

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant: Hublot SA
Chemin de la Vuarpilliere 33, 1260 Nyon, Switzerland

Product Name: BIG BANG e

Brand Name: Hublot

Model No.: HB440 1

Model Difference: N/A

Report Number: ER/2019/B0055

FCC ID: 2AUTBHB4401

IC: 25553-HB4401

FCC Rule Part: §15.247, Cat: DTS

IC RSS: RSS-247 issue 2 Feb 2017

Issue Date: Jan. 22, 2020

Date of Test: Nov. 28, 2019 ~ Dec. 24, 2019

Date of EUT Received: Nov. 28, 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 / Sr. Engineer



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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2019/B0055	Rev.00	Original.	Jan. 22, 2020	Revised By: Stefanie Yu

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1 GENERAL INFORMATION

1.1 Product description

Product Name:	BIG BANG e		
Brand Name:	Hublot		
Model No.:	HB440 1		
Model Difference:	N/A		
Hardware Version:	N/A		
Software Version:	N/A		
Power Supply:	3.8Vdc from Rechargeable Li-ion Battery or 5Vdc from AC/DC Adapter		
	Battery:	Model No.: APP00282, Supplier: APACK	
	Adapter:	Model No.: 1A70, Supplier: LUCENT TRANS	

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)	Modulation Technology		
b	2412-2472	13	17.83	DSSS,		
g			19.89	OFDM		
n_HT20			HT: 19.82			
Antenna Designation		PCB Antenna, Gain: -4.97dBi				
Modulation type:		CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM				
Transition Rate:		802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_HT20MHz: 6.5 – 72.2 Mbps				

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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 a 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 30MHz. The CISPR Quasi-Peak and Average detector mode is employed. The two LISNs provide 50uH/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 a 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 Radiated Emission & Conducted Emission (AC Power Line) Configuration

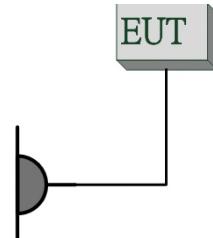


Fig. 2-2 Conducted (Antenna Port) Configuration

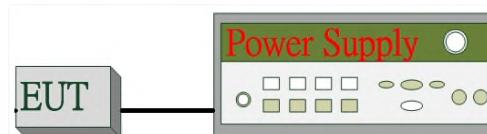


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	WLAN Test Software	N/A	N/A	N/A	N/A	N/A
2	DC Power Supply	Agilent	E3640A	MY52410006	12/04/2018	12/03/2019

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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

13channels are provided for 802.11b/g/n 20M.

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
12	2467
13	2472

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 given UE is pre-scanned among below modes.

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

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

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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 13	1, 6, 13	OFDM	6	Ch0
RADIATED EMISSION TEST (ABOVE 1 GHz)					
802.11b	1 to 13	1, 6, 13	DSSS	1	Ch0
802.11g	1 to 13	1, 6, 13	OFDM	6	Ch0
802.11n 20M	1 to 13	1, 6, 13	OFDM	MCS 0	SISO

Note:

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

4.4 Antenna Port Conducted Mesurement:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 13	1, 6, 13	DSSS	1	Ch0
802.11g	1 to 13	1, 6, 13	OFDM	6	Ch0
802.11n 20M	1 to 13	1, 6, 13	OFDM	MCS 0	SISO

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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 3	100335	02/12/2019	02/11/2020
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.

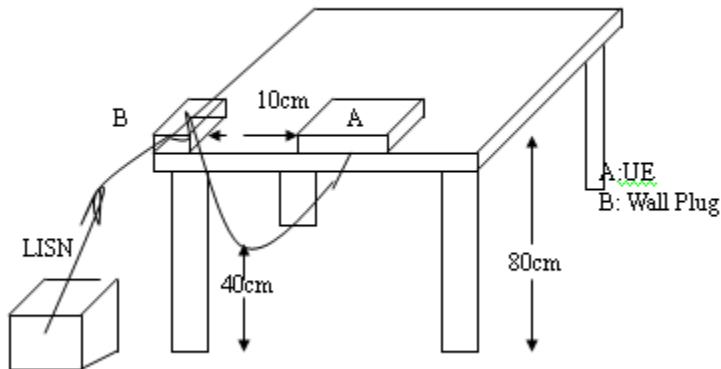
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6.4 Test SET-UP (Block Diagram of Configuration)



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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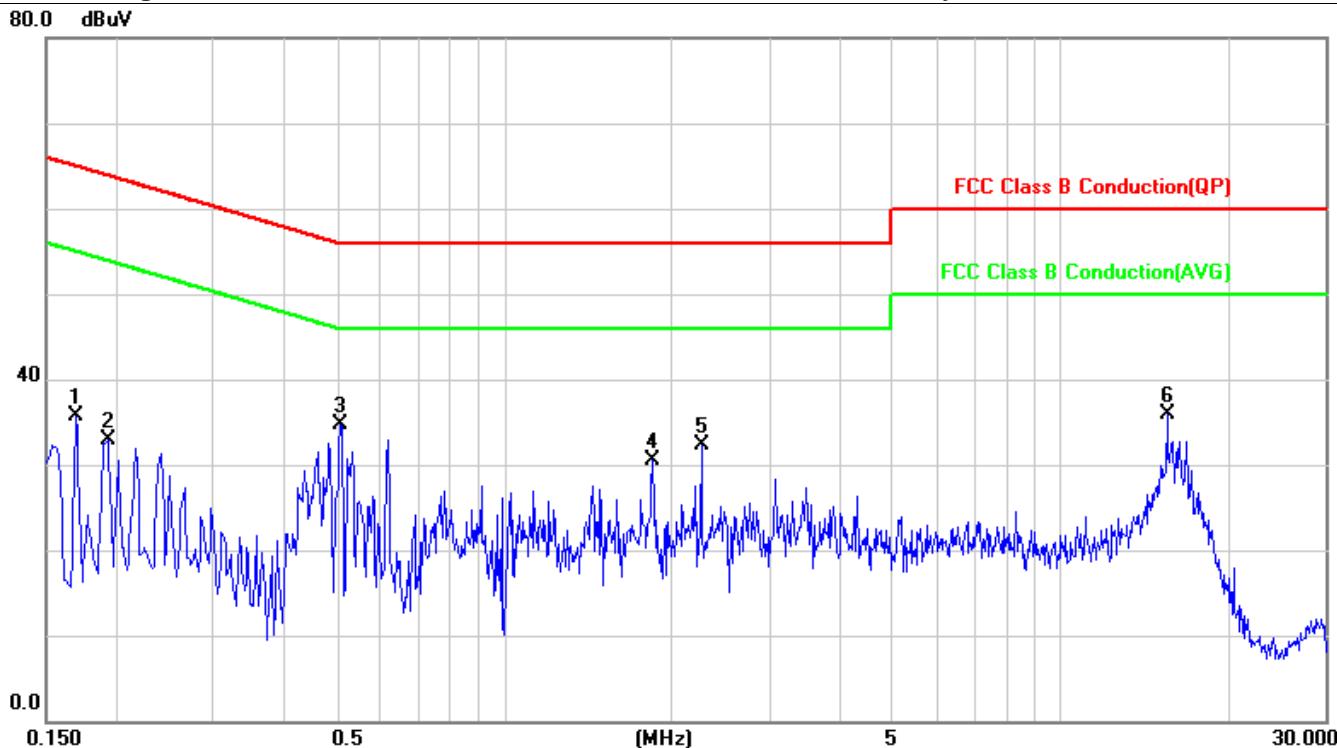
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Description:	Operation	Date:	2019/12/21
Line:	L1	Temp.(°C)/Hum.(%):	24.7(°C)/67%
Test Voltage:	AC 120V/60Hz	Test By:	Kane



No.	Mk.	Freq.	Reading	Factor	Measure- ment	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1700	35.71	0.00	35.71	64.96	-29.25	peak	
2		0.1940	32.90	0.01	32.91	63.86	-30.95	peak	
3	*	0.5100	34.70	0.01	34.71	56.00	-21.29	peak	
4		1.8540	30.50	0.04	30.54	56.00	-25.46	peak	
5		2.2620	32.28	0.05	32.33	56.00	-23.67	peak	
6		15.6300	35.50	0.34	35.84	60.00	-24.16	peak	

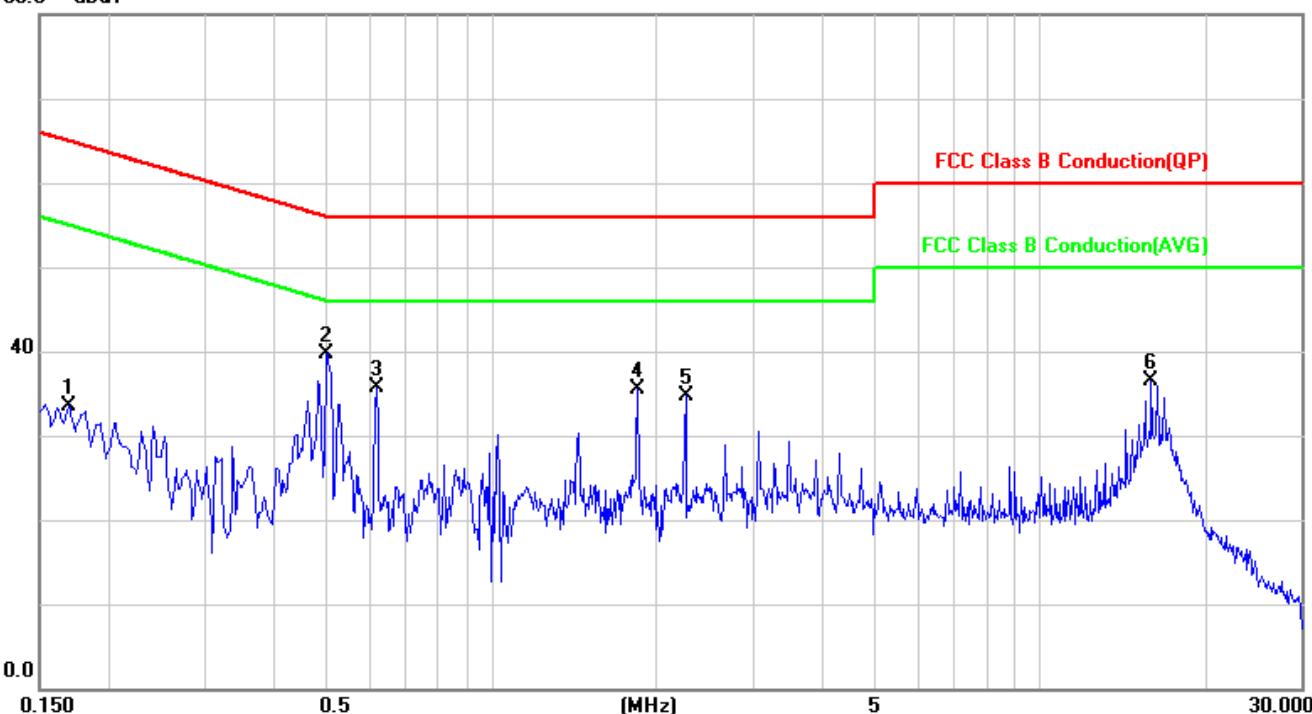
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Description: Operation	Date: 2019/12/21
Line: N	Temp.(°C)/Hum.(%): 24.7(°C)/67%
Test Voltage: AC 120V/60Hz	Test By: Kane
80.0 dBuV	



No.	Mk.	Freq.	Reading	Factor	Measure- ment	Limit	Over	Detector	Comment
		(MHz)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dB)		
1		0.1700	33.51	0.03	33.54	64.96	-31.42	peak	
2	*	0.5020	39.66	0.03	39.69	56.00	-16.31	peak	
3		0.6180	35.59	0.03	35.62	56.00	-20.38	peak	
4		1.8500	35.43	0.06	35.49	56.00	-20.51	peak	
5		2.2620	34.64	0.07	34.71	56.00	-21.29	peak	
6		16.0420	36.22	0.37	36.59	60.00	-23.41	peak	

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7 DUTY CYCLE OF TEST SIGNAL

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

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

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	97.63	0.10	0.12	1.00
802.11g	87.27	0.59	0.73	1.00
802.11n_20	86.57	0.63	0.78	1.00

Duty Cycle Factor: $10 * \log(1/0.9763) = 0.1$

Duty Cycle Factor: $10 * \log(1/0.8727) = 0.59$

Duty Cycle Factor: $10 * \log(1/0.8657) = 0.63$

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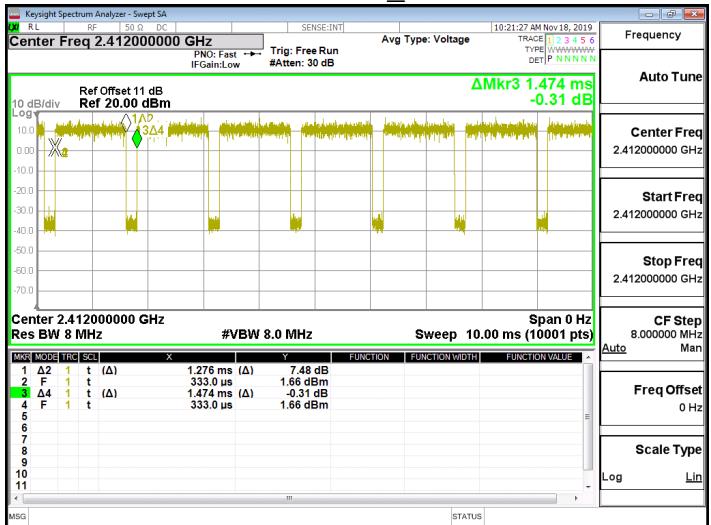
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7.3 Duty Cycle test plots

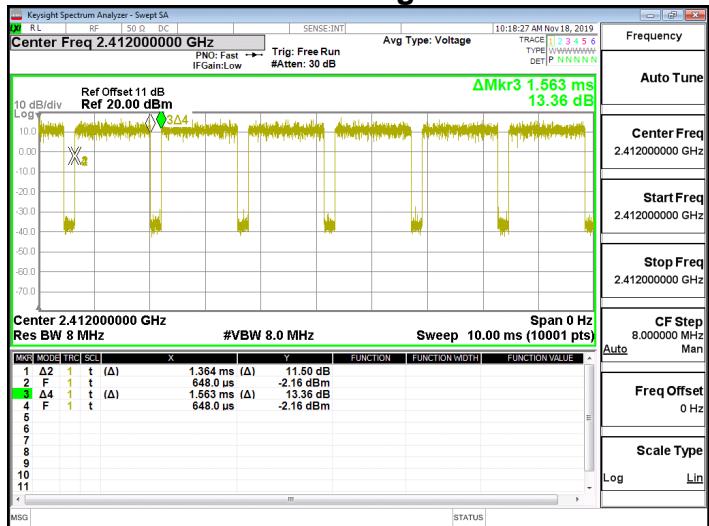
802.11b



802.11n_20



802.11g



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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, ..., G_N 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 grater 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
DC Power Supply	Agilent	E3640A	MY52410006	12/04/2018	12/03/2019

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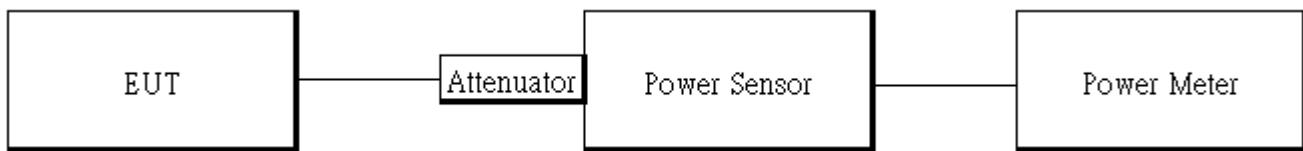
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8.3 Test Set-up

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.**

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8.5 Measurement Result

802.11b Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	17.83	30.00	PASS
6	2437	1	17.64	30.00	PASS
11	2462	1	17.73	30.00	PASS
12	2467	1	17.71	30.00	PASS
13	2472	1	17.17	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	14.93	30.00	PASS
6	2437	1	14.83	30.00	PASS
11	2462	1	14.87	30.00	PASS
12	2467	1	14.90	30.00	PASS
13	2472	1	14.53	30.00	PASS

802.11g Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	19.49	30.00	PASS
6	2437	6	19.23	30.00	PASS
11	2462	6	19.69	30.00	PASS
12	2467	6	19.58	30.00	PASS
13	2472	6	19.89	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	9.70	30.00	PASS
6	2437	6	9.65	30.00	PASS
11	2462	6	9.85	30.00	PASS
12	2467	6	9.55	30.00	PASS
13	2472	6	9.88	30.00	PASS

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802.11n_HT20M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	19.37	30.00	PASS
6	2437	MCS0	19.15	30.00	PASS
11	2462	MCS0	19.52	30.00	PASS
12	2467	MCS0	19.82	30.00	PASS
13	2472	MCS0	19.68	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	9.62	30.00	PASS
6	2437	MCS0	9.55	30.00	PASS
11	2462	MCS0	9.83	30.00	PASS
12	2467	MCS0	9.56	30.00	PASS
13	2472	MCS0	9.80	30.00	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	14.93	-4.97	9.96	36	PASS
6	2437	1	14.83	-4.97	9.86	36	PASS
11	2462	1	14.87	-4.97	9.90	36	PASS
12	2467	1	14.90	-4.97	9.93	36	PASS
13	2472	1	14.53	-4.97	9.56	36	PASS

802.11g Ch0

CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	9.70	-4.97	4.73	36	PASS
6	2437	6	9.65	-4.97	4.68	36	PASS
11	2462	6	9.85	-4.97	4.88	36	PASS
12	2467	6	9.55	-4.97	4.58	36	PASS
13	2472	6	9.88	-4.97	4.91	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	9.62	-4.97	4.65	36	PASS
6	2437	MCS0	9.55	-4.97	4.58	36	PASS
11	2462	MCS0	9.83	-4.97	4.86	36	PASS
12	2467	MCS0	9.56	-4.97	4.59	36	PASS
13	2472	MCS0	9.80	-4.97	4.83	36	PASS

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9 6DB & 99% BANDWIDTH MEASUREMENT

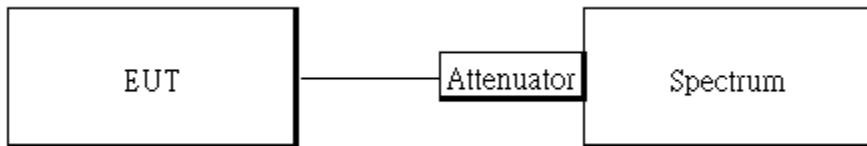
9.1 Standard Applicable

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
DC Power Supply	Agilent	E3640A	MY52410006	12/04/2018	12/03/2019
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	8113.00	> 500	PASS
2437	8085.00	> 500	PASS
2462	8108.00	> 500	PASS
2467	8097.00	> 500	PASS
2472	8112.00	> 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	16420.00	> 500	PASS
2437	16430.00	> 500	PASS
2462	16440.00	> 500	PASS
2467	16450.00	> 500	PASS
2472	16460.00	> 500	PASS

802.11_n HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	17650.00	> 500	PASS
2437	17640.00	> 500	PASS
2462	17650.00	> 500	PASS
2467	17640.00	> 500	PASS
2472	17630.00	> 500	PASS

*Refer to next page for plots

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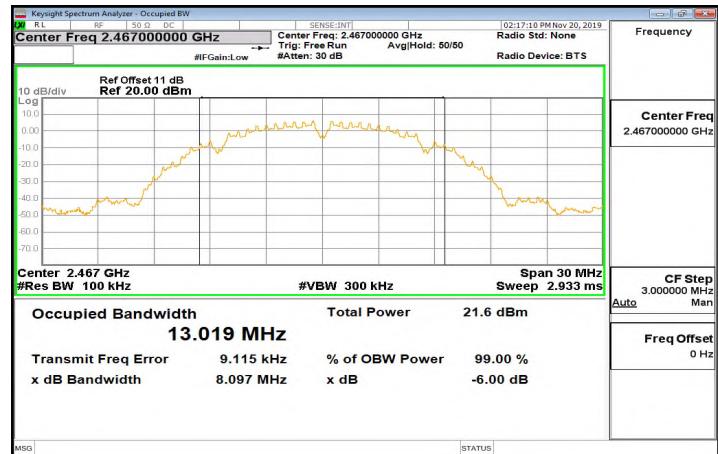
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802.11b (CH0) 6dB Band Width Test Data CH-2412MHz



6dB Band Width Test Data CH-2467MHz

6dB Band Width Test Data CH-2467MHz

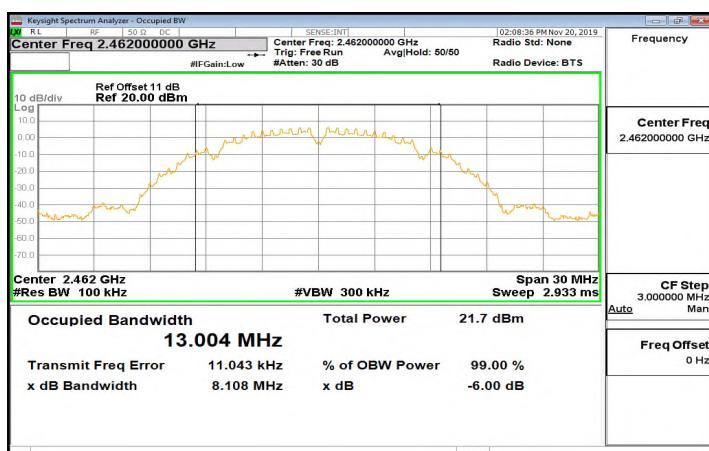


6dB Band Width Test Data CH-2437MHz

6dB Band Width Test Data CH-2472MHz



6dB Band Width Test Data CH-2462MHz



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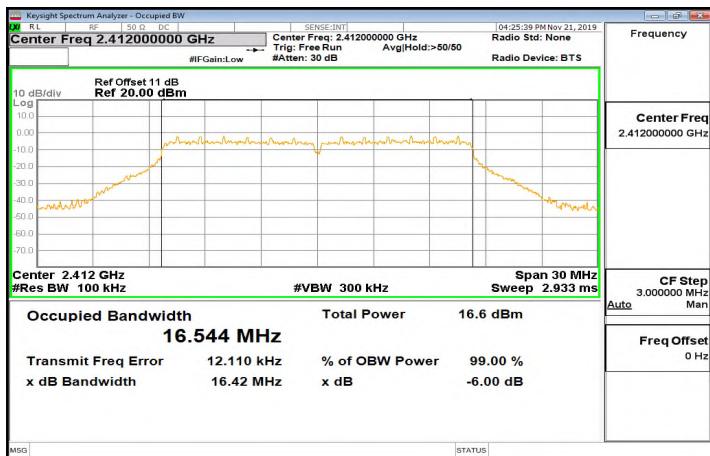
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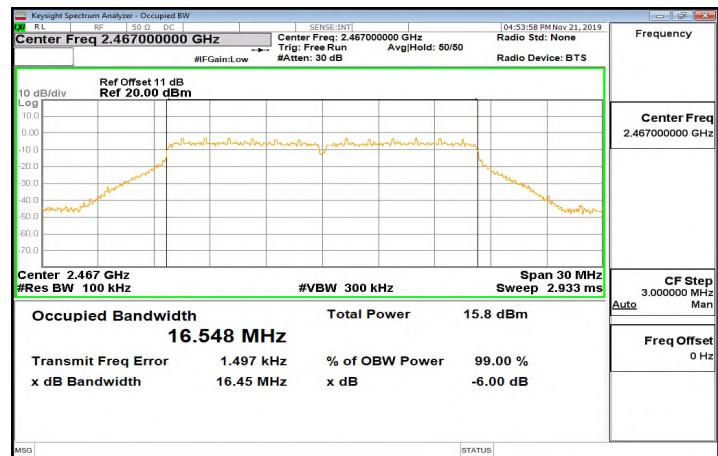
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802.11g (CH0)

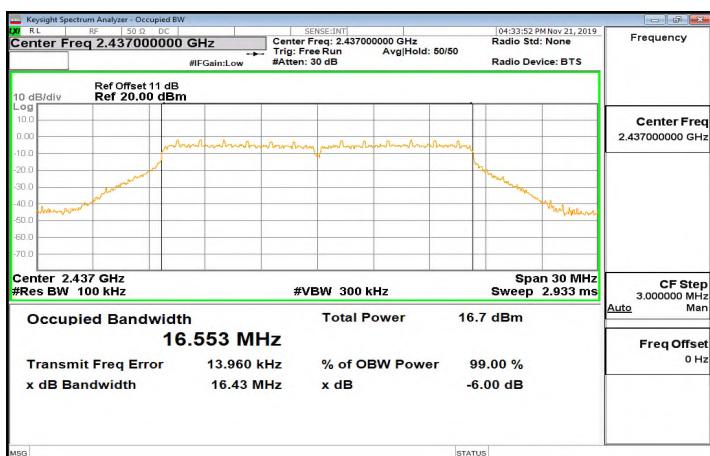
6dB Band Width Test Data CH-2412MHz



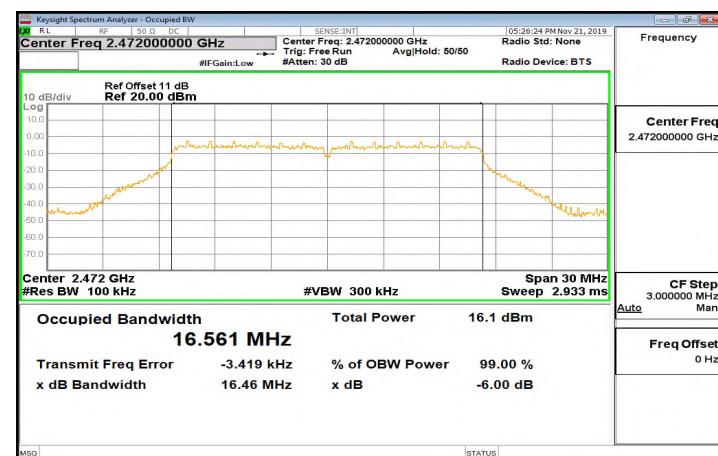
6dB Band Width Test Data CH-2467MHz



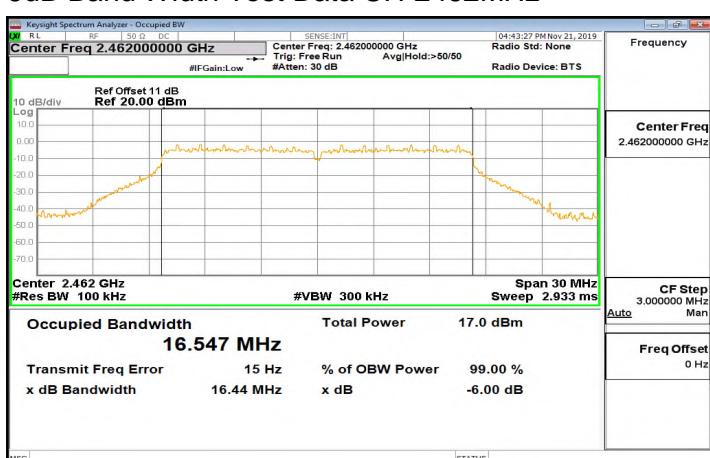
6dB Band Width Test Data CH-2437MHz



6dB Band Width Test Data CH-2472MHz



6dB Band Width Test Data CH-2462MHz



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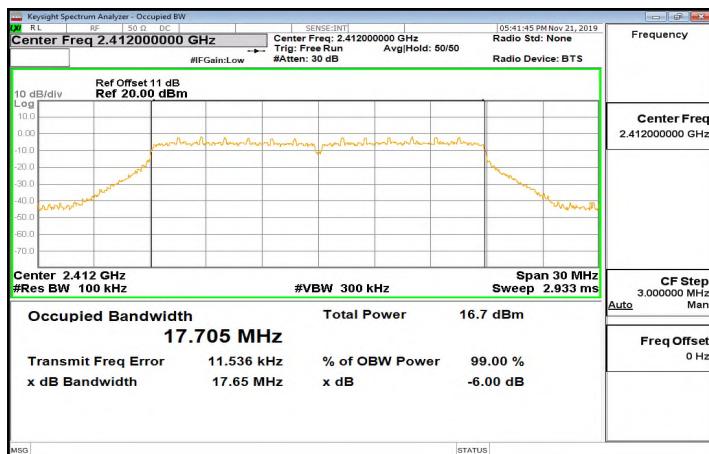
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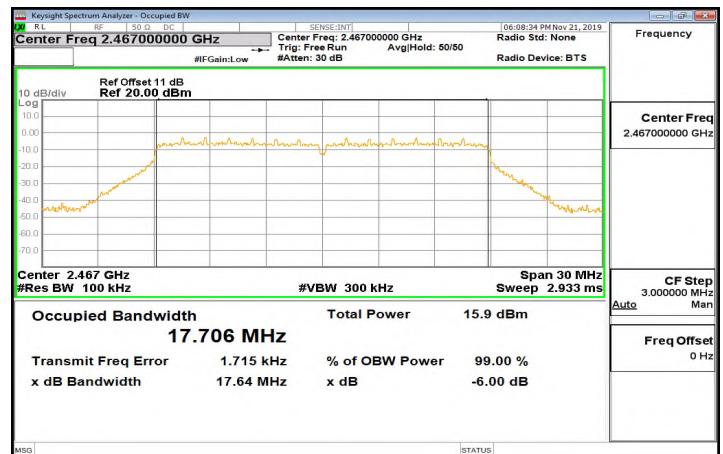
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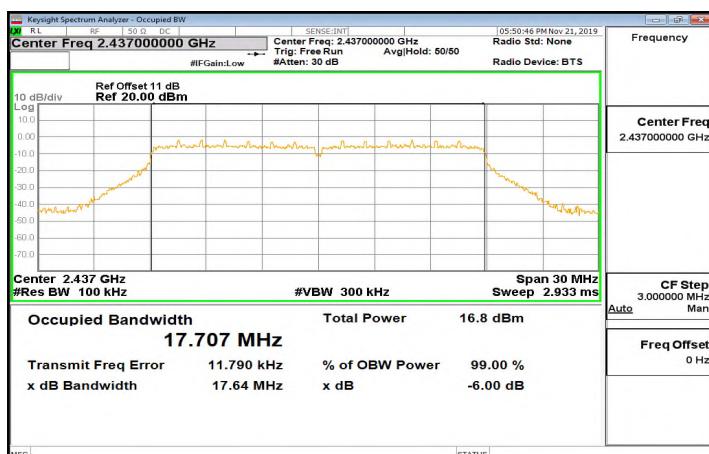
802.11n_20M (CH0)
6dB Band Width Test Data CH-2412MHz



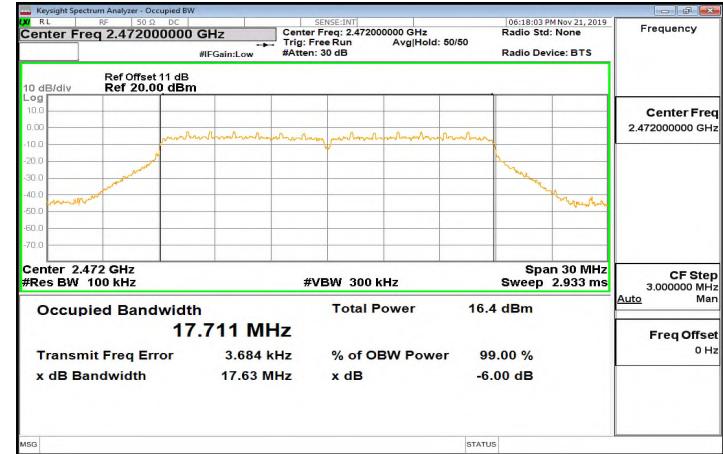
6dB Band Width Test Data CH-2467MHz



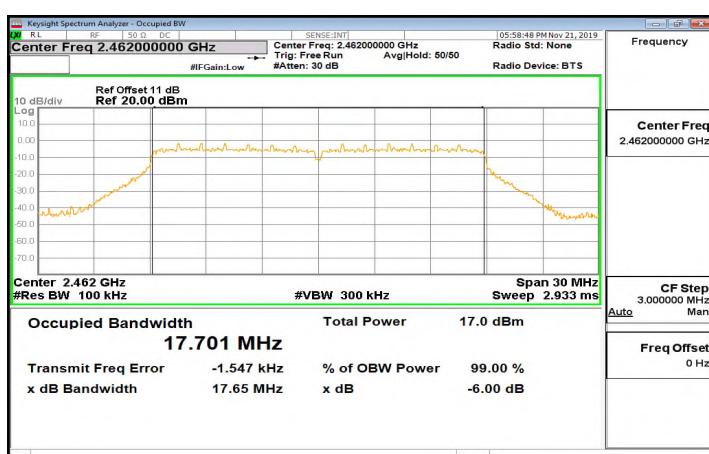
6dB Band Width Test Data CH-2437MHz



6dB Band Width Test Data CH-2472MHz



6dB Band Width Test Data CH-2462MHz



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9.6 99% Bandwidth

802.11b Ch0	
Freq. (MHz)	99% BW (MHz)
2412	13.164
2437	13.094
2462	13.07
2467	13.064
2472	13.074

802.11g Ch0	
Freq. (MHz)	99% BW (MHz)
2412	17.101
2437	17.112
2462	17.094
2467	17.081
2472	17.061

802.11n HT20M Ch0	
Freq. (MHz)	99% BW (MHz)
2412	18.084
2437	18.077
2462	18.07
2467	18.083
2472	18.06

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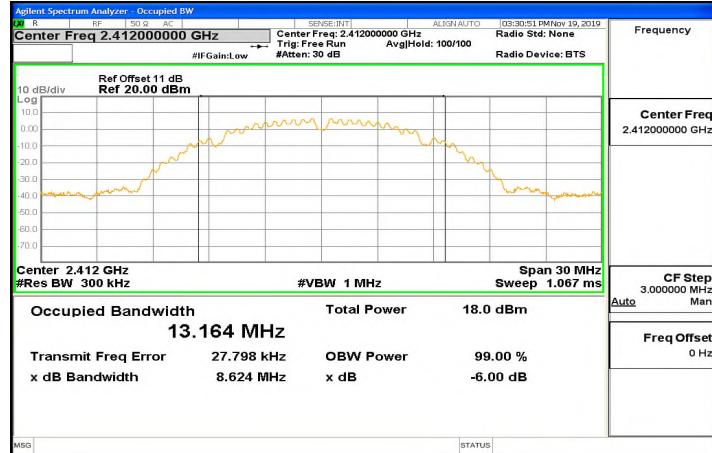
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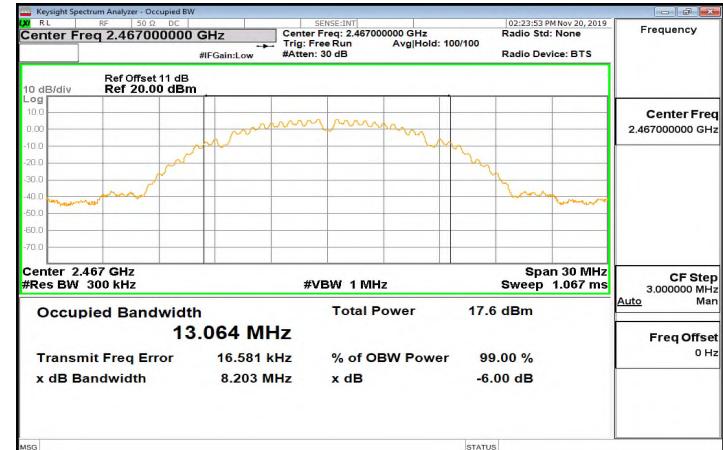
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802.11b (CH0)

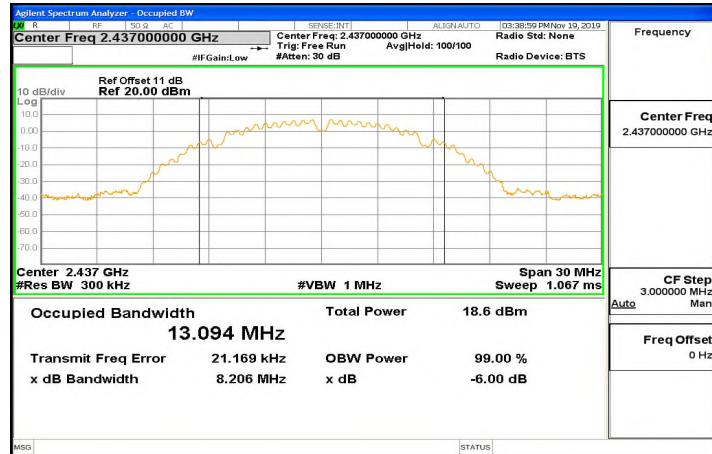
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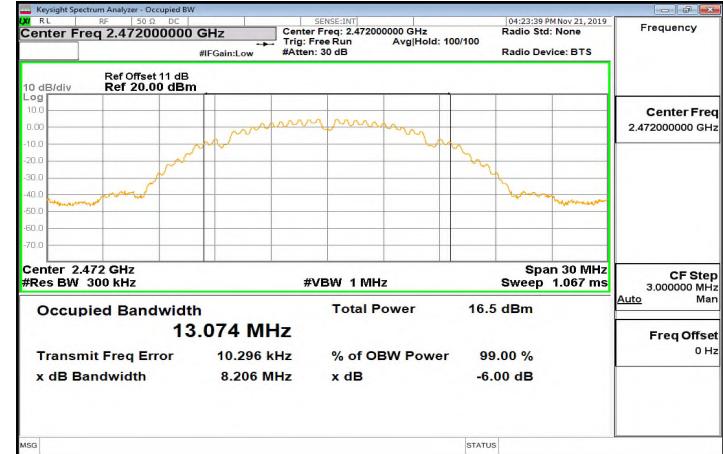
99% Band Width Test Data CH-2467MHz



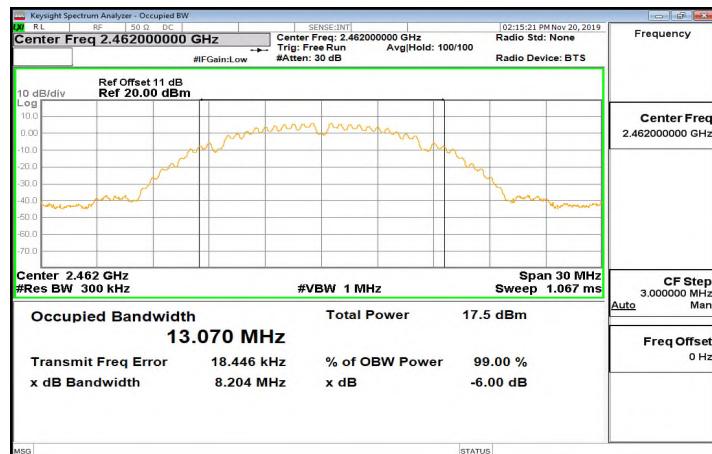
99% Band Width Test Data CH-2437MHz



99% Band Width Test Data CH-2472MHz



99% Band Width Test Data CH-2462MHz



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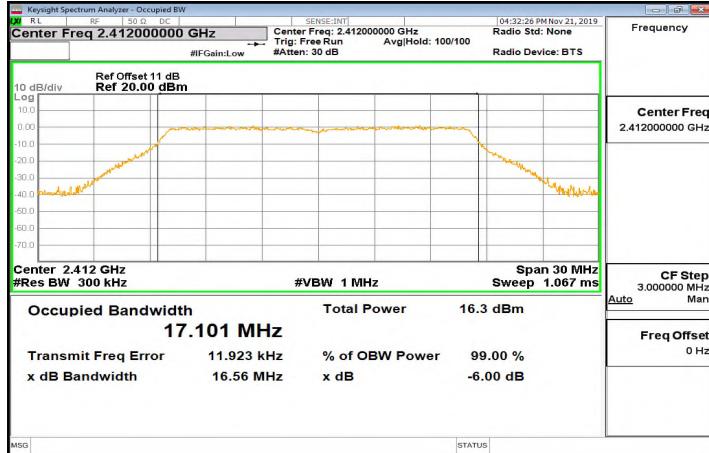
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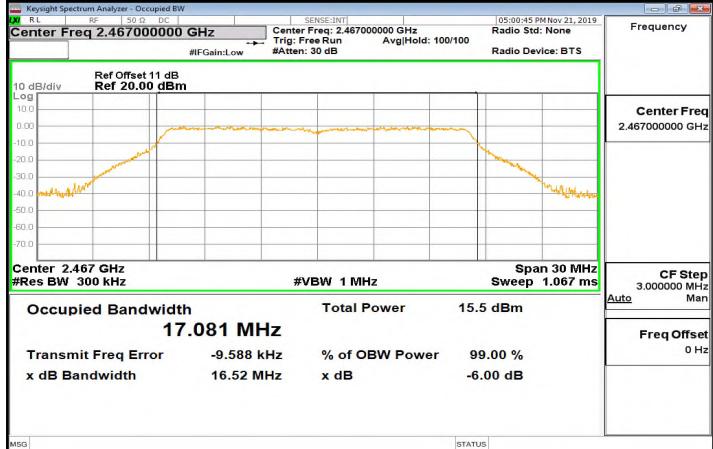


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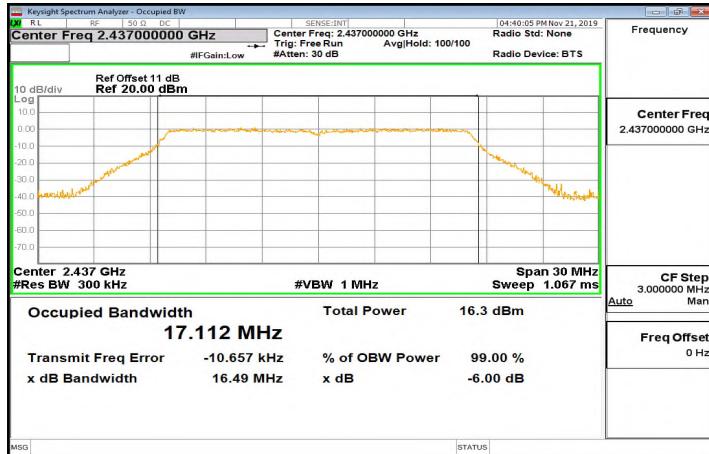
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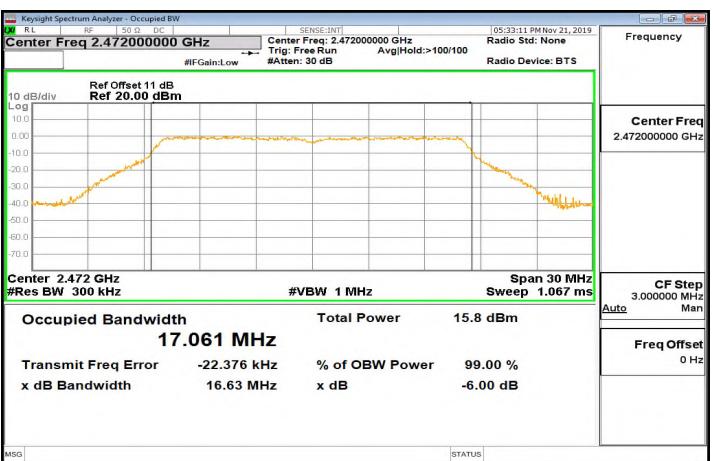
99% Band Width Test Data CH-2467MHz



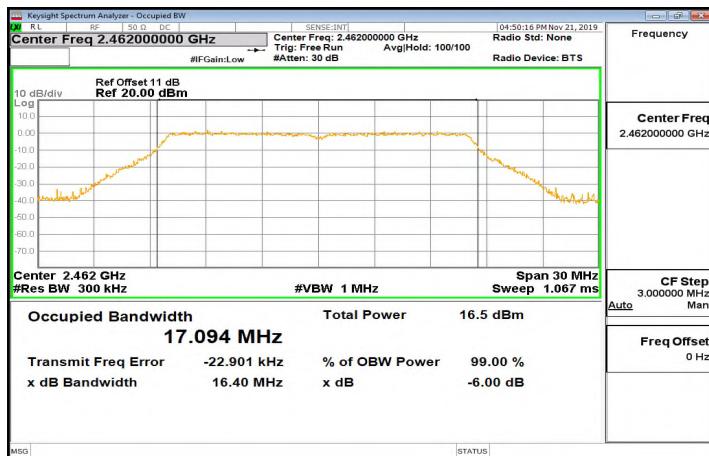
99% Band Width Test Data CH-2437MHz



99% Band Width Test Data CH-2472MHz



99% Band Width Test Data CH-2462MHz



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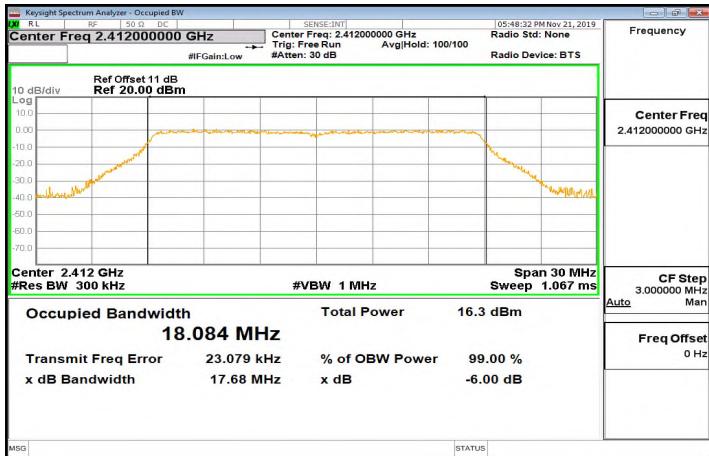
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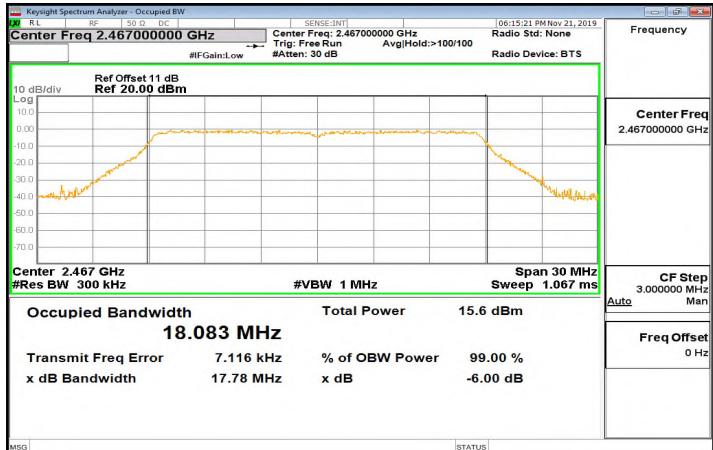
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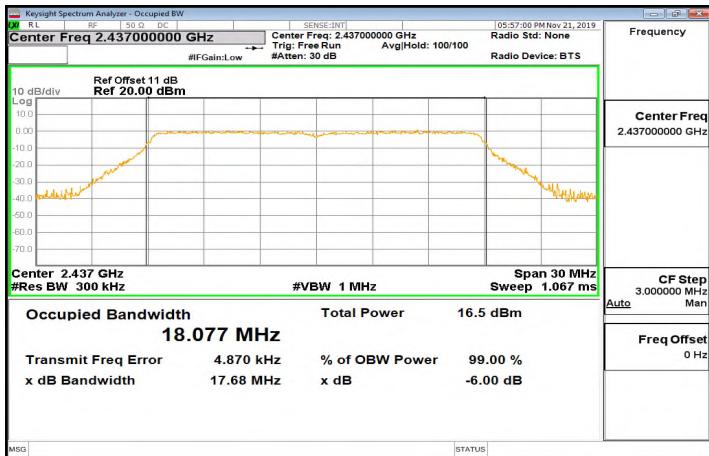
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802.11n_20M (CH0)
 99% Band Width Test Data CH-2412MHz


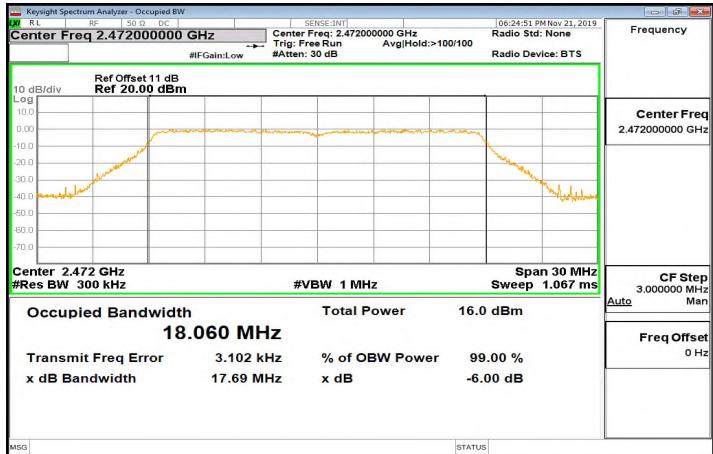
99% Band Width Test Data CH-2467MHz



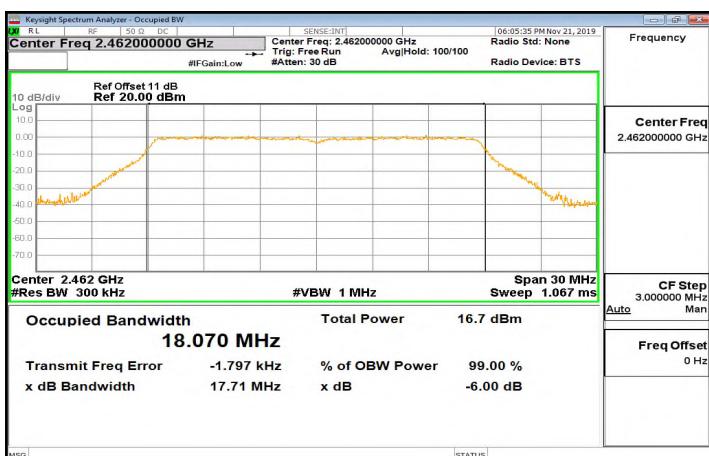
99% Band Width Test Data CH-2437MHz



99% Band Width Test Data CH-2472MHz



99% Band Width Test Data CH-2462MHz



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10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

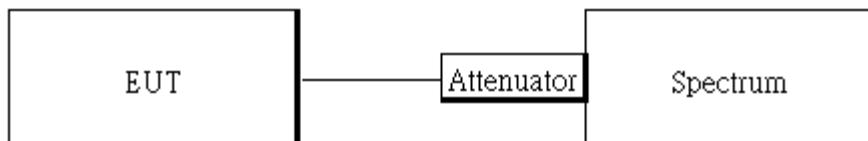
10.1 Standard Applicable

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
DC Power Supply	Agilent	E3640A	MY52410006	12/04/2018	12/03/2019
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.

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Use the peak marker function to determine the maximum amplitude level.

Conducted Band Edge:

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

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Conducted Spurious Emission:

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

10.5 Measurement Result

Reference Level of Limit 802.11b mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	6.12	-13.88
2437	6.63	-13.37
2462	5.99	-14.01
2467	5.88	-14.12
2472	4.94	-15.06

Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	-1.96	-21.96
2437	-1.93	-21.93
2462	-1.64	-21.64
2467	-2.78	-22.78
2472	-2.46	-22.46

Reference Level of Limit 802.11n20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	-2.03	-22.03
2437	-1.97	-21.97
2462	-1.63	-21.63
2467	-2.79	-22.79
2472	-2.26	-22.26

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Note

Cable Loss 11.00 dB

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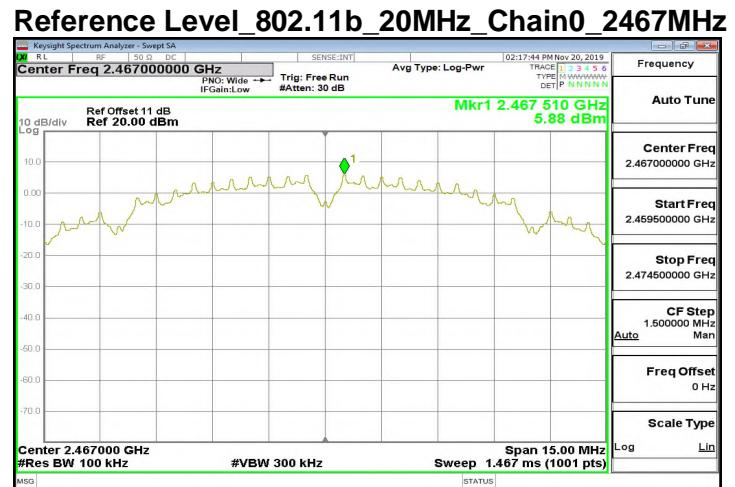
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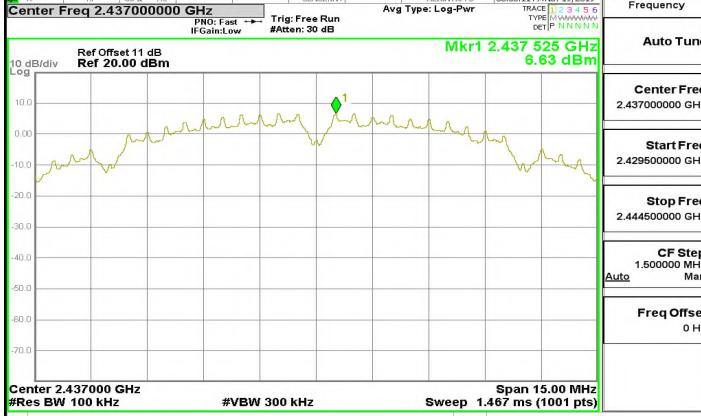
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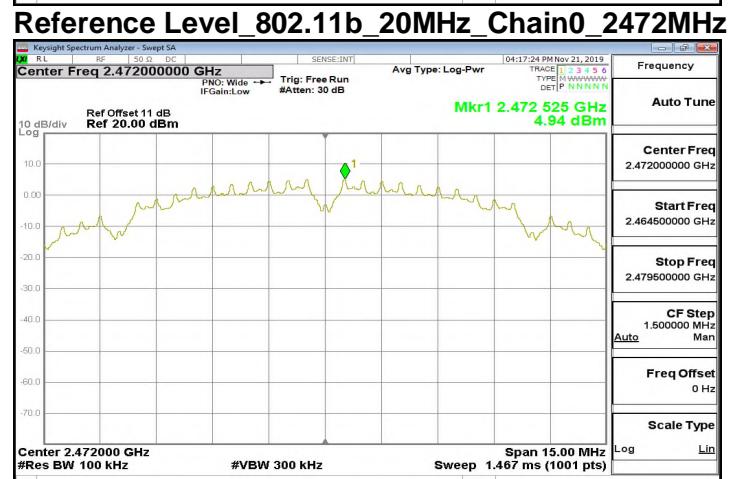
Reference Level_802.11b_20MHz_Chain0_2467MHz



Reference Level_802.11b_20MHz_Chain0_2437MHz



Reference Level_802.11b_20MHz_Chain0_2472MHz



Reference Level_802.11b_20MHz_Chain0_2462MHz



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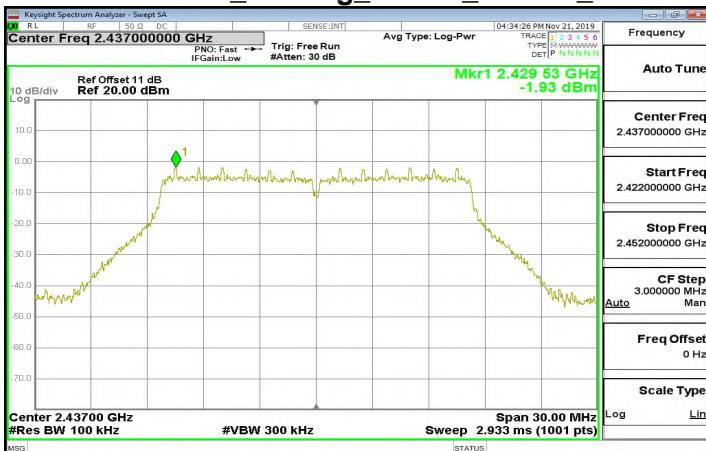
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Reference Level_802.11g_20MHz_Chain0_2412MHz



Reference Level_802.11g_20MHz_Chain0_2437MHz



Reference Level_802.11g_20MHz_Chain0_2462MHz



Reference Level_802.11g_20MHz_Chain0_2467MHz



Reference Level_802.11g_20MHz_Chain0_2472MHz



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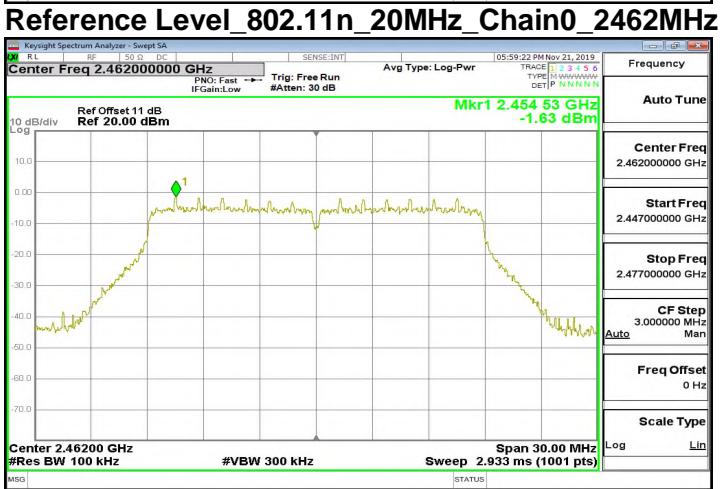
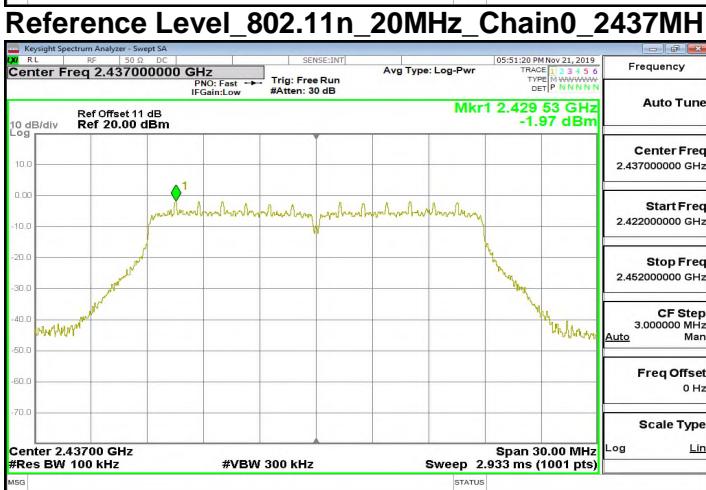
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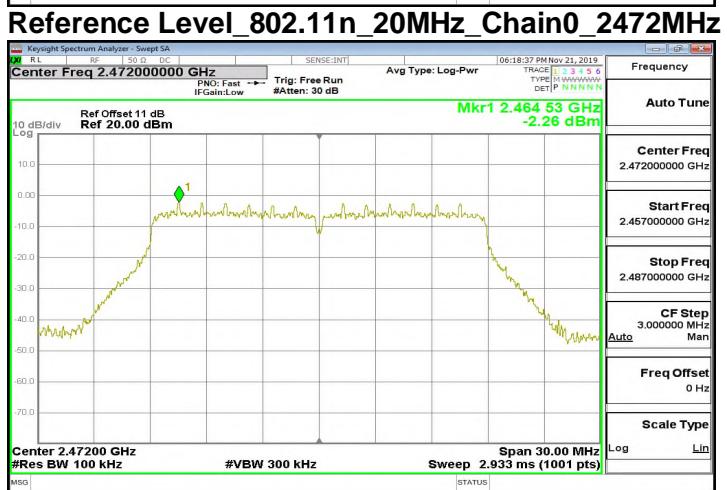
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Reference Level_802.11n_20MHz_Chain0_2412MHz



Reference Level_802.11n_20MHz_Chain0_2467MHz



Reference Level_802.11n_20MHz_Chain0_2462MHz



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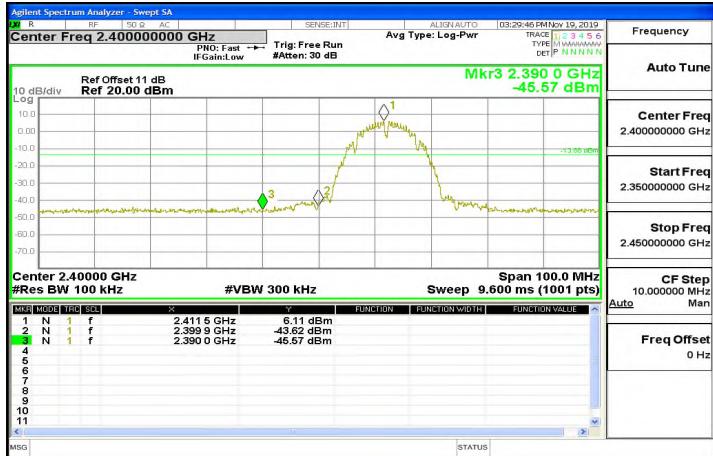
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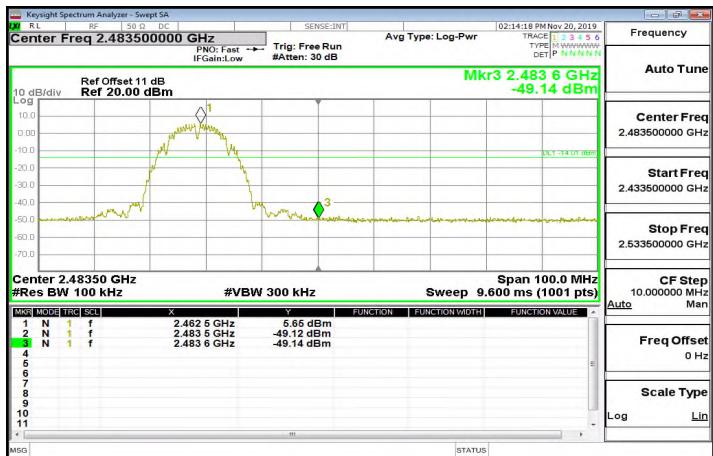
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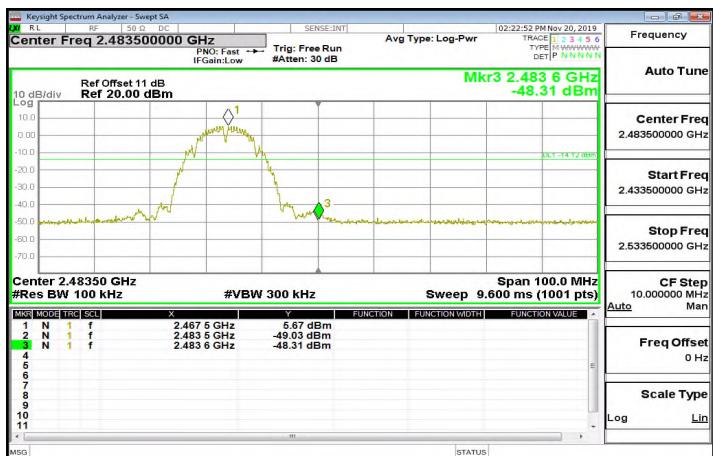
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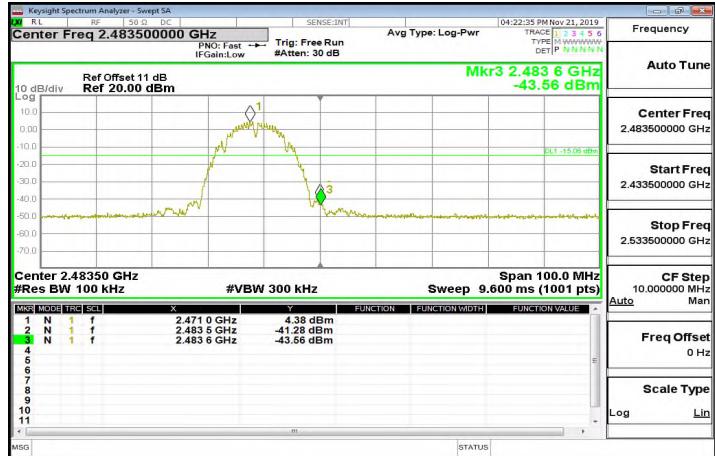
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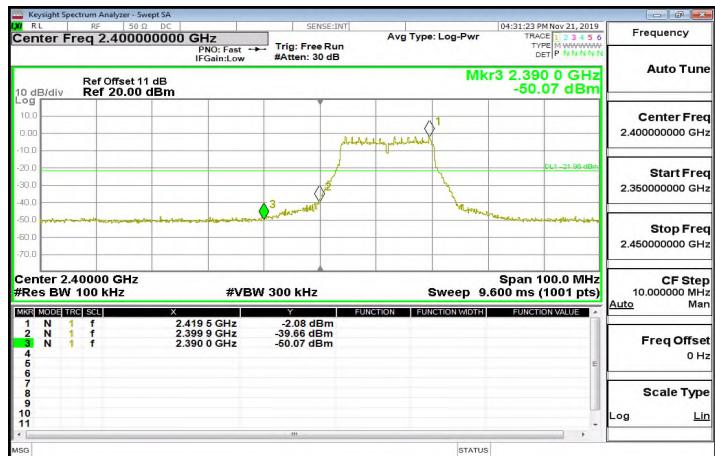
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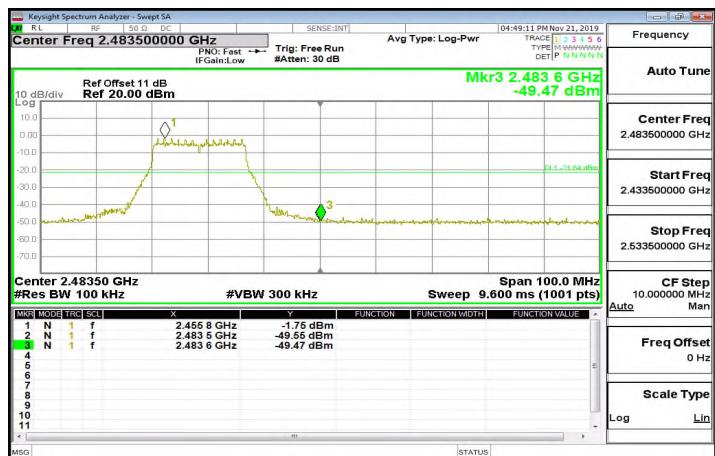
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Band Edge_802.11g_20MHz_Chain0_2412MHz



Band Edge_802.11g_20MHz_Chain0_2462MHz



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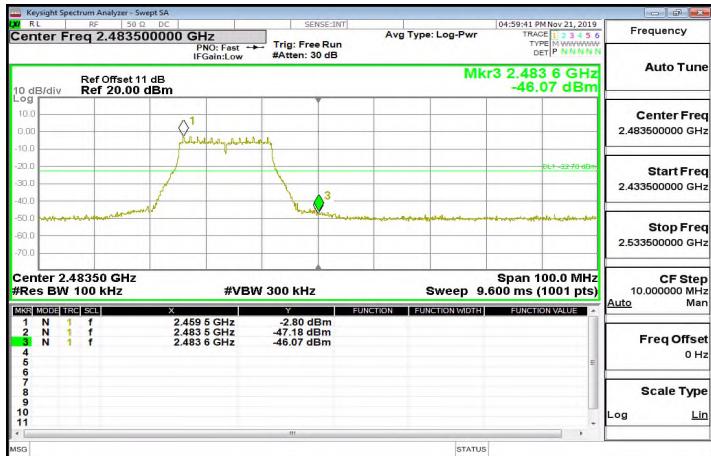
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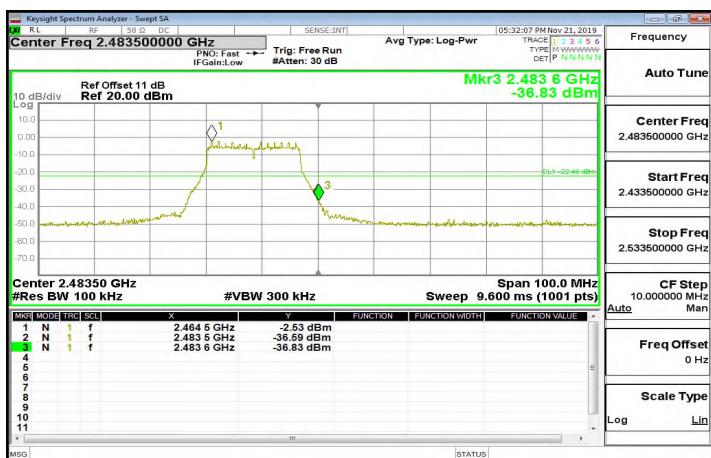
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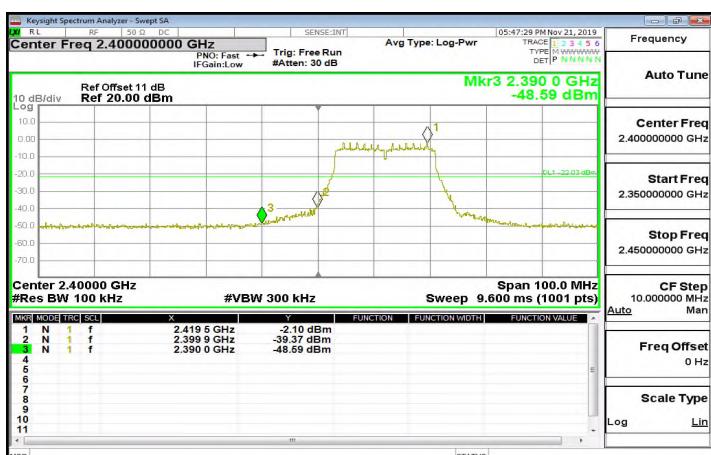
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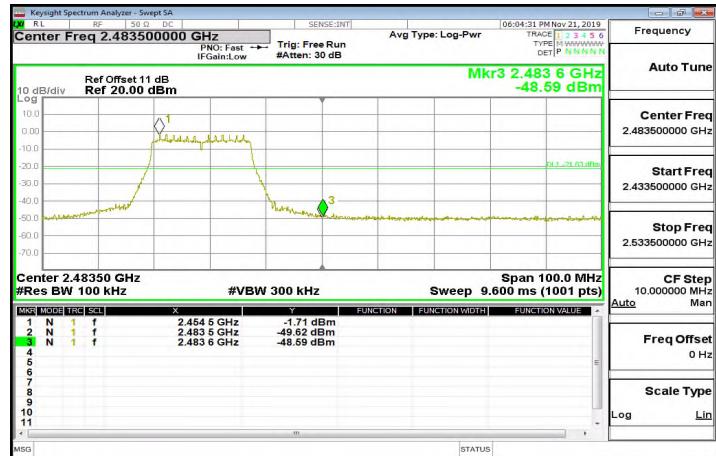
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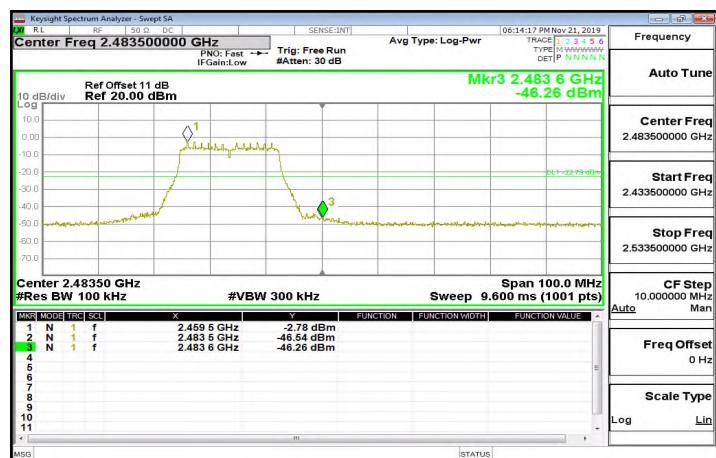
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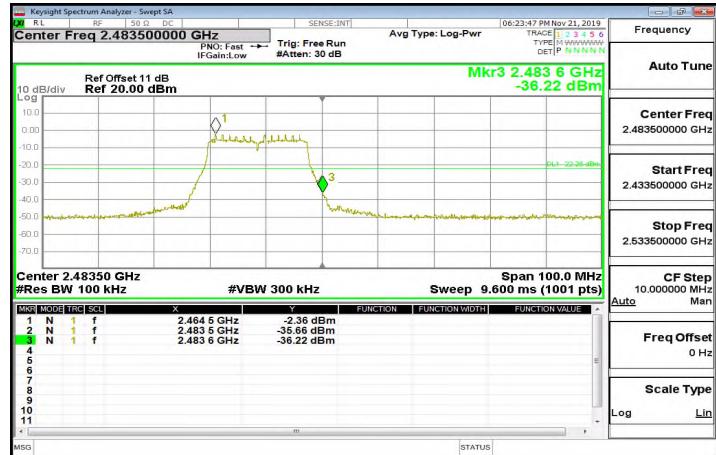
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Band Edge_802.11n_40MHz_Chain0_2462MHz



Band Edge_802.11n_40MHz_Chain0_2412MHz



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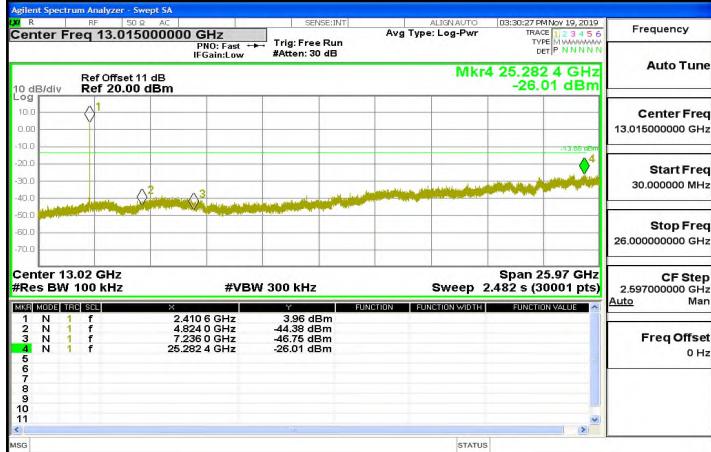
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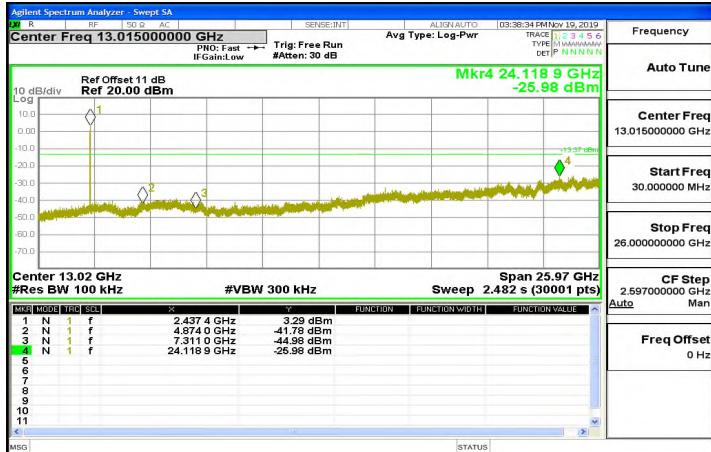
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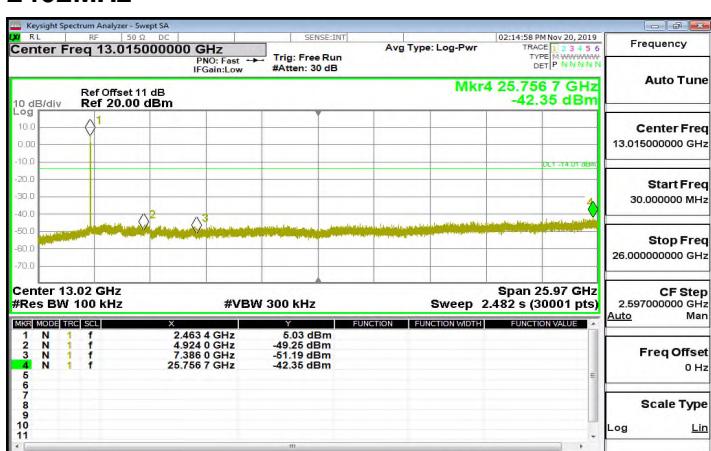
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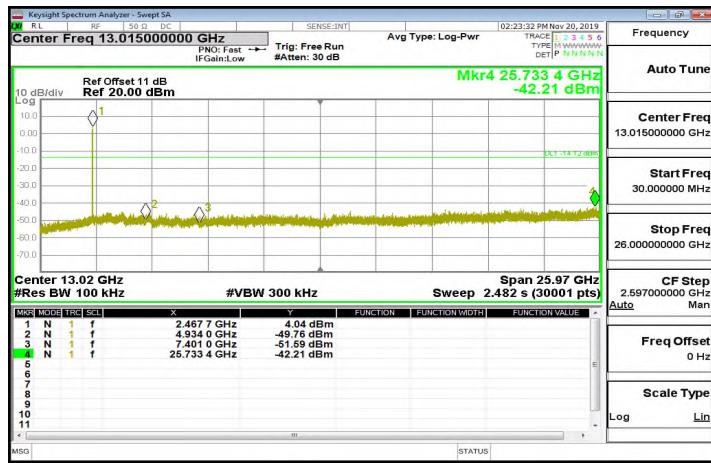
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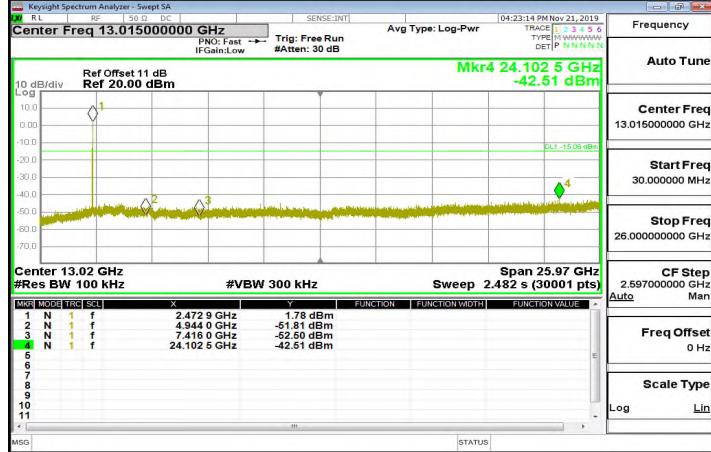
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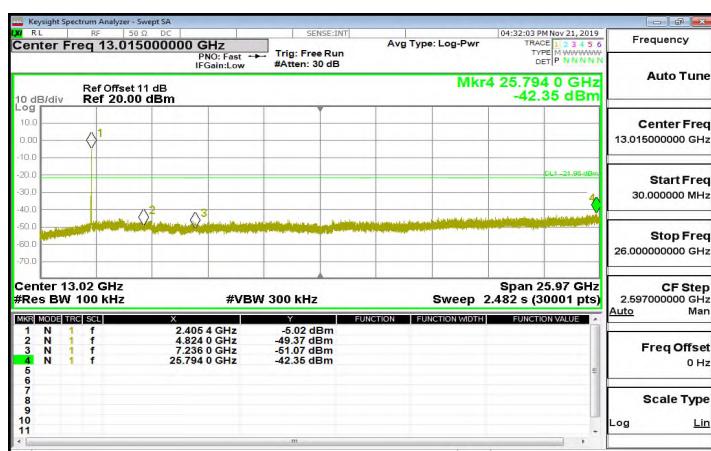
Spurious Emission_ 802.11b_20MHz_ Chain0_ 2467MHz



Spurious Emission_ 802.11b_20MHz_ Chain0_ 2472MHz



Spurious Emission_ 802.11g_20MHz_ Chain0_ 2412MHz



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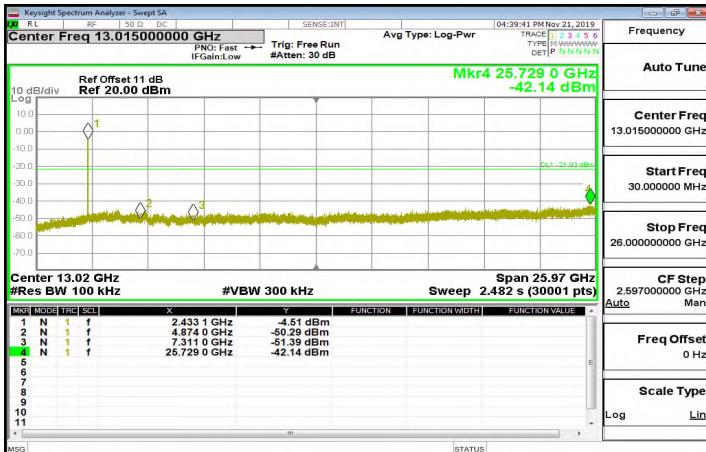
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f (886-2) 2298-0488

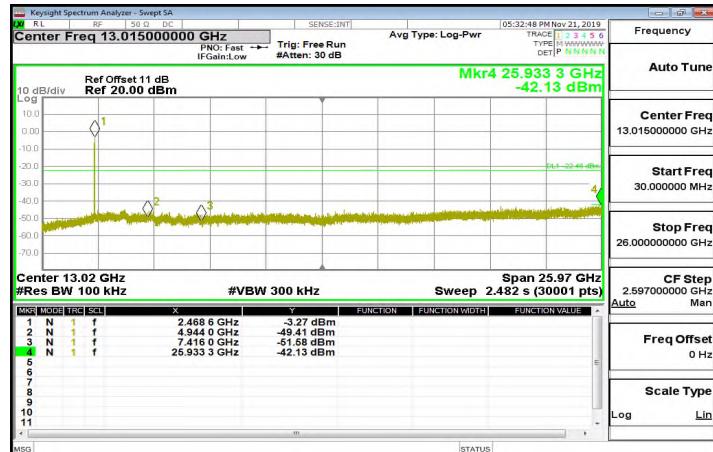
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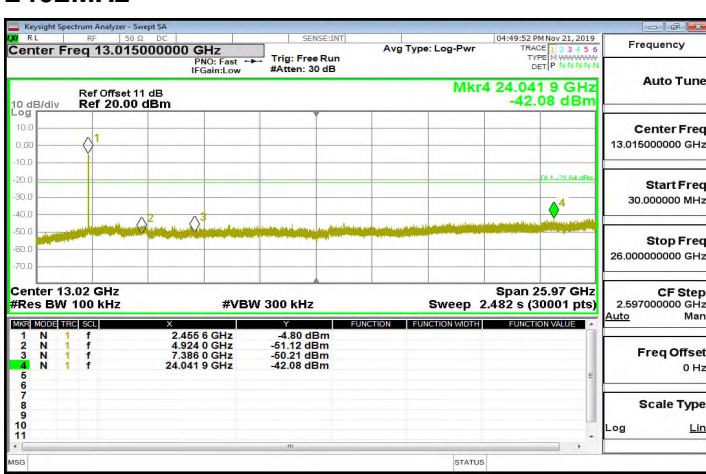
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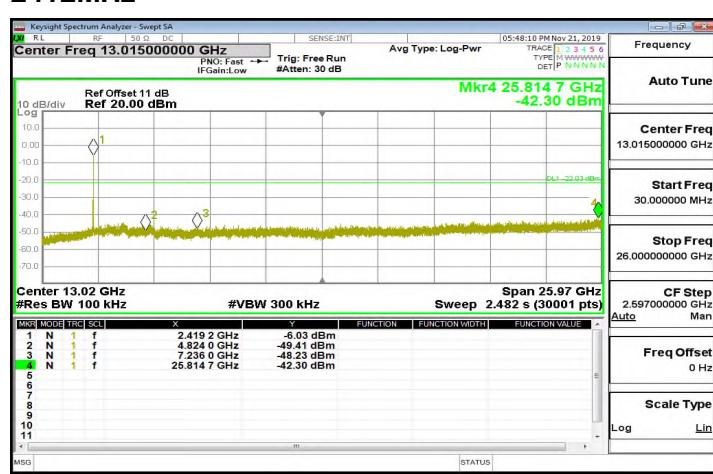
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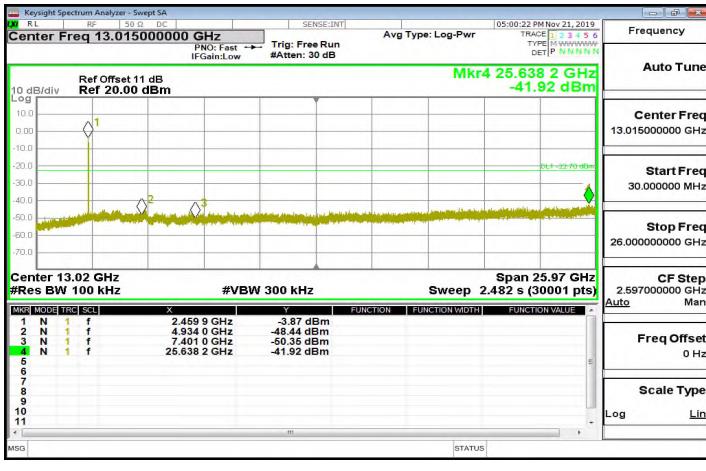
Spurious Emission_ 802.11g_20MHz_ Chain0_ 2462MHz



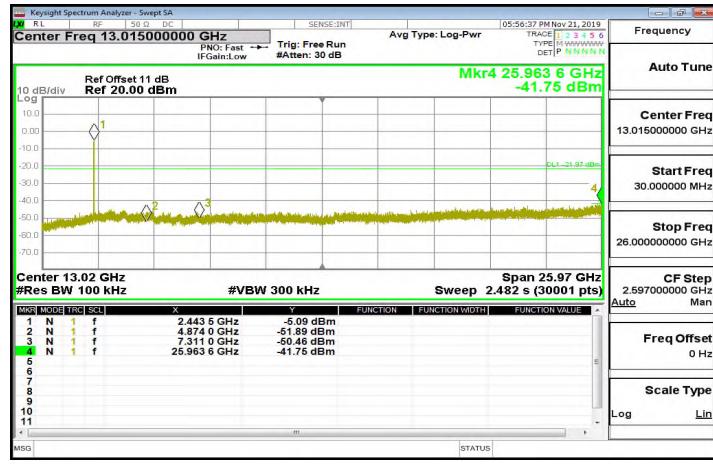
Spurious Emission_ 802.11n_20MHz_ Chain0_ 2412MHz



Spurious Emission_ 802.11g_20MHz_ Chain0_ 2467MHz



Spurious Emission_ 802.11n_20MHz_ Chain0_ 2437MHz



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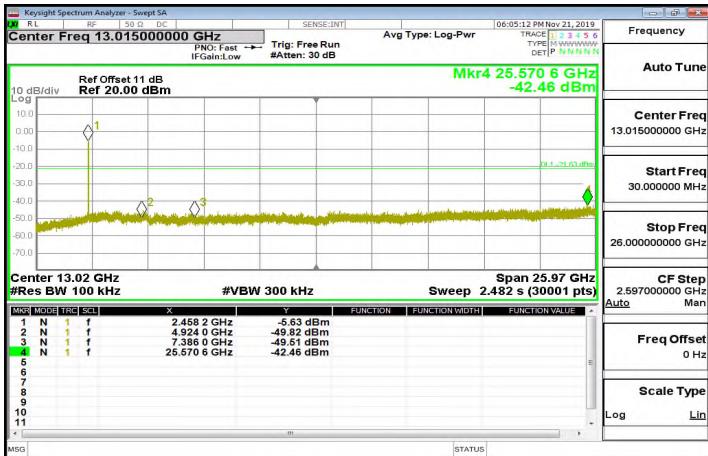
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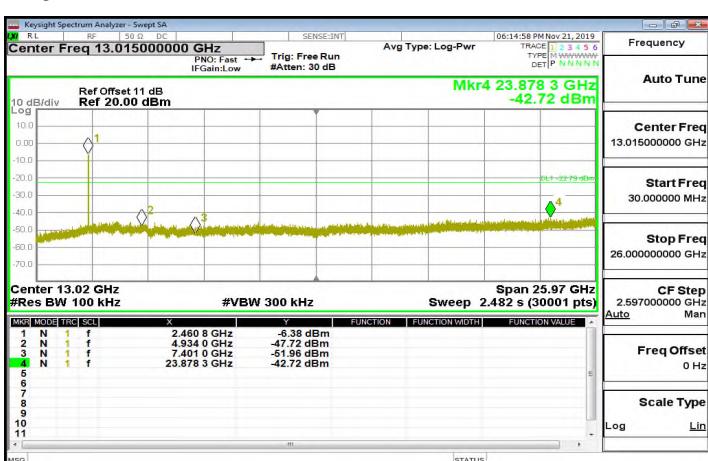
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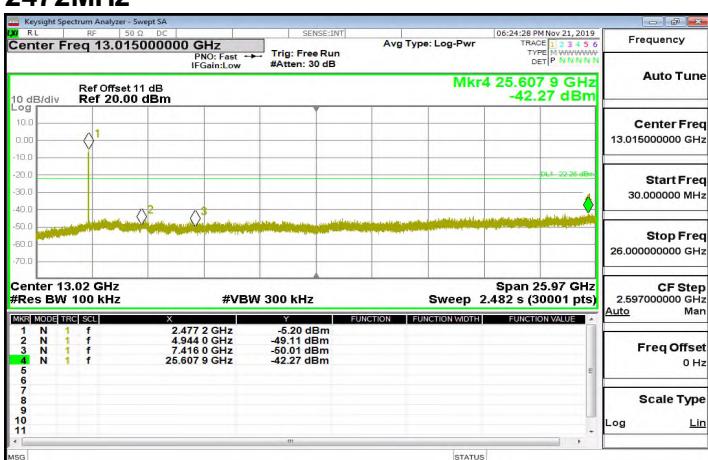
Spurious Emission_ 802.11n_20MHz_ Chain0_ 2462MHz



Spurious Emission_ 802.11n_40MHz_ Chain0_ 2467MHz



Spurious Emission_ 802.11n_40MHz_ Chain0_ 2472MHz



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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 (dB μ V/m) = 20 log Emission level (dB μ V/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	01/04/2019	01/03/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1441	08/20/2019	08/19/2020
Horn Antenna	Schwarzbeck	BBHA9170	184	12/27/2018	12/26/2019
3m Site NSA	SGS	966 chamber	N/A	01/02/2019	01/01/2020
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	8447D	2944A07676	01/02/2019	01/01/2020
Pre-Amplifier	EMC Instruments	EMC184045B	980135	01/02/2019	01/01/2020
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M1	01/02/2019	01/01/2020
High Pass Filter	WI	WHKX4.0/18G-10SS	22	01/01/2019	01/02/2020
Low Loss Cable	Huber Suhner	966_RX	9	01/02/2019	01/01/2020

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

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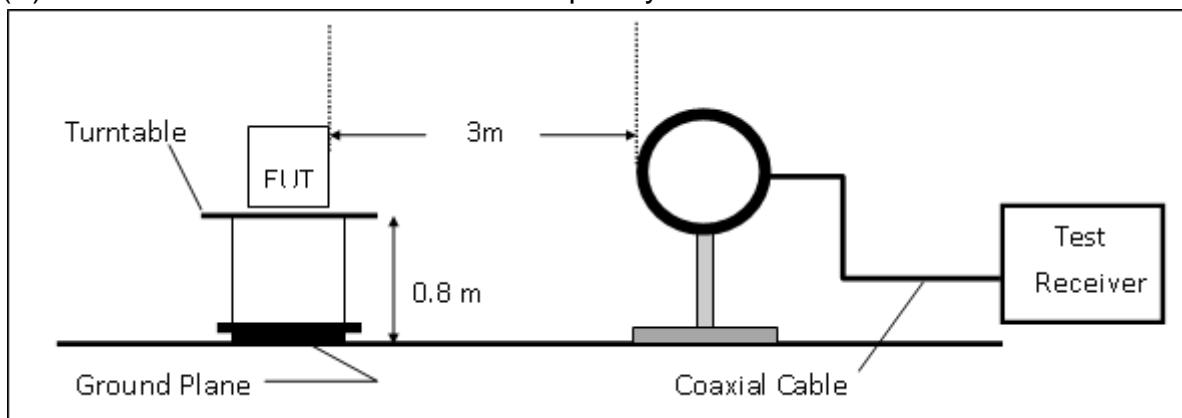
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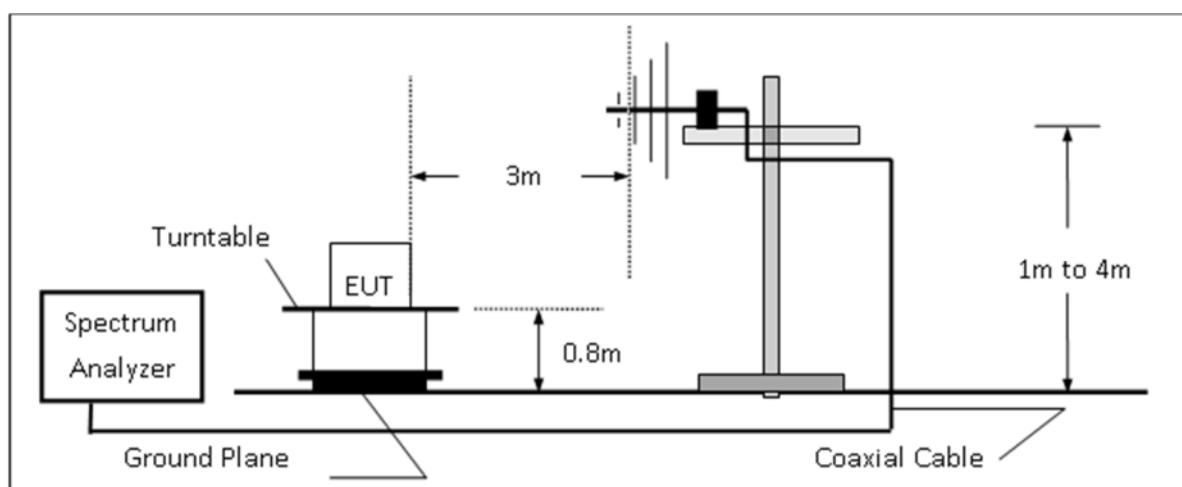
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11.3 Test SET-UP

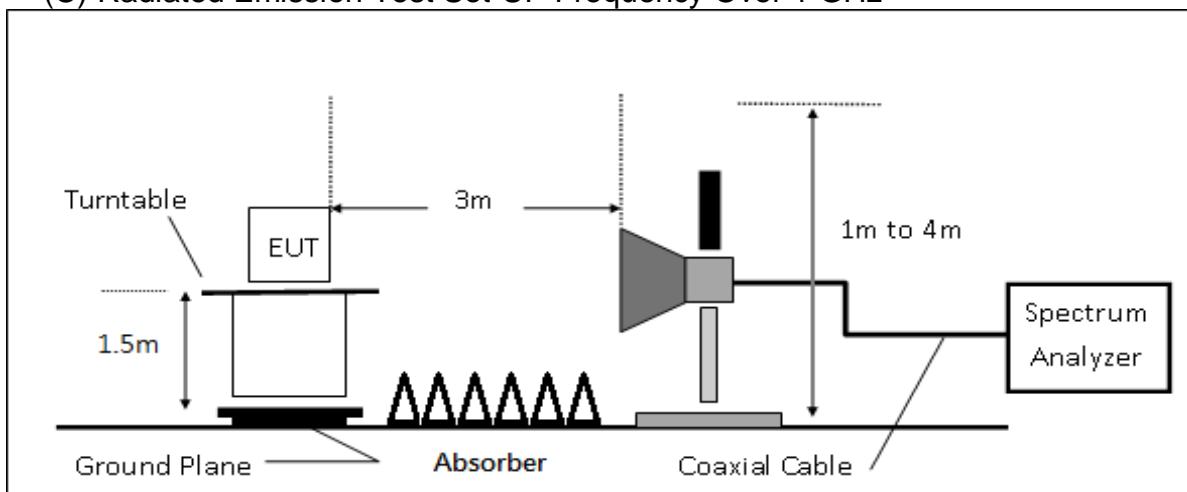
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



(B) Radiated Emission Test Set-UP, Frequency from 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 $dB\mu V/m$, which converts $20 * \log(\mu V/m)$

Actual $FS(dB\mu V/m) = SPA \cdot Reading\ level(dB\mu V) + Factor(dB)$

$Factor(dB) = Antenna\ Factor(dB\mu V/m) + Cable\ Loss(dB) - Pre_Amplifier\ Gain(dB)$

11.6 Test Results of Radiated Spurious Emissions from 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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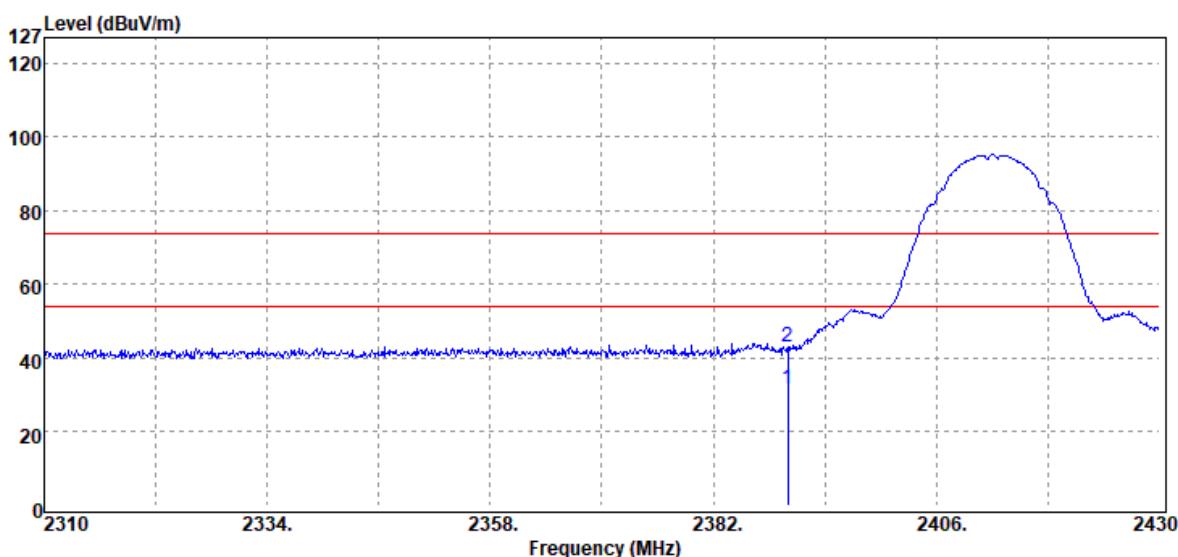
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11.7.1 Radiated Band Edge Measurement Result

Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2412 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH Low Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					2310	2334.
2390.00	Average	31.40	0.24	31.64	54.00	-22.36
2390.00	Peak	42.92	0.24	43.16	74.00	-30.84

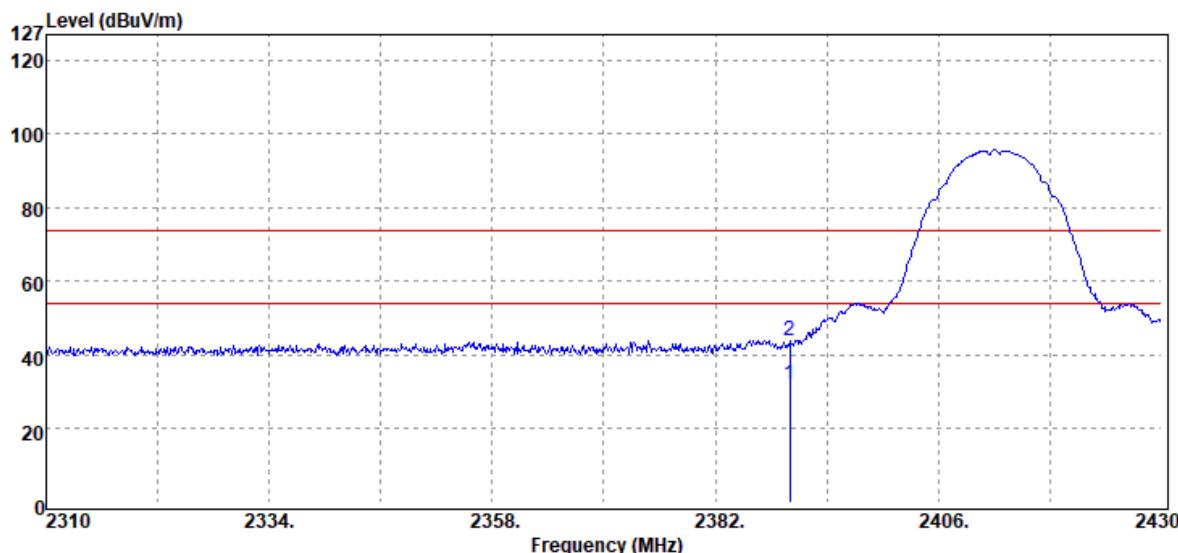
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2412 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH Low Engineer :Kane
 EUT Pol :H Plane



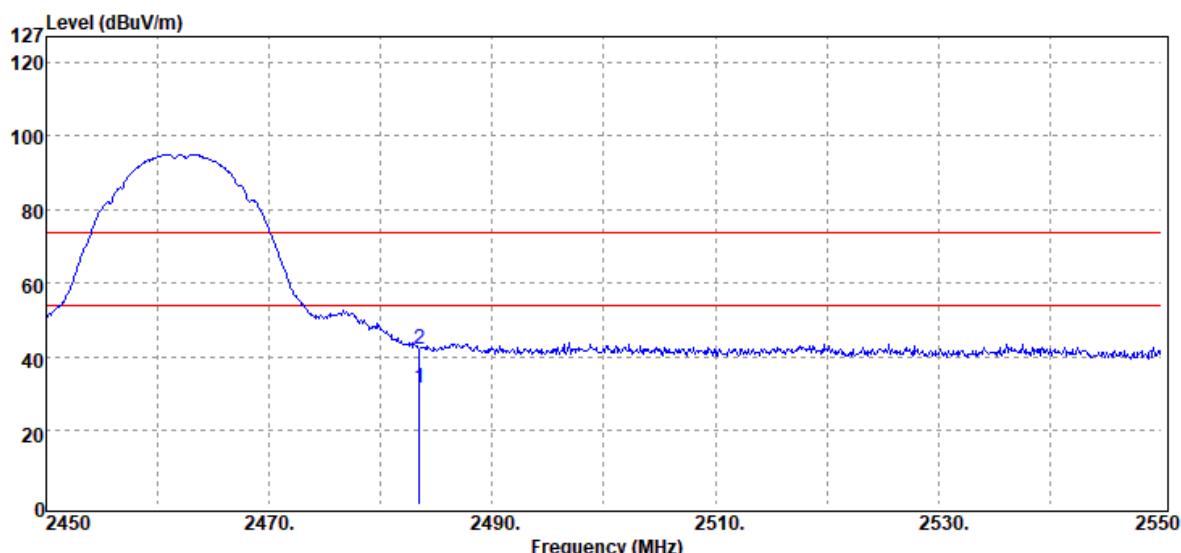
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	32.03	0.24	32.27	54.00	-21.73
2390.00	Peak	43.62	0.24	43.86	74.00	-30.14

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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2462 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



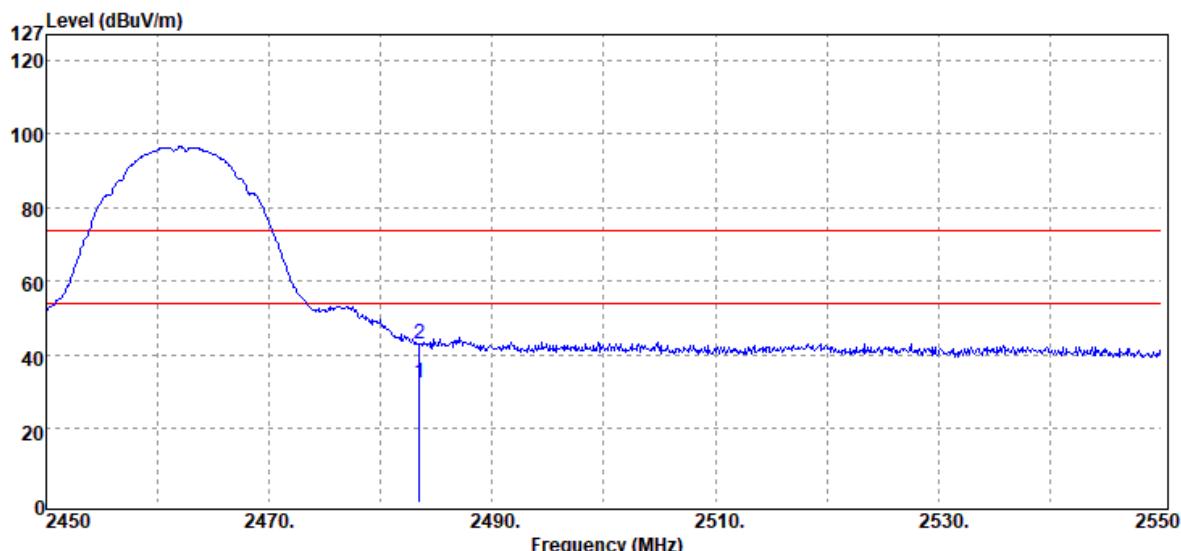
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	31.76	-0.17	31.59	54.00	-22.41
2483.50	Peak	42.51	-0.17	42.34	74.00	-31.66

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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2462 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	32.59	-0.17	32.42	54.00	-21.58
2483.50	Peak	43.22	-0.17	43.05	74.00	-30.95

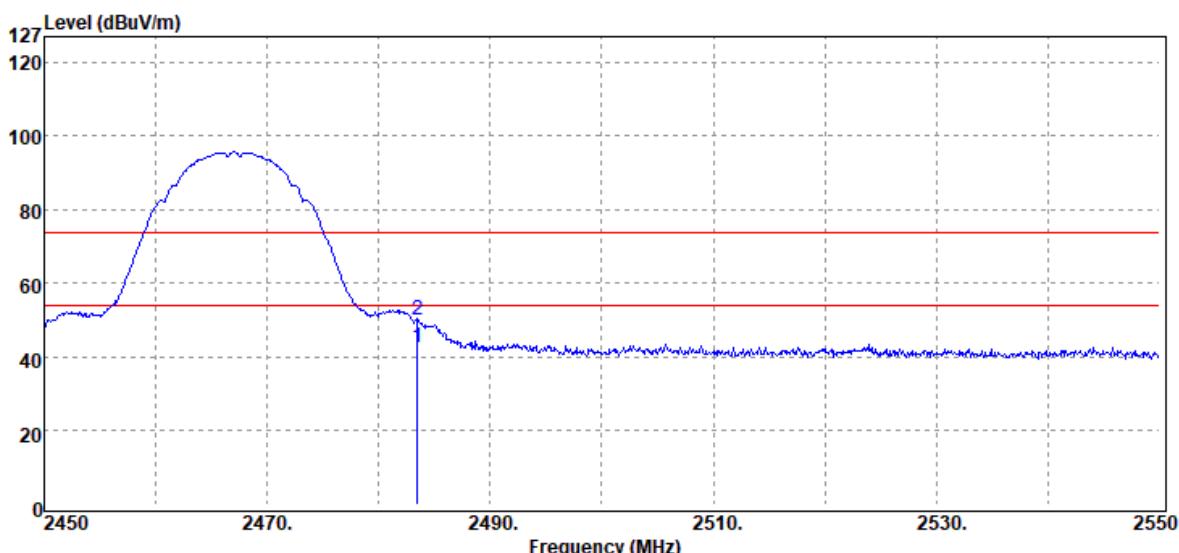
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2467 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	42.63	-0.17	42.46	54.00	-11.54
2483.50	Peak	50.18	-0.17	50.01	74.00	-23.99

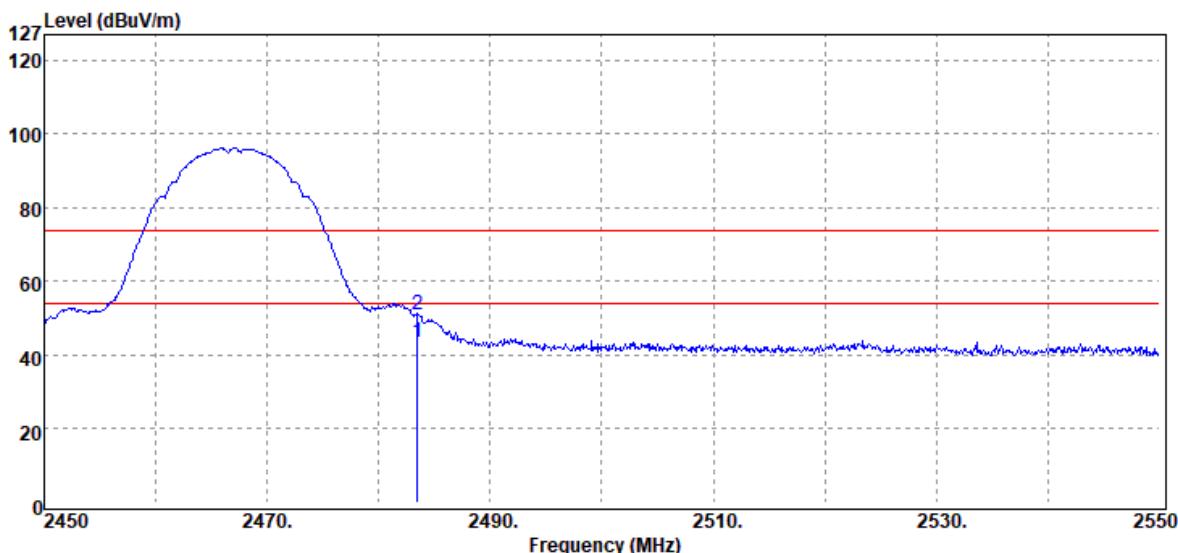
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2467 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	43.80	-0.17	43.63	54.00	-10.37
2483.50	Peak	50.99	-0.17	50.82	74.00	-23.18

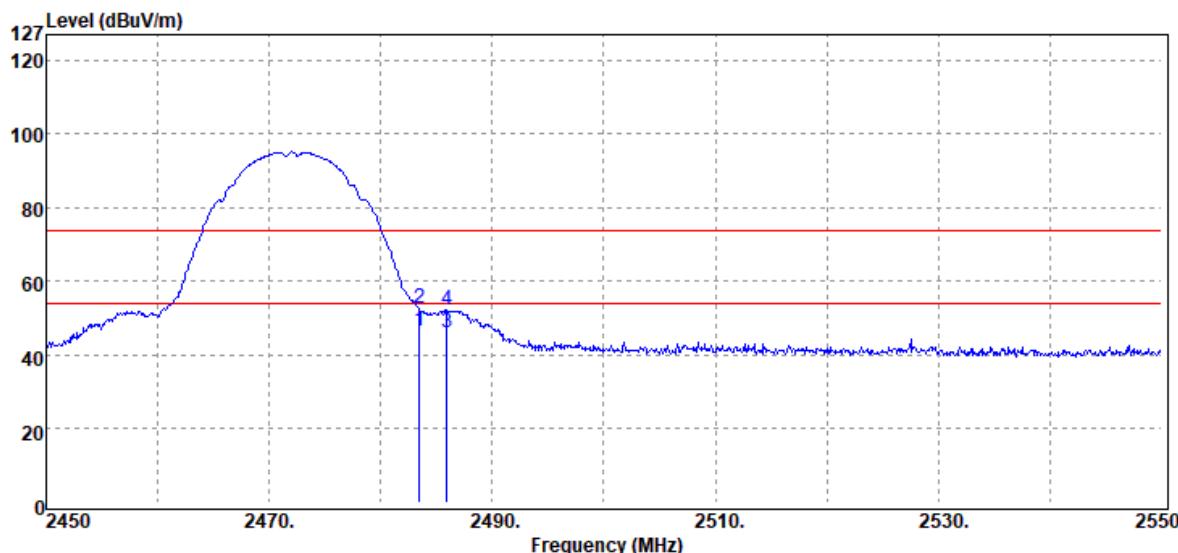
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11b Temp./Humi. :21.3/58
 Test Channel :2472 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



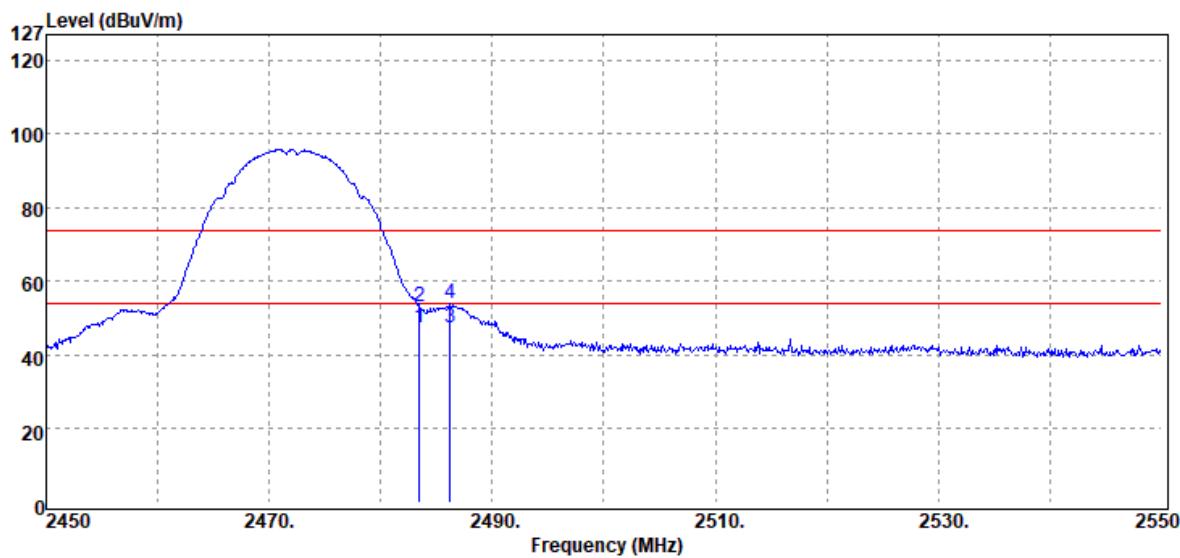
Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
2483.50	Average	46.71	-0.17	46.54	54.00	-7.46
2483.50	Peak	52.75	-0.17	52.58	74.00	-21.42
2485.90	Average	46.45	-0.18	46.27	54.00	-7.73
2485.90	Peak	52.33	-0.18	52.15	74.00	-21.85

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Report Number :ER/2019/B0055 Test Date :2019-12-05
Operation Mode :802.11b Temp./Humi. :21.3/58
Test Channel :2472 MHz Antenna Pol. :HORIZONTAL
Test Mode :Bandedge CH High Engineer :Kane
EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	47.59	-0.17	47.42	54.00	-6.58
2483.50	Peak	53.20	-0.17	53.03	74.00	-20.97
2486.20	Average	47.68	-0.19	47.49	54.00	-6.51
2486.20	Peak	54.03	-0.19	53.84	74.00	-20.16

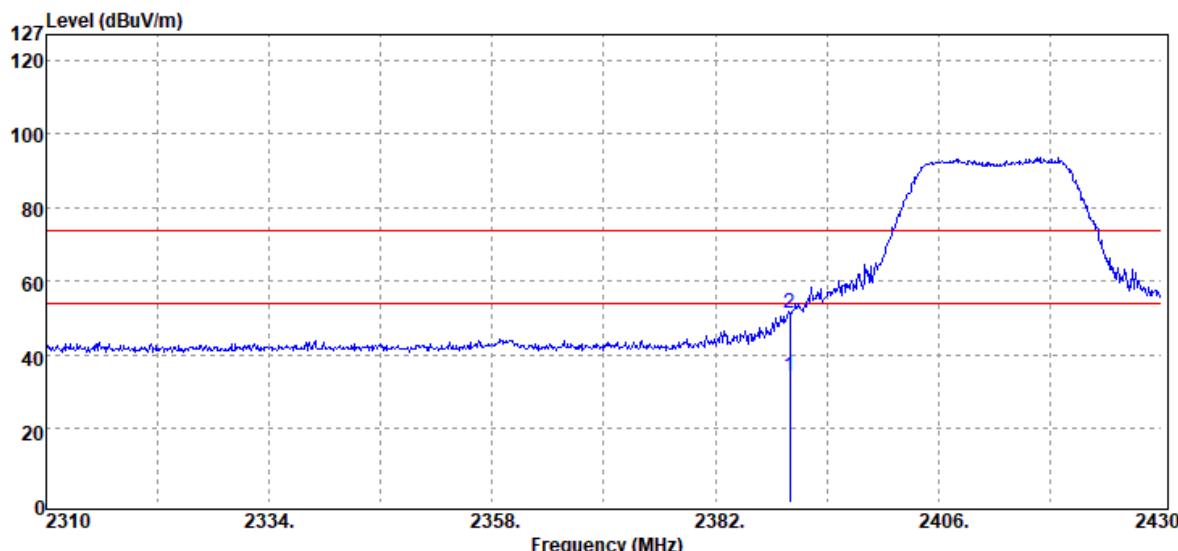
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2412 MHz
 Test Mode :Bandedge CH Low
 EUT Pol :H Plane

Test Date :2019-12-05
 Temp./Humi. :21.3/58
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	34.16	0.24	34.40	54.00	-19.60
2390.00	Peak	51.33	0.24	51.57	74.00	-22.43

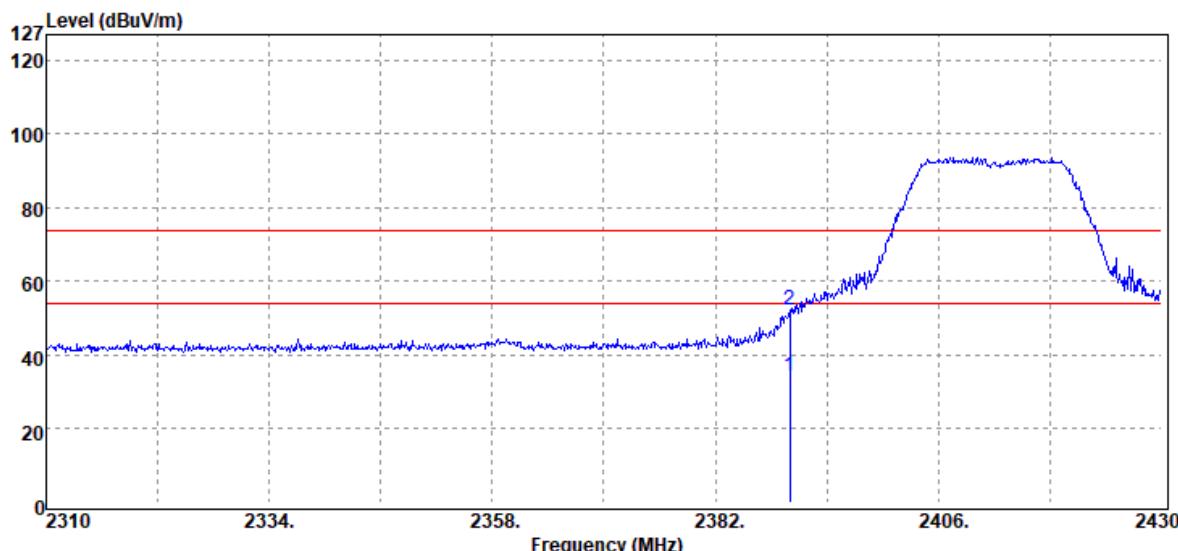
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11g Temp./Humi. :21.3/58
 Test Channel :2412 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH Low Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	34.01	0.24	34.25	54.00	-19.75
2390.00	Peak	52.00	0.24	52.24	74.00	-21.76

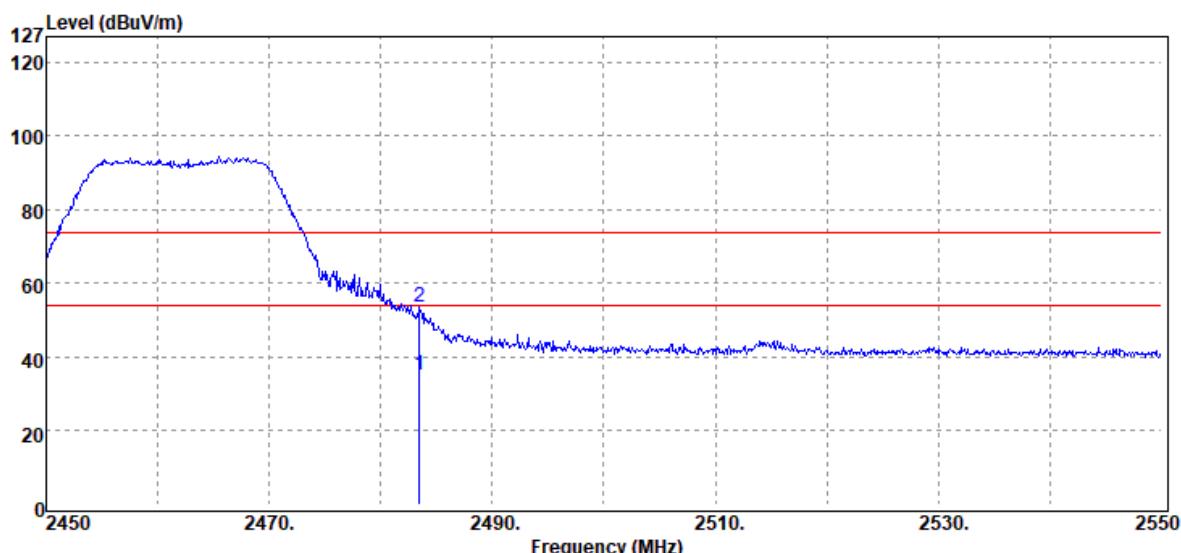
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11g Temp./Humi. :21.3/58
 Test Channel :2462 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	35.16	-0.17	34.99	54.00	-19.01
2483.50	Peak	53.61	-0.17	53.44	74.00	-20.56

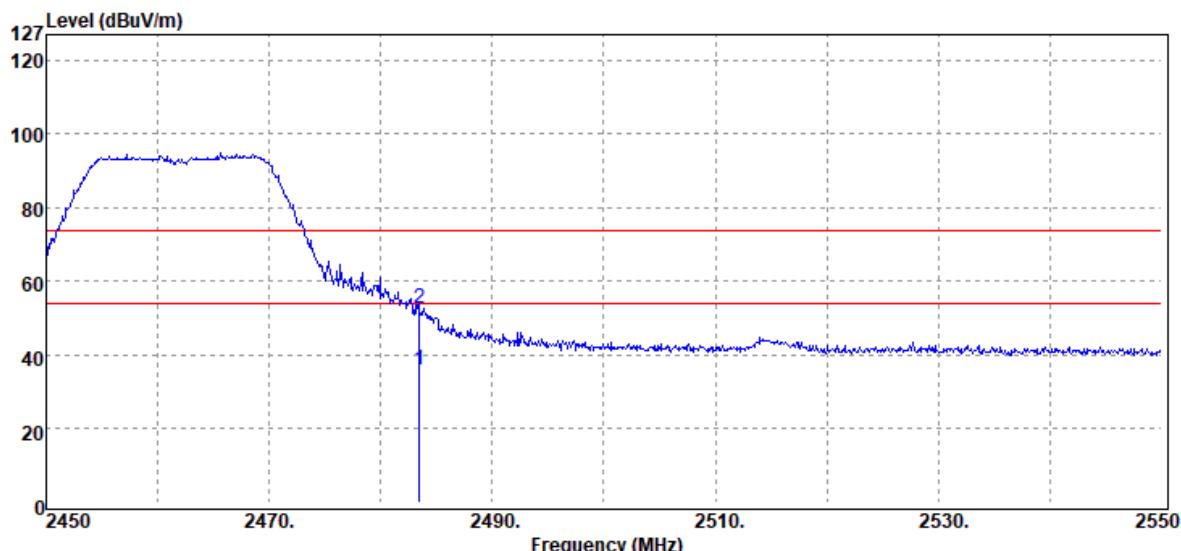
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 Operation Mode :802.11g Temp./Humi. :21.3/58
 Test Channel :2462 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	36.19	-0.17	36.02	54.00	-17.98
2483.50	Peak	52.92	-0.17	52.75	74.00	-21.25

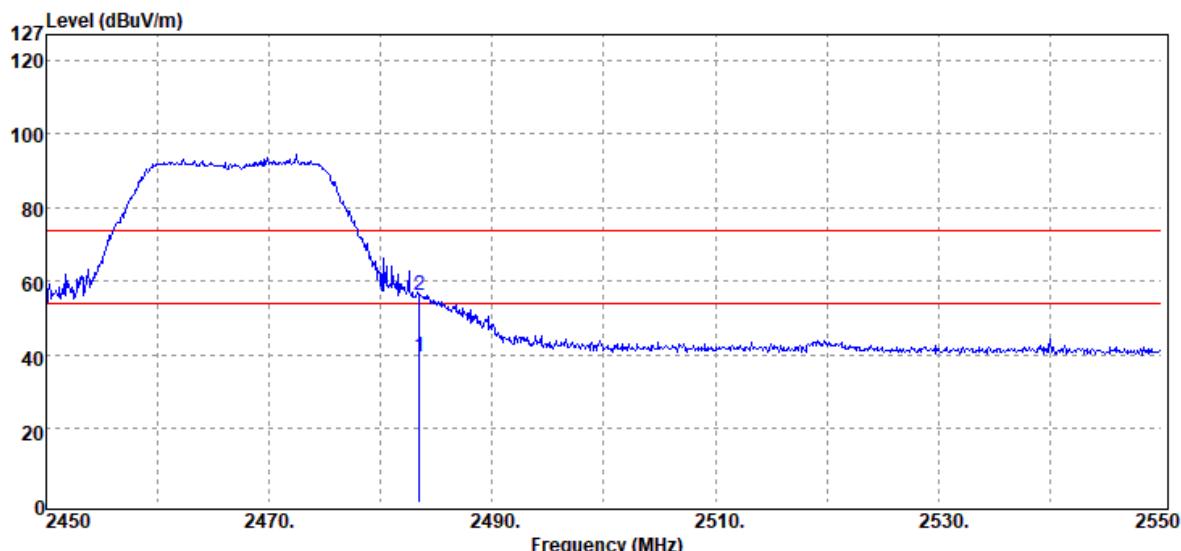
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11g Temp./Humi. :21.3/58
 Test Channel :2467 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	39.72	-0.17	39.55	54.00	-14.45
2483.50	Peak	56.24	-0.17	56.07	74.00	-17.93

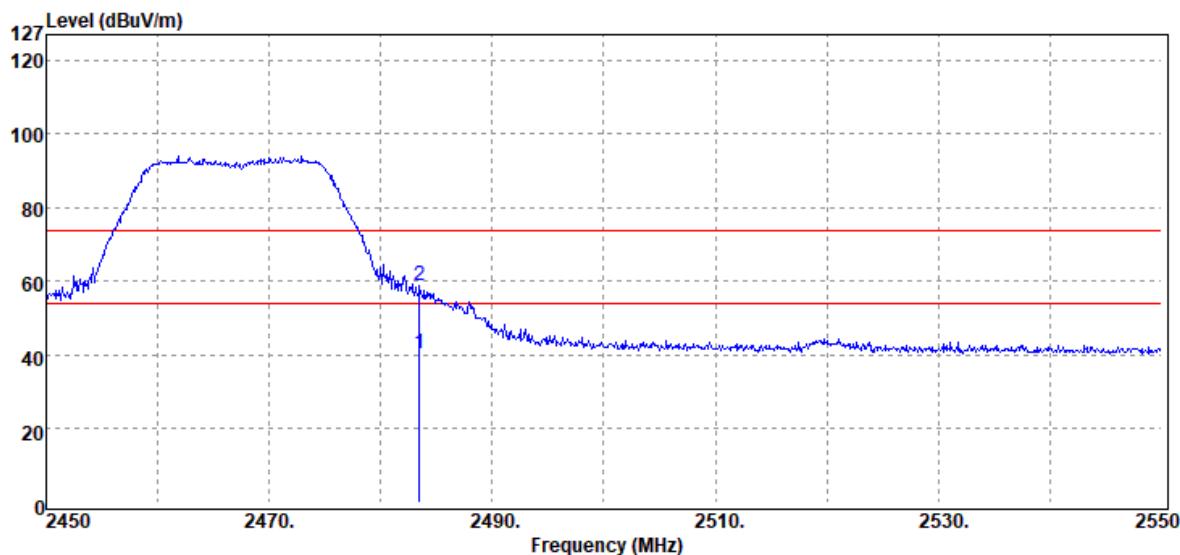
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 Test Channel :2467 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	40.55	-0.17	40.38	54.00	-13.62
2483.50	Peak	59.24	-0.17	59.07	74.00	-14.93

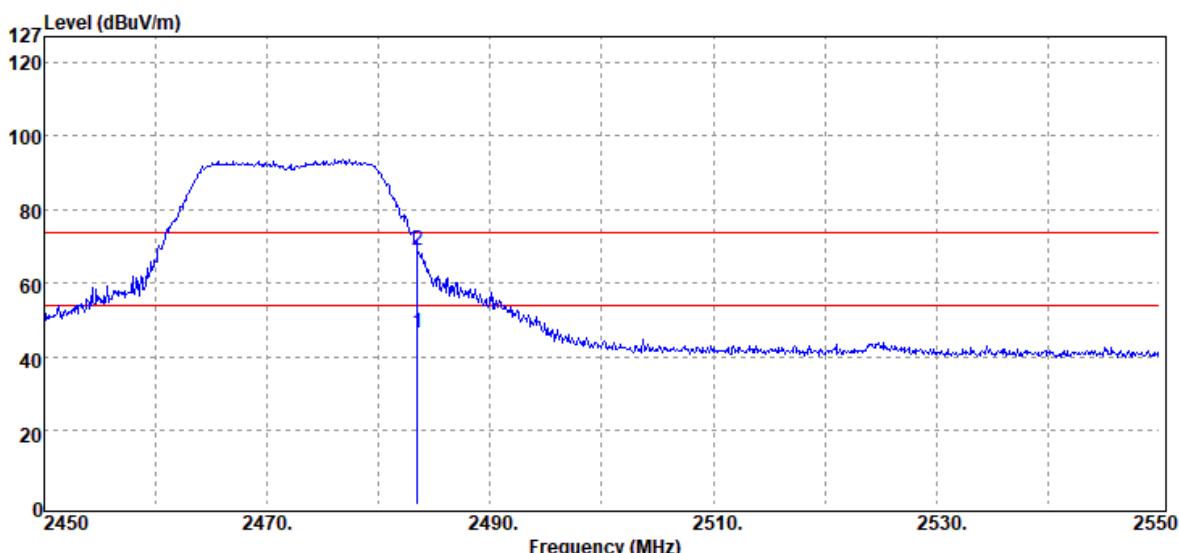
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 Operation Mode :802.11g Temp./Humi. :21.3/58
 Test Channel :2472 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	46.71	-0.17	46.54	54.00	-7.46
2483.50	Peak	69.38	-0.17	69.21	74.00	-4.79

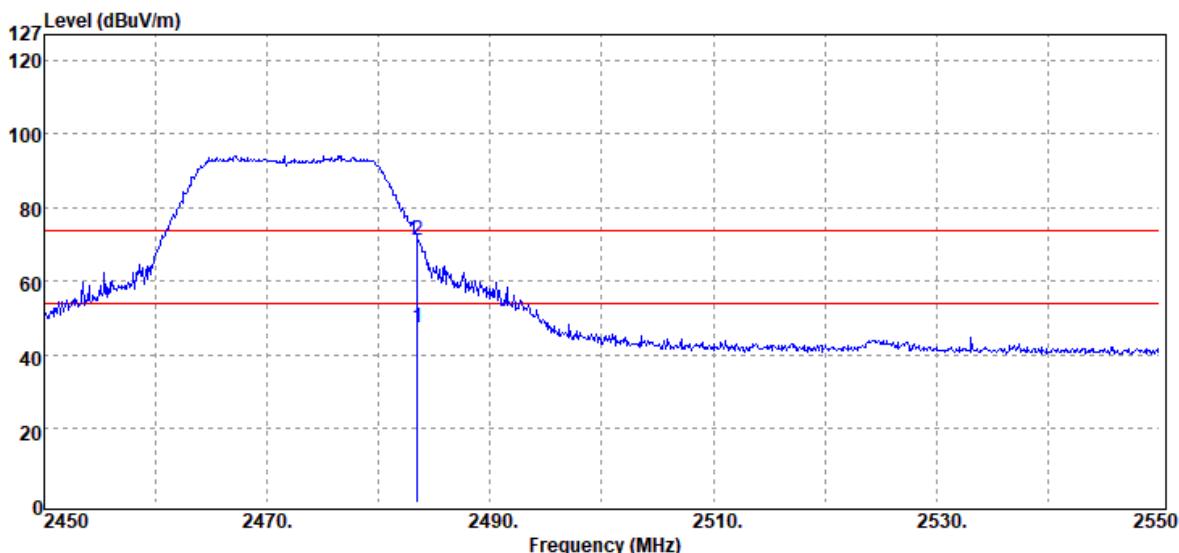
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 Test Channel :2472 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	47.46	-0.17	47.29	54.00	-6.71
2483.50	Peak	71.33	-0.17	71.16	74.00	-2.84

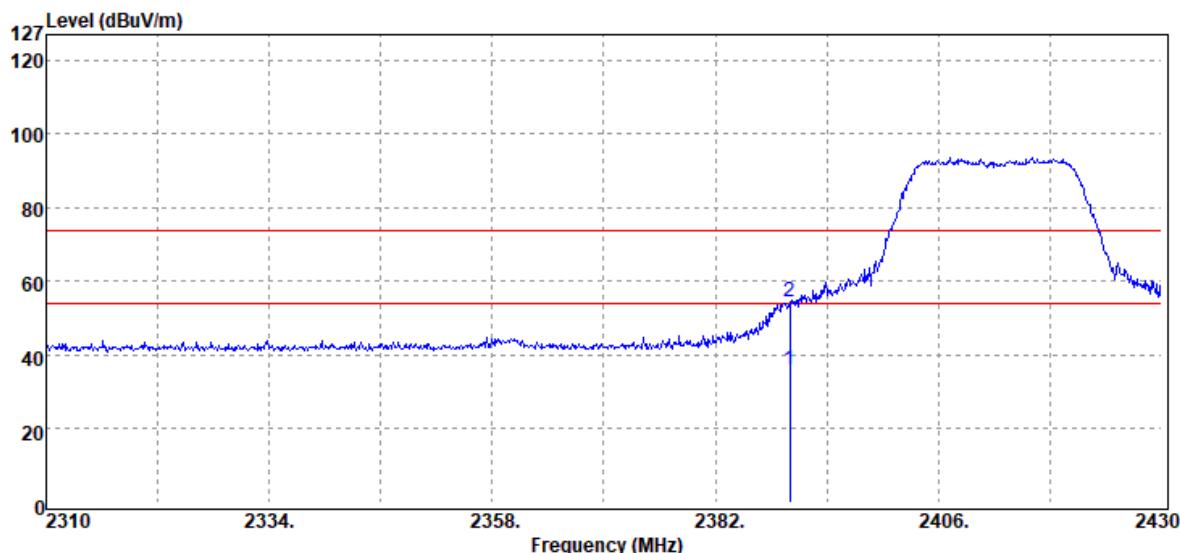
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2412 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH Low Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	35.69	0.24	35.93	54.00	-18.07
2390.00	Peak	54.36	0.24	54.60	74.00	-19.40

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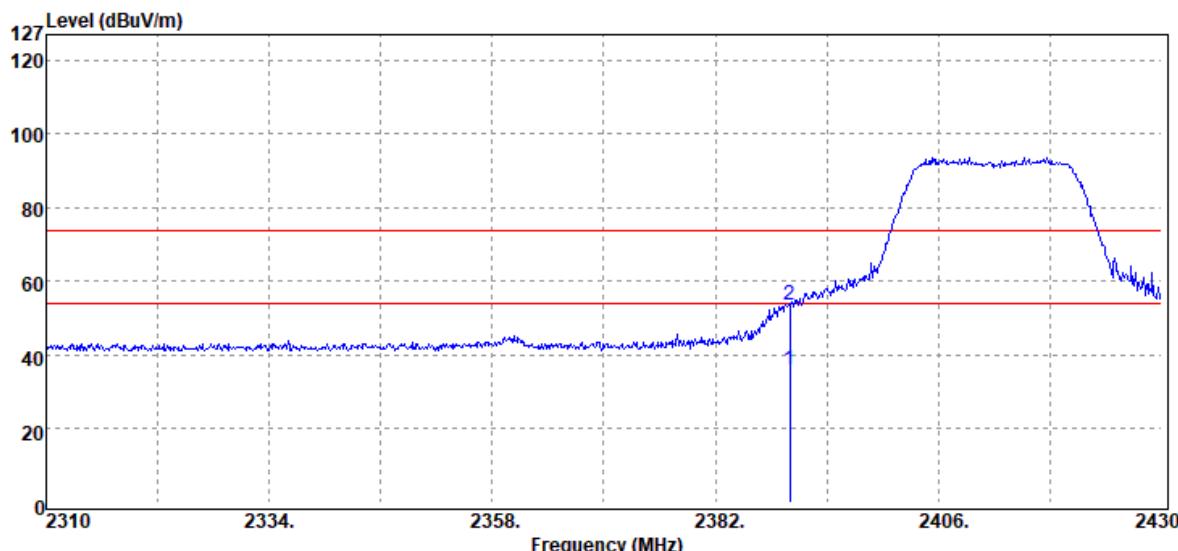
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2412 MHz
 Test Mode :Bandedge CH Low
 EUT Pol :H Plane

Test Date :2019-12-05
 Temp./Humi. :21.3/58
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2390.00	Average	35.76	0.24	36.00	54.00	-18.00
2390.00	Peak	53.52	0.24	53.76	74.00	-20.24

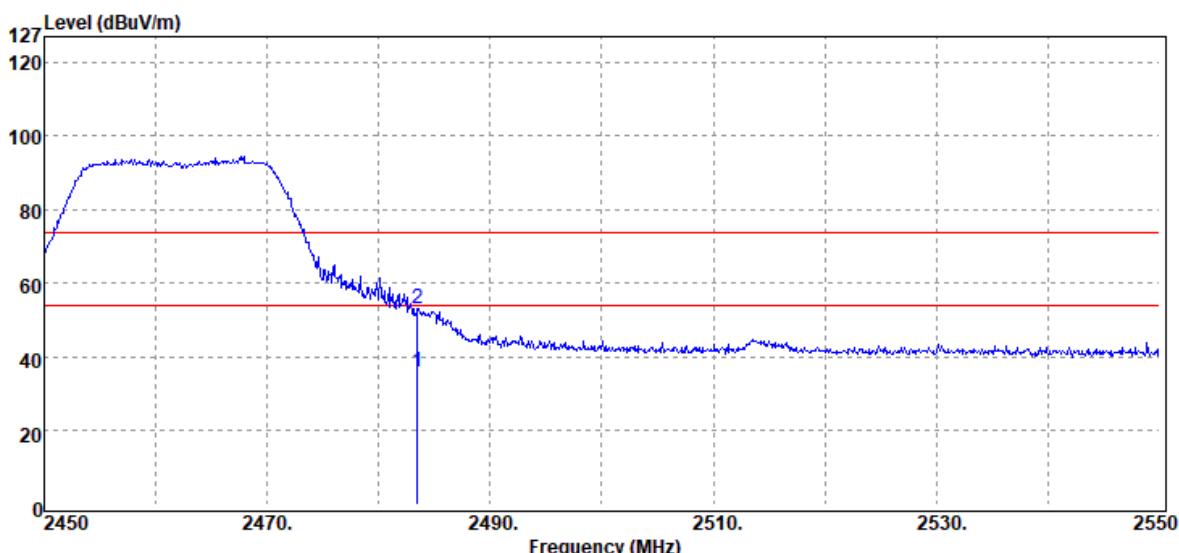
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2462 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	36.17	-0.17	36.00	54.00	-18.00
2483.50	Peak	53.50	-0.17	53.33	74.00	-20.67

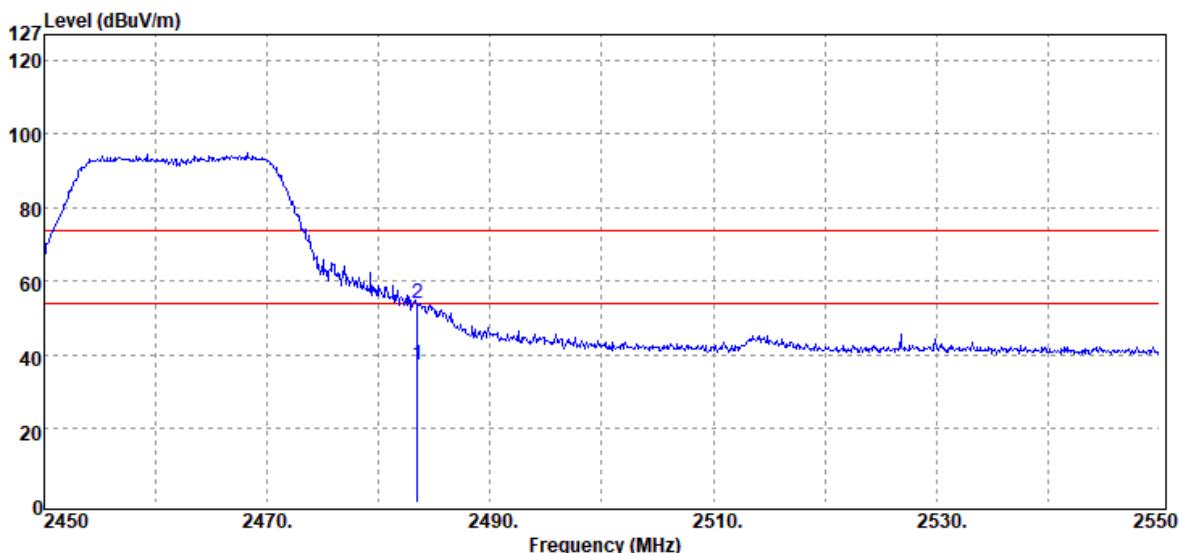
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2462 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	37.56	-0.17	37.39	54.00	-16.61
2483.50	Peak	54.04	-0.17	53.87	74.00	-20.13

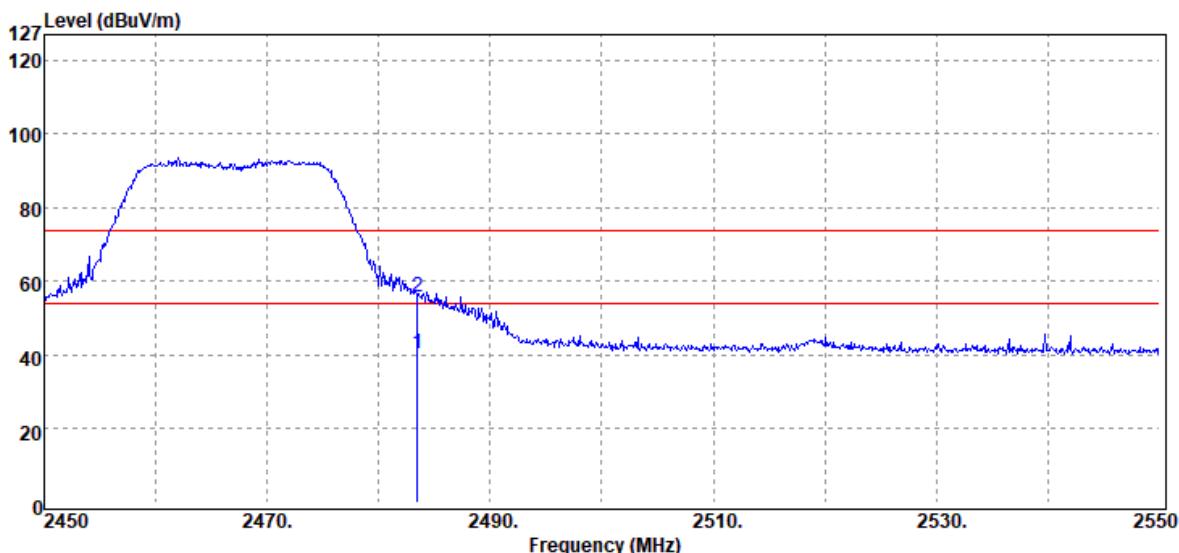
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2467 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	40.50	-0.17	40.33	54.00	-13.67
2483.50	Peak	55.81	-0.17	55.64	74.00	-18.36

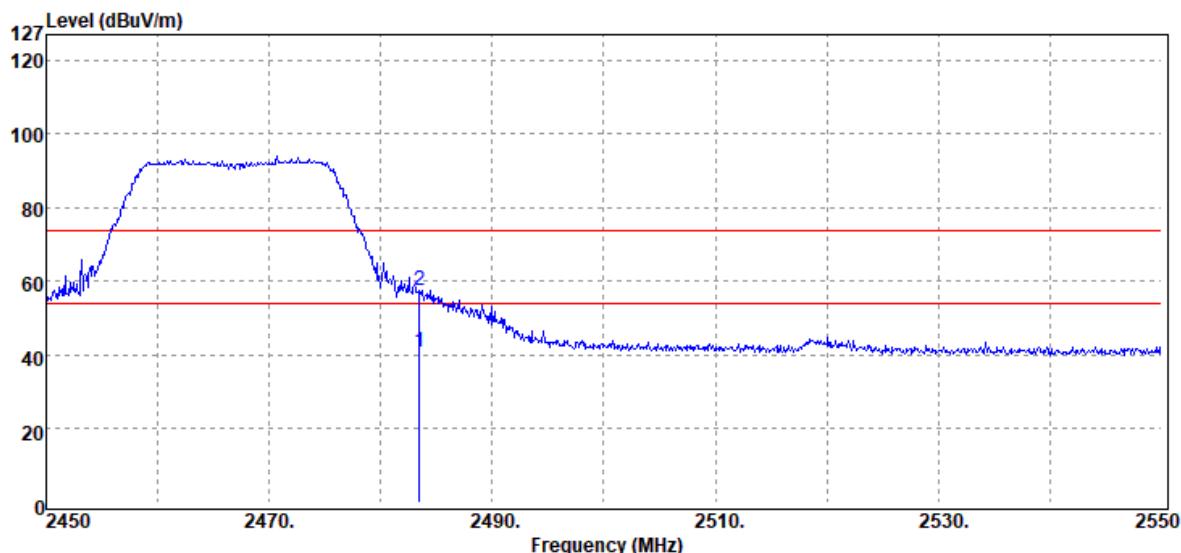
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2467 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	41.04	-0.17	40.87	54.00	-13.13
2483.50	Peak	57.94	-0.17	57.77	74.00	-16.23

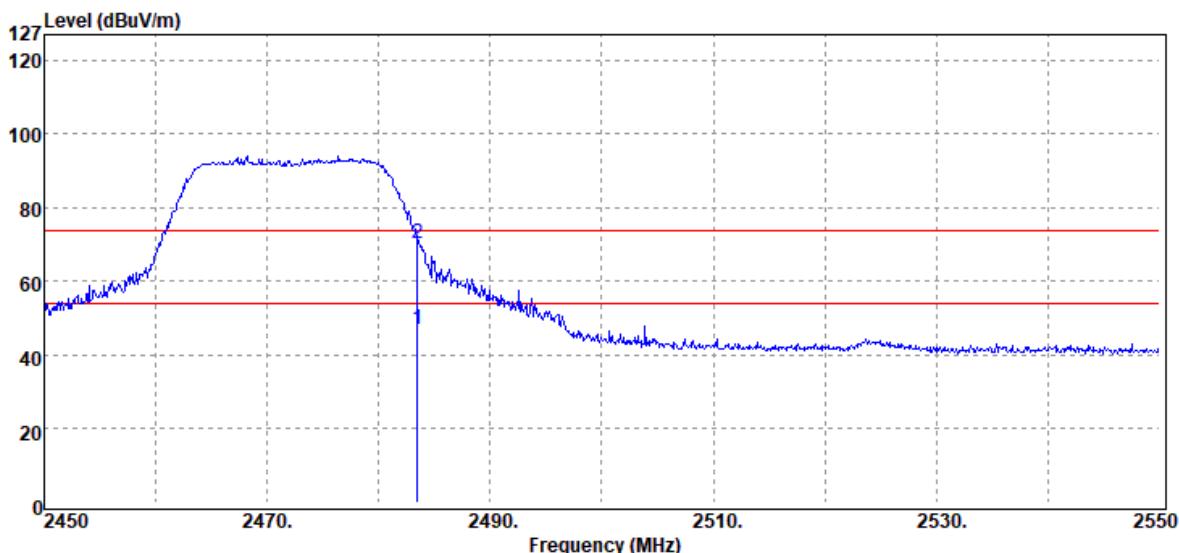
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2472 MHz Antenna Pol. :VERTICAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	47.19	-0.17	47.02	54.00	-6.98
2483.50	Peak	70.67	-0.17	70.50	74.00	-3.50

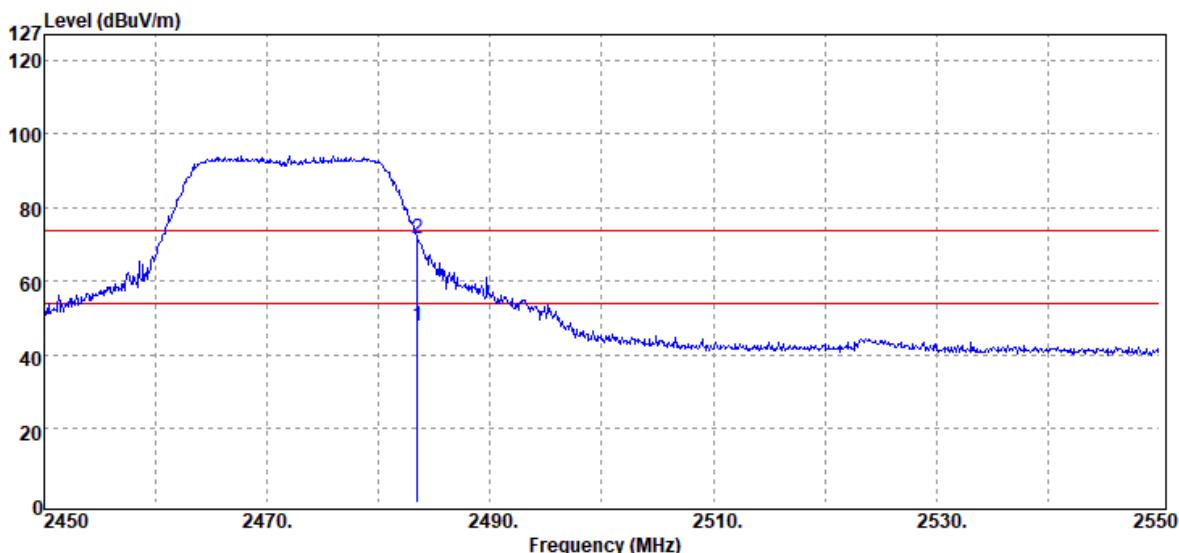
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Report Number :ER/2019/B0055 Test Date :2019-12-05
 Operation Mode :802.11n20 Temp./Humi. :21.3/58
 Test Channel :2472 MHz Antenna Pol. :HORIZONTAL
 Test Mode :Bandedge CH High Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
2483.50	Average	48.04	-0.17	47.87	54.00	-6.13
2483.50	Peak	71.78	-0.17	71.61	74.00	-2.39

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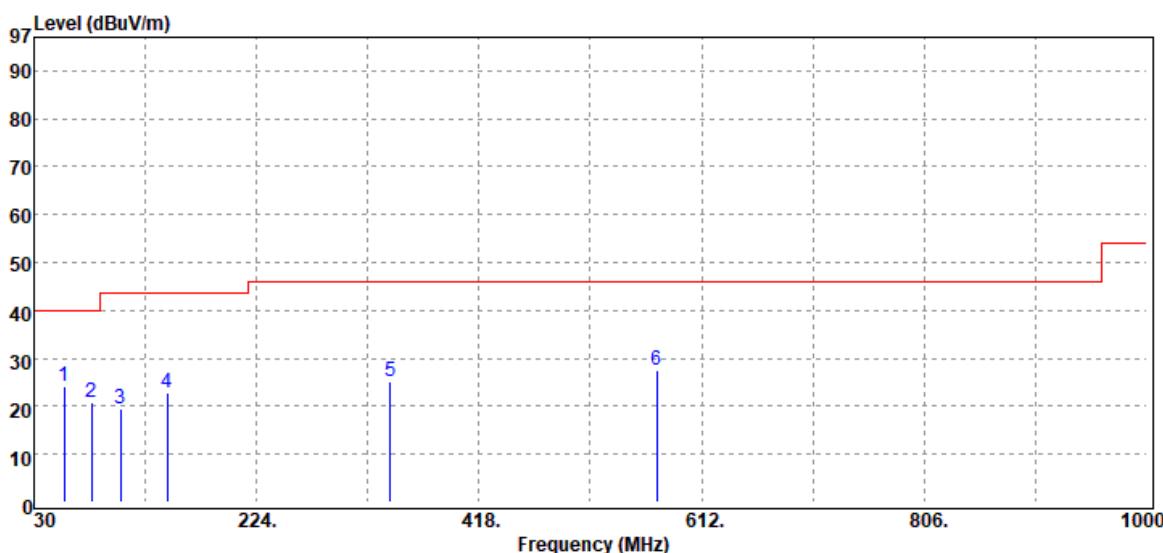
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11.7.2 Below 1GHz Worst-Case Emission:

Report Number :ER/2019/B0055 Test Date :2019-12-10
 Operation Mode :802.11g Temp./Humi. :21.1/61
 Test Channel :2437 MHz Antenna Pol. :VERTICAL
 Test Mode :Tx CH Mid Engineer :Kane
 EUT Pol :H Plane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual		Margin dB
				FS	@3m dB μ V/m	
56.19	Peak	32.30	-7.97	24.33	40.00	-15.67
80.44	Peak	33.21	-12.30	20.91	40.00	-19.09
105.66	Peak	30.94	-11.50	19.44	43.50	-24.06
146.40	Peak	29.88	-7.08	22.80	43.50	-20.70
340.40	Peak	30.26	-5.13	25.13	46.00	-20.87
573.20	Peak	28.84	-1.23	27.61	46.00	-18.39

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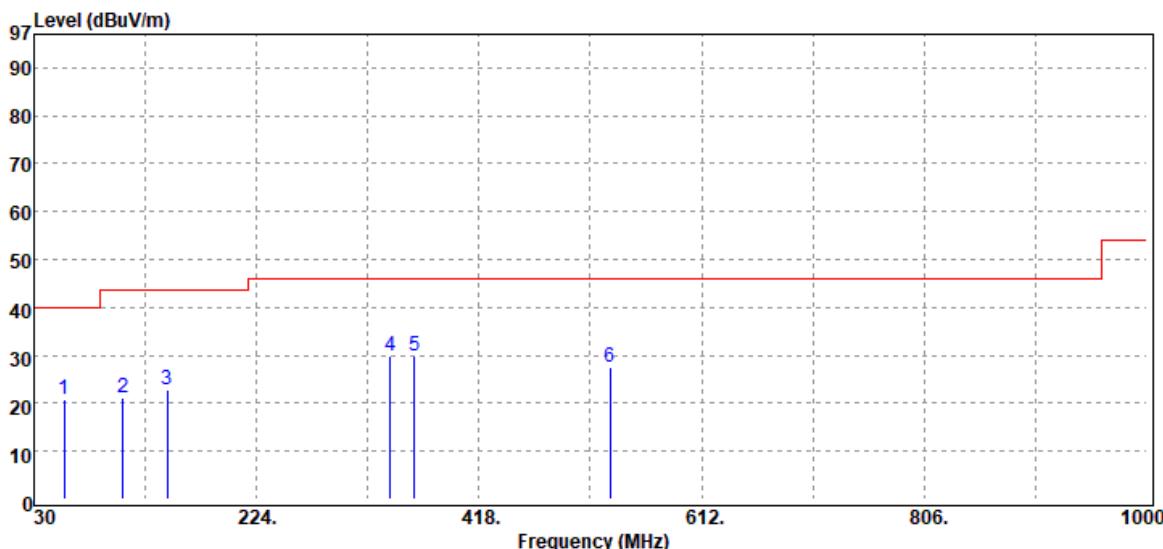
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2437 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual		Margin dB
				FS	@3m	
56.19	Peak	28.82	-7.97	20.85	40.00	-19.15
107.60	Peak	32.44	-11.26	21.18	43.50	-22.32
146.40	Peak	29.88	-7.08	22.80	43.50	-20.70
340.40	Peak	34.99	-5.13	29.86	46.00	-16.14
361.74	Peak	34.78	-4.87	29.91	46.00	-16.09
532.46	Peak	29.69	-2.13	27.56	46.00	-18.44

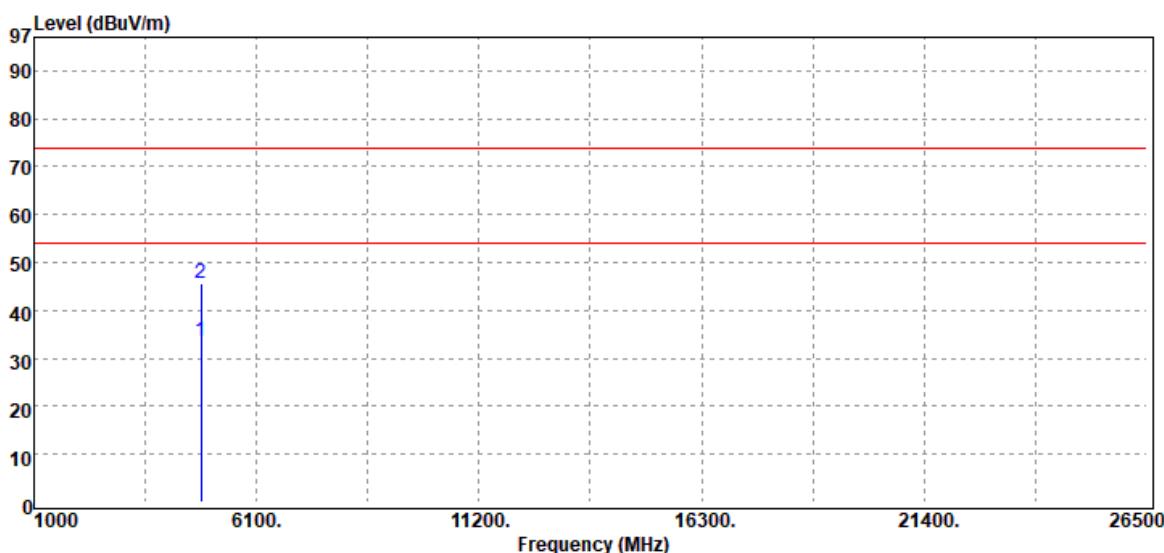
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11.7.3 Above 1GHz Emission:

Report Number :ER/2019/B0055 Test Date :2019-12-10
Operation Mode :802.11b Temp./Humi. :21.1/61
Test Channel :2412 MHz Antenna Pol. :VERTICAL
Test Mode :Tx CH Low Engineer :Kane
EUT Pol :H Plane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit @3m dB μ V/m	Margin dB
				FS dB μ V/m		
4824.00	Average	26.95	6.53	33.48	54.00	-20.52
4824.00	Peak	38.97	6.53	45.50	74.00	-28.50

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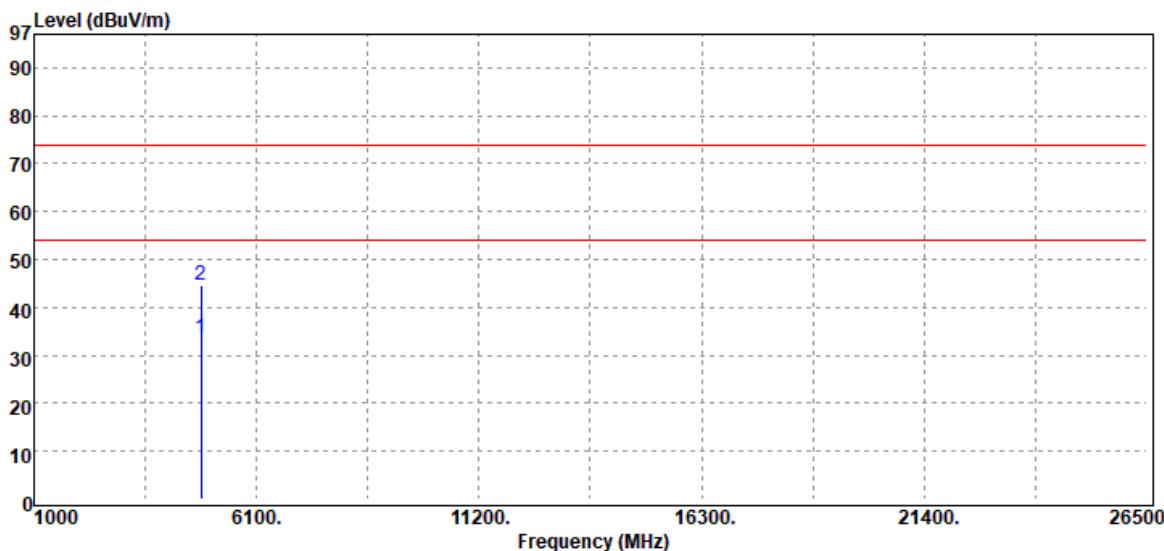
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Report Number :ER/2019/B0055
Operation Mode :802.11b
Test Channel :2412 MHz
Test Mode :Tx CH Low
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	
4824.00	Average	26.96	6.53	33.49	54.00	-20.51
4824.00	Peak	38.24	6.53	44.77	74.00	-29.23

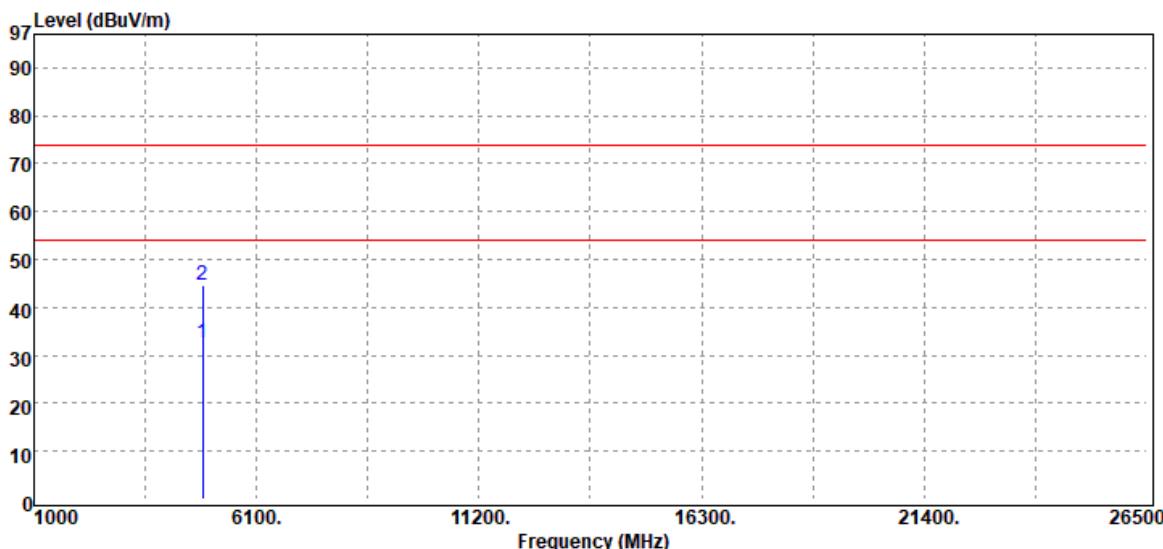
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Report Number :ER/2019/B0055
Operation Mode :802.11b
Test Channel :2437 MHz
Test Mode :Tx CH Mid
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :VERTICAL
Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					Factor dB	Actual FS dB μ V/m
4874.00	Average	26.01	6.69	32.70	54.00	-21.30
4874.00	Peak	37.97	6.69	44.66	74.00	-29.34

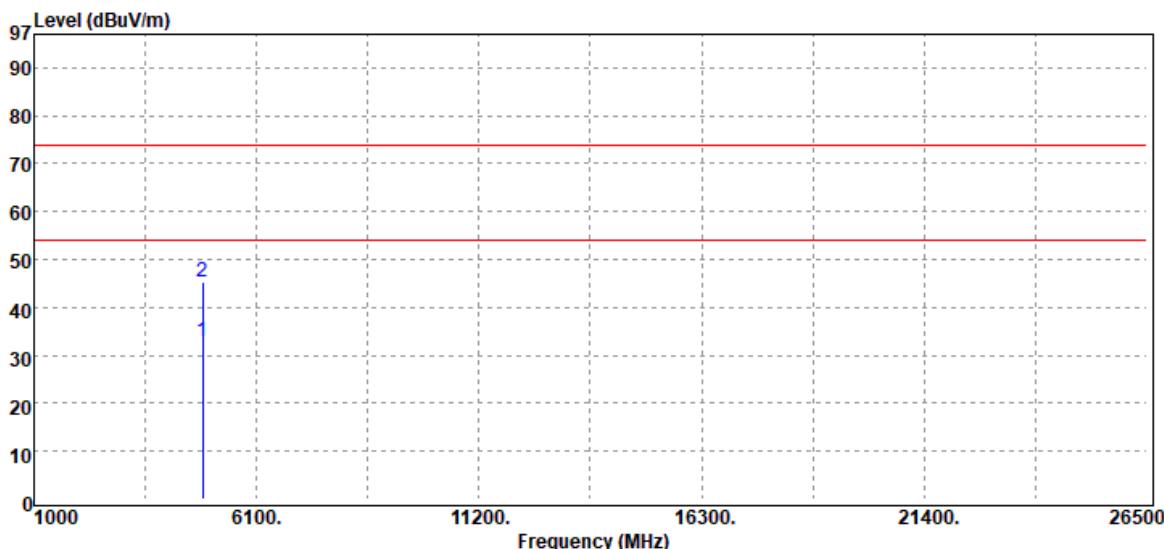
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Report Number :ER/2019/B0055
 Operation Mode :802.11b
 Test Channel :2437 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual		Limit @3m dB μ V/m	Margin dB
				PK/QP/AV	FS dB μ V/m		
4874.00	Average	26.25	6.69		32.94	54.00	-21.06
4874.00	Peak	38.70	6.69		45.39	74.00	-28.61

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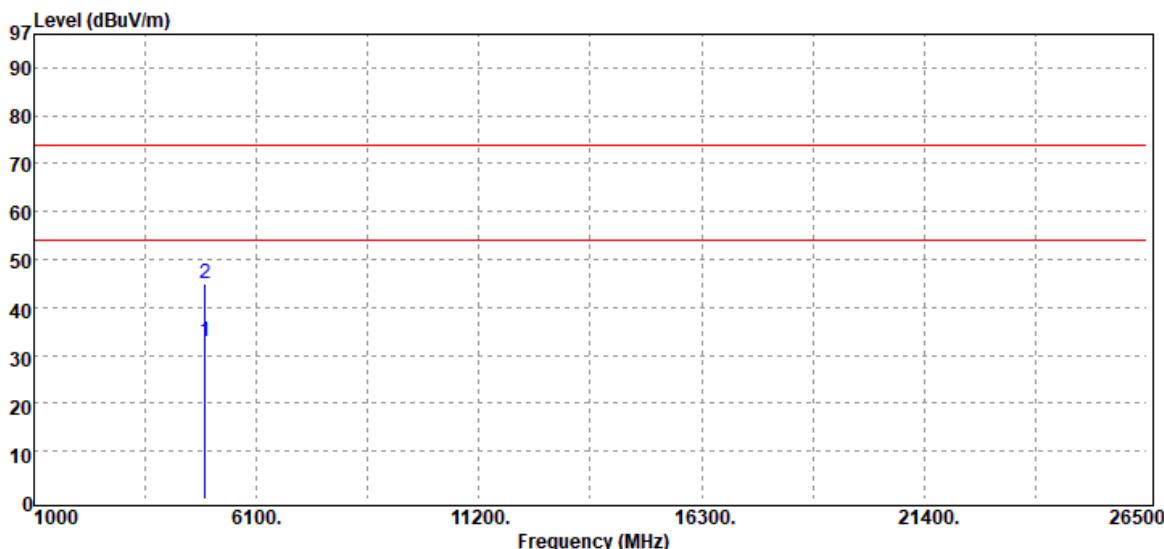
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Report Number :ER/2019/B0055
 Operation Mode :802.11b
 Test Channel :2462 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
4924.00	Average	26.18	6.85	33.03	54.00	-20.97
4924.00	Peak	38.14	6.85	44.99	74.00	-29.01

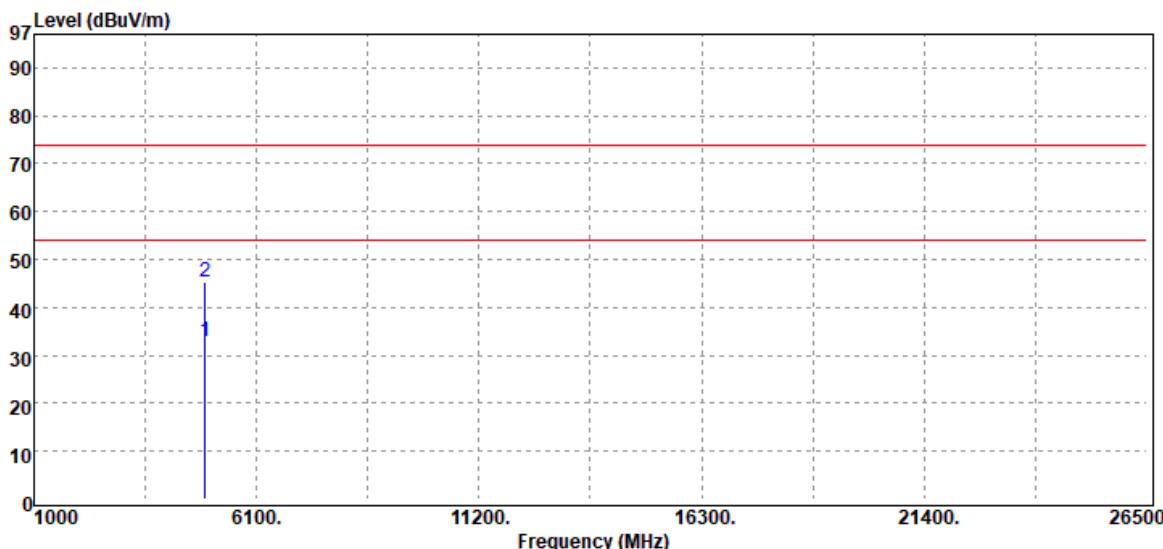
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Report Number :ER/2019/B0055
 Operation Mode :802.11b
 Test Channel :2462 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	dB
4924.00	Average	26.20	6.85	33.05	54.00	-20.95
4924.00	Peak	38.52	6.85	45.37	74.00	-28.63

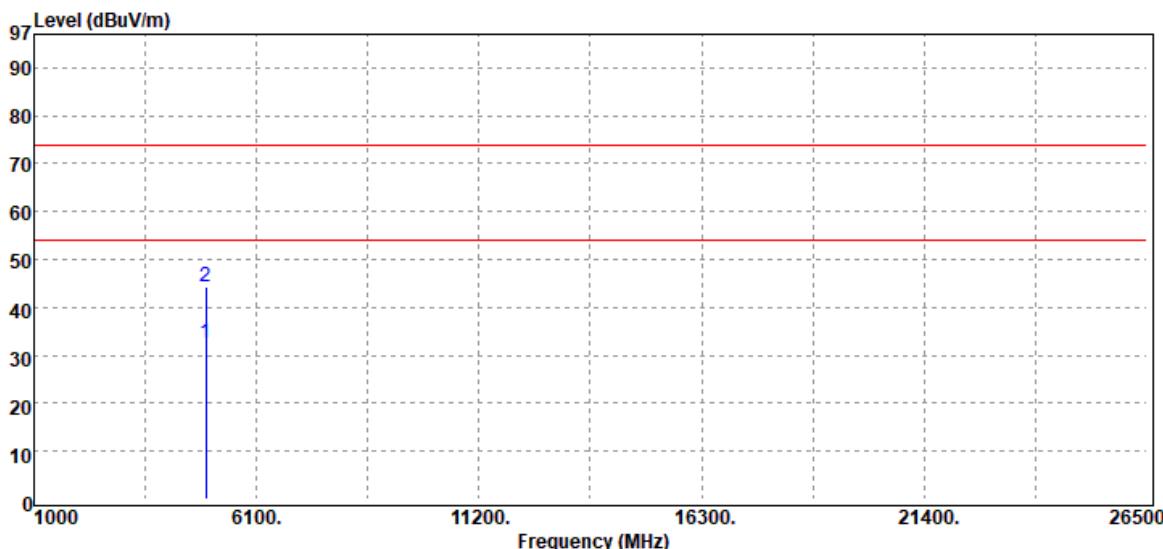
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Report Number :ER/2019/B0055
Operation Mode :802.11b
Test Channel :2467 MHz
Test Mode :Tx CH High
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :VERTICAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level	Factor	Actual	Limit	Margin
				FS	@3m	
	PK/QP/AV	dB μ V	dB	dB μ V/m	dB μ V/m	dB
4934.00	Average	25.79	6.90	32.69	54.00	-21.31
4934.00	Peak	37.56	6.90	44.46	74.00	-29.54

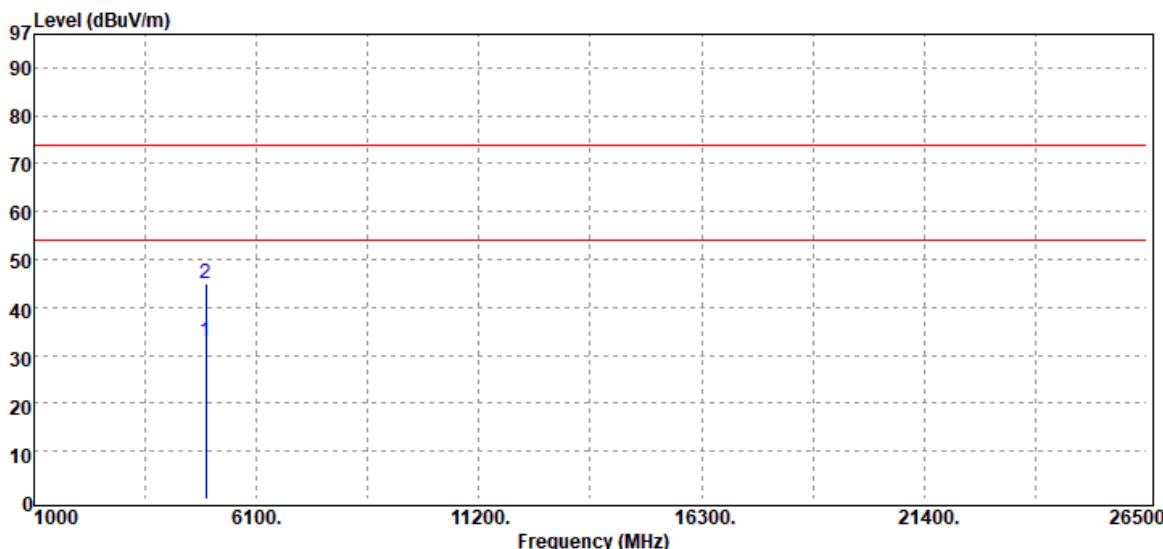
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Report Number :ER/2019/B0055
Operation Mode :802.11b
Test Channel :2467 MHz
Test Mode :Tx CH High
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	dB
4934.00	Average	25.98	6.90	32.88	54.00	-21.12
4934.00	Peak	37.94	6.90	44.84	74.00	-29.16

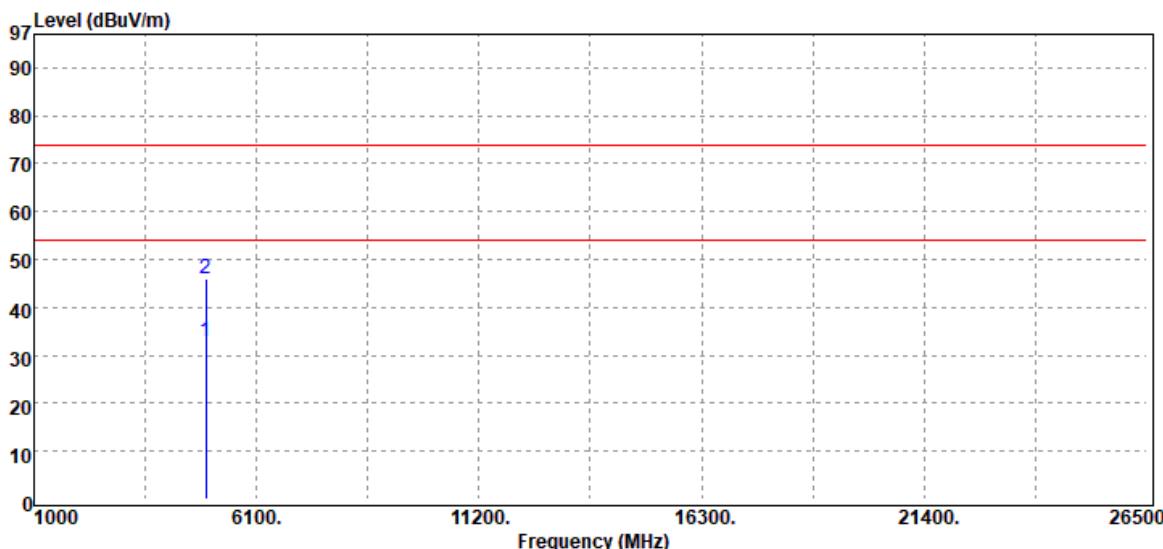
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Report Number :ER/2019/B0055
 Operation Mode :802.11b
 Test Channel :2472 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit	Margin
					@3m	
					dB μ V/m	dB
4944.00	Average	25.95	6.94	32.89	54.00	-21.11
4944.00	Peak	39.20	6.94	46.14	74.00	-27.86

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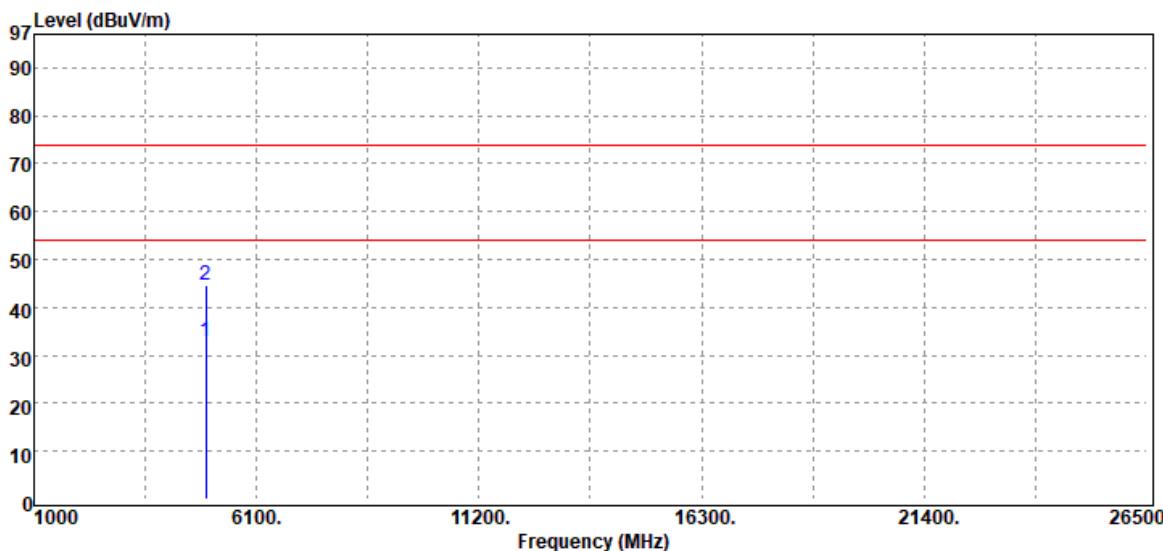
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Report Number :ER/2019/B0055
Operation Mode :802.11b
Test Channel :2472 MHz
Test Mode :Tx CH High
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	
4944.00	Average	26.04	6.94	32.98	54.00	-21.02
4944.00	Peak	37.79	6.94	44.73	74.00	-29.27

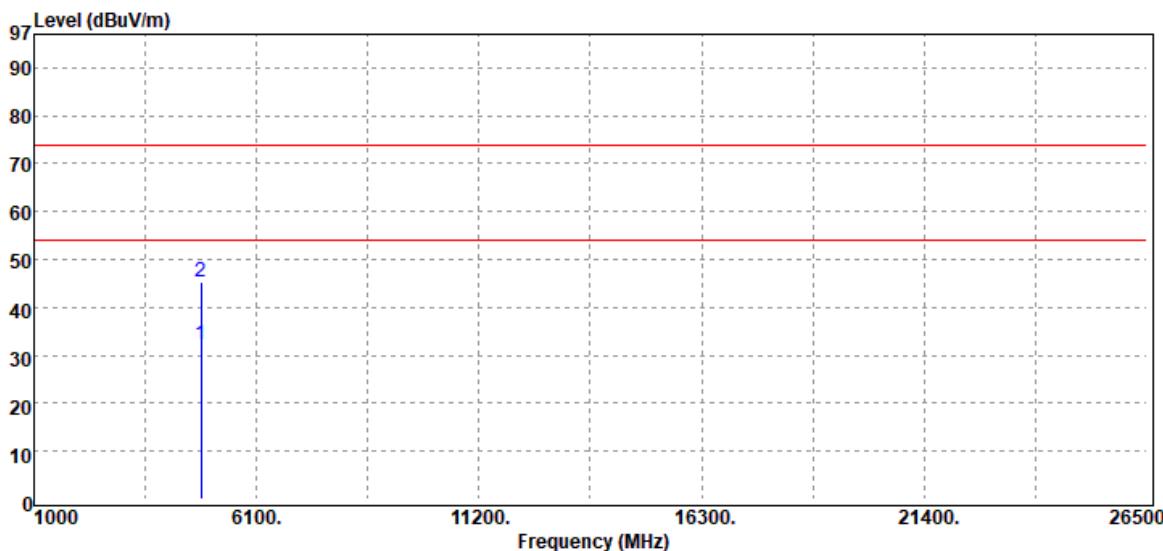
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2412 MHz
 Test Mode :Tx CH Low
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					dB μ V/m	dB
4824.00	Average	25.81	6.53	32.34	54.00	-21.66
4824.00	Peak	38.87	6.53	45.40	74.00	-28.60

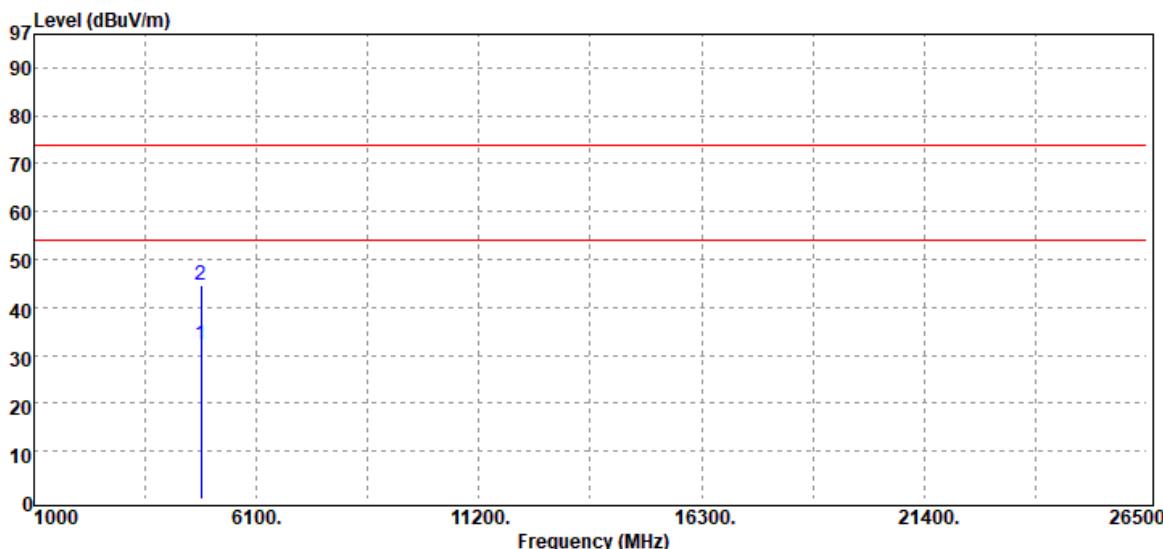
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Report Number :ER/2019/B0055
Operation Mode :802.11g
Test Channel :2412 MHz
Test Mode :Tx CH Low
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
4824.00	Average	25.85	6.53	32.38	54.00	-21.62
4824.00	Peak	38.20	6.53	44.73	74.00	-29.27

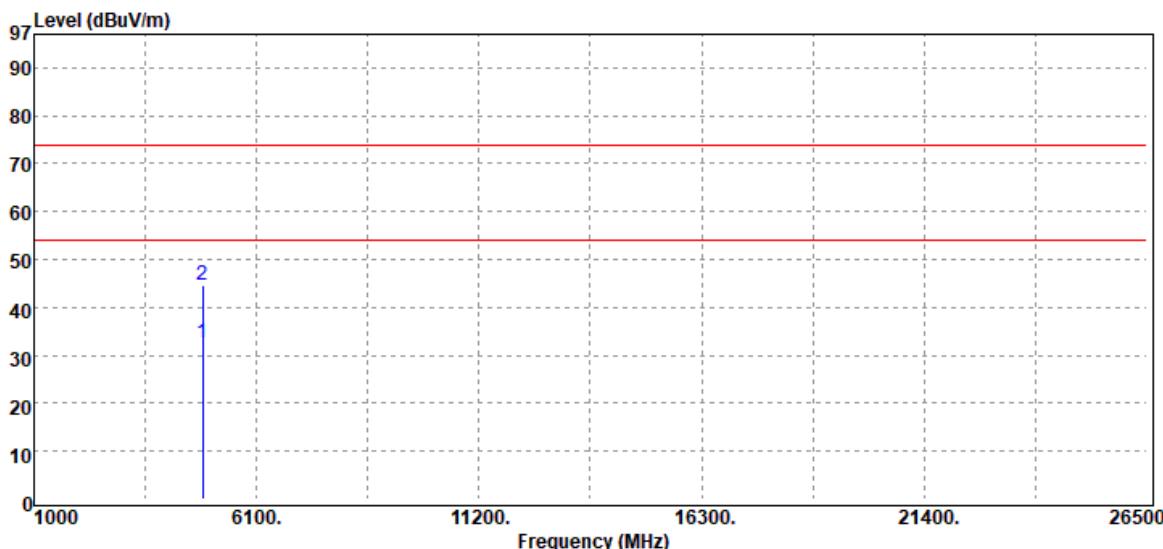
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2437 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					dB μ V/m	dB
4874.00	Average	26.02	6.69	32.71	54.00	-21.29
4874.00	Peak	37.79	6.69	44.48	74.00	-29.52

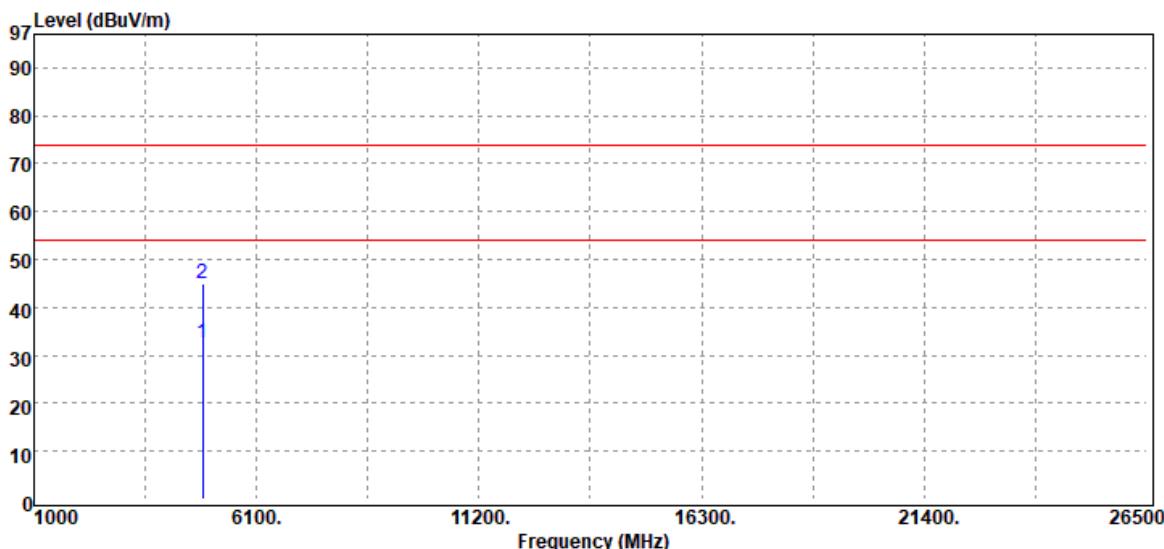
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Report Number :ER/2019/B0055
Operation Mode :802.11g
Test Channel :2437 MHz
Test Mode :Tx CH Mid
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	dB
4874.00	Average	25.92	6.69	32.61	54.00	-21.39
4874.00	Peak	38.14	6.69	44.83	74.00	-29.17

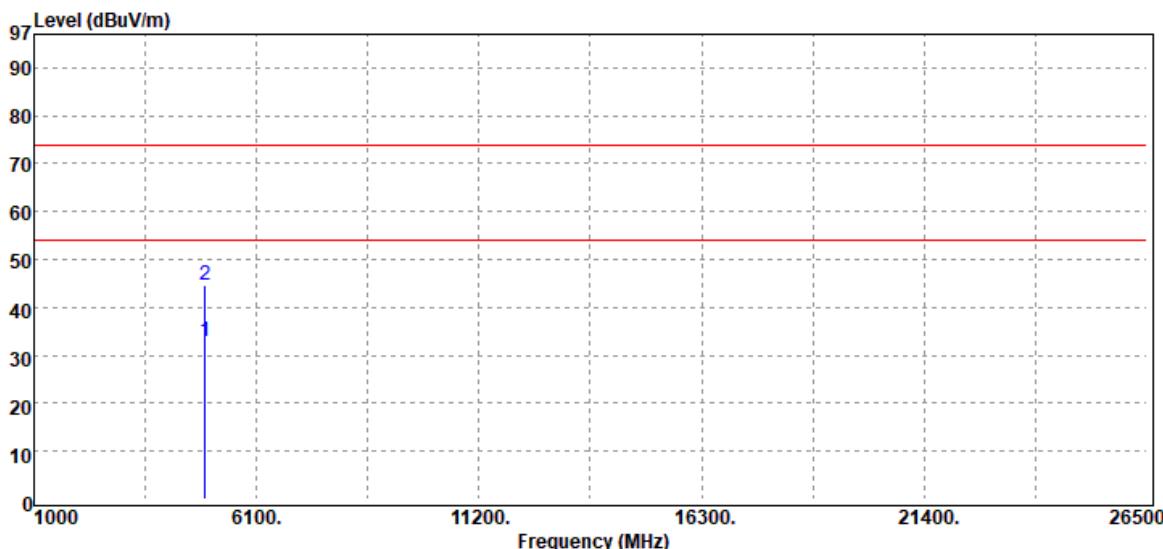
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2462 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
4924.00	Average	25.94	6.85	32.79	54.00	-21.21
4924.00	Peak	37.68	6.85	44.53	74.00	-29.47

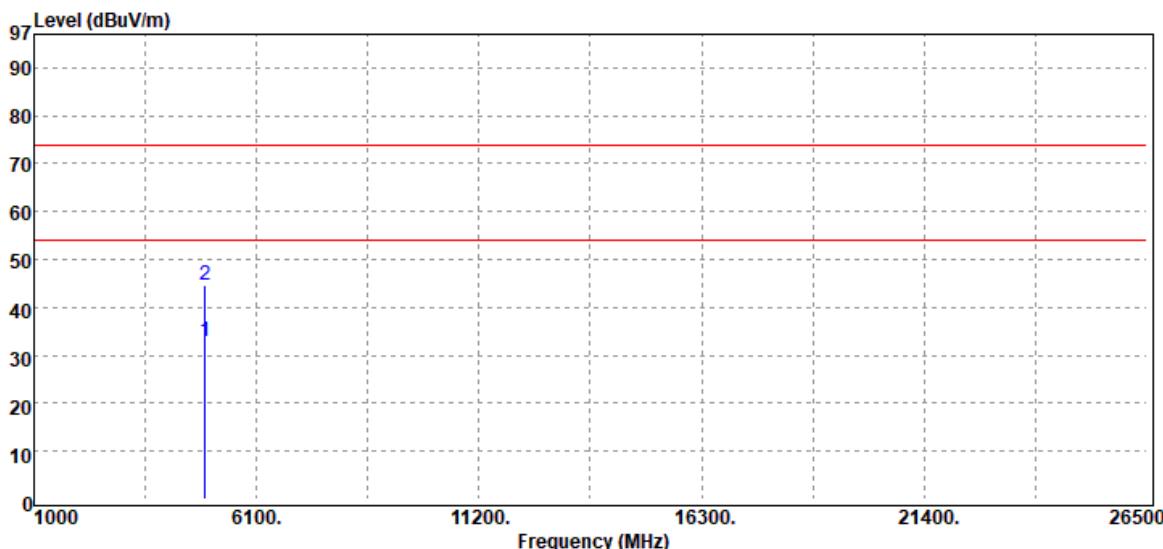
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2462 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin dB
				FS	@3m	
4924.00	Average	25.88	6.85	32.73	54.00	-21.27
4924.00	Peak	37.85	6.85	44.70	74.00	-29.30

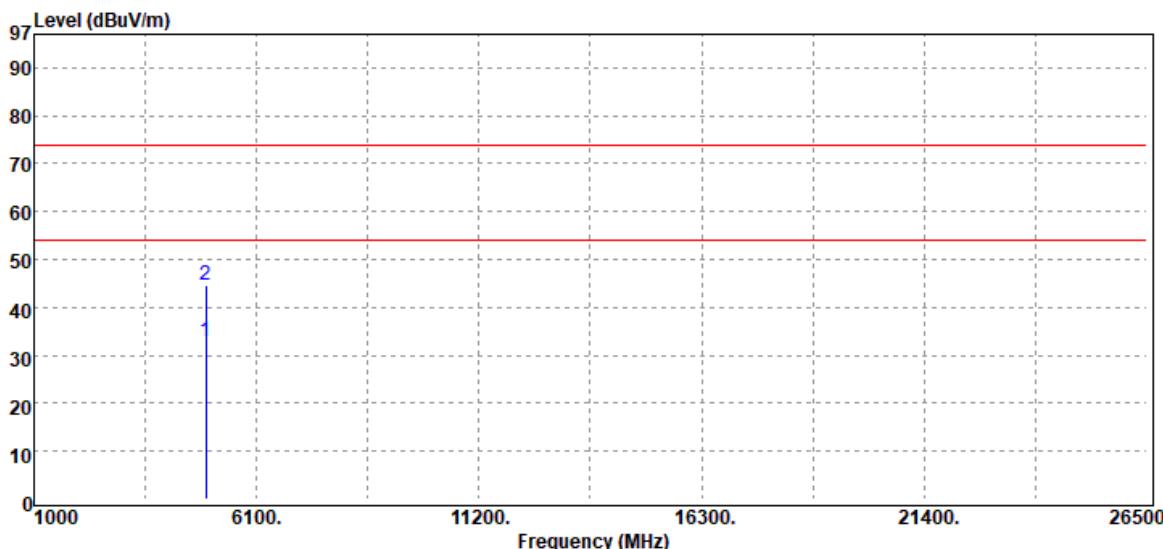
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Report Number :ER/2019/B0055
Operation Mode :802.11g
Test Channel :2467 MHz
Test Mode :Tx CH High
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :VERTICAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	
4934.00	Average	25.96	6.90	32.86	54.00	-21.14
4934.00	Peak	37.80	6.90	44.70	74.00	-29.30

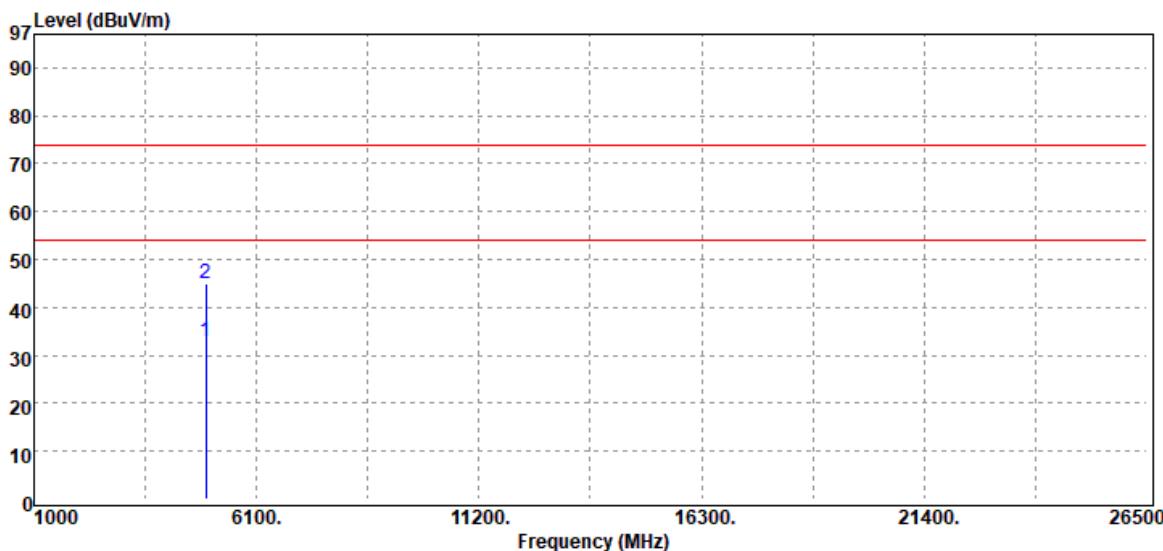
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Report Number :ER/2019/B0055
Operation Mode :802.11g
Test Channel :2467 MHz
Test Mode :Tx CH High
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :HORIZONTAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m	dB
4934.00	Average	26.04	6.90	32.94	54.00	-21.06
4934.00	Peak	38.14	6.90	45.04	74.00	-28.96

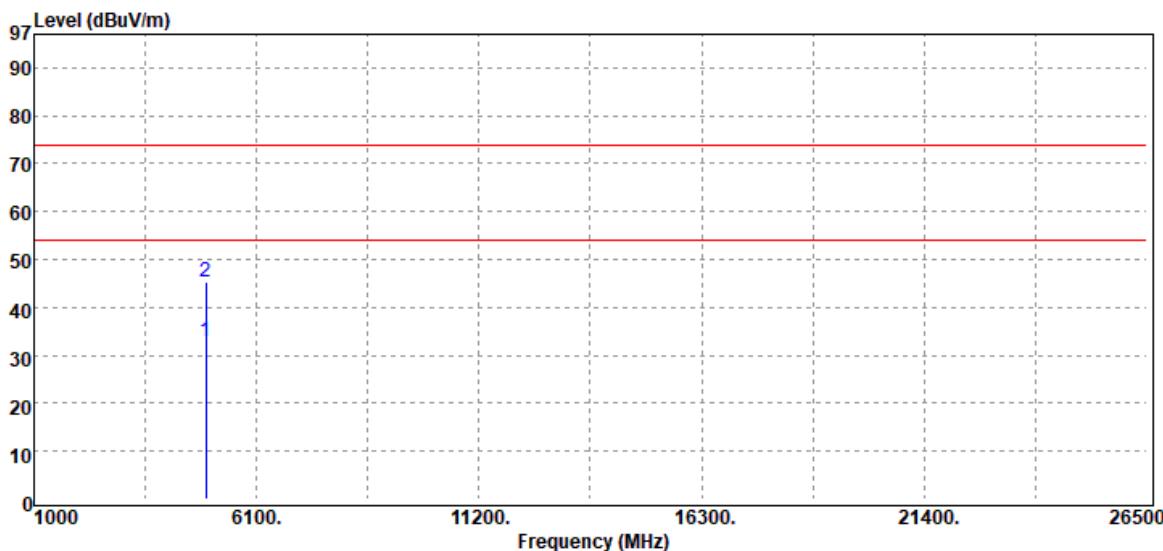
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2472 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					dB μ V/m	dB
4944.00	Average	25.88	6.94	32.82	54.00	-21.18
4944.00	Peak	38.49	6.94	45.43	74.00	-28.57

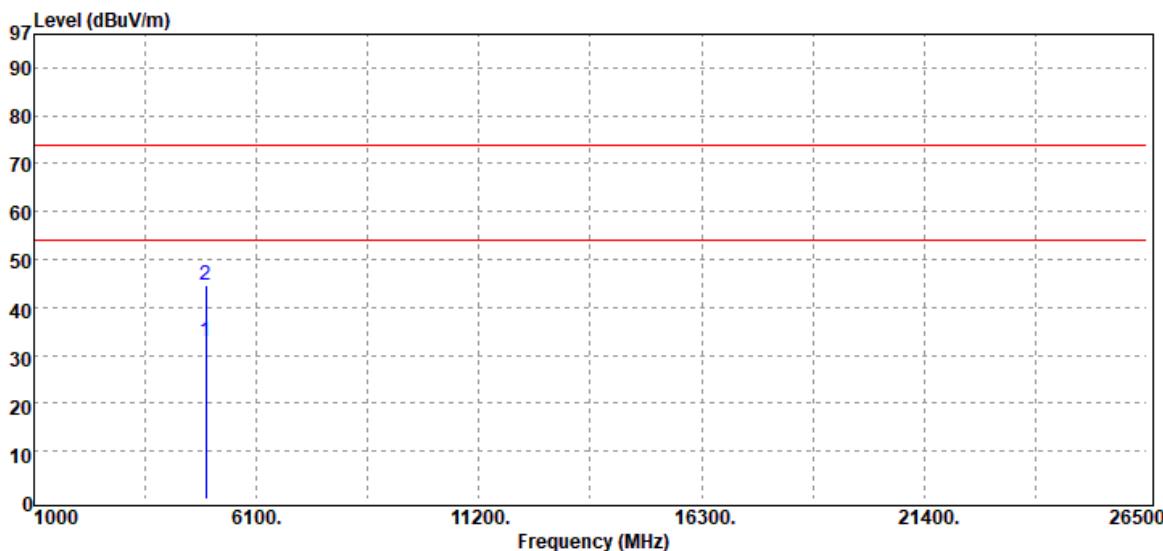
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Report Number :ER/2019/B0055
 Operation Mode :802.11g
 Test Channel :2472 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					Factor dB	Margin dB
4944.00	Average	25.93	6.94	32.87	54.00	-21.13
4944.00	Peak	37.69	6.94	44.63	74.00	-29.37

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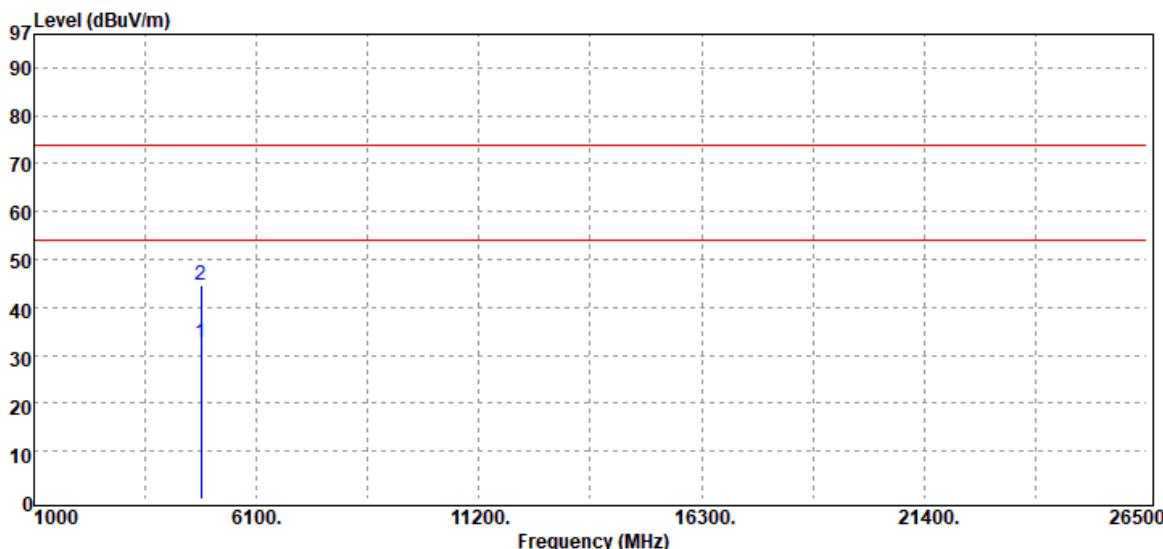
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Report Number :ER/2019/B0055
Operation Mode :802.11n20
Test Channel :2412 MHz
Test Mode :Tx CH Low
EUT Pol :H Plane

Test Date :2019-12-10
Temp./Humi. :21.1/61
Antenna Pol. :VERTICAL
Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin dB
				FS dB μ V/m	@3m dB μ V/m	
4824.00	Average	26.01	6.53	32.54	54.00	-21.46
4824.00	Peak	37.97	6.53	44.50	74.00	-29.50

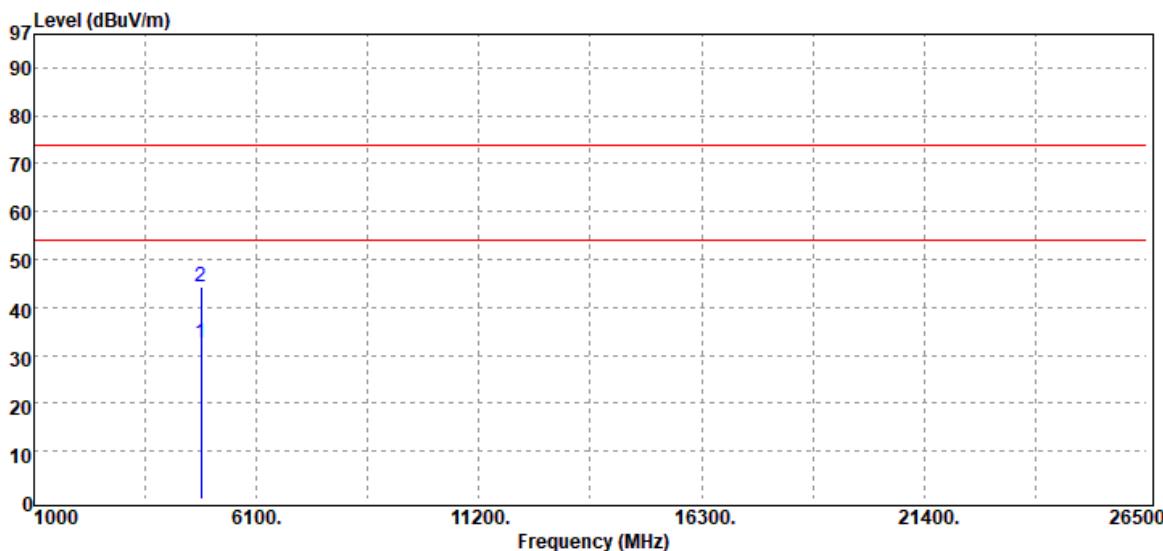
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2412 MHz
 Test Mode :Tx CH Low
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual		Margin dB	
				Limit @3m			
				FS dB μ V/m	Limit dB μ V/m		
4824.00	Average	25.90	6.53	32.43	54.00	-21.57	
4824.00	Peak	37.74	6.53	44.27	74.00	-29.73	

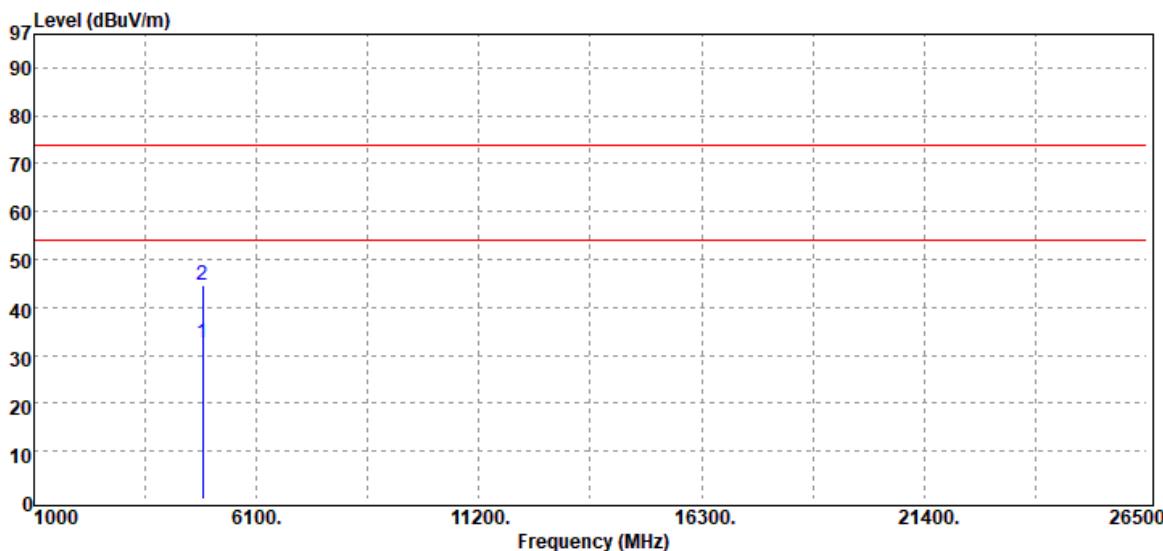
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2437 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					dB μ V/m	
4874.00	Average	26.00	6.69	32.69	54.00	-21.31
4874.00	Peak	37.86	6.69	44.55	74.00	-29.45

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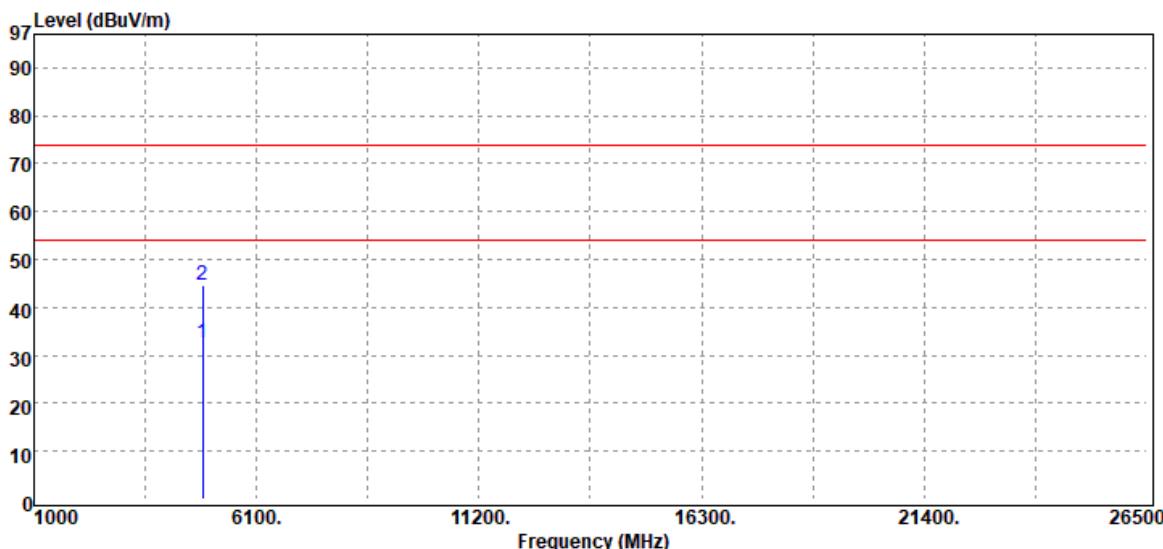
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2437 MHz
 Test Mode :Tx CH Mid
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS	@3m dB μ V/m	dB μ V/m
4874.00	Average	25.96	6.69	32.65	54.00	-21.35
4874.00	Peak	37.80	6.69	44.49	74.00	-29.51

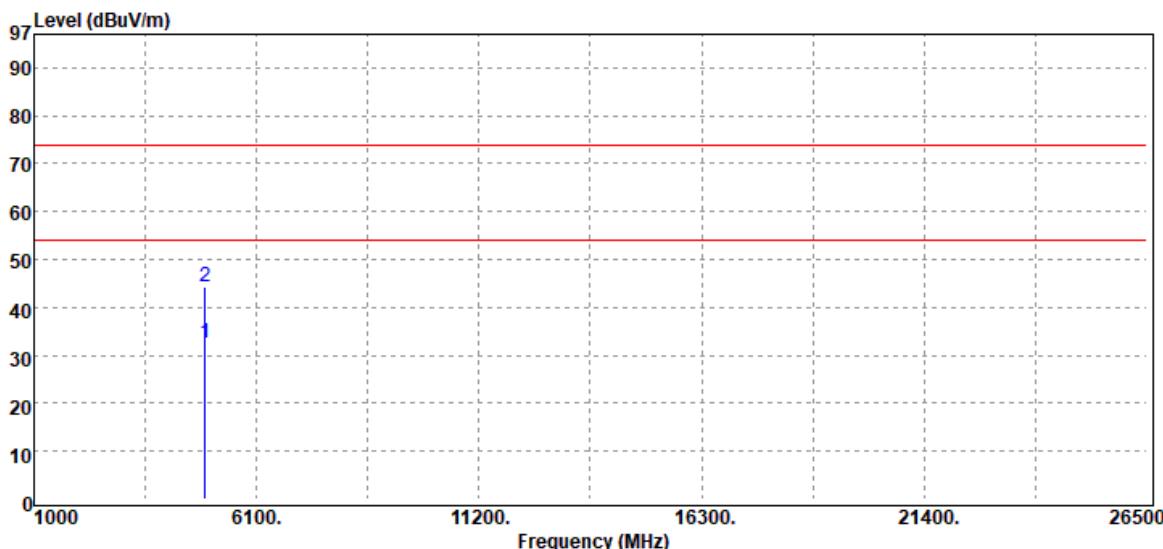
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2462 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					dB μ V/m	
4924.00	Average	25.83	6.85	32.68	54.00	-21.32
4924.00	Peak	37.53	6.85	44.38	74.00	-29.62

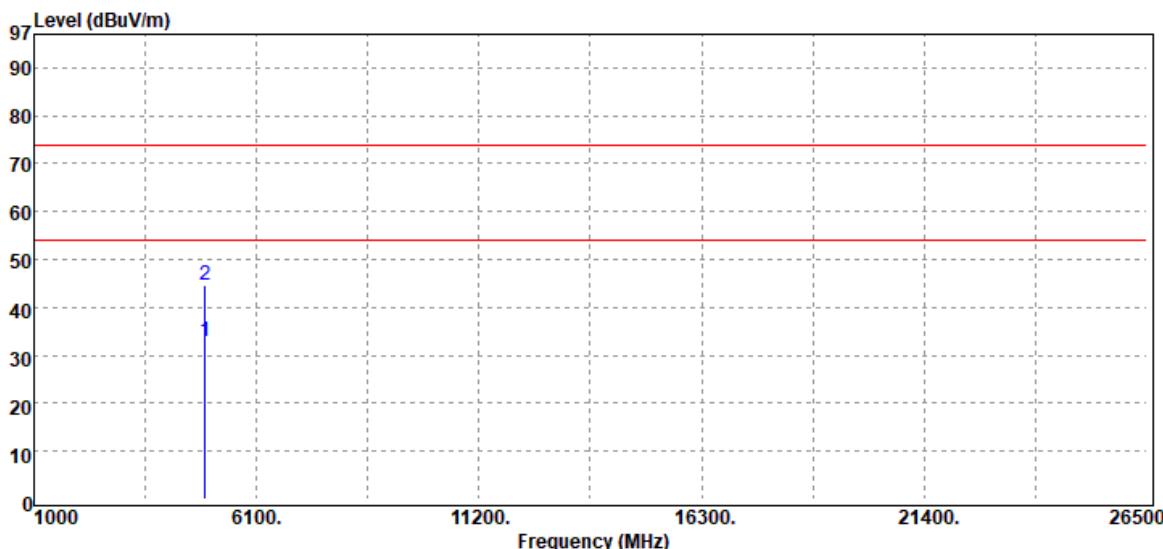
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 Test Channel :2462 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode PK/QP/AV	Spectrum Reading Level dB μ V	Factor dB	Actual FS dB μ V/m	Limit @3m dB μ V/m	Margin dB
					Factor dB	Margin dB
4924.00	Average	25.95	6.85	32.80	54.00	-21.20
4924.00	Peak	37.84	6.85	44.69	74.00	-29.31

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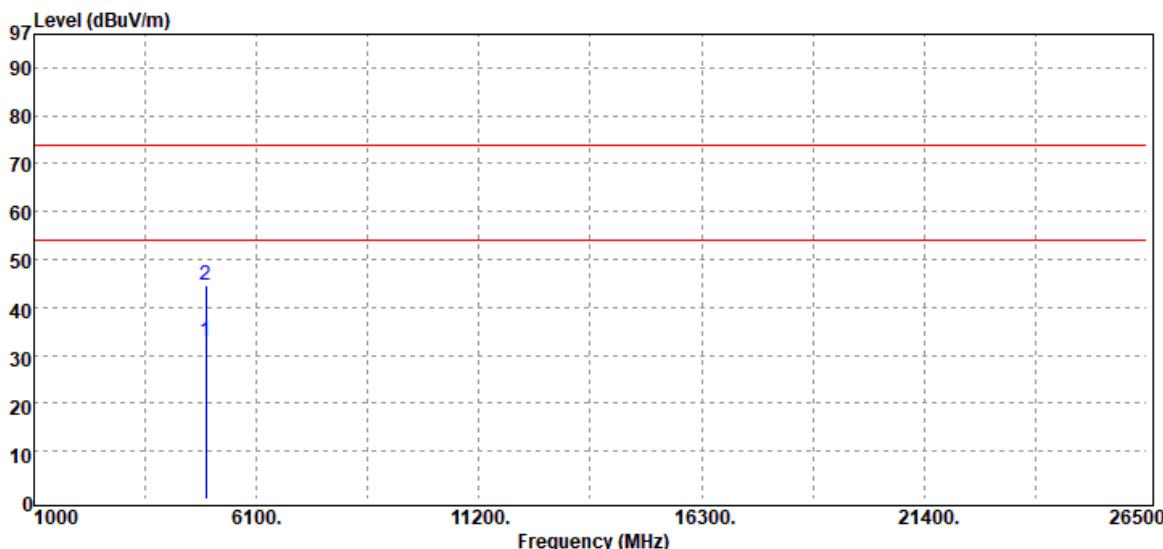
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2467 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin dB
				FS dB μ V/m	@3m dB μ V/m	
4934.00	Average	25.91	6.90	32.81	54.00	-21.19
4934.00	Peak	37.84	6.90	44.74	74.00	-29.26

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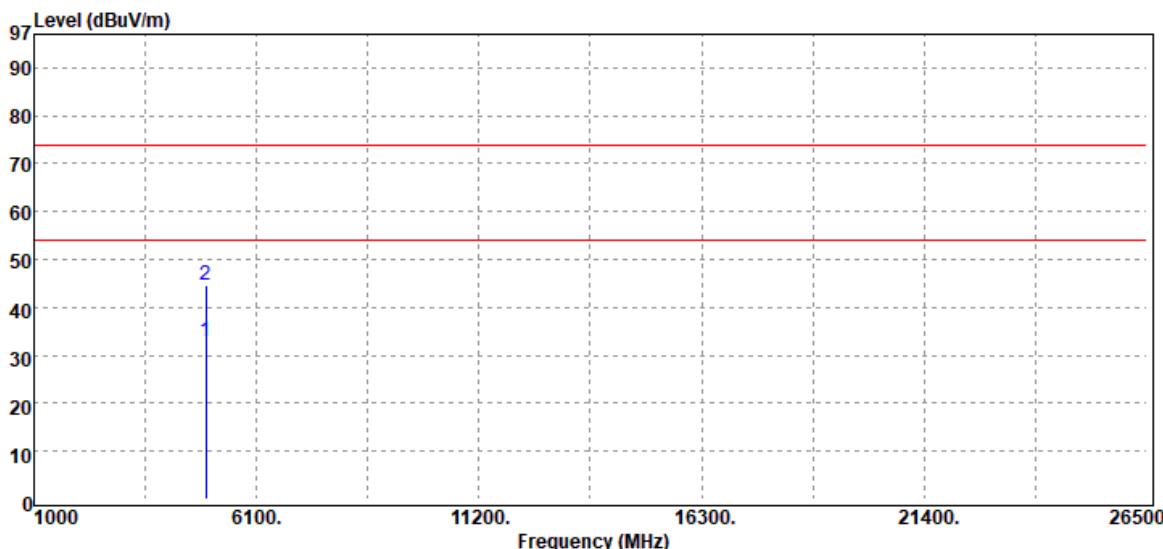
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2467 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
4934.00	Average	25.83	6.90	32.73	54.00	-21.27
4934.00	Peak	37.84	6.90	44.74	74.00	-29.26

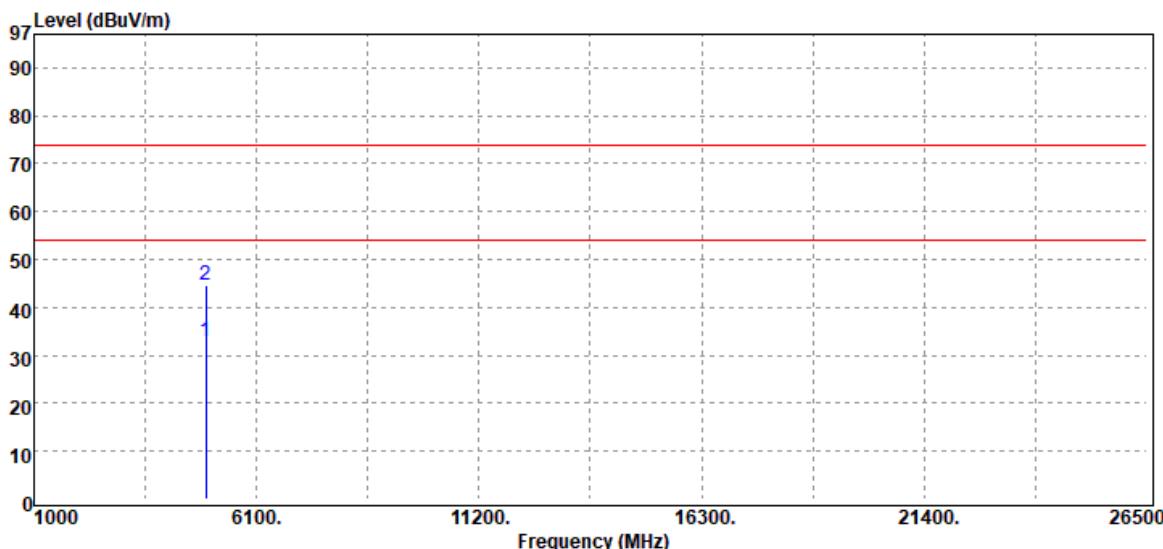
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2472 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :VERTICAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
4944.00	Average	25.79	6.94	32.73	54.00	-21.27
4944.00	Peak	37.66	6.94	44.60	74.00	-29.40

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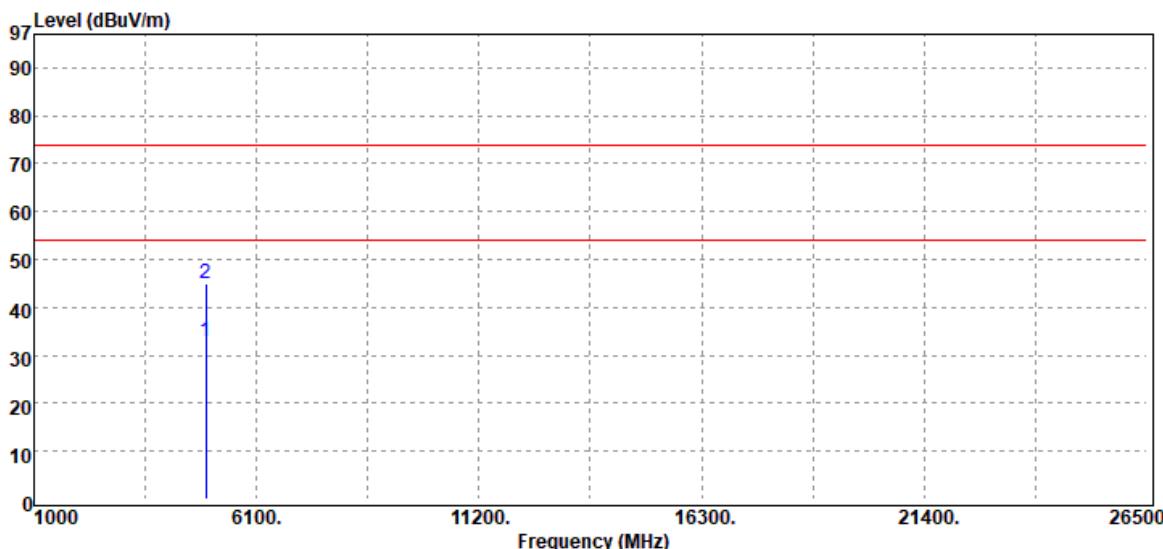
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Report Number :ER/2019/B0055
 Operation Mode :802.11n20
 Test Channel :2472 MHz
 Test Mode :Tx CH High
 EUT Pol :H Plane

Test Date :2019-12-10
 Temp./Humi. :21.1/61
 Antenna Pol. :HORIZONTAL
 Engineer :Kane



Freq. MHz	Detector Mode	Spectrum Reading Level dB μ V	Factor dB	Actual	Limit	Margin
				FS dB μ V/m	@3m dB μ V/m	dB
4944.00	Average	25.84	6.94	32.78	54.00	-21.22
4944.00	Peak	38.16	6.94	45.10	74.00	-28.90

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12 POWER SPECTRAL DENSITY

12.1 Standard Applicable

Per Part 15.247 (e)

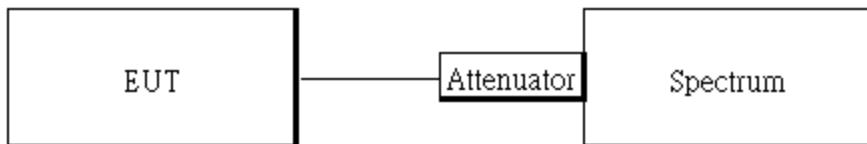
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

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

12.2 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
DC Power Supply	Agilent	E3640A	MY52410006	12/04/2018	12/03/2019
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

12.3 Test Set-up



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12.4 Measurement Procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. The testing follows the Measurement Procedure of FCC KDB 558074 D01 DTS Meas. Guidance .
3. Set the span to 1.5 times the DTS channel bandwidth.
4. Set the RBW = 3 kHz & VBW = 10 kHz.
5. For defining Restricted Band Edge Limit:
Set the RBW = 100kHz & VBW = 300 kHz
6. Detector = peak.
7. Sweep time = auto couple.
8. Trace mode = max hold.
9. Allow trace to fully stabilize.
10. Use the peak marker function to determine the maximum amplitude level.
11. 802.11n MIMO mode: offset is set following “measure and add 10 Log (N)” on spectrum to measure the PSD for MIMO mode. Offset = cable loss + 10 log (N), where N is number of transmitting antenna. N=2 for this given application.

Note:

For the test of PSD at MIMO mode, the highest emission of worst case employing Measure and add 10 log (N) technical is reported on this report after the comparison between Main Antenna at single transmitting mode and Aux that yields the higher value. The MIMO transmitting mode produces higher value of outcome

12.5 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 grater than 6 dBi. Therefore, reduction of power is not required.

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12.6 Power spectral density

POWER DENSITY 802.11b_Ch0			
Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-6.97	8.00	PASS
2437	-8.02	8.00	PASS
2462	-7.27	8.00	PASS
2467	-8.74	8.00	PASS
2472	-9.97	8.00	PASS

POWER DENSITY 802.11g_Ch0			
Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-15.95	8.00	PASS
2437	-16.54	8.00	PASS
2462	-15.25	8.00	PASS
2467	-17.18	8.00	PASS
2472	-16.89	8.00	PASS

POWER DENSITY 802.11n HT20_Ch0			
Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Result
2412	-16.77	8.00	PASS
2437	-15.87	8.00	PASS
2462	-16.21	8.00	PASS
2467	-17.42	8.00	PASS
2472	-16.35	8.00	PASS

Note

Cable Loss 11.00 dB

*Refer to next page for plots

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802.11b

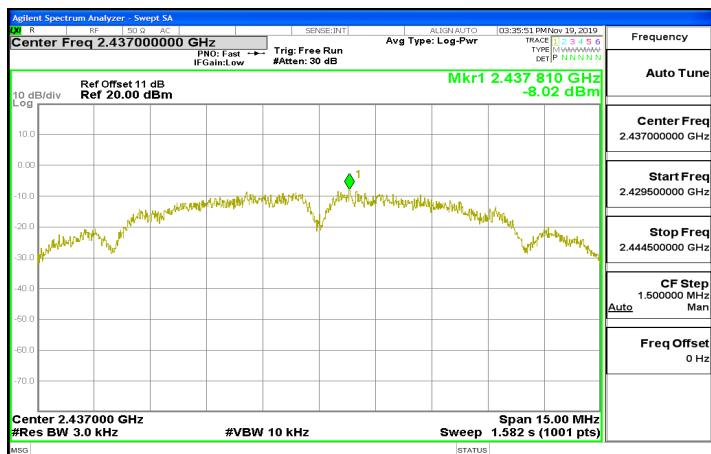
Power Spectral Density Test Plot-2412MHz



Power Spectral Density Test Plot-2467MHz



Power Spectral Density Test Plot-2437MHz



Power Spectral Density Test Plot-2472MHz



Power Spectral Density Test Plot-2462MHz



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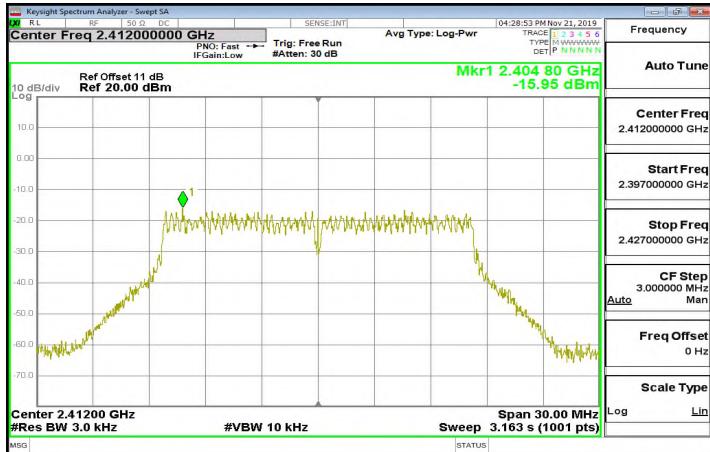
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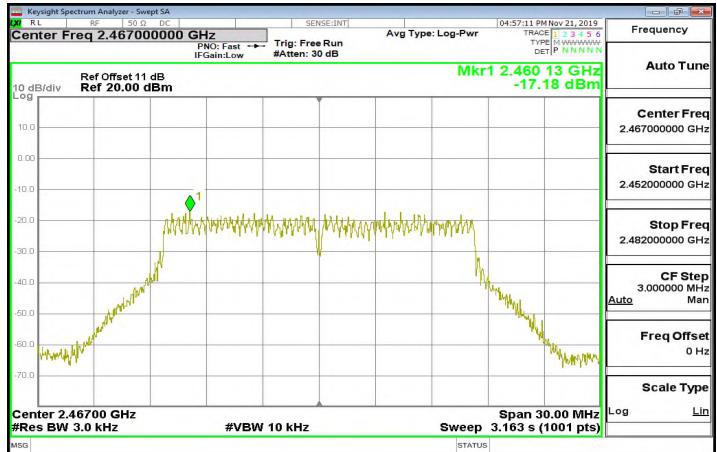


802.11g

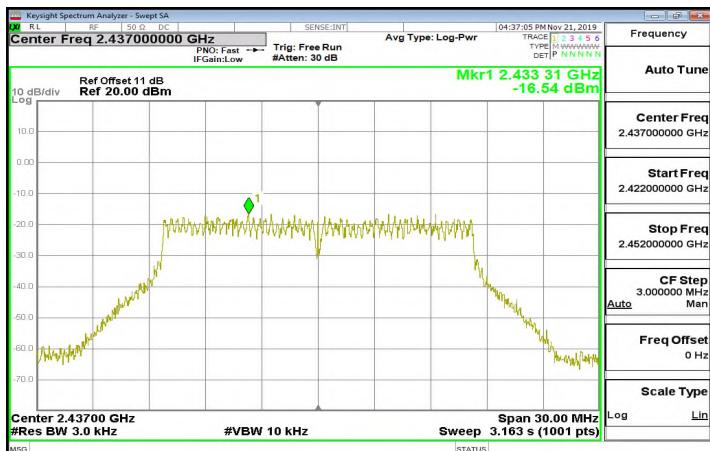
Power Spectral Density Test Plot-2412MHz



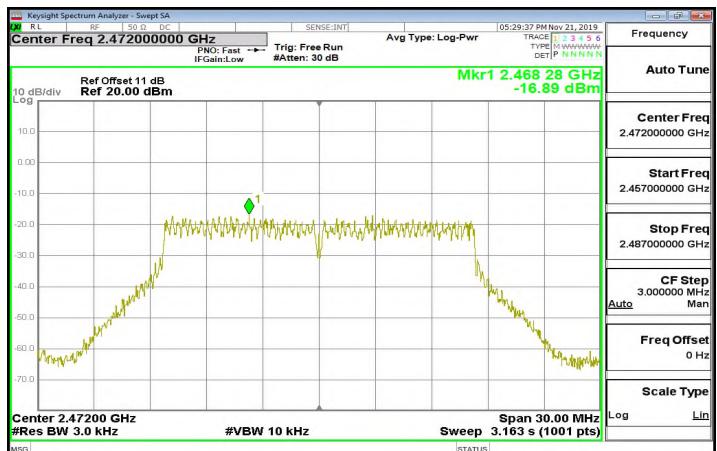
Power Spectral Density Test Plot-2467MHz



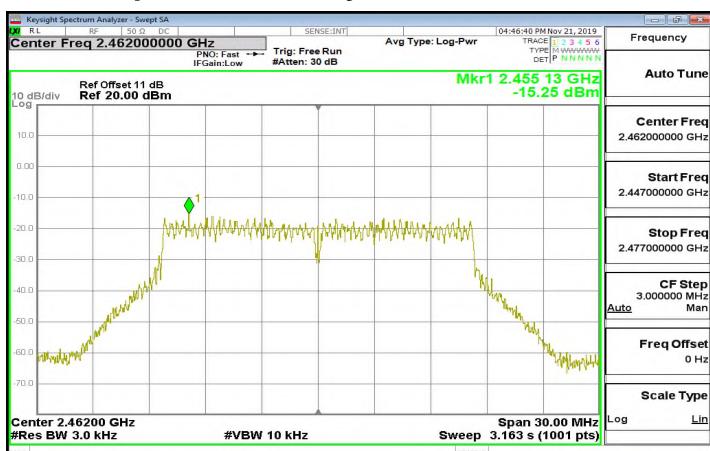
Power Spectral Density Test Plot-2437MHz



Power Spectral Density Test Plot-2472MHz



Power Spectral Density Test Plot-2462MHz



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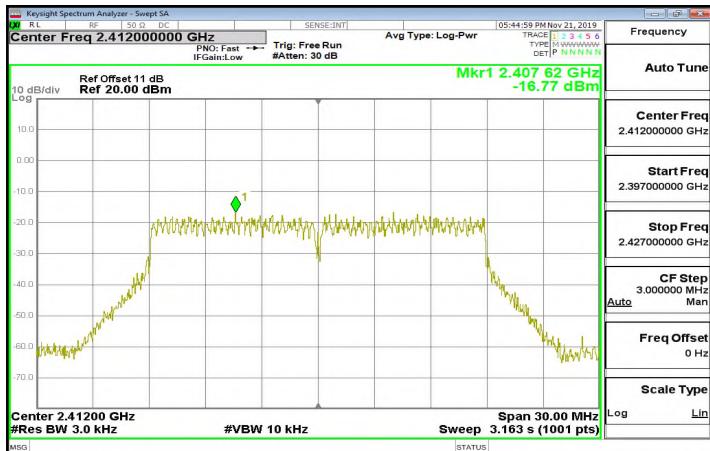
f (886-2) 2298-0488

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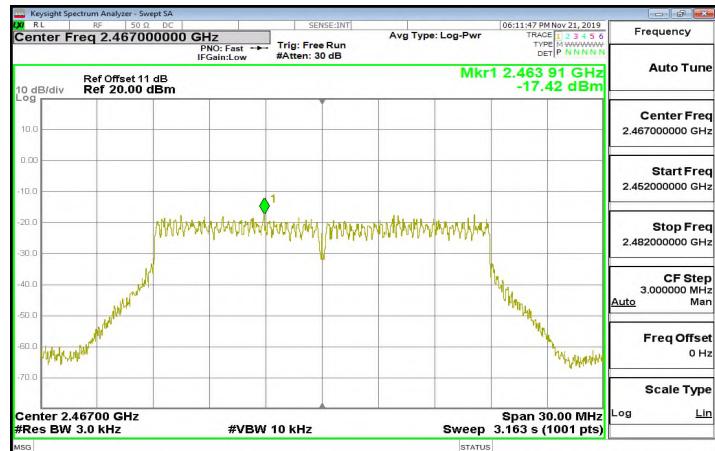
Member of SGS Group

802.11n_HT20

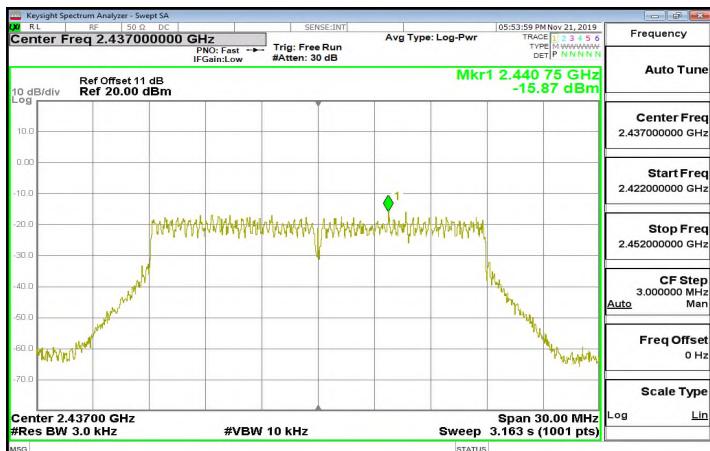
Power Spectral Density Test Plot-2412MHz



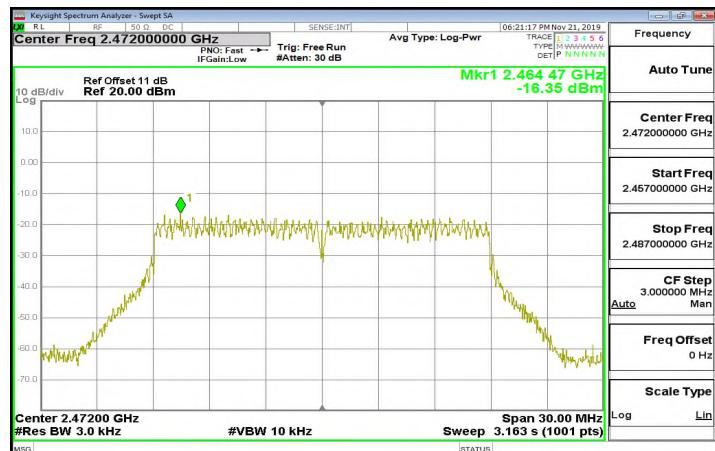
Power Spectral Density Test Plot-2467MHz



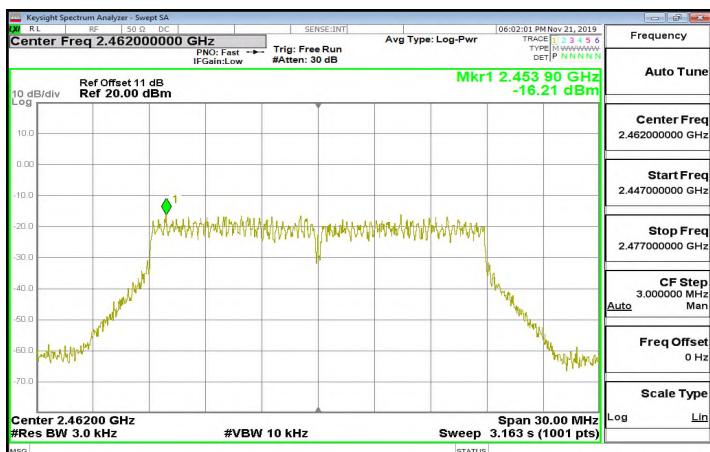
Power Spectral Density Test Plot-2437MHz



Power Spectral Density Test Plot-2472MHz



Power Spectral Density Test Plot-2462MHz



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13 ANTENNA REQUIREMENT

13.1 Standard Applicable

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

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

13.2 Antenna Connected Construction

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

~ End of Report ~

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