

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C AND INDUSTRY CANADA RSS 247 REQUIREMENT

OF

Applicant: CYBERNET Manufacturing Inc
5 Holland, Bldg. 201 Irvine. CA92618

Product Name: Cybernet Tablet PC

Brand Name: Cybernet

Model No.: CyberMed Rx, Rugged X10

Model Difference: appearance different

FCC ID: 2AHZW-CYBRXX10

IC: 24472-CYBRXX10

Report Number: E2/2019/10029

FCC Rule Part: §15.247, Cat: DTS

IC Rule Part: RSS-247 issue 2 Feb 2017

Issue Date: Feb. 25, 2019

Date of Test: Jan. 22, 2019 ~ Jan. 30, 2019

Date of EUT Received: Jan. 09, 2019

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits.

The test results of this report relate only to the tested sample identified in this report.

Tested By: 
Pony Chen / Engineer

Approved By: 
Vito Pei / Sr. Engineer



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Revision History

Report Number	Revision	Description	Effected Page	Issue Date	Revised By
E2/2019/10029	Rev.00	Initial creation of document	All	Feb. 12, 2019	Karen Huang
E2/2019/10029	Rev.01	Updated model number and measurement data	Page 1,4,9,65,66,106	Feb. 21, 2019	Karen Huang
E2/2019/10029	Rev.02	Added remark	Page 109	Feb. 25, 2019	Karen Huang

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Table of Contents

1	GENERAL INFORMATION	4
2	SYSTEM TEST CONFIGURATION.....	6
3	SUMMARY OF TEST RESULTS	8
4	DESCRIPTION OF TEST MODES.....	8
5	MEASUREMENT UNCERTAINTY	11
6	CONDUCTED EMISSION TEST	12
7	DUTY CYCLE OF TEST SIGNAL	18
8	PEAK OUTPUT POWER MEASUREMENT	20
9	6dB & 99% BANDWIDTH MEASUREMENT	27
10	CONDUCTED BAND EDGE AND SPURIOUS EMISSION MEASUREMENT	40
11	RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT	50
12	POWER SPECTRAL DENSITY	107
13	ANTENNA REQUIREMENT	112

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	Cybernet Tablet PC	
Brand Name:	Cybernet	
Model No.:	CyberMed Rx, Rugged X10	
Model Difference:	appearance different	
Hardware Version:	N/A	
Software Version:	N/A	
Power Supply:	10.8Vdc from Rechargeable Li-polymer Battery or 19Vdc from AC/DC Adapter	
	Battery:	Model No.: CyberMed Rx/Rugged X10, Supplier: FUJI Electronics (Shenzhen) Co., Ltd.
	Adapter:	1. Model No.: FSP065-DBBM1, Supplier: FSP GROUP INC. 2. Model No.: EM10681V, Supplier: EDACPOWER ELEC.

WLAN 2.4GHz:

Wi-Fi	Frequency Range	Channels	Rated Power in dBm (Peak)	Rated Power in dBm (EIRP)	Type of Emission	Modulation Technology
802.11b	2412-2462	11	20.58	14.34	13M0G1D	DSSS,
802.11g			19.86	11.45	16M8D1D	OFDM
802.11n HT20			21.47	14.46	17M7D1D	
802.11n HT40	2422-2452	7	19.44	13.73	36M0D1D	
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transition Rate:		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps				

Antenna Designation

Antenna Type	Main / Aux	Part Number	Supplier	Peak Gain (dBi)
PIFA	Main	RFA-25-AP238-70B180T	Aristotle	-3
PIFA	Aux	RFA-25-AP238-70B-240	Aristotle	-4.12

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v05r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5 Apr. 2018

ANSI C63.10:2013

Note: All test items have been performed and record as per the above standards.

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd.,
Guishan District, Taoyuan City, Taiwan 333 (TAF code 0513)

FCC Designation number: TW0002

Canada Registration Number: 4620E-1

1.4 Special Accessories

There are no special accessories used while test was conducted.

1.5 Equipment Modifications

There was no modification incorporated into the EUT.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

2.3 Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a table which is 0.8 m above ground plane. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz. The CISPR Quasi-Peak and Average detector mode is employed according to §15.207. The two LISNs provide 50 µH/50 ohm of coupling impedance for the measuring instrument. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

2.3.2 Conducted Test (RF)

The active antenna port of the unlicensed wireless device is connected to the spectrum analyzer with attenuator to protect the instrumentation. If a second antenna port is available, it is tested at one operating frequency, with other port(s) appropriately terminated, to verify it has similar output characteristics as the fully tested port.

2.3.3 Radiated Emissions

The EUT is placed on a turn table. For emissions testing at or below 1 GHz, the table height shall be 0.8 m above the reference ground plane. For emission measurements above 1 GHz, the table height shall be 1.5 m. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.

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2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuation factor between EUT conducted port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly EUT RF output level.

Note:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor. Following shows an offset computation example with cable loss and attenuator.

2.5 Configuration of Tested System

Fig. 2-1 Radiated Emission Configuration



Fig.2-3 Conducted Emission (Antenna Port) Configuration



Fig. 2-2 Conducted Emission (AC Power Line) Configuration

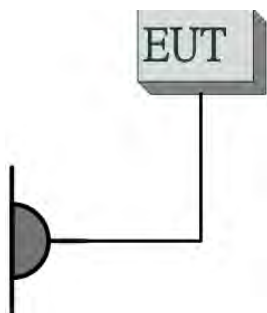


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	WLAN Test Software	N/A	N/A	N/A	N/A	N/A

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3 SUMMARY OF TEST RESULTS

FCC Rules	IC Rules	Description Of Test	Result
§15.207(a)	RSS-Gen §8.8	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	RSS-247 §5.4(4)	Peak Output Power	Compliant
§15.247(a)(2)	RSS-247 §5.1 (1) RSS-Gen §6.7	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	RSS-247 §5.5 RSS-Gen §8.10	Conducted Band Edge and Spurious Emission	Compliant
§15.205 §15.209 §15.247(d)	RSS-247 §5.5 RSS-Gen §8.9 RSS-Gen §8.10 RSS-Gen §6.13	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	RSS-247 §5.2(2)	Power Spectral Density	Compliant
§15.203 §15.247(b)	RSS- Gen §6.8	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

11 channels are provided for 802.11b, 802.11g and 802.11n_HT20

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

7 channels are provided for 802.11n_HT40

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
3	2422 MHz	7	2442 MHz
4	2427 MHz	8	2447 MHz
5	2432 MHz	9	2452 MHz
6	2437 MHz		

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4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case. The given UE is pre-scanned among below modes.

Modulation	Transmission Chain				Multiple Transmission Spatial
<input checked="" type="checkbox"/> 802.11 b	<input checked="" type="checkbox"/> Ch0	<input checked="" type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> 2TX
<input checked="" type="checkbox"/> 802.11 g	<input checked="" type="checkbox"/> Ch0	<input checked="" type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input type="checkbox"/> 2TX
<input checked="" type="checkbox"/> 802.11 n (HT20)	<input checked="" type="checkbox"/> Ch0	<input checked="" type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> MIMO
<input checked="" type="checkbox"/> 802.11 n (HT40)	<input checked="" type="checkbox"/> Ch0	<input checked="" type="checkbox"/> Ch1	<input type="checkbox"/> Ch2	<input type="checkbox"/> Ch3	<input checked="" type="checkbox"/> MIMO

4. Therefore, below summary is the modes of test configuration that yield the highest reading and generate the highest emission chosen to carry out the relevantly mandatory test items.

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RADIATED EMISSION TEST:

RADIATED EMISSION TEST (BELOW 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11g	1 to 11	1,6,11	OFDM	6	Aux

RADIATED EMISSION TEST (ABOVE 1 GHz)					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	Aux
802.11g	1 to 11	1, 6, 11	OFDM	6	Aux
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO

Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for 802.11b/g/n WLAN Transmitter for channel Low, Mid and High, the worst case H position was reported.

ANTENNA PORT CONDUCTED MEASUREMENT:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	11	Aux
802.11g	1 to 11	1, 6, 11	OFDM	54	Aux
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n (HT40)	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO

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5 MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
Peak Output Power	+/- 0.84 dB
6dB Bandwidth	+/- 51.33 Hz
100 KHz Bandwidth Of Frequency Band Edge	+/- 0.84 dB
Peak Power Density	+/- 1.3 dB
Temperature	+/- 0.65 °C
Humidity	+/- 4.6 %
DC / AC Power Source	DC= +/- 0.13%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : Vertical)	9kHz-30MHz: +/-2.87dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : Horizontal)	9kHz-30MHz: +/-2.87dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

Frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	100950	12/08/2016	12/07/2017
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	08/30/2017	08/29/2018
LISN	Schwarzbeck	NSLK 8127	8127-648	06/18/2017	06/17/2018
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

6.3 EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI 63.10:2013.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

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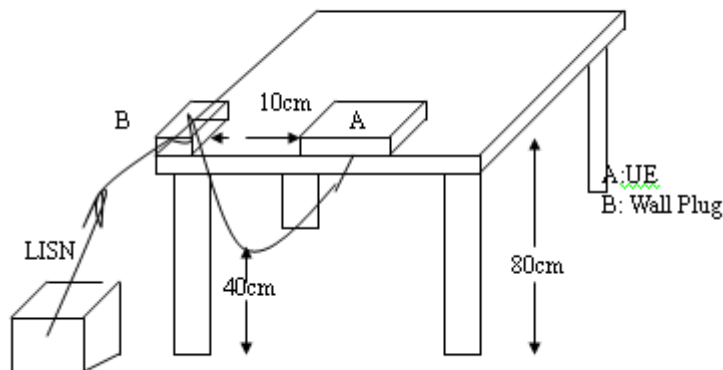
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

6.6 Measurement Result

Note: Refer to next page for measurement data and plots.

Note2: The * reveals the worst-case results that closet to the limit

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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode: operation mode

Test By: Pony

Adaprer 1

Site : Conduction Room B

Phase: L1

Temperature: 23.0

Limit: FCC Class B Conduction(QP)

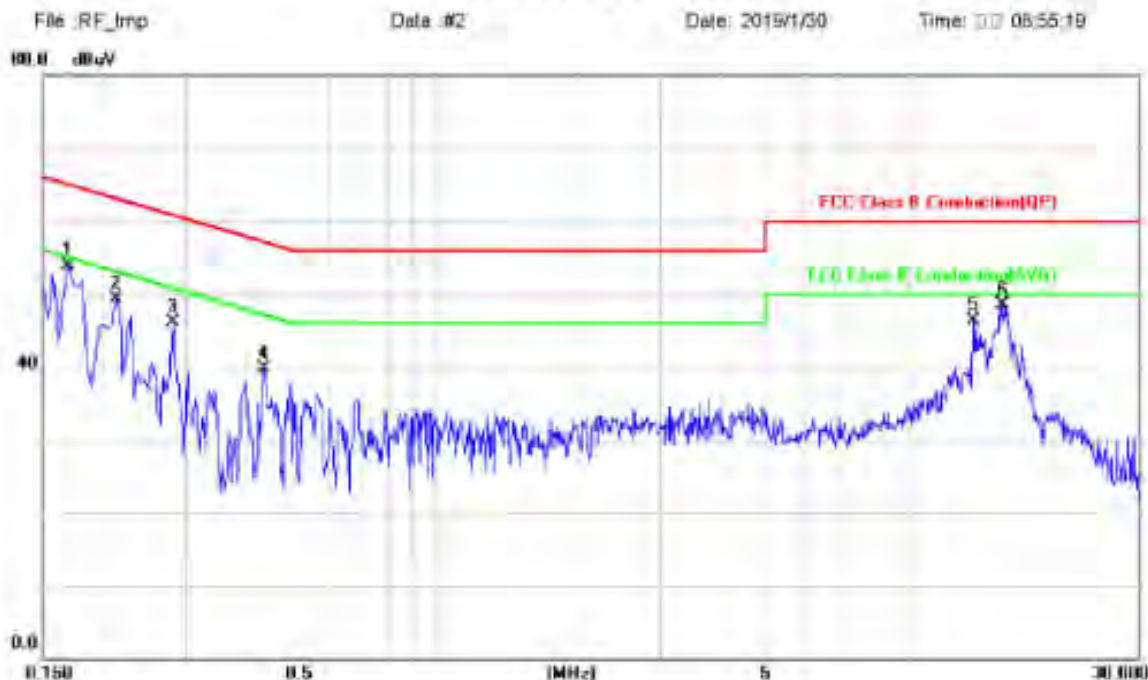
Power: AC 120V/60Hz

Humidity: 57%

Mode:

Note:

Conducted Emission



No.	Mk	Freq	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1700	34.25	19.69	53.94	64.96	-11.02	peak	
2		0.2140	29.56	19.76	49.32	63.05	-13.73	peak	
3		0.2820	26.26	19.88	46.14	60.76	-14.62	peak	
4		0.4380	19.57	20.13	39.70	57.10	-17.40	peak	
5		13.5620	26.37	19.97	46.34	60.00	-13.66	peak	
6		15.8060	28.44	19.99	48.43	60.00	-11.57	peak	

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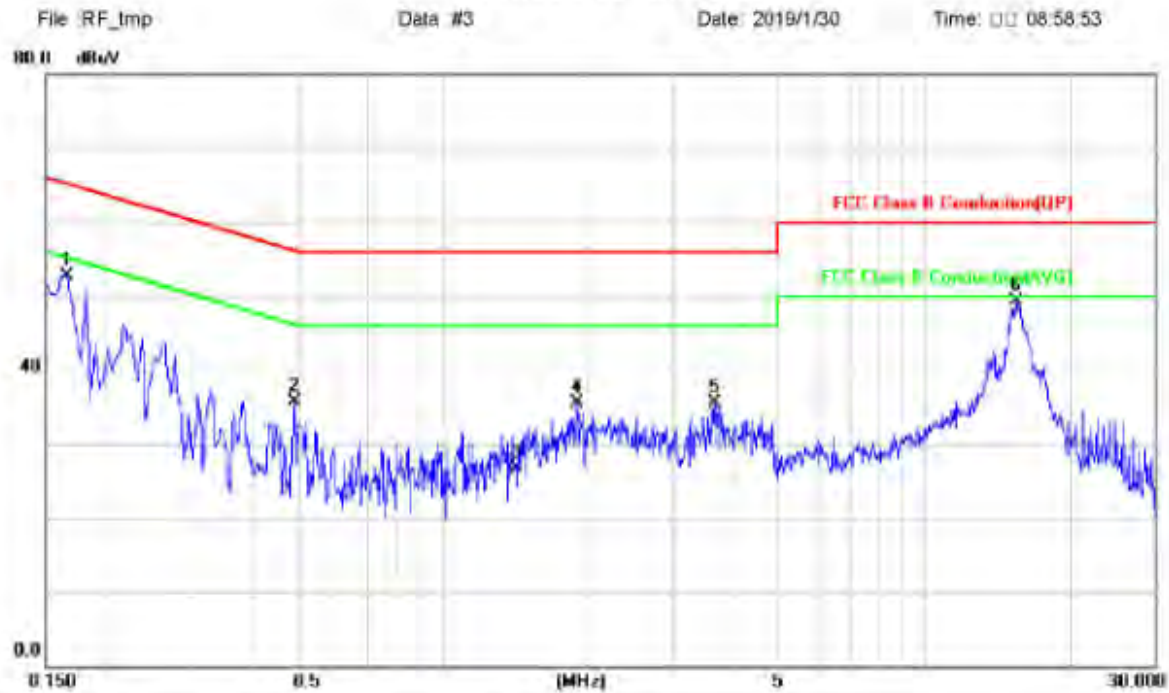
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Site : Conduction Room B
Limit: FCC Class B Conduction(QP)
Mode:
Note:

Phase: **N**
Power: AC 120V/60Hz

Temperature: 23 °C
Humidity: 57 %

Conducted Emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1660	33.12	19.66	52.78	65.16	-12.38	peak	
2		0.4940	15.53	20.21	35.74	56.10	-20.36	peak	
3		1.4140	6.58	20.12	26.70	56.00	-29.30	peak	
4		1.9060	15.04	20.47	35.51	56.00	-20.49	peak	
5		3.6700	15.33	20.23	35.56	56.00	-20.44	peak	
6 *		15.5100	29.25	20.01	49.26	60.00	-10.74	peak	

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Adapter 2

Site : Conduction Room B Phase: **L1** Temperature: 23 °C
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 57 %
 Mode:
 Note:

Conducted Emission



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1580	33.22	19.66	52.88	65.57	-12.69	peak	
2		0.1780	31.42	19.69	51.11	64.58	-13.47	peak	
3		0.2260	24.65	19.77	44.42	62.60	-18.18	peak	
4		0.5300	18.60	20.20	38.80	56.00	-17.20	peak	
5		2.7300	19.04	20.40	39.44	56.00	-16.56	peak	
6		24.5940	26.73	20.15	46.88	60.00	-13.12	peak	

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Site : Conduction Room B

Phase: **N**

Temperature: 23 °C

Limit: FCC Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 57 %

Mode:

Note:

Conducted Emission

File: RF

Data: #11

Date: 2019/1/29

Time: 09:10:33

dBuV



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1540	33.46	19.65	53.11	65.78	-12.67	peak	
2		0.1660	30.75	19.67	50.42	65.16	-14.74	peak	
3		0.1787	29.75	19.69	49.44	64.55	-15.11	peak	
4		0.2140	25.78	19.75	45.53	63.05	-17.52	peak	
5		17.8460	26.54	20.06	46.60	60.00	-13.40	peak	
6	*	24.5700	27.94	20.22	48.16	60.00	-11.84	peak	

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7 DUTY CYCLE OF TEST SIGNAL

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

Formula:

$$\text{Duty Cycle} = T_{\text{on}} / (T_{\text{on}} + T_{\text{off}})$$

Measurement Procedure:

1. Set span = Zero
2. RBW = 8MHz
3. VBW = 8MHz,
4. Detector = Peak

Duty Cycle:

	Duty Cycle (%)	Duty Factor (dB)	1/T (kHz)	VBW setting (kHz)
802.11b	98.95	0.05	0.08	0.01
802.11g	94.98	0.22	0.49	1.00
802.11n_20	84.60	0.73	1.03	2.00
802.11n_40	84.62	0.73	2.03	3.00

$$b = 98.95\%, g = 94.98\%, n_{ht_20} = 84.6\%$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9895) = 0.05$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9498) = 0.22$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.846) = 0.73$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.99) = 0.04$$

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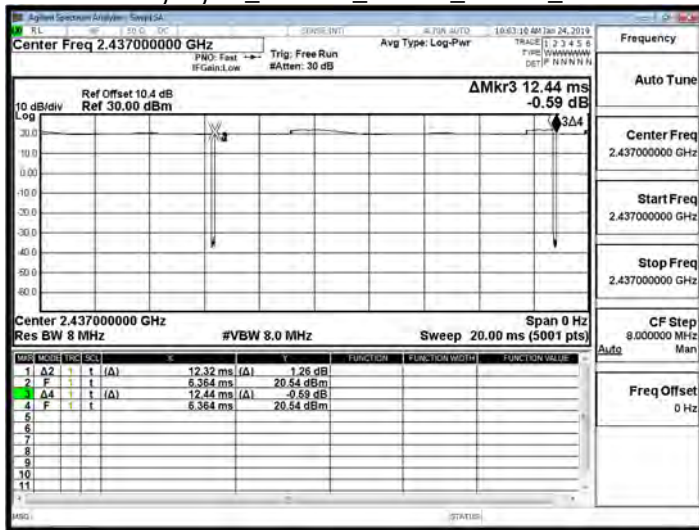
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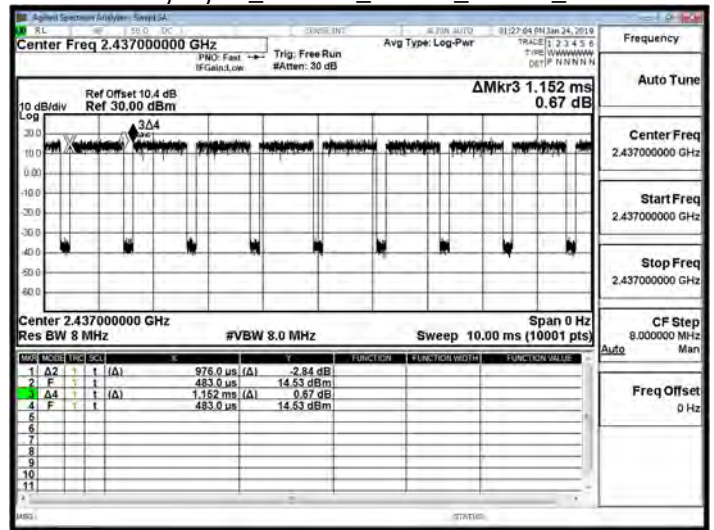
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7.1 DUTY CYCLE TEST SIGNAL Measurement Result

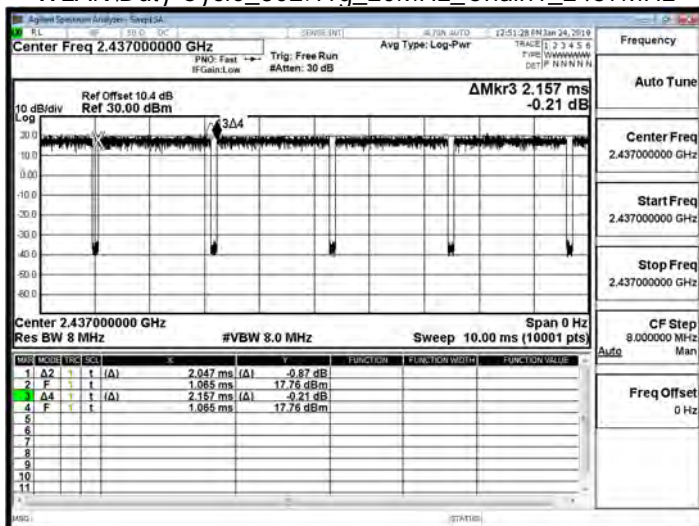
WLAN\Duty Cycle_802.11b_20MHz_Chain1_2437MHz



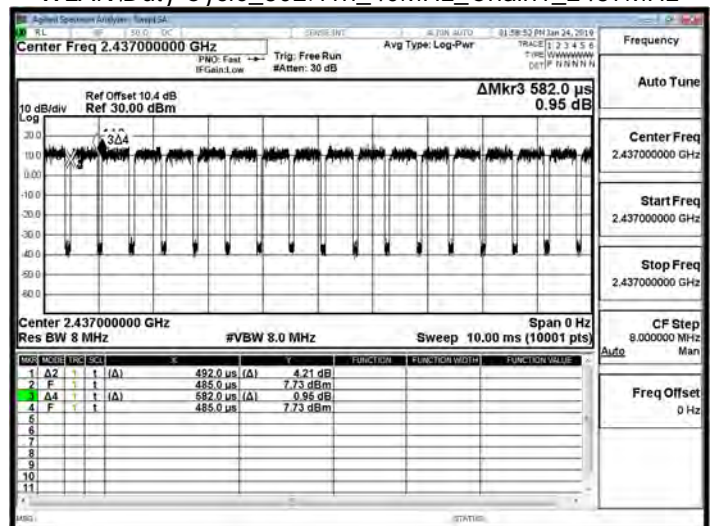
WLAN\Duty Cycle_802.11n_20MHz_Chain1_2437MHz



WLAN\Duty Cycle_802.11g_20MHz_Chain1_2437MHz



WLAN\Duty Cycle_802.11n_40MHz_Chain1_2437MHz



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8 PEAK OUTPUT POWER MEASUREMENT

8.1 Standard Applicable

For systems using digital modulation in the 2400-2483.5 MHz bands, the limit for peak output power is 1Watt.

Per RSS-247 §5.4(d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

If the transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of Antenna exceeds 6dBi.

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, \dots, G_N dBi.

(i) If transmit signals are correlated, then Directional gain

$$= 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi}$$

[Note the "20"s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.]

The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

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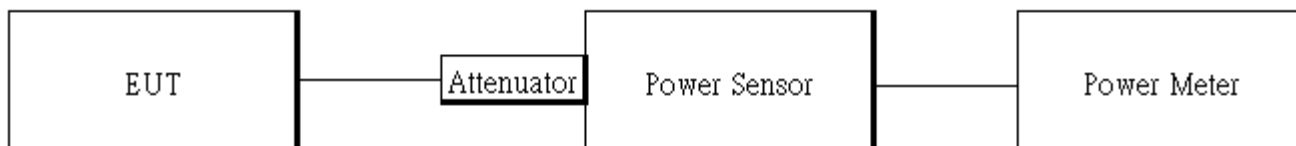
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8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1326001	08/09/2018	08/02/2019
Power Sensor	Anritsu	MA2411B	1315048	08/09/2018	08/02/2019
Power Sensor	Anritsu	MA2411B	1315049	08/09/2018	08/02/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019

8.3 Test Set-up

Power Meter:



8.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter.

Power Meter:

It is used as the auxiliary test equipment to conduct the output power measurement.

4. Record the max. Reading as observed from Spectrum or Power Meter.

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8.5 Measurement Result

Antenna Chain 0

802.11b Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	20.07	30.00	PASS
6	2437	1	20.58	30.00	PASS
11	2462	1	20.28	30.00	PASS
802.11b Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	17.12	30.00	PASS
6	2437	1	17.34	30.00	PASS
11	2462	1	17.23	30.00	PASS
802.11g Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	19.53	30.00	PASS
6	2437	6	19.86	30.00	PASS
11	2462	6	17.65	30.00	PASS
802.11g Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	13.92	30.00	PASS
6	2437	6	14.45	30.00	PASS
11	2462	6	12.44	30.00	PASS

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Antenna Chain 1

802.11b Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	20.16	30.00	PASS
6	2437	1	20.45	30.00	PASS
11	2462	1	20.35	30.00	PASS
802.11b Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	17.19	30.00	PASS
6	2437	1	17.47	30.00	PASS
11	2462	1	17.29	30.00	PASS
802.11g Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	19.81	30.00	PASS
6	2437	6	19.74	30.00	PASS
11	2462	6	17.86	30.00	PASS
802.11g Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	14.38	30.00	PASS
6	2437	6	14.47	30.00	PASS
11	2462	6	12.46	30.00	PASS

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MIMO

802.11n_HT20M MIMO							
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	MCS8	16.94	17.35	20.16	30.00	PASS
6	2437	MCS8	18.57	18.34	21.47	30.00	PASS
11	2462	MCS8	17.67	17.05	20.38	30.00	PASS
802.11n_HT20M MIMO							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	MCS8	10.95	11.36	14.90	30.00	PASS
6	2437	MCS8	10.77	10.26	14.26	30.00	PASS
11	2462	MCS8	11.03	11.43	14.97	30.00	PASS

802.11n_HT40M MIMO							
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
3	2422	MCS8	14.67	14.29	17.49	30.00	PASS
6	2437	MCS8	16.58	16.27	19.44	30.00	PASS
9	2452	MCS8	14.62	14.57	17.61	30.00	PASS
802.11n_HT40M MIMO							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
3	2422	MCS8	8.43	8.98	12.45	30.00	PASS
6	2437	MCS8	10.66	10.36	14.25	30.00	PASS
9	2452	MCS8	8.72	8.79	12.49	30.00	PASS

*** Note: The duty cycle factor is compensated to obtain the maximum value of measurement in average.**

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EIRP

Antenna Chain 0

802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	17.12	-3.00	14.12	36	PASS
6	2437	1	17.34	-3.00	14.34	36	PASS
11	2462	1	17.23	-3.00	14.23	36	PASS

802.11g Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	13.92	-3.00	10.92	36	PASS
6	2437	6	14.45	-3.00	11.45	36	PASS
11	2462	6	12.44	-3.00	9.44	36	PASS

Antenna Chain 1

802.11b Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	17.19	-4.12	13.07	36	PASS
6	2437	1	17.47	-4.12	13.35	36	PASS
11	2462	1	17.29	-4.12	13.17	36	PASS

802.11g Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	14.38	-4.12	10.26	36	PASS
6	2437	6	14.47	-4.12	10.35	36	PASS
11	2462	6	12.46	-4.12	8.34	36	PASS

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MIMO

802.11n_HT20M MIMO									
CH	Freq. (MHz)	Data Rate	Avg. Output Power		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	MCS8	16.94	17.35	14.90	-0.51	14.38	36	PASS
6	2437	MCS8	18.57	18.34	14.26	-0.51	13.75	36	PASS
11	2462	MCS8	17.67	17.05	14.97	-0.51	14.46	36	PASS

802.11n_HT40M MIMO									
CH	Freq. (MHz)	Data Rate	Avg. Output Power		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
3	2422	MCS8	8.43	8.98	12.45	-0.51	11.94	36	PASS
6	2437	MCS8	10.66	10.36	14.25	-0.51	13.73	36	PASS
9	2452	MCS8	8.72	8.79	12.49	-0.51	11.98	36	PASS

* **Note:** EIRP = Average Power + Gain

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9 6DB & 99% BANDWIDTH MEASUREMENT

9.1 Standard Applicable

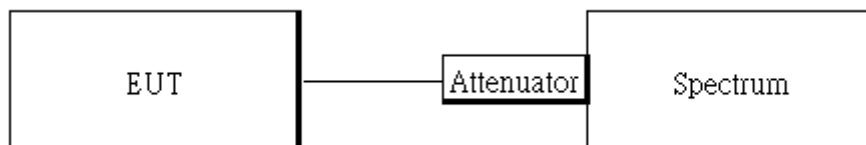
The minimum 6 dB bandwidth shall be at least 500 kHz.

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs

9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

9.3 Test Set-up



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9.4 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. For 6dB Bandwidth:
Set the spectrum analyzer as RBW = 100 kHz, VBW = 3*RBW, Span = 30M/50MHz, Detector=peak, Sweep=auto.
5. Mark the peak frequency and -6dB (upper and lower) frequency.
6. For 99% Bandwidth:
Set the spectrum analyzer as RBW=1%, VBW = 3*RBW, Span = 30M/50MHz, Detector=Sample, Sweep=auto.
7. Turn on the 99% bandwidth function, max reading.
8. Repeat above procedures until all frequency of interest measured was complete.

9.5 Measurement Result

6dB Bandwidth

Antenna Chain 0

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	10070.00	> 500	PASS
2437	10080.00	> 500	PASS
2462	10070.00	> 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15130.00	> 500	PASS
2437	15140.00	> 500	PASS
2462	15120.00	> 500	PASS

802.11_n_HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16290.00	> 500	PASS
2437	15720.00	> 500	PASS
2462	15730.00	> 500	PASS

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802.11_n_HT40 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35150.00	> 500	PASS
2437	35160.00	> 500	PASS
2452	35160.00	> 500	PASS

Antenna Chain 1

802.11b Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	10080.00	> 500	PASS
2437	10070.00	> 500	PASS
2462	10070.00	> 500	PASS

802.11g Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15120.00	> 500	PASS
2437	15140.00	> 500	PASS
2462	15140.00	> 500	PASS

802.11_n_HT20 Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16250.00	> 500	PASS
2437	16280.00	> 500	PASS
2462	15730.00	> 500	PASS

802.11_n_HT40 Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35150.00	> 500	PASS
2437	35150.00	> 500	PASS
2452	35160.00	> 500	PASS

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99% Bandwidth

Antenna Chain 0

802.11b Ch0	
Freq. (MHz)	99% BW (MHz)
2412	12.959
2437	12.732
2462	12.642

802.11g Ch0	
Freq. (MHz)	99% BW (MHz)
2412	16.751
2437	16.711
2462	16.619

802.11n_HT20M Ch0	
Freq. (MHz)	99% BW (MHz)
2412	17.712
2437	17.694
2462	17.684

802.11n_HT40M Ch0	
Freq. (MHz)	99% BW (MHz)
2422	36.013
2437	36.032
2452	36.020

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Antenna Chain 1

802.11b Ch1	
Freq. (MHz)	99% BW (MHz)
2412	12.973
2437	12.733
2462	12.711

802.11g Ch1	
Freq. (MHz)	99% BW (MHz)
2412	16.735
2437	16.694
2462	16.672

802.11n_HT20M Ch1	
Freq. (MHz)	99% BW (MHz)
2412	17.724
2437	17.699
2462	17.701

802.11n_HT40M Ch1	
Freq. (MHz)	99% BW (MHz)
2422	36.008
2437	36.026
2452	36.024

**Refer to next page for plots*

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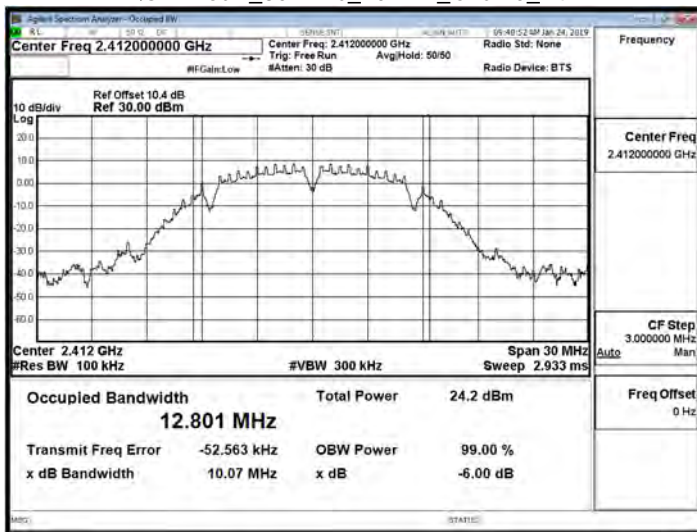
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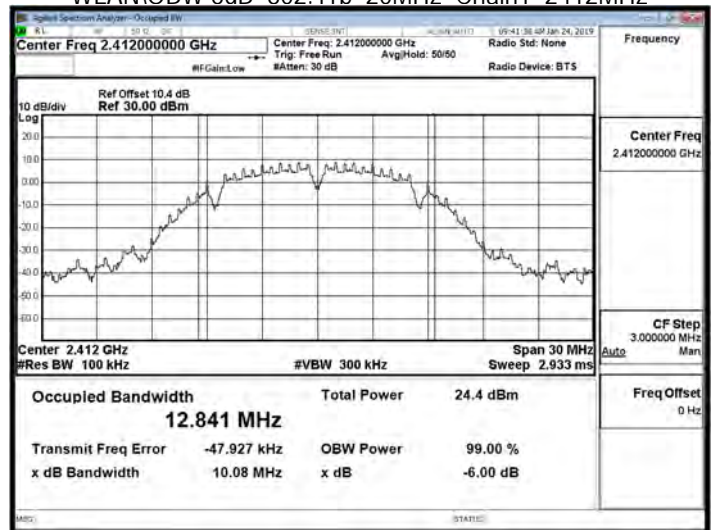
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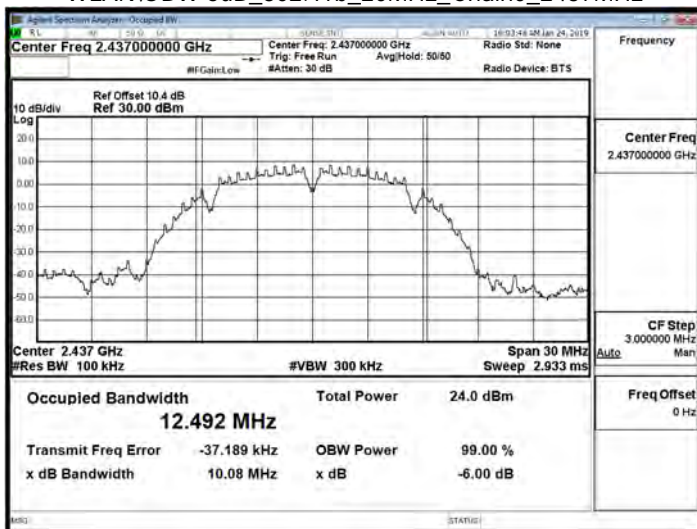
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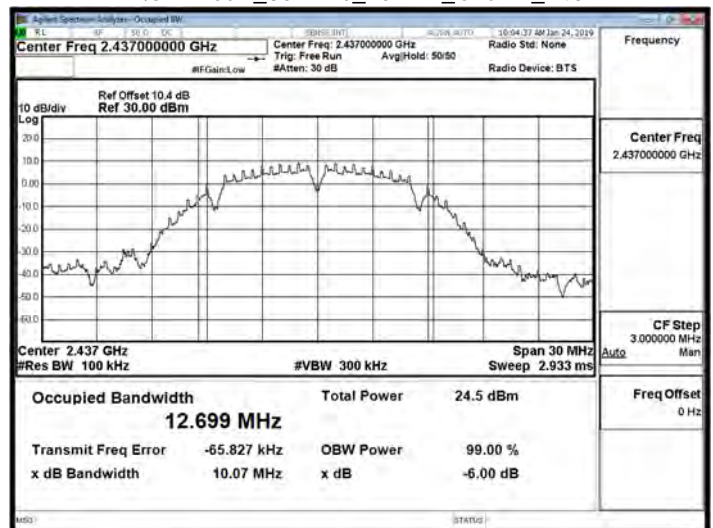
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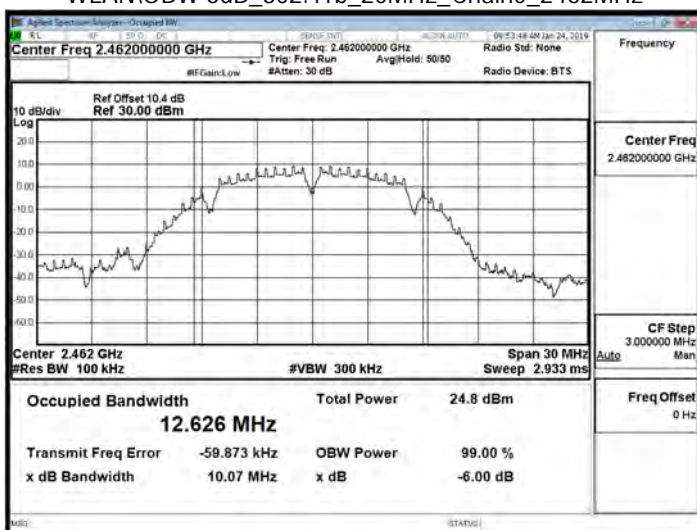
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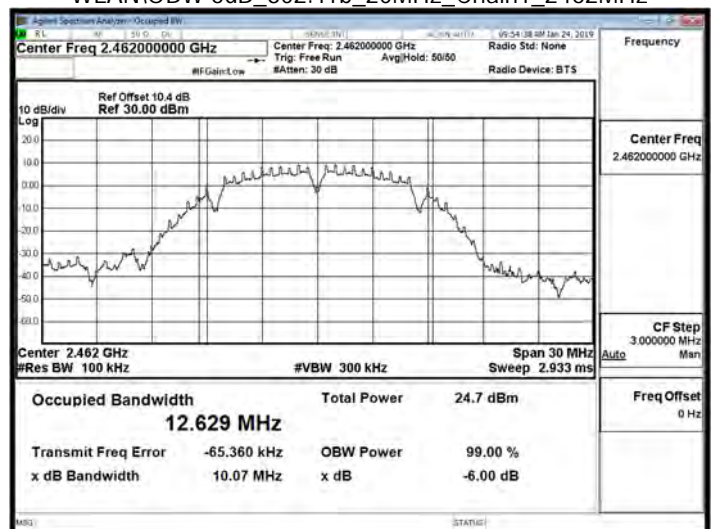
WLAN\OBW 6dB_802.11b_20MHz_Chain1_2437MHz



WLAN\OBW 6dB_802.11b_20MHz_Chain0_2462MHz



WLAN\OBW 6dB_802.11b_20MHz_Chain1_2462MHz

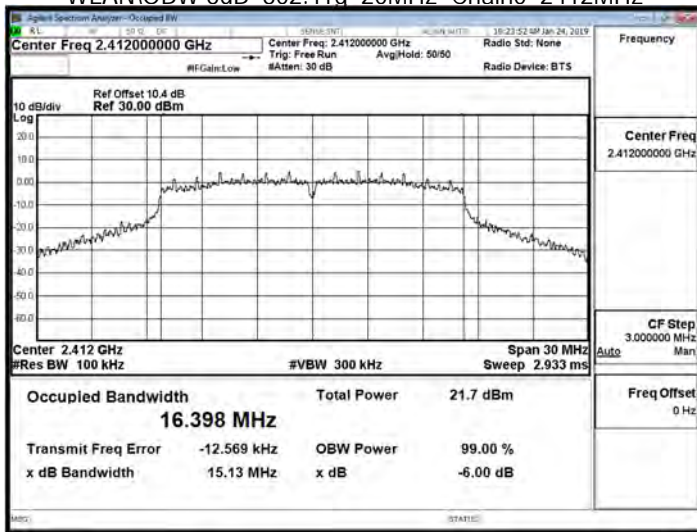


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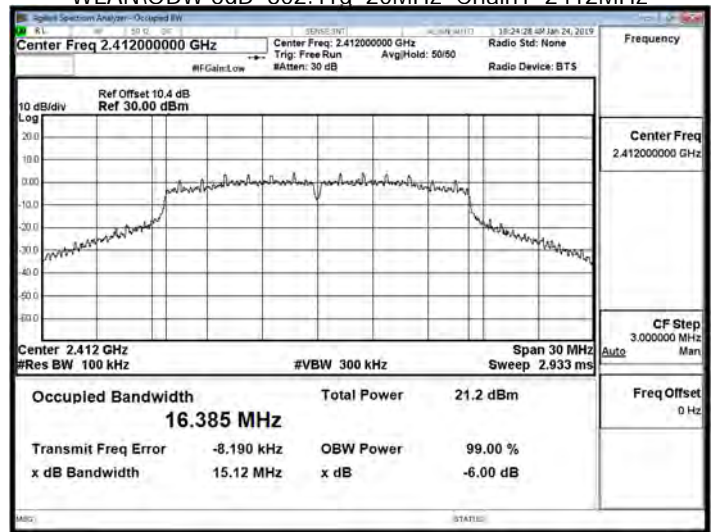
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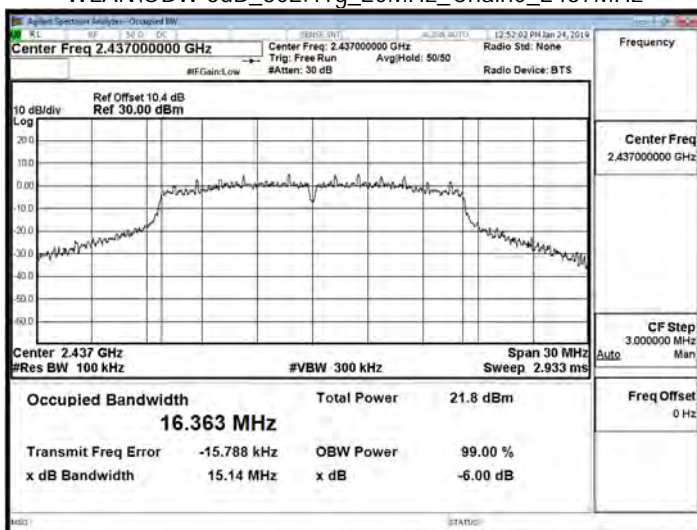
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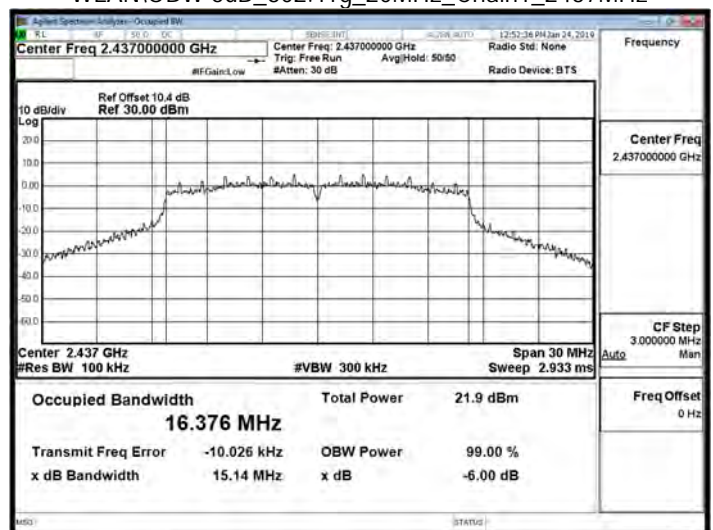
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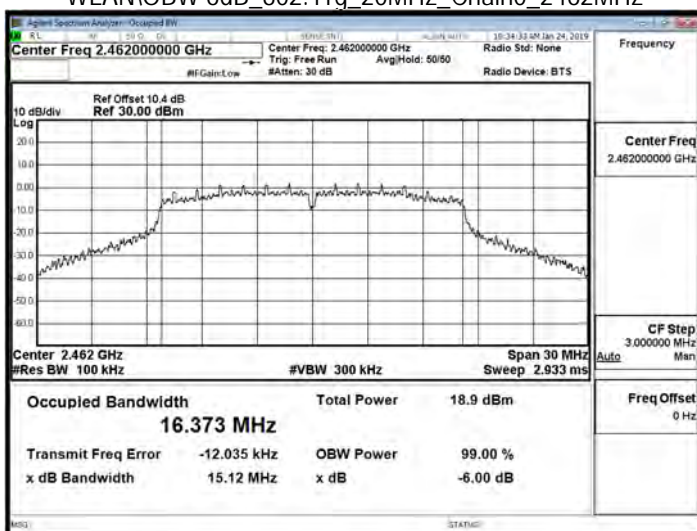
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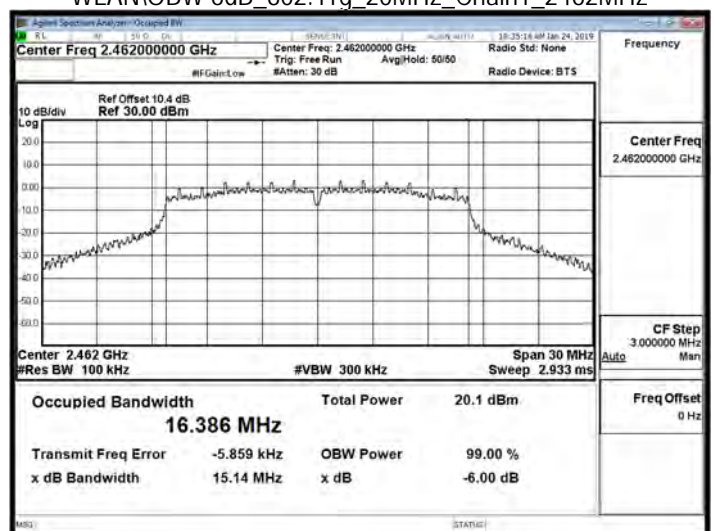
WLAN\OBW 6dB 802.11g 20MHz Chain1 2437MHz



WLAN\OBW 6dB 802.11g 20MHz Chain0 2462MHz



WLAN\OBW 6dB 802.11g 20MHz Chain1 2462MHz

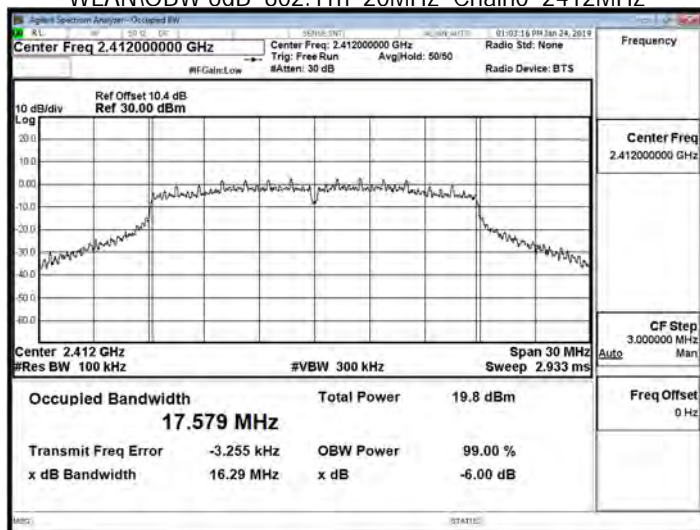


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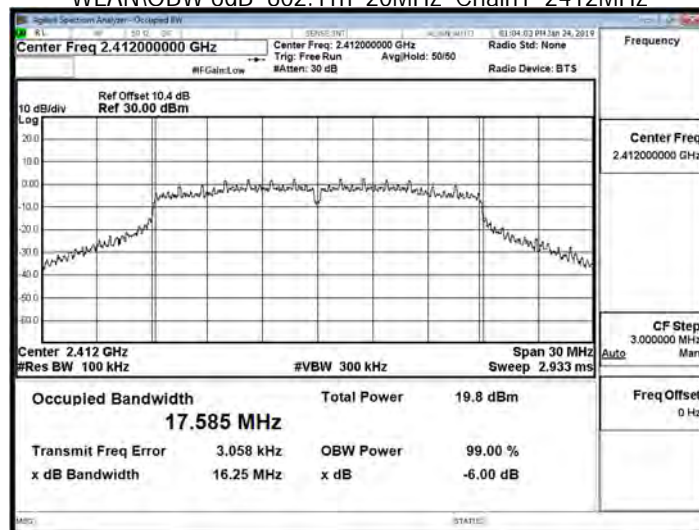
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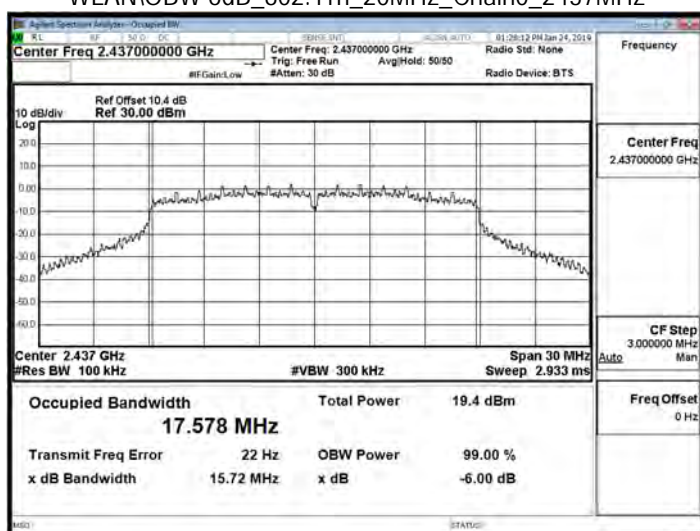
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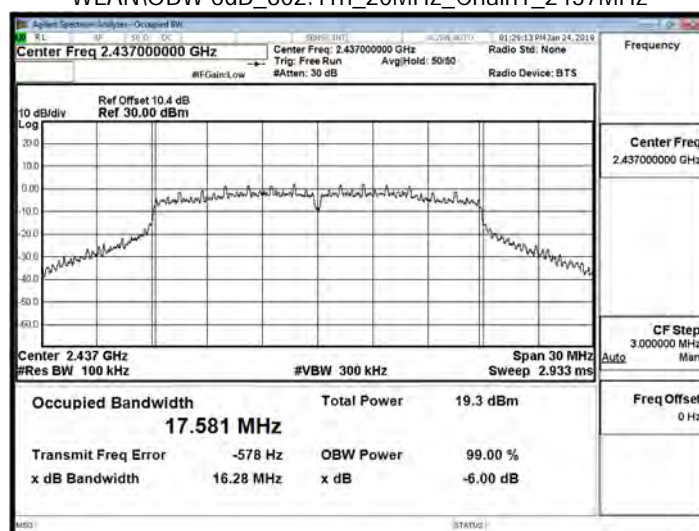
WLAN\OBW 6dB 802.11n 20MHz Chain1 2412MHz



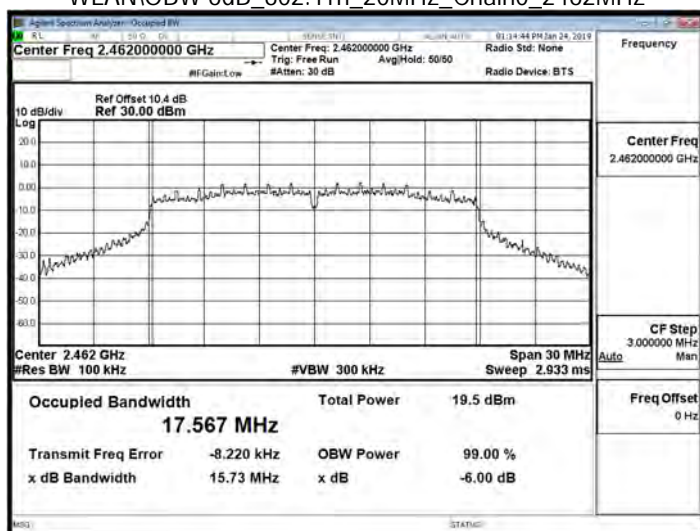
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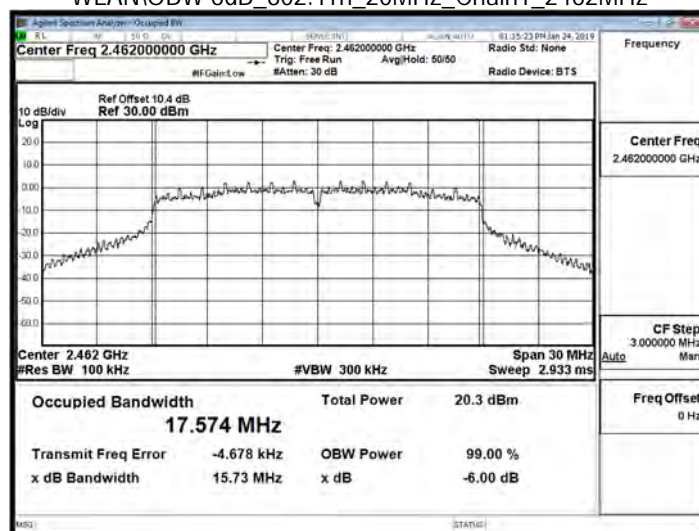
WLAN\OBW 6dB 802.11n 20MHz Chain1 2437MHz



WLAN\OBW 6dB 802.11n 20MHz Chain0 2462MHz



WLAN\OBW 6dB 802.11n 20MHz Chain1 2462MHz

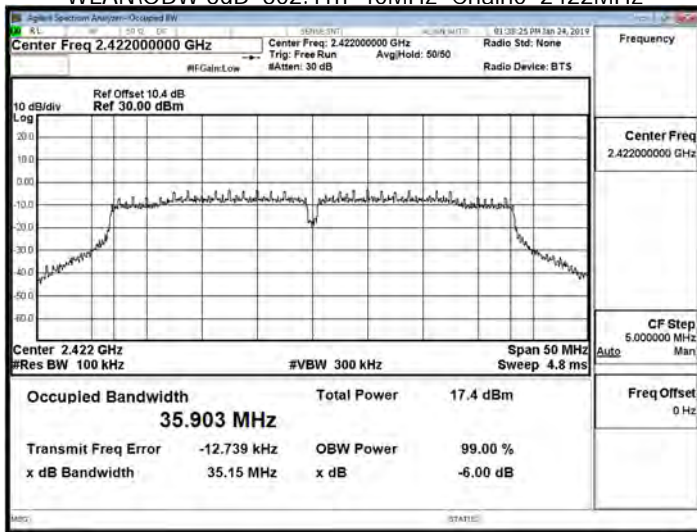


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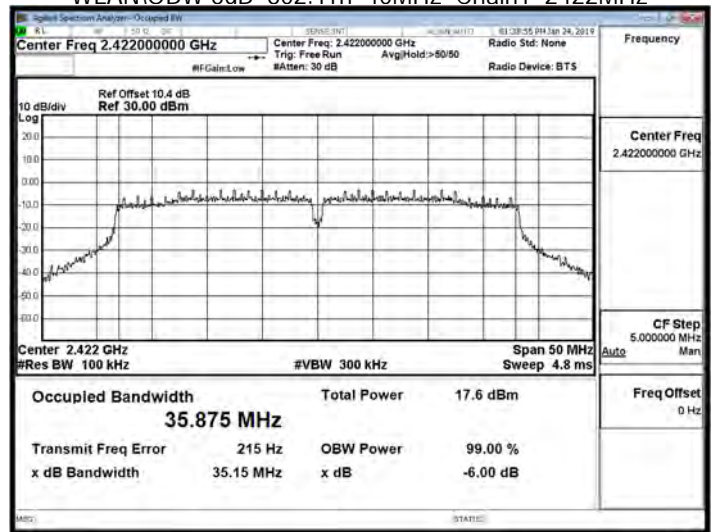
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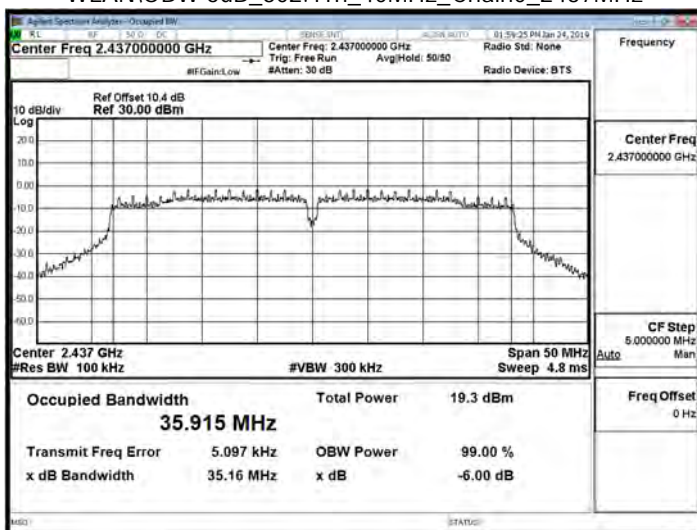
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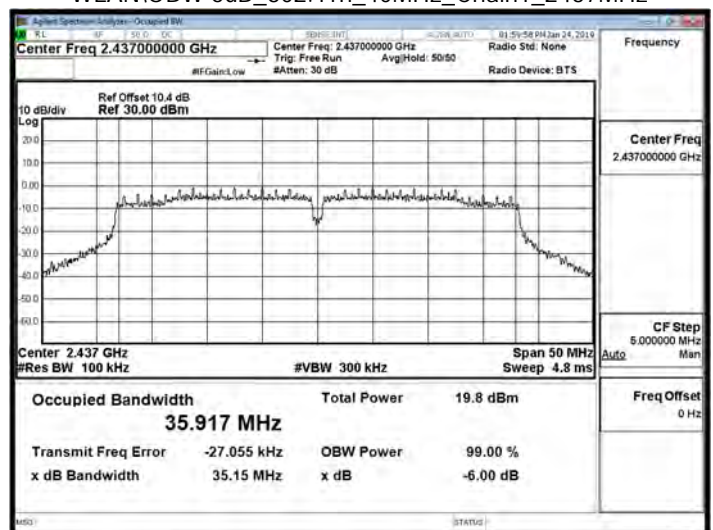
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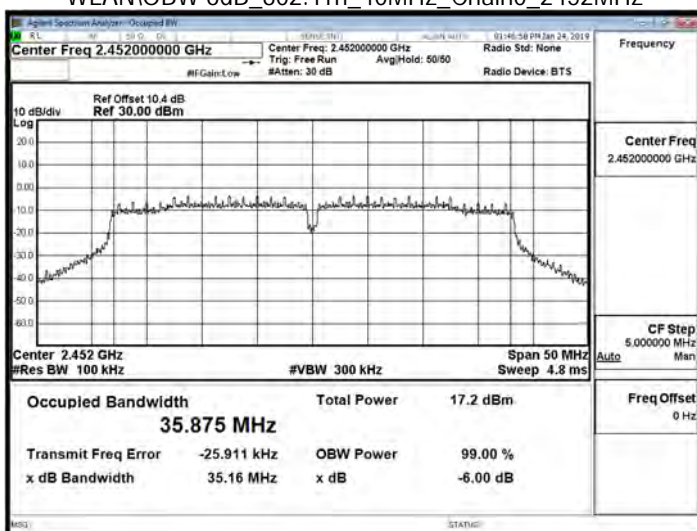
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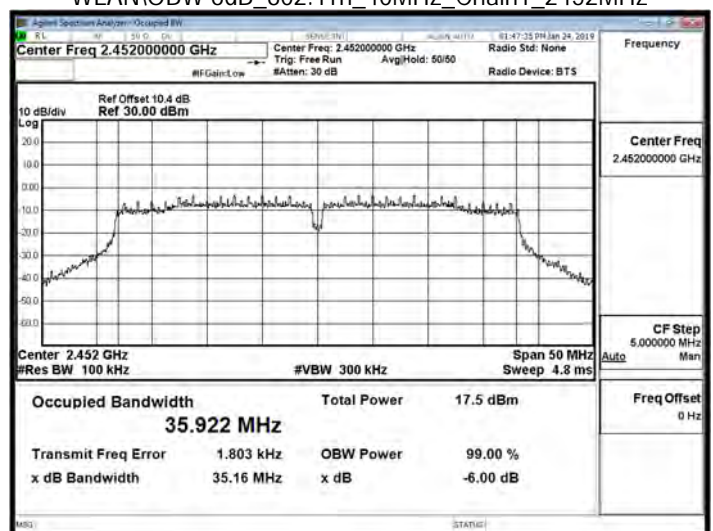
WLAN\OBW 6dB 802.11n 40MHz Chain1 2437MHz



WLAN\OBW 6dB 802.11n 40MHz Chain0 2452MHz



WLAN\OBW 6dB 802.11n 40MHz Chain1 2452MHz

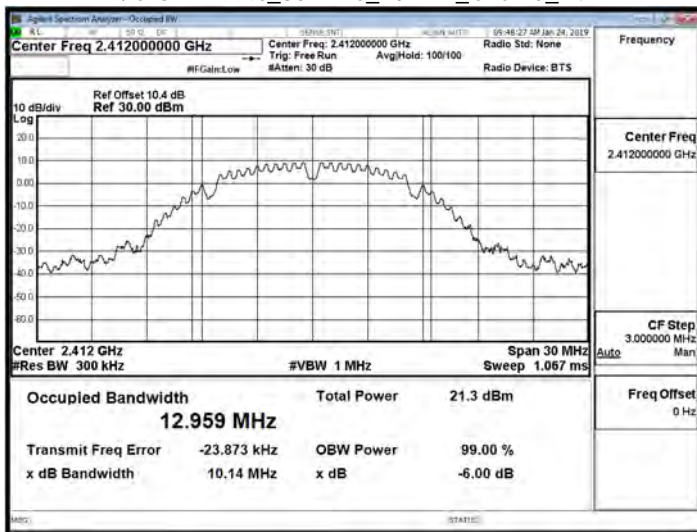


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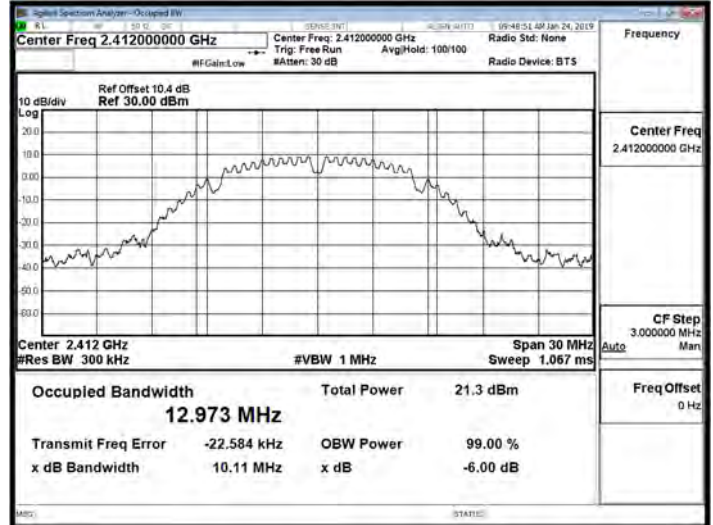
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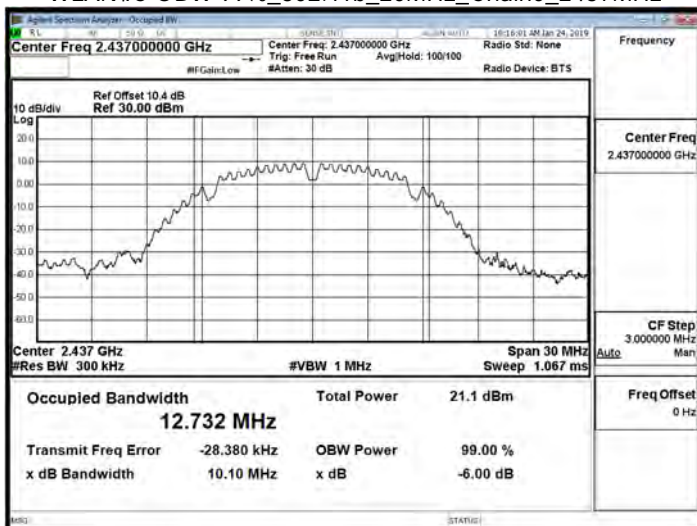
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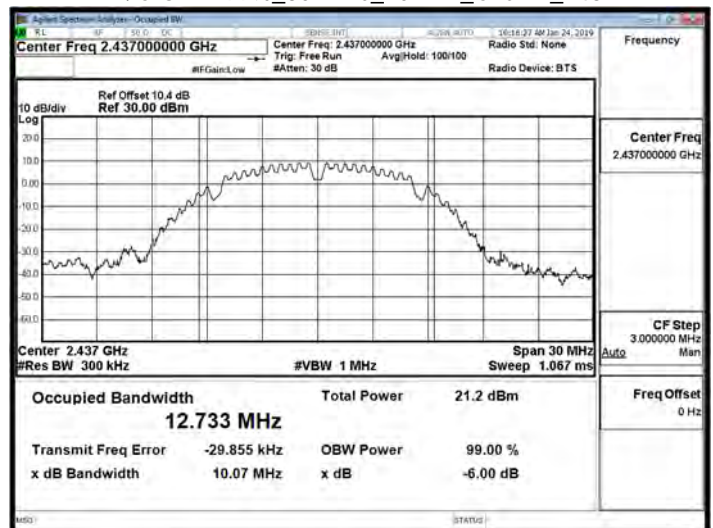
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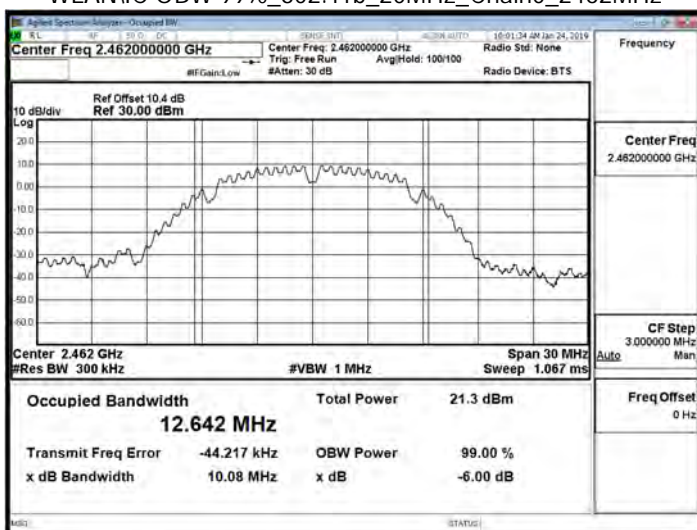
WLANIC OBW 99%_802.11b_20MHz_Chain0_2437MHz



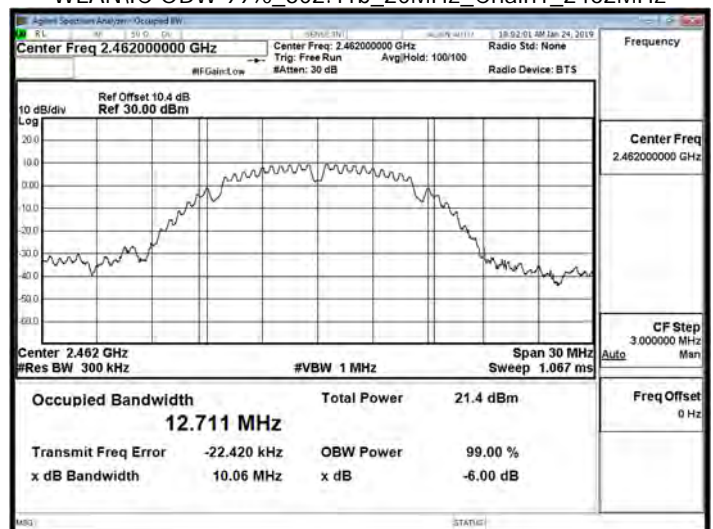
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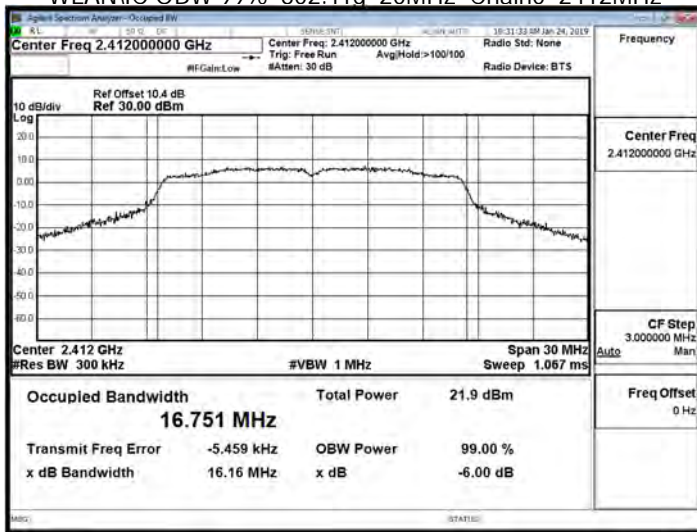


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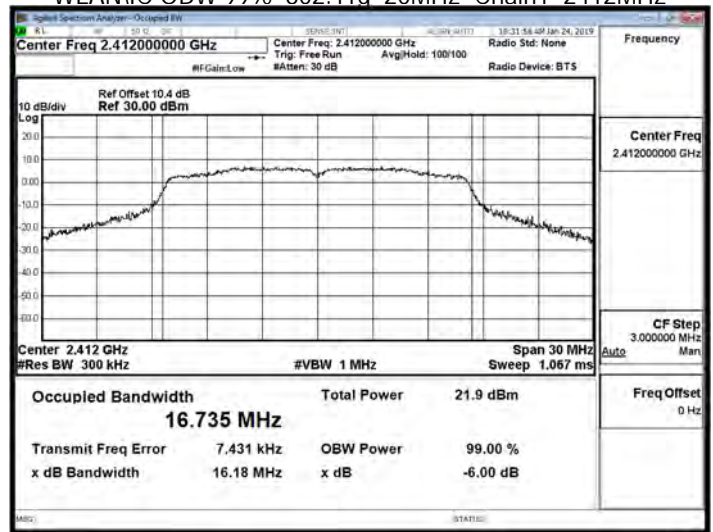
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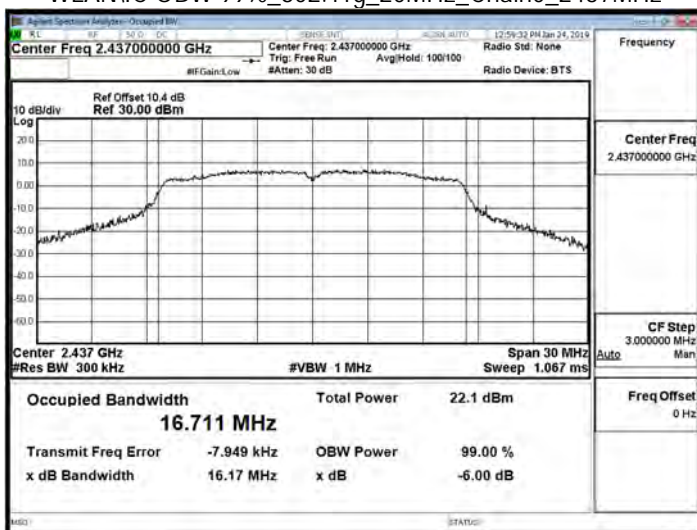
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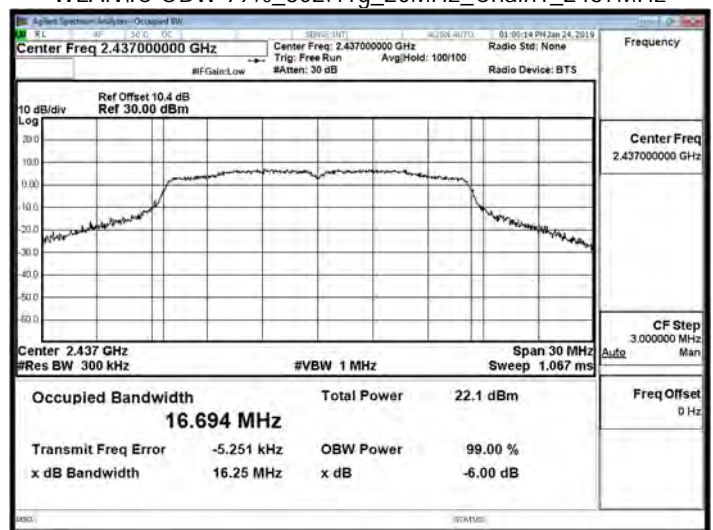
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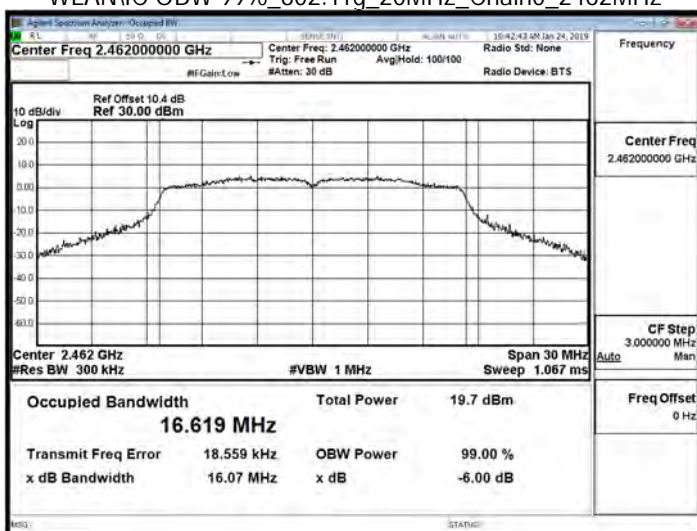
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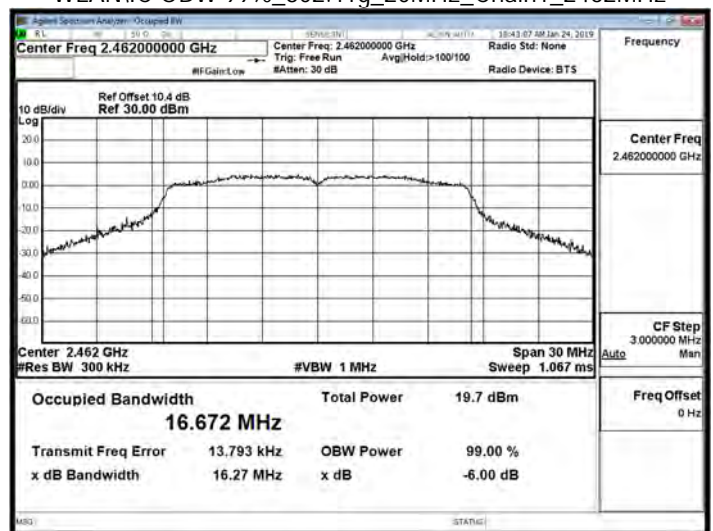
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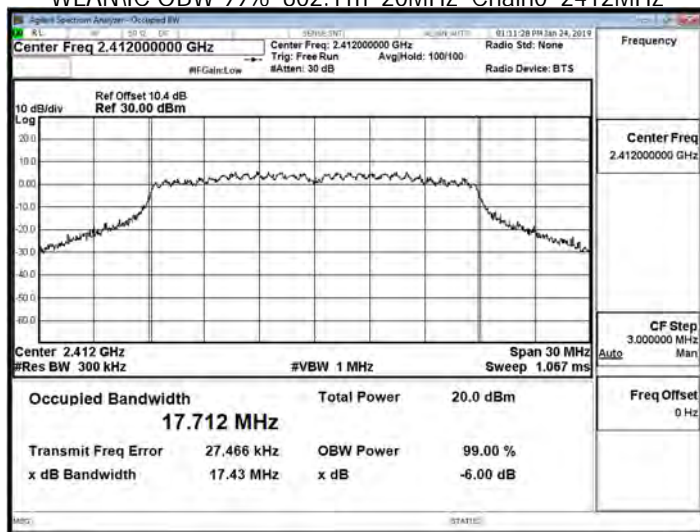


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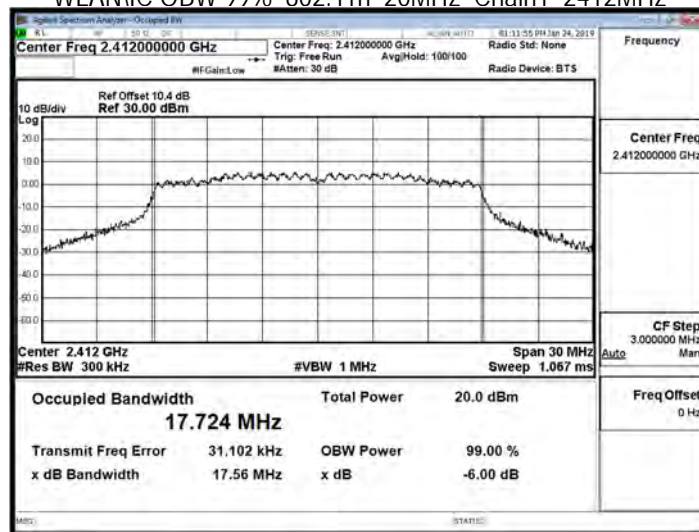
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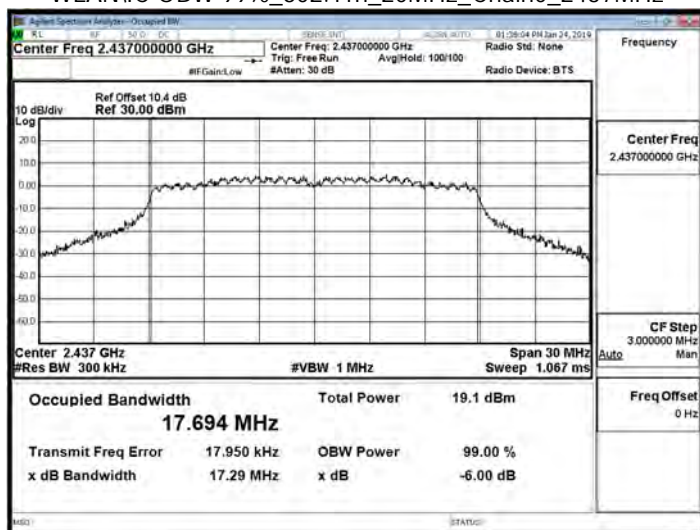
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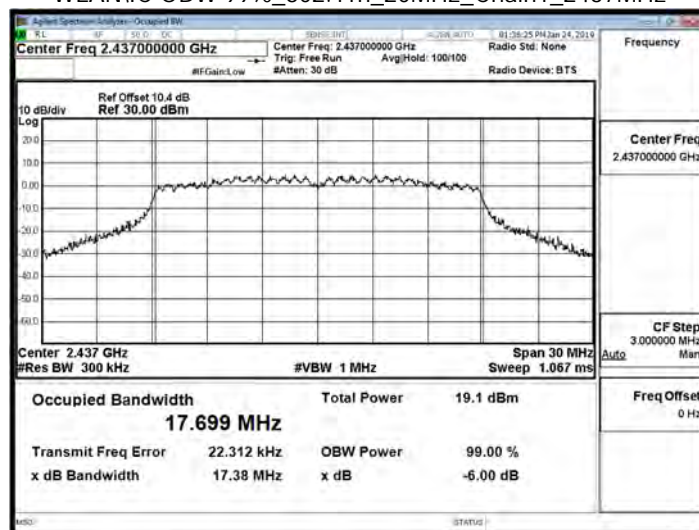
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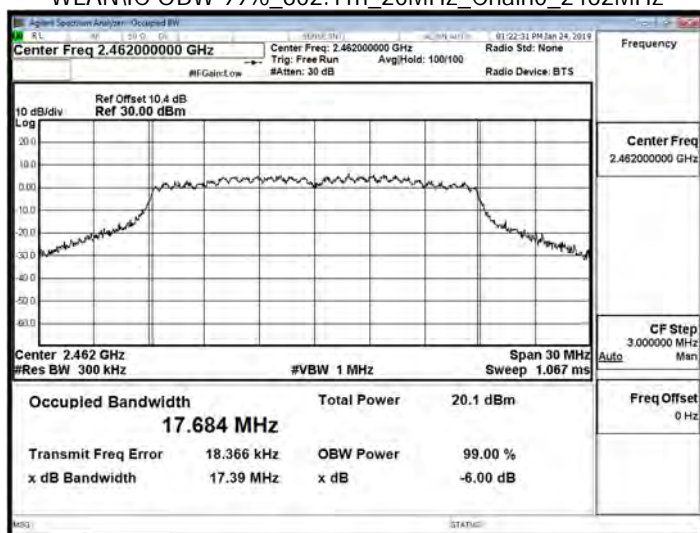
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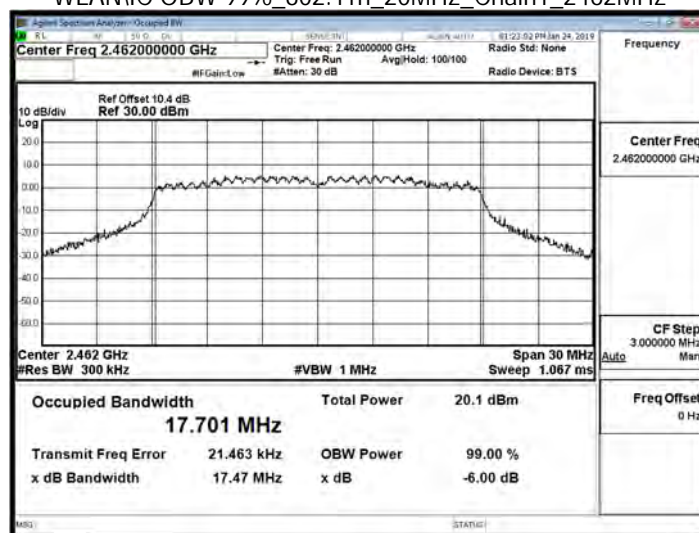
WLANIC OBW 99% 802.11n 20MHz Chain1 2437MHz



WLANIC OBW 99% 802.11n 20MHz Chain0 2462MHz



WLANIC OBW 99% 802.11n 20MHz Chain1 2462MHz

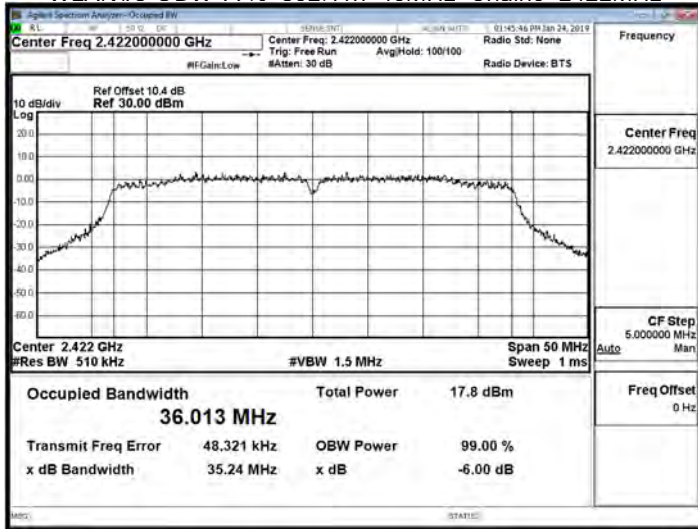


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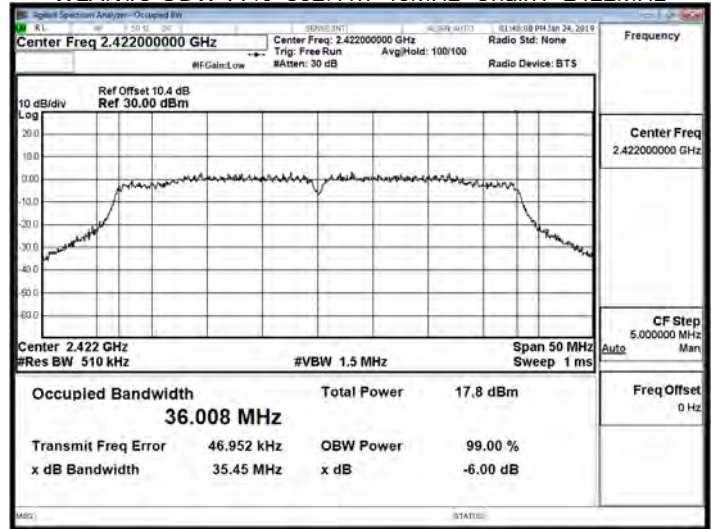
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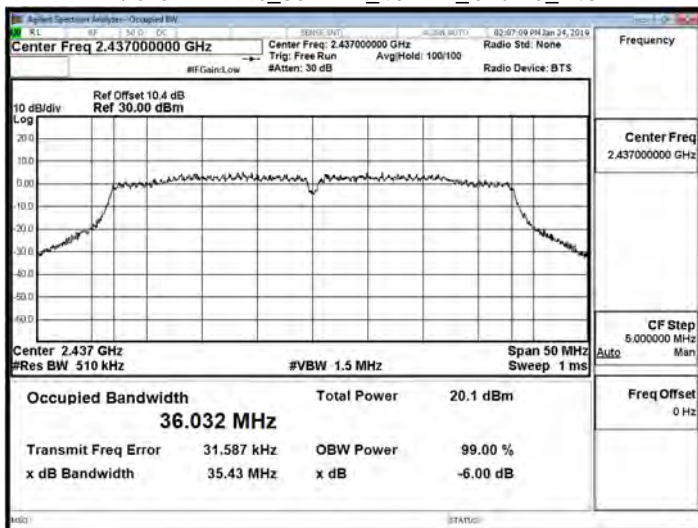
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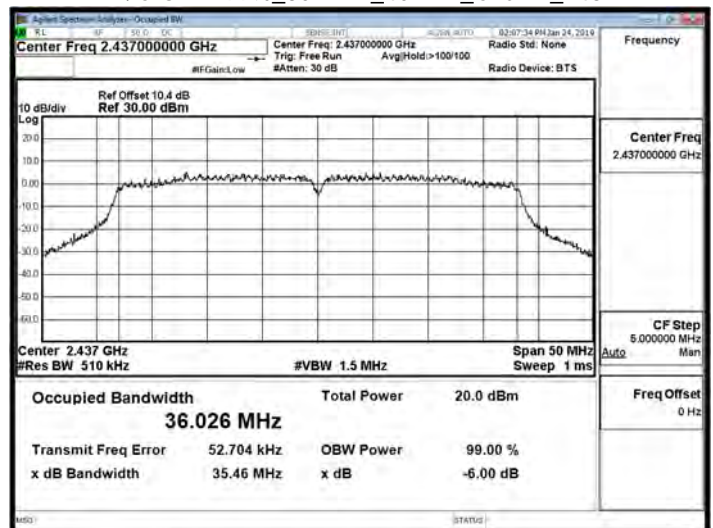
WLANIC OBW 99% 802.11n 40MHz Chain1 2422MHz



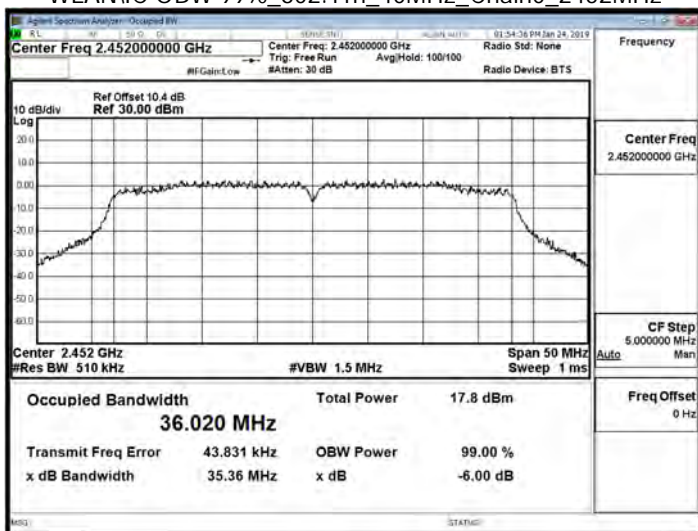
WLANIC OBW 99% 802.11n 40MHz Chain0 2437MHz



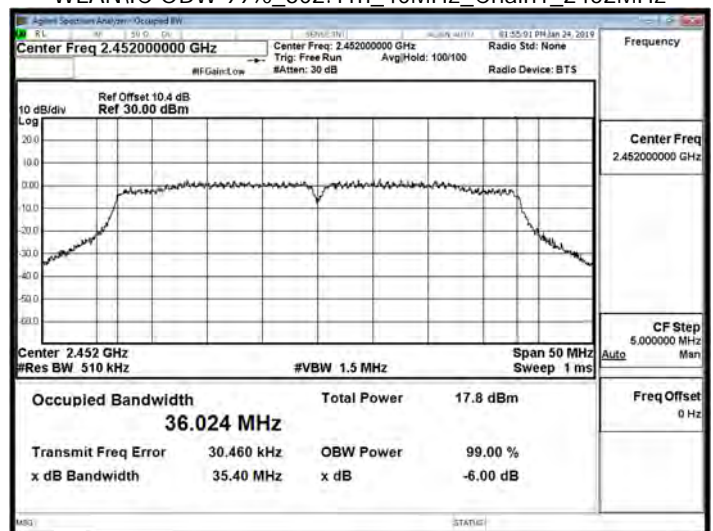
WLANIC OBW 99% 802.11n 40MHz Chain1 2437MHz



WLANIC OBW 99% 802.11n 40MHz Chain0 2452MHz



WLANIC OBW 99% 802.11n 40MHz Chain1 2452MHz



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10 CONDUCTED BAND EDGE AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

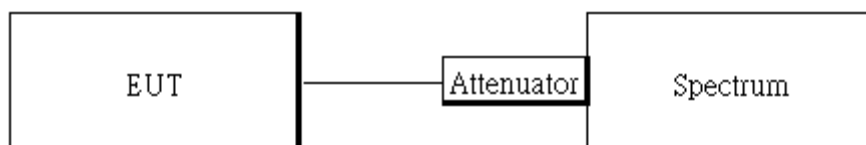
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a) & RSS-Gen §8.10, must also comply with the radiated emission limits specified in §15.209(a) & RSS-Gen §8.9.

If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

10.3 Test SET-UP



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10.4 Measurement Procedure

Conducted Band Edge Limit

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 100kHz & VBW = 300 kHz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.

Conducted Band Edge:

1. To connect Antenna Port of EUT to Spectrum.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
4. Set start to edge frequency, and stop frequency of spectrum analyzer so as to encompass the spectrum to be examined.
5. Set the spectrum analyzer as RBW=100 kHz, VBW=300 kHz, Detector = Peak, Sweep = auto
6. Mark the highest reading of the emission as the reference level measurement.
7. Set DL as the limit = reading on marker 1 – 20dBm
8. Marker on frequency, 2.3999GHz and 2.4836GHz, and examine shall 100 kHz immediately outside the authorized (2400~2483.5) be attenuated by 20dB at least relative to the maximum emission of power.
9. Repeat above procedures until all default test channel (low, middle, and high) was complete.

Conducted Spurious Emission:

1. To connect Antenna Port of EUT to Spectrum
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
3. Set RBW = 100 kHz & VBW= 300 kHz, Detector =Peak, Sweep = Auto.
4. Allow trace to fully stabilize.
5. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
6. Repeat above procedures until all default test channel measured were complete.

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10.5 Measurement Result

Reference Level of Limit 802.11b mode			Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	8.79	-11.21	2412	4.84	-15.16
2437	8.97	-11.03	2437	5.15	-14.85
2462	9.07	-10.93	2462	2.93	-17.07

Reference Level of Limit 802.11n20 mode			Reference Level of Limit 802.11n40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)	Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	5.46	-14.54	2422	-0.24	-20.24
2437	4.93	-15.07	2437	2.02	-17.98
2462	5.89	-14.11	2452	-0.21	-20.21

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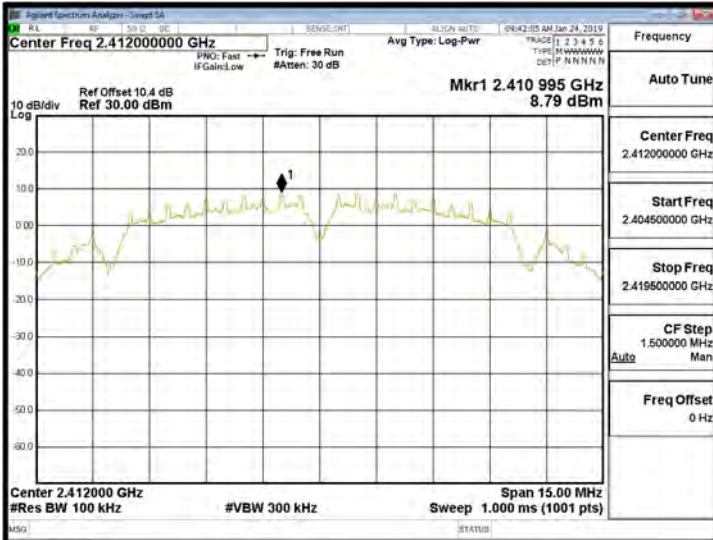
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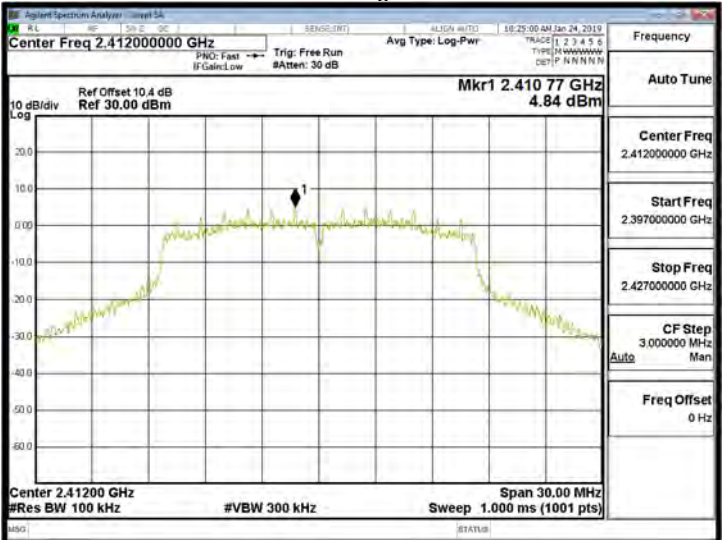
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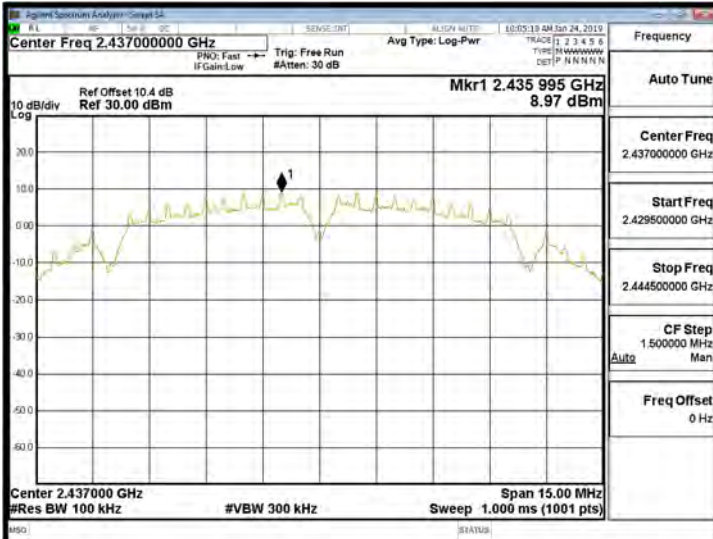
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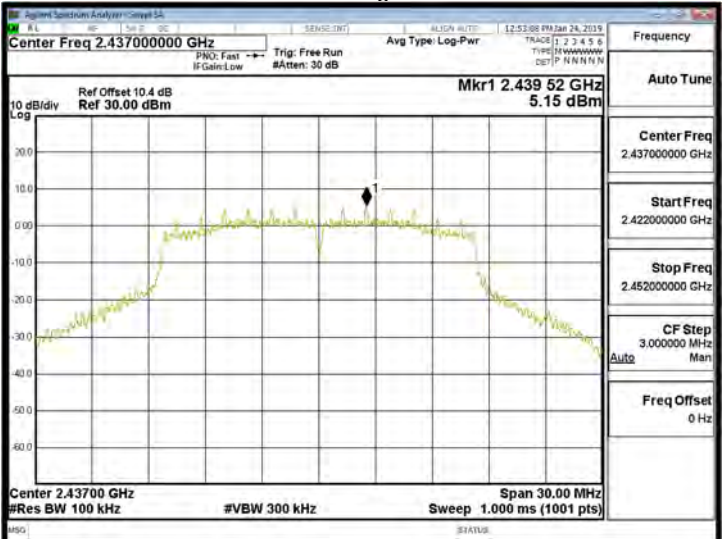
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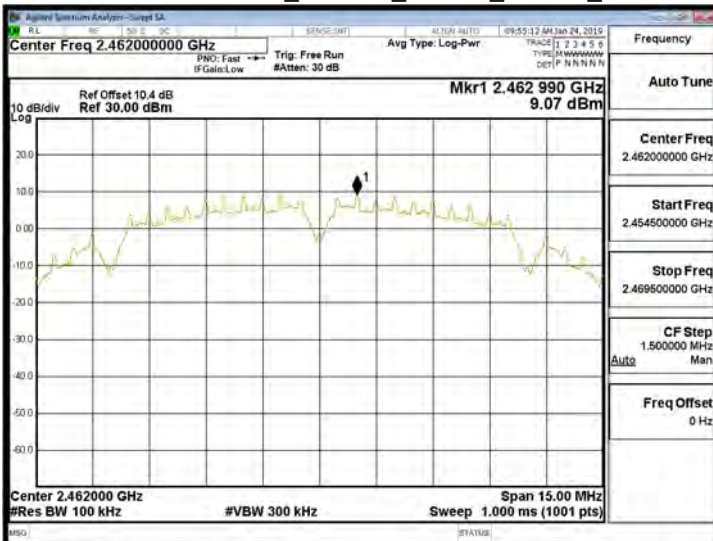
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WLAN\Reference Level_802.11g_20MHz_Chain1_2437MHz



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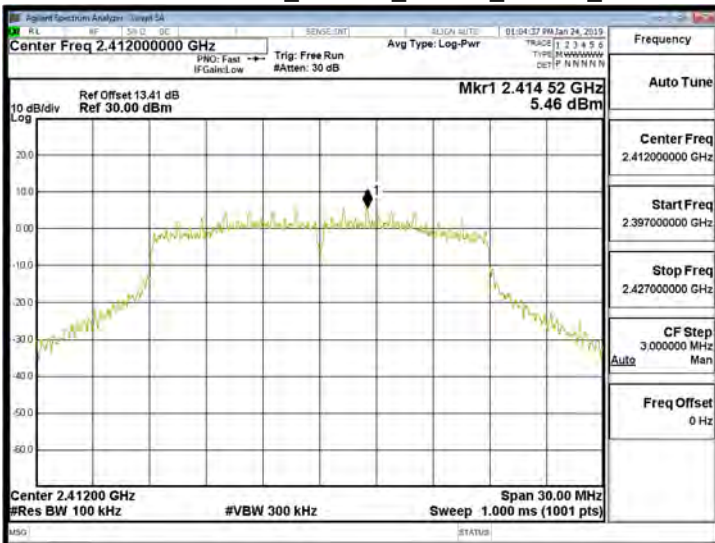


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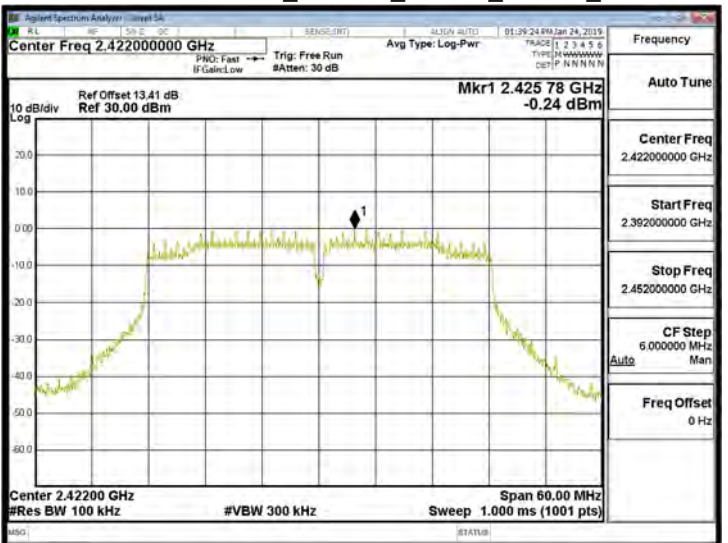
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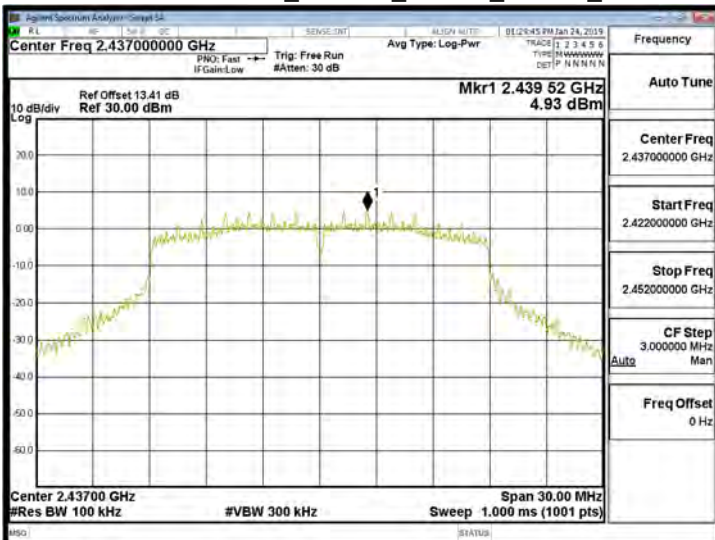
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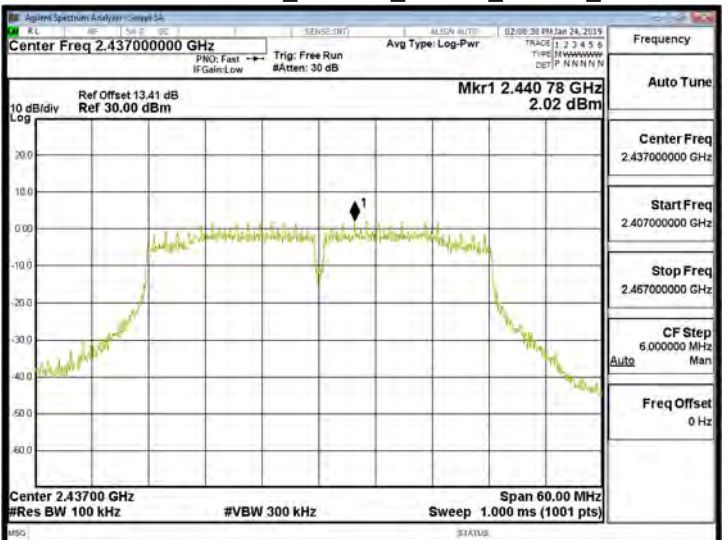
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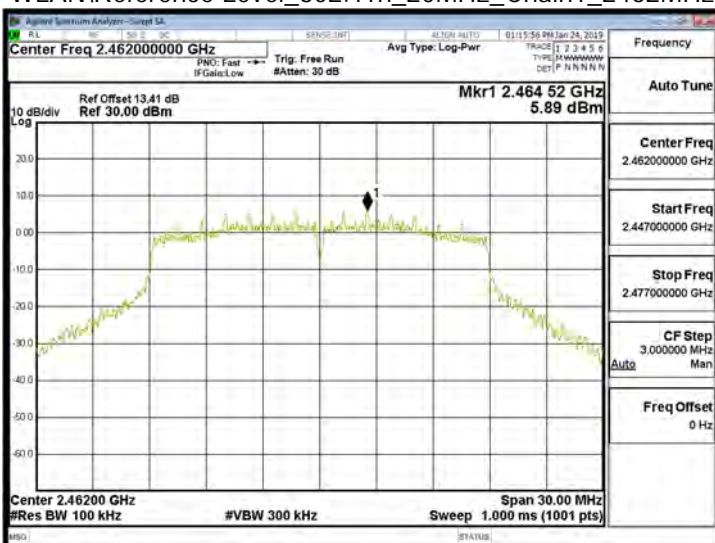
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WLAN\Reference Level_802.11n_40MHz_Chain1_2437MHz



WLAN\Reference Level_802.11n_20MHz_Chain1_2462MHz



WLAN\Reference Level_802.11n_40MHz_Chain1_2452MHz

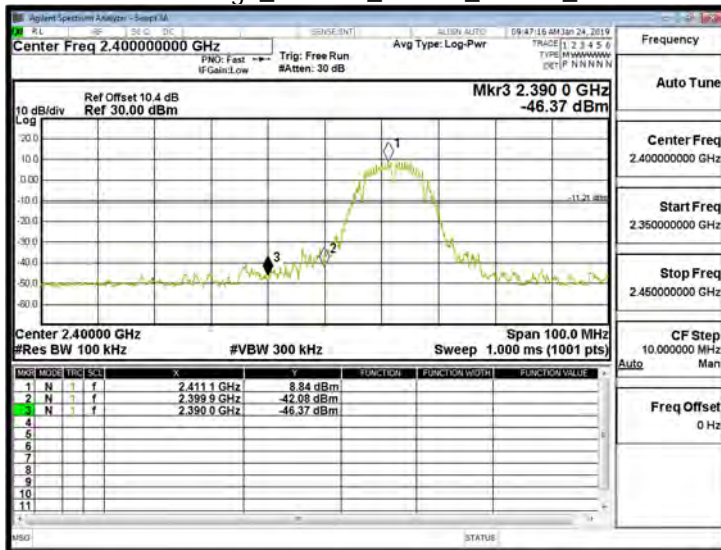


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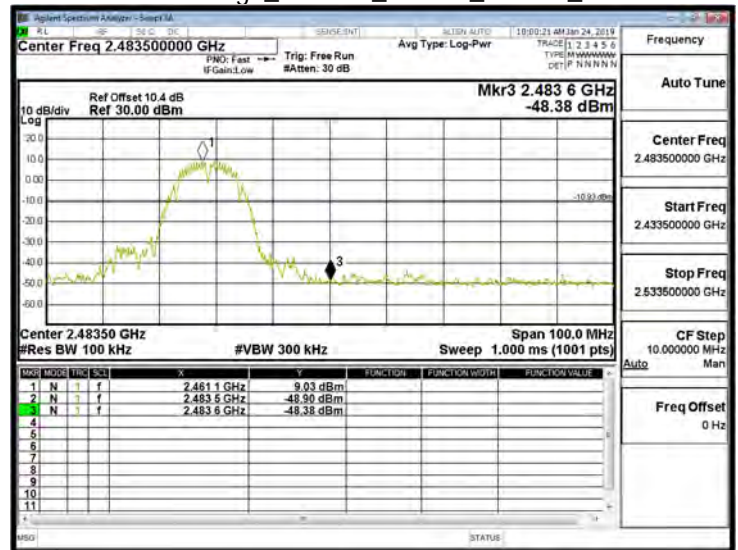
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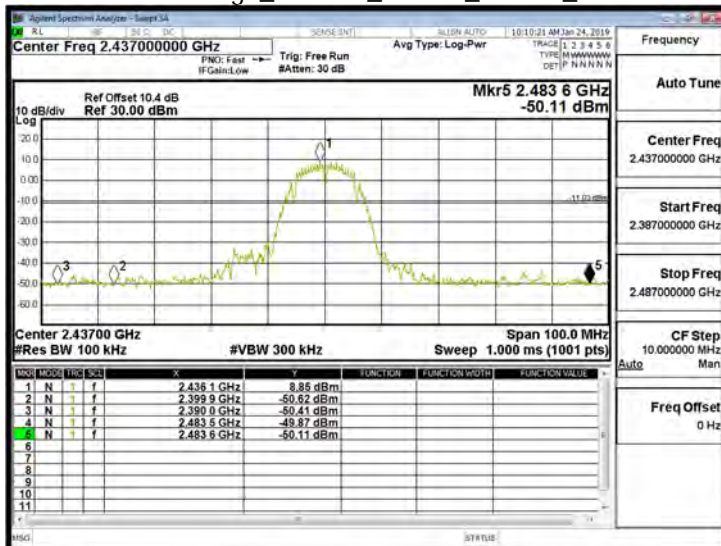
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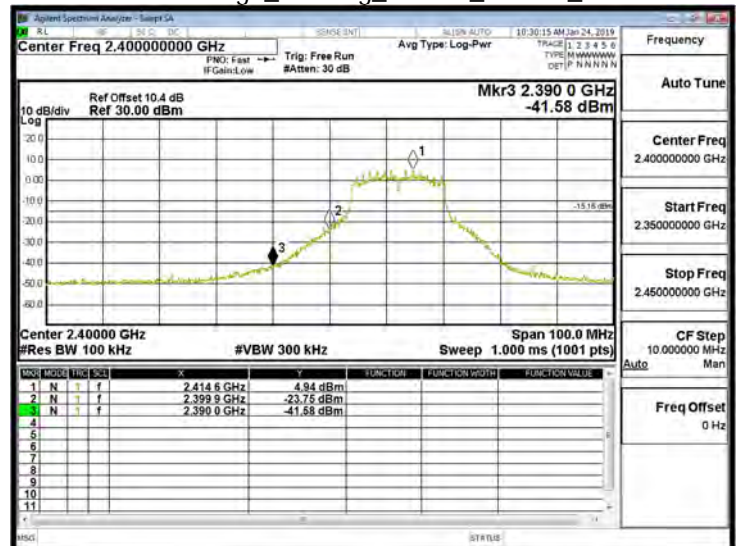
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WLAN\Band Edge_802.11b_20MHz_Chain1_2437MHz



WLAN\Band Edge_802.11g_20MHz_Chain1_2412MHz



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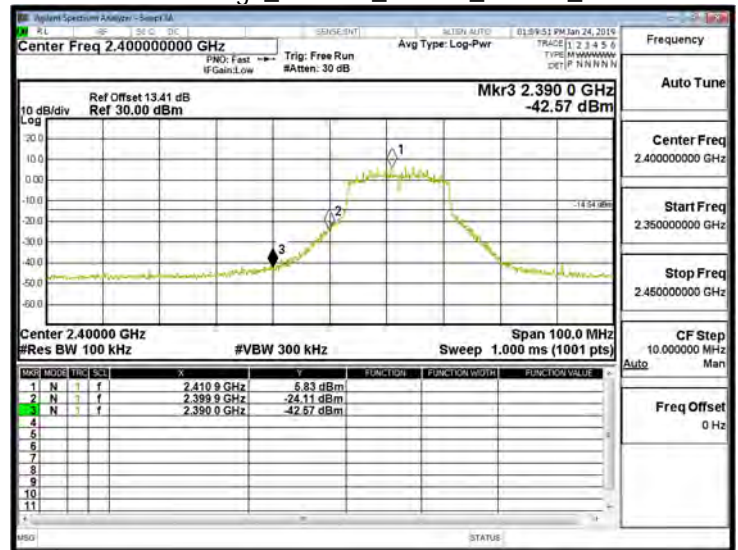
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WLAN\Band Edge_802.11g_20MHz_Chain1_2437MHz



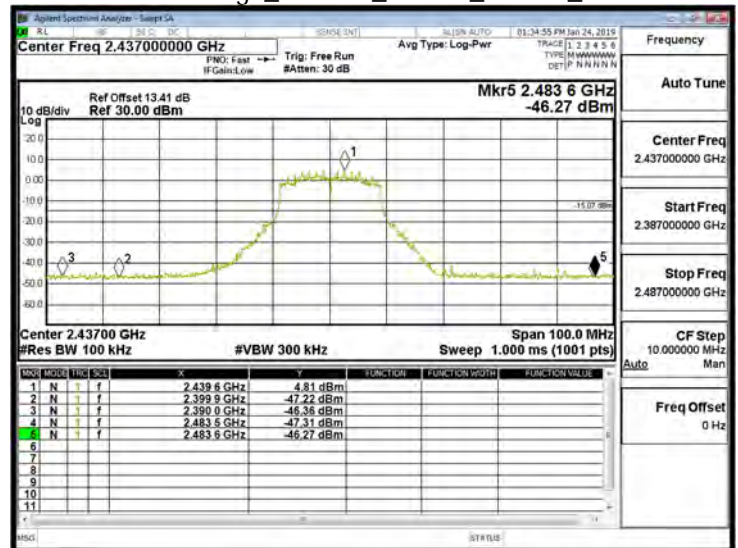
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WLAN\Band Edge_802.11g_20MHz_Chain1_2462MHz



WLAN\Band Edge_802.11n_20MHz_Chain1_2437MHz

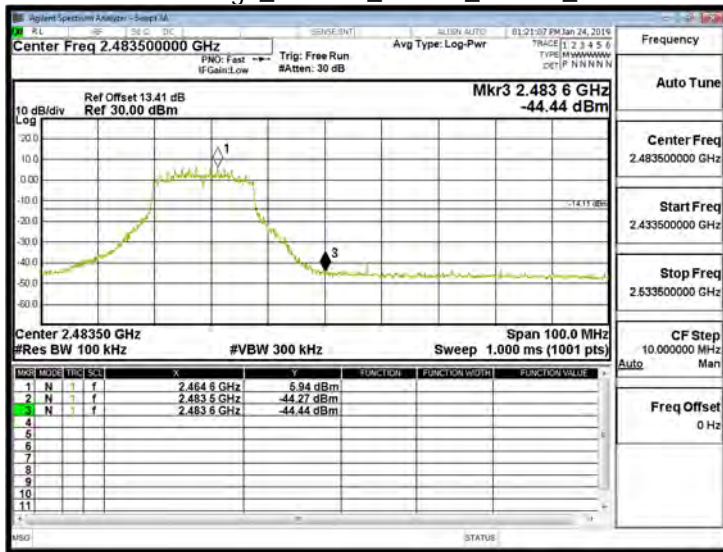


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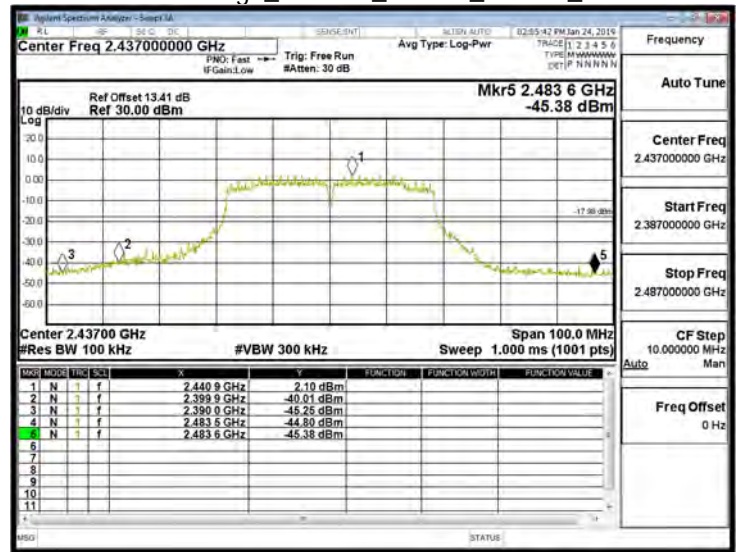
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WLAN\Band Edge_802.11n_20MHz_Chain1_2462MHz



WLAN\Band Edge_802.11n_40MHz_Chain1_2437MHz



WLAN\Band Edge_802.11n_40MHz_Chain1_2422MHz



WLAN\Band Edge_802.11n_40MHz_Chain1_2452MHz

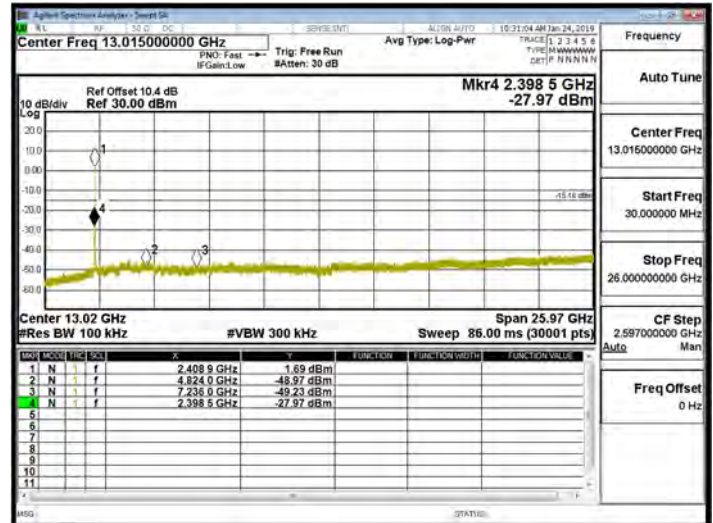
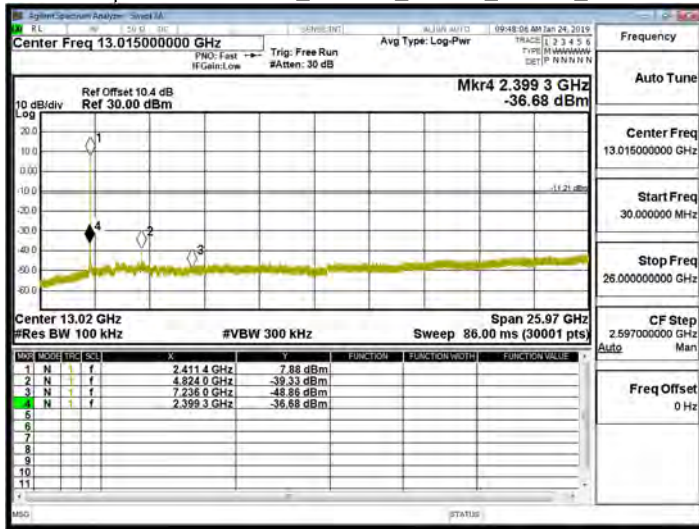


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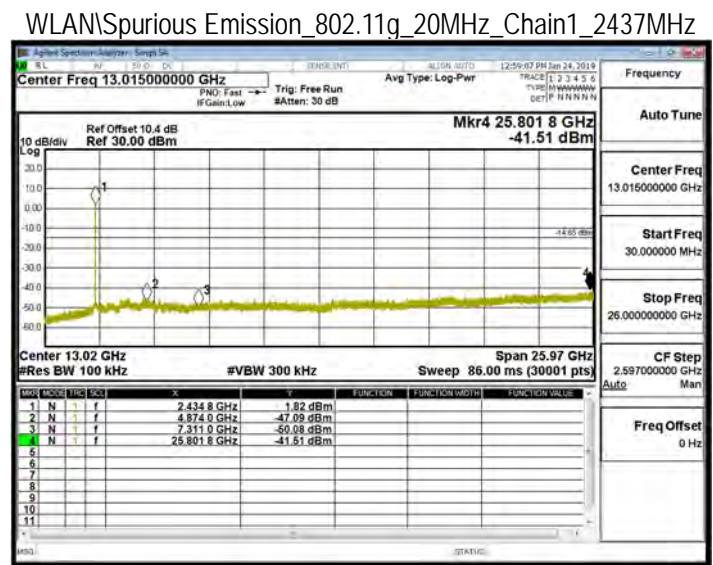
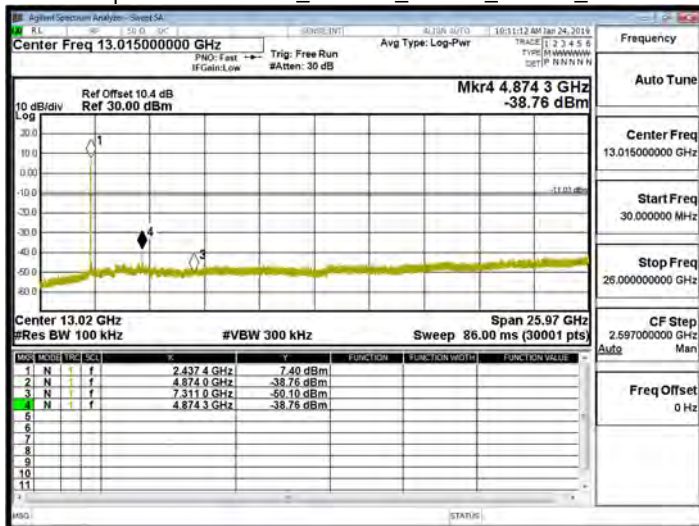
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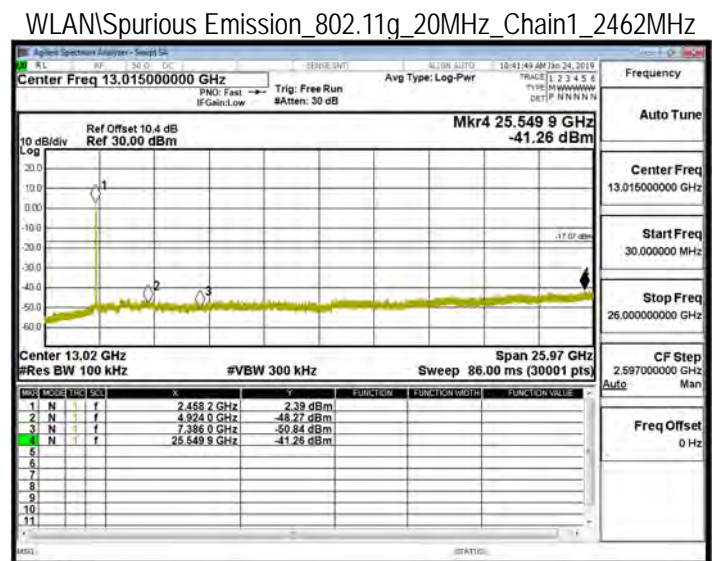
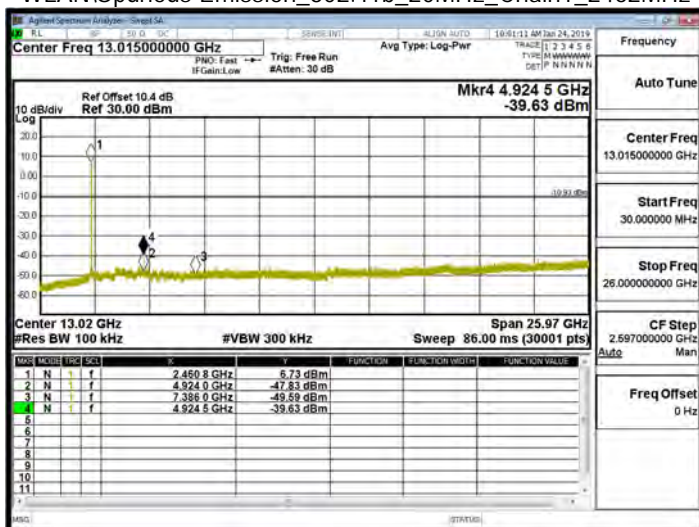
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WLAN\Spurious Emission_802.11b_20MHz_Chain1_2437MHz



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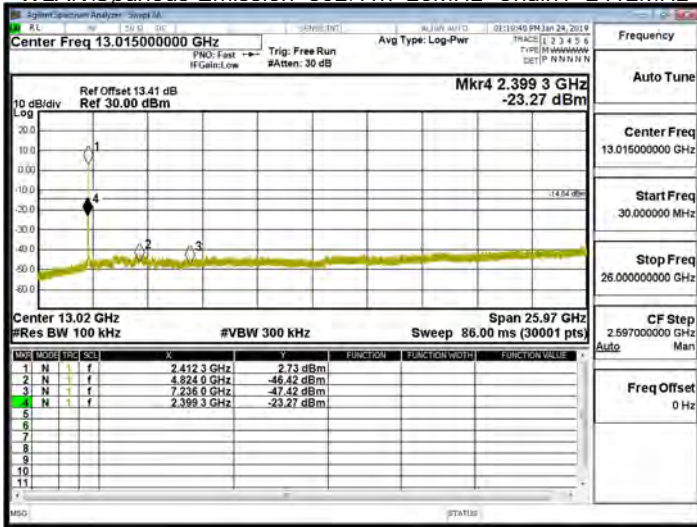
WLAN\Spurious Emission_802.11g_20MHz_Chain1_2412MHz

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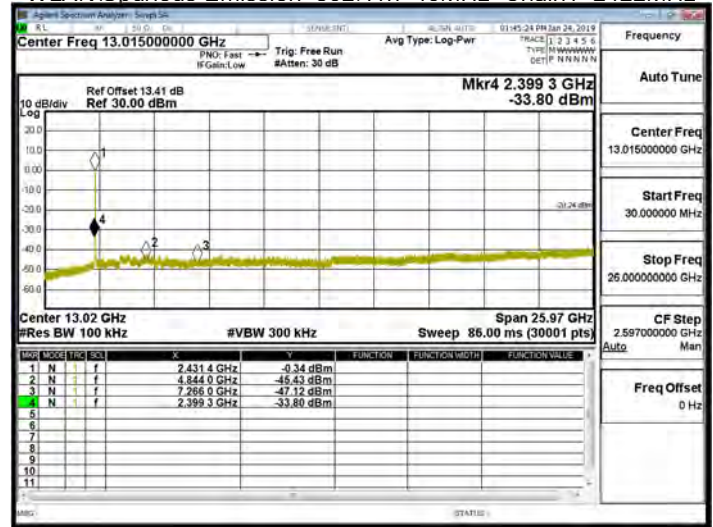
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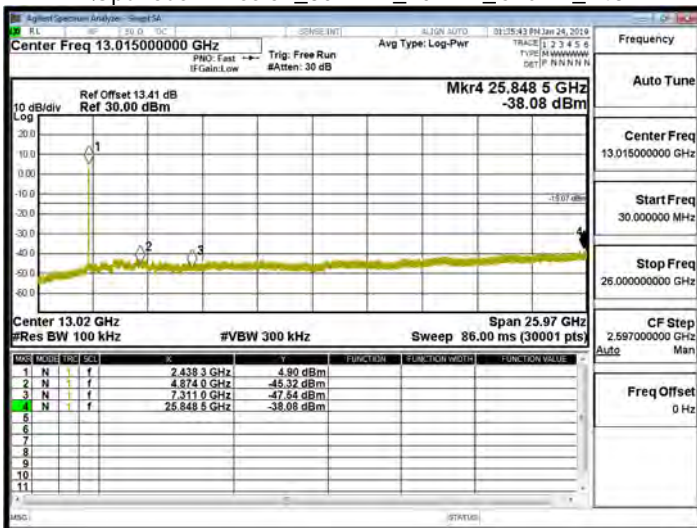
WLAN\Spurious Emission 802.11n 20MHz Chain1 2412MHz



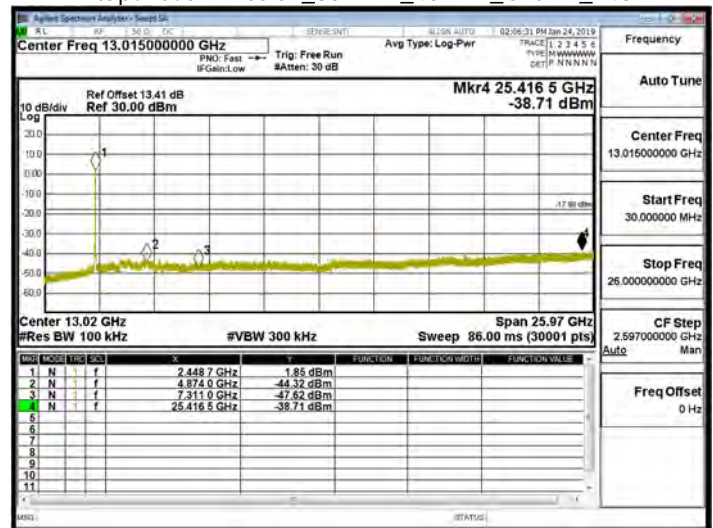
WLAN\Spurious Emission 802.11n 40MHz Chain1 2422MHz



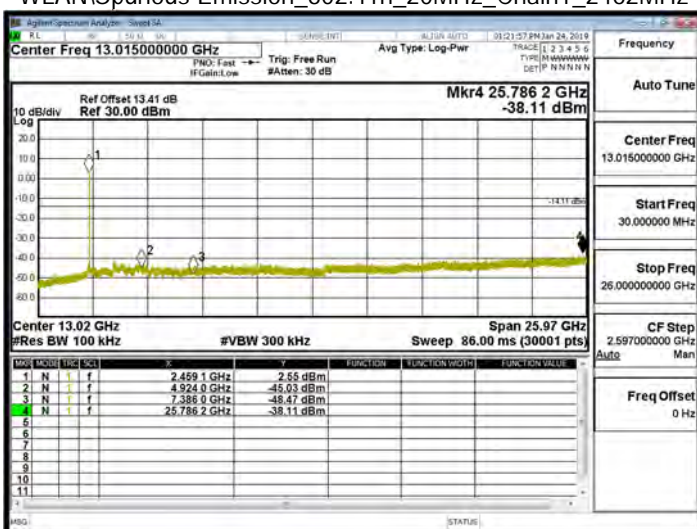
WLAN\Spurious Emission 802.11n 20MHz Chain1 2437MHz



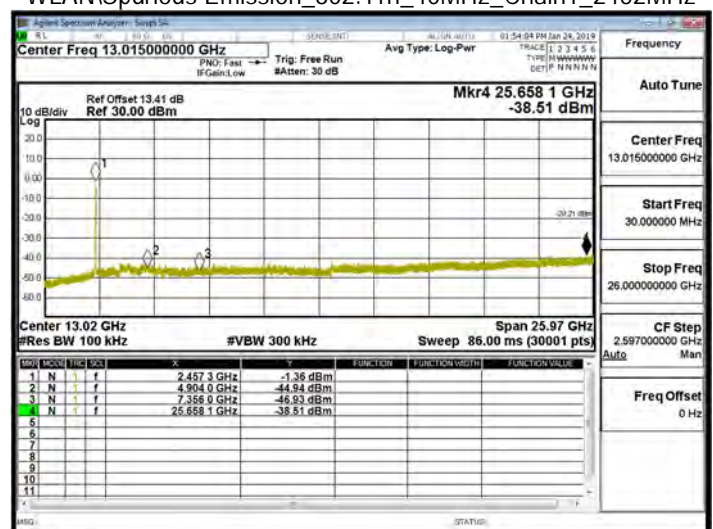
WLAN\Spurious Emission 802.11n 40MHz Chain1 2437MHz



WLAN\Spurious Emission 802.11n 20MHz Chain1 2462MHz



WLAN\Spurious Emission 802.11n 40MHz Chain1 2452MHz



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11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

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. In addition, radiated emissions which fall in the restricted bands must also comply with the RSS-Gen §8.10 Table 7.

And according to 15.33(a)(1) & RSS-Gen §6.13(a) for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-Gen §8.9 Table 5 & 6 Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission

Frequency (MHz)	Field strength (microvolts/meter)	Distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBμV/m) = 20 log Emission level (dBμV/m)

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11.2 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Broadband Antenna	TESEQ	CBL 6112D	35243	2018/10/30	2019/10/29
Horn Antenna	Schwarzbeck	BBHA9120D	1187	2019/01/09	2020/1/8
Horn Antenna	SCHWAZBECK	BBHA9170	185	2018/08/02	2019/8/1
Loop Antenna	ETS.LINDGREN	6502	148045	2018/04/19	2019/4/18
EMI Test Receiver	R&S	ESU 40	100363	2018/04/11	2019/4/10
Pre-Amplifier	EMC Instruments	EMC330	980096	2018/12/25	2019/12/24
Pre-Amplifier	EMC Instruments	EMC0011830	980199	2018/12/25	2019/12/24
Pre-Amplifier	EMC Instruments	EMC184045B	980135	2018/12/25	2019/12/24
Attenuator	Marvelous	WATT-218FS-10	RF246	2018/12/25	2019/12/24
Band Rejection Filter	Micro-Tronics	G015	RF100	2018/12/25	2019/12/24
Band Rejection Filter	Micro-Tronics	G016	RF101	2018/12/25	2019/12/24
Band Rejection Filter	Micro-Tronics	G021	RF102	2018/12/25	2019/12/24
Coaxial Cable	Huber+Suhner	RG 214/U	W21.01	2018/12/25	2019/12/24
Coaxial Cable	Huber Suhner	EMC106-SM-SM-7200	150703	2018/12/25	2019/12/24
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	2018/12/25	2019/12/24

NOTE: N.C.R refers to Not Calibrated Required.

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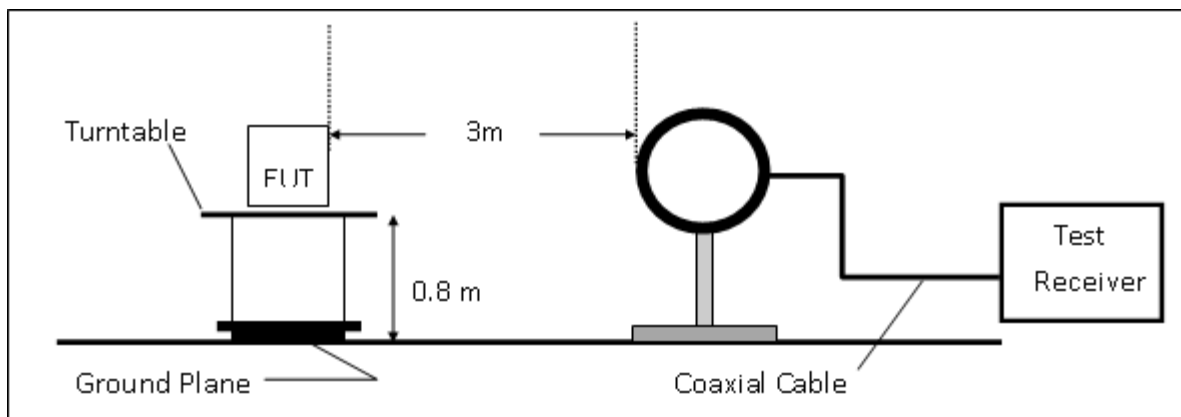
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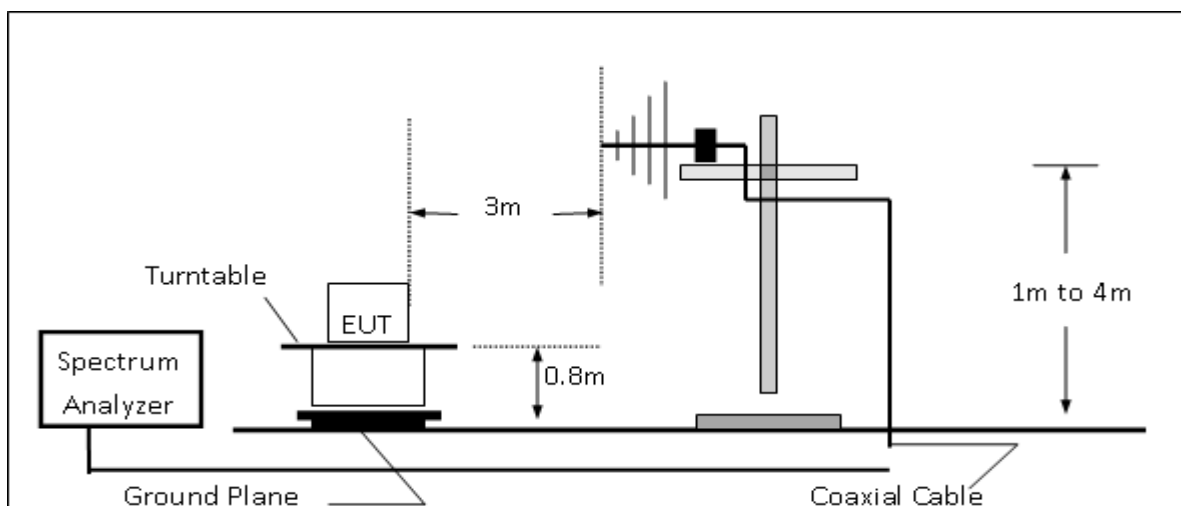
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11.3 Test SET-UP

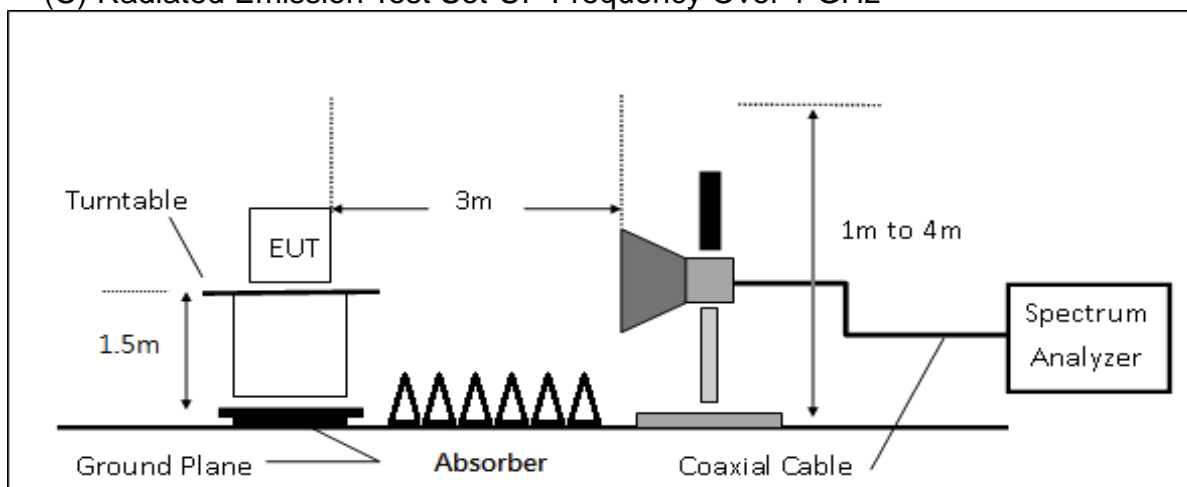
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency form 30MHz to 1000MHz



(C) Radiated Emission Test Set-UP Frequency Over 1 GHz



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11.4 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
2. The EUT was placed on a turn table with 0.8m for frequency < 1GHz and 1.5m for frequency > 1GHz above ground plane.
3. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
5. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
6. Set the spectrum analyzer as RBW=120 kHz and VBW=300 kHz for Peak Detector (PK) and Quasi-peak (QP) at frequency below 1 GHz.
7. Set the spectrum analyzer as RBW=1 MHz, VBW=3 MHz for Peak Detector at frequency above 1 GHz.
8. Set the spectrum analyzer as RBW=1 MHz, VBW=10 Hz (Duty cycle > 98%) or VBW ≥ 1/T (Duty cycle < 98%) for Average Detector at frequency above 1 GHz.
9. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
10. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
11. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. On spectrum, change spectrum mode in linear display mode, and reduce VBW = 10Hz if average reading is measured.
12. Repeat above procedures until all default test channel measured were complete.

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11.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre_Amplifier Gain(dB)

11.6 Test Results of Radiated Spurious Emissions form 9 kHz to 30 MHz

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) was not reported.

11.7 Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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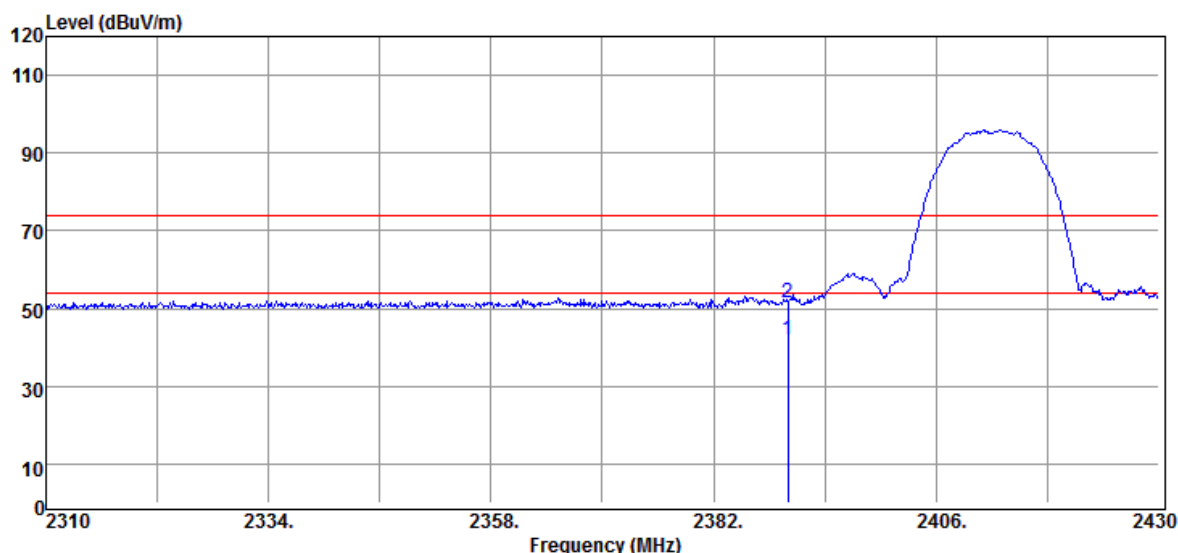
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Radiated Band Edge Measurement Result

Operation Mode	:802.11b	Test Date	:2019-01-24
Test Mode	:BE CH LOW	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2412 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
2390.00	Average	38.87	2.98	41.85	54.00	-12.15
2390.00	Peak	48.71	2.98	51.69	74.00	-22.31

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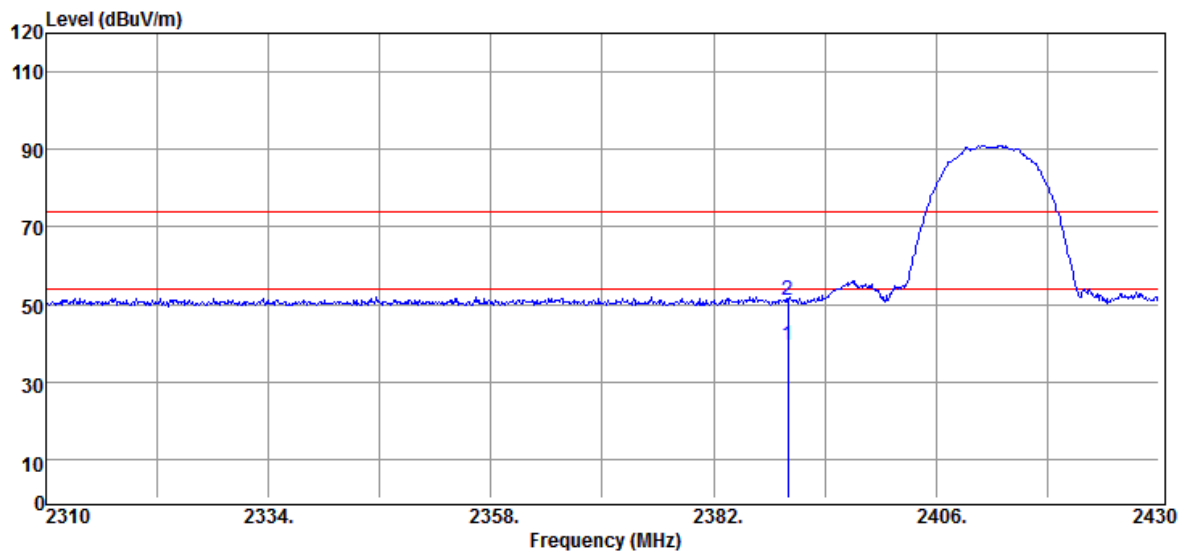
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Operation Mode :802.11b
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2390.00	Average	36.63	2.98	39.61	54.00	-14.39
2390.00	Peak	47.90	2.98	50.88	74.00	-23.12

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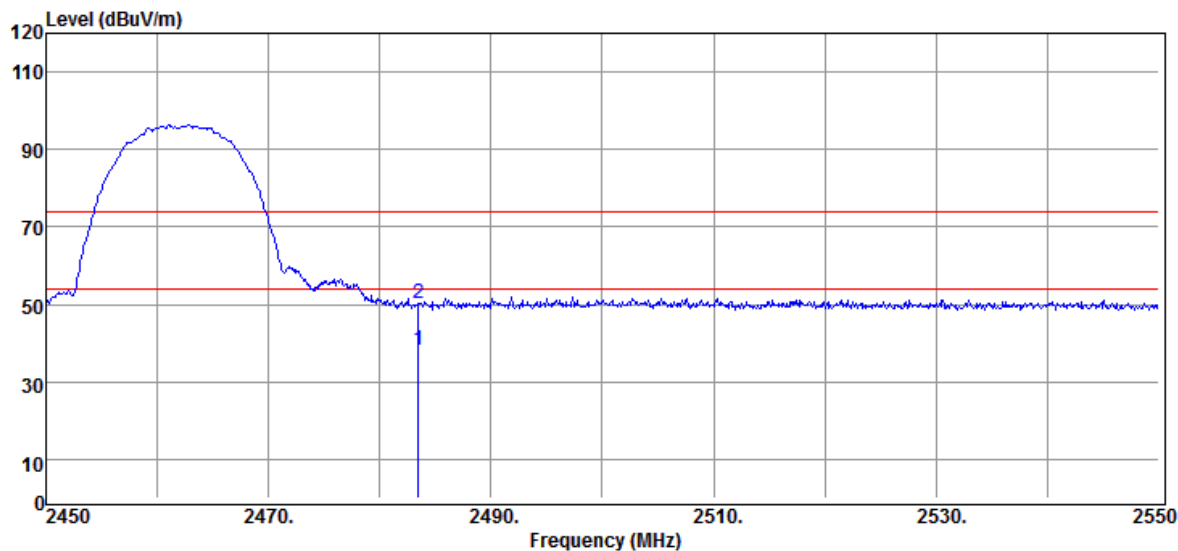
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Operation Mode	:802.11b	Test Date	:2019-01-24
Test Mode	:BE CH HIGH	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2462 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	35.09	2.97	38.06	54.00	-15.94
2483.50	Peak	47.43	2.97	50.40	74.00	-23.60

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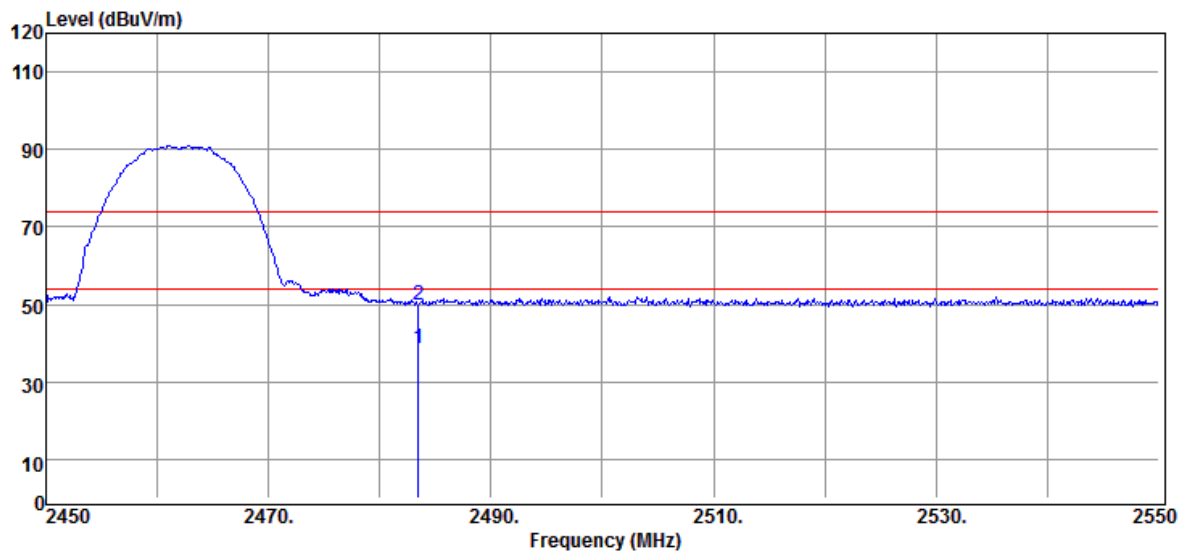
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Operation Mode :802.11b
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	35.48	2.97	38.45	54.00	-15.55
2483.50	Peak	46.94	2.97	49.91	74.00	-24.09

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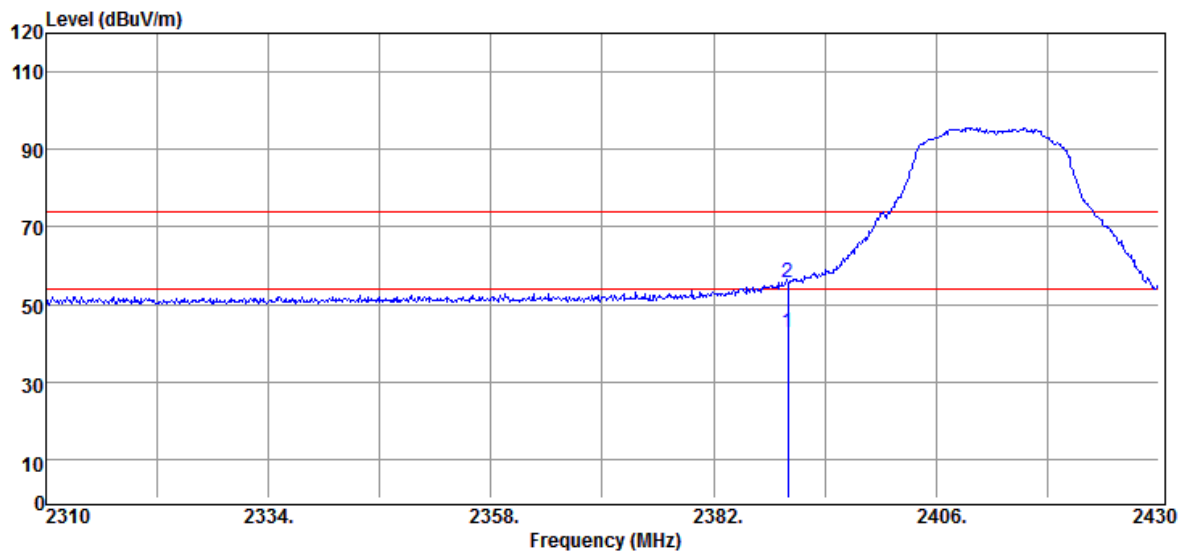
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Member of SGS Group

Operation Mode :802.11g
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	39.68	2.98	42.66	54.00	-11.34
2390.00	Peak	52.57	2.98	55.55	74.00	-18.45

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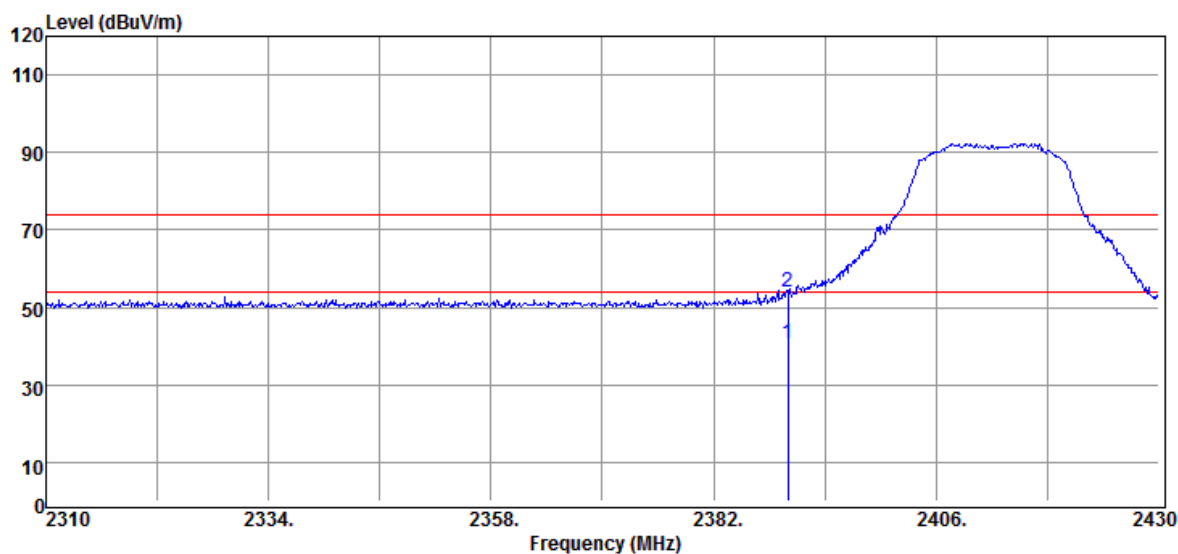
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Member of SGS Group

Operation Mode :802.11g
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level d μ V	Factor dB	Actual FS d μ V/m	Limit @3m d μ V/m	Margin dB
2390.00	Average	37.86	2.98	40.84	54.00	-13.16
2390.00	Peak	50.92	2.98	53.90	74.00	-20.10

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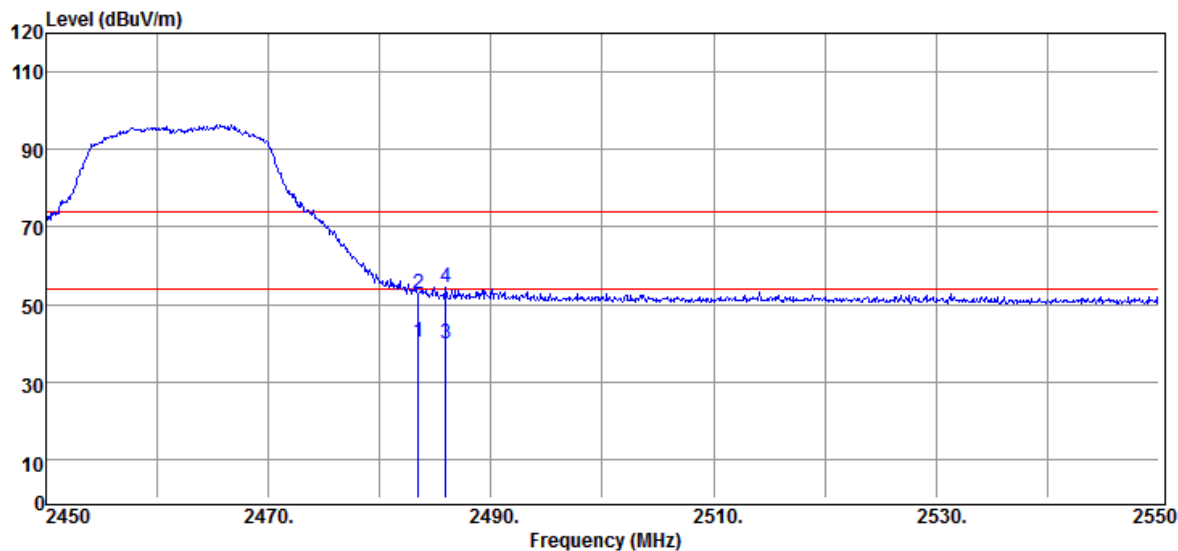
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Operation Mode :802.11g
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	37.41	2.97	40.38	54.00	-13.62
2483.50	Peak	49.94	2.97	52.91	74.00	-21.09
2485.90	Average	36.74	2.97	39.71	54.00	-14.29
2485.90	Peak	51.49	2.97	54.46	74.00	-19.54

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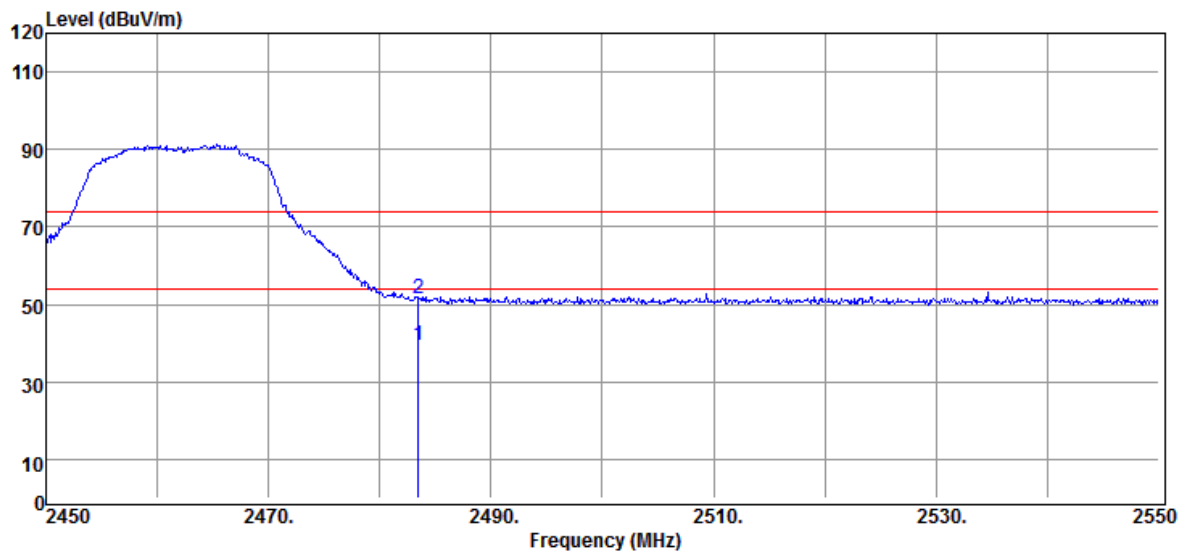
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Operation Mode	:802.11g	Test Date	:2019-01-24
Test Mode	:BE CH HIGH	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2462 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	Average	36.50	2.97	39.47	54.00	-14.53
2483.50	Peak	48.66	2.97	51.63	74.00	-22.37

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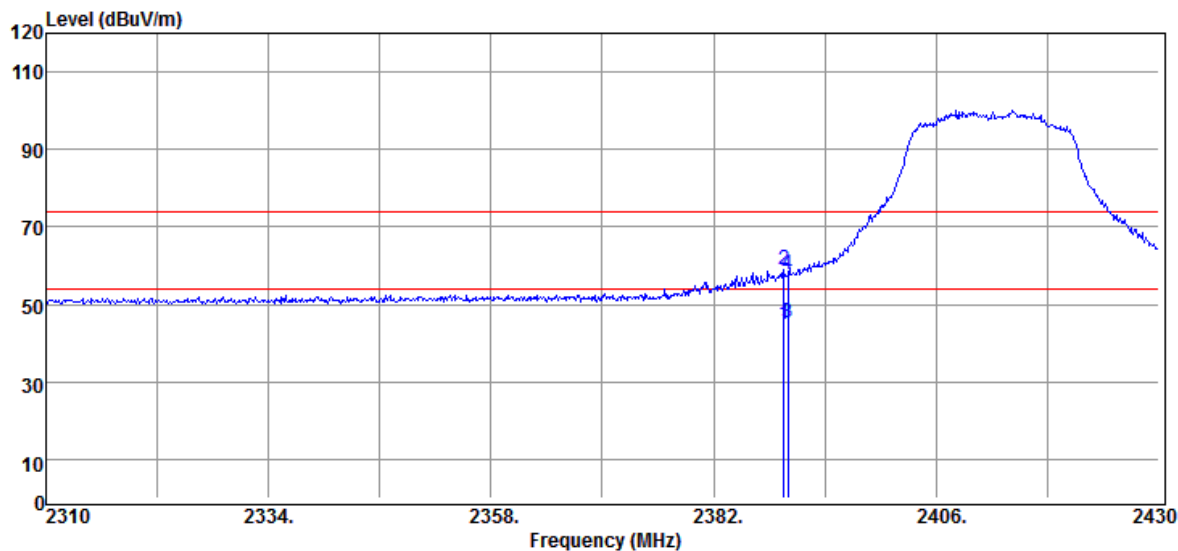
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Operation Mode :802.11n20
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2389.56	Average	41.81	2.98	44.79	54.00	-9.21
2389.56	Peak	55.99	2.98	58.97	74.00	-15.03
2390.00	Average	42.12	2.98	45.10	54.00	-8.90
2390.00	Peak	54.77	2.98	57.75	74.00	-16.25

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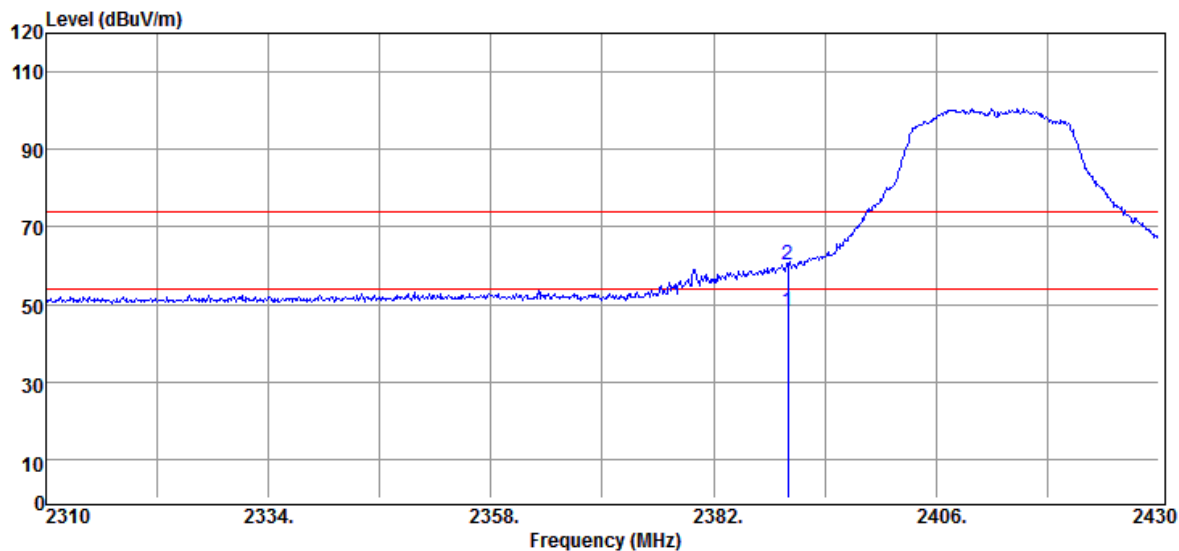
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Operation Mode :802.11n20
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2390.00	Average	45.23	2.98	48.21	54.00	-5.79
2390.00	Peak	57.12	2.98	60.10	74.00	-13.90

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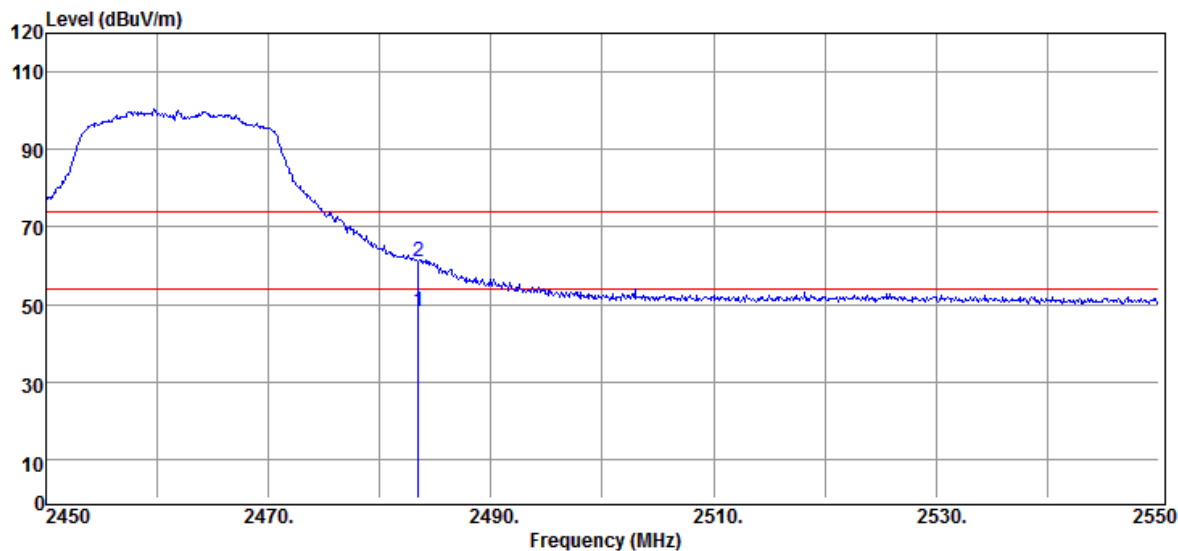
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Operation Mode :802.11n20
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	45.22	2.97	48.19	54.00	-5.81
2483.50	Peak	58.05	2.97	61.02	74.00	-12.98

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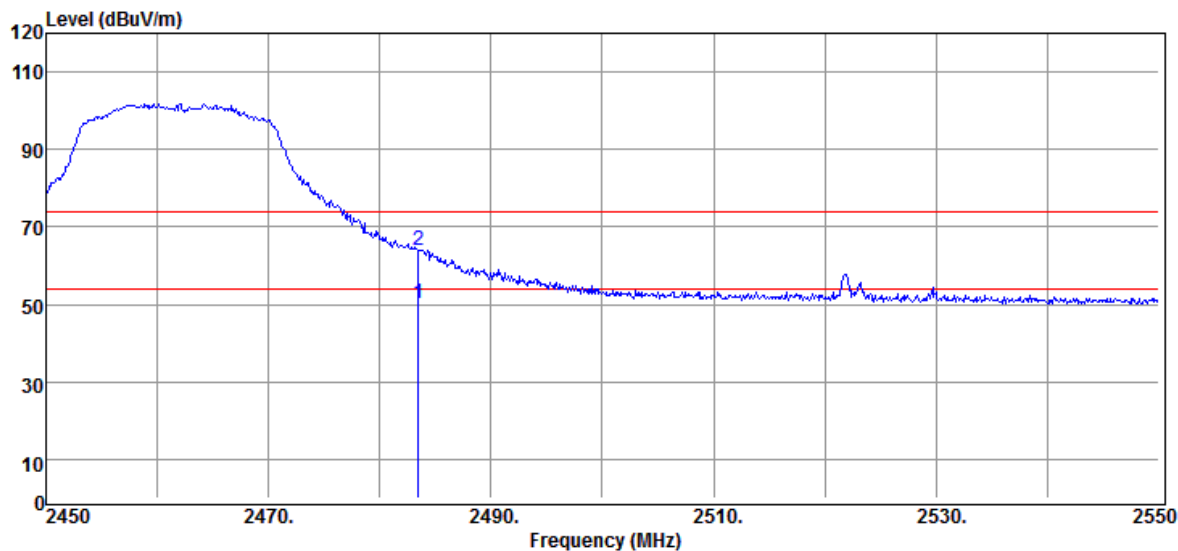
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Operation Mode :802.11n20
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	47.41	2.97	50.38	54.00	-3.62
2483.50	Peak	60.84	2.97	63.81	74.00	-10.19

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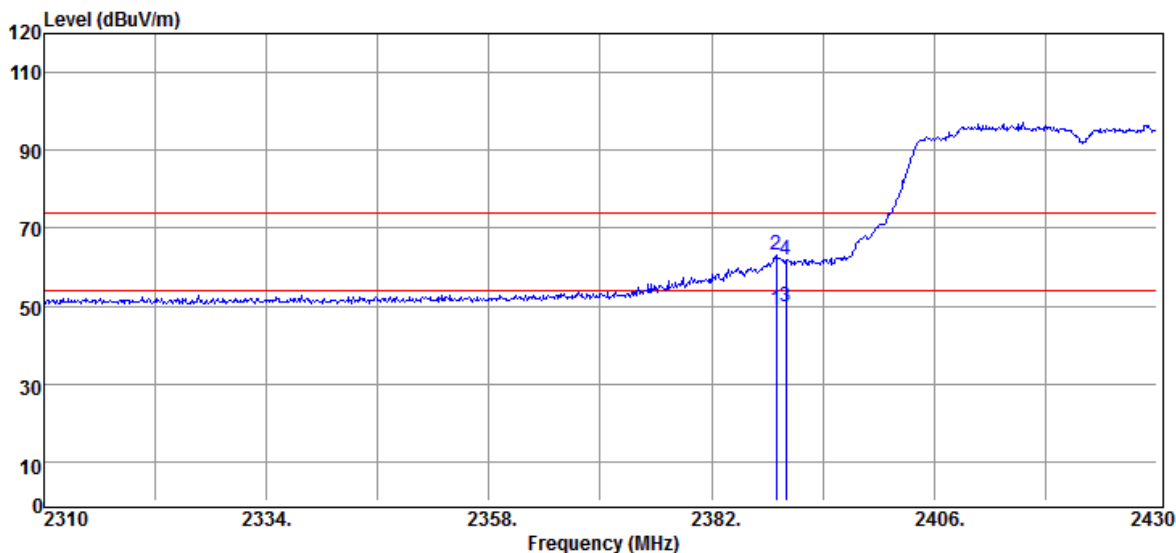
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Operation Mode :802.11n40
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2422 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2388.96	Average	46.13	2.98	49.11	54.00	-4.89
2388.96	Peak	60.13	2.98	63.11	74.00	-10.89
2390.00	Average	46.87	2.98	49.85	54.00	-4.15
2390.00	Peak	58.99	2.98	61.97	74.00	-12.03

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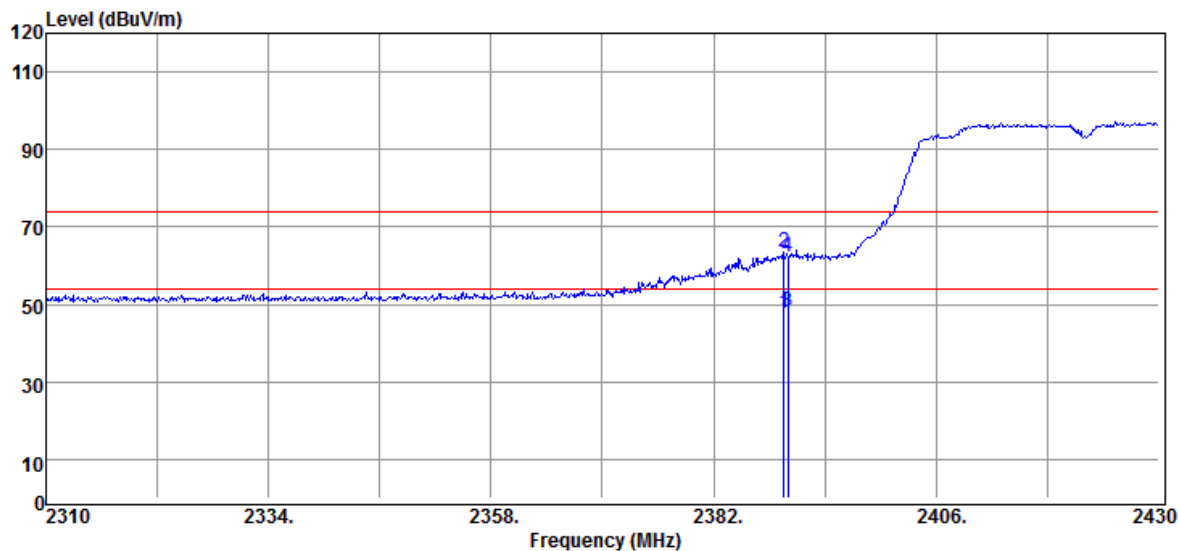
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Operation Mode :802.11n40
Test Mode :BE CH LOW
EUT Pol :H Plan
Test Channel :2422 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2389.56	Average	44.82	2.98	47.80	54.00	-6.20
2389.56	Peak	60.57	2.98	63.55	74.00	-10.45
2390.00	Average	44.98	2.98	47.96	54.00	-6.04
2390.00	Peak	59.18	2.98	62.16	74.00	-11.84

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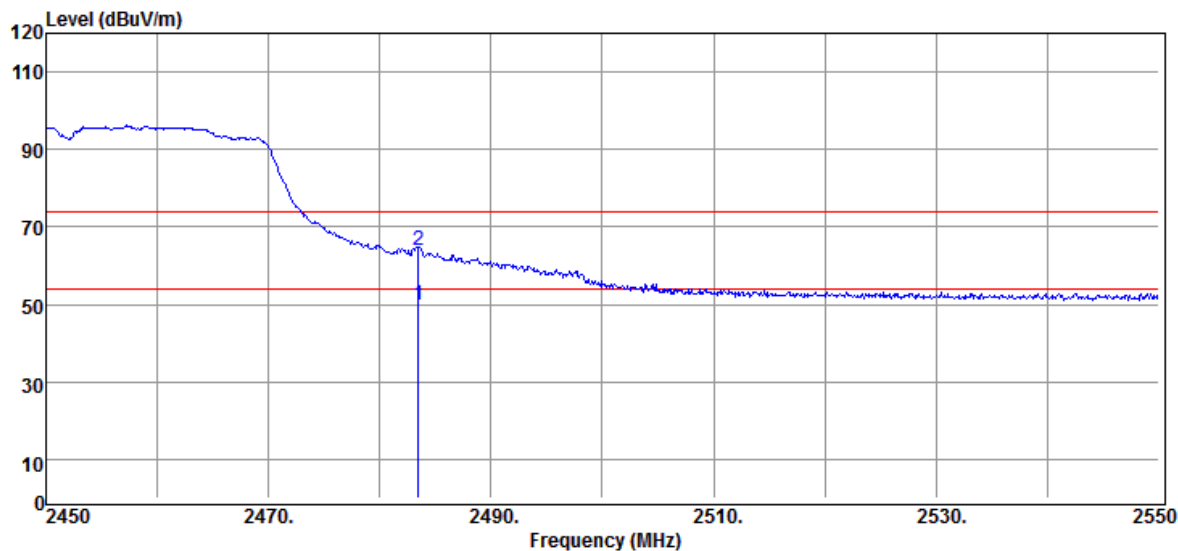
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Operation Mode :802.11n40
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :2452 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	46.97	2.97	49.94	54.00	-4.06
2483.50	Peak	61.17	2.97	64.14	74.00	-9.86

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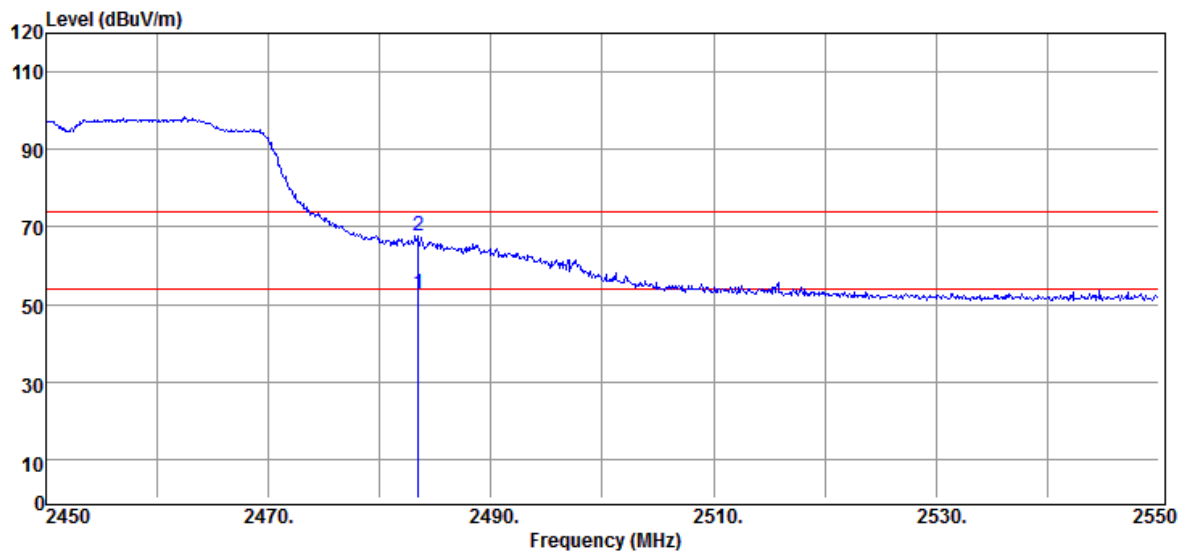
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Operation Mode :802.11n40
Test Mode :BE CH HIGH
EUT Pol :H Plan
Test Channel :2452 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	Average	49.82	2.97	52.79	54.00	-1.21
2483.50	Peak	64.60	2.97	67.57	74.00	-6.43

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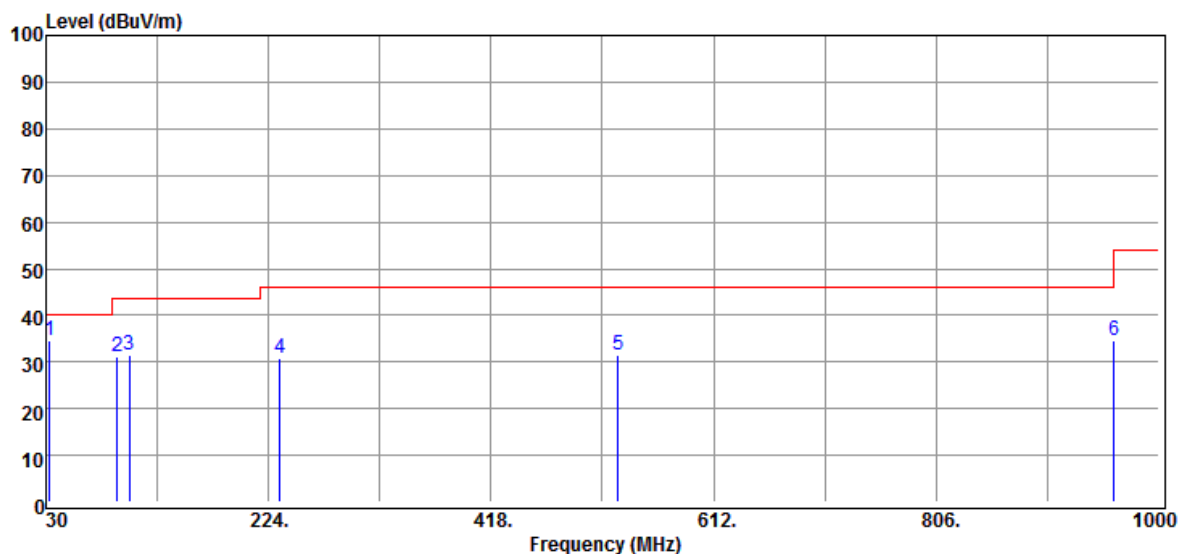
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Radiated Spurious Emission Measurement Result

Below 1GHz Worst-Case Data:

Operation Mode	:802.11g	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:21/57
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2412 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
32.91	Peak	38.50	-3.88	34.62	40.00	-5.38
92.08	Peak	47.34	-16.29	31.05	43.50	-12.45
102.75	Peak	46.29	-14.77	31.52	43.50	-11.98
233.70	Peak	43.35	-12.61	30.74	46.00	-15.26
528.58	Peak	35.60	-4.13	31.47	46.00	-14.53
961.20	Peak	31.21	3.41	34.62	54.00	-19.38

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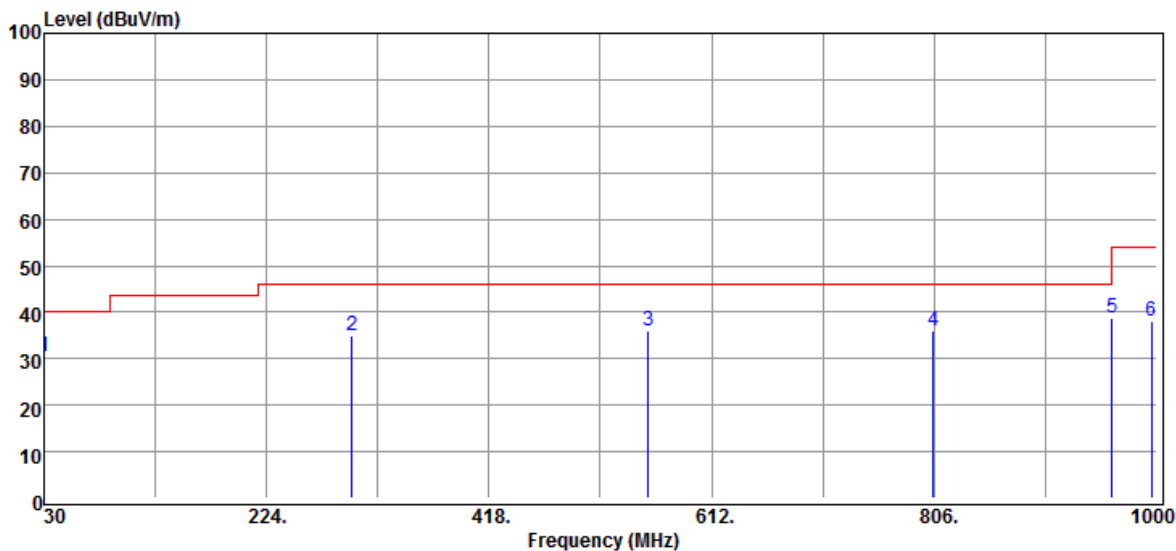
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Operation Mode :802.11g
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
30.00	Peak	32.83	-2.36	30.47	40.00	-9.53
298.69	Peak	44.87	-10.08	34.79	46.00	-11.21
556.71	Peak	39.37	-3.28	36.09	46.00	-9.91
805.03	Peak	36.07	0.02	36.09	46.00	-9.91
961.20	Peak	35.41	3.41	38.82	54.00	-15.18
995.15	Peak	34.44	3.47	37.91	54.00	-16.09

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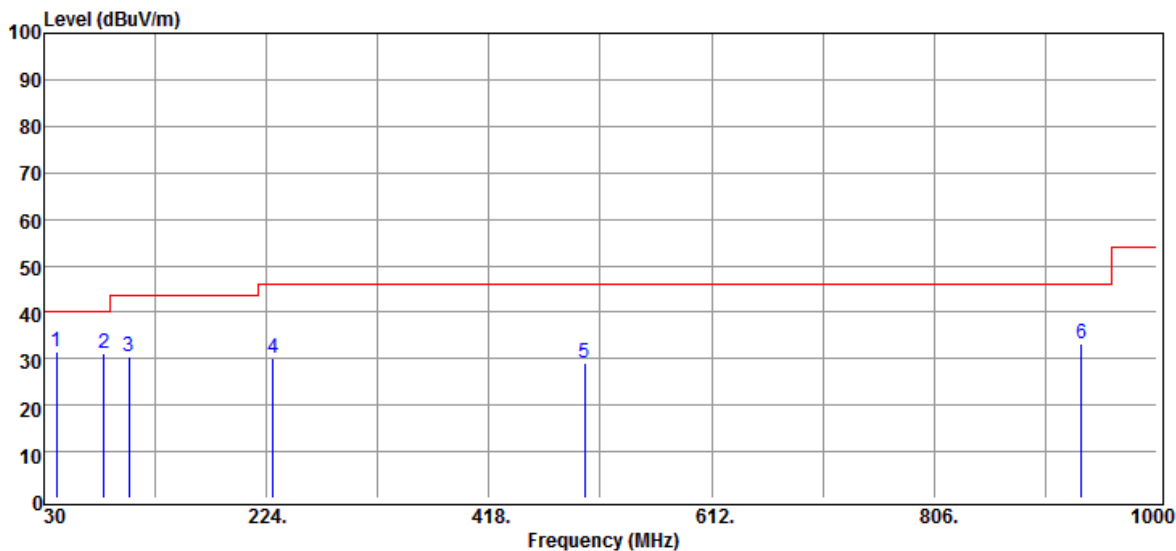
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Operation Mode :802.11g
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
40.67	Peak	40.22	-8.57	31.65	40.00	-8.35
82.38	Peak	48.35	-17.13	31.22	40.00	-8.78
103.72	Peak	44.96	-14.61	30.35	43.50	-13.15
229.82	Peak	42.96	-13.02	29.94	46.00	-16.06
501.42	Peak	33.50	-4.51	28.99	46.00	-17.01
934.04	Peak	31.16	2.21	33.37	46.00	-12.63

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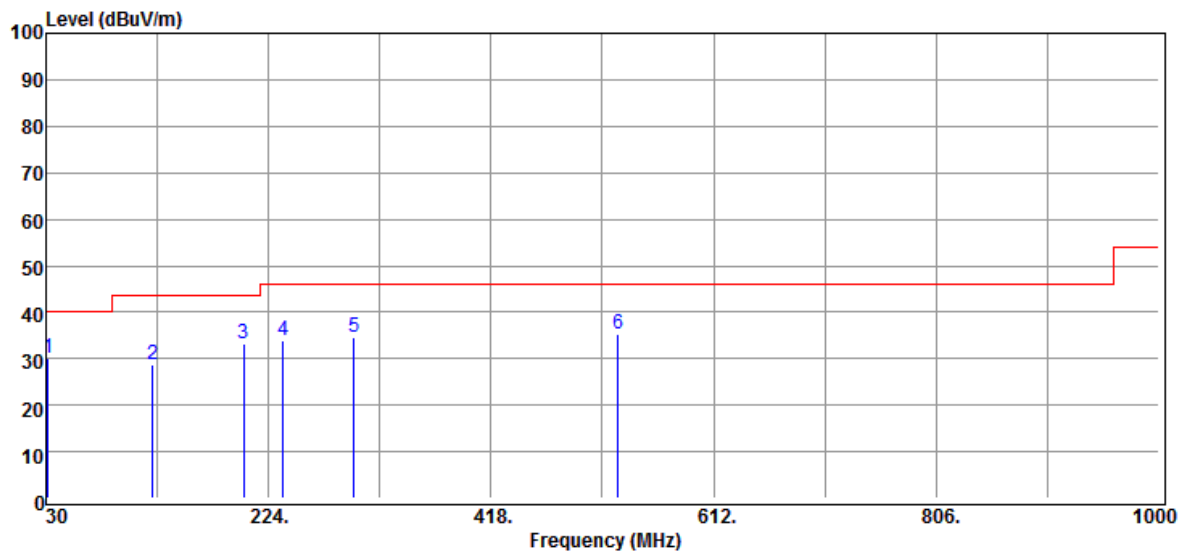
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Operation Mode :802.11g
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
31.94	Peak	33.31	-3.13	30.18	40.00	-9.82
123.12	Peak	41.29	-12.57	28.72	43.50	-14.78
202.66	Peak	47.08	-14.00	33.08	43.50	-10.42
236.61	Peak	46.14	-12.30	33.84	46.00	-12.16
298.69	Peak	44.66	-10.08	34.58	46.00	-11.42
528.58	Peak	39.46	-4.13	35.33	46.00	-10.67

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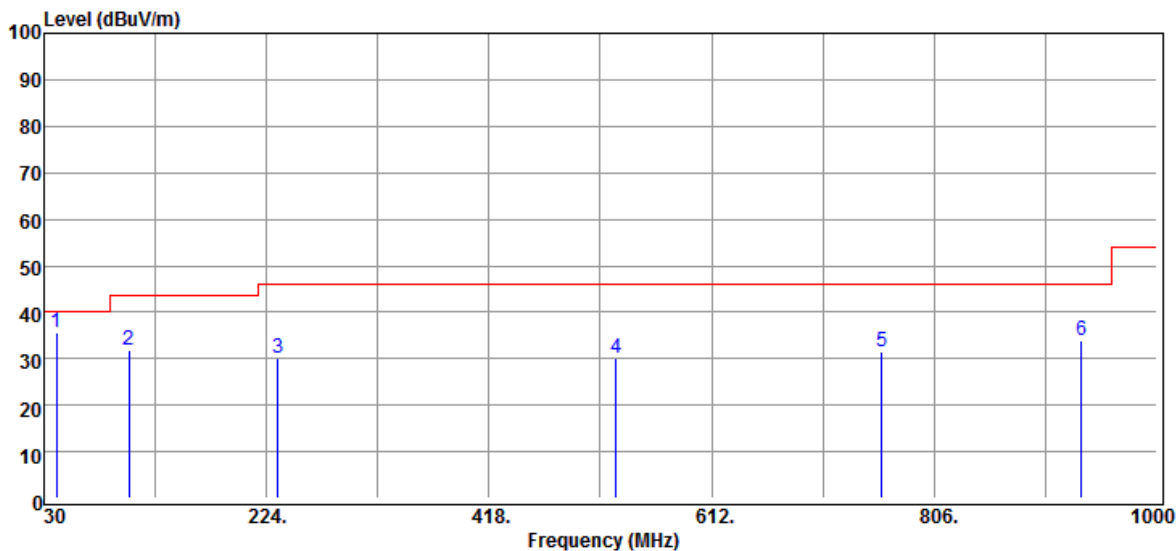
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Operation Mode :802.11g
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
40.67	Peak	44.12	-8.57	35.55	40.00	-4.45
103.72	Peak	46.35	-14.61	31.74	43.50	-11.76
233.70	Peak	42.87	-12.61	30.26	46.00	-15.74
528.58	Peak	34.17	-4.13	30.04	46.00	-15.96
760.41	Peak	31.79	-0.42	31.37	46.00	-14.63
934.04	Peak	31.82	2.21	34.03	46.00	-11.97

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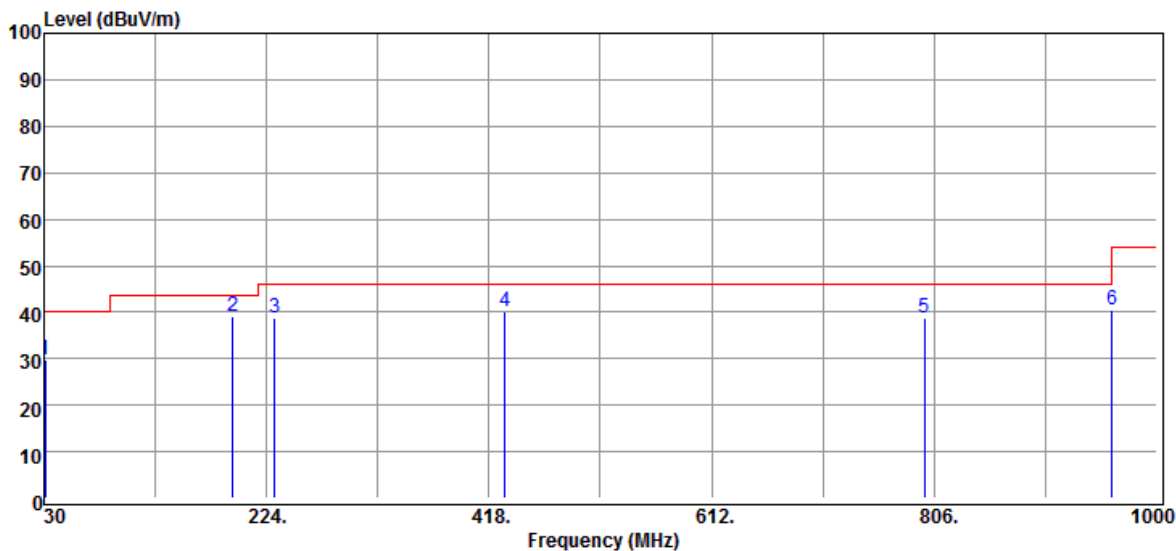
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Operation Mode :802.11g
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
30.97	Peak	32.37	-2.64	29.73	40.00	-10.27
194.90	Peak	53.68	-14.66	39.02	43.50	-4.48
230.79	Peak	51.53	-12.93	38.60	46.00	-7.40
431.58	Peak	46.54	-6.38	40.16	46.00	-5.84
797.27	Peak	38.87	0.00	38.87	46.00	-7.13
961.20	Peak	37.19	3.41	40.60	54.00	-13.40

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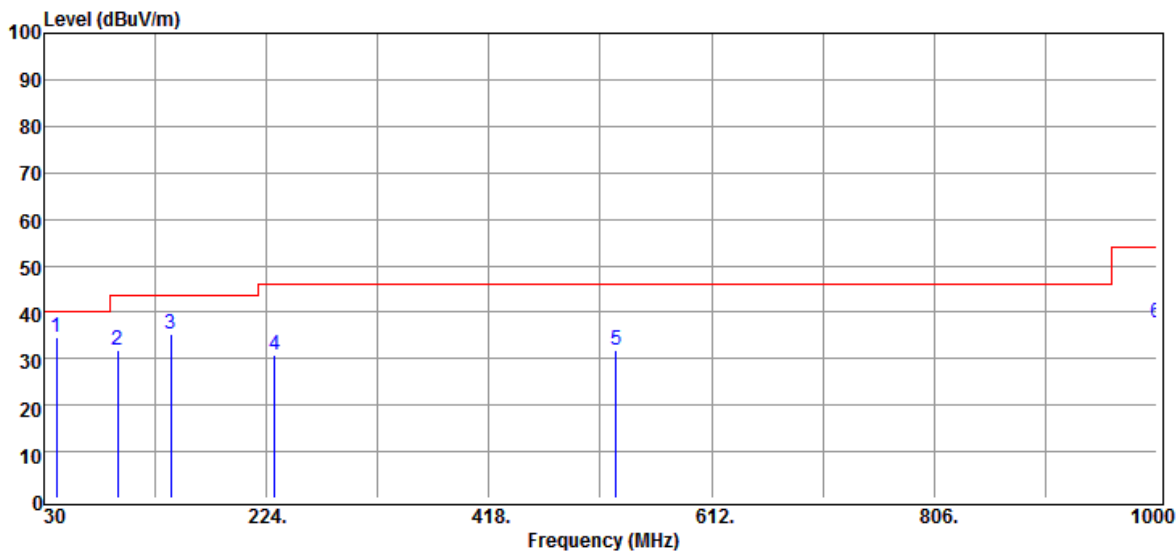
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Operation Mode :802.11n40
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2422 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
40.67	Peak	43.19	-8.57	34.62	40.00	-5.38
94.02	Peak	47.68	-16.01	31.67	43.50	-11.83
140.58	Peak	47.97	-12.60	35.37	43.50	-8.13
230.79	Peak	43.72	-12.93	30.79	46.00	-15.21
528.58	Peak	36.00	-4.13	31.87	46.00	-14.13
1000.00	Peak	33.87	3.82	37.69	54.00	-16.31

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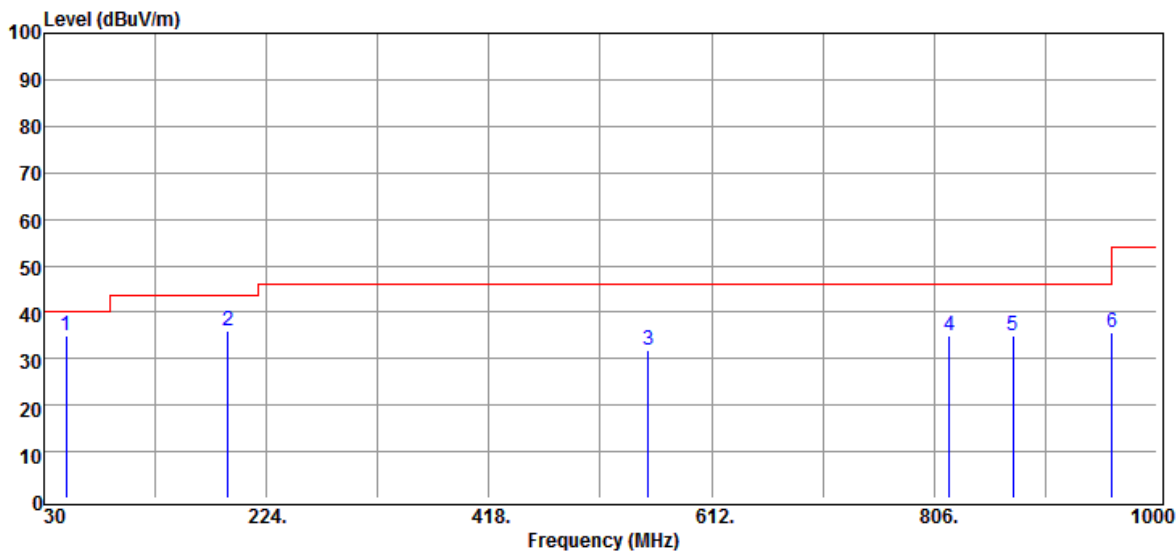
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Operation Mode :802.11n40
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2422 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBUV	Factor dB	Actual FS dBUV/m	Limit @3m dBUV/m	Margin dB
49.40	Peak	49.41	-14.54	34.87	40.00	-5.13
190.05	Peak	50.66	-14.84	35.82	43.50	-7.68
556.71	Peak	35.09	-3.28	31.81	46.00	-14.19
819.58	Peak	34.79	0.02	34.81	46.00	-11.19
874.87	Peak	32.98	1.81	34.79	46.00	-11.21
961.20	Peak	32.08	3.41	35.49	54.00	-18.51

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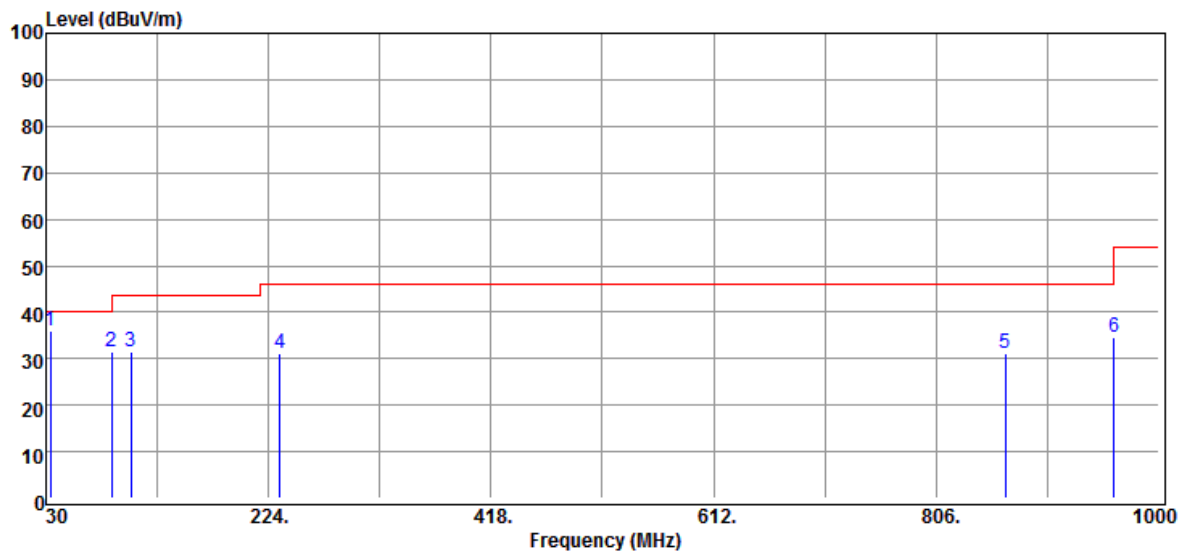
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Operation Mode :802.11n40
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
33.88	Peak	40.21	-4.29	35.92	40.00	-4.08
87.23	Peak	48.21	-16.85	31.36	40.00	-8.64
103.72	Peak	46.12	-14.61	31.51	43.50	-11.99
233.70	Peak	43.68	-12.61	31.07	46.00	-14.93
866.14	Peak	29.02	2.24	31.26	46.00	-14.74
961.20	Peak	31.36	3.41	34.77	54.00	-19.23

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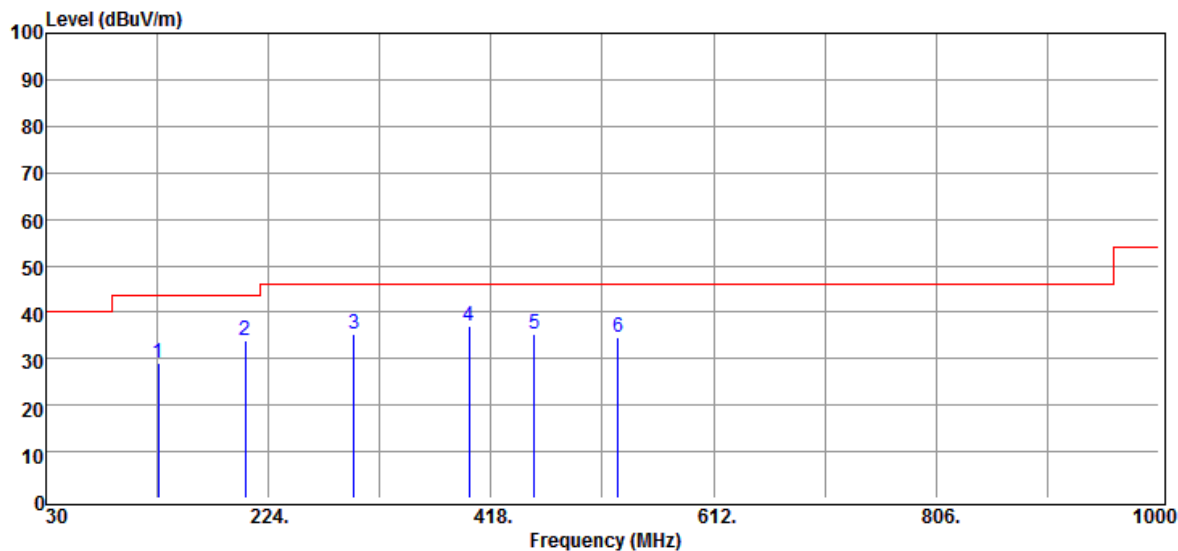
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Operation Mode :802.11n40
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
127.97	Peak	41.44	-12.35	29.09	43.50	-14.41
203.63	Peak	47.88	-13.94	33.94	43.50	-9.56
298.69	Peak	45.29	-10.08	35.21	46.00	-10.79
398.60	Peak	43.22	-6.19	37.03	46.00	-8.97
455.83	Peak	41.52	-6.14	35.38	46.00	-10.62
528.58	Peak	38.70	-4.13	34.57	46.00	-11.43

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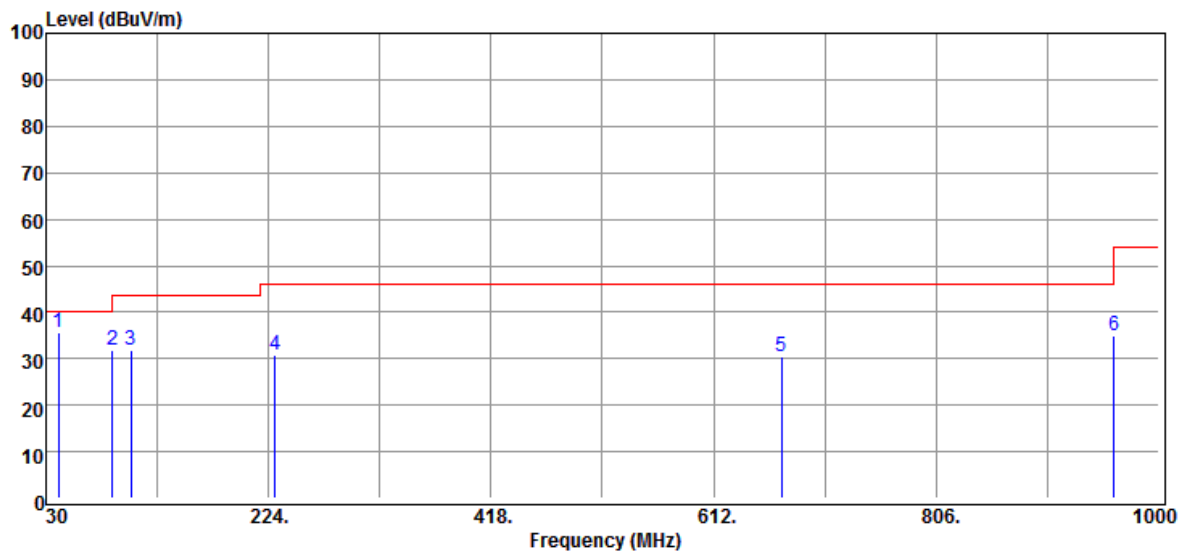
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Operation Mode :802.11n40
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2452 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
40.67	Peak	44.17	-8.57	35.60	40.00	-4.40
88.20	Peak	48.55	-16.82	31.73	43.50	-11.77
103.72	Peak	46.46	-14.61	31.85	43.50	-11.65
229.82	Peak	43.98	-13.02	30.96	46.00	-15.04
671.17	Peak	32.10	-1.70	30.40	46.00	-15.60
961.20	Peak	31.46	3.41	34.87	54.00	-19.13

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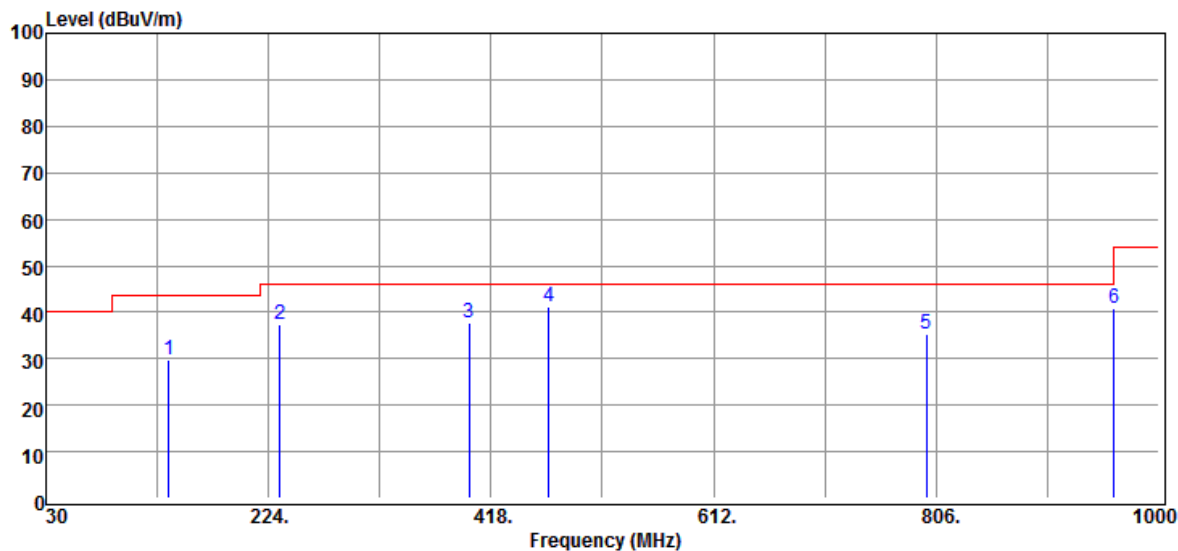
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Operation Mode :802.11n40
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2452 MHz

Test Date :2019-01-28
Temp./Humi. :21/57
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
136.70	Peak	42.11	-12.39	29.72	43.50	-13.78
233.70	Peak	50.14	-12.61	37.53	46.00	-8.47
398.60	Peak	43.87	-6.19	37.68	46.00	-8.32
468.44	Peak	46.67	-5.62	41.05	46.00	-4.95
797.27	Peak	35.31	0.00	35.31	46.00	-10.69
961.20	Peak	37.52	3.41	40.93	54.00	-13.07

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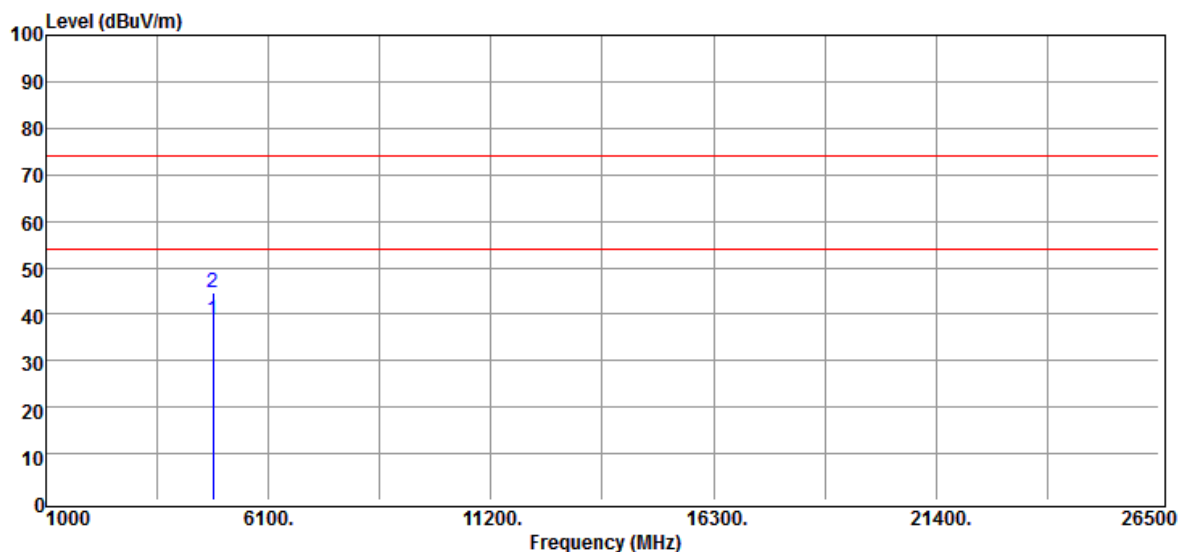
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Radiated Spurious Emission Measurement Result

Above 1GHz Data:

Operation Mode	:802.11b	Test Date	:2019-01-24
Test Mode	:TX CH LOW	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2412 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4824.00	Average	27.70	10.96	38.66	54.00	-15.34
4824.00	Peak	33.81	10.96	44.77	74.00	-29.23

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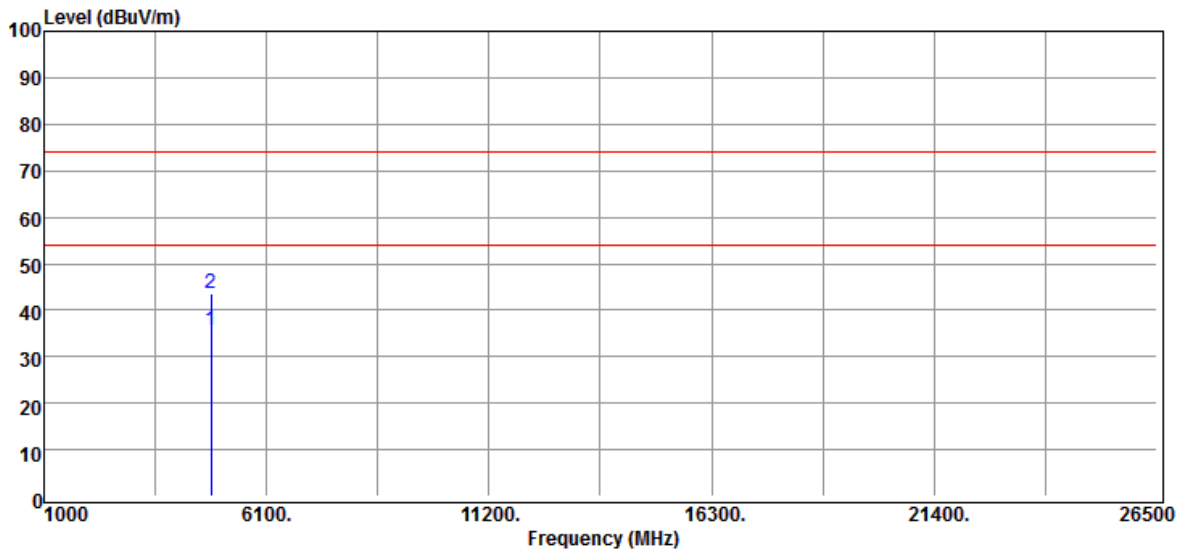
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Operation Mode :802.11b
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4824.00	Average	24.74	10.96	35.70	54.00	-18.30
4824.00	Peak	32.74	10.96	43.70	74.00	-30.30

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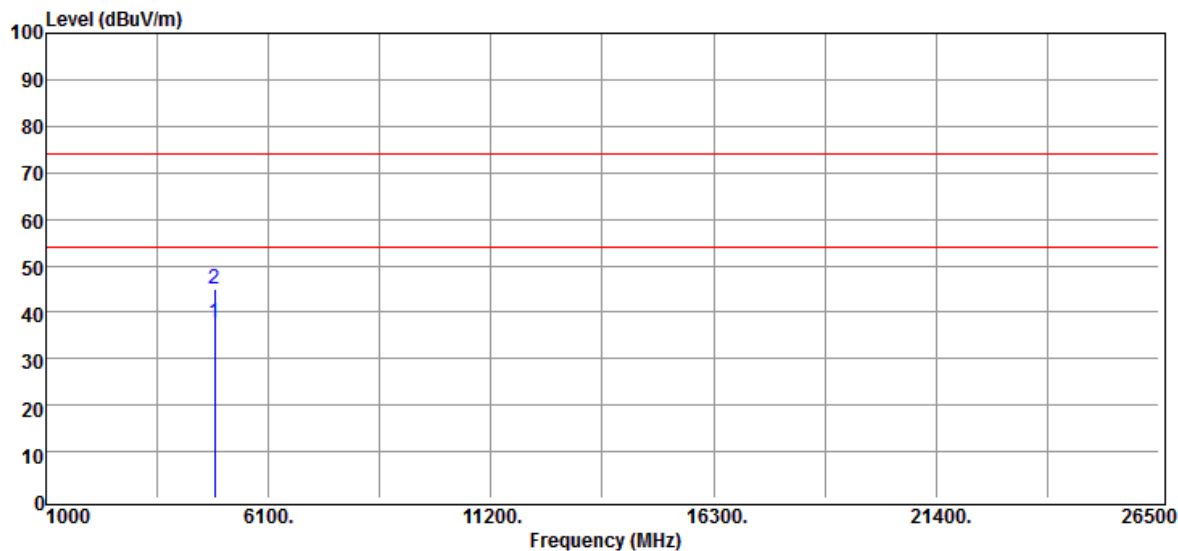
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Operation Mode :802.11b
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	Average	26.69	11.03	37.72	54.00	-16.28
4874.00	Peak	33.87	11.03	44.90	74.00	-29.10

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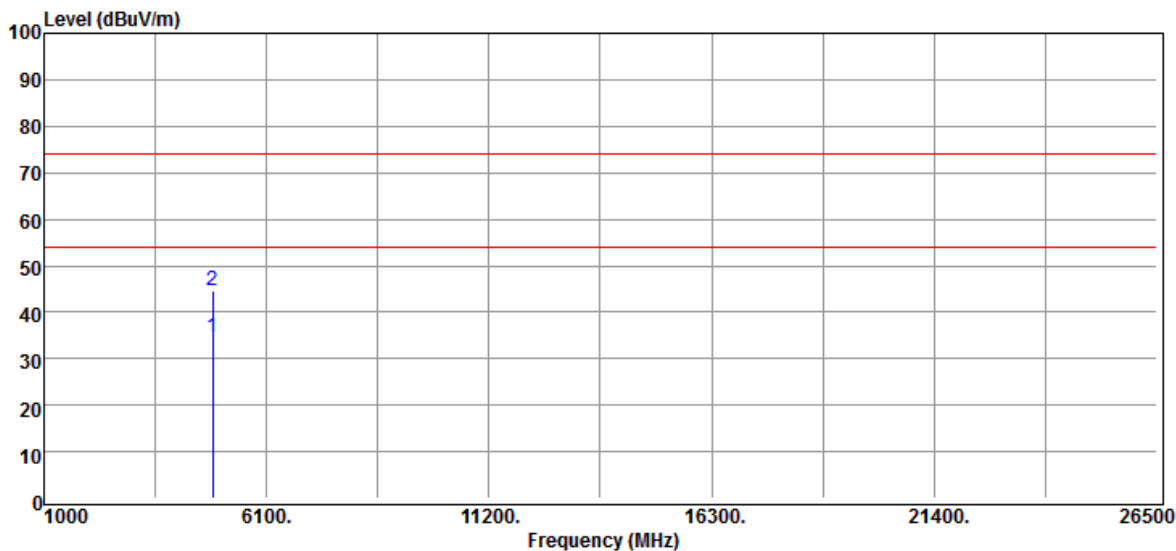
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Operation Mode :802.11b
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	Average	23.73	11.03	34.76	54.00	-19.24
4874.00	Peak	33.62	11.03	44.65	74.00	-29.35

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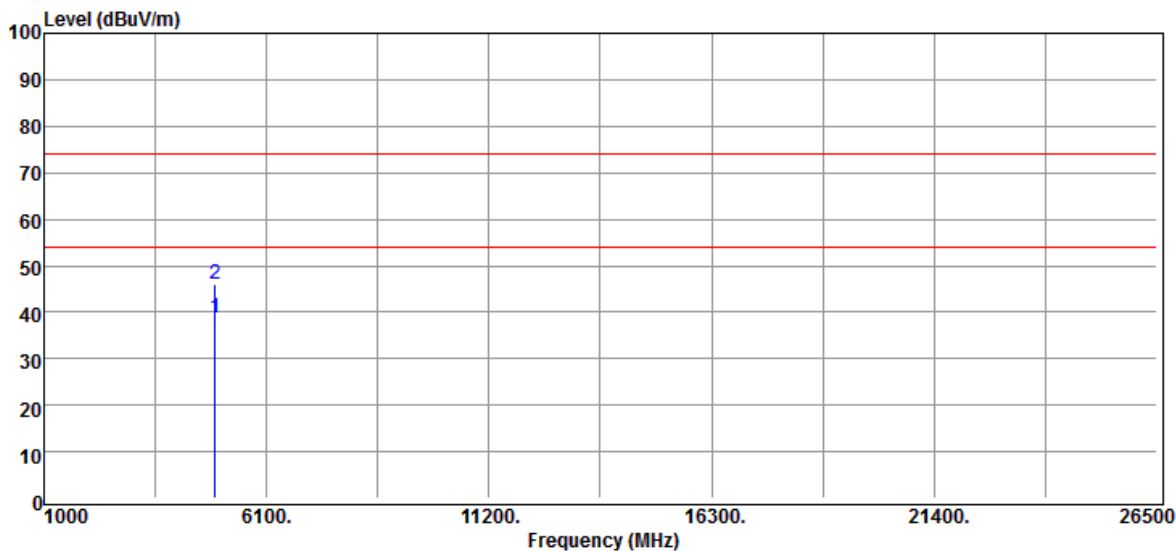
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Operation Mode	:802.11b	Test Date	:2019-01-24
Test Mode	:TX CH HIGH	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2462 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4924.00	Average	27.74	11.17	38.91	54.00	-15.09
4924.00	Peak	34.92	11.17	46.09	74.00	-27.91

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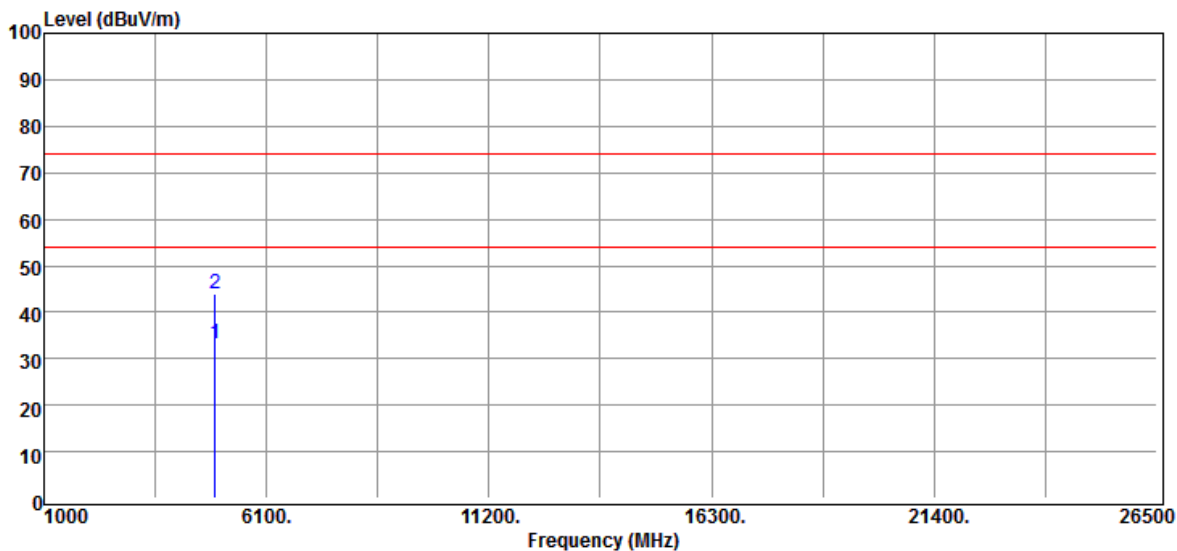
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Operation Mode :802.11b
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4924.00	Average	22.12	11.17	33.29	54.00	-20.71
4924.00	Peak	32.91	11.18	44.09	74.00	-29.91

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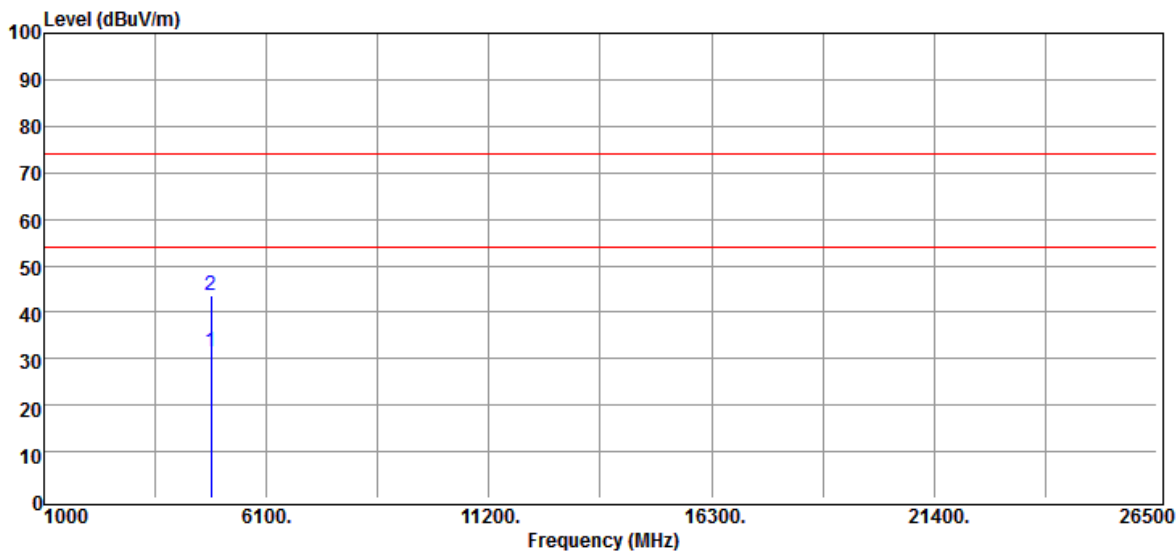
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Operation Mode :802.11g
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4824.00	Average	20.49	10.96	31.45	54.00	-22.55
4824.00	Peak	32.69	10.96	43.65	74.00	-30.35

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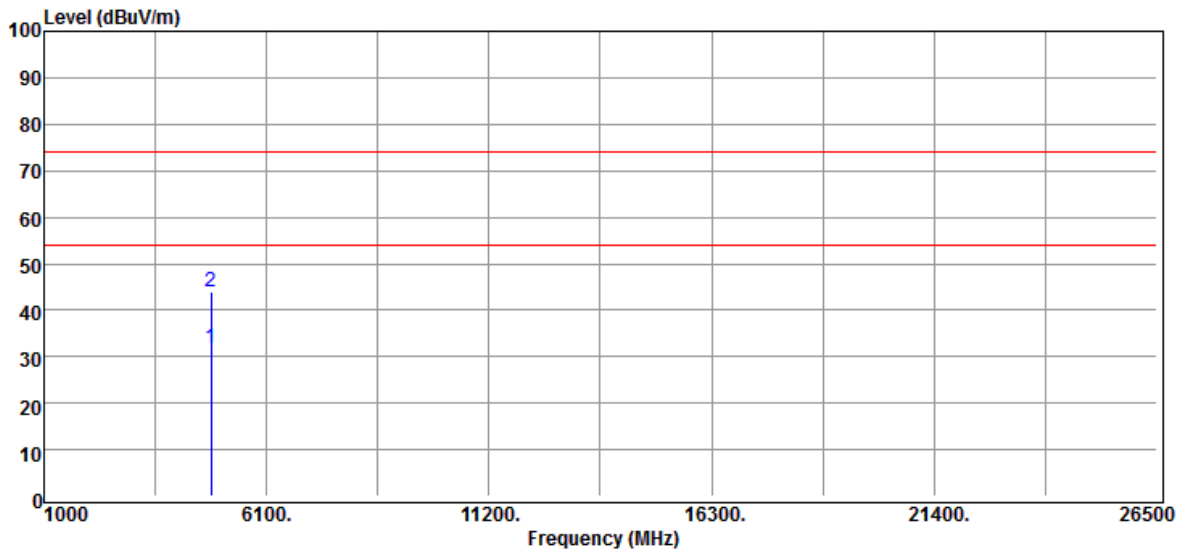
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Operation Mode :802.11g
 Test Mode :TX CH LOW
 EUT Pol :H Plan
 Test Channel :2412 MHz

Test Date :2019-01-24
 Temp./Humi. :23/51
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4824.00	Average	20.73	10.96	31.69	54.00	-22.31
4824.00	Peak	33.07	10.96	44.03	74.00	-29.97

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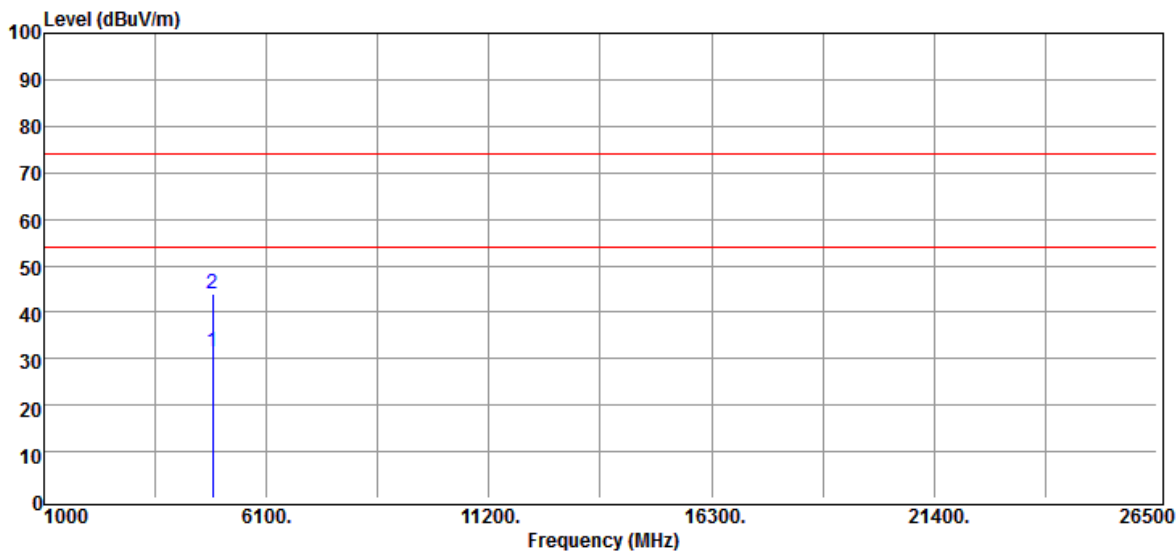
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Member of SGS Group

Operation Mode :802.11g
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	Average	20.45	11.03	31.48	54.00	-22.52
4874.00	Peak	32.89	11.03	43.92	74.00	-30.08

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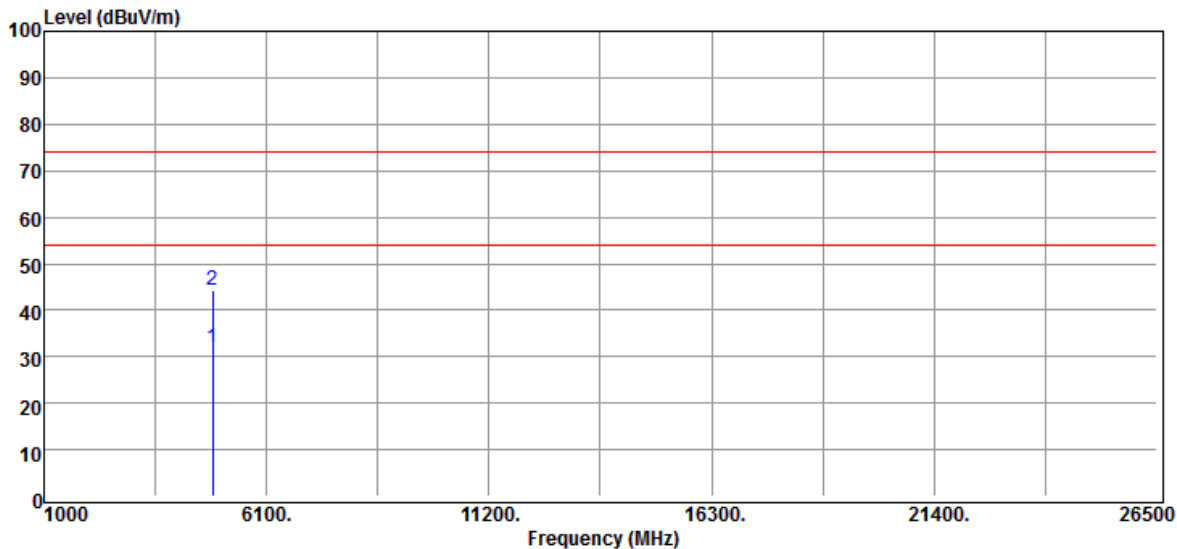
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Operation Mode :802.11g
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-24
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4874.00	Average	20.76	11.03	31.79	54.00	-22.21
4874.00	Peak	33.13	11.03	44.16	74.00	-29.84

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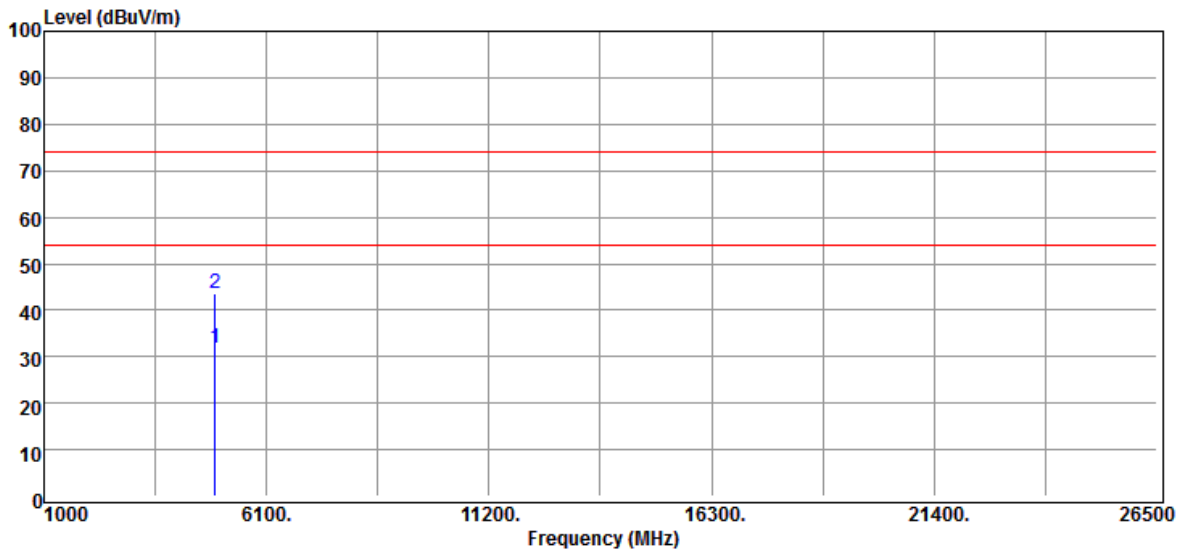
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Operation Mode	:802.11g	Test Date	:2019-01-24
Test Mode	:TX CH HIGH	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2462 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4924.00	Average	20.60	11.17	31.77	54.00	-22.23
4924.00	Peak	32.56	11.17	43.73	74.00	-30.27

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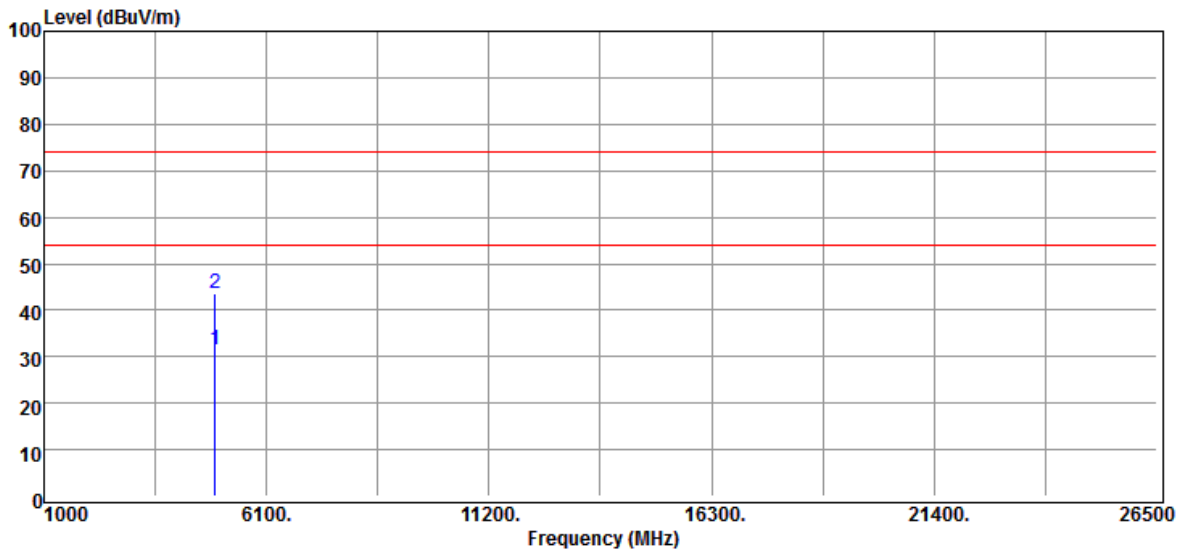
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Operation Mode	:802.11g	Test Date	:2019-01-24
Test Mode	:TX CH HIGH	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2462 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4924.00	Average	20.20	11.17	31.37	54.00	-22.63
4924.00	Peak	32.32	11.17	43.49	74.00	-30.51

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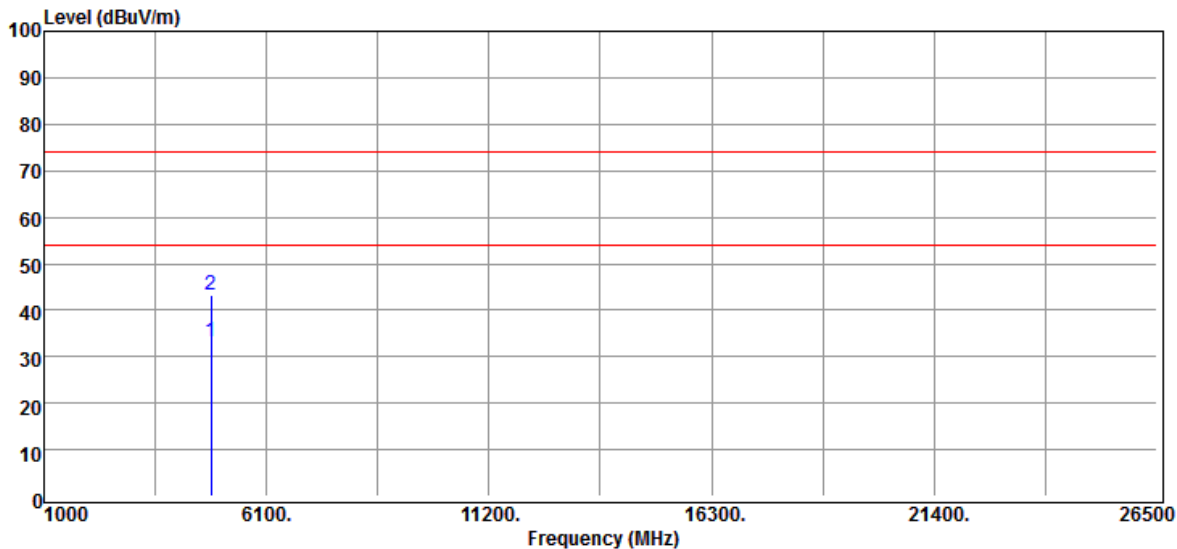
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Operation Mode :802.11n20
 Test Mode :TX CH LOW
 EUT Pol :H Plan
 Test Channel :2412 MHz

Test Date :2019-01-25
 Temp./Humi. :23/51
 Antenna Pol. :VERTICAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4824.00	Average	22.11	10.96	33.07	54.00	-20.93
4824.00	Peak	32.39	10.96	43.35	74.00	-30.65

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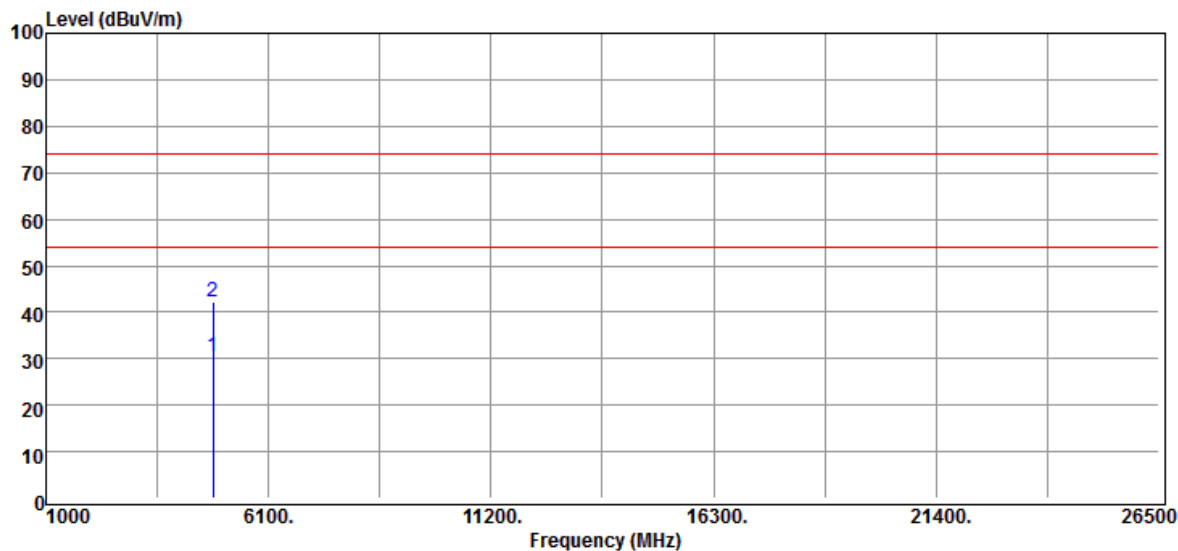
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Operation Mode :802.11n20
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2412 MHz

Test Date :2019-01-25
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4824.00	Average	19.47	10.96	30.43	54.00	-23.57
4824.00	Peak	31.12	10.96	42.08	74.00	-31.92

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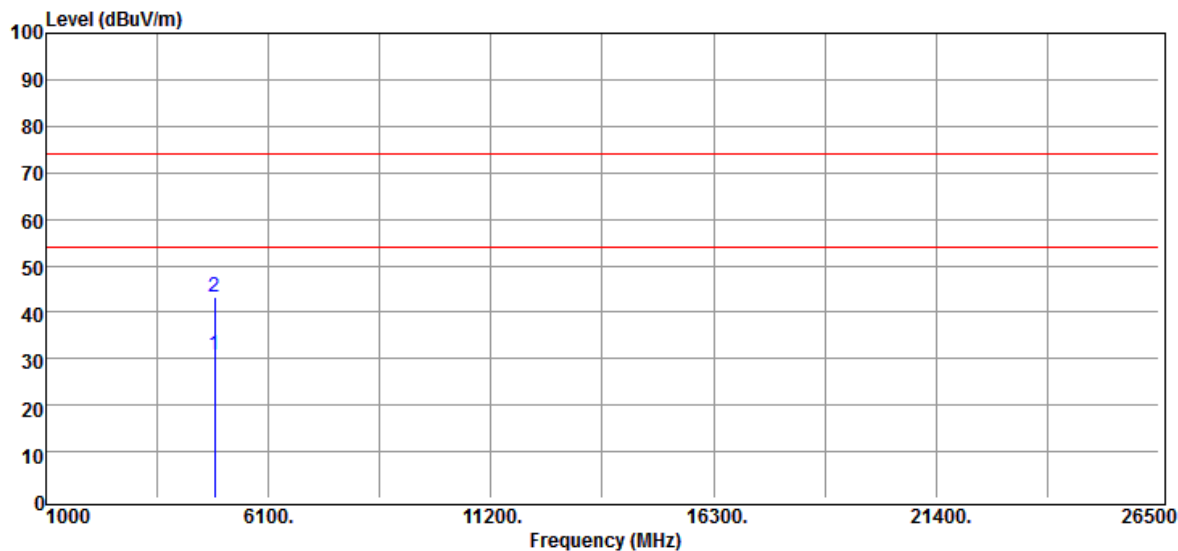
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Operation Mode :802.11n20
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-25
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
4874.00	Average	19.70	11.03	30.73	54.00	-23.27
4874.00	Peak	32.08	11.03	43.11	74.00	-30.89

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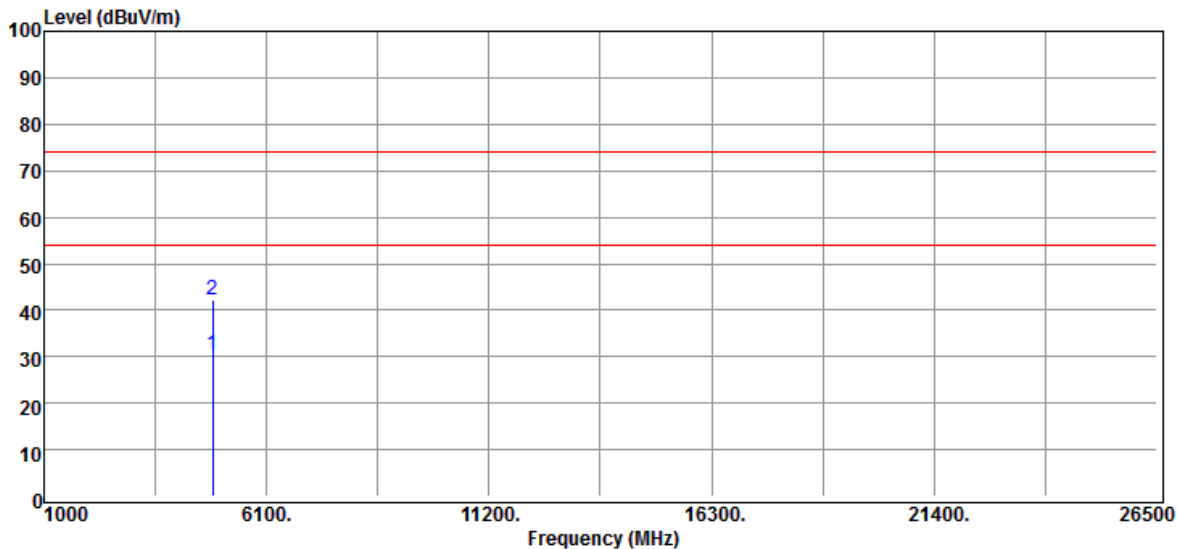
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Operation Mode :802.11n20
 Test Mode :TX CH MID
 EUT Pol :H Plan
 Test Channel :2437 MHz

Test Date :2019-01-25
 Temp./Humi. :23/51
 Antenna Pol. :HORIZONTAL
 Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	Average	19.41	11.03	30.44	54.00	-23.56
4874.00	Peak	31.32	11.03	42.35	74.00	-31.65

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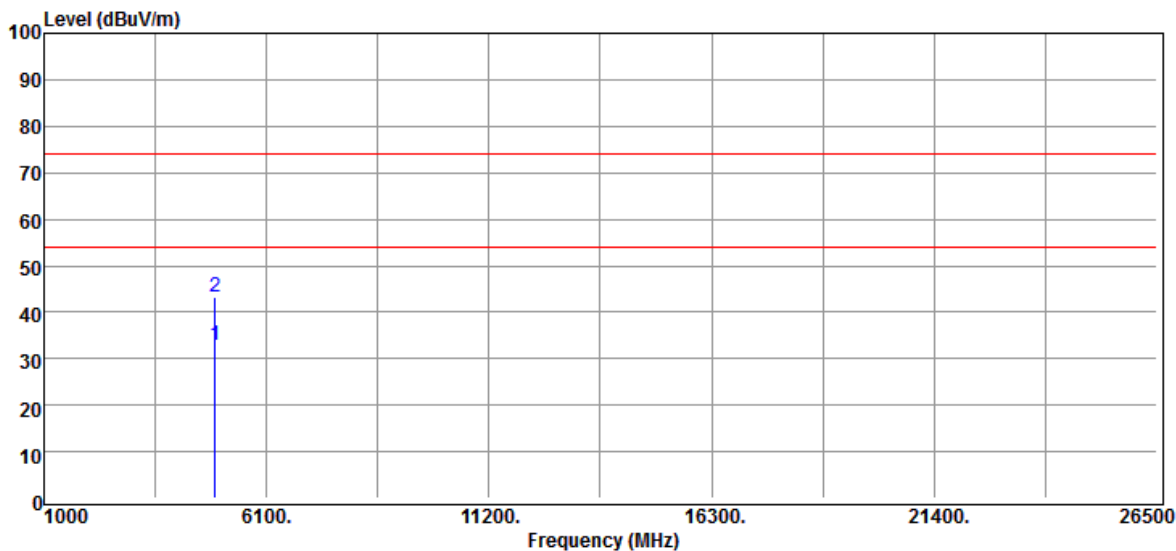
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Operation Mode :802.11n20
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-25
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4924.00	Average	21.71	11.17	32.88	54.00	-21.12
4924.00	Peak	32.12	11.17	43.29	74.00	-30.71

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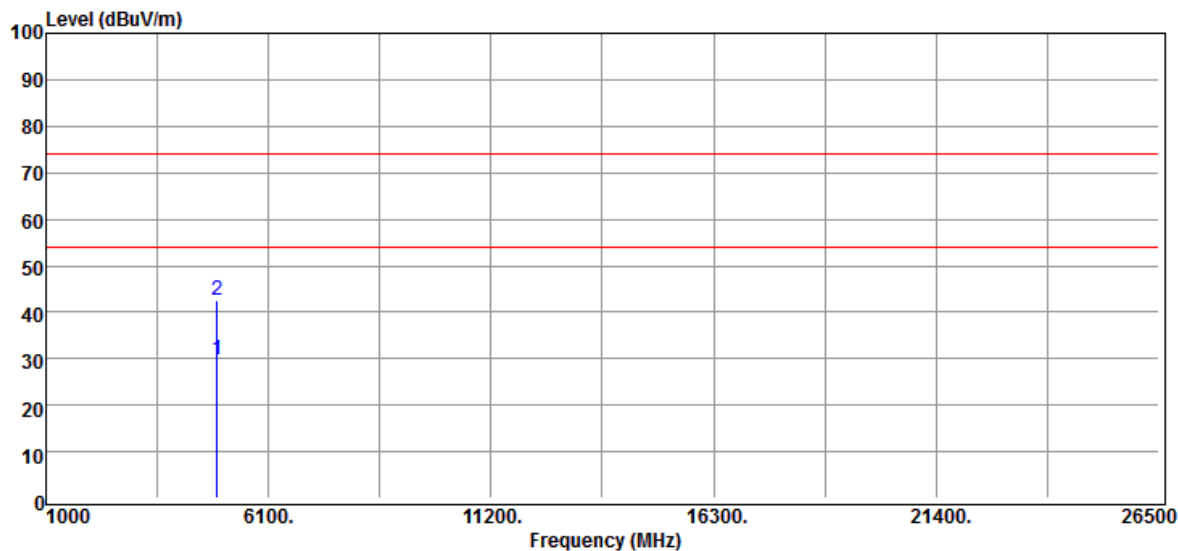
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Operation Mode :802.11n20
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2462 MHz

Test Date :2019-01-25
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4924.00	Average	18.50	11.17	29.67	54.00	-24.33
4924.00	Peak	31.34	11.17	42.51	74.00	-31.49

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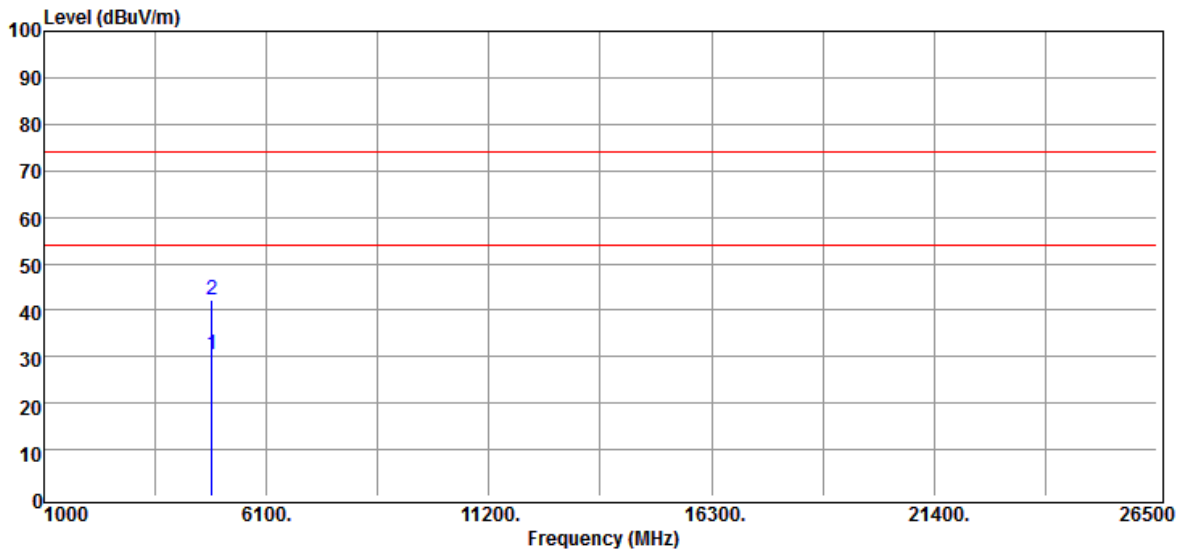
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Operation Mode	:802.11n40	Test Date	:2019-01-28
Test Mode	:TX CH LOW	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:VERTICAL
Test Channel	:2422 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4844.00	Average	19.33	10.98	30.31	54.00	-23.69
4844.00	Peak	31.30	10.98	42.28	74.00	-31.72

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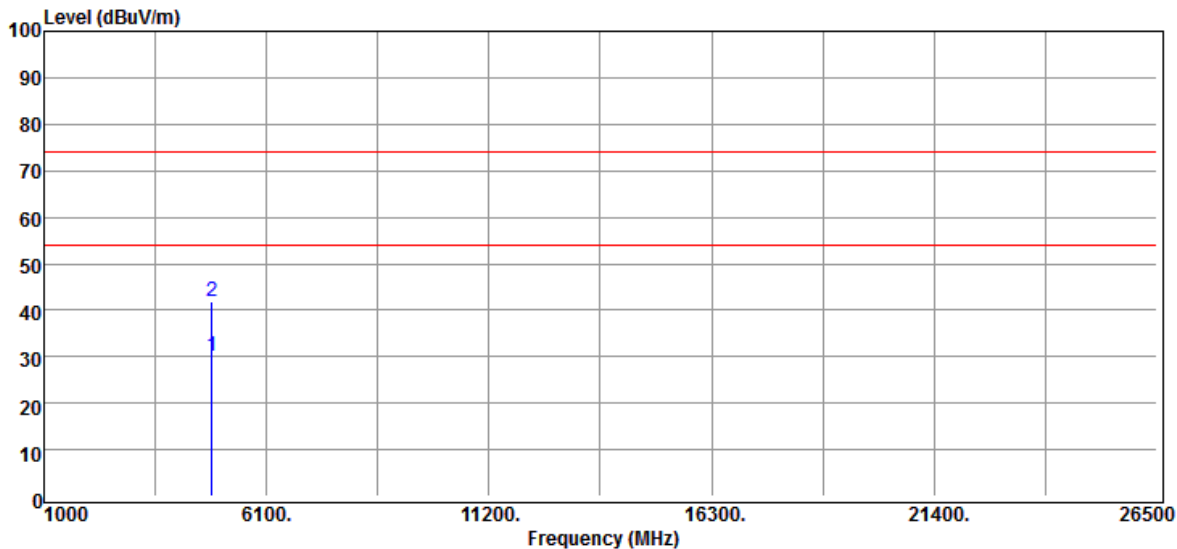
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Operation Mode :802.11n40
Test Mode :TX CH LOW
EUT Pol :H Plan
Test Channel :2422 MHz

Test Date :2019-01-28
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4844.00	Average	19.24	10.98	30.22	54.00	-23.78
4844.00	Peak	30.79	10.98	41.77	74.00	-32.23

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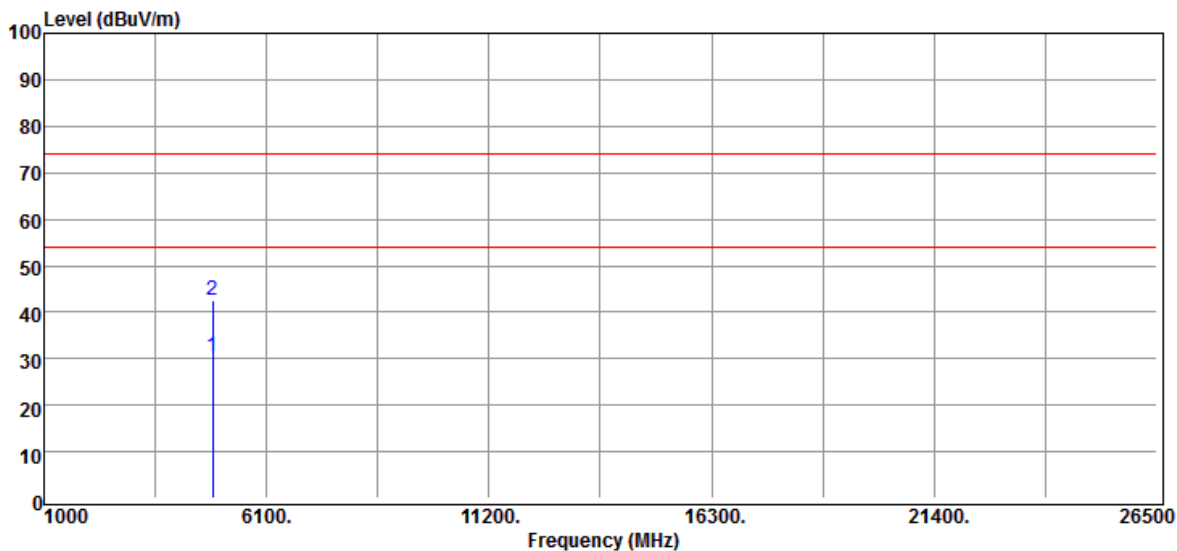
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Operation Mode :802.11n40
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-28
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	Average	19.47	11.03	30.50	54.00	-23.50
4874.00	Peak	31.47	11.03	42.50	74.00	-31.50

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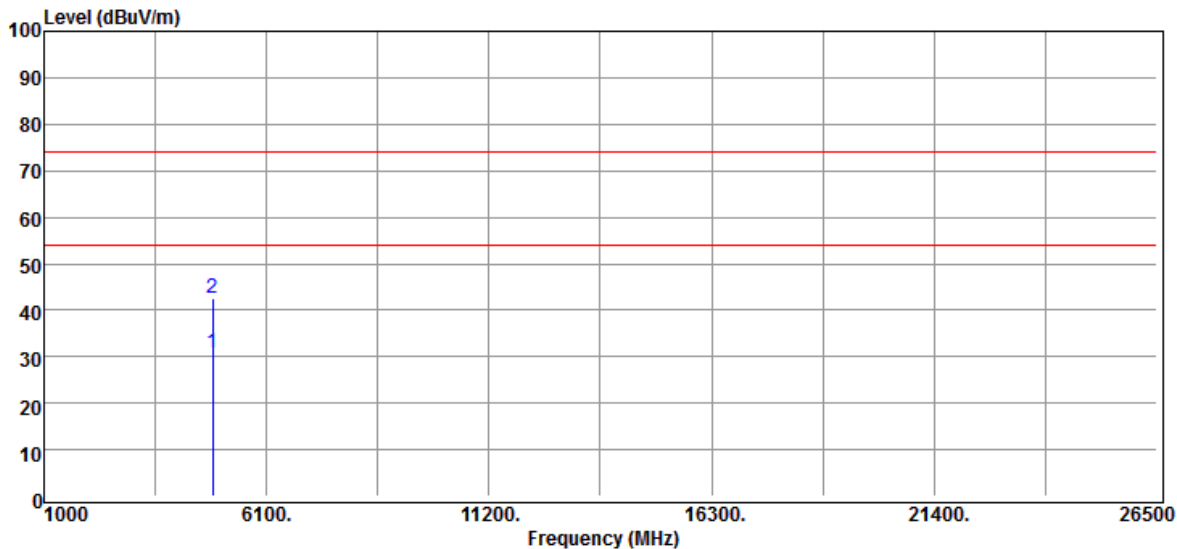
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Operation Mode :802.11n40
Test Mode :TX CH MID
EUT Pol :H Plan
Test Channel :2437 MHz

Test Date :2019-01-28
Temp./Humi. :23/51
Antenna Pol. :HORIZONTAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	Average	19.65	11.03	30.68	54.00	-23.32
4874.00	Peak	31.60	11.03	42.63	74.00	-31.37

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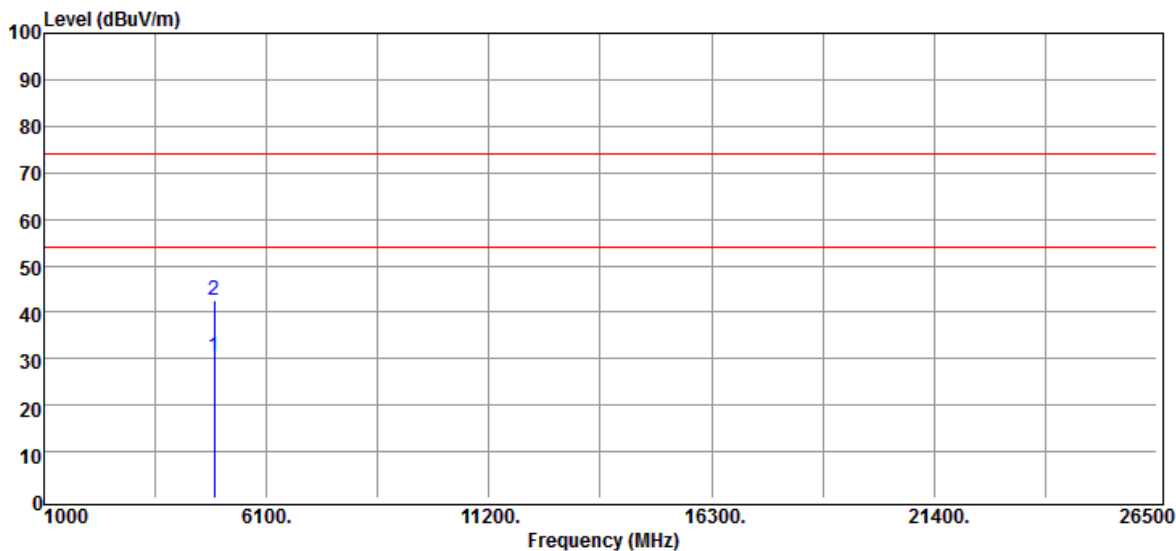
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Operation Mode :802.11n40
Test Mode :TX CH HIGH
EUT Pol :H Plan
Test Channel :2452 MHz

Test Date :2019-01-28
Temp./Humi. :23/51
Antenna Pol. :VERTICAL
Engineer :Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4904.00	Average	19.30	11.09	30.39	54.00	-23.61
4904.00	Peak	31.58	11.09	42.67	74.00	-31.33

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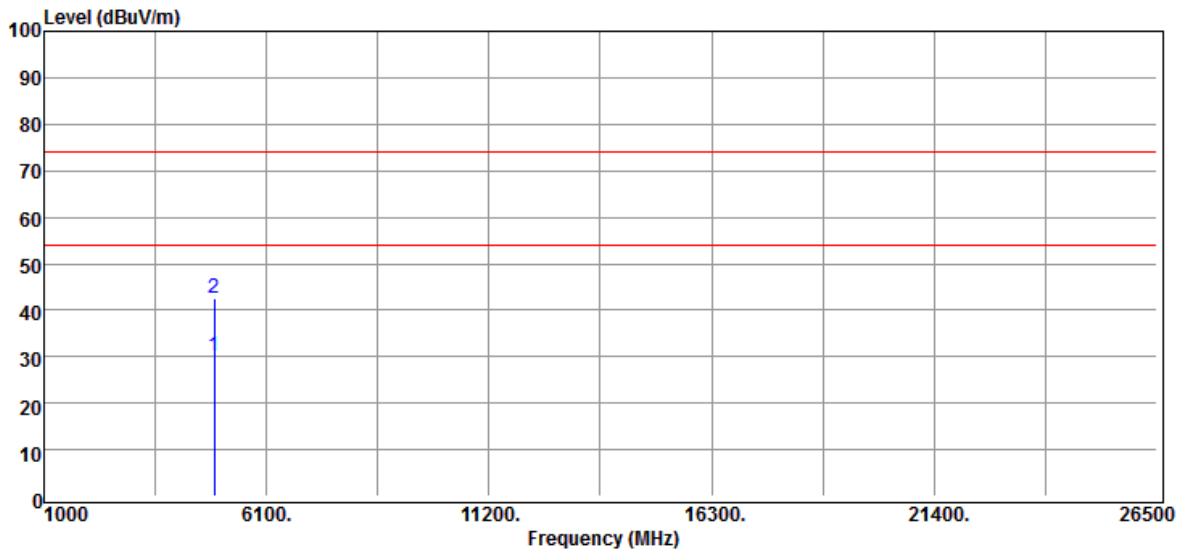
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Operation Mode	:802.11n40	Test Date	:2019-01-28
Test Mode	:TX CH HIGH	Temp./Humi.	:23/51
EUT Pol	:H Plan	Antenna Pol.	:HORIZONTAL
Test Channel	:2452 MHz	Engineer	:Ashton



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4904.00	Average	19.14	11.09	30.23	54.00	-23.77
4904.00	Peak	31.32	11.09	42.41	74.00	-31.59

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12 POWER SPECTRAL DENSITY

12.1 Standard Applicable

Per Part 15.247 (e)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

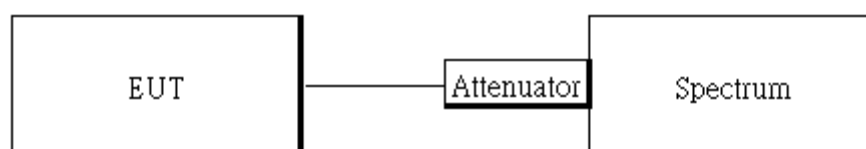
Per RSS-247 section 5.4 d

For DTSSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e).

12.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	N9010A	MY51440113	06/20/2018	06/19/2019
Attenuator	Marvelous	MVE2213-10	RF30	12/25/2018	12/24/2019
DC Block	PASTERNAK	PE8210	RF29	12/25/2018	12/24/2019

12.3 Test Set-up



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12.4 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance & ANSI C63.10.
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz. & the VBW = 10 kHz
5. For defining Restricted Band Edge Limit:
Set the RBW = 100kHz & VBW = 300 kHz.
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, \dots, G_N dBi.

(i) If transmit signals are correlated, then Directional gain

$$= 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi}$$

[Note the “20”s in the denominator of each exponent and the square of the sum of terms; the object is to combine the signal levels coherently.].

The antenna gain is not greater than 6 dBi. Therefore, reduction of power is not required.

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12.5 Measurement Result

POWER DENSITY 802.11b			
Freq. (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-4.20	8.00	PASS
2437	-4.41	8.00	PASS
2462	-4.13	8.00	PASS

POWER DENSITY 802.11g			
Freq. (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-9.92	8.00	PASS
2437	-9.23	8.00	PASS
2462	-11.41	8.00	PASS

POWER DENSITY 802.11n HT20 (MIMO)			
Freq. (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-13.80	8.00	PASS
2437	-9.16	8.00	PASS
2462	-9.02	8.00	PASS

POWER DENSITY 802.11n HT40 (MIMO)			
Freq. (MHz)	PPSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2422	-15.08	8.00	PASS
2437	-12.13	8.00	PASS
2452	-14.5	8.00	PASS

Note

Cable Loss 10.40 dB

*Refer to next page for plots

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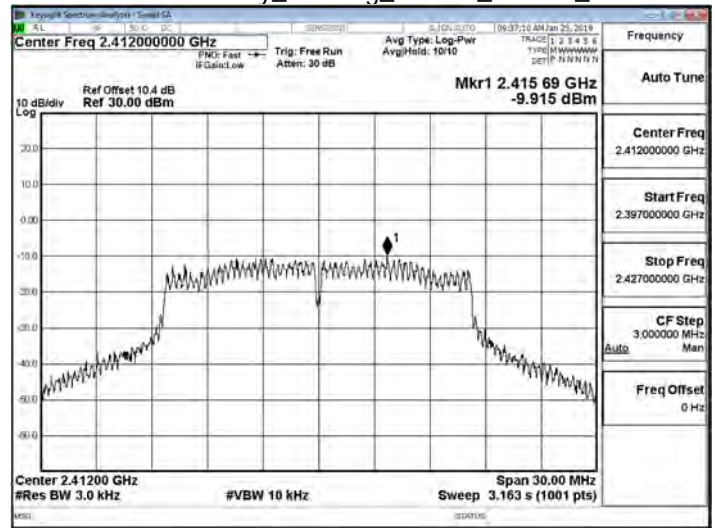
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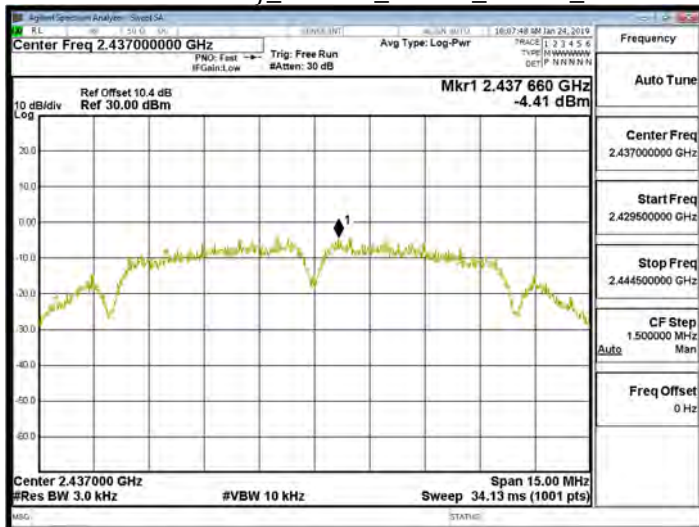
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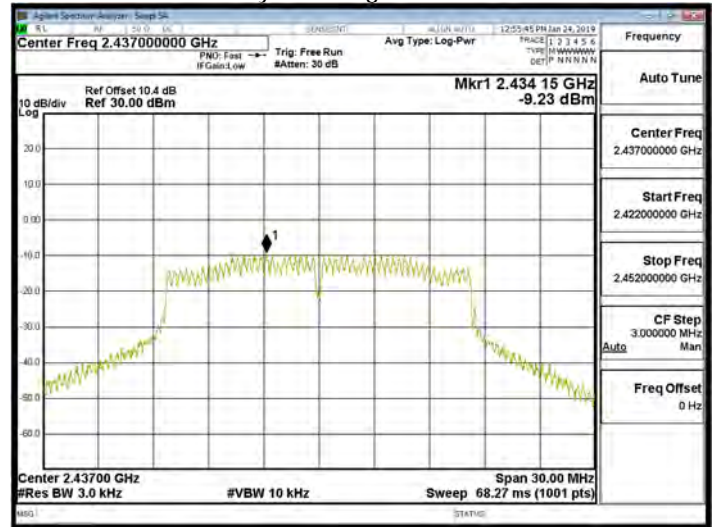
WLAN\Power Density_802.11g_20MHz_Chain1_2412MHz



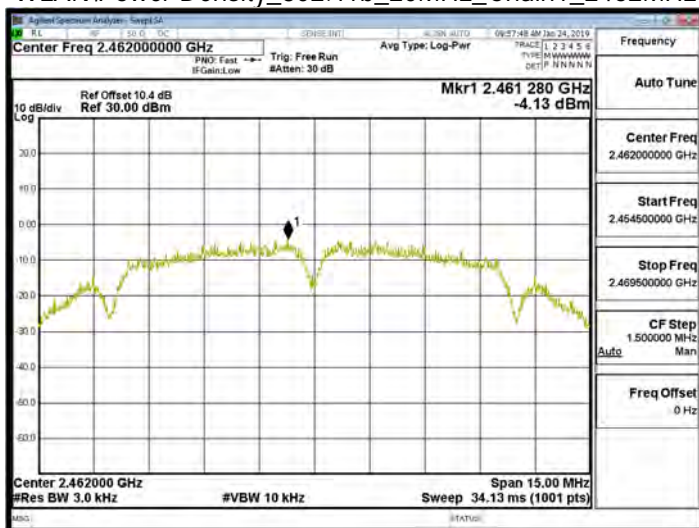
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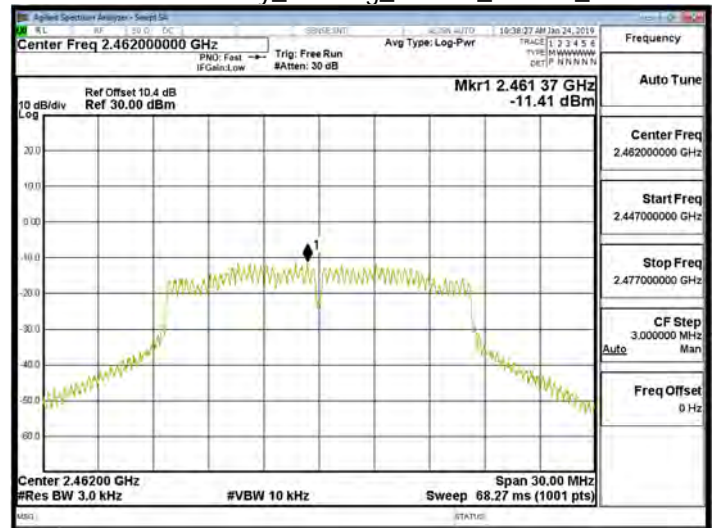
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WLAN\Power Density_802.11b_20MHz_Chain1_2462MHz



WLAN\Power Density_802.11g_20MHz_Chain1_2462MHz

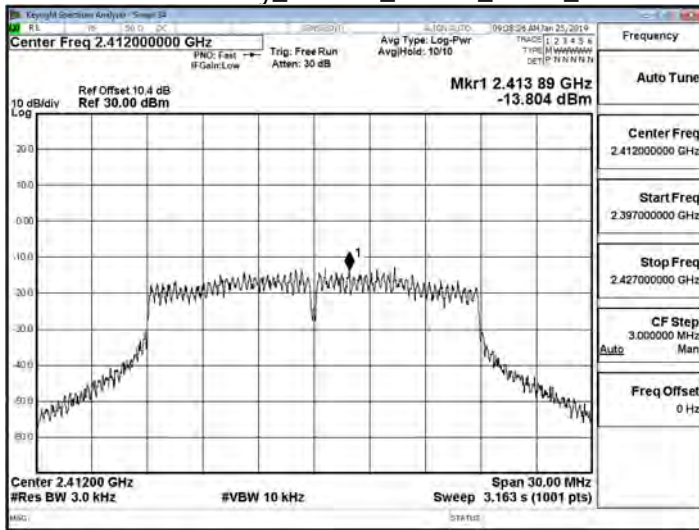


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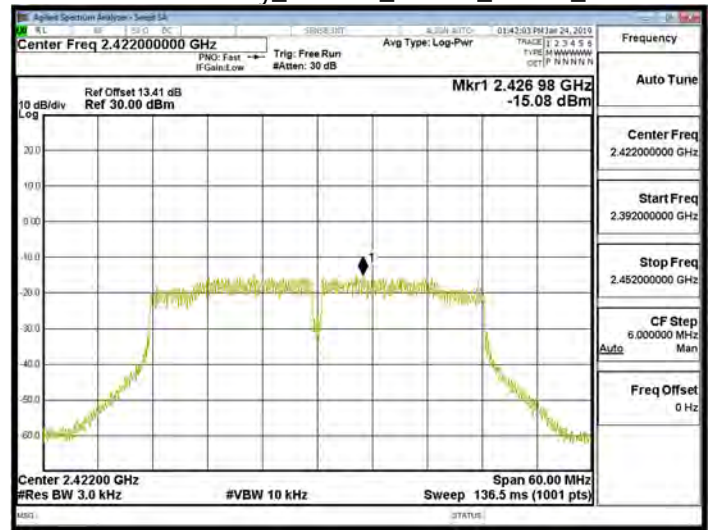
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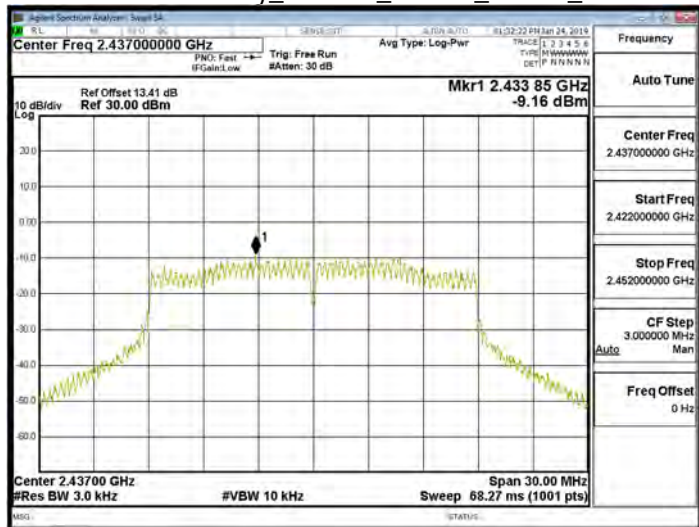
WLAN\Power Density_802.11n_20MHz_MIMO_2412MHz



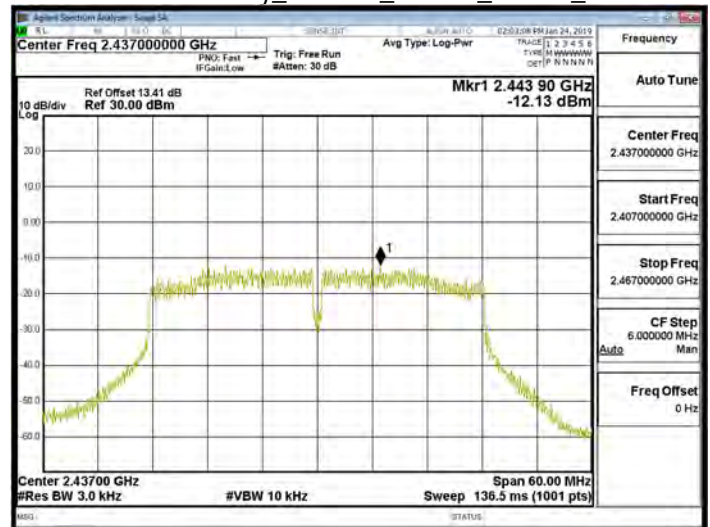
WLAN\Power Density_802.11n_40MHz_MIMO_2422MHz



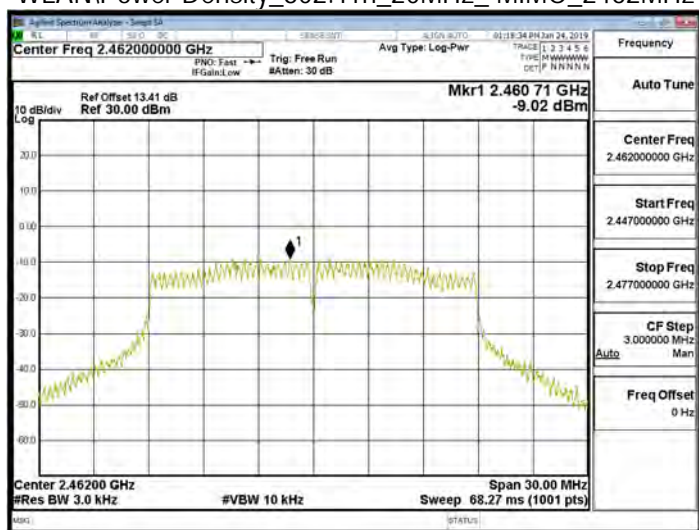
WLAN\Power Density_802.11n_20MHz_MIMO_2437MHz



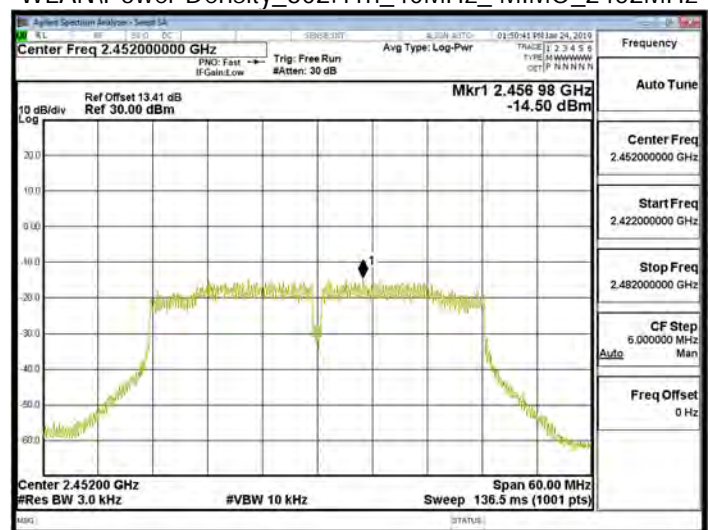
WLAN\Power Density_802.11n_40MHz_MIMO_2437MHz



WLAN\Power Density_802.11n_20MHz_MIMO_2462MHz



WLAN\Power Density_802.11n_40MHz_MIMO_2452MHz



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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13 ANTENNA REQUIREMENT

13.1 Standard Applicable

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

If the transmitting antenna is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi.

13.2 Antenna Connected Construction

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

~ End of Report ~

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