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EMC Test Report

Application for FCC Grant of Equipment Authorization
Canada Certification

Innovation, Science and Economic Development Canada
RSS-Gen Issue 5 / RSS-247 Issue 2
FCC Part 15 Subpart C

Model: 10503

IC CERTIFICATION #:	29927-61100001
FCC ID:	2AYXT61100001
APPLICANT:	Eight Sleep 212 W 35th, FLoor 4 New York, NY 10123
TEST SITE(S):	NTS Labs, LLC 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4, 2845B-5, 2845B-7
PROJECT NUMBER:	PR167335
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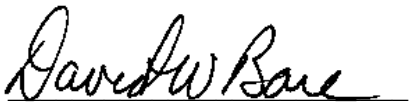
FINAL TEST DATES:	December 5, 12, 13, 14, 15, 16, 19 and 20, 2022 and January 10, 11, 18 and 19, 2023
TOTAL NUMBER OF PAGES:	102

ACCREDITED
Testing Cert #0214.26

VALIDATING SIGNATORIES

PROGRAM MGR



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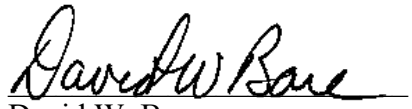

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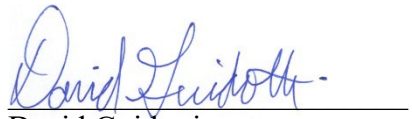

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	January 24, 2023	First release	
1	February 7, 2023	Some of the page headers were updated to add RSS-247 and remove FCC 15.407 references. Additional information about the test conditions was added on Page 11. The statement about factors on page 21 was revised.	David Bare
2	February 9, 2023	Removed all references to 15.407. Added note about cable calibration.	David Bare
3	February 17, 2023	Revised antenna gain on page 7, added note about MIMO mode and nominal bandwidths	David Bare

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SCOPE

An electromagnetic emissions test has been performed on the Eight Sleep model 10503, pursuant to the following rules:

RSS-GEN Issue 5 " General Requirements for Compliance of Radio Apparatus"
RSS 247 Issue 2 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in NTS Labs, LLC test procedures:

ANSI C63.10-2013
FCC DTS Measurement Guidance KDB558074

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

NTS Labs, LLC is accredited by the A2LA, certificate number 0214.26, to perform the test(s) listed in this report, except where noted otherwise.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Eight Sleep model 10503 complied with the requirements of the following regulations:

RSS-GEN Issue 5 " General Requirements for Compliance of Radio Apparatus"
RSS 247 Issue 2 "Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Eight Sleep model 10503 and therefore apply only to the tested sample. The sample was selected and prepared by Alex Lednev of Eight Sleep.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS SUMMARY

DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz) BLE

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 247 5.2	Digital Modulation	Systems uses GFSK modulation techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 247 5.2 (1)	6dB Bandwidth	0.669 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 247 5.4 (4)	Output Power (multipoint systems)	6.7 dBm (0.0047 Watts) EIRP = 0.0023 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	Test not required as total output power is less than PSD limit.	8dBm/3kHz	Complies
15.247(d)	RSS 247 5.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All < -20 dBc	< -20dBc Note 2	Complies
15.247(d) / 15.209	RSS 247 5.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.3 dBµV/m @ 2389.8 MHz (-0.7 dB)	Refer to the limits section (p20) for restricted bands, all others <-20dBc Note 2	Complies

Note 1 EIRP calculated using antenna gains of -2.7 dBi for the highest EIRP system.
Note 2 Limit of -20dBc used because the power was measured using the peak power method.
Note 3 Pass/Fail criteria defined by standards listed above.

DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz) Wi-Fi

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 247 5.2	Digital Modulation	Systems uses OFDM / DSSS modulation techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 247 5.2 (1)	6dB Bandwidth	802.11b: 8.08 MHz G802.11: 15.07 MHz ac20: 15.04 MHz ac40: 35.06 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 247 5.4 (4)	Output Power (multipoint systems)	802.11b: 21.2 dBm 802.11g: 21.9 dBm ac20: 19.2 dBm ac40: 19.1 dBm (Max 0.155 Watts) EIRP = 0.276 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	-7.0 dBm	8dBm/3kHz - directional antenna gain	Complies
15.247(d)	RSS 247 5.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All < -20 dBc	< -30dBc Note 2	Complies
15.247(d) / 15.209	RSS 247 5.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.8 dBµV/m @ 7310.1 MHz (-0.2 dB)	Refer to the limits section (p20) for restricted bands, all others <-30dBc Note 2	Complies

Note 1 EIRP calculated using antenna gains of 2.5 dBi () for the highest EIRP system.
Note 2 Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst).
Note 3 the device is operating under the smart antenna rules as detailed in FCC 15.247(c) (2) / RSS 247 5.4 (6). Refer to the operational description for additional justification.
Note 4 Pass/Fail criteria defined by standards listed above.

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Integral antenna	Unique or integral antenna required	Complies
15.207	RSS-Gen Table 4	AC Conducted Emissions	42.8 dBµV @ 0.276 MHz (-8.1 dB)	Refer to page 20	Complies
15.247 (i)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in separate exhibit, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSS-Gen 6.8	User Manual	Non detachable antennas	Statement for products with detachable antenna	N/A
-	RSS-Gen 8.4	User Manual	See separate user manual exhibit	Statement for all products	Complies

Note 1 Pass/Fail criteria defined by standards listed above.

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Eight Sleep model 10503 is a thermoregulated mattress cover and hub that is designed to aid sleep. The Pod Hub would normally be placed on the floor, but for testing the radio it was treated as table-top equipment during testing. The electrical rating of the Pod is 110-240 Volts, 50-60 Hz, 300 Watts.

The samples were received on December 5, 2022 and tested on December 5, 12, 13, 14, 15, 16, 19 and 20, 2022 and January 10, 11, 18 and 19, 2023. The following samples of the EUT were used during testing:

Company	Model	Description	Serial Number	FCC ID
Eight Sleep, Inc.	10503	Pod Hub	000182A5	2AYXT61100001
Eight Sleep, Inc.	10503	Pod Hub	000119876	2AYXT61100001

OTHER EUT DETAILS

The following EUT details should be noted: The EUT employs a MediaTek MT7663BSN Wi-Fi and BLE radio chip with (2) TE 2344656 Wi-Fi antennas and an integrated PCB BLE antenna. The Wi-Fi radio uses 20 and 40 MHz bandwidth modes and 2x2 MIMO operation.

ENCLOSURE

The Pod enclosure is primarily constructed of plastic. It measures approximately 16 cm wide by 37.5 cm deep by 38.5 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Labs, LLC.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Lenovo	ThinkPad X1	Laptop	PF-3T5W0H	-

No remote support equipment was used during testing.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
AC	Mains	Three wire	Unshielded	1.7
Temporary USB	Laptop	Multiwire	Shielded/Unshielded	2

EUT OPERATION

During emissions testing the EUT was commanded to transmit continuously at the selected power setting and on the channel with commands from the laptop. For the Wi-Fi radio, both chains are active using a single spatial stream. The power settings used during power measurements are detailed below. Settings during radiated tests may exceed these values but the power settings used will be those recorded during the power measurements.

Mode	Date Rate	Frequency	Setting
BLE	1 Mbps	2402	6
BLE	1 Mbps	2440	6
BLE	1 Mbps	2480	6
b	1 Mbps	2412	17
b	1 Mbps	2437	13
b	1 Mbps	2462	13
g	6 Mbps	2412	19
g	6 Mbps	2437	16
g	6 Mbps	2462	16
ac20	6.5 Mbps	2412	17
ac20	6.5 Mbps	2437	17
ac20	6.5 Mbps	2462	17
ac40	13.5 Mbps	2417	17
ac40	13.5 Mbps	2437	17
ac40	13.5 Mbps	2452	17

TEST SITE

GENERAL INFORMATION

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 6.2 of RSS-GEN, NTS Labs, LLC has been recognized as an accredited test laboratory by the Commission and Innovation, Science and Economic Development Canada. A description of the facilities employed for testing is maintained by NTS Labs, LLC.

Site	Company / Registration Numbers		Location
	FCC	Canada	
Chamber 3, 4, 5 & 7	US1031	2845B (Wireless Test Lab #US0027)	41039 Boyce Road Fremont, CA 94538-2435

ANSI C63.4 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement. The test site(s) contain separate areas for radiated and conducted emissions testing. Results from testing performed in this chamber have been correlated with results from an open area test site. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

Software is used to view and convert receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers. The software used for radiated and conducted emissions measurements is NTS Labs, LLC EMI Test Software (rev 2.10)

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 80 centimeters for testing below 1 GHz and 1.5m for testing above 1 GHz. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor as specified in ANSI C63.4. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.10, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

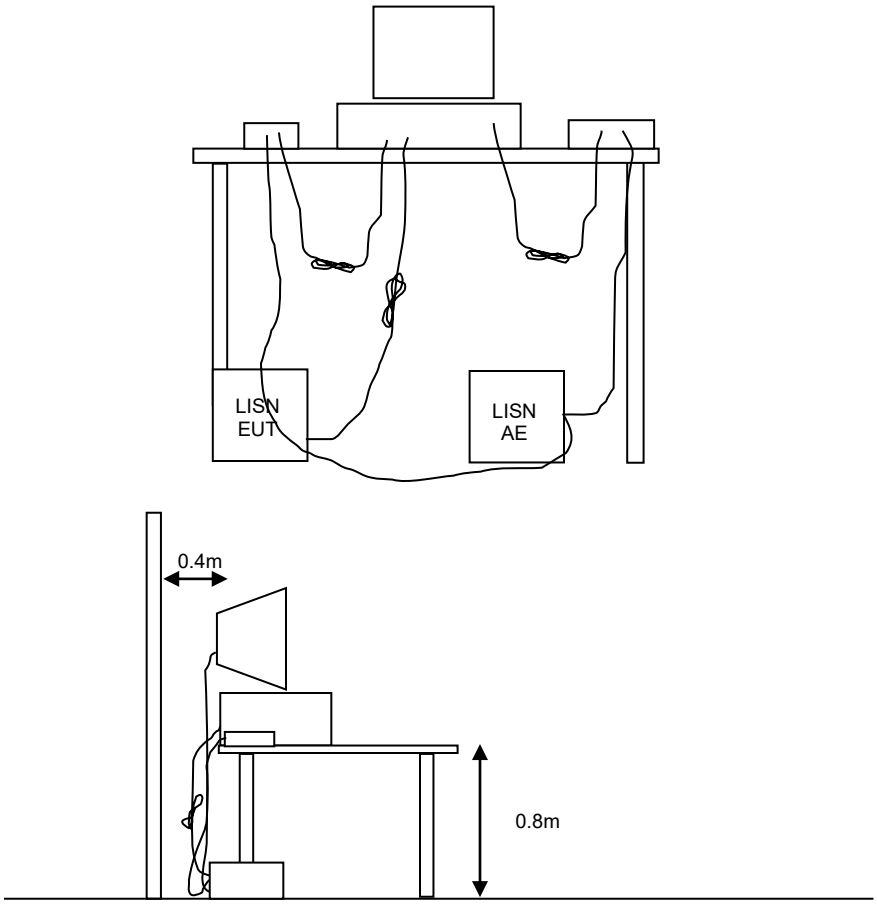


Figure 1 Typical Conducted Emissions Test Configuration

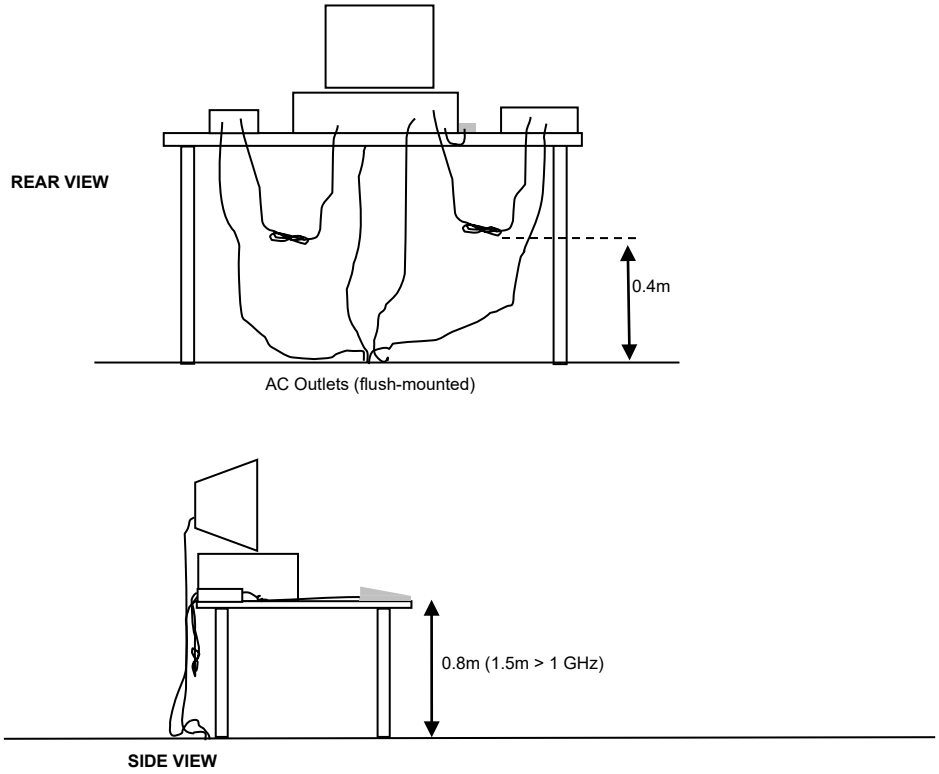
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

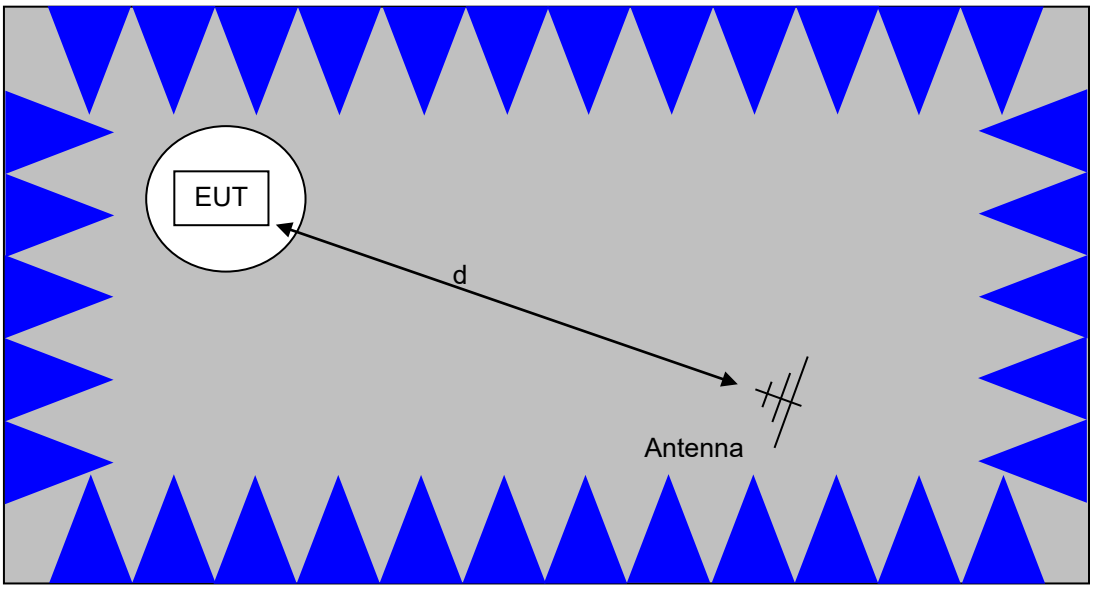
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.

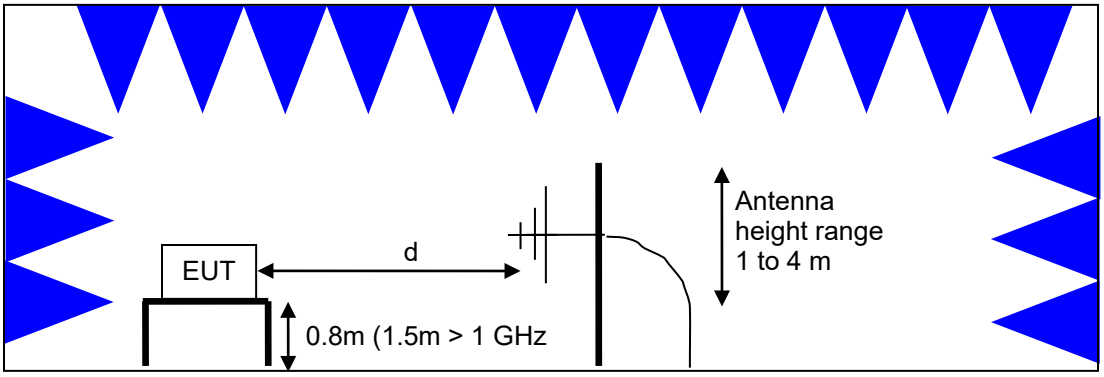


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

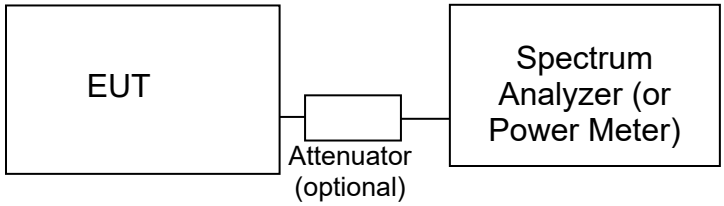
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements of power, bandwidth and power spectral density are performed, where possible, with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and NTS Labs, LLC test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1].

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

[1] The restricted bands are detailed in FCC 15.205 and RSS-Gen Table 7

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. For FCC, fixed point to point applications using the 2400-2483.5 MHz band may use antennas with more than 6 dBi gain but output power is reduced by 1 dB for every 3dB that the antenna gain exceeds 6 dBi. For Canada, fixed point-to-point applications using the 2400-2483.5 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS GEN. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:
R_r = Receiver Reading in dBuV
S = Specification Limit in dBuV
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

A computer program reads the receiver levels and corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements. The corrected receiver readings are compared directly to the specification limit (decibel form).

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:
F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:
R_r = Receiver Reading in dBuV/m
F_d = Distance Factor in dB
R_c = Corrected Reading in dBuV/m
L_s = Specification Limit in dBuV/m
M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of d (meters) from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{d} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.2dB.

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 30 - 40,000 MHz, Dec 12-16, 2022					
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055650	8/30/2022	8/31/2023
Hewlett Packard	Microwave Preamplifier Head, 18-40 GHz (Blue)	84125C EMI Test Head (Blue)	WC055663	1/24/2022	1/24/2023
Hewlett Packard	High Pass filter, 8.2 GHz	P/N 84300-80039	WC064433	11/14/2022	11/14/2023
Hewlett Packard	High Pass filter, 3.7 GHz	P/N 84300-80038	WC064434	2/9/2022	2/9/2023
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	WC064481	11/15/2022	11/15/2023
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	WC064536	1/29/2021	3/23/2023
A. H. Systems	Antenna, Horn, 18-40GHz	SAS-574	WC064556	11/18/2022	11/18/2024
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	WC064594	10/17/2022	10/17/2023
EMCO	Antenna, Horn, 1-18 GHz	3115	WC064725	8/17/2021	8/17/2023
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	WC064733	6/2/2022	6/2/2023
Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	ESI	WC068000	7/21/2022	7/21/2023
Micro-Tronics	Band Reject Filter	BRC50705-02	WC068022	1/31/2022	1/31/2023
MITEQ	Preamplifier, 1-18 GHz	AFS44	WC071561	4/22/2022	4/22/2023
Conducted Emissions - AC Power Ports, 16-Dec-22					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Fischer Custom Communications	LISN, 25A, 150kHz to 30MHz, 25 Amp	FCC-LISN-50-25-2-09	WC064532	9/8/2022	9/8/2023
Rohde & Schwarz	EMI Test Receiver, 20Hz-40GHz	ESI	WC068000	7/21/2022	7/21/2023
Rohde & Schwarz	Pulse Limiter	ESH3-Z2	WC072359	6/30/2022	6/30/2023
Radio Antenna Port (Power and Spurious Emissions), 19-20-Dec-2022, 11-Jan-2023					
National Technical Systems	NTS UNII Power Software (rev 4.0)	N/A	WC022700	N/A	
National Technical Systems	NTS Capture Analyzer Software (rev 4.0)	N/A	WC022706	N/A	
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055650	8/30/2022	8/31/2023
Agilent Technologies	Signal Generator (Vector) (PSG)	E8267D	WC055673	4/26/2022	4/26/2023
Agilent Technologies	USB Average Power Sensor	U2001A	WC064661	1/26/2021	1/24/2023
BLE Spurious 1000- 18000 MHz, 18-Jan-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055670	10/24/2022	10/31/2023
EMCO	Horn Antenna, 1-18 GHz (SA40-Purple)	3115	WC062583	9/12/2022	9/12/2024
Hewlett Packard	High Pass filter, 3.7 GHz	P/N 84300-80038	WC064434	2/9/2022	2/9/2023

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
MITEQ	Preamplifier, 1-18 GHz	AFS44	WC080962	7/18/2022	7/18/2023
BLE Spurious 1000- 18000 MHz, 18-Jan-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055670	10/24/2022	10/31/2023
EMCO	Horn Antenna, 1-18 GHz (SA40-Purple)	3115	WC062583	9/12/2022	9/12/2024
Hewlett Packard	High Pass filter, 3.7 GHz	P/N 84300-80038	WC064434	2/9/2022	2/9/2023
MITEQ	Preamplifier, 1-18 GHz	AFS44	WC080962	7/18/2022	7/18/2023
Radio Antenna Port (Power, Bandwidth and Spurious Emissions), 10-11-Jan-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
National Technical Systems	NTS Capture Analyzer Software (rev 4.0)	N/A	WC022706	N/A	
Agilent Technologies	PSA Spectrum Analyzer	E4446A	WC055650	8/30/2022	8/31/2023
Rohde & Schwarz	Power Meter	NRVS	WC064428	12/8/2022	12/8/2023
Rohde & Schwarz	Peak Power Sensor 100 uW - 2 Watts use with 20dB attenuator sn:1031.6959.00 only	NRV-Z32	WC064862	12/8/2022	12/8/2023
Radiated Emissions, 30 - 1,000 MHz, 19-Jan-23					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	WC022452	N/A	
Rohde & Schwarz	EMI Test Receiver, 20Hz-226.5GHz	ESI	WC071498	6/20/2022	6/20/2023
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	WC064536	1/29/2021	3/23/2023
Com-Power	Preamplifier, 1-1000 MHz	PAM-103	WC064733	6/2/2022	6/2/2023

Note: All cables used during testing are identified and included in the calibration database and are calibrated annually. The factors for the cable loss used by the emissions test software is updated each time calibration is performed.

Appendix B Test Data

TL167335 Pages 27 – 101

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Product	Pod Hub	T-Log Number:	TL167335 Hub 182A5
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Emissions Standard(s):	FCC part 15.247, RSS-247	Class:	-
Immunity Standard(s):	-	Environment:	Home

EMC Test Data

For The

Eight Sleep, Inc.

Product

Pod Hub

Date of Last Test: 1/25/2023

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Power vs. Data Rate

In normal operating modes the EUT uses power settings stored on EEPROM to set the output power. For a given nominal output power the actual transmit power normally is reduced as the data rate increases, therefore testing was performed at the data rate in the mode with highest power to determine compliance with the requirements.
The following power measurements were made using a **GATED** average power meter and with the device configured in a continuous transmit mode on Chain 1 at the various data rates in each mode to verify the highest power mode:

Sample Notes

Sample S/N: Hub: 000182A5, SOM: 70B651000024
Driver: Wifitest Tool, Ver 1.9.6

Date of Test: 12/5/2022
Test Engineer: David Bare
Test Location: Fremont Chamber #7

Mode	Data Rate	Power (dBm)	Power setting
802.11b	1	**15.3**	17.0
	2	15.2	
	5.5	15.2	
	11	15.2	
802.11g	6	**15.2**	17.0
	9	15.2	
	12	15.2	
	18	15.2	
	24	15.2	
	36	15.2	
	48	15.2	
	54	15.2	

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Mode	Data Rate (800ns GI, 1SS)	Power (dBm)	Power setting	
802.11n/ac 20MHz	6.5	**15.3**	17.0	
	13	15.2		
	19.5	15.2		
	26	14.6		
	39	14.5		
	52	14.0		
	58.5	14.1		
	65	13.6		
	78	12.2		<<-11ac mode only
802.11n/ac 40MHz	13.5	**15.5**	17.0	
	27	15.4		
	40.5	15.2		
	54	14.6		
	81	14.5		
	108	13.3		
	121.5	13.3		
	135	12.8		
	162	11.4		<<-11ac mode only
	180	10.8		<<-11ac mode only
802.11ac 80MHz	29.3	**15.2**	17.0	
	58.5	14.5		
	87.8	14.2		
	117	13.2		
	175.5	13.0		
	234	12.3		
	266.3	12.3		
	292.5	11.5		
	351	10.3		
	390	10.0		

Note :	Power setting - the software power setting used during testing, included for reference only.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 20-22 °C
Rel. Humidity: 38-42 %

Modifications Made During Testing

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 2412MHz	21	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	46.1 dBµV/m @ 2386.8 MHz (-7.9 dB)
	b	11 2462MHz	21	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	47.0 dBµV/m @ 2499.7 MHz (-7.0 dB)
2	g	1 2412MHz	19	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	51.7 dBµV/m @ 2390.0 MHz (-2.3 dB)
	g	11 2462MHz	19	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	52.4 dBµV/m @ 2483.5 MHz (-1.6 dB)
3	ac20	1 2412MHz	19	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.2 dBµV/m @ 2390.0 MHz (-0.8 dB)
	ac20	11 2462MHz	20	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.1 dBµV/m @ 2483.5 MHz (-0.9 dB)
4	ac40	3 2422MHz	17	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.3 dBµV/m @ 2389.8 MHz (-0.7 dB)
	ac40	9 2452MHz	17	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.0 dBµV/m @ 2484.5 MHz (-1.0 dB)

Sample Notes

Sample S/N: Hub: 000182A5, SOM: 70B651000006
Driver: Wifitest Tool, Ver 1.9.6

Note: Multiple test runs show bandedge measurement worse case postion is horizontal.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with ANSI C63.10
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has a duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear voltage average, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)	
11b	1 Mbps	99.4%	Yes	8.2	0	0	10	
11g	6 Mbps	98.1%	Yes	2.566	0	0	10	
ac20	MCS 0	98.2%	Yes	2.567	0	0	10	
ac40	MCS 0	94.8%	Yes	1.228	0.234	0.468	814	1 kHz

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has a duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear voltage correction factor
Note 5:	Emission has constatnt duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear voltage average, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 7:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, RMS detector, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 8:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

* Pwr Cor Factor calculated using 10 X log(1/duty cycle)
** Lin Volt Cor Factor is calculated using 20 x log(1/duty cycle)

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

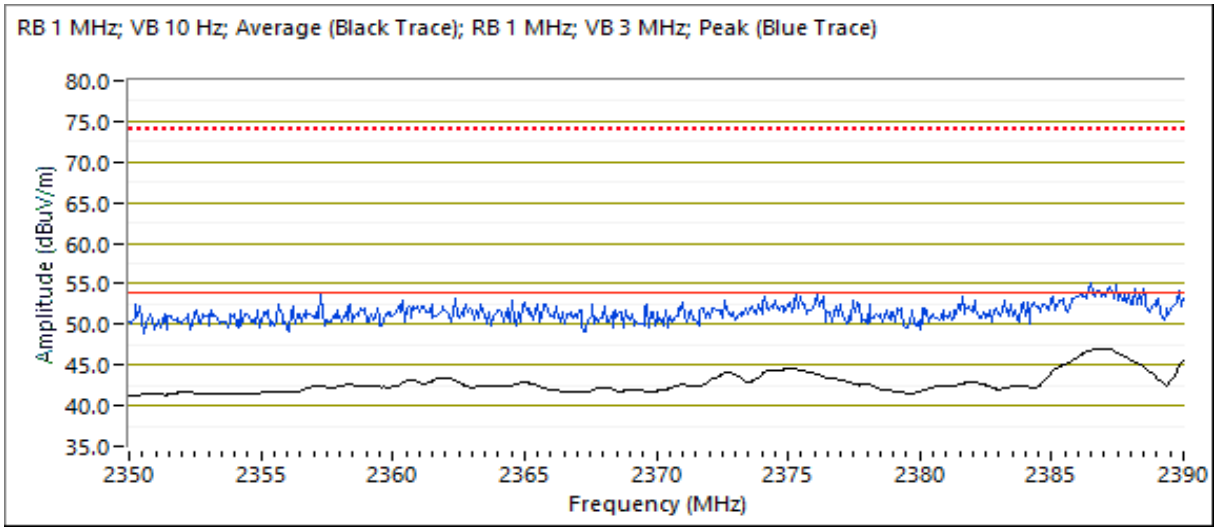
Run #1: Radiated Bandedge Measurements

Date of Test: 12/12/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: None
Test Location: Chamber 7 EUT Voltage: 120 V/60 Hz

Channel: 1 Mode: b Pwr Setting: 21
Tx Chain: Data Rate: 1 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2386.780	**46.1**	H	54.0	**-7.9**	AVG	82	2.0	RB 1 MHz; VB: 10 Hz
2386.220	54.7	H	74.0	-19.3	PK	82	2.0	RB 1 MHz; VB: 3 MHz

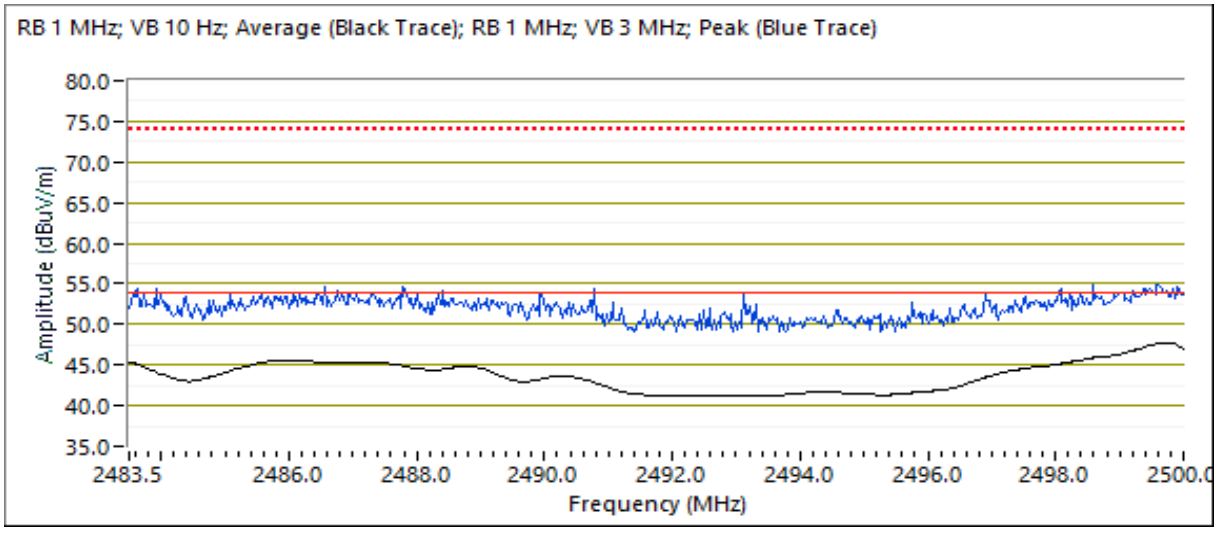


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Channel: 11 Mode: b Pwr Setting: 21
Tx Chain: Data Rate: 1 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2499.730	**47.0**	H	54.0	**-7.0**	AVG	82	2.0	RB 1 MHz; VB: 10 Hz
2485.430	54.8	H	74.0	-19.2	PK	82	2.0	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

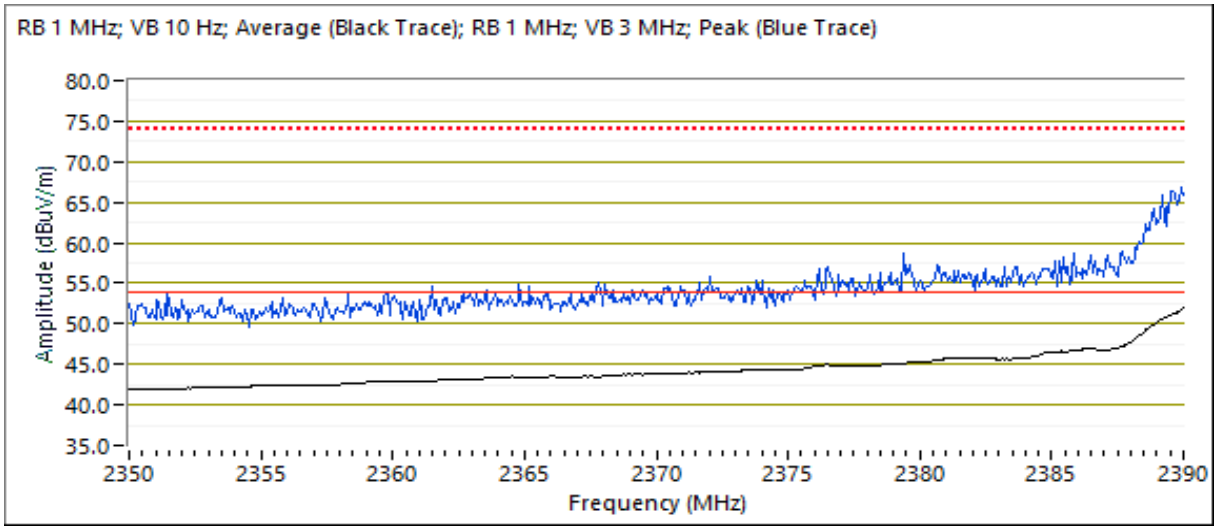
Run #2: Radiated Bandedge Measurements

Date of Test: 12/12/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: None
Test Location: Chamber 7 EUT Voltage: 120 V/60 Hz

Channel: 1 Mode: g Pwr Setting: 19
Tx Chain: 2x2 Data Rate: 6 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.000	**51.7**	H	54.0	**-2.3**	AVG	82	2.0	RB 1 MHz; VB: 10 Hz
2389.980	66.2	H	74.0	-7.8	PK	82	2.0	RB 1 MHz; VB: 3 MHz

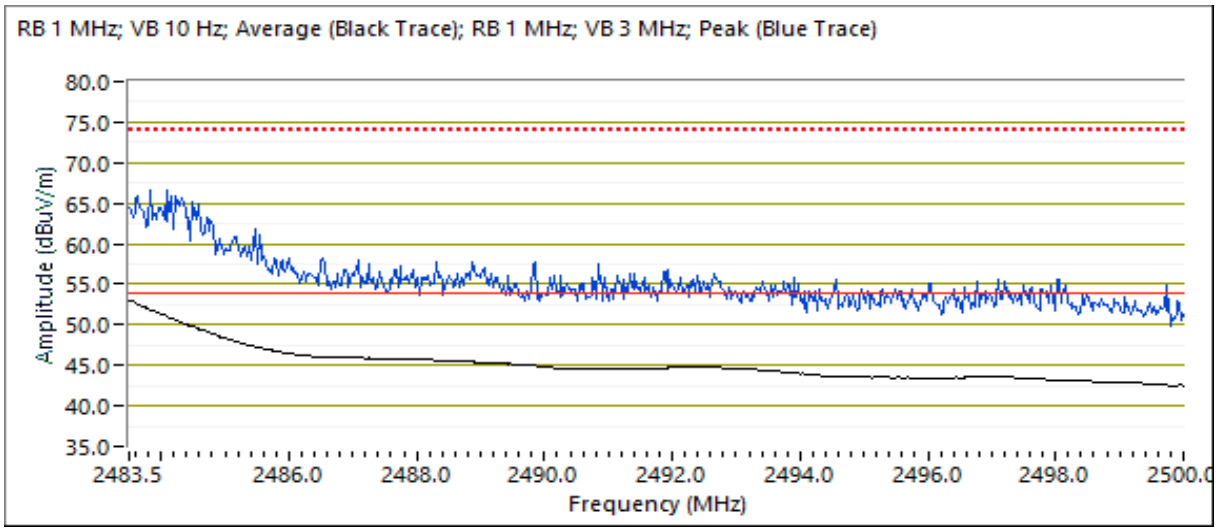


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Channel: 11 Mode: g Pwr Setting: 19
Tx Chain: 2x2 Data Rate: 6 Mbps

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	**52.4**	H	54.0	**-1.6**	AVG	82	2.0	RB 1 MHz; VB: 10 Hz
2483.680	66.8	H	74.0	-7.2	PK	82	2.0	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

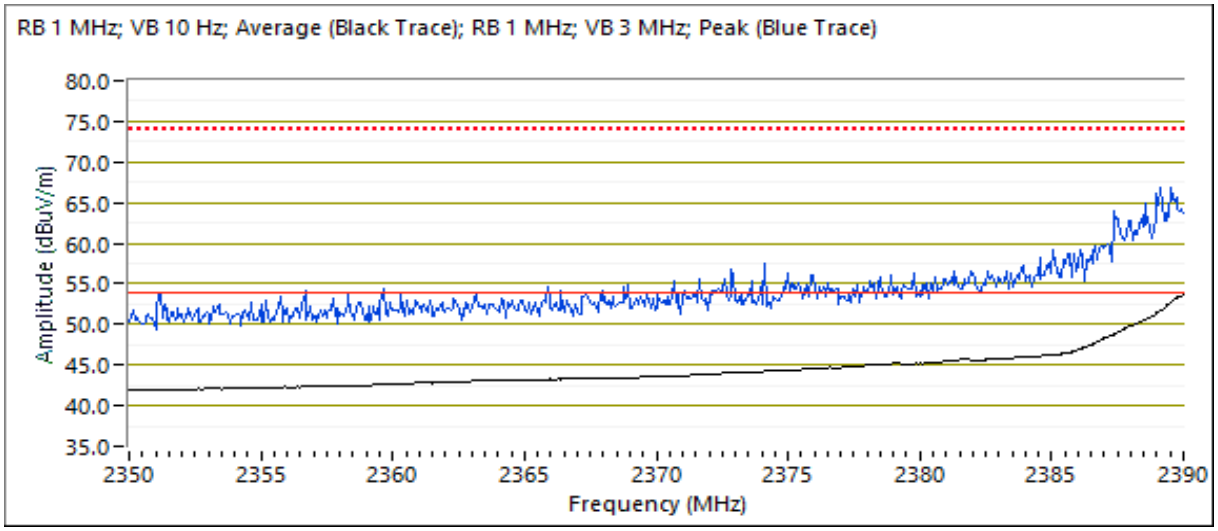
Run #3: Radiated Bandedge Measurements

Date of Test: 12/12/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: -
Test Location: Chamber 7 EUT Voltage: 120V/60 Hz

Channel: 1 Mode: ac20 Pwr Setting: 19
Tx Chain: 2x2 Data Rate: MCS0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.990	**53.2**	H	54.0	**-0.8**	AVG	82	2.0	RB 1 MHz; VB: 10 Hz
2389.850	67.0	H	74.0	-7.0	PK	82	2.0	RB 1 MHz; VB: 3 MHz

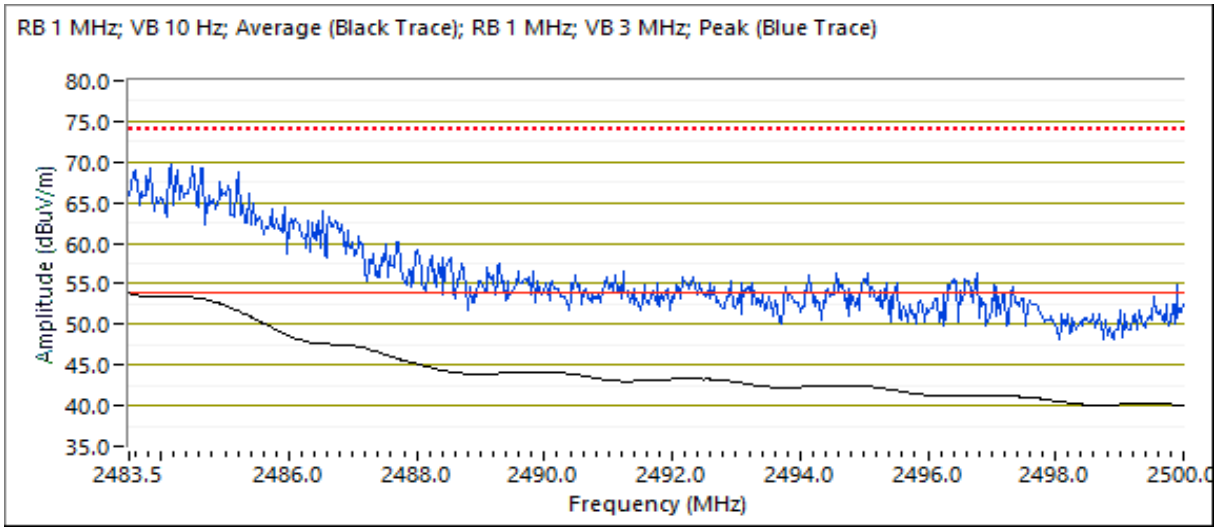


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Channel: 11 Mode: ac20 Pwr Setting: 20
Tx Chain: 2x2 Data Rate: MCS 0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	**53.1**	H	54.0	**-0.9**	AVG	82	2.0	RB 1 MHz; VB: 10 Hz
2484.950	69.7	H	74.0	-4.3	PK	82	2.0	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

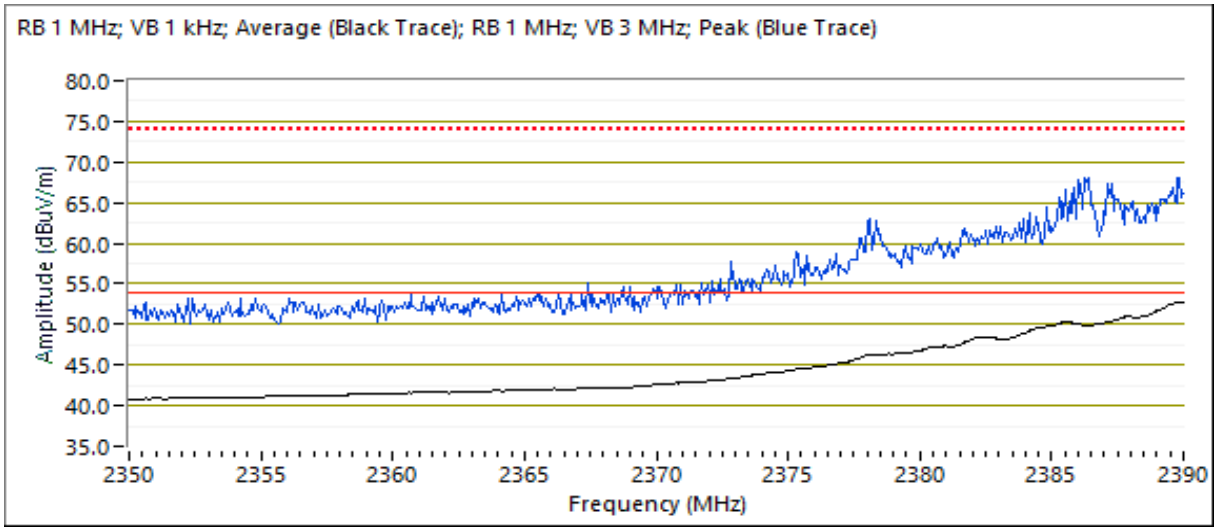
Run #4: Radiated Bandedge Measurements

Date of Test: 12/12/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: -
Test Location: Chamber 7 EUT Voltage: 120 V/60 Hz

Channel: 3 Mode: ac40 Pwr Setting: 17
Tx Chain: 2x2 Data Rate: MCS 0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.820	**53.3**	H	54.0	**-0.7**	VAVG	82	2.0	RB 1 MHz; VB: 1 kHz
2389.990	68.6	H	74.0	-5.4	PK	82	2.0	RB 1 MHz; VB: 3 MHz

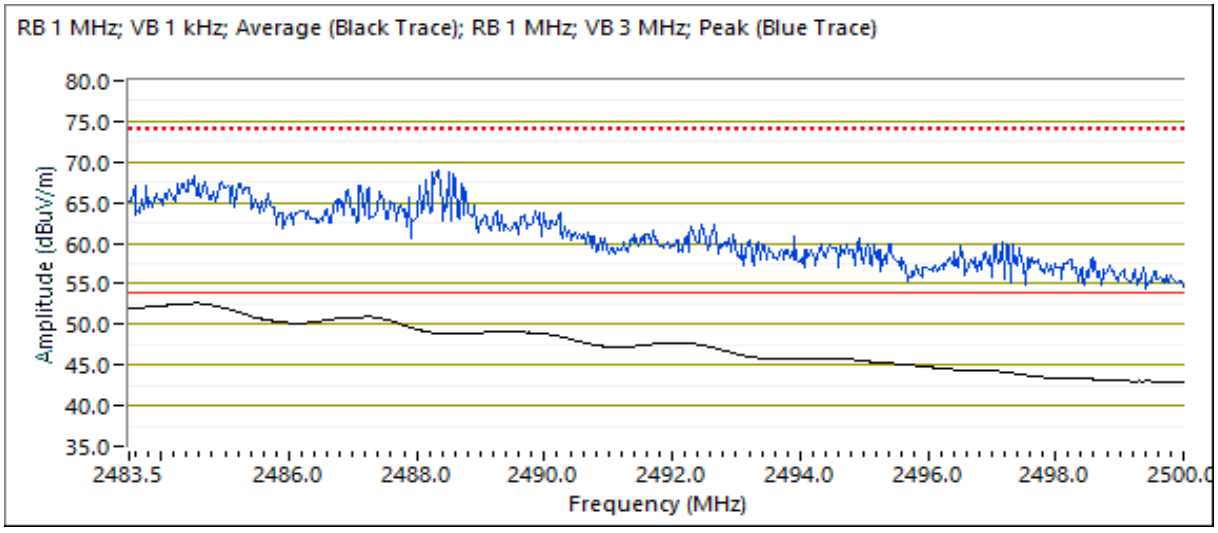


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Channel: 9 Mode: ac40 Pwr Setting: 17
Tx Chain: 2x2 Data Rate: MCS 0

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2484.500	53.0	H	54.0	-1.0	VAVG	246	2.0	RB 1 MHz; VB: 1 kHz
2484.470	68.0	H	74.0	-6.0	PK	246	2.0	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 20-21 °C
Rel. Humidity: 31-33 %

Modifications Made During Testing

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel Frequency	Power Setting	Test Performed	Limit	Result / Margin
1	b	1 2412MHz	17	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	51.4 dBµV/m @ 4824.0 MHz (-2.6 dB)
	b	6 2437MHz	13	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.8 dBµV/m @ 7310.1 MHz (-0.2 dB)
	b	11 2462MHz	13	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	53.5 dBµV/m @ 7386.7 MHz (-0.5 dB)
Scans on center channel in all three OFDM modes to determine the worst case mode.						
2	g	6 2437MHz	16	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	52.5 dBµV/m @ 7307.8 MHz (-1.5 dB)
	ac20	6 2437MHz	17	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	52.4 dBµV/m @ 7307.3 MHz (-1.6 dB)
	ac40	6 2437MHz	17	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	49.7 dBµV/m @ 7309.5 MHz (-4.3 dB)
Measurements on low and high channels in worst-case OFDM mode.						
3	g	1 2412MHz	19	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	61.9 dBµV/m @ 7232.1 MHz (-6.1 dB)
	g	11 2462MHz	16	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	52.3 dBµV/m @ 7388.0 MHz (-1.7 dB)

Sample Notes

Sample S/N: Hub: 000182A5, SOM: 70B651000006
Driver: Wifitest Tool, Ver 1.9.6

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with ANSI C63.10
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear voltage average, auto sweep time, max hold.
2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)	
11b	1 Mbps	99.4%	Yes	8.2	0	0	10	
11g	6 Mbps	98.1%	Yes	2.566	0	0	10	
ac20	MCS 0	98.2%	Yes	2.567	0	0	10	
ac40	MCS 0	94.8%	Yes	1.228	0.2	0.5	814	1 kHz

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has a duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear voltage correction factor
Note 5:	Emission has constatnt duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear voltage average, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 7:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, RMS detector, sweep time auto, max hold. Max hold for 50*(1/DC) traces

* Pwr Cor Factor calculated using 10 X log(1/duty cycle)
** Lin Volt Cor Factor is calculated using 20 x log(1/duty cycle)

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

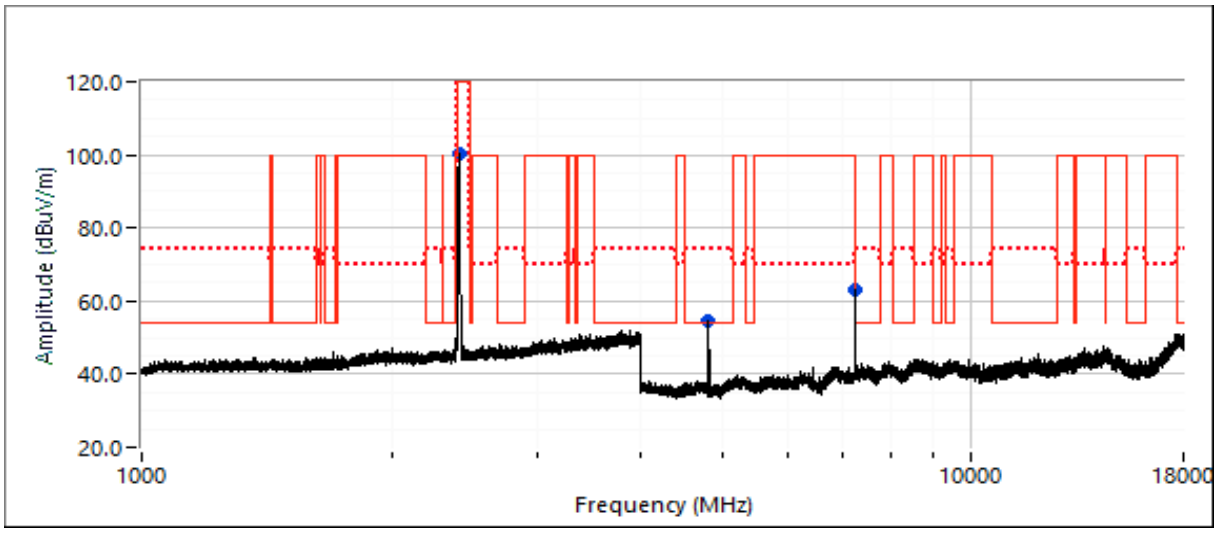
Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: 802.11b

Date of Test: 12/12-13/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: None
Test Location: Chamber 7 EUT Voltage: 120 V/60 Hz

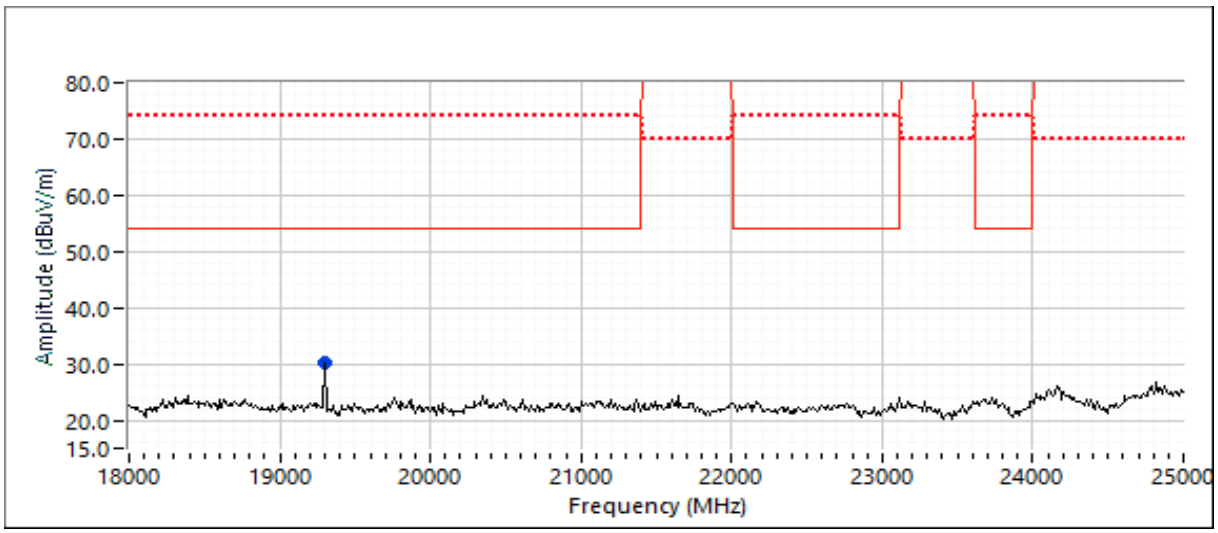
Run #1a: Low Channel

Channel: 1 Mode: b Pwr Setting: 17
Tx Chain: 2x2 Data Rate 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2409.970	97.4	H	N/A	N/A	PK	256	2.2	Peak-RB 100kHz; VB 300kHz
4823.920	36.9	V	54.0	-17.1	AVG	174	1.9	RB 1 MHz; VB: 10 Hz
4823.940	43.4	V	74.0	-30.6	PK	174	1.9	RB 1 MHz; VB: 3 MHz
4823.950	51.4	H	54.0	-2.6	AVG	86	1.8	RB 1 MHz; VB: 10 Hz
4823.810	53.4	H	74.0	-20.6	PK	86	1.8	RB 1 MHz; VB: 3 MHz
7235.410	61.6	V	67.4	-5.8	PK	175	1.9	RB 100kHz; VB 300kHz
7235.370	62.8	H	67.4	-4.6	PK	84	1.8	RB 100kHz; VB 300kHz
19295.670	35.7	V	54.0	-18.3	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19314.600	47.3	V	74.0	-26.7	PK	106	1.9	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

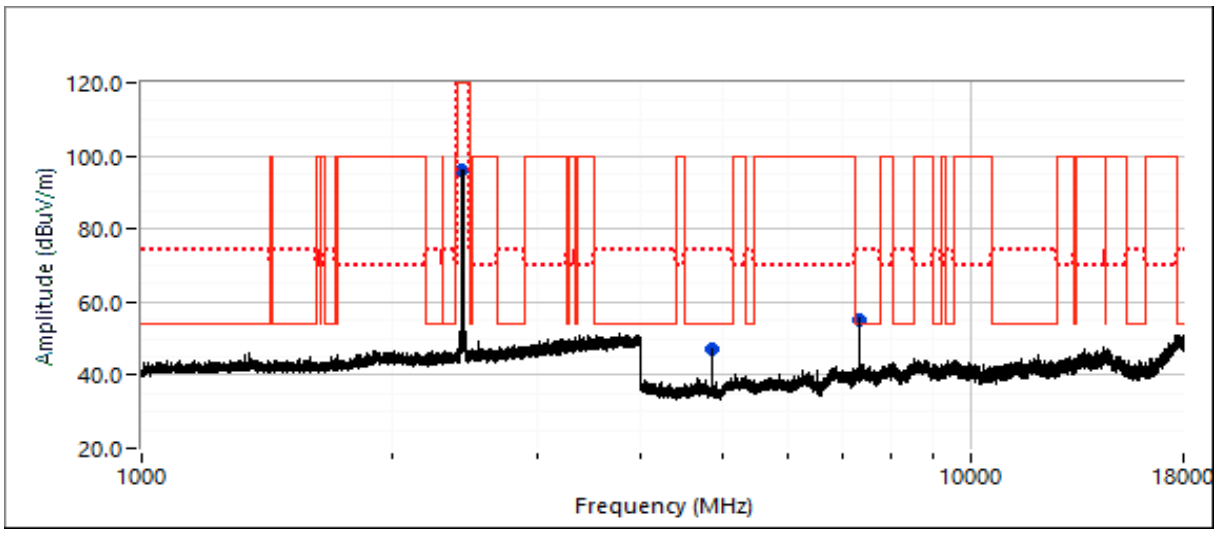
Run #1b: Center Channel

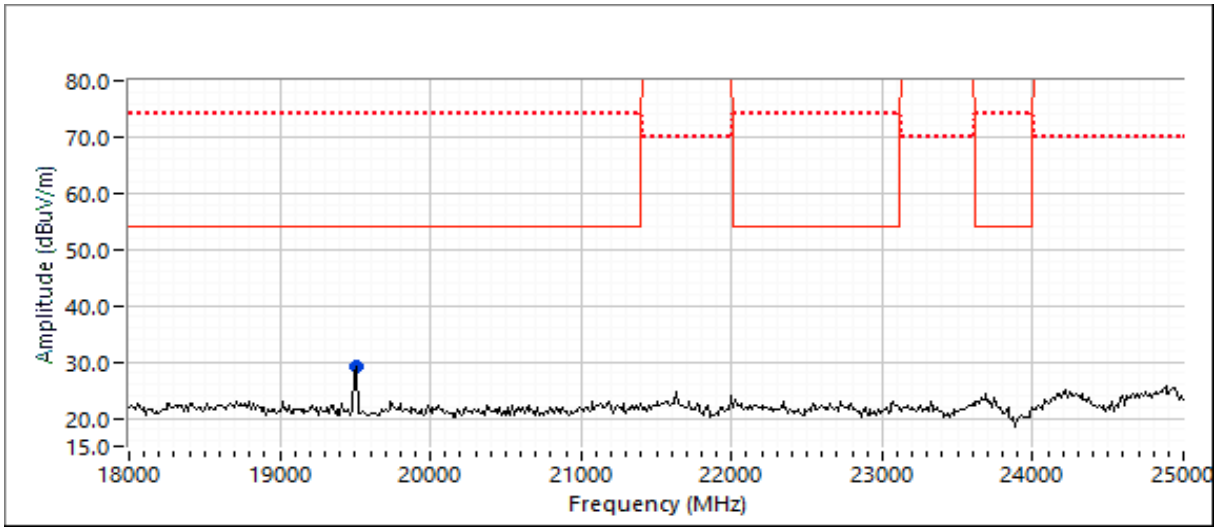
Channel: 6 Mode: b Pwr Setting: 13
Tx Chain: 2x2 Data Rate 1Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.920	44.8	H	54.0	-9.2	AVG	85	1.9	RB 1 MHz; VB: 10 Hz
4873.900	48.2	H	74.0	-25.8	PK	85	1.9	RB 1 MHz; VB: 3 MHz
7311.690	52.1	H	54.0	-1.9	AVG	70	1.7	RB 1 MHz; VB: 10 Hz
7311.220	56.3	H	74.0	-17.7	PK	70	1.7	RB 1 MHz; VB: 3 MHz
7310.100	53.8	V	54.0	-0.2	AVG	172	1.8	RB 1 MHz; VB: 10 Hz
7311.450	57.7	V	74.0	-16.3	PK	172	1.8	RB 1 MHz; VB: 3 MHz
19495.730	35.4	V	54.0	-18.6	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19517.670	46.4	V	74.0	-27.6	PK	106	1.9	RB 1 MHz; VB: 3 MHz

Note:	Scans made between 18 - 25 GHz with the measurement antenna moved around the EUT and its antennas 30cm from the device indicated there were no significant emissions in this frequency range

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



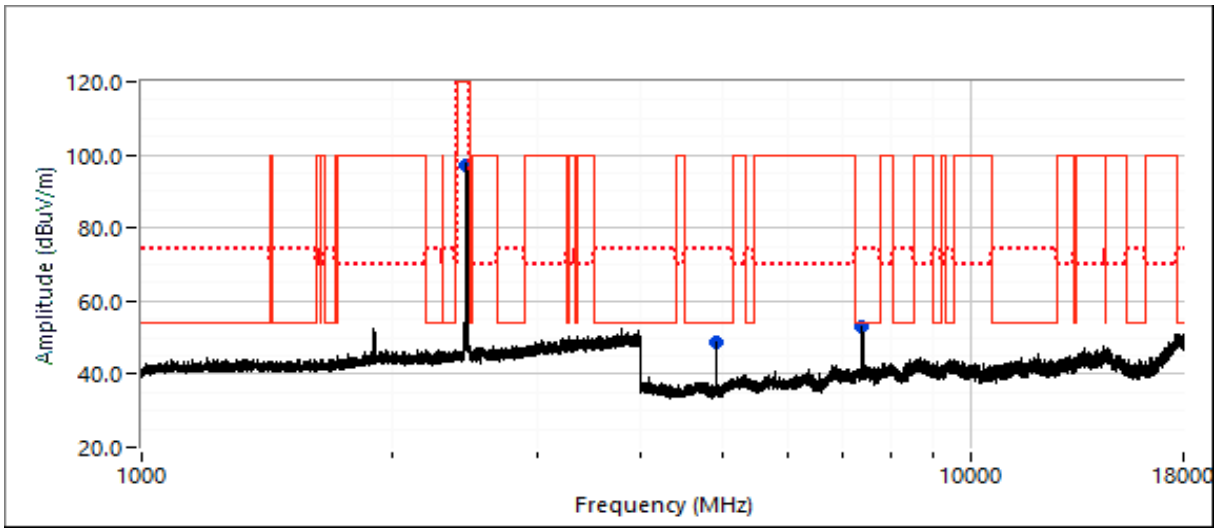


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

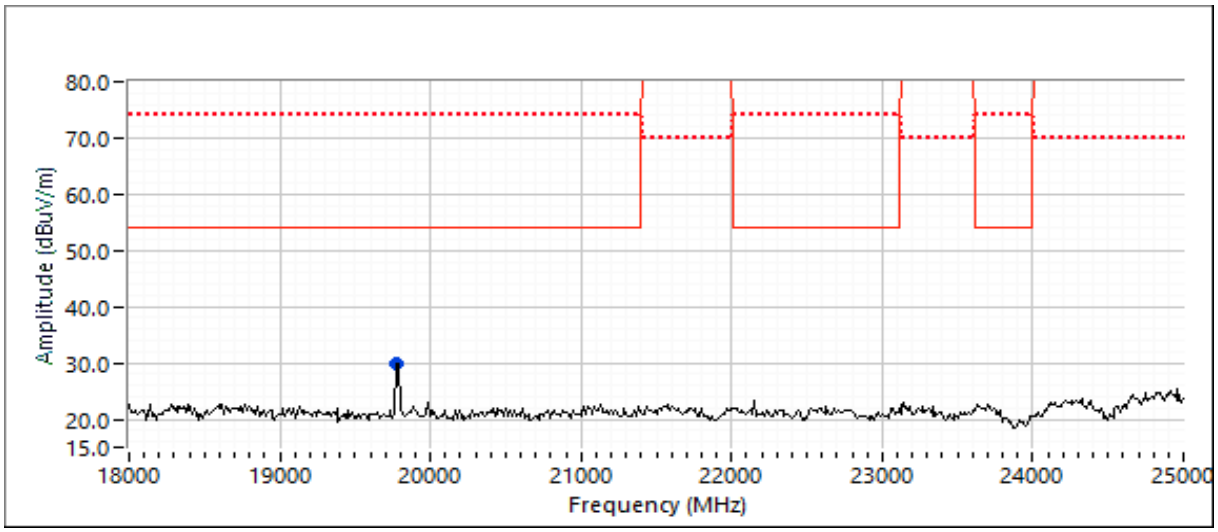
Run #1c: High Channel

Channel: 11 Mode: b Pwr Setting: 13
Tx Chain: 2x2 Data Rate 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
7386.680	53.5	V	54.0	-0.5	AVG	127	2.5	RB 1 MHz; VB: 10 Hz
7385.030	57.3	V	74.0	-16.7	PK	127	2.5	RB 1 MHz; VB: 3 MHz
4923.940	44.2	V	54.0	-9.8	AVG	94	2.4	RB 1 MHz; VB: 10 Hz
4923.890	47.9	V	74.0	-26.1	PK	94	2.4	RB 1 MHz; VB: 3 MHz
19793.130	35.5	V	54.0	-18.5	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19774.530	47.3	V	74.0	-26.7	PK	106	1.9	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #2: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: OFDM

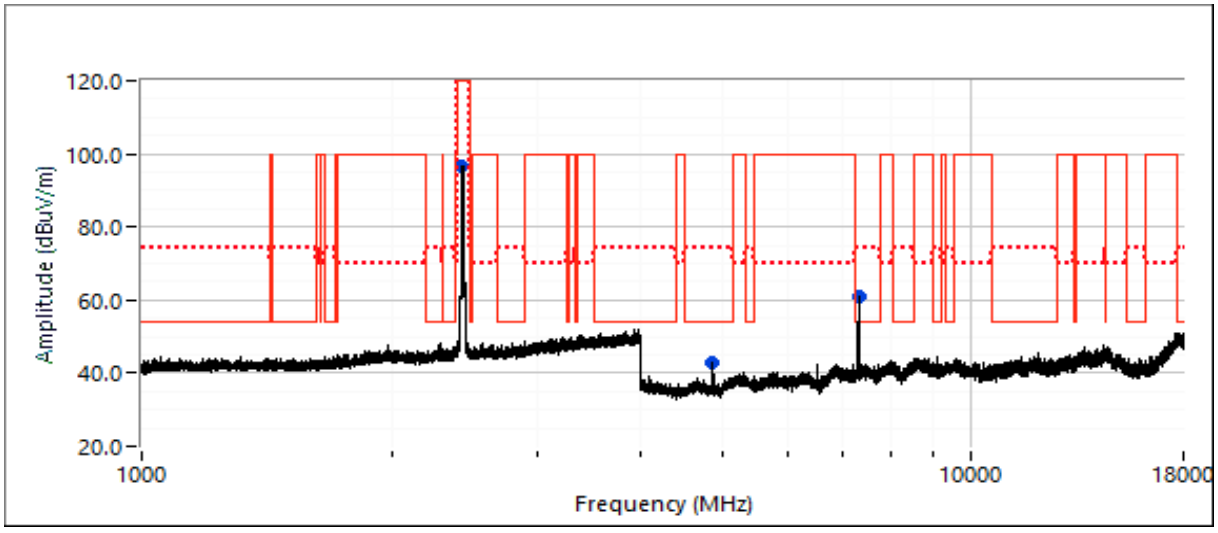
Date of Test: 12/12/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: None
Test Location: Fremont Chamber #7 EUT Voltage: 120V/60Hz

Run #2a: Center Channel

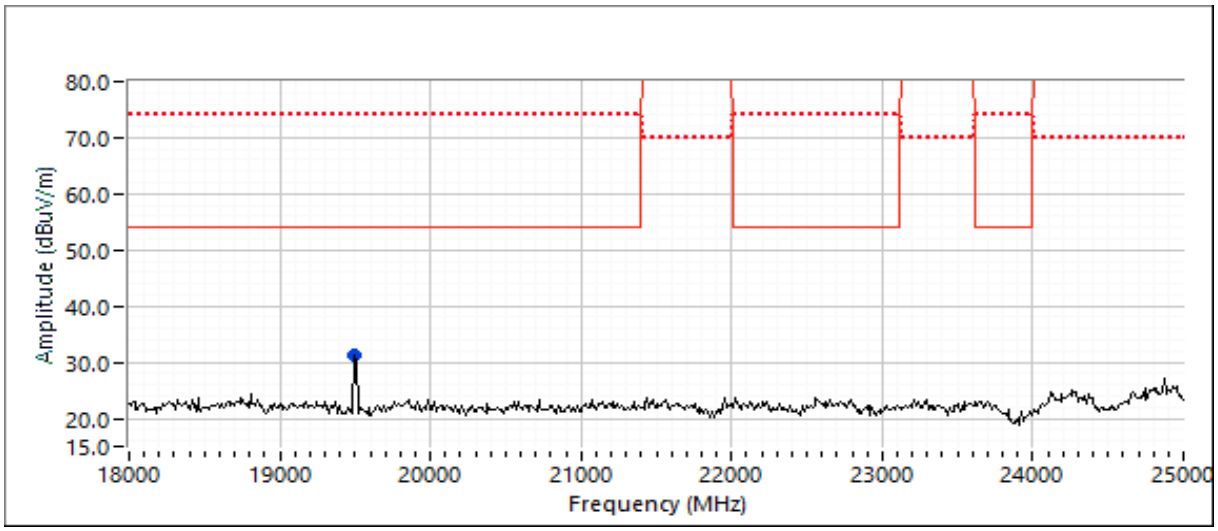
Channel: 6 Mode: g Pwr Setting: 16
Tx Chain: 2x2 Data Rate: 6 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4875.130	38.7	V	54.0	-15.3	AVG	39	2.0	RB 1 MHz; VB: 10 Hz
4874.530	51.2	V	74.0	-22.8	PK	39	2.0	RB 1 MHz; VB: 3 MHz
7307.800	52.5	V	54.0	-1.5	AVG	168	1.8	RB 1 MHz; VB: 10 Hz
7306.600	64.9	V	74.0	-9.1	PK	168	1.8	RB 1 MHz; VB: 3 MHz
7309.400	52.3	H	54.0	-1.7	AVG	202	1.7	RB 1 MHz; VB: 10 Hz
7308.800	66.4	H	74.0	-7.6	PK	202	1.7	RB 1 MHz; VB: 3 MHz
19495.800	35.2	V	54.0	-18.8	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19476.930	46.5	V	74.0	-27.5	PK	106	1.9	RB 1 MHz; VB: 3 MHz

Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the EUT and its antennas 30cm from the device indicated there were no significant emissions in this frequency range



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

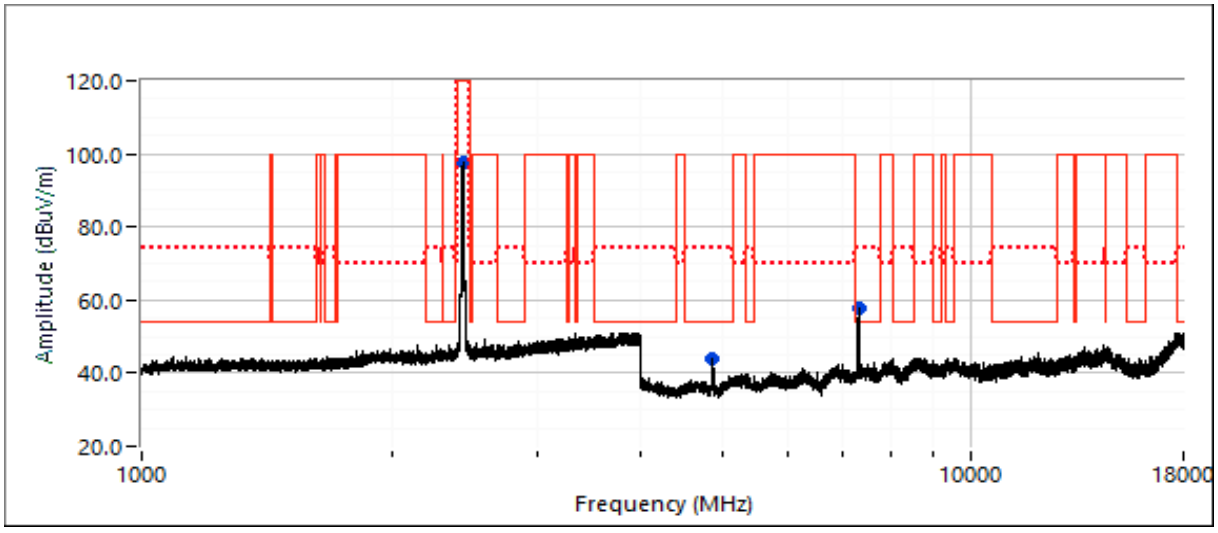


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

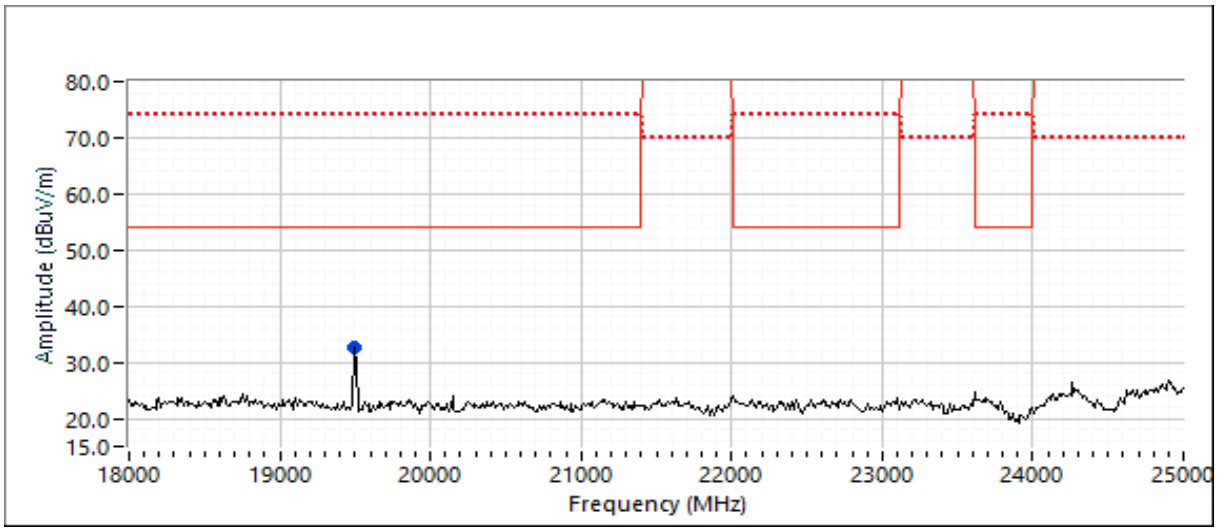
Run #2b: Center Channel

Channel: 6 Mode: ac20 Pwr Setting: 17
Tx Chain: 2x2 Data Rate: MCS 0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.600	37.0	V	54.0	-17.0	AVG	38	2.3	RB 1 MHz; VB: 10 Hz
4874.530	49.2	V	74.0	-24.8	PK	38	2.3	RB 1 MHz; VB: 3 MHz
7307.270	52.4	V	54.0	-1.6	AVG	132	2.2	RB 1 MHz; VB: 10 Hz
7307.270	65.9	V	74.0	-8.1	PK	132	2.2	RB 1 MHz; VB: 3 MHz
7307.270	50.4	H	54.0	-3.6	AVG	246	2.2	RB 1 MHz; VB: 10 Hz
7316.800	63.3	H	74.0	-10.7	PK	246	2.2	RB 1 MHz; VB: 3 MHz
19495.800	35.2	V	54.0	-18.8	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19479.800	46.5	V	74.0	-27.5	PK	106	1.9	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

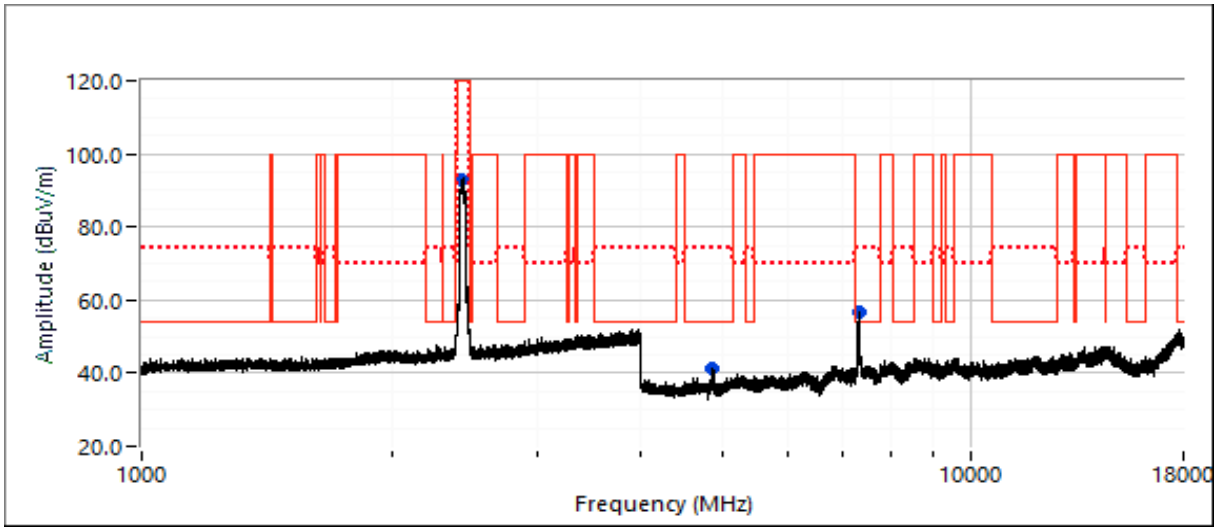


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

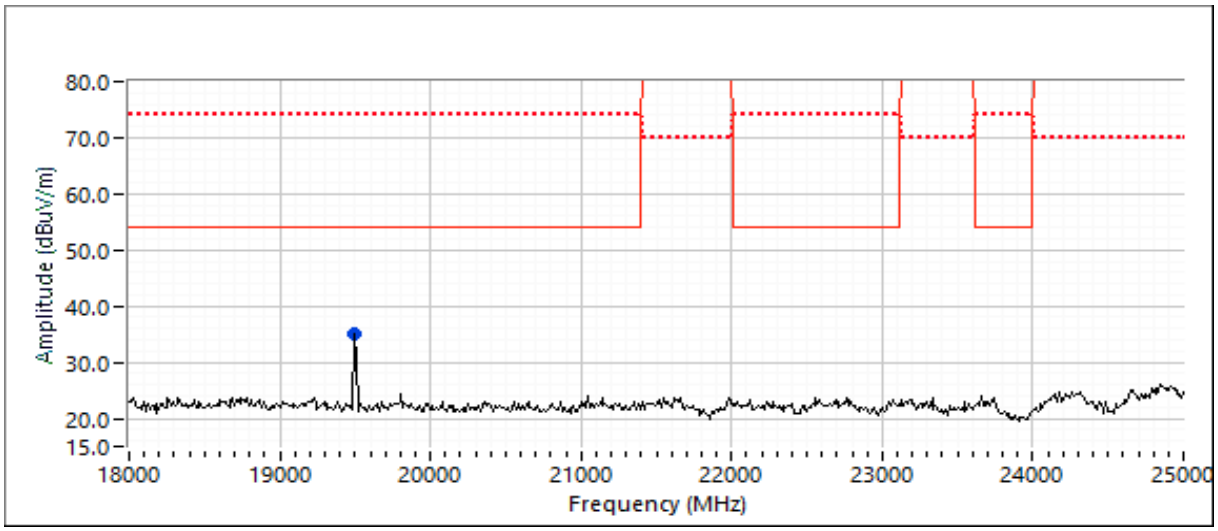
Run #2c: Center Channel

Channel: 6 Mode: ac40 Pwr Setting: 17
Tx Chain: 2x2 Data Rate: MCS 0

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2435.990	92.5	H	N/A	N/A	PK	235	1.9	Peak-RB 100kHz; VB 300kHz
4874.460	35.4	V	54.0	-18.6	VAVG	38	2.1	RB 1MHz; VB 1kHz
4874.100	48.8	V	74.0	-25.2	PK	38	2.1	RB 1MHz; VB 3MHz
7309.500	49.7	V	54.0	-4.3	VAVG	126	2.2	RB 1MHz; VB 1kHz
7310.810	61.4	V	74.0	-12.6	PK	126	2.2	RB 1MHz; VB 3MHz
7311.020	47.5	H	54.0	-6.5	VAVG	248	2.0	RB 1MHz; VB 1kHz
7312.110	60.4	H	74.0	-13.6	PK	248	2.0	RB 1MHz; VB 3MHz
19495.730	35.8	V	54.0	-18.2	VAVG	106	1.9	RB 1MHz; VB 1kHz
19487.530	46.3	V	74.0	-27.7	PK	106	1.9	RB 1MHz; VB 3MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

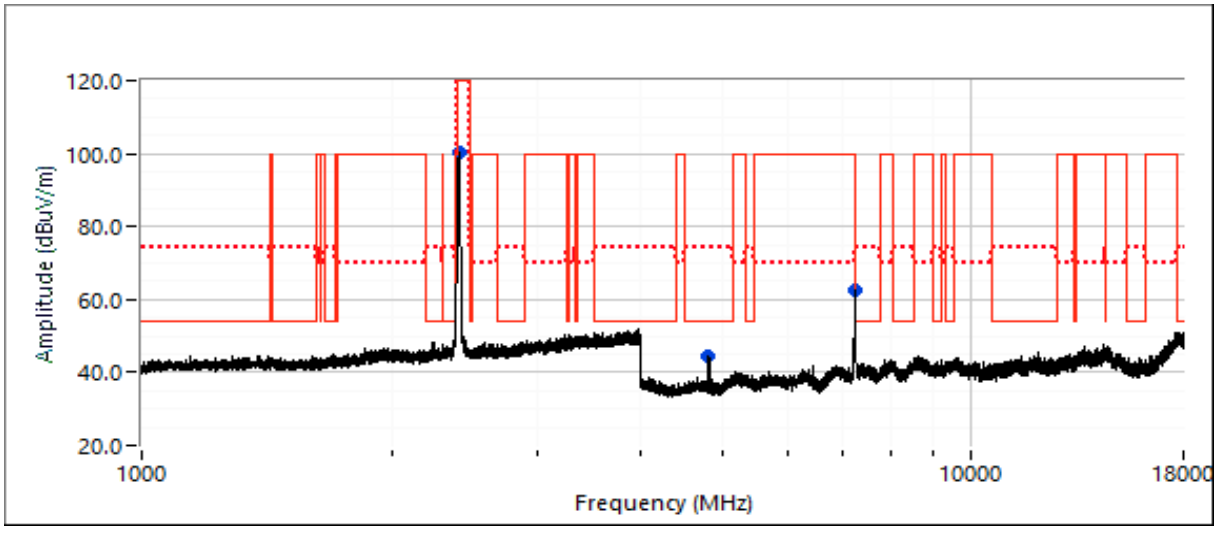
Run #3: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: Worse case from Run #2

Date of Test: 12/13/2022 Config. Used: 1
Test Engineer: M. Birgani Config Change: -
Test Location: Chamber 7 EUT Voltage: 120V/ 60Hz

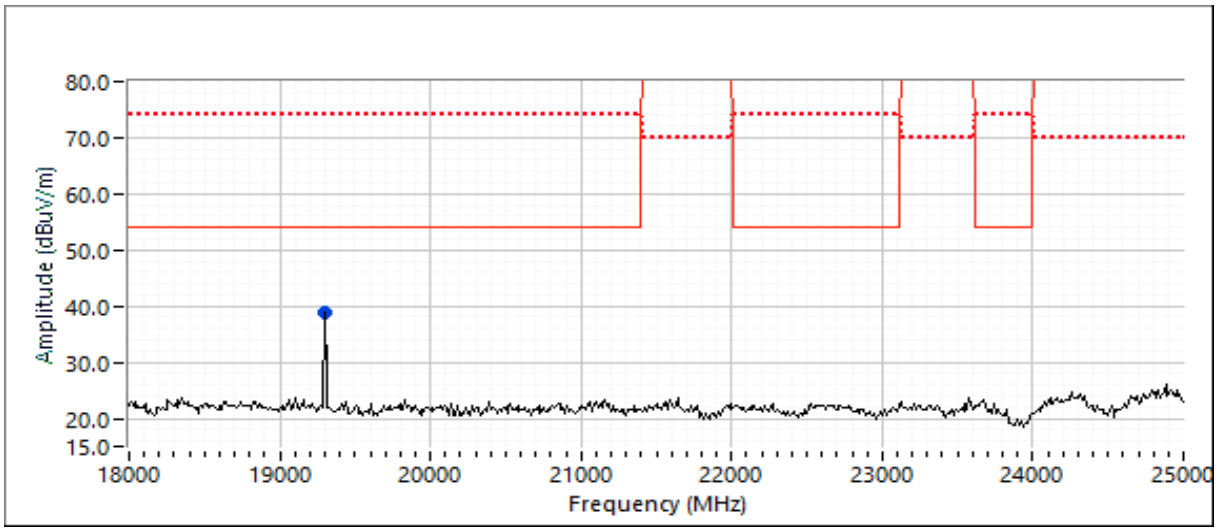
Run #3a: Low Channel

Channel: 1 Mode: g Pwr Setting: 19
Tx Chain: 2x2 Data Rate: 6 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2409.460	98.0	H	N/A	N/A	PK	98	1.6	RB 100kHz; VB 300kHz
4824.940	38.8	V	54.0	-15.2	AVG	41	2.1	RB 1 MHz; VB: 10 Hz
4824.980	51.0	V	74.0	-23.0	PK	41	2.1	RB 1 MHz; VB: 3 MHz
7232.050	61.9	V	68.0	-6.1	PK	176	1.9	RB 100 kHz; VB: 300 kHz
7234.370	60.0	H	68.0	-8.0	PK	78	1.9	RB 100 kHz; VB: 300 kHz
19295.670	35.5	V	54.0	-18.5	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19293.530	48.4	V	74.0	-25.6	PK	106	1.9	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

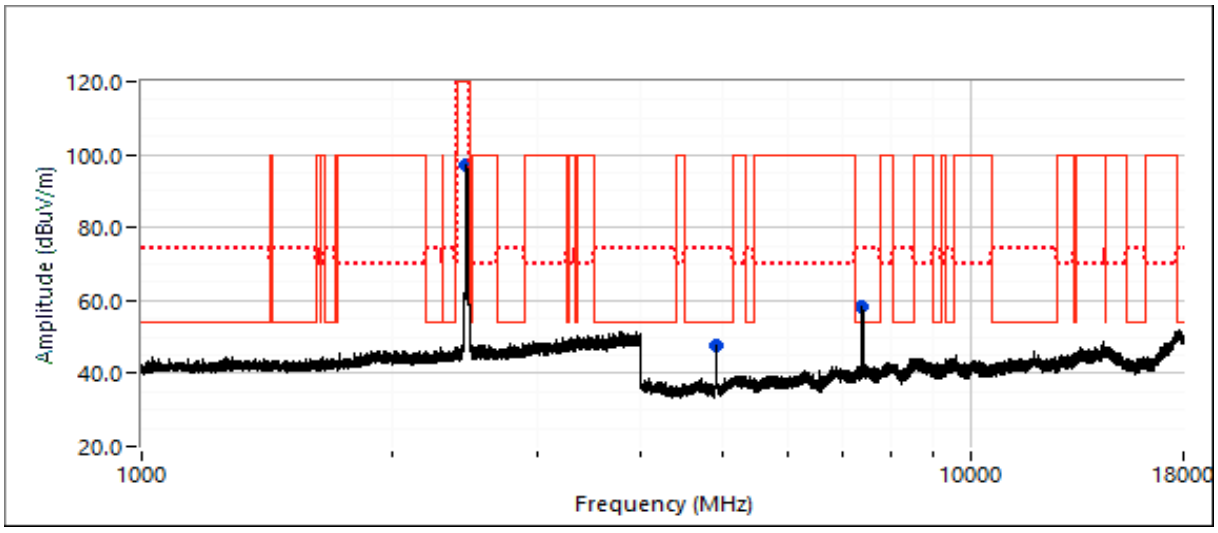


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

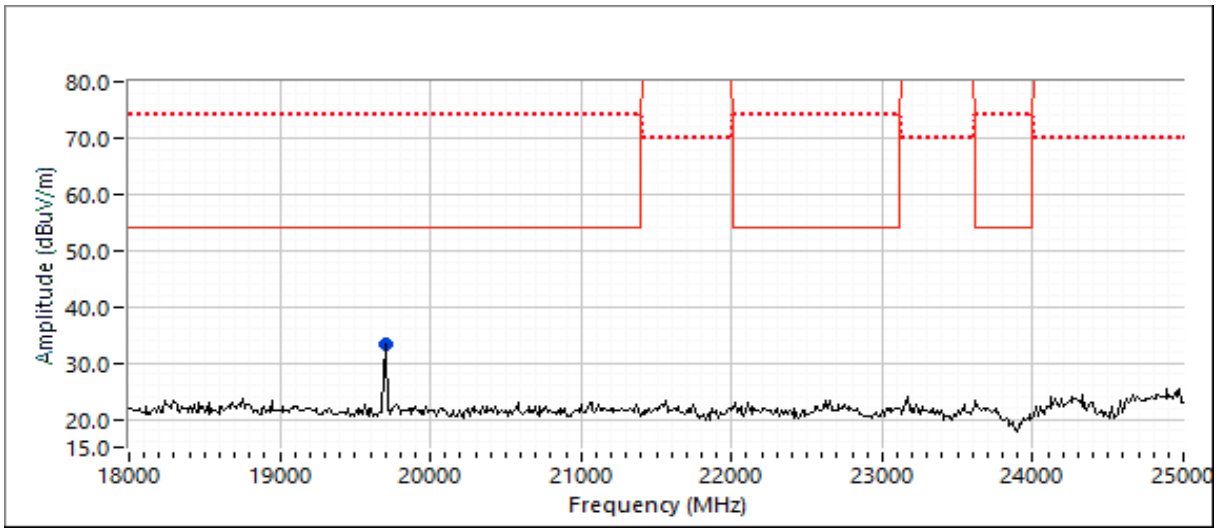
Run #3b: High Channel

Channel: 11 Mode: g Pwr Setting: 16
Tx Chain: 2x2 Data Rate: 6 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4925.150	40.8	V	54.0	-13.2	AVG	38	2.3	RB 1 MHz; VB: 10 Hz
4925.810	53.1	V	74.0	-20.9	PK	38	2.3	RB 1 MHz; VB: 3 MHz
7386.420	51.6	H	54.0	-2.4	AVG	205	1.9	RB 1 MHz; VB: 10 Hz
7388.100	63.5	H	74.0	-10.5	PK	205	1.9	RB 1 MHz; VB: 3 MHz
7387.980	52.3	V	54.0	-1.7	AVG	132	2.5	RB 1 MHz; VB: 10 Hz
7386.570	63.9	V	74.0	-10.1	PK	132	2.5	RB 1 MHz; VB: 3 MHz
19695.730	36.0	V	54.0	-18.0	AVG	106	1.9	RB 1 MHz; VB: 10 Hz
19708.200	48.1	V	74.0	-25.9	PK	106	1.9	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-

Radiated Emissions

(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform engineering evaluation testing of the EUT with respect to the specification listed above.

Date of Test: 12/16/2022
Test Engineer: M. Birgani
Test Location: Chamber 7

Config. Used: 1
Config Change: -
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.
The test distance and extrapolation factor (if applicable) are detailed under each run description.
Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 19-20 °C
Rel. Humidity: 38-40 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
2	Radiated Emissions 30 - 1000 MHz, Ch 1	FCC §15.209	Pass	36.3 dBµV/m @ 34.33 MHz (-3.7 dB)
	Radiated Emissions 30 - 1000 MHz, Ch 165	FCC §15.209	Pass	36.2 dBµV/m @ 34.87 MHz (-3.8 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

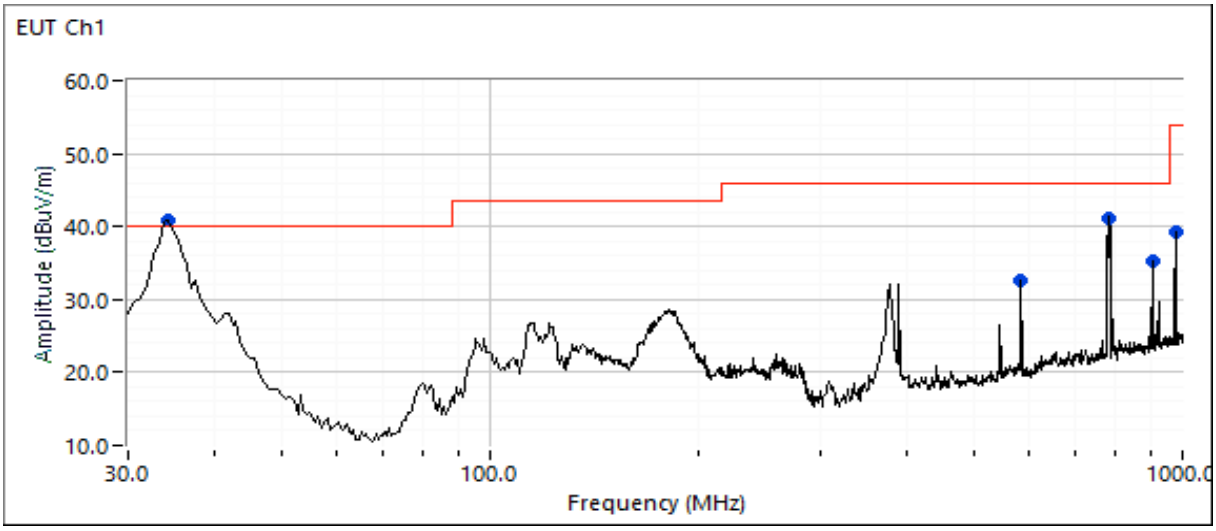
Sample S/N: Hub: 000182A5, SOM: 70B651000006
Driver: Wifitest Tool, Ver 1.9.6

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

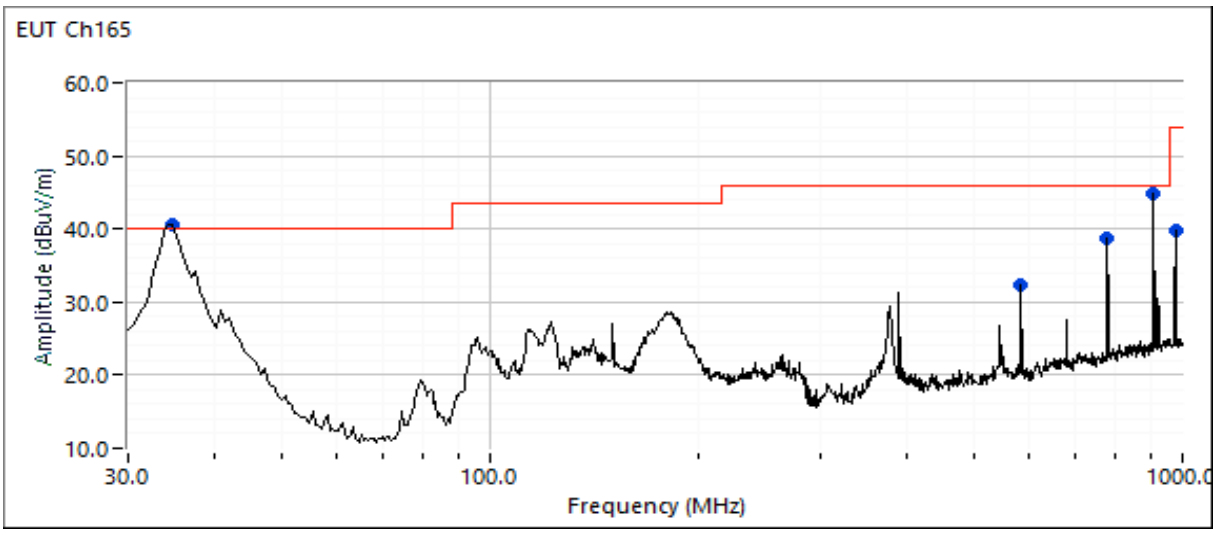
Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-

Run #1: Radiated Emissions, 30 - 1000 MHz

EUT operating in 2.4 GHz band @ Power Setting: 21 in 2x2 MIMO



EUT operating in 5.8 GHz band @ Power Setting: 21 in 2x2 MIMO



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-

Run #1: Radiated Emissions, 30 - 1000 MHz

Preliminary peak readings captured during pre-scan

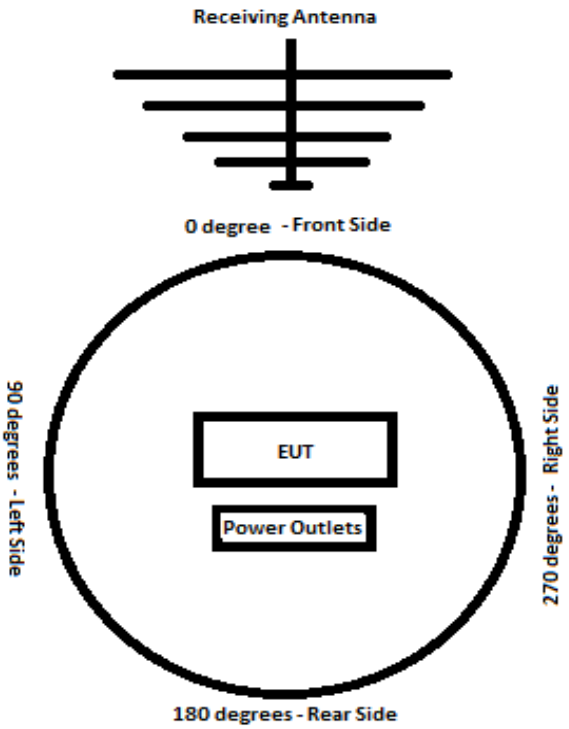
Frequency	Level	Pol	FCC §15.209		Detector	Azimuth	Height	Comments	
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		Channel
34.329	*40.9*	*V*	*40.0*	*0.9*	*Peak*	*31*	*1.0*		*1*
584.770	*32.5*	*V*	*46.0*	*-13.5*	*Peak*	*241*	*1.5*		*1*
783.968	*41.2*	*V*	*46.0*	*-4.8*	*Peak*	*277*	*1.5*		*1*
907.415	*35.2*	*V*	*46.0*	*-10.8*	*Peak*	*233*	*1.0*	*Cellphone Ambient*	*1*
976.152	*39.2*	*V*	*54.0*	*-14.8*	*Peak*	*52*	*1.0*		*1*
34.870	*40.6*	*V*	*40.0*	*0.6*	*Peak*	*340*	*1.0*		165
584.770	*32.4*	*V*	*46.0*	*-13.6*	*Peak*	*162*	*1.5*		165
779.760	*38.8*	*V*	*46.0*	*-7.2*	*Peak*	*36*	*2.0*		165
908.818	*44.8*	*V*	*46.0*	*-1.2*	*Peak*	*307*	*1.0*	*Cellphone Ambient*	165
976.152	*39.7*	*V*	*54.0*	*-14.3*	*Peak*	*56*	*1.0*		165

Run #2: Maximized Readings From Run #1

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol			Detector	Azimuth	Height	Comments	
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		Channel
34.329	36.3	V	40.0	-3.7	QP	32	1.0	QP (1.00s)	1
584.986	32.7	V	46.0	-13.3	QP	238	1.5	QP (1.00s)	1
779.987	37.7	V	46.0	-8.3	QP	293	1.4	QP (1.00s)	1
974.982	39.3	V	54.0	-14.7	QP	52	1.0	QP (1.00s)	1
34.870	36.2	V	40.0	-3.8	QP	360	1.0	QP (1.00s)	165
584.992	32.4	V	46.0	-13.6	QP	162	1.5	QP (1.00s)	165
779.987	38.9	V	46.0	-7.1	QP	36	2.0	QP (1.00s)	165
974.990	39.1	V	54.0	-14.9	QP	56	1.0	QP (1.00s)	165

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Antenna Port Measurements
MIMO and Smart Antenna Systems
Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/19/2022
Test Engineer: David Bare
Test Location: Fremont Chamber #2
Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain at a time.
All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 36 %

Summary of Results

Run #			Test Performed	Limit	Pass / Fail	Result / Margin
1			Output Power	15.247(b)	Pass	b: 21.2 dBm g: 21.9 dBm ac20: 19.2 dBm ac40: 19.1 dBm
2			Power spectral Density (PSD)	15.247(d)	Pass	b: -9.9 dBm/3kHz g: -7.0 dBm/3kHz ac20: -8.3 dBm/3kHz ac40: -9.1 dBm/3kHz
3			Minimum 6dB Bandwidth	15.247(a)	Pass	b: 8.08 MHz g: 15.07 MHz ac20: 15.04 MHz ac40: 35.06 MHz
3			99% Bandwidth	RSS GEN	Pass	b: 13.416 g: 16.574 ac20: 17.564 ac40: 36.308 MHz
4			Spurious emissions	15.247(b)	Pass	-30.2 dBc

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Procedure Comments:

Measurements performed in accordance with ANSI C63.10

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1 Mbps	99.4%	Yes	8.2	0	0	10
11g	6 Mbps	98.1%	Yes	2.566	0.0	0.0	10
n20	MCS 0	98.2%	Yes	2.567	0	0	10
n40	MCS 0	94.8%	Yes	1.228	0.2	0.5	814

Sample Notes

Sample S/N: Hub: 000182A5, SOM: 70B651000006
Driver: Wifitest Tool, Ver 1.9.6

Antenna Gain Information

Freq	Antenna Gain (dBi) / Chain				BF	MultiChain Legacy	CDD	Sectorized / Xpol	Dir G (PWR)	Dir G (PSD)
	1	2	3	4						
2450	2.5	2.5			No	Yes	Yes	No	2.5	5.5

For devices that support CDD modes

Min # of spatial streams: 1
Max # of spatial streams: 2

Notes:	BF = beamforming mode supported, Multichain Legacy = 802.11 legacy data rates supported for multichain transmissions, CDD = Cyclic Delay Diversity (or Cyclic Shift Diversity) modes supported, Sectorized / Xpol = antennas are sectorized or cross polarized
Notes:	Dir G (PWR) = total gain (Gant + Array Gain) for power calculations; Dir G (PSD) = total gain for PSD calculations based on FCC KDB 662911. Depending on the modes supported, the Array Gain value for power could be different from the PSD value.
Notes:	Array gain for power/psd calculated per KDB 662911 D01, v01r02.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #1: Output Power

Operating Mode: 802.11b
Directional Gain (dBi): 2.5

Max EIRP (mW): 232.45484

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	
2412	1	17	17.1	51.3	130.7	21.2	0.131	30.0	Pass	
	3			0.0						
	4			0.0						
	2		19.0	79.4						
2437	1	13	13.0	20.0	51.6	17.1				
	3			0.0						
	4			0.0						
	2		15.0	31.6						
2462	1	13	12.7	18.6	50.2	17.0				
	3			0.0						
	4			0.0						
	2		15.0	31.6						

Operating Mode: 802.11g
Directional Gain (dBi): 2.5

Max EIRP (mW): 276.10938

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	
2412	1	19	17.6	57.5	155.3	21.9	0.155	30.0	Pass	
	3			0.0						
	4			0.0						
	2		19.9	97.7						
2437	1	16	14.9	30.9	82.2	19.1				
	3			0.0						
	4			0.0						
	2		17.1	51.3						
2462	1	16	14.8	30.2	80.3	19.0				
	3			0.0						
	4			0.0						
	2		17.0	50.1						

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Operating Mode: 802.11ac20
Directional Gain (dBi): 2.5

Max EIRP (mW): 148.27952

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	
2412	1	17	14.9	30.9	83.4	19.2	0.083	30.0	Pass	
	3			0.0						
	4			0.0						
	2		17.2	52.5						
2437	1	17	14.7	29.5	80.8	19.1				
	3			0.0						
	4			0.0						
	2		17.1	51.3						
2462	1	17	14.5	28.2	78.3	18.9				
	3			0.0						
	4			0.0						
	2		17.0	50.1						

Operating Mode: 802.11ac40
Directional Gain (dBi): 2.5

Max EIRP (mW): 144.90426

Frequency (MHz)	Chain	Software Setting	Power[1] dBm	Power[1] mW	Total mW	Total dBm	Max Power (W)	Limit dBm	Result	
2422	1	17	14.8	30.2	81.5	19.1	0.081	30.0	Pass	
	3			0.0						
	4			0.0						
	2		17.1	51.3						
2437	1	17	14.7	29.5	79.6	19.0				
	3			0.0						
	4			0.0						
	2		17.0	50.1						
2452	1	17	14.6	28.8	77.8	18.9				
	3			0.0						
	4			0.0						
	2		16.9	49.0						

Note 1:	Output power measured using gated average power meter. (option AVGPM-G in ANSI C63.10). Spurious limit becomes -30dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #2: Power spectral Density

Mode: 11b

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 2					Limit dBm/3kHz	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
17	2412	-14.4	-11.8			-9.9	2.5	Pass
13	2437	-16.9	-11.7			-10.6	2.5	Pass
13	2462	-17.2	-15.5			-13.3	2.5	Pass

Mode: 11g

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
19	2412	-9.4	-10.8			-7.0	2.5	Pass
16	2437	-11.6	-12.1			-8.8	2.5	Pass
16	2462	-12.0	-12.8			-9.4	2.5	Pass

Mode: ac20

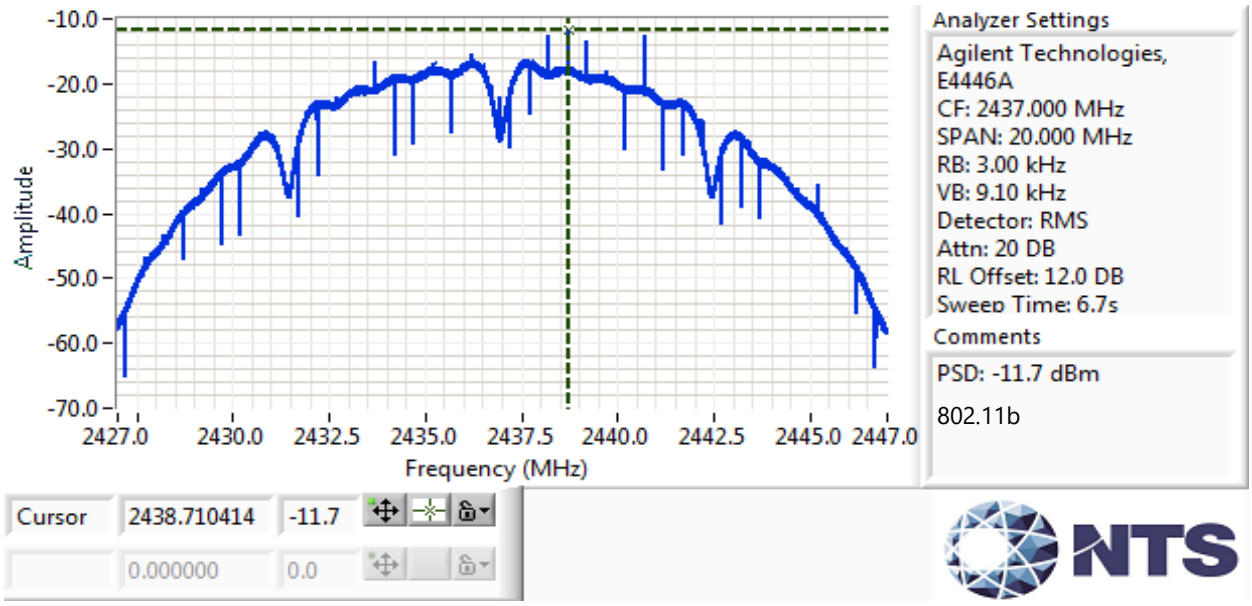
Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
17	2412	-12.5	-10.3			-8.3	2.5	Pass
17	2437	-12.2	-11.8			-9.0	2.5	Pass
17	2462	-12.3	-12.4			-9.3	2.5	Pass

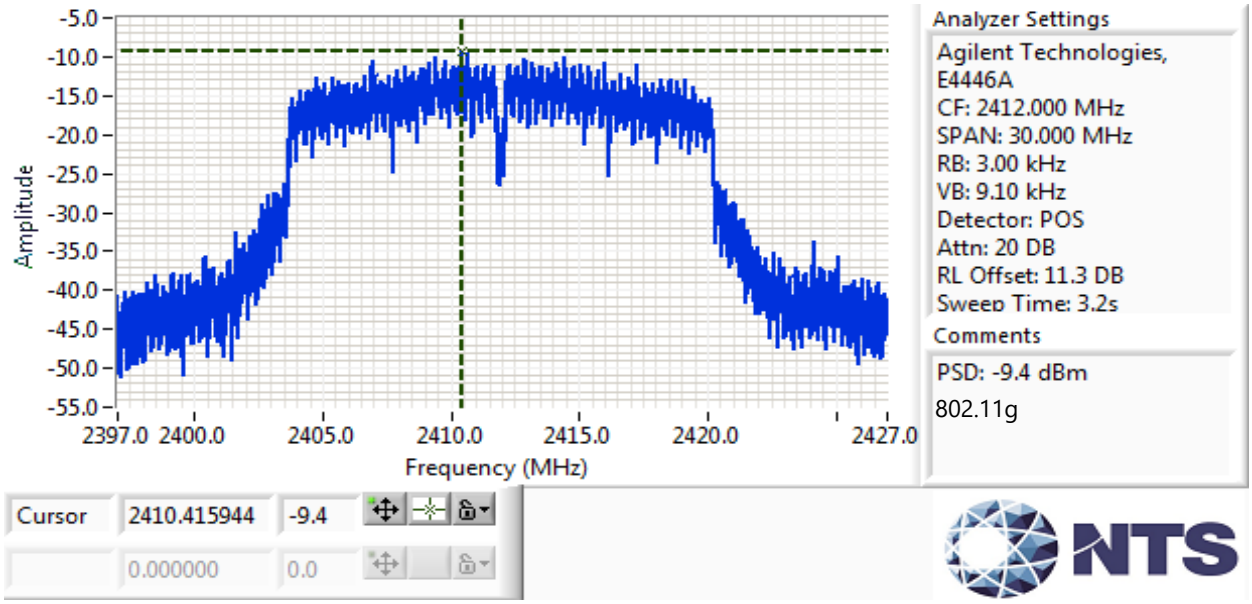
Mode: ac40

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
17	2422	-13.0	-11.5			-9.2	2.5	Pass
17	2437	-12.6	-11.8			-9.2	2.5	Pass
17	2452	-12.6	-11.7			-9.1	2.5	Pass

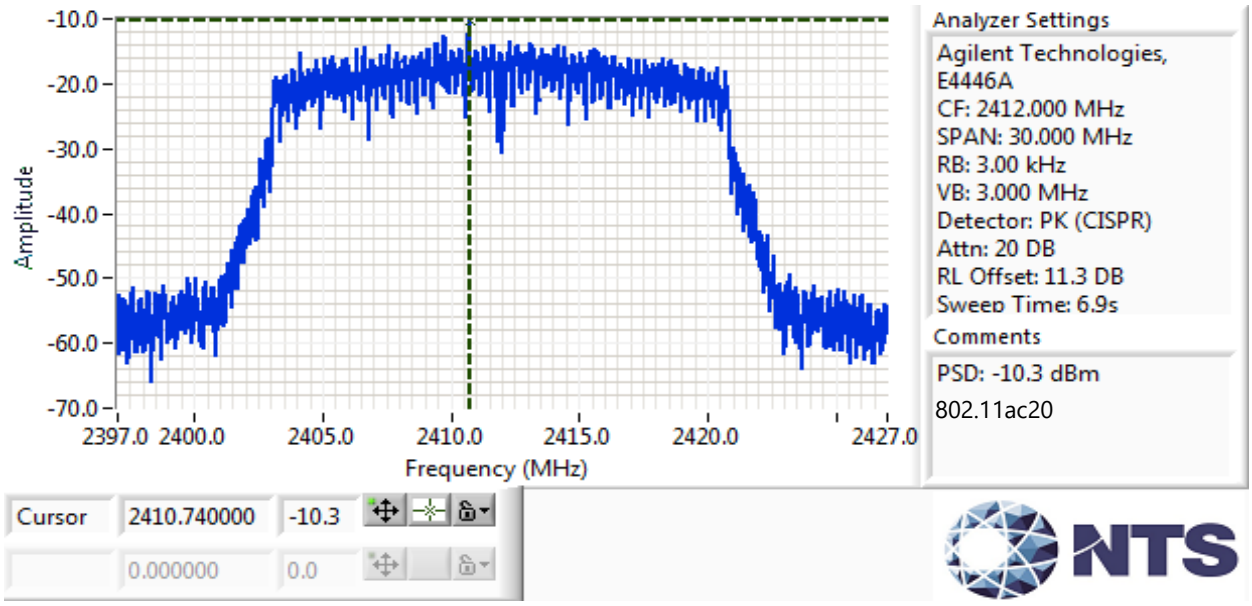
Note 1:	Test performed per method PKSPD, in KDB 558074. Power spectral density measured using: 3kHz ≤ RBW ≤ 100kHz, VBW=3*RBW, peak detector, span = 1.5*DTS BW, auto sweep time, max hold.
Note 2:	Test performed per method AVGPSD-1 in KDB 558074. Power spectral density measured using: 3kHz ≤ RBW ≤ 100kHz, VBW=3*RBW, RMS detector, span = 1.5*DTS BW, auto sweep time, 100 trace averages.

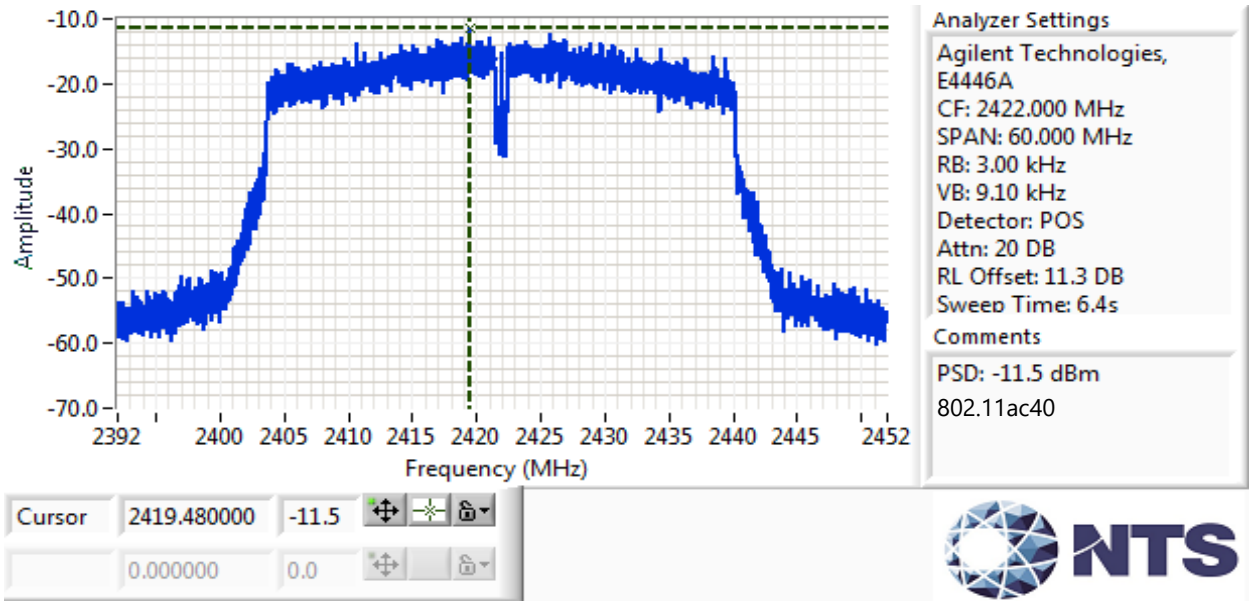
Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A





Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A





Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #3: Signal Bandwidth

Mode: 11b

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
17	2412	8.080	13.326	0.1	0.3
13	2437	9.070	13.316	0.1	0.3
13	2462	9.030	13.416	0.1	0.3

Mode: 11g

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
19	2412	15.070	16.574	0.1	0.3
16	2437	15.100	16.524	0.1	0.3
16	2462	15.110	16.455	0.1	0.3

Mode: ac20

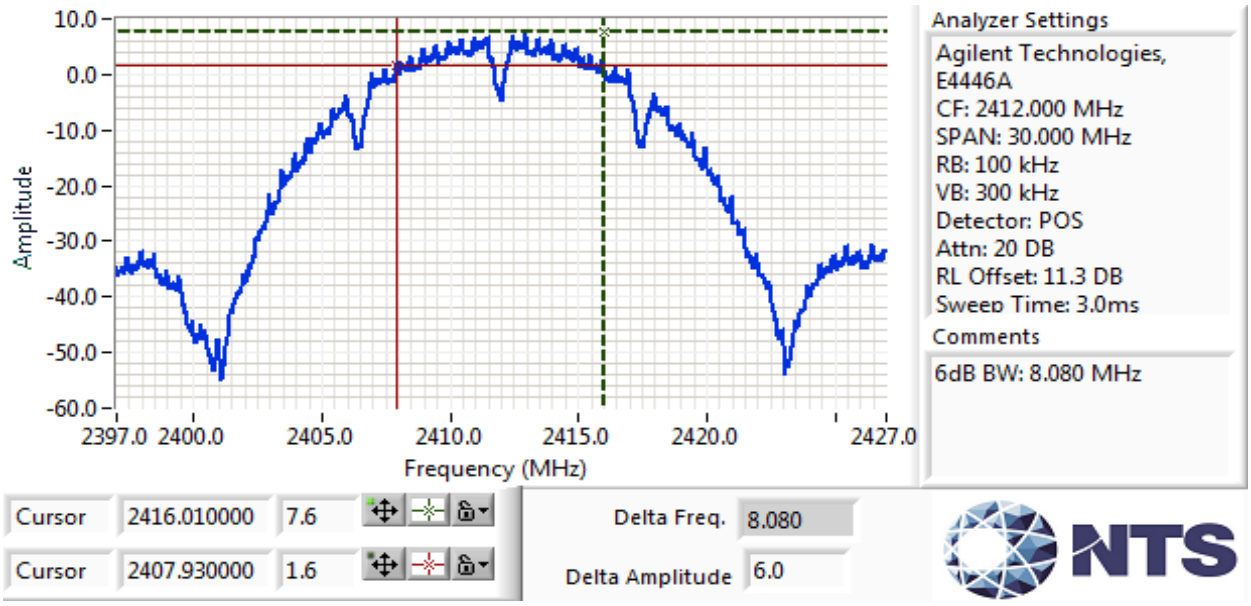
Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
17	2412	16.290	17.554	0.1	0.3
17	2437	15.040	17.554	0.1	0.3
17	2462	15.700	17.564	0.1	0.3

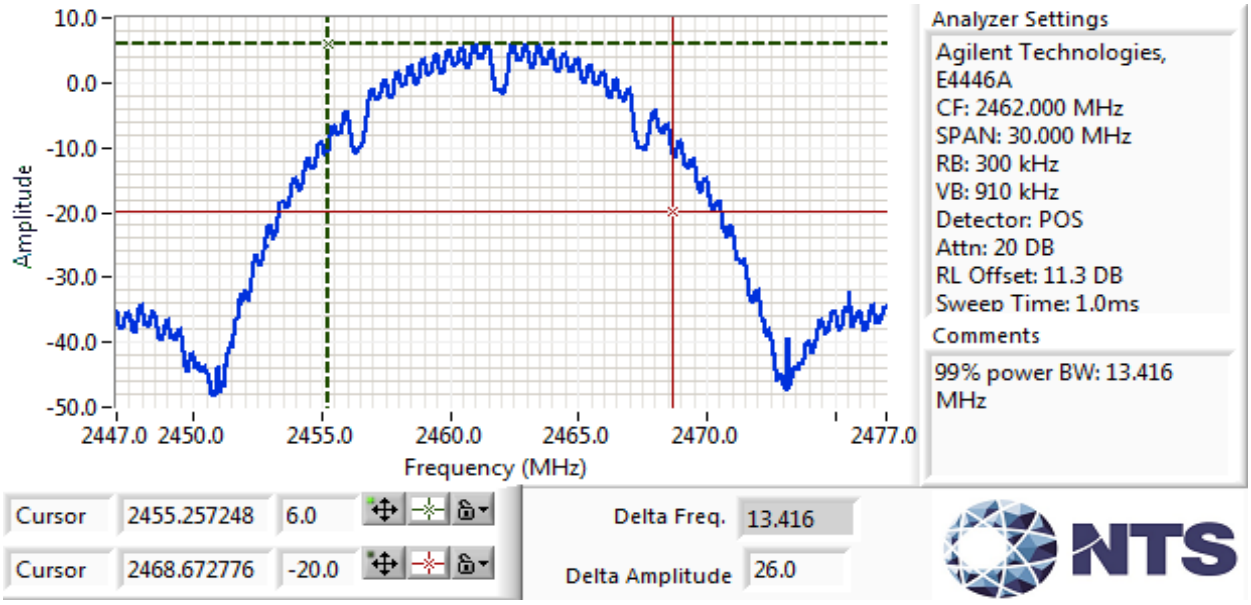
Mode: ac40

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
17	2422	35.060	36.308	0.1	1
17	2437	35.060	36.228	0.1	1
17	2452	35.073	36.208	0.1	1

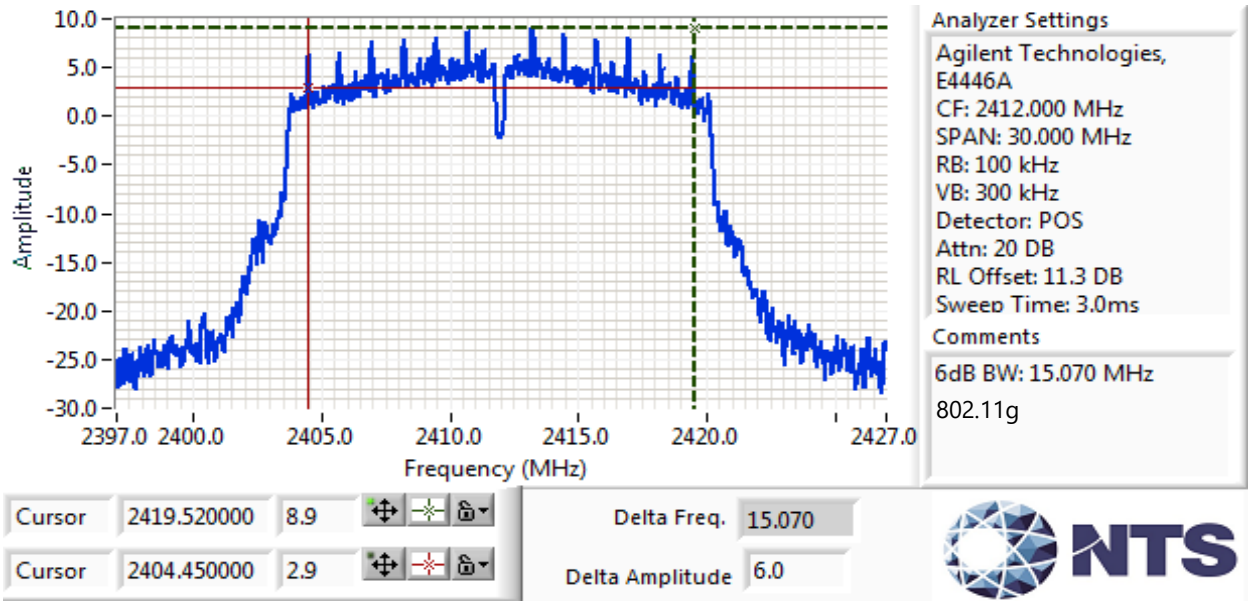
Note 1:	DTS BW: RBW=100kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW. 99% BW: RBW=1-5% of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW.
Note 2:	Measurements performed on chain 1

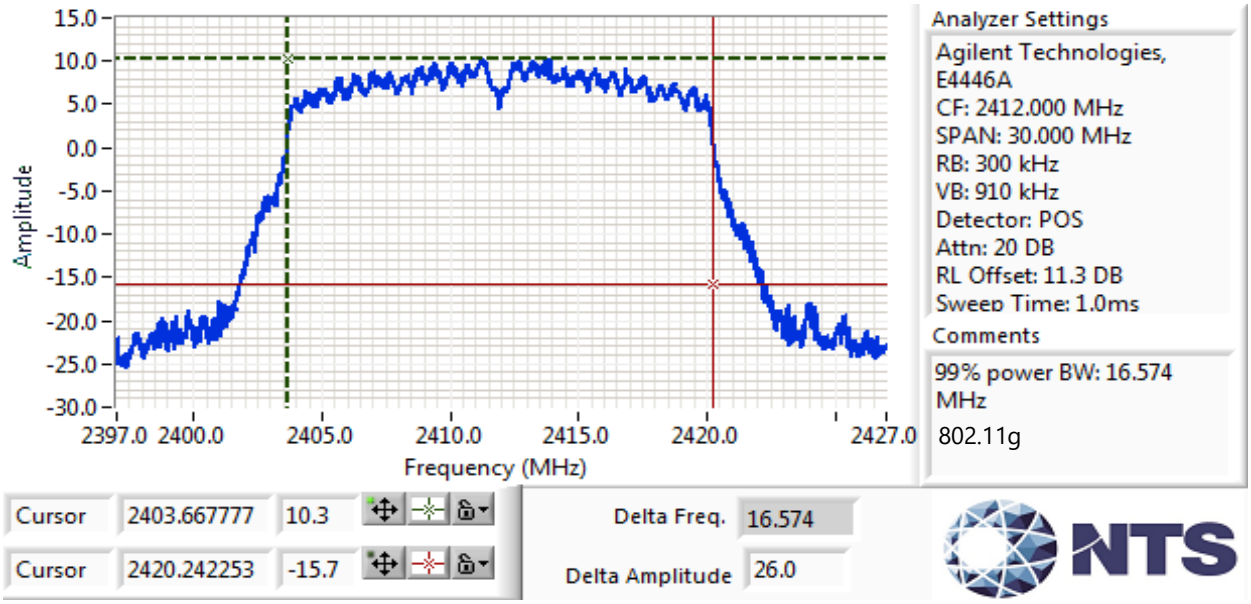
Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



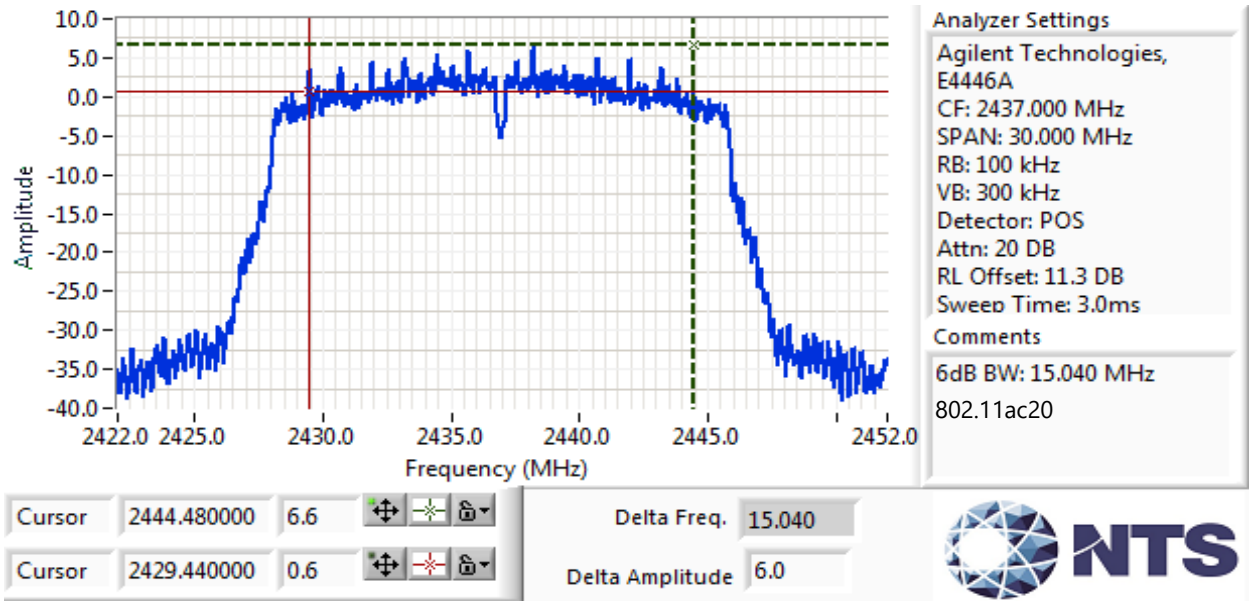


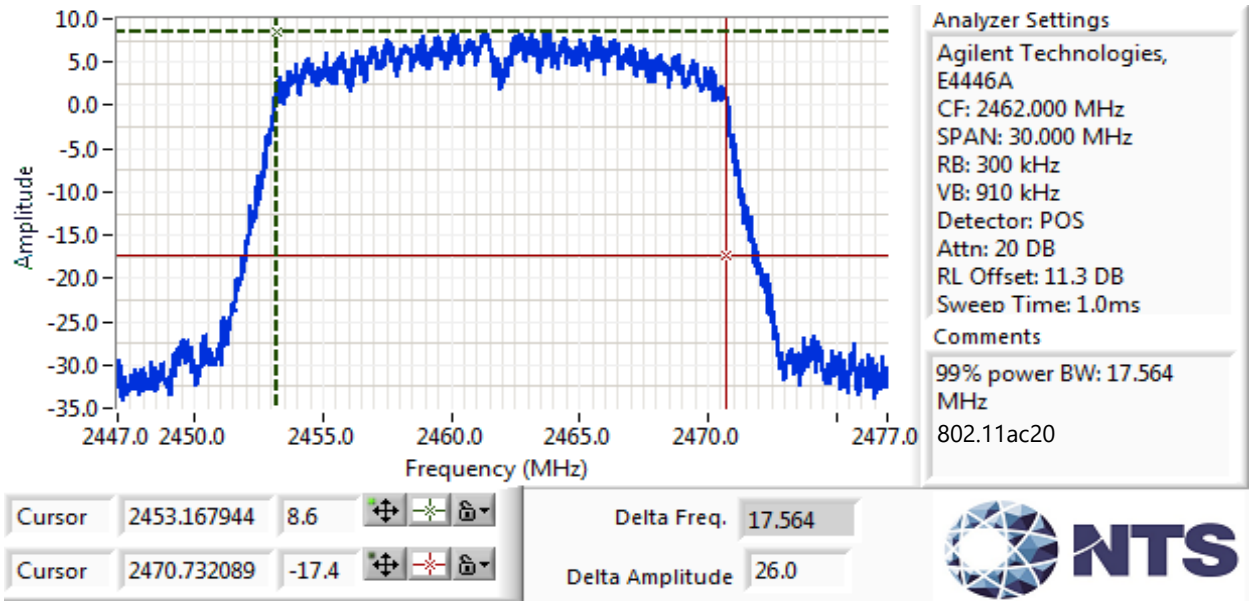
Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



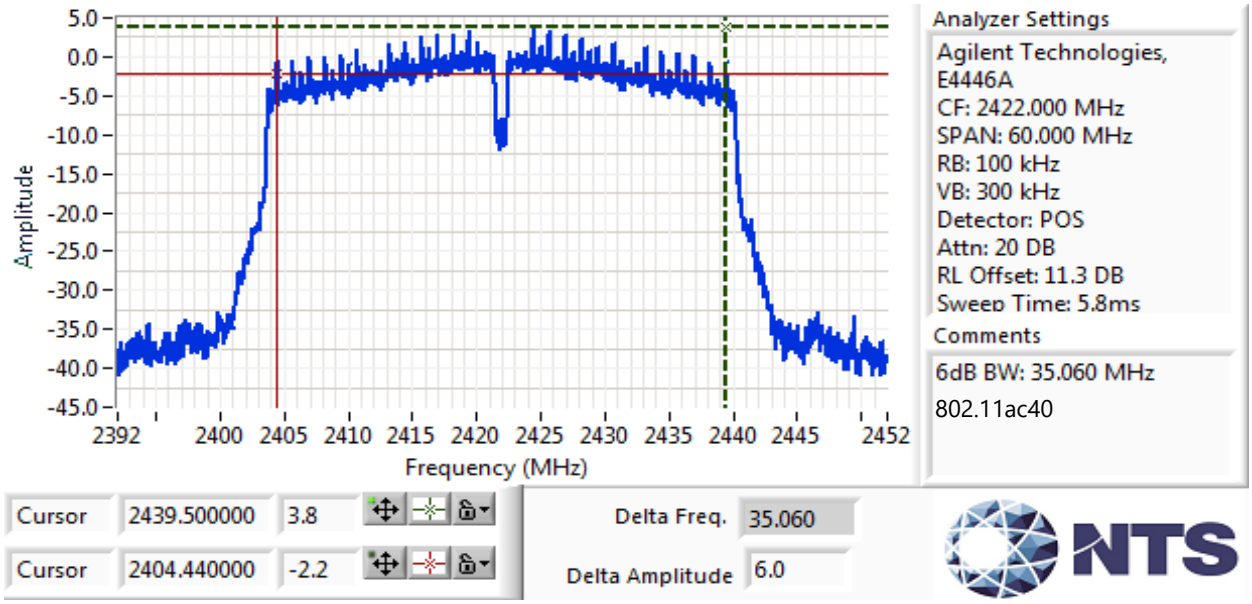


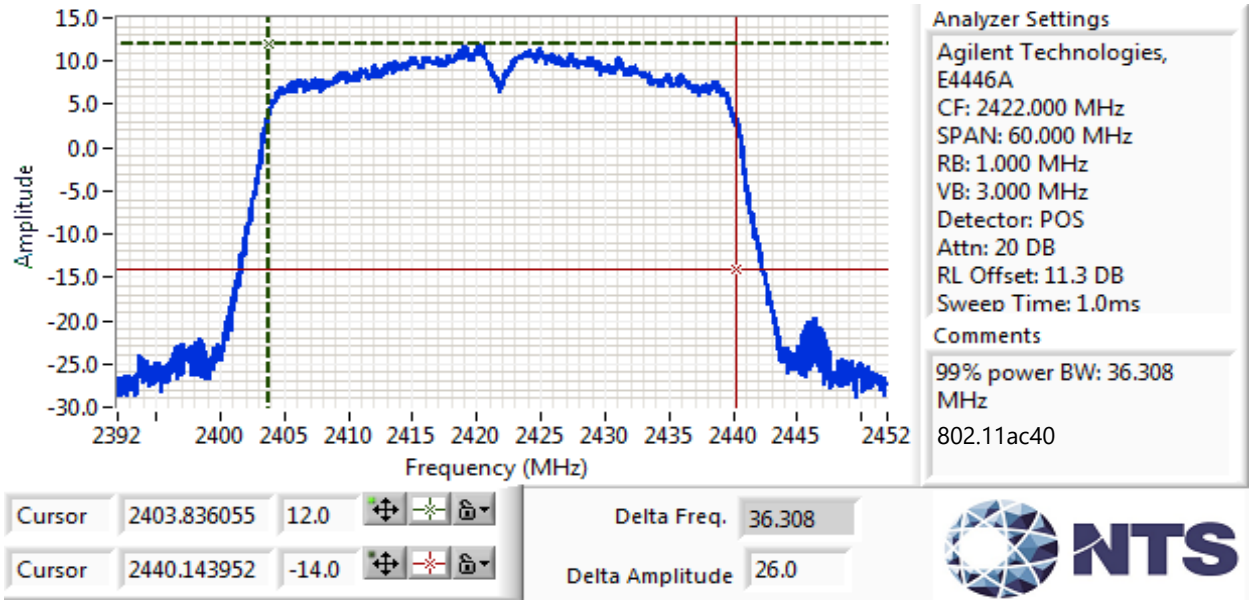
Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A





Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A





Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

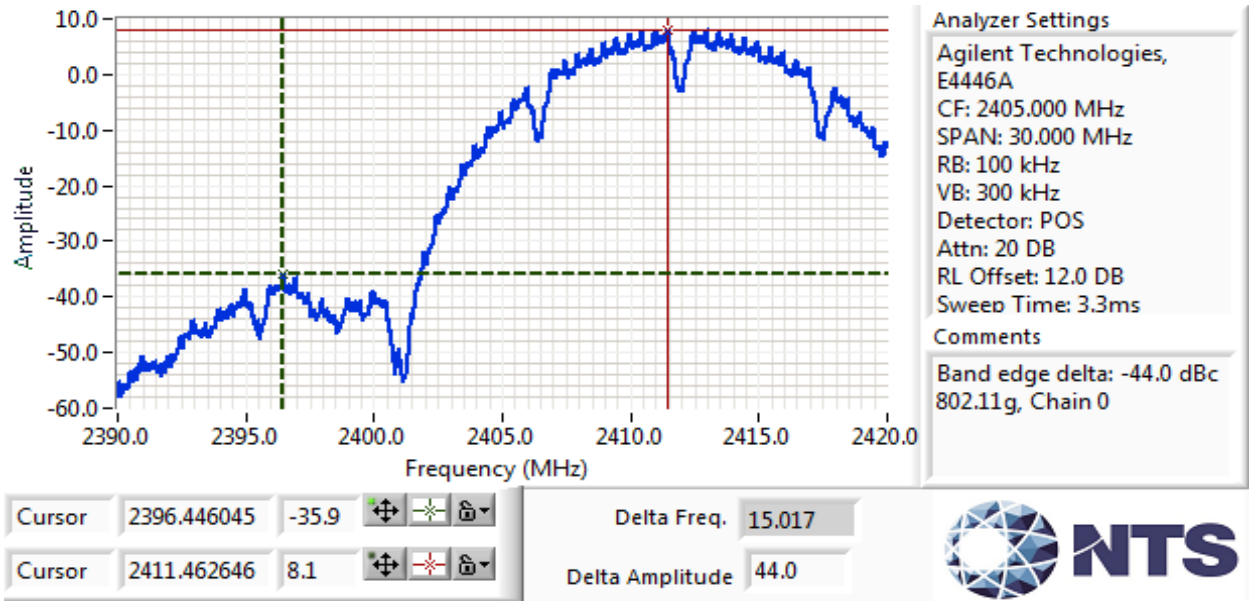
Run #4a: Out of Band Spurious Emissions

Power Setting Per Chain				Mode	Frequency (MHz)	Limit	Result
#1	#2	#3	#4				
17	17			11b	2412	-30 dBc	-44.0
19	19			11g	2412	-30 dBc	-30.2
17	17			11ac20	2412	-30 dBc	-34.8
17	17			11ac40	2422	-30 dBc	-36.8

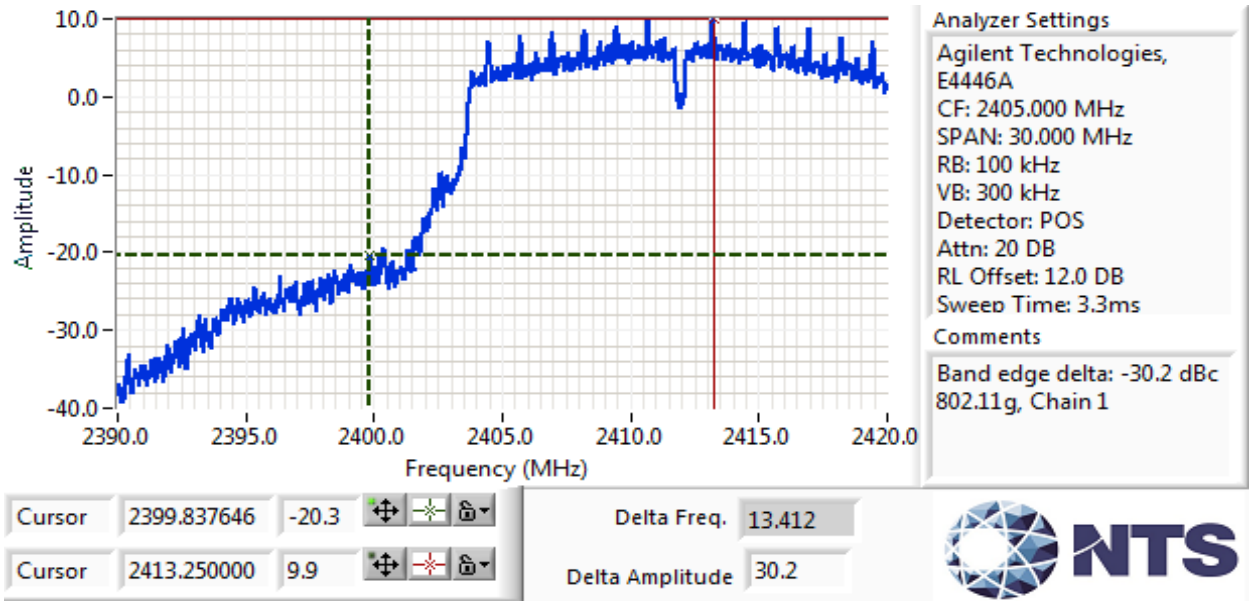
Note 1:	Measured on each chain individually

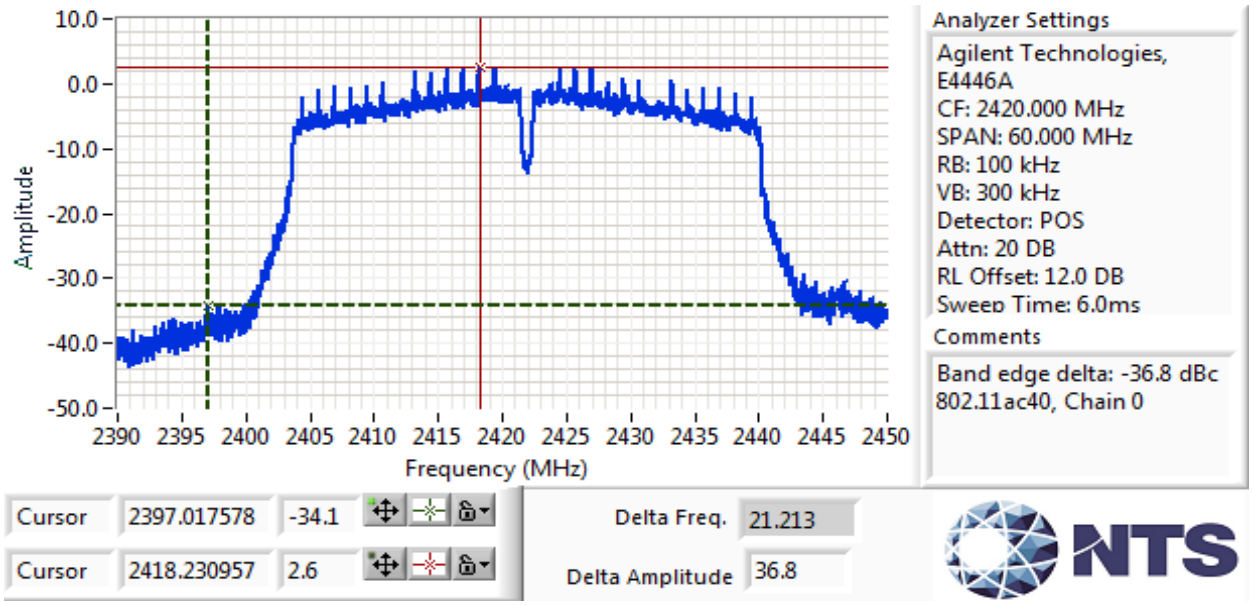
Plots for low channel

Plots showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits at all other frequencies.

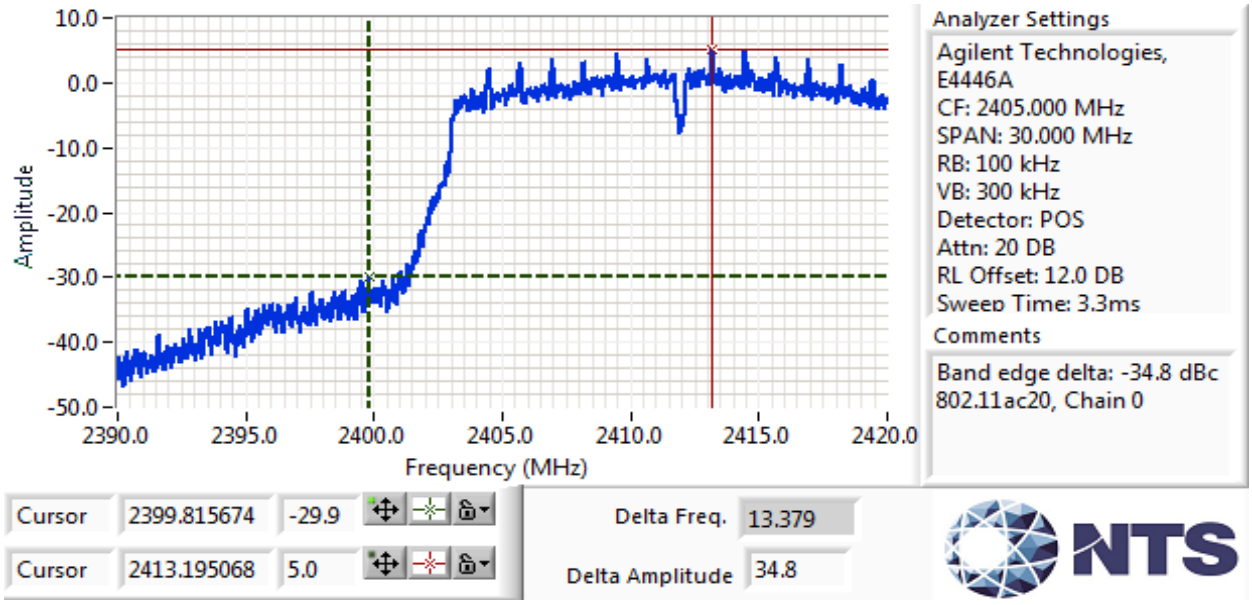


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

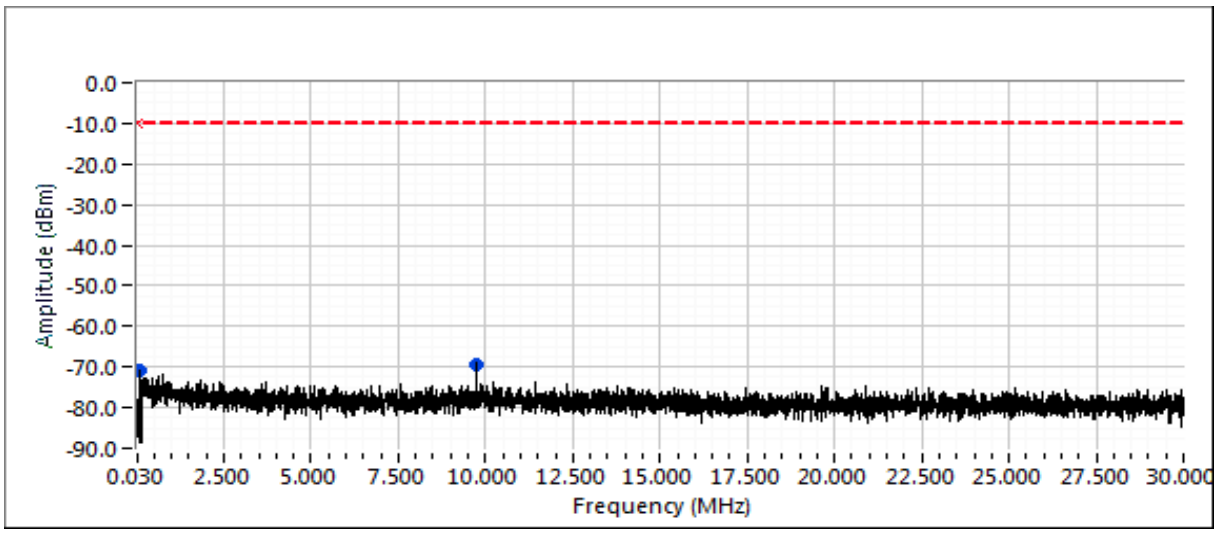




Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A



Additional plot showing compliance with -30dBc limit from 30 kHz to 30 MHz. Radiated measurements used to show compliance with the limits at all other frequencies. All emisisons were more than 60 dB below the limit.



Note1:	Based on preliminary testing, no emisisons were observed related to the fundamental from 30 kHz to 30 MHz, therefore only channel 1, g mode was included in report.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-

Conducted Emissions

(NTS Silicon Valley, Fremont Facility, Semi-Anechoic Chamber)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/16/2022
Test Engineer: M. Birgani
Test Location: Chamber 7

Config. Used: 1
Config Change: -
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was located above a ground plane inside the semi-anechoic chamber, 80 cm from the LISN.

Ambient Conditions:

Temperature: 19-20 °C
Rel. Humidity: 38-40 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz Operating @ Channel 6	FCC 15.207(a)	Pass	42.8 dBµV @ 0.276 MHz (-8.1 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

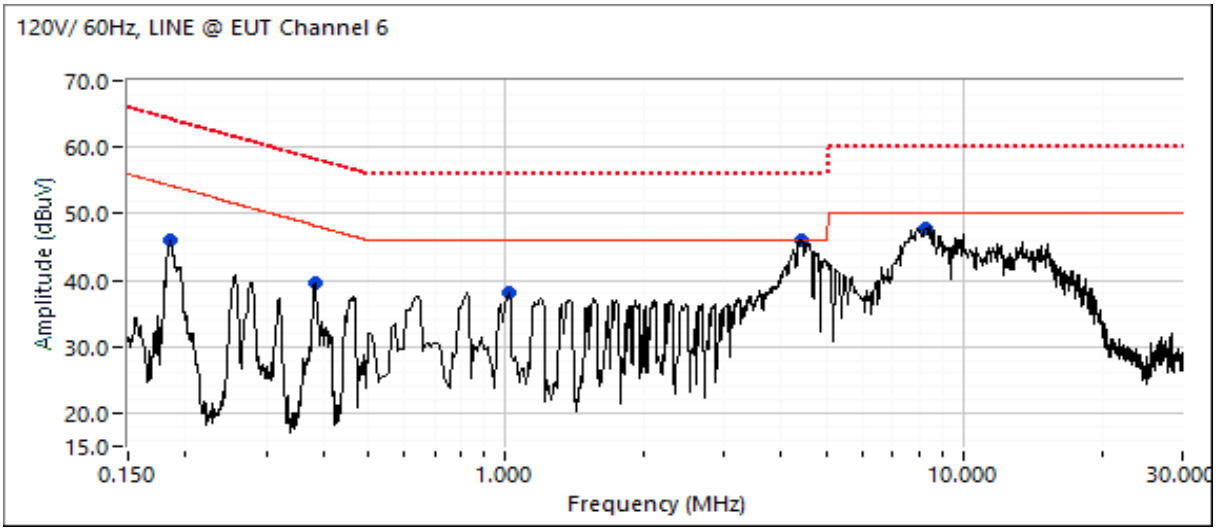
Deviations From The Standard

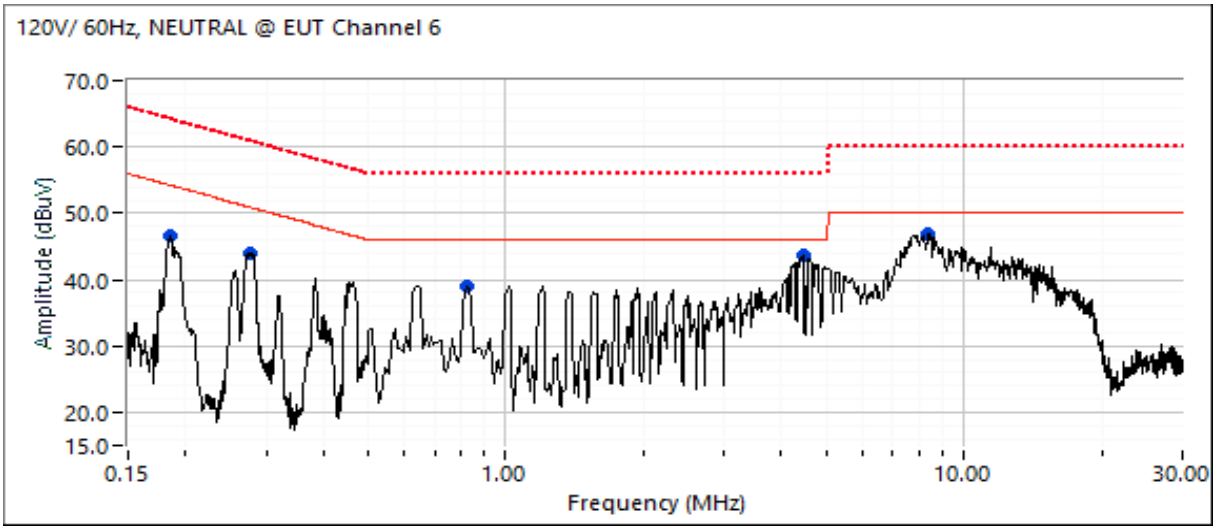
No deviations were made from the requirements of the standard.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

EUT operating on Channel 6 at Power setting of 21 in 2x2 MIMO





Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

EUT operating on Channel 6 at Power setting of 21 in 2x2 MIMO

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

Frequency	Level	AC	FCC §15.207(a)		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.185	45.9	Line	54.2	-8.3	Peak	
0.186	46.6	Neutral	54.2	-7.6	Peak	
0.276	44.1	Neutral	50.9	-6.8	Peak	
0.382	39.6	Line	48.2	-8.6	Peak	
0.828	39.0	Neutral	46.0	-7.0	Peak	
1.010	38.2	Line	46.0	-7.8	Peak	
4.417	45.9	Line	46.0	-0.1	Peak	
4.459	43.7	Neutral	46.0	-2.3	Peak	
8.262	47.8	Line	50.0	-2.2	Peak	
8.364	46.9	Neutral	50.0	-3.1	Peak	

Final quasi-peak and average readings

Frequency	Level	AC	FCC §15.207(a)		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.276	**42.8**	Neutral	50.9	**-8.1**	AVG	AVG (0.10s)
0.828	34.7	Neutral	46.0	-11.3	AVG	AVG (0.10s)
4.417	44.5	Line	56.0	-11.5	QP	QP (1.00s)
1.010	32.9	Line	46.0	-13.1	AVG	AVG (0.10s)
8.262	45.5	Line	60.0	-14.5	QP	QP (1.00s)
4.459	41.4	Neutral	56.0	-14.6	QP	QP (1.00s)
0.382	33.4	Line	48.2	-14.8	AVG	AVG (0.10s)
4.417	31.1	Line	46.0	-14.9	AVG	AVG (0.10s)
8.364	43.7	Neutral	60.0	-16.3	QP	QP (1.00s)
0.276	43.6	Neutral	60.9	-17.3	QP	QP (1.00s)
0.828	38.3	Neutral	56.0	-17.7	QP	QP (1.00s)
0.186	35.0	Neutral	54.2	-19.2	AVG	AVG (0.10s)
8.262	30.2	Line	50.0	-19.8	AVG	AVG (0.10s)
1.010	35.8	Line	56.0	-20.2	QP	QP (1.00s)
0.382	37.9	Line	58.2	-20.3	QP	QP (1.00s)
8.364	29.2	Neutral	50.0	-20.8	AVG	AVG (0.10s)
0.185	42.8	Line	64.3	-21.5	QP	QP (1.00s)
0.186	42.6	Neutral	64.2	-21.6	QP	QP (1.00s)
0.185	31.3	Line	54.3	-23.0	AVG	AVG (0.10s)
4.459	22.1	Neutral	46.0	-23.9	AVG	AVG (0.10s)

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247 , RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 1/10/2023
Test Engineer: David Bare
Test Location: Fremont Chamber #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 19.4 °C
Rel. Humidity: 51 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	6		Output Power	15.247(b)	Pass	6.7 dBm
2			Power spectral Density (PSD)	15.247(d)	Pass	
3	6		Minimum 6dB Bandwidth	15.247(a)	Pass	0.67 MHz
3	6		99% Bandwidth	RSS GEN	-	1.043 MHz
4	6		Spurious emissions	15.247(b)	Pass	All < -20 dBc

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247 , RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with ANSI C63.10

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mb/s	0.85	Yes	2.125	0.7	1.4	471

Sample Notes

Sample S/N: 36202200006
Driver: boots -c, Ver 1.3

Run #1: Output Power

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W		
6	2402	6.2	4.2	-3.7	Pass	2.5	0.0018		
6	2440	6.7	4.7	-4.7	Pass	2.0	0.0016		
6	2480	6.3	4.3	-2.7	Pass	3.6	0.0023		

Note 1:	Output power measured using a peak power meter, spurious limit is **-20dBc**.
Note 2:	Power setting - the software power setting used during testing, included for reference only.

Run #2: Power spectral Density

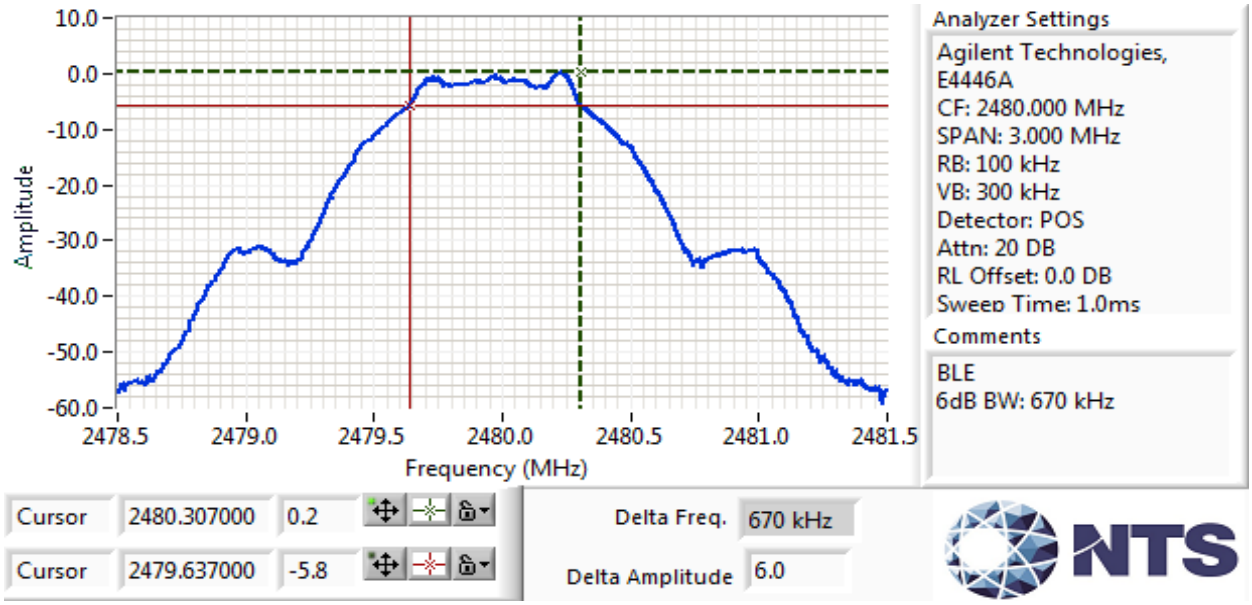
Test not requied as total output power is less than PSD limit.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247 , RSS-247	Class:	N/A

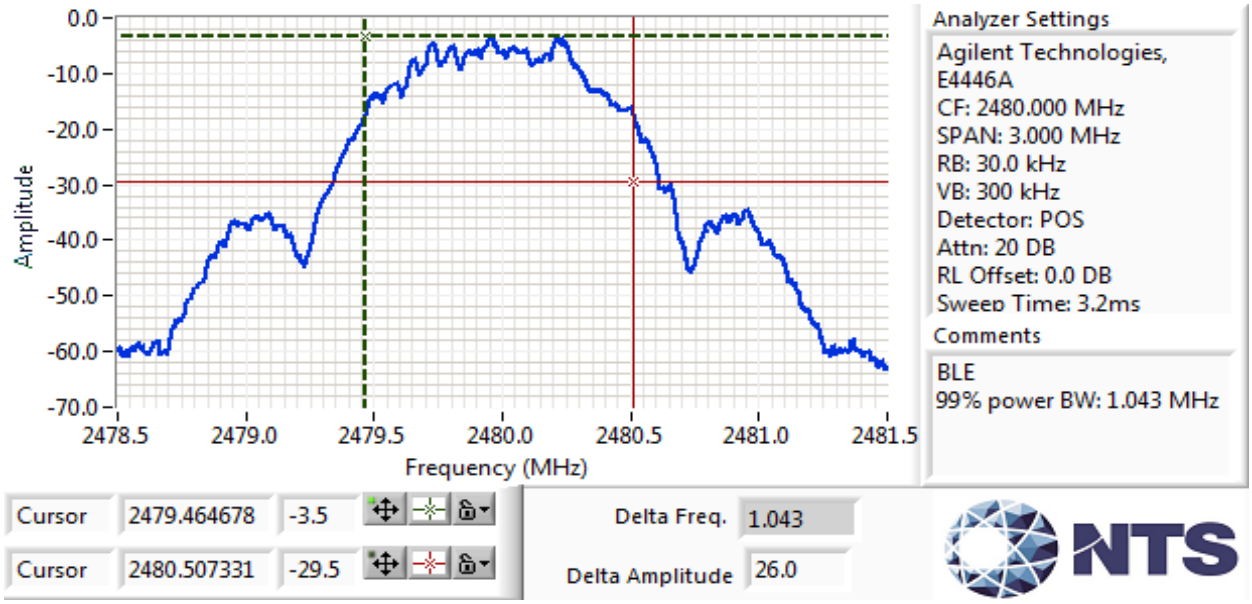
Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6dB	99%	6dB	99%
6	2402	0.67	1.042	0.1	0.03
6	2440	0.669	1.042	0.1	0.03
6	2480	0.67	1.043	0.1	0.03

Note 1:	DTS BW: RBW=100kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW. 99% BW: RBW=1-5% of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW.



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247 , RSS-247	Class:	N/A



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247 , RSS-247	Class:	N/A

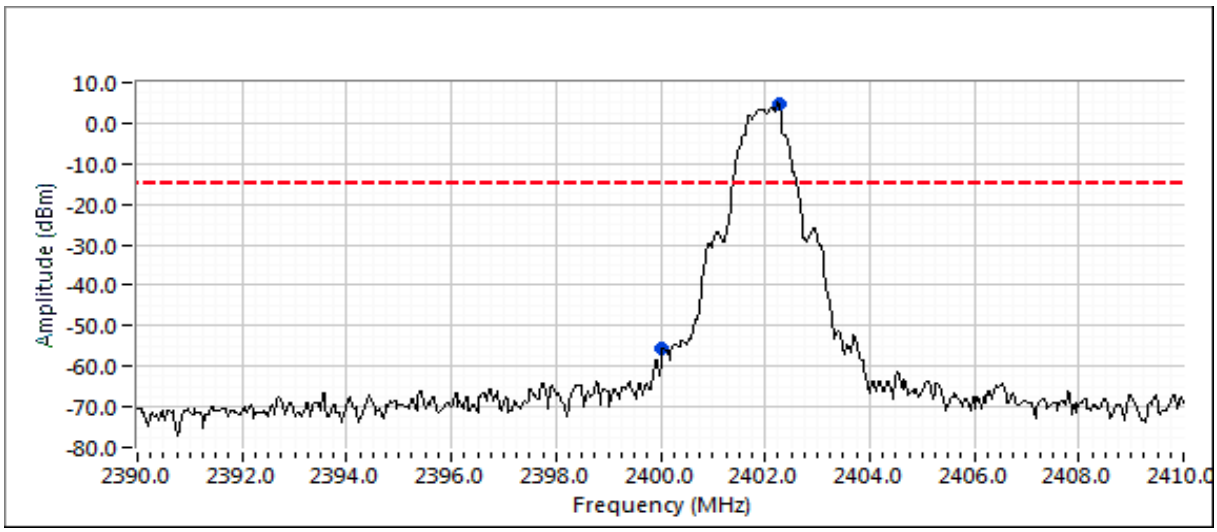
Run #4a: Out of Band Spurious Emissions

Frequency (MHz)	Power Setting	Mode	Limit	Result
2400	7	BLE	-20dBc	-53.6 dBc

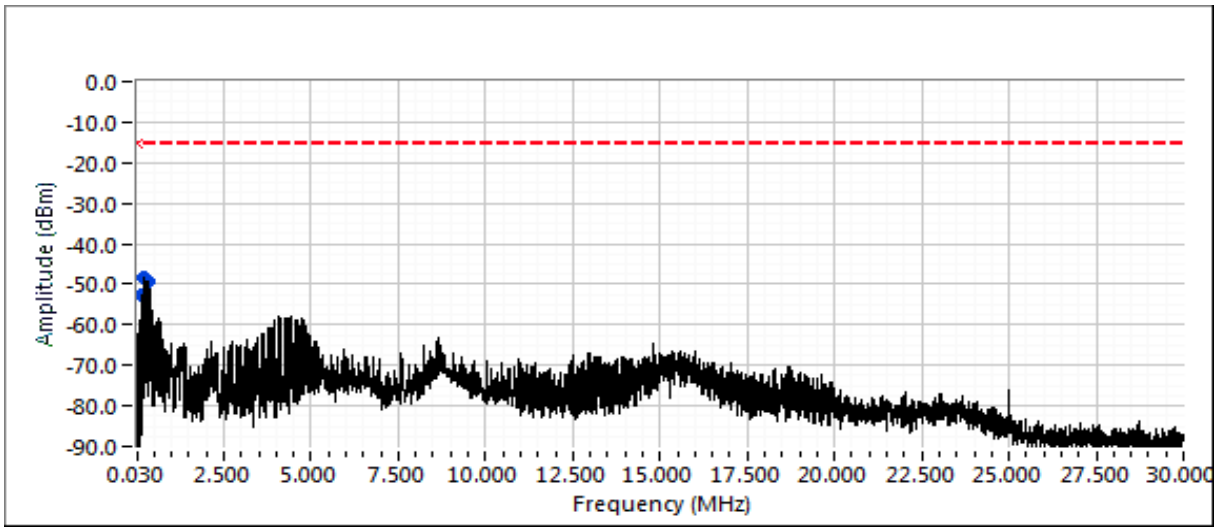
RBW = 100 kHz and VBW = 300 kHz for all plots.

Plot for low channel

Plot showing compliance with -20dBc limit from 2390 MHz to 2400 MHz and 30 kHz to 30 MHz. Radiated measurements used to show compliance with the limits in all other bands.



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 182A5
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247 , RSS-247	Class:	N/A



Frequency MHz	Level dBµ	AC Line	-20dBc Limit	-20dBc Margin	Detector QP/Ave	Comments
0.127	-52.4	RF Port	-15.1	-37.3	Peak	RBW = 100 kHz; VBW = 300 kHz
0.190	-48.7	RF Port	-15.1	-33.6	Peak	RBW = 100 kHz; VBW = 300 kHz
0.318	-49.5	RF Port	-15.1	-34.4	Peak	RBW = 100 kHz; VBW = 300 kHz
2400.000	-55.6	RF Port	-15.1	-40.5	Peak	RBW = 100 kHz; VBW = 300 kHz

Note1:	Based on preliminary testing, no emisisons were observed related to the fundamental from 30 kHz to 30 MHz, therefore only channel 0 was included in report.

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 21-22 °C
Rel. Humidity: 31-33 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel Frequency	Power Setting	Test Performed	Limit	Result / Margin
1	BLE	37 2402MHz	Max	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	44.2 dBµV/m @ 3704.9 MHz (-9.8 dB)
	BLE	17 2440MHz	Max	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	44.8 dBµV/m @ 3704.9 MHz (-9.2 dB)
	BLE	39 2480MHz	Max	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	45.0 dBµV/m @ 4960.0 MHz (-9.0 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: Hub: 00019876, SOM: 70B65100004B
Driver: boots -c, Ver 1.3

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with ANSI C63.10
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear voltage average, auto sweep time, max hold.
2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mbps	85.4%	Yes	2.147	0.68	1.37	466

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has a duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear voltage correction factor
Note 5:	Emission has constatnt duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear voltage average, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 7:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, RMS detector, sweep time auto, max hold. Max hold for 50*(1/DC) traces

* Pwr Cor Factor calculated using 10 X log(1/duty cycle)
** Lin Volt Cor Factor is calculated using 20 x log(1/duty cycle)

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: BLE

Date of Test: 1/18/2023 Config. Used: 1
Test Engineer: Said Abdelwafi Config Change: -
Test Location: Chamber # 7 EUT Voltage: 120V/ 60Hz

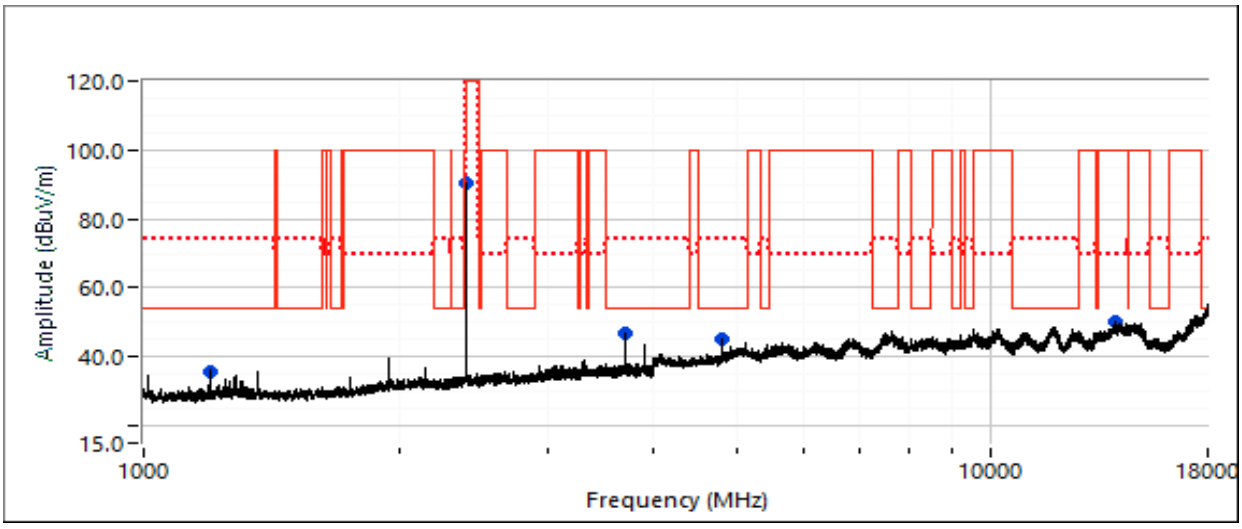
Run #1a: Low Channel

Channel: 37 Mode: BLE Pwr Setting: Max Data Rate: 1 Mbps

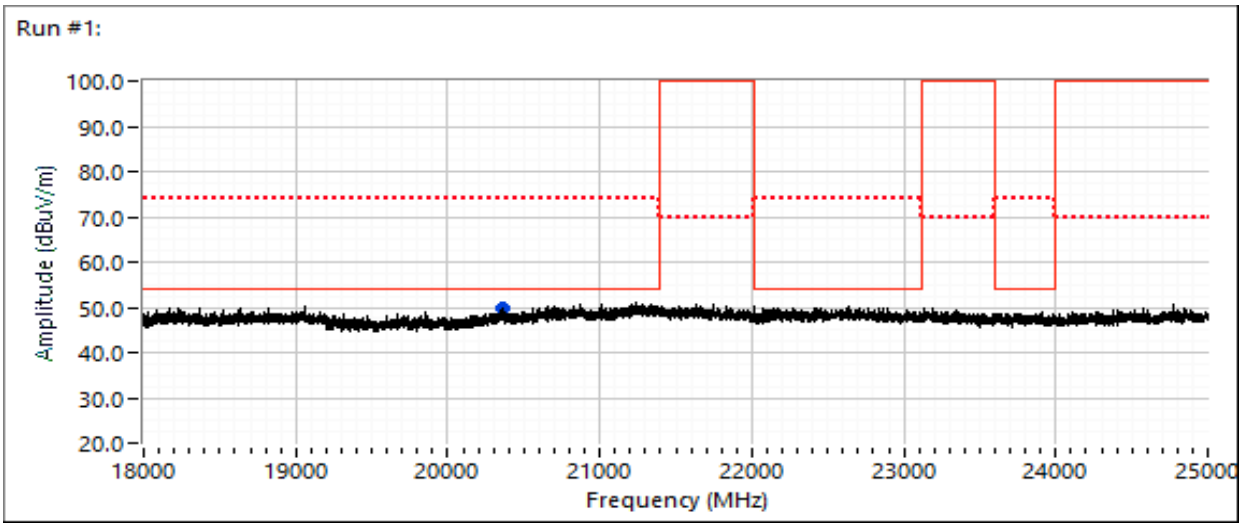
Run #1a: Low Channel

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1200.010	37.5	H	54.0	-16.5	AVG	62	1.7	Note 6: RB 1 MHz; VB: 1 kHz
1200.040	39.2	H	74.0	-34.8	PK	62	1.7	RB 1 MHz; VB: 3 MHz
3704.910	44.2	V	54.0	-9.8	AVG	168	1.9	Note 6: RB 1 MHz; VB: 1 kHz
3704.880	50.6	V	74.0	-23.4	PK	168	1.9	RB 1 MHz; VB: 3 MHz
4803.960	40.6	H	54.0	-13.4	AVG	194	2.4	Note 6: RB 1 MHz; VB: 1 kHz
4804.430	48.5	H	74.0	-25.5	PK	194	2.4	RB 1 MHz; VB: 3 MHz
13986.860	44.2	H	100.0	-55.8	AVG	86	1.5	Note 6: RB 1 MHz; VB: 1 kHz
13989.050	55.0	H	70.0	-15.0	PK	86	1.5	RB 1 MHz; VB: 3 MHz
20356.520	38.7	V	54.0	-16.7	AVG	16	1.6	Note 6: RB 1 MHz; VB: 1 kHz
20358.920	50.1	V	74.0	-23.9	PK	16	1.6	RB 1 MHz; VB: 3 MHz

Note:	Scan made between 18 - 25 GHz with the measurement antenna moved around the EUT its antennas 30cm from the device indicated there were no significant emissions in this frequency range



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

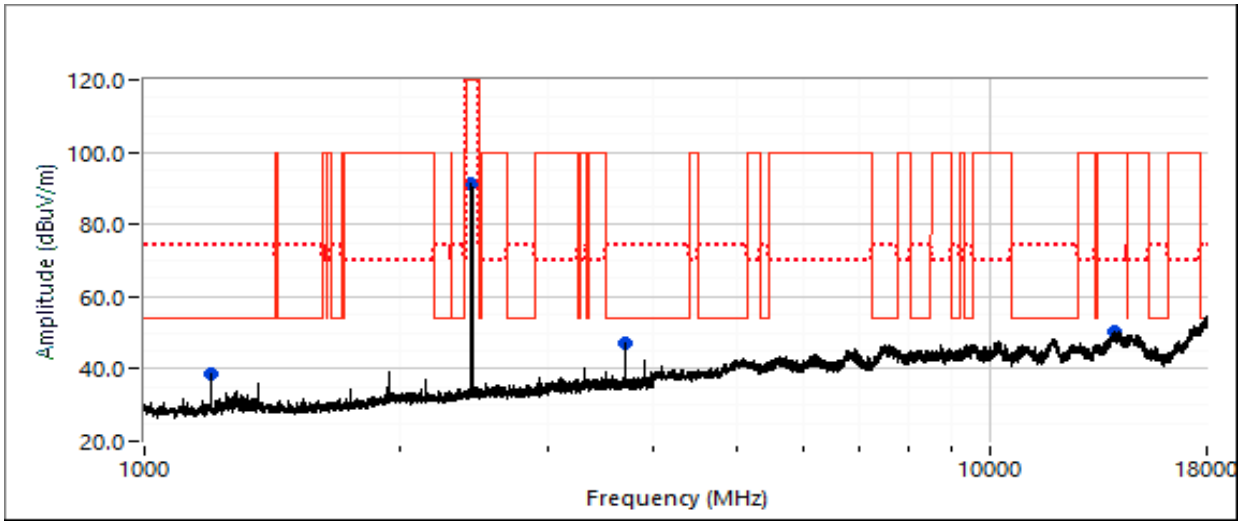


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #1b: Center Channel

Channel: 17 Mode: BLE Pwr Setting: Max Data Rate: 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1200.020	37.4	H	54.0	-16.6	AVG	142	2.4	Note 6: RB 1 MHz; VB: 1 kHz
1199.910	39.4	H	74.0	-34.6	PK	142	2.4	RB 1 MHz; VB: 3 MHz
3704.860	44.8	V	54.0	-9.2	AVG	168	2.1	Note 6: RB 1 MHz; VB: 1 kHz
3705.440	50.6	V	74.0	-23.4	PK	168	2.1	RB 1 MHz; VB: 3 MHz
13985.070	40.6	H	100.0	-59.4	AVG	243	2.5	Note 6: RB 1 MHz; VB: 1 kHz
13985.440	50.1	H	70.0	-19.9	PK	243	2.5	RB 1 MHz; VB: 3 MHz

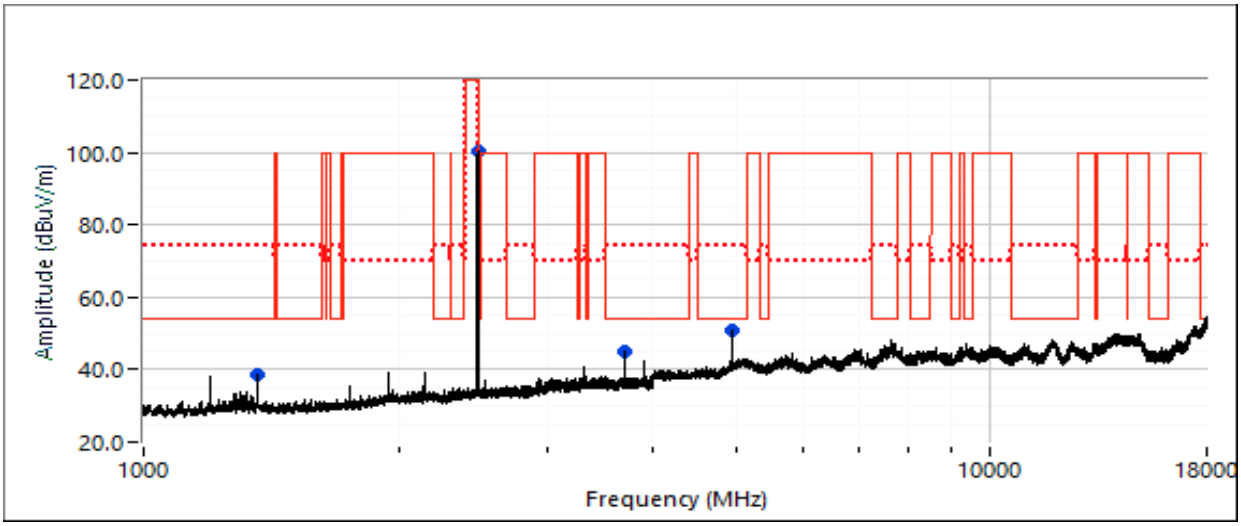


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #1c: High Channel

Channel: 39 Mode: BLE Pwr Setting: Max Data Rate: 1 Mbps

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1364.970	38.2	V	54.0	-15.8	AVG	119	1.3	Note 6: RB 1 MHz; VB: 1 kHz
1365.100	40.6	V	74.0	-33.4	PK	119	1.3	RB 1 MHz; VB: 3 MHz
3704.860	40.2	V	54.0	-13.8	AVG	171	2.2	Note 6: RB 1 MHz; VB: 1 kHz
3704.800	47.0	V	74.0	-27.0	PK	171	2.2	RB 1 MHz; VB: 3 MHz
4960.010	45.0	H	54.0	-9.0	AVG	174	1.6	Note 6: RB 1 MHz; VB: 1 kHz
4959.560	52.2	H	74.0	-21.8	PK	174	1.6	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 21-22 °C
Rel. Humidity: 31-33 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Power Setting	Test Performed	Limit	Result / Margin
1	BLE	37 2402MHz	6	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	25.4 dBµV/m @ 2389.8 MHz (-28.6 dB)
	BLE	39 2480MHz	6	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	31.0 dBµV/m @ 2483.5 MHz (-23.0 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: Hub: 00019876, SOM: 70B65100004B
Driver: boots -c, Ver 1.3

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with ANSI C63.10
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has a duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear voltage average, auto sweep time, max hold.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mbps	85.4%	Yes	2.147	0.68	1.37	466

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has a duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear voltage correction factor
Note 5:	Emission has constatnt duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear voltage average, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 7:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, RMS detector, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 8:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

* Pwr Cor Factor calculated using 10 X log(1/duty cycle)
** Lin Volt Cor Factor is calculated using 20 x log(1/duty cycle)

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

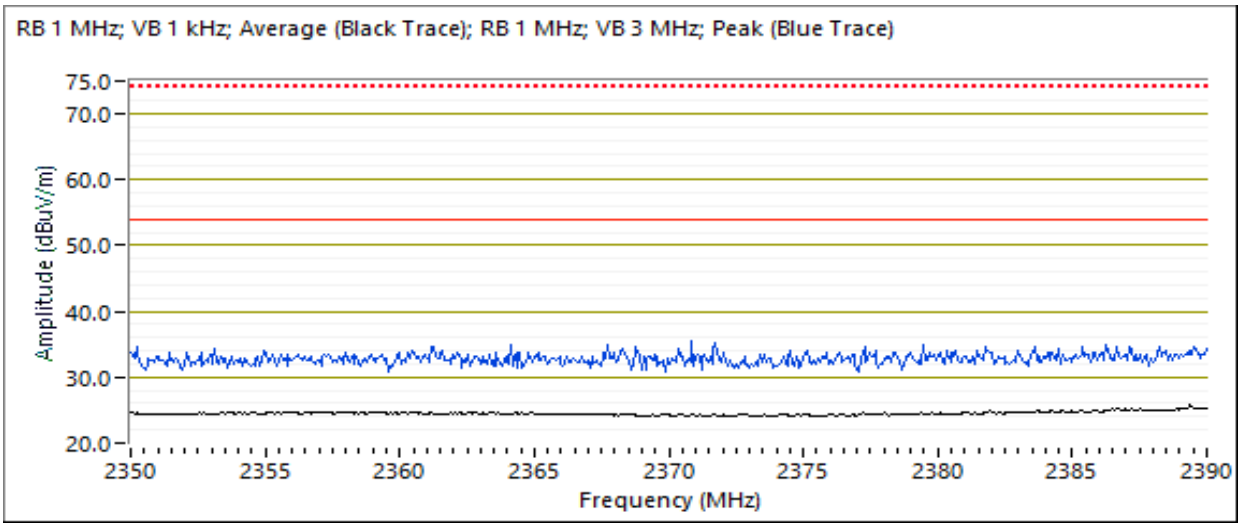
Run #1: Radiated Bandedge Measurements

Date of Test: 01/18/23 Config. Used: 1
Test Engineer: M. Birgani Config Change: -
Test Location: Chamber 7 EUT Voltage: 120V/ 60Hz

Channel: 37 Mode: BLE Pwr Setting: 6

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.750	**25.4**	V	54.0	**-28.6**	AVG	360	2.5	Note 6: RB 1 MHz; VB: 1 kHz
2388.000	24.9	H	54.0	-29.1	AVG	245	1.0	Note 6: RB 1 MHz; VB: 1 kHz
2388.200	35.9	V	74.0	-38.1	PK	360	2.5	RB 1 MHz; VB: 3 MHz
2367.070	35.9	H	74.0	-38.1	PK	245	1.0	RB 1 MHz; VB: 3 MHz

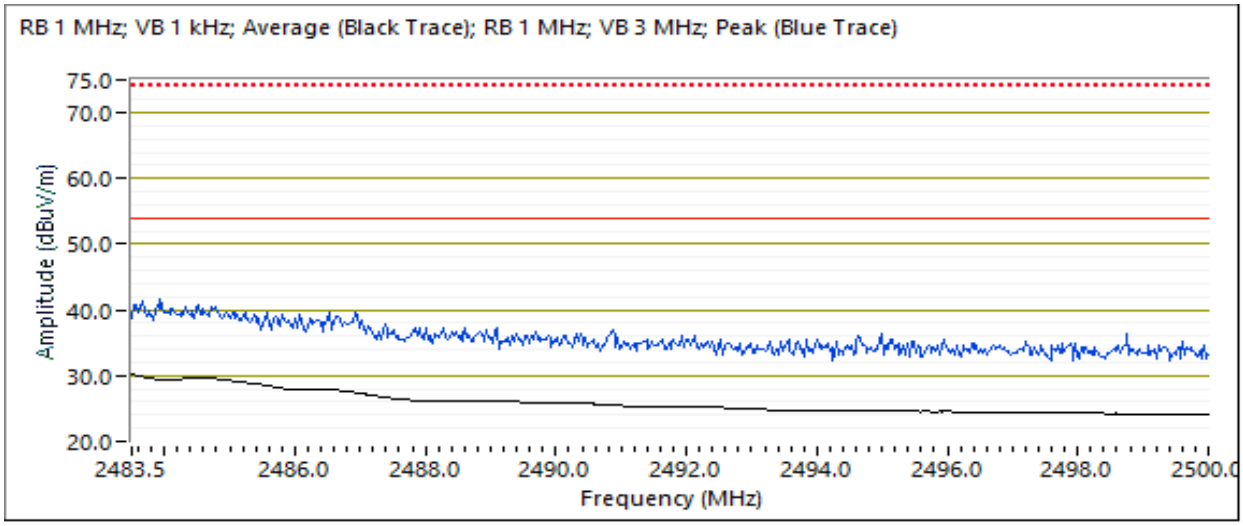


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Channel: 39 Mode: BLE Pwr Setting: 6

Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	**31.0**	V	54.0	**-23.0**	AVG	203	1.8	Note 6: RB 1 MHz; VB: 1 kHz
2483.510	28.8	H	54.0	-25.2	AVG	203	1.5	Note 6: RB 1 MHz; VB: 1 kHz
2484.660	41.6	V	74.0	-32.4	PK	203	1.8	RB 1 MHz; VB: 3 MHz
2483.620	39.9	H	74.0	-34.1	PK	203	1.5	RB 1 MHz; VB: 3 MHz



Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

RSS-247 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT, unless otherwise noted.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 52 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Mode	Channel	Power Setting		Test Performed	Limit	Result / Margin
1a		low	6		Radiated Emissions, 30 MHz-1 GHz	FCC Part 15.209 / 15.247(c)	33.3 dBµV/m @ 128.78 MHz (-10.2 dB)
1b		High	6		Radiated Emissions, 30 MHz-1 GHz	FCC Part 15.209 / 15.247(c)	33.3 dBµV/m @ 125.96 MHz (-10.2 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Sample Notes

Sample S/N: Hub: 00019876, SOM: 70B65100004B
Driver: boots -c, Ver 1.3

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with ANSI C63.10
Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear voltage average, auto sweep time, max hold.
2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	1 Mbps	85.4%	Yes	2.147	0.68	1.37	466

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 20dB below the level of the fundamental and measured in 100kHz.
Note 3:	Emission has a duty cycle ≥ 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 4:	Emission has constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW>1/T but not less than 10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear voltage correction factor
Note 5:	Emission has constatnt duty cycle < 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, peak detector, linear voltage average, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 7:	Emission has non constant duty cycle < 98%, average measurement performed: RBW=1MHz, VBW> 1/T, RMS detector, sweep time auto, max hold. Max hold for 50*(1/DC) traces

* Pwr Cor Factor calculated using 10 X log(1/duty cycle)
** Lin Volt Cor Factor is calculated using 20 x log(1/duty cycle)

Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 1,000 MHz. Operating Mode: BLE

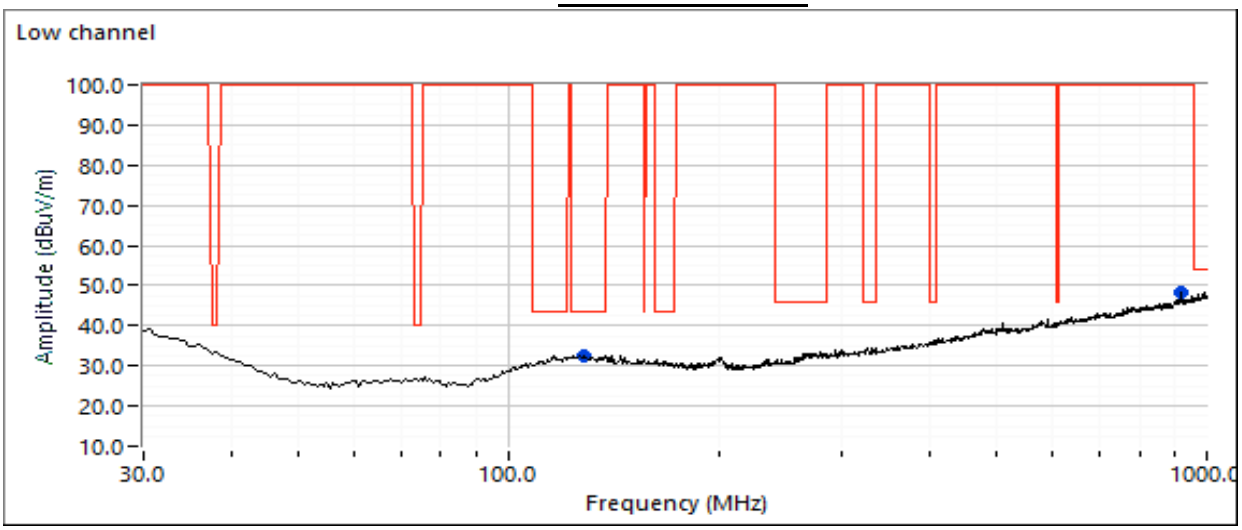
Date of Test: 1/19/2023 Config. Used: 1
Test Engineer: Said Abdelwafi Config Change: -
Test Location: Chamber # 7 EUT Voltage: 120V/ 60Hz

Run #1a: Low Channel

Channel: 37 Mode: BLE Pwr Setting: Max Data Rate: Data Rate

Run #1a: Low Channel

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters		
128.775	**33.3**	H	43.5	**-10.2**	QP	112	2.5	QP (1.00s)	
921.115	49.1	V	77.7	-28.6	QP	144	2.5	QP (1.00s)	Note 2

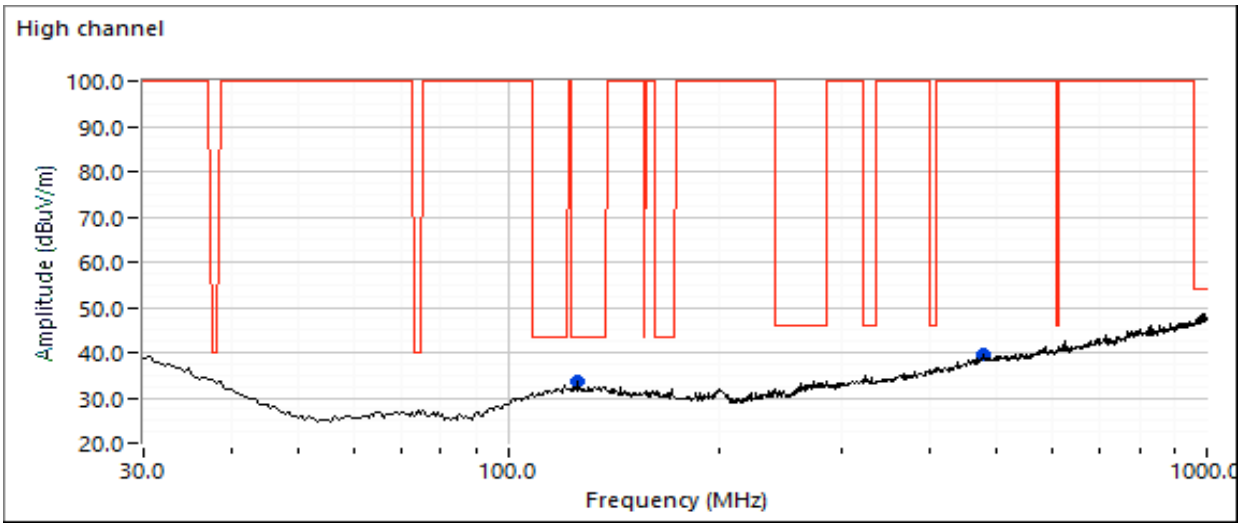


Client:	Eight Sleep, Inc.	PR Number:	PR167335
Model:	Pod Hub	T-Log Number:	TL167335 Hub 19876
		Project Manager:	Christine Krebill
Contact:	Alex Lednev, Patrick McCabe	Project Engineer:	David Bare
Standard:	FCC part 15.247, RSS-247	Class:	N/A

Run #1b: High Channel

Fundamental emission level @ 3m in 100kHz RBW:		dBµV/m	
Limit for emissions outside of restricted bands:	-20	dBµV/m	Limit is -20dBc (Peak power measurement)
Limit for emissions outside of restricted bands:	-30	dBµV/m	Limit is -30dBc (UNII power measurement)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
125.961	**33.3**	H	43.5	**-10.2**	QP	167	3.3	QP (1.00s)
480.634	40.9	H	77.2	-36.3	QP	170	3.5	QP (1.00s) Note 2



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