

Emissions Test Report

EUT Name: eero 6 and eero 6 Extender

Model No.: N010001 and Q010001

CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 2017

Prepared for:

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Note: Latest revision report will replace all previous reports.

Statement of Compliance

Applicant: eero LLC
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Name of Equipment: eero 6 and eero 6 Extender
Model No. N010001 and Q010001
Type of Equipment: Intentional Radiator
Application of Regulations: CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 2017
Test Dates: June 5, 2020 to August 25, 2020

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02

Test Methods:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.



Kerwinn Corpuz

James Borrott

Test Engineer

Date August 26, 2020

Reviewer Signatory

Date August 31, 2020



Industry
Canada Industrie
Canada

Testing Cert #3331.02

US1131

2932M

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1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 2017 based on the results of testing performed on June 5, 2020 to August 25, 2020 on the eero 6 and eero 6 Extender Model N010001 and Q010001 manufactured by eero LLC. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report. The 2412 MHz to 2462 MHz frequency band is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.10	Test Parameters	Measured Value	Result
Spurious Emission in Transmitted Mode	CFR47 15.209, CFR47 15.247 (d), RSS-GEN Sect.8.9	Class B	-0.42 dB (Margin)	Complied
Restricted Bands of Operation	CFR47 15.205, RSS GEN Sect.8.10	Class B		Complied
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	-7.88 dB (Margin)	Complied
Occupied Bandwidth	CFR47 15.247 (a2), RSS GEN 6.7, RSS 247 Sect.5.2 (a)	≥ 500 kHz	11b: 7.1 MHz (6dB) 11b: 12.8 MHz (99%) 11g: 15.0 MHz (6dB) 11g: 16.3 MHz (99%) HT20: 13.9 MHz (6dB) HT20: 17.7 MHz (99%) HT40: 32.6 MHz (6dB) HT40: 35.9 MHz (99%)	Complied
Maximum Output Power	CFR47 15.247 (b), RSS 247 Sect. 5.4 (d)	30 dBm w/ 6 dBi antenna	11b: 23.36 dBm 11g: 22.29 dBm HT20: 25.45 dBm* HT40: 20.81 dBm*	Complied
Peak Power Spectral Density	CFR47 15.247 (e), RSS 247 Sect. 5.2 (b)	8 dBm/ 3 kHz	11b: -7.78 dBm 11g: -10.46 dBm HT20: -9.72 dBm* HT40: -15.47 dBm*	Complied
Out of Band Emission	CFR47 15.247 (d), RSS 247 Sect.5.5	-30 dB	-18.21 dB (Margin)	Complied

* Measurements are conducted 2x2 total power for correlated.

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission



TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 is recognized by the commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (US1131). The laboratory scope of accreditation includes: Title 47 CFR Parts 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / A2LA



TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:2017 and ISO 9002 (Lab Code Testing Cert #3331.02). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada



TUV Rheinland of North America at the 1279 Quarry Ln, Pleasanton, CA 94566 address is accredited by Industry Canada for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by Industry Canada (File Number 2932M). This reference number is the indication to the Industry Canada Certification Officers that the site meets the requirements of RSS 212, Issue 1 (Provisional). The accreditation is updated every 3 years.

2.1.4 Japan – VCCI



The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at 1279 Quarry Ln, Pleasanton, CA 94566 has been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0326

2.1.5 Acceptance by Mutual Recognition Arrangement



The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at 1279 Quarry Ln, Pleasanton, CA 94566 test results and test reports within the scope of the laboratory NIST / A2LA accreditation will be accepted by each member

country.

2.2 Test Facilities

All of the test facilities are located at 1279 Quarry Lane, Pleasanton, California 94566, USA.

2.2.1 Emission Test Facility

The Semi-Anechoic chamber and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 and 5 meters. The site is listed with the FCC and accredited by A2LA (Lab Code Testing Cert #3331.02). The 3/5-meter semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4-2014, at a test distance of 3 meter and 5 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 4.8 m x 3.175 mm thick aluminum floor connected to PE ground.

For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470-k Ω resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470-k Ω resistors.

For EFT, Surge, PQF, the HCP and VCP are removed.

RF Field Immunity testing is performed in a 7.3m x 4.3m x 4.1m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.8m x 3.7m x 3.175mm thick aluminum ground plane.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities; it is equal to the positive square root of the sum of the variances or co-variances of these other quantities, weighted according to how the measurement result varies with changes in these quantities. The term *standard uncertainty* is the result of a measurement expressed as a standard deviation.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{RAW} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: RAW = Measured level before correction (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V/m}}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dB μ V/m)

$$25 \text{ dB}\mu\text{V/m} + 17.5 \text{ dB} - 20 \text{ dB} + 1.0 \text{ dB} = 23.5 \text{ dB}\mu\text{V/m}$$

2.3.2 Measurement Uncertainty

Per CISPR 16-4-2	U _{lab}	U _{cispr}
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 40 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		
30 MHz – 300 MHz	3.92 dB	4.3 dB

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is $\pm 5.0\%$.	Per CISPR 16-4-2 Methods
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Measurement Uncertainty - EMC Immunity

The estimated combined standard uncertainty for ESD immunity measurements is $\pm 8.2\%$.	Per IEC 61000-4-2
The estimated combined standard uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated combined standard uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated combined standard uncertainty for power frequency magnetic field immunity is $\pm 2.9\%$.	Per IEC 61000-4-8
The estimated combined standard uncertainty for EFT fast transient immunity measurements is $\pm 2.6\%$.	Per IEC 61000-4-4
The estimated combined standard uncertainty for surge immunity measurements is $\pm 2.6\%$.	Per IEC 61000-4-5
The estimated combined standard uncertainty for voltage variation and interruption measurements is $\pm 1.74\%$.	Per IEC 61000-4-11

Measurement Uncertainty – Radio Testing

The estimated combined standard uncertainty for frequency error measurements is ± 3.88 Hz
The estimated combined standard uncertainty for carrier power measurements is ± 0.70 dB.
The estimated combined standard uncertainty for adjacent channel power measurements is ± 1.47 dB.
The estimated combined standard uncertainty for modulation frequency response measurements is ± 0.46 dB.
The estimated combined standard uncertainty for transmitter conducted emission measurements is ± 2.06 dB

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2017. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model N010001 and Q010001, eero 6 and eero 6 Extender, is a 2x2 home WiFi router. It is intended to operate as a dual band (2.4GHz and 5GHz) wireless router over 20 MHz, 40 MHz and 80 MHz channels. The router will be in compliance with regulatory standards of regions it will be operating in.

Model differences:

N010001, eero 6 Gateway, contains two RJ45 ports and USB-C AC/DC adapter port.

Q010001, eero 6 Extender, USB-C AC/DC adapter port; No RJ45 ports. BLE/802.15.4 RF circuitry has been removed.

Both have the same WLAN radio hardware.

Model N010001 is considered worst case and used for testing.

3.2 Equipment Configuration

A description of the equipment configuration is given in the Test Plan Section. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.3 Operating Mode

A description of the operation mode is given in the Test Plan Section. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing and to place the EUT in the most susceptible state for immunity testing.

3.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The N010001 has 3 internal antennas. BLE and ZigBee uses 1 Stamped Metal, Planar Inverted F, Antenna and 2 Flex PCB for WiFi in the band 2.4 GHz and 5 GHz.

The Q010001 has 2 internal antennas, 2 Flex PCB for WiFi in the band 2.4 GHz and 5 GHz.

Max Antenna Gain		Antenna Type		
	dBi			
BLE/ZigBee (2.4-2483.5 GHz)	3.46	Stamped metal, Planar Inverted F		
Wi-Fi			<u>Antenna 1 (dBi)</u>	<u>Antenna 2 (dBi)</u>
2.4-2483.5 GHz	3.72	Flexible Printed Circuit Board (FPCB)	3.72	3.25
U-NII-1 (5.15-5.25 GHz)	3.42	Flexible Printed Circuit Board (FPCB)	2.52	3.42
U-NII-2A (5.25-5.35 GHz)	2.37		1.69	2.37
U-NII-2C (5.47-5.725 GHz)	3.57		2.72	3.57
U-NII-3 (5.725-5.85 GHz)	4.17		4.04	4.17

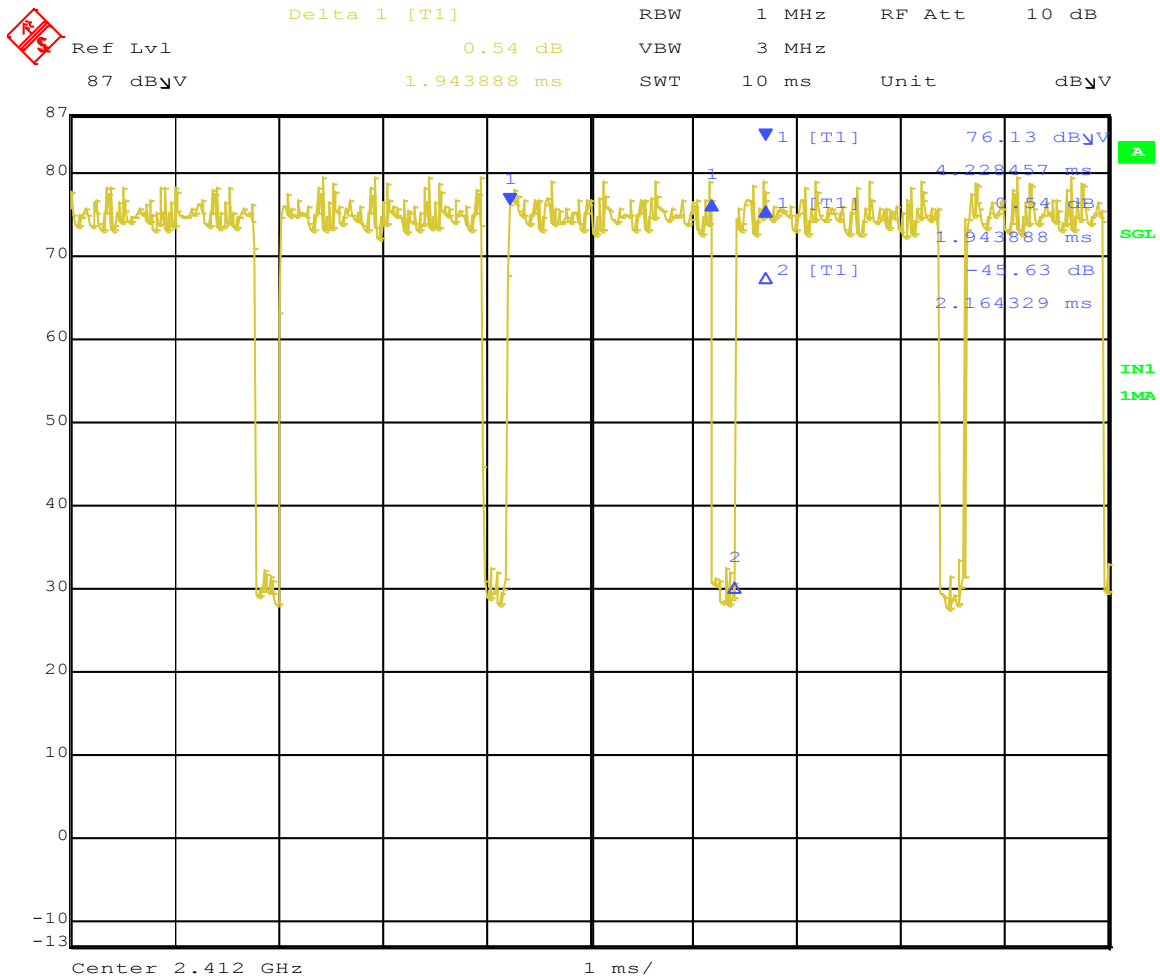
3.5 Duty Cycle

The N010001, were measured for the duty cycle.

Calculation of transmit duty cycle. Duty cycle (%) = (ON time / Period) * 100%

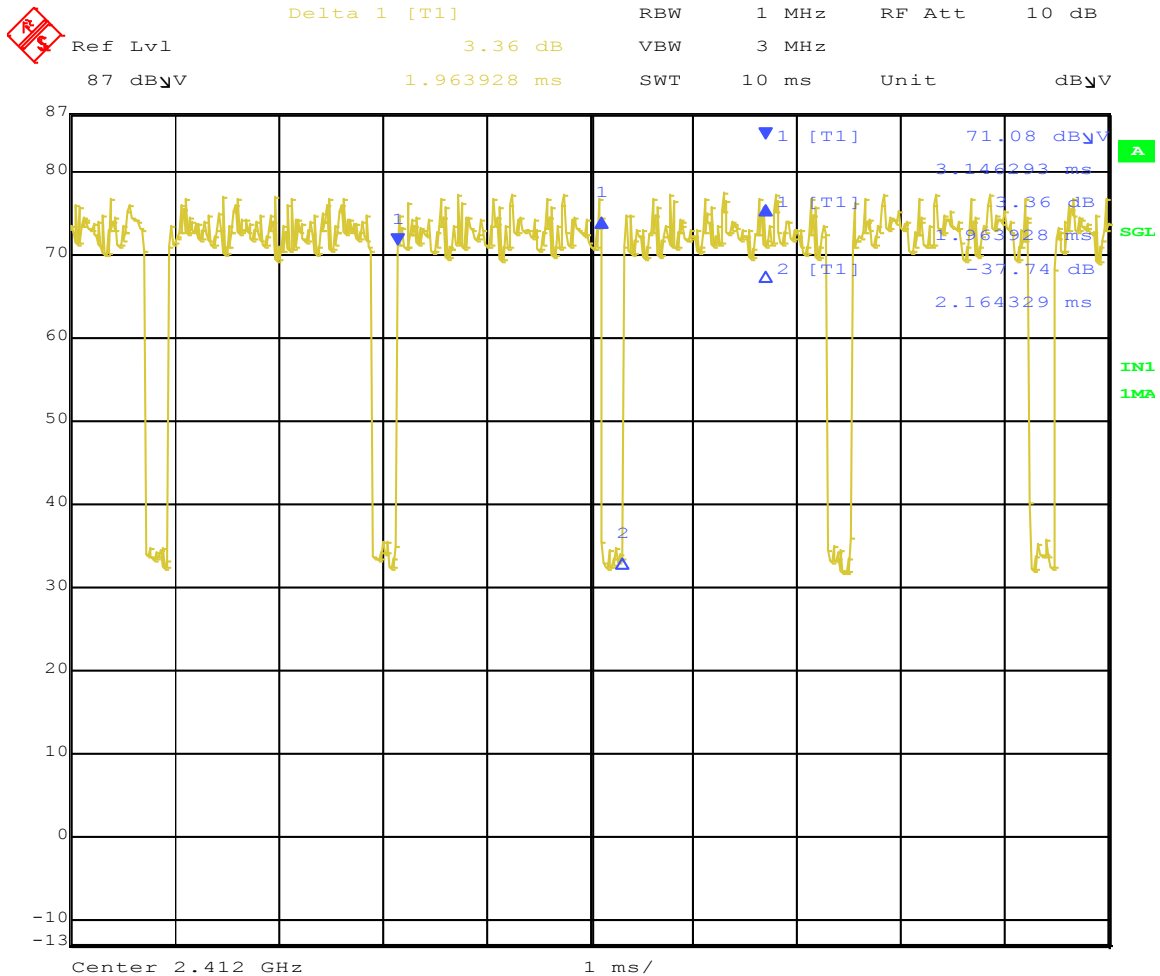
3.5.1 Results

Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Factor (dB)	Remark
802.11b	1.94	2.16	89.8	0.9	Radiated Bandedge
802.11g	1.96	2.16	90.8	0.8	Radiated Bandedge
802.11n HT20	5.37	5.57	96.4	0.3	Radiated Bandedge
802.11n HT40	5.42	5.58	97.1	0.25	Radiated Bandedge
802.11b	1.94	2.16	89.8	0.47	Conducted
802.11g	1.96	2.16	90.8	0.42	Conducted
802.11n HT20	5.37	5.57	96.4	0.16	Conducted
802.11n HT40	5.42	5.58	97.1	0.13	Conducted
Note: EUT configured and measured for duty cycle. Duty cycle factor will be used toward RF measurement offset.					



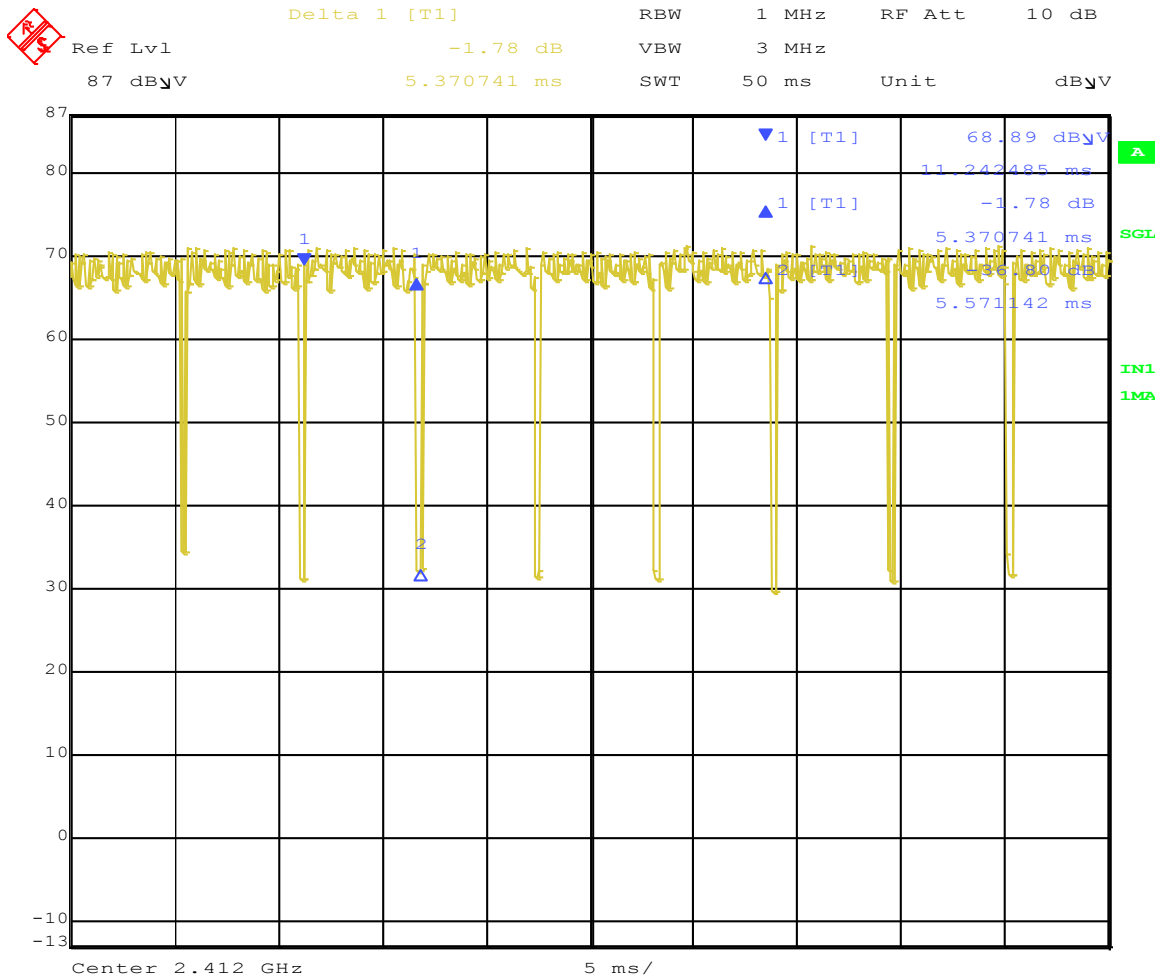
Date: 24.AUG.2020 11:52:05

Figure 1: Duty Cycle for 802.11b



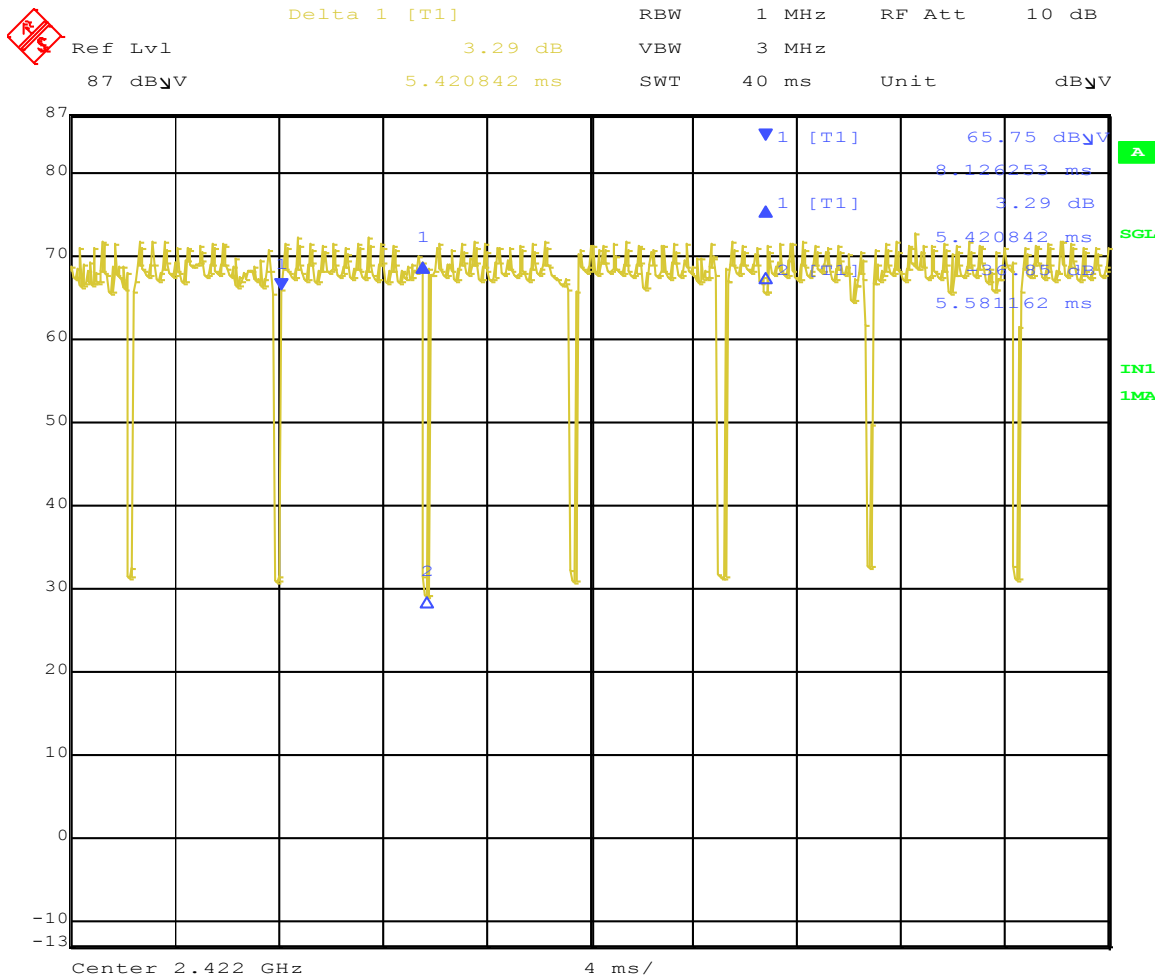
Date: 24.AUG.2020 11:36:33

Figure 2: Duty Cycle for 802.11g



Date: 24.AUG.2020 10:08:30

Figure 3: Duty Cycle for 802.11n HT20



Date: 24.AUG.2020 10:41:35

Figure 4: Duty Cycle for 802.11n HT40

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2020 and RSS 247 Issue 2, 2017. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in section 8 of the standard were used.

4.1 Output Power Requirements

The maximum output power requirement is the maximum equivalent isotropic radiated power delivering at the transmitting antenna under specified conditions of measurements in the presence of modulation.

The maximum output power and harmonics shall not exceed CFR47 Part 15.247 (b):2020 and RSS 247: 2017 Sect. 5.4.(d).

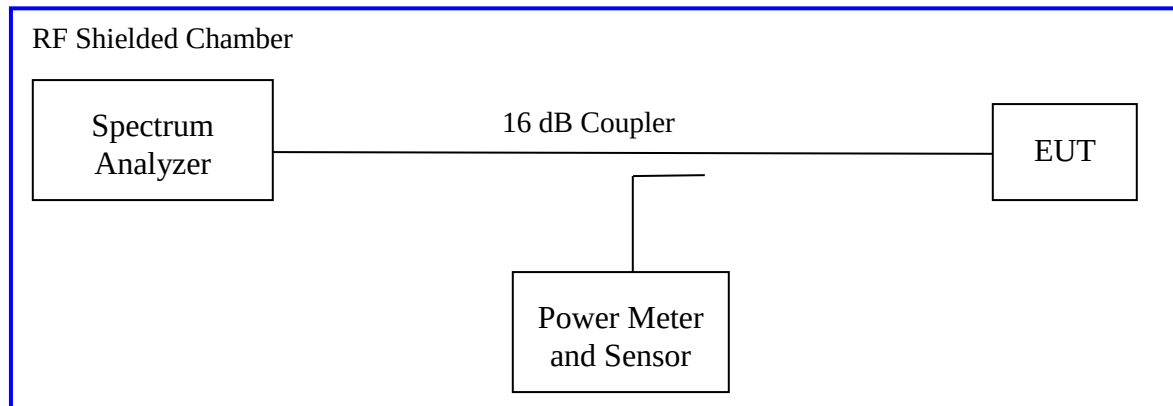
The maximum transmitted powers are

Band 2400-2483.5 MHz: 1 W

4.1.1 Test Method

The ANSI C63.10-2013 Section 11.9.2.2.2. conducted method was used to measure the channel power output. The preliminary investigation was performed at different data rate/ chain to determine the highest power output for each mode. The worst findings were conducted on 3 channels in each operating range per CFR47 Part 15.247(b): 2020 and RSS 247 Sect. 5.4 (d). This test was conducted on 3 channels of Sample. The worst mode result indicated below.

Test Setup:



Method AVGSA-1 of "KDB 558074 – DTS Measurement Guidance v05r02" applies since the EUT continuously transmits with duty cycle greater than 98%. Sample detector was used.

4.1.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 2: RF Output Power at the Antenna Port – Test Results

Date: August 25, 2020			Tested By: Kerwinn Corpuz			
Test Method: Conducted Measurements			Power Setting: See test plan.			
Antenna Type: FPCB			Max Antenna Gain: 3.72 dBi			
Operating Mode: Uncorrelated			Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)			
Ambient Temp.: 21 °C			Relative Humidity: 36%			
802.11b at 1 Mbps						
Frequency (MHz)	CH 0 Pout [dBm]	CH 1 Pout [dBm]	Duty Cycle [dB]	Max Power [dBm]	Limit [dBm]	Margin [dB]
2412	19.66	19.96	0.47	20.43	30.00	-9.57
2437	22.27	22.89	0.47	23.36	30.00	-6.64
2462	19.32	19.89	0.47	20.36	30.00	-9.64
802.11g at 6 Mbps						
2412	17.12	19.26	0.42	19.68	30.00	-10.32
2437	19.57	21.87	0.42	22.29	30.00	-7.71
2462	16.64	18.74	0.42	19.16	30.00	-10.84
802.11n HT20 at MCS0						
2412	18.94	18.97	0.16	19.13	30.00	-10.87
2437	21.93	22.61	0.16	22.77	30.00	-7.23
2462	19.67	19.96	0.16	20.12	30.00	-9.88
802.11n HT40 at MCS0						
2422	16.96	17.08	0.13	17.21	30.00	-12.79
2437	17.47	17.87	0.13	18.00	30.00	-12.00
2452	17.61	17.65	0.13	17.78	30.00	-12.22
Note: Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.						

Table 3: RF Output Power at the Antenna Port – Test Results Continued

Date: August 25, 2020			Tested By: Kerwinn Corpuz			
Test Method: Conducted Measurements			Power Setting: See test plan.			
Antenna Type: FPCB			Total Antenna Gain: 6.50 dBi			
Operating Mode: Correlated			Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle			
Ambient Temp.: 21 °C			Relative Humidity: 36%			
802.11n HT20 at MCS0						
Frequency (MHz)	CH 0 Output [dBm]	CH 1 Output [dBm]	Duty Cycle [dB]	Total Power [dBm]	Limit [dBm]	Margin [dB]
2412	18.94	18.97	0.16	22.13	29.50	-7.37
2437	21.93	22.61	0.16	25.45	29.50	-4.05
2462	19.67	19.96	0.16	22.99	29.50	-6.51
802.11n HT40 at MCS0						
2422	16.96	17.08	0.13	20.16	29.50	-9.34
2437	17.47	17.87	0.13	20.81	29.50	-8.69
2452	17.61	17.65	0.13	20.77	29.50	-8.73
Note: Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.						

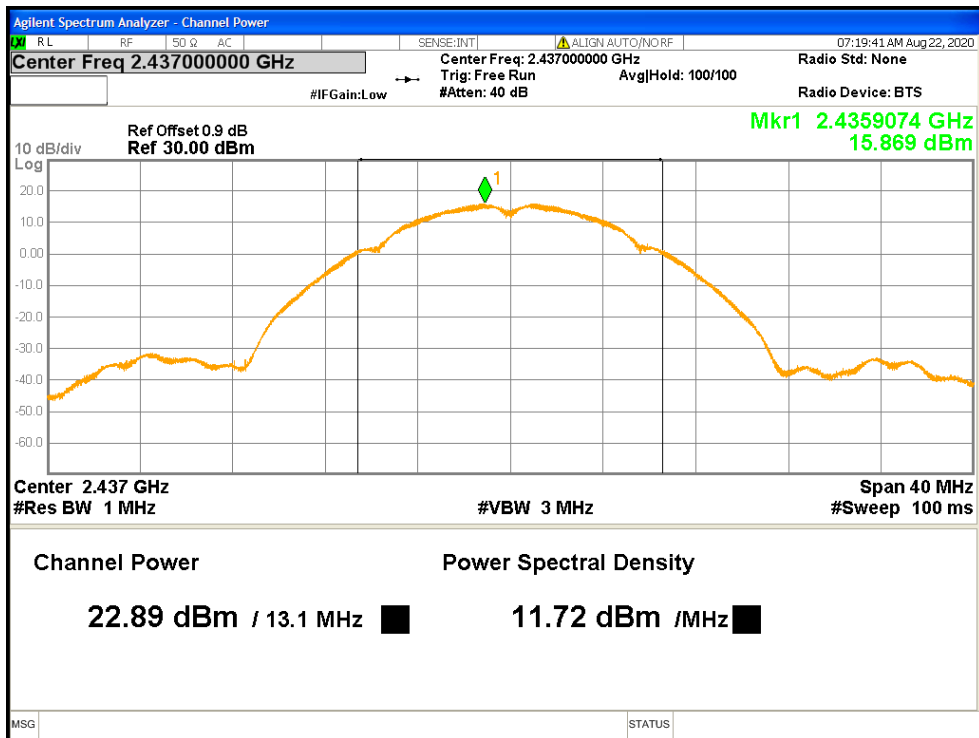


Figure 5: Uncorrelated Max Conducted Power-2437 MHz-802.11b-1 Mbps-Ch1

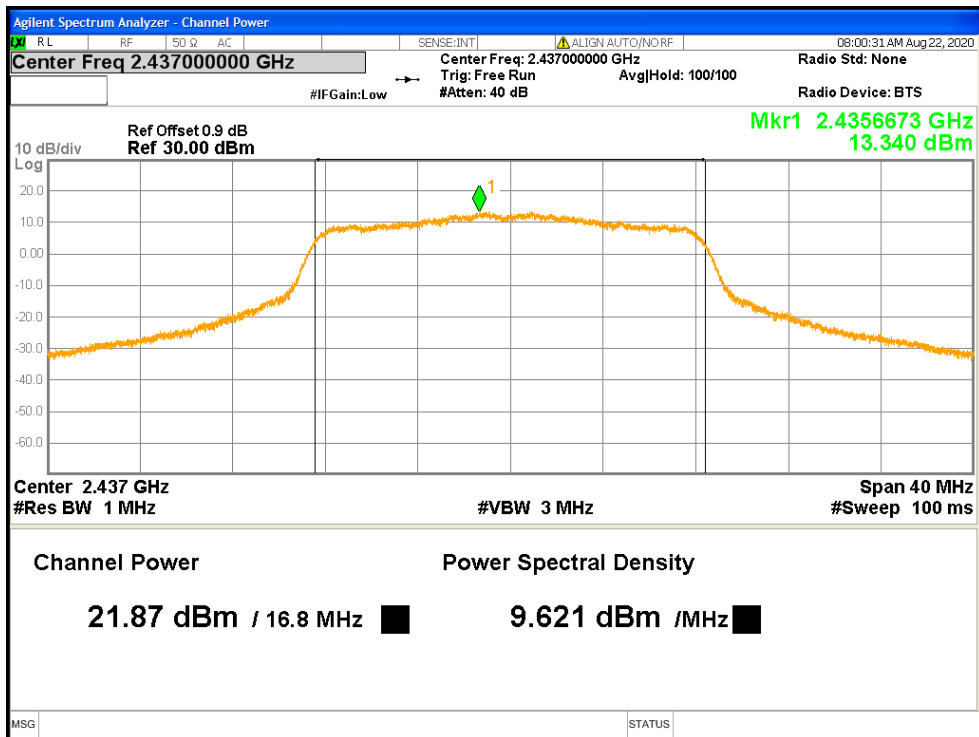


Figure 6: Uncorrelated Max Conducted Power-2437 MHz-802.11g-6 Mbps-Ch1

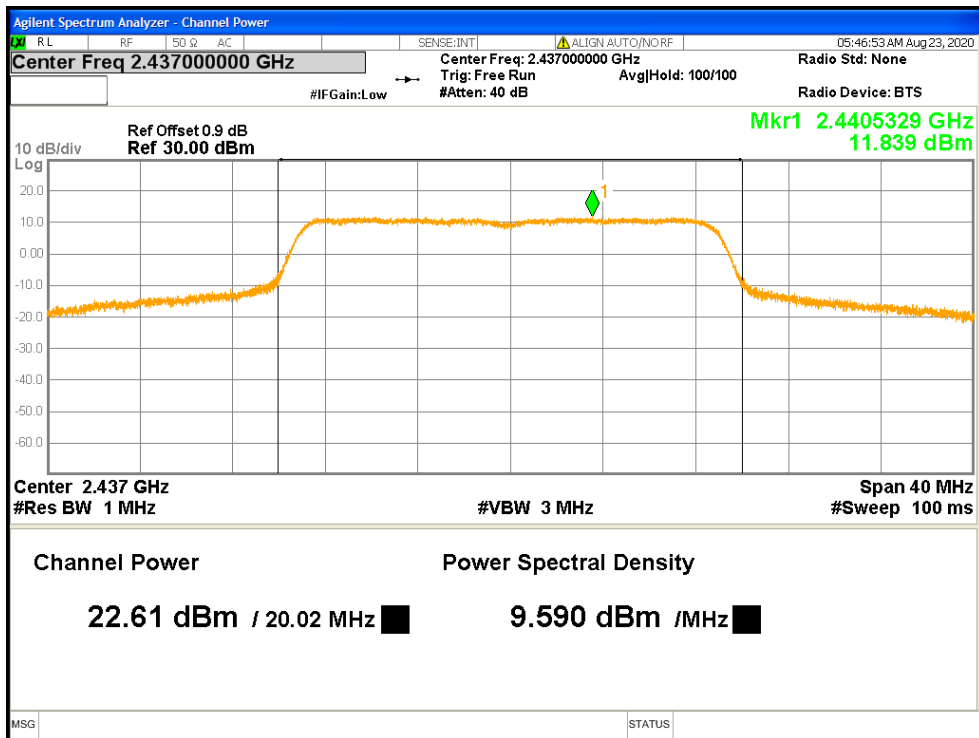


Figure 7: Uncorrelated Max Conducted Power-2437 MHz-HT20-MCS0-Ch1

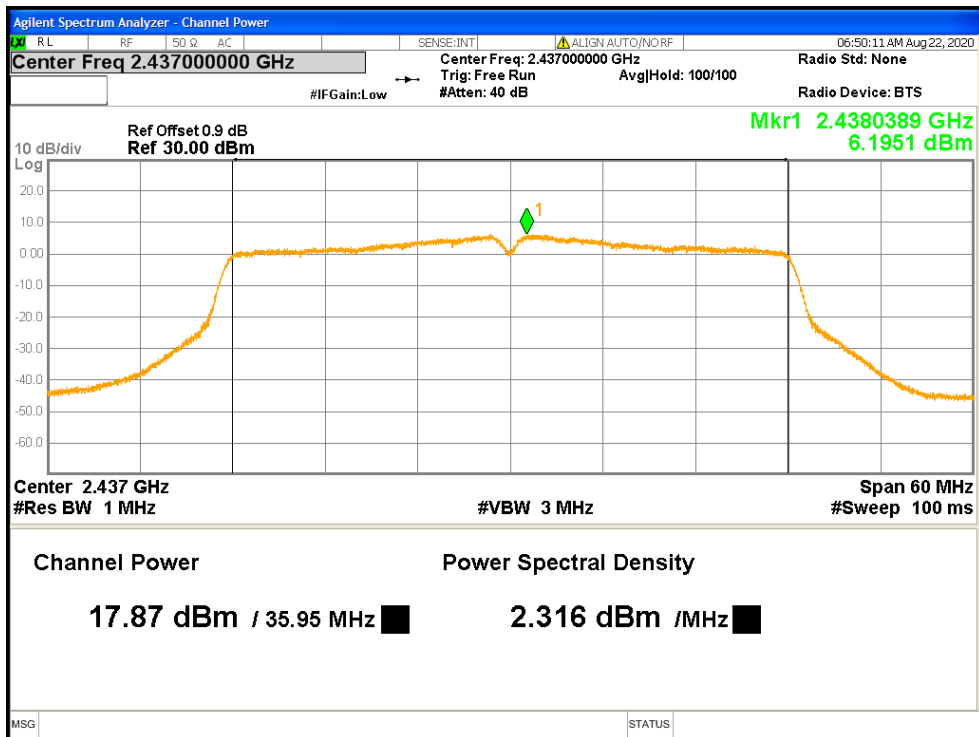


Figure 8: Uncorrelated Max Conducted Power-2437 MHz-HT40-MCS0-Ch1

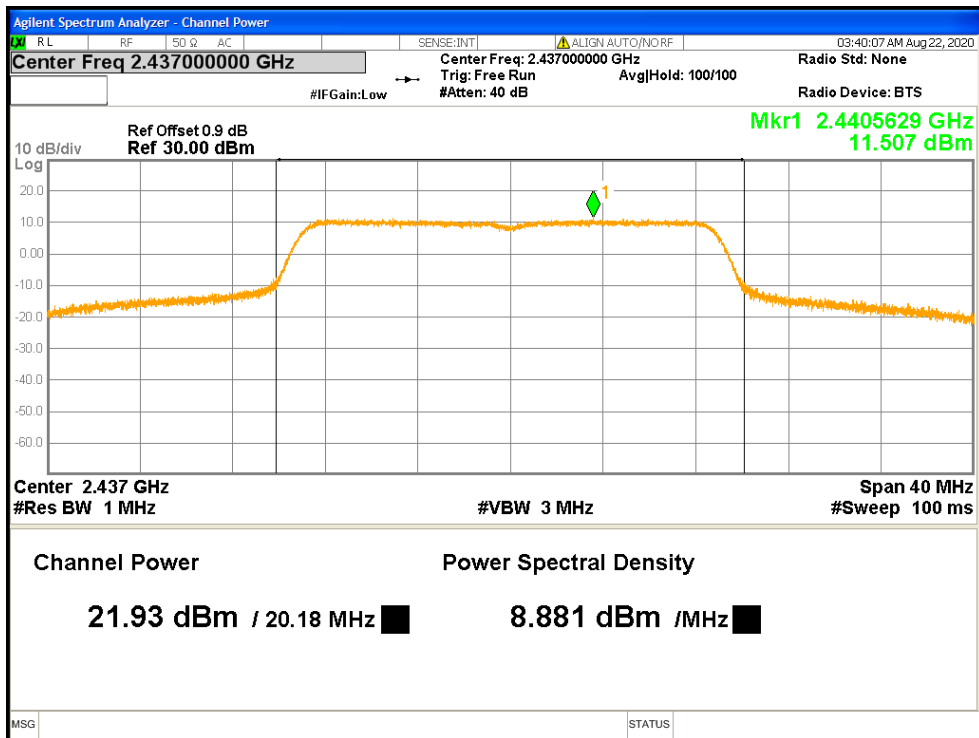


Figure 9: Correlated Max Conducted Power-2437 MHz-HT20-MCS0-Ch0

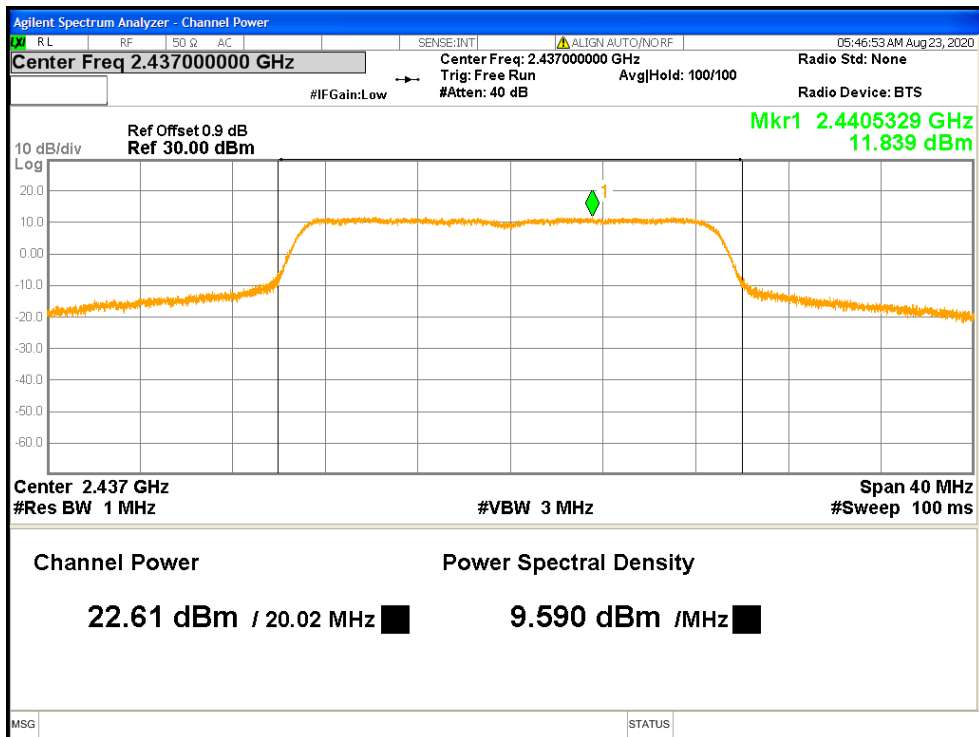


Figure 10: Correlated Max Conducted Power-2437 MHz-HT20-MCS0-Ch1

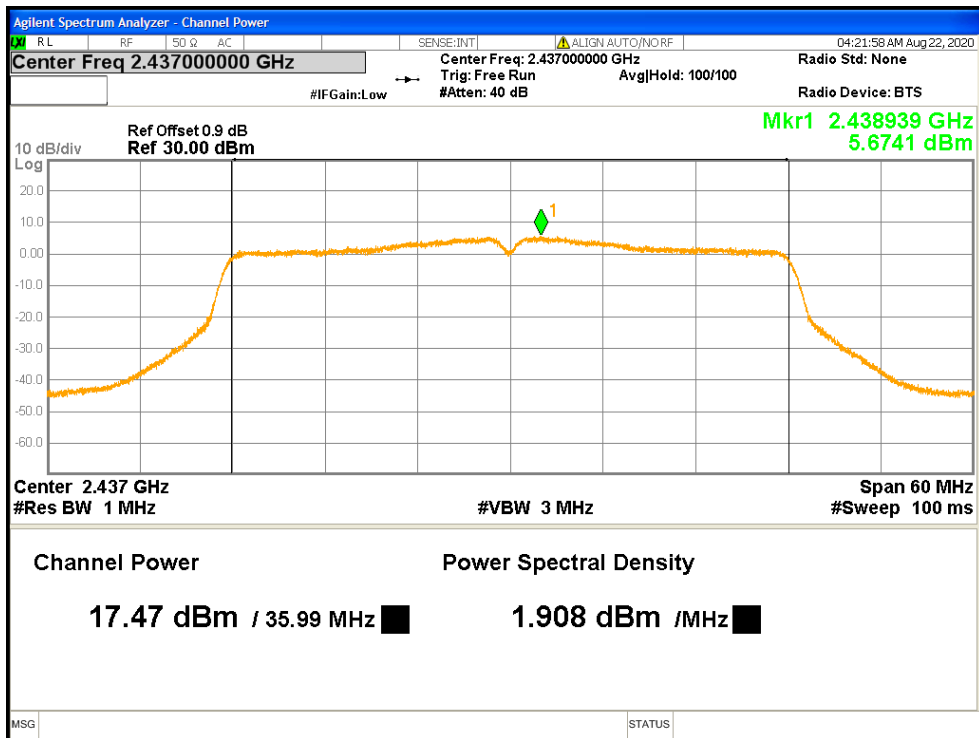


Figure 11: Correlated Max Conducted Power-2437 MHz-HT40-MCS0-Ch0

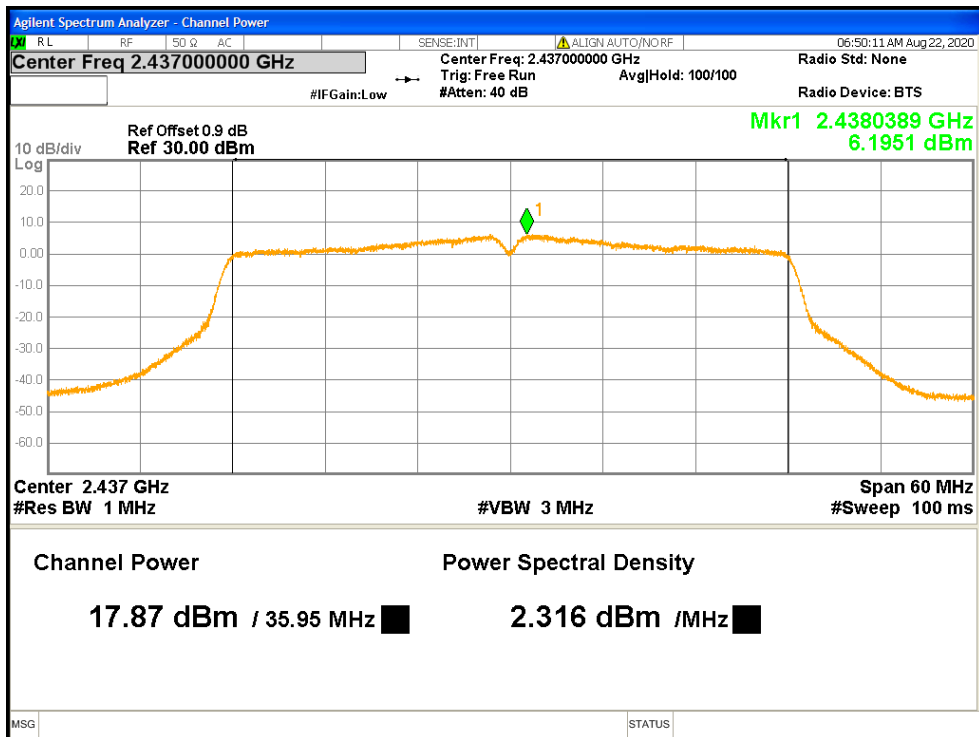


Figure 12: Correlated Max Conducted Power-2437 MHz-HT40-MCS0-Ch1

4.2 Occupied Bandwidth

The occupied bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency.

The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

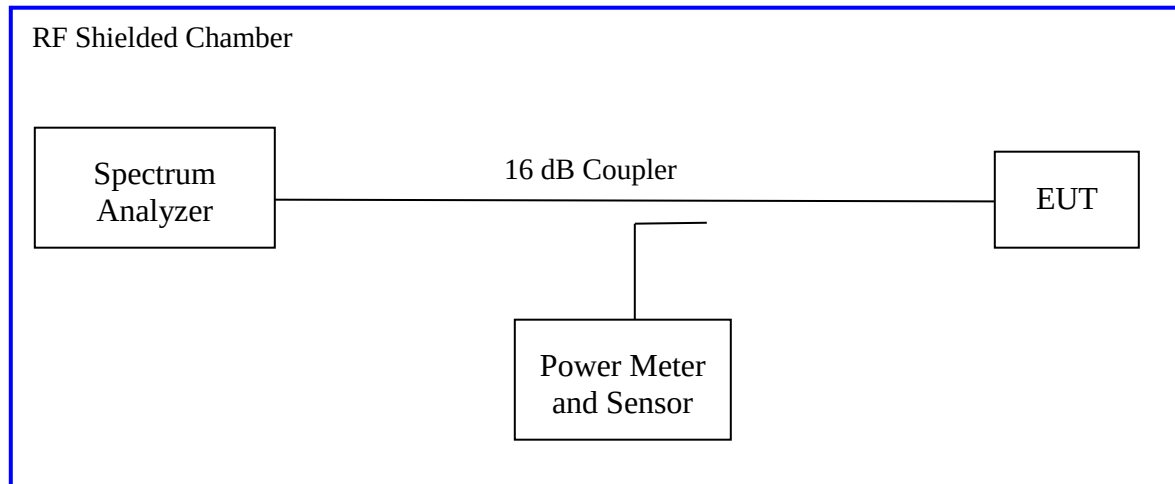
The minimum 6 dB bandwidth shall be at least 500 kHz.

The bandwidth shall be at least 500 kHz per Section CFR47 15.247(a2) 2020 and RSS 247 Sect.5.2 (a): 2017

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth according to ANSI C63.10:2013 Section 11.8.1. The measurement was performed with modulation per CFR47 15.247(a) (2) 2020 and RSS Gen Sect. 6.7 2019. The preliminary investigation was performed to find the narrowest 6 dB bandwidth for each operational mode at different data rates. This worst finding was performed on 3 channels in each operating frequency range; 2400 MHz to 2483.5 MHz. This test was conducted on 3 channels in each mode of Sample. The worst sample result indicated below.

Test Setup:



4.2.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 4: Occupied Bandwidth – Test Results

Date: August 25, 2020			Tested By: Kerwinn Corpuz		
Test Method: Conducted Measurements			Power Setting: See test plan.		
Antenna Type: FPCB			Max Antenna Gain: 3.72 dBi		
Operating Mode: Uncorrelated			Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)		
Ambient Temp.: 21 °C			Relative Humidity: 36%		
802.11b, 1 Mbps					
Frequency (MHz)	99% Bandwidth (MHz)		6 dB Bandwidth (MHz)		Limit (kHz)
	Ch0	Ch1	Ch0	Ch1	
2412	13.009	13.115	7.096	8.046	500
2437	12.976	12.840	8.046	8.046	500
2462	13.009	12.823	8.051	8.051	500
802.11g, 6 Mbps					
2412	16.334	16.293	15.062	15.042	500
2437	16.368	16.322	15.082	15.047	500
2462	16.324	16.291	15.082	15.077	500
802.11n HT20, MCS0					
2412	17.722	17.730	17.727	13.877	500
2437	17.892	17.871	17.707	15.112	500
2462	17.730	17.731	17.717	15.097	500
802.11n HT40, MCS0					
2422	35.947	35.947	33.814	32.584	500
2437	35.950	35.935	33.709	33.807	500
2452	35.958	35.939	33.829	33.859	500
Note: 1. The 99% bandwidth measurements are informative, and 6 dB bandwidth must be at least 500 kHz. 2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of The report, Highlighted Plots are placed in the report.					

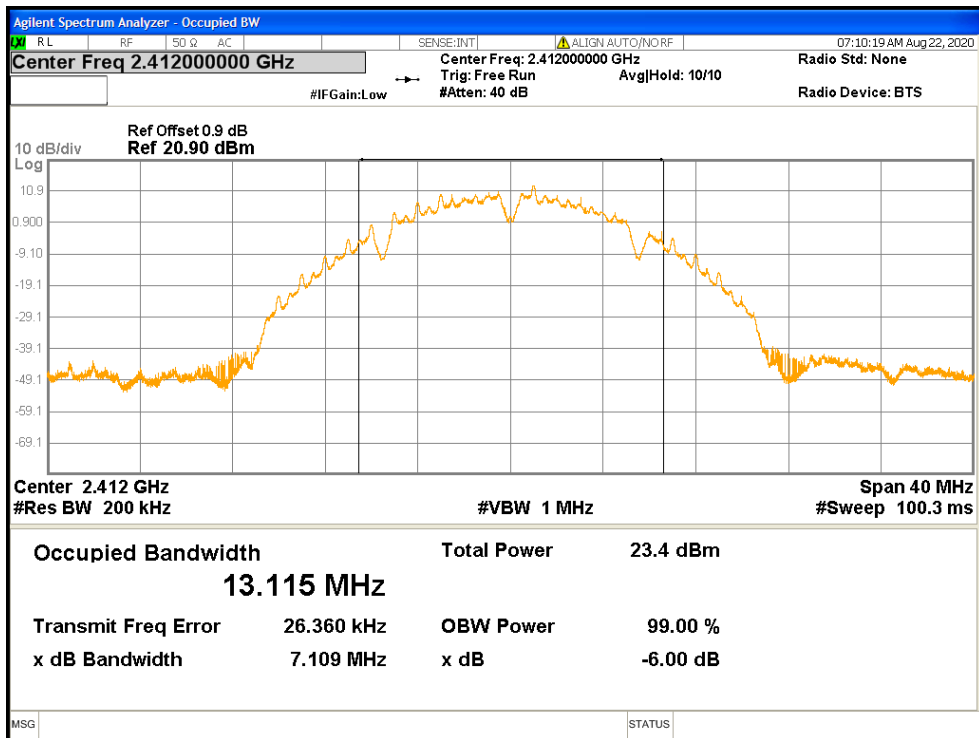


Figure 13: 99% Occupied Bandwidth-2412 MHz-802.11b-Ch1

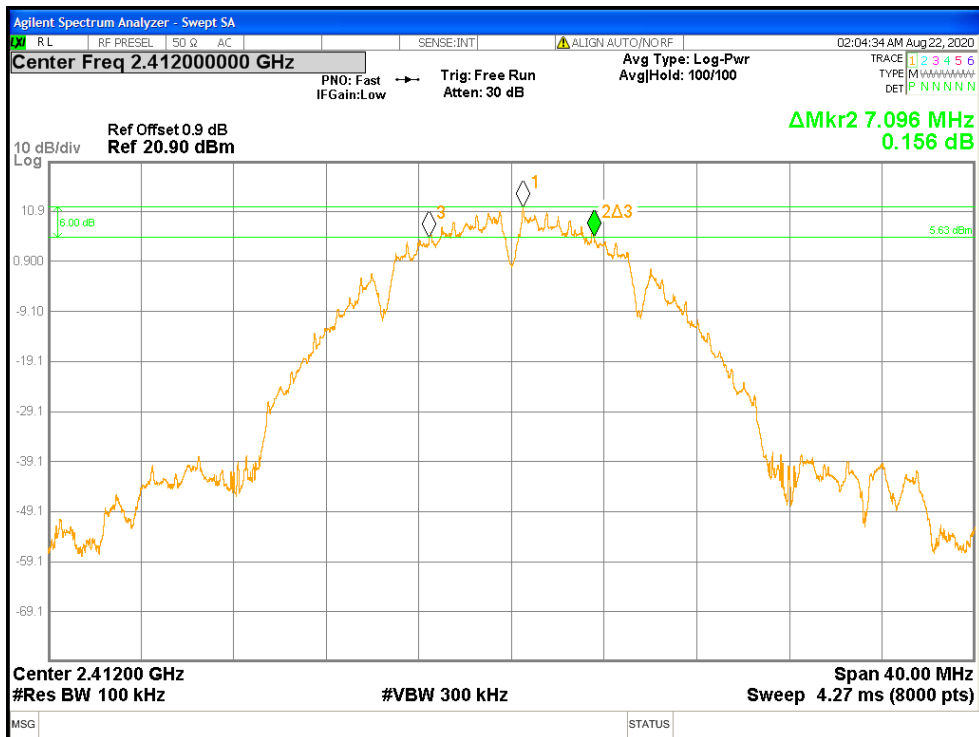


Figure 14: 6 dB Occupied Bandwidth-2412 MHz-802.11b-Ch0

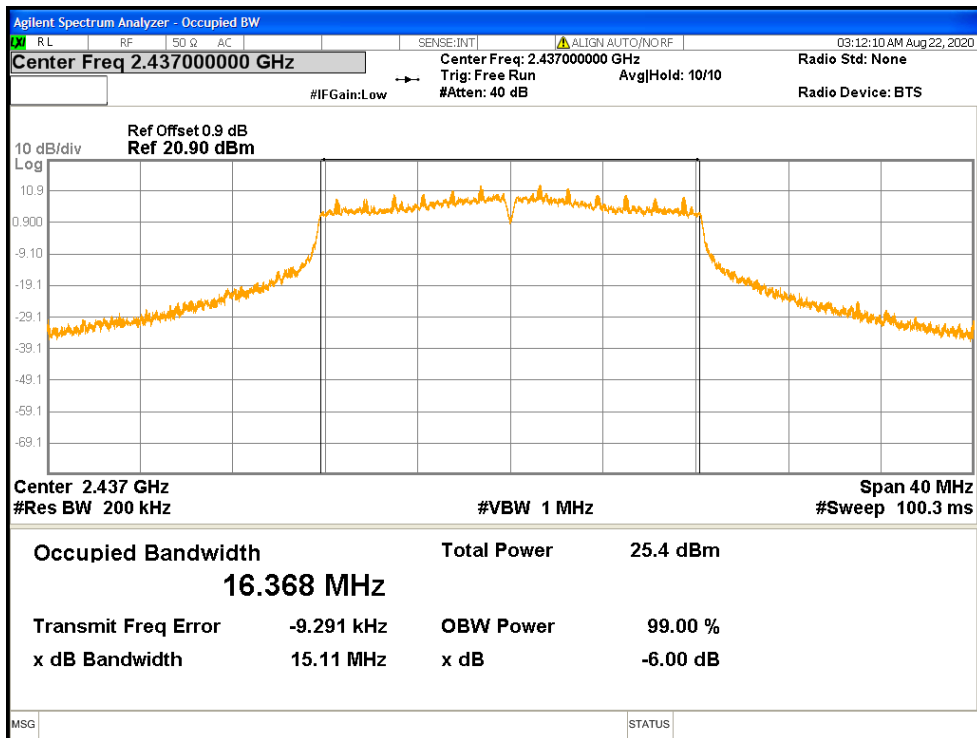


Figure 15: 99% Occupied Bandwidth-2437 MHz-802.11g-Ch0

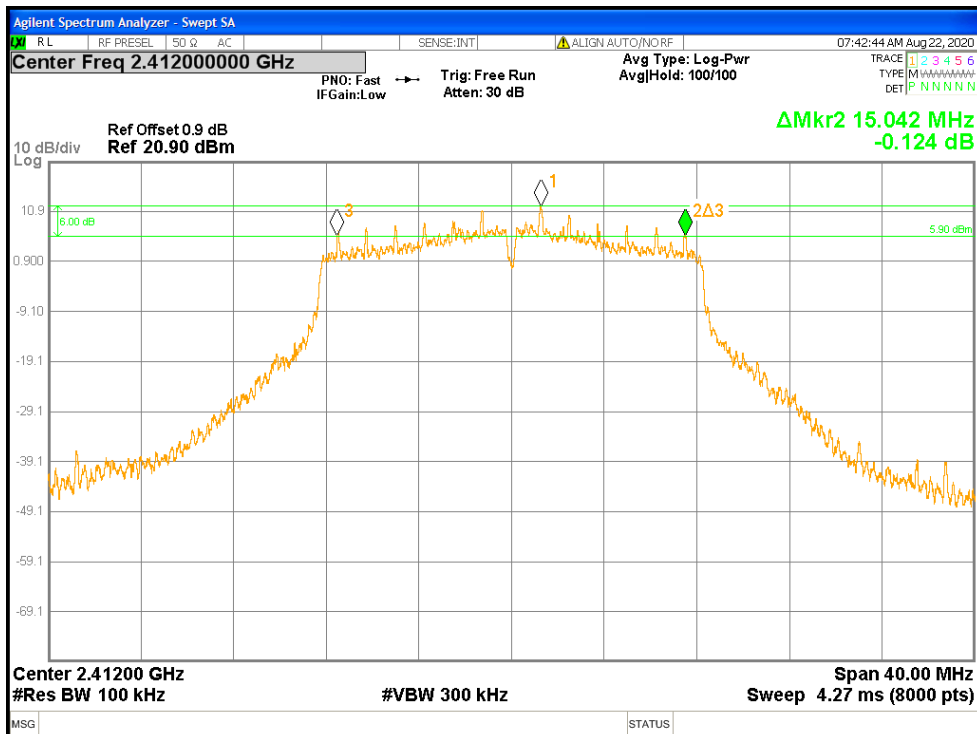


Figure 16: 6 dB Occupied Bandwidth-2412 MHz-802.11g-Ch1

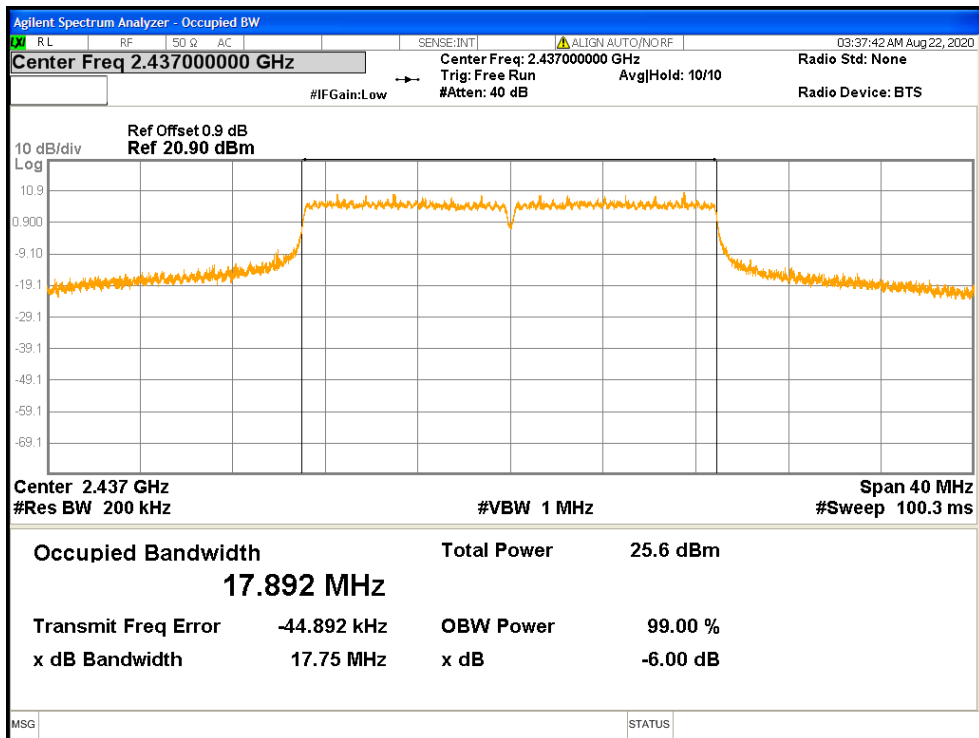


Figure 17: 99% Occupied Bandwidth-2437 MHz-802.11n HT20-Ch0

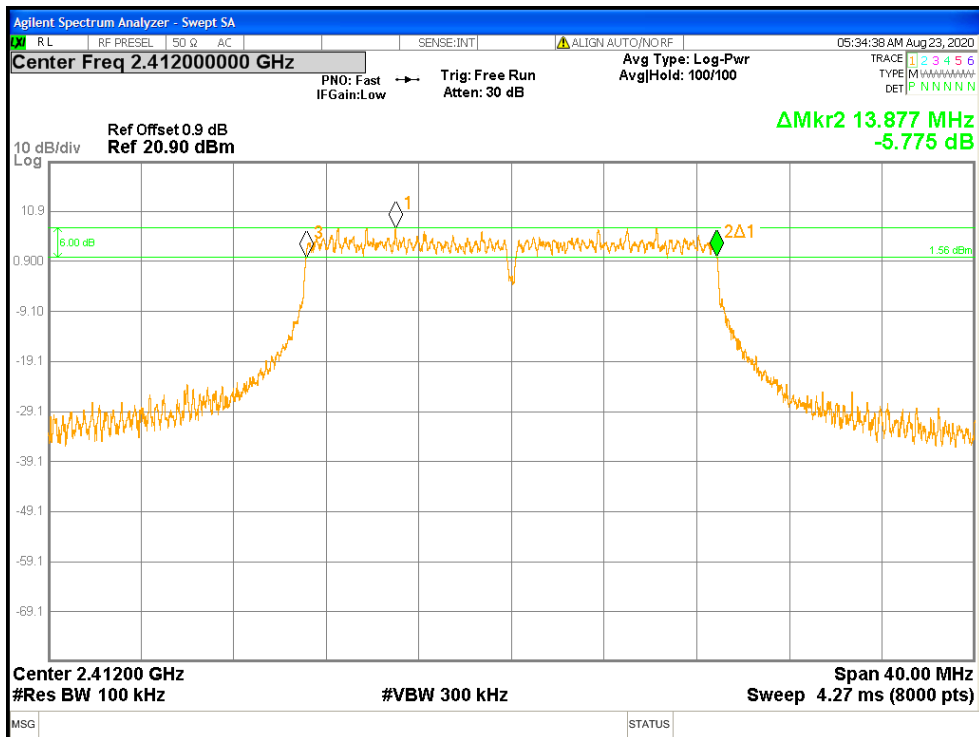


Figure 18: 6 dB Occupied Bandwidth-2412 MHz-802.11n HT20-Ch1

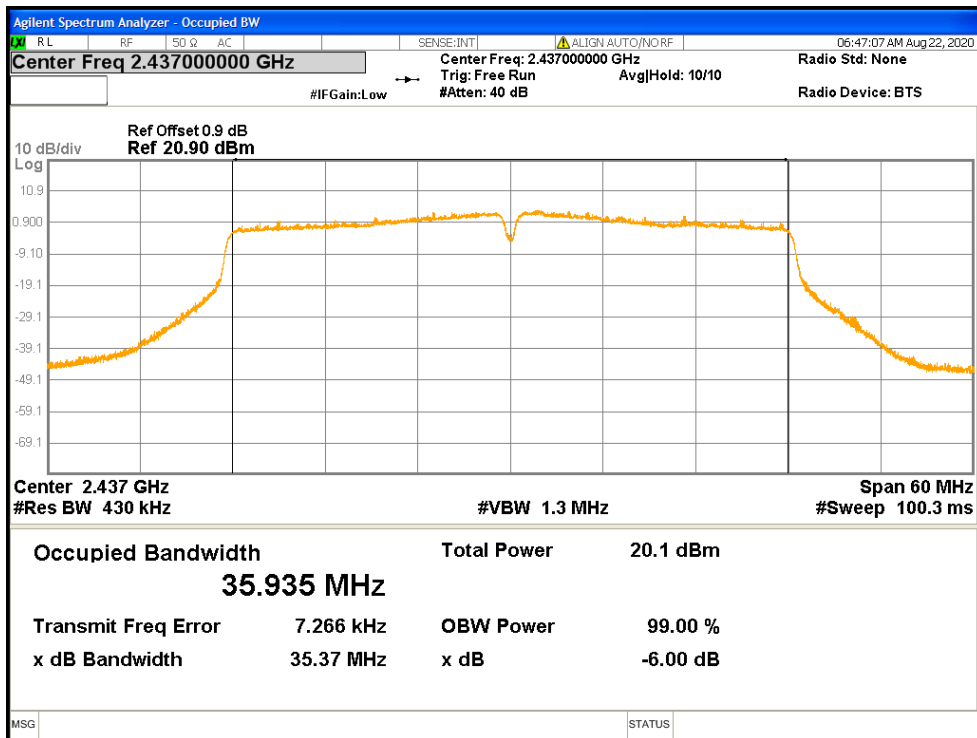


Figure 19: 99% Occupied Bandwidth-2437 MHz-802.11n HT40-Ch1

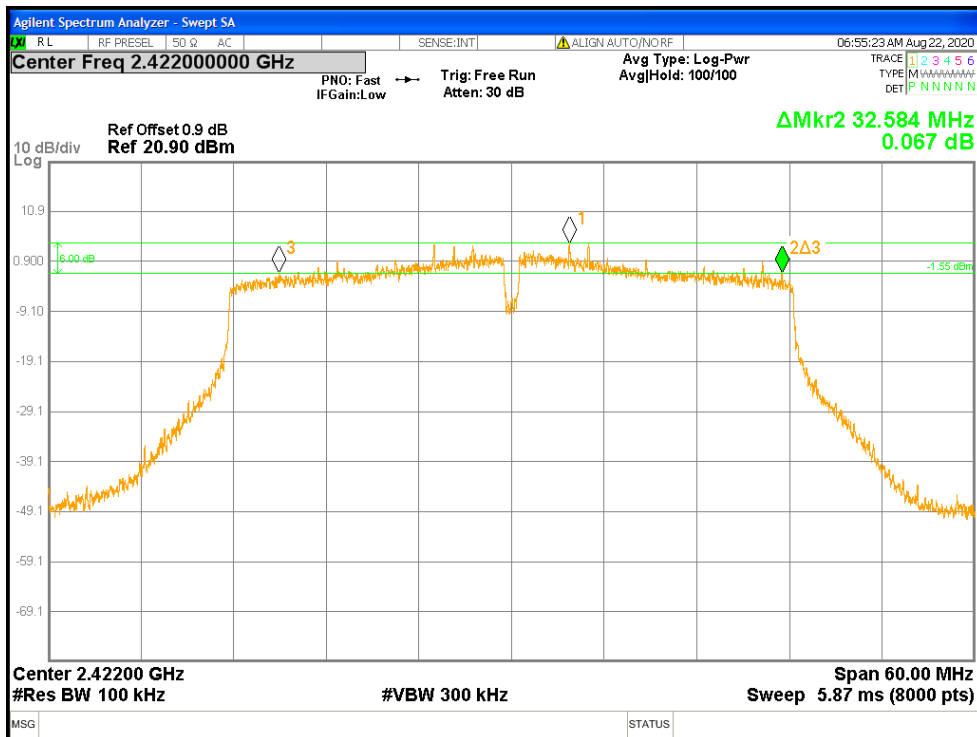


Figure 20: 6 dB Occupied Bandwidth-2422 MHz-802.11n HT40-Ch1

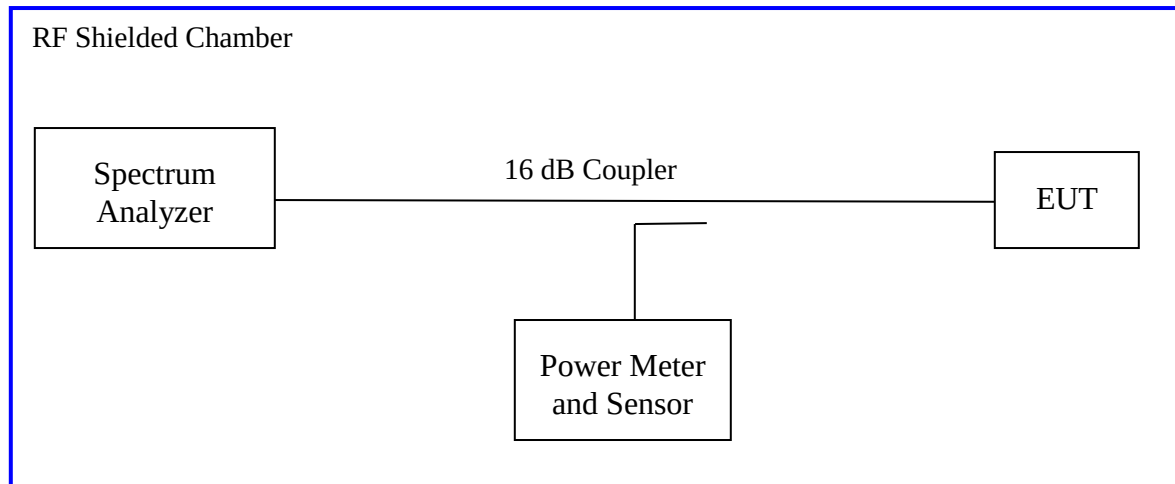
4.3 Peak Power Spectral Density

According to the CFR47 Part 15.247 (e) and RSS 247 Sect.5.2 (b), the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.1 Test Method

The conducted method was used to measure the channel power output per ANSI C63.10-2013 Section 11.10.3. The measurement was performed with modulation per CFR47 Part 15.247 (e) and RSS 247 Sect.5.2 (b). The pre-evaluation was performed to find the worst modes. The worst findings were conducted on 3 channels in each operating frequency range of 2400 MHz to 2483.5 MHz. This test was conducted on 3 channels of Sample. The worst sample result indicated below.

Test Setup:



4.3.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 5: Peak Power Spectral Density – Test Results

Date: August 25, 2020			Tested By: Kerwinn Corpuz			
Test Method: Conducted Measurements			Power Setting: See test plan.			
Antenna Type: FPCB			Max Antenna Gain: 3.72 dBi			
Operating Mode: Uncorrelated			Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)			
Ambient Temp.: 21 °C			Relative Humidity: 36%			
802.11b at 1 Mbps						
Frequency (MHz)	CH 0 Output [dBm]	CH 1 Output [dBm]	CF [dB]	Max PSD [dBm]	Limit [dBm]	Margin [dB]
2412	3.75	3.92	-14.76	-10.84	8.00	-18.84
2437	6.29	6.98	-14.76	-7.78	8.00	-15.78
2462	3.52	4.50	-14.76	-10.27	8.00	-18.27
802.11g at 6 Mbps						
2412	-0.19	1.74	-14.81	-13.07	8.00	-21.07
2437	2.37	4.35	-14.81	-10.46	8.00	-18.46
2462	-0.10	1.33	-14.81	-13.48	8.00	-21.48
802.11n HT20 at MCS0						
2412	-0.90	-0.84	-15.07	-15.91	8.00	-23.91
2437	2.05	2.62	-15.07	-12.45	8.00	-20.45
2462	-0.22	0.31	-15.07	-14.76	8.00	-22.76
802.11n HT40 at MCS0						
2422	-4.27	-4.04	-15.10	-19.14	8.00	-27.14
2437	-3.88	-3.38	-15.10	-18.48	8.00	-26.48
2452	-3.33	-3.44	-15.10	-18.43	8.00	-26.43
Note: 1. CF accounted for the measured RBW and the EUT duty cycle. 2. The bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.						

Table 6: Peak Power Spectral Density – Test Results Continued

Date: August 25, 2020			Tested By: Kerwinn Corpuz			
Test Method: Conducted Measurements			Power Setting: See test plan.			
Antenna Type: FPCB			Total Antenna Gain: 6.50 dBi			
Operating Mode: Correlated			Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)			
Ambient Temp.: 21 °C			Relative Humidity: 36%			
802.11n HT20 at MCS0						
Frequency (MHz)	CH 0 Output [dBm]	CH 1 Output [dBm]	CF [dB]	Total PSD [dBm]	Limit [dBm]	Margin [dB]
2412	-0.90	-0.84	-15.07	-12.93	8.00	-20.93
2437	2.05	2.62	-15.07	-9.72	8.00	-17.72
2462	-0.22	0.31	-15.07	-12.01	8.00	-20.01
802.11n HT40 at MCS0						
2422	-4.27	-4.04	-15.10	-16.24	8.00	-24.24
2437	-3.88	-3.38	-15.10	-15.72	8.00	-23.72
2452	-3.33	-3.44	-15.10	-15.47	8.00	-23.47
Note: 1. CF accounted for the measured RBW and the EUT duty cycle. 2. The bandwidth ratio is 10*log (3kHz/100kHz) or -15.23 dB. 3. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.						

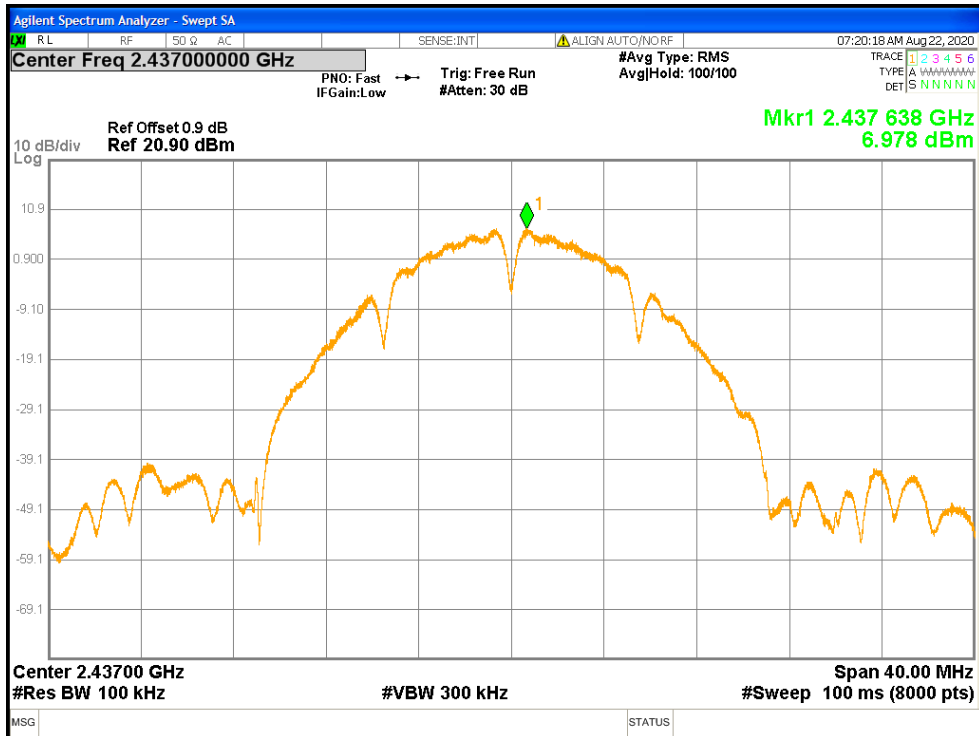


Figure 21: Uncorrelated Max Power Spectral Density-2437 MHz-11b-1Mbps-Ch1

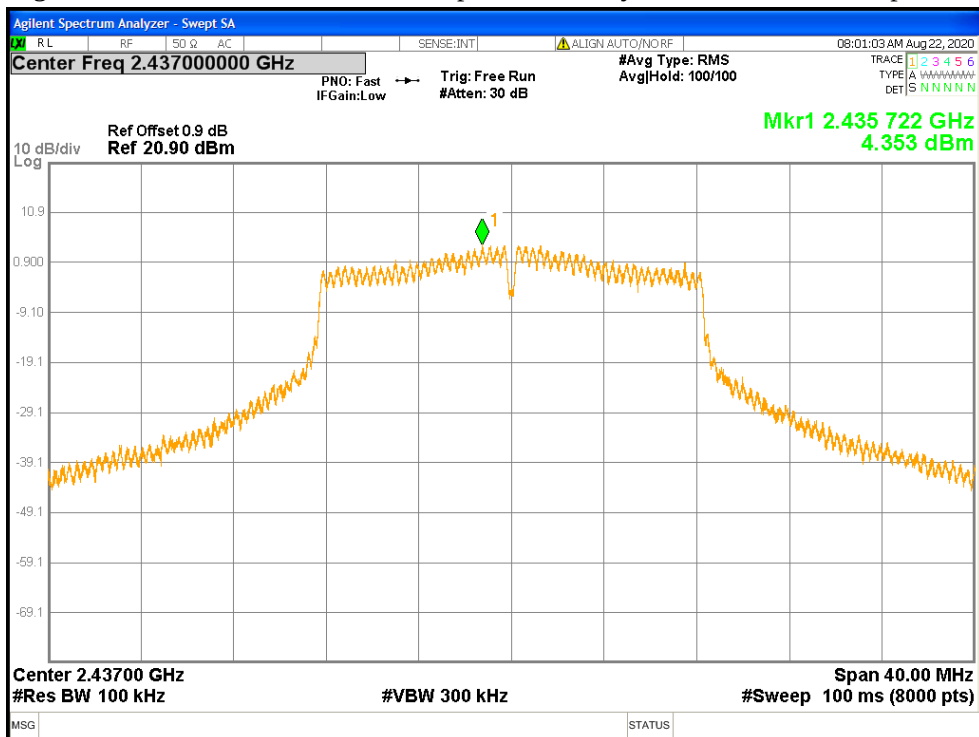


Figure 22: Uncorrelated Max Power Spectral Density-2437 MHz-11g-6Mbps-Ch1

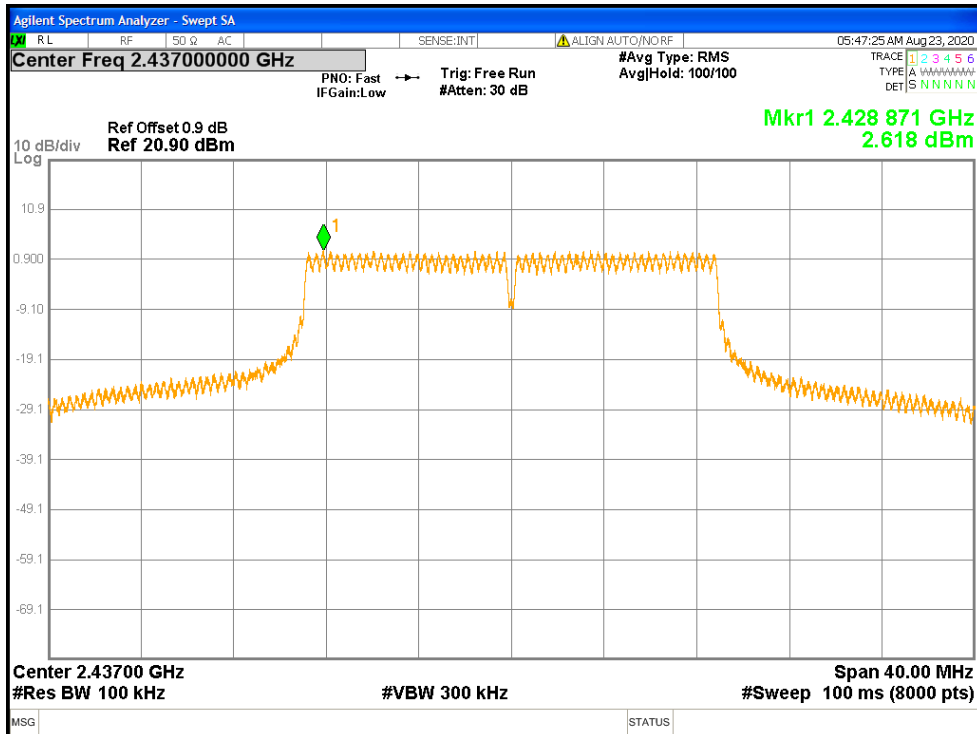


Figure 23: Uncorrelated Max Power Spectral Density-2437 MHz-HT20-MCS0-Ch1

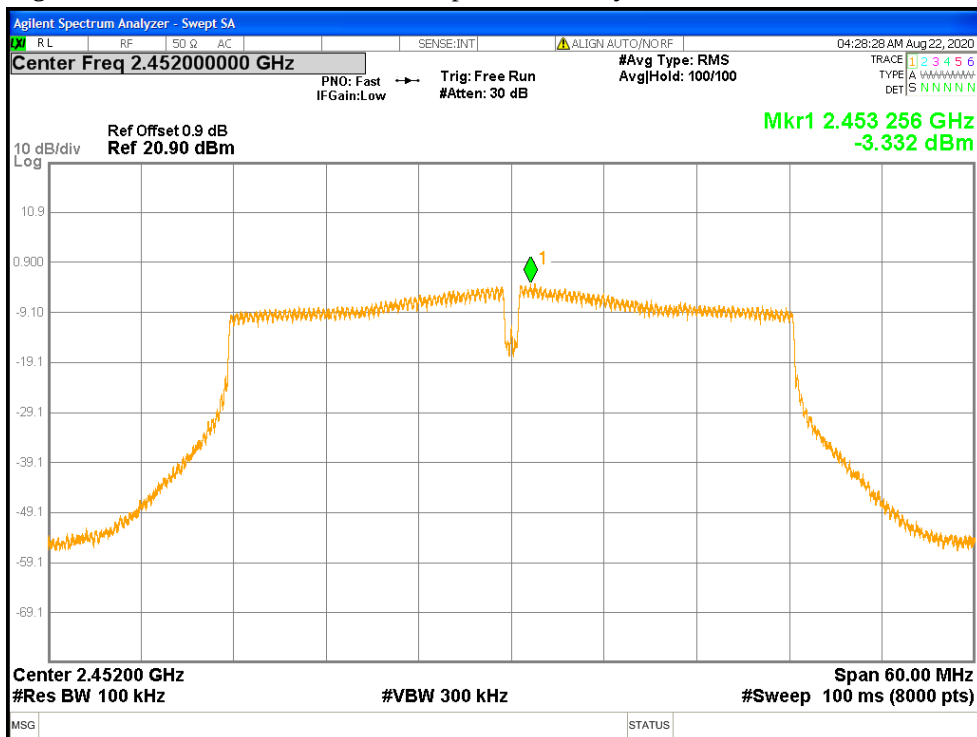


Figure 24: Uncorrelated Max Power Spectral Density-2452 MHz-HT40-MCS0-Ch0

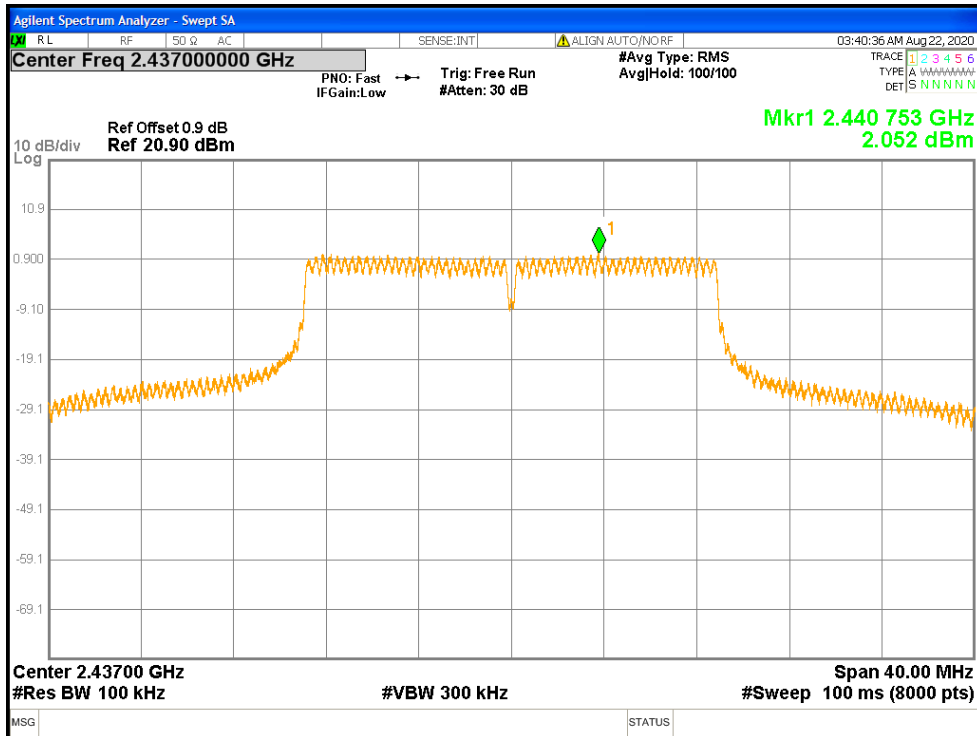


Figure 25: Correlated Max Power Spectral Density-2437 MHz-HT20-MCS0-Ch0

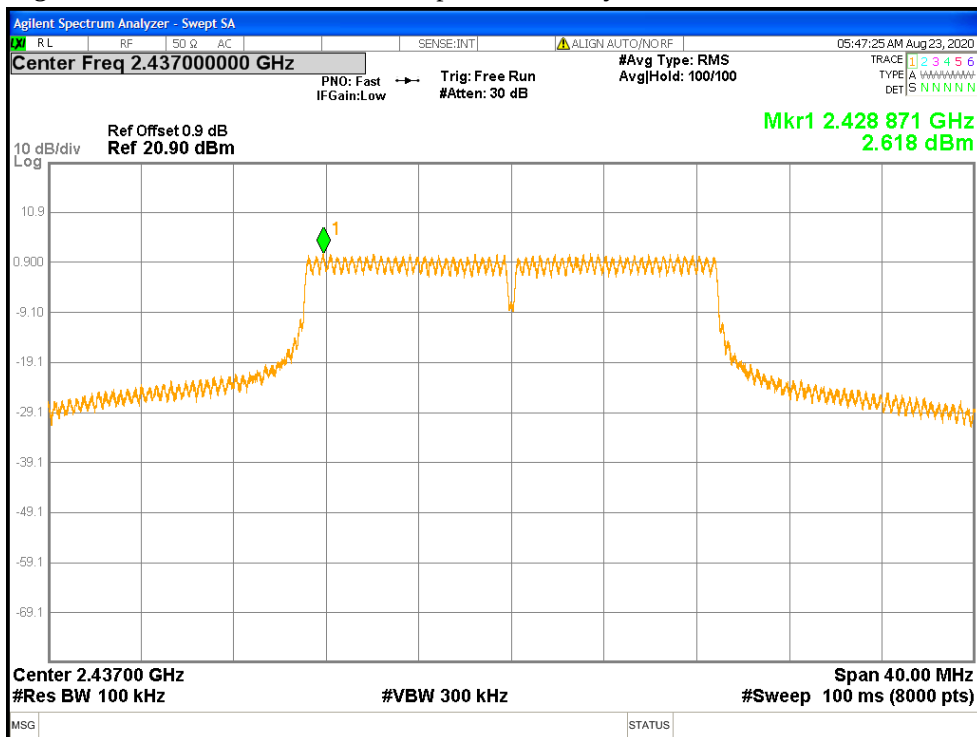


Figure 26: Correlated Max Power Spectral Density-2437 MHz-HT20-MCS0-Ch1

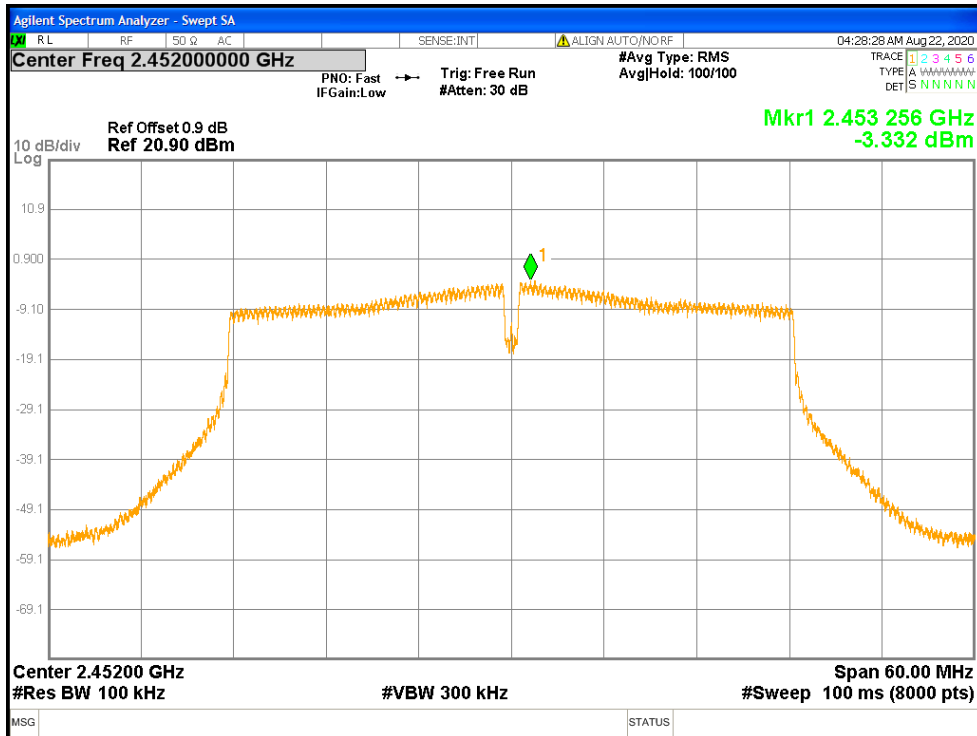


Figure 27: Correlated Max Power Spectral Density-2452 MHz-HT40-MCS0-Ch0

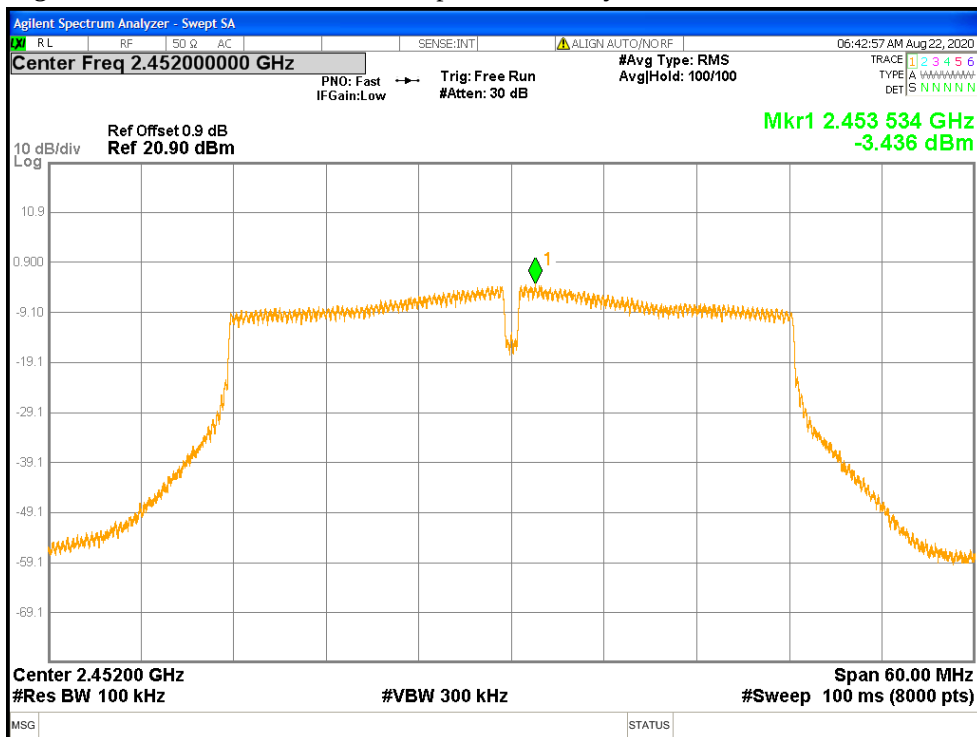


Figure 28: Correlated Max Power Spectral Density-2452 MHz-HT40-MCS0-Ch1

4.4 Out of Band Emissions

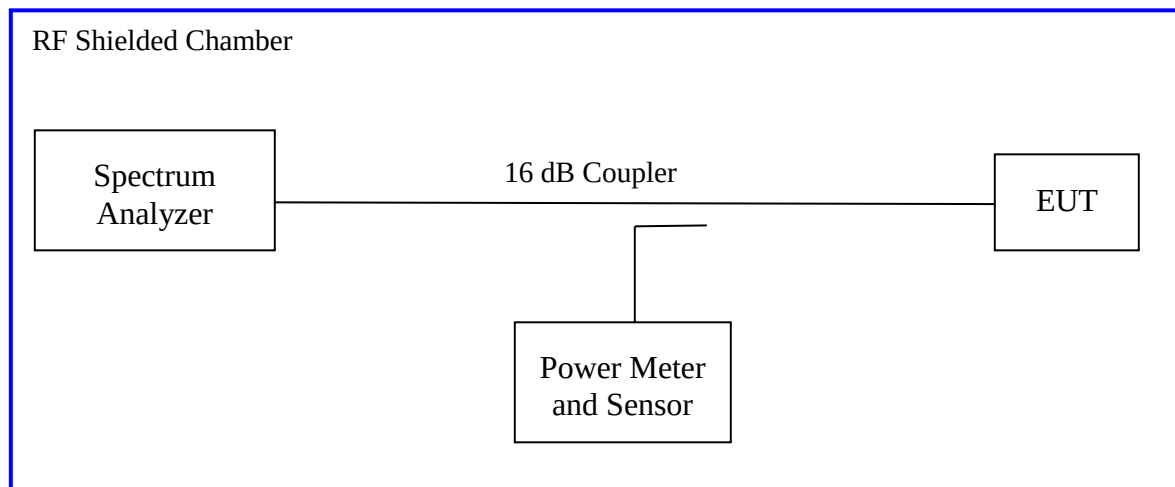
The setup was identical to RF output power measurement. Intentional radiators operating under the alternative provisions to the general emission limits, must be designed to ensure that the 20 dB or 30 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If the frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

Since the transmitter complies with the conducted power limits base on the use of RMS averaging per CFR47 Part 15.247(b)(3), any frequency outside the band of 2400MHz to 2483.5MHz, the power output level must be below 30db from the in-band transmitting signal; CFR 47 Part 15.215, 15.247(d) and RSS-247 Sect.5.5.

4.4.1 Test Method

The conducted method was used to measure the out-of-band emission requirement. The measurement was performed with modulation per CFR47 15.247(4) (d) 2020 and RSS-247 Sect.5.5: 2017. This test was conducted on 3 channels of Sample. The worst sample result indicated below.

Test Setup:



4.4.2 Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 7: Out of Band Emissions – Test Results

Date: August 25, 2020		Tested By: Kerwinn Corpuz	
Test Method: Conducted Measurements		Power Setting: See test plan.	
Antenna Type: FPCB		Max Antenna Gain: 3.72 dBi	
Operating Mode: Uncorrelated		Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)	
Ambient Temp.: 21 °C		Relative Humidity: 36%	
802.11b at 1 Mbps (Chain 0)			
Operating Channel (MHz)	Out of Band Level (dBm)	30 dBc Level (dBm)	Margin (dB)
2412	-44.92	-18.41	-26.51
2437	-45.18	-15.32	-29.86
2462	-45.38	-18.34	-27.04
802.11b at 1 Mbps (Chain 1)			
2412	-44.62	-17.73	-26.89
2437	-43.88	-14.75	-29.13
2462	-44.34	-17.83	-26.51
802.11g at 6 Mbps (Chain 0)			
2412	-45.55	-18.36	-27.19
2437	-45.01	-15.78	-29.23
2462	-44.80	-19.43	-25.37
802.11g at 6 Mbps (Chain 1)			
2412	-45.40	-18.52	-26.88
2437	-45.16	-15.46	-29.70
2462	-45.15	-19.45	-25.71
Note: 1. dBc is defined as the level below the main carrier. The band-edge level must be lower than the 30dBc level. The maximum out of band emission on each individual output is at least 30 dB below the maximum in-band PSD on that output. (*) The band-edge is compared to the highest -30dBc level of the test mode. 2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.			

Table 8: Out of Band Emissions – Test Results Continued

Date: August 25, 2020		Tested By: Kerwinn Corpuz	
Test Method: Conducted Measurements		Power Setting: See test plan.	
Antenna Type: FPCB		Max Antenna Gain: 3.72 dBi	
Operating Mode: Uncorrelated		Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)	
Ambient Temp.: 21 °C		Relative Humidity: 36%	
802.11n HT20 at MCS0 (Chain 0)			
Operating Channel (MHz)	Out of Band Level (dBm)	30 dBc Level (dBm)	Margin (dB)
2412	-44.88	-22.23	-22.65
2437	-45.38	-19.31	-26.07
2462	-45.43	-21.47	-23.96
802.11n HT20 at MCS0 (Chain 1)			
2412	-45.72	-22.55	-23.16
2437	-45.87	-19.82	-26.05
2462	-45.29	-21.30	-24.00
802.11n HT40 at MCS0 (Chain 0)			
2422	-44.54	-26.32	-18.21
2437	-45.19	-25.23	-19.96
2452	-45.59	-25.33	-20.26
802.11n HT40 at MCS0 (Chain 1)			
2422	-45.39	-25.96	-19.43
2437	-45.38	-25.21	-20.16
2452	-45.65	-25.49	-20.17
Note: 1. dBc is defined as the level below the main carrier. The band-edge level must be lower than the 30dBc level. The maximum out of band emission on each individual output is at least 30 dB below the maximum in-band PSD on that output. (*) The band-edge is compared to the highest -30dBc level of the test mode. 2. Plots for all the measurements stated above were taken. To reduce complexity and bulkiness of the report, Highlighted Plots are placed in the report.			

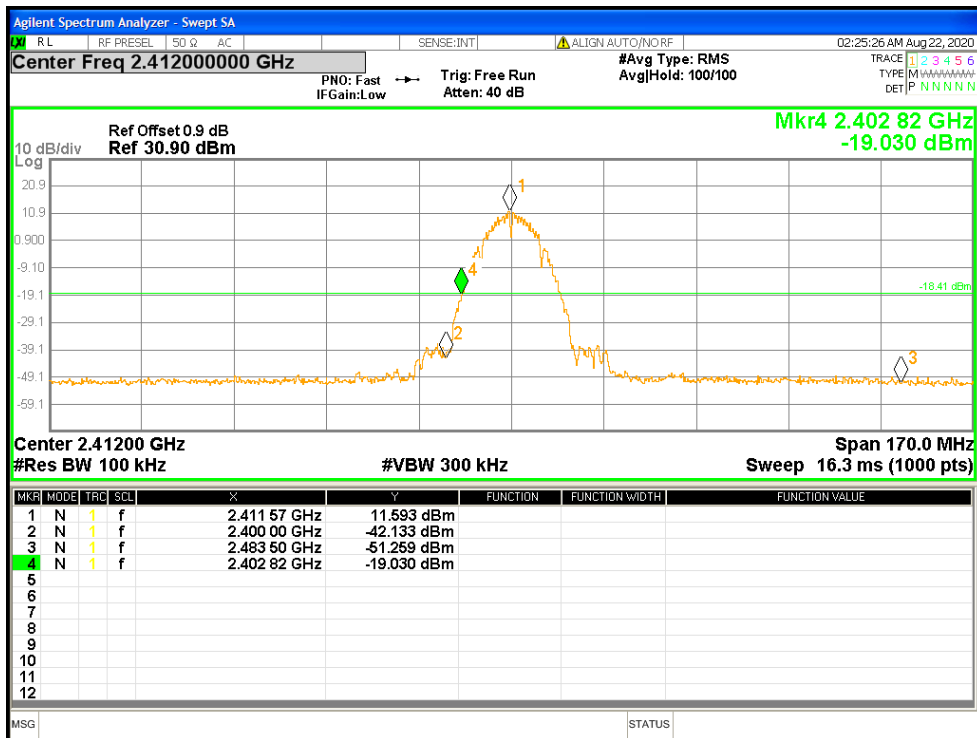


Figure 29: Conducted Band Edge-2412 MHz-802.11b-1 Mbps-Ch0

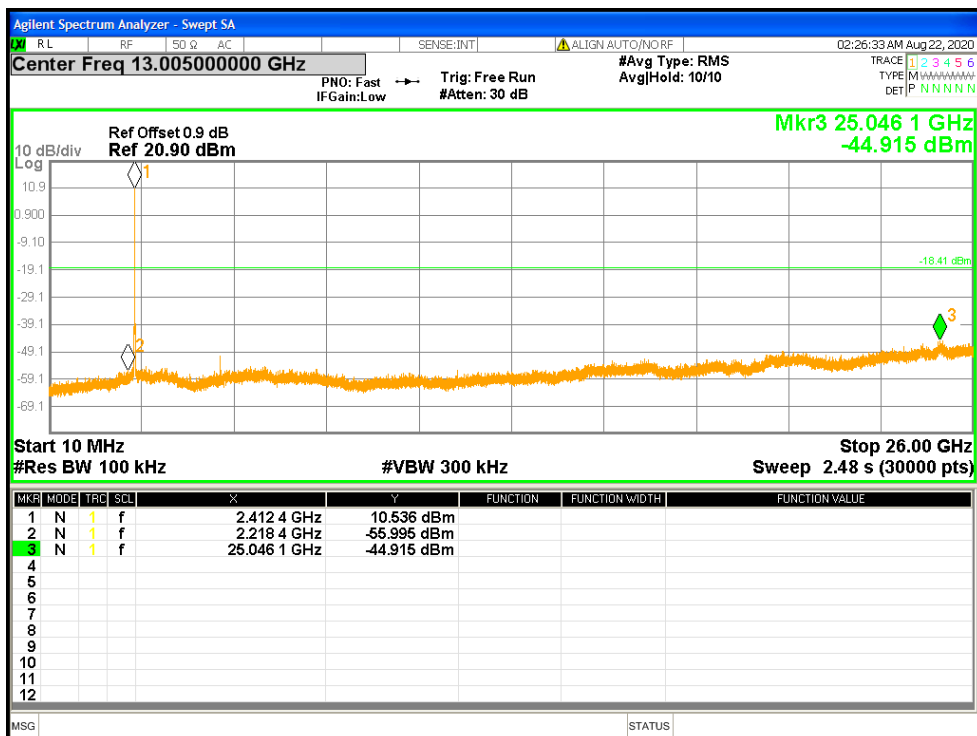


Figure 30: Conducted Out of Band Emission-2412 MHz-802.11b-1 Mbps-Ch0

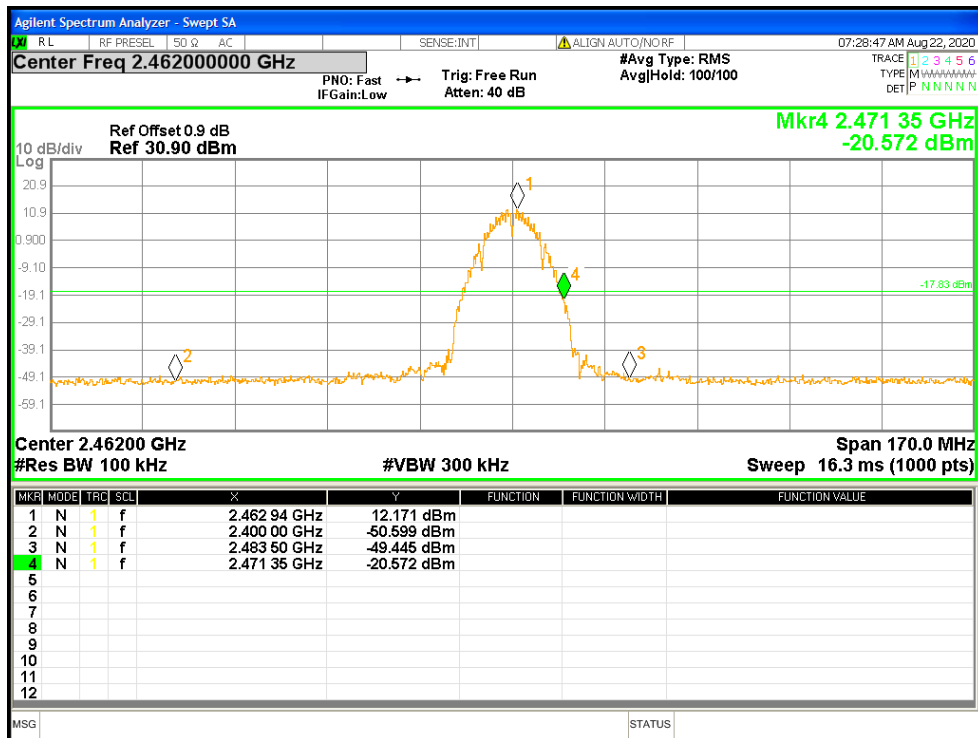


Figure 31: Conducted Band Edge-2462 MHz-802.11b-1 Mbps-Ch1

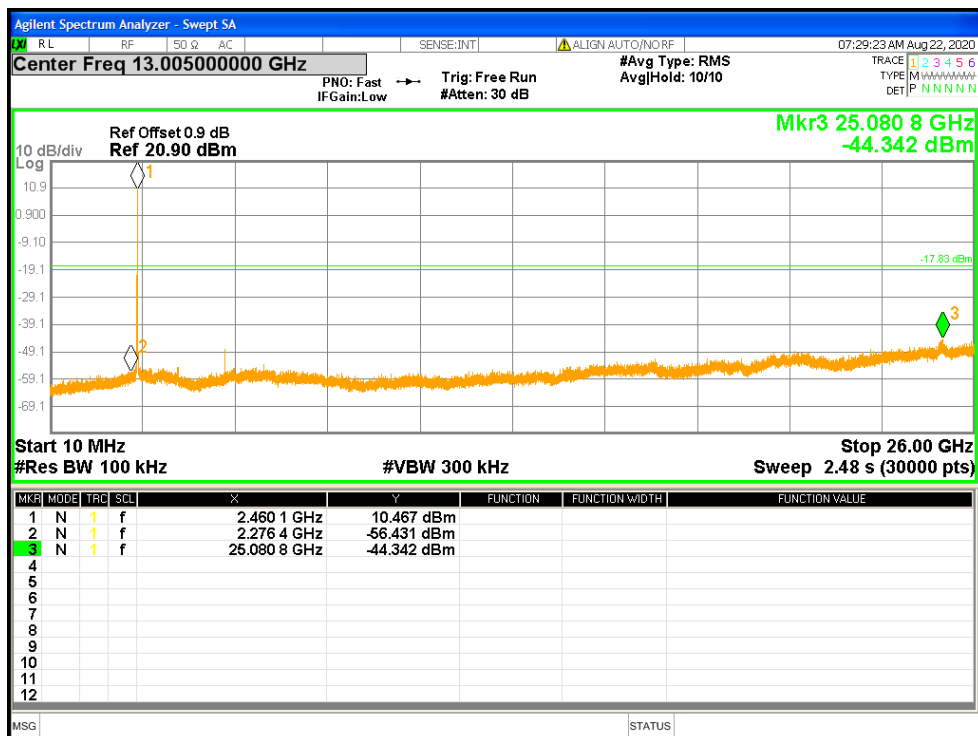


Figure 32: Conducted Out of Band Emission-2462 MHz-802.11b-1 Mbps-Ch1

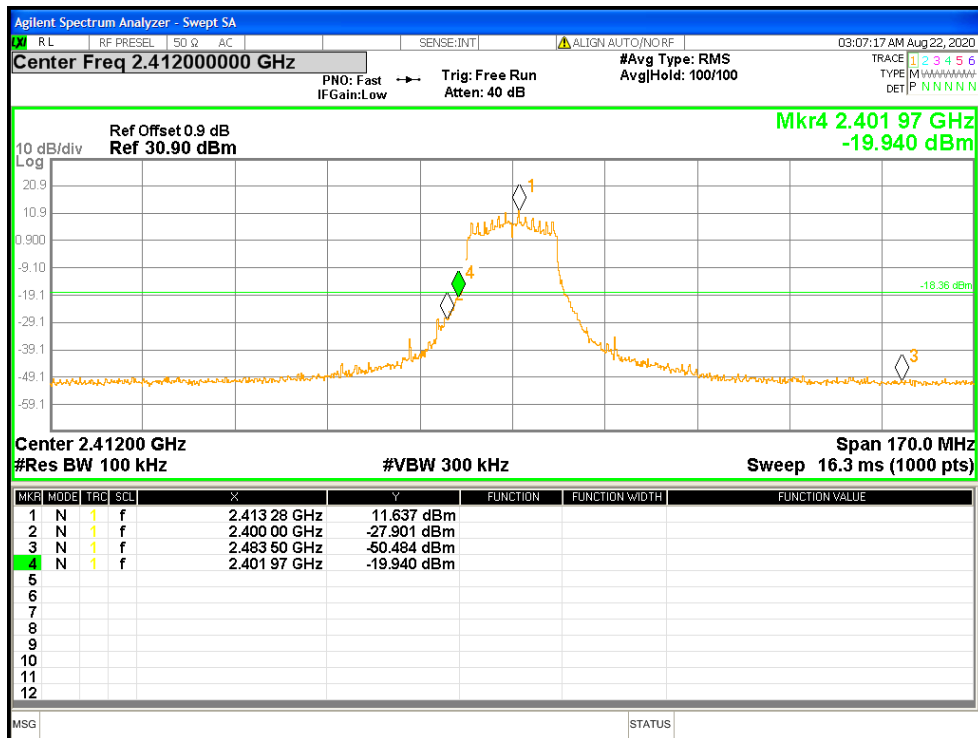


Figure 33: Conducted Band Edge-2412 MHz-802.11g-6 Mbps-Ch0

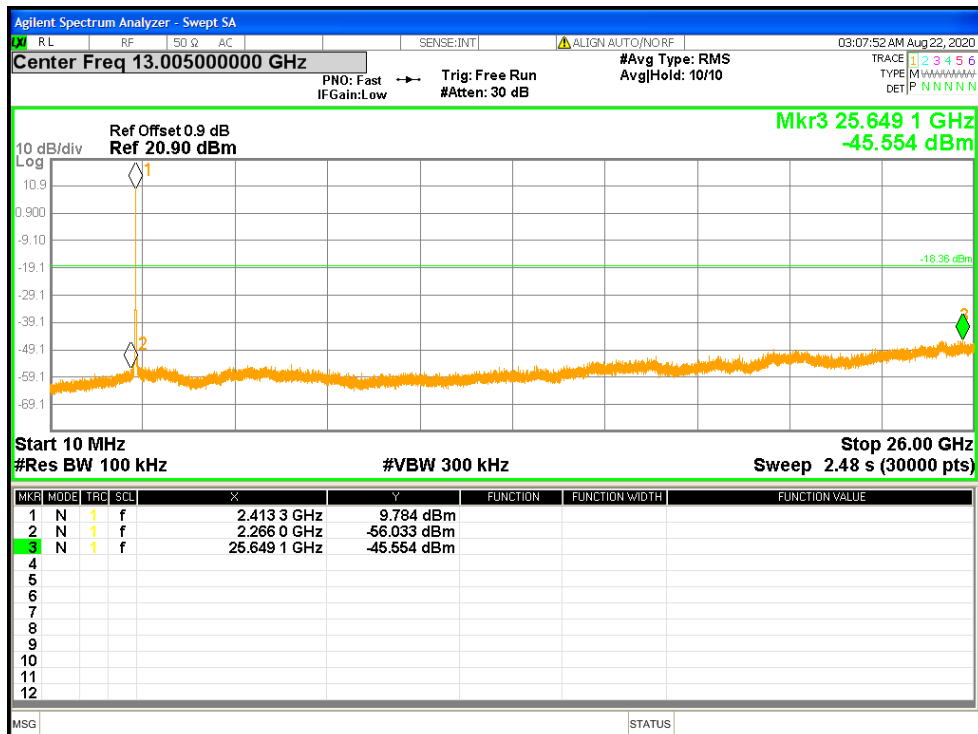


Figure 34: Conducted Out of Band Emission-2412 MHz-802.11g-6 Mbps-Ch0

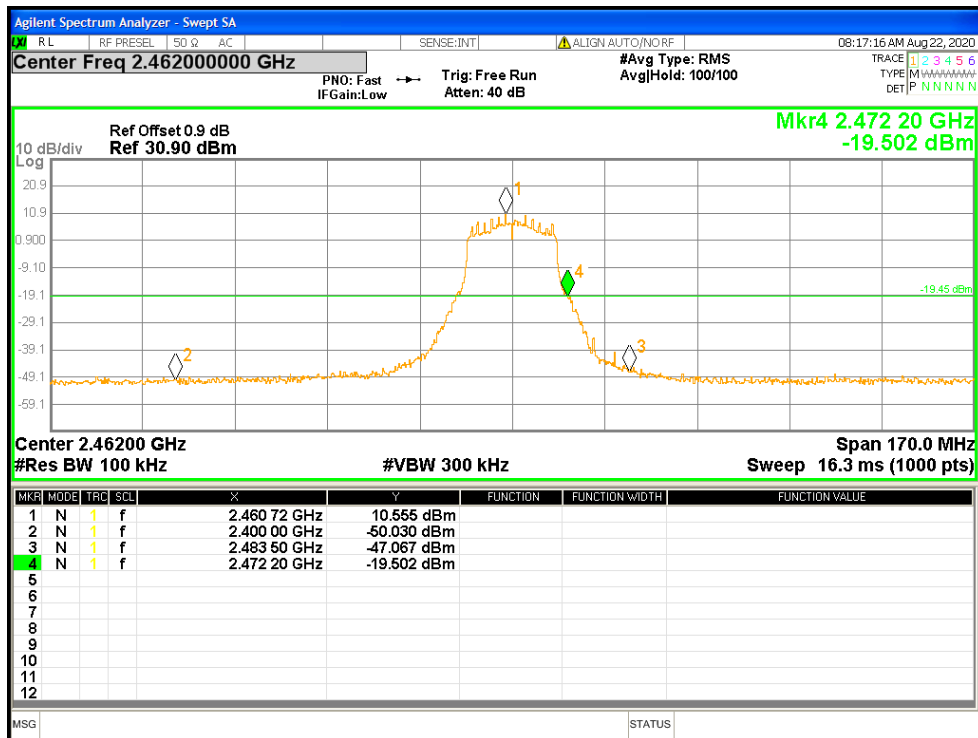


Figure 35: Conducted Band Edge-2462 MHz-802.11g-6 Mbps-Ch1

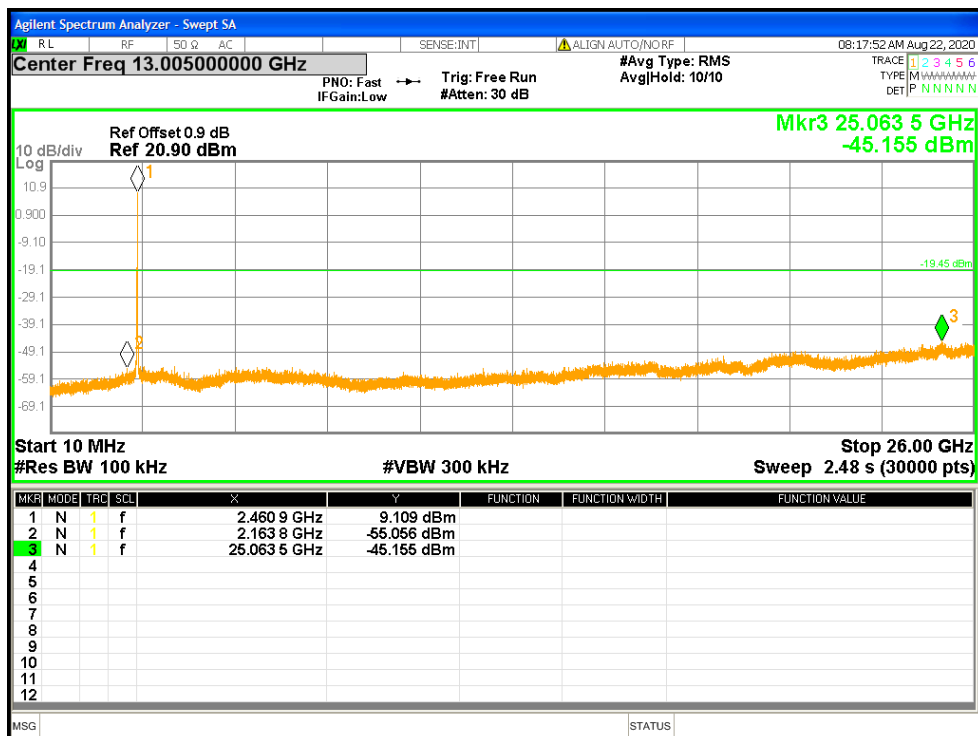


Figure 36: Conducted Out of Band Emission-2462 MHz-802.11g-6 Mbps-Ch1

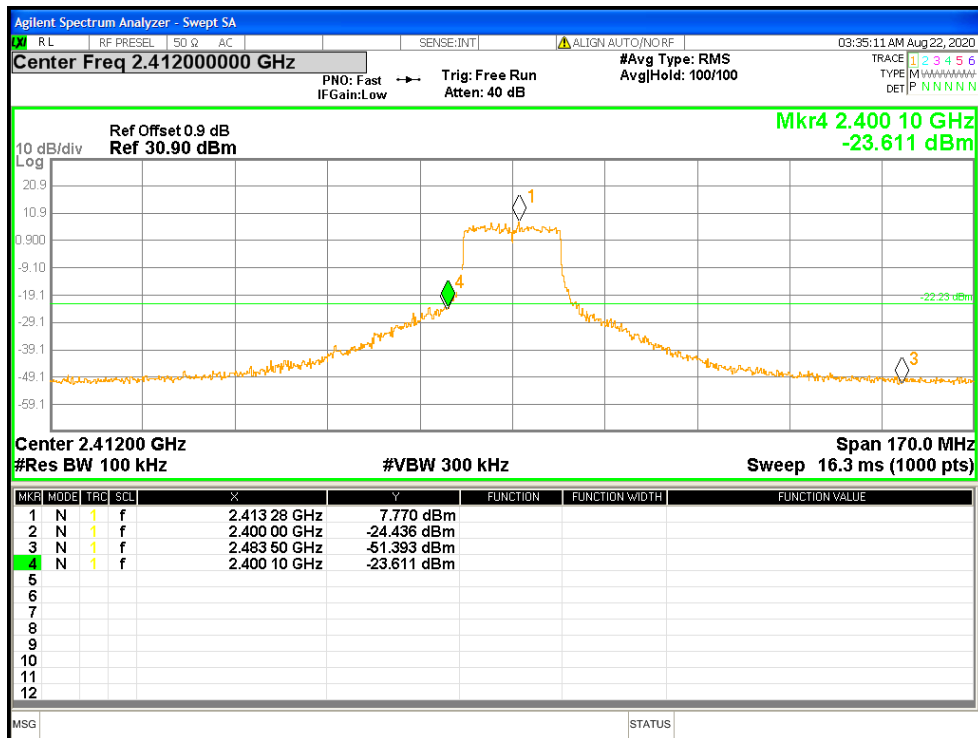


Figure 37: Conducted Band Edge-2412 MHz-802.11n HT20-MCS0-Ch0

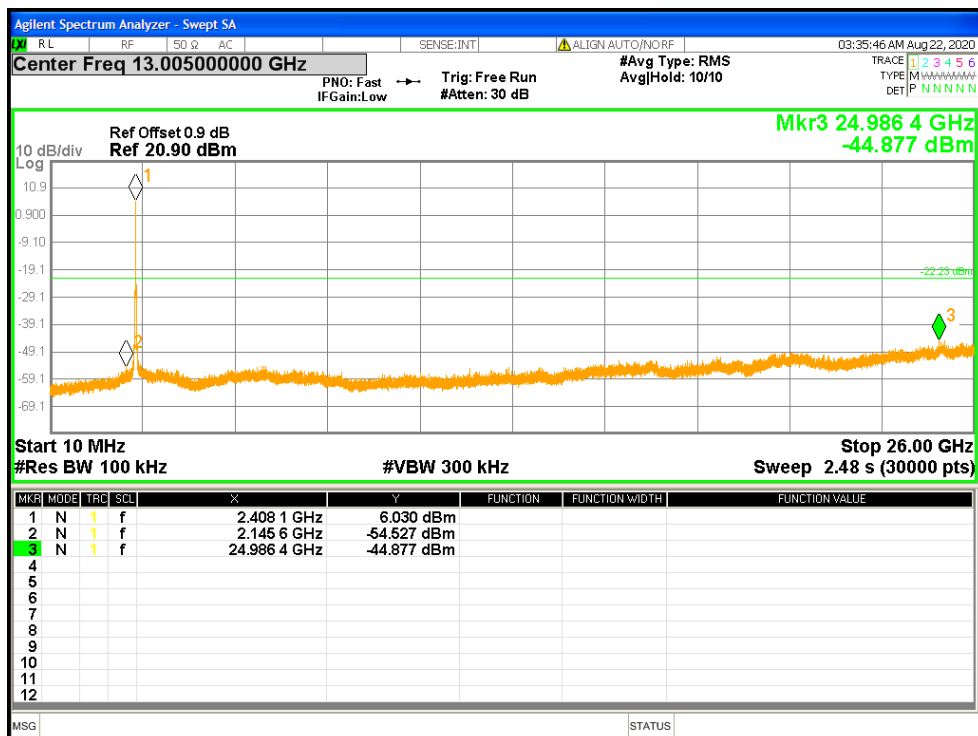


Figure 38: Conducted Out of Band Emission-2412 MHz-802.11n HT20-MCS0-Ch0

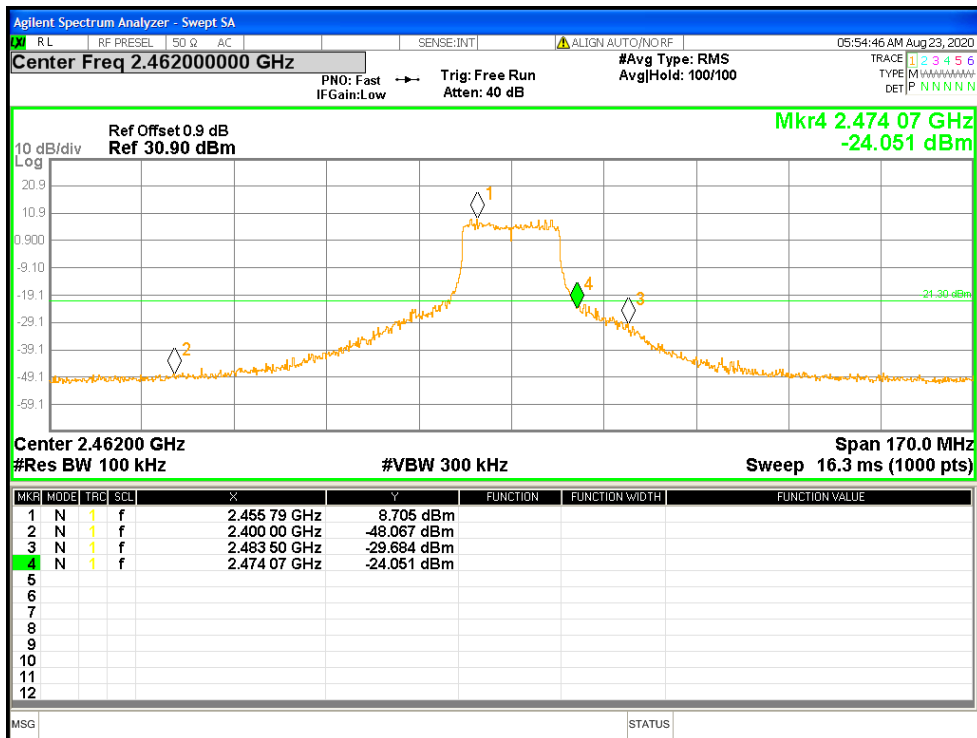


Figure 39: Conducted Band Edge-2462 MHz-802.11n HT20-MCS0-Ch1

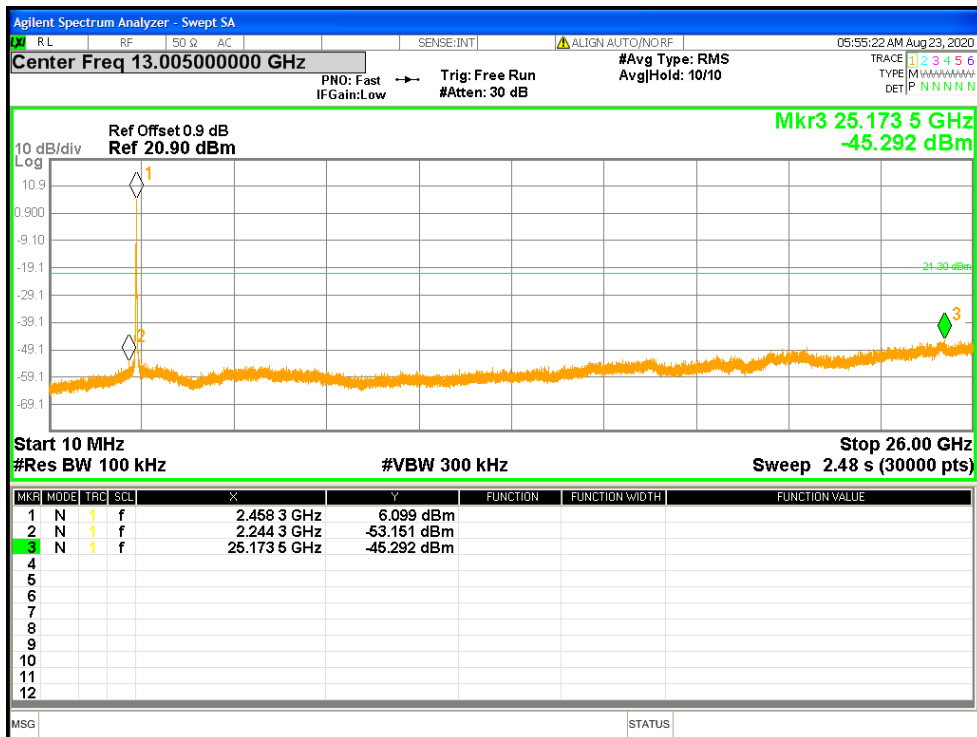


Figure 40: Conducted Out of Band Emission-2462 MHz-802.11n HT20-MCS0-Ch1

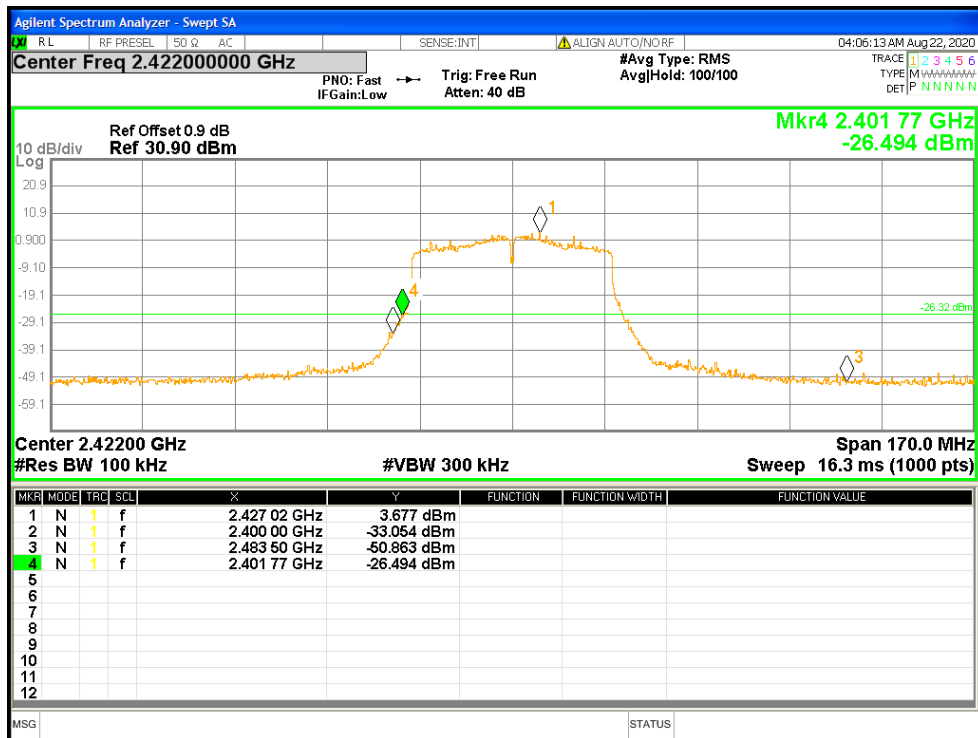


Figure 41: Conducted Band Edge-2422 MHz-802.11n HT40-MCS0-Ch0

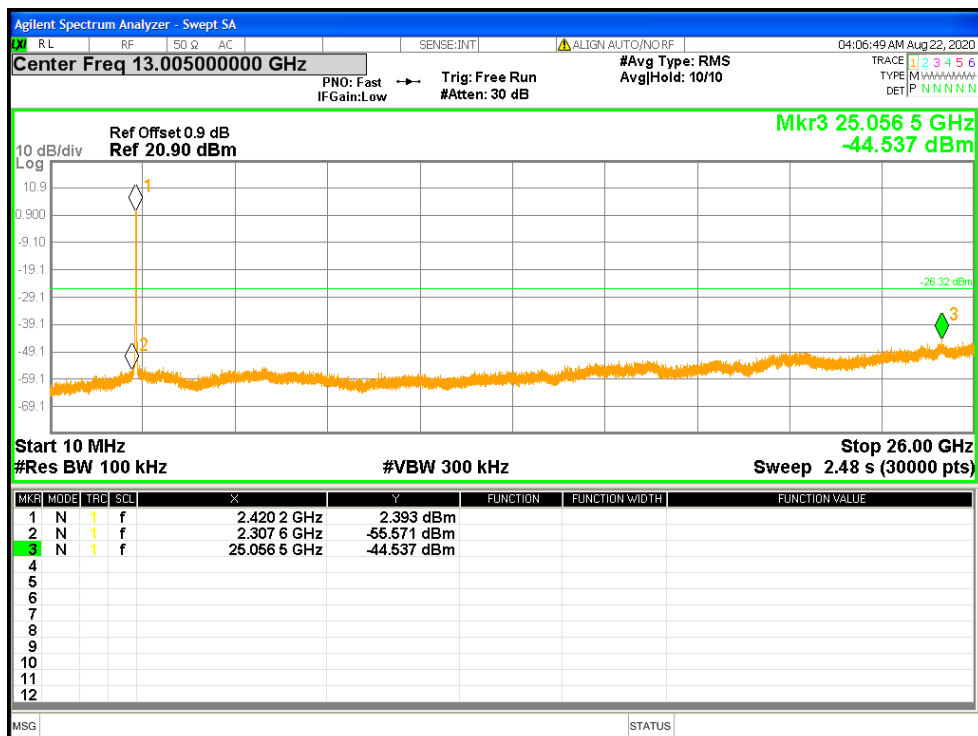


Figure 42: Conducted Out of Band Emission-2422 MHz-802.11n HT40-MCS0-Ch0

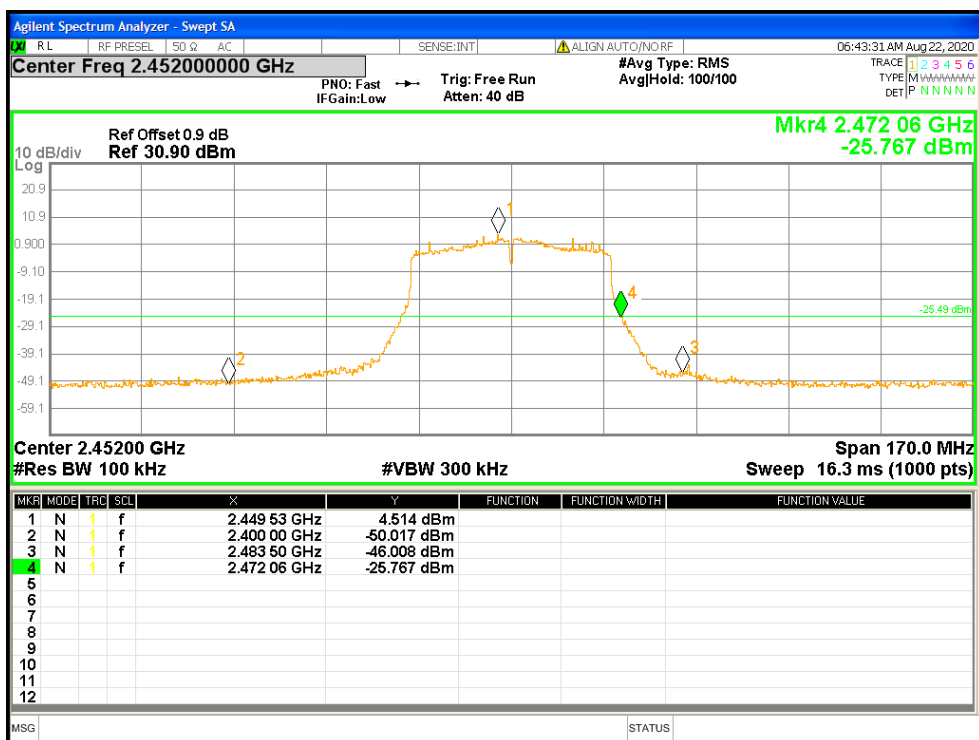


Figure 43: Conducted Band Edge-2452 MHz-802.11n HT40-MCS0-Ch1

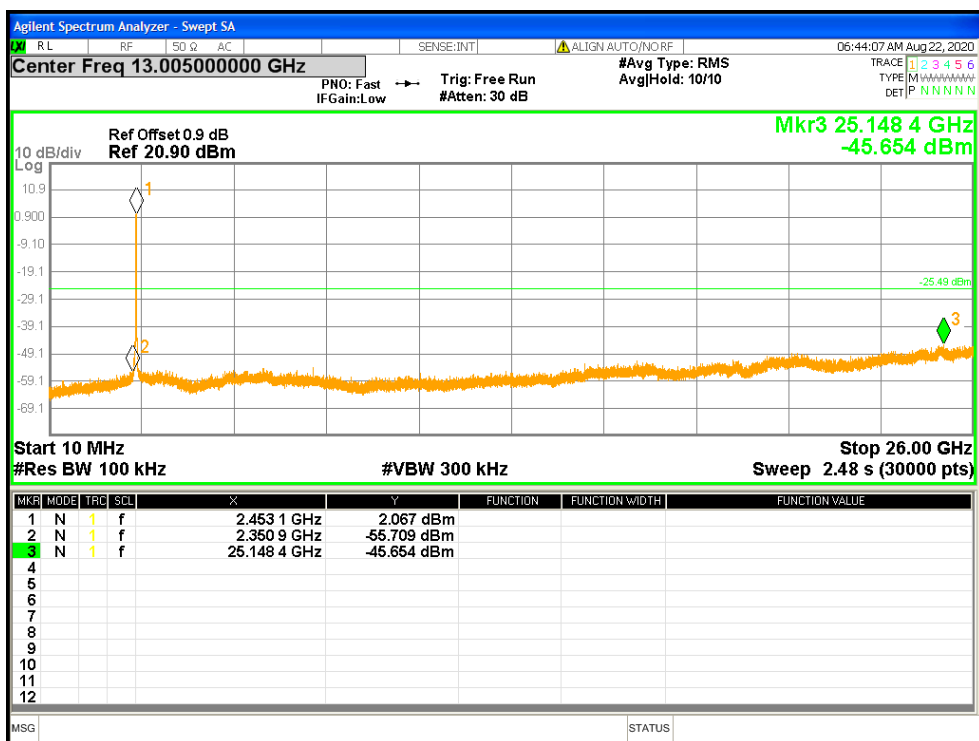


Figure 44: Conducted Out of Band Emission-2452 MHz-802.11n HT40-MCS0-Ch1

4.5 Transmit Spurious Emissions

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS-Gen Sect. 8.9, RSS-Gen Sect. 8.10.

4.5.1 Test Methodology

4.5.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

Pres-scans were performed to determine the worst case configuration; 802.11b, 802.11g, 802.11n (HT20 and HT40).

4.5.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, then the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm (<1 GHz) and 150cm (>1 GHz) above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The final scans performed on the worst axis, Y-Axis, for three operating channels in each operating mode;

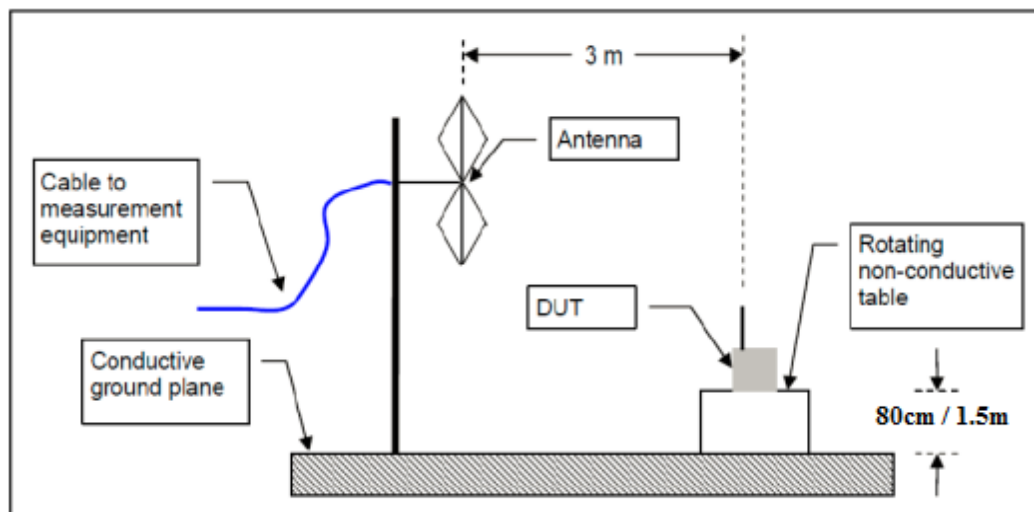
2412 MHz, 2437 MHz, and 2462 MHz for 802.11b (covers 802.11g and HT20 for 20 MHz channel).

2422 MHz, 2437 MHz, and 2452 MHz for 802.11n HT40.

4.5.1.3 Deviations

None.

Test Setup:



4.5.2 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2020 and RSS Gen Sect. 8.10: 2019.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F (kHz)	300
0.490-1.705.....	24000/F (kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

All harmonics and spurious emission which are outside of the restricted band shall be 20dB below the in-band emission.

4.5.3 Test Results

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 9: Transmit Spurious Emission at Band-Edge Requirements

Test Date: August 24, 2020						Test By: Kerwinn Corpuz			
Test Method: Radiated Measurements						Power Setting: See test plan.			
Antenna Type: FPCB						Max Antenna Gain: 3.72 dBi			
Operating Mode: Uncorrelated						Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)			
Ambient Temp.: 20 °C						Relative Humidity: 35%			
Band-Edge Results (802.11b)									
Oper. Freq.	Edge Freq.	Pol	Ant.	Tbl.	Det.	Level	Limit	Margin	Note
MHz	MHz	V/H	cm	Deg	Pk/Ave	dBuV/m	dBuV/m	dB	
2412	2390.00	V	200	198	Pk	69.82	74.00	-4.18	11b-1Mbps-TP20-Ch0 & Ch1
2412	2390.00	V	200	198	Ave	52.75	54.00	-1.25	11b-1Mbps-TP20-Ch0 & Ch1
2412	2389.94	H	164	232	Pk	67.40	74.00	-6.60	11b-1Mbps-TP20-Ch0 & Ch1
2412	2390.00	H	164	232	Ave	51.00	54.00	-3.00	11b-1Mbps-TP20-Ch0 & Ch1
2462	2483.50	V	273	175	Pk	67.51	74.00	-6.49	11b-1Mbps-TP19.5-Ch0 & Ch1
2462	2483.50	V	273	175	Ave	53.58	54.00	-0.42	11b-1Mbps-TP19.5-Ch0 & Ch1
2462	2483.80	H	162	217	Pk	63.43	74.00	-10.57	11b-1Mbps-TP19.5-Ch0 & Ch1
2462	2483.50	H	162	217	Ave	49.40	54.00	-4.60	11b-1Mbps-TP19.5-Ch0 & Ch1
Band-Edge Results (802.11g)									
2412	2389.17	V	200	195	Pk	69.99	74.00	-4.01	11g-6Mbps-TP20-Ch0 & Ch1
2412	2390.00	V	200	195	Ave	53.16	54.00	-0.84	11g-6Mbps-TP20-Ch0 & Ch1
2412	2390.00	H	156	232	Pk	67.21	74.00	-6.79	11g-6Mbps-TP20-Ch0 & Ch1
2412	2390.00	H	156	232	Ave	50.91	54.00	-3.09	11g-6Mbps-TP20-Ch0 & Ch1
2462	2483.88	V	272	181	Pk	67.86	74.00	-6.14	11g-6Mbps-TP19.5-Ch0 & Ch1
2462	2483.50	V	272	181	Ave	53.53	54.00	-0.47	11g-6Mbps-TP19.5-Ch0 & Ch1
2462	2483.73	H	153	218	Pk	64.74	74.00	-9.26	11g-6Mbps-TP19.5-Ch0 & Ch1
2462	2483.50	H	153	218	Ave	50.19	54.00	-3.81	11g-6Mbps-TP19.5-Ch0 & Ch1
Note: 1. The emissions were measured at the adjacent restricted band of the fundamental signal. All the band-edge measurements met the restricted band requirements of CFR47 15.205 Band-edge measurement plots use a wider span than 2 MHz to evaluate additional spectrum bands for in-band leakage and spurious emission. 2. The duty cycle factor, cable loss, and antenna gain were added in the test equipment reference level accordingly.									

Table 10: Transmit Spurious Emission at Band-Edge Requirements

Test Date: August 24, 2020						Test By: Kerwinn Corpuz			
Test Method: Radiated Measurements						Power Setting: See test plan.			
Antenna Type: FPCB						Max Antenna Gain: 3.72 dBi			
Operating Mode: Uncorrelated						Signal State: Modulated (refer to Section 3.5.1 for Duty Cycle)			
Ambient Temp.: 20 °C						Relative Humidity: 35%			
Band-Edge Results (802.11n HT20)									
Oper. Freq.	Edge Freq.	Pol	Ant.	Tbl.	Det.	Level	Limit	Margin	Note
MHz	MHz	V/H	cm	Deg	Pk/Ave	dBuV/m	dBuV/m	dB	
2412	2389.74	V	208	190	Pk	68.05	74.00	-5.95	HT20-MCS0-TP19-Ch0 & Ch1
2412	2390.00	V	208	190	Ave	53.16	54.00	-0.84	HT20-MCS0-TP19-Ch0 & Ch1
2412	2389.10	H	163	230	Pk	65.45	74.00	-8.55	HT20-MCS0-TP19-Ch0 & Ch1
2412	2390.00	H	163	230	Ave	50.69	54.00	-3.31	HT20-MCS0-TP19-Ch0 & Ch1
2462	2483.58	V	205	183	Pk	67.91	74.00	-6.09	HT20-MCS0-TP19.5-Ch0 & Ch1
2462	2483.50	V	205	183	Ave	53.40	54.00	-0.60	HT20-MCS0-TP19.5-Ch0 & Ch1
2462	2483.96	H	166	239	Pk	64.67	74.00	-9.33	HT20-MCS0-TP19.5-Ch0 & Ch1
2462	2483.50	H	166	239	Ave	49.12	54.00	-4.88	HT20-MCS0-TP19.5-Ch0 & Ch1
Band-Edge Results (802.11n HT40)									
2422	2385.79	V	200	195	Pk	68.04	74.00	-5.96	HT40-MCS0-TP16.5-Ch0 & Ch1
2422	2390.00	V	200	195	Ave	52.63	54.00	-1.37	HT40-MCS0-TP16.5-Ch0 & Ch1
2422	2389.92	H	156	232	Pk	65.52	74.00	-8.48	HT40-MCS0-TP16.5-Ch0 & Ch1
2422	2389.92	H	156	232	Ave	49.61	54.00	-4.39	HT40-MCS0-TP16.5-Ch0 & Ch1
2452	2484.46	V	261	184	Pk	66.67	74.00	-7.33	HT40-MCS0-TP17-Ch0 & Ch1
2452	2483.50	V	261	184	Ave	52.42	54.00	-1.58	HT40-MCS0-TP17-Ch0 & Ch1
2452	2485.81	H	164	211	Pk	65.61	74.00	-8.39	HT40-MCS0-TP17-Ch0 & Ch1
2452	2483.50	H	164	211	Ave	49.35	54.00	-4.65	HT40-MCS0-TP17-Ch0 & Ch1
Note: 1. The emissions were measured at the adjacent restricted band of the fundamental signal. All the band-edge measurements met the restricted band requirements of CFR47 15.205 Band-edge measurement plots use a wider span than 2 MHz to evaluate additional spectrum bands for in-band leakage and spurious emission. 2. The duty cycle factor, cable loss, and antenna gain were added in the test equipment reference level accordingly.									

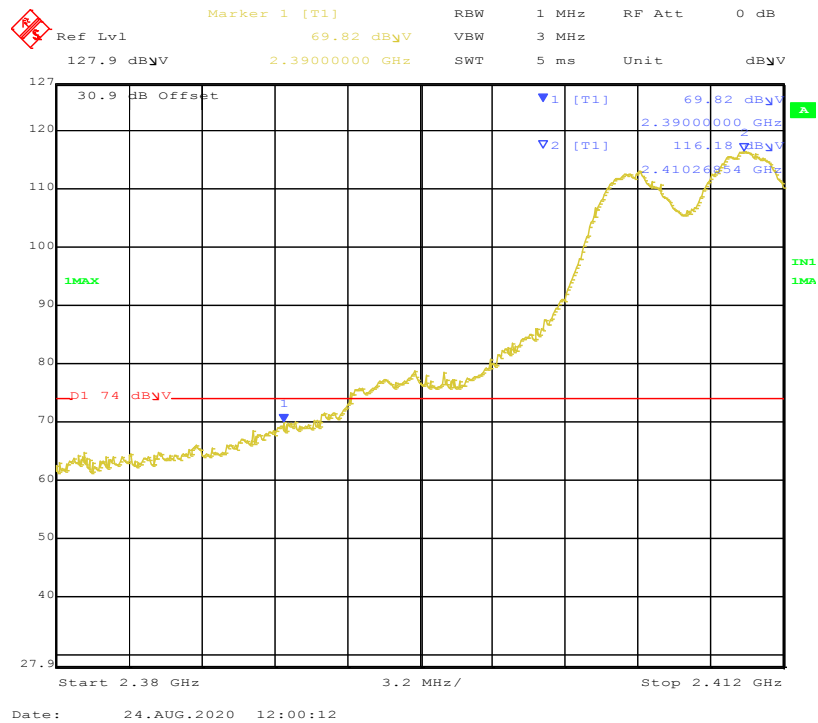


Figure 45: Radiated Bandedge at 2390 MHz for 802.11b 2412 MHz-Vert-Pk

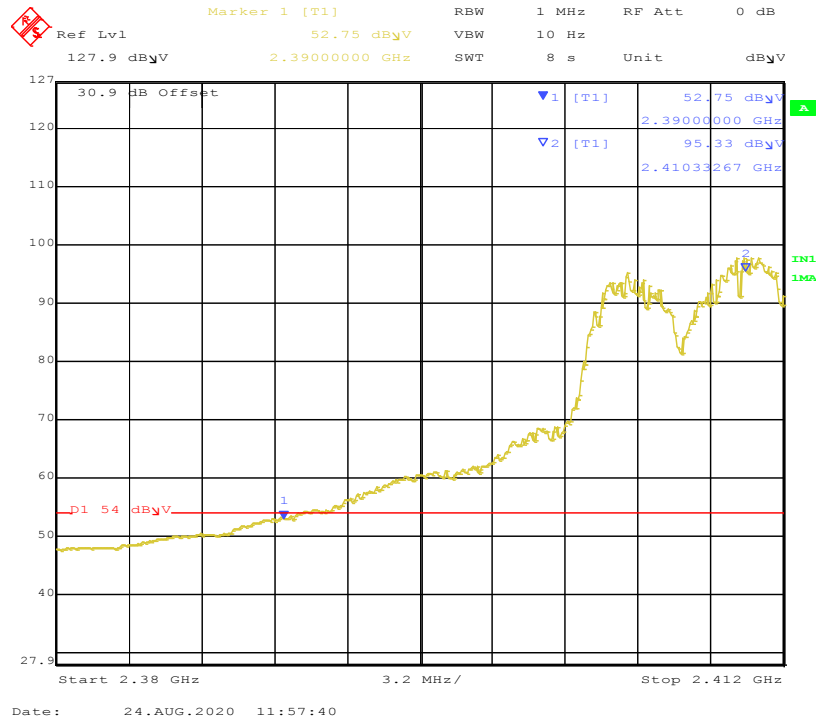


Figure 46: Radiated Bandedge at 2390 MHz for 802.11b 2412 MHz-Vert-Ave

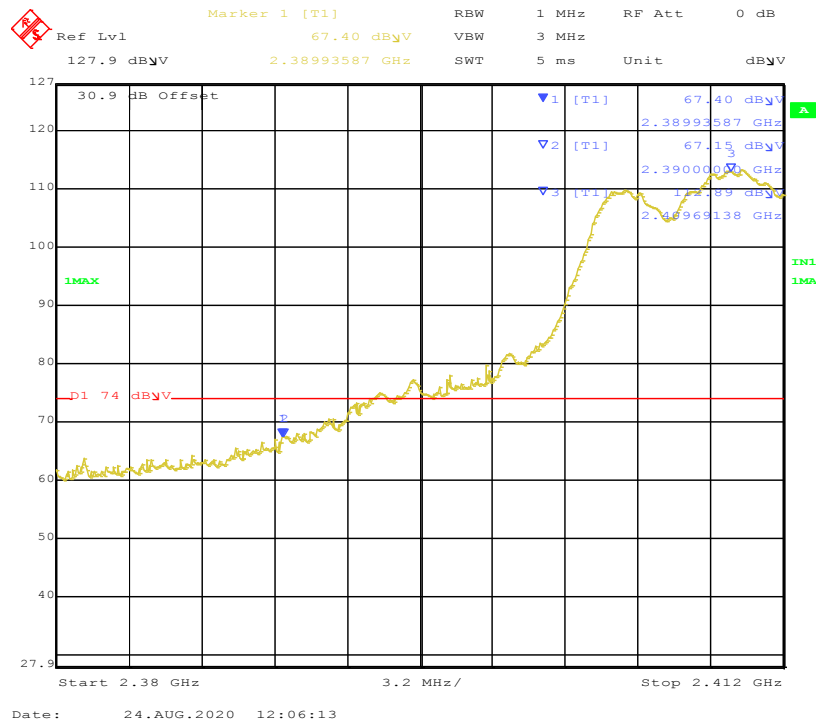


Figure 47: Radiated Bandedge at 2390 MHz for 802.11b 2412 MHz-Horz-Pk

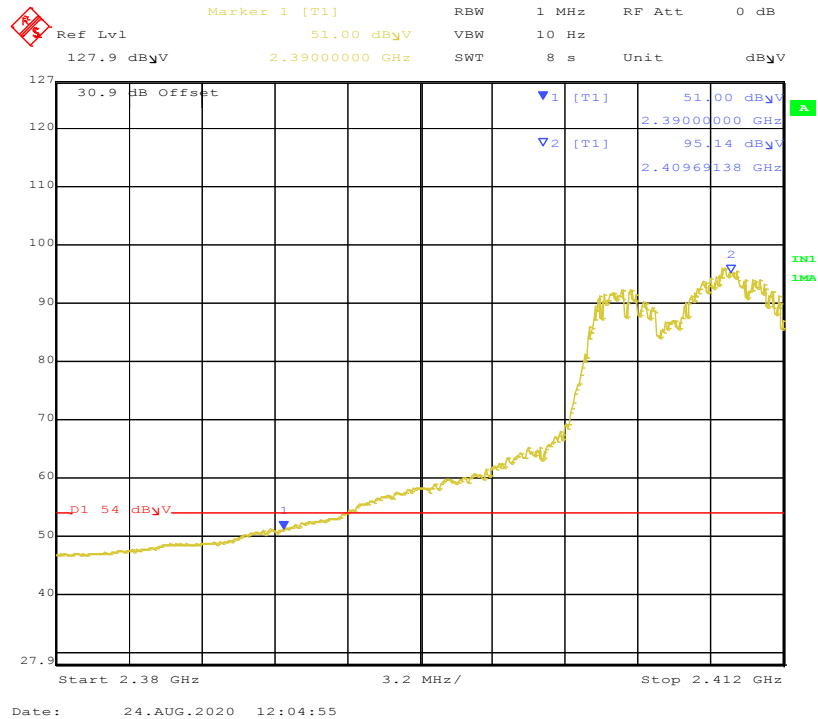


Figure 48: Radiated Bandedge at 2390 MHz for 802.11b 2412 MHz-Horz-Ave

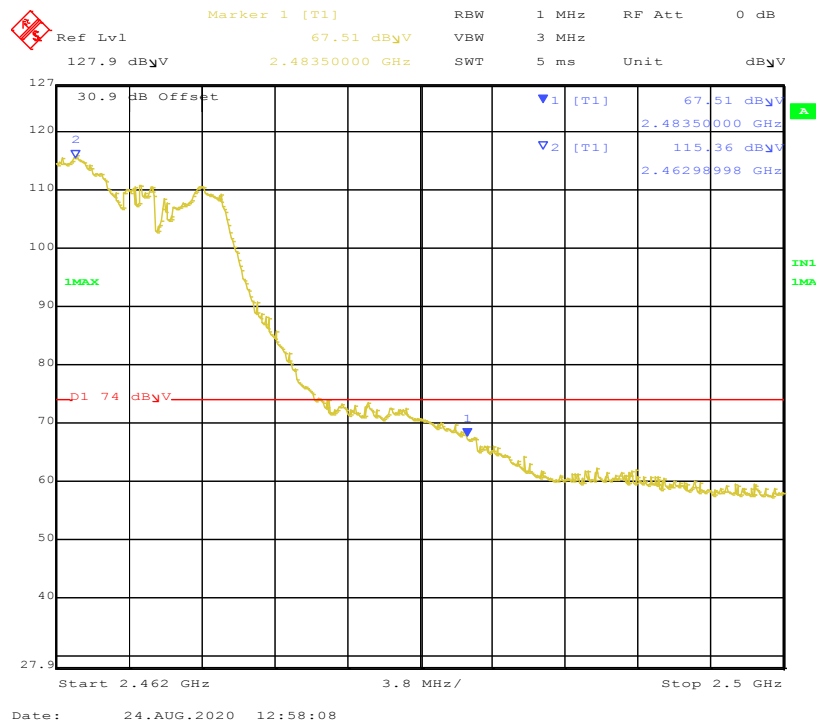


Figure 49: Radiated Bandedge at 2483.5 MHz for 802.11b 2462 MHz-Vert-Pk

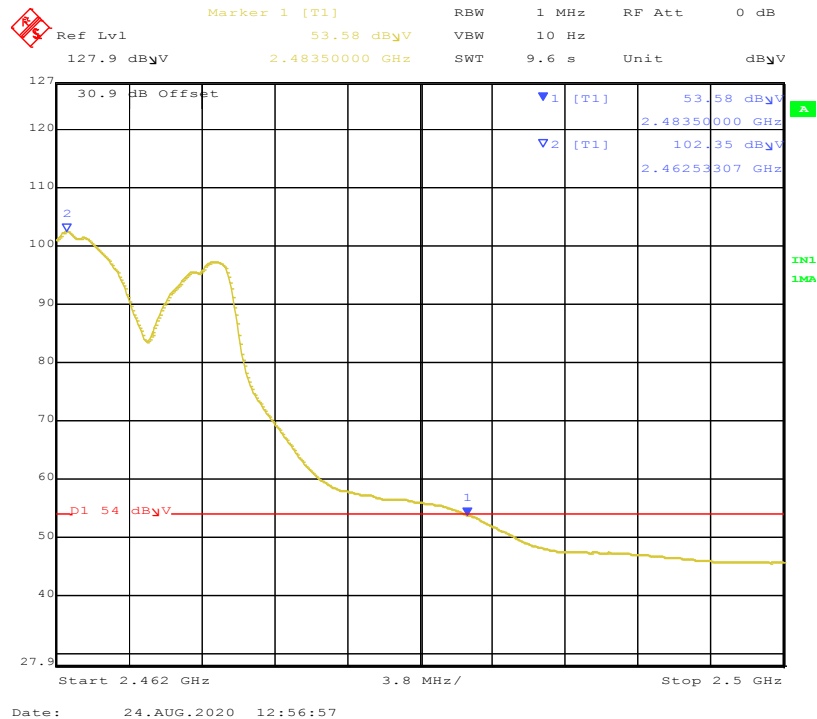


Figure 50: Radiated Bandedge at 2483.5 MHz for 802.11b 2462 MHz-Vert-Ave

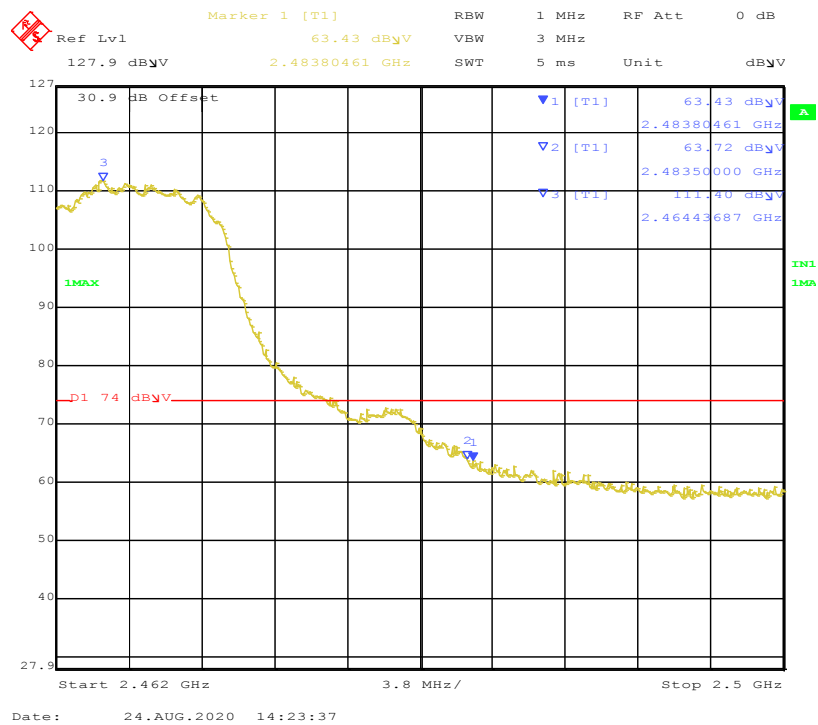


Figure 51: Radiated Bandedge at 2483.5 MHz for 802.11b 2462 MHz-Horz-Pk

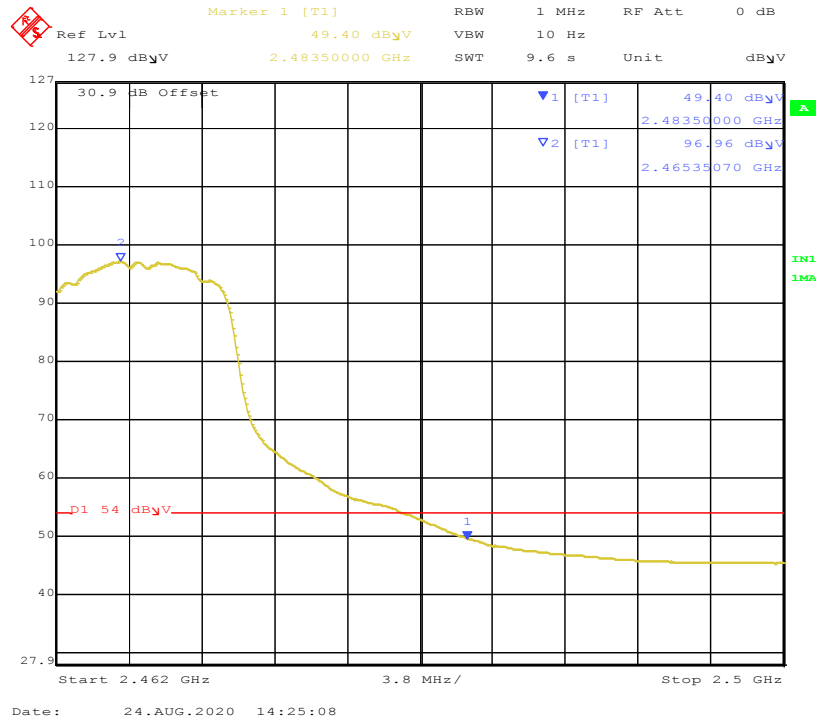


Figure 52: Radiated Bandedge at 2483.5 MHz for 802.11b 2462 MHz-Horz-Ave

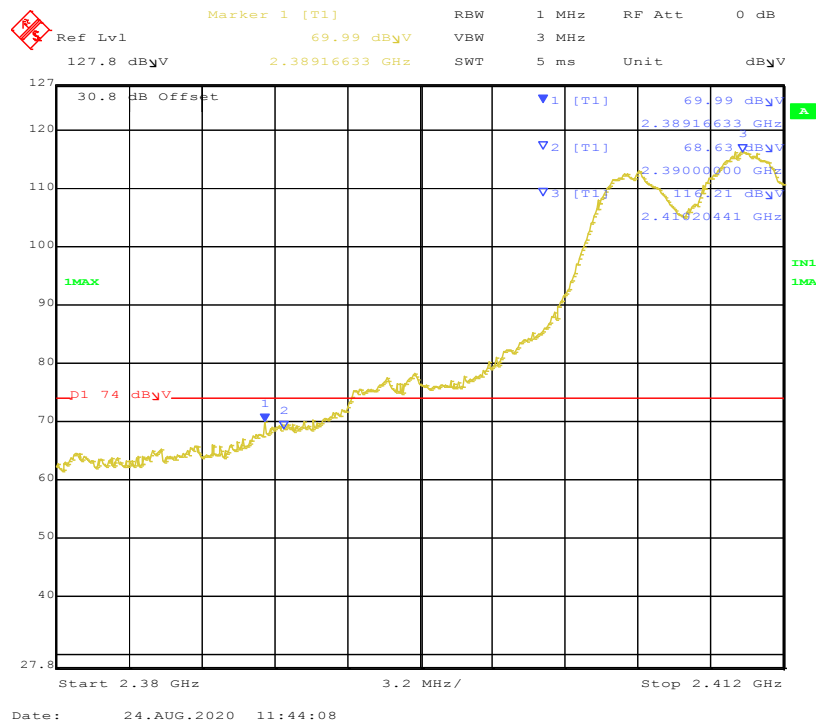


Figure 53: Radiated Bandedge at 2390 MHz for 802.11g 2412 MHz-Vert-Pk

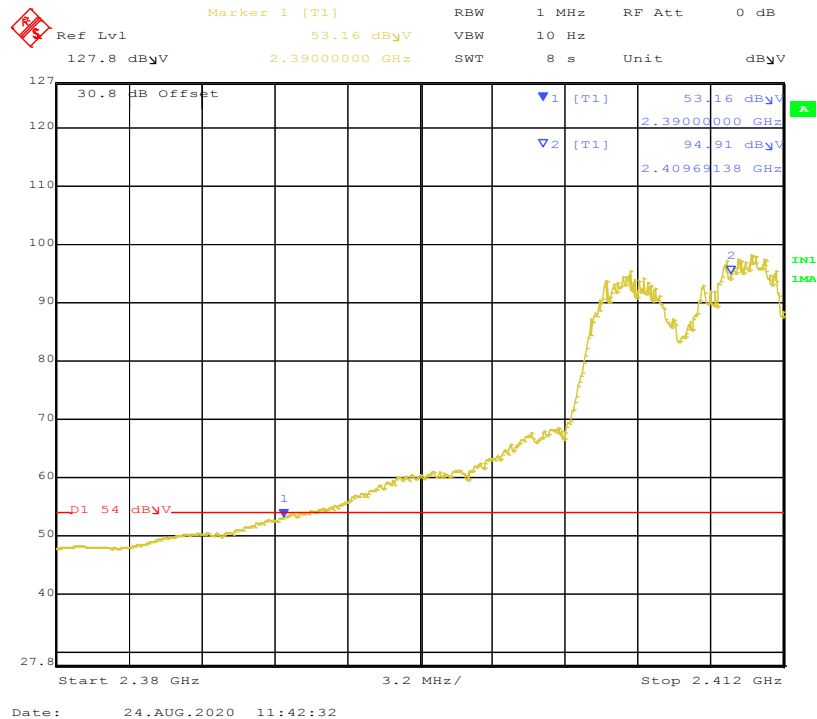


Figure 54: Radiated Bandedge at 2390 MHz for 802.11g 2412 MHz-Vert-Ave

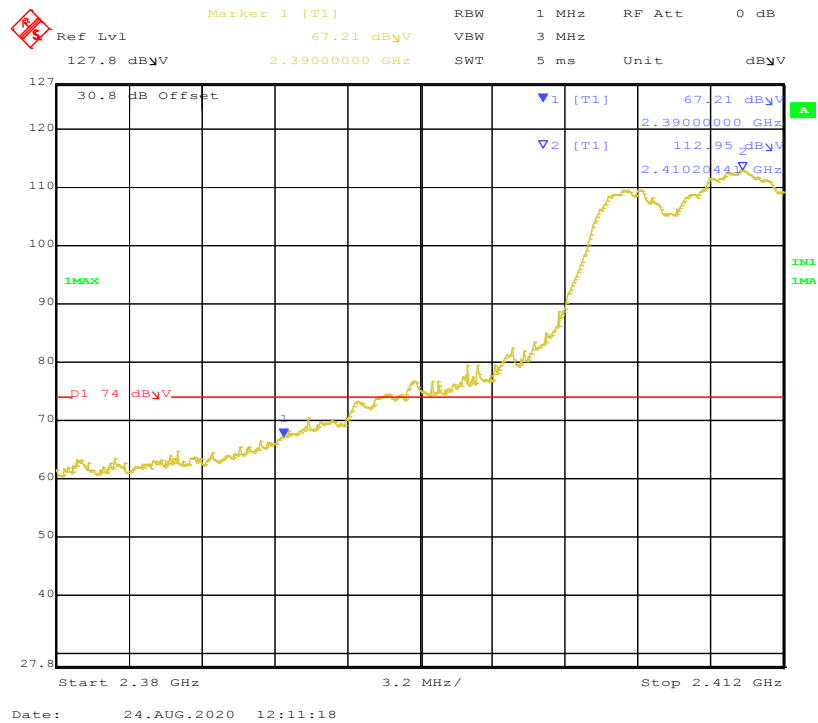


Figure 55: Radiated Bandedge at 2390 MHz for 802.11g 2412 MHz-Horz-Pk

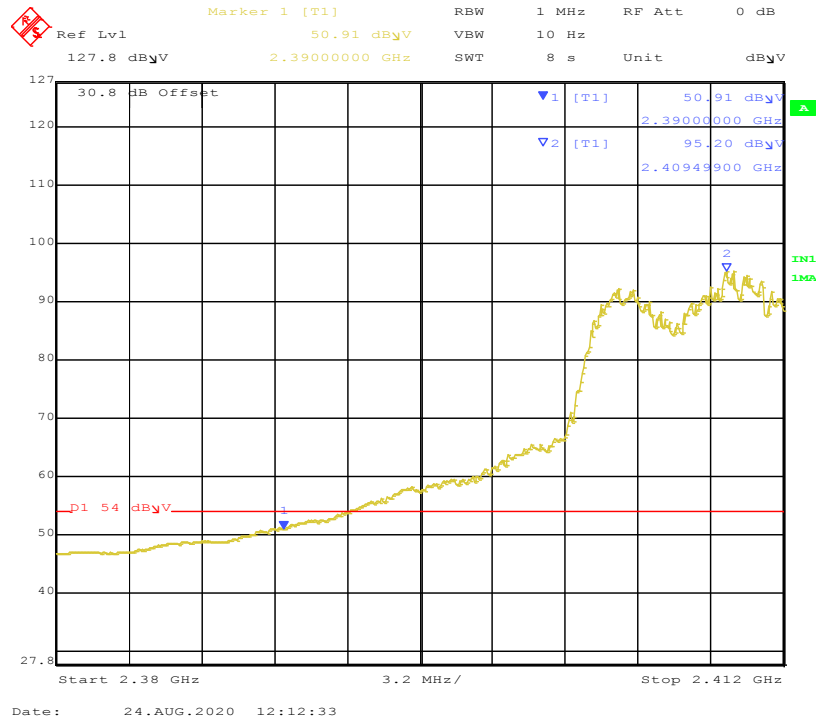


Figure 56: Radiated Bandedge at 2390 MHz for 802.11g 2412 MHz-Horz-Ave

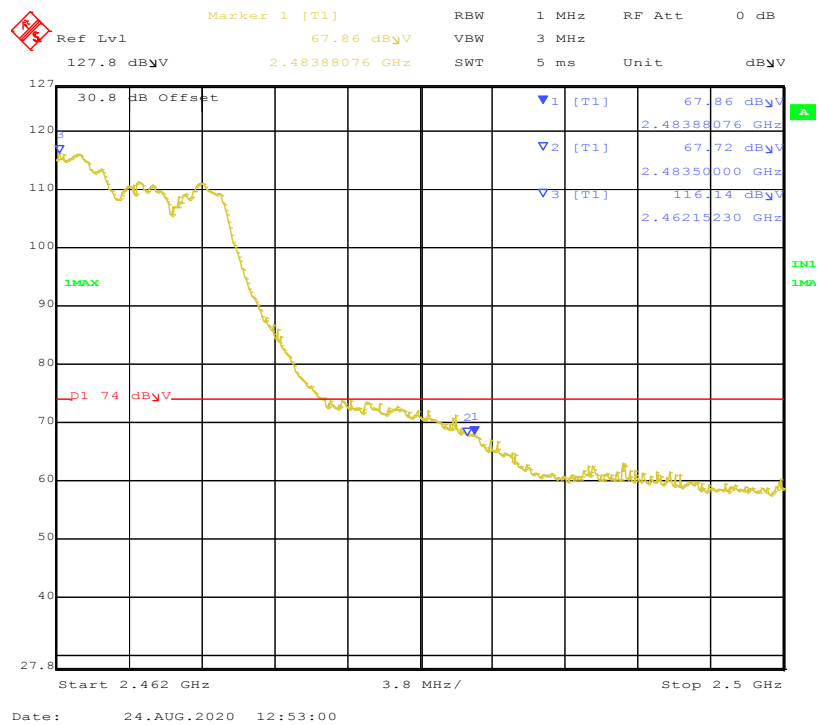


Figure 57: Radiated Bandedge at 2483.5 MHz for 802.11g 2462 MHz-Vert-Pk

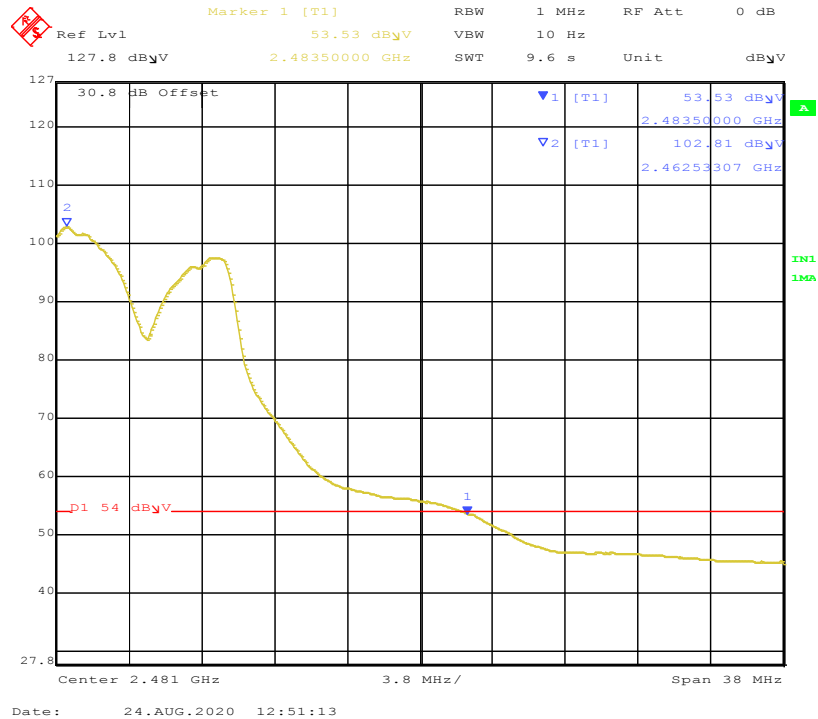


Figure 58: Radiated Bandedge at 2483.5 MHz for 802.11g 2462 MHz-Vert-Ave

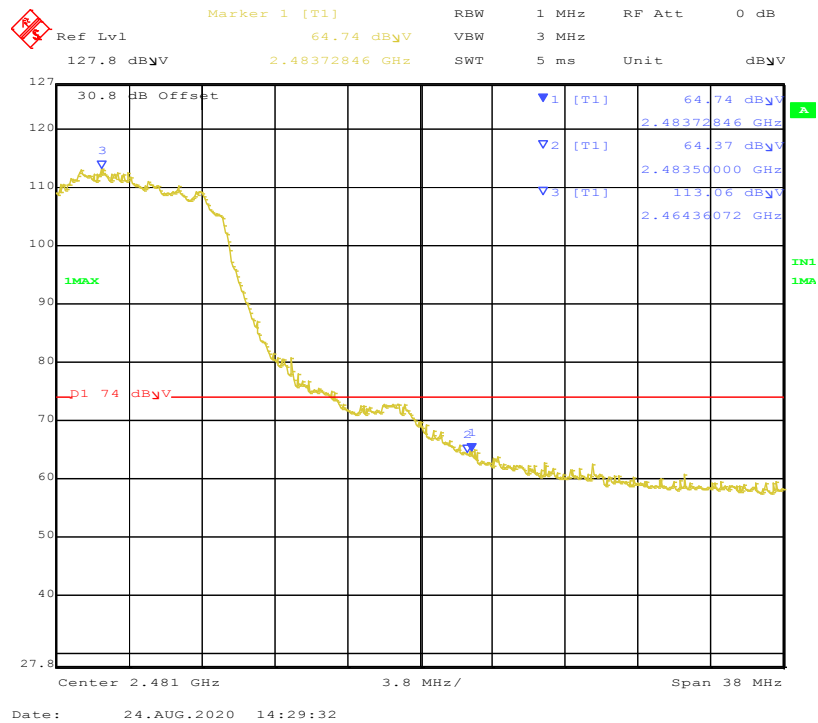


Figure 59: Radiated Bandedge at 2483.5 MHz for 802.11g 2462 MHz-Horz-Pk

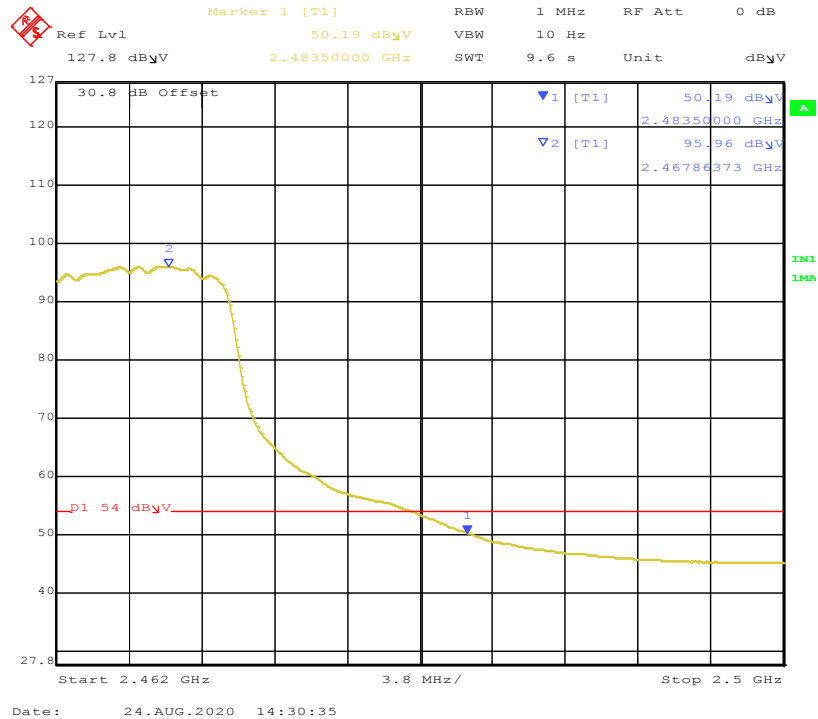


Figure 60: Radiated Bandedge at 2483.5 MHz for 802.11g 2462 MHz-Horz-Ave

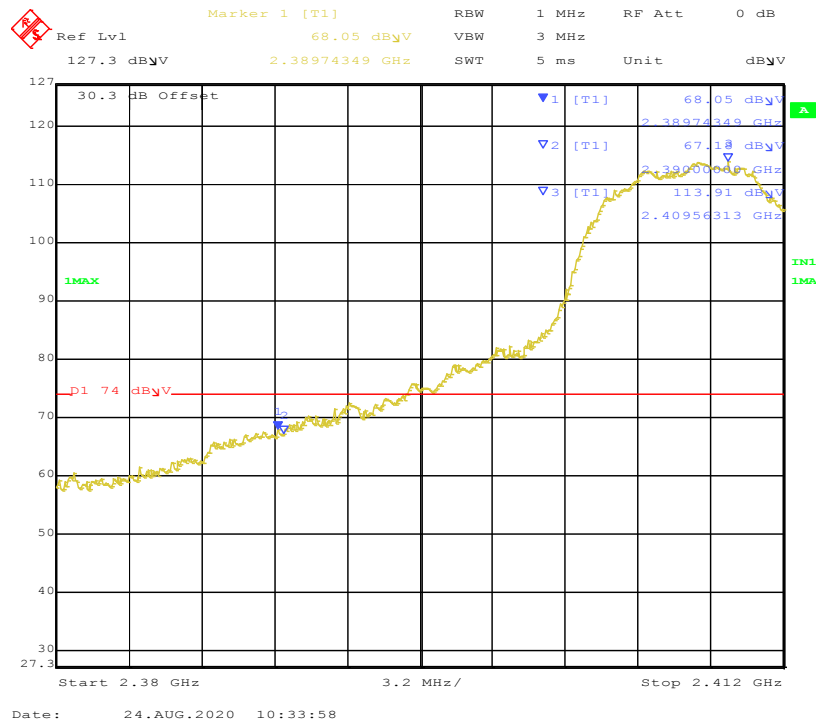


Figure 61: Radiated Bandedge at 2390 MHz for HT20 2412 MHz-Vert-Pk

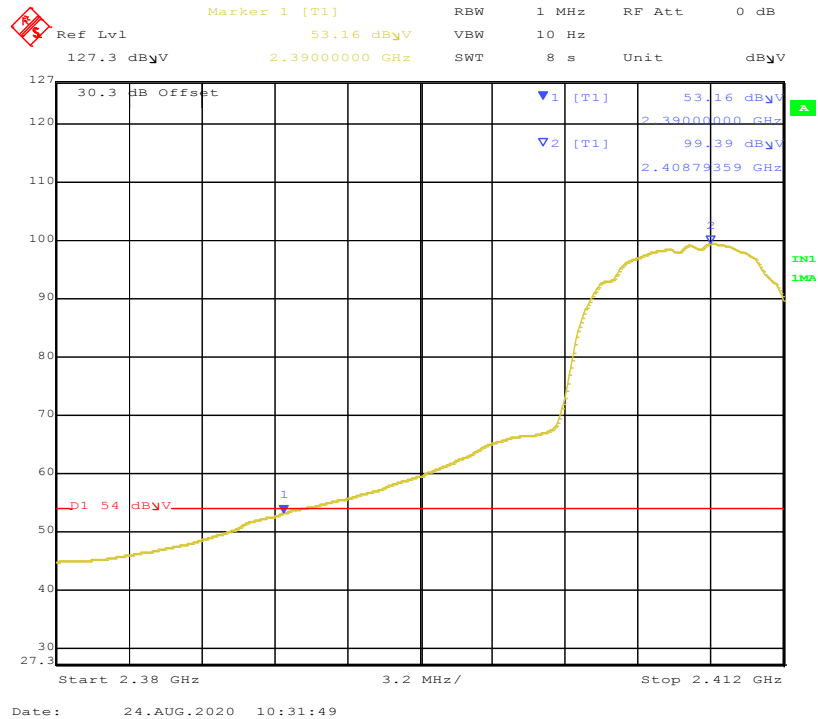


Figure 62: Radiated Bandedge at 2390 MHz for HT20 2412 MHz-Vert-Ave

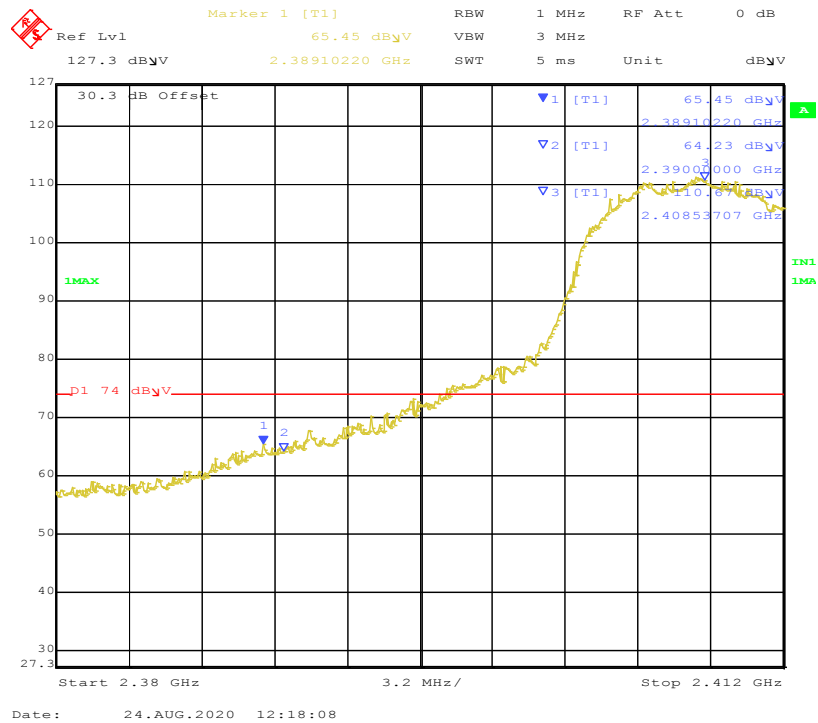


Figure 63: Radiated Bandedge at 2390 MHz for HT20 2412 MHz-Horz-Pk

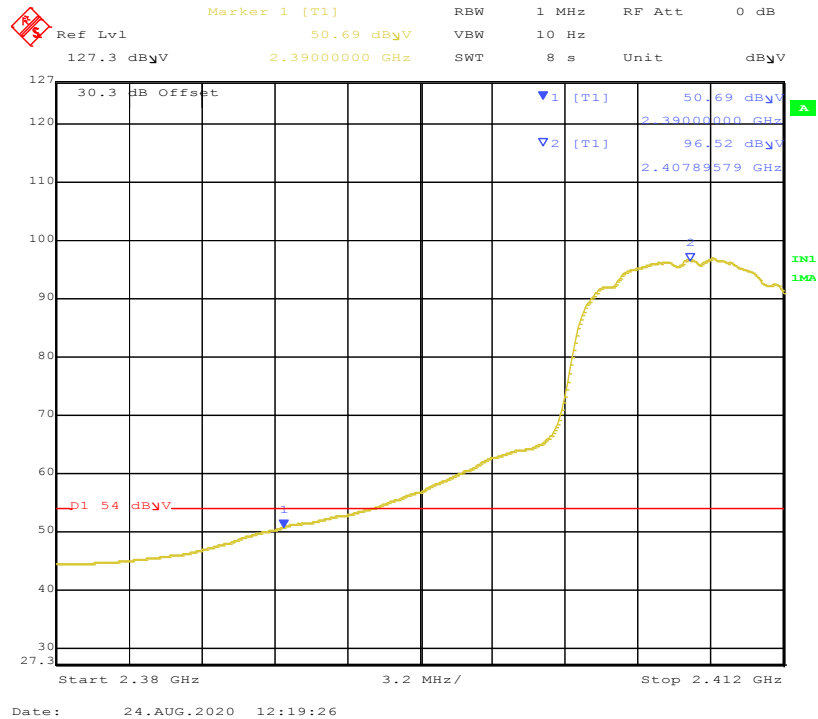


Figure 64: Radiated Bandedge at 2390 MHz for HT20 2412 MHz-Horz-Ave

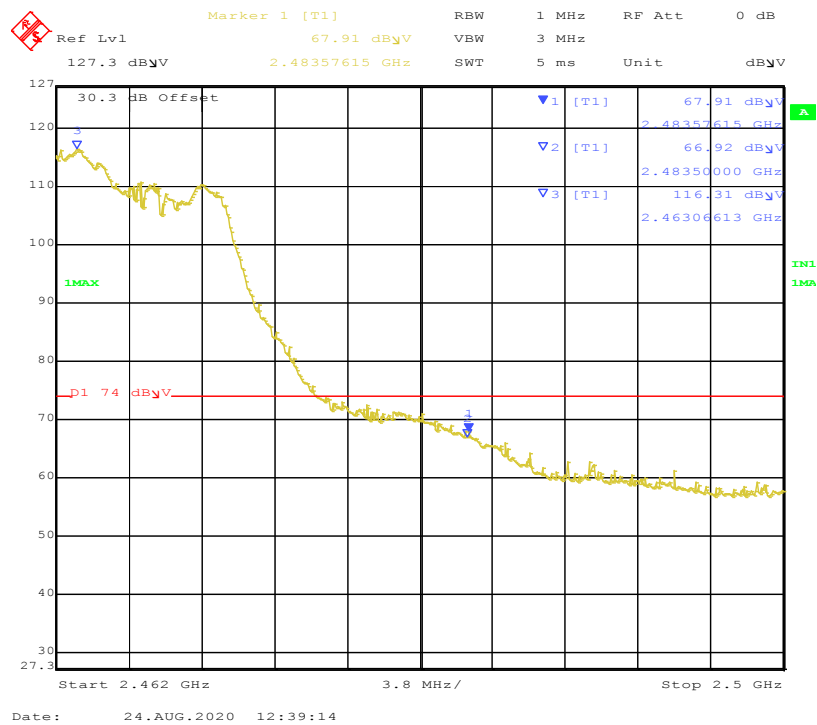


Figure 65: Radiated Bandedge at 2483.5 MHz for HT20 2462 MHz-Vert-Pk

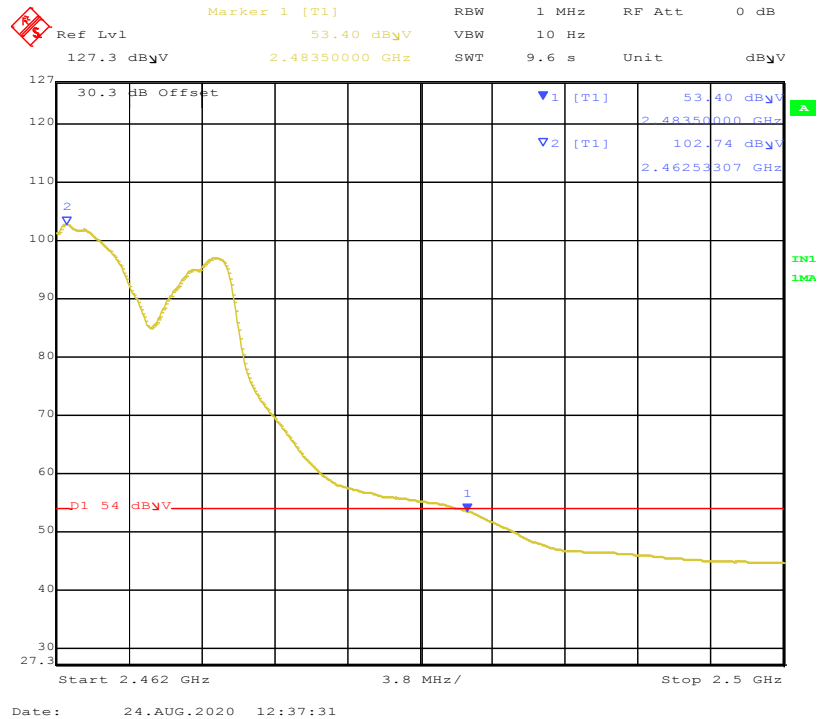


Figure 66: Radiated Bandedge at 2483.5 MHz for HT20 2462 MHz-Vert-Ave

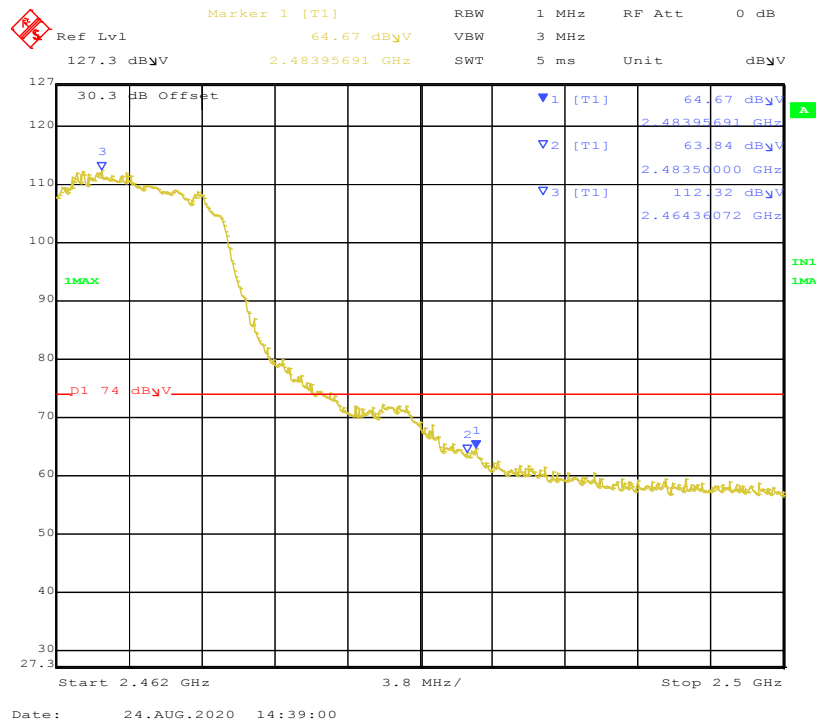


Figure 67: Radiated Bandedge at 2483.5 MHz for HT20 2462 MHz-Horz-Pk

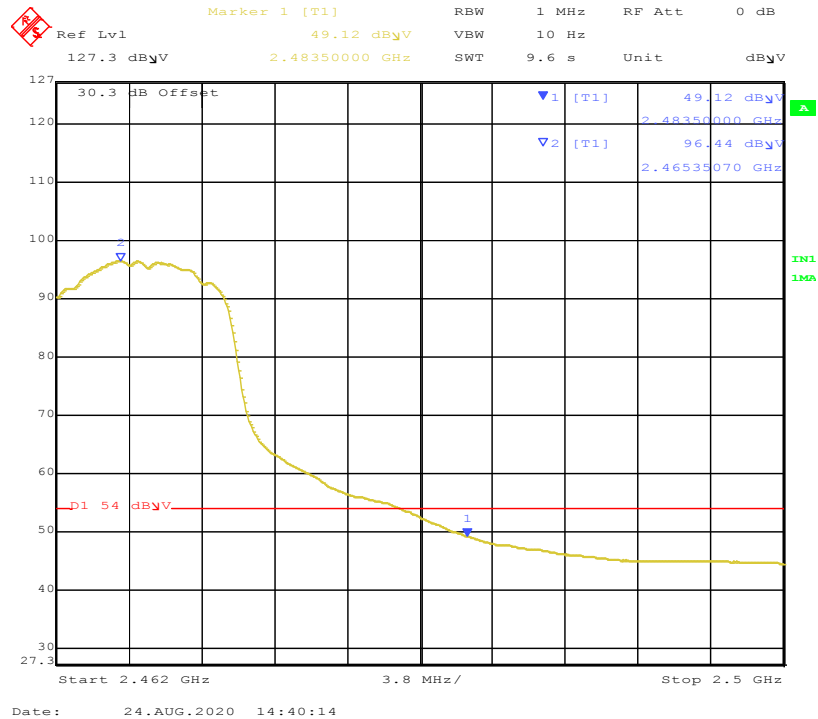


Figure 68: Radiated Bandedge at 2483.5 MHz for HT20 2462 MHz-Horz-Ave

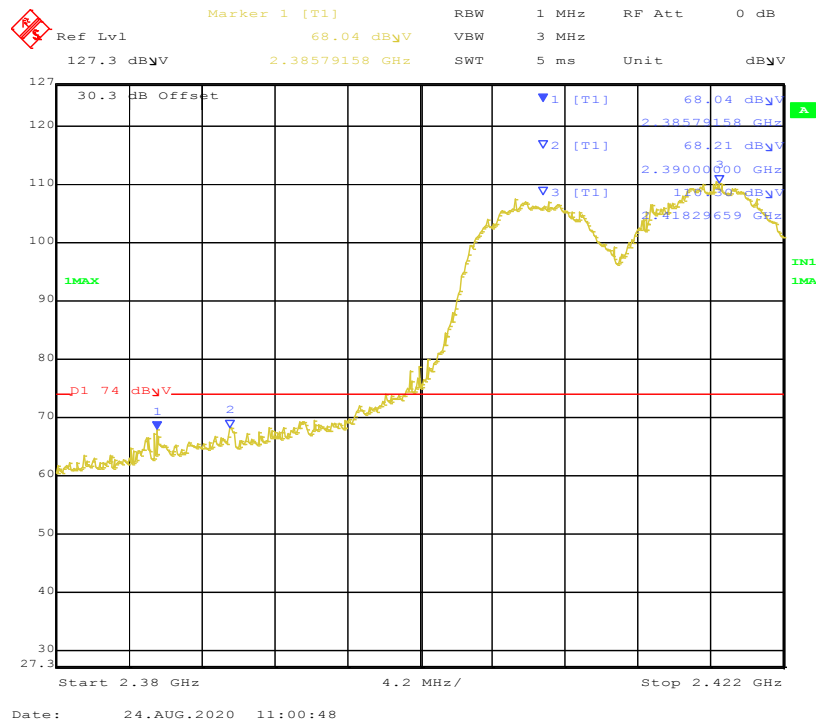


Figure 69: Radiated Bandedge at 2390 MHz for HT40 2422 MHz-Vert-Pk

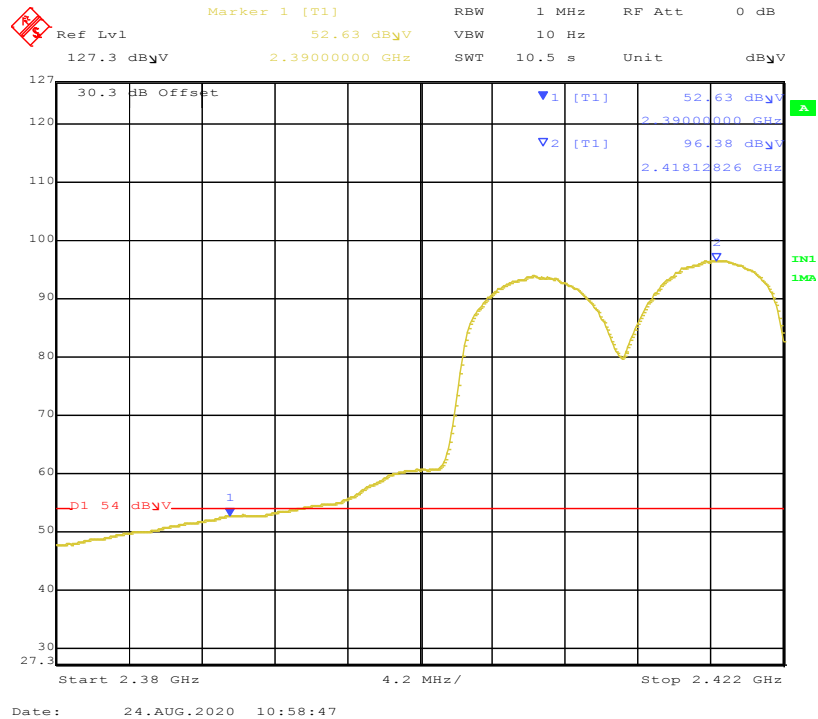


Figure 70: Radiated Bandedge at 2390 MHz for HT40 2422 MHz-Vert-Ave

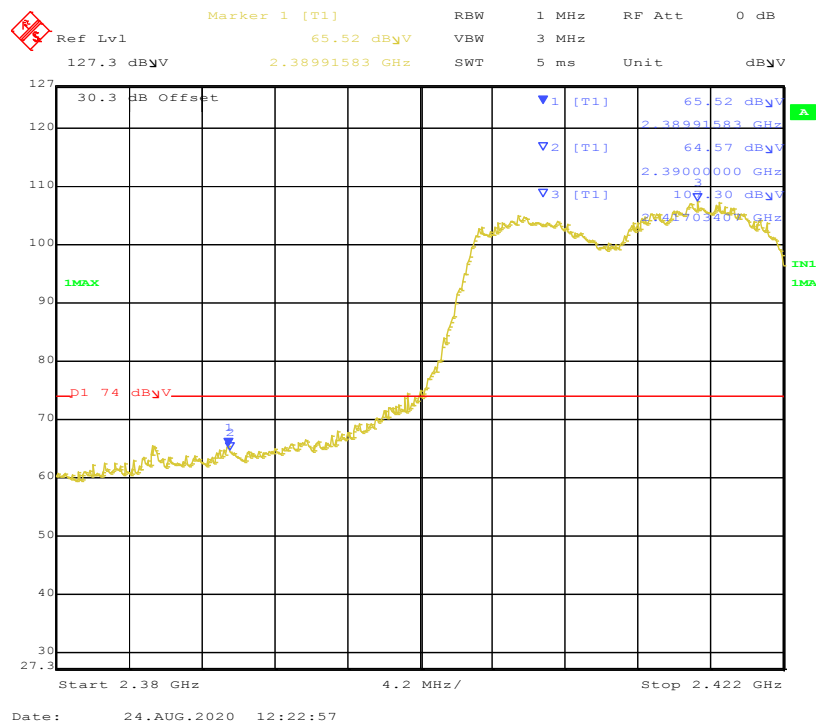


Figure 71: Radiated Bandedge at 2390 MHz for HT40 2422 MHz-Horz-Pk

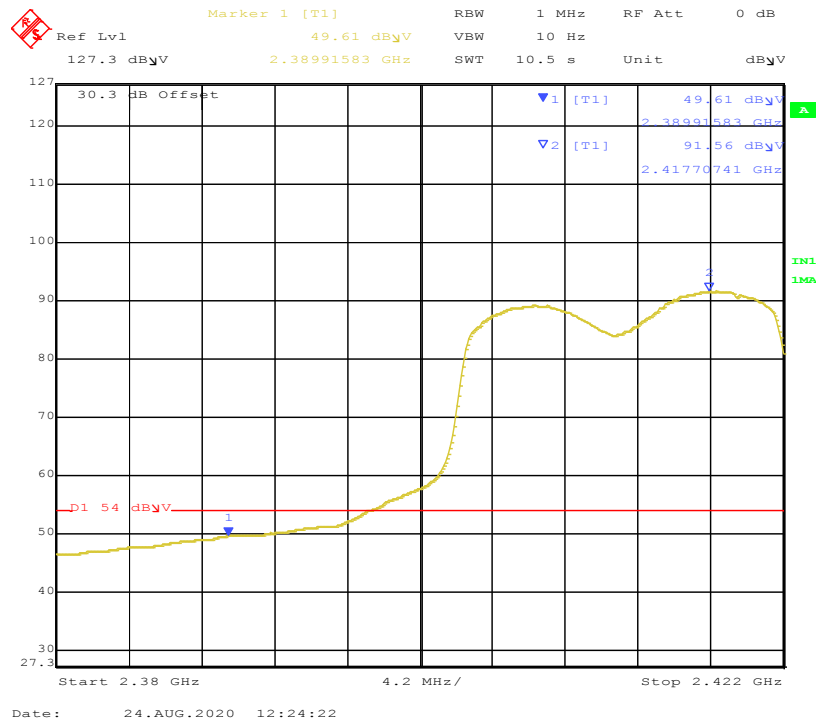


Figure 72: Radiated Bandedge at 2390 MHz for HT40 2422 MHz-Horz-Ave

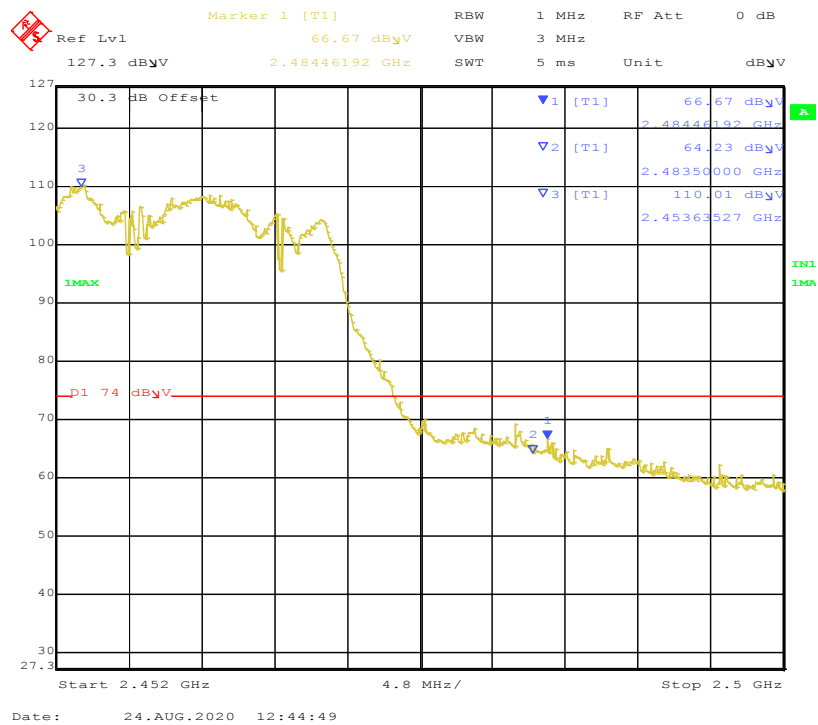


Figure 73: Radiated Bandedge at 2483.5 MHz for HT40 2452 MHz-Vert-Pk

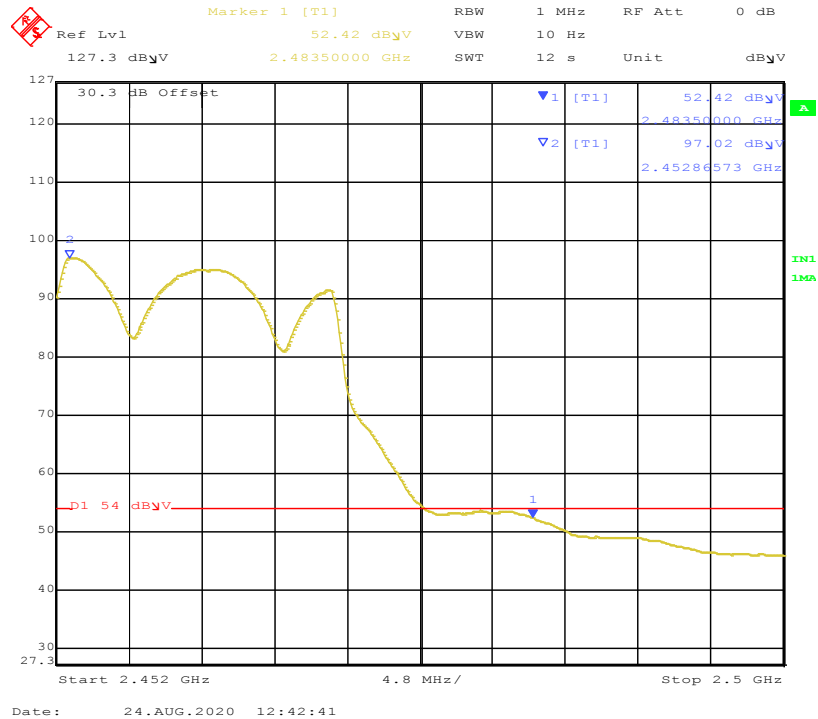


Figure 74: Radiated Bandedge at 2483.5 MHz for HT40 2452 MHz-Vert-Ave

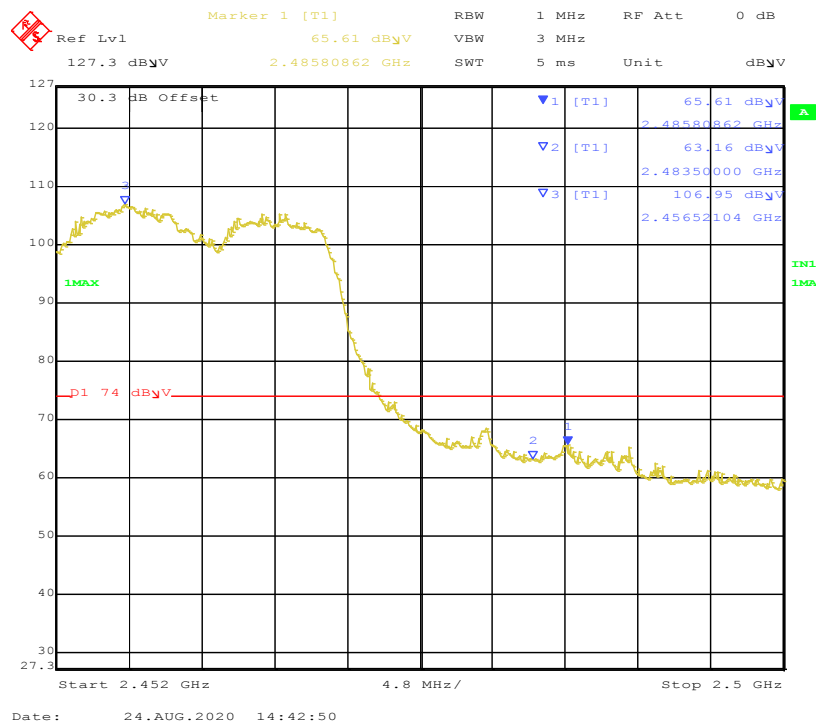


Figure 75: Radiated Bandedge at 2483.5 MHz for HT40 2452 MHz-Horz-Pk

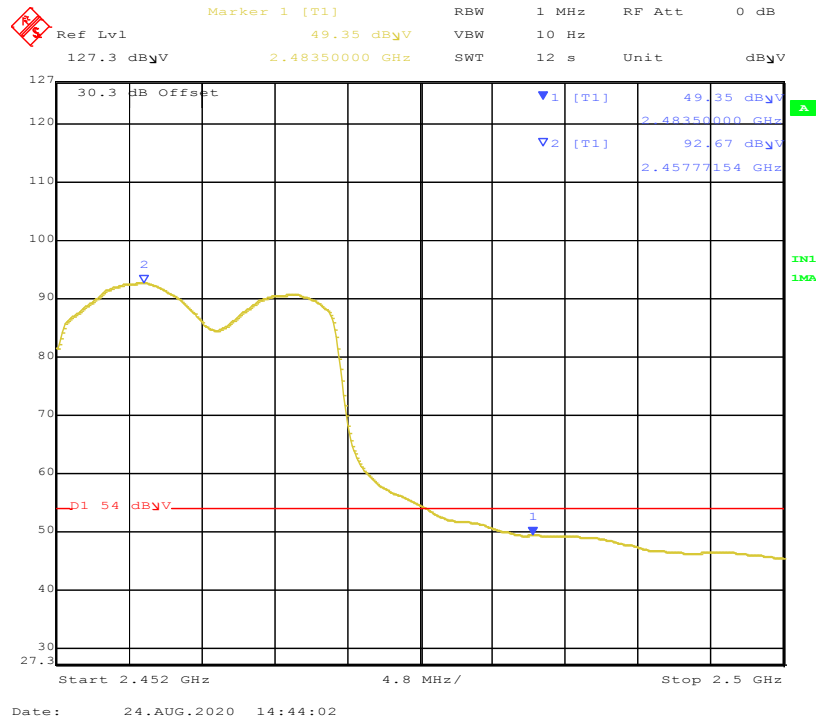


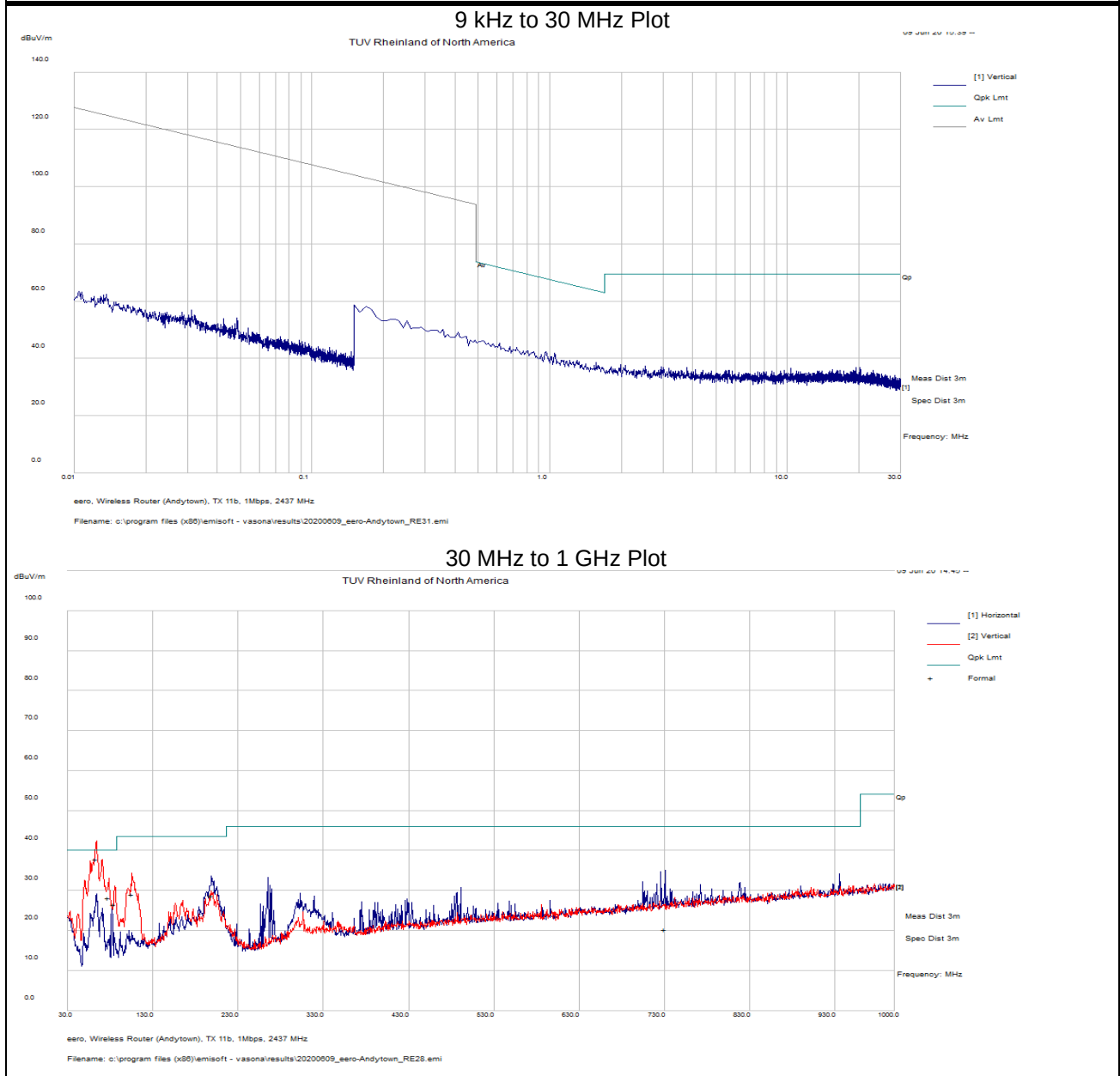
Figure 76: Radiated Bandedge at 2483.5 MHz for HT40 2452 MHz-Horz-Ave

SOP 1 Radiated Emissions							Tracking # 32062994.001 Page 1 of 16				
EUT Name		eero 6 and eero 6 Extender					Date		June 9, 2020		
EUT Model		N010001					Temp / Hum in		21°C / 38%rh		
EUT Serial		NA4V-0034-0FZS-B958					Temp / Hum out		N/A		
EUT Config.		802.11b mode at 1Mbps / chain 0 & 1					Line AC / Freq		110Vac / 60 Hz		
Standard		CFR47 Part 15 Subpart C / RSS-GEN					RBW / VBW		Per ANSI C63.10		
Dist/Ant Used		3m / JB3 and EMCO 6502					Performed by		Kerwinn Corpuz		
9 kHz to 1 GHz, Transmit at 2437 MHz											
Freq.	Raw	Cbl	AF	Level	Det.	Pol.	Hght.	Azt	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
0.80	30.06	2.28	10.30	42.64	Pk	V	100	360	69.55	-26.90	Pass
1.57	25.59	2.32	10.60	38.51	Pk	V	100	46	63.68	-25.17	Pass
199.26	40.71	3.29	-15.23	28.76	QP	H	186	86	43.50	-14.74	Pass
730.94	22.43	4.64	-6.74	20.33	QP	H	224	326	46.00	-25.67	Pass
64.16	55.51	2.70	-20.37	37.84	QP	V	120	184	40.00	-2.16	Pass
78.49	45.61	2.78	-20.23	28.16	QP	V	120	214	40.00	-11.84	Pass
85.23	44.35	2.80	-20.67	26.48	QP	V	135	36	40.00	-13.52	Pass
105.97	42.33	2.90	-16.26	28.97	QP	V	111	360	43.50	-14.53	Pass
Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty											
CF= Amp Gain + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Note: 1. Modes tested are 802.11b, 802.11g and 802.11n HT20, (low, mid & high channels).											
2. Worst case emission was observed on 802.11b at 1 Mbps, 2437 MHz mode for 20 MHz channel BW.											
3. No significant emission was observed below 30 MHz. Detected noise floor.											

SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 9, 2020
EUT Model	N010001	Temp / Hum in	21°C / 38%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b mode at 1Mbps / chain 0 & 1	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	Per ANSI C63.10
Dist/Ant Used	3m / 6502 & JB3	Date	Kerwinn Corpuz



Notes: Transmit at 2437 MHz.

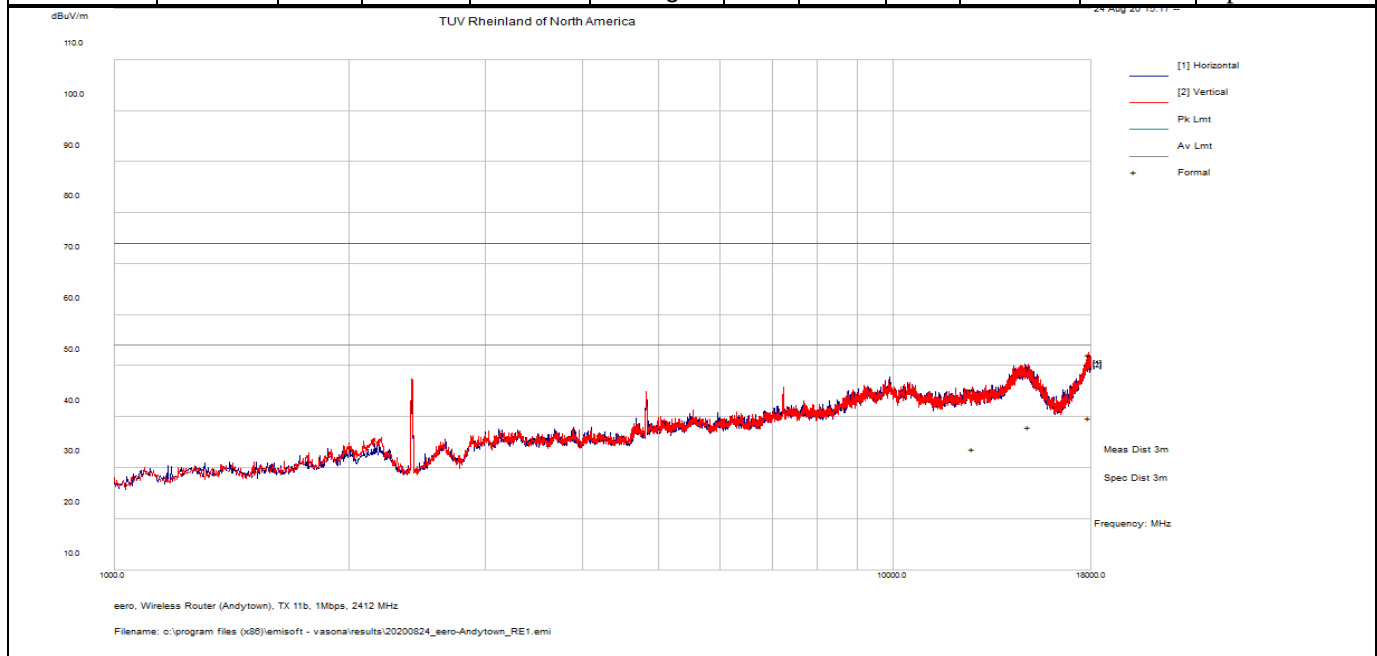
SOP 1 Radiated Emissions

Tracking # 32062994.001 Page 3 of 16

EUT Name	eero 6 and eero 6 Extender	Date	August 24, 2020
EUT Model	N010001	Temp / Hum in	20°C / 35%rh
EUT Serial	NA77-001A-YH4B-YK9D	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps, 2412 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 1 – 18 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
12680.50	58.91	3.37	-16.89	45.39	Pk	V	188	360	74.00	-28.61	Spurious
12680.50	47.11	3.37	-16.89	33.60	Avg	V	188	360	54.00	-20.40	Spurious
14948.69	59.28	3.63	-13.08	49.83	Pk	V	188	102	74.00	-24.17	Spurious
14948.69	47.48	3.63	-13.08	38.02	Avg	V	188	102	54.00	-15.98	Spurious
17877.59	55.75	4.10	-7.73	52.12	Pk	V	147	124	74.00	-21.88	Spurious
17877.59	43.31	4.10	-7.73	39.68	Avg	V	147	124	54.00	-14.32	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case emission is observed on 802.11b. 802.11g & HT20 are covered for 20 MHz channel BW.

Emission at 2412 MHz is the fundamental.

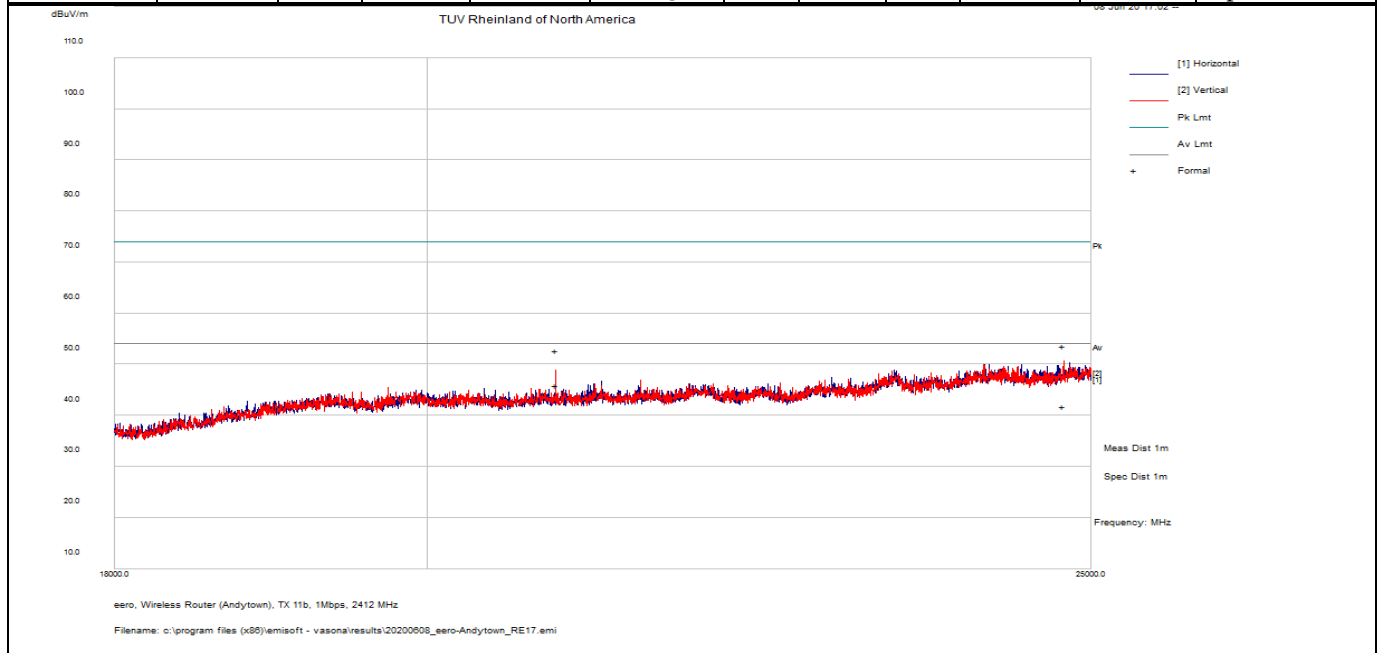
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 8, 2020
EUT Model	N010001	Temp / Hum in	21°C / 39%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps, 2412 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 18 – 25 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
20880.13	44.90	7.60	0.25	52.75	Pk	V	147	114	74.00	-21.25	Spurious
20880.13	38.04	7.60	0.25	45.89	Avg	V	147	114	54.00	-8.11	Spurious
24770.23	42.89	8.19	2.46	53.54	Pk	V	132	154	74.00	-20.47	Spurious
24770.23	31.16	8.19	2.46	41.80	Avg	V	132	154	54.00	-12.20	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case emission was observed on 802.11b. 802.11g & HT20 are covered for 20 MHz channel BW.

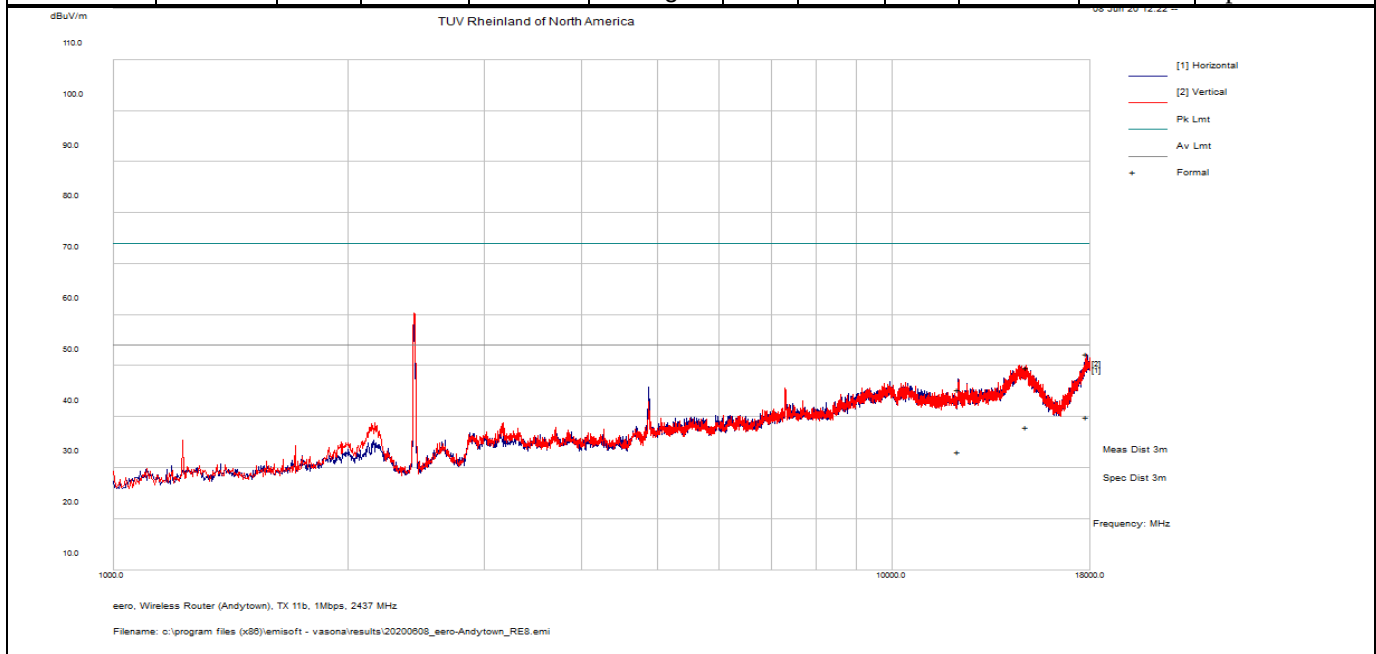
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 8, 2020
EUT Model	N010001	Temp / Hum in	21°C / 39%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps, 2437 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 1 – 18 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
12179.17	59.01	3.33	-16.94	45.39	Pk	H	172	262	74.00	-28.61	Harmonic
12179.17	46.83	3.33	-16.94	33.21	Avg	H	172	262	54.00	-20.79	Harmonic
14898.66	58.89	3.61	-12.94	49.57	Pk	V	151	192	74.00	-24.43	Spurious
14898.66	47.22	3.61	-12.94	37.89	Avg	V	151	192	54.00	-16.11	Spurious
17825.18	56.27	4.10	-7.99	52.38	Pk	V	174	44	74.00	-21.62	Spurious
17825.18	43.81	4.10	-7.99	39.91	Avg	V	174	44	54.00	-14.09	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case emission was observed on 802.11b. 802.11g & HT20 are covered for 20 MHz channel BW.

Emission at 2437 MHz is the fundamental.

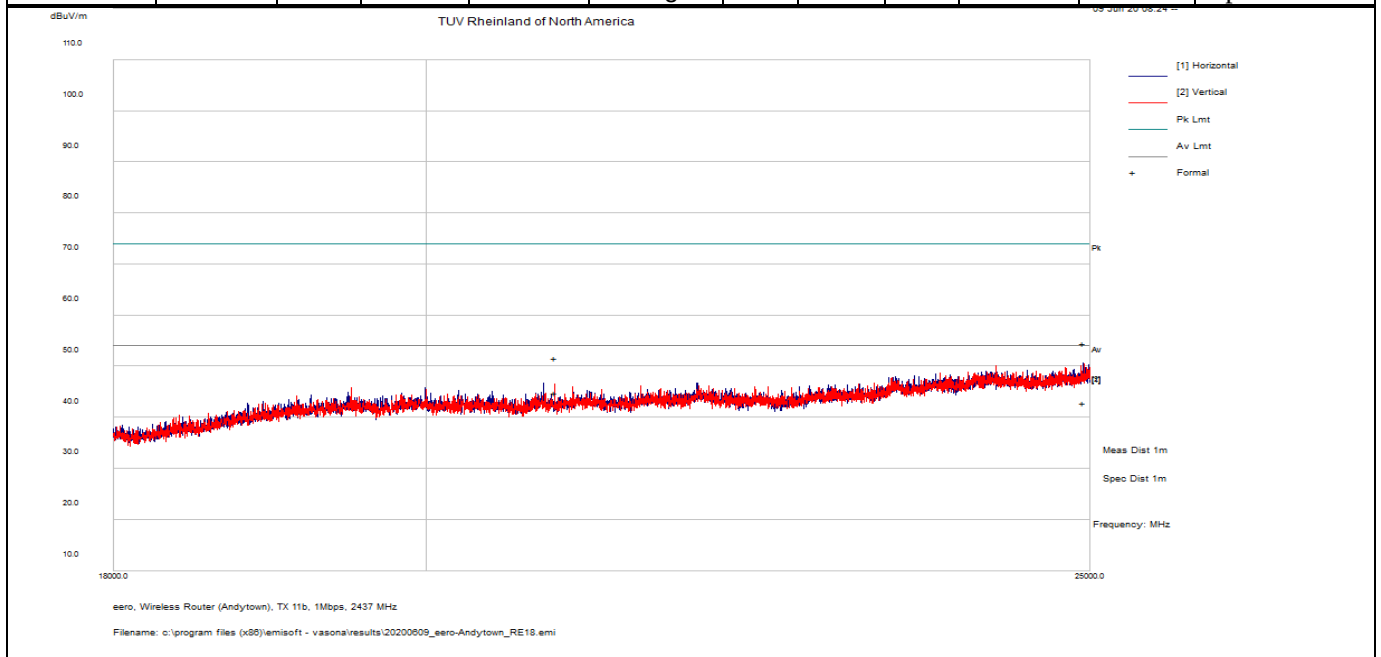
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 9, 2020
EUT Model	N010001	Temp / Hum in	21°C / 38%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps, 2437 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 18 – 25 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
24943.12	43.99	8.17	2.34	54.50	Pk	H	132	89	74.00	-19.50	Spurious
24943.12	32.30	8.17	2.34	42.82	Avg	H	132	89	54.00	-11.18	Spurious
20879.99	43.80	7.60	0.25	51.65	Pk	V	183	108	74.00	-22.35	Spurious
20879.99	36.96	7.60	0.25	44.81	Avg	V	183	108	54.00	-9.19	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case emission was observed on 802.11b. 802.11g & HT20 are covered for 20 MHz channel BW.

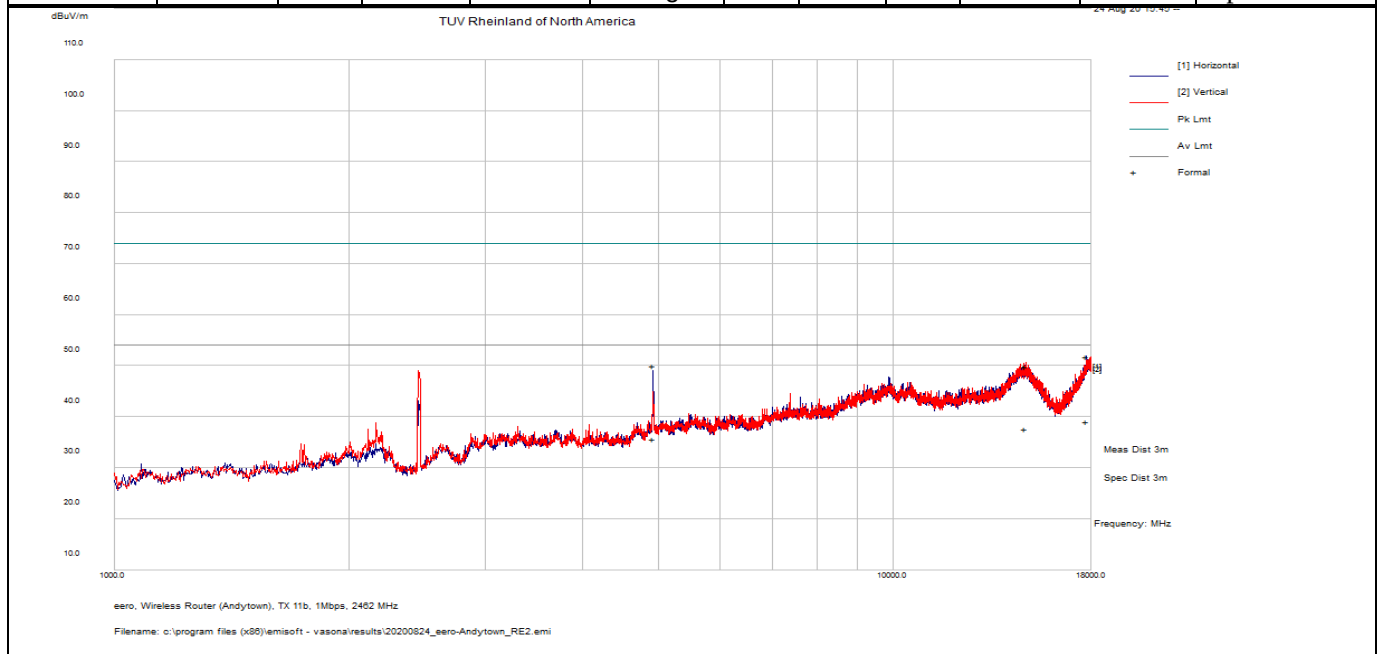
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	August 24, 2020
EUT Model	N010001	Temp / Hum in	20°C / 35%rh
EUT Serial	NA77-001A-YH4B-YK9D	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps, 2462 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 1 – 18 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
4917.88	71.25	1.87	-23.04	50.07	Pk	H	132	174	74.00	-23.93	Harmonic
4917.88	56.88	1.87	-23.04	35.70	Avg	H	132	174	54.00	-18.30	Harmonic
17741.92	56.13	4.06	-8.46	51.73	Pk	H	174	292	74.00	-22.27	Spurious
17741.92	43.48	4.06	-8.46	39.08	Avg	H	174	292	54.00	-14.92	Spurious
14818.52	58.58	3.68	-12.53	49.73	Pk	V	254	192	74.00	-24.27	Spurious
14818.52	46.53	3.68	-12.53	37.68	Avg	V	254	192	54.00	-16.32	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Worst case emission is observed on 802.11b. 802.11g & HT20 are covered for 20 MHz channel BW.

Emission at 2462 MHz is the fundamental.

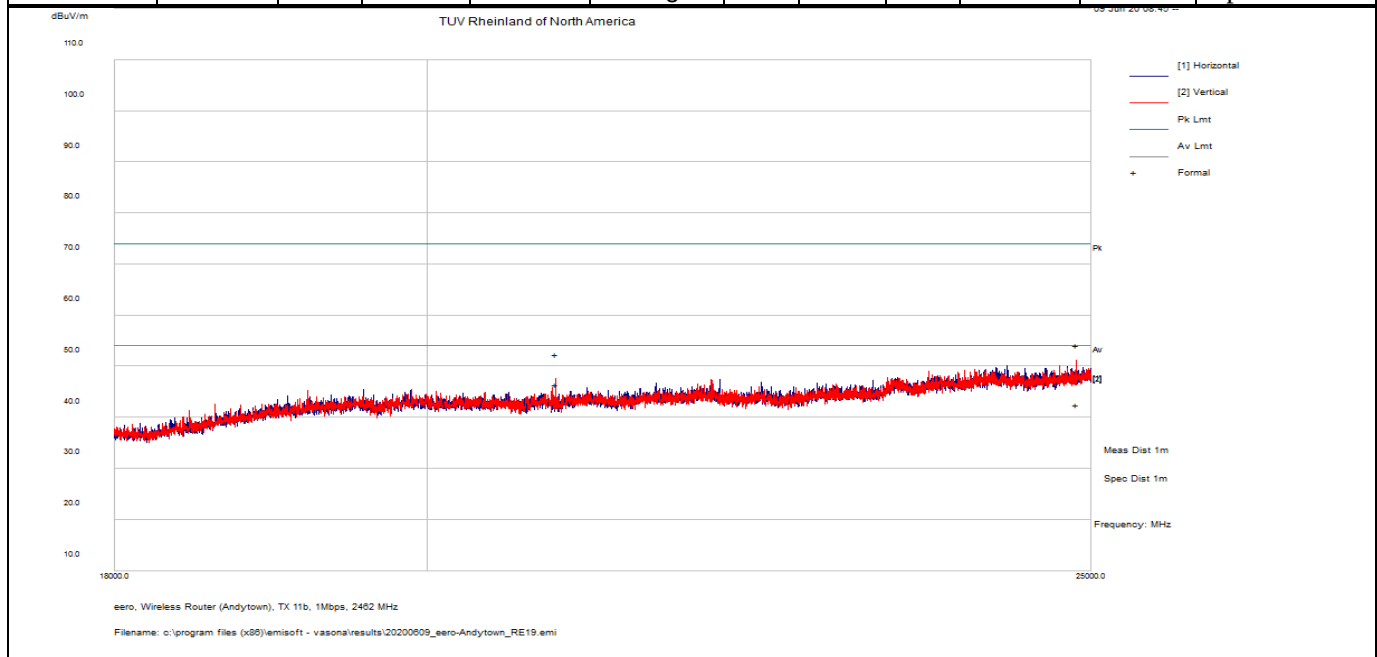
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 9, 2020
EUT Model	N010001	Temp / Hum in	21°C / 38%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps, 2462 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 18 – 25 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
20879.88	44.54	7.60	0.25	52.39	Pk	V	128	122	74.00	-21.61	Spurious
20879.88	38.54	7.60	0.25	46.39	Avg	V	128	122	54.00	-7.61	Spurious
24873.87	43.64	8.17	2.29	54.10	Pk	V	122	288	74.00	-19.90	Spurious
24873.87	32.06	8.17	2.29	42.52	Avg	V	122	288	54.00	-11.48	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

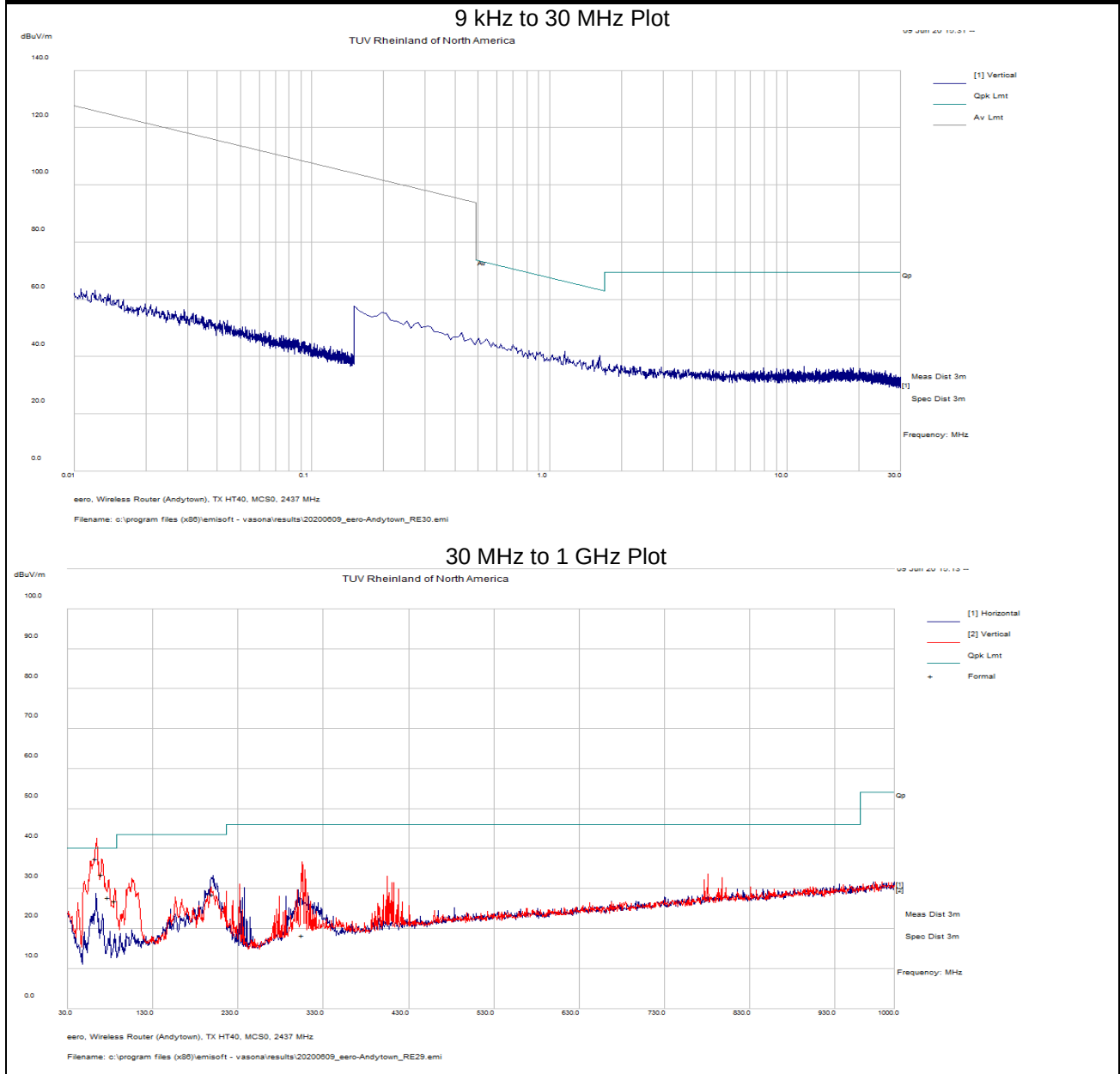
Notes: Worst case emission was observed on 802.11b. 802.11g & HT20 are covered for 20 MHz channel BW.

SOP 1 Radiated Emissions							Tracking # 32062994.001 Page 9 of 16				
EUT Name		eero 6 and eero 6 Extender					Date		June 9, 2020		
EUT Model		N010001					Temp / Hum in		21°C / 38%rh		
EUT Serial		NA4V-0034-0FZS-B958					Temp / Hum out		N/A		
EUT Config.		802.11n HT40 mode at MCS0 / chain 0 & 1					Line AC / Freq		110Vac / 60 Hz		
Standard		CFR47 Part 15 Subpart C / RSS-GEN					RBW / VBW		Per ANSI C63.10		
Dist/Ant Used		3m / JB3 and EMCO 6502					Performed by		Kerwinn Corpuz		
9 kHz to 1 GHz, Transmit at 2437 MHz											
Freq.	Raw	Cbl	AF	Level	Det.	Pol.	Hght.	Azt	Limit	Margin	Result
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
1.16	28.90	2.31	10.60	41.81	Pk	V	100	344	66.30	-24.50	Pass
1.63	27.27	2.32	10.60	40.20	Pk	V	100	332	63.38	-23.18	Pass
200.32	40.47	3.28	-15.19	28.56	QP	H	139	251	43.50	-14.94	Pass
63.94	55.22	2.70	-20.40	37.52	QP	V	149	142	40.00	-2.48	Pass
70.22	50.81	2.74	-19.99	33.56	QP	V	118	136	40.00	-6.44	Pass
78.46	45.26	2.78	-20.23	27.82	QP	V	166	126	40.00	-12.18	Pass
85.70	44.85	2.81	-20.67	26.99	QP	V	133	68	40.00	-13.01	Pass
305.31	28.63	3.62	-13.87	18.38	QP	V	122	0	46.00	-27.62	Pass
Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty											
CF= Amp Gain + ANT Factor											
Combined Standard Uncertainty $u_c(y) = \pm 3.2$ dB Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence											
Note: 1. Mode tested is 802.11n HT40, (low, mid & high channels).											
2. Worst case emission was observed on 802.11n HT40, 2437 MHz (mid channel).											
3. No significant emission was observed below 30 MHz. Detected noise floor.											

SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 9, 2020
EUT Model	N010001	Temp / Hum in	21°C / 38%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11n HT40 mode at MCS0 / chain 0 & 1	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	Per ANSI C63.10
Dist/Ant Used	3m / 6502 & JB3	Date	Kerwinn Corpuz



Notes: Transmit at 2437 MHz.

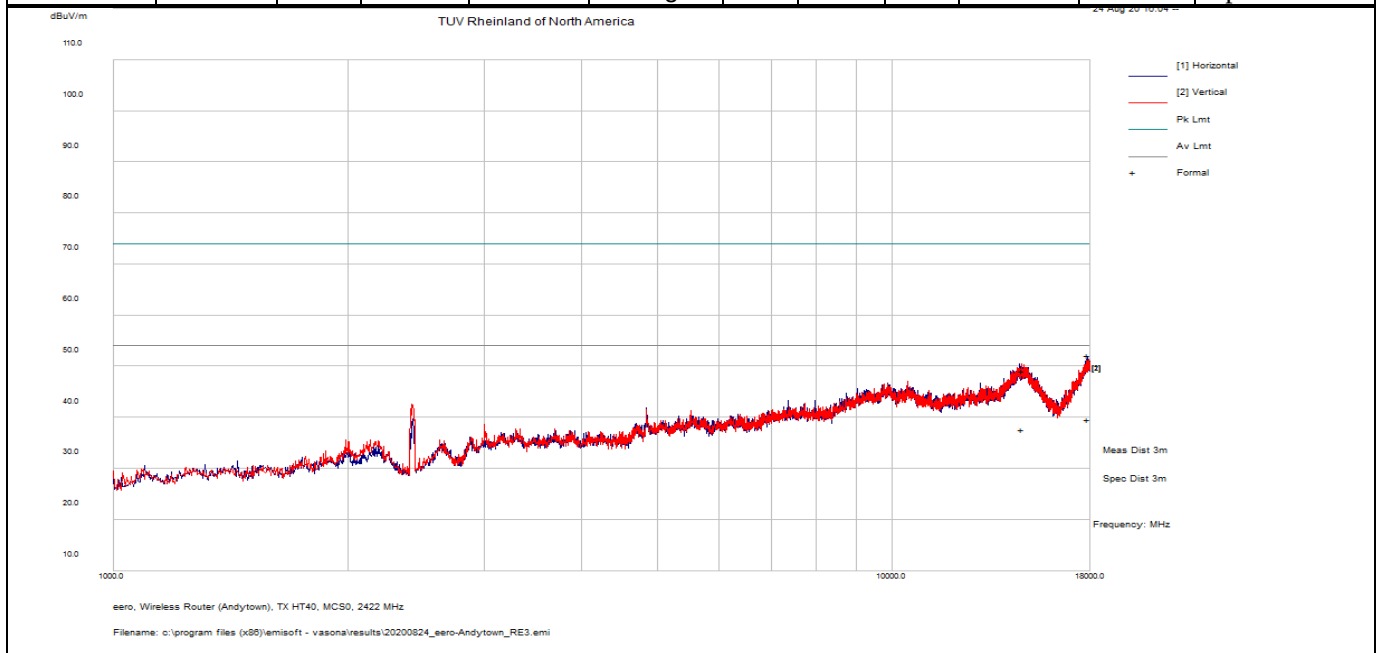
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	August 24, 2020
EUT Model	N010001	Temp / Hum in	20°C / 35%rh
EUT Serial	NA77-001A-YH4B-YK9D	Temp / Hum out	N/A
EUT Config.	802.11n HT40, MCS0, 2422 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 1 – 18 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
17876.61	55.71	4.10	-7.74	52.07	Pk	H	245	112	74.00	-21.93	Spurious
17876.61	43.25	4.10	-7.74	39.61	Avg	H	245	112	54.00	-14.39	Spurious
14699.25	58.18	3.55	-12.57	49.16	Pk	V	169	152	74.00	-24.84	Spurious
14699.25	46.66	3.55	-12.57	37.64	Avg	V	169	152	54.00	-16.37	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Emission at 2422 MHz is the fundamental.

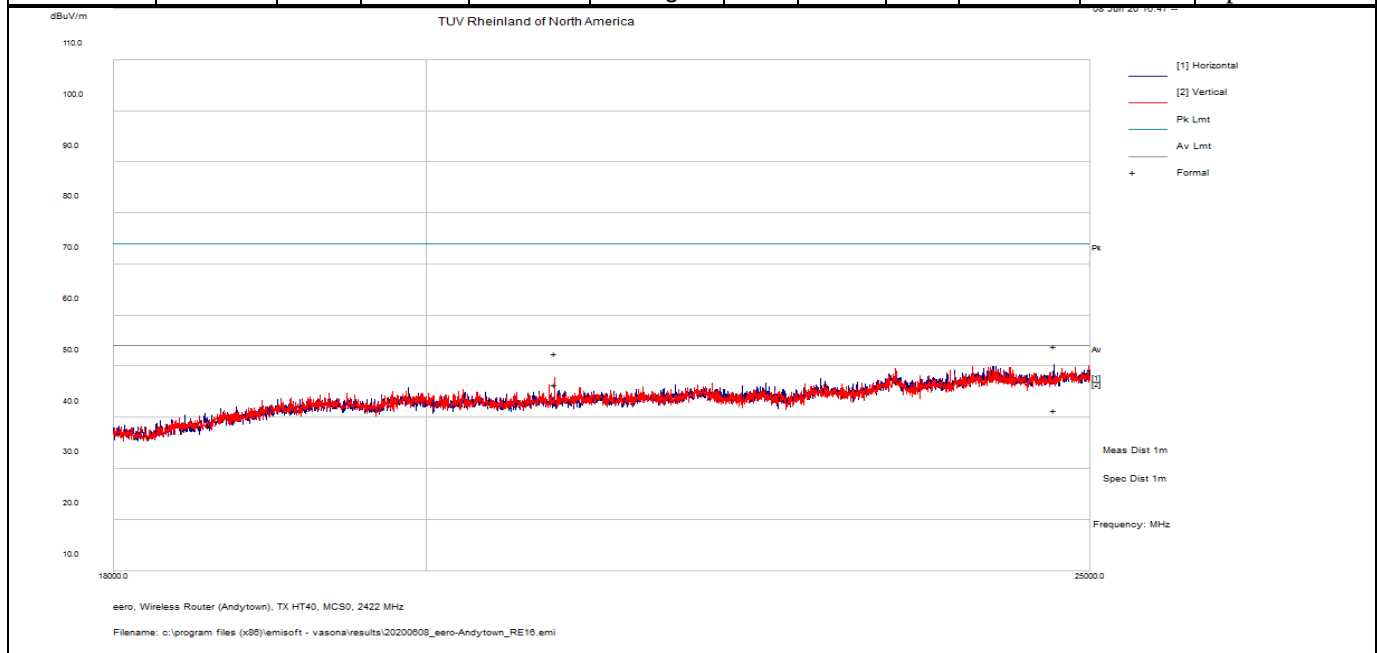
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 8, 2020
EUT Model	N010001	Temp / Hum in	21°C / 39%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11n HT40, MCS0, 2422 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 18 – 25 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
24697.14	43.33	8.13	2.49	53.95	Pk	H	198	342	74.00	-20.05	Spurious
24697.14	30.76	8.13	2.49	41.38	Avg	H	198	342	54.00	-12.63	Spurious
20880.12	44.65	7.60	0.25	52.50	Pk	V	128	124	74.00	-21.50	Spurious
20880.12	38.58	7.60	0.25	46.44	Avg	V	128	124	54.00	-7.57	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: None

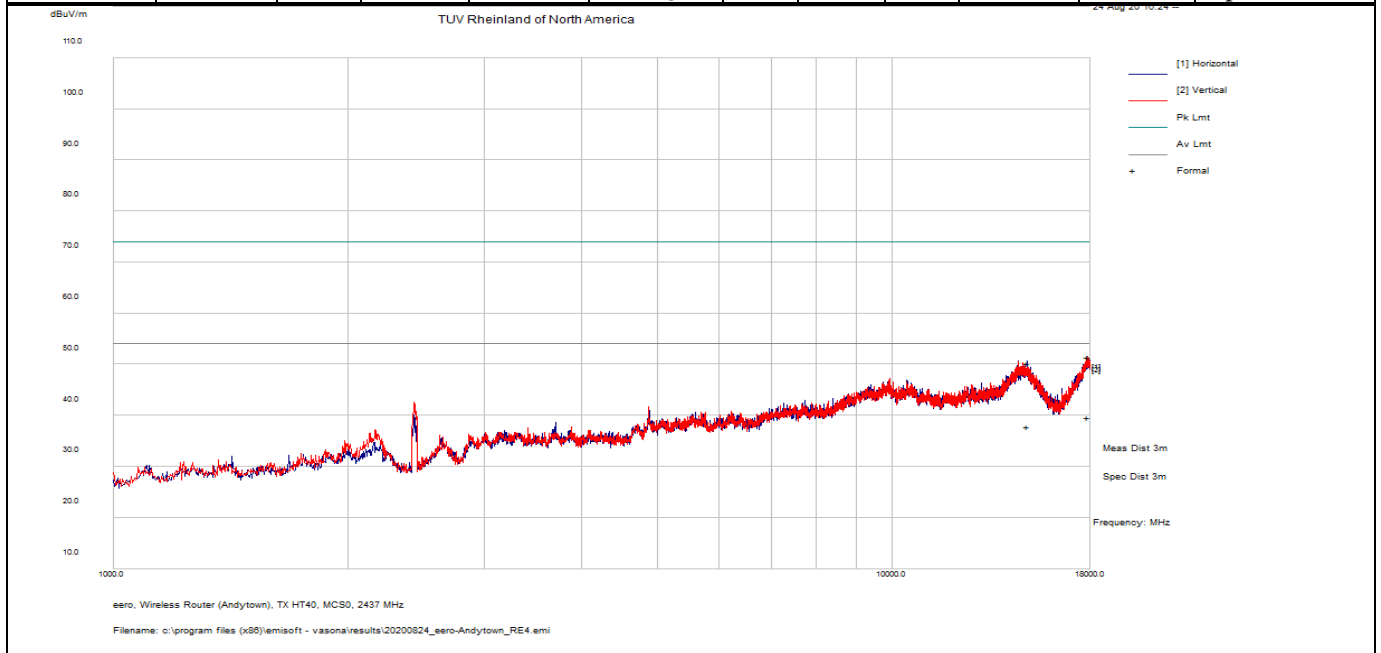
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	August 24, 2020
EUT Model	N010001	Temp / Hum in	20°C / 35%rh
EUT Serial	NA77-001A-YH4B-YK9D	Temp / Hum out	N/A
EUT Config.	802.11n HT40, MCS0, 2437 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 1 – 18 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
14940.38	59.54	3.63	-13.07	50.10	Pk	H	204	232	74.00	-23.91	Spurious
14940.38	47.17	3.63	-13.07	37.73	Avg	H	204	232	54.00	-16.27	Spurious
17860.60	55.20	4.09	-7.80	51.48	Pk	V	201	54	74.00	-22.52	Spurious
17860.60	43.27	4.09	-7.80	39.56	Avg	V	201	54	54.00	-14.45	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Emission at 2437 MHz is the fundamental.

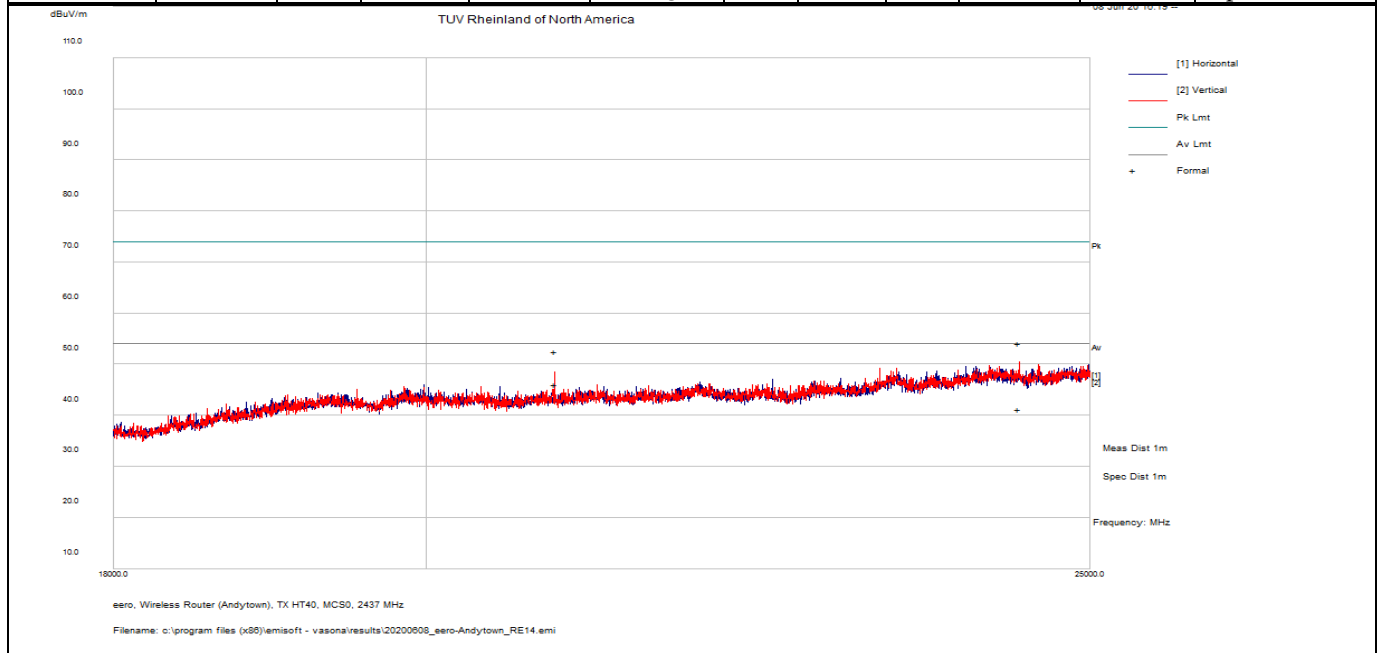
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 8, 2020
EUT Model	N010001	Temp / Hum in	21°C / 39%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11n HT40, MCS0, 2437 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 18 – 25 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
20879.98	44.61	7.60	0.25	52.46	Pk	V	127	114	74.00	-21.54	Spurious
20879.98	38.18	7.60	0.25	46.03	Avg	V	127	114	54.00	-7.97	Spurious
24409.82	43.70	8.09	2.30	54.09	Pk	V	196	360	74.00	-19.91	Spurious
24409.82	30.84	8.09	2.30	41.23	Avg	V	196	360	54.00	-12.77	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: None

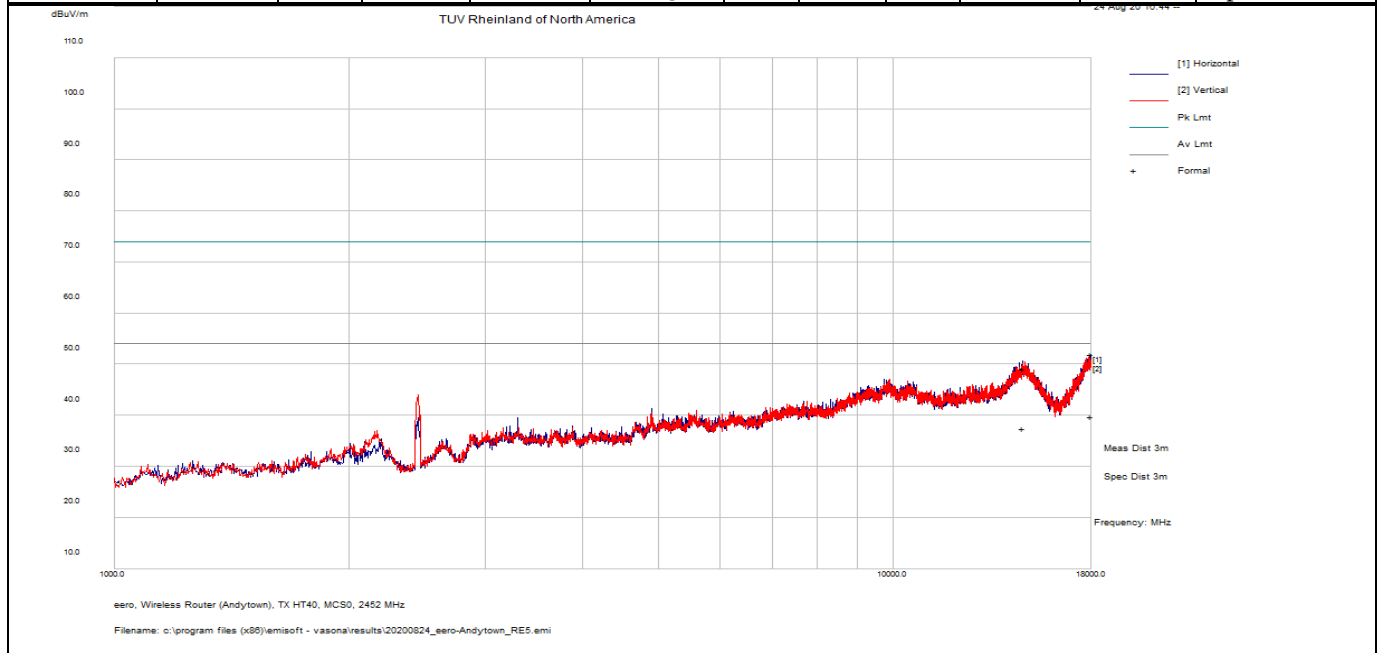
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EUT Name	eero 6 and eero 6 Extender	Date	August 24, 2020
EUT Model	N010001	Temp / Hum in	20°C / 35%rh
EUT Serial	NA77-001A-YH4B-YK9D	Temp / Hum out	N/A
EUT Config.	802.11n HT40, MCS0, 2452 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 1 – 18 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
14716.95	58.20	3.57	-12.66	49.11	Pk	H	161	342	74.00	-24.89	Spurious
14716.95	46.49	3.57	-12.66	37.41	Avg	H	161	342	54.00	-16.59	Spurious
17994.64	55.55	4.12	-7.77	51.90	Pk	H	132	256	74.00	-22.10	Spurious
17994.64	43.35	4.12	-7.77	39.70	Avg	H	132	256	54.00	-14.30	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: Emission at 2452 MHz is the fundamental.

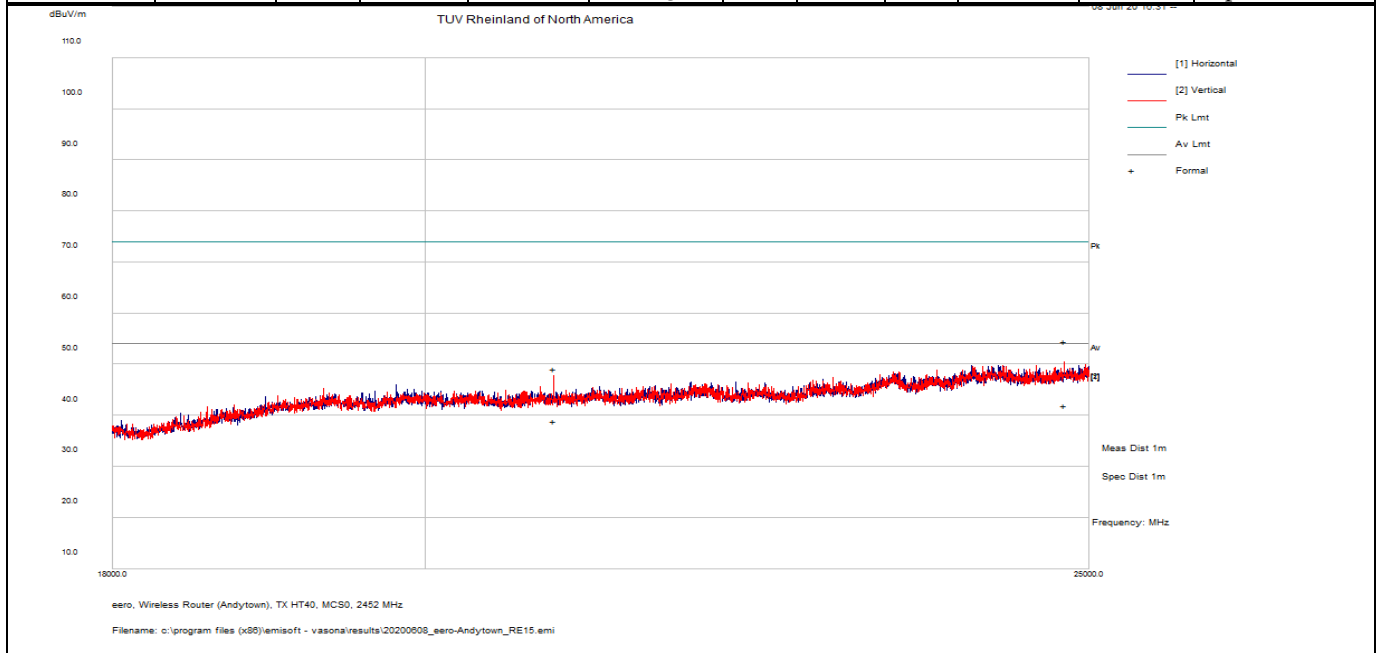
SOP 1 Radiated Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	June 8, 2020
EUT Model	N010001	Temp / Hum in	21°C / 39%rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11n HT40, MCS0, 2452 MHz (Ch0 & Ch1)	Line AC / Freq	110Vac / 60 Hz
Standard	CFR47 Part 15 Subpart C / RSS-GEN	RBW / VBW	1 MHz / 3 MHz
Dist/Ant Used	3m / EMCO-3115, 1m / ComPower-AHA840	Performed by	Kerwinn Corpuz

Emission band 18 – 25 GHz

Freq	Raw	Cbl	AF	Level	Det	Pol	Hght	Azt	Limit	Margin	Comment
MHz	dBuV/m	dB	dB	dBuV/m		H/V	cm	deg	dBuV/m	dB	
20880.05	41.25	7.60	0.25	49.10	Pk	V	152	305	74.00	-24.90	Spurious
20880.05	31.01	7.60	0.25	38.86	Avg	V	152	305	54.00	-15.14	Spurious
24793.38	43.75	8.20	2.44	54.40	Pk	V	186	182	74.00	-19.60	Spurious
24793.38	31.36	8.20	2.44	42.01	Avg	V	186	182	54.00	-11.99	Spurious



Spec Margin = Level - Limit, Level = Raw+ Cbl+ CF ± Uncertainty

CF= Amp Gain + ANT Factor

Combined Standard Uncertainty $u_c(y) = \pm 3.2\text{dB}$ Expanded Uncertainty $U = k u_c(y)$ $k = 2$ for 95% confidence

Notes: None

4.5.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

$$\text{Field Strength (dB}\mu\text{V/m)} = \text{FIM} - \text{AMP} + \text{CBL} + \text{ACF}$$

Where: FIM = Field Intensity Meter (dB μ V)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu\text{V/m} = 10^{\frac{\text{dB}\mu\text{V} / \text{m}}{20}}$$

4.6 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.10: 2013. These test methods are listed under the laboratory's A2LA Scope of Accreditation.

This test measures the levels emanating from the EUT's AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR47 Part 15.207: 2020 and RSS Gen: 2019 Sect. 8.8.

4.6.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50 μ H / 50 Ω LISNs.

Testing is performed in Lab 5. The setup photographs clearly identify which site was used. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

4.6.1.1 Deviations

There were no deviations from this test methodology.

4.6.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 11: AC Conducted Emissions – Test Results

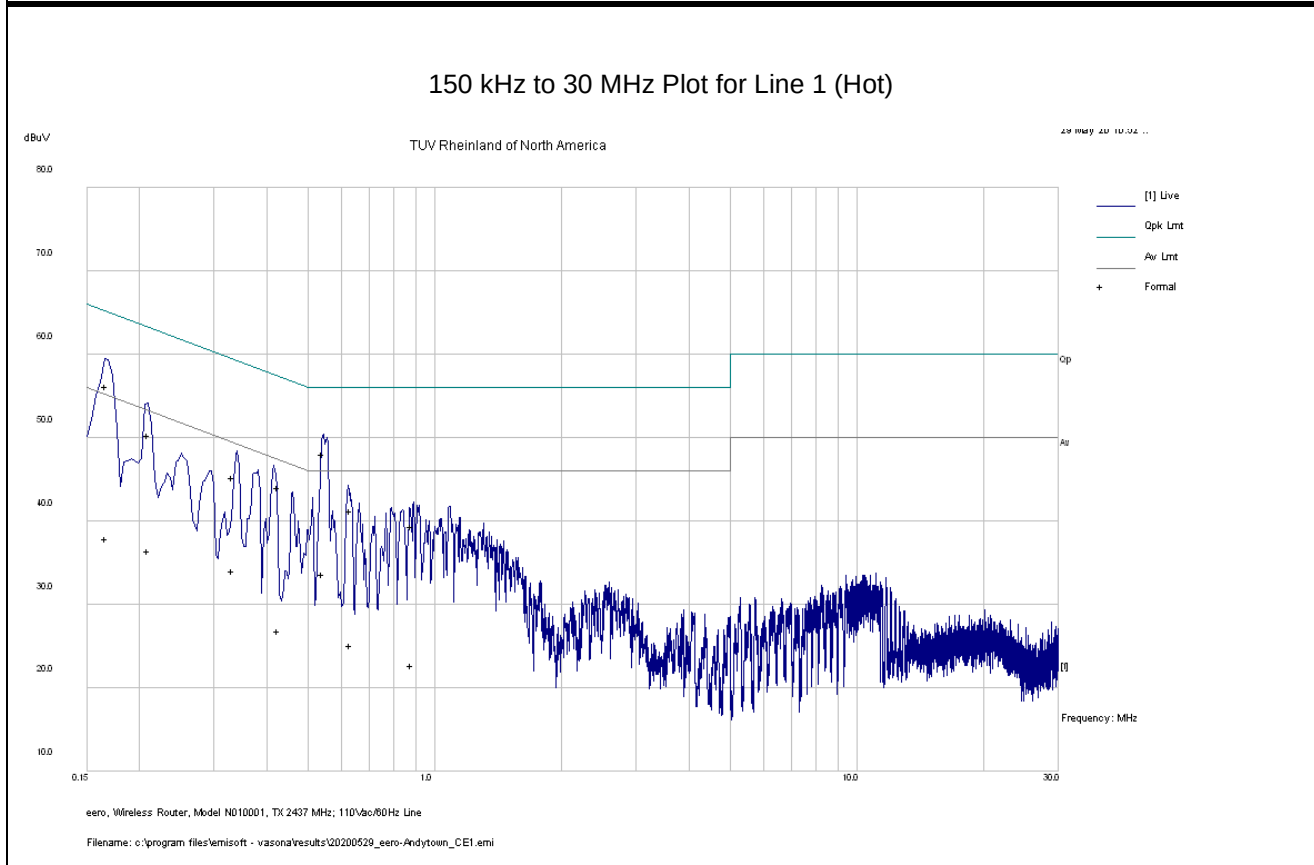
Test Conditions: Conducted Measurement		Test Date: May 29, 2020
Antenna Type: Integrated		Power Level: See Test Plan
AC Power: 110Vac / 60 Hz		Configuration: Tabletop
Ambient Temperature: 22° C		Relative Humidity: 39% RH
Configuration	Frequency Range	Test Result
Line 1 (Hot)	0.15 to 30 MHz	Pass
Line 2 (Neutral)	0.15 to 30 MHz	Pass

SOP 2 Conducted Emissions						Tracking # 32062994.001 Page 1 of 4			
EUT Name	eero 6 and eero 6 Extender					Date	May 29, 2020		
EUT Model	N010001					Temp / Hum in	22° C / 39% rh		
EUT Serial	NA4V-0034-0FZS-B958					Temp / Hum out	N/A		
EUT Config.	802.11b, 1 Mbps; TX at 2437 MHz					Line AC / Freq	110 Vac/60 Hz		
Standard	CFR47 Part 15.207 / RSS-GEN Sect. 8.8					RBW / VBW	9 kHz / 30 kHz		
Lab/LISN	Lab #5 /Com-Power, Line 1					Performed by	Kerwinn Corpuz		
Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.166	46.18	9.95	0.08	56.22	QP	Live	65.14	-8.92	Pass
0.166	27.84	9.95	0.08	37.88	Ave	Live	55.14	-17.26	Pass
0.210	40.28	9.95	0.07	50.30	QP	Live	63.20	-12.90	Pass
0.210	26.41	9.95	0.07	36.43	Ave	Live	53.20	-16.77	Pass
0.333	35.26	9.96	0.05	45.27	QP	Live	59.38	-14.11	Pass
0.333	24.08	9.96	0.05	34.09	Ave	Live	49.38	-15.29	Pass
0.427	34.01	9.97	0.04	44.03	QP	Live	57.31	-13.29	Pass
0.427	16.83	9.97	0.04	26.85	Ave	Live	47.31	-20.46	Pass
0.544	38.10	9.98	0.04	48.12	QP	Live	56.00	-7.88	Pass
0.544	23.66	9.98	0.04	33.68	Ave	Live	46.00	-12.32	Pass
0.630	31.19	9.98	0.04	41.21	QP	Live	56.00	-14.79	Pass
0.630	15.08	9.98	0.04	25.10	Ave	Live	46.00	-20.90	Pass
Spec Margin = QP./Ave. - Limit, ± Uncertainty									
Combined Standard Uncertainty $u_c(y) = \pm 2.18$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence									
Notes: EUT was setup as table top equipment									

SOP 2 Conducted Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	May 29, 2020
EUT Model	N010001	Temp / Hum in	22° C / 39% rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps; TX at 2437 MHz	Line AC / Freq	110 Vac/60 Hz
Standard	CFR47 Part 15.207 / RSS-GEN Sect. 8.8	RBW / VBW	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 1	Performed by	Kerwinn Corpuz



Notes: Meets FCC Class B limit.

SOP 2 Conducted Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	May 29, 2020
EUT Model	N010001	Temp / Hum in	22° C / 39% rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps; TX at 2437 MHz	Line AC / Freq	110 Vac/60 Hz
Standard	CFR47 Part 15.207 / RSS-GEN Sect. 8.8	RBW / VBW	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	Performed by	Kerwinn Corpuz

Frequency	Raw	Limiter	Ins. Loss	Level	Detector	Line	Limit	Margin	Result
MHz	dBuV	dB	dB	dBuV		Line	dBuV	dB	
0.172	41.24	9.95	0.08	51.27	QP	Neutral	64.88	-13.61	Pass
0.172	23.29	9.95	0.08	33.32	Ave	Neutral	54.88	-21.57	Pass
0.475	29.30	9.98	0.04	39.32	QP	Neutral	56.42	-17.10	Pass
0.475	16.49	9.98	0.04	26.51	Ave	Neutral	46.42	-19.91	Pass
0.553	34.95	9.98	0.04	44.97	QP	Neutral	56.00	-11.03	Pass
0.553	23.60	9.98	0.04	33.62	Ave	Neutral	46.00	-12.38	Pass
0.619	28.22	9.98	0.04	38.24	QP	Neutral	56.00	-17.76	Pass
0.619	13.10	9.98	0.04	23.12	Ave	Neutral	46.00	-22.88	Pass
0.652	29.70	9.98	0.04	39.72	QP	Neutral	56.00	-16.28	Pass
0.652	14.84	9.98	0.04	24.86	Ave	Neutral	46.00	-21.14	Pass
0.769	30.48	9.99	0.04	40.50	QP	Neutral	56.00	-15.50	Pass
0.769	15.85	9.99	0.04	25.87	Ave	Neutral	46.00	-20.13	Pass
0.884	26.25	9.99	0.04	36.28	QP	Neutral	56.00	-19.72	Pass
0.884	9.67	9.99	0.04	19.70	Ave	Neutral	46.00	-26.30	Pass

Spec Margin = QP./Ave. - Limit, $\pm$ Uncertainty

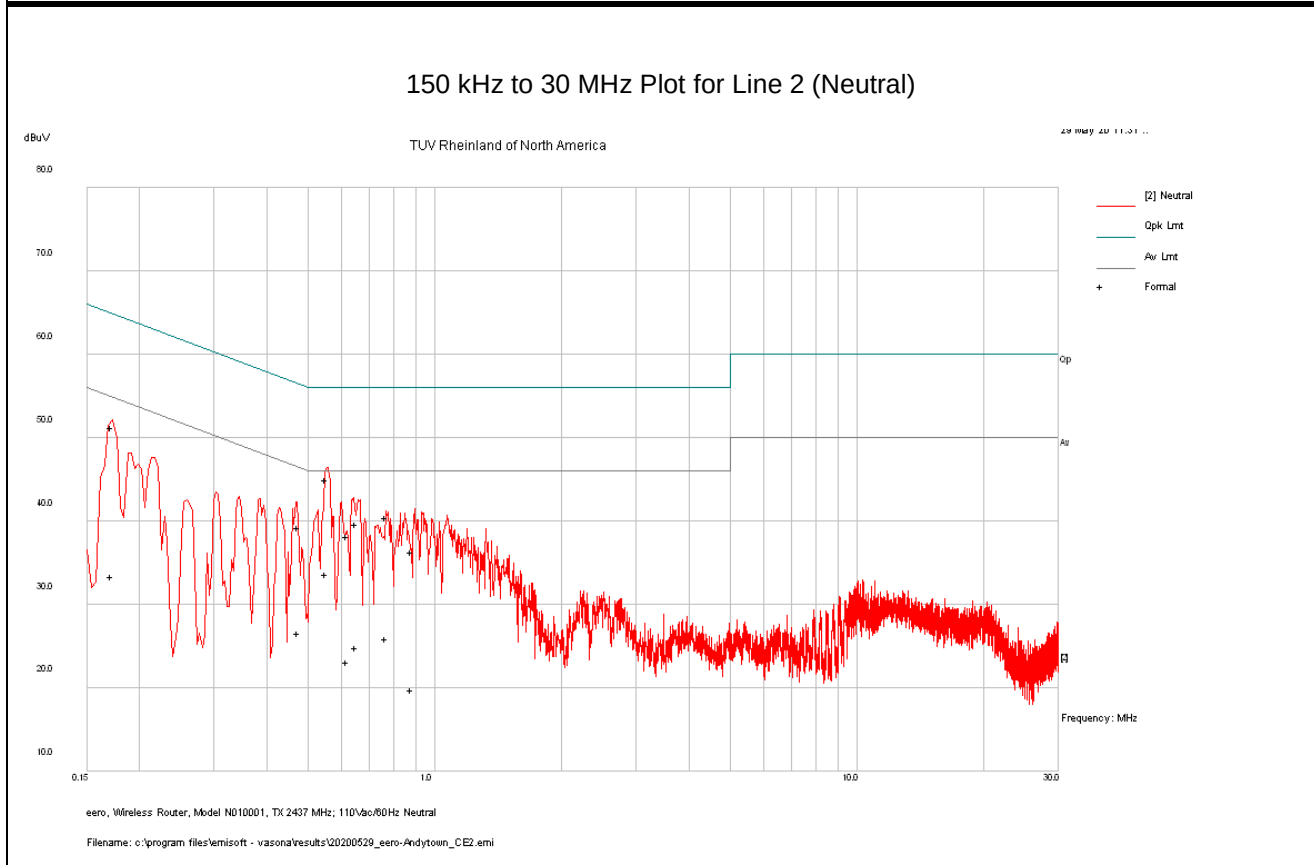
Combined Standard Uncertainty $u_c(y) = \pm 2.18$ dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: EUT was setup as table top equipment

SOP 2 Conducted Emissions

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EUT Name	eero 6 and eero 6 Extender	Date	May 29, 2020
EUT Model	N010001	Temp / Hum in	22° C / 39% rh
EUT Serial	NA4V-0034-0FZS-B958	Temp / Hum out	N/A
EUT Config.	802.11b, 1 Mbps; TX at 2437 MHz	Line AC / Freq	110 Vac/60 Hz
Standard	CFR47 Part 15.207 / RSS-GEN Sect. 8.8	RBW / VBW	9 kHz / 30 kHz
Lab/LISN	Lab #5 /Com-Power, Line 2	Performed by	Kerwinn Corpuz



Note: Meets FCC Class B Limit.

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Loop Antenna	EMCO	6502	62531	07/01/2019	07/01/2021
Bilog Antenna	Sunol Sciences	JB3	A020502	03/11/2020	03/11/2021
Horn Ant. (1-18GHz)	Sunol Sciences	3115	9211-3969	06/20/2019	06/20/2021
Horn Ant. w/ Pre-Amp	Com-Power	AHA-840	105005	08/26/2019	08/26/2020
EMI Receiver	Agilent	N9038A	MY52260210	02/15/2020	02/15/2021
Spectrum Analyzer	Agilent	N9030A	MY52350885	10/26/2019	10/26/2020
EMI Receiver	Rohde & Schwarz	ESIB40	100180	09/20/2019	09/20/2020
Preamplifier	Sonoma Inst.	310	185516	02/12/2020	02/12/2021
Preamplifier	Miteq	TTA1800-30-HG	184252	02/12/2020	02/12/2021
RF Power Meter	Agilent	E4418A	MY45103902	02/13/2020	02/13/2021
Power Sensor	Agilent	8481A	US37295801	02/13/2020	02/13/2021
Thermometer	Extech Instruments	SD700	A095319	03/18/2020	03/18/2021
Thermo Chamber	Espec	BTZ-133	0613436	12/20/2019	12/20/2020
Signal Generator	Anritsu	MG3694A	042803	02/13/2020	02/13/2021
Notch Filter	Micro-Tronics	BRM50702	37	VBU	VBU

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

6.2 Customer

Table 12: Customer Information

Company Name	eero LLC
Address	660 3rd Street
City, State, Zip	San Francisco, CA 94107
Country	USA

Table 13: Technical Contact Information

Name	eero LLC
E-mail	cliff@eero.com
Phone	+1 415-738-7972

6.3 Equipment Under Test (EUT)

Table 14: EUT Specifications

EUT Specification	
AC Power Input	100-240V AC, 50 – 60 Hz, 0.5A
DC Power Input	5 VDC, 3 A, 15W
Environment	Indoor
Operating Temperature Range:	0 to 35 degrees C
Multiple Feeds:	☐ Yes and how many ☒ No
Product Marketing Name (PMN)	N010001 and Q010001
Hardware Version Identification Number (HVIN)	N010001 and Q010001
Firmware Version Identification Number (FVIN)	eeroOS 5.0.0
Operating Mode	802.11a, 802.11b, 802.11g, 802.11n (HT20 & HT40), 802.11ac (VHT20, VHT40 & VHT80)
Transmitter Frequency Band	2412 MHz to 2462 MHz
Total Measured Power Output	+25.45 dBm
Power Setting @ Operating Channel	See Table 19: EUT Channel Power Specifications.
Antenna Type	Refer to Section 3.4.1
Modulation Type	☒ Thread (Zigbee) ☒ BLE ☒ DSSS ☒ OFDM ☒ Other describe: 16-QAM to 256-QAM
Date Rate	802.11a: 1 Spatial Stream: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n HT20: 2 Spatial Streams: 13, 26, 39, 52, 78, 104, 117, 130 Mbps 802.11n HT40: 2 Spatial Streams: 27, 54, 81, 108, 162, 216, 243, 270 Mbps 802.11ac VHT20: 2 Spatial Streams: 13, 26, 39, 52, 78, 104, 117, 130, 156 Mbps 802.11ac VHT40: 2 Spatial Streams: 27, 54, 81, 108, 240, 270, 300, 360, 400 Mbps 802.11ac VHT80: 2 Spatial Streams: 58.5, 117, 175.5, 234, 351, 468, 526.5, 585, 702, 780 Mbps
TX/RX Chain (s)	MIMO (2x2)

Directional Gain Type	☒ Correlated ☒ Beam-Forming ☐ Other describe:
Type of Equipment	☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☐ Other
Note: 1. All two chains will be on / transmitted at all time. 2. EUT software: eero test image 4470b6a83278; Fri may 29 18:01:48 UTC 2020. 3. Support laptop interface software: Qualcomm® Radio Control Toolkit v4.0, Version 4.0.00163.0. Also known as QRCT4.	

Table 15: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
RJ45	Terminated to Host Ethernet Port	☒ No	☒ Metric:2m	☒ N/A

Table 16: Supported Equipment

Equipment	Manufacturer	Model	Serial	Used for
Laptop	DELL	Latitude 5420	GBGHMQ1	Set test mode

Table 17: Description of Sample used for Testing

Device	Serial Number	Configuration	Used For
N010001	NA4V-0034-0FZS-B958	Radiated Sample	Radiated Emissions. Conducted Emission
N010001	NA77-001A-YH4B-YK9D	Radiated Sample	Radiated Emissions
N010001	NA4V-003K-J9V4-FP58	Conducted Sample	Output Power, Occupied Bandwidth, Conducted Spurious Emissions, Peak Power Spectral Density
Note: None			

Table 18: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Description
N010001	Integrated	Transmit & Receive	N010001 positioned tabletop.
Note: This is the final setup configuration used for testing on its normal positioned.			

Table 19: EUT Channel Power Specifications

No.	Freq. (MHz)	Target Power Value dBm					
		Uncorrelated Mode				Correlated Mode	
		802.11b	802.11g	802.11n HT20	802.11n HT40	802.11n HT20	802.11n HT40
		Power Setting (TP)					
1	2412	20	20	19		19	
3	2422				16.5		16.5
6	2437	21.5	22.5	22.5	17	22.5	17
9	2452				17		17
11	2462	19.5	19.5	19.5		19.5	
Note: The adjusted power target values are updated at the evaluated frequencies. Refer to Table 14 for detailed RF controller software.							

6.4 Test Specifications

Table 20: Test Specifications

Emissions and Immunity	
Rules & Regulations / Standard	Requirement
CFR 47 Part 15.247: 2020	All
RSS 247 Issue 2, 2017	All

END OF REPORT