

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Applicant: Korenix Technology
14F., No.213, Sec. 3, Beixin Rd., Xindian Dist., New Taipei City
23143, | Taiwan (R.O.C)

Product Name: Wireless AP

Brand Name: Korenix

Model No.: JetWave 2450 v2

Model Difference: N/A

FCC ID: SSA-JETWAVE2450V2

Report Number: E2/2017/70047

FCC Rule Part: §15.247, Cat: DTS

Issue Date: Feb. 01, 2018

Date of Test: Aug. 08, 2014 ~ Nov. 28, 2017, Jan. 26, 2018

Date of EUT Received: Aug. 08, 2014

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.

Prepared By:

Karen Huang

Karen Huang / Clerk

Approved By:

Jim Chang

Jim Chang / Asst. Manager



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Revision History

Report Number	Revision	Description	Issue Date
E2/2017/70047	Rev.00	Initial creation of document	Feb. 01, 2018

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1 GENERAL INFORMATION

1.1 Product description

General:

Product Name:	Wireless AP	
Brand Name:	Korenix	
Model No.:	JetWave 2450 v2	
Model Difference:	Different models for the market segmentation	
Product SW version:	N/A	
Radio HW version:	N/A	
Pole Mounting Ring:	Model No.: N/A, Supplier: N/A	
Ferrite Suppression Core:	Model No.: N/A, Supplier: N/A	
Grounding Wire:	Model No.: N/A, Supplier: N/A	
Power Supply:	24Vdc from Power Cord & PoE Injector	
	Power Cord & PoE Injector:	1. Model No.: GRT-240100, Supplier: GREAT POWER SUPPLY CO. LTD

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WLAN 2.4GHz:

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)	Modulation Technology
b	2412-2462	11	25.64	DSSS,
g			24.73	OFDM
n_HT20			25.46	
n_HT40	2422-2452	7	25.02	
Antenna Designation		Dipole Array Antenna, Model Number: 25-600000-00N, Peak Gain: 6.57dBi (Main), Gain: 6.88dBi (Aux)		
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 – 144Mbps 802.11 n_40MHz: 13.5 – 300Mbps		

The 2.4G max antenna gain is 6.88dBi which was choosing for Radiated Spurious Emission test.

The test report applies for WLAN 802.11 b/g/n function.

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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 v04

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

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 Registration Number and Designation are: 735305 / TW0002

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 turn 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 ohm/ 50 uH 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 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 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



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	Atheros	Atheros Radio Test 2	N/A	N/A	N/A
2.	Notebook	Lenovo	L412	LR-027LM	shielding	Un-shielding

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3 SUMMARY OF TEST RESULTS

FCC Rules / IC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB & 99% Emission Bandwidth	Compliant
§15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

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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		

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.

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	54	MIMO

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	11	MIMO
802.11g	1 to 11	1, 6, 11	OFDM	54	MIMO
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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Note:

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) for WLAN Transmitter for channel Low, Mid and High, the worst case E2 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	MIMO
802.11g	1 to 11	1, 6, 11	OFDM	54	MIMO
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 Edges	+/- 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	ESC17	100760	05/26/2014	05/25/2015
LISN	Rolf-Heine	NNB-2/16Z	99012	03/26/2014	03/25/2015
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/19/2014	03/18/2015
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2013	11/25/2014

Remark: Please note that the duration to conduct the test took place in the mean time when the calibration for several equipments is due, and therefore extra tables of equipment calibration is constructed to indicate the calibration work is still maintained.

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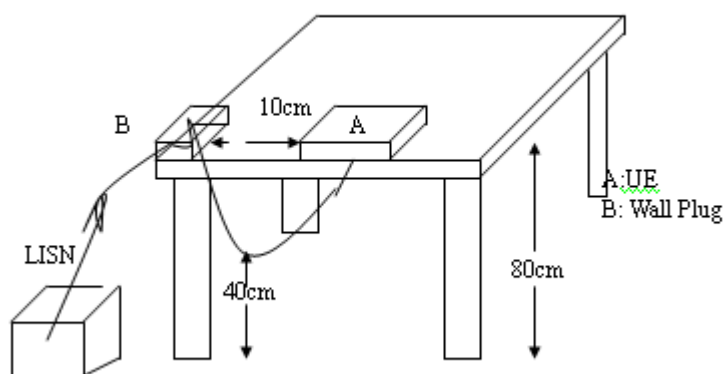
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Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 3	101311	06/18/2015	06/17/2016
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	02/07/2016	02/06/2017
LISN	Schwarzbeck	NSLK 8127	8127-648	06/09/2015	06/08/2016
LISN	Rolf-Heine	NNB-2/16Z	99012	03/04/2015	03/03/2016
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.

6.4 Test SET-UP (Block Diagram of Configuration)



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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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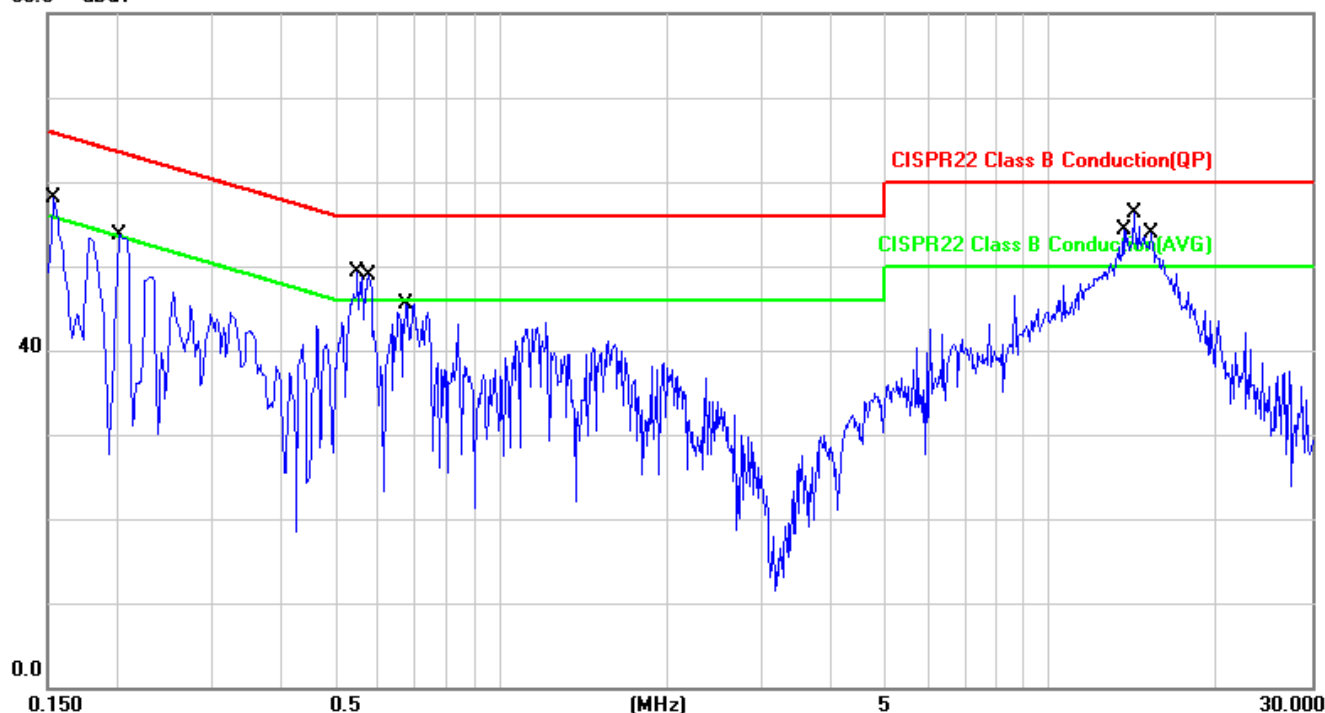
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode - 1			Test Date:	Sep. 09, 2014
Temperature:	26 °C	Humidity:	52 %	Test By:	Jazz
Phase:	L1				

80.0 dBuV



No.	Mk.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Over (dB)	Detector	Comment
1		0.15	40.09	0.09	40.18	55.79	-15.61	AVG	
2		0.15	57.97	0.09	58.06	65.78	-7.72	QP	
3		0.20	37.16	0.08	37.24	53.54	-16.30	AVG	
4		0.20	53.60	0.08	53.68	63.53	-9.85	QP	
5		0.55	35.67	0.24	35.91	46.00	-10.09	AVG	
6		0.55	48.92	0.24	49.16	56.00	-6.84	QP	
7		0.58	47.59	0.25	47.84	56.00	-8.16	QP	
8		0.58	37.78	0.25	38.03	46.00	-7.97	AVG	
9		0.67	31.41	0.30	31.71	46.00	-14.29	AVG	
10		0.67	45.10	0.30	45.40	56.00	-10.60	QP	
11		13.62	53.53	0.61	54.14	60.00	-5.86	QP	
12		13.71	33.71	0.61	34.32	50.00	-15.68	AVG	
13	*	14.21	55.55	0.60	56.15	60.00	-3.85	QP	
14		14.22	34.80	0.60	35.40	50.00	-14.60	AVG	
15		15.27	35.29	0.59	35.88	50.00	-14.12	AVG	
16		15.30	53.27	0.58	53.85	60.00	-6.15	QP	

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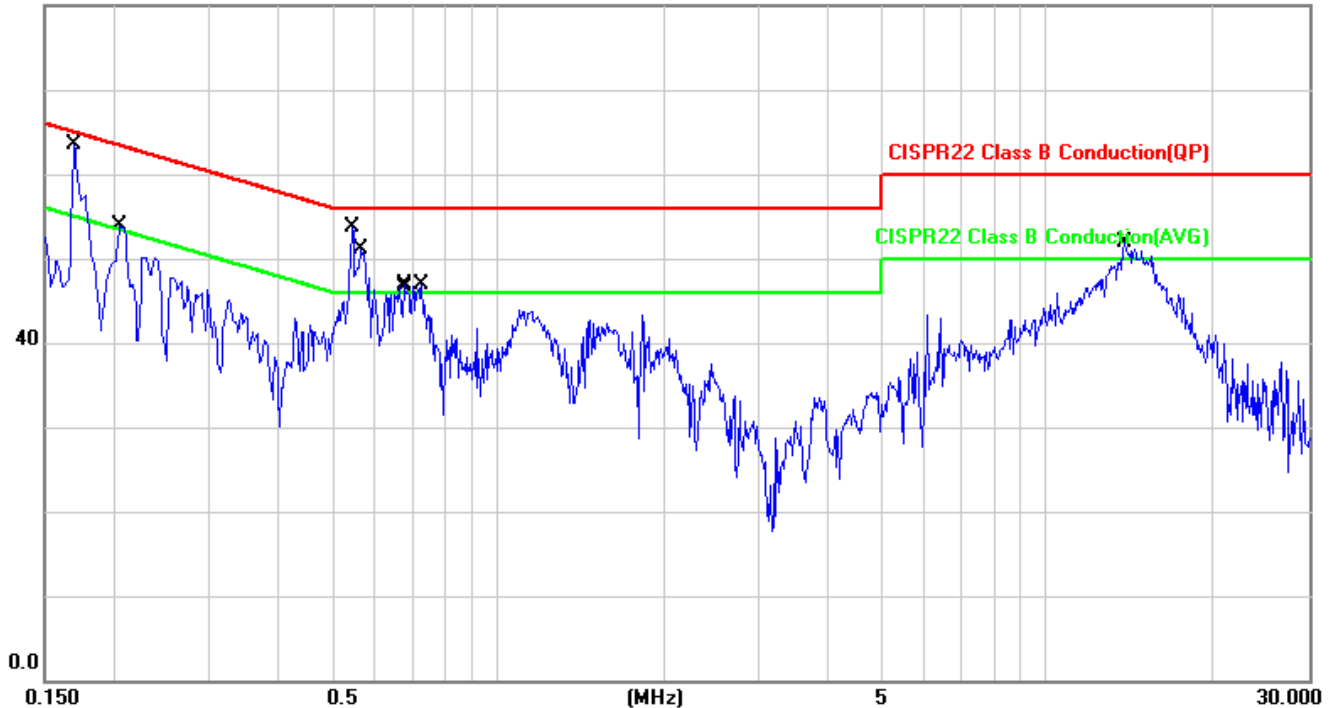
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Operation Mode:	Operation mode			Test Date:	Sep. 09, 2014
Temperature:	26 °C	Humidity:	52 %	Temperature:	26 °C
Phase:	N				

80.0 dBuV



No.↕	Mk.↕	Freq.↕	Reading↕	Factor↕	Measurement↕	Limit↕	Over↕	Detector↕	Comment↕
↕	↕	(MHz)↕	(dBuV)↕	(dB)↕	(dBuV)↕	(dBuV)↕	(dB)↕	↕	↕
1↕	<input type="checkbox"/>	0.17↕	55.97↕	0.09↕	56.06↕	64.91↕	-8.85↕	QP↕	↕
2↕	<input type="checkbox"/>	0.17↕	40.20↕	0.09↕	40.29↕	54.91↕	-14.62↕	AVG↕	↕
3↕	<input type="checkbox"/>	0.20↕	37.74↕	0.09↕	37.83↕	53.47↕	-15.64↕	AVG↕	↕
4↕	<input type="checkbox"/>	0.21↕	53.60↕	0.09↕	53.69↕	63.37↕	-9.68↕	QP↕	↕
5↕	<input type="checkbox"/>	0.55↕	47.90↕	0.25↕	48.15↕	56.00↕	-7.85↕	QP↕	↕
6↕	<input type="checkbox"/>	0.55↕	36.56↕	0.25↕	36.81↕	46.00↕	-9.19↕	AVG↕	↕
7↕	*↕	0.57↕	50.09↕	0.26↕	50.35↕	56.00↕	-5.65↕	QP↕	↕
8↕	<input type="checkbox"/>	0.57↕	39.74↕	0.26↕	40.00↕	46.00↕	-6.00↕	AVG↕	↕
9↕	<input type="checkbox"/>	0.68↕	46.45↕	0.30↕	46.75↕	56.00↕	-9.25↕	QP↕	↕
10↕	<input type="checkbox"/>	0.69↕	33.98↕	0.30↕	34.28↕	46.00↕	-11.72↕	AVG↕	↕
11↕	<input type="checkbox"/>	0.72↕	33.41↕	0.33↕	33.74↕	46.00↕	-12.26↕	AVG↕	↕
12↕	<input type="checkbox"/>	0.73↕	46.52↕	0.33↕	46.85↕	56.00↕	-9.15↕	QP↕	↕
13↕	<input type="checkbox"/>	13.81↕	33.44↕	0.64↕	34.08↕	50.00↕	-15.92↕	AVG↕	↕
14↕	<input type="checkbox"/>	13.82↕	51.13↕	0.64↕	51.77↕	60.00↕	-8.23↕	QP↕	↕

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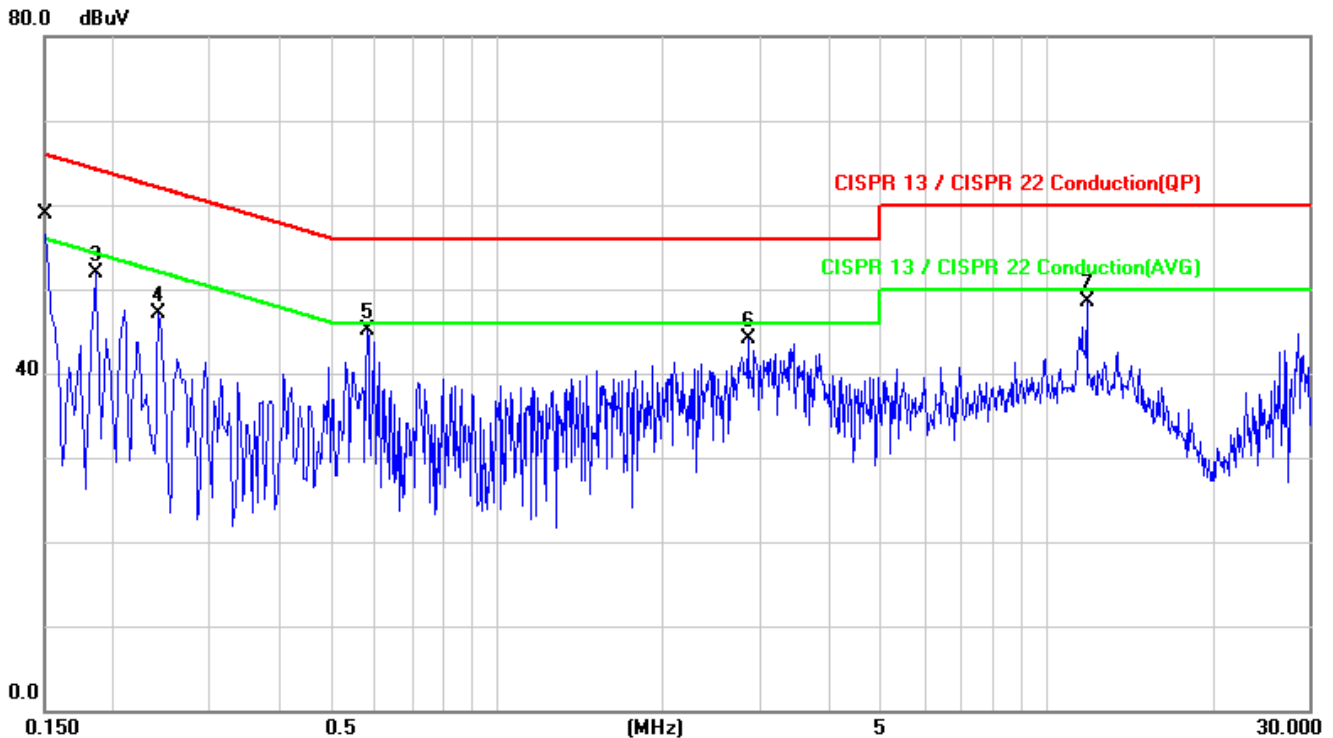
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation mode - 2			Test Date:	Mar. 09, 2016
Temperature:	22 °C	Humidity:	71 %	Test By:	Jazz
Phase:	L1				



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1	*	0.1500	37.10	19.59	56.69	66.00	-9.31	QP	
2		0.1500	15.00	19.59	34.59	56.00	-21.41	AVG	
3		0.1860	32.28	19.56	51.84	64.21	-12.37	peak	
4		0.2420	27.54	19.59	47.13	62.03	-14.90	peak	
5		0.5820	25.37	19.80	45.17	56.00	-10.83	peak	
6		2.8660	24.24	19.93	44.17	56.00	-11.83	peak	
7		11.8380	28.82	19.76	48.58	60.00	-11.42	peak	

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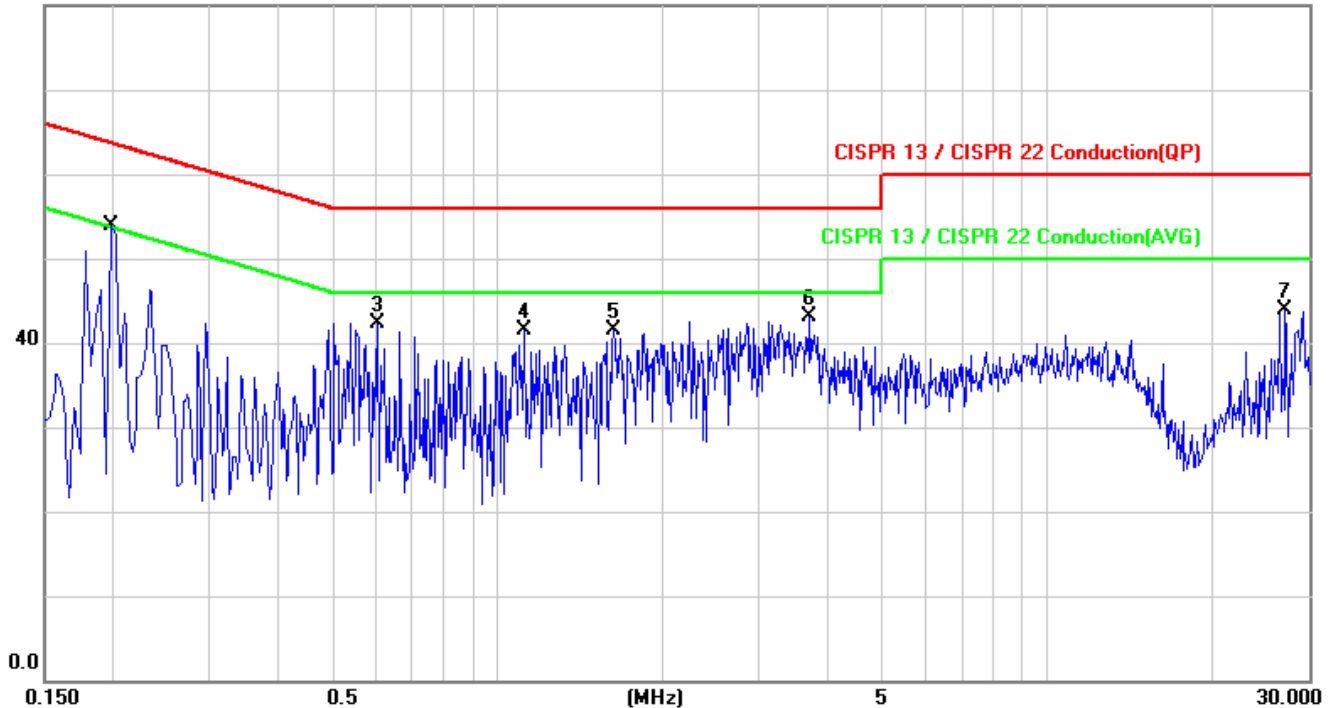
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Operation Mode:	Operation mode - 2			Test Date:	Mar. 09, 2016
Temperature:	22 °C	Humidity:	71 %	Temperature:	22 °C
Phase:	N				

80.0 dBuV



No.↕	Mk.↕	Freq.↕	Reading↕	Factor↕	Measurement↕	Limit↕	Over↕	Detector↕	Comment↕
↕	↕	(MHz)↕	dBuV↕	(dB)↕	(dBuV)↕	(dBuV)↕	(dB)↕	↕	↕
1↕	↕	0.1980↕	30.10↕	19.56↕	49.66↕	63.69↕	-14.03↕	QP↕	↕
2↕	↕	0.1980↕	10.10↕	19.56↕	29.66↕	53.69↕	-24.03↕	AVG↕	↕
3↕	↕	0.6060↕	22.53↕	19.81↕	42.34↕	56.00↕	-13.66↕	peak↕	↕
4↕	↕	1.1220↕	21.65↕	19.79↕	41.44↕	56.00↕	-14.56↕	peak↕	↕
5↕	↕	1.6300↕	21.67↕	19.91↕	41.58↕	56.00↕	-14.42↕	peak↕	↕
6↕	*↕	3.7180↕	23.14↕	19.87↕	43.01↕	56.00↕	-12.99↕	peak↕	↕
7↕	↕	27.1580↕	24.15↕	19.82↕	43.97↕	60.00↕	-16.03↕	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:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

Measurement Procedure:

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

Duty Cycle:

	Duty Cycle (%)	Duty Factor (dB)
802.11b	99.32	0.03
802.11g	96.45	0.16
802.11n_20	92.91	0.32
802.11n_40	89.95	0.46

$$b = 99.32\%, g = 96.45\%, n_{ht_20} = 92.91\%, n_{ht_40} = 89.95\%,$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9932) = 0.03$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9645) = 0.16$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.9291) = 0.32$$

$$\text{Duty Cycle Factor: } 10 * \log(1/0.8995) = 0.46$$

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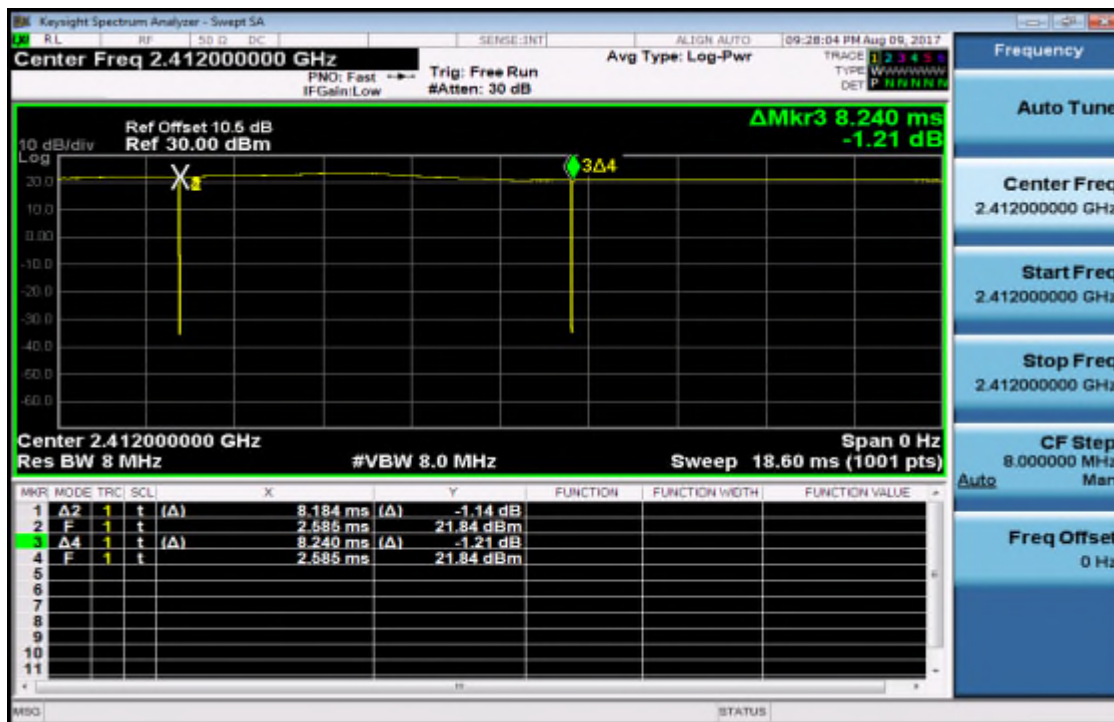
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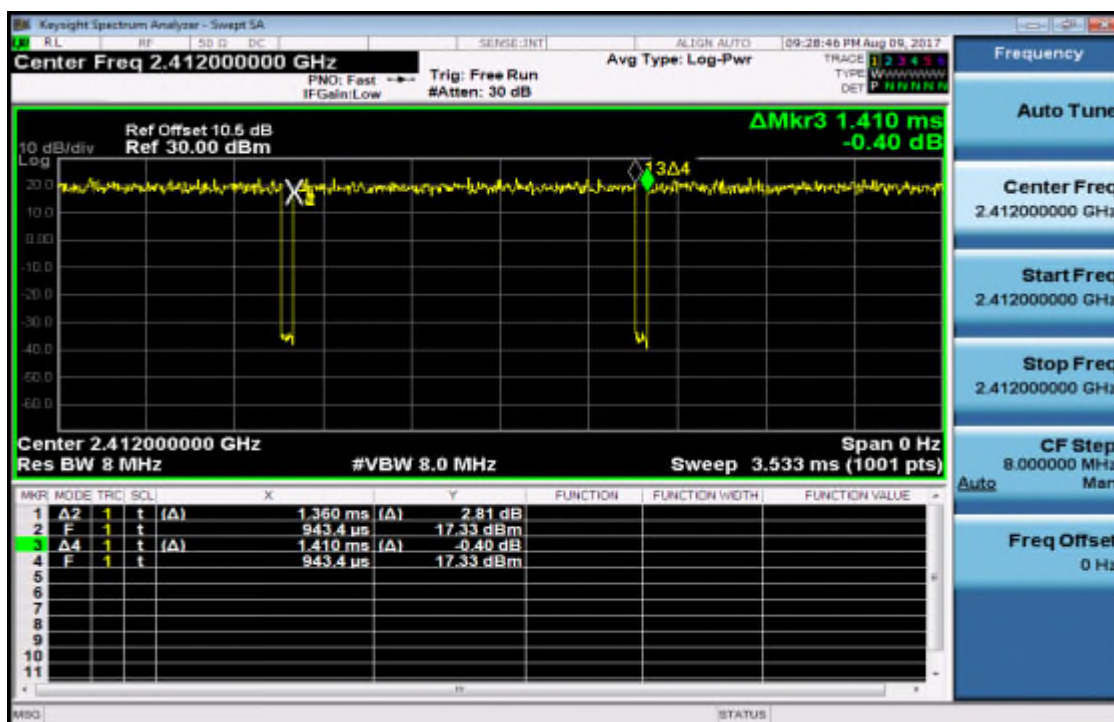
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7.1 DUTY CYCLE TEST SIGNAL Measurement Result

802.11 b



802.11 g



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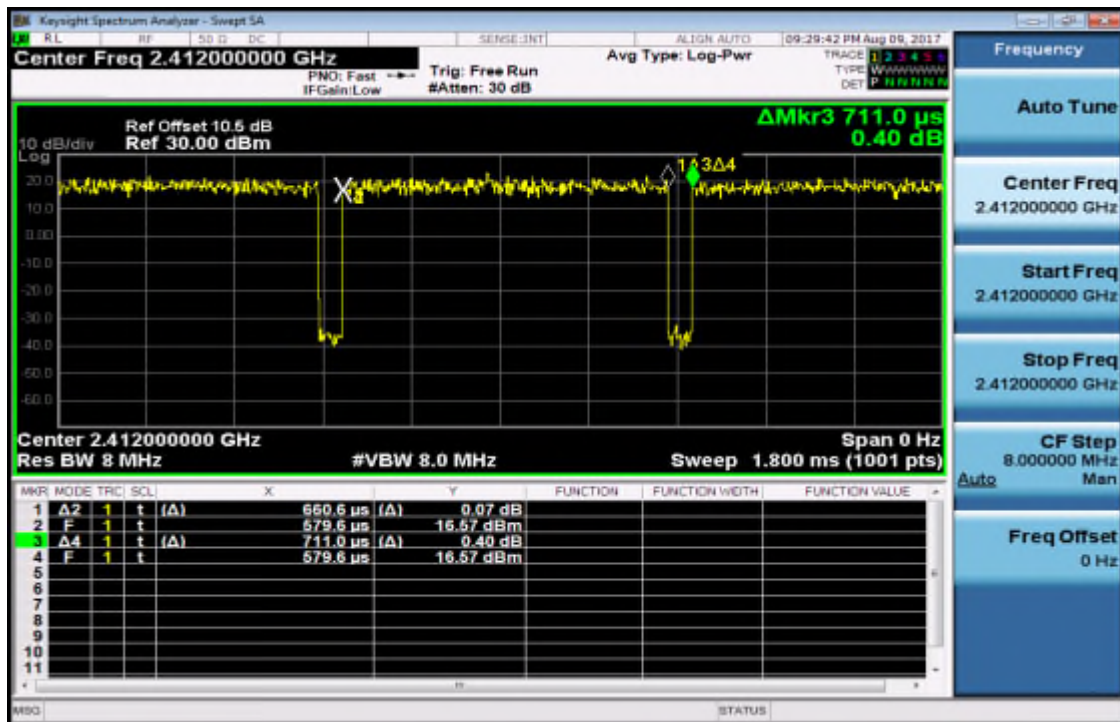
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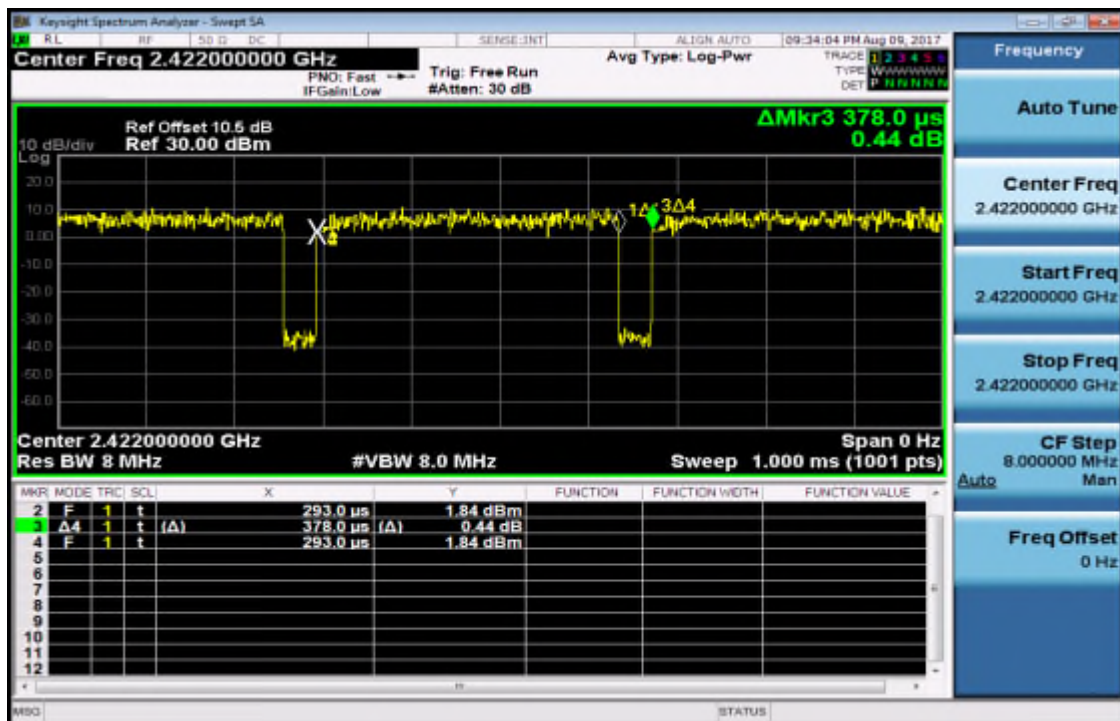
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802.11 n_20 MHz



802.11 n_40 MHz



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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.

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.

Note:

The antenna gain is greater than 6 dBi so the limit reduce as below:

2.4G Aux Antenna Gain= 6.88dBi,

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain = 6.88+3.01=9.89dBi

802.11b/g/n20/n40 (Aux): power limit= 30 dBm-(6.88-6)= 29.12 dBm= 0.817W (Peak)

802.11n20/n40(MIMO): power limit =30 dBm-(9.89-6)= 26.11 dBm = 0.408W (Peak)

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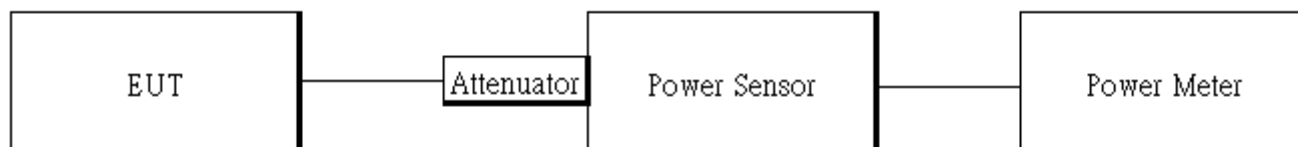
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8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/25/2016	12/24/2017
DC Block	PASTERNAK	PE8210	RF29	12/25/2016	12/24/2017
Splitter	RF-LAMBDA	RFLT2W1G18G	RF35	12/25/2016	12/24/2017
Attenuator	WOKEN	218FS-10	RF23	12/25/2016	12/24/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

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 (Worst Case Data Rate)

802.11b Aux1						
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit		RESULT
1	2412	1	20.72	0.62 watt	29.12 dBm	PASS
6	2437	1	25.64	0.62 watt	29.12 dBm	PASS
11	2462	1	21.73	0.62 watt	29.12 dBm	PASS
802.11b Aux1						
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit		RESULT
1	2412	1	18.07	0.62 watt	29.12 dBm	PASS
6	2437	1	23.55	0.62 watt	29.12 dBm	PASS
11	2462	1	19.30	0.62 watt	29.12 dBm	PASS
802.11g Aux1						
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit		RESULT
1	2412	6	18.46	0.62 watt	29.12 dBm	PASS
6	2437	6	24.73	0.62 watt	29.12 dBm	PASS
11	2462	6	18.50	0.62 watt	29.12 dBm	PASS
802.11g Aux1						
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit		RESULT
1	2412	6	15.57	0.62 watt	29.12 dBm	PASS
6	2437	6	21.81	0.62 watt	29.12 dBm	PASS
11	2462	6	15.65	0.62 watt	29.12 dBm	PASS

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802.11n_HT20M MIMO

CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit			RESULT
			CH 0	CH 1						
1	2412	MCS8	18.09	18.20	21.16	130.49	0.41 watt	26.11	dBm	PASS
6	2437	MCS8	22.31	22.58	25.46	351.35	0.41 watt	26.11	dBm	PASS
11	2462	MCS8	17.82	18.00	20.92	123.63	0.41 watt	26.11	dBm	PASS

802.11n_HT20M MIMO

CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit			RESULT
			CH 0	CH 1						
1	2412	MCS8	14.69	15.12	17.92	61.95	0.41 watt	26.11	dBm	PASS
6	2437	MCS8	19.28	19.67	22.49	177.41	0.41 watt	26.11	dBm	PASS
11	2462	MCS8	15.17	15.19	18.19	65.92	0.41 watt	26.11	dBm	PASS

802.11n_HT40M MIMO

CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit			RESULT
			CH 0	CH 1						
3	2422	MCS8	10.81	10.87	13.85	24.27	0.41 watt	26.11	dBm	PASS
6	2437	MCS8	21.97	22.05	25.02	317.72	0.41 watt	26.11	dBm	PASS
9	2452	MCS8	10.86	11.80	14.37	27.33	0.41 watt	26.11	dBm	PASS

802.11n_HT40M MIMO

CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit			RESULT
			CH 0	CH 1						
3	2422	MCS8	8.00	8.04	11.03	12.68	0.41 watt	26.11	dBm	PASS
6	2437	MCS8	19.19	19.50	22.36	172.11	0.41 watt	26.11	dBm	PASS
9	2452	MCS8	8.04	9.06	11.59	14.42	0.41 watt	26.11	dBm	PASS

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

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9 6DB & 99% BANDWIDTH MEASUREMENT

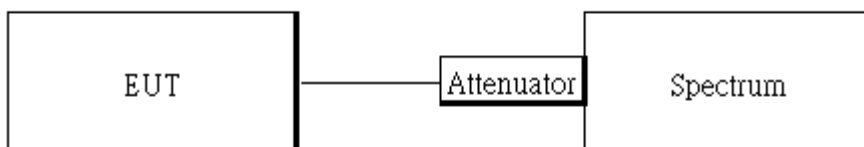
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
Power Meter	Anritsu	ML2496A	1326001	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315048	06/23/2017	06/22/2018
Power Sensor	Anritsu	MA2411B	1315049	06/23/2017	06/22/2018
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	RF01	12/25/2016	12/24/2017
DC Block	PASTERNAK	PE8210	RF29	12/25/2016	12/24/2017
Splitter	RF-LAMBDA	RFLT2W1G18G	RF35	12/25/2016	12/24/2017
Attenuator	WOKEN	218FS-10	RF23	12/25/2016	12/24/2017
DC Power Supply	Agilent	E3640A	MY53140006	05/02/2017	05/01/2018

9.3 Test Set-up



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.

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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

802.11b Aux1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	10120	> 500	PASS
2437	10110	> 500	PASS
2462	10120	> 500	PASS

802.11g Aux1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16430	> 500	PASS
2437	16400	> 500	PASS
2462	16400	> 500	PASS

802.11_n HT20 Main

802.11_n HT20 Aux1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result	Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17680	> 500	PASS	2412	17690	> 500	PASS
2437	17680	> 500	PASS	2437	17670	> 500	PASS
2462	17690	> 500	PASS	2462	17710	> 500	PASS

802.11_n HT40 Main

802.11_n HT40 Aux1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result	Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	36410	> 500	PASS	2422	36190	> 500	PASS
2437	36370	> 500	PASS	2437	36380	> 500	PASS
2452	36430	> 500	PASS	2452	36440	> 500	PASS

*Refer to next page for plots

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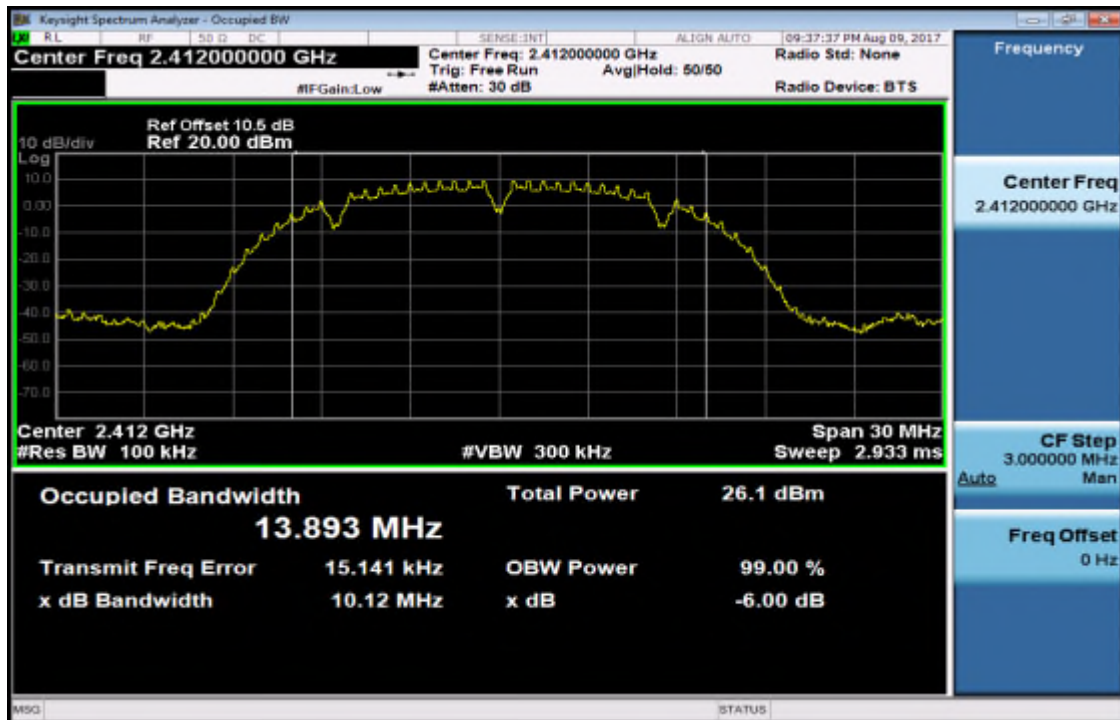
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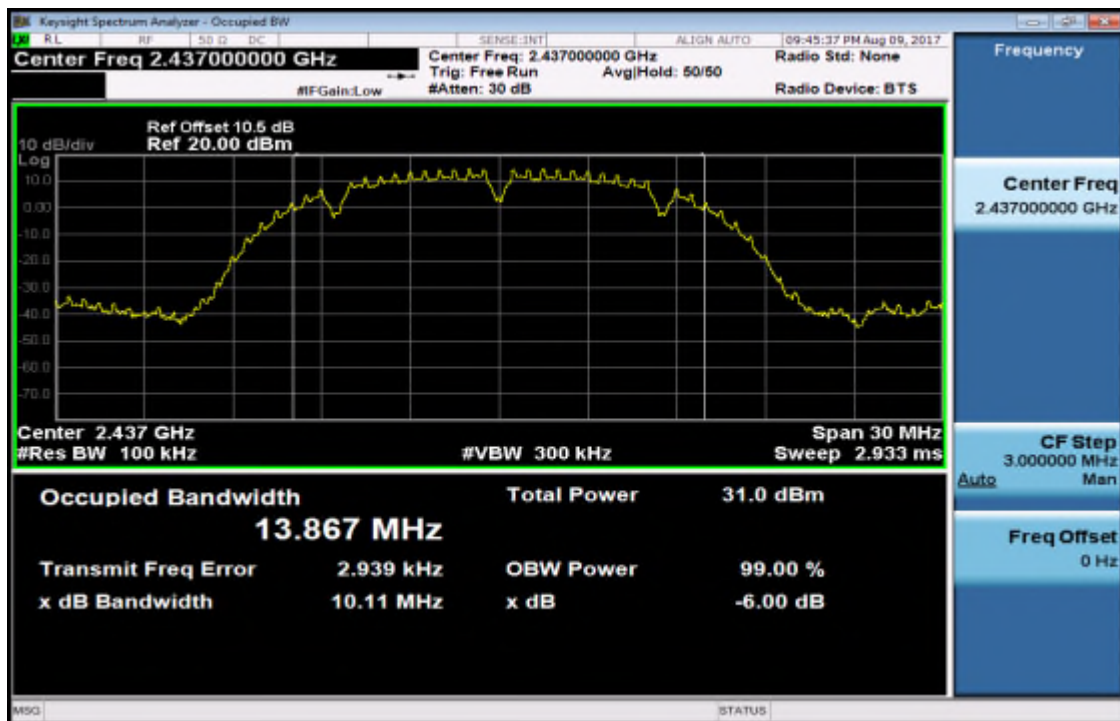
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802.11b (AUX1) 6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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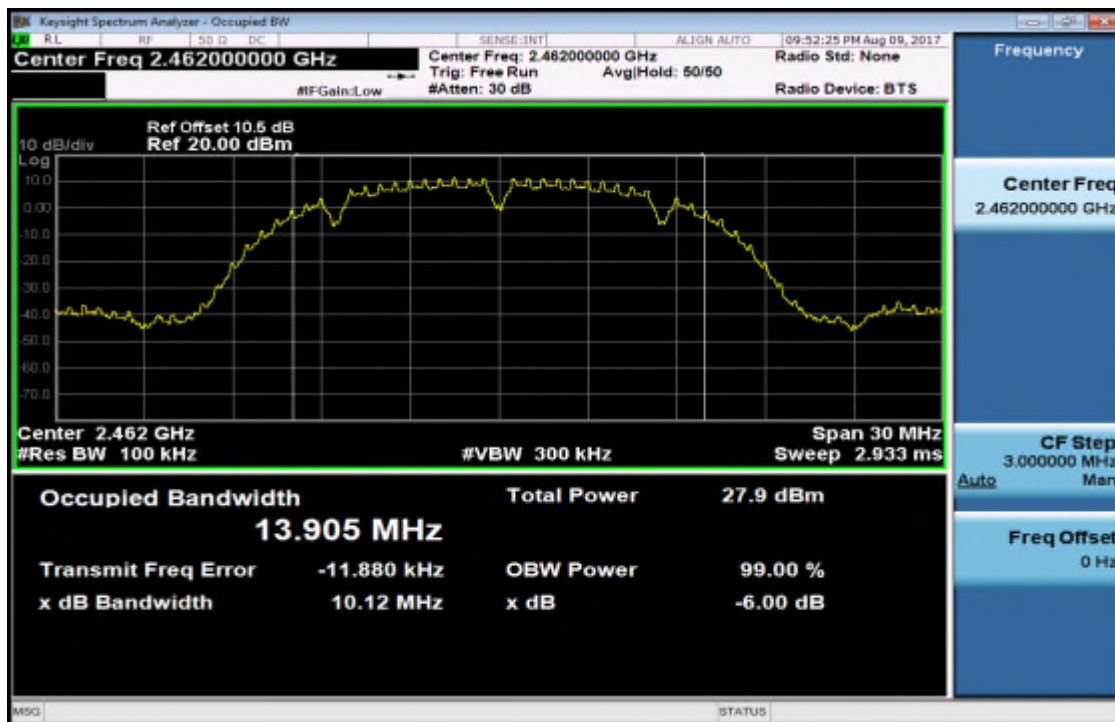
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6dB Band Width Test Data CH-High



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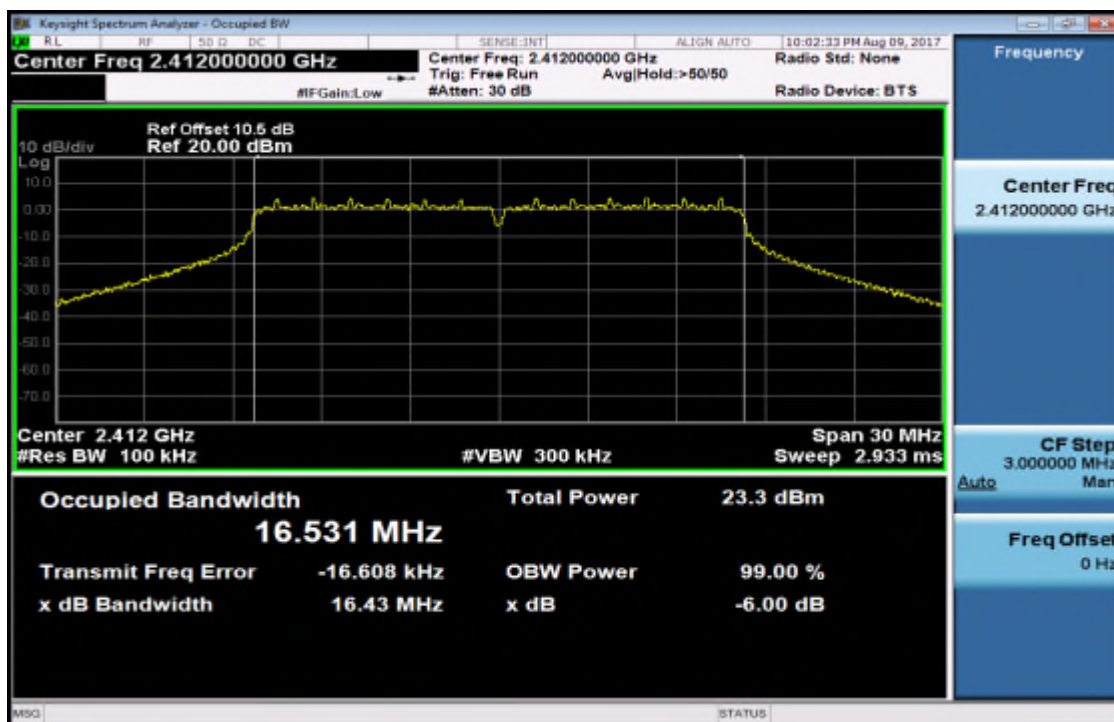
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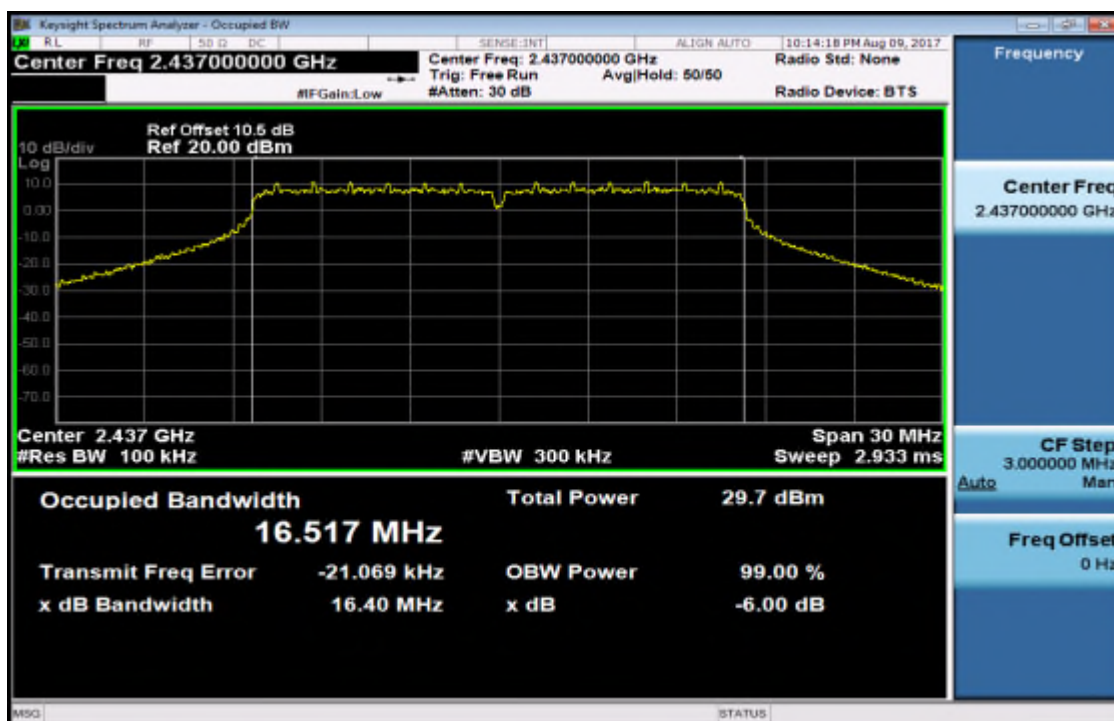
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802.11g (AUX1)

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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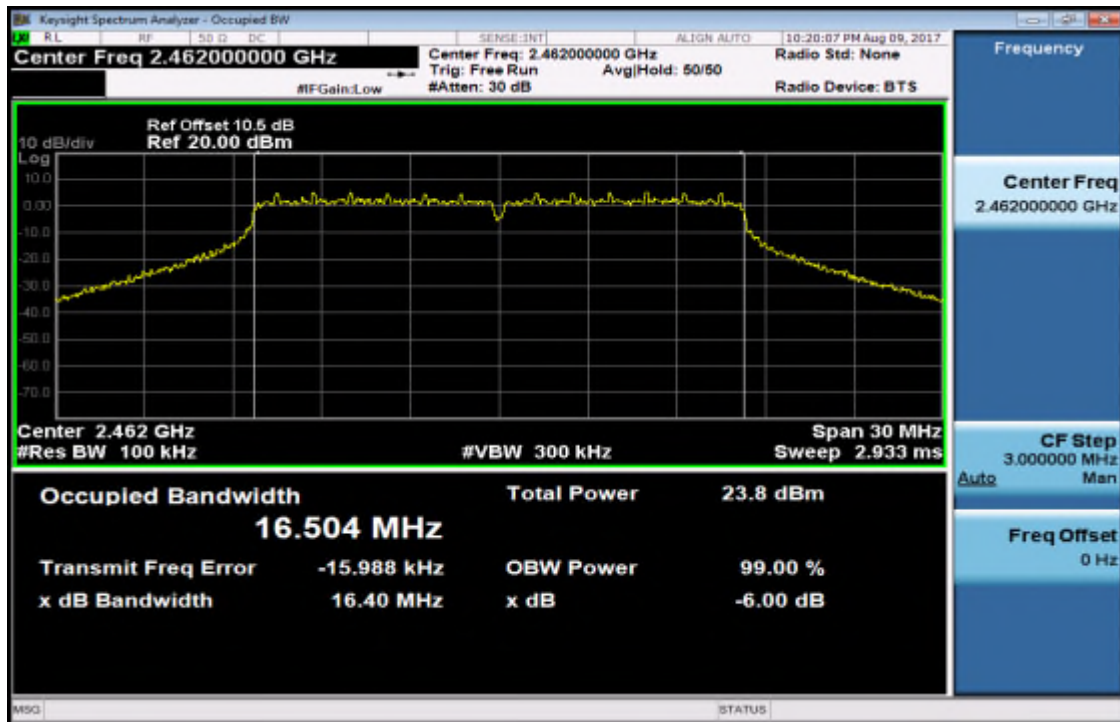
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6dB Band Width Test Data CH-High



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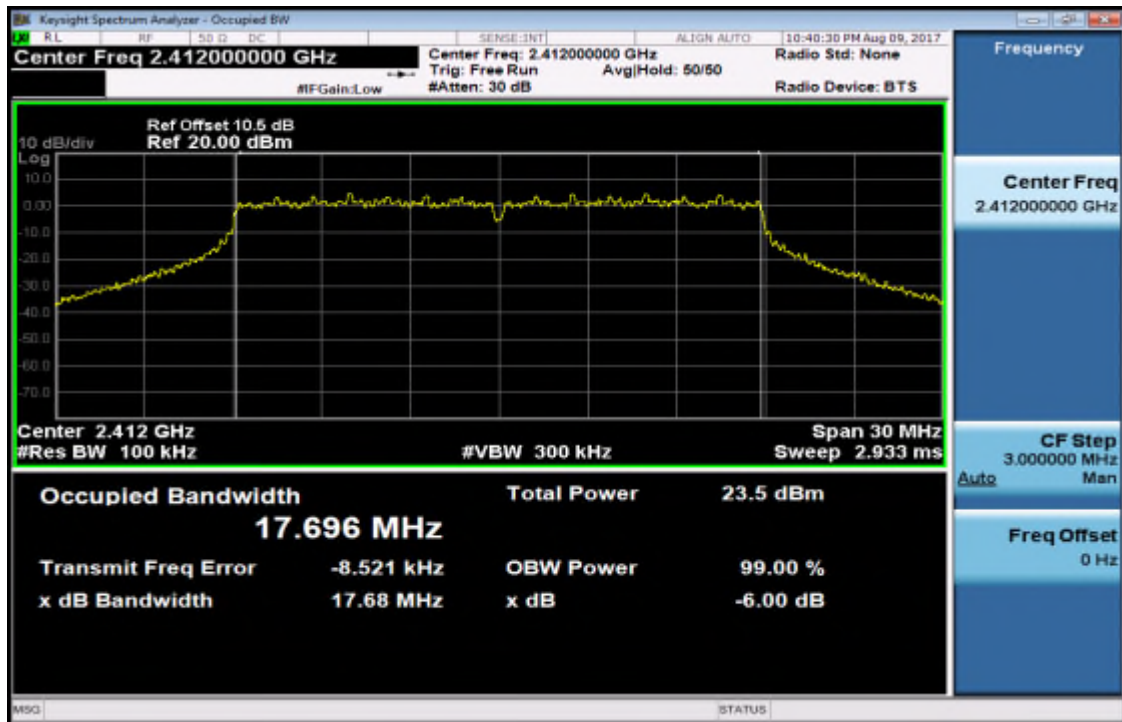
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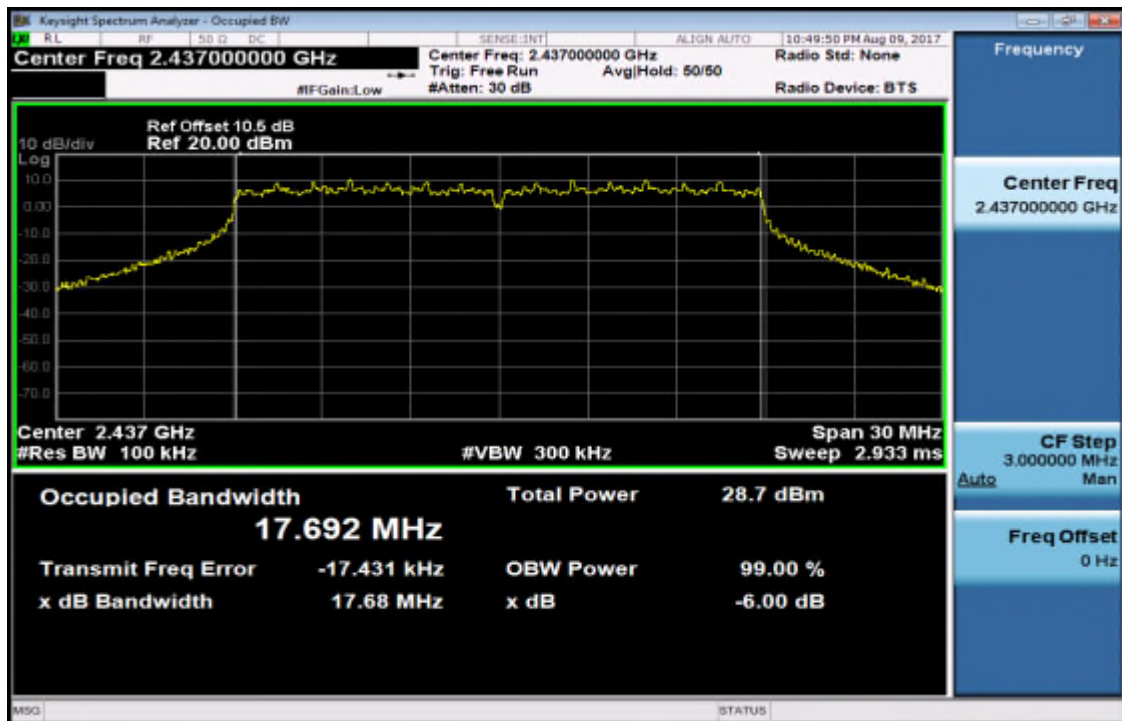
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802.11n_20M (Main)

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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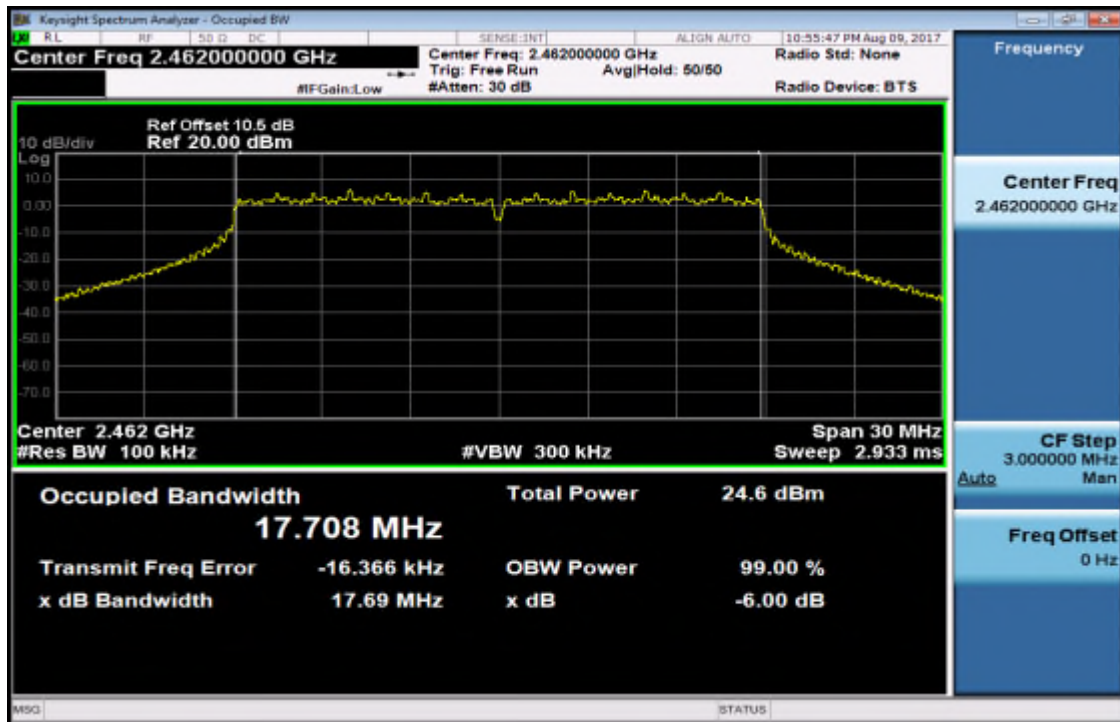
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6dB Band Width Test Data CH-High



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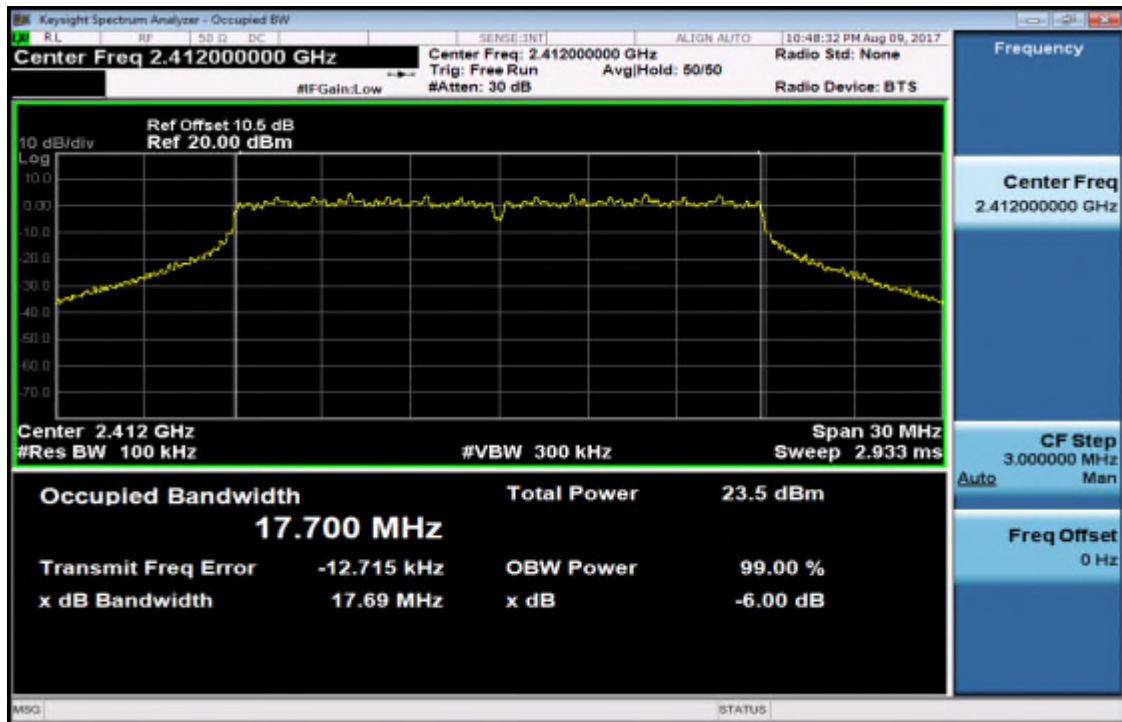
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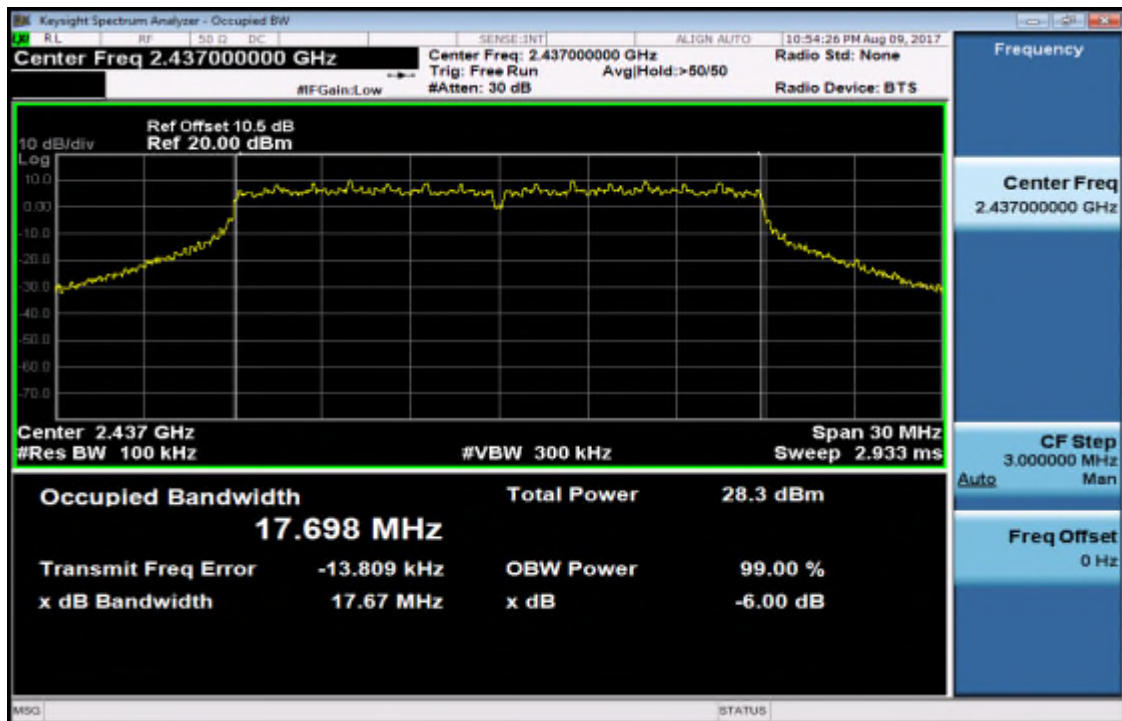
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802.11n_20M (AUX1)

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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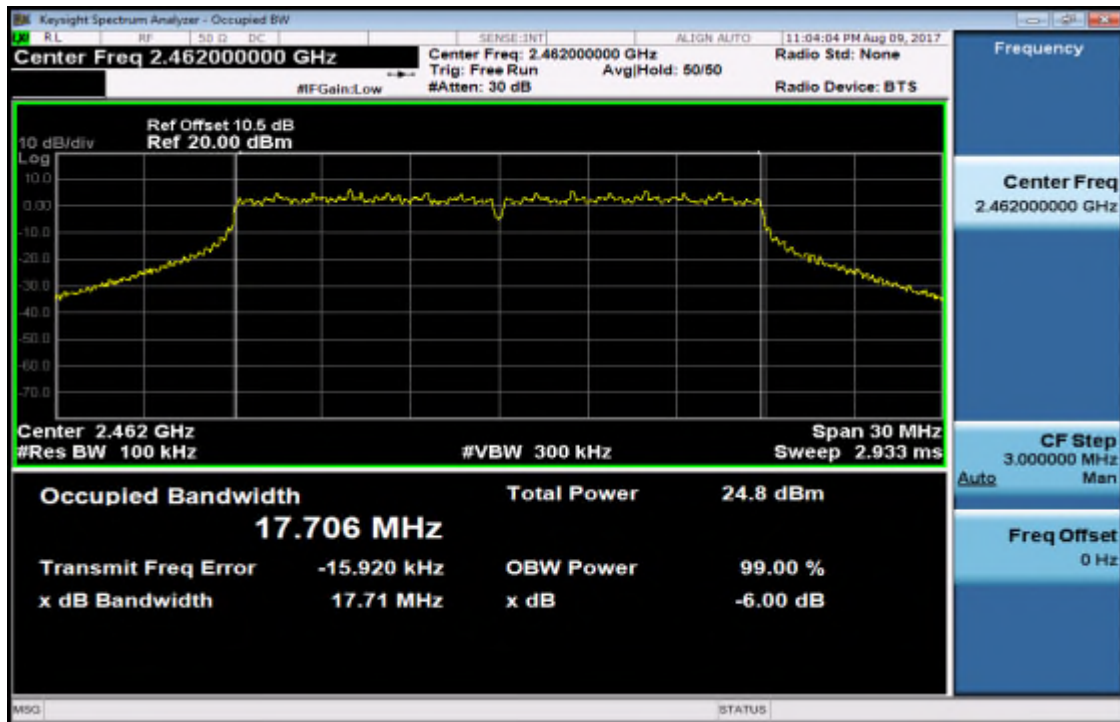
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6dB Band Width Test Data CH-High



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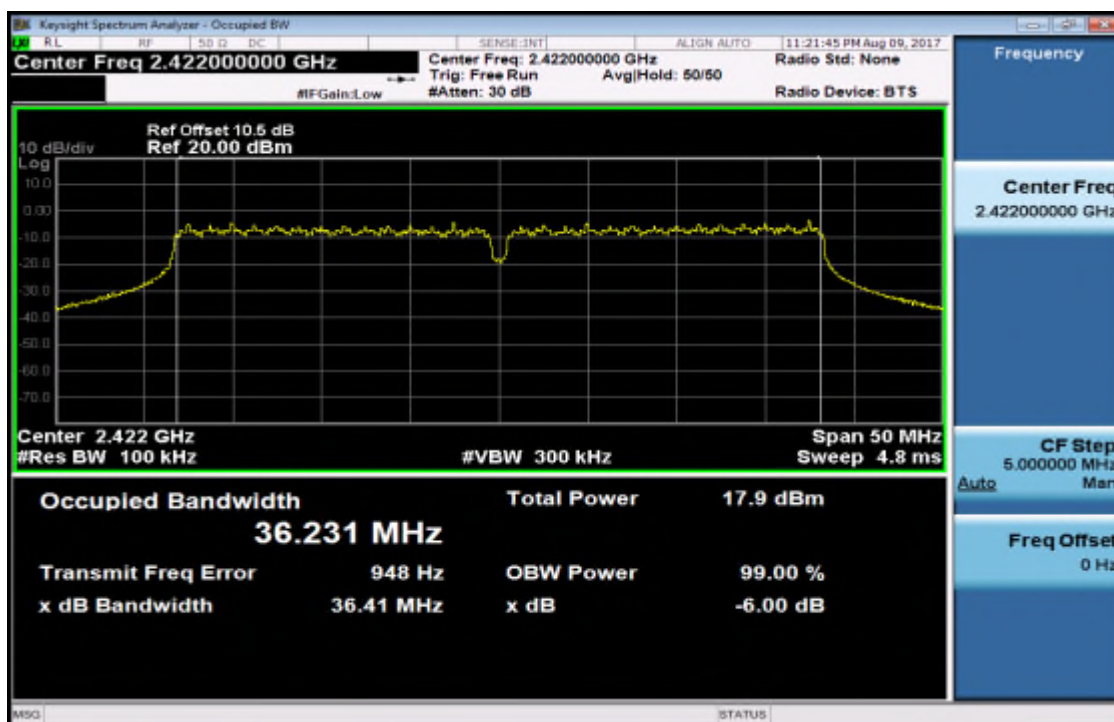
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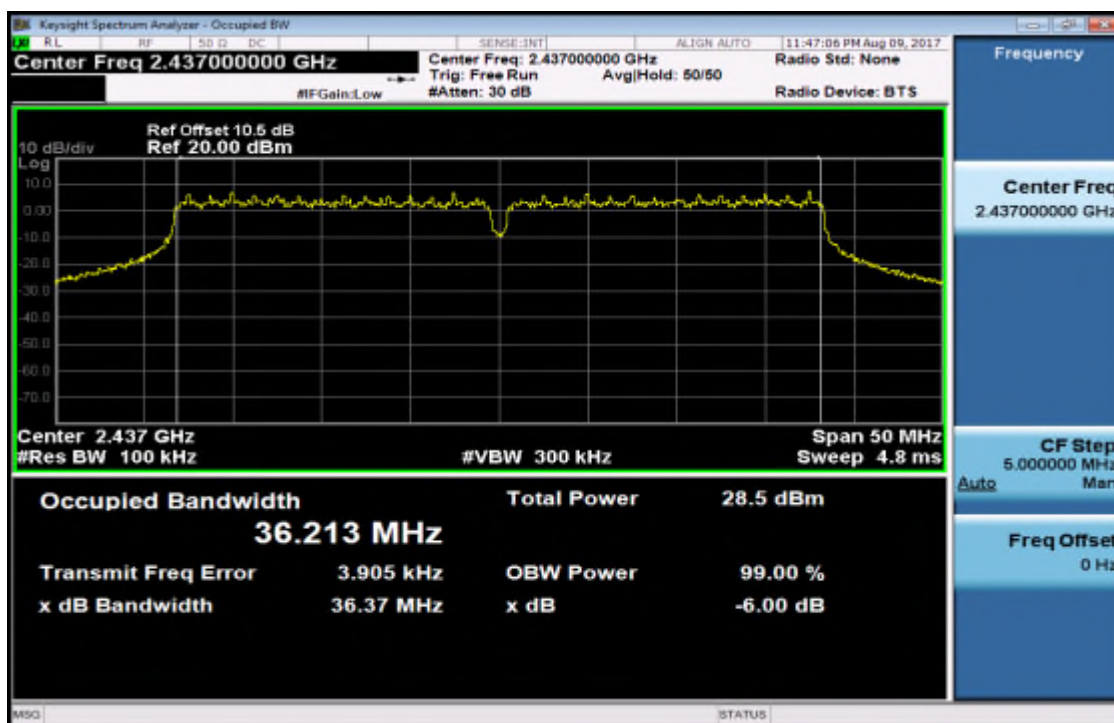
Member of SGS Group

802.11n_40M (Main)

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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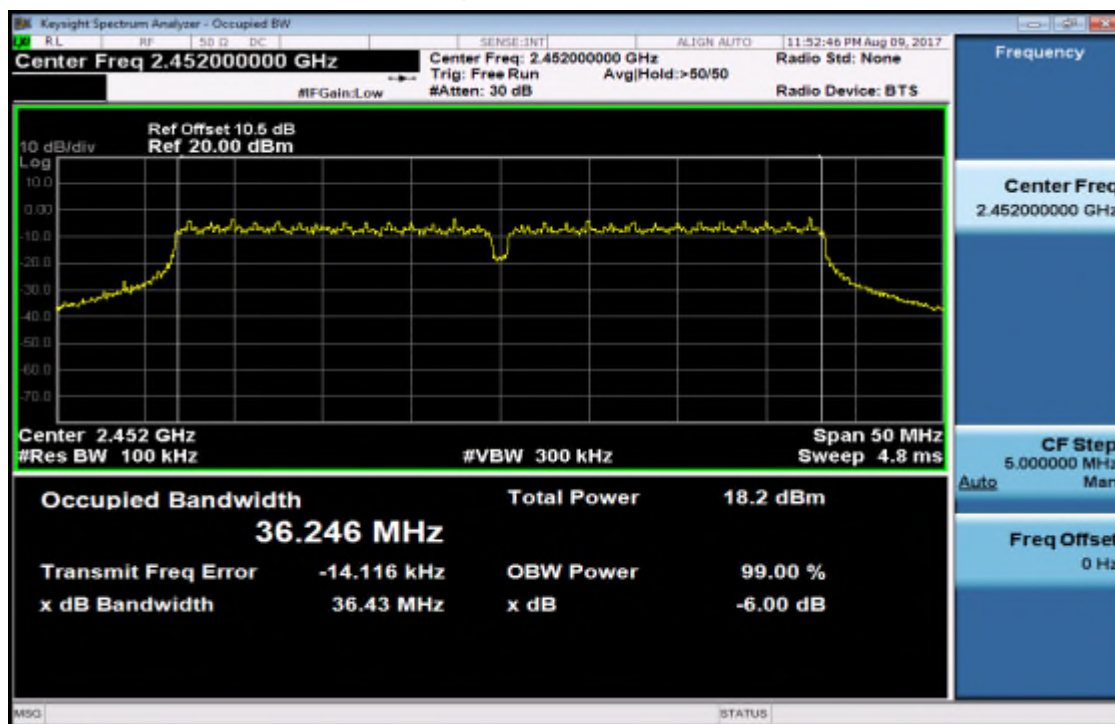
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6dB Band Width Test Data CH-High



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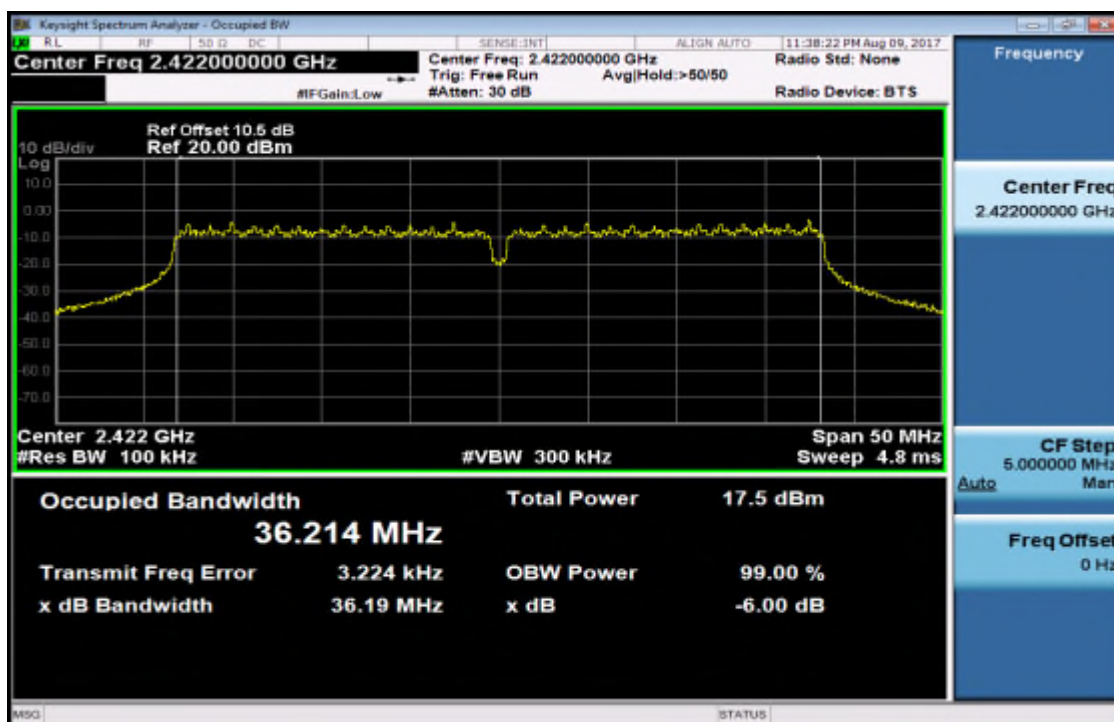
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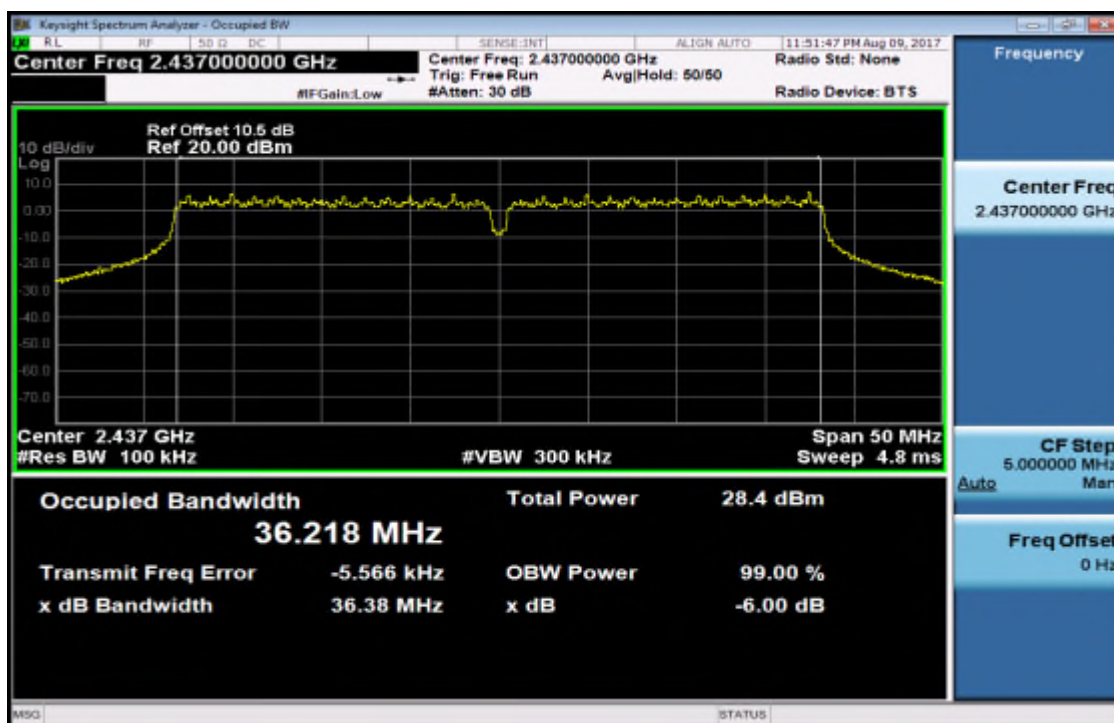
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802.11n_40M (AUX1)

6dB Band Width Test Data CH-Low



6dB Band Width Test Data CH-Mid



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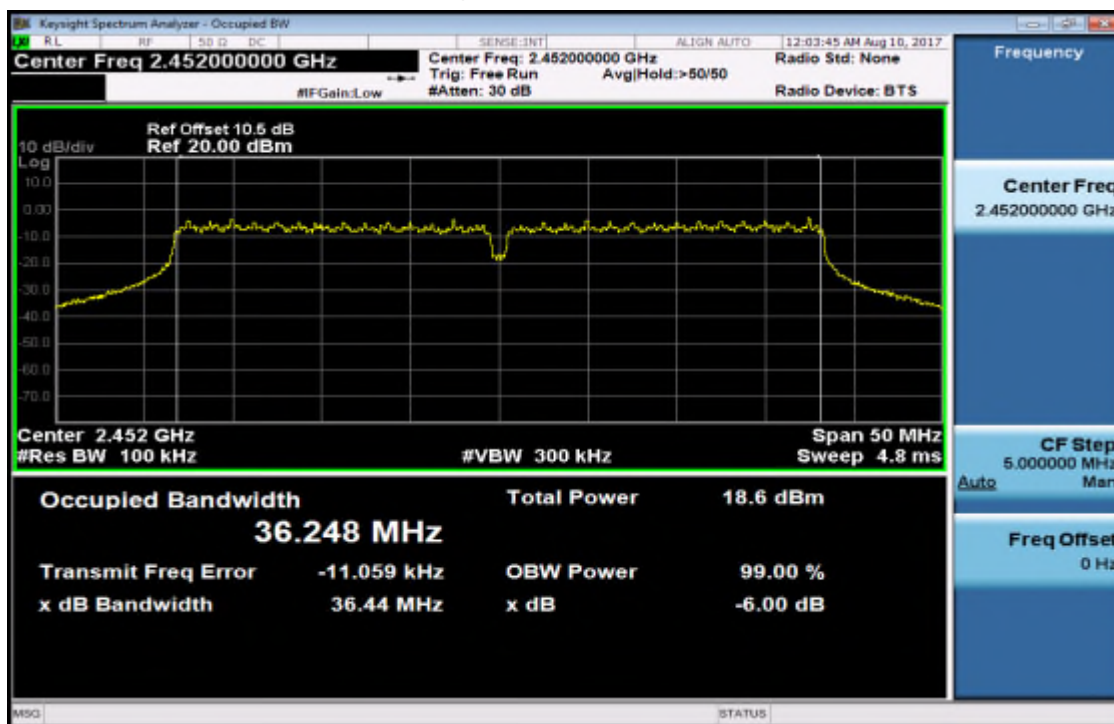
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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

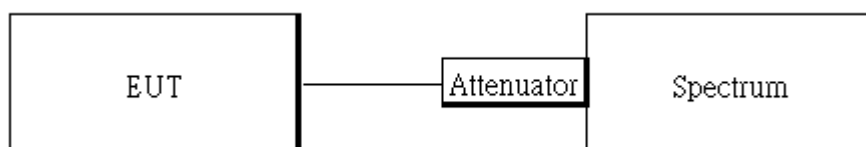
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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), must also comply with the radiated emission limits specified in §15.209(a).

10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
DC Block	PASTERNAK	PE8210	RF29	12/25/2016	12/24/2017
Attenuator	WOKEN	218FS-10	RF23	12/25/2016	12/24/2017

10.3 Test SET-UP



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10.4 Measurement Procedure

Reference Level of Emission 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 .
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.
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 .
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.

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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 .
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.

10.5 Measurement Result**Note:**

Antenna Gain: 6.57 dBi
Aux1 Antenna Gain: 6.88 dBi
Aux2 Antenna Gain: 0.00 dBi
Aux3 Antenna Gain: 0.00 dBi
Number Antenna: 2 pcs
Limit: 8 dBm

The antenna gain is grater than 6dBi in MIMO mode the limit reduce as below:
Directional gain = gain of antenna element + 10 log (# of TX antenna elements)
Effective Legacy Gain (dBi) =
6.88+3.01=9.89dBi
Limit: 8dBm – (9.89– 6dBi)=4.11dBm

Note:

offset 10.50 dB for SISO mode
offset 13.50 dB for MIMO mode

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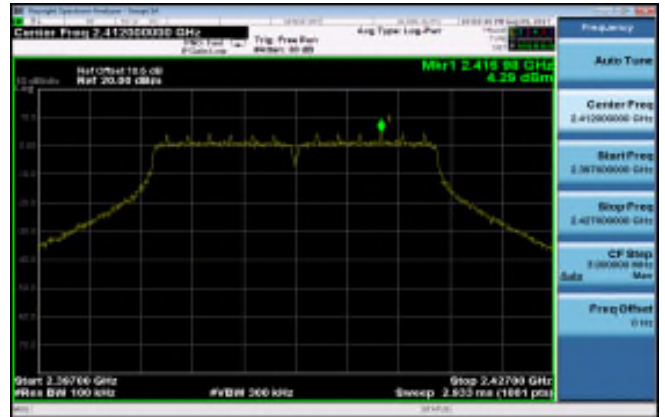
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802.11b Reference Level of Emission Limit
(CH-Low)



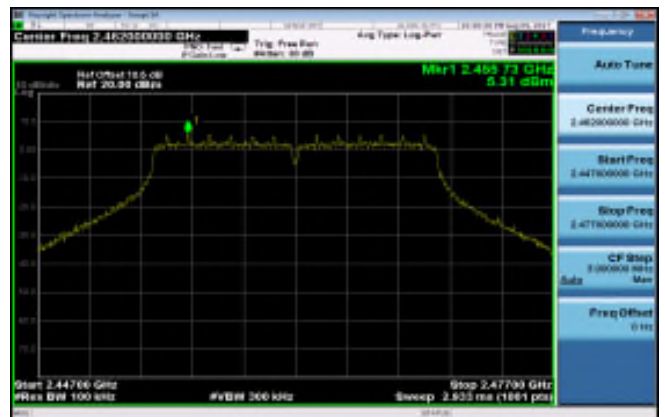
802.11g Reference Level of Emission Limit
(CH-Low)



802.11b Reference Level of Emission Limit
(CH-High)



802.11g Reference Level of Emission Limit
(CH-High)



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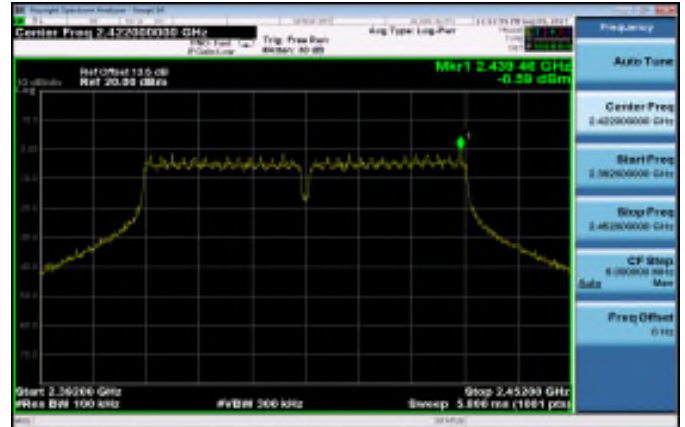
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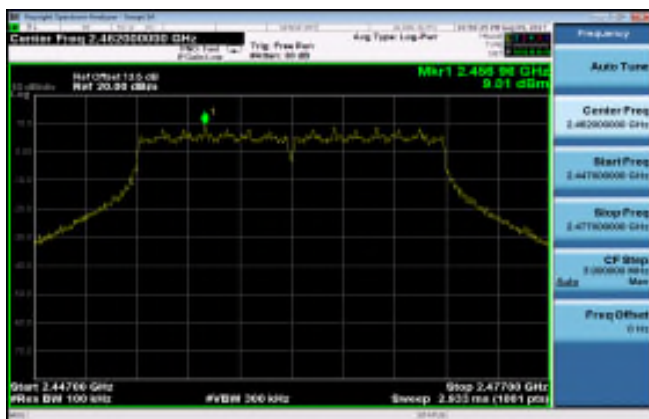
802.11n_HT20 Reference Level of Emission Limit(CH-Low)



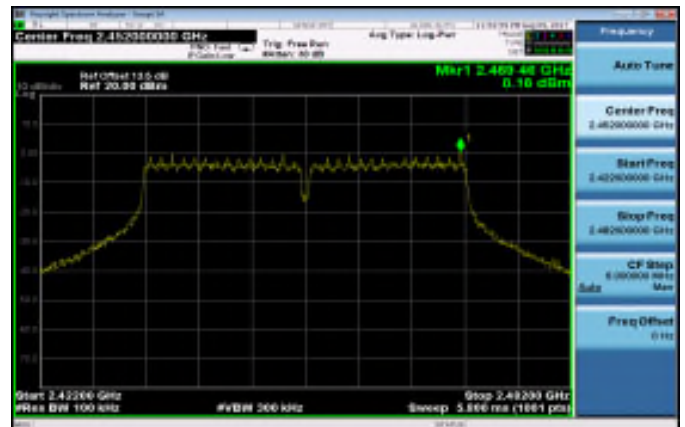
802.11n_HT40 Reference Level of Emission Limit(CH-Low)



802.11n_HT20 Reference Level of Emission Limit(CH-High)



802.11n_HT40 Reference Level of Emission Limit(CH-High)



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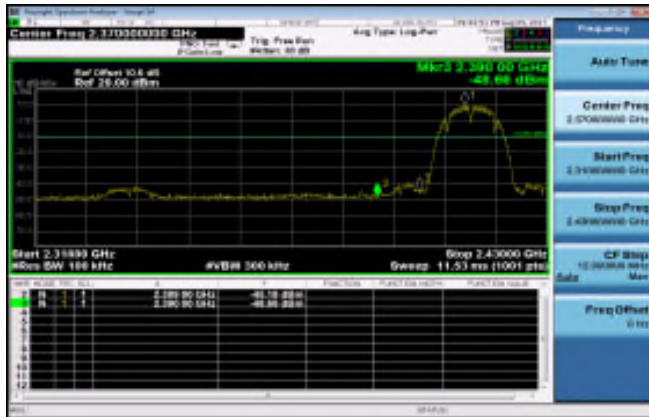
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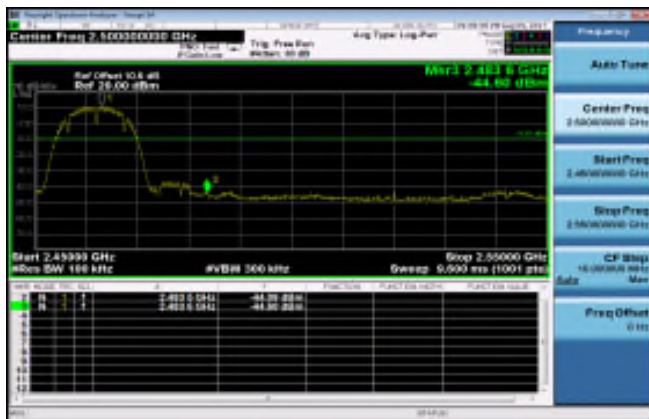
802.11b: Band Edges Test Data CH-Low



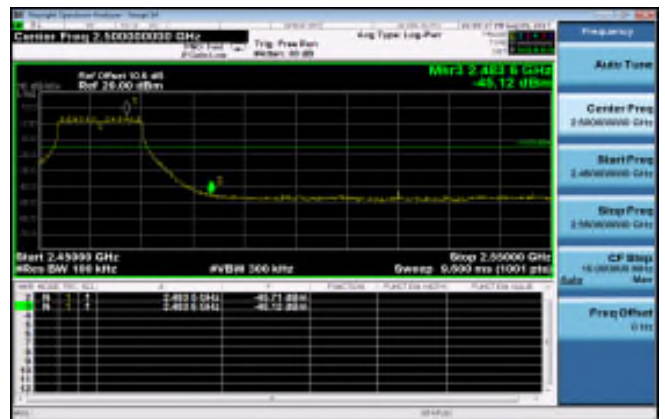
802.11g: Band Edges Test Data CH-Low



802.11b: Band Edges Test Data CH-High



802.11g: Band Edges Test Data CH-High



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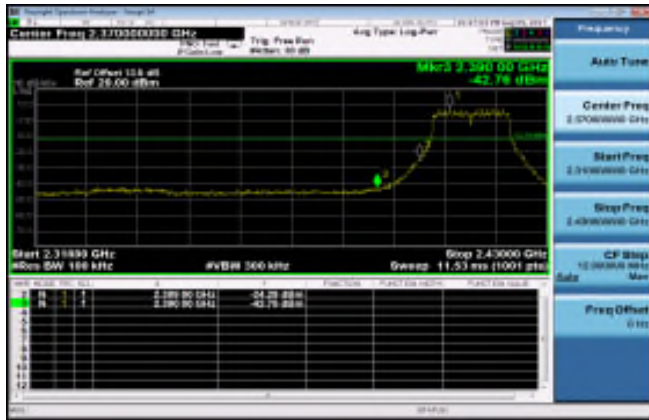
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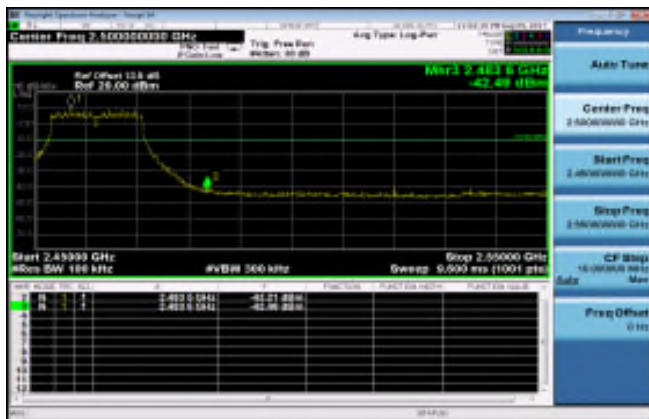
802.11n_HT20: Band Edges Test Data CH-Low



802.11n_HT40: Band Edges Test Data CH-Low



802.11n_HT20: Band Edges Test Data CH-High



802.11n_HT40: Band Edges Test Data CH-High



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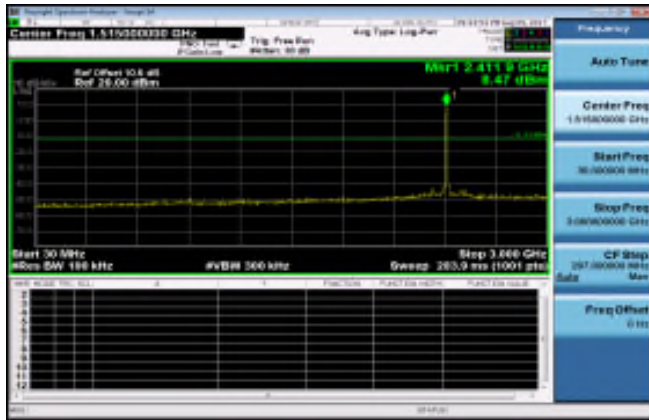
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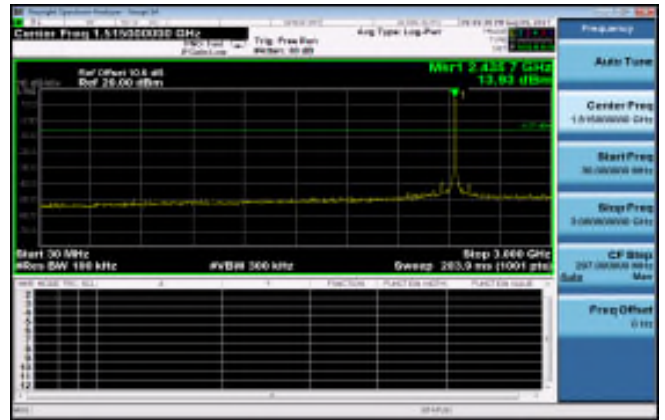
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802.11b: Spurious Emission Test Data CH-Low



802.11b: Spurious Emission Test Data CH-Mid



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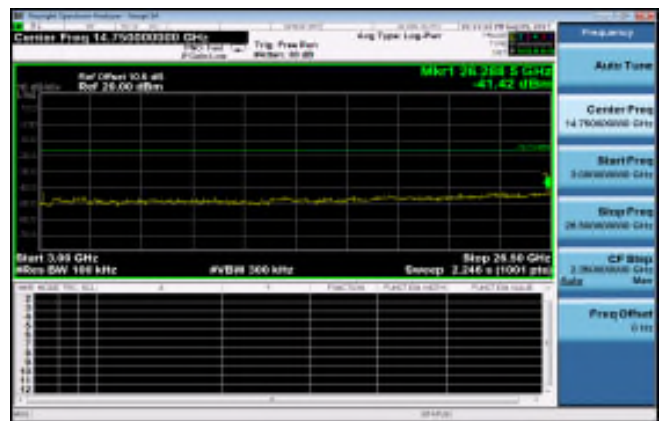
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802.11b: Spurious Emission Test Data CH-High



802.11g: Spurious Emission Test Data CH-Low



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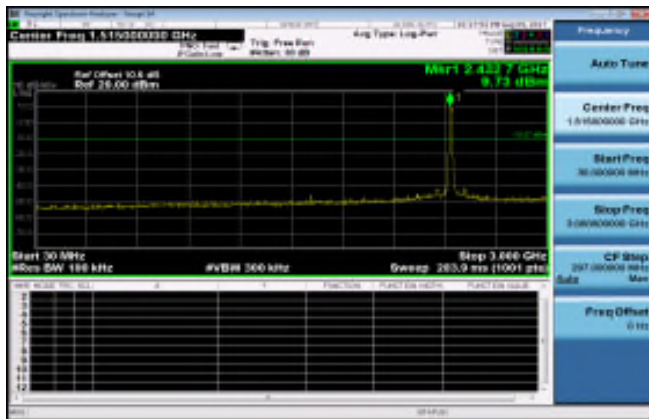
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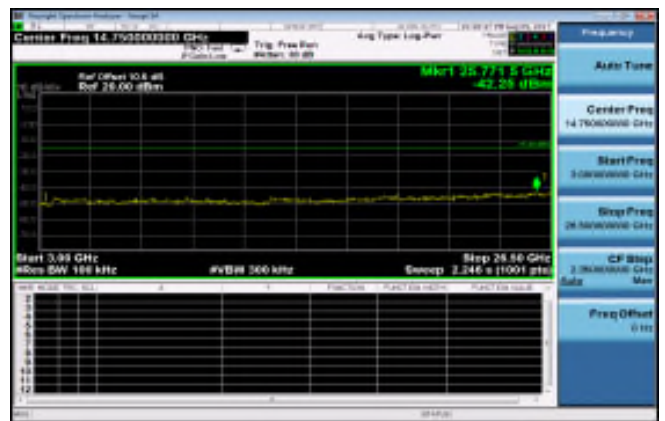
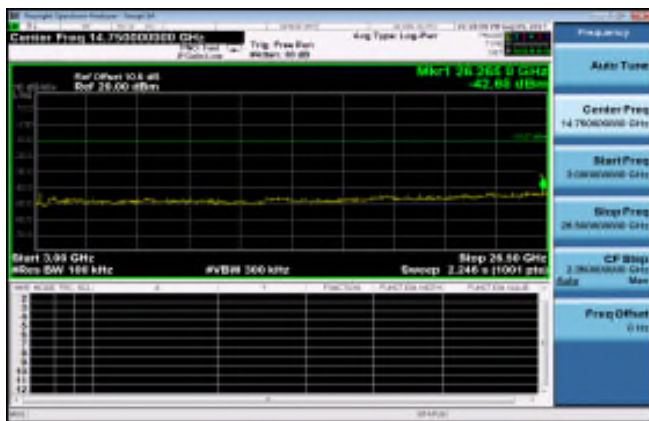
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802.11g: Spurious Emission Test Data CH-Mid



802.11g: Spurious Emission Test Data CH-High



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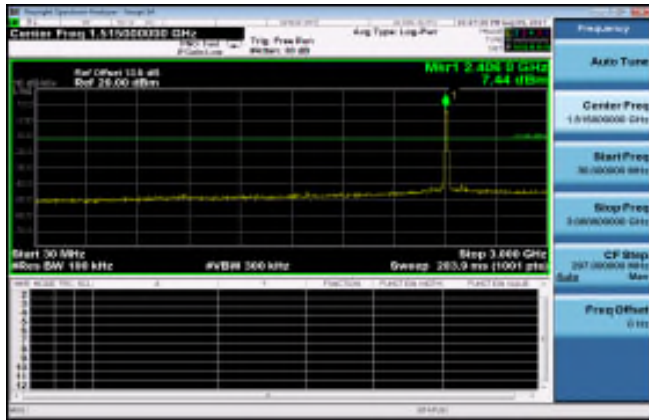
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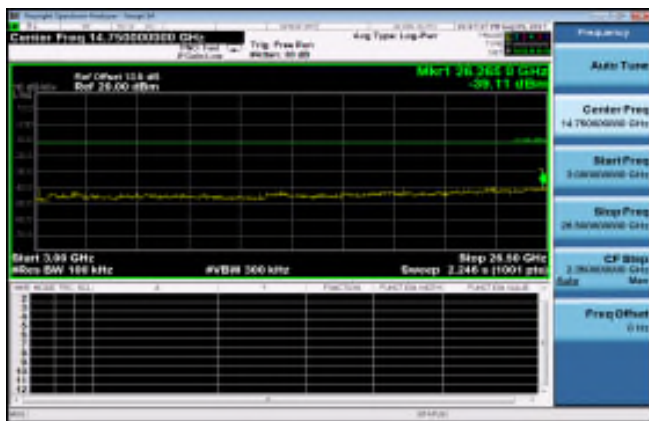
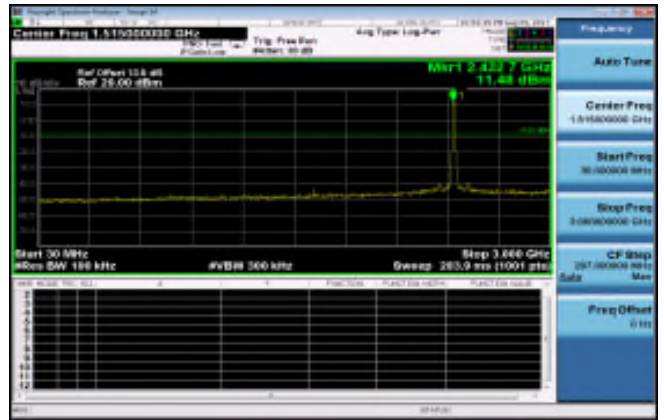
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802.11n_HT20: Spurious Emission Test Data CH-Low



802.11n_HT20: Spurious Emission Test Data CH-Mid



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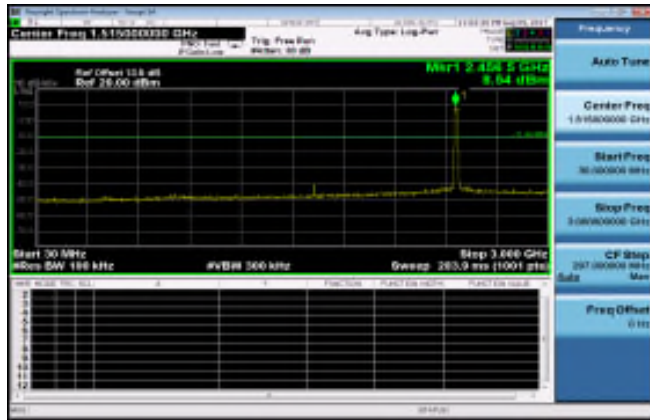
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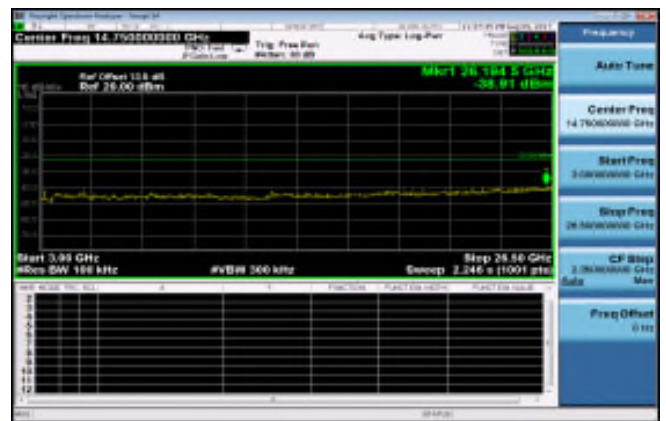
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802.11n_HT20: Spurious Emission Test Data CH-High



802.11n_HT40: Spurious Emission Test Data CH-Low



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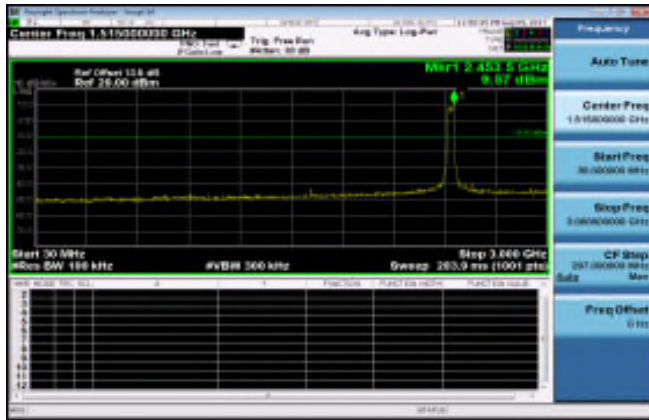
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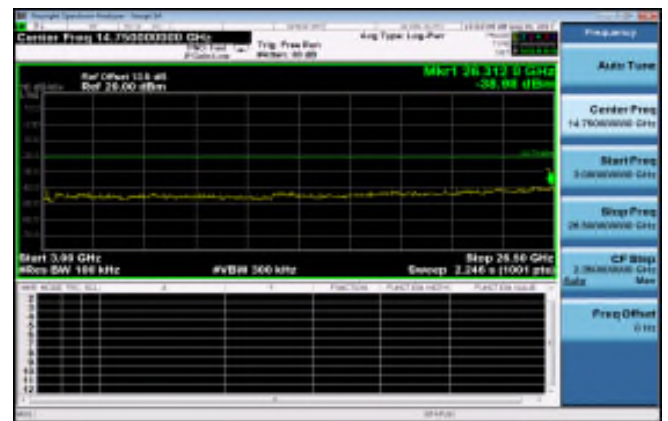
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802.11n_HT40: Spurious Emission Test Data CH-Mid



802.11n_HT40: Spurious Emission Test Data CH-High



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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 §15.209 limit as below.

And according to §15.33(a) (1), 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.

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)

11.2 Measurement Equipment Used:

Please refer to next page.

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SGS 966 Chamber No.C

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	04/18/2017	04/17/2018
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2016	12/22/2017
Broadband Antenna	TESEQ	CBL 6112D	35240	08/01/2017	07/31/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2016	12/16/2017
Horn Antenna	Schwarzbeck	BBHA9170	185	08/01/2017	07/31/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/12/2016	12/11/2017
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-18	10204	12/12/2016	12/11/2017
Pre Amplifier	R&S	SCU-26	100780	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/12/2016	12/11/2017
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/12/2016	12/11/2017
Attenuator	WOKEN	218FS-10	RF27	12/12/2016	12/11/2017
Site NSA	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
Site VSWR	SGS	966 Chamber C	SAC-C	03/02/2017	03/01/2018
DC Power Supply	HOLA	DP-3003	D7070035	05/04/2017	05/03/2018
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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

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Remark: Please note that the duration to conduct the test took place in the mean time when the calibration for several equipments is due, and therefore extra tables of equipment calibration is constructed to indicate the calibration work is still maintained.

SGS 966 Chamber No.C					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Loop Antenna	ETS-Lindgren	6502	00143303	12/23/2017	12/22/2018
Horn Antenna	ETS-Lindgren	3117	00143272	12/15/2017	12/16/2018
Pre Amplifier	EMC Instruments	EMC330	980096	12/24/2017	12/23/2018
Pre Amplifier	EMC Instruments	EMC0011830	980199	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-18	10204	12/24/2017	12/23/2018
Pre Amplifier	R&S	SCU-26	100780	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U	966Rx 9K-30M	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	RG 214/U SUCOFLEX 104	966Rx 30M-3G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Rx 1G-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	mini 141-12 SUCOFLEX 104	966Rx 18G-40G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 104	966Tx 30M-18G	12/24/2017	12/23/2018
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	966Tx 18G-40G	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF27	12/24/2017	12/23/2018

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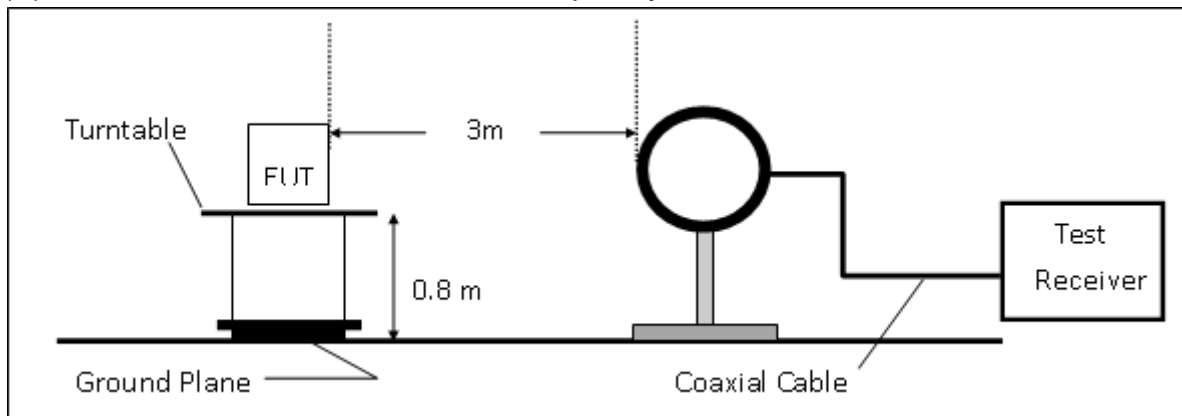
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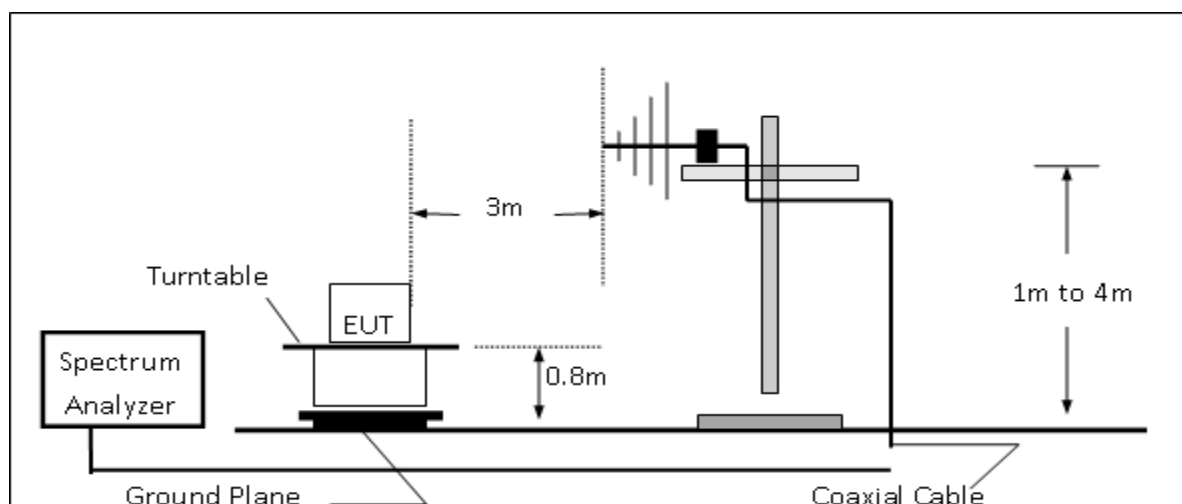
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11.3 Test SET-UP

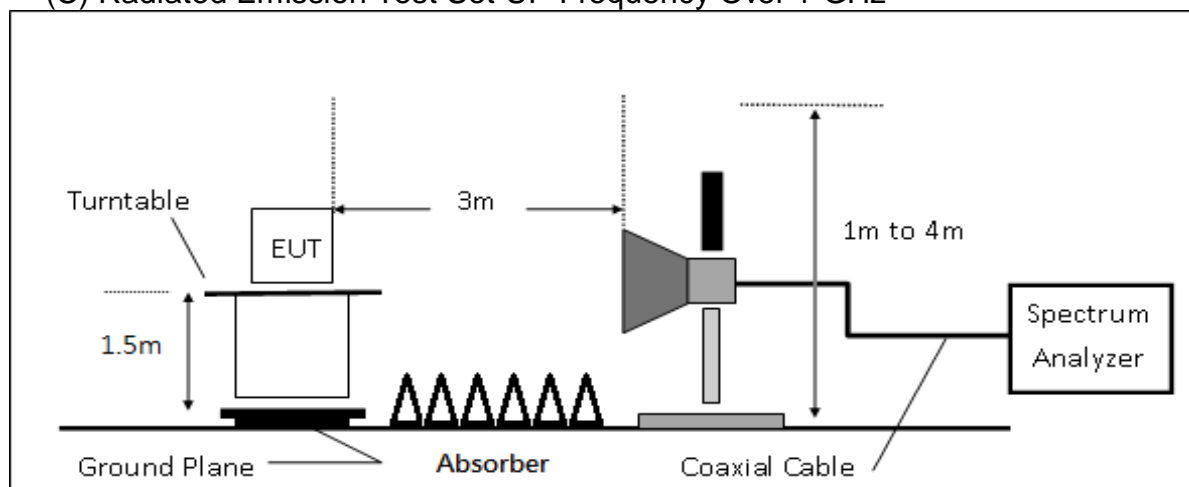
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(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 .
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)

Note :

“F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

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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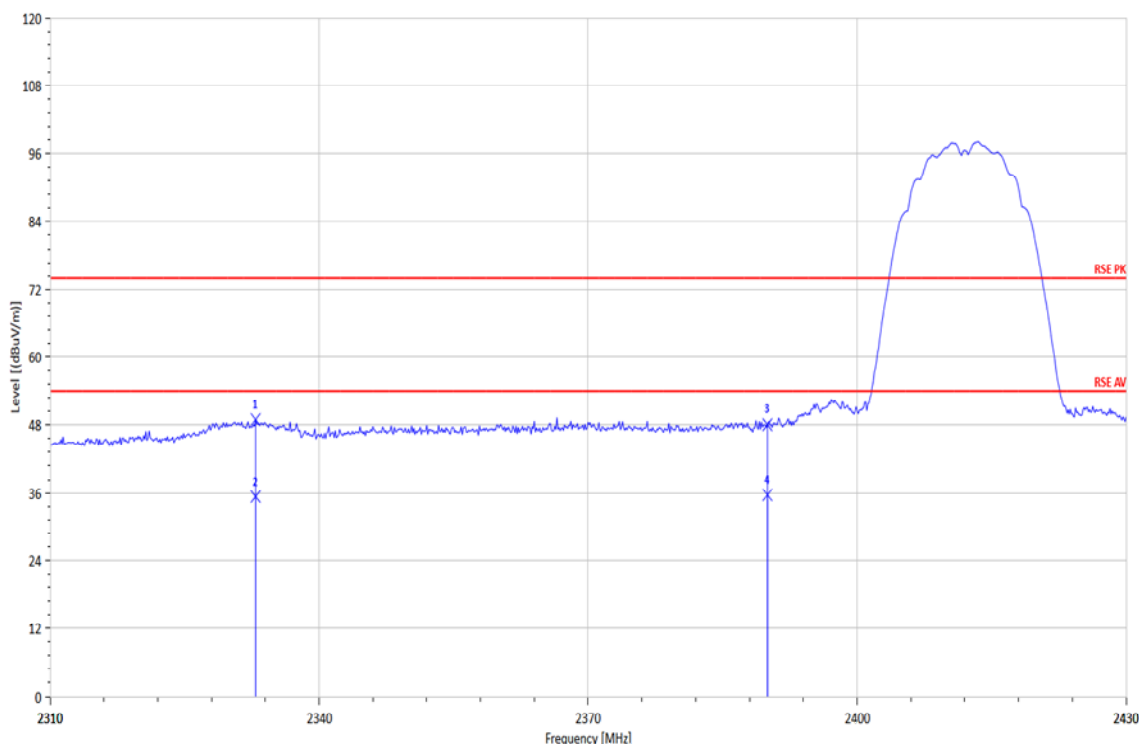
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Radiated Band Edge Measurement Result (802.11b)

Operation Mode : 802.11b Test Date : 2017/8/8
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch Low Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2332.92	S	Peak	48.28	0.69	48.97	74	-25.03
2332.92	S	Average	34.66	0.69	35.35	54	-18.65
2390.00	E	Peak	47.14	0.92	48.07	74	-25.93
2390.00	E	Average	34.73	0.92	35.65	54	-18.35

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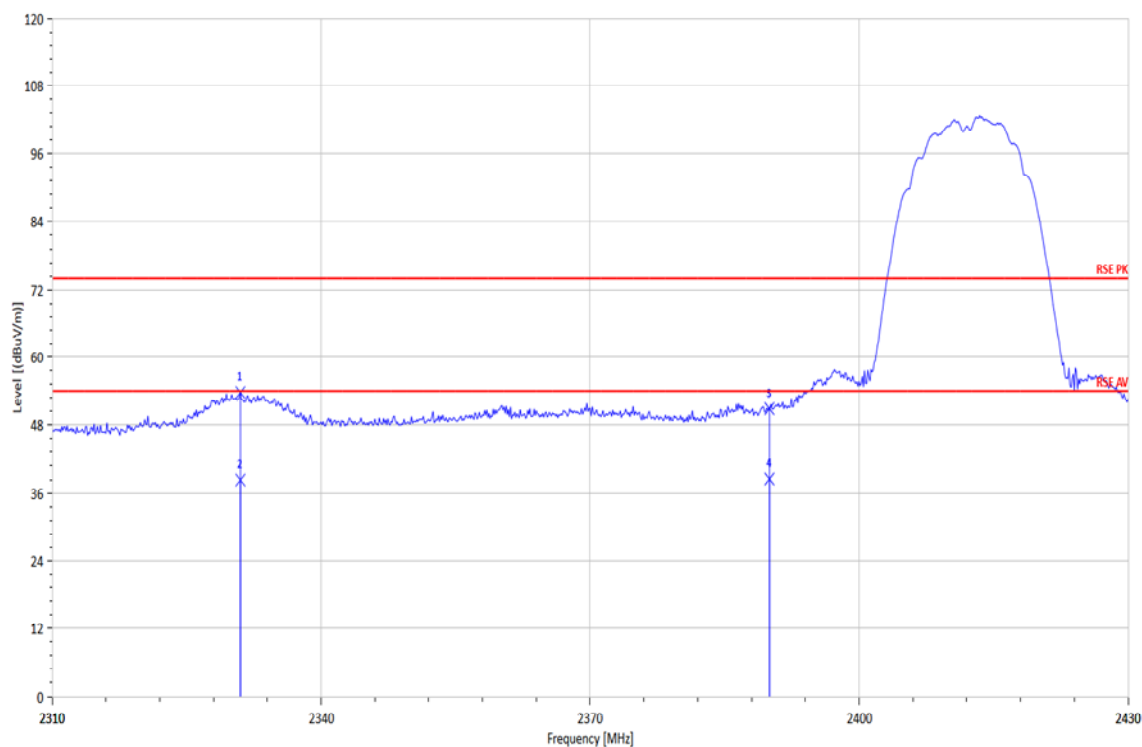
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Operation Mode : 802.11b Test Date : 2017/8/8
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch Low Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2331.00	S	Peak	53.07	0.68	53.76	74	-20.24
2331.00	S	Average	37.66	0.68	38.34	54	-15.66
2390.00	E	Peak	49.95	0.92	50.87	74	-23.13
2390.00	E	Average	37.61	0.92	38.53	54	-15.47

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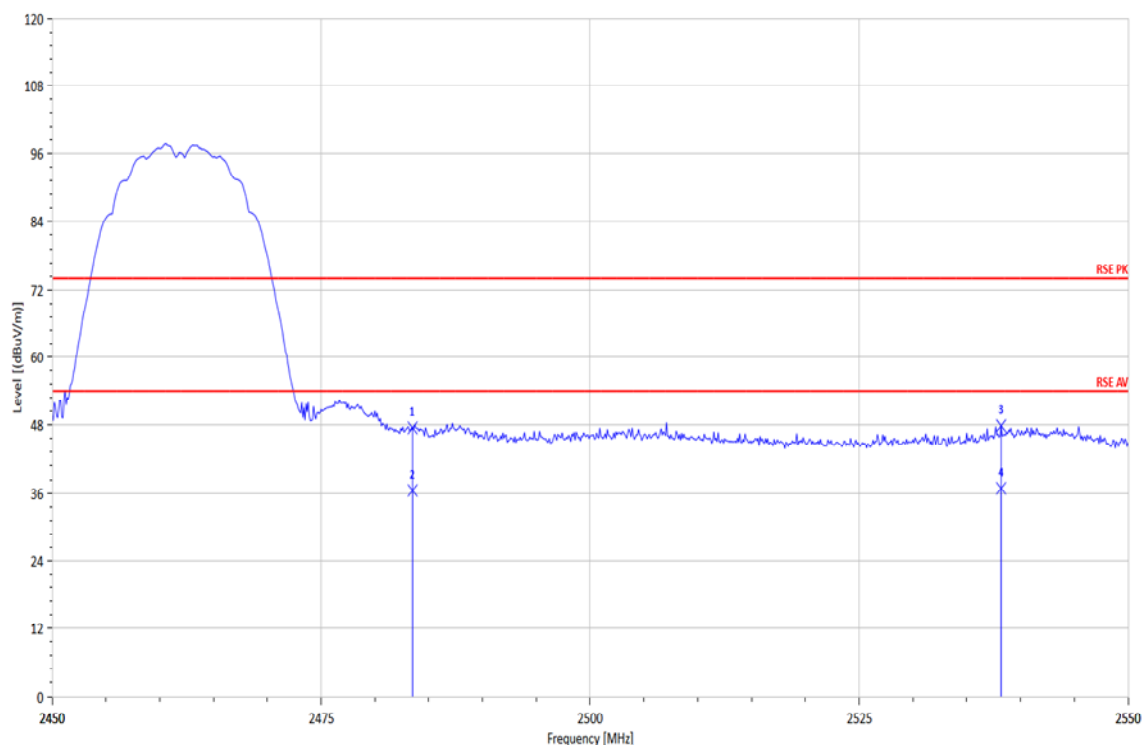
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Operation Mode : 802.11b Test Date : 2017/8/8
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	46.36	1.16	47.52	74	-26.48
2483.50	E	Average	35.33	1.16	36.49	54	-17.51
2538.20	S	Peak	46.38	1.51	47.89	74	-26.11
2538.20	S	Average	35.35	1.51	36.86	54	-17.14

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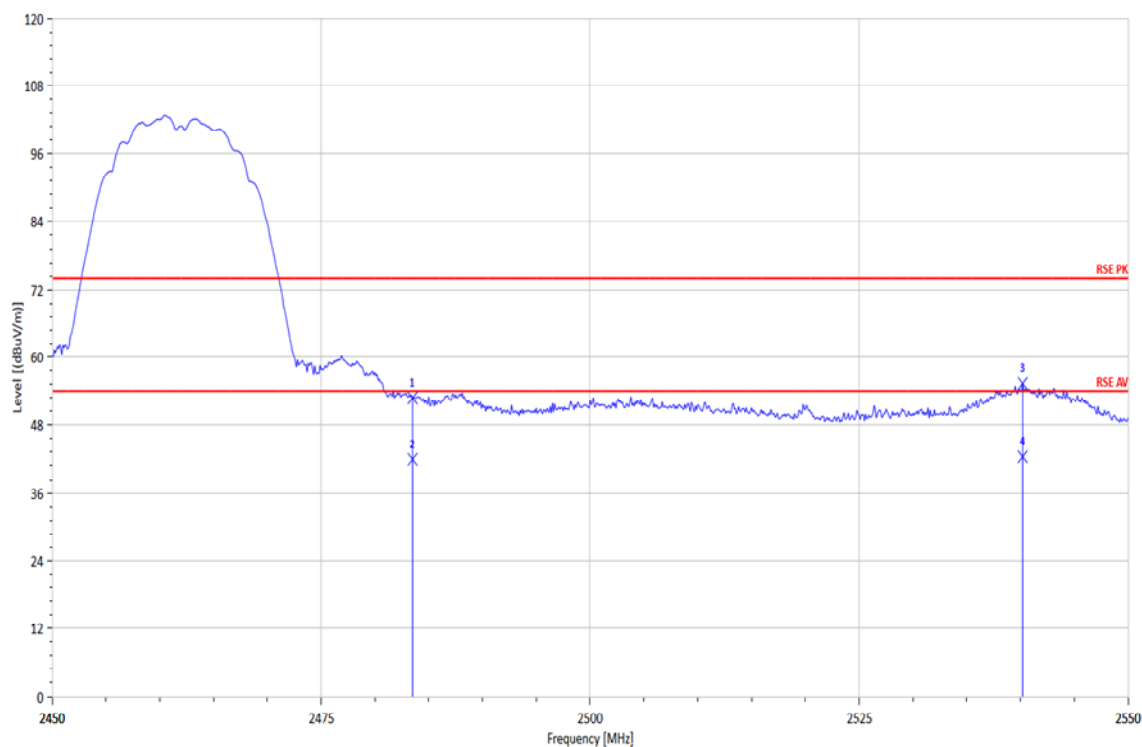
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Operation Mode : 802.11b Test Date : 2017/8/8
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	E	Peak	51.61	1.16	52.77	74	-21.23
2483.50	E	Average	40.78	1.16	41.94	54	-12.06
2540.20	S	Peak	53.83	1.52	55.35	74	-18.65
2540.20	S	Average	40.87	1.52	42.39	54	-11.61

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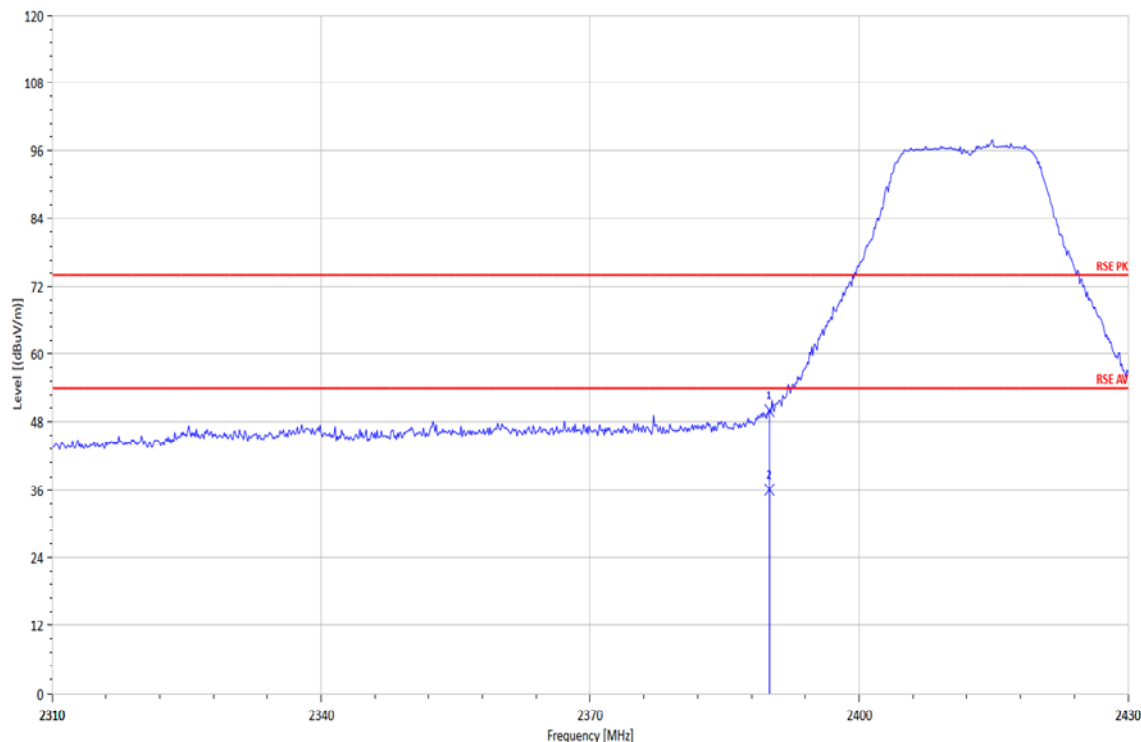
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Radiated Band Edge Measurement Result (802.11g)

Operation Mode :	802.11g	Test Date :	2017/8/8
Fundamental Frequency :	2412 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	BE Ch Low	Test Engineer :	Enzo
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Vertical



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	E	Peak	49.08	0.92	50.01	74	-23.99
2390.00	E	Average	35.14	0.92	36.06	54	-17.94

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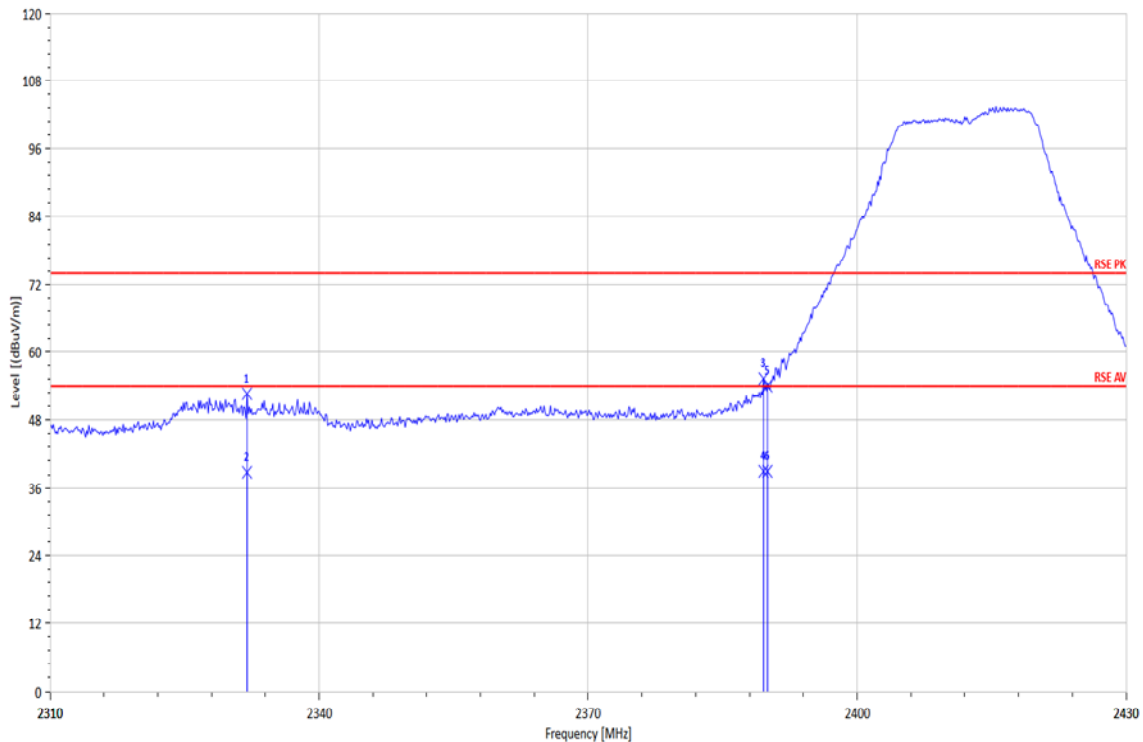
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Operation Mode : 802.11g Test Date : 2017/8/8
Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE Ch Low Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2331.96	S	Peak	51.96	0.69	52.64	74	-21.36
2331.96	S	Average	38.14	0.69	38.83	54	-15.17
2389.56	S	Peak	54.38	0.92	55.29	74	-18.71
2389.56	S	Average	38.08	0.92	39.00	54	-15.00
2390.00	E	Peak	53.11	0.92	54.03	74	-19.97
2390.00	E	Average	38.07	0.92	38.99	54	-15.01

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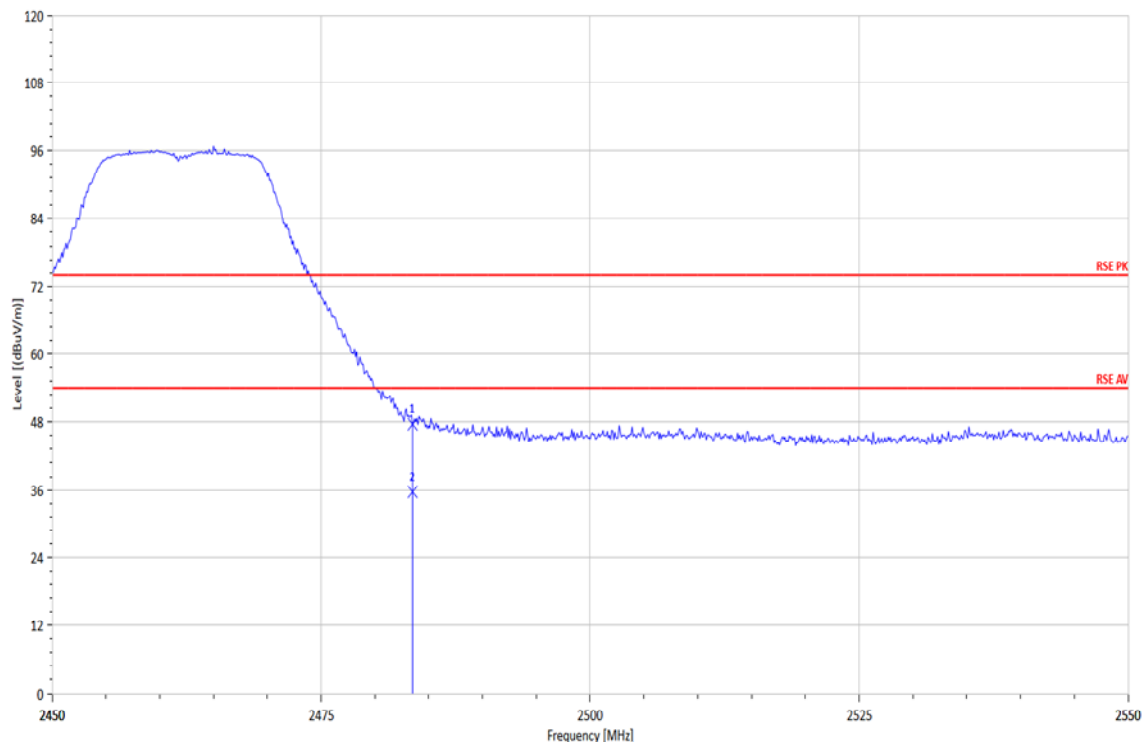
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Operation Mode : 802.11g Test Date : 2017/8/8
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	46.47	1.16	47.63	74	-26.37
2483.50	E	Average	34.51	1.16	35.67	54	-18.33

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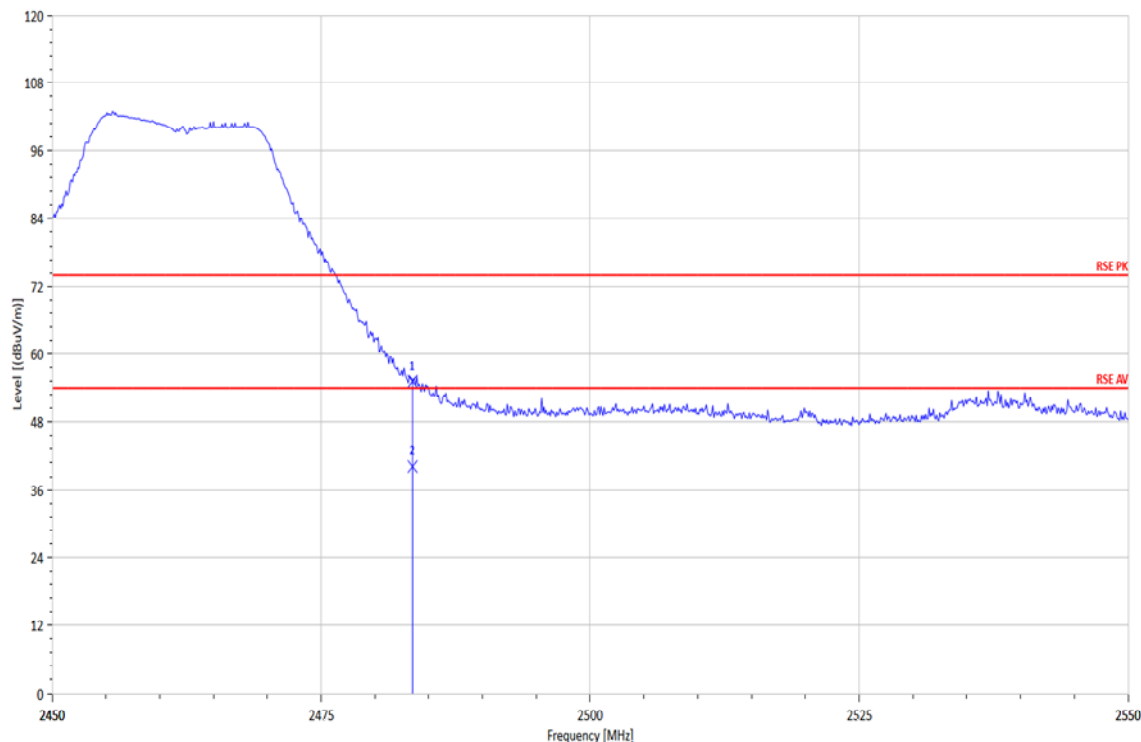
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Operation Mode : 802.11g Test Date : 2017/8/8
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2483.50	E	Peak	54.04	1.16	55.20	74	-18.80
2483.50	E	Average	39.01	1.16	40.17	54	-13.83

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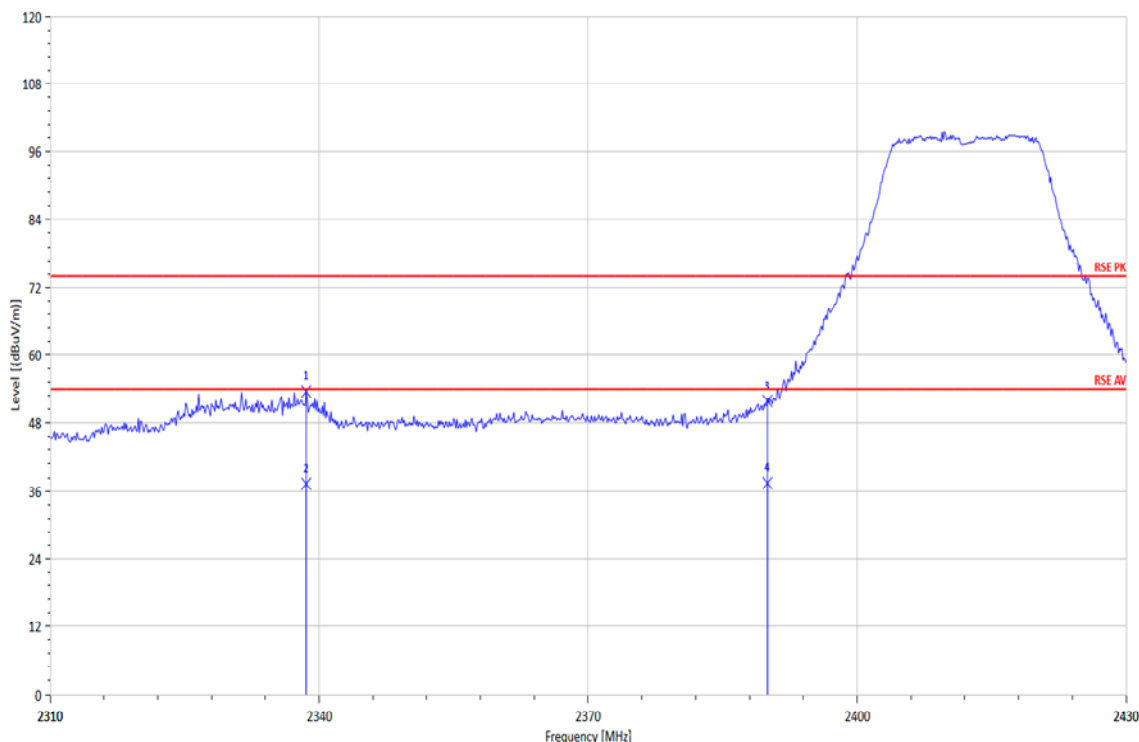
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Radiated Band Edge Measurement Result (802.11_HT20)

Operation Mode : 802.11n20 Test Date : 2017/8/8
Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE Ch Low Test Engineer : Enzo
EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2338.56	S	Peak	52.87	0.72	53.59	74	-20.41
2338.56	S	Average	36.61	0.72	37.33	54	-16.67
2390.00	E	Peak	50.98	0.92	51.90	74	-22.10
2390.00	E	Average	36.52	0.92	37.44	54	-16.56

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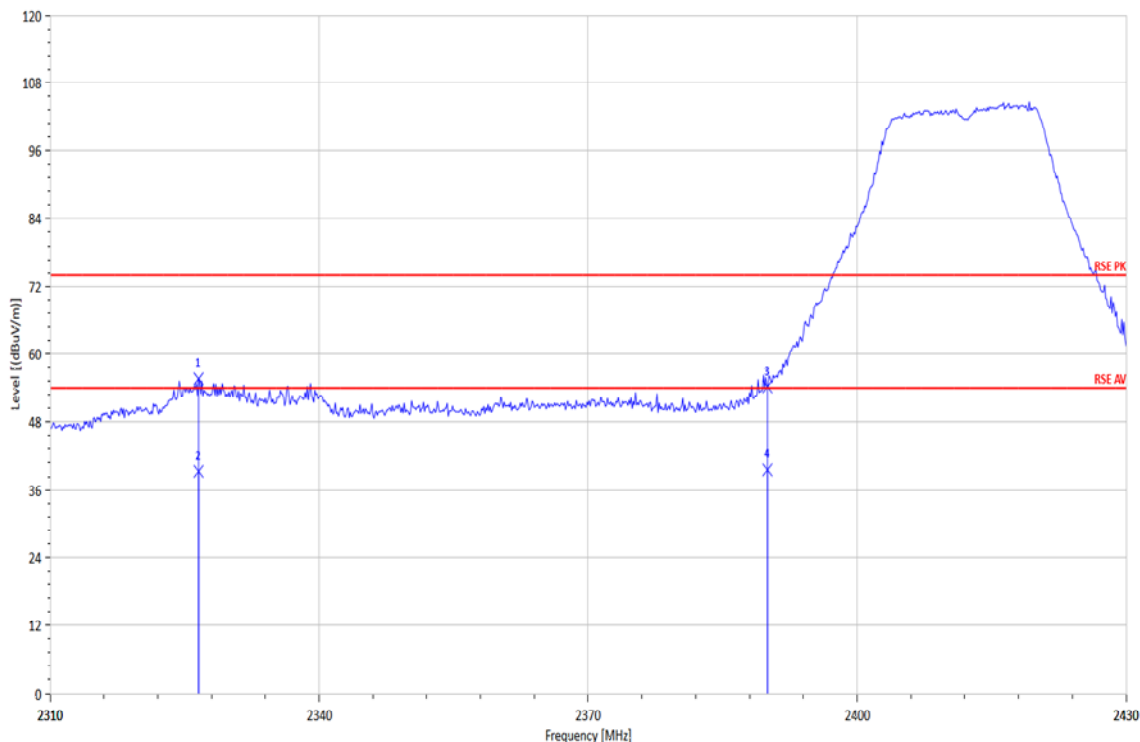
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Operation Mode : 802.11n20 Test Date : 2017/8/8
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch Low Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2326.56	S	Peak	54.97	0.66	55.64	74	-18.36
2326.56	S	Average	38.67	0.66	39.33	54	-14.67
2390.00	E	Peak	53.31	0.92	54.23	74	-19.77
2390.00	E	Average	38.68	0.92	39.60	54	-14.40

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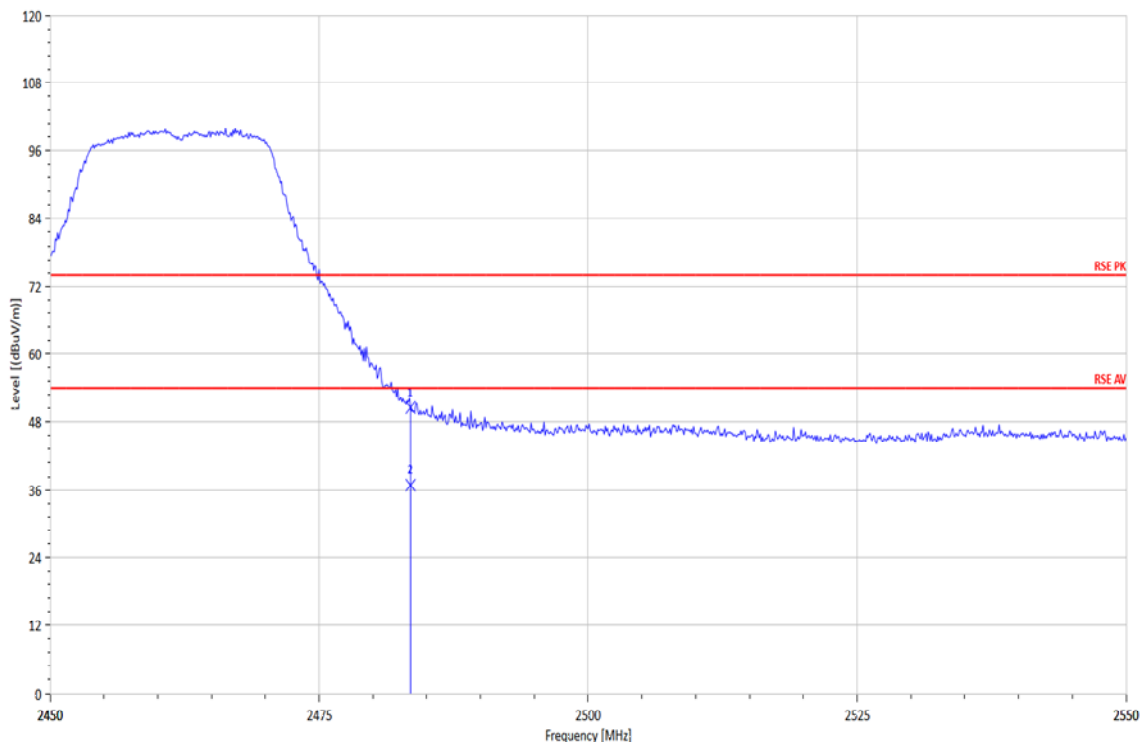
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Operation Mode : 802.11n20 Test Date : 2017/8/8
Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE Ch High Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	49.39	1.16	50.55	74	-23.45
2483.50	E	Average	35.73	1.16	36.89	54	-17.11

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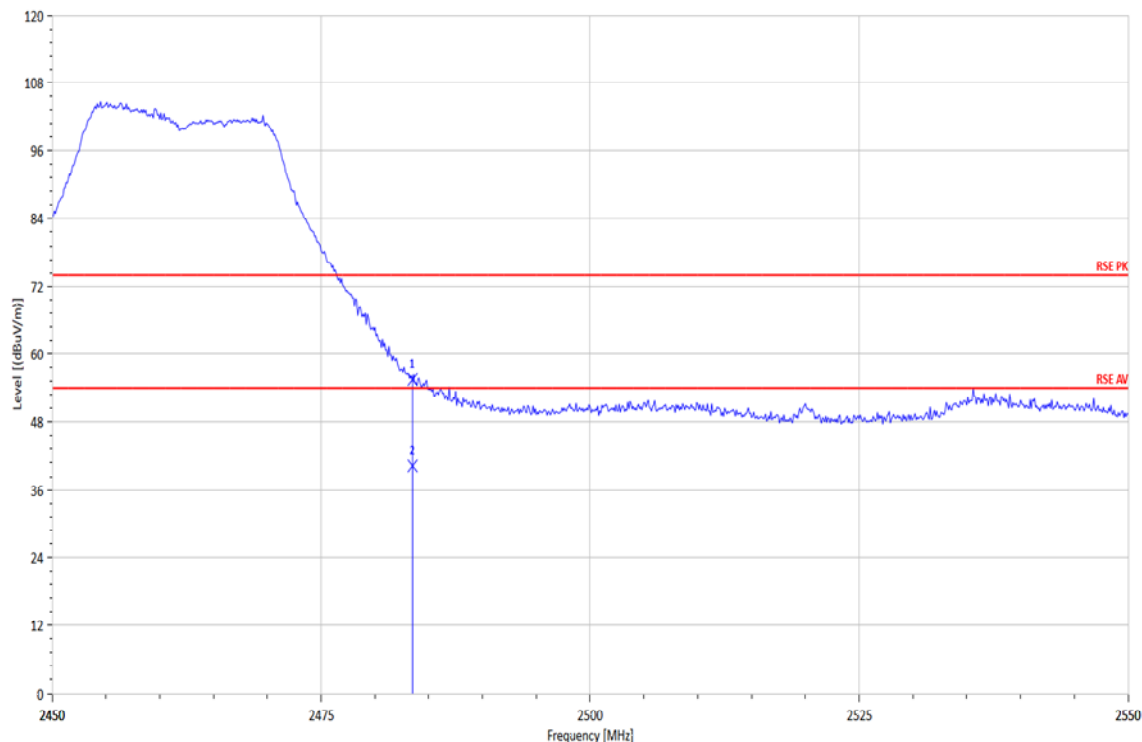
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Operation Mode : 802.11n20 Test Date : 2017/8/8
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	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
2483.50	E	Peak	54.36	1.16	55.52	74	-18.48
2483.50	E	Average	39.13	1.16	40.29	54	-13.71

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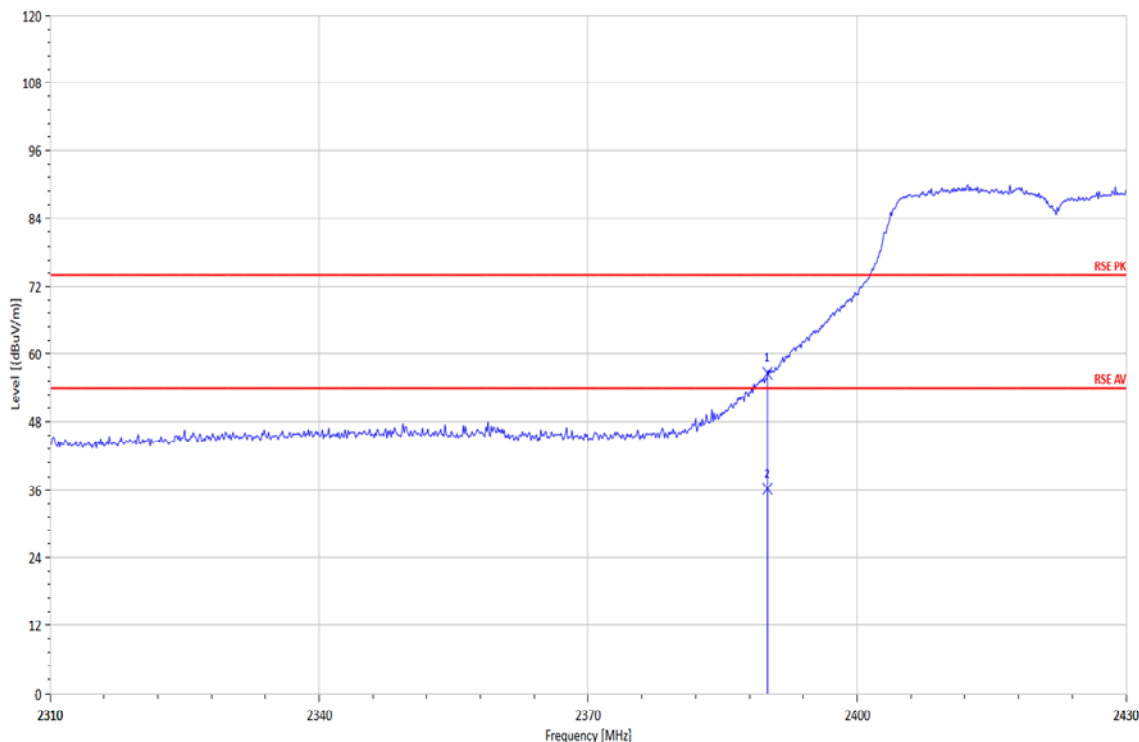
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Radiated Band Edge Measurement Result (802.11_HT40)

Operation Mode : 802.11n40 Test Date : 2017/8/8
 Fundamental Frequency : 2422 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch Low Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2390.00	E	Peak	55.68	0.92	56.60	74	-17.40
2390.00	E	Average	35.33	0.92	36.25	54	-17.75

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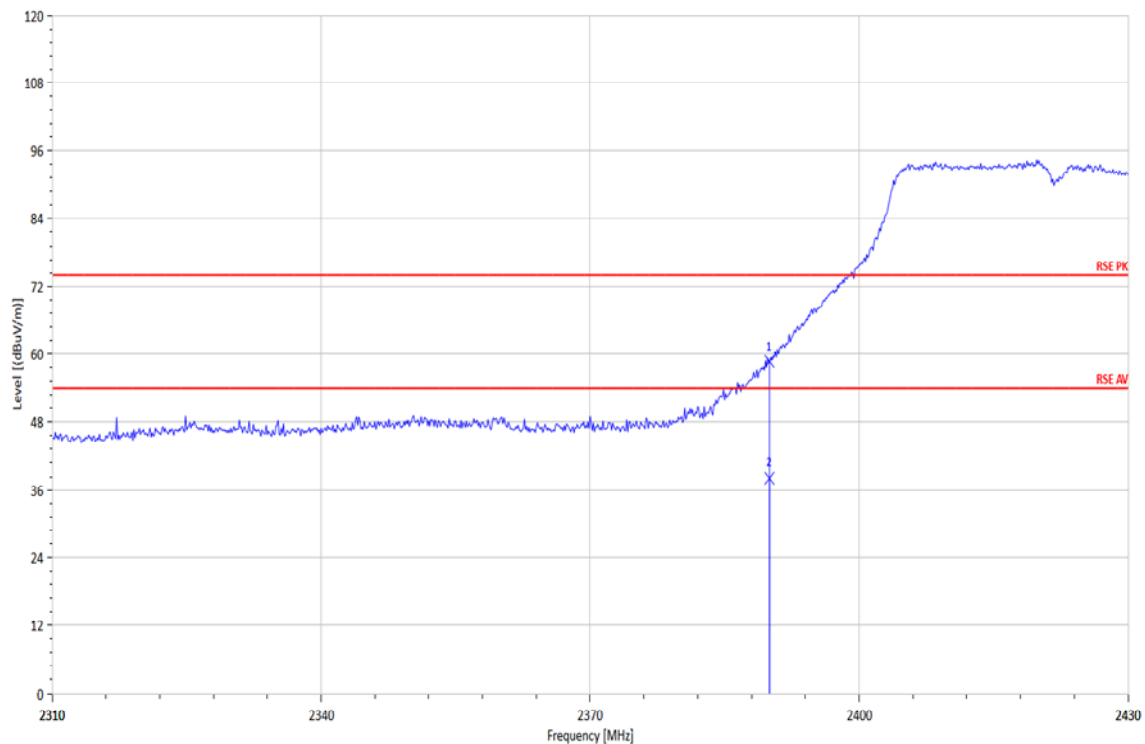
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Operation Mode : 802.11n40 Test Date : 2017/8/8
Fundamental Frequency : 2422 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE Ch Low Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2390.00	E	Peak	57.74	0.92	58.66	74	-15.34
2390.00	E	Average	37.21	0.92	38.13	54	-15.87

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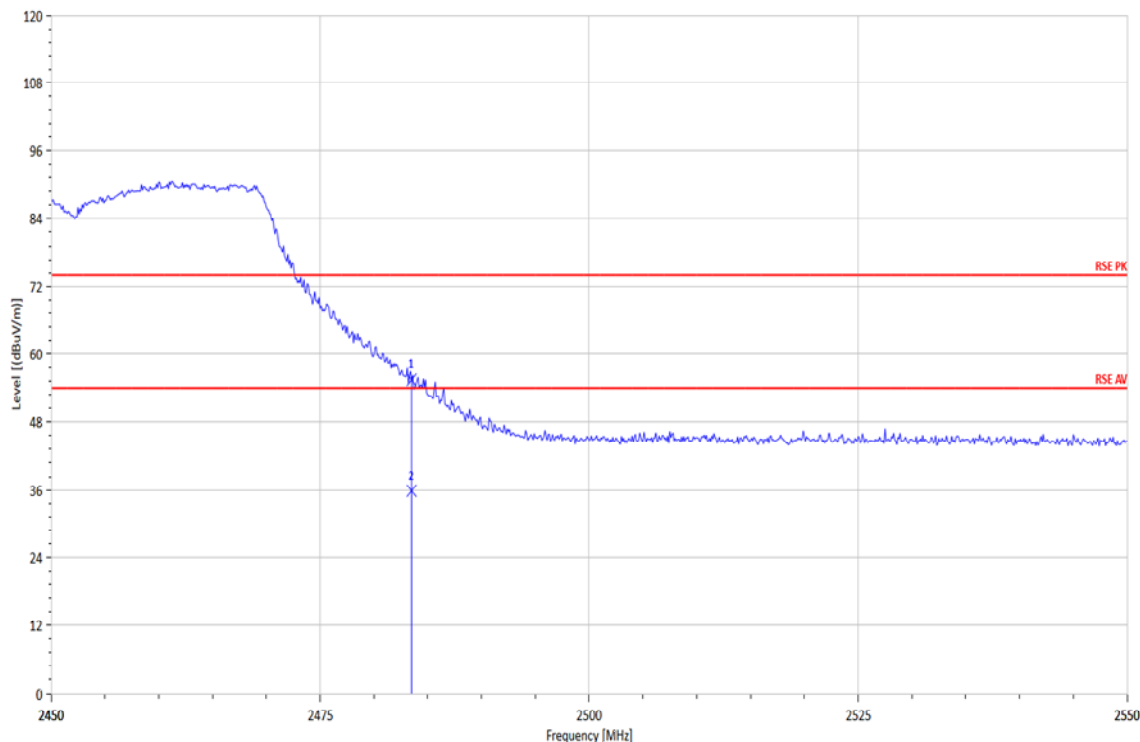
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Operation Mode : 802.11n40 Test Date : 2017/8/8
Fundamental Frequency : 2452 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : BE Ch High Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	54.31	1.16	55.47	74	-18.53
2483.50	E	Average	34.71	1.16	35.87	54	-18.13

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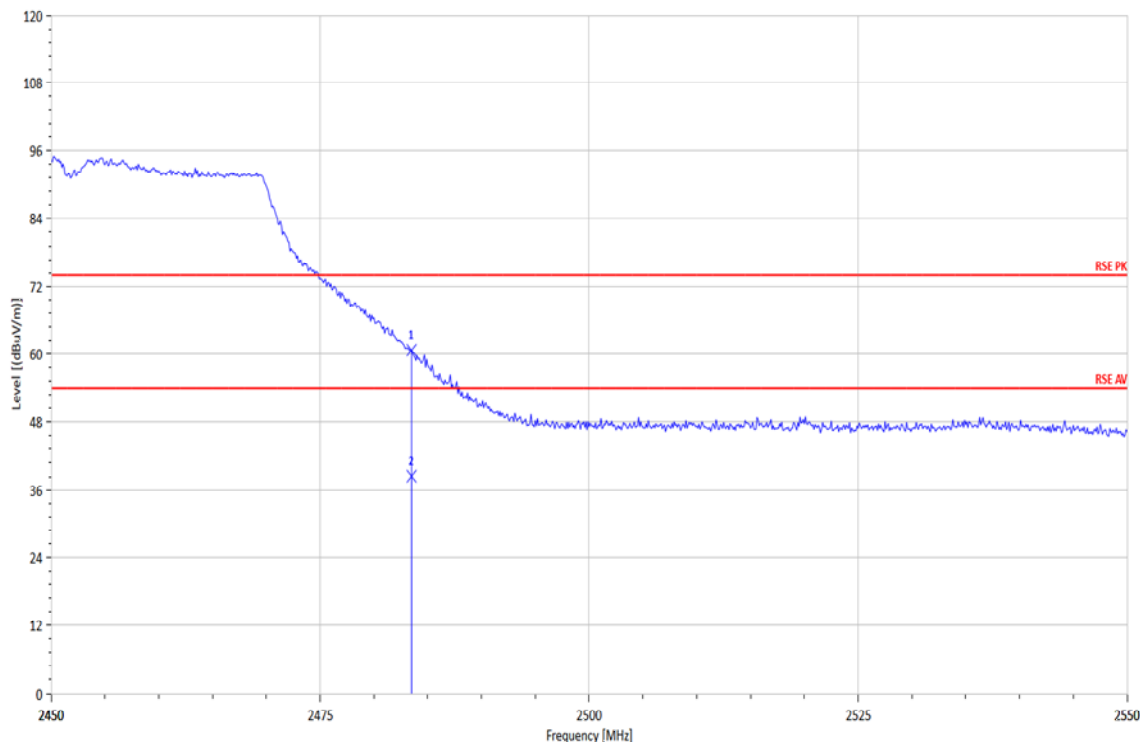
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Operation Mode : 802.11n40 Test Date : 2017/8/8
 Fundamental Frequency : 2452 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : BE Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
2483.50	E	Peak	59.52	1.16	60.68	74	-13.32
2483.50	E	Average	37.33	1.16	38.49	54	-15.51

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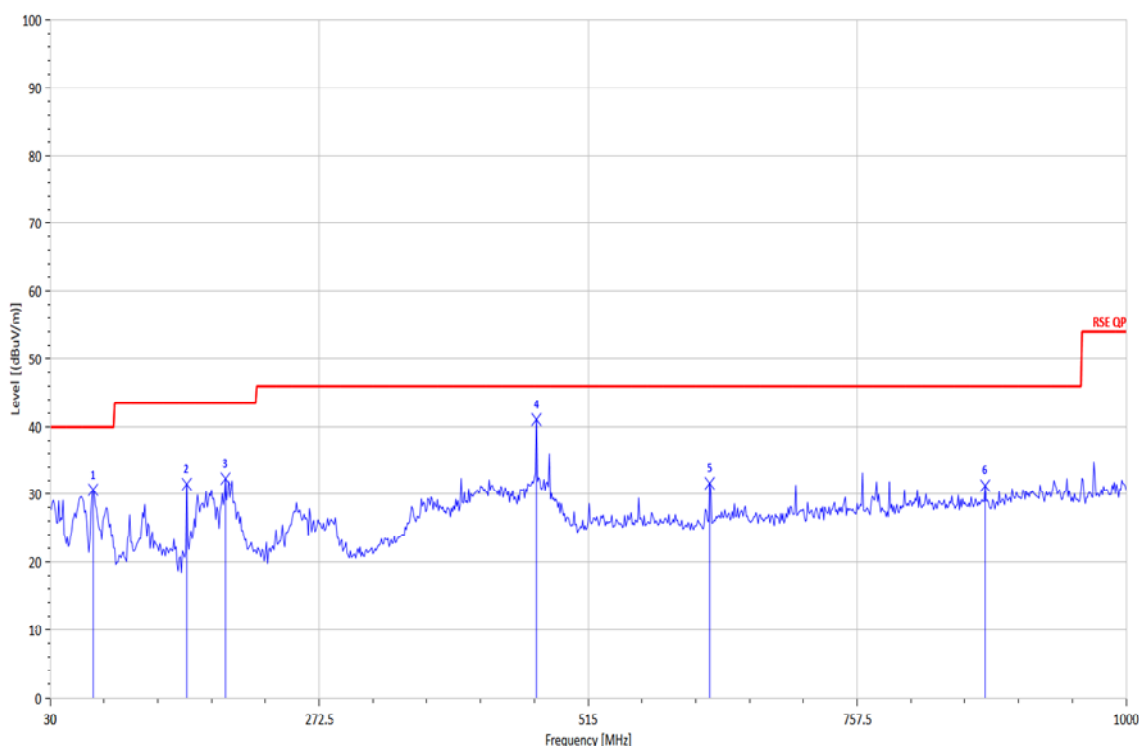
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Below 1GHz Worst-Case Data:

Radiated Spurious Emission Measurement Result (802.11 g)

Operation Mode : 802.11g Test Date : 2018/1/26
Fundamental Frequency : 2412 MHz Temp. / Humi. : 23.5deg_C/50RH
Operation Band : TX CH LOW Test Engineer : Ashton
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
68.80	S	Peak	52.59	-21.95	30.64	40	-9.36
153.19	S	Peak	48.38	-16.88	31.50	43.5	-12.00
188.11	S	Peak	50.75	-18.42	32.33	43.5	-11.17
468.44	S	Peak	48.75	-7.66	41.09	46	-4.91
624.61	S	Peak	37.74	-6.11	31.63	46	-14.37
872.93	S	Peak	33.95	-2.68	31.27	46	-14.73

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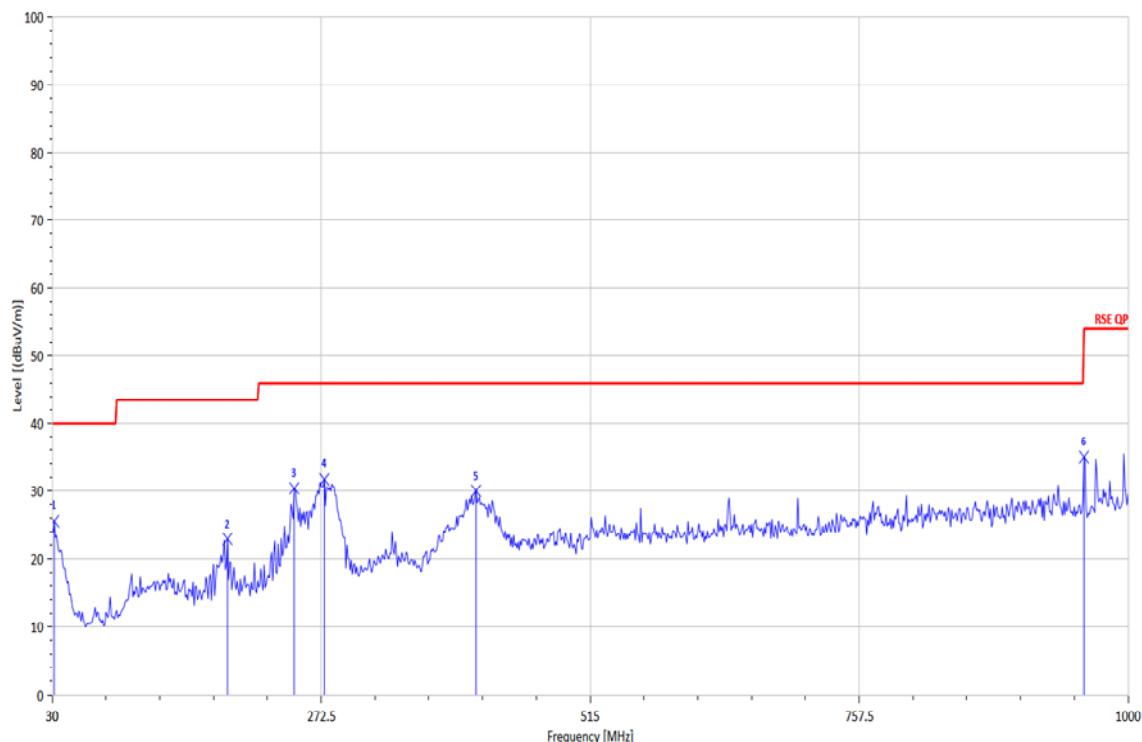
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Operation Mode :	802.11g	Test Date :	2018/1/26
Fundamental Frequency :	2412 MHz	Temp. / Humi. :	23.5deg_C/50RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
31.94	S	Peak	33.83	-8.23	25.60	40	-14.40
188.11	S	Peak	41.37	-18.42	22.95	43.5	-20.55
248.25	S	Peak	45.12	-14.70	30.42	46	-15.58
275.41	S	Peak	45.47	-13.73	31.74	46	-14.26
412.18	S	Peak	39.41	-9.38	30.03	46	-15.97
960.23	S	Peak	37.20	-2.23	34.97	54	-19.03

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Operation Mode : 802.11g

Test Date : 2018/1/26

Fundamental Frequency : 2437 MHz

Temp. / Humi. : 23.5deg_C/50RH

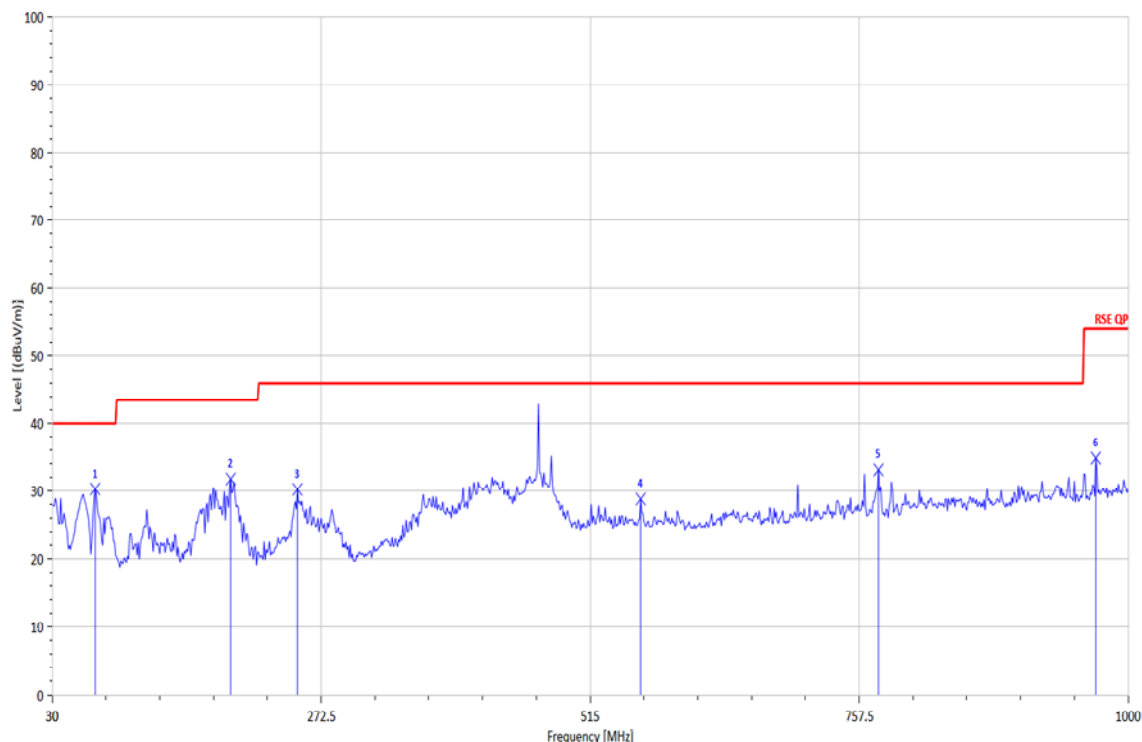
Operation Band : TX CH MID

Test Engineer : Ashton

Measurement Antenna

EUT Pol. : E2

Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
68.80	S	Peak	52.27	-21.95	30.32	40	-9.68
191.02	S	Peak	50.00	-18.21	31.79	43.5	-11.71
251.16	S	Peak	44.73	-14.48	30.25	46	-15.75
560.59	S	Peak	35.47	-6.65	28.82	46	-17.18
774.96	S	Peak	37.88	-4.75	33.13	46	-12.87
970.90	S	Peak	36.40	-1.57	34.83	54	-19.17

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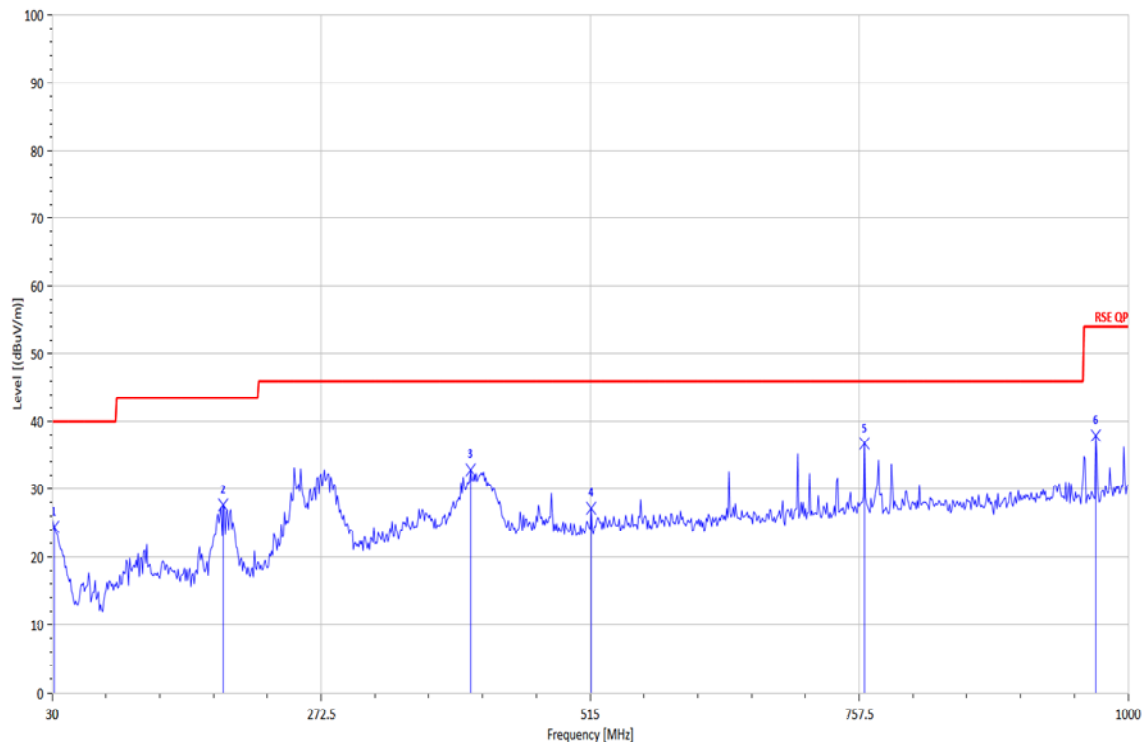
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Operation Mode :	802.11g	Test Date :	2018/1/26
Fundamental Frequency :	2437 MHz	Temp. / Humi. :	23.5deg_C/50RH
Operation Band :	TX CH MID	Test Engineer :	Ashton
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
31.94	S	Peak	32.69	-8.23	24.46	40	-15.54
184.23	S	Peak	46.12	-18.46	27.66	43.5	-15.84
407.33	S	Peak	41.99	-9.16	32.83	46	-13.17
515.97	S	Peak	34.85	-7.67	27.18	46	-18.82
762.35	S	Peak	40.88	-4.17	36.71	46	-9.29
970.90	S	Peak	39.48	-1.57	37.91	54	-16.09

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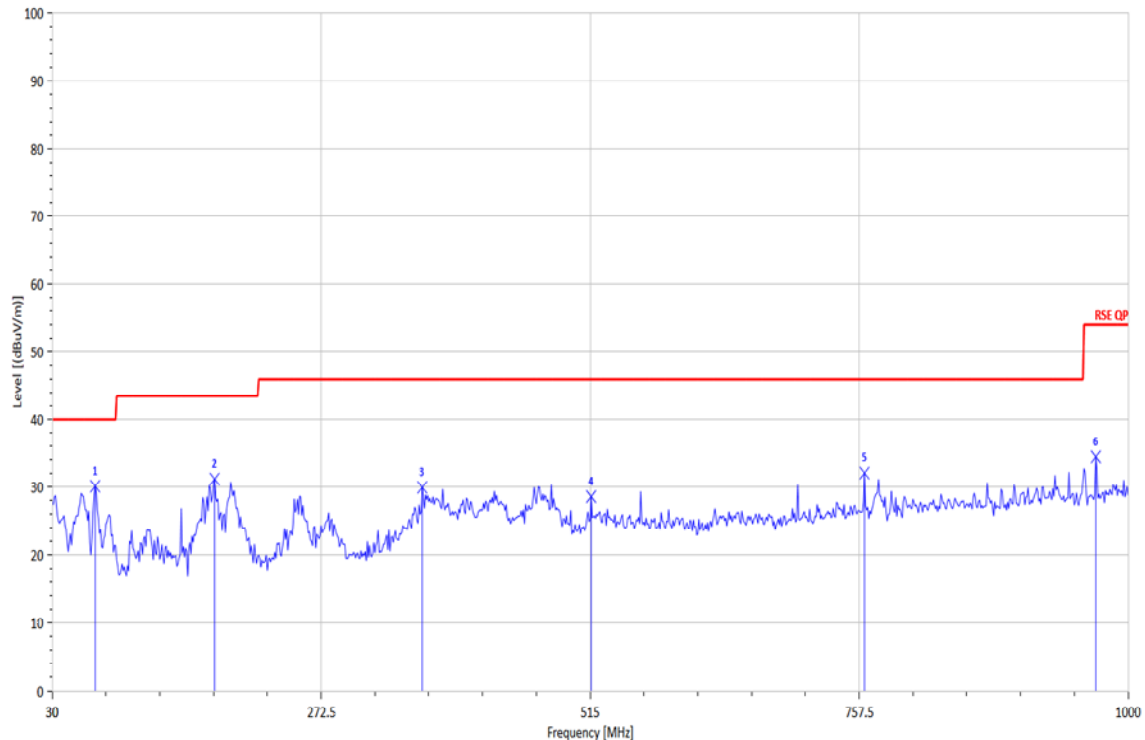
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Operation Mode : 802.11g Test Date : 2018/1/26
Fundamental Frequency : 2462 MHz Temp. / Humi. : 23.5deg_C/50RH
Operation Band : TX CH HIGH Test Engineer : Ashton
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
68.80	S	Peak	52.07	-21.95	30.12	40	-9.88
176.47	S	Peak	49.71	-18.52	31.19	43.5	-12.31
363.68	S	Peak	40.91	-10.95	29.96	46	-16.04
515.97	S	Peak	36.26	-7.67	28.59	46	-17.41
762.35	S	Peak	36.25	-4.17	32.08	46	-13.92
970.90	S	Peak	36.01	-1.57	34.44	54	-19.56

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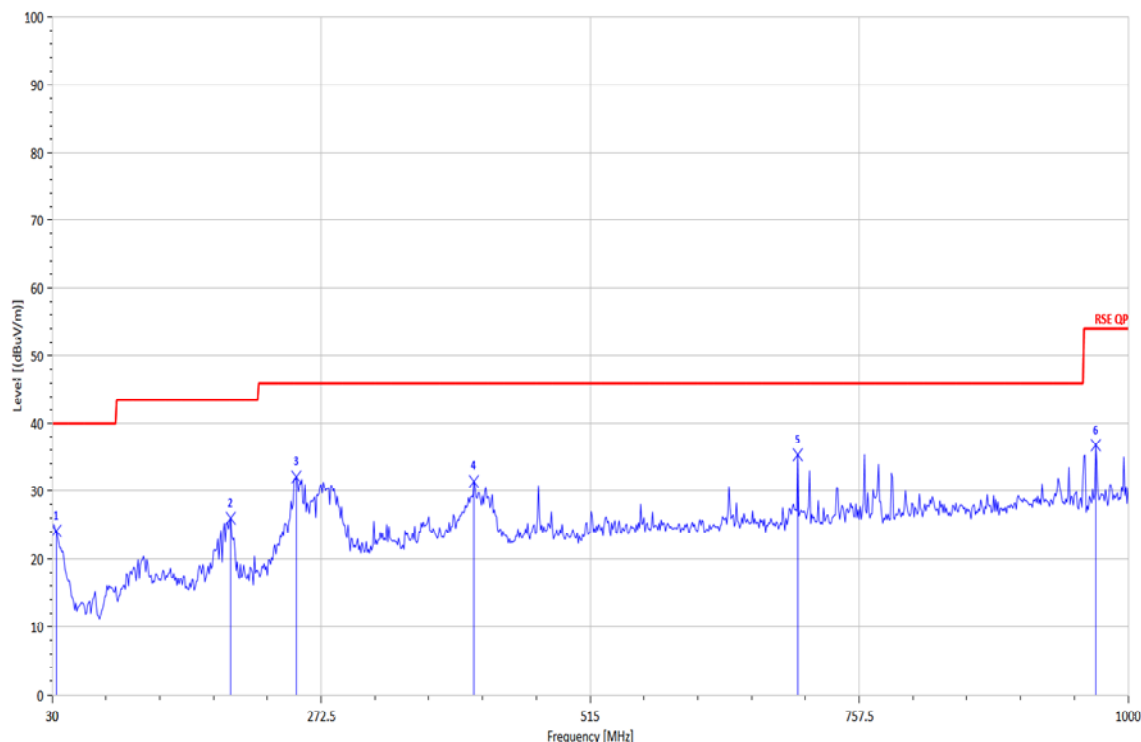
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Operation Mode : 802.11g
Fundamental Frequency : 2462 MHz
Operation Band : TX CH HIGH

Test Date : 2018/1/26
Temp. / Humi. : 23.5deg_C/50RH
Test Engineer : Ashton
Measurement Antenna

EUT Pol. : E2

Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
33.88	S	Peak	33.43	-9.27	24.16	40	-15.84
191.02	S	Peak	44.24	-18.21	26.03	43.5	-17.47
250.19	S	Peak	46.68	-14.58	32.10	46	-13.90
410.24	S	Peak	40.61	-9.17	31.44	46	-14.56
702.21	S	Peak	40.61	-5.30	35.31	46	-10.69
970.90	S	Peak	38.32	-1.57	36.75	54	-17.25

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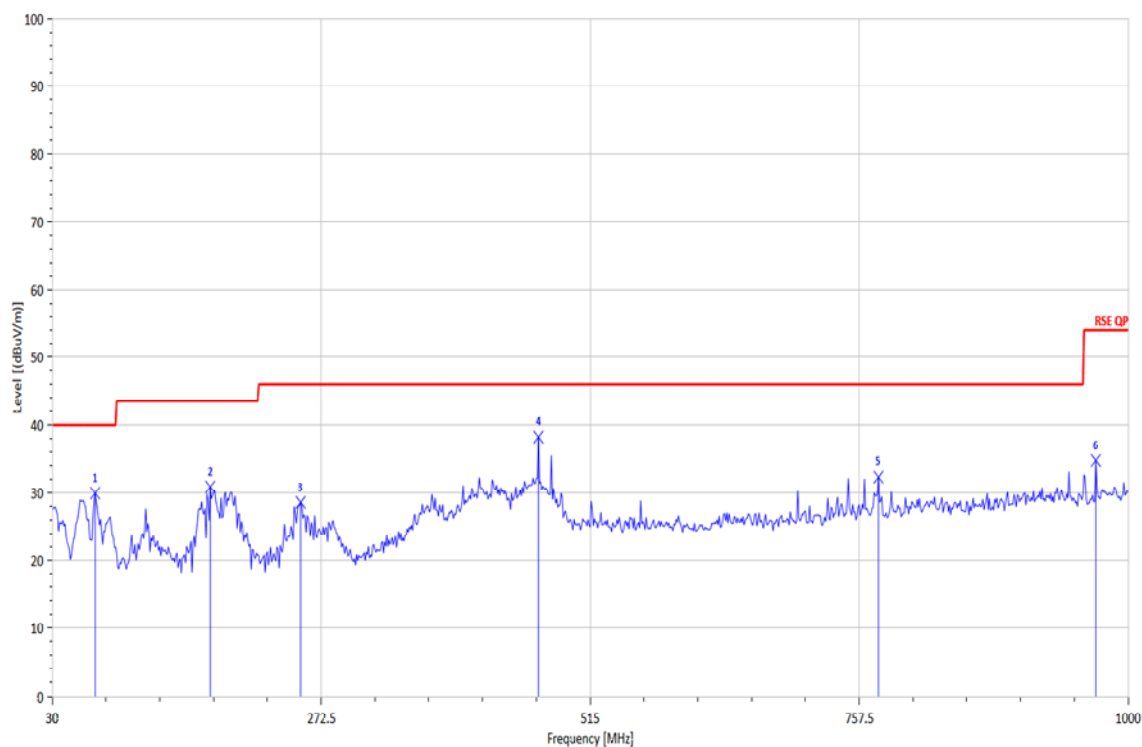
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Radiated Spurious Emission Measurement Result (802.11n_40M) below 1 GHz

Operation Mode :	802.11n40	Test Date :	2018/1/26
Fundamental Frequency :	2422 MHz	Temp. / Humi. :	23.5deg_C/50RH
Operation Band :	TX CH LOW	Test Engineer :	Ashton
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Vertical



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
68.80	S	Peak	51.95	-21.95	30.00	40	-10.00
172.59	S	Peak	49.28	-18.37	30.91	43.5	-12.59
254.07	S	Peak	42.95	-14.33	28.62	46	-17.38
468.44	S	Peak	45.91	-7.66	38.25	46	-7.75
774.96	S	Peak	37.11	-4.75	32.36	46	-13.64
970.90	S	Peak	36.36	-1.57	34.79	54	-19.21

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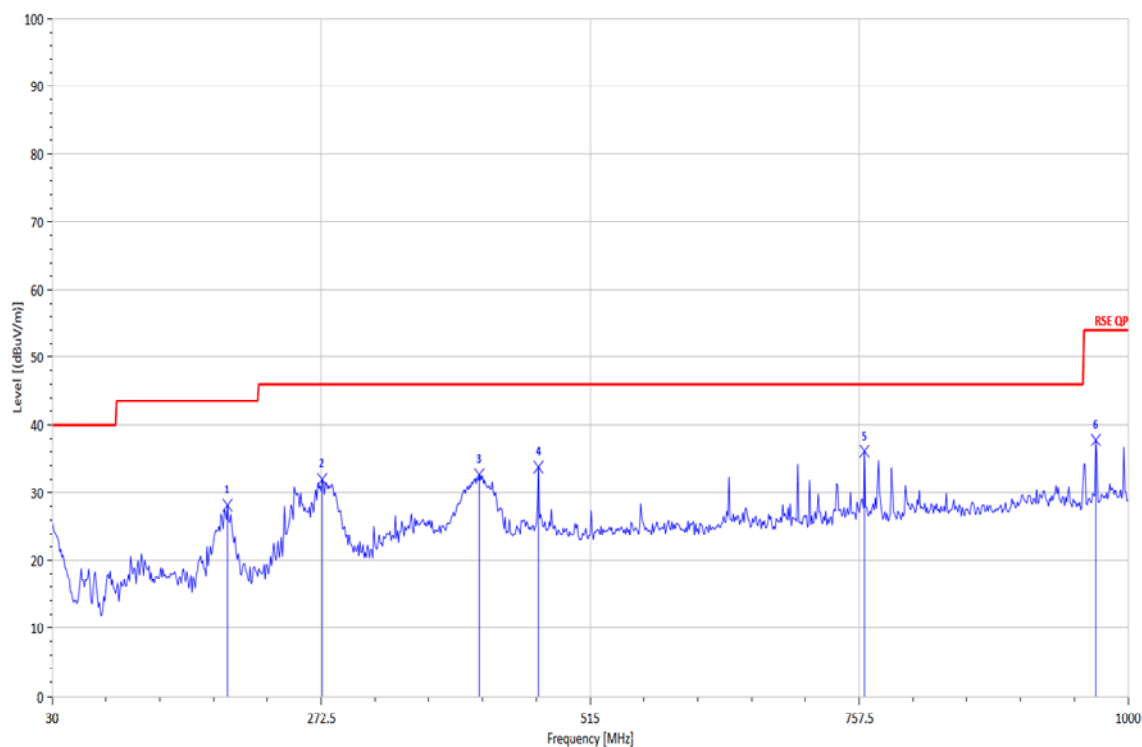
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Operation Mode : 802.11n40 Test Date : 2018/1/26
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 23.5deg_C/50RH
 Operation Band : TX CH LOW Test Engineer : Ashton
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
188.11	S	Peak	46.62	-18.42	28.20	43.5	-15.30
273.47	S	Peak	45.85	-13.82	32.03	46	-13.97
415.09	S	Peak	41.84	-9.12	32.72	46	-13.28
468.44	S	Peak	41.48	-7.66	33.82	46	-12.18
762.35	S	Peak	40.28	-4.17	36.11	46	-9.89
970.90	S	Peak	39.39	-1.57	37.82	54	-16.18

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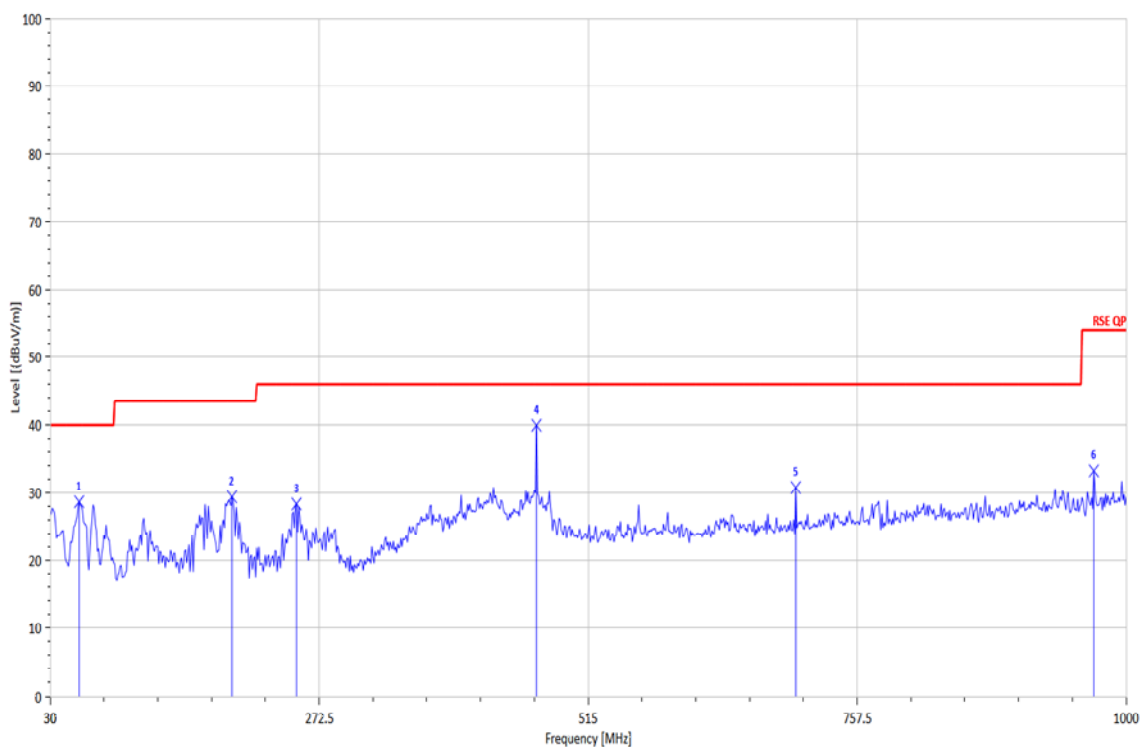
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Operation Mode : 802.11n40 Test Date : 2018/1/26
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 23.5deg_C/50RH
 Operation Band : TX CH MID Test Engineer : Ashton
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
56.19	S	Peak	50.30	-21.58	28.72	40	-11.28
193.93	S	Peak	47.39	-17.94	29.45	43.5	-14.05
252.13	S	Peak	42.85	-14.46	28.39	46	-17.61
468.44	S	Peak	47.62	-7.66	39.96	46	-6.04
702.21	S	Peak	36.11	-5.30	30.81	46	-15.19
970.90	S	Peak	34.84	-1.57	33.27	54	-20.73

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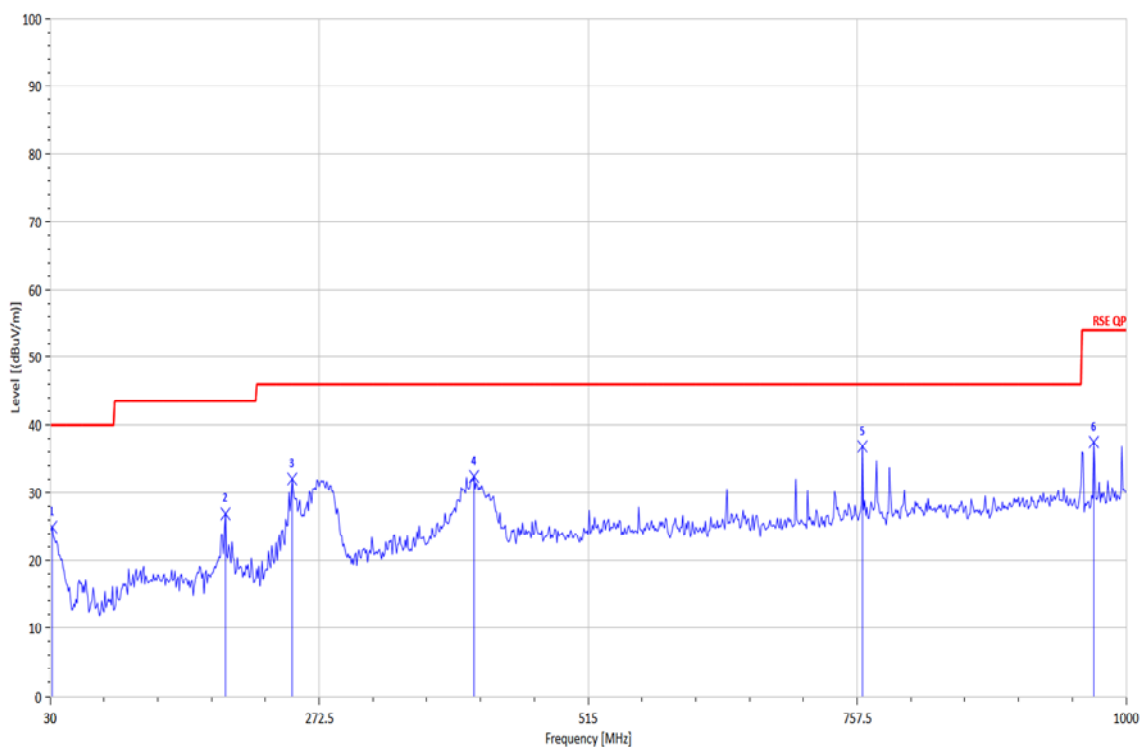
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 Fundamental Frequency : 2437 MHz Temp. / Humi. : 23.5deg_C/50RH
 Operation Band : TX CH MID Test Engineer : Ashton
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
31.94	S	Peak	33.26	-8.23	25.03	40	-14.97
188.11	S	Peak	45.38	-18.42	26.96	43.5	-16.54
248.25	S	Peak	46.81	-14.70	32.11	46	-13.89
412.18	S	Peak	41.85	-9.38	32.47	46	-13.53
762.35	S	Peak	41.02	-4.17	36.85	46	-9.15
970.90	S	Peak	39.07	-1.57	37.50	54	-16.50

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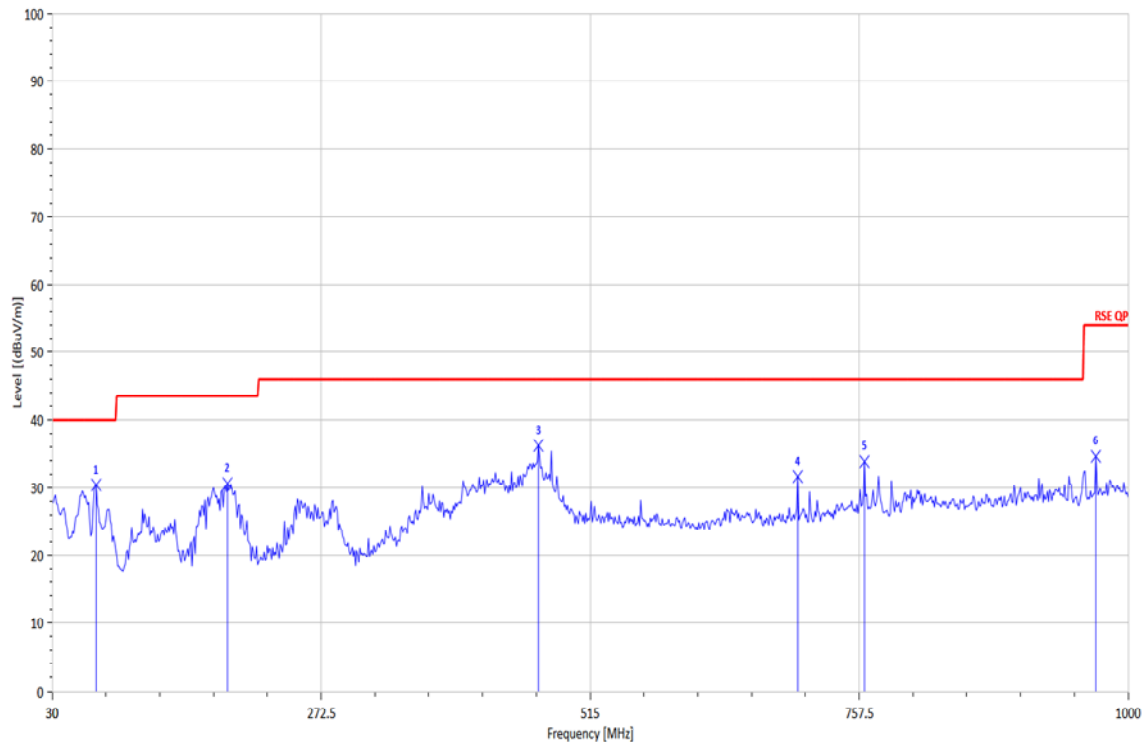
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Operation Mode : 802.11n40 Test Date : 2018/1/26
Fundamental Frequency : 2452 MHz Temp. / Humi. : 23.5deg_C/50RH
Operation Band : TX CH HIGH Test Engineer : Ashton
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	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
69.77	S	Peak	52.27	-21.79	30.48	40	-9.52
188.11	S	Peak	49.09	-18.42	30.67	43.5	-12.83
468.44	S	Peak	43.90	-7.66	36.24	46	-9.76
702.21	S	Peak	37.02	-5.30	31.72	46	-14.28
762.35	S	Peak	38.05	-4.17	33.88	46	-12.12
970.90	S	Peak	36.22	-1.57	34.65	54	-19.35

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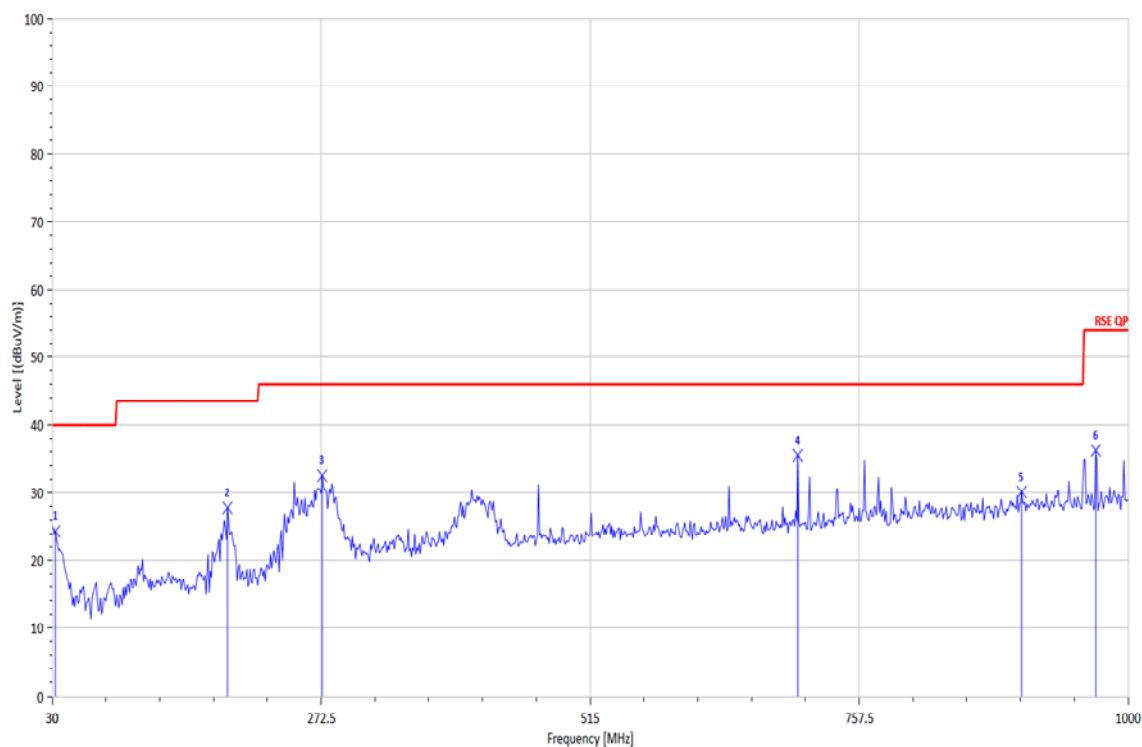
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Operation Mode : 802.11n40 Test Date : 2018/1/26
 Fundamental Frequency : 2452 MHz Temp. / Humi. : 23.5deg_C/50RH
 Operation Band : TX CH HIGH Test Engineer : Ashton
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
32.91	S	Peak	33.13	-8.74	24.39	40	-15.61
188.11	S	Peak	46.25	-18.42	27.83	43.5	-15.67
273.47	S	Peak	46.40	-13.82	32.58	46	-13.42
702.21	S	Peak	40.81	-5.30	35.51	46	-10.49
903.97	S	Peak	31.96	-1.80	30.16	46	-15.84
970.90	S	Peak	37.81	-1.57	36.24	54	-17.76

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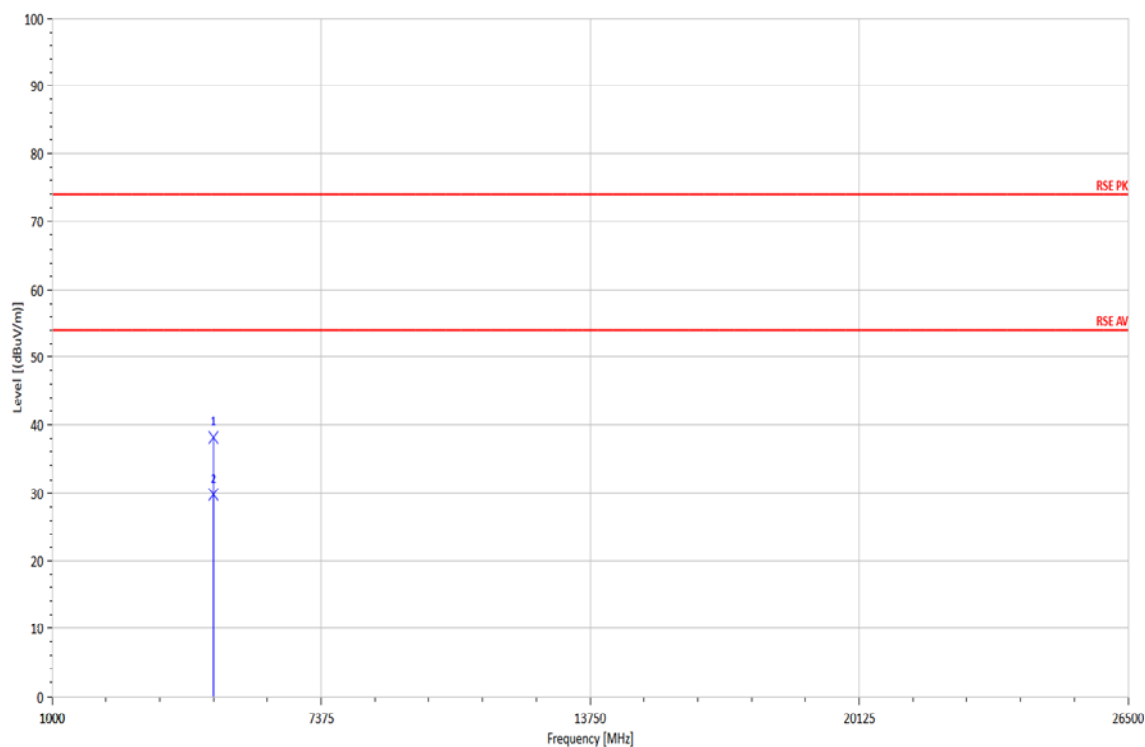
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Radiated Spurious Emission Measurement Result (802.11b) above 1GHz

Operation Mode :	802.11b	Test Date :	2017/8/9
Fundamental Frequency :	2412 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx Ch Low	Test Engineer :	Enzo
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Vertical



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4824.00	H	Peak	30.66	7.58	38.23	74	-35.77
4824.00	H	Average	22.22	7.58	29.80	54	-24.20

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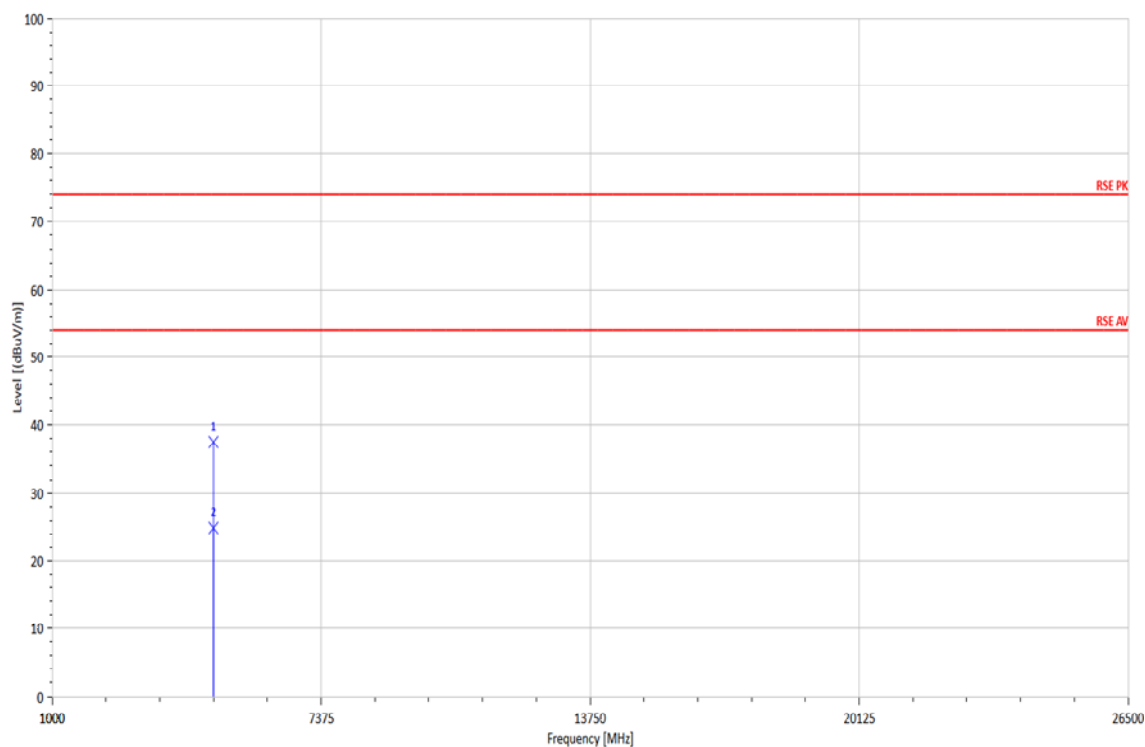
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Operation Mode :	802.11b	Test Date :	2017/8/9
Fundamental Frequency :	2412 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx Ch Low	Test Engineer :	Enzo
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4824.00	H	Peak	29.95	7.58	37.53	74	-36.47
4824.00	H	Average	17.35	7.58	24.93	54	-29.07

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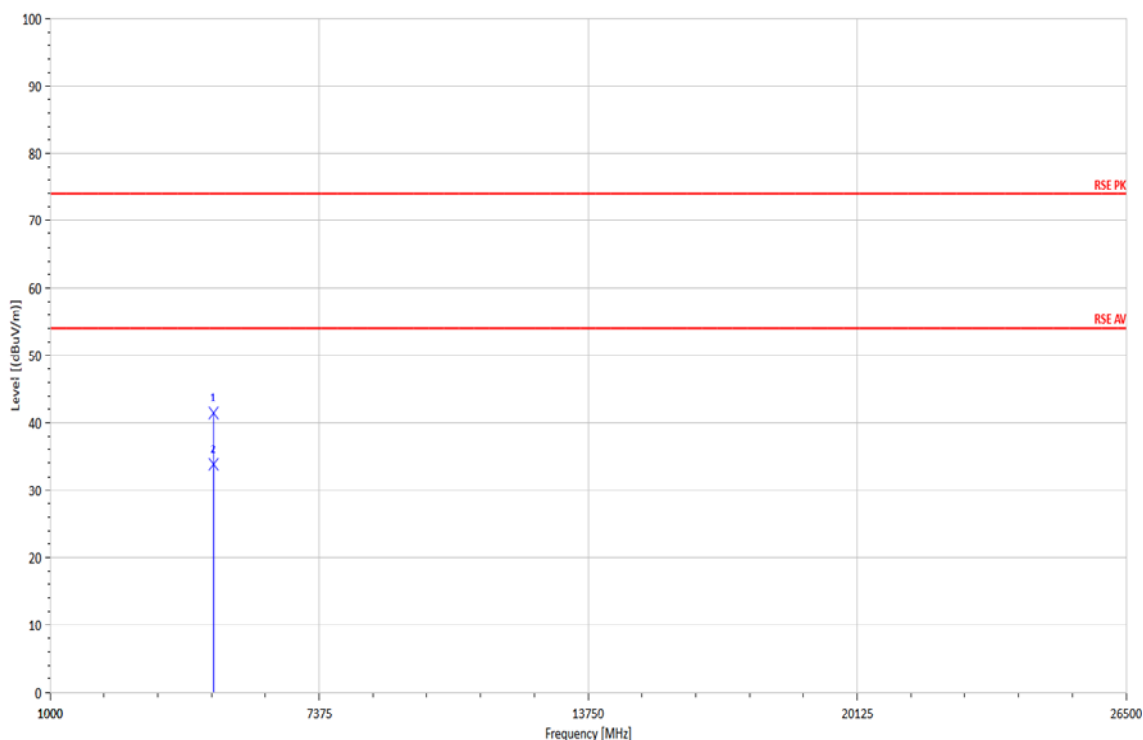
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Operation Mode : 802.11b Test Date : 2017/8/9
Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Mid Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	H	Peak	33.61	7.86	41.47	74	-32.53
4874.00	H	Average	25.94	7.91	33.85	54	-20.15

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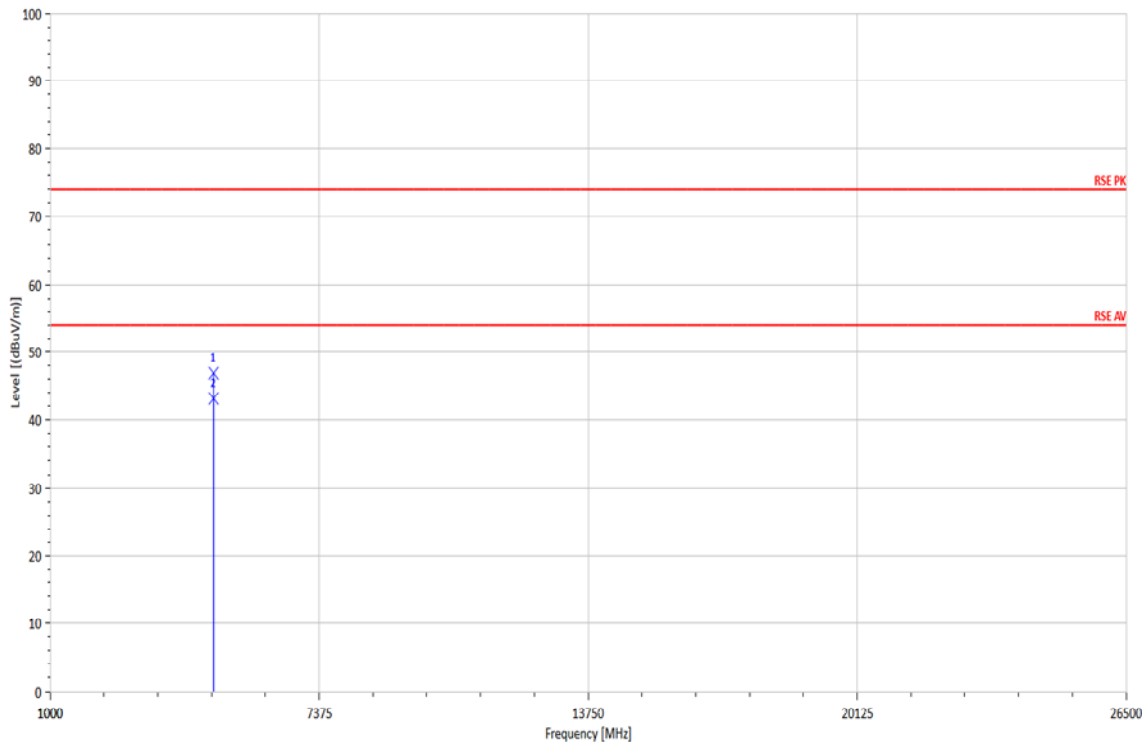
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Operation Mode : 802.11b Test Date : 2017/8/9
Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Mid Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	H	Peak	39.02	7.86	46.88	74	-27.12
4874.00	H	Average	35.25	7.91	43.16	54	-10.84

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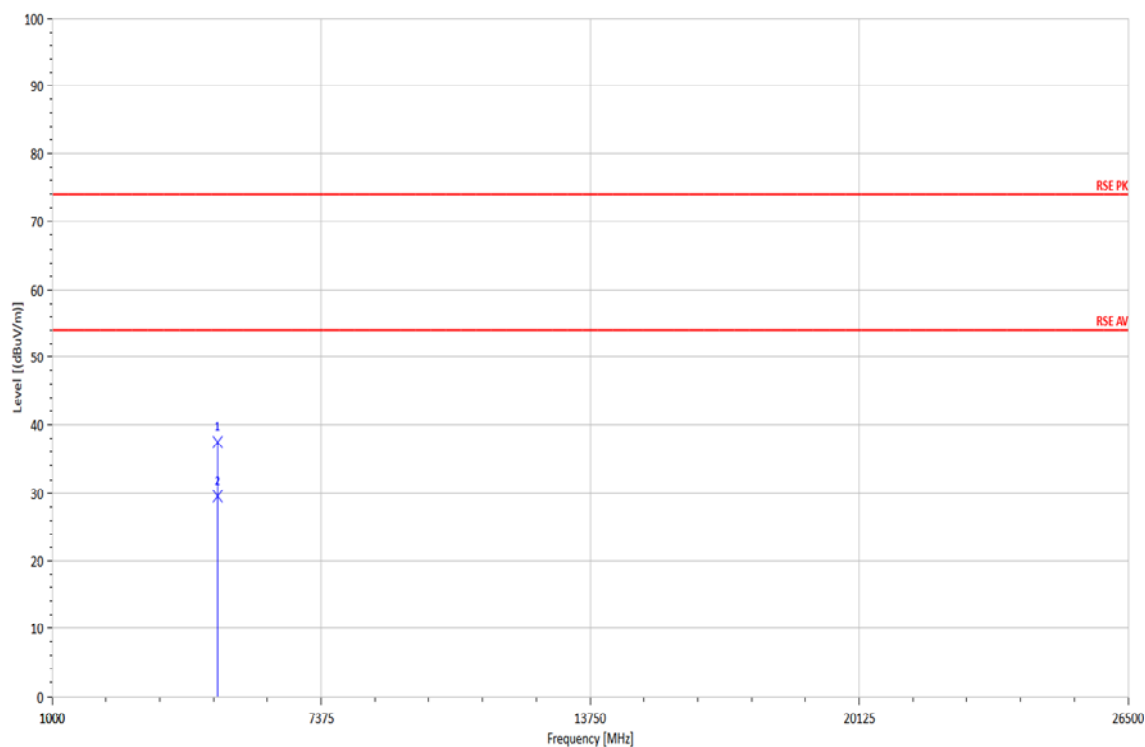
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Operation Mode : 802.11b Test Date : 2017/8/9
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4924.00	H	Peak	29.58	7.92	37.51	74	-36.49
4924.00	H	Average	21.61	7.92	29.53	54	-24.47

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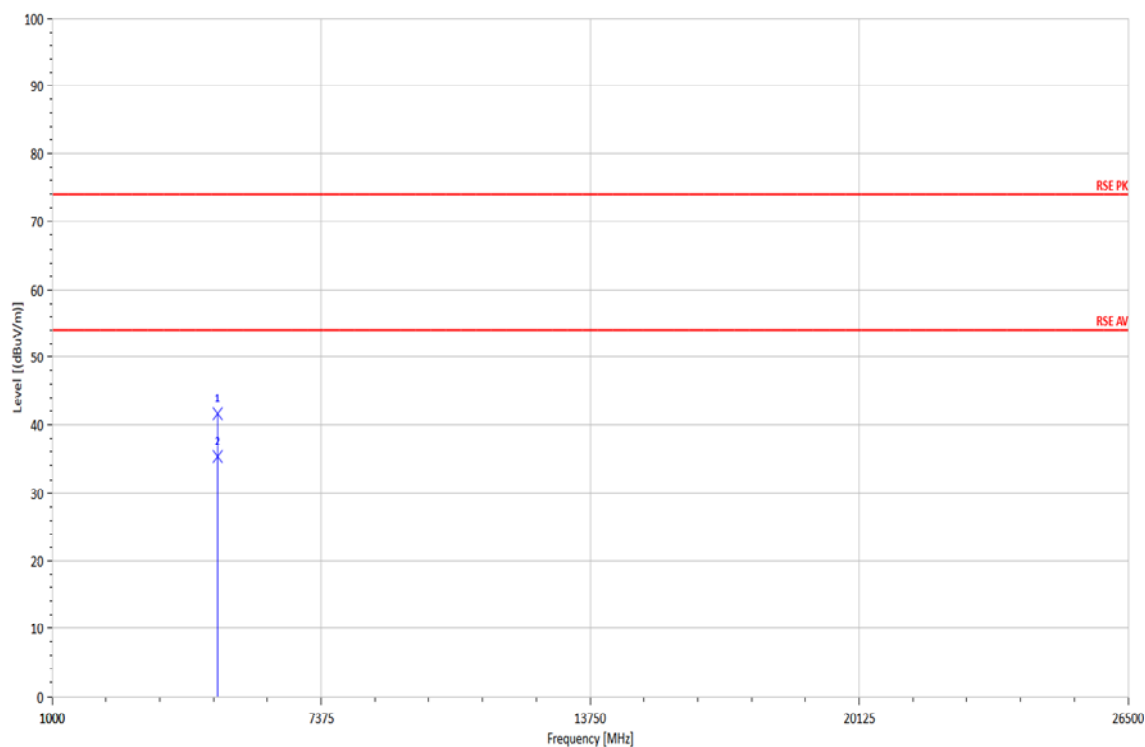
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Fundamental Frequency :	2462 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx Ch High	Test Engineer :	Enzo
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4924.00	H	Peak	33.64	8.00	41.64	74	-32.36
4924.00	H	Average	27.43	7.92	35.35	54	-18.65

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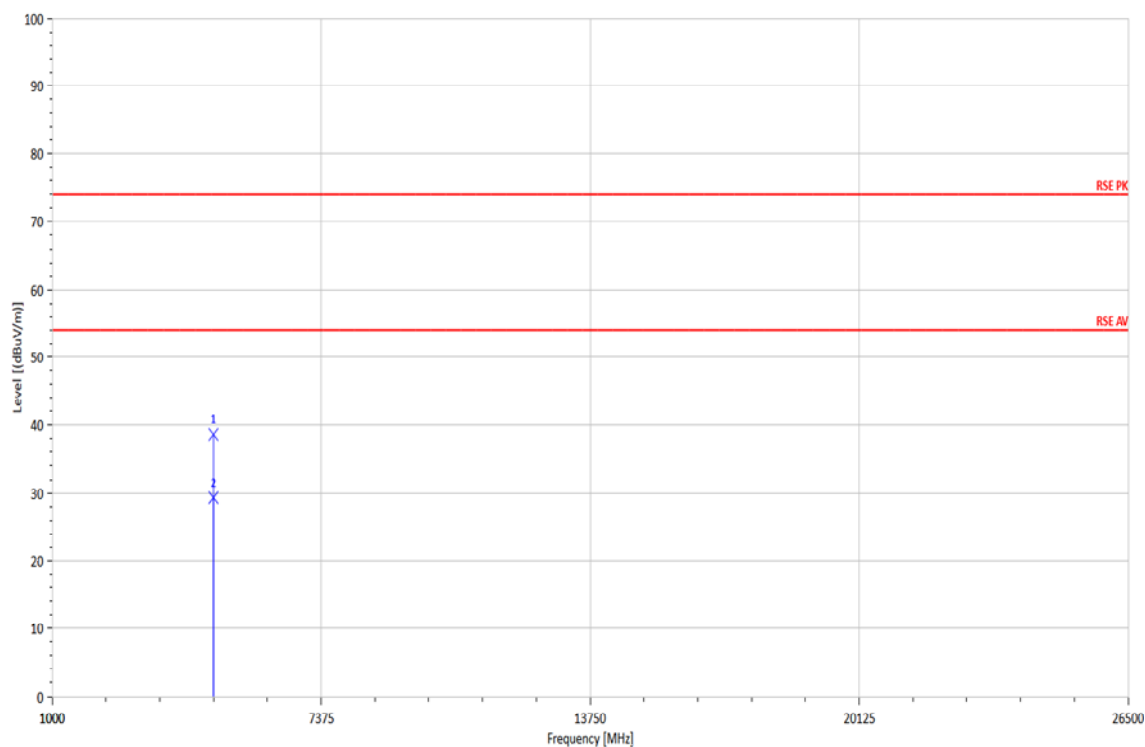
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Radiated Spurious Emission Measurement Result (802.11g) above 1GHz

Operation Mode : 802.11g Test Date : 2017/8/9
Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Low Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4824.00	H	Peak	31.07	7.58	38.65	74	-35.35
4824.00	H	Average	21.74	7.58	29.32	54	-24.68

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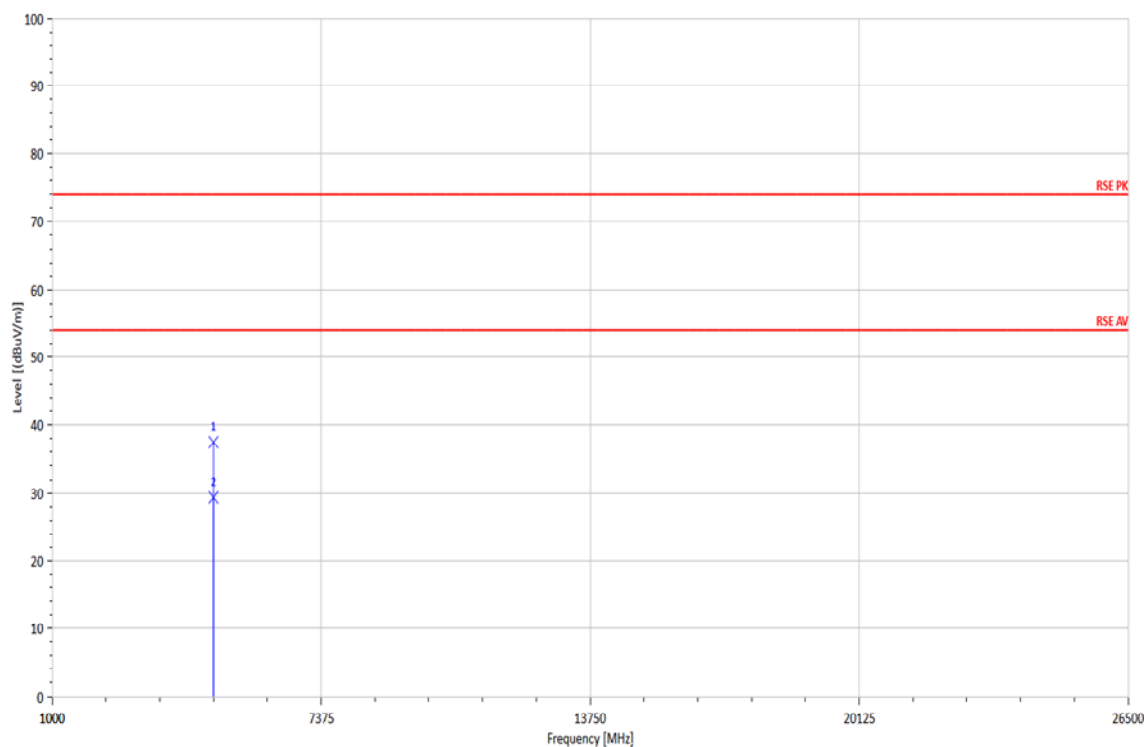
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Operation Mode : 802.11g Test Date : 2017/8/9
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch Low Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4824.00	H	Peak	29.92	7.58	37.50	74	-36.50
4824.00	H	Average	21.77	7.58	29.35	54	-24.65

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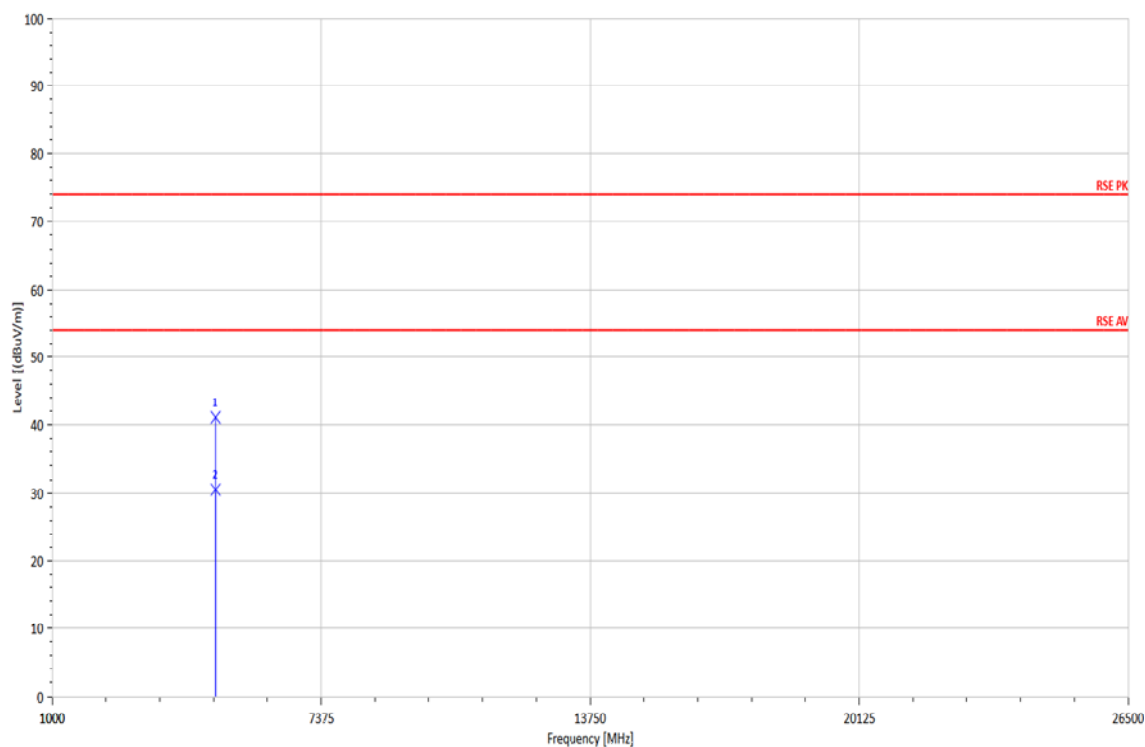
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Operation Mode : 802.11g Test Date : 2017/8/9
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch Mid Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4874.00	H	Peak	33.26	7.86	41.12	74	-32.88
4874.00	H	Average	22.62	7.91	30.53	54	-23.47

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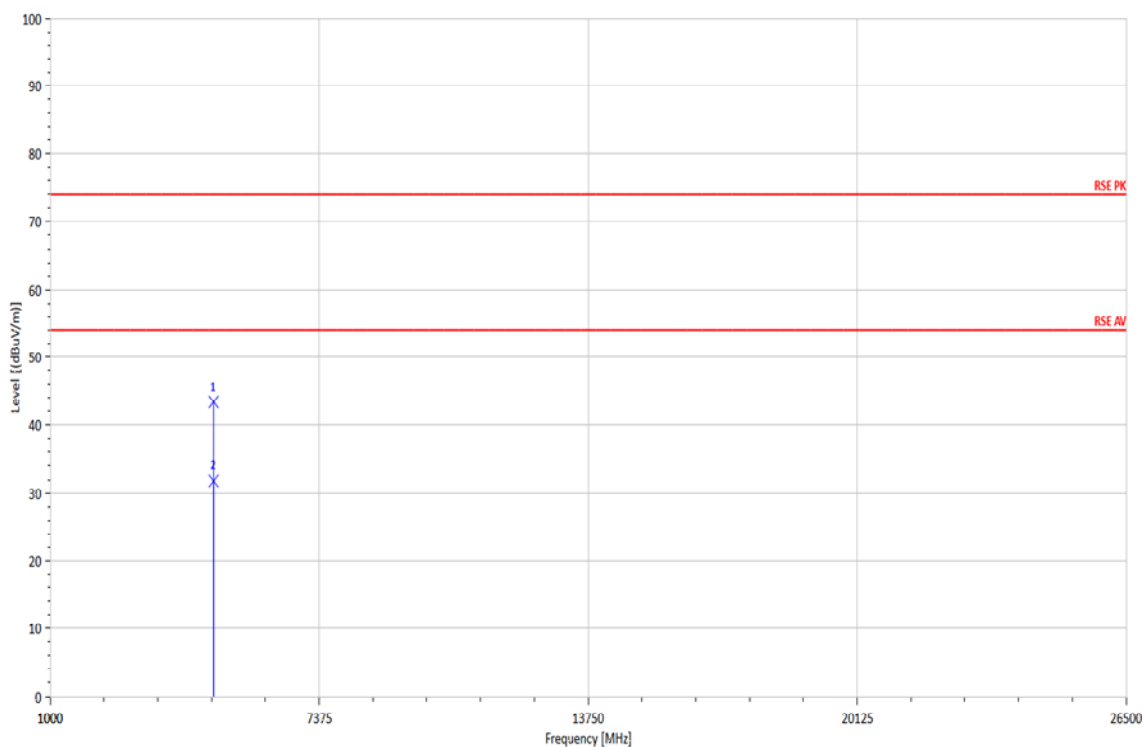
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Operation Mode : 802.11g Test Date : 2017/8/9
Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Mid Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4874.00	H	Peak	35.54	7.86	43.40	74	-30.60
4874.00	H	Average	23.92	7.91	31.83	54	-22.17

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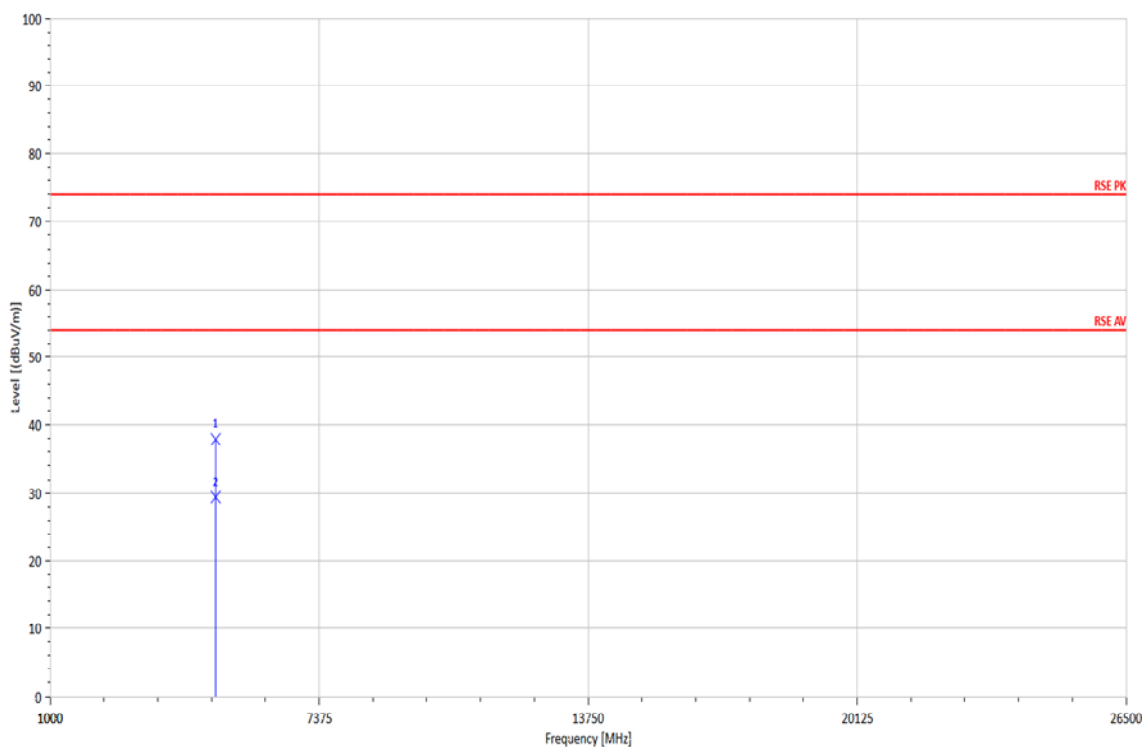
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Operation Mode : 802.11g Test Date : 2017/8/9
Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch High Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4924.00	H	Peak	30.01	7.92	37.94	74	-36.06
4924.00	H	Average	21.47	7.92	29.39	54	-24.61

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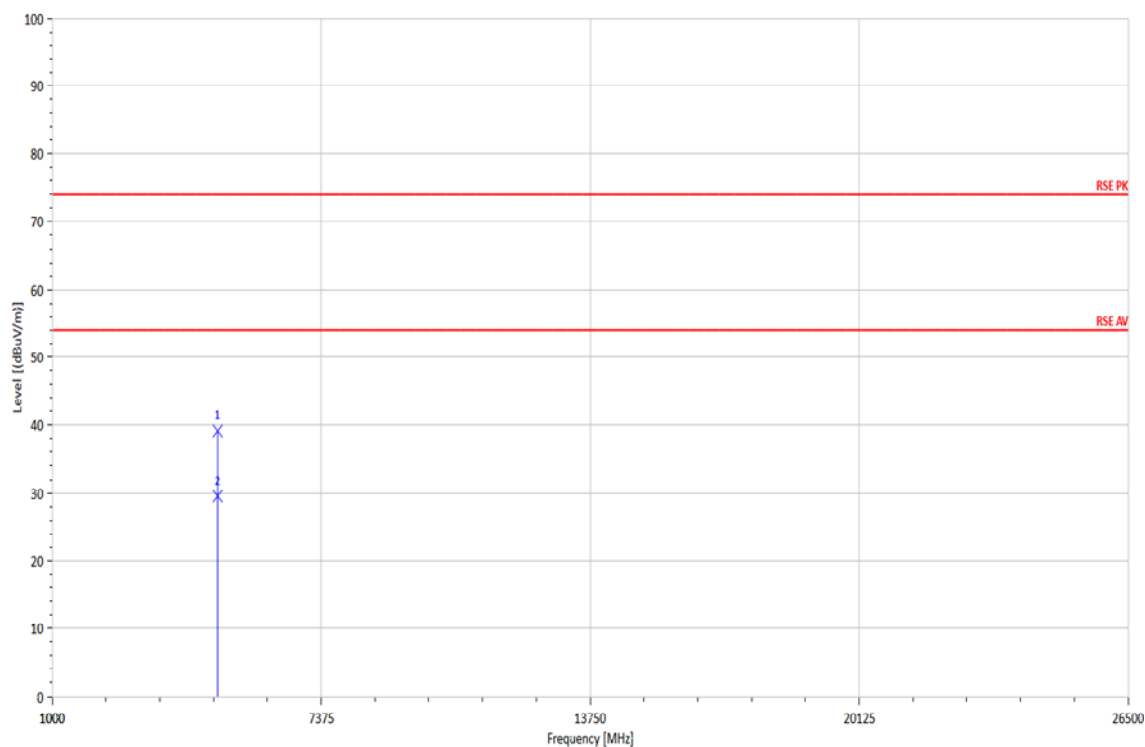
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Operation Mode :	802.11g	Test Date :	2017/8/9
Fundamental Frequency :	2462 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx Ch High	Test Engineer :	Enzo
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	H	Peak	31.23	7.92	39.15	74	-34.85
4924.00	H	Average	21.62	7.92	29.54	54	-24.46

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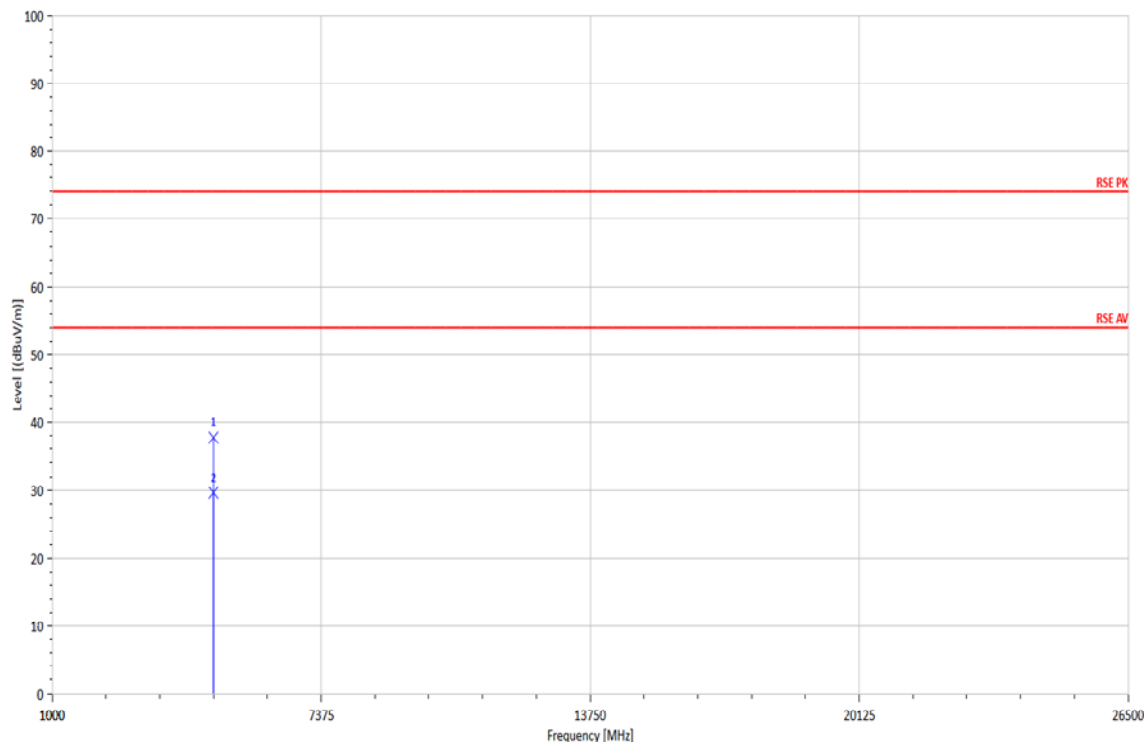
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Radiated Spurious Emission Measurement Result (802.11n_20M) above 1GHz

Operation Mode : 802.11n20 Test Date : 2017/8/9
 Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch Low Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4824.00	H	Peak	30.19	7.58	37.76	74	-36.24
4824.00	H	Average	22.04	7.58	29.62	54	-24.38

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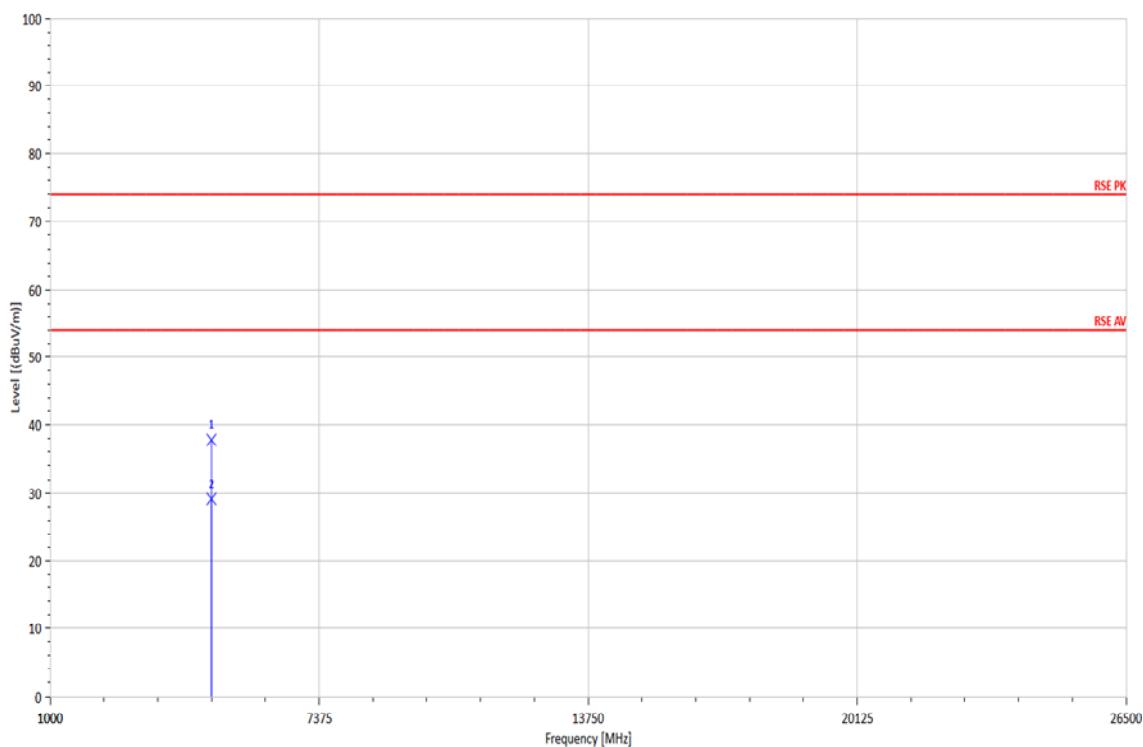
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Operation Mode : 802.11n20 Test Date : 2017/8/9
Fundamental Frequency : 2412 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Low Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4824.00	H	Peak	30.28	7.58	37.85	74	-36.15
4824.00	H	Average	21.55	7.58	29.13	54	-24.87

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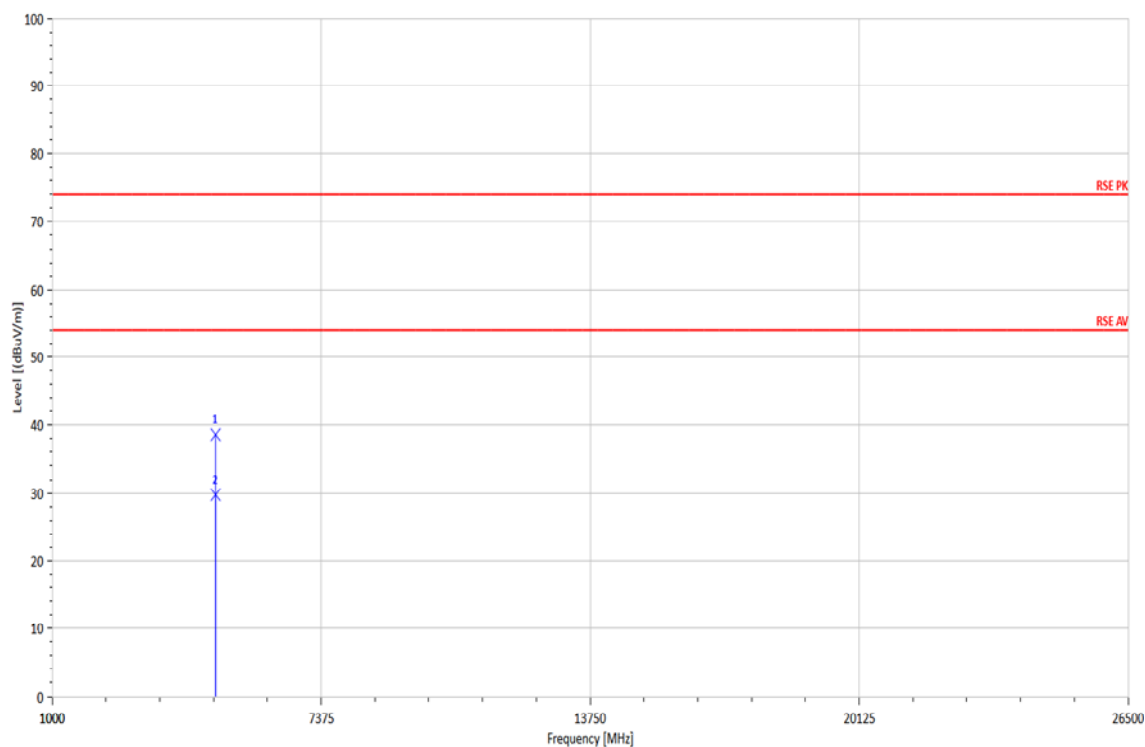
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Operation Mode : 802.11n20 Test Date : 2017/8/9
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch Mid Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4874.00	H	Peak	30.71	7.91	38.62	74	-35.38
4874.00	H	Average	21.85	7.91	29.76	54	-24.24

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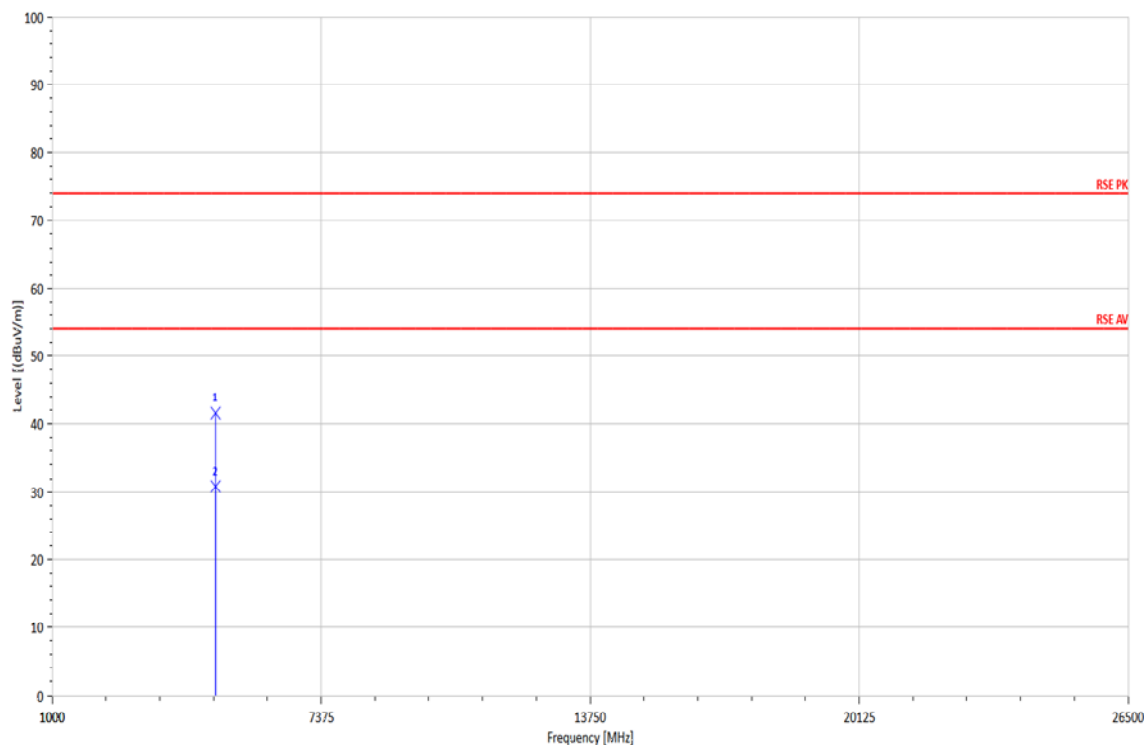
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 Operation Band : Tx Ch Mid Test Engineer : Enzo
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level		FS	@3m	
		PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4874.00	H	Peak	33.72	7.86	41.58	74	-32.42
4874.00	H	Average	22.93	7.91	30.84	54	-23.16

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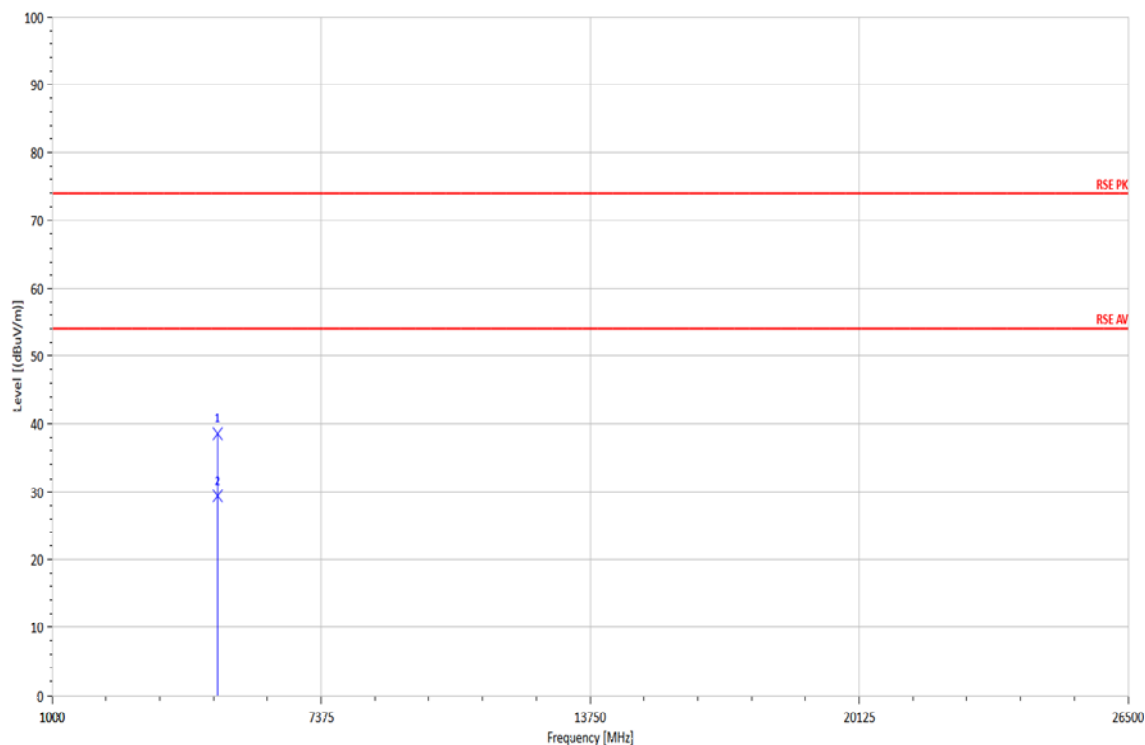
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Operation Mode : 802.11n20 Test Date : 2017/8/9
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch High Test Engineer : Enzo
 EUT Pol. : E2 Measurement Antenna Pol. : Vertical



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBuV	dB	dBuV/m	dBuV/m	dB
4924.00	H	Peak	30.71	7.92	38.63	74	-35.37
4924.00	H	Average	21.47	7.92	29.39	54	-24.61

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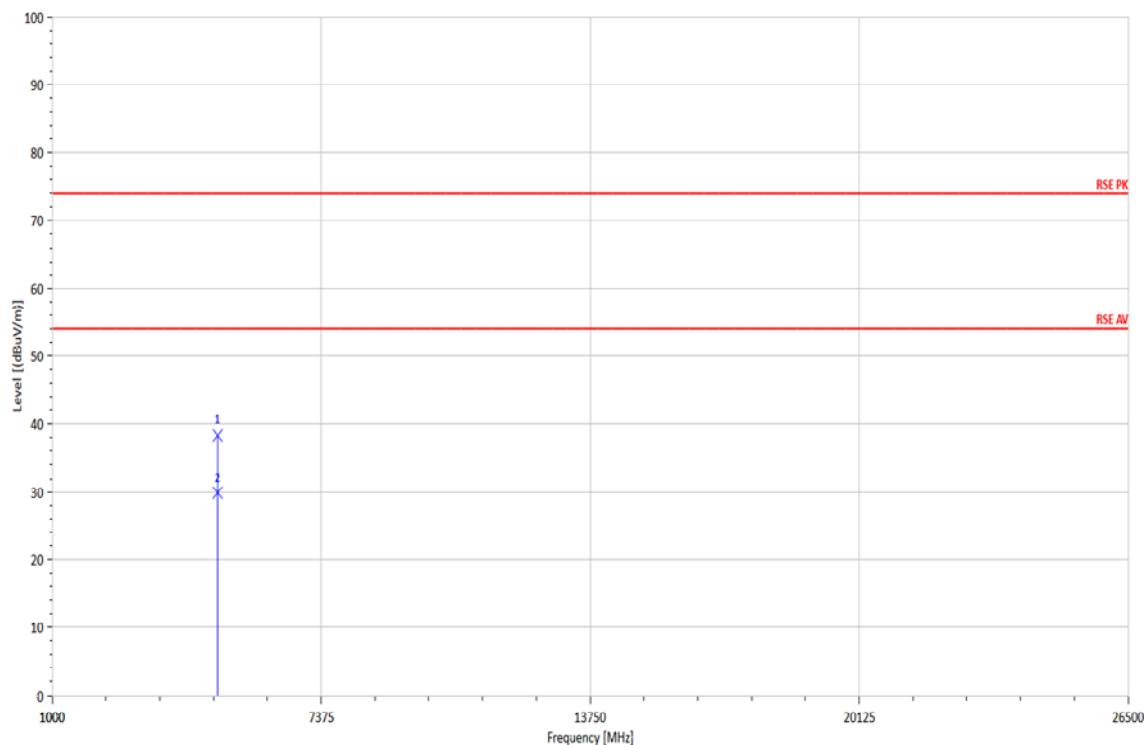
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Operation Mode : 802.11n20 Test Date : 2017/8/9
 Fundamental Frequency : 2462 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch High Test Engineer : Enzo
 EUT Pol. : E2 Measurement Antenna Pol. : Horizontal



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4924.00	H	Peak	30.45	7.92	38.37	74	-35.63
4924.00	H	Average	21.98	7.92	29.90	54	-24.10

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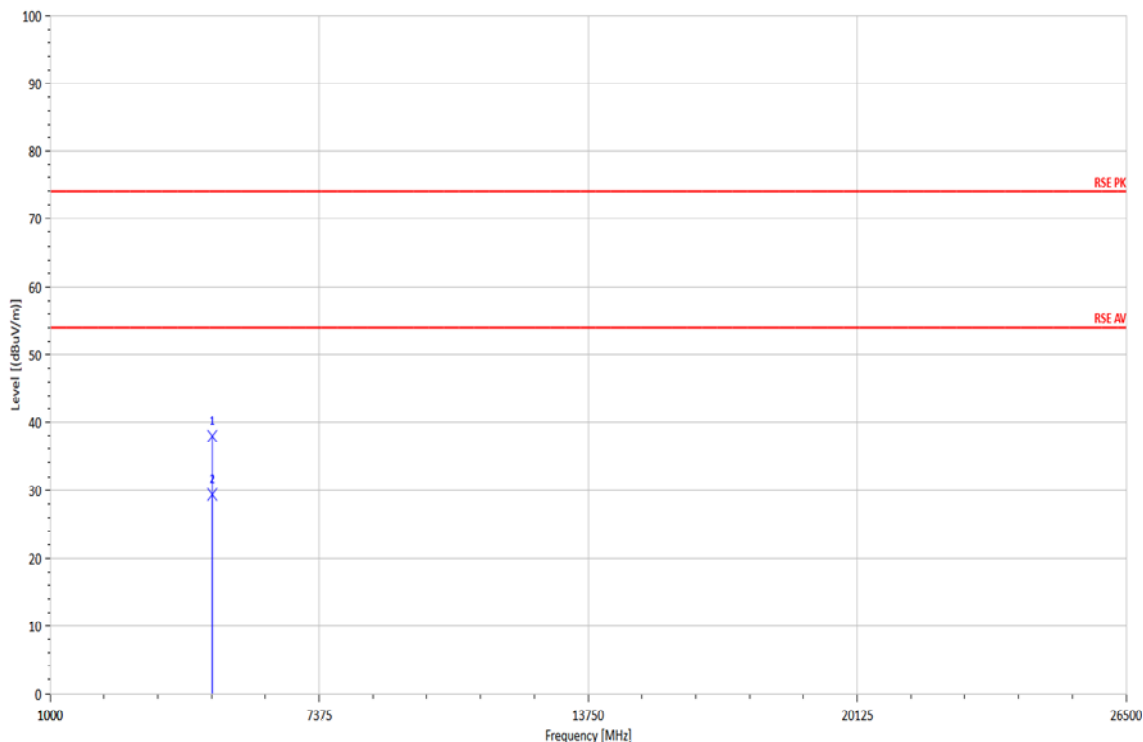
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Radiated Spurious Emission Measurement Result (802.11n_40M) above 1GHz

Operation Mode :	802.11n40	Test Date :	2017/8/9
Fundamental Frequency :	2422 MHz	Temp. / Humi. :	22.7deg_C/57RH
Operation Band :	Tx Ch Low	Test Engineer :	Enzo
		Measurement Antenna	
EUT Pol. :	E2	Pol. :	Vertical



Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
4844.00	H	Peak	30.43	7.55	37.98	74	-36.02
4844.00	H	Average	21.79	7.55	29.34	54	-24.66

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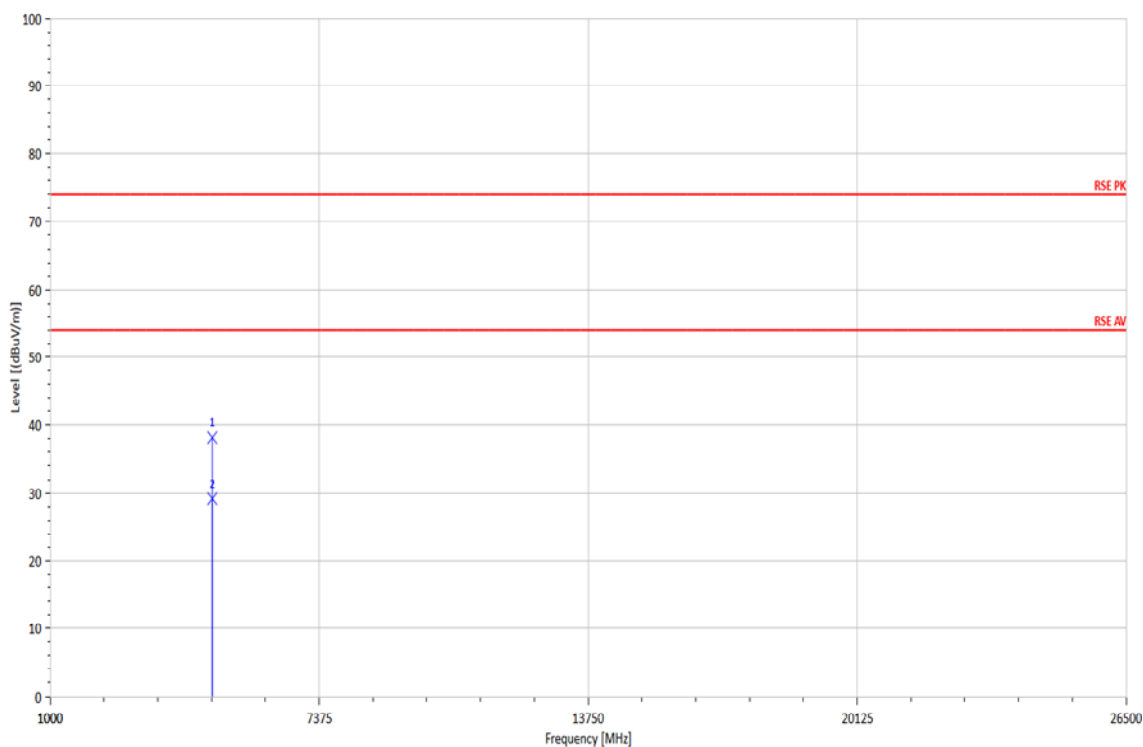
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Operation Mode : 802.11n40 Test Date : 2017/8/9
Fundamental Frequency : 2422 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Low Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4844.00	H	Peak	30.66	7.55	38.21	74	-35.79
4844.00	H	Average	21.61	7.55	29.16	54	-24.84

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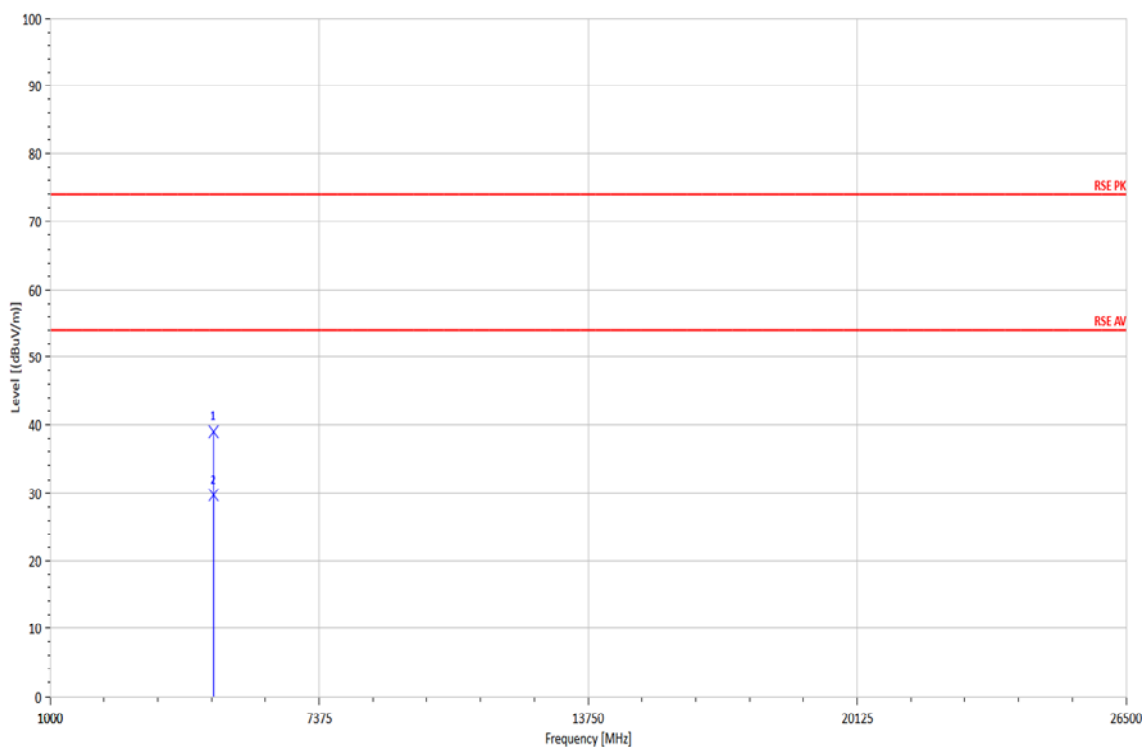
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Operation Mode : 802.11n40 Test Date : 2017/8/9
 Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch Mid Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4874.00	S	Peak	31.14	7.91	39.05	74	-34.95
4874.00	S	Average	21.81	7.91	29.72	54	-24.28

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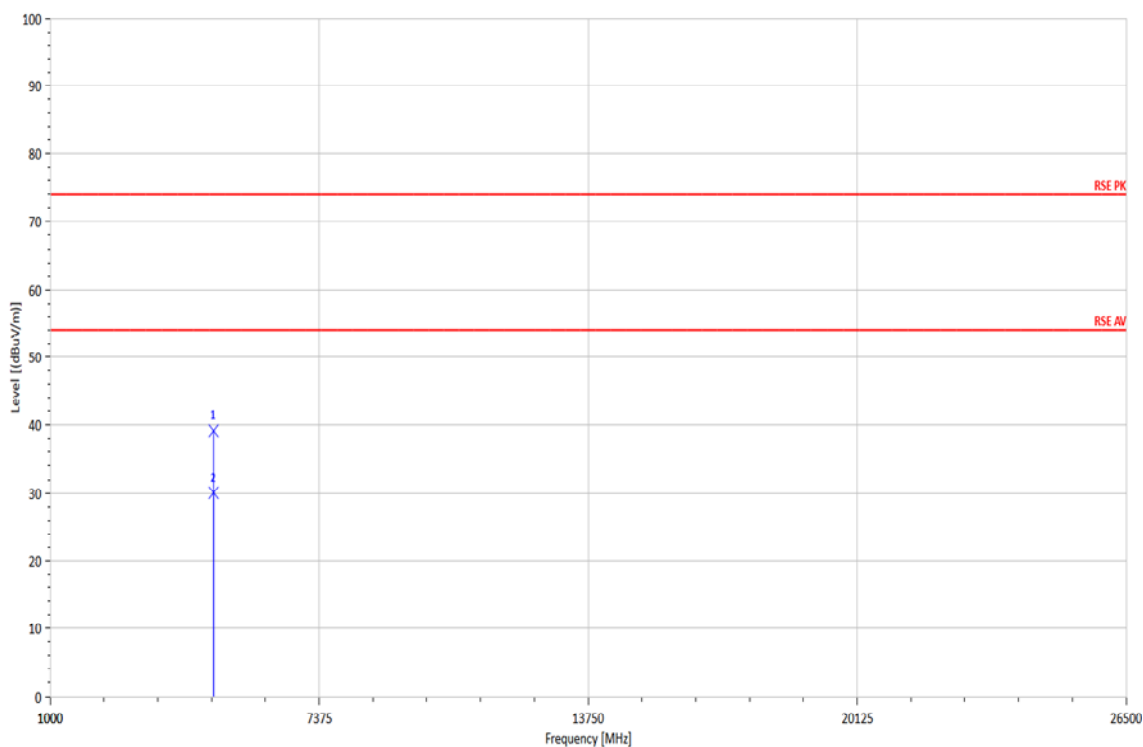
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Operation Mode : 802.11n40 Test Date : 2017/8/9
Fundamental Frequency : 2437 MHz Temp. / Humi. : 22.7deg_C/57RH
Operation Band : Tx Ch Mid Test Engineer : Enzo
Measurement Antenna
EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4874.00	H	Peak	31.27	7.91	39.18	74	-34.82
4874.00	H	Average	22.15	7.91	30.06	54	-23.94

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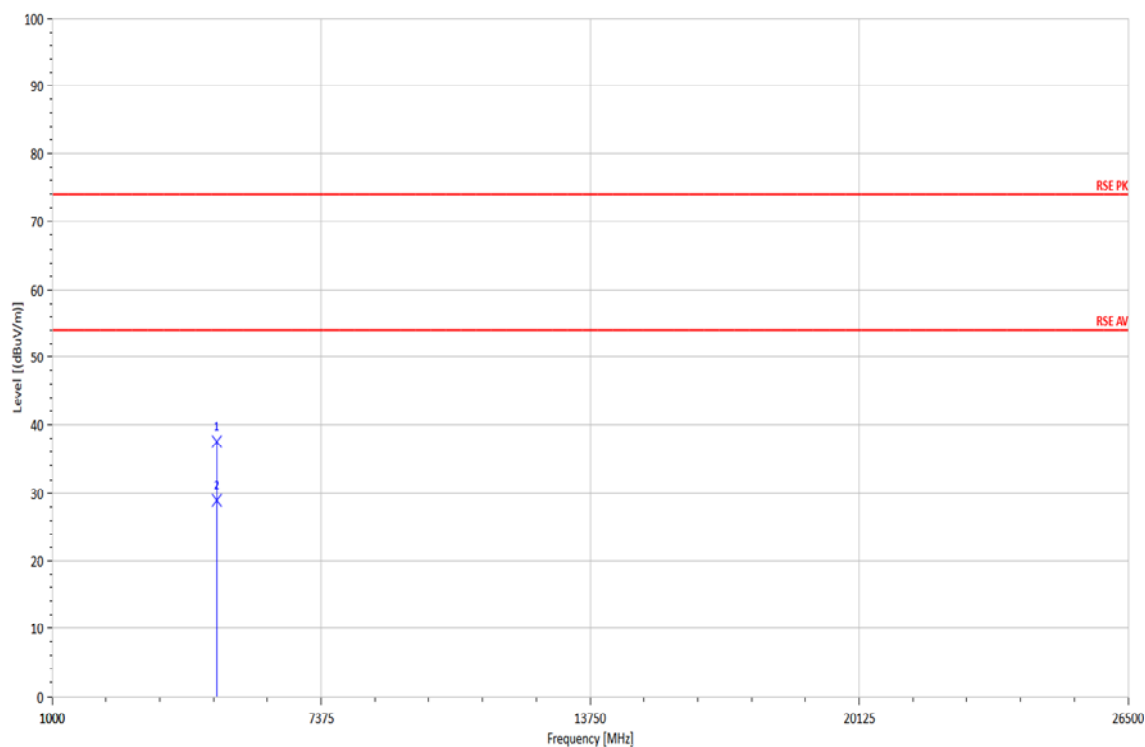
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Operation Mode : 802.11n40 Test Date : 2017/8/9
 Fundamental Frequency : 2452 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Vertical



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBuV	Factor dB	Actual FS dBuV/m	Limit @3m dBuV/m	Margin dB
4904.00	H	Peak	30.14	7.44	37.59	74	-36.41
4904.00	H	Average	21.47	7.44	28.91	54	-25.09

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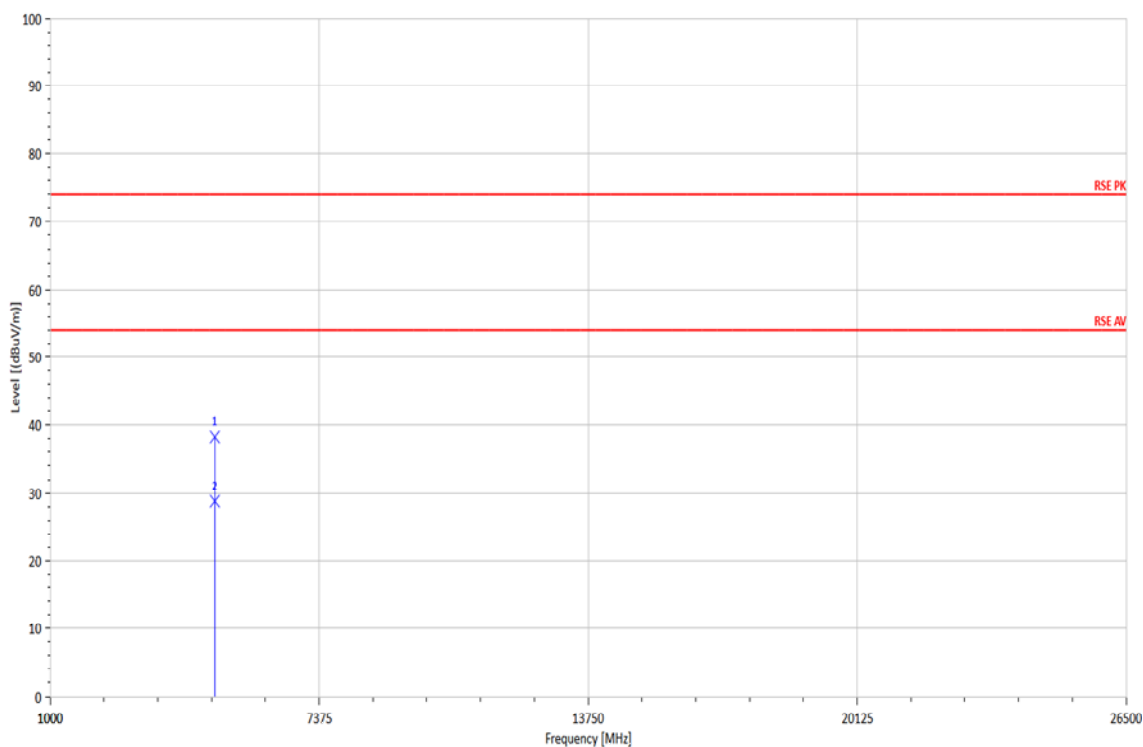
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Operation Mode : 802.11n40 Test Date : 2017/8/9
 Fundamental Frequency : 2452 MHz Temp. / Humi. : 22.7deg_C/57RH
 Operation Band : Tx Ch High Test Engineer : Enzo
 Measurement Antenna
 EUT Pol. : E2 Pol. : Horizontal



Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
4904.00	H	Peak	30.85	7.44	38.30	74	-35.70
4904.00	H	Average	21.36	7.44	28.80	54	-25.20

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12 PEAK POWER SPECTRAL DENSITY

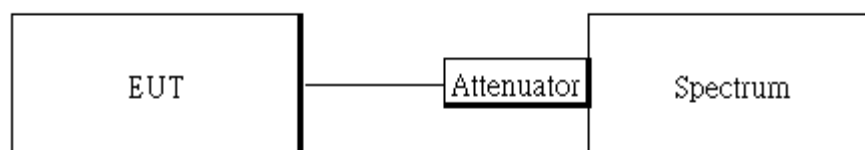
12.1 Standard Applicable

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.

12.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010A	MY51440113	06/20/2017	06/19/2018
DC Block	PASTERNAK	PE8210	RF29	12/24/2017	12/23/2018
Attenuator	WOKEN	218FS-10	RF23	12/24/2017	12/23/2018

12.3 Test Set-up



12.4 Measurement Procedure

- Set analyzer center frequency to DTS channel center frequency.
- The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
- Set the span to 1.5 times the DTS channel bandwidth.
- Set the RBW = 3 kHz & VBW = 10 kHz.
- For defining Restricted Band Edge Limit:
Set the RBW = 100kHz & VBW = 300 kHz
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level.
- 802.11n MIMO mode: offset is set following "measure and add 10 Log (N)" on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

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Note:

Antenna Gain: 6.57 dBi

Aux1 Antenna Gain: 6.88 dBi

Aux2 Antenna Gain: 0.00 dBi

Aux3 Antenna Gain: 0.00 dBi

Number Antenna: 2 pcs

Limit: 8 dBm

The antenna gain is grater than 6dBi in MIMO mode the limit reduce as below:

Directional gain = gain of antenna element + 10 log (# of TX antenna elements)

Effective Legacy Gain (dBi) = 6.88+3.01=9.89dBi

Limit: 8dBm – (9.89– 6dBi)=4.11dBm

12.5 Measurement Result

POWER DENSITY 802.11b					
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Result
2412	-6.05	0.03	-6.02	7.12	PASS
2437	-1.32	0.03	-1.29	7.12	PASS
2462	-3.27	0.03	-3.24	7.12	PASS

POWER DENSITY 802.11g					
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Result
2412	-9.63	0.16	-9.47	7.12	PASS
2437	-3.84	0.16	-3.68	7.12	PASS
2462	-9.42	0.16	-9.26	7.12	PASS

POWER DENSITY 802.11n HT20					
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Result
2412	-7.89	0.32	-7.57	4.11	PASS
2437	-2.94	0.32	-2.62	4.11	PASS
2462	-7.25	0.32	-6.93	4.11	PASS

POWER DENSITY 802.11n HT40					
Freq. (MHz)	PPSD W/O Duty Factor (dBm)	Duty Factor	PPSD With Duty Factor (dBm)	Limit (dBm)	Result
2422	-15.92	0.46	-15.46	4.11	PASS
2437	-6.01	0.46	-5.55	4.11	PASS
2452	-15.26	0.46	-14.80	4.11	PASS

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Bandedge Limit 802.11b MODE			Bandedge Limit 802.11g MODE		
Freq. (MHz)	PSD (dBm)	Bandedge Limit (dBm)	Freq. (MHz)	PSD (dBm)	Bandedge Limit (dBm)
2412	9.15	-10.85	2412	4.29	-15.71
2462	11.09	-8.91	2462	5.31	-14.69

Bandedge Limit 802.11n20 MODE			Bandedge Limit 802.11n40 MODE		
Freq. (MHz)	PSD (dBm)	Bandedge Limit (dBm)	Freq. (MHz)	PSD (dBm)	Bandedge Limit (dBm)
2412	7.81	-12.19	2422	-0.59	-20.59
2462	9.01	-10.99	2452	0.16	-19.84

*Refer to next page for plots

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802.11b

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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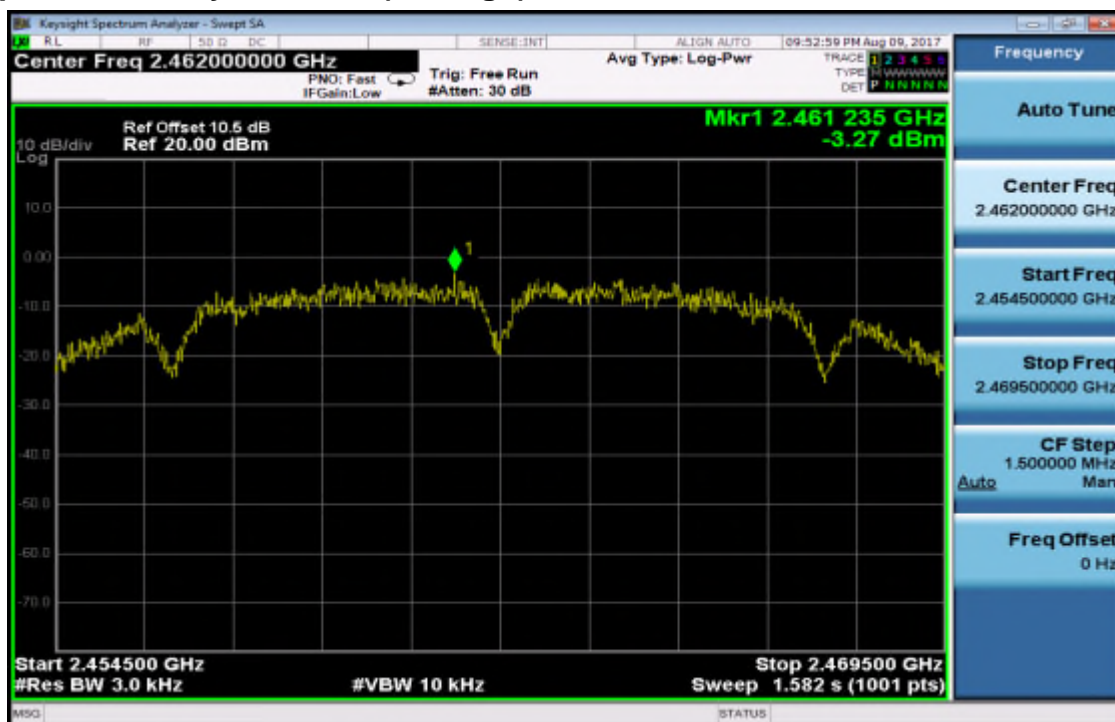
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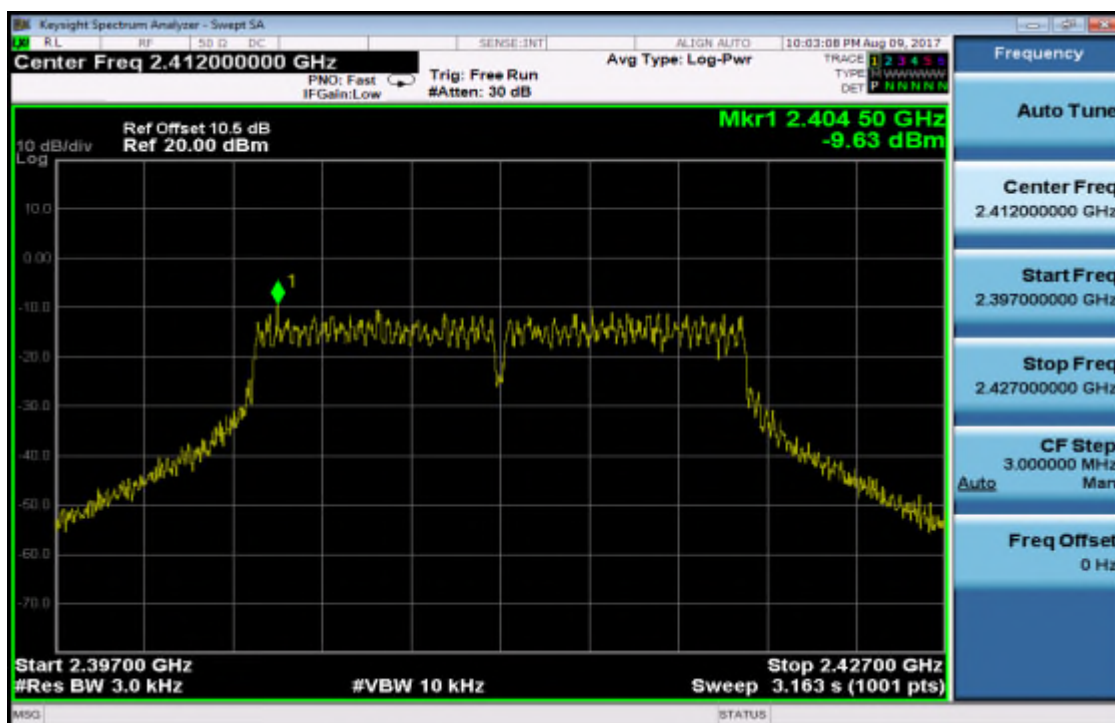
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Power Spectral Density Test Plot (CH-High)



802.11g

Power Spectral Density Test Plot (CH-Low)



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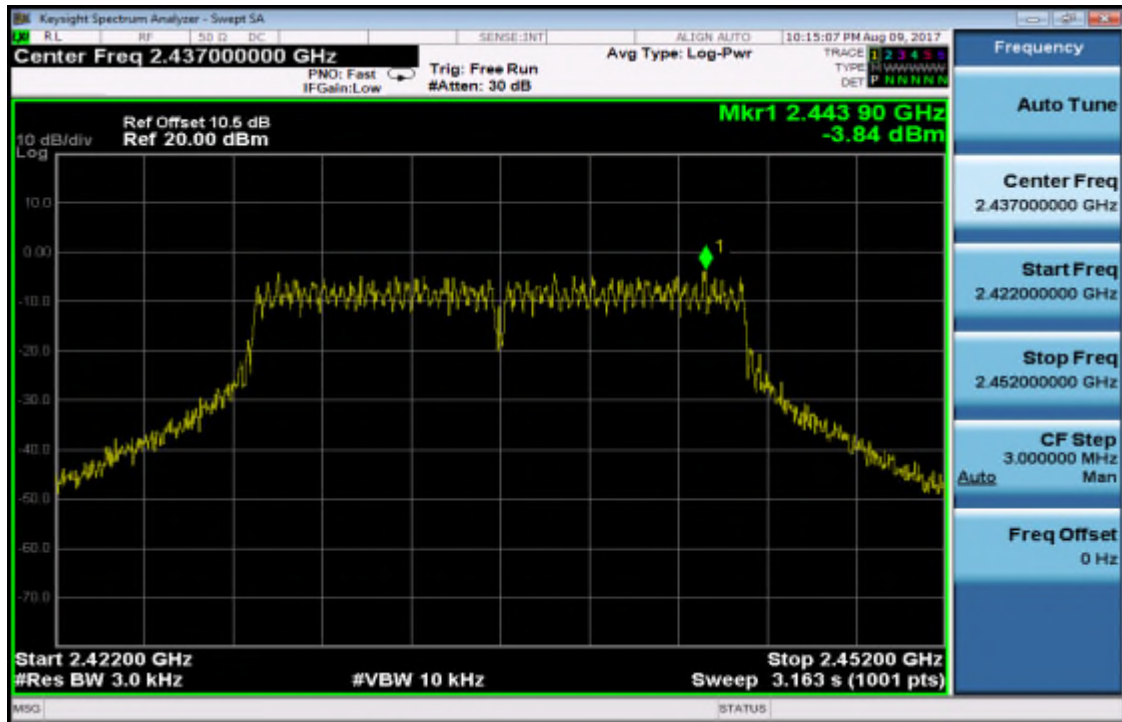
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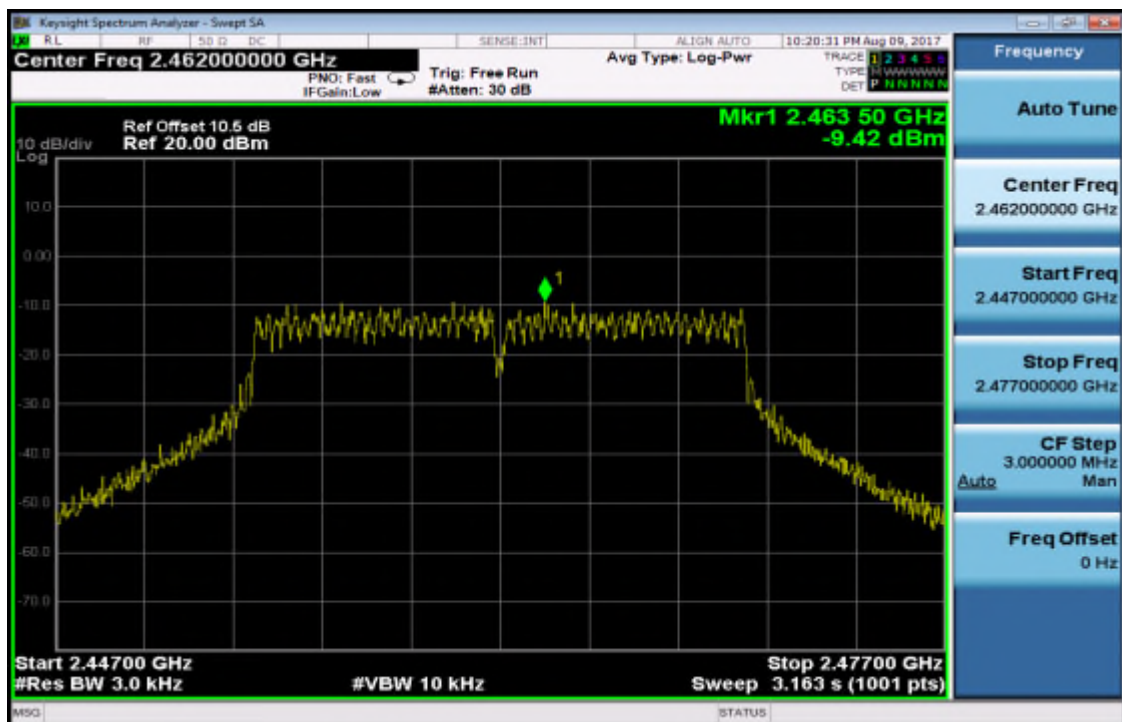
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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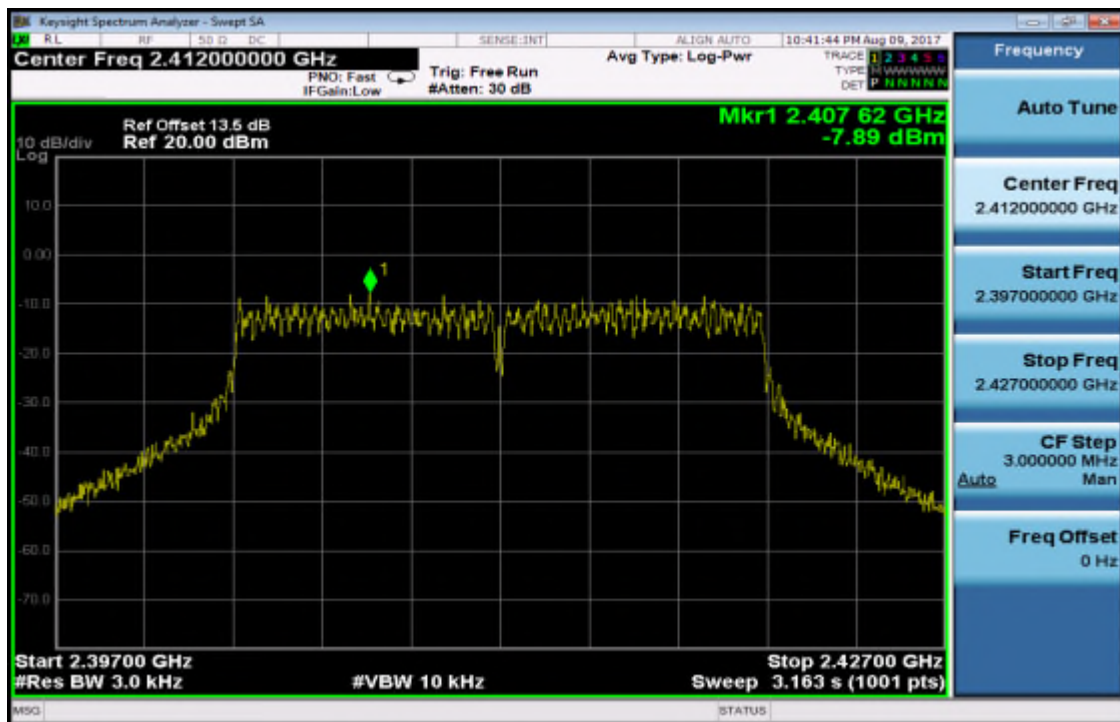
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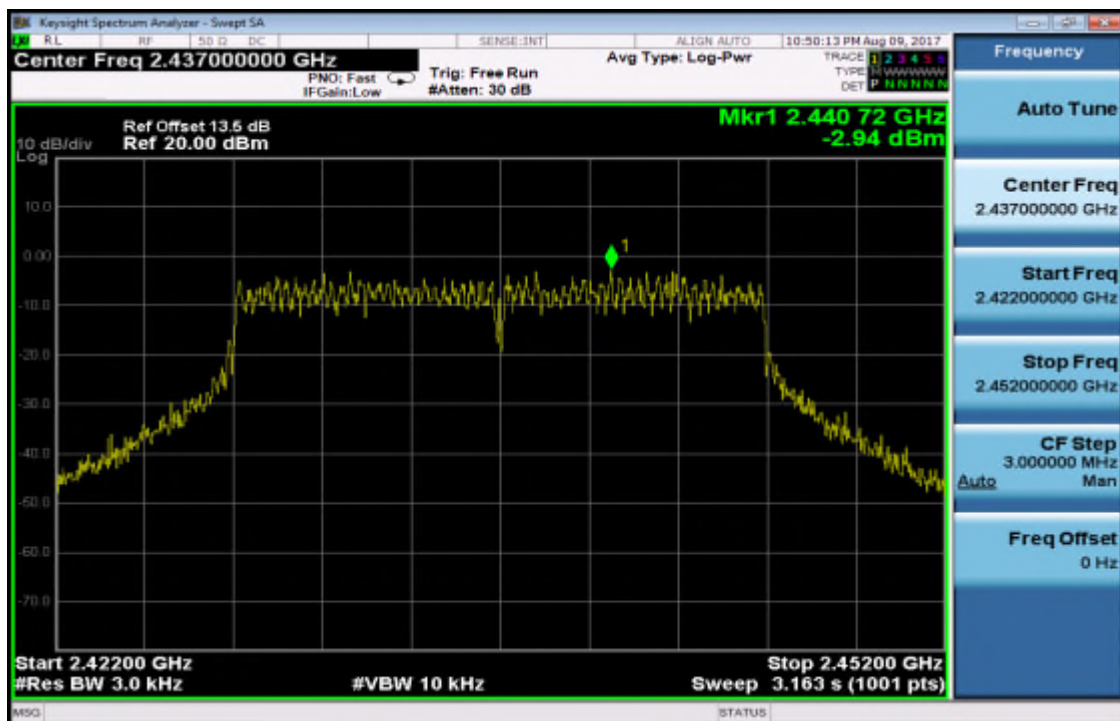
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802.11n_HT20 (MIMO)

Power Spectral Density Test Plot (CH-Low)



Power Spectral Density Test Plot (CH-Mid)



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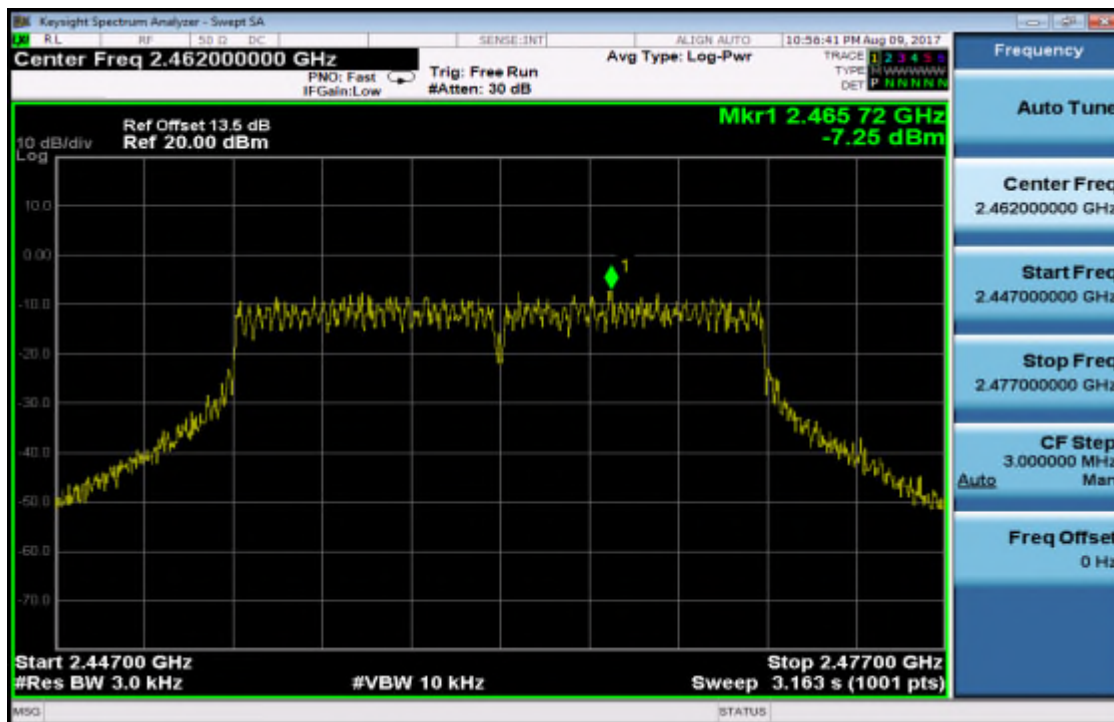
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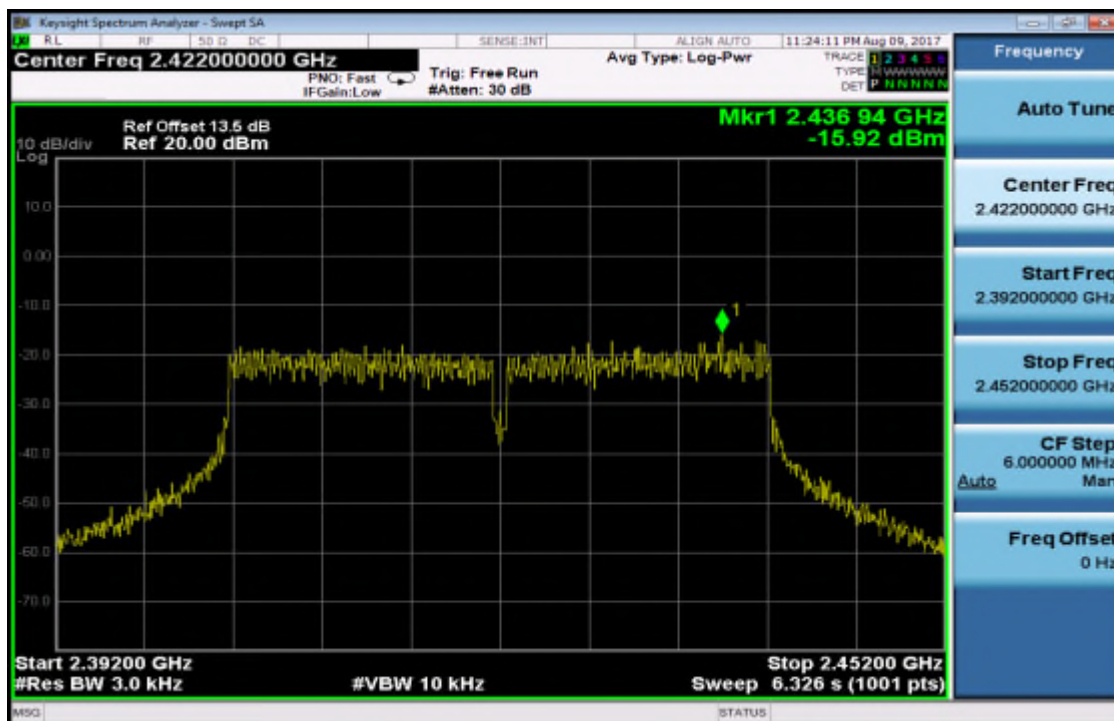
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Power Spectral Density Test Plot (CH-High)



802.11n_HT40 (MIMO)

Power Spectral Density Test Plot (CH-Low)



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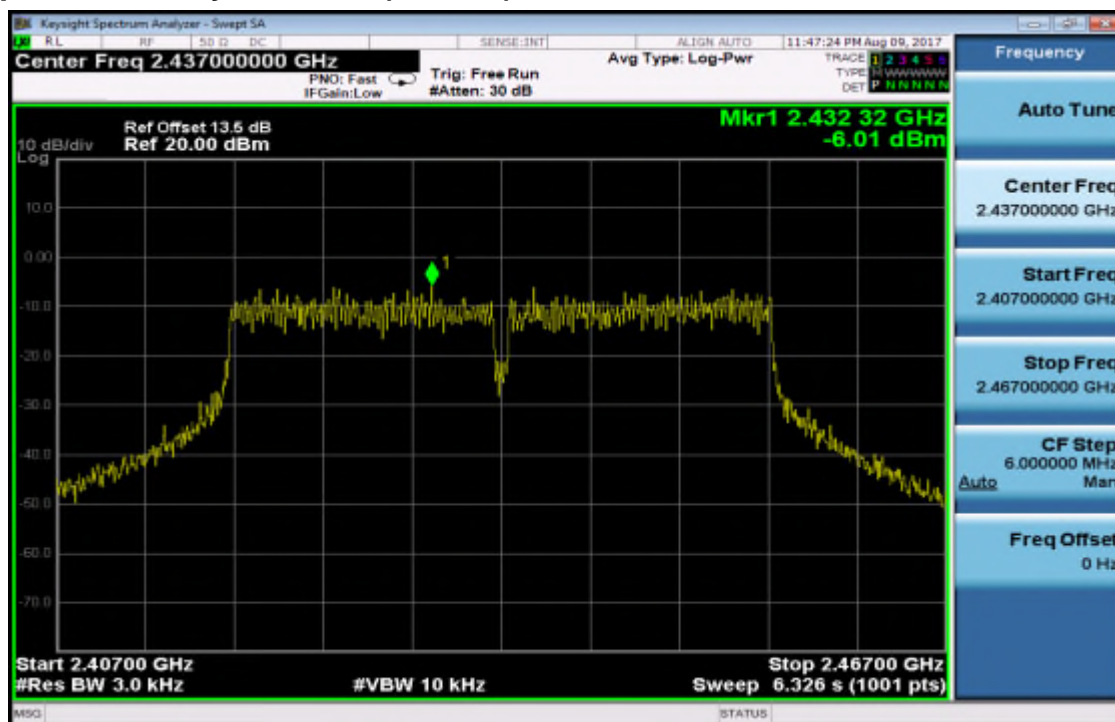
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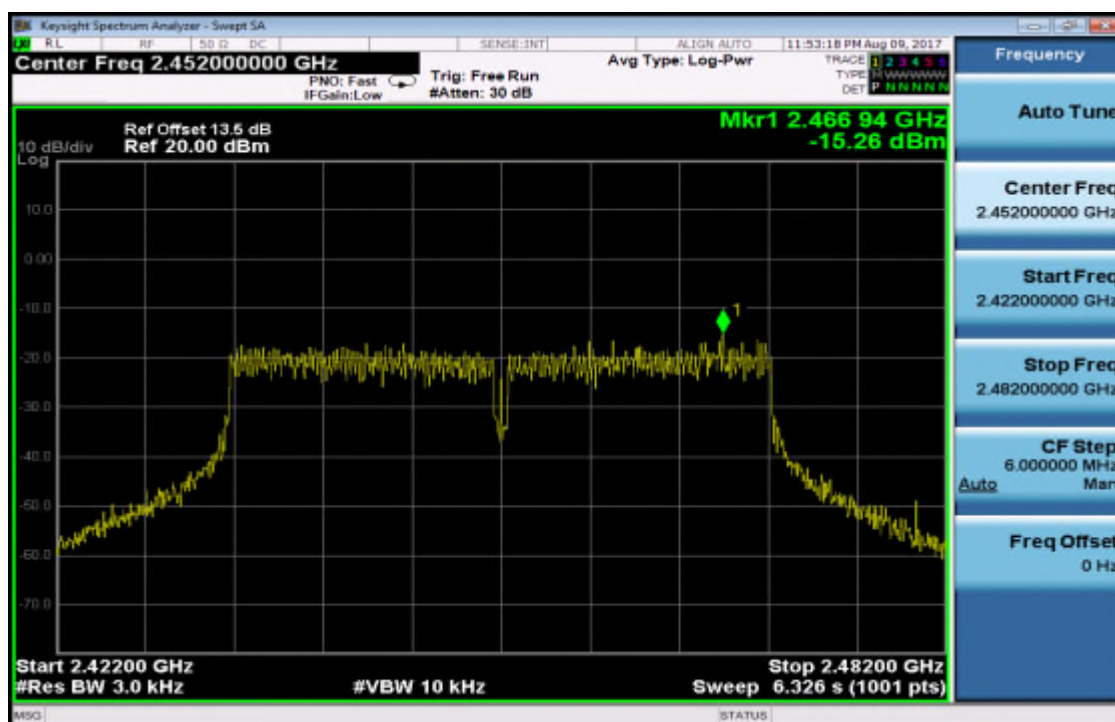
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Power Spectral Density Test Plot (CH-Mid)



Power Spectral Density Test Plot (CH-High)



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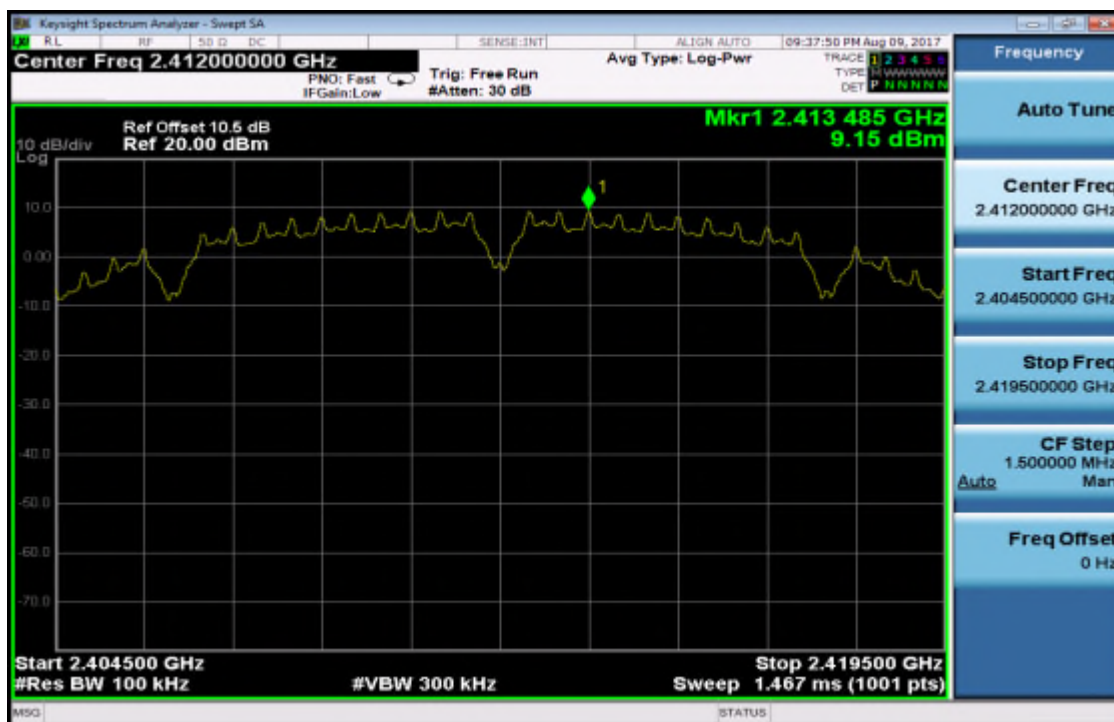
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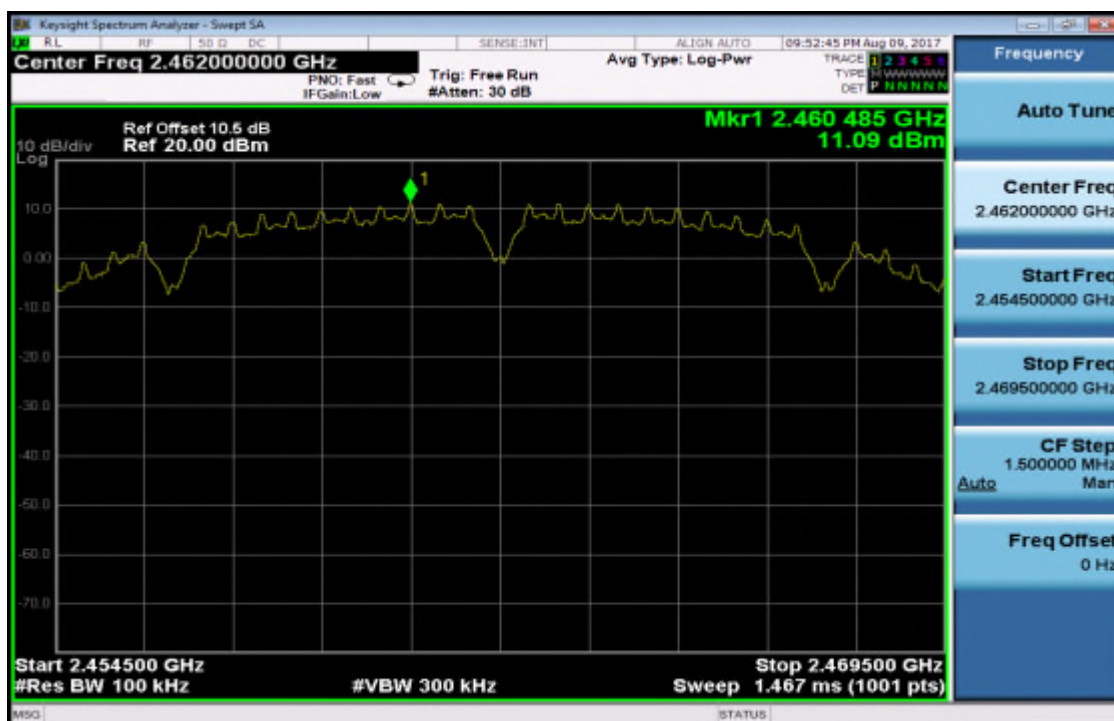
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802.11b

Power Spectral Density for Bandedge Limit (CH-Low)



Power Spectral Density for Bandedge Limit (CH-High)



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802.11g

Power Spectral Density for Bandedge Limit (CH-Low)



Power Spectral Density for Bandedge Limit (CH-High)



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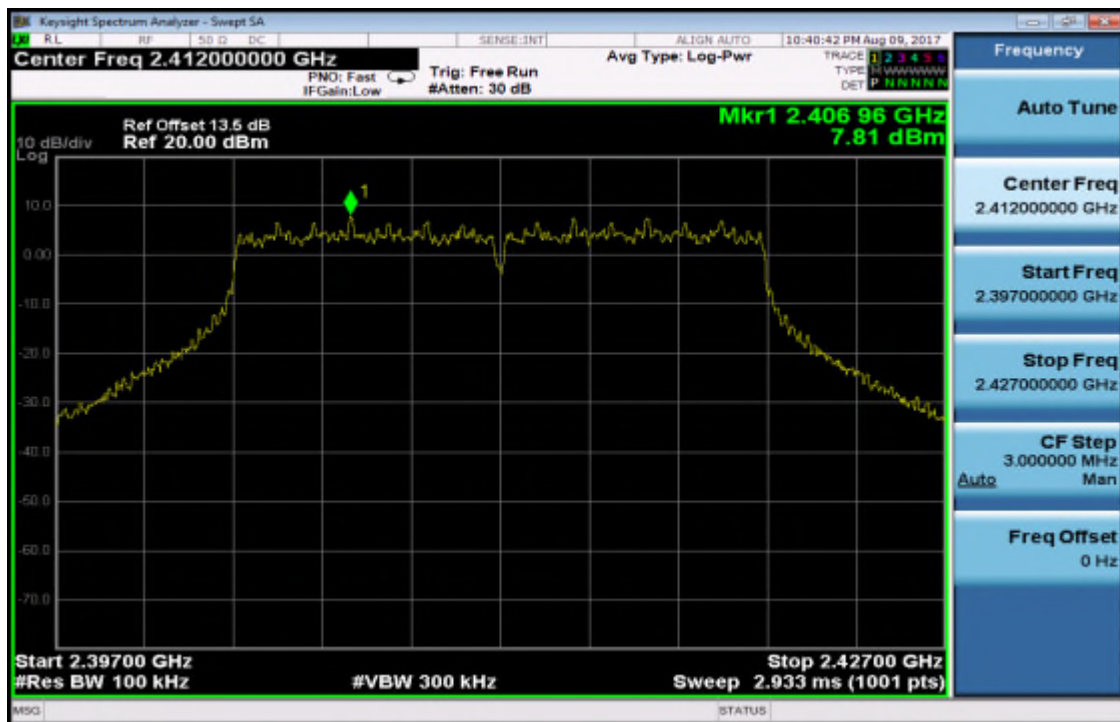
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802.11n_HT20

Power Spectral Density for Bandedge Limit (CH-Low)



Power Spectral Density for Bandedge Limit (CH-High)



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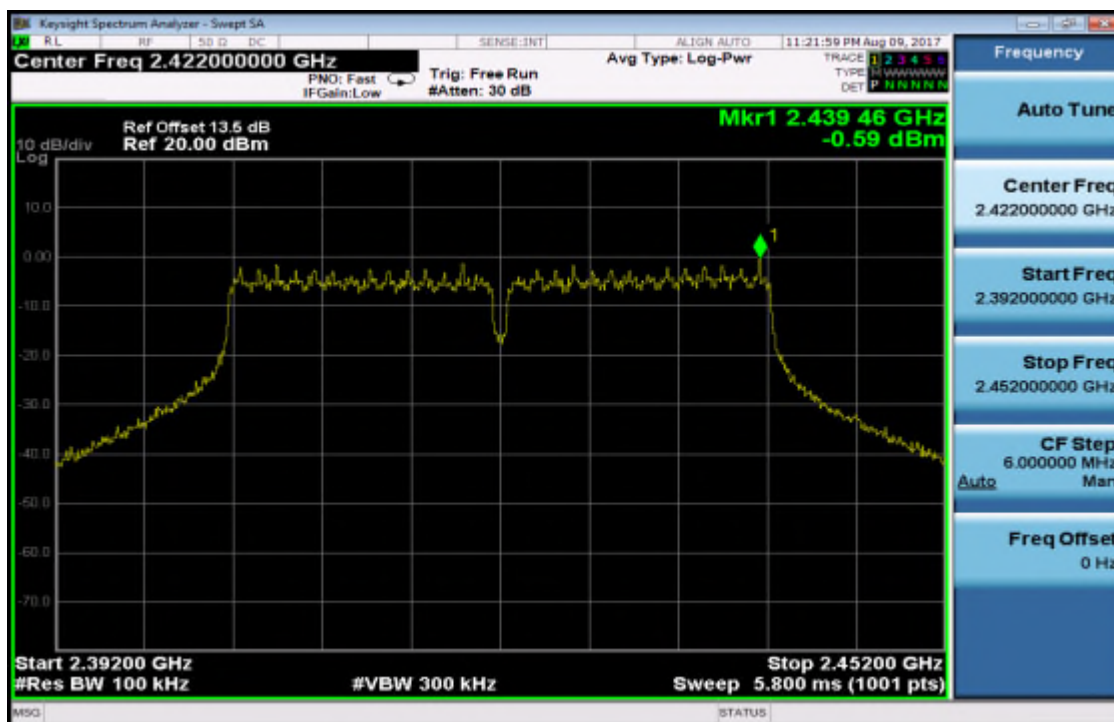
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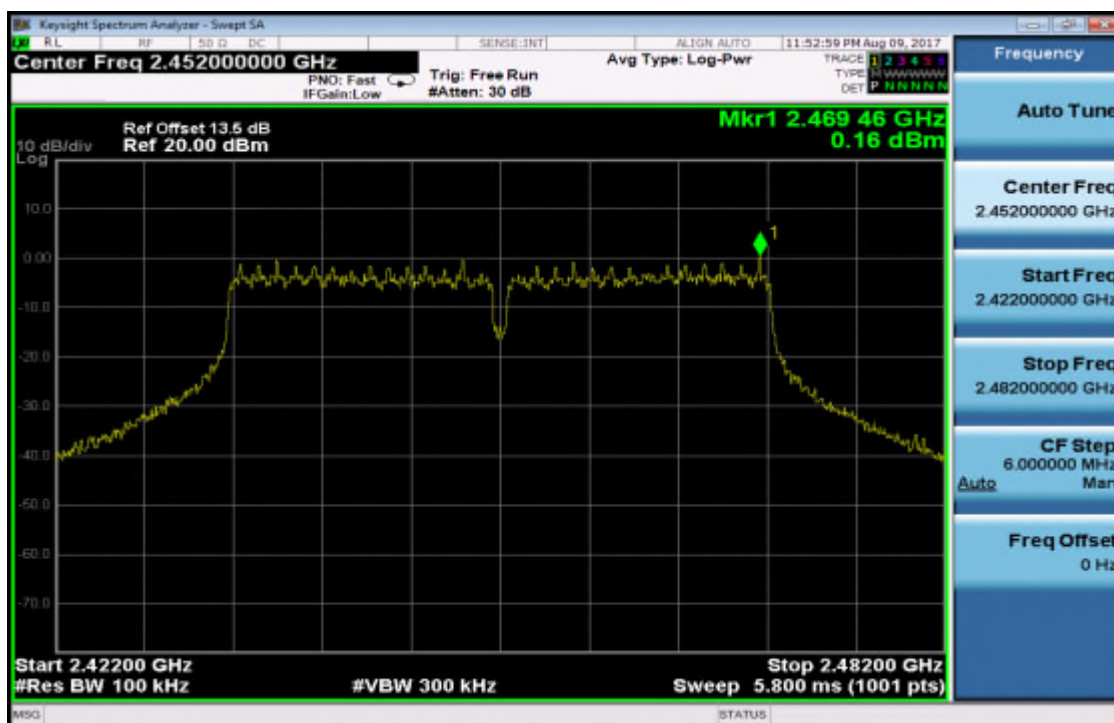
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802.11n_HT40

Power Spectral Density for Bandedge Limit (CH-Low)



Power Spectral Density for Bandedge Limit (CH-High)



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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 directional gains of antenna used for transmitting is 6.57dBi for 2.4GHz (Main), 6.88dBi for 2.4GHz (Aux), 9.89dBi for 2.4GHz (MIMO) and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

~ End of Report ~

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