10.72
7311.00	42.43	PK	326	1.2	H	2.21	44.64	74.00	-29.36
7311.00	40.50	Ave	326	1.2	H	2.21	42.71	54.00	-11.29
2316.42	46.38	PK	99	1.1	V	-13.19	33.19	74.00	-40.81
2316.42	38.57	Ave	99	1.1	V	-13.19	25.38	54.00	-28.62
2375.41	44.04	PK	27	1.6	H	-13.14	30.90	74.00	-43.10
2375.41	37.60	Ave	27	1.6	H	-13.14	24.46	54.00	-29.54
2499.11	42.22	PK	21	1.4	V	-13.08	29.14	74.00	-44.86
2499.11	37.00	Ave	21	1.4	V	-13.08	23.92	54.00	-30.08

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)
ANT2 11b: High Channel 2462MHz									
74.39	48.15	QP	199	1.1	H	-17.38	30.77	40.00	-9.23
74.39	49.49	QP	72	1.6	V	-17.38	32.11	40.00	-7.89
4924.00	48.28	PK	241	1.0	V	-0.24	48.04	74.00	-25.96
4924.00	42.97	Ave	241	1.0	V	-0.24	42.73	54.00	-11.27
7386.00	43.28	PK	193	1.5	H	2.84	46.12	74.00	-27.88
7386.00	39.81	Ave	193	1.5	H	2.84	42.65	54.00	-11.35
2335.71	45.24	PK	13	1.0	V	-13.19	32.05	74.00	-41.95
2335.71	39.40	Ave	13	1.0	V	-13.19	26.21	54.00	-27.79
2358.02	42.27	PK	217	1.4	H	-13.14	29.13	74.00	-44.87
2358.02	36.79	Ave	217	1.4	H	-13.14	23.65	54.00	-30.35
2486.57	42.05	PK	246	1.6	V	-13.08	28.97	74.00	-45.03
2486.57	37.34	Ave	246	1.6	V	-13.08	24.26	54.00	-29.74

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1 11g: Low Channel 2412MHz									
74.39	48.65	QP	204	1.1	H	-17.38	31.27	40.00	-8.73
74.39	48.79	QP	216	1.7	V	-17.38	31.41	40.00	-8.59
4824.00	48.81	PK	31	1.6	V	-1.06	47.75	74.00	-26.25
4824.00	45.73	Ave	31	1.6	V	-1.06	44.67	54.00	-9.33
7236.00	44.58	PK	34	1.2	H	1.33	45.91	74.00	-28.09
7236.00	41.42	Ave	34	1.2	H	1.33	42.75	54.00	-11.25
2329.01	45.53	PK	204	1.2	V	-13.19	32.34	74.00	-41.66
2329.01	38.90	Ave	204	1.2	V	-13.19	25.71	54.00	-28.29
2386.05	44.44	PK	41	1.5	H	-13.14	31.30	74.00	-42.70
2386.05	37.35	Ave	41	1.5	H	-13.14	24.21	54.00	-29.79
2487.26	42.90	PK	272	1.3	V	-13.08	29.82	74.00	-44.18
2487.26	37.59	Ave	272	1.3	V	-13.08	24.51	54.00	-29.49

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1 11g: Middle Channel 2437MHz									
74.39	48.40	QP	231	1.2	H	-17.38	31.02	40.00	-8.98
74.39	48.96	QP	151	1.8	V	-17.38	31.58	40.00	-8.42
4874.00	49.36	PK	289	1.7	V	-0.62	48.74	74.00	-25.26
4874.00	46.38	Ave	289	1.7	V	-0.62	45.76	54.00	-8.24
7311.00	45.64	PK	331	1.0	H	2.21	47.85	74.00	-26.15
7311.00	42.17	Ave	331	1.0	H	2.21	44.38	54.00	-9.62
2349.47	45.60	PK	353	1.2	V	-13.19	32.41	74.00	-41.59
2349.47	39.56	Ave	353	1.2	V	-13.19	26.37	54.00	-27.63
2366.76	42.30	PK	61	1.0	H	-13.14	29.16	74.00	-44.84
2366.76	38.45	Ave	61	1.0	H	-13.14	25.31	54.00	-28.69
2491.10	44.79	PK	20	1.5	V	-13.08	31.71	74.00	-42.29
2491.10	38.45	Ave	20	1.5	V	-13.08	25.37	54.00	-28.63

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1 11g: High Channel 2462MHz									
74.39	48.80	QP	37	1.9	H	-17.38	31.42	40.00	-8.58
74.39	50.36	QP	30	2.0	V	-17.38	32.98	40.00	-7.02
4924.00	49.62	PK	256	2.0	V	-0.24	49.38	74.00	-24.62
4924.00	45.08	Ave	256	2.0	V	-0.24	44.84	54.00	-9.16
7386.00	46.01	PK	213	1.5	H	2.84	48.85	74.00	-25.15
7386.00	41.85	Ave	213	1.5	H	2.84	44.69	54.00	-9.31
2326.56	45.83	PK	296	1.7	V	-13.19	32.64	74.00	-41.36
2326.56	39.90	Ave	296	1.7	V	-13.19	26.71	54.00	-27.29
2378.50	44.83	PK	188	1.7	H	-13.14	31.69	74.00	-42.31
2378.50	38.87	Ave	188	1.7	H	-13.14	25.73	54.00	-28.27
2494.41	42.83	PK	150	1.1	V	-13.08	29.75	74.00	-44.25
2494.41	36.66	Ave	150	1.1	V	-13.08	23.58	54.00	-30.42

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)
ANT2 11g: Low Channel 2412MHz									
74.39	48.15	QP	8	1.1	H	-17.38	30.77	40.00	-9.23
74.39	48.68	QP	248	1.3	V	-17.38	31.30	40.00	-8.70
4824.00	47.88	PK	312	1.5	V	-1.06	46.82	74.00	-27.18
4824.00	43.41	Ave	312	1.5	V	-1.06	42.35	54.00	-11.65
7236.00	42.99	PK	78	2.0	H	1.33	44.32	74.00	-29.68
7236.00	41.34	Ave	78	2.0	H	1.33	42.67	54.00	-11.33
2339.08	46.60	PK	266	2.0	V	-13.19	33.41	74.00	-40.59
2339.08	37.32	Ave	266	2.0	V	-13.19	24.13	54.00	-29.87
2367.92	44.58	PK	204	1.3	H	-13.14	31.44	74.00	-42.56
2367.92	36.24	Ave	204	1.3	H	-13.14	23.10	54.00	-30.90
2486.04	43.53	PK	144	1.3	V	-13.08	30.45	74.00	-43.55
2486.04	36.66	Ave	144	1.3	V	-13.08	23.58	54.00	-30.42

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)
ANT2 11g: Middle Channel 2437MHz									
74.39	48.62	QP	119	1.6	H	-17.38	31.24	40.00	-8.76
74.39	48.51	QP	314	1.4	V	-17.38	31.13	40.00	-8.87
4874.00	46.71	PK	294	1.7	V	-0.62	46.09	74.00	-27.91
4874.00	43.83	Ave	294	1.7	V	-0.62	43.21	54.00	-10.79
7311.00	42.03	PK	348	1.0	H	2.21	44.24	74.00	-29.76
7311.00	42.11	Ave	348	1.0	H	2.21	44.32	54.00	-9.68
2318.63	46.74	PK	258	1.8	V	-13.19	33.55	74.00	-40.45
2318.63	37.97	Ave	258	1.8	V	-13.19	24.78	54.00	-29.22
2376.25	44.28	PK	282	1.7	H	-13.14	31.14	74.00	-42.86
2376.25	37.39	Ave	282	1.7	H	-13.14	24.25	54.00	-29.75
2487.29	42.65	PK	338	1.1	V	-13.08	29.57	74.00	-44.43
2487.29	38.76	Ave	338	1.1	V	-13.08	25.68	54.00	-28.32

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)
ANT2 11g: High Channel 2462MHz									
74.39	48.89	QP	169	1.8	H	-17.38	31.51	40.00	-8.49
74.39	48.26	QP	346	1.7	V	-17.38	30.88	40.00	-9.12
4924.00	47.27	PK	28	1.4	V	-0.24	47.03	74.00	-26.97
4924.00	42.83	Ave	28	1.4	V	-0.24	42.59	54.00	-11.41
7386.00	40.80	PK	302	1.1	H	2.84	43.64	74.00	-30.36
7386.00	41.31	Ave	302	1.1	H	2.84	44.15	54.00	-9.85
2338.62	46.20	PK	14	1.8	V	-13.19	33.01	74.00	-40.99
2338.62	37.03	Ave	14	1.8	V	-13.19	23.84	54.00	-30.16
2354.44	42.81	PK	24	1.6	H	-13.14	29.67	74.00	-44.33
2354.44	38.51	Ave	24	1.6	H	-13.14	25.37	54.00	-28.63
2499.67	43.35	PK	350	1.7	V	-13.08	30.27	74.00	-43.73
2499.67	37.87	Ave	350	1.7	V	-13.08	24.79	54.00	-29.21

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 n20: Low Channel 2412MHz									
74.39	47.64	QP	217	1.2	H	-17.38	30.26	40.00	-9.74
74.39	48.21	QP	311	1.1	V	-17.38	30.83	40.00	-9.17
4824.00	49.46	PK	295	1.8	V	-1.06	48.40	74.00	-25.60
4824.00	46.93	Ave	295	1.8	V	-1.06	45.87	54.00	-8.13
7236.00	43.53	PK	1	1.3	H	1.33	44.86	74.00	-29.14
7236.00	40.79	Ave	1	1.3	H	1.33	42.12	54.00	-11.88
2326.46	45.60	PK	141	1.6	V	-13.19	32.41	74.00	-41.59
2326.46	37.46	Ave	141	1.6	V	-13.19	24.27	54.00	-29.73
2380.09	44.36	PK	42	1.4	H	-13.14	31.22	74.00	-42.78
2380.09	38.75	Ave	42	1.4	H	-13.14	25.61	54.00	-28.39
2489.12	44.58	PK	94	1.9	V	-13.08	31.50	74.00	-42.50
2489.12	37.05	Ave	94	1.9	V	-13.08	23.97	54.00	-30.03

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 n20: Middle Channel 2437MHz									
74.39	46.21	QP	263	1.8	H	-17.38	28.83	40.00	-11.17
74.39	49.55	QP	319	1.2	V	-17.38	32.17	40.00	-7.83
4874.00	50.17	PK	205	1.8	V	-0.62	49.55	74.00	-24.45
4874.00	48.24	Ave	205	1.8	V	-0.62	47.62	54.00	-6.38
7311.00	44.34	PK	153	1.8	H	2.21	46.55	74.00	-27.45
7311.00	41.55	Ave	153	1.8	H	2.21	43.76	54.00	-10.24
2340.90	45.32	PK	26	1.2	V	-13.19	32.13	74.00	-41.87
2340.90	39.07	Ave	26	1.2	V	-13.19	25.88	54.00	-28.12
2387.26	43.58	PK	78	1.4	H	-13.14	30.44	74.00	-43.56
2387.26	36.03	Ave	78	1.4	H	-13.14	22.89	54.00	-31.11
2486.39	43.89	PK	49	1.4	V	-13.08	30.81	74.00	-43.19
2486.39	38.27	Ave	49	1.4	V	-13.08	25.19	54.00	-28.81

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 n20: High Channel 2462MHz									
74.39	47.35	QP	217	1.1	H	-17.38	29.97	40.00	-10.03
74.39	49.49	QP	22	1.6	V	-17.38	32.11	40.00	-7.89
4924.00	48.91	PK	252	1.2	V	-0.24	48.67	74.00	-25.33
4924.00	47.61	Ave	252	1.2	V	-0.24	47.37	54.00	-6.63
7386.00	43.86	PK	349	1.7	H	2.84	46.70	74.00	-27.30
7386.00	41.40	Ave	349	1.7	H	2.84	44.24	54.00	-9.76
2341.09	46.08	PK	191	1.9	V	-13.19	32.89	74.00	-41.11
2341.09	38.51	Ave	191	1.9	V	-13.19	25.32	54.00	-28.68
2369.39	43.32	PK	80	1.5	H	-13.14	30.18	74.00	-43.82
2369.39	37.77	Ave	80	1.5	H	-13.14	24.63	54.00	-29.37
2494.22	42.50	PK	310	1.2	V	-13.08	29.42	74.00	-44.58
2494.22	36.71	Ave	310	1.2	V	-13.08	23.63	54.00	-30.37

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 n40: Low Channel 2422MHz									
74.39	46.08	QP	34	1.7	H	-17.38	28.70	40.00	-11.30
74.39	45.52	QP	13	1.5	V	-17.38	28.14	40.00	-11.86
4844.00	47.86	PK	315	1.3	V	-1.06	46.80	74.00	-27.20
4844.00	40.71	Ave	315	1.3	V	-1.06	39.65	54.00	-14.35
7266.00	43.75	PK	158	1.3	H	1.33	45.08	74.00	-28.92
7266.00	40.34	Ave	158	1.3	H	1.33	41.67	54.00	-12.33
2314.67	46.58	PK	320	1.7	V	-13.19	33.39	74.00	-40.61
2314.67	38.00	Ave	320	1.7	V	-13.19	24.81	54.00	-29.19
2382.61	42.42	PK	265	1.9	H	-13.14	29.28	74.00	-44.72
2382.61	37.09	Ave	265	1.9	H	-13.14	23.95	54.00	-30.05
2499.21	43.55	PK	157	1.6	V	-13.08	30.47	74.00	-43.53
2499.21	38.52	Ave	157	1.6	V	-13.08	25.44	54.00	-28.56

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 n40: Middle Channel 2437MHz									
74.39	46.42	QP	81	1.1	H	-17.38	29.04	40.00	-10.96
74.39	46.10	QP	204	1.0	V	-17.38	28.72	40.00	-11.28
4874.00	48.50	PK	189	1.5	V	-0.62	47.88	74.00	-26.12
4874.00	41.29	Ave	189	1.5	V	-0.62	40.67	54.00	-13.33
7311.00	44.25	PK	112	1.5	H	2.21	46.46	74.00	-27.54
7311.00	41.12	Ave	112	1.5	H	2.21	43.33	54.00	-10.67
2315.01	46.26	PK	198	2.0	V	-13.19	33.07	74.00	-40.93
2315.01	37.67	Ave	198	2.0	V	-13.19	24.48	54.00	-29.52
2353.47	43.12	PK	332	1.9	H	-13.14	29.98	74.00	-44.02
2353.47	38.34	Ave	332	1.9	H	-13.14	25.20	54.00	-28.80
2485.43	44.55	PK	286	1.7	V	-13.08	31.47	74.00	-42.53
2485.43	37.50	Ave	286	1.7	V	-13.08	24.42	54.00	-29.58

Frequency	Receiver Reading	Detector	Turn table Angle	RX Antenna		Corrected Factor	Corrected Amplitude	FCC Part 15.247/209/205	
				Height	Polar			Limit	Margin
(MHz)	(dBμV)	(PK/QP/Ave)	Degree	(m)	(H/V)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
ANT1+ANT2 n40: High Channel 2452MHz									
74.39	46.15	QP	231	1.3	H	-17.38	28.77	40.00	-11.23
74.39	45.46	QP	153	1.5	V	-17.38	28.08	40.00	-11.92
4904.00	48.98	PK	153	1.1	V	-0.24	48.74	74.00	-25.26
4904.00	42.09	Ave	153	1.1	V	-0.24	41.85	54.00	-12.15
7356.00	44.74	PK	314	1.3	H	2.84	47.58	74.00	-26.42
7356.00	41.87	Ave	314	1.3	H	2.84	44.71	54.00	-9.29
2330.87	45.08	PK	111	1.1	V	-13.19	31.89	74.00	-42.11
2330.87	38.87	Ave	111	1.1	V	-13.19	25.68	54.00	-28.32
2360.92	44.32	PK	277	1.8	H	-13.14	31.18	74.00	-42.82
2360.92	38.86	Ave	277	1.8	H	-13.14	25.72	54.00	-28.28
2497.48	44.68	PK	80	1.4	V	-13.08	31.60	74.00	-42.40
2497.48	36.27	Ave	80	1.4	V	-13.08	23.19	54.00	-30.81

9 Band Edge Measurement

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013 662911 D01 Multiple Transmitter Output v02r01 662911 D02 MIMO with Cross-Polarized Antennas v01
Test Limit:	Regulation 15.247 (d),In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
Test Mode:	Transmitting

9.1 Test Produce

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

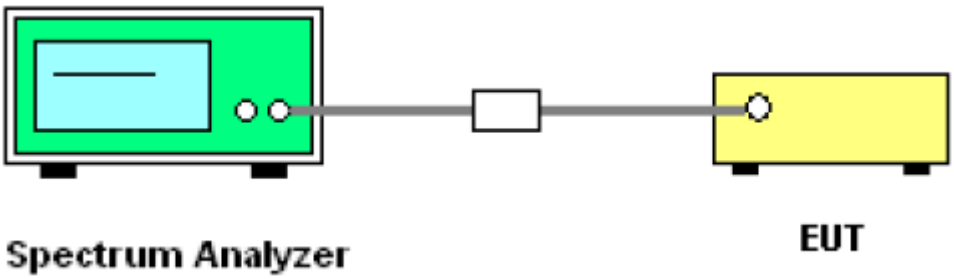
6. If The EUT supports multiple transmit chains using options given below:

☐Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.

☒Option 2: Measure and sum spectral maxima across the outputs. Refer as FCC KDB 662911, With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,

☐Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

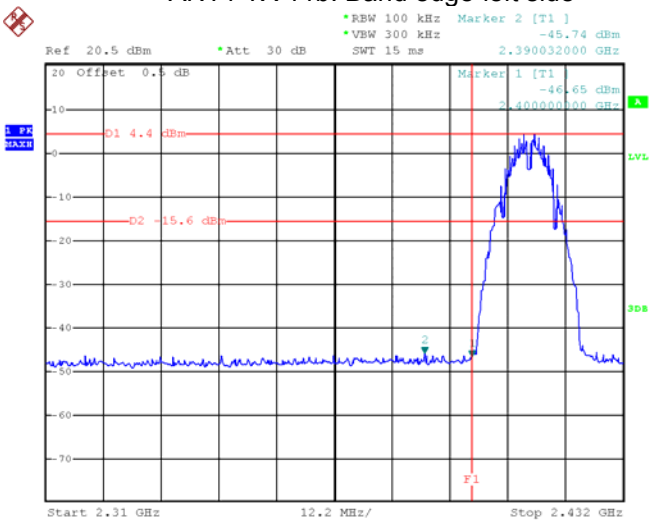
9.2 Test Setup



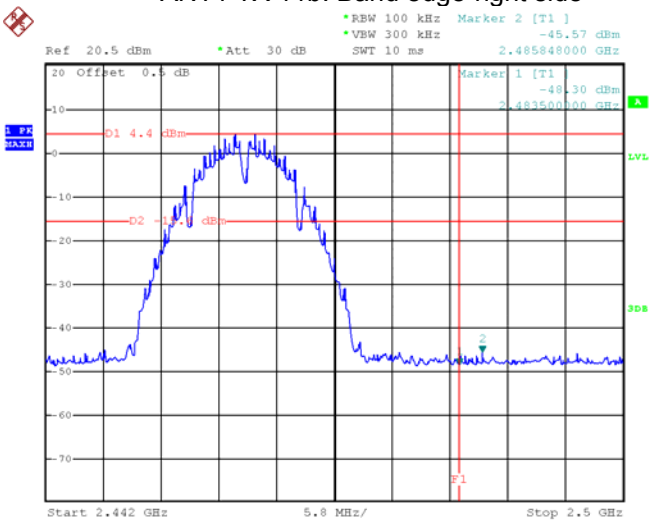
9.3 Test Result

Test result plots shown as follows:

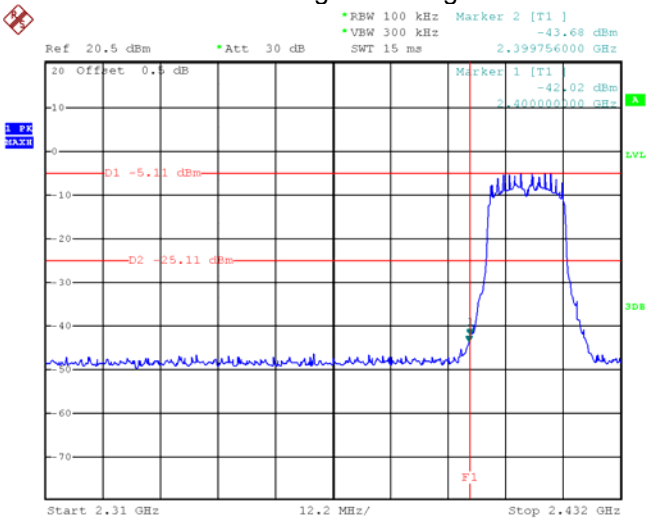
ANT1 TX 11b: Band edge-left side



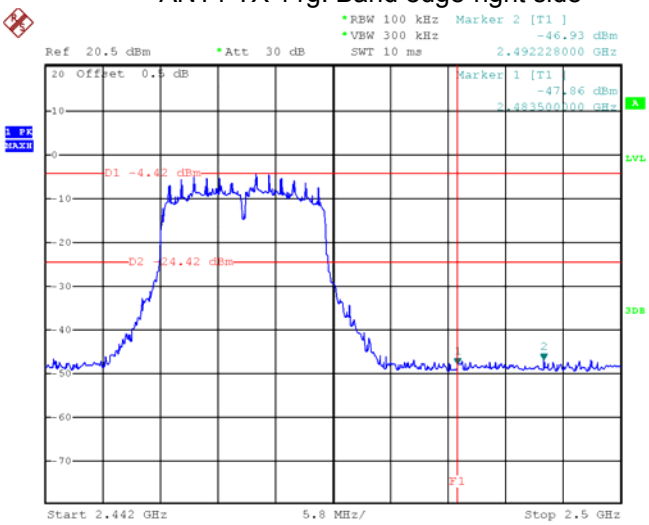
ANT1 TX 11b: Band edge-right side



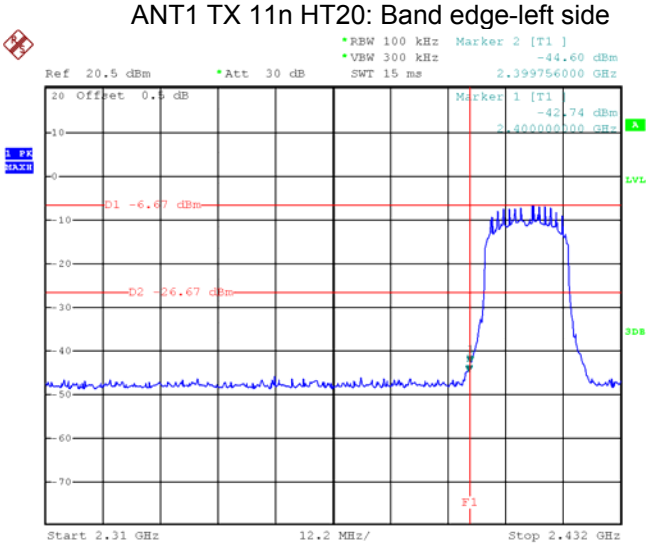
ANT1 TX 11g: Band edge-left side



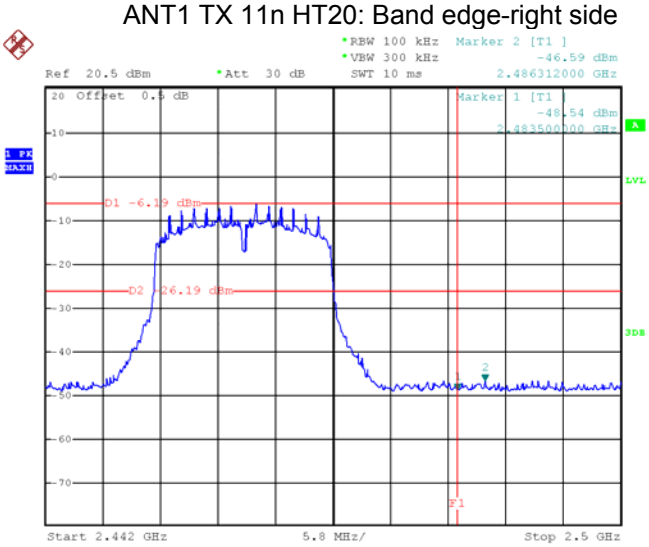
ANT1 TX 11g: Band edge-right side



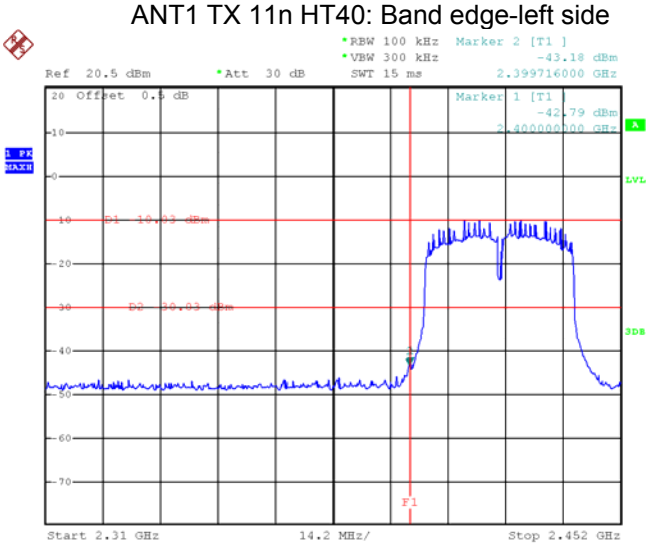
ANT1 TX 11n HT20: Band edge-left side



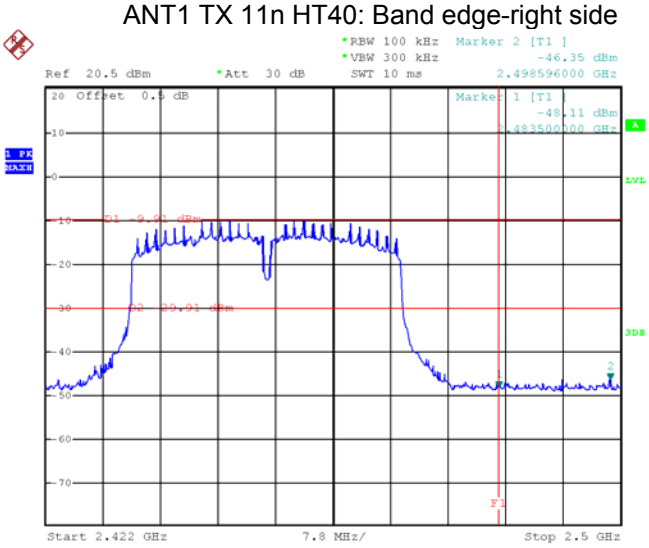
ANT1 TX 11n HT20: Band edge-right side



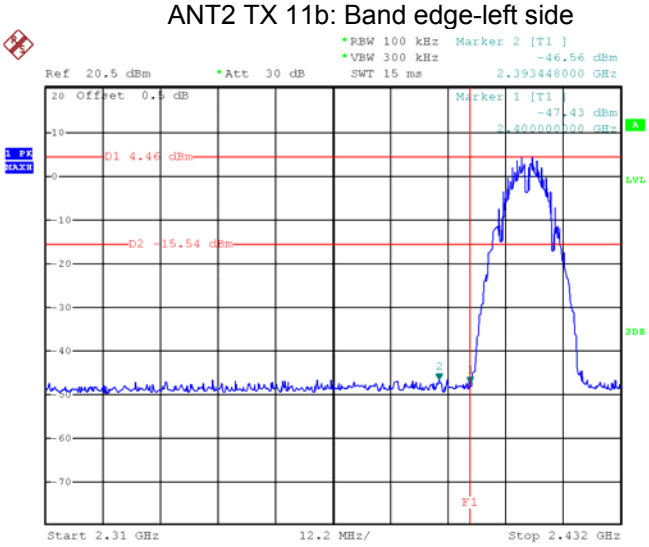
ANT1 TX 11n HT40: Band edge-left side



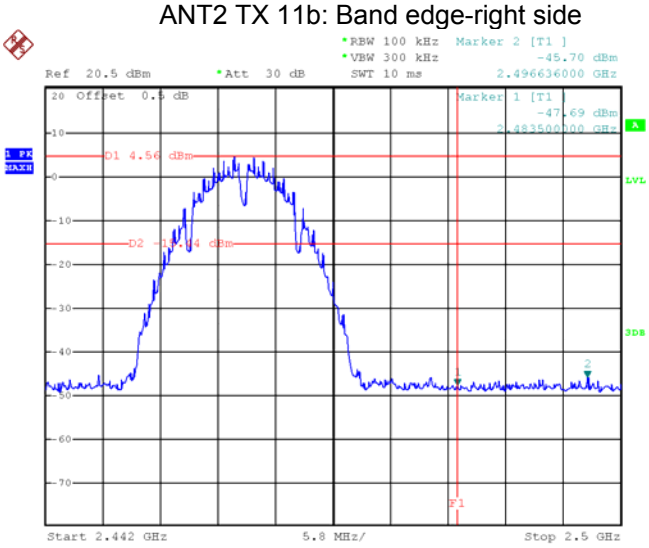
ANT1 TX 11n HT40: Band edge-right side



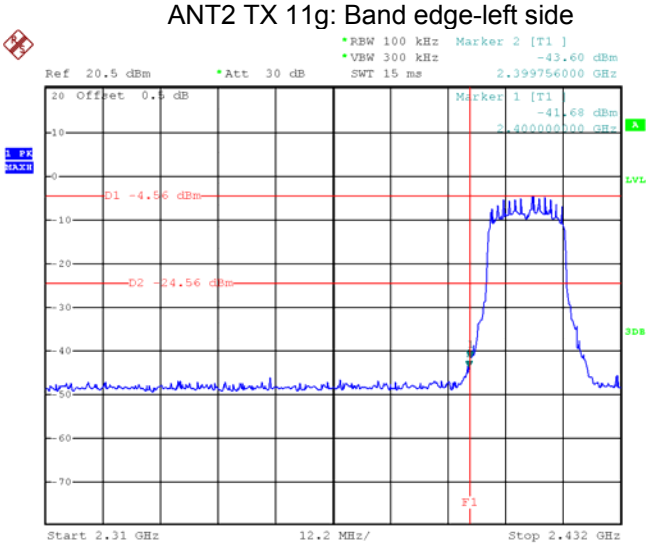
ANT2 TX 11b: Band edge-left side



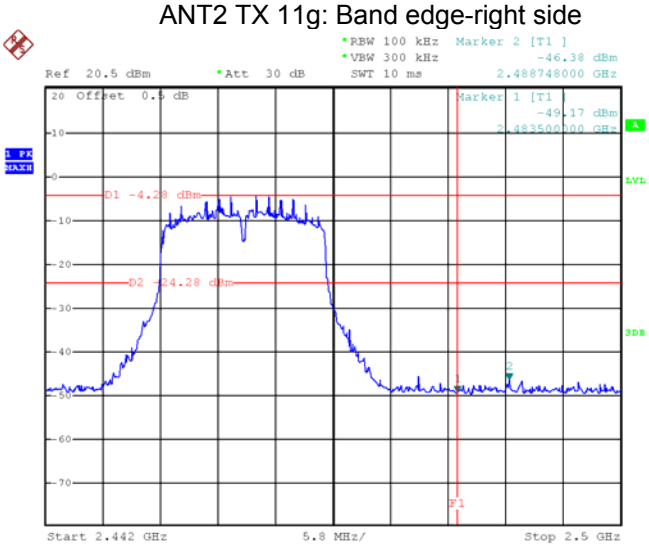
ANT2 TX 11b: Band edge-right side



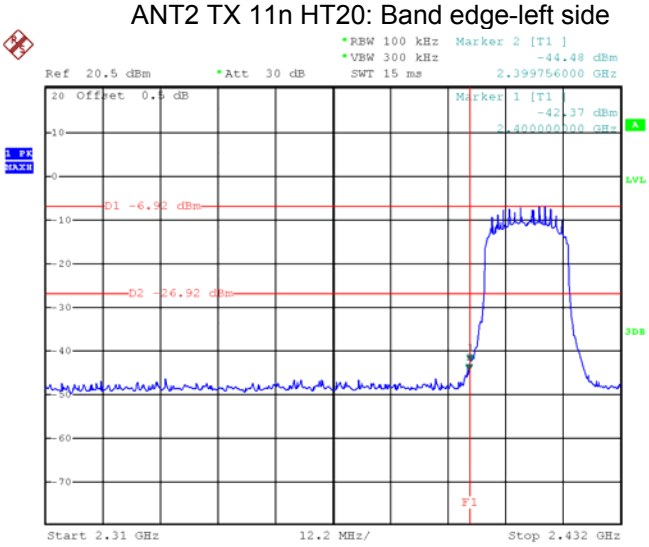
ANT2 TX 11g: Band edge-left side



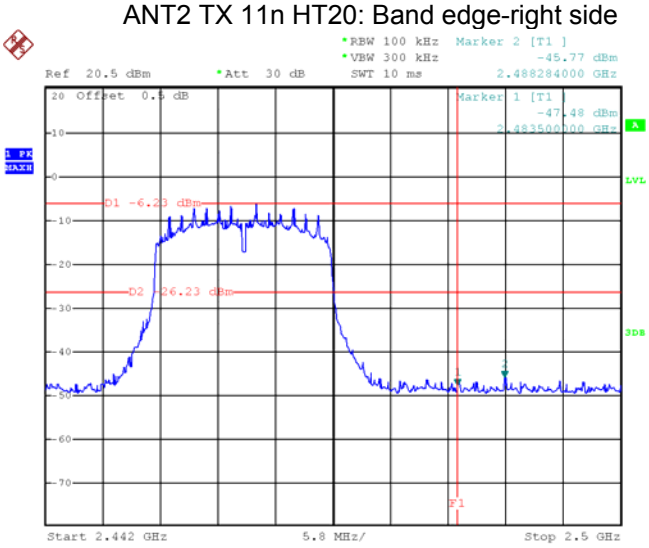
ANT2 TX 11g: Band edge-right side



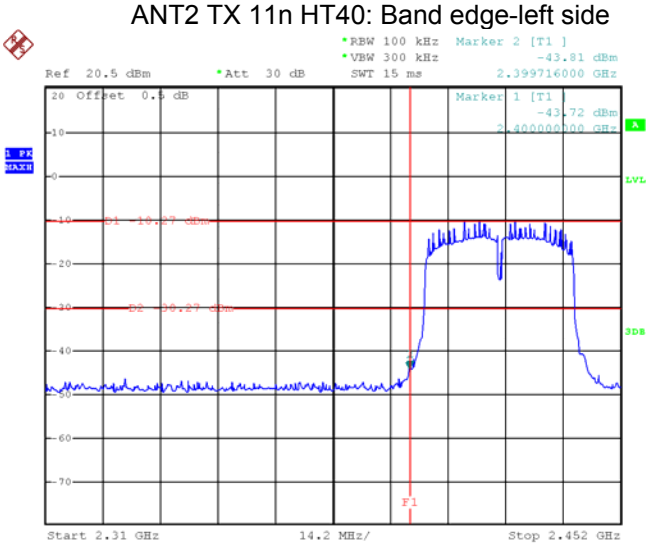
ANT2 TX 11n HT20: Band edge-left side



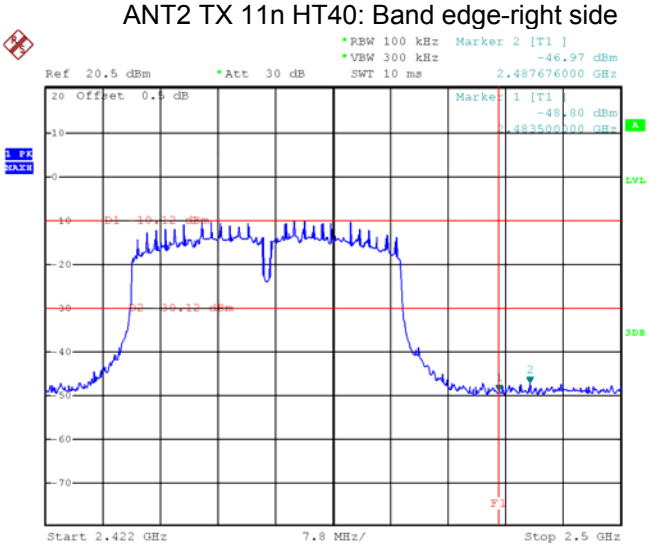
ANT2 TX 11n HT20: Band edge-right side



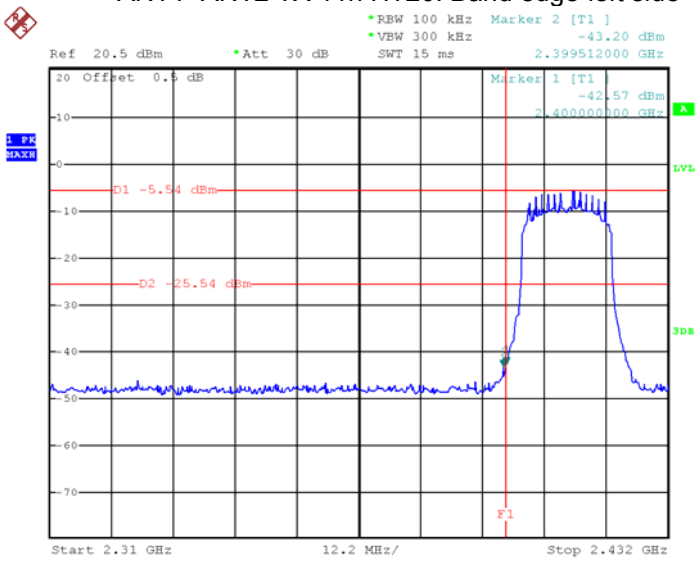
ANT2 TX 11n HT40: Band edge-left side



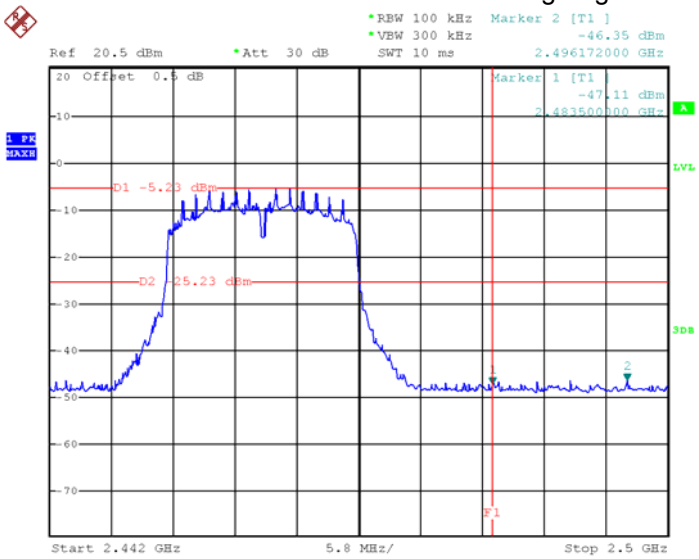
ANT2 TX 11n HT40: Band edge-right side



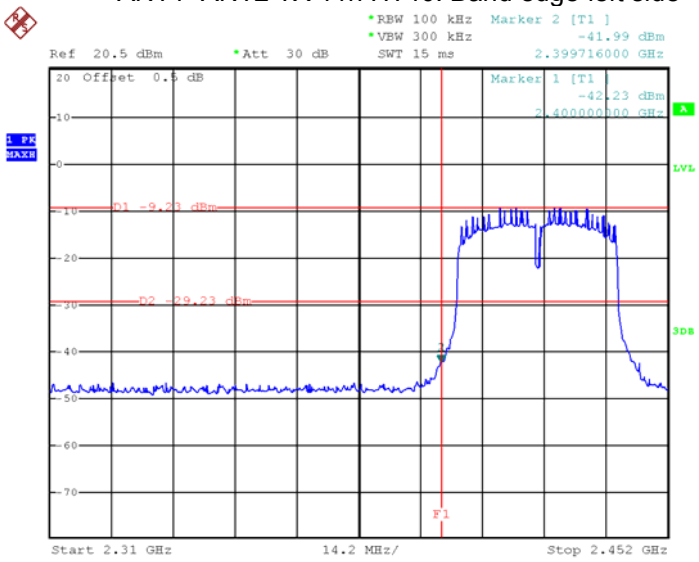
ANT1+ANT2 TX 11n HT20: Band edge-left side



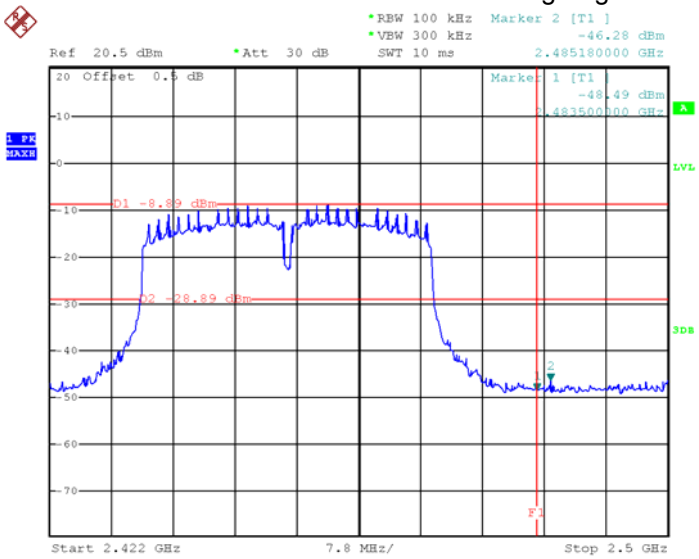
ANT1+ANT2 TX 11n HT20: Band edge-right side



ANT1+ANT2 TX 11n HT40: Band edge-left side



ANT1+ANT2 TX 11n HT40: Band edge-right side



10 Conducted Spurious Emissions

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013 662911 D01 Multiple Transmitter Output v02r01 662911 D02 MIMO with Cross-Polarized Antennas v01
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

10.1 Test Produce

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

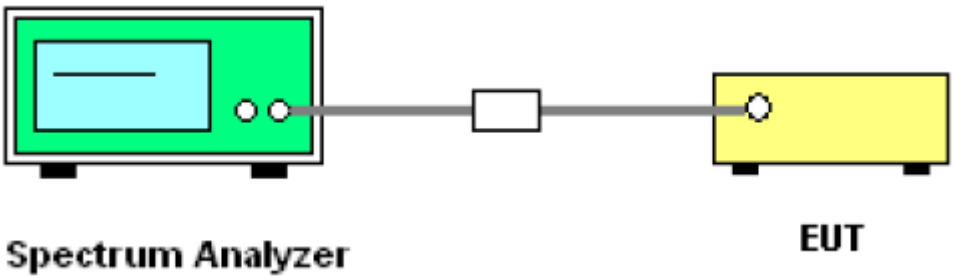
6. If The EUT supports multiple transmit chains using options given below:

☐Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.

☒Option 2: Measure and sum spectral maxima across the outputs. Refer as FCC KDB 662911, With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,

☐Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

10.2 Test Setup

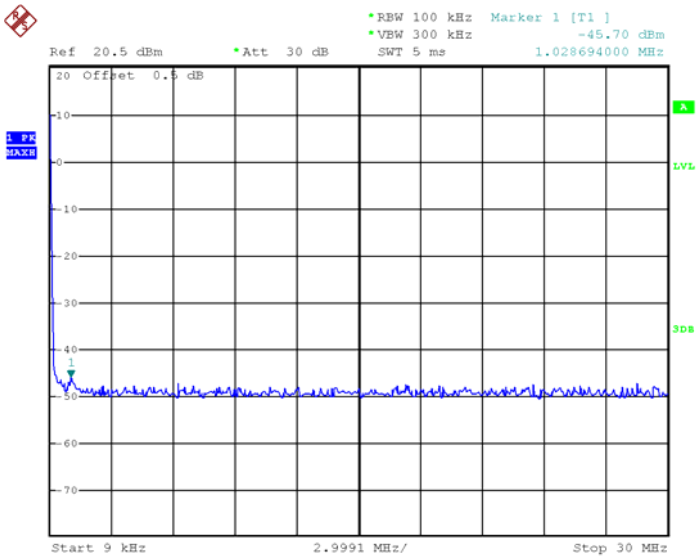


10.3 Test Result

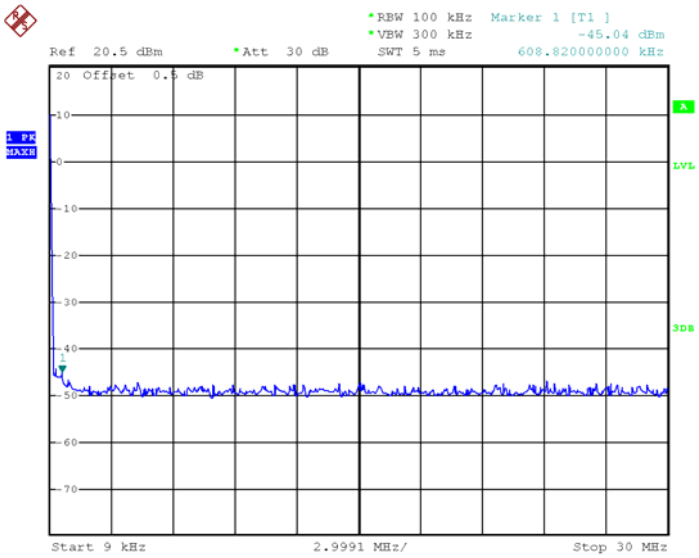
9 KHz – 30MHz

ANT1 802.11b

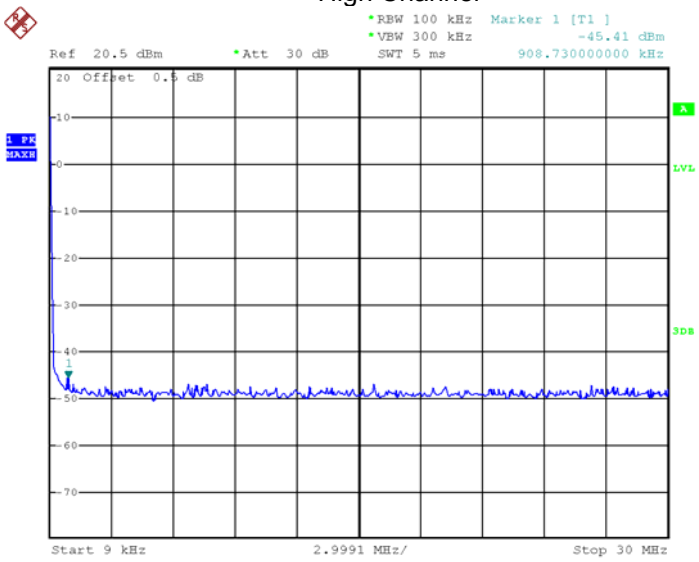
Low Channel



Middle Channel

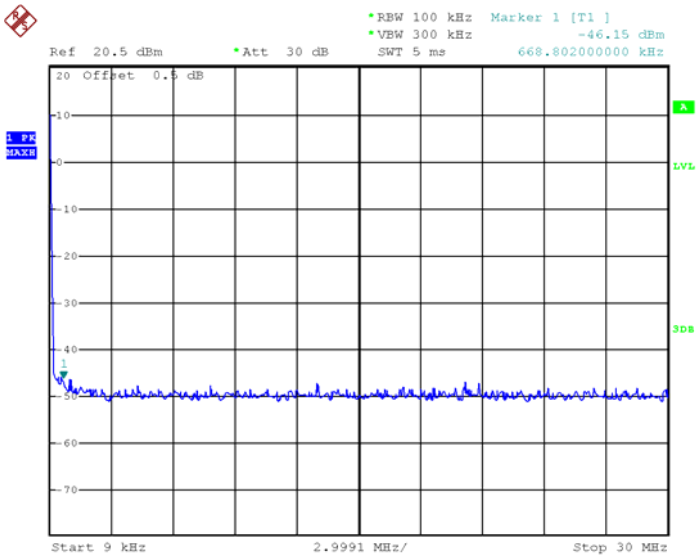


High Channel

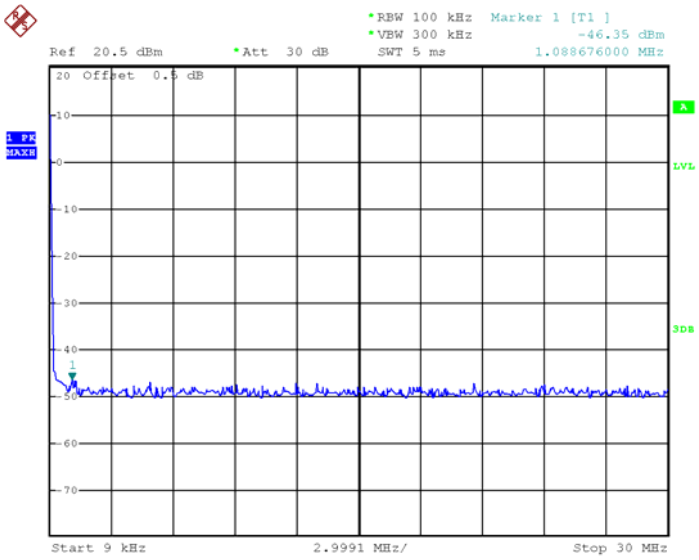


ANT1 802.11g

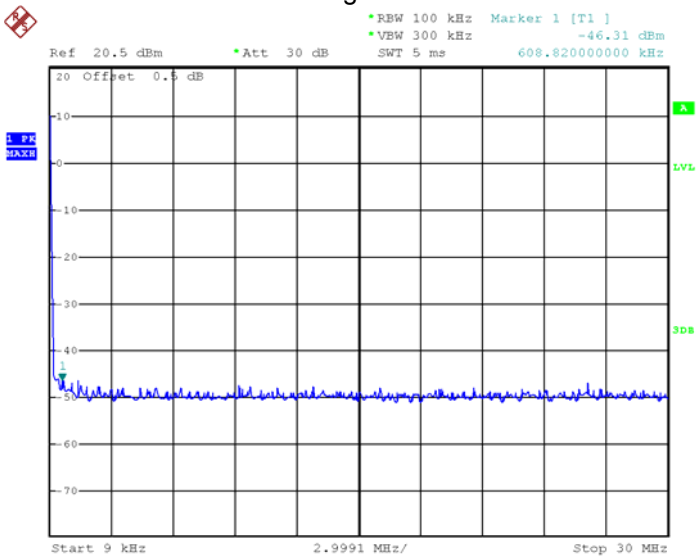
Low Channel



Middle Channel

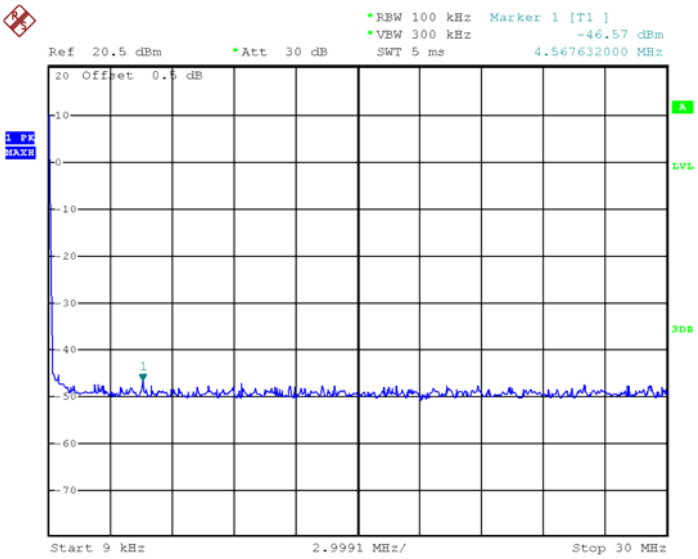


High Channel

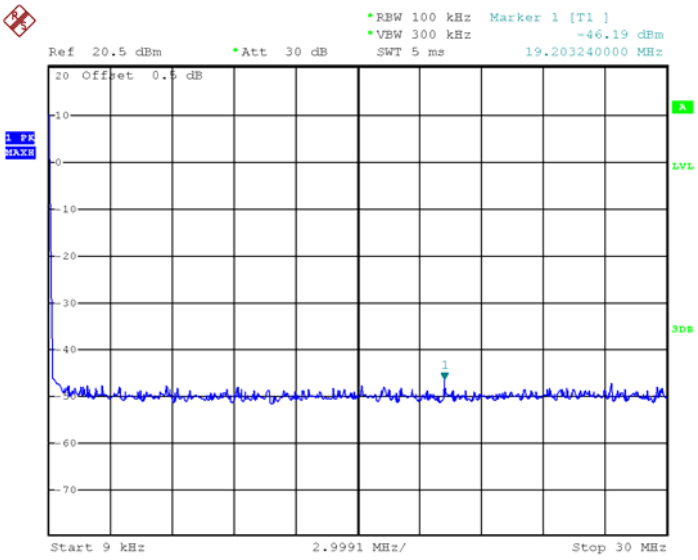


ANT1 802.11n HT20

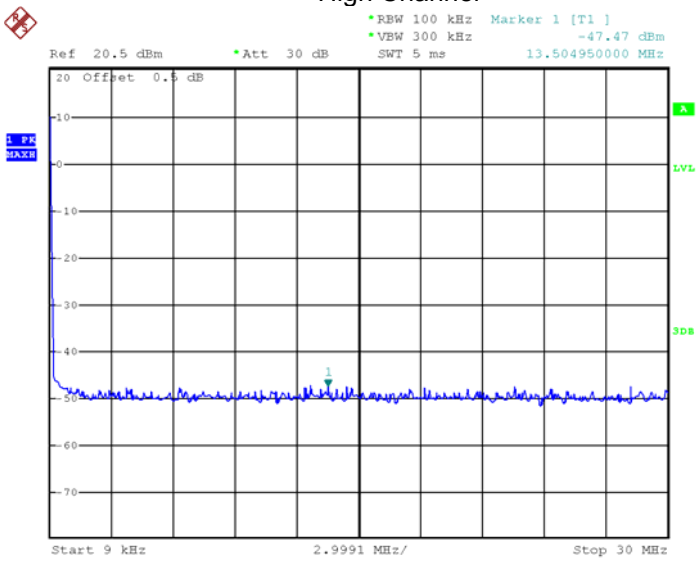
Low Channel



Middle Channel

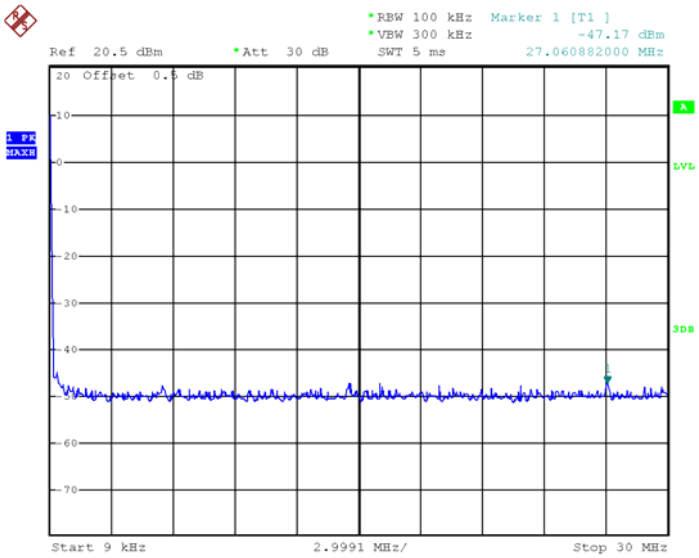


High Channel

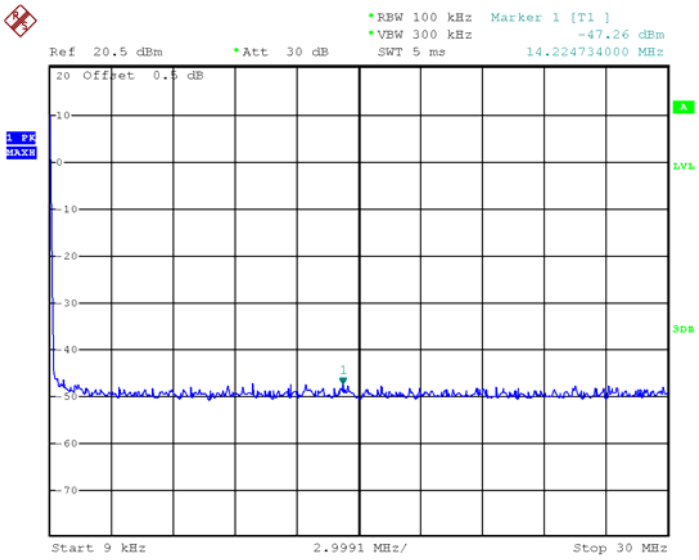


ANT1 802.11n HT40

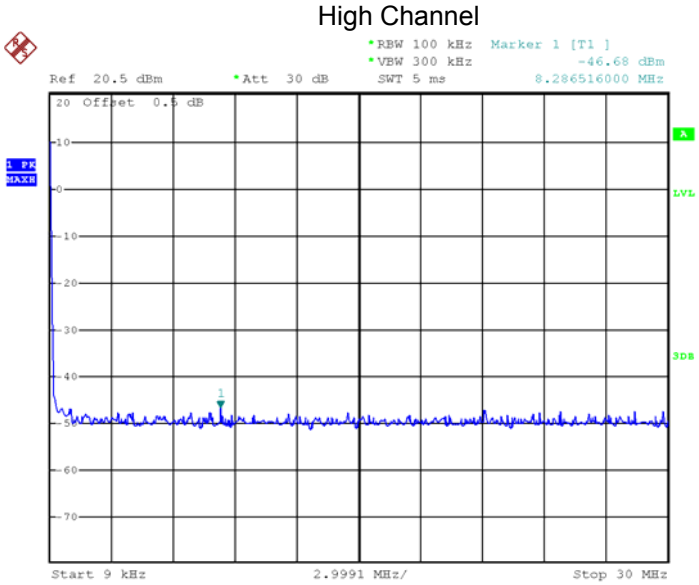
Low Channel



Middle Channel

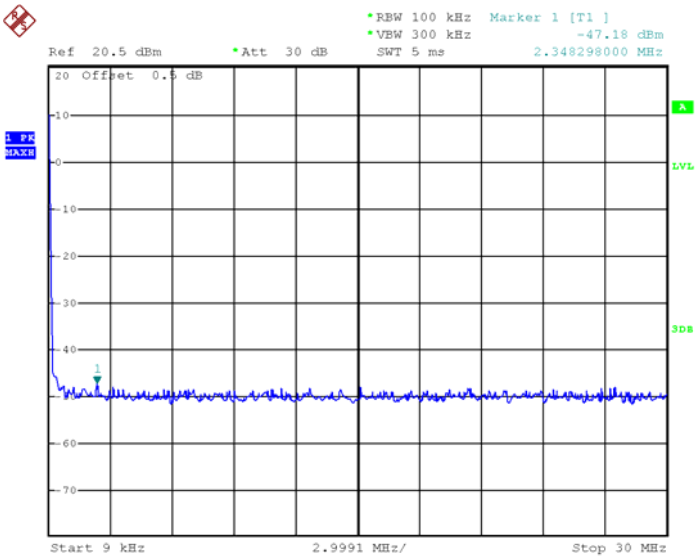


High Channel

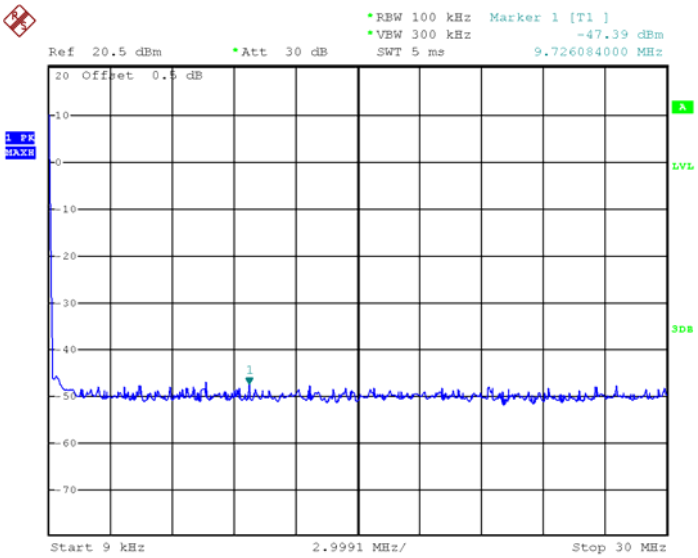


ANT2 802.11b

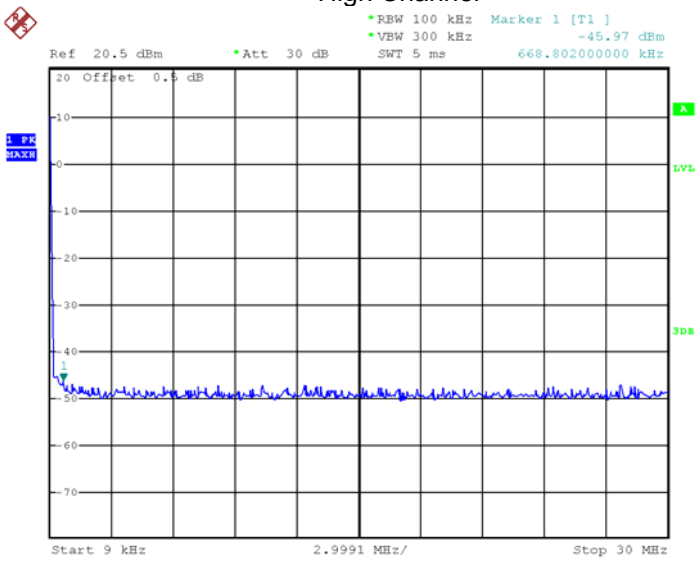
Low Channel



Middle Channel

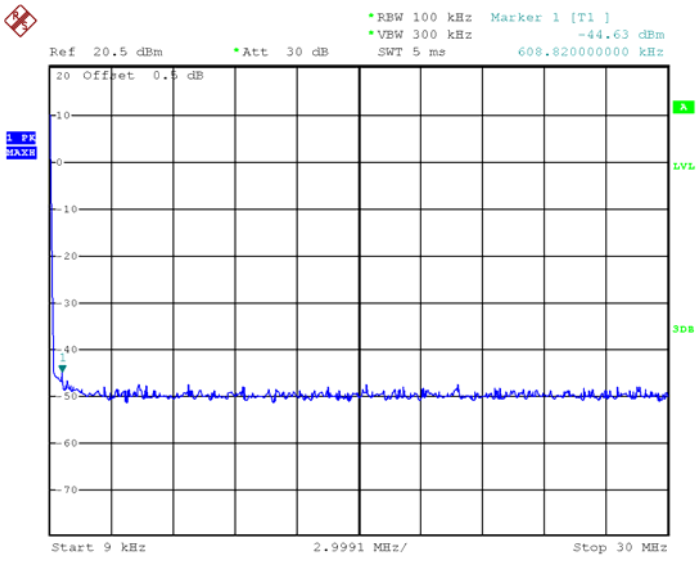


High Channel

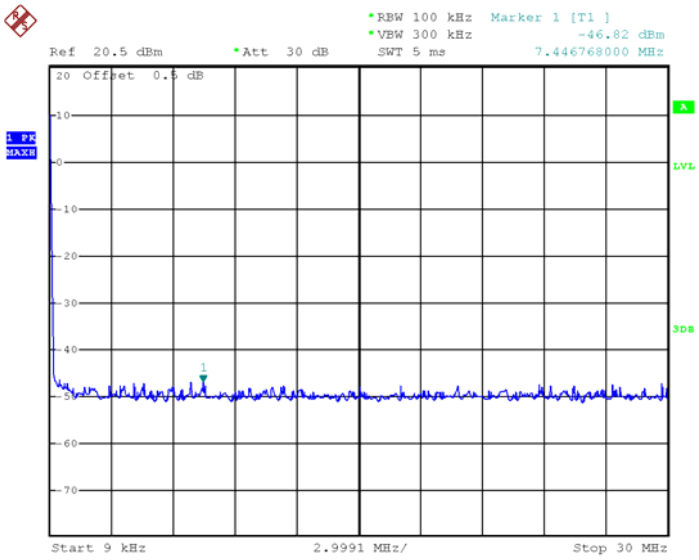


ANT2 802.11g

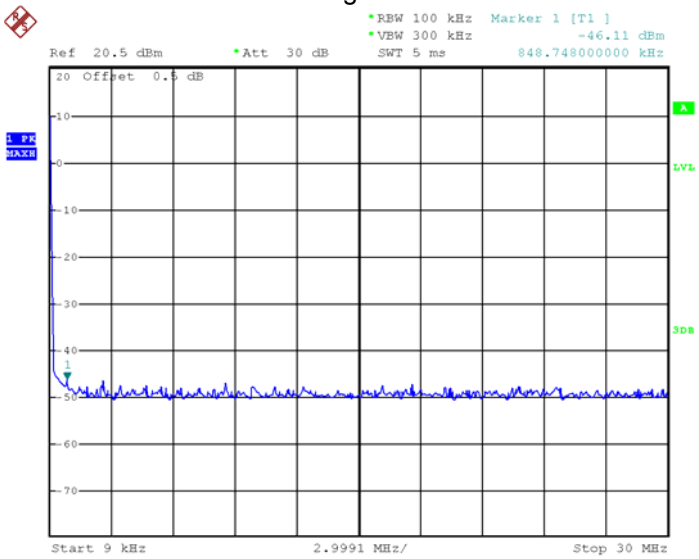
Low Channel



Middle Channel

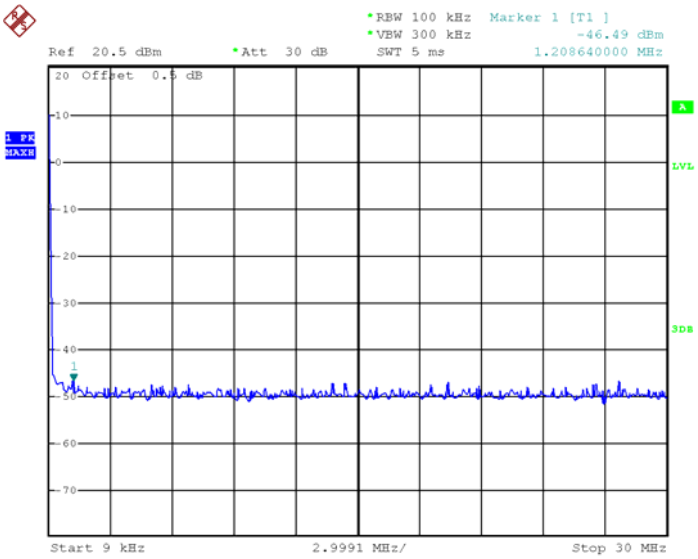


High Channel

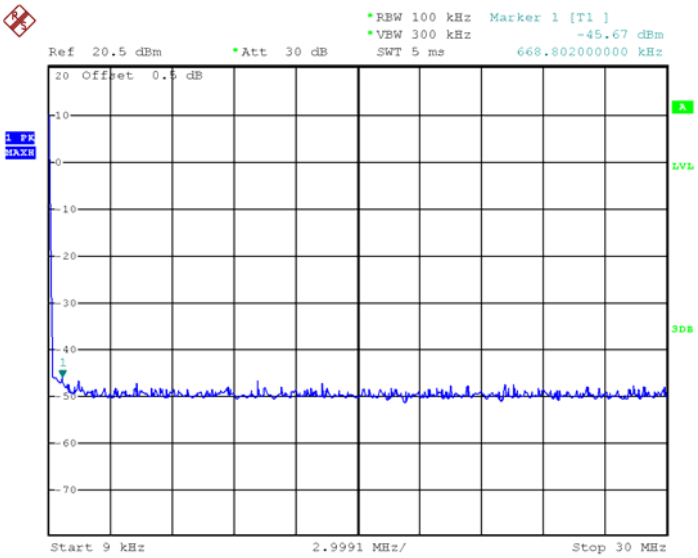


ANT2 802.11n HT20

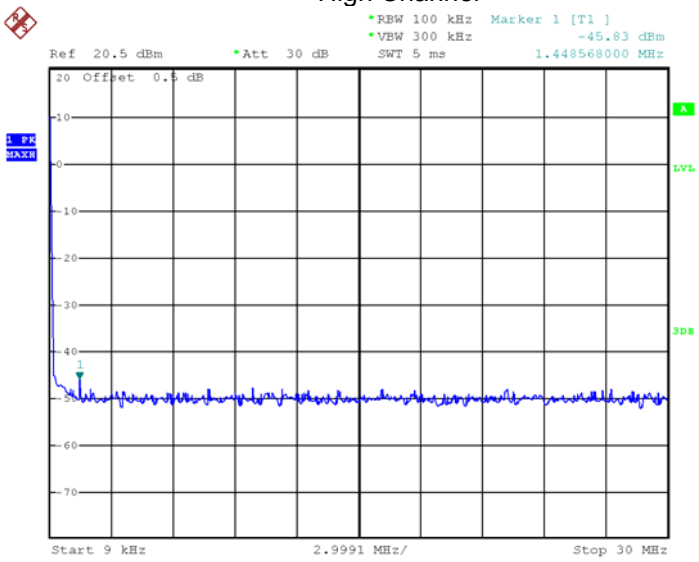
Low Channel



Middle Channel

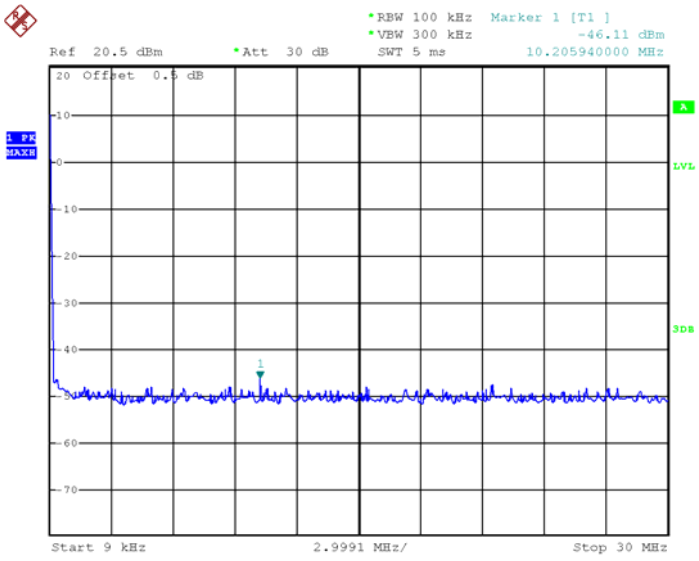


High Channel

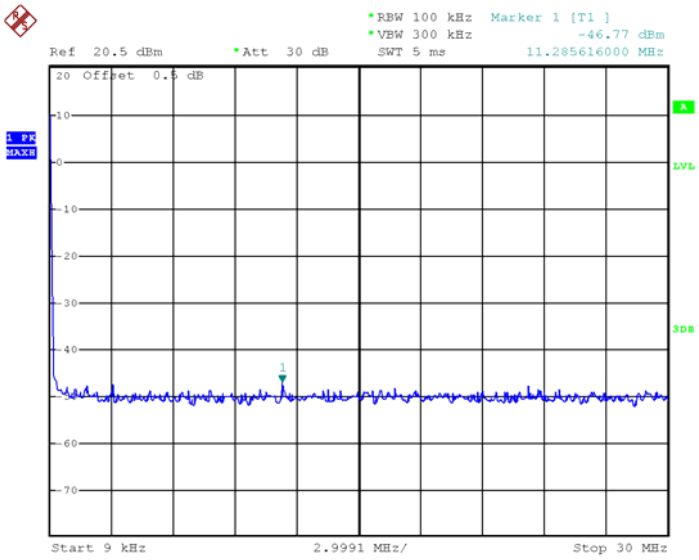


ANT2 802.11n HT40

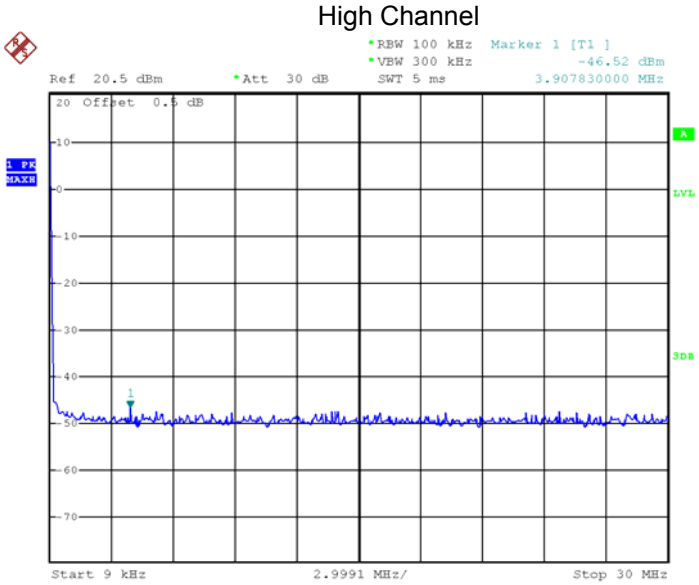
Low Channel



Middle Channel

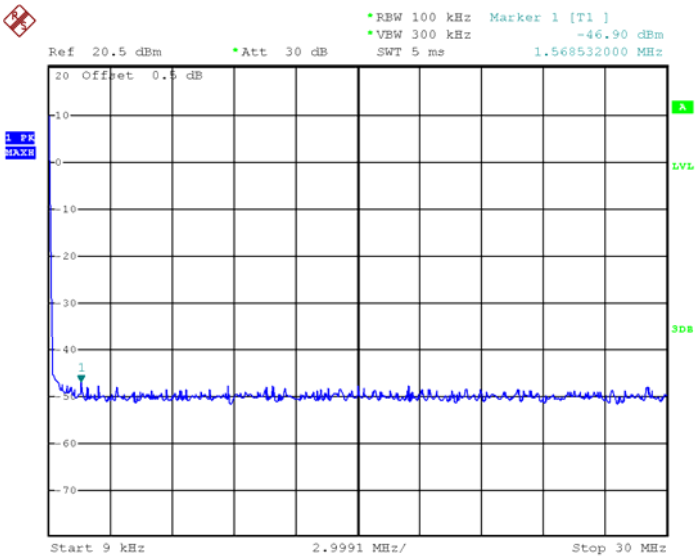


High Channel

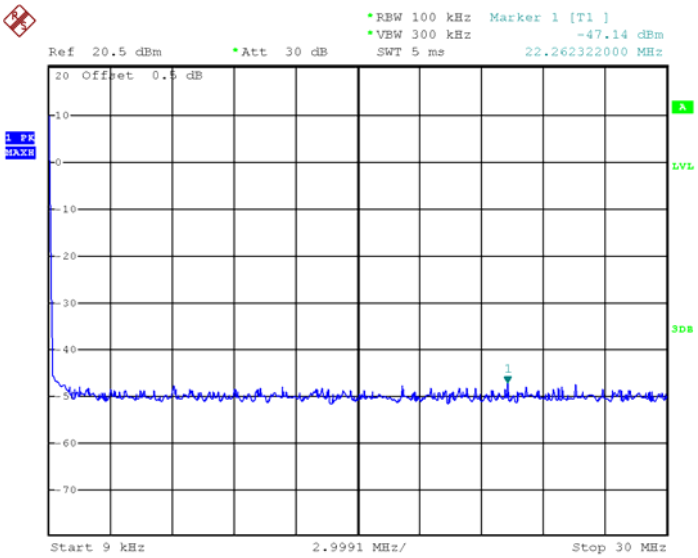


ANT1+ANT2 802.11n HT20

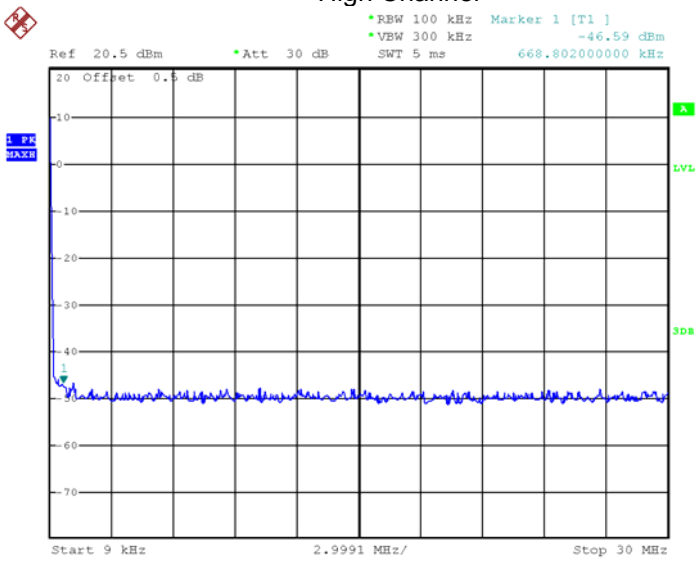
Low Channel



Middle Channel

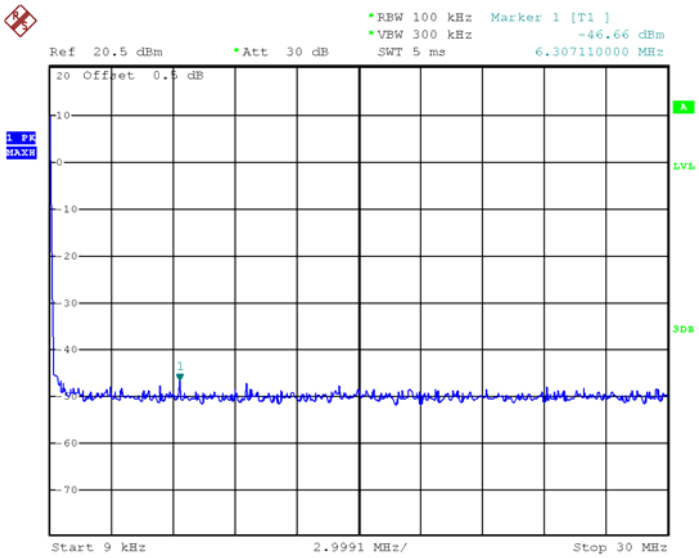


High Channel

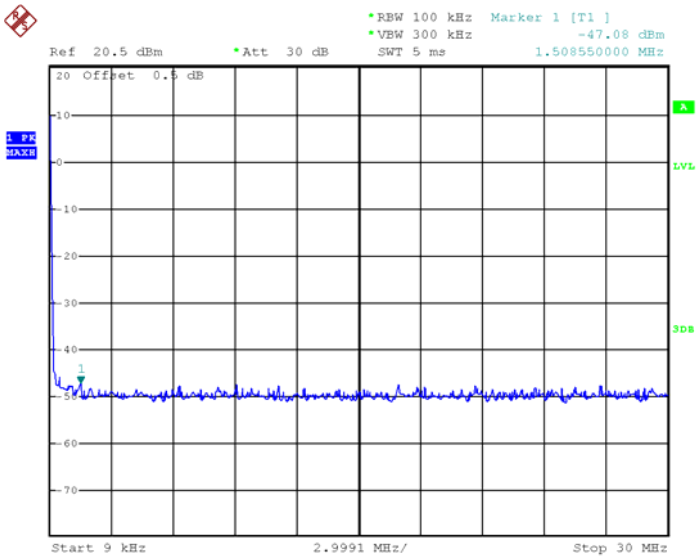


ANT1+ANT2 802.11n HT40

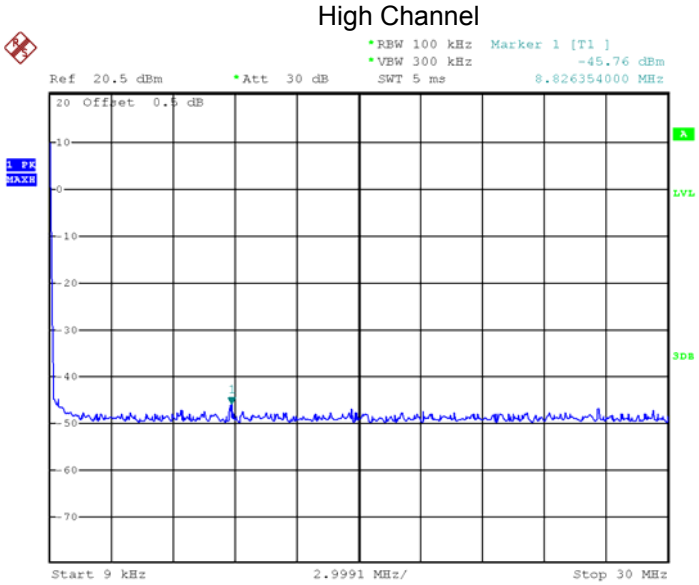
Low Channel



Middle Channel



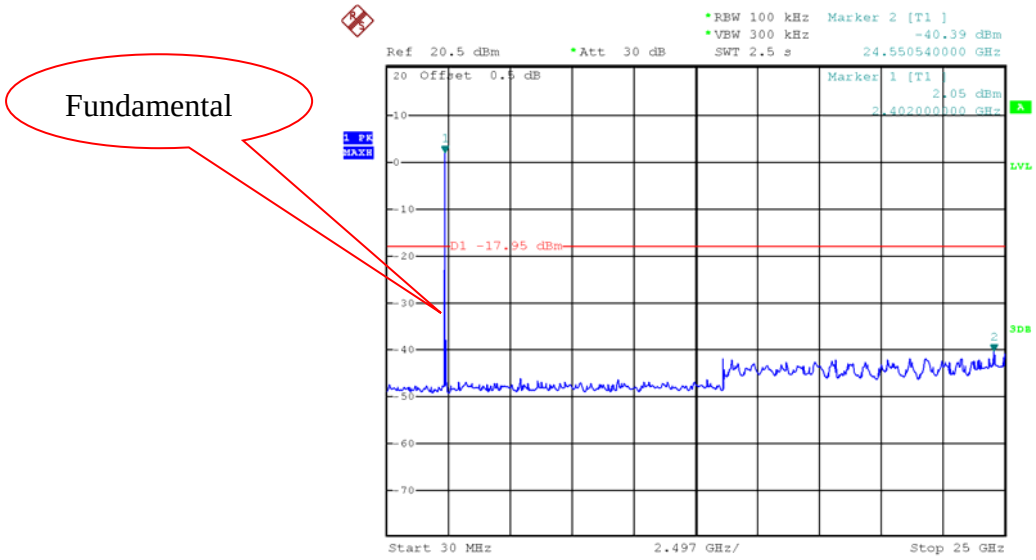
High Channel



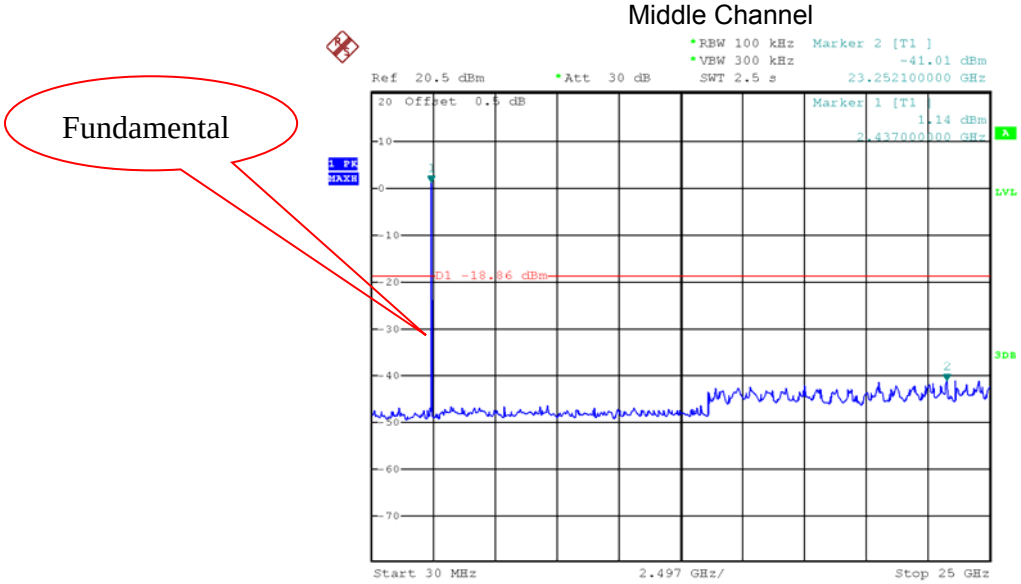
Above 30MHz

ANT1 802.11b

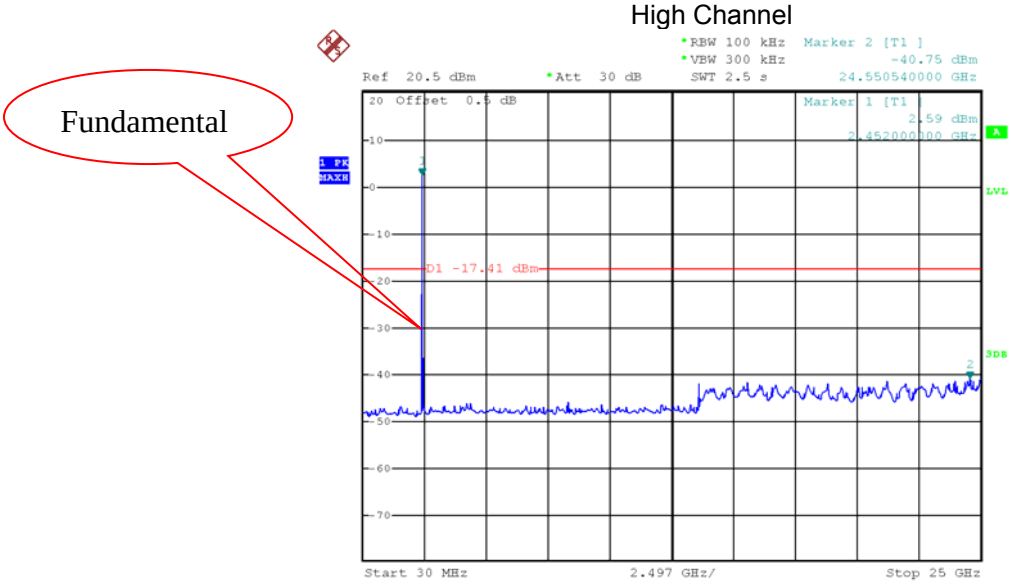
Low Channel



Middle Channel

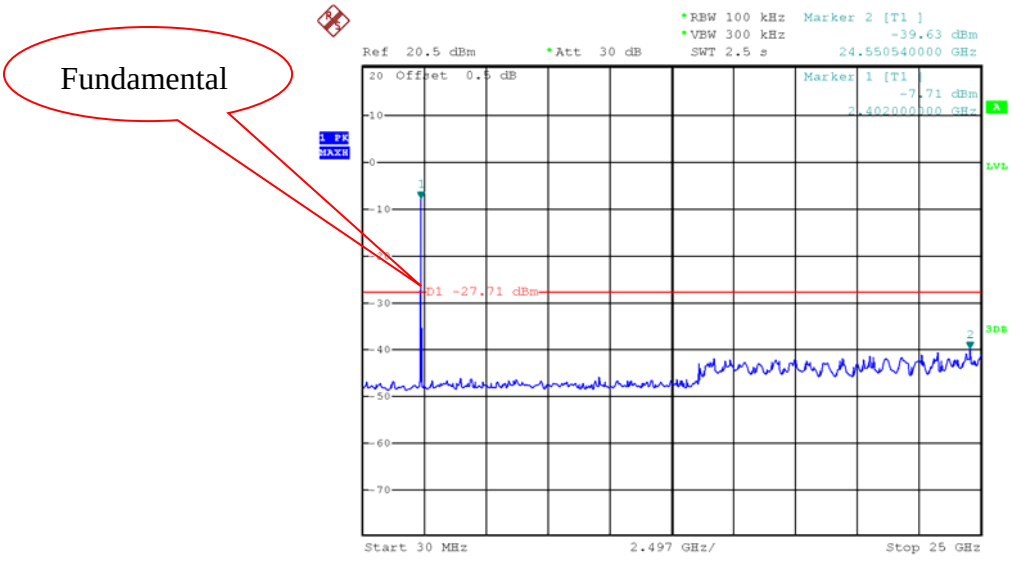


High Channel

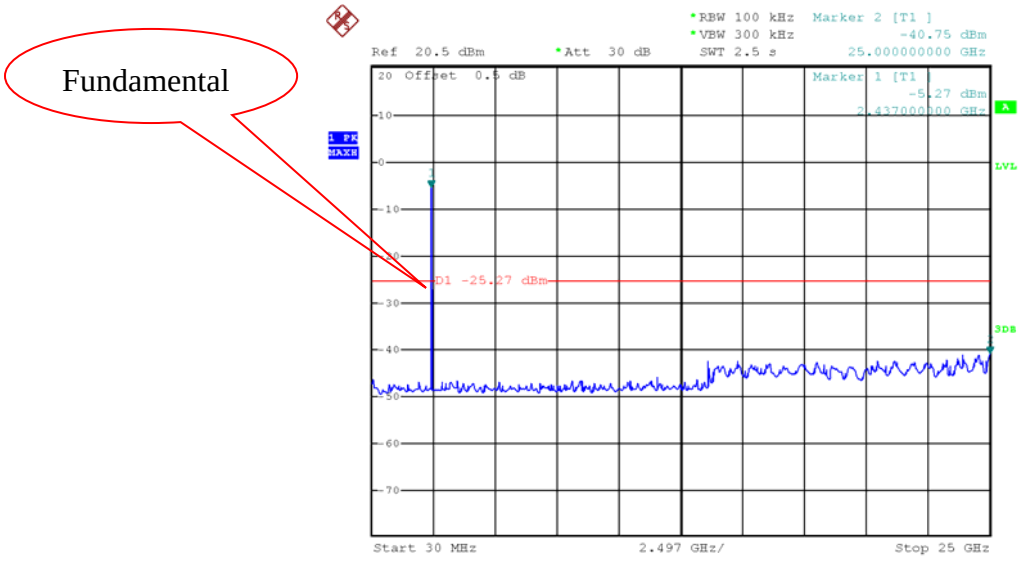


ANT1 802.11g

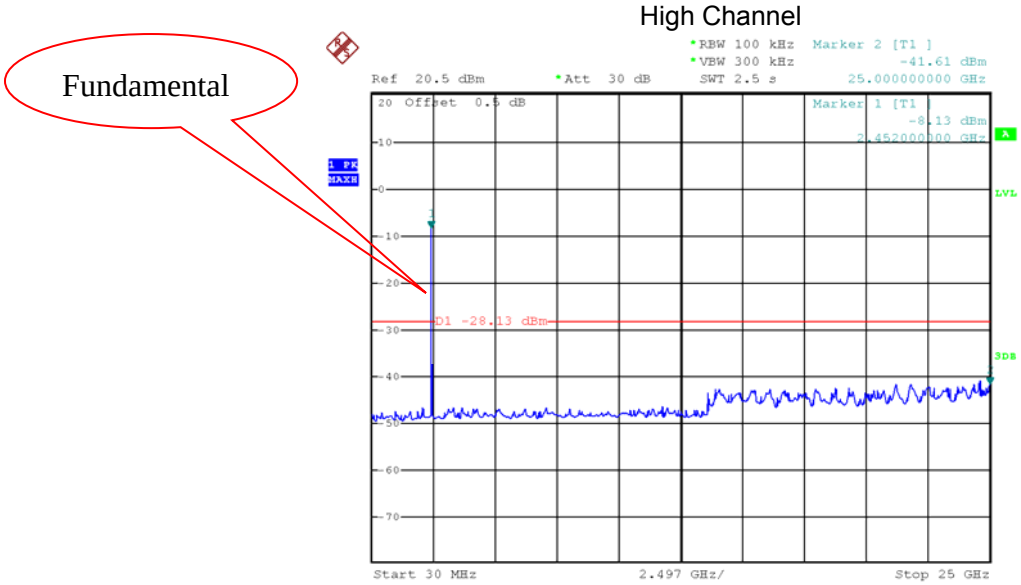
Low Channel



Middle Channel

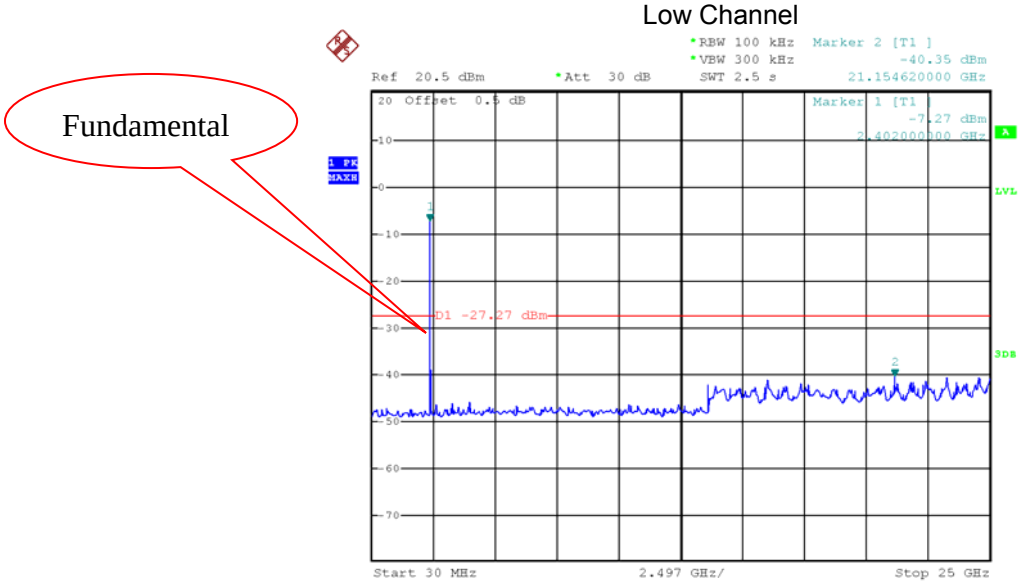


High Channel

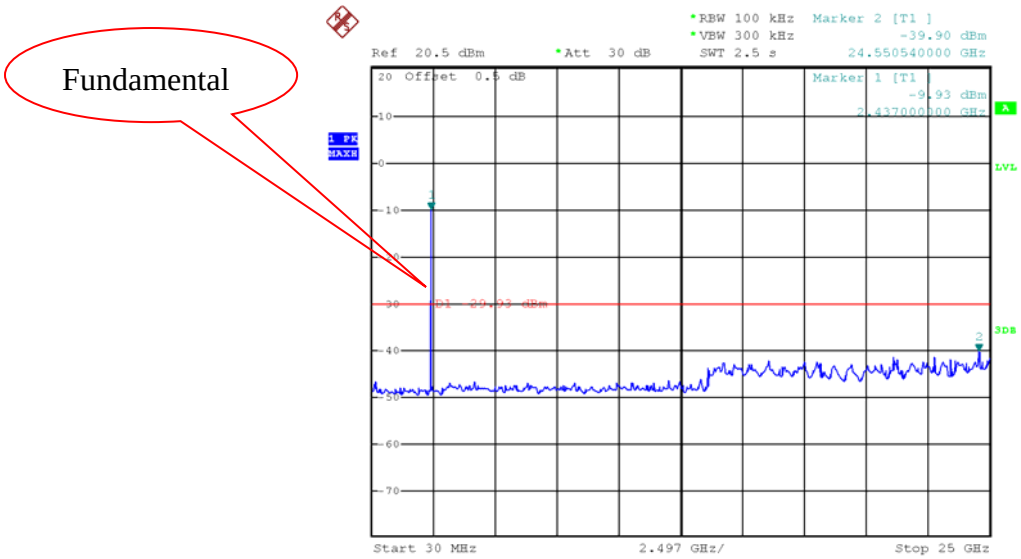


ANT1 802.11n HT20

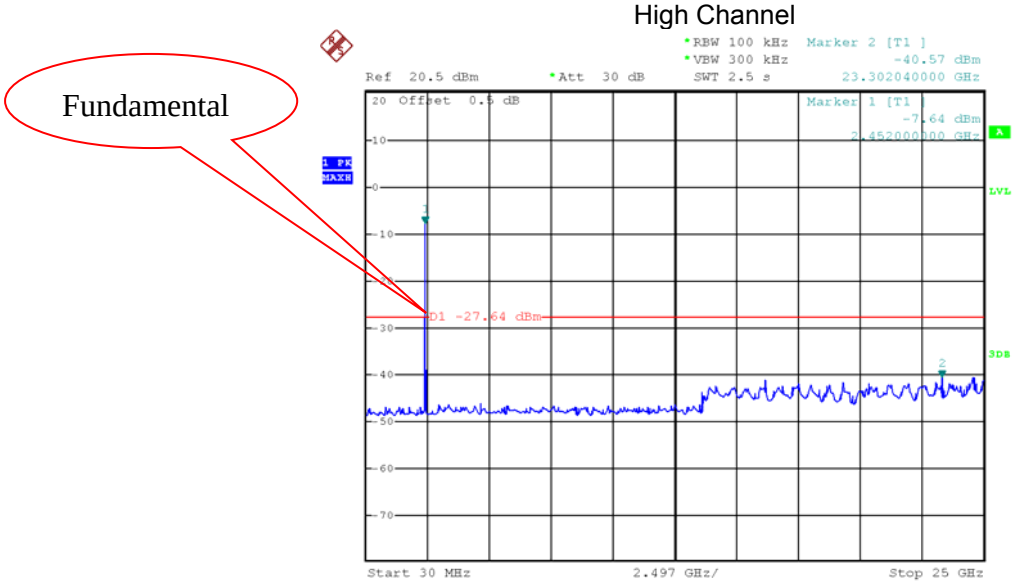
Low Channel



Middle Channel

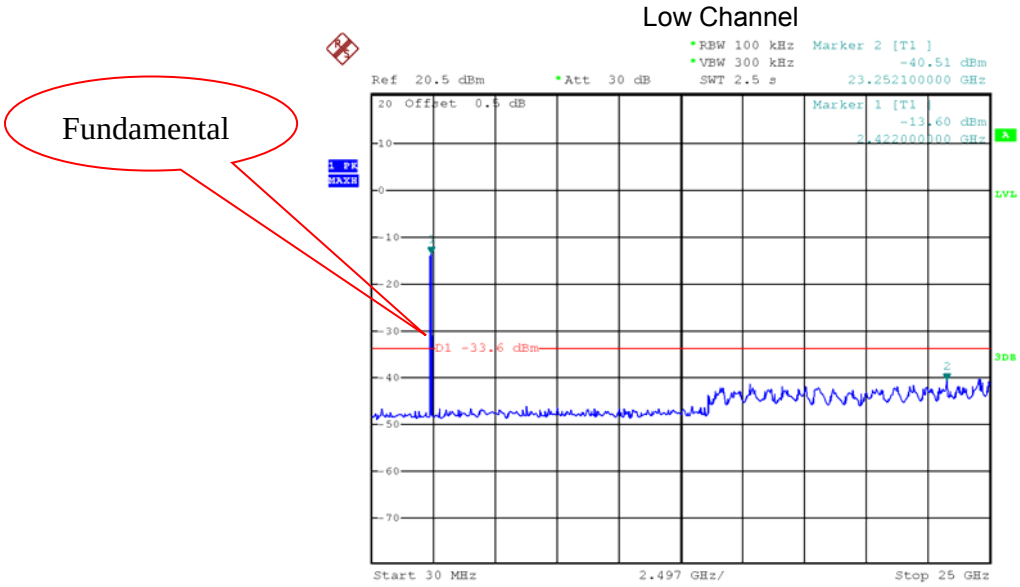


High Channel

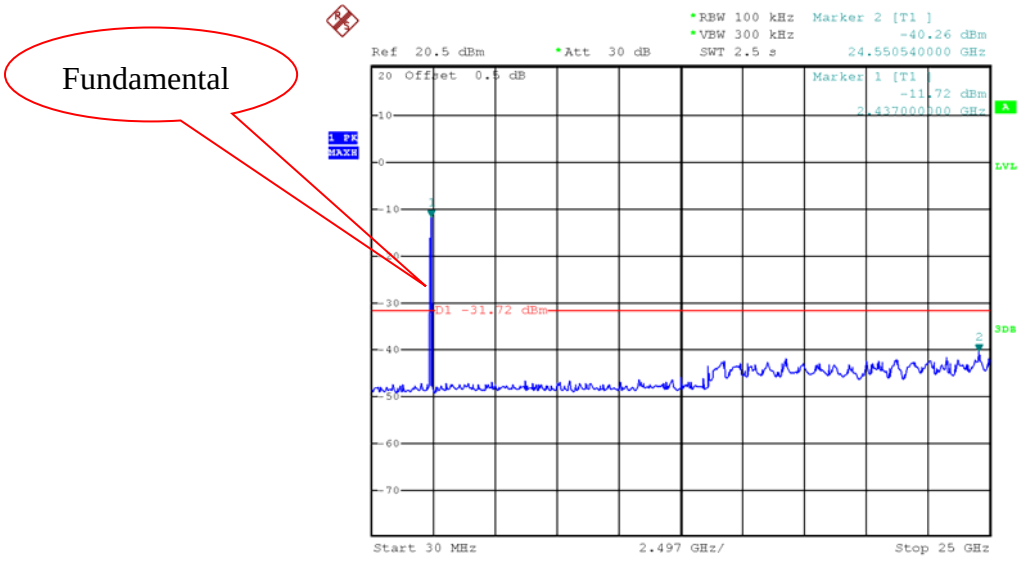


ANT1 802.11n HT40

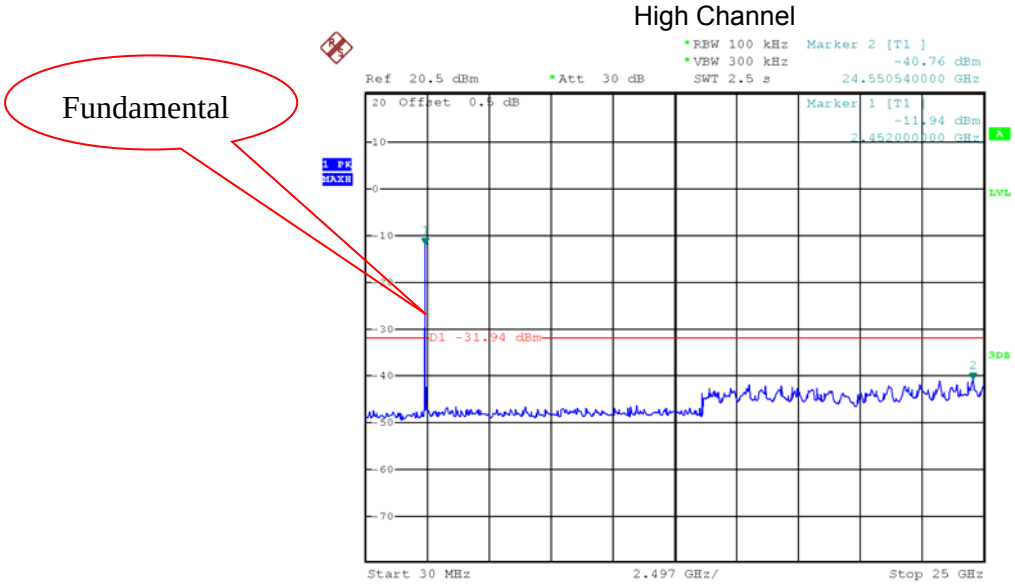
Low Channel



Middle Channel

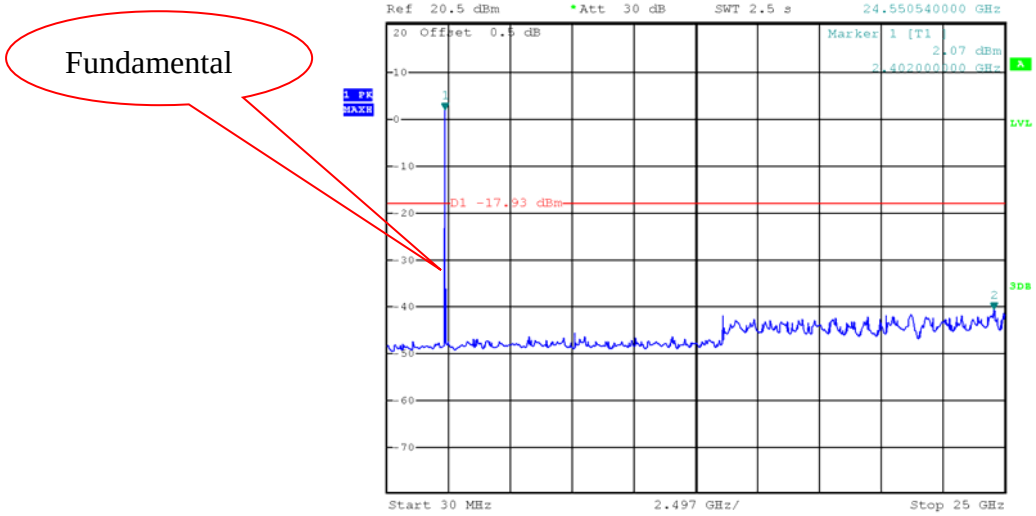


High Channel

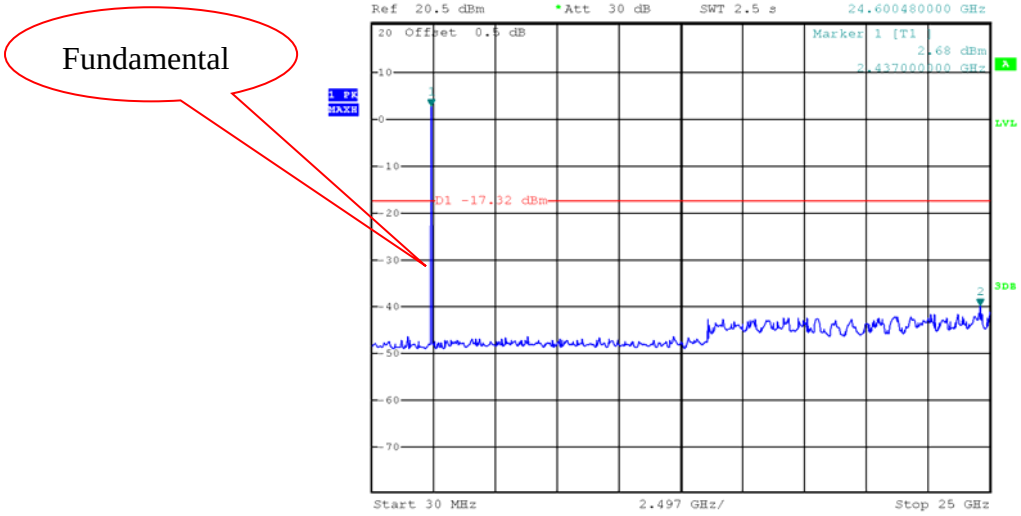


ANT2 802.11b

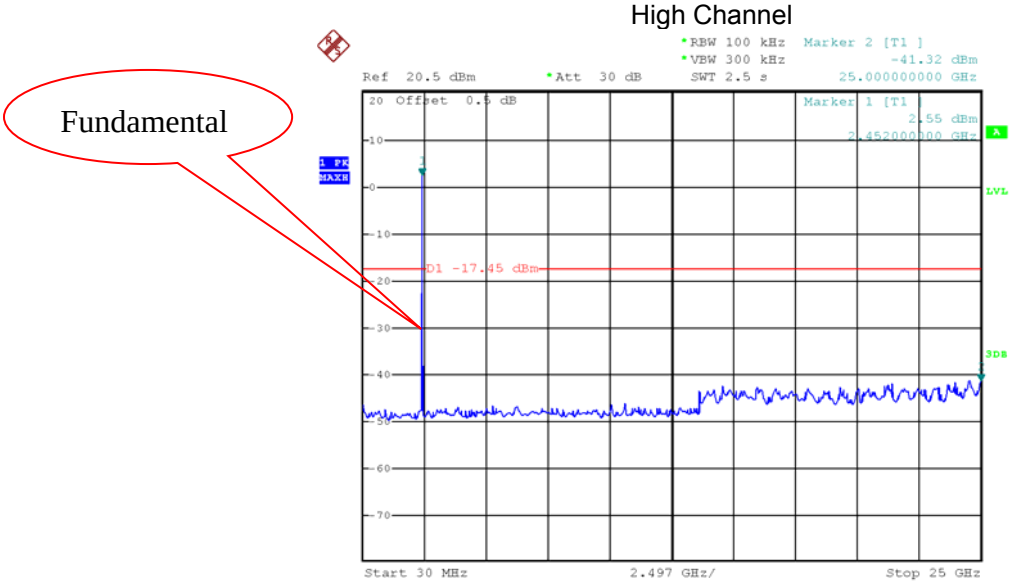
Low Channel



Middle Channel

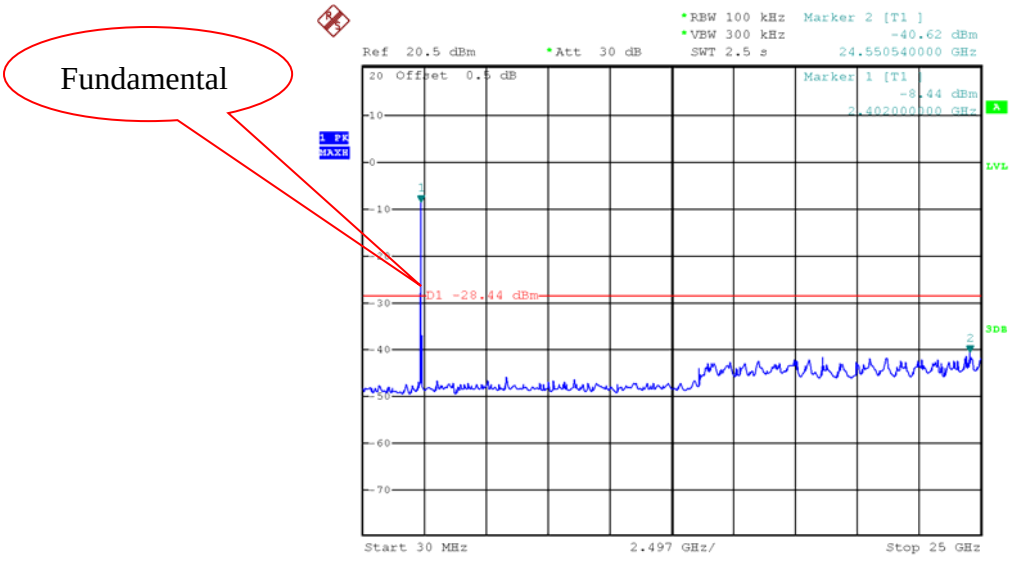


High Channel

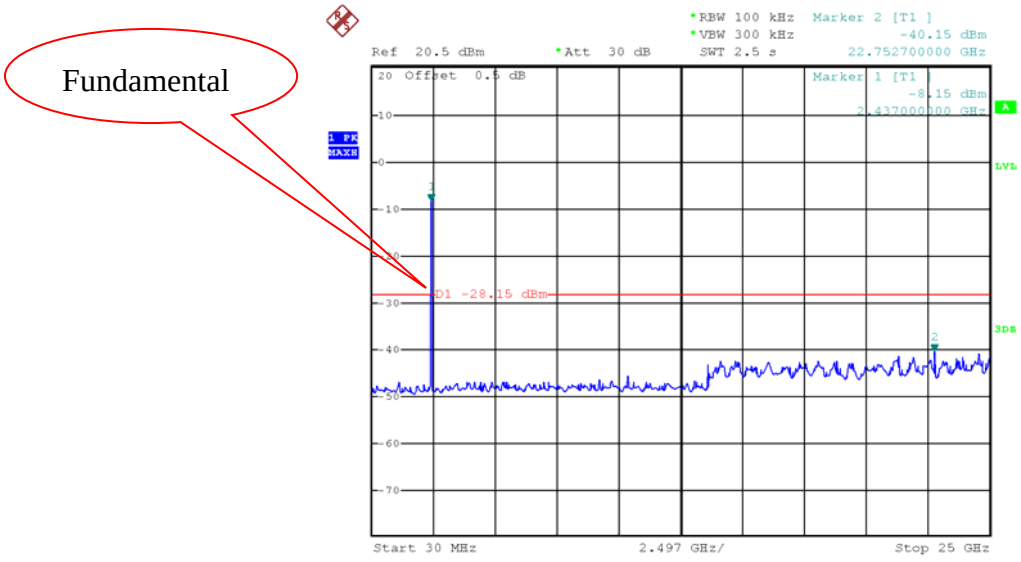


ANT2 802.11g

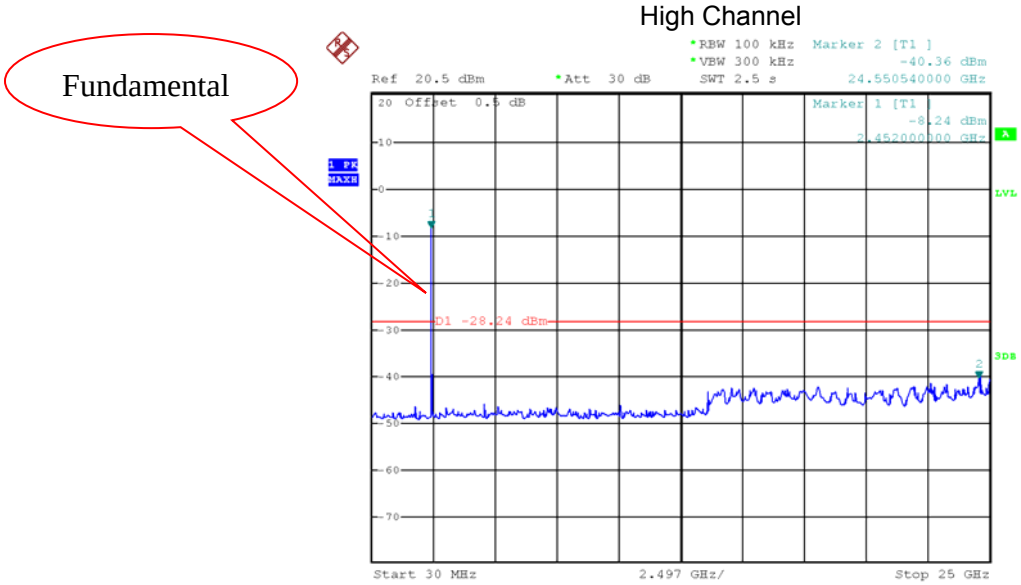
Low Channel



Middle Channel

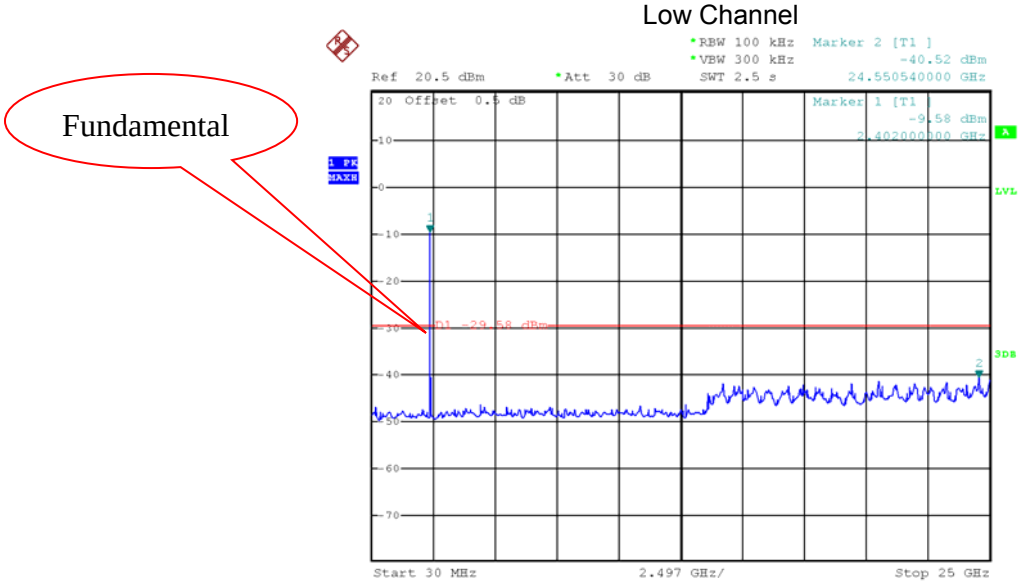


High Channel

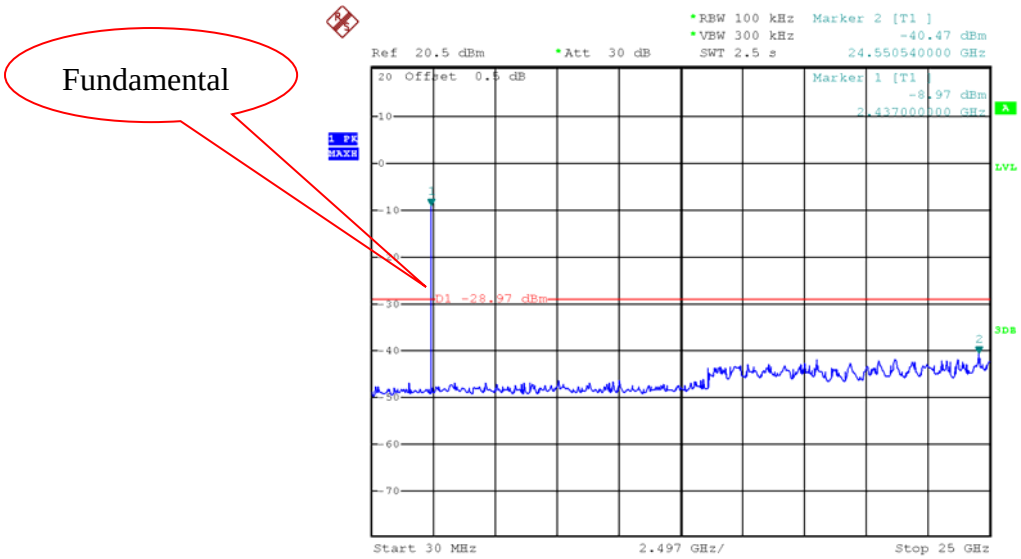


ANT2 802.11n HT20

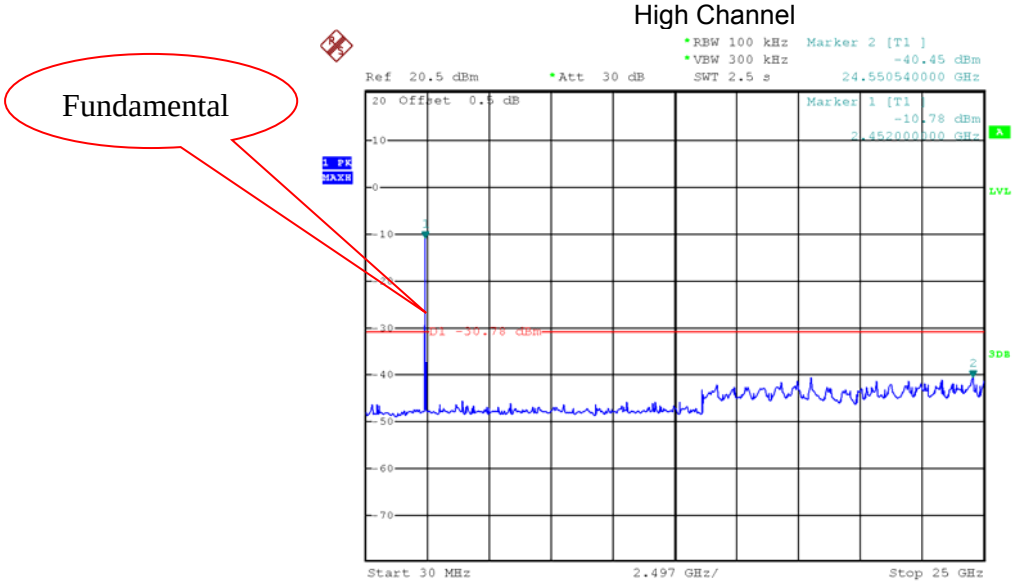
Low Channel



Middle Channel

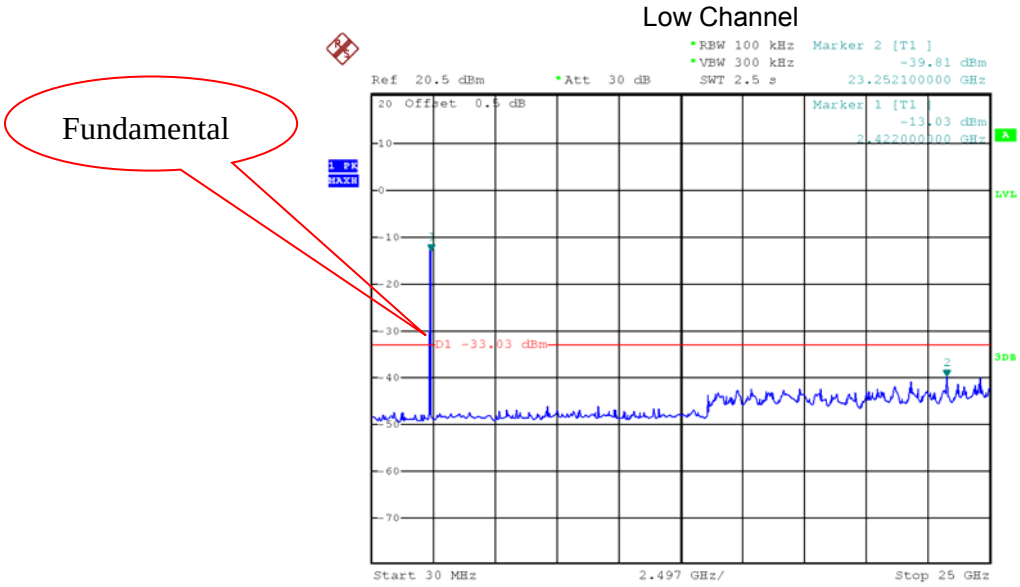


High Channel

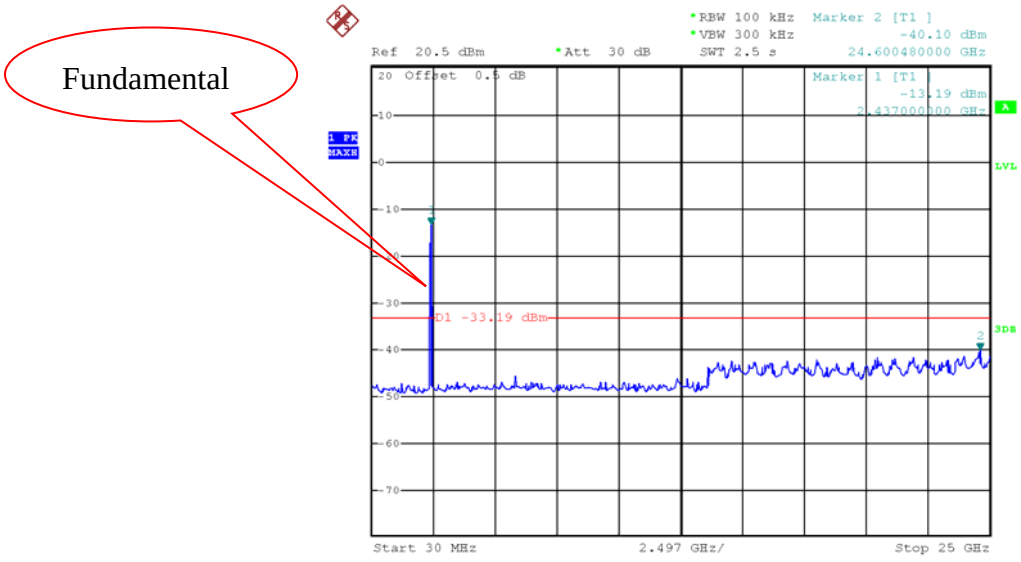


ANT2 802.11n HT40

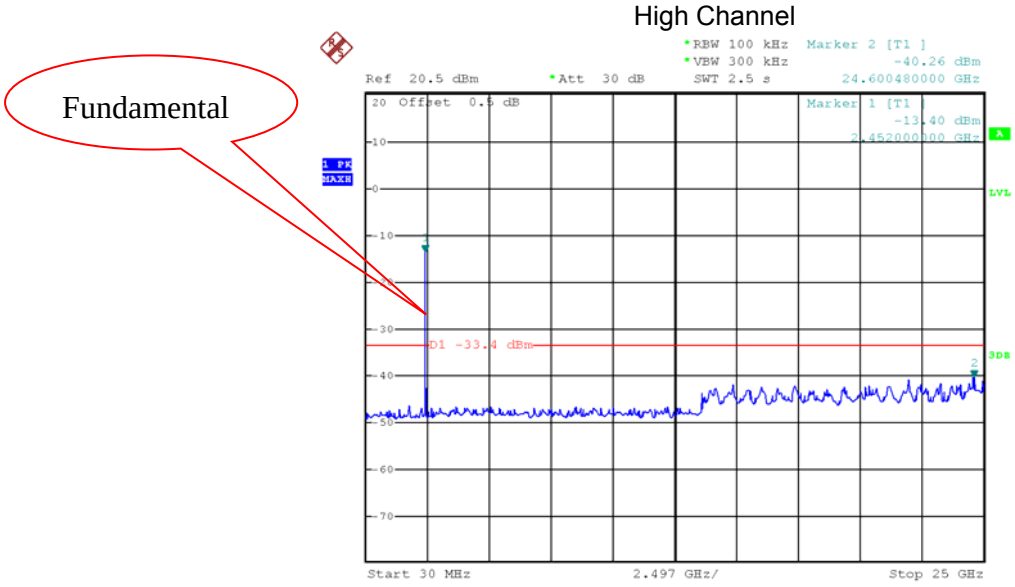
Low Channel



Middle Channel

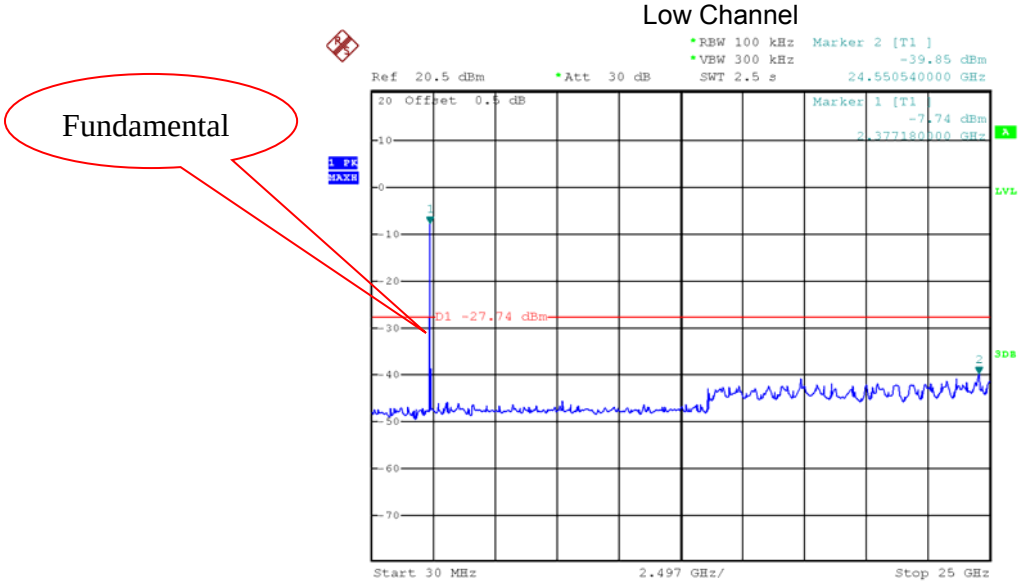


High Channel

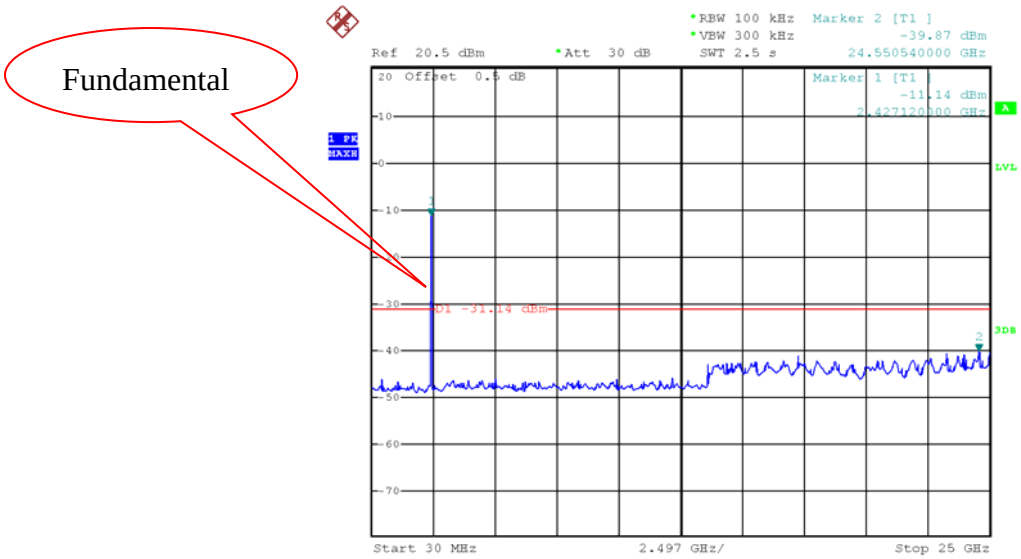


ANT1+ANT2 802.11n HT20

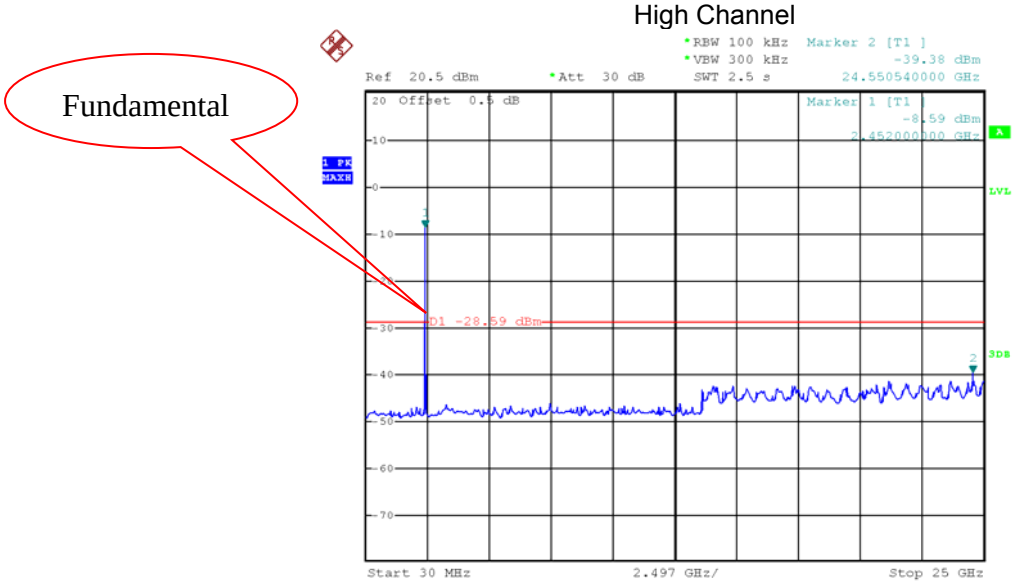
Low Channel



Middle Channel

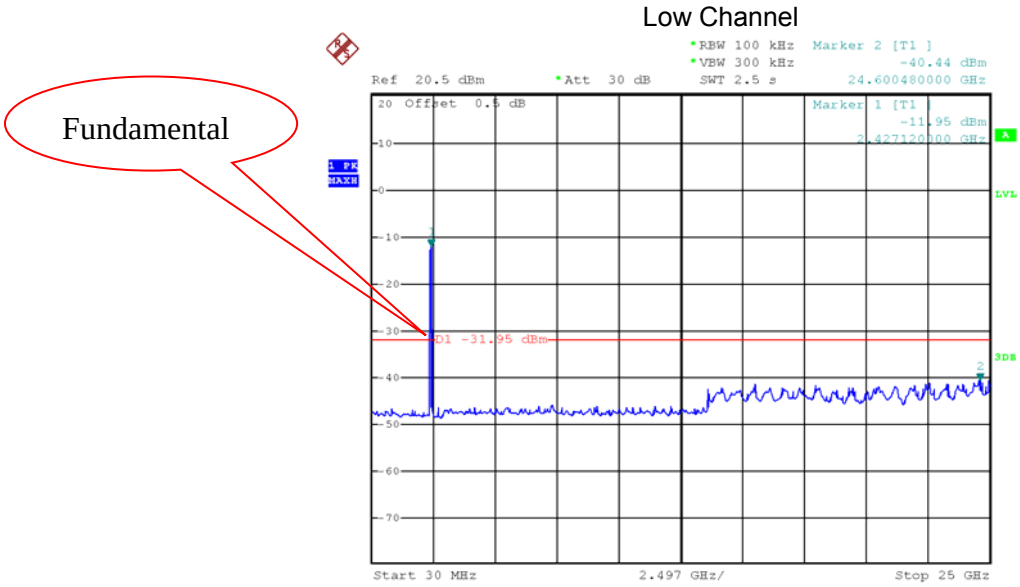


High Channel

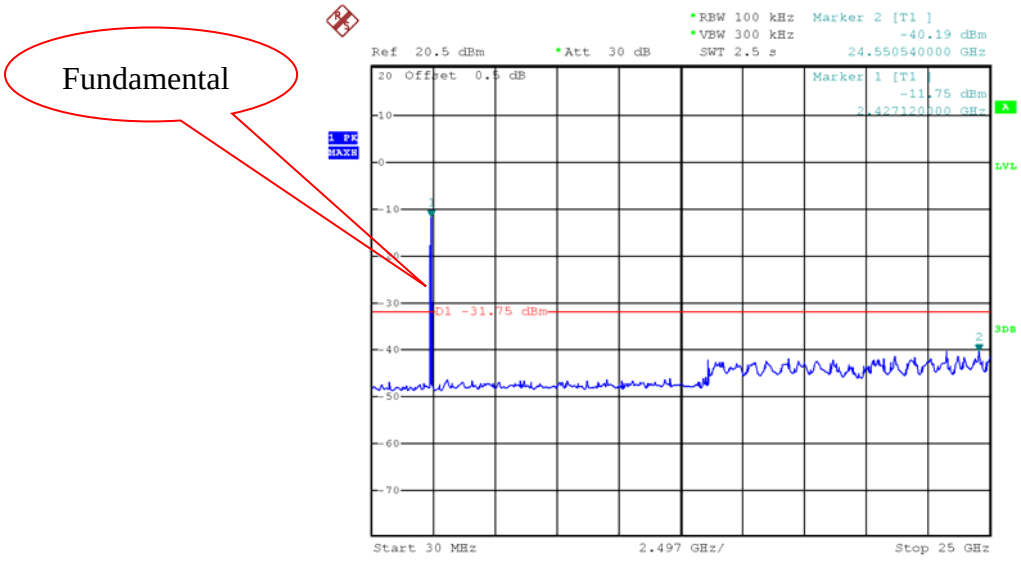


ANT1+ANT2 802.11n HT40

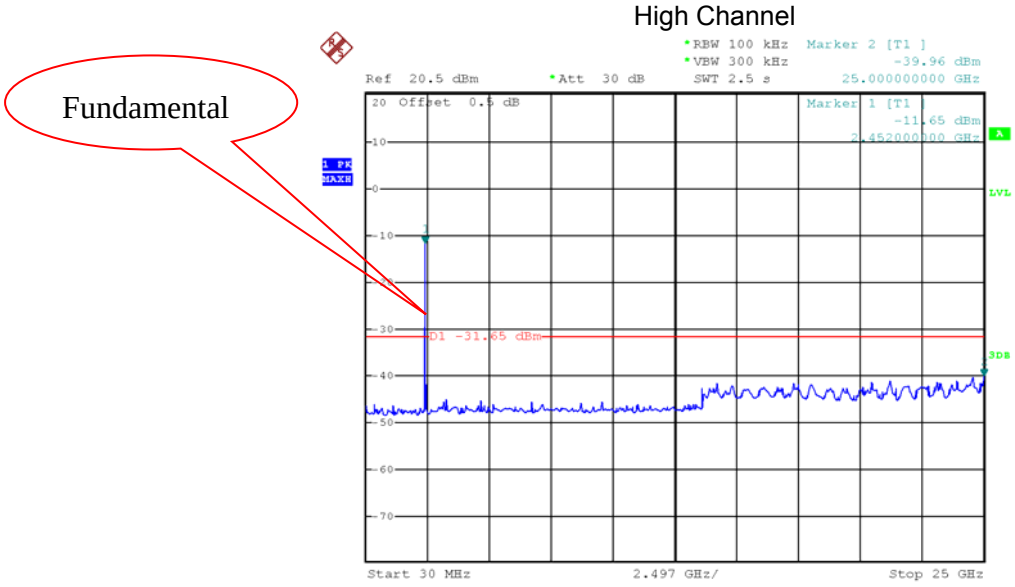
Low Channel



Middle Channel



High Channel



11 Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

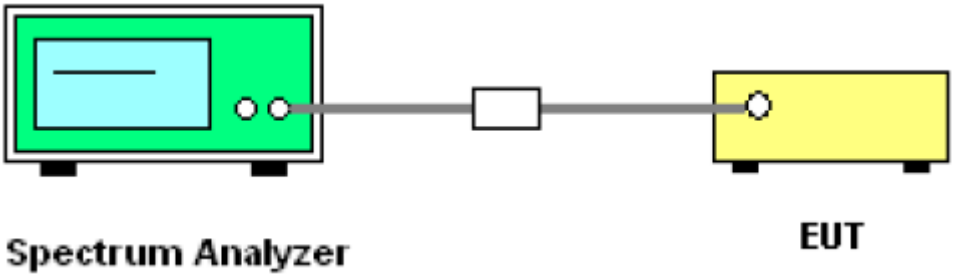
Test Method: 558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013

11.1 Test Procedure

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

2. Set the spectrum analyzer: RBW = 100kHz/300kHz/1MHz, VBW = 300kHz/1MHz/3MHz

11.2 Test Setup

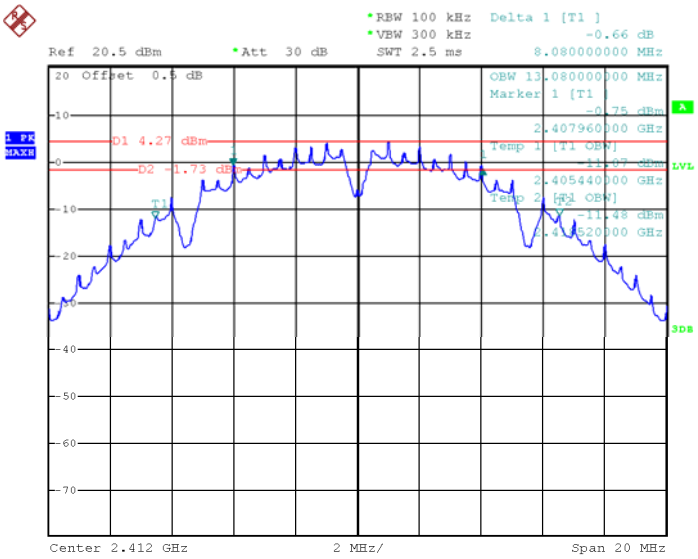


11.3 Test Result

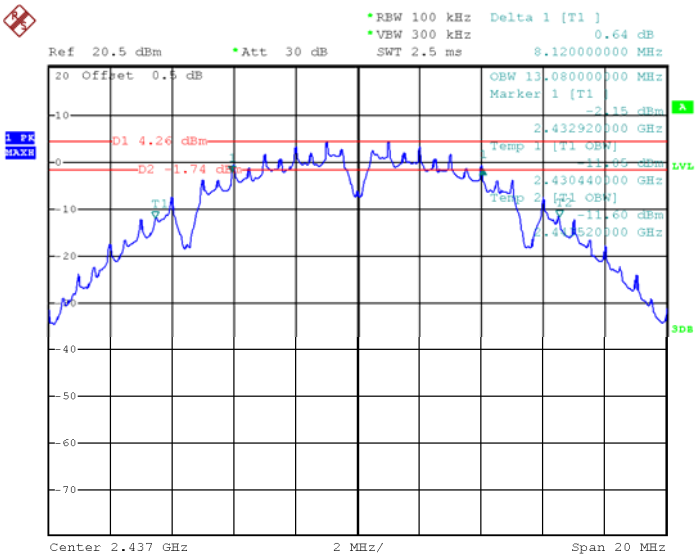
ANT	Operation mode	6dB Bandwidth (MHz)			99% Bandwidth (MHz)		
ANT1	TX 11b	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
		8.080	8.120	8.120	13.040	13.120	13.040
	TX 11g	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
		15.350	15.200	15.590	16.400	16.400	16.320
	TX 11n HT20	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
		15.228	15.228	15.228	17.520	17.440	17.520
	TX 11n HT40	Channel 3	Channel 6	Channel 9	Channel 3	Channel 6	Channel 9
		35.424	35.316	35.408	36.320	36.320	36.320
ANT2	TX 11b	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
		8.080	8.120	8.080	13.040	13.120	13.040
	TX 11g	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
		15.200	15.200	15.540	16.400	16.400	16.400
	TX 11n HT20	Channel 1	Channel 6	Channel 11	Channel 1	Channel 6	Channel 11
		15.160	15.228	15.228	17.520	17.440	17.520
	TX 11n HT40	Channel 3	Channel 6	Channel 9	Channel 3	Channel 6	Channel 9
		35.208	35.208	35.424	36.320	36.320	36.320

6dB Bandwidth Test result plot as follows:

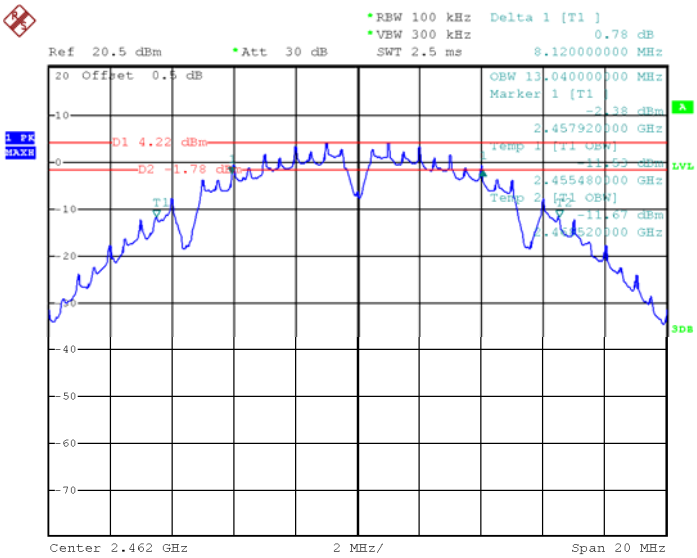
ANT1 Mode: TX 11b channel 1



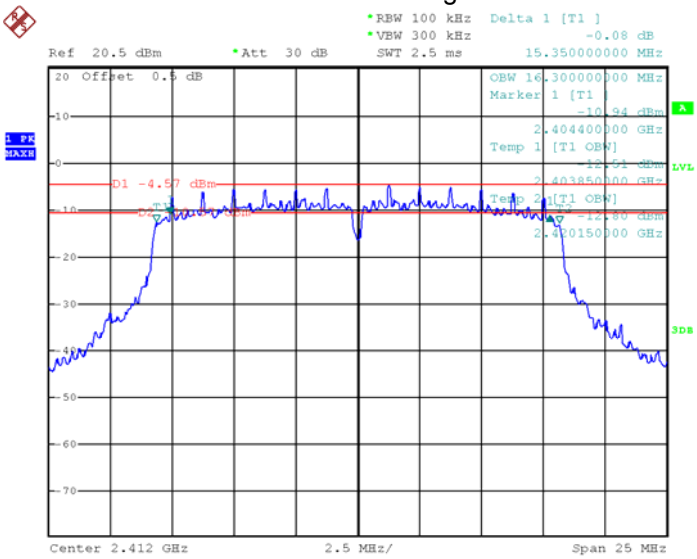
ANT1 Mode: TX 11b channel 6



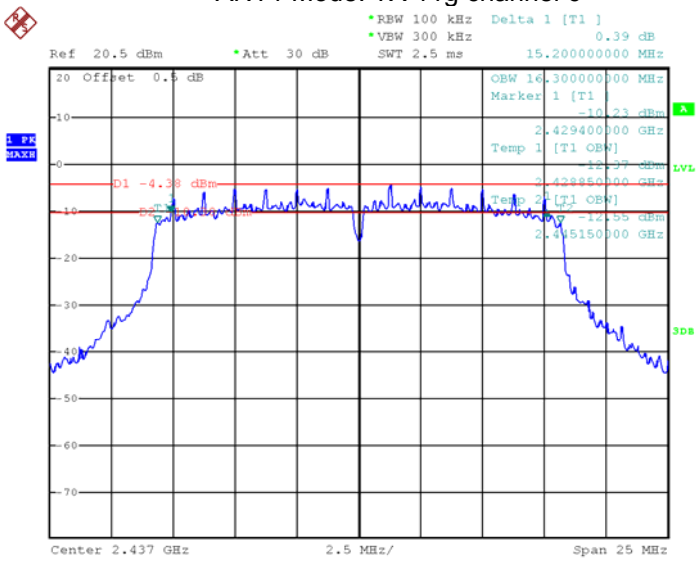
ANT1 Mode: TX 11b channel 11



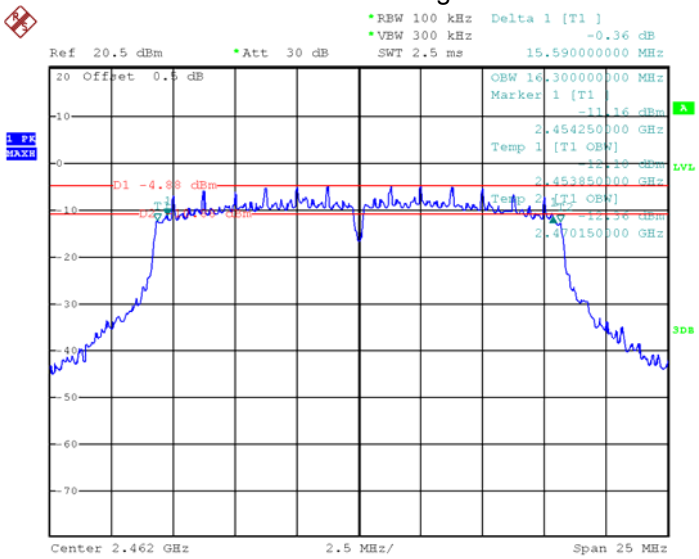
ANT1 Mode: TX 11g channel 1



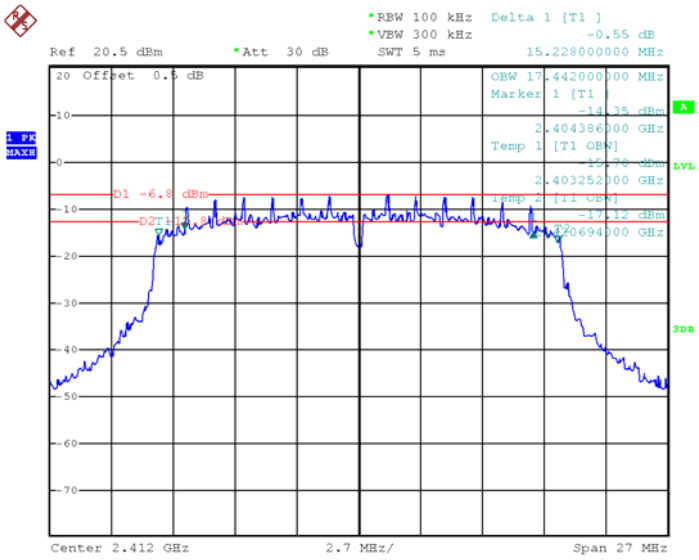
ANT1 Mode: TX 11g channel 6



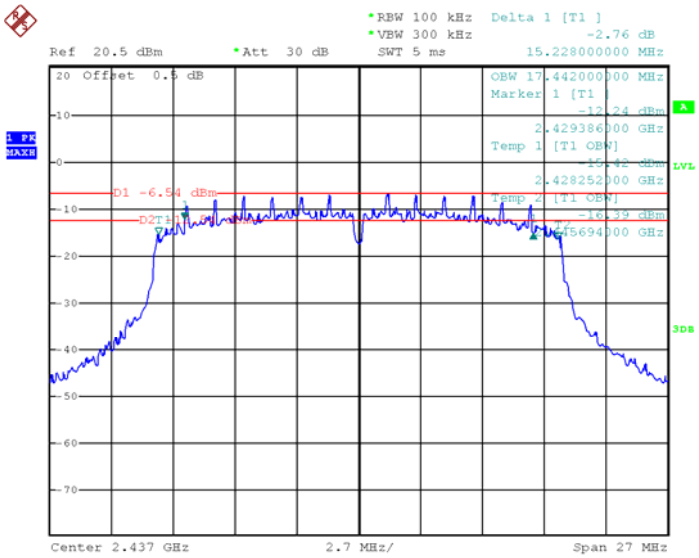
ANT1 Mode: TX 11g channel 11



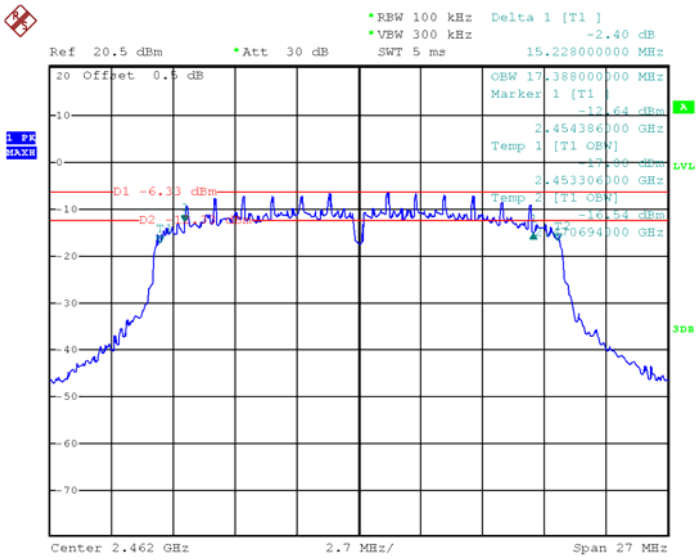
ANT1 Mode: TX 11n HT20 channel 1



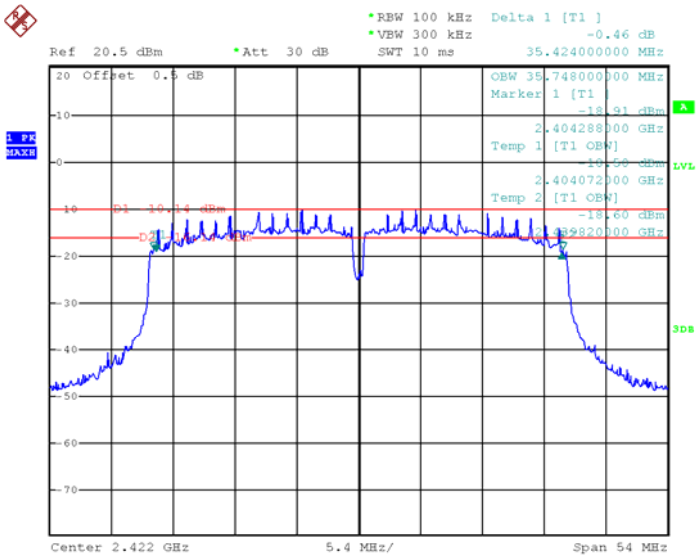
ANT1 Mode: TX 11n HT20 channel 6



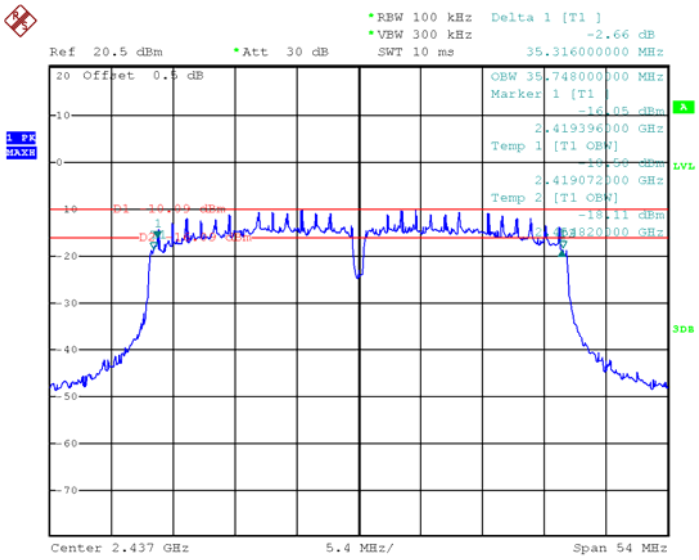
ANT1 Mode: TX 11n HT20 channel 11



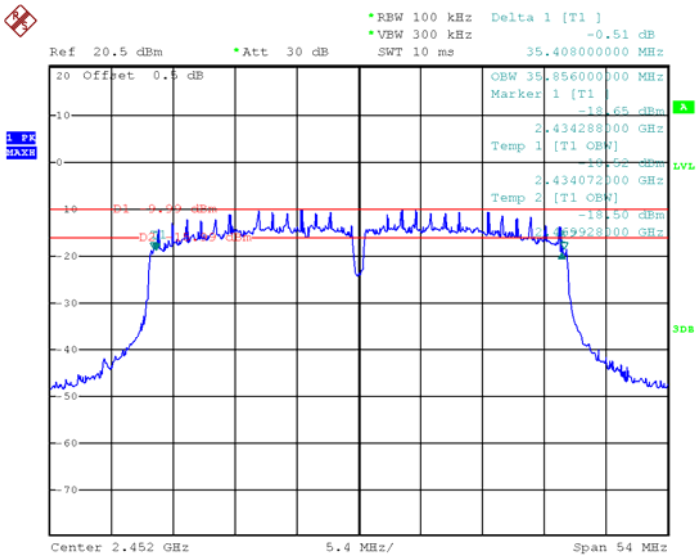
ANT1 Mode: TX 11n HT40 channel 3



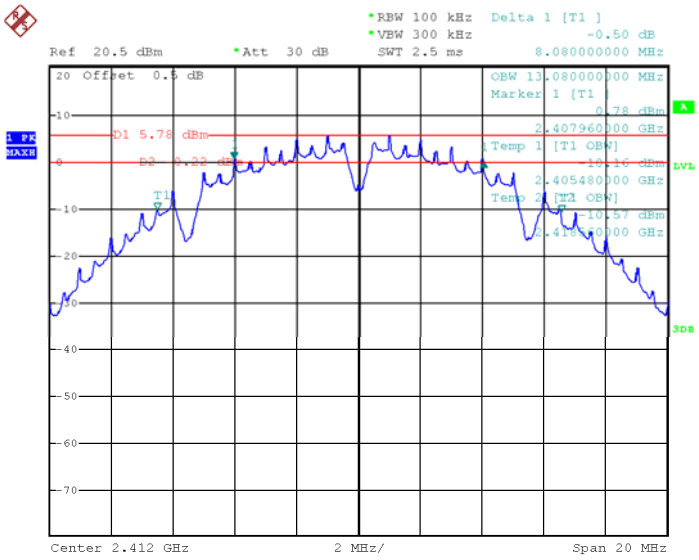
ANT1 Mode: TX 11n HT40 channel 6



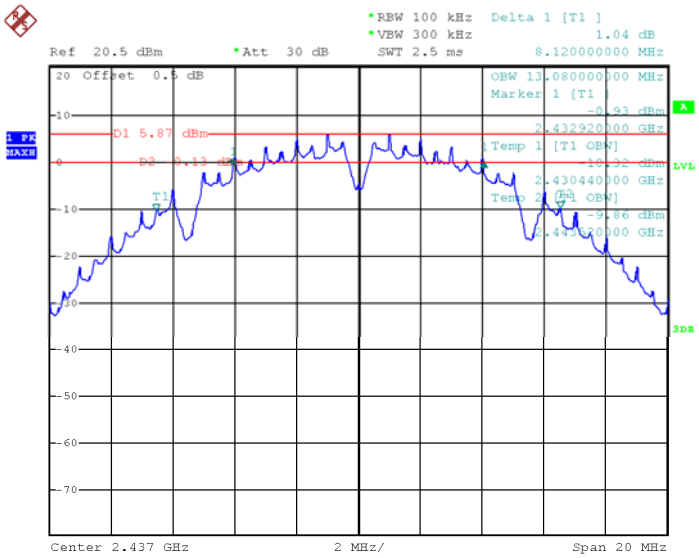
ANT1 Mode: TX 11n HT40 channel 9



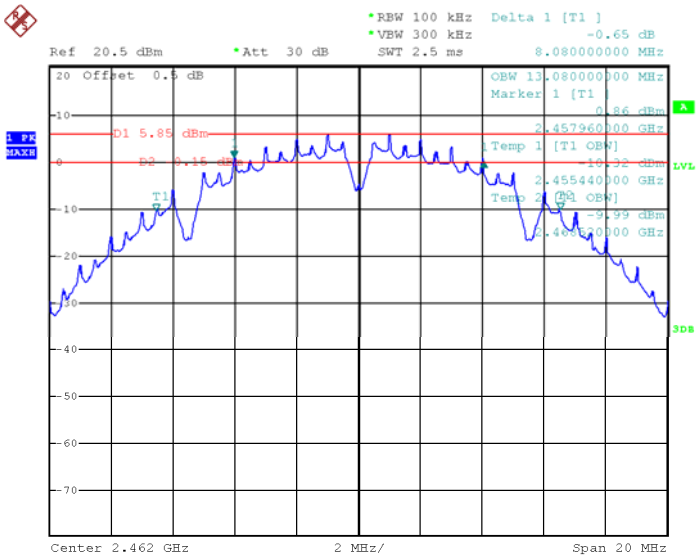
ANT2 Mode: TX 11b channel 1



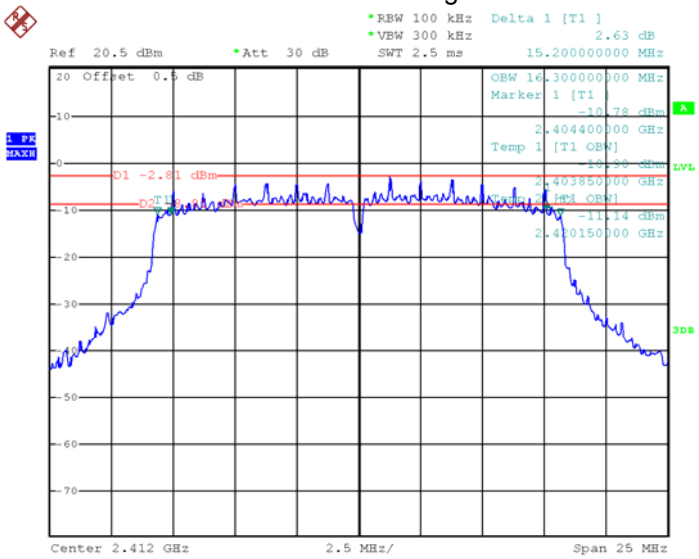
ANT2 Mode: TX 11b channel 6



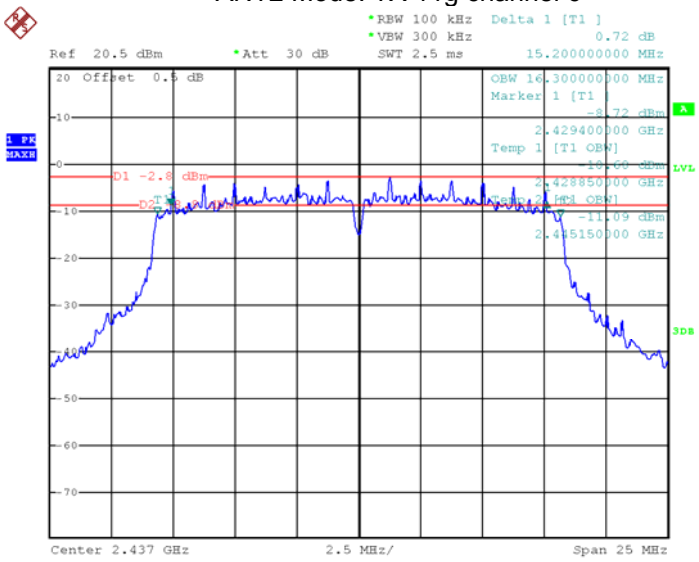
ANT2 Mode: TX 11b channel 11



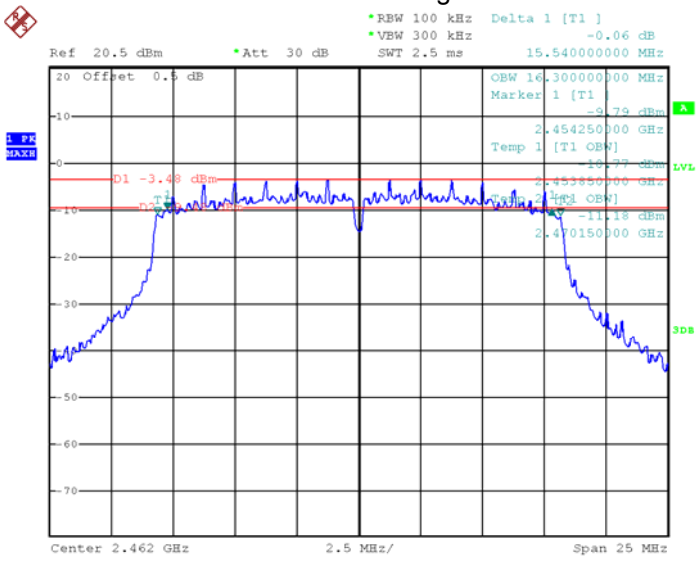
ANT2 Mode: TX 11g channel 1



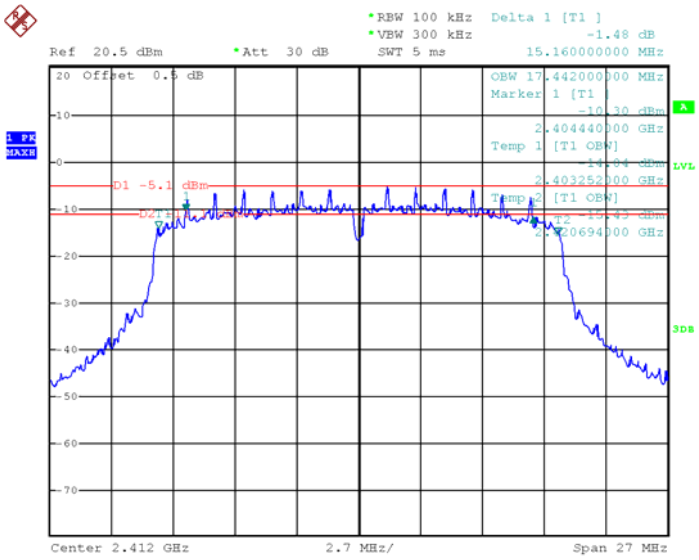
ANT2 Mode: TX 11g channel 6



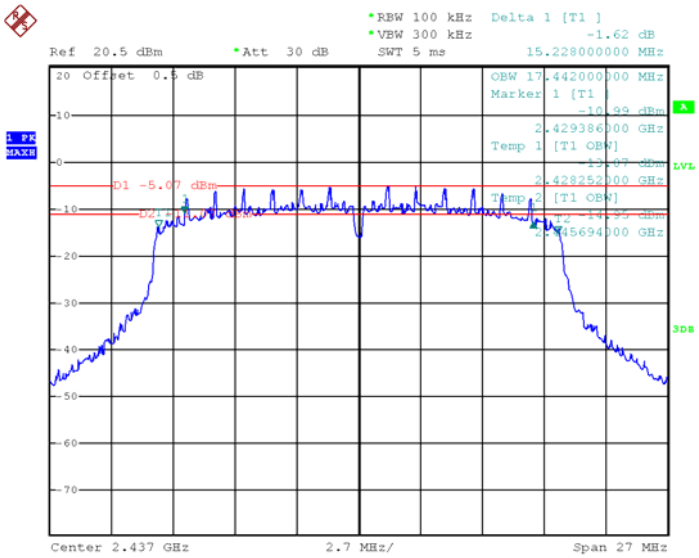
ANT2 Mode: TX 11g channel 11



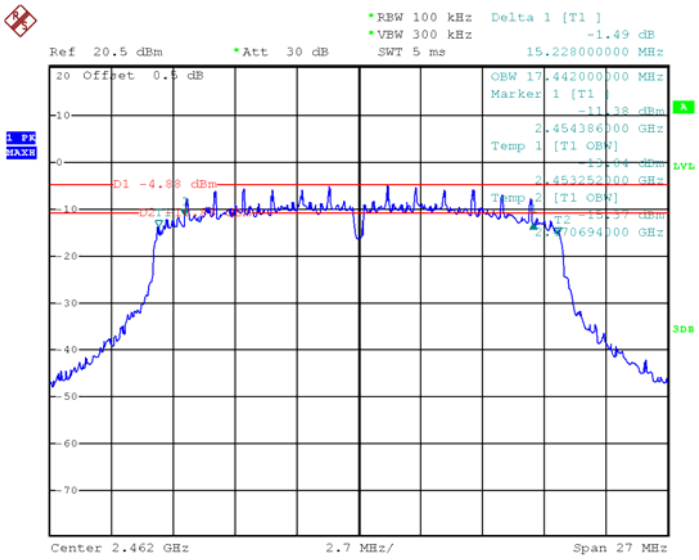
ANT2 Mode: TX 11n HT20 channel 1



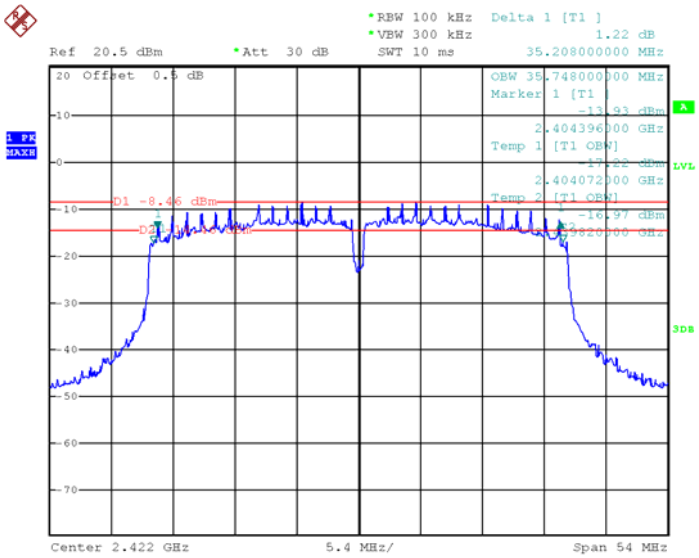
ANT2 Mode: TX 11n HT20 channel 6



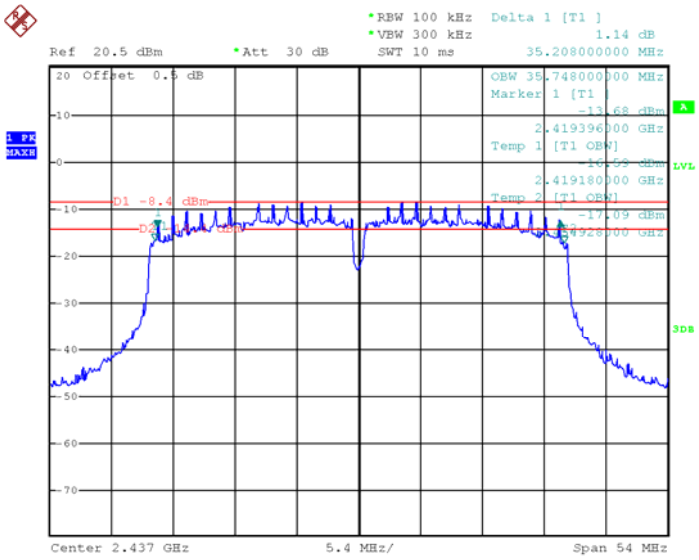
ANT2 Mode: TX 11n HT20 channel 11



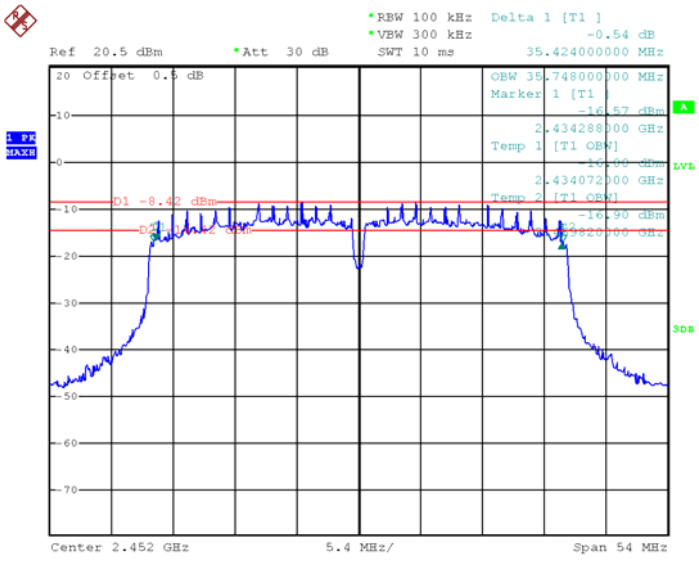
ANT2 Mode: TX 11n HT40 channel 3



ANT2 Mode: TX 11n HT40 channel 6

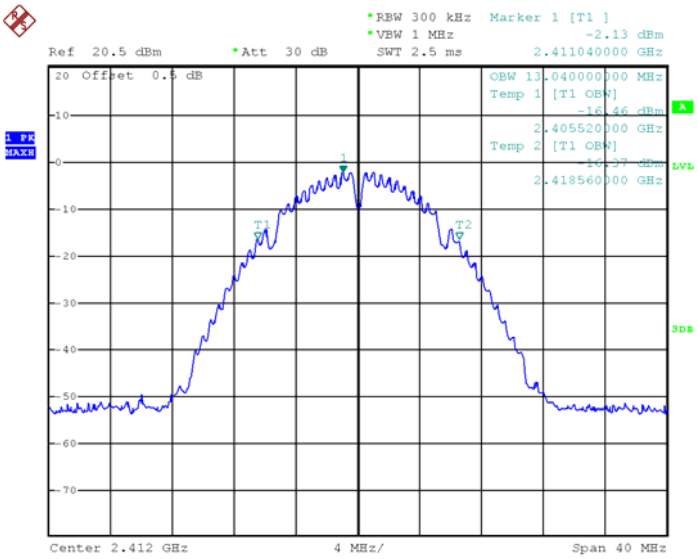


ANT2 Mode: TX 11n HT40 channel 9

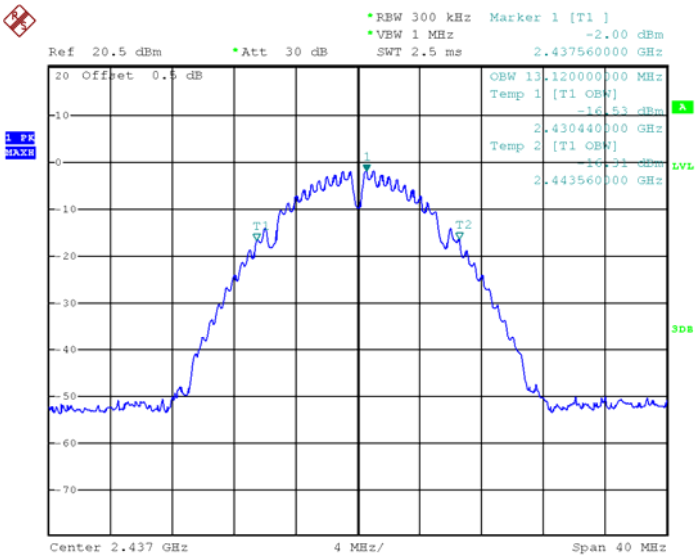


99% Bandwidth Test result plot as follows:

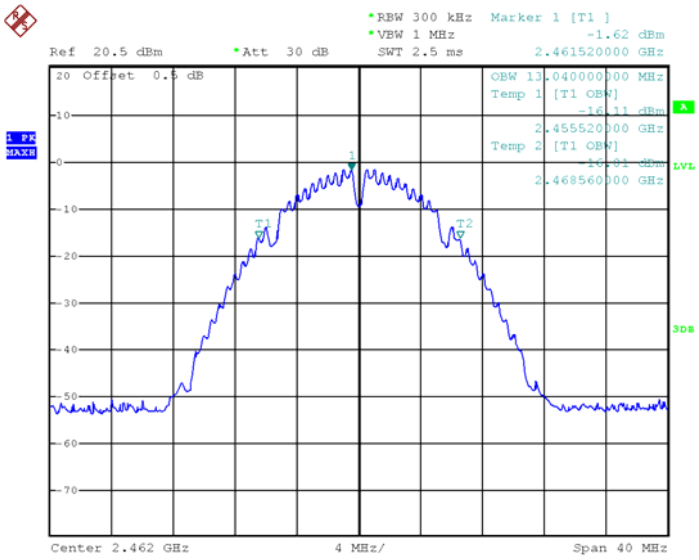
ANT1 Mode: TX 11b channel 1



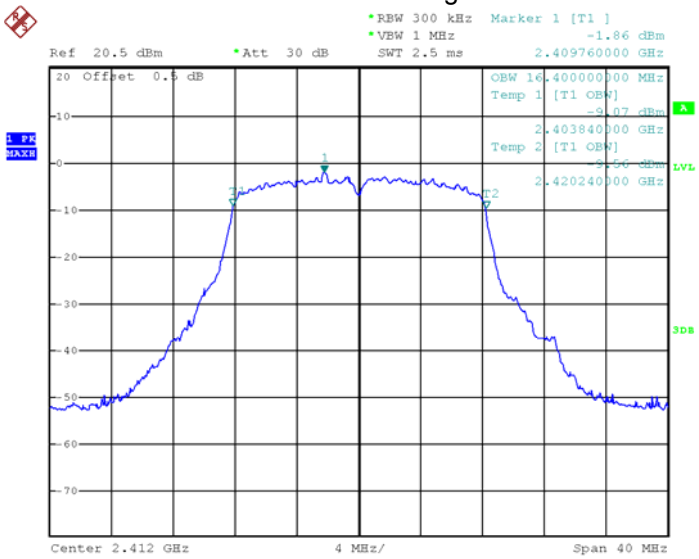
ANT1 Mode: TX 11b channel 6



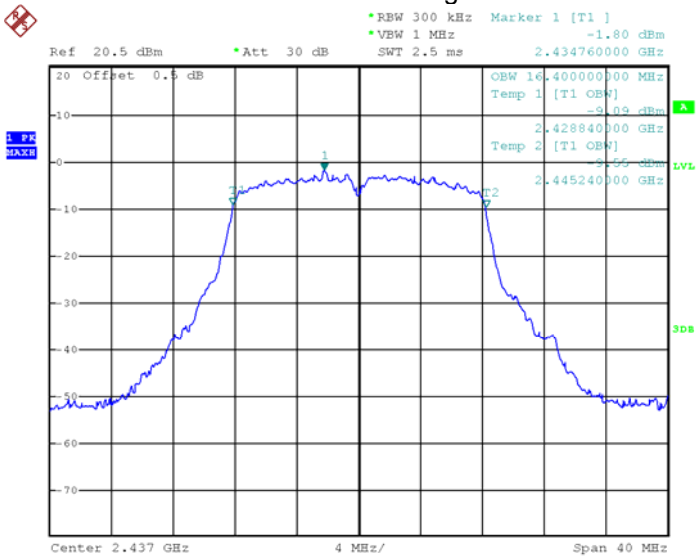
ANT1 Mode: TX 11b channel 11



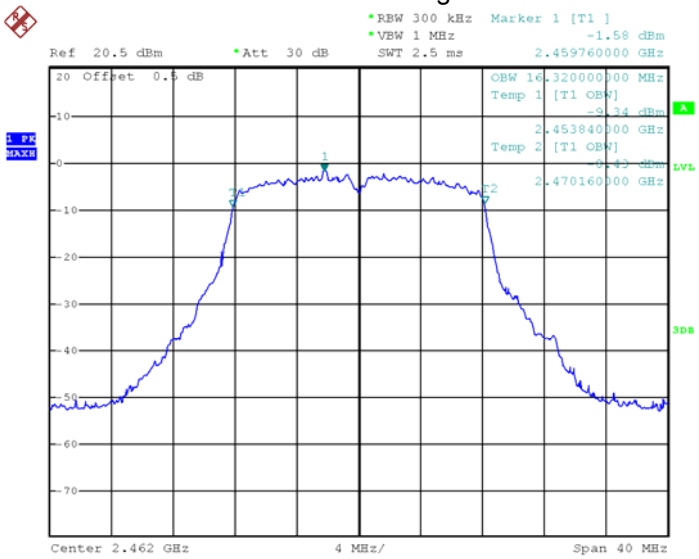
ANT1 Mode: TX 11g channel 1



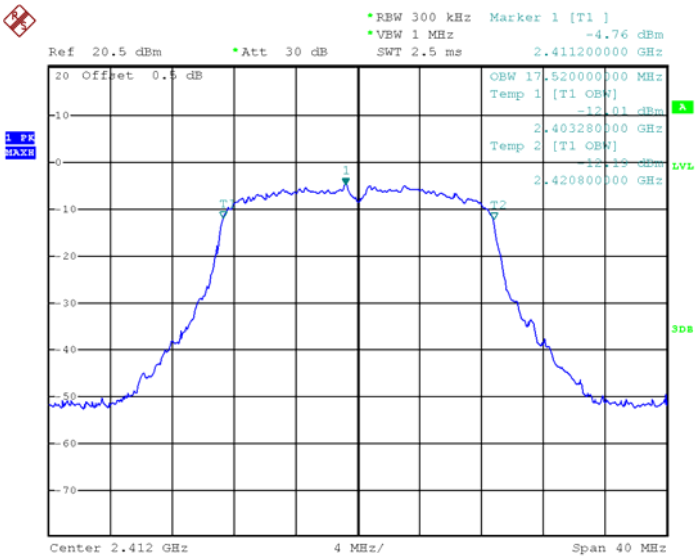
ANT1 Mode: TX 11g channel 6



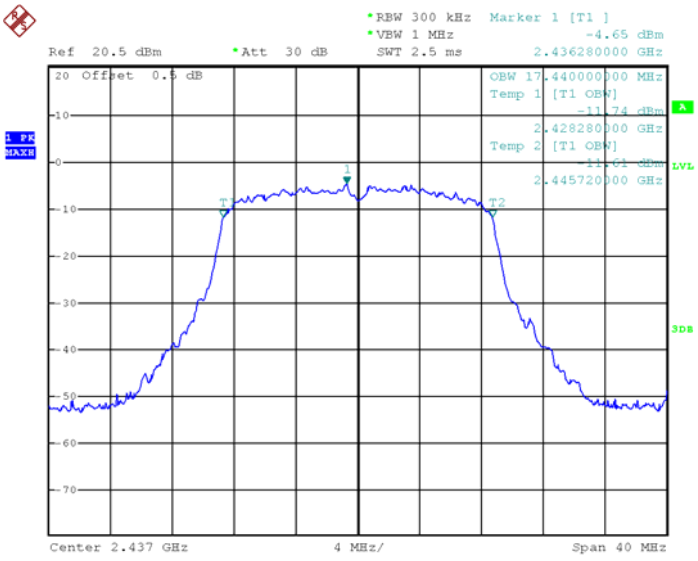
ANT1 Mode: TX 11g channel 11



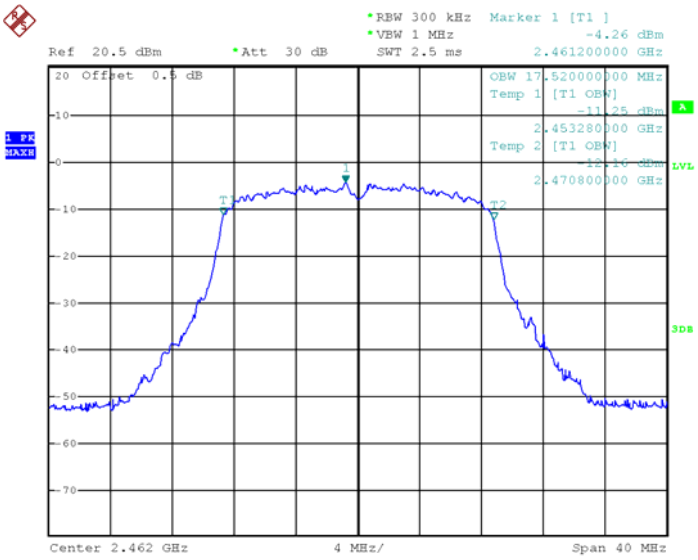
ANT1 Mode: TX 11n HT20 channel 1



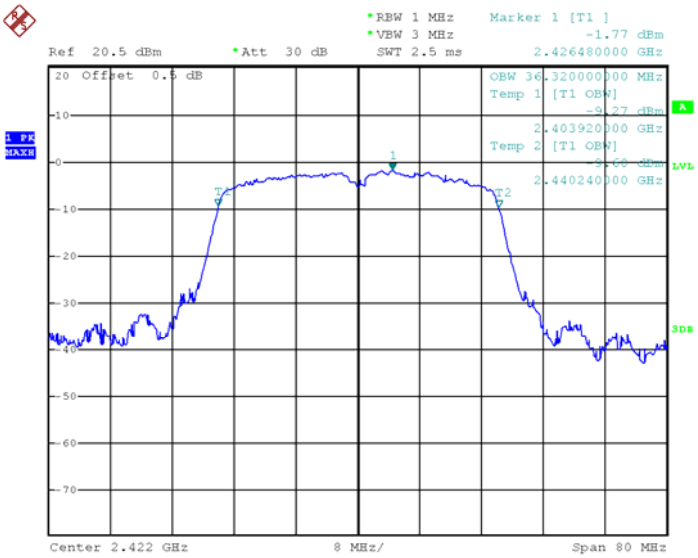
ANT1 Mode: TX 11n HT20 channel 6



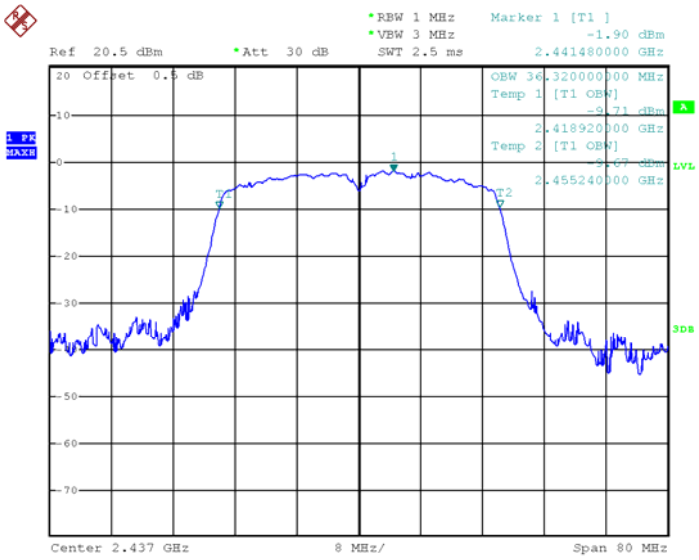
ANT1 Mode: TX 11n HT20 channel 11



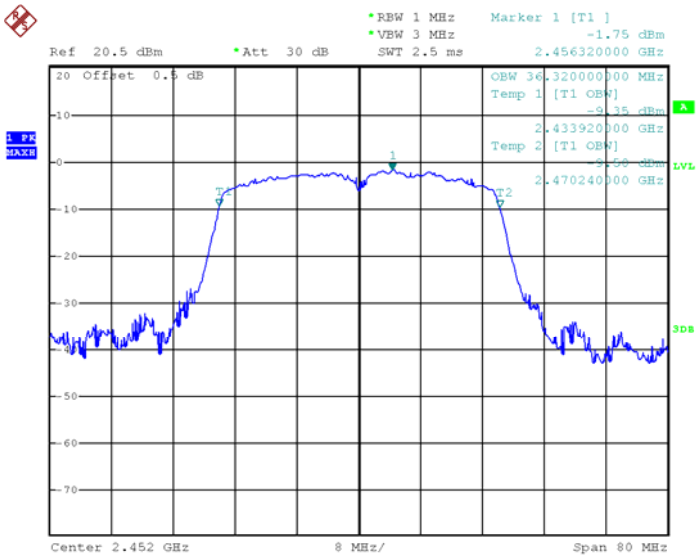
ANT1 Mode: TX 11n HT40 channel 3



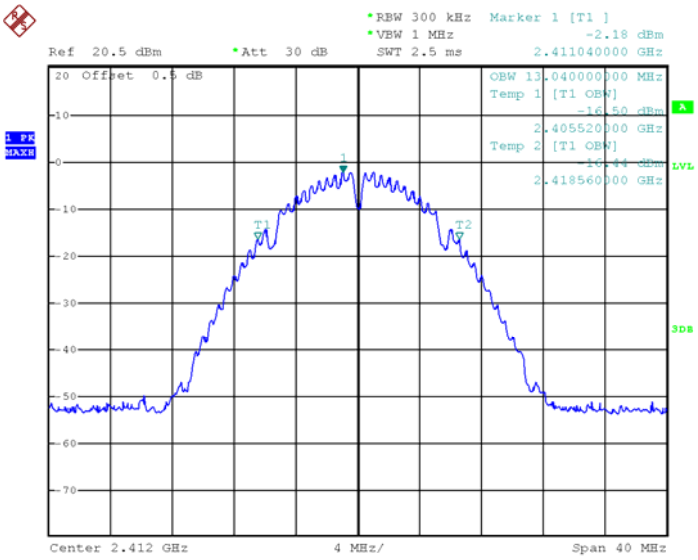
ANT1 Mode: TX 11n HT40 channel 6



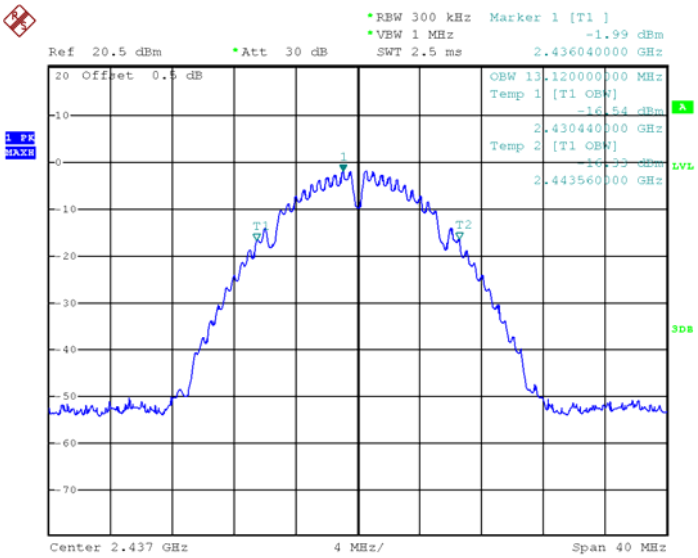
ANT1 Mode: TX 11n HT40 channel 9



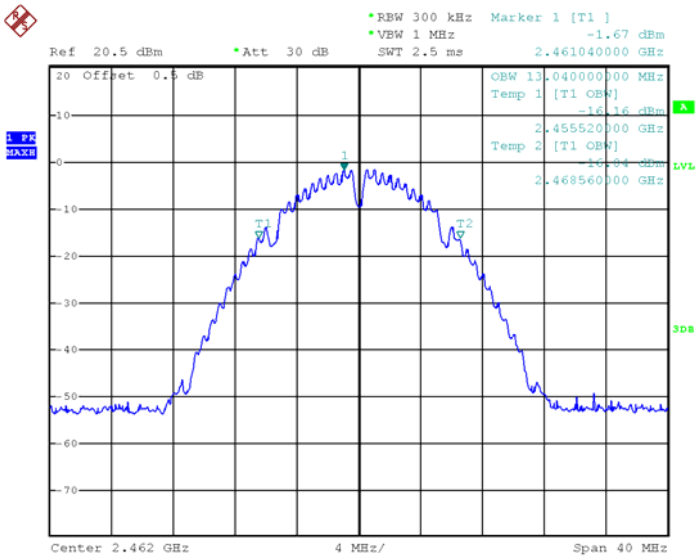
ANT2 Mode: TX 11b channel 1



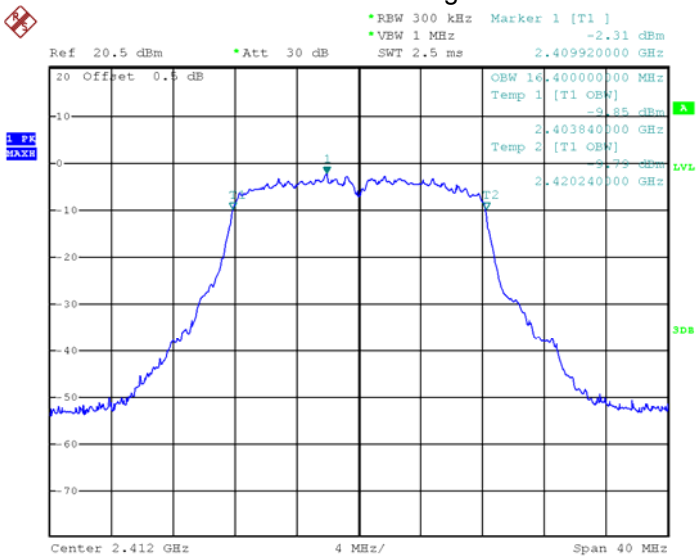
ANT2 Mode: TX 11b channel 6



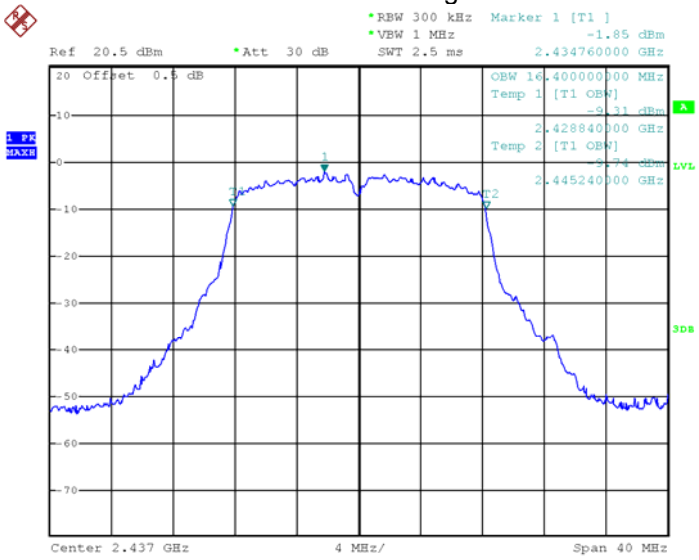
ANT2 Mode: TX 11b channel 11



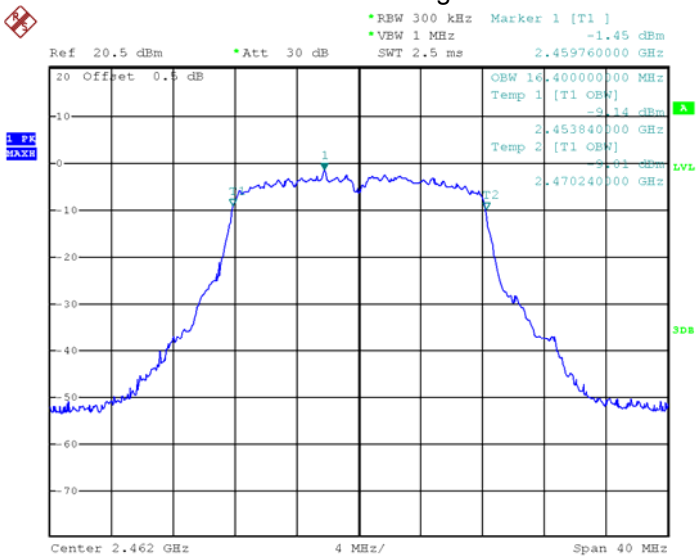
ANT2 Mode: TX 11g channel 1



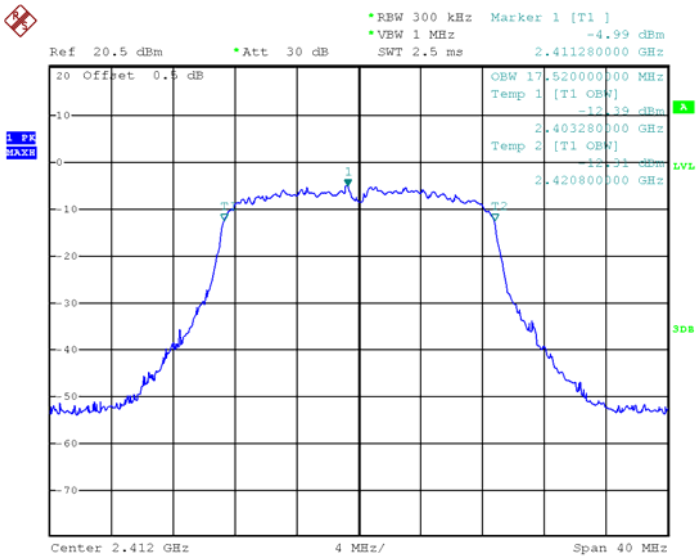
ANT2 Mode: TX 11g channel 6



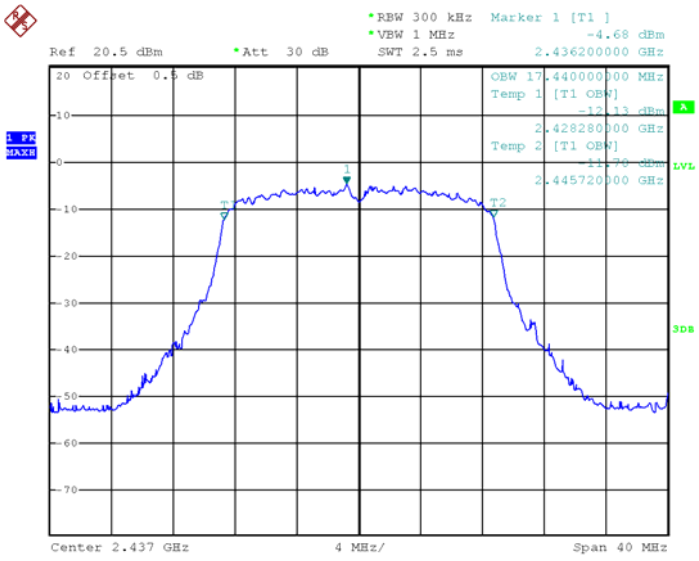
ANT2 Mode: TX 11g channel 11



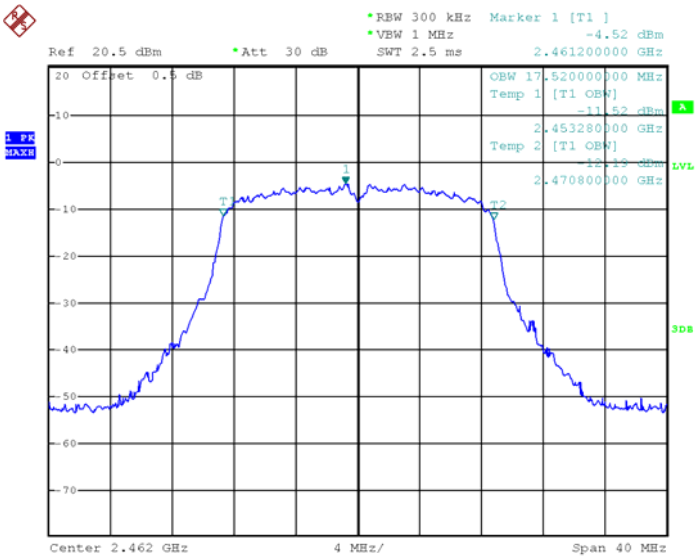
ANT2 Mode: TX 11n HT20 channel 1



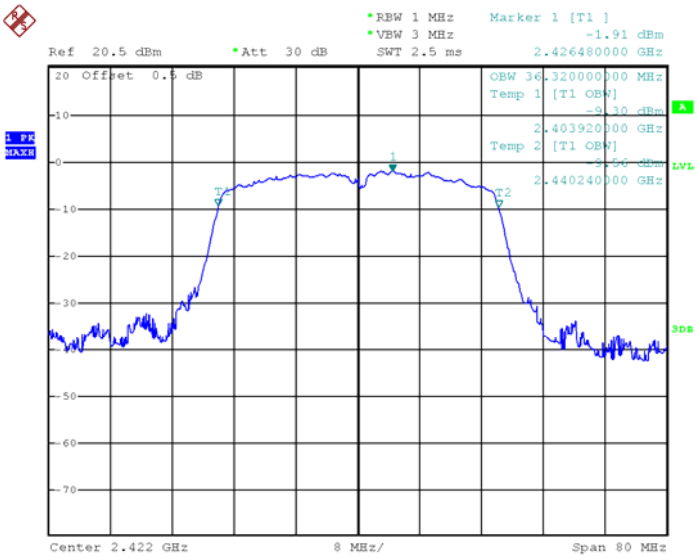
ANT2 Mode: TX 11n HT20 channel 6



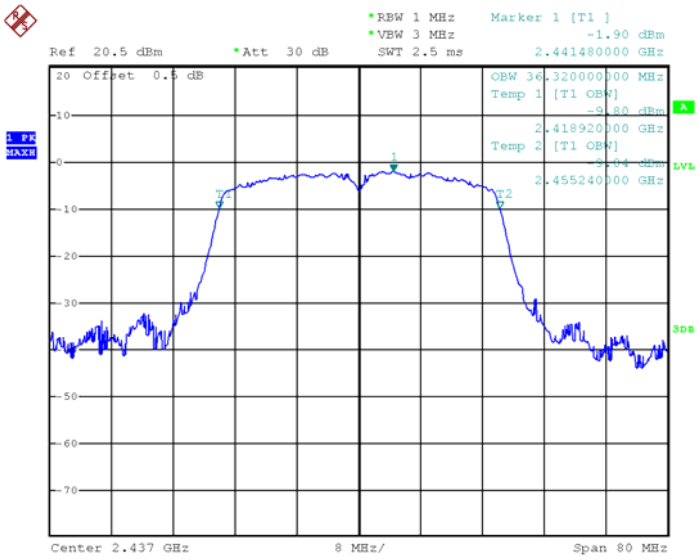
ANT2 Mode: TX 11n HT20 channel 11



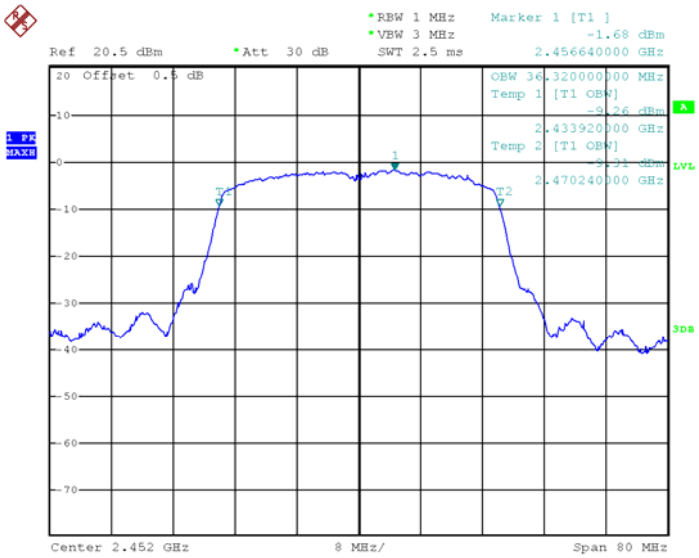
ANT2 Mode: TX 11n HT40 channel 3



ANT2 Mode: TX 11n HT40 channel 6



ANT2 Mode: TX 11n HT40 channel 9



12 Maximum Peak output power

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013
662911 D01 Multiple Transmitter Output v02r01
662911 D02 MIMO with Cross-Polarized Antennas v01

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. Set the spectrum analyzer: RBW = 1 MHz. VBW = 3 MHz. Sweep = auto; Detector Function = RMS, Set the span to fully encompass the DTS bandwidth.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.
4. If The EUT supports multiple transmit chains using options given below:

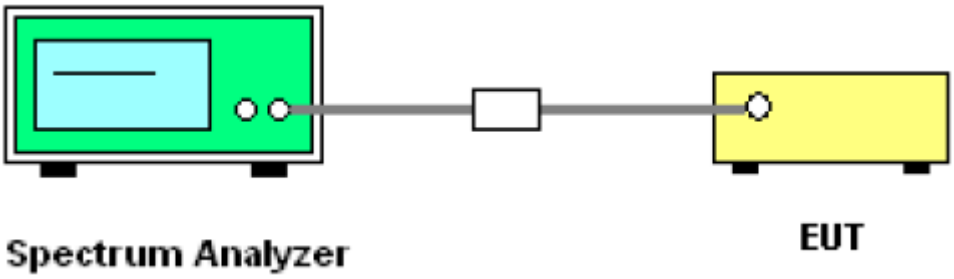
☒In-band power measurements. Refer as FCC KDB 662911, Using the measure-and-sum approach, measured all transmit ports individually. Sum the power (in linear power units e.g., mW) of all ports for each individual sample and save them.

☐EIRP Refer as FCC KDB 662911 calculation could be following as methods:

Ptotal = P1 + P2 +… + Pn (calculated in linear unit [mW] and transfer to log unit [dBm])

EIRPtotal = Ptotal + DG

12.2 Test Setup



12.3 Test Result

ANT1

Test mode :TX 11b		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
15.24	**15.45**	15.28
Limit: 1W/30dBm		

Test mode :TX 11g		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
13.23	13.44	13.48
Limit: 1W/30dBm		

Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
11.14	11.58	11.49
Limit: 1W/30dBm		

Test mode : TX 11n HT40		
Maximum Peak Output Power (dBm)		
2422MHz	2437MHz	2452MHz
11.34	11.42	11.51
Limit: 1W/30dBm		

ANT2

Test mode :TX 11b		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
15.16	15.31	**15.33**
Limit: 1W/30dBm		

Test mode :TX 11g		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
13.37	13.64	13.41
Limit: 1W/30dBm		

Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
11.23	11.51	11.40
Limit: 1W/30dBm		

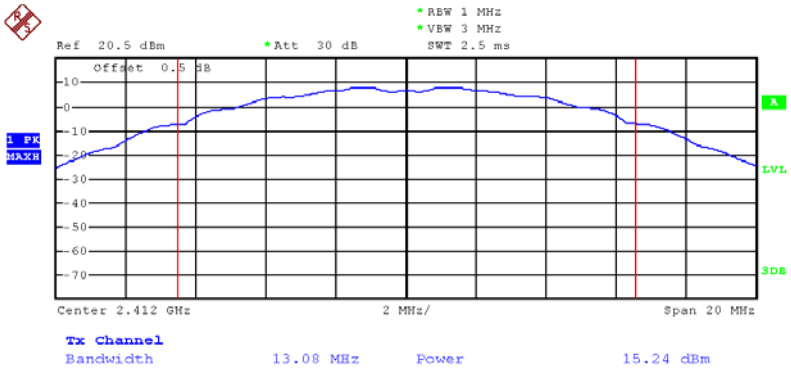
Test mode : TX 11n HT40		
Maximum Peak Output Power (dBm)		
2422MHz	2437MHz	2452MHz
11.29	11.34	11.44
Limit: 1W/30dBm		

ANT1+ANT2

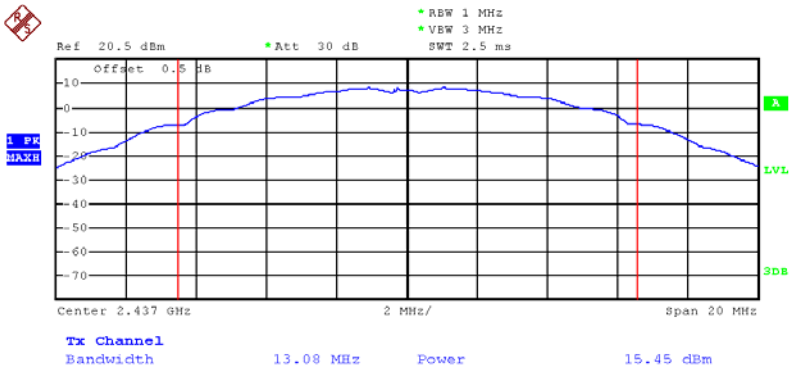
Test mode :TX 11n HT20		
Maximum Peak Output Power (dBm)		
2412MHz	2437MHz	2462MHz
14.20	**14.56**	14.46
Limit: 1W/30dBm		

Test mode : TX 11n HT40		
Maximum Peak Output Power (dBm)		
2422MHz	2437MHz	2452MHz
14.33	14.39	14.49
Limit: 1W/30dBm		

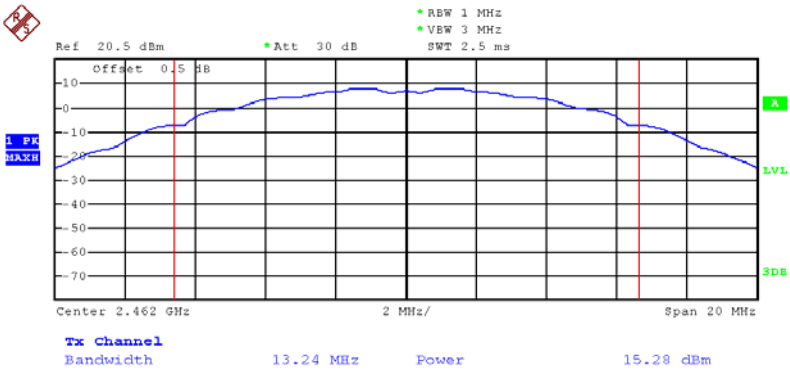
ANT1 Mode: TX 11b 2412MHz



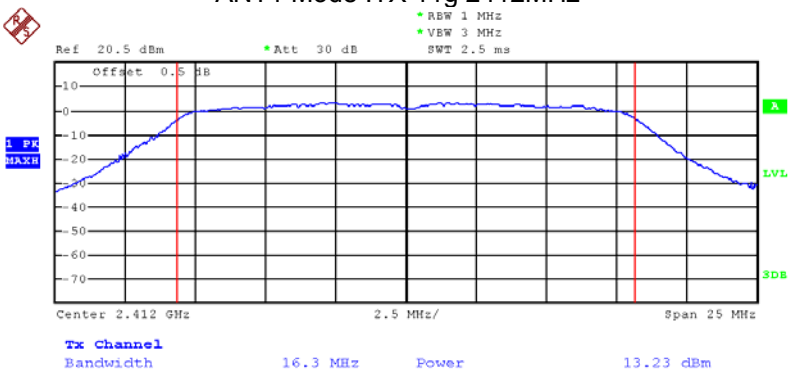
ANT1 Mode: TX 11b 2437MHz



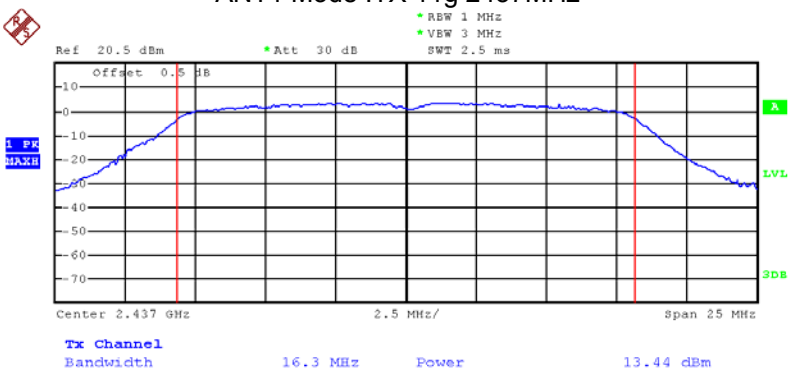
ANT1 Mode: TX 11b 2462MHz



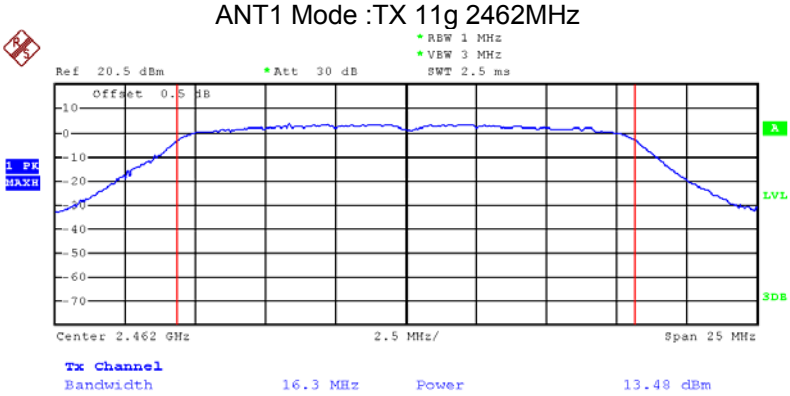
ANT1 Mode :TX 11g 2412MHz



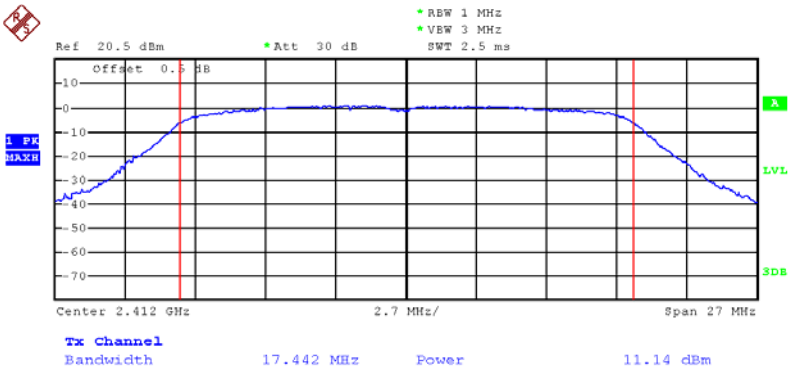
ANT1 Mode :TX 11g 2437MHz



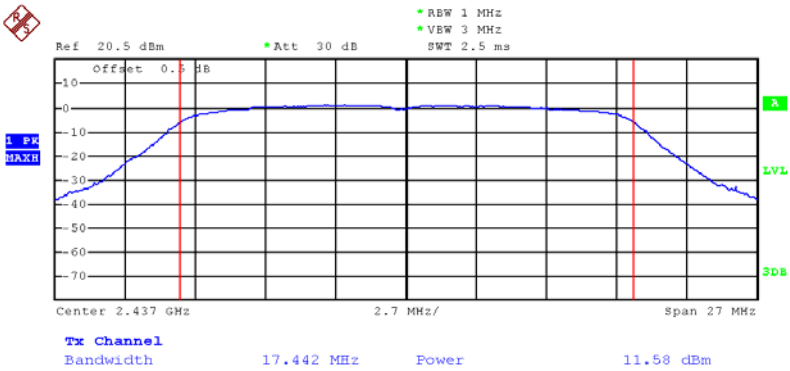
ANT1 Mode :TX 11g 2462MHz



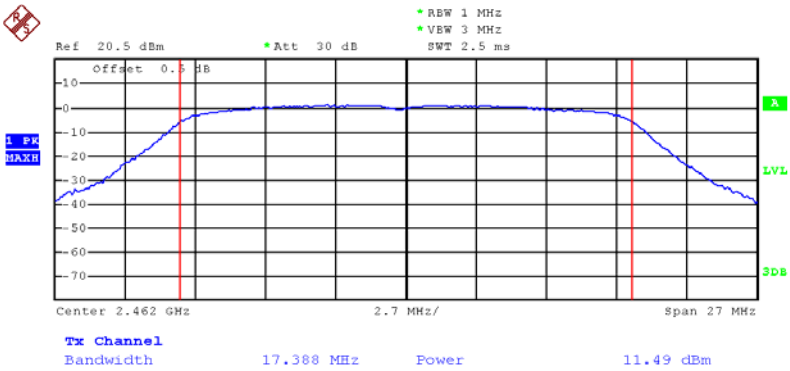
ANT1 Mode: TX 11n HT20 2412MHz



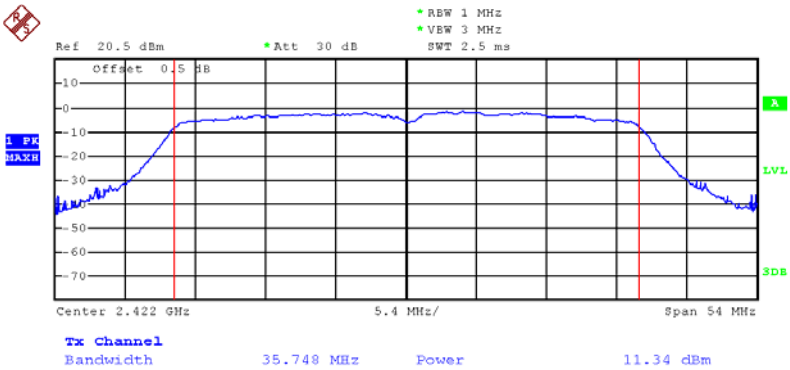
ANT1 Mode: TX 11n HT20 2437MHz



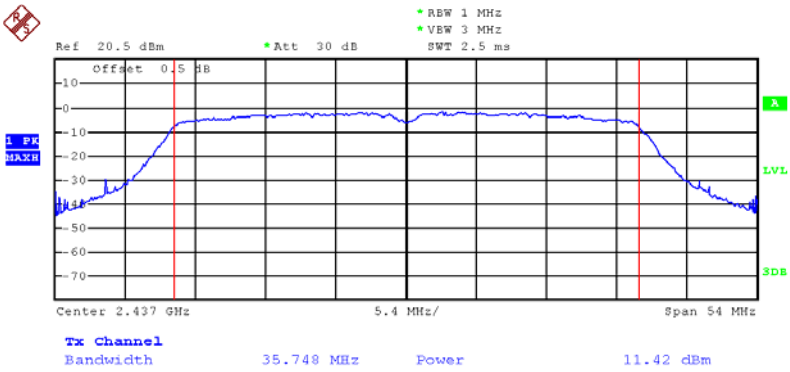
ANT1 Mode: TX 11n HT20 2462MHz



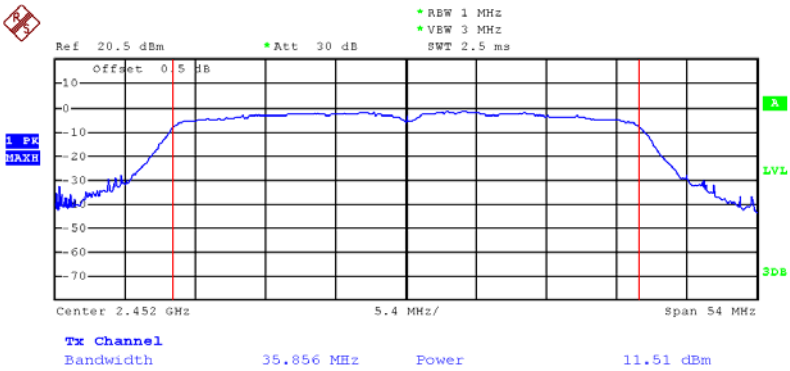
ANT1 Mode: TX 11n HT40 2422MHz



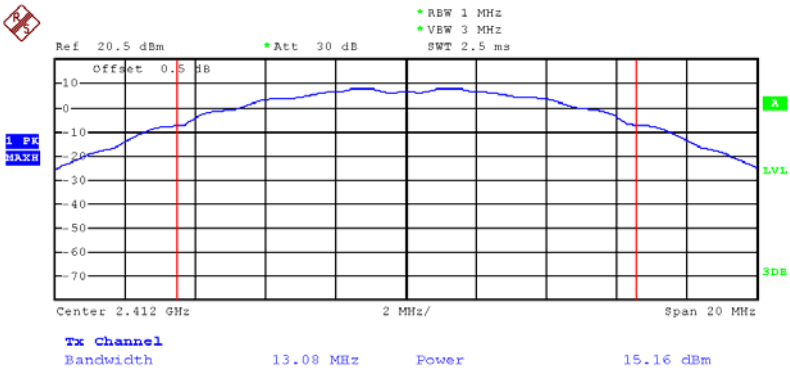
ANT1 Mode: TX 11n HT40 2437MHz



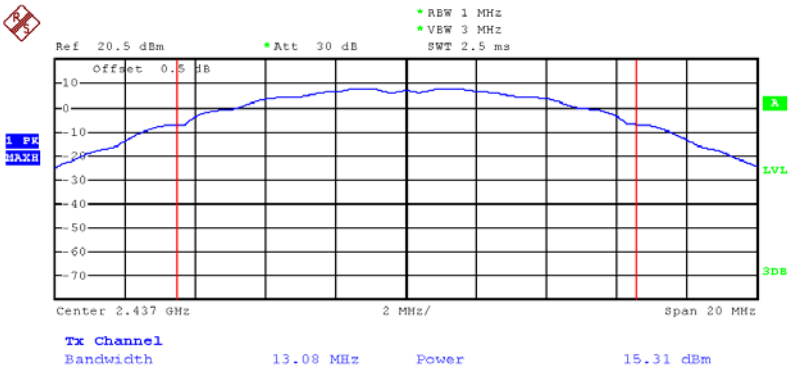
ANT1 Mode: TX 11n HT40 2452MHz



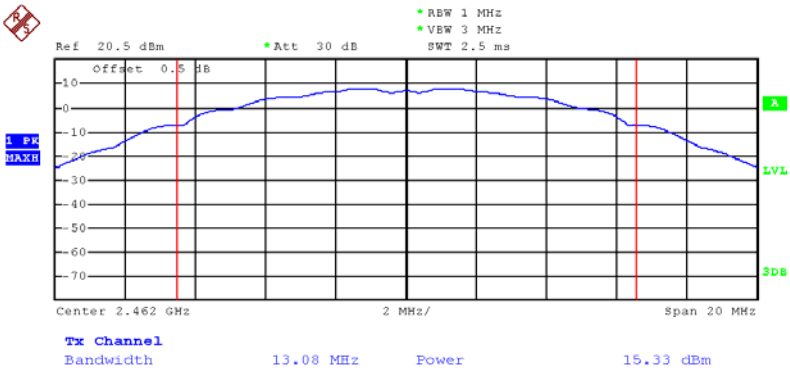
ANT2 Mode: TX 11b 2412MHz



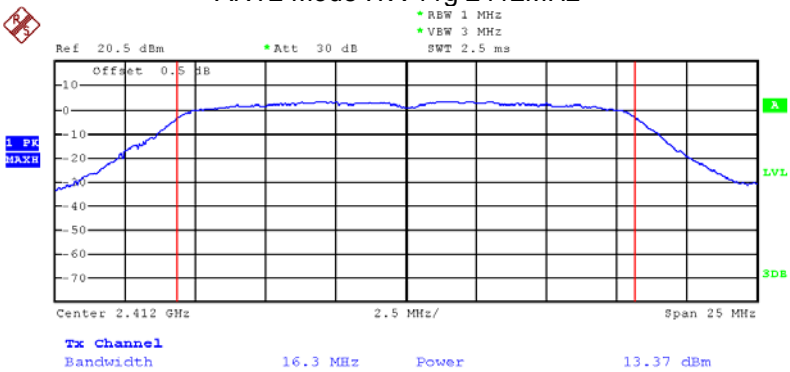
ANT2 Mode: TX 11b 2437MHz



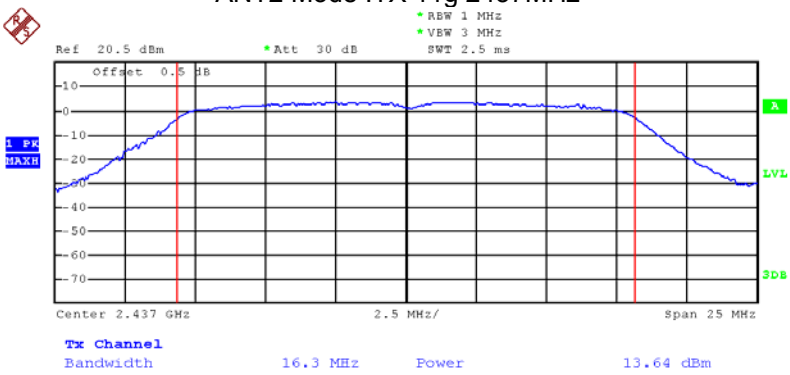
ANT2 Mode: TX 11b 2462MHz



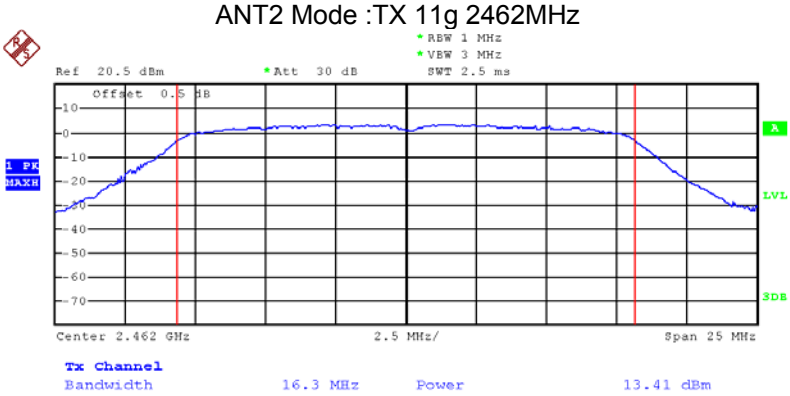
ANT2 Mode :TX 11g 2412MHz



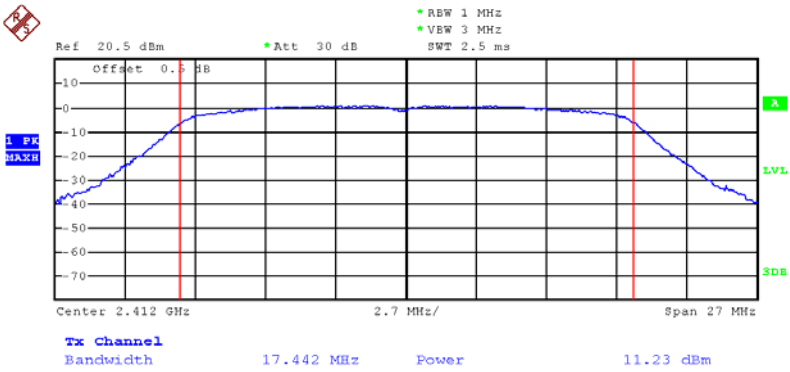
ANT2 Mode :TX 11g 2437MHz



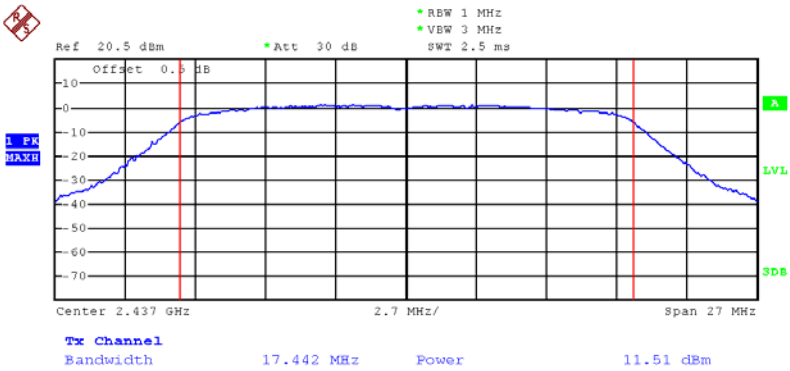
ANT2 Mode :TX 11g 2462MHz



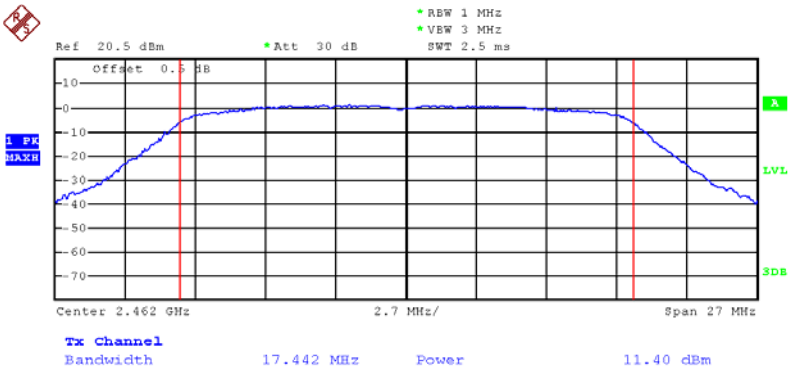
ANT2 Mode: TX 11n HT20 2412MHz



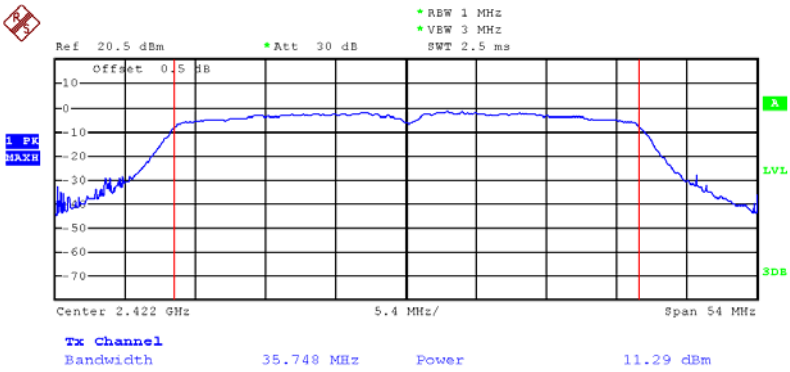
ANT2 Mode: TX 11n HT20 2437MHz



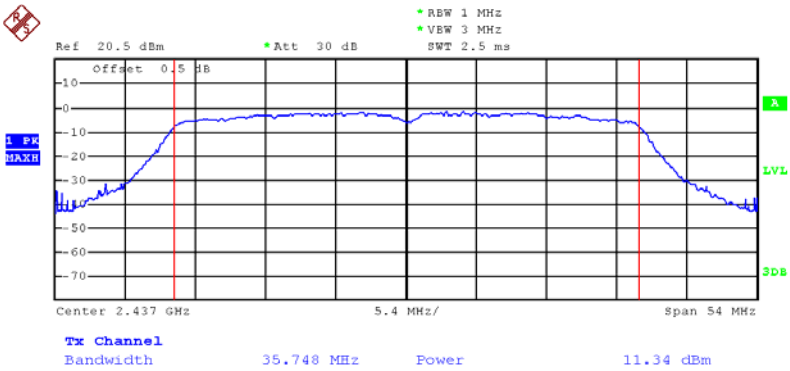
ANT2 Mode: TX 11n HT20 2462MHz



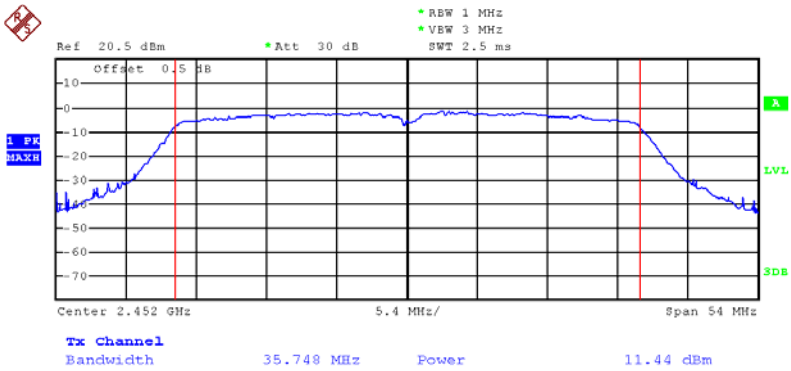
ANT2 Mode: TX 11n HT40 2422MHz



ANT2 Mode: TX 11n HT40 2437MHz



ANT2 Mode: TX 11n HT40 2452MHz



13 Power Spectral density

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: 558074 D01 15.247 Meas Guidance v05r02, ANSI C63.10:2013
662911 D01 Multiple Transmitter Output v02r01
662911 D02 MIMO with Cross-Polarized Antennas v01

13.1 Test Procedure

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

2. Set the spectrum analyzer: RBW = 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.

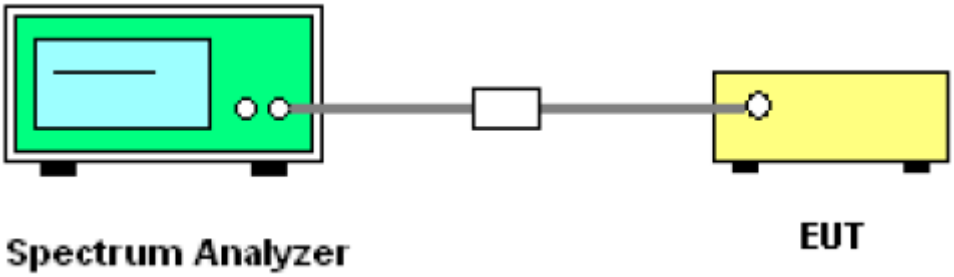
4.If The EUT supports multiple transmit chains using options given below:

☒Option 1: Measure and sum the spectra across the outputs. Refer as FCC KDB 662911, In-band power spectral density (PSD). Sample all transmit ports simultaneously using a spectrum analyzer for each transmit port. Where the trace bin-by-bin of each transmit port summing can be performed. (i.e., in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 and that from the first spectral bin of output 3, and so on up to the NTX output to obtain the value for the first frequency bin of the summed spectrum.). Add up the amplitude (power) values for the different transmit chains and use this as the new data trace.

☐Option 2: Measure and sum spectral maxima across the outputs. Refer as FCC KDB 662911, With this technique, spectra are measured at each output of the device at the required resolution bandwidth. The maximum value (peak) of each spectrum is determined. These maximum values are then summed mathematically in linear power units across the outputs. These operations shall be performed separately over frequency spans that have different out-of-band or spurious emission limits,

☐Option 3: Measure and add 10 log(N) dB, where N is the number of transmit chains. Refer as FCC KDB 662911, In-band power spectral density (PSD). Performed at each transmit chains and each transmit chains shall be compared with the limit have been reduced with 10 log(N). Or each transmit chains shall be add 10 log(N) to compared with the limit.

13.2 Test Setup



13.3 Test Result

ANT1

Test mode :TX 11b		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-13.50	-14.51	-13.05
Limit: 8dBm per 3kHz		

Test mode :TX 11g		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-16.13	-15.65	-15.93
Limit: 8dBm per 3kHz		

Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-23.19	-23.44	-21.36
Limit: 8dBm per 3kHz		

Test mode : TX 11n HT40		
Power Spectral (dBm per 3kHz)		
2422MHz	2437MHz	2452MHz
-25.33	-25.01	-26.47
Limit: 8dBm per 3kHz		

ANT2

Test mode :TX 11b		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-13.11	-14.21	-13.54
Limit: 8dBm per 3kHz		

Test mode :TX 11g		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-16.16	-14.89	-14.34
Limit: 8dBm per 3kHz		

Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-24.08	-24.12	-20.82
Limit: 8dBm per 3kHz		

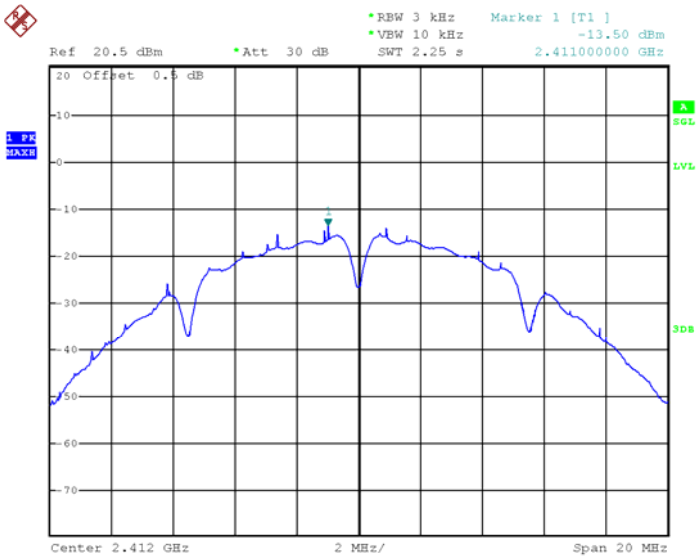
Test mode : TX 11n HT40		
Power Spectral (dBm per 3kHz)		
2422MHz	2437MHz	2452MHz
-25.28	-25.83	-25.31
Limit: 8dBm per 3kHz		

ANT1+ANT2

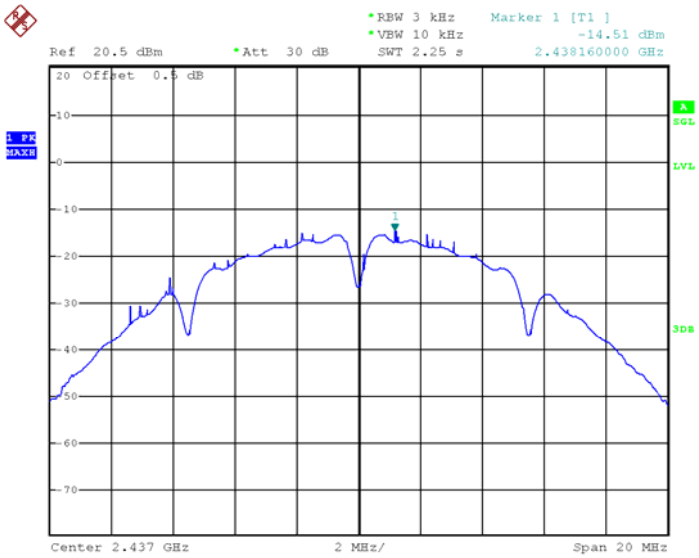
Test mode :TX 11n HT20		
Power Spectral (dBm per 3kHz)		
2412MHz	2437MHz	2462MHz
-20.60	-20.76	-18.07
Limit: 8dBm per 3kHz		

Test mode : TX 11n HT40		
Power Spectral (dBm per 3kHz)		
2422MHz	2437MHz	2452MHz
-22.29	-22.37	-22.84
Limit: 8dBm per 3kHz		

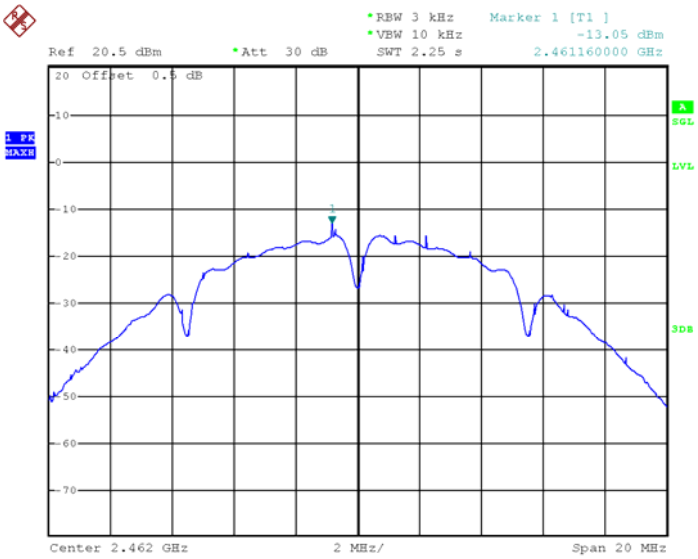
ANT1 Mode: TX 11b 2412MHz



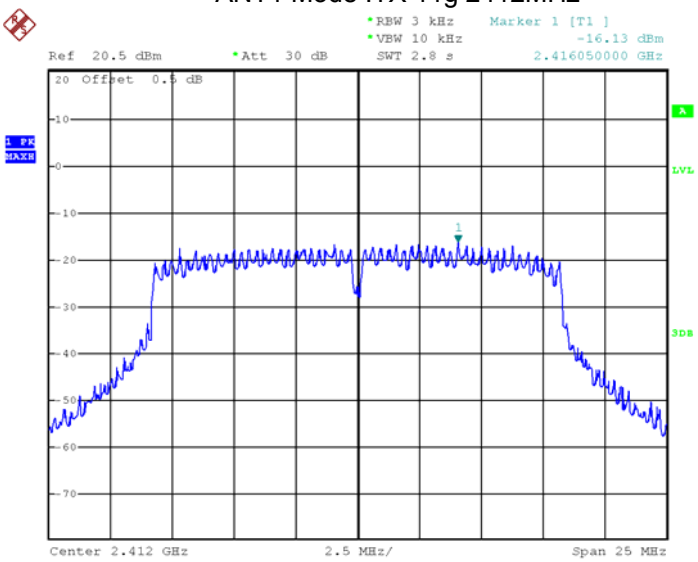
ANT1 Mode: TX 11b 2437MHz



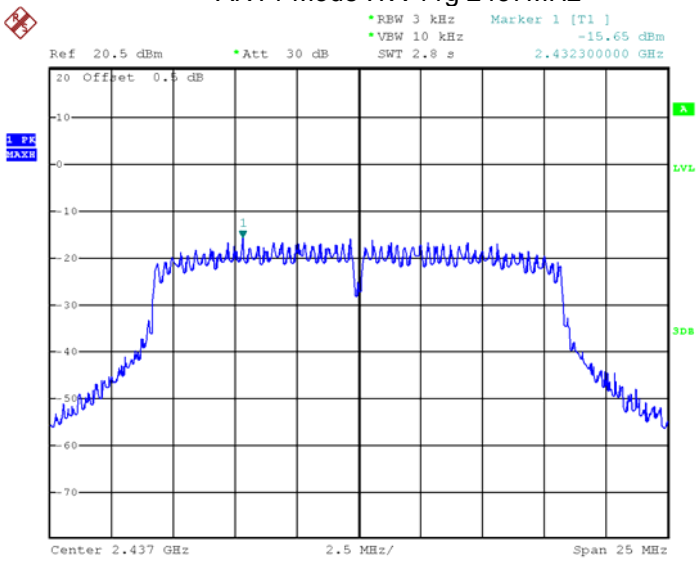
ANT1 Mode: TX 11b 2462MHz



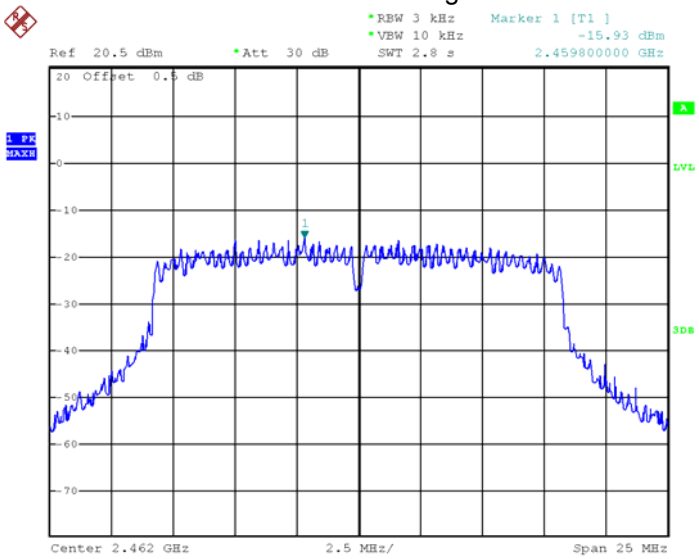
ANT1 Mode :TX 11g 2412MHz



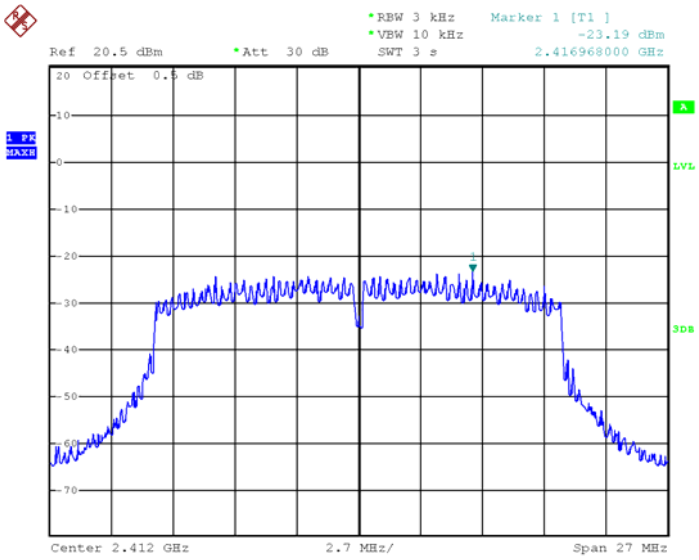
ANT1 Mode :TX 11g 2437MHz



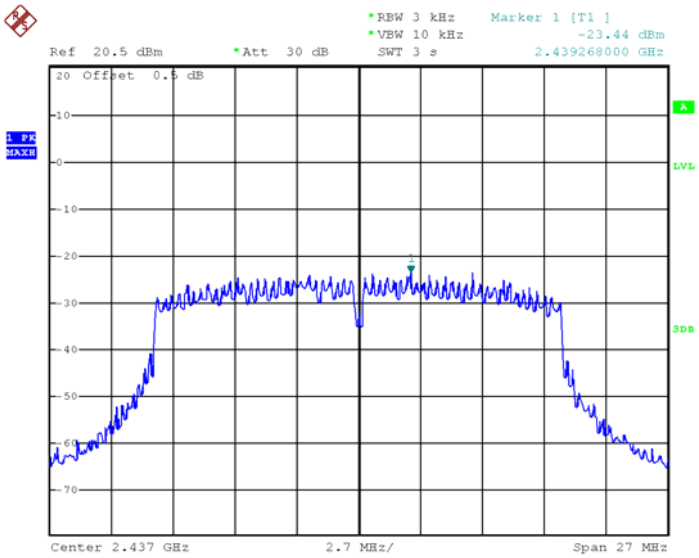
ANT1 Mode :TX 11g 2462MHz



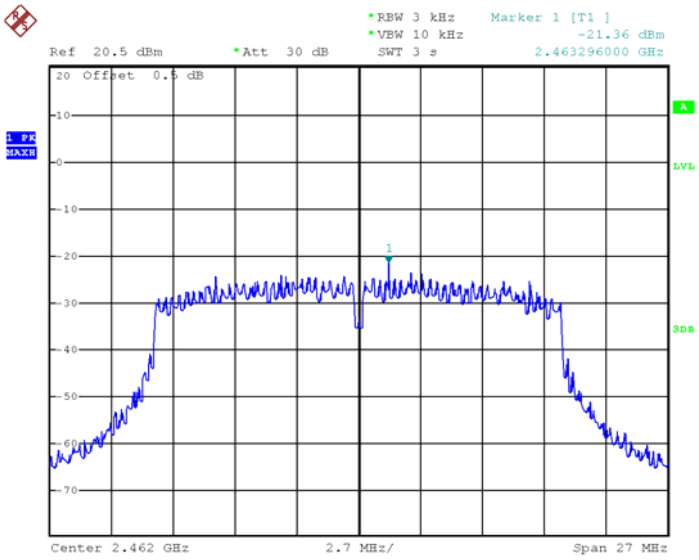
ANT1 Mode: TX 11n HT20 2412MHz



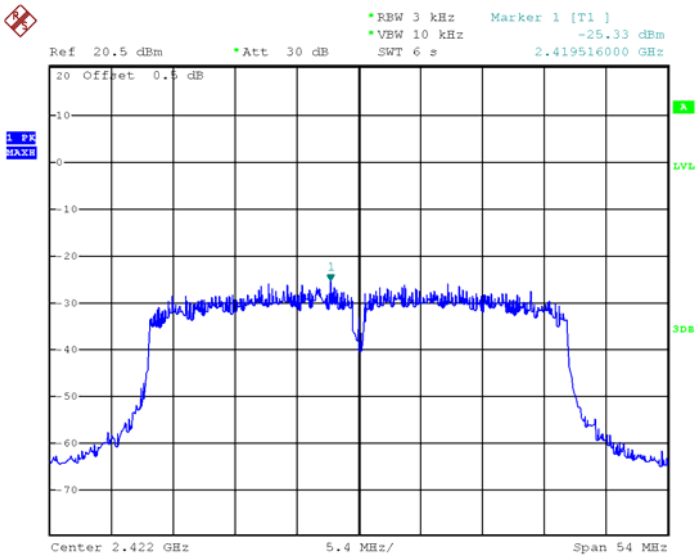
ANT1 Mode: TX 11n HT20 2437MHz



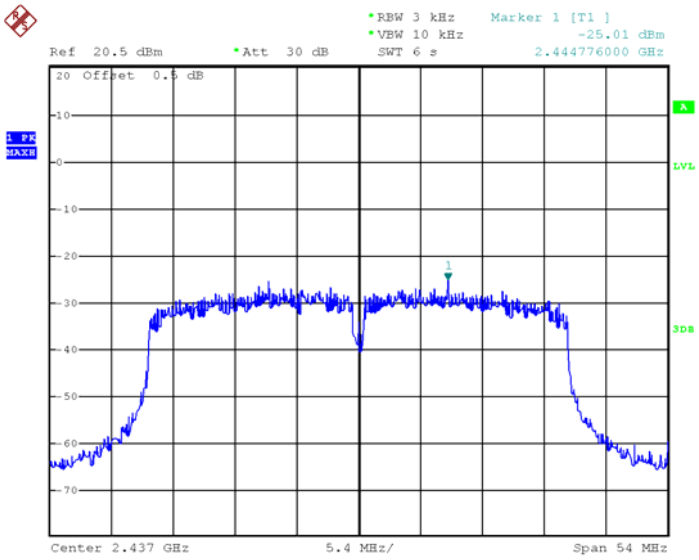
ANT1 Mode: TX 11n HT20 2462MHz



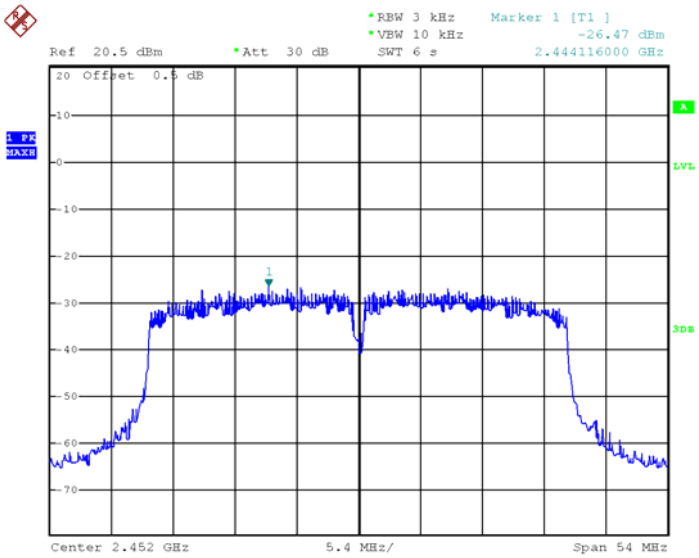
ANT1 Mode: TX 11n HT40 2422MHz



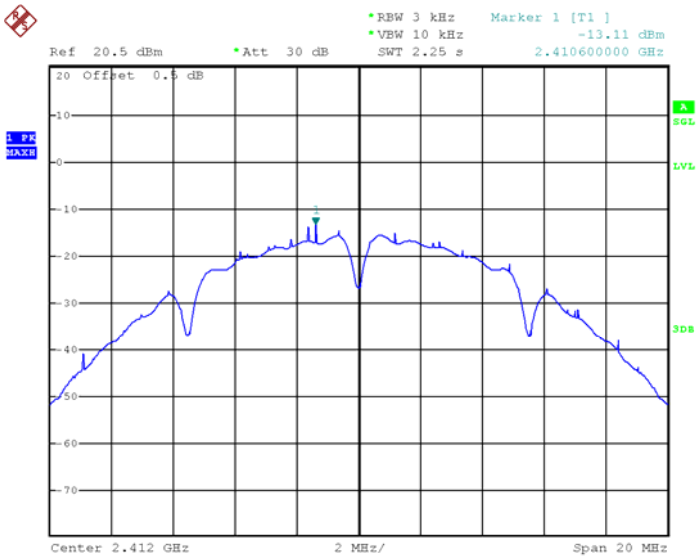
ANT1 Mode: TX 11n HT40 2437MHz



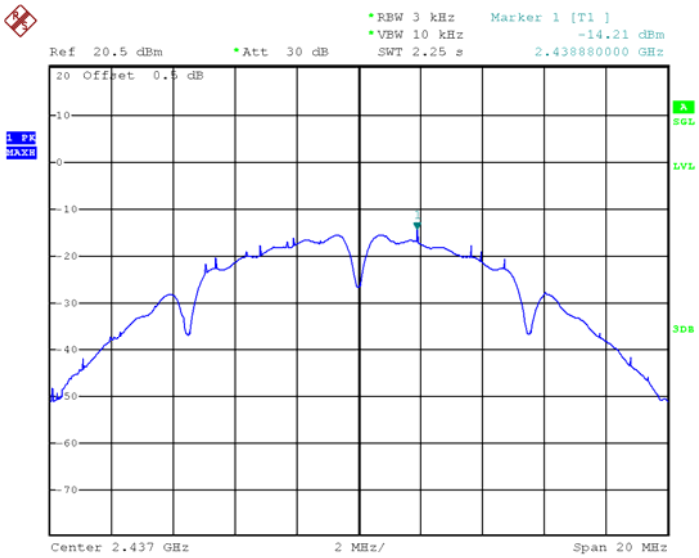
ANT1 Mode: TX 11n HT40 2452MHz



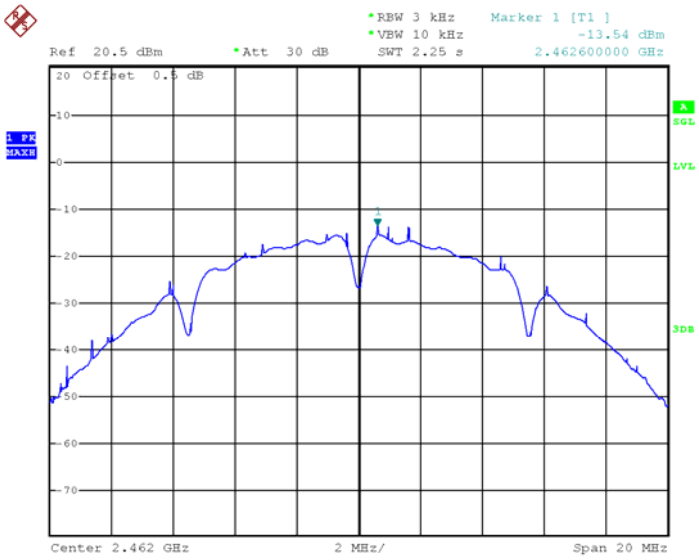
ANT2 Mode: TX 11b 2412MHz



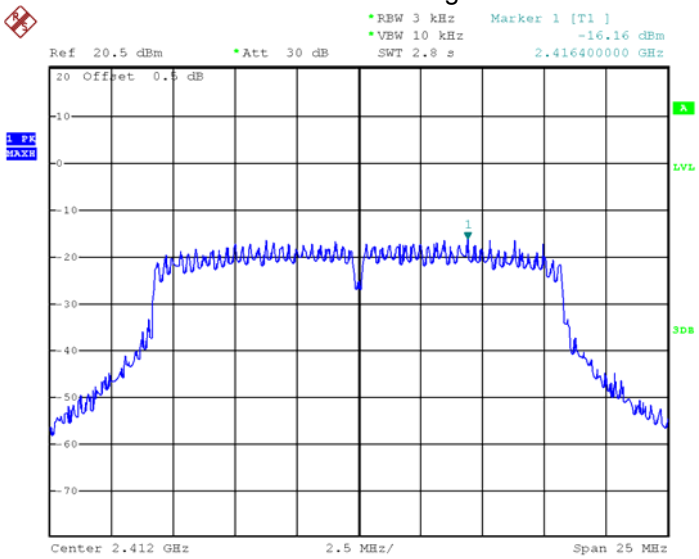
ANT2 Mode: TX 11b 2437MHz



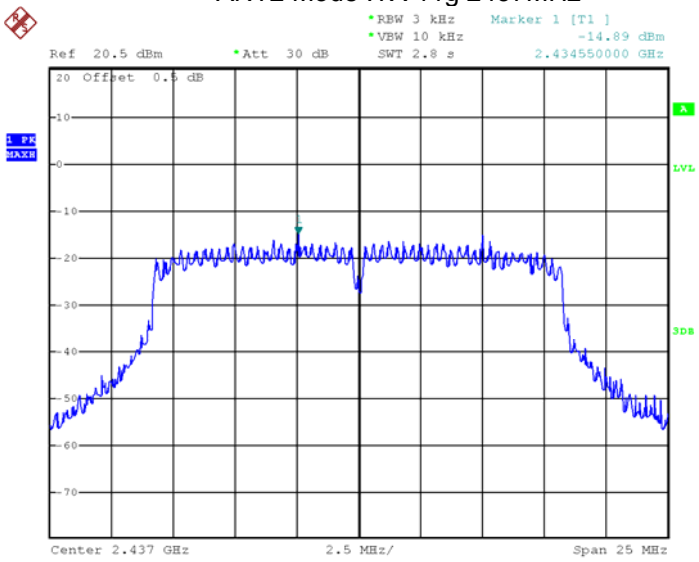
ANT2 Mode: TX 11b 2462MHz



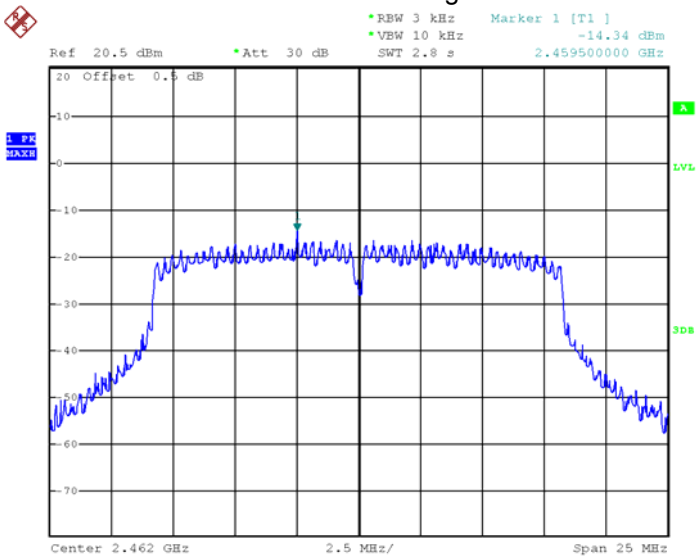
ANT2 Mode :TX 11g 2412MHz



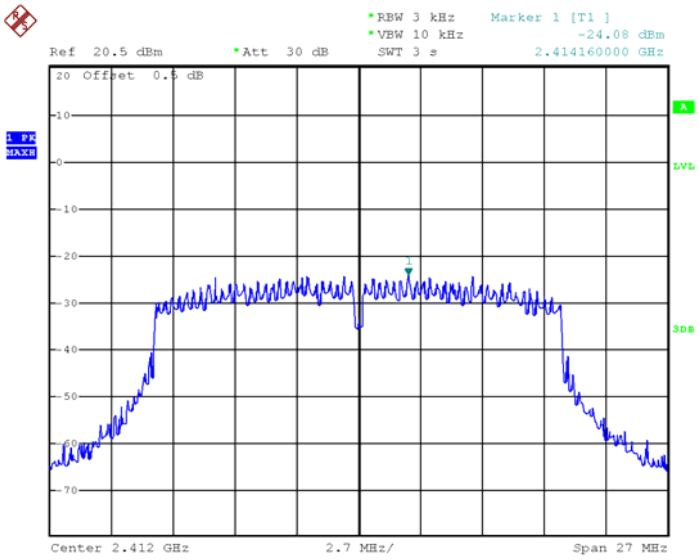
ANT2 Mode :TX 11g 2437MHz



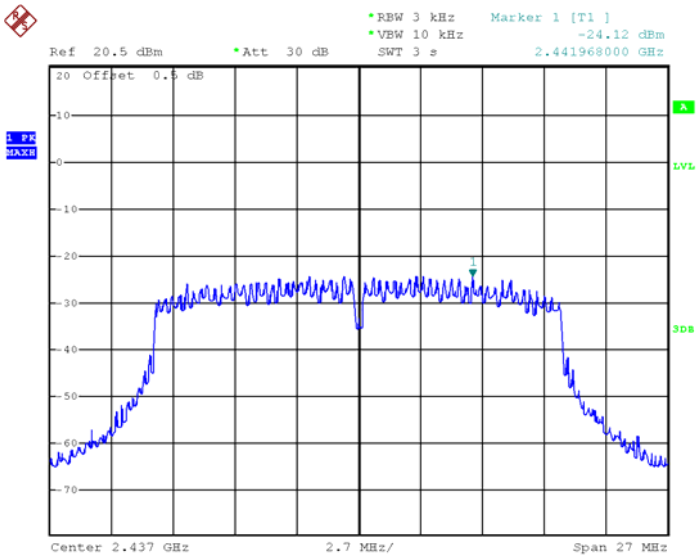
ANT2 Mode :TX 11g 2462MHz



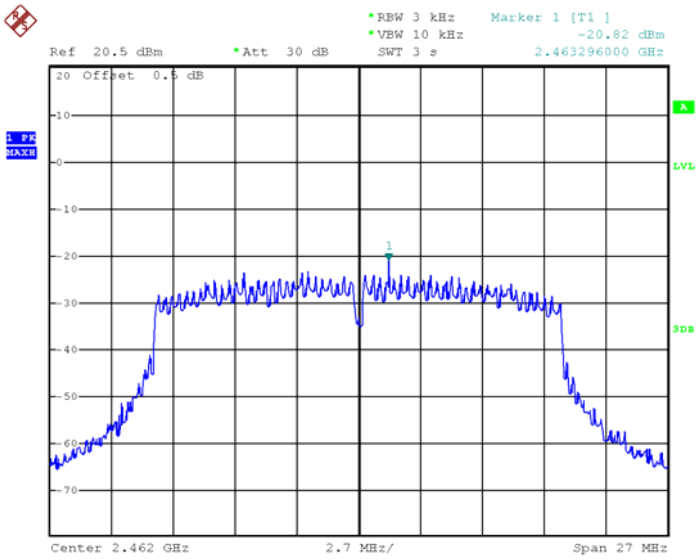
ANT2 Mode: TX 11n HT20 2412MHz



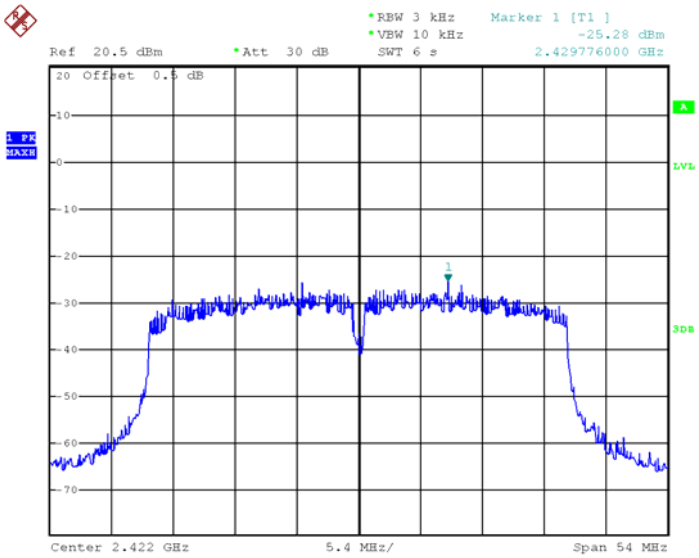
ANT2 Mode: TX 11n HT20 2437MHz



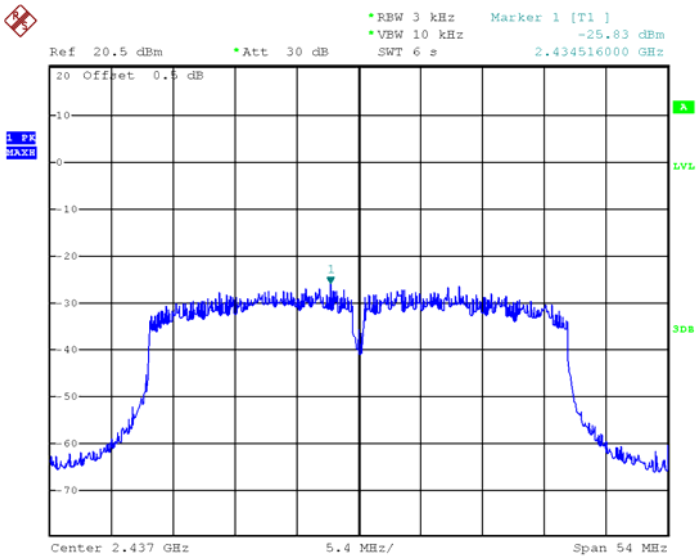
ANT2 Mode: TX 11n HT20 2462MHz



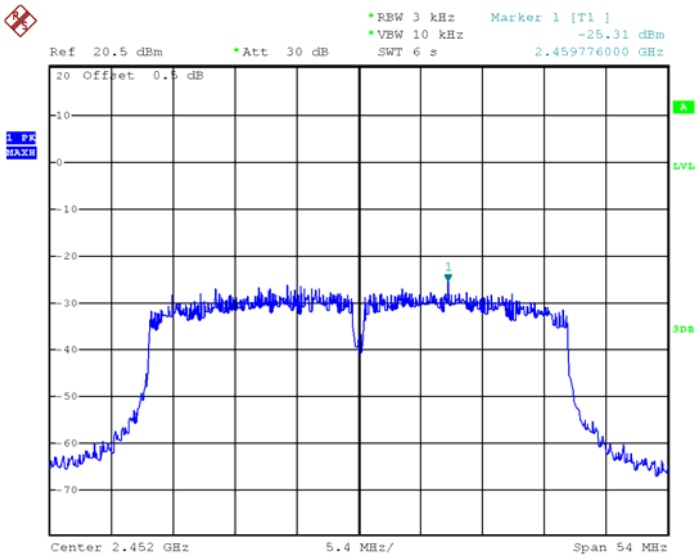
ANT2 Mode: TX 11n HT40 2422MHz



ANT2 Mode: TX 11n HT40 2437MHz



ANT2 Mode: TX 11n HT40 2452MHz



14 Antenna Requirement

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

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

Result:

The EUT has two Internal Integrated Antenna, meets the requirements of FCC 15.203.

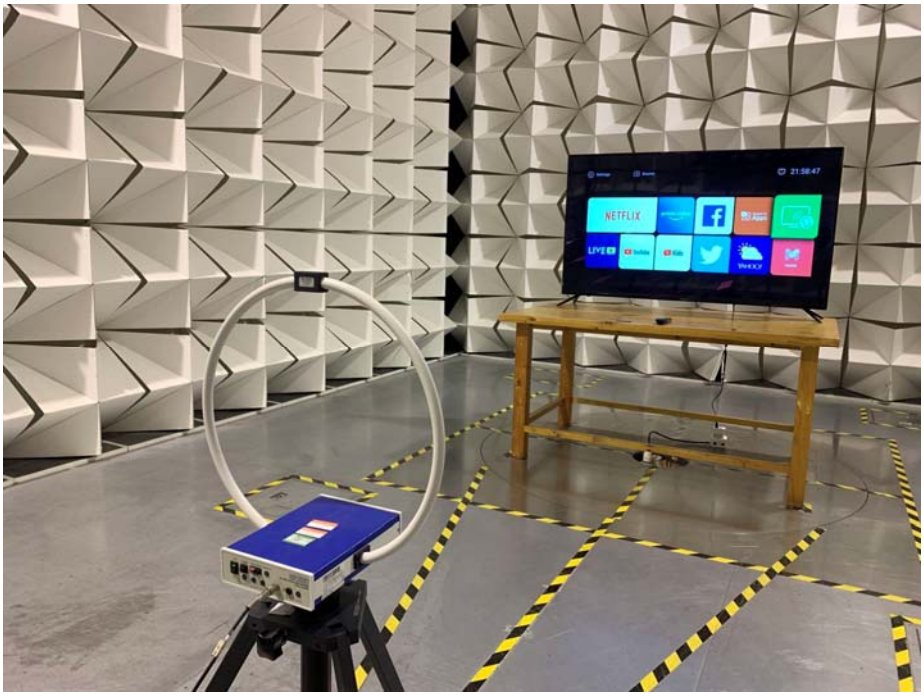
15 FCC ID: 2AV6X-65T7U RF Exposure Report

Note: Please refer to RF Exposure Report: WTS20S04018065W002.

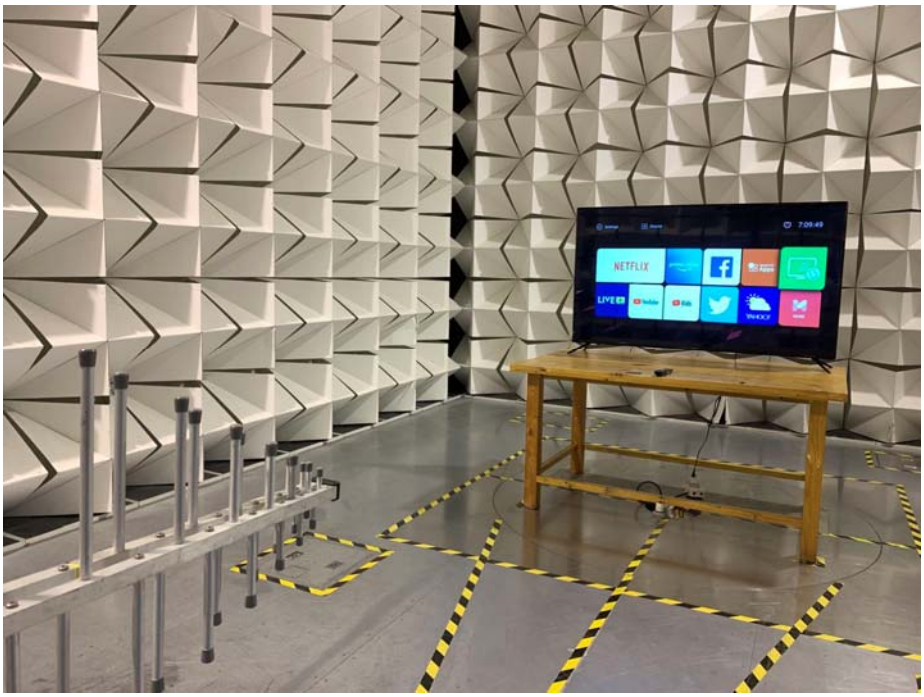
16 Photographs – Model 65T7U Test Setup

16.1 Radiated Emission

Test frequency Below 30MHz

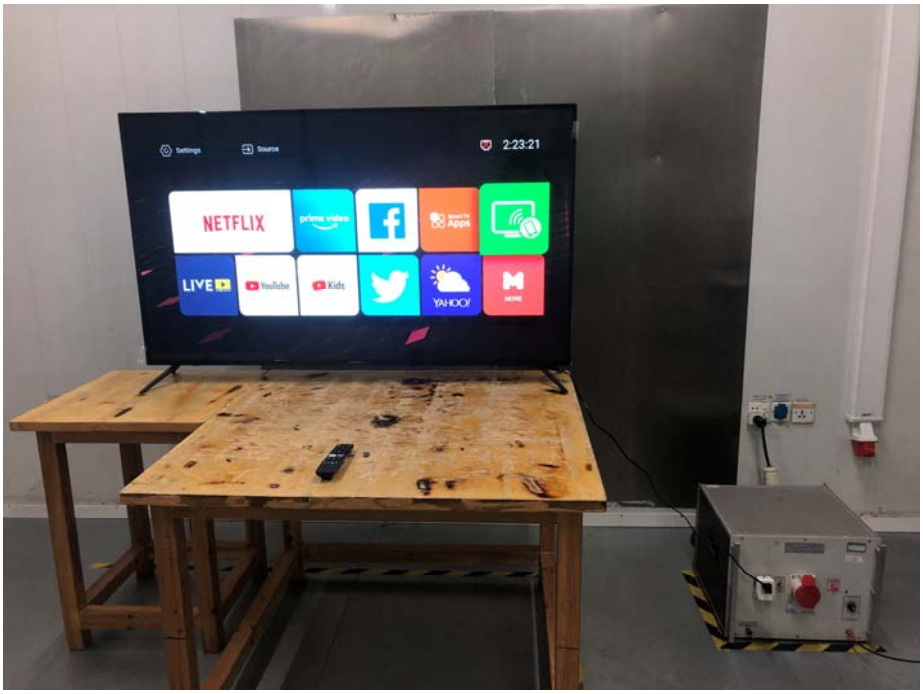


Test frequency from 30MHz to 1GHz



Test frequency above 1GHz

16.2 Conducted Emission



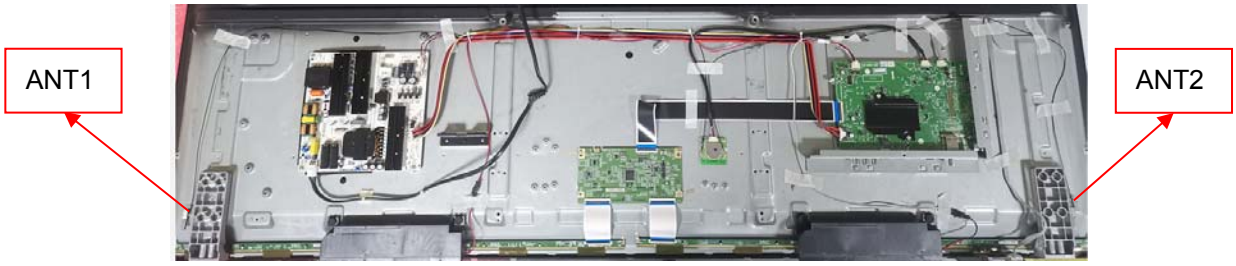
17 Photographs - Constructional Details

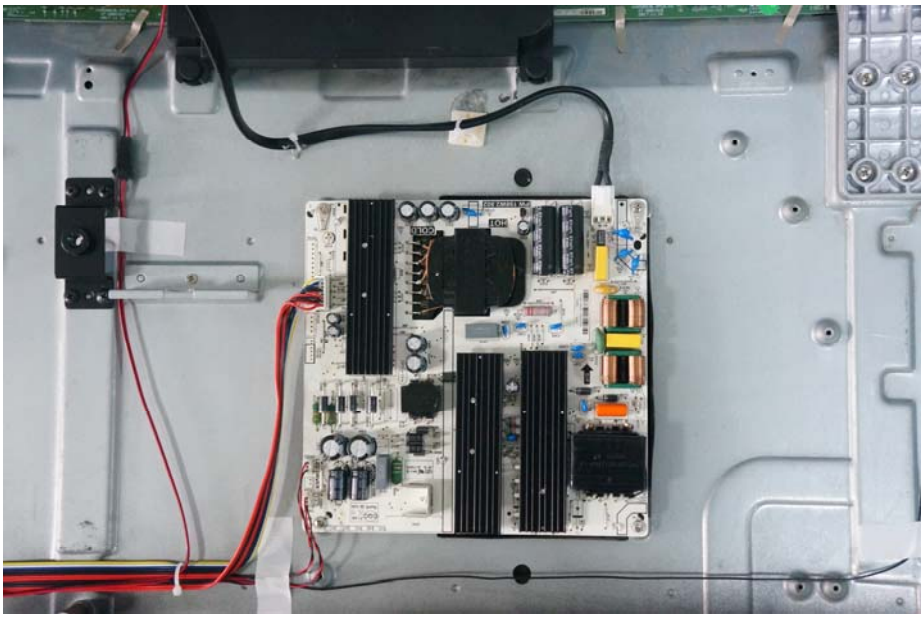
17.1 Model 65T7U-External Photos

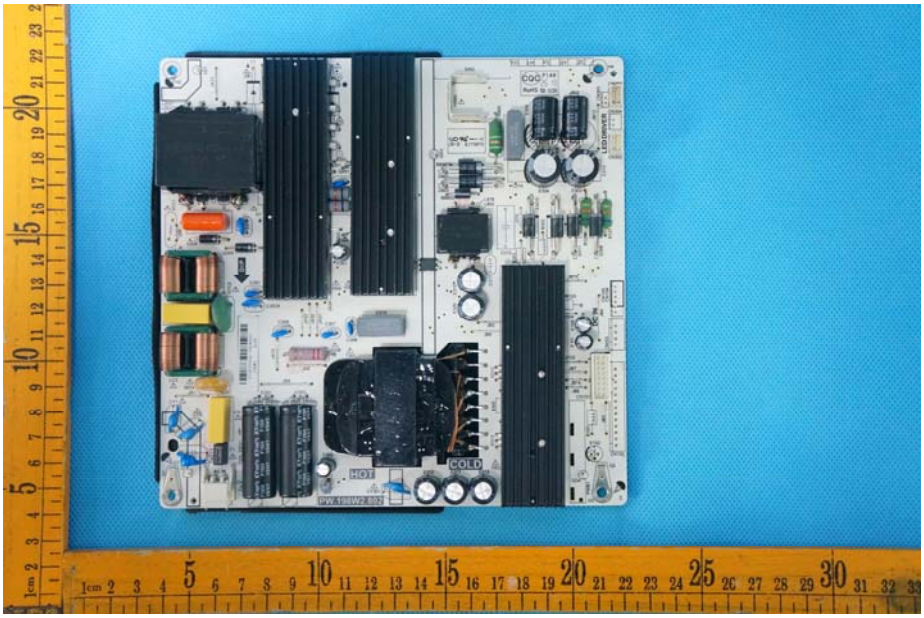
Story

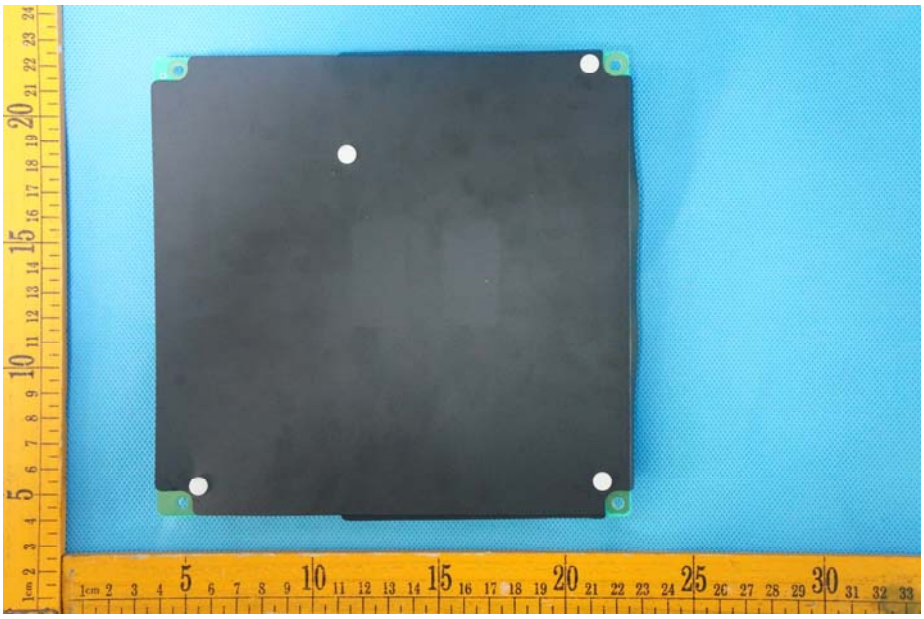
Story
my shade and be happy

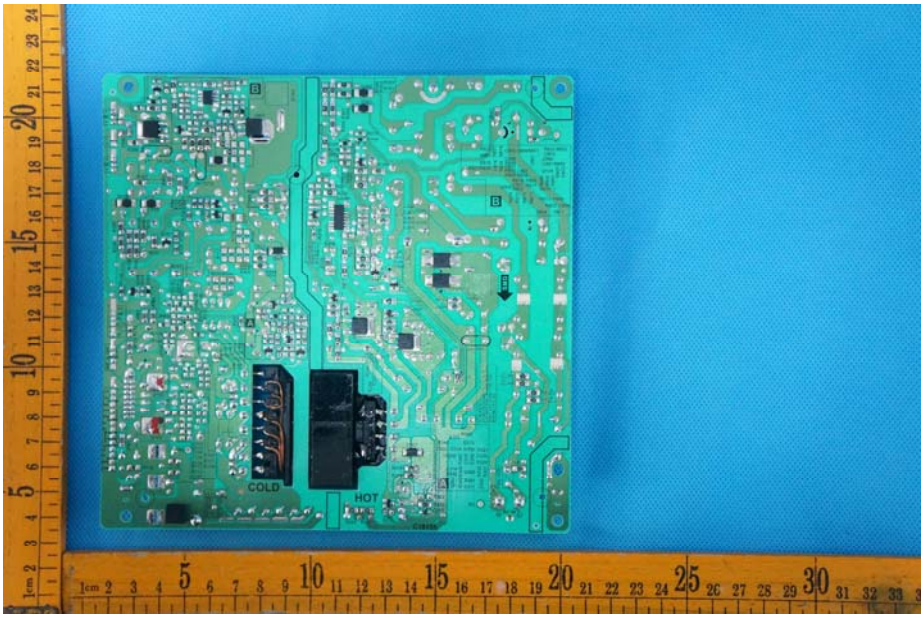
17.2 Model 65T7U-Internal Photos

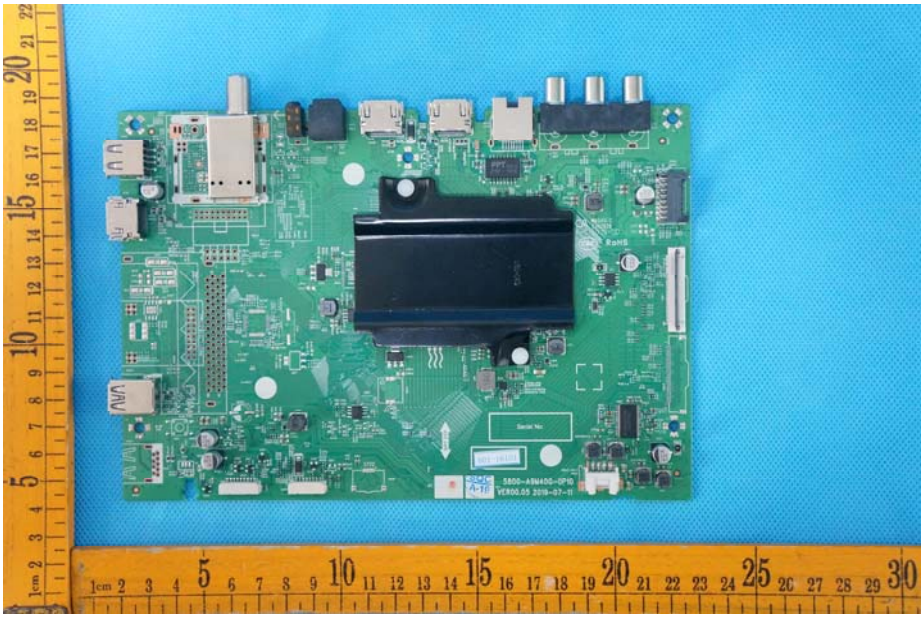


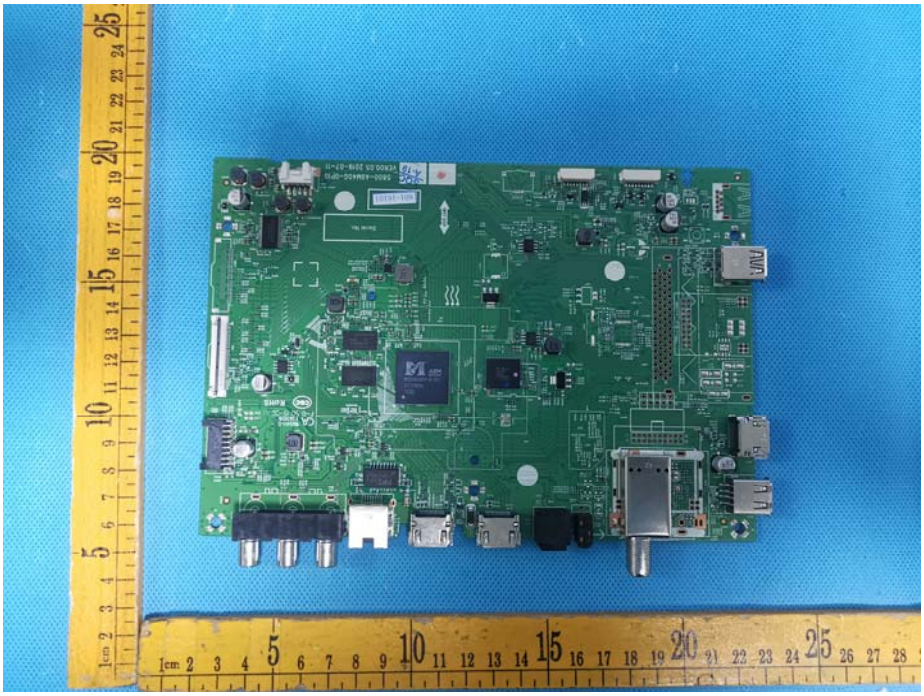


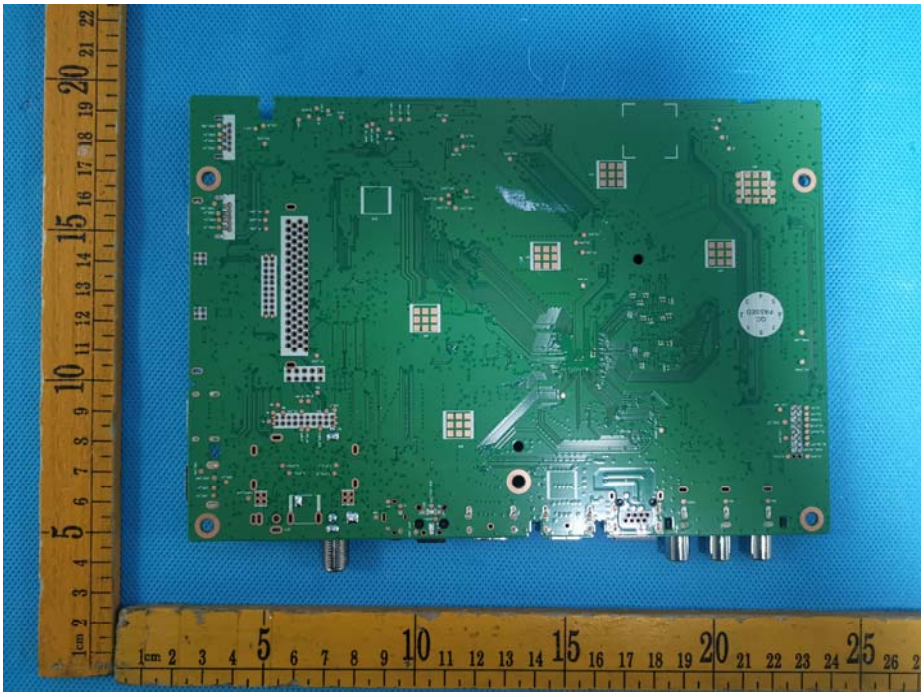

HOT
COLD
LED DRIVER

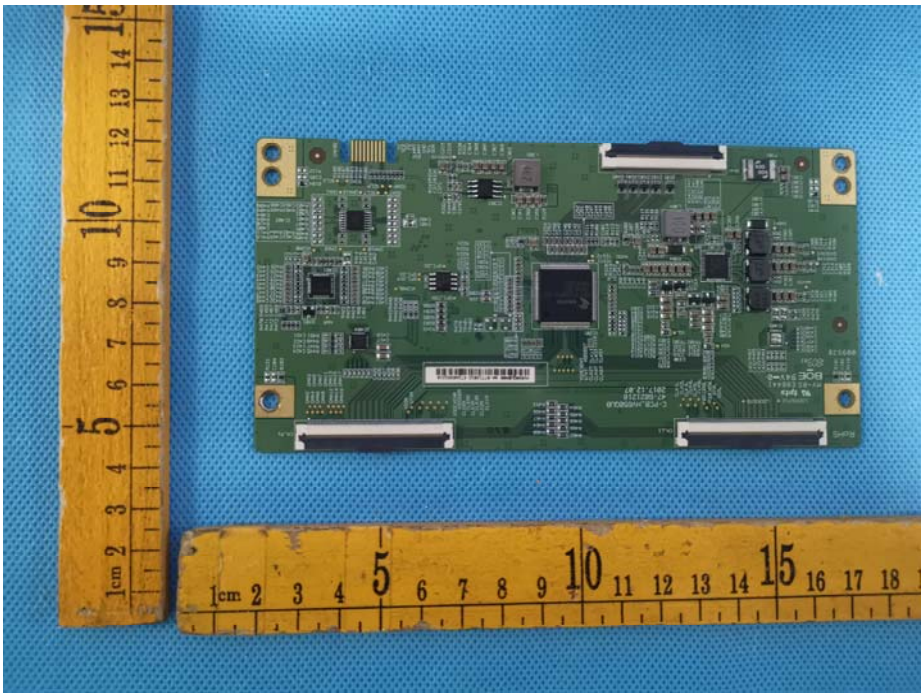


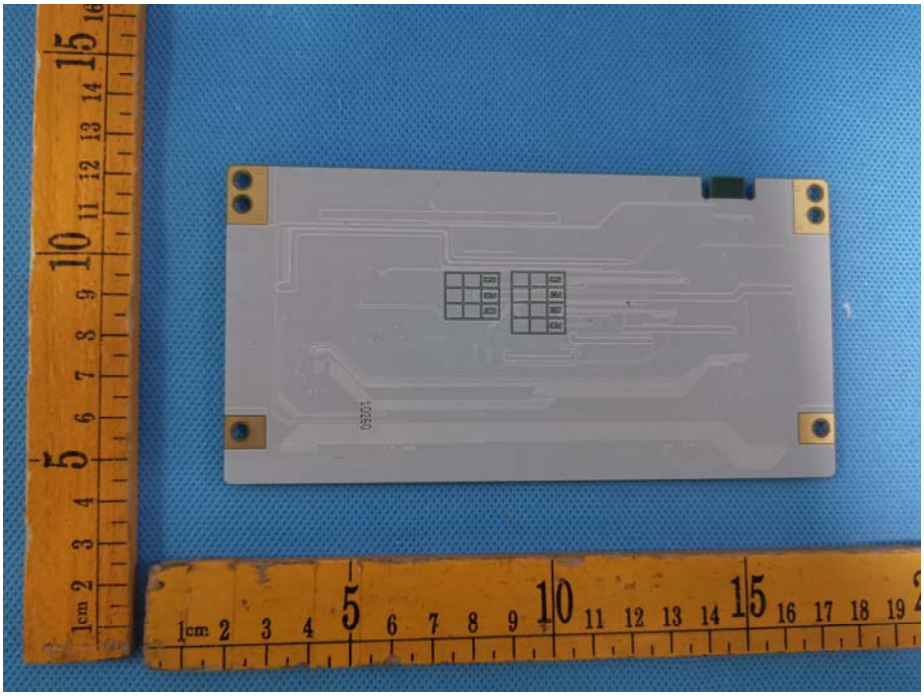

COLD
HOT

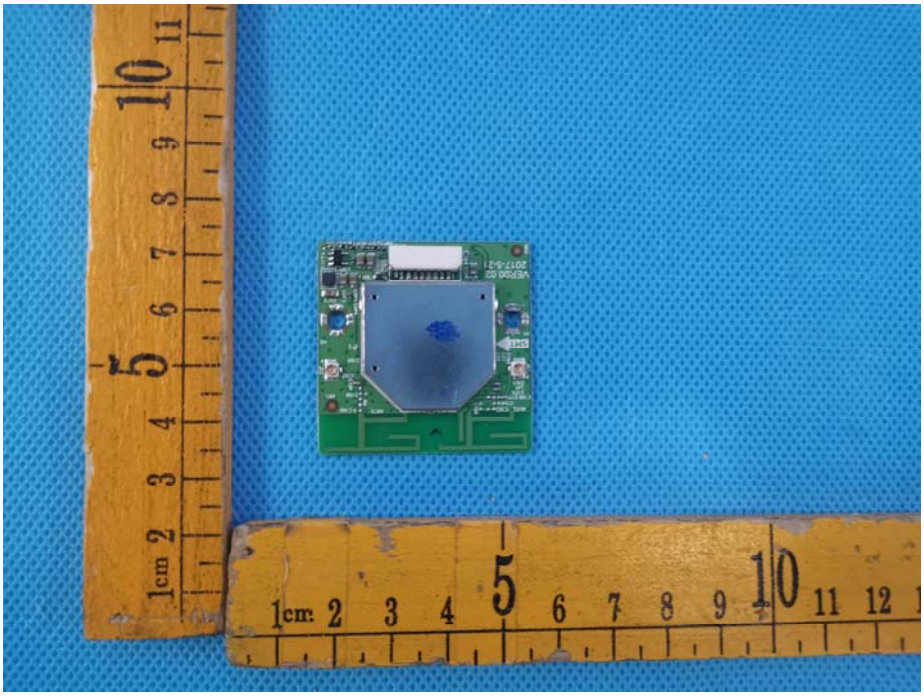


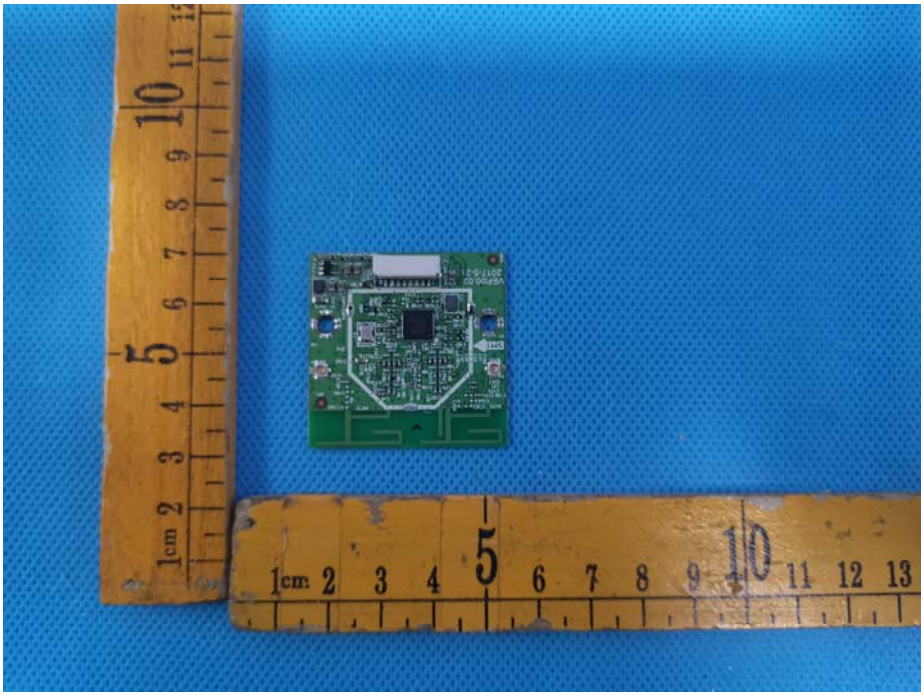


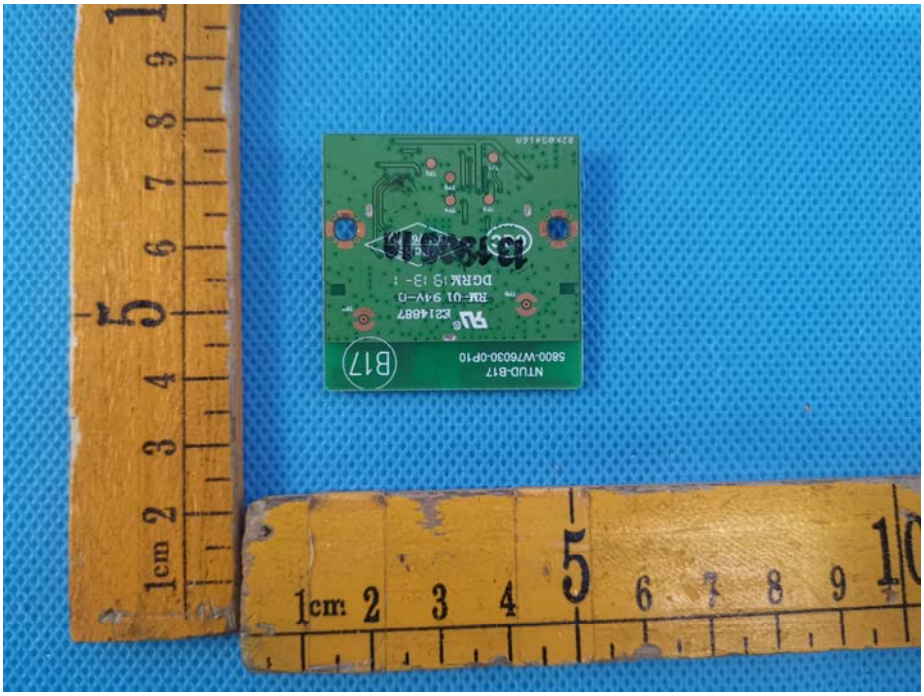












======End of Report======