Emissions
Test Report

EUT Name: eero

Model No.: J010001

CFR 47 Part 15.247: 2019 and RSS 247: 2017

Prepared for:

eero LLC
660 3rd Street, 4th floor
San Francisco, CA, 94107

Prepared by:

TUV Rheinland of North America, Inc.
5015 Brandin Ct.
Fremont, CA 94538
Tel: (925) 249-9123
Fax: (925) 249-9124
http://www.tuv.com/

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Revisions

Revision No.	Date MM/DD/YYYY	Reason for Change	Author
0	6/21/19	Original Document	JB
1	7/3/19	Updated unit information	OC
1.1	9/9/19	TCB Review	OC

Note: Latest revision report will replace all previous reports.

Statement of Compliance

Manufacturer:	eero LLC 660 3rd Street, 4th floor San Francisco, CA, 94107
Requester / Applicant:	eero LLC
Name of Equipment:	eero
Model No.	J010001
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.247: 2019 and RSS 247: 2017
Test Dates:	May 28th, 2019 to May 30th, 2019

Guidance Documents:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02, KDB 662911 D01 Multiple Transmitter Output v02r01

Test Methods:

Emissions: ANSI C63.10-2013, KDB 558074 D01 DTS Measurement Guidance v05r02, KDB 662911 D01 Multiple Transmitter Output v02r01

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 shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

James Borrott		Richard Decker	
Test Engineer	Date September 9, 2019	A2LA Signatory	Date September 9, 2019

Testing Cert #3331.02 **US1131** **2932D**

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: 2019 and RSS 247: 2017 based on the results of testing performed on May 28th, 2019 to May 30th, 2019 on the eero Model J010001 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 2402 MHz to 2480 MHz frequency band for Bluetooth, Low Energy is covered in this document.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C 63.10 & C63.4	Worse Case (Measured)	Result
Maximum Output Power	CFR47 15.247 (b), RSS 247 Sect. 5.4 (d)	7.16dBm @ 2440MHz Channel, 1Mbps	**Complied**
DTS Bandwidth (6dB)	CFR47 15.247 (a)(2), RSS 247 Sect. 5.2 (a)	0.697MHz @ 2402MHz Channel, 1Mbps	**Complied**
Peak Power Spectral Density	CFR47 15.247 (e), RSS 247 Sect. 5.2 (b)	-7.07 dBm @ 2440MHz channel, 1Mbps	**Complied**
Out of Band Emissions: Non-Restricted	CFR47 15.247 (d), RSS 247 Sect.5.5	-49.28 dBc @ 2399.82 MHz, Lower Band Edge	**Complied**
Out of Band Emissions: Restricted	CFR47 15.247 (d), RSS 247 Sect.5.5	-23.35dB margin @ 2484.176 MHz, Average	**Complied**
Transmitter Spurious Emissions	CFR47 15.247 (d), RSS 247 Sect.5.5	-10.57dB Margin @ 6249.925 MHz, Average	**Complied**
AC Power Conducted Emission	CFR47 15.207, RSS-GEN Sect.8.8	Class B	**Complied**

Note 1: This test report covers 2400 MHz to 2483.5 MHz band. * = summed power.

Note 2: Class B limits were applied where applicable.

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 EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA 94538, are 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 (Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three 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 17025:2005. The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

Industry Canada Industrie Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014.

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 EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct, Fremont, CA 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0268

VCCI Registration No. for Fremont: A-0268

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

Test facilities are located at 5015 Brandin Ct, Fremont, California, 94538, USA and 1279 Quarry Lane, Pleasanton, California 94566, USA (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

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.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurement and the fraction may be viewed as the coverage probability or level of confidence of the interval.

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:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

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

Sample radiated emissions calculation @ 30 MHz

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

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/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 – 18 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 ± 5.0%.	Per CISPR 16-4-2 Methods

2.3.3 Measurement Uncertainty Immunity

The estimated combined standard uncertainty for ESD immunity measurements is ± 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 ± 2.9%.	Per IEC 61000-4-8

Thermo KeyTek EMC Pro

The estimated combined standard uncertainty for EFT fast transient immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for surge immunity measurements is ± 2.6%.
The estimated combined standard uncertainty for voltage variation and interruption measurements is ± 1.74%.

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 17025:2005. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The Model J010001, eero, is a Home wi-fi router utilizing Bluetooth. The EUT will be in compliance with regulatory standards of regions it will be operating in.

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.

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 eero has 1 Flex PCB dipole dedicated Bluetooth antenna that has maximum gain of + 4.15dBi. It is connected via RF connector that is not easily accessible to the end user.

Refer to Table 30 for additional antenna information.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.247: 2019 and RSS 247: 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.

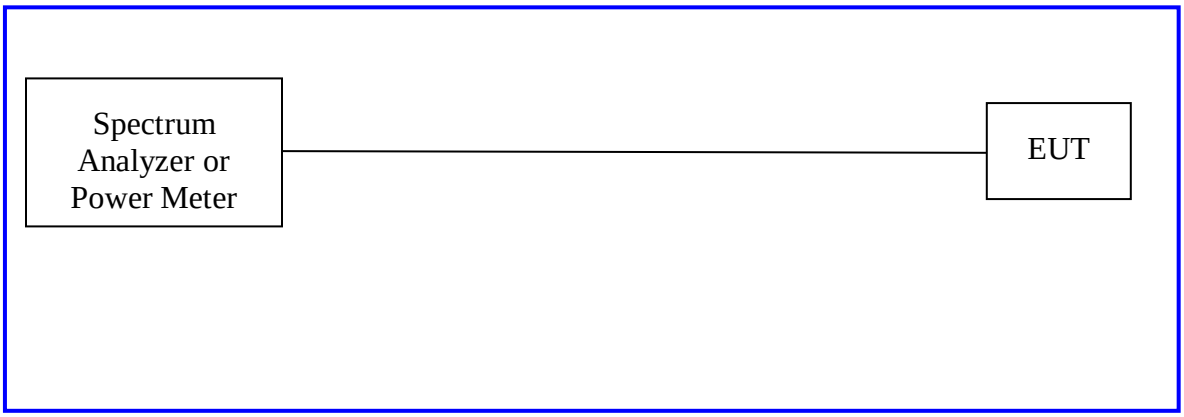
The maximum output power and harmonics shall not exceed CFR47 Part 15.247 (b) and RSS 247 5.4 (d).

The maximum transmitted power in the band 2400-2483.5 MHz: 1 W

4.1.1 Test Method

Conducted method was used to measure the channel power output. The worst findings were conducted on 3 channels in each operating range per CFR47 Part 15.247(b) and RSS 247 Sect. 5.4(d); 2400 MHz to 2483.5 MHz. The worst mode results indicated below.

Test Setup:

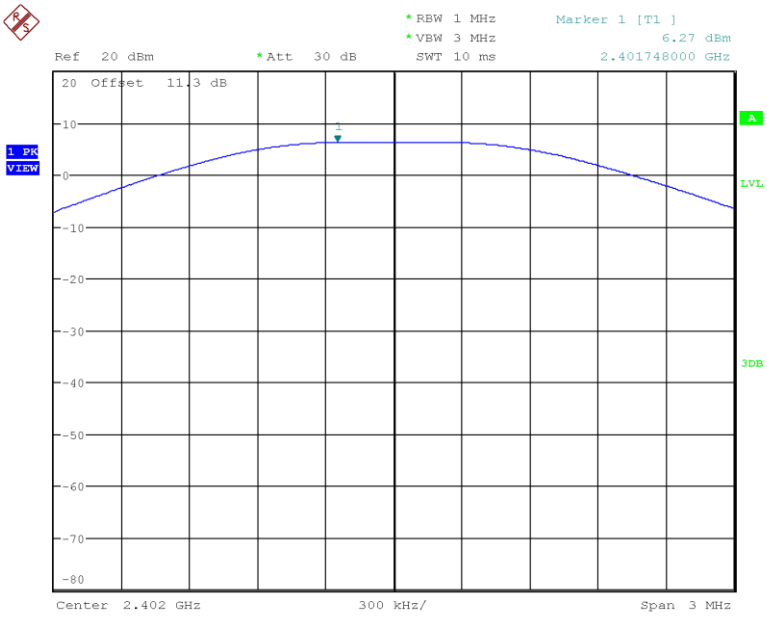


4.1.2 Results

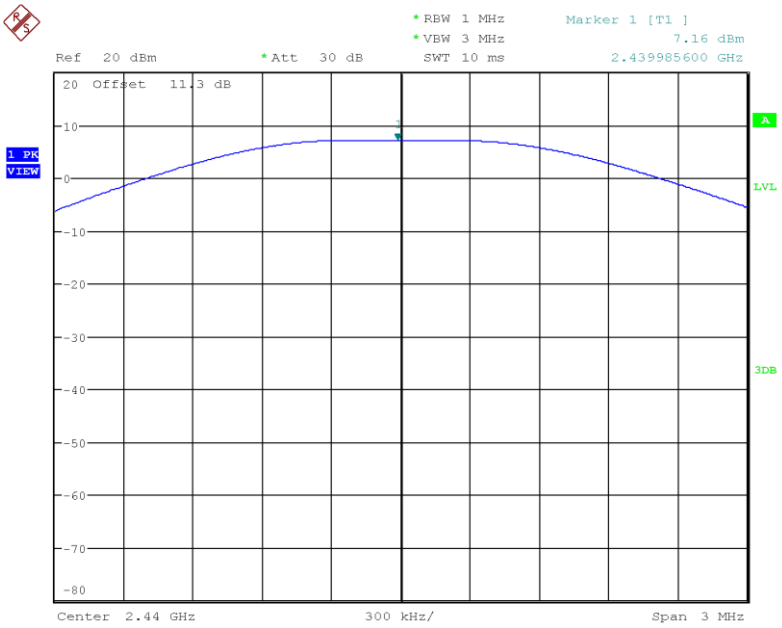
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s). Worse case data for each mode reported below. Plots of highest power included for low, medium, and high channels.

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

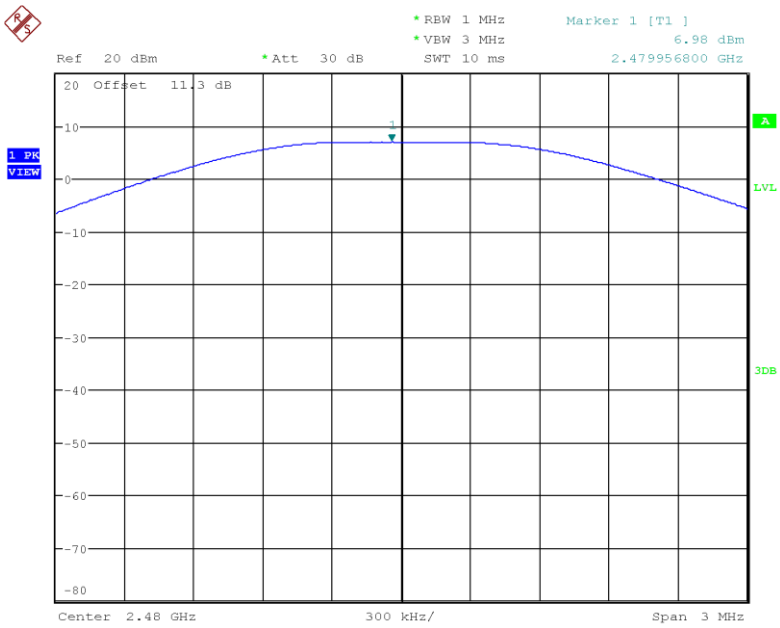
Test Conditions: Conducted Measurement, Normal Temperature			
Antenna Type: Flex PCB dipole			
Max. Antenna Gain: 4.15 dBi			
Operating Channel (MHz)	**Limit [dBm]**	**Total Power [dBm]**	**Margin [dB]**
2402.00	30.00	6.27	-23.73
2440.00	30.00	7.16	-22.84
2480.00	30.00	6.98	-23.02



Plot 1. Maximum Conducted Power, 2402MHz



Plot 2. Maximum Conducted Power, 2440MHz



Plot 3. Maximum Conducted Power, 2480MHz

4.2 DTS Bandwidth (6dB) and 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.

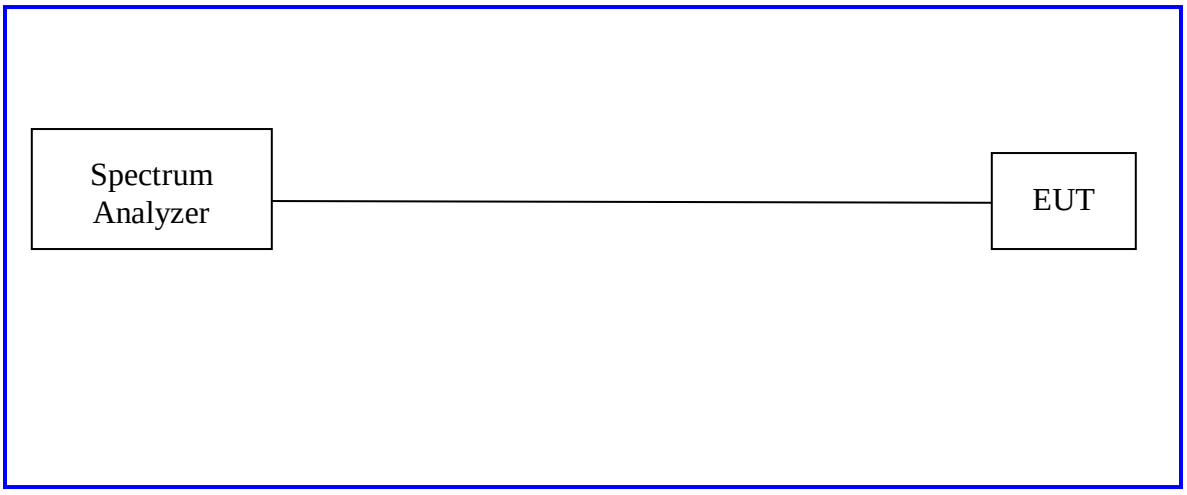
The 99% bandwidth is the bandwidth in which 99% of the transmitted power occupied.

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

4.2.1 Test Method

The conducted method was used to measure the occupied bandwidth according to ANSI C63.10:2013 Section 11.8. The measurement was performed with modulation per CFR47 15.247 (a) (2) and RSS Gen Sect. 6.6. Measurements were performed on the low, middle and high channels of the operating frequency range; 2400 MHz to 2483.5 MHz.

Test Setup:

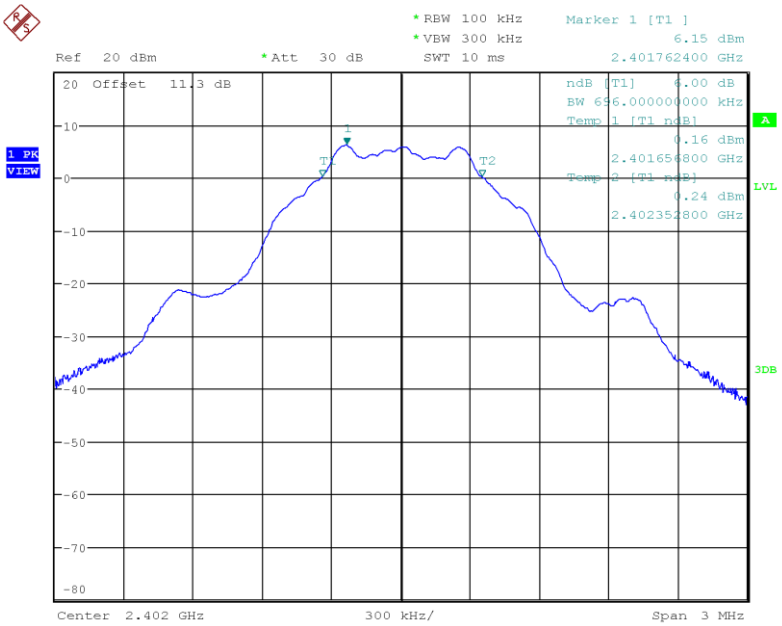


Results
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

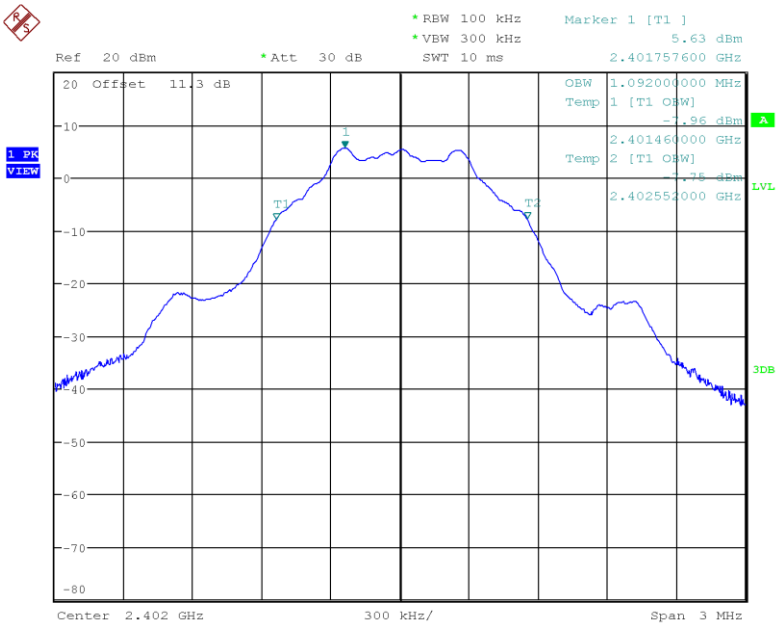
Table 3: Occupied Bandwidth – Test Results

Test Conditions: Conducted Measurement, Normal Temperature

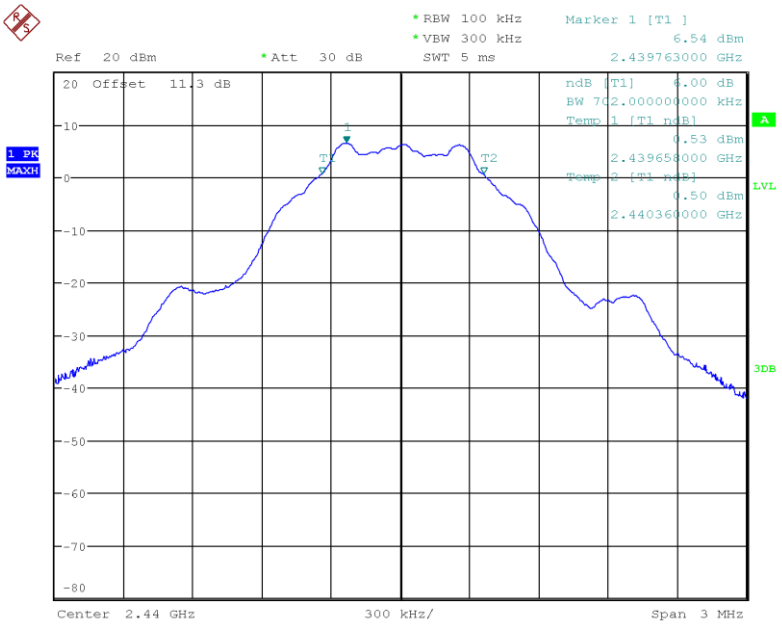
Bandwidth (MHz)		
Freq. (MHz)	**99% Bandwidth (MHz)**	**6dB (DTS) Bandwidth (MHz)**
2402	1.092	0.696
2440	1.0968	0.702
2480	1.0968	0.702
Note: None		



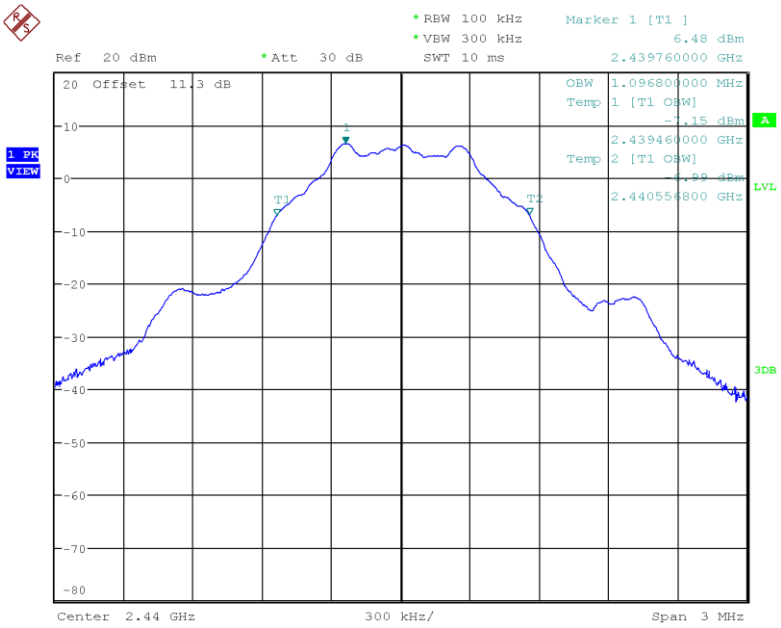
Plot 4. 2402MHz, 6dB Bandwidth



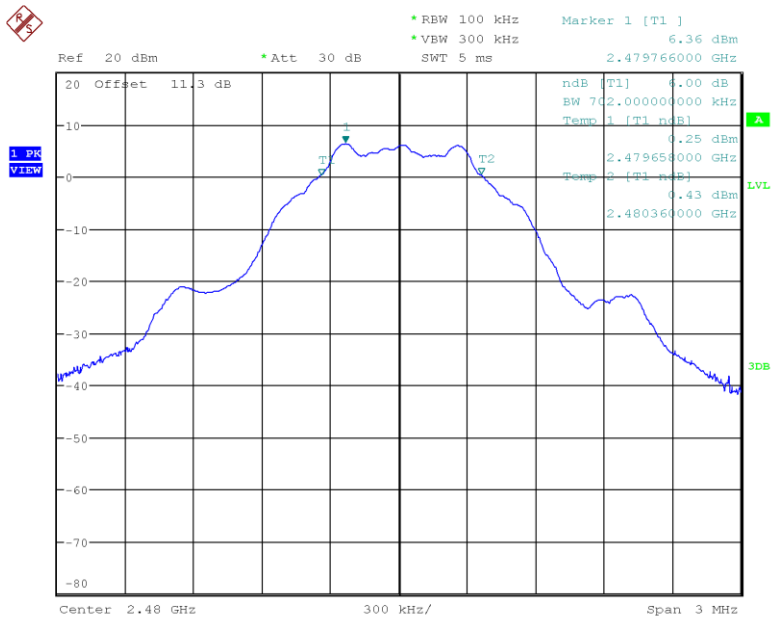
Plot 5. 2402MHz, 99% Bandwidth



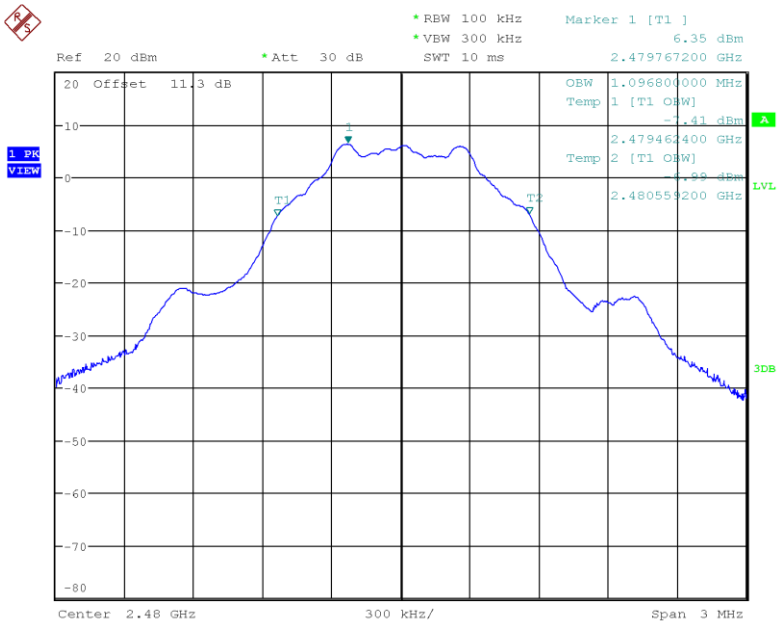
Plot 6. 2440MHz, 6dB Bandwidth



Plot 7. 2440MHz, 99% Bandwidth



Plot 8. 2480MHz, 6dB Bandwidth



Plot 9. 2480MHz, 99% Bandwidth

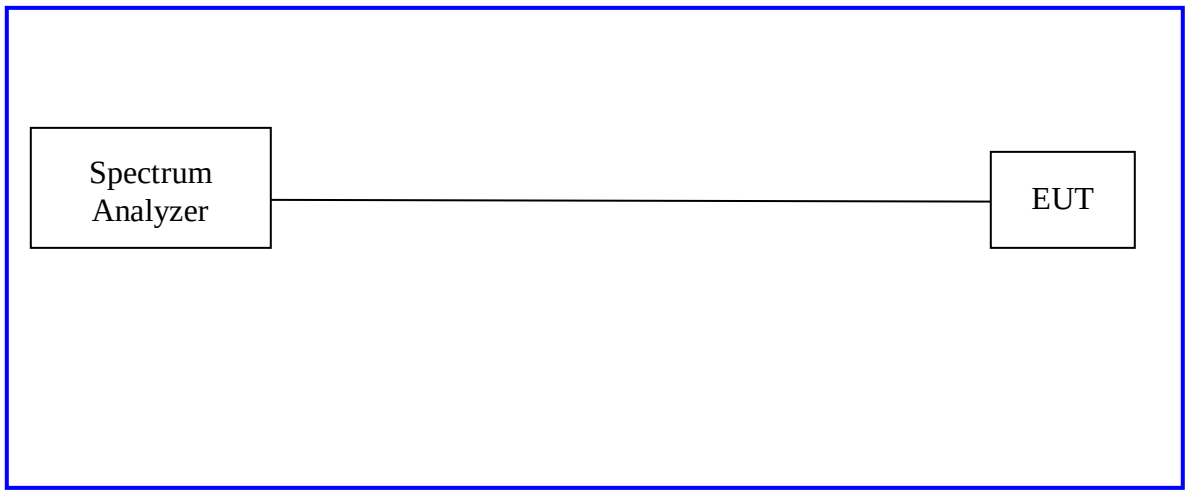
4.3 Peak Power Spectral Density

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 11.10.2. The measurement was performed with modulation per CFR47 Part 15.247 (e) and RSS 247 Sect.5.2 (b). The worst findings were conducted on 3 channels in each operating frequency range of 2400 MHz to 2483.5 MHz.

Test Setup:



Method PKPSD of "KDB 558074 – DTS Measurement Guidance v04" was used.

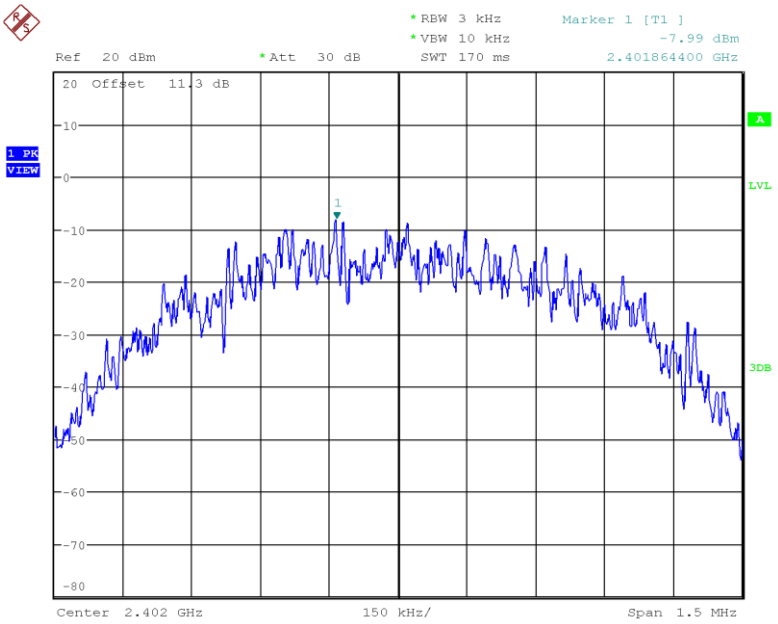
4.3.2 Results

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

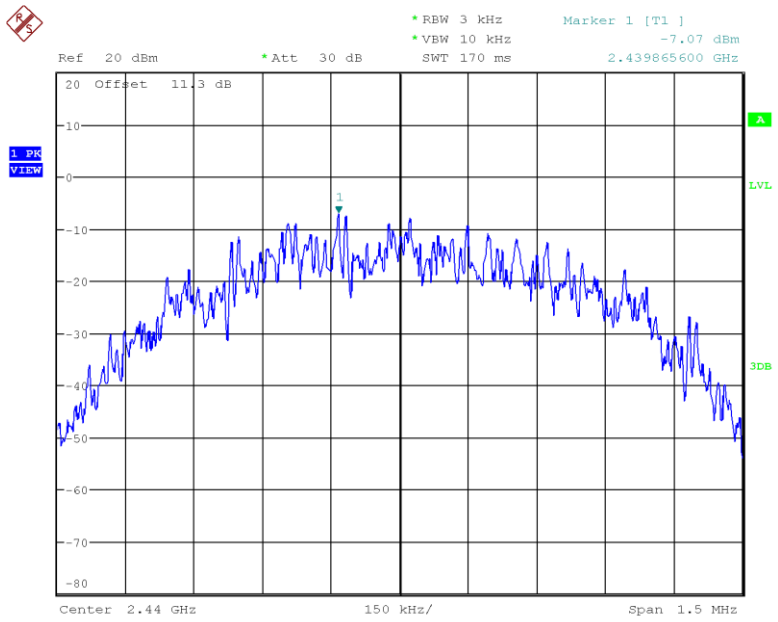
Table 4: Peak Power Spectral Density – Test Results

Test Conditions: Conducted Measurement, Normal Temperature

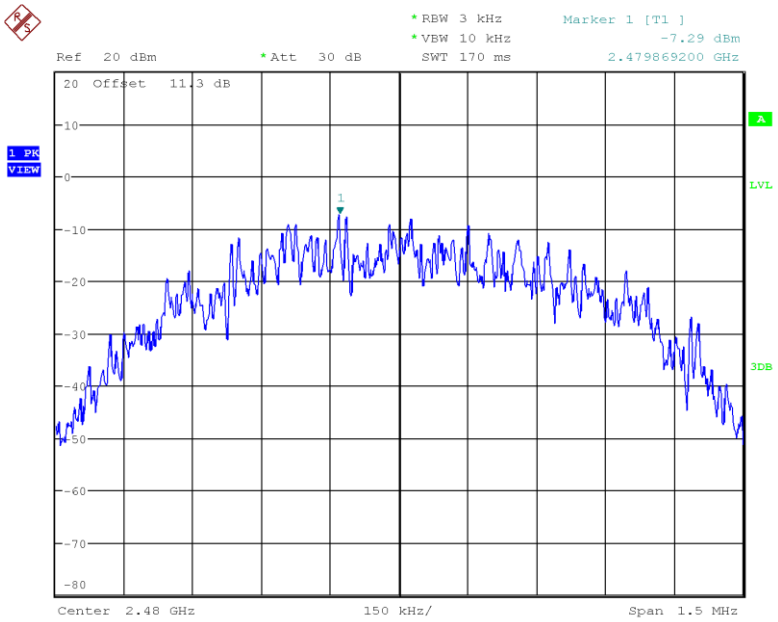
Peak Power Spectral Density			
Freq. (MHz)	**Total PSD [dBm]**	**Limit [dBm]**	**Margin [dB]**
2402	-7.99	8.0	-15.99
2440	-7.07	8.0	-15.07
2480	-7.29	8.0	-15.29
Note: None			



Plot 10. 2402MHz PSD



Plot 11. 2440MHz PSD



Plot 12. 2480MHz PSD

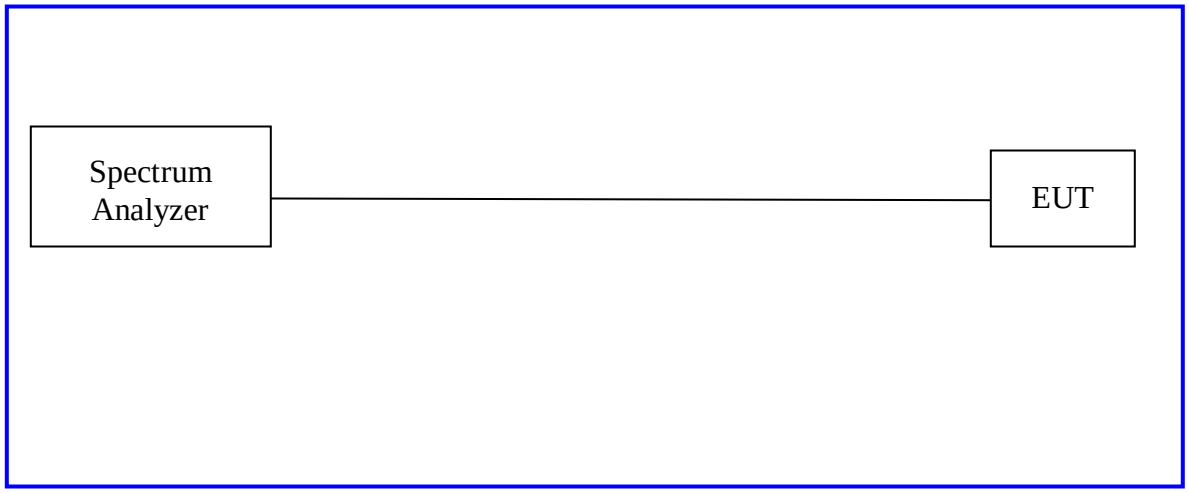
4.4 Out of Band Emissions: Non-Restricted Bands

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmitting mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS-247 Sect. 5.5, RSS-GEN Sect. 8.9 and 8.10.

4.4.1 Test Method

Conducted measurements per ANSI C63.10-2013 Sections 6.10, 11.11, 14.3.3 were used to measure the undesirable emission requirement in non-restricted bands. The measurement was performed with modulation. The measurement was conducted from 30MHz to 26.5GHz on 3 channels in each mode on the EUT. Reference level was established on the channel with highest measured PSD (2440MHz) as stated in ANSI C63.10-2013 Section 11.11.2. Band edge tests were conducted on the low and high channel of each mode. The worst case measurement of each mode is recorded in this report.

Test Setup:

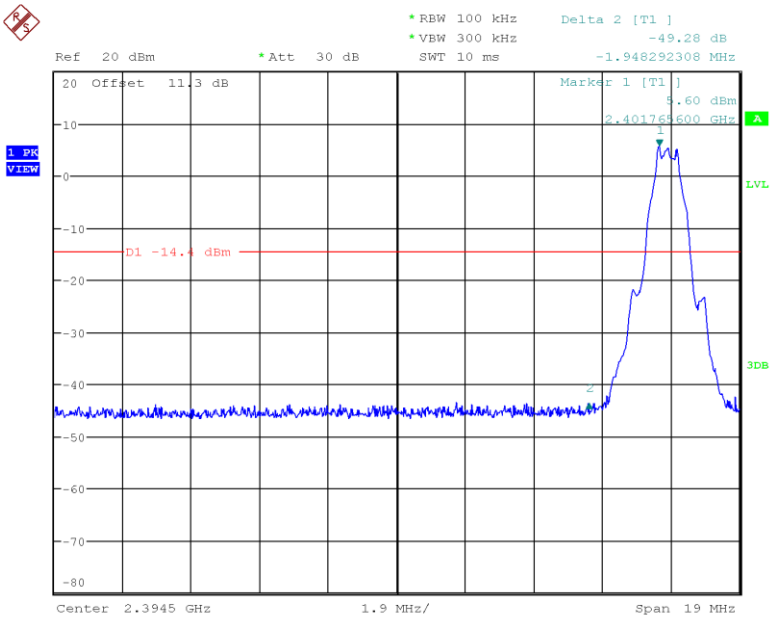


4.4.2 Results

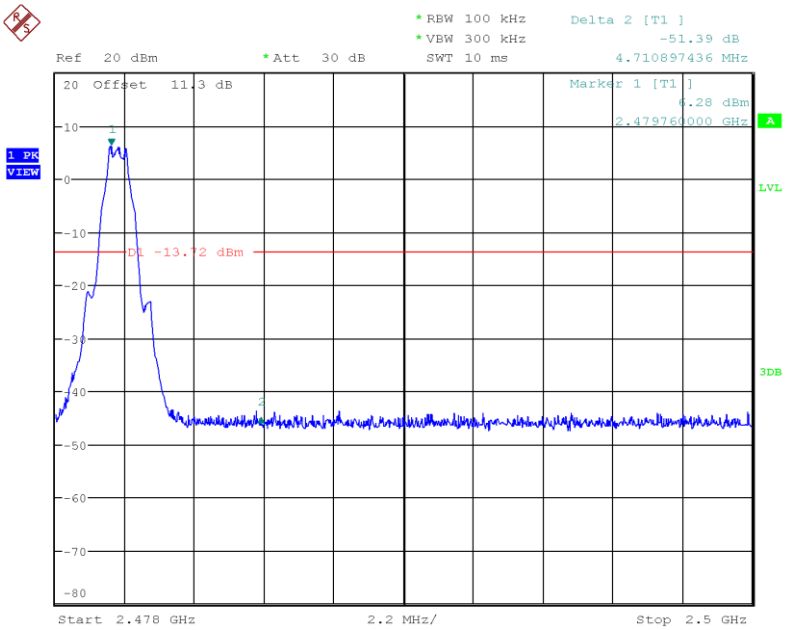
As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Table 5: Emissions at the Band-Edge – Test Results

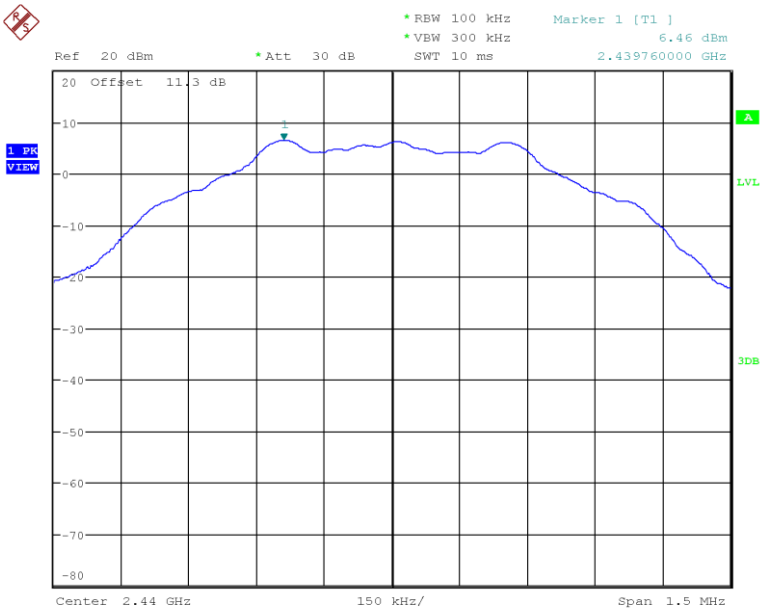
Test Conditions: Conducted Measurement, Normal Temperature and Voltage only					
Non-Restricted Frequency Band Edge Emissions – Worse Case					
Band Edge	**Center Freq (MHz)**	**Measured (dBc)**	**Limit (dBc)**	**Freq (MHz)**	**Results**
Low	2402	-49.28	20	2399.82	Pass
High	2480	-51.39	20	2484.47	Pass
Note:					



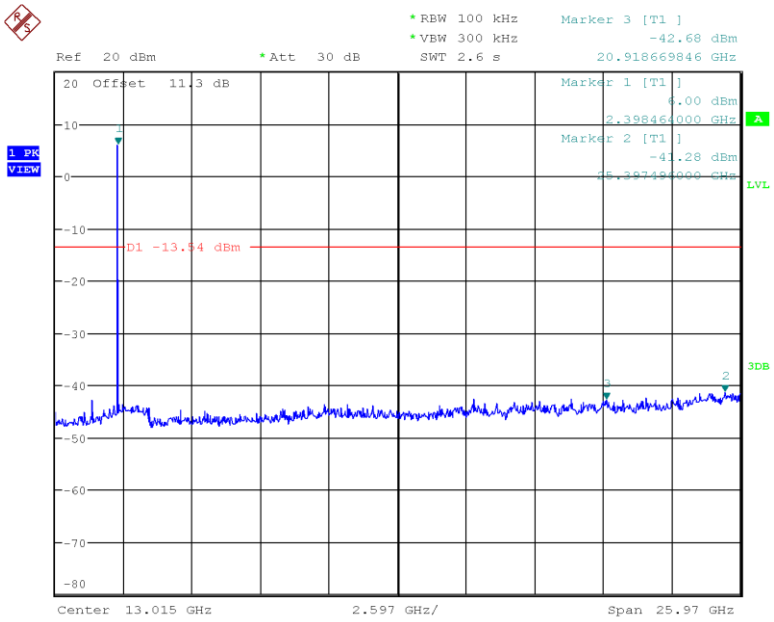
Plot 13. 2402MHz Lower Band Edge



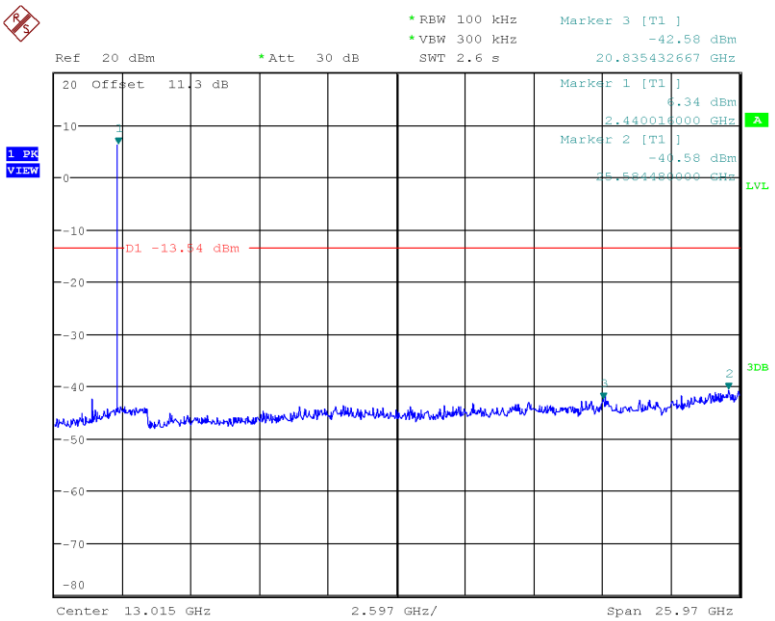
Plot 14. 2480MHz Upper Band Edge



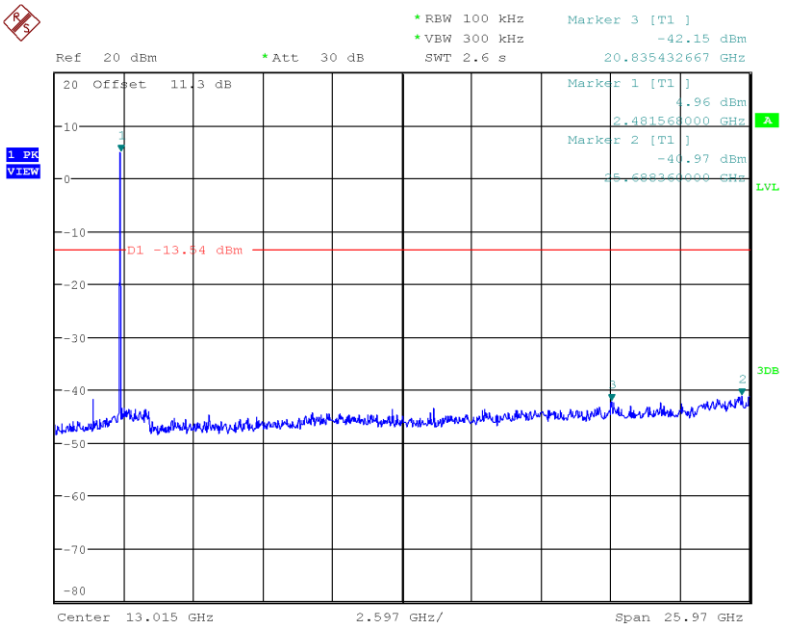
Plot 15. Non-Restricted Reference Measurement, 2440MHz



Plot 16. 2402MHz 30MHz-26GHz Spurious



Plot 17. 2440MHz 30MHz-26GHz Spurious



Plot 18. 2480MHz 30MHz-26GHz Spurious

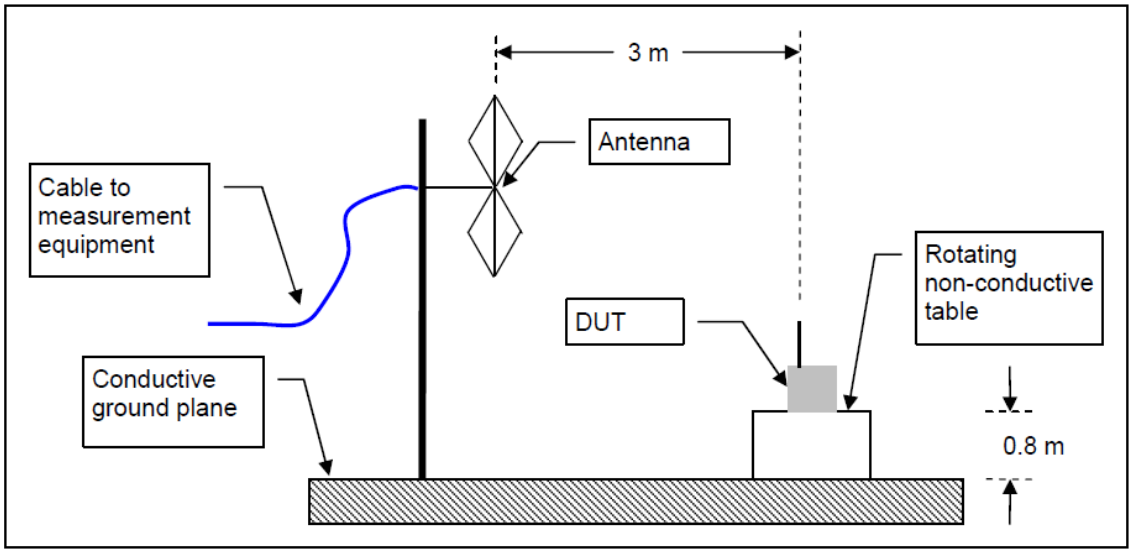
4.5 Out of Band Emissions: Restricted Band Edge

Transmitter spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmitting mode; per requirement of CFR47 15.205, 15.209, 15.247(d), RSS-247 Sect. 5.5, RSS-GEN Sect. 8.9 and 8.10.

4.5.1 Test Method

Radiated measurements per ANSI C63.10-2013 Section 6.10.5 were used to measure the undesirable emission requirement in restricted bands. Peak points were found and RMS Average was taken for each point found. The measurement was performed with modulation. This test was conducted on 3 channels in each mode on the EUT. The worst case measurement of each channel is recorded in this report. All channels were tested at highest power settings.

Test Setup

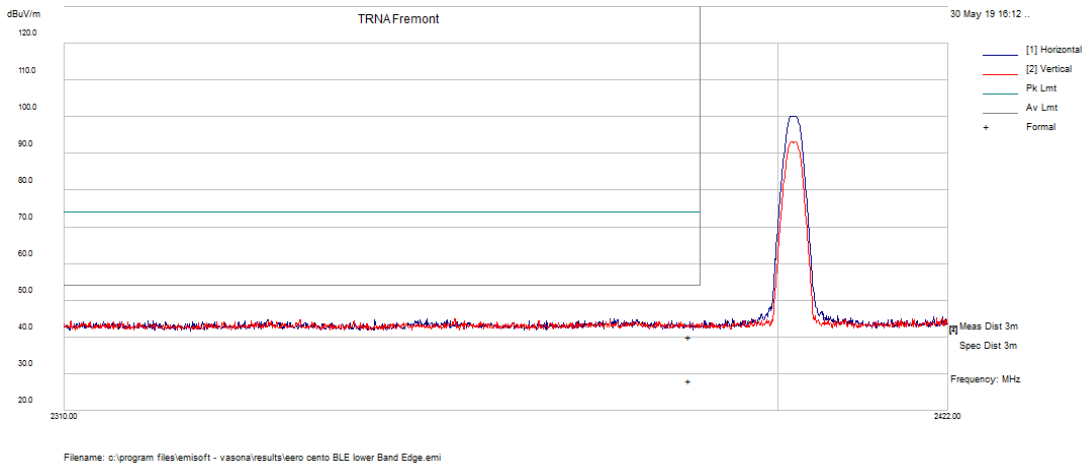


The DUT was stimulated by manufacturer provided test software that is not available to the end user.

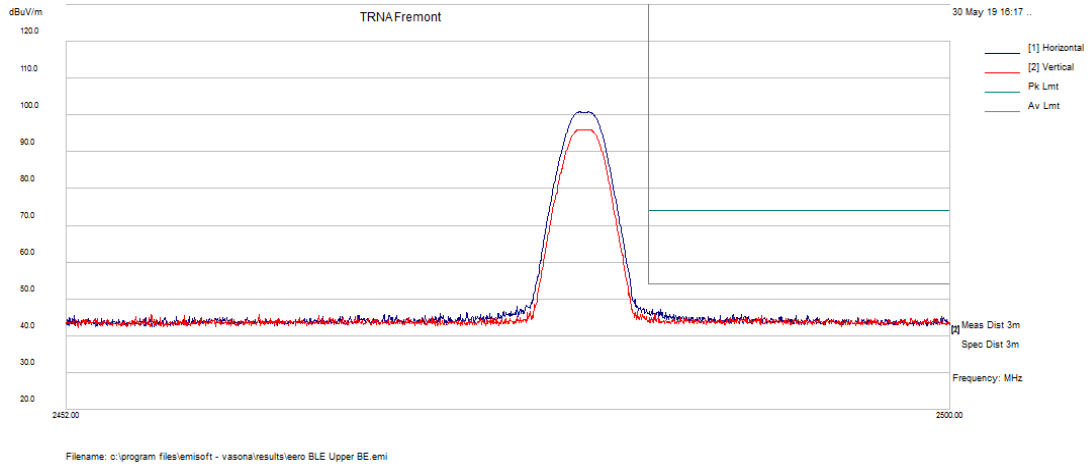
4.5.2 Test Results

Table 6: Emissions at the Band-Edge – Test Results

Test Conditions: Radiated Measurement, Normal Temperature and Voltage							
Lower Restricted Band Edge							
Freq. (MHz)	**Mode**	**Center Freq (MHz)**	**Detector (Average/ Peak)**	**Measured (dBuV/m)**	**Limit (dBuV/m)**	**Margin**	**Results**
2388.683	BLE GFSK 1Mbps	2402	Average	28.25	54	-33.93	Pass
2388.683	BLE GFSK 1Mbps	2402	Peak	40.07	74	-25.76	Pass
Upper Restricted Band Edge							
Freq. (MHz)	**Mode**	**Center Freq (MHz)**	**Detector (Average/ Peak)**	**Measured (dBuV/m)**	**Limit (dBuV/m)**	**Margin**	**Results**
2484.176	BLE GFSK 1Mbps	2480	Average	30.56	54	-23.35	Pass
2484.176	BLE GFSK 1Mbps	2480	Peak	43.63	74	-30.37	Pass
Note: 1. The DCCF (Average Detector) is included in this table, the following plots are of peak values							



Plot 19. 2402MHz, Lower Band Edge, Restricted



Plot 20. 2480MHz, Upper Band Edge, Restricted

4.6 Transmitter 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 247 Sect.5.5, RSS-GEN Sect. 8.9 and 8.10.

4.6.1 Test Methodology

4.6.1.1 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.

Pre-scans were performed to determine the worst data rate / chains.

4.6.1.2 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, than 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.

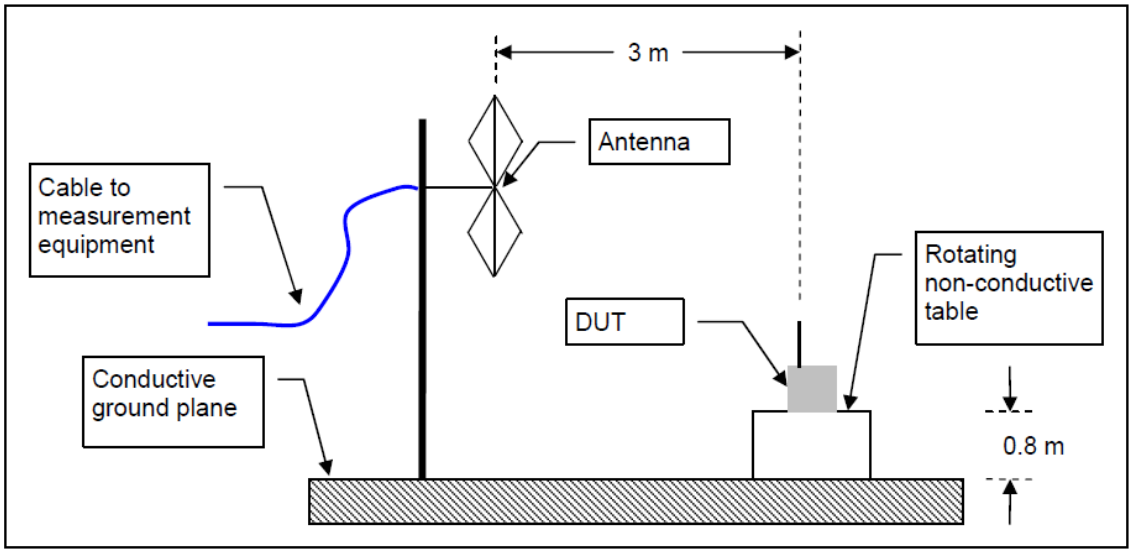
4.6.1.3 Deviations

None.

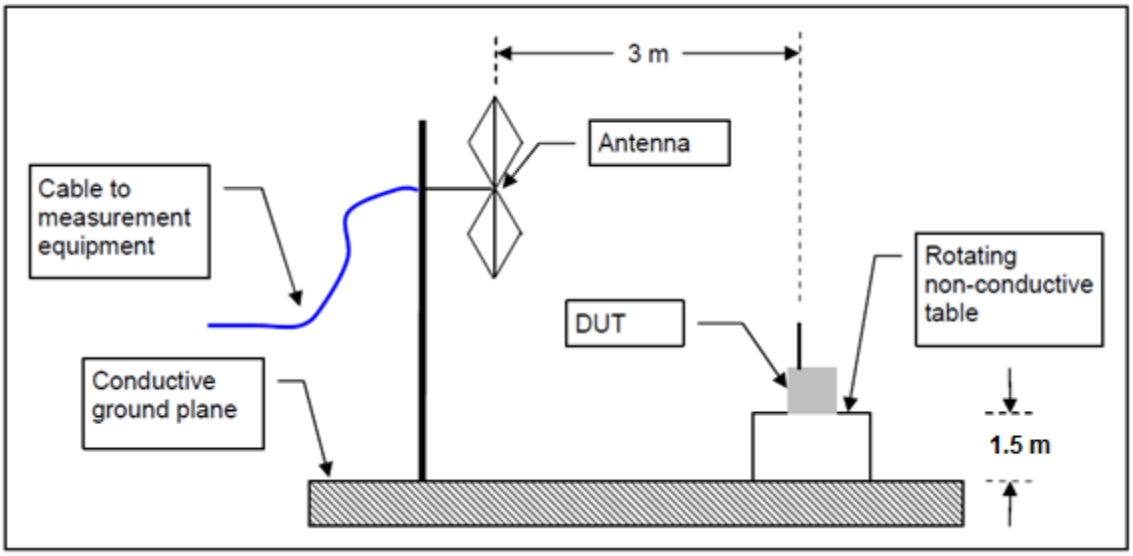
4.6.2 Test Setup:

All tests were conducted at full power on low, middle, and high channels. The DUT was stimulated by manufacturer provided test software that is not available to the end user.

30MHz-1GHz



1-26GHz



4.6.3 Transmitter Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209: 2015 and RSS Gen Sect. 8.9 and 8.10: 2014.

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

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4.6.4 Test Results

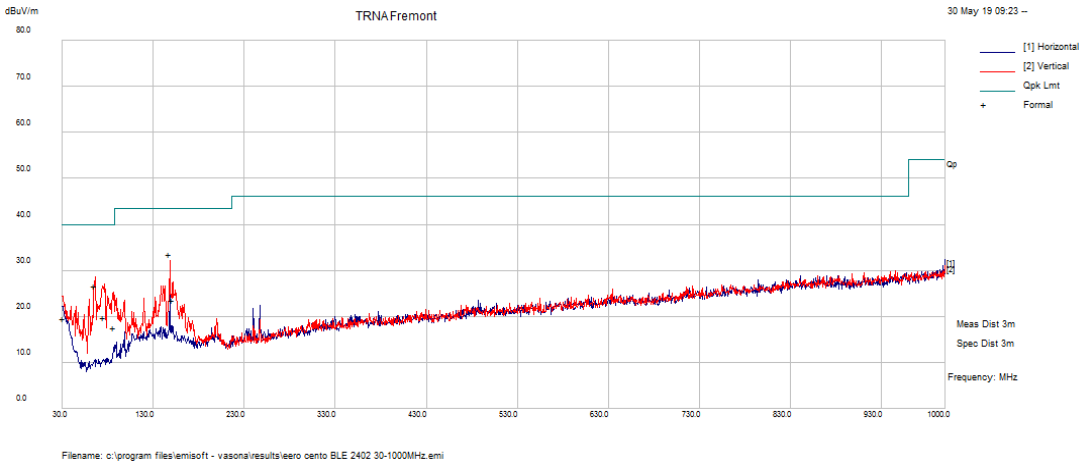
The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and test plan.

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

Note: Below 30 MHz was investigated and no emissions was found above noise floor.

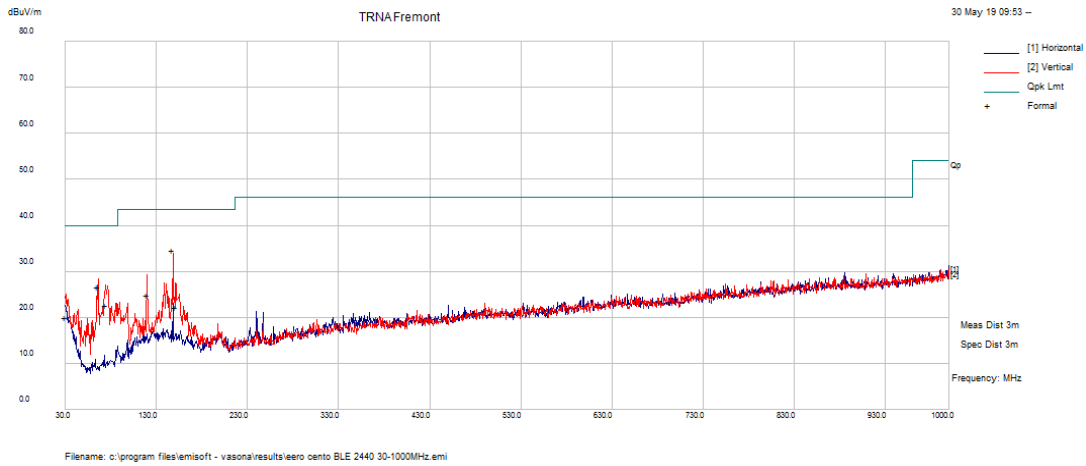
4.6.4.1 Plots

Vasona Data : Formally Assessed Peaks												
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1 (21)	66.2825	45.39	2.11	-20.67	26.83	Quasi Max	V	167	25	40	-13.17	Pass
2 (25)	151.608125	36.85	2.71	-15.9	23.66	Quasi Max	V	124	74	43.5	-19.84	Pass
3 (20)	148.352188	46.71	2.7	-15.78	33.63	Quasi Max	V	101	103	43.5	-9.87	Pass
4 (22)	76.135	38.12	2.22	-20.57	19.77	Quasi Max	V	201	144	40	-20.23	Pass
5 (23)	86.584063	36.51	2.32	-21.16	17.67	Quasi Max	V	148	241	40	-22.33	Pass
6 (24)	31.415313	26.06	1.61	-8.12	19.56	Quasi Max	V	129	349	40	-20.44	Pass



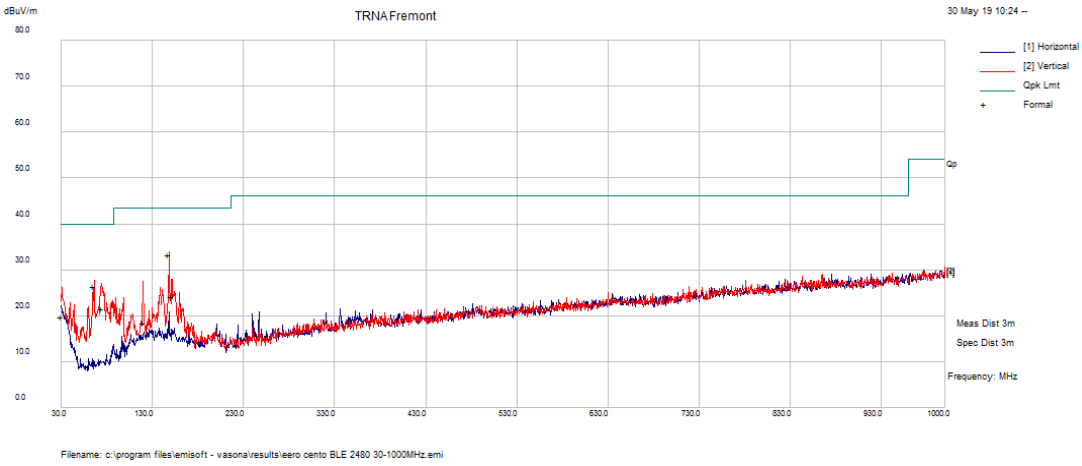
Plot 21. 30MHz-1GHz, 2402MHz

Vasona Data : Formally Assessed Peaks												
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1 (62)	30.659375	25.95	1.59	-7.54	19.99	Quasi Max	V	112	4	40	-20.01	Pass
2 (59)	66.289063	45.42	2.11	-20.67	26.86	Quasi Max	V	138	20	40	-13.14	Pass
3 (61)	119.974688	37.31	2.55	-14.86	25	Quasi Max	V	109	57	43.5	-18.5	Pass
4 (63)	151.489063	35.41	2.71	-15.89	22.23	Quasi Max	V	159	71	43.5	-21.27	Pass
5 (58)	148.3475	47.85	2.7	-15.77	34.78	Quasi Max	V	105	113	43.5	-8.72	Pass
6 (60)	74.897813	41.12	2.21	-20.56	22.77	Quasi Max	V	145	221	40	-17.23	Pass



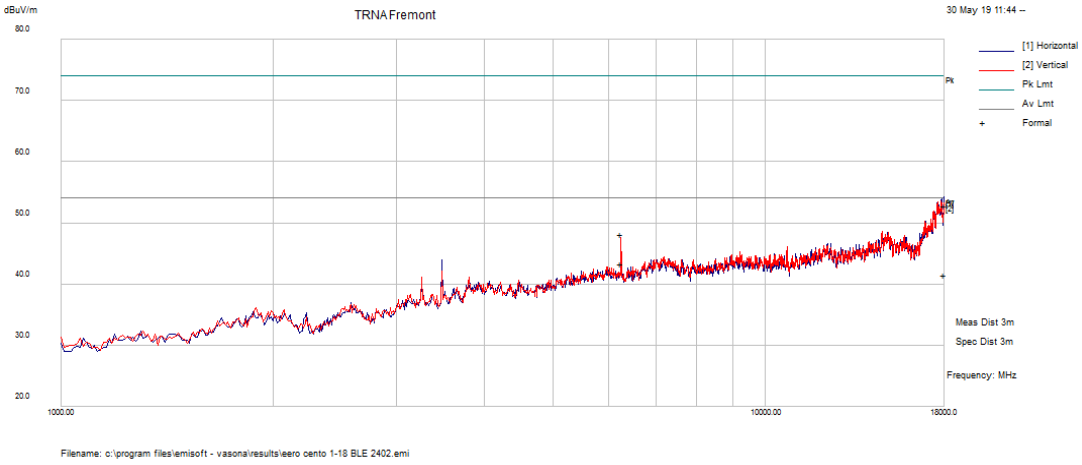
Plot 22. 30MHz-1GHz, 2440MHz

Vasona Data : Formally Assessed Peaks												
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1 (96)	66.27375	45.09	2.11	-20.67	26.53	Quasi Max	V	124	25	40	-13.47	Pass
2 (100)	119.96625	30.83	2.55	-14.86	18.52	Quasi Max	V	122	44	43.5	-24.98	Pass
3 (98)	30.655938	25.8	1.59	-7.54	19.85	Quasi Max	V	143	80	40	-20.15	Pass
4 (95)	148.364063	46.39	2.7	-15.78	33.32	Quasi Max	V	113	96	43.5	-10.18	Pass
5 (99)	151.610313	37.42	2.71	-15.9	24.23	Quasi Max	V	113	122	43.5	-19.27	Pass
6 (97)	74.366563	39.88	2.2	-20.51	21.58	Quasi Max	V	101	221	40	-18.42	Pass



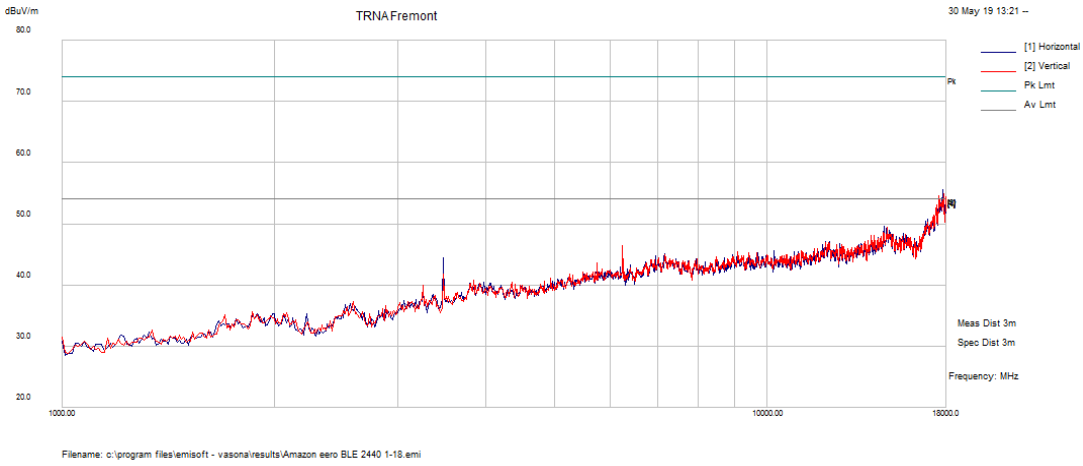
Plot 23. 30MHz-1GHz, 2480MHz

Vasona Data : Formally Assessed Peaks												
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
3 (2)	6249.925	56.33	4.86	-17.76	43.44	Average Max	V	199	194	54	-10.57	Pass
4 (2)	6249.925	61.15	4.86	-17.76	48.25	Peak Max	V	199	194	74	-25.75	Pass
5 (1)	17976.75	34.57	8.98	-2.02	41.53	Average Max	H	206	26	54	-12.47	Pass
6 (1)	17976.75	45.97	8.98	-2.02	52.93	Peak Max	H	206	26	74	-21.07	Pass
1 (11)	3475.7325	55.24	3.62	-21.24	37.62	Peak Max	H	154	7	74	-36.38	Pass
2 (11)	3475.7325	43.43	3.62	-21.24	25.81	Average Max	H	154	7	54	-28.19	Pass



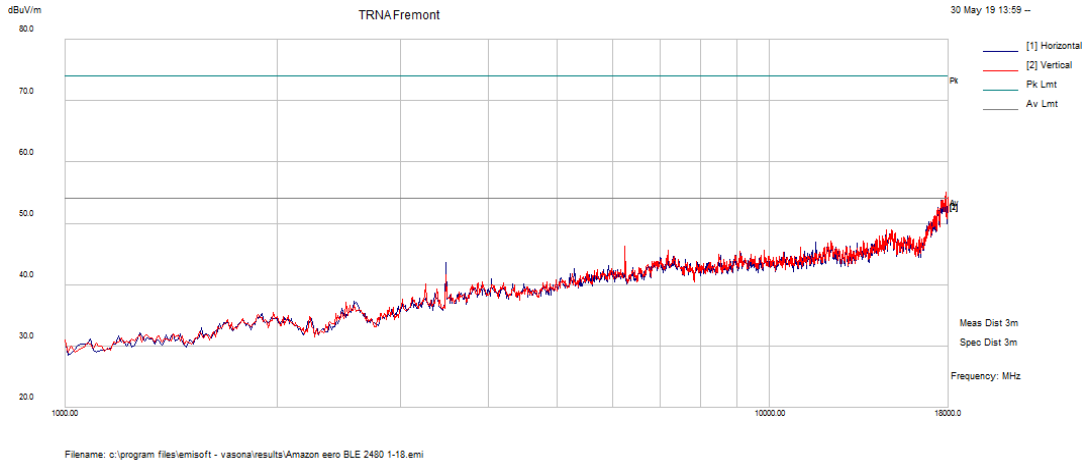
Plot 24. 1-18GHz, 2402MHz

Vasona Data : Formally Assessed Peaks													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	
1 (3)	3476.0375	54.85	3.62	-21.24	37.23	Peak Max	H	246	322	74	-36.77	Pass	
2 (3)	3476.0375	43.47	3.62	-21.24	25.85	Average Max	H	246	322	54	-28.15	Pass	
3 (2)	6249.84	55.34	4.86	-17.76	42.44	Average Max	V	187	189	54	-11.56	Pass	
4 (2)	6249.84	60.88	4.86	-17.76	47.98	Peak Max	V	187	189	74	-26.02	Pass	
5 (1)	17796.535	35.37	9.05	-1.72	42.7	Average Max	H	168	214	54	-11.3	Pass	
6 (1)	17796.535	47	9.05	-1.72	54.33	Peak Max	H	168	214	74	-19.67	Pass	



Plot 25. 1-18GHz, 2440MHz

Vasona Data : Formally Assessed Peaks													
No	Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	
1 (11)	3475.315	55.92	3.62	-21.24	38.3	Peak Max	H	203	67	74	-35.7	Pass	
2 (11)	3475.315	43.37	3.62	-21.24	25.75	Average Max	H	203	67	54	-28.25	Pass	
3 (10)	6250.0725	56.05	4.86	-17.76	43.16	Average Max	V	183	148	54	-10.84	Pass	
4 (10)	6250.0725	61.19	4.86	-17.76	48.3	Peak Max	V	183	148	74	-25.7	Pass	
5 (9)	17829.603	36.08	8.95	-2.1	42.94	Average Max	V	183	183	54	-11.06	Pass	
6 (9)	17829.603	48.54	8.95	-2.1	55.4	Peak Max	V	183	183	74	-18.6	Pass	



Plot 26. 1-18GHz, 2480MHz

4.7 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2014. 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 and RSS-GEN. Sect. 8.8.

4.7.1 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 50μH / 50Ω LISNs.

Testing is performed in Lab1. 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.

4.7.1.1 Deviations

There were no deviations from this test methodology.

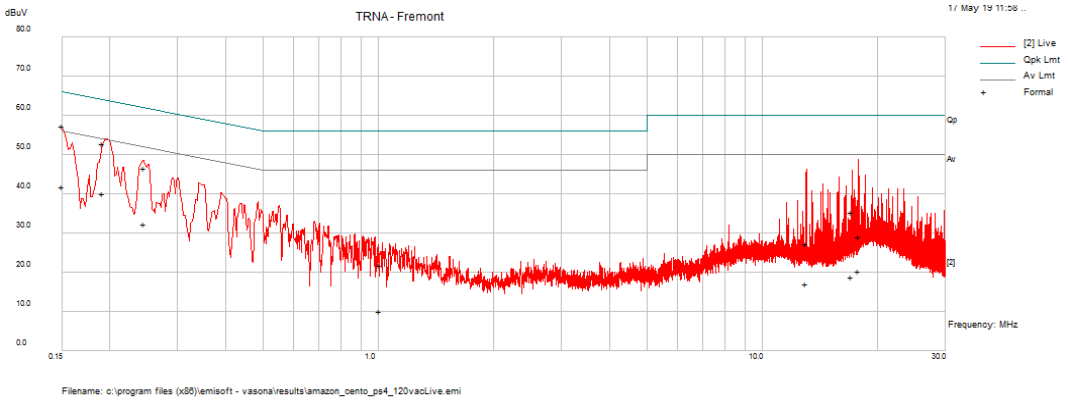
4.7.2 Test Results

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

Table 7: AC Conducted Emissions – Test Results

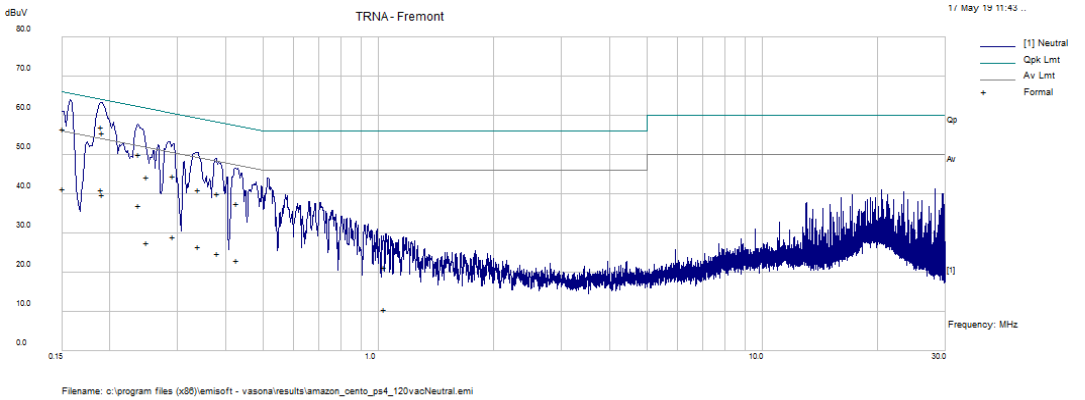
Test Conditions: Conducted Measurement at Normal Conditions only		
Antenna Type: Flex PCB dipole	**Power Level:** See Section 4.1.4.1	
AC Power: 120 Vac/60 Hz	**Configuration:** Tabletop	
Configuration	**Frequency Range**	**Test Result**
Line 1 (Live)	0.15 to 30 MHz	Pass
Line 2 (Neutral)	0.15 to 30 MHz	Pass

4.7.2.1 Live Line



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
0.150007	30.53	11.2	0.09	41.82	Average	Live	56	-14.18	Pass
0.150007	46.03	11.2	0.09	57.32	Quasi Peak	Live	66	-8.68	Pass
0.192018	29.68	10.25	0.07	40	Average	Live	53.95	-13.95	Pass
0.192018	42.57	10.25	0.07	52.89	Quasi Peak	Live	63.95	-11.06	Pass
0.245255	36.4	10.17	0.05	46.63	Quasi Peak	Live	61.92	-15.29	Pass
0.245255	22.2	10.17	0.05	32.42	Average	Live	51.92	-19.49	Pass
1.008361	0.06	10.12	0.03	10.21	Average	Live	46	-35.79	Pass
1.008361	11.63	10.12	0.03	21.78	Quasi Peak	Live	56	-34.22	Pass
13.01084	17.08	10.39	-0.03	27.44	Quasi Peak	Live	60	-32.56	Pass
13.01084	6.73	10.39	-0.03	17.09	Average	Live	50	-32.91	Pass
17.09842	8.61	10.47	-0.09	18.99	Average	Live	50	-31.01	Pass
17.09842	24.96	10.47	-0.09	35.34	Quasi Peak	Live	60	-24.66	Pass
17.77038	9.88	10.48	-0.11	20.25	Average	Live	50	-29.75	Pass
17.77038	18.81	10.48	-0.11	29.18	Quasi Peak	Live	60	-30.82	Pass

4.7.2.2 Neutral Line



Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail
0.150878	45.38	11.15	0.09	56.62	Quasi Peak	Neutral	65.95	-9.33	Pass
0.150878	30.22	11.15	0.09	41.46	Average	Neutral	55.95	-14.5	Pass
0.190305	30.76	10.26	0.07	41.08	Average	Neutral	54.02	-12.94	Pass
0.190305	46.65	10.26	0.07	56.98	Quasi Peak	Neutral	64.02	-7.05	Pass
0.191128	45.27	10.26	0.07	55.59	Quasi Peak	Neutral	63.99	-8.39	Pass
0.191128	29.59	10.26	0.07	39.91	Average	Neutral	53.99	-14.08	Pass
0.238569	39.8	10.18	0.05	50.04	Quasi Peak	Neutral	62.15	-12.11	Pass
0.238569	26.98	10.18	0.05	37.22	Average	Neutral	52.15	-14.93	Pass
0.250232	17.4	10.17	0.05	27.62	Average	Neutral	51.75	-24.13	Pass
0.250232	34.11	10.17	0.05	44.33	Quasi Peak	Neutral	61.75	-17.42	Pass
0.292599	34.49	10.13	0.05	44.67	Quasi Peak	Neutral	60.45	-15.78	Pass
0.292599	18.91	10.13	0.05	29.09	Average	Neutral	50.45	-21.36	Pass
0.341483	30.87	10.11	0.04	41.03	Quasi Peak	Neutral	59.17	-18.14	Pass
0.341483	16.54	10.11	0.04	26.69	Average	Neutral	49.17	-22.48	Pass
0.382978	30.05	10.1	0.04	40.18	Quasi Peak	Neutral	58.21	-18.03	Pass
0.382978	14.65	10.1	0.04	24.79	Average	Neutral	48.21	-23.42	Pass
0.429944	27.36	10.1	0.04	37.5	Quasi Peak	Neutral	57.25	-19.75	Pass
0.429944	12.88	10.1	0.04	23.02	Average	Neutral	47.25	-24.23	Pass
1.035926	0.5	10.12	0.03	10.66	Average	Neutral	46	-35.34	Pass
1.035926	11.13	10.12	0.03	21.28	Quasi Peak	Neutral	56	-34.72	Pass

5 Test Equipment List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yyyy	Next Cal mm/dd/yyyy
Spectrum Analyzer	Rohde & Schwarz	FSU26.5	200050	11/20/2018	11/20/2019
Spectrum Analyzer	Rohde & Schwarz	FSU8	101358	12/07/2018	12/07/2019
EMI Receiver	Rohde & Schwarz	ESIB40	100180	05/31/2018	05/31/2020
L.I.S.N.	Com-Power	LI-215	192000	01/16/2019	01/16/2020
Transient Limiter	Com-Power	LIT-930	531582	01/16/2019	01/16/2020
EMI Receiver	Agilent	MXE N9038A	MY51210195	01/16/2019	01/16/2020
Preamplifier, 9 kHz – 1 GHz	Sonoma	310N	213221	01/16/2019	01/16/2020
Bilog Antenna	Sunol Sciences	JB3	A060502	05/27/2018	05/27/2020
Amplifier	Miteq	TTA1800-30-HG	1842452	01/15/2019	01/15/2020
Horn Antenna	Sunol Sciences	DRH-118	A040806	03/05/2019	03/05/2020
Amplifier	HP	8449B	3008A01013	01/15/2019	01/15/2020
Amplifier	Sonoma	310N	185516	N/A (See Note)	
1.6 GHz Low Pass Filter	K&L Microwave	8L120-X1600-0/09135-0249	UA691-35	N/A (See Note)	
3.5 GHz High Pass Filter	Hewlett Packard	84300-80038	820004	N/A (See Note)	

Note: Equipment is characterized before use.

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 8: Customer Information

Company Name	eero LLC
Address	660 3rd Street, 4th floor
City, State, Zip	San Francisco, CA, 94107
Country	USA

Table 9: Technical Contact Information

Name	Clifford Clarke
E-mail	compliance@eero.com

6.3 Equipment Under Test (EUT)

The information provided in the following table should be listed as it should appear in the final report. For those products that have only a model name, list the model number as *non-applicable* and vice-versa.

Table 10: EUT Designation

Product Name	eero
Model Number	J010001
System Name	Eero Home wi-fi router
Product Description	Home wi-fi router

6.4 Product Specifications

Table 11: EUT Specifications

EUT Specifications	
AC Input	100-240V AC, 50 – 60 Hz
Environment	Indoor
Operating Temperature Range:	0-35°C
Multiple Feeds:	☐ Yes and how many ☒ No
Product Marketing Name (PMN)	eero
Hardware Version Identification Number (HVIN)	A01
Firmware Version Identification Number (FVIN)	eeroOS
RF Test Software Version	BusyBox v1.23.2
Operating Modes	BT Low Energy, 1Mbps
Transmitter Frequency Band	2.4 GHz – 2.4835 GHz
Power Setting @ Operating Channel	See section 4.1.2.
Modulation	GFSK
TX/RX Chain (s)	SISO
Type of Equipment	☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☐ Other:
Note: EUT will be on / transmitted at all times with the highest power levels and antenna gains per channel.	

Table 12: Antenna Information

Number	Antenna Type	Description	Max Gain (dBi)
Antenna 0	Internal, Flex PCB Dipole	Bluetooth Low Energy	4.15

Table 13: 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?
Ethernet	Ethernet	☐ Yes	☒ Metric: < 3.0m	☒ M

Table 14: Accessory Equipment

Equipment	Manufacturer	Model	Serial	Comment
AC/DC Converter	Luxshare	C110011	See Note	

1. **Note:** All eero devices are serialized at the time of manufacturer. The devices used for the certification testing were assembled in the factory but did not go through the regular marking process so they were not serialized.

Table 15: Ancillary Equipment (used for test purposes only)

Equipment	Manufacturer	Model	Serial	Used for
Laptop	Lenovo	Thinkpad	N/A	Setup EUT operating channels via Ethernet connection to EUT
Note: None.				

Table 16: Description of Sample used for Testing

Sample Number	Device	Serial Number	Configuration	Used For
1	eero	Unit #1	Radiated Sample	TX Spurious Emissions, Bandedge
2	eero	Unit #1	Radiated Sample	AC Mains Conducted Emissions
3	eero	Unit #2	Conducted Sample	All other conducted Measurments
Note: None.				

Table 17: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
eero	Flex PCB Dipole	Transmit	EUT upright	N/A	N/A
Note: Manufacturer has declared that the EUT is designed to operate in a fixed, upright position.					

6.5 Test Specifications

Table 18: Test Specifications

Emissions and Immunity	
Standard	**Requirement**
CFR 47 Part 15.247: 2019	All
RSS 247 Issue 2, 2017	All

END OF REPORT