# Test Report

**Prepared for: Comprod Communications Ltd.**

**Model: BDA896940**

**Description: 30 dBm DBA 900 with MCU**

**Serial Number: 5F35567**

**FCC ID: WDM-BDA896940**

**To**

**FCC Part 20**

**Date of Issue: February 4, 2016**

| | |
|---|---|
| **On the behalf of the applicant:** | **Comprod Communications Ltd.**<br>**88 boul, Industriel**<br>**Boucherville, QB J4B 2X2**<br>**Canada** |
| **Attention of:** | **Jawad Abulnour, Engineer**<br>**Ph: (514)777-2892**<br>**E-Mail: jawad@comprodcom.com** |

**Prepared By**
**Compliance Testing, LLC**
**1724 S. Nevada Way**
**Mesa, AZ 85204**
**(480) 926-3100 phone / (480) 926-3598 fax**
**www.compliancetesting.com**
**Project No: p15a0020**

Greg Corbin

**Greg Corbin**
**Project Test Engineer**

**Test Report Revision History**

| Revision | Date | Revised By | Reason for Revision |
|---|---|---|---|
| 1.0 | February 2, 2016 | Greg Corbin | Original Document |
| | | | |
| | | | |
| | | | |

## Table of Contents

## 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 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**

ilac-MRA
ACCREDITED
TESTING CERT
#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 the 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 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.

**Test and Measurement Data**

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, KDB 935210 D05 Indus Booster Basic Measurements v01 and FCC Part 2, Part 20.21.

**Standard Test Conditions and Engineering Practices**

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

In accordance with ANSI/TIA 603C, 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 specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

| Environmental Conditions | | |
|---|---|---|
| **Temp (ºC)** | **Humidity (%)** | **Pressure (mbar)** |
| 18.8 – 22.1 | 27.8 – 45.7 | 956.8 – 981.6 |

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

**Model:** BDA896940
**Description:** 30 dBm BDA 900 with MCU
**Firmware:** BDA RF GUI v1.02
**Serial Number:** 5F35567

**Additional Information:**
The EUT is classified as a Part 20 (CMRS 90-S) **Class B** industrial signal booster.

The EUT is a Bi-directional Amplifier that operates from 896 - 901 MHz (Uplink, Mobile to Base) and 935 - 940 MHz (Downlink, Base to Mobile).

System Power is 120 VAC @ 60 Hz.

**EUT Operation during Tests**

The EUT was tested under normal operating conditions with the gain control attenuators set to 0 dB for all measurements.

30 dB, 50 watt attenuators were installed on both RF ports for all tests.

The following emission designators listed are representative emission designators used by transmitters whose signal is amplified by this booster.

| Frequency (MHz) | Emission Designators |
|---|---|
| 896 – 901<br>935 - 940 | F3E, G1D, G1E, G7W |

**Accessories:** None

**Cables:**

| Qty | Description | Length (M) | Shielding Y/N | Shielded Hood Y/N | Termination |
|---|---|---|---|---|---|
| 1 | AC Power Cable | 2 | N | N | N/A |

**Modifications:** None

**EUT Operation during Tests**

**AGC Threshold**

Several tests reference the AGC Threshold level.
The AGC Threshold was measured as follows:

- Connect a signal generator to the input of the EUT.
- Connect a spectrum analyzer to the output of the EUT using appropriate attenuation.
- Use a CW signal.
- While monitoring the output of the EUT, increase the input level until the output stops increasing or drops a few $10^{th}$'s of a dB.
- This is the AGC threshold level of the EUT.
- When the procedure calls out to set the RF Input to just below the AGC Threshold, The AGC Threshold is measured using the procedure listed above, and then the RF Input is backed off 0.2 dB below this threshold level.

**Test Result Summary**

| Specification | Test Name | Pass, Fail, N/A | Comments |
|---|---|---|---|
| 935210 D05 | AGC Threshold | Pass | |
| 935210 D05 | Out-of-Band Rejection | Pass | |
| 935210 D05 | Input-Versus-Output Signal Comparison | Pass | |
| 935210 D05 | Mean Output Power and Amplifier gain | Pass | |
| 935210 D05 | Out-Of-Band/Block Emissions Conducted | Pass | |
| 935210 D05 | Spurious Emissions Conducted | Pass | |
| 935210 D05 | Frequency Stability | N/A | Does not have Frequency translation |
| 935210 D05 | Spurious Emissions Radiated | Pass | |

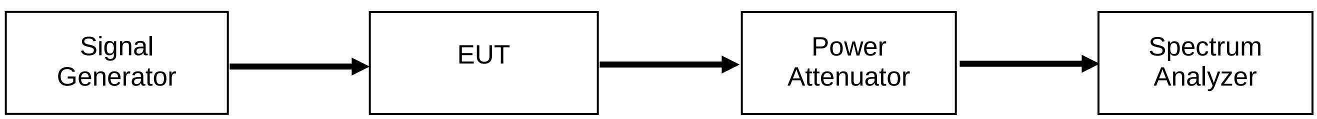
**AGC Threshold**
**Engineer:** Greg Corbin
**Test Date:** 1/27/2016

**Test Procedure**

A signal generator was connected to the input of the EUT. A spectrum analyzer was connected to the EUT in order to monitor the output power levels. The Signal Generator was configured to produce the necessary broadband and narrow band signals. The input power level was increase in 1 dB increments until the power no longer increased. The input levels were recorded in the table below.

Spectrum Analyzer settings
Power Channel integration
RBW = 1-5% of EBW
Video BW = 3x RBW

**Test Setup**




| Frequency Band (MHz) | Tuned Frequency (MHz) | Signal Type | AGC Threshold (dBm) |
|---|---|---|---|
| 896 - 901 | 898.6 | AWGN | -50.1 |
| 896 - 901 | 898.6 | GSM | -50.4 |
| 935 - 940 | 937.6 | AWGN | -49.5 |
| 935 - 940 | 937.6 | GSM | -49.5 |

**Out-Of-Band Rejection**
**Engineer:** Greg Corbin
**Test Date:** 1/27/2016

## Test Procedure

The test equipment was set with the following parameters:

*Signal Generator:*

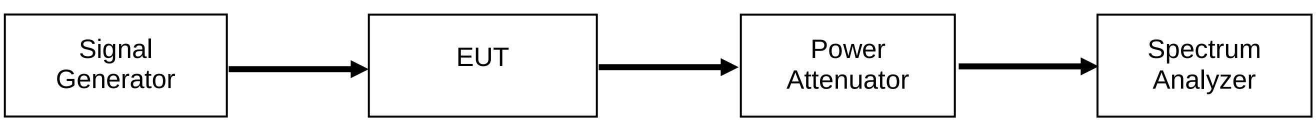
CW Signal
Dwell time = approx. 10 ms
Frequency range = ± 250 % of the passband from the center of the passband.

*Spectrum analyzer:*

Span ± 250 % of the passband from the center of the passband
Level = a sufficient level to affirm that the out-of-band rejection is > 20 dB above the noise floor
Number of points = SPAN/(RBW/2)
RBW 1 % to 5 % of the passband
VBW to ≥ 3 × RBW
Peak detector with Max Hold

**Procedure:**
The peak of the frequency response was found and recorded below as $f_0$.
Two markers we placed at the −20 dB down amplitude point to determine the 20 dB bandwidth. The Band Pass width was recorded below:

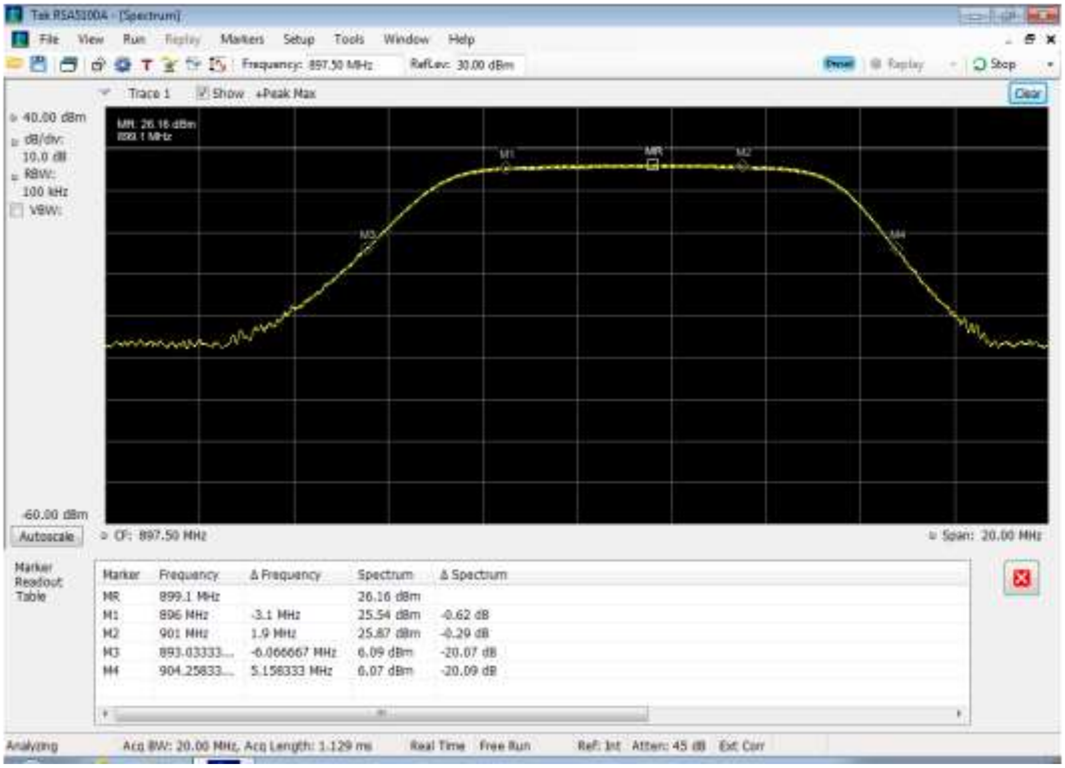
## Test Setup



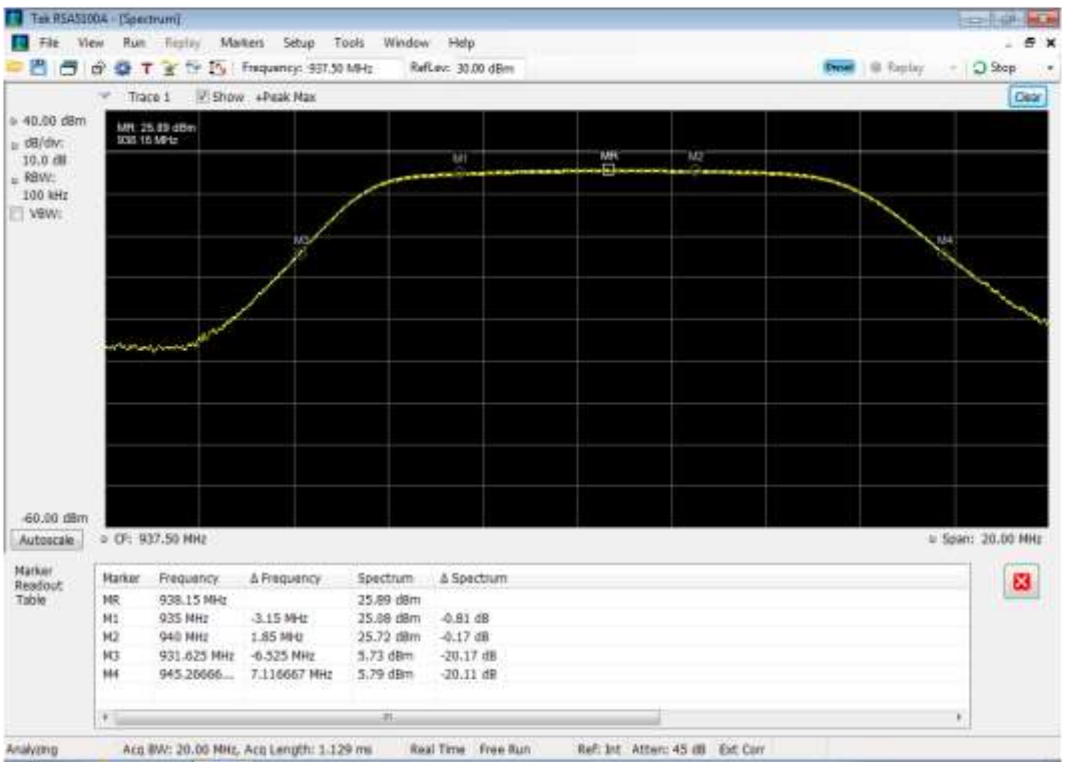

## Out of Band Rejection Test Data

| Frequency Band (MHz) | $f_0$ (MHz) | Band Pass Width (MHz) |
|---|---|---|
| 896 - 901 | 899.1 | 11.224 |
| 935 - 940 | 938.15 | 13.641 |

**896 – 901 MHz**




**935 – 940 MHz**



**Input-Versus-Output Signal Comparison**
**Engineer:** Greg Corbin
**Test Date:** 1/28/2016

## Test Procedure

A signal generator was connected to the input of the EUT and was configured to transmit an AWGN signal. The amplitude was set to be just below the AGC threshold level but not more than 0.5 dB.

Spectrum analyzer setting:

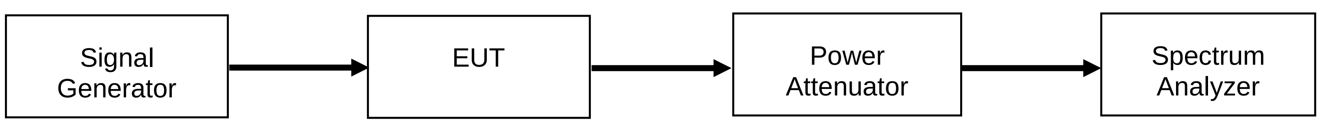
Span 2 times to 5 times the EBW or alternatively the OBW.
Frequency set to the center frequency of the operational band under test.
RBW to 1% to 5 % of the anticipated OBW
VBW ≥ 3 × RBW
Reference Level 10 log (OBW / RBW) below the reference level
Positive Peak Detector
Max Hold

The -26dB bandwidth was compared between the input and the output of the EUT.

The input level was then increased by 3 dB above and the comparison repeated.

The tests were repeated with a GSM test signal.

## Test Setup




**Refer to Annex A for Input vs Output test results.**

**Mean Output Power and Amplifier Gain**
**Engineer:** Greg Corbin
**Test Date:** 1/28/2016

### Test Procedure

A signal generator was connected to the input of the EUT. A spectrum analyzer was connected to the EUT in order to monitor the output power levels. The Signal Generator was configured to produce the necessary broadband and narrow band signals. The input power level was increase in 1 dB increments until the power no longer increased. The input and output levels were recorded in the table below. The amplifier gain was determined from the delta between the input and output levels.

Spectrum Analyzer settings
Power Channel integration
RBW = 1-5% of EBW
Video BW = 3x RBW

### Test Setup


### Output Power and Gain Test REsults

| Frequency Band (MHz) | Modulation | Tuned Frequency (MHz) | Input Power (dBm) | Output Power (dBm) | Gain (dB) | Output Power (Pin + 3 dB) (dBm) |
|---|---|---|---|---|---|---|
| 896 – 901 | AWGN | 938.15 | -50.1 | 28.6 | 78.7 | 29.0 |
| 896 – 901 | GSM | 938.15 | -50.4 | 29.2 | 79.6 | 29.1 |
| 935 – 940 | AWGN | 899.1 | -49.5 | 29.0 | 78.5 | 29.4 |
| 935 - 940 | GSM | 899.1 | -49.5 | 29.2 | 78.7 | 29.2 |

**Out-Of-Band/Block Emission**
**Engineer:** Greg Corbin
**Test Date:** 1/28/2016

## Test Procedure

A signal generator connected to the input of the EUT was configured to produce two modulated carriers simultaneously. The center frequencies used were set to the lowest band edge and then to the highest band edge of each applicable band. The input power level was set to just below the AGC threshold but not more than 0.5dB. The composite power was measured using the procedures provided in KDB 971168.

This test is performed using AWGN and GSM modulated carriers.

Note: KDB 935210 D05 states that the test does not need to be performed with the AWGN modulation if the passband is too narrow to accommodate 2 AWGN carriers. The passband of 5 MHz is to narrow for AWGN carriers whose passband is 4.2 MHz each.

This test was performed using 2 GSM modulated carriers only for the dual carrier portion of the test.

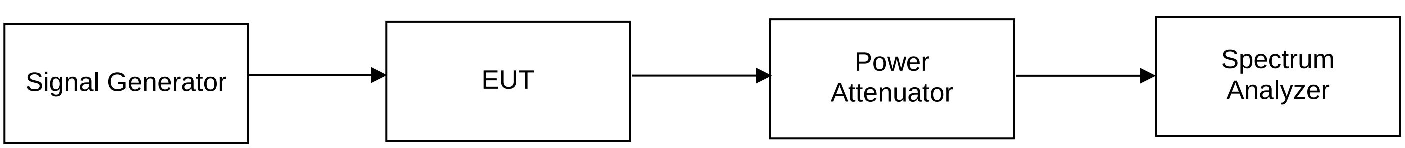
The test was repeated using a single carrier test signal per KDB 935210 D05 v01.

The signal amplitudes were set to equal levels using signal generator offsets.
The signal level inputs were increased until the EUT output stopped increasing.
The input power was recorded.
The lower and upper band edges were recorded per KDB 935210 D05 v01..
The input power was increased 3 dB and the lower and upper band edges were recorded again.

The spectrum analyzer was set with the following parameters
RBW = 1 % of the emission bandwidth, 100 kHz, or 1 MHz
VBW = 3 × RBW
Average power detector
Sweep time = auto-couple
Trace average at least 100 traces in power averaging

Start frequency was set to the upper block edge frequency and the stop frequency to the upper block edge frequency plus 300 kHz or 3 MHz for frequencies below and above 1 GHz, respectively. The traces were captured and recorded. The input level was increased by 3dB and recorded again. This was repeated for all carriers being used with the EUT. The stop frequency was then set to the lower block edge and the start frequency set to 300 kHz or 3 MHz for frequencies below and above 1 GHz respectively. This was repeated for all carriers being used with the EUT. This was applied to all bands being used with the EUT.

## Test Setup




**Refer to Annex B for Out-Of-Band/Block Emission (Dual Carrier) and (Single Carrier)**

**Conducted Spurious Emissions**
**Engineer:** Greg Corbin
**Test Date:** 1/28/2016

### Test Procedure

A signal generator was connected to the input of the EUT which was configured to produce one modulated AWGN carrier. The center frequencies was set to the lowest available frequency within the band and then to the highest possible frequency in the band. The input power level was set to just below the AGC threshold but not more than 0.5dB.

The spectrum analyzer was set with the following parameters:

RBW = 1 % of the emission bandwidth, 100 kHz, or 1 MHz
VBW = 3 × RBW.
Detector to power averaging (rms)
Sweep time = auto-couple
Number of points ≥ (2 × span/RBW)
Trace average at least 10 traces in power averaging mode

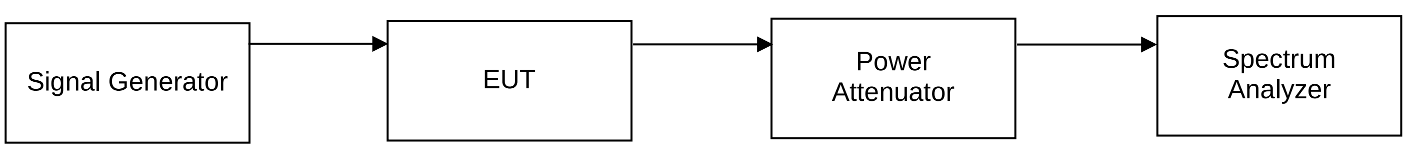
The start frequency was set to the lowest radio frequency signal generated in the equipment, without going below 9 kHz, and the stop frequency to the lower band/block edge frequency minus 100 kHz or 1 MHz, as specified in the applicable rule part.

The start frequency was set to the upper band/block edge frequency plus 100 kHz or 1 MHz, as specified in the applicable rule part and the analyzer stop frequency to 10 times the highest frequency of the fundamental emission

The test was repeated with GSM test signals.

The traces were captured and recorded.

### Test Setup




**Refer to Annex C for Conducted Spurious Emission Test Results**

**Radiated Spurious Emissions**
**Engineer:** Greg Corbin
**Test Date:** 2/1/2016

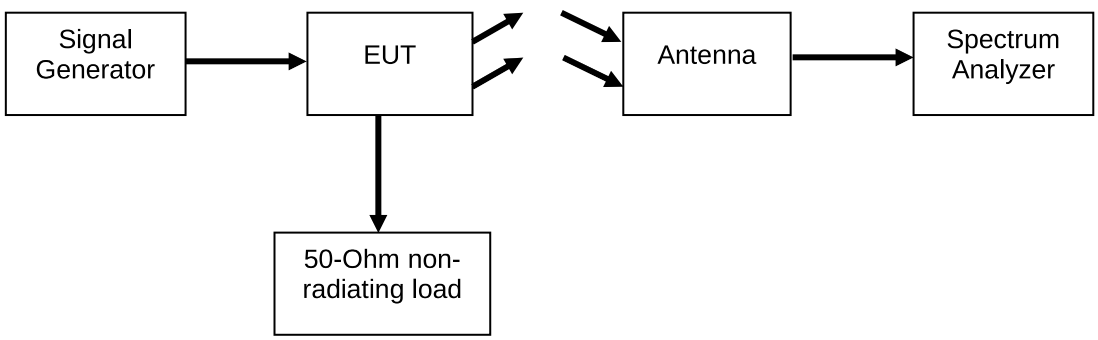
**Test Procedure**

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 antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized. All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm. A signal generator was used to provide a CW signal. The EUT output was terminated into a 50 Ohm non-radiating load.

The RBW was set to 100 kHz for measurements below 1 GHz and 1 MHz for measurements above 1 GHz.
The VBW was set to 3 times the RBW.

The following formula was used for calculating the limits:
Radiated Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13dBm

**Test Setup**




**Refer to Annex D for Radiated Spurious Emission test results.**

**Test Equipment Utilized**

| Description | Manufacturer | Model # | CT Asset # | Last Cal Date | Cal Due Date |
|---|---|---|---|---|---|
| Horn Antenna, Amplified | ARA | DRG-118/A | i00271 | 5/8/14 | 5/8/16 |
| Humidity / Temp Meter | Newport | IBTHX-W-5 | i00282 | 4/1/15 | 4/1/16 |
| Bi-Log Antenna | Schaffner | CBL 6111D | i00349 | 10/19/15 | 10/19/17 |
| EMI Analyzer | Agilent | E7405A | i00379 | 2/5/15 | 2/5/16 |
| Signal Generator | Rohde & Schwarz | SMU200A | i00405 | 1/22/16 | 1/22/17 |
| Spectrum Analyzer | Textronix | RSA5126A | i00424 | 3/12/15 | 3/12/16 |
| 3 Meter Semi-Anechoic Chamber | Panashield | 3 Meter Semi-Anechoic Chamber | i00428 | 7/27/14 | 7/27/16 |
| Noise Figure Meter | HP | 8970B | i00444 | 8/13/15 | 8/13/16 |
| Noise Source | HP | 346A | i00445 | 8/13/15 | 8/13/16 |

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