



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: ClimbTag LLC

Model: Climbtag

Description: RFID BLE wrist worn device for monitoring rock climbing activities

Serial Number: N/A

FCC ID: NANLO-CLIMBTAG10

To

FCC Part 15.247

And

IC RSS-247

Date of Issue: October 13, 2017

On the behalf of the applicant:

ClimbTag LLC
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Attention of:

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Project No: p1790019

Kenneth Lee
Project Test Engineer

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All results contained herein relate only to the sample tested.



Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	September 27, 2017	Kenneth Lee	Original Document
2.0	October 13, 2017	Kenneth Lee	Updated the Output Power and PSD results to show the Antenna Gain removed from the EIRP. Added statements to Annex A



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ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

The applicant has been cautioned as to the following

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.



Standard Test Conditions Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.10-2013 and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the particular equipment requirements specified testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Measurement results, unless otherwise noted, are worst-case measurements.

Environmental Conditions		
Temperature (°C)	Humidity (%)	Pressure (mbar)
19-25	30-38	962-974

EUT Description

Model: Climbttag

Description: RFID BLE wrist worn device for monitoring rock climbing activities

Firmware: N/A

Software: N/A

Serial Number: N/A

Additional Information: The EUT implements BLE modulation. The EUT was not provided with an AC adapter so a generic adapter was used to show compliance for Conducted Emissions.

EUT Operation during Tests

The EUT was set to transmit at the lowest, middle and highest channel of operation at the maximum available power setting. The EUT was controlled via TeraTerm software on a laptop computer.

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	AC Adapter	Just Wireless	SKU 04068	N/A

Cables: None

	Modifications: None
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15.203: Antenna Requirement:

- ☒ The antenna is permanently attached to the EUT
- ☐ The antenna uses a unique coupling
- ☐ The EUT must be professionally installed
- ☐ The antenna requirement does not apply



Test Results Summary

FCC 15.247 Specification	RSS-247 Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)	Section 5.4(d)	Output Power	Pass	
15.247(d)	Section 5.5	Conducted Spurious Emissions	N/A	EUT has No Antenna Port
15.247(d), 15.209(a), 15.205	Section 5.5	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Section 5.5	Emissions At Band Edges	Pass	
15.247(a)(2)	Sections 5.2(a)	Occupied Bandwidth	Pass	
15.247(e)	Section 5.2(b)	Transmitter Power Spectral Density	Pass	
15.207	RSS-GEN Section 8.8	A/C Powerline Conducted Emissions	Pass	

References	Description
CFR47, Part 15, Subpart B	Unintentional Radiators
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63.10-2013	American National standard for testing Unlicensed Wireless Devices
ANSI C63.4-2014	Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz.
ISO/IEC 17025:2005	General requirements for the Competence of Testing and Calibrations Laboratories
KDB 558074 D01 v04	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247



Output Power

Engineer: Kenneth Lee

Test Date: 9/27/2017

Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Output Power. A reference level offset of 11.8 was put into the analyzer to obtain EIRP measurements. The Antenna gain was then added to the EIRP to obtain Antenna Port results.

The Spectrum Analyzer was set to the following:

RBW $\geq$ DTS Bandwidth

VBW $\geq 3 \times$ RBW

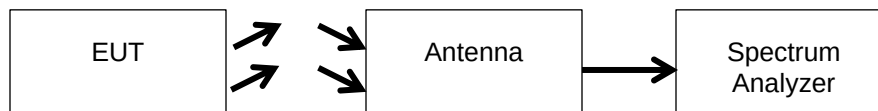
Span $\geq 3 \times$ RBW

Sweep time = auto couple

Detector = peak

Trace Mode = max hold

Test Setup



Transmitter Output Power Summary Table

Tuned Frequency (MHz)	Measured Value (dBm)	Antenna Gain (dBi)	Corrected Reading (dBm)	Specification Limit	Result
2402	-2.075	-1.925	-0.15	1 W (30 dBm)	Pass
2440	-3.446	-1.925	-1.521	1 W (30 dBm)	Pass
2480	-4.293	-1.925	-2.368	1 W (30 dBm)	Pass



Radiated Spurious Emissions

Engineer: Kenneth Lee

Test Date: 9/27/2017

Test Procedure Radiated Spurious Emissions: 30 – 1000 MHz

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions.

All emissions from 30 MHz to 1 GHz were examined.

Measured Level includes antenna and receiver cable correction factors.

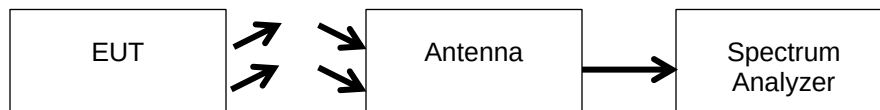
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz

VBW = 300 KHz

Detector – Quasi Peak

Test Setup



Test Procedure for Radiated Spurious Emissions above 1 GHz

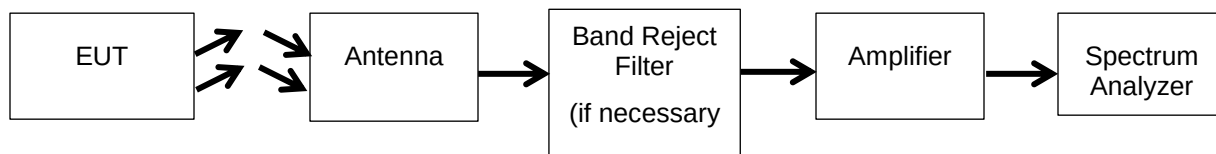
The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions.

RBW = 100 KHz and 1 MHz

VBW = 300 KHz and 3 MHz

Detector – Peak

Test Setup



See Annex A for test data



Emissions at Band Edges

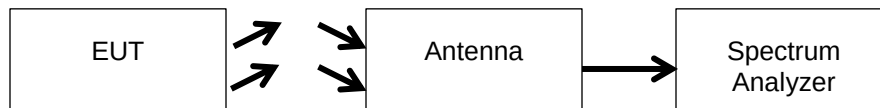
Engineer: Kenneth Lee

Test Date: 9/27/2017

Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for band edges.

Test Setup



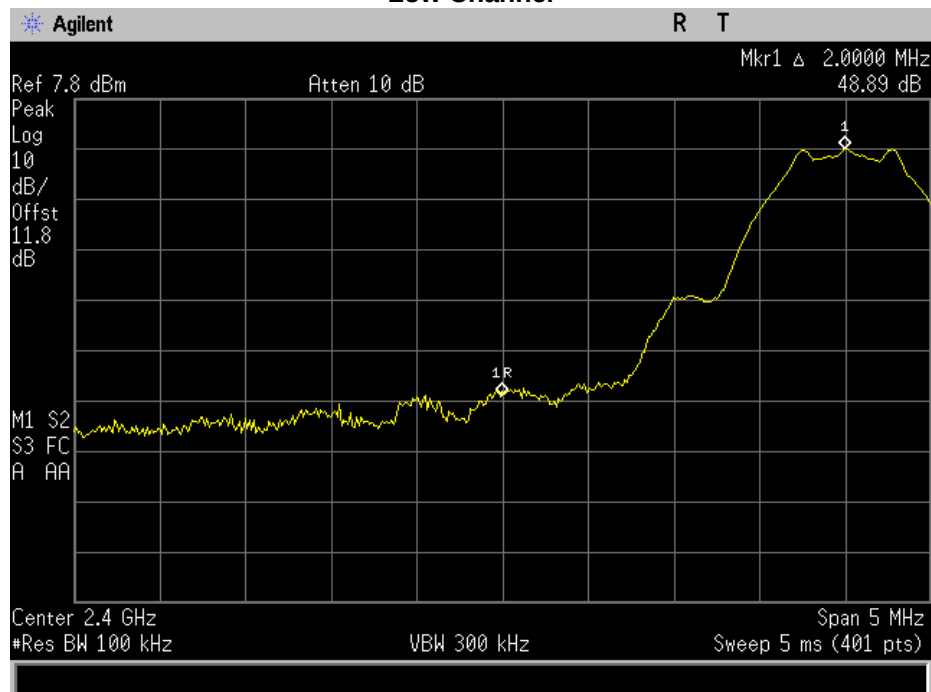
Band Edge Emissions Summary

Tuned Frequency (MHz)	Emission Frequency (MHz)	Monitored Level	Detector	Limit	Result
2402	2400	-48.89	Peak	-20 dBc	Pass
2480	2483.5	-51.91	Peak	-20 dBc	Pass

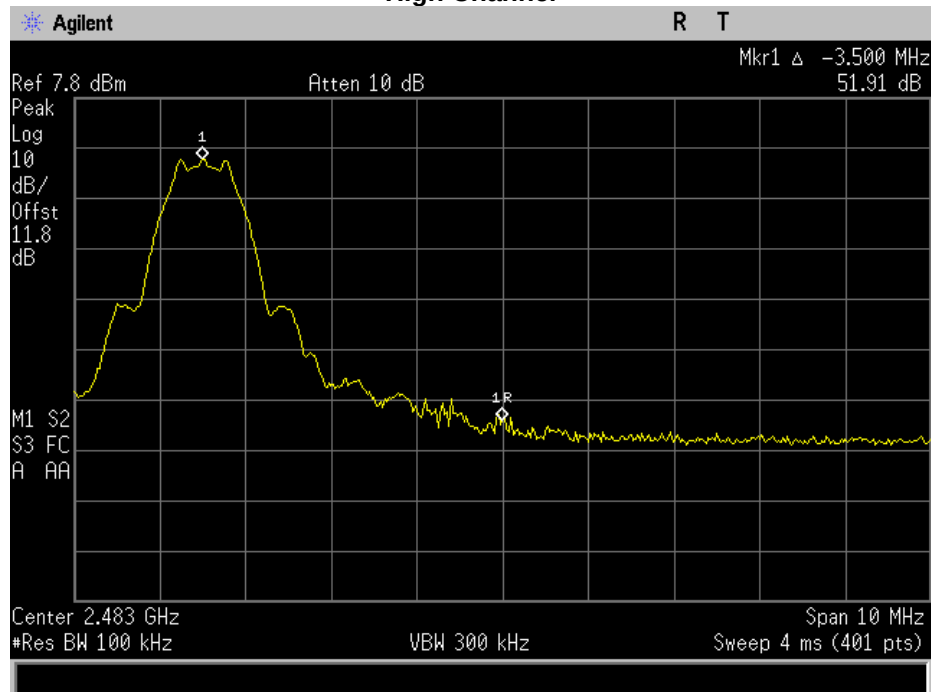


Band Edge Plots

Low Channel



High Channel





DTS Bandwidth

Engineer: Kenneth Lee

Test Date: 9/27/2017

Test Procedure

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the Bandwidth requirements.

The Spectrum Analyzer was set to the following:

RBW = 100 kHz

VBW $\geq 3 \times$ RBW

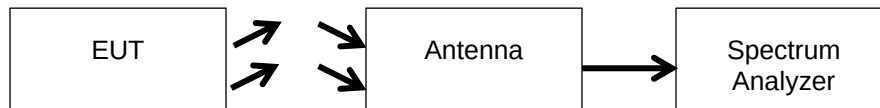
Peak Detector

Trace mode = max hold

Sweep = auto couple

The Spectrum Analyzers Occupied Bandwidth Function was used, with the measurement set to -6dB Bandwidth.

Test Setup



6 dB Occupied Bandwidth Summary

Frequency (MHz)	Measured Bandwidth (kHz)	Specification Limit (kHz)	Result
2402	706.546	≥ 500	Pass
2440	705.22	≥ 500	Pass
2480	712.986	≥ 500	Pass

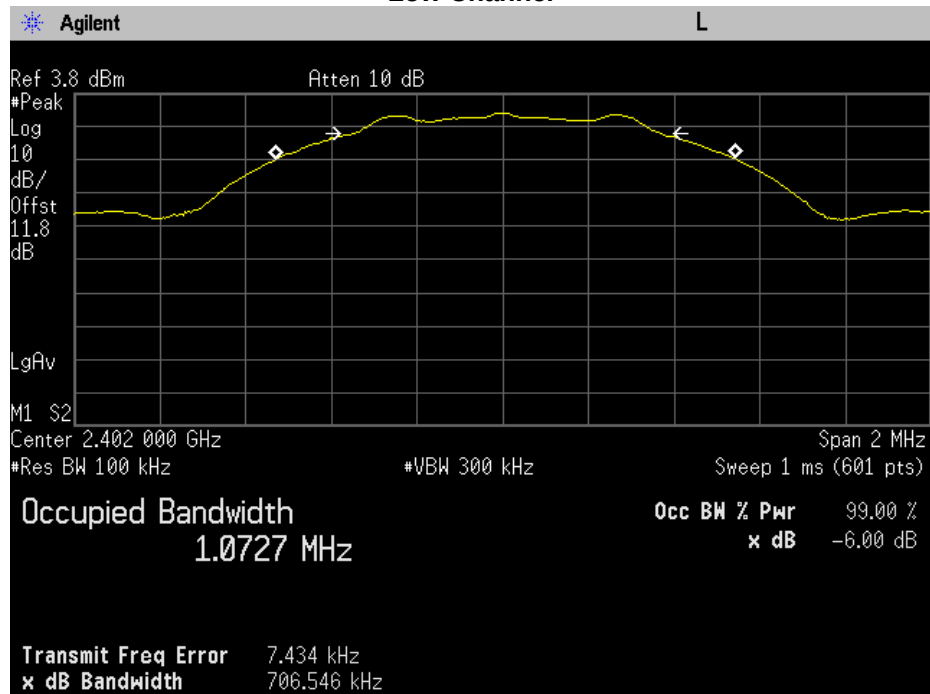
99% Bandwidth Summary

Frequency (MHz)	Measured Bandwidth (kHz)	Result
2402	1072.7	Pass
2440	1068.2	Pass
2480	1070.8	Pass

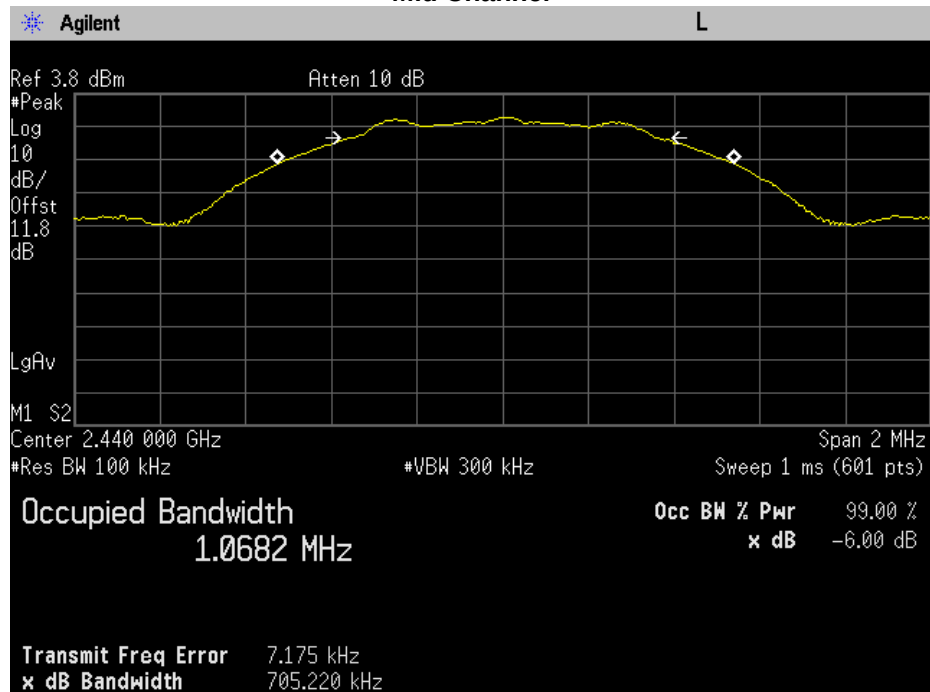


6 dB and 99% Bandwidth Plots

Low Channel

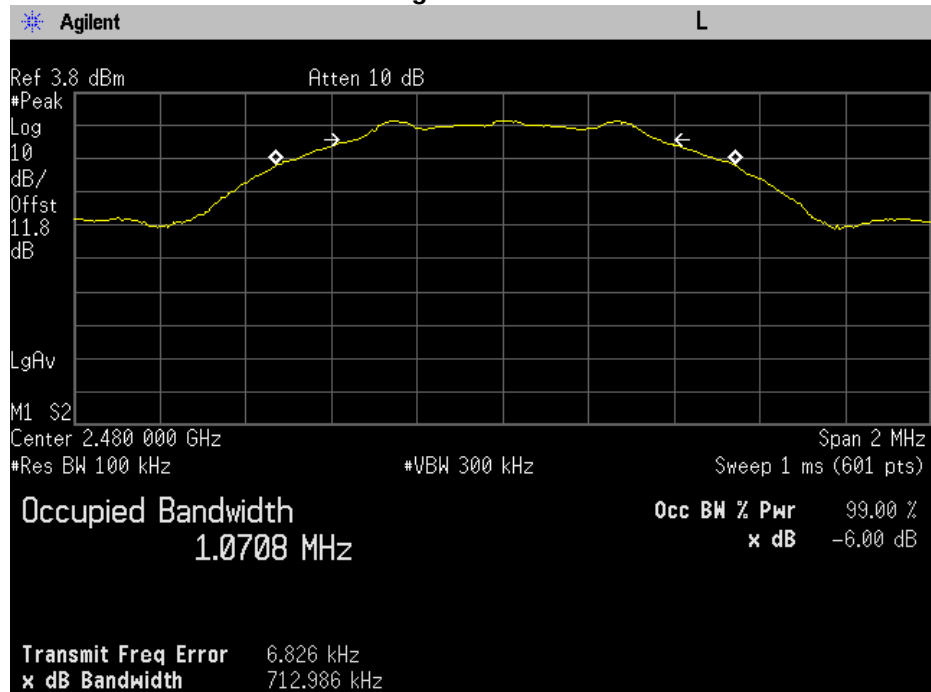


Mid Channel





High Channel





Transmitter Power Spectral Density (PSD)

Engineer: Kenneth Lee

Test Date: 9/27/2017

Test Procedure

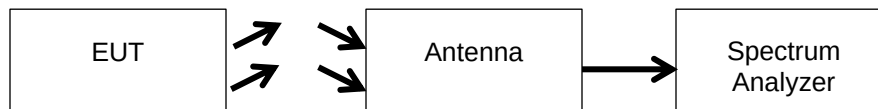
The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements. A reference level offset of 11.8 was put into the analyzer to obtain EIRP measurements. The Antenna gain was then added to the EIRP to obtain Antenna Port results.

The Spectrum Analyzer was set to the following:

DTS channel center frequency
Span 1.5 x DTS bandwidth
RBW = 3 kHz ≤ RBW ≤ 100 kHz
VBW ≥ 3 x RBW
Peak Detector
Sweep time = auto couple
Trace mode = max hold

Once the trace has stabilized the peak marker was used to determine the power spectral density.

Test Setup



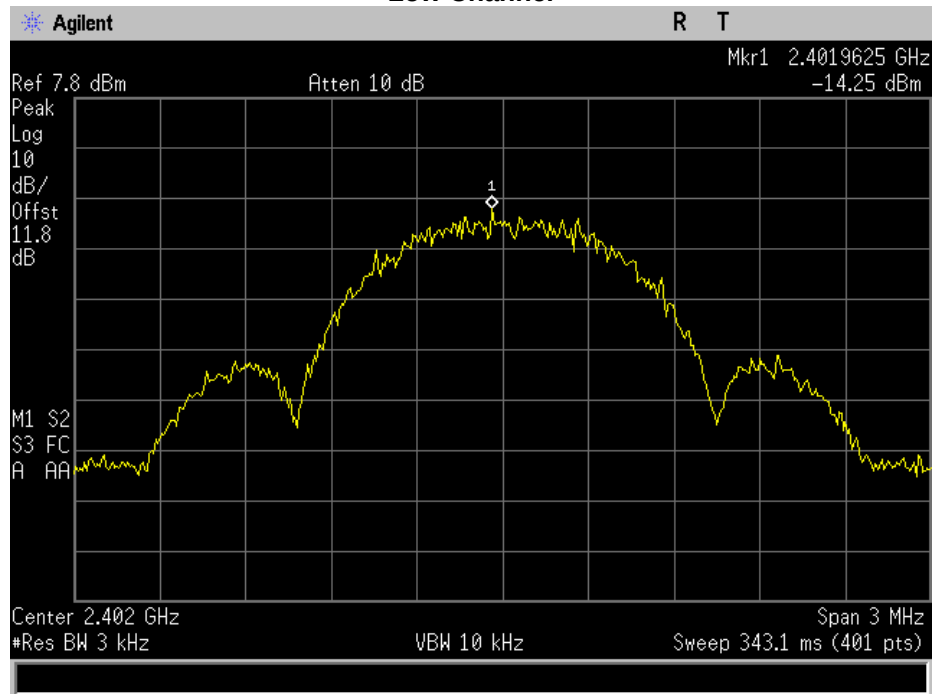
PSD Summary

Frequency (MHz)	Measured Data (dBm)	Antenna Gain (dBi)	Corrected Reading (dBm)	Specification Limit (dBm)	Result
2402	-14.25	-1.925	-12.325	8	Pass
2440	-15.93	-1.925	-14.005	8	Pass
2480	-16.3	-1.925	-14.375	8	Pass

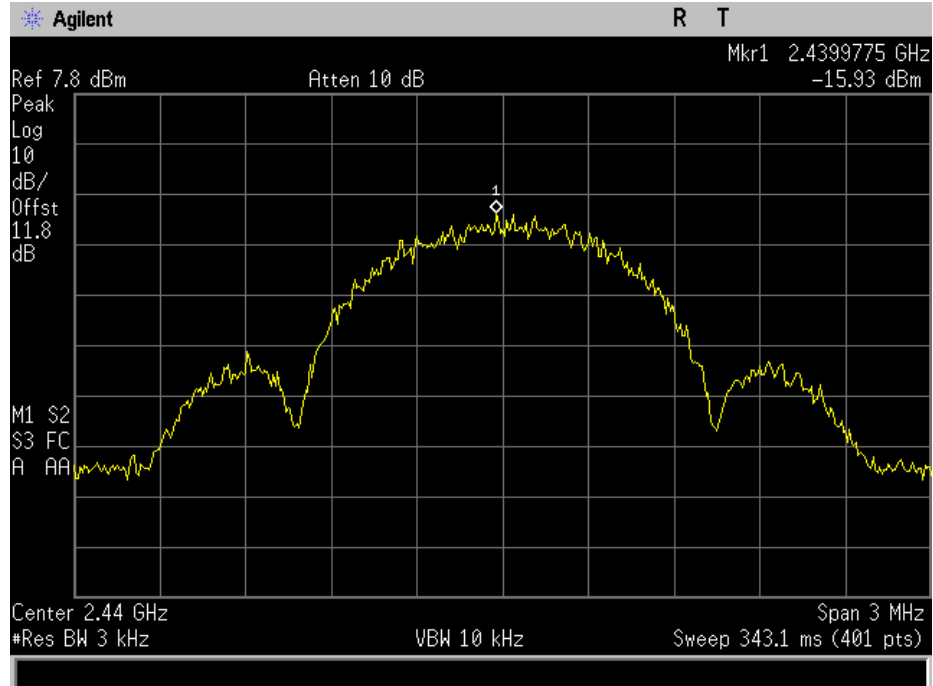


PSD Plots

Low Channel

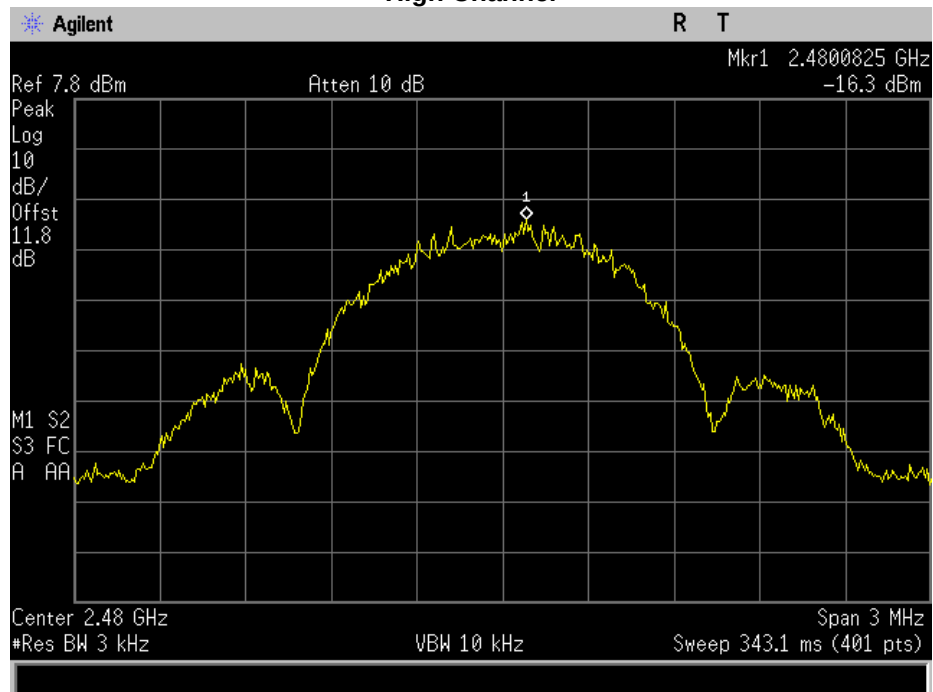


Mid Channel





High Channel





A/C Powerline Conducted Emission

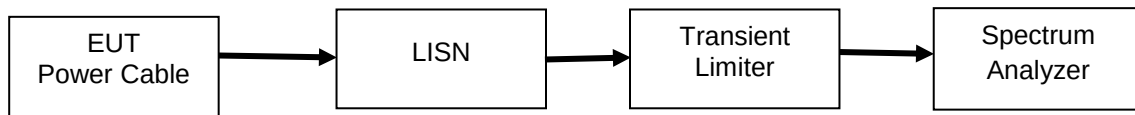
Engineer: Kenneth Lee

Test Date: 9/27/2017

Test Procedure

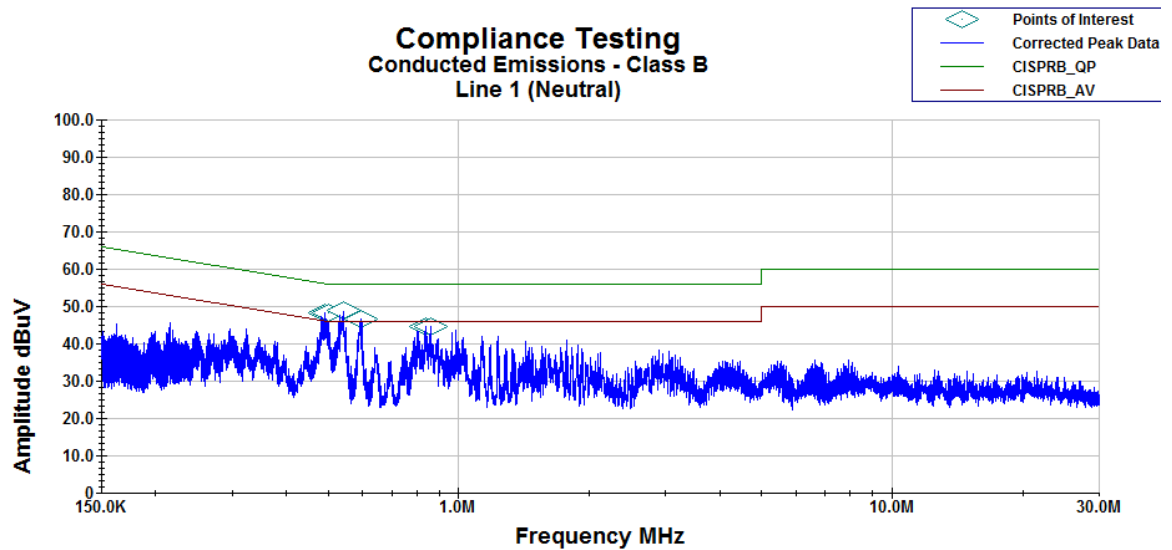
The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup





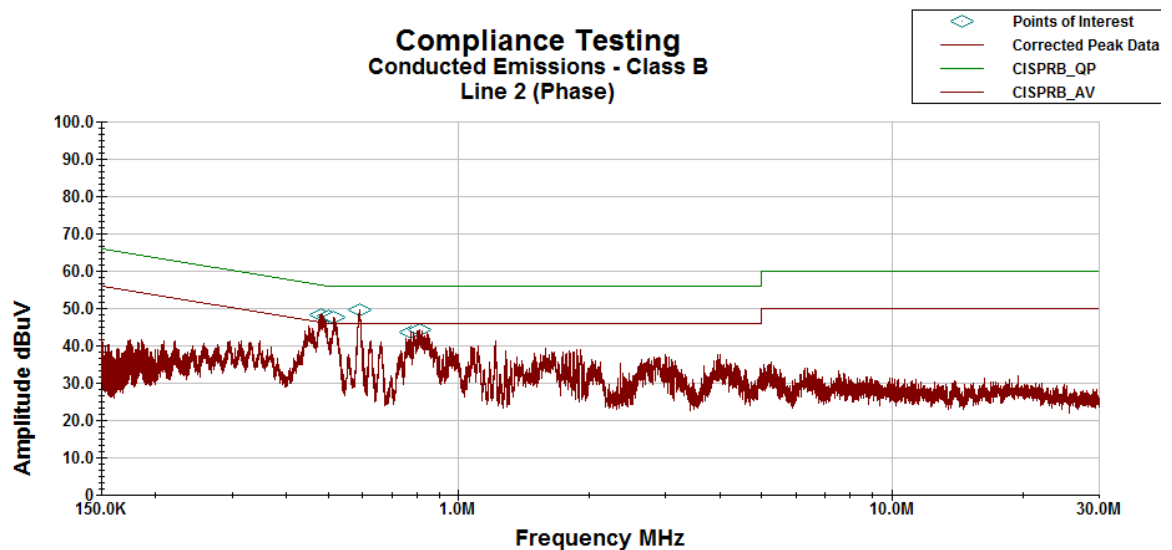
Conducted Emissions Test Results



Operator: KL

Conducted Emissions.til

Job #: p1790019



Operator: KL

Conducted Emissions.til

Job #: p1790019



Line 1 Neutral Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
492.87 KHz	26.19	0.1	0.03	10.1	36.423	46.204	-9.78
497.15 KHz	25.73	0.1	0.03	10.1	35.957	46.081	-10.125
544.67 KHz	21.45	0.1	0.03	10.1	31.68	46	-14.32
592.33 KHz	30.03	0.1	0.03	10.1	40.26	46	-5.74
848.3 KHz	20.67	0	0.04	10.1	30.807	46	-15.193
865.55 KHz	19.27	0	0.04	10.1	29.413	46	-16.587

Line 2 Phase Avg Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	Avg Margin (dB)
485.0 KHz	25.26	0.1	0.03	10.1	35.487	46.429	-10.942
490.6 KHz	27.71	0.1	0.03	10.1	37.943	46.269	-8.325
524.1 KHz	21.67	0.1	0.03	10.1	31.897	46	-14.103
590.1 KHz	33.08	0.1	0.03	10.1	43.31	46	-2.69
775.33 KHz	21.36	0.01	0.039	10.1	31.514	46	-14.486
814.86 KHz	21.8	0	0.04	10.1	31.94	46	-14.06

Line 1 Neutral QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
492.87 KHz	32.46	0.1	0.03	10.1	42.69	56.204	-13.514
497.15 KHz	32.71	0.1	0.03	10.1	42.94	56.081	-13.141
544.67 KHz	27.97	0.1	0.03	10.1	38.2	56	-17.8
592.33 KHz	32.93	0.1	0.03	10.1	43.16	56	-12.84
848.3 KHz	26.16	0	0.04	10.1	36.3	56	-19.7
865.55 KHz	28.05	0	0.04	10.1	38.19	56	-17.81

Line 2 Phase QP Detector

Frequency	Measured Value (dBuV)	LISN Correction Factor (dB)	Cable Loss (dB)	Transient Limiter (dB)	Final Data (dBuV)	Limit (dBuV)	QP Margin (dB)
485.0 KHz	33.76	0.1	0.03	10.1	43.99	56.429	-12.439
490.6 KHz	34.7	0.1	0.03	10.1	44.93	56.269	-11.339
524.1 KHz	28.6	0.1	0.03	10.1	38.83	56	-17.17
590.1 KHz	36.35	0.1	0.03	10.1	46.58	56	-9.42
775.33 KHz	28.63	0.01	0.039	10.1	38.781	56	-17.219
814.86 KHz	29.44	0	0.04	10.1	39.58	56	-16.42



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
EMI Receiver	HP	8546A	i00033	3/28/17	3/28/18
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 9/27/17	
Horn Antenna	ARA	DRG-118/A	i00271	6/16/16	6/16/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	6/9/17	6/9/18
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/16	8/3/18
AC Power Source	Behlman	BL 6000	i00362	Verified on: 9/27/17	
EMI Analyzer	Agilent	E7405A	i00379	2/22/17	2/22/18
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
LISN	COM-Power	LI-125A	i00447	9/11/17	9/11/19
LISN	COM-Power	LI-125A	i00449	9/11/17	9/11/19
PSA Spectrum Analyzer	Agilent	E4445A	i00471	9/6/17	9/6/19
Preamplifier for 1-18GHz horn antenna	Miteq	AFS44 00101 400 23-10P-44	i00509	N/A	N/A

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT