ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

Applicant:	Seiko Epson Corporation 6925 Tazawa, Toyoshina, Azumino-shi, Nagano, 399-8285 Japan
Product Name:	Intelligent Controller
Brand Name:	EPSON
Model No.:	BO-IC400
Model Difference:	N/A
Report Number:	E2/2020/50084
FCC ID:	SKSBO-IC400
FCC Rule Part:	§15.247, Cat: DTS
Issue Date:	Jul. 31, 2020
Date of Test:	May 29, 2020 ~ Jul. 03, 2020
Date of EUT Received:	May 29, 2020

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. Central RF Lab 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: Jazz Huang

Jazz Huang / Asst. Supervisor

Testing Laboratory
3702

Revision History

Report Number	Revision	Description	Issue Date	Remark
E2/2020/50084	Rev.00	Original.	Jul. 31, 2020	Revised By: Yuri Tsai

Note:

1、Disclaimer

Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

Table of Contents

1 GENERAL INFORMATION

1.1 Product description

Product Name:	Intelligent Controller	
Brand Name:	EPSON	
Model No.:	BO-IC400	
Model Difference:	N/A	
Hardware Version:	DVT	
Software Version:	Android 9	
Power Supply:	3.85Vdc from Rechargeable Li-ion Battery or 5Vdc from Micro USB port	
	Battery:	Model No.: EAR1B, Supplier: Shen Zhen KAYO Battery Co., Ltd.

Wi-Fi 802.11	Frequency Range	Channels	Rated Power (dBm)	Modulation Technology
b	2412-2462	11	22.41	DSSS,
g			24.20	OFDM
n_HT20			23.70	
n_HT40	2422-2452	7	23.98	
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 256QAM for OFDM in 802.11ac only			
Transistion Rate	802.11 b: 1/2/5.5/11 Mbps 802.11 g: 6/9/12/18/24/36/48/54 Mbps 802.11 n_20MHz: 6.5 – 144.4Mbps 802.11 n_40MHz: 13.5 – 300.0Mbps			

1.2 Antenna Designation

Antenna Type	Supplier	Antenna Part No.	Freq. (MHz)	Peak Antenna Gain (dBi)	Worst Antenna Gain
PIFA	PEGATRON	K1606-00028F1BS1	2412~2462	0.2 (Main)	
		K1606-00029E1BS1		2.7 (Aux)	V
Note: Pre-scanned was done on the above 2 antennas, the Aux antenna results higher emission at 2.4GHz. Therefore, the completed set of measurement was done on the antenna to be presented on this test report.					

1.3 Test Methodology of Applied Standards

FCC Part 15, Subpart C §15.247
FCC KDB 558074 D01 15.247 Meas Guidance v05r02
FCC KDB 662911 D01 Multiple Transmitter Output v02r01
ANSI C63.10:2013

1.4 Test Facility

SGS Taiwan Ltd. Central RF Lab (TAF code 3702)
No.2, Keji 1st Rd., Guishan District, Taoyuan City, Taiwan 333

FCC Designation number: TW0028

1.5 Special Accessories

There are no special accessories used while test was conducted.

1.6 Equipment Modifications

There was no modification incorporated into the EUT.

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.

2.4 Measurement Results Explanation Example

2.4.1 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.

2.4.2 For all conducted test items:

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

2.5 Configuration of Tested System

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

Fig. 2-2 Conduction (AC Power Line) Radiated Emission

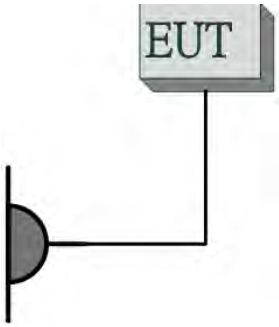


Table 2-1 Equipment Used in Tested System

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	Notebook	Lenovo	L440	P0000367	N/A	N/A

3 SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	AC Power Line Conducted Emission	Compliant
§15.247(b) (3)	Peak Output Power	Compliant
§15.247(a)(2)	6dB Emission Bandwidth	Compliant
§15.205 §15.209 §15.247(d)	Conducted Band Edge and Spurious Emission	Compliant
§15.205 §15.209 §15.247(d)	Radiated Band Edge and Spurious Emission	Compliant
§15.247(e)	Power Spectral Density	Compliant
§15.203 §15.247(b)	Antenna Requirement	Compliant

4 DESCRIPTION OF TEST MODES

4.1 Operated in 2400 ~ 2483.5MHz Band

13 channels 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

9 channels are provided for 802.11n 40M

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

4.2 The Worst Test Modes and Channel Details

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

The gevin UE is pre-scanned among below modes.

Modulation	Transmission Chain				Single Transmission Spatial	Multiple Transmission Spatial
☒ 802.11 b	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ 1TX	☒ 2TX
☒ 802.11 g	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ 1TX	☒ 2TX
☒ 802.11 n	☒ Ch0	☒ Ch1	☐ Ch2	☐ Ch3	☐ SISO	☒ MIMO
☐ 802.11 ax	☐ Ch0	☐ Ch1	☐ Ch2	☐ Ch3	☐ SISO	☐ 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.

4.3 Radiated Emission Test:

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
RADIATED EMISSION TEST (BELOW 1 GHz)					
802.11g	1 to 11	6	OFDM	6	2TX
802.11n 40M	3 to 9	6	OFDM	MCS 8	MIMO
RADIATED EMISSION TEST (ABOVE 1 GHz)					
802.11b	1 to 11	1, 6, 11	DSSS	1	2TX
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX
802.11n 20M	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n 40M	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO

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

4.4 Antenna Port Conducted Mesurement:

CONDUCTED TEST					
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION	DATA RATE (Mbps)	ANTENNA PORT
802.11b	1 to 11	1, 6, 11	DSSS	1	2TX
802.11g	1 to 11	1, 6, 11	OFDM	6	2TX
802.11n 20M	1 to 11	1, 6, 11	OFDM	MCS 8	MIMO
802.11n 40M	3 to 9	3, 6, 9	OFDM	MCS 8	MIMO

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.

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.		

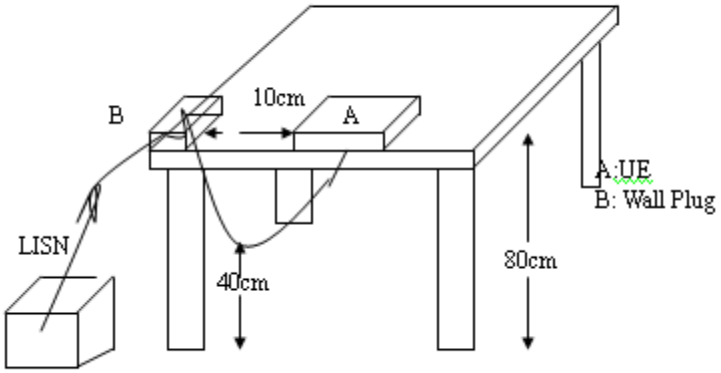
6.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
LISN	SCHWARZBECK Mess-Elektronik	NSLK8127	974	03/25/2020	03/24/2021
EMI Test Receiver	R&S	ESCI	101342	04/28/2020	04/27/2021

6.3 EUT Setup

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

6.4 Test SET-UP (Block Diagram of Configuration)



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

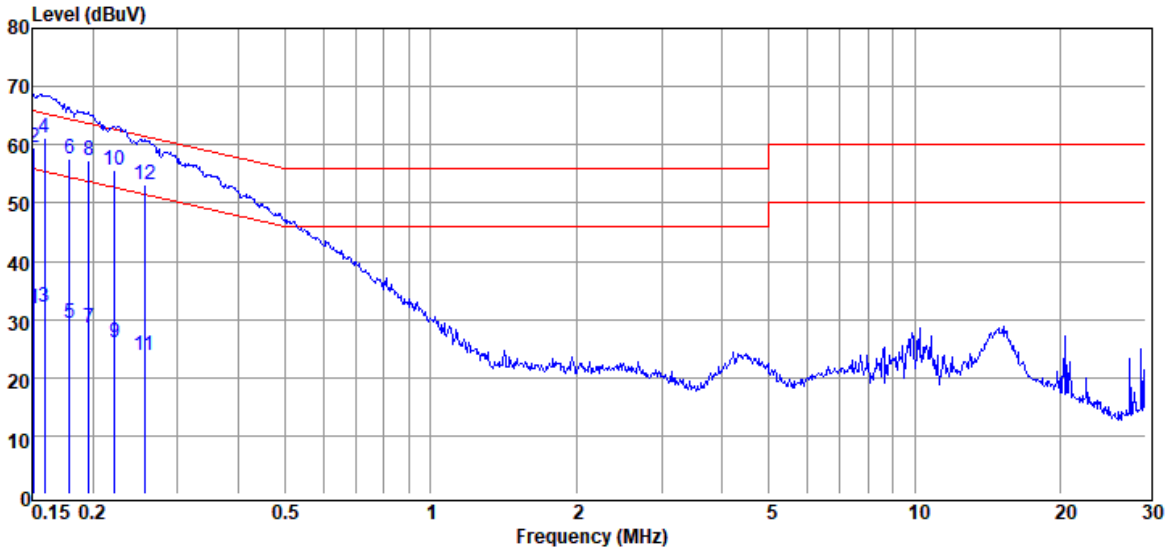
6.6 Measurement Result

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

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

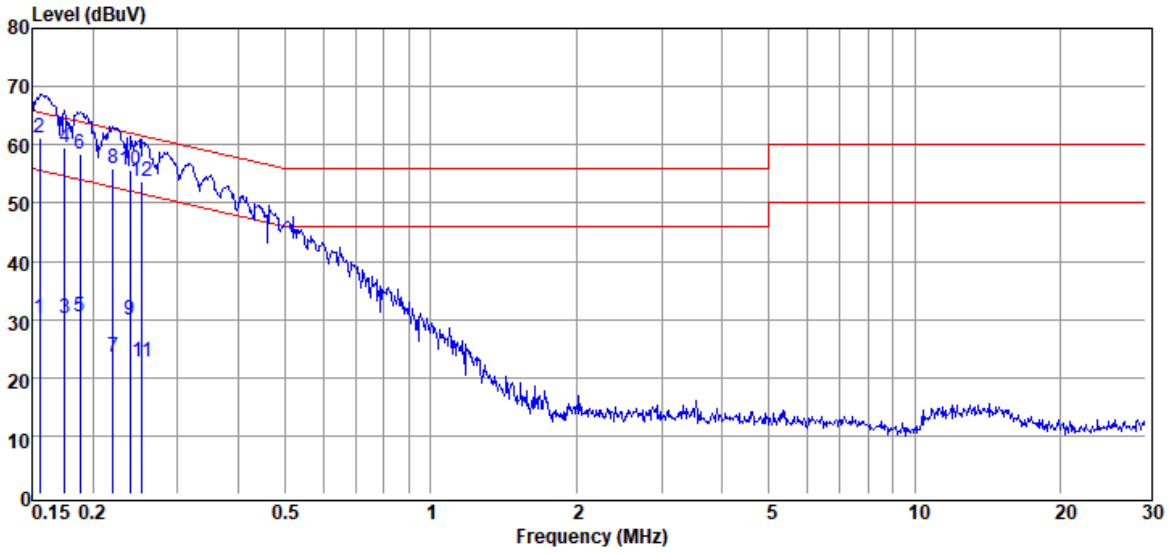
AC POWER LINE CONDUCTED EMISSION TEST DATA

Report Number	:E2/2020/50084	Test Date	:2020-06-17
Test Mode	:WLAN 2.4G	Temp./Humi.	:23.6/58
Power	:120V/60Hz	Engineer	:Ashton
Probe	:L1		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
0.15	Average	21.50	10.22	31.72	55.91	-24.19
0.15	QP	49.40	10.22	59.62	65.91	-6.29
0.16	Average	21.90	10.22	32.12	55.52	-23.40
0.16	QP	51.00	10.22	61.22	65.52	-4.30
0.18	Average	19.00	10.22	29.22	54.50	-25.28
0.18	QP	47.40	10.22	57.62	64.50	-6.88
0.20	Average	18.40	10.22	28.62	53.76	-25.14
0.20	QP	47.20	10.22	57.42	63.76	-6.34
0.22	Average	15.70	10.22	25.92	52.74	-26.82
0.22	QP	45.50	10.22	55.72	62.74	-7.02
0.26	Average	13.70	10.22	23.92	51.56	-27.64
0.26	QP	42.90	10.22	53.12	61.56	-8.44

Report Number	:E2/2020/50084	Test Date	:2020-06-17
Test Mode	:WLAN 2.4G	Temp./Humi.	:23.6/58
Power	:120V/60Hz	Engineer	:Ashton
Probe	:N		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
0.16	Average	20.00	10.21	30.21	55.69	-25.48
0.16	QP	51.00	10.21	61.21	65.69	-4.48
0.17	Average	20.00	10.21	30.21	54.72	-24.51
0.17	QP	49.40	10.21	59.61	64.72	-5.11
0.19	Average	20.30	10.21	30.51	54.11	-23.60
0.19	QP	48.20	10.21	58.41	64.11	-5.70
0.22	Average	13.21	10.21	23.42	52.79	-29.37
0.22	QP	45.70	10.21	55.91	62.79	-6.88
0.24	Average	19.70	10.21	29.91	52.13	-22.22
0.24	QP	45.30	10.21	55.51	62.13	-6.62
0.25	Average	12.60	10.21	22.81	51.64	-28.83
0.25	QP	43.40	10.21	53.61	61.64	-8.03

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	98.87	0.05	0.12	0.01
802.11g	97.43	0.11	0.71	1.00
802.11n_20	94.81	0.23	1.48	2.00
802.11n_40	94.94	0.23	1.48	2.00

7.3 Duty Cycle test plots

Duty Cycle_802.11b_20MHz_2437MHz

Duty Cycle_802.11n_20MHz_2437MHz

Duty Cycle_802.11g_20MHz_ 2437MHz

Duty Cycle_802.11n_40MHz_2437MHz

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 form the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the Antenna exceeds 6dBi.

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

Note:

As per FCC KDB 662911 D01

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

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

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

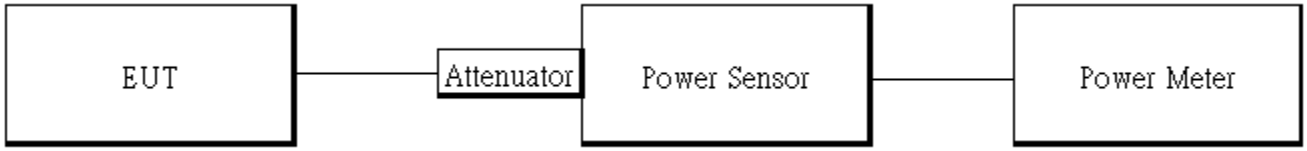
The antenna gain is not grater than 6 dBi. Therefore, reduction of power is not required.

8.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Power Meter	Anritsu	ML2496A	1804002	04/06/2020	04/05/2021
Power Sensor	Anritsu	MA2411B	1726105	04/06/2020	04/05/2021
Power Sensor	Anritsu	MA2411B	1726106	04/06/2020	04/05/2021
Attenuator	Marvelous	MVE2213-10	RF80	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF245	11/20/2019	11/19/2020

8.3 Test Set-up

Power Meter:



8.4 Measurement Procedure

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

   Power Meter:

   It is used as the auxiliary test equipment to conduct the output power measurement.
4. Record the max. Reading as observed from Spectrum or Power Meter.

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

8.5 Measurement Result

802.11b Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19.08	30.00	PASS
6	2437	1	19.32	30.00	PASS
11	2462	1	19.40	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	16.78	30.00	PASS
6	2437	1	16.93	30.00	PASS
11	2462	1	16.88	30.00	PASS

802.11b Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	1	19.59	30.00	PASS
6	2437	1	19.27	30.00	PASS
11	2462	1	19.40	30.00	PASS
802.11b Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	1	16.92	30.00	PASS
6	2437	1	16.95	30.00	PASS
11	2462	1	16.97	30.00	PASS

802.11b_2TX								
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
1	2412	1	19.72	18.54	22.18	165.21	30.00	PASS
6	2437	1	20.11	18.56	22.41	174.34	30.00	PASS
11	2462	1	19.30	19.18	22.25	167.91	30.00	PASS
802.11b_2TX								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
1	2412	1	16.73	16.68	19.76	94.73	30.00	PASS
6	2437	1	16.89	16.75	19.88	97.28	30.00	PASS
11	2462	1	16.82	16.73	19.83	96.27	30.00	PASS

802.11g Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	20.93	30.00	PASS
6	2437	6	21.18	30.00	PASS
11	2462	6	21.39	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	15.86	30.00	PASS
6	2437	6	15.92	30.00	PASS
11	2462	6	15.95	30.00	PASS

802.11g Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	6	21.24	30.00	PASS
6	2437	6	20.66	30.00	PASS
11	2462	6	20.88	30.00	PASS
802.11g Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	6	15.97	30.00	PASS
6	2437	6	15.93	30.00	PASS
11	2462	6	15.96	30.00	PASS

802.11g_2TX								
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
1	2412	6	21.85	20.42	24.20	263.26	30.00	PASS
6	2437	6	21.09	20.53	23.83	241.51	30.00	PASS
11	2462	6	19.73	19.40	22.58	181.07	30.00	PASS
802.11g_2TX								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
1	2412	6	15.81	15.48	18.77	75.36	30.00	PASS
6	2437	6	15.89	15.65	18.90	77.54	30.00	PASS
11	2462	6	14.84	14.13	17.62	57.85	30.00	PASS

802.11n_HT20M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	20.58	30.00	PASS
6	2437	MCS0	19.76	30.00	PASS
11	2462	MCS0	20.60	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	15.45	30.00	PASS
6	2437	MCS0	15.18	30.00	PASS
11	2462	MCS0	15.41	30.00	PASS

802.11n_HT20M Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	20.81	30.00	PASS
6	2437	MCS0	20.03	30.00	PASS
11	2462	MCS0	20.45	30.00	PASS
802.11n_HT20M Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15.47	30.00	PASS
6	2437	MCS0	15.45	30.00	PASS
11	2462	MCS0	15.44	30.00	PASS

802.11n_HT20M MIMO								
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
1	2412	MCS8	21.24	20.07	23.70	234.67	30.00	PASS
6	2437	MCS8	20.52	19.77	23.17	207.56	30.00	PASS
11	2462	MCS8	20.49	20.63	23.57	227.56	30.00	PASS
802.11n_HT20M MIMO								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
1	2412	MCS8	15.42	14.71	18.32	67.94	30.00	PASS
6	2437	MCS8	15.15	14.89	18.26	67.05	30.00	PASS
11	2462	MCS8	15.29	15.17	18.47	70.34	30.00	PASS

802.11n_HT40M Ch0					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	21.89	30.00	PASS
6	2437	MCS0	22.10	30.00	PASS
9	2452	MCS0	21.98	30.00	PASS
802.11n_HT40M Ch0					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	15.23	30.00	PASS
6	2437	MCS0	15.45	30.00	PASS
9	2452	MCS0	15.38	30.00	PASS

802.11n_HT40M Ch1					
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	21.98	30.00	PASS
6	2437	MCS0	22.36	30.00	PASS
9	2452	MCS0	22.13	30.00	PASS
802.11n_HT40M Ch1					
CH	Freq. (MHz)	Data Rate	Max. Avg. Output include tune up tolerance Power (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	15.47	30.00	PASS
6	2437	MCS0	15.48	30.00	PASS
9	2452	MCS0	15.40	30.00	PASS

802.11n_HT40M MIMO								
CH	Freq. (MHz)	Data Rate	Peak Output Power (dBm)		Total Peak Output Power (dBm)	Total Peak Output Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
3	2422	MCS8	21.66	20.15	23.98	250.07	30.00	PASS
6	2437	MCS8	20.63	20.89	23.77	238.36	30.00	PASS
9	2452	MCS8	20.05	19.50	22.79	190.28	30.00	PASS
802.11n_HT40M MIMO								
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Max. Avg. Output include tune up tolerance Power (dBm)	Max. Avg. Output include tune up tolerance Power (mW)	Limit (dBm)	RESULT
			CH 0	CH 1				
3	2422	MCS8	14.64	13.52	17.35	54.35	30.00	PASS
6	2437	MCS8	15.28	15.11	18.43	69.69	30.00	PASS
9	2452	MCS8	13.34	12.97	16.39	43.60	30.00	PASS

EIRP

802.11b Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	16.78	0.20	16.98	36	PASS
6	2437	1	16.93	0.20	17.13	36	PASS
11	2462	1	16.88	0.20	17.08	36	PASS
12	2467	1	0.05	0.20	0.25	36	PASS
13	2472	1	0.05	0.20	0.25	36	PASS

802.11b Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	1	16.92	2.70	19.62	36	PASS
6	2437	1	16.95	2.70	19.65	36	PASS
11	2462	1	16.97	2.70	19.67	36	PASS
12	2467	1	0.05	2.70	2.75	36	PASS
13	2472	1	0.05	2.70	2.75	36	PASS

802.11b_2TX									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	1	16.73	16.68	19.76	4.64	24.40	36	PASS
6	2437	1	16.89	16.75	19.88	4.64	24.52	36	PASS
11	2462	1	16.82	16.73	19.83	4.64	24.47	36	PASS
12	2467	1	0.00	0.00	3.06	4.64	7.70	36	PASS
13	2472	1	0.00	0.00	3.06	4.64	7.70	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	15.86	0.20	16.06	36	PASS
6	2437	6	15.92	0.20	16.12	36	PASS
11	2462	6	15.95	0.20	16.15	36	PASS

802.11g Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	6	15.97	2.70	18.67	36	PASS
6	2437	6	15.93	2.70	18.63	36	PASS
11	2462	6	15.96	2.70	18.66	36	PASS

802.11g_2TX									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	6	15.81	15.48	18.77	4.64	23.41	36	PASS
6	2437	6	15.89	15.65	18.90	4.64	23.53	36	PASS
11	2462	6	14.84	14.13	17.62	4.64	22.26	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	15.45	0.20	15.65	36	PASS
6	2437	MCS0	15.18	0.20	15.38	36	PASS
11	2462	MCS0	15.41	0.20	15.61	36	PASS

802.11n_HT20M Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
1	2412	MCS0	15.47	2.70	18.17	36	PASS
6	2437	MCS0	15.45	2.70	18.15	36	PASS
11	2462	MCS0	15.44	2.70	18.14	36	PASS

802.11n_HT20M MIMO									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
1	2412	MCS8	21.24	20.07	18.32	4.64	22.96	36	PASS
6	2437	MCS8	20.52	19.77	18.26	4.64	22.90	36	PASS
11	2462	MCS8	20.49	20.63	18.47	4.64	23.11	36	PASS

802.11n_HT40M Ch0							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	15.23	0.20	15.43	36	PASS
6	2437	MCS0	15.45	0.20	15.65	36	PASS
9	2452	MCS0	15.38	0.20	15.58	36	PASS

802.11n_HT40M Ch1							
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
3	2422	MCS0	15.47	2.70	18.17	36	PASS
6	2437	MCS0	15.48	2.70	18.18	36	PASS
9	2452	MCS0	15.40	2.70	18.10	36	PASS

802.11n_HT40M MIMO									
CH	Freq. (MHz)	Data Rate	Avg. Output Power (dBm)		Total Avg. Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	RESULT
			CH 0	CH 1					
3	2422	MCS8	14.64	13.52	17.35	4.64	21.99	36	PASS
6	2437	MCS8	15.28	15.11	18.43	4.64	23.07	36	PASS
9	2452	MCS8	13.34	12.97	16.39	4.64	21.03	36	PASS

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

9 6DB BANDWIDTH MEASUREMENT

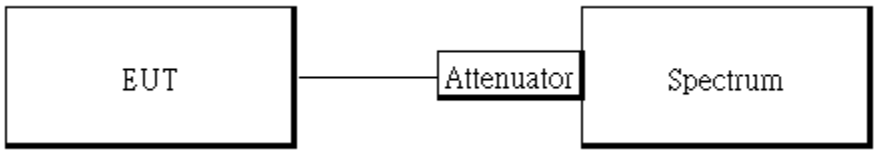
9.1 Standard Applicable

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

9.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	KEYSIGHT	N9010B	MY590701916	03/22/2020	03/21/2021
DC Block	PASTERNACK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF245	11/20/2019	11/19/2020

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 = large enough to capture all products of the modulation process, Detector=peak, Sweep=auto.
5. Mark the peak frequency and –6dB (upper and lower) frequency.

9.5 6dB Bandwidth

802.11b Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	8098.00	> 500	PASS
2437	**8120.00**	> 500	PASS
2462	8113.00	> 500	PASS

802.11b Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	8107.00	> 500	PASS
2437	**8121.00**	> 500	PASS
2462	8120.00	> 500	PASS

802.11g Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15150.00	> 500	PASS
2437	15550.00	> 500	PASS
2462	**15720.00**	> 500	PASS

802.11g Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15150.00	> 500	PASS
2437	**16000.00**	> 500	PASS
2462	15740.00	> 500	PASS

802.11_n_HT20 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15150.00	> 500	PASS
2437	**15750.00**	> 500	PASS
2462	15730.00	> 500	PASS

802.11_n_HT20 Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2412	15970.00	> 500	PASS
2437	**16560.00**	> 500	PASS
2462	16060.00	> 500	PASS

802.11_n_HT40 Ch0

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35150.00	> 500	PASS
2437	**35320.00**	> 500	PASS
2452	35180.00	> 500	PASS

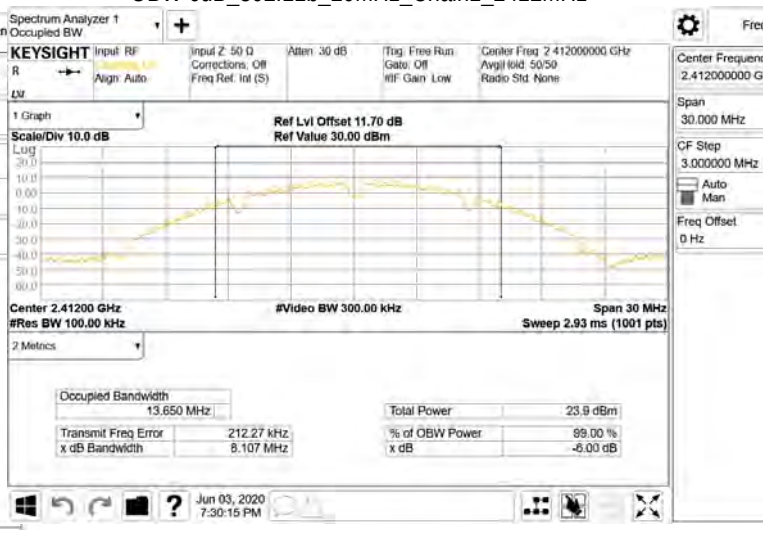
802.11_n_HT40 Ch1

Freq. (MHz)	6dB BW (kHz)	Limit (kHz)	Result
2422	35140.00	> 500	PASS
2437	**35790.00**	> 500	PASS
2452	35750.00	> 500	PASS

Refer to next page for plots

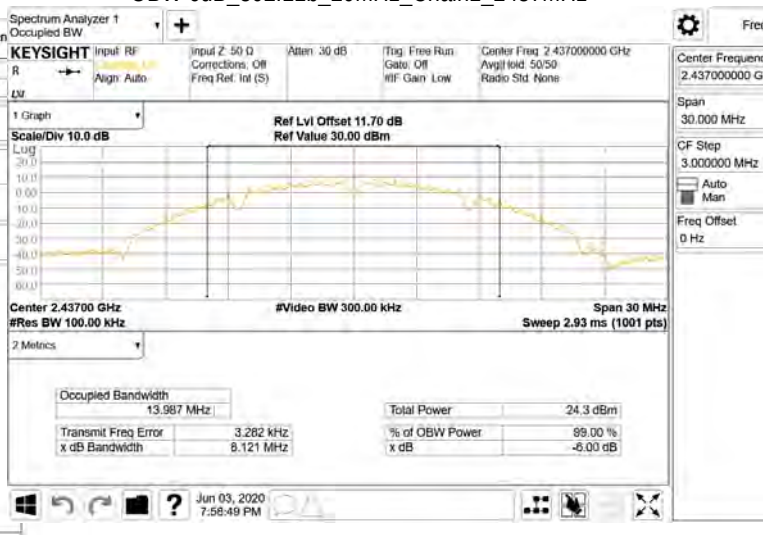
OBW 6dB_802.11b_20MHz_Chain0_2412MHz

OBW 6dB_802.11b_20MHz_Chain1_2412MHz



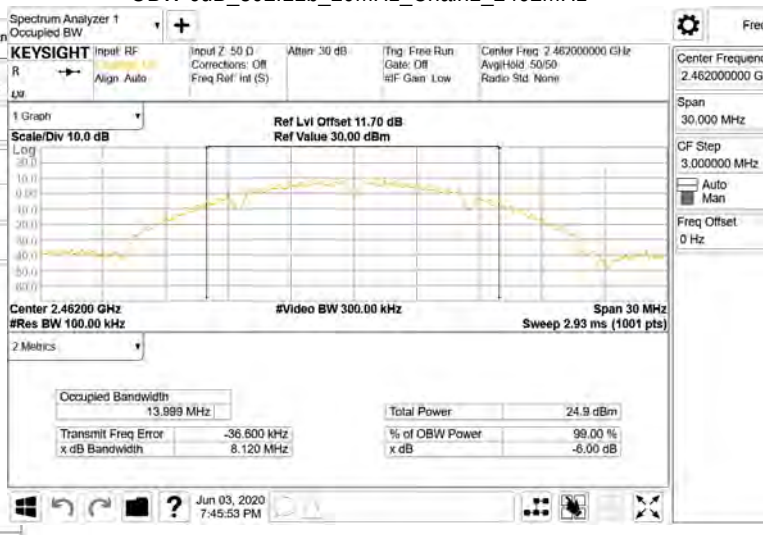
OBW 6dB_802.11b_20MHz_Chain0_2437MHz

OBW 6dB_802.11b_20MHz_Chain1_2437MHz



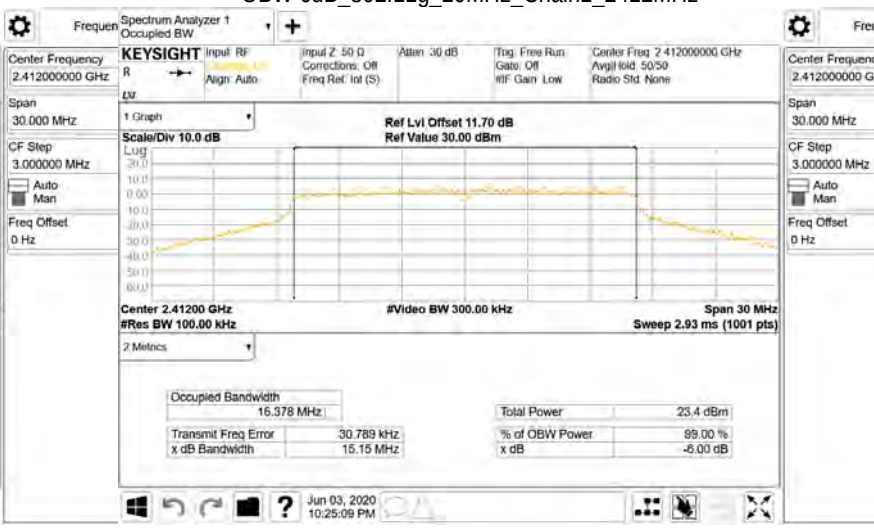
OBW 6dB_802.11b_20MHz_Chain0_2462MHz

OBW 6dB_802.11b_20MHz_Chain1_2462MHz



OBW 6dB_802.11g_20MHz_Chain0_2412MHz

OBW 6dB_802.11g_20MHz_Chain1_2412MHz

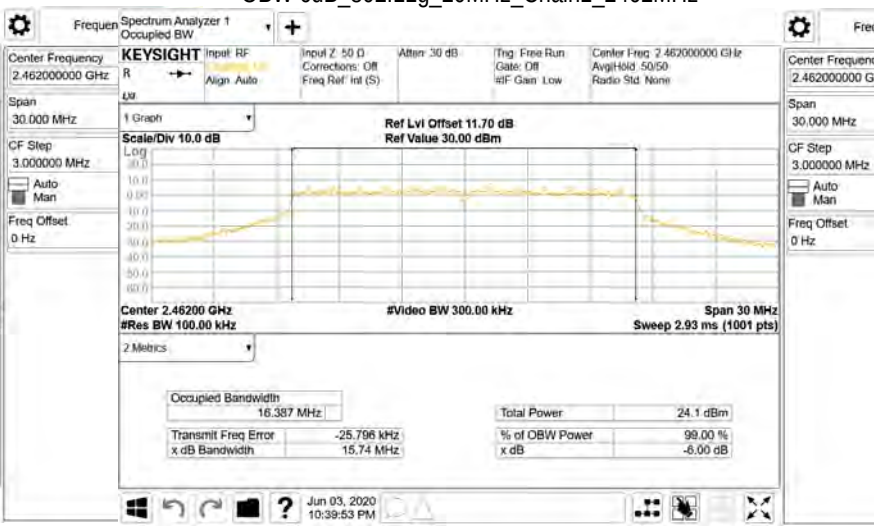


OBW 6dB_802.11g_20MHz_Chain0_2437MHz

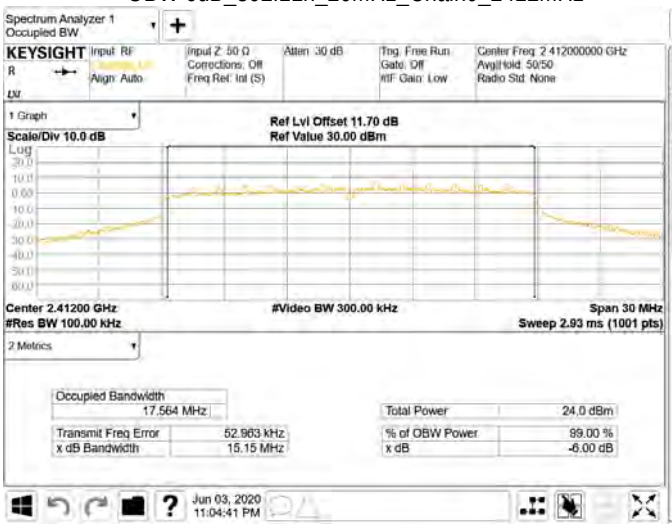
OBW 6dB_802.11g_20MHz_Chain1_2437MHz

OBW 6dB_802.11g_20MHz_Chain0_2462MHz

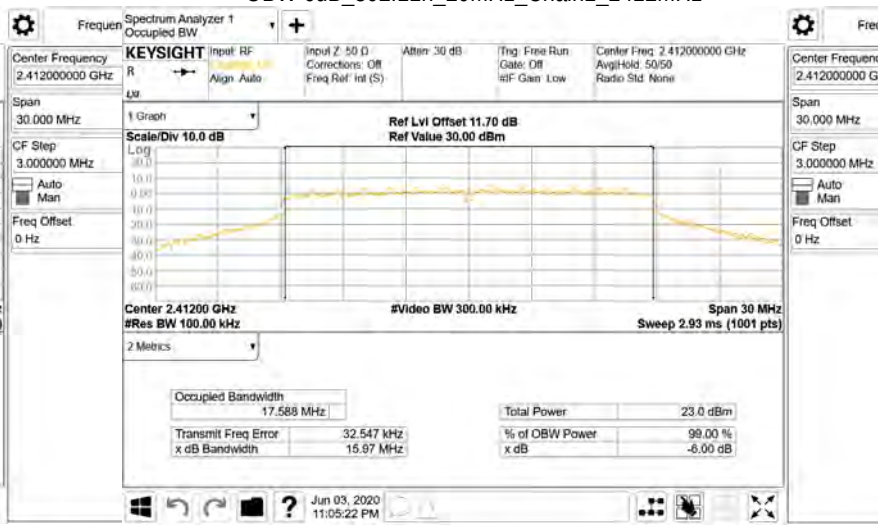
OBW 6dB_802.11g_20MHz_Chain1_2462MHz



OBW 6dB_802.11n_20MHz_Chain0_2412MHz

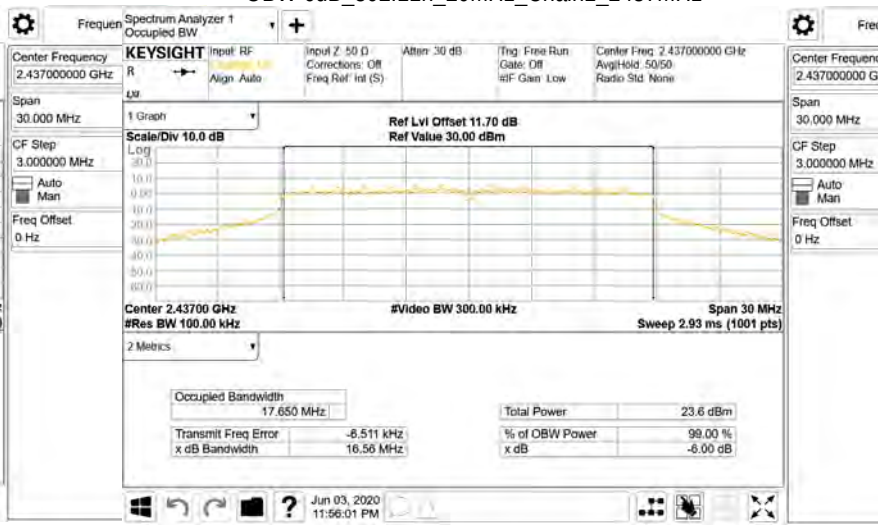


OBW 6dB_802.11n_20MHz_Chain1_2412MHz



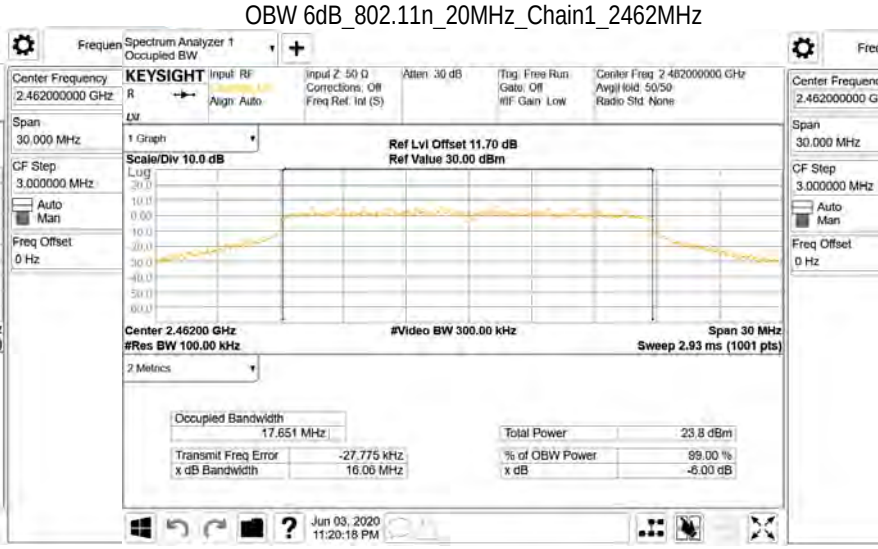
OBW 6dB_802.11n_20MHz_Chain0_2437MHz

OBW 6dB_802.11n_20MHz_Chain1_2437MHz



OBW 6dB_802.11n_20MHz_Chain0_2462MHz

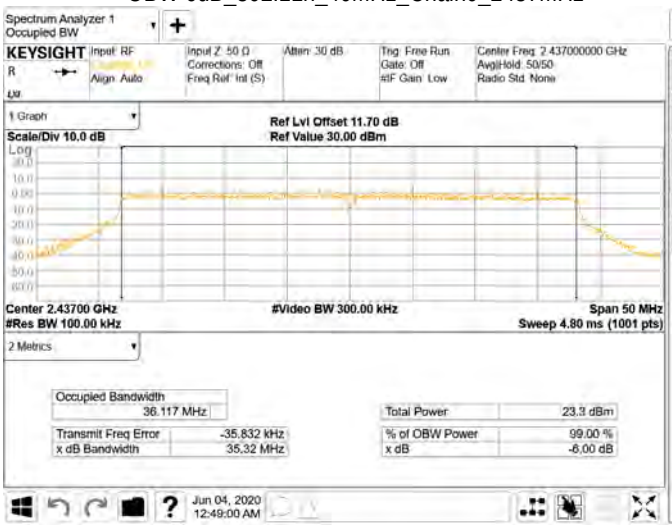
OBW 6dB_802.11n_20MHz_Chain1_2462MHz



OBW 6dB_802.11n_40MHz_Chain0_2422MHz

OBW 6dB_802.11n_40MHz_Chain1_2422MHz

OBW 6dB_802.11n_40MHz_Chain0_2437MHz



OBW 6dB_802.11n_40MHz_Chain1_2437MHz

OBW 6dB_802.11n_40MHz_Chain0_2452MHz

OBW 6dB_802.11n_40MHz_Chain1_2452MHz

10 CONDUCTED BAND EDGES AND SPURIOUS EMISSION MEASUREMENT

10.1 Standard Applicable

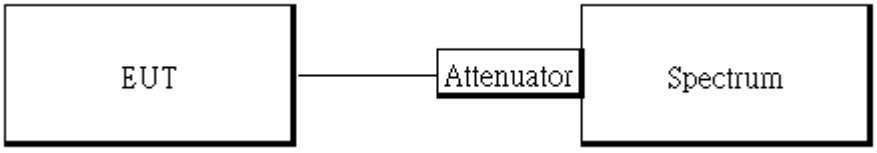
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the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

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

10.2 Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Spectrum Analyzer	KEYSIGHT	N9010B	MY590701916	03/22/2020	03/21/2021
DC Block	PASTERNACK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF245	11/20/2019	11/19/2020

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.
9. Use the peak marker function to determine the maximum amplitude level.
10. 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.

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.

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	11.68	-8.32
2437	11.99	-8.01
2462	12.61	-7.39

Reference Level of Limit 802.11g mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	9.75	-10.25
2437	10.01	-9.99
2462	10.26	-9.74

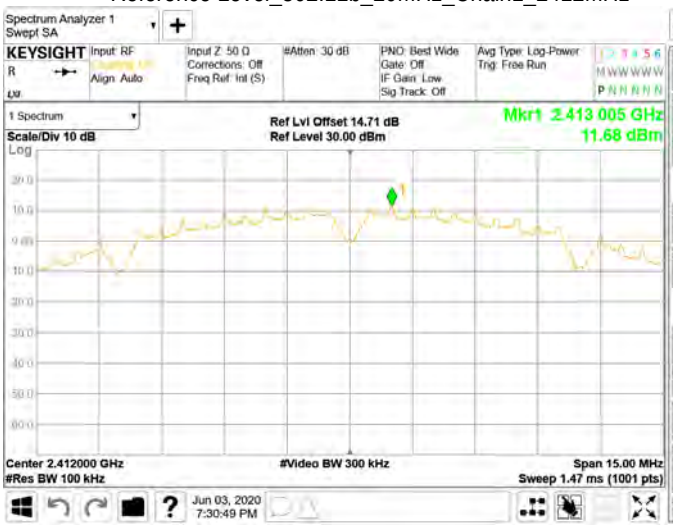
Reference Level of Limit 802.11n20 mode		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2412	9.22	-10.78
2437	9.58	-10.42
2462	9.60	-10.40

Reference Level of Limit 802.11n40 MODE		
Freq. (MHz)	PSD (dBm)	Reference Level of Limit (dBm)
2422	6.66	-13.34
2437	5.15	-14.85
2452	6.03	-13.97

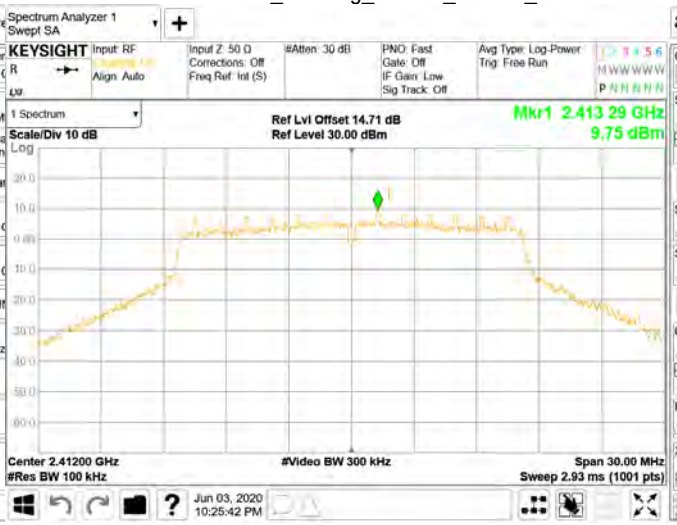
Note

Cable Loss 11.70 dB

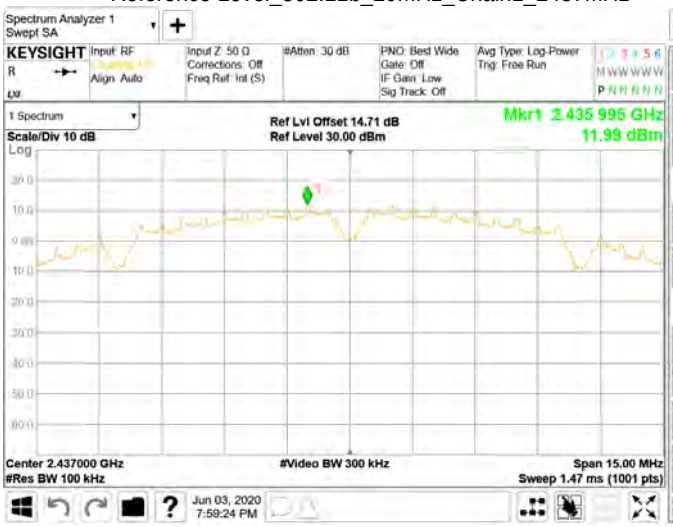
Reference Level_802.11b_20MHz_Chain1_2412MHz



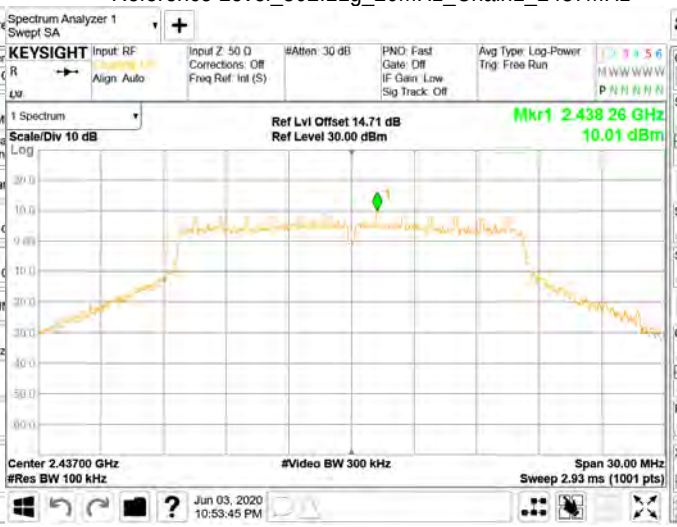
Reference Level_802.11g_20MHz_Chain1_2412MHz



Reference Level_802.11b_20MHz_Chain1_2437MHz

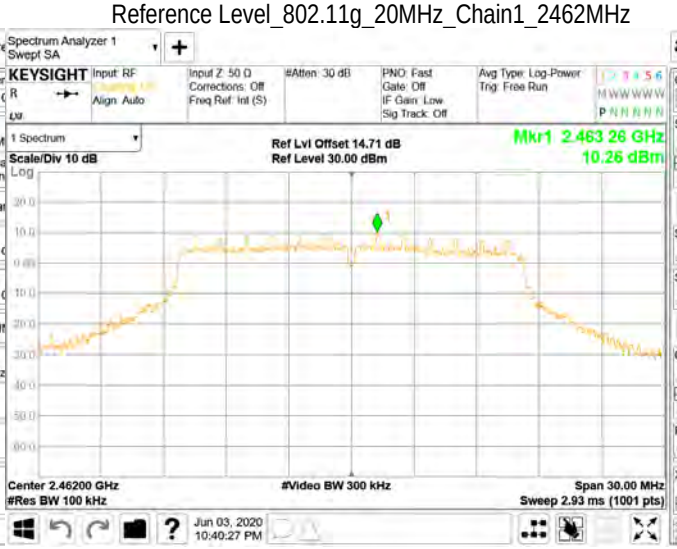


Reference Level_802.11g_20MHz_Chain1_2437MHz

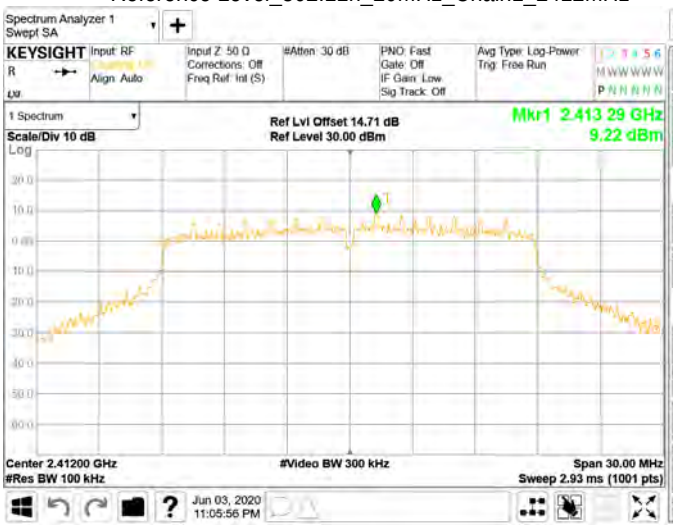


Reference Level_802.11b_20MHz_Chain1_2462MHz

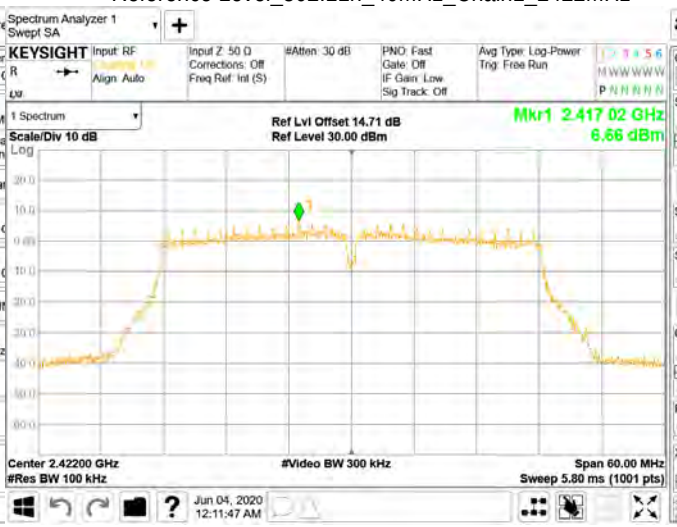
Reference Level_802.11g_20MHz_Chain1_2462MHz



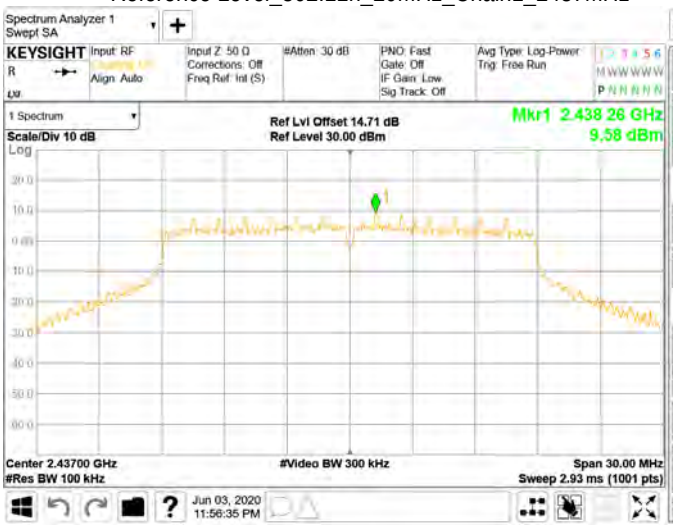
Reference Level_802.11n_20MHz_Chain1_2412MHz



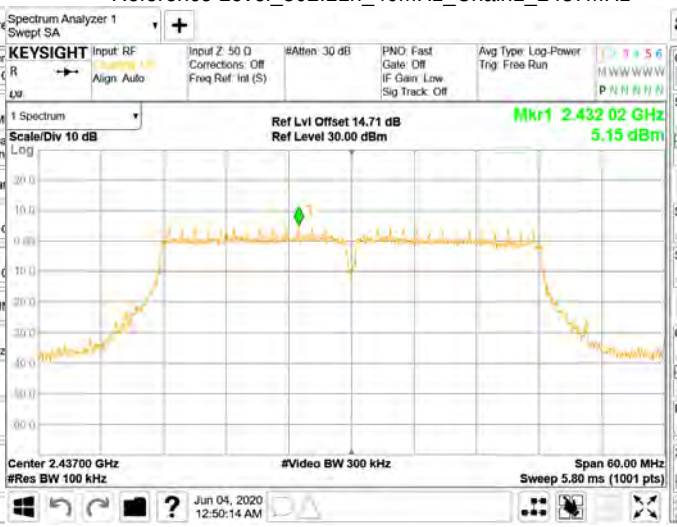
Reference Level_802.11n_40MHz_Chain1_2422MHz



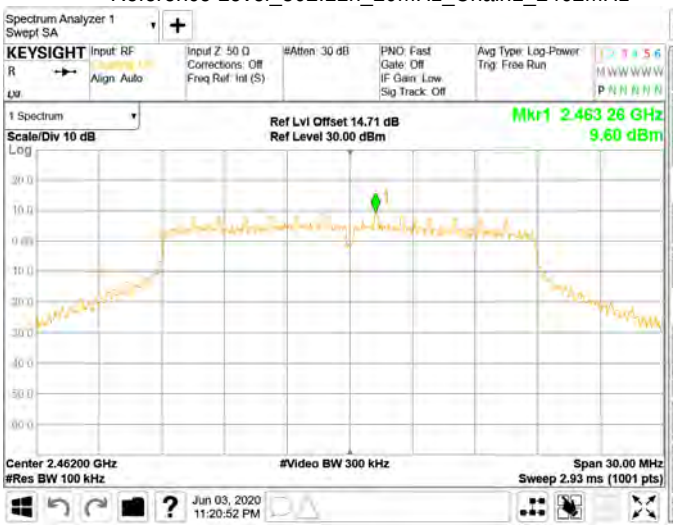
Reference Level_802.11n_20MHz_Chain1_2437MHz



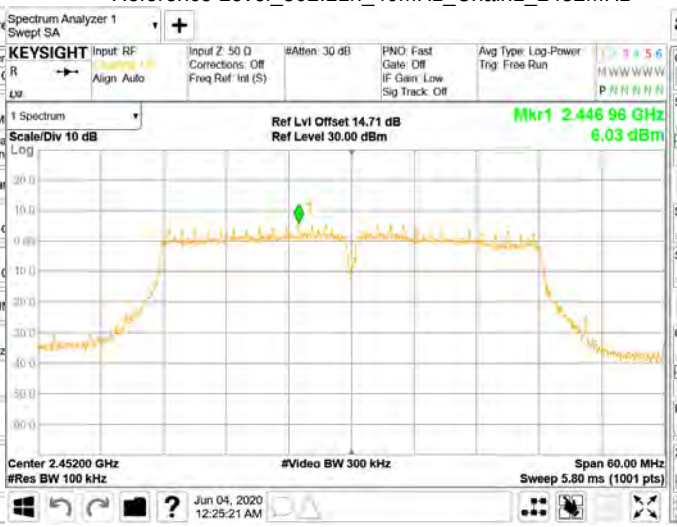
Reference Level_802.11n_40MHz_Chain1_2437MHz



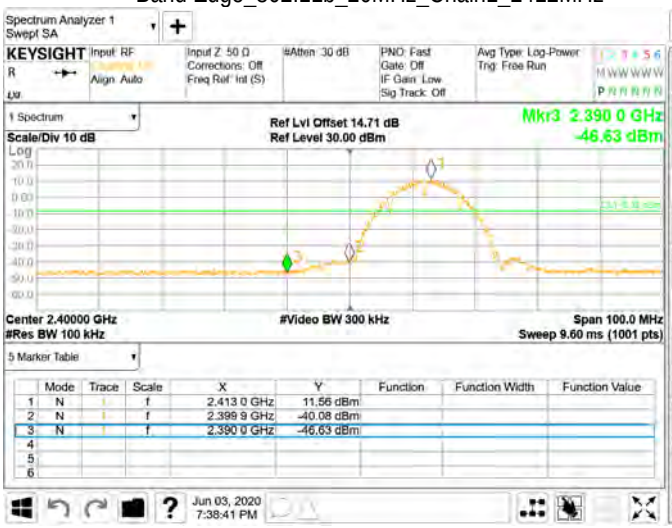
Reference Level_802.11n_20MHz_Chain1_2462MHz



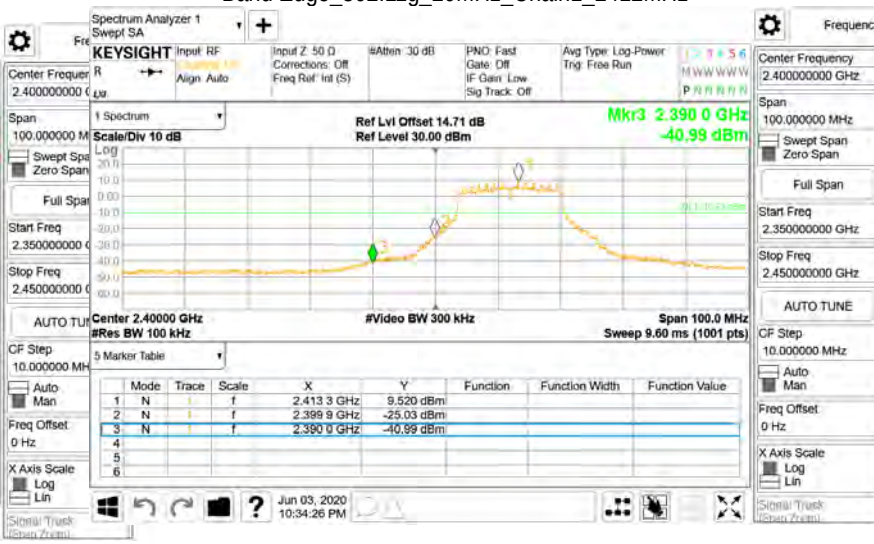
Reference Level_802.11n_40MHz_Chain1_2452MHz



Band Edge_802.11b_20MHz_Chain1_2412MHz

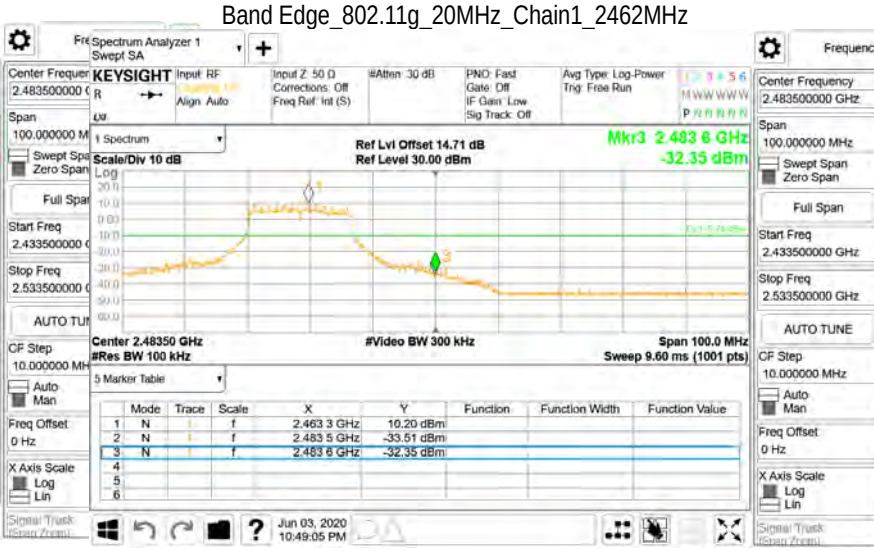


Band Edge_802.11g_20MHz_Chain1_2412MHz

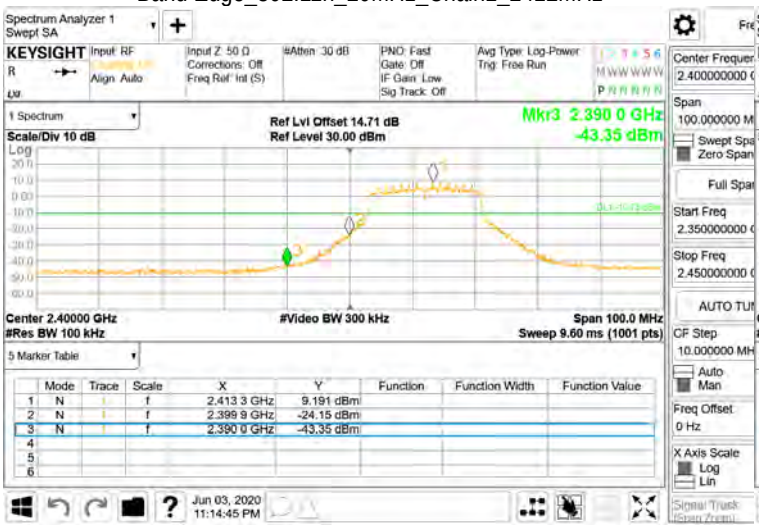


Band Edge_802.11b_20MHz_Chain1_2462MHz

Band Edge_802.11g_20MHz_Chain1_2462MHz



Band Edge_802.11n_20MHz_Chain1_2412MHz



Band Edge_802.11n_40MHz_Chain1_2422MHz

Band Edge_802.11n_20MHz_Chain1_2462MHz

Band Edge_802.11n_40MHz_Chain1_2452MHz

11 RADIATED BANDEDGE AND SPURIOUS EMISSION MEASUREMENT

11.1 Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands must also comply with the §15.209 limit as below.

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

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

Note:

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

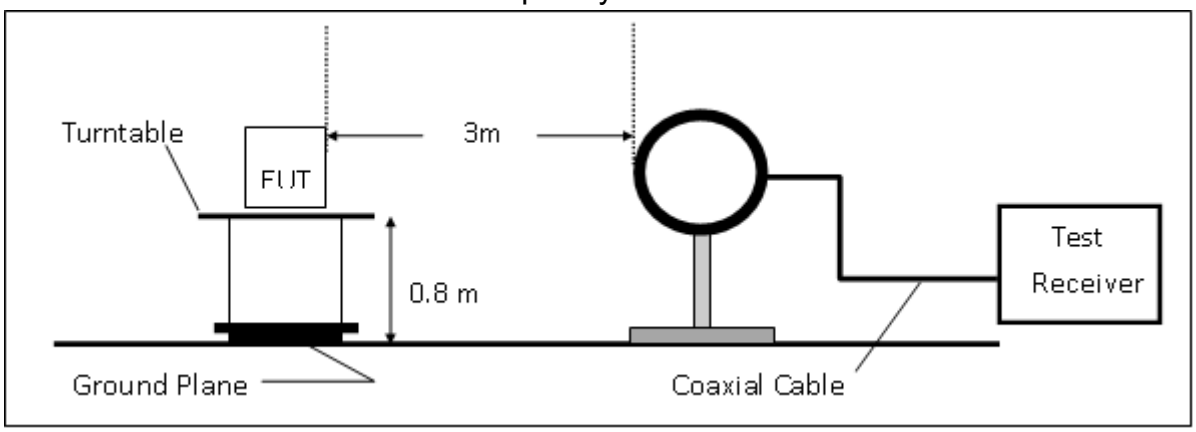
11.2 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	**MFR**	**MODEL NUMBER**	**SERIAL NUMBER**	**LAST CAL.**	**CAL DUE.**
Horn Antenna	Schwarzbeck	BBHA9170	185	08/07/2019	08/06/2020
Horn Antenna	Schwarzbeck	BBHA9120D	1187	01/10/2020	01/09/2021
EMI Test Receiv-er	R&S	ESU 40	100363	04/29/2020	04/28/2021
Pre-Amplifier	EMC Instru-ments	EMC0011830	980199	11/20/2019	11/19/2020
Pre-Amplifier	EMC Instru-ments	EMC184045B	980135	11/20/2019	11/19/2020
Attenuator	Woken	WATT-218FS-10	RF25	11/20/2019	11/19/2020
Highpass Filter	Micro Tronics	BRM50701-01	G008	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	SUCOFLEX 104	MY17388/4	11/20/2019	11/19/2020
Coaxial Cable	Huber Suhner	RG 214/U	W22.03	11/20/2019	11/19/2020

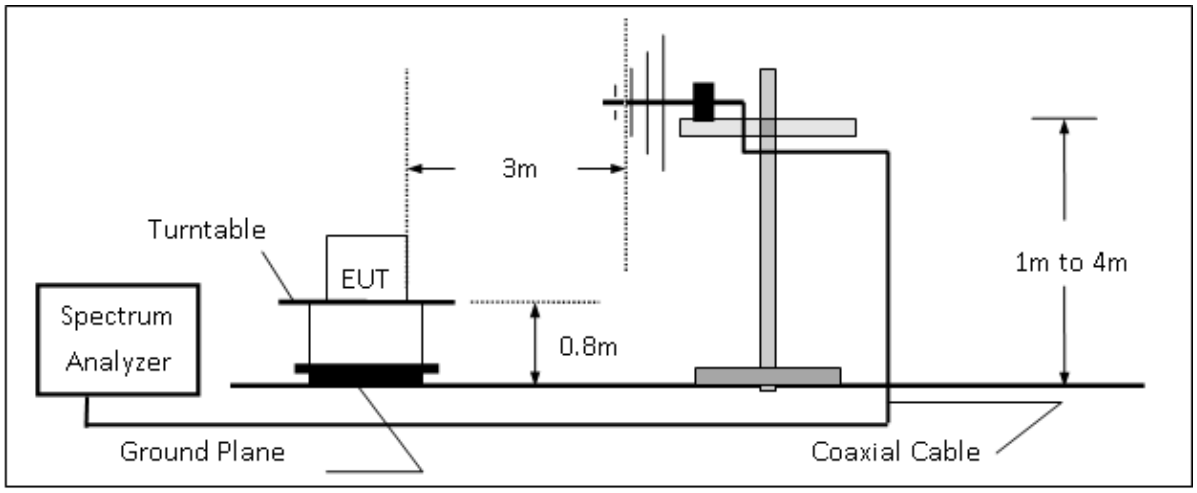
NOTE: N.C.R refers to Not Calibrated Required.

11.3 Test SET-UP

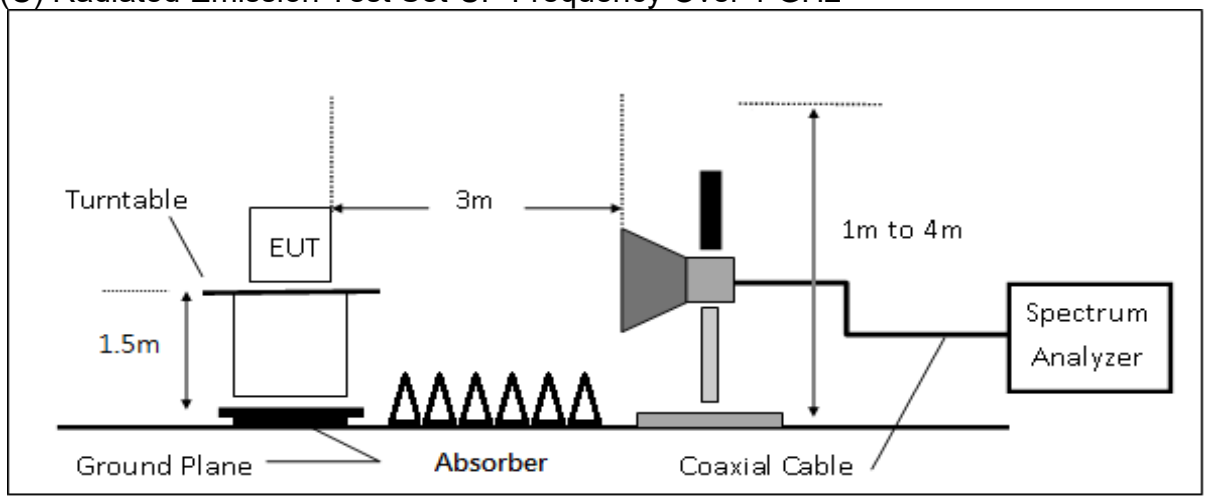
(A) Radiated Emission Test Set-UP Frequency Below 30MHz.



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



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



11.4 Measurement Procedure

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

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 dBuV/m, which converts 20*log(uV/m)*

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

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

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

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

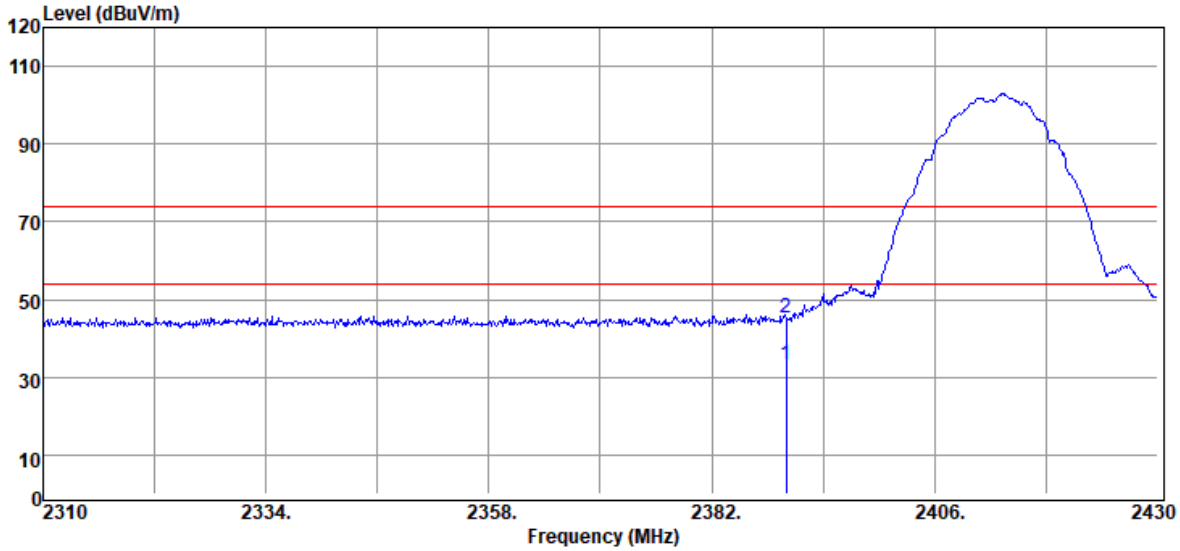
11.7 Measurement Result

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*

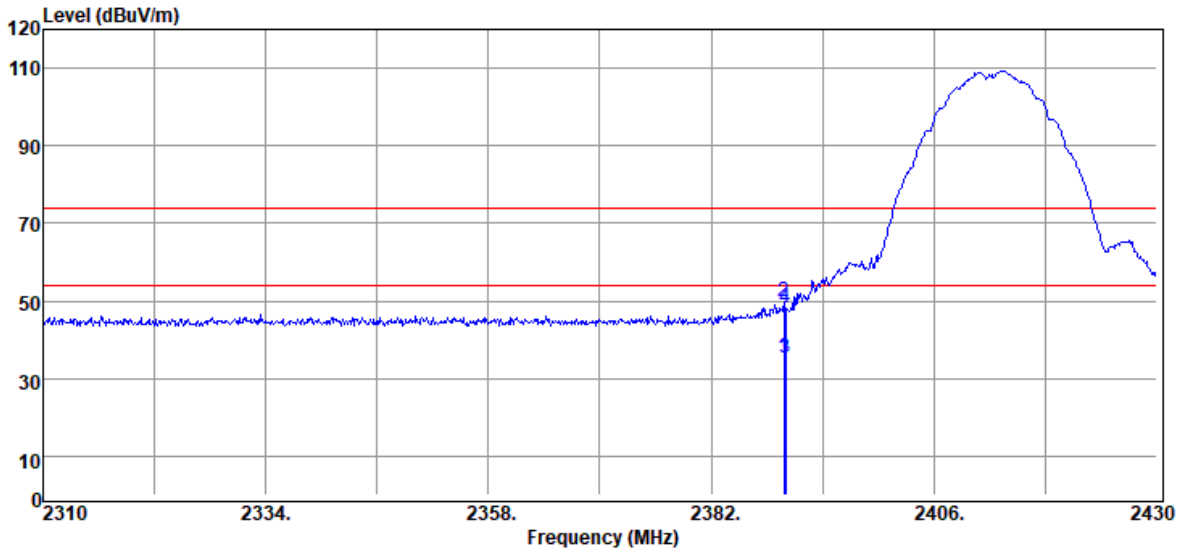
11.7.1 Radiated Band Edge Measurement Result

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11b	Temp./Humi.	:22.5/66
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



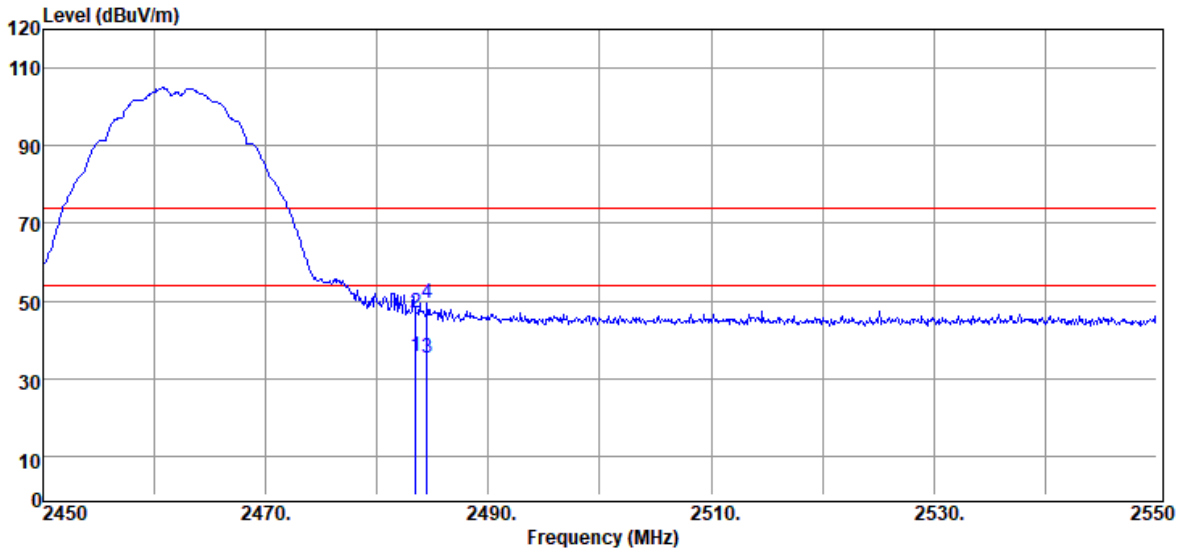
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	29.61	3.76	33.37	54.00	-20.63
2390.00	Peak	41.38	3.76	45.14	74.00	-28.86

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11b	Temp./Humi.	:22.5/66
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



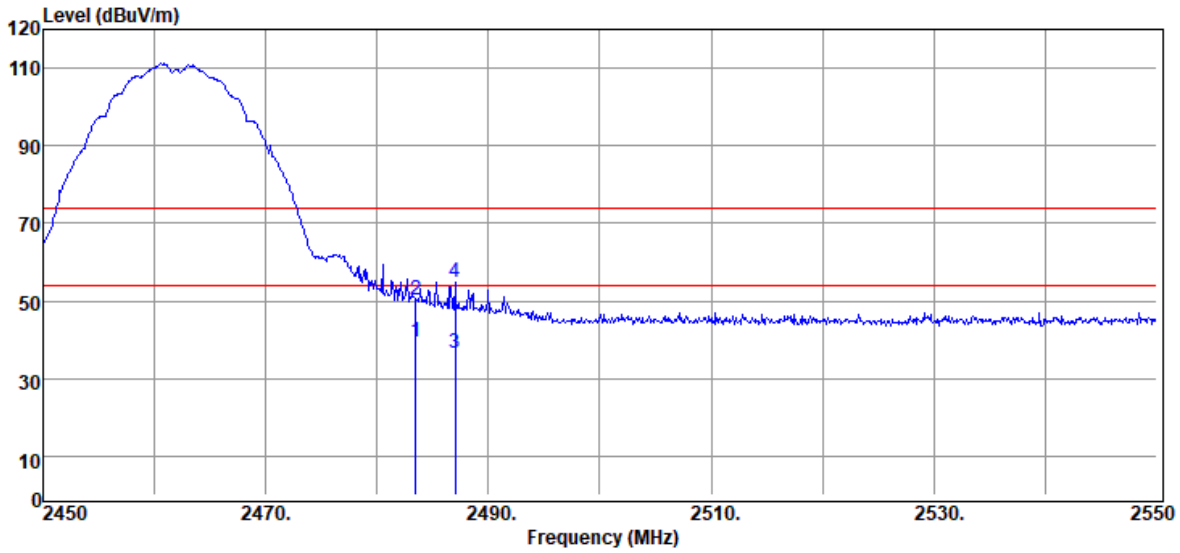
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2389.80	Average	31.58	3.76	35.34	54.00	-18.66
2389.80	Peak	46.07	3.76	49.83	74.00	-24.17
2390.00	Average	31.65	3.76	35.41	54.00	-18.59
2390.00	Peak	44.56	3.76	48.32	74.00	-25.68

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11b	Temp./Humi.	:22.5/66
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



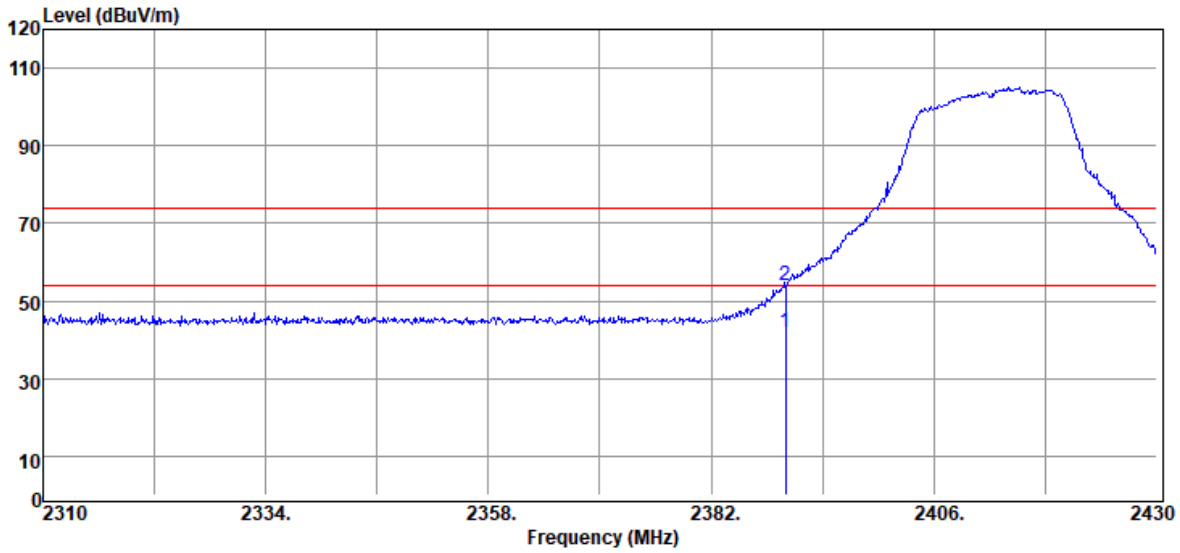
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	31.25	4.42	35.67	54.00	-18.33
2483.50	Peak	42.31	4.42	46.73	74.00	-27.27
2484.50	Average	30.81	4.45	35.26	54.00	-18.74
2484.50	Peak	45.09	4.45	49.54	74.00	-24.46

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11b	Temp./Humi.	:22.5/66
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



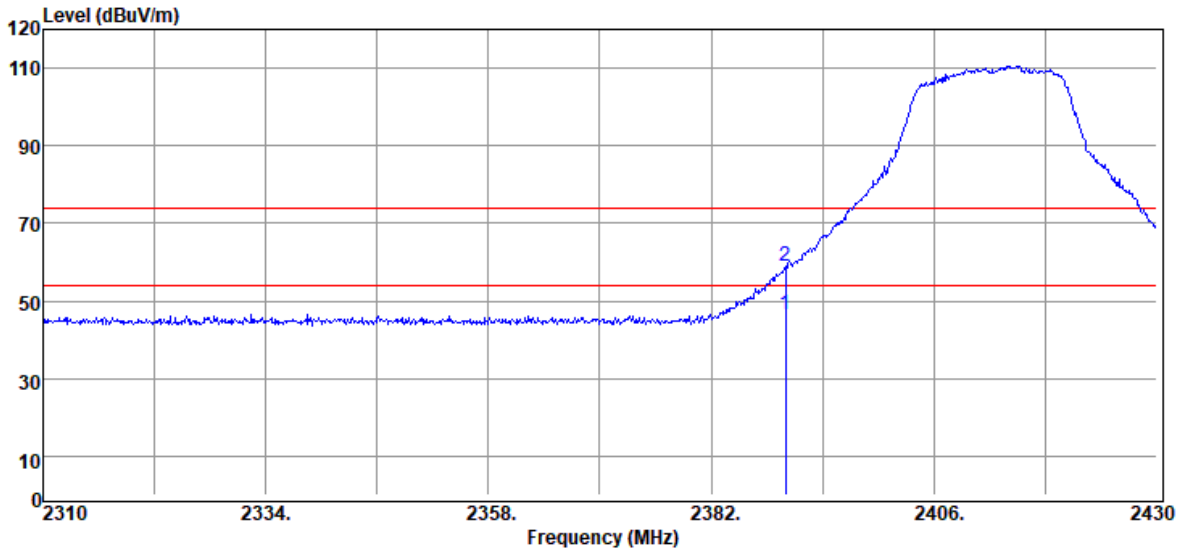
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	34.92	4.42	39.34	54.00	-14.66
2483.50	Peak	45.95	4.42	50.37	74.00	-23.63
2487.00	Average	32.17	4.46	36.63	54.00	-17.37
2487.00	Peak	50.33	4.46	54.79	74.00	-19.21

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11g	Temp./Humi.	:22.5/66
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



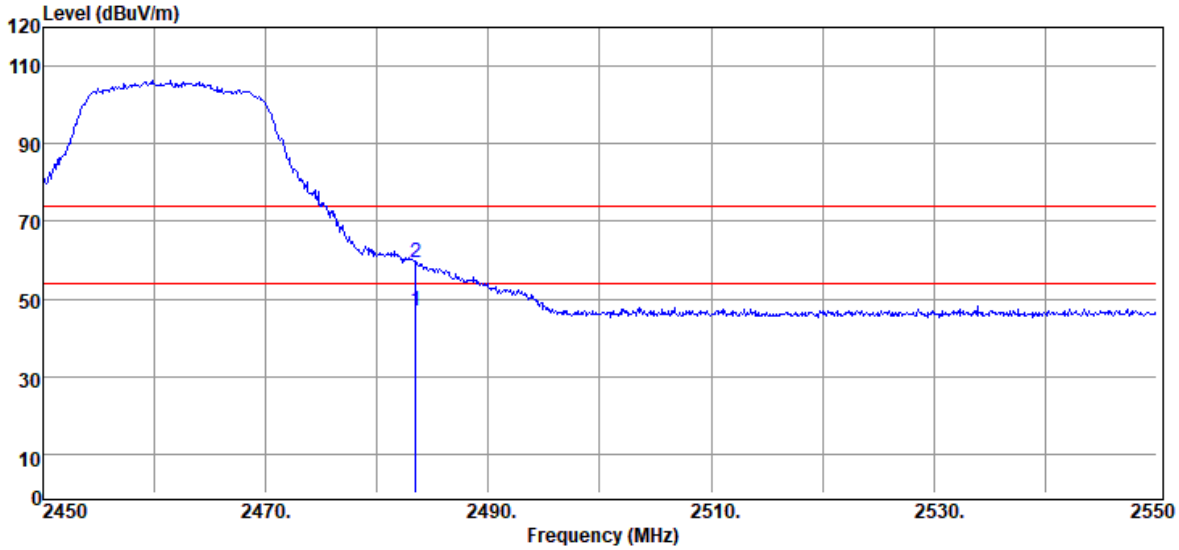
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	38.27	3.76	42.03	54.00	-11.97
2390.00	Peak	50.33	3.76	54.09	74.00	-19.91

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11g	Temp./Humi.	:22.5/66
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



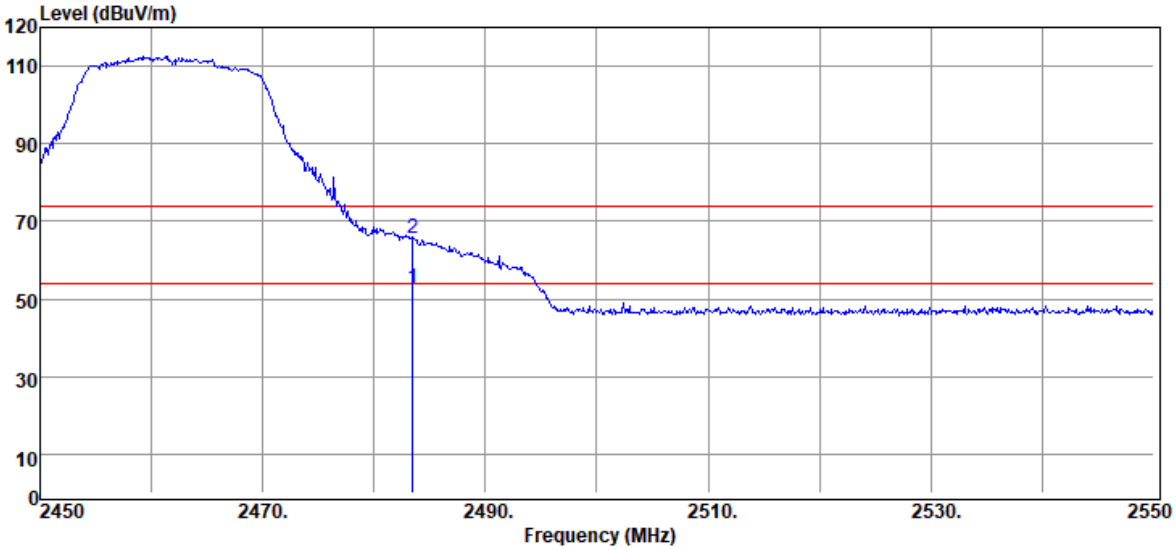
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	42.72	3.76	46.48	54.00	-7.52
2390.00	Peak	55.12	3.76	58.88	74.00	-15.12

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11g	Temp./Humi.	:22.5/66
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



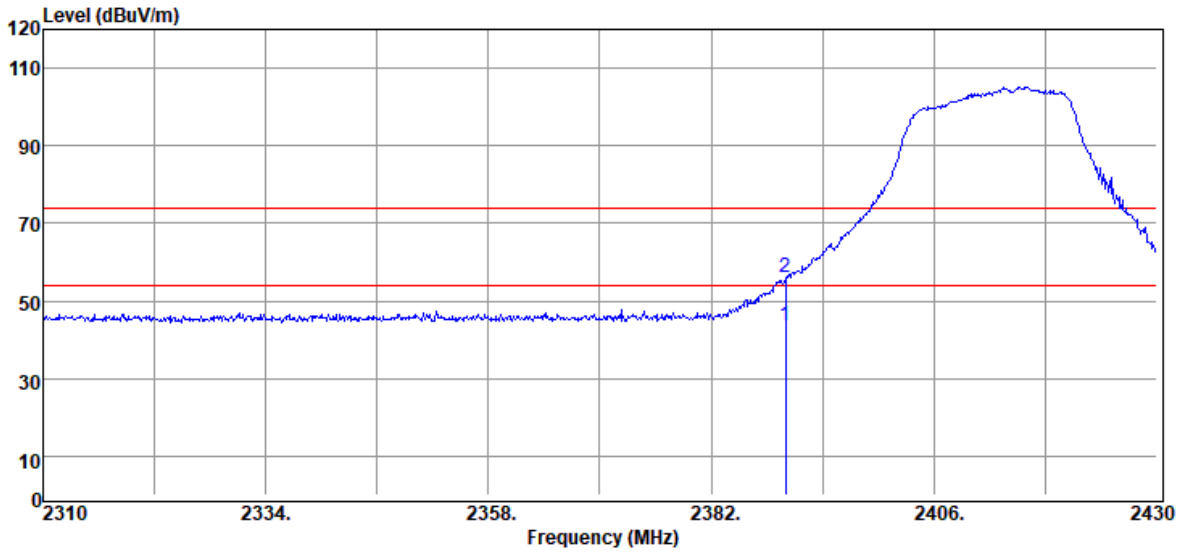
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	42.40	4.42	46.82	54.00	-7.18
2483.50	Peak	54.96	4.42	59.38	74.00	-14.62

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11g	Temp./Humi.	:22.5/66
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



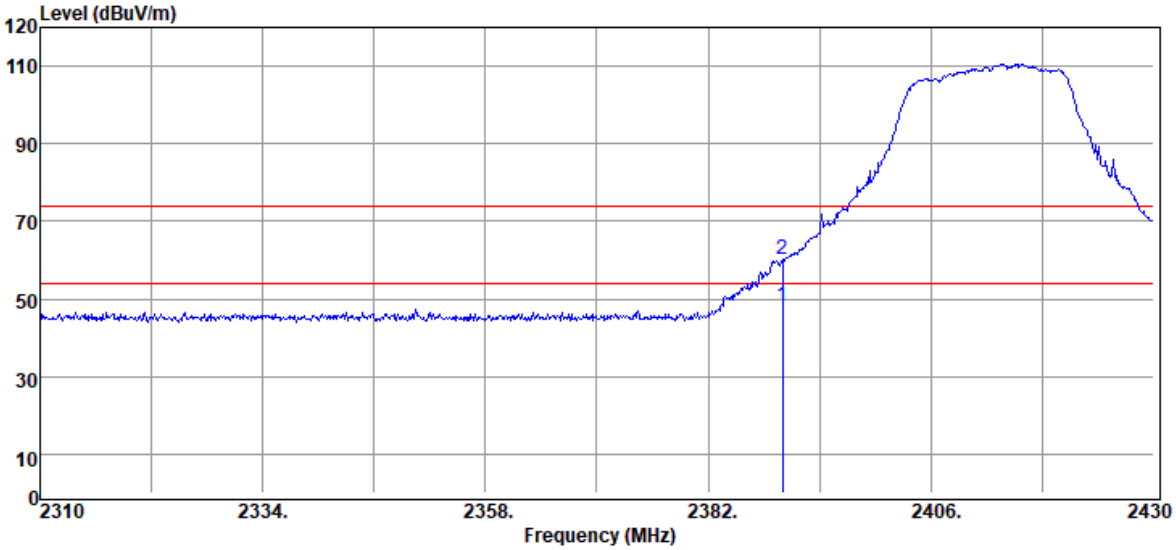
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	48.35	4.42	52.77	54.00	-1.23
2483.50	Peak	61.16	4.42	65.58	74.00	-8.42

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n20	Temp./Humi.	:22.5/66
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



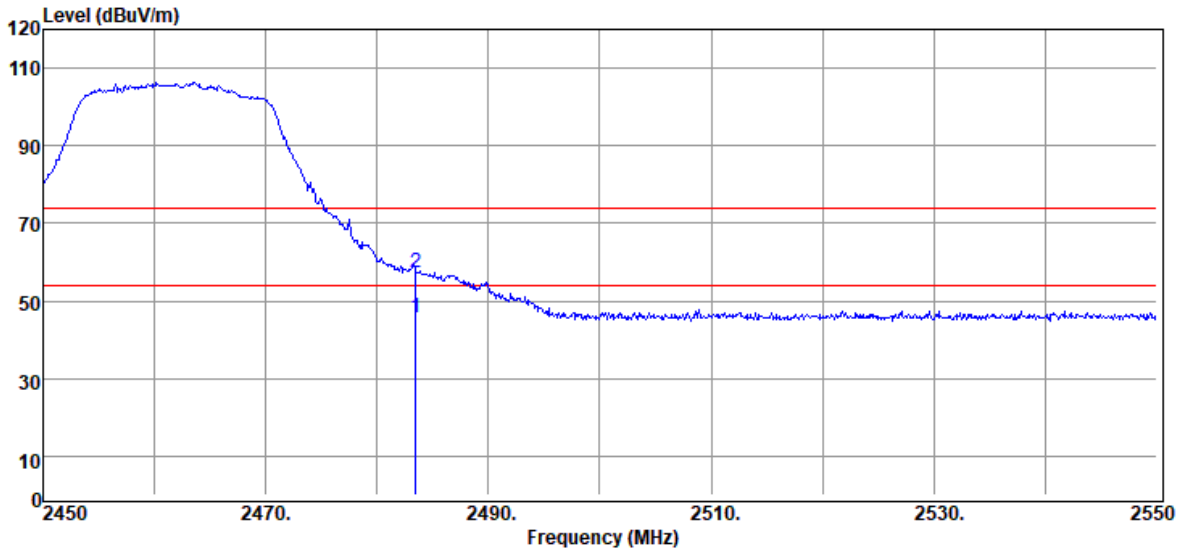
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	39.64	3.76	43.40	54.00	-10.60
2390.00	Peak	52.18	3.76	55.94	74.00	-18.06

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n20	Temp./Humi.	:22.5/66
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



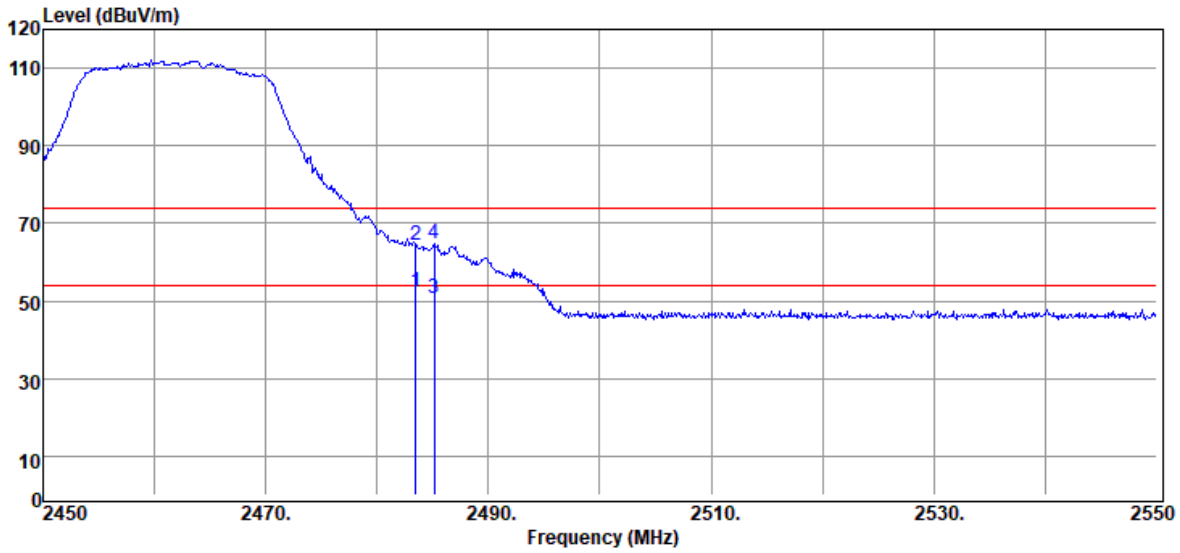
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	44.26	3.76	48.02	54.00	-5.98
2390.00	Peak	56.31	3.76	60.07	74.00	-13.93

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n20	Temp./Humi.	:22.5/66
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



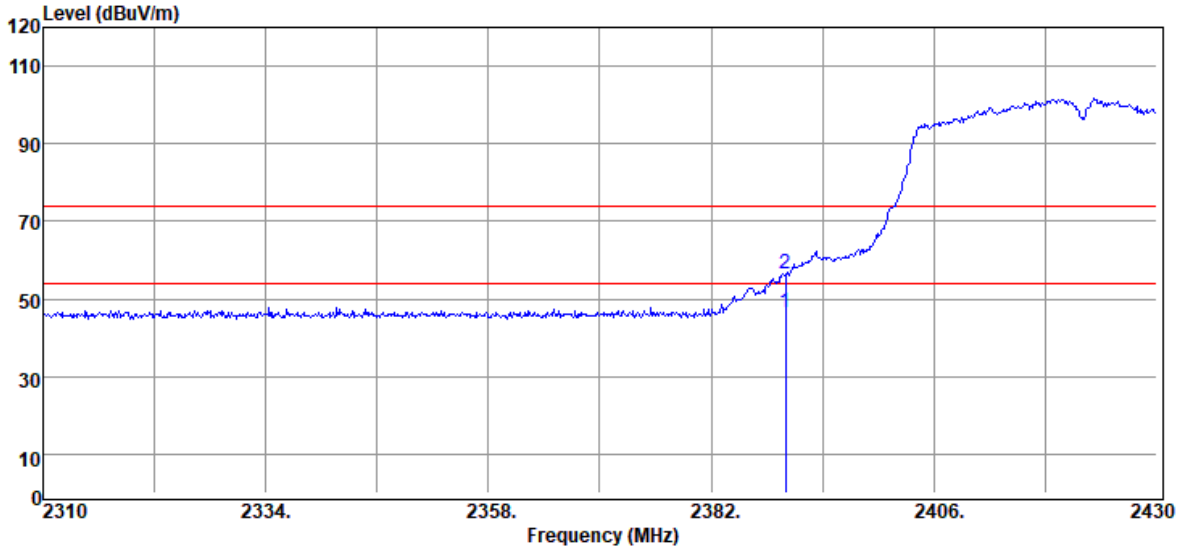
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	41.17	4.42	45.59	54.00	-8.41
2483.50	Peak	52.93	4.42	57.35	74.00	-16.65

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n20	Temp./Humi.	:22.5/66
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



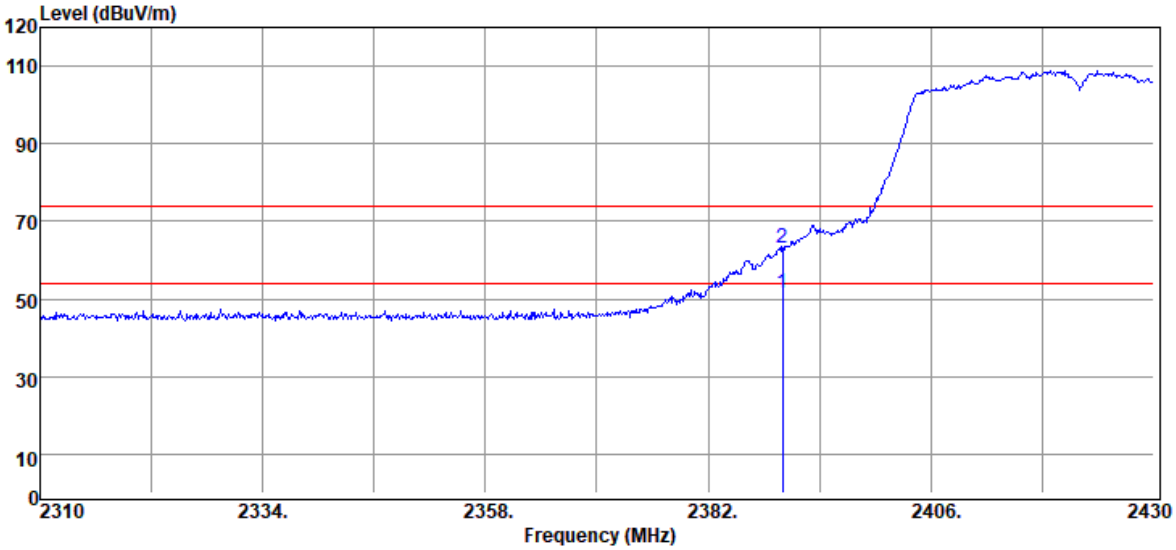
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	47.71	4.42	52.13	54.00	-1.87
2483.50	Peak	59.85	4.42	64.27	74.00	-9.73
2485.10	Average	46.40	4.45	50.85	54.00	-3.15
2485.10	Peak	60.46	4.45	64.91	74.00	-9.09

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n40	Temp./Humi.	:22.5/66
Test Frequency	:2422 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



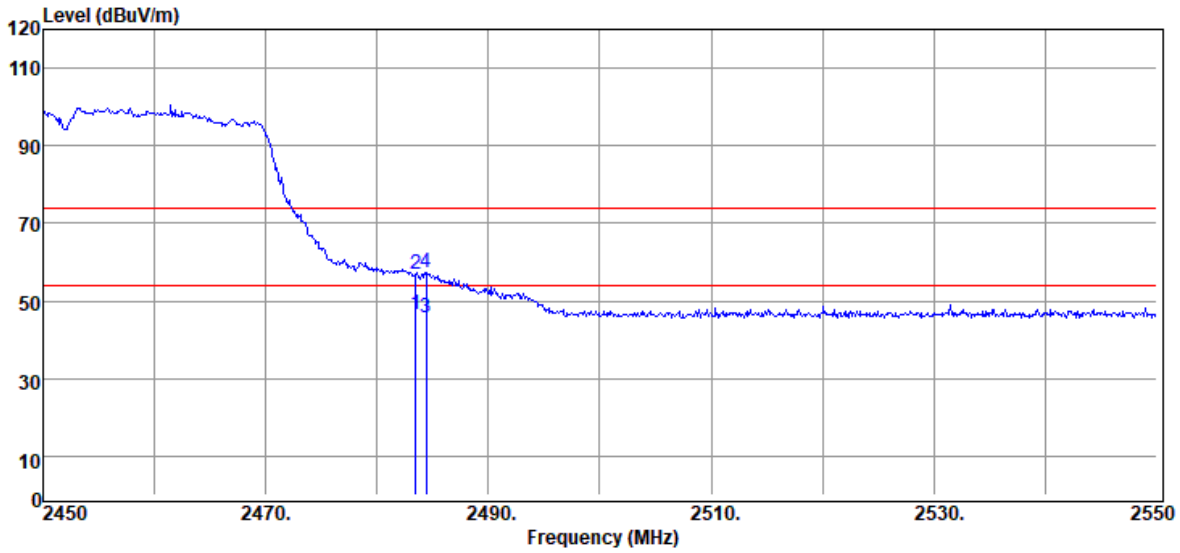
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	42.73	3.76	46.49	54.00	-7.51
2390.00	Peak	52.83	3.76	56.59	74.00	-17.41

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n40	Temp./Humi.	:22.5/66
Test Frequency	:2422 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



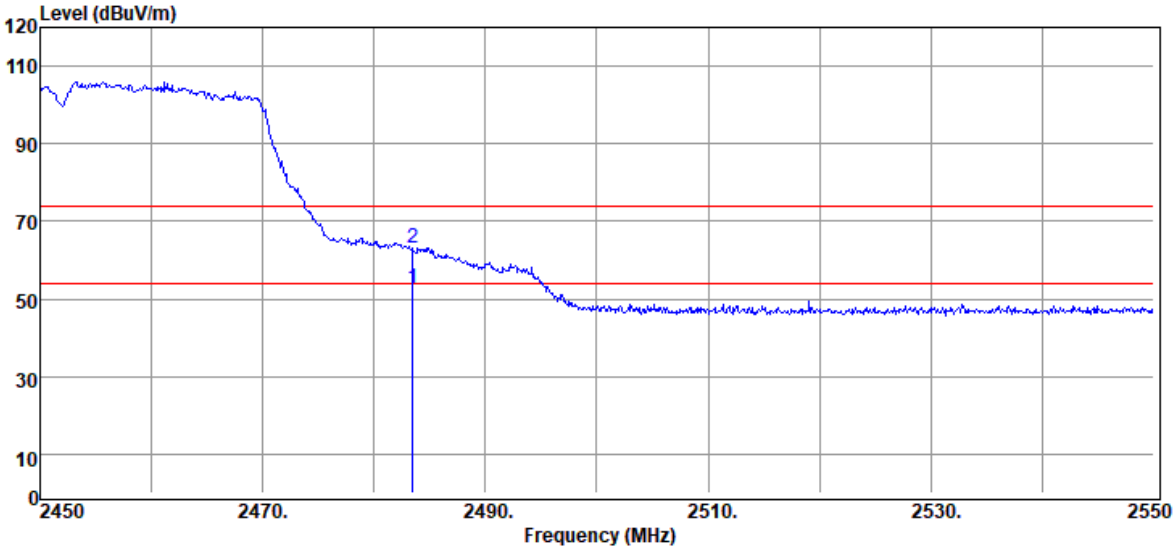
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2390.00	Average	47.56	3.76	51.32	54.00	-2.68
2390.00	Peak	59.34	3.76	63.10	74.00	-10.90

Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n40	Temp./Humi.	:22.5/66
Test Frequency	:2452 MHz	Antenna Pol.	:VERTICAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	42.15	4.42	46.57	54.00	-7.43
2483.50	Peak	52.67	4.42	57.09	74.00	-16.91
2484.40	Average	41.42	4.45	45.87	54.00	-8.13
2484.40	Peak	52.99	4.45	57.44	74.00	-16.56

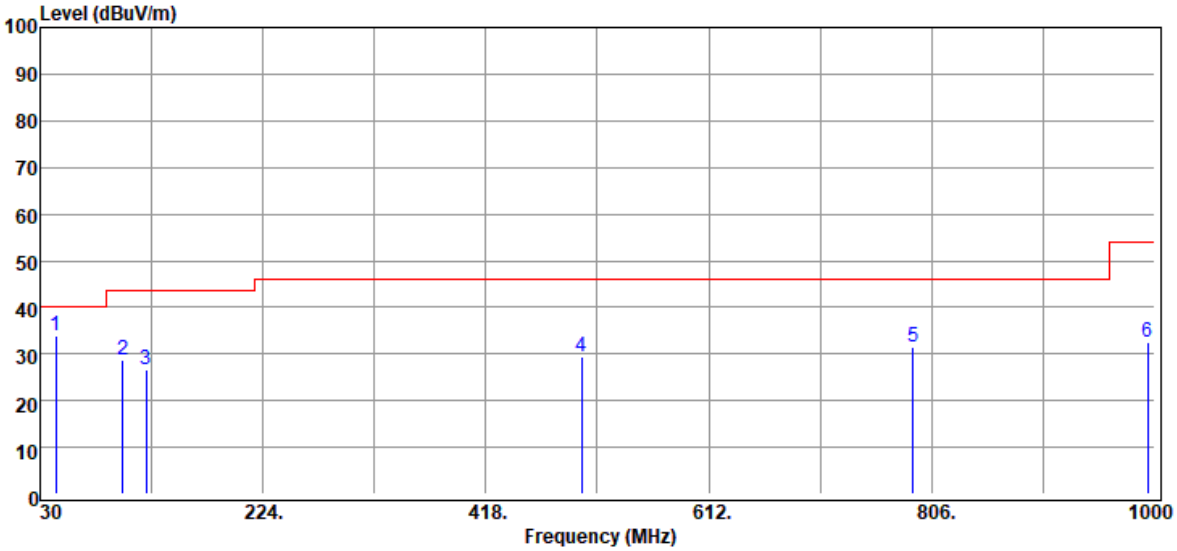
Report Number	:E2/2020/50084	Test Date	:2020-06-08
Operation Mode	:802.11n40	Temp./Humi.	:22.5/66
Test Frequency	:2452 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:BE CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
2483.50	Average	48.15	4.42	52.57	54.00	-1.43
2483.50	Peak	58.52	4.42	62.94	74.00	-11.06

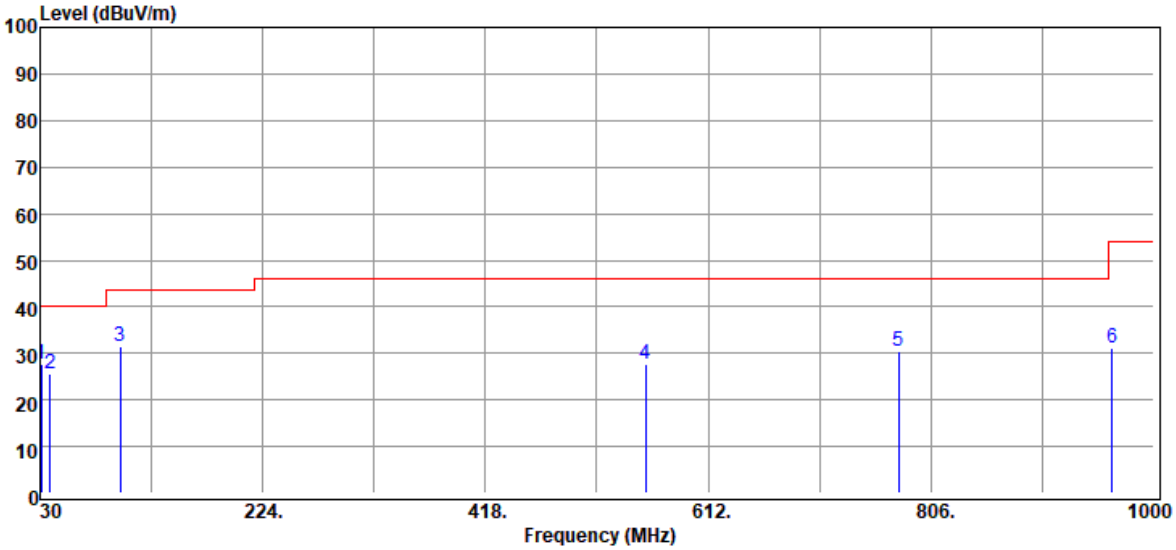
11.7.2 Below 1GHz Worst-Case Emission:

Report Number	:E2/2020/50084	Test Date	:2020-06-06
Operation Mode	:802.11g	Temp./Humi.	:23.8/57
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH MID	Engineer	:Ashton
EUT Pol	:E2 Plan		



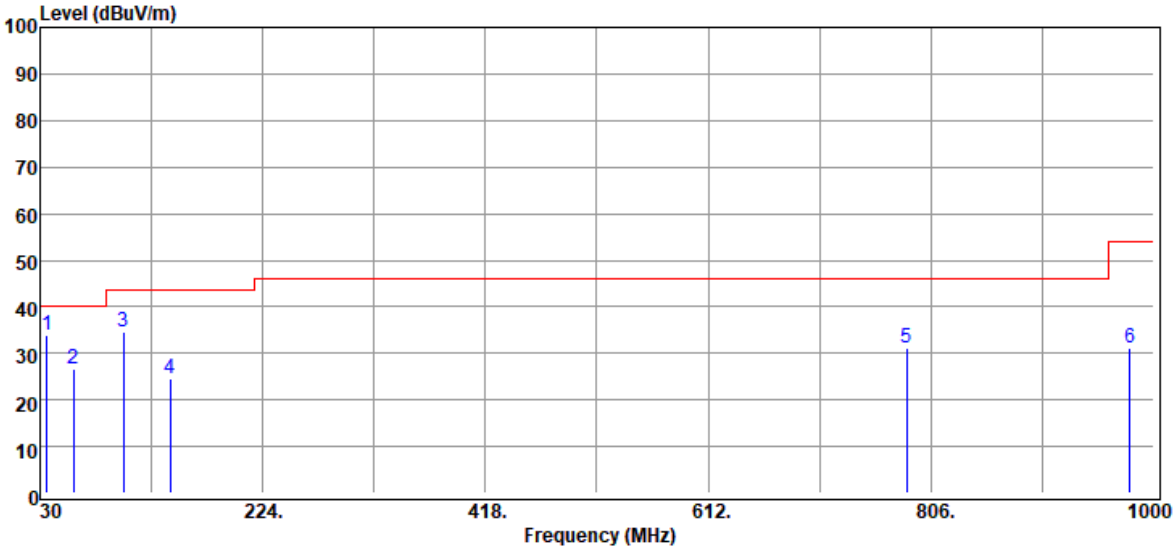
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
43.58	Peak	45.26	-11.27	33.99	40.00	-6.01
101.78	Peak	44.07	-15.21	28.86	43.50	-14.64
122.15	Peak	39.32	-12.83	26.49	43.50	-17.01
501.42	Peak	34.44	-5.10	29.34	46.00	-16.66
789.51	Peak	31.38	0.23	31.61	46.00	-14.39
994.18	Peak	30.97	1.69	32.66	54.00	-21.34

Report Number	:E2/2020/50084	Test Date	:2020-06-06
Operation Mode	:802.11g	Temp./Humi.	:23.8/57
Test Frequency	:2437 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH MID	Engineer	:Ashton
EUT Pol	:E2 Plan		



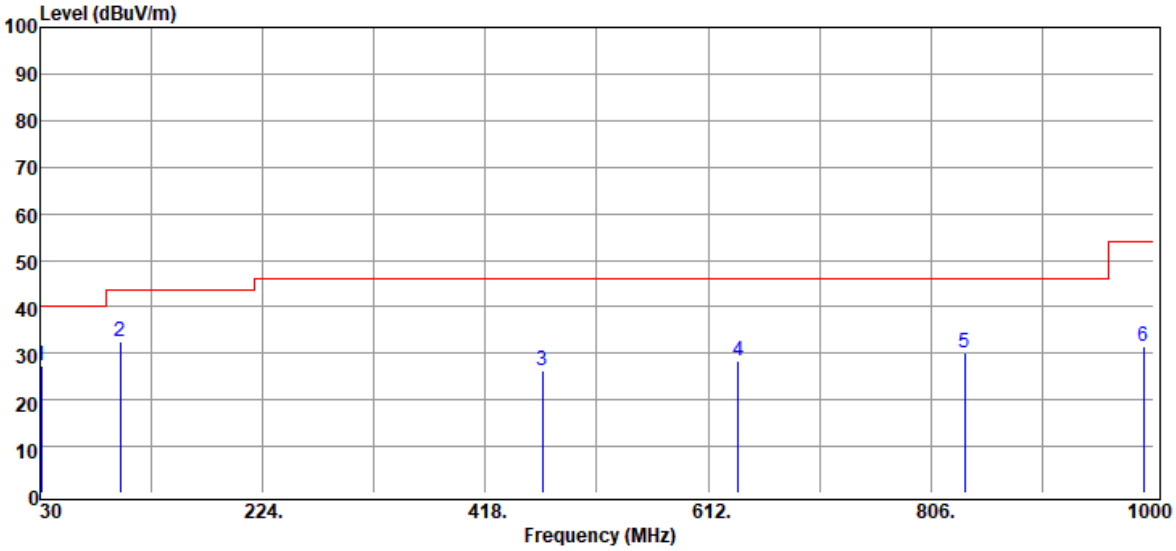
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	Peak	31.46	-3.89	27.57	40.00	-12.43
38.73	Peak	33.49	-7.95	25.54	40.00	-14.46
99.84	Peak	47.29	-15.66	31.63	43.50	-11.87
557.68	Peak	31.16	-3.40	27.76	46.00	-18.24
777.87	Peak	30.45	0.05	30.50	46.00	-15.50
964.11	Peak	29.79	1.30	31.09	54.00	-22.91

Report Number	:E2/2020/50084	Test Date	:2020-06-06
Operation Mode	:802.11n40	Temp./Humi.	:23.9/58
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH MID	Engineer	:Ashton
EUT Pol	:E2 Plan		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
35.82	Peak	40.20	-6.15	34.05	40.00	-5.95
59.10	Peak	47.14	-20.43	26.71	40.00	-13.29
102.75	Peak	49.72	-15.14	34.58	43.50	-8.92
143.49	Peak	37.95	-13.29	24.66	43.50	-18.84
784.66	Peak	31.05	0.21	31.26	46.00	-14.74
979.63	Peak	29.44	1.86	31.30	54.00	-22.70

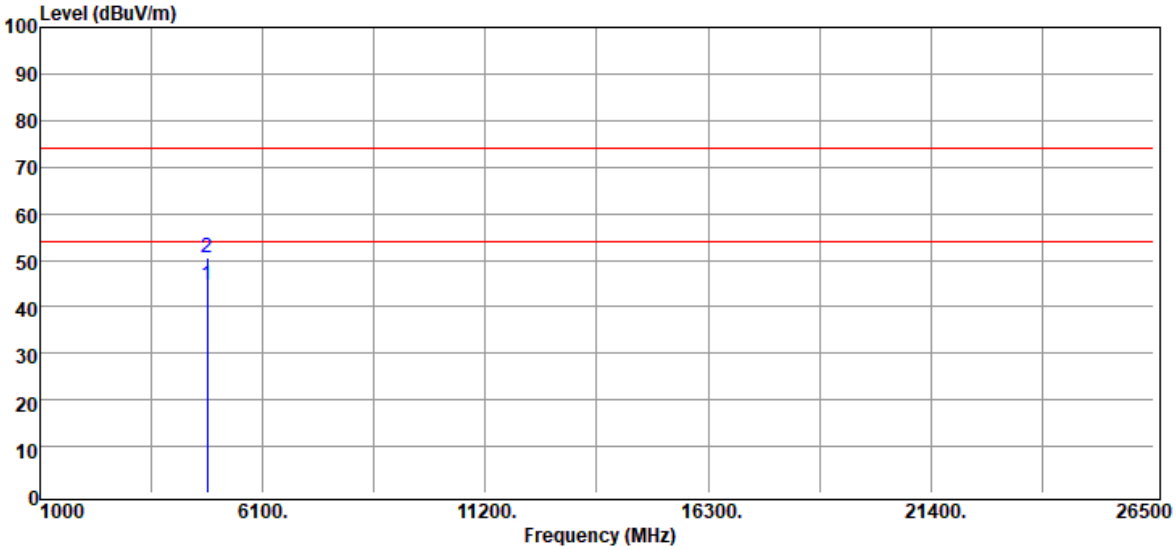
Report Number	:E2/2020/50084	Test Date	:2020-06-06
Operation Mode	:802.11n40	Temp./Humi.	:23.9/58
Test Frequency	:2437 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH MID	Engineer	:Ashton
EUT Pol	:E2 Plan		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
30.97	Peak	31.21	-3.89	27.32	40.00	-12.68
99.84	Peak	48.30	-15.66	32.64	43.50	-10.86
467.47	Peak	31.88	-5.60	26.28	46.00	-19.72
638.19	Peak	30.42	-1.96	28.46	46.00	-17.54
835.10	Peak	29.84	0.10	29.94	46.00	-16.06
991.27	Peak	29.66	1.74	31.40	54.00	-22.60

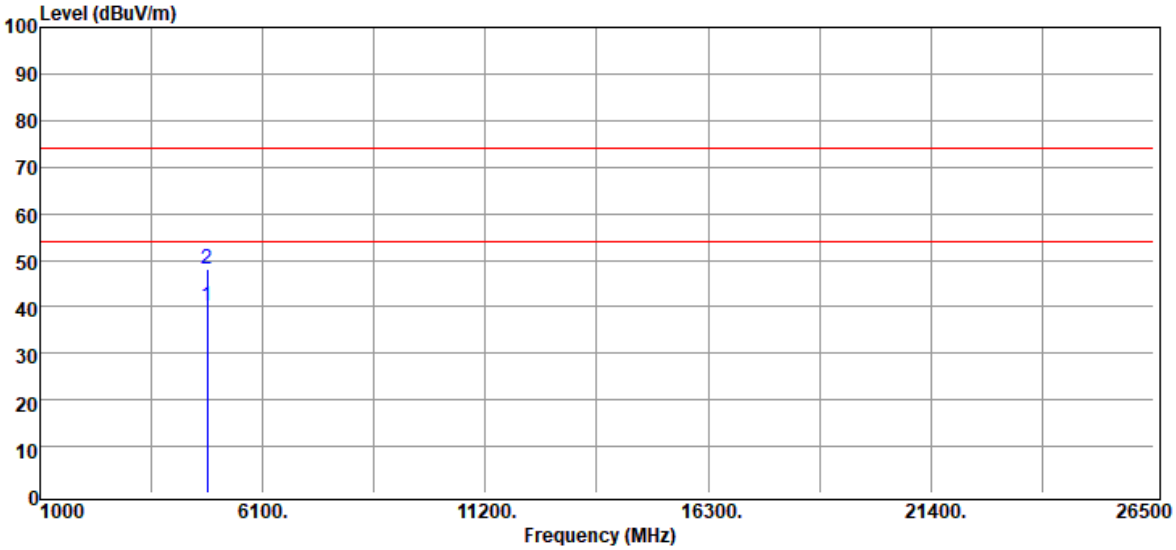
11.7.3 Above 1GHz Emission:

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11b	Temp./Humi.	:22.8/65
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



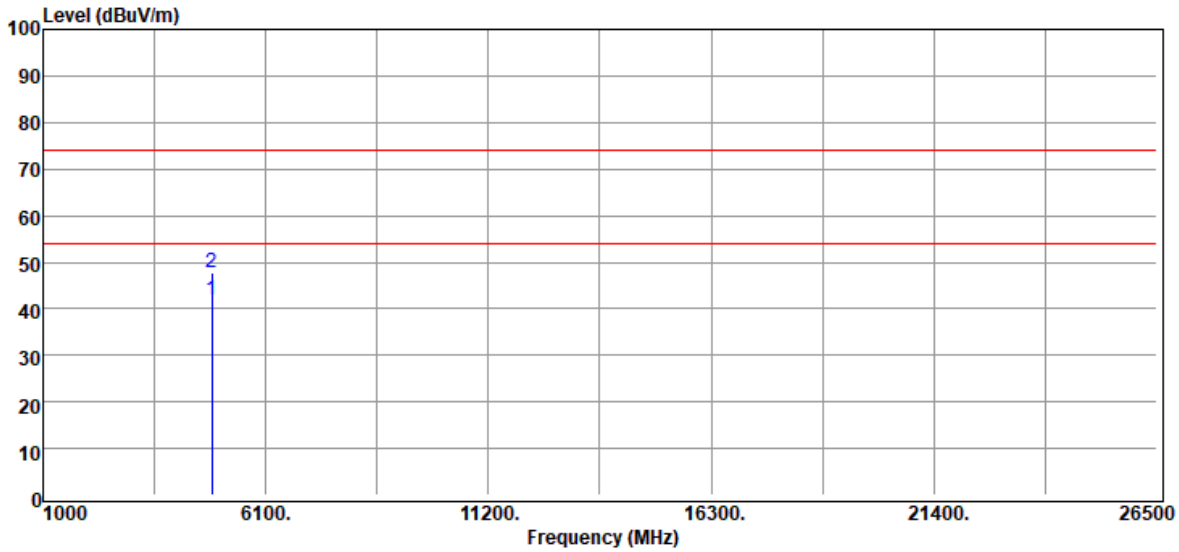
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Average	30.70	14.10	44.80	54.00	-9.20
4824.00	Peak	36.30	14.10	50.40	74.00	-23.60

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11b	Temp./Humi.	:22.8/65
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



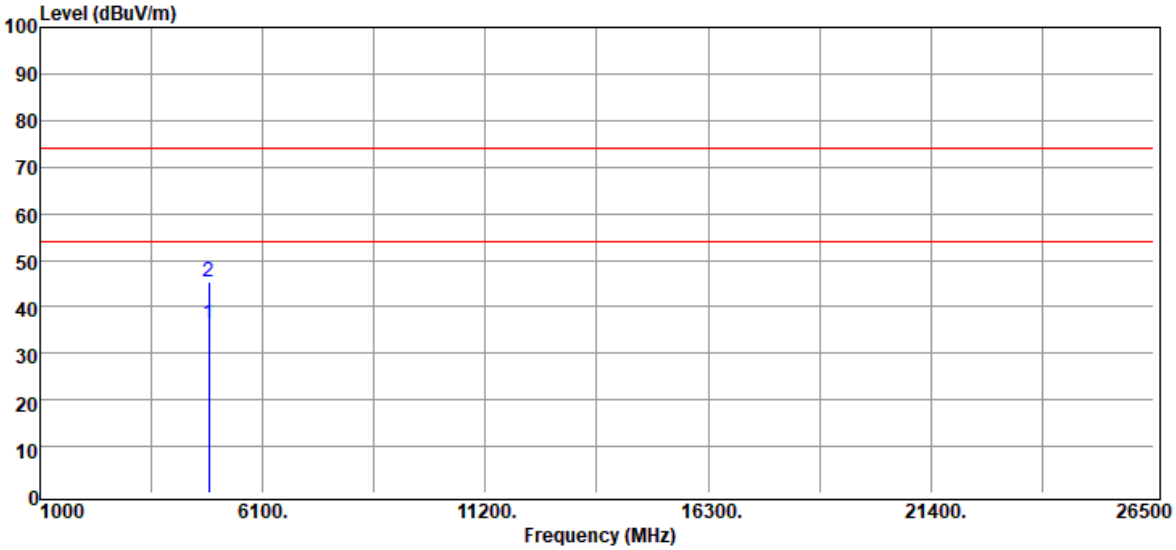
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Average	25.92	14.10	40.02	54.00	-13.98
4824.00	Peak	33.92	14.10	48.02	74.00	-25.98

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11b	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



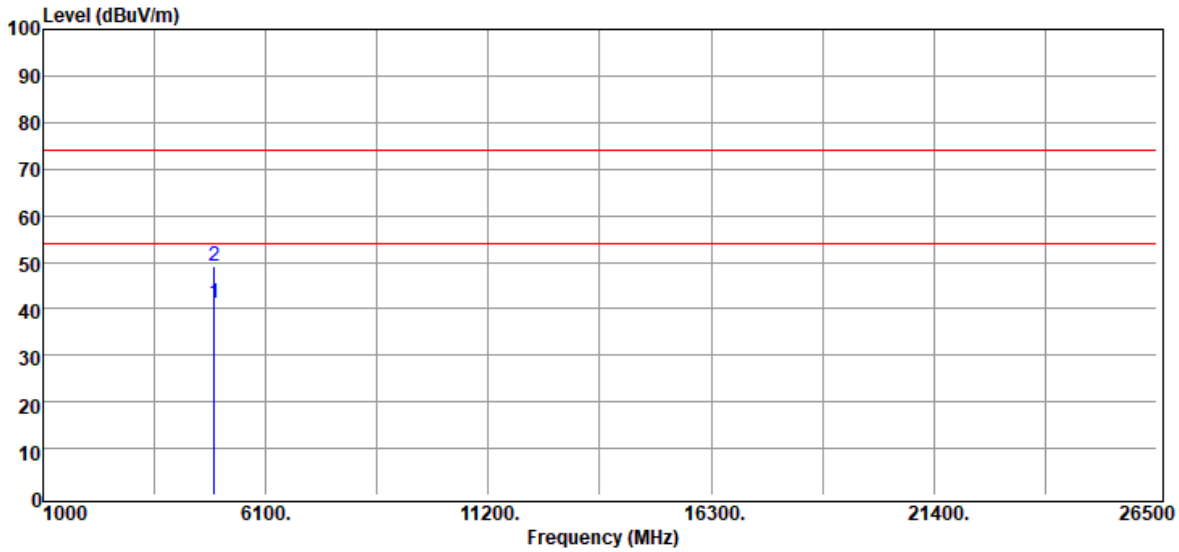
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	27.83	14.19	42.02	54.00	-11.98
4874.00	Peak	33.71	14.19	47.90	74.00	-26.10

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11b	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



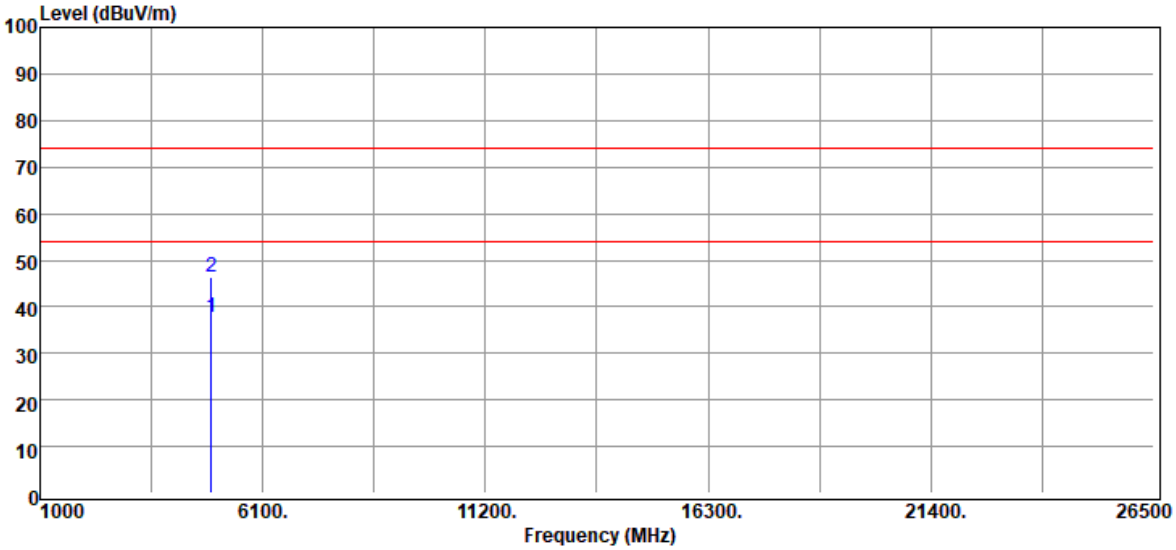
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	22.29	14.19	36.48	54.00	-17.52
4874.00	Peak	31.09	14.19	45.28	74.00	-28.72

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11b	Temp./Humi.	:22.8/65
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



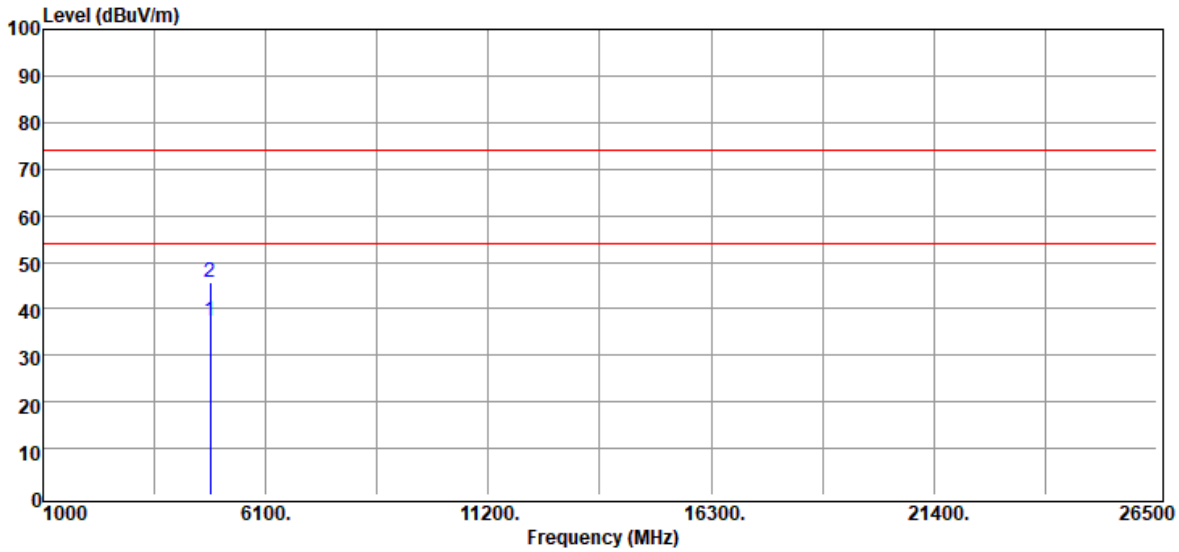
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	26.92	14.19	41.11	54.00	-12.89
4924.00	Peak	35.05	14.19	49.24	74.00	-24.76

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11b	Temp./Humi.	:22.8/65
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



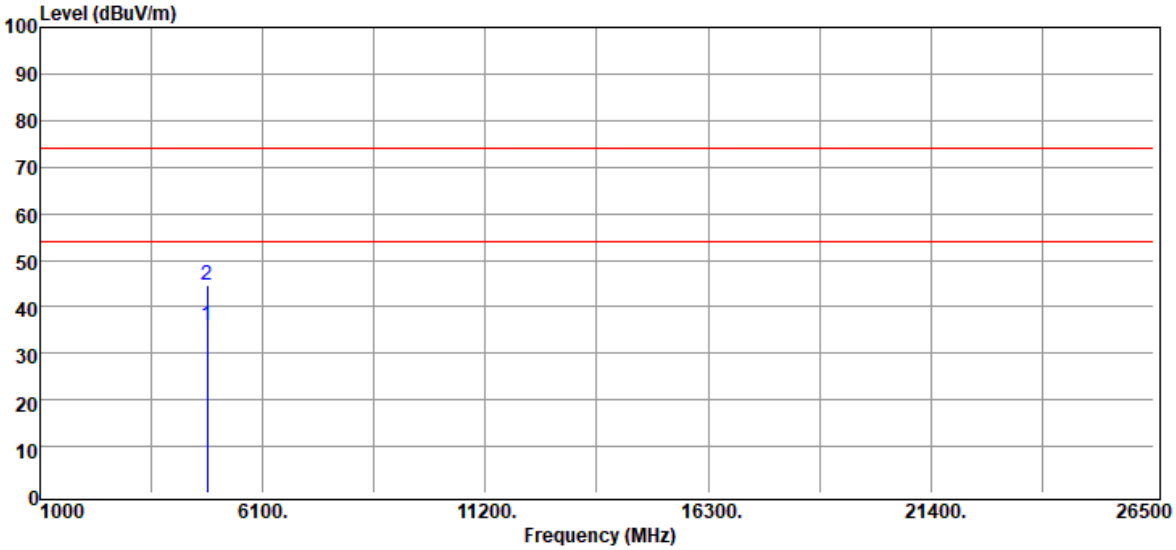
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	23.50	14.19	37.69	54.00	-16.31
4924.00	Peak	32.31	14.19	46.50	74.00	-27.50

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11g	Temp./Humi.	:22.8/65
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



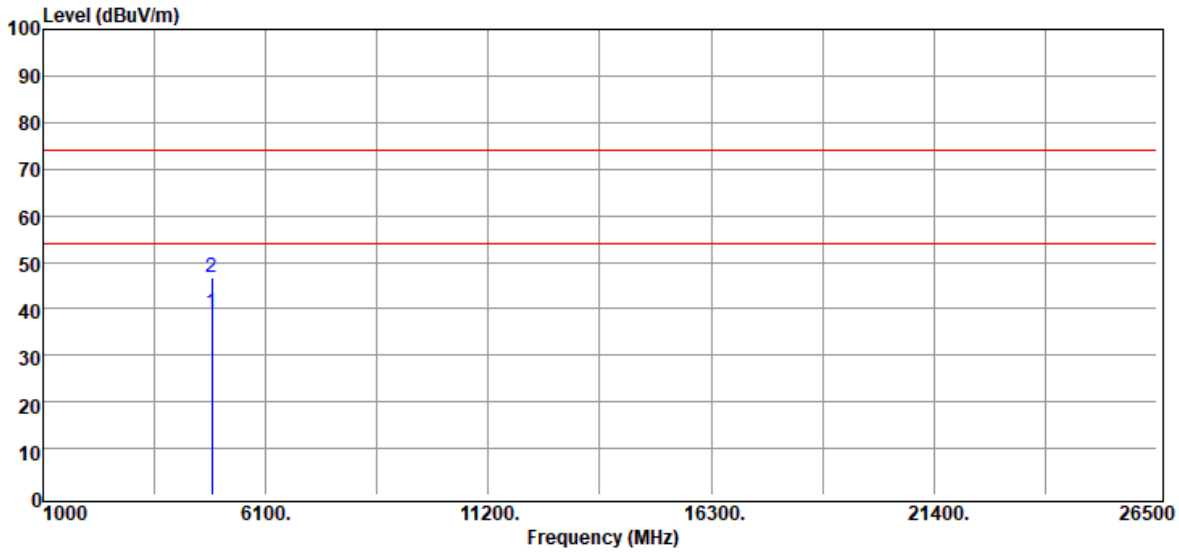
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Average	23.21	14.10	37.31	54.00	-16.69
4824.00	Peak	31.45	14.10	45.55	74.00	-28.45

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11g	Temp./Humi.	:22.8/65
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



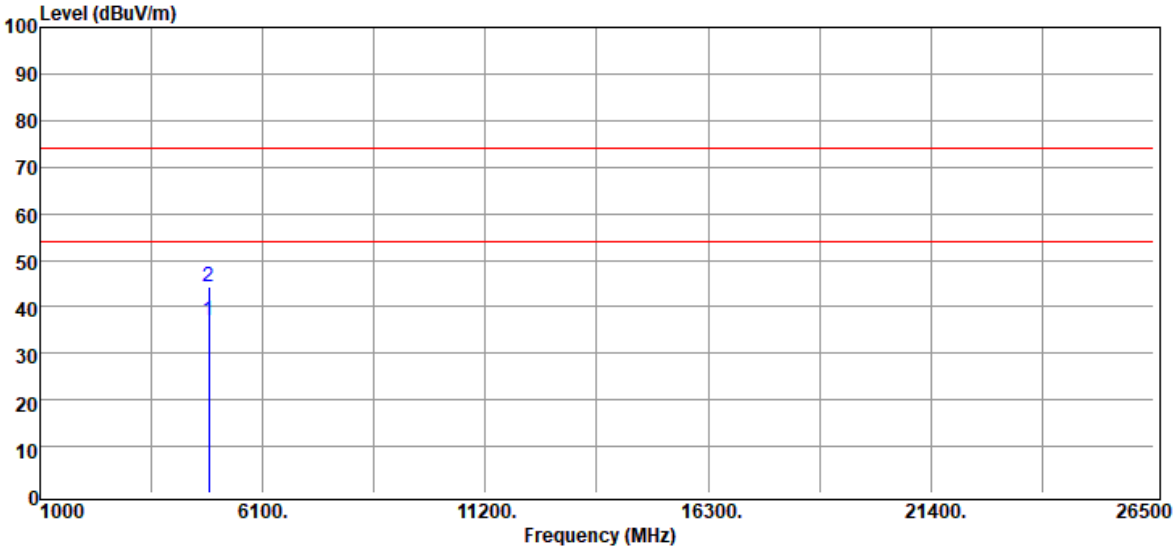
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Average	21.94	14.10	36.04	54.00	-17.96
4824.00	Peak	30.42	14.10	44.52	74.00	-29.48

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11g	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



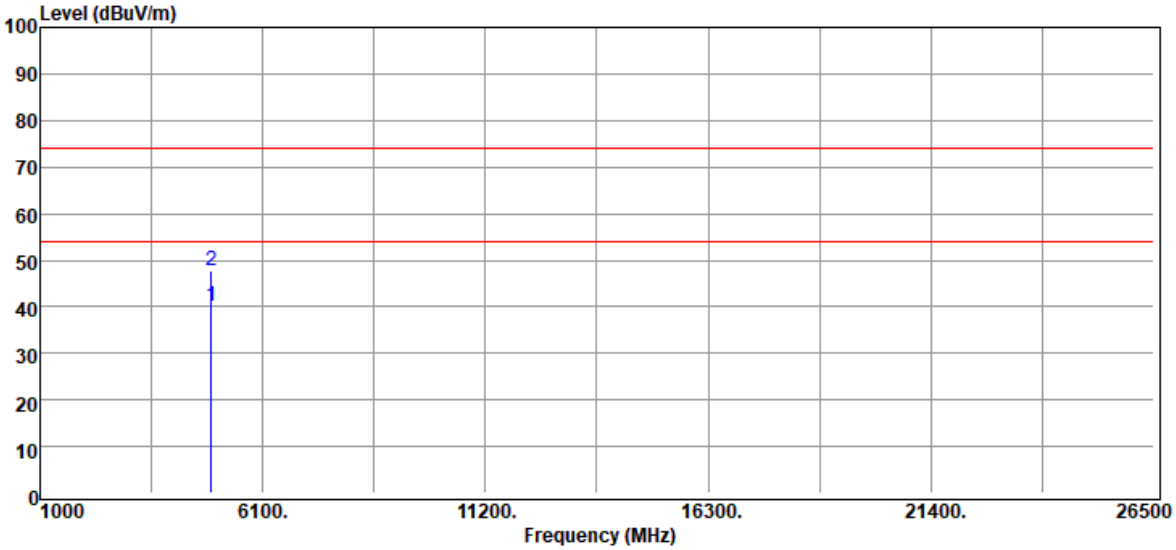
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	24.86	14.19	39.05	54.00	-14.95
4874.00	Peak	32.50	14.19	46.69	74.00	-27.31

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11g	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



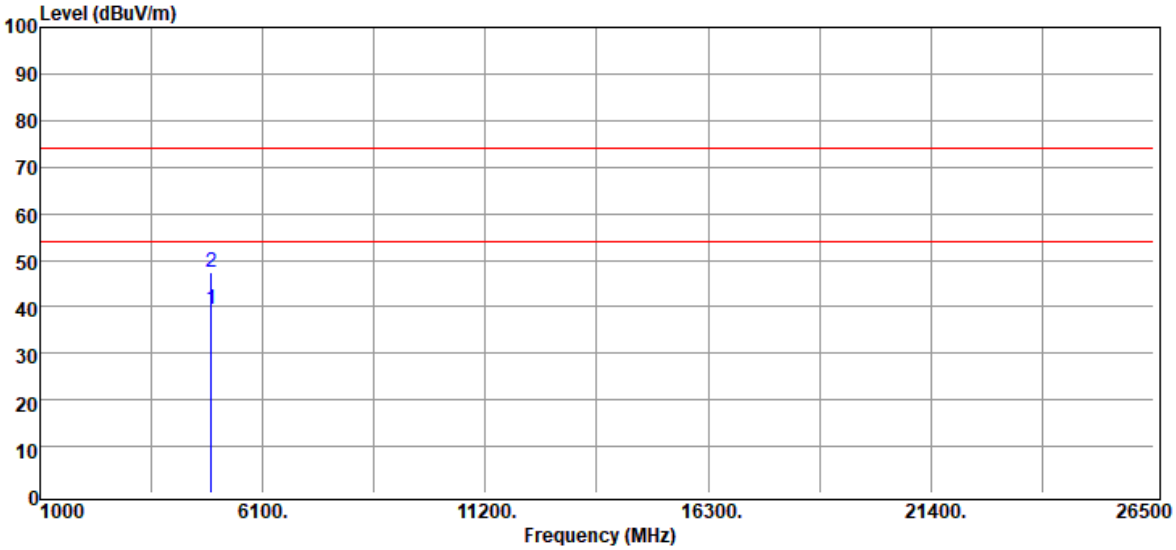
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	22.92	14.19	37.11	54.00	-16.89
4874.00	Peak	30.19	14.19	44.38	74.00	-29.62

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11g	Temp./Humi.	:22.8/65
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



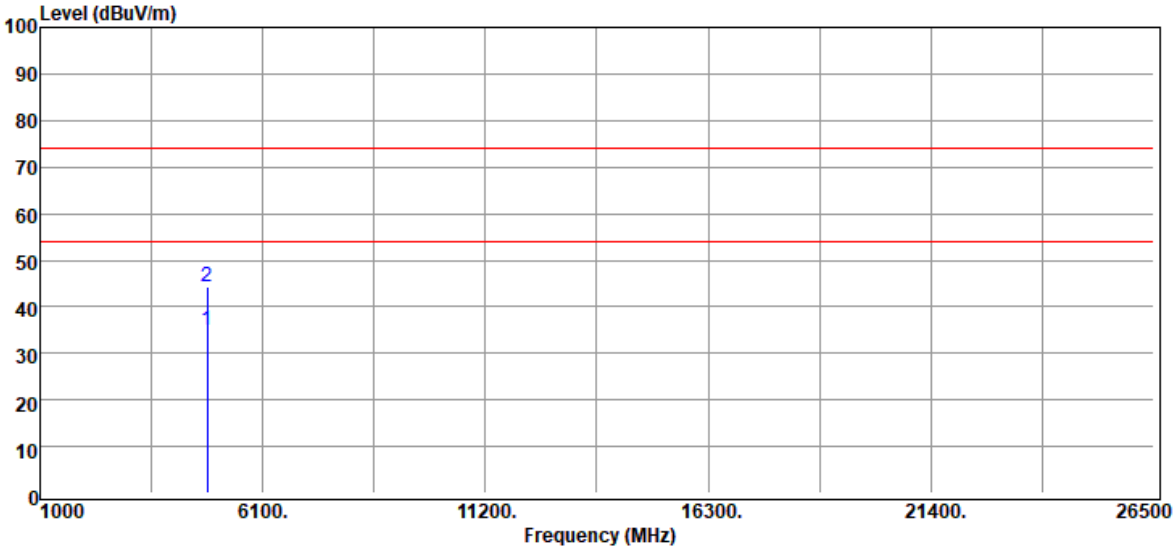
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	25.90	14.19	40.09	54.00	-13.91
4924.00	Peak	33.52	14.19	47.71	74.00	-26.29

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11g	Temp./Humi.	:22.8/65
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



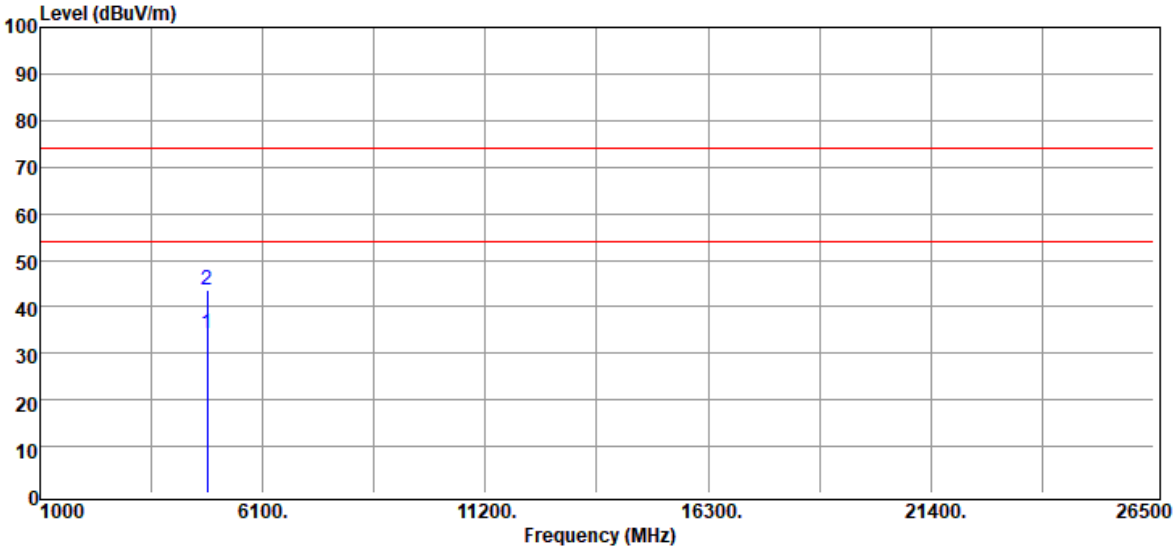
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	25.15	14.19	39.34	54.00	-14.66
4924.00	Peak	33.28	14.19	47.47	74.00	-26.53

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n20	Temp./Humi.	:22.8/65
Test Frequency	:2412 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



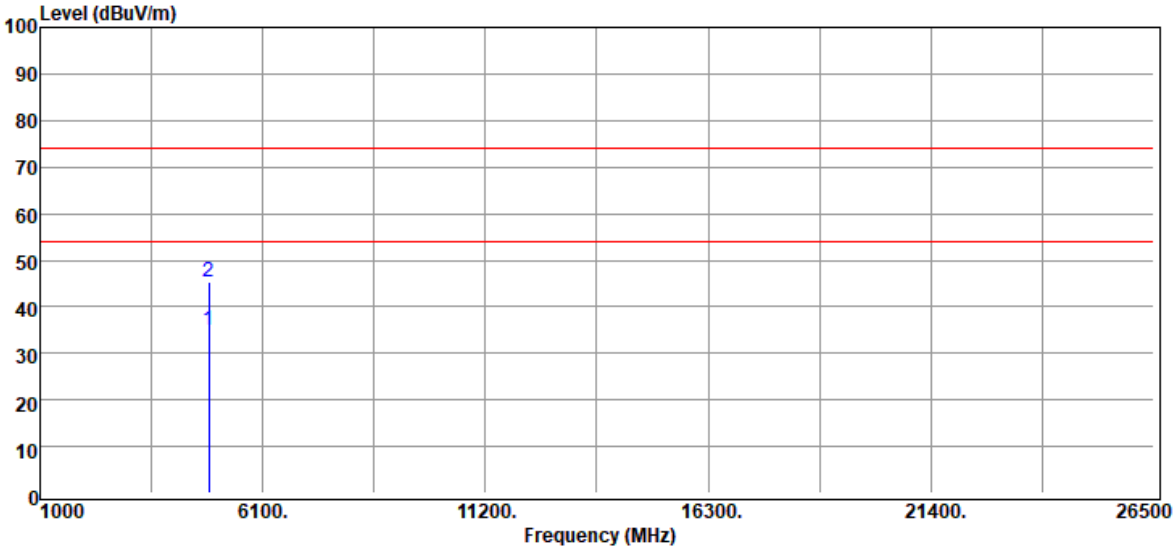
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Average	20.73	14.10	34.83	54.00	-19.17
4824.00	Peak	30.13	14.10	44.23	74.00	-29.77

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n20	Temp./Humi.	:22.8/65
Test Frequency	:2412 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



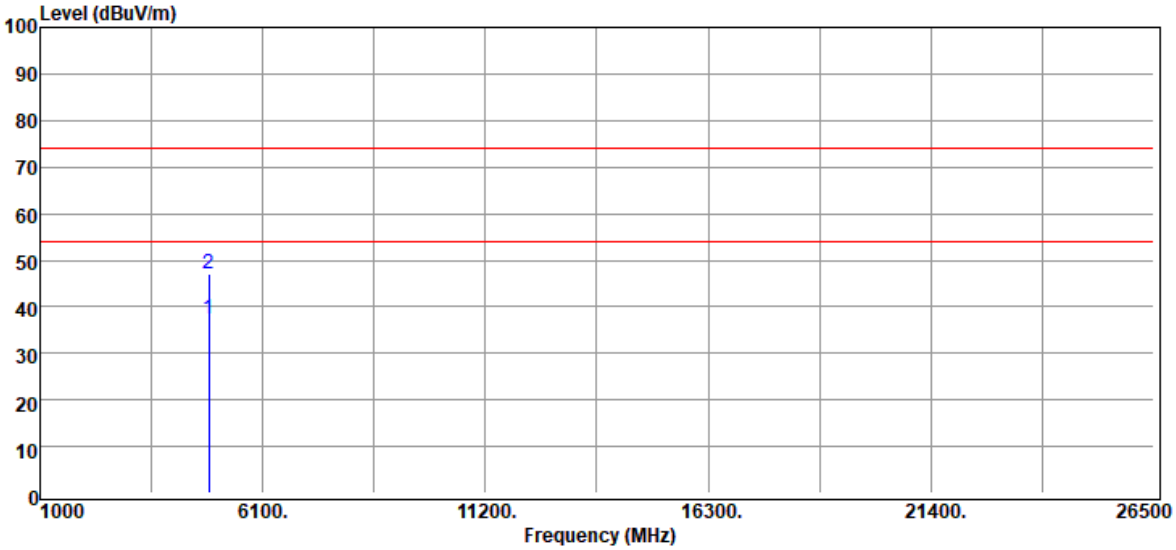
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4824.00	Average	20.01	14.10	34.11	54.00	-19.89
4824.00	Peak	29.37	14.10	43.47	74.00	-30.53

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n20	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



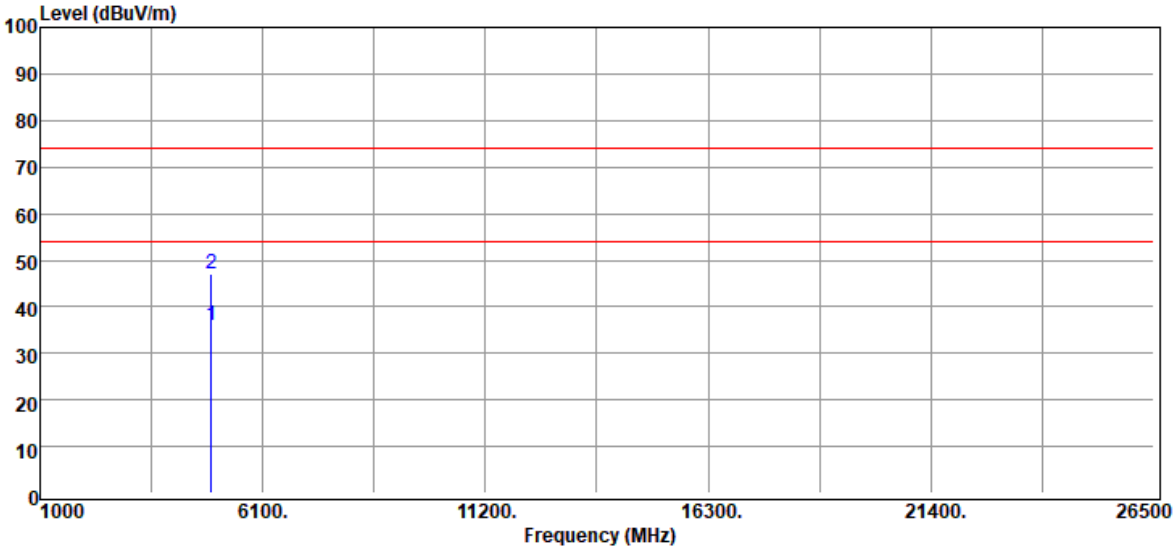
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	20.82	14.19	35.01	54.00	-18.99
4874.00	Peak	31.09	14.19	45.28	74.00	-28.72

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n20	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



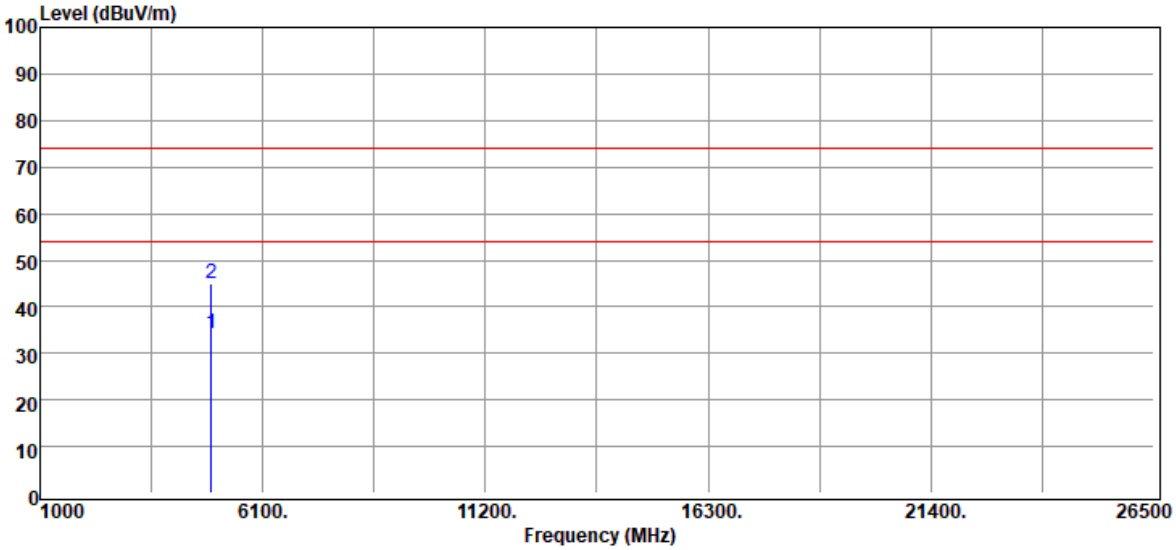
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	23.12	14.19	37.31	54.00	-16.69
4874.00	Peak	32.99	14.19	47.18	74.00	-26.82

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n20	Temp./Humi.	:22.8/65
Test Frequency	:2462 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



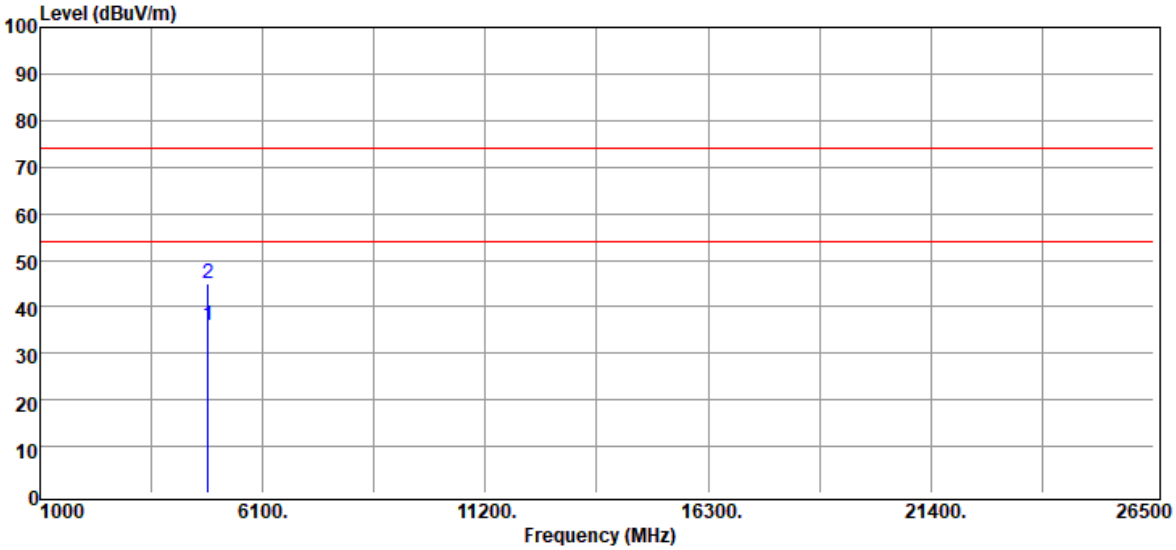
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	21.68	14.19	35.87	54.00	-18.13
4924.00	Peak	32.74	14.19	46.93	74.00	-27.07

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n20	Temp./Humi.	:22.8/65
Test Frequency	:2462 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



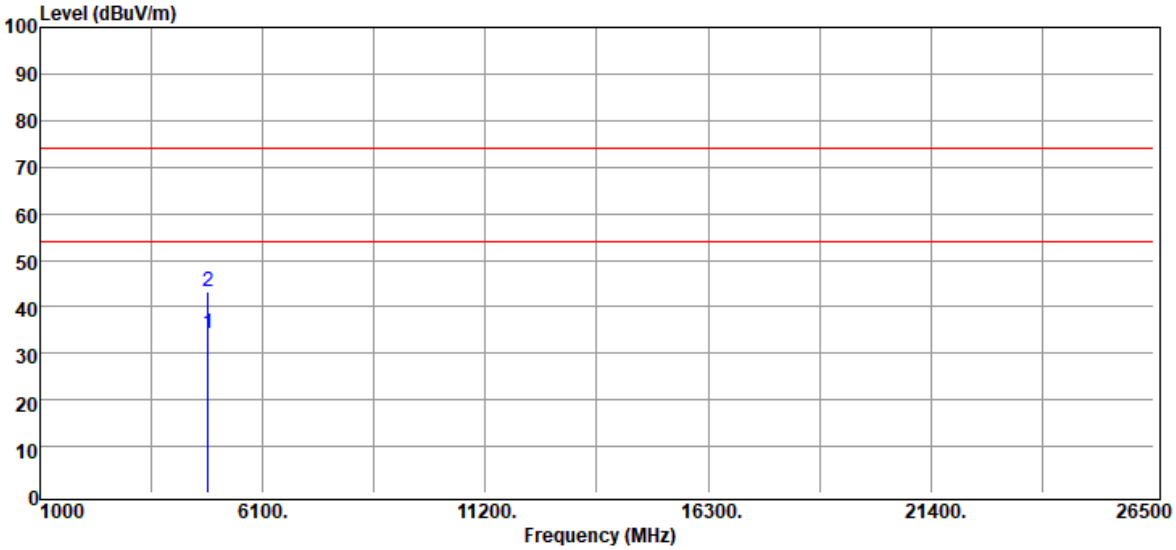
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4924.00	Average	20.04	14.19	34.23	54.00	-19.77
4924.00	Peak	30.82	14.19	45.01	74.00	-28.99

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n40	Temp./Humi.	:22.8/65
Test Frequency	:2422 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



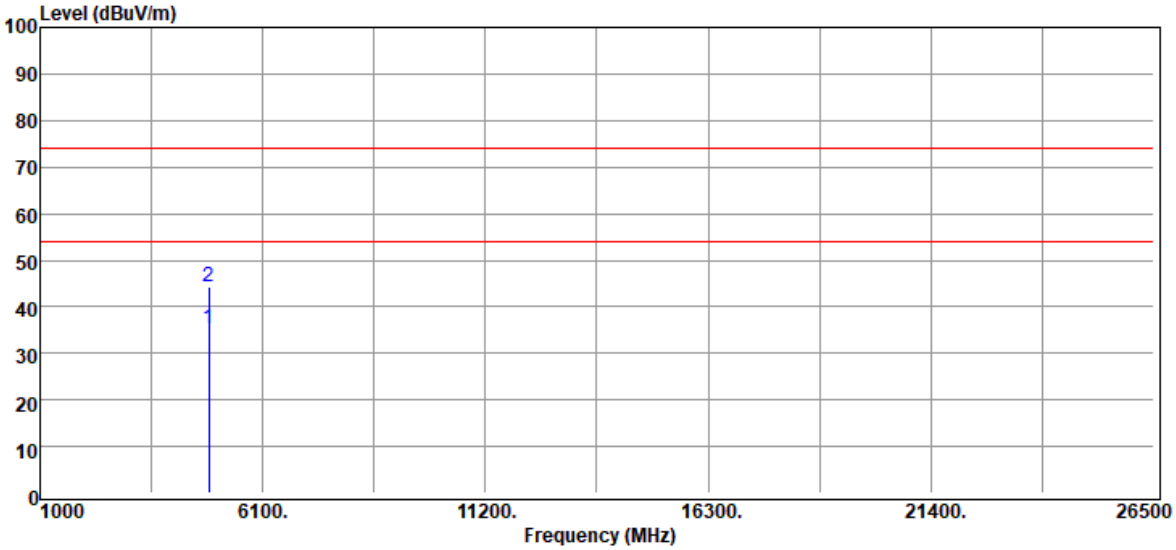
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4844.00	Average	21.85	14.14	35.99	54.00	-18.01
4844.00	Peak	30.74	14.14	44.88	74.00	-29.12

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n40	Temp./Humi.	:22.8/65
Test Frequency	:2422 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH LOW	Engineer	:Enzo
EUT Pol	:E2 Plan		



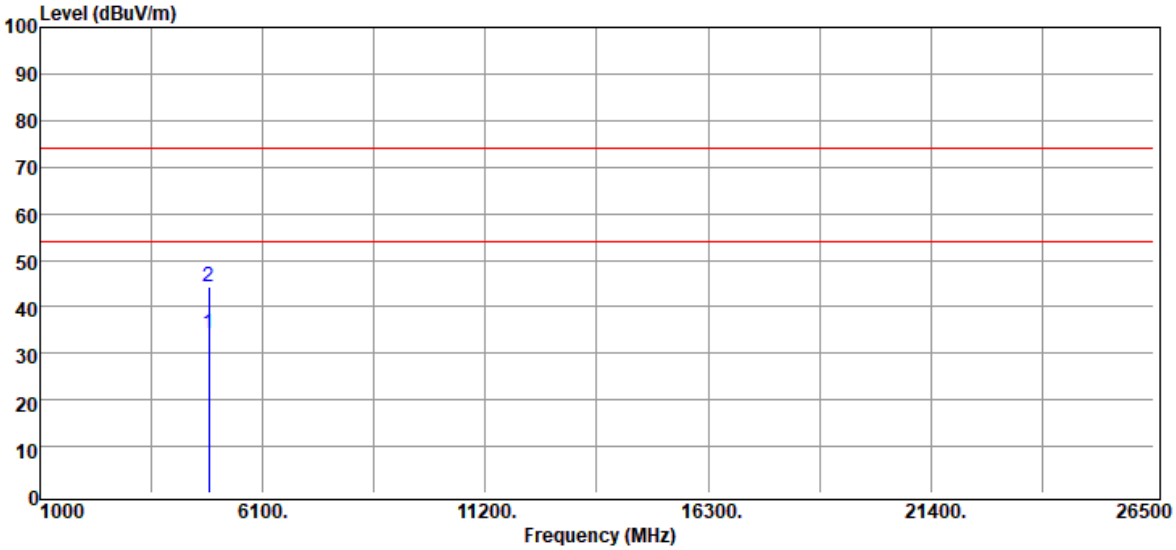
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4844.00	Average	20.06	14.14	34.20	54.00	-19.80
4844.00	Peak	29.06	14.14	43.20	74.00	-30.80

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n40	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



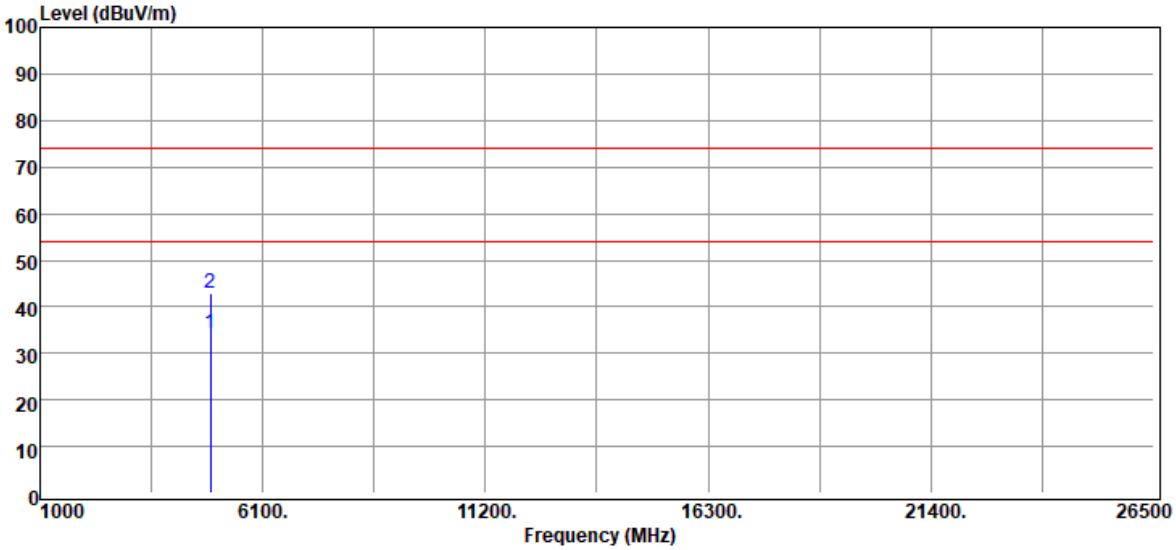
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	21.01	14.19	35.20	54.00	-18.80
4874.00	Peak	30.16	14.19	44.35	74.00	-29.65

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n40	Temp./Humi.	:22.8/65
Test Frequency	:2437 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH MID	Engineer	:Enzo
EUT Pol	:E2 Plan		



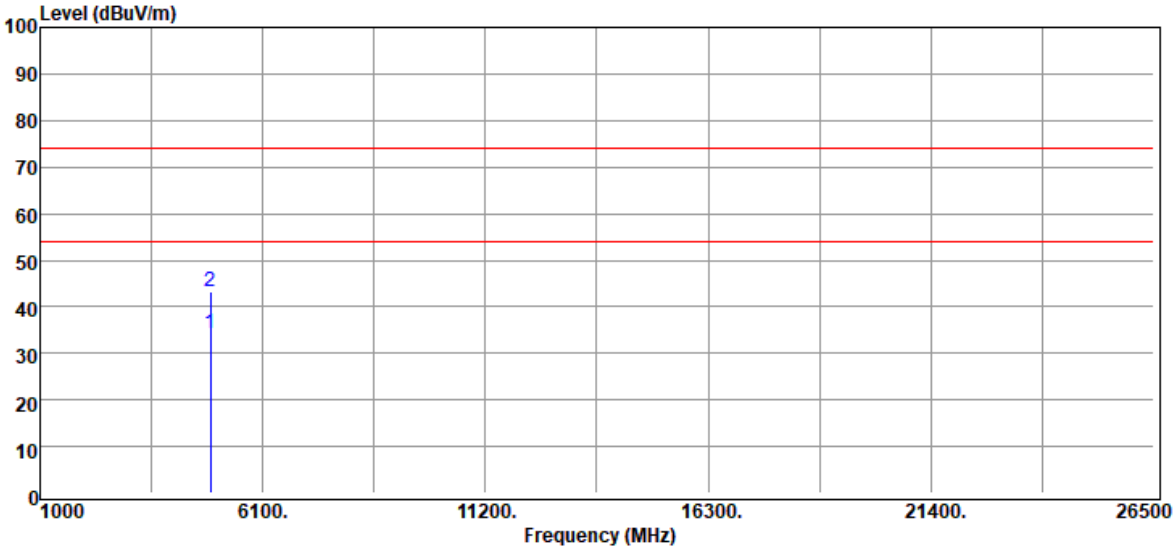
Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4874.00	Average	20.15	14.19	34.34	54.00	-19.66
4874.00	Peak	30.04	14.19	44.23	74.00	-29.77

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n40	Temp./Humi.	:22.8/65
Test Frequency	:2452 MHz	Antenna Pol.	:VERTICAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4904.00	Average	20.07	14.24	34.31	54.00	-19.69
4904.00	Peak	28.50	14.24	42.74	74.00	-31.26

Report Number	:E2/2020/50084	Test Date	:2020-06-05
Operation Mode	:802.11n40	Temp./Humi.	:22.8/65
Test Frequency	:2452 MHz	Antenna Pol.	:HORIZONTAL
Test Mode	:TX CH HIGH	Engineer	:Enzo
EUT Pol	:E2 Plan		



Freq.	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	PK/QP/AV	dBµV	dB	dBµV/m	dBµV/m	dB
4904.00	Average	20.05	14.24	34.29	54.00	-19.71
4904.00	Peak	29.13	14.24	43.37	74.00	-30.63

12 POWER SPECTRAL DENSITY

12.1 Standard Applicable

Per Part 15.247 (e)

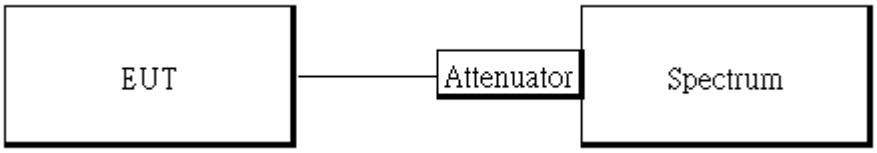
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

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.**
Spectrum Analyzer	KEYSIGHT	N9010B	MY59070196	03/22/2020	03/21/2021
DC Block	PASTERNACK	PE8210	RF256	11/20/2019	11/19/2020
Attenuator	Marvelous	WATT-218FS-10	RF245	11/20/2019	11/19/2020

12.3 Test Set-up



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

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

12.6 Power spectral density

POWER DENSITY 802.11b						
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Offset	Limit (dBm/3kHz)	Result
2412	-7.17	-8.12	-4.61	14.71	8.00	PASS
2437	-10.79	-8.75	-6.64	14.71	8.00	PASS
2462	-8.21	-7.53	-4.85	14.71	8.00	PASS

POWER DENSITY 802.11g						
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Offset	Limit (dBm/3kHz)	Result
2412	-9.47	-10.98	-7.15	14.71	8.00	PASS
2437	-9.97	-11.09	-7.48	14.71	8.00	PASS
2462	-10.3	-9.75	-7.01	14.71	8.00	PASS

POWER DENSITY 802.11n HT20						
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Offset	Limit (dBm/3kHz)	Result
2412	-10.6	-11.39	-7.97	14.71	8.00	PASS
2437	-10.68	-10.54	-7.60	14.71	8.00	PASS
2462	-9.46	-9.82	-6.63	14.71	8.00	PASS

POWER DENSITY 802.11n HT40						
Freq. (MHz)	Ch0 PSD	Ch1 PSD	PSD (dBm/3kHz)	Offset	Limit (dBm/3kHz)	Result
2422	-10.76	-13.35	-8.85	14.71	8.00	PASS
2437	-15.04	-14.44	-11.72	14.71	8.00	PASS
2452	-13.35	-13.46	-10.39	14.71	8.00	PASS

Note

Cable Loss 11.70 dB

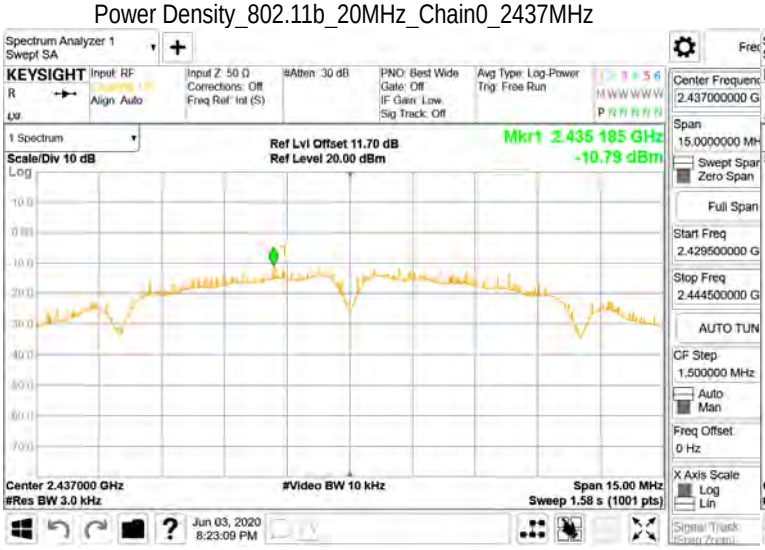
Offset: 11.7+3.01=14.71dB

**Refer to next page for plots*

Power Density_802.11b_20MHz_Chain0_2412MHz

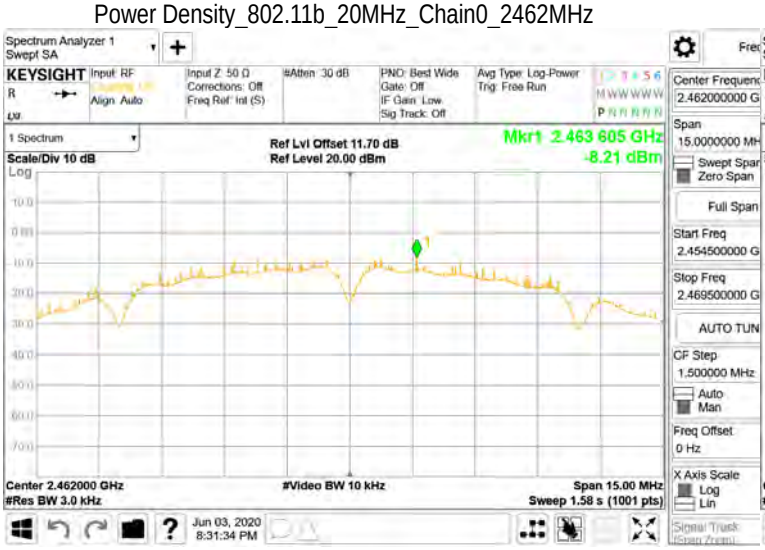
Power Density_802.11b_20MHz_Chain1_2412MHz

Power Density_802.11b_20MHz_Chain0_2437MHz

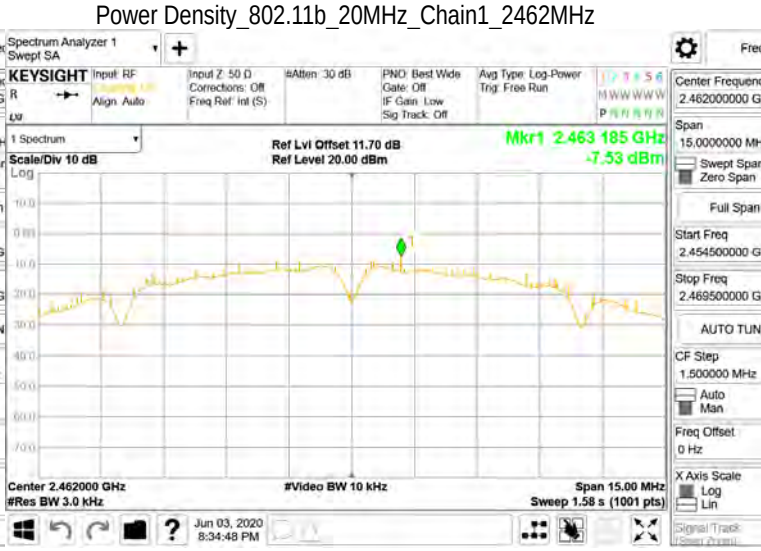


Power Density_802.11b_20MHz_Chain1_2437MHz

Power Density_802.11b_20MHz_Chain0_2462MHz

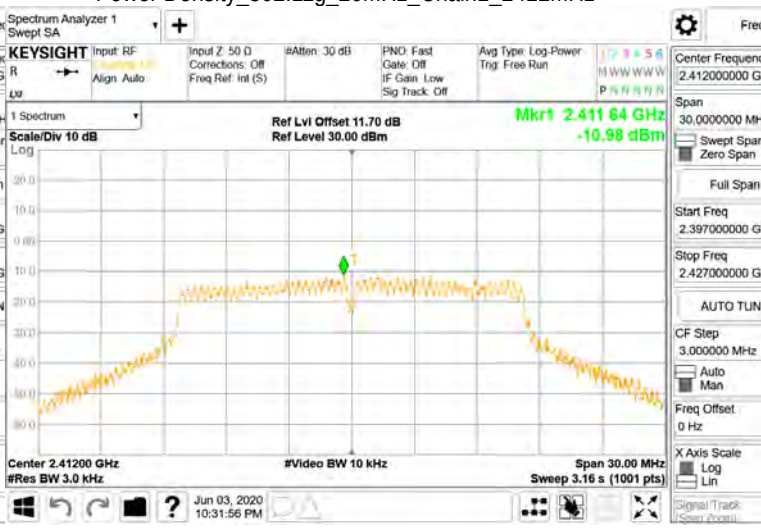


Power Density_802.11b_20MHz_Chain1_2462MHz

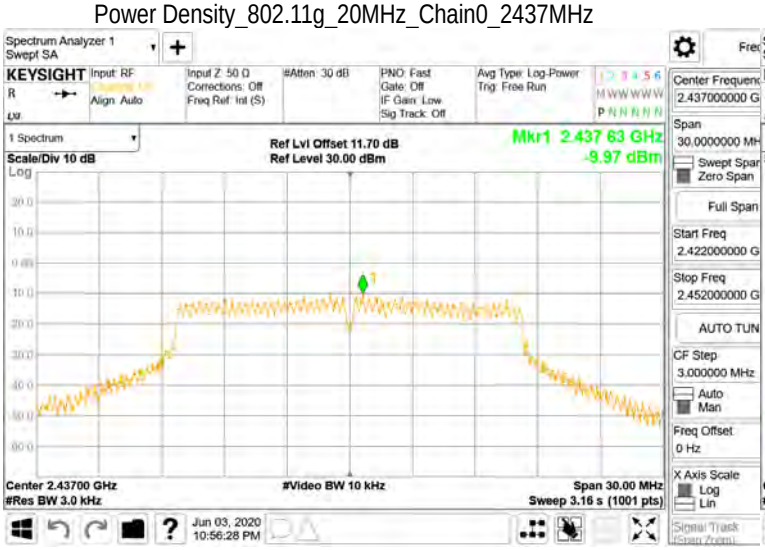


Power Density_802.11g_20MHz_Chain0_2412MHz

Power Density_802.11g_20MHz_Chain1_2412MHz

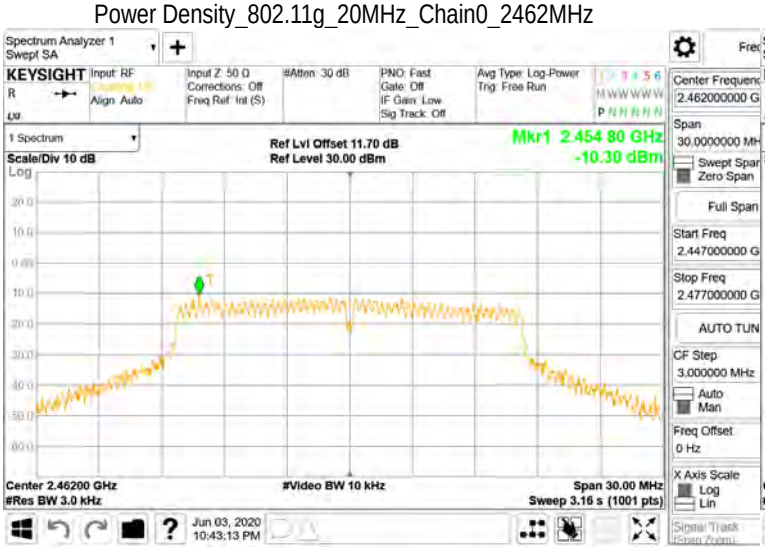


Power Density_802.11g_20MHz_Chain0_2437MHz

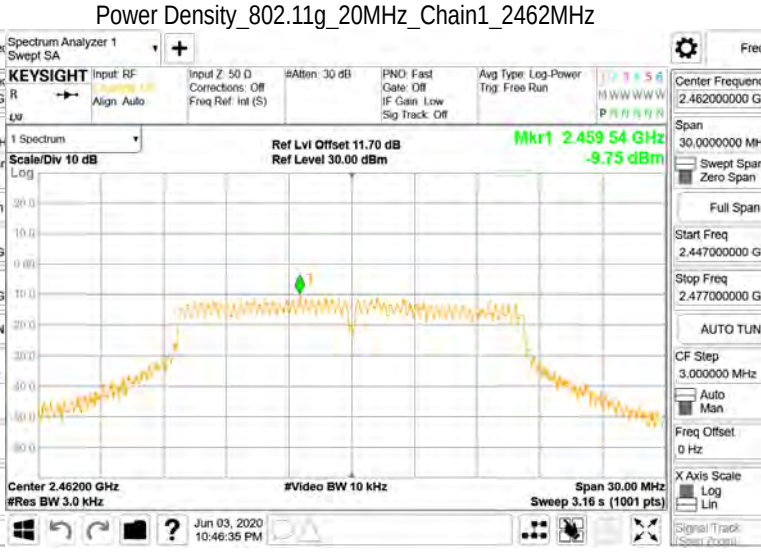


Power Density_802.11g_20MHz_Chain1_2437MHz

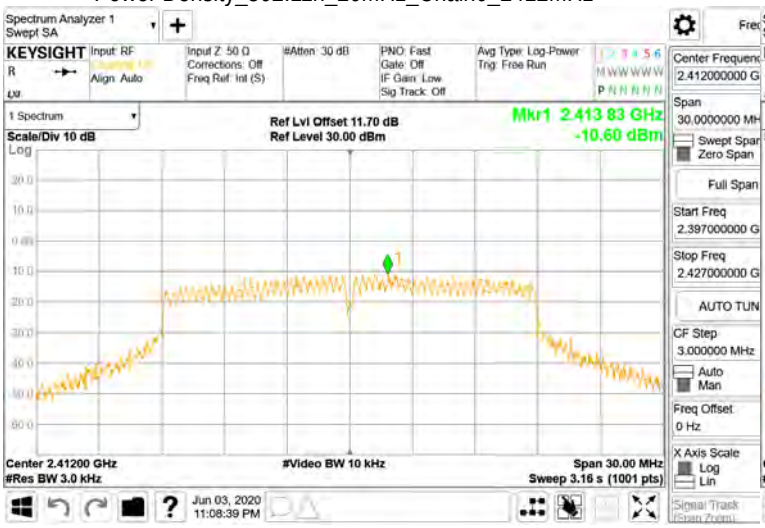
Power Density_802.11g_20MHz_Chain0_2462MHz



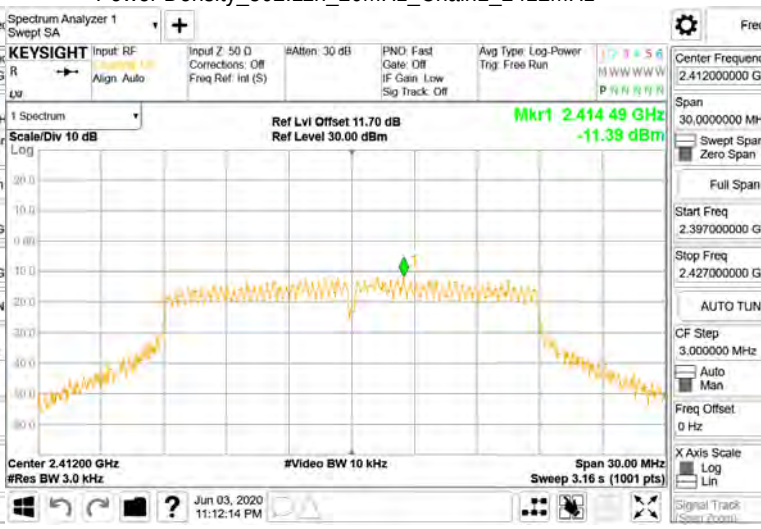
Power Density_802.11g_20MHz_Chain1_2462MHz



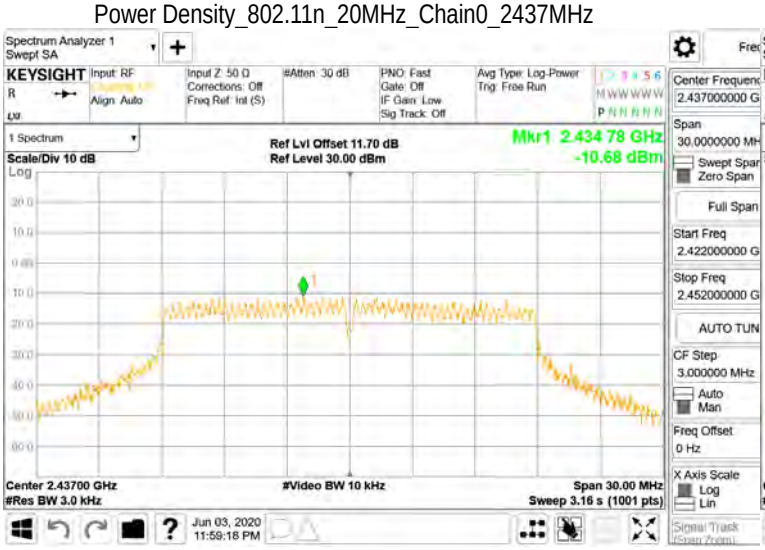
Power Density_802.11n_20MHz_Chain0_2412MHz



Power Density_802.11n_20MHz_Chain1_2412MHz

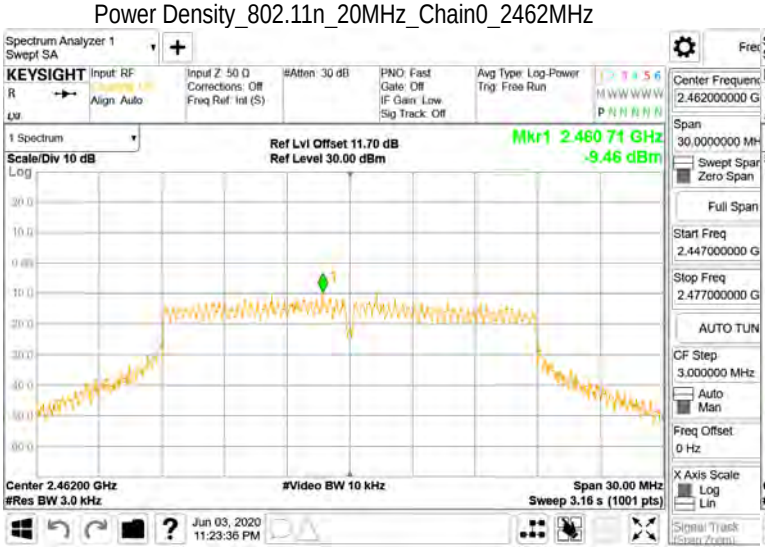


Power Density_802.11n_20MHz_Chain0_2437MHz

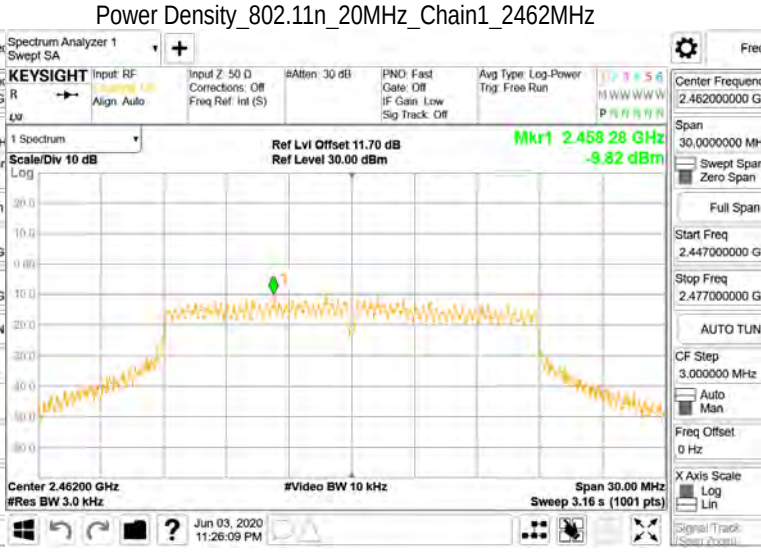


Power Density_802.11n_20MHz_Chain1_2437MHz

Power Density_802.11n_20MHz_Chain0_2462MHz

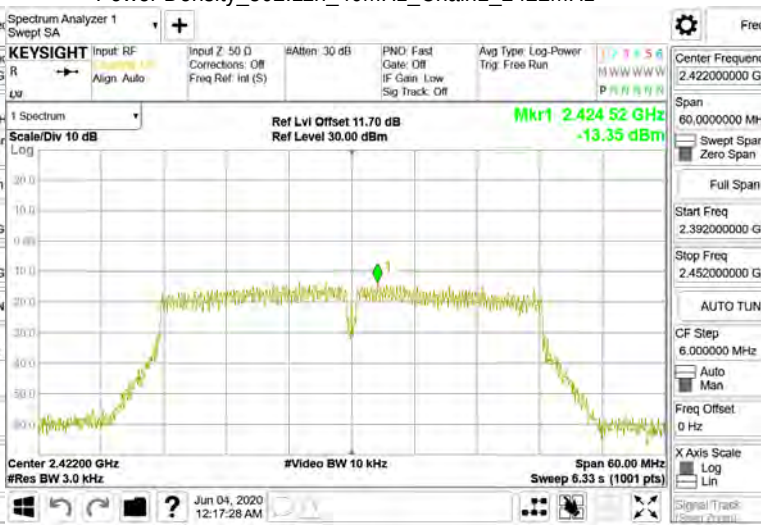


Power Density_802.11n_20MHz_Chain1_2462MHz

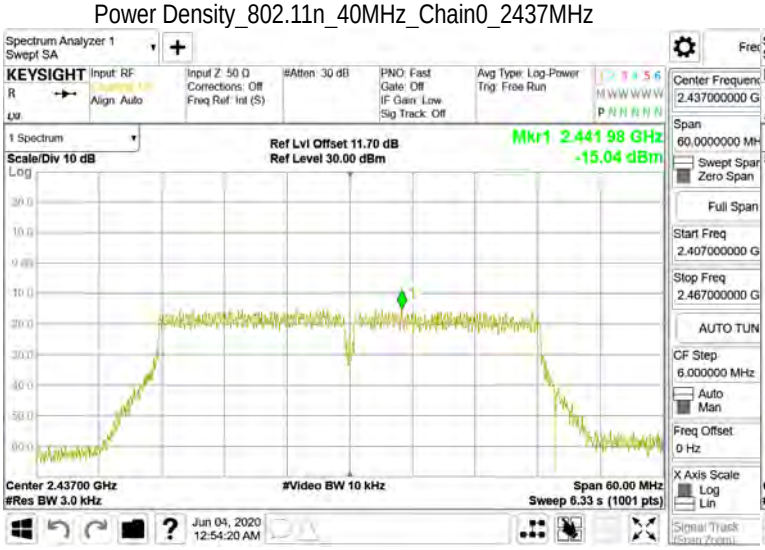


Power Density_802.11n_40MHz_Chain0_2422MHz

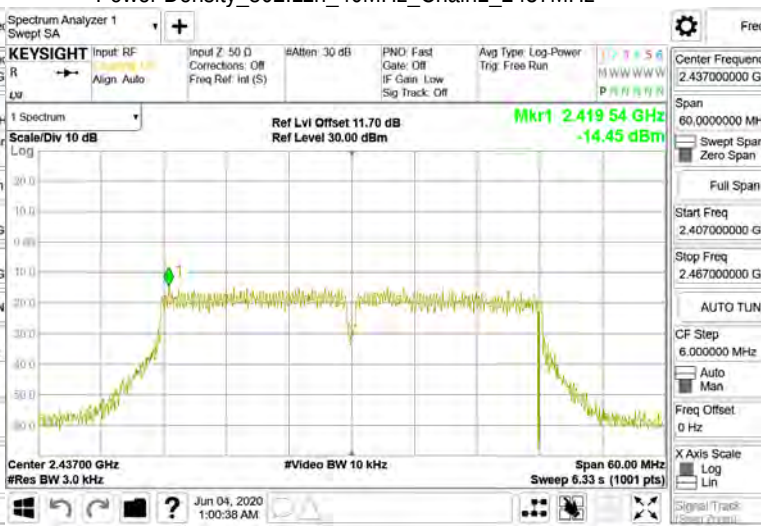
Power Density_802.11n_40MHz_Chain1_2422MHz



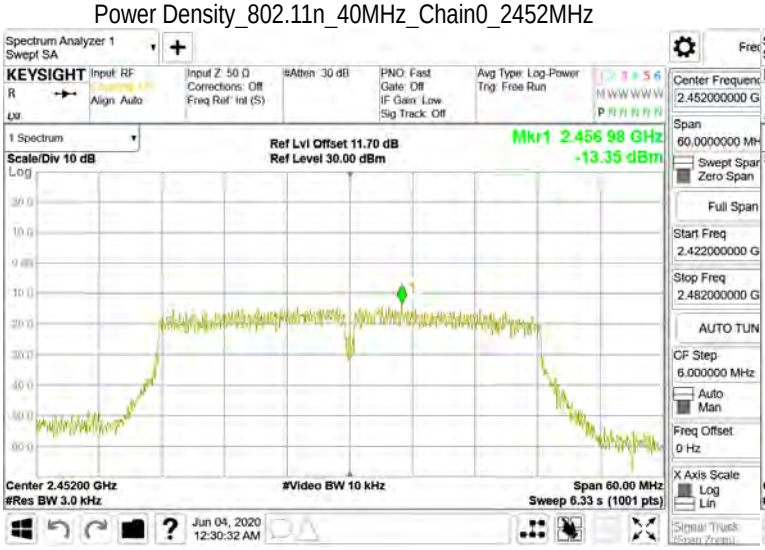
Power Density_802.11n_40MHz_Chain0_2437MHz



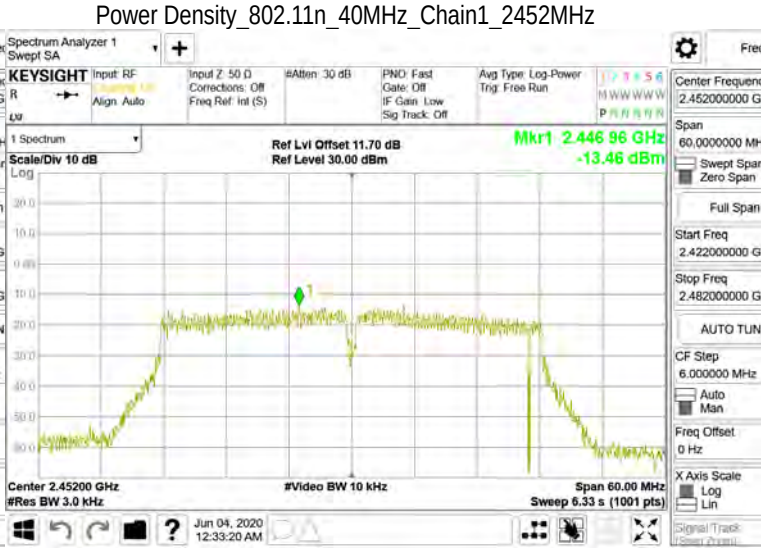
Power Density_802.11n_40MHz_Chain1_2437MHz



Power Density_802.11n_40MHz_Chain0_2452MHz



Power Density_802.11n_40MHz_Chain1_2452MHz



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 ~