

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant: Honeywell International Inc.
9680 Old Bailes Road, Fort Mill, SC 29707, USA
Product Name: Vehicle Mount Computer
Brand Name: Honeywell
Model No.: VM3AL0N
Model Difference: N/A
Report Number: ER/2019/C0047
FCC ID: HD5-VM3AL0N
IC: 1693B-VM3AL0N
FCC Rule Part: §15.247, Cat: DTS
IC RSS: RSS-247 issue 2 Feb 2017
Issue Date: Mar. 20, 2020
Date of Test: Dec. 09, 2019 ~ Jan. 02, 2020
Date of EUT Received: Dec. 09, 2019

We hereby certify that:

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

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

Approved By: _____

Vito Pei

Vito Pei / Sr. Engineer



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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2019/C0047	Rev.00	Original.	Mar. 20, 2020	Revised By: Stefanie Yu

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1 GENERAL INFORMATION

1.1 Product description

Product Name:	Vehicle Mount Computer	
Brand Name:	Honeywell	
Model No.:	VM3AL0N	
Model Difference:	N/A	
Hardware Version:	VM3A_MB	
Software Version:	87.07.00-1218	
Power Supply:	7.2Vdc from Rechargeable Li-polymer Battery or 15Vdc from AC/DC Adapter	
	Battery:	Model No.: OVT270L1R01 Supplier: Totex
	Adapter:	Model No.: GT-46600-6015-T3 Supplier: Globtek

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)		Modulation Technology
b	2412-2462	11	25.10 (2TX)		DSSS
g			26.80 (2TX)		OFDM
n_HT20 ax_HEW20			HT:	26.63(MIMO)	
n_HT40 n_HEW40	2422-2452	7	HT:	24.96(MIMO)	
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM			
Transistion Rate		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps			
Antenna Designation:		External Antenna: 1. Dipole Antenna, Part No.: WTS 2450, Supplier: Laird Gain: 2.1dBi (Main/Aux) 2. Dipole Antenna, Part no.: R380500314, Supplier: LARSEN Gain: 1.6dBi (Main/Aux) Internal Antenna: 1. Printed Antenna, Gain: 3.9dBi (Main), 3.3dBi (Aux)			

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Antenna Designation

Antenna Type	Supplier	Antenna Model No.	Freq. (MHz)	Transmitter Chain	Peak Antenna Gain (dBi)
External Di-pole antenna	LARSEN	R380500314	2.4GHz	Ch 0 & Ch 1	1.6
	LAIRD	WTS 2450	2.4GHz	Ch 0 & Ch 1	2.1
Internal Printed Antenna	N/A	N/A	2.4GHz	Ch0	3.9
	N/A	N/A	2.4GHz	Ch1	3.3

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1.2 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247

FCC KDB 558074 D01 DTS Meas. Guidance v05r01

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

RSS-247 issue 2 Feb. 2017

RSS-Gen. issue 5, Amendment 1, March 2019

ANSI C63.10:2013

1.3 Test Facility

SGS Taiwan Ltd. Electronics & Communication Laboratory (TAF code 0513)

No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

FCC Designation number: TW0001

ISED CAB identifier: TW0513

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.

1.6 Radiated Emission Test Sites For Measurements From 9 kHz To 30 MHz

Radiated emission below 30MHz is measured in a 9m*9m*6m semi-anechoic chamber, the measurements correspond to those obtained at an open-field test site.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

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2 SYSTEM TEST CONFIGURATION

2.1 EUT Configuration

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

2.2 EUT Exercise

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

2.3 Test Procedure

2.3.1 Conducted Emissions

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

2.3.2 Conducted Test (RF)

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

2.3.3 Radiated Emissions

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

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2.4 Configuration of Tested System

Fig. 2-1 Conducted (Antenna Port) Emission Configuration & Radiated Emission



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

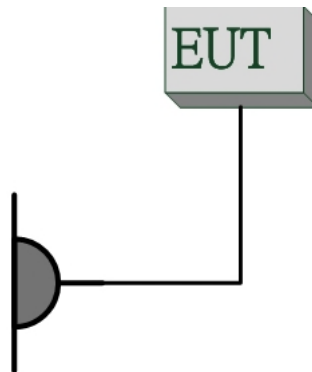


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1.	Wlan Test Software	Honeywell	FTMTool	N/A	Power Setting: b: 20 g: 17 n20: 17 n40: 15

Note:

Product VPN: VM3A-L0N-1B2A20F

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3 SUMMARY OF TEST RESULTS

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

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4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

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

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

4.2 The Worst Test Modes and Channel Details

1. The EUT has been tested under operating condition.
2. aTest program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.
3. Investigation has been done on all the possible configurations for searching the worst case.

The gevin UE is pre-scanned among below modes.

Modulation	Transmission Chain				Multiple Transmission Spatial
☒ 802.11 b	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ 2TX
☒ 802.11 g	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ 2TX
☒ 802.11 n	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☒ MIMO

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

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4.3 Radiated Emission Test:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
RADIATED EMISSION TEST (BELOW 1 GHz)					
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX
RADIATED EMISSION TEST (ABOVE 1 GHz)					
802.11b	1 to 11	1, 6, 11	DSSS	1	2TX
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX
802.11n20M	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n40M	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO

Note:

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

4.4 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	1	2TX
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX
802.11n 20M	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n 40M	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: +/-2.3dB
	30MHz - 180MHz: +/- 3.37dB
	180MHz -417MHz: +/- 3.19dB
	0.417GHz-1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB
Polarization: Horizontal	9kHz~30MHz: +/-2.3dB
	30MHz - 167MHz: +/- 4.22dB
	167MHz -500MHz: +/- 3.44dB
	0.5GHz-1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

Note:

1. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.
2. The conformity assessment statement in this report is based solely on the test results, measurement uncertainty is excluded.

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6 CONDUCTED EMISSION TEST

6.1 Standard Applicable

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

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

6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI 7	1166.5950.07	07/04/2019	07/03/2020
Coaxial Cables	N/A	WK CE Cable	N/A	11/26/2019	11/25/2020
LISN	SCHWARZ- BECK	NSLK 8127	8127-649	04/02/2019	04/01/2020
Test Software	Farad	EZ-EMC	Ver. SGS- 03A2	N.C.R	N.C.R

6.3 EUT Setup

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

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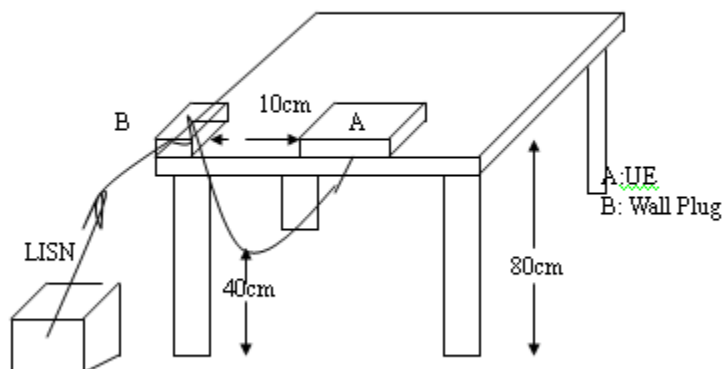
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6.4 Test SET-UP (Block Diagram of Configuration)



6.5 Measurement Procedure

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

6.6 Measurement Result

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

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

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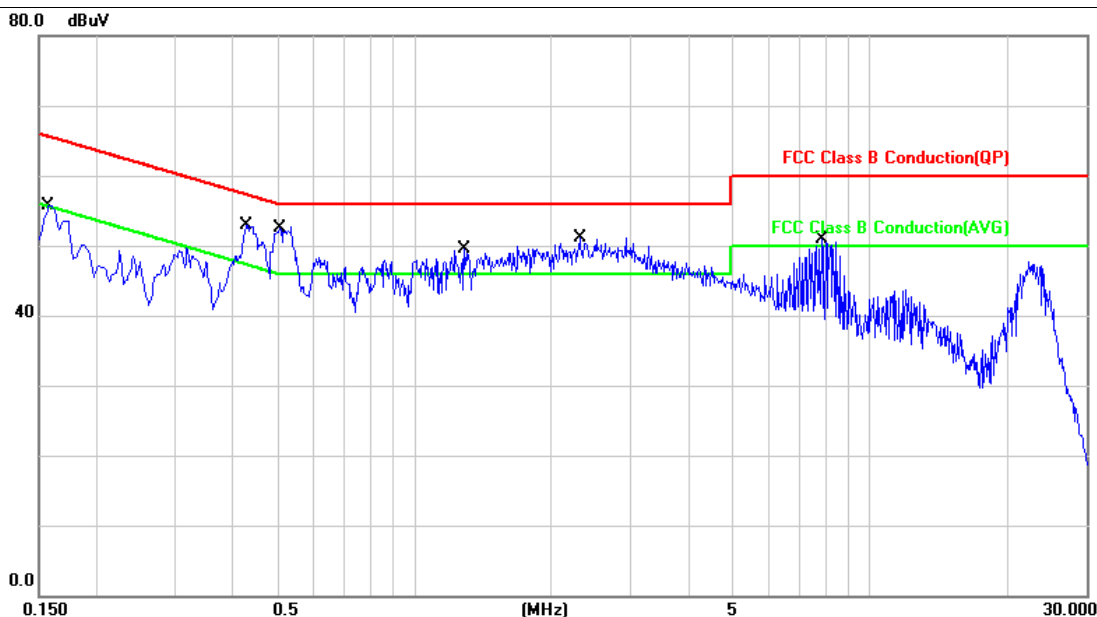
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Description:	Operation	Date:	2019/12/28
Line:	L1	Temp.(°C)/Hum.(%):	22.9(°C)/57%
Test Voltage:	AC 120V/60Hz	Test By:	Kane
Report Number:	ER/2019/C0047		



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1580	51.10	0.00	51.10	65.57	-14.47	QP	
2		0.1580	34.90	0.00	34.90	55.57	-20.67	AVG	
3		0.4300	50.30	0.01	50.31	57.25	-6.94	QP	
4		0.4300	37.60	0.01	37.61	47.25	-9.64	AVG	
5		0.5100	49.90	0.01	49.91	56.00	-6.09	QP	
6		0.5100	38.90	0.01	38.91	46.00	-7.09	AVG	
7		1.2900	43.70	0.03	43.73	56.00	-12.27	QP	
8		1.2900	33.10	0.03	33.13	46.00	-12.87	AVG	
9		2.3140	44.90	0.05	44.95	56.00	-11.05	QP	
10		2.3140	38.10	0.05	38.15	46.00	-7.85	AVG	
11		7.8620	48.80	0.24	49.04	60.00	-10.96	QP	
12	*	7.8620	47.90	0.24	48.14	50.00	-1.86	AVG	

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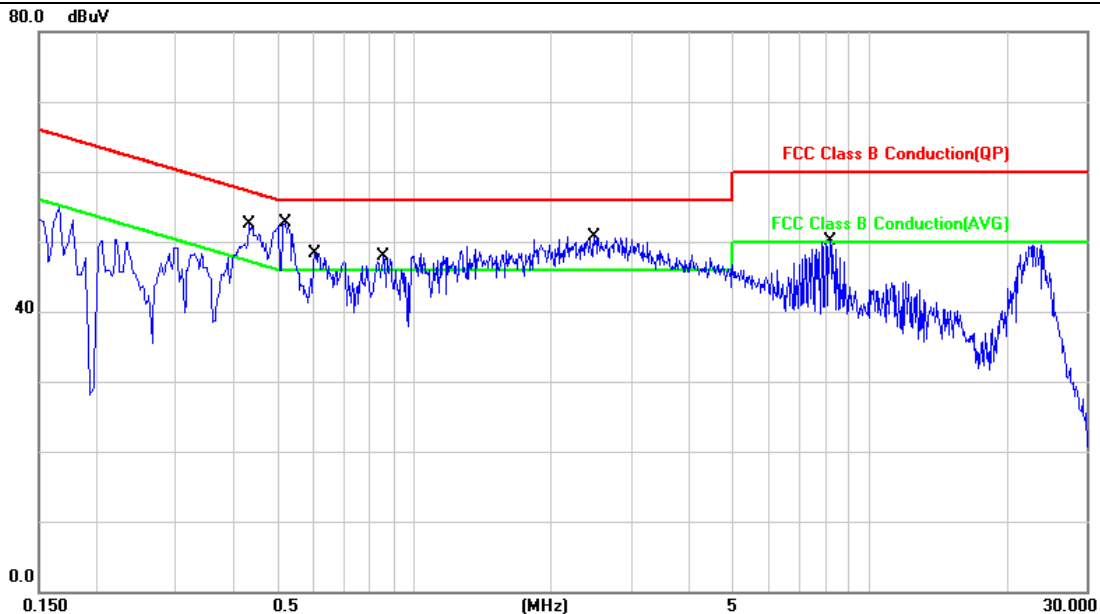
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Description:	Operation	Date:	2019/12/28
Line:	N	Temp.(°C)/Hum.(%):	22.9(°C)/57%
Test Voltage:	AC 120V/60Hz	Test By:	Kane
Report Number:	ER/2019/C0047		



No.	Mk.	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.4340	51.10	0.03	51.13	57.18	-6.05	QP	
2		0.4340	40.40	0.03	40.43	47.18	-6.75	AVG	
3		0.5220	49.90	0.03	49.93	56.00	-6.07	QP	
4		0.5220	37.40	0.03	37.43	46.00	-8.57	AVG	
5		0.6060	45.60	0.03	45.63	56.00	-10.37	QP	
6		0.6060	36.60	0.03	36.63	46.00	-9.37	AVG	
7		0.8580	44.10	0.04	44.14	56.00	-11.86	QP	
8		0.8580	32.30	0.04	32.34	46.00	-13.66	AVG	
9		2.4900	45.20	0.08	45.28	56.00	-10.72	QP	
10		2.4900	38.30	0.08	38.38	46.00	-7.62	AVG	
11		8.2340	48.20	0.26	48.46	60.00	-11.54	QP	
12	*	8.2340	46.70	0.26	46.96	50.00	-3.04	AVG	

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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.

7.1 Measurement Procedure:

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

7.2 Duty Cycle:

	Duty Cycle (%) = Ton / (Ton+Toff)	Duty Factor (dB) =10*log (1/Duty Cycle)	1/T (kHz)	VBW setting (kHz)
802.11b	99.23	0.03	0.08	0.01
802.11g	95.29	0.21	0.48	1.00
802.11n_20	94.73	0.24	1.02	2.00
802.11n_40	91.06	0.41	2.02	3.00

Duty Cycle Factor: $10 * \log(1/0.9923) = 0.03$

Duty Cycle Factor: $10 * \log(1/0.9529) = 0.21$

Duty Cycle Factor: $10 * \log(1/0.9473) = 0.24$

Duty Cycle Factor: $10 * \log(1/0.9106) = 0.41$

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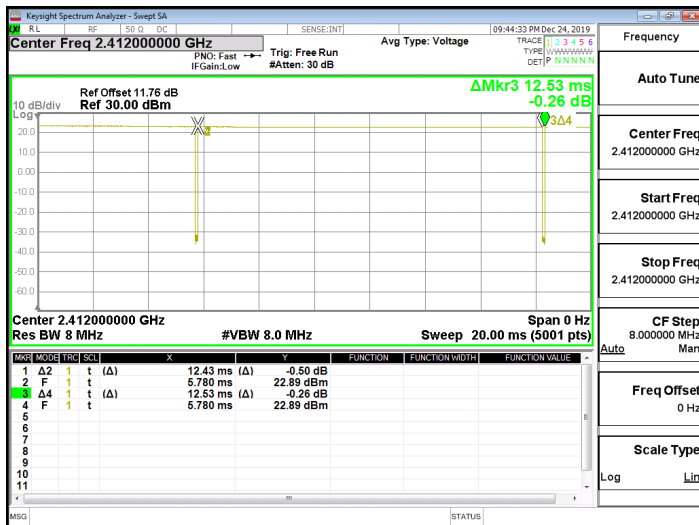
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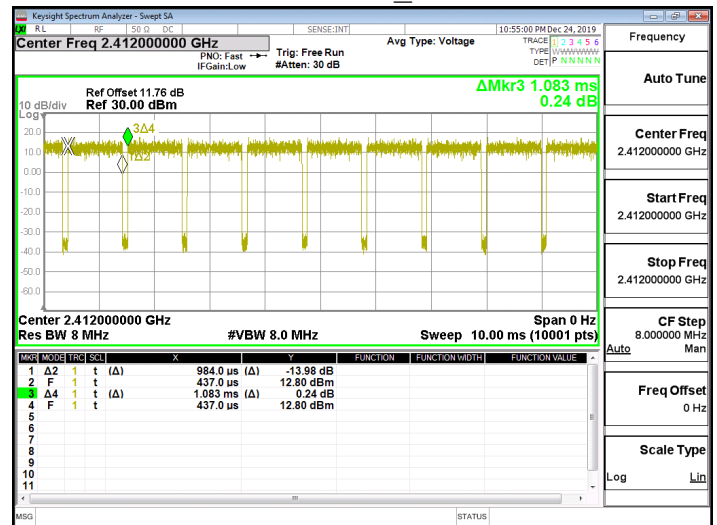
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7.3 Duty Cycle test plots

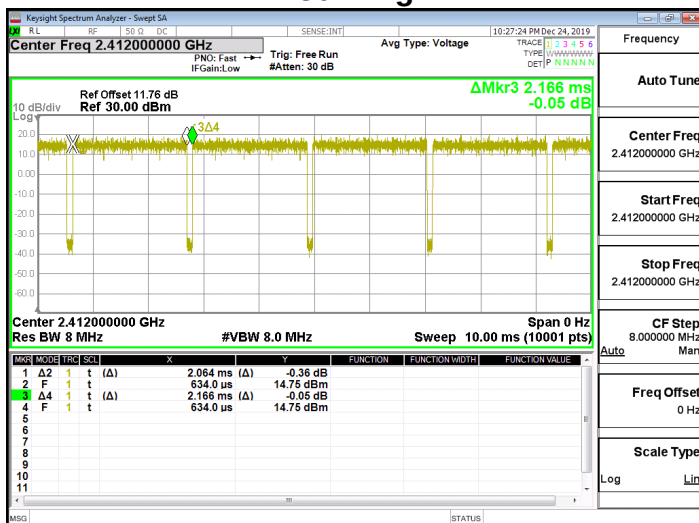
802.11b



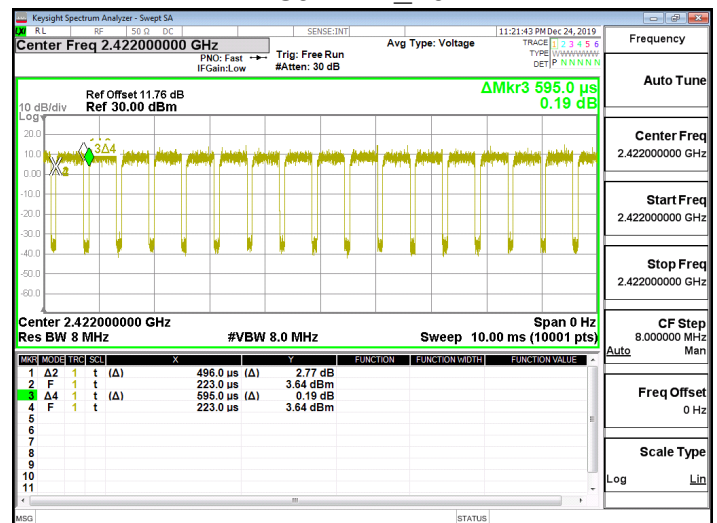
802.11n_20



802.11g



802.11n_40



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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:

As per FCC KDB 662911 D01

Unequal antenna gains, with equal transmit powers. For antenna gains given by G1, G2, ..., GN dBi.

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

$$= 10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{ANT}] \text{ dBi}$$

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

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

8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Meter	Anritsu	ML2496A	1804001	02/13/2019	02/12/2020
Power Sensor	Anritsu	MA2411B	1726104	02/13/2019	02/12/2020
Power Sensor	Anritsu	MA2411B	1726107	02/13/2019	02/12/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020

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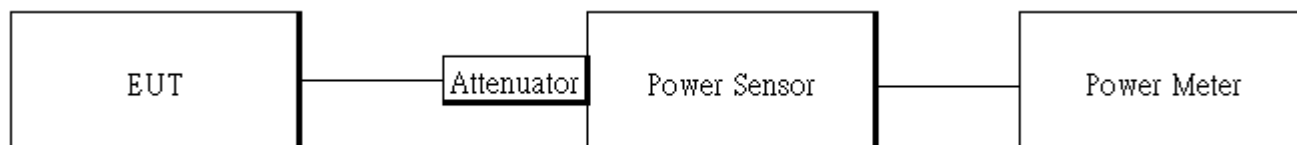
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8.3 Test Set-up

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.

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

8.5 Measurement Result

802.11b Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	21.63	30.00	PASS
6	2437	1	22.19	30.00	PASS
11	2462	1	22.23	30.00	PASS
802.11b Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19.22	30.00	PASS
6	2437	1	19.43	30.00	PASS
11	2462	1	19.37	30.00	PASS

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802.11b Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	22.04	30.00	PASS
6	2437	1	22.10	30.00	PASS
11	2462	1	22.53	30.00	PASS
802.11b Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19.70	30.00	PASS
6	2437	1	19.49	30.00	PASS
11	2462	1	19.85	30.00	PASS

802.11b_2TX							
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	1	21.93	21.89	24.92	29.38	PASS
6	2437	1	22.12	22.06	25.10	29.38	PASS
11	2462	1	21.63	21.02	24.35	29.38	PASS
802.11b_2TX							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	1	19.22	19.33	22.32	29.38	PASS
6	2437	1	19.22	19.31	22.31	29.38	PASS
11	2462	1	18.72	18.96	21.89	29.38	PASS

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802.11g Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	22.34	30.00	PASS
6	2437	6	23.80	30.00	PASS
11	2462	6	22.96	30.00	PASS
802.11g Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	13.43	30.00	PASS
6	2437	6	15.55	30.00	PASS
11	2462	6	13.64	30.00	PASS

802.11g Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	22.48	30.00	PASS
6	2437	6	24.05	30.00	PASS
11	2462	6	22.83	30.00	PASS
802.11g Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	13.81	30.00	PASS
6	2437	6	15.71	30.00	PASS
11	2462	6	13.34	30.00	PASS

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802.11g_2TX							
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	6	22.12	22.31	25.23	29.38	PASS
6	2437	6	23.70	23.87	26.80	29.38	PASS
11	2462	6	23.43	23.88	26.67	29.38	PASS
802.11g_2TX							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	6	13.10	13.40	16.47	29.38	PASS
6	2437	6	15.18	15.36	18.49	29.38	PASS
11	2462	6	13.17	13.60	16.61	29.38	PASS

802.11n_HT20M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	20.66	30.00	PASS
6	2437	MCS0	24.04	30.00	PASS
11	2462	MCS0	21.66	30.00	PASS
802.11n_HT20M Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	11.62	30.00	PASS
6	2437	MCS0	16.45	30.00	PASS
11	2462	MCS0	12.73	30.00	PASS

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802.11n_HT20M Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	20.88	30.00	PASS
6	2437	MCS0	23.95	30.00	PASS
11	2462	MCS0	22.59	30.00	PASS
802.11n_HT20M Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	11.46	30.00	PASS
6	2437	MCS0	16.47	30.00	PASS
11	2462	MCS0	13.32	30.00	PASS

802.11n_HT20M MIMO							
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	MCS8	20.60	20.86	23.74	29.38	PASS
6	2437	MCS8	23.52	23.71	26.63	29.38	PASS
11	2462	MCS8	21.66	22.41	25.06	29.38	PASS
802.11n_HT20M MIMO							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	MCS8	11.27	11.59	14.68	29.38	PASS
6	2437	MCS8	16.00	16.10	19.30	29.38	PASS
11	2462	MCS8	12.54	12.99	16.02	29.38	PASS

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802.11n_HT40M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	19.72	30.00	PASS
6	2437	MCS0	21.09	30.00	PASS
9	2452	MCS0	21.91	30.00	PASS
802.11n_HT40M Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	10.70	30.00	PASS
6	2437	MCS0	11.90	30.00	PASS
9	2452	MCS0	12.73	30.00	PASS

802.11n_HT40M Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	20.09	30.00	PASS
6	2437	MCS0	21.47	30.00	PASS
9	2452	MCS0	22.14	30.00	PASS
802.11n_HT40M Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	10.65	30.00	PASS
6	2437	MCS0	12.04	30.00	PASS
9	2452	MCS0	13.07	30.00	PASS

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802.11n_HT40M MIMO							
CH	Freq. (MHz)	Data Rate	Peak Output Power		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
3	2422	MCS8	19.76	21.02	23.45	29.38	PASS
6	2437	MCS8	20.42	21.21	23.84	29.38	PASS
9	2452	MCS8	21.79	22.10	24.96	29.38	PASS
802.11n_HT40M MIMO							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
3	2422	MCS8	9.88	10.02	13.37	29.38	PASS
6	2437	MCS8	10.91	11.18	14.46	29.38	PASS
9	2452	MCS8	12.05	12.36	15.62	29.38	PASS

802.11ax_HE20M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	0.00	30.00	PASS
6	2437	MCS0	0.00	30.00	PASS
11	2462	MCS0	0.00	30.00	PASS
802.11ax_HE20M Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	0.24	30.00	PASS
6	2437	MCS0	0.24	30.00	PASS
11	2462	MCS0	0.24	30.00	PASS

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802.11ax_HE20M Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	0.00	30.00	PASS
6	2437	MCS0	0.00	30.00	PASS
11	2462	MCS0	0.00	30.00	PASS
802.11ax_HE20M Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	0.24	30.00	PASS
6	2437	MCS0	0.24	30.00	PASS
11	2462	MCS0	0.24	30.00	PASS

802.11ax_HE20M MIMO							
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	MCS0	0.00	0.00	3.01	29.38	PASS
6	2437	MCS0	0.00	0.00	3.01	29.38	PASS
11	2462	MCS0	0.00	0.00	3.01	29.38	PASS
802.11ax_HE20M MIMO							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
1	2412	MCS0	0.00	0.00	3.25	29.38	PASS
6	2437	MCS0	0.00	0.00	3.25	29.38	PASS
11	2462	MCS0	0.00	0.00	3.25	29.38	PASS

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802.11ax_HE40M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	0.00	30.00	PASS
6	2437	MCS0	0.00	30.00	PASS
9	2452	MCS0	0.00	30.00	PASS
802.11ax_HE40M Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	0.41	30.00	PASS
6	2437	MCS0	0.41	30.00	PASS
9	2452	MCS0	0.41	30.00	PASS

802.11ax_HE40M Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	0.00	30.00	PASS
6	2437	MCS0	0.00	30.00	PASS
9	2452	MCS0	0.00	30.00	PASS
802.11ax_HE40M Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	0.41	30.00	PASS
6	2437	MCS0	0.41	30.00	PASS
9	2452	MCS0	0.41	30.00	PASS

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802.11ax_HE40M MIMO							
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
3	2422	MCS0	0.00	0.00	3.01	29.38	PASS
6	2437	MCS0	0.00	0.00	3.01	29.38	PASS
9	2452	MCS0	0.00	0.00	3.01	29.38	PASS

802.11ax_HE40M MIMO							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1			
3	2422	MCS0	0.00	0.00	3.42	29.38	PASS
6	2437	MCS0	0.00	0.00	3.42	29.38	PASS
9	2452	MCS0	0.00	0.00	3.42	29.38	PASS

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

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EIRP

802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	19.22	3.90	23.12	36	PASS
2	2417	1	19.21	3.90	23.11	36	PASS
6	2437	1	19.43	3.90	23.33	36	PASS
10	2457	1	19.42	3.90	23.32	36	PASS
11	2462	1	19.37	3.90	23.27	36	PASS
802.11b Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	19.70	3.30	23.00	36	PASS
2	2417	1	19.48	3.30	22.78	36	PASS
6	2437	1	19.49	3.30	22.79	36	PASS
10	2457	1	19.75	3.30	23.05	36	PASS
11	2462	1	19.85	3.30	23.15	36	PASS

802.11b_2TX									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	1	19.22	19.33	22.32	6.62	28.94	36	PASS
2	2417	1	19.01	19.51	22.31	6.62	28.93	36	PASS
6	2437	1	19.22	19.31	22.31	6.62	28.93	36	PASS
10	2457	1	19.11	19.23	22.21	6.62	28.83	36	PASS
11	2462	1	18.72	18.96	21.89	6.62	28.51	36	PASS

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802.11g Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	13.43	3.90	17.33	36	PASS
2	2417	6	16.25	3.90	20.15	36	PASS
6	2437	6	15.55	3.90	19.45	36	PASS
10	2457	6	15.51	3.90	19.41	36	PASS
11	2462	6	13.64	3.90	17.54	36	PASS
802.11g Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	13.81	3.30	17.11	36	PASS
2	2417	6	16.36	3.30	19.66	36	PASS
6	2437	6	15.71	3.30	19.01	36	PASS
10	2457	6	15.67	3.30	18.97	36	PASS
11	2462	6	13.34	3.30	16.64	36	PASS

802.11g_2TX									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	6	13.10	13.40	16.47	6.62	23.09	36	PASS
2	2417	6	15.92	16.05	19.21	6.62	25.83	36	PASS
6	2437	6	15.18	15.36	18.49	6.62	25.11	36	PASS
10	2457	6	15.15	15.51	18.55	6.62	25.17	36	PASS
11	2462	6	13.17	13.60	16.61	6.62	23.23	36	PASS

802.11n_HT20M Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	11.62	3.90	15.52	36	PASS
2	2417	MCS0	16.05	3.90	19.95	36	PASS
6	2437	MCS0	16.45	3.90	20.35	36	PASS
10	2457	MCS0	16.33	3.90	20.23	36	PASS
11	2462	MCS0	12.73	3.90	16.63	36	PASS

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802.11n_HT20M Ch1

CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	11.46	3.30	14.76	36	PASS
2	2417	MCS0	16.36	3.30	19.66	36	PASS
6	2437	MCS0	16.47	3.30	19.77	36	PASS
10	2457	MCS0	16.44	3.30	19.74	36	PASS
11	2462	MCS0	13.32	3.30	16.62	36	PASS

802.11n_HT20M MIMO

CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	MCS8	20.60	20.86	14.68	6.62	21.30	36	PASS
2	2417	MCS8	23.20	23.44	19.22	6.62	25.84	36	PASS
6	2437	MCS8	23.52	23.71	19.30	6.62	25.92	36	PASS
10	2457	MCS8	23.88	24.11	19.30	6.62	25.92	36	PASS
11	2462	MCS8	21.66	22.41	16.02	6.62	22.64	36	PASS

802.11n_HT40M Ch0

CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	10.70	3.90	14.60	36	PASS
4	2427	MCS0	10.72	3.90	14.62	36	PASS
5	2432	MCS0	11.70	3.90	15.60	36	PASS
6	2437	MCS0	11.90	3.90	15.80	36	PASS
7	2442	MCS0	14.48	3.90	18.38	36	PASS
8	2447	MCS0	13.66	3.90	17.56	36	PASS
9	2452	MCS0	12.73	3.90	16.63	36	PASS

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802.11n_HT40M Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	10.65	3.30	13.95	36	PASS
4	2427	MCS0	10.77	3.30	14.07	36	PASS
5	2432	MCS0	11.92	3.30	15.22	36	PASS
6	2437	MCS0	12.04	3.30	15.34	36	PASS
7	2442	MCS0	14.89	3.30	18.19	36	PASS
8	2447	MCS0	13.75	3.30	17.05	36	PASS
9	2452	MCS0	13.07	3.30	16.37	36	PASS

802.11n_HT40M MIMO									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
3	2422	MCS8	9.88	10.02	13.37	6.62	19.99	36	PASS
4	2427	MCS8	9.87	9.96	13.33	6.62	19.95	36	PASS
5	2432	MCS8	10.81	11.06	14.35	6.62	20.97	36	PASS
6	2437	MCS8	10.91	11.18	14.46	6.62	21.08	36	PASS
7	2442	MCS8	13.75	14.00	17.29	6.62	23.91	36	PASS
8	2447	MCS8	12.60	13.15	16.30	6.62	22.92	36	PASS
9	2452	MCS8	12.05	12.36	15.62	6.62	22.25	36	PASS

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9 6DB & 99% BANDWIDTH MEASUREMENT

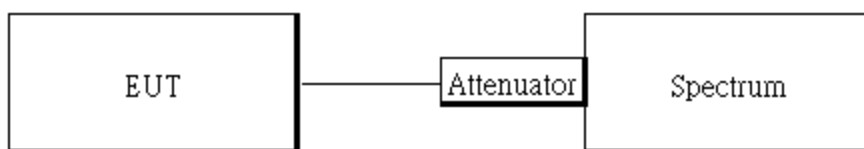
9.1 Standard Applicable

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.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/02/2019	05/01/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

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.
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.

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9.5 6dB Bandwidth

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	8077.00	> 500	PASS
2437	8075.00	> 500	PASS
2462	8070.00	> 500	PASS

802.11b Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	8086.00	> 500	PASS
2437	8064.00	> 500	PASS
2462	8067.00	> 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16350.00	> 500	PASS
2437	16370.00	> 500	PASS
2462	16350.00	> 500	PASS

802.11g Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16420.00	> 500	PASS
2437	16400.00	> 500	PASS
2462	16400.00	> 500	PASS

802.11_n_HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17580.00	> 500	PASS
2437	17620.00	> 500	PASS
2462	17360.00	> 500	PASS

802.11_n_HT20 Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17620.00	> 500	PASS
2437	17630.00	> 500	PASS
2462	17620.00	> 500	PASS

802.11_n_HT40 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35790.00	> 500	PASS
2437	35830.00	> 500	PASS
2452	35790.00	> 500	PASS

802.11_n_HT40 Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	36380.00	> 500	PASS
2437	36380.00	> 500	PASS
2452	36000.00	> 500	PASS

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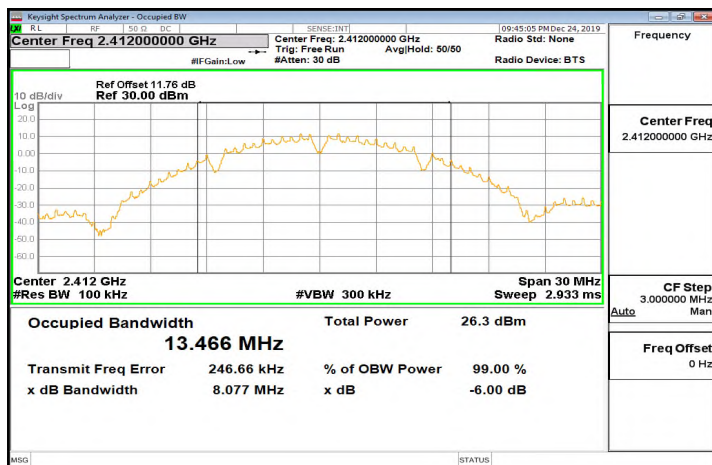
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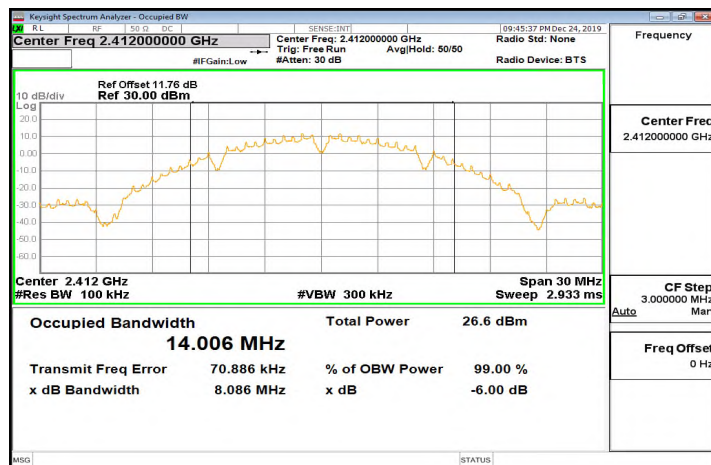
802.11b (CH0)

6dB Band Width Test Data CH-Low

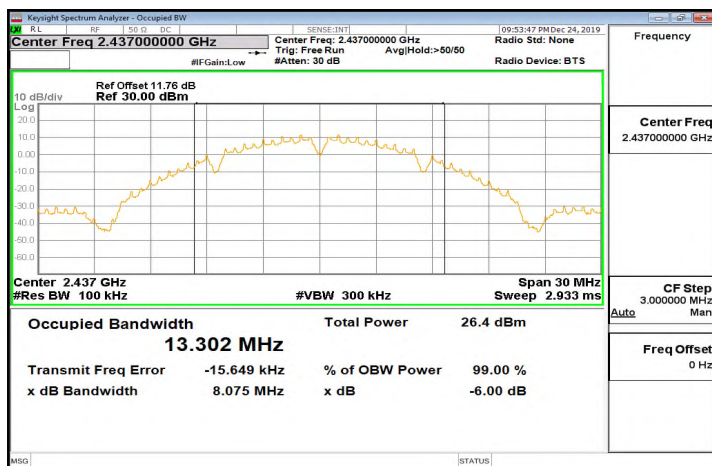


802.11b (CH1)

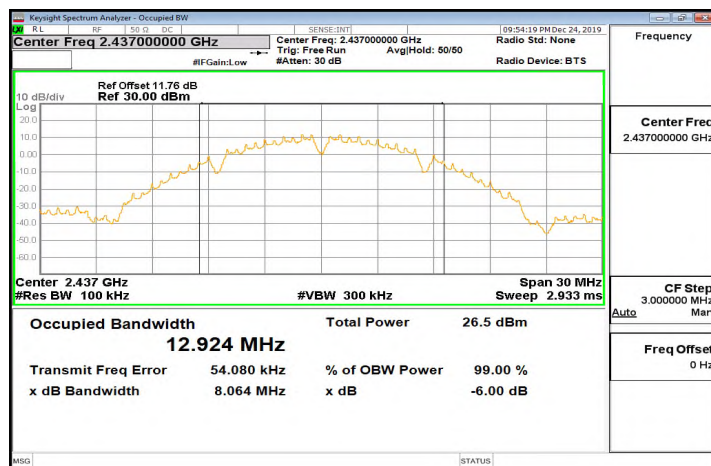
6dB Band Width Test Data CH-Low



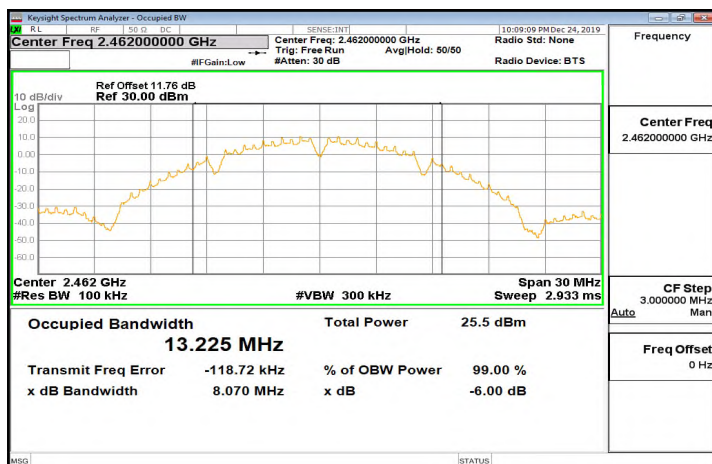
6dB Band Width Test Data CH-Mid



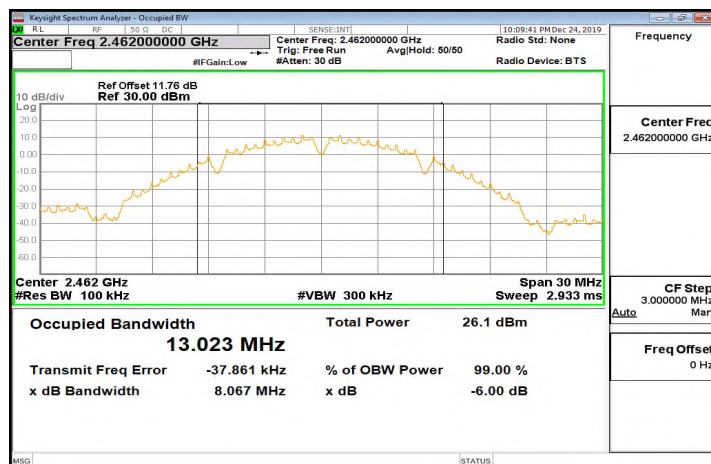
6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



6dB Band Width Test Data CH-High



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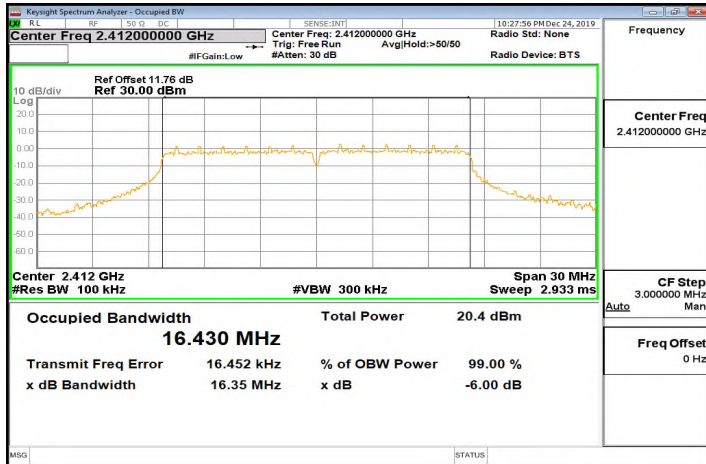
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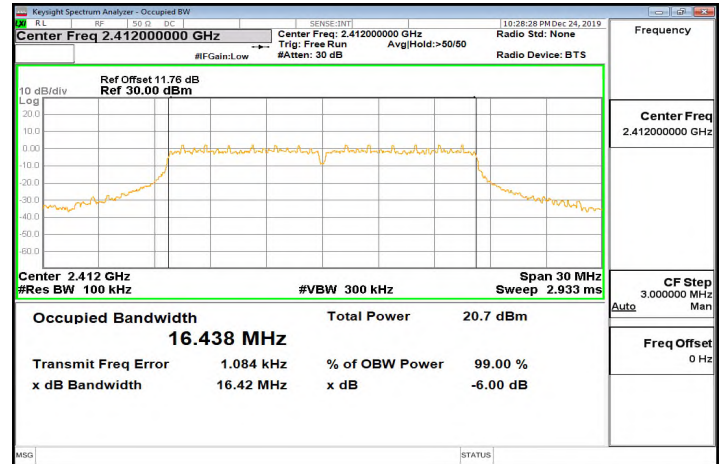
802.11g (CH0)

6dB Band Width Test Data CH-Low

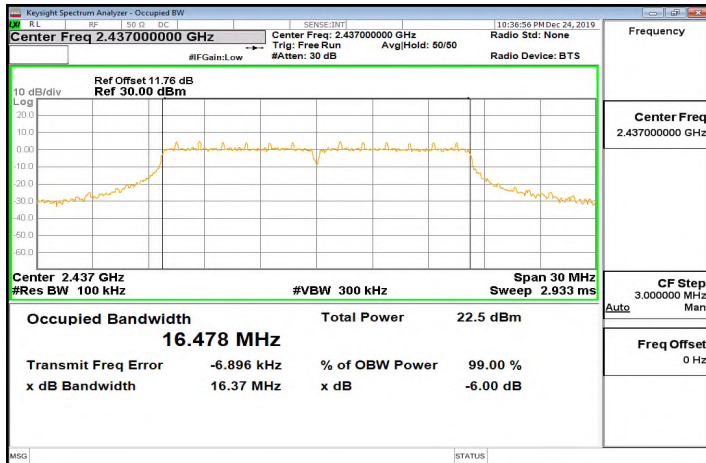


802.11g (CH1)

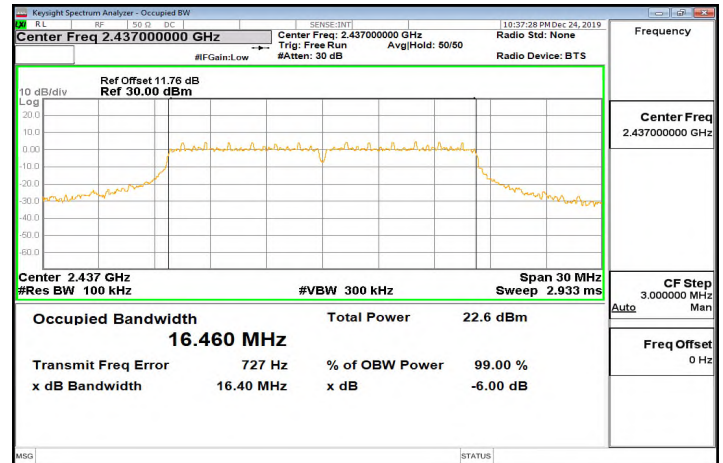
6dB Band Width Test Data CH-Low



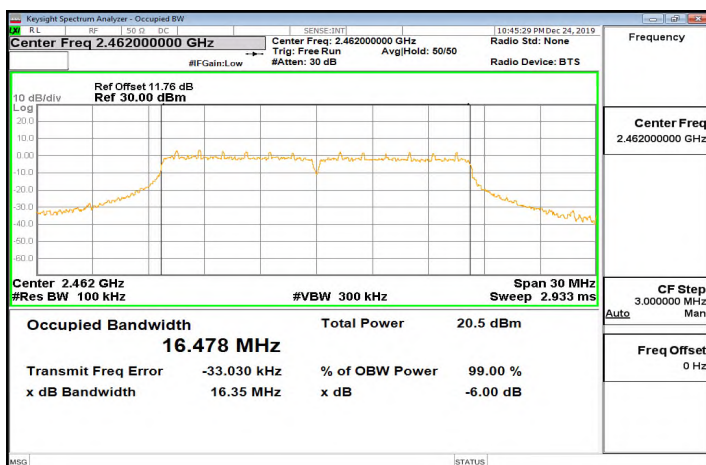
6dB Band Width Test Data CH-Mid



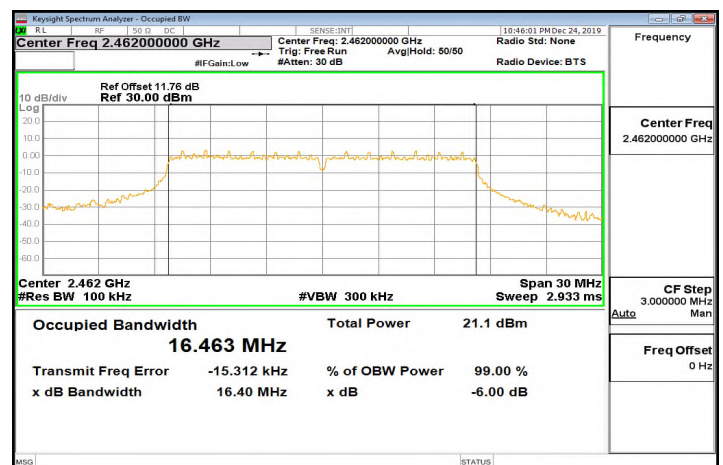
6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



6dB Band Width Test Data CH-High



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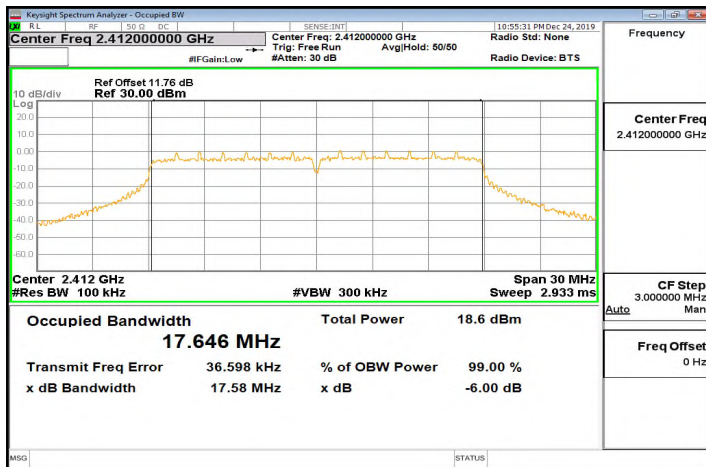
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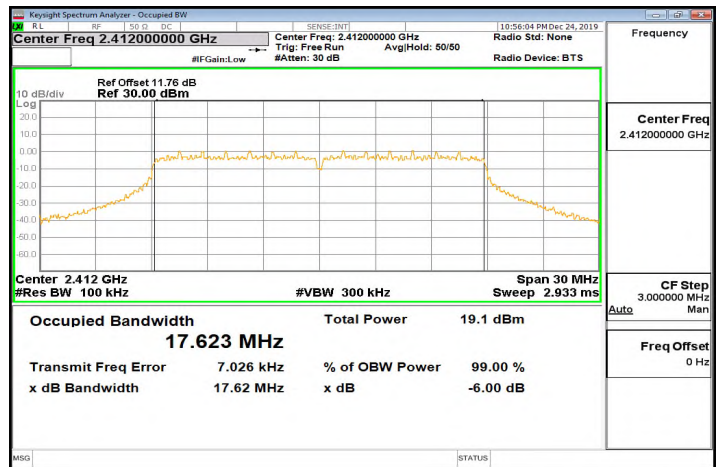
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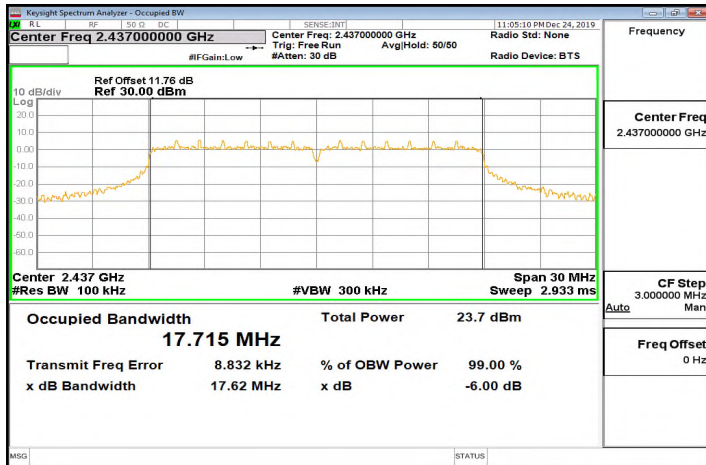
802.11n_20M (CH0)
6dB Band Width Test Data CH-Low



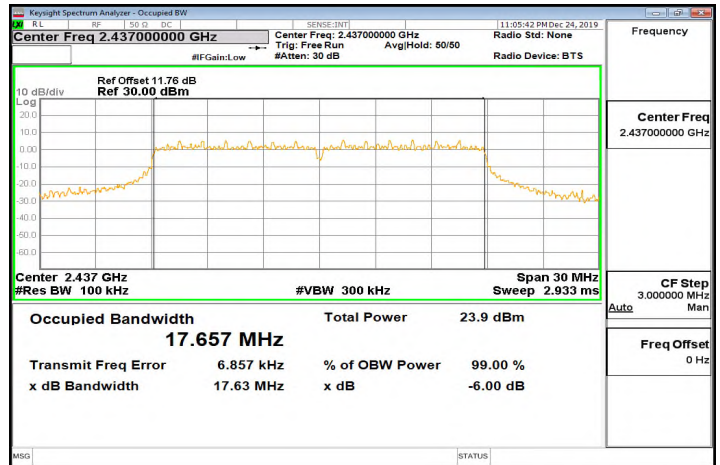
802.11n_20M (CH1)
6dB Band Width Test Data CH-Low



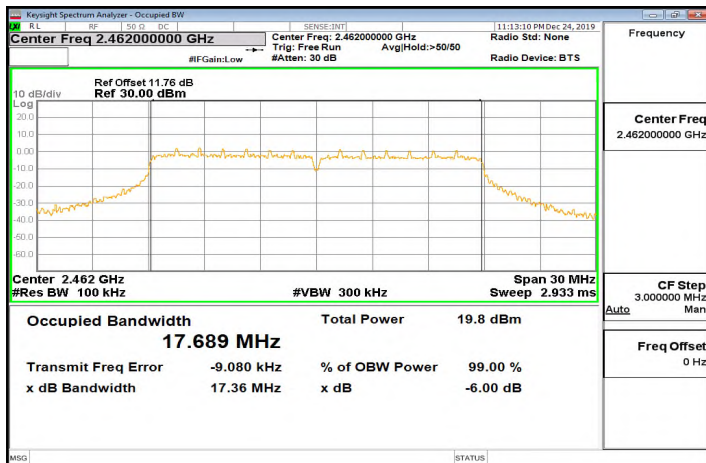
6dB Band Width Test Data CH-Mid



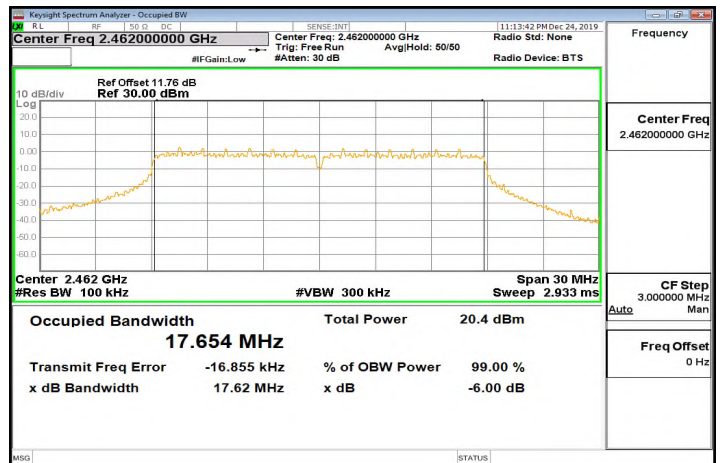
6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



6dB Band Width Test Data CH-High



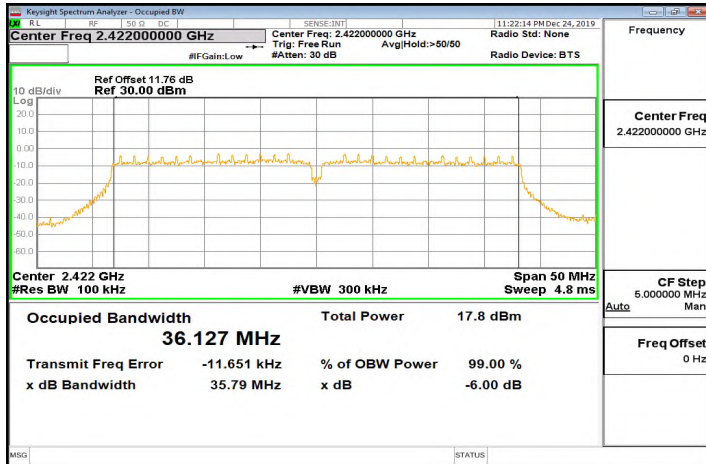
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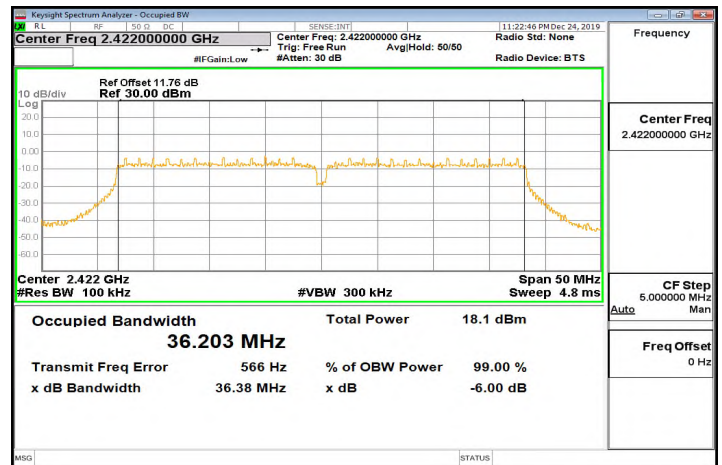
802.11n_40M (CH0)

6dB Band Width Test Data CH-Low

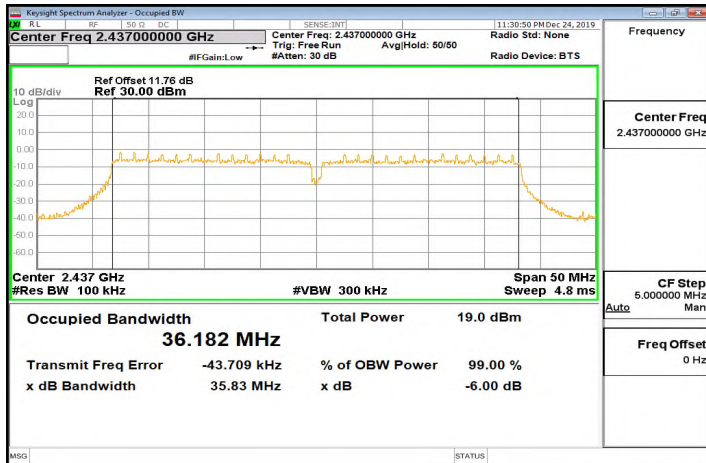


802.11n_40M (CH1)

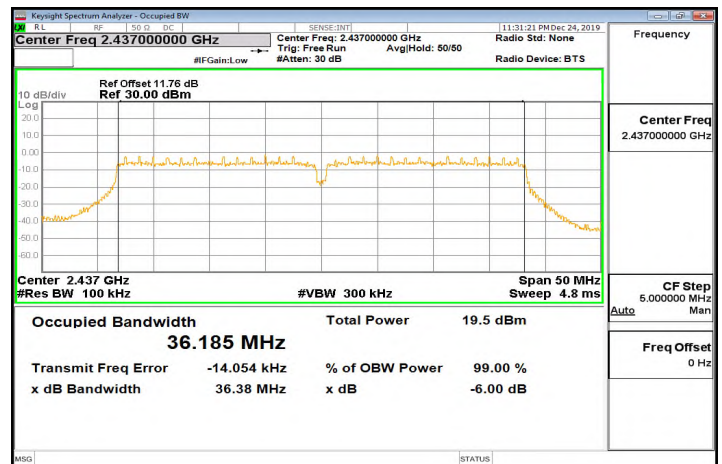
6dB Band Width Test Data CH-Low



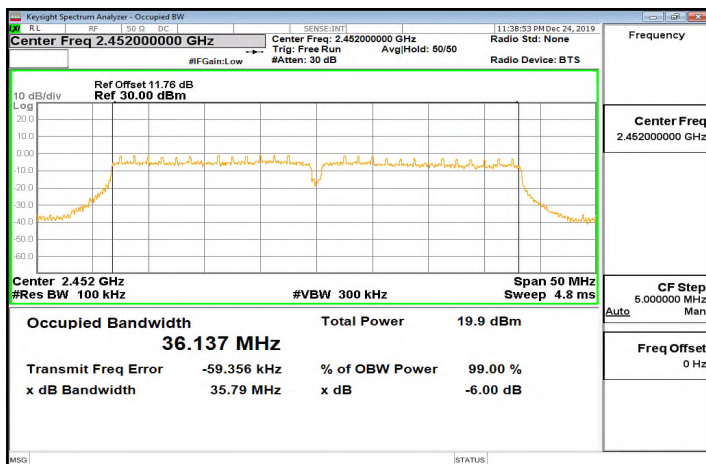
6dB Band Width Test Data CH-Mid



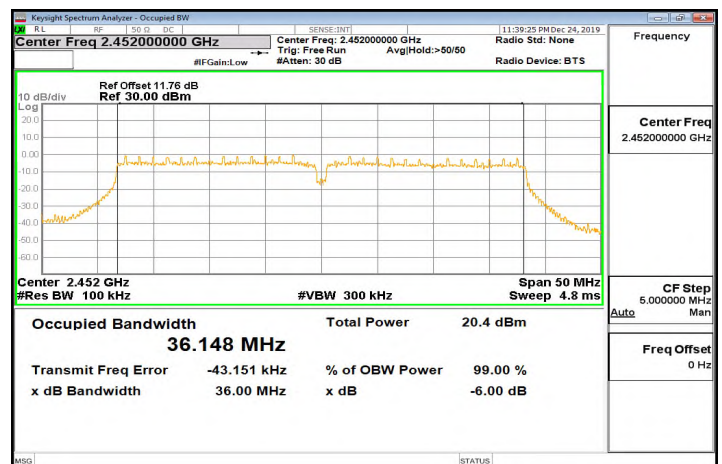
6dB Band Width Test Data CH-Mid



6dB Band Width Test Data CH-High



6dB Band Width Test Data CH-High



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9.6 99% Bandwidth

802.11b Ch0		802.11b Ch1	
Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)
2412	13.333	2412	15.934
2437	13.284	2437	12.985
2462	13.241	2462	13.067

802.11g Ch0		802.11g Ch1	
Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)
2412	16.79	2412	16.609
2437	16.885	2437	16.681
2462	16.914	2462	16.668

802.11n_HT20M Ch0		802.11n_HT20M Ch1	
Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)
2412	17.993	2412	17.794
2437	18.143	2437	17.882
2462	18.135	2462	17.865

802.11n_HT40M Ch0		802.11n_HT40M Ch1	
Freq. (MHz)	99% BW (MHz)	Freq. (MHz)	99% BW (MHz)
2422	36.523	2422	36.393
2437	36.685	2437	36.331
2452	36.613	2452	36.35

**Refer to next page for plots*

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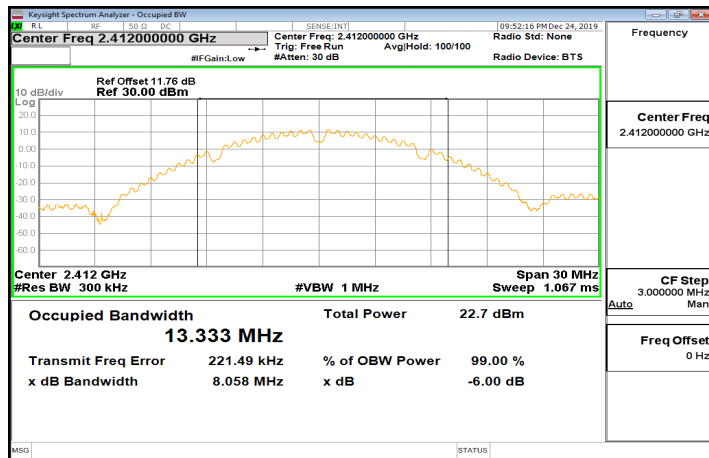
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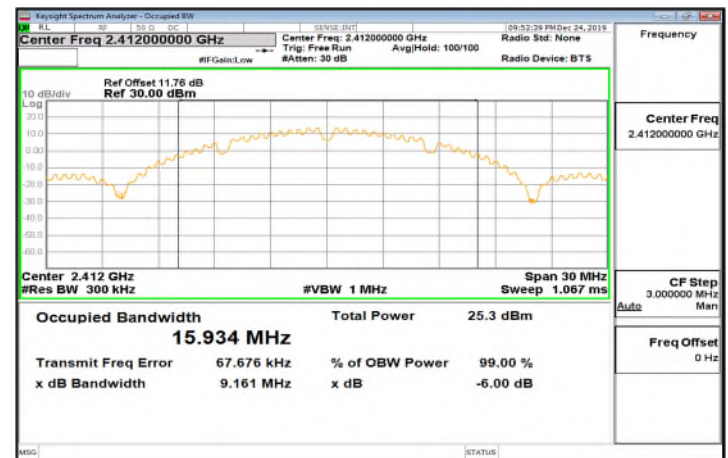
802.11b (CH1)

99% Band Width Test Data CH-Low

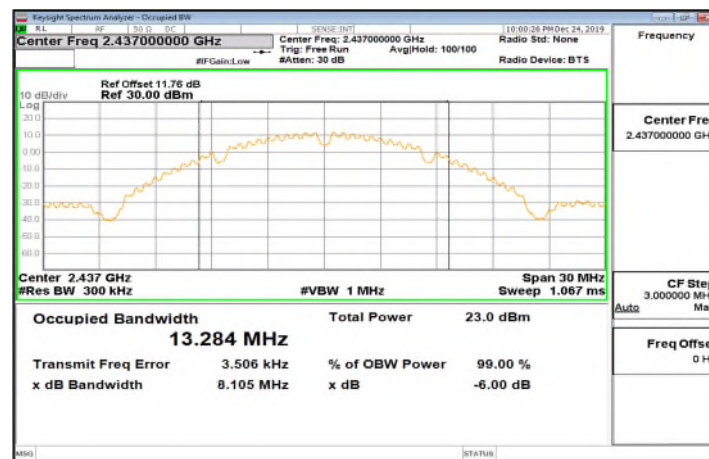


802.11b (CH1)

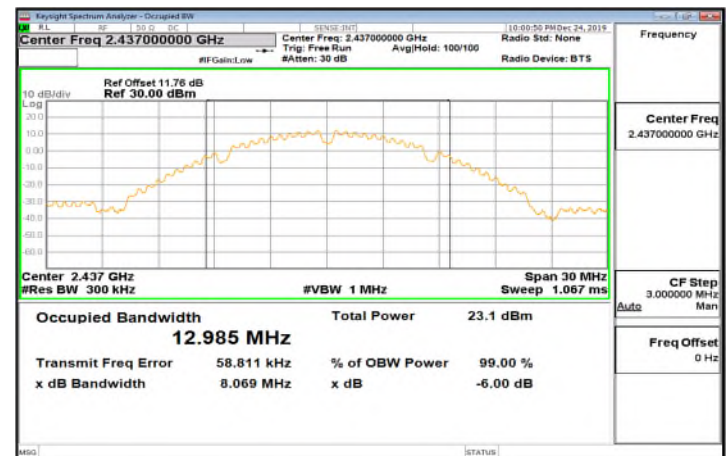
99% Band Width Test Data CH-Low



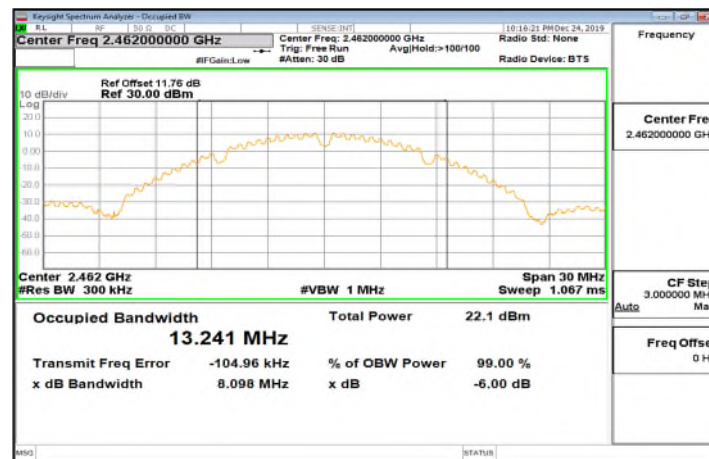
99% Band Width Test Data CH-Mid



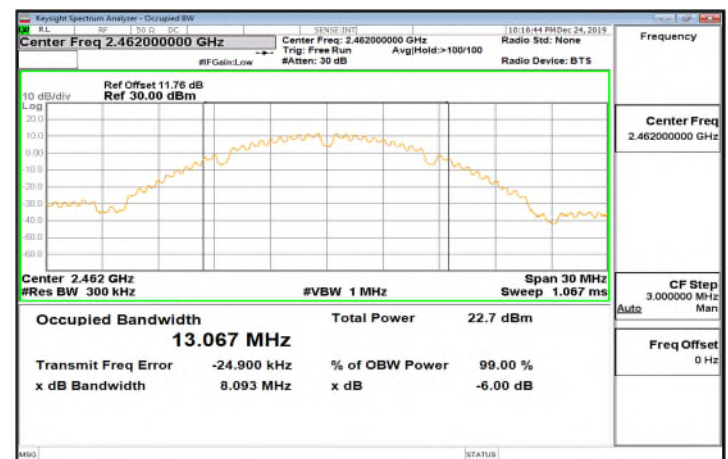
99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



99% Band Width Test Data CH-High



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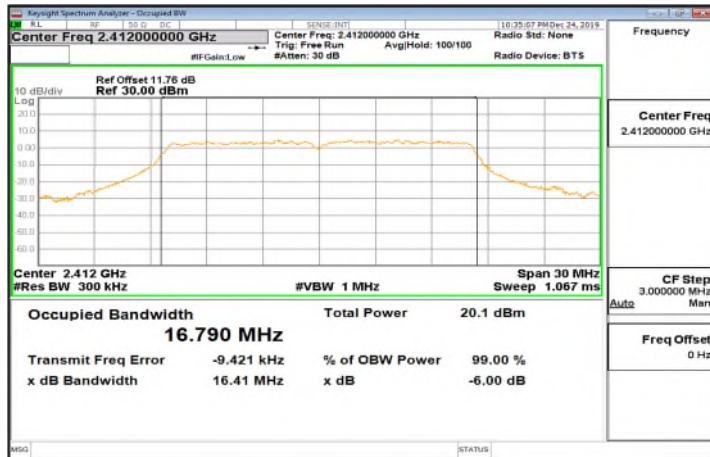
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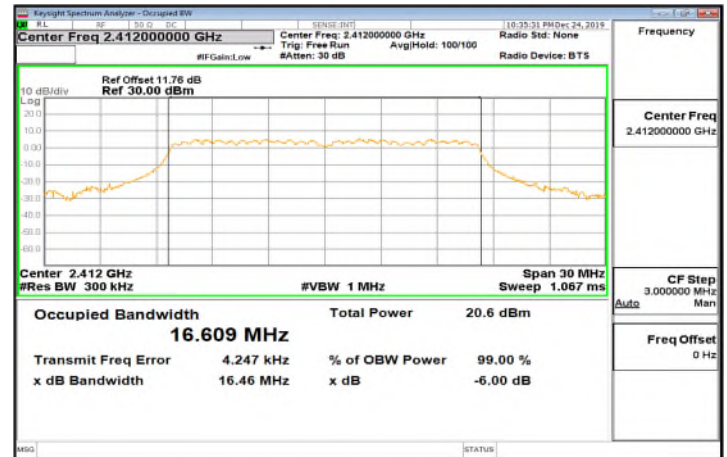
802.11g (CH0)

99% Band Width Test Data CH-Low

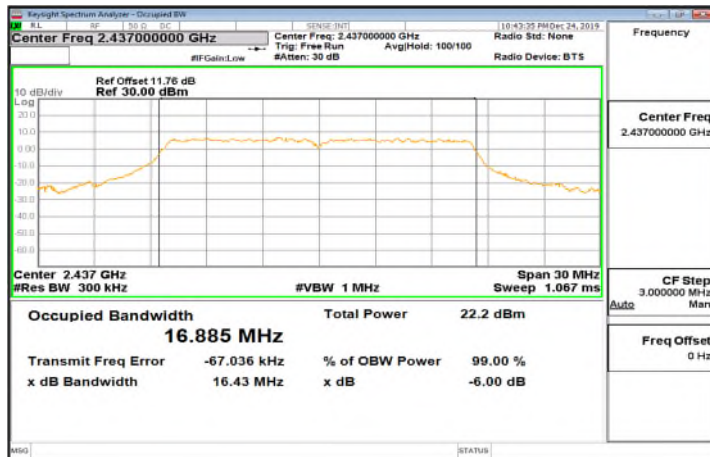


802.11g (CH1)

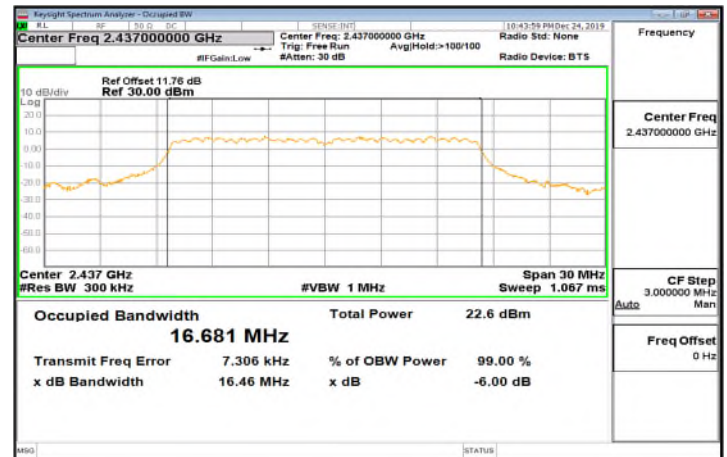
99% Band Width Test Data CH-Low



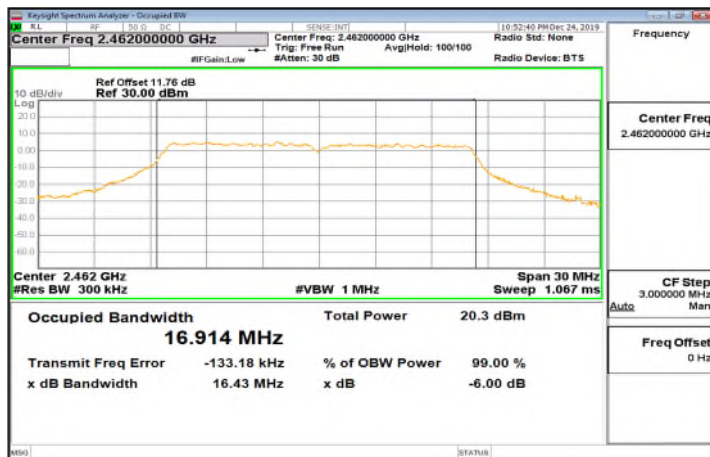
99% Band Width Test Data CH-Mid



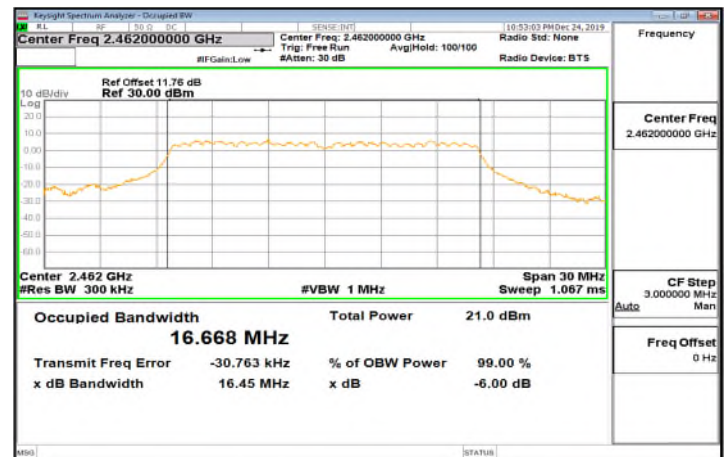
99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



99% Band Width Test Data CH-High



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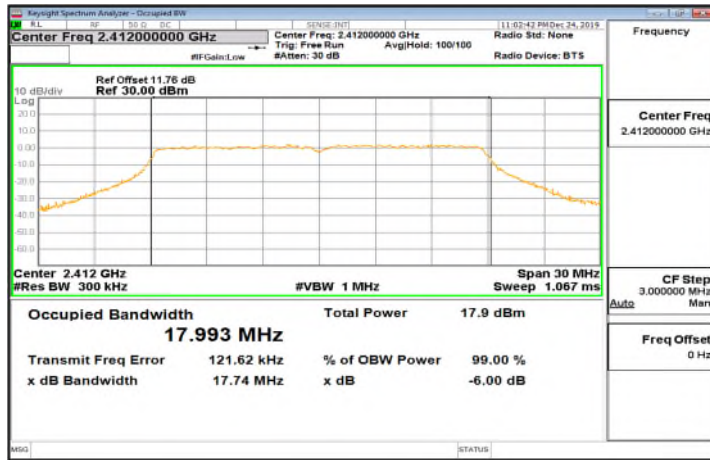
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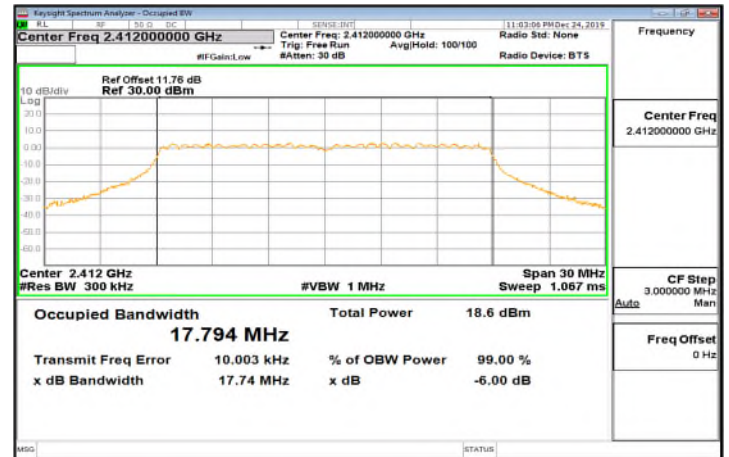
802.11n_20M (CH0)

99% Band Width Test Data CH-Low

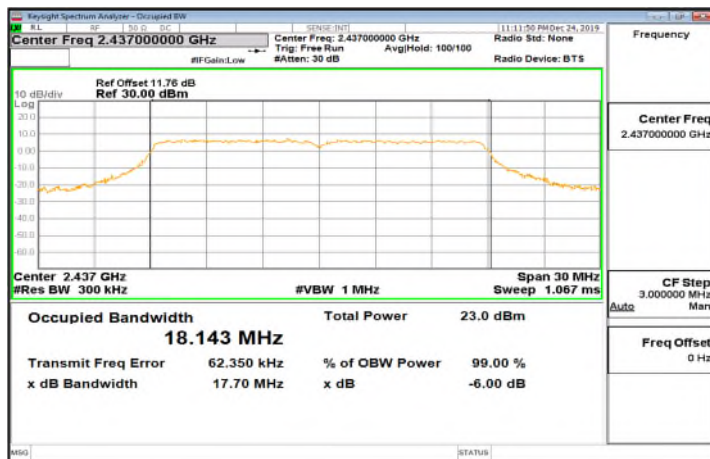


802.11n_20M (CH1)

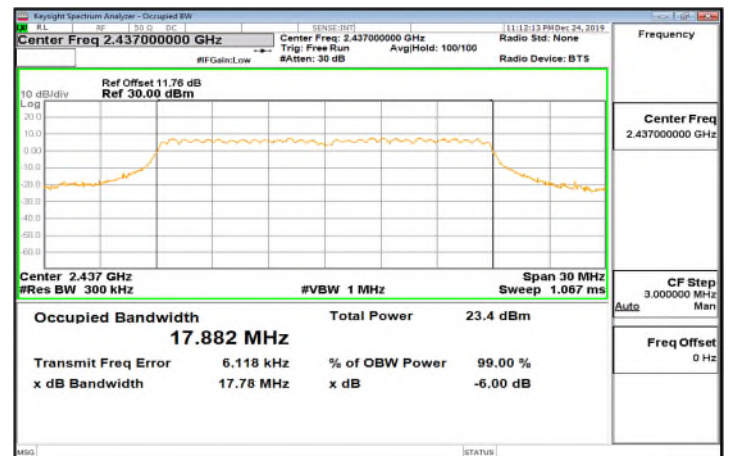
99% Band Width Test Data CH-Low



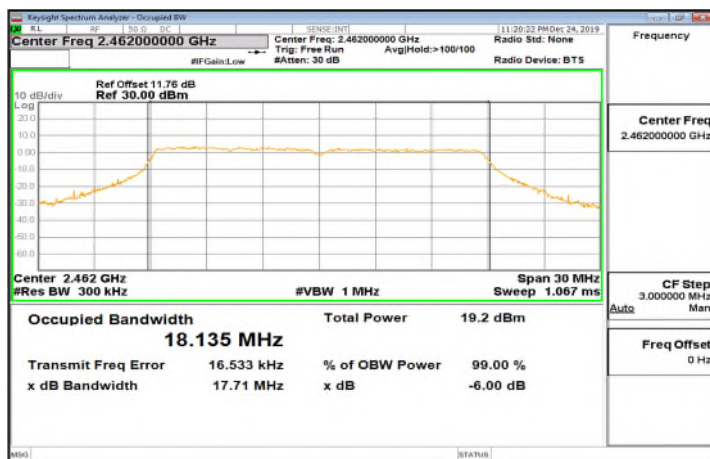
99% Band Width Test Data CH-Mid



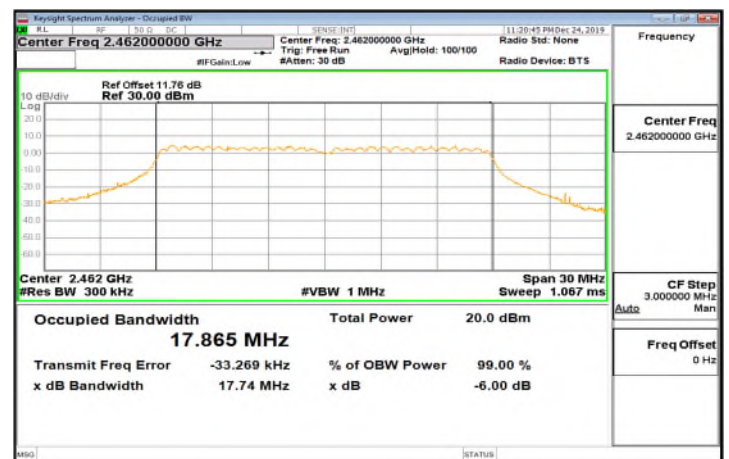
99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



99% Band Width Test Data CH-High



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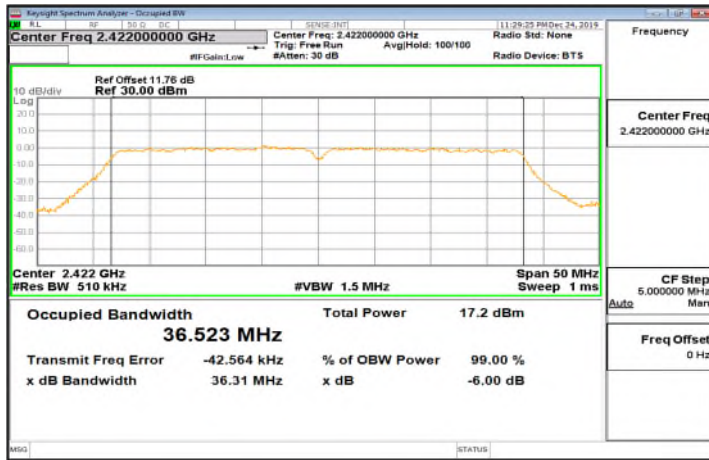
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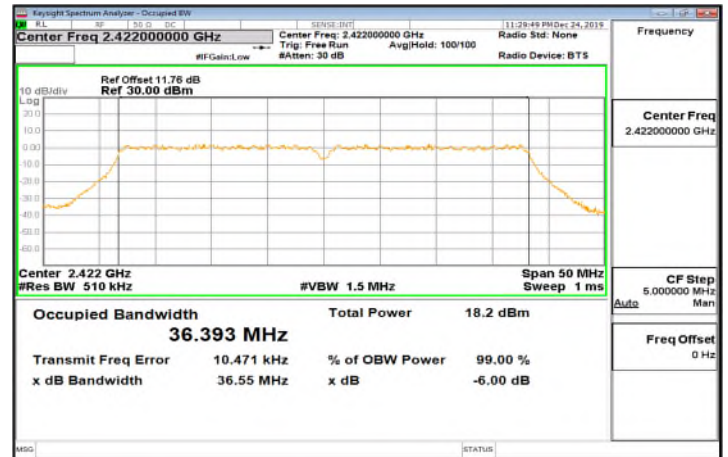
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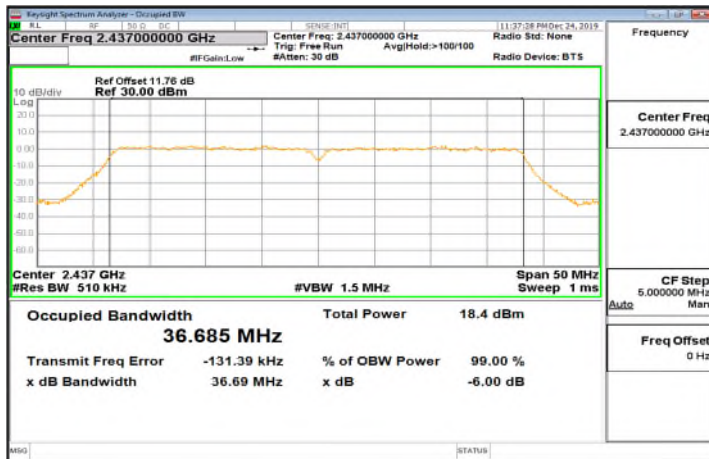
802.11n_40M (CH0) 99% Band Width Test Data CH-Low



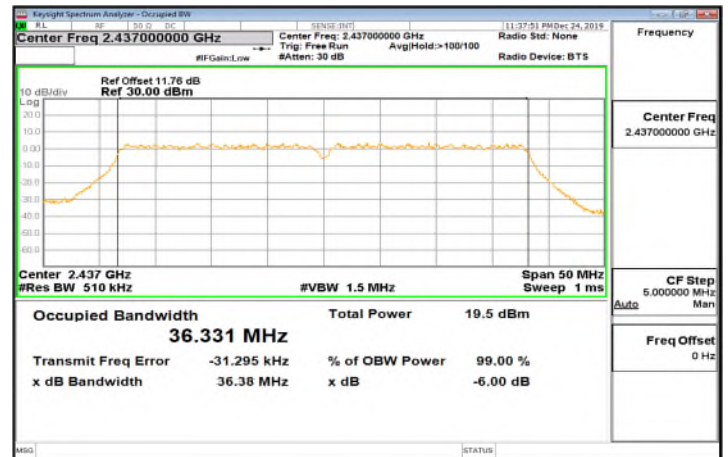
802.11n_40M (CH1) 99% Band Width Test Data CH-Low



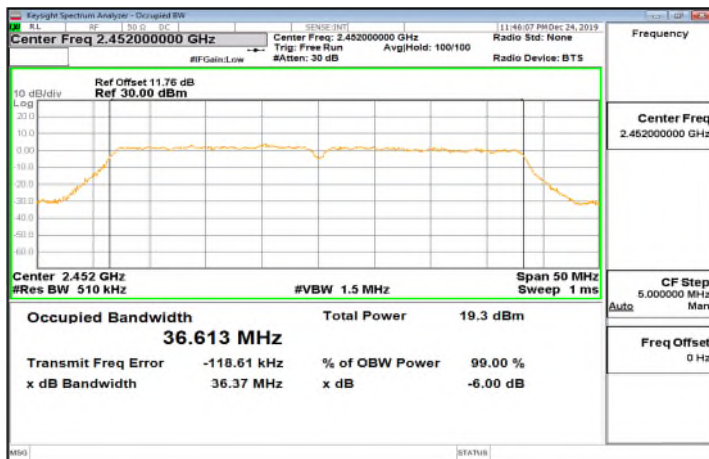
99% Band Width Test Data CH-Mid



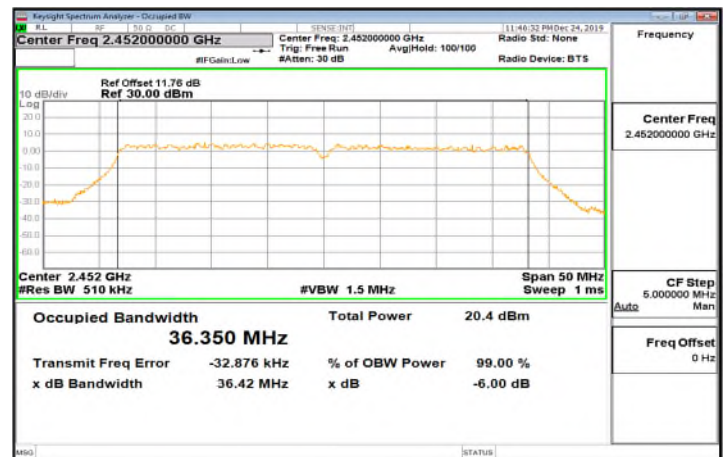
99% Band Width Test Data CH-Mid



99% Band Width Test Data CH-High



99% Band Width Test Data CH-High



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

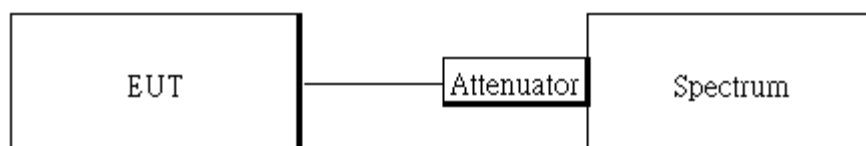
10.1 Standard Applicable

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.
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	05/02/2019	05/01/2020
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2019	01/01/2020
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2019	01/01/2020

10.3 Test SET-UP



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.

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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

Reference Level of Limit 802.11b mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	14.24	-5.76
2437	14.46	-5.54
2462	13.59	-6.41

Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	5.57	-14.43
2437	7.53	-12.47
2462	5.83	-14.17

Reference Level of Limit 802.11n20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	3.73	-16.27
2437	8.46	-11.54
2462	5.07	-14.93

Reference Level of Limit 802.11n40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	-0.13	-20.13
2437	1.33	-18.67
2452	2.25	-17.75

Note

Cable Loss 11.76 dB

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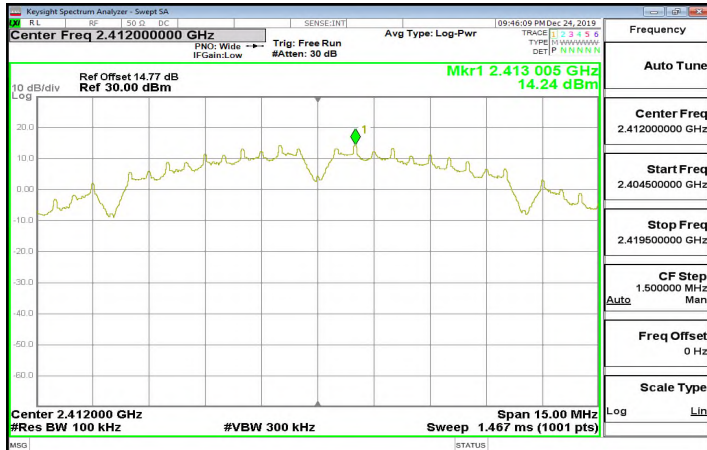
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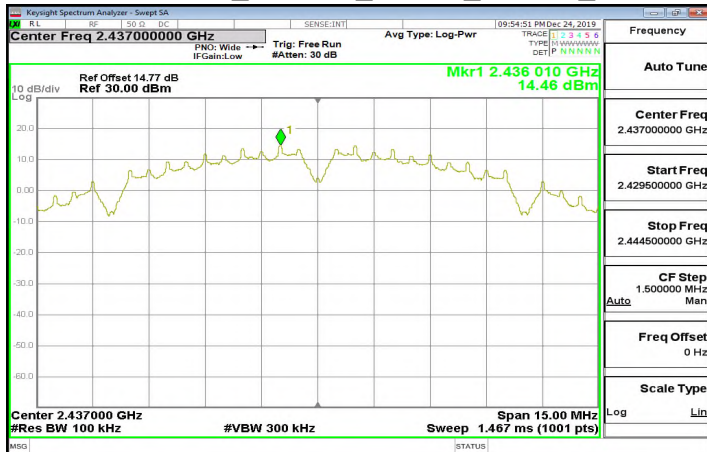
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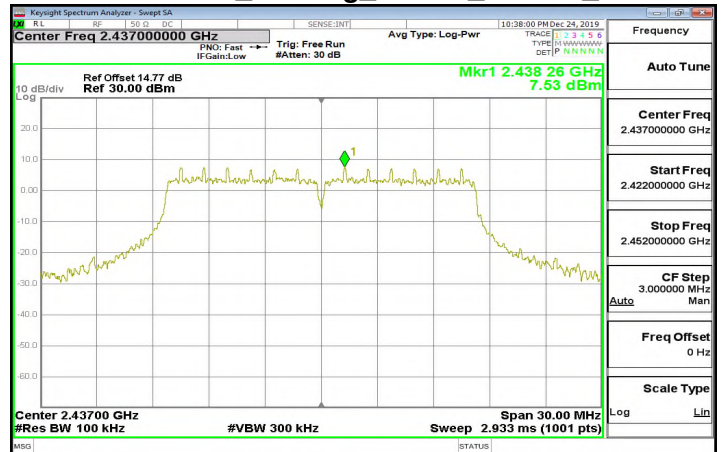
Reference Level 802.11g 20MHz Chain0 2412MHz



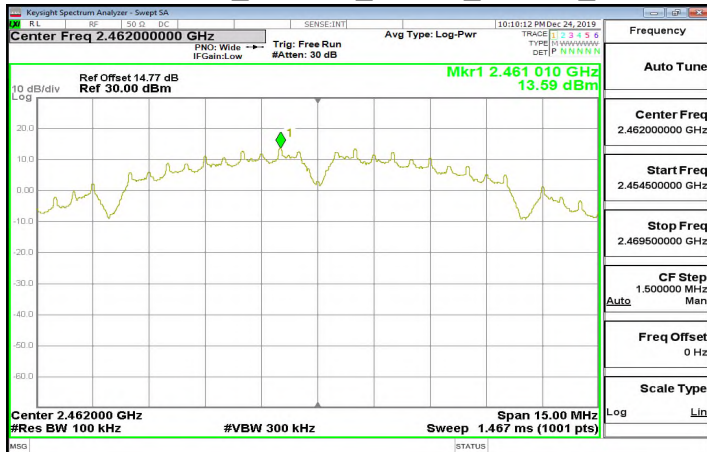
Reference Level 802.11b 20MHz Chain0 2437MHz



Reference Level 802.11g 20MHz Chain0 2437MHz



Reference Level 802.11b 20MHz Chain0 2462MHz



Reference Level 802.11g 20MHz Chain0 2462MHz



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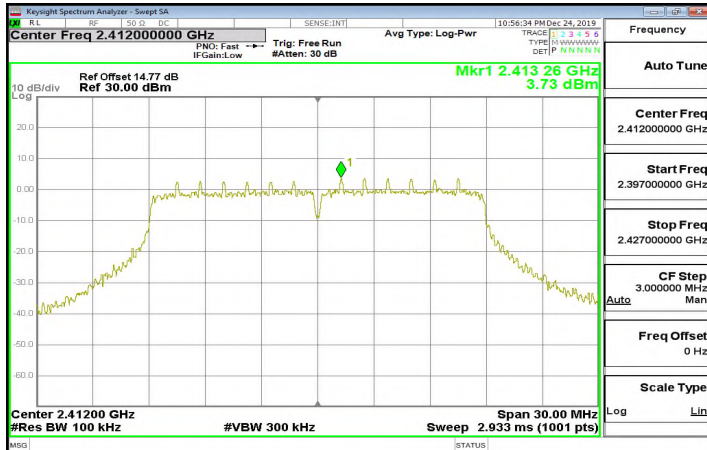
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Reference Level 802.11n 20MHz Chain0 2412MHz



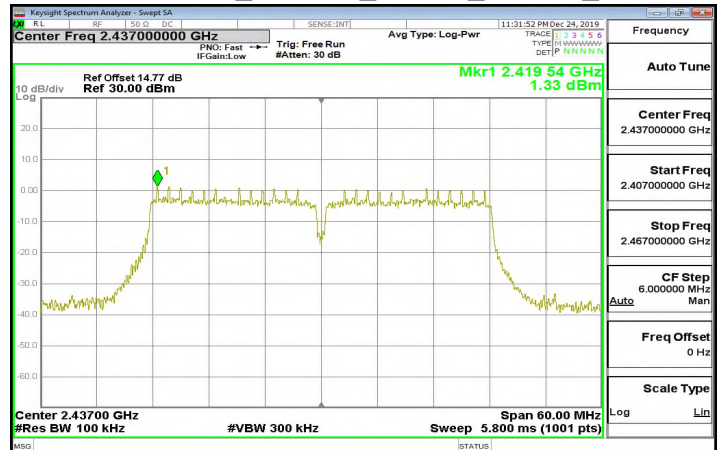
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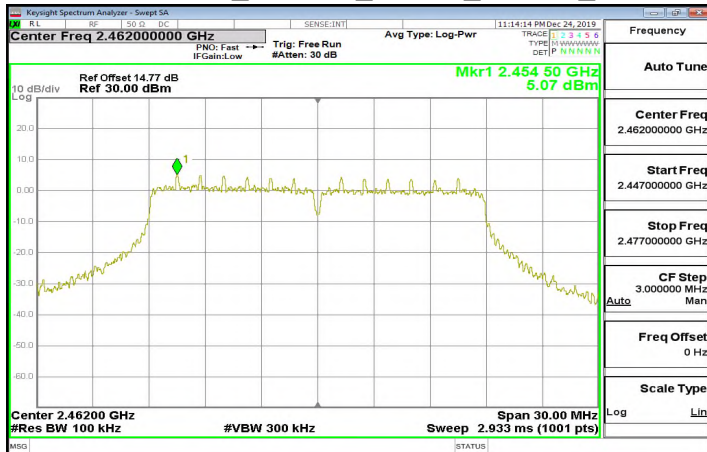
Reference Level 802.11n 20MHz Chain0 2437MHz



Reference Level 802.11n 40MHz Chain0 2437MHz



Reference Level 802.11n 20MHz Chain0 2462MHz



Reference Level 802.11n 40MHz Chain0 2452MHz



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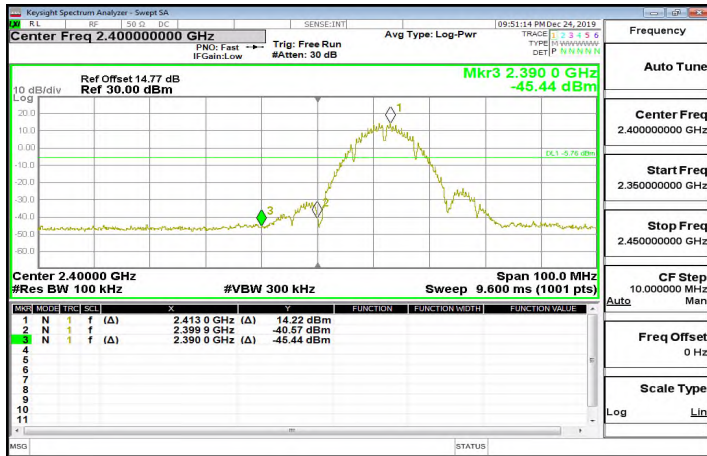
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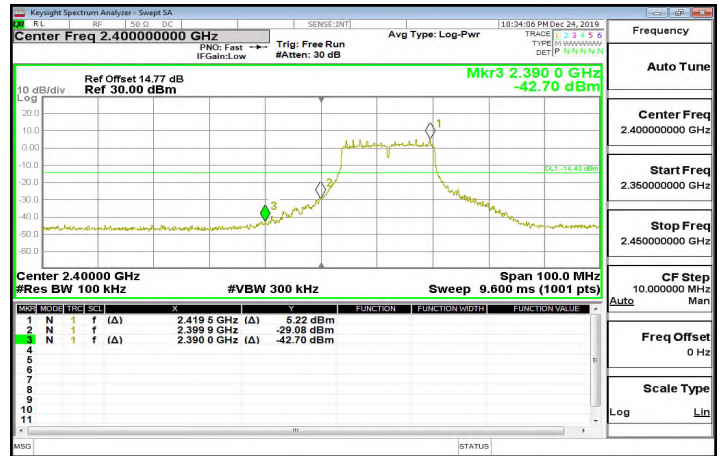
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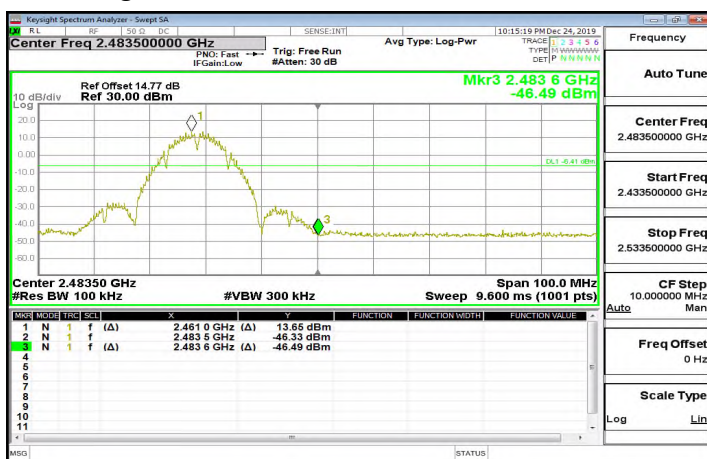
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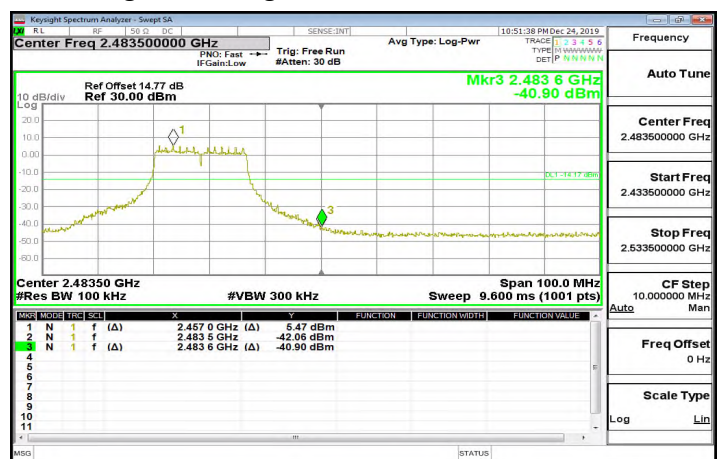
Band Edge_802.11g_20MHz_Chain0_2412MHz



Band Edge_802.11b_20MHz_Chain0_2462MHz



Band Edge_802.11g_20MHz_Chain0_2462MHz



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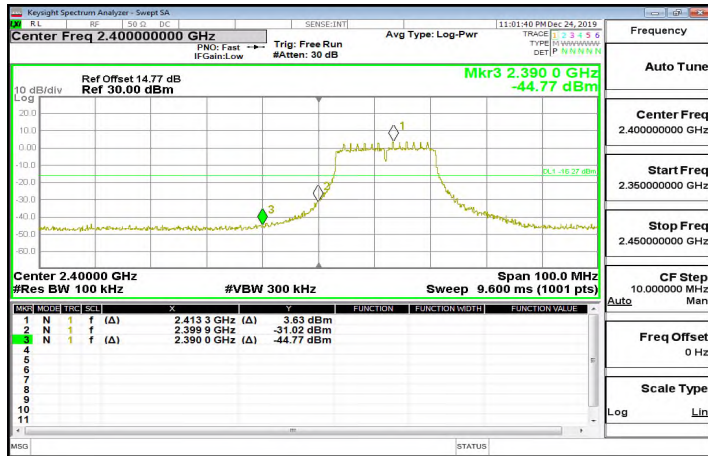
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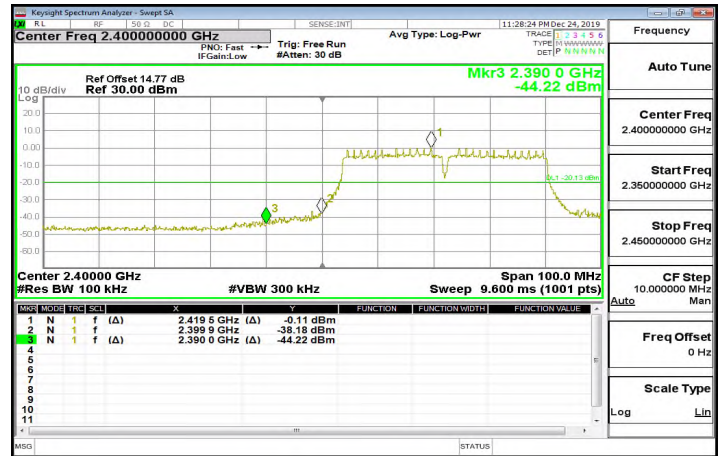
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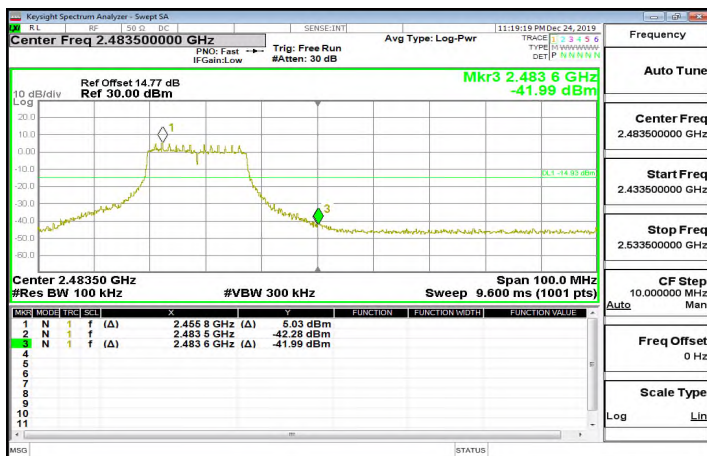
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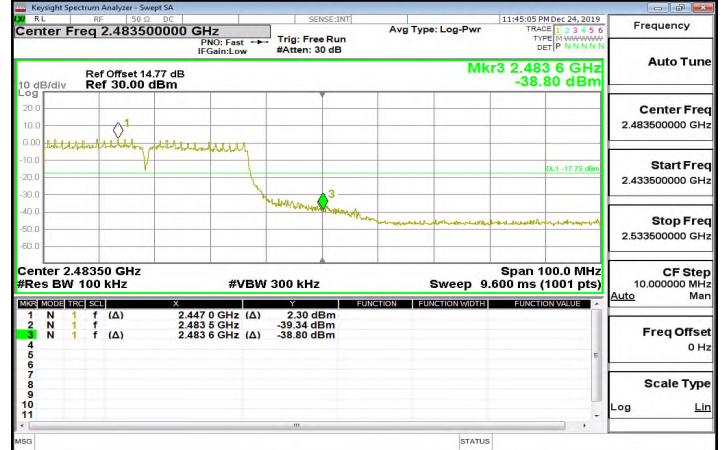
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Band Edge_802.11n_20MHz_Chain0_2462MHz



Band Edge_802.11n_40MHz_Chain0_2452MHz



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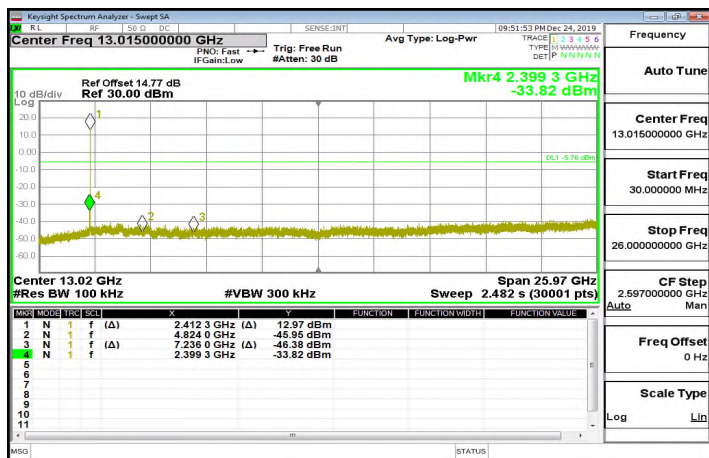
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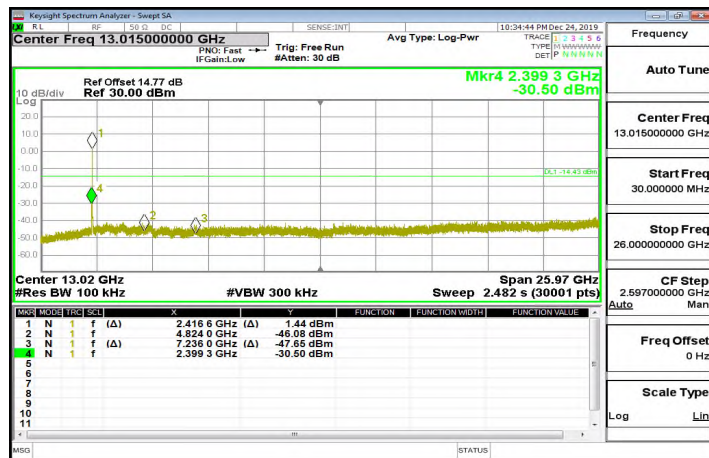
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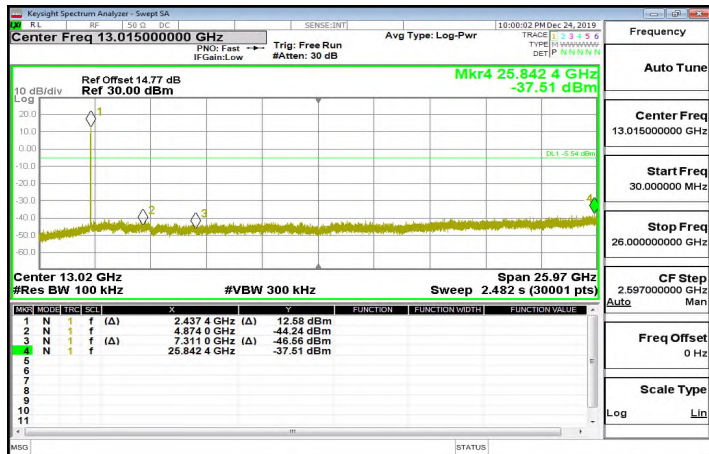
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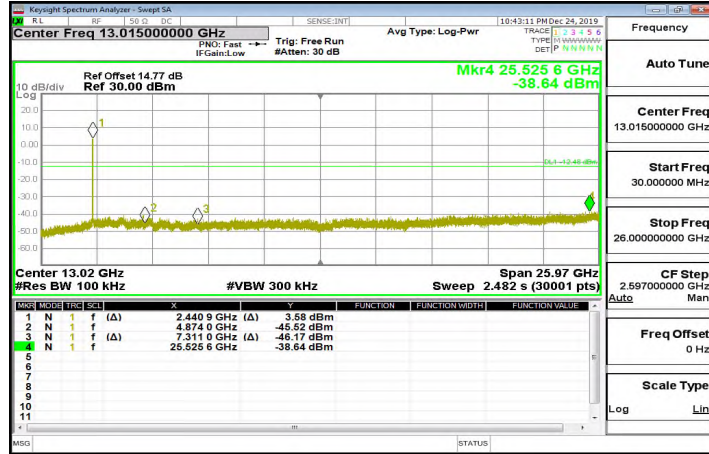
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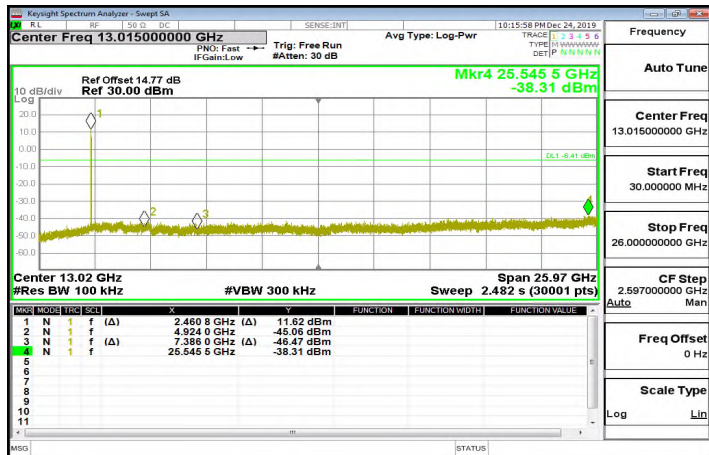
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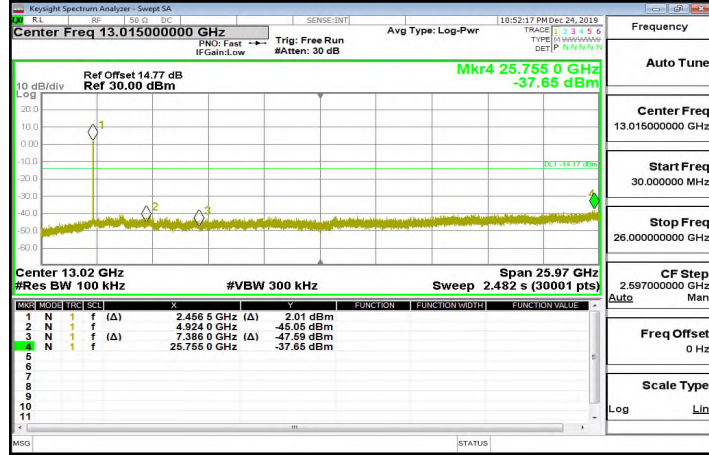
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Spurious Emission_ 802.11b_20MHz_Chain0_2462MHz



Spurious Emission_ 802.11g_20MHz_Chain0_2462MHz



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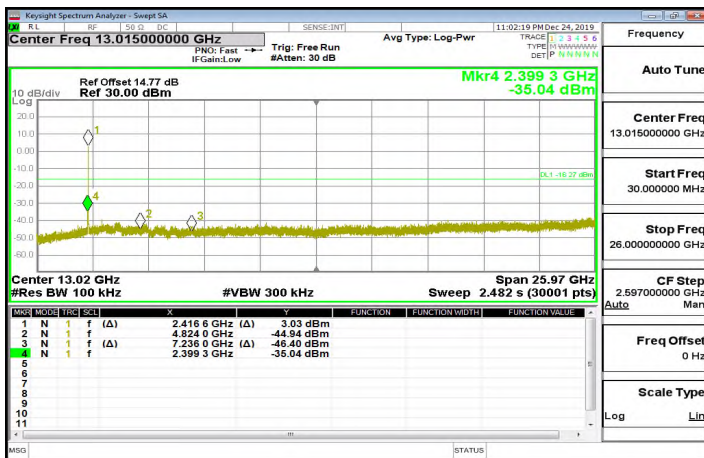
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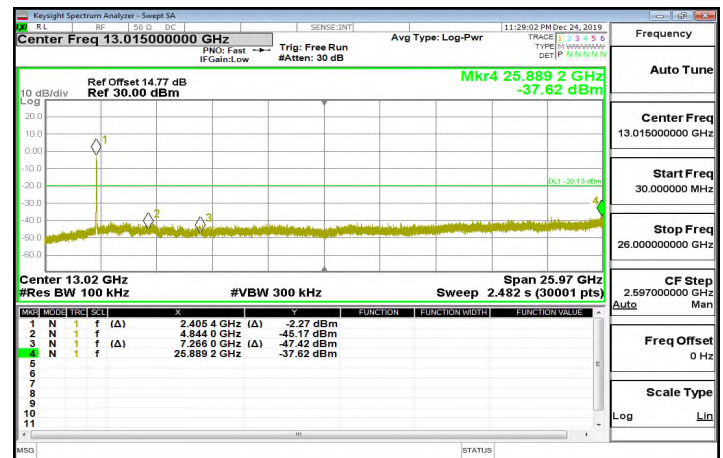
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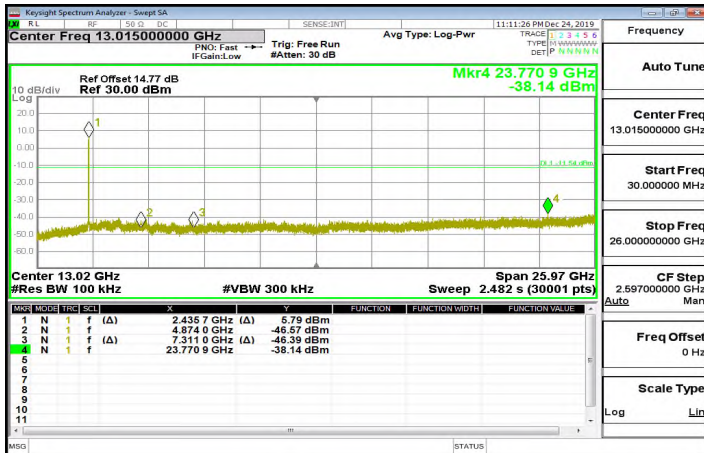
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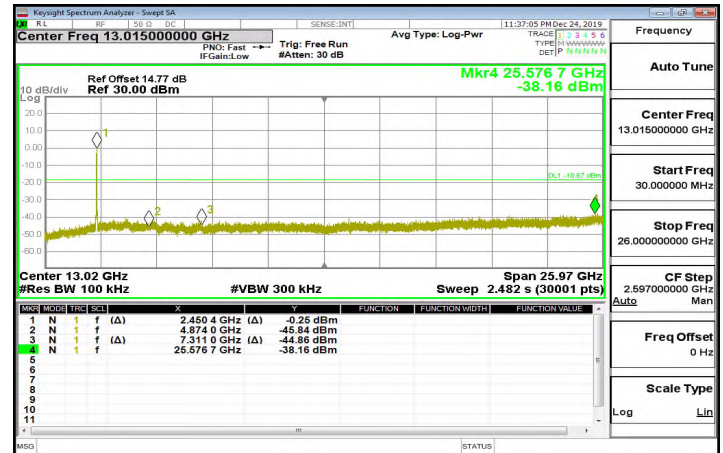
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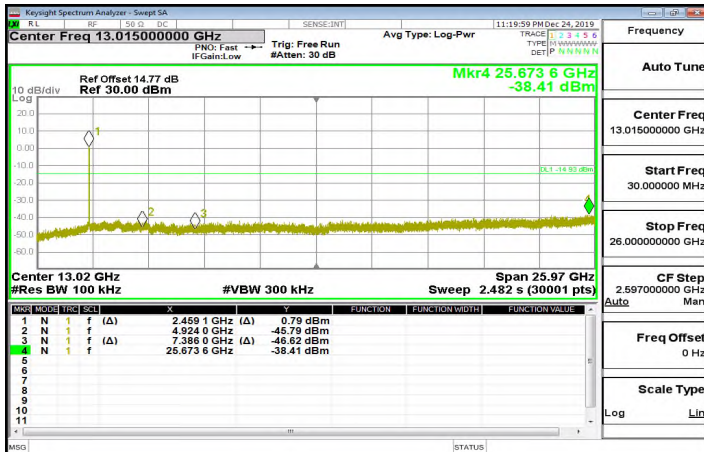
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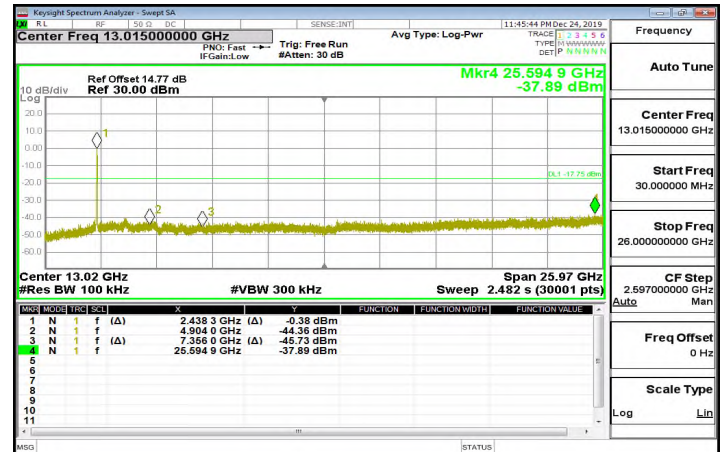
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Spurious Emission_ 802.11n_20MHz_Chain0_2462MHz



Spurious Emission_ 802.11n_40MHz_Chain0_2452MHz



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11 RADIATED BANDEdge AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §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)

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11.2 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Bi-log Antenna	SCHWAZBECK	VULB9168	378	01/04/2020	01/04/2021
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/20/2019	08/19/2020
Horn Antenna	Schwarzbeck	BBHA9170	184	12/25/2019	12/24/2020
3m Site NSA	SGS	966 chamber	N/A	01/02/2019	01/01/2020
3m Site NSA	SGS	966 chamber	N/A	01/02/2020	01/01/2021
Loop Antenna	ETS.LINDGREN	6502	148045	10/15/2019	10/14/2020
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/22/2019	04/21/2020
EMI Test Receiver	R&S	ESCI 7	1166.5950.07	07/04/2019	07/03/2020
Pre-Amplifier	HP	8449B	3008A00578	01/02/2019	01/01/2020
Pre-Amplifier	HP	8449B	3008A00578	01/02/2020	01/01/2021
Pre-Amplifier	HP	8447D	2944A07676	01/02/2019	01/01/2020
Pre-Amplifier	HP	8447D	2944A07676	01/02/2020	01/01/2021
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2019	01/01/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2020	01/01/2021
Attenuator	Mini-Circuit	BW-S10W2+	4	01/02/2019	01/01/2020
Attenuator	Mini-Circuit	BW-S10W2+	4	01/02/2020	01/01/2021
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	01/02/2019	01/01/2020
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	01/02/2020	01/01/2021
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/02/2019	01/01/2020
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/02/2020	01/01/2021
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2019	01/01/2020
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2020	01/01/2021

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

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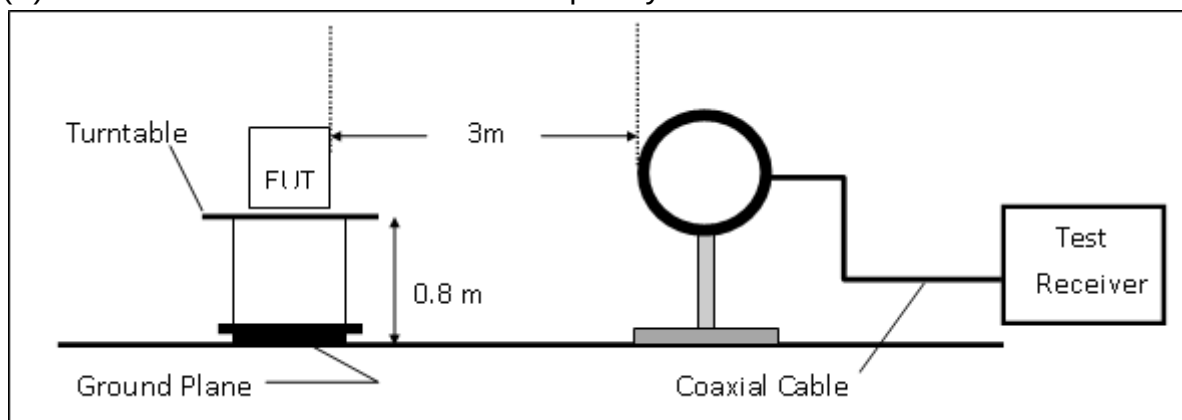
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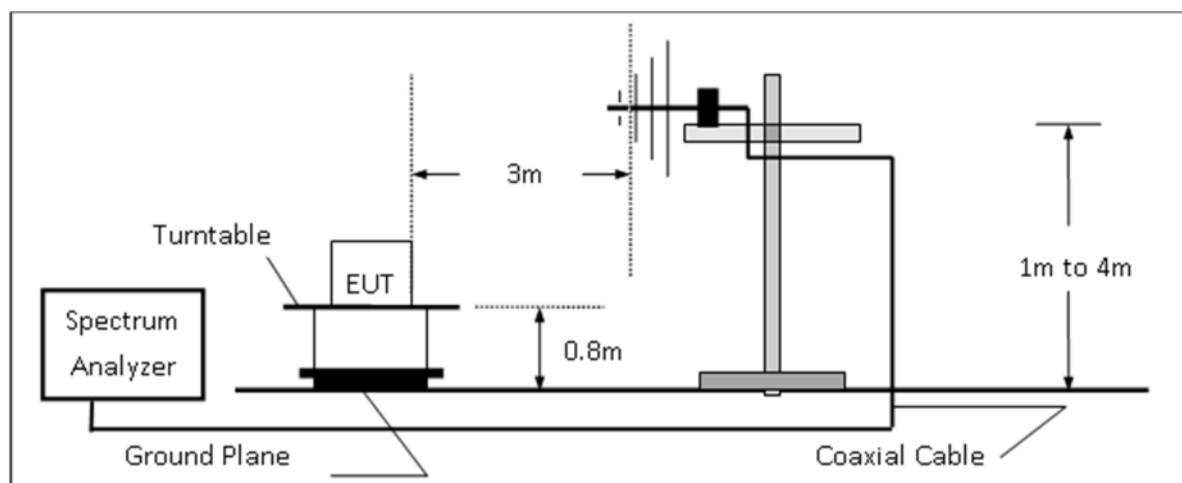
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11.3 Test SET-UP

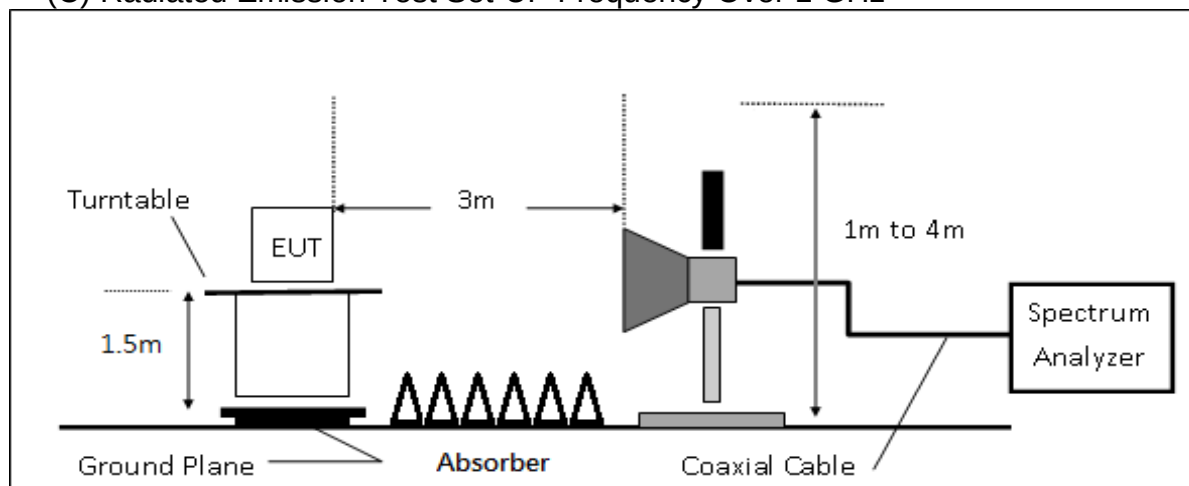
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



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11.4 Measurement Procedure

1. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
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 $\geq 1/T$ (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

The limit of the emission level is expressed in dBμV/m, which converts $20 \cdot \log(uV/m)$

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

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

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

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit per 15.31(o) & RSS-GEN §6.13.2 was not reported.

11.7 Measurement Result

Note:

1. Refer to next page spectrum analyzer data chart and tabular data sheets.
2. Measurements are completed at peak and average level, the mark of average is the highest emission in restricted bands

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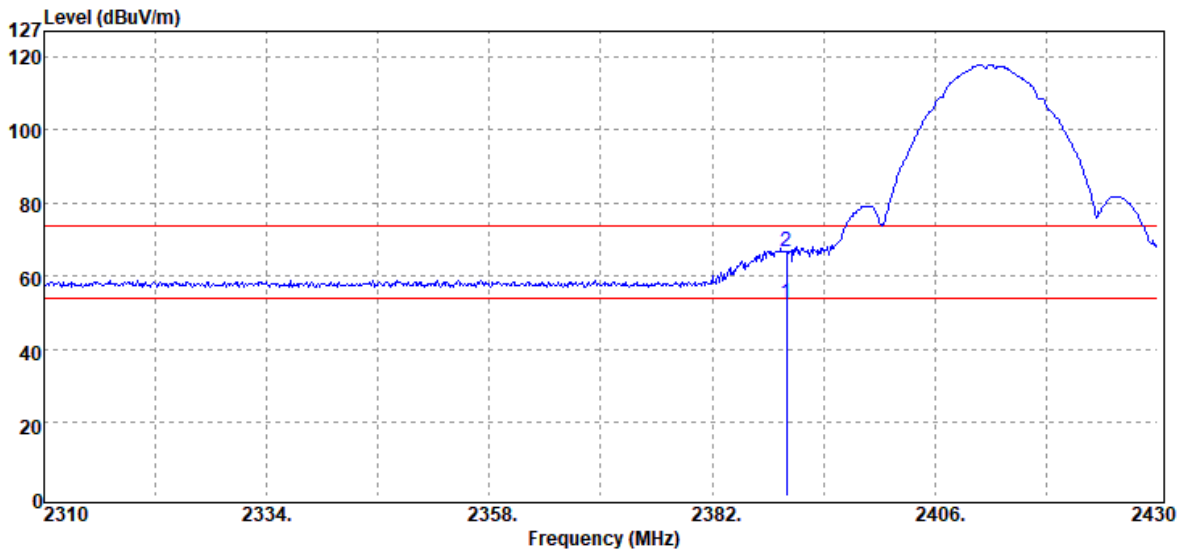
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11.7.1 Radiated Band Edge Measurement Result

External Antenna (Type: Dipole Antenna, Model no: WTS2450)

Report Number	:ER/2019/C0047	Test Date	:2019-11-28
Operation Mode	:802.11b	Temp./Humi.	:23.7/57
Test Channel	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:Bandedge CH Low	Engineer	:Kane
EUT Pol	:E2 Plane		



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	52.48	0.24	52.72	54.00	-1.28
2390.00	Peak	66.73	0.24	66.97	74.00	-7.03

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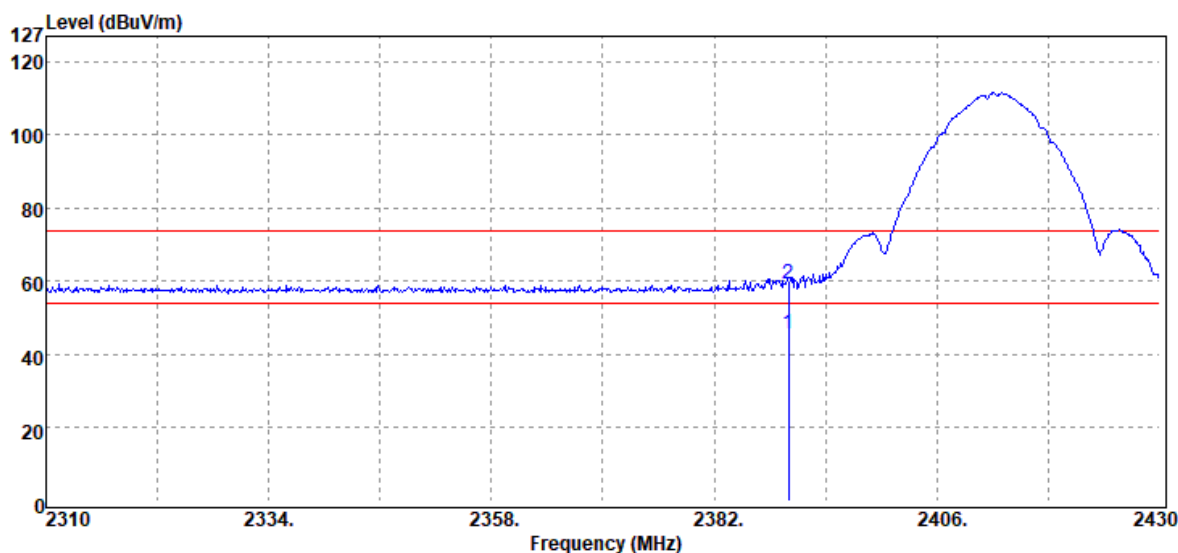
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	45.58	0.24	45.82	54.00	-8.18
2390.00	Peak	59.13	0.24	59.37	74.00	-14.63

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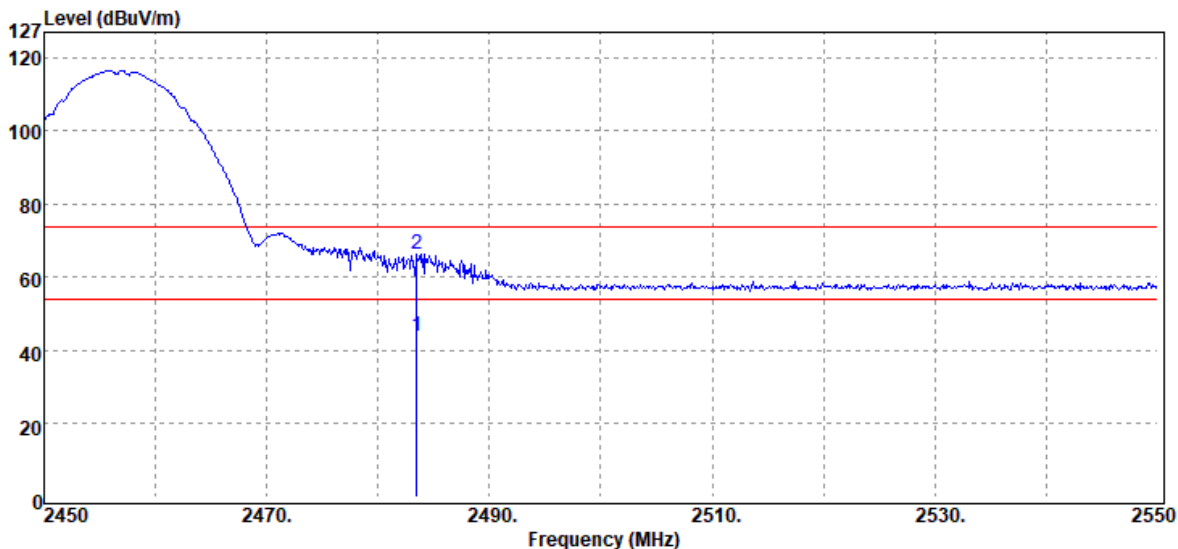
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	44.15	-0.17	43.98	54.00	-10.02
2483.50	Peak	66.34	-0.17	66.17	74.00	-7.83

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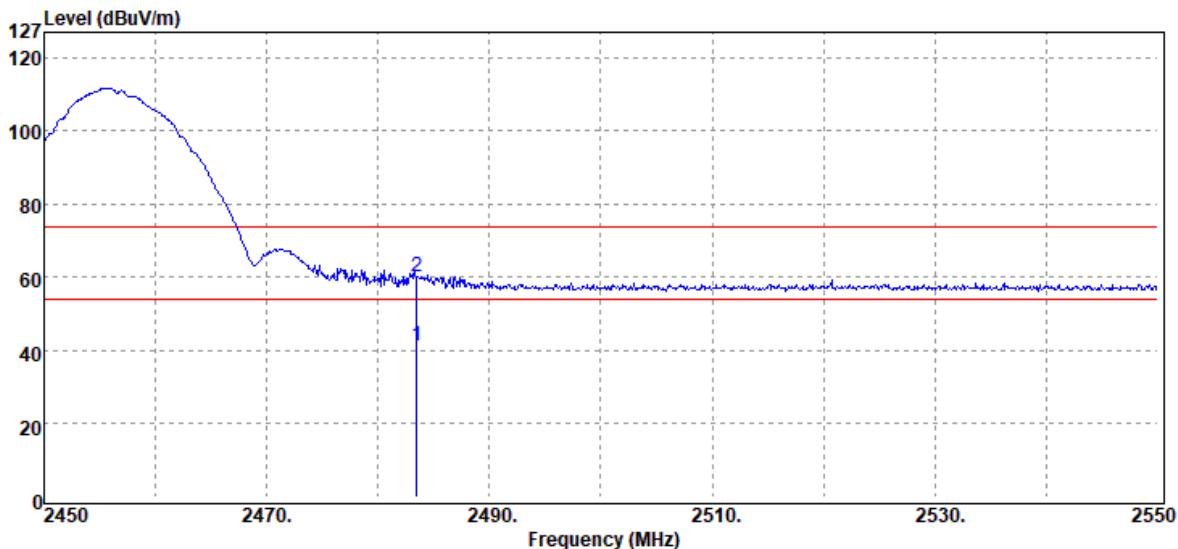
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	41.59	-0.17	41.42	54.00	-12.58
2483.50	Peak	60.39	-0.17	60.22	74.00	-13.78

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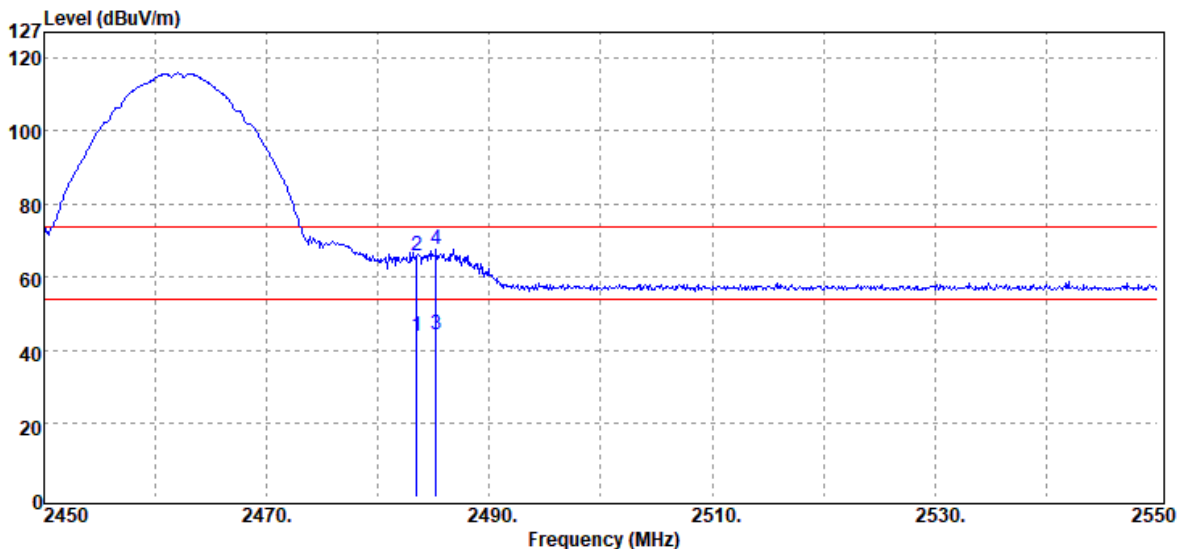
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	44.01	-0.17	43.84	54.00	-10.16
2483.50	Peak	66.13	-0.17	65.96	74.00	-8.04
2485.20	Average	44.42	-0.18	44.24	54.00	-9.76
2485.20	Peak	68.03	-0.18	67.85	74.00	-6.15

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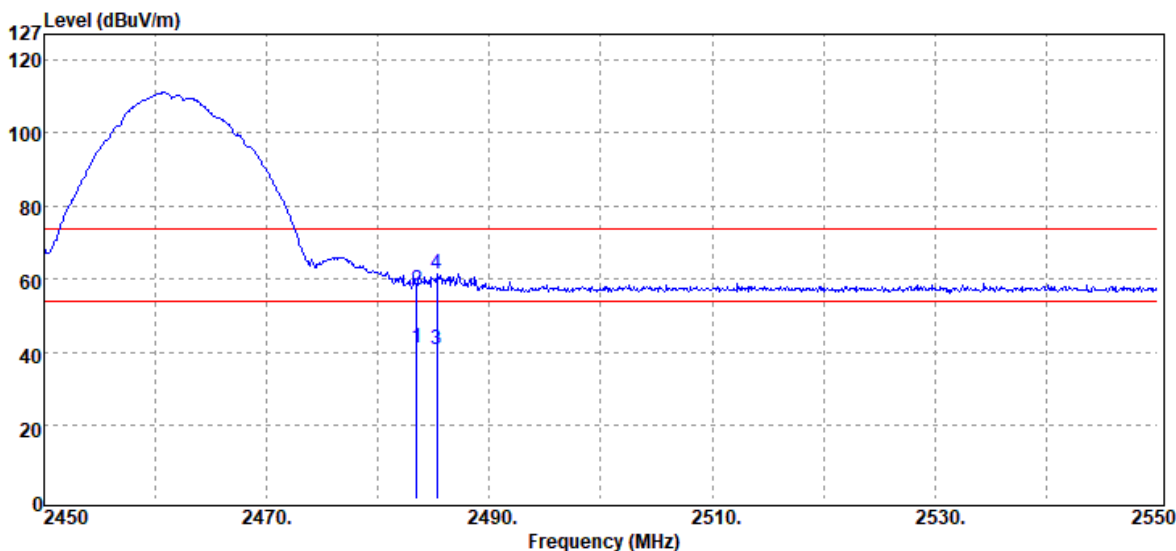
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	41.58	-0.17	41.41	54.00	-12.59
2483.50	Peak	57.47	-0.17	57.30	74.00	-16.70
2485.30	Average	41.19	-0.18	41.01	54.00	-12.99
2485.30	Peak	61.73	-0.18	61.55	74.00	-12.45

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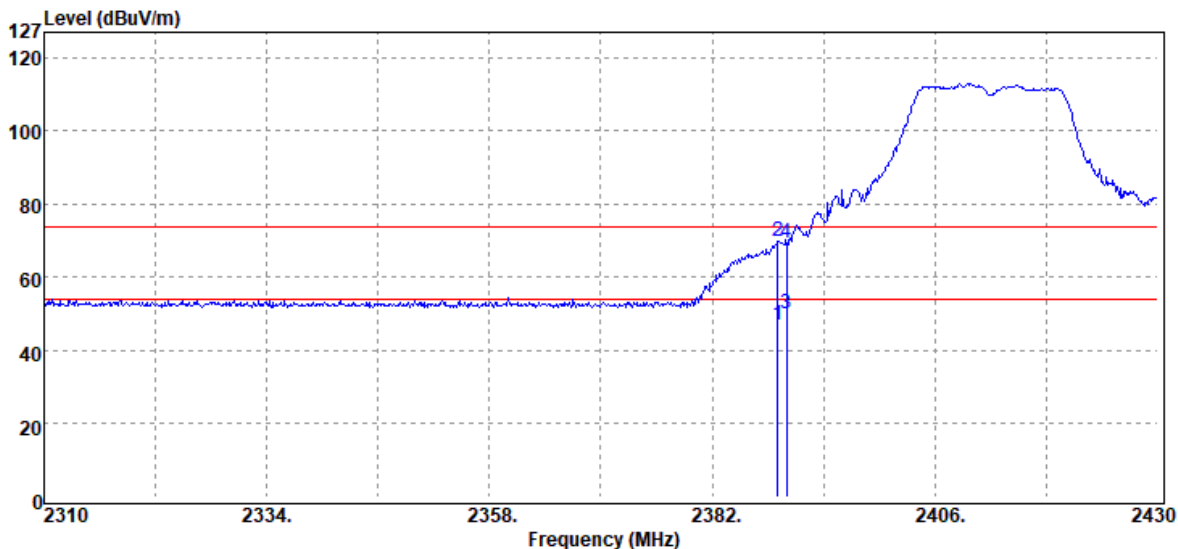
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Member of SGS Group

Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2389.08	Average	46.83	0.24	47.07	54.00	-6.93
2389.08	Peak	69.65	0.24	69.89	74.00	-4.11
2390.00	Average	49.73	0.24	49.97	54.00	-4.03
2390.00	Peak	69.22	0.24	69.46	74.00	-4.54

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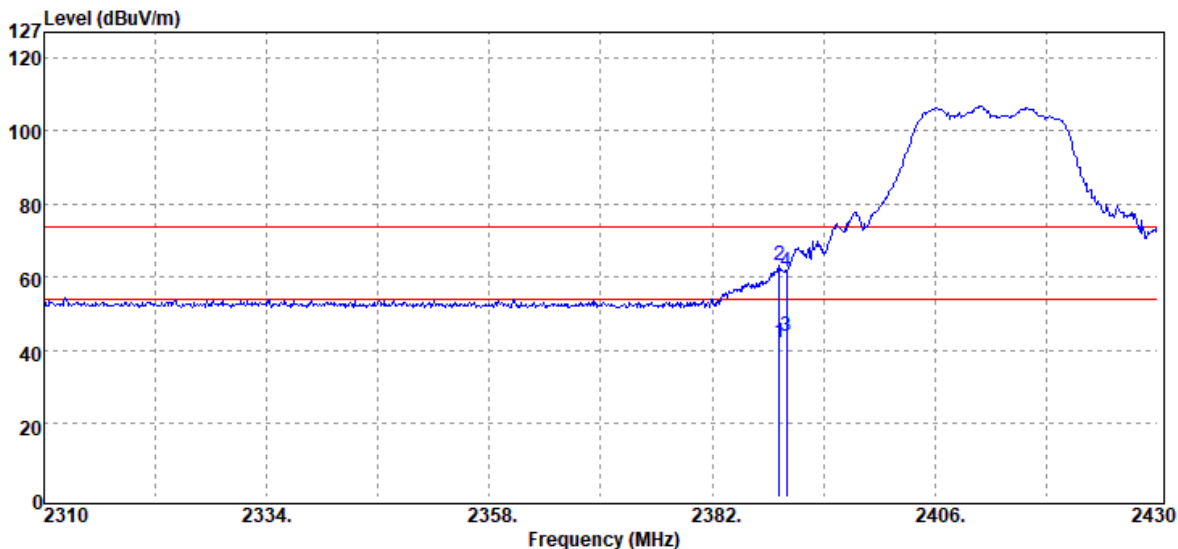
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2389.20	Average	41.97	0.24	42.21	54.00	-11.79
2389.20	Peak	62.92	0.24	63.16	74.00	-10.84
2390.00	Average	43.60	0.24	43.84	54.00	-10.16
2390.00	Peak	61.50	0.24	61.74	74.00	-12.26

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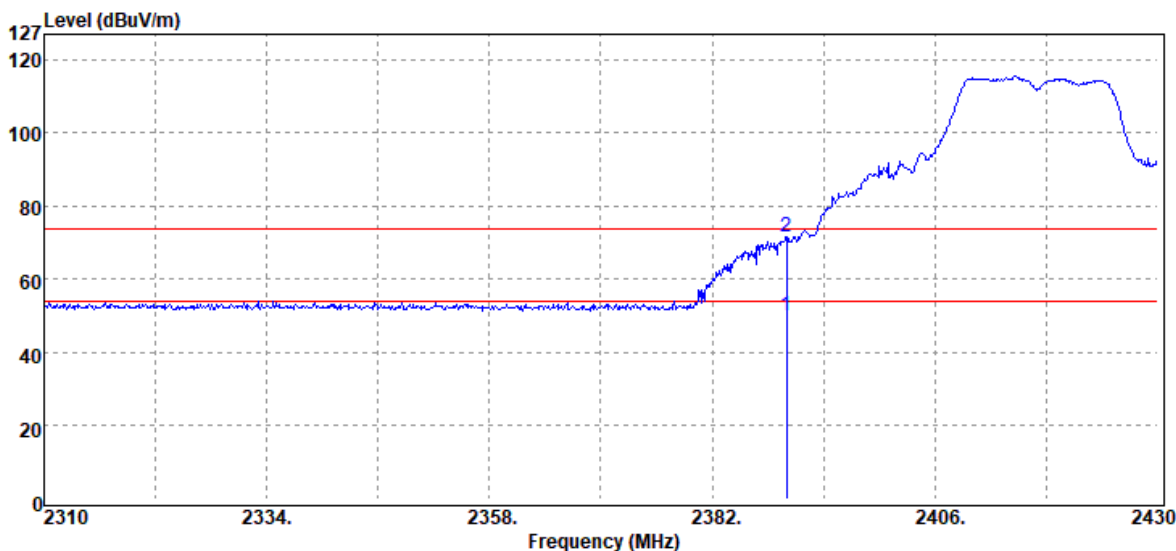
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2417 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	50.03	0.24	50.27	54.00	-3.73
2390.00	Peak	71.22	0.24	71.46	74.00	-2.54

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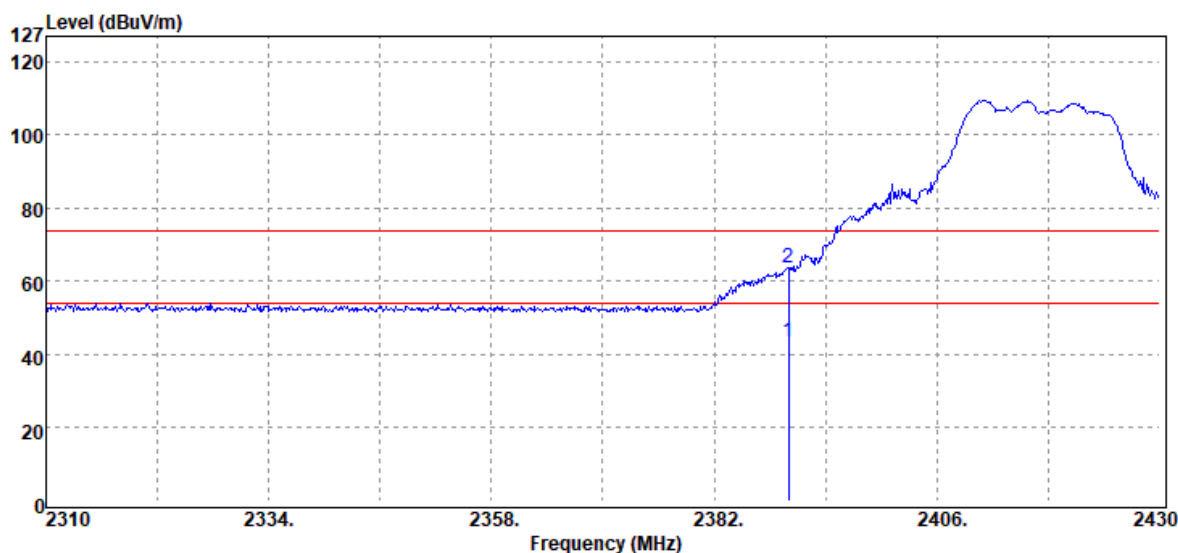
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2417 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	43.22	0.24	43.46	54.00	-10.54
2390.00	Peak	63.65	0.24	63.89	74.00	-10.11

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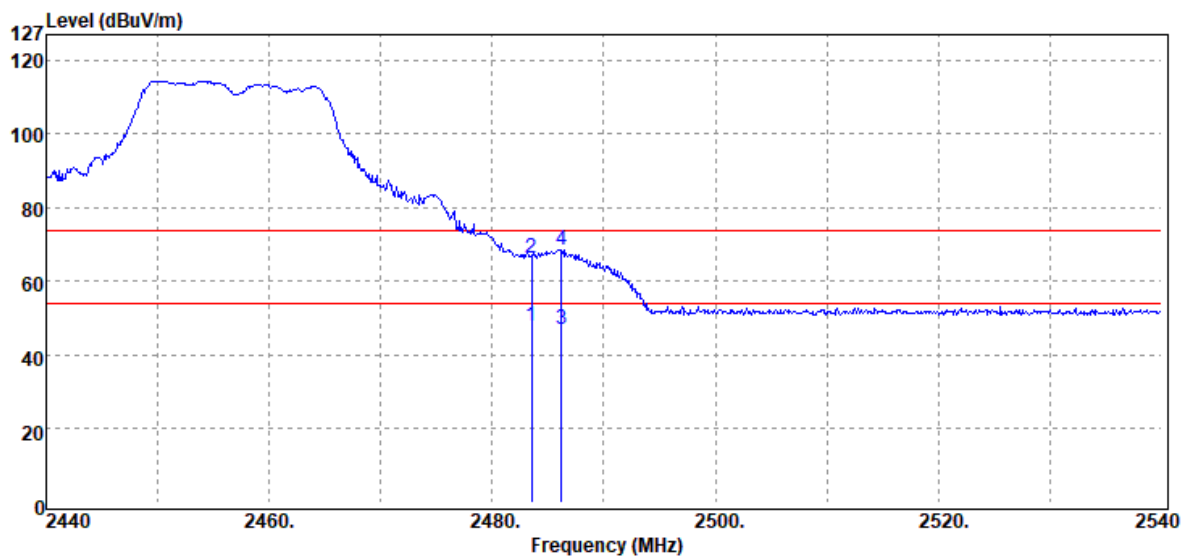
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane


Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode		Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	47.86	-0.17	47.69	54.00	-6.31
2483.50	Peak	66.65	-0.17	66.48	74.00	-7.52
2486.20	Average	47.22	-0.19	47.03	54.00	-6.97
2486.20	Peak	68.75	-0.19	68.56	74.00	-5.44

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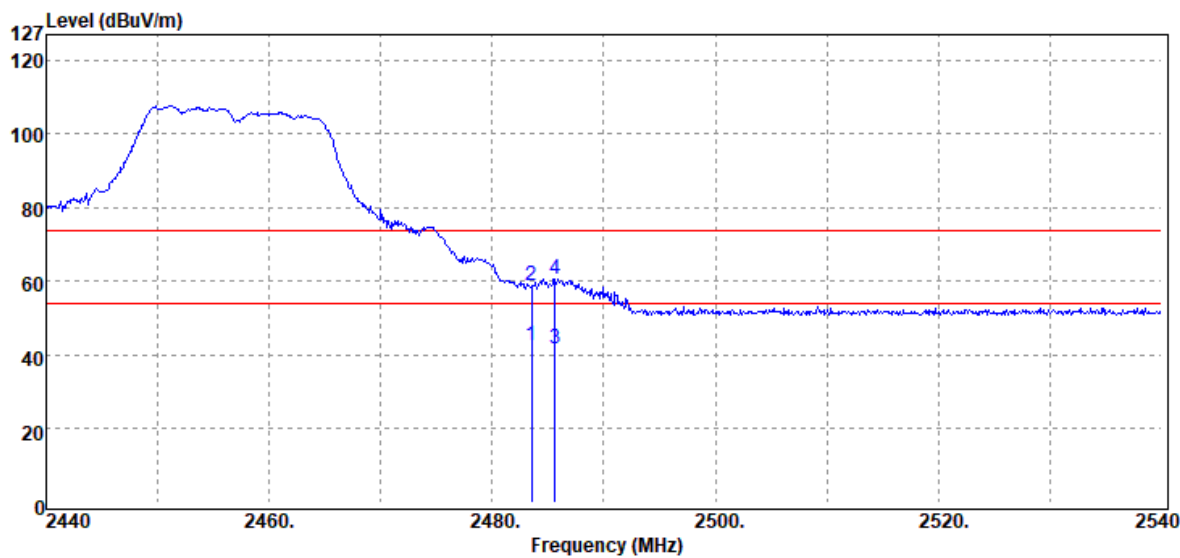
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	42.91	-0.17	42.74	54.00	-11.26
2483.50	Peak	59.00	-0.17	58.83	74.00	-15.17
2485.60	Average	41.96	-0.18	41.78	54.00	-12.22
2485.60	Peak	61.01	-0.18	60.83	74.00	-13.17

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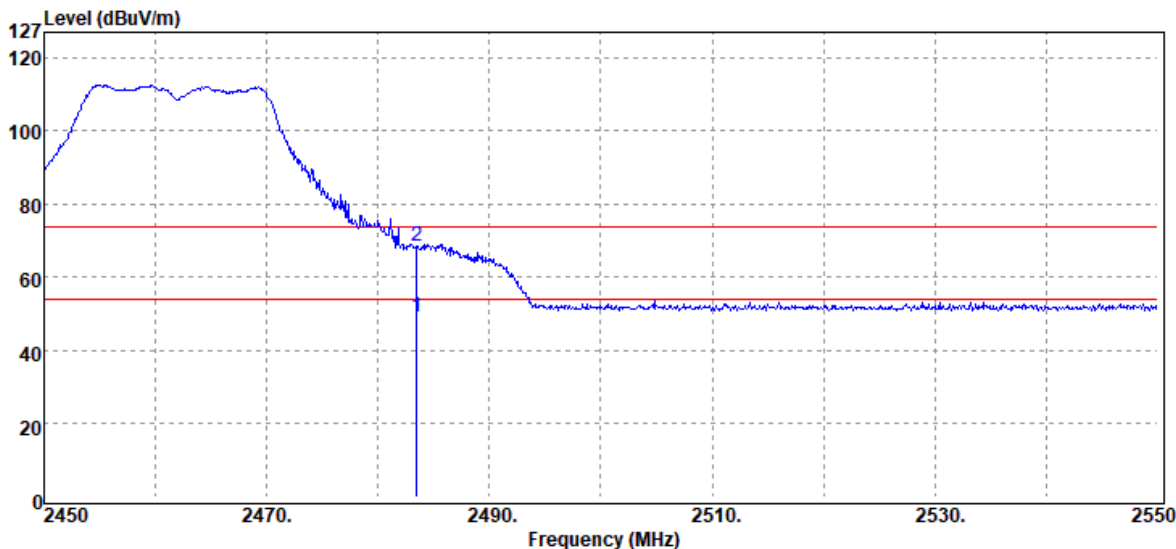
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	49.58	-0.17	49.41	54.00	-4.59
2483.50	Peak	68.85	-0.17	68.68	74.00	-5.32

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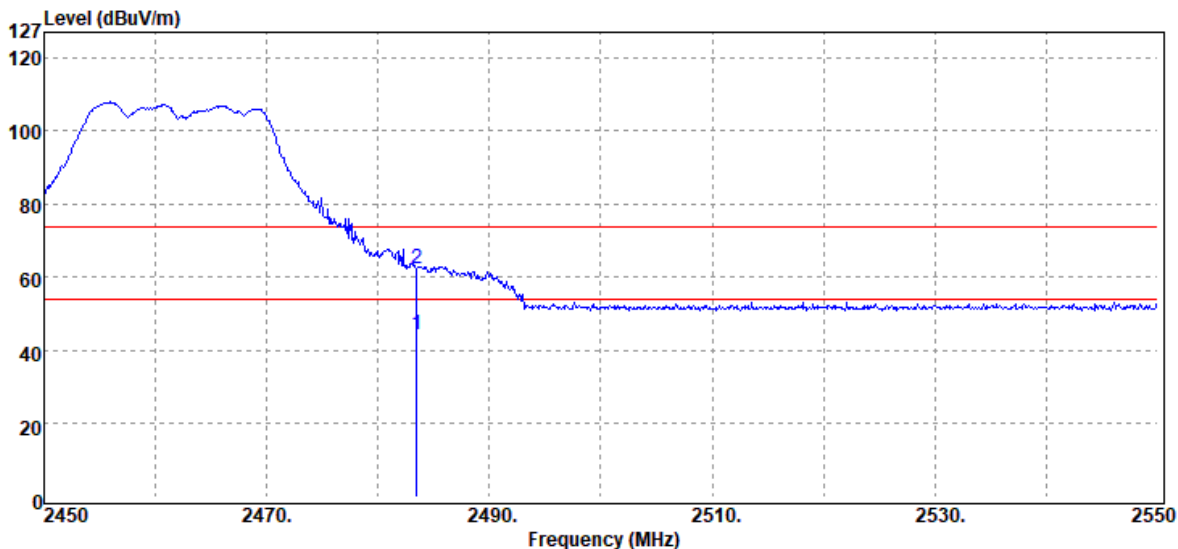
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	44.62	-0.17	44.45	54.00	-9.55
2483.50	Peak	62.79	-0.17	62.62	74.00	-11.38

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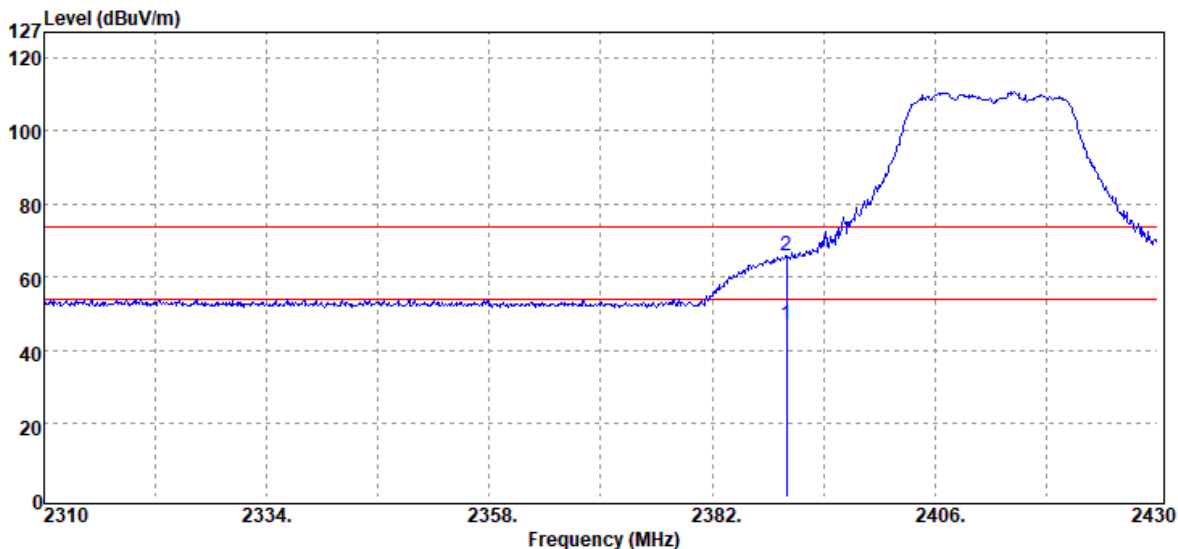
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
2390.00	Average	46.62	0.24	46.86	54.00	-7.14
2390.00	Peak	65.56	0.24	65.80	74.00	-8.20

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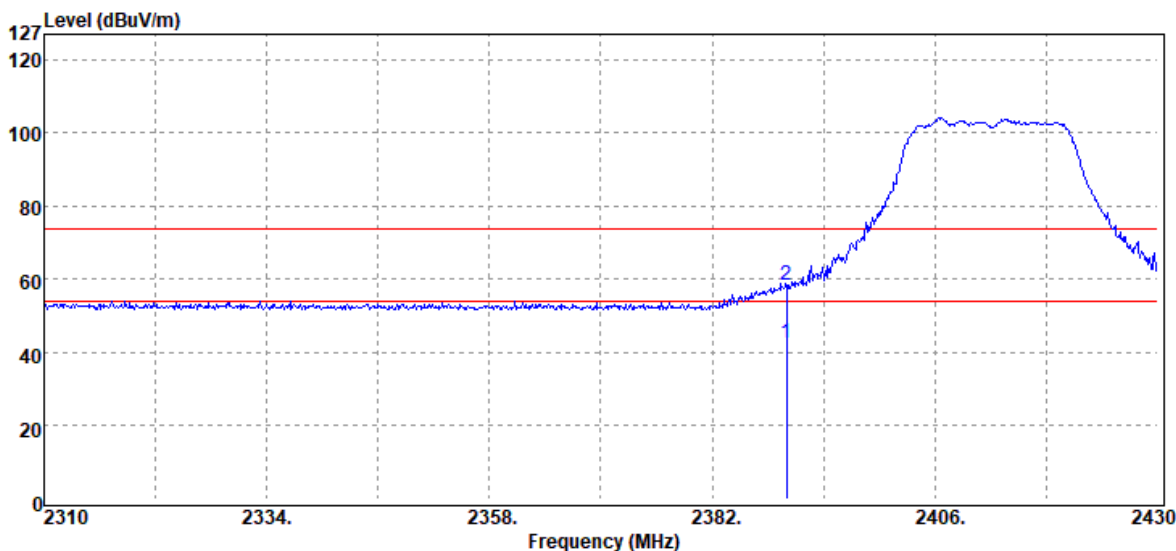
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	42.28	0.24	42.52	54.00	-11.48
2390.00	Peak	58.35	0.24	58.59	74.00	-15.41

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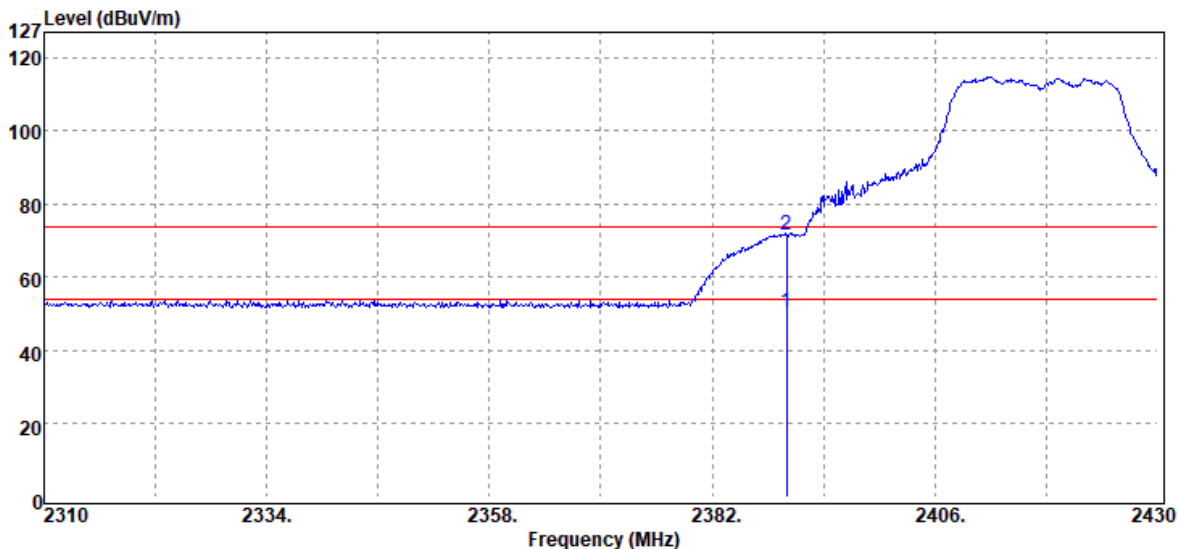
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Member of SGS Group

Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2417 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	50.47	0.24	50.71	54.00	-3.29
2390.00	Peak	71.34	0.24	71.58	74.00	-2.42

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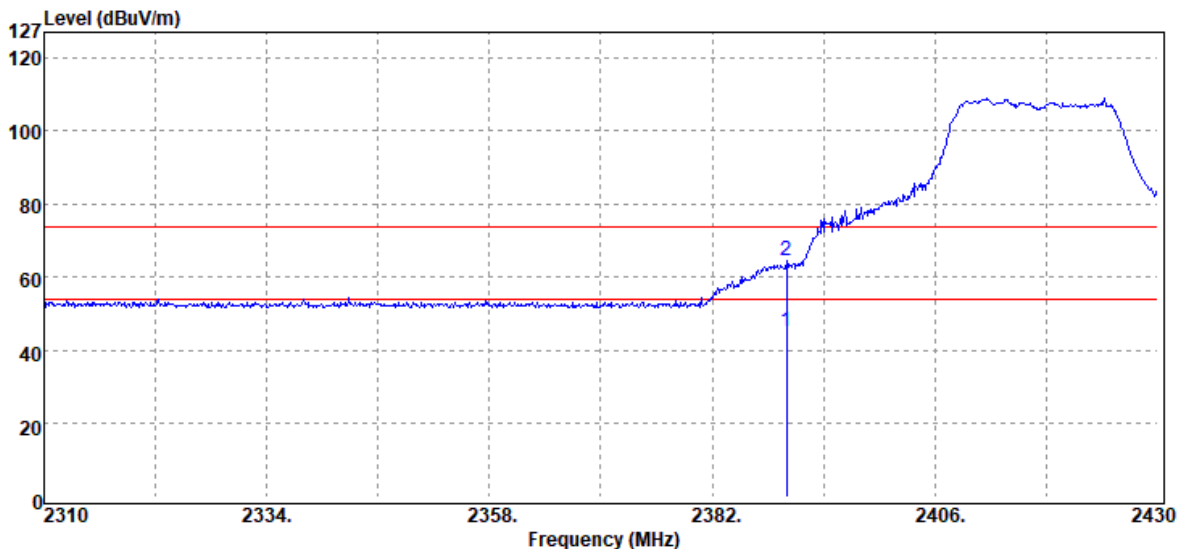
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2417 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	44.89	0.24	45.13	54.00	-8.87
2390.00	Peak	64.45	0.24	64.69	74.00	-9.31

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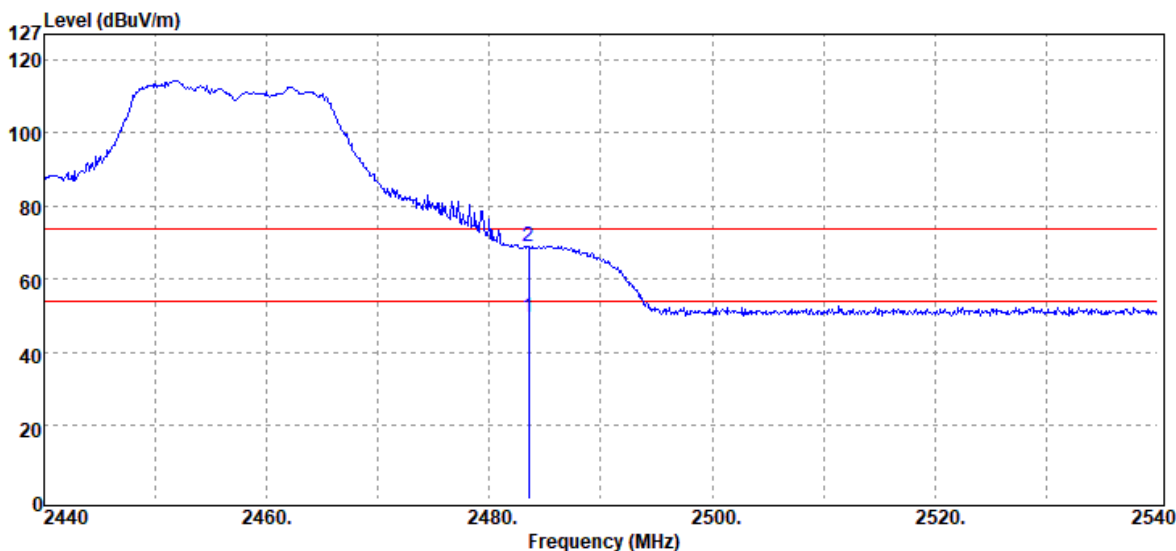
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	49.99	-0.17	49.82	54.00	-4.18
2483.50	Peak	69.22	-0.17	69.05	74.00	-4.95

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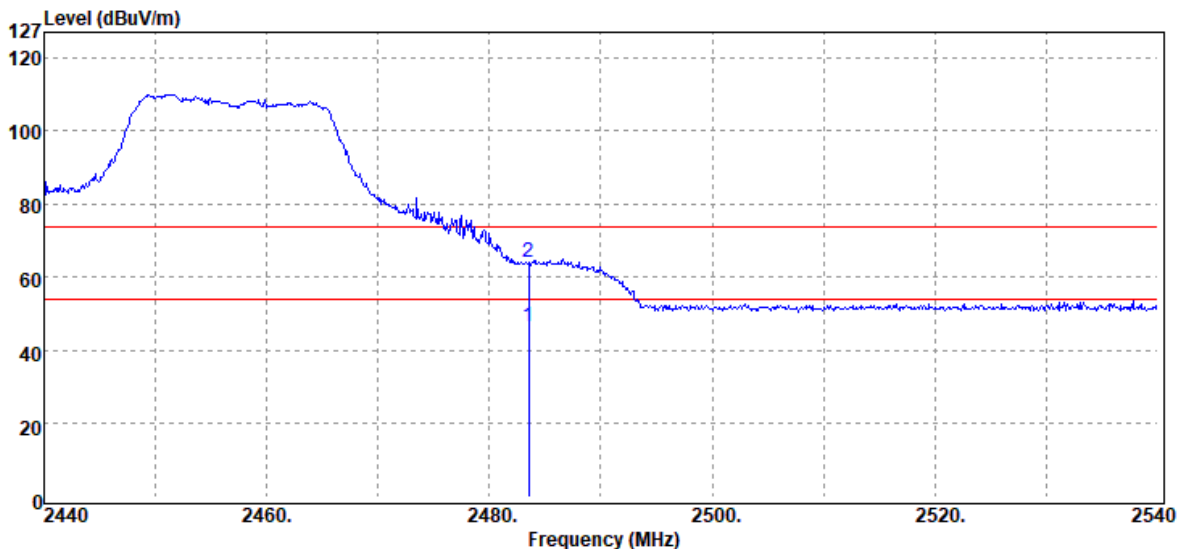
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	46.67	-0.17	46.50	54.00	-7.50
2483.50	Peak	64.17	-0.17	64.00	74.00	-10.00

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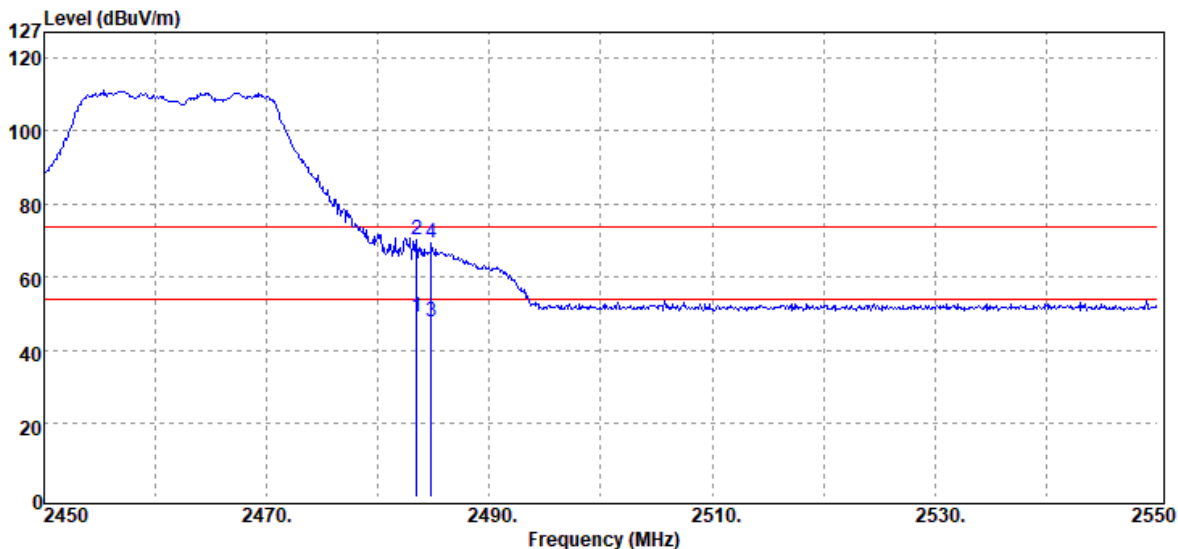
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	49.57	-0.17	49.40	54.00	-4.60
2483.50	Peak	70.29	-0.17	70.12	74.00	-3.88
2484.80	Average	48.12	-0.18	47.94	54.00	-6.06
2484.80	Peak	69.41	-0.18	69.23	74.00	-4.77

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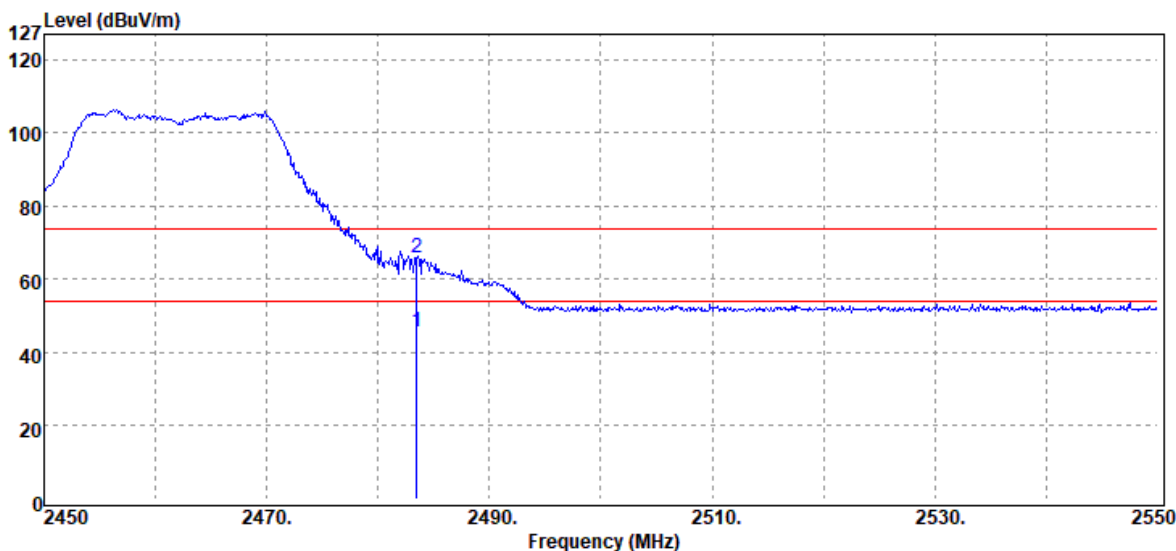
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Report Number :ER/2019/C0047
Operation Mode :802.11n20
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	45.76	-0.17	45.59	54.00	-8.41
2483.50	Peak	66.02	-0.17	65.85	74.00	-8.15

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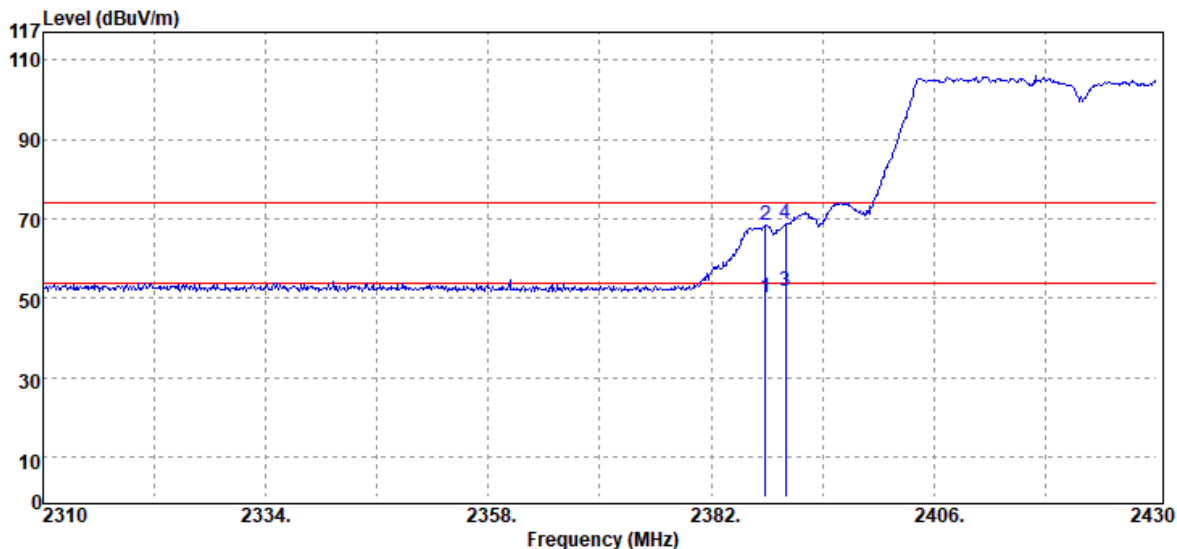
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2422 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2387.88	Average	50.07	0.25	50.32	54.00	-3.68
2387.88	Peak	68.30	0.25	68.55	74.00	-5.45
2390.00	Average	51.64	0.24	51.88	54.00	-2.12
2390.00	Peak	68.63	0.24	68.87	74.00	-5.13

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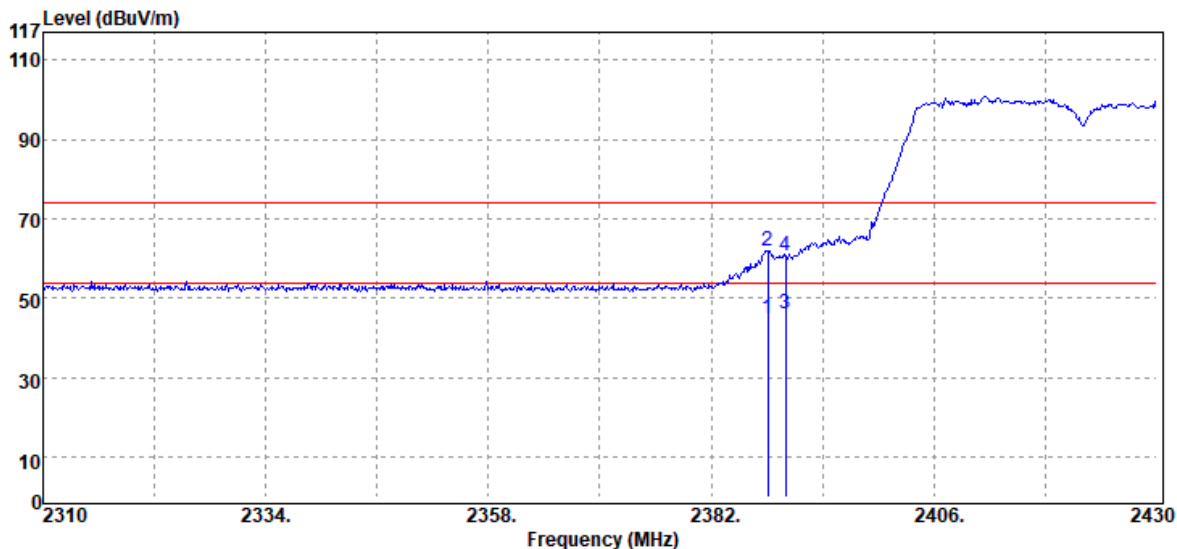
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2422 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2388.12	Average	44.69	0.25	44.94	54.00	-9.06
2388.12	Peak	61.80	0.25	62.05	74.00	-11.95
2390.00	Average	45.79	0.24	46.03	54.00	-7.97
2390.00	Peak	60.40	0.24	60.64	74.00	-13.36

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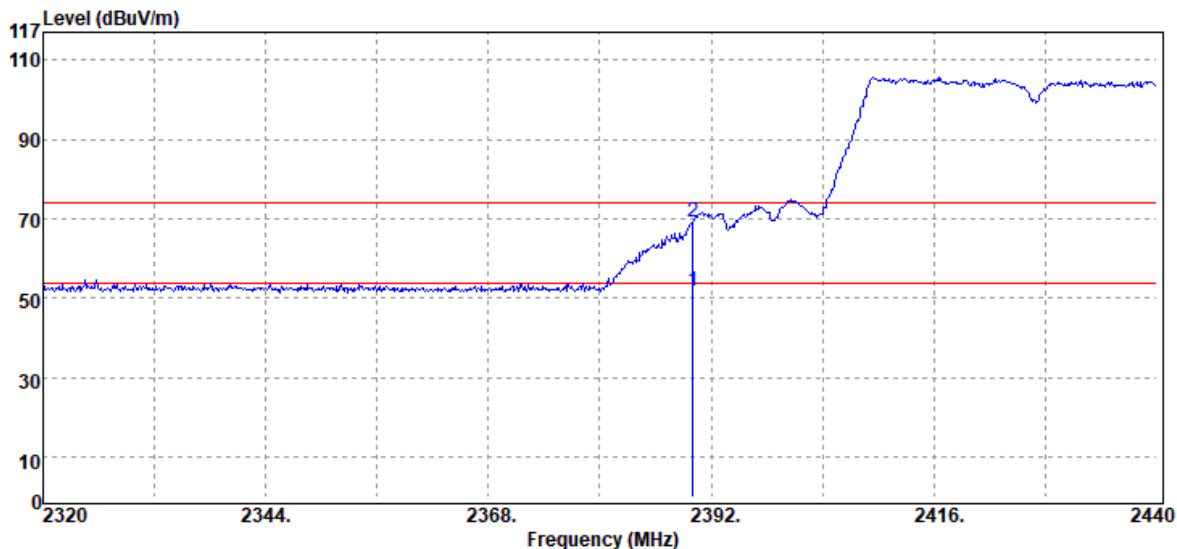
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2427 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	51.57	0.24	51.81	54.00	-2.19
2390.00	Peak	68.96	0.24	69.20	74.00	-4.80

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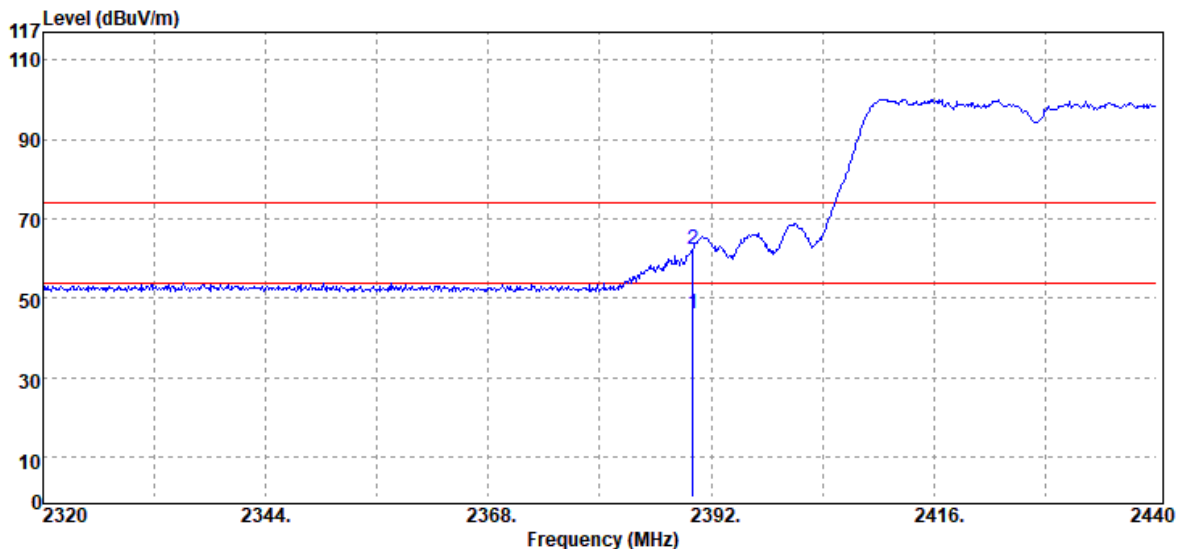
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2427 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	45.92	0.24	46.16	54.00	-7.84
2390.00	Peak	62.18	0.24	62.42	74.00	-11.58

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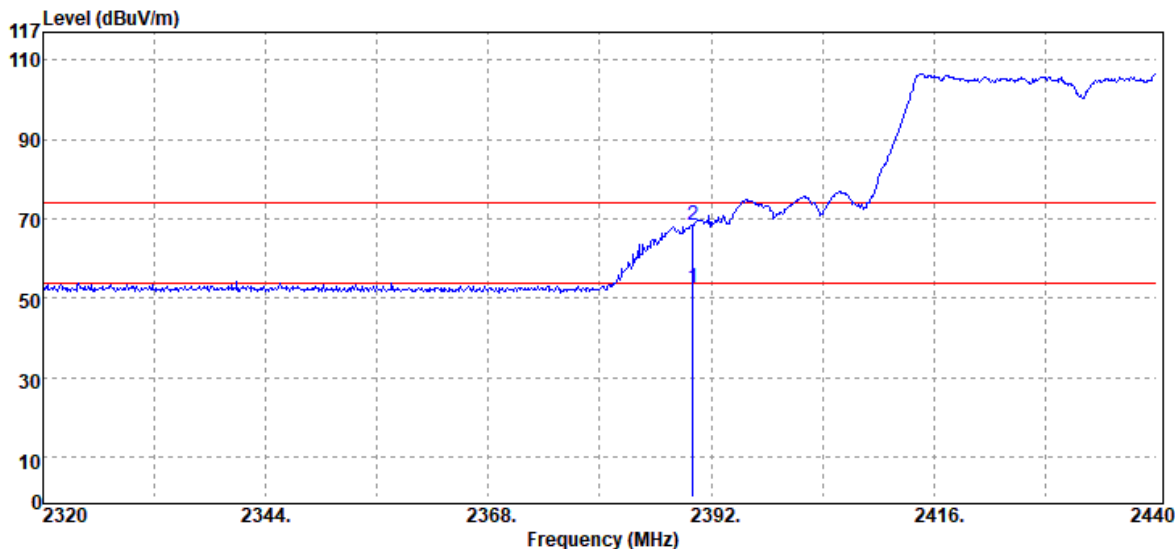
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2432 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	52.58	0.24	52.82	54.00	-1.18
2390.00	Peak	68.14	0.24	68.38	74.00	-5.62

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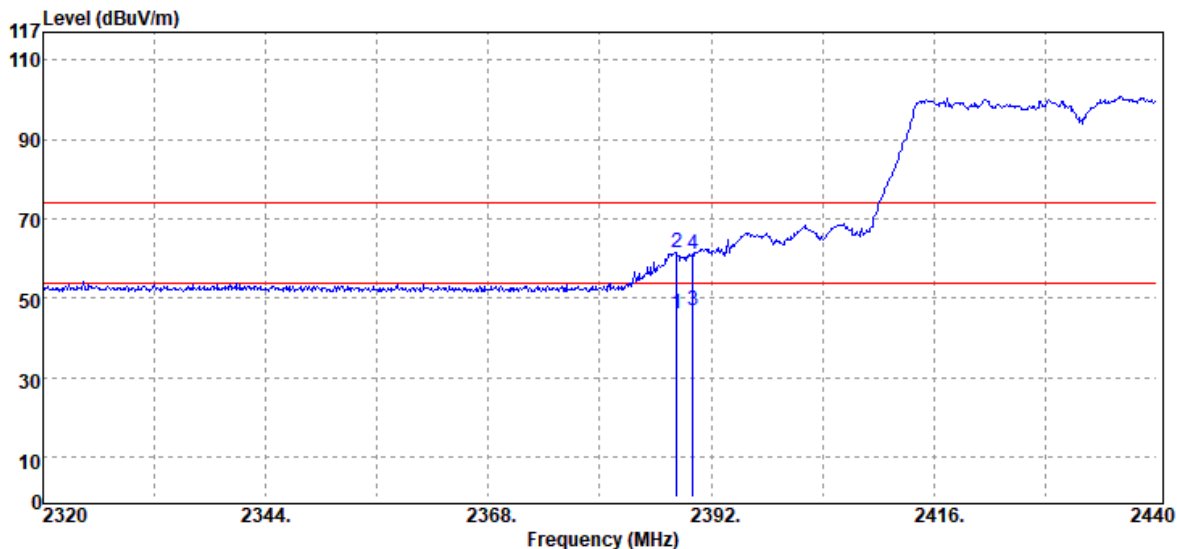
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2432 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2388.28	Average	45.82	0.25	46.07	54.00	-7.93
2388.28	Peak	61.40	0.25	61.65	74.00	-12.35
2390.00	Average	46.63	0.24	46.87	54.00	-7.13
2390.00	Peak	60.87	0.24	61.11	74.00	-12.89

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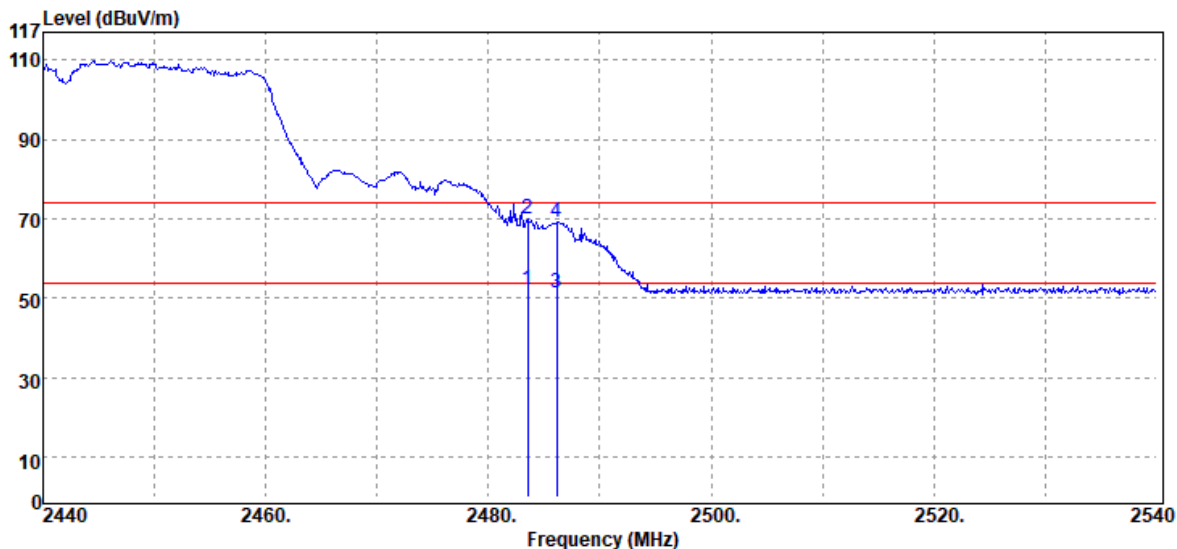
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2442 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	52.31	-0.17	52.14	54.00	-1.86
2483.50	Peak	70.05	-0.17	69.88	74.00	-4.12
2486.10	Average	51.57	-0.18	51.39	54.00	-2.61
2486.10	Peak	69.50	-0.18	69.32	74.00	-4.68

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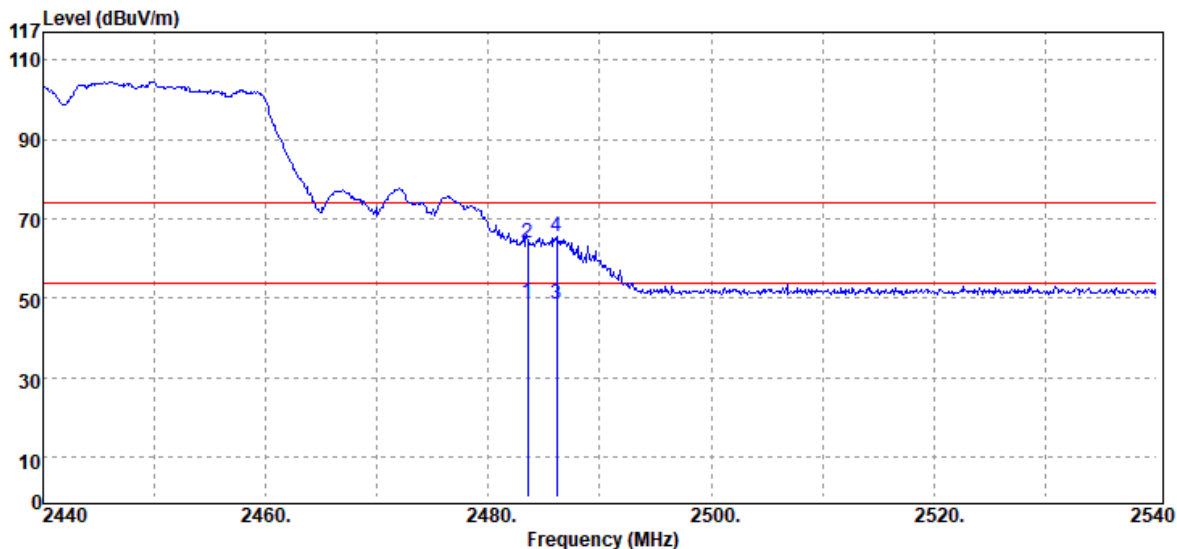
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2442 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	49.05	-0.17	48.88	54.00	-5.12
2483.50	Peak	64.04	-0.17	63.87	74.00	-10.13
2486.10	Average	48.84	-0.18	48.66	54.00	-5.34
2486.10	Peak	65.90	-0.18	65.72	74.00	-8.28

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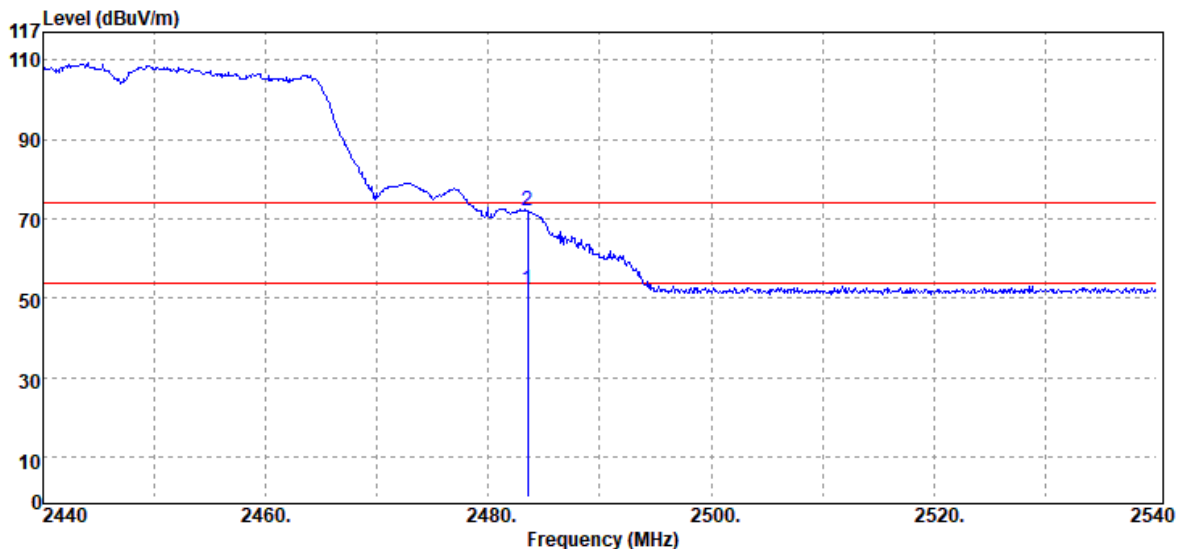
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Member of SGS Group

Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2447 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	52.40	-0.17	52.23	54.00	-1.77
2483.50	Peak	72.28	-0.17	72.11	74.00	-1.89

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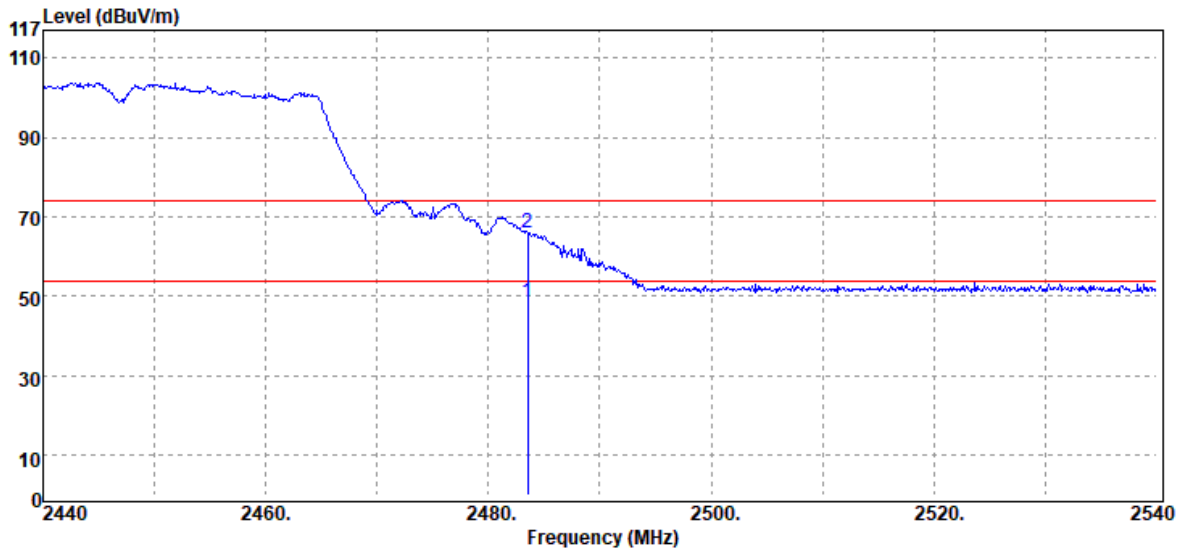
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2447 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	48.65	-0.17	48.48	54.00	-5.52
2483.50	Peak	66.12	-0.17	65.95	74.00	-8.05

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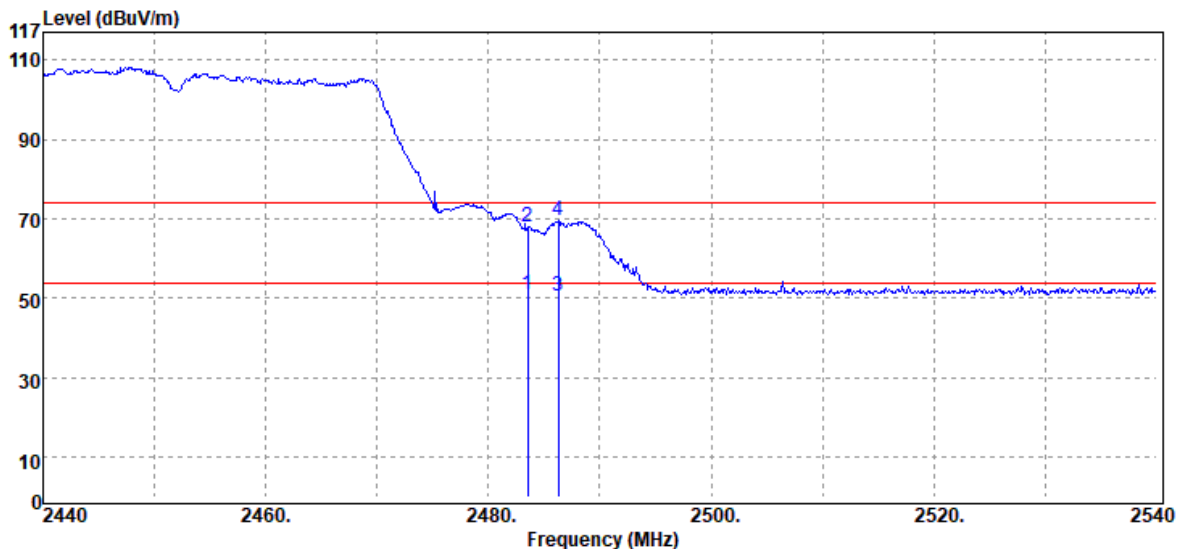
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2452 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	51.36	-0.17	51.19	54.00	-2.81
2483.50	Peak	68.20	-0.17	68.03	74.00	-5.97
2486.30	Average	50.66	-0.19	50.47	54.00	-3.53
2486.30	Peak	69.86	-0.19	69.67	74.00	-4.33

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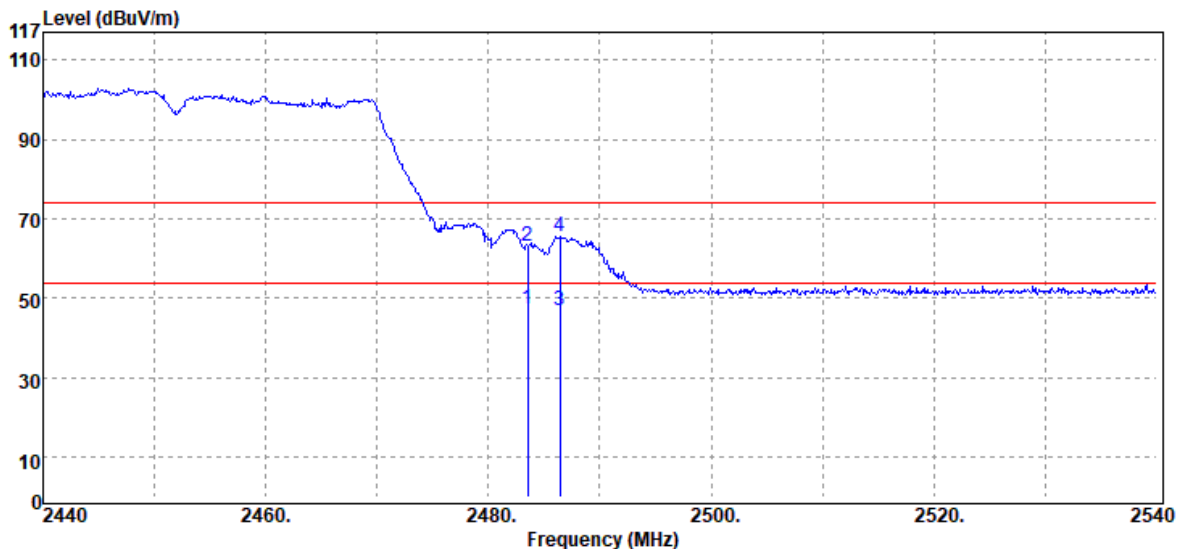
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Report Number :ER/2019/C0047
Operation Mode :802.11n40
Test Channel :2452 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-28
Temp./Humi. :23.7/57
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	47.72	-0.17	47.55	54.00	-6.45
2483.50	Peak	63.49	-0.17	63.32	74.00	-10.68
2486.40	Average	47.02	-0.19	46.83	54.00	-7.17
2486.40	Peak	65.80	-0.19	65.61	74.00	-8.39

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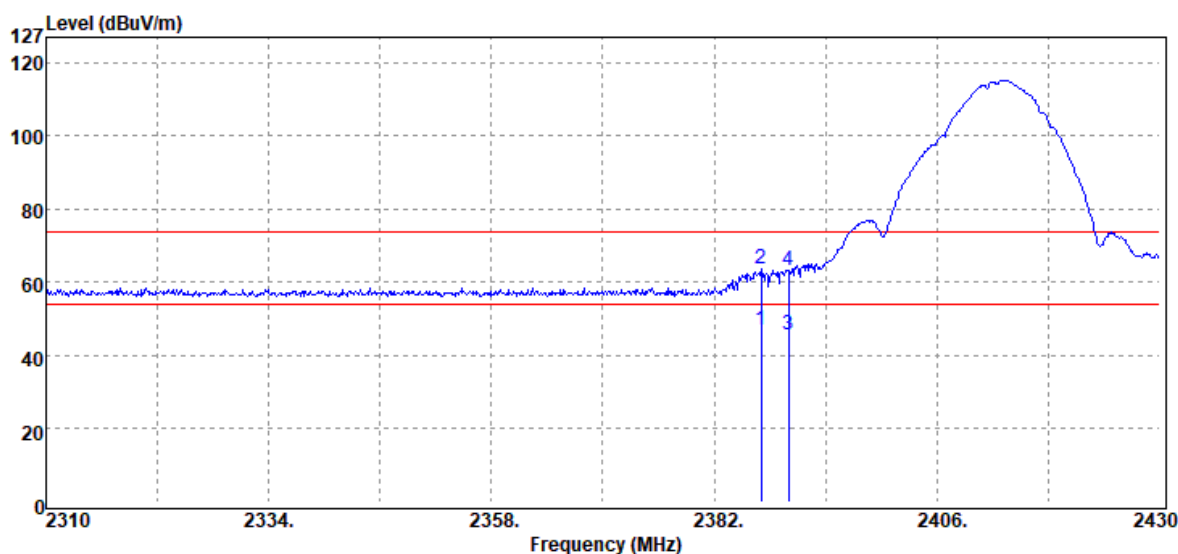
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Internal Antenna

Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
Mode	Reading Level			FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2387.04	Average	46.72	0.25	46.97	54.00	-7.03
2387.04	Peak	63.40	0.25	63.65	74.00	-10.35
2390.00	Average	45.33	0.24	45.57	54.00	-8.43
2390.00	Peak	63.23	0.24	63.47	74.00	-10.53

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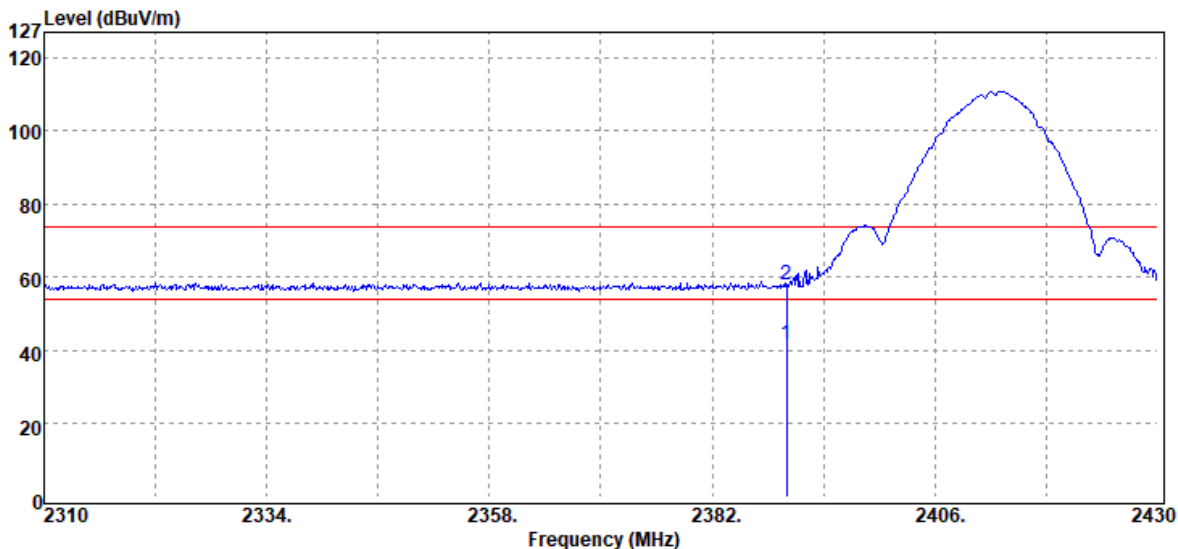
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	41.57	0.24	41.81	54.00	-12.19
2390.00	Peak	57.89	0.24	58.13	74.00	-15.87

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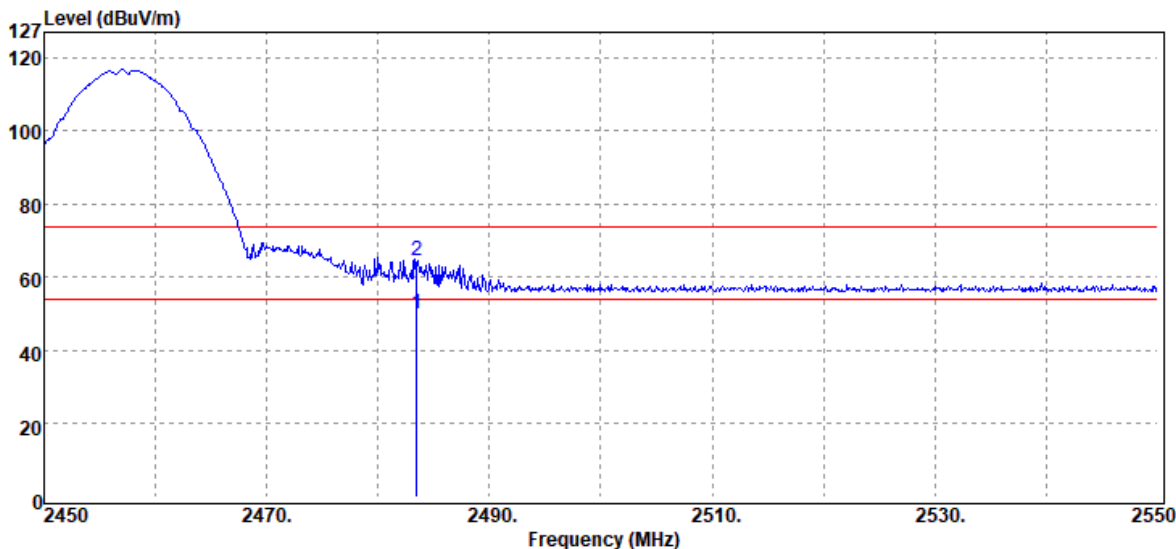
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Member of SGS Group

Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	50.21	-0.17	50.04	54.00	-3.96
2483.50	Peak	64.91	-0.17	64.74	74.00	-9.26

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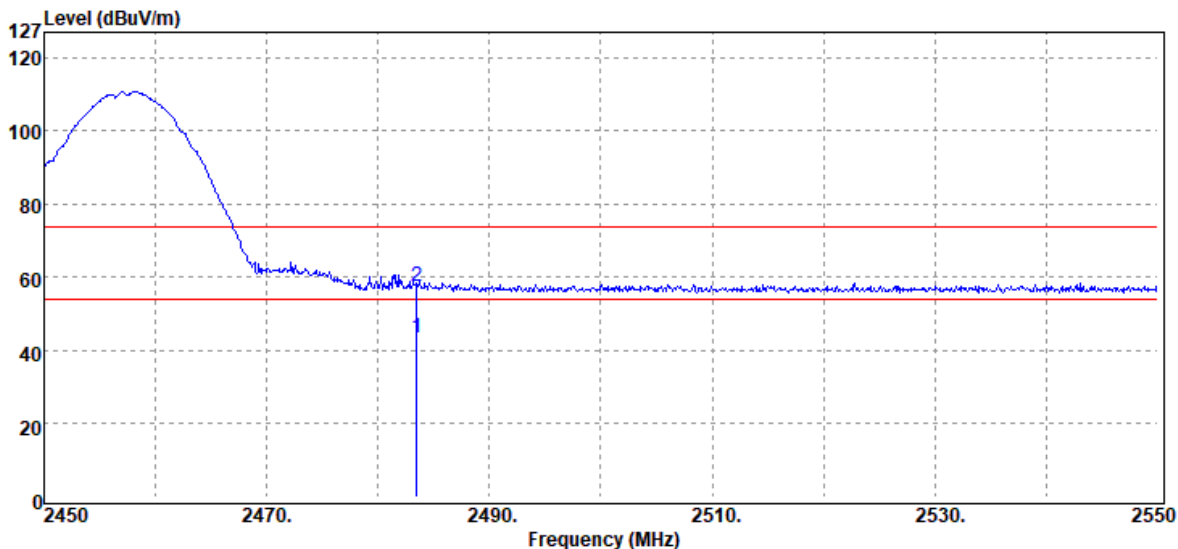
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Member of SGS Group

Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2457 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	43.46	-0.17	43.29	54.00	-10.71
2483.50	Peak	57.79	-0.17	57.62	74.00	-16.38

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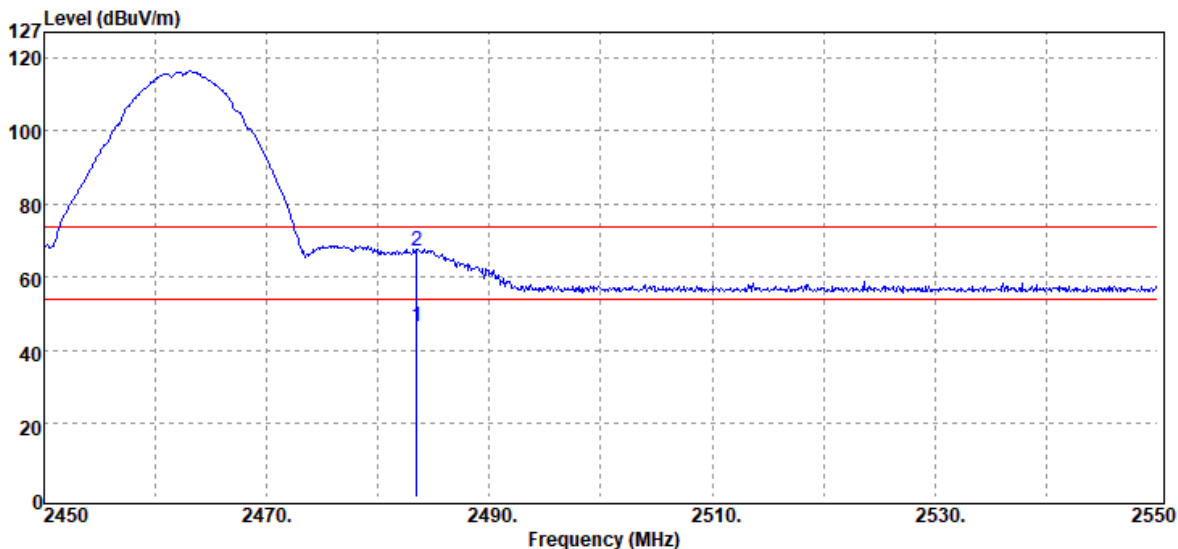
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Member of SGS Group

Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	46.83	-0.17	46.66	54.00	-7.34
2483.50	Peak	67.30	-0.17	67.13	74.00	-6.87

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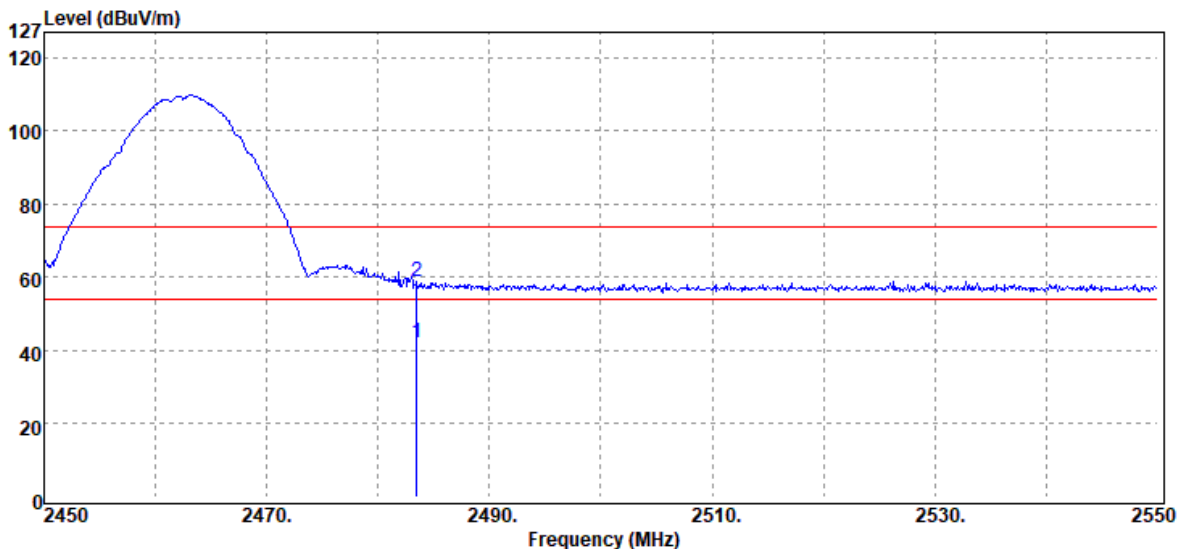
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Report Number :ER/2019/C0047
Operation Mode :802.11b
Test Channel :2462 MHz
Test Mode :Bandedge CH High
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2483.50	Average	42.54	-0.17	42.37	54.00	-11.63
2483.50	Peak	58.94	-0.17	58.77	74.00	-15.23

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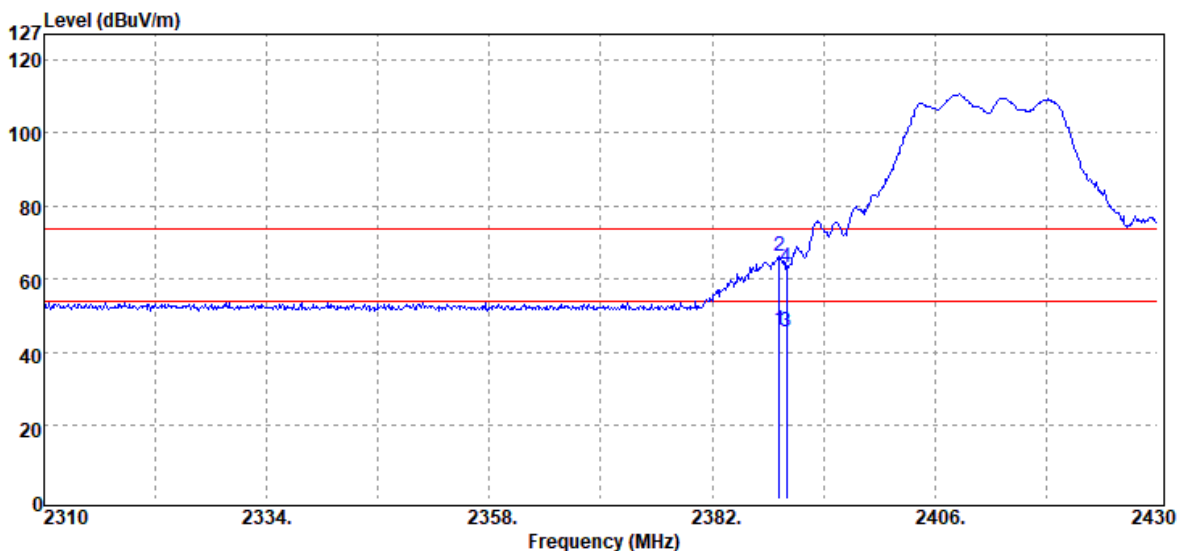
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :VERTICAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2389.20	Average	45.99	0.24	46.23	54.00	-7.77
2389.20	Peak	66.18	0.24	66.42	74.00	-7.58
2390.00	Average	45.61	0.24	45.85	54.00	-8.15
2390.00	Peak	63.19	0.24	63.43	74.00	-10.57

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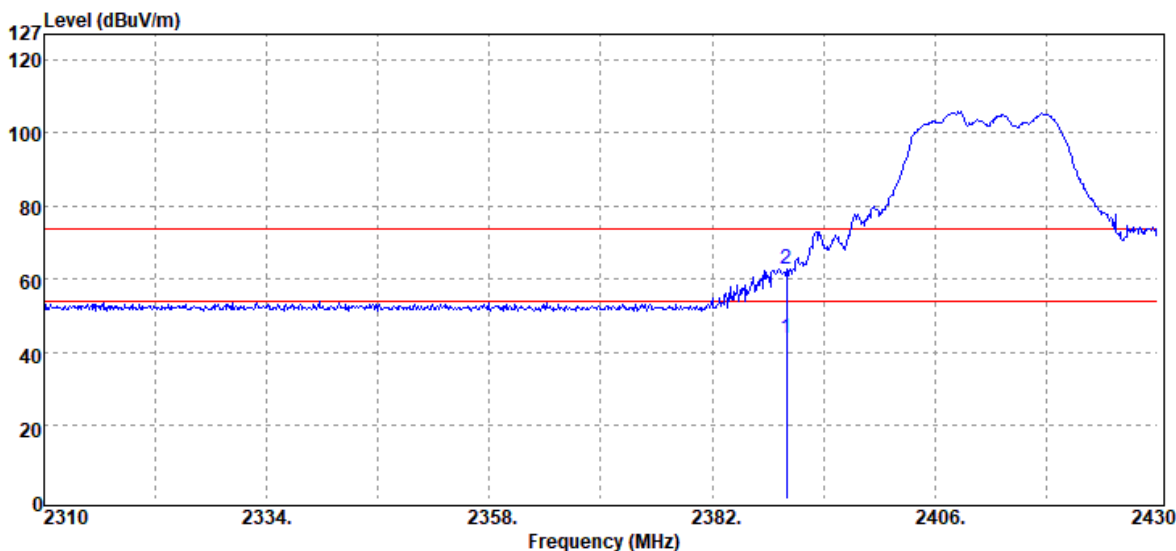
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Report Number :ER/2019/C0047
Operation Mode :802.11g
Test Channel :2412 MHz
Test Mode :Bandedge CH Low
EUT Pol :E2 Plane

Test Date :2019-11-24
Temp./Humi. :23.0/67
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq.	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	Mode	Reading Level		FS	@3m	
MHz	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2390.00	Average	43.56	0.24	43.80	54.00	-10.20
2390.00	Peak	62.53	0.24	62.77	74.00	-11.23

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