



Compliance Testing, LLC

Previously Flom Test Lab

EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Garmin International Inc

Model: A02812

Description: Dog training device

Serial Number: N/A

FCC ID: IPH-02812

IC: 1792A-02812

To

FCC Part 15.247 DTS

IC RSS-247

Date of Issue: March 8, 2016

On the behalf of the applicant:

**Garmin International Inc
1200 E. 151st. Street
Olathe, KS 66062**

Attention of:

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Project No: p1620030**

**Alex Macon
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	February 29, 2016	Alex Macon	Original Document
2.0	May 10, 2016	Alex Macon	Added test setup photos for Radiated emissions below 1 GHz and above 18 GHz



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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 C63.10-2009 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)
21.3 – 23.6	28.4 – 34.2	970.5 – 974.3

EUT Description

Model: A02812

Description: Dog training device

Firmware: N/A

Software: N/A

Serial Number: N/A

Additional Information:

The EUT incorporates BLE and ANT modulations

EUT Operation during Tests

EUT was placed in a test mode enabling continuous transmission and CW signals.



Accessories:

Qty	Description	Manufacturer	Model	S/N
1	AC Adapter	Garmin	ADP-5BW	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Ferrite Y/N
1	USB cable	<3m	Y	Y	N

Modifications: None

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

Specification	Test Name	Pass, Fail, N/A	Comments
15.247(b)	Peak Output Power	Pass	
15.247(b)	Conducted Spurious Emissions	N/A	EUT does not have a conducted port
15.247(d), 15.209(a), 15.205	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Emissions At Band Edges	Pass	
15.247(a)(2)	Occupied Bandwidth	Pass	
15.247(e)	Transmitter Power Spectral Density	Pass	
15.207	A/C Powerline Conducted Emissions	Pass	
RSS-Gen §7	Receiver Spurious Emission Limits	Pass	



Peak Output Power

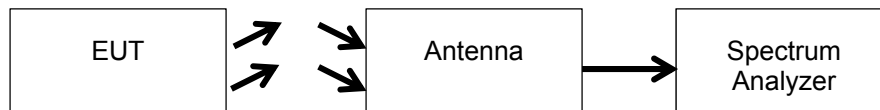
Engineer: Alex Macon

Test Date: 2/26/16

Test Procedure

The EUT was tested in a semi-anechoic test chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements. The EUT was tested by rotating it 360° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

Test Setup



Transmitter Peak Output Power

Tuned Frequency (MHz)	Measured Value (dBm)	Specification Limit	Result
2402	-4.21	1 W (30 dBm)	Pass
2440	-1.12	1 W (30 dBm)	Pass
2480	-0.37	1 W (30 dBm)	Pass



Radiated Spurious Emissions

Engineer: Alex Macon

Test Date: 2/26/16

Test Procedure

Radiated Spurious Emissions: 30 – 1000 MHz

The EUT was tested in a semi-anechoic test chamber 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° with the antennas in both the vertical and horizontal orientation and was raised from 1 to 4 meters to ensure the TX signal levels were maximized.

All emissions from 30 MHz to 1 GHz were examined.

Measured Level includes antenna and receiver cable correction factors.

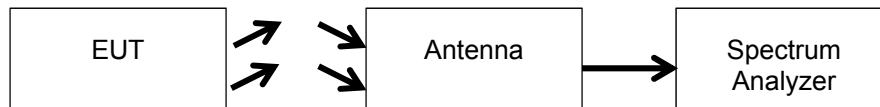
Correction factors were input into the spectrum analyzer before recording “Measured Level”.

RBW = 100 KHz

VBW = 300 KHz

Detector – Quasi Peak

Test Setup

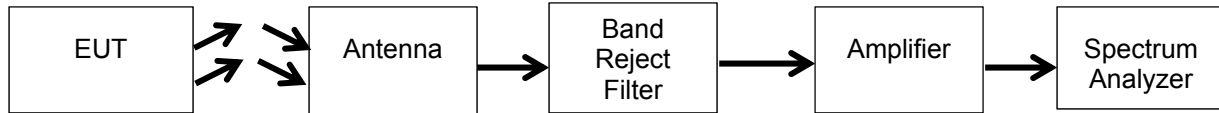


See Annex A for test results

Test Procedure for Radiated Spurious Emissions above 1 GHz

The EUT was tested in a semi anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. The antenna, band reject filter, amplifier and cable correction factors were input into the spectrum analyzer before recording the Measured Level to ensure accurate readings. The spectrum for each tuned frequency was examined to the 10th harmonic.

Test Setup



Detector Settings	RBW (MHz)	VBW (MHz)	Span
Peak	1	3	As Necessary
Average	1	3	As Necessary

See Annex A for test results



Emissions at Band Edges

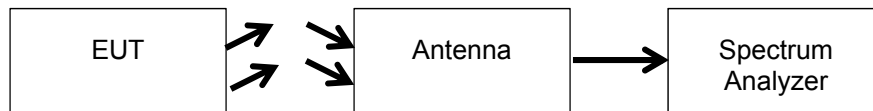
Engineer: Alex Macon

Test Date: 2/26/16

Test Procedure

The EUT was tested in a semi-anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for band edge and restricted band for both peak and average measurements. The cable and antenna correction factors were input into the analyzer as a reference level offset to ensure accurate readings. For the restricted band the amplifier and band reject filter correction factors were also input to the spectrum analyzer.

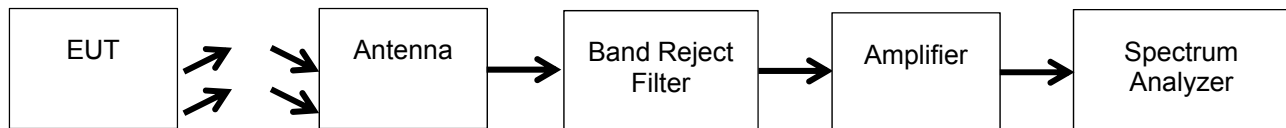
Band Edge Test Setup



Band Edge Emissions Summary

Tuned Frequency (MHz)	Emission Frequency (MHz)	Measured Value (dBc)	Detector	Limit (dBc)	Result
2480	2483.5	56.39	Peak	-20 dBc	Pass
2401	2400	31.38	Peak	-20dBc	Pass

Restricted Band Test Setup



See Annex A for test results



Occupied Bandwidth

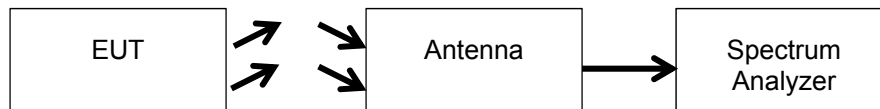
Engineer: Alex Macon

Test Date: 3/1/16

Test Procedure

The EUT was connected directly to a spectrum analyzer. The Span was set wide enough to capture the entire transmit spectrum and the resolution bandwidth was set to at least 1% of the span. The analyzer was set to max hold and when the entire spectrum was captured the 6dB and 99% bandwidths were measured to verify the bandwidth met the specification.

Test Setup



6 dB Occupied Bandwidth Summary

Modulation	Frequency (MHz)	Measured Bandwidth (kHz)	Specification Limit (kHz)	Result
BLE	2402	697	≥ 500	Pass
BLE	2440	693	≥ 500	Pass
BLE	2480	698	≥ 500	Pass
ANT	2401	501	≥ 500	Pass
ANT	2440	500	≥ 500	Pass
ANT	2480	500	≥ 500	Pass

99% Bandwidth Summary

Modulation	Frequency (MHz)	Measured Bandwidth (kHz)	Result
BLE	2402	1080	Pass
BLE	2440	1145	Pass
BLE	2480	1058	Pass
ANT	2401	1093	Pass
ANT	2440	975	Pass
ANT	2480	958	Pass

See Annex B for test results

Transmitter Power Spectral Density (PSD)

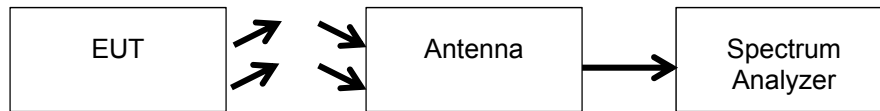
Engineer: Alex Macon

Test Date: 2/26/16

Test Procedure

The EUT was tested in a semi-anechoic chamber set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements.

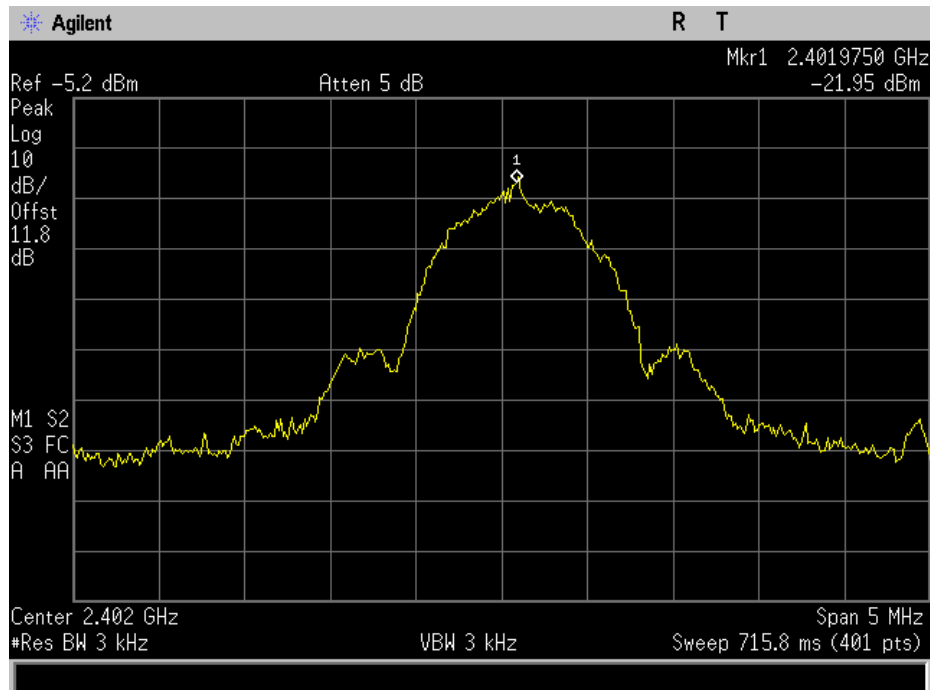
Test Setup



PSD Summary

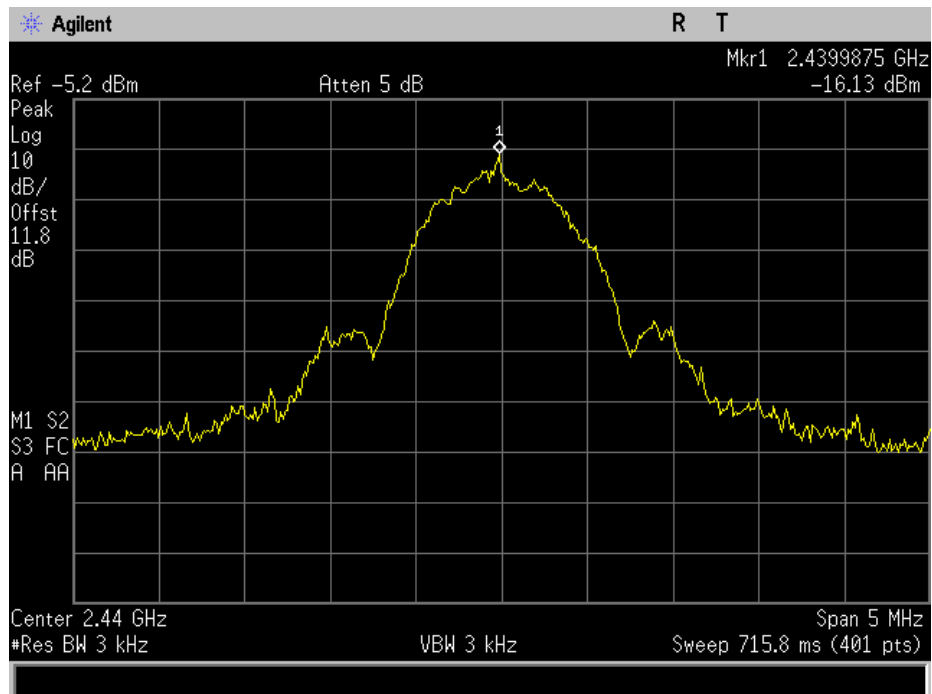
Frequency (MHz)	Measured Data (dBm)	Specification Limit (dBm)	Result
2402	-21.95	8	Pass
2440	-16.13	8	Pass
2480	-14.33	8	Pass

PSD 2402 MHz

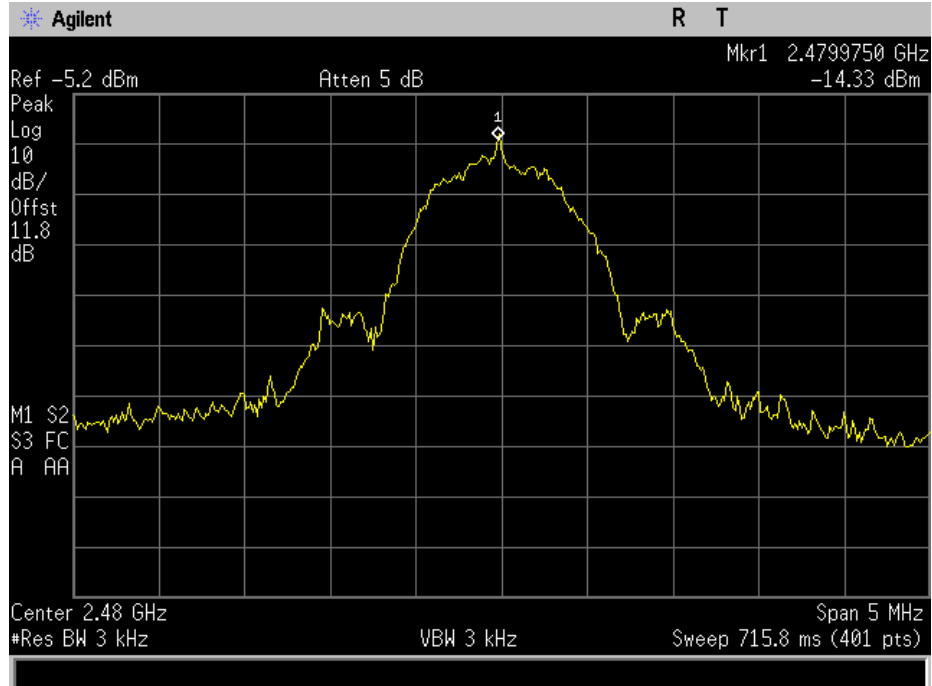




PSD 2440 MHz



PSD 2480 MHz





A/C Powerline Conducted Emission

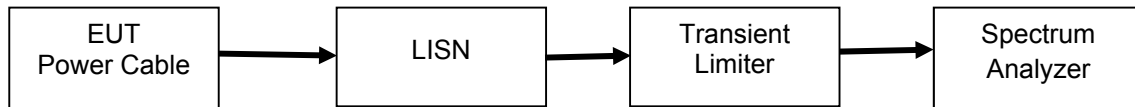
Engineer: Paul Hay

Test Date: 3/1/16

Test Procedure

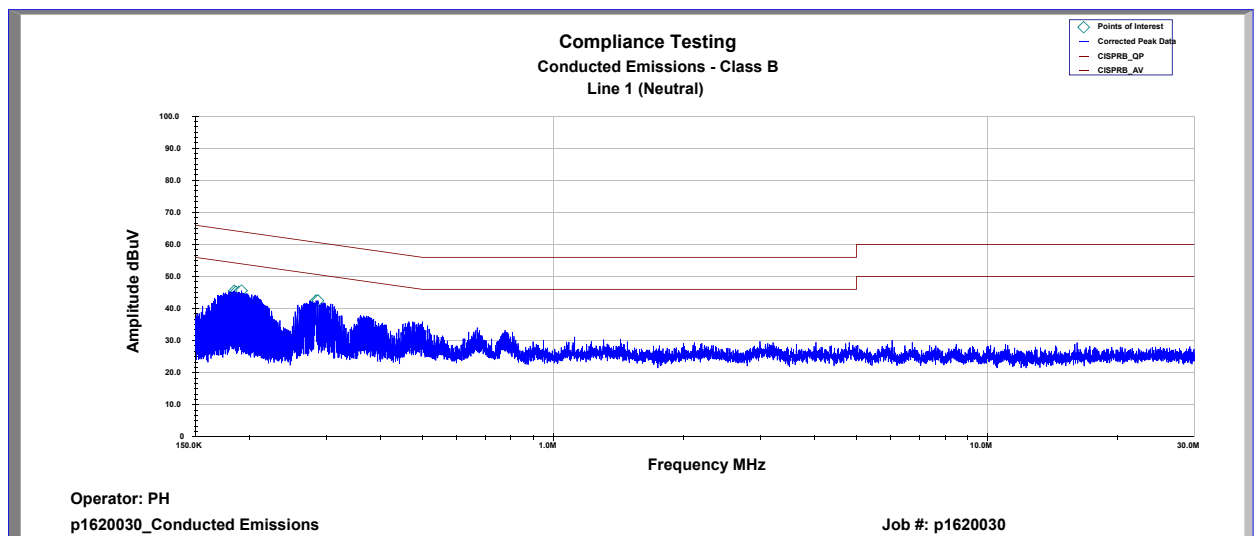
The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup

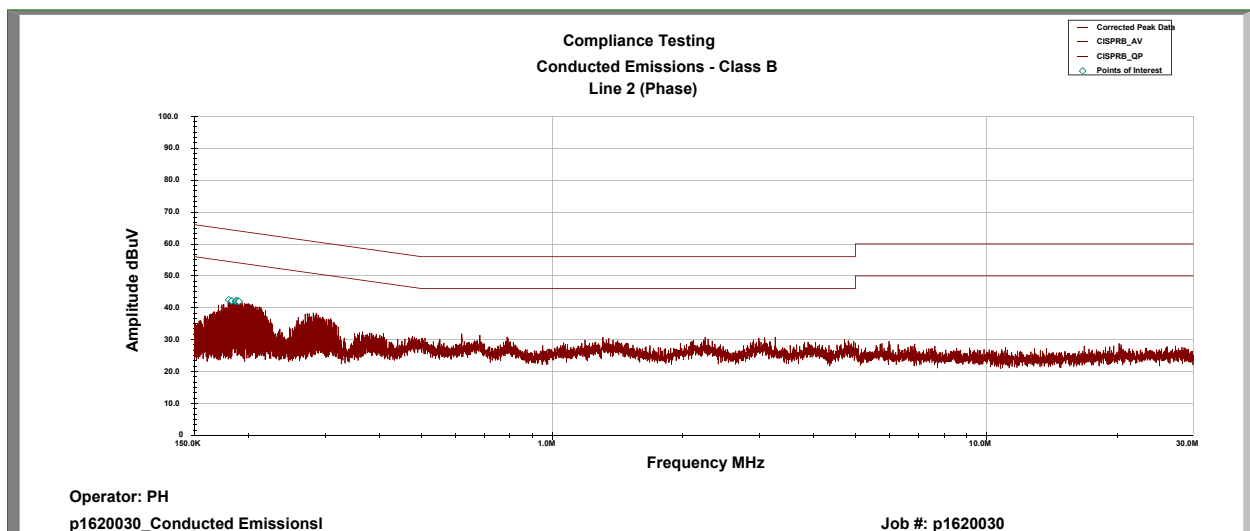


Conducted Emission Test Results

Line 1 Peak Plot



Line 2 Peak Plot



*All peak emissions are below the average and quasi-peak limits.



Receiver Spurious Emissions

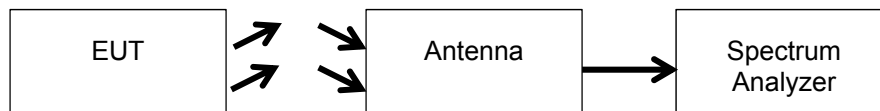
Engineer: Alex Macon

Test Date: 2/26/16

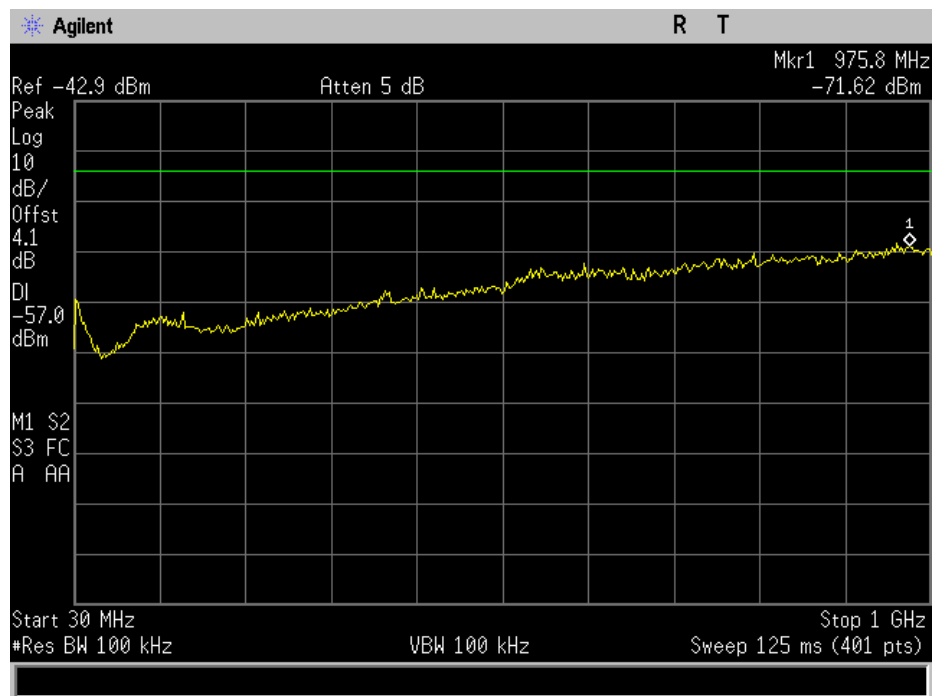
Test Procedure

The EUT was connected directly to a spectrum analyzer. The receiver spurious emissions were measured from 30 MHz to greater than 3 times the highest tunable frequency.

Test Setup



Receiver Spurious Emissions Summary



Emissions up to 8GHz were investigated but only noise floor was observed



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
EMI Receiver	HP	8546A	i00033	2/26/15	2/26/16*
Horn Antenna	EMCO	3115	i00103	1/20/15	1/20/17
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	5/8/14	5/8/16
Horn Antenna, Amplified	ARA	MWH-1826/B	i00273	4/22/15	4/22/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	4/1/15	4/1/16
Spectrum Analyzer	Agilent	E4407B	i00331	9/18/15	9/18/16
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	10/19/15	10/19/17
AC Power Source	Behlman	BL 6000	i00362	Verified on: 3/1/16	
EMI Analyzer	Agilent	E7405A	i00379	2/11/16	2/11/17
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/27/14	7/27/16
PSA Spectrum Analyzer	Agilent	E4445A	i00471	8/26/15	8/26/16

*Equipment is under a 30 day calibration extension at Lab Manager's discretion

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