Compliance Testing, LLC
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Q-Track Corporation

Model: QT-643 TX Tag

Description: Powered Asset Tracking Tag

Serial Number: 11

FCC ID: VJ3-QT-643-TAG
IC: 10503-TXTAG643

To

FCC Part 15.209

And

IC RSS-210 Issue 9 (November 2017)

Date of Issue: March 21, 2018

On the behalf of the applicant:	**Q-Track Corporation** **2223 Drake Avenue** **SW 1st Floor** **Huntsville, AL 35805**
Attention of:	**Hans Schantz, Chief Technical Officer** **Ph: (256)489-0075** **E-Mail: h.schantz@q-track.com**

Prepared By
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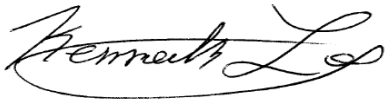
Project ID: p17a0005



Kenneth Lee
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	10/13/17	Kenneth Lee	Original Document
2.0	3/20/2018	Kenneth Lee	Updated Standard to RSS-210, added RSS-Gen Section 6.6, Updated Additional Information Section

Table of Contents

The applicant has been cautioned as to the following

FCC

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 marketed 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 the 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.

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

Test and Measurement Data
Subpart 2.1033(b)

All tests and measurement data shown were performed in accordance with FCC Rule Parts: 15.207, 15.209 (Intentional Radiators).

All tests and measurement data shown are deemed satisfactory evidence of compliance with Industry Canada General Requirements for Compliance of Radio Apparatus Standard RSS-GEN.

Name of Test	FCC Section	RSS-GEN
A/C Powerline Conducted Emissions	15.207	Section 8.8
Radiated Emissions	15.209	Section 8.9

Standard Engineering Practices

Unless otherwise indicated, the procedures contained in ANSI C63.10-2013 were observed during testing.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.

Standard Test Conditions and Engineering Practices

Unless otherwise indicated in the specific measurement results, the ambient temperature was maintained within the range of 10º to 40ºC (50º to 104ºF) and the relative humidity levels were in the range of 10% to 90%.

Environmental Conditions	
Temperature (ºC)	Humidity (%)
19-24	30-36

EUT Description
Model: QT-643 TX Tag
Description: Powered Asset Tracking Tag
Firmware: N/A
Software: N/A
Serial Number: 11
Additional Information: The EUT normally operates with a 100% Duty Cycle and transmits on a single channel without implementing any modulation.

EUT Operation during Tests
The EUT was powered on and transmitting continuously throughout testing.

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Charging Dock	Q-Track Corporation	QT-654	N/A
1	Switch-Mode Power Supply	CUI Inc.	ETSA050360UD	N/A

Cables: None

Modifications: None

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.207	A/C Powerline Conducted Emissions	Pass	
15.209	Radiated Emissions	Pass	
RSS-GEN Section 6.6	Occupied Bandwidth	Pass	

15.207 A/C Powerline Conducted Emissions

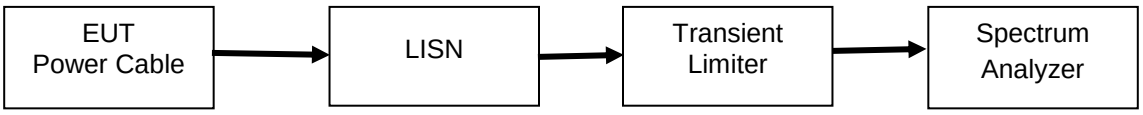
Engineer: Kenneth Lee

Test Date: 10/13/2017

Test Procedure

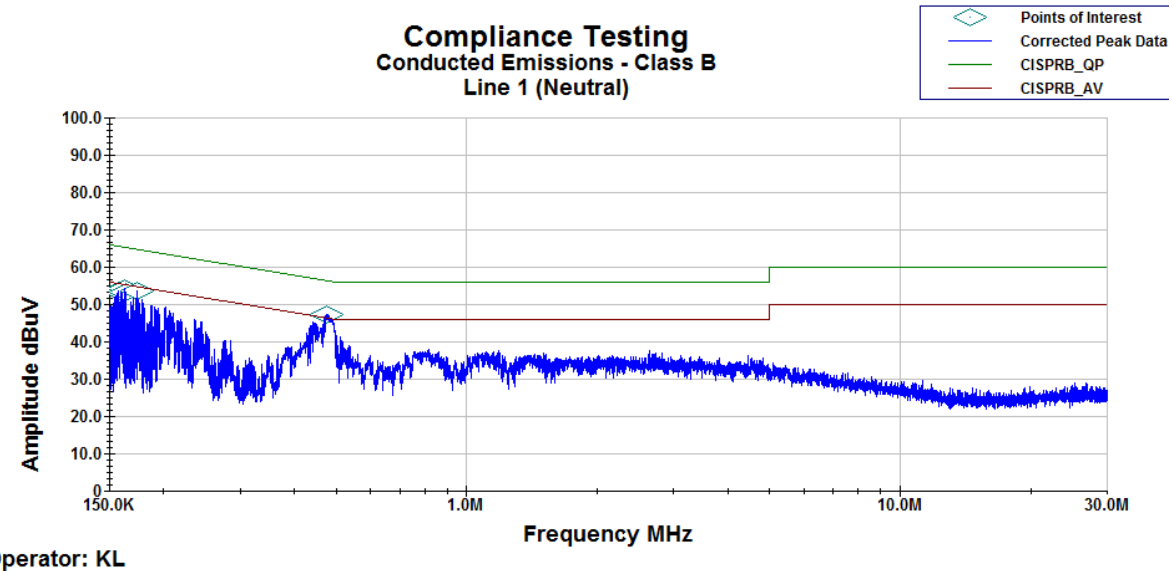
The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup



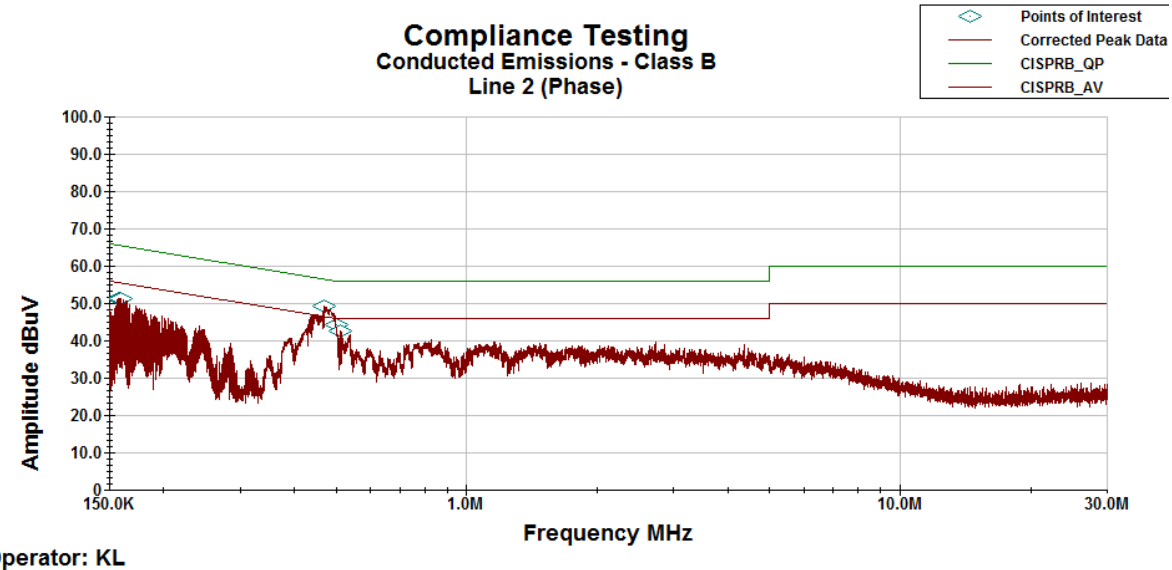
Conducted Emissions Test Results

Line 1 Peak Plot



Operator: KL
Conducted Emissions.til **Job #: p17a0005**

Line 2 Peak Plot



Operator: KL
Conducted Emissions.til **Job #: p17a0005**

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)
156.48 KHz	15.94	0.24	0.02	10.2	26.399	55.815	-29.416
158.55 KHz	16.04	0.21	0.02	10.2	26.478	55.756	-29.278
158.65 KHz	16.08	0.21	0.02	10.2	26.51	55.753	-29.243
158.7 KHz	16.19	0.21	0.02	10.2	26.62	55.751	-29.132
161.67 KHz	17.32	0.2	0.02	10.183	27.727	55.667	-27.94
473.95 KHz	25.7	0.1	0.03	10.1	35.93	46.744	-10.814

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)
158.53 KHz	15.19	0.21	0.02	10.2	25.625	55.756	-30.132
158.8 KHz	15.29	0.21	0.02	10.2	25.719	55.749	-30.03
159.58 KHz	15.38	0.2	0.02	10.2	25.808	55.726	-29.919
473.0 KHz	28.16	0.1	0.03	10.1	38.39	46.771	-8.381
482.6 KHz	27.21	0.1	0.03	10.1	37.443	46.497	-9.054
491.03 KHz	28.53	0.1	0.03	10.1	38.76	46.256	-7.496

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)
156.48 KHz	37.71	0.235	0.02	10.2	48.165	65.815	-17.65
158.55 KHz	37.94	0.215	0.02	10.2	48.374	65.756	-17.381
158.65 KHz	38.09	0.214	0.02	10.2	48.523	65.753	-17.229
158.7 KHz	38.24	0.213	0.02	10.2	48.673	65.751	-17.078
161.67 KHz	38.57	0.2	0.02	10.183	48.973	65.667	-16.693
473.95 KHz	35.57	0.1	0.03	10.1	45.8	56.744	-10.944

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)
158.53 KHz	35.18	0.21	0.02	10.2	45.615	65.756	-20.142
158.8 KHz	35.06	0.21	0.02	10.2	45.492	65.749	-20.257
159.58 KHz	35.41	0.2	0.02	10.2	45.834	65.726	-19.892
473.0 KHz	37.76	0.1	0.03	10.1	47.99	56.771	-8.781
482.6 KHz	36.35	0.1	0.03	10.1	46.58	56.497	-9.917
491.03 KHz	35.6	0.1	0.03	10.1	45.83	56.256	-10.426

15.209 Radiated Emissions

Engineer: Kenneth Lee

Test Date: 10/13/2017

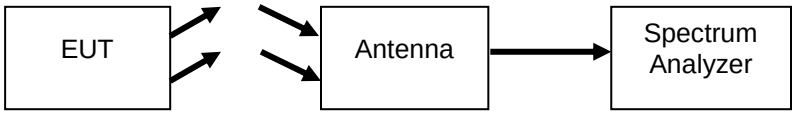
Test Procedure Below 30 MHz

The EUT was tested in a semi-anechoic chamber with the device set 3m from the receiving loop antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by placing it in 3 orthogonal axes. With the EUT in each axis, the loop antenna was also positioned into 3 orthogonal axes to ensure worst case emissions were measured. All Emissions from 9 kHz to 30 MHz were examined.

Test Procedure Above 30 MHz

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antennas in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the signal levels were maximized. All emissions from 30 MHz to 1 GHz were examined.

Test Setup



Analyzer Settings for 9-490 kHz

RBW = 300 Hz

VBW = 1 KHz

Detector – Peak

Analyzer Settings for 490-30000 kHz

RBW = 10 kHz

VBW = 30 KHz

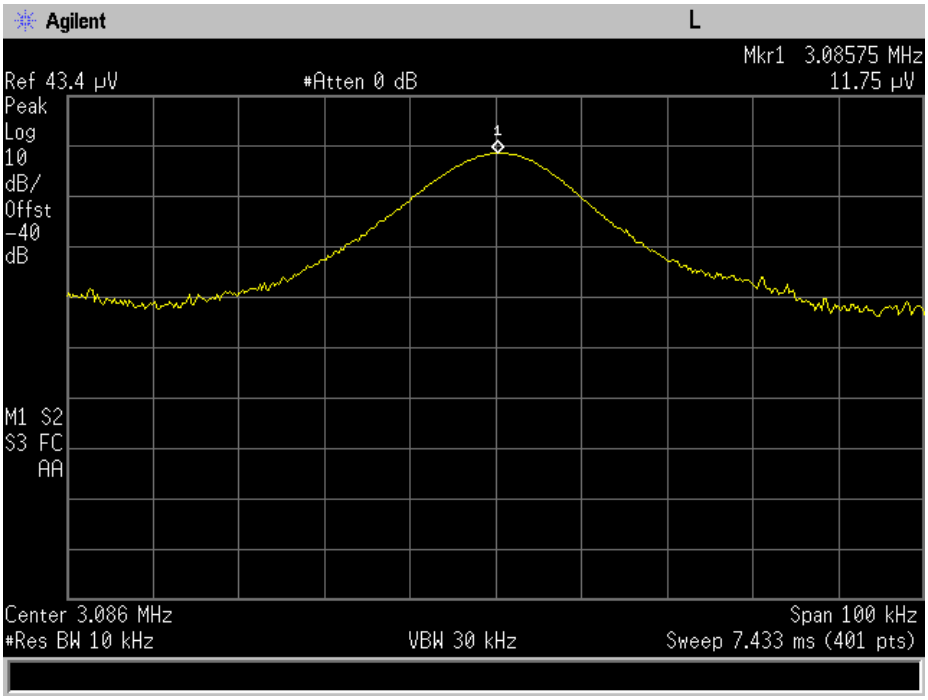
Detector – Peak

Sample Calculations

Corrected Value = Measured Value + Correction factor

Correction factor = ACF + Cable loss

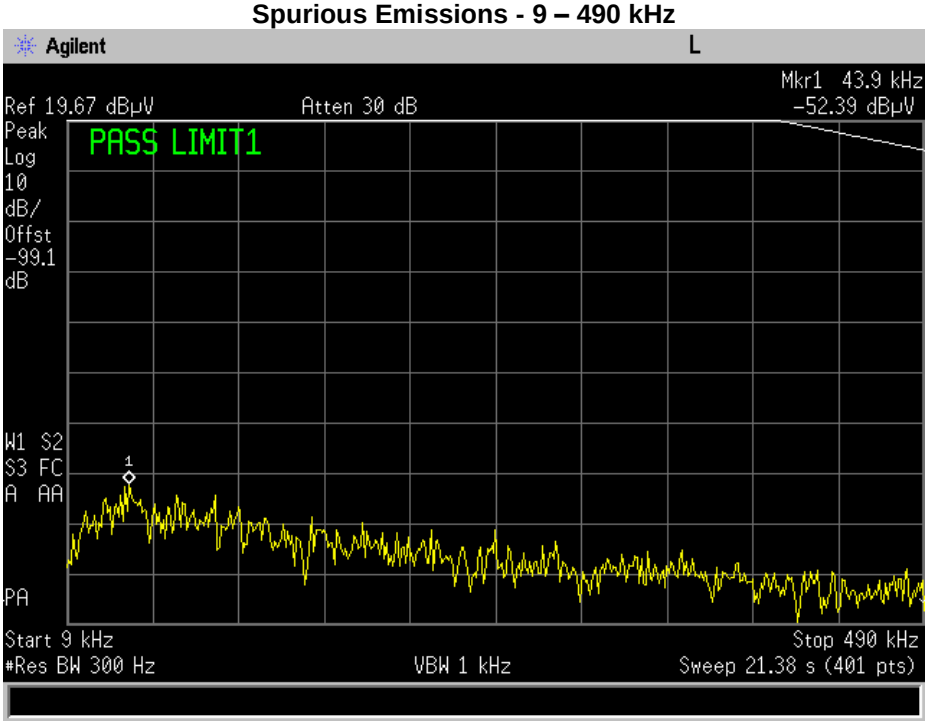
Fundamental Measurement



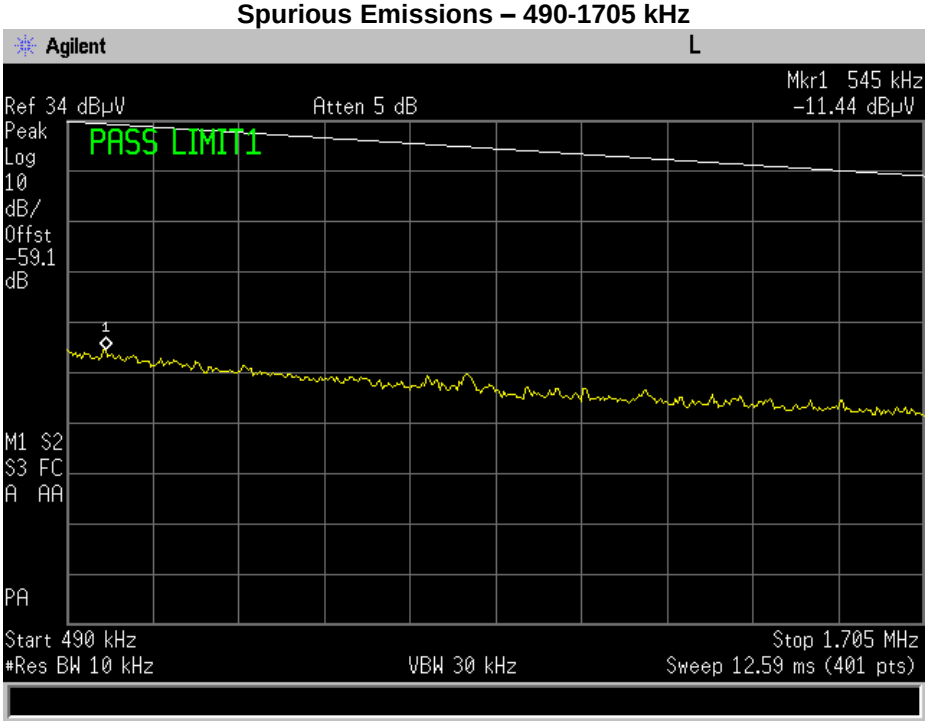
A -40 dB offset was input into the analyzer to accommodate the reduction is test distance. The -40 dB was derived from the equation in ANSI C63.10 stating the extrapolation factor of 40 dB/decade of distance will be used for frequencies below 30 MHz.

Distance Correction Factor = 40 Log(30/3) = 40

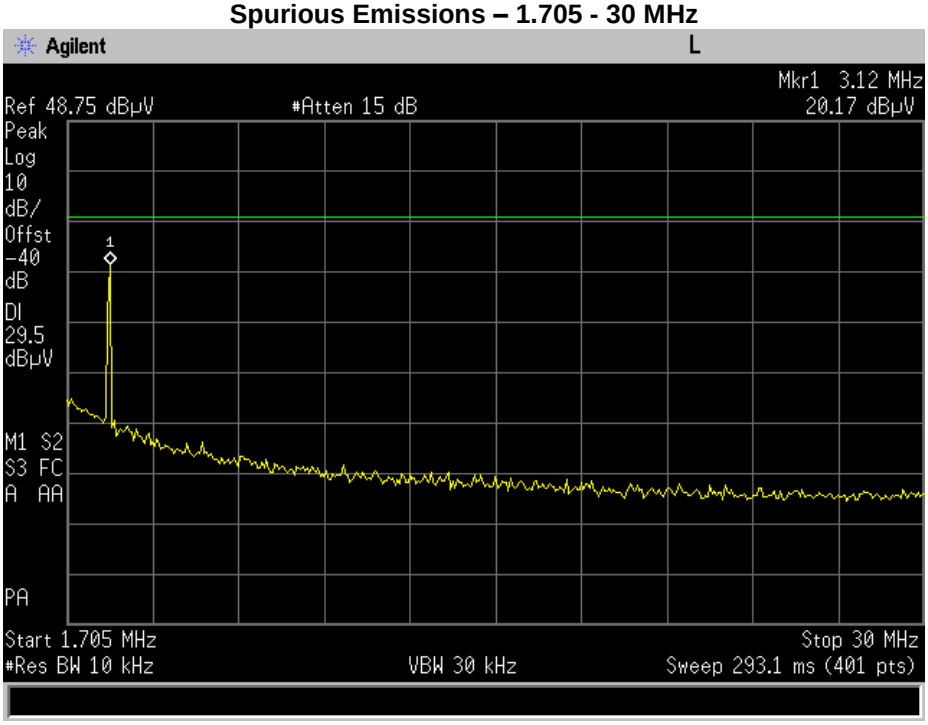
Spurious Emissions - 9 – 490 kHz



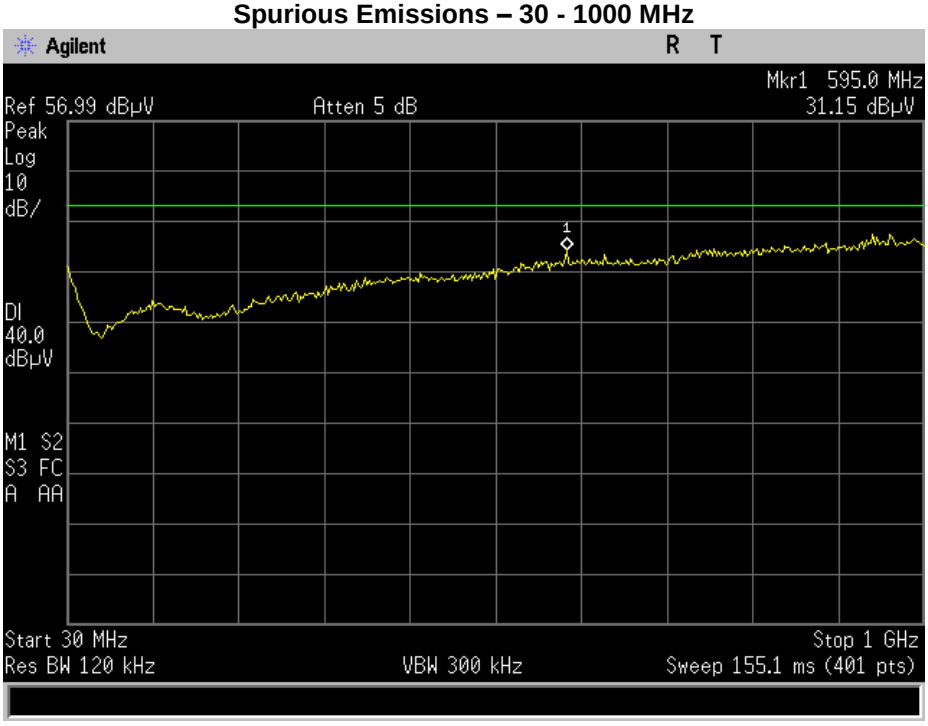
Spurious Emissions – 490-1705 kHz



Spurious Emissions – 1.705 - 30 MHz



Spurious Emissions – 30 - 1000 MHz



RSS-GEN Section 6.6 – Occupied Bandwidth

Engineer: Kenneth Lee

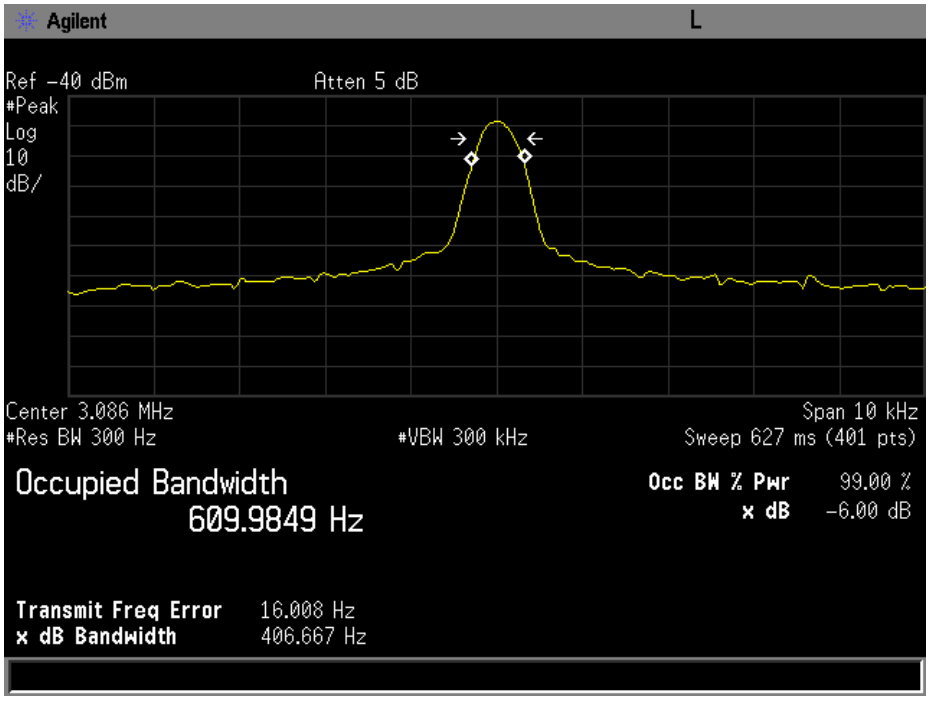
Test Date: 3/20/2018

Test Procedure

The EUT was tested in a semi-anechoic chamber with the device set 3m from the receiving loop antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Occupied Bandwidth. The EUT was tested by placing it in 3 orthogonal axes. With the EUT in each axis, the loop antenna was also positioned into 3 orthogonal axes to ensure worst case emissions were measured.

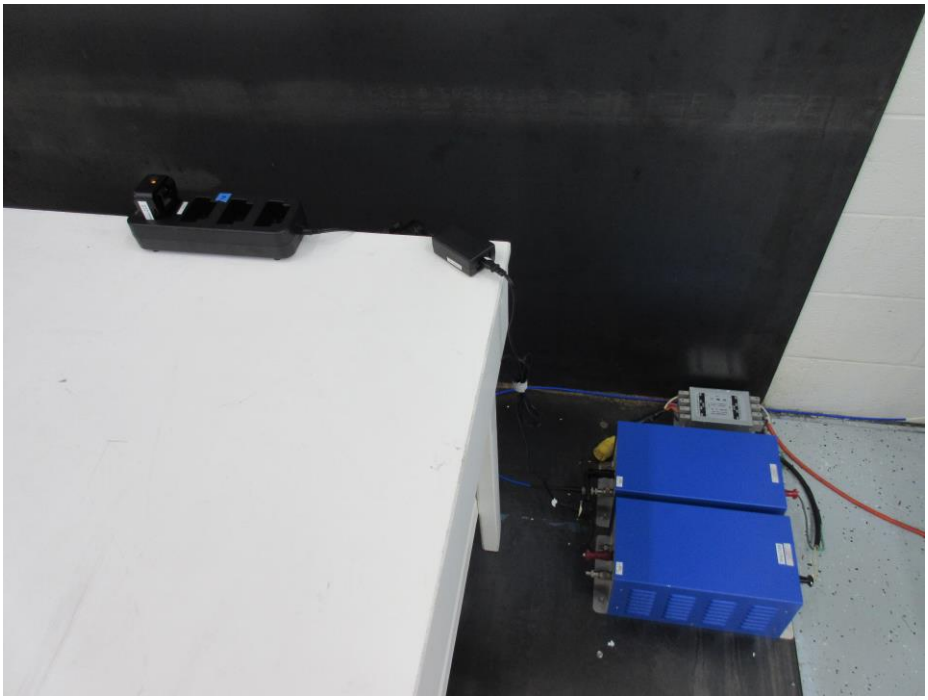
Test Results

Frequency (MHz)	Measured Bandwidth (Hz)	Result
3.086	609.985	Pass

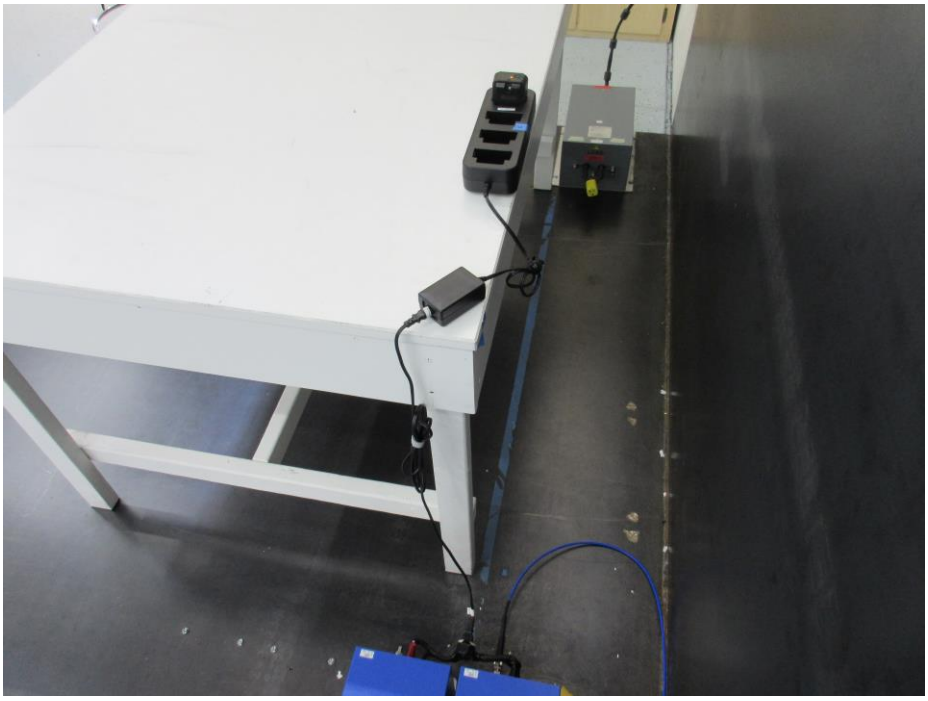


A/C Conducted Emissions Test Setup Photos

Front

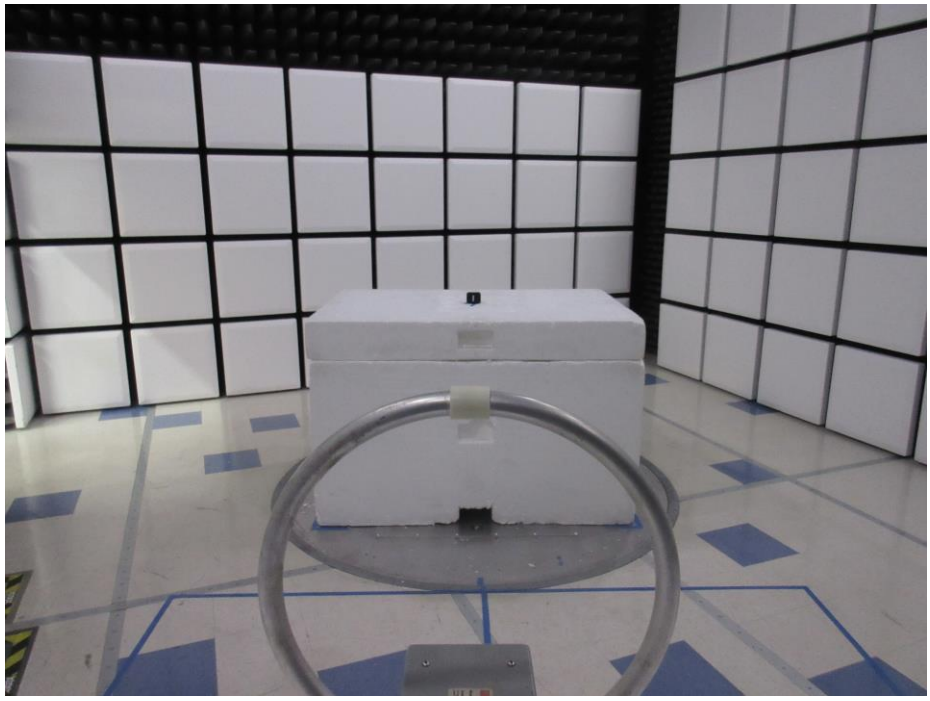


Side

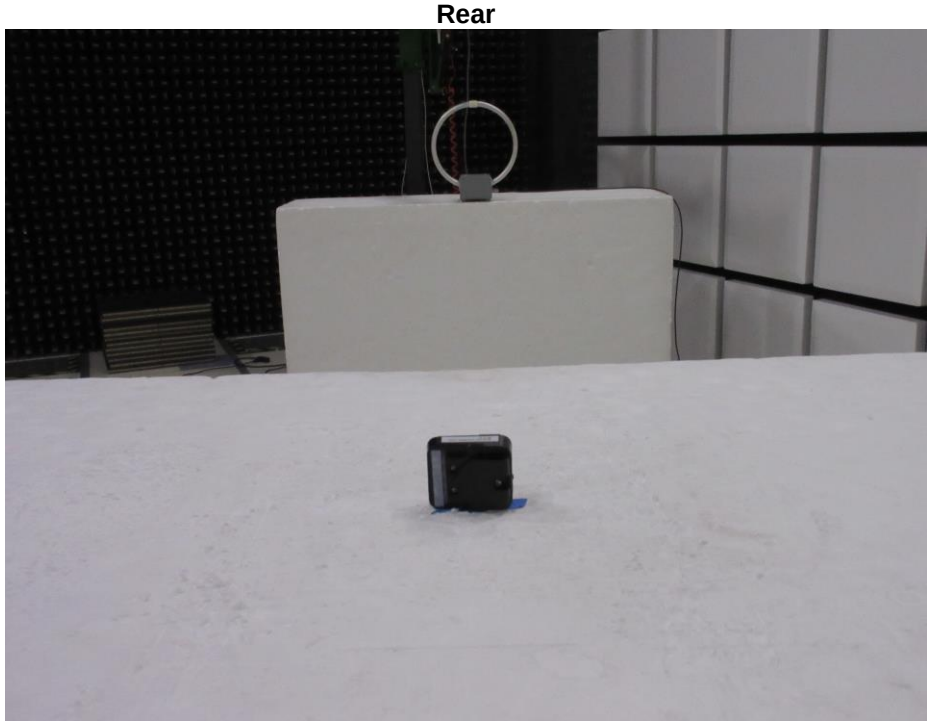


Radiated Emissions Test Setup Photos Below 30 MHz

Front

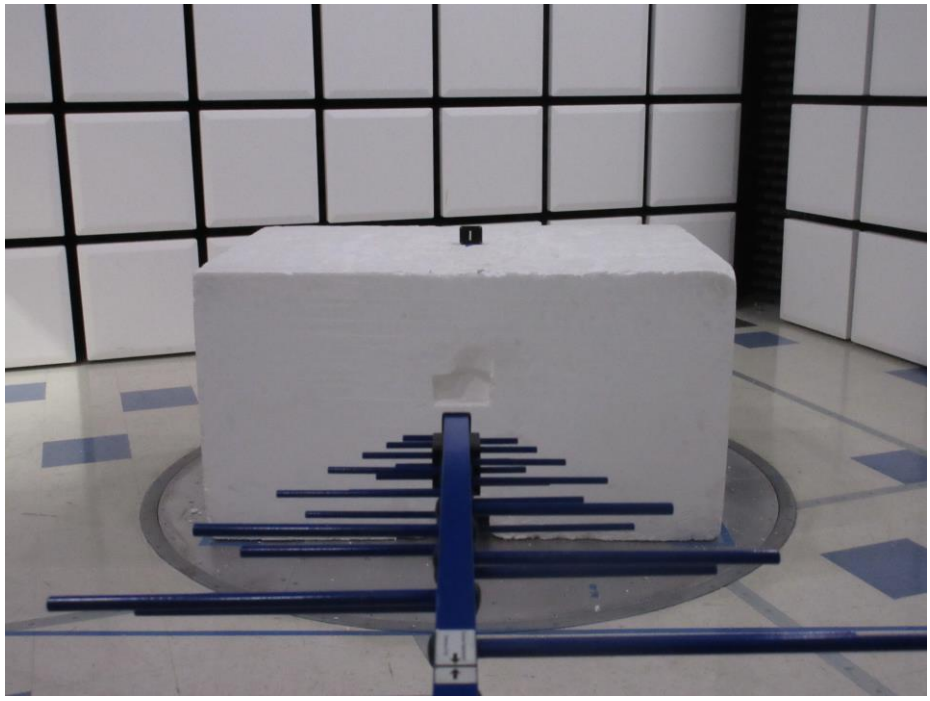


Rear

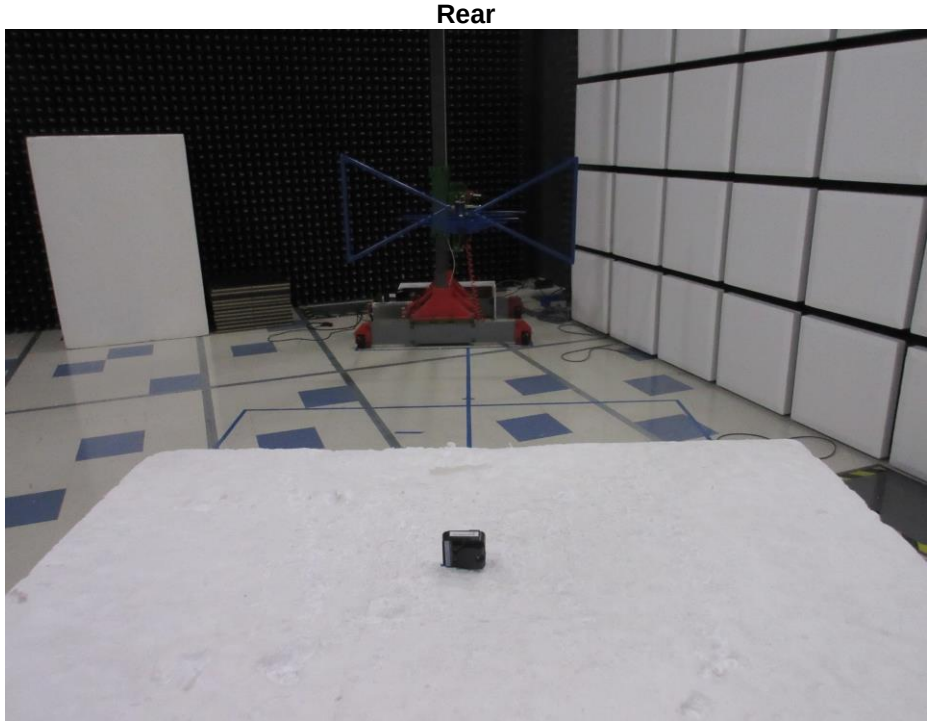


Radiated Emissions Test Setup Photos Above 30 MHz

Front



Rear



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: 10/13/2017	
Horn Antenna	ARA	DRG-118/A	i00271	6/16/16	6/16/18
Active Loop Antenna	EMCO	6507	i00326	9/25/17	9/25/19
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: 10/13/2017	
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

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