



## **MET Laboratories, Inc.** *Safety Certification - EMI - Telecom Environmental Simulation*

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September 14, 2016

CommScope  
250 Apollo Drive  
Chelmsford, MA 01824

Dear Kevin Craig,

Enclosed is the EMC Wireless test report for compliance testing of the CommScope, Small Cell/ Model S1000C as tested to the requirements of the FCC Certification rules under Title 47 of the CFR Part 90 Subpart S for Private Land Mobile Radio Services.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please contact me.

Sincerely yours,  
MET LABORATORIES, INC.

Jennifer Warnell  
Documentation Department

Reference: (\CommScope\EMC88789-FCC90S Rev. 1)

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### **Electromagnetic Compatibility Criteria Test Report**

for the

**CommScope  
Small Cell/ Model S1000C**

Tested under  
FCC Certification Rules  
Title 47 of the CFR,  
Part 90 Subpart S for Private Land Mobile Radio Services

**MET Report: EMC88789-FCC90S Rev. 1**

September 14, 2016

#### **Prepared For:**

**CommScope  
250 Apollo Drive  
Chelmsford, MA 01824**

**Prepared By:**  
**MET Laboratories, Inc.**  
914 W. Patapsco Ave  
Baltimore, MD 21230

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Title 47 of the CFR,  
Part 90 Subpart S for Private Land Mobile Radio Services**



Djed Mouada  
Project Engineer, Electromagnetic Compatibility Lab



Jennifer Warnell  
Documentation Department

**Engineering Statement:** The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 90 Subpart S of the FCC Rules under normal use and maintenance.



Asad Bajwa,  
Director, Electromagnetic Compatibility Lab



CommScope  
Small Cell/ Model S1000C

Report Status  
CFR Title 47 Part 90 Subpart S

## Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	August 10, 2016	Initial Issue.
1	September 14, 2016	Editorial corrections.

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## List of Terms and Abbreviations

<b>AC</b>	Alternating Current
<b>ACF</b>	Antenna Correction Factor
<b>Cal</b>	Calibration
<i>d</i>	Measurement Distance
<b>dB</b>	Decibels
<b>dB<sub>μ</sub>A</b>	Decibels above one <b>microamp</b>
<b>dB<sub>μ</sub>V</b>	Decibels above one <b>microvolt</b>
<b>dB<sub>μ</sub>A/m</b>	Decibels above one <b>microamp per meter</b>
<b>dB<sub>μ</sub>V/m</b>	Decibels above one <b>microvolt per meter</b>
<b>DC</b>	Direct Current
<b>E</b>	Electric Field
<b>DSL</b>	Digital Subscriber Line
<b>ESD</b>	Electrostatic Discharge
<b>EUT</b>	Equipment Under Test
<i>f</i>	Frequency
<b>FCC</b>	Federal Communications Commission
<b>GRP</b>	Ground Reference Plane
<b>H</b>	Magnetic Field
<b>HCP</b>	Horizontal Coupling Plane
<b>Hz</b>	Hertz
<b>IEC</b>	International Electrotechnical Commission
<b>kHz</b>	kilohertz
<b>kPa</b>	kilopascal
<b>kV</b>	kilovolt
<b>LISN</b>	Line Impedance Stabilization Network
<b>MHz</b>	Megahertz
<b>μH</b>	<b>microhenry</b>
<b>μ</b>	<b>microfarad</b>
<b>μs</b>	<b>microseconds</b>
<b>NEBS</b>	Network Equipment-Building System
<b>PRF</b>	Pulse Repetition Frequency
<b>RF</b>	Radio Frequency
<b>RMS</b>	Root-Mean-Square
<b>TWT</b>	Traveling Wave Tube
<b>V/m</b>	Volts <b>per meter</b>
<b>VCP</b>	Vertical Coupling Plane



## I. Executive Summary



## A. Purpose of Test

An EMC evaluation was performed to determine compliance of the CommScope Small Cell/ Model S1000C, with the requirements of Part 90 Subpart S. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Small Cell/ Model S1000C. CommScope should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Small Cell/ Model S1000C, has been **permanently** discontinued.

## B. Executive Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90 Subpart S, in accordance with CommScope, purchase order number 60210.

FCC Reference	Description	Compliance
§2.1051; §90.691(a)	Conducted Spurious Emissions	Compliant
§2.1053; §90.691(a)	Radiated Spurious Emissions	Compliant
§90.635	RF Power	Compliant
§90.691	Emission Mask	Compliant

**Table 1. Executive Summary of EMC Compliance Testing**

## II. Equipment Configuration

## A. Overview

MET Laboratories, Inc. was contracted by CommScope to perform testing on the Small Cell/ Model S1000C, under CommScope's purchase order number 60210.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the CommScope, Small Cell/ Model S1000C.

The results obtained relate only to the item(s) tested.

<b>Model(s) Tested:</b>	Small Cell/ Model S1000C
<b>Model(s) Covered:</b>	Small Cell/ Model S1000C
<b>Filing Status:</b>	Original
<b>EUT Specifications:</b>	Primary Power: 120 VAC, 60 Hz
	FCC ID: QHY-S1000C
	Type of Modulations: GSM
	Equipment Code: AMP
	RF Power Output 5.95 dBm
	EUT Frequency Ranges: 862.6-867.9MHz
<b>Analysis:</b>	The results obtained relate only to the item(s) tested.
<b>Environmental Test Conditions:</b>	Temperature: 15-35° C
	Relative Humidity: 30-60%
	Barometric Pressure: 860-1060 mbar
<b>Evaluated by:</b>	Djed Mouada
<b>Date(s):</b>	September 14, 2016

## B. References

<b>CFR 47, Part 90, Subpart S</b>	Federal Communication Commission, Code of Federal Regulations, Title 47, Part 90S: Regulations Governing Licensing and Use of Frequencies in the 806-824, 851-869, 896-901, and 935-940 MHz Bands
<b>ANSI C63.4:20014</b>	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
<b>ISO/IEC 17025:2005</b>	General Requirements for the Competence of Testing and Calibration Laboratories
<b>EIA/TIA-603-A-2001</b>	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards

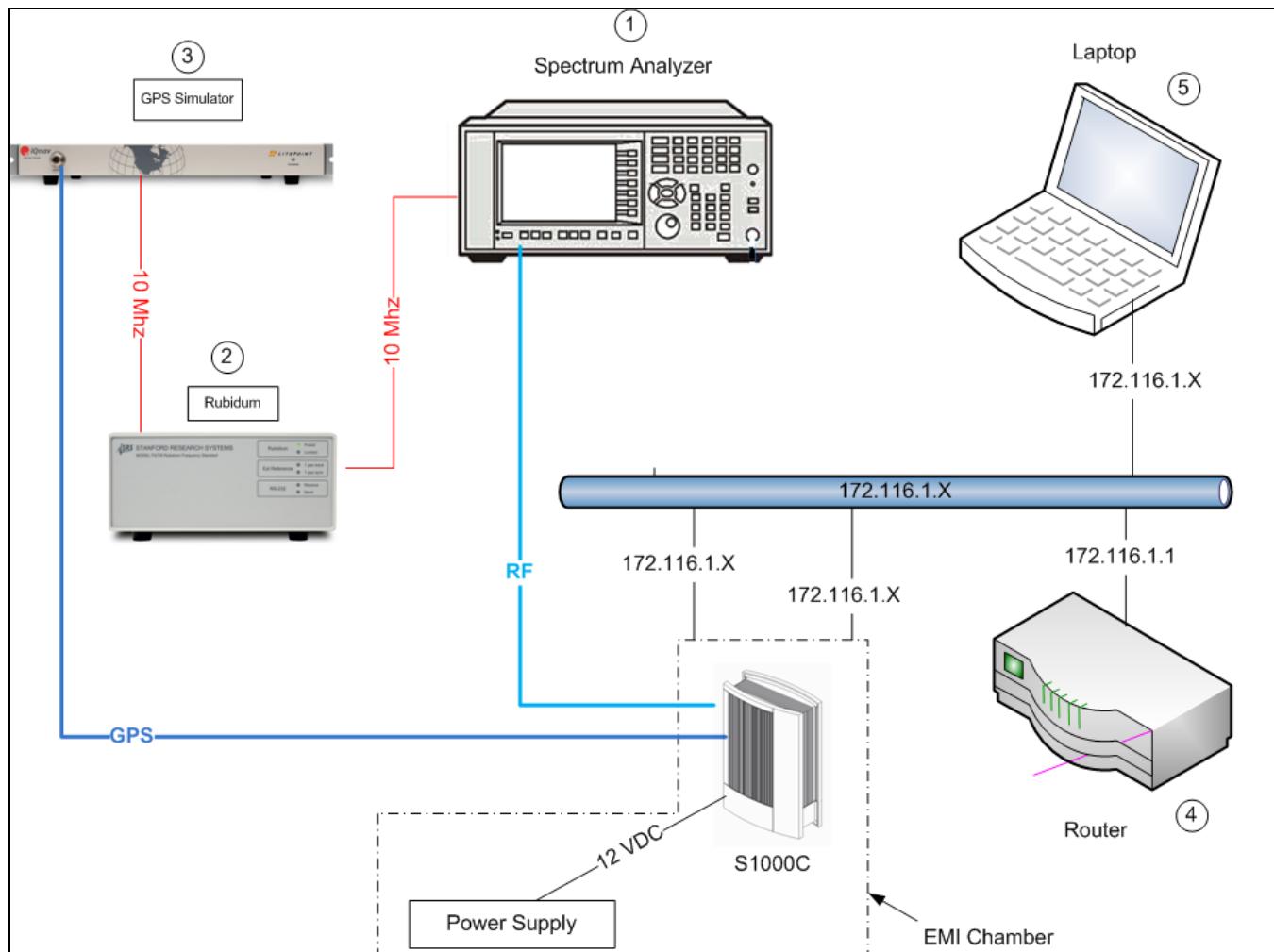
## C. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 meter semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

## D. Description of Test Sample

The Multi-Protocol Base Transceiver Station (Small Cell/ Model S1000C), Equipment Under Test (EUT), is a CDMA/LTE/Wi-Fi Low Power Femto Base Station. It is intended to be used in the Small to Medium Business's to provide indoor voice and data coverage.



**Figure 1. Block Diagram of Equipment Configuration**

## E. Equipment Configuration

Ref. ID	Name/Description	Model Number	Part Number	Serial Number
1	Femto Basestation	S1000C	800236	TBD
2	DYS Switching Mode Power Supply	DYS650-120400W-1	DYS650-120400-16419	TBD

**Table 2. Equipment Configuration**

## F. Support Equipment

Ref. ID	Name / Description	Manufacturer	Model Number	Customer Supplied Calibration Data
1	MXA Analyzer	Agilent	N9020A	10-14-2015
2	Rubidium	Stanford Research Systems	FS725	06-06-2016
3	GPS Simulator	LitePoint	IQNAV-6CH	not applicable
4	Wi-Fi Router	Linksys	EA2700	not applicable
5	Laptop	Dell	Latitude E6440	not applicable
6	USB Optical Mouse	Dell		not applicable
7	AC Adapter for Laptop	Dell		not applicable
8	Cat5 cables			not applicable
9	RF Test cables	Murata	MXHS83QE3000	not applicable
10	RF Terminators	Molex	0733910680	not applicable

Table 3. Support Equipment

## G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description or Reason for No Cable	Qty.	Max Length	Shielded? (Y/N)	Termination Box ID & Port Name
1	Power	Part of AC Adapter	1	1.8	N	--
2	WAN - NSC	Cat5 Cable (8)	1	10	N	--
3	Console - CDMA	Cat5 Cable (8)	1	10	N	--
4	CDMA - RF - Beacon-BC1 J18	RF Test Cable (9)	1	0.3	Y	--
5	CDMA - RF - Beacon-BC0/10 J21	RF Test Cable (9)	1	0.3	Y	--
6	CDMA - EVDO - BC1 J15	RF Test Cable (9)	1	0.3	Y	--
7	CDMA - 1X - BC1 J17	RF Test Cable (9)	1	0.3	Y	--
8	NSC - LTE -BAND41 TX1 J4437	RF Test Cable (9)	1	0.3	Y	--
9	NSC - LTE -BAND41 TX2 J4438	RF Test Cable (9)	1	0.3	Y	--
10	CDMA - Console	Serial Cable	1	--	--	--
11	NSC - Console J1323				--	--

Table 4. Ports and Cabling Information

## H. Mode of Operation

The Femto Base station will be operating in 3 modes, CDMA, LTE and Wi-Fi.

CDMA - The service radios, voice and data, transmit in CDMA Band 1. The beacon radio transmits in subsets of Band 0 & 10. Test mode uses system software with security disabled. Transmitters shall be at max power of +13dBm.

LTE - The service radio transmits in Band 41 (TDD). Test mode uses the chipset suppliers test software TMU in order to be able to provide a continuous transmit stream for EMC testing. Transmitters shall be at max power of +20dBm.

Wi-Fi – The Wi-Fi radios, 2.4 & 5 MHz, will be tested uses the chipset suppliers test software ART. Transmitters shall be at max power of +17dBm.

A laptop using telnet sessions and test scripts will be used to control the radio for CDMA, LTE and Wi-Fi during EMC testing.

A laptop using a serial connection and test scripts will be used during CDMA Radio & Safety testing.

## I. Method of Monitoring EUT Operation

All radios can be monitored by the software indicating the state of the radio links via CLI. Also the DC power consumed is an indicator of the state of the system.

## J. Modifications

### a) Modifications to EUT

No modifications were made to the EUT.

### b) Modifications to Test Standard

No modifications were made to the test standard.

## K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to CommScope upon completion of testing.



### III. Electromagnetic Compatibility Criteria for Intentional Radiators



## Electromagnetic Compatibility Criteria for Intentional Radiators

### §90.635 RF Power Output

**Test Requirements:** **§90.635 Limitations on power and antenna height:**

**§90.635 (a)** The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested.

**§90.635 (b)** The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

Antenna height (ATT) meters (feet)	Effective radiated power (watts) <sup>1 2 4</sup>
Above 1,372 (4,500)	65
Above 1,220 (4,000) to 1,372 (4,500)	70
Above 1,067 (3,500) to 1,220 (4,000)	75
Above 915 (3,000) to 1,067 (3,500)	100
Above 763 (2,500) to 915 (3,000)	140
Above 610 (2,000) to 763 (2,500)	200
Above 458 (1,500) to 610 (2,000)	350
Above 305 (1,000) to 458 (1,500)	600
Up to 305 (1,000)	<sup>3</sup> 1,000

<sup>1</sup>Power is given in terms of effective radiated power (ERP).

<sup>2</sup> Applicants in the Los Angeles, CA, area who demonstrate a need to serve both the downtown and fringe areas will be permitted to utilize an ERP of 1 kw at the following mountaintop sites: Santiago Park, Sierra Peak, Mount Lukens, and Mount Wilson.

<sup>3</sup> Stations with antennas below 305 m (1,000 ft) (AAT) will be restricted to a maximum power of 1 kw (ERP).

<sup>4</sup> Licensees in San Diego, CA, will be permitted to utilize an ERP of 500 watts at the following mountaintop sites: Palomar, Otay, Woodson and Miguel.

**Table 5. Equivalent Power and Antenna Heights for Base Stations in the 851-869 MHz and 935-940 MHz Bands Which Have a Requirement for a 32 km (20 mi) Service Area Radius**

### Test Procedures:

**Test Results:** The EUT complies with the requirements of this section.

**Test Engineer(s):** Djed Mouada

**Test Date(s):** 07/27/16



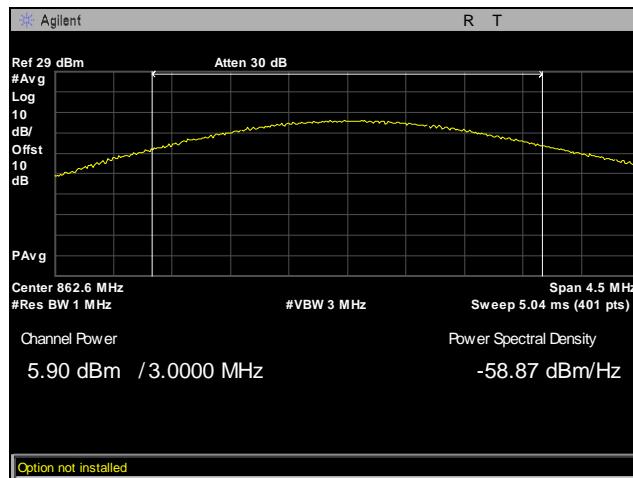
<b>Beacon Radio (PART90S)</b>					
<b>Channel</b>	<b>Average Power(dBm)</b>	<b>Antenna gain (dBi)</b>	<b>ERP (W)</b>	<b>Limit W</b>	<b>Margin</b>
<b>1110</b>	5.9	<b>-4.2</b>	<b>0.000901571</b>	500	499.9990984

**Table 6. ERP, Test Results, Beacon Radio**

<b>Beacon Radio BC10 (PART90S)</b>					
<b>Chanel</b>	<b>Average Power(dBm)</b>	<b>Antenna gain (dBi)</b>	<b>ERP (W)</b>	<b>Limit</b>	<b>Margin</b>
<b>Low</b>	5.95	<b>-4.2</b>	<b>0.000912011</b>	500	499.999088
<b>Mid</b>	5.67	<b>-4.2</b>	<b>0.000855067</b>	500	499.9991449
<b>High</b>	5.49	<b>-4.2</b>	<b>0.000820352</b>	500	499.9991796

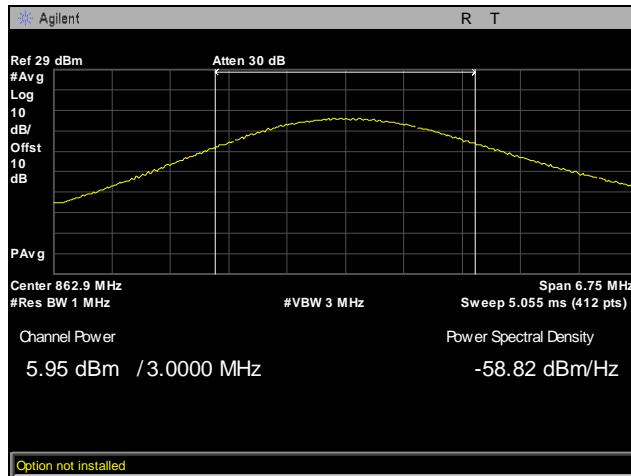
**Table 7. ERP, Test Results, Beacon Radio, BC10**

## RF Power Output, Beacon Radio, BC0

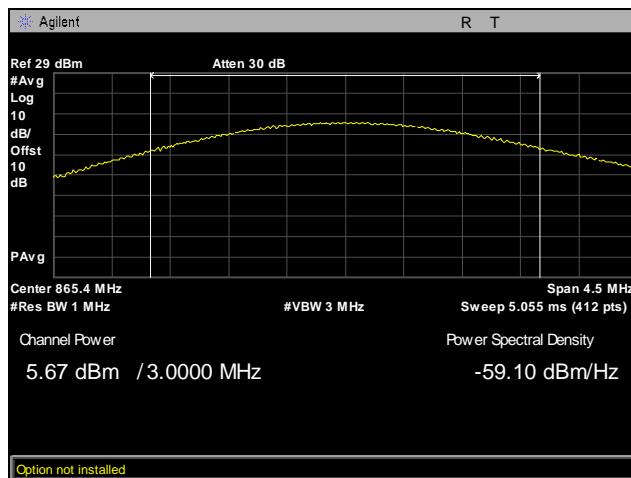


**Plot 1. RF Output Power, Beacon Radio, BC0, Channel 1110, Average**

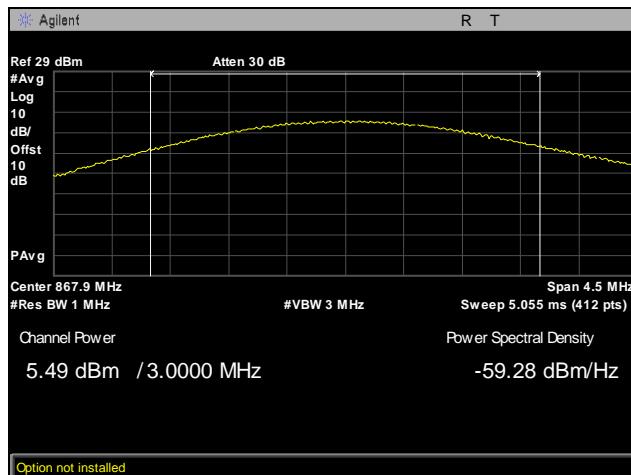
## RF Power Output, Beacon Radio, BC10



Plot 2. RF Output Power, Beacon Radio, BC10, Low Channel Average



Plot 3. RF Output Power, Beacon Radio, BC10, Mid Channel, Average



Plot 4. RF Output Power, Beacon Radio, BC10, High Channel, Average



## §90.691 Emissions Mask

**Test Requirement(s): §90.691 Emission mask requirements for EA-based systems:**

**§90.691 (a)** Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

- (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \log_{10}(f/6.1)$  decibels or  $50 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
- (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10 \log_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

**§90.691 (b)** When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

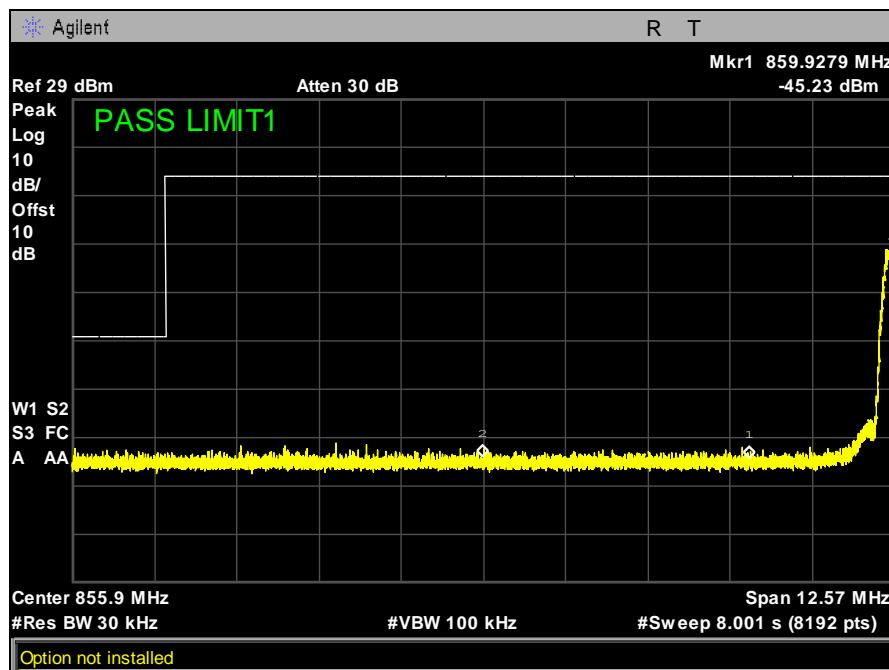
### Test Procedures:

**Test Results:** Equipment complies with FCC requirements.

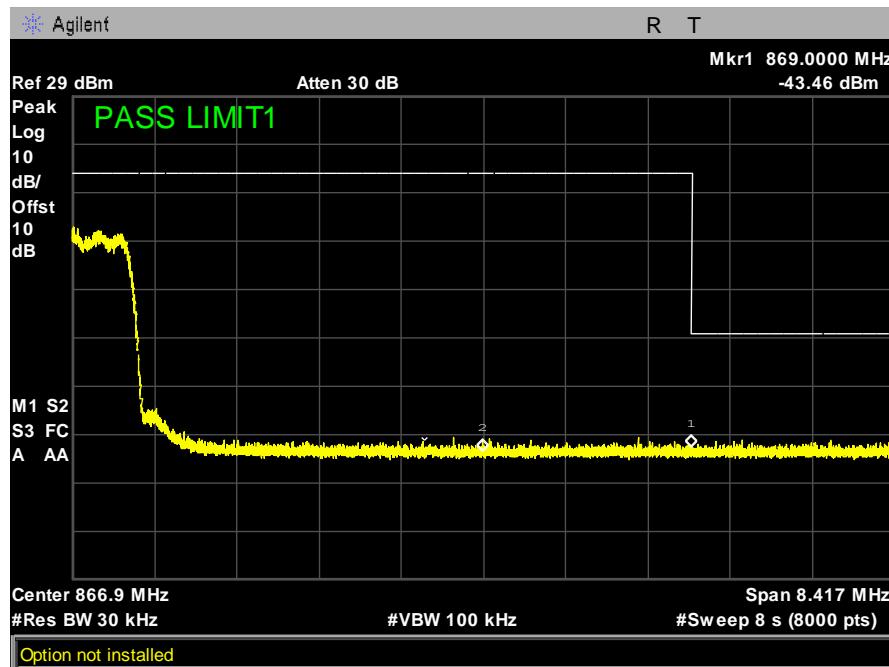
**Test Engineer(s):** Djed Mouada

**Test Date(s):** 07/26/16

## Emissions Mask, Beacon Radio, BC0

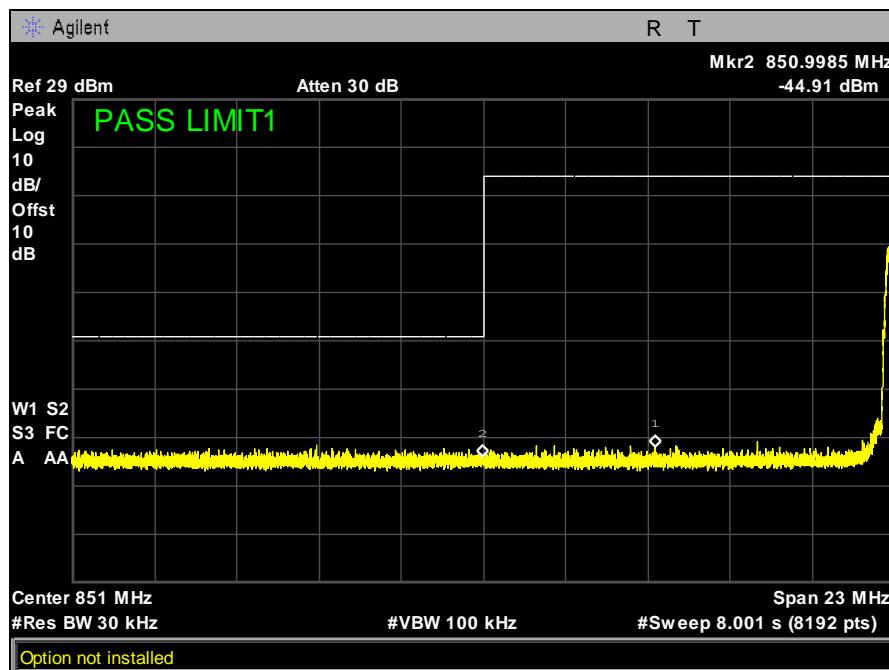


Plot 5. Emissions Mask, Beacon Radio, BC0, Lower Mask

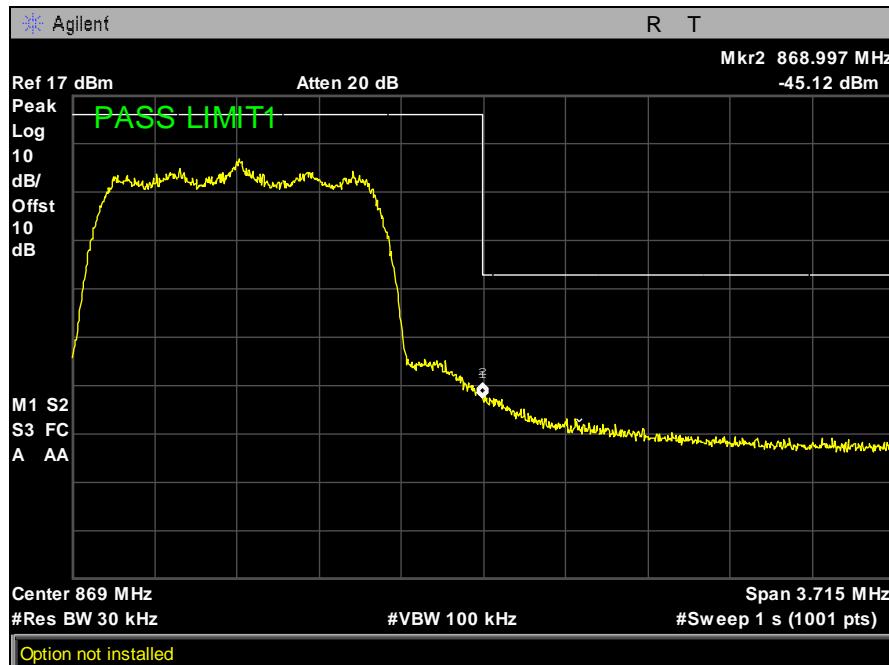


Plot 6. Emissions Mask, Beacon Radio, BC0, Upper Mask

## Emissions Mask, Beacon Radio, BC10



Plot 7. Emissions Mask, Beacon Radio, BC10, Lower Mask



Plot 8. Emissions Mask, Beacon Radio, BC10, Upper Mask



## Electromagnetic Compatibility Criteria for Intentional Radiators

### §2.1053 Radiated Spurious Emissions

**Test Requirement(s): §2.1053 Measurements required: Field strength of spurious radiation.**

**§2.1053 (a)** Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of § 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

**§2.1053 (b):** The measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz.
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

**§90.691 (a)** Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

- (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \text{ Log10}(f/6.1)$  decibels or  $50 + 10 \text{ Log10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
- (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\text{Log10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.



**Test Procedures:** As required by 47 CFR 2.1053, *field strength of radiated spurious measurements* was made in accordance with the procedures of TIA/EIA-603-A-2001 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".

Radiated emission measurements were performed inside a 3 meter semi-anechoic chamber. The EUT's RF ports were terminated to 50ohm load. The EUT was tested using both modulations and at the low, mid, and high channels. The EUT was rotated about 360<sup>0</sup> and the receiving antenna scanned from 1-4m in order to capture the maximum emission. The plots are corrected for cable loss, antenna correction factor, and distance correction. The field strength was mathematically corrected to an E.I.R.P. Harmonic emissions up to the 10<sup>th</sup> or 40GHz, which ever was the lesser, were investigated.

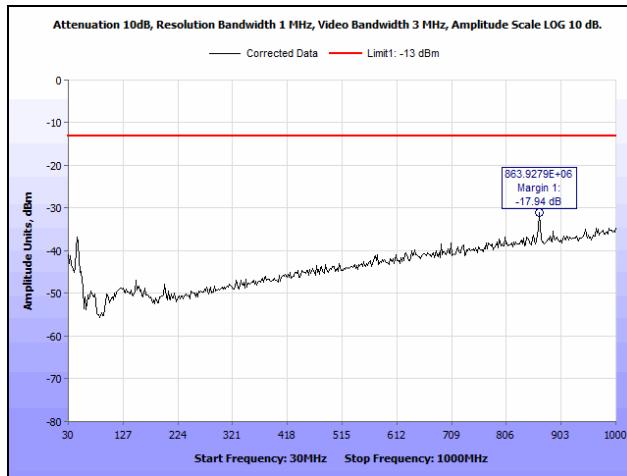
The spectrum analyzer was set to 1MHz RBW and 3MHz VBW. The spectrum was investigated from 30MHz to the 10<sup>th</sup> harmonic of the carrier.

**Test Results:** The EUT complies with the requirements of this section.

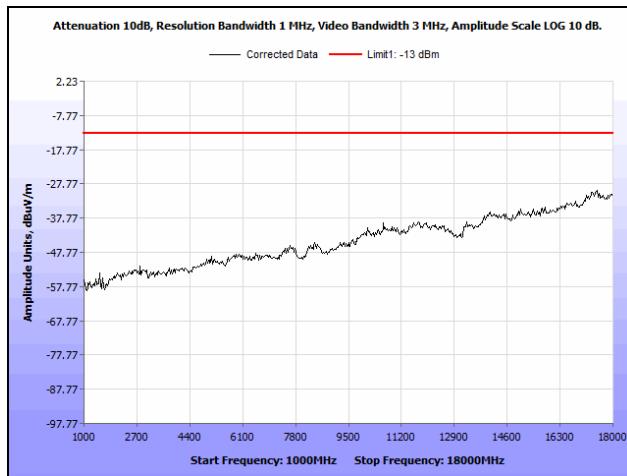
**Test Engineer:** Djed Mouada

**Test Date(s):** 07/26/16

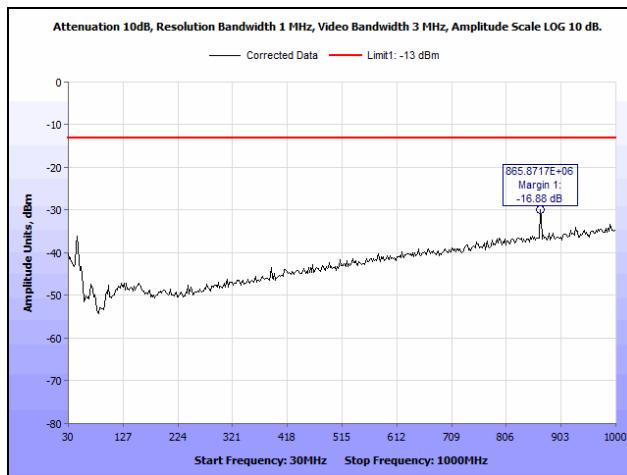
## Radiated Spurious Emissions, Beacon Radio, BC10



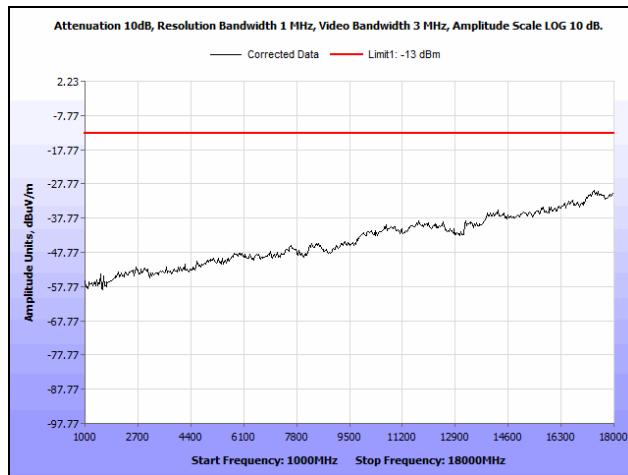
Plot 9. Radiated Spurious Emissions, Beacon Radio, BC10, Low Channel, 30 MHz – 1 GHz



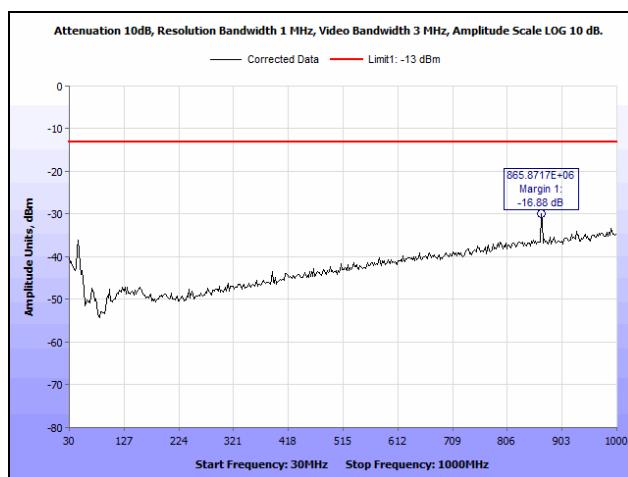
Plot 10. Radiated Spurious Emissions, Beacon Radio, BC10, Low Channel, 1 GHz – 18 GHz



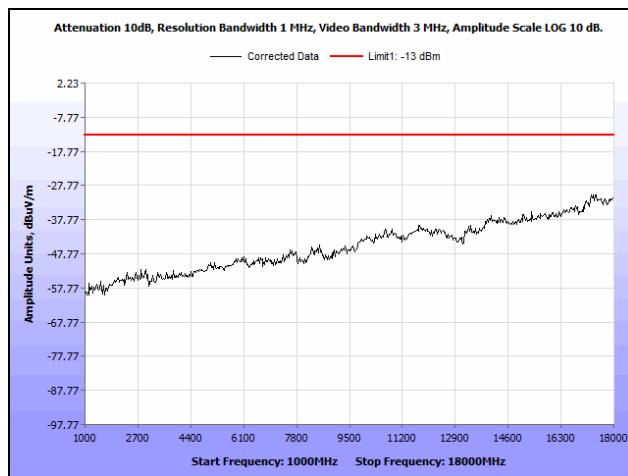
Plot 11. Radiated Spurious Emissions, Beacon Radio, BC10, Mid Channel, 30 MHz – 1 GHz



Plot 12. Radiated Spurious Emissions, Beacon Radio, BC10, Mid Channel, 1 GHz – 18 GHz

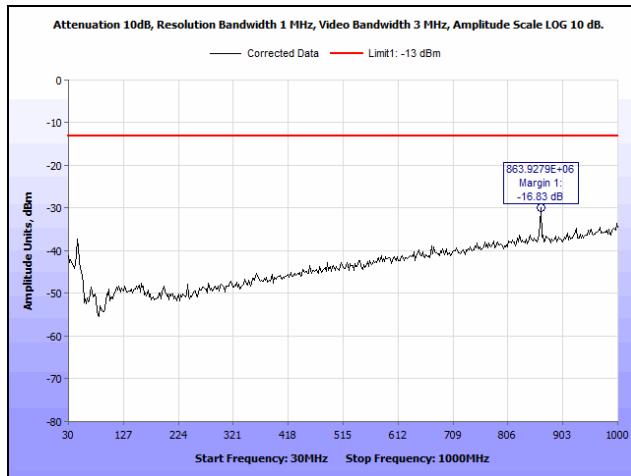


Plot 13. Radiated Spurious Emissions, Beacon Radio, BC10, High Channel, 30 MHz – 1 GHz

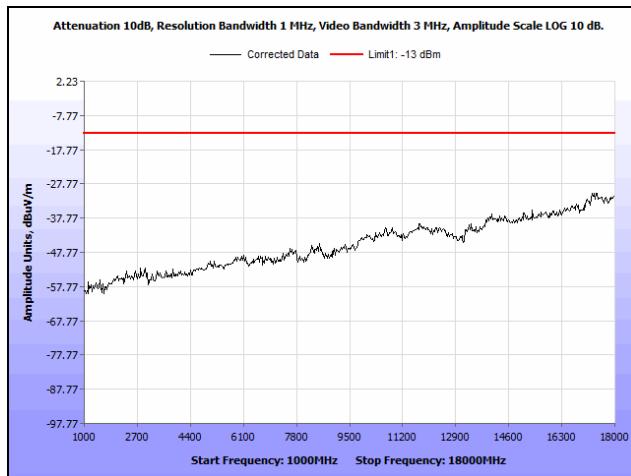


Plot 14. Radiated Spurious Emissions, Beacon Radio, BC10, High Channel, 1 GHz – 18 GHz

## Radiated Spurious Emissions, Beacon Radio, BC0



Plot 15. Radiated Spurious Emissions, Beacon Radio, BC0, Channel 1110, 30 MHz – 1 GHz



Plot 16. Radiated Spurious Emissions, Beacon Radio, BC0, Channel 1110, 1 GHz – 18 GHz



## Electromagnetic Compatibility Criteria for Intentional Radiators

### §2.1051 Spurious Emissions at Antenna Terminals

**Test Requirement(s):**

**§2.1051 Measurements required: Spurious emissions at antenna terminals:** The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in § 2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

**§90.691 (a)** Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

- (1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $116 \text{ Log10}(f/6.1)$  decibels or  $50 + 10 \text{ Log10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.
- (2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least  $43 + 10\text{Log10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

**Test Procedures:**

As required by 47 CFR §2.1051, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a Spectrum Analyzer.

A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer through an attenuator. The Spectrum Analyzer was set to sweep 30 MHz and up to  $10^{\text{th}}$  harmonic of the fundamental or 40 GHz whichever is the lesser. Measurements were made in all applicable frequency bands.

**Band Edge Plots:** If a reduction of power was necessary for compliance at band edges, a second band edge plot was taken at the outermost channel that was compliant at the highest power. The channel number is noted in the caption of those plots.

**Test Results:**

Equipment complies with these requirements.

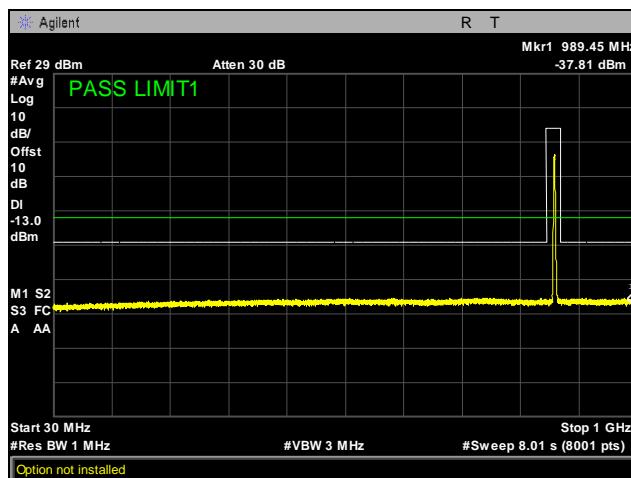
**Test Engineer(s):**

Djed Mouada

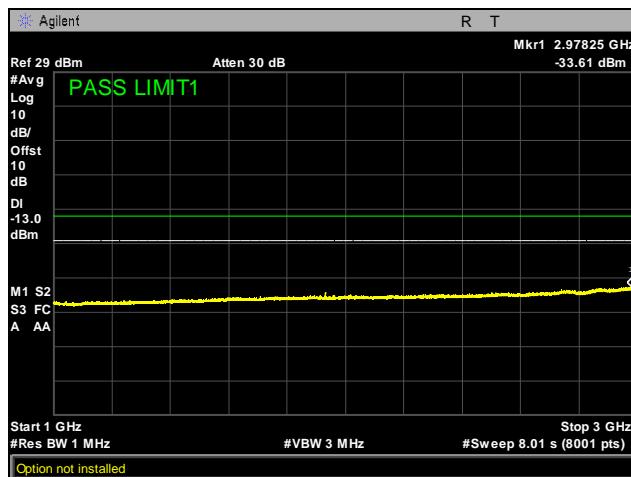
**Test Date(s):**

07/26/16

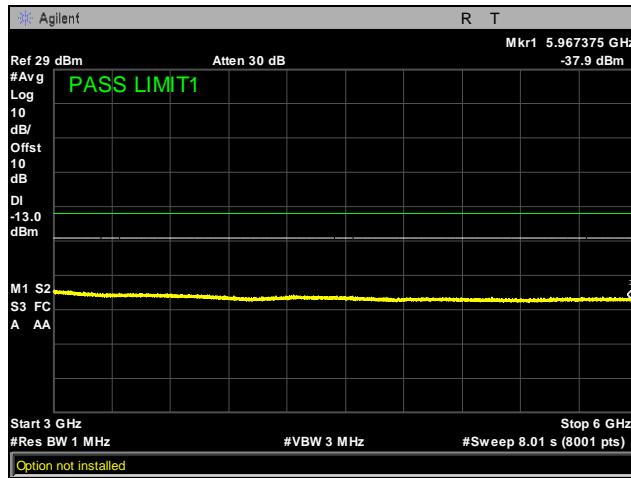
## Conducted Spurious Emissions, Beacon Radio



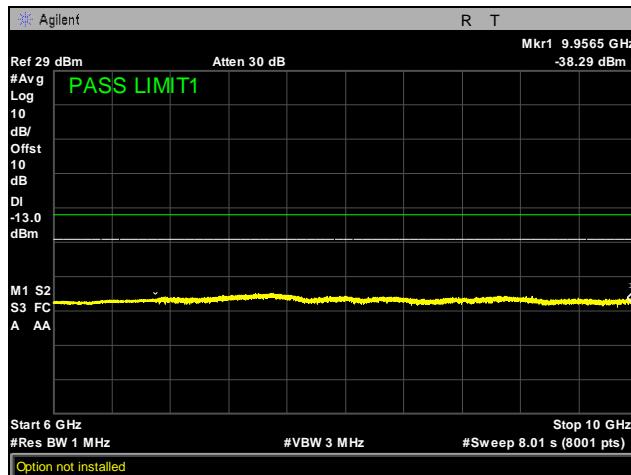
Plot 17. Conducted Spurious Emissions, Beacon Radio, Channel 1110, 30 MHz – 1 GHz



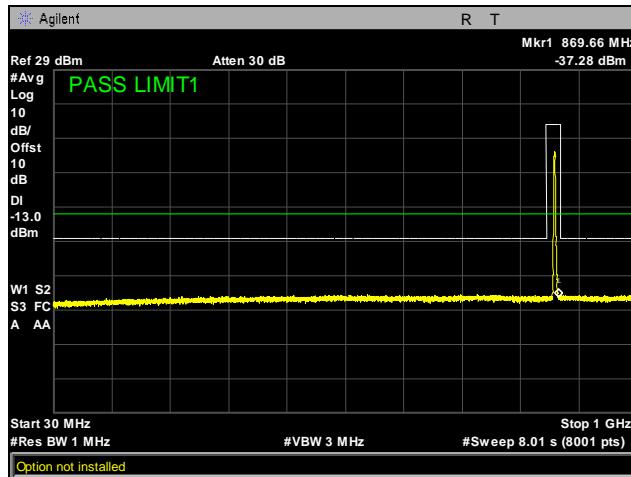
Plot 18. Conducted Spurious Emissions, Beacon Radio, Channel 1110, 1 GHz – 3 GHz



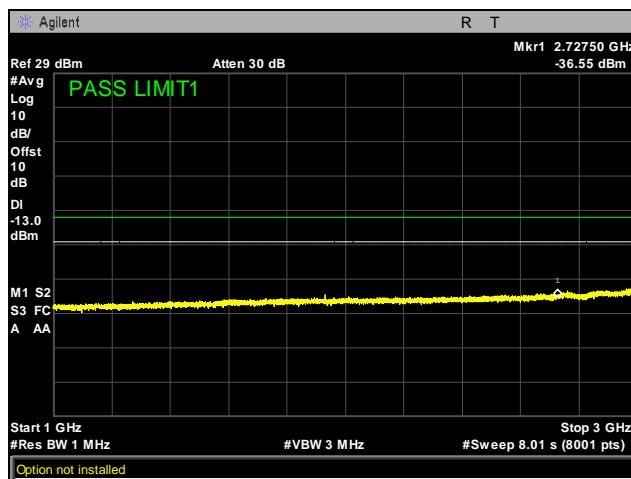
Plot 19. Conducted Spurious Emissions, Beacon Radio, Channel 1110, 3 GHz – 6 GHz



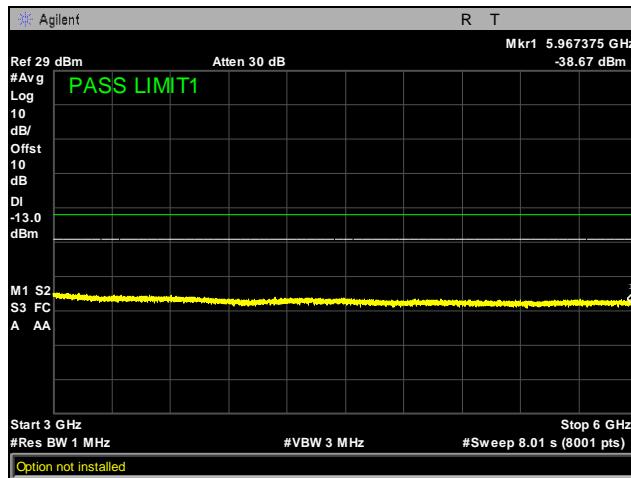
Plot 20. Conducted Spurious Emissions, Beacon Radio, Channel 1110, 6 GHz – 10 GHz



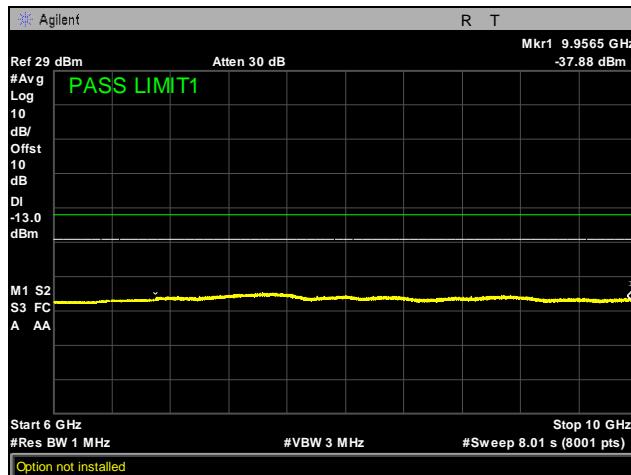
Plot 21. Conducted Spurious Emissions, Beacon Radio, Low Channel, 30 MHz – 1 GHz



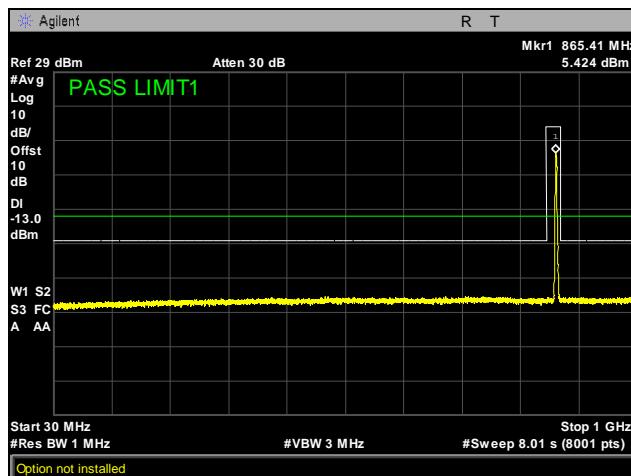
Plot 22. Conducted Spurious Emissions, Beacon Radio, Low Channel, 1 GHz – 3 GHz



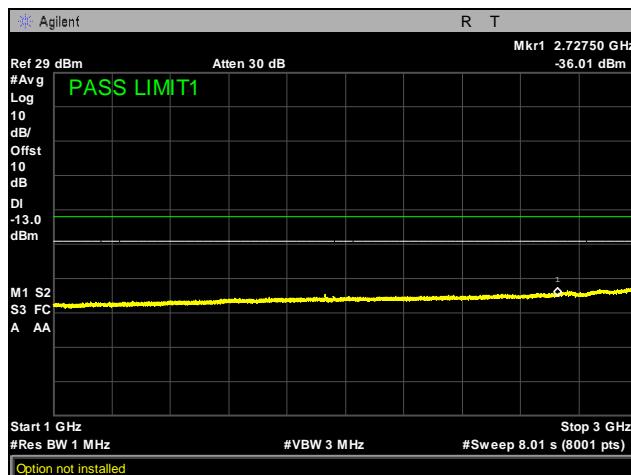
Plot 23. Conducted Spurious Emissions, Beacon Radio, Low Channel, 3 GHz – 6 GHz



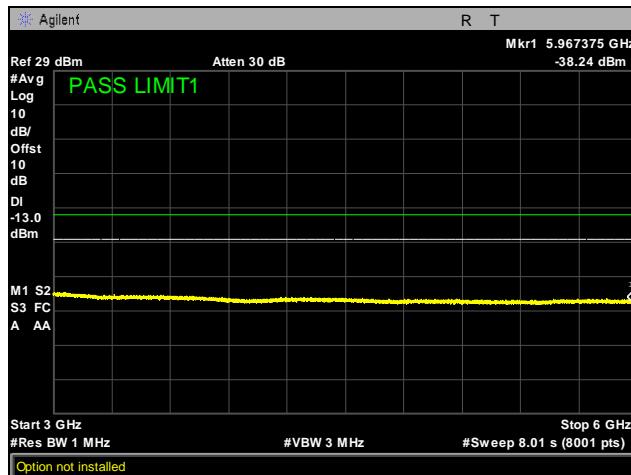
Plot 24. Conducted Spurious Emissions, Beacon Radio, Low Channel, 6 GHz – 10 GHz



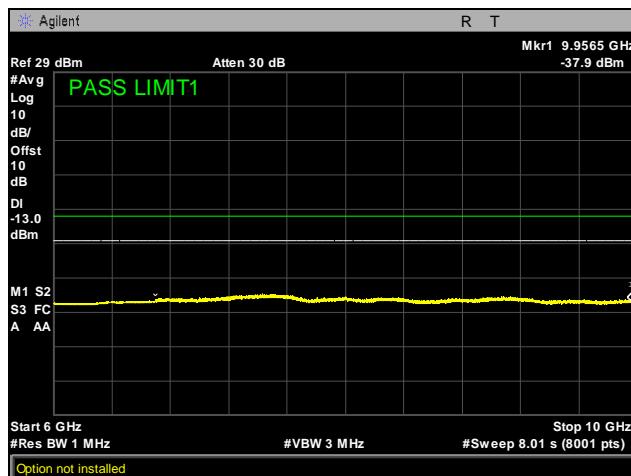
Plot 25. Conducted Spurious Emissions, Beacon Radio, Mid Channel, 30 MHz – 1 GHz



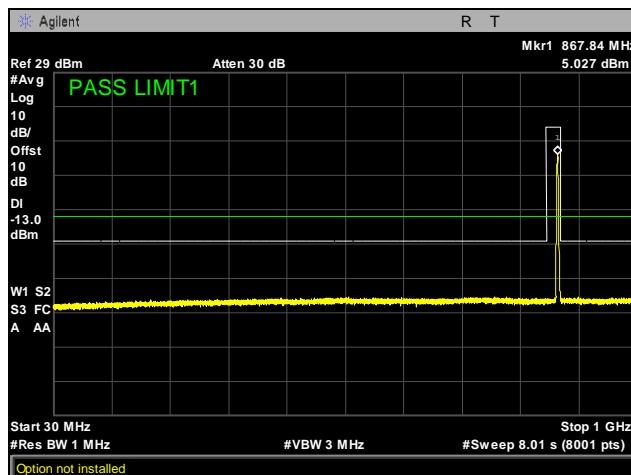
Plot 26. Conducted Spurious Emissions, Beacon Radio, Mid Channel, 1 GHz – 3 GHz



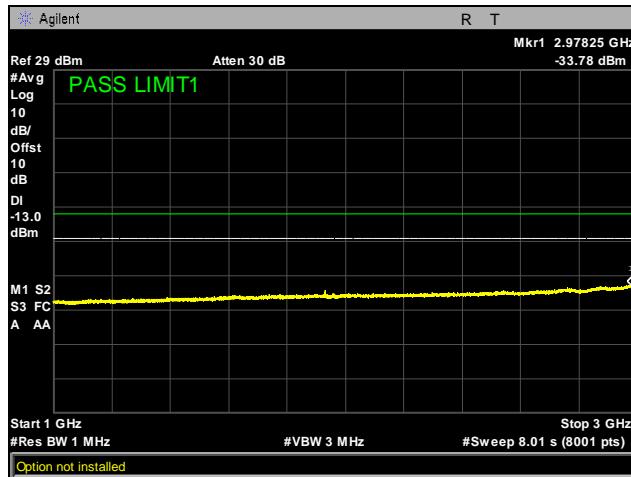
Plot 27. Conducted Spurious Emissions, Beacon Radio, Mid Channel, 3 GHz – 6 GHz



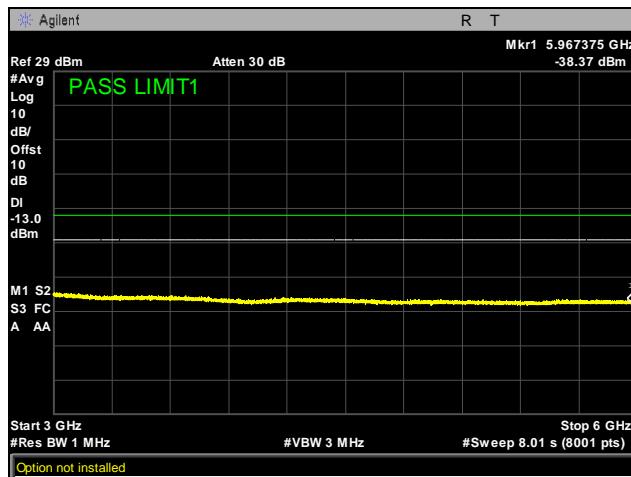
Plot 28. Conducted Spurious Emissions, Beacon Radio, Mid Channel, 6 GHz – 10 GHz



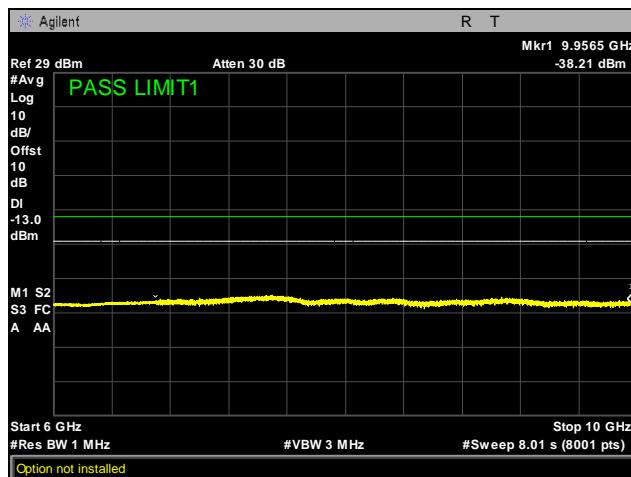
Plot 29. Conducted Spurious Emissions, Beacon Radio, High Channel, 30 MHz – 1 GHz



Plot 30. Conducted Spurious Emissions, Beacon Radio, High Channel, 1 GHz – 3 GHz



Plot 31. Conducted Spurious Emissions, Beacon Radio, High Channel, 3 GHz – 6 GHz



Plot 32. Conducted Spurious Emissions, Beacon Radio, High Channel, 6 GHz – 10 GHz



## Maximum Permissible Exposure

**RF Exposure Requirements:** **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

**RF Radiation Exposure Limit:** **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit: EUT's operating frequencies @ 862.6-867.9MHz; **Limit for Uncontrolled exposure: 1 mW/cm<sup>2</sup> or 10 W/m<sup>2</sup>**

Equation from page 18 of OET 65, Edition 97-01

$$S = PG / 4\pi R^2 \quad \text{or} \quad R = \sqrt{PG / 4\pi S}$$

where,   
S = Power Density (mW/cm<sup>2</sup>)  
P = Power Input to antenna (mW)  
G = Antenna Gain (numeric value)  
R = Distance (cm)

### Test Results:

FCC									
Frequency (MHz)	Con. Pwr. (dBm)	Con. Pwr. (mW)	Ant. Gain (dBi)	Ant. Gain numeric	Pwr. Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Margin	Distance (cm)	Result
882.9	5.95	3.936	0	1	0.00078	1	0.99922	20	Pass

The safe distance where Power Density is less than the MPE Limit listed above was found to be 20 cm.



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Test Equipment  
CFR Title 47 Part 90 Subpart S

## IV. Test Equipment



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Test Equipment  
CFR Title 47 Part 90 Subpart S

## Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4483	ANTENNA; HORN	ETS-LINDGREN	3117	10/08/2015	04/08/2017
1T4771	PSA SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	01/25/2015	07/25/2016
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY PROOF	81	NOT REQUIRED	
1T4300	SEMI-ANECHOIC CHAMBER # 1 (NSA)	EMC TEST SYSTEMS	NONE	02/06/2015	02/06/2018
1T4751	ANTENNA - BILOG	SUNOL SCIENCES	JB6	02/26/2016	08/26/2017
1T4409	EMI RECEIVER	ROHDE & SCHWARZ	ESIB7	10/29/2014	10/29/2016
1T4859	DIGITAL BAROMETER, HYGROMETER, THERMOMETER	CONTROL COMPANY	15-078-198, FB70423, 245CD	02/10/2016	02/10/2018
1T4505	TEMPERATURE CHAMBER	TESTEQUITY	115	2/11/2016	2/11/2017

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.



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Electromagnetic Compatibility  
End of Report  
CFR Title 47 Part 90 Subpart S

## End of Report