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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

Precept Touch, Smart Lock with Bluetooth

IC CERTIFICATION #:	2APE74513C
FCC ID:	23786-4513C
APPLICANT:	AmesburyTruth 5001 W. Delbridge St. Sioux Falls, SD 57107
TEST SITE(S):	National Technical Systems 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4 and 2845B-5
PROJECT NUMBER:	PR076543
REPORT DATE:	October 24, 2018
FINAL TEST DATES:	April 17, September 24, 26, 27 and 28, 2018
TOTAL NUMBER OF PAGES:	73

ACCREDITED
Testing Cert #0214.26

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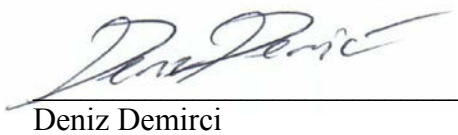
VALIDATING SIGNATORIES

PROGRAM MGR



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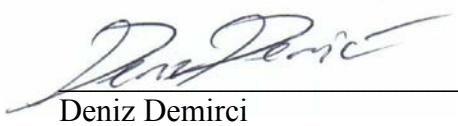

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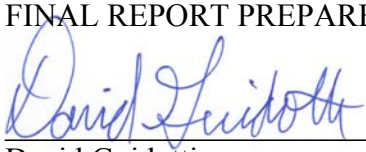

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	October 24, 2018	First release	

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SCOPE

An electromagnetic emissions test has been performed on the AmesburyTruth Precept Touch, Smart Lock with Bluetooth, 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 National Technical Systems 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.

National Technical Systems 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 AmesburyTruth Precept Touch, Smart Lock with Bluetooth 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 AmesburyTruth Precept Touch, Smart Lock with Bluetooth and therefore apply only to the tested sample. The sample was selected and prepared by Max Raviani on behalf of AmesburyTruth.

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)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 247 5.2	Digital Modulation	Systems uses DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 247 5.2 (1)	6 dB Bandwidth	0.713 MHz	>500 kHz	Complies
15.247 (b) (3)	RSS 247 5.4 (4)	Output Power (multipoint systems)	3.9 dBm (0.0025 Watts) EIRP = 0.004 W Note 1	1 Watt, EIRP limited to 4 Watts.	Complies
15.247(e)	RSS 247 5.2 (2)	Power Spectral Density	-0.4 dBm/10 kHz	8 dBm/3 kHz	Complies
15.247(d)	RSS 247 5.5	Antenna Port Spurious Emissions	-39.9 dBc	< -20 dBc	Complies
15.247(d) / 15.209	RSS 247 5.5	Radiated Spurious Emissions 9 kHz – 25 GHz	44.4 dBµV/m @ 4960 MHz (-9.6 dB)	Refer to the limits section (p17) for restricted bands, all others < -20 dBc	Complies
Note 1: EIRP calculated using antenna gains of 1.8 dBi for the highest EIRP system.					

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 antennas	Unique or integral antenna required	Complies
15.407 (b) (6)	RSS-Gen Table 4	AC Conducted Emissions	Testing was not performed as the EUT is battery powered.		
15.247 (i) 15.407 (f)	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	N/A Integral antennas	Statement for products with detachable antenna	N/A
-	RSS-Gen 8.4	User Manual	Refer to user manual	Statement for all products	Complies
-	RSP-100 RSS-Gen 6.7	Occupied Bandwidth	1.08 MHz	Information only	N/A

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
Radiated emission (field strength)	dBµV/m	9 KHz to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The AmesburyTruth Precept Touch, Smart Lock with Bluetooth is a sliding door handle/lock with BLE radio. The EUT was treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 6 Vdc (Battery operated)

The sample was received on April 17, 2018 and tested on April 17, September 24, 26, 27 and 28, 2018. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID / ISED
Sanmina	Smart Lock	Sliding door handle/lock with BLE radio	000149	2APE74513C
			000163	
			000165	
			000172	
			000178	
			000177	

ANTENNA SYSTEM

Main and diversity integral antennas

ENCLOSURE

The EUT enclosure is primarily constructed of metal and plastic. It measures approximately 5 cm wide by 6 cm deep by 28 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

No 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)
None				

EUT OPERATION

During emissions testing the EUT was transmitting in a rated RF power and channels required by the test cases.

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 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Designation / Registration Numbers		Location
	FCC	Canada	
Chamber 3	US0027	2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	US0027	2845B-4	
Chamber 5	US0027	2845B-5	

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.

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 20 Hz, 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 1000 MHz 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 EMI Test Software (rev 2.10)

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 1 m above the ground plane.

ANSI C63.10 specifies that the test height above ground for table mounted devices shall be 80 cm for testing below 1 GHz and 1.5 m for testing above 1 GHz.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.

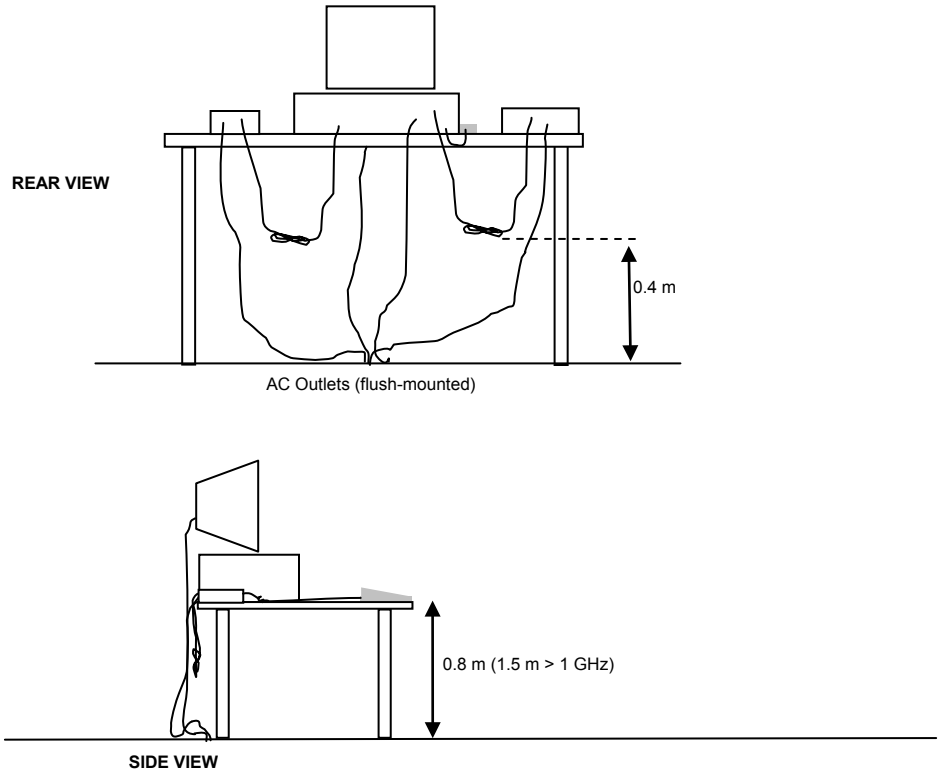
TEST PROCEDURES

RADIATED EMISSIONS

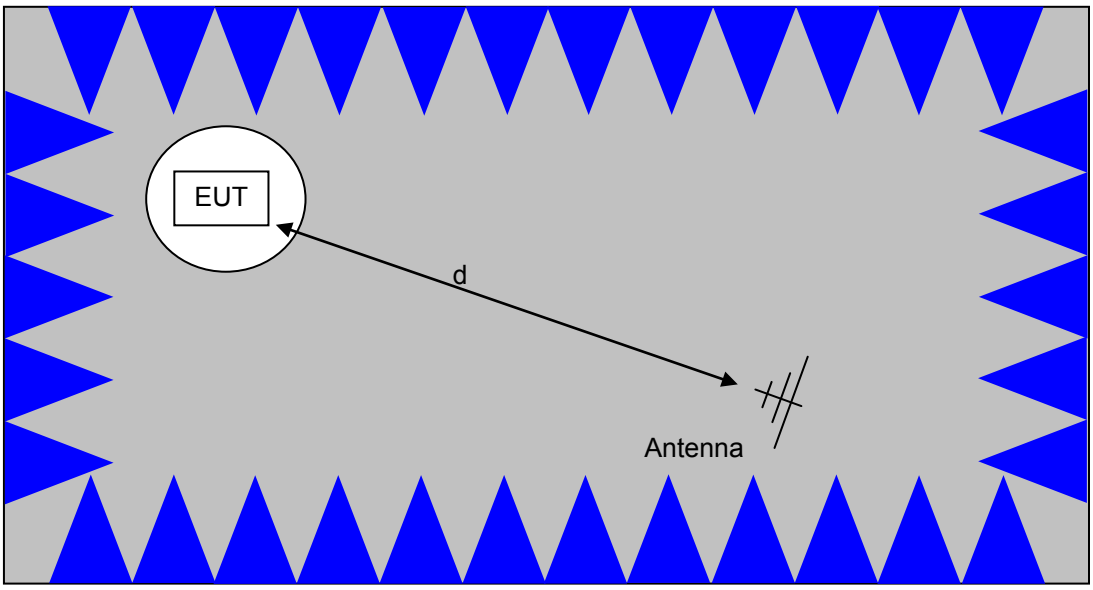
A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). 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.

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 1 m). 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 antenna height is restricted to a maximum of 2.5 meters.

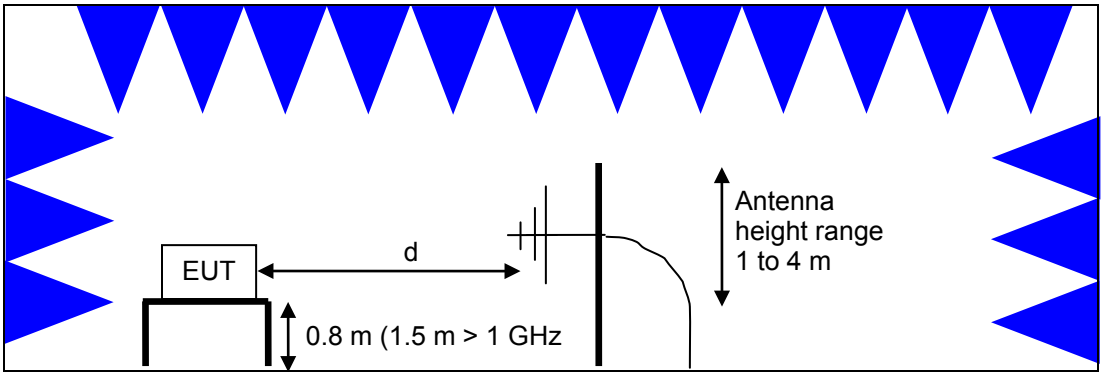


Typical Test Configuration for Radiated Field Strength Measurements



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.

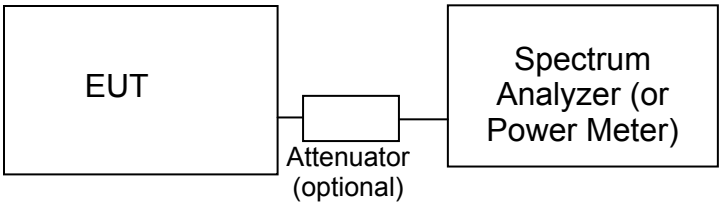
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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 Silicon Valley's 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 6 dB, 20 dB, 26 dB 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 (dBµV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBµV/m). The results are then converted to the linear forms of µV and µV/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:

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 (µV/m)	Limit (dBµV/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

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
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3 kHz

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 210. All other unwanted (spurious) emissions shall be at least 20 dB below the level of the highest in-band signal level (30 dB if the power is measured using the sample detector/power averaging method).

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

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally 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.

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 dBµV/m
F_d = Distance Factor in dB
R_c = Corrected Reading in dBµV/m
L_s = Specification Limit in dBµV/m
M = Margin in dB Relative to Spec

Appendix A Test Equipment Calibration Data

Manufacturer	Description	Model	Asset #	Calibrated	Cal Due
Radiated Emissions, 1,000 - 18,000 MHz, 24-Sep-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
EMCO	Antenna, Horn, 1-18GHz	3115	868	7/9/2018	7/9/2020
Hewlett Packard	Spectrum Analyzer (SA40) Red 30 Hz -40 GHz	8564E (84125C)	1148	10/14/2017	10/14/2018
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	4/18/2018	4/18/2019
Hewlett Packard	Preamplifier, 1-26.5GHz	8449B	WC062438	11/22/2017	11/22/2018
Radiated Emissions, 1,000 - 26,000 MHz, 26-Sep-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
HP / Miteq	SA40 P Head HF preAmplifier, 18-40 GHz (w/2415)	TTA1840-45-5P-HG-S	1772	9/12/2018	N/A
A. H. Systems	System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	7/21/2017	7/21/2019
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	2199	8/30/2018	8/30/2019
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2249	5/1/2018	5/1/2019
Hewlett Packard	Spectrum Analyzer (SA40) Purple 9 kHz - 40 GHz,	8564E (84125C)	2415	2/16/2018	2/16/2019
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/24/2017	8/24/2019
Radiated Emissions Band Edge, 26-Sep-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
EMCO	Antenna, Horn, 1-18 GHz	3115	2870	8/24/2017	8/24/2019
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	9482	10/28/2016	10/28/2018
Radiated Emissions, 9 kHz - 1 GHz, 27-Sep-18					
National Technical Systems	NTS EMI Software (rev 2.10)	N/A	0		N/A
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB 7	1538	2/10/2018	2/10/2019
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	1/30/2018	1/30/2019
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	10/4/2017	10/4/2019
Rhode & Schwarz	Magnetic Loop Antenna, 9 kHz-30 MHz	HFH2-Z2	WC062457	1/5/2018	1/5/2020
Conducted RF Measurement, 27-Sep-18					
Rohde & Schwarz	Power Meter, Dual Channel	NRVD	1071	4/4/2018	4/4/2019
Rohde & Schwarz	Peak Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	6/21/2018	6/21/2019
Agilent Technologies	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	7/27/2018	7/27/2019

Appendix B Test Data

TL076543-RA Pages 21 – 72

Client:	AmesburyTruth	Job Number:	PR076543
Product	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
System Configuration:	-	Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Emissions Standard(s):	FCC 15.247, RSS-247	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

AmesburyTruth

Product

Precept Touch, Smart Lock with Bluetooth

Date of Last Test: 9/27/2018

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 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: 23 °C
Rel. Humidity: 38 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	BLE (Inside Antenna)	37 - 2402 MHz	-	Default	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	30.7 dBµV/m @ 2389.1 MHz (-23.3 dB)
	BLE (Inside Antenna)	39 - 2480 MHz	-	Default	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	37.2 dBµV/m @ 2483.5 MHz (-16.8 dB)
2	BLE (Outside Antenna)	37 - 2402 MHz	-	Default	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	31.0 dBµV/m @ 2378.0 MHz (-23.0 dB)
	BLE (Outside Antenna)	39 - 2480 MHz	-	Default	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	38.2 dBµV/m @ 2483.6 MHz (-15.8 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

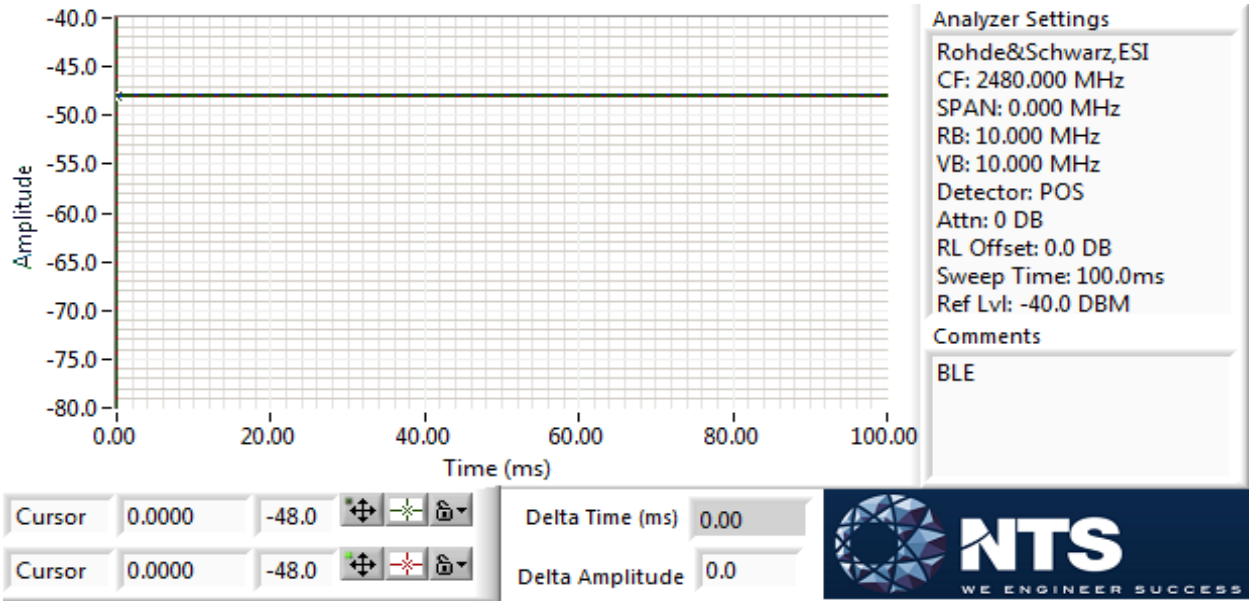
No deviations were made from the requirements of the standard.

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074
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 average mode, 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	---	1.00	---	100	0	0	10



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 30 dB below the level of the fundamental and measured in 100 kHz.

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

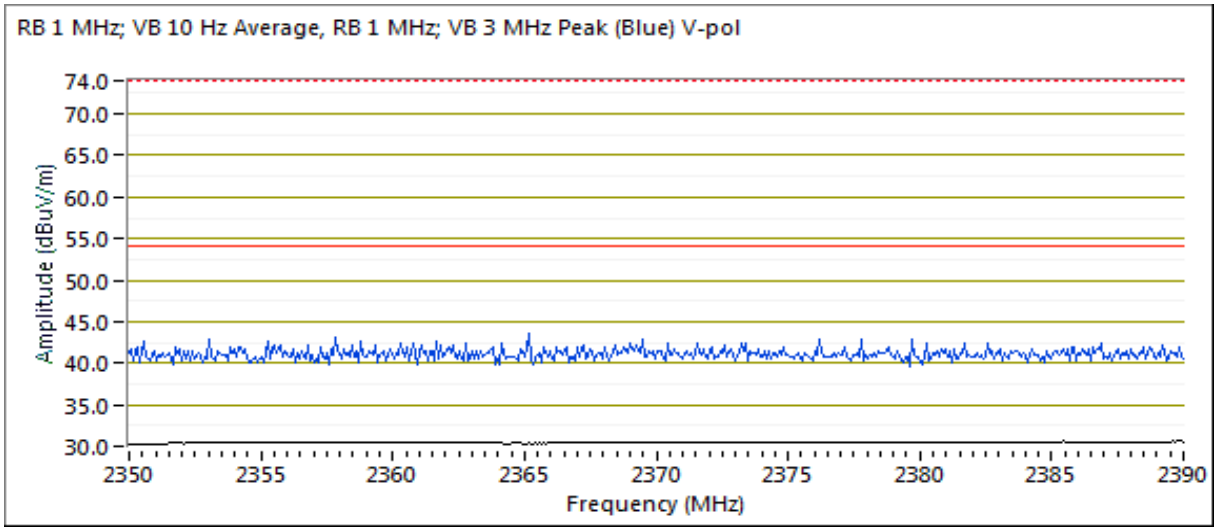
Run #1: Radiated Bandedge Measurements

Date of Test: 9/26/2018 Config. Used: 1
Test Engineer: Deniz Demirci Config Change: None
Test Location: FT Ch #5 EUT Voltage: Battery operated

Channel: 37 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---

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	
2389.080	30.7	V	54.0	-23.3	AVG	168	1.6	POS; RB 1 MHz; VB: 10 Hz
2388.970	44.5	V	74.0	-29.5	PK	168	1.6	POS; RB 1 MHz; VB: 3 MHz
2389.960	30.1	H	54.0	-23.9	AVG	148	1.6	POS; RB 1 MHz; VB: 10 Hz
2388.870	43.2	H	74.0	-30.8	PK	148	1.6	POS; RB 1 MHz; VB: 3 MHz

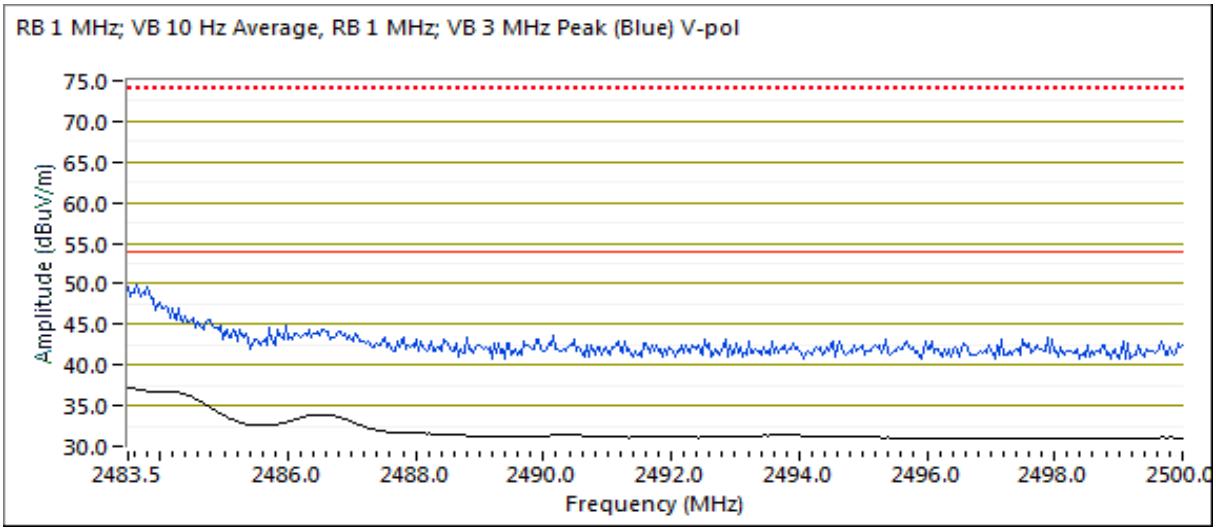


Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 39 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---

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	
2483.530	37.2	V	54.0	-16.8	AVG	73	1.8	POS; RB 1 MHz; VB: 10 Hz
2483.650	50.5	V	74.0	-23.5	PK	73	1.8	POS; RB 1 MHz; VB: 3 MHz
2483.520	33.3	H	54.0	-20.7	AVG	88	1.7	POS; RB 1 MHz; VB: 10 Hz
2484.030	46.1	H	74.0	-27.9	PK	88	1.7	POS; RB 1 MHz; VB: 3 MHz



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

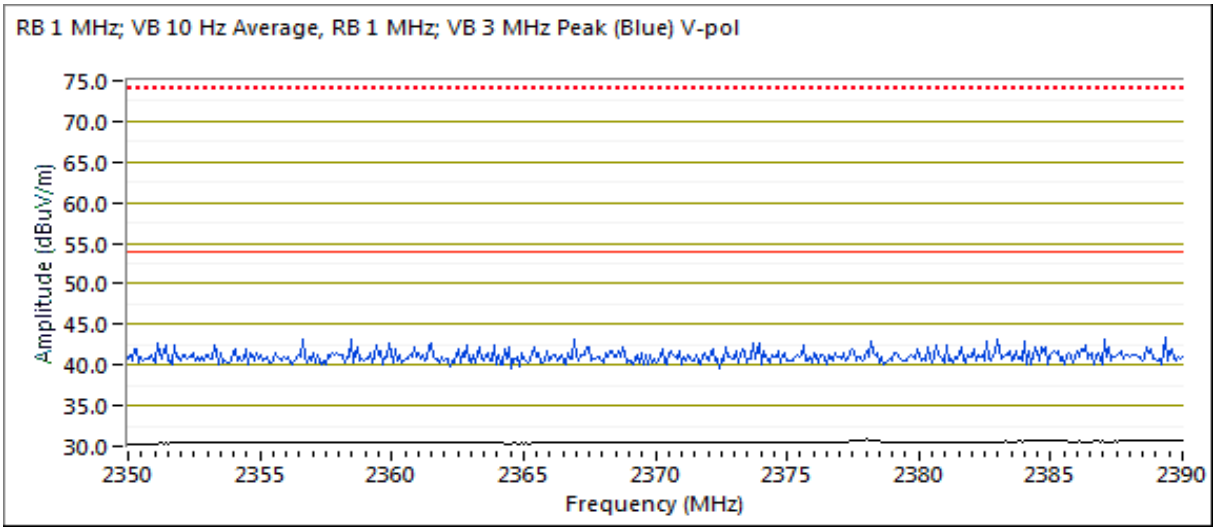
Run #2: Radiated Bandedge Measurements

Date of Test: 9/26/2018 Config. Used: 1
Test Engineer: Deniz Demirci Config Change: None
Test Location: FT Ch #5 EUT Voltage: Battery operated

Channel: 37 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---

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	
2378.010	31.0	V	54.0	-23.0	AVG	232	1.5	POS; RB 1 MHz; VB: 10 Hz
2384.560	44.0	V	74.0	-30.0	PK	232	1.5	POS; RB 1 MHz; VB: 3 MHz
2385.730	30.7	H	54.0	-23.3	AVG	260	1.9	POS; RB 1 MHz; VB: 10 Hz
2383.750	43.3	H	74.0	-30.7	PK	260	1.9	POS; RB 1 MHz; VB: 3 MHz

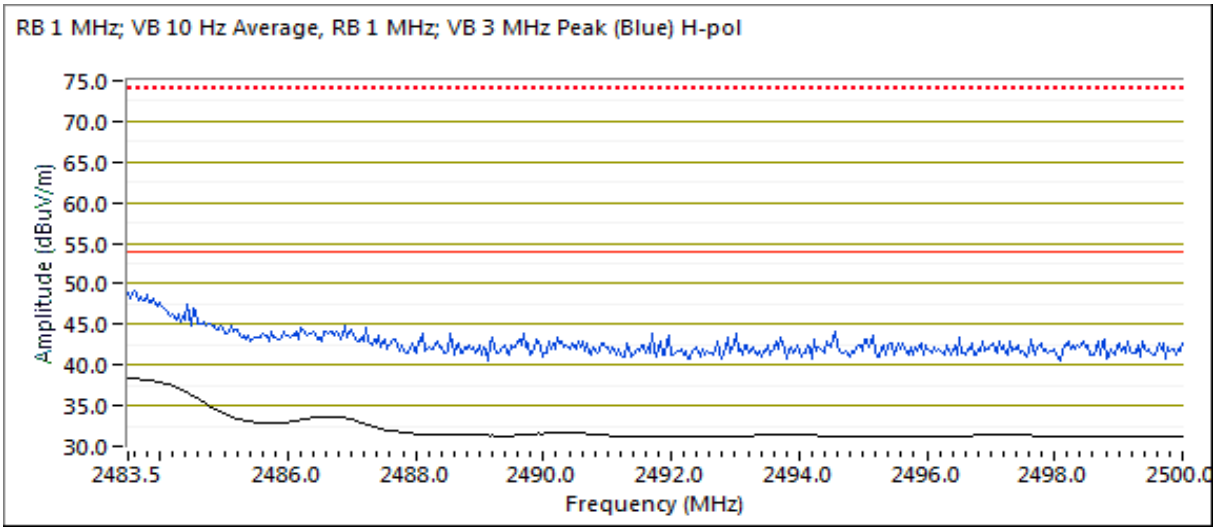


Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 39 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---

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	
2483.560	38.2	H	54.0	-15.8	AVG	259	1.2	POS; RB 1 MHz; VB: 10 Hz
2483.540	52.5	H	74.0	-21.5	PK	259	1.2	POS; RB 1 MHz; VB: 3 MHz
2483.590	31.9	V	54.0	-22.1	AVG	286	1.2	POS; RB 1 MHz; VB: 10 Hz
2484.060	44.9	V	74.0	-29.1	PK	286	1.2	POS; RB 1 MHz; VB: 3 MHz



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 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: 23 °C
Rel. Humidity: 39 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	BLE (Inside Ant.)	37 - 2402 MHz	-	Default	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	37.0 dBµV/m @ 4804.2 MHz (-17.0 dB)
	BLE (Inside Ant.)	17 - 2440 MHz	-	Default	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	38.3 dBµV/m @ 4879.6 MHz (-15.7 dB)
	BLE (Inside Ant.)	39 - 2480 MHz	-	Default	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	40.1 dBµV/m @ 4959.9 MHz (-13.9 dB)
2	BLE (Outside Ant.)	37 - 2402 MHz	-	Default	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	38.8 dBµV/m @ 4804.0 MHz (-15.2 dB)
	BLE (Outside Ant.)	17 - 2440 MHz	-	Default	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	39.7 dBµV/m @ 4879.6 MHz (-14.3 dB)
	BLE (Outside Ant.)	39 - 2480 MHz	-	Default	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	44.4 dBµV/m @ 4960.0 MHz (-9.6 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

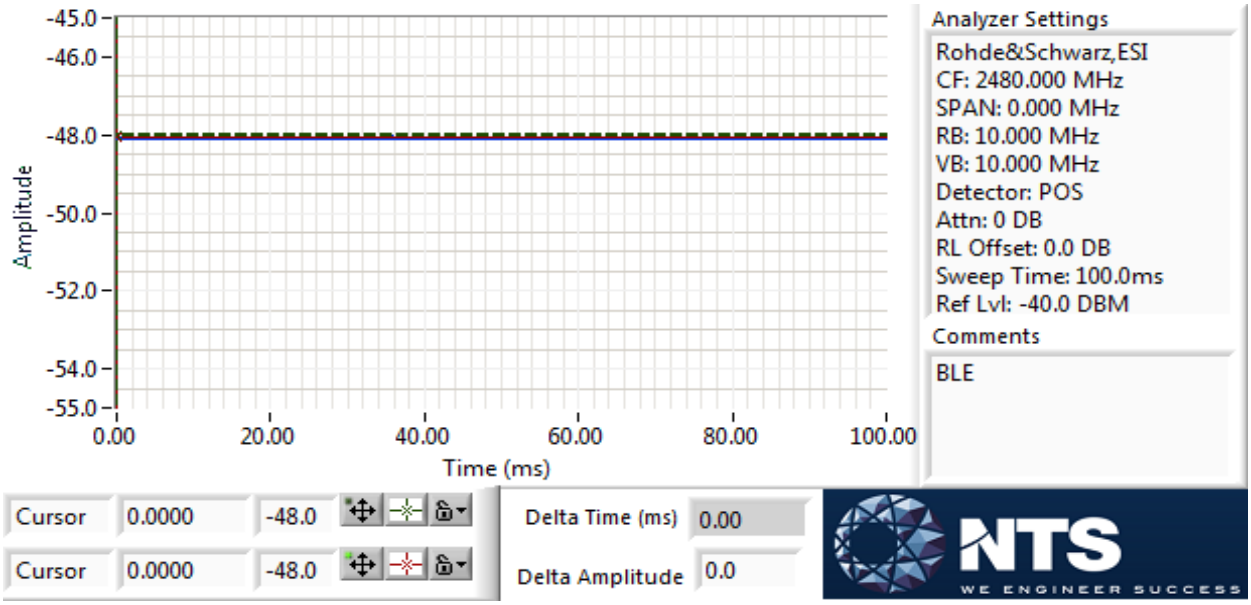
No deviations were made from the requirements of the standard.

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074
Peak measurements performed with: RBW=1 MHz, VBW=3 MHz, peak detector, max hold, auto sweep time
Unless otherwise stated/noted, emission has duty cycle ≥ 98% and was measured using RBW=1 MHz, VBW=10 Hz, peak detector, linear average mode, auto sweep time, max hold.
2.4 GHz 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	---	1.00	---	100	0	0	10



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 30 dB below the level of the fundamental and measured in 100 kHz.

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #1: Radiated Spurious Emissions, 1,000 - 26000 MHz. Operating Mode: BLE

Run #1a: Low Channel

Channel: 37 Mode: BLE

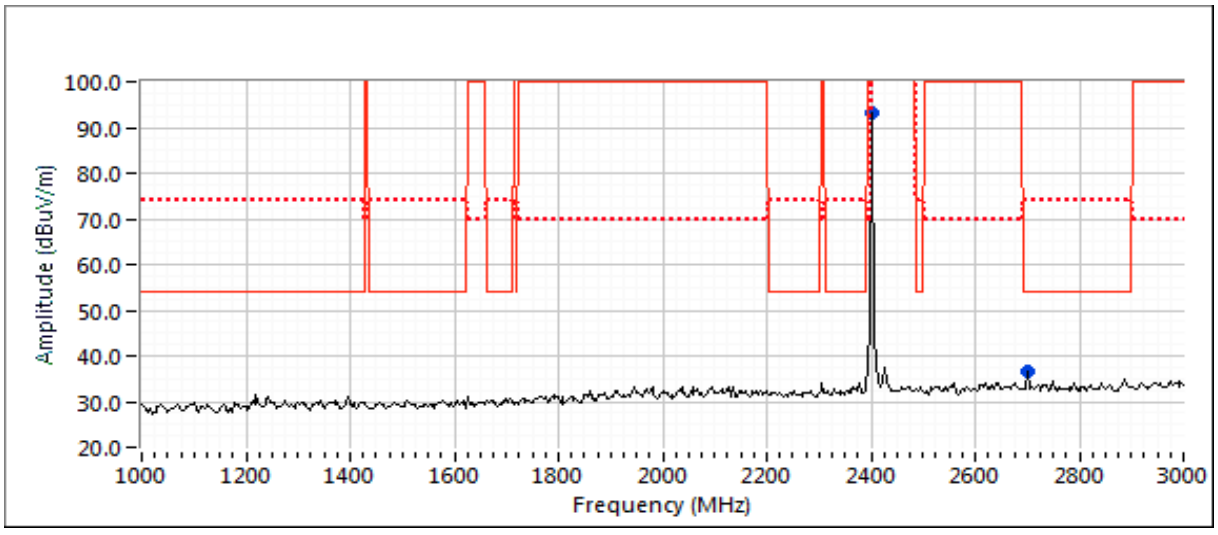
Tx Chain: Inside Antenna Data Rate: ---

Date of Test: 9/24/2018 Config. Used: 1

Test Engineer: Deniz Demirci Config Change: None

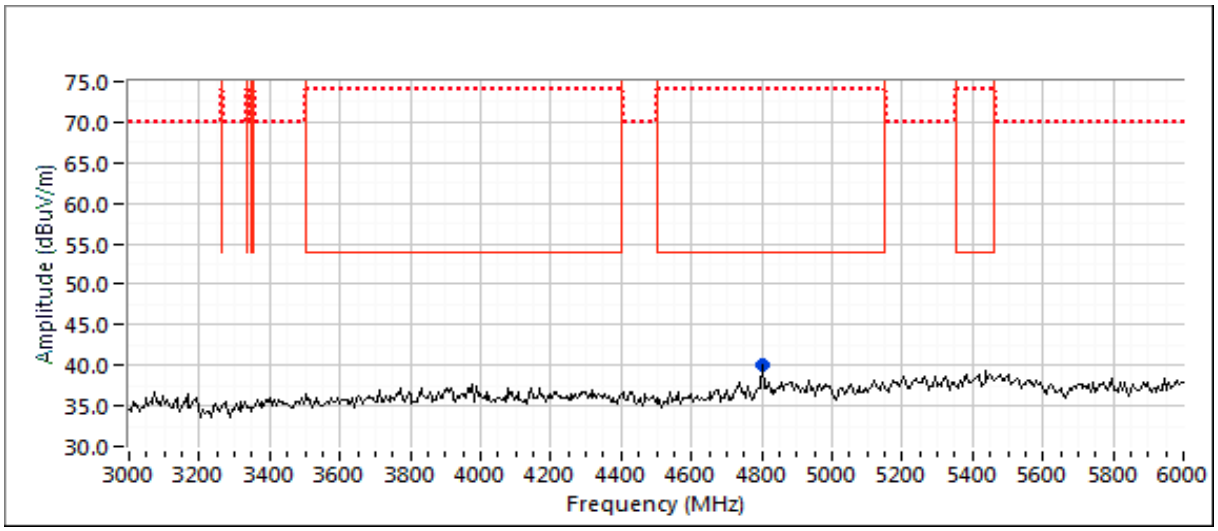
Test Location: FT Ch #4 EUT Voltage: Battery operated

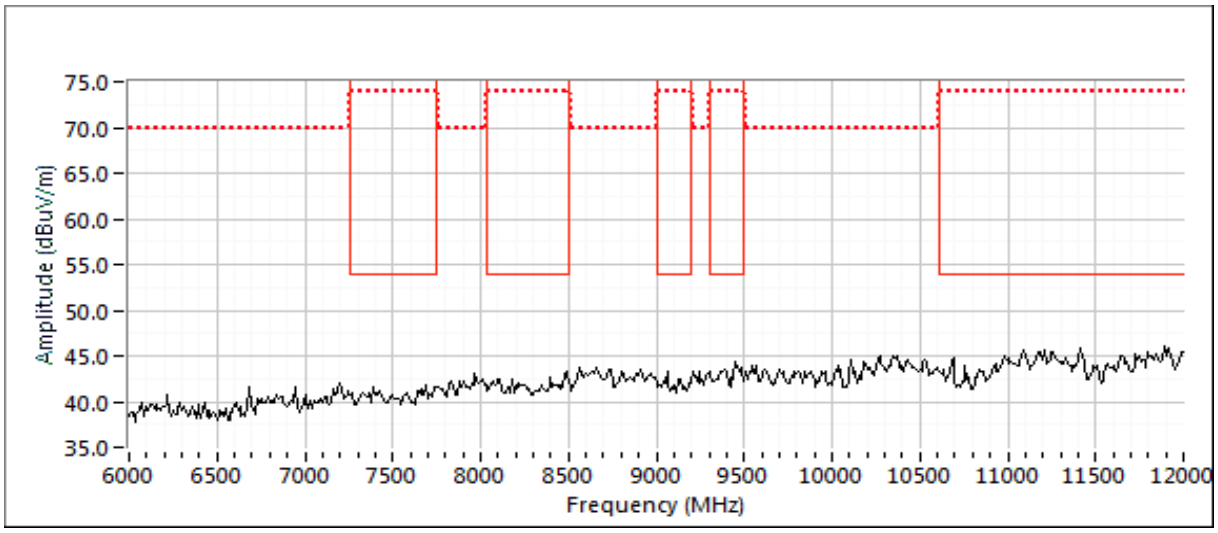
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.000	93.4	V	-	-	PK	63	2.0	Fundamental
2699.990	35.6	V	54.0	-18.4	AVG	315	1.5	RB 1 MHz;VB 10 Hz;Peak
2700.200	45.0	V	74.0	-29.0	PK	315	1.5	RB 1 MHz;VB 3 MHz;Peak
4804.210	37.0	V	54.0	-17.0	AVG	195	1.0	RB 1 MHz;VB 10 Hz;Peak
4803.660	48.0	V	74.0	-26.0	PK	195	1.0	RB 1 MHz;VB 3 MHz;Peak



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

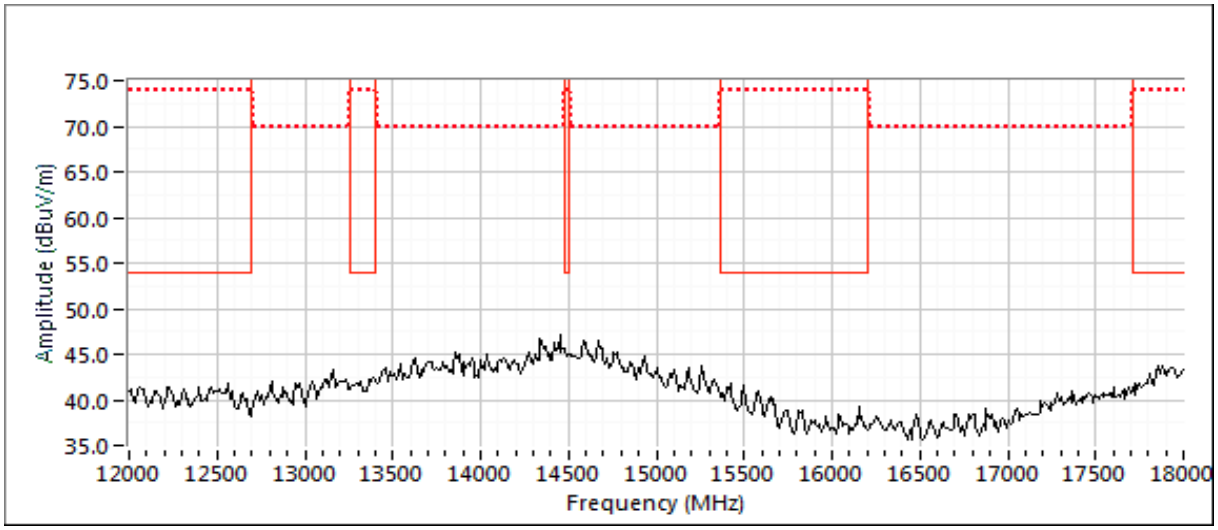
Channel: 37 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---

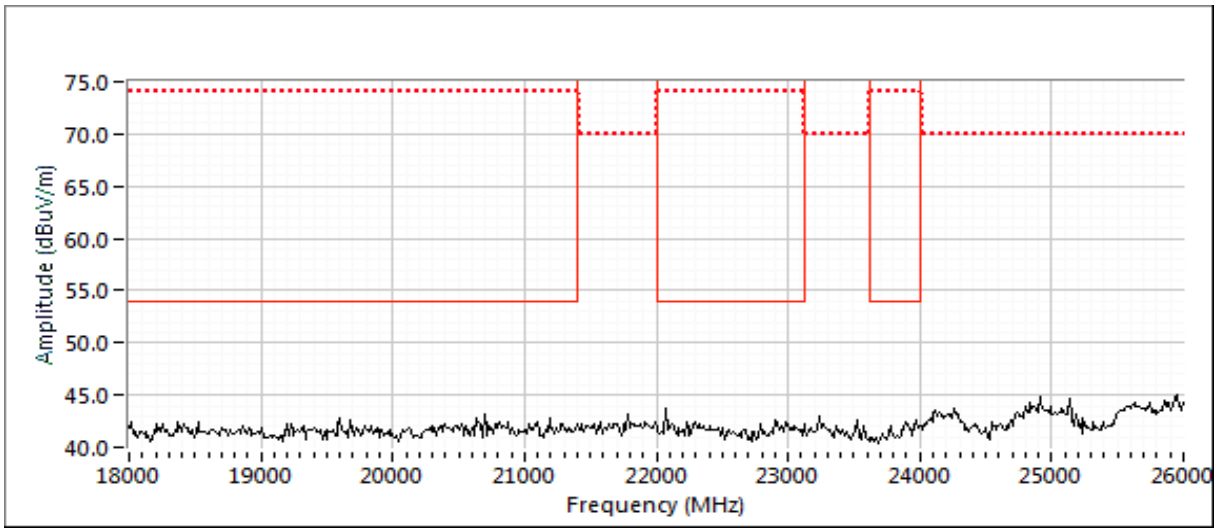




Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 37 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---



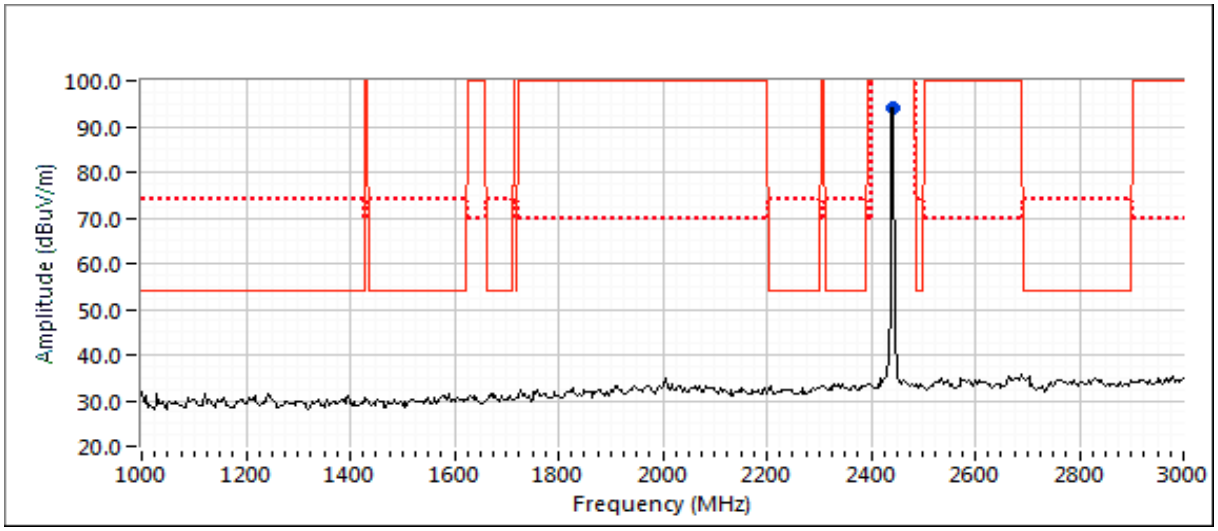


Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #1b: Center Channel
Channel: 17 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---

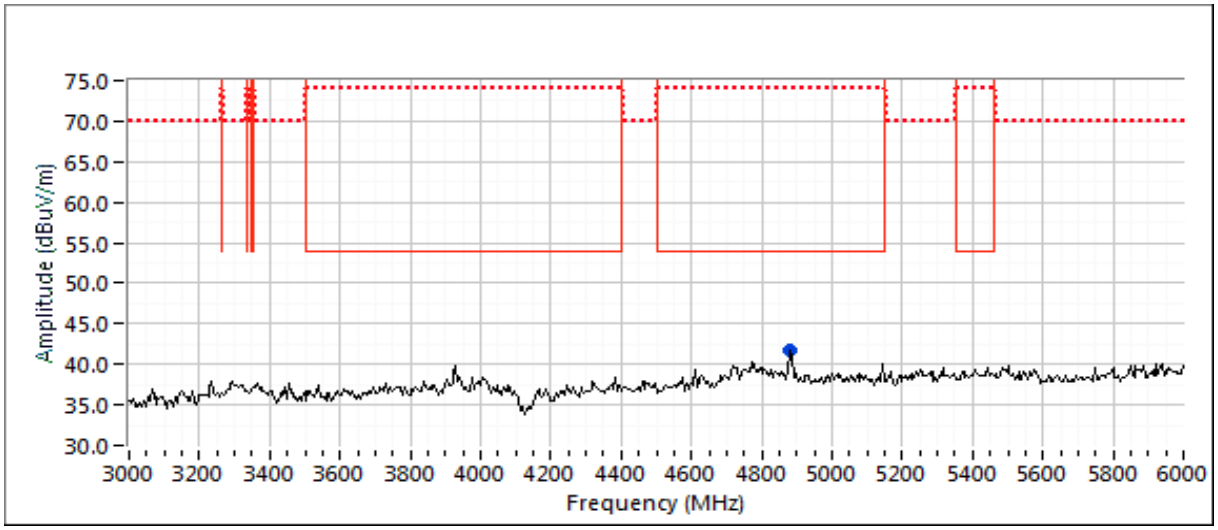
Date of Test: 9/26/2018 Config. Used: 1
Test Engineer: Deniz Demirci Config Change: None
Test Location: FT Ch #5 EUT Voltage: Battery operated

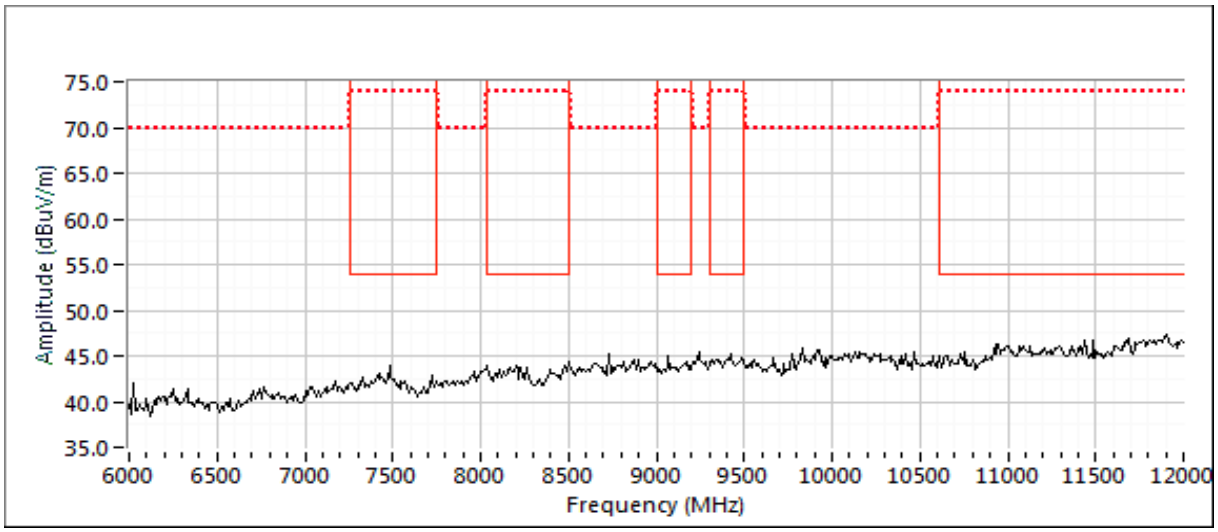
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2440.030	94.1	V	-	-	PK	68	1.5	Fundamental
4879.610	38.3	V	54.0	-15.7	AVG	360	1.4	RB 1 MHz;VB 10 Hz;Peak
4880.480	48.6	V	74.0	-25.4	PK	360	1.4	RB 1 MHz;VB 3 MHz;Peak



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

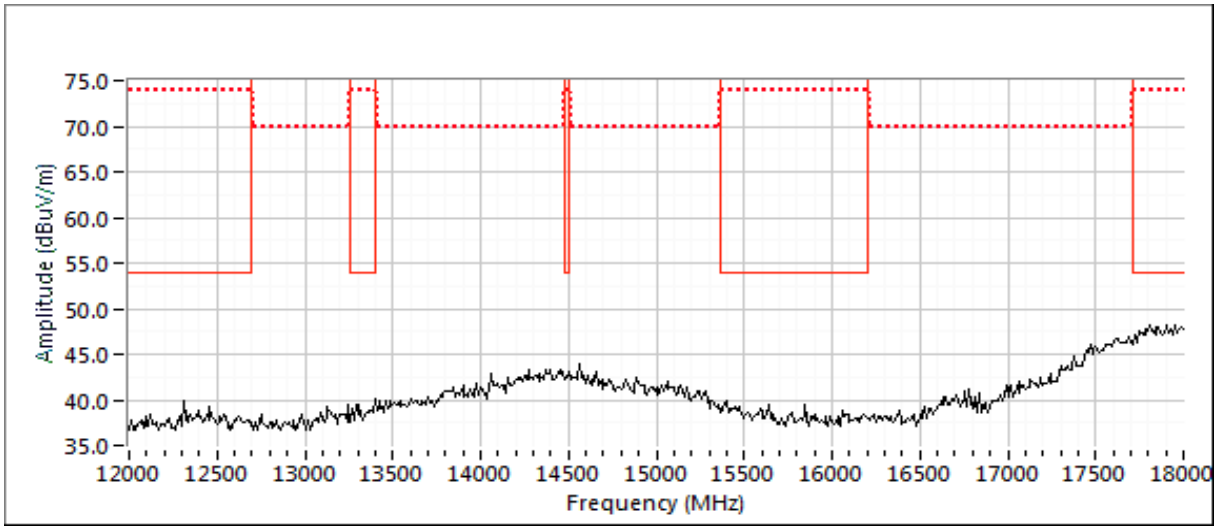
Channel: 17 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---

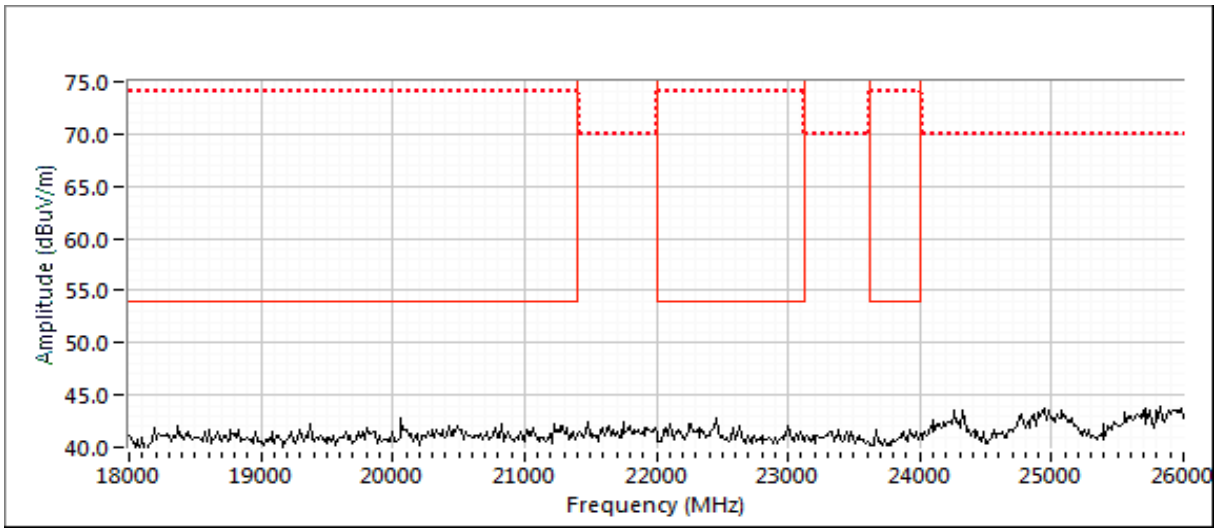




Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 17 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #1c: High Channel

Channel: 39 Mode: BLE

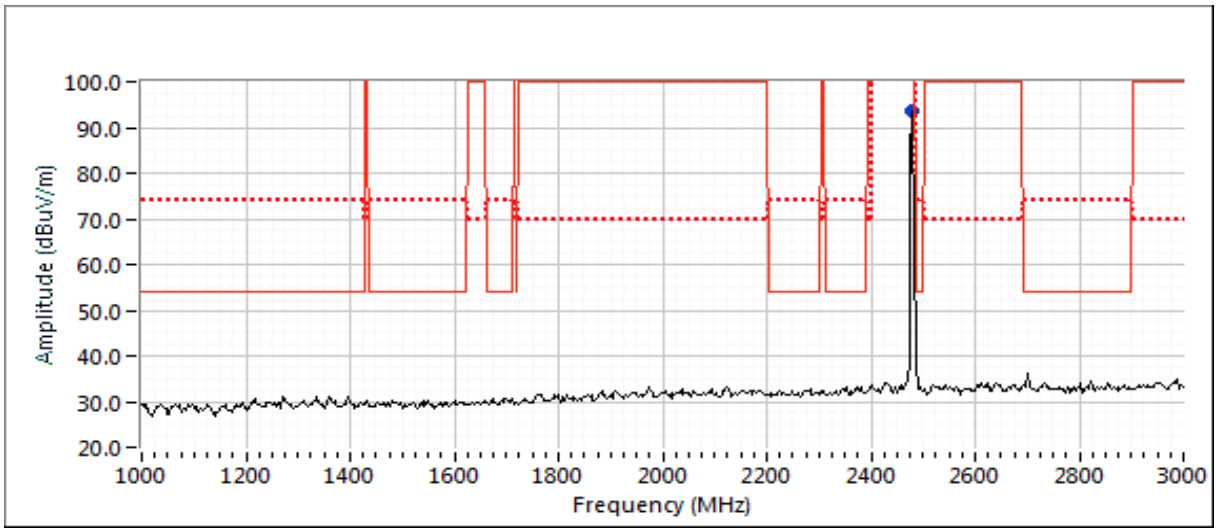
Tx Chain: Inside Antenna Data Rate: ---

Date of Test: 9/24/2018 Config. Used: 1

Test Engineer: Deniz Demirci Config Change: None

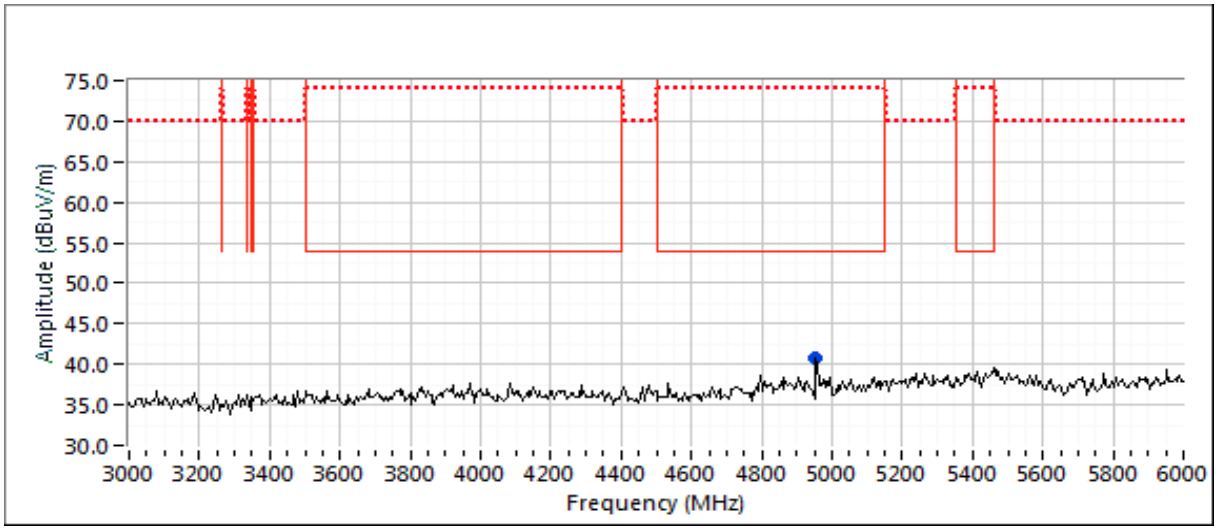
Test Location: FT Ch #4 EUT Voltage: Battery operated

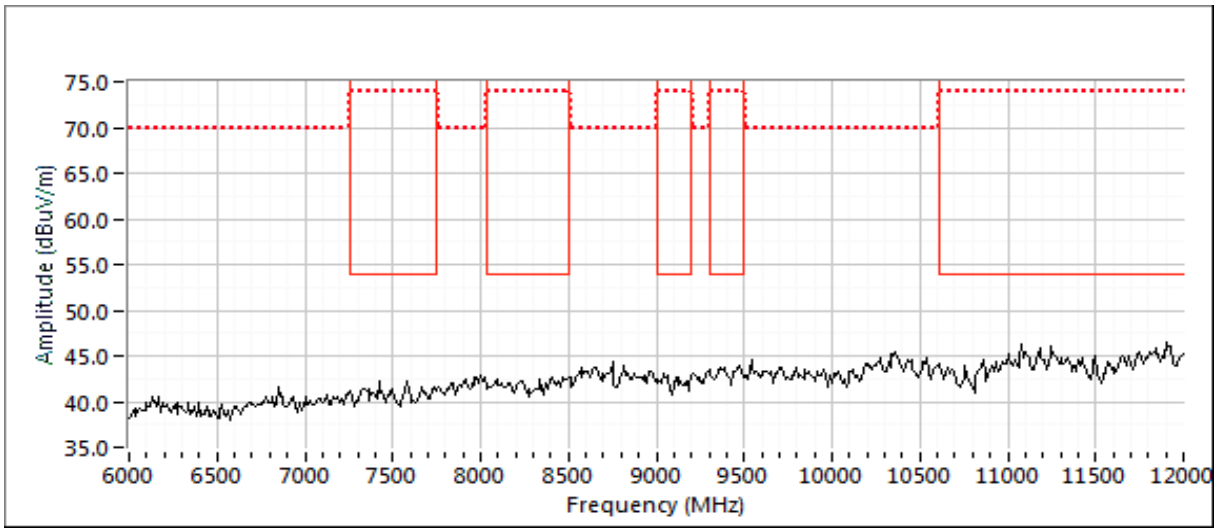
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.000	93.5	V	-	-	PK	81	2.0	Fundamental
4959.930	40.1	V	54.0	-13.9	AVG	6	1.7	RB 1 MHz;VB 10 Hz;Peak
4960.140	49.2	V	74.0	-24.8	PK	6	1.7	RB 1 MHz;VB 3 MHz;Peak



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

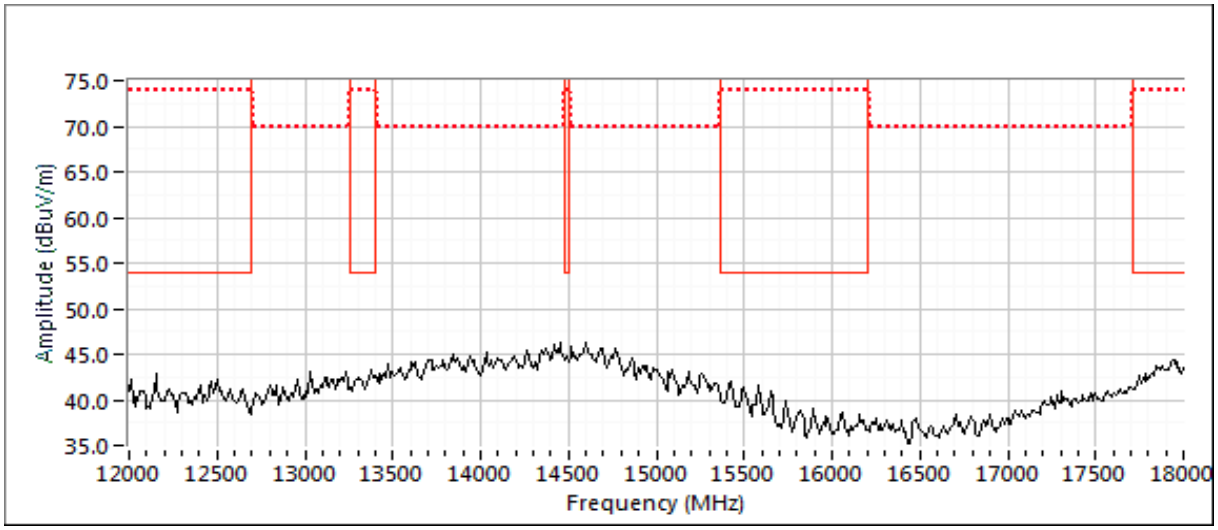
Channel: 39 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---

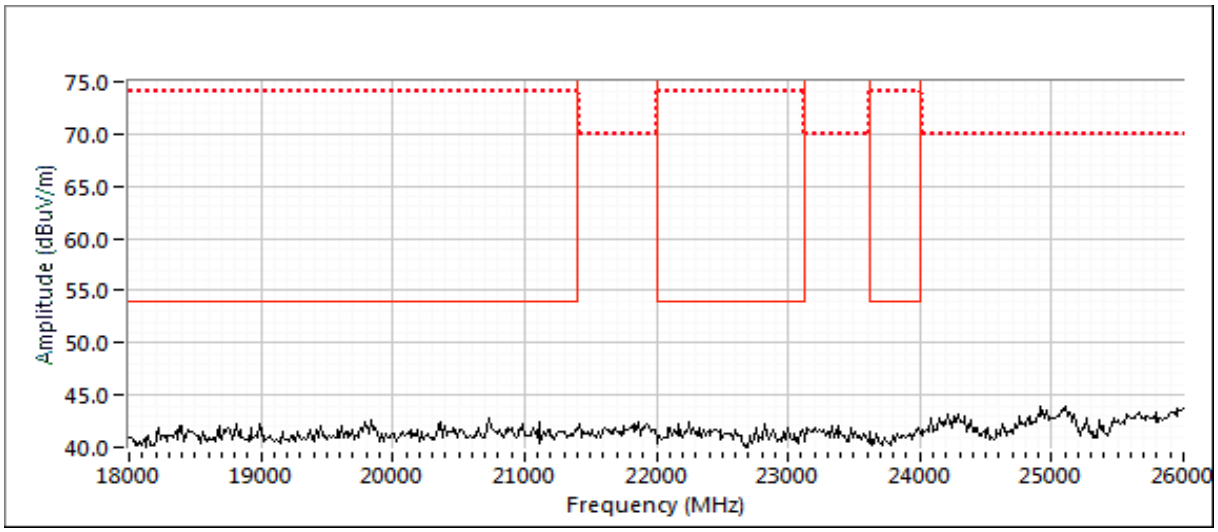




Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 39 Mode: BLE
Tx Chain: Inside Antenna Data Rate: ---





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #2: Radiated Spurious Emissions, 1,000 - 26000 MHz. Operating Mode: BLE

Run #2a: Low Channel

Channel: 37 Mode: BLE

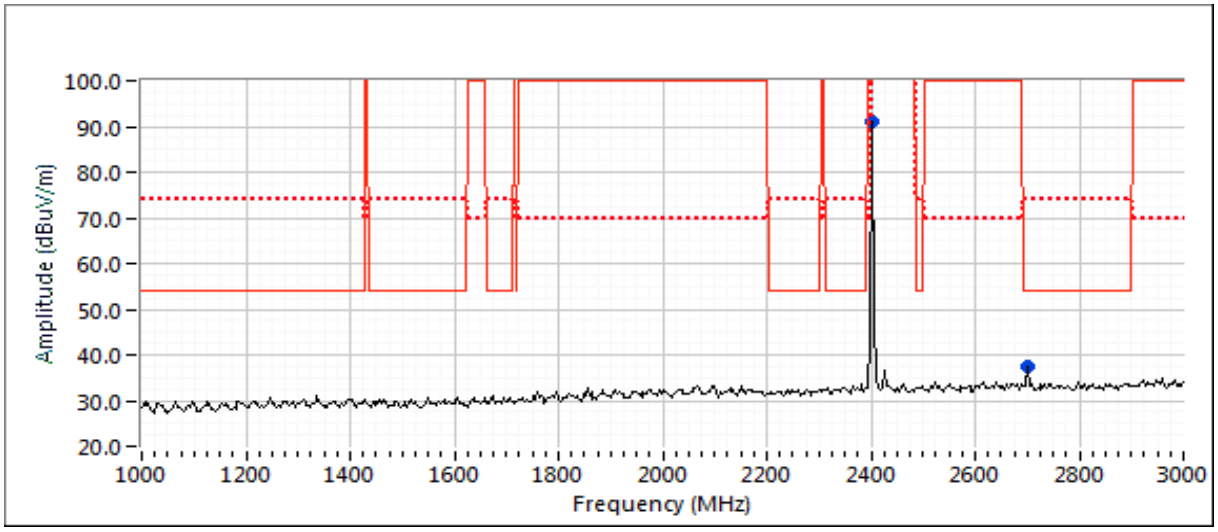
Tx Chain: Outside Antenna Data Rate: ---

Date of Test: 9/24/2018 Config. Used: 1

Test Engineer: Deniz Demirci Config Change: None

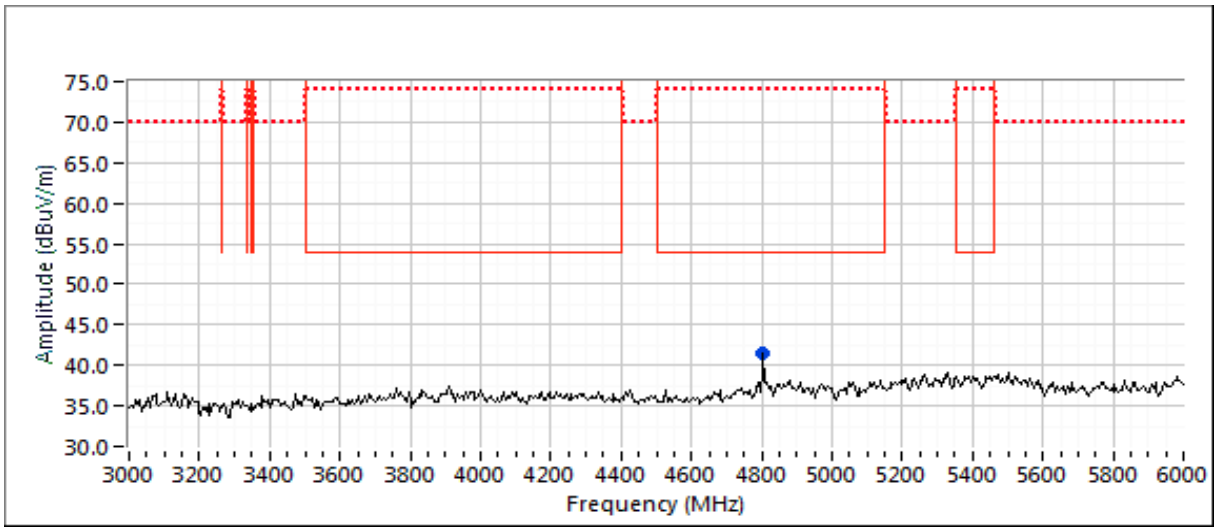
Test Location: FT Ch #4 EUT Voltage: Battery operated

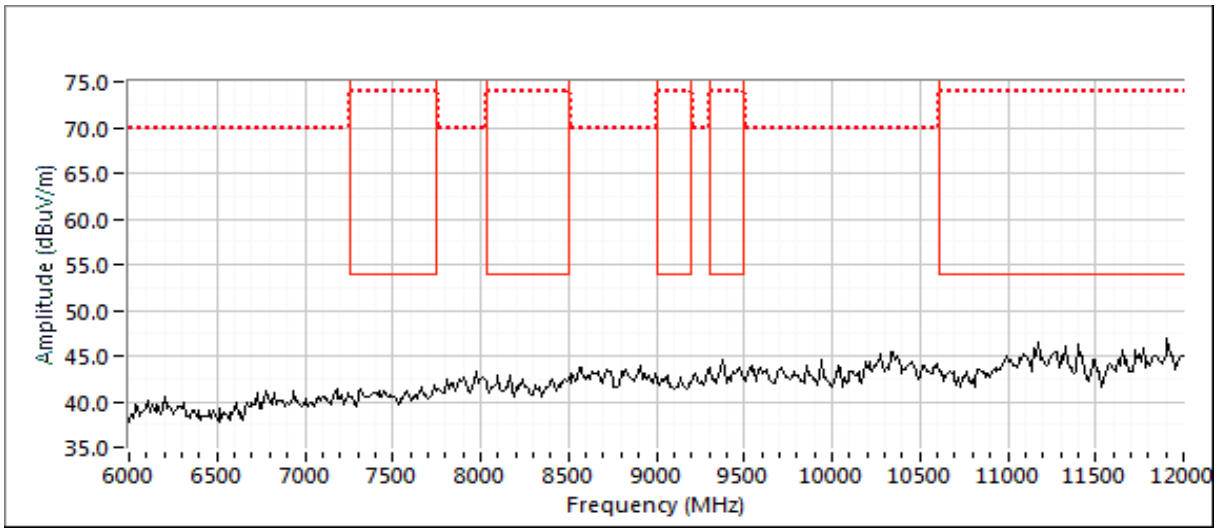
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.000	92.1	V	-	-	PK	258	2.0	Fundamental
2700.000	35.7	V	54.0	-18.3	AVG	151	1.5	RB 1 MHz;VB 10 Hz;Peak
2699.840	45.2	V	74.0	-28.8	PK	151	1.5	RB 1 MHz;VB 3 MHz;Peak
4803.960	38.8	V	54.0	-15.2	AVG	184	1.4	RB 1 MHz;VB 10 Hz;Peak
4804.020	48.6	V	74.0	-25.4	PK	184	1.4	RB 1 MHz;VB 3 MHz;Peak



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

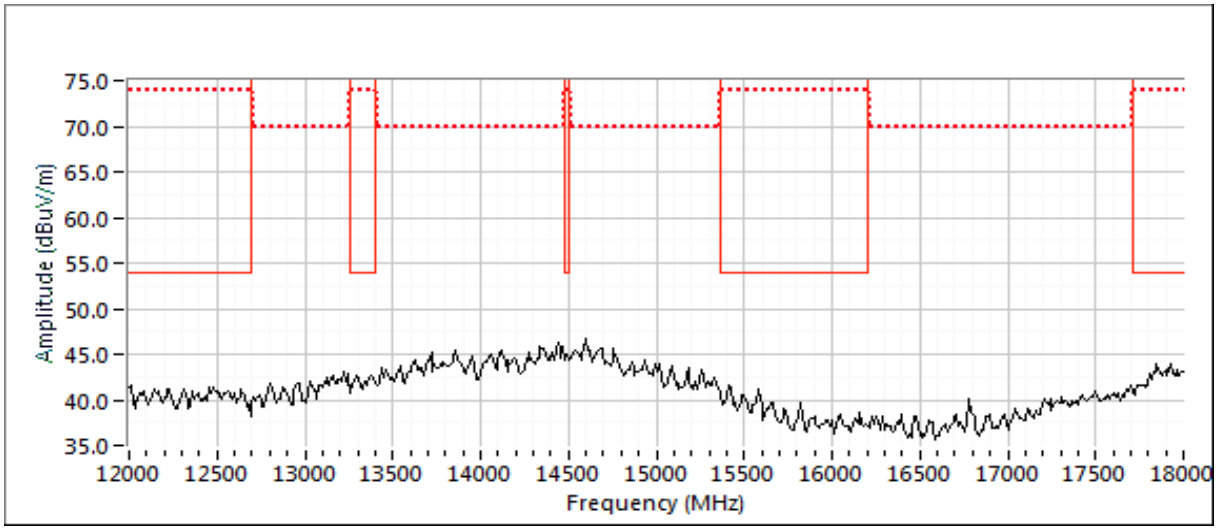
Channel: 37 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---

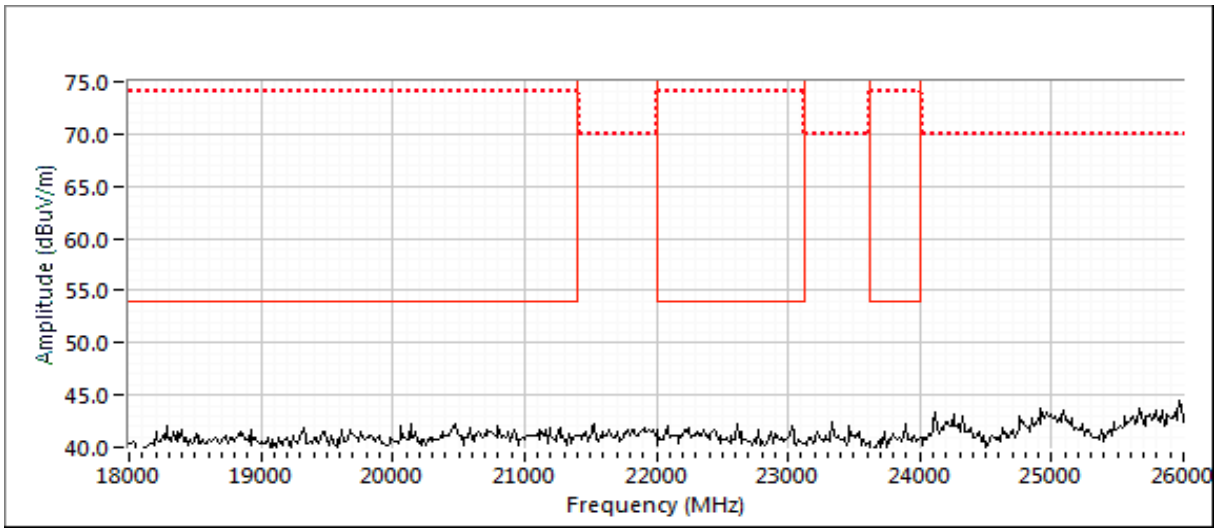




Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 37 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---



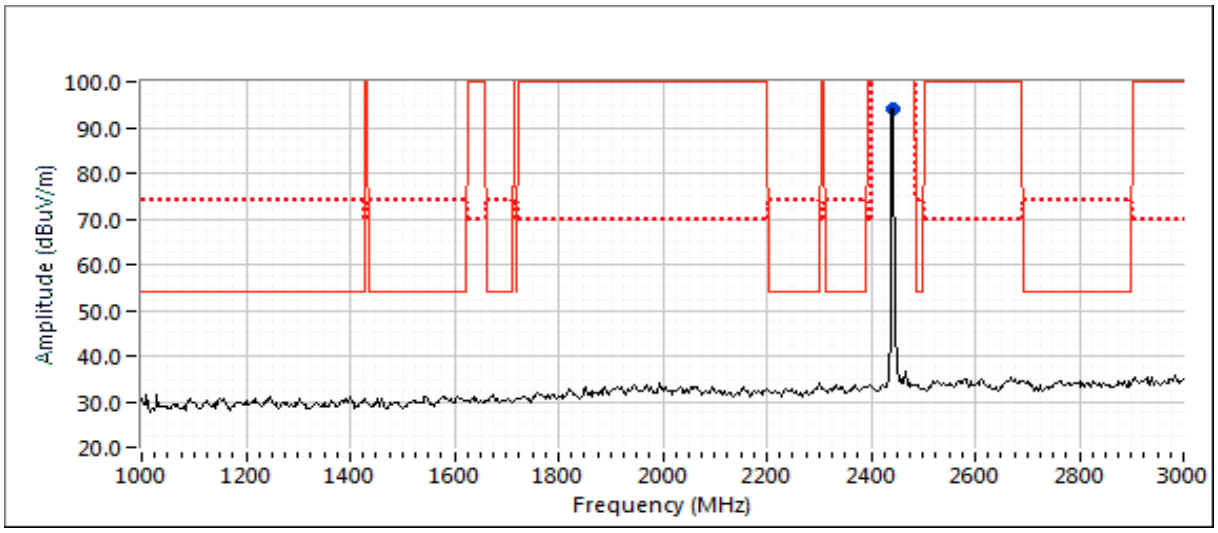


Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #2b: Center Channel
Channel: 17 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---

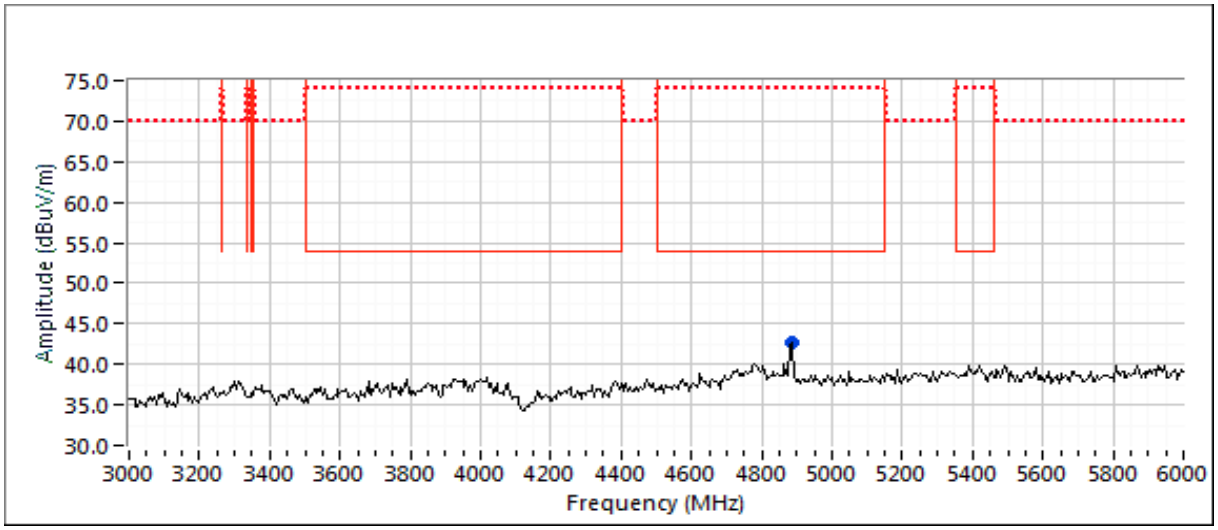
Date of Test: 9/26/2018 Config. Used: 1
Test Engineer: Deniz Demirci Config Change: None
Test Location: FT Ch #5 EUT Voltage: Battery operated

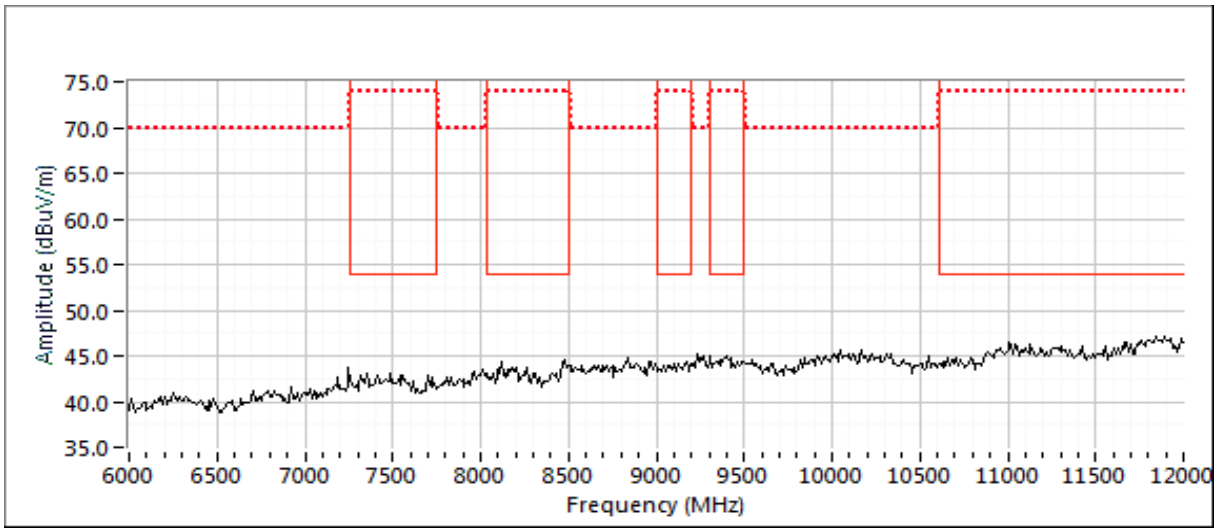
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2440.070	94.1	V	-	-	PK	265	2.0	Fundamental
4879.550	39.7	H	54.0	-14.3	AVG	225	1.5	RB 1 MHz;VB 10 Hz;Peak
4880.570	49.0	H	74.0	-25.0	PK	225	1.5	RB 1 MHz;VB 3 MHz;Peak



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

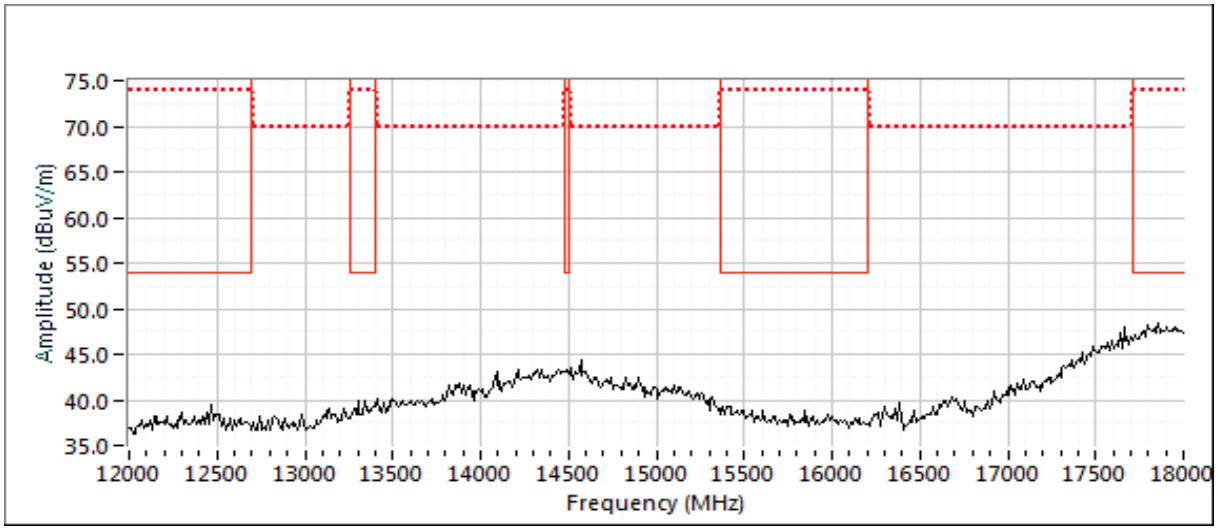
Channel: 17 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---

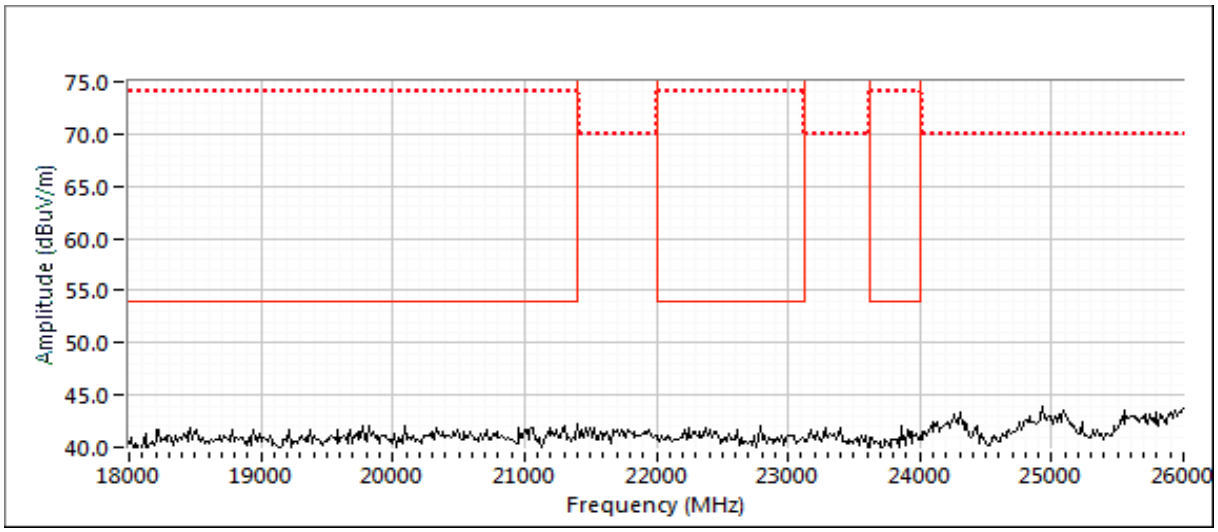




Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 17 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #2c: High Channel

Channel: 39 Mode: BLE

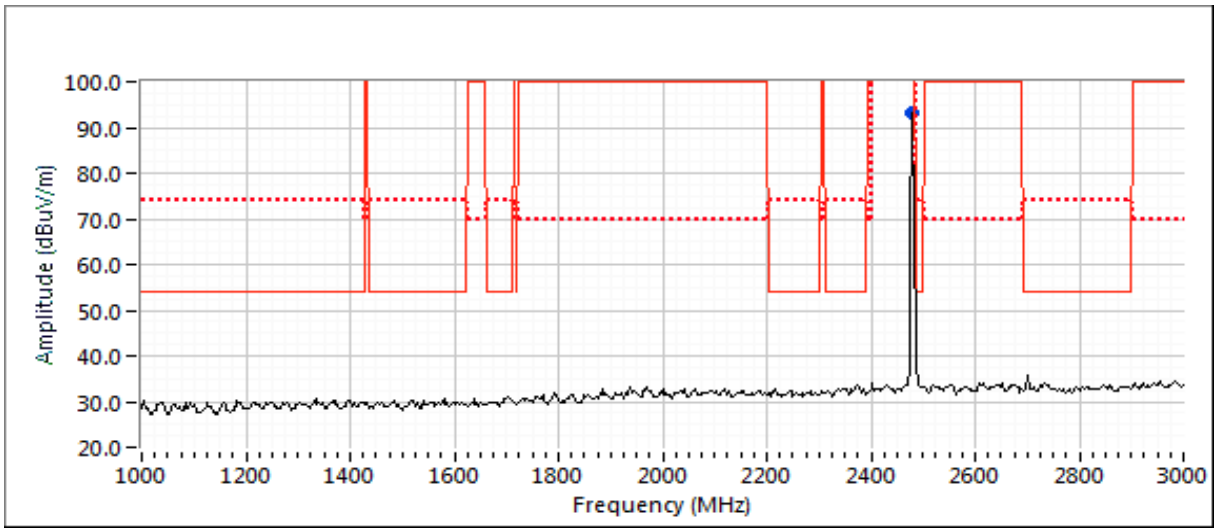
Tx Chain: Outside Antenna Data Rate: ---

Date of Test: 9/24/2018 Config. Used: 1

Test Engineer: Deniz Demirci Config Change: None

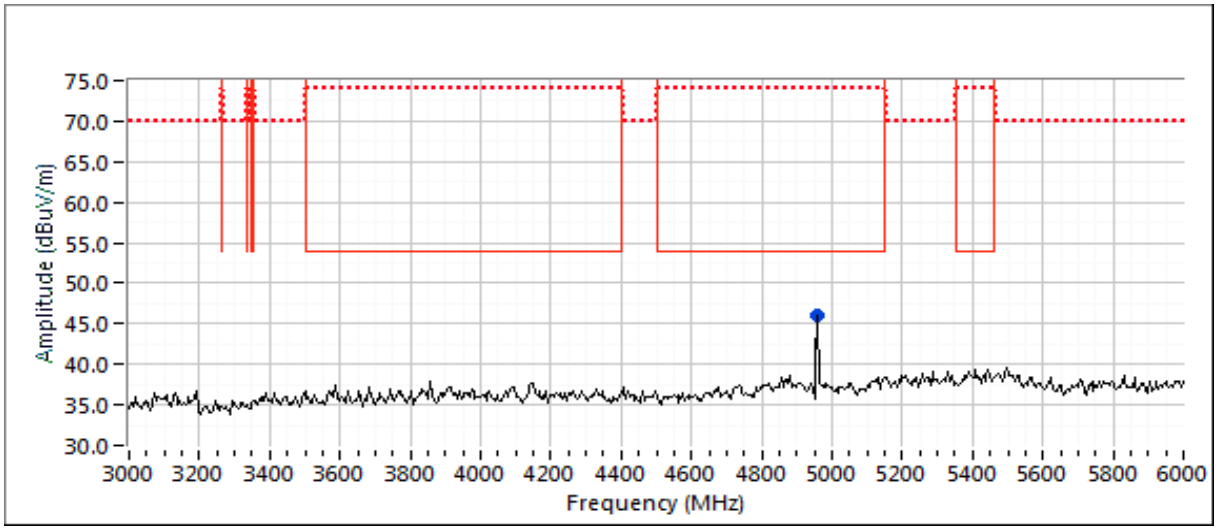
Test Location: FT Ch #4 EUT Voltage: Battery operated

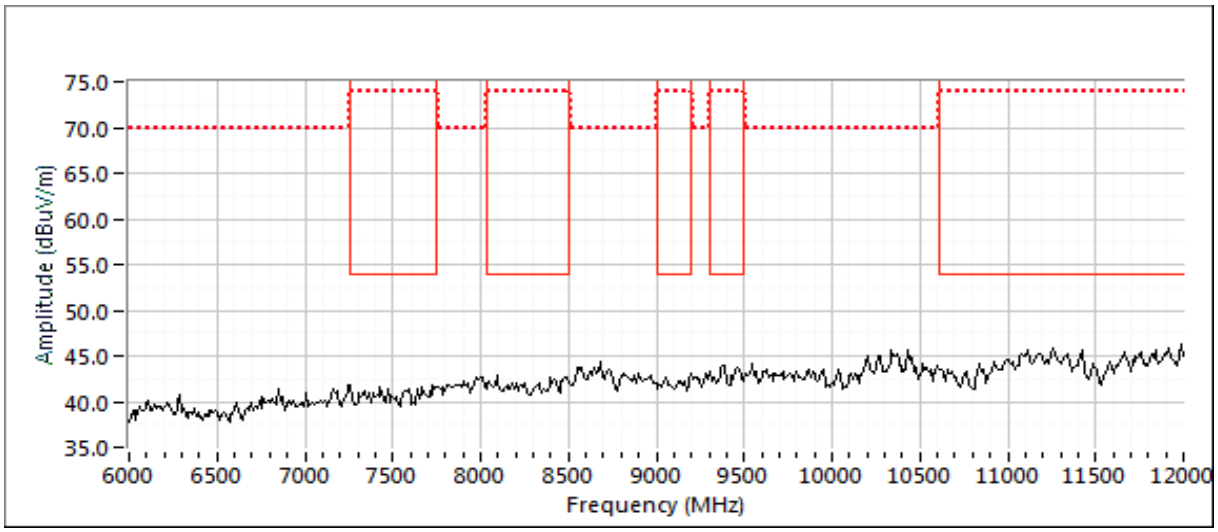
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.000	93.0	H	-	-	PK	112	1.5	Fundamental
4959.980	44.4	H	54.0	-9.6	AVG	147	2.5	RB 1 MHz;VB 10 Hz;Peak
4959.550	51.6	H	74.0	-22.4	PK	147	2.5	RB 1 MHz;VB 3 MHz;Peak



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

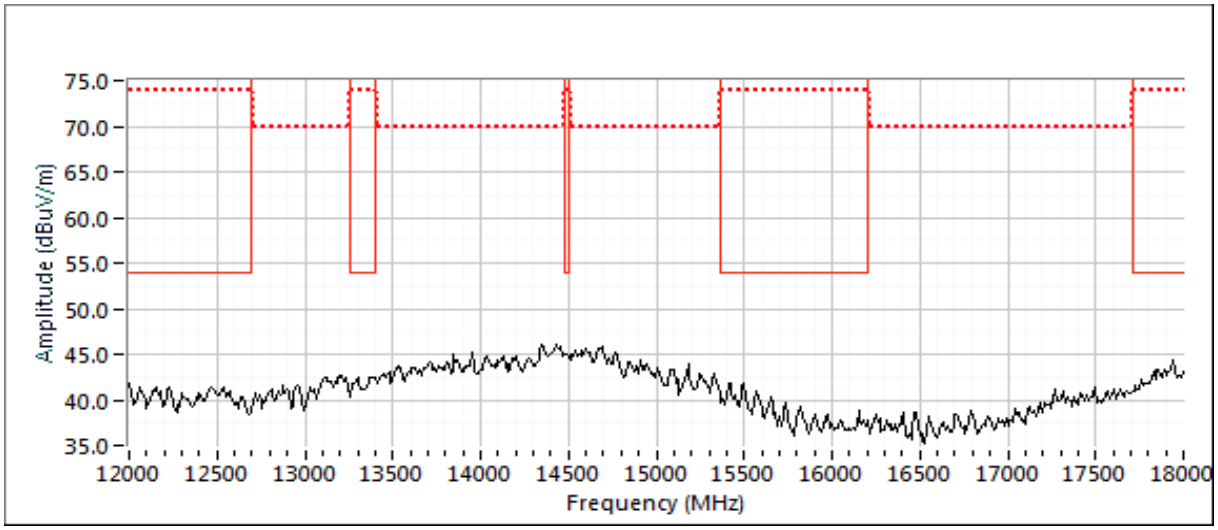
Channel: 39 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---

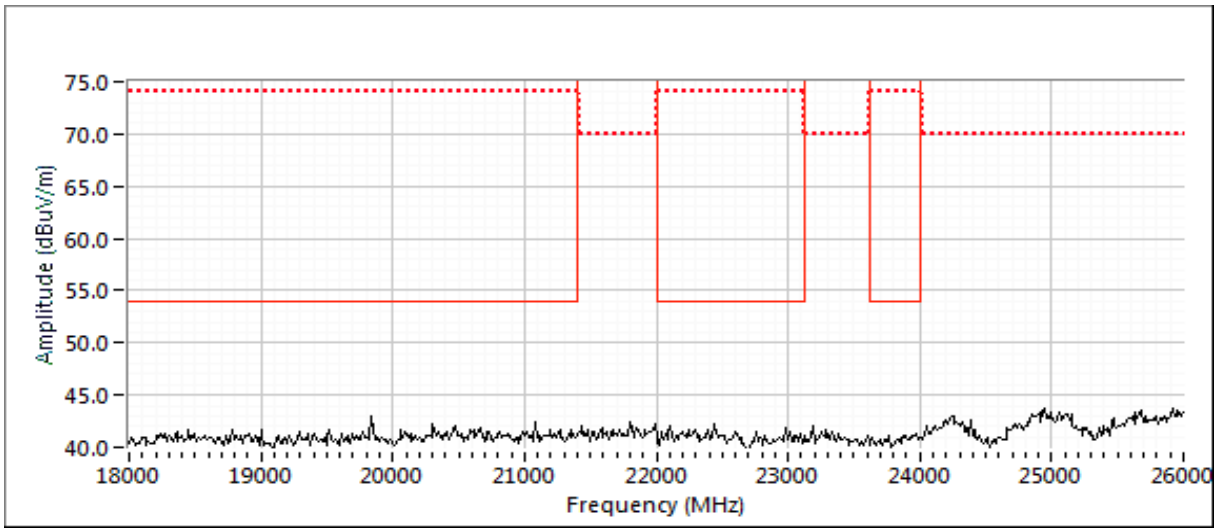




Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Channel: 39 Mode: BLE
Tx Chain: Outside Antenna Data Rate: ---





Client:	AmesburyTruth	PR Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Engineer:	-
Standard:	FCC 15.247, RSS-247	Class:	B

Radiated 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: 9/24/2018
Test Engineer: Deniz Demirci
Test Location: FT Ch #3

Config. Used: 1
Config Change: None
EUT Voltage: Battery operated

General Test Configuration

The EUT was located on the turntable for radiated emissions testing. No remote support equipment was used.
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: 22 °C
Rel. Humidity: 34 %

Summary of Results

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	BLE (Inside Antenna)	17 - 2440	-	Default	Radiated Emissions, 9 kHz - 1 GHz	FCC Part 15.209 / 15.247(c)	27.8 dBµV/m @ 341.06 MHz (-18.2 dB)
2	BLE (Outside Antenna)	17 - 2440	-	Default	Radiated Emissions, 9 kHz - 1 GHz	FCC Part 15.209 / 15.247(c)	33.8 dBµV/m @ 461.27 MHz (-12.2 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.

Client:	AmesburyTruth	PR Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Engineer:	-
Standard:	FCC 15.247, RSS-247	Class:	B

Run #1: Radiated Emissions, 9 kHz - 1 GHz

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
0.009 - 0.490	3	300	-80.0
0.490 - 1.705	3	30	-40.0
1.705 - 30.0	3	30	-40.0
30 - 1000	3	3	0.0

BLE 2440 MHz (Inside Antenna)
Preliminary peak readings captured during pre-scan

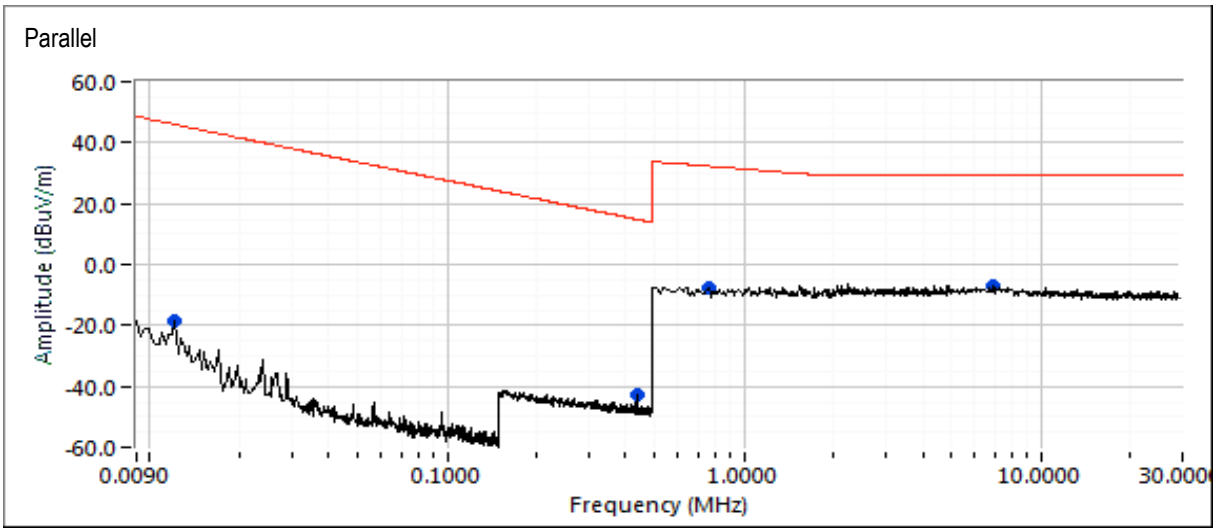
Frequency	Level	Pol	FCC Part 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
0.012	*-18.8*	*V*	*45.9*	*-64.7*	*Peak*	*108*	*1.0*	*Parallel - Noise floor reading*
0.438	*-42.5*	*V*	*14.8*	*-57.3*	*Peak*	*0*	*1.0*	*Parallel - Noise floor reading*
0.788	*14.0*	*V*	*32.2*	*-18.2*	*Peak*	*52*	*1.0*	*Parallel - Noise floor reading*
0.761	*-7.5*	*V*	*32.3*	*-39.8*	*Peak*	*123*	*1.0*	*Parallel - Noise floor reading*
6.954	*-6.9*	*V*	*29.5*	*-36.4*	*Peak*	*360*	*1.0*	*Parallel - Noise floor reading*
203.006	*26.4*	*H*	*43.5*	*-17.1*	*Peak*	*353*	*1.5*	
339.078	*31.0*	*V*	*46.0*	*-15.0*	*Peak*	*279*	*1.5*	
490.701	*30.1*	*H*	*46.0*	*-15.9*	*Peak*	*353*	*1.5*	

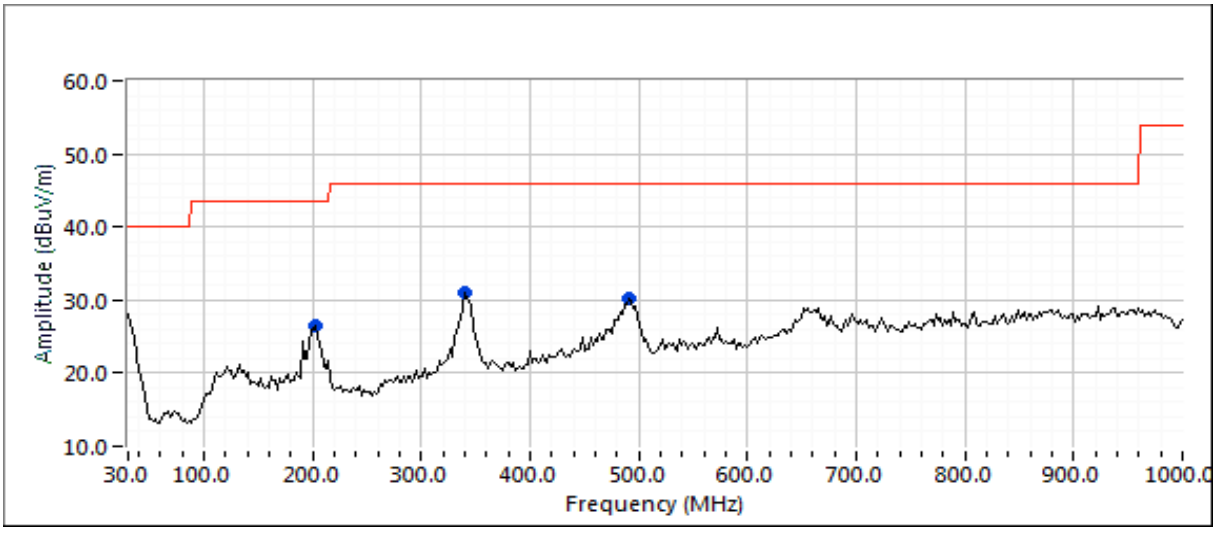
Maximized readings

Frequency	Level	Pol	FCC Part 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
341.061	27.8	V	*46.0*	-18.2	QP	270	1.2	QP (1.00s)
490.741	25.8	H	*46.0*	-20.2	QP	183	1.5	QP (1.00s)
203.823	20.7	H	*43.5*	-22.8	QP	359	2.2	QP (1.00s)

Client:	AmesburyTruth	PR Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Engineer:	-
Standard:	FCC 15.247, RSS-247	Class:	B

BLE 2440 MHz (Inside Antenna)





Client:	AmesburyTruth	PR Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Engineer:	-
Standard:	FCC 15.247, RSS-247	Class:	B

Run #2: Radiated Emissions, 9 kHz - 1 GHz

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
0.009 - 0.490	3	300	-80.0
0.490 - 1.705	3	30	-40.0
1.705 - 30.0	3	30	-40.0
30 - 1000	3	3	0.0

BLE 2440 MHz (Outside Antenna)
Preliminary peak readings captured during pre-scan

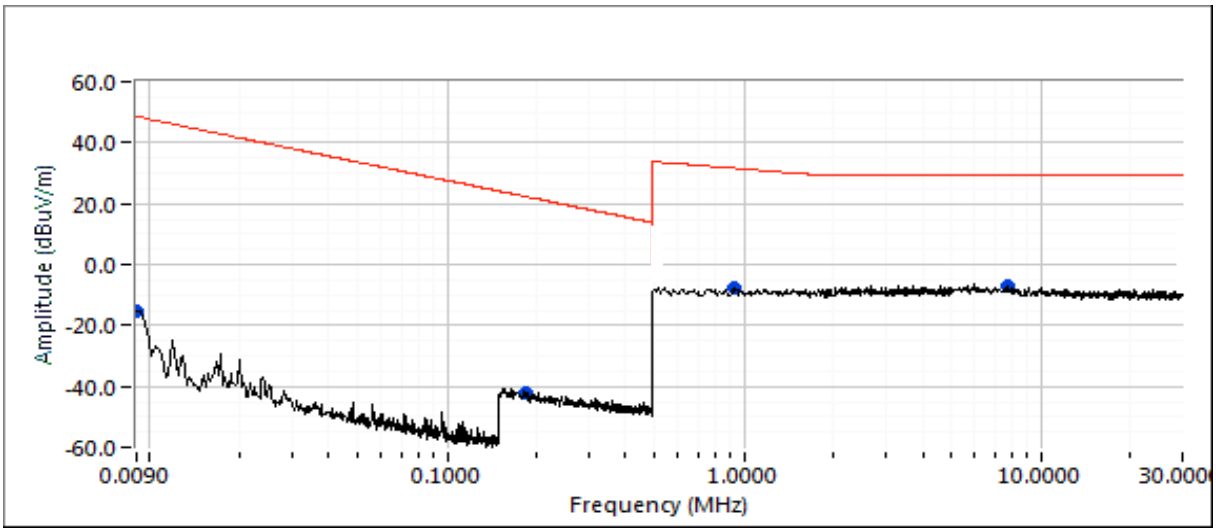
Frequency	Level	Pol	FCC Part 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
0.009	*-15.3*	*V*	*48.5*	*-63.8*	*Peak*	*360*	*1.0*	*Parallel - Noise floor reading*
0.184	*-42.0*	*V*	*22.3*	*-64.3*	*Peak*	*357*	*1.0*	*Parallel - Noise floor reading*
0.924	*-7.8*	*V*	*31.6*	*-39.4*	*Peak*	*27*	*1.0*	*Parallel - Noise floor reading*
7.705	*-7.2*	*V*	*29.5*	*-36.7*	*Peak*	*344*	*1.0*	*Parallel - Noise floor reading*
212.725	*25.3*	*V*	*43.5*	*-18.2*	*Peak*	*287*	*3.0*	
412.946	*33.8*	*V*	*46.0*	*-12.2*	*Peak*	*143*	*1.0*	
463.487	*32.2*	*V*	*46.0*	*-13.8*	*Peak*	*281*	*2.5*	
725.912	*30.2*	*H*	*46.0*	*-15.8*	*Peak*	*156*	*1.0*	

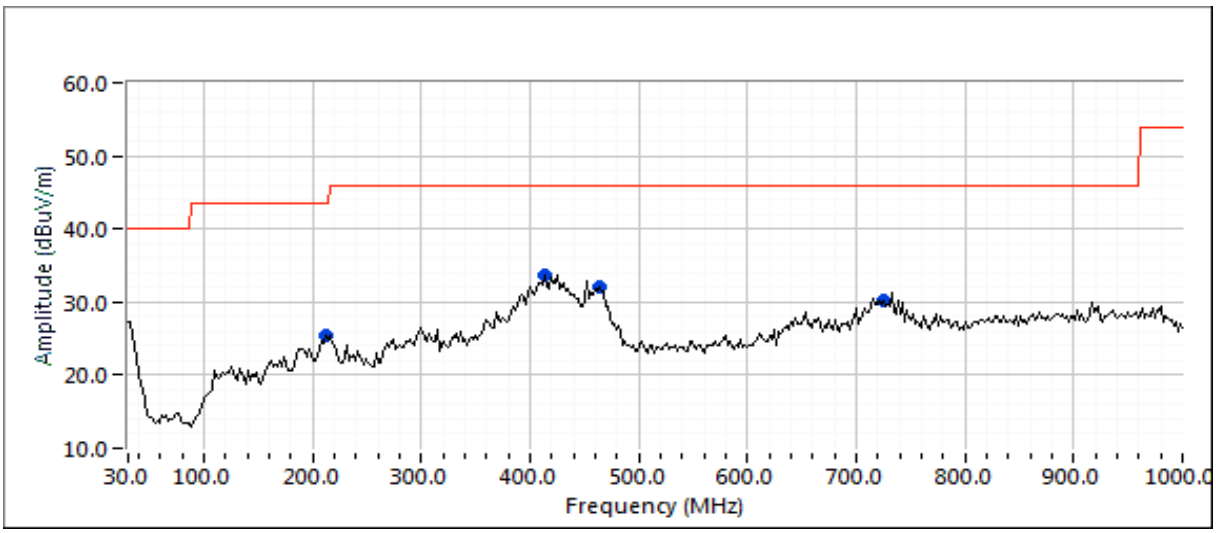
Maximized readings

Frequency	Level	Pol	FCC Part 15.209		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
461.271	33.8	V	46.0	-12.2	QP	287	1.0	QP (1.00s)
428.691	28.5	V	46.0	-17.5	QP	298	1.1	QP (1.00s)
725.251	26.5	H	46.0	-19.5	QP	162	1.0	QP (1.00s)
215.097	22.9	V	43.5	-20.6	QP	272	2.2	QP (1.00s)

Client:	AmesburyTruth	PR Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Engineer:	-
Standard:	FCC 15.247, RSS-247	Class:	B

BLE 2440 MHz (Outside Antenna)





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 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: 9/27/2018
Test Engineer: Deniz Demirci / Jude Semana
Test Location: Fremont EMC Lab #4B

Config. Used: 1
Config Change: None
EUT Voltage: Battery operated

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: 22 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	Default	-	Output Power	15.247(b)	Pass	3.9 dBm
2	Default	-	Power spectral Density (PSD)	15.247(d)	Pass	-0.4 dBm/10 kHz
3	Default	-	Minimum 6 dB Bandwidth	15.247(a)	Pass	0.717 MHz
3	Default	-	99% Bandwidth	RSS GEN	-	1.08 MHz
4	Default	-	Spurious emissions	15.247(b)	Pass	-40.7 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:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

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	1.00	Yes	-	-	-	-

Sample Notes

Sample S/N: 000177, 000178 and 000172
Driver: -

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #1: Output Power - Inside Antenna

Mode: BLE

Power Setting	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna[2] Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
Default	2402	3.9	2.5	1.8	Pass	5.7	0.004		
Default	2440	3.5	2.2	1.8	Pass	5.3	0.003		
Default	2480	3.3	2.1	1.8	Pass	5.1	0.003		

Note 1:	Output power measured using a peak power meter, spurious limit is -20 dBc.
Note 2:	2 dBi (antenna gain) - 0.25 dB (cable loss): 1.8 dBi

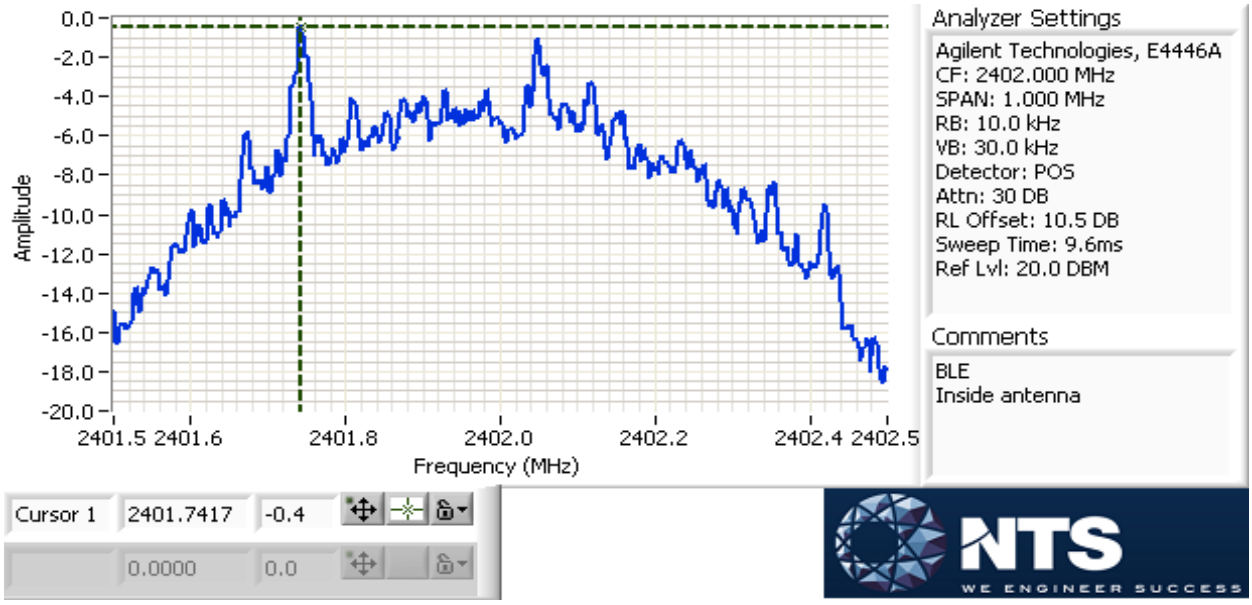
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #2: Power spectral Density - Inside Antenna

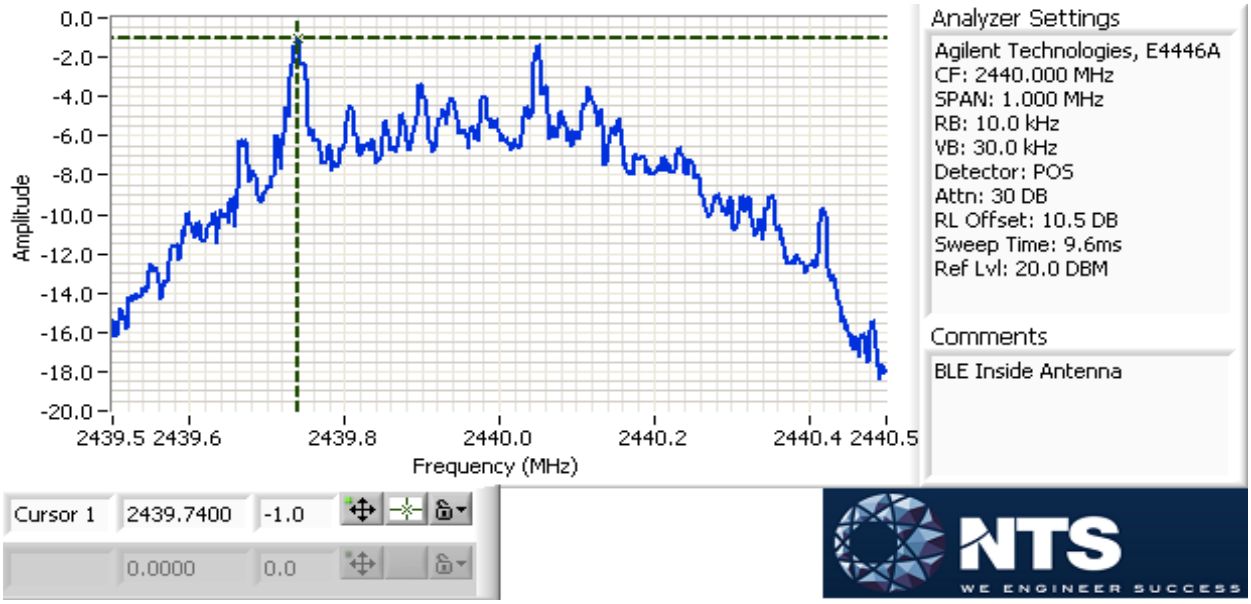
Mode: BLE

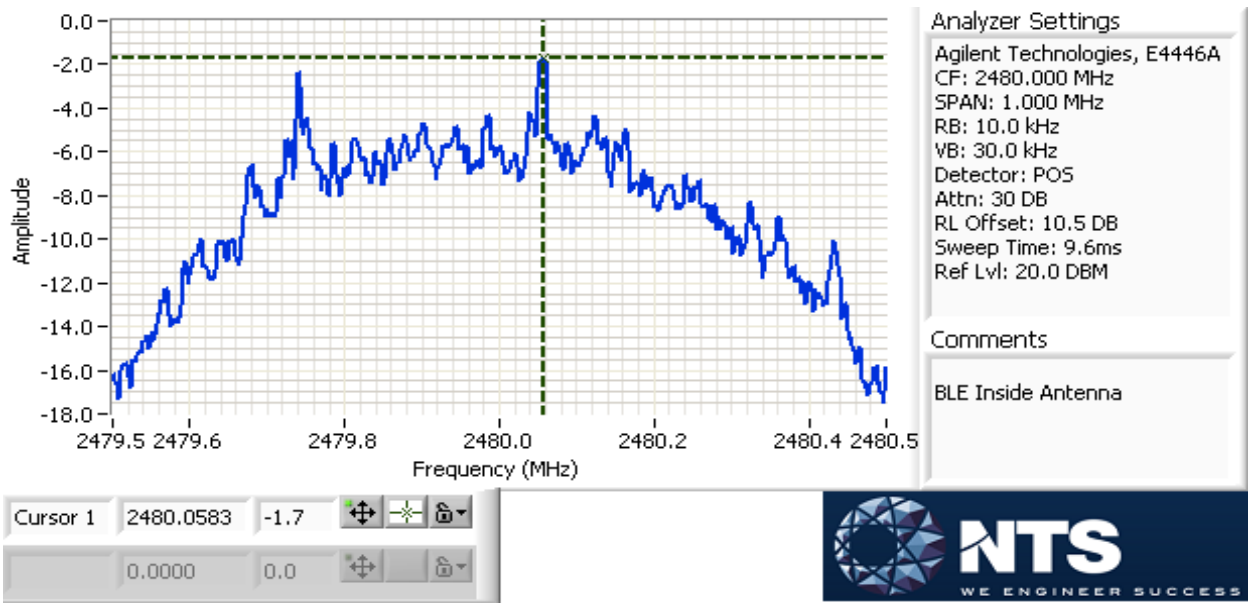
Power Setting	Frequency (MHz)	PSD (dBm/10 kHz) Note 1	Limit dBm/3kHz	Result
Default	2401.742	-0.4	8.0	Pass
Default	2439.740	-1.0	8.0	Pass
Default	2480.058	-1.7	8.0	Pass

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.



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

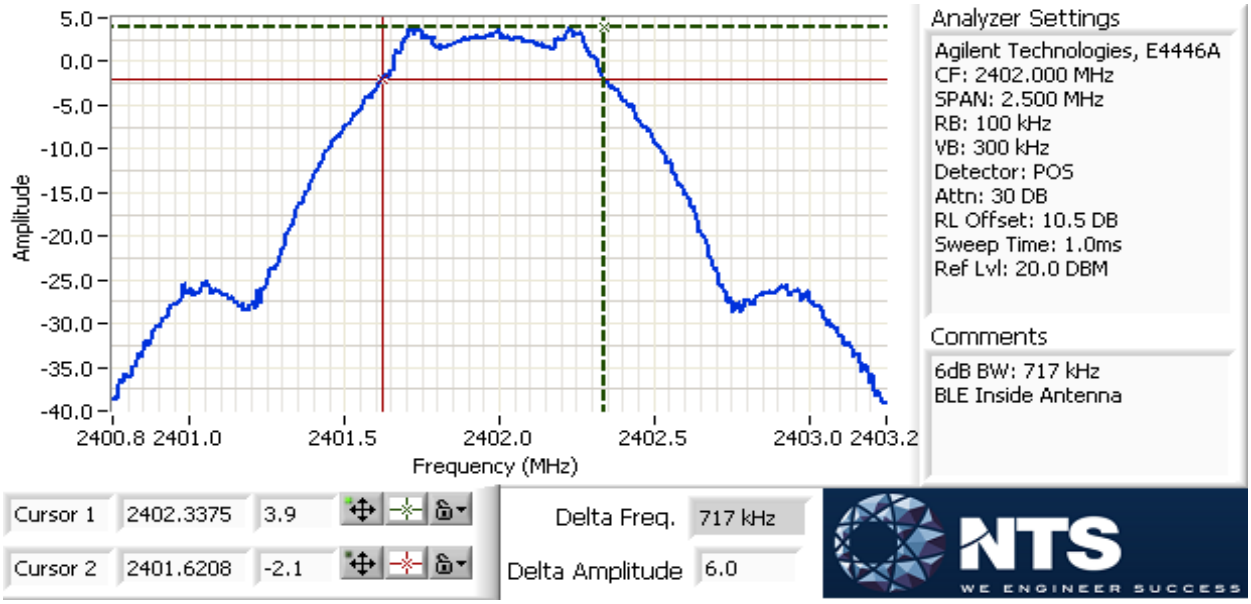
Run #3: Signal Bandwidth - Inside Antenna

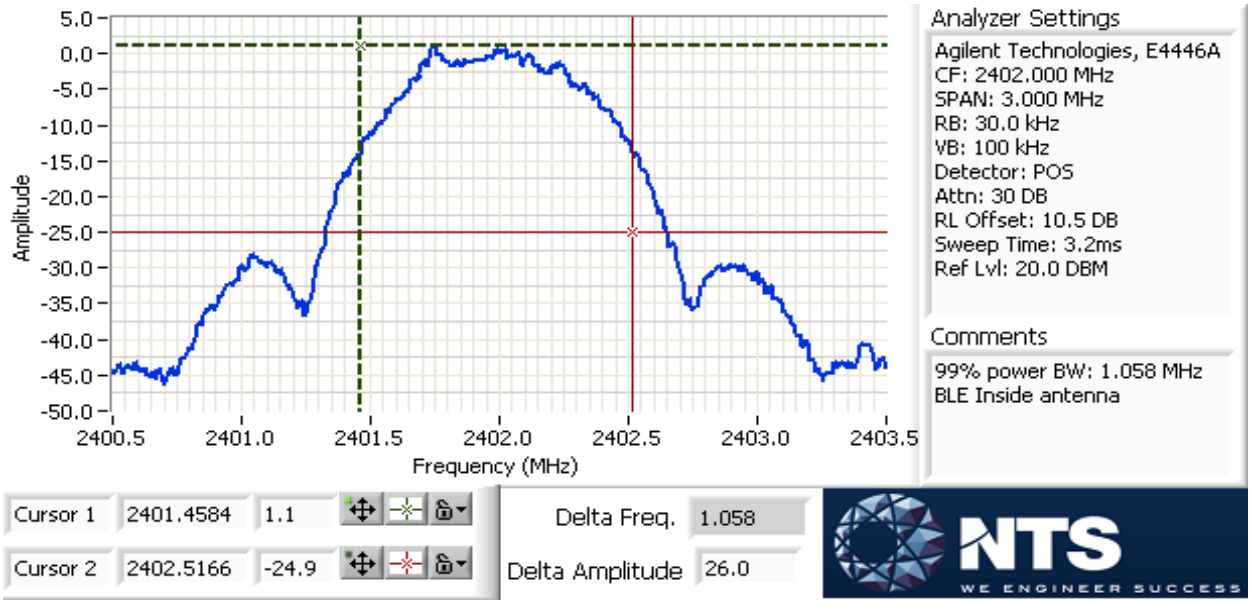
Mode: BLE

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6 dB	99%	6 dB	99%
Default	2402	0.717	1.058	0.1	0.03
Default	2440	0.721	1.068	0.1	0.03
Default	2480	0.750	1.078	0.1	0.03

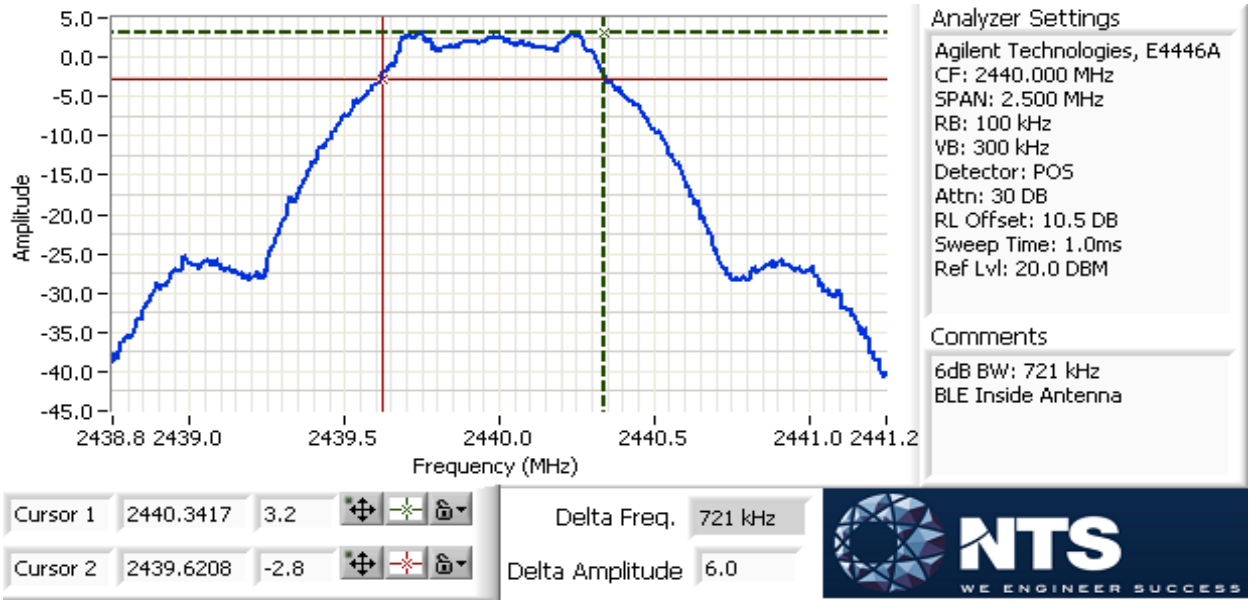
Note 1:	DTS BW: RBW=100 kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW. 99% BW: RBW=1-5% of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW.

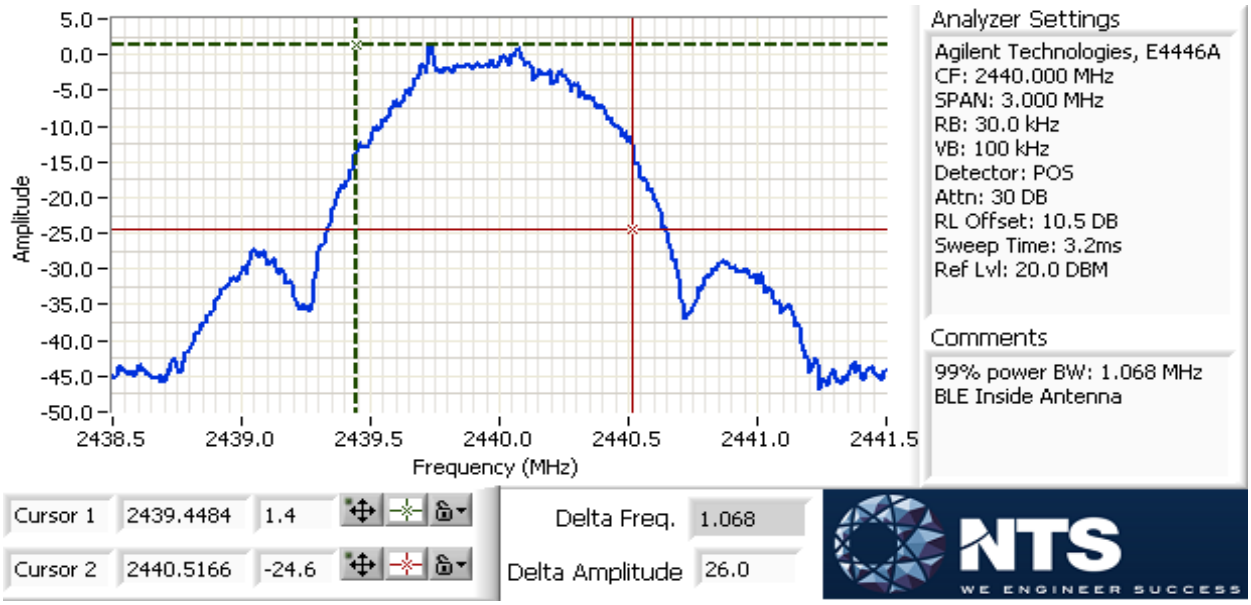
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A



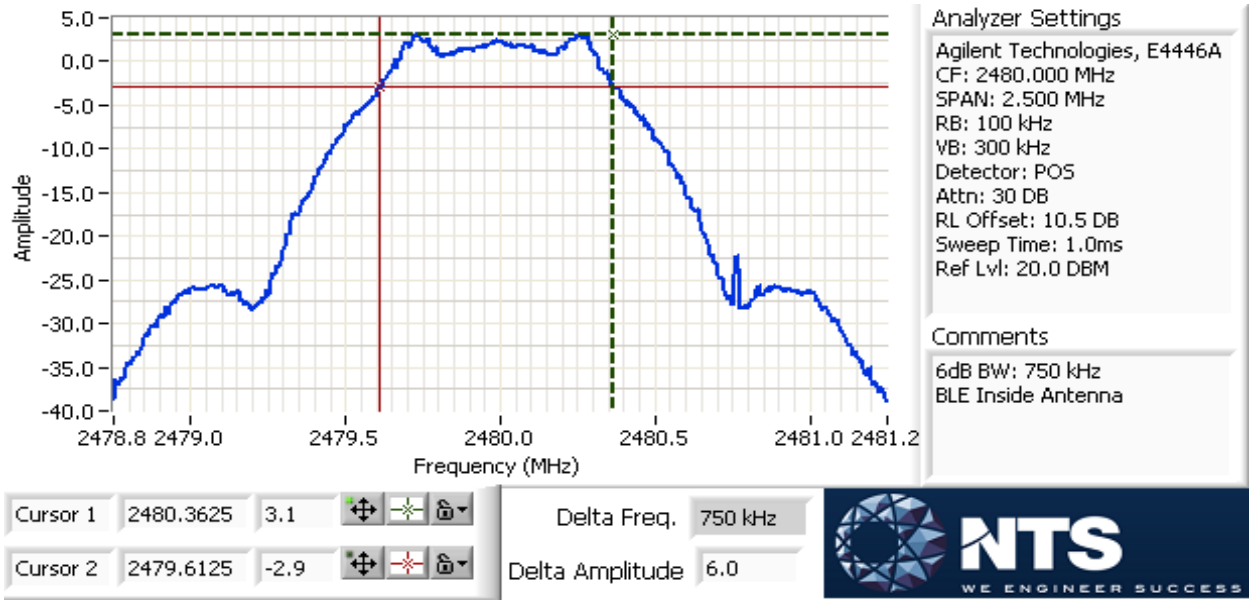


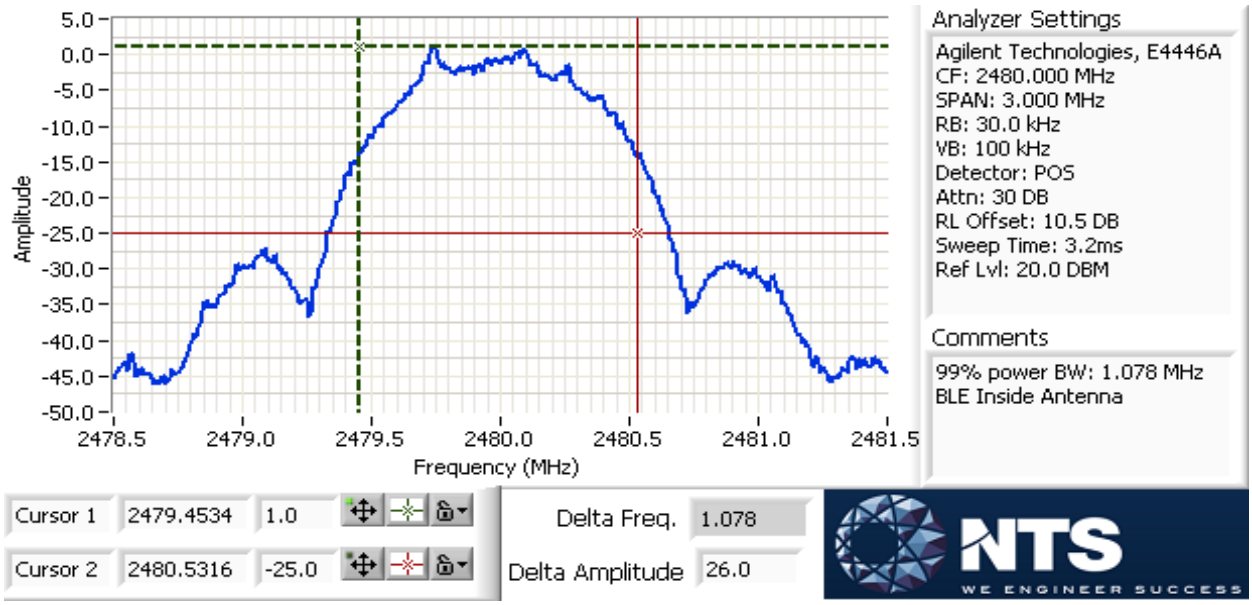
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





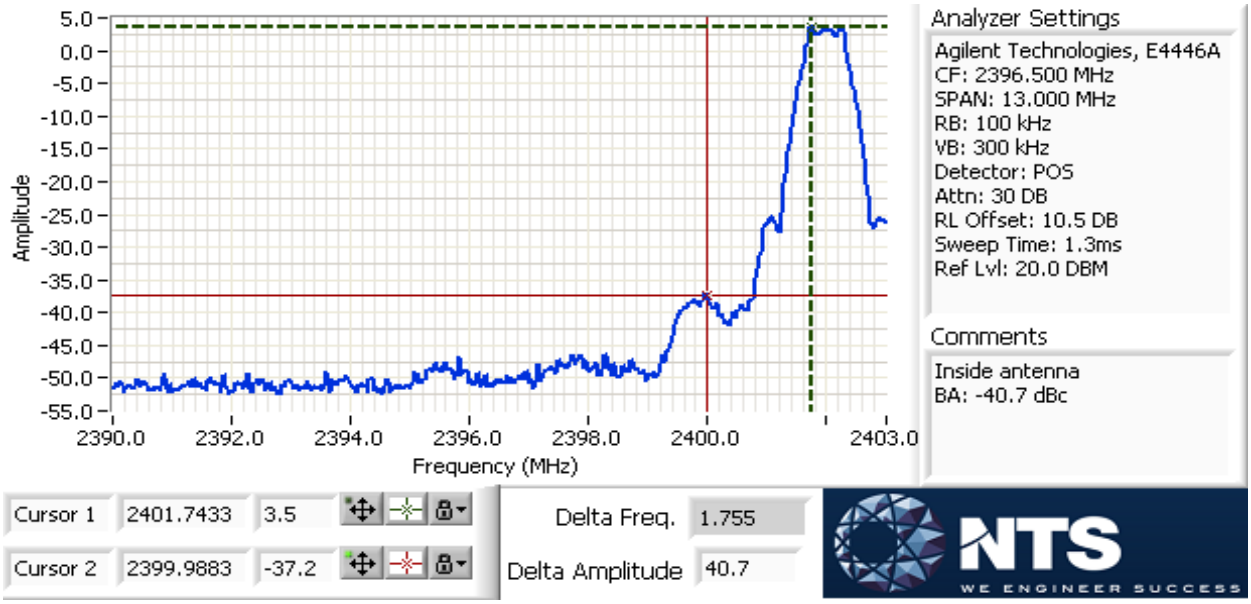
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #4a: Out of Band Spurious Emissions - Inside Antenna

Frequency (MHz)	Power Setting	Mode	Limit	Result
2402	Default	BLE	-20 dBc	-40.7 dBc / Pass

Plots for low channel

Additional plot showing compliance with -20 dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 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: 9/27/2018
Test Engineer: Jude Semana
Test Location: Fremont EMC Lab #4B
Config. Used: 1
Config Change: None
EUT Voltage: Battery operated

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: 22 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	Default	-	Output Power	15.247(b)	Pass	3.9 dBm
2	Default	-	Power spectral Density (PSD)	15.247(d)	Pass	-0.4 dBm/10 kHz
3	Default	-	Minimum 6 dB Bandwidth	15.247(a)	Pass	0.713 MHz
3	Default	-	99% Bandwidth	RSS GEN	-	1.07 MHz
4	Default	-	Spurious emissions	15.247(b)	Pass	-39.9 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:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

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	1.00	Yes	-	-	-	-

Sample Notes

Sample S/N: 000163, 000149 and 000165
Driver: -

Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #1: Output Power - Outside Antenna

Mode: BLE

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna[2] Gain (dBi)	Result	EIRP dBm	EIRP W	Output Power (dBm)[3]	Output Power mW
Default	2402	3.9	2.5	1.8	Pass	5.7	0.004		
Default	2440	3.5	2.2	1.8	Pass	5.3	0.003		
Default	2480	3.4	2.2	1.8	Pass	5.2	0.003		

Note 1:	Output power measured using a peak power meter, spurious limit is -20 dBc.
Note 2:	2 dBi (antenna gain) - 0.21 dB (cable loss): 1.8 dBi

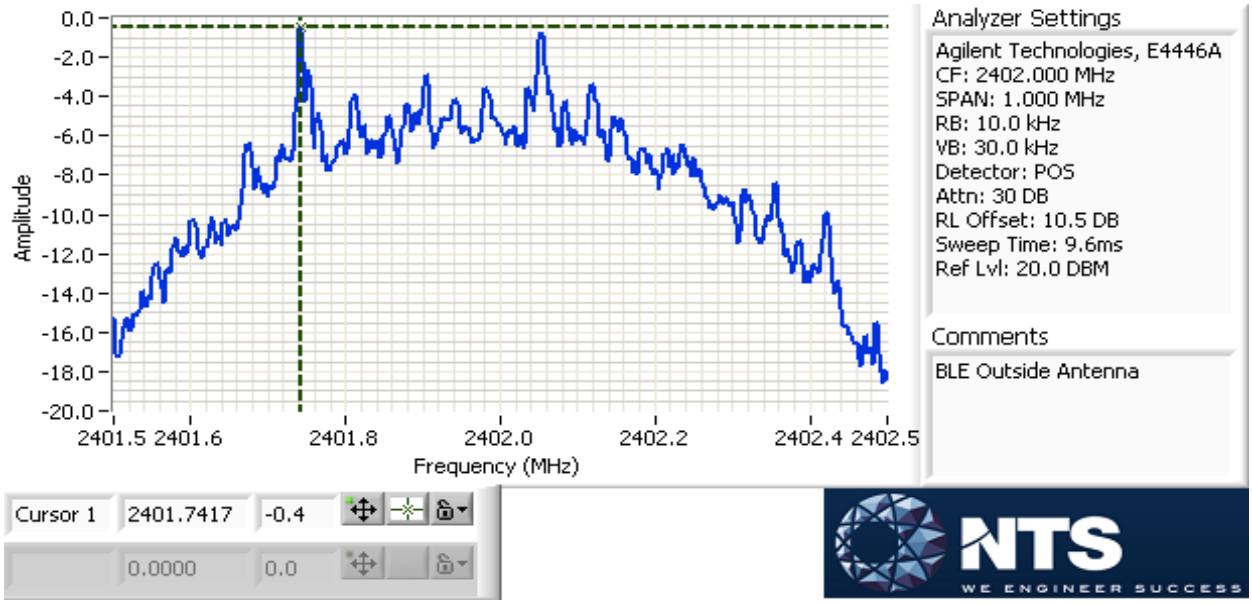
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #2: Power spectral Density - Outside Antenna

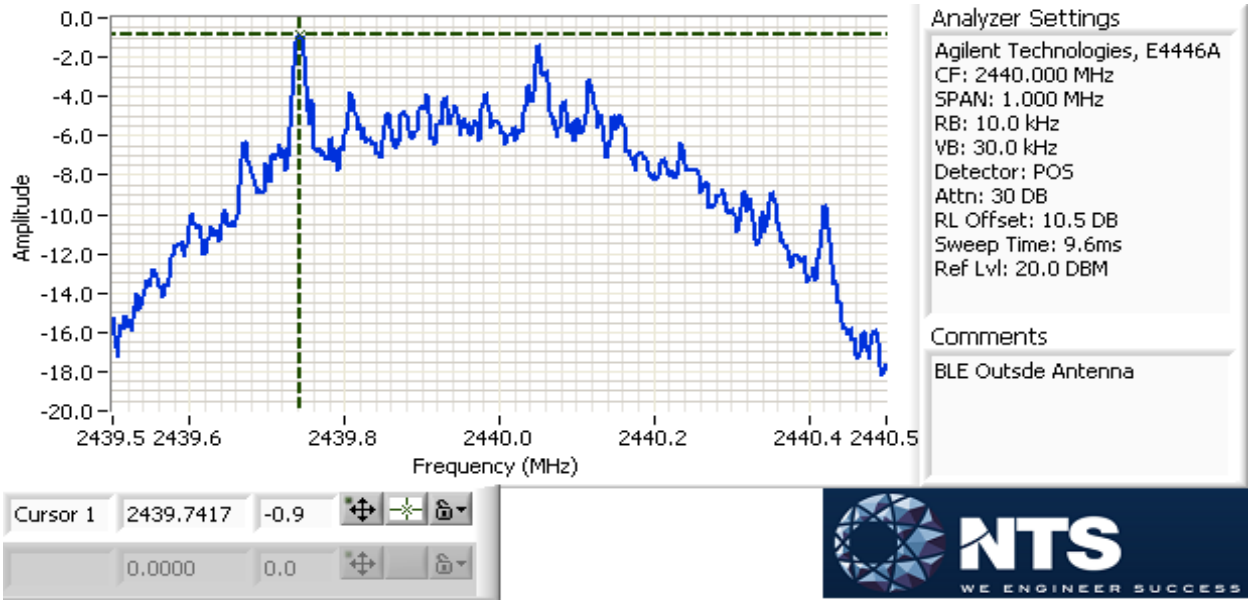
Mode: BLE

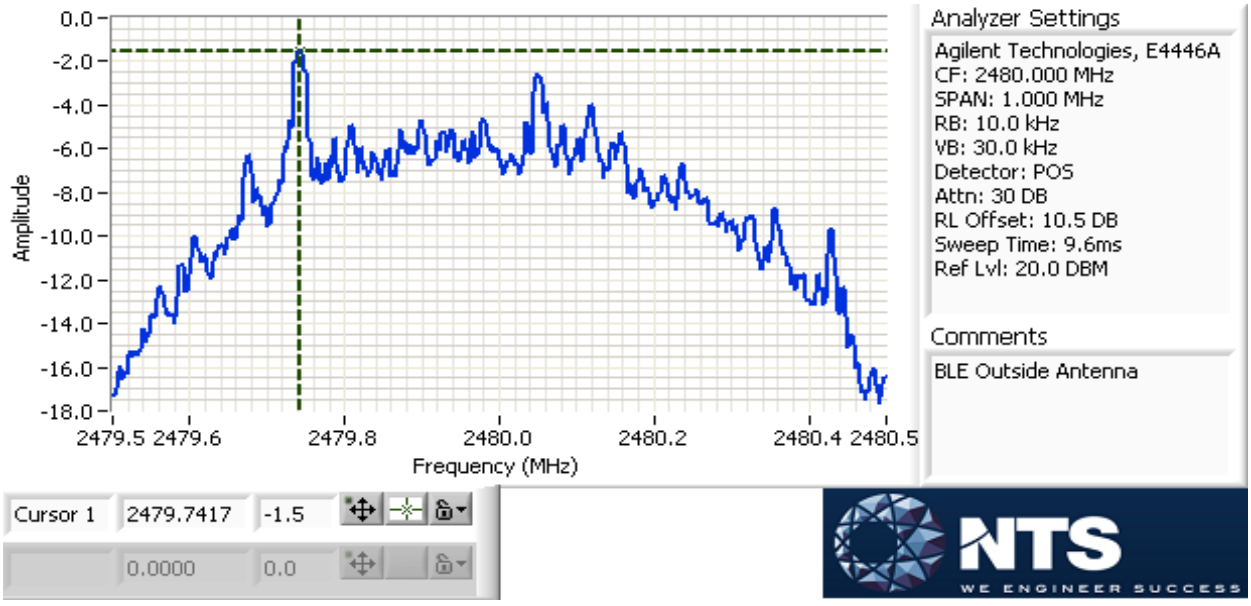
Power Setting	Frequency (MHz)	PSD (dBm/10 kHz) Note 1	Limit dBm/3kHz	Result
Default	2401.742	-0.4	8.0	Pass
Default	2439.742	-0.9	8.0	Pass
Default	2479.742	-1.5	8.0	Pass

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.



Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

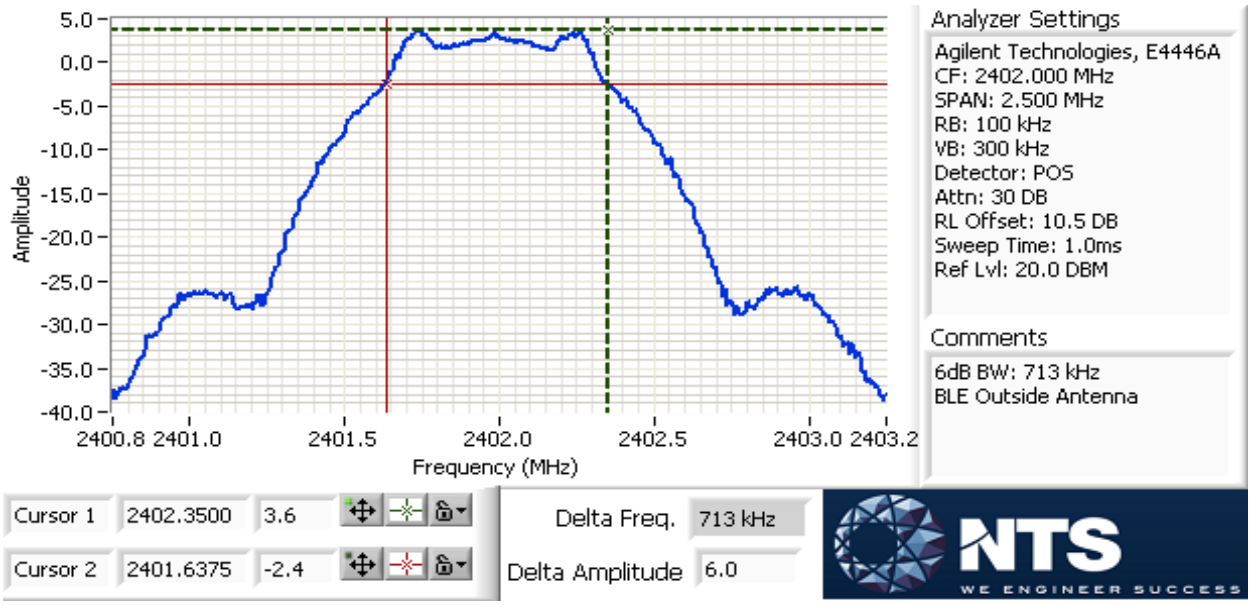
Run #3: Signal Bandwidth - Outside Antenna

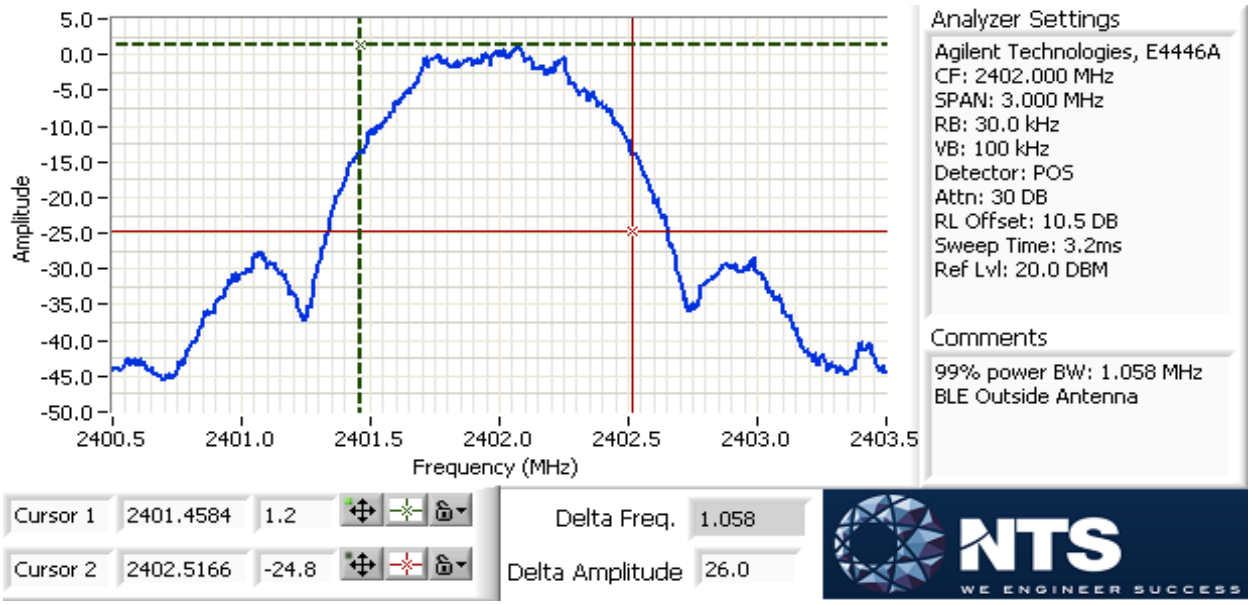
Mode: BLE

Power Setting	Frequency (MHz)	Bandwidth (MHz)		RBW Setting (MHz)	
		6 dB	99%	6 dB	99%
Default	2402	0.713	1.06	0.1	0.03
Default	2440	0.713	1.05	0.1	0.03
Default	2480	0.750	1.07	0.1	0.03

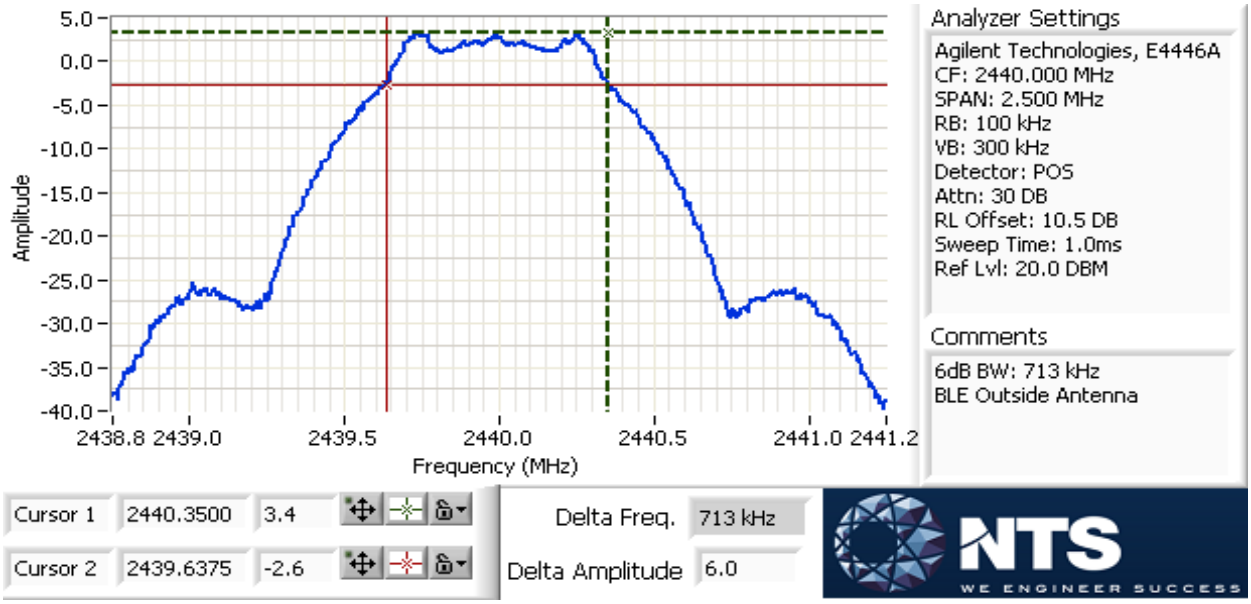
Note 1:	DTS BW: RBW=100 kHz, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time, Span 2-5 times measured BW. 99% BW: RBW=1-5% of 99%BW, VBW ≥ 3*RBW, peak detector, max hold, auto sweep time. Span 1.5-5 times OBW.

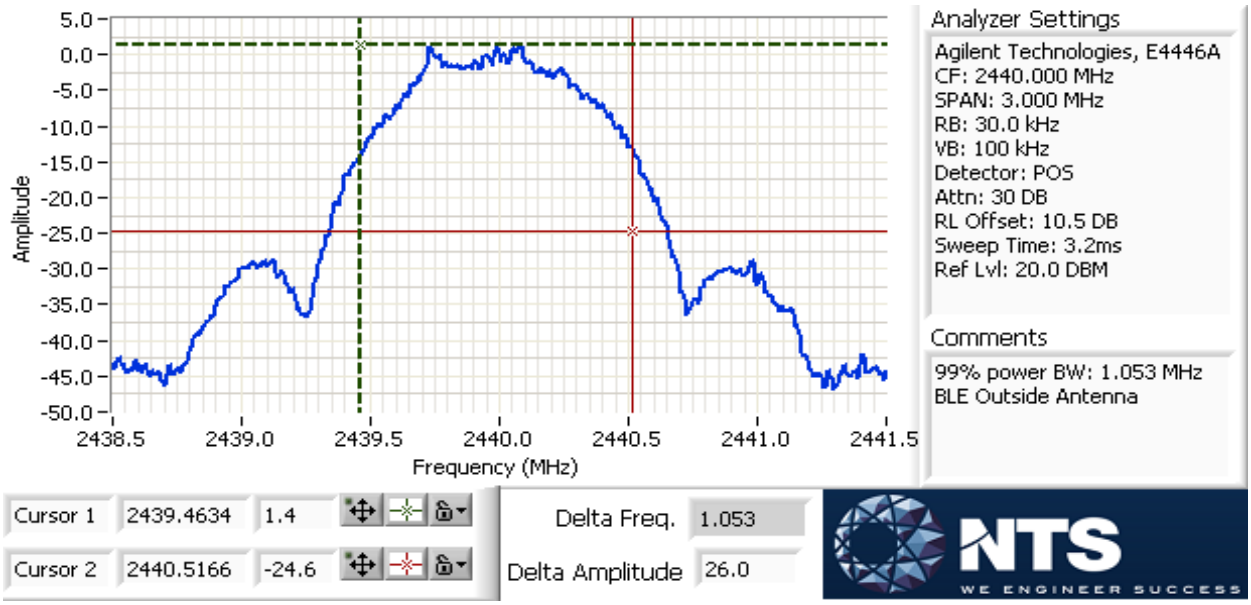
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





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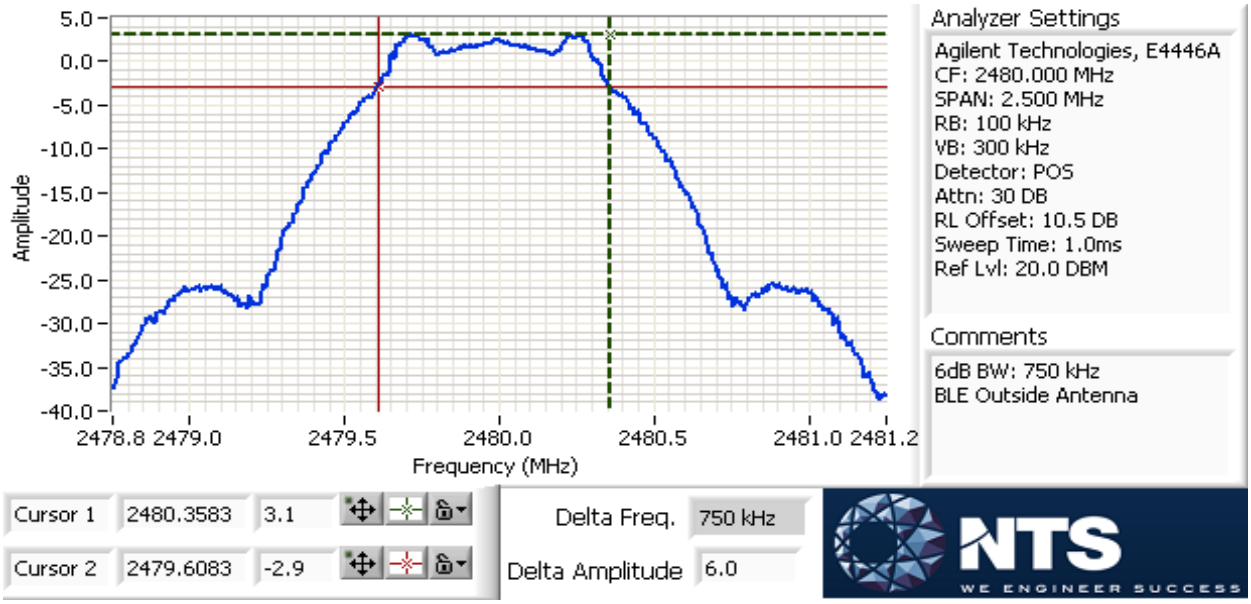
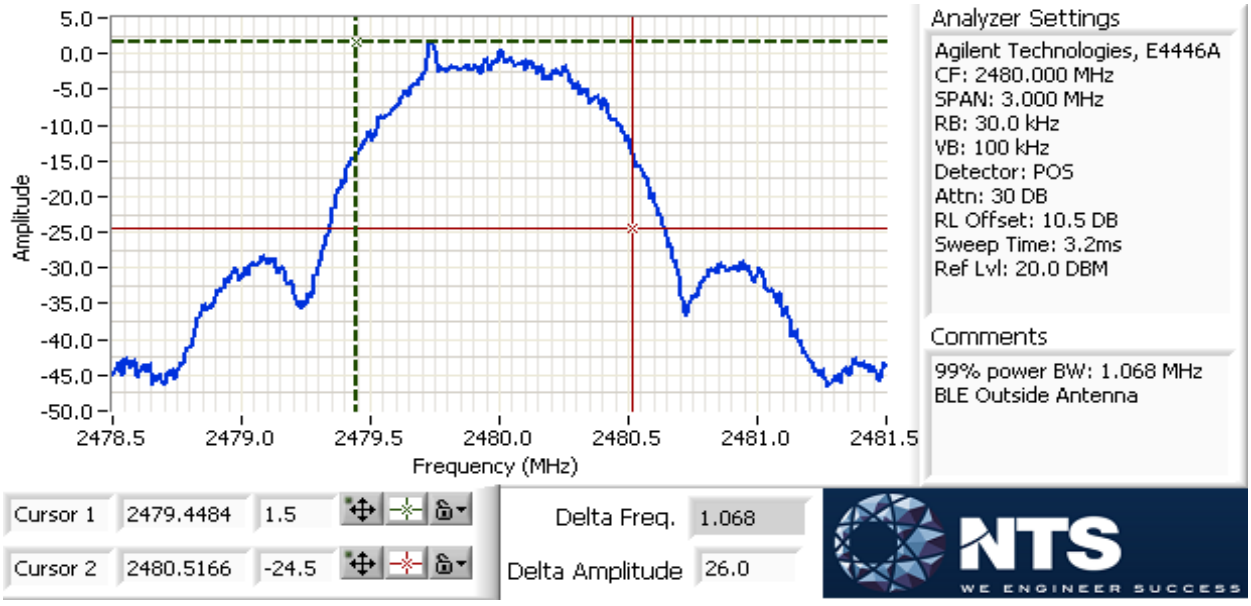
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A





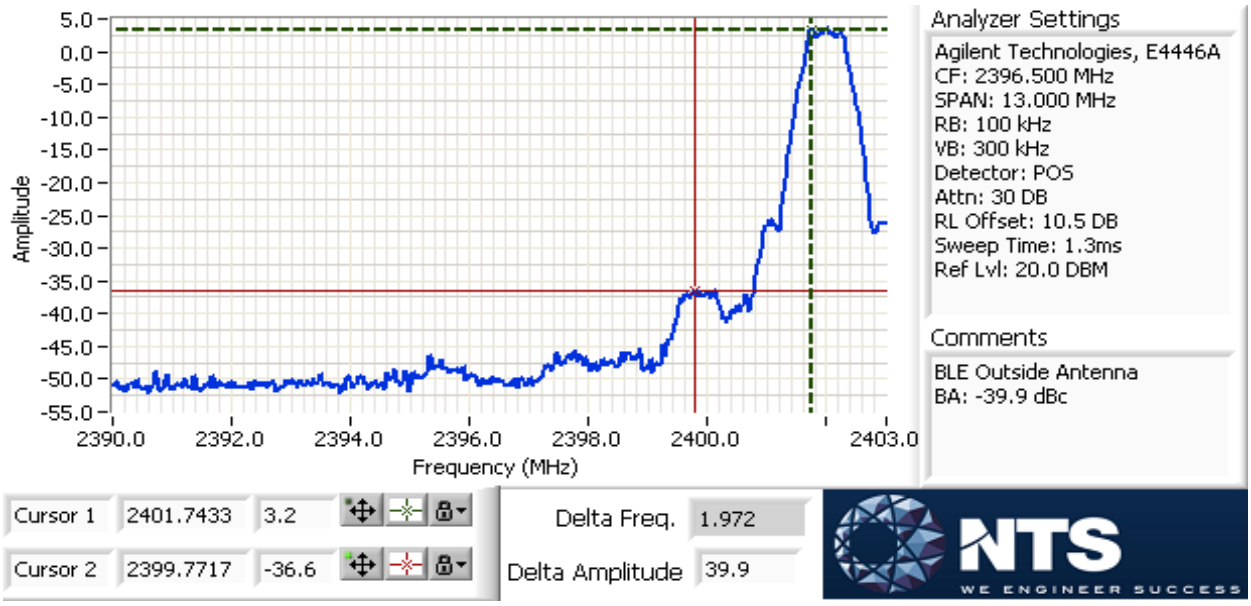
Client:	AmesburyTruth	Job Number:	PR076543
Model:	Precept Touch, Smart Lock with Bluetooth	T-Log Number:	TL076543
		Project Manager:	Christine Krebill
Contact:	Max Raviani	Project Coordinator:	-
Standard:	FCC 15.247, RSS-247	Class:	N/A

Run #4a: Out of Band Spurious Emissions - Outside Antenna

Frequency (MHz)	Power Setting	Mode	Limit	Result
2402	Default	BLE	-20 dBc	-39.9 dBc / Pass

Plot for low channel

Additional plot showing compliance with -20 dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



End of Report

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