



FCC TEST REPORT

FCC ID: 2AAD8-U1233

On Behalf of

HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD

802.11ac Wireless USB Adapter

Model No.: U1233, WU1200

Prepared for : HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD
Address : 3/F, Building A1, Junfeng Industrial Park Yonghe Road, Fuyong,
 Bao'an District, Shenzhen, Guangdong, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,
 518103, Shenzhen, Guangdong, China

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TEST REPORT DECLARATION

Applicant : HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD
Address : 3/F, Building A1, Junfeng Industrial Park Yonghe Road, Fuyong, Bao'an District, Shenzhen, Guangdong, China
Manufacturer : HAOLIYUAN (SHENZHEN) ELECTRONIC CO., LTD
Address : 3/F, Building A1, Junfeng Industrial Park Yonghe Road, Fuyong, Bao'an District, Shenzhen, Guangdong, China
EUT Description : 802.11ac Wireless USB Adapter
(A) Model No. : U1233, WU1200
(B) Trademark : N/A

Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247,
ANSI C63.10:2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Ella Liang
Project Engineer

Approved by (name + signature).....: Simple Guan
Project Manager

Date of issue.....: May 17, 2019

Revision History

Revision	Issue Date	Revisions	Revised By
V0	May 17, 2019	Initial released Issue	Simple Guan

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Test Requirement	Standards Paragraph	Result
Conducted Emission	FCC PART 15:2017	15.207	P
6dB Bandwidth	FCC PART 15:2017	15.247 (a)(2)	P
Output Power	FCC PART 15:2017	15.247 (b)(3)	P
Radiated Spurious Emission	FCC PART 15:2017	15.247 (c)	P
Conducted Spurious & Band Edge Emission	FCC PART 15:2017	15.247 (d)	P
Power Spectral Density	FCC PART 15:2017	15.247 (e)	P
Radiated Band Edge Emission	FCC PART 15:2017	15.205	P
Antenna Requirement	FCC PART 15:2017	15.203	P
Note:		<ol style="list-style-type: none">1. P is an abbreviation for Pass.2. F is an abbreviation for Fail.3. N/A is an abbreviation for Not Applicable.	

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : 802.11ac Wireless USB Adapter

Model Number : U1233, WU1200
Diff : There is no difference between all the models, except the appearance industrial design and model number, this report performs the model U1233.

Trademark : N/A

Test Voltage : DC 5V by SUB Port

Operation frequency : 2412MHz-2462MHz for IEEE 802.11 b, g,n/HT20, 2422MHz~2452MHz for IEEE802.11n/HT40

Channel No. : 802.11b/802.11g /802.11n(HT20): 11
802.11(HT40): 7

Modulation type : IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)
IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)

Antenna Type : ANT1: Internal Antenna, Maximum Gain is 2.0dBi
ANT2: External Antenna, Maximum Gain is 5.0dBi

Software version : 1030.28

Hardware version : V1.0

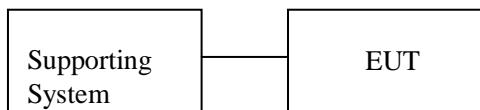
2.2.Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 Power supply : /

2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1	Notebook	ACER	ZQT	N/A	DOC

2.4.Block Diagram of connection between EUT and simulators



2.5.Test Mode Description

Duty cycle :100%Keeping TX			
Mode	data rate (Mbps)(see Note)	Channel	Frequency (MHz)
IEEE 802.11b	1	Low :CH1	2412
	1	Middle: CH6	2437
	1	High: CH11	2462
IEEE 802.11g	6	Low :CH1	2412
	6	Middle: CH6	2437
	6	High: CH11	2462
IEEE 802.11 n/HT20 with 2.4G	6.5	Low :CH1	2412
	6.5	Middle: CH6	2437
	6.5	High: CH11	2462
IEEE 802.11 n/HT40 with 2.4G	13	Low :CH3	2422
	13	Middle: CH6	2437
	13	High: CH9	2452

Note: According exploratory test, EUT will have maximum output power in those data rate. so those data rate were used for all test.

Channel list:

For IEEE 802.11b, g, n/HT20 and IEEE 802.11 n/HT40 with 2.4G

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
CH1	2412	CH5	2432	CH9	2452
CH2	2417	CH6	2437	CH10	2457
CH3	2422	CH7	2442	CH11	2462
CH4	2427	CH8	2447		

Setting output power (Max)

802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
4dBm	5dBm	4dBm	4dBm

2.6. Test Conditions

Items	Required	Actual
Temperature range:	15-35°C	27°C
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd
 Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
 Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
 Registration Number: 293961

July 25, 2017 Certificated by IC
 Registration Number: 12135A

2.8.Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2 °C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2018.09.21	1 Year
Spectrum analyzer	ROHDE&SCHW ARZ	FSU	1166.1660.26	2018.09.21	1 Year
Receiver	ROHDE&SCHW ARZ	ESR	1316.3003K03-10208 2-Wa	2018.09.21	1 Year
Receiver	R&S	ESCI	101165	2018.09.21	1 Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2018.04.13	2 Year
Horn Antenna	SCHWARZBEC K	BBHA 9120 D	BBHA 9120 D(1201)	2018.04.13	2 Year
Active Loop Antenna	SCHWARZBEC K	FMZB 1519B	00059	2018.09.26	2 Year
Cable	Resenberger	N/A	No.1	2018.09.21	1 Year
Cable	Resenberger	N/A	No.2	2018.09.21	1 Year
Cable	Resenberger	N/A	No.3	2018.09.21	1 Year
Pre-amplifier	HP	HP8347A	2834A00455	2018.09.21	1 Year
Pre-amplifier	Agilent	8449B	3008A02664	2018.09.21	1 Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2018.09.21	1 Year
L.I.S.N.#2	ROHDE&SCHW ARZ	ENV216	101043	2018.09.21	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2018.09.21	1 Year
Horn Antenna	A-INFOMW	LB-180100-KF	J211020657	2018.09.21	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2018.09.21	1 Year
Power Meter	Agilent	E9300A	MY41496625	2018.09.21	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000-40-8 80	100631	2018.9.11	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2018.09.11	1 Year

3. SPURIOUS EMISSION

3.1. Test Limits

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(Uv/m)

3.2. Test Procedure

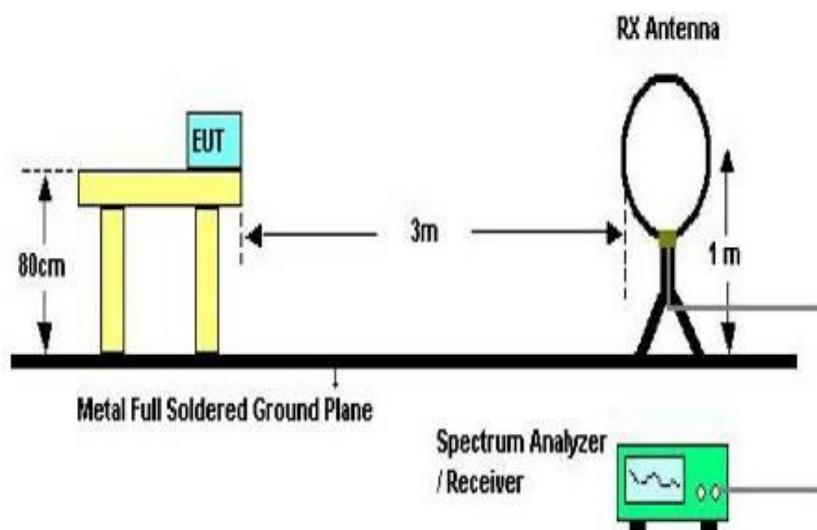
The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground, The table was rotated 360 degrees to determine the position of the highest radiation The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured

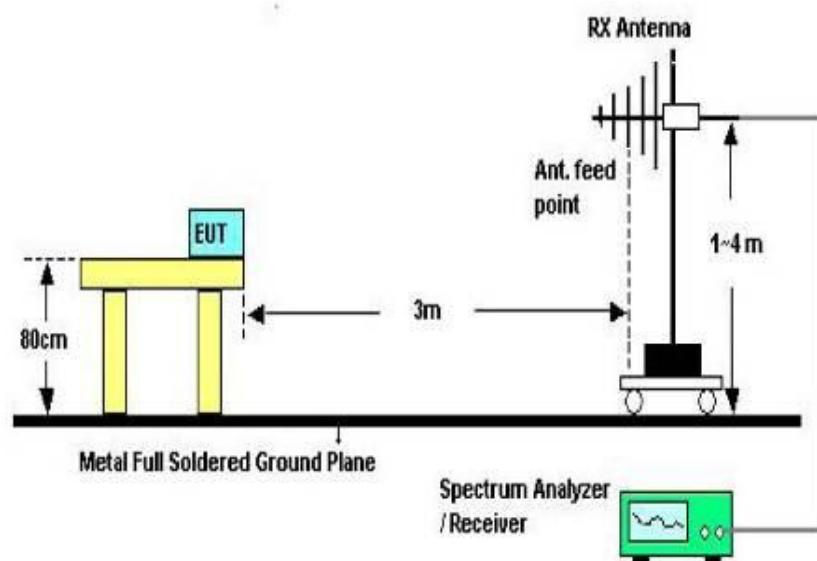
If Peak value comply with QP limit Below 1GHz. The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

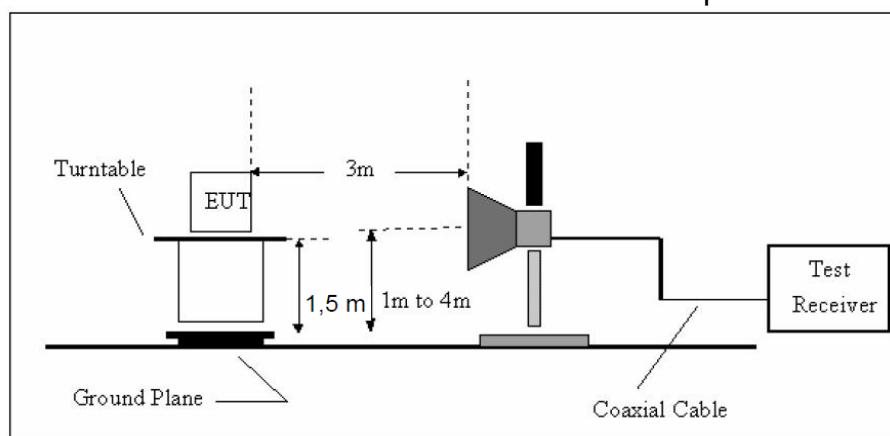
3.3. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4. Test Results

Test Condition

Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHZ~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned the 10th harmonic from 9 kHz to the EUT.

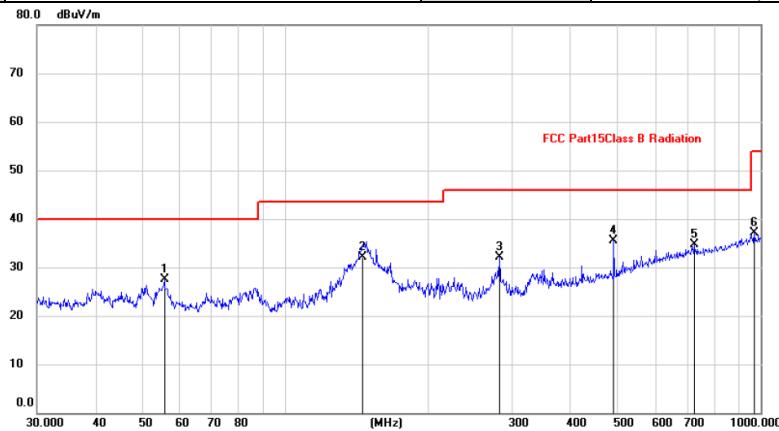
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: 1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

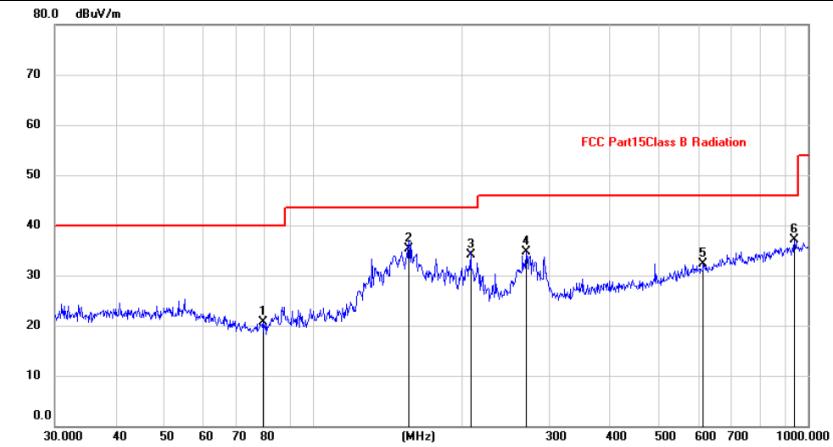
2. Only show the test data of the worst Channel in this report.

EUT Description	802.11ac Wireless USB Adapter	Model No.	U1233
Temperature	24°C	Humidity	56%
Pol	Vertical	Test date	2019/5/15
Test Voltage	AC 120V/60Hz	Test mode	802.11 n/HT40 (High Channel, ANT1+ANT2)



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm degree Comment
1		55.6094	13.26	14.21	27.47	40.00	-12.53	peak	
2		145.3506	16.41	15.69	32.10	43.50	-11.40	QP	
3		282.9852	17.33	14.84	32.17	46.00	-13.83	peak	
4	*	490.7447	16.15	19.45	35.60	46.00	-10.40	peak	
5		724.2611	11.27	23.53	34.80	46.00	-11.20	peak	
6		972.3374	10.93	26.22	37.15	54.00	-16.85	peak	

Pol	Horizontal	Test date	2019/5/15
------------	------------	------------------	-----------



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm degree Comment
1		79.2426	10.18	10.60	20.78	40.00	-19.22	peak	
2	*	155.9101	19.24	16.04	35.28	43.50	-8.22	QP	
3		207.8501	22.05	12.12	34.17	43.50	-9.33	QP	
4		269.4284	20.33	14.41	34.74	46.00	-11.26	peak	
5		614.2142	10.33	21.95	32.28	46.00	-13.72	peak	
6		938.8326	11.16	26.01	37.17	46.00	-8.83	peak	

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2. Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

From 1G-25GHz

Test Mode: IEEE 802.11b TX Low (worst case : ANT1)

Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	40.37	V	33.95	10.18	34.26	50.24	74	23.76	PK
4824	30.36	V	33.95	10.18	34.26	40.23	54	13.77	AV
7236	/								
9648	/								
4824	37.48	H	33.95	10.18	34.26	47.35	74	26.65	PK
4824	27.94	H	33.95	10.18	34.26	37.81	54	16.19	AV
7236									
9648									

Test Mode: IEEE 802.11b TX Mid

4874	38.19	V	33.93	10.2	34.29	48.03	74	25.97	PK
4874	29.00	V	33.93	10.2	34.29	38.84	54	15.16	AV
7311	/								
9748	/								
4874	39.49	H	33.93	10.2	34.29	49.33	74	24.67	PK
4874	28.16	H	33.93	10.2	34.29	38.00	54	16.00	AV
7311									
9748									

Test Mode: IEEE 802.11b TX High

4924	39.04	V	33.98	10.22	34.25	48.99	74	25.01	PK
4924	28.88	V	33.98	10.22	34.25	38.83	54	15.17	AV
7386	/								
9848	/								
4924	39.18	H	33.98	10.22	34.25	49.13	74	24.87	PK
4924	28.34	H	33.98	10.22	34.25	38.29	54	15.71	AV
7386									
9848									

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Test Model IEEE 802.11n HT20 TX Low (ANT1+ANT2)									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4824	42.16	V	33.95	10.18	34.26	52.03	74	21.97	PK
4824	28.60	V	33.95	10.18	34.26	38.47	54	15.53	AV
7236	/								
9648	/								
4824	39.63	H	33.95	10.18	34.26	49.50	74	24.50	PK
4824	29.32	H	33.95	10.18	34.26	39.19	54	14.81	AV
7236									
9648									
Test Mode: IEEE 802.11n HT20 TX Mid (ANT1+ANT2)									
4874	37.61	V	33.93	10.2	34.29	47.45	74	26.55	PK
4874	27.29	V	33.93	10.2	34.29	37.13	54	16.87	AV
7311	/								
9748	/								
4874	36.58	H	33.93	10.2	34.29	46.42	74	27.58	PK
4874	28.85	H	33.93	10.2	34.29	38.69	54	15.31	AV
7311									
9748									
Test Mode: IEEE 802.11n HT20 TX High (ANT1+ANT2)									
4924	37.93	V	33.98	10.22	34.25	47.88	74	26.12	PK
4924	28.34	V	33.98	10.22	34.25	38.29	54	15.71	AV
7386	/								
9848	/								
4924	37.97	H	33.98	10.22	34.25	47.92	74	26.08	PK
4924	28.94	H	33.98	10.22	34.25	38.89	54	15.11	AV
7386									
9848									

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Test Model IEEE 802.11n HT40 TX Low (ANT1+ANT2)									
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4844	38.82	V	33.95	10.18	34.26	48.69	74	25.31	PK
4844	29.23	V	33.95	10.18	34.26	39.10	54	14.90	AV
7266	/								
9688	/								
4844	40.64	H	33.95	10.18	34.26	50.51	74	23.49	PK
4844	29.29	H	33.95	10.18	34.26	39.16	54	14.84	AV
7266									
9688									
Test Mode: IEEE 802.11n HT40 TX Mid (ANT1+ANT2)									
4874	38.27	V	33.93	10.2	34.29	48.11	74	25.89	PK
4874	27.88	V	33.93	10.2	34.29	37.72	54	16.28	AV
7311	/								
9748	/								
4874	37.51	H	33.93	10.2	34.29	47.35	74	26.65	PK
4874	28.62	H	33.93	10.2	34.29	38.46	54	15.54	AV
7311									
9748									
Test Mode: IEEE 802.11n HT40 TX High (ANT1+ANT2)									
4904	37.55	V	33.98	10.22	34.25	47.50	74	26.50	PK
4904	28.09	V	33.98	10.22	34.25	38.04	54	15.96	AV
7356	/								
9808	/								
4904	37.93	H	33.98	10.22	34.25	47.88	74	26.12	PK
4904	28.51	H	33.98	10.22	34.25	38.46	54	15.54	AV
7356									
9808									

Note:

1, Result = Read level + Antenna factor + cable loss-Amp factor

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

4. POWER LINE CONDUCTED EMISSION

4.1. Test Limits

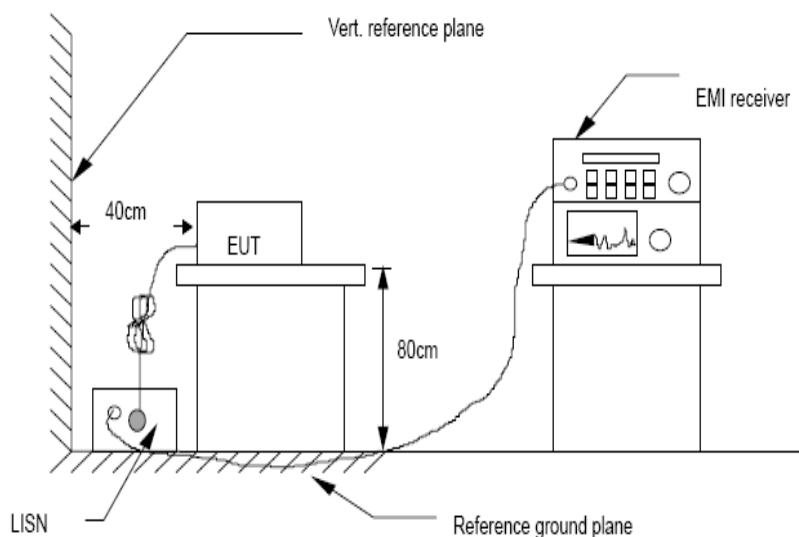
Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
 2. The lower limit shall apply at the transition frequencies.
 3. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement. The bandwidth of test receiver is set at 9 kHz.

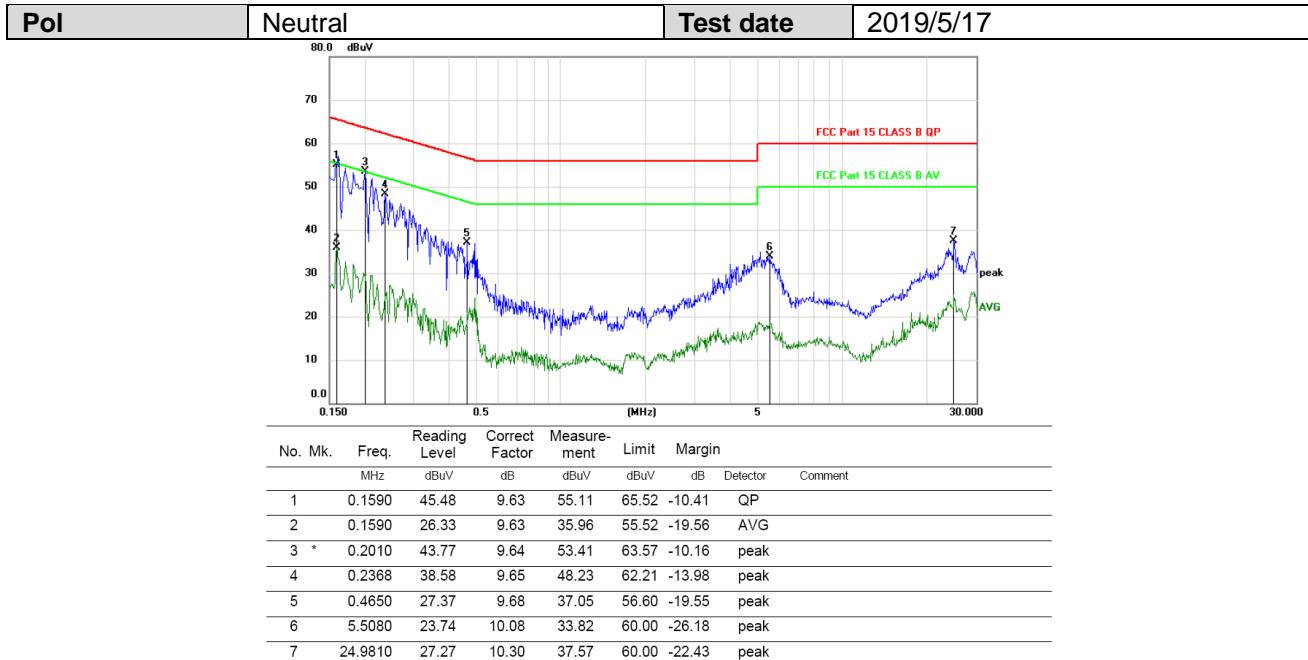
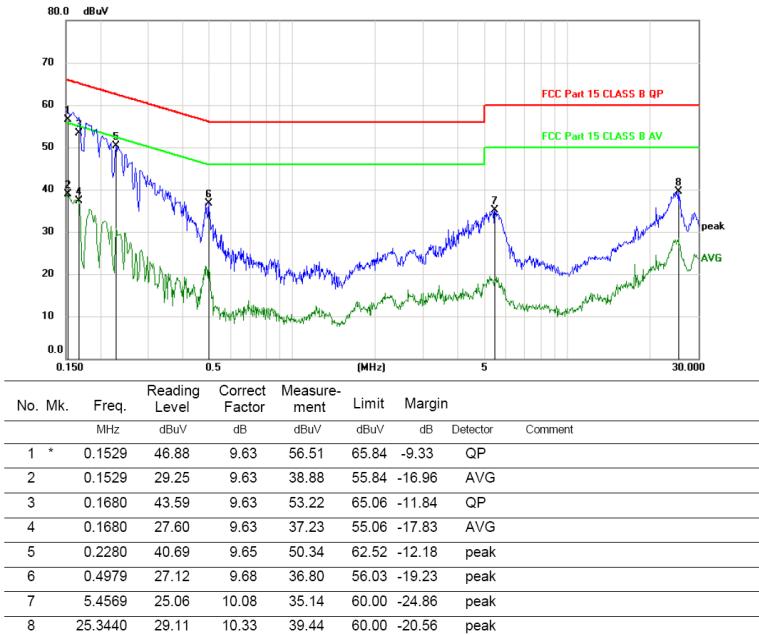
4.3. Test Setup



4.4. Test Results

Note: Only show the test data of the worst Channel in this report.

EUT Description	802.11ac Wireless USB Adapter	Model No.	U1233
Temperature	24°C	Humidity	56%
Pol	Line	Test date	2019/5/17
Test Voltage	AC 120V/60Hz	Test mode	802.11 n/HT40 (High Channel, ANT1+ANT2)



*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

5. CONDUCTED MAXIMUM OUTPUT POWER

5.1. Test limits

Please refer section 15.247.

Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 1 W(30dBm)

5.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V04

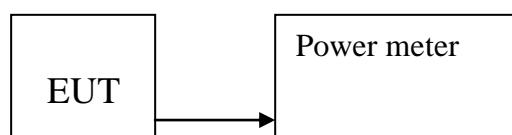
5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Connect the EUT's antenna port to peak power meter by 20dB attenuator.

5.2.3 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

PASS

Detailed information please see the following page.

Mode	Frequency (MHz)	PK Output power(dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT1+ANT2		
IEEE 802.11 b	CH1: 2412	2.861	2.915	/	29.36	PASS
	CH6: 2437	3.111	3.076	/	29.36	PASS
	CH11: 2462	3.493	3.423	/	29.36	PASS
IEEE 802.11 g	CH1: 2412	4.187	3.025	/	29.36	PASS
	CH6: 2437	2.877	2.919	/	29.36	PASS
	CH11: 2462	2.830	2.683	/	29.36	PASS
IEEE 802.11 n/HT20	CH1: 2412	3.233	3.092	6.17	28.72	PASS
	CH6: 2437	1.880	1.707	4.80	28.72	PASS
	CH11: 2462	1.707	1.667	4.70	28.72	PASS
IEEE 802.11 n/HT40	CH3: 2422	3.321	3.276	6.31	28.72	PASS
	CH6: 2437	3.325	3.297	6.32	28.72	PASS
	CH9: 2452	3.281	3.355	6.33	28.72	PASS

Note:

1, As Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20})^2 / N_{\text{ANT}}]$ dBi=6.64>6dBi,
so limit=29.36-(6.64-6.00)=28.72dBm.

6. PEAK POWER SPECTRAL DENSITY

6.1. Test limits

6.1.1 Please refer section 15.247.

6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V04

6.2.1 Place the EUT on the table and set it in transmitting mode.

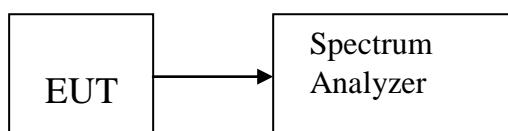
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 3kHz (Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$), VBW = 10kHz (Set the VBW $\geq 3 \times \text{RBW}$), span = $1.5 \times \text{DTS}$ bandwidth., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

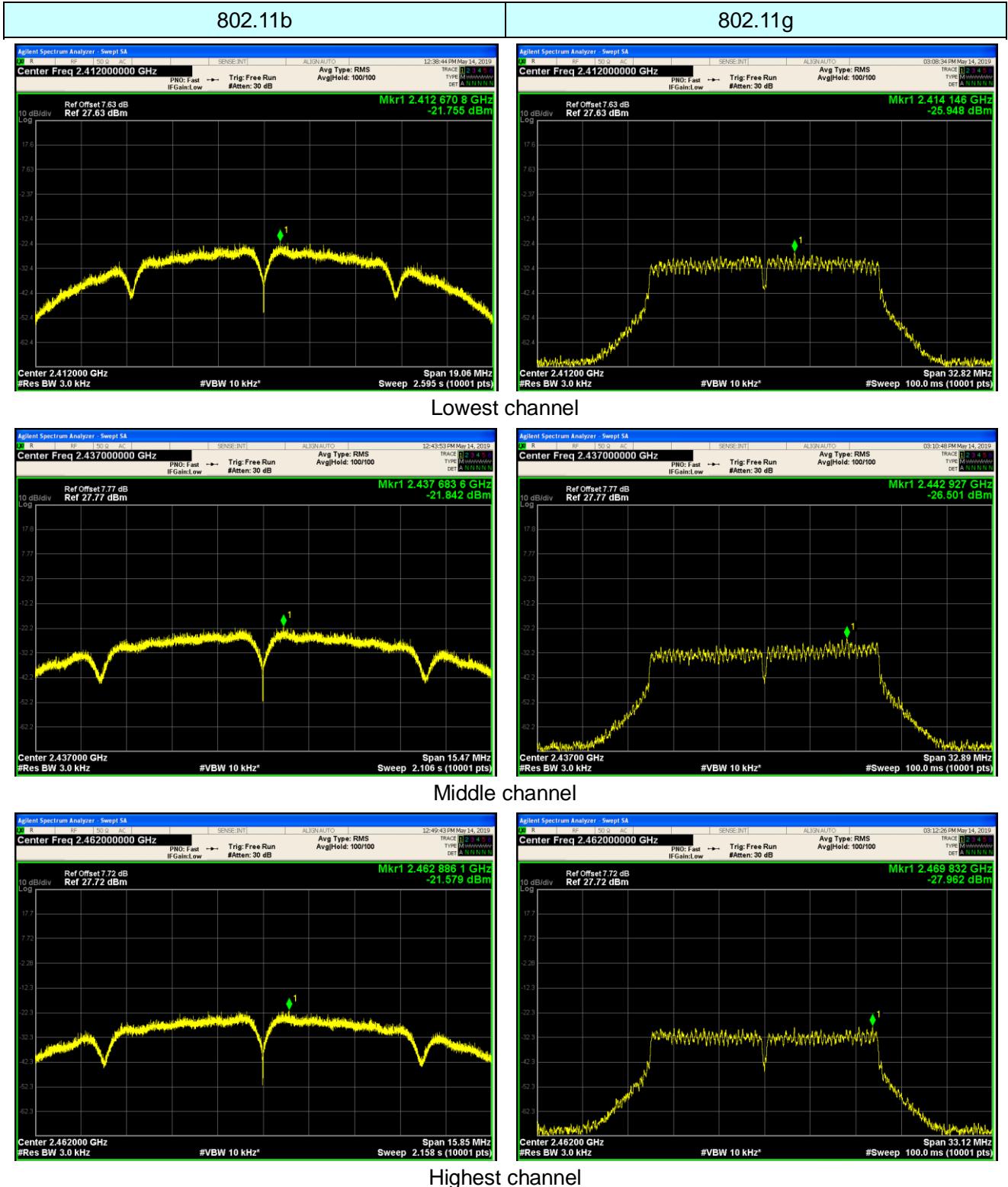
6.3. Test Setup



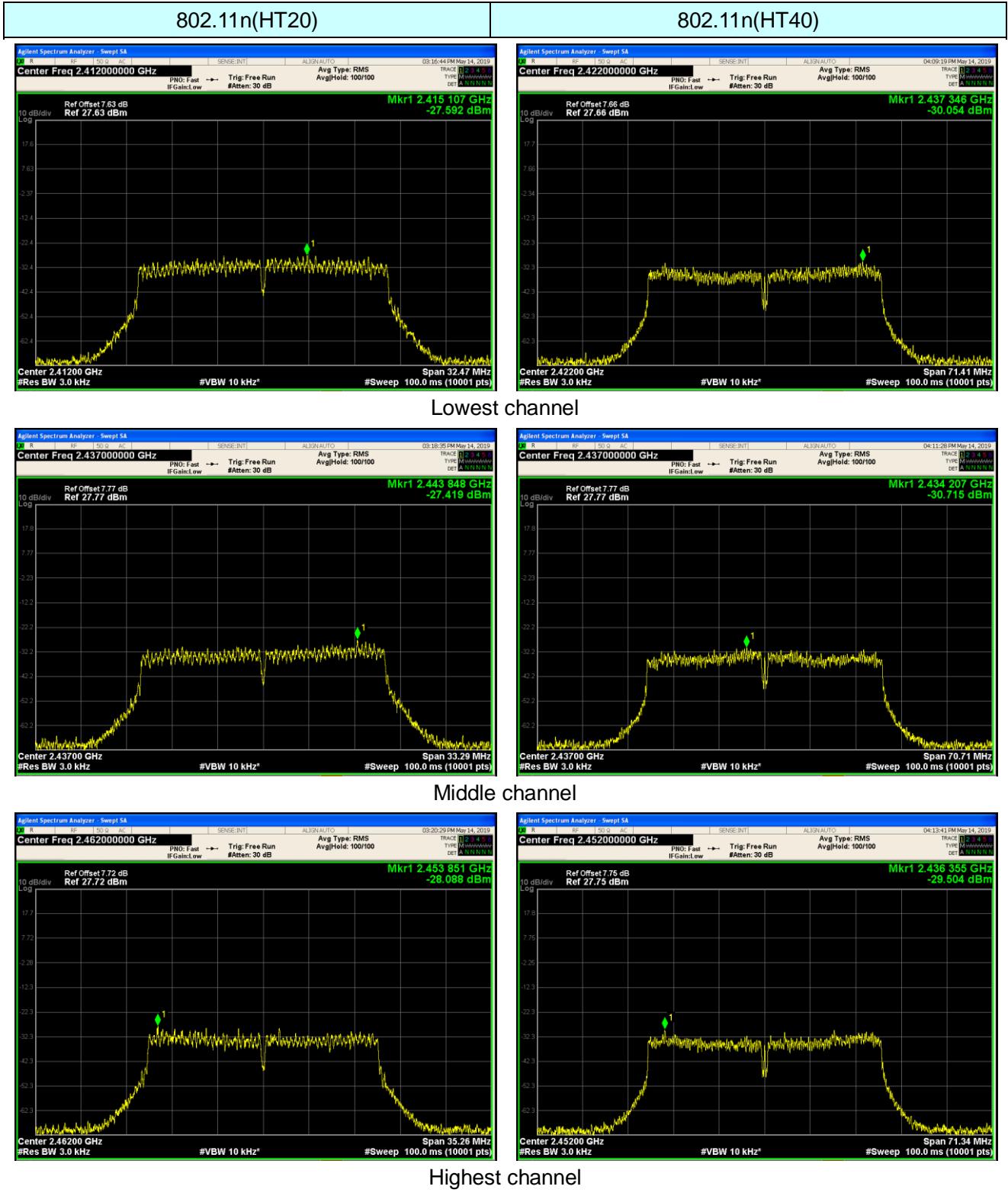
6.4. Test Results

Mode	Frequency (MHz)	Power Spectral Density (dBm)			Limit (dBm)	Result
		ANT1	ANT2	ANT1+ANT2		
IEEE 802.11 b	Lowest	-21.755	-21.889	/	8	PASS
	Middle	-21.842	-22.46	/	8	PASS
	Highest	-21.579	-20.331	/	8	PASS
IEEE 802.11 g	Lowest	-25.948	-25.316	/	8	PASS
	Middle	-26.501	-26.332	/	8	PASS
	Highest	-27.962	-27.677	/	8	PASS
IEEE 802.11 n/HT20	Lowest	-27.592	-27.778	-24.67	8	PASS
	Middle	-27.419	-28.691	-25.00	8	PASS
	Highest	-28.088	-29.254	-25.62	8	PASS
IEEE 802.11 n/HT40	Lowest	-30.054	-30.845	-27.42	8	PASS
	Middle	-30.715	-31.01	-27.85	8	PASS
	Highest	-29.504	-29.081	-26.28	8	PASS

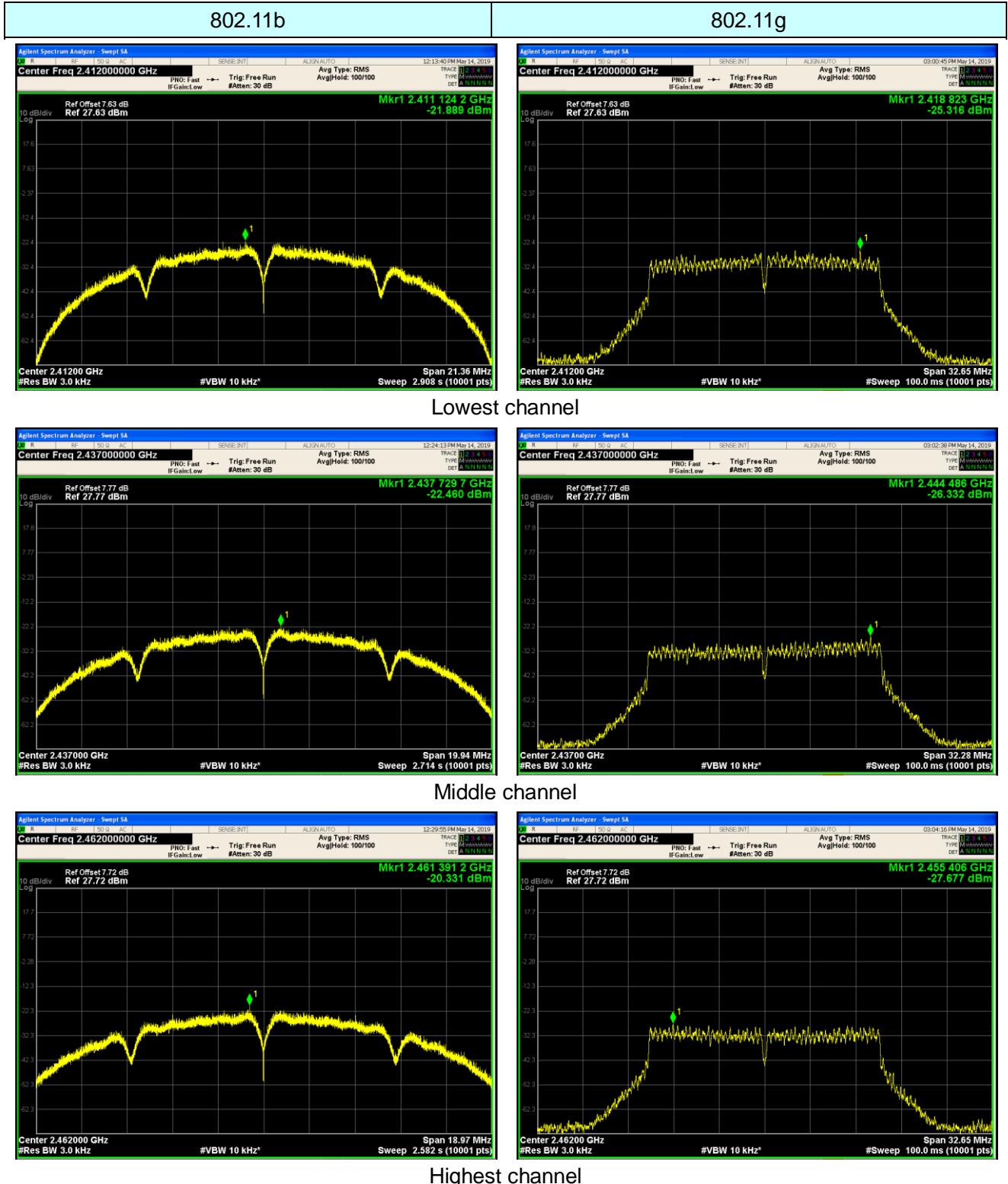
ANT1:



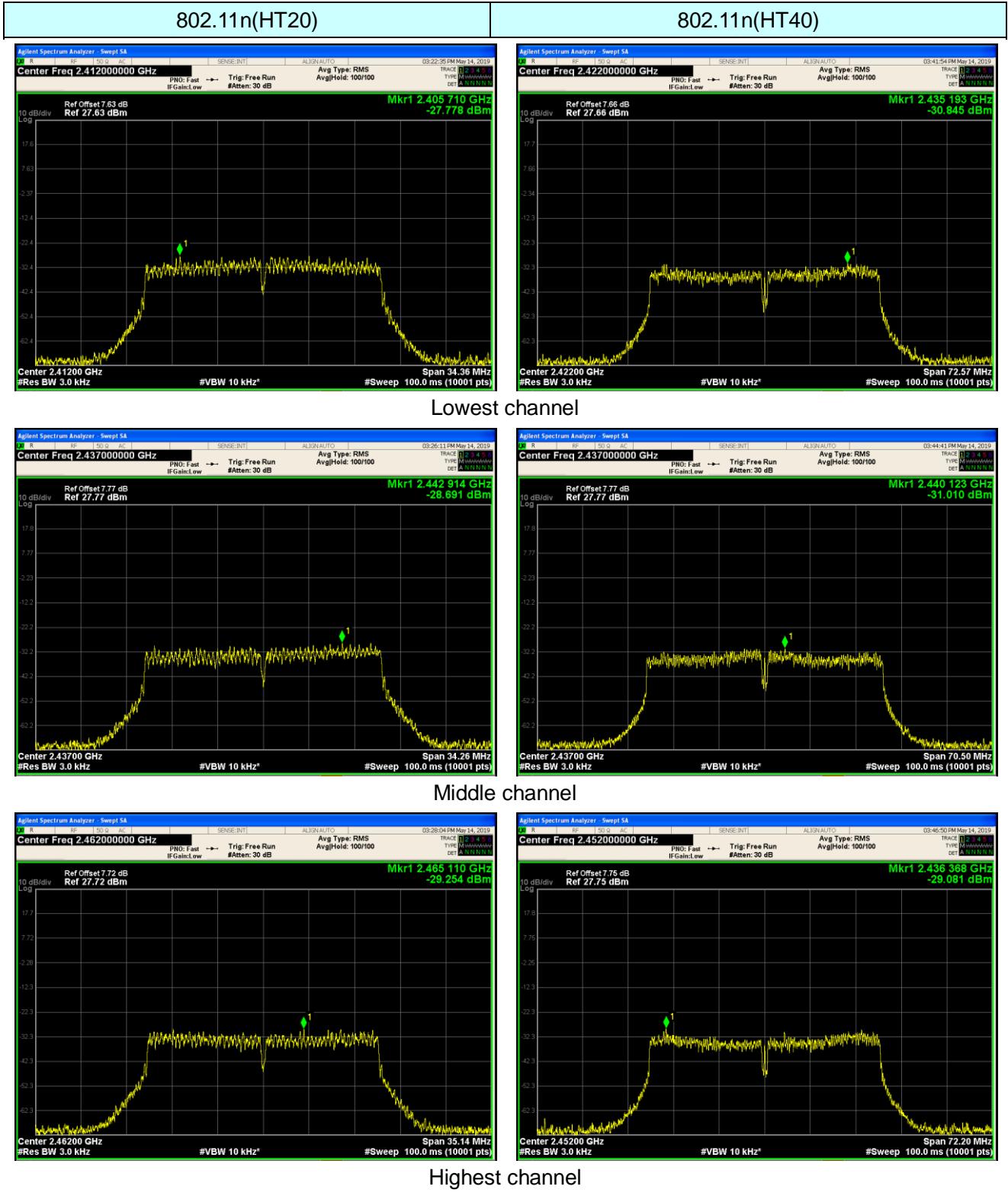
ANT1:



ANT2:



ANT2:



7. BANDWIDTH

7.1. Test limits

Please refer section 15.247

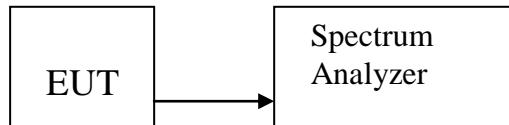
For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V04

- a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- b) The test receiver set RBW = 100kHz, VBW \geq 3*RBW =300kHz,, Peak Detector, Sweep time set auto, detail see the test plot.

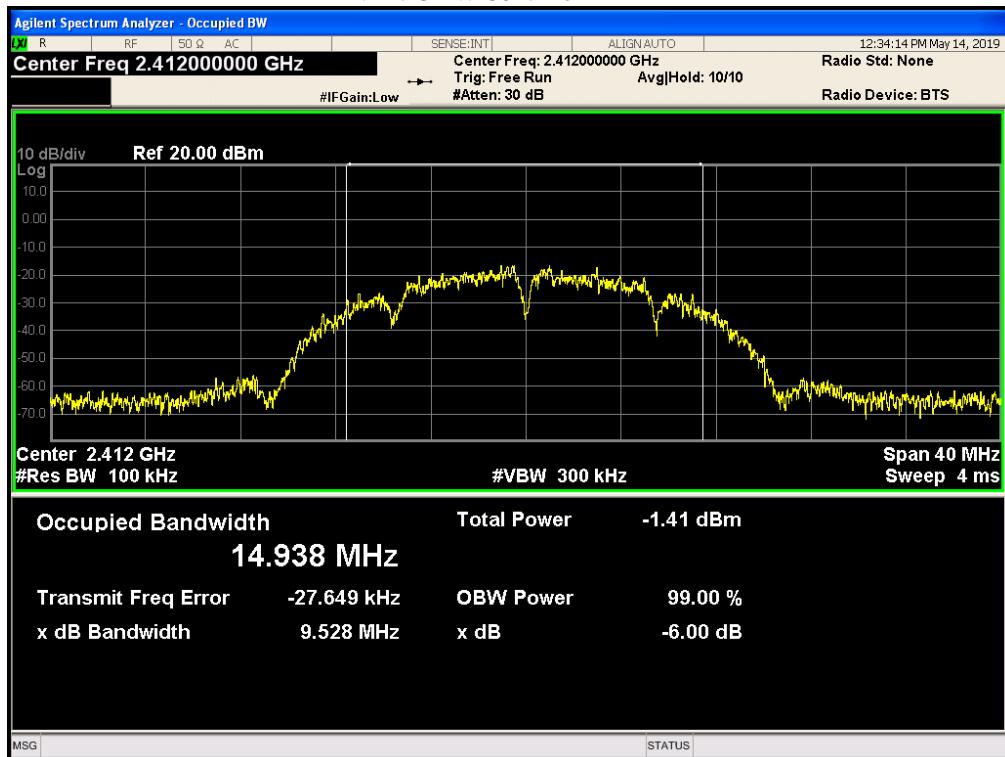
7.3. Test Setup



7.4. Test Results

Condition	Mode	Frequency (MHz)	99% OBW (MHz)	-6 dB Bandwidth (MHz)	Limit -6 dB Bandwidth (MHz)	Verdict
ANT1	802.11b	2412	14.9378	9.5284	0.5	Pass
ANT1	802.11b	2437	14.8747	7.7334	0.5	Pass
ANT1	802.11b	2462	14.876	7.9257	0.5	Pass
ANT2	802.11b	2412	15.0132	10.6809	0.5	Pass
ANT2	802.11b	2437	14.9559	9.968	0.5	Pass
ANT2	802.11b	2462	14.9223	9.4834	0.5	Pass
ANT1	802.11g	2412	16.3793	16.4097	0.5	Pass
ANT1	802.11g	2437	16.4697	16.4446	0.5	Pass
ANT1	802.11g	2462	16.5102	16.5583	0.5	Pass
ANT2	802.11g	2412	16.4509	16.3235	0.5	Pass
ANT2	802.11g	2437	16.4801	16.1406	0.5	Pass
ANT2	802.11g	2462	16.5043	16.3229	0.5	Pass
ANT1	802.11n(HT20)	2412	17.5757	16.2339	0.5	Pass
ANT1	802.11n(HT20)	2437	17.6383	16.6449	0.5	Pass
ANT1	802.11n(HT20)	2462	17.6752	17.6319	0.5	Pass
ANT2	802.11n(HT20)	2412	17.569	17.1776	0.5	Pass
ANT2	802.11n(HT20)	2437	17.6797	17.131	0.5	Pass
ANT2	802.11n(HT20)	2462	17.6957	17.572	0.5	Pass
ANT1	802.11n(HT40)	2422	36.242	35.7042	0.5	Pass
ANT1	802.11n(HT40)	2437	36.2087	35.3554	0.5	Pass
ANT1	802.11n(HT40)	2452	36.2835	35.6711	0.5	Pass
ANT2	802.11n(HT40)	2422	36.2404	36.2851	0.5	Pass
ANT2	802.11n(HT40)	2437	36.1784	35.2495	0.5	Pass
ANT2	802.11n(HT40)	2452	36.2509	36.1019	0.5	Pass

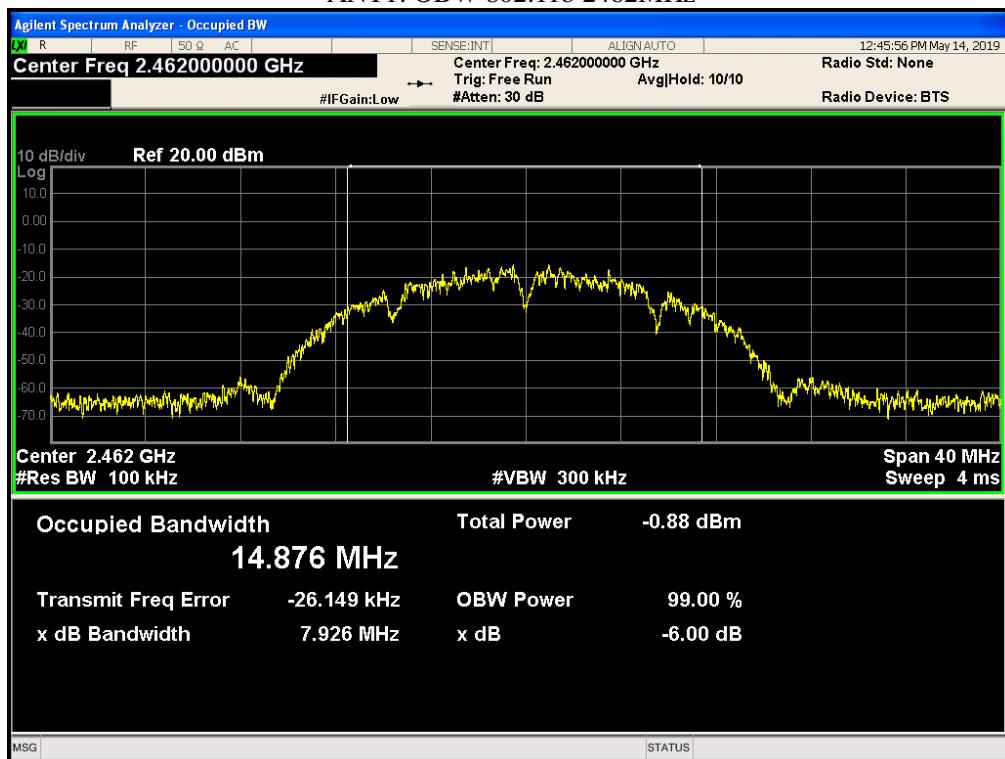
ANT1: OBW 802.11b 2412MHz



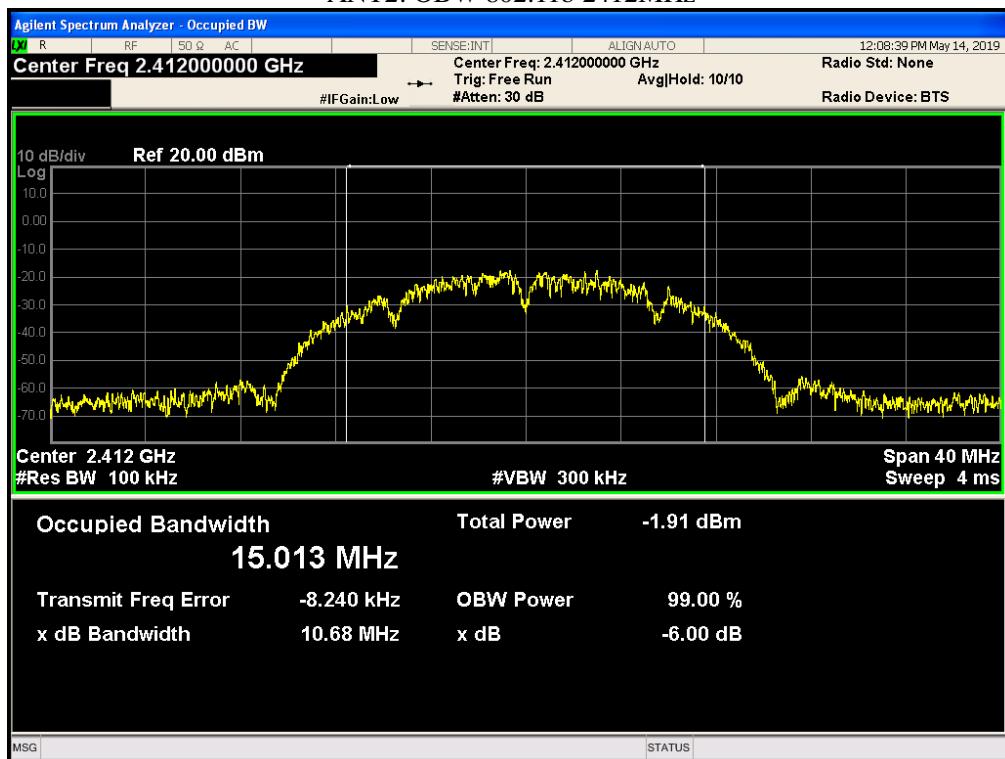
ANT1: OBW 802.11b 2437MHz



ANT1: OBW 802.11b 2462MHz



ANT2: OBW 802.11b 2412MHz



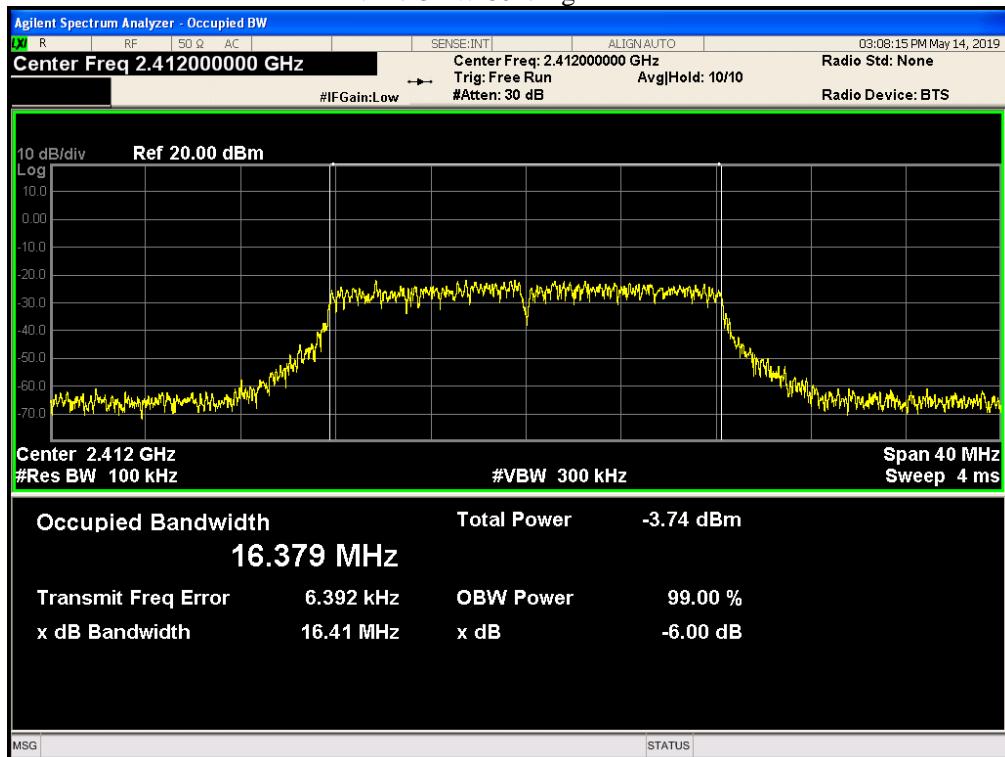
ANT2: OBW 802.11b 2437MHz



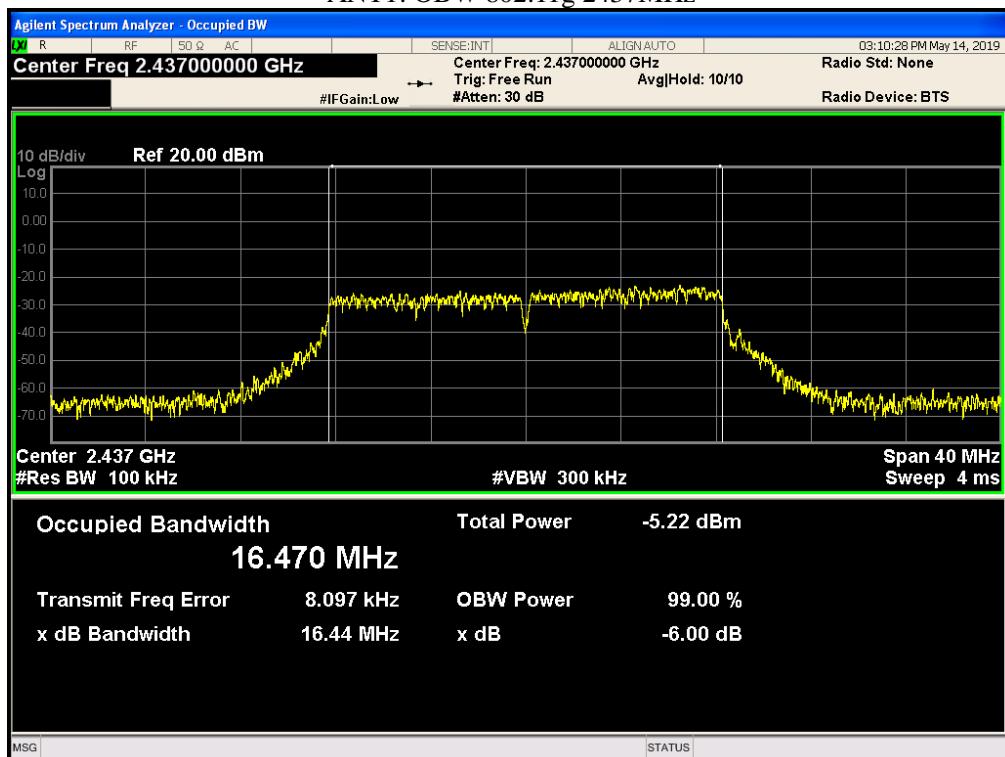
ANT2: OBW 802.11b 2462MHz



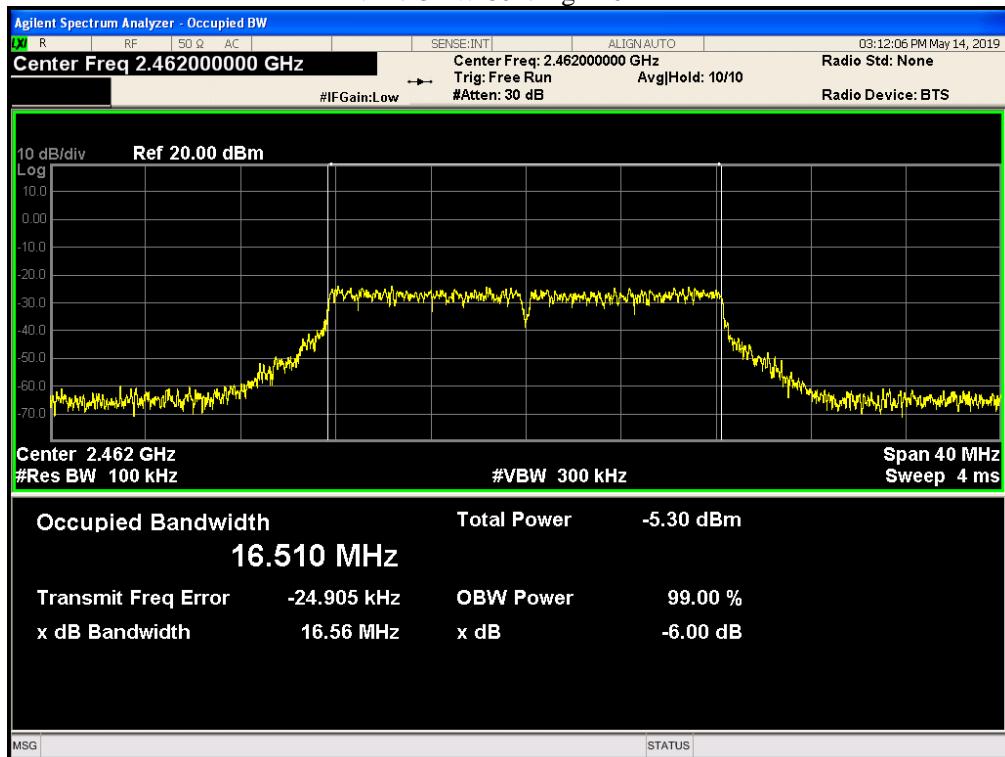
ANT1: OBW 802.11g 2412MHz



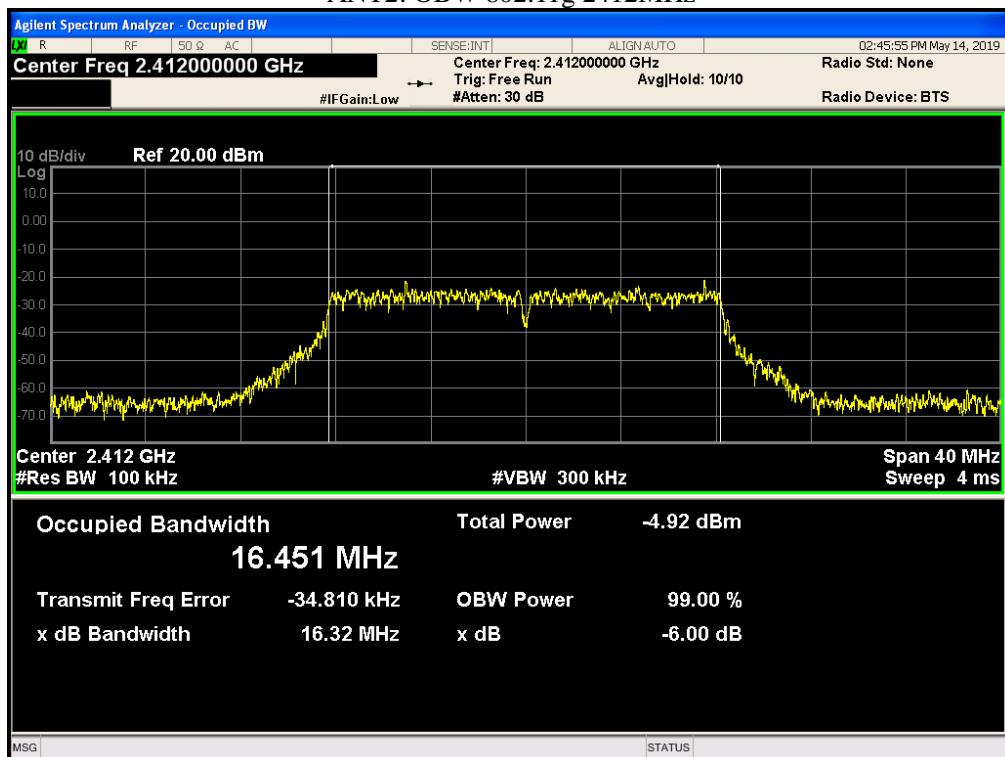
ANT1: OBW 802.11g 2437MHz



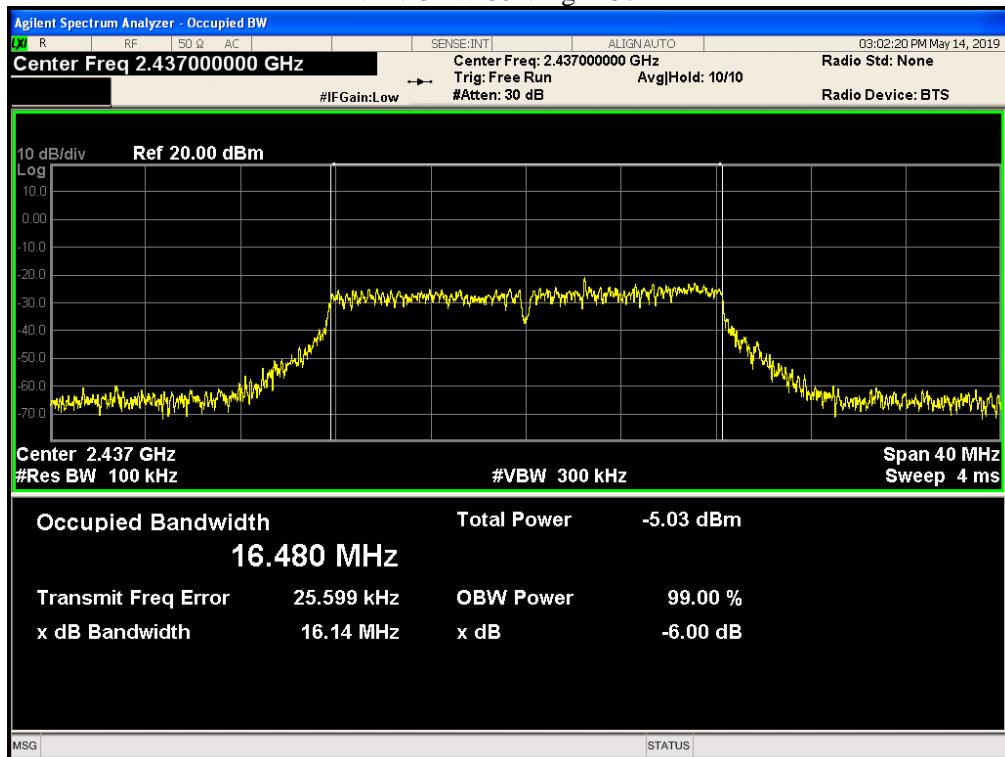
ANT1: OBW 802.11g 2462MHz



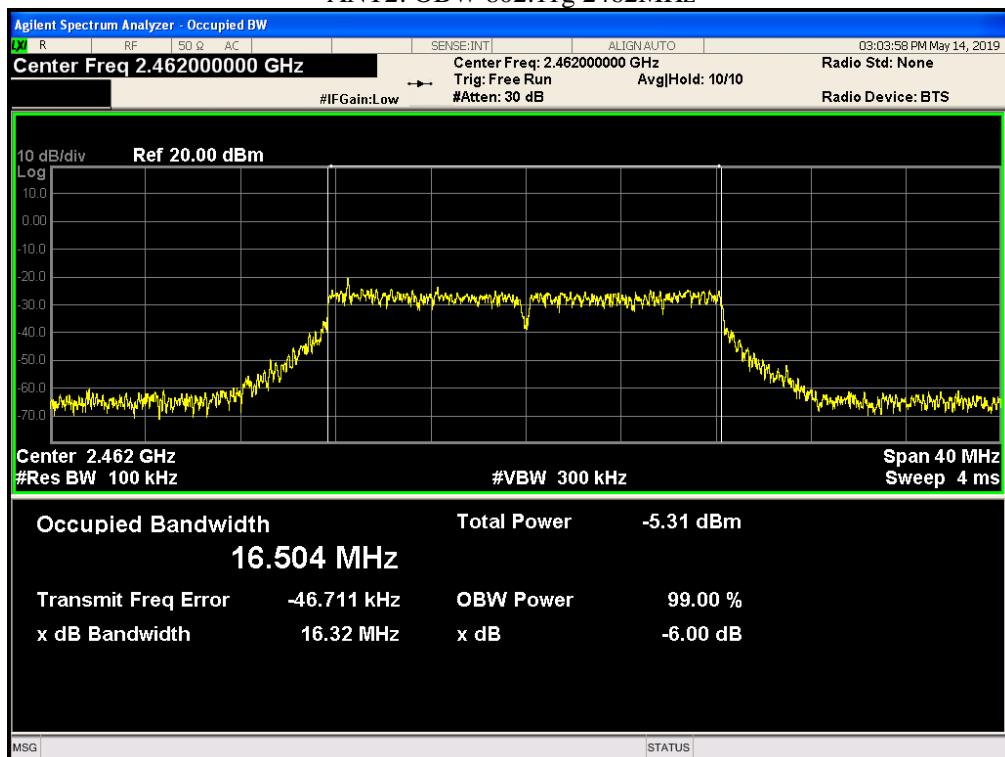
ANT2: OBW 802.11g 2412MHz



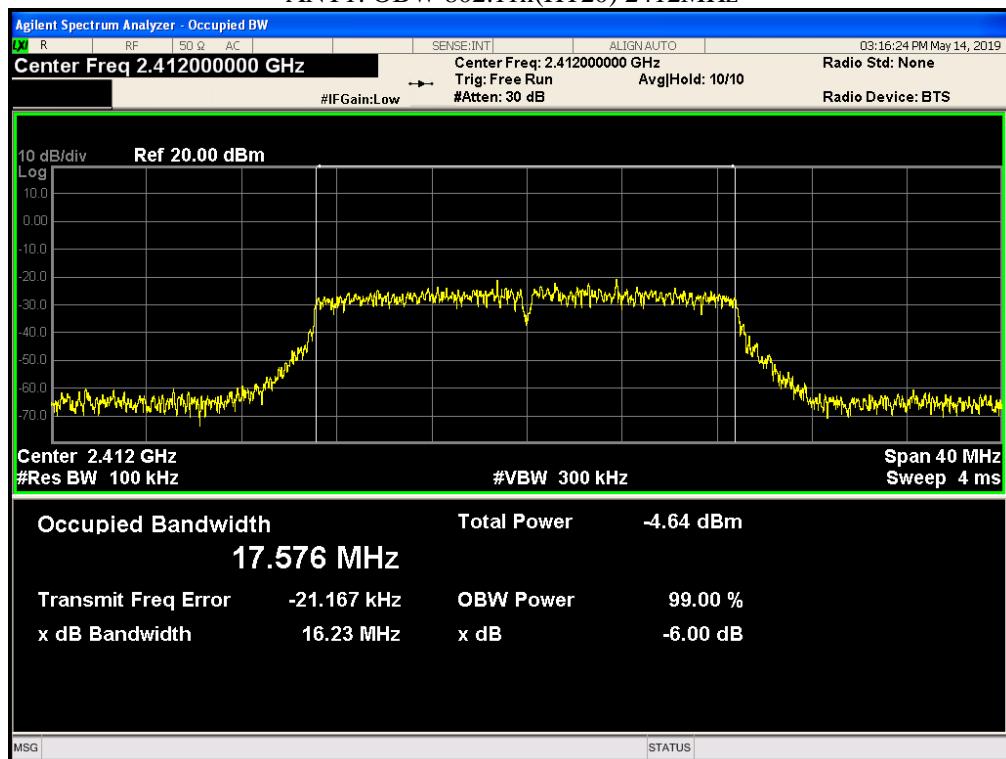
ANT2: OBW 802.11g 2437MHz



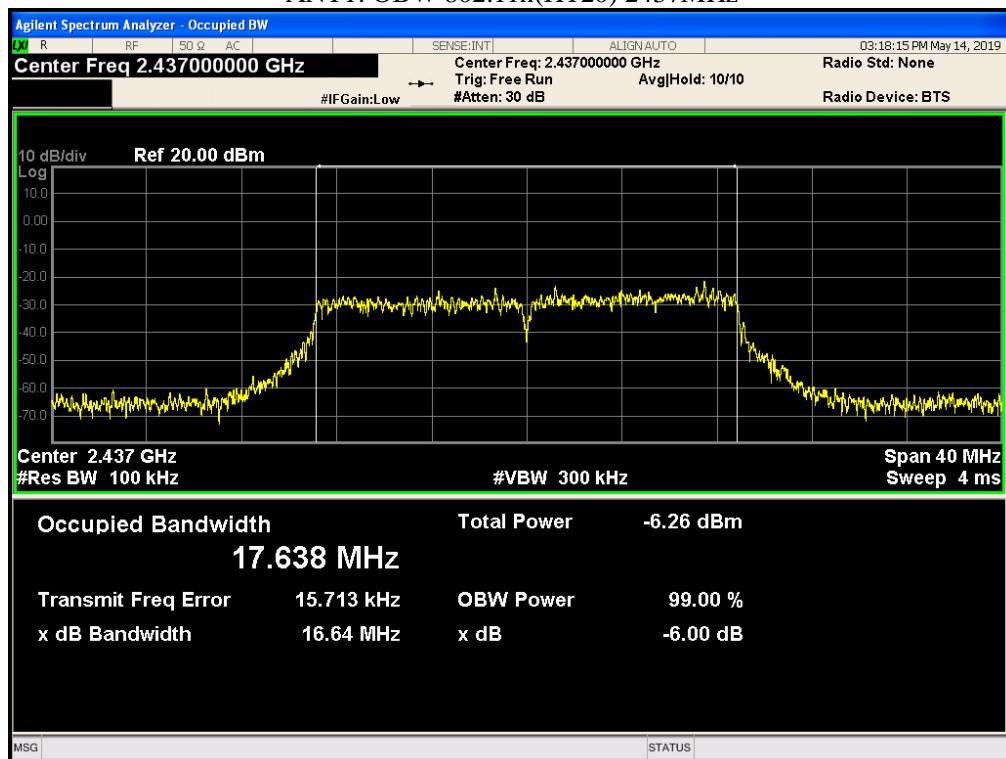
ANT2: OBW 802.11g 2462MHz



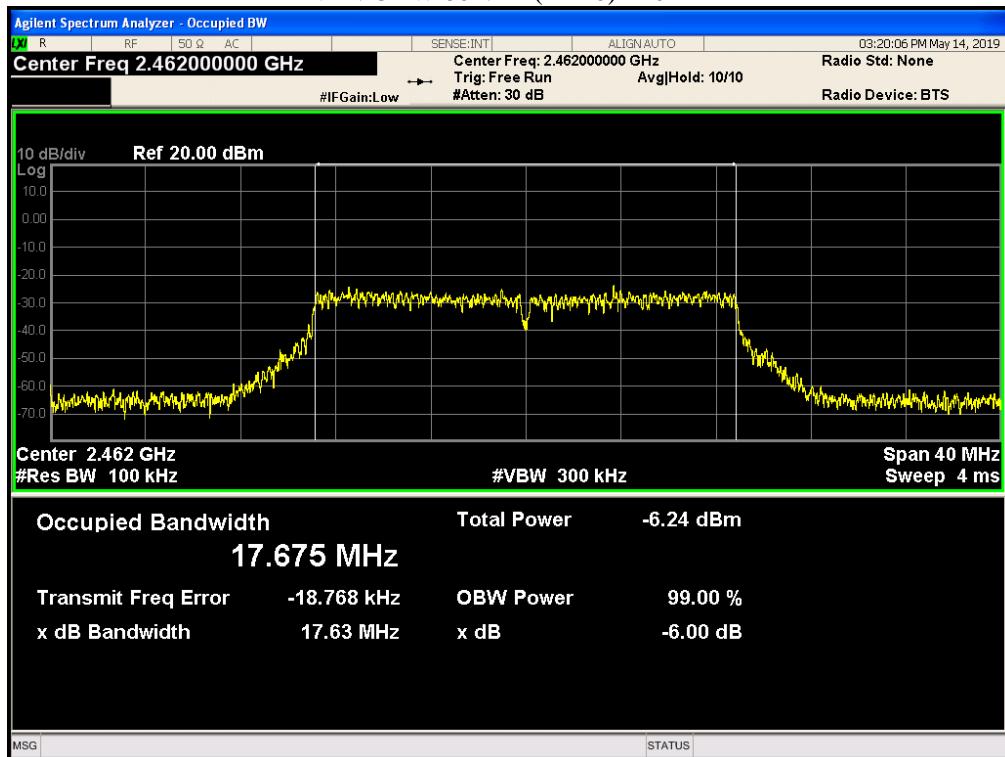
ANT1: OBW 802.11n(HT20) 2412MHz



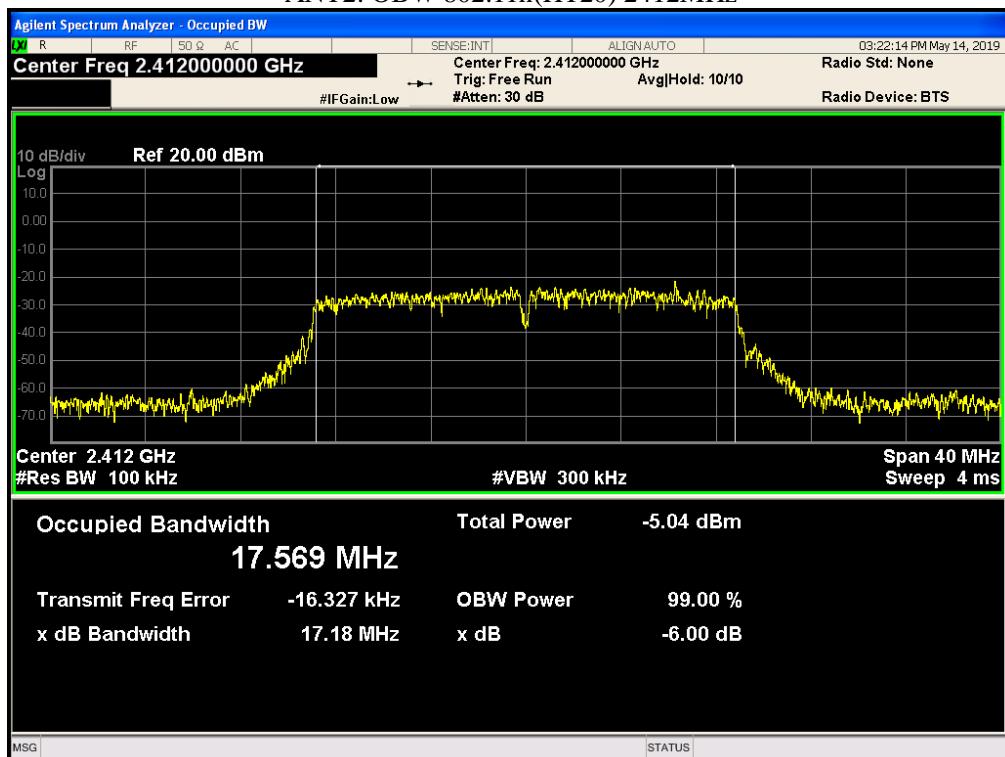
ANT1: OBW 802.11n(HT20) 2437MHz



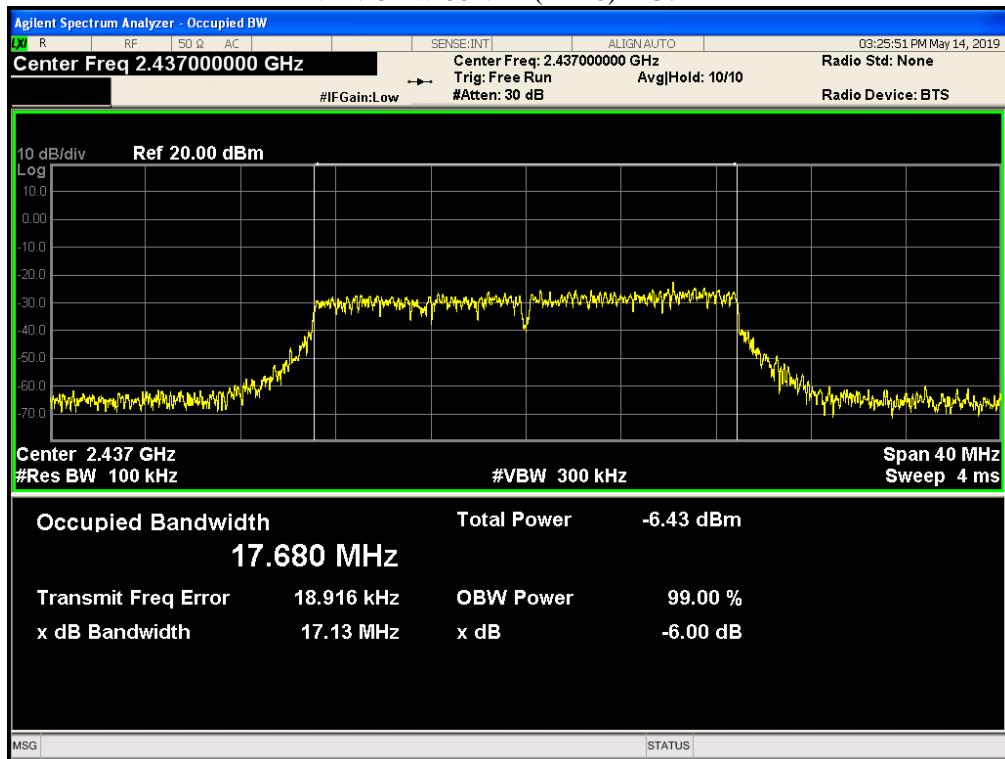
ANT1: OBW 802.11n(HT20) 2462MHz



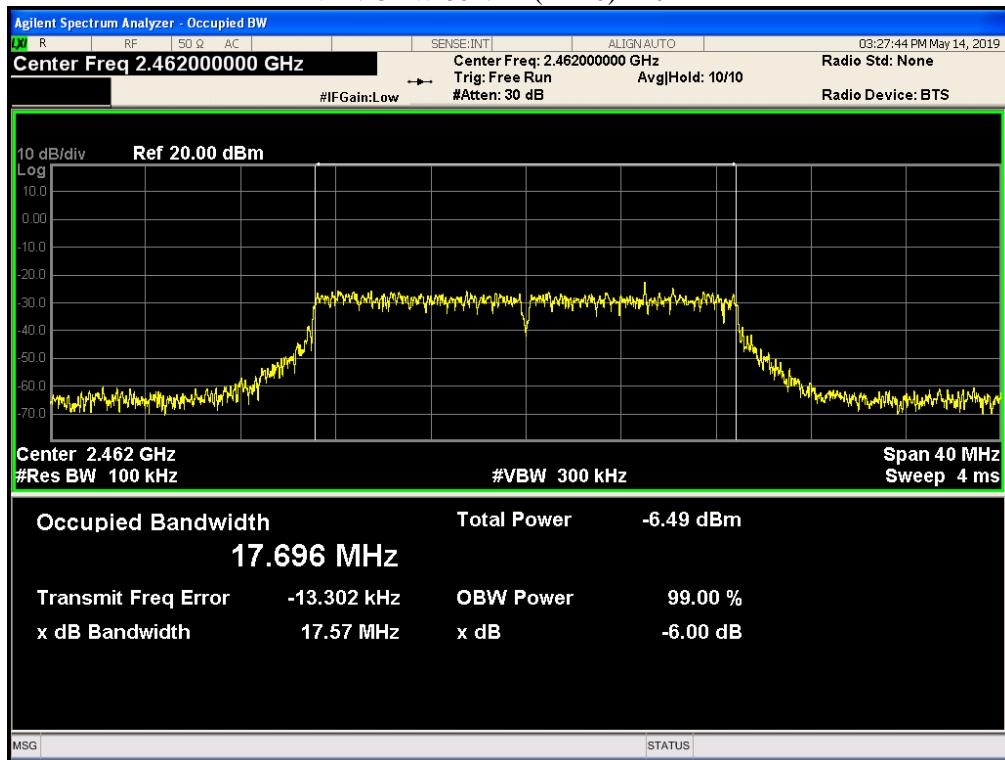
ANT2: OBW 802.11n(HT20) 2412MHz



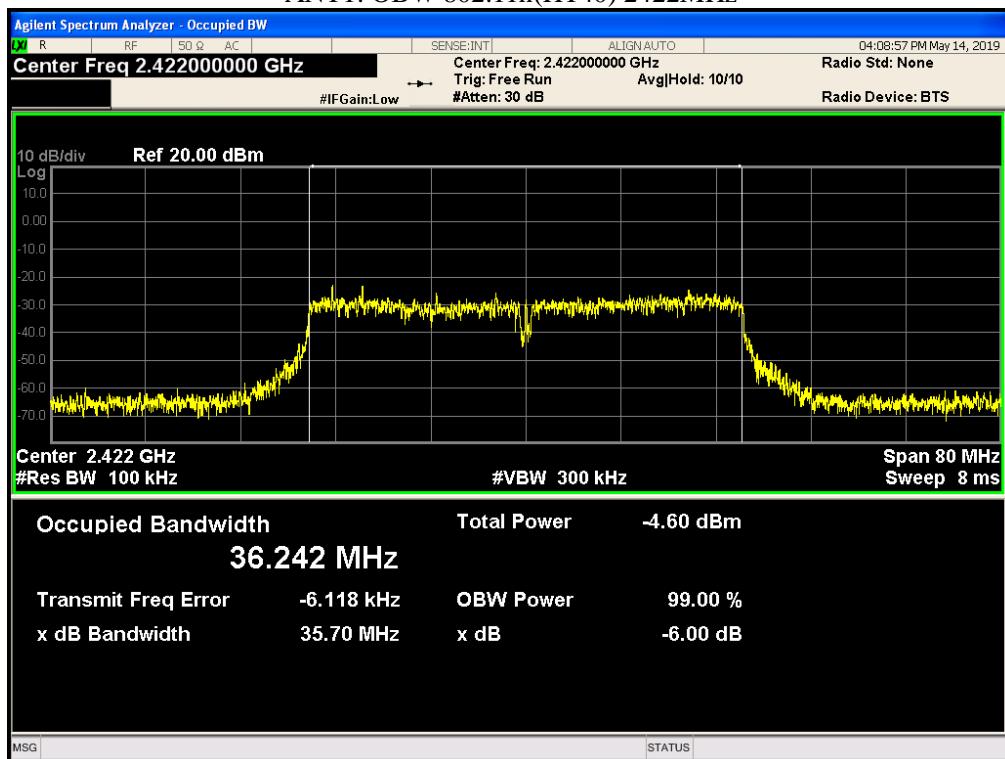
ANT2: OBW 802.11n(HT20) 2437MHz



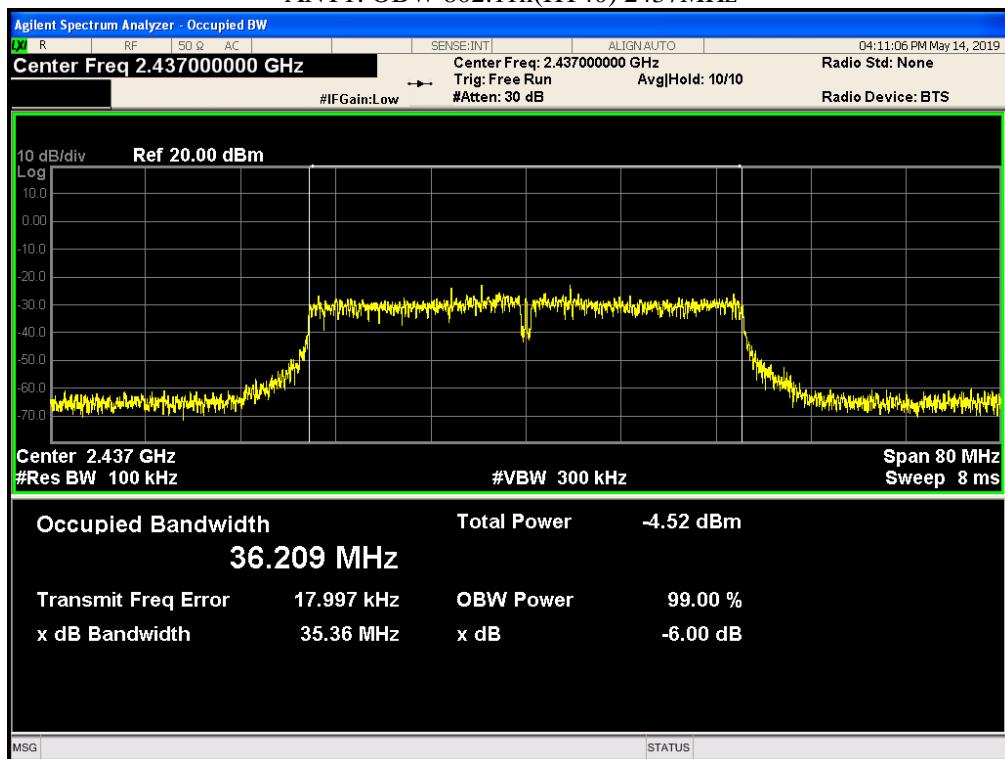
ANT2: OBW 802.11n(HT20) 2462MHz



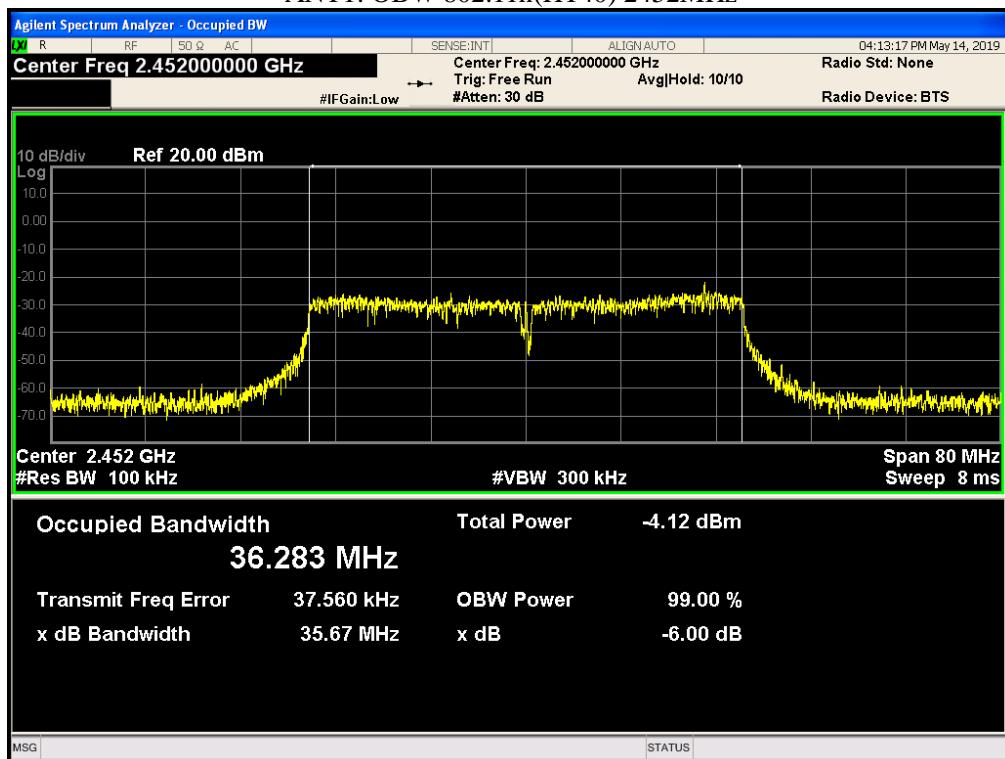
ANT1: OBW 802.11n(HT40) 2422MHz



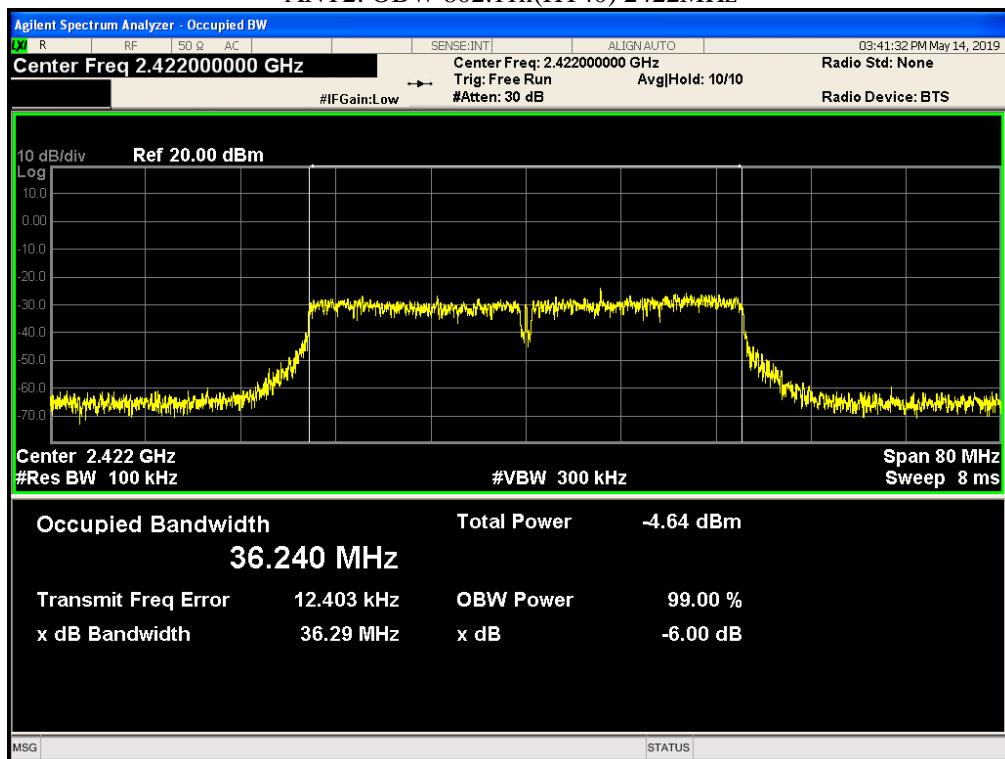
ANT1: OBW 802.11n(HT40) 2437MHz



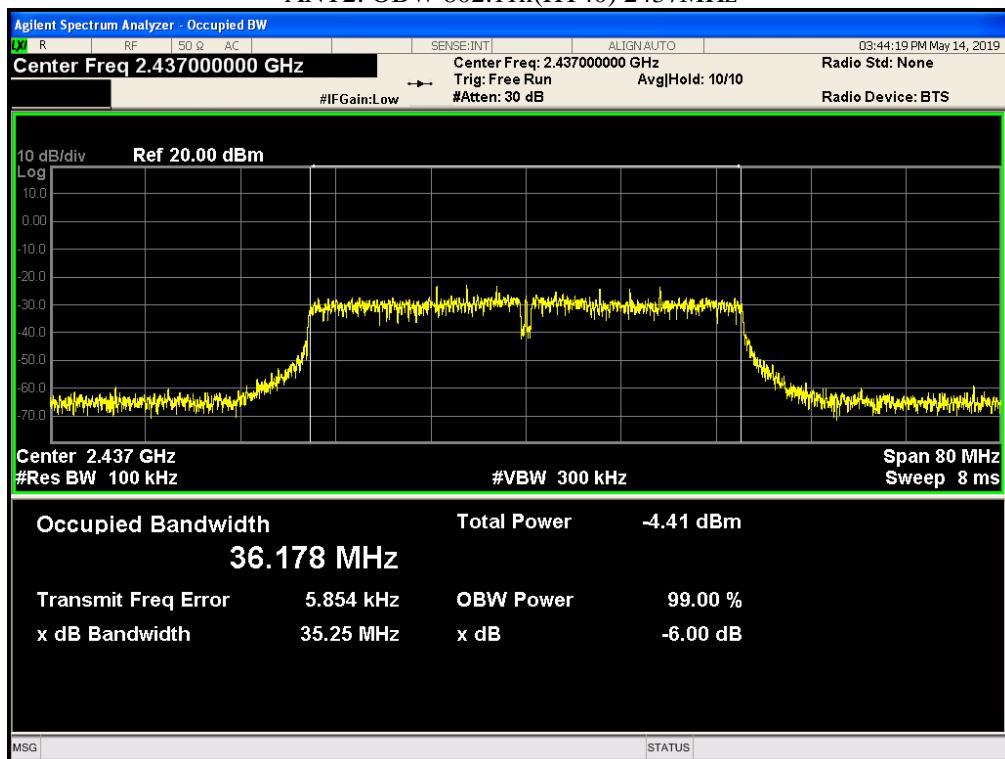
ANT1: OBW 802.11n(HT40) 2452MHz



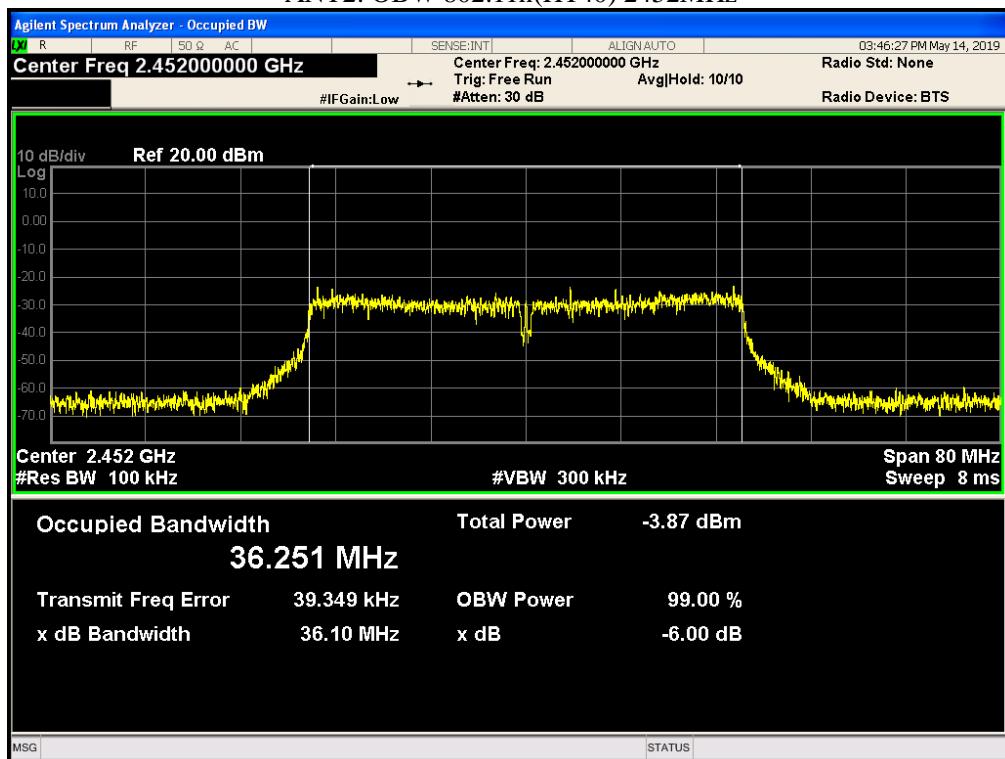
ANT2: OBW 802.11n(HT40) 2422MHz



ANT2: OBW 802.11n(HT40) 2437MHz



ANT2: OBW 802.11n(HT40) 2452MHz



8. BAND EDGE CHECK

8.1. Test limits

Please refer section 15.247

All the lower and upper band-edges emissions appearing within 2310MHz to 2390MHz and 2483.5MHz to 2500MHz restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz and 5725MHz to 5850MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V04

8.2.1 Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value , RBW 1MHz ,VBW 10Hz , RMS detector for AV value.

8.3. Test Setup

Same as 5.2.2.

8.4. Test Results

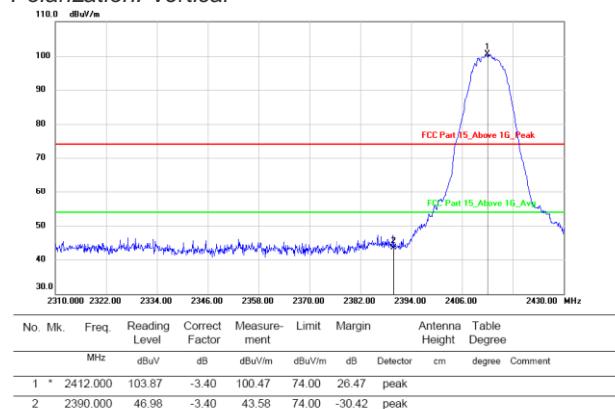
PASS.

Detailed information please see the following page.

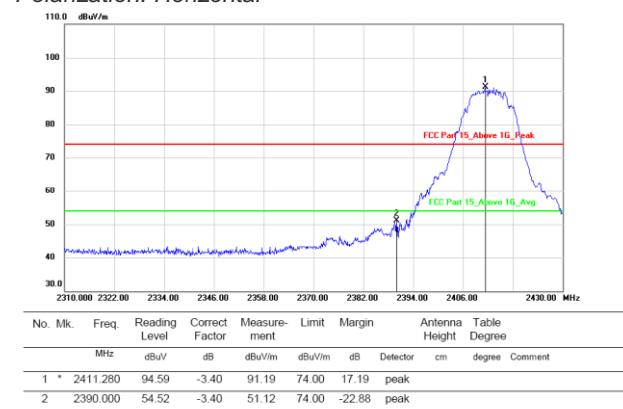
Worst case : ANT2

Test Mode: IEEE 802.11b-Low

Polarization: Vertical

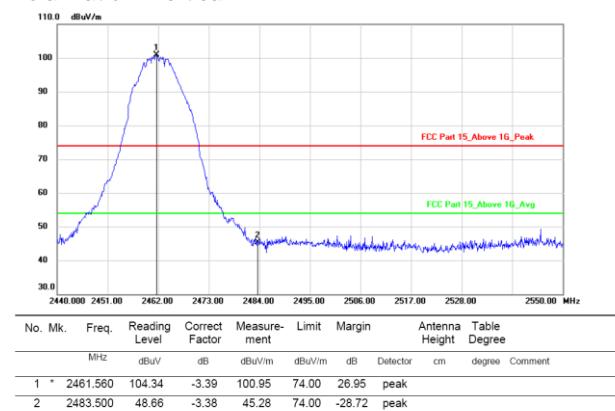


Polarization: Horizontal

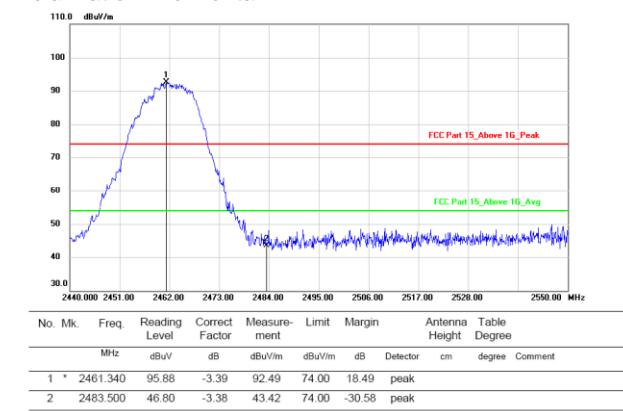


Test Mode: IEEE 802.11b-High

Polarization: Vertical



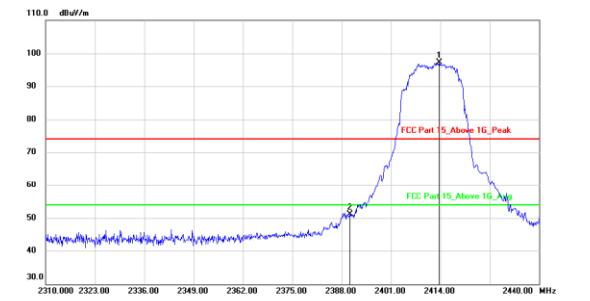
Polarization: Horizontal



Worst case : ANT2

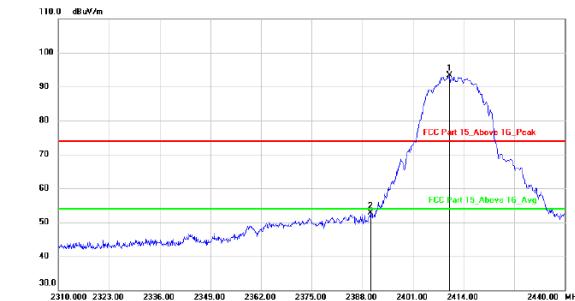
Test Mode: IEEE 802.11g-Low

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 *		2413.740	100.63	-3.41	97.22	74.00	23.22	peak			
2		2390.000	54.52	-3.40	51.12	74.00	-22.88	peak			

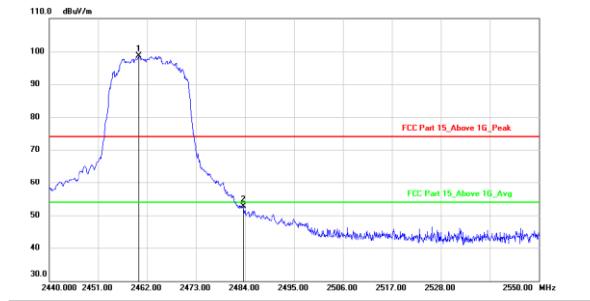
Polarization: Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 *		2410.360	96.76	-3.40	93.36	74.00	19.36	peak			
2		2390.000	56.15	-3.40	52.75	74.00	-21.25	peak			

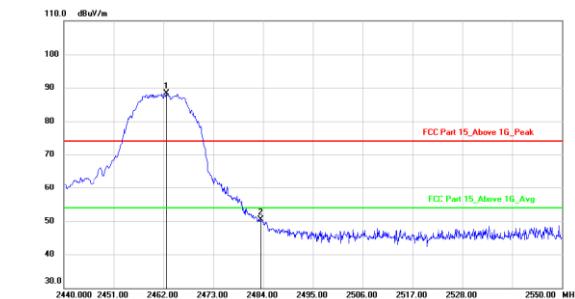
Test Mode: IEEE 802.11g-High

Polarization: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 *		2460.130	102.14	-3.38	98.75	74.00	24.75	peak			
2		2483.500	56.12	-3.38	52.74	74.00	-21.26	peak			

Polarization: Horizontal

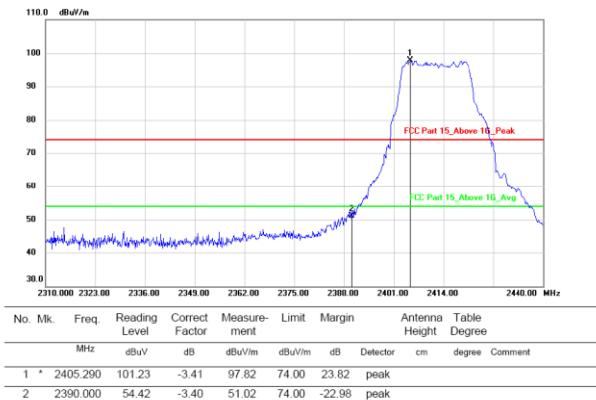


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	Antenna Height	Table Degree		
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1 *		2462.660	91.68	-3.40	88.28	74.00	14.28	peak			
2		2483.500	53.85	-3.38	50.47	74.00	-23.53	peak			

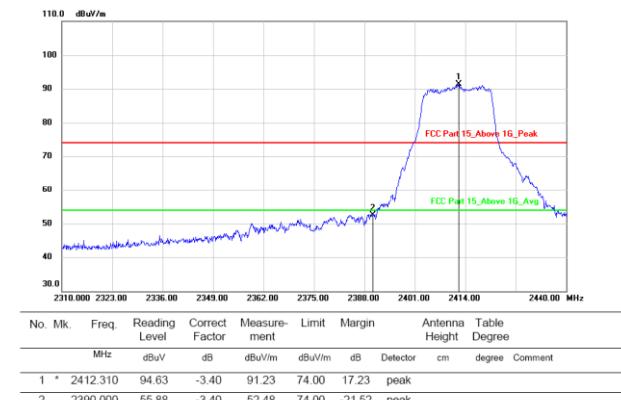
Worst case : ANT1+ANT2

Test Mode: IEEE 802.11n20-Low

Polarization: Vertical

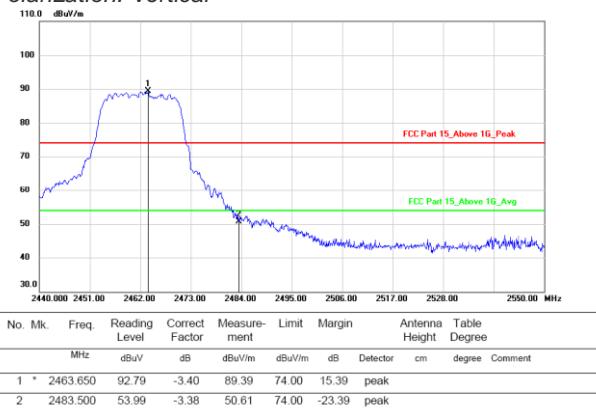


Polarization: Horizontal

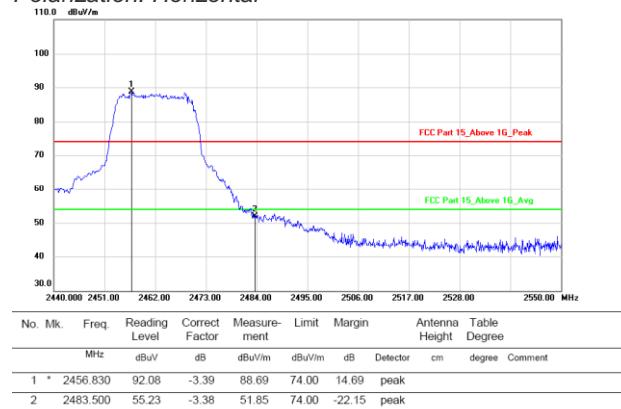


Test Mode: IEEE 802.11n20-High

Polarization: Vertical



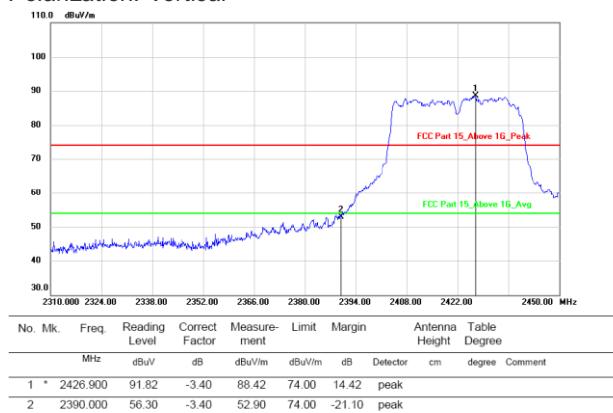
Polarization: Horizontal



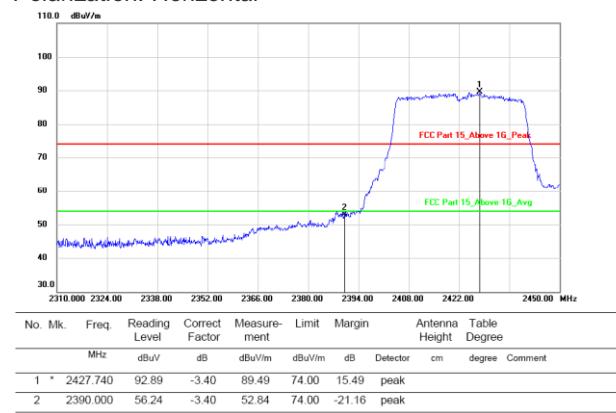
Worst case : ANT1+ANT2

Test Mode: IEEE 802.11n40-Low

Polarization: Vertical

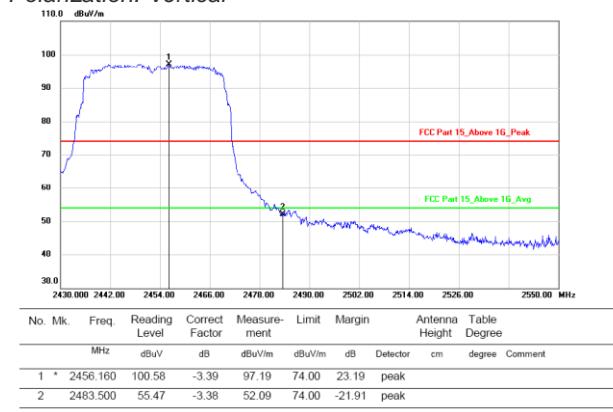


Polarization: Horizontal

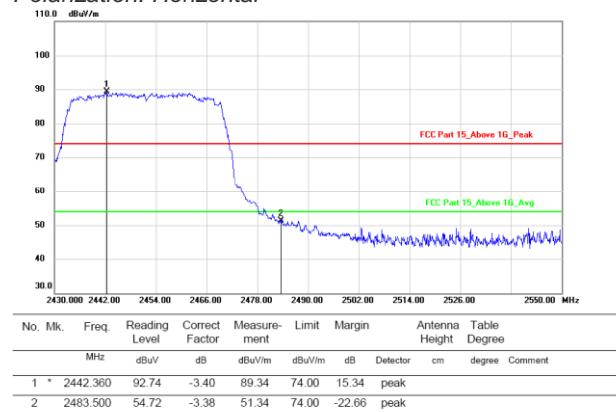


Test Mode: IEEE 802.11n40-High

Polarization: Vertical



Polarization: Horizontal



Note: 1. *:Maximum data; x:Over limit; !:over margin.

2. Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

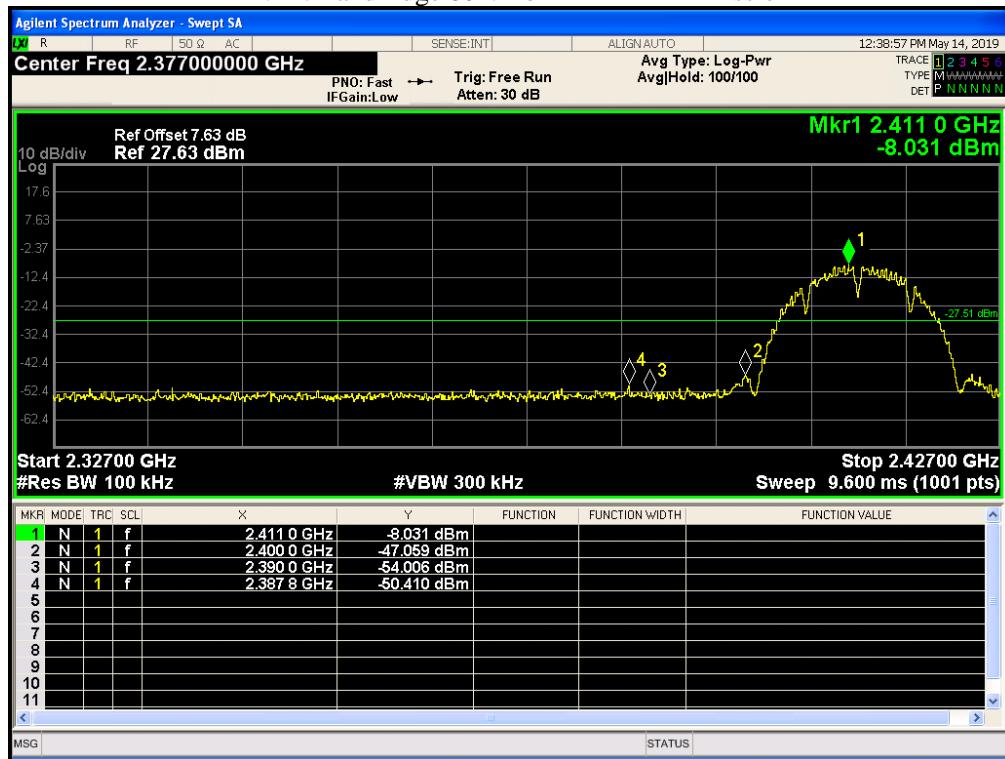
Band Edge

Condition	Mode	Frequency (MHz)	Max Value (dBc)	Limit (dBc)	Verdict
ANT1	802.11b	2412	-42.902	-20	Pass
ANT1	802.11b	2462	-44.322	-20	Pass
ANT2	802.11b	2412	-43.071	-20	Pass
ANT2	802.11b	2462	-43.761	-20	Pass
ANT1	802.11g	2412	-39.56	-20	Pass
ANT1	802.11g	2462	-36.788	-20	Pass
ANT2	802.11g	2412	-38.732	-20	Pass
ANT2	802.11g	2462	-38.152	-20	Pass
ANT1	802.11n(HT20)	2412	-39.539	-20	Pass
ANT1	802.11n(HT20)	2462	-36.708	-20	Pass
ANT2	802.11n(HT20)	2412	-38.328	-20	Pass
ANT2	802.11n(HT20)	2462	-36.962	-20	Pass
ANT1	802.11n(HT40)	2422	-37.06	-20	Pass
ANT1	802.11n(HT40)	2452	-37.982	-20	Pass
ANT2	802.11n(HT40)	2422	-36.715	-20	Pass
ANT2	802.11n(HT40)	2452	-37.442	-20	Pass

ANT1: Band Edge 802.11b 2412MHz Ref



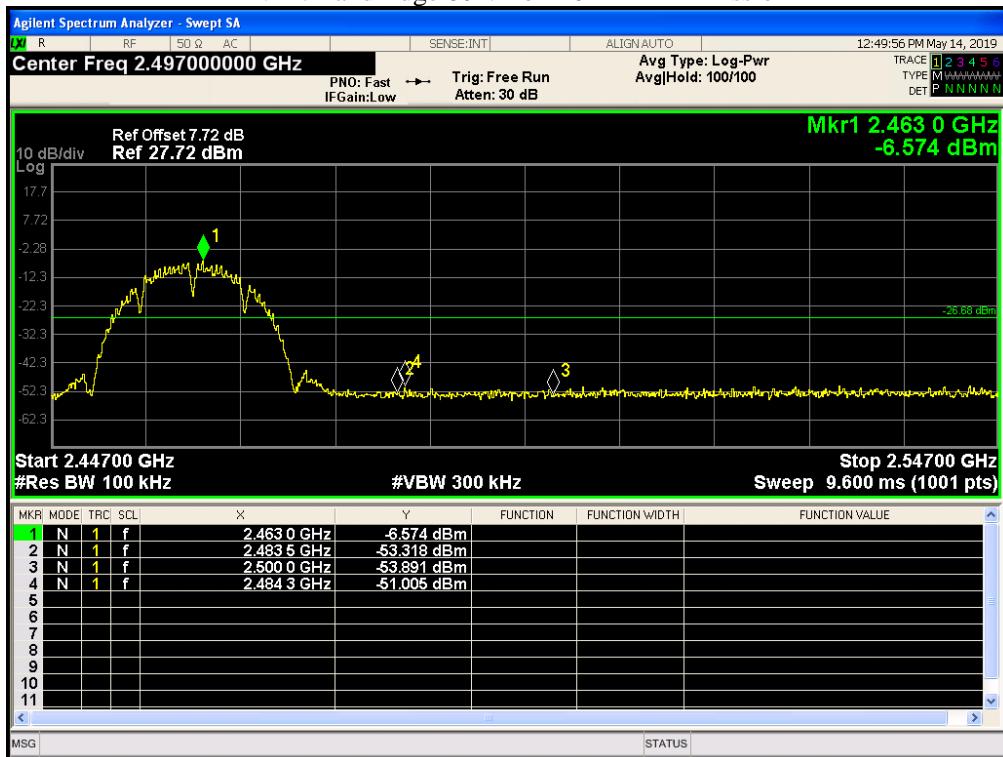
ANT1: Band Edge 802.11b 2412MHz Emission



ANT1: Band Edge 802.11b 2462MHz Ref



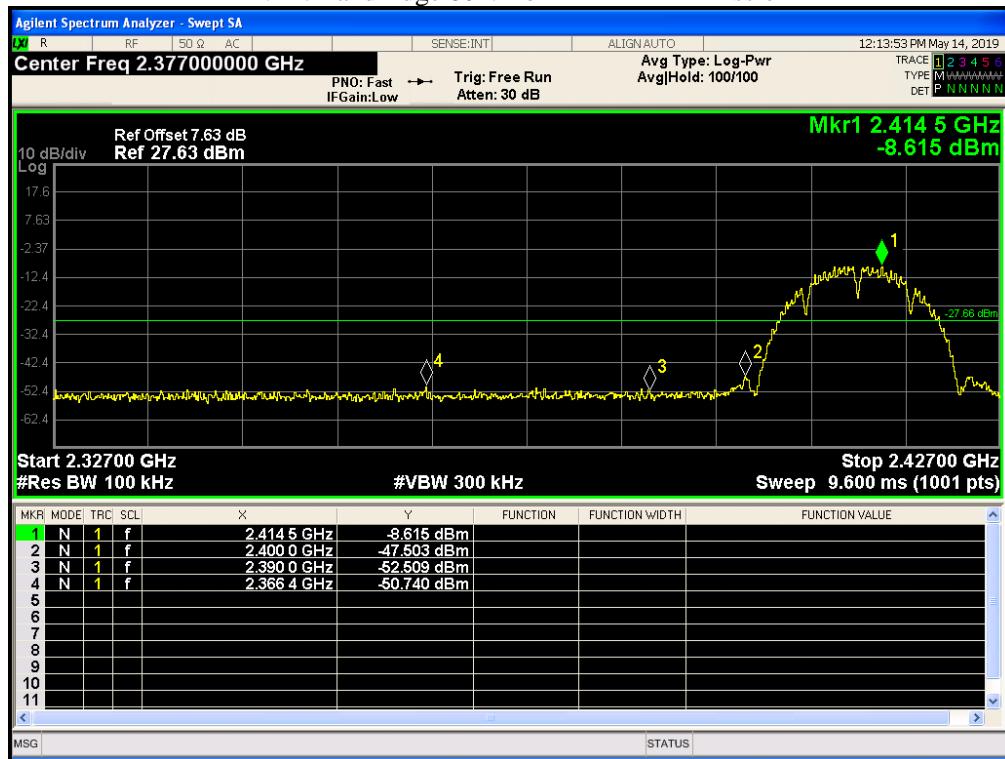
ANT1: Band Edge 802.11b 2462MHz Emission



ANT2: Band Edge 802.11b 2412MHz Ref



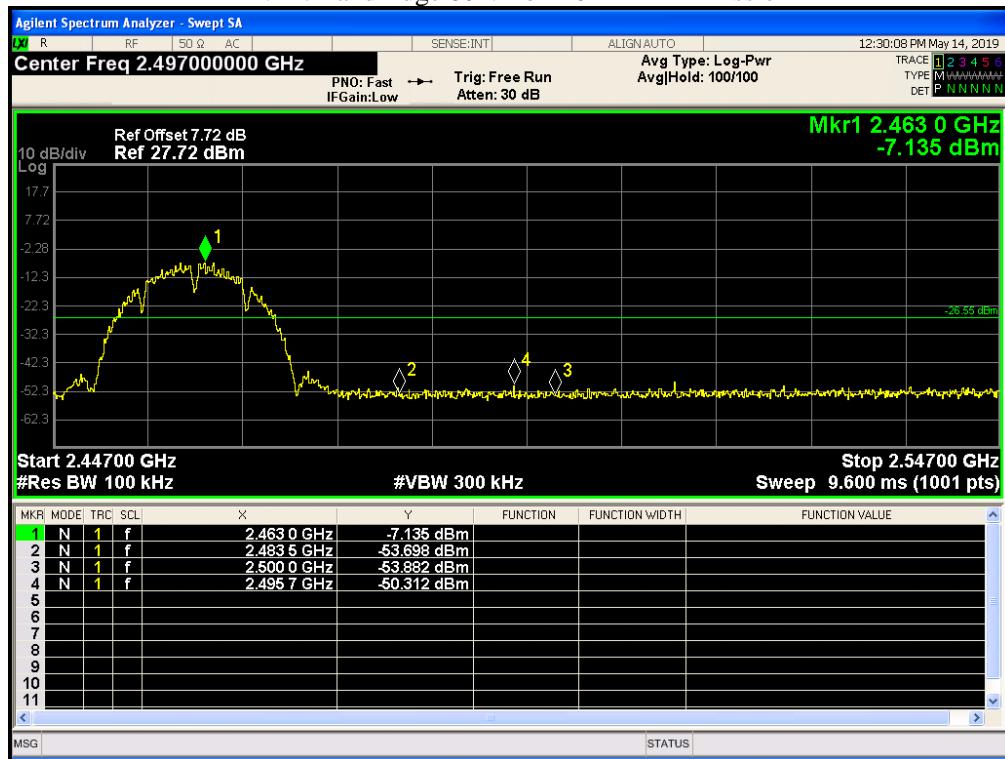
ANT2: Band Edge 802.11b 2412MHz Emission



ANT2: Band Edge 802.11b 2462MHz Ref



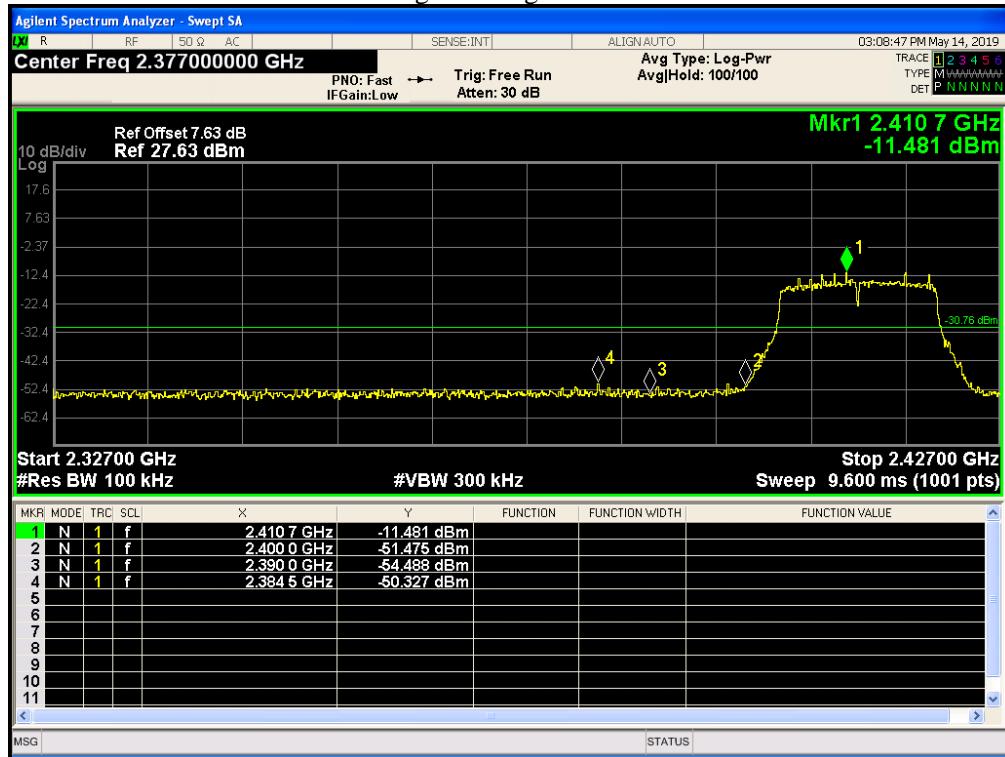
ANT2: Band Edge 802.11b 2462MHz Emission



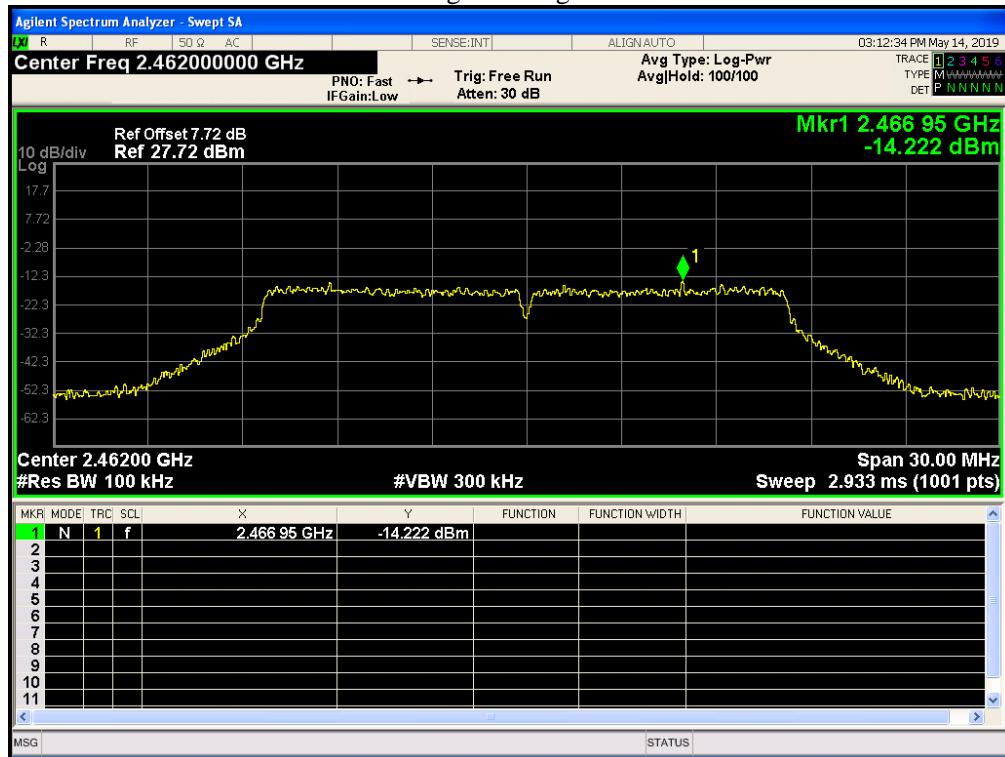
ANT1: Band Edge 802.11g 2412MHz Ref



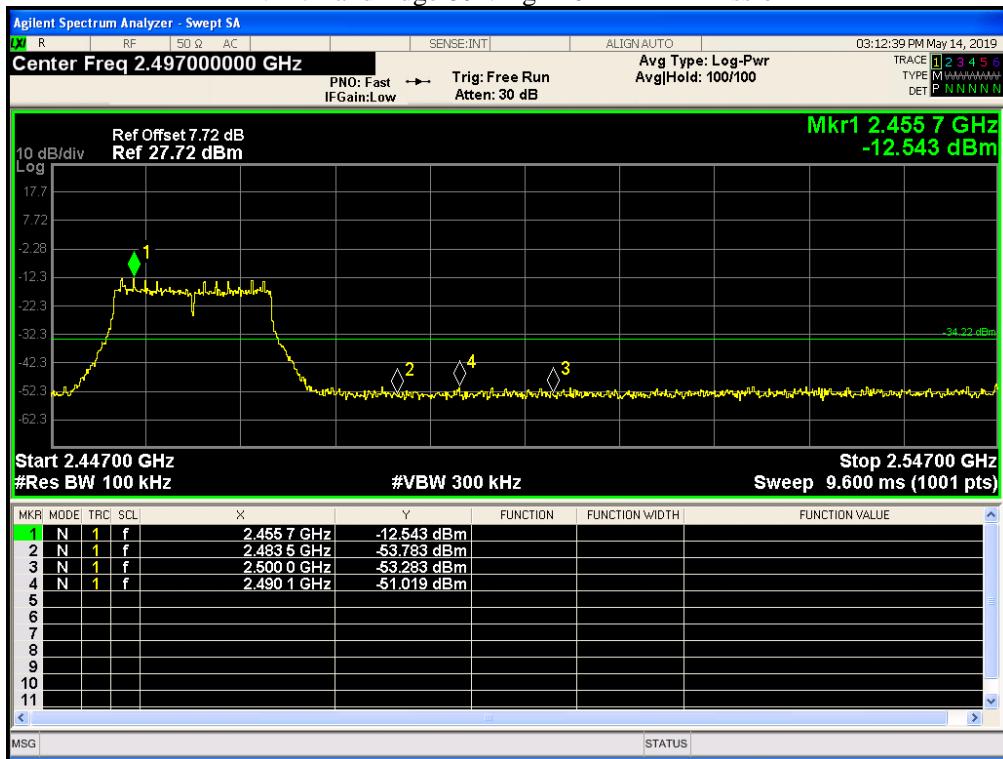
ANT1: Band Edge 802.11g 2412MHz Emission



ANT1: Band Edge 802.11g 2462MHz Ref



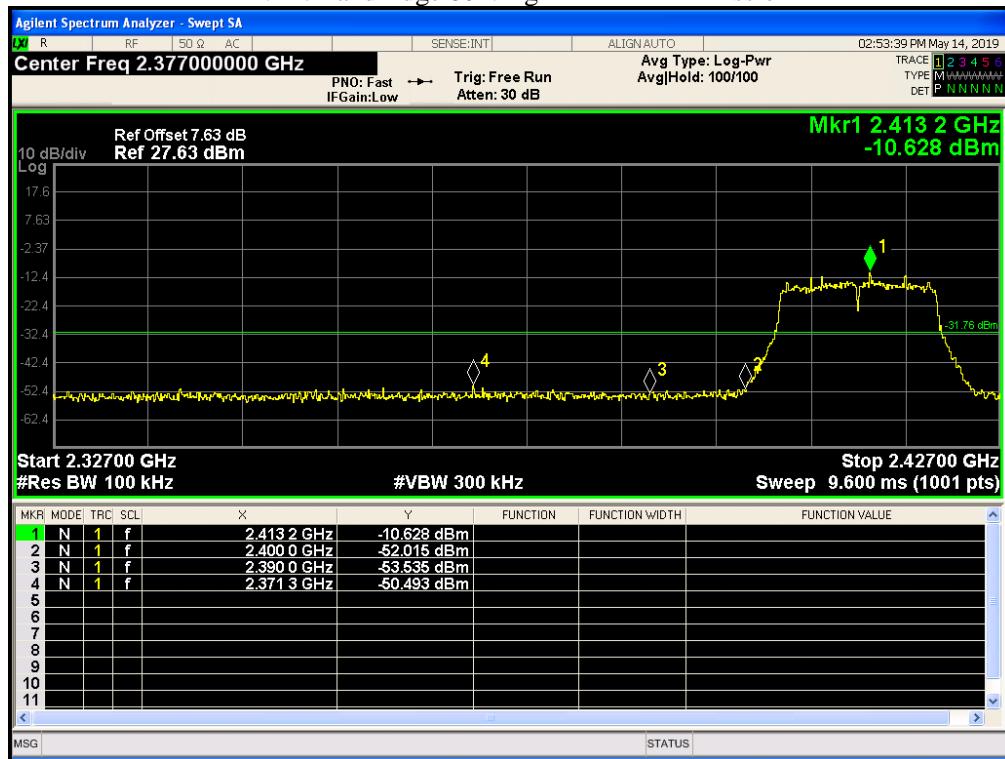
ANT1: Band Edge 802.11g 2462MHz Emission



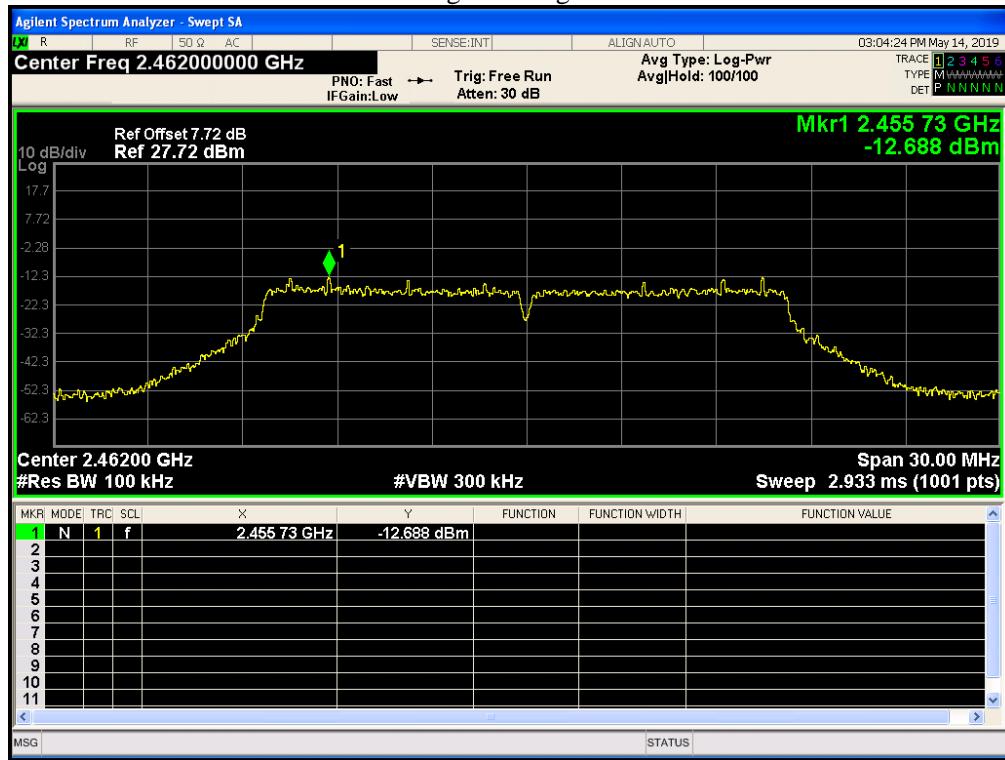
ANT2: Band Edge 802.11g 2412MHz Ref



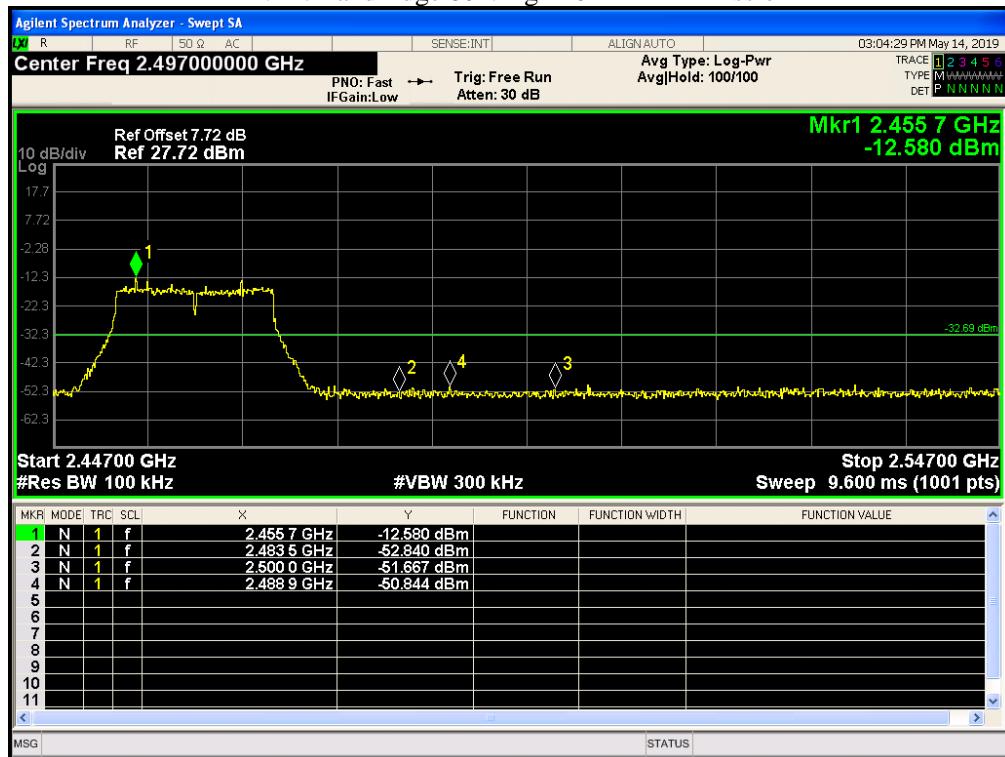
ANT2: Band Edge 802.11g 2412MHz Emission



ANT2: Band Edge 802.11g 2462MHz Ref



ANT2: Band Edge 802.11g 2462MHz Emission



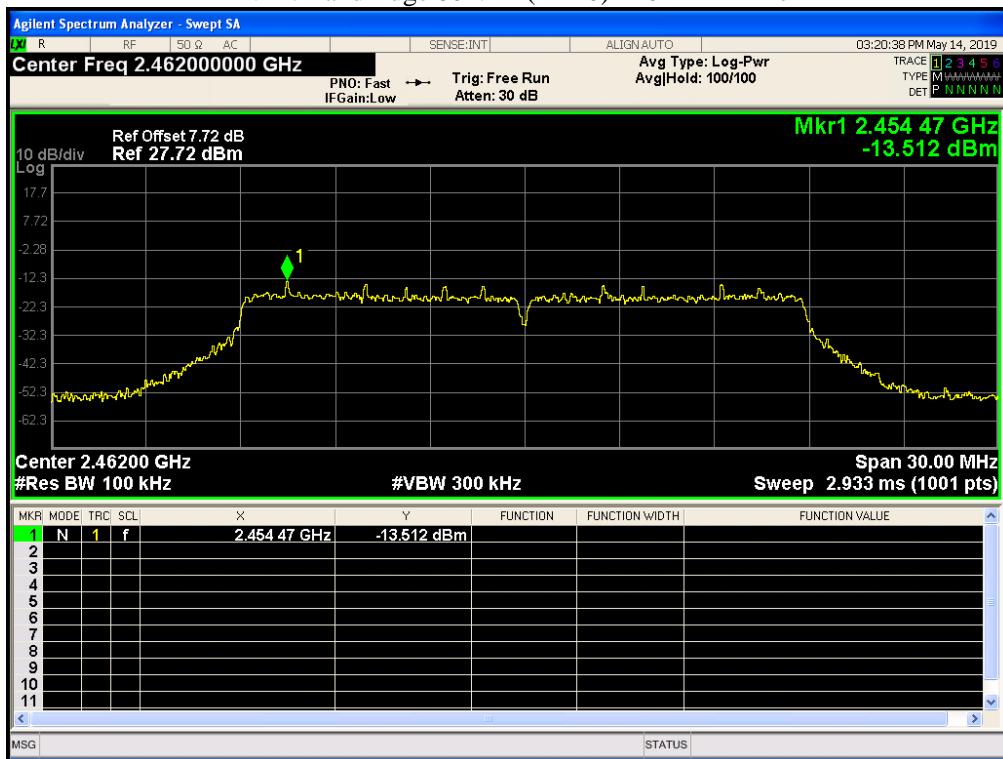
ANT1: Band Edge 802.11n(HT20) 2412MHz Ref



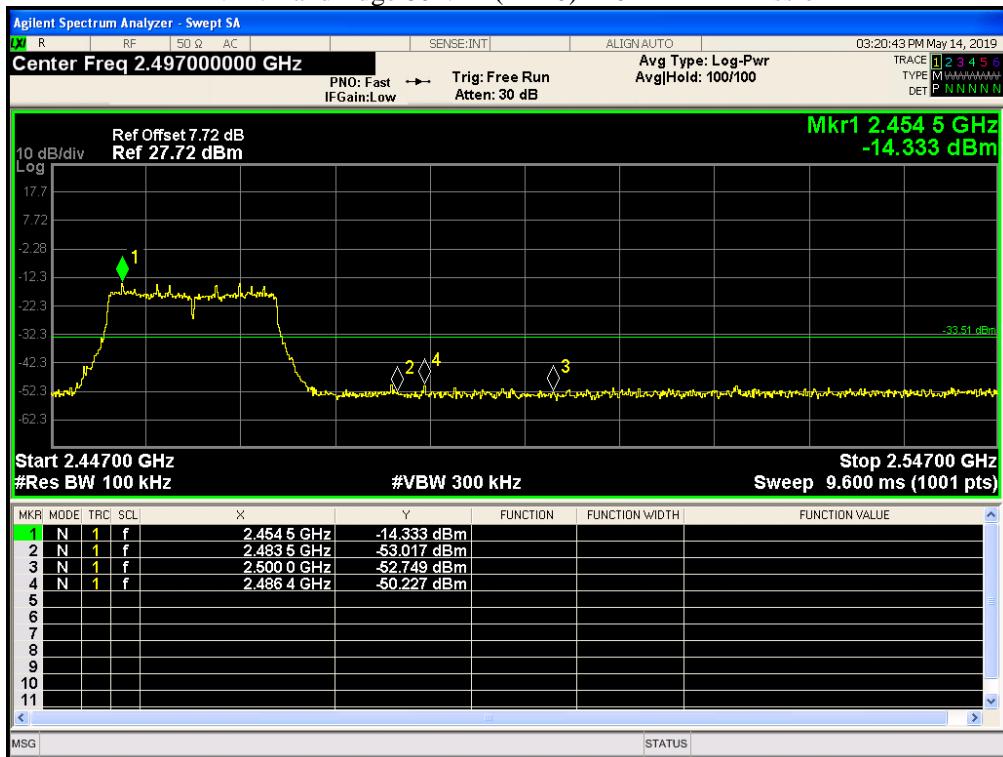
ANT1: Band Edge 802.11n(HT20) 2412MHz Emission



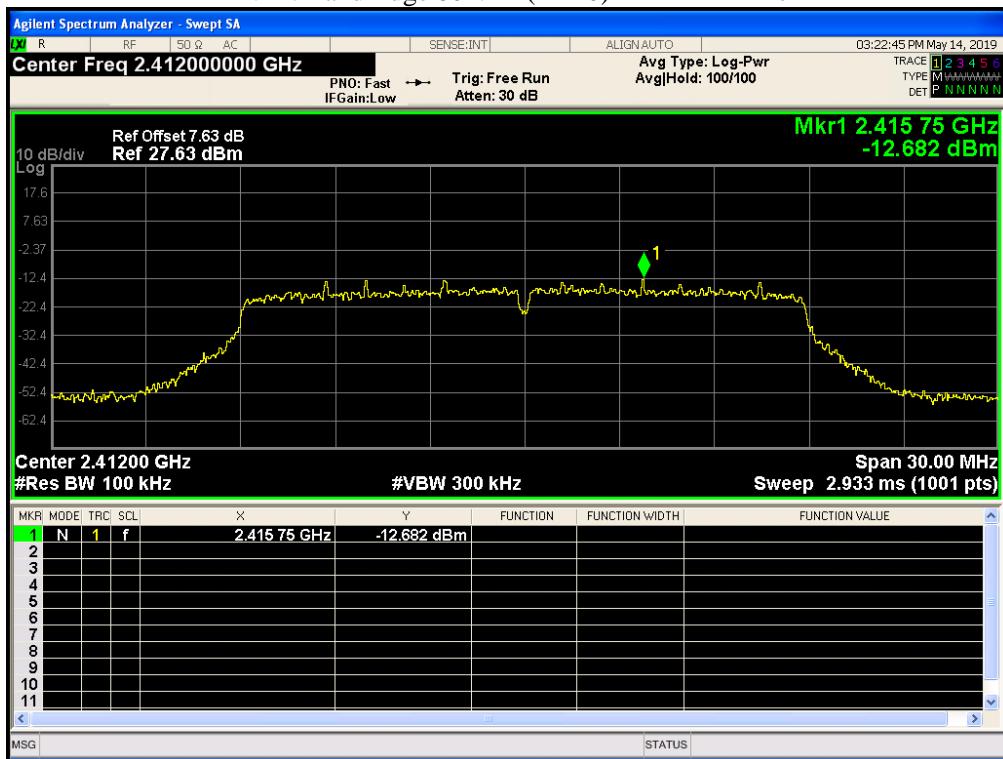
ANT1: Band Edge 802.11n(HT20) 2462MHz Ref



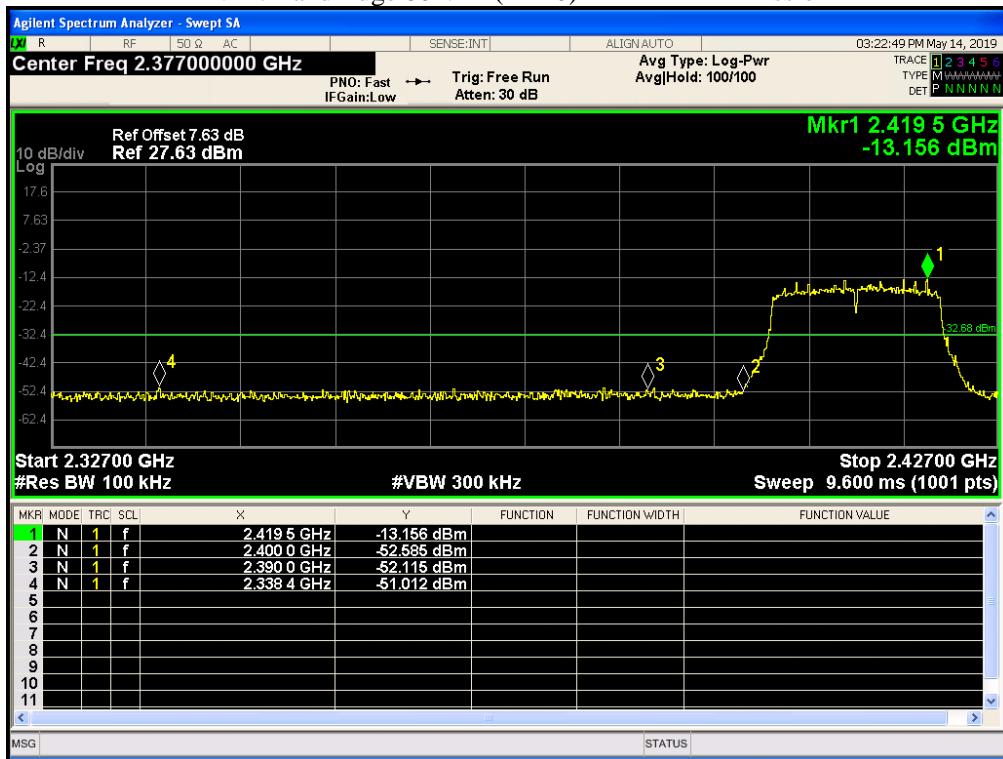
ANT1: Band Edge 802.11n(HT20) 2462MHz Emission



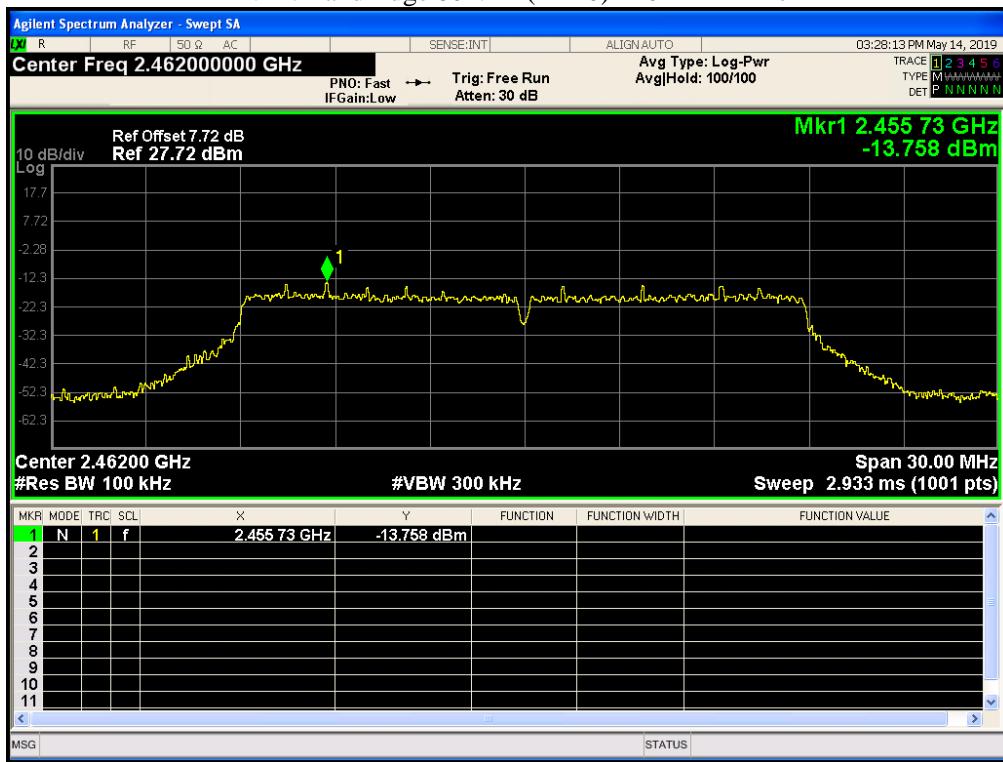
ANT2: Band Edge 802.11n(HT20) 2412MHz Ref



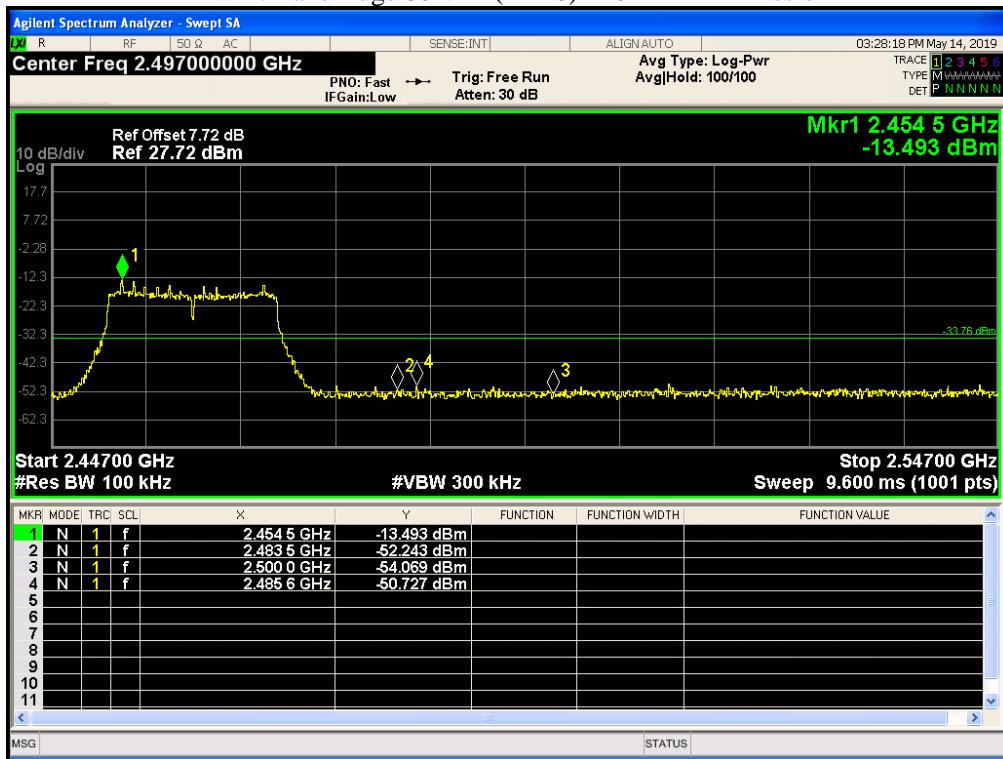
ANT2: Band Edge 802.11n(HT20) 2412MHz Emission



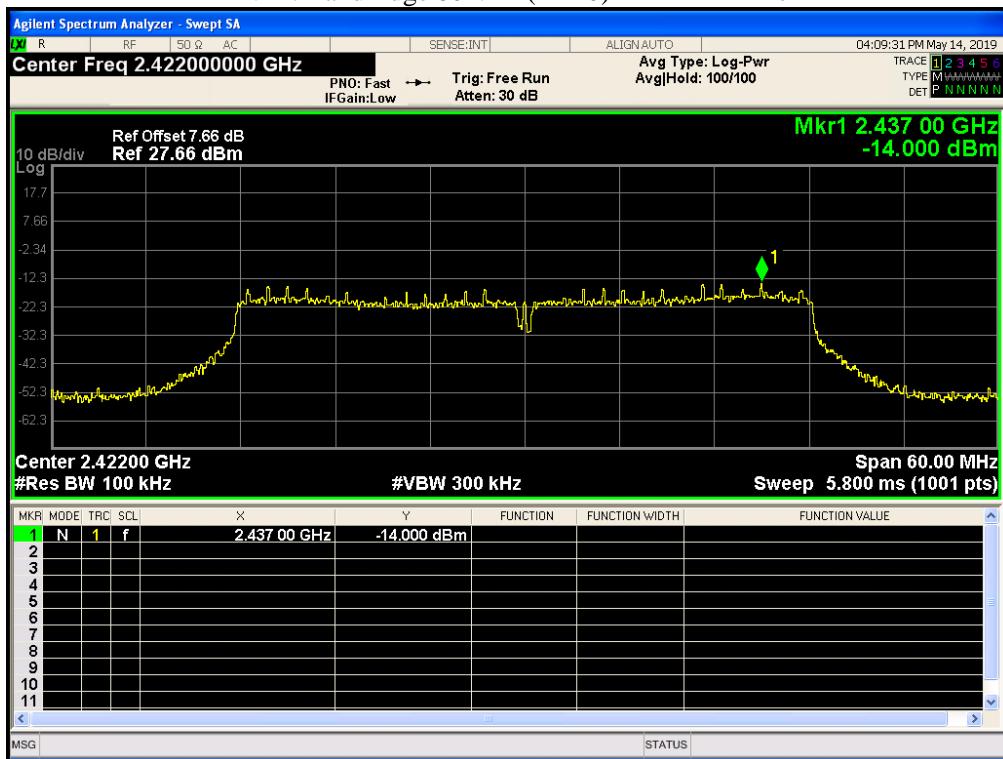
ANT2: Band Edge 802.11n(HT20) 2462MHz Ref



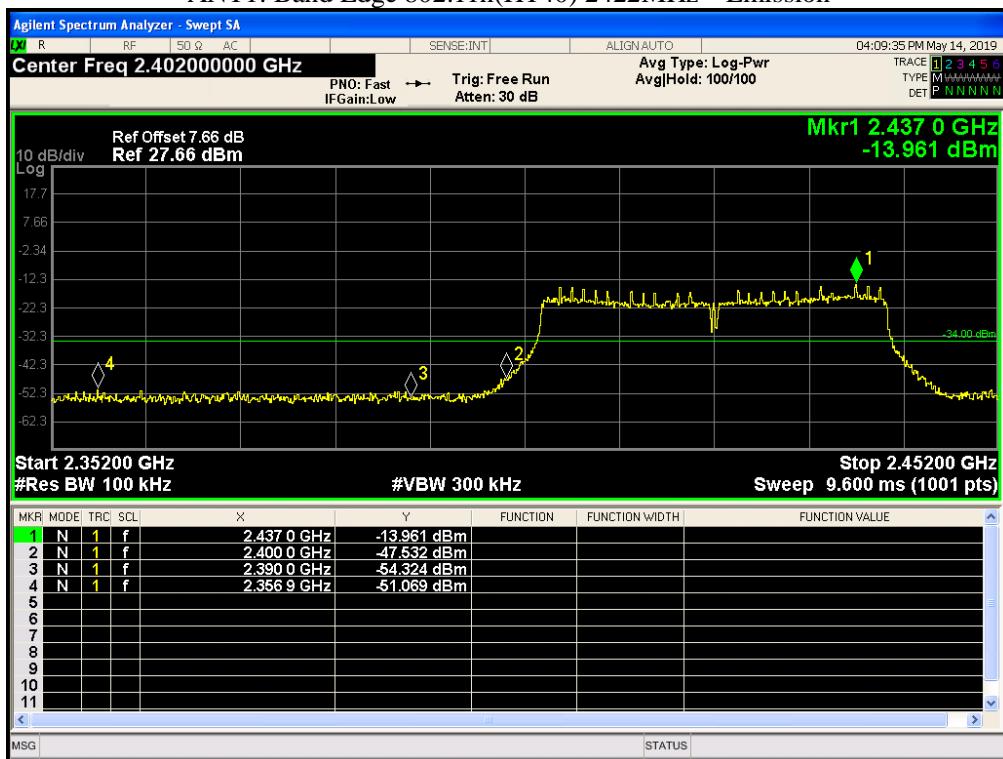
ANT2: Band Edge 802.11n(HT20) 2462MHz Emission



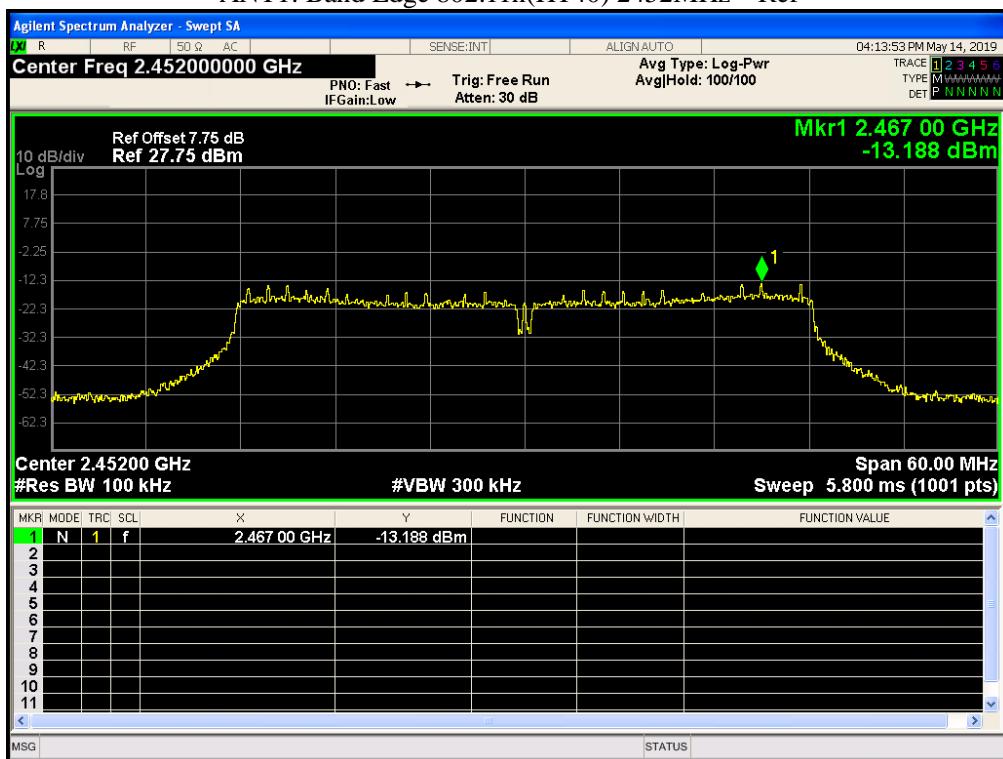
ANT1: Band Edge 802.11n(HT40) 2422MHz Ref



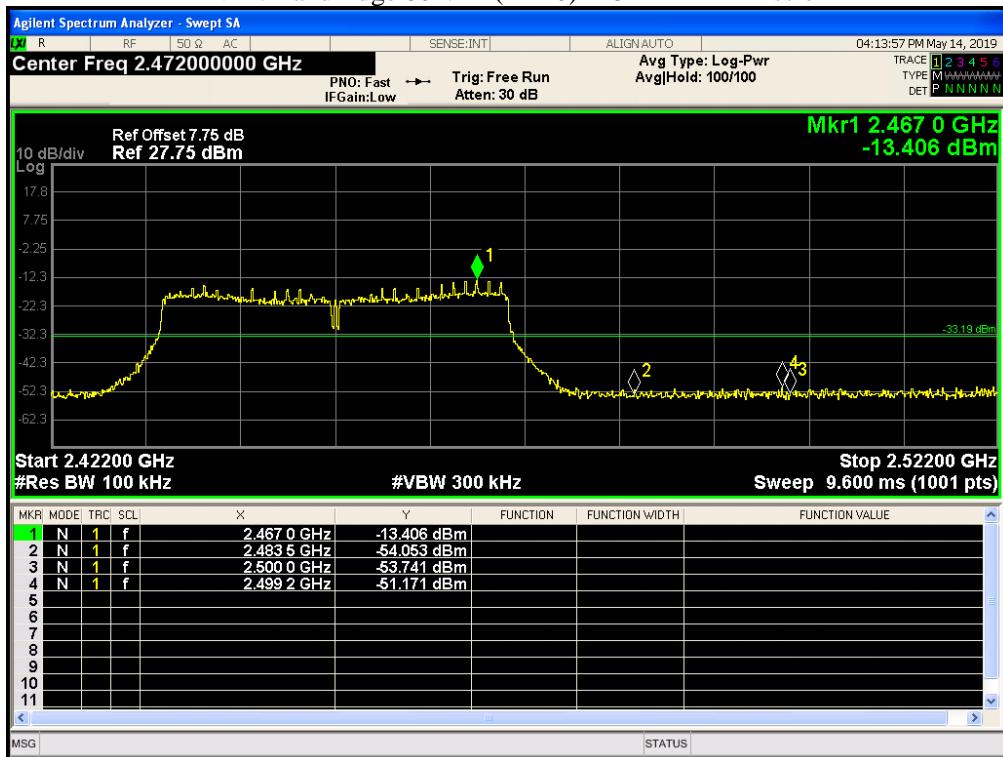
ANT1: Band Edge 802.11n(HT40) 2422MHz Emission



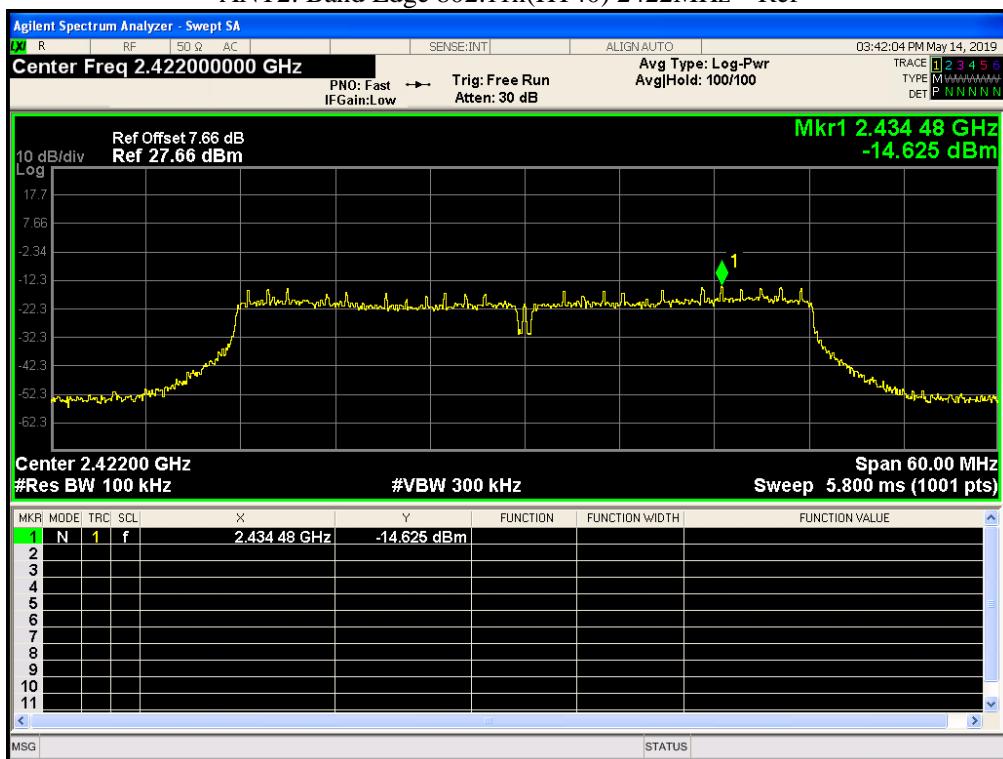
ANT1: Band Edge 802.11n(HT40) 2452MHz Ref



ANT1: Band Edge 802.11n(HT40) 2452MHz Emission



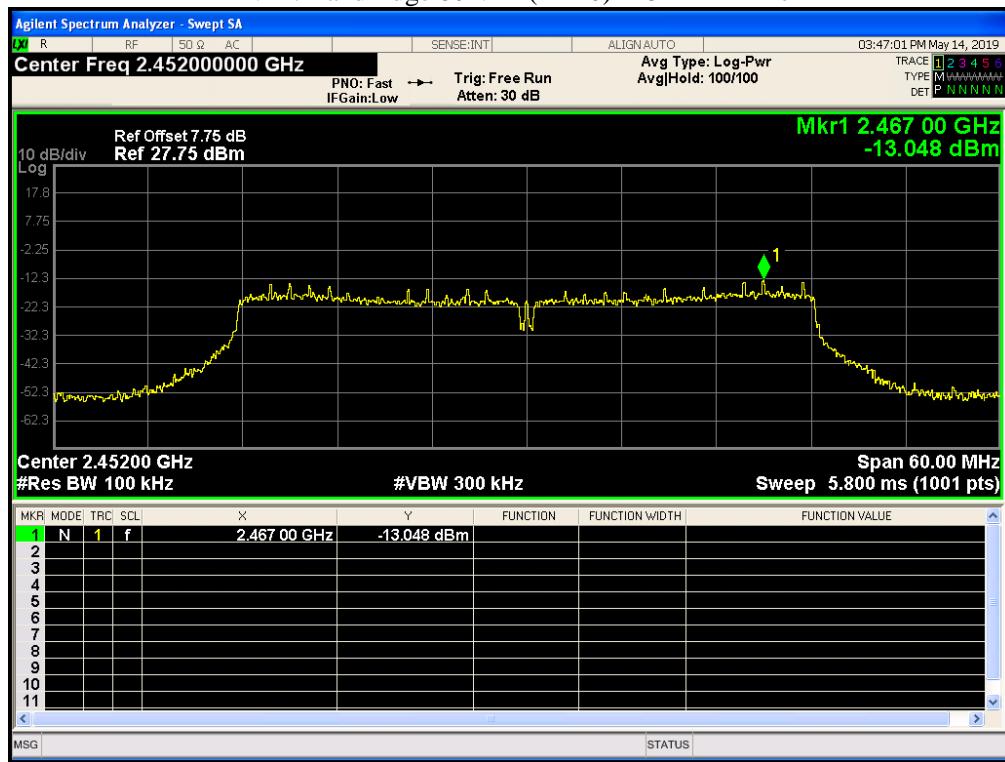
ANT2: Band Edge 802.11n(HT40) 2422MHz Ref



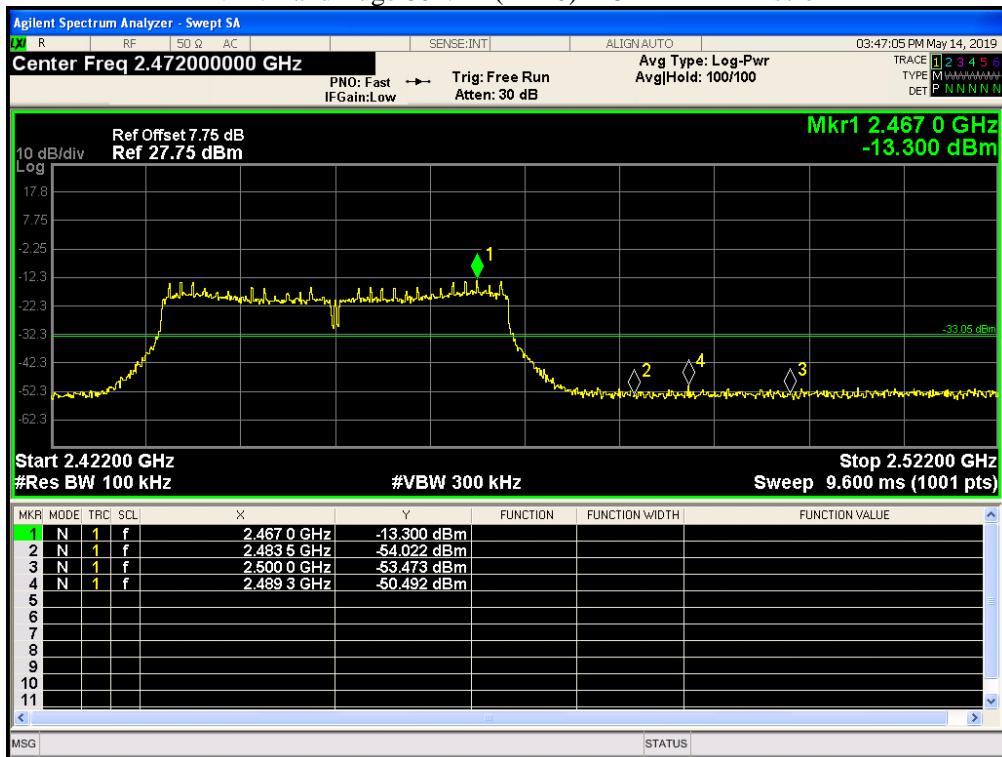
ANT2: Band Edge 802.11n(HT40) 2422MHz Emission



ANT2: Band Edge 802.11n(HT40) 2452MHz Ref



ANT2: Band Edge 802.11n(HT40) 2452MHz Emission



9. ANTENNA REQUIREMENT

9.1. Standard 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.

9.2. Antenna Connected Construction

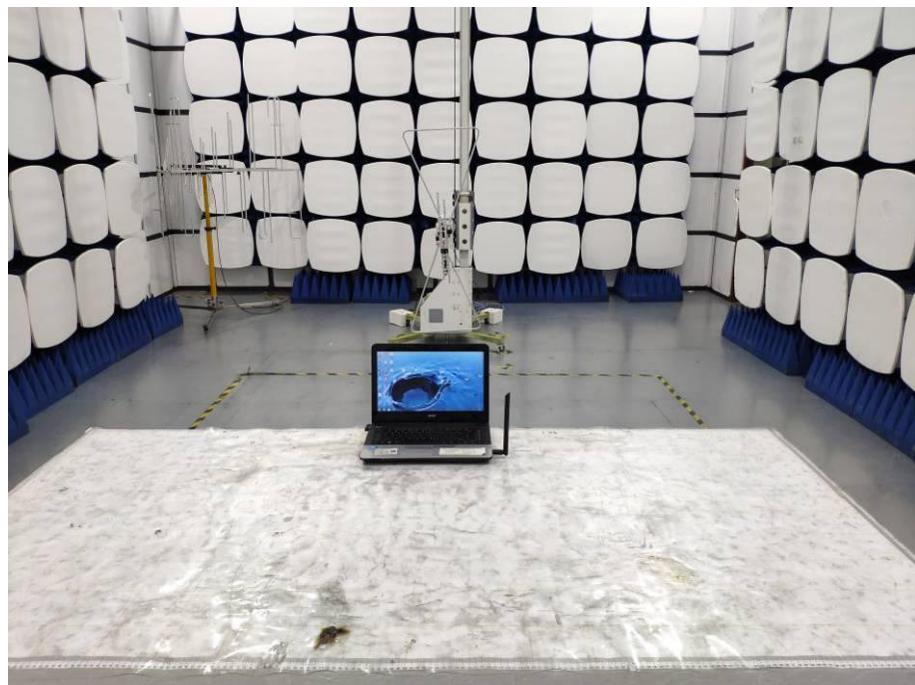
The antenna used for transmitting is permanently attached and no consideration of replacement. Please see EUT photo for details.

9.3. Results

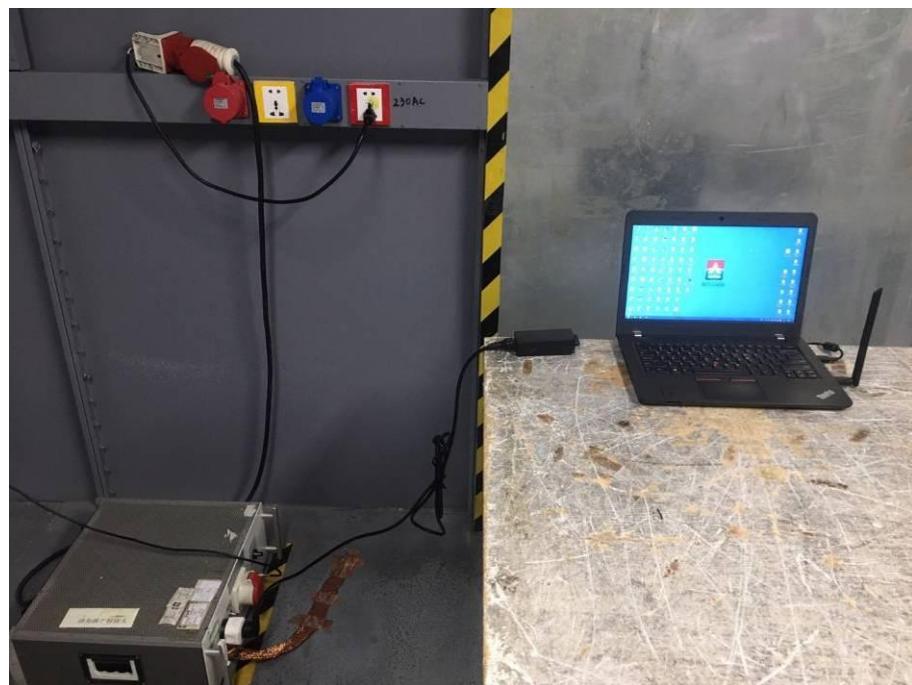
The 2.4G Wifi have one Internal antennas & one external antenna. It complies with the standard requirement.

10.TEST SETUP PHOTO

10.1.Photos of Radiated emission



10.2.Photos of Conducted Emission test



11.EUT PHOTOS

Please refer to separated files for External Photos & Internal Photos of the EUT.

-----THE END OF REPORT-----